

# Agilent E6651A Mobile WiMAX<sup>™</sup> Test Set

**User's Guide** 



Agilent Technologies

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Agilent E6651A Mobile WiMAX Test Set E6651A User's Guide

# Introduction

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This document describes the operation of the E6651A Test Set, a Mobile WiMAX 802.16e Subscriber Station Tester. This product is used for protocol verification and performance measurement of Mobile WiMAX Subscriber Stations (SS). The E6651A Test Set was designed to be operated as a standard Mobile WiMAX base station, and is also capable of analyzing and generating Mobile WiMAX signals.



# **Product Overview**

The E6651A Test Set is designed to test and analyze the performance and signaling of Mobile WiMAX subscriber stations based on the IEEE 802.16e standard. The Test Set consists of three major operating modes:



Figure 1 The Agilent E6651A Mobile WiMAX Test Set

### **Base Station Emulator (BSE)**

In Base Station Emulator (BSE) mode, the Test Set simulates the operation of a Mobile WiMAX base station.

### Signal Analyzer (SA)

In Signal Analyzer (SA) mode, the Test Set can be used to analyze Mobile WiMAX uplink signals using modulation, spectrum and flatness analysis. Modulation Analysis mode displays the OFDM signal in both frequency and time domain. The Spectrum Analysis functionality, implemented using a Fast Fourier Transform (FFT) algorithm, displays the measured WiMAX signal in the frequency domain. Flatness Analysis enables comparison of power levels of the spectral components.

# Signal Generator (SG)

In Signal Generator (SG) mode, the Test Set generates standard Mobile WiMAX uplink and downlink signals.

# **Functions and Features**

#### **E6651A Features**

- IEEE 802.16e OFDMA Mobile WiMAX subscriber station tester
- Real-time Mobile WiMAX downlink signal modulation
- Real-time Mobile WiMAX uplink demodulation
- Base station emulation with MAC, protocol stack
- TDD synchronization (auto-switching) of signal generator and signal analyzer
- Ranging code detection
- Various preamble, FCH, DL-MAP, UL-MAP, burst configuration settings
- DL PUSC, DL FUSC, UL PUSC

# Mobile WiMAX radio<br/>(PHY) measurements• OFDM constellation and EVM (BPSK, QPSK, 16QAM,<br/>64QAM)

- UL data EVM
- Error vector spectrum, error vector versus time
- CCDF (complimentary cumulative distribution function)
- Channel power, occupied bandwidth

#### Transmitter • Modulation and coding

- Ranging support
- Power level control
- Synchronization
- Maximum output signal
- Frequency accuracy
- Channel bandwidth measurement
- Spectral flatness
- Relative constellation error (EVM)

Receiver •		Maximum	tolerab	le	signal
------------	--	---------	---------	----	--------

- Maximum input signal
- Sensitivity
- Cyclic prefix
- Preambles
- Frame duration timing
- RSSI
- BER versus CINR

## Mobile WiMAX

MAC test items

- Response time for MAC management request message
  Initial ranging procedure verification under exceptional RF conditions
- Dynamic service flow status for given conditions
- SS MAC layer verification and performance test

# **General Specifications**

Environmental		
	<b>Operating Temperature</b>	0°C to +55°C
	Storage Temperature:	-20°C to +70°C
	Humidity:	15% to 95% Relative Humidity at +40°C
	Altitude:	3000m (9,840 ft.)
	EMC:	Meets EN55011: 1991 (Group 1, Class A), and EN50082-1:1992.
Physical Specifications		
	Weight (Net):	: 25.8 Kg
	Dimensions:	222 H x 444 W x 647 D mm nominal
Power Requirements	a detachable main This instrument has	as an IEC 60320-1 C14 inlet for connecting ns cord set. an autoranging line voltage input, ensure the thin the specified range.
	Table 1         Agilent E6651	1A Mobile WiMAX Test Set Power Requirements
		Power: Input Voltage Range: 100 to 240 Vac, automatic selection
	$\overline{}$	Input Frequency Range: 50 to 60 Hz
		<b>Power Requirement:</b> 150 VA (max)
WARNING	earthing ground, ind shall only be inserte earth contact. Any i or outside of the ins	ss 1 Product (provided with a protective corporated in the power cord). The mains plug ed in a socket outlet provided with a protective interruption of the protective conductor inside strument is likely to make the instrument anal interruption is prohibited.

### CAUTION

**Ventilation Requirements:** When installing the instrument in a cabinet, the convection into and out of the instrument must not be restricted. The ambient temperature (outside the cabinet) must be lest than the maximum operating temperature of the instrument by  $4 \times C$  for every 100 Watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater then 800 Watts, then forced convection must be used.

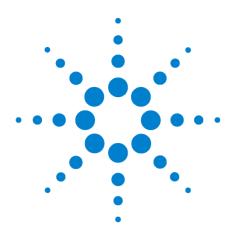
# **Agilent Sales and Service Offices**

In any correspondence or telephone conversations, refer to the Test Set by its model number and full serial number. With this information, the Agilent representative can quickly determine whether your unit is still within its warranty period.

UNITED STATES	Agilent Technologies (tel) 1 800 829 4444
CANADA	Agilent Technologies Canada Inc. Test & Measurement (tel) 1 877 894 4414
EUROPE	Agilent Technologies Test & Measurement European Marketing Organization (tel) (31 20) 547 2000
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#### Introduction



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# 2 Getting Started

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This chapter describes the primary hardware and software interfaces used in the operation of the E6651A Test Set, as well as basic operating procedures for the system.



# **Basic Configuration**

## **Front Panel**

To begin using the E6651A Test Set, you should become familiar with the layout of the Front Panel and the displayed menu systems. The items described in this section are the Front and Rear Panel of the Test Set, the Measurement Screen, the Setting Window, and the Menu Tree configuration.

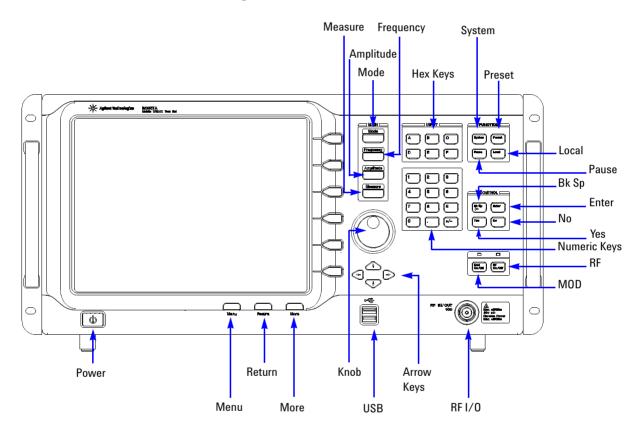


Figure 2 Front Panel Configuration

**Power** This is the On/Off button for AC power. Pressing this button when the Test Set is powered off turns it on. Pressing this button after the OS has completed booting turns the power off.

The **Power** button does *not* power the Test Set off while the Graphical User Interface (GUI) is running. To power off from this state, press the **No** button on the Front Panel to close the GUI, followed by the **Power** button. If pressing the **Power** 

button does not turn the power off, hold the button down for 5 seconds to bypass the operating system termination, and power off.

- **LCD Screen** Measurement results are displayed on the LCD Screen. Different screen layouts are used for each mode of operation. In each layout, the screen is divided into three areas: the Setting Window, the Working Window, and the Selection Menu.
  - **Menu** Press the **Menu** button to display the top level menu for the current Measurement Window.
  - **Return** Press the **Return** button to display the previous menu for the current Measurement Window.
    - **More** Use this button to select additional options when more than 6 menu options are available.
    - **Knob** Increments and decrements the value of the currently selected parameter.
  - **USB Port** The Test Set software runs on an embedded operating system. Devices using a USB interface may be connected to this port.
- **Arrow Key** Move the on-screen cursor using the Left and Right Arrow Keys.

Numeric and HexParameters like frequency can be input using these keys.KeysHexadecimal values can be input using the Hexadecimal<br/>Keys.

- **RF I/O** An antenna or cable is connected to this port for communication with the subscriber station. This port can act as an RF input port, an RF output port or a duplex port based on the mode of operation. In BSE mode, this port automatically switches between input and output based on the downlink and uplink frame duration. In SA mode, this port may operate as an RF input or duplex port.
- Menu SelectionSix buttons are available on the right hand side of the LCDKeysScreen for menu selection. The current menu is displayed at<br/>the right side of the screen. When more than 6 menu<br/>options are available, select More to see the additional<br/>options.
  - AmplitudeAdjust values related to input power using this button,<br/>including Amplitude, Attenuation, Reference Level, Scale and<br/>Amplitude Offset.

- **Frequency** Use this button to set frequency-related values including Center Frequency, Frequency Offset, Resolution Bandwidth (RBW), Channel Bandwidth (CBW) and SPAN. The Center Frequency is used as the starting point for frequency parameter adjustment.
  - **Mode** Use this button to select the BSE (Base Station Emulator), SA (Signal Analyzer) or SG (Signal Generator) mode of operation.
  - Measure Use this button to display the Measurement Menu in SA mode. When the unit is in BSE or SG mode, pressing this button switches the mode to SA. SA measurement selections available in this mode include Spectrum Analysis, WiMAX Modulation Analysis, I/Q input Analysis, Error Vector Spectrum Analysis, and CCDF.
  - System This button displays the Mode Setup Menu including options for Input Source Selection, Reference Clock Selection, Trigger On/Off Selection, I/Q Output Level Adjustment, Connect E6655A On/Off Selection, Machine ID Adjustment, UL Permbase Adjustment and I/Q Reverse On/Off Selection.
  - **Preset** Use this button to revert most parameters to their default values and some are unaffected.
  - **Pause** Use the **Pause** button to stop Test Set operation in BSE or SA mode. When Pause status is active, PAU in Setting Window is lit in red.
  - **Local** Use this to return the Test Set to front panel control after remote interface operation.
  - **Bk Sp** Press the **Bk Sp** (back space) key to delete the selected digit.
    - **ENT** Press the **Enter** key to apply inputs and terminate input selection.
    - **Yes** This button is used to confirm the action or choice presented in the Yes/No window
    - No Press this button to terminate the Test Set GUI.
    - **RF** Press this button to generate an RF modulation signal. Both the **RF** and **MOD** functions must be enabled to generate a WiMAX output signal.
  - **MOD** Press this button to generate a modulation signal. Both the **RF** and **MOD** functions must be enabled to generate a WiMAX output signal.

### **Rear Panel**

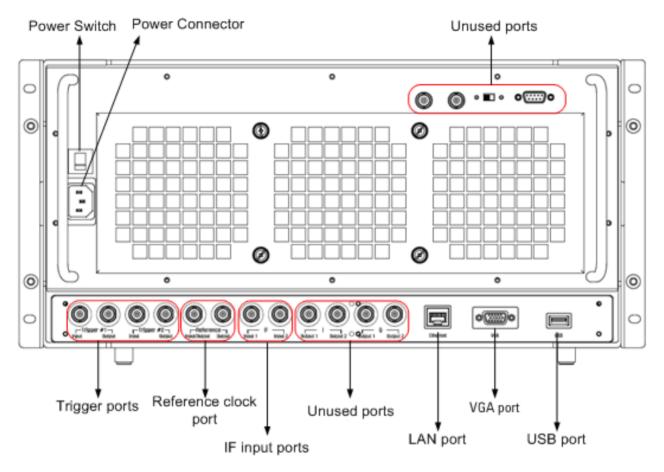


Figure 3 The E6651A Test Set Rear Panel

**Power Switch** This switch must be 'ON' to enable switching the Test Set on and off using the Front Panel On/Off switch.

**Power Connector:** Connect the AC power cable here.

- Reference clockUse the 10 MHz Clock Port to synchronize all system clocksPortof the Test Set with the Device Under Test (DUT). Use the<br/>Output Port if you want to supply the DUT with the Test<br/>Set's clock. Use the Input Port if you want to provide the<br/>DUT's clock to the Test Set.
  - **Trigger Ports** Use the Trigger Port to synchronize the WiMAX TDD frame of the Test Set with the DUT. Use the Output Port if you want to apply the synchronization signal from the Test Set to the DUT. Use the Input Port if you want to apply the signal from the DUT to the Test Set. Trigger #2 ports are used to provide downlink and uplink transition information.

#### 2 Getting Started

- **IF input Ports** The Test Set gets IF input signal from external RF device using IF input ports. This port is not used in current product version.
  - LAN Port This port is used to interface with an external internet network or controller. When both are required simultaneously, an Ethernet hub may be connected here. A hub is required when connecting to the Agilent E6655A WiMAX Lab Application.
  - VGA Port Standard VGA output port.
  - **USB Port** Devices using a USB interface such as a keyboard or mouse may be connected to this port.

# **Measurement Screen Configuration**

This section describes the main areas of the Measurement Screen including the Setting Window, Working Window, Selection Menu, Program Title, Menu Title and Program Info.

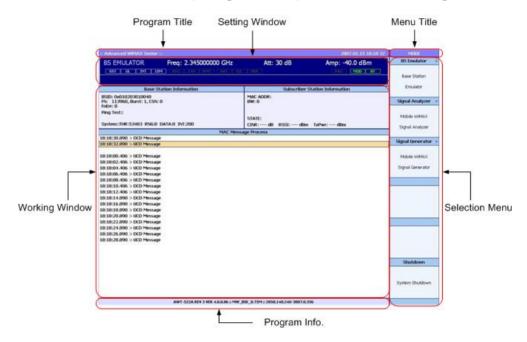
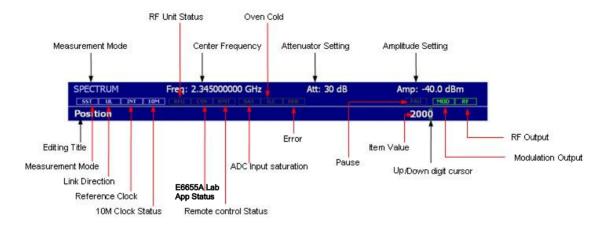


Figure 4 E6651A Test Set Measurement Screen Configuration

- **Setting Window** This window displays settings including the current operation mode, the frequency, the attenuator setting, and the input value. Refer to "Setting Window" on page 22 for more information.
- **Working Window** This window displays measurement values in graphical or numeric format. The items displayed here are applicable to the current mode of operation.
- **Selection Menu** Selectable menu items are displayed here, aligned with the menu selection buttons. Select individual items using the selection buttons or Mouse. Menu items shown in Figure 4 include the BS Emulator, Signal Analyzer, Signal Generator.
  - **Program Title** The Test Set program title, current date and current time are displayed in this area. The date and time displayed are based on the system's PC clock time.
  - Menu Title The title of the current Selection Menu is displayed here.
  - **Program Info** The program information, including version information, is displayed in this area.

# **Setting Window**

This window contains detailed information about the mode of operation and parameter settings.



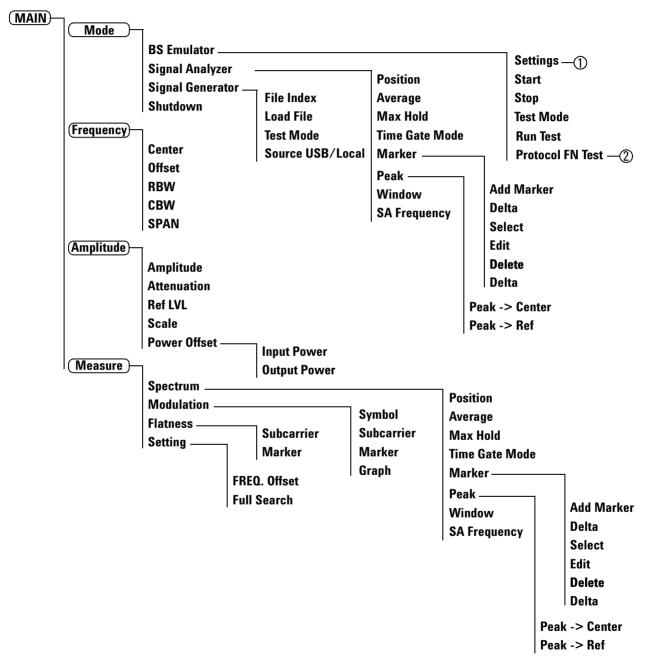


Measurement Mode	The current mode of operation (BSE, SA or SG) is displayed in this window.
<b>Center Frequency</b>	The current center frequency is displayed here.
Link Direction	The Link Direction display always indicates " <b>UL</b> " in SA and BSE mode.
ADC Input Saturation	Saturation may cause the signals to become distorted. When this condition occurs, the <b>SAT</b> Indicator is illuminated in one of four colors.
Attenuator Setting	The current Attenuator Setting is displayed here.
Error	When an error occurs during operation, the <b>ERR</b> Indicator is illuminated in red.
Amplitude Setting	This displays the Test Set's current transmitter power.
RF Output	This area displays the status of the RF output. When the RF output is on, this area is highlighted in green.
Editing Title	The Editing Title shows the parameter currently selected to be modified.
Measurement mode	This area indicates the selected mode.
Reference Clock	The Reference Clock selection is displayed in this area as either INT (Internal) or EXT (External).

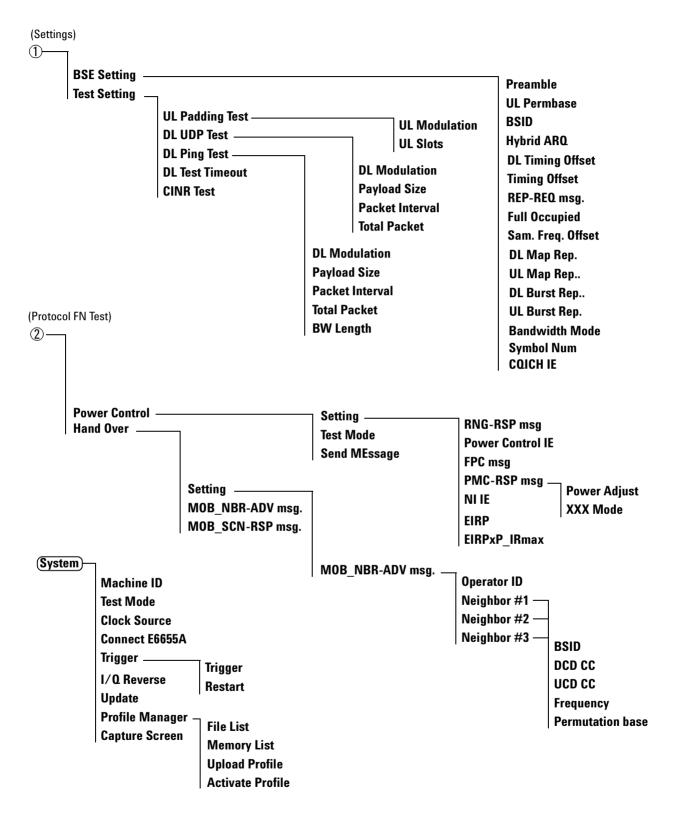
Oven Cold	When the Oven Controlled Crystal Oscillator (OCXO), used to generate the internal reference clock, has not sufficiently 'warmed up' for reliable operation, the <b>0.C.</b> Indicator is illuminated in red.
Pause	This indicator lights up when the <b>Pause</b> button is pressed during Test Set operation.
Item Value:	The Item Value shows the current value of the parameter selected to be modified.
Up/Down Digit Cursor	This indicator marks the position of the digit selected for modification. Use the Arrow Keys to select the digit you want to modify. Increase or decrease the value of the selected digit using the Arrow Keys or the Knob.
Modulation Output	This area displays the status of the Modulation. When the Modulation is on, this area is highlighted in green.
Lab Application Status	When the Test Set interoperates with the E6655A WiMAX Lab Application to connect to an external IP network this area is highlighted in green.
Remote control Status	When Test Set is remote controlled, this area is highlighted in yellow.
10M Clock Status	This area displays status of 10MHz clock.

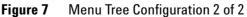
# **Menu Tree Configuration**

The following diagrams show how the menu structure is organised under the Mode, Frequency, Amplitude, Measure and System hardkeys.









# **Basic Operation**

# **Turning the Power ON**

- **1 Connect the AC power cable:** Insert the AC power cable into the power inlet on the rear panel of the Test Set.
- **2** Turn on the Power Switch: Turn on the Power Switch above the AC power inlet.
- **3 Power the Unit On:** With the system in stand-by, press the Power button on the Front Panel. The Power LED turns green, indicating that the Test Set is in Power On State. The E6651A Test Set program starts automatically.
- **4 Program Start-Up:** Figure 3-6 depicts the start-up screen displayed while the Test Set measurement application loads. Please be aware that this process may take several minutes.

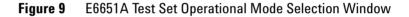


Figure 8 E6651A Test Set Program Start-Up Screen

### **Operational Mode Selection**

Freq: 2.345000000 GH Att: 30 dB Amp: -40.0 dBr ATOP TW TRETURE BSE Mode Evaluation of the local division of the loca MAC AL nat Anaki STAT SA Mode D DATAD INTS Signal A **Signal Generator** SG Mode Margine Contact Signal Generator AWT-5224 REV 5 VER 4.0.0.05 - HW ENE 8.754 - 20

When the application has loaded completely, the Operational Mode Selection Window, shown in Figure 9, is displayed.



Press the **Mode** button on the Front Panel to display the Operational Mode Selection Menu on the right side of the screen. The three operational modes available are:

BS Emulator (Base Station Emulator)	Press this button to select BSE mode. In this mode, the Test Set simulates a standard Mobile WiMAX base station for air interface and subscriber station communication testing.
Signal Analyzer (Mobile WiMAX Signal Analyzer)	Press this button to select SA mode. Alternatively, press the Measure button on the Front Panel for SA mode operation. In this mode, the Test Set performs spectrum analysis and modulation analysis for standard Mobile WiMAX signals.
Signal Generator (Mobile WiMAX Signal Generator)	Press this button to select SG mode. In this mode, the Test Set transmits a standard Mobile WiMAX signal stored in memory. You can choose from among several signals and adjust the output power of the signal.
	Refer to Figure 6 on page 24 for details of the menu structure for each operational mode.

# **Turning the Power OFF (Normal Termination)**

To power the Test Set off:

- **1 Terminate the program:** Select **Mode > shutdown**. The dialog box shown in Figure 10 is displayed.
- 2 Press the Yes button on the front panel.

### CAUTION

Turning the power OFF by pressing power button may cause damage to the Test Set.

:: Advanced WiMAX Tester ::	2007.01.15 21:12 36	MODE
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB Amp: -40.0 dBm	BS Emulator »
SST UL INT 10M RPU CSN RMT SAT O		Base Station
Base Station Information	Subscriber Station Information	Emulator
BSID: 0x010203010040 FN: 30984, Burst: 1, CSN: 0 FnErr: 1	MAC ADDR: BW: 0	Signal Analyzer »
Ping Test::		Mobile WIMAX
System::THR:52810 RNG:0 DATA:0 INT:200	STATE: CINR: dB RSSI: dBm TxPwr: dBm	
MAC Mess	sage Process	Signal Analyzer
21:12:18.109 > DCD Message		Signal Generator »
21:12:20.109 > UCD Message		oignaí deneracor "
21:12:22.187 > DCD Message 21:12:24.187 > UCD Message :: AWT-522A ::		Mobile WIMAX
21:12:26.187 > DCD Message		
21:12:28.187 > UCD Message Are v	you sure system shutdown?	Signal Generator
21:12:30.187 > DCD Message		
21:12:32.187 > UCD Message 21:12:34.187 > DCD Message		
21:12:34:167 > DCD Message	Yes No	
		Shutdown
		System Shutdown
AWT-522A REV 3 VER 4.0.0.86 :: MW	BSE_8.75M :: 2058.140.240-3007.0.356	

Figure 10 Terminate the E6651A Test Set program

**3** When the measurement applications and Windows have closed, the message "**It is now safe to turn off your computer**" is displayed. Press the front panel Power button to power down the Test Set.

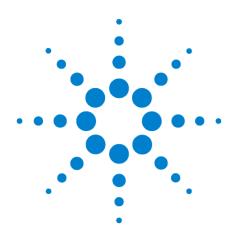
## **Turning the Power OFF (Abnormal Termination)**

When the program cannot be terminated normally, terminate manually by holding down the **Power** button for more than 5 seconds.

CAUTION

Do not turn the power off while the equipment is reading to or writing from the internal disk (this includes the OS boot process and program initiation). Doing so may damage the disk's internal file system.

# 2 Getting Started



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3

# **Base Station Emulator Mode**

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In Base Station Emulator (BSE) mode, the E6651A Test Set simulates a Mobile WiMAX base station's operation for use in the development and test of Mobile WiMAX subscriber stations. This section describes the procedure for interfacing with a subscriber station and for running uplink and downlink tests in BSE mode.



# Interfacing With the Subscriber Station

To begin interfacing with the Subscriber Station (SS) in BSE mode:

- **1 Connect the E6651A and the SS:** After applying AC power to the E6651A and initializing the program, connect the SS to the unit using an RF cable or antenna.
- 2 Select BSE mode: In the initial Measurement Window, select the Test BS menu item.
- 3 Adjust Output Power: The default output power of the E6651A is set to the minimum level (-124 dBm) to protect the subscriber station from damage. It is necessary to adjust the output power to an appropriate level for the test subscriber station's specifications and the method of connection between the SS and the unit. To adjust the output power, press Amplitude on the Front Panel and enter the desired level using the Knob or Numeric Keys. When using the Numeric Keys, press ENT to confirm the input. When an antenna is used to connect the SS to the Test Set, the recommended output level is about 0 dBm. When a cable connection is used, the recommended range is between -50 and -40 dBm. Please contact the SS vendor for more detailed guidelines on a specific device.
- **4** Adjust Input Attenuation Value: The Test Set can attenuate the input signal to protect it's internal circuitry. It is necessary to adjust the input attenuation value to an appropriate level for the SS specifications and connection method. Please refer to Table 2 for recommended input attenuation value settings.

Reference Level (dBm)	-30	-20	-10	0	10	20	30
	0	10	20	30	40	50	60
Attenuation Setting (dB)	5	15	25	35	45	55	65
	10	20	30	40	50	60	70
	15	25	35	45	55	65	75
	20	30	40	50	60	70	80
	25	35	45	55	65	75	85
	30	40	50	60	70	80	

ttenuation Range

5	Set the Modulation: The Test Set can modulate the
	output signal as described in the Mobile WiMAX
	specification. Press MOD on the Front Panel to modulate
	the output signal.

6 Set the RF Modulation: The Test Set can apply OFDMA. Press **RF** on the Front Panel to apply.

**NOTE** Both **MOD** and **RF** must be enabled to generate a WiMAX output signal.

7 Begin Signal Transmission: To begin transmitting an output signal, press START on the Selection Menu.
 Alternatively, press the Pause button on the Front Panel.

After completing these steps, the Test Set transmits Downlink Channel Descriptor (DCD) and Uplink Channel Descriptor (UCD) messages continuously to the subscriber station. The BSE Mode Setting Window, shown in Figure 11, is displayed.

BS EMULATOR Freq: 2.345000000 G	GHz Att: 30 dB Amp: -40.0 dBm	Settings
SST UL INT ION DUT CSN DONT CSN		BSE & Test
Base Station Information	Subscriber Station Information	Settings
BSID: 0x010203010040 FN: 89391, Burst: 1, CSN: 0 FnErr: 0	MAC ADDR: BW: 0	Start
Ping Test::		Emulator
System::THR:53047 RNG:0 DATA:0 INT:200	STATE: CINR: dB RSSI: dBm TxPwr: dBm	Emulator
	AC Message Process	Start
21:16:56.875 > DCD Message		Stop
21:16:58.875 > UCD Message		
21:17:00.875 > DCD Message 21:17:02.875 > UCD Message		Emulator
21:17:04.875 > DCD Message		Emulator
21:17:06.875 > UCD Message		Stop
21:17:08.875 > DCD Message		
21:17:10.875 > UCD Message		Test Mode
21:17:12.875 > DCD Message		
21:17:14.875 > UCD Message		
21:17:16.875 > DCD Message		[UL Padding Test]
21:17:18.875 > UCD Message		Lor Packing rest
21:17:20.875 > DCD Message		
21:17:22.875 > UCD Message		
21:17:24.875 > DCD Message		Run Test
21:17:26.875 > UCD Message		
		QPSK (CTC) 1/2 140 Slot
		ON/[OFF]
		Ranging Test
A107 PRA 611 8 107 1 8 8	86 :: MW_85E 8.75M :: 2058.140.240-3007.0.356	more 1/2

Figure 11 BSE Mode Setting Window

8 Establishing Two Way Communications With the SS: The SS must execute a Network Entry procedure in order to begin two way communications with the E6651A. Details of this procedure are provided in "Appendix A -Network Entry Procedure" on page 171. The Network

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Entry procedure must be invoked from the SS using a Network Entry Application. Obtain this application from the SS vendor. A Network Entry Application is typically applied from a PC, PDA, or from the SS itself.

After successfully establishing two way communications, various control messages between the E6651A and the SS are displayed in the Action Window, as shown in Figure 12. If only DCD and UCD messages are present in the window, two way communications have not been established.

:: Advanced WiMAX Tester ::	2007.01.15 21:22 32	BS EMULATOR			
BS EMULATOR Freq: 2.345000000	GHz Att: 30 dB Amp: -40.0 dBm	Settings			
SST LUL I INT LION CONCERNICIENT. LO		BSE & Test			
Base Station Information	Subscriber Station Information	Settings			
BSID: 0x010203010040 FN: 147997, Burst: 1, CSN: 0 FnErr: 3	MAC ADDR: 0018AF80EEC6 BW: 0	Start			
Ping Test:: System::THR:0 RNG:0 DATA:0 INT:0	STATE: Connection CINR: dB R5SI: dBm TxPwr: dBm	Emulator			
	AC Message Process	Start			
21:22:05.843 > DSA-REQ UL Message	inc message Process	Stop			
21:22:05.937 < DSA-RSP Message		otop			
21:22:05.953 > DSA-ACK Message 21:22:05.953 > DSA-REQ DL Message		Constant of			
21:22:05.953 > DSA-REQ DL Message 21:22:06.046 < DSA-RSP Message		Emulator			
21:22:00.046 > DSA-RCK Message					
21:22:07.312 > UCD Message					
21:22:09.312 > DCD Message					
21:22:10.875 < Periodic Ranging [FN:145839, RC:5, FO:-17,	, DP:200, RM:675, RP:130844 (51.17:-14.13)]				
21:22:11.312 > UCD Message					
21:22:13.312 > DCD Message		(UL Padding Test)			
21:22:15.312 > UCD Message 21:22:15.875 < Periodic Ranging [FN:146838, RC:7, FO:-22,	00.000 04.004 00.400204 (51.40.44.00)				
21:22:15.875 < Periodic Ranging [Pi:146838, RC:7, PO:-22, 21:22:17.312 > DCD Message	, DP:200, RP1854, RP:128734 (51.10-14.20)]				
21:22:17.312 > 000 Message 21:22:19.312 > 000 Message		Run Test			
21:22:20.875 < Periodic Ranging [FN:147838, RC:7, FO:-19,	DP:196_RM:796_RP:128973 (51.10:-14.20))	Runnen			
21:22:21.312 > DCD Message		- service - serv			
		QP5K (CTC) 1/2 140 Slot			
		140 Slot			
		ON/TOFF1			
		Ranging Test			
AWT-522A REV 3 VER 4.0.0	D.86 :: MW_BSE_R.75M = 2058.140.240-3007.0.356	more 1/2			

**Figure 12** Establishing Two Way Communications Between the E6651A and the SS

# **Uplink Padding Test**

Upon establishing two way communications, control and broadcast messages are transmitted between the Test Set and the SS, though no user traffic is present. The E6651A can test the transmitter performance of the SS by invoking the transmission of uplink data from the SS.

To perform the Uplink Padding Test:

- Select the Uplink Padding Test Mode: After establishing two way communications, press Test Mode in the BSE Mode Selection Menu to select UL Padding Test. Test Mode is a toggle function.
- 2 Run the Uplink Padding Test: Press Run Test in the Selection Menu. The measurement screen is frozen and the product continuously demodulates the uplink signal.
- **3** Perform Modulation Analysis: While the Uplink Test is in progress, the Test Set can analyze the uplink signal's quality and performance. Press Measure on the Front Panel, followed by Modulation in the Selection Menu. The "Uplink SYNC Detection" message is displayed, indicating that uplink synchronization processing is in progress. When this process is complete, the Measurement Window in Figure 13 is displayed. Refer to "Signal Analyzer Mode" on page 57 for more details of analyzer functions.

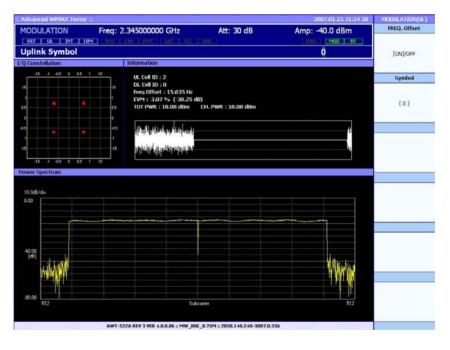


Figure 13 Uplink Test Modulation Analysis Window

**4 Apply a Frequency Offset:** The E6651A can measure the frequency offset of an uplink signal, and to analyze signal performance after a frequency offset has been applied.

To apply the frequency offset in the **Frequency** Menu (see also "Frequency Menu" on page 61), set **FREQ.Offset** to **ON** using the **Selection** Menu. To analyze a signal without frequency offset, ensure that **FREQ.Offset** is set to **OFF**.

- 5 Select the Symbol Position: The E6651A can measure the signal quality for each symbol within a frame. Press
  Symbol button in the Selection Menu and use the Knob or Numeric Keys to select the desired symbol position.
- 6 Perform Spectrum Measurement: During the Uplink Test, the E6651A can provide spectrum measurement for the uplink signal. To activate spectrum measurement, press Measure on the Front Panel, followed by Spectrum in the Selection Menu. The Measurement Window shown in Figure 14 is displayed. Refer to Chapter 4, "Signal Analyzer Mode" for more information about analysis operations. Note that spectrum analysis must be performed after modulation analysis.

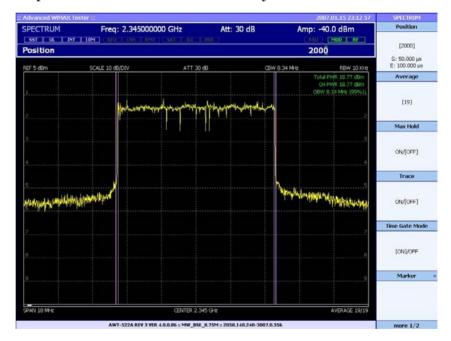


Figure 14 Uplink Spectrum Measurement

# **Downlink UDP Test**

Upon establishing two way communications, control and broadcast messages are transmitted between the E6651A and the SS, though no user traffic is present. The E6651A can test the receiver performance of the SS by transmitting user data in the downlink direction. To perform the Downlink UDP Test:

- Set the Downlink UDP Test Mode: After establishing two way communications, press Test Mode in the BSE Mode Selection Menu to select DL UDP Test. Test Mode is a toggle type.
- 2 Run the Downlink UDP Test: Press Run Test in the Selection Menu. While Downlink UDP test is in progress, the counts of transmitted packets, received packets, and lost packets in Base Station Information window are being updated continuously with error rate value.
- **3 Measure the Signal Quality:** In Downlink Test Mode, the E6651A transmits a downlink signal that is only available for measurement at the subscriber station. Contact the SS vendor for a testing tool that may be connected to the SS for downlink signal performance measurement.

# **Downlink Ping Test**

Upon establishing two way communications, control and broadcast messages are transmitted between the E6651A and the SS, though no user traffic is present. The E6651A can test the receiver performance of the SS by transmitting user data in the downlink direction. To perform the Downlink Ping Test:

- Set the Downlink Ping Test Mode: After establishing two way communications, press Test Mode in the BSE Mode Selection Menu to select DL Ping Test. Test Mode is toggle type.
- 2 Run the Downlink Ping Test: Press Run Test in the Selection Menu. While DL Ping Test is in progress, the counts of transmitted packets, received packets and lost packets in Base Station Information window are being updated continuously with error rate value.
- **3 Measure the Signal Quality:** In Downlink Test Mode, the E6651A transmits a downlink signal that is only available for measurement at the subscriber station. Contact the SS vendor for a testing tool that may be connected to the SS for downlink signal performance measurement.

#### The difference between DL UDP Test and DL Ping Test:

The purpose of DL UDP Test and DL Ping Test is to measure downlink performance of Mobile WiMAX subscriber station.

- In DL UDP Test, E6651A continuously transmits test packets to subscriber station. And subscriber station sends only acknowledgements to E6651A for the received packets.
- In DL Ping Test, E6651A continuously transmits test packets to subscriber station. And subscriber station sends back the received packets.

Therefore, in DL Ping Test, identical load is applied in downlink path and uplink path. But in DL UDP test, load is applied in downlink direction only.

NOTE

# **CINR Test**

Upon establishing two way communications, the E6651A can adjust the CINR value of the transmitted signal.

- Set the Downlink CINR Test Mode: After establishing two way communications, press Settings in the BSE Mode Selection Menu to select Parameter Settings.
- **2** Run the Downlink CINR Test: 4 test modes are available: OFF, Preamble, Pilot and Hybrid.
  - **OFF:** signal with no interference is transmitted.
  - **Preamble**: interference is added in signal in Preamble portion to produce signal with designated CINR value.
  - **Pilot**: interference is added in signal in Pilot portion to produce signal with designated CINR value.
  - **Hybrid**: interference is added in signal in Preamble and pilot portions together to produce signal with designated CINR value.
- **3** Adjust CINR value: use the Knob or Numeric Keys to select the desired CINR value of transmitting signal.
- **4 Measure the Signal Quality:** In Downlink Test Mode, the E6651A transmits a downlink signal that is only available for measurement at the subscriber station. Contact the SS vendor for a testing tool that may be connected to the SS for downlink signal performance measurement.

Advanced WPAX Tester 1:	2007/01.17 18:22 22	TEST SETTING		
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB Amp: -40.0 dBm	UL Padding Test		
SST LOG LENT LIGHT CHER COST THE CONTENTS	ACT BRIT			
CINR Ratio	14 dB	QPSK (CTC) 1/2 140 Skt		
Base Station Information	Subscriber Station Information			
BSID: 0x010203010040 FN: 011291, Burst: 2, CSN: 0 FnErr: 0	MAC ADOR: 0018A/00EEC6 BW: 0	DL UDP Test		
Ping Test::5:6646 R:3525 L:2909 PER: 45.2129%	STATE: Connection	QPSK (CTC) 1/2		
System::THR:49072 RNG:12 DATA:200 INT:200	CINR: d0 RSSI: d0m TxPwr: d0m	288 byte / 1 frame Total: 10000 pkt		
MAC Mes	sage Process	Total Incode per		
18:21:57.921 > DCD Message		DL Ping Test		
18:21:59.937 > 0CD Message	Income an according for the second			
10:22:20.484 < Periodic Ranging [FN:806811, RC:4, F0:50, DP:200, RM:852, RP:263611 (54.21:11.09)]				
18:22:01.937 > DCD Message 18:22:03.937 > UCD Message		QPSK (CTC) 1/2 576 byte / 1 frame		
18:22:05:494 < Periodic Ranging [FN:807811, RC:4, F0:46, DP:200,	PARD24 00:067200 /54 10:11 111	Total: 150000 pkt		
18:22:05.937 > DCD Message	(*1)11, (**202208 (**11/11))	the state part		
18:22:07.937 > UCD Message		OL Ack/Nack Test		
18:22:09.953 > DCD Message		DEPERTMENT OF		
18:22:10.494 < Periodic Ranging [FN:808812, RC:6, F0:30, DP:200,	RM:686, RP:261748 (54.18:-11.12)]			
18:22:11.953 > UCD Message				
18:22:13.953 > DCD Message				
18:22:15.494 < Periodic Ranging [FN:809811, RC:7, F0:43, DP:200,	RM833, RP:262123 (54.19:-11.11)]			
18:22:15.953 > UCD Message		and the second se		
18:22:17.968 > DCD Message	(	CINR Test		
18:22:19.968 > UCD Message				
18:22:20.484 < Periodic Ranging [FN:810811, RC:6, F0:34, DP:200,	RM:855, RP:262431 (54.19:-11.11)]	OFF/[Preamble]		
18:22:21.994 > DCD Message		/Pilot/Hybrid		
18:21:45.875 > DCD Message				
18:21:47.890 > UCD Message		Ratio : [14 d8]		
10:21:49.090 > DCD Message				
10:21:50.404 < Periodic Ranging [FN:904012, RC:6, F0:65, DP:200,	RM-702, RP:261027 (54.17:-11.13)			
18:21:51.906 > UCD Message				
18:21:53.905 > DCD Message				
18:21:55.484 < Periodic Ranging [FN:805812, RC:4, F0:36, DP:200,	RM:706, RP:262217 (54.19:-11.11)]			
18:21:55.921 > UCD Message	a na ser a for an anno 1997 an			
	CAN'S STATISTICS TO A DATA DATA DATA DATA DATA DATA DATA			

Figure 15 CINR test

# **Ranging Test**

Upon establishing two way communications, the E6651A can adjust transmit power of the SS.

- Set the Ranging Test Mode: Upon establishing two way communication path between E6651A and subscriber station, select BS Emulator, Ranging Test.
- 2 Run the Ranging Test: There are 3 sub menus in Ranging test. They are Power UP(1dB), Power Down(1dB) and RNG-RSP Power Offset.
  - **Power UP(1dB)**: When selected, a control command to boost the output power of SS by 1dB is transmitted to subscriber station.
  - **Power Down(1dB)**: When selected, a control command to decrease the output power of SS by 1dB is transmitted to subscriber station.
  - **RNG-RSP Power Offset:** When **ON** is selected, a control command to boost the output power of SS by 1dB is transmitted to subscriber station after receiving ranging request message.

BS EMULATOR	Freg: 2.345000000 GHz	Att: 30 dB	Amp: -40.0 dBm	Power Up (1d8)
	A to Design of Decision Decision and the sector			Send RNG-RSP
				Power Offset +1dB
Base !	itation Information	Contraction of the second s	Station Information	TONG CHINE( + 105
8510: 0x010203010040 FN: 719344, Burst: 2, CSN Febr: 37	3	MAC ADOR: 0018AF80EEC6 BW: 0		Power Down (1dB)
Ping Test::5:6646 R:3525 PER: 45.2129%	L:2909	STATE: Connection		Send RNG-RSP
System://HR:47581_RNG:1	4 DATA:198 INT:199	CINR: dB RSSI: dBm	TaPwr: dBm	Power Offset -1db
	MAC Meso	age Process		Contrast Contrast - Las
	iging (FN:716812, RC:6, FO:48, DP:198, F	RM:829, RP:264593 (54.23: 11.0	(7)]	RNG-RSP PwrOffset
18:14:32.171 > UCD Messag				NAME AND A DESCRIPTION OF THE OWNER OWNER OF THE OWNER
18:14:34.203 > DCD Messa				
18:14:35.484 < Penode Ra 18:14:36.203 > UCD Messae	nging (FN:717812, RC:4, FD:47, DP:198, F	RP13043, R0P2204236 (54.22:-11.0	H1)]	ON/(OFF)
18:14:38.234 > DCD Messa 18:14:38.234 > DCD Messa				Custon-1
18:14:40.234 > UCD Messac				
	ana DN:718811, RC:7, F0:72, DP:198, F	RMIR21. RP:264569 (54.23-11.0	1711	
18:14:42.250 > DCD Messar				1
A Sector States and				
18:14:05.546 > DCD Messa				
18:14:07.562 > UCD Messag				
10:14:09.562 > DCD Messa			100	
18:14:10.468 < Periodic Ra 18:14:11.562 > UCD Messad	nging [PN:712811, RC:6, FO:56, DP:198, F	RM3806, RP:264809 (54.23:-11.0	1201	
18:14:11.562 > 0CD Messae 18:14:13.578 > DCD Messae				
	nging (FN:713811, RC:5, FO:48, DP:198, F	PM 866, 8P-264017 (54, 22-11.0	101	
18:14:16.078 > UCD Messac		a construction of the second s		
18:14:18.093 > DCD Messa				
18:14:20.093 > UCD Messag				
10:14:20.404 < Periodic Ra	iging (FN:714812, RC:7, FO:64, DP:198, F	RM:777, RP:264176 (54.22: 11.0	1011	
18:14:22.109 > DCD Messar				-
18:14:24.109 > UCD Messag	PF			
	nging (FN:715812, RC:4, FO:59, DP:198, F	RM:808, RP:264601 (54.23:-11.0	(7)]	
18:14:26.125 > DED Messae	per l			
18:14:28.140 > 0CD Messa 18:14:28.140 > 0CD Messa 18:14:30.156 > 0CD Messa				

Figure 16 Ranging Test

# **PMC-RSP** Test

Upon establishing two way communications, control and broadcast messages are transmitted between the E6651A and the SS. The E6651A can test the power control performance of the SS.

- Set the PMC-RSP Test Mode: After establishing two way communications, press PMC-RSP Test in the BSE Mode Selection Menu.
- 2 Set parameters: There are 3 sub menus in PMC-RSP test. They are Power control mode, Start Frame and Power Adjust.
  - **Power Control Mode:** Closed Loop power control and Open Loop power control options can be selected. This is a toggle function.
  - **Start Frame**: This is to set the start frame for power control. Power control function is activated after the number of frames defined by the button.
  - Power Adjust: This sets the amount of power adjustment.
- **3 Run the PMC-RSP Test:** Pressing **Send PMC-RSP** sends a power control command to the subscriber station after Start Frame.

: Advanced WMAX Tester :			2007.01.17 18:16 51	PMC-RSP TEST
BS EMULATOR	Freq: 2.345000000 GHz	Att: 30 dB	Amp: -40.0 dBm	Power Control Mode
551 UL 101 10	CHIU CSS (1991) (SAUTHA		LANLE MOD I RE	
Power Adjust / O	ffset		6	[CL]/OLP/OLA
Base St	ation Information	Subscriber 9	Station Information	S.S.R. (1998).
BSID: 0x010203010040 FN: 745018, Burst: 3, CSN: 0 FnErr: 37	0	MAC ADDR: 0018AF80EEC6 BW: 0		Start Frame
Ping Test::5:6646 R:3525 L PER: 45.2129%		STATE: Connection		[0]
System::THR:47679 RNG:12	DATA:197 INT:199	CINR; dB RSSI; dBm	TxPwr: dBm	fol
		sage Process		
18:16:26.812 > DCD Message				Power Adjust
18:16:28.828 > UCD Message				
18:16:30.484 < Periodic Rang 18:16:30.843 > DCD Message	ing [FN:740812, RC:7, FD:42, DP:200, 1	RM:801, RP:263619 (54.21:-11.0	931	
10:15:30.843 > 0CD Message 18:16:32.843 > 0CD Message				
18:16:34.843 > DCD Message				[2]
	ing (FN:741811, RC:6, FD:64, DP:200, I	RM-944, RP-268883 (54,30-11.0	011	
18:16:36.859 > UCD Message				Send PMC-RSP
18:16:38.859 > DCD Message				DETRI PINC PLSP
18:16:40.484 < Periodic Rang	ing [FN:742812, RC:5, FO:61, DP:200, I	RM:745, RP:266534 (54.26:-11.0	4)]	
18:16:40.859 > UCD Message				
18:16:42.875 > DCD Message				
18:16:44.875 > UCD Message				
	ing [FN:743811, RC:7, FD:18, DP:200, 1	RM:798, RP:268968 (54.30:-11.0	0)]	
18:16:46.890 > DCD Message				
18:16:48.890 > UCD Message				
	ing [FN:744811, RC:4, FO:49, DP:200, 1	RM:784, RP:268748 (54.29:-11.0	1)]	
18:16:50.890 > DCD Message	16			
18:16:15.484 < Periodic Rang	ing [FN:737812, RC:4, FD:46, DP:202, 1	RM:868, RP:264300 (54.22:-11.0	8)]	
18:16:16.750 > UCD Message			10 III III III III III III III III III I	
18:16:18.781 > DCD Message				
18:16:20.468 < Periodic Rang	ing [FN:738811, RC:6, FO:38, DP:202, I	RM:659, RP:264622 (54.23:-11.0	7)]	
18:16:20.781 > UCD Message				
18:16:22.781 > DCD Message				
18:16:24.796 > UCD Message				
		RM:810, RP:262701 (54.19:-11.1		

Figure 17 PMC-RSP test

# **Protocol Function Test**

The Protocol Function Test enables the E6651A to test the MAC layer protocol of mobile WiMAX. Click

**Protocol Function Test** at the bottom of **BS Emulator** menu as shown in Figure 18.

E6651A Mobile WIMAX Test Set		BS EMULATOR
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB Amp: -30.0 dBm	Settings »
SST UL INT TOM ( IRU ( CSN ) GAN ) GAN ) G		BSE & Test Settings
	Subscriber Station Information	
BS ID: 010203010040	MAC: BW:	Start
Ping Test:: System::THR:0_RNG:0_DATA:0_INT:0	STATE: CINR: di0 RSSI: di0m TxPwr: di0m	Emulator Start
MAC Mer	ssage Process	
		Stop
		Emulator Stop
		Test Mode
		(UL Padding Test)
		Run Test
		QPSK (CTC) 1/2 140 Slot ON/TOFF1
		Protocol FN Test »
		Protocol Functional Test
E6651A ver. 5.0.1.0 = [ BSE : 1.A	(8.75M)] :: 2058.190.290-300E.0.3004	

Figure 18 BS Emulator menu

You can use the Protocol Function Test to simulate Power Control and Handover functions.

Press **Protocol Function Test** to display the screen as shown in Figure 19 on page 44.

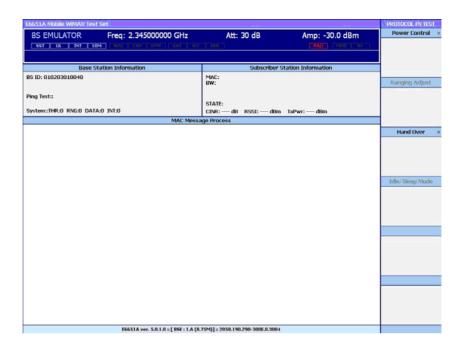


Figure 19 Protocol FN Test window

The following functions are available:

- Power Control Test the SS Tx Power Control function.
- **Handover** Test the scanning function to get Neighboring BS CINR information.

### **Power Control Test**

The Power Control Test function implemented in the E6651A Test Set operates through MAC messages between the BS and SS. All the power control algorithms specified in IEEE802.16 are supported in the E6651A.

#### **Power Control modes supported in E6651A**

E6651A supports close loop and open loop mode which are the SS power control mode.

#### Power control parameters supported in E6651A

- Closed Loop Adjust the Power Adjust value.
- Open Loop Adjust the OffsetBSperSS and NI (UL noise and interference level IE) value.

The E6651A Power Control menu has three sub menus:

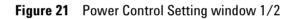
E6651A Mobile WIMAX Test Set			II POWER CONTROL
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB	Amp: -30.0 dBm	Setting
SST UL INT IOM DELICITIES MAT SAT DE		PAU MOD RF	Power Control
Base Station Information	Subscriber Station	Information	Test Setting
BS ID: 010203010040	MAC: BW:		Test Mode
Ping Test:: System::THR:0_RNG:0_DATA:0_INT:0	STATE: CINR: dB RSSI: dBm TxPw	r: dDm	RNG-RSP msg.
MAC Mess	age Process		
			Send Message
			Power Adjust [0] - 0.00 dB
E6651A ver. 5.0.1.0 = [ B5E : 1.A (B	.75M)] = 2058.190.290-300E.0.3004		

Figure 20 Power Control menu screen

- **Setting** Use **Setting** to configure the power control parameters.
- **Test Mode** Use **Test Mode** to configure the power control mode (algorithm).
- Send Message Use Send Message to send the MAC message for the selected test mode to the SS.

To test the power control function of the SS, you can configure power control related parameters for the DUT using **Setting**. The power control mode is selected using **Test Mode**. Finally, select **Send Message** to send the selected message to SS after establishing network connection between the BS and SS.

E6651A Mobile WIMAX Test Set		SETTING
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB Amp: -30.0 dB	RNG-RSP msg.
SST UL INT IOM RULLEN MAT SAT DO	TERR MOD	. AF
		[0]
Base Station Information	Subscriber Station Information	0.00 dB
BS ID: 010203010040	MAC:	
	BW:	Power Control IE
Ping Test::		[0]
System::THR:0 RNG:0 DATA:0 INT:0	STATE: CINR: dB RSSI: dBm TxPwr: dBm	
MAC Messa		0.00 dB
		FPC msg.
		[0]
		0.00 dB
		PMC-RSP msg. >-
		for him pairs a
		[CL]/OLP/OLA
		Power Adjust : [0]
		NI IE
		ON/[OFF]
		[42]
		-129.0 dBm
		EIRP
		[40] d8m
E6651A ver. 5.0.1.0 = [ BSE : 1.A (8.	75M)] :: 2058.190.290-300E.0.3004	more 1/2



5651A Mobile WIMAX Tes	t Set			SETTING
BS EMULATOR	Freq: 2.345000000 GHz	Att: 30 dB	Amp: -30.0 dBm	EIRxP_IRmax
SST UL INT I	M RIU ( CSN   RMT   SAT   U.C.			
				[-10] dBm
Base 9	station Information	Subscriber S	tation Information	[-10] dbiii
ID: 010203010040		MAC:		
		BW:		
ng Test::				
	10 87.0	STATE:		
stem::THR:0 RNG:0 DAT		CINR: dD RSSI: dDm	TxPwr: dBm	
	MAC Messa	ge Process		

Figure 22 Power Control Setting window 2/2

#### **Power Control Setting parameter**

The available menu functions are as follows:

- **RNG-RSP msg.** Adjust Power Adjust value of RNG-RSP message, one of Power Control methods of the E6651A.
- **Power Control IE** Adjust Power Adjust value of Power Control IE message, one of Power Control methods of the E6651A.
- **FPC msg.** Adjust Power Adjust value of FPC message, one of Power Control methods of the E6651A.
- **PMC-RSP msg.** Adjust Power Adjust value of PMC-RSP message, one of Power Control methods of the E6651A. Or select power control mode.
- **NI IE** Select "NI IE" value. "NI IE" is "UL noise and interference level IE" which is used in Open Loop Power Control and broadcast from the BS.
- **EIRP** Select EIRP value. EIRP is BS's "Equivalent isotropic radiated power" and is basic information to determine the SS Tx Power.
- **EIRxP\_IRmax** Select EIRxP\_IRmax value. EIRxP\_IRmax is the BS maximum received power in Equivalent isotropic and is basic information to determine the SS Tx power.

#### **Power Control Test Mode menu**

E6651A provides four power control methods:

- **RNG-RSP MAC Message** Controls the SS Tx power in 0.25 dB steps.
- **Power Control IE** Controls the SS Tx power in 0.25 dB steps.
- **FPC MAC Message** Controls the SS Tx power in 0.25 dB steps.
- **PMC\_RSP MAC Message** Controls the SS Tx power in 0.25 dB steps.

### **Hand-over Test function**

The Hand-over Test function implemented in the E6651A operates through MAC messages between the BS and SS. All the power control algorithms specified in IEEE802.16 are supported in E6651A.

E6651A Mobile WIMAX Test Set		HAND OVER
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB Amp: -30.0	
SST UL INT IOM ARU (CSN ) RMT (SAT ) OC	TERR (PAU) MO	O RE
Base Station Information	Subscriber Station Information	
Base station information BS ID: 010203010040	MAC:	
	BW:	MOB_NBR-ADV msg.
Ping Test::		ON/[OFF]
System::THR:0 RNG:0 DATA:0 INT:0	STATE: CINR: dB RSSI: dBm TxPwr: dBm	Rate: per [600] frames
MAC Messo	age Process	Rate: per [000] irames
		MOB_SCN-RSP msg.
		Send MOB-SCN-RSP
		Message
E6651A ver. 5.0.1.0 :: [ B5E : 1.A (8.	75M)] :: 2058.190.290-300E.0.3004	

Figure 23 E6651A Handover Menu window

#### Major Hand-over functions supported in E6651A

The E6651A controls MOB\_NBR-ADV and MOB\_SCN-RSP which determine hand-over mode.

#### E6651A's Hand-over related major Parameters

- **MOB\_NBR-ADV** UCD CC (Configuration Change Count), DCD CC (Configuration Change Count), frequency and Permutation Base parameters can be adjusted.
- **MOB\_SCN-RSP** a response message specified in mobile WIMAX specification.

Scan Duration = 0 Report Mode = periodic report Report period = 50 frame Report metric: CINR

E6651A Mobile WIMAX Test Set	==	==	HAND OVER
BS EMULATOR Freq: 2.3450		Amp: -30.0 dBm	Setting
Base Station Information BS ID: 010203010040	MAC:	r Station Information	
Ping Test:: System::THR:0_RNG:0_DATA:0_INT:0	BW: STATE: CINR: d0 RSSI: d0		MOB_NBR-ADV msg
	MAC Message Process	m IxPwr: dum	Rate: per [600] frame
			M08_SCN-RSP msg
E6651A ver.	5.0.1.0 = [ BSE : 1.A (8.75M)] :: 2058.190.290-300E.0.300	04	

The E6651A Handover menu has three sub menus:

Figure 24 E6651A Handover Menu window

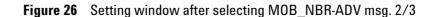
- **Setting:** Use **Setting** to configure the MOB\_NBR-ADV message parameters.
- MOB\_NBR-ADV Use **MOB\_NBR\_ADV** to send the MOB\_NBR-ADV message periodically.
- MOB\_SCN-RSP Use **MOB\_SCN-RSP** to send the MOB\_SCN-RSP message.

To test the Handover function of the SS configure hand-over related parameters for the DUT with the **Setting** function. Select **MOB\_NBR\_ADV** or **MOB\_SCN-RSP** to send the selected message to the SS after establishing a network connection between the BS and SS.

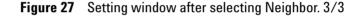
E6651A Mobile WIMAX Tes	t Set			SETTING
BS EMULATOR	Freq: 2.345000000 GHz	Att: 30 dB	Amp: -30.0 dBm	MOB_NBR-ADV msg.×
Base S	tation Information	Subscriber	Station Information	
BS ID: 010203010040		MAC: BW:		
Ping Test::		STATE:		
System::THR:0 RNG:0 DAT		CINR: dB RSSI: dBm	TxPwr: dBm	
	MAC Mess	age Process		
	E6651A ver. 5.0.1.0 = [ BSE : 1.A (8	.75M)] = 2058.190.290-300E.0.3004		



6651A Mobile WIMAX Te	st Set			MOB_NER-ADV MS	st,
BS EMULATOR	Freq: 2.345000000 GHz	Att: 30 dB	Amp: -30.0 dBm	Operator ID	
SST UL INT I	OM RAU ( CSN   RMT   SAT   GC		PAU MOD RF		
				0x010203	
Base	Station Information	Subscriber	Station Information		
BS ID: 010203010040		MAC: BW:		Neighbor #1	
		DW.		Neighbor #1	
Ping Test::		STATE:			
system::THR:0 RNG:0 DA	TA:0 INT:0	CINR: dB RSSI: dBm	TxPwr: dBm		
	MAC Mess	age Process			
				Neighbor #2	
				Neighbor #3	
					Ì
					Ī
	E6651A ver. 5.0.1.0 = [ BSE : 1.A (8	.75M)] :: 2058.190.290-300E.0.3004			ľ



5551A Mobile WiMAX Te	t Set			NEIGHBOR #1
BS EMULATOR	Freq: 2.345000000 GHz	Att: 30 dB	Amp: -30.0 dBm	BSID
SST UL INT 1	OM REU ( CSN   RMT   SAT   D.C		PAU MOD RF	
				0x010101
Base	Station Information		Station Information	
S ID: 010203010040		MAC: BW:		DCD CC
ing Test::				
		STATE:		[0]
ystem::THR:0 RNG:0 DA1		CINR: dB RSSI: dBm	TxPwr: dBm	(0)
	MAC Messa	ige Process		
				UCD CC
				[0]
				Frequency
				[2.345 GH2]
				Permutation bas
				[17]



#### **Handover Setting Parameter**

The available menu functions are as follows:

**MOB\_NBR-ADV msg** - Configure parameters in MOB\_NBR-ADV message, one of hand over test functions.

- **Operator ID** Select Operator ID parameter. Shared by several E6651As as Common ID.
- Neighbor #1 Configuring Neighbor #1 information. (The same parameters can be configured for Neighbor #2 and #3.)
  - **BS ID** Select Neighbor BS ID. Minimum 24 bits base station Id parameter information in DL-MAP message.
  - **DCD CC** Select DCD CC parameter. DCD CC is "DCD Configuration Change Count" and SS can get information on whether neighbor BS's DCD parameters are changed or not. Upon DCD parameters change, the count number will be changed accordingly.
  - **UCD CC** Select UCD CC parameter. UCD CC is "UCD Configuration Change Count" and SS can get information on whether neighbor BS's UCD parameters are changed or not. Upon UCD parameters change, the count number will be changed accordingly.

- **Frequency** Select Frequency value. Provides center frequency information.
- **Permutation Base** Select UL permutation base value. ID information of UL data region.

# **Setting Parameters**

### Setting General BSE configuration parameter

It is possible to adjust the settings for various parameters used in the Test mode operations. Press **Settings** in the **BSE Mode Selection** menu to display available parameters as shown in Figure 28. Select the parameters to be modified and adjust the parameter value.

: Advanced WiMAX Tester ::		2007.01.17 20:39 20	BSE SETTING	
BS EMULATOR Freg: 2.3	345000000 GHz Att: 41 dB	Amp: -40.0 dBm	Preamble	
SST UL INT 10M JUU C		PAU MOD RF		
Preamble Index		Control of the Contro	Index: 0	
Preamble Index		0	ID Cell: 0	
Base Station Informat	tion Subs	scriber Station Information	Segment: 0	
BSID: 0x010203010040 FN: 2454728, Burst: 1, CSN: 0 FnErr: 44	MAC ADDR: 0018AF80 BW: 0	EEC6	UL Permbase	
Ping Test::S:6646 R:3525 L:2909 PER: 45.2129%	STATE: Connection			
System::THR:52410 RNG:0 DATA:0 INT:20	0 CINR: dB RSSI:-	dBm TxPwr: dBm	[2]	
	MAC Message Process			
20:38:40.593 < Periodic Ranging [FN:24468]	11, RC:7, F0:37, DP:200, RM:797, RP:20713 (43.1	(6:-11.14)]	-	
20:38:42.000 > UCD Message			BSID	
20:38:44.000 > DCD Message				
20:38:45.593 < Periodic Ranging [FN:24478]	11, RC:6, FD:66, DP:200, RM:833, RP:20923 (43.2	21:-11.09)]		
20:38:46.015 > UCD Message		12	[0040]	
20:38:48.015 > DCD Message	8:48.015 > DCD Message			
20:38:50.031 > UCD Message				
20:38:50.593 < Periodic Ranging [FN:2448811, RC:4, F0:42, DP:204, RM:826, RP:20790 (43.18:-11.12)]			Spec Version	
20:38:52.031 > DCD Message				
20:38:54.046 > UCD Message				
20:38:55.593 < Periodic Ranging [FN:24498]	12, RC:4, F0:62, DP:200, RM:899, RP:20729 (43.1	(7:-11.13)]		
20:38:56.046 > DCD Message			D2/[D5]	
20:38:58.062 > UCD Message				
20:39:00.062 > DCD Message				
20:39:00.609 < Periodic Ranging [FN:24508]	13, RC:4, F0:66, DP:200, RM:893, RP:20563 (43.1	(3:-11.17)]	Hybrid ARQ	
20:39:02.078 > UCD Message				
20:39:04.093 > DCD Message				
20:39:05.593 < Periodic Ranging [FN:24518]	12, RC:5, F0:36, DP:200, RM:692, RP:20694 (43.1	(6:-11.14)]	101	
20:39:06.093 > UCD Message			[0]	
20:39:08.093 > DCD Message				
20:39:10.109 > UCD Message				
20:39:10.593 < Periodic Ranging [FN:24528]	039:10.593 < Periodic Ranging [FN:2452812, RC:6, F0:50, DP:200, RM:649, RP:20765 (43.17:-11.13)]		Timing Offset	
20:39:12.109 > DCD Message		14		
20:39:14.109 > UCD Message				
0:39:15.593 < Periodic Ranging [FN:2453811, RC:4, F0:17, DP:200, RM:663, RP:20535 (43.12:-11.18)]			[0]	
20:39:16.109 > DCD Message		2234323635	[0]	

Figure 28 Setting General BSE configuration parameters

- Preamble The Cell ID and Segment ID can be adjusted to simulate different base stations in the Downlink Test. Use the Knob to adjust the parameter values. The value of Segment ID and Cell ID is varied together. The range of Segment ID is 0 to 2. The range of Cell ID is 0 to 31. The range of Preamble Index is 0 to 113.
- **UL Permbase** Select to change the Uplink Permutation base value.
  - **BSID** Use the **Knob** or **Numeric Keys** to adjust the Base Station ID to a unique value.
  - Hybrid ARQ the Hybrid ARQ function of subscriber station can be tested.
- **Frame Offset** Use the **Knob** or **Numeric Keys** to adjust the frame offset of the downlink signal.

Timing Offset	Use the <b>Knob</b> or <b>Numeric Keys</b> to adjust the timing offset of the uplink signal.
UL MAP Offset	MCS scheme in uplink direction is applied after the number of frames specified in UL MAP Offset.

# **Setting Test Parameters**

It is possible to adjust the settings for various parameters used in the Uplink and Downlink Test modes. Press the Parameter Settings button in the BSE Mode Selection menu to display available parameters as shown in Figure 29 and Figure 30. Select the parameters to be modified and adjust the parameter value.

: Advanced WiMAX Tester ::	2007.01.15 21:28 28	TEST SETTING
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB Amp: -40.0 dBm	UL Padding Test
SST UL INT 10M   NU   DN   DNT   SAT   0	(PAU) HOO R	QPSK (CTC) 1/2 140 Slot
Base Station Information	Subscriber Station Information	10000
85ID: 0x010203010040 FN: 221458, Burst: 1, CSN: 0 FnErr: 6	MAC ADDR: 0018AF80EEC6 BW: 0	DL UDP Test
Ping Test::	STATE: Deregistration	QPSK (CTC) 1/2 288 byte / 1 frame
System::THR:52713 RNG:0 DATA:0 INT:200	CINR: d0 RSSI: d0m TxPwr: d0m	Total: 10000 pkt
MAC Mes 21:28:26.937 > UCD Message	sage Process	
21:28:28.937 > DCD Message		DL Ping Test
21:27:56.937 > DCD Message		QPSK (CTC) 1/2
21:27:58.937 > UCD Message		576 byte / 1 frame
21:28:00.937 > DCD Message		Total: 150000 pkt
21:20:02.937 > UCD Message		
21:28:04.937 > DCD Message		DL Ack/Nack Test
21:28:06.937 > UCD Message		
21:28:08.937 > DCD Message		
21:28:10.937 > UCD Message		
21:28:12.937 > DCD Message		
21:28:14.937 > UCD Message		
21:28:16.937 > DCD Message		
21:28:18.937 > UCD Message		CINR Test
21:28:20.937 > DCD Message		
21:28:22.937 > UCD Message 21:28:24.937 > DCD Message		[OFF]/Preamble /Pilot/Hybrid
		Ratio : [0 dB]
		Ratio : To de t
AWT-5224 DEV 3 VED 4 0 0 86 - MW	BSE 8.75M :: 2058.140.240-3007.0.356	

Figure 29 Adjustable Parameters (Screen 1 of 2)

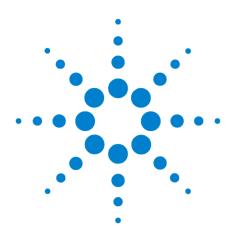
2007.01.15 21:31 5	1 DL PING TEST	
Amp: -40.0 dBm	DL Modulation	
PAU MOD RE		
576 byte	[QPSK (CTC) 1/2]	
nformation		
	Payload Size	
	[576 byte]	
: dBm	[370 Dyte]	
	Packet Interval	
	[1 frame]	
21:31:35.093 > UCD Message 21:31:37.093 > DCD Message		
	Total Packet	
	TOTOTOTOCKET	
	[150000 pkt]	
	[150000 pkr]	
	BW Length	
	[700]	
	[/00]	
	-	

**Figure 30** Adjustable Parameters (Screen 2 of 2)

UL Modulation	Select to toggle between available uplink modulation schemes. Selected mode will be applied to UL Padding Test.
DL Modulation	Select to toggle between available downlink modulation schemes. Selected mode will be applied to DL UDP Test and DL Ping Test.
Payload size	use this to determine the payload size of packets in DL UDP Test and DL Ping Test.
Packet Interval	use this to designate the number of frames to convey 1 data packet in downlink direction.
Total Packet	use this to designate total number of test packets for DL Ping Test and DL UDP Test.
BW Length	use this to designate the bandwidth value in uplink direction for DL Ping Test. The unit is in bytes
UL Slot	use this to designate the number of data slots in one frame for UL Padding Test.

# **Terminating BSE Mode Operation**

To terminate BSE Mode and stop signal transmission, press **STOP** in the **BSE Mode Selection** Menu. The Test Set stops transmitting signals in downlink and measurement window is frozen.



Agilent E6651A Mobile WiMAX Test Set E6651A User's Guide

# Signal Analyzer Mode

Measurement Preparation 58 Modulation Analysis 64 Spectrum Analysis 66 Flatness Analysis 71

4

In Signal Analyzer (SA) mode, the E6651A Test Set may be used to analyze Mobile WiMAX uplink signals using modulation, spectrum and flatness analysis. Modulation Analysis mode displays the OFDM signal in both frequency and time domain form. The Spectrum Analysis functionality, implemented using a Fast Fourier Transform (FFT) algorithm, displays the measured WiMAX signal in frequency domain graph form. This mode is used to analyze the center frequency, bandwidth and amplitude of the broadband signal. Flatness analysis allows for the comparison of power intensity among spectral components.



# **Measurement Preparation**

## **SA Mode Setup Procedure**

- 1 Connect the Test Set With the Device Under Test (DUT): After applying AC power to the E6651A and initializing the program, connect the DUT to the Test Set using either an RF cable or antenna.
- 2 Select SA Mode: In the initial Measurement Window, select the Signal Analyzer menu item. The DUT is now transmitting a signal. Figure 31 shows the Initial Measurement Screen for SA mode.

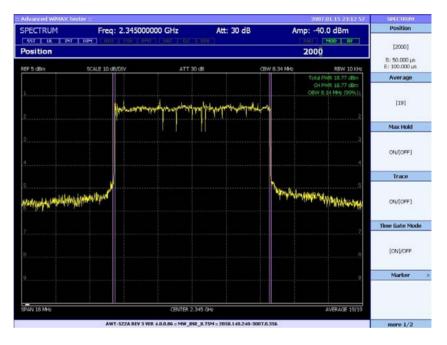
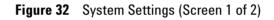


Figure 31 Initial Measurement Screen for SA Mode

# **System Settings**

Press **System** to display the Mode Setup (System) Menu. This menu includes options for Mobile WiMAX, Machine ID, Test Mode, Clock Source, Connect E6655A, Trigger, Update.

: Advanced WiMAX Tester		2007.01.15 21:34 05	SYSTEM
BS EMULATOR	Freg: 2.345000000 GHz	Att: 30 dB Amp: -40.0 dBm	WiBro
SST UL INT 10	M ANU CSN ( MMT ) ( SAT ] .0.		
Machine ID		Ö	DOWN Link
Base St	tation Information	Subscriber Station Information	[UP Link]
BSID: 0x010203010040 FN: 288803, Burst: 1, CSN: FnErr: 12	0	MAC ADDR: 0018AF80EEC6 BW: 0	Machine ID
Ping Test:: System::THR:52519 RNG:0	DATA D BIT ODD	STATE: Deregistration CINR: dia RSSI: diam T:xPwr: diam	[0]
SystemInk.32319 KA0.0		LINR: du RSSI: dum Isewr: dum sage Process	
21:33:51.140 > UCD Message		saye mucess	2010/0201/20
21:33:53.140 > DCD Message			Test Mode
21:33:55.140 > UCD Message			
21:33:57.140 > DCD Message 21:33:59.140 > UCD Message			5A/5G/
21:34:01.140 > DCD Message			[SA+SG]
21:34:03.140 > UCD Message			
21:34:05.140 > DCD Message			Clock Source
21:33:33.140 > DCD Message 21:33:35.140 > UCD Message			
21:33:35.140 > 0CD Message 21:33:37.140 > DCD Message			[Int]/Ext
21:33:39.140 > UCD Message			
21:33:41.140 > DCD Message			
21:33:43.140 > UCD Message			Connect CSN
21:33:45.140 > DCD Message			
21:33:47.140 > UCD Message 21:33:49.140 > DCD Message			ON/(OFF)
			UN/(UPP)
			Trigger
	AWT-522A REV 3 VER 4.0.0.86 = MW	BSE 8.75M :: 2058.140.240-3007.0.356	more 1/2



: Advanced WMAX Teste	r 10	2007.01.15 21:35 25	SYSTEM
BS EMULATOR	Freq: 2.345000000 GHz	Att: 30 dB Amp: -40.0 dBm	I/Q Reverse
SST UL INT I	M HEU LORY HEET SAT ) O	LE DIAL MOD RE	
Machine ID		Q	ON/[OFF]
Base	Station Information	Subscriber Station Information	
BSID: 0x010203010040 FN: 304924, Burst: 1, CSN FnErr: 14	£ 0	MAC ADDR: 0018AF80EEC6 BW: 0	Calibration
Ping Test::		STATE Bassistedias	
System::THR:52558 RNG:	DATA:0 INT:200	STATE: Deregistration CINR: dB RSSI: dBm TxPwr: dBm	
and a second		sage Process	
21:35:03.187 > UCD Messa			Update
21:35:05.187 > DCD Messa 21:35:07.187 > UCD Messa			
21:35:09.187 > DCD Messa			
21:35:11.187 > UCD Messa			Application Update
1135113187 > DCD Message			
21:35:15.187 > UCD Messa	ge		
21:35:17.187 > DCD Messa	ge .		
21:35:19.187 > UCD Messa	ge		5
21:35:21.187 > DCD Messa	ge		
21:35:23.187 > UCD Messa	ge		
21:35:25.187 > DCD Messa	ge		
21:34:53.187 > DCD Messa	ge		
21:34:55.187 > UCD Messa	ge		
21:34:57.187 > DCD Messa	ge		
21:34:59.187 > UCD Messa			
21:35:01.187 > DCD Messa	ge		
			2
		BSE 8.75M = 2058.140.240-3007.0.356	
	ATT - SEEN NET 3 TER 4.0.0.00 1 PTW	"nae"er i er i en en er i er en er i er	more 2/2

Figure 33 System Settings (Screen 2 of 2)

Machine IDUse this option to adjust the unique Test Set ID. This is<br/>used when a PC running the Agilent E6655A Lab<br/>Application is connected to Test Set for external IP<br/>connection.

Test Mode Selection	Use this option to select the mode as SA, SG or SA + SG (BSE) Mode. When BSE mode is selected from the Mode Menu, $SA + SG$ mode is automatically set.
Clock Source	Use this option to select either the Internal Clock ( <b>INT</b> ) or the External Clock ( <b>EXT</b> ) as the reference clock.
Connect E6655A	Use this option to connect or disconnect the E6655A Lab Application. The E6655A is an optional PC Application used for quality and performance measurement of application services.
Trigger	Display the Trigger Menu to select either <b>Single Mode</b> or <b>Continuous Mode</b> . In Single Mode, a single set of input data are captured and analyzed. In this mode, use <b>Pause</b> and <b>Restart</b> options on the <b>Trigger</b> Menu or press <b>Pause</b> on the Front Panel to control data capture and analysis. In Continuous Mode, input data is continuously captured and analyzed until the program is manually paused.
I/Q Reverse	Use this option to swap the I and Q output.
Update	The Test Set provides ease of use software upgrade. Connect the memory device which contains upgrade software to USB port. Press <b>Update</b> and the Test Set downloads the software from the memory device and the upgrade is executed

automatically.

### **Frequency Menu**

Press Frequency on the Front Panel to access the Frequency Menu. The Frequency Menu is used to adjust frequency-related values including Center Frequency, Frequency Offset, Resolution Bandwidth (RBW) and Channel Bandwidth (CBW), SPAN using the Knob or Numeric Keys.

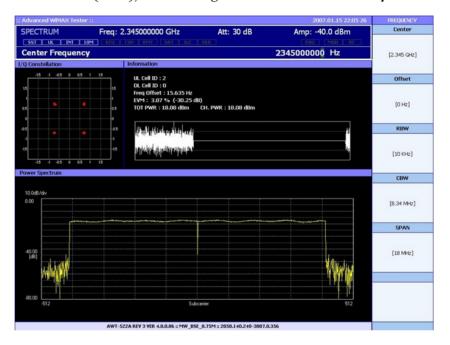


Figure 34 Frequency Menu

**Center Frequency** Select to adjust the Center Frequency using the **Numeric Keys** or the **Knob**.

- **Frequency Offset** Select to adjust the Frequency Offset. Frequency Offset can be enabled in the Modulation Accuracy Analysis Window, as described in "Modulation Analysis" on page 64.
  - **RBW** Select to adjust the Resolution Bandwidth. Resolution Bandwidth is used to control the sampling frequency within the displayed range.
  - **CBW** Select to adjust the Channel Bandwidth. Channel Bandwidth refers to the bandwidth containing 99% of the total input power for the signal.
  - **SPAN** Use to adjust the frequency range shown on the display screen.

### **Amplitude Menu**

The Amplitude Menu is used to adjust values related to input power including the Amplitude, Attenuation, Reference Level, Scale and Amplitude Offset. Access the Amplitude Menu by pressing **Amplitude** on the Front Panel.



Figure 35 Amplitude Menu

**Amplitude** Use to adjust the output signal power.

- AttenuationThe input attenuation is automatically adjusted based on the<br/>reference level to protect the first stage mixer and ensure<br/>linearity. Select Attenuation to manually adjust the input<br/>attenuation.
- **Reference Level** Use to set the power level displayed at the top of the Spectrum Analysis Screen.
  - **Scale** Use to adjust the power level scale on the Spectrum Analysis Screen.
- InPower Offset<br/>and OutPowerUse to adjust the offset power for the measured power level.OffsetThis function is used to compensate for cable loss and other<br/>discrepancies between the Test Set and the Device Under<br/>Test.

### **Measurement Menu**

Following completion of the subscriber station's network entrance procedure, the Uplink Padding test can be performed. The Uplink signal analysis function is provided when the Uplink Padding Test is in progress.

#### **Uplink Measurement Menu**

In SA mode, press **Measure** on the Front Panel to display the menu shown in Figure 36. This mode is used to measure and analyze the quality of uplink signals transmitted by a Mobile WiMAX subscriber station or repeater. This section lists the options available in the Uplink Measurement Menu.

: Advanced WMAX Teste	w ::		2007.01.15 22:11 45	MEASURE(UL)
BS EMULATOR	Freq: 2.345000000 GHz	Att: 30 dB	Amp: -40.0 dBm	Spectrum
SST UL INT	10M HRU CON HSH SAL I	C. 1 (00.	PAU MOD RF	
Base	Station Information	Subscriber t	Station Information	
BSID: 0x010203010040 FN: 382530, Burst: 1, CS FnErr: 1	N: 0	MAC ADDR: 0018AF80EEC6 BW: 0		Modulation(UL)
Ping Test::		STATE: Connection		
System::THR:53829 RNG:	2 DATA:0 INT:200	CINR: dB RSSI: dBm	TxPwr: dBm	
	MAC Mes	sage Process		
22:11:40.531 > UCD Messa				Flatness
22:11:40.984 > DCD Messa 22:11:40.984 > UCD Messa				
22:11:40.984 > 0CD Messa 22:11:40.984 > DCD Messa				
22:11:40.904 > UCD Messa	Software and a second se			
22:11:38.515 > DCD Messa	ice			
	dessage [MAC: 0x0018AF80EEC6]			
22:11:38.609 < 58C-REQ M	fessage			5
22:11:38.609 > SBC-RSP N	fessage			
22:11:38.703 < REG-REQ N	lessage			
22:11:38.703 > REG-RSP N	fessage			
22:11:38.703 > DSA-REQ (				
22:11:38.796 < DSA-RSP N				
22:11:38.812 > DSA-ACK N				
22:11:38.812 > DSA-REQ I				
22:11:38.906 < DSA-RSP N				
22:11:38.906 > DSA-ACK N	Message			
	AWT-5224 DEV 3 VED 4 0 0 85 MW	BSE 8.75M = 2058.140.240-3007.0.3	32	
	ANT - SEEN NET 3 TER 4.0.0.00 I PTW	"nae"or total a constitue 540-300 170-3		

Figure 36 SA Mode Uplink Measurement Window

- **Spectrum** Use to display the Spectrum Measurement Window. "Spectrum Measurement Window" on page 66 describes this window in detail.
- **Modulation** Use to display the Mobile WiMAX Modulation Accuracy Analysis Window. "Mobile WiMAX Modulation Accuracy Analysis Window" on page 64 describes this window in detail.
  - **Flatness** Use this button to display the Mobile WiMAX Flatness Analysis Window. "Flatness Analysis" on page 71 describes this window in detail.

# **Modulation Analysis**

Modulation Analysis mode of the E6651A Test Set displays the Mobile WiMAX OFDM signal in both frequency and time domain form. This is typically useful in the development of Mobile WiMAX subscriber stations and repeaters. A detailed description of these functions are provided here.

### Mobile WiMAX Modulation Accuracy Analysis Window

The Modulation Accuracy Analysis Window displays the Mobile WiMAX OFDM signal in both time and frequency domain. The frequency domain graph provides information on subcarriers including the number of subcarriers, subcarrier usage, and the relative powers of subcarriers. The time domain graph shows the length of an OFDM signal and relative power of different parts of the signal. The I/Q constellation graph shows the constellation for the currently selected symbol. Access this window from the **Uplink Measurement** Menu.

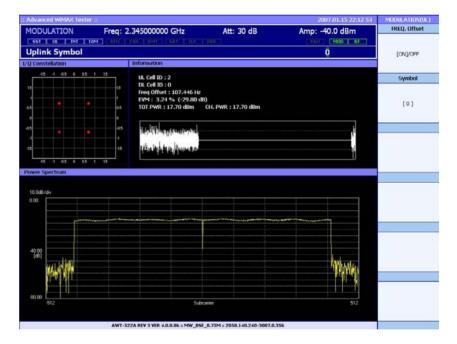


Figure 37 Modulation Accuracy Analysis Window

Three sub-windows are provided in the Modulation Accuracy Analysis Window:

I/**Q** Constellation This displays the constellation of the currently selected symbol.

**Information** The Information Window displays signal information and a time-domain waveform of the signal. The signal information includes the detected preamble's cell ID, segment ID, measured frequency offset, and the preamble's EVM. Additionally, for a downlink symbol with Symbol Index = 0, the pilot EVM average value is given. Otherwise, the symbol data EVM average is provided. The waveform graph in the Information Window provides a time domain view of the input data used for analysis. This view displays data for a single frame in the time domain providing the length of the frame and the relative power of different components of the frame.

**Power Spectrum** This window displays a frequency domain subcarrier spectrum graph of the currently selected symbol. This view can be used to display the number of subcarriers, subcarrier usage, and the relative powers of the subcarriers.

Two selections are available from the Modulation Menu:

- **FREQ. Offset** Use to apply the offset specified in the **Frequency** menu to the measured carrier's frequency.
  - **Symbol** Use to select the specific symbol index for detailed analysis. For downlink analysis, the symbol index range is 0-26 with 0 being the preamble. For uplink analysis, the symbol index range is 0-11.

NOTE

Note that Position 0 in the Processing Symbol Index corresponds to Position 3 in the Original Symbol Index.

# **Spectrum Analysis**

Spectrum Analysis mode displays the measured WiMAX signal in the frequency domain. This mode is used to analyze the center frequency, bandwidth and amplitude of the broadband signal.

### **Spectrum Measurement Window**

This section describes the menu options available from the Spectrum Measurement Window, the primary screen used for Spectrum Analysis. Access this window through the **Uplink Measurement** Menu.

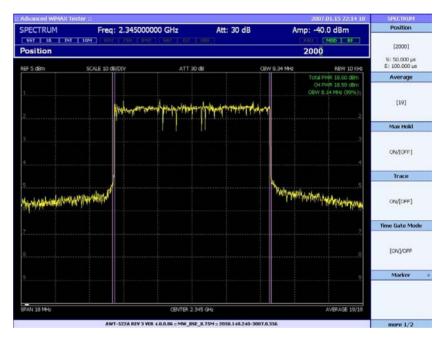


Figure 38 Spectrum Measurement Menu (Screen 1 of 2)

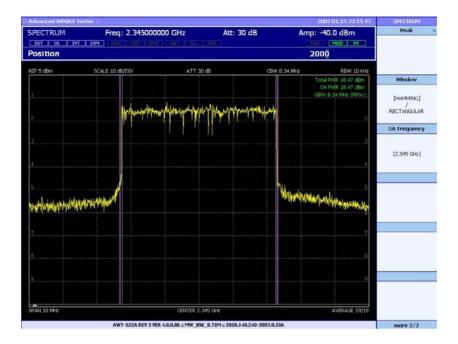


Figure 39 Spectrum Measurement Menu (Screen 2 of 2)

- **FFT Start Position** The FFT Start Position represents the time index at which the FFT input begins. The index value is a sample of the mobile WiMAX 5 ms frame. With the Test Set sampling frequency of 40 MHz, the index values can range from 1-200,000. The starting time and ending time of the sample are calculated and displayed as "S:" and "E:" respectively.
  - **Average** This sets the number of consecutive measurement results averaged to produce the spectrum display. The available range is 0-100 frames.
  - **Max Hold** Set **Max Hold** to **ON** to display the frequency component with the maximum signal amplitude.
    - **Trace** Set **Trace** to **ON** to trace up to five signal frequency components.
  - **Time Gate Mode** Disable **Time Gate Mode** to determine the average spectrum information of a single Mobile WiMAX frame without the need for frame synchronization or knowledge of the exact starting point of the frame.
    - Marker Use to display the Marker Menu. The Marker functions can only be used for an RF input source. A detailed description of the Marker Menu is provided in "Marker Menu" on page 69.

Peak	Use to display the <b>Peak</b> Menu. A detailed description of the <b>Peak</b> Menu is provided in "Peak Menu" on page 70.
Window	Use to select either <b>Hamming</b> or <b>Rectangular</b> Windowing for frequency domain analysis.
SA Frequency	Use to test the center frequency of the subscriber station for RCT testing.

### Marker Menu

The **Marker** Menu is used to display the absolute value of the spectrum power at a particular frequency as well as the difference in power between two frequencies. Access the **Marker** Menu from the **Spectrum** Menu.

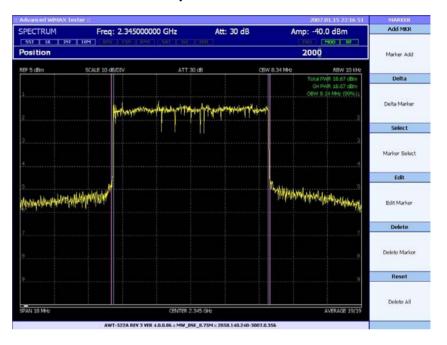


Figure 40 Marker Menu

- **Add MKR** Select to display the absolute value of the spectrum power at a selected frequency.
  - **Delta** Select to add a second marker. Use this to determine the relative value between the two selected frequencies.
  - Select Use to select a marker to be edited or deleted.
    - Edit Use to change the frequency of the selected marker.
  - **Delete** Use to delete the selected marker.
  - **Reset** Use to delete all of the markers.

### Peak Menu

The **Peak** Menu is used to adjust the display based on the strongest power spectrum measurements. Access the **Peak** Menu from the **Spectrum** Menu.

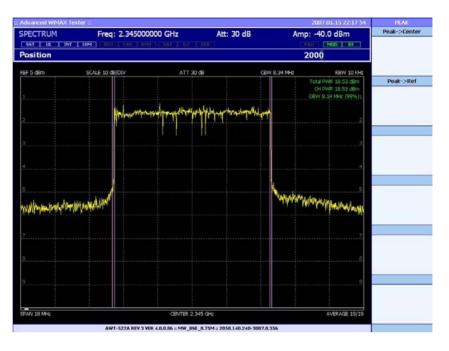


Figure 41 Peak Menu

 $\label{eq:peak} \begin{array}{ll} \mbox{Peak} \to \mbox{Center} & \mbox{Select to change the center frequency to the strongest} \\ & \mbox{frequency component.} \end{array}$ 

# **Flatness Analysis**

Flatness Analysis mode of the Test Set allows for the measurement of the difference in power intensity among spectral components. Access this window from the **Uplink Measurement** Menu.

Advanced WIMAX Tester ::				2007.01.15 22:19 00	RAINESS
SPECTRUM Freq: 2.345000000 GHz Att: 30 dB		Att: 30 dB	Amp: -40.0 dBm	Subcarrier	
SST UL INT IOM	OUT CSN 11	USIT SAT.   D.C.	CLEMENT.	PAU MOD RE	
Subcarrier Index				Ô	[0]
Q Constellation	Subcar	rier Power Table			101
45 4 405 0 0.5 1 15					
		Subcarrier Index	Signal Power		
13	1.5		1.000000		
		1	1.006120		
	0.5	2	0.896795		
0	0	3	1.000000		
	-0.5	4	1.000000		
	4	5	0.923553		
15	-15	6	0.959010		
-15 -1 -0.5 0 0.5 1 15			1.000000		
-Nused/4 to -1 avg power		0.992492 c	lB		
+1 to Nused/4 avg power		0.992492 0	IB		
-Nused/2 to -Nused/4 avg p	ower	0.992144	iB-		
-Nused/2 to -Nused/4 avg po +Nused/4 to +Nused/2 avg		: 0.992144 d			

**Figure 42** Flatness Analysis Window

Three sub-windows are provided in the **Flatness** Analysis Window:

I/Q Constellation	This window displays a constellation graph of the currently selected subcarrier. Select the subcarrier using the <b>SubCarrier</b> menu option.
Subcarrier Power Table	This window displays the power value for each subcarrier. Use the <b>SubCarrier</b> menu option to select the value of interest for display.
Subcarrier Group Average Power	This window displays the difference between the average power of a group of subcarriers and the total average power.
	One selection is available from the <b>Flatness</b> Menu:
SubCarrier	Use to select the subcarrier value of interest to be highlighted in the Measurement Window.

### 4 Signal Analyzer Mode



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# **Signal Generator Mode**

Signal Generator Mode 74

In Signal Generator (SG) mode, the E6651A Test Set generates standard Mobile WiMAX downlink signals.



## **Signal Generator Mode**

#### **SG Mode Setup Procedure**

To provide a standard Mobile WiMAX signal to a Device Under Test (DUT):

Connect the E6651A with the<br/>Device Under Test (DUT)After applying AC power to the Test Set and initializing the<br/>program, connect the DUT to the Test Set using either an RF<br/>cable or antenna.

Select SG Mode In the initial Measurement Window, select the Signal Generator menu item. The Test Set is not transmitting a signal at this point. Figure 43 shows the initial display window for SG mode.

Advanced WIMAX Tester ::		2007.01.15 22:22 55	SIGNAL GENERATOR
SIGNAL GEN. Freq: 2.345000000 GHz	Att: 30 dB	Amp: -40.0 dBm	File Index
SG UL INT IOM AND TOSK LIAMT CAAT LO		PAU NOO RE	
Waveform File Index		10	[101]
Waveform File List	Waveform	File Information	0.000
NO_DAGEBANO_GIG_1226.1Q RHF_IEST_SIG_INNO.11) SKW_TEST_IO TON+ROK13.1Q TON+ROK13.1Q TON+ROK13.1Q TON+ROK15.1Q TON+ROK15.1Q WIBRO_DECRAY.1Q WIBRO_DECRAY.1Q WIBRO_DECRAY.1Q WIBRO_DECRAY.1Q WIBRO_DECRAY.1Q WIBRO_DECRAY.1Q	[PR0JECT]           DATE: 2006-02-01 20:25:43           FRAME DURATION: Sms           DL SYMBOL: 27           UL SYMBOL: 15           TIG: 87.2 µs           RTG: 74.4 µs           FA MIMBER: 1           OVERSAMPLE FACTOR: 4           [DOWN LINK]           PREAMBLE INDEX: 0           DI CELI: 0           BURST NUMBER: 7           PAPR: 10.0           DATA RATE: 1000           [UP LINK]           DEST NUMBER: 0           PAPR: 11.0           DATA RATE: 500		Load File [WIBRO_DLONLV.IQ] Test Mode SA/[SG]/ SA+SG

Figure 43 Signal Generator Window

The menu items available in SG mode are:

- File IndexUse to select one of the signal files in the Waveform File List.<br/>Detailed information for the selected signal is displayed in<br/>the Waveform File Information area. Adjust the File Index<br/>value using the Knob or Numeric Keys.
- **Load File** Select this to continuously transmit the selected signal. To cease signal transmission, press the **MOD** and **RF** Front Panel buttons to turn off Modulation and RF output.
- **Test Mode** Select **SG** when using Signal Generator mode.



Agilent E6651A Mobile WiMAX Test Set E6651A User's Guide

# Remote Interface (API) Programming Command Reference

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6

The Remote Programming interface for the E6651A WiMAX Test Set takes the form of a Dynamic Link Library (DLL) or Application Programming Interface (API). This chapter shows you the basic steps required to use this DLL and lists the E6651A Command Set.



#### **Creating a Test Program**

This section shows you the 6 basic steps involved in making a test program using the Agilent E6651A Test Set API (or DLL - Dynamic Link Library).

- 1 Copy and Reference the Dynamic Link Library (DLL)
- 2 Install the IPX LAN protocol
- 3 Initialize and Start the E6651A remote interface
- 4 Configure the Measurement Parameters
- 5 Perform the Test
- 6 Get the Results
- 7 Close the Session

Step 1 "Reference", Step 2 "Create" and Step 6 "Close" must be performed if the PC or the E6651A Test Set is power cycled. Steps 3 to 5 can be repeated as many times as required for a full test sequence of measurements to cover the chosen test plan for the WiMAX subscriber station.

It is advisable during software test development / debugging to catch any potential exceptions due to potential errors in the programming or setup. For example the use of Try / Catch Blocks in Microsoft Visual Studio .NET, allows the program to catch any errors without the program aborting.

#### Step 1 - Copy and Reference the Dynamic Link Library (DLL)

First copy the DLL and header files from the CD-ROM to a suitable location on your development computer. For development programming environments such as the Microsoft Visual Studio Integrated Development Environment (IDE), the programming language needs to first reference the E6651A DLL. How this is done varies between development environments.

#### **Required Files:**

- E6651\_API.dll
- E6651\_API.h

Reference the file: E6651\_API.DLL

#### Step 2 - Install the IPX LAN protocol

Whilst TCP/IP is the most commonly used internet protocol, the IPX protocol is used for communication between the E6651A Test Set and your computer. Typically a computer does not have this protocol installed by default, but it is part of the Windows operating system and can be added using Windows XP system tools.

Addition of the IPX protocol does not interfere with normal communications using the default TCP/IP protocol.

Proceed as follows:

- 1 Using the Windows XP desktop, click start > Control Panel.
- 2 Select Network Connections.
- **3** In the Network Connections Window, right click on the **Local Area Connection** icon and select **Properties**. The 'LAN Connection Properties' Window is displayed.

- **?**× Local Area Connection Properties General Authentication Advanced Connect using: Broadcom NetXtreme Gigabit Etherne Configure... This connection uses the following items: NWLink NetBIOS NWLink IPX/SPX/NetBIOS Compatible Transport Prot AEGIS Protocol (IEEE 802.1x) v3.2.0.3 ✓ There Protocol (TCP/IP) > < Install... Uninstall **Properties** Description An implementation of the IPX and SPX protocols, which are used by NetWare networks. Show icon in notification area when connected Votify me when this connection has limited or no connectivity OK. Cancel
- 4 Click the General tab.

5 Click Install... and choose Protocol. Select Add....

Select Network Component Type 🛛 🛛 🔀
Click the type of network component you want to install:
🖳 Client
E Service
Protocol
Description
A protocol is a language your computer uses to communicate with other computers.
communicate with other computers.
Add Cancel

6 Scroll to find and select the NWLink IPX/SPX/NetBIOS checkbox.

🕹 Local Area Connection Properties 🛛 🔹 💽
General Authentication Advanced
Connect using:
Broadcom NetXtreme Gigabit Etherne
This connection uses the following items:
🗹 🐨 NWLink NetBIOS
✓ 〒NWLink IPX/SPX/NetBIOS Compatible Transport Prot
AEGIS Protocol (IEEE 802.1x) v3.2.0.3
🗹 🐨 Internet Protocol (TCP/IP)
I <u>n</u> stall <u>U</u> ninstall P <u>r</u> operties
- Description
An implementation of the IPX and SPX protocols, which are used by NetWare networks.
<ul> <li>Show icon in notification area when connected</li> <li>Notify me when this connection has limited or no connectivity</li> </ul>
OK Cancel

7 Click **OK** to close the 'Local Area Connection Properties' window.

Installation of the IPX protocol is now complete.

#### Step 3 - Initialize the E6651A Interface

Each program begins with the initialization of the E6651 interface. You must also ensure the IPX LAN protocol is installed on your development computer. The following steps are required:

- Confirm the IPX LAN Protocol is installed on any computer being connected to the E6651A TestSet.
- Initialize the Interface using the E6651\_Init() command.

- Start the Remote Interface operation using the E6651\_RemoteStart command.
- Check the return values for success.

#### Example code: Initialize the Interface(C# syntax)

```
// Initialize and start the E6651 interface
BYTE mid = 0;
E6651_Init( );
E6651_remoteStart(mid);
```

#### **Step 4 - Configure the Measurement Parameters**

§

**Step 5 - Perform the Test** 

§

**Step 6 - Get the Measurement Results** 

§

#### **Step 7 - Close the Session**

End the program and release the test set using the E6651\_close() function. As well as releasing memory space used by the E6651 API, this also releases the handle on the VISA resource allowing communication with the test set through other means.

#### Example code: Closing the session (C# syntax)

// Close the session

E6651\_Close();

## **Command Reference**

### E6651\_Init

Declaration	<pre>int E6651_Init(void);</pre>	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	API command to initialize Remote API Library.	
	E6651_Close	
Declaration	<pre>int E6651_Close(void);</pre>	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	API command to close Remote API Library.	

#### E6651\_RemoteStart

Declaration	<pre>int E6651_RemoteStart(BYTE MID);</pre>	
Return Value	Success:STATE_SUCCESS(1)Failure:STATE_ERROR(-1)	
Description	API command to start the remote interface.	

### E6651\_GetDLLVersion

Declaration	<pre>int E6651_GetDllVersion(char*);</pre>	
Parameter	Version [out]: The version information of DLL	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Acquire version information of Remote API DLL currently being used.	

## E6651\_SetTurnOffOption

Declaration	<pre>Int E6651_SetTurnOffOption(BYTE MID, Int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Turn off option value to be set.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	<ul> <li>Set E6651(MID)'s power control (shut down) option.</li> <li>0: Rebooting</li> <li>1: Shut down</li> <li>2: Exit Application</li> </ul>	

#### **System information functions**

#### E6651\_GetSystemModel

Declaration	<pre>int E6651_GetSystemModel(BYTE MID, char* Model);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Model [out]:	E6651' s model information.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve mode	l name (String value) of E6651 which is being

**Description** Retrieve model name (String value) of E6651 which is being controlled remotely.

#### E6651\_GetSystemVersion

Declaration	<pre>int E6651_GetSystemVersion(BYTE MID, char* Version);</pre>		
Parameter	<b>MID</b> [in]: E6651's equipment number to be controlled remotely.		
	Version [out]:	The Current version information of E6651.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	

**Description** Retrieve version information (String value) of E6651 which is being controlled remotely.

#### E6651\_GetSerialNumber

Declaration	<pre>int E6651_GetSerialNumber(BYTE MID, Char *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Serial Number is written in flash memory.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Serial	Number is written in flash memory.

## **General functions**

	E6651_GetWorkMode		
Declaration	<pre>int E6651_GetWorkMode(BYTE MID, int* Value);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	The current Work Mode value of E6651.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve Work controlled rem 0: E6651 1: SA 2: SG	Mode value of E6651 which is being otely.	
	E6651_SetWorkMode		
Declaration	int E6651_S	etWorkMode(BYTE MID, int Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [in]:	E6651's Work Mode value to be set.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Modify Work M 0: E6651 1: SA 2: SG	Node value of E6651(MID).	
	E6651_GetDLULMode		
Declaration	int E6651_G	etDLULMode(BYTE MID, int* Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	The current measure mode information. (DL: Downlink, UL: Uplink)	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve the m downlink or u 0: DL 1: UL	easurement mode information of E6651, plink.	

#### E6651\_SetDLULMode

Declaration	<pre>int E6651_SetDLULMode(BYTE MID, int Value);</pre>	
Parameter	MID [in]: E6651's equipment number to be controlled remotely.	
	Value [in]:	E6651' Measure Mode value to be set. (DL or UL) DL: 0 UL: 1
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Measure Mode value of E6651(MID).	

#### E6651\_GetPathMode

**Declaration** int E6651\_GetPathMode(BYTE MID, int\* Value);

 Parameter
 MID [in]:
 E6651's equipment number to be controlled remotely.

 Value [out]:
 Current Test Mode value of E6651

 SA: 0
 SG: 1

 SA+SG: 2
 STATE\_SUCCESS(1)

 Failure:
 STATE\_ERROR(-1)

**Description** Retrieve Test Mode information of E6651(MID).

#### E6651\_SetPathMode

Declaration	<pre>int E6651_SetPathMode(BYTE MID, int Value);</pre>			
Parameter	MID [in]: E6651's equipment number to be controlly.			
	Value [in]:	E6651' Test Mode value to be set. SA: 0 SG: 1 SA+SG: 2		
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)		
Description	Set Test Mode	of E6651(MID).		

## E6651\_GetDispMode

Declaration	<pre>int E6651_GetDispMode(BYTE MID, int* Value);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	Current Display Mode of SA. The E6651 is operating in SA mode. Spectrum: 0 Modulation: 1 I/Q: 2 MAP: 3 EVS: 4 EVT: 5 CCDF: 6	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve SA Display Mode information when E6651(MID) is operating in SA mode.		
	E6651_SetDis	spMode	
Declaration	—	<pre>spMode etDispMode(BYTE MID, int Value);</pre>	
Declaration Parameter	—	etDispMode(BYTE MID, int Value); E6651's equipment number to be controlled	
	_ int E6651_S	etDispMode(BYTE MID, int Value);	
	_ int E6651_S MID [in]:	etDispMode(BYTE MID, int Value); E6651's equipment number to be controlled remotely. SA's Display Mode value to be set. Spectrum: 0 Modulation: 1 I/Q: 2 MAP: 3 EVS: 4 EVT: 5	

## E6651\_GetRFSwitch

Declaration	<pre>int E6651_GetRFSwitch(BYTE MID, int * Value);</pre>		
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current E6651's RF Switch operational information 0: OFF 1: ON	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve RF Sv	witch's ON/OFF information.	
	E6651_SetRF	Switch	
Declaration	<pre>int E6651_SetRFSwitch(BYTE MID, int Value);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled	
	Value [in]:	remotely. E6651's RF Switch value to be set.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Turn On or Turn Off RF Switch of E6651(MID).		
	E6651_GetMODSwitch		
Declaration	<pre>int E6651_GetMODSwitch(BYTE MID, int * Value);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	Current Modulation Switch On/Off information of E6651 0:OFF 1:ON	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve Modulation Switch's operational information.		

#### E6651\_SetMODSwitch

Declaration	int E6651_S	etMODSwitch(BYTE MID, int Value);			
Parameter	MID [in]: E6651's equipment number to be control remotely.				
	Value [in]:	E6651's Modulation Switch value to be set 0: OFF 1: ON			
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)			
Description	Turn On or Turn Off Modulation Switch of E6651(MID).				

## E6651\_GetClockSource

Declaration	<pre>int E6651_GetClockSource(BYTE MID, int * Value);</pre>				
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current E6651's Clock Source information Internal: 0			
		External: 1			
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)			

**Description** Retrieve E6651's Clock Source information.

#### Set\_ClockSource

Declaration	int E6651_S	etClockSource(BYTE MID, int Value);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	E6651's Clock Source value to be set. Internal: 0 External: 1
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set E6651's Clock Source.	

#### E6651\_Preset

Declaration	<pre>int E6651_Preset(BYTE MID, int Value);</pre>		
Parameter	<ul> <li>MID [in]: E6651's equipment number to be control remotely.</li> <li>Value [in]: Single Meas value for setting Measurem triggering mode of E6651(MID).</li> </ul>		
Return Value	Success : Failure :	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Execute current preset of E6651(MID)		
		If (SingleMeas = TRUE) then Measurement triggering mode:= 'Single' (Default)	
		If (SingleMeas = FALSE) then Measurement triggering mode:= 'Cont'	

#### E6651\_GetFrequency

Declaration	int E6651_G Value);	etFrequency(BYTE MID, double *		
Parameter	MID [in]: E6651's equipment number to be cor remotely.			
	Value [out]:	Current E6651's Center Frequency information (Hz).		
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)		
Description	Retrieve Center Frequency value of E6651(MID).			

#### E6651\_SetFrequency

Declaration	int E6651_S	etFrequency(BYTE MID, double Value);	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. E6651's Center Frequency value to be set (Hz).	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Set E6651's Center Frequency.		

### E6651\_GetAttenuate

Declaration	<pre>int E6651_GetAttenuate(BYTE MID, int * Value);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	Current Attenuation value of E6651's attenuator (0 $\sim$ 62 dB)	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve Attenuation value of E6651(MID).		

#### E6651\_SetAttenuate

Declaration	int	E6651_	_SetAttenuate	(BYTE	MID,	int	Value);
-------------	-----	--------	---------------	-------	------	-----	---------

Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. E6651's Attenuation value to be set(0 ~ 62 dB)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Set Attenuation value of E6651(MID).

### E6651\_GetAmplitude

Declaration	<pre>int E6651_GetAmplitude(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Amplitude value of E6651 (dBm).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve current Amplitude value of E6651(MID).	

#### E6651\_SetAmplitude

int E6651_S	etAmplitude(BYTE MID, double value);
MID [in]:	E6651's equipment number to be controlled remotely.
Value [in]:	E6651's Amplitude value to be set (dBm).
Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
	MID [in]: Value [in]: Success:

**Description** Set Amplitude value of E6651(MID).

#### E6651\_GetInPowerOffset

- Declarationint E6651\_GetInPowerOffset(BYTE MID, double \*<br/>Value);ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.<br/>Value [out]:Value [out]:Current Input Power Offset value of E6651.Return ValueSuccess:STATE SUCCESS(1)
  - Seturn Value
     Success:
     STATE\_SUCCESS(1)

     Failure:
     STATE\_ERROR(-1)
- **Description** Retrieve Input Power Offset value of E6651(MID). Input Power Offset is introduced to compensate cable loss between E6651 and DUT in input power perspective.

When Input Power Offset value is set, E6651 calculates input power as measured input power plus Input Power Offset value.

#### E6651\_SetInPowerOffset

Declaration	<pre>int E6651_SetInPowerOffset(BYTE MID, double     value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	E6651's Input Power offset value to be set. (-100dB ~ 100dB)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set the Input power offset value of E6651(MID).	

#### E6651\_GetOutPowerOffset

- - Value [out]: Current E6651's Output power offset value (dBm).
- Return Value
   Success:
   STATE\_SUCCESS(1)

   Failure:
   STATE\_ERROR(-1)
- **Description** Retrieve Output Power Offset value of E6651(MID). Output Power Offset is introduced to compensate cable loss between E6651 and DUT in output power perspective. When Output Power Offset value is set, E6651 transmits output power more than designated amplitude of E6651 so that measured input power in the DUT front end shall match current amplitude of E6651.

#### E6651\_SetOutPowerOffset

- Declaration int E6651\_SetOutPowerOffset(BYTE MID, double
   value);
- ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.Value [in]:E6651's Output Power Offset value to be set<br/>(dBm).
- Return ValueSuccess:<br/>Failure:STATE\_SUCCESS(1)<br/>STATE\_ERROR(-1)
- **Description** Set Output Power Offset value of E6651(MID).

#### E6651\_SetSAFrequency

- Declaration int E6651\_SetSAFrequency(BYTE MID, double
   value);
  Parameter MID [in]: E6651's equipment number to be controlled
   remotely.
  Value [in]: Frequency value of SA mode to be set when
   E6651 is operating in SA mode.
- Return Value
   Success:
   STATE\_SUCCESS(1)

   Failure:
   STATE\_ERROR(-1)

   Description
   Set Center Frequency of SA mode when E6651(MID) is operating in SA mode.

## E6651\_SetSGFrequency

Declaration	<pre>int E6651_SetSGFrequency(BYTE MID, double     value);</pre>	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Frequency value of SG mode to be set when
		E6651 is operating in SG mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Center Fre operating in S	equency of SG mode when E6651(MID) is G mode.
	E6651 GetCA	DTimeOffect
	E0051_delCA	rimeonsei
Declaration	<pre>int E6651_GetCAPTimeOffset(BYTE MID, DWORD*     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [out]:	remotely. Current SA Capture Time offset value of E6651.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Capture Time Offset value which is calculated in E6651's Measure Mode.	
	E6651 SetCA	.PTimeOffset
Declaration	<pre> int E6651_SetCAPTimeOffset(BYTE MID, DWORD value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [in]:	remotely. SA Capture Time Offset value to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Capture Time Offset value of E6651(MID).	

#### E6651\_GetSkewlGain

Declaration	int E6651_G Value);	etSkewIGain(BYTE MID, double *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current value of Skew I Gain.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve current Skew I Gain of E6651(MID).	

### E6651\_SetSkewlGain

Declaration	<pre>int E6651_SetSkewIGain(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Skew I Gain value to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Skew I Gain value of E6651(MID).	

### E6651\_GetSkewQGain

Declaration	<pre>int E6651_GetSkewQGain(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current value of Skew Q Gain.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve current Skew Q Gain value of E6651(MID).	

#### E6651\_SetSkewQGain

Declaration	int E6651_S Value);	etSkewQGain(BYTE MID, double *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Skew I Gain value to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Skew Q Gain value of E6651(MID).	

### E6651\_GetSkewTheta

Declaration	<pre>int E6651_GetSkewTheta(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current value of Skew Theta
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve current Skew Theta value of E6651(MID).	

### E6651\_SetSkewTheta

Declaration	<pre>int E6651_SetSkewTheta(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Skew Theta value to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Skew Theta value of E6651(MID).	

### E6651\_GetSkewIOffset

Declaration	int E6651_G	etSkewIOffset(BYTE MID, int * Value);
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current value of Skew I Offset
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Skew	I Offset value of E6651(MID).

## E6651\_SetSkewIOffset

Declaration	int E6651_S	etSkewIOffset(BYTE MID, int Value);
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Skew I Offset value to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Skew I Offset value of E6651(MID).	

## E6651\_GetSkewQOffset

Declaration	<pre>int E6651_GetSkewQOffset(BYTE MID, int * Value);</pre>	
Parameter	<b>MID</b> [in]: E6651's equipment number to be contaremotely.	
	Value [out]:	Current value of Skew Q Offset
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Skew	Q Offset value of E6651(MID).

## E6651\_SetSkewQOffset

Declaration	<pre>int E6651_SetSkewQOffset(BYTE MID, int Value);</pre>	
Parameter	MID [in]: E6651's equipment number to be controller remotely.	
	Value [in]:	Skew I Offset value to be set
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Skew Q Offset value of E6651(MID).	

#### **Spectrum Mode**

## E6651\_GetSPAverage

Declaration	<pre>int E6651_GetSPAverage(BYTE MID, int * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	"Number of Average" information which is needed to determine measurement average value when E6651 is operating in Spectrum Analyzer mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve "Number of Average" value of E6651(MID), when E6651 is operating in Spectrum Analyzer mode.	

#### E6651\_SetSPAverage

Declaration	<pre>int E6651_SetSPAverage(BYTE MID, int Value);</pre>	

Parameter	MID [in]:	E6651's equipment number to be controlled
		remotely.
	Value [in]:	"Number of Average" value when E6651 is

value [III].	Number of Average value when 10001 is
	operating in Spectrum Analyzer Mode.

Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)

**Description** Set "Number of Average" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.

#### E6651\_GetSPCBW

Declaration	int E6651_GetSPCBW(BYTE MID, DWORD * Value);	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. "Channel Bandwidth" value when E6651 is
		operating is Spectrum Analyzer mode.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve "Channel Bandwidth" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.	

#### E6651\_SetSPCBW

Declaration	int E6651_SetSPCBW(BYTE MID, DWORD Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	"Channel Bandwidth" value to be set when E6651 is to be operated in Spectrum Analyzer mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set "Channel	Bandwidth" value of E6651(MID) when E6651

is to be operated in Spectrum Analyzer mode.

## E6651\_GetSPREF

**Declaration** int E6651\_GetSPREF(BYTE MID, int \* Value);

Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current "Reference Level" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode (dB).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Retrieve "Reference Level" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.

#### E6651\_SetSPREF

Declaration	<pre>int E6651_SetSPREF(BYTE MID, int Value);</pre>	
Parameter	er MID [in]: E6651's equipment number to be corremotely.	
	Value [in]:	"Reference Level" value of E6651 when E6651 is operating in Spectrum Analyzer mode. (-200dBm ~ 200dBm)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set "Reference Level" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.	

#### E6651\_GetSPRBW

Declaration	<pre>int E6651_GetSPRBW(BYTE MID, DWORD * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current "Resolution Bandwidth" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
<b>D</b> • •		

**Description** Retrieve "Resolution Bandwidth" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.

#### E6651\_SetSPRBW

**Declaration** int E6651\_SetSPRBW(BYTE MID, DWORD Value);

ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.Value [out]:"Resolution Bandwidth" value of E6651 when

E6651 is operating in Spectrum Analyzer mode. (10000 Hz (10KHz) ~ 100000Hz (100KHz)

<b>Return Value</b>	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)

**Description** Set "Resolution Bandwidth" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.

#### E6651\_GetSPScale

Declaration	int E6651_G	etSPScale(BYTE MID, int * Value);
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current "Scale" value of E6651(MID) when
		E6651 is operating in Spectrum Analyzer mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		e" value of E6651(MID) when E6651 is spectrum Analyzer mode.

#### E6651\_SetSPScale

Declaration	int E6651_8	SetSPScale(BYTE MID, int Value);
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. "Scale" value of E6651 when E6651 is operating in Spectrum Analyzer mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Sot "Scalo" va	lue of F6651(MID) when F6651 is operating in

**Description** Set "Scale" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.

#### E6651\_GetSPSpan

**Declaration** int E6651\_GetSPSpan(BYTE MID, int \* Value);

ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.Value [out]:Current "Span" value of E6651(MID) when<br/>E6651 is operating in Spectrum Analyzer<br/>mode.Return ValueSuccess:STATE\_SUCCESS(1)

- Failure:STATE\_ERROR(-1)
- **Description** Retrieve "Span" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.

#### E6651\_SetSPSpan

Declaration	<pre>int E6651_SetSPSpan(BYTE MID, int Value);</pre>		
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. "Span" value of E6651 when E6651 is operating in Spectrum Analyzer mode. (10000Hz(10KHz) ~ 1600000Hz(16MHz)	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Set "Span" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.		

## E6651\_GetFFTPosition

Declaration	<pre>int E6651_GetFFTPosition(BYTE MID, DWORD * Value);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	Current "FFT Position" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode (PS - Physical Slot: 1 PS = 16 sample).	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve "FFT Position" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.		
	E6651_SetFF	Position	
Declaration	int E6651_Se	etFFTPosition(BYTE MID, DWORD Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [in]:	"FFT Position" value of E6651 when E6651 is operating in Spectrum Analyzer mode (PS - Physical Slot: 1 PS = 16 sample).	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Set "FFT Position" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.		
	E6651_GetSP	CHPower	
Declaration	int E6651_G	etSPCHPower(BYTE MID, double * Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	Current Channel power value of E6651(MID) within pre-defined channel bandwidth when E6651 is operating in Spectrum Analyzer mode.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description		ured channel power value of E6651(MID) when ating in Spectrum Analyzer mode.	

#### E6651\_GetSPT0TPower

Declaration	<pre>int E6651_GetSPTOTPower(BYTE MID, double * Value);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	Current "Total Power" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve "Total Power" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.		

#### E6651\_GetSPOBW

Declaration	int	E6651_	_GetSPOBW	(BYTE	MID,	double	*	Value);
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ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.Value [out]:Current "Occupied Bandwidth" value of<br/>E6651(MID) when E6651 is operating in<br/>Spectrum Analyzer mode.

Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)

**Description** Retrieve "Occupied Bandwidth" value of E6651(MID) when E6651 is operating in Spectrum Analyzer mode.

#### E6651\_AddMarker

Declaration	int E6651_A	ddMarker(BYTE MID, double Freq);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Freq [in]:	Frequency value of Marker to be added.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Add Marker b	y setting Frequency value of the marker when

## E6651\_EditMarker

Declaration	<pre>int E6651_EditMarker(BYTE MID, int Index, double     Freq);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled	
	Index [in]:	remotely. Marker's index value when the marker's	
	Freq [in]:	frequency value is to be changed (0 $\sim$ 11) New Frequency value of Marker.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description		lency value of a certain marker when operating in Spectrum Analyzer mode.	
	E6651_Delete	eMarker	
Declaration	int E6651_D	eleteMarker(BYTE MID, int Index);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Index [in]:	Marker's Index value when the Marker is to be deleted.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Delete a certain Marker when E6651(MID) is operating in Spectrum Analyzer mode.		
	E6651_GetMa	arkerValue	
Declaration	int E6651_G double *	etMarkerValue(BYTE MID, int Index, Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Index [in]:	Marker's Index value when user want to fetch the marker's power information.	
	Value [out]:	Measured power value of the Marker designated by Index.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description			

## E6651\_GetUIQCHPower

Declaration	<pre>int E6651_GetUIQCHPower(BYTE Mouldable * Value);</pre>		
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	Channel power value when E6651 is operating in Spectrum Analyzer mode and Uplink measurement mode is in progress.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve Channel power value of E6651(MID) when E6651 is operating in Uplink measurement mode.		
	E6651_GetUI	QEVM	
Declaration	int E6651_G	etUIQEVM(BYTE MID, double * Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	EVM value when E6651 is operating in Spectrum Analyzer mode and Uplink measurement mode is in progress. (dB)	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve EVM value of E6651(MID) when E6651 is operating in Uplink measurement mode.		
	E6651_GetUI	QFreqOffset	
Declaration	int E6651_G Value);	etUIQFreqOffset(BYTE MID, double *	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	designated Frequency Offset value of E6651 when SA is operating in Uplink Measure Mode.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	-	nated Frequency Offset value when operating in Spectrum Analyzer mode.	

## E6651\_SetSPMMode

Declaration	<pre>int E6651_SetSPMMode(BYTE MID, int Mode);</pre>		
Parameter	MID [in]: Mode [in]:	E6651's equipment number to be controlled remotely. Time Gate Mode information of E6651(MID) when E6651 is operating is Spectrum Analyzer mode. ON: 1 OFF: 0	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Turn On or Turn Off Time Gate mode when E6651(MID) is operating in Spectrum Analyzer mode.		
	E6651_GetUI	QMax	
Declaration	int E6651_G	etUIQMax(BYTE MID, double * Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled	
	Value [out]:	remotely. measured Maximum Flatness value when E6651(MID) is operating in Uplink Flatness Measure Mode.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve Maximum Flatness value when E6651(MID) is operating in Uplink Flatness Measure Mode.		
	E6651_GetUI	QMin	
Declaration	int E6651_G	etUIQMin(BYTE MID, double * Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.	
	Value [out]:	measured Minimum Flatness value when E6651(MID) is operating in Uplink Flatness Measure Mode.	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)	
Description	Retrieve Minimum Flatness value when E6651(MID) is operating in Uplink Flatness Measure Mode.		

## E6651\_SetSPMaxHold

Declaration	<pre>int E6651_SetSPMaxHold(BYTE MID, int Value);</pre>	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Max Hold information of E6651(MID) when E6651 is operating is Spectrum Analyzer mode. ON: 1 OFF: 0
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Turn On or Turn Off Max Hold when E6651(MID) is operating in Spectrum Analyzer mode.	
		0.4 D
	E6651_GetUI	QAvgPower
Declaration	—	<b>QAvgPower</b> etUIQAvgPower(BYTE MID, double *
Declaration Parameter	_ int E6651_G	etUIQAvgPower(BYTE MID, double * E6651's equipment number to be controlled
	_ int E6651_G Value);	etUIQAvgPower(BYTE MID, double *
	_ int E6651_G Value); MID[in]:	etUIQAvgPower(BYTE MID, double * E6651's equipment number to be controlled remotely. measured Average Flatness value when E6651(MID) is operating in Uplink Flatness

## E6651\_GetUIQNegHalfAvgPower

Declaration	<pre>int E6651_GetUIQNegHalfAvgPower(BYTE MID, double     * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Average power of sub-carriers (sub-carrier interval:-N to -1) when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve Average power within sub-carrier interval of -N to -1 when E6651(MID) is operating in Uplink Flatness Measure	

#### E6651\_GetUIQPosHalfAvgPower

Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Average power of sub-carriers (sub-carrier interval:+N to +1) when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		age power within sub-carrier interval of +N to 1(MID) is operating in Uplink Flatness Measure

Mode.

#### E6651\_GetUIQNegQuaterAvgPower

Declaration	<pre>int E6651_GetUIQNegQuaterAvgPower(BYTE MID, double * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Average power of sub-carriers (sub-carrier interval: -Nused/2 to -Nused/4) when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Average power within sub-carrier interval of -Nused/2 to -Nused/4 when E6651(MID) is operating in	

# E6651 GetUIQPosQuaterAvgPower

Uplink Flatness Measure Mode.

Declaration	<pre>int E6651_GetUIQPosQuaterAvgPower(BYTE MID,</pre>
	double * Value);

- ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.Value [out]:Average power of sub-carriers (sub-carrier<br/>interval: +Nused/2 to +Nused /4) when<br/>E6651(MID) is operating in Uplink Flatness<br/>Measure Mode.Return ValueSuccess:<br/>Failure:STATE\_SUCCESS(1)<br/>STATE\_ERROR(-1)
  - **Description** Retrieve Average power within sub-carrier interval of +Nused/2 to +Nused/4 when E6651(MID) is operating in Uplink Flatness Measure Mode.

## E6651\_IsUIQFlatness

Declaration	<pre>int E6651_IsUIQFlatness(MID: byte);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Get information of Flatness pass /fail result to see if DUT meet the pass criteria of flatness test. Flatness: 1 non flatness: 0	

#### E6651\_SetRFAttenuate

Declaration	int E6651_S	etRFAttenuate(BYTE MID, int Atten);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Eaten [in]:	RF Attenuation value to be set (dB).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set RF Attenuation value of E6651(MID).	

# E6651\_GetRFAttenuate

Declaration	<pre>int E6651_GetRFAttenuate(BYTE MID, int * Atten);</pre>	
Parameter	MID [in]: Atten [out]:	E6651's equipment number to be controlled remotely. Current RF Attenuation value of E6651(MID) (dB).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve RF A	ttenuation value of E6651(MID).

## E6651\_SetIFAttenuate

Declaration	int E6651_S	etIFAttenuate(BYTE MID, int Atten);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Atten [in]:	IF Attenuation value to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set IF Attenua	ation value of E6651(MID).

# E6651\_GetIFAttenuate

Declaration	<pre>int E6651_GetIFAttenuate(BYTE MID, int * Atten);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Atten [out]:	Current IF Attenuation value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE ERROR(-1)
Description		tenuation value of E6651(MID).

# E6651\_GetDLPreambleEVM

Declaration	int E6651_G Value);	etDLPreambleEVM(BYTE MID, double *
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. measured Preamble EVM value when E6651 is operating in SA DL Measure Mode. (%)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Get measured Preamble EVM value of E6651(MID) when E6651 is operating in SA DL Measure Mode.	

# E6651\_GetDLPilotEVMPct

Declaration	<pre>int E6651_GetDLPilotEVMPct(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. measured Pilot EVM value when E6651 is operating in SA DL Measure Mode. (%)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		Pilot EVM value of E6651(MID) when E6651 is A DL Measure Mode.
	E6651_SetSA	WindowType
Declaration	<pre>int E6651_SetSAWindowType(BYTE MID, int WindowType);</pre>	
Parameter	MID [in]: WindowType [in	E6651's equipment number to be controlled remotely. ]: Windowing type of E6651(MID) when E6651 is operating in Spectrum Analyzer mode. Hamming: 0 Rectangular: 1
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

# E6651\_GetSPMaskValue

Declaration	<pre>int E6651_GetSPMaskValue(BYTE MID, const double</pre>
	SFreq, const double EFreq, double* MaxFreq,
	double* MaxPwr);

Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	SFreq [in]:	measurement Start Frequency of Spectrum Analyzer screen.
	EFreq [in]:	measurement Stop Frequency of Spectrum Analyzer screen.
	MaxFreq [out]:	Frequency component of peak power within start and stop frequency band.
	MaxPwr [out]:	peak power value within start and stop frequency band.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve power and frequency information of peak power point within start and stop frequency band when E6651(MID) is operating in Spectrum Analyzer mode.	

# E6651\_GetSPAvgPower

Declaration	_	etSPAvgPower(BYTE MID, const double nst double EFreq, double * AvgPower);
Parameter	MID [in]: SFreq [in]: EFreq [in]: AvgPower [out]:	E6651's equipment number to be controlled remotely. Measurement Start Frequency Measurement Stop Frequency Averaged power value within frequency interval from SFreq to EFreq.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	frequency inte	ged power value of E6651(MID) within rval from SFreq to EFreq when E6651 is pectrum Analyzer mode.

# E6651\_GetSPUserCHPower

Declaration	<pre>int E6651_GetSPUserCHPower(BYTE MID, double     Freq, double * UserCHPower);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Freq [in]:	Center Frequency value when Channel Power is measured.
	UserCHPower [o	<b>but]:</b> Channel power value for a signal with designated Center frequency.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve channel power value when a signal is defined using center frequency.	

#### Flatness

#### E6651 GetUpFlatnessGroup0MIN

Declaration	<pre>int E6651_GetUpFlatnessGroup0MIN(BYTE MID,</pre>	
	double * Value);	

Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. The minimum value of the first group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Retrieve Average the minimum value of the first group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.

### E6651\_GetUpFlatnessGroup0MAX

Declaration	<pre>int E6651_GetUpFlatnessGroup0MAX(BYTE MID,</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. The maximum value of the first group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the maximum value of the first group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.	

# E6651\_GetUpFlatnessGroup1MIN

Declaration	<pre>int E6651_GetUpFlatnessGroup1MIN(BYTE MID, double * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The minimum value of the second group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve the minimum value of the second group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.	

# E6651\_GetUpFlatnessGroup1MAX

Declaration	<pre>int E6651_GetUpFlatnessGroup1MAX(BYTE MID,</pre>
	double * Value);

Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The maximum value of the second group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the maximum value of the second group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure	

# E6651\_GetUpFlatnessGroup2MIN Declaration

Declaration	<pre>int E6651_GetUpFlatnessGroup2MIN(BYTE MID,</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The minimum value of the third group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve the minimum value of the third group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.	

# E6651\_GetUpFlatnessGroup2MAX

Declaration	<pre>int E6651_GetUpFlatnessGroup2MAX(BYTE MID,</pre>
	double * Value);

Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. The maximum value of the third group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the maximum value of the third group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure	

### E6651\_GetUpFlatnessGroup3MIN

Declaration	<pre>int E6651_GetUpFlatnessGroup3MIN(BYTE MID,</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The minimum value of the last group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve the minimum value of the last group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure	

# E6651\_GetUpFlatnessGroup3MAX

Declaration	<pre>int E6651_GetUpFlatnessGroup3MAX(BYTE MID,</pre>
	double * Value);

Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. The maximum value of the last group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the maximum value of the last group of 4 groups when E6651(MID) is operating in Uplink Flatness Measure	

Mode.

## E6651\_GetUpGroup0MINSC

Declaration	<pre>int E6651_GetUpGroup0MINSC(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The sub carrier index of the minimum value in the first group.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the s	ub carrier index of the minimum value in the

## E6651\_GetUpGroup0MAXSC

first group.

Declaration	<pre>int E6651_GetUpGroup0MAXSC(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. The sub carrier index of the maximum value in the first group.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the sub carrier index of the maximum value in the first group.	

# E6651\_GetUpGroup1MINSC

Declaration	<pre>int E6651_GetUpGroup1MINSC(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The sub carrier index of the minimum value in the second group.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the s first group.	ub carrier index of the minimum value in the

## E6651\_GetUpGroup1MAXSC

Declaration	<pre>int E6651_GetUpGroup1MAXSC(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The sub carrier index of the maximum value in the second group.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the s	ub carrier index of the maximum value in the

E6651\_GetUpGroup2MINSC

second group.

Declaration	<pre>int E6651_GetUpGroup2MINSC(BYTE MID, double * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The sub carrier index of the minimum value in the third group.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve the st third group.	ub carrier index of the minimum value in the

# E6651\_GetUpGroup2MAXSC

Declaration	<pre>int E6651_GetUpGroup2MAXSC(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. The sub carrier index of the maximum value in the third group.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the s third group.	ub carrier index of the maximum value in the

#### E6651\_GetUpGroup3MINSC

Declaration	<pre>int E6651_GetUpGroup3MINSC(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. The sub carrier index of the minimum value
		in the last group.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the st last group.	ub carrier index of the minimum value in the

#### E6651\_GetUpGroup3MAXSC

Declaration	<pre>int E6651_GetUpGroup3MAXSC(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:E6651's equipment number to be controlled remotely.Value [out]:The sub carrier index of the maximum value in the last group.	
Return Value	Success:STATE_SUCCESS(1)Failure:STATE_ERROR(-1)	
Description	Retrieve the sub carrier index of the maximum value in the last group.	
	E6651_GetUpMAXABSDiff	
Declaration	<pre>int E6651_GetUpMAXABSDiff(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The biggest difference range between two sub-carriers when E6651(MID) is operating in Uplink Flatness Measure Mode.

Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)

**Description** Retrieve Average power within sub-carrier interval of +NUsed/2 to +Nused/4 when E6651(MID) is operating in Uplink Flatness Measure Mode.

# E6651\_GetUpMAXABSSC1

Declaration	<pre>int E6651_GetUpMAXABSSC1(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [out]:	remotely. One of sub-carrier indexes have the biggest difference between sub-carriers.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		f sub-carrier indexes have the biggest ween sub-carriers.
	E6651_GetUpMAXABSSC2	
Declaration	<pre>int E6651_GetUpMAXABSSC2(BYTE MID, double *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The other of sub-carrier indexes have the biggest difference between sub-carriers. when E6651(MID) is operating in Uplink Flatness Measure Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the other of sub-carrier indexes have the biggest difference between sub-carriers. when E6651(MID) is operating in Uplink Flatness Measure Mode.	
	6651_GetFlatnessDCPWR	
Declaration	<pre>int E6651_GetUIQPosQuaterAvgPower(BYTE MID,</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The relative power difference to total power.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the relative power difference to total power when	

**Description** Retrieve the relative power difference to total power when E6651(MID) is operating in Uplink Flatness Measure Mode.

## **BS Emulator Mode**

# E6651\_GetBSStart

Declaration	int E6651_G	etBSStart(BYTE MID, BYTE * Value);
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current status of E6651 Base Station Emulation mode. Start: 1 Stop: 0
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve E6651(MID)'s Base Station Emulation mode information.	
	E6651_SetBS	Start
Declaration	<pre>int E6651_SetBSStart(BYTE MID, BYTE Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [in]:	remotely. E6651 Base Station Emulation mode information. Start: 1 Stop: 0
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Stop or Start Base Station Emulation mode of E6651(MID).	
	E6651_GetBSPreamble	
Declaration	<pre>int E6651_GetBSPreamble(BYTE MID, BYTE * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [out]:	remotely. Current Preamble Index value of E6651(MID). (0 ~ 113)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Preamble Index value of E6651(MID) when E6651 is operating in Base Station Emulator Mode.	

#### E6651\_SetBSPreamble

Declaration	int E6651_S	etBSPreamble(BYTE MID, BYTE Value);
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Preamble Index value to be set when E6651 is operating in Base Station Emulator mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Preamble	Index value of E6651(MID) when E6651 is

operating in Base Station Emulator Mode.

# E6651 GetBSUIPermbase

Declaration	<pre>int E6651_GetBSUlPermbase(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Permutation base value of E6651(MID) when E6651 is operating in Base Station Emulator mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Current Permutation base value of E6651(MID)	

when E6651 is operating in Base Station Emulator Mode.

## E6651\_SetBSUIPermbase

Declaration	<pre>int E6651_SetBSUlPermbase(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	UL Permutation base value to be set when E6651 is operating in Base Station Emulator mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set UL Permutation base value of E6651(MID) when E6651 is operating in Base Station Emulator Mode.	

#### E6651\_GetBSID

Declaration	int E6651_GetBSID(BYTE MID, Char * Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Current Base Station ID value of E6651(MID) when E6651 is operating in Base Station Emulator mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Base Station ID value of E6651(MID) when E6651 is	

operating in Base Station Emulator Mode.

#### E6651\_SetBSID

Declaration	int E6651_S	etBSID(BYTE MID, Char * Value);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Base Station ID value to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Set Base Station ID value of E6651(MID) when E6651 is operating in Base Station Emulator Mode.

## E6651\_GetBSRngTimeOffset

Declaration	int E6651_G Offset);	etBSRngTimeOffset(BYTE MID, int *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Offset [out]:	Current Timing Offset value of E6651(MID) when E6651 is operating in Base Station Emulator mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Timing Offset value of E6651(MID) when E6651 is operating in Base Station Emulator Mode.	

#### E6651\_SetBSRngTimeOffset

Declaration	int E6651_S Offset);	etBSRngTimeOffset(BYTE MID, int
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Offset [in]:	Timing Offset value to be set.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Set Timing Offset value of E6651(MID) when E6651 is operating in Base Station Emulator Mode.	

#### E6651\_GetBSFrameOffset

Declaration	int E6651_G Offset);	etBSFrameOffset(BYTE MID, int *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Offset [out]:	Current Frame Offset value of E6651(MID) when E6651 is operating in Base Station Emulator mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Retrieve Frame Offset value of E6651(MID) when E6651 is operating in Base Station Emulator Mode.

#### E6651\_SetBSFrameOffset

Declaration int E6651\_SetBSFrameOffset(BYTE MID, int Offset); Parameter MID [in]: E6651's equipment number to be controlled remotely. Offset [in]: Frame Offset value to be set. **Return Value** STATE\_SUCCESS(1) Success: Failure: STATE\_ERROR(-1) Description Set Frame Offset value of E6651(MID) when E6651 is operating in Base Station Emulator Mode.

## E6651\_GetBSRepetition

Declaration	<pre>int E6651_GetBSRepetition(BYTE MID,int * value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Repetition value of E6651(MID).
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve Repetition value of E6651(MID).	
	0: none	
	1: 2 Repetition	1
	2: 4 Repetition	1
	3: 6 Repetition	1

#### E6651\_SetBSRepetition

Declaration	<pre>int E6651_SetBSRepetition(BYTE MID,int * value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Repetition value of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1), STATE_ERROR(-1)
Description	Set Repetition value of E6651(MID) 0: none 1: 2 Repetition	

- 2: 4 Repetition
- 3: 6 Repetition

# E6651\_GetSamplingFrequency

Declaration	<pre>int E6651_GetSamplingFrequency(BYTE MID, double</pre>	
Parameter	MID [in]: E6651's equipment number to be control remotely.	
	Value [out]:	Current Sampling Frequency value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Sampling Frequency value of E6651(MID).	

## E6651\_SetSamplingFrequency

Declaration	<pre>int E6651_SetSamplingFrequency(BYTE MID, double     value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Sampling Frequency value of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Sampling Frequency value of E6651(MID).	

#### E6651\_GetBSRNGRSP\_PowerOffset

Declaration	<pre>int E6651_GetBSRNGRSP_PowerOffset(BYTE MID, int  * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Power Offset of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Power	r Offset of E6651(MID).

# E6651\_SetBSRNGRSP\_PowerOffset

Declaration	<pre>int E6651_SetBSRNGRSP_PowerOffset(BYTE MID, int     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Power Offset of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Power Off	set of E6651(MID) during Initial Ranging.

#### E6651\_GetBSRNGRSP\_FreqOffset

Declaration	<pre>int E6651_GetBSRNGRSP_FreqOffset(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Frequency Offset value of E6651(MID)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Frequency Offset value of E6651(MID).	

#### E6651\_SetBSRNGRSP\_FreqOffset

- Declarationint E6651\_SetBSRNGRSP\_FreqOffset(BYTE MID, int<br/>Value);ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.<br/>Value [in]:Value [in]:Frequency Offset value of E6651(MID) to be<br/>set.Return ValueSuccess:<br/>Failure:STATE\_SUCCESS(1)<br/>STATE\_ERROR(-1)
- **Description** Set Frequency Offset value of E6651(MID) is set during Initial Ranging.

## E6651\_GetBSRNGRSP\_TimeOffset

Declaration	<pre>int E6651_GetBSRNGRSP_TimeOffset(BYTE MID, double * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Time Offset of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Time	Offset of E6651(MID).

# E6651\_SetBSRNGRSP\_TimeOffset

Declaration	<pre>int E6651_SetBSRNGRSP_TimeOffset(BYTE MID,</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Time Offset of E6651(MID) to be set.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Set Time Offset of E6651(MID) is set during Initial Ranging. Units of set value: 0.25 * n ps.	

#### E6651\_GetBSRNGRSP\_Status

Declaration	<pre>int E6651_GetBSRNGRSP_Status(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current State value of RNG-RSP msg. Transmission Mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	<ul> <li>Retrieve Status value of Initial Ranging' Result Transmission Mode.</li> <li>E6651_GetBSRNGRSP_Status retrieves:</li> <li>0 if Transmission mode is changed 'Success' or 'Continue' by current rule when a mobile phone is trying Initial Ranging.</li> <li>1 if Transmission mode is always 'Success' when a mobile phone is trying Initial Ranging.</li> <li>2 if Transmission mode is always 'Continue' when a mobile phone is trying Initial Ranging.</li> <li>3 if Transmission mode is always 'Abort' when a mobile phone is trying Initial Ranging.</li> </ul>	

#### E6651\_SetBSRNGRSP\_Status

**Declaration** int E6651\_SetBSRNGRSP\_Status(BYTE MID, int Value);

- ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.Value [in]:State value of RNG-RSP msg. Transmission<br/>Mode to be set.
- Return Value
   Success:
   STATE\_SUCCESS(1)

   Failure:
   STATE\_ERROR(-1)
- **Description** Set State value of Initial Ranging' Result Transmission Mode.

#### E6651\_SetBSRNGRSP\_Status sets:

0 if Transmission mode is changed 'Success' or 'Continue' by current rule when a mobile phone is trying Initial Ranging.

1 if Transmission mode is always 'Success' when a mobile phone is trying Initial Ranging.

2 if Transmission mode is always 'Continue' when a mobile phone is trying Initial Ranging.

3 if Transmission mode is always 'Abort' when a mobile phone is trying Initial Ranging.

#### E6651\_GetDLMAPRepetition

Declaration	<pre>int E6651_GetDLMAPRepetition(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current DL MAP Repetition value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve DL MAP Repetition value of E6651(MID).	

## E6651\_SetDLMAPRepetition

Declaration	<pre>int E6651_SetDLMAPRepetition(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	DL MAP Repetition value of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set DL MAP H	Repetition value of E6651(MID).

# E6651\_GetULMAPRepetition

Declaration	<pre>int E6651_GetULMAPRepetition(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current UL MAP Repetition value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve UL M	IAP Repetition value of E6651(MID).

## E6651\_SetULMAPRepetition

Declaration	<pre>int E6651_SetULMAPRepetition(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	UL MAP Repetition value of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set UL MAP 1	Repetition value of E6651(MID).

## E6651\_GetULBurstRepetition

Declaration	<pre>int E6651_GetULBurstRepetition(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current UL Burst Repetition value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve UL Burst Repetition value of E6651(MID).	

## E6651\_SetULBurstRepetition

Declaration	<pre>int E6651_SetULBurstRepetition(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	UL Burst Repetition value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set UL Burst	Repetition value of E6651(MID).

# E6651\_GetDLBurstRepetition

Declaration	int E6651_G Value);	etDLBurstRepetition(BYTE MID, int *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current DL Burst Repetition value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve DL B	urst Repetition value of E6651(MID).

# E6651\_SetDLBurstRepetition

Declaration	int E6651_S Value);	etDLBurstRepetition(BYTE MID, int
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	DL Burst Repetition value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set DL Burst	Repetition value of E6651(MID).

## **BS Emulator Functions**

# E6651\_GetSSMacAddr

Declaration	int E6651_G	etSSMacAddr(BYTE MID, Char * Value);
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. MAC Address information of SS (Subscriber Station) when the SS successfully finished network entrance procedure to E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the SS MAC address information after SS finish network entrance procedure to E6651(MID).	
	E6651_GetSE6651ate	
Declaration	int E6651_GetSE6651ate(BYTE MID, BYTE * Value);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current status of SS which is connected to E6651(Base Station Emulator mode) ssDREG: 0 ssINIT: 1 ssNEGO: 2 ssPKM: 3 ssREG: 4 ssCONN: 5 ssIDLE: 6 ssHO: 7
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the SS operational status information when SS is inter-operating with E6651(MID).	

# E6651\_GetSSCINR

Declaration	int E6651_G	etSSCINR(BYTE MID, double * Value);
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [out]:	remotely. SS CINR value when the SS is inter-operating with E6651(Base Station
	Emulator)	
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the SS CINR value when SS is inter-operating with E6651. SS periodically reports CINR value to E6651.	
	E6651_GetSSRSSI	
Declaration	<pre>int E6651_GetSSRSSI(BYTE MID, double * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [out]:	remotely. The SS RSSI value when SS is inter-operating with E6651(Base Station Emulator)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve the SS RSSI value when SS is inter-operating with E6651. SS periodically reports RSSI value to E6651.	
	E6651_GetE6	651TxPower
Declaration	int E6651_G Value);	etE6651TxPower(BYTE MID, double *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	The SS Tx power value when SS is inter-operating with E6651(Base Station Emulator)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		S Tx power value when SS is inter-operating S periodically reports Tx power value to

# E6651\_GetPERInfo

Declaration	TestState	etPERInfo(BYTE MID, DWORD * , DWORD * PktTotalCnt, DWORD * WORD * Loss, double * PER);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	TestState [out]:	Č.
	<b>PktTotalCnt [out]:</b> The number of Transmitted packets from E6651(Base Station Emulator) to SS in DL UDP or DL Ping test.	
	PktCnt [out]:	The number of acknowledged packets for transmitted packets from E6651(Base Station Emulator) in DL UDP or DL Ping test.
	Loss [out]:	The number of unacknowledged packets for the transmitted packets form E6651(Base Station Emulator).
	PER [out]:	PER value measured at E6651(Base Station Emulator).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	in progress af	information when DL Ping or DL UDP test is ter SS finish network entrance procedure to ation Emulator).

# **BS Emulator Test Functions**

# E6651\_GetBSTestMode

Declaration	<pre>int E6651_GetBSTestMode(BYTE MID, int * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current activated test mode information. UL Padding: 0 DL UDP: 1 DL Ping: 2
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve current active test mode of E6651(MID) when E6651 is operating in Base Station Emulator mode.	
	E6651_SetBS	TestMode
Declaration	<pre>int E6651_SetBSTestMode(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Test mode information to be set. UL Padding: 0 DL UDP: 1 DL Ping: 2
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set test mode	of E6651(MID).
	E6651_GetBS	RunTest
Declaration	<pre>int E6651_GetBSRunTest(BYTE MID, int * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	On/Off information of Test Mode ON: 1 OFF: 0
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve test mode On/Off information of E6651(MID) when E6651 is operating in Base Station Emulator mode.	

## E6651\_SetBSRunTest

Declaration	<pre>int E6651_SetBSRunTest(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Activation information of Test Mode ON: 1 OFF: 0
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Turn On or T	urn Off test mode of F6651(MID) when F6651

**Description** Turn On or Turn Off test mode of E6651(MID) when E6651 is operating in Base Station Emulator mode.

#### E6651\_GetDLPayloadPattern

Declaration	<pre>int E6651_GetDLPayloadPattern(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Payload Pattern value of E6651(MID). 1: Random Mode 0: Pattern Mode
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Payload Pattern value of E6651(MID).	

## E6651\_SetDLPayloadPattern

Declaration	<pre>int E6651_SetDLPayloadPattern(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	<ul><li>Payload Pattern value of E6651(MID) to be set.</li><li>1: Random Mode</li><li>0: Pattern Mode</li></ul>
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Payload Pattern value of E6651(MID).	

#### **UL Padding Test**

#### E6651\_SetBSULPadTest

Declaration	<pre>int E6651_SetBSULPadTest(BYTE MID, int Value);</pre>	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Activation information of UL Padding Test ON: 1 OFF: 0
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(- 1)
Description	Turn On or Turn Off UL Padding test of E6651(MID) when E6651 is operating in Base Station Emulator mode.	

## E6651\_GetBSULPadUIMod

Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current UL Modulation Mode of E6651 (Base
		Station Emulator)
		QPSK (CTC) 1/2: 1
		QPSK (CTC) 3/4: 2
		16-QAM (CTC) 1/2: 3
		16-QAM (CTC) 3/4: 4
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve modulation mode information of E6651(MID) when E6651 is operating in UL Padding Test mode.	

# E6651\_SetBSULPadUIMod

Declaration	<pre>int E6651_SetBSULPadUlMod(BYTE MID, int Value);</pre>	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. UL Modulation Mode value to be set. QPSK (CTC) 1/2: 1 QPSK (CTC) 3/4: 2 16-QAM (CTC) 1/2: 3 16-QAM (CTC) 3/4: 4
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set modulation mode of E6651(MID) when E6651 is operating in UL Padding Test mode.	
	E6651_GetBSULPadUISIot	
	<pre>int E6651_GetBSULPadUlSlot(BYTE MID, int *     Value);</pre>	
Declaration		etBSULPadUlSlot(BYTE MID, int *
Declaration Parameter		etBSULPadUlSlot(BYTE MID, int * E6651's equipment number to be controlled remotely. UL Slot number information for UL Padding Test.
	Value); MID[in]:	E6651's equipment number to be controlled remotely. UL Slot number information for UL Padding
Parameter	Value); MID [in]: Value [out]: Success: Failure: Retrieve UL S	E6651's equipment number to be controlled remotely. UL Slot number information for UL Padding Test. STATE_SUCCESS(1)
Parameter Return Value	Value); MID [in]: Value [out]: Success: Failure: Retrieve UL Stoperating in U	E6651's equipment number to be controlled remotely. UL Slot number information for UL Padding Test. STATE_SUCCESS(1) STATE_ERROR(-1) lot value of E6651(MID) when E6651 is

	integer);	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	UL Slot value to be set for UL Padding Test.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Set UL Slot value of E6651(MID) when E6651 is operating in UL Padding Test mode.	

#### **DL UDP Test**

#### E6651\_SetBSDLUdpTest

Declaration	<pre>int E6651_SetBSDLUdpTest(BYTE MID, int Value);</pre>	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Activation information of DL UDP Test (ON: 1, OFF: 0)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Turn On or T	urn Off DL UDP test of E6651(MID) when

E6651 is operating in Base Station Emulator mode.

#### E6651\_GetBSDLUdpDIMod

- **Declaration** int E6651\_GetBSDLUdpDlMod(BYTE MID, int \* Value);
- MID [in]: **Parameter** E6651's equipment number to be controlled remotely. Value [in]: Current DL Modulation Mode of E6651 (Base Station Emulator) QPSK (CTC) 1/2: 0 QPSK (CTC) 3/4: 1 16-QAM (CTC) 1/2: 2 16-QAM (CTC) 3/4: 3 64-QAM (CTC) 1/2: 4 64-QAM (CTC) 2/3: 5 64-QAM (CTC) 3/4: 6 64-QAM (CTC) 5/6: 7 **Return Value** Success: STATE\_SUCCESS(1) Failure: STATE\_ERROR(-1) Description Retrieve modulation mode information of E6651(MID) when

#### E6651\_SetBSDLUdpDIMod

Declaration	int E6651_S	etBSDLUdpDlMod(BYTE MID, int Value);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.

E6651 is operating in DL UDP Test mode.

	Value [in]:	DL Modulation Mode value to be set in DL UDP test mode. QPSK (CTC) 1/2: 0 QPSK (CTC) 3/4: 1 16-QAM (CTC) 1/2: 2 16-QAM (CTC) 3/4: 3 64-QAM (CTC) 1/2: 4 64-QAM (CTC) 2/3: 5 64-QAM (CTC) 3/4: 6
Return Value	Success:	64-QAM (CTC) 5/6: 7 STATE_SUCCESS(1)
Description	Failure: Set modulation	STATE_ERROR(-1) n mode of E6651(MID) when E6651 is

## E6651\_GetBSDLUdpLength

operating in DL UDP Test mode.

Declaration	<pre>int E6651_GetBSDLUdpLength(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Payload Length value in DL UDP test (1 $\sim$ 3000).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Retrieve Payload length value of E6651(MID) when E6651 is operating in DL UDP Test mode.

#### E6651\_SetBSDLUdpLength

Declaration	<pre>int E6651_SetBSDLUdpLength(BYTE MID, int Value);</pre>	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Payload Length value to be set for DL UDP Test (1 $\sim$ 3000).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Payload length value of E6651(MID) when E6651 is operating in DL UDP Test mode.	

#### E6651\_GetBSDLUdpRate

Declaration	<pre>int E6651_GetBSDLUdpRate(BYTE MID, int * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Frame Rate information for DL UDP Test.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve Frame Rate information of F6651(MID) when F6651	

**Description** Retrieve Frame Rate information of E6651(MID) when E6651 is operating in DL UDP Test mode. Frame Rate determines how many frames are allocated for one data packet transmission. For example, single packet size is 300bytes and frame rate is three, then 300bytes data are transmitted over 3 frames period.

#### E6651\_SetBSDLUdpRate

Declaration	<pre>int E6651_SetBSDLUdpRate(BYTE MID, int * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Frame Rate value to be set for DL UDP Test.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Frame Rat	te value of E6651(MID) when E6651 is

# **Description** Set Frame Rate value of E6651(MID) when E6651 is operating in DL UDP Test mode.

#### E6651\_GetBSDLUdpTotal

Declaration	int E6651_G Value);	etBSDLUdpTotal(BYTE MID, int *
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Total Packet value information for DL UDP
		Test.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Total Packet value of E6651(MID) when E6651 is operating in DL UDP Test mode.	

# E6651\_SetBSDLUdpTotal

Declaration	<pre>int E6651_SetBSDLUdpTotal(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Total Packet value to be set for DL UDP Test.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Total Packet value of E6651(MID) when E6651 is operating in DL UDP Test mode.	

# **DL Ping Test**

# E6651\_SetBSDLPingTest

Declaration	int E6651_S	etBSDLPingTest(BYTE MID, int Value);
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Activation information of DL Ping Test (ON: 1, OFF: 0)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Turn On or Turn Off DL Ping test of E6651(MID) when E6651 is operating in Base Station Emulator mode.	

# E6651\_GetBSDLPingDIMod

Declaration	int E6651_G Value);	etBSDLPingDlMod(BYTE MID, int *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current DL Modulation Mode of E6651(Base Station Emulator) QPSK (CTC) 1/2: 0 QPSK (CTC) 3/4: 1 16-QAM (CTC) 1/2: 2 16-QAM (CTC) 3/4: 3 64-QAM (CTC) 1/2: 4 64-QAM (CTC) 2/3: 5 64-QAM (CTC) 3/4: 6 64-QAM (CTC) 5/6: 7
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(- 1)
Description	Retrieve modulation mode information of E6651(MID) when	

E6651 is operating in DL Ping Test mode.

# E6651\_SetBSDLPingDIMod

Declaration	<pre>int E6651_SetBSDLPingDlMod(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	DL Modulation Mode value to be set in DL Ping test mode. QPSK (CTC) 1/2: 0 QPSK (CTC) 3/4: 1 16-QAM (CTC) 1/2: 2 16-QAM (CTC) 3/4: 3 64-QAM (CTC) 1/2: 4 64-QAM (CTC) 2/3: 5 64-QAM (CTC) 3/4: 6 64-QAM (CTC) 5/6: 7
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set modulation mode of E6651(MID) when E6651 is operating in DL Ping Test mode.	

## E6651\_GetBSDLPingLength

Declaration	<pre>int E6651_GetBSDLPingLength(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Payload Length value in DL Ping test (1 ~ 3000)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Payload length value of E6651(MID) when E6651 is	

### E6651\_SetBSDLPingLength

operating in DL Ping Test mode.

Declaration	<pre>int E6651_SetBSDLPingLength(BYTE MID, int     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [in]:	remotely. Payload Length value to be set for DL Ping Test (1 ~ 3000)
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Set Payload length value of E6651(MID) when E6651 is operating in DL Ping Test mode.	

### E6651\_GetBSDLPingRate

Declaration	<pre>int E6651_GetBSDLPingRate(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Frame Rate information for DL Ping Test.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Fram	e Rate information of E6651(MID) when E6651 DL Ping Test mode.

### E6651\_SetBSDLPingRate

Declaration	int E6651_S Value);	etBSDLPingRate(BYTE MID, int *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Frame Rate value to be set for DL Ping test.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE ERROR(-1)
Description	Set Frame Rate value of E6651(MID) when E6651 is operating in DL Ping Test mode.	

# E6651\_GetBSDLPingTotal

Declaration	<pre>int E6651_GetBSDLPingTotal(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Total Packet value information for DL Ping Test.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Total Packet value of E6651(MID) when E6651 is operating in DL Ping Test mode.	
	E6651_SetBSDLPingTotal	
Declaration	<pre>int E6651_SetBSDLPingTotal(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Total Packet value to be set for DL Ping Test.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Total Packet value of E6651(MID) when E6651 is operating in DL Ping Test mode.	

#### **Power Control Test**

#### E6651\_GetPCEIRP

Declaration	<pre>int E6651_GetPCEIRP(BYTE MID, int * Value);</pre>	
Parameter	<b>MID</b> [in]: E6651's equipment number to be controlled remotely.	
	Value [out]:	Current DCD message's EIRP of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve DCD message's EIRP of E6651(MID).	

# E6651\_SetPCEIRP

Declaration	int E6651 <u></u>	_SetPCEIRP(BYT	E MID,	int Value);
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ParameterMID [in]:E6651's equipment number to be controlled<br/>remotely.Value [in]:EIRP value of E6651(MID) to be set in DCD<br/>message.Return ValueSuccess:STATE\_SUCCESS(1)

- Failure: STATE\_ERROR(-1)
- **Description** Set EIPR value of E6651(MID) in DCD message.

#### E6651\_GetPCEIRxP

Declaration	int E6651_GetPCEIRxP(BYTE MID, int * Value);	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current DCD message's Earwax IR, max value of E6651(MID)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve DCD	message's EIRxP IR, max value of E6651(MID).

### E6651\_SetPCEIRxP

Declaration	int E6651_S	etPCEIRxP(BYTE MID, int Value);
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. EIRxP IR,max value of E6651(MID) to be set in DCD message.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

Description Set EIRxP IR,max value of E6651(MID) in DCD message.

# E6651\_GetPCNIEnable

Declaration	<pre>int E6651_GetPCNIEnable(BYTE MID, int * Value);</pre>	
Parameter	MID [in]: E6651's equipment number to be contro remotely.	
	Value [out]:	Current value is indicated that NI (Noise Interference) is used or not.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve NI (Noise Interference) using or not value.	
	E6651_GetPCNIEnable returns 0(Disable) if NI was not used, or returns 1 if NI was used.	

#### E6651\_SetPCNIEnable

Declaration	<pre>int E6651_SetPCNIEnable(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	The value decides to use NI or not to be set
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set the value decides to use NI or not of E6651(MID) E6651_SetPCNIEnable sets 0(Disable) if NI will not be used or returns 1 if NI will be used.	

# E6651\_GetPCNIPUSC

Declaration	int E6651_GetPCNIPUSC(BYTE MID, int * Value);	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current Power Level of E6651(MID)'s NI PUSC
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Power Level of E6651(MID)'s NI PUSC.	
	Limits of Power Level: 0~255(-150dBm ~ -22.5 dBm)	

# E6651\_SetPCNIPUSC

Declaration	<pre>int E6651_SetPCNIPUSC(BYTE MID, int value);</pre>	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Power Level of E6651(MID)'s NI PUSC to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Power Level of E6651(MID)'s NI PUSC.	
	Limits of Power Level: 0~255(-150dBm ~ -22.5 dBm).	

# E6651\_GetBSRNGRSPOffset

Declaration	<pre>int E6651_GetBSRNGRSPOffset(BYTE MID, int *     Value);</pre>	
Parameter M	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Power Offset is user can set additionally during Initial Ranging or Periodic Ranging.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description		Offset is user can set additionally during or Periodic Ranging.

# E6651\_SetBSRNGRSPOffset

Declaration	int E6651_Se	etBSRNGRSPOffset(BYTE MID, int value);
Parameter	MID [in]: Volue [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Power Offset of E6651(MID) is user can set additionally during Initial Ranging or Periodic Ranging to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		set of E6651(MID) is user can set additionally Ranging or Periodic Ranging.
	E6651_GetBS	REPREQEnable
Declaration	<pre>int E6651_GetBSREPREQEnable(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current value is indicated that REP-REQ is used or not
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve REP-	REQ using or not value.
	E6651_ GetBSREPREQEnable returns 0(Disable) if REP-REQ was not used, or returns 1 if REP-REQ was used.	
	E6651_SetBS	REPREQEnable
Declaration	<pre>int E6651_SetBSREPREQEnable(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	The value decides to use REP-REQ or not to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set the value decides to use REP-REQ or not of E6651(MID). E6651_SetBSREPREQEnable sets 0(Disable) if REP-REQ will not be used, or returns 1 if REP-REQ will be used.	

### E6651\_GetBSREPREQFrameRate

Declaration	int E6651_G Value);	etBSREPREQFrameRate(BYTE MID, int *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Frame Rate value of REP-REQ.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Retrieve Frame Rate value of REP-REQ.

#### E6651\_SetBSREPREQFrameRate

Declaration	int E6651_S Value);	etBSREPREQFrameRate(BYTE MID, int
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Frame Rate value of REP-REQ to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Set Frame Rate value of REP-REQ.

# E6651\_GetPCTestMode

Declaration	<pre>int E6651_GetPCTestMode(BYTE MID, int * Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current Power Control Test Mode of E6651(MID)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Power Control Test Mode of E6651(MID). 0: RNG-RSP 1: Power Control IE in UL-MAP 2: FPC 3: PMC-RSP	

# E6651\_SetPCTestMode

Declaration	<pre>int E6651_SetPCTestMode(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Power Control Test Mode of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Power Control Test Mode of E6651(MID). 0: RNG-RSP 1: Power Control IE in UL-MAP 2: FPC 3: PMC-RSP	
	E6651_GetPC	RNGRSPPowerAdjust
Declaration	int E6651_Ge Value);	etPCRNGRSPPowerAdjust(BYTE MID, int *
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current RNG-RSP Power Adjust value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve RNG-RSP Power Adjust value of E6651(MID). Limits of Power Adjust: -128 $$ 127.	
	E6651_SetPCRNGRSPPowerAdjust	
Declaration	int E6651_S Value);	etPCRNGRSPPowerAdjust(BYTE MID, int
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	RNG-RSP Power Adjust value of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set RNG-RSP Power Adjust value of E6651(MID). Limits of Power Adjust: -128 $$ 127.	

#### E6651\_GetPCIEPowerAdjust

Declaration	<pre>int E6651_GetPCIEPowerAdjust(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current Power Control IE Power Adjust value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Power Control IE Power Adjust value of E6651(MID). Limits of Power Adjust: -128 ~ 127.	

#### E6651\_SetPCIEPowerAdjust

Declaration	<pre>int E6651_SetPCIEPowerAdjust(BYTE MID, int</pre>	
	Value);	

Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Power Control IE Power Adjust value of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Set Power Control IE Power Adjust value of E6651(MID). Limits of Power Adjust: -128 ~ 127.

#### E6651\_GetPCFPCPowerAdjust

Declaration	<pre>int E6651_GetPCFPCPowerAdjust(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current FPC Power Adjust value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve FPC Power Adjust value of E6651(MID). Limits of Power Adjust: -128 ~ 127.	

# E6651\_SetPCFPCPowerAdjust

Declaration	<pre>int E6651_SetPCFPCPowerAdjust(BYTE MID, int     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	FPC Power Adjust value of E6651(MID) to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set FPC Power Adjust: -128 ~	Adjust value of E6651(MID). Limits of Power 127.
	E6651_GetPCPMCLoopMode	
Declaration	<pre>int E6651_GetPCPMCLoopMode(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
i alametei		remotely
i arameter	Value [out]:	remotely. Current PMC-RSP Loop Mode of E6651(MID).
Return Value		
	Value [out]: Success: Failure:	Current PMC-RSP Loop Mode of E6651(MID). STATE_SUCCESS(1) STATE_ERROR(-1) RSP Loop Mode of E6651(MID). Passive
Return Value	Value [out]: Success: Failure: Retrieve PMC- 0: Close Loop 2: Open Loop 3: Open Loop	Current PMC-RSP Loop Mode of E6651(MID). STATE_SUCCESS(1) STATE_ERROR(-1) RSP Loop Mode of E6651(MID). Passive

Declaration	INT E6651_S	etPCPMCLoopMode(BYTE MID, int Value)
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	PMC-RSP Loop Mode of E6651(MID) to be set.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	<ul><li>Set PMC-RSP Loop Mode of E6651(MID).</li><li>0: Close Loop</li><li>2: Open Loop Passive</li><li>3: Open Loop Active</li></ul>	

### E6651\_GetPCPMCPowerAdjust

Declaration	int E6651_0 Value);	GetPCPMCPowerAdjust(BYTE MID, int *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current PMC-RSP Power Adjust value of E6651(MID).
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve PMC-RSP Power Adjust value of E6651(MID). Limits of Power Adjust: -128 ~ 127.	

#### E6651\_SetPCPMCPowerAdjust

Declaration	<pre>int E6651_SetPCPMCPowerAdjust(BYTE MID, int     Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	PMC-RSP Power Adjust value of E6651(MID).
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Set PMC-RSP Power Adjust of E6651(MID). Limits of Power Adjust: -128 ~ 127.	

#### E6651\_PCSendMessage

Declaration	<pre>int E6651_PCSendMessage(BYTE MID);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Send Power Control Test Message to a mobile phone.	

# E6651\_GetBSFullOccupied

Declaration	<pre>int E6651_GetBSFullOccupied(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current Full Occupied Function's On or Off information of E6651(MID) when E6651 is operating in Base Station Emulator mode.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Full Occupied Function's On or Off information of E6651(MID) when E6651 is operating in Base Station Emulator mode. 0: OFF 1: ON	

# E6651\_SetBSFullOccupied

Declaration	<pre>int E6651_SetBSFullOccupied(BYTE MID, int Value);</pre>	
Parameter	MID [in]: Value [in]:	E6651's equipment number to be controlled remotely. Full Occupied Function's ON or OFF value of E6651(MID) when E6651 is operating in Base Station Emulator mode to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Full Occupied Function's ON or OFF of E6651(MID) when E6651 is operating in Base Station Emulator mode. 0: OFF 1: ON	

# E6651\_GetBSSBCMaximumTransmittedPowerBPSK

Declaration	<pre>int E6651_GetBSSBCMaximumTransmittedPowerBPSK  (BYTE MID, int * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [out]:	remotely. Current Maximum Transmitted Power for BPSK value is in SBC-REQ message from a mobile.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		num Transmitted Power for BPSK value is in sage from a mobile.
	E6651_GetBS	SBCMaximumTransmittedPowerQPSK
Declaration	<pre>int E6651_GetBSSBCMaximumtransmittedPowerQPSK   (BYTE MID, int * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Maximum Transmitted Power for QPSK value is in SBC-REQ message from a mobile.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		num Transmitted Power for QPSK value is in sage from a mobile.
	E6651_GetBS	SBCMaximumTransmittedPower160AM
Declaration		BSSBCMaximumTransmittedPower16QAM(BY nt * Value);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Maximum Transmitted Power for 16QAM value is in SBC-REQ message from a mobile.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description		num Transmitted Power for 16QAM value is in sage from a mobile.

# E6651\_GetBSSBCMaximumTransmittedPower64QAM

Declaration	<pre>int E6651_GetBSSBCMaximumTransmittedPower64QAM  (BYTE MID, int * Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current Maximum Transmitted Power for 64QAM value is in SBC-REQ message from a mobile.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Maximum Transmitted Power for 64QAM value is in SBC-REQ message from a mobile.	
	E6651_GetBSH00peratorID	
Declaration	<pre>int E6651_GetBSHOOperatorID(BYTE MID, int *     Value);</pre>	
Parameter	MID [in]: Value [out]:	E6651's equipment number to be controlled remotely. Current Operator ID of MOB_NBR-ADV message.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Operator ID of MOB_NBR-ADV message.	
	E6651_SetBSH00peratorID	
Declaration	<pre>int E6651_SetBSHOOperatorID(BYTE MID, int Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Operator ID of MOB_NBR-ADV message to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)

**Description** Set Operator ID of MOB\_NBR-ADV message.

# E6651\_GetBSHONeighborBSID

Declaration	<pre>int E6651_GetBSHONeighborBSID(BYTE MID, int Index, int * Value);</pre>	
Parameter	MID [in]: E6651's equipment number to be con remotely.	
	Index [in]:	The value of index 0: Neighbor #1 1: Neighbor #2 2: Neighbor #3
	Value [out]:	Current Neighbor BSID of the index in MOB_NBR-ADV message.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Neighbor BSID of the index is made from MOB_NBR-ADV message. There are 3 Neighbors and the index starts from 0.	

# E6651\_SetBSHONeighborBSID

Declaration	<pre>int E6651_SetBSHONeighborBSID(BYTE MID, int Index, int Value);</pre>	
Parameter	MID [in]: E6651's equipment number to be control remotely.	
	Index [in]:	The value of index
	0: Neighbor #1 1: Neighbor #2	
		2: Neighbor #3
	Value [in]:	Neighbor BSID of the index in
		MOB_NBR-ADV message to be set.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Set Neighbor BSID of the index is made from MOB_NBR-ADV message.	

# E6651\_GetBSHONeighborDCDCC

Declaration	<pre>int E6651_GetBSHONeighborDCDCC(BYTE MID, int Index, int * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Index [in]:	The value of index
		0: Neighbor #1
		1: Neighbor #2
		2: Neighbor #3
	Value [out]:	Current Neighbor DCD Configuration Change
		Count value of the index in MOB_NBR-ADV message.
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Retrieve Neighbor DCD Configuration Change Count value of the index is made from MOB_NBR-ADV message (0 $\sim$ 15).	

# E6651\_SetBSHONeighborDCDCC

Declaration	<pre>int E6651_SetBSHONeighborDCDCC(BYTE MID, int Index, int Value);</pre>	
Parameter	<b>MID</b> [in]: E6651's equipment number to be control remotely.	
	Index [in]:	The value of index
		0: Neighbor #1
		1: Neighbor #2
		2: Neighbor #3
	Value [in]:	Neighbor DCD Configuration Change Count
		value of the index in MOB_NBR-ADV message
		to be set
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Set Neighbor DCD Configuration Change Count value of the index is made from MOB_NBR-ADV message (0 $\sim$ 15).	

# E6651\_GetBSHONeighborUCDCC

Declaration	<pre>int E6651_GetBSHONeighborUCDCC(BYTE MID, int Index, int * Value);</pre>	
Parameter	MID [in]: Index [in]: Value [out]:	E6651's equipment number to be controlled remotely. The value of index 0: Neighbor #1 1: Neighbor #2 2: Neighbor #3 Current Neighbor UCD Configuration Change Count value of the index in MOB_NBR-ADV message.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Neighbor UCD Configuration Change Count value of the index is made from MOB_NBR-ADV message (0 $\sim$ 15).	

# E6651\_SetBSHONeighborUCDCC

Declaration	<pre>int E6651_SetBSHONeighborUCDCC(BYTE MID, int Index, int Value);</pre>	
Parameter	MID [in]: E6651's equipment number to be contracted remotely.	
	Index [in]: Value [in]:	The value of index 0: Neighbor #1 1: Neighbor #2 2: Neighbor #3 Neighbor UCD Configuration Change Count value of the in MOB_NBR-ADV message to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Neighbor UCD Configuration Change Count value of the index is made from MOB_NBR-ADV message (0 $\sim$ 15).	

# E6651\_GetBSHONeighborFrequency

Declaration	<pre>int E6651_GetBSHONeighborFrequency(BYTE MID, int Index, double * Value);</pre>	
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Index [in]: Value [out]:	The value of index 0: Neighbor #1 1: Neighbor #2 2: Neighbor #3 Current Neighbor Frequency value of the index in MOB_NBR-ADV message.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Neighbor Frequency value of the index is made from MOB_NBR-ADV message.	

# E6651\_SetBSHONeighborFrequency

Declaration	<pre>int E6651_SetBSHONeighborFrequency(BYTE MID, int Index, double Value);</pre>	
Parameter	MID [in]: E6651's equipment number to be control remotely.	
	Index [in]: Value [in]:	The value of index 0: Neighbor #1 1: Neighbor #2 2: Neighbor #3 Neighbor Frequency value of the index in
Return Value	Success: Failure:	MOB_NBR-ADV message to be set. STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Neighbor Frequency value of the index is made from MOB_NBR-ADV message.	

#### E6651\_GetBSHONeighborPermutationBase

Declaration		etBSHONeighborPermutationBase(BYTE Index, int * Value);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Index [in]: Value [out]:	The value of index 0: Neighbor #1 1: Neighbor #2 2: Neighbor #3 Current Neighbor Permutation Base value of the index in MOB_NBR-ADV message.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Neighbor Permutation Base value of the index is made from MOB_NBR-ADV message.	

# E6651\_SetBSHONeighborPermutationBase

Declaration		etBSHONeighborPermutationBase(BYTE Index, int Value);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Index [in]: Value [in]:	The value of index 0: Neighbor #1 1: Neighbor #2 2: Neighbor #3 Neighbor Permutation Base value of the index
Return Value	Success: Failure:	in MOB_NBR-ADV message to be set. STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Ũ	Permutation Base value of the index is made R-ADV message.

# E6651\_GetBSHOMOB\_NBR\_ADVEnable

Declaration	int E6651_Ge * Value);	etBSHOMOB_NBR_ADVEnable(BYTE MID, int
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Transmission mode of MOB_NBR-ADV message.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Trans 0: Stop 1: Start	mission mode of MOB_NBR-ADV message.
	E6651_SetBS	HOMOB_NBR_ADVEnable
Declaration	int E6651_Se Value);	etBSHOMOB_NBR_ADVEnable(BYTE MID, int
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Transmission mode of MOB_NBR_ADV message to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Transmissi 0: Stop 1: Start	ion mode of MOB_NBR_ADV message.
	E6651 GetBS	HOMOB NBR ADVRate

#### E6651\_GetBSHUMUB\_NBK\_ADVKate

Declaration	int E6651_Ge Value);	etBSHOMOB_NBR_ADVRate(BYTE MID, int *
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [out]:	Current Transmission Rate value of MOB_NBR-ADV message.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Retrieve Trans	mission Rate of MOB_NBR-ADV message. per a Value Frame.

### E6651\_SetBSHOMOB\_NBR\_ADVRate

Declaration	int E6651_S Value);	etBSHOMOB_NBR_ADVRate(BYTE MID, int
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	Transmission Rate value of MOB_NBR_ADV message to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set Transmiss	ion Rate value of MOB_NBR-ADV message.

#### E6651\_SendBSHOMOB\_SCN\_RSP

Transmit once per a Value Frame.

Declaration	int E6651_S	endBSHOMOB_SCN_RSP(BYTE MID);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Transmit MOB	_SCN-RSP Message.

#### **Tools Functions**

#### E6651\_BSAddBurst

Declaration	int E6651_B DIUC, Cha	SAddBurst(BYTE MID, WORD CID, BYTE r * MSG);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	CID [in]:	CID to be added in Burst
	DIUC [in]:	DIUC to be added in Burst
	MSG [in]:	Message to be added in Burst
Return Value	Success:	STATE_SUCCESS(1)
	Failure:	STATE_ERROR(-1)
Description	Used when us E6651(MID)'s	er want to generate an arbitrary Burst in Downlink.

#### E6651\_WaitMessage

- **Declaration** int E6651\_WaitMessage(BYTE MID, BYTE MSG, DWORD TimeOut);
- Parameter MID [in]: E6651's equipment number to be controlled remotely. MSG [in]: MAC Message Type number to wait until receive it. TimeOut [in]: Time duration to wait the message (ms) **Return Value** Success: STATE\_SUCCESS(1) Failure: STATE\_ERROR(-1) Description Wait until E6651(MID) receive designated MAC Message
- **Description** Wait until E6651(MID) receive designated MAC Message Type.

# Functions used in V1.5

# E6651\_SetBSPayloadLen

Declaration	int E6651_S	etBSPayloadLen(BYTE MID, int Value);
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [in]:	remotely. E6651 Base Station Emulation Payload length value to be set. (0, 1, 2, etc.)
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	value. If (Value = 0) if (Value = 1)	)) Base Station Emulation Payload Length then Value:= 288 then Value:= 576 then Value:= 1488 else Value:= 288;
	E6651_SetBS	DLTest
Declaration	int E6651_S	etBSDLTest(BYTE MID, int Value);
Parameter	MID [in]:	E6651's equipment number to be controlled
	Value [in]:	remotely. DL Test Mode of E6651(MID) Base Station Emulator to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set DL Test M 0: Off 1: On	ode of E6651(MID) Base Station Emulator.
	E6651_SetBS	ULTest
Declaration	int E6651_S	etBSULTest(BYTE MID, int Value);
Parameter	MID [in]:	E6651's equipment number to be controlled remotely.
	Value [in]:	UL Test Mode of E6651(MID) Base Station Emulator to be set.
Return Value	Success: Failure:	STATE_SUCCESS(1) STATE_ERROR(-1)
Description	Set DL Test M 0: Off 1: On	ode of E6651(MID) Base Station Emulator.



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# **Appendix A - Network Entry Procedure**

Network Entry Procedure Overview 172 Network Entry Procedure Detail 174 Downlink Synchronization and Uplink Parameter Information 174 Initial Ranging Procedure Execution and Basic Capabilities Negotiation 176 Registration Procedure 180 Periodic Ranging for Connection Maintenance 182 REP-REQ message Setting 183 Profile Selection 185

A Mobile WiMAX subscriber station (SS) executes the Network Entry procedure in order to begin two way communications with a base station.



# **Network Entry Procedure Overview**

	A Mobile WiMAX subscriber station (SS) executes the Network Entry procedure in order to begin two way communications with any base station, including the E6651A Mobile WiMAX Test Set. The SS executes this procedure after acquiring relevant information from broadcast messages.
	The initial registration procedure of the SS can be summarized as follows:
Scanning for Downlink Channel	The SS scans a Mobile WiMAX base station (BS) signal and determines whether the signal level is strong enough to provide adequate service quality.
Downlink Synchronization	The SS executes a synchronization procedure to obtain downlink channel information from the BS.
	After acquiring synchronization, the SS obtains downlink and uplink information from the BS.
Obtaining Uplink Parameters	Using downlink information, the SS obtains uplink information for the Ranging and Registration procedures.
Execution of Ranging Procedure	Using the acquired uplink information, the SS executes the Ranging procedure which includes the adjustment of time, frequency and power parameters to meet the uplink burst allocation.
	The Ranging algorithm used in Mobile WiMAX 1.A is the "CDMA Initial Ranging" algorithm. When this algorithm is used, the SS transmits an "Initial Ranging Code" in an Initial Ranging Region allocated by the BS.
Negotiation of Basic Capabilities	The SS negotiates physical layer properties and capabilities with the BS.
Registration With the BS	The SS provides information to the network and receives information from the network in order to register with the Mobile WiMAX service.
	The Network Entry procedure is complete at the end of the Registration Procedure. From this point on, the SS executes a Periodic Ranging procedure to assist in maintaining a reliable connection with the network.

The flow diagram in Figure 44 depicts the general Network Entry procedure of the SS. "Network Entry Procedure Detail" on page 174 provides detail on each step in the Network Entry procedure.

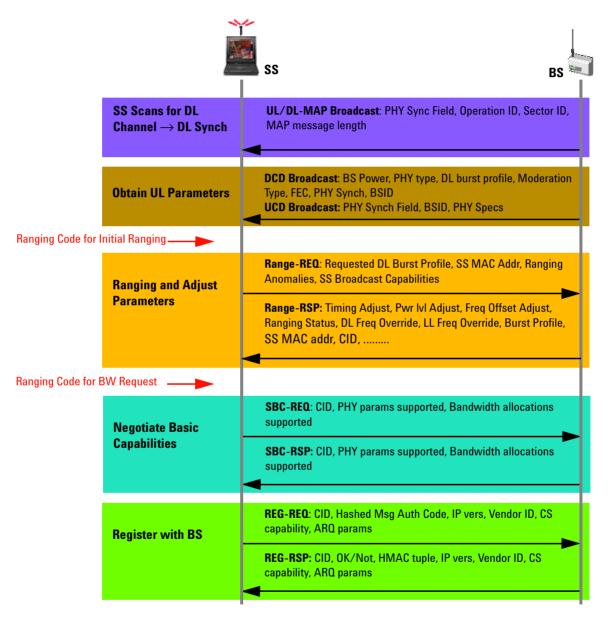


Figure 44 Initial Network Entry Procedure of the SS

# **Network Entry Procedure Detail**

The Test Set engages in the Network Entry procedure when establishing two way communications with the SS. The messages transmitted during the each phase of the Network Entry procedure are displayed in the Measurement Window when the Test Set is operating in BSE mode. The following sections describe the detailed steps in the procedure, and show the operation of the Test Set for each step.

#### **Downlink Synchronization and Uplink Parameter Information**

In the Downlink Synchronization procedure, the BS transmits an OFDMA frame to the SS containing the DL-MAP information. The SS uses the DL-MAP information to obtain UL-MAP, DCD and UCD information. The OFDMA frame structure, including the mapping of each information type, is shown in Figure 45.

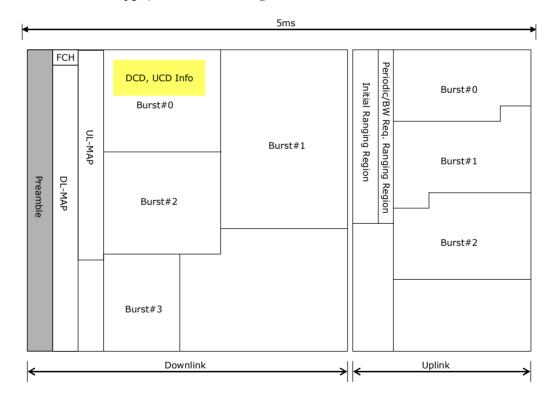


Figure 45 OFDMA Frame Structure

The Test Set periodically broadcasts DCD and UCD information to the SS to provide downlink synchronization and uplink parameter information at the designated

frequency. The broadcast operation of the product for downlink synchronization and uplink parameter information is shown in Figure 46.

: Advanced WMAX Tester ::	2007.01.15 22:30 58	BS EMULATOR
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB Amp: -40.0 dBm	Settings
SST UL INT ION CHUICENSCOULD SALED		BSE & Test
Base Station Information	Subscriber Station Information	Settings
BSID: 0x010203010040 FN: 614046, Burst: 1, CSN: 0 FnErr: 0	MAC ADDR: 0018AF80EEC6 BW: 0	Start
UDP Test::5:473 R:465 L:1 PER: 0.2146%	STATE: Deregistration	Emulator
System::THR:52859 RNG:0 DATA:0 INT:200	CINR: dB RSSI: dBm TxPwr: dBm	Start
MAC Me	ssage Process	Start
22:30:50.250 > UCD Message		
22:30:52.250 > DCD Message		Stop
22:30:54.250 > UCD Message		
22:30:56.250 > DCD Message		Emulator
22:30:58.250 > UCD Message	3	Stop
22:30:26.250 > UCD Message		
22:30:28.250 > DCD Message		Test Mode
22:30:30.250 > UCD Message		
22:30:32.250 > DCD Message		
22:30:34.250 > UCD Message		[DL UOP Test]
22:30:36.250 > DCD Message		for one read
22:30:38.250 > UCD Message		
22:30:40.250 > DCD Message		
22:30:42.250 > UCD Message		Run Test
22:30:44.250 > DCD Message 22:30:46.250 > UCD Message		QP5K (CTC) 1/2 288 byte / 1 frame
22:30:48.250 > DCD Message		Total: 10000 pkt
		ON/[OFF]
		Ranging Test
AWT-522A REY 3 VER 4.0.0.86 :: MI	¥_85E_8.75M :: 2058.140.240-3007.0.356	more 1/2

**Figure 46** UCD and DCD Message Transmission for Downlink Synchronization and Uplink Parameter Information

The DCD and UCD messages shown in Figure 46 provide the following types of information:

#### DCD Message (Downlink Channel Descriptor)

- BS Power
- PHY Type
- DL Burst Profile
- Modulation Type
- FEC
- PHY Sync
- BSID Information

#### UCD Message (Uplink Channel Descriptor)

- PHY Sync field
- BSID
- PHY Specification

#### Initial Ranging Procedure Execution and Basic Capabilities Negotiation

Using the initial ranging region information and initial ranging code information obtained from the UL-MAP and UCD messages, the SS attempts the Contention Based Initial Ranging procedure.

The E6651A measures the quality of the initial ranging code. Provided that the code quality exceeds a specified threshold, the unit sends the ranging code, time offset, frequency offset and power offset through the RNG-RSP message and provides CDMA Allocation IE information through UL-MAP. CDMA Allocation IE information is used in the transmission of the RNG-REQ message.

When the RNG-RSP message and CDMA Allocation IE is received from the Test Set, the SS sends the RNG-REQ message in the uplink region specified in the CDMA Allocation IE.

Upon successful exchange of the RNG-REQ and RNG-RSP messages, the physical connection is established between the SS and the Test Set. At this point, the SS and the Test Set share information including the Basic CID and the Burst Profile.

In the next step of the Initial Ranging Procedure, known as "Basic Capabilities Negotiation", the SS sends the BW Request message to the Test Set. Upon receipt of the BW Request message, the Test Set sends an ALLOC UL-MAP message, containing information about the bandwidth that the unit has allocated to the SS.

The SS provides its PHY and Bandwidth Allocation information by sending SBC-REQ messages using the uplink resources allocated by the Test Set. After receiving the SBC-REQ message from the SS, the Test Set responds with an SBC-RSP message to the SS. The SBC-REQ and SBC-RSP message pair constitutes the negotiation of basic physical layer properties between the SS and the BS. The Initial Ranging Procedure and Negotiation of Basic Capabilities as seen in the Measurement Window of the E6651A are shown in Figure 47.

:: Advanced WiMAX Tester ::	2007.01.15 22:32 10	BS EMULATOR
BS EMULATOR Freq: 2.345000000 GHz	Att: 30 dB Amp: -40.0 dBm	Settings BSE & Test
Base Station Information	Subscriber Station Information	Settings
BSID: 0x010203010040 FN: 620461, Burst: 1, CSN: 0 FnErr: 5	MAC ADDR: 0018AF80EEC6 BW: 0	Start
UDP Test::5:473 R:465 L:1 PER: 0.2146%	STATE: Connection	Emulator
System::THR:52900 RNG:0 DATA:0 INT:200	CINR: dB RSSI: dBm TxPwr: dBm	Start
MAC Me	isage Process	start
22:32:02.609 > UCD Message		1.44
22:32:02.750 < Initial Ranging [FN:626882, RC:0, FO:-161, DP:-2, F	M:850, RP:122250 (50.87:-14.43)]	Stop
22:32:02.701 < RNG-REQ Message [MAC: 0x0018AF00EEC6]		10 m
22:32:02.875 < SBC-REQ Message		Emulator
22:32:02.875 > SBC-RSP Message		100000000
22:32:02.968 < REG-REQ Message		Stop
22:32:02.968 > REG-RSP Message		N. C.
22:32:02.984 > DSA-REQ UL Message		Test Mode
22:32:03.078 < DSA-RSP Message		
22:32:03.078 > DSA-ACK Message		
22:32:03.078 > DSA-REQ DL Message		[DL UDP Test]
22:32:03.171 < DSA-RSP Message		[DL UDP Test]
22:32:03.171 > DSA-ACK Message		
22:32:04.609 > DCD Message		
22:32:06.609 > UCD Message		Run Test
22:32:08.000 < Periodic Ranging (FN:627932, RC:4, FO:-26, DP:196	, RM:608, RP:122981 (50.90:-14.40)]	OPSK (CTC) 1/2
22:32:08.609 > DCD Message		268 byte / 1 frame
22:32:10.609 > UCD Message		Total: 10000 pkt
		Contraction of the
		ON/TOFF1
		Ranging Test
		-
AWT-522A REV 3 VER 4.0.0.86 :: MV	/_BSE_8.75M :: 2058.140.240-3007.0.356	more 1/2

Figure 47 Measurement Window Showing the Initial Ranging Procedure and Negotiation of Basic Capabilities

The messages seen in the Initial Ranging Procedure and Basic Capabilities Negotiation of Figure 47 are:

**Initial Ranging Region** The SS sends this message to provide ranging detection to Information the BS using information received in the Initial Ranging Region. This message serves as the initial request by the SS for uplink resources from the BS. Information contained in this message includes:

- Frame Number (FN): The frame number at which the BS detected Initial Ranging
- Detected Position (DP): The time at which the BS detected Initial Ranging
- Ranging Code (RC): The Ranging Code value sent by the BS and then used by the SS to gain access to allocated uplink resources
- Frequency Offset (FO): The Frequency Offset detected between the SS and the BS during Initial Ranging
- Ranging Matching Rate (RM): The ratio of valid Initial Ranging attempts to total ranging attempts

• **Ranging Power (RP):** The power information for the Initial Ranging Code

This is the response to the Ranging Code or RNG-REQ message sent from the BS to the SS. Information contained in this message includes:

- Timing Adjustment
- Power Level Adjustment
- Frequency Offset Adjustment
- Ranging Status
- DL Frequency Override
- UL Frequency Override
- Burst Profile
- SS MAC Address
- CID

**RNG-REO MAC Management**<br/>MessageThis is the ranging request message sent from the SS to the<br/>BS during the ranging procedure. Information contained in<br/>this message includes:

- Requested DL Burst Profiles
- SS MAC Address
- Ranging Anomalies
- SS Broadcast Capabilities
- **BW-REQ Message** This is the bandwidth request message sent from the SS to the BS.

**ALLOC UL-MAP Message** The BS sends this message to the SS to provide information about the bandwidth allocated to the SS. Information contained in this message includes:

- CID: Requested uplink region's connection ID
- **BR:** Allocated bandwidth size in bytes
- **SL:** The number of slots corresponding to the allocated bandwidth size

# SBC-REQ MAC Management<br/>MessageThe SS sends this message to the BS to initiate the<br/>negotiation of basic physical layer properties. Information<br/>requested in this message includes:

- CID
- Supported PHY parameters
- Supported Bandwidth allocations

# **SBC-RSP MAC Management Message** The BS sends this message to the SS in response to the request for basic physical layer properties. Information provided in this message includes:

- CID
- Supported PHY parameters
- Supported Bandwidth allocations

#### **Registration Procedure**

After the negotiation of physical layer properties, the SS enters the registration procedure with the BS using the REG-REQ / REG-RSP message pair.

Using its primary CID, the SS sends a BW-REQ message to request a new uplink region for the transmission of user traffic. The BS responds with a ALLOC UL-MAP message containing updated bandwidth allocation and primary CID information.

Once the SS has received this information, it proceeds through the registration process consisting of the REG-REQ sent to the BS, followed by the receipt of a REG-RSP from the BS. The completion of the registration process marks the end of the Network Entry procedure.

The Registration Procedure as seen in the Measurement Window of the E6651A is shown in Figure 48.

🐠 WIBRO SUBSCRIBER STATION TESTER : ITS-501A	2006.06.14 16:49 41	EMULATOR
BS EMULATOR Freq: 2.345000000	GHz Att: 0 dB Amp: -15.0 dBm	SETTINGS
Signal: SST UL Amplitude Base Station Information		General Settings
BSID: 0x010203010040		START
ERR: 0, FN: 432990, BC: 1, CNT: 16	MAC ADDR: 001589828F95	Emulator
MAC Messa	ge Process	Start
16:49:18.597 << RNG-REQ Message [MAC: 0x0015B	9B2BF95]	
16:49:18.597 >> RNG-RSP Message		STOP
16:49:18.627 << Periodic Ranging [FN: 432887, DP: 16:49:18.627 >> RNG-RSP Message 16:49:18.657 << BW-RED Message [CID: 0x100, BR	480, RC: 8, FO: 4, RM: 801, RP: 68421 (48.35, -46.9	Emulator
16:49:18.657 >> ALLOC UL-MAP [CID: 0x100, BR: 5	-	Stop
16:49:18.687 << SBC-REQ Message	7, SE. 10J	
16:49:18.687 >> SBC-RSP Message		UL TEST
16:49:18.737 << Periodic Ranging [FN: 432908, DP:	480, RC: 11, FO: 20, RM: 813, RP: 68680 (48.37, -4(	
16:49:18.737 >> RNG-RSP Message	15	[QPSK (CTC) 1/2]
16:49:18.767 << BW-REQ Message [CID: 0x200, BR 16:49:18.767 >> ALLOC UL-MAP [CID: 0x200, BR: 4	-	ON/[OFF]
16:49:18.767 >> ALLUC UL-MAP [CID: 0x200, BR: 4 16:49:18.767 << BW-REQ Message [CID: 0x200, BR	· -	
16:49:18.767 >> ALLOC UL-MAP [CID: 0x200, BR: 4		DL TEST
16:49:18.797 << REG-REQ Message	-,	
16:49:18.797 >> REG-RSP Message		[QPSK (CTC) 1/2]
16:49:18.567 >> RNG-RSP Message		ON/[OFF]
LP:2 LP:4 DTA :: FN: 432922, FLAG: [ R[0] D[0] I[0]	-	
Copyright(c) 2006, Innowireless (Innovation f	or wireless communication) ITS-501A REV 2 VER 2.0.2.8 (10	2.204.302)

**Figure 48** Uplink Region Allocation for Basic CID and Primary CID for Registration Procedure

The messages seen in the Registration Procedure of Figure 48 are:

**REG-REO MAC Management** Message The SS sends this message to request registration with the BS. Information provided in this message includes:

• Secondary CID

- Hashed Message Auth Code
- IP Version
- Vendor ID
- CS Capability
- ARQ Parameter

#### REG-RSP MAC Management Message

The BS sends this message to the SS in response to the registration request. Information provided in this message includes:

- Secondary CID
- OK/Not
- HMAC Tuple
- IP Version
- Vendor ID
- CS Capability
- ARQ Parameter

#### **Periodic Ranging for Connection Maintenance**

After the Network Entry procedure has been completed, the SS engages in the Periodic Ranging procedure to assist in maintaining a reliable connection with the network.

The Periodic Ranging Procedure as seen in the Measurement Window of the E6651A is shown in Figure 49.

BS EMULATOR         Freq: 2.345000000         GHz         Att: 0 dB         Amp: -15.0 dBm         SETUR           Signal:         SST         UL         INT         SST         Control of the final intermediate inter	eral ings IRT lator
Signal:     SST_UL_INT_SAT_IOC_IERR_IMAL_INA_MOD_RF       Amplitude     -1\$ dBm       Base Station Information     Subscriber Station Information       BSID: 0x010203010040 ERR: 0, FN: 499359, BC: 1, CNT: 16     MAC ADDR: 001589828F95       MAC Message Process     Station Information       16:54:46.188 >> DCD Message     Station Information	ings IRT lator
Base Station Information     Subscriber Station Information       BSID: 0x010203010040 ERR: 0, FN: 499359, BC: 1, CNT: 16     MAC ADDR: 001589828F95       Image: Comparison of the state	IRT lator
BSID: 0x010203010040 ERR: 0, FN: 499359, BC: 1, CNT: 16         MAC ADDR: 0015B9B2BF95         STA           Image: State of the stat	ator
BSID: 0x0102/03010040         MAC ADDR: 0015898/28F95         Emul           ERR: 0, FN: 499359, BC: 1, CNT: 16         Emul         Emul           MAC Message Process         Stat           16:54:46.188 >> DCD Message         Stat	ator
MAC Message Process Sta 16:54:46.188 >> DCD Message	
16:54:46.188 >> DCD Message	art
16:54:47 189 STILD Message	
	OP
16:54:48.191 >> DCD Message	
16:54:49.192 >> UCD Message Emul.	ator
16:54:49.493 << Periodic Ranging [FN: 499061, DP: 478, RC: 7, FO: 41, RM: 830, RP: 28331 (44.52, -50.	
16:54:49.493 >> RNG-RSP Message Sto	op
16:54:50.194 >> DCD Message	
	EST
16:54:44.355 >> SBC-RSP Message	
16:54:44.395 << Periodic Ranging [FN: 498042, DP: 480, RC: 10, FO: 35, RM: 664, RP: 17450 (42.42, -52 [QPSK (C	TC) 1/2]
16:54:44.395 >> RNG-RSP Message	orrl
10.54.44.425 << bit NLQ Message [EID: 0x200, DK. 45]	UFF
16:54:44.425 >> ALLOC UL-MAP [CID: 0x200, BR: 45, SL: 8]	
16:54:44.435 << BW-REQ Message [CID: 0x200, BR: 45]	EST
16:54:44.435 >> ALLOC UL-MAP [CID: 0x200, BR: 45, SL: 8]	
16:54:44.456 << REG-REQ Message [QPSK (C	TC) 1/2]
16:54:44.456 >> REG-RSP Message	0551
10.34/43.197 // 000 Pressage	onj
LP:2 LP:4 PRD :: ERR: 0, FrmaeNumber: 499061, DetectPos: 478, FreqOffset: 41	
R[0] D[0] I[0] PRD :: RngCodeIDX: 7, RngMath: 830, RngInPower: 28331 Copyright(c) 2006, Innowireless (Innovation for wireless communication) IT5-501A REV 2 VER 2.0.2.8 (102.204.302)	

Figure 49 Periodic Ranging Procedure

The message used in the Periodic Ranging Procedure of Figure 49 is:

Periodic Ranging Region<br/>InformationThe SS sends this message to provide ranging detection to<br/>the BS for connection maintenance using information<br/>received in the Periodic Ranging Region. This message<br/>serves as a request by the SS for continued uplink resources<br/>from the BS. Information contained in this message includes:

- Frame Number (FN): The frame number at which the BS detected Periodic Ranging
- **Detected Position (DP):** The time at which the BS detected Periodic Ranging
- **Ranging Code (RC):** The Ranging Code value sent by the BS and then used by the SS to gain access to allocated uplink resources
- Frequency Offset (FO): The Frequency Offset detected between the SS and the BS during Periodic Ranging

- **Ranging Matching Rate (RM):** The ratio of valid Periodic Ranging attempts to total ranging attempts
- **Ranging Power (RP):** The power information for the Periodic Ranging Code

#### **REP-REQ** message Setting

The E6651A Test Set can control the transmission of REP-REQ message. The message is sent from BS to SS and is used to get the SS's status information by the BS. Two control parameters are provided.

- REP-REQ msg. Enable/Disable Setting
- REP-REQ msg. Transmission rate control : determines time interval between subsequent messages.

E6651A Mobile WIMAX Test Set		BSE SETTING
BS EMULATOR Freq: 2.345000000 GHz	Att: 10 dB Amp: -20.0 dBm	Timing Offset
SST UL INT IOM CREDITISN CRMT CAT LOC		
Preamble Index	Ô	
		[0]
Base Station Information	Subscriber Station Information	
BSID: 0x010203010040 FN: 2815376, Burst: 1, CSN: 0 FnErr: 14	MAC ADDR: BW: 0	REP-REQ msg.
Ping Test::		
	STATE:	Louis Inco
System::THR:54365 RNG:0 DATA:0 INT:0	CINR: dB RSSI: dBm TxPwr: dBm	[ON]/OFF
	age Process	Rate: per 60 frames
20:19:05.125 > DCD Message		Full Occupied
20:19:09.812 > UCD Message		Tur occupied
20:19:14.531 > DCD Message		
20:19:19.328 > UCD Message		
20:19:24.210 > DCD Message		ON/[OFF]
20:19:29.000 > UCD Message 20:19:33.843 > DCD Message		
20:19:38.421 > UCD Message		
20:19:43.125 > DCD Message		Sam. Freq. Offset
20:19:47.921 > UCD Message		
20:19:52.703 > DCD Message		
		[0.00] Hz
20:17:54.781 > UCD Message		
20:17:59.406 > DCD Message		
20:18:04.015 > UCD Message		DLMap Rep.
20:18:08.734 > DCD Message		
20:18:13.468 > UCD Message		[No]
20:18:18.156 > DCD Message		[140]
20:18:22.906 > UCD Message		Repetition
20:10:27.562 > DCD Message		
20:18:32.203 > UCD Message		ULMAP Rep.
20:18:36.890 > DCD Message		and a roop
20:18:41.546 > UCD Message 20:18:46.250 > DCD Message		
20:18:46.250 > DCD Message 20:18:50.921 > UCD Message		[No]
20:18:55.609 > DCD Message		Repetition
20:19:00.296 > UCD Message		inspectoon i
	.75M)] = 2058.190.290-300E.0.3004	
E6651A ver. 5.0.0.1 = [ 85E : 1.A (8	rvau/1 = 502011401540-30061013004	more 2/3

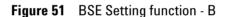
Figure 50 BSE Setting function - A

**Full Occupied Setting** The E6651A provides the function to fill unallocated sub-channels and symbols of downlink frame with arbitrary data to support mobile WiMAX RCT test function. The "Full Occupied" setting is a toggle function.

- **On:** fill unallocated data region of downlink frame with arbitrary data bits.
- Off: don't fill unallocated data region of downlink frame.

**Repetition Setting** The E6651A can repeat UL MAP and DL MAP information in downlink frames. The repetition control function is provided as shown in Figure 50 on page 183. And the DL/UL user data repetition function is provided also as shown in Figure 51.

E6651A Mobile WIMAX Test Se	et			BSE SETTING
BS EMULATOR	Freg: 2.345000000 GHz	Att: 10 dB	Amp: -20.0 dBm	DL Burst Rep.
SST UL INT 10M			PAU MOD RE	
Preamble Index			Ô	[No]
	ion Information	Subscriber Stat	tion Information	Repetition
BSID: 0x010203010040		MAC ADDR:		
FN: 2815376, Burst: 1, CSN: 0 FnErr: 14		BW: 0		UL Burst Rep.
Ping Test::				[No]
		STATE:		[NO]
System::THR:54326 RNG:0 DA		CINR: dB RSSI: dBm T	xPwr: dBm	Repetition
	MAC Mess	age Process		
20:19:05.125 > DCD Message				Bandwidth Mode
20:19:09.812 > UCD Message				
20:19:14.531 > DCD Message 20:19:19.328 > UCD Message				
20:19:24.218 > DCD Message				[BW-REQ]/UGS
20:19:29.000 > UCD Message				[pw-kcQ]/ogs
20:19:33.843 > DCD Message				
20:19:38.421 > UCD Message				0.110
20:19:43.125 > DCD Message				Symbol Num
20:19:47.921 > UCD Message				
20:19:52.703 > DCD Message				DL : 27
-				u. 115
20:17:54.781 > UCD Message				UL ? 15
20:17:59.406 > DCD Message				
20:18:04.015 > UCD Message				
20:18:08.734 > DCD Message				
20:18:13.468 > UCD Message				
20:18:18.156 > DCD Message				
20:18:22.906 > UCD Message				
20:18:27.562 > DCD Message				
20:18:32.203 > UCD Message				
20:18:36.890 > DCD Message				
20:18:41.546 > UCD Message				
20:18:46.250 > DCD Message				
20:18:50.921 > UCD Message				
20:18:55.609 > DCD Message				
20:19:00.296 > UCD Message				
	E6651A ver. 5.0.0.1 = [ BSE : 1.A (8	.75M)] :: 2058.190.290-300E.0.3004		more 3/3



**Bandwidth Request Mode** Setting The E6651A provides two bandwidth allocation algorithms to allocate uplink data region for SS's data transmission. They are BW-REQ and UGS. The BW-REQ algorithm allocates uplink data region based on bandwidth request from SS. The UGS algorithm allocates uplink data region amount to "UL BW Size". You can select between the two algorithms as shown in Figure 51.

- n
- **Symbol Number** Allocated number of symbols between uplink and downlink can be adjusted in the E6651A as shown in Figure 51. You can adjust uplink and downlink symbol ratio.

#### **Profile Selection**

The Profiles are displayed in 2 lists, the **File List** and the **Memory List**. The **Memory List** shows the profiles loaded in FPGA Memory. To be used, a profile must be loaded into FPGA memory.

The required profile can be selected for use as follows:

- **1** Press **System > More > Profile Manager** to display the Profile Manager screen as shown in Figure 52.
- 2 Press **Memory List** and use the knob, arrow or numeric entry keys to highlight the required profile in the Memory List.
- **3** Press **Activate Profile** to test the SS using the selected profile.

6651A Mobile WIMAX Text Set			
BS EMULATOR Freq: 2.00000000 GHz	Att: 30 dB	Amp: -52.0 dBm	File List
BSE UL INT IOM RELITERASA DHT SAT O	CELT THE OPTIMAL	TPAIL   HODDE DE	
File Index 5			[5]
File List	Men	Memory List	
Profile Type : [ BSE : 3.A (10MHz) ] Profile Version : 0000.0190.0290-0003.0000.3005	Bank 1 - Profile Type : [ BSE : 1.A (9.75M)] Profile Version : 2059.0140.0242-3007.0000.0362		Memory List
Profile Type : [ BSE : 3.A (10*Hz) ] Profile Version : 0000.0190.0291-0003.0000.3006	Bank 2 - Profile Type : [ BSE : 1.A (8.75M)] Profile Version : 2058.0190.0290-3007.0000.3006		103
Profile Type : [ BSE : 1.A (8.75M)] Profile Verson : 2058.0140.0242-3007.0000.0362	Bank 3 - Profile Type : [ BSE : 3.A (104Hz) ] Profile Verson : 0000.0190.0290-0003.0000.3006		[1]
Profile Type : [ BSE : 1.A (8.75M)] Profile Version : 2058.0150.0259-3007.0000.3005	Bank 4 - Profile Type : Profile Version :		Upload Profile
	Bank 5 - Profile Type : Profile Version :		
			File -> Memory
	Bank 7 - Profile Type : Profile Version :		Activate Profile
	J[L		1

Figure 52 Certification Profile Selection window

- 4 If the required profile is not in the **Memory List** press File List and highlight a **Profile Type** in the File List.
- **5** Press **Memory List** and use the knob, arrow or numeric entry keys to highlight a free **Bank** in the **Memory List**.
- **6** Press **Upload Profile** to upload the selected profile into FPGA memory. The profile name is displayed in the Bank list.
- 7 Highlight and activate the profile for use as described in steps 2 and 3.

#### A Appendix A - Network Entry Procedure