Agilent PXT Wireless Communications Test Set (E6621A)

User's Guide

Agilent Technologies

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This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Manual Part Number

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Electrical Rating

100-240 VAC, 50/60 Hz, 260 W max.

This instrument has an auto-ranging line voltage input, ensure the supply voltage is within the specified range.

WARNING	This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

WARNING	No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

WARNING	For continued protection against fire hazard, replace fuses, and or circuit breakers only with same type and ratings. The use of other fuses, circuit breakers or materials is prohibited.

CAUTION	The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure, to ensure adequate earth grounding by not using the correct components may cause product damage, and serious injury.

CAUTION	This product is designed for use in Installation Category II and Pollution Degree 2, per IEC 61010 Second Edition and 664 respectively.

Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, Agilent Technologies will, at its option, either repair or replace products that prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies. Buyer shall prepay shipping charges to Agilent Technologies. Agilent Technologies shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent Technologies from another country.

Where to Find the Latest Information

Agilent will periodically update product documentation. For the latest information about this wireless test set, including software upgrades, operating and application information, and product and accessory information, see the following URL: http://www.agilent.com/find/pxt

Is your product software up-to-date?

Agilent will periodically release software updates to fix known defects and incorporate product enhancements. To search for software updates for your product, go to the Agilent Technical Support website at

http://www.agilent.com/find/softwaremanager

IMPORTANT	An active N6050AS software and technical support contract (STSC) is required to access the software manager website (displayed above), together with the login credentials registered by you or your company for activation. See the "Redeem Your Entitlement Certificate" section in the ***Agilent PXT Wireless Communications Test Set Getting Started Guide*** for instructions to activate your STSC.

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1 Introduction

Welcome to the ***User's Guide*** for the Agilent E6621A PXT Wireless Communications Test Set (PXT). The purpose of this guide is to provide you with what you need to know after you have finished performing the setup procedures described in the *Getting Started Guide*, that you received with your test set. It also provides key menu descriptions, measurement examples, LTE concepts, and where you can go to get additional help information.

Your test set will help you meet your stringent time-to-market schedules and design quality goals. From protocol development through RF conformance and interoperability testing, the PXT is a powerful, scalable user equipment (UE) test platform. The advanced capabilities of the PXT include real-time, system-rate network and base station emulation. The test set also provides bench-top network emulation for quick and easy UE application and performance testing. Downlink MIMO, RF measurements and end-to-end IP data connections are just a few of the many features that will make your UE development process more efficient and successful.

This User's Guide documents all functions available for the instrument. Menu functions which require an option you have not selected are grayed out.

Agilent E6621A PXT Overview

The Agilent E6621A PXT is designed to test and analyze the performance and signaling of LTE UEs based on the 3GPP standard. The PXT has two operating modes:

Figure 1-1: Agilent E6621A PXT Wireless Communications Test Set

Base Station Emulator (BSE)

In BSE mode, the PXT simulates the operation of an LTE eNodeB, for use in the development and test of LTE UEs. In this mode, you can setup a call, establish a link, and transmit data.

Signal Analyzer (SA)

In Signal Analyzer (SA) mode, the PXT can be used to analyze LTE signals using modulation and spectrum analysis. The Modulation Analysis mode displays the constellation and modulation errors of the signal. The Spectrum Analysis functionality, implemented using a Fast Fourier Transform (FFT) algorithm, displays the measured LTE signal in the frequency domain.

General Capabilities of the Agilent E6621A PXT

- Frequency Division Duplex (FDD) and Time Division Duplex (TDD) options
- Real-time 3GPP LTE downlink (DL) signal modulation and uplink (UL) demodulation
- eNodeB simulation with L1, L2 and L3 protocol stack
- Settable eNodeB, UE, and network operation parameters
- Settable frequency, power and modulation schemes
- SISO and MIMO testing capabilities

General Specifications

Environmental

Operating Temperature:

Location	Maximum Ambient Temperature
Rack Mount	35° C
Table Top	45° C

Storage Temperature: -20° C to +70° C

Altitude: 2000 meters (maximum)

Humidity: Maximum relative humidity is 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C

This product is designed for indoor use, only.

Physical Specifications

Weight: 27.6 Kg max (depending on product option)

Dimensions: 222 H x 444 W x 600 D mm nominal

Power Requirements

Input Voltage Range: 100 to 240 VAC, automatic selection

Input Frequency Range: 50/60Hz

Input Current Rating: 5A @ 240 VAC (maximum)

7A @ 100 VAC (maximum)

WARNING	This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited. (IEC 348 clauses 17.3.3c & 17.3.4)

CAUTION	This instrument has an auto-ranging line voltage input. Ensure the supply voltage is within the specified range. When installing the product in a cabinet the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4° C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used. It is your responsibility to ensure the ambient temperature does not exceed the rated ambient temperature stated in the specification.

PXT Software Applications

Agilent N6050A LTE Mobile Test Software

This software application comes installed as a standard product on the PXT. It is the basis for all UE testing. N6050A-7FP provides LTE-FDD base station emulation and N6050A-8FP provides LTE-TDD base station emulation.

Agilent N6051A LTE RF Parametric Test with Test Mode Signaling

This software application is useful for RF design. It is installed in the PXT and includes a suite of LTE RF measurements that are used for characterization, calibration, and verification purposes, available while on a connection. This software application is optional.

Agilent N6052A LTE Functional and Application Test

This software application enables the PXT to provide a controlled environment where you can verify network attach, idle and connected mode operation and functional performance such as throughput. Maximum flexibility makes it possible for you to configure a range of connection and network parameters where you can test, stress, and debug the protocol and data handling capabilities of designs including DL 2x2 MIMO and handovers. This software application is optional.

Agilent N6061A Protocol Logging and Analysis

This application software is developed for use on systems running the Microsoft (MS) Windows XP or Windows 7 operating systems. It displays and stores protocol and event logs of Agilent E6621A PXT. The stored log files can be replayed and analyzed using this software and other advanced post-processing tools. Please consult the *Agilent LTE Protocol Logging and Analysis User's Guide* for more information.

Agilent N6062A Protocol Message Editor

This software application is developed for use on systems running the MS Windows XP or Windows 7 operating systems. The N6062A provides the ability to define RRC/NAS messages and event-driven scenarios which can be utilized during the Base Station Emulator (BSE) operating mode of the Agilent E6621A PXT. Please consult the *Agilent LTE Message Editor User's Guide* for more information.

Agilent N6070A series Signaling Conformance Test solution

The N6070A series Signaling Conformance Test solution verifies the protocol characteristics of LTE UEs. It provides a standards-based and flexible development environment for the LTE protocol stack development, regression test, pre-conformance and conformance. The system uses the Agilent E6621A PXT with TTCN-3 test scripts released from ETSI. Please consult the *Agilent N6070 Series Signaling Conformance Test User's Guide* for more information.

Latest Documentation

For the latest documentation on the above products, please go to www.agilent.com/find/pxt.

Latest Software Application Release

For the latest release of all PXT related software, please go to http://www.agilent.com/find/softwaremanager. See "Upgrading Your Instrument Software" for installation instructions.

IMPORTANT	An active N6050AS Software and Technical Support Contract (STSC) is required to access the software manager website (displayed above), together with the login credentials registered by you or your company for activation. See the "Redeem Your Entitlement Certificate" section in the ***Agilent PXT Wireless Communications Test Set Getting Started Guide*** for instructions to activate your STSC.

Software and Technical Support Contracts

Software and Technical Support Contracts (STSC) entitle you to software updates and feature enhancements, as well as direct access to a technical expert for technical support for a fixed period, usually one year.

The STSC gives you direct access to technical product experts to increase your productivity and minimize the software difficulties you encounter. These technical support engineers are experts on the N6070A series Signaling Conformance Test solution, the E6621A PXT test set, and its complementary software products. They have instant access to instruments and software to enable them to resolve your issues as quickly as possible. Agilent will investigate all software defects and operational problems reported through the technical support channel. Upon completion of the investigation, we will advise you on possible solutions and functional alternatives. Where possible, Agilent will provide software releases to address problems caused by defects in the firmware or software.

STSCs for the Agilent E6621A PXT

The N6050AS STSC covers the N6050A, N6051A and N6052A software applications running on the E6621A PXT wireless communications test set, plus the associated N6061A and N6062A PC software applications.

For more information on how to access technical support, refer to the section in the manual entitle, *Software and Technical Support Contracts*.

2 Front-panel and Menu Keys

This chapter outlines the front-panel key menus for the E6621A PXT in the Base Station Emulator mode. All front-panel keys are listed in alphabetical order. All other keys (menu keys) are listed in the order they appear in their menu (that is, not in alphabetical order).

Please note the following while reading this chapter:

- When discussing key paths within tables or text, front-panel keys are represented in bold; menu keys appear in bold, italics.
- To determine the hierarchy of the keys, refer to the bookmarks in the PDF by selecting View > Navigation Panels > Bookmarks.
- If the Mode row in the menu key parameter table does not specify FDD or TDD, then it is available in both modulation formats.
- All front-panel keys associated with the SA mode are discussed in chapter 7, RF Measurements.

Amp

(Amplitude) This front-panel key activates the following menu of keys.

Amplitude

RF1 Amplitude

RF2 Amplitude

RF1 Output Power Offset

RF2 Output Power Offset

Key Path: Front-panel key

Amplitude

Sets the RF1/RF2 power level(s) in dBm.

This amplitude level represents the integrated power level, assuming all resource elements in the bandwidth are occupied. It is sometimes called Channel BW Power (see 36.521-1 Appendix C.0) and, when doing sensitivity testing, is equivalent to the concept of $P_{REFSENS}$ (see chapter 7 of 36.521-1).

In order to determine the true Reference Signal Receive Power (RSRP), it is necessary to take into consideration the actual number of occupied resource elements in the bandwidth.

NOTE	The PXT calculates the RSTP for you. See the RF1 Amplitude (RSTP) and RF2 Amplitude (RSTP) menu keys.

Because reference signals are always transmitted and RSRP = Reference Signal Transmit Power (RSTP) when the path loss is 0, the equation below is always true:

$$\text{RSTP power level} = \text{PXT Amplitude} - 10\log_{10}(\text{number of resource elements in the cell bandwidth})$$

For example: If the BW = 10 MHz:

$$\text{RSTP power level} = \text{PXT Amplitude} - 10\log_{10}(600)$$

$$= \text{PXT Amplitude} - 27.8$$

Bandwidth	Number of Resource Elements in Bandwidth
5	300
10	600
20	1200

RSRP is defined in 3GPP TS 36.133, section 9.1.4.

For more information on RSRP, see the **Meas** > ***Information*** key description on page 62.

For more information on how power level settings can affect the ability for the UE to connect, see UE is Not Connecting.

Mode	BSE. SA
Range	–120 dBm to +10 dBm
Preset	–57 dBm
State Saved	Yes
Dependencies and/or Couplings	Coupled to RF1/RF2 Amplitude
Initial S/W Revision	6.0
Key Path	**Amp**

RF1 Amplitude

Sets the output power level in dBm for RF1.

NOTE	The specified output power for the PXT is –110 dBm to –10 dBm.

Mode	BSE. SA
Range	–120 dBm to +10 dBm
Preset	–57 dBm
State Saved	Yes
Dependencies and/or Couplings	Coupled to RF1 Amplitude (RSTP)
Initial S/W Revision	6.0
Key Path	**Amp**

RF2 Amplitude

Sets the output power level in dBm for RF2.

NOTE	The specified output power for the PXT is –110 dBm to –10 dBm.

Mode	BSE. SA
Range	–120 dBm to +10 dBm
Preset	–57 dBm
State Saved	Yes
Dependencies and/or Couplings	Coupled to RF2 Amplitude (RSTP)
Initial S/W Revision	6.0
Key Path	**Amp**

RF1 Amplitude (RSTP)

The value displayed on this menu key is read-only and is the RF1 amplitude expressed as an RSTP power level determined by the following equation:

RSTP = Cell Power – 10 $\log_{10}$ (number of subcarriers in the bandwidth)

Mode	BSE. SA
Range	–150.79 dBm (for 20MHz Channel Bandwidth) to –14.77 dBm (for 5MHz)
Preset	– 84.78 dBm
State Saved	Yes
Dependencies and/or Couplings	Read-only key dependent upon cell power and number of subcarriers in the bandwidth.
Initial S/W Revision	6.3
Key Path	**Amp**

RF2 Amplitude (RSTP)

The value displayed on this menu key is read-only and is the RF2 amplitude expressed as an RSTP power level determined by the following equation:

RSTP = Cell Power – 10 $\log_{10}$ (number of sub-carriers in the bandwidth)

Mode	BSE. SA
Range	–150.79 dBm (for 20MHz Channel Bandwidth) to –14.77 dBm (for 5MHz)
Preset	–84 78 dBm
State Saved	Yes
Dependencies and/or Couplings	Read-only key dependent upon cell power and number of subcarriers in the bandwidth.
Initial S/W Revision	6.3
Key Path	**Amp**

AWGN

AWGN, also referred to as N_{oc}, in 3GPP specifications, is defined as the power spectral density of a white noise source (average power per resource element (RE) normalized to the subcarrier spacing), simulating interference from cells, as measured at the UE antenna connector.

Note that the AWGN is determined by using a signal to noise ratio relative to the cell power.

IMPORTANT	You can change the cell power level without changing AWGN settings, enabling you to maintain a constant signal to noise ratio, when required.

This menu key enables you to access the following functions:

Apply AWGN

Signal to Noise Ratio (RF1)

Signal to Noise Ratio (RF2)

Noc (RF1)

Noc (RF2)

Noise Amplitude (RF1)

Noise Amplitude (RF2)

AWGN MIMO Channel Mode

Mode	BSE, SA
Dependencies and/or Couplings	AWGN is determined by using a signal to noise ratio relative to the cell power and is therefore dependent upon the cell power.
Initial S/W Revision	6.3
Key Path	**Amp**

Apply AWGN

On: Applies AWGN to the signal.

Off: Turns off AWGN.

Mode	BSE, SA
Range	On | Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**Amp** > **AWGN**

Signal to Noise Ratio (RF1)

Specifies the desired signal to noise ratio for antenna port 1. Using the current amplitude, this value determines the power level of AWGN applied to the signal.

Mode	BSE, SA
Range	–10 to +30
Preset	0
Initial S/W Revision	6.3
Key Path	**Amp** > **AWGN**

Signal to Noise Ratio (RF2)

Specifies the desired signal to noise ratio for antenna port 2.This value is based on the current amplitude and sets the power level of AWGN.

Mode	BSE, SA
Range	–10 to +30
Preset	0
Initial S/W Revision	6.3
Key Path	**Amp** > **AWGN**

N_{oc} (RF1)

Displays the resultant value of AWGN power level relative to a single resource element (as described in 3GPP 36.521-1) for RF port 1. This is the power level of AWGN relative to a single resource element given the SNR RF1 and cell power setting.

NOTE	Most of the RF conformance tests are expected to use N_{oc} (AWGN) = -98 [dBm/15kHz] where the bandwidth is set equal to the serving cell channel bandwidth profile.

Mode	BSE, SA
Value	= Noise Amplitude (RF1) – 10 $\log_{10}$(Number Resource Elements in Bandwidth)
Dependencies and/or Couplings	Read-only key
Initial S/W Revision	6.3
Key Path	**Amp** > **AWGN**

N_{oc} (RF2)

Displays the resultant value of AWGN power level relative to a single resource element (as described in 3GPP 36.521-1) for antenna port 2. This is the power level of AWGN relative to a single resource element, given the SNR RF2 and cell power setting.

NOTE	Most of the RF conformance tests are expected to use (AWGN) = –98 [dBm/15kHz] where the bandwidth is set equal to the serving cell channel bandwidth profile.

Mode	BSE, SA
Value	= Noise Amplitude (RF2) – 10 $\log_{10}$(Number Resource Elements in Bandwidth)
Dependencies and/or Couplings	Read-only key
Initial S/W Revision	6.3
Key Path	**Amp** > **AWGN**

Noise Amplitude (RF1)

Displays the AWGN power level of antenna port 1 as an integrated power level, which is the same terms used to set or display the total Cell power RF1 amplitude.

Mode	BSE. SA
Value	= RF1 Amplitude – Signal to Noise Ratio (RF1)
Preset	–57
Dependencies and/or Couplings	Read-only key.
Initial S/W Revision	6.3
Key Path	**Amp** > **AWGN**

Noise Amplitude (RF2)

Displays the AWGN power level of antenna port 2 as an integrated power level, which is the same terms used to set or display the total Cell power RF2 amplitude.

Mode	BSE, SA
Value	= RF1 Amplitude – Signal to Noise Ratio (RF2)
Preset	–57
Dependencies and/or Couplings	Read-only key
Initial S/W Revision	6.3
Key Path	**Amp** > **AWGN**

AWGN MIMO Channel Mode

Enables you to set the AWGN for a MIMO model or for a Normal model (not MIMO).

MIMO: Sets AWGN for both paths of the MIMO channel setup.

Normal: Sets AWGN for normal channel setup.

Mode	BSE, SA
Range	MIMO | Normal
Preset	Normal
Initial S/W Revision	6.3
Key Path	**Amp** > **AWGN**

RF1 Output Power Offset

Enables you to specify an amplitude offset to compensate for a gain or loss between the RF1 Output and the UE. For example: If there is a 40 dB loss, then set this value to +40 dB, thereby increasing the output power of the instrument by 40 dB. Refer to **Meas** > ***Information*** section (calculating RSRP/RSTP) on page 62 for more information.

NOTE	Maximum RF1 Output power is -10dBm.

Mode	BSE, SA
Range	–100 dB to +100 dB
Units	dB
Preset	0
Initial S/W Revision	6.0
Key Path	**Amp**

RF2 Output Power Offset

Enables you to specify an amplitude offset to compensate for a gain or loss between the RF2 Output and the UE. For example: If there is a 40 dB loss, then set this value to +40 dB, thereby increasing the output power of the instrument by 40 dB. Refer to **Meas** > ***Information*** section (calculating RSRP/RSTP) on page 62 for more information.

This setting is primarily used with testing MIMO configurations.

NOTE	Maximum RF2 Output power is -10dBm.

Mode	BSE, SA
Range	–100 dB to +100 dB
Units	dB
Preset	0
Initial S/W Revision	6.0
Key Path	**Amp**

Atten – Key Menu 1

(Attenuation) Accesses the settings that enable you to control the receiver level(s).

Ref Level

RF1 Ref Level

RF2 Ref Level

Attenuation

RF1 Input Attenuation

RF2 Input Attenuation

Key Path: Front-panel key

Ref Level

Sets the expected receiver level(s) for RF1.

Mode	BSE, SA
Range	–120 dBm to +50 dBm
Units	dBm
Initial S/W Revision	6.0
Key Path	**Atten**

CAUTION	If the reference (or attenuation) levels are incorrectly set, causing an overload condition, the red OVF warning indicator in the top right of the display illuminates. In this case, increase the reference level or attenuation until the warning indicator turns off.

NOTE	To ensure your measurement results are displayed correctly, compensate for external loss or gain by setting **Atten** > **More** > ***RF1 Input Power Offset***.

RF1 Ref Level

Sets the expected receiver level for RF1 when you wish to specify different values for RF1 and RF2 inputs. Otherwise, this value is set by pressing **Atten** > ***Ref Level***.

Mode	BSE. SA
Range	-120 dBm to +10 dBm
Preset	-57 dBm
State Saved	Yes for BSE mode. No for SA mode.
Initial S/W Revision	6.0
Key Path	**Atten**

RF2 Ref Level

This function is currently not available.

Mode	BSE. SA
Range	-120 dBm to +10 dBm
Preset	-57 dBm
State Saved	Yes for BSE mode. No for SA mode.
Initial S/W Revision	6.0
Key Path	**Atten**

Attenuation

Manual: Enables you to define the attenuation level(s) for RF1.

Auto: Enables the PXT to calculate and set the optimum attenuation value based on the reference level (and other internal parameters) set by pressing **Atten** > ***Ref Level***.

This menu key is coupled to **RF1 Input Attenuation** settings.

NOTE	To ensure your measurement results are displayed correctly, compensate for external loss or gain by setting **Atten** > **More** > ***RF1 Input Power Offset***.

For more information on how power level settings can affect the ability for the UE to connect, see UE is Not Connecting.

Mode	BSE, SA
Range	Auto | Manual
Preset	Auto
Initial S/W Revision	6.0
Key Path	**Atten**

RF1 Input Attenuation

Auto: Enables the PXT to use the value set for **Atten** > ***RF1 Ref Level*** to calculate the required input attenuation. Otherwise, this value is set by the ***Attenuation*** menu key.

Manual: Enables you to set the RF1 input attenuation value manually.

NOTE	1. Measurement results are not affected by this setting. To change the offset of your measurement results, use the **Atten** > ***RF1 Input Power Offset*** setting. 2. The maximum power level to this input is: 27 dBm (.5 Watts) 5VDC.

Mode	BSE, SA
Range	Auto | Manual
Preset	Auto
Initial S/W Revision	6.0
Key Path	**Atten**

RF2 Input Attenuation

This function is currently not available.

Atten – Key Menu 2

(Attenuation) Accesses the following settings that enable you to control how the results are displayed.

Scale/Div

RF1 Input Power Offset

RF2 Input Power Offset

Key Path: Front-panel key

Scale/Div

Sets the units per vertical graticule division on the display.

Mode	BSE, SA
Range	1 dB to 20 dB
Units	dB
Preset	10
Initial S/W Revision	6.0
Key Path	**Atten**

RF1 Input Power Offset

Enables you to enter a value to adjust the measurement results.

Enter a positive value to correct for a loss. For example: For 20dB of loss, enter +20dB.

NOTE	This setting does NOT adjust the input attenuation. You must set the attenuation by setting **Atten** > ***Attenuation*** to **Manual** and then setting **Atten** > ***RF1 Input Attenuation*** to the desired level**.**

Mode	BSE, SE
Range	–100 dB to +100 dB
Units	dB
Preset	0
Initial S/W Revision	6.0
Key Path	**Atten**

RF2 Input Power Offset

This function is currently not available.

BSE

In the Base Station Emulator (eNodeB emulation) mode, the PXT simulates an LTE eNodeB's operation for use in the development and test of LTE UEs. In this mode, you test the UE by setting up a call and establishing a link.

Key Path: Front-panel key (Note: You may have to press the **Mode** key to obtain the menu keys below.)

Emulator Mode

The eNodeB simulation starts and stops by pressing this menu key. If simulation has started, the instrument is ready to be connected with the UE. When simulation stops, the instrument transmits only default signals in the downlink and all the tests are frozen.

Key Path: **Mode** > **BSE**

Mode	BSE
Range	Run | Stop
Preset	Stop
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE**

Cell Selection

Sets the active cell to which all other cell settings pertain. This includes the loading of scenario files and the sending of any custom or other messages you initiate within the *N6062A Protocol Message Editor* software.

Key Path: **Mode** > **BSE**

Mode	BSE
Range	Acell | Bcell
Preset	Acell
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE**

Config

(Configuration) This front-panel key activates the following menu of functions:

External Sync

RF Setup

Network Setup

Cell Setup

Key Path: Front-panel key

External Sync

Accesses the ***SIB8 Force Sync*** key,

Mode	BSE
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Config**

SIB8 Force Sync

Pressing this key enables the following:

1. Resets the value of synchronousSystemTime inside the SIB8 message to the value specified in the scenario file.
2. Sends an external trigger signal at the beginning of the subframe to transmit this same SIB8 message containing the reset value.

NOTE	If you include an SIB8 message in the scenario file, the following occurs: • The synchronousSystemTime parameter increments by one with each transmission of SIB8. • The first transmission of SIB8 sends a trigger at the beginning of the subframe. This trigger signal replaces the frame trigger. • Frame triggering is disabled.

Mode	BSE
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Config** > ***External Sync***

RF Setup

Accesses the available parameters you can set to configure the RF in the BSE mode. Refer to RF Measurements section for more information on the menus below.

RF Input Control

RF Output Control

Ref. Clock Source

Key Path: **BSE** > **Config**

RF Input Control

This menu key activates the following menu of functions:

Input Mode

Input Source

RF Select

Ext Cell Select

Refer to RF Measurements section for more information on the menus below.

Key Path: **Config** > ***RF Setup***

Input Mode

Int: When set to internal, the front-panel inputs are active.

Ext: When set to external, the ***Input Source*** key is activated to enable selection from the rear panel inputs.

Mode	BSE, SA
Range	Int | Ext
Preset	Int
Initial S/W Revision	6.0
Key Path	**Config** > ***RF Setup*** > ***RF Input Control***

Input Source

IF: When set to IF, the uplink rear panel inputs accept IF signals.

IQ: When set to IQ, the uplink inputs accept analog IQ signals and the downlink analog IQ outputs and inputs are active.

Mode	BSE, SA
Range	IF | IQ
Preset	IF
Initial S/W Revision	6.0
Key Path	**Config** > ***RF Setup*** > ***RF Input Control***

RF Select

Sets RF port.

Key Path: **Config** > ***RF Setup*** > ***RF Input Control***

Ext Cell Select

Sets the cell (A or B) for which you are defining all parameters.

Mode	BSE, SA
Range	A-Cell | B-Cell
Preset	B-Cell
Initial S/W Revision	6.0
Key Path	**BSE** > **Config** > ***RF Setup*** > ***RF Input Control***

RF Output Control

This menu key activates the following menu of functions:

RF DL Output

RF1 Front Output

RF2 Front Output

Ext Cell Select

Refer to RF Measurements section for more information on the menus below.

Key Path: **BSE** > **Config** > ***RF Setup***

RF DL Output

Enables external processing of the IQ signals (for example: fading) before RF up-conversion takes place. There are four BNC outputs associated with this menu key: I1 OUTPUT, Q1 OUTPUT, I2 OUTPUT, and Q2 OUTPUT. The corresponding inputs are: I1 RETURN, Q1 RETURN, I2 RETURN, and Q2 RETURN.

Mode	BSE, SA
Range	Int | Ext
Preset	Int
Initial S/W Revision	6.0
Key Path	**BSE** > **Config** > ***RF Setup*** > ***RF Output Control***

RF1 Front Output

TRX: Indicates that the DL RF1 Output is present on the antenna port labeled RF1 Input/Output.

TX: Indicates that the DL RF1 Output is present on the antenna port labeled RF1 Output.

Mode	BSE, SA
Range	TRX | TX
Preset	TRX
Initial S/W Revision	6.0
Key Path	**BSE** > **Config** > ***RF Setup*** > ***RF Output Control***

RF2 Front Output

TRX: Currently not available because RF2 Input/Output is not available.

TX: Indicates that the DL RF2 Output is present on the antenna port labeled RF2 Output.

Mode	BSE, SA
Range	TRX | TX
Preset	TRX
Initial S/W Revision	6.0
Key Path	**BSE** > **Config** > ***RF Setup*** > ***RF Output Control***

Ext Cell Select

NOTE	You must select External, by pressing **BSE** > **Config** > ***RF Output Control*** > ***RF DL Output*** to enable the functionality of this key.

A-Cell: Enables external processing (for example: fading) of internally generated IQ signals, as described in RF DL Output, above.

B-Cell: Enables an external signal to be injected into B-Cell via the I/IF INPUT and Q/IF INPUT BNCs, where it is processed and pushed back out through the IQ OUTPUT BNCs.

Mode	BSE
Range	A-Cell | B-Cell
Preset	B-cell
Initial S/W Revision	Menu key present at 6.0. SCPI command introduced at 6.3
Key Path	**Config** > ***RF Setup*** > ***RF Output Control***

Ref. Clock Source

Auto enables the timing synch to come from external or internal (the E6621A PXT) sources. The blocks at the top-right of the display indicate external (EXT) or internal (INT) in yellow to show these conditions are met.

Internal sets the timing synch to come from inside the PXT. If you connect an external clock source, it will disregard it and continue to use the internal clock as the reference.

Key Path: **BSE** > **Config** > ***RF Setup***

Network Setup

This menu key accesses the topics that enable you to configure your network.

IP Setup

Remote Ctrl Setup

EPC Setup

Key Path: **BSE** > **Config**

IP Setup

Internet Protocol (IP) setup enables you to set the IP addresses for the following components.

IP

Netmask

Gateway

DNS

OK

All parameters set in this menu are persistent through an instrument power cycle.

Key Path: **BSE** > **Config** > ***Network Setup***

IP

Sets the PXT IP address.

The IP address is persistent through a power cycle of the PXT.

NOTE	IP address of the PXT is needed to connect to the *N6061A Protocol Logging and Analysis* tool, the *N6062A Protocol Message Editor* tool, the *N6070A Series Signaling Conformance Test* tool, and the E6621A Remote API DLL.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***IP Setup***

Netmask

This value is a 32-bit mask used to divide an IP address into subnets and specify the networks available hosts.

NOTE	The netmask IP address is needed to connect to the *N6061A Protocol Logging and Analysis* tool, the *N6062A Protocol Message Editor* tool, the *N6070A Series Signaling Conformance Test* tool, and the E6621A Remote API DLL.

This setting is persistent through an instrument power cycle.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***IP Setup***

Gateway

This IP address is that address for the computer or network that enables or controls access to the other computers or a network you are accessing. When you are doing end-to-end data, this is the address to which uplink data will be sent. It could be an application server or a router on your network.

NOTE	The gateway IP address is needed to connect to the *N6061A Protocol Logging and Analysis* tool, the *N6062A Protocol Message Editor* tool, the *N6070A Series Signaling Conformance Test* tool, and the E6621A Remote API DLL.

This setting is persistent through an instrument power cycle.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***IP Setup***

DNS

Directory Name Service (DNS)

Set this if you have a DNS on your network.

This setting is persistent through an instrument power cycle.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***IP Setup***

OK

After designating all the necessary IP addresses above, press this key to activate these settings. Changes to the IP configuration will not take effect until the **OK** key is pressed.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***IP Setup***

Remote Ctrl Setup

This key accesses the menus to configure remote control of the PXT using either .DLL or GPIB.

The settings in this menu are all persistent through an instrument power cycle.

Key Path: **BSE** > **Config** > ***Network Setup***

TCP/IP

Accesses the key menu that enables you to specify and activate TCP/IP port.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***Remote Control Setup***

Port

Specifies the port number used to control the PXT if remote control is to be performed over TCP/IP.

The port number specified here must match that used in the E6621_Connect command (one of the API commands supported by the E6621A Remote API DLL).

Key Path: **BSE** > **Config** > ***Network Setup*** > ***Remote Control Setup*** > ***TCP/IP***

Apply

Sets the port defined in Port above. Changes to the **Port** field will not take effect until the **Apply** key is pressed.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***Remote Control Setup*** > ***TCP/IP***

GPIB

Accesses the key menu that enables you to specify and activate the GPIB address.

This setting is persistent through an instrument power cycle.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***Remote Control Setup***

GPIB Address

Specifies the GPIB address used to control the PXT if remote control is to be performed over GPIB.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***Remote Control Setup*** > ***GPIB***

Apply

Sets the GPIB address defined above. Changes to the **GPIB Address** field will not take effect until the **Apply** key is pressed.

Key Path: **BSE** > **Config** > ***Network Setup*** > ***Remote Control Setup*** > ***GPIB***

Cell Setup

Accesses the menus enabling you to setup the following parameters:

A-Cell Ratio

B-Cell Ratio

SA Cell Selection

Key Path: **Config**

A-Cell Ratio

Selects the ratio in percent of the relative power allocated to A-cell compared to B-cell. For example, if A-cell is set to 80%, then B-cell is set to 20%.

Mode	BSE, SA
Range	0 to 100
Units	%
Preset	100%
Dependencies and/or Couplings	This setting is coupled to B-Cell Ratio.
Initial S/W Revision	6.0
Key Path	**Config** > ***Cell Setup***

B-Cell Ratio

Selects the ratio in percent of the relative power allocated to B-cell compared to A-cell. For example, if B-cell is set to 100%, then A-cell is set to 0%.

Mode	BSE, SA
Range	0 to 100
Units	%
Preset	0%
Dependencies and/or Couplings	This setting is coupled to A-Cell Ratio.
Initial S/W Revision	6.0
Key Path	**Config** > ***Cell Setup***

SA Cell Selection

Selects A-cell or B-cell as the target for performing RF measurements.

Key Path: **Config** > ***Cell Setup***

Cont

Sets the PXT for continuous measurement operation. The single/continuous state is only effective when you are in SA mode. If you are in Single mode, pressing **Cont** causes the measurement operation to resume.

Mode	SA
Initial S/W Revision	6.0
Key Path	Front-panel key

Freq – Key Menu 1

Accesses the menu enabling you to set the UL and DL frequencies.

Setting Method

Center (DL) Freq

Center (UL) Freq

Center (UL/DL) Freq

Band

DL EARFCN

UL EARFCN

UL/DL EARFCN

Key Path: Front-panel key

Setting Method

Enables you to select how you wish to set the Frequency.

EARFCN: When you select this option, the PXT frequency is determined by the values set using the Band menu key and those values entered for the EARFCN parameters. Refer to DL EARFCN, UL EARFCN, and UL/DL EARFCN for further clarification.

FREQ: Sets the PXT frequency based on the values set using the and Center (UL) Freq menu keys when **Tech** is set to **FDD**. The Center (UL/DL) Freq menu key is used to set the frequency when **Tech** is set to **TDD**.

NOTE	When changing **Setting Method** from **FREQ** to **EARFCN**, the frequency used by the PXT may change, depending upon the current settings of the EARFCN menu keys.

Mode	BSE
Range	EARFCN | FREQ
Preset	EARFCN
Initial S/W Revision	6.3
Key Path	**Freq**

Center (DL) Freq

Sets the DL center frequency to a value that is different from the UL.

Mode	BSE, SA, FDD
Range	350 MHz to 3 GHz or 6 GHz (Depends upon license.)
Units	Hz, kHz, MHz, GHz
Preset	FDD: 2.140 GHz TDD: None (grayed out)
Dependencies and/or Couplings	Frequency range depends on installed license. This key is grayed out when **Tech** is set to **TDD**.
Initial S/W Revision	6.0
License Type	E6621A-503 = 350 MHz to 3 GHz E6621A-506 = 350 MHz to 6 GHz
Key Path	**Freq**

Center (UL) Freq

Sets the UL center frequency to a value that is different from the DL.

Mode	BSE, SA, FDD
Range	350 MHz to 3 GHz or 6 GHz (Depends upon license.)
Units	Hz, KHz, MHz, GHz
Preset	FDD: 1.950 GHz TDD: None (grayed out)
Dependencies and/or Couplings	This key is grayed out when **Tech** is set to **TDD**. Frequency range depends on installed license.
Initial S/W Revision	6.0
License Type	E6621A-503 = 350 MHz to 3 GHz E6621A-506 = 350 MHz to 6 GHz
Key Path	Freq

Center (UL/DL) Freq

Sets the UL and DL center frequency to the same value.

Mode	BSE, SA, TDD
Range	350 MHz to 3 GHz or 6 GHz (Depends upon license.)
Units	Hz, KHz, MHz, GHz
Preset	TDD: 1.910 GHz
Dependencies and/or Couplings	This key is grayed out when **Tech** is set to **FDD.** Frequency range depends on installed license.
Initial S/W Revision	6.0
License Type	E6621A-503 = 350 MHz to 3 GHz E6621A-506 = 350 MHz to 6 GHz
Key Path	**Freq**

Band

When **Freq** > **Setting Method** is set to **EARFCN**, this menu key sets the frequency band transmitted in SIB1 based on the tables shown below:

Table of DL EARFCN Default Values for LTE Frequency Bands (FDD Only)

Table of UL EARFCN Default Values for LTE Frequency Bands (10 MHz cells -FDD Only)

Table of UL/DL EARFCN Default Values for LTE Frequency Bands (TDD Only)

When **Freq** > **Setting Method** is set to **FREQ**, this menu key sets the stored value(s) of the EARFCN(s) based on the tables referenced above.

It does not change the DL or UL frequency used by the PXT. The EARFCN values are immediately active when you switch back to **Setting Method** > **EARFCN**.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE, SA
Overwrites Scenario File Value	Yes
Range	FDD: 1 to 32 TDD: 33 to 64
Preset	FDD: 1 TDD: 33
Initial S/W Revision	6.3
Key Path	**Freq**

DL EARFCN

Sets the downlink EARFCN and uses the default separation for the selected frequency band as specified in the 3GPP test specification 36.101 section 5.7.4 to calculate the correct value of **UL EARFCN**. This setting automatically overwrites the **UL EARFCN** value and the **Center(DL)Freq** value.

Table of DL EARFCN Default Values for LTE Frequency Bands (FDD Only)

Parameter	Range	Default Value
DL EARFCN	25 – 575 (Band 1) 607 – 1193 (Band 2) 1207 – 1943 (Band 3) 1957 – 2393 (Band 4) 2407 – 2643 (Band 5) 2775 – 3425 (Band 7) 3457 – 3793 (Band 8) 3825 – 4125 (Band 9) 4175 – 4725 (Band 10) 4775 – 4925 (Band 11) 5017 – 5173 (Band 12) 5205 – 5255 (Band 13) 5305 – 5355 (Band 14) 5755 – 5825 (Band 17) 5875 – 5975 (Band 18) 6025 – 6125 (Band 19) 6175 – 6425 (Band 20) 6475 – 6575 (Band 21) 7525 – 7625 (Band 23) 7750 – 7989 (Band 24) 8090 – 8640 (Band 25)	300 (Band1) 900 (Band2) 1575 (Band3) 2175 (Band4) 2525 (Band5) 3100 (Band7) 3625 (Band8) 3975 (Band9) 4450 (Band10) 4850 (Band11) 5095 (Band 12) 5230 (Band 13) 5330 (Band 14) 5790 (Band 17) 5925 (Band 18) 6075 (Band 19) 6300 (Band 20) 6525 (Band 21) 7600 (Band 23) 7870 (Band 24) 8365 (Band 25)

Mode	BSE, SA, FDD
Range	25 to 7989
Preset	FDD: 300 TDD: None (grayed out)
Dependencies and/or Couplings	This key is grayed out when: • **Setting Method** is set to **FREQ** • **Tech** is set to TDD.
Initial S/W Revision	6.3
Key Path	**Freq**

UL EARFCN

Sets the uplink EARFCN.

The **UL EARFCN** can be set independently to the **DL EARFCN** (to enable different separations between DL and UL). Setting the **UL EARFCN** value has no effect on the **DL EARFCN** value. Setting the **UL EARFCN** (even if this is done automatically by setting a **DL EARFCN**) over-writes the **Center(UL)Freq** value.

Table of UL EARFCN Default Values for LTE Frequency Bands (10 MHz cells -FDD Only)

Parameter	Range	Default Value
UL EARFCN	18025 – 18575 (Band 1) 18607 – 19193 (Band 2) 19207 – 19943 (Band3) 19957 – 20393 (Band 4) 20407 – 20643 (Band5) 20775 – 21425 (Band 7) 21457 – 21793 (Band 8) 21825 – 22125 (Band 9) 22175 – 22725 (Band 10) 22775 – 22925 (Band 11) 23017 – 23173 (Band 12) 23205 – 23255 (Band 13) 23305 – 23355 (Band 14) 23755 – 23825 (Band 17) 23875 – 23975 (Band 18) 24025 – 24125 (Band 19) 24175 – 24425 (Band 20) 24475 – 24575 (Band 21) 25525 – 25675 (Band 23) 25750 – 25989 (Band 24) 26090 – 26640 (Band 25)	18300 (Band 1) 18900 (Band 2) 19575 (Band3) 20175 (Band 4) 20525 (Band5) 21100 (Band 7) 21625 (Band 8) 21975 (Band 9) 22450 (Band 10) 22850 (Band 11) 23095 (Band 12) 23230 (Band 13) 23330 (Band 14) 23790 (Band 17) 23925 (Band 18) 24075 (Band 19) 24300 (Band 20) 24525 (Band 21) 26365 (Band 23) 25870 (Band 24) 26365 (Band 25)

Mode	BSE, SA, FDD
Range	FDD: 18025 to 25989
Preset	FDD: 18300 TDD: None (grayed out)
Dependencies and/or Couplings	This key is grayed out when: • **Setting Method** is set to **FREQ** • **Tech** is set to TDD.
Initial S/W Revision	6.3
Key Path	**Freq**

UL/DL EARFCN

Sets the uplink and downlink EARFCN to the same value.

Table of UL/DL EARFCN Default Values for LTE Frequency Bands (TDD Only)

Parameter	Range	Default Value
UL/DL EARFCN	36025 – 36175 (Band 33)	36100 (Band 33)
	36225 – 36325 (Band 34)	36275 (Band 34)
	36357 – 36943 (Band 35)	36650 (Band 35)
	36957 – 37543 (Band 36)	37250 (Band 36)
	37575 – 37725 (Band 37)	37650 (Band 37)
	37775 – 38225 (Band 38)	38000 (Band 38)
	38275 – 38625 (Band 39)	38450 (Band 39)
	38675 – 39625 (Band 40)	39150 (Band 40)
	39675 – 41565 (Band 41)	40620 (Band 41)
	41615 – 43565 (Band 42)	42590 (Band 42)
	43615 – 45565 (Band 43)	44590 (Band 43)

Mode	BSE, SA, TDD
Range	36000 to 45565
Preset	39150
Dependencies and/or Couplings	This key is grayed out when: • **Setting Method** is set to **FREQ** • **Tech** is set to **FDD**
Initial S/W Revision	6.3
Key Path	**Freq**

Freq – Key Menu 2

Tab Step

Sets the incremental value that is added to the selected frequency type when you press the **INC** front-panel key. This key is located on the front-panel just above the right arrow key.

Mode	BSE, SA
Units	Hz, kHz, MHz
Preset	10 MHz
Initial S/W Revision	6.0
Key Path	**Freq > More**

Func - Key Menu 1

Accesses the menu enabling you to control the following:

DTCH Test

UE Power Control

Handover

UE Detach

Paging

Custom Messages

PDCCH Order

OCNG

Key Path: Front-panel key

DTCH Test

Dedicated Traffic Channel Test (DTCH) enables you to access functions that activate the DTCH test, manually control the data transfer, and set parameters to define the data throughput.

Key Path: **Func**

Test

You must have a connected call to turn on this DTCH test.

Mode	BSE
Range	Off | On
Preset	Off
Dependencies and/or Couplings	UE must be connected.
Initial S/W Revision	6.0
Key Path	**Mode >BSE > Func** > ***DTCH Test***

Manual Transfer

Pressing this key enables the PXT to send one packet to the UE.

IMPORTANT	You must set **Func > *DTCH Test*** > ***Parameter > Transfer Mode*** to **Manual**, to enable this function.

Mode	BSE
Dependencies and/or Couplings	UE must be connected.
Initial S/W Revision	6.0
Key Path	**Mode >BSE > Func** > ***DTCH Test***

Parameter (Key Menu 1)

Enables you to access parameter settings to define the data throughput.

Ipv4 Setting

UDP Setting

Subframe Interval

Transfer Mode

Transfer Rate

Format

Payload Type

Key Path: **Mode > BSE > Func** > ***DTCH Test***

Ipv4 Setting

The Internet Protocol version 4 (IPv4) setting enables you to set the source and destination address for this IP network protocol. This enables you to send "ping" packets to the UE.

To activate this function, you must select **IPv4** by pressing **Func** > ***DTCH Test*** > ***Parameter*** > ***Format*** until one of the IPv4 options is underlined.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter***

Source address

Sets the IPv4 source address.

NOTE	Do not use the remote command for this setting over the LAN, only via GPIB.

Mode	BSE
Preset	"0.0.0.0"
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Func** > ***DTCH Test*** > ***Parameter*** > ***IPv4 Setting***

Destination

Sets the IPv4 destination address.

NOTE	Do not use the remote command for this setting over the LAN, only via GPIB.

Mode	BSE
Preset	"0.0.0.0"
Initial S/W Revision	6.0
Key Path	**Mode > BSE > Func > *DTCH Test* > *Parameter* > *IPv4 Setting***

UDP Setting

(User Datagram Protocol)

The User Datagram Protocol (UDP) setting enables you to set the source and destination ports for this network protocol.

To activate this function, you must select **UDPv4** by pressing **Func** > ***DTCH Test*** > ***Parameter*** > ***Format*** until this option is underlined.

Key Path: **Mode** > **BSE** > **Func** > ***DTCH Test*** > ***Parameter***

Source

Sets the port number from which the datagram is sent.

Mode	BSE
Range	0 to 65535
Preset	10000
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Func** > ***DTCH Test*** > ***Parameter*** > ***UDP Setting***

Destination

Sets the port number to which the datagram is sent.

Key Path: **Func** > ***DTCH Test*** > ***Parameter*** > ***UDP Setting***

Mode	BSE
Range	0 to 65535
Preset	10000
Initial S/W Revision	6.0
Key Path	**Mode > BSE > Func > *DTCH Test* > *Parameter* > *UDP Setting***

Subframe Interval

Sets the frequency with which the datagrams are sent when the Transfer Mode menu key is set to **Auto**.

Mode	BSE
Range	1 to 5
Preset	1
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Func** > ***DTCH Test*** > ***Parameter***

Transfer Mode

Auto: When DTCH Test is turned **On**, (by pressing **Func** > ***DTCH Test*** > ***Test***) a setting of **Auto** continuously sends datagrams to the UE for the duration of the test. (In general, this is one transport block per subframe (or two transport blocks per subframe for a TM3 or TM4 configuration).

Manual: Enables the Manual Transfer function located by pressing **Func** > ***DTCH Test***.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter***

Transfer Rate

Maximum: Enables you to send the maximum number of packets in the DTCH test. (Approximately 1000 packets per second (pps))

Manual: Use this setting if you want to test data by sending packets at a slower rate.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter***

Format

RAW: When selected, the data format is random, based on the Pseudo Random Binary Sequence (PRBS).

ICMPv4: When selected, the data format used is that required for the internet layer. (Internet Control Message Protocol version 4)

UDPv4: When selected, the data format used is that required for the transfer layer.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter***

Payload Type

Enables you to select three payload types: Random, Incremental, and User Defined. Random is the preset value.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter***

Random

For UDPv4 and ICMPv4, this setting enables random data to be carried inside the data packet. This is the preset value.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter > Payload Type***

Incremental

For UDPv4 and ICMPv4, the hexadecimal content of the payload of the packets can be set to increment between transmissions. This is helpful in packet identification.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter > Payload Type***

User Define

For UDP and ICMPv4, this selection enables you to define the sixteen bits of hex data, which are repeated inside each packet payload sent to the UE.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter > Payload Type***

(DTCH) Parameter (Key Menu 2)

Enables you to select the packet size and the total number of packets you wish to send.

Packet Size

Total Packet

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter > More***

Packet Size

Specifies the number of bytes you wish to send in each packet during DTCH test.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter > More***

Total Packet

Specify the total number of packets you wish to send during DTCH test. The preset value is 10,000,000 packets.

Key Path: **Mode > BSE > Func** > ***DTCH Test > Parameter > More***

UE Power Control

Accesses the menus enabling you to send messages to the UE to increase or decrease the power it uses to transmit.

Send Message

DCI Format

Power Adjust (Accumulated)

Power Adjust (Absolute)

Power Adjust (DCI3A)

Power Adjust (All Up)

Power Adjust (All Down)

Frame Configuration

Key Path: **Mode >BSE > Func**

Send Message

Pressing this key sends a single DCI message, using the format you selected using the DCI format key. See **Func** > ***UE Power Control*** > ***DCI Format***. These messages are used to control the UL power used by the UE.

Key Path: **Mode >BSE > Func > *UE Power Control***

DCI Format

(Downlink Control Information) format determines which DCI message is sent when the ***Send Message*** menu key is pressed. The options available are: 0, 1A, 3, and 3A. (See Power Adjust (DCI3A) for more information on option 3A).

When option 0 is selected, pressing ***Send Message*** in the UE Power Control menu (the key above) transmits a single DCI 0 message with a modified TPC command value, as specified in the ***Power Adjust (Accumulated)*** setting (the key below). This adjusts the power of the PUSCH transmission by the specified amount.

When option **1A** is selected, pressing ***Send Message*** in the UE Power Control menu (the key above) transmits a single DCI 1A message with a modified TPC command value, as specified in the ***Power Adjust (Accumulated)*** setting (the key below).

Selection **1A** is required in some RF conformance test cases. For example: The PUCCH part of Aggregate Power Control Tolerance (as described in 36.521-1 v9.1.0, section 6.3.5.3) requires control of the power level of the PUCCH using the TPC bits transmitted in DCI 1A messages.

Selecting 3 or 3A is only possible if the scenario file contains a tpc-PDCCH-ConfigPUSCH information element, with a tpc-Index value set to transmit the appropriate type of DCI message. Like 0 and 1A above, a single DCI message is sent upon pressing the ***Send Message*** menu key.

Mode	BSE
Range	0 | 1A | 3 | 3A
Preset	0
Initial S/W Revision	6.0 (Selection "1A" added in 6.3)
Key Path	**Mode > BSE > *Func* > *UE Power Control***

Power Adjust (Accumulated)

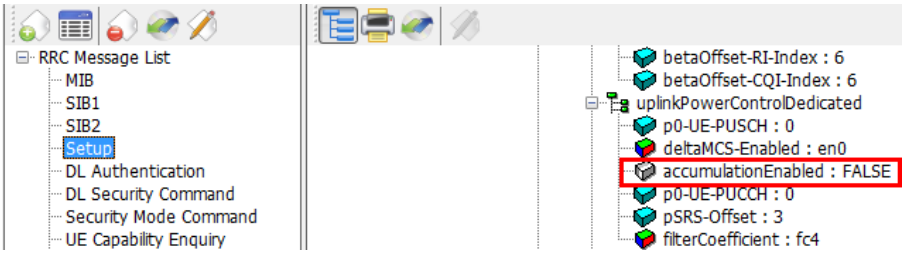
The value selected under this setting (–1, 0, 1, and 3) determines the amount by which the UE's transmit power is adjusted by TPC bits inside the specified DCI message.

IMPORTANT	For DCI3A format, the power adjustment is handled using the Power Adjust (DCI3A) menu key below. This key does not affect the DCI3A format type.

Key Path: **Mode >BSE > Func > *UE Power Control***

Power Adjust (Absolute)

The value selected under this setting (–4, –1, 1, 4) adjusts the UL Transmit power of the UE.

IMPORTANT	The scenario file must be set as follows in order to enable this function:  You must set accumlationEnabled inside the uplinkPowerControlDedicated Information Element, inside the RRC Connection Setup message to **False**.

Key Path: **Mode >BSE > Func > *UE Power Control***

Power Adjust (DCI3A)

The value selected under this setting (–1 or 1) adjusts the UL Transmit power of the UE, when the DCI Format selected is **3A**.

Selecting DCI 3A is only possible if the scenario file contains a tpc-PDCCH-ConfigPUSCH information element, with a tpc-Index value set to transmit the appropriate type of DCI message. Like those DCI formats described above, a single DCI message is sent upon pressing the ***Send Message*** menu key.

IMPORTANT	You must set **Func > *UE Power Control*** > ***DCI Format*** to **3A**, to enable this function.

NOTE	DCI 3A messages only have two power adjustment values because they contain only one TPC bit. This is unlike DCI 0, DCI 1A, and DCI 3 messages.

Key Path: **Mode >BSE > Func > *UE Power Control***

Power Adjust (All Up)

This key is primarily useful when performing Radio Conformance Testing.

If set to **On**, DCI 0 messages are continuously sent to the UE, instructing the UE to increase its transmission power of the PUSCH. This causes the UE to quickly reach its maximum transmit power.

Key Path: **Mode >BSE > Func > *UE Power Control***

Power Adjust (All Down)

This key is primarily useful when performing Radio Conformance Testing.

If set to **On**, DCI 0 messages are continuously sent to the UE, instructing it to decrease its transmission power of the PUSCH.

Key Path: **Mode >BSE > Func > *UE Power Control***

Frame Configuration

Accesses the menus that enable you to configure subframes and control resource block allocation. The user can turn on/off the resource block allocation per subframe definition to specify a different uplink resource block assignment to the UE for each sub-frame of a single radio frame. Upon pressing the ***Send Pattern*** menu key, the PXT sends the ten equivalent DCI format 0 messages (one per consecutive sub-frame) to the UE, to schedule the uplink resource block, according to the user request.

The main purpose of this feature is for radio conformance test support of test case 6.3.5.2 of 3GPP TS 36.521-1 in which various patterns generation is required; however, it could be used generally for specific uplink transmission pattern generation.

Mode	BSE. FDD
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Func** > ***UE Power Control***

Handover

Accesses the Send and Message Name functions.

Mode	BSE. FDD
Dependencies and/or Couplings	You must have a scenario file that includes handover messages.
Initial S/W Revision	6.1
Notes	SCPI command returns number of HANDOVER messages available.
Key Path	**Mode** > **BSE** > **Func**

Send

Sends the specified Handover message from the list displayed when you press **Func** > ***Handover*** > ***Message Name***.

Mode	BSE, FDD
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Func** > ***Handover***

Message Name

Enables you to select the message you wish to send from the list of Paging messages you defined in the currently loaded scenario file.

NOTE	Messages shown here are those you created in the *N6062A Message Editor* software on the "Extended" tab.

Mode	BSE, FDD
Initial S/W Revision	6.1
Notes	SCPI command returns the name of the specified HANDOVER message.
Key Path	**Mode** > **BSE** > **Func** > ***Handover***

Start HO to eHRPD

In conjunction with an 8960 running E6706F Lab Application or later, this menu key initiates an optimized handover to eHRPD. The PXT and 8960 must be EPC connected as described in the EPC Setup section on 69. Refer to the chapter entitled, "UTRAN/LTE & GERAN/LTE Inter-RAT Handovers" for more information on supported hardware versions of the 8960.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Func** > ***Handover***

UE Detach

Accesses the Send and Message Name functions. This is the "Release Message" box shown on the Extended tab of the *N6062A Protocol Message Editor* software tool.

Mode	BSE
Dependencies and/or Couplings	You must have a scenario file that includes UE Detach messages.
Initial S/W Revision	6.1
Notes	SCPI command returns the number of DETACH messages available.
Key Path	**Mode** > **BSE** > **Func**

Send

Sends the specified UE Detach message from the list displayed when you press **Func** > ***UE Detach*** > ***Message Name***.

Mode	BSE
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Func** > ***UE Detach***

Message Name

Enables you to select the message you wish to send from the list of UE Detach messages you defined in the currently loaded scenario file.

NOTE	Messages shown here are those you created using the *N6062A Protocol Message Editor* software tool on the "Extended" tab.

Mode	BSE
Range	1-8
Dependencies and/or Couplings	You must have an active scenario file that includes UE Detach messages.
Initial S/W Revision	6.1
Notes	SCPI command returns the name of the specified DETACH message.
Key Path	**Mode** > **BSE** > **Func** > ***UE Detach***

Paging

Accesses the Send and Message Name functions.

Key Path: **Mode** > **BSE** > **Func**

Send

Sends the specified Paging message from the list displayed when you press **Mode** > **BSE** > **Func** > ***Paging*** > ***Message Name***.

Key Path: **Mode** > **BSE** > **Func** > ***Paging***

Message Name

Enables you to select the message you wish to send from the list of Paging messages you defined in the currently loaded scenario file.

NOTE	Messages shown here are those you created using the *N6062A Protocol Message Editor* software on the "Extended" tab.

Mode	BSE
Dependencies and/or Couplings	You must have a scenario file that includes Paging messages.
Initial S/W Revision	6.1
Notes	SCPI command returns the number of CUSTOM messages available.
Key Path	**Mode** > **BSE** > **Func**

Custom Messages

Accesses the Send and Message Name functions. For example, this is where you would find a Measurement Report custom message you created using the *N6062A Protocol Message Editor* software, as shown below.

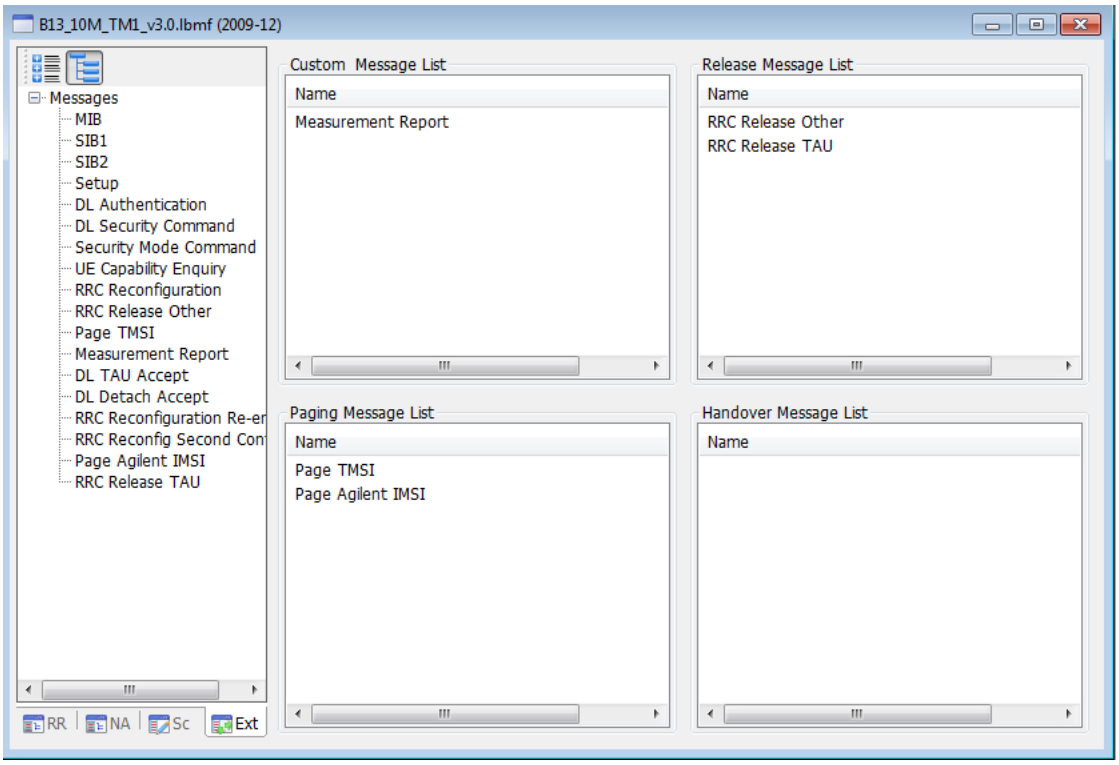


Figure 2-2: Extended Tab of *N6062A Protocol Message Editor* Software

Key Path: **Mode** > **BSE** > **Func**

Send

Sends the specified Custom Message from the list displayed when you press **Func** > ***Custom Message*** > ***Message Name***.

Mode	BSE
Dependencies and/or Couplings	You must have a scenario file that includes all handover settings.
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Func** > ***Custom Messages***

Message Name

Enables you to select the message you wish to send from the list of Paging messages you defined in the currently loaded scenario file.

NOTE	Messages shown here are those you created in the *N6062A Protocol Message Editor* software on the "Extended" tab.

Mode	BSE
Dependencies and/or Couplings	You must have an active scenario file that includes UE Detach messages.
Initial S/W Revision	6.1
Notes	SCPI command returns the name of the specified CUSTOM message
Key Path	**Mode** > **BSE** > **Func** > ***Custom Messages***

Measurement Report

Measurement Reports only exist here if you have created them using the *N6062A Protocol Message Editor* software on the Extended tab. Refer to Measurement Report on page 61 for more information.

Key Path: **Mode** > **BSE** > **Func** > ***Custom Messages*** > ***Message Name***

PDCCH Order

Accesses the menu that enables the sending of a PDCCH order. The functions in this menu are not available in TDD.

Key Path: **Mode** > **BSE** > **Func**

Send PDCCH Order

Sends a PDCCH Order message (a special type of a DCI1A message) containing a PRACH Mask Index of 0 and a Preamble Index of 1.

The PDCCH order is sent on a PDCCH masked with the C-RNTI value (set by selecting **Mode Setup** on the PXT front-panel) and in the UE specific search space.

To respond to this PDCCH order, the UE must be in an RRC Connected state. The BSE can send the PDCCH order if the UE is not RRC Connected – but it is not detected by the UE.

Mode	BSE, FDD
Initial S/W Revision	6.0
Notes	This key is primarily useful when performing Radio Conformance Testing.
Key Path	**Mode** > **BSE** > **Func** > ***PDCCH Order***

OCNG

(Orthogonal Channel Noise Generation or OFDM Channel Noise Generation)

This function implements OCNG with the following options, as defined in 3GPP TS 36.521-1, section A.5.

The functions in this menu are primarily useful when performing Radio Conformance Testing and are currently not available in TDD.

Key Path: **Mode** > **BSE > Func**

OP.1/OP.2 – OP.3

Setting OCGN OP.1/OP.2 to **On**, implements OCNG as defined in 3GPP TS 36.521-1, section A.5. The PXT fills the unused RB with OCNG (pattern 1 or 2 for one sided or two sided OCNG, respectively).

Mode	BSE, FDD
Range	On | Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE > Func > *OCNG***
Notes	OP.3 is not currently functional.

RA

In each test case, the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level (γ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. Refer to 3GPP TS 36.521-1, section A.5.

Mode	BSE, FDD
Range	-6 dB, -4.77 dB, -3 dB, -1.77 dB, 0 dB, 1 dB, 2 dB, 3 dB
Preset	3 dB
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE > Func > *OCNG***

RB

In each test case, the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level (γ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. Refer to 3GPP TS 36.521-1, section A.5.

Mode	BSE, FDD
Range	0 – 3 (Integer only)
Preset	0
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE > Func > *OCNG***

Func - Key Menu 2

Accesses the menu enabling you to control the following parameters:

DL Power Control

RCT

CQI Median

Key Path: **Mode** > **BSE** > **Func** > **More**

DL Power Control

Accesses the ability to boost or de-boost the power of individual channels.

Key Path: **Mode** > **BSE** > **Func** > **More**

PDSCH channel

Accesses the Ra and Rb values as described below.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Func** > **More** > **DL Power Control**

Ra and Rb

Displays the PDSCH R_a and R_b derived from the setting in the scenario of P_a and P_b according to TS 36.213. The values P_a and P_b are signaled to the UE over the air by upper layers.

Mode	BSE, FDD
Dependencies and/or Couplings	Read-only (derived from scenario)
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Func** > **More** > **DL Power Control** > **PDSCH channel**

Other PHY CHs

These settings allow the power level of the physical channels other than the PDSCH relative to the Cell-specific Reference Signals to be controlled.

Accesses the Ra and Rb values as described below.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Func** > **More** > **DL Power Control**

Ra and Rb

These settings enable you to manually boost or de-boost the power level of all physical channels (except DL PDSCH) by modifying the R_a and R_b parameters manually. The boosting or de-boosting of DL PDSCH is controlled via the scenario file and signaled to the UE by the Pa and Pb settings.

Mode	BSE, FDD
Range	-6, -4.77, -3, -1.77, 0, 1, 2, 3
Preset	0
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Func** > **More** > **DL Power Control** > **Other PHY CHs**

RCT

Accesses the following parameter menus:

Statistical Throughput

Pm-an

Pm-dsg

Statistical CQI Performance

Key Path: **Mode** > **BSE** > **Func** > **More**

Statistical Throughput

The Statistical Throughput measurement enables testing of 36.521-1, section 7 test cases. (Section 7 test cases are all SISO.)

The Statistical Testing of Receiver Characteristics, defined in 3GPP TS 36.521-1 Appendix G.2 describes this measurement.

This menu key accesses the menu enabling you to control Max Frame Size, Confidence Level, Test Start, and Test Stop and is only available in FDD.

Mode	BSE, FDD
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** >**Func** > **More** > ***RCT***

Max Frame Size

This setting determines the maximum number of transport blocks sent when **Mode** > **BSE** > **Func** > **More** > ***RCT*** > ***Statistical Throughput*** > ***Test Start*** is selected.

NOTE	If Confidence Level is set to **On**, the test may stop before reaching the maximum number of frames.

Mode	BSE, FDD
Range	1 to 1000000
Preset	2466
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Func** > **More** > ***RCT*** > ***Statistical Throughput***

Confidence Level

Setting this menu key to **On** enables the PXT to determine the probability of whether the Statistical Throughput measurement will pass or fail, based on the table in 3GPP TS 36.521-1 Appendix G.2. This may cause the statistical throughput measurement to stop before the Max Frame Size has been reached.

Setting this menu key to **Off** enables the statistical throughput measurement to run for the number of transmissions set using the Max Frame Size menu key.

Mode	BSE, FDD
Range	On/Off
Preset	Off
Initial S/W Revision	6.0
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***Statistical Throughput***

Test Start

Starts the statistical throughput measurement.

Mode	BSE, FDD
Initial S/W Revision	6.0
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***Statistical Throughput***

Test Stop

Stops the statistical throughput measurement.

Mode	BSE, FDD
Initial S/W Revision	6.0
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***Statistical Throughput***

Pm-an

(Probability of Misdetection of Ack/Nack)

The Pm-an measurement is used as part of an RCT system to perform test cases in 36.521-1, section 8.5.1. As described in this specification, these test cases require generation of a sequence of DCI 0 messages and PHICH transmissions in a specific pattern. This pattern, together with a measurement that determines whether the UE is transmitting in certain subframes (these transmissions counting as NACKs) are covered by this measurement.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT***

Max Frame Size

This setting determines the maximum number of opportunities for the UE to transmit or not transmit (this being counted as a NACK or ACK respectively) when ***Test Start*** is selected.

NOTE	If Confidence Level is set to **On**, the test may stop before reaching the maximum number of frames.

Mode	BSE, FDD
Range	1 to 10000000
Preset	130752
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***PM-an***

Confidence Level

Setting this menu key to **On** enables the PXT to determine the probability of whether the Pm-an measurement will pass or fail, based on the table in 3GPP TS 36.521-1 Appendix G.4.4-2. This may cause the Pm-an measurement to stop before the Max Frame Size has been reached.

Setting this menu key to **Off** enables the Pm-an measurement to run for the number of transmissions set using the Max Frame Size menu key.

Mode	BSE, FDD
Range	On | Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***PM-an***

Test Start

Starts the Pm-an measurement.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***PM-an***

Test Stop

Stops the Pm-an measurement.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***PM-an***

Pm-dsg

(Probability of misdetection of downlink signaling grant)

The Pm-dsg measurement is used as part of an RCT system to perform test cases in 36.521-1, section 8.4.1. As described in this specification, this measurement sends MAC padding data to the UE and counts the numbers of ACKs, NACKs and statDTX. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

The measurement checks whether the PDCCH has been received by the UE at all. An ACK or a NACK implies that it has been, whereas detection of a statDTX condition implies it has not.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT***

Max Frame Size

This setting determines the maximum number of transport blocks sent when Test Start is selected.

NOTE	If Confidence Level is set to **On**, the test may stop before reaching the maximum number of frames.

Mode	BSE, FDD
Range	1 to 1000000
Preset	12913
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***PM-dsg***

Confidence Level

Setting this menu key to **On** enables the PXT to determine the probability of whether the PM-dsg measurement will pass or fail, based on the table in 3GPP TS 36.521-1 Appendix G.4.4-1. This may cause the Pm-dsg measurement to stop before the Max Frame Size has been reached.

Setting this menu key to **Off** enables the Pm-dsg measurement to run for the number of transport blocks set using the Max Frame Size menu key.

Mode	BSE, FDD
Range	On | Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***PM-dsg***

Test Start

This menu key starts the Pm-dsg measurement.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***PM-dsg***

Test Stop

This menu key stops the Pm-dsg measurement.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***PM-dsg***

Statistical CQI Performance

The Statistical CQI Performance measurement is used as part of an RCT system to perform test cases in 36.521-1, section 9. As described in this specification, the measurement sends transport blocks containing fixed MAC padding data to the UE and counts the ACKs and NACKs sent in response. The ratio of (NACK)/(NACK+ACK) determines the block error rate.

Mode	BSE, FDD
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT***

Max Frame Size

This setting determines the maximum number of transport blocks sent when Test Start is selected.

Mode	BSE, FDD
Range	1 to 1000000
Preset	1000
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More** > ***RCT*** > ***Statistical CQI Performance***

Test Start

This menu key starts the Statistical CQI Performance measurement.

Key Path: **Mode > BSE > Func** > **More** > ***RCT*** > ***Statistical CQI Performance***

Test Stop

This menu key stops the Statistical CQI Performance measurement.

Key Path: **Mode > BSE > Func** > **More** > ***RCT*** > ***Statistical CQI Performance***

CQI Median

Accesses the following parameters settings:

Number of CQI Report

Median CQI Start

Median CQI Stop

Key Path: **Mode > BSE > Func** > **More**

Number of CQI Report

Indicates the number of CQI reports to be captured for the median CQI statistics.

Mode	BSE, FDD
Range	1 to 1000
Preset	2000
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More > CQI Median**

Median CQI Start

This setting starts/initiates the collection of CQI reports from UE.

- For aperiodic CQI reports this setting requires the PXT to start asking for aperiodic CQI reports implicitly.
- For periodic CQI reports the UE will continue to send CQI reports periodically; this setting will start collect periodic CQI reports to generate the medium CQI statistics.

IMPORTANT	For this to work properly, the scenario must contain the appropriate CQI Report Configuration (either periodic or aperiodic) in the RRC Setup message information. This enables the UE to generate the correct CQI reports.

Mode	BSE
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More > CQI Median**
Notes	The calculation for the Median CQI stops automatically when the desired number of CQI reports are obtained. Alternatively, you can stop the calculation by manually pressing **Mode > BSE > Func** > **More > CQI Median > *Mediam CQI Stop***.

Median CQI Stop

Enables you to manually stop the calculation for the Median CQI.

Mode	BSE
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Func** > **More > CQI Median**
Notes	The calculation for the Median CQI stops automatically when the desired number of CQI reports are obtained. Alternatively, you can stop the calculation by manually pressing this key.

Func Setup

(Functional Setup) Accesses trigger menu options.

Refer to RF Measurements section for more information on the menus below.

Key Path: Front-panel key

Trigger

Accesses Free Run and External Trigger menu options.

Refer to RF Measurements section for more information on the menus below.

Key Path: **Mode > BSE > Func Setup**

Free Run

Pressing this key, when it is not selected, selects free-run triggering. Free run triggering occurs immediately after the sweep/measurement is initiated.

Key Path: **Mode > BSE > Func Setup** > ***Trigger***

External Trigger

Refer to Triggering on page 134 for descriptions of the following functions: Trigger Slope, Trigger Delay, Internal Trigger, Trigger Slope, Trigger Delay, and Trigger Output.

Key Path: **Mode > BSE > Func Setup** > ***Trigger***

Sweep

Refer to RF Measurements section for information on this function.

Key Path: **Mode** > **BSE** > ***Func Setup***

Help

Displays the URL where the ***Agilent PXT Wireless Communications Test Set (E6621A)*** documentation is located.

Key Path: Front-panel key

Info (System Info)

Displays important facts about your instrument. Accesses the menu enabling you to control the following:

Update Application

Update License

System Temperature

Key Path: Front-panel key

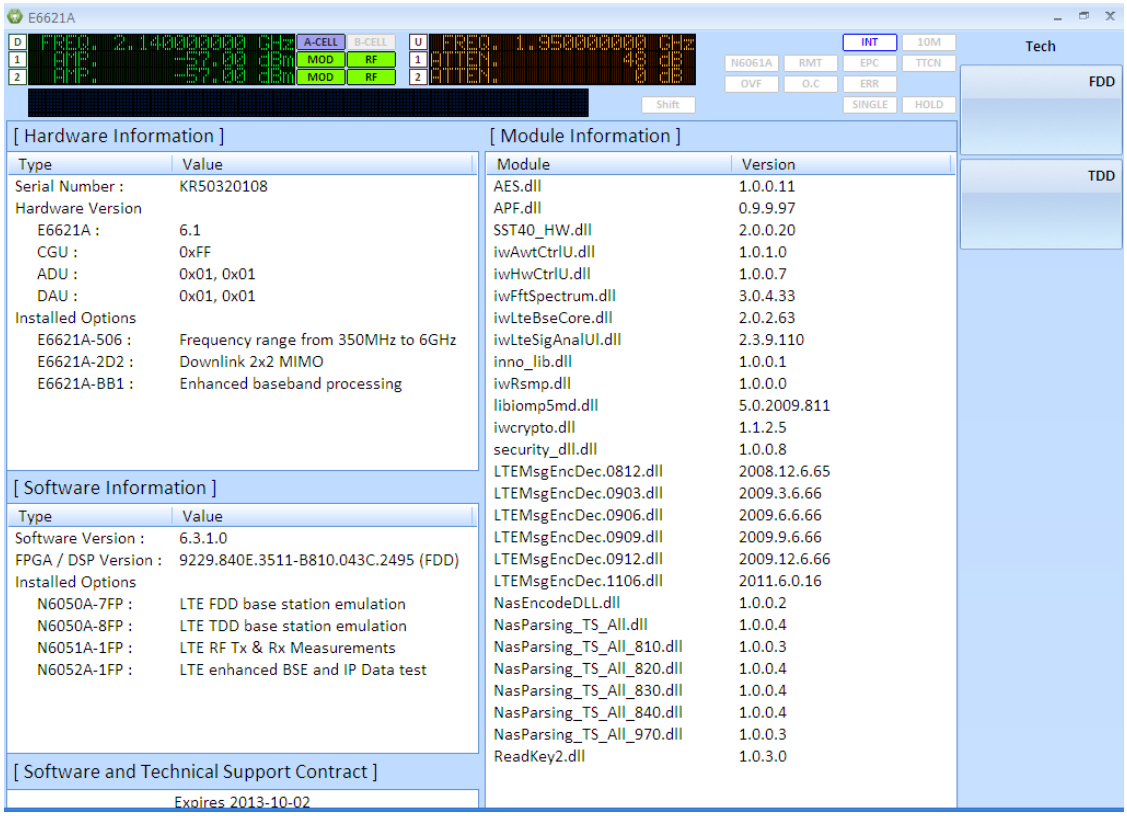


Figure 2-3: Information Screen

[Hardware Information]

Displays serial number, hardware version and installed options of your instrument.

[Module Information]

Displays version of software components required to for instrument operation.

[Software Information]

Displays installed software revision numbers and options.

[Software and Technical Support Contract (STSC)]

States the date your STSC expires.

Update Application

Press this menu key after inserting a USB memory stick (to which you have already copied the latest version of PXT firmware) into one of the USB ports of the PXT. Refer to the section entitled, "Upgrading Your Instrument Software" in the PXT Getting Started Guide for detailed instructions.

Key Path: **Info**

Update License

Refer to step 3 of the "Installing a License on the E6621A PXT" section of the PXT Getting Started Guide for information on using this menu key.

Key Path: **Info**

System Temperature

Enables the PXT to display the system temperature of its various components on the information screen.

Key Path: **Info**

Local

Returns the instrument from remote to local (front-panel) control.

Key Path: Front-panel key

Management

Function is not currently available.

Key Path: Front-panel key

Meas (BSE Mode)

Measurements available under the **Meas** key are specific to the current Mode. This section refers to those measurements made when you select **BSE** on the front-panel, as described on page 17. For information when you select SA mode, refer to the RF Measurements section on page 131.

The following menu key functions are available in this section:

Message

L1/L2 Status

BLER/Throughput

Information

Channel State Information

Key Path: **Mode** > **BSE** > **Meas**

Clear

Key Path: Front-panel key

Interpreting Display Information

The indicators described below are those currently used by the PXT.

Shift: Shift in the input keypad.

N6061A: Logger is currently connected

OVF: Overflow. When this icon is lit up, it means the uplink power level is too high for the PXT to provide accurate measurements. In order to achieve accurate power measurements, the OVF light should only come on approximately 0-10 dB above the power level at which you wish to measure.

Note: If you set the reference level (**Atten**, ***Ref Level***) of the attenuator high enough to achieve valid measurement results, it may be too high for PRACH detection, the next time you wish to connect to the UE. Therefore, it is recommended that you increase the attenuation if OVF is indicated while transferring DL data (ensuring a correct decoding of the UL ACK/NACKs and preventing a reduced throughput reading), then reduce it again to ensure you can connect when or if the UE drops the connection.

RMT: The instrument is being controlled remotely.

O.C: Oven cold (This indicator is highlighted ≤ 5 minutes after instrument is powered on.

INT: The instrument is using its built-in 10MHz reference.

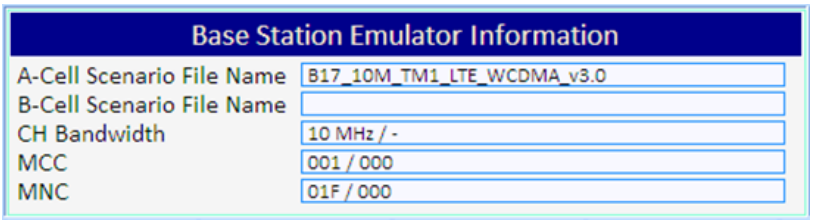
EPC: The Evolved Packet Core is in use. You need this to be yellow for end to end IP data.

SINGLE: You are in single measurement mode versus continuous measurement mode.

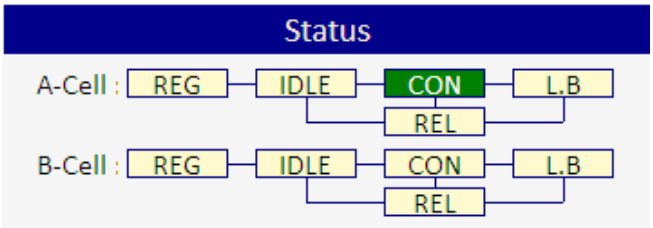
10M: The instrument is using an external 10MHz reference.

TTCN: You are using TTCN. This is for protocol conformance testing.

HOLD: Disables all keys on the front-panel.



The displayed information above is described in the Scenario Information section on page 109.

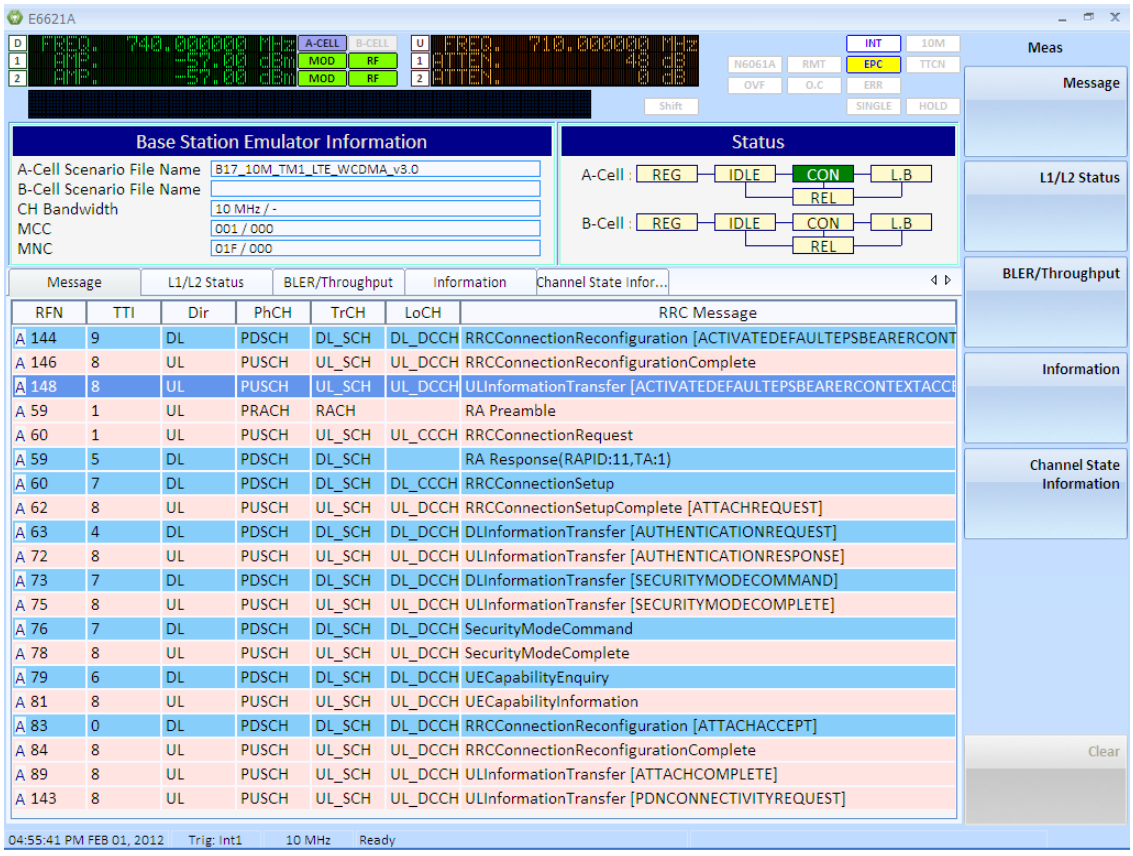


The displayed information above is described in the UE State section on page109.

Message

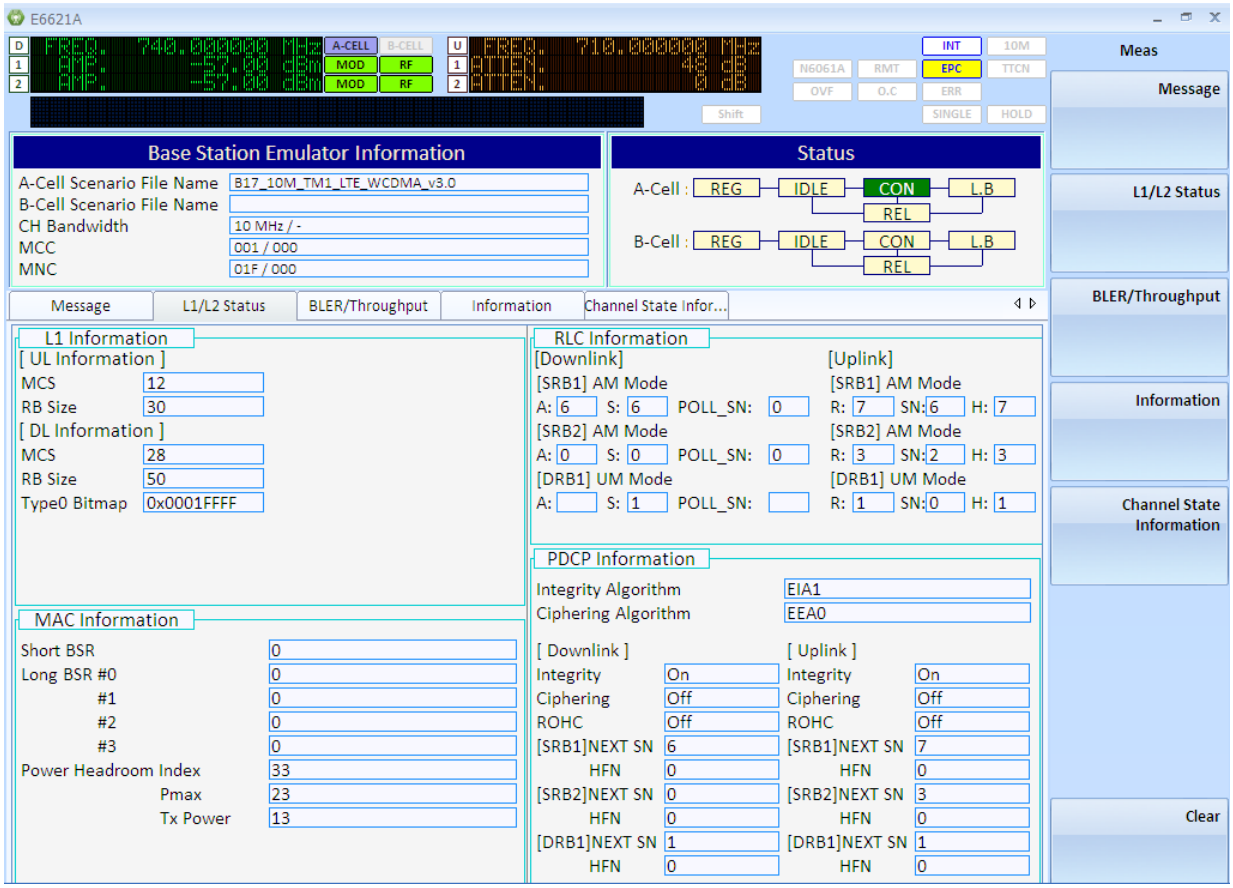
This tab displays UL RRC messages highlighted in pink and DL RRC messages highlighted in blue. Each column is defined in the table below:

Field	Description
RFN:	System Frame Number
TTI:	Transmission Time Interval/Subframe Number
Dir:	Direction of data flow: uplink or downlink
PhCH:	Physical Channel
TrCH:	Transport Channel
LoCH:	Logical Channel
RRC Message:	Radio Resource Control Message



Key Path: **Mode** > **BSE** > **Meas**

L1/L2 Status



L1 Information – UL Information

Display the MCS index and Number of Resource Blocks currently selected for use on the uplink.

L1 Information – DL Information

Displays the MCS Index, Number of Resource Blocks and the Type 0 Bitmap currently selected for use on the downlink.

NOTE	If ***MCS Based on CQI*** is set to **On**, the MCS Index changes frequently and is not reflected here.

RLC Information

The Radio Link Control (RLC) information is described in the table below.

Field	Description
Downlink – 'A' fields	Equivalent to VT(A) in 3GPP 36.322 section 5.1.3.1.1
Downlink – 'S' fields	Equivalent to VT(S) in 3GPP 36.322 section 5.1.3.1.1
Downlink – 'POLL SN' fields	If Status Reporting active, equivalent to POLL_SN in 5.2.2.1
Uplink – 'R' fields	Equivalent to VR(R) in 3GPP 36.322 section 5.1.3.2.1
Uplink – 'SN' fields	Equivalent to SN in 3GPP 36.322 section 5.1.3.2.1
Uplink – 'H' fields	Equivalent to VR(H) in 36.322 section 5.1.3.2.3

MAC Information

The Medium Access Control (MAC) information is described in the table below.

Field	Description
Short BSR	Displays the latest Short Buffer Status Report sent by the UE
Long BSR #0 - 3	Displays the latest Long Buffer Status Reports (indices 0 – 3) sent by the UE
Power Headroom Index	Display the index contained in the latest Power Headroom Report sent by the UE
pMax	Displays the maximum power (in dBm) that can be used by the UE. This is either contained in System Information Block 1, or if not present, is set to 23 dBm.
Tx Power	Displays the estimated power being transmitted by the UE and is based on the value of pMax and the Power Headroom Index sent by the UE.

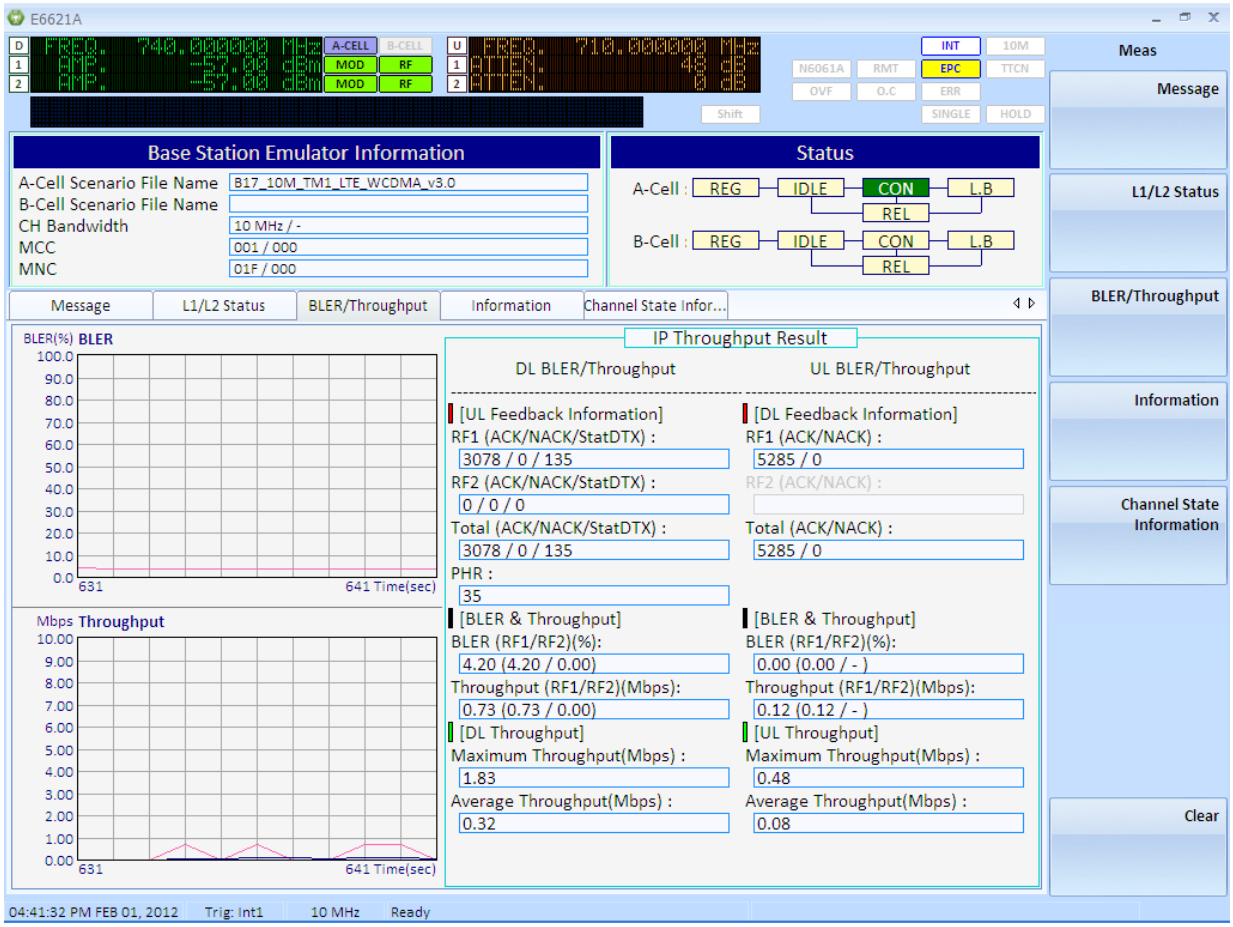
PDCP Information

The Packet Data Control Plane (PDCP) information is described in the table below.

Field	Description
Integrity Algorithm	Displays the integrity algorithm currently running in the Non-Access Stratum
Ciphering Algorithm	Displays the ciphering algorithm currently running in the Non-Access Stratum
Integrity	Displays On if Integrity Protection is enabled in the Access Stratum and Off if it is disabled.
Ciphering	Displays On if Ciphering is enabled in the Access Stratum and Off if it is disabled.
ROHC	Displays On if Robust Header Compression (ROHC) is enabled and Off if it is disabled. (This indicator is not yet supported.)
Downlink Next SN	The Next PDCP Sequence Number (SN) to be transmitted on the downlink
Uplink Next SN	The Next PDCP SN that is expected on the uplink
HFN	How many times the PDCP SN has incremented beyond the number of bits available to represent it (this resets the transmitted SN to 0, but is represented in this field).

Key Path: **Mode** > **BSE** > **Meas**

BLER/Throughput



BLER(%) BLER: Displays the block error rate in percent versus time in seconds.

NOTE	The UL throughout measurements are currently FDD only.

Mbps Throughput: Displays the megabits per second of data throughput versus time in seconds as measured at the top of the PHY layer..

IP Throughput Result:

DL BLER/Throughput

[UL Feedback Information]

Displays the feedback sent on the Uplink by the UE regarding the DL transmission.

Note: This information is grayed out for TDD.

RF1 and **RF2 (ACK/NACK/StatDTX):**

RF1 and **RF2** represent codewords 1 and 2 – there will be no feedback on a second codeword unless the DL transmission mode is either mode 3 or 4.

ACK & **NACK** represent the number of transport blocks that have been positively or negatively acknowledged as having been received by the UE. A **StatDTx** is a transport block that the PXT expects the UE to ACK or NACK, but for which it receives neither. The concept of StatDTX exists for DL throughput but not for UL throughput.

PHR represents the value of the latest Power Headroom Report received by the PXT from the UE. This information is also displayed on the L1/L2 Status screen.

[BLER & Throughput]

Displays the ratios defined as stated on screen.

Throughput (RF1/RF2)(Mbps)

This value represents the instantaneous DL throughput as measured over the last 100 ms.

[DL Throughput]

Displays maximum and average throughput as stated on screen.

UL BLER/Throughput

[DL Feedback Information]

Displays the feedback sent on the Downlink to the UE regarding the UL transmission.

RF1/RF2 (ACK/NACK)

This represents the number of UL transport blocks transmitted by the UE that have either been acknowledged or negatively acknowledged (ACKed or NACKed).

[BLER & Throughput]

BLER (RF1/RF2)(%)

Represents the Block Error Ratio of the UL connection (Number of ACKs divided by Number of ACKs plus Number of NACKs). ACKs or NACKs will be sent on the PHICH to the UE. Only RF1 (representing the first codeword) is supported at this time for UL transmissions.

Throughput (RF1/RF2)(Mbps)

This value represents the instantaneous UL throughput as measured over the last 100 ms.

[UL Throughput]

Maximum Throughput(Mbps)

This represents the maximum throughput observed on the UL since the last time the Clear button was pressed.

Average Throughput(Mbps)

This value represents the average throughput observed on the UL since the last time the Clear button was pressed.

Key Path: **Mode** > **BSE** > **Meas**

Information

Displays the information requested when the custom message, "Measurement Report" is included in the scenario file as well as basic BSE and UE data.

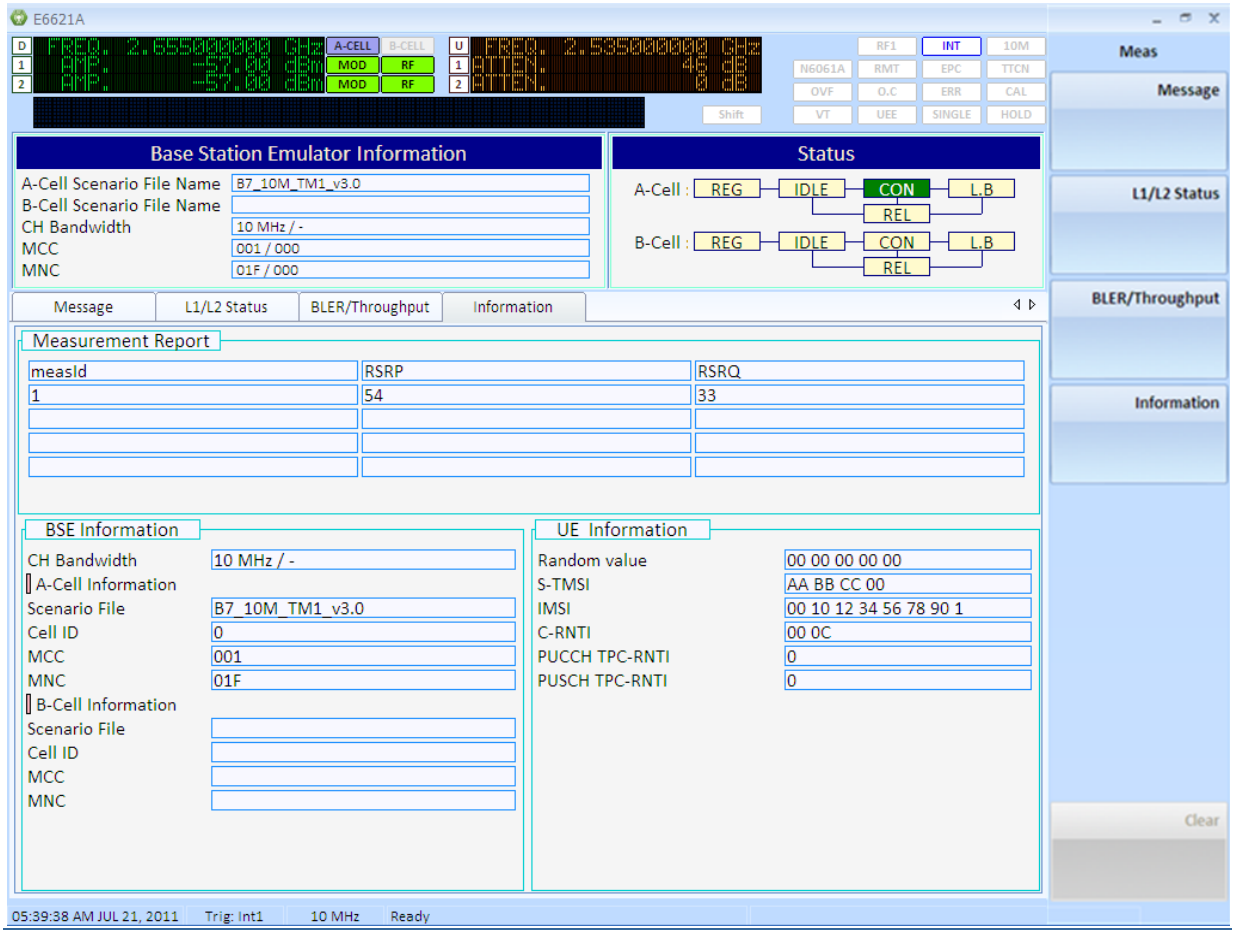
The following topics describe the information displayed on this tab:

Measurement Report

RSRP

BSE Information

UE Information



Measurement Report

NOTE	You must create a custom message using the Extended Tab of the *N6062A Protocol Message Editor* software in order to populate this section of the display.

Field	Description
MeasId	Represents the Measurement Identity as typically configured in an RRC Connection Reconfiguration message.
RSRP	Reference Signal Received Power – the value is an index. 3GPP 36.133, section 9.1.4 shows the mapping here between the displayed value and the measured quantity value in dBm. See More Information on RSRP below and under the Amplitude front-panel key description.
RSRQ	Reference Signal Received Quality – the value here is an index. 3GPP 36.133, section 9.1.7 shows the mapping between the displayed value and the measured quantity value in dB.

RSRP

RSRP values returned by the UE to the PXT represent a value somewhere within a 1dB range (see table below). For a measured quantity value of 40, RSRP equals a measurement of the reference symbols between -99 and -100 dBm.

Reported value	Measured quantity value	Unit
RSRP_00	RSRP < -140	dBm
RSRP_01	-140 < RSRP < -139	dBm
RSRP_02	-139 < RSRP < -138	dBm
...	...	...
RSRP_95	-46 < RSRP < -45	dBm
RSRP_96	-45 < RSRP < -44	dBm
RSRP_97	-44 < RSRP	dBm

EXAMPLE: Calculating the expected RSRP using the PXT DL Amp Setting

NOTE	If the path loss is zero, then the RSRP and the RSTP are equal.

Refer to the **Amp** > ***Amplitude*** section on page 7 for more information on the equation below.

RSTP power level = PXT Amplitude – 10 $\log_{10}$ (number of resource elements in the cell bandwidth)

1. Set **Amp** to the default value of –57 dBm.

   For a 10MHz channel: RSRP = RSTP = –57 – 27.8 = –84.8dBm.

   If there are no losses in the setup, the UE reports this -84.8 dBm value, as **RSRP_56**.

2. Always consider these variables when calculating RSRP:

   a. For each dB of cable loss this RSRP value drops by 1dB.

b. The setting of **Amp** > ***Output Power Offset***. For example, when this is set to 10dB, the **Amp** > ***Amplitude*** setting is boosted by 10dB, which means the UE sees an RSTP value that is 10 dB higher and reports a 10 dB higher RSRP. See **Amp** > ***RF1 Output Power Offset*** on page 9 for more information.

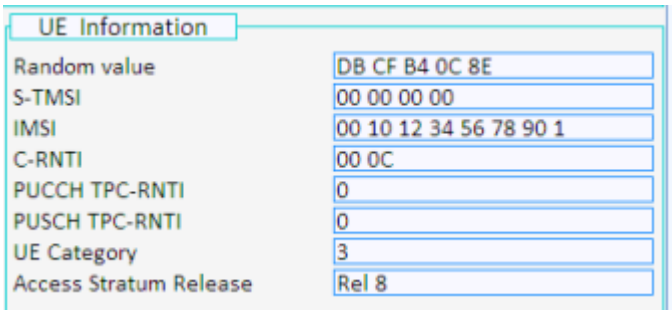
c. Any errors from the DL signal level.

d. Any other measurement errors.

BSE Information

Refer to BSE Information on page 55 for descriptions of the information displayed here.

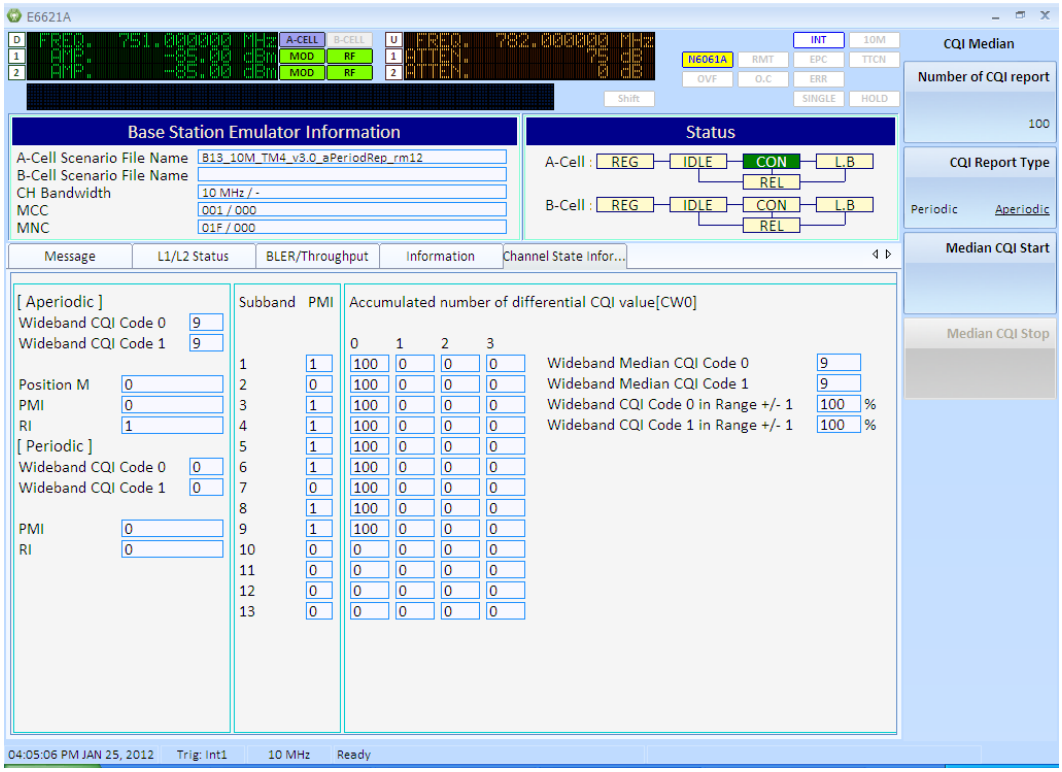
UE Information



Field	Description
Random value	Provided by UE in RRC Connection Request message. If never connected to network before, it sends this random value. If has been connected to the network before, the S-TMSI is assigned.
S-TMSI	SAE (System Architecture-Temporary Mobile Subscriber Identity
IMSI	International Mobile Subscriber Identity – See IMSI value on page 104.
C-RNTI	Cell-Radio Network Temporary ID – See C-RNTI on page 76 for the UL description and page 86 for the DL description.
PUCCH TPC-RNTI	This field displays the PUCCH TPC-RNTI value assigned to the UE in the RRC Connection Setup message. Adjustment of PUCCH power levels using DCI 3 or 3A messages is not currently supported.
PUSCH TPC-RNTI	This field displays the PUSCH TPC-RNTI value assigned to the UE in the RRC Connection Setup message. See the UE Power Control section on page 36 to learn how to send DCI 3/3A messages to adjust the PUSCH power level.
UE Category	This field displays the UE Category reported by the UE inside the UE Capability Information message. This represents the capabilities of the UE as described in 3GPP TS 36.306.
Access Stratum Release	This field displays the Access Stratum release reported by the UE in the UE Capability Information message. This will correspond to the release of the 3GPP standards that the UE adheres to.

Key Path: **Mode** > **BSE** > **Meas**

Channel State Information (FDD only)



Aperiodic

Wideband CQI Code 0: Dynamically displays the aperiodic Wideband CQI value reported by the UE for Code 0

Wideband CQI Code 1: Dynamically displays the aperiodic Wideband CQI value reported by the UE for Code 1

PMI: Dynamically displays the aperiodic PMI value reported by the UE

RI: Dynamically displays the aperiodic PMI value being reported by the UE

Periodic

Wideband CQI Code 0: Dynamically displays the periodic Wideband CQI value reported by the UE for Code 0

Wideband CQI Code 1: Dynamically displays the periodic Wideband CQI value reported by the UE for Code 1

PMI: Dynamically displays the periodic PMI value reported by the UE

RI: Dynamically displays the periodic PMI value reported by the UE

Subband PMI

Displays the Subband pre-coding matrix indication (PMI) reported by the UE for each subband.

For example, in the picture above, the channel bandwidth is 10 MHz and there are 9 PMI subband aperiodic reports from the UE. The value of the PMI for each subband is either zero or one.

Accumulated number of differential CQI value for codeword 0:

For example, in the picture above the channel bandwidth is 10 MHz and there are 9 PMI subband aperiodic reports from the UE. The median CQI for codeword 0 and 1 has been calculated for over 100 reports and has a Wideband Median CQI value equal to 9. All the reports of CQI for codeword 0 have a value of 9 so we can observe 100 reports under the "0" column of the matrix for the differential CQI report.

After Running the Median CQI, the following results are available:

Wideband median CQI Code 0

Wideband median CQI Code 1

Wideband CQI Code 0 in the range of +/- 1: Displays the percentage of how many CQI reports are in the range +1/-1 from the medium CQI code 0. For example, 100% will indicate that all the CQI code 0 reports used for the medium are within +1/-1 range.

Wideband CQI Code 1 in the range of +/- 1: Displays the percentage of how many CQI reports are in the range +1/-1 from the medium CQI code 1. For example, 100% will indicate that all the CQI code 1 reports used for the medium are within +1/-1 range.

For example, in the picture above the median CQI for codeword 0 and 1 has been calculated over 100 reports and has a Wideband Median CQI value equal to 9. All the reports of CQI for codeword 0 have a value of 9 so we can observe 100 reports under the "0" column of the matrix for the differential CQI report. Wideband CQI Code 0 and 1 indicate 100% since all the reports are in the range 9 +/-1,

Key Path: **Mode** > **BSE** > **Meas**

Clear

Clears the data displayed on the screen.

Key Path: **Mode** > **BSE** > **Meas**

Meas Setup

This key has no effect when in BSE mode.

When in SA mode, you can setup the measurements depending upon which selection you have made: Spectrum Analyzer or LTE. Refer to RF Measurements section for more information on the menus below.

Key Path: Front-panel key

Average

This menu key only applies when you are making RF Measurements.

Turns averaging **On** and **Off** and specifies the number of measurement averages used to calculate the measurement result. The average is displayed at the end of each sweep. After the specified number of average counts, the average mode (termination control) setting determines the average action.

Key Path: **Mode** > **BSE** or **SA** > **Meas Setup**

Average Mode

This function determines the averaging action after the specified number of data acquisitions (determined using the Average menu key) is reached.

Exp: The measurement averaging continues using the specified number of averages to compute each averaged value. The average is displayed at the end of each sweep.

Repeat: The measurement resets the average counter each time the specified number of averages is reached.

Key Path: **Mode** > **BSE** or **SA** > **Meas Setup**

Max Hold

Setting ***Max Hold*** to **On** enables the PXT to display a trace, which represents the maximum data value on a point-by-point basis of the new trace data and previous trace data. If a measurement-related instrument setting is changed, the **Max Hold** sequence restarts and a new sweep is initiated but the trace is not cleared.

Key Path: **Mode** > **BSE** or **SA** > **Meas Setup**

Edit Interval

Interval

Specifies the measurement interval (index) you wish to control.

Mode	SA, LTE
Range	1-9
Preset	1
Initial S/W Revision	6.3
Key Path	**Mode** > **SA/LTE** > **Meas Setup** > ***Max Hold*** > ***Edit Interval***

Start Time

Specifies the time you wish the measurement interval to start.

Mode	SA, LTE
Preset	5000 us
Initial S/W Revision	6.3
Key Path	**Mode** > **SA/LTE** > **Meas Setup** > ***Edit Interval***

Duration

Specifies the interval of time for which you wish to make the measurement.

Mode	SA, LTE
Preset	1000 us
Initial S/W Revision	6.3
Key Path	**Mode** > **SA/LTE** > **Meas Setup** > ***Edit Interval***

Measurement BW

Specifies the resolution bandwidth for which you wish to make the measurement.

Mode	SA, LTE
Preset	10.000 MHz
Initial S/W Revision	6.3
Key Path	**Mode** > **SA/LTE** > **Meas Setup** > ***Edit Interval***

Display Interval

Specifies the frequency interval or index number for which you wish to display.

Mode	SA, LTE
Preset	0
Initial S/W Revision	6.3
Key Path	**Mode** > **SA/LTE** > **Meas Setup**

Integ. BW

Specifies the integration bandwidth used to calculate the power in the reference channel.

Key Path: **Mode** > **BSE** or **SA** > **Meas Setup**

Mode

There are two modes in the PXT: Signal Analyzer (SA) and Base Station Emulator (BSE).

Refer to SA for more information.

Refer to BSE for more information.

Key Path: Front-panel key

Mode Setup (BSE Mode)-Key Menu 1

Accesses the available parameters you can set to configure the BSE mode.

Cell Selection

Call Scenario

EPC

Control Mode

CH Bandwidth

C-RNTI

Key Path: Front-panel key

Cell Selection

Accesses the available parameters you can set to configure the selection of the cell.

Key Path: **Mode** > **BSE** > **Mode Setup**

Cell Selection

Sets the active cell to which all other cell settings pertain. This includes the loading of scenario files and the sending of any custom or other messages you initiate within the *N6062A Protocol Message Editor* software.

Cell Selection

Copy PHY Parameter - Acell to Bcell

Copy PHY Parameter - Bcell to Acell

Mode	BSE
Range	Acell | Bcell
Preset	Acell
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE > Mode Setup > *Cell Selection***

Copy PHY Parameter - Acell to Bcell

Copies the PHY layer parameters from cell A to cell B.

Note: This function is useful when using the PXT to emulate two cells simultaneously and the PHY settings must be identical. See "Testing Two Cells" on page 126 for more information.

Key Path: **Mode** > **BSE > Mode Setup > *Cell Selection***

Copy PHY Parameter - Bcell to Acell

Copies the PHY layer parameters from cell B to cell A.

Note: This function is useful when using the PXT to emulate two cells simultaneously and the PHY settings must be identical. See "Testing Two Cells" on page 126 for more information.

Key Path: **Mode** > **BSE > Mode Setup > *Cell Selection***

Call Scenario

Accesses the Change Directory/Load, Unload, and Delete options available for scenario files created using the *N6062A Protocol Message Editor* software.

Key Path: **Mode** > **BSE** > **Mode Setup**

Change Directory/Load

Change Directory: If the instrument is highlighting a directory, you can access a new directory level using the up/down arrow keys on the front-panel. Pressing this key selects the highlighted directory.

Load: If the instrument is highlighting a scenario file, pressing this key activates this file.

Mode	BSE
Initial S/W Revision	6.0 (Load available in 6.0) 6.3 (Change Directory available in 6.3)
Key Path	**Mode Setup** > ***Call Scenario***

Unload

Deactivates the loaded scenario file.

Mode	BSE
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup** > ***Call Scenario***

Delete

Deletes the selected scenario file.

Key Path: **Mode** > **BSE > Mode Setup >** ***Call Scenario***

EPC

The Evolved Packet Core (EPC) in the E6621A is an abbreviated version of the LTE EPC. It is responsible for IP traffic routing – accepting uplink IP data from the UE and putting it on to the network. Similarly for the downlink, it acts as a proxy for UE IP addresses, accepting and forwarding IP data to the stack.

Off: Set EPC off when you are doing RF transmitter or receiver measurements.

Embed: Use this setting when you are doing end-to-end functional tests.

IMPORTANT	You must set ***EPC*** to ***Embed*** to enable IP connectivity. Otherwise, all uplink IP data will be discarded.

When using the E6621A alone, (not connected to an 8960), the UE IP addresses are taken from the scenario files. In this case, you need to verify the BSE network settings by selecting **Config, *Network Setup*, *IP Setup***.

When using the E6621A connected to an 8960, see EPC Setup for more information. Refer to "WCDMA/LTE Inter-RAT Handovers on page 115 for more information.

Mode	BSE, SA
Range	Off | Embed
Preset	Off
State Saved	No
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE > Mode Setup**

Control Mode

TTCN: Sets the PXT in a state where TTCN is part of the system.

Standalone: Sets the PXT so that it is operating without TTCN.

NOTE	To switch between Standalone and TTCN mode, you must select **Preset** after either event below occurs: • A scenario file is loaded and run in Standalone mode • TTworkbench has executed a test case in TTCN mode

Mode	BSE
Range	TTCN | Standalone
Preset	Standalone
State Saved	
Dependencies and/or Couplings	Grayed out after you load a scenario file or after switching to TTCN mode in TTworkbench.
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Mode Setup**

CH Bandwidth

After loading the scenario file, you can overwrite the channel bandwidth using this menu key. Currently, the PXT supports 5.0 MHz, 10 MHz, and 20 MHz.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	5 MHz, 10 MHz, 20 MHz
Preset	10 MHz
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Mode Setup**

C-RNTI

(Cell Radio Network Temporary Identity)

Enables you to set the C-RNTI assigned to the UE during connection setup.

Mode	BSE
Range	10 to 65522
Preset	12
State Saved	No
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE**, **Mode Setup**

Mode Setup (BSE Mode)-Key Menu 2

Accesses the available parameters you can set to configure the BSE mode.

PHY Settings

MAC Settings

RRC Settings – Key Menu 1

NAS Settings

Security

NOTE	You must press the **More** front-panel key to access this key menu.

Key Path: Front-panel key

PHY Settings

Accesses the physical layer parameters available to you for configuration.

Cell ID

PHICH Resource

CFI

CFI (Normal SF)

CFI (Special SF)

UL Resource Allocation

DL Resource Allocation - Key Menu 1

DL Resource Allocation - Key Menu 2

Key Path: **BSE > Mode Setup > More**

Cell ID

Sets the Physical Layer Cell Identity as defined in 3GPP 36.211, referred to as $N_{\mathrm{ID}}^{\mathrm{cell}}$.

Mode	BSE
Range	0 to 503
Preset	ACELL = 0 BCELL = 2
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings***

PHICH Resource

The PHICH Resource helps determine the number of PHICH groups that are used. (See 3GPP 36.331 - PHICH-Config.)

Normally, this parameter is determined by the equivalent setting inside the Master Information Block in the loaded scenario file created using the *N6062A Protocol Message Editor* software. If you select the value using this menu key, it will be overwritten when you load the scenario file.

Mode	BSE
Range	1/6 | 1/2 |1|2
Preset	ACell = 1 BCell = 1
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings***

CFI

The Control Format Indicator (CFI) sets the number of OFDM symbols used for the PDCCHs in a subframe.

Transmission Bandwidth Configuration	Number of PDCCH Symbols per Subframe
> 10 RB (1.8 MHz)	CFI value
≤ 10 RB	CFI + 1

The CFI is mapped to the Physical Control Format Indicator Channel (PCFICH) in the physical layer.

Mode	BSE, FDD
Range	1 - 3
Preset	ACELL = 2 / BCELL = 2
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings***

CFI (Normal SF)

The Control Format Indicator (CFI) sets the number of OFDM symbols used for the PDCCHs in a subframe, that is reserved for downlink transmission.

Transmission Bandwidth Configuration	Number of PDCCH Symbols per Subframe
> 10 RB (1.8 MHz)	CFI value
≤ 10 RB[1]	CFI + 1

1. ≤ 10 RB is currently not supported as this is 1.4 MHz BW.

The CFI is mapped to the Physical Control Format Indicator Channel (PCFICH) in the physical layer.

Mode	BSE, TDD
Range	1, 2, or 3
Preset	ACELL = 2 / BCELL = 2
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings***

CFI (Special SF)

The Control Format Indicator (CFI) sets the number of OFDM symbols used for the PDCCHs in a special subframe.

See the CFI (Normal SF) table above for reference.

Mode	BSE, TDD
Range	1,2
Preset	1
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup> More** > ***PHY Settings***

UL Resource Allocation

Accesses the Uplink Resource Allocation parameters available for you to configure.

Resource Allocation Mode Auto/Fixed MAC Padding

I_MCS

RB Size

RB Start

Ignore PRACHs

Aggregation Level

RCT

Key Path: **Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings***

Resource Allocation Mode Auto/Fixed MAC Padding

Auto: This is a dynamic mode of operation where the values of RB Size, RB Start, and I_MCS are selected by the settings used on the instrument. UL PUSCH allocations are assigned based on the UE sending Scheduling Request messages. The UE transmits these when higher protocol layers (for example: IP or RRC) have data that they want to send.

Fixed MAC Padding: This is a fixed mode of operation in which the UE is asked to transmit on the PUSCH every subframe, regardless of any Scheduling Request messages it may choose to send. If the UE has nothing useful to send (as in "real data") it sends padding data which is discarded at the MAC layer. It is a useful mode of operation when performing transmitter testing.

Mode	BSE
Range	Auto | Fixed MAC Padding
Preset	Acell / Bcell = Auto
Initial S/W Revision	6.1
Notes	This is a requirement stated in 36.521-1, V 9.1.0 in PUCCH. This is a procedure for generating the pattern.
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***UL Resource Allocation***

I_MCS

Sets the MCS Index used by the UE for uplink transmissions.

This parameter is referenced as I_{MCS} in 3GPP 36.213, section 8.6.

The selected MCS Index determines the modulation order and transport block size used for the transmission (see 3GPP 36.213 sections 8.6.1 and 7.1.7.2.1).

NOTE	1. Only MCS Indices that map onto a modulation order of 2 or 4 (QPSK or 16 QAM) are supported. 2. In TDD, the range of allowed MCS Indices is constrained at an uplink data rate of 20 Mbps. For example, when using 100 resource blocks on the uplink, the maximum value of the MCS Index is 12.

Mode	BSE
Range	FDD: 5 and10 MHz: 0 to 28, 29 FDD: 20 MHz: 0 to 23, 29 TDD: 0 to 20
Preset	ACELL / BCELL = 12
Initial S/W Revision	6.1
Notes	This key changed at S/W Revision 6.3.
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***UL Resource Allocation***

RB Size

Sets the number of contiguously allocated resource blocks used on the uplink.

This parameter is referenced as L_{CRBs} in 3GPP 36.213, section 8.1.

The number of resource blocks allocated is constrained by the bandwidth of the cell.

Mode	BSE
Range	1 – 25 (5 MHz Bandwidth) 1 – 50 (10 MHz Bandwidth) 1 – 100 (20 MHz Bandwidth)
Preset	ACELL / BCELL = 30 (10 MHz)
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***UL Resource Allocation***

RB Start

Sets the starting resource block used for the uplink allocation.

This parameter is referenced as RB_{START} in 3GPP 36.213, section 8.1

Mode	BSE
Range	0 – 24 (5 MHz Bandwidth) 0 – 49 (10 MHz Bandwidth) 1 – 99 (20 MHz Bandwidth)
Preset	ACELL / BCELL = 0
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***UL Resource Allocation***

Ignore PRACHs

Setting this parameter to **On,** enables the BSE to ignore UL PRACH preambles from the UE.

Mode	BSE, FDD
Range	On | Off
Preset	Acell / Bcell = Off
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***UL Resource Allocation***

Aggregation Level

Accesses the menu that enables you to set the PDCCH C-RNTI Aggregation Level for the UL.

Aggregation level sets the number of CCEs occupied by the various DCI messages, to enable more efficient transmission of control information.

Mode	BSE, FDD
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***UL Resource Allocation***

C-RNTI

(Cell Radio Network Temporary Identity)

Sets the number of Control Channel Elements (CCEs) occupied by DCI messages for the UL.

Mode	BSE, FDD
Range	1 | 2 | 4 | 8
Preset	ACELL = 2 BCELL = 4
State Saved	No
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings > UL Resource Allocation > Aggregation Level***

RCT

Accesses the menu that enables you to configure the UL Resource Allocation parameters used in performing Radio Conformance Testing.

Key Path: **BSE** > **Mode Setup** > **More** > ***PHY Settings > UL Resource Allocation***

UL Tx Pattern

Sets one of the following subframe uplink transmission patterns:

All: All subframes (TDD and FDD)

SF2: Only subframe two (TDD and FDD)

SF3: Only subframe three (FDD only)

SF0/5: Only subframe 0 or five (FDD only)

SF1/3/5/7: Only subframe one, three, five, or seven (FDD only)

SF3/8: Only subframe three or eight (TDD and FDD)

Mode	BSE
Range	ALL, SF2, SF3, SF0/5, SF1/3/5/7, SF3/8
Preset	ALL
State Saved	No
Initial S/W Revision	6.1 (Added SF2, SF1/3/5/7, and SF3/8 in 6.3)
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings > UL Resource Allocation > RCT***

Aperiodic CQI

The settings in this menu control the starting and stopping of aperiod CQI reports and the frequency for which they are generated. You must use a scenario file that has the CQI report configuration set appropriately to aperiodic for the UE to report them.

Mode	BSE
Preset	01
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup> More >** ***PHY Settings > UL Resource Allocation > RCT***

CQI Request

Starts or stops the sending of UE report requests by the PXT.

Mode	BSE, FDD
Range	On, Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup> More >** ***PHY Settings > UL Resource Allocation > RCT > Aperiodic CQI***

Report Frequency

Indicates the frequency at which the PXT requests aperiodic reports by setting the interval (in subframes) between the two UE aperiodic CQI reports. For example: with ***Report Frequency*** set to 1, the PXT requests a report every subframe.

Mode	BSE, FDD
Preset	1
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup> More >** ***PHY Settings > UL Resource Allocation > RCT> Aperiodic CQI***

DL Resource Allocation - Key Menu 1

Accesses the 1st menu of configurable Downlink Resource Allocation parameters.

Resource Allocation Mode

CQI Reports

I_MCS

RB Size

RB Start

Type0 Bitmap

Subframe #5 Control

Special SF control

Subframe #0 Control

Key Path: **Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings***

Resource Allocation Mode

Auto: This is a dynamic mode of operation where the values of RB Size, RB Start, and I_MCS are selected by the settings on the instrument. The decision to make a DL transmission is determined by the presence of data from higher protocol layers (for example: IP or RRC) that is pending transmission.

Fixed MAC Padding: This replaces the data on the DL with transport blocks comprised entirely of padding data which is then discarded by the UE at its MAC layer. This Fixed MAC Padding option is used during statistical throughput to provide a reference measurement channel with the correct contents.

Mode	BSE
Range	Auto | Fixed MAC Padding
Preset	Acell/ Bcell = Auto
Initial S/W Revision	6.0
Notes	This is a requirement stated in 36.521-1 , V 9.1.0 in PUCCH and is a procedure for generating the pattern.
Key Path	**Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings > DL Resource Allocation***

CQI Reports

Accesses the following functions:

MCS Based on CQI

Enables the MCS Index used on the downlink, to be determined by the latest wideband CQI report sent by the UE on the uplink.

NOTE	You must load a scenario file that has configured the UE to send wideband CQI reports.

Mode	BSE
Range	On | Off
Preset	Off
State Saved	No
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > ***CQI Reports***

Use Report Type

Enables you to select the UE CQI report type on which the selection of downlink MCS is based. This must be used in conjunction with ***MCS Based on CQI*** set to **On** and with an appropriately configured scenario file.

Wideband: Use this setting to select the downlink MCS index based on wideband CQI reports.

Subband: Use this setting to select the downlink MCS index based on subband CQI reports. The MCS index is based on the best subband CQI report (the one with the highest value of CQI). Using this setting also means that the DL allocation moves in frequency to the subband represented by that report.

This setting can only be used when the number of resource blocks selected by either the resource block size (RB Size) or the Type 0 Bitmap (Type0 Bitmap) parameter is less than or equal to the current DL PDSCH resource block size allocation.

For example: If the RB Size is ≤ 6 RBs for a 10 MHz channel bandwidth, Subband may be selected. However, for RB Size values > 6, you must select ***Wideband***.

Mode	BSE, FDD
Range	Wideband | Subband
Preset	Wideband
Dependencies and/or Couplings	• ***MCS Based on CQI*** must be set to ***On*** to access this function. • Selecting **Subband** depends upon the current DL PDSCH RB size allocation.
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup**> **More** > ***PHY Settings*** > ***DL Resource Allocation*** > ***CQI Reports***

Random Subband Selection

Enables the random selection of subband regardless of the UE CQI Subband actual reports. When this is enabled, the subband used is selected randomly (with each subband having equal probability) rather than making the selection based on the best subband reported. When this selection is enabled, the DL Start RB (RB Start) key is not available (grayed out) since the DL start RB is dynamically (randomly) selected. To use this feature, the number of resource blocks in the DL allocation must be less than or equal to the subband size (which is different depending on bandwidth – see 3GPP TS 36.213 table 7.2.1-3)

Mode	BSE, FDD
Range	On | Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup**> **More** > ***PHY Settings*** > ***DL Resource Allocation*** > ***CQI Reports***

I_MCS

Sets the MCS Index used by the UE for downlink transmissions.

This parameter is referenced as I_{MCS} in 3GPP 36.213, section 7.1.7.

The selected MCS Index determines the modulation order and transport block size used for the transmission (see 3GPP 36.213 sections 7.1.7.1 and 7.1.7.2.1).

Mode	BSE
Range	0 – 28
Preset	5
Dependencies and/or Couplings	Only available when ***MCS Based on CQI*** is set to ***Off***.
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation***

RB Size

Sets the number of contiguously allocated localized virtual resource blocks used on the downlink.

This parameter is referenced as L_{CRBs} in 3GPP 36.213, section 7.1.6.3.

The number of resource blocks allocated is constrained by the bandwidth of the cell.

This parameter is only available when using transmission modes one and two (which use Resource Allocation Type 2).

Mode	BSE
Range	1-25 (5 MHz Bandwidth) 1-50 (10 MHz Bandwidth) 1-100 (20 MHz Bandwidth)
Preset	50 (10 MHz Bandwidth)
Dependencies and/or Couplings	Only available in TM1 and TM2 scenarios (MIMO).
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation***

RB Start

Sets the starting resource block used for the downlink allocation.

This parameter is referenced as RB_{START} in 3GPP 36.213, section 7.1.6.3.

This field is only available when using transmission modes one and two (which use Resource Allocation Type 2).

Mode	BSE
Range	0 – 24 (5 MHz) 0 – 49 (10 MHz) 0 – 99 (20 MHz)
Preset	0
Dependencies and/or Couplings	• Only available in TM1 and TM2 scenarios (MIMO). • Grayed out when **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > ***CQI Reports*** > ***Random Subband Selection*** is set to **On**. (• Random Subband Selection)
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation***

Type0 Bitmap

When using Resource Allocation Type 0 (see 3GPP 36.213, section 7.1.6.1), this bitmap indicates the resource block groups that are allocated to the UE.

This field is only available when using transmission modes three and four (which use Resource Allocation Type 0).

Mode	BSE
Range	0x00000000 – 0x00001FFF (5 MHz) 0x00000000 – 0x0001FFFF (10 MHz) 0x00000000 – 0x01FFFFFF (20 MHz)
Preset	FDD:(N_PRB=50) 0x0001FFFF TDD: (N_PRB=50) 0x0001FFFF
Dependencies and/or Couplings	Only available in TM3 and TM4 scenarios (MIMO).
Initial S/W Revision	6.0 (Changed preset in 6.3)
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation***

Subframe #5 Control

This controls the usage of subframe number five regarding the transmission of System Information and UE Specific transmissions. There are three possible options.

1. Radio Conformance Tests state that subframe five must always be reserved for System Information and not used for UE specific transmissions.
2. Default operation is to use subframe five for UE specific transmissions only when it is not being used for System Information.
3. For Maximum Throughput, after a connection has been established, subframe five can be used for UE specific transmissions and not for System Information.

Mode	BSE
Range	Default | Max Th | RCT
Preset	Default
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation***

Special SF control

Determines if any special subframes in the uplink/downlink configuration are used to transmit downlink data or not. A setting of Default means that they are used, a setting of Null means that are not used. Some RCT tests demand that they are not used.

Mode	BSE, TDD
Range	Default | Null
Preset	Default
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > **More** > ***RCT***

Subframe #0 Control

This controls the usage of subframe number zero regarding the transmission of UE Specific transmissions. Some Radio Conformance Tests state that subframe number zero must not be used. By default, the PXT uses subframe zero to send DL data to the UE. However, if RCT is selected, subframe zero is not used.

Mode	BSE, FDD
Range	Default | RCT
Preset	Default
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation***

DL Resource Allocation - Key Menu 2

Accesses the 2nd Menu of available to configure Downlink Resource Allocation parameters.

MIMO Setting

Aggregation Level

RCT

Key Path: **BSE** > **Mode Setup** > **More** > ***PHY Settings***

MIMO Setting

Accesses the menu of settings available to configure Multiple Input Multiple Output (MIMO).

Codebook

Number of Codewords

Codeword 2 MCS Index

I_MCS (Codeword 2)

Precoder Selection

Rank Selection

Key Path: **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > **More**

Codebook

Controls the Codebook Index in use.

When using Transmission Mode Four (TM4), there is a choice of which codebook entry to use for pre-coding (see 3GPP 36.211, section 6.3.4.2.3.) For TM4, a Codebook Index of either 1 or 2 can be used when using two layers and a Codebook Index of 0, 1, 2 or 3 can be used when using one layer.

Mode	BSE, FDD
Range	0 – 3 (One Layer) 1 – 2 (Two Layers)
Preset	1
Dependencies and/or Couplings	Only applicable when using Transmission Mode 4 (MIMO).
Initial S/W Revision	6.0
Key Path	**Mode > BSE > Mode Setup > More > *PHY Settings* > *DL Resource Allocation* > More > *MIMO Setting***

Number of Codewords

When using either Transmission Mode 3 (TM3) or Transmission Mode 4 (TM4), it is possible to use either one or two codewords in every subframe – which results in either one or two transport blocks being transmitted.

See 3GPP 36.211, section 6.3 for an illustration of the physical channel processing.

In TM3, when using two codewords, DCI Format 2A will be used. When using one codeword, DCI Format 1A will be used.

In TM4, when using two codewords, DCI Format 2 will be used. When using one codeword, DCI Format 2 will continue to be used, but only one codeword will be marked as being enabled.

Mode	BSE
Range	1 -2
Preset	2
Dependencies and/or Couplings	Only applicable when using Transmission Mode 3 or 4 (MIMO).
Initial S/W Revision	6.0
Key Path	**Mode > BSE > Mode Setup > More > *PHY Settings* > *DL Resource Allocation* > More > *MIMO Setting***

Codeword 2 MCS Index

When using transmission modes 3 or 4, two transport blocks are sent to the UE in a subframe.

Default: The MCS index value of these transport blocks (also referred to as codewords) to be the same and is specified by the I_MCS parameter, by default.

Specified: Enables the second transport block to use the MCS index specified in the I_MCS (Codeword 2) setting below.

Note that this will take effect during DTCH Test, Statistical Throughput or Statistical CQI Performance measurements, but will not take effect during end-to-end data.

Mode	BSE, FDD
Range	Default | Specified
Preset	Default
Dependencies and/or Couplings	Only applicable when using Transmission Mode 3 or 4 (MIMO).
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Mode Setup > More > *PHY Settings* > *DL Resource Allocation* > More > *MIMO Setting***

I_MCS (Codeword 2)

This setting selects the MCS Index that is used for the second codeword when the Codeword 2 MCS Index setting is set to **Specified**.

Mode	BSE, FDD
Preset	5
Dependencies and/or Couplings	Only applicable when using Transmission Mode 3 or 4 (MIMO). This function is only available when ***Codeword 2 MCS Index*** is set to ***Specified***.
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Mode Setup > More > *PHY Settings* > *DL Resource Allocation* > More > *MIMO Setting***

Precoder Selection

This setting enables you to toggle between two modes of operation when selecting the pre-coding that is applied during transmission mode 4.

Auto: Enables the pre-coder selection to change dynamically, based on the wideband PMI reports that are received from the UE in periodic reports. Note that the scenario file used must enable this behavior by enabling wideband CQI/PMI reporting.

Manual: Enables the setting in the "Codebook" field to determine the pre-coding that is applied.

Mode	BSE, FDD
Range	Auto | Manual
Preset	Manual
Dependencies and/or Couplings	Only applicable when using Transmission Mode 3 or 4 (MIMO).
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Mode Setup > More > *PHY Settings* > *DL Resource Allocation* > More > *MIMO Setting***

Rank Selection

For transmission modes 3 or 4, the method of selecting the number of codewords used in a subframe can be determined using this setting.

Auto: Sets the number of codewords used to be determined by Rank Indicator reports received from the UE in periodic reports. Note that the scenario used must enable this behavior.

Manual: Sets the number of codewords used to be determined by the 'Number of Codewords' setting.

Mode	BSE, FDD
Range	Auto | Manual
Preset	Manual
Dependencies and/or Couplings	Only applicable when using Transmission Mode 3 or 4 (MIMO).
Initial S/W Revision	6.3
Key Path	**Mode > BSE > Mode Setup > More > *PHY Settings* > *DL Resource Allocation* > More > *MIMO Setting***

Aggregation Level

Accesses the menu that enables you to select the PDCCH Aggregation Level for DCI messages providing DL allocations.

Aggregation Level sets the number of CCEs occupied by the various DCI messages, to enable more efficient transmission of control information.

C-RNTI

SI/RA/P-RNTI

Key Path: **Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > **More**

C-RNTI

(Cell Radio Network Temporary Identity)

Sets the number of Control Channel Elements (CCEs) occupied by DCI messages for the DL.

Mode	BSE, FDD
Range	1 | 2 | 4 | 8
Preset	ACELL = 2 BCELL = 4
State Saved	No
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > **More** > ***Aggregation Level***

SI/RA/P-RNTI

Enables you to set the aggregation level or number of Control Channel Elements (CCEs) occupied by the following DCI broadcast message types:

SI: System Information

RA: Random Access Response

P-RNTI: Paging Radio Network Temporary Identity

Select the aggregation level by referencing the tables above as they are dependent upon the channel bandwidth for the DL Resource Allocation.

Mode	BSE
Range	4, 8
Preset	ACELL = 4 BCELL = no preset
State Saved	No
Initial S/W Revision	6.1
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > **More** > ***Aggregation Level***

TM1 Resource Allocation Type

Enables the selection of the resource allocation type that must be used for DL allocations in Transmission Mode 1. The different types of allocations are described in 3GPP TS 36.213 s7.1.6. By default, Type 2 Localized Allocations are used and DCI 1A messages assign the DL resource. Selecting Type 0/1 here means that DCI 1 messages will assign the DL resource. Currently, only Type 0 allocations are supported.

Mode	BSE, FDD
Range	Type0/1, Type2
Preset	Type2
Dependencies and/or Couplings	This function is only available in TM1.
Initial S/W Revision	6.3
Key Path	**Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > **More**

RCT

Accesses the menu of DL Resource Allocation parameters used in performing Radio Conformance Testing.

Key Path: **Mode** > **BSE** > **Mode Setup** > **More** > ***PHY Settings*** > ***DL Resource Allocation*** > **More**

I_MCS sf-control

This Modulation Coding Scheme (MCS) index subframe control setting determines the usage of subframe zero. During normal operation, the MCS Index used on all downlink subframes is the same and controlled by the I_MCS menu key located on the first menu of DL Resource Allocation.

During receiver testing as specified in 3GPP 36.521-1 the MCS Index used on subframe zero may need to be different than that used on the other downlink subframes to allow configuration of the appropriate Reference Measurement Channel.

When I_MCS sf-control is set to On, this can be specified.

This is only used during Statistical Throughput testing.

Mode	BSE, FDD
Range	On | Off
Preset	Off
Dependencies and/or Couplings	To enable this function, press **Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings > DL Resource Allocation > Subframe #5 Control*** and select ***RCT***.
Initial S/W Revision	6.0
Key Path	**Mode** > **BSE > Mode Setup** > **More** > ***PHY Settings > DL Resource Allocation*** **> More** > ***RCT***

I_MCS(subframe#0)

If I_MCS sf-control is set to **On**, this specifies the MCS Index that is used on the downlink in subframe zero during statistical throughput testing.

Mode	BSE, FDD
Range	0 – 28
Preset	5
Initial S/W Revision	6.0
Key Path	**BSE > Mode Setup** > **More** > ***PHY Settings > DL Resource Allocation*** **> More** > ***RCT***

I_MCS(Subframe #1-9)

If I_MCS sf-control is set to **On**, this value specifies the MCS Index that is used on the downlink in subframes one through nine during statistical throughput testing.

Mode	BSE, FDD
Range	1 to 9
Preset	5
Dependencies and/or Couplings	I_MCS sf-control must be set to ***On*** to enable this function.
Initial S/W Revision	6.0
Key Path	**BSE > Mode Setup** > **More** > ***PHY Settings > DL Resource Allocation*** **> More** > ***RCT***

DL TX Pattern

This enables configuration of the downlink to transmit UE specific data on all subframes (normal operation) or to transmit UE specific data only on downlink subframes one and six. This function is primarily used for Radio Conformance Testing.

Mode	BSE, FDD
Range	ALL | SF1/6
Preset	ALL
Initial S/W Revision	6.0
Key Path	**BSE > Mode Setup** > **More** > ***PHY Settings > DL Resource Allocation*** **> More>*RCT***

RV Coding Sequence

A redundancy version (or RV) is used during the rate matching process when a transport block is being encoded. If a transport block is retransmitted, a different redundancy version from the original transmission is generally used – this enables incremental redundancy to improve the chances of the transport block being decoded.

For the UL, the sequence of RV values used is fixed (to 0,2,3,1) as specified in 3GPP 36.321. On the DL, however, the sequence can be modified. The main reason to use this setting is to perform some of the RCT tests specified in 3GPP 36.521-1, where a different sequence is specified.

Mode	BSE, FDD
Range	0,2.3,1 (You may select any of these 4 numbers in any order.)
Preset	0, 2, 3, 1
Initial S/W Revision	6.3
Key Path	**BSE > Mode Setup** > **More** > ***PHY Settings > DL Resource Allocation*** **> More>*RCT***

Special SF control

Determines if any special subframes in the uplink/downlink configuration are used to transmit downlink data or not. A setting of Default means that they will be used, a setting of Null means that they will not. Some RCT tests demand that they are not used.

Mode	BSE, TDD
Range	Default, Null
Preset	Default
Initial S/W Revision	6.3
Key Path	**Mode** > **Mode > SA >** ***LTE*** **> Mode Setup** > **More** > ***PHY Settings > DL Resource Allocation > More > RCT***

MAC Settings

Accesses the menu of settings available to configure the Medium Access Control (MAC).

DL HARQ Max Trans

UL HARQ Max Trans

Key Path: **BSE** > **Mode Setup> More**

DL HARQ Max Trans

Downlink Hybrid Automatic Repeat Request (HARQ) maximum transmission controls the number of times the PXT attempts to transmit a downlink transport block before it is discarded. Successful transmission of a downlink transport block is met with the UE sending an ACK or NACK.

Mode	BSE, FDD
Range	1 – 8
Preset	1
State Saved	Yes
Initial S/W Revision	6.1
Key Path	**BSE** > **Mode Setup> More** > ***MAC Settings***

UL HARQ Max Trans

Uplink Hybrid Automatic Repeat Request (HARQ) maximum transmission controls the number of times the PXT expects the UE to attempt to transmit a transport block before it is discarded.

It must be set to the same value as the maxHARQ-Tx parameter which is usually contained in the RRC Connection Setup message of the scenario file (created using the *N6062A Protocol Message Editor* software).

Mode	BSE, FDD
Range	1 – 8
Preset	1
State Saved	Yes
Initial S/W Revision	6.1
Key Path	**BSE** > **Mode Setup> More** > ***MAC Settings***

RRC Settings – Key Menu 1

No of Tx Antennas

Sets the number of transmit antennae to 1 or 2.

Mode	BSE
Overwrites Scenario File Value	No
Range	1 | 2
Preset	1
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More** > ***RRC Settings***

Transmission Mode

Controls the transmission mode assigned in the RRC Connection Setup message. If set to TM3 or TM4, this menu key also enables the codebook subset restriction field.

The **Implicit** setting enables the UE to derive the transmission mode based on the number of Tx Antennas setting (the parameter is not signaled inside the RRC Connection Setup message in this case). If the No of Tx Antennas is set to 1, the UE assumes TM1 is being used. If it is set to 2, the UE assumes TM2 is being used.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	TM1 | TM2 | TM3 | TM4 | Implicit
Preset	TM1
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings***

p-Max On/Off

The p-Max value is carried in SIB1 and determines the maximum power that the UE is allowed to transmit. This setting controls whether the IE is present or not.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	On | Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings***

p-Max

The p-Max value is carried in SIB1 and determines the maximum power that the UE is allowed to transmit.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	–30 to 33
Preset	23
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings***

p0-NominalPUSCH

This value contributes towards the power of the PUSCH and is carried in SIB2.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	–126 to 24
Preset	–85
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings***

p0-UE-PUSCH

This value contributes towards the PUSCH power and is carried in RRC Connection Setup message.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	–8 to 7 (Integer)
Preset	0
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings***

Default Paging Cycle

Controls how frequently UE can be paged. This setting is contained in SIB2.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	Rf32 | Rf64 | Rf128 | Rf256
Preset	Rf32
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings***

NB

Controls how frequently UE can be paged. This setting is contained in SIB2.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	fourT | twoT | oneT | halfT | quarterT | oneEighthT | oneSixteenthT | oneThirtySecondT
Preset	oneT
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings***

RRC Settings - Key Menu 2

Accesses the menu that enables you to configure the following Discontinuous Reception (DRx) settings.

IMPORTANT	All the settings in this key menu overwrite the comparable values defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Connected DRX On/Off

Controls the drx-Config element of the RRC Connection Reconfiguration message to be set to *setup* or *release*. This enables or disables Connected Mode DRX in the UE.

NOTE	**PXT connected mode implementation compared to eNB operation** An eNB can instruct a UE to enter a mode of operation known as Connected Mode DRX which allows the UE to turn off its receiver for short periods of time during periods of inactivity, thus saving battery power. The Connected Mode DRX signaling parameters described in this section can be set and the UE instructed to go into Connected Mode DRX during establishment of the connection. When DRX is on, the UE would normally be sent data by an eNB only during the periods when the UE is expecting data as signaled by the eNB. If the PXT is instructed to send data while DRX is on, it will send the data irrespective of the DRX cycle. During these periods, the user may experience 100% BLER. Full observation of the DRX cycle by the PXT will be implemented in a future release.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	On|Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More** > ***RRC Settings*** > **More**

longDRX-Cycle

Enables you change the setting of the longDRx-cycle that is present in the RRC Connection Reconfiguration message of the currently loaded scenario file.

Mode	BSE
Overwrites Scenario File Value	Yes
Range	SF10 | SF20 | SF32 | SF40 | SF64 | SF80 | SF128 | SF160 | SF256 | SF320 | SF512 | SF640 | SF1024 | SF1280 | SF2048 | SF2560
Preset	Sf40
Dependencies and/or Couplings	***Connected DRx On/Off*** must be set to **On**.
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More** > ***RRC Settings*** > **More**

Long DRX-CycleStartOffset

Enables you change the setting of the longDRx-cycle starting offset that is present in the RRC Connection Reconfiguration message of the currently loaded scenario file.

Mode	BSE
Overwrites Scenario File Value	Yes
Range	0 ~ 2559
Preset	0
Dependencies and/or Couplings	***Connected DRx On/Off*** must be set to **On**.
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings*** **> More**

onDurationTimer

Enables you change the setting of the on duration timer that is present in the RRC Connection Reconfiguration message of the currently loaded scenario file.

Mode	BSE
Overwrites Scenario File Value	Yes
Range	psf1 | psf2 | psf3 | psf4 | psf5 | psf6 | psf8 | psf10 | psf20 | psf30 | psf40 | psf50 | psf60 | psf80 | psf100 | psf200
Preset	psf6
Dependencies and/or Couplings	***Connected DRx On/Off*** must be set to **On**.
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings*** **> More**

DRX-InactivityTime

Specifies the number of PDCCH-subframe(s) after successfully decoding a PDCCH that the UE will listen to the PDCCH before turning off its receiver.

Specifies the number of consecutive PDCCH-subframe(s) after successfully decoding a PDCCH indicating an initial UL or DL user data transmission for this UE.

For example, a value of psf5 corresponds to 5 PDCCH sub-frames.

Mode	BSE
Overwrites Scenario File Value	Yes
Range	Psf1 to psf2560
Preset	Psf1920
Dependencies and/or Couplings	***Connected DRx On/Off*** must be set to **On**.
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings*** **> More**

Short DRX Cycle On/Off

Connected Mode DRX related – present in RRC Connection Reconfiguration. Controls whether shortDRX IE present or not.

Mode	BSE
Overwrites Scenario File Value	Yes
Range	On|Off
Preset	Off
Dependencies and/or Couplings	***Connected DRx On/Off*** must be set to **On**.
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings*** **> More**

Short DRx-Cycle

Specifies the number of subframes between the onDurationTimer starting for each short cycle

Specifies the number of consecutive subframe(s) for which the UE follows the Short DRX cycle. Value sf2 corresponds to 2 sub-frames, sf5 corresponds to 5 subframes and so on.

Mode	BSE
Overwrites Scenario File Value	Yes
Range	sf2 to sf640
Preset	sf2
Dependencies and/or Couplings	***Short DRX Cycle On/Off*** must be set to **On**.
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings*** **> More**

drxShortCycleTimer

Specifies the Timer for the DRX Short Cycle as multiples of the shortDRX-Cycle. For example, entering a value of 3 for this setting corresponds to 3 times the number of subframes you specified for shortDRX-Cycle.

Mode	BSE
Overwrites Scenario File Value	Yes
Range	1 to 16
Preset	1
Dependencies and/or Couplings	***Short DRX Cycle On/Off*** must be set to **On**.
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***RRC Settings*** **> More**

RRC – Key Menu 3

Accesses the menu that enables you to configure the following settings:

Connection Timer Status

Connection Timer

Additional Spectrum Emission

Connection Timer Status

Turns on or off the Connection Timer.

Mode	BSE, FDD
Range	On | Off
Preset	Off
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More** > ***RRC Settings*** > **More** > **More**

Connection Timer

The Connection Timer adds the ability to periodically check whether the UE, while in the RRC Connected state, is still able to communicate with the PXT. An example of where this would *not* be the case is where the UE has been physically disconnected from the PXT without being turned off, and going through the Detach procedure.

If the Connection Timer is enabled (using the Connection Timer Status field), a transport block filled with MAC padding data is occasionally sent to the UE. If this is ACKed or NACKed, it will be taken as a sign that the UE is still present. If the UE does not send an ACK or NACK for the number of seconds specified in the Connection Timer field, the UE is assumed to have disconnected and the state of the PXT changes to Idle.

Mode	BSE, FDD
Range	2 to 60
Preset	5
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More** > ***RRC Settings*** > **More** > **More**

Additional Spectrum Emission

Controls how much leakage the UE is allowed into adjacent frequencies. This setting is contained in SIB2.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE, FDD
Overwrites Scenario File Value	Yes
Range	1-32 (Integer only)
Preset	1
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More** > ***RRC Settings***

NAS Settings

Enables you to access the Non-Access Stratum (NAS) parameter settings that are available to you.

The NAS contains all the functions and protocols used directly between the UE and the core network. The main NAS specification is 3GPP TS 24.301. The NAS protocols are transparent to the access network. These protocols manage the mobility of the UE and the activation, modification, and deactivation of user-plane channels for transferring user data between the UE and the IP network.

Key Path: **BSE** > **Mode Setup> More**

PTI Handling

Procedure Transaction Identity (PTI)

Auto: Utilizes "intelligent caching" of the PTI received in the UL messages and auto-populates this PTI value into the EPS Session Management (ESM) messages sent on the DL.

Manual: Disables Auto function and enables you to manually set the value of the PTI for the ESM messages sent on the DL.

NOTE	In manual mode, the PTI value contained in a particular ESM message is as specified in the loaded scenario file.

Manual mode may be useful in the following situations:

- A UE is performing erroneously. For example: The UE initiates a procedure with one PTI value, but incorrectly expects a corresponding response to contain a different or default/uninitialized value.
- Testing a UEs handling of receiving a mismatched PTI value. For example: Testing the rejection logic in the UE.

ESM layer messages contain a PTI which is used to uniquely identify transactions (for example: matching responses to requests). The 3GPP specification does not outline a particular algorithm for how these numbers are selected – and therefore the UE implementation for UL messages can vary. If the PTI of messages (which are intended to be part of the same "exchange") do not match, the UE discards DL messages and indicates the cause of the PTI mismatch error. This function prevents this mismatch error.

Key Path: **BSE** > **Mode Setup> More** > ***NAS Settings***

DUT IP Address #1

Enables you to set the IP address assigned in the Activate Default EPS Bearer Context Request message of the currently loaded scenario file.

Since this is the #1 DUT IP address, it is the one contained inside the Attach Accept message.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is not running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Preset	0.0.0.0
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***NAS Settings***

MCC

This value is carried in SIB1 and in the Attach Accept message (if GUTI is present). Setting this menu key overwrites this value in both locations.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is not running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Preset	001
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***NAS Settings***

MNC

This value is carried in SIB1 and in the Attach Accept message. Setting this menu key overwrites this value in both messages.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Preset	01
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More >** ***NAS Settings***

2 or 3 Digit MNC

Controls the number of digits of MNC. This setting overwrites both locations: SIB1 and Attach Accept.

IMPORTANT	This setting overwrites the value defined in the currently loaded scenario file, when the BSE emulator is *not* running (**Mode** > **BSE** > ***Emulator Mode- Stop*** is selected).

Mode	BSE
Overwrites Scenario File Value	Yes
Range	2,3
Preset	2
Initial S/W Revision	6.3
Key Path	**BSE** > **Mode Setup> More** > ***NAS Settings***

Security – Key Menu 1

Accesses the menu of Security features available for configuration.

Security

Authentication Algorithm

Key Option

K value

OP value

OPc value

AMF value

IMSI value

Replay

Key Path: **BSE** > **Mode Setup> More**

Security

On: Ensures the following security-related procedures are taken care of automatically by the PXT:

- The AUTN parameter inside the DL EMM Authentication Request message contained in the scenario file is overwritten with a value that is valid for the currently selected Authentication Algorithm and derived from applicable settings in the Security Menu, including the K Value.
- Security Protected NAS Message containers are added to "plain NAS" messages contained in scenario files after security activation. During a typical connection setup sequence, the EMM Security Mode Command and EMM Attach Accept (which contains the Activate Default EPS Bearer Context Request message) have these headers added.

NOTE	It is not necessary to add the Security Protected NAS Message containers to messages that are specified in scenario files, as this is done automatically.

- Inside Security Protected NAS Messages, the Security Header Type, the Message Authentication Code and the Sequence Number fields are filled in automatically.
- If activated, NAS messages are ciphered after security activation. For example: Algorithm **eea1** or **eea2** has been selected by the EMM Security Mode Command.
- Inside PDCP PDUs, the MAC-I field (the message authentication code) which is present on SRB channels, is automatically filled in after security activation.
- If activated, PDCP PDUs will be ciphered after security activation. For example: Algorithm **eea1** or **eea2** has been selected by the RRC Security Mode Command.

Off: The above events do not occur automatically. Depending upon the capabilities of the UE under test, it may be possible to manually add the correct headers inside scenario files, or not to enable security at all, by skipping over the Authentication and Security Procedures.

Key Path: **BSE** > **Mode Setup> More** > **Security**

Authentication Algorithm

Sets the conformance test algorithm.

MILENAGE: Sets the normal authentication algorithm (Rijndael) as described in 3GPP TS 35.206.

Dummy: Sets the conformance test algorithm described in 3GPP TS 34.108.

Key Path: **BSE** > **Mode Setup> More** > **Security**

Key Option

Enables you to specify whether the key option contains OP or OPc.

OP: Enables you to manually enter the OP value.

OPC: Calculates the OPc value as defined in 3GPP TS 35.206 and is derived from the OP and K values.

NOTE	This setting is only available if you have selected **MILENAGE** for the Authentication Algorithm. above.

Key Path: **BSE** > **Mode Setup> More** > ***Security***

K value

32 Hex digit for Agilent SIM

32 hex digits representing the 128-bit subscriber key (K). Selecting Agilent will select the K value which matches the Agilent USIM's "Applicative Key" as described at www.agilent.com/find/usim. If you choose 3GPP, it matches the value defined in 3GPP TS 34.108.

If you select the User, then you must enter the 32 Hex Digit.

Mode	BSE
Range	Agilent SIM | 3GPP Test SIM | User Defined
Units	Hex
Preset	Agilent SIM
State Saved	No, except when "User Defined" is selected.
Initial S/W Revision	6.0
Key Path	**BSE** > **Mode Setup> More** > ***Security***

Agilent SIM

Selecting Agilent will select the K value which matches the Agilent USIM's "Applicative Key" as described at www.agilent.com/find/usim.

Key Path: **BSE** > **Mode Setup> More** > **Security > K Value**

3GPP Test SIM

This selection matches the value defined in 3GPP TS 34.108.

Key Path: **BSE** > **Mode Setup> More** > **Security > K Value**

User Defined

If you select the **User Defined**, then you must enter the 32 Hex Digit.

Mode	BSE
Range	16 Byte Hex in string format
Units	Hex
Preset	None
State Saved	Yes
Initial S/W Revision	6.0
Key Path	**BSE** > **Mode Setup> More** > ***Security*** **> *K Value***

OP value

You manually type in value here.

Mode	BSE
Range	16 Byte Hex in string format
Units	Hex
Preset	None
State Saved	Yes
Dependencies and/or Couplings	**Mode Setup** > **More** > ***Security*** > ***Authentication Algorithm*** must be set to MILENAGE. **Mode Setup** > **More** > ***Security*** > ***Key Option*** must be set to OP.
Initial S/W Revision	6.0
Key Path	**BSE** > **Mode Setup> More** > ***Security***

OPc value

You manually type in value here.

Mode	BSE
Range	16 Byte Hex in string format
Units	Hex
Preset	None
State Saved	Yes
Dependencies and/or Couplings	**Mode Setup** > **More** > ***Security*** > ***Authentication Algorithm*** must be set to MILENAGE. **Mode Setup** > **More** > ***Security*** > ***Key Option*** must be set to OPc.
Initial S/W Revision	6.0
Key Path	**BSE** > **Mode Setup> More** > ***Security***

AMF value

Authentication Management Field (AMF)

Refer to 3GPP 33.102.

Mode	BSE
Range	0000 to FFFF
Units	Hex
Preset	8000
State Saved	No
Initial S/W Revision	6.0
Key Path	**BSE** > **Mode Setup> More** > ***Security***

IMSI value

International Mobile Subscriber Identity (IMSI)

Type in the value that matches the SIM you are using. (primarily used during paging.)

Mode	BSE
Range	Agilent|3GPP|User Defined
Preset	Agilent
State Saved	No, except when "User Defined" is selected.
Initial S/W Revision	6.0
Key Path	**BSE** > **Mode Setup> More** > ***Security***

Agilent

Selecting Agilent will select the IMSI value which matches the Agilent USIM's "Applicative Key" as described at www.agilent.com/find/usim.

Key Path: **BSE** > **Mode Setup> More** > **Security > IMSI value**

3GPP

THE PXT implements this value: 001010123456789.

Key Path: **BSE** > **Mode Setup> More** > **Security > IMSI value**

User Defined

You must enter a 15 hex digit.

Mode	BSE
Range	000000000000000 to FFFFFFFFFFFFFF
Preset	None
State Saved	Yes. This value is saved in the Security .ini file.
Initial S/W Revision	6.0
Key Path	**BSE** > **Mode Setup> More** > ***Security*** **> IMSI value**

Security – Key Menu 2

Replay

When selecting **On**, the PXT automatically populates the Information Element (within the SECURITY_MODE_COMMAND) called, "Replayed UE Security Capabilities" with the exact capability content received by the UE within the previously received ATTACH_REQUEST UL EPS Mobility Management (EMM) Message.

When selecting **Off**, you manually define this Information Element within the SECURITY_MODE_COMMAND of the currently loaded scenario file.

NOTE	The SECURITY_MODE_COMMAND is a DL EMM Message, sent to the UE during connection setup with security enabled. It enables ciphering and integrity at NAS.

Mode	BSE
Range	ON|OFF|1|0
Preset	ON|1
State Saved	No. Instrument always boots up in the "On" state.
Initial S/W Revision	6.1
Key Path	**BSE** > **Mode Setup> More** > ***Security*** **> More**

Preset

Returns all settings to their default factory values.

Key Path: Front-panel key

Print

Function is not currently available.

Key Path: Front-panel key

Recall

Enables you to load parameter settings from the state files saved in registers. See ***Save State*** menu for more information.

Key Path: Front-panel key

Recall State

Enables you to recall state files from registers and delete state files.

Key Path: **Recall**

SA

Signal Analyzer (**SA)** mode enables two sub-modes: ***Spectrum Analyzer*** and ***LTE***. Refer to the RF Measurements chapter on page 131.

Key Path: Front-panel key

Spectrum Analyzer

Refer to the RF Measurements chapter on page 131.

Key Path: Front-panel key

LTE

Refer to the RF Measurements chapter on page 131.

Key Path: Front-panel key

Save

Enables you to save states and screen captures in your specific filenamed locations.

Key Path: Front-panel key

Save State

Enables you to save state files in the register locations (1-7) by selecting the file displayed on the screen using the up/down arrow keys and then pressing the ***Save*** menu key. You can rename the highlighted register location to one you prefer.

Key Path: **Save**

Save Screen Setup

Accesses the functions that enable you to specify where and what format you wish to save screen captures.

Key Path: **Save**

Default Saved Position

Locations to save: USB memory stick or hard drive disk (HDD). When selecting **HDD**, the files are saved to this location: C: > Documents and Settings > Administrator > My Documents > E6621A > Screenshots.

Key Path: **Save > *Save Screen Setup***

Format

File types that can be saved: bmp, jpg, png.

Key Path: **Save > *Save Screen Setup***

Save Screen

Saves screen shot of display in location determined by setting the ***Default Saved Position***.

Key Path: **Save**

SG

Function is not currently available.

Key Path: Front-panel key

Single

Sets measurement to one sweep when in SA mode.

Key Path: Front-panel key

Spectrum

Accesses those measurements available when you press **Mode** > **SA** > ***Spectrum Analyzer***.

Key Path: Front-panel key

Tool

Function is not currently available.

Key Path: Front-panel key

Tech

If you have the appropriate licenses, this key enables you to switch modes between FDD and TDD. Switching modes takes a few minutes and the application then restarts using the chosen format.

Key Path: Front-panel key

3 Using the Base Station Emulator Mode (BSE)

In the Base Station Emulator (eNodeB emulation) mode, the PXT simulates an LTE eNodeB's operation for use in the development and test of LTE UEs. In this mode, you test the UE by setting up a call and establishing a link. When the link is established the uplink and downlink tests described below can be performed.

The following topics are included in this section:

Display and Menu Descriptions

The section describes the Emulator and Configuration displays, menus, and keys that are available in the BSE mode. These menus and displays are accessed by selecting the **BSE** front-panel key.

NOTE	When discussing key paths within tables or text, front-panel keys are represented in **bold;** menu keys appear in ***bold, italics***.

Emulator Mode Menu and Display

The areas labeled in the figure below are described in this section.

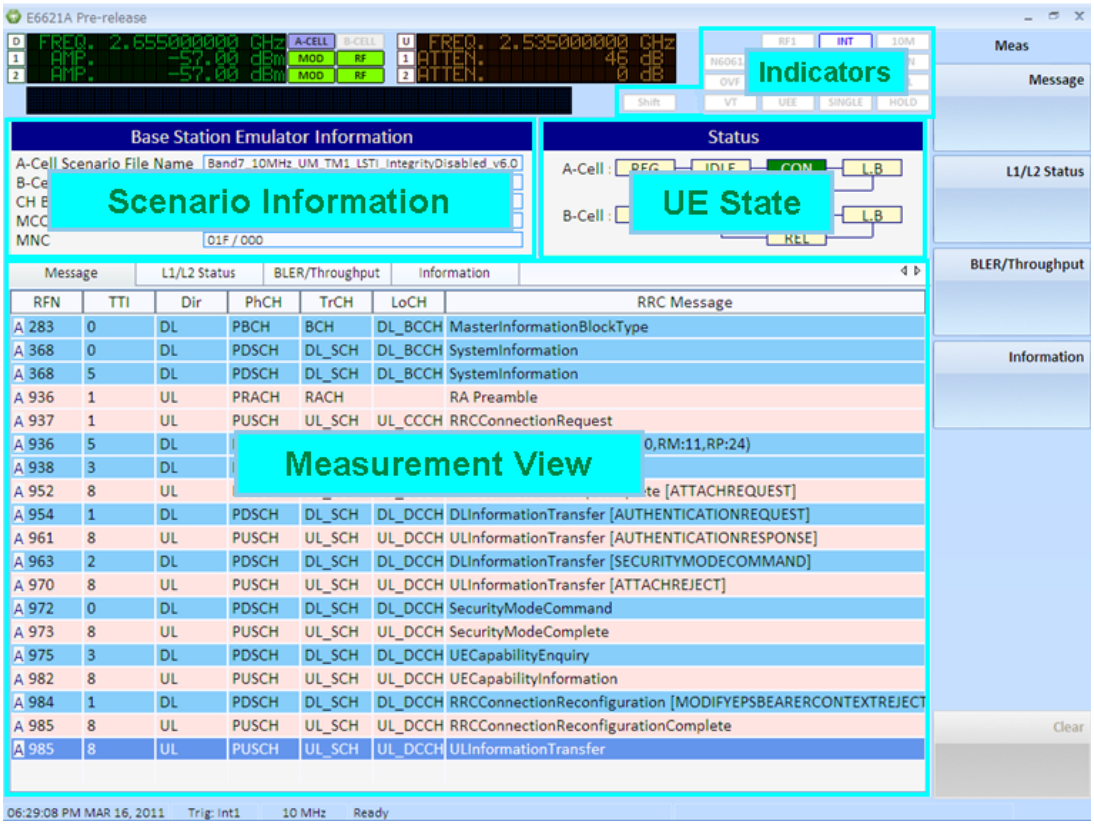
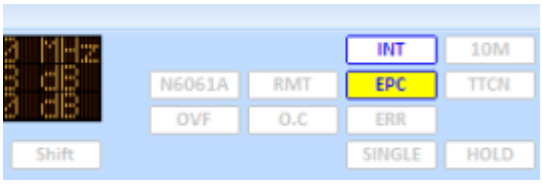


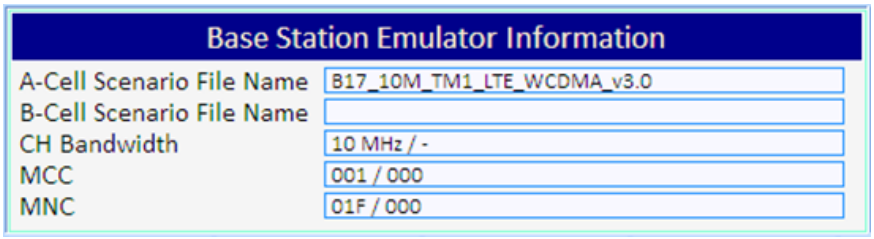
Figure 3-1: Emulator Mode

Indicators

The indicators shown below are those currently used by the PXT. Refer to Interpreting Display Information on page 55 for Indicator descriptions.



Scenario Information



A-Cell Scenario File Name: Displays the scenario file selected for cell A.

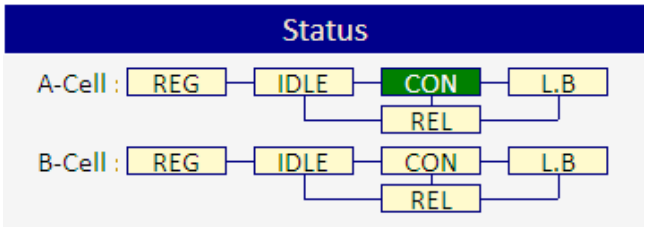
B-Cell Scenario File Name: Displays the scenario file selected for cell B.

CH Bandwidth: The frequency range in which the base station is sending and receiving data.

MCC: Mobile Country Code (Unique country identifier specified in standards)

MNC: Mobile Network Code (Unique network operator code)

UE State



For either A-Cell or B-Cell, the rectangular boxes under "Status" indicate your system is in one of the following states:

REG: The UE is attempting to register the LTE cell.

IDLE: The UE is in RRC idle mode.

CON: The UE is in the RRC Connected state.

REL: BSE has released UE from call.

L.B: Currently has no function.

Meas View

This window displays various kinds of information including messages transmitted/received, L1/L2 status, ER/Throughput and a brief report containing the current emulator configuration. Each view is activated by selecting the **Meas** front-panel key. For more information, refer to the **Meas** front-panel key on page 54.

Emulator Run/Stop

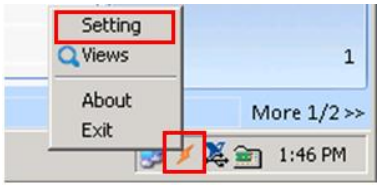
The eNodeB Simulation starts and stops by pressing this button. If simulation has started, the instrument is ready to be connected with the UE. When simulation stops, the instrument transmits only default signals in the downlink and all the tests are frozen.

EPC Setup

IMPORTANT	Configuration of the EPC is not required unless you are connecting to an 8960. The EPC currently supports inter-RAT for eHRPD and WCMDA.

IMPORTANT	You must set ***EPC*** to ***Embed*** to enable IP connectivity. Otherwise, all uplink IP data will be discarded. To make this selection, press **Mode Setup** > ***EPC.***

To access the EPC setup menu, right click on the orange icon, in the task bar at the bottom of your MS Windows screen and select "Setting", as shown below. Note that the orange icon shown in the graphic below changes to this:  when you are already in a connected state.



The following window is displayed:

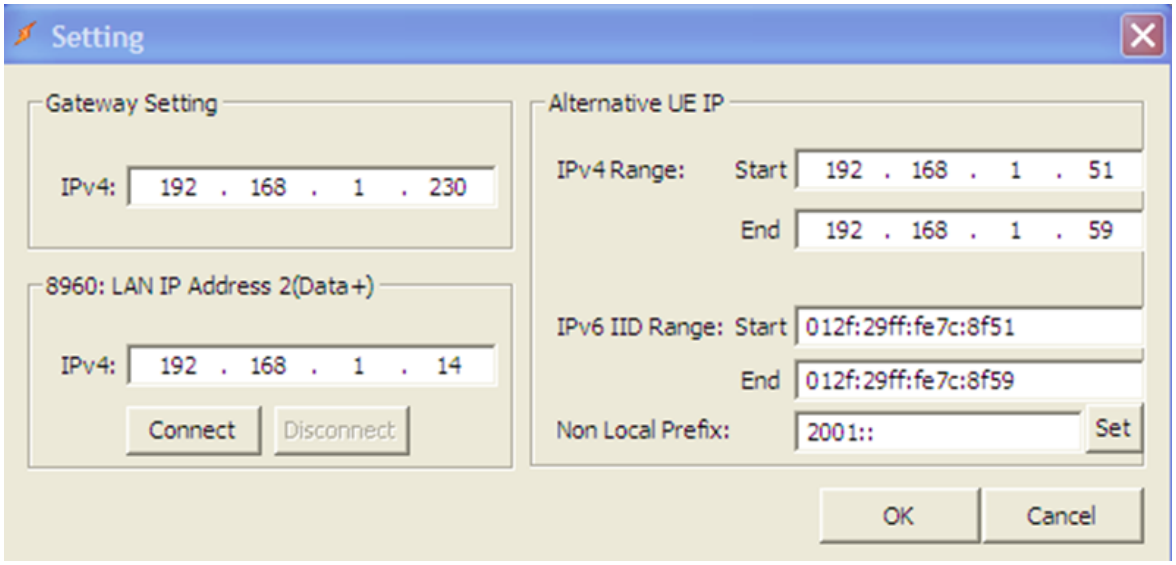


Figure 2-1: EPC Settings

For inter-RAT handovers, the EPC must be connected to the 8960, prior to initiating any IP Context on the 8960 or the E6621A. This is achieved by selecting **Connect** (as shown in the above figure), or by initiating the connection from the appropriate page on the 8960. Before continuing be sure that the 8960 reports the EPC Connection Status as "Connected".

Gateway Setting:

This is where all UE uplink IP data is directed during Inter-RAT testing, regardless to which subnet the IP data is destined. So, when setting up the IRAT handover procedure, this IP address is the target for 8960 UE IP traffic, and typically this is set to the "Server" PC IP address. (You can also set it to a corporate LAN "Default Gateway".)

8960: LAN IP Address 2(Data+):

This is the IP address of the 8960. For correct operation, both 8960 LAN ports must be connected and allocated IP addresses. On the 8960, the value set for the 'LAN IP Address 2 (Data+)' setting should also be entered here.

NOTE	This is not an essential field if the expected operation is to initiate the connection from the 8960.

Alternative UE IP-Ipv4Range:

This is the IPv4 address range used when the UE requests an IPv4 address when attached to the 8960. Note that this should match any scenario file in use for inter-RAT handovers.

Alternative UE IP-Ipv6 IID Range:

This is the Ipv6 address range used when the UE requests an IPv6 address when attached to the 8960. Note that this should match any scenario file in use for eHRPD inter-RAT handovers.

Non Local Prefix: This is the IPv6 network prefix which is used for the UE when not link-local.

Setup and Operation

General Call Setup Procedure

1. Press **Emulator Mode > Mode Setup >** ***Call Scenario*** to select the call scenario you wish to use.

NOTE	All instrument parameters must match the selected scenario file in order to successfully connect to the UE.

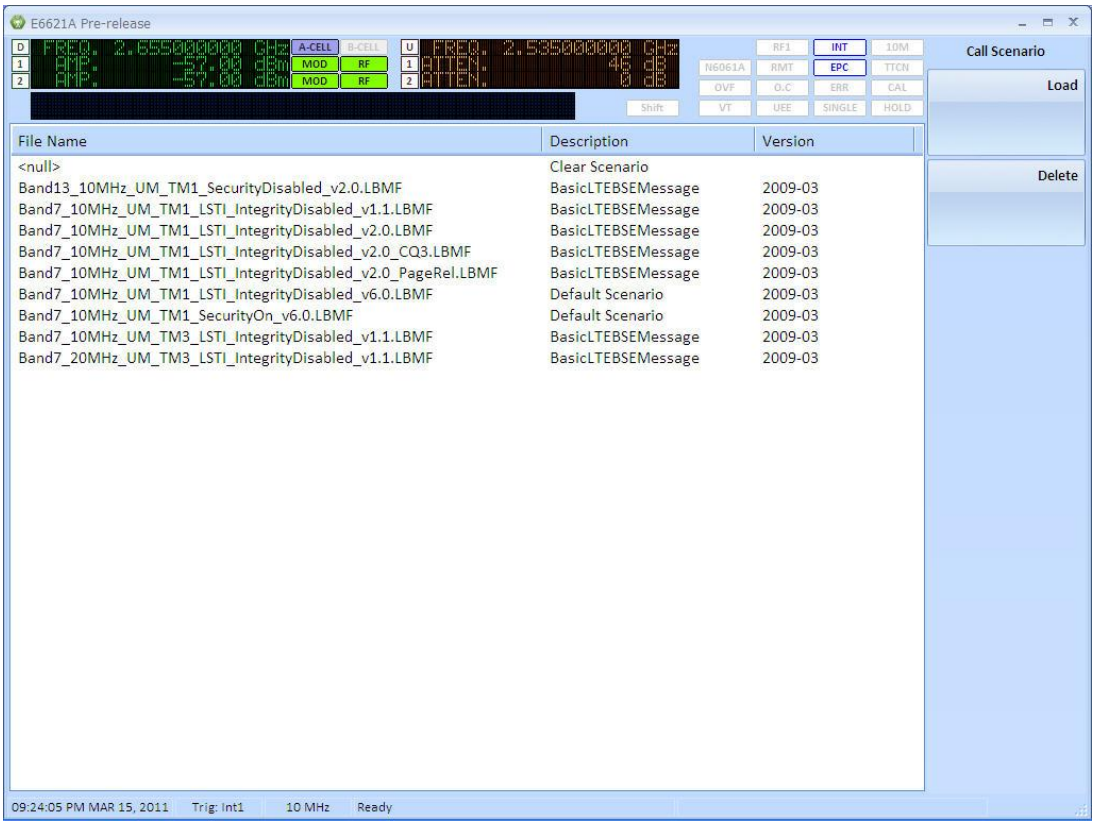


Figure 3-2: Example Call Scenario List

2. Adjust the **Profile type**, **C-RNTI**, and **UE Category** to align with the call scenario selected.
3. Adjust ***Cell ID***, ***PHICH Resource***, ***CFI*** to align with the call scenario selected by pressing **BSE** > **Mode Setup** > **More** > ***PHY Settings***. Refer to the "PHY Settings" section on page 71 a**Error! Bookmark not defined.**bove for more information.
4. To specify security settings, select **BSE** > **Mode Setup** > **More** > ***Security***. You can enter the algorithm used as well as the values for K, OP, OPc, and AMF. Refer to the "Security" section on page 100 above for more information.
5. Select **BSE**, and set the Emulator to **Run**. If it is already running, select **Stop** and reset it to **Run**, again. The UE is now ready to be connected.
6. When the UE tries to connect, the transmitted messages are shown on the Message Display Window. If the connection is successful, the UE Status Information changes to "CON" (connected).

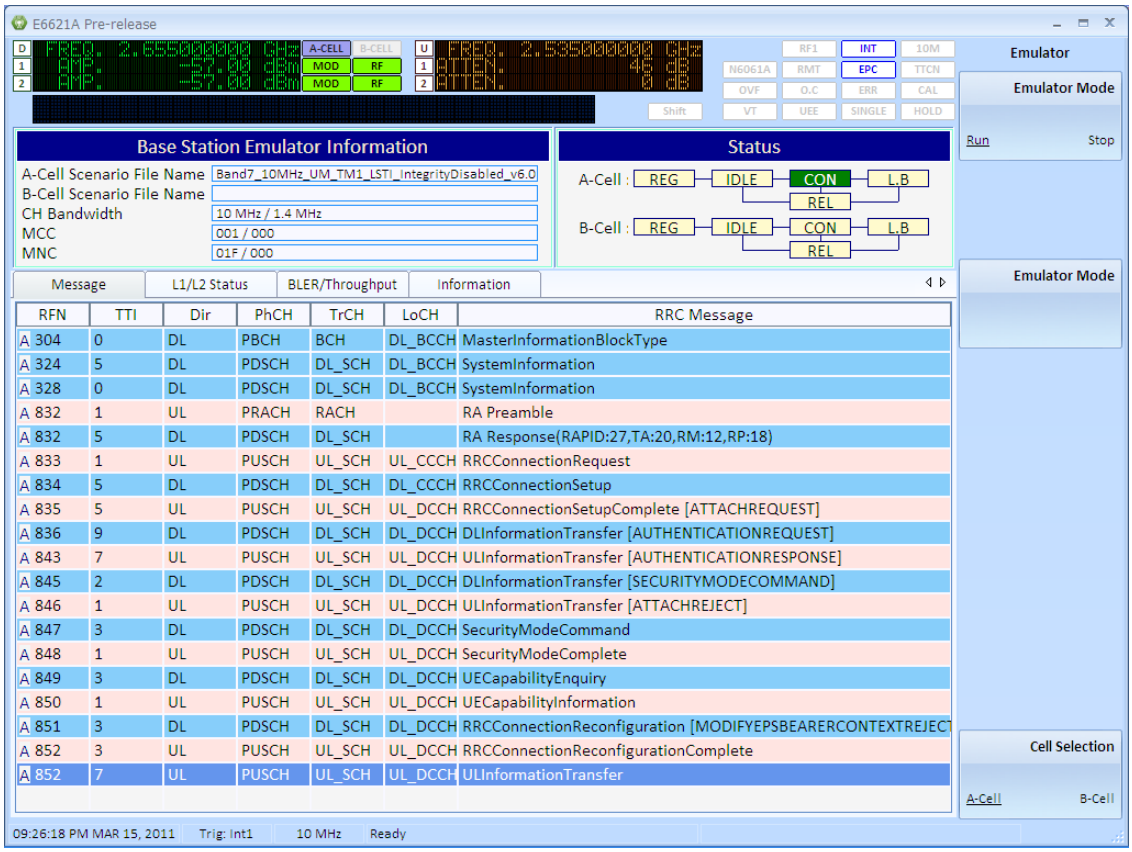


Figure 3-3: General Call Setup Procedure Complete

Functional Tests and E2E Test

The following tests can be performed after call procedure is completed. Before performing various tests, settings for uplink and downlink resource allocation must be set. There are 2 uplink allocation modes, Auto and Fixed MAC Padding. Auto means the PXT sends an uplink allocation when there is a scheduling request or buffer status report from the UE, as specified in the 3GPP specification. While, in Fixed MAC Padding mode, the PXT sends the uplink resource allocation continuously without the UE's request. This mode is used for full throughput test or uplink signal test.

There is a configuration for max throughput test in the downlink resource allocation setting as well, which is Subframe #5 Control. To obtain maximum throughput for DTCH data, select **MAX Th**. (SystemInformationBlock on subframe #5 affects the DTCH throughput.)

E2E Tests

Functional Tests

Press the **Func** front-panel key. The following list of functional tests are displayed:

- DTCH Test
- UE Power Control
- Handover
- UE Detach
- Paging
- Custom Message
- PDCCH Order
- OCNG

Refer to Func menu key on page 32 for more information.

DTCH Test

For the downlink data transmission test, select **Func**, **DTCH Test**. The packet to be transmitted is configured by selecting the Parameter menu. Data format, network interface, transfer rate, payload type, packet size, and numbers of packets to be transmitted are all set in this menu. The test results are viewed on the ER/Throughput display by selecting **Meas**.

After configuring the necessary parameters for this measurement, select **Test** (**On**). If **Transfer Mode** (**Auto**) is selected, the data transmission starts automatically. Setting **Transfer Mode** to **Manual**, requires that you select **Manual Transfer** in the sub-menu to transfer the packet.

UE Power Control

To test the power control function, select **Func**, **UE Power Control**. You can send a power control message (**Send Message**), set the **DCI** Format and set the power control to **All Up** or **All Down**.

Handover, UE Detach, Paging, Custom Message

To perform these functional tests, the message to be sent is edited using the *N6062A Protocol Message Editor* software and is included in each field. The menu keys are configured when the scenario is loaded. In each field, multiple rrcConnectionReconfiguration messages can be included, for various protocol or radio tests.

PDCCH Order

Refer to PDCCH Order for more information.

OCNG

Refer to OCNG for more information.

4 UTRAN/LTE & GERAN/LTE Inter-RAT Handovers

The PXT can be used in conjunction with the Agilent E5515 (8960) to perform inter-RAT (Radio Access Technologies) operations. This combination of instruments enables you to test multi-mode wireless devices for inter-RAT handovers between legacy 3GPP and E-UTRAN (LTE) using the 8960 as the UTRAN or GERAN simulator.

Note that throughout this section, the term UTRAN will be used to refer to the WCDMA technology running as the E6703 or E6785 application on the 8960. Similarly GERAN refers to GSM, GPRS and EGPRS technologies running as the E6701 or E6785 applications. (Refer to section the appendix of the *Agilent PXT Getting Started Guide* for an acronym descriptive). Collectively UTRAN and GERAN will be referred to as the 'legacy 3GPP' networks.

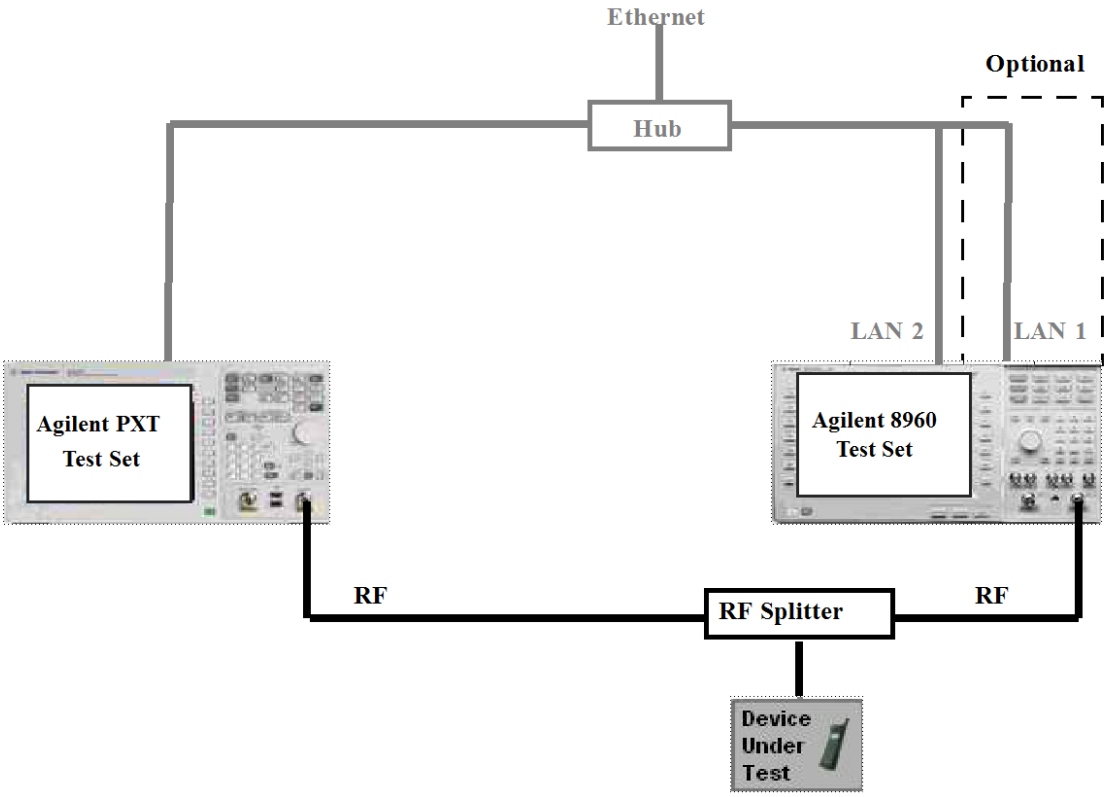
The following test scenarios are supported using the 8960/PXT combination:

- Cell reselection between UTRAN and LTE (bi-directional, UE-initiated only).
- Cell reselection between GERAN and LTE (bi-directional, UE-initiated only).
- PS (Packet Switched) Handover between UTRAN and LTE (bi-directional, network-initiated only).
- PS Handover between GPRS/EGPRS and LTE (bi-directional, network-initiated only).
- RRC (Radio Resource Control) Redirection from LTE to WCDMA.
- CSFB (Circuit Switched Fallback) from LTE to either UTRAN or GERAN.

NOTE	For more information on handovers, refer to the application note, ***Testing Handovers Between LTE and 3G cdma2000/1xEV-DOCellular Networks*** located here: http://cp.literature.agilent.com/litweb/pdf/5990-8362EN.pdf.

Connecting the Hardware Components

The figure below shows a typical physical connection for interworking between legacy 3GPP networks and LTE.



Component	Function
Agilent PXT (E6621A)	LTE system simulator.
8960 (Lab Application)	Legacy 3GPP network simulator. For UTRAN simulation, a lab application of E6703H H.00.06 (E6785H H.00.06) or later is required. For GERAN simulation, a lab application of E6701I I.01.13 (E6785H H.01.13) or later is required.
Ethernet (LAN) Connection	Enables the exchange of signaling messages or packet data. **NOTE**: There are two LAN Ports on the rear panel of the 8960 test set. For LTE interworking, LAN 2 PORT is required to exchange signaling messages or packet data. (LAN 1 PORT is optional, but it is still useful for other LAN operations such as protocol logging, firmware downloads or screen captures.)
RF Interface	The UE must be able to communicate with both simulators. To accomplish this, it is common to use an RF splitter to connect the mobile to both test sets simultaneously.
GPIB Connection	The GPIB connection between both test sets and a controlling PC are necessary if remote control of the instruments in the system is required.

Ethernet Switch or Hub	An Ethernet switch or hub is required to connect the following: • UE to external servers • PC running WPA (Wireless Protocol Advisor) to the 8960 • PC running N6061A Protocol Logging and Analysis software

NOTE	Only one 8960 and one PXT can be connected at any time.

Refer to the 8960-WCDMA Documentation or (soon to be available – GSM/GPRS/EGPRS Documentation) for further setup required on the Agilent 8960.

Setting the Software Parameters

The connection between the 8960 and PXT can be initiated from the 8960 or via the EPC interface within the PXT.

Initiating Connection From:	Use this documentation
8960 running WCDMA (E6703H/E6785H)	8960-WCDMA Documentation
8960 running GERAN (E6701I/E6785H)	(soon to be available – GSM/GPRS/EGPRS Documentation)
PXT	"EPC Setup" on page 110 of this document.

Performing Cell Reselections

IMPORTANT	You must have already completed the two setup procedures above: • Connecting the Hardware Components • Setting the Software Parameters and set all other 8960 parameters as appropriate for the DUT.

Cell Reselections from UTRAN/GERAN to LTE

With a UE camped on the legacy 3GPP network, it is possible to reselect to the PXT acting as the LTE cell.

NOTE	For a typical network, the WCDMA cell will normally broadcast SIB19 LTE neighbor information (refer to WCDMA SIB19 Setup). Even though the UE may require this, it is not essential from an operational perspective. Likewise the SI-2quater information is transmitted to broadcast the LTE neighbors on GERAN. However releases E6701I & E6785H do not support this feature.

The PXT (LTE Cell) must be running a scenario file (on the appropriate LTE frequency band and EARFCN) that handles the TAU (Tracking Area Update) messaging.

Specifically, to successfully perform a reselection to LTE when the UE is PDP (Packet Data Protocol) Active on the legacy network, the TrackingAreaUpdateAccept message must have the EPSBearerContextStatus information element present. This requires the following:

- The EBID matching the active NSAPI (Network Service Access Point Identifier) on UTRAN/GERAN is marked as "true".
- The appropriate DRBs (Data Radio Bearers) with matching eps-BearerIdentity are sent in the rrcConnectionReconfiguration message.

When following the above requirements, the IP address allocated by the EPC when the UE was on UTRAN/GERAN, will continue to provide IP throughput while on LTE.

IMPORTANT	Only when performing the TAU procedure will IP connectivity be preserved during the cell reselection.

Cell Reselections from LTE to UTRAN/GERAN

With a UE camped on LTE, it is possible to reselect to the 8960, acting as a UTRAN or GERAN cell.

NOTE	For a typical network, the LTE cell will normally broadcast SIB6 UTRAN or SIB7 GERAN neighbor information. Even though the UE may require this, it is not essential from an operational perspective.

The PXT (LTE Cell) must be running a scenario file that allocates an EBID which is valid for use on the legacy cell. (This means values which are within the range 5-15.) Although the IP address configured on the EPC UI does not have to match that allocated in the scenario file, it can be beneficial to maintain IP address consistency. This enables the UE to deactivate the PDP context and re-establish another; being allocated the same IP address. However it is not required.

Other than the EPC connection and any other specific settings for the UE, there is no need to set any parameters on the 8960.

IMPORTANT	Only when performing the RAU (Routing Area Update) procedure will IP connectivity be preserved during the cell reselection.

NOTE	When performing cell reselections to UTRAN only one context is preserved. This restriction does not apply for reselections to GERAN.

Performing PS (Packet Switched) Handovers

PS Handovers from UTRAN/GERAN to LTE

PS Handovers require the target cell to setup dedicated resources for an incoming UE. The source cell queries the target cell for the resource configuration, and then communicates this information to the UE to enable it to access the target cell. This technique bypasses the RRC connection setup procedure and subsequently minimizes the data flow interruptions.

The LTE scenario must contain the RrcConnectionReconfiguration message describing the waiting resources. The same message (as a transparent hex string) must be communicated to the 8960 via SCPI (refer to WCDMA PS Handovers or (soon to be available – GSM/GPRS/EGPRS Documentation)). It is important that the EBIDs used match between the two formats. (Specifically, the UE requested NSAPI must match the EBID in the RrcConnectionReconfiguration.)

The LTE scenario must also correctly process a TAU procedure, with the EPSBearerContextStatus bitmap set as described above.

The PS handover can then be initiated via the 8960 UI when the UE is PDP active.

IMPORTANT	Only when performing the TAU procedure will IP connectivity be preserved during the PS handover.

NOTE	When performing cell reselections to UTRAN only one context is preserved. This restriction does not apply for reselections to GERAN.

PS Handovers from LTE to UTRAN/GERAN

PS Handovers require the target cell to setup dedicated resources for an incoming UE. The source cell queries the target cell for the resource configuration, and then communicates this information to the UE to enable it to access the target cell. This technique bypasses the connection setup procedures and subsequently minimizes the data flow interruptions.

For the PXT/8960 this process must be performed in two phases.

The first phase is to setup the 8960 for the requirements of the test (which may be nothing). The LTE scenario is configured as normal, and the UE attached to the stage where a PS handover is performed. At this point, the 8960 is set up for an inbound PS handover (refer to WCDMA PS Handovers or (soon to be available – GSM/GPRS/EGPRS Documentation)). The 8960 queries the EPC for a description of the NAS resources allocated to the UE, and then enters into a 'Handover' state. The transparent-hex string describing the waiting resources can be retrieved via SCPI.

Phase two involves modifying the scenario file used in phase one. A MobilityFromEUTRACommand is added, with the targetRAT-Type being utra or geran and the targetRAT-MessageContainer set to the transparent-hex string retrieved above. This message is added as a Handover message on the Extended tab of the *N6062A Protocol Message Editor* software application. The scenario should be reloaded and the UE re-attached to the same point as before. Again, the 8960 is set up for an inbound PS handover.

The handover message is now sent to the UE which performs the PS handover to the legacy 3GPP network.

NOTE: Phase One is only required once per test configuration, and is necessary only to retrieve the transparent-hex string describing the 8960 waiting resources.

IMPORTANT	Only when performing the RAU procedure will IP connectivity be preserved during the PS handover.

NOTE	When performing cell reselections to UTRAN only one context is preserved. This restriction does not apply for reselections to GERAN.

Performing RRC Redirection

RRC Redirection is only supported in the direction LTE to UTRAN.

The RRC Redirection involves adding an rrcConnectionRelease message to the scenario file. The redirectedCarrierInfo must have the type utra-TDD or utra-FDD and frequency as set on the 8960. This message is also added as a Handover message on the Extended tab of the *N6062 Message Editor* software application.

Send the redirection message to the UE when on the LTE cell.

IMPORTANT	Only when performing the RAU procedure will IP connectivity be preserved during an LTE to WCDMA redirection.

Performing Circuit Switched Fallback

Mobile Originated CSFB

Prior to performing the CSFB, the 8960 must be set up to respond to Unexpected Page Response (refer to WCDMA Unexpected Page Response or GERAN Unexpected Page Response). The voice parameters (if required) must also be set (refer to WCDMA AMR Setup or GERAN Channel Mode Setup).

The LTE scenario file must be modified to respond to an ulInformationTransfer with EXTENDED_SERVICE_REQUEST on the appropriate scenario tab. This sends an rrcConnectionRelease with redirectedCarrierInfo of type utra-TDD, utra-FDD or geran and frequency as set on the 8960.

The CSFB is now exercised by camping the UE and initiating a MO voice call.

Mobile Terminated CSFB

Prior to performing the CSFB, the 8960 must be set up to respond to Unexpected Page Response (refer to WCDMA Unexpected Page Response or GERAN Unexpected Page Response). The voice parameters (if required) must also be set (refer to WCDMA AMR Setup, GERAN Channel Mode Setup or GERAN AMR Setup).

The scenario file must be modified with one (or both) of the following as a Custom message on the Extended tab of the *N6062 Protocol Message Editor* software application:

- If the UE will be RRC-Idle when initiating the MT call, you must add a PCCH message to page the UE with the cn-Domain being cs (informing it of the MT call).
- If the UE will be RRC-Connected when initiating the MT call, you must add a DL-InformationTransfer message with dedicatedInfoNAS being a CS_SERVICE_NOTIFICATION

In either case, the UE response is the same. Therefore, the scenario file must also respond to an ulInformationTransfer with EXTENDED_SERVICE_REQUEST on the appropriate scenario tab. This sends an rrcConnectionRelease with redirectedCarrierInfo of type utra-TDD, utra-FDD or geran and frequency as set on the 8960.

5 WCDMA/LTE Inter-RAT Handovers

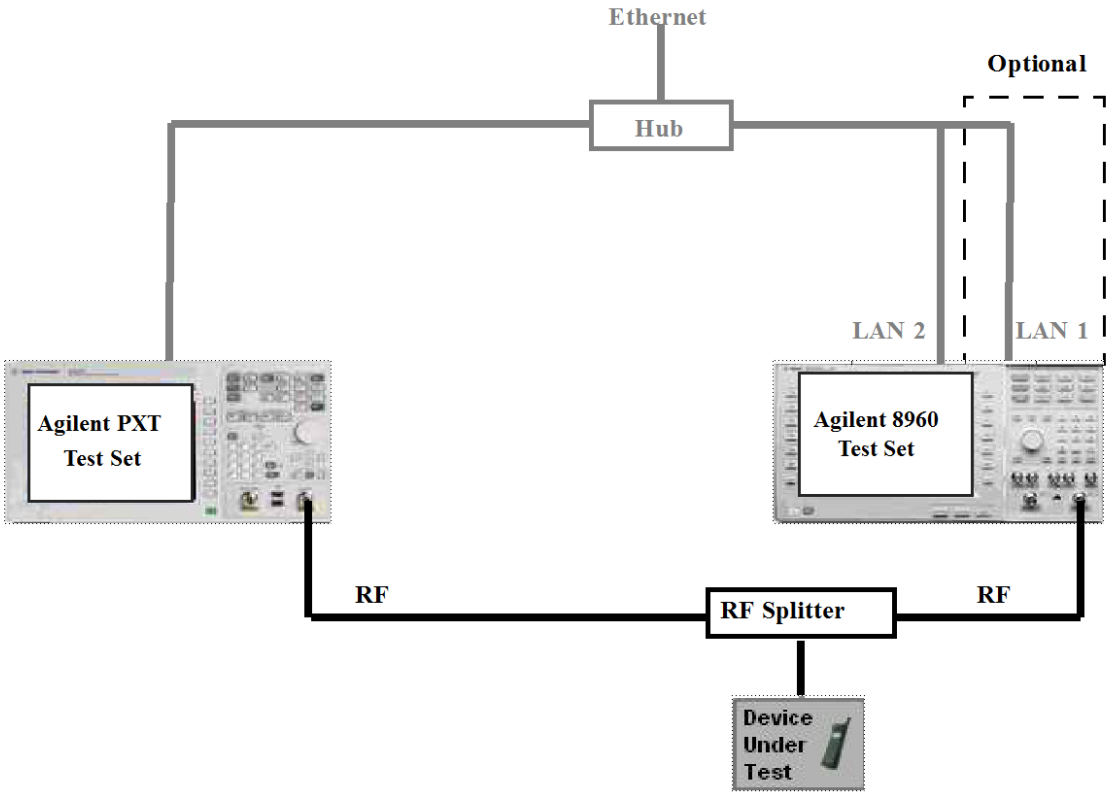
The PXT can be used in conjunction with the Agilent E5515 (8960) to perform inter-RAT (Radio Access Technologies) operations. This combination of instruments enables you to test multi-mode wireless devices for WCDMA/E-UTRAN (LTE) inter-RAT performance using the 8960 as the WCDMA network simulator. The following test scenarios are supported:

- Cell reselection between WCDMA and LTE (bi-directional, UE-initiated only).
- PS (Packet Switched) Handover between WCDMA and LTE (bi-directional, network-initiated only).
- RRC (Radio Resource Control) Redirection from LTE to WCDMA.
- CSFB (Circuit Switched Fallback) from LTE.

NOTE	For more information on handovers, refer to the application note, ***Testing Handovers Between LTE and 3G cdma2000/1xEV-DOCellular Networks*** located here: http://cp.literature.agilent.com/litweb/pdf/5990-8362EN.pdf.

Connecting the Hardware Components

The figure below shows a typical physical connection for LTE/WCDMA interworking.



Component	Function
Agilent PXT (E6621A)	LTE system simulator
8960 – running the Lab Application: ≥ E6703H	WCDMA network simulator
Ethernet (LAN) Connection	Enables the exchange of signaling messages or packet data. **NOTE**: There are two LAN Ports on the rear panel of the 8960 test set. For LTE /WCDMA interworking, LAN 2 PORT is required to exchange signaling messages or packet data. (LAN 1 PORT is optional, but it is still useful for other LAN operations such as protocol logging, firmware downloads or screen captures.)
RF Interface	The UE must be able to communicate with both simulators. To accomplish this, it is common to use an RF splitter to connect the mobile to both test sets simultaneously.
GPIB Connection	The GPIB connection between both test sets and a controlling PC are necessary if remote control of the instruments in the system is required.
Ethernet Switch or Hub	An Ethernet switch or hub is required to connect the following: • UE to external servers • PC running WPA (Wireless Protocol Advisor) to the 8960 • PC running N6061A Protocol Logging and Analysis software

Refer to the 8960-WCDMA Documentation for further setup required on the Agilent 8960.

Setting the Software Parameters

The connection between the 8960 and PXT can be initiated from the 8960 or via the EPC interface within the PXT.

Initiating Connection From:	Use this documentation
8960 running WCDMA (E6703H)	8960-WCDMA Documentation
PXT	"EPC Setup" on page 110 of this document.

Performing Cell Reselections

IMPORTANT	You must have already completed the two setup procedures above: • Connecting the Hardware Components • Setting the Software Parameters and set all other appropriate 8960 parameters correctly, to ensure success in performing cell reselections.

Cell Reselections from WCDMA to LTE

With a UE camped on WCDMA, it is possible to reselect to the PXT, acting as the LTE cell.

NOTE	For a typical network, the WCDMA cell will normally broadcast SIB19 LTE neighbor information (refer to WCDMA SIB19 Setup). Even though the UE may require this, it is not essential from an operational perspective.

The PXT (LTE Cell) must be running a scenario file (on the appropriate LTE frequency band and EARFCN) that handles the TAU (Tracking Area Update) messaging.

Specifically, to successfully perform a reselection to LTE when the UE is PDP (Packet Data Protocol) Active on WCDMA, the TrackingAreaUpdateAccept message must have the EPSBearerContextStatus information element present. This requires the following:

- The EBID matching the active NSAPI (Network Service Access Point Identifier) on WCDMA is marked as "true".
- The appropriate DRBs (Data Radio Bearers) with matching eps-BearerIdentity are sent in the rrcConnectionReconfiguration message.

When following the above requirements, the IP address allocated by the EPC when the UE was on WCDMA, will continue to provide IP throughput while on LTE.

IMPORTANT	Only when performing the TAU procedure will IP connectivity be preserved during a WCDMA to LTE cell reselection.

Cell Reselections from LTE to WCDMA

With a UE camped on LTE, it is possible to reselect to the 8960, acting as a WCDMA cell.

NOTE	For a typical network, the LTE cell will normally broadcast SIB6 WCDMA neighbor information. Even though the UE may require this, it is not essential from an operational perspective.

The PXT (LTE Cell) must be running a scenario file that allocates an EBID which is valid for use on the legacy cell (this means values which are within the range 5-15). Although the IP address configured on the EPC UI does not have to match that allocated in the scenario file, it can be beneficial to maintain IP address consistency. This enables the UE to deactivate the PDP context and re-establish another; being allocated the same IP address. However it is not required.

Other than the EPC connection and any other specific settings for the UE, there is no need to set any parameters on the 8960.

IMPORTANT	Only when performing the RAU (Routing Area Update for WCDMA) procedure will IP connectivity be preserved during a WCDMA to LTE cell reselection.

Performing PS (Packet Switched) Handovers

PS Handovers from WCDMA to LTE

PS Handovers require the target cell to setup dedicated resources for an incoming UE. The source cell queries the target cell for the resource configuration, and then communicates this information to the UE to enable it to access the target cell. This technique bypasses the RRC connection setup procedure and subsequently minimizes the data flow interruptions.

The LTE scenario must contain the RrcConnectionReconfiguration message describing the waiting resources. The same message (as a transparent hex string) must be communicated to the 8960 via SCPI (refer to WCDMA PS Handovers). It is important that the EBIDs used match between the two formats. (Specifically, the UE requested NSAPI must match the EBID in the RrcConnectionReconfiguration.)

The LTE scenario must also correctly process a TAU procedure, with the EPSBearerContextStatus bitmap set as described above.

The PS handover can then be initiated via the 8960 UI when the UE is PDP active.

IMPORTANT	Only when performing the TAU procedure will IP connectivity be preserved during a WCDMA to LTE PS handover.

PS Handovers from LTE to WCDMA

PS Handovers require the target cell to setup dedicated resources for an incoming UE. The source cell queries the target cell for the resource configuration, and then communicates this information to the UE to enable it to access the target cell. This technique bypasses the RRC connection setup procedure and subsequently minimizes the data flow interruptions.

For the PXT/8960 this process must be performed in two phases.

The first phase is to setup the 8960 for the requirements of the test (which may be nothing). The LTE scenario is configured as normal, and the UE attached to the stage where a PS handover is performed. At this point, the 8960 is set up for an inbound PS handover (refer to WCDMA PS Handovers). The 8960 queries the EPC for a description of the NAS resources allocated to the UE, and then enters into a 'Handover' state. The transparent-hex string describing the waiting resources can be retrieved via SCPI.

Phase two involves modifying the scenario file used in phase one. A MobilityFromEUTRACommand is added, with the targetRAT-Type being utra and the targetRAT-MessageContainer set to the transparent-hex string retrieved above. This message is added as a Handover message on the Extended tab of the *N6062A Protocol Message Editor* software application. The scenario should be reloaded and the UE re-attached to the same point as before. Again, the 8960 is set up for an inbound PS handover.

The handover message is now sent to the UE which performs the PS handover to the WCDMA cell.

NOTE: Phase One is only required once per test configuration, and is necessary only to retrieve the transparent-hex string describing the WCDMA waiting resources.

IMPORTANT	Only when performing the RAU procedure will IP connectivity be preserved during an LTE to WCDMA PS handover.

Performing RRC Redirection

RRC Redirection is only supported in the direction LTE to WCDMA.

The RRC Redirection involves adding an rrcConnectionRelease message to the scenario file. The redirectedCarrierInfo must have the type utra-TDD or utra-FDD and frequency as set on the 8960. This message is also added as a Handover message on the Extended tab of the *N6062 Message Editor* software application.

Send the redirection message to the UE when on the LTE cell.

IMPORTANT	Only when performing the RAU procedure will IP connectivity be preserved during an LTE to WCDMA redirection.

Performing Circuit Switched Fallback

Mobile Originated CSFB

Prior to performing the CSFB, the 8960 must be set up to respond to Unexpected Page Response (refer to WCDMA Unexpected Page Response). The AMR Voice parameters (if required) must also be set (refer to WCDMA AMR Setup).

The LTE scenario file must be modified to respond to an ulInformationTransfer with EXTENDED_SERVICE_REQUEST on the appropriate scenario tab. This sends an rrcConnectionRelease with redirectedCarrierInfo of type utra-TDD or utra-FDD and frequency as set on the 8960.

The CSFB is now exercised by camping the UE and initiating a MO voice call.

Mobile Terminated CSFB

Prior to performing the CSFB, the 8960 must be set up to respond to Unexpected Page Response (refer to WCDMA Unexpected Page Response). The AMR Voice parameters (if required) must also be set (refer to WCDMA AMR Setup).

The scenario file must be modified with one (or both) of the following as a Custom message on the Extended tab of the *N6062 Protocol Message Editor* software application:

- If the UE will be RRC-Idle when initiating the MT call, you must add a PCCH message to page the UE with the cn-Domain being cs (informing it of the MT call).
- If the UE will be RRC-Connected when initiating the MT call, you must add a DL-InformationTransfer message with dedicatedInfoNAS being a CS_SERVICE_NOTIFICATION

In either case, the UE response is the same. Therefore, the scenario file must also respond to an ulInformationTransfer with EXTENDED_SERVICE_REQUEST on the appropriate scenario tab. This sends an rrcConnectionRelease with redirectedCarrierInfo of type utra-TDD or utra-FDD and frequency as set on the 8960.

6 Testing Two Cells

The E6621A supports the ability to emulate two LTE cells at the same time. These are referred to as Cell A and Cell B within the instrument. Cell B is always regarded as the receiver of the handover, although it also supports most other functionality. It is recommended that you use Cell A to test all major functionality.

Configuration Requirements and Limitations

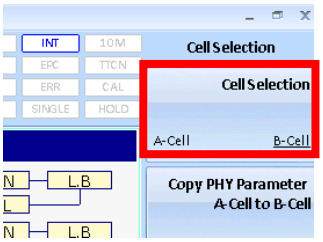
There are several restrictions when the E6621A is emulating two cells. The cells must occupy the same bandwidth and frequency. Maximum throughput is unavailable – that is maximum throughput can only be achieved when the E6621A is emulating a single cell.

IP connectivity is maintained following handovers between the two cells, providing the UE performs a Tracking Area Update (TAU) procedure. For other handover messaging (for example a Service Request) IP connectivity is not maintained.

Setup

Cell Selection

Before attempting to change any scenario or cell parameter, it is necessary to first select the cell which you wish to modify. Using the front-panel, press **BSE > Mode Setup > *Cell Selection.***



NOTE	This setting also effects which cell will send any custom or other user initiated message.

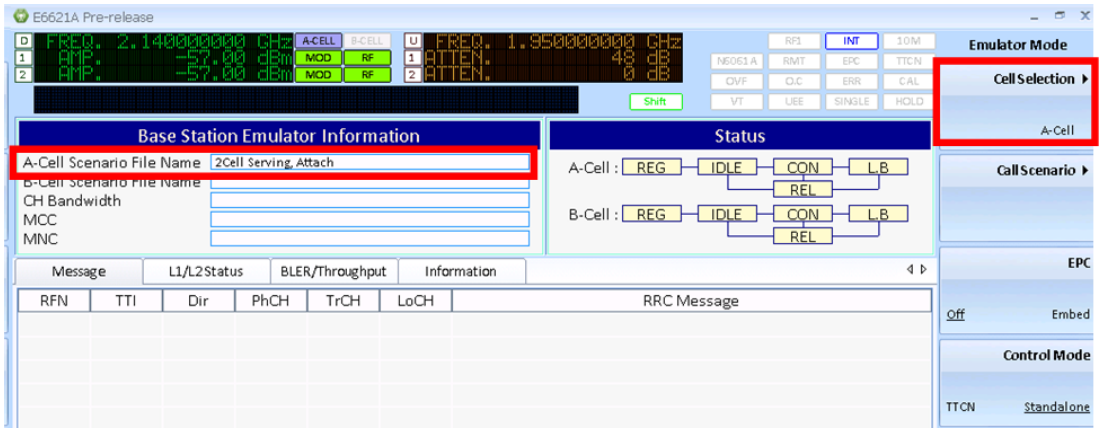
Scenarios

Configuring the E6621A for two cells involves using two scenario files. These files can be the same physical file if it supports all functionality required for both cells.

To load a scenario on Cell A:

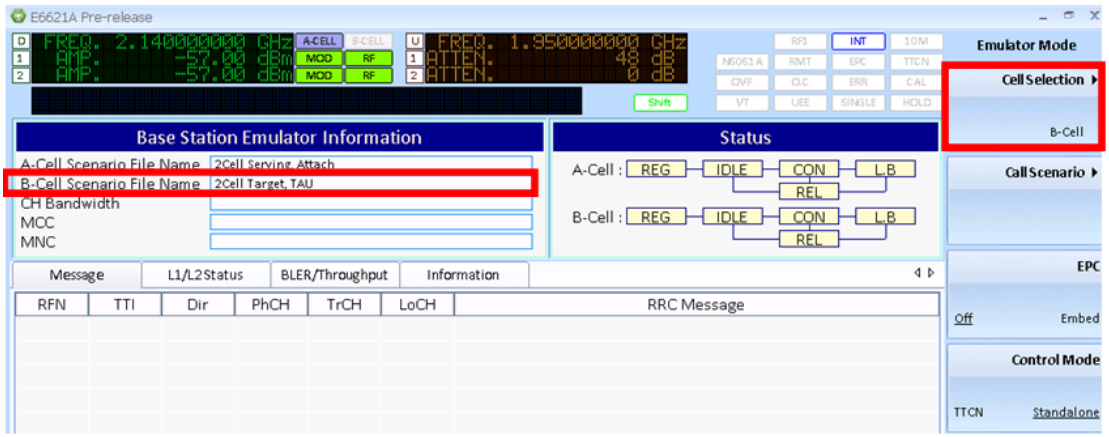
- Select the ***A-Cell*** after pressing **BSE > Mode Setup > *Cell Selection***.
- Press **Mode Setup > *Call Scenario.*** Select a scenario file and load it into the setup.

Note that the "A-Cell Scenario File Name" window, now displays the scenario loaded, as shown below.



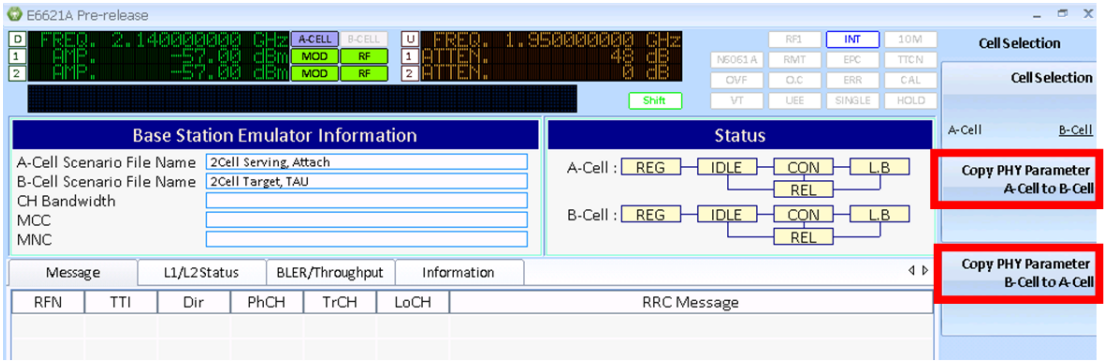
To load a scenario on Cell B:

- Select the ***B-Cell*** after pressing **BSE > Mode Setup > *Cell Selection***.
- Press **Mode Setup > *Call Scenario.*** Select a scenario file and load it into the setup.
  Note that the "B-Cell Scenario File Name" window, now displays the scenario loaded, as shown below.



General Parameters

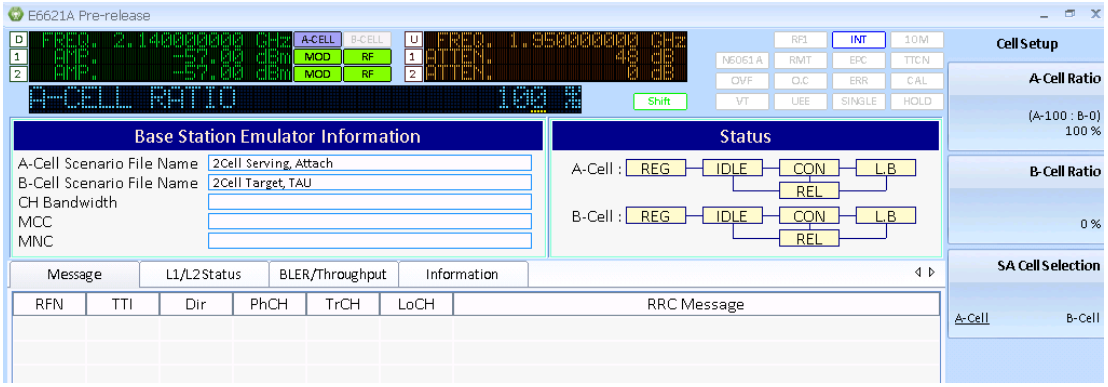
Most PHY Parameters are independent between Cell A and Cell B. For simplicity, the settings may be copied from one to the other via the page as shown below: Press **BSE > Mode Setup > *Cell Selection.***



NOTE	For a UE to differentiate between the two cells, (in most cases) the Physical Cell ID should be different for each.

Power

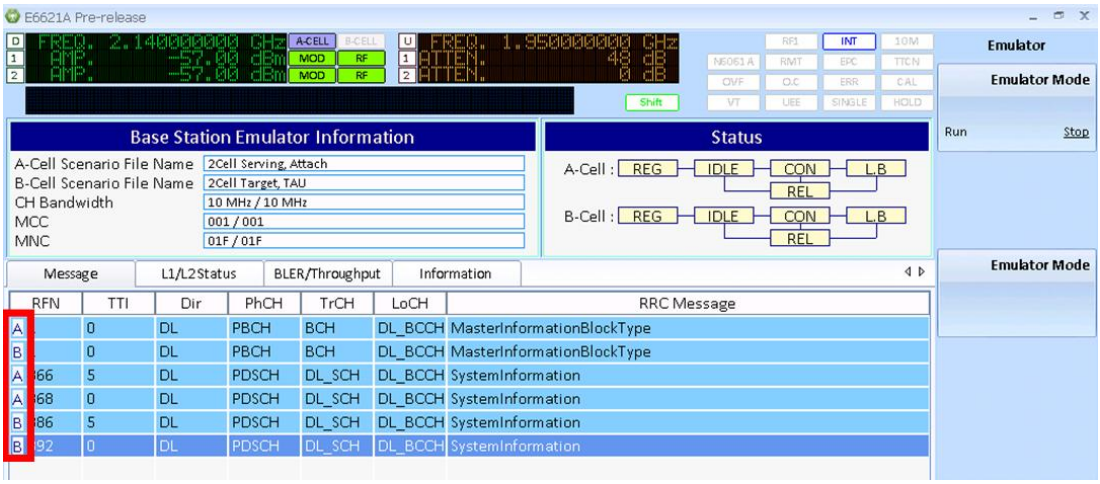
The relative power allocated to each of the two cells is configured as a percentage of the total. Set this by pressing: **Config > *Cell Setup***.



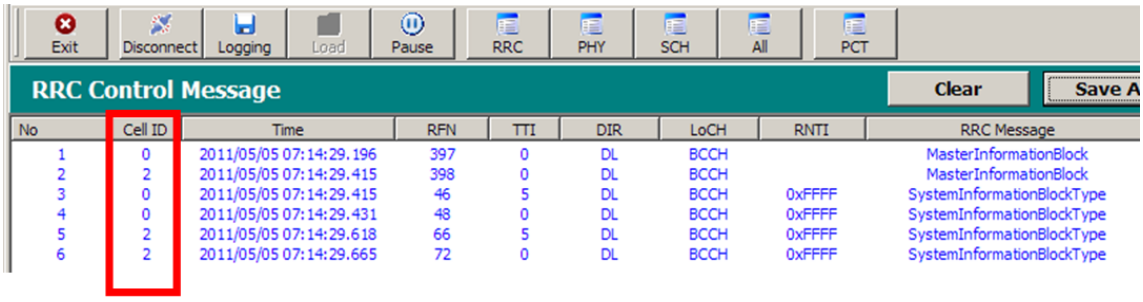
Note that this key menu also enables you to set SA cell selection.

Display / Logging

When running the PXT with two cells, the "Message" tab displays a prefix to the relevant lines in the log, denoting them as messages for A-cell (A) or B-cell (B).



The N6061A logging application shows the Physical Cell ID in the "Cell ID" column.



Example Use Case – Cell Reselection from Cell A to Cell B

The following is a typical test showing UE reselection between the two cells.

1. On Cell A, load a scenario which handles an Attach procedure.
    - Select cell A by pressing **BSE > Mode Setup > *Cell Selection* > *Cell A.***
    - Load the scenario file by pressing **Mode Setup > *Call Scenario* > *Load.***
2. Configure Cell A to have Physical Cell ID 0
    - If necessary select cell A as in step 1.
    - Set cell ID by pressing **BSE > Mode Setup > More > *PHY Settings* > *Cell ID.***
3. On Cell B, load a scenario which handles a TAU procedure.
    - Select cell B by pressing **BSE > Mode Setup > *Cell Selection* > *Cell B.***
    - Load the scenario by pressing **Mode Setup > *Call Scenario* > *Load.***
4. Configure Cell B to have Physical Cell ID 1
    - If necessary, select cell B as in step 3.
    - Set cell ID by pressing **BSE > Mode Setup > More > *PHY Settings* > *Cell ID.***
5. Configure the PHY settings as required by the UE.
6. Ensure Cell A has 100% power resulting in Cell B having 0%.
    - Press **Config > *Cell Setup* > *A-Cell Ratio* >** 100***, %.***
7. Start the emulator.
    - Press **Mode > BSE > *Emulator Mode - Run***
8. Attach the UE.
9. Verify IP throughput by pinging the IP address allocated to the UE in the scenario file.
10. Turn the power of Cell A to zero, meaning Cell B is now 100%
    - Press **Config > *Cell Setup* > *A-Cell Ratio* >** 0, ***%.***

    The UE detects the loss of the A cell and initiates a search.
    The UE discovers Cell B and performs a TAU procedure.

11. Verify IP throughput by pinging the same IP address.

7 RF Measurements

This section provides a brief summary of how the RF measurements in the E6621A PXT are organized and a short description of what each measurement does. These measurements are accessed by selecting the Signal Analysis **SA** front-panel key. There are two Signal Analysis modes: LTE and Spectrum. Use the LTE Analysis mode for LTE-specific measurements and Spectrum Analysis mode for General Purpose measurements.

NOTE	TDD measurements are enabled by selecting **Tech** > ***TDD***.

The following topics are included in this section:

Common Measurement Functions

Generally, all measurements require you to setup the functions listed below:

Channel Bandwidth

Sets the channel bandwidth for the system. Refer to CH Bandwidth in the Front-panel and Menu Keys chapter for more information.

Key Path:	**SA > Mode Setup**
Preset:	10 MHz
Range:	5, 10, 20
Default Units:	MHz

Frequency

Sets the uplink or downlink frequency, or both, for the system. Refer to the

Freq – Key Menu 1 in the Front-panel and Menu Keys chapter for more information.

Key Path:	**Freq**	
Preset:	UL/DL Frequency: UL Frequency: DL Frequency:	1.95 GHz 1.95 GHz 2.14 GHz
Range:	E6621-503: 350 MHz – 3 GHz E6621-506: 350 MHz – 6 GHz	
Default Units:	GHz	
Notes:	The same receiver is used for measurements and link maintenance.	

***Center (UL/DL) Freq* (TDD only)**
Sets the uplink and downlink frequency to the same value.

Center (UL) Freq
Sets the uplink frequency.

Center (DL) Freq
Sets the downlink frequency.

Source Port Setup

RF Output Control

The PXT has one receiver and two sources. Source1 can be routed to either RF1 Output or RF1 Input /Output. Source 2 is always routed to RF2 Output. The settings ***RF1 Front Panel Output*** and ***RF2 Front Panel Output*** in the RF Output Control menu determine this routing. ***RF2 Front Panel Output*** is grayed out.

The sources' baseband signals normally connect internally to the RF signal generators. However, the baseband signals (balanced I and Q signals) may be routed to the rear panel to allow UE baseband-to-baseband testing. The ***RF DL Output*** setting in the RF Output Control menu determines the baseband routing.

Source power and modulation can be turned On/Off using the ***RF*** and ***MOD*** keys above the ports. LEDs indicate the power and modulation state of each source.

Key Path:	**Config > *RF Setup***	
Preset:	RF Output control 1	**TRX**
	RF Output Control 2	**TX**
	RF Input Control	**Internal**
	RF1 Power	**On**
	RF2 Power	**On**
	RF1 Modulation	**On**
	RF2 Modulation	**On**

Source Level

The same level can be set on both sources using the Amplitude setting or the two sources can be set to different values using the RF1 Amplitude or RF2 Amplitude settings. Each source may be offset for path loss or gain using the RF1 Output Power Offset and RF2 Output Power Offset. The source power will be increased by the value of the power offset. That is, positive values for power offsets are regarded as external cable losses and the actual source power is adjusted so that the requested power appears at the input to the device under test.

Key Path:	**Amp**	
Preset:	Source 1 amplitude	–57 dBm
	Source 1 offset	0 dB
	Source 2 amplitude:	–57 dBm
	Source 2 offset	0 dB

Receiver Port Setup

The ***Input Mode*** setting determines whether the ADC takes its input from the downconvertor **INT** or the rear panel **EXT**. If the rear panel is selected as the input mode, the Input Source can be specified to be an IF signal at 76.8 MHz or an IQ baseband signal.

Key Path:	**Config > *RF Setup* > *RF Input Control***	
Preset:	Input mode:	***Internal***

Receiver Level

Select **Atten >** ***Ref Level*** to set the receiver level. This setting is applied to both receivers (if second receiver option is available). To set the two receiver levels to different values use the ***RF1 Ref Level*** and ***RF2 Ref Level*** menu keys. The ***Ref Level*** and the ***Scale/Div*** settings are applied to all the Power Spectrum and Power vs. Time displays.

If the reference levels / attenuators are incorrectly set so that an overload condition occurs, the red OVF warning indicator in the top right of the display will illuminate. If this happens, increase the reference level or attenuation until the warning indicator turns off.

External loss/gain can be compensated for with the ***RF1 / RF2 Input Power Offset***. To compensate for a 6 dB path loss to RX1, for example, set ***RF1 Input Power Offset*** to +6 dB.

Key Path:	**Atten**	
Preset:	RF 1 and RF2 reference level	**0 dBm**
	RF 1 and RF2 attenuation mode	**Auto**
	RF1 and RF2 attenuation value	**49 dB**
	RF1 and RF2 power offset	**0 dB**
Notes:	The ***Ref Level*** and the ***Scale/Div*** settings are applied to all the Power Spectrum and Power vs. Time displays.	

Triggering

If the UE is making a call to the BSE, or the UE is in test mode but synchronized to the BSE frame then the ***Internal Trigger*** is the preferred trigger source. ***External Trigger*** can be used if the UE is in test mode and the UE provides a frame trigger. ***Free Run*** is not recommended for any bursted measurements or measurements requiring demodulation.

For LTE measurements requiring demodulation, any one subframe can be selected for measurement using the ***Target Subframe*** setting in the ***UL Config*** menu.

For LTE measurements not requiring demodulation and for general purpose measurements, only the first subframe following a trigger is measured. These measurements also assume that the trigger falls on a subframe boundary. If there is a need to measure a different subframe, then the ***Trigger Delay*** should be advanced to the required subframe boundary. For example, if the signal to be measured is in subframe2, the internal ***Trigger Delay*** should be set to 2 ms.

Measurements can be set to trigger in single or continuous (**Cont**) mode. When **Single** is selected, each key-press initiates a single measurement.

Key Path:	**Func Setup** > ***Trigger***	
Preset:	Trigger Source	**Internal**
	Internal and External Trigger Slope	**Positive**
	Internal and External Trigger Delay State	**Off**
	Internal and External Trigger Delay Value	**0 us**
Notes:	Trigger status is displayed at the bottom of the PXT screen.	

Averaging

Key Path: **Meas Setup** > ***Average Mode***

Selecting ***Repeat*** means that averaging will restart each time the averaging count completes.

Selecting ***Exponential*** means that once the averaging count is reached the measurement will continue averaging the same number of results by adding the latest sample and deleting the oldest sample.

Instead of averaging, the measurement can be set for ***Max Hold***. Turning ***Max Hold*** disables averaging and vice versa.

Measurement Markers

General Purpose Measurement Markers are supported by the following measurements:

- Spectrum (Spectrum and LTE mode)
- Channel Power (Spectrum and LTE mode)
- Occupied Bandwidth
- PVT
- SEM
- ACLR

Specific markers are available in other measurements as described in the measurement.

Markers function in the same way in both spectral and time domain measurements.

Select Marker

Selects the active marker. The marker selections are **Normal**, **Delta** or **Fixed**. Markers may be disabled individually using the **Off** menu key or collectively using the ***All Markers Off*** menu key.

Key Path: **Function > *Marker***

Normal

The marker frequency / time defaults to the centre frequency / 0ms point. The marker frequency / time may be set to any absolute frequency / time value. The marker value will track the trace value at the marker frequency / time on each measurement pass. The marker value is in dBm.

Fixed

The marker frequency defaults to the centre frequency / 0ms point. The marker frequency / time may be set to any absolute frequency / time value. The marker value will hold the trace value at the marker frequency / time from the first measurement pass after the marker mode is set to *Fixed*. The marker value is in dBm. The fixed marker frequency / time and marker value can be edited if required: in the Fixed Marker menu, X refers to the marker frequency / time and Y refers to the power value.

Delta

The next marker after the active marker becomes the reference for the active marker. For example, if Marker 3 is the active marker, Marker 4 becomes the reference for Marker 3. Marker 3's frequency / time value is then the frequency difference between Marker 3 and Marker 4; and Marker 3's value is the power difference between Marker 3 and Marker 4. If the last marker which is on is the active marker, Marker 1 becomes its reference.

If when Delta mode is selected for the active marker, the next marker is Off, the next marker will be turned on as a **Fixed** marker. If the next marker is already on, its marker mode will remain unchanged. If the next marker is a **Delta** marker, the next again marker effectively becomes the reference for the active marker.

Uniquely, the Spectrum measurement supports a marker table which is enabled using the **Marker Table** setting.

Marker To

Key Path: **Function > Marker To**

The **Mkr -> CF** setting changes the tuned frequency to the absolute frequency value of the active marker. If the active marker is in Delta mode, the relative frequency value is first converted to an absolute frequency value. This feature is not available for time domain measurements.

The **Mkr ->Ref Lvl** setting changes the reference level to the absolute power value of the active marker. If the active marker is in Delta mode, the relative power value is first converted to an absolute power value.

The **Peak** setting in the **Func** menu moves the marker to the peak value of the measurement trace taken immediately before the menu key was pressed. The marker will remain in that position over subsequent measurements unless **Peak** is pressed again or the **Continuous Peak Search** setting is On. Note that the **Continuous Peak Search** setting is on the second page of the Peak menu.

Next Peak moves the marker to the next highest power value in the trace, which may be to the left or the right of the current marker position. **Next (Low) Right** and **Next Low Left** will only consider next highest power values to the right or left respectively of the current marker position.

Marker Delta converts the active marker into a delta marker (if it isn't already a delta marker). The next marker becomes the reference marker.

The **Mkr -> CF** and **Mkr -> Ref Lvl** settings in the **Peak** menu have the same behavior as those settings in the **Marker To** menu. They are repeated in the **Peak** menu for convenience.

If **Min Search** is required, **Continuous Peak Search** must first be turned off. **Min Search** behaves like **Peak**. The active marker moves to the minimum power point of the measurement taken immediately before the menu key is pressed and the marker remains in that position over subsequent measurements unless **Min Search** is pressed again.

If after pressing **Peak**, **Pk-Pk Search** is selected, the active marker mode is changed to **Delta** and moved to the minimum power of the trace; the next marker is moved to the peak of the trace (turning it on as a fixed marker if off). The active marker in **Delta** mode then displays the peak-to-peak difference in the measurement trace taken immediately before the menu key was pressed. The marker will remain in that position over subsequent measurements unless **Pk-Pk Search** is pressed again.

Frequency Reference

The PXT has an internal reference which will be used if no external reference is detected on the Reference Input of the rear panel. To override this **Auto** selection mode of operation and force the use of the internal reference, select the **Internal** setting.

Key Path:	**Config > *RF Setup* > *Ref Clock Source***
Preset:	**Auto**

RF Measurement Setup

RF measurement settings are configured separately from those in BSE mode. This means the same procedure is followed for making measurements on a UE with a call to the BSE and a UE in test mode.

If a call is made to the BSE using the default BSE settings, then the default measurement settings match and no further measurement setting changes are required.

General Purpose Measurements

Key Path: **SA > Spectrum**

This section describes the general purpose measurements available in the PXT. These measurements allow more flexible selection of parameters than the specific LTE measurements.

- Spectrum Measurement
- Channel Power Measurement
- Occupied Bandwidth Measurement
- Complementary Cumulative Distribution Function (CCDF) Measurement

The general settings described above are sufficient to make the General Purpose measurements. The following descriptions assume that the frequency, reference level and system bandwidth have been correctly set, and that the trigger source is set to ***Internal*** and that the ***trigger delay*** is set to 0 ms.

Spectrum Measurement

Key Path: **Mode > SA > *Spectrum Analyzer* > MEAS > *Spectrum***

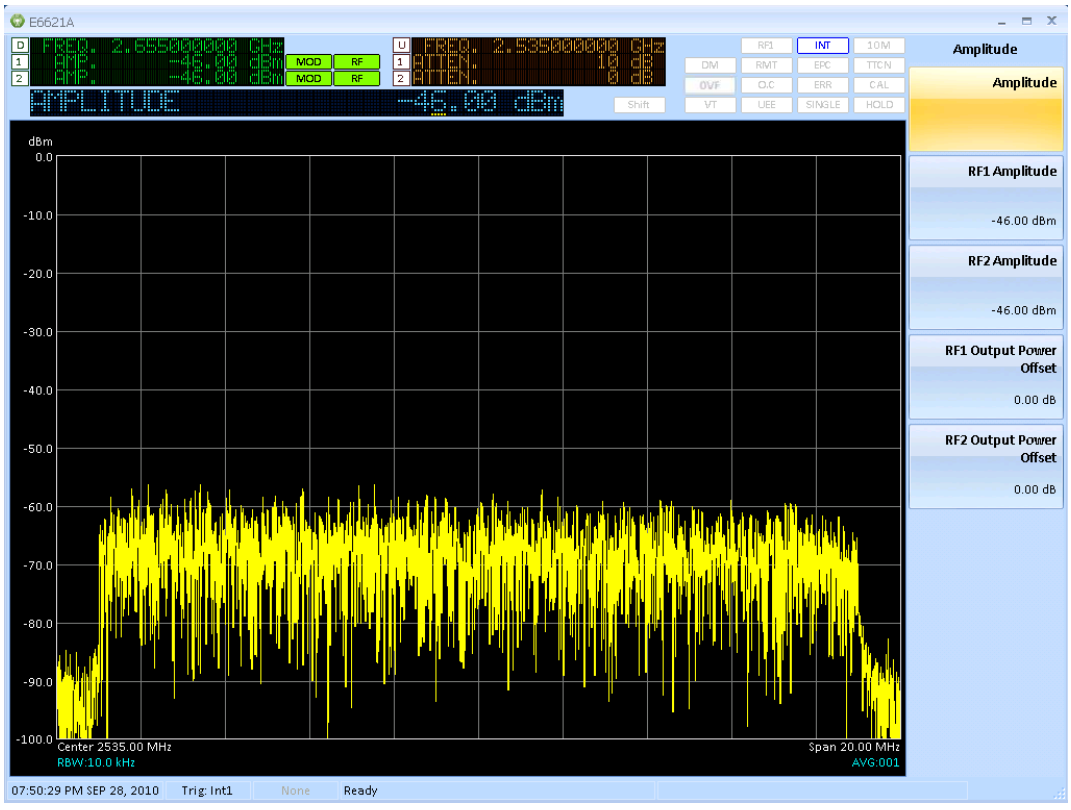


Figure 6-1: Spectrum measurement

Measurement Setup

Access the frequency ***Span*** for the Power Spectrum graphic and the resolution bandwidth (***RBW***) for the measurement, by selecting the **Func** front-panel key.

The maximum available span is 22 MHz, which can be set directly using the ***Span*** menu key or selecting the ***Full Span*** menu key. Selecting ***Last Span*** toggles between the two most recent span settings. The spectrum measurement can be set to ***Zero Span*** to obtain a power versus time measurement.

The ***RBW*** defaults to an auto setting of 10 kHz, but can also be set manually.

Channel Power Measurement

Key Path: **Mode > SA > *Spectrum* > MEAS > *Channel Power***

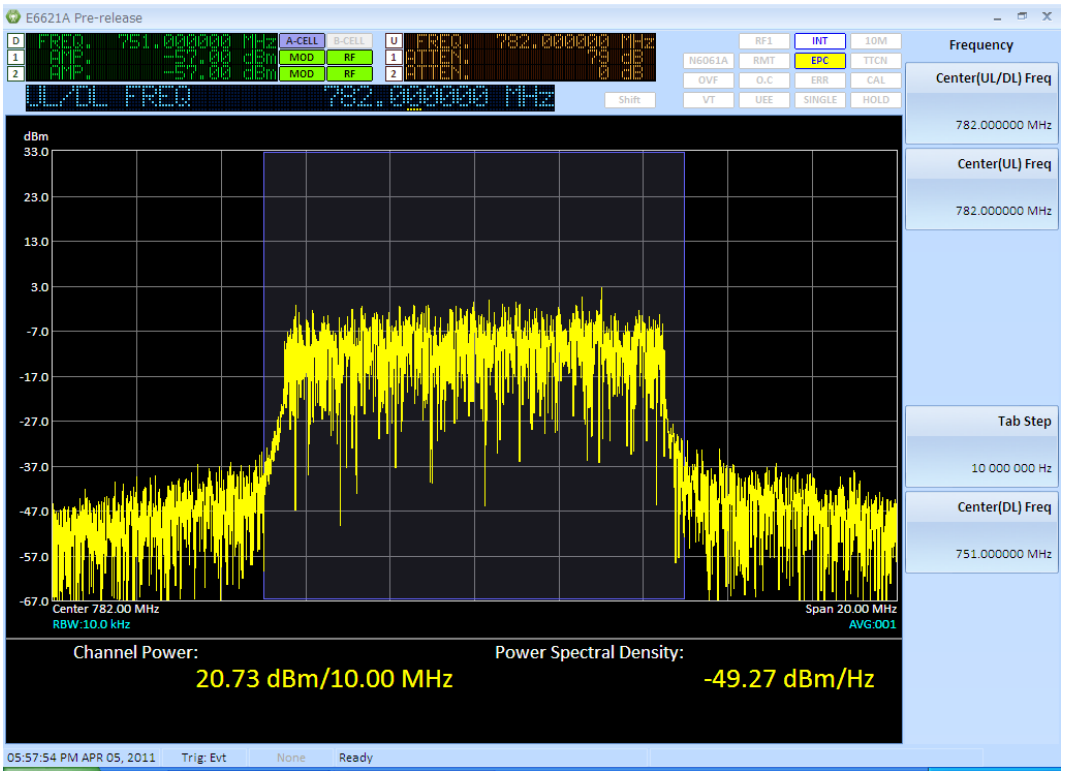


Figure 6-2: Channel Power measurement

Channel power measures power in the frequency domain by integrating the power spectrum of the signal over a specified bandwidth. The measurement displays a graphic of the power spectrum of the signal and numeric values for the Channel Power in the specified bandwidth and the average power per hertz across the specified bandwidth. The Channel Power measurements in the LTE and Spectrum measurement modes are identical.

Measurement Setup

Access the frequency ***Span*** for the Channel Power graphic and the resolution bandwidth (RBW) for the measurement, by selecting the **Func** front-panel key.

The maximum available span is 22 MHz, which can be set directly using the ***Span*** menu key or selecting the ***Full Span*** menu key. The ***Last Span*** menu key toggles between the two most recent span settings.

The ***RBW*** defaults to an auto setting of 10 kHz, but can also be set manually.

The ***Integration BW*** setting specifies the bandwidth over which power is integrated for the channel power measurement.

Occupied Bandwidth Measurement

Key Path: **Mode > SA > *Spectrum* > MEAS > *Occupied BW***

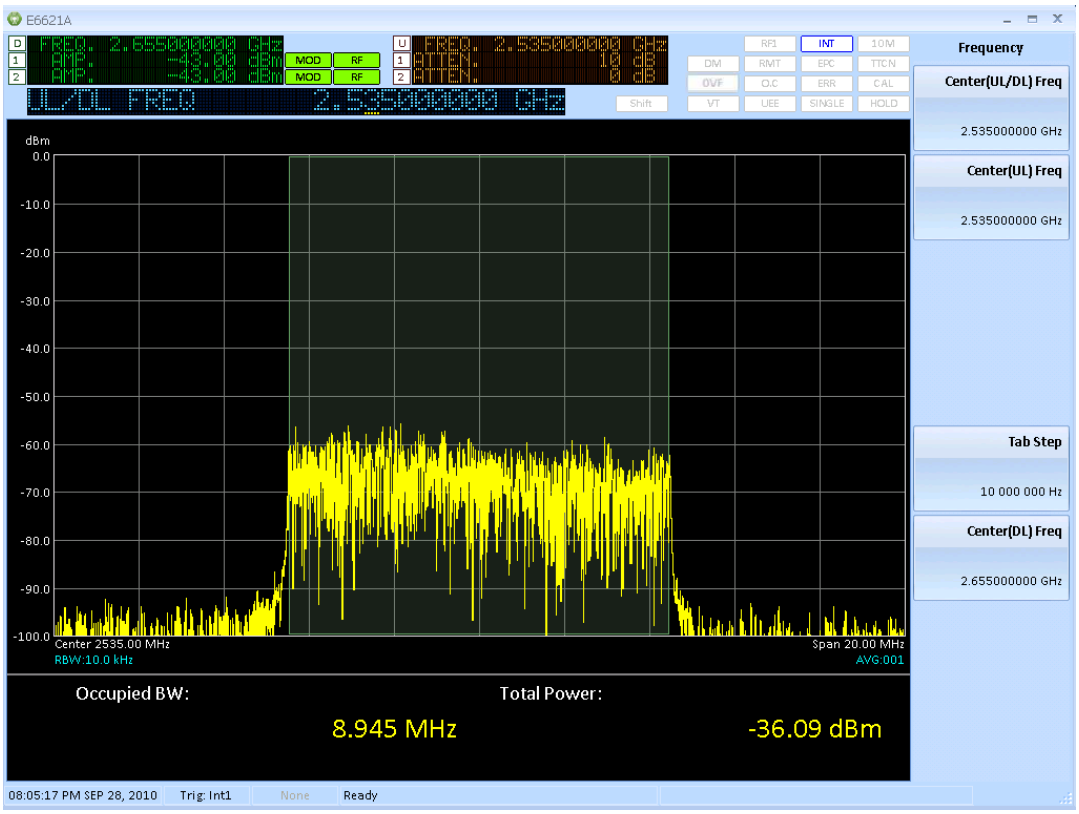


Figure 6-3: Occupied Bandwidth measurement

The Occupied BW measurement looks at the total power in a span of twice the nominal system bandwidth. It then determines the frequency range, centered on the carrier frequency, which contains 99% of the total power. This frequency range is the value of the Occupied BW.

The measurement displays a graphic of the power spectrum of the signal and numeric values for the Occupied BW and the total power.

The Occupied Bandwidth measurements in LTE and Spectrum measurement modes are identical.

Measurement Setup

Access the ***Span*** menu key by selecting the **Func** front-panel key.

By default, the span for the Occupied Bandwidth power spectrum graphic is set to twice the nominal system bandwidth. The span may be adjusted manually. For system bandwidths of 10 MHz or less, the span is limited to a range between 1 MHz to 22 M Hz. For the 15 MHz system bandwidth, the additional value of a 30 MHz span can be set; span values between 22 MHz to 30 MHz cannot be set. For the 20 MHz system bandwidth, the additional value of a 40 MHz span can be set; span values between 22 MHz to 40 MHz cannot be set.

Full Span selects the largest span available for the current System Bandwidth.

Last Span toggles between the two most recent span settings.

The ***RBW*** defaults to an auto setting of 10 kHz, but can also be set manually.

Access the ***OBW Power*** setting by selecting the **Meas Setup** front-panel key. This setting specifies the percentage value of power contained within the OBW measurement result. For example, if OBW Power is set to 99%, the OBW result means that 99% of the power is contained within that bandwidth. The power in twice the nominal system bandwidth is regarded as 100 %.

Complementary Cumulative Distribution Function (CCDF) Measurement

Key Path: **Mode > SA > *Spectrum* > MEAS > *CCDF***

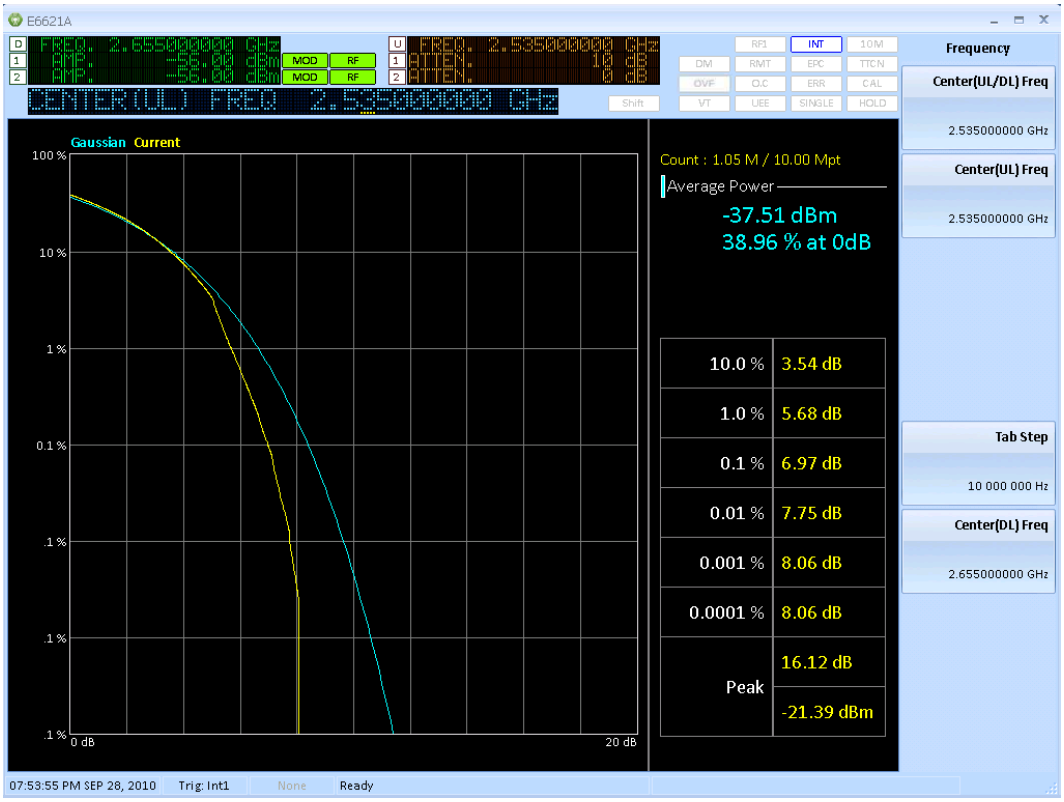


Figure 6-4: CCDF measurement

The complementary cumulative distribution function (CCDF) is a statistical-power calculation. The measurement computes the average power of all measured samples. This becomes the 0 dB point at the left end of the horizontal axis. The average value and the percentage of samples greater than the average value are displayed in the top right-hand corner of the display.

All power samples are normalized to the average power value and expressed in dB terms. The graph is computed by considering power samples which are greater than the average power. Each of these samples is placed in a bin between 0 dB and 20 dB. As the count progresses the graph is calculated for each bin. The ordinate of the CCDF graph for a bin is calculated as the number of points in bins to the right of the current bin (for example, of a higher power) divided by the total number of power samples to date – including those less than the average power value. As a reference, CCDF graph for a Gaussian distribution is displayed.

A table shows the power values in dB terms for some CCDF values. The peak power in dB and dBm terms is also reported in the table.

Measurement Setup

Access the ***Measurement Interval*** setting by selecting the **Meas Setup** front-panel key. This setting must be specified first. This will occur at the delayed trigger event. Once the measurement interval is specified the number of power samples to consider for the CCDF calculation can either be set directly using the ***Count*** setting or indirectly using the ***Measurement Cycles*** setting. If the ***Count*** is set, the number of measurement cycles required is calculated by dividing the count value by the internal sampling rate times the length of the measurement interval. If the ***Measurement Cycle*** is set, the count is calculated by multiplying the number of measurement cycles, the internal sampling rate and the measurement interval. Changing the ***Measurement Interval*** will cause the count and the number of measurement cycles to be recalculated.

Uplink LTE Measurements

Key Path: **Mode > SA > *LTE***

The uplink LTE measurements fall into two groups – those which require demodulation of the signal and those that do not.

The uplink LTE measurements that **do not require** demodulation are:

- Channel Power Measurement
- Occupied Bandwidth Measurement (FDD/TDD)
- Power vs. Time (FDD/TDD)
- Spectrum Emission Mask (SEM) Measurement (FDD/TDD)
- Adjacent Channel Leakage Ratio (ACLR) Measurement (FDD/TDD)

The uplink LTE measurements that **require** demodulation are:

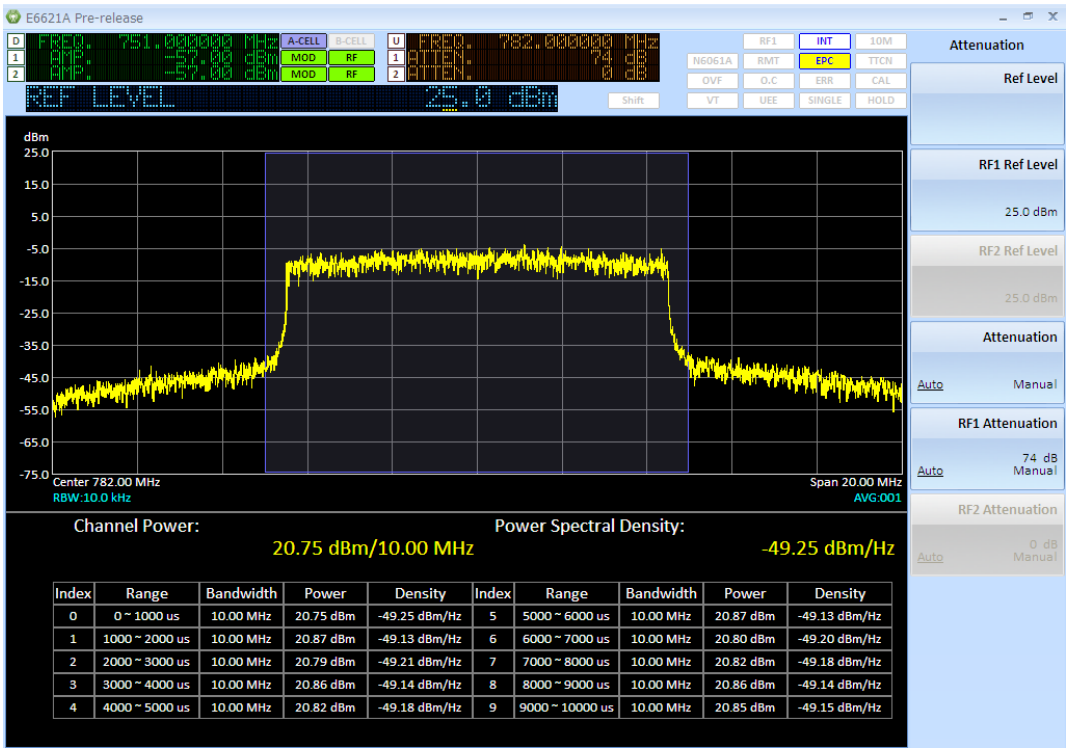
- Constellation Measurement
- Power Spectrum Measurement
- Received IQ Data Measurement
- Map Information Measurement
- Error Vector Measurement
- Decoding Information Measurement
- Spectrum Flatness Measurement
- Modulation Quality Summary

Making Measurements Not Requiring Demodulation

The general settings described above are sufficient to make measurements not requiring demodulation. The following description assumes that the frequency, reference level, and system bandwidth have been correctly set. It also assumes that the trigger source is Internal and that the trigger delay is 0 ms.

Channel Power Measurement (FDD/TDD)

Key Path: **Mode > SA > *LTE* > *Channel Power***



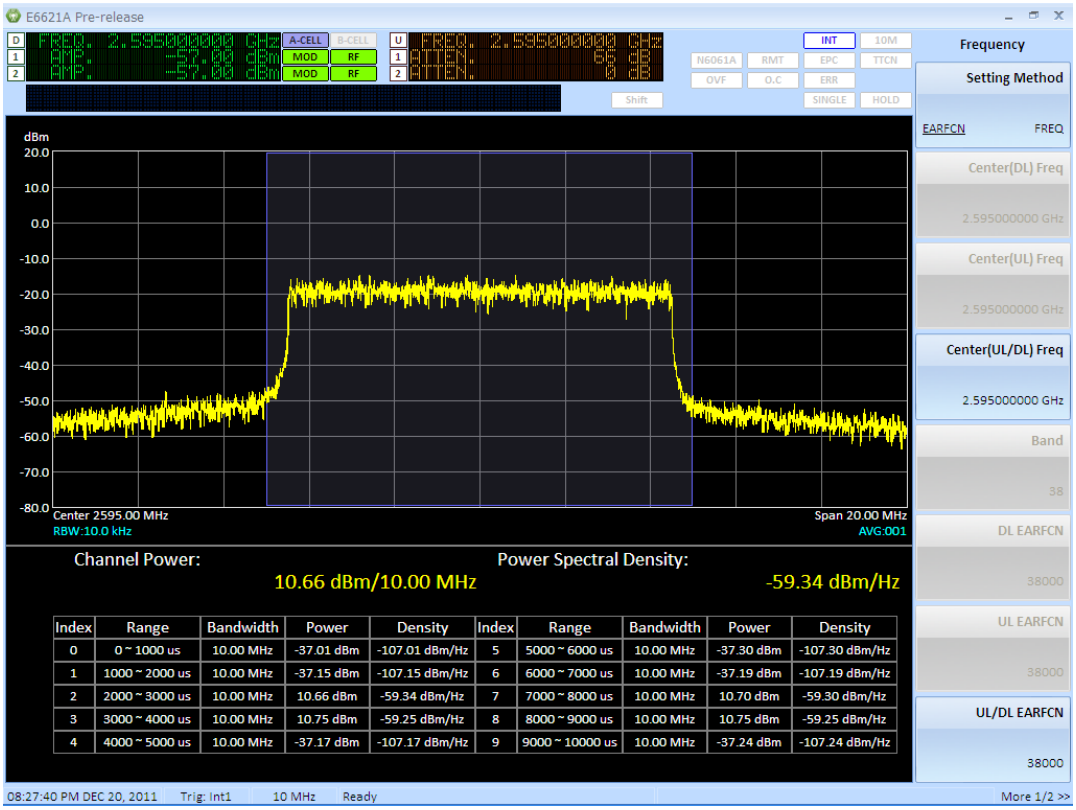
Index	Range	Bandwidth	Power	Density	Index	Range	Bandwidth	Power	Density
0	0 ~ 1000 us	10.00 MHz	20.75 dBm	-49.25 dBm/Hz	5	5000 ~ 6000 us	10.00 MHz	20.87 dBm	-49.13 dBm/Hz
1	1000 ~ 2000 us	10.00 MHz	20.87 dBm	-49.13 dBm/Hz	6	6000 ~ 7000 us	10.00 MHz	20.80 dBm	-49.20 dBm/Hz
2	2000 ~ 3000 us	10.00 MHz	20.79 dBm	-49.21 dBm/Hz	7	7000 ~ 8000 us	10.00 MHz	20.82 dBm	-49.18 dBm/Hz
3	3000 ~ 4000 us	10.00 MHz	20.86 dBm	-49.14 dBm/Hz	8	8000 ~ 9000 us	10.00 MHz	20.86 dBm	-49.14 dBm/Hz
4	4000 ~ 5000 us	10.00 MHz	20.82 dBm	-49.18 dBm/Hz	9	9000 ~ 10000 us	10.00 MHz	20.85 dBm	-49.15 dBm/Hz

Figure 6-5: Channel Power measurement

The Channel Power measurement captures 10 sub-frames as represented by the indices 0-9 in the Figure above. Each of the ten intervals can be edited to a specific start time and duration time for general purposes. For example, you might want to exclude 20 µsec transition periods on the sub-frame index 0 boundaries. You would then edit index 0 by changing the range from 0 – 1000 µsec to 20 – 980 µsec. This is useful in situations where you wish to exclude transient periods from the measurement period interval.

Channel Power Measurement (TDD Example)

Key Path: **Mode > SA > *LTE* > *Channel Power***



Index	Range	Bandwidth	Power	Density	Index	Range	Bandwidth	Power	Density
0	0 ~ 1000 us	10.00 MHz	-37.01 dBm	-107.01 dBm/Hz	5	5000 ~ 6000 us	10.00 MHz	-37.30 dBm	-107.30 dBm/Hz
1	1000 ~ 2000 us	10.00 MHz	-37.15 dBm	-107.15 dBm/Hz	6	6000 ~ 7000 us	10.00 MHz	-37.19 dBm	-107.19 dBm/Hz
2	2000 ~ 3000 us	10.00 MHz	10.66 dBm	-59.34 dBm/Hz	7	7000 ~ 8000 us	10.00 MHz	10.70 dBm	-59.30 dBm/Hz
3	3000 ~ 4000 us	10.00 MHz	10.75 dBm	-59.25 dBm/Hz	8	8000 ~ 9000 us	10.00 MHz	10.75 dBm	-59.25 dBm/Hz
4	4000 ~ 5000 us	10.00 MHz	-37.17 dBm	-107.17 dBm/Hz	9	9000 ~ 10000 us	10.00 MHz	-37.24 dBm	-107.24 dBm/Hz

Figure 6-6: Channel Power measurement (TDD Example)

Notice the power levels are only present on subframes 2, 3, 7, and 8. This is because the UE only transmits on those subframes, when using TDD. For this example, the UL-DL configuration selected is 6.

You can graphically display any of the 10 measured subframes by pressing **Meas Setup** > ***Display Interval***. Subframe #2 is displayed in this example.

Measurement Setup

Select the **Meas Setup** front-panel key to select which subframe power measurement to display. To edit the interval duration, press ***Edit Interval***. You must set ***Interval*** to **On** in order to change any other settings in this menu. Set the ***Start Time*** and ***Duration*** in µsec. The resolution bandwidth is set by the ***Measurement BW*** setting.

Occupied Bandwidth Measurement (FDD/TDD)

Key Path: **Mode > SA > *LTE* > *Occupied BW***

The Occupied Bandwidth measurements in LTE and Spectrum measurement modes are identical. See "General Purpose Measurements" on page 137 for details.

Occupied Bandwidth Measurement (TDD Example)

Key Path: **Mode > SA > *LTE* > *Occupied BW***

Below, the OBW measurement using TDD is displayed. For TDD, special care must be taken with regard to the UL-DL configuration in order to be certain you are measuring an uplink subframe. In this example, subframe 2 is measured. Ensure these settings are selected in order to obtain valid measurement results:

1. Set the target subframe = 2 by pressing **Mode Setup > *Uplink Config* > *Target Subframe.* 2**,
2. Set the trigger delay = 2 ms by pressing **Func Setup** > ***Trigger*> *Internal Trigger* > *Trigger Delay, 2, ms.***

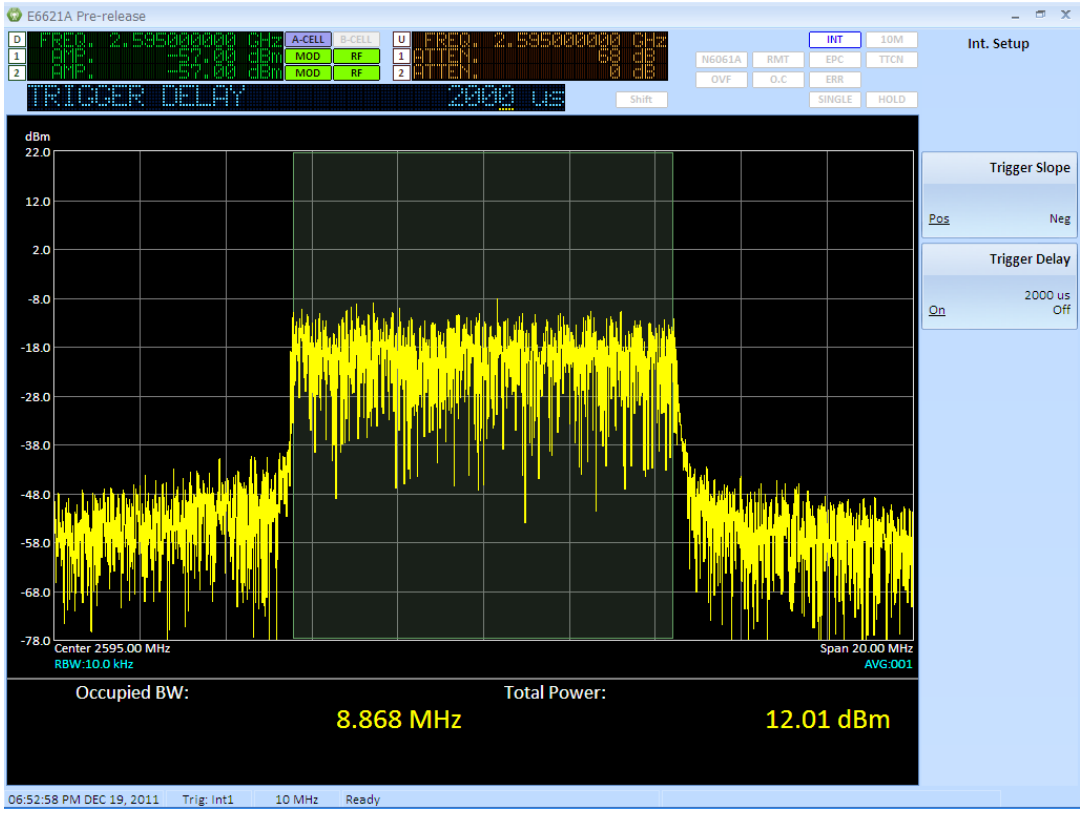


Figure 6-7: Occupied Bandwidth measurement (TDD)

Power vs. Time (FDD/TDD)

Key Path: **Mode > SA > *LTE* > *Power vs. Time***

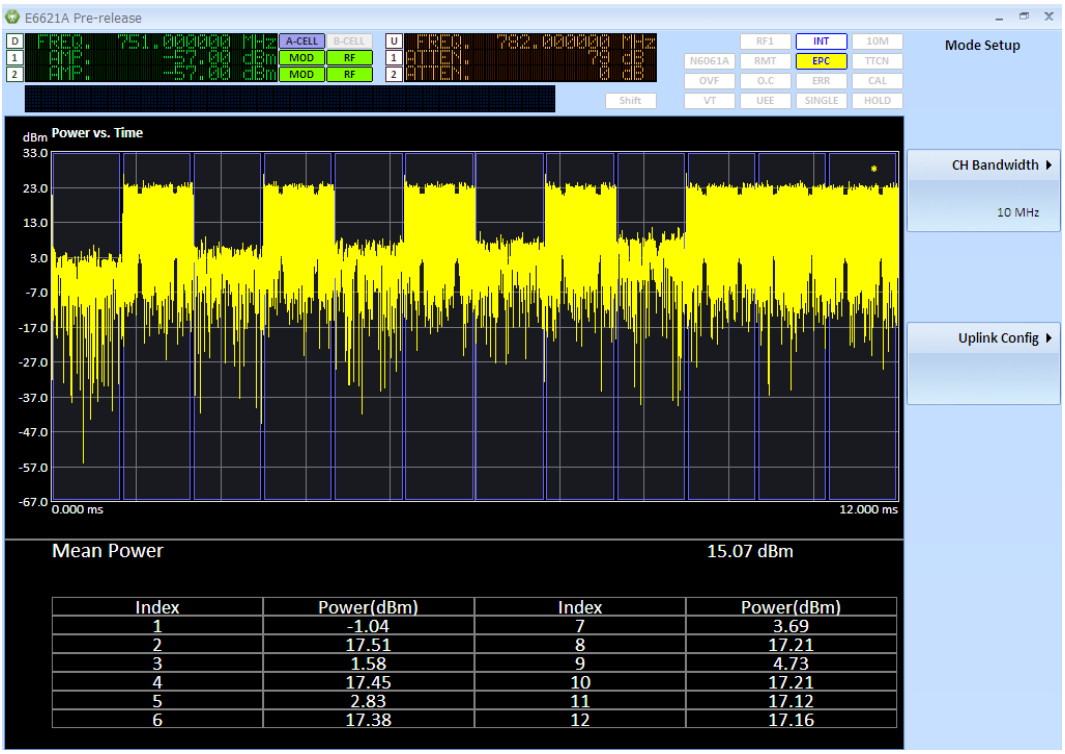


Figure 6-8: Power vs. Time measurement (FDD Example)

The Power vs. Time measurement can be used to verify that the UE is transmitting at the correct power level on different subframes. For example, if the only allocation is in subframe 0 and 5, there should only be signal power in the 0 ms to 1 ms interval and 5 to 6 ms of the Power Vs. Time trace. Make sure the trigger delay is set appropriately (set to 0ms for most of the time) otherwise it will affect the position of displayed graphical power measurement with respect to the frame boundaries. There are 12 measurement gates available and the sweep time can be controlled and extended to 60 ms. Each measurement gate has control of the gate delay, gate length, and gate delta in order to enable you to modify the measurement period according to your requirements (for example, excluding transition periods on subframe boundaries).

Power vs. Time (TDD Example)

Key Path: **Mode > SA > *LTE* > *Power vs. Time***

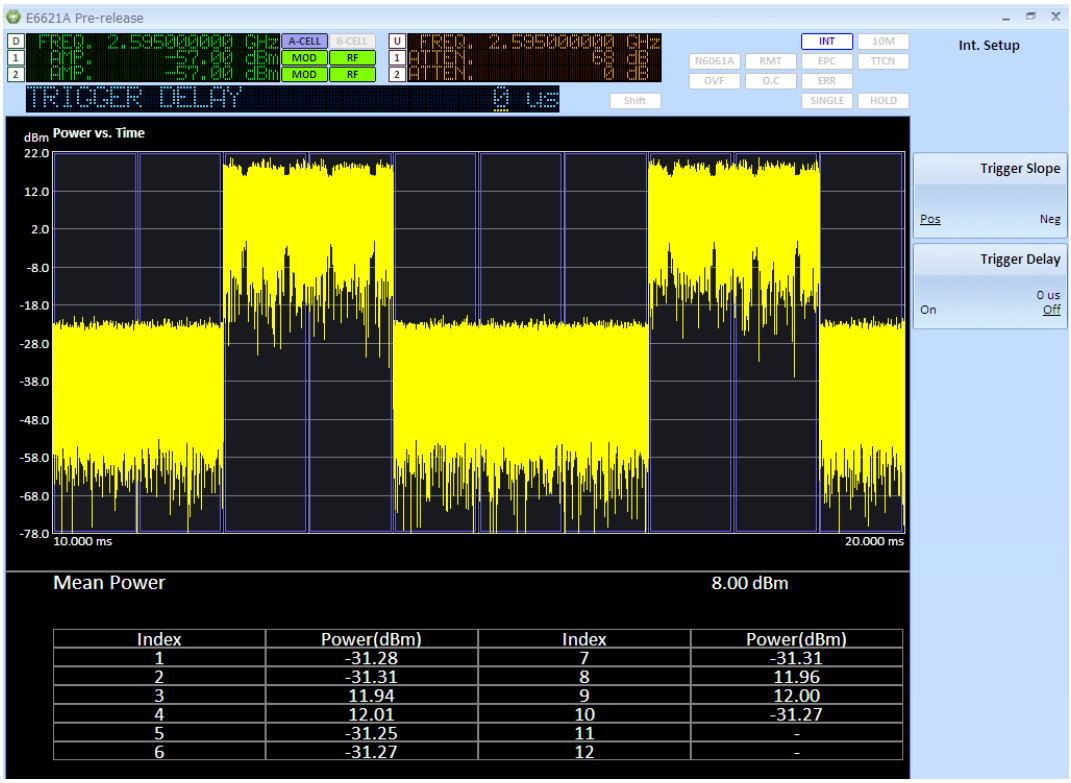


Figure 6-9: Power vs. Time measurement (TDD)

In the figure above, a TDD PvT measurement was taken as example using the Uplink-downlink configuration equal to 6. Notice that the UE is only transmitting on those subframes 2,3,7 and 8 according to the UL-DL TDD configuration.

Measurement Setup

Set the measurement sweep time by selecting **Func Setup** > ***Sweep*** > ***Sweep Time***.

Measurement Interval Parameters

Define the measurement interval parameters for power averaging, by selecting the **Meas Setup** front-panel key.

Gate Number selects the number of measurement intervals.

Gate Delay specifies the start of the first measurement interval relative to the trigger event – the 0 ms reference point.

Gate Length sets the time duration of all measurement intervals.

Gate Delta sets the offset time of the second and subsequent measurement intervals, relative to the start time of the previous measurement interval.

As an example of how these settings are used, if there are three measurement intervals of Gate Length 1 ms, a Gate Delay of 500 us and a Gate Delta of 2 ms, the three measurement intervals are .500 ms to 1.5 ms, 2.5 ms to 3.5 ms and 4.5 ms to 5.5 ms.

Spectrum Emission Mask (SEM) Measurement (FDD/TDD)

Key Path: **Mode > SA > *LTE* > *Spectrum Emission Mask***

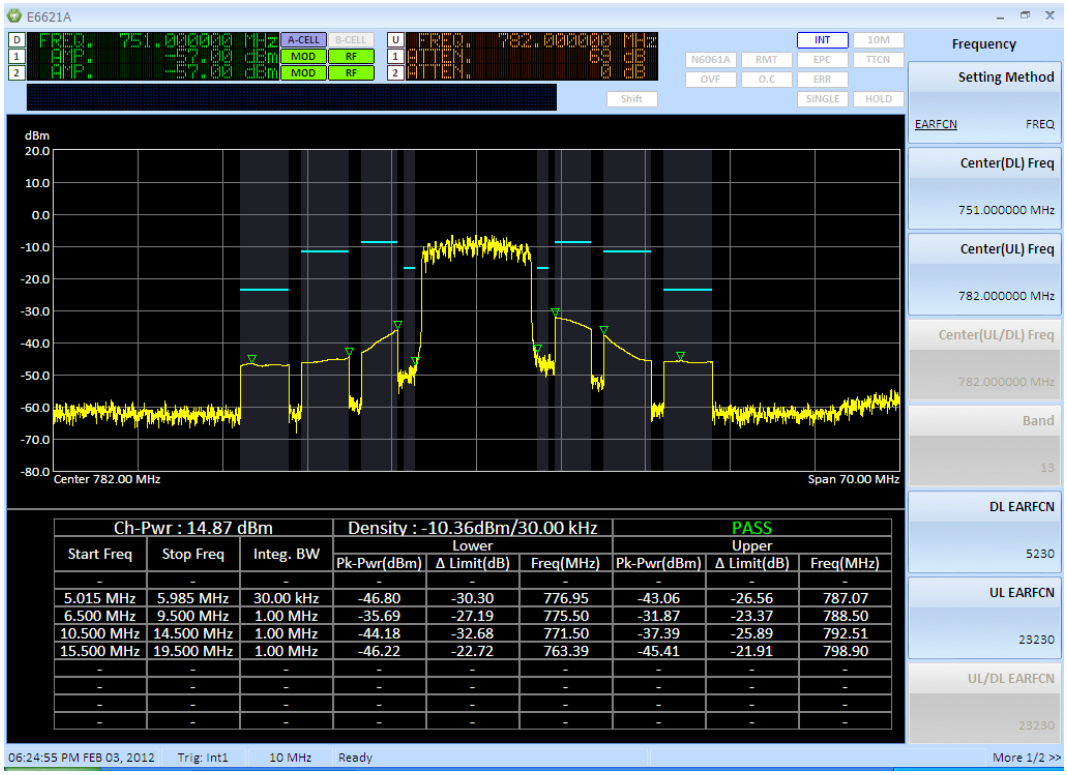


Figure 6-10: SEM measurement (FDD Example)

The SEM measurement considers the Power Spectrum at various frequency offsets from the carrier. Contiguous frequency offsets are grouped into segments which are usually defined as pairs on either side of the carrier, although a segment can be specified to be on one side of the carrier or the other. Segments are then defined in terms of a start and stop offset frequency; an integration BW and whether the measured spectrum power should be tested against an absolute or relative limit value. A set of segments so defined constitutes a mask. You may specify a number of different masks.

The measurement displays a graphic of the spectrum emission mask (showing measured spectrum power and limit values) and a table summarizing the key measured values.

Spectrum Emission Mask (SEM) Measurement (TDD)

Key Path: **Mode > SA > *LTE* > *Spectrum Emission Mask***

Below, the SEM measurement using TDD is displayed. For TDD, special care must be taken with regard to the UL-DL configuration in order to be certain you are measuring an uplink subframe.

In this example, subframe 2 is measured. Ensure these settings are selected in order to obtain valid measurement results:

1. Set the target subframe = 2 by pressing **Mode Setup > *Uplink Config* > *Target Subframe.* 2**,

2. Set the trigger delay = 2 ms by pressing **Func Setup** > ***Trigger> Internal Trigger > Trigger Delay, 2, ms.***

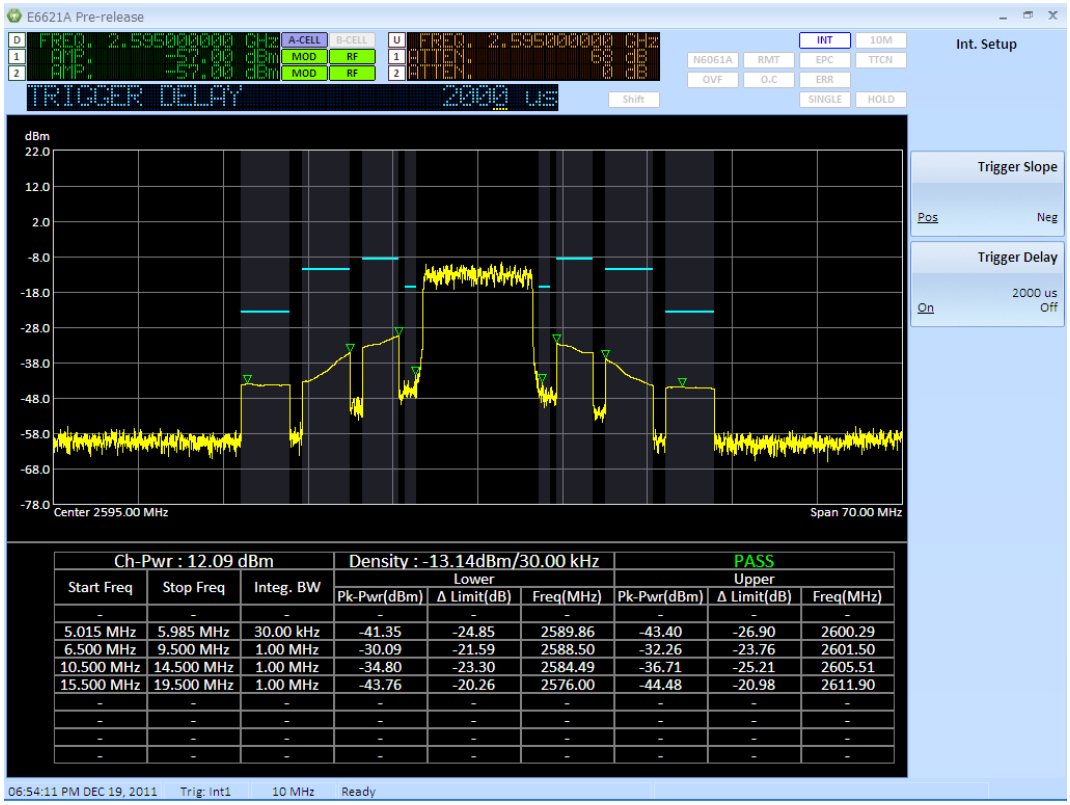


Figure 6-11: SEM measurement (TDD)

Measurement Setup

The frequency span of the measurement is fixed at 70 MHz. This is the span required for the 20 MHz system bandwidth.

Select the **Meas Setup** front-panel key to access the settings described below.

Use the ***Select Mask*** menu key to select from ten masks. Masks are initially undefined. A mask can either be defined from scratch by enabling the required number of segments and then editing each segment or use the ***Load Default Mask*** menu key and edit that mask.

The ***Measurement Interval*** defines the time interval over which samples are taken. The spectrum is computed using multiple FFT computations from samples in sub-intervals of the measurement interval. The FFT outputs are averaged by frequency bin to yield the spectrum. The sub-intervals used for the FFT computation can be specified to be adjacent or overlapping using the ***FFT Overlap*** setting. An ***FFT Overlap*** setting of 0 means sub-intervals are adjacent and not overlapping.

The ***Edit Mask*** menu key accesses a sub-menu for specifying each segment of the mask. The segment to be edited is selected by pressing the ***Segment*** menu key and entering the segment index numerically or by using the RPG or the Up / Down arrows. A segment's state is toggled by pressing the ***Segment*** menu key.

Segment 0, if enabled, is used to define the carrier power spectrum. For this reason the ***Start Freq*** is fixed at 0 Hz. For all other segments both the ***Start Freq*** and the ***Stop Freq*** of the segment can be specified. Segments can be specified to overlap.

The ***Segment Side*** setting specifies whether the segment is a positive and negative frequency pair or just one-sided. The ***Integration BW*** of each segment can be specified independently.

Having specified a segment, it is necessary to define what type of limit that segment should be tested against. This is done through the ***Fail*** menu. The default limit type is Absolute as this is the type of limit specified by the LTE standards, but a limit may be specified to be Relative to the carrier or a combination of Relative and / or Absolute limits. The Absolute and Relative limits are specified separately through the ***Absolute Start Power / Absolute Stop Power*** and ***Relative Start Power / Relative Stop Power*** settings. Provision of Start and Stop Power pairs allow limits to be set as a linear function of frequency, if required.

Adjacent Channel Leakage Ratio (ACLR) Measurement (FDD/TDD)

Key Path: **Mode > SA > *LTE* > *ACLR***

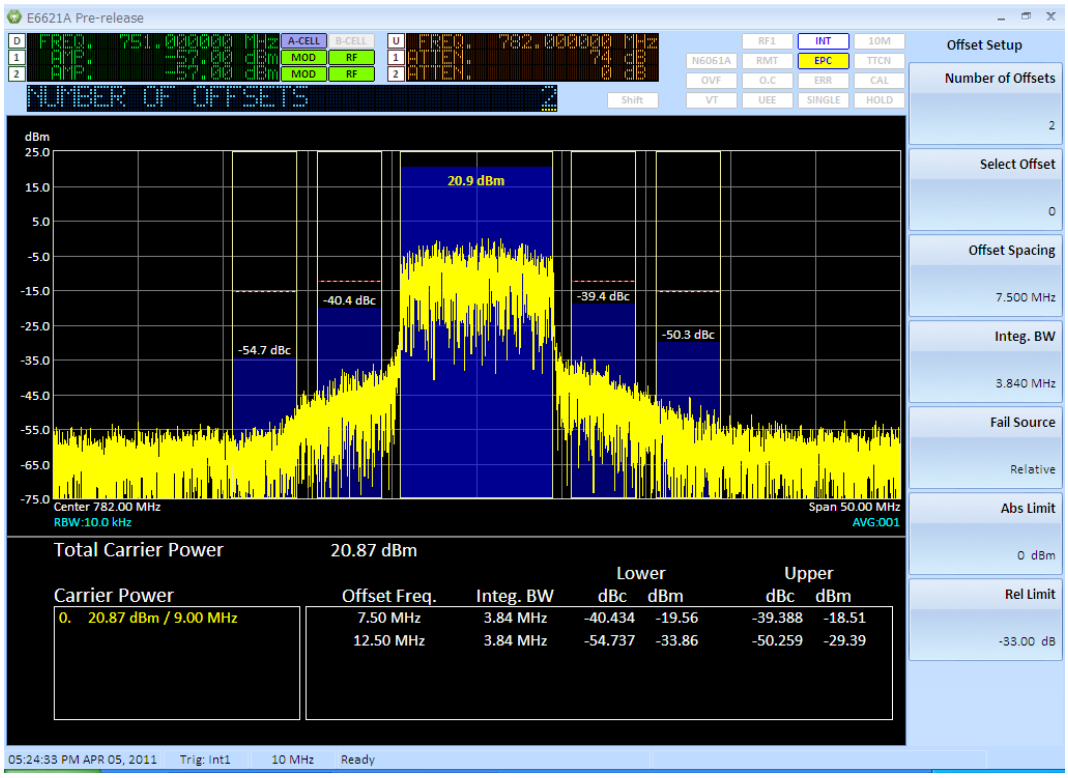


Figure 6-12: ACLR measurement

The ACLR measurement determines the ratio of Channel Power to power leaked into adjacent channels. The adjacent channels can be either E-UTRA channels or UTRA channels. The standards require that both are measured.

The measurement displays a graphic of the power spectrum of the signal with histograms representing channel powers superimposed. The key measurement results are summarized in a table.

Adjacent Channel Leakage Ratio (ACLR) Measurement (TDD example)

For TDD, special care must be taken with regard to the UL-DL configuration in order to be certain you are measuring an uplink subframe. For example, to measure ACLR of subframe 2 ensure these settings are selected in order to obtain valid measurement results:

1. Set the target subframe = 2 by pressing **Mode Setup > *Uplink Config* > *Target Subframe.* 2**,

2. Set the trigger delay = 2 ms by pressing **Func Setup** > ***Trigger> Internal Trigger > Trigger Delay, 2, ms.***

Measurement Setup

The frequency span of the measurement is fixed for a given system bandwidth.

Access the ***Carrier Setup*** menu, by selecting the **Meas Setup** front-panel key.

One or two carriers can be specified using the ***Number of Carriers*** setting. If two carriers are specified, either one can be selected as the ***Reference Carrier*** for the measurement. The carriers are specified in terms of a ***Carrier Spacing*** from the center frequency and an ***Integration Bandwidth***. These parameters can be set for both carriers by first setting ***Select Carrier*** to the index of the carrier to be modified.

Access the ***Offset Setup*** menu by selecting the **Meas Setup** front-panel key.

Up to five offset pairs can be enabled using the ***Number of Offsets*** setting. Offset pairs are located symmetrically about the center frequency. An offset pair must be selected using the ***Select Offset*** setting in order to modify it. The offsets are specified in terms of an ***Offset Spacing*** from the center frequency and an ***Integration Bandwidth***. Limit testing is specified separately for each offset pair using the ***Fail Source*** setting. The limit testing may be ***Absolute*** (where the absolute power in the integration BW for the offset is compared to an absolute limit value), ***Relative*** (where the power ratio of Offset Power to Channel Power is compared to a relative limit value) or ***None***. Repeated key presses of the ***Fail Source*** menu key cycles through the limit testing options. Absolute Limit and Relative Limit values may be set for each offset pair.

Making Measurements Requiring Demodulation

The general settings described above together with the settings described below are required for making measurements requiring demodulation. The following description assumes that the frequency, reference level, and system bandwidth have been correctly set. It also assumes that the trigger source is Internal and that the trigger delay is 0ms.

Auto Config

Key Path: **Mode** > **SA** > ***LTE*** > **Mode Setup**

This setting enables you to make UE uplink measurements easily when a call is in progress. The measurement settings shown below are automatically configured, without having to select them manually.

NOTE	When the UE is in test mode, you must configure the measurement settings manually.

PXT Settings

When **Mode** > **SA** > ***LTE*** > **Mode Setup** > ***AutoConfig*** is set to **On**, the settings shown in the table below are automatically configured to those currently set in the PXT. (There must a call in progress.)

Setting	Menu Key Name	Key Path
Channel Bandwidth	CH Bandwidth	**Mode** > **SA** > **Mode Setup**
Cell ID	Cell ID	**Mode** > **SA** > **Mode Setup** > ***Uplink Config***
PUSCH	RB Start	**Mode** > **SA** > **Mode Setup** > ***Uplink Config*** > ***PUSCH***
PUSCH	RB Size	**Mode** > **SA** > **Mode Setup** > ***Uplink Config*** > ***PUSCH***
PUSCH	I_MCS	**Mode** > **SA** > **Mode Setup** > ***Uplink Config*** > ***PUSCH***
UL Config, page 2	nRNTI	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > **More**
PUSCH	BetaOffset-CQI-Index	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***PUSCH***
PUSCH	BetaOffset-RI-Index	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***PUSCH***
PUCCH	nCS-AN (N1CS)	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***PUCCH***
PUCCH	nRB-CQI (N2RB)	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***PUCCH***
PUCCH	Delta PUCCH Shift	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***PUCCH***
PUCCH	N1PUCCH	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config***
Sounding-RS	Cyclic Shift SRS (n_cs_SRS)	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***Sounding RS***
Sounding-RS	SRS Band Config (C_SRB)	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***Sounding RS***
Sounding-RS	SRS Band (B_SRS_	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***Sounding RS***
Sounding-RS	SRS Band (B_SRS)	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***Sounding RS***
Sounding-RS	Transmission Comb. (k_TC)	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***Sounding RS***
Sounding-RS	SRS Hopping Bandwidth	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***Sounding RS***
Sounding-RS	FreqDomainPosition (n_rrc)	**Mode** > **SA** > ***LTE*** > **Mode Setup** > ***UL Config*** > ***Sounding RS***

Scenario File Settings

When **Mode** > **SA** > ***LTE*** > **Mode Setup** > ***AutoConfig*** is set to **On**, the settings shown in the table below are automatically set to those same values determined by the currently loaded scenario file. (There must a call in progress.)

Setting	Message Editor Parameter	Message
Sounding RS	SRS Applying Flag	SIB2 – if soundingRS-UL_ConfigCOmmon = release = Off, otherwise On
Ref Signal	Sequence Hopping	SIB2->groupHoppingEnabled
Ref Signal	Group Hopping	SIB2->SequenceHoppingEnabled
Ref Signal	Group Assign PUSCH	SIB2->groupAssignmentPUSCH
Ref Signal	nDMRS(1)	SIB2->cyclicShift
PUCCH	nCS-AN	SIB2>nCS-AN
PUCCH	nRB-CQI	SIB2->nRB-CQI
PUCCH	Delta PUCCH Shift	SIB2->deltaPUCCHShift
PUSCH	BetaOffsetCQIIndex	RRC Conn Setup->betaOffset-CQI-Index
PUSCH	BetaOffset-RI-Index	RRC Conn Setup->betaOffset-CQI-Index
PUSCH	BetaOffset-AckIndex	RRC Conn Setup->betaOffset-CQI-Index
PUSCH	UE Category	Emulator Mode->UE Category
Sounding RS	Cyclic Shift SRS	RRC Conn Setup->cyclicShift
Sounding RS	SRS Band Config	SIB2->srs-BandwidthConfig
Sounding RS	SRS Band	RRC Conn Setup->srs Bandwidth
Sounding RS	Transmission Comb	RRC Conn Setup->TransmissionComb
Sounding RS	SRS Hopping Bandwidth	RRC Conn Setup->srs-HoppingBandwidth
Sounding RS	Freq Domain Position	RRC Conn Setup->freqDomainPosition
Sounding RS	SRS Config Index	RRC Conn Setup->srsConfigIndex

Uplink Configuration Settings

Access the uplink configuration settings by selecting the **Mode Setup** front-panel key. These settings must match those of the applied signal in order to synchronize, demodulate, and measure correctly.

General Settings

Cell ID sets the physical (PHY) layer Cell ID. This PHY-layer ***Cell ID*** determines the Cell ID Group and Cell ID Sector. There are 168 possible Cell ID groups and 3 possible Cell ID sectors; therefore, there are 3 * 168 = 504 possible PHY-layer Cell IDs.

The ***nRNTI*** (Radio Network Temporary Identifier) setting is used by the PHY scrambling algorithms.

The ***IQ Inverse*** setting enables you to measure an inverted spectrum.

The ***Target Subframe*** setting provides the mechanism for selecting the subframe to measure. ***Target Subframe*** selection assumes that the trigger occurs at the frame boundary.

PUSCH Settings

The same Resource Block (RB) allocation is applied to both slots in a subframe. The ***RB Start*** setting and ***RB Size*** setting specify the index of the first RB and the number of RBs in the allocation.

The ***I_MCS*** (Modulation and Coding Scheme Index) specify the coding scheme of the allocation. For the measurements to synchronize and demodulate correctly, it is only necessary that the modulation format implied by this setting matches the modulation format of the signal. So, for a QPSK signal, the range of ***I_MCS*** is 0 and 10; 11 to 20 for a 16 QAM signal; and 21 to 28 for a 64 QAM signal. For 64 QAM measurements, ***UE Category*** must be set to 5 as only Category 5 UEs support 64 QAM modulation.

The settings ***CQI Bit Length***, ***RI Bit Length***, and ***HARQ Bit Length*** refer to the number of bits allocated for Channel Quality Indication, Rank Indication, and HARQ ACK.

The settings ***BetaOffset-CQI-Index***, ***BetaOffset-RI-Index***, and ***BetaOffset-Ack-Index*** are the layer 3 indices for the PHY parameters β_{offset}^{CQI}, β_{offset}^{RI}, and $\beta_{offset}^{HARQ-ACK}$. Refer to TS 3GPP 36.331, 6.3.2 (PUSCH-Config) and TS 3GPP 36.213, 8.6.3 for further details. This group of settings, together with ***RV Index*** and the redundancy version, are used by the Decoding Information measurement.

The ***PUSCH Hopping*** menu key accesses the PUSCH Hopping menu. Refer to TS 3GPP 36.213, 8.4 for a description of the ***PUSCH Hopping Type***, ***Hopping Mode***, ***PUSCH Hopping Offset*** ($N_{\mathrm{RB}}^{\mathrm{HO}}$), ***N_sb*** (number of subbands), ***Current_Tx_NB*** and ***Hopping Flag***. The Hopping Flag setting refers to the information content in the hopping bits. This information determines the allocation to be used in type-1 hopping (see table TS 3GPP 36.213, table 8.4-2). Please note that PUSCH Hopping is not supported in BSE call processing mode; therefore, all the above settings for PUSCH Hopping are relevant only for non-signalling testing in SA mode.

Reference Signal Settings

The ***Sequence Hopping***, ***Group Hopping***, ***GroupAssignment PUSCH*** (**Δss**), ***nDMRS(1)*** and ***nDMRS(2)*** settings define the reference signal. These settings must match the applied signal in order for the demodulation measurements to synchronize. Refer to TS 3GPP 36.211, 5.5 for a description of these parameters.

PUCCH Settings

NOTE	When you set **Mode** > **SA** > ***LTE*** > **Mode Setup** > ***Auto Config*** to On, the settings discussed below are configured automatically..

nCS-AN is the layer 3 name for the PHY setting N_{cs}. ***nRB-CQI*** is the layer 3 name for the PHY setting N_{RB}. ***Delta PUCCH Shift CQI*** is the layer 3 name for the PHY setting Δ_{shift}^{PUCCH}. Refer to TS 3GPP 36.211, 5.4 for further information on these settings. These settings must match the applied signal in order for the demodulation measurements to synchronize.

N1PUCCH-AN is the layer 3 name for the PHY setting N_{PUCCH}. It is used in the determination of PHY setting n_{PUCCH}. ***CQI-PUCCH ResourceIndex*** is the layer 3 name for the PHY setting n_{PUCCH}. ***PUCCH CQI Length*** specifies the number of bits allocated to CQI Reporting on PUCCH. Refer to TS 3GPP 36.211, 7.2 for further information on these settings. This group of settings is used by the Decoding Information measurement.

SRS Settings

Cyclic Shift SRS is the layer 3 name for the PHY setting n_{SRS}^{cs}. Refer to TS 3GPP 36.211, 5.5.3.1 for further information.

SRS Band Config is the layer 3 name for the PHY setting C_{SRS}. ***SRS Band*** is the layer 3 name for the PHY setting B_{SRS}. ***Transmission Comb*** is the layer 3 name for the PHY setting k_{TC}. ***SRS Hopping Bandwidth*** is the layer 3 name for the PHY setting b_{hop}. ***Freq Domain Position*** is the layer 3 name for the PHY setting n_{rrc}. These settings determine the SRS allocation. Refer to TS 3GPP 36.211, 5.5.3.2 for further information.

SRS Config Index is the layer 3 name for the PHY setting I_{SRS}. This setting determines the SRS periodicity. Refer to TS 3GPP 36.211, 8.2 for further information.

The setting ***System Frame Number*** is the PHY parameter n_f in 36.211, 5.5.3.2.

The setting ***SRS Flag*** indicates to the measurement that there is an SRS in the PUSCH or PUCCH.

PRACH Settings

The ***PRACH ConfigIndex*** parameter defines the preamble format and the frames / subframes that can be used for PRACH transmissions. The ***Search Subframe*** setting must match one of the subframes allowed by the ***PRACH ConfigIndex***. ***PRACH-FreqOffset*** is the layer 3 name for the PHY parameter $n_{PRBoffset}^{RA}$ and indicates the resource block offset to be used for transmission. Refer to TS 3GPP 36.211, 5.7.1 for a description of these parameters.

The settings ***Root Sequence Index***, ***High Speed Flag*** and ***ZeroCorrelation ZoneConfig*** specify the Zadoff-Chu sequence used by the PRACH. ***ZeroCorrelation ZoneConfig*** is the layer 3 name for the PHY parameter N_{cs} Config. Refer to TS 3GPP 36.211, 5.7.2 for a description of these parameters.

The setting ***Number of RA Preambles*** is the parameter 'numberOfRA-Preambles' in 36.321, 5.1. ***Number of RA Preambles*** sets the total available number of RA preambles in the cell, and the measurement algorithm will search RA preambles only within this boundary.

Please note that PRACH measurements are not supported dynamically with BSE mode call processing in this release. Therefore the PRACH settings are targeted for non call processing signal generator measurements.

Modulation Quality Summary

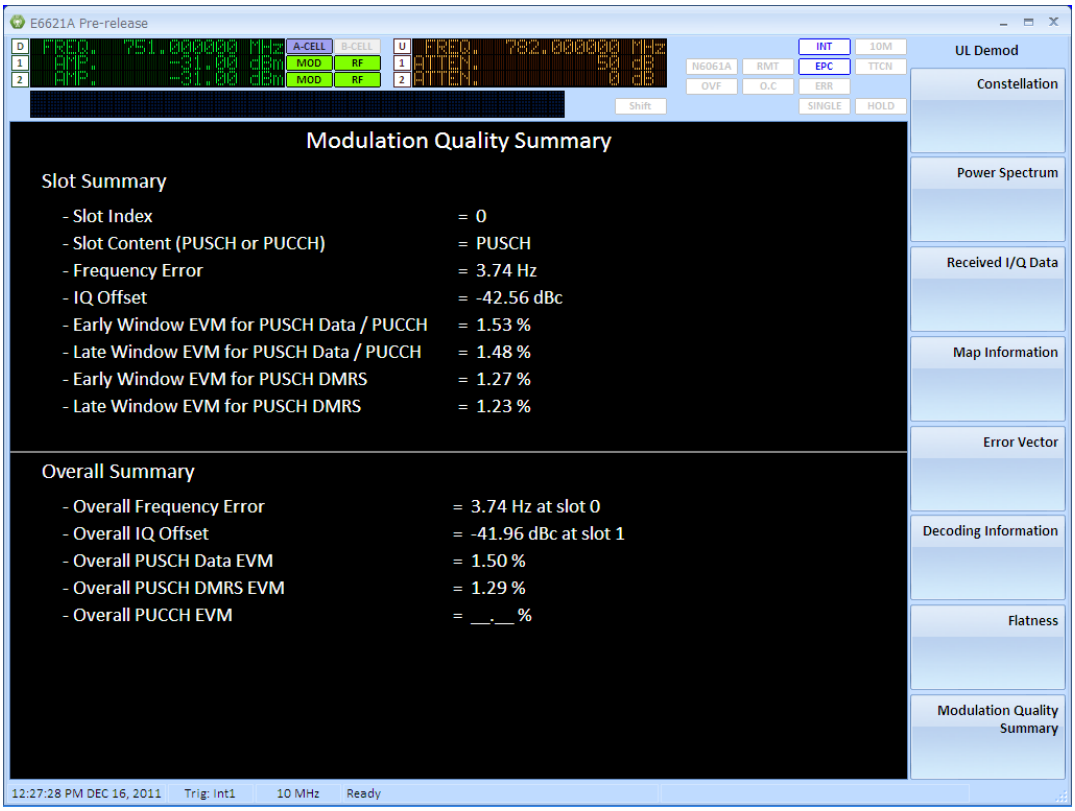


Figure 6-13: Modulation Quality Summary

Key Path: Mode > SA > *LTE* > Meas > *UL Demodulation*

The modulation quality summary provides you with the information you need to comply with 3GPP Test Specification (TS) 36.521.1 requirements. Frequency error, IQ Offset, and EVM are calculated for each slot and the overall summary is displayed in the lower section of the window, as shown in the figure above. All calculations in this summary are defined by the 3GPP TS 36.521.1. Each measurement is listed below with the specific section of this specification where the calculation is defined.

Slot Frequency Error and IQ Offset are calculated according to 3GPP TS 36.521-1, section E.3.1.

The overall frequency error is the largest absolute value of frequency error determined over all slots in the measurement interval. (Refer to 3GPP TS 36.521-1, section 6.5.1.5.)

The overall IQ Offset value is the least negative value of IQ offset determined over all slots in the measurement interval. (Refer to 3GPP TS 36.521-1, section 6.5.2.2.5.)

To display the measurements for a particular slot press **Meas Setup -> Modulation Quality Summary Slot Index.** You can set this to any slot in the settable measurement period range (from Start to Stop subframe).

For each slot in the measurement interval, you also find calculations for early window, center window and late window DMRS EVM and Data EVM in the case of PUSCH and PUCCH. The Fast-Fourier Transform (FFT) calculations for these values are made as defined in 3GPP TS 36.521-1, section E.3.2. Post FFT equalization is performed as defined in 3GPP TS 36.521-1, section E.3.3.

For each slot in the measurement interval, the early window EVM and late window EVM values are calculated as defined by the 3GPP TS 3GPP 36.521-1. Each measurement is defined in detail in the section of this specification as shown below:

Early Window and Late Window EVM Calculations

Measurement Calculation	Compliance with 3GPP 36.521-1, section:
PUSCH Data EVM	E.4.1
PUSCH DMRS EVM	E.4.6
PUCCH EVM	E.5.9.1

Overall EVM Results for PUSCH and PUCCH

Measurement Calculation	Compliance with 3GPP 36.521-1, section:
PUSCH Data EVM	E.4.6.1 (1st average only – not E.4.6.2)
PUCCH EVM	E.5.9.2

Constellation Measurement

Key Path: **Mode > SA > *LTE* > *UL Demodulation* > *Constellation***

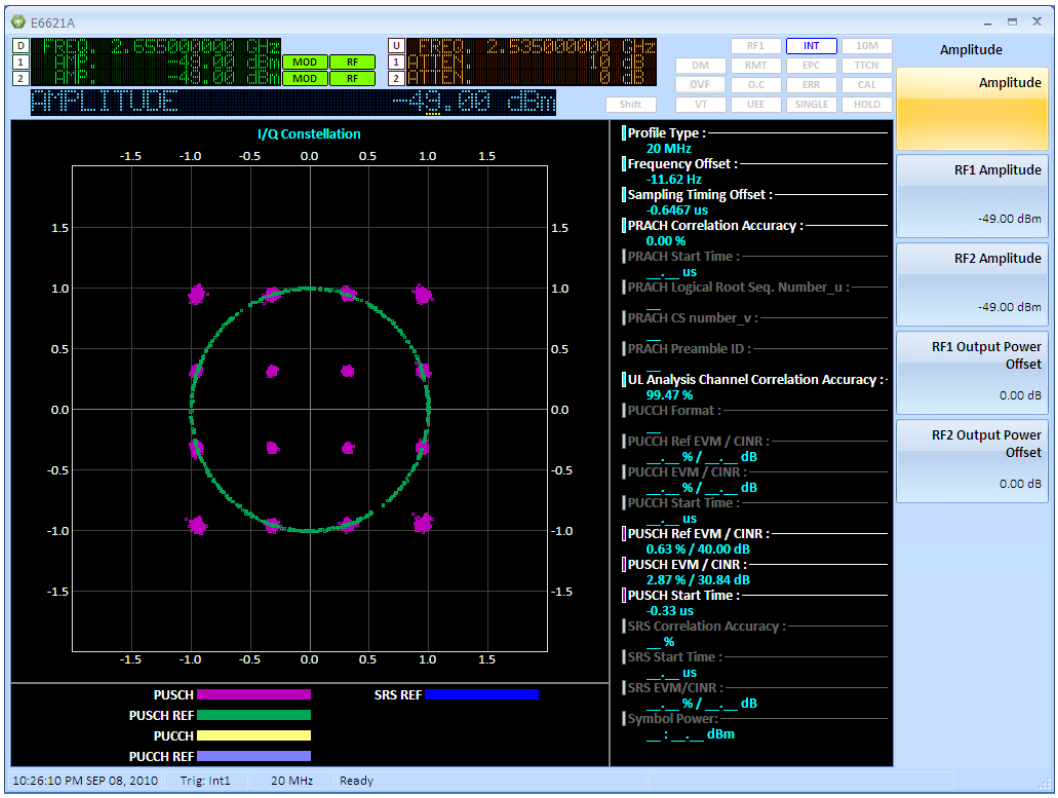


Figure 6-9: Constellation measurement

Use this measurement to view the constellation diagram for PUSCH and PUCCH reference signals, and data. Numeric results for PRACH, PUCCH, PUSCH and SRS are also presented. These numeric results include frequency error and symbol power, correlation accuracy and start time for the channel type detected, parameter information for PRACH and PUCCH and EVM / CINR for PUCCH, PUSCH and SRS.

The Constellation graphic displays the demodulated symbols (data and reference) as points in the IQ plane. In terms of the uplink receiver chain, reference symbols are taken directly from the FFT output but data symbols are taken from the iDFT output. Demodulated symbols for PUSCH and PUCCH channel types and Sounding Reference Signals (SRS) can be independently selected and displayed.

Measurement Setup

Access the following settings by selecting the **Meas Setup** front-panel key.

The ***Scale*** setting adjusts the scale per division on both the I and Q axes. The graphic has a fixed number of 8 divisions on each axis.

The menu key ***Channel Manager*** leads to a menu where the uplink channels and signals can be selected for display.

The menu key ***Constellation Subframe Select*** enables you to select for which subframe you wish to perform and display the measurement. For example, in TDD mode, you would select subframe #2.

Power Spectrum Measurement

Key Path: **Mode > SA > *LTE* > *UL Demodulation* > *Power Spectrum***

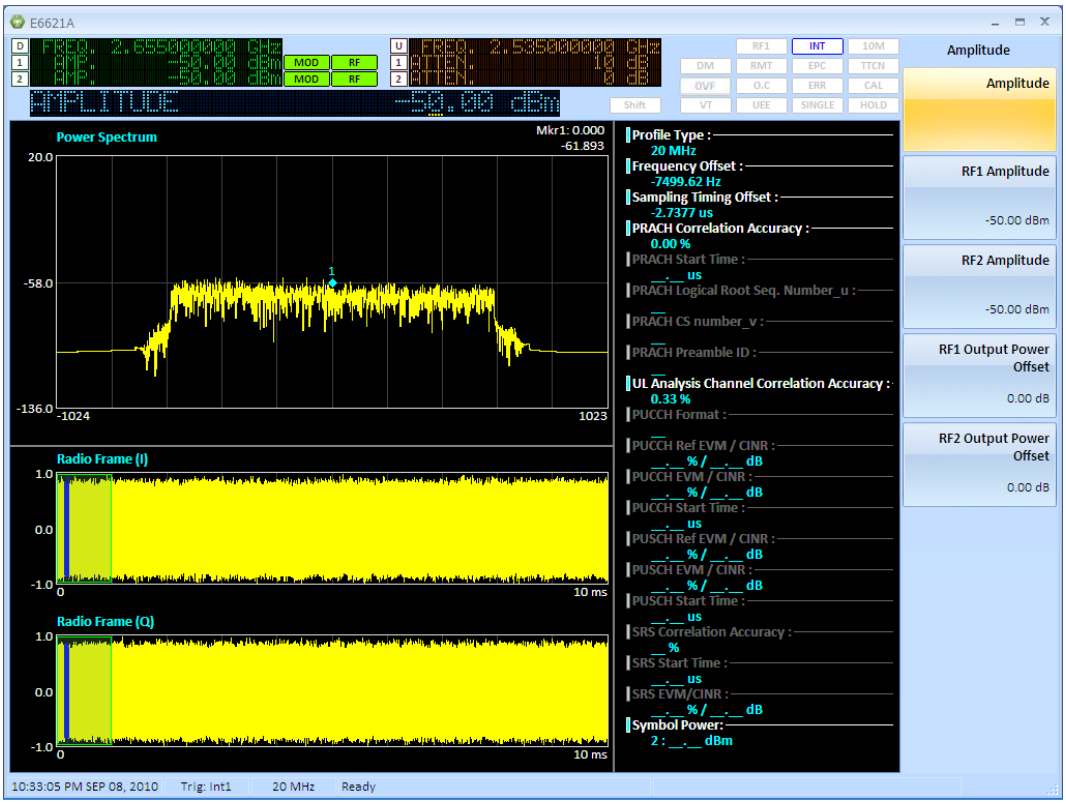


Figure 6-10: Power Spectrum measurement

This measurement displays a frequency domain graphic of the subcarrier powers for a selected symbol, and time domain graphics of the IQ signal over a radio frame. Additionally, the numeric results presented by the Constellation measurement are also presented here.

The measurement can be used to measure the power of individual resource elements in the uplink allocation.

Measurement Setup

Uplink Config

The green outlined box on the IQ time domain (Figure 6-10: Power Spectrum measurement), above) indicates the subframe being measured. Use the ***Target Subframe*** setting in the ***Uplink Config*** menu to select the required subframe for this measurement.

Access the following settings by selecting the **Meas Setup** front-panel key.

The ***Symbol*** setting is the symbol index within the selected subframe. The selected symbol is indicated on the IQ time domain screen by a blue outlined box.

The frequency domain graphic shows the subcarrier powers for the selected symbol. The ***Subcarrier*** setting is used to move the marker on the frequency domain graphic. The marker result, power in dBm, is displayed in the top right-hand corner of the frequency domain graphic. This is the power of the resource element selected by symbol and subcarrier.

The ***Power Spectrum Subframe Select*** setting enables you to select which subframe in the radio frame to make the measurements. For example, in TDD mode, you would select subframe #2.

Received IQ Data Measurement

Key Path: **Mode > SA > *LTE* > *UL Demodulation* > *Received I/Q Data***

Figure 6-11: Received IQ Data measurement

Use this measurement to see resource element IQ component magnitudes in tabular and graphic form. For a user selectable symbol, this measurement displays the subcarrier IQ component magnitudes across subcarriers. The same numeric results presented in the constellation measurement are also presented here.

Measurement Setup

Access the following settings by selecting the **Meas Setup** front-panel key.

Use the ***Scale*** setting to set the scale per division on the vertical axes of the I and Q graphics. The units are linear.

The ***Symbol*** setting is the symbol index within the selected subframe. Use the ***Target Subframe*** setting in the Uplink Config menu to select the required subframe for this measurement.

The blue outlined box overlaying the I and Q graphics indicates the ten subcarriers listed in the table. Use the ***Subcarrier*** setting to set the index of the first subcarrier in the table.

The ***Power Spectrum Subframe Select*** setting enables you to select which subframe in the radio frame to make the measurements. For example, in TDD mode, you would select subframe #2.

Map Information Measurement

Key Path: **Mode > SA > *LTE* > *UL Demodulation* > *Map Information***

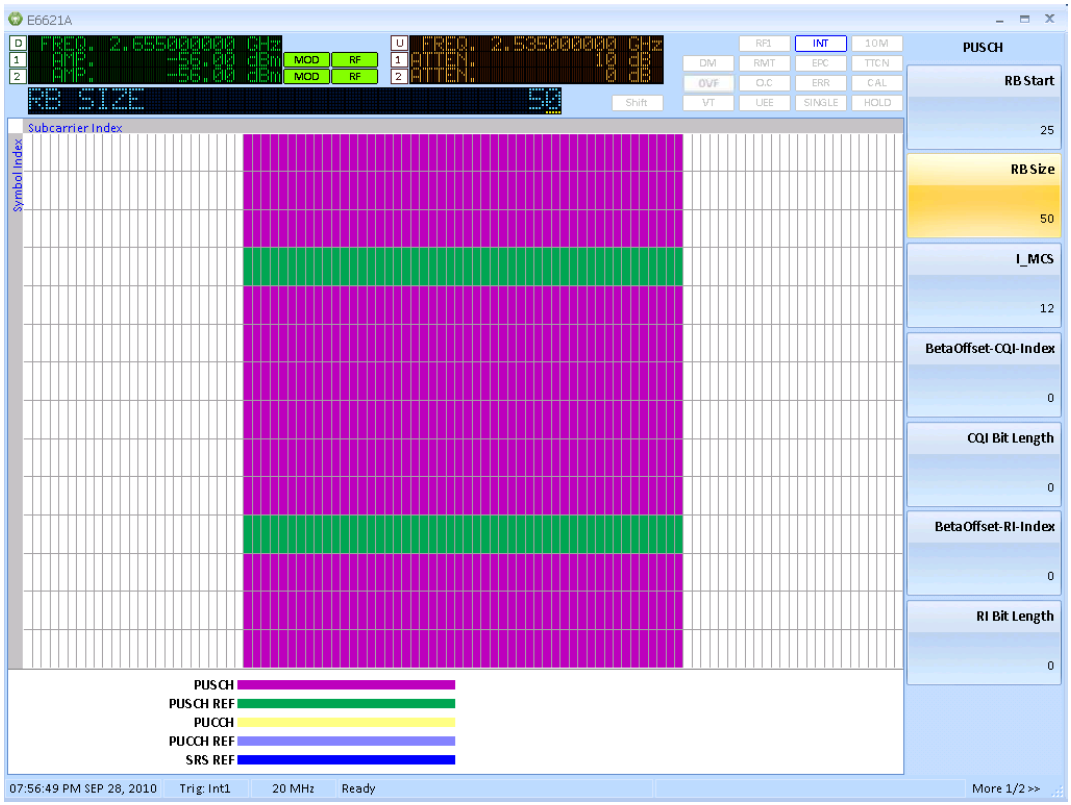


Figure 6-12: Map Information measurement

The Map Information measurement is a graphical display of the physical channels and signals in the measured subframe. Use this measurement to see the resource grid indicating the allocations for PUCCH, PUSCH and SRS.

Measurement Setup

Uplink Config

Use the ***Target Subframe*** setting in the **Uplink Config** menu to select the required subframe for this measurement.

Access the following settings by selecting the **Meas Setup** front-panel key.

The ***X-Y Axis*** setting allows the graphic to be displayed with either symbols or subcarriers along the horizontal axis. The ***Channel Table*** setting turns the legend at the bottom of the graphic on or off.

Error Vector Measurement

Key Path: **Mode > SA > *LTE* > *UL Demodulation* > *Error Vector***

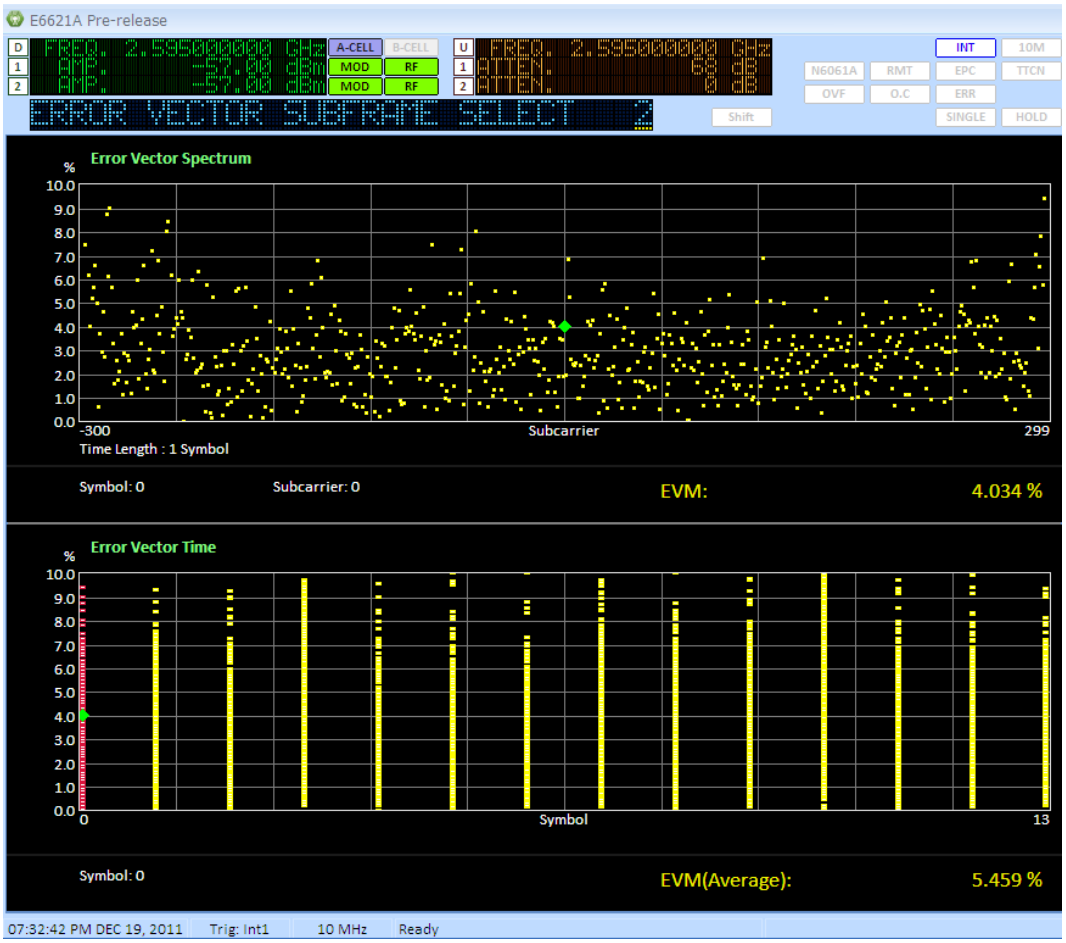


Figure 6-13: Error Vector Spectrum measurement

The Error Vector measurement presents the EVM results in two graphics. The Error Vector Spectrum shows the EVM result of each subcarrier for the selected symbol – the horizontal axis is subcarrier index. The Error Vector Time graphic has symbol index as the horizontal axis and displays the EVM value of all subcarriers for a symbol as a stack of points. So the Error Vector Time graphic is a summary view of all resource element EVM values; and the Error Vector Spectrum graphic is a detailed view where it is possible to observe the EVM value of a particular resource element.

Measurement Setup

Access the following settings by selecting the **Meas Setup** front-panel key.

The upper ***Scale*** setting scales the Error Vector Spectrum graphic. The lower ***Scale*** setting scales the Error Vector Time graphic.

The ***Symbol*** setting selects the symbol index within the measured subframe. Use the ***Target Subframe*** setting in the ***Uplink Config*** menu to select the required subframe for this measurement. The selected symbol moves the marker on the Error Vector Time display. The marker value, displayed in the bottom right-hand corner of the Error Vector Time graphic, is the average EVM for all subcarriers on the selected symbol. The selected symbol also determines the symbol used for the Error Vector Spectrum display.

The ***Subcarrier*** setting moves the marker in the Error Vector Spectrum graphic. The marker value, displayed in the bottom right-hand corner of the Error Vector Spectrum graphic, is then the EVM value for the resource element indexed by the ***Symbol*** and ***Subcarrier*** settings.

The ***Error Vector Subframe Select*** setting enables you to select which subframe in the radio frame to make the measurements. For example, in TDD mode, you would select subframe #2.

Decoding Information Measurement

Key Path: **Mode > SA > *LTE* > *UL Demodulation* > *Decoding Information***

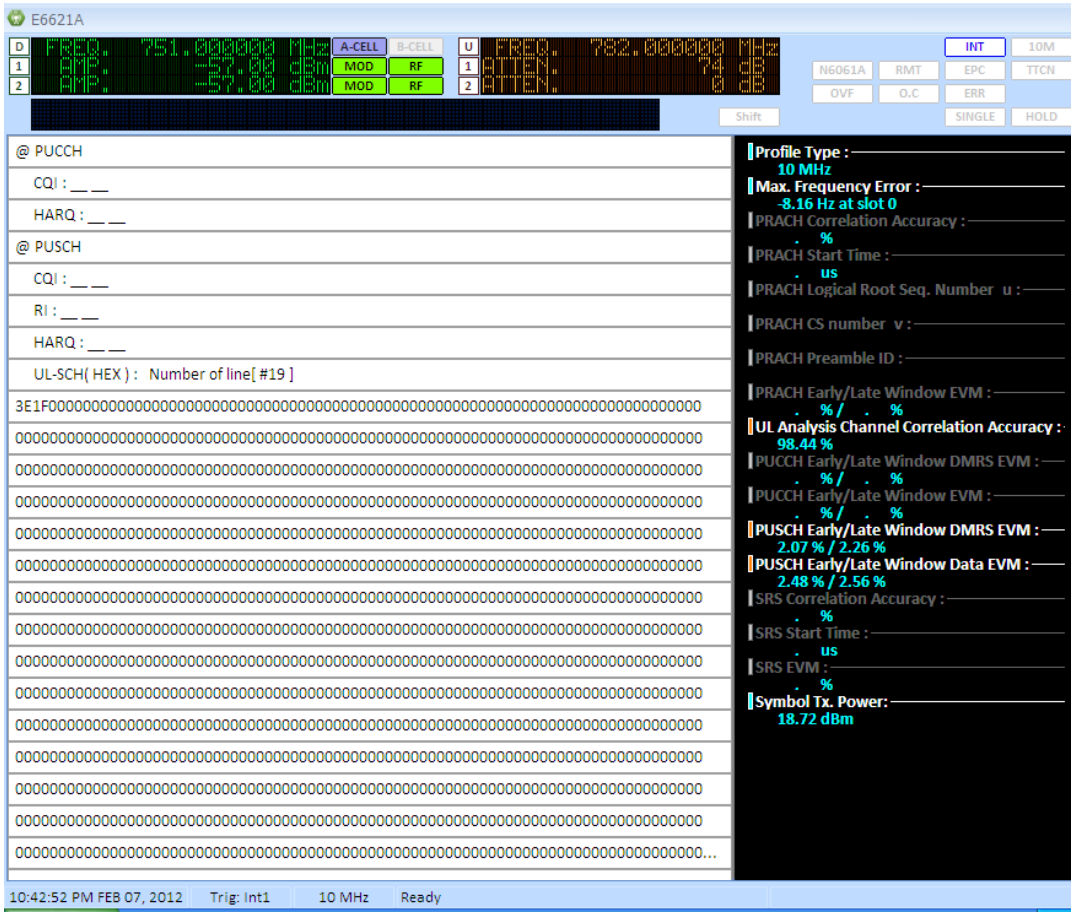


Figure 6-14: Decoding Information measurement

This measurement displays the information content of the subframe selected for measurement. If the measured subframe contains PUCCH, the Channel Quality Indicator (CQI) and Hybrid Acknowledge Request (HARQ) information are displayed, if present. If the subframe contains PUSCH, Rank Indication (R) and the transport block content (UL-SCH) in addition to CQI and HARQ are displayed, if present.

Measurement Setup

Uplink Config

Use the ***Target Subframe*** setting in the ***Uplink Config*** menu to select the required subframe for this measurement.

Spectrum Flatness Measurement

Key Path: **Mode > SA > *LTE* > *UL Demodulation* > *Flatness***

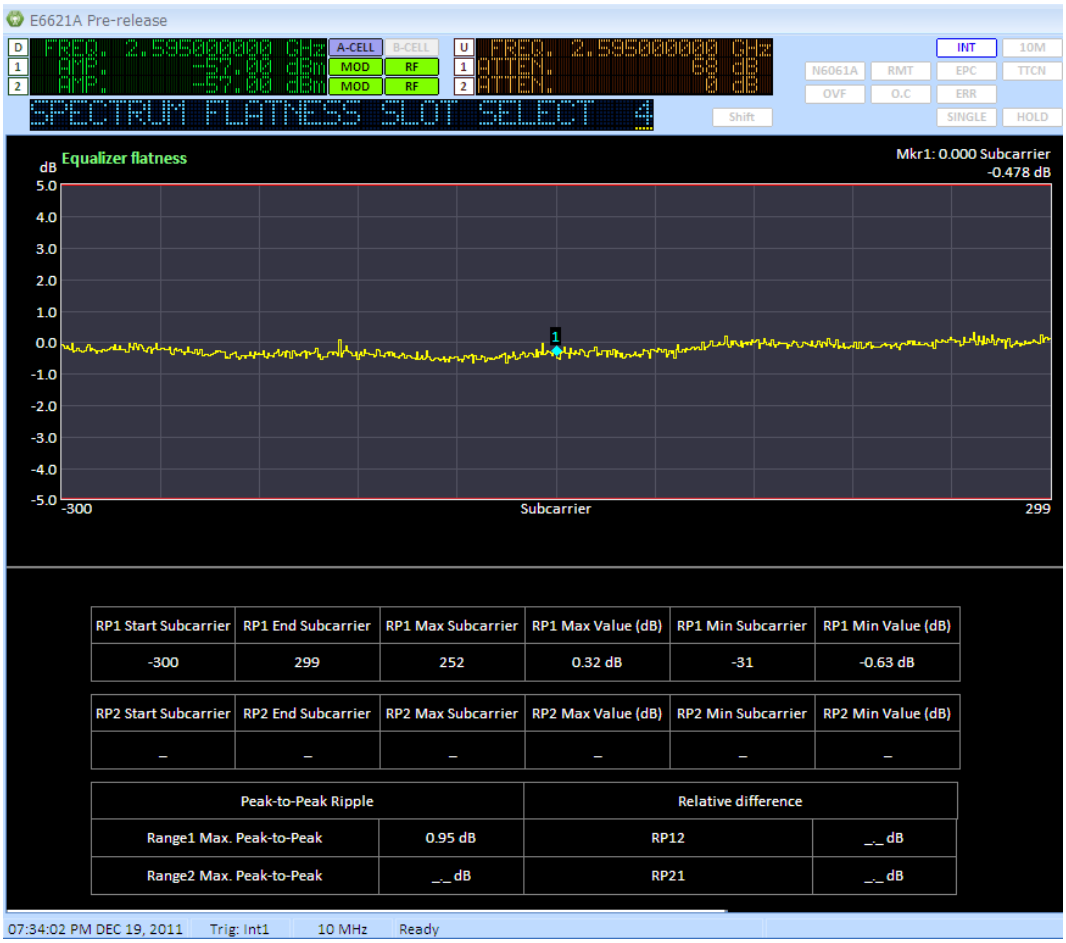


Figure 6-15: Spectrum Flatness measurement

The Spectrum Flatness measurement determines the power of each active uplink subcarrier. The Absolute Flatness measurement represents the power of each subcarrier relative to the average power of all the subcarriers. This measurement is aligned with TS 36.521-1. This measurement is used to verify that the peak-to-peak variation of the EVM equalizer coefficients contained within the frequency range of the uplink allocation do not exceed the maximum ripple.

Two ranges are specified as follows:

Range 1 (RP1):

$$F_{UL\_Meas} - F_{UL\_Low} \geq 3\ MHz \text{ and } F_{UL\_High} - F_{UL\_Meas} \geq 3\ MHz$$

Range 2 (RP2):

$$F_{UL\_Meas} - F_{UL\_Low} < 3\ MHz \text{ or } F_{UL\_High} - F_{UL\_Meas} < 3\ MHz$$

Where F_{UL_Meas} refers to the sub-carrier frequency for which the equalizer coefficient is evaluated and F_{UL_Low} and F_{UL_High} refer to each E-UTRA frequency band.

For both ranges (RP1 and RP2) the measurement displays the start and end subcarrier number, the maximum and minimum power values, and the corresponding subcarrier's number for which the max and min have been calculated. In addition, the max peak to peak ripple for each range is displayed.

Measurement Setup

Access the following settings by selecting the **Meas Setup** front-panel key.

The ***Scale*** setting applies to both the Absolute Flatness and Differential Flatness graphics.

The ***Subcarrier*** setting moves the display marker. The marker result the subcarrier power appears in the top right-hand corner of the display.

The ***Spectrum Flatness Slot Select*** will let the user select which slot in the radio frame to make the measurements. For example, in TDD mode, you would select subframe #4.

Measurement Results

The display shows the equalizer flatness over the specified subcarrier range for RP1. In this case, the measurement starts at –300 and ends at +299. Below the graph, summary results are displayed showing RP minimum and maximum values, RP minimum subcarrier, Peak-to-Peak Ripple and the Relative difference between RP1 and RP2.

8 Troubleshooting

WARNING	No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

Solutions

Problem:

UE is not connecting.

Solution:

1. Use the PXT default values for attenuation. The PXT may not be detecting the PRACH from the UE.

   The various *N6062A Protocol Message Editor* software settings for starting power and power ramping for the UE when it connects are important and matched to the PXT's default power levels. These have been selected to ensure most UEs can connect without difficulties relating to power levels. If these are adjusted dramatically it is likely the UE cannot connect because either the UE will transmit at the wrong power levels, or the PXT will be set to the wrong attenuation values.

   The PXT normally signals to the UE that it is transmitting at a high power to match the typical set up of an eNB. However, the actual power transmitted is much lower. The UE determines that the path loss is high and adjusts it's transmit power accordingly. The resultant uplink power from the UE is within the input power range configured by default on the PXT.

   It is recommended to use the default values because in the majority of cases, the default values will allow a connection to be successfully established

Upgrading Your Instrument Software

If you are having problems, the solution may be as simple as upgrading your instrument software. Agilent periodically releases software updates to fix known defects and incorporate product enhancements. To ensure you have the latest software for your product, go to the Agilent Technical Support website at

http://www.agilent.com/find/softwaremanager

IMPORTANT	An active N6050AS Software and Technical Support Contract (STSC) is required to access the software manager website (displayed above), together with the login credentials registered by you or your company for activation. See the "Redeem Your Entitlement Certificate" section in the ***Agilent PXT Wireless Communications Test Set Getting Started Guide*** for instructions to activate your STSC.

After you download the ZIP file from the software manager website shown above, perform the following steps to complete the upgrade installation:

- Extract the ZIP file to the root of a USB memory stick. This creates the file structure: "\setup.e6621a\setup.cab" on the USB drive.
- Connect the memory stick to one of the E6621A USB ports.
- Wait several seconds for MS Windows operating system to recognize the USB stick.
- Press the **INFO** front-panel key.
- Press the **Update Application** menu key.
- Wait until the upgrade process is complete.
- Remove the USB memory stick.

NOTE	If the software is not found on the USB stick, or it is incompatible with the instrument hardware, a message is displayed and the software will not be installed. Contact Agilent support if you need assistance obtaining the correct software.

-

NOTE	If the software release date is after your Software and Technical Support Contract expired, a message is displayed and the software will not be installed. Renew your Software and Technical Support Contract to allow the installation to proceed. You can install software created prior to the Software and Technical Support Contract expiry date.

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Functional Check

NOTE	This functional check is only available if you have *Option N6051A RF Parametric Test with Test Mode Signaling* installed on your PXT.

Turn on the instrument. Wait until the boot procedure completes: indicated by the appearance of the Base Station Emulator startup screen. With no cabling connected to the front-panel, perform the following:

- Press the **Amp** key and set the RF1 output power to 0 dBm.
- Press the **FREQ** key and set the RF1 DL frequency to match the UL frequency.
- Press the **SPECTRUM** key. The display should be similar to the picture below. This indicates that the LTE transmit and receive functions are operational.

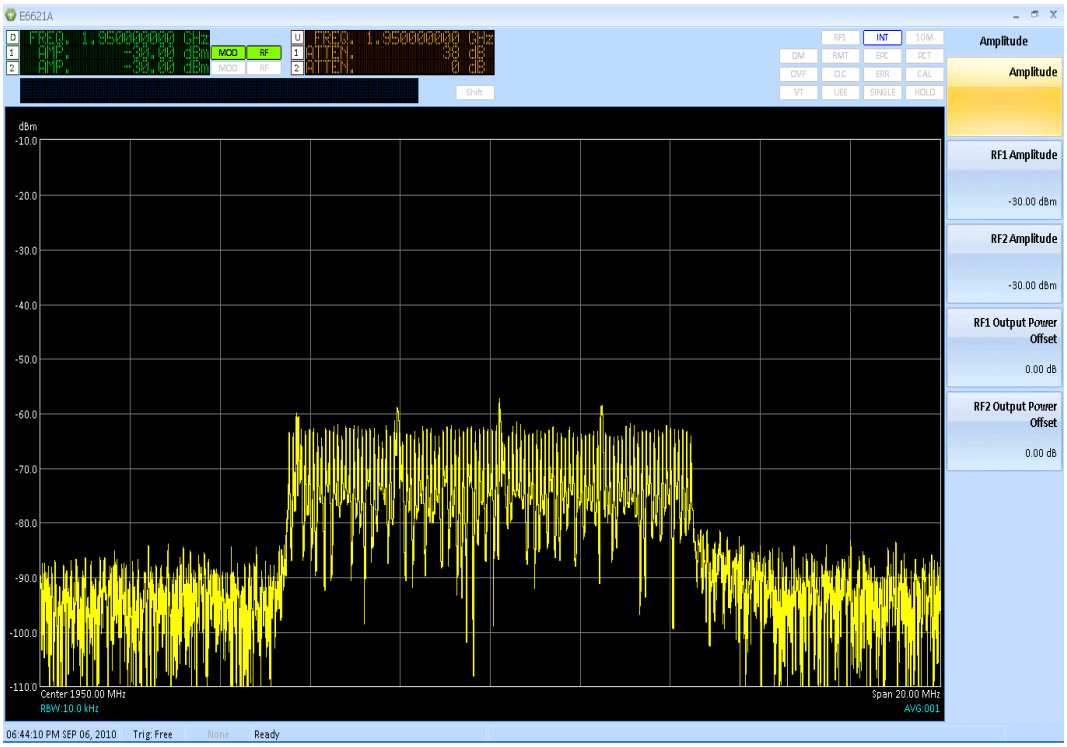


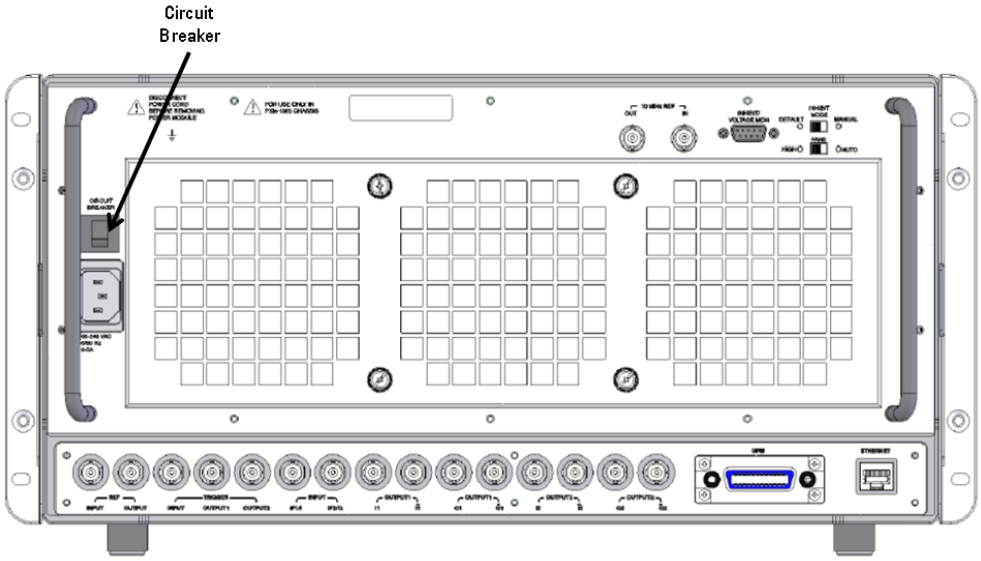
Figure 7-1: Functional Test Verification

Resetting the AC Mains Circuit Breaker

If the PXT is connected to an AC source and encounters an over-current condition, the circuit breaker on the rear panel will trip to prevent damage to the instrument. Complete the following steps to reset the circuit breaker.

1. Turn the off the front-panel power button.
2. Disconnect the AC power cable.
3. Depress the circuit breaker to reset it.
4. Reconnect the AC power cable.
5. Turn on the front-panel power button.

If the circuit breaker trips again, contact Agilent customer support at the locations listed in "Service and Support" section.



Returning Your Test Set for Service

Calling Agilent Technologies

Agilent Technologies has offices around the world to provide you with complete support for your wireless test set. To obtain servicing information or to order replacement parts, contact the nearest Agilent Technologies office listed below. In any correspondence or telephone conversations, refer to your test set by its product number, full serial number, and software revision.

Press the **INFO** front-panel key to view the product number (E6621A), serial number, and software revision information. A serial number label is also located on the rear panel of the test set.

Locations for Agilent Technologies

Online assistance: http://www.agilent.com/find/assist

If you do not have access to the Internet, one of the centers listed below can direct you to your nearest representative:

(Note, if you have a Software and Technical Support Contract you can contact Agilent at the email addresses listed in section of this manual entitled, "Software and Technical Support Contracts".

Should the Declaration of Conformity be required, please contact an Agilent Sales Representative, or the closest Agilent Sales Office. Alternately, contact Agilent at: www.agilent.com.

Service and Support

Americas

Brazil
(11) 4197 3600

Canada
(877) 894 4414

Mexico
01800 5064 800

United States
(800) 829 4444

Asia Pacific

Australia
1 800 629 485

India
1 800 112 929

Malaysia
1 800 888 848

China
800 810 0189

Japan
0120 (421) 345

Singapore
1 800 375 8100

Hong Kong
800 938 693

Korea
080 769 0800

Taiwan
0800 047 866

Other Asian Countries:
www.agilent.com/find/contactus

Europe & Middle East

Belgium
32 (0) 2 404 93 40

Ireland
1890 924 204

Spain
34 (91) 631 3300

Denmark
45 45 80 12 15

Israel
972-3-9288-504/544

Sweden
0200-88 22 55

Finland
358 (0) 10 855 2100

Italy
39 02 92 60 8484

Switzerland
0800 80 53 53

France
0825 010 700*
*0.125 €/minute

Netherlands
31 (0) 20 547 2111

United Kingdom
44 (0) 118 927 6201

Germany
49 (0) 7031 464 6333

Other Unlisted Countries:
www.agilent.com/find/contactus

Software and Technical Support Contracts

If you have a Software and Technical Support Contract, there are three methods of accessing your technical support:

- Web-based support: My Support Center
- E-mail support
- Phone support

For fastest response times, we recommend using the web-based or email access methods as these provide the most direct route to your technical support expert. All support cases may be viewed and tracked through the online support center (My Support Center), regardless of how you initially contacted technical support.

Web-based support

You can directly enter and manage your support requests online via www.agilent.com/find/mysupportcenter.

The first time you use My Support Center you will be asked to create a profile and provide proof of entitlement. Once your profile is created, you can use the online support center to enter your support request.
Each support request will be given a unique case number which you can use to track the progress of your support case. A technical expert will contact you via phone or email (whichever you have stated as your preferred option) to resolve your issue.

English, Japanese, Korean, and Mandarin local language support is available.

E-mail support

You can also contact our technical support at the following e-mail addresses:

- wireless_test_support_americas@agilent.com
- wireless_test_support_japan@agilent.com
- wireless_test_support_europe@agilent.com
- wireless_test_support_asia@agilent.com
- wireless_test_support_korea@agilent.com

Your support request will be routed to a technical expert who will contact you via e-mail or phone (whichever you have stated as your preferred option) to help resolve your issue.

English, Japanese, Korean, and Mandarin local language support is available.

Phone support

If you prefer to speak to someone directly, you can call the Agilent customer contact centers in the *Service and Support* section of this chapter.

The customer contact center will route your request to a technical support expert, who will contact you about your support request via phone or email. Local language support is available in many countries.

For more information on STSCs, refer to "Software and Technical Support Contracts" on page 4.

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