Agilent Technologies 8960 Series 10 Wireless Communications Test Set

Manual Operation Guide

Making C.S0033-A Tests Manually

E1966A 1xEV-DO Terminal Test Application Revision: A.06
E6706A 1xEV-DO Lab Application Revision: A.03

1000-1927 (not orderable)

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Introduction

The intent of this guide is to help you quickly learn how to use the E1966A and E6706A 1xEV-DO Applications to manually make access terminal receiver and transmitter tests as specified in the C.S0033-A standard.

- See "Performing Individual C.S0033-A Tests" on page 7.

In addition, two measurements that are used for fast calibration on an access terminal are also provided:

- TX Dynamic Power Measurement Description
- Fast Device Tune Measurement Description

The "Appendix" includes additional information to help you perform the C.S0033-A tests:

- Test Adherence to Standards table that shows which tests are supported by the test set.
- General procedures that are required to set up the measurements.
- Calibration procedures that must be performed periodically when testing access terminals with the test set.
- Amplitude Offset information to help you properly account for losses in your system.

The scope of this guide does not cover the numerous features and capabilities of the test set. For additional information, refer to the E1966A/E6706A Online User's Guide which is available at:

- http://wireless.agilent.com/rfcomms/refdocs/1xevdo/, or
- User Documentation CD-ROM shipped with your application.

Performing Individual C.S0033-A Tests

This chapter demonstrates the step-by-step procedures for making the following tests specified in the C.S0033-A standard. The procedures for each test are based on one set of settings as specified for the test. However, the general setup procedures are the same for other sets of settings. To learn more about which tests are supported by the test set, see "Test Adherence to Standards" on page 68.

Measuring Packet Error Rate (PER)

Last updated: July 21, 2006

General Procedure

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on.
2. Wait for the access terminal to open a session and then open an FTAP (for subtype 0 physical layer) or FETAP (for subtype 2 physical layer) test data connection for AT's receiver test. See "How Do I Open a Session and Test Data Connection?" on page 72 for detailed procedure.
3. Set the `FTAP Rate` (**F11**) on the `Call Parms 1 of 3` menu as needed if during an FTAP connection, or set the `F-Traffic Format` (**F12**) on the `Call Parms 1 of 3` menu as needed if during an FETAP connection.
4. Initialize the PER measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Packet Error Rate` measurement and press the knob.
5. Select `Packet Error Rate Setup` (**F1**) to access the `Packet Error Rate Setup` menu. From this menu you can configure measurement parameters such as `Confidence Level`, `PER Requirement`, as well as some general parameters that are required for some C.S0033 tests. For example, you can set `AT Directed Packets`, which helps you optimize PER test throughput.

NOTE If Limited TAP is on while Test Application Protocol is set to FTAP, AT Directed Packets must not be greater than 50%.

Packet Error Rate Setup	Value
Confidence Level	95.00 %
PER Requirement	1.00 %
Minimum Packet Count	0
Maximum Packet Count	10000
Control Channel Data Rate	76.8 kbps
AT Directed Packets	50 %
Trigger Arm	Continuous
Measurement Timeout	Off

6. Select `Close Menu` (**F6**) to close the `Packet Error Rate Setup` window.

7. From the `Call Parms` menu, configure `Cell Power` (**F7**) and `FTAP Rate` (**F11**), as needed. See “How Do I Change Call Parameters?” on page 77 for detailed procedure.

NOTE If Limited TAP is on while Test Application Protocol is set to FTAP, RTAP Rate must be set to 9.6 kbps.

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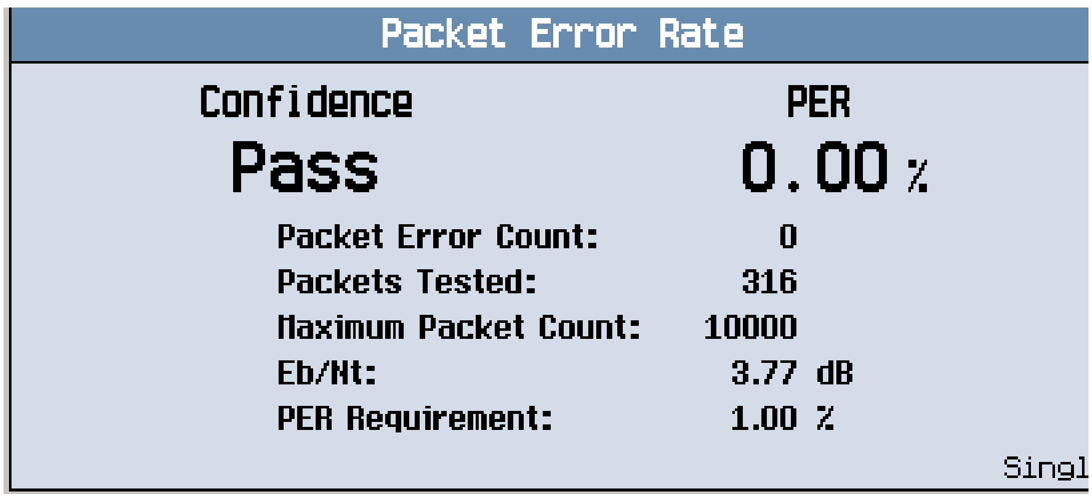
8. From the `Call Control` menu, configure `AWGN Power` (**F3**), as needed. (If you set AWGN Power too high relative to Cell Power, you may drop the connection). See “How Do I Change Generator Information?” on page 93 for detailed procedure.
9. Measure PER:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous` the measurement began executing as soon as you initialized it in step 3.

A typical display is shown below:



Testing 3.2.1 Demodulation of Forward Traffic Channel in AWGN

For details on performing the steps below, see the “General Procedure” on page 8 above.

1. C.S0033 specifies to set the AN forward packet activity to 100%. Forward packet activity is fixed in the test set, always set to 100%. See Fixed Settings.
2. Set the `Control Channel Data Rate to 38.4 kbps` (see “How Do I Change Cell Parameters?” on page 83).
3. C.S0033 specifies to set Pilot Drop to -14 dB. Set `Pilot Drop to 28` (see “How Do I Change Cell Parameters?” on page 83). Note that changing the Pilot Drop results in a session re-negotiation.
4. Set up a Test Application session and open an FTAP connection for tests 1-18. See “How Do I Open a Session and Test Data Connection?” on page 72 for detailed procedure.
5. Initialize the PER measurement.
6. Set `AT Directed Packets` under the `Application Config` (**F10** on `Call Parms 1 of 3`) menu as needed (In an FTAP connection, if Limited TAP is on, AT Directed Packets must not be greater than 50%,

and RTAP Rate must be set to 9.6 kbps).

7. Set the `ACK Channel Bit Fixed Mode Attribute` to `Off` under the `Application Config` (**F10** on `Call Parms 1 of 3`) menu. (Otherwise, you may drop the data connection when AWGN is applied. This recommendation is based on many of experiments.)

8. Set $\hat{I}_{or}$ (`Cell Power`) to `-55 dBm/1.23 MHz`.

9. Set I_{oc} (`AWGN Power`) and Data Rate/Slots per Physical Layer Packet (`FTAP Rate`) for tests 1-18 as specified by C.S0033.
   For example, in test 15, set the `FTAP Data Rate` to `307.2 kbps (2 Slot)` and set the `AWGN Power` to `-52.5 dBm/1.23 MHz`.

10. Set `Confidence Level` to `95%` and `PER Requirement` as specified by C.S0033.

11. Set `Maximum Packet Count` as desired.

12. Measure PER for tests 1-18.

13. If your AT supports Subtype 2 Physical Layer, continue to measure PER for tests 19-28 and 30 with the following setups.

   - Set `Pilot Drop` to `32` (corresponding to -16 dB). Note: This results in a session re-negotiation. See "How Do I Change Cell Parameters?" on page 83.
   - Set up a Test Application session and open an FETAP connection. See "How Do I Open a Session and Test Data Connection?" on page 72 for detailed procedure.
   - Set $\hat{I}_{or}$ (`Cell Power`), I_{oc} (`AWGN Power`) and forward packet format (packet size, slots, preamble length, data rate) per Physical Layer Packet for tests 19-30 as specified by C.S0033.
     For example, for test 25, set the `Cell Power` to `-55 dBm/1.23 MHz`, the `AWGN Power` to `-47.07 dBm/1.23 MHz`. Set the `F-Traffic Format` to `1 (512, 16, 1024)` and the `Max Forward Packet Duration` to `4 slots` which results in the nominal data rate of 19.2 kbps and the effective data rate of 76.8 kbps. (The `Max Forward Packet Duration` is set from the `Termination Parameters` menu, see "How Do I Change Generator Information?" on page 93 for detailed procedure).
   - Repeat steps 9 -11 for tests 19-30.

Testing 3.2.2 Demodulation of Forward Traffic Channel in Multipath Fading Channel (Lab Application Only)

This test requires a faded signal with AWGN. When the test set is configured to generate faded forward channel signals with AWGN enabled, it requires a rear panel digital bus connection to an external PC running Baseband Studio software.

The Baseband Studio software is capable of generating fading patterns and AWGN on the forward channel. RF power levels, including AWGN, are controlled by this software. (Note that when the test set is configured to generate a faded signal, the test set's internal AWGN generator is automatically turned off to allow the AWGN to be added by the external fading software. The resulting RF signal from the test set will have fading applied to the forward channel only, with no fading applied to AWGN.)

For detailed setup and operating instructions pertaining to the faded signal generation, refer to the:

E5515C Fading Solution Application Guide

(It can be downloaded at *http://cp.literature.agilent.com/litweb/pdf/1000-1894.pdf*).

1. C.S0033 specifies to set the AN forward packet activity to 100%. Forward packet activity is fixed in the test set, always set to 100%.
2. Set the `Control Channel Data Rate` to `38.4 kbps`.
3. C.S0033 specifies to set Pilot Drop to -14 dB. Set `Pilot Drop` to `28` (see "How Do I Change Cell Parameters?" on page 83).
4. Set up a Test Application session and open an FTAP connection for tests 1-24. See "How Do I Open a Session and Test Data Connection?" on page 72 for detailed procedure.
5. Initialize the PER measurement. (See step 3 of "General Procedure" on page 8.)
6. Set up the following key parameters from the Baseband Studio software. For example, for test 1:
   - Set the `Cell Band` to a value supported by your AT (for example, `US PCS`).
   - Set the `Channel` to a value supported by your AT (for example, `425`).
   - Set $\hat{I}_{or}$ (`Cell Power`) to `-55 dBm/1.23 MHz`.
   - Set I_{oc} (`AWGN Power`) to `-49 dBm/1.23 MHz` (for Band 0: US Cellular) or `-47.6 dBm/1.23 MHz` (for Band 1: US PCS).
   - Select the `1xEV-DO Mobile Station` fading configuration `Case 1` from the standard `Path Config` menu.
7. Set up the following key parameters from the `Packet Error Rate Setup` menu on the test set. For example, in test 1 as specified by C.S0033:
   - Set `FTAP Rate` (Data Rate/Slots per Physical Layer Packet) to `38.4kbps`.
   - Set `Confidence Level` to `95%` and `PER Requirement` to `3.00%`.
   - Set `Maximum Packet Count` as desired.
   - Set `Minimum Packet Count` to 375 for test 1. (C.S0033 specifies the minimum test duration required for channel simulator configuration 1 is 6000 slots. The test 1 specifies at data rate of 38.4 kbps (16 slots per packet). So the minimum packet count should be 6000/16=375 packets.)
   - Set `AT Directed Packets` as needed (if Limited TAP is on, AT Directed Packets must not be greater than 50%, and RTAP Rate must be set to 9.6 kbps).
8. Measure PER. Repeat the steps 5 - 7 and change the parameters as required for each of the tests 1-24.
9. If your AT supports Subtype 2 Physical Layer, continue to measure PER for tests 25-28 with the following setups.
   - Set up a Test Application session and open an FETAP connection.
   - Follow the above steps 6-7, set $\hat{I}_{or}$ (`Cell Power`), I_{oc} (`AWGN Power`) and transmission format (packet size, slots, preamble length, data rate) per Physical Layer Packet for tests 25-28 as specified by C.S0033. For example, for test 25, set the `Cell Power` to `-55 dBm/1.23 MHz`, the `AWGN Power` to `-67.5 dBm/1.23 MHz` (for Band 0: US Cellular) or `-62.5 dBm/1.23 MHz` (for Band 1: US PCS). Set the `F-Traffic Format` to `1 (512, 16, 1024)` and the `Max Forward Packet Duration` to `4 slots` which results in the nominal data rate of 19.2 kbps and the effective data rate of 76.8 kbps. (The `Max Forward Packet Duration` is set from the `Termination Parameters` menu, see "How Do I Change Generator Information?" on page 93 for detailed procedure).

Testing 3.3.1 Receiver Sensitivity and Dynamic Range

For details on performing the steps below, see the "General Procedure" on page 8 above.

1. Set up a Test Application session and open an FTAP or FETAP connection. See "How Do I Open a Session and Test Data Connection?" on page 72 for detailed procedure.
2. Initialize the PER measurement.
3. Set `AT Directed Packets` as needed (if in a FTAP connection, Limited TAP is on, AT Directed Packets must not be greater than 50%, and RTAP Rate must be set to 9.6 kbps).
4. Receiver Sensitivity (test 1): Set $\hat{I}_{or}$ `(Cell Power)` to -105.5 dBm/1.23 MHz. Set `FTAP Rate` to `307.2 (2 Slot)` if in an FTAP connection or set `F-Traffic Format` to `4 (1024, 2, 128)` (corresponding to 307.2 kbps) if in an FETAP connection.
5. Dynamic Range: Set $\hat{I}_{or}$ `(Cell Power)` to -25 dBm/1.23 MHz. Set `FTAP Rate` to `307.2 (2 Slot)` for test 2 or `2457.6 (1 Slot)` for test 3 if in an FTAP connection, or set `F-Traffic Format` to `4 (1024, 2, 128)` for test 2 or `C (4096, 1, 64)` for test 3 if in an FETAP connection
6. Set `Confidence Level` to `95%` and `PER Requirement` to 0.50%.
7. Set `Maximum Packet Count` as desired.
8. Measure PER for each test.

Measuring Access Probe Power

- "General Procedure"
- "Testing 4.3.1 Range of Open Loop Output Power"

General Procedure

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the access probe power measurement. See "Calibrating the Test Set" on page 97 for details.

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session. See "How Do I Open a Session and Test Data Connection?" on page 72 for more details.
2. Initialize the access probe power measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Access Probe Power` measurement and press the knob.
3. Select `Access Probe Power Setup` (**F1**) to access the `Access Probe Power Setup` menu. From this menu you can configure measurement parameters such as `Measurement Timeout` and `Trigger Arm`, and also access parameters (such as `Open Loop Adjust` and `Probe Sequence Max`), specified for some C.S0033 tests.

Access Probe Power Setup	Value
Open Loop Adjust	81 dB
Probe Initial Adjust	0 dB
Probe Power Step	0.0 dB
Probe Num Step	5
Probe Sequence Max	1
Preamble Length (Frames)	7
Trigger Arm	Continuous
Measurement Timeout	Off

4. Select `Close Menu` (**F6**) to close the `Access Probe Power Setup` window.

5. Set the access network to ignore all access attempts by setting `Call Limit Mode` to `On` (**F10** on the `Call Parms 2 of 3` menu). See "How Do I Change Call Parameters?" on page 77 for more details.

NOTE It is recommended that you always turn Call Limit Mode on when measuring access probe power. The easiest way to induce access probes from the access terminal is to page the access terminal. If you do not have call limit mode set to on, when you page the access terminal, the connection will complete, which clears the access probe power result from the measurement screen.

Set call limit mode back to off when you have finished measuring access probe power.

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6. If you wish to only capture the first access probe, set `Trigger Arm` to `Single` and press the **START SINGLE** key. When the `Trigger Arm` is set to `Continuous`, the test set will display the power level of the most recent access probe power measurement. In either case, a measurement result will not be returned until you complete step 7.

IMPORTANT If `Trigger Arm` is set to `Single`, you must press the **Start Single** key to arm the measurement. The measurement will not operate until you arm it by pressing the **Start Single** key.

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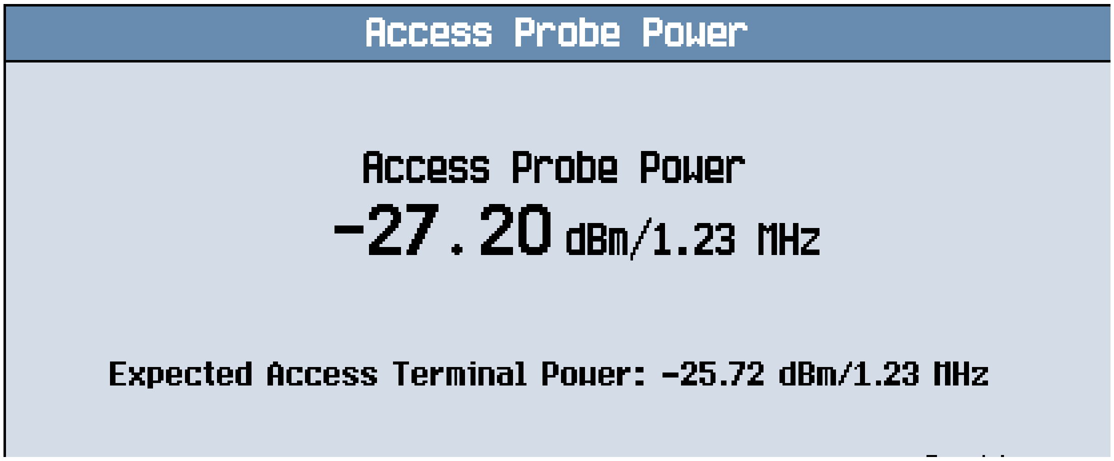
7. In order to perform the access probe power measurement, the access terminal must send an access probe. The easiest way to induce this is to page the AT (open a connection) by selecting `Start Data Connection` (**F3** on the `Control 2 of 2` menu). When the AT sends an access probe in response the page, its power level will be measured and displayed.
8. After finishing the measurements:
   - End the connection attempt by selecting `End Data Connection` (**F3** on the `Control 2 of 2` menu).
   - Turn the `Call Limit Mode` back to `Off`.
   - Turn the access probe power measurement off by pressing the **Measurement selection** key, selecting `Access Probe Power`, then `Close Measurement` (**F4**).

IMPORTANT If the access probe power measurement is on and waiting to measure a probe, all other measurements (except digital average power) will not be able to execute. It is therefore recommended that you turn off the access probe power measurement before attempting any other measurements.

A typical display is shown below:



Testing 4.3.1 Range of Open Loop Output Power

For details on performing the steps below, see the "General Procedure" on page 13 above. In the *lab application*, the 4.3.1 test can also be performed with Graphical Access Probe Power measurement, see "Measuring Graphical Access Probe Power" on page 17.

1. This test specifies using Default Access Channel MAC Protocol and Access Parameter message. See "To Configure the Test Set to Default Access Channel MAC Subtype" on page 86 for detailed procedure.
2. Set the `Cell Band` and `Channel` as needed and wait for access terminal automatically opening a session.
3. Initialize the access probe measurement.
4. Set `Probe Power Step` to `0 dB`. This ensures that all access probes in the probe sequence will transmit at the same power level, rather than incrementing in power. This is beneficial in manual operation if you are running the measurement in continuous mode for the purpose of measuring the power level of all of the probes rather than just the first probe in the sequence.
5. Set `Probe Sequence Max` to `1`.
6. Set `Preamble Length` to `7`.
7. Set `Open Loop Adjust` to `78 dB` or `81 dB`, depending upon band class.
8. C.S0033 specifies to set the AN forward packet activity to 100%. Forward packet activity is fixed in the test set, always set to 100%.
9. Set the access network to ignore all access attempts by setting `Call Limit Mode` to `On`.
10. Set $\hat{I}_{or}$ (`Cell Power`) to `-25`, `-65` or approximately `-95 dBm/1.23 MHz` (value depends on band class and access terminal class) for tests 1-3 as specified by C.S0033.

IMPORTANT If `Trigger Arm` is set to `Single`, you must press the **Start Single** key to arm the measurement. The measurement will not operate until you arm it by pressing the **Start Single** key.

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11. Send a page to the access terminal by selecting `Start Data Connection`.
12. Measure access probe power.

13.Stop the page to the access terminal by selecting `Stop Data Connection`.

14.Perform steps 10-13 for tests 1-3.

Measuring Graphical Access Probe Power

This section is only applicable to the lab application.

- "General Procedure"
- "Testing 4.3.1 Range of Open Loop Output Power"

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the graphical access probe power measurement. See "Calibrating the Test Set" on page 97 for details.

General Procedure

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session. See "How Do I Open a Session and Test Data Connection?" on page 72 for more details.
2. Initialize the graphical access probe power measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Graphical Access Probe Power` measurement and press the knob.
3. Select `Graphical Access Probe Pwr Setup` (**F1**) to access the `Graphical Access Probe Power Setup` menu. Turn the knob to select the parameters and set the value as required for your test situation. For example,
   - set `Probe Power Step` to `2.0 dB`.
   - set `Probe Num Step` to `6`.
   - set `Probe Sequence Max` to `4`.
   - set `Preamble Length (Frames)` to `7`.

NOTE The Probe Sequence Max is a "Configurable Attribute" that is configured during the Session Negotiate State. Its value can not be changed when a session is open and Call Limit Mode is on.

Graphical Access Probe Power Setup	Value
Open Loop Adjust	81 dB
Probe Initial Adjust	0 dB
Probe Power Step	2.0 dB
Probe Num Step	6
Probe Sequence Max	4
Preamble Length (Frames)	7
Measurement Timeout	Off

4. Select `Close Menu` (**F6**) to close the `Graphical Access Probe Power Setup` menu.
5. Set the access network to ignore all access attempts by setting `Call Limit Mode` to `On` (**F10** on the `Call Parms 2 of 3` menu).

NOTE It is recommended that you always turn all Limit Mode on when measuring graphical access probe power. The easiest way to induce access probes from the access terminal is to page the access terminal. If you do not have call limit mode set to on, when you page the access terminal, the connection will complete, which clears the access probe power result from the measurement screen.

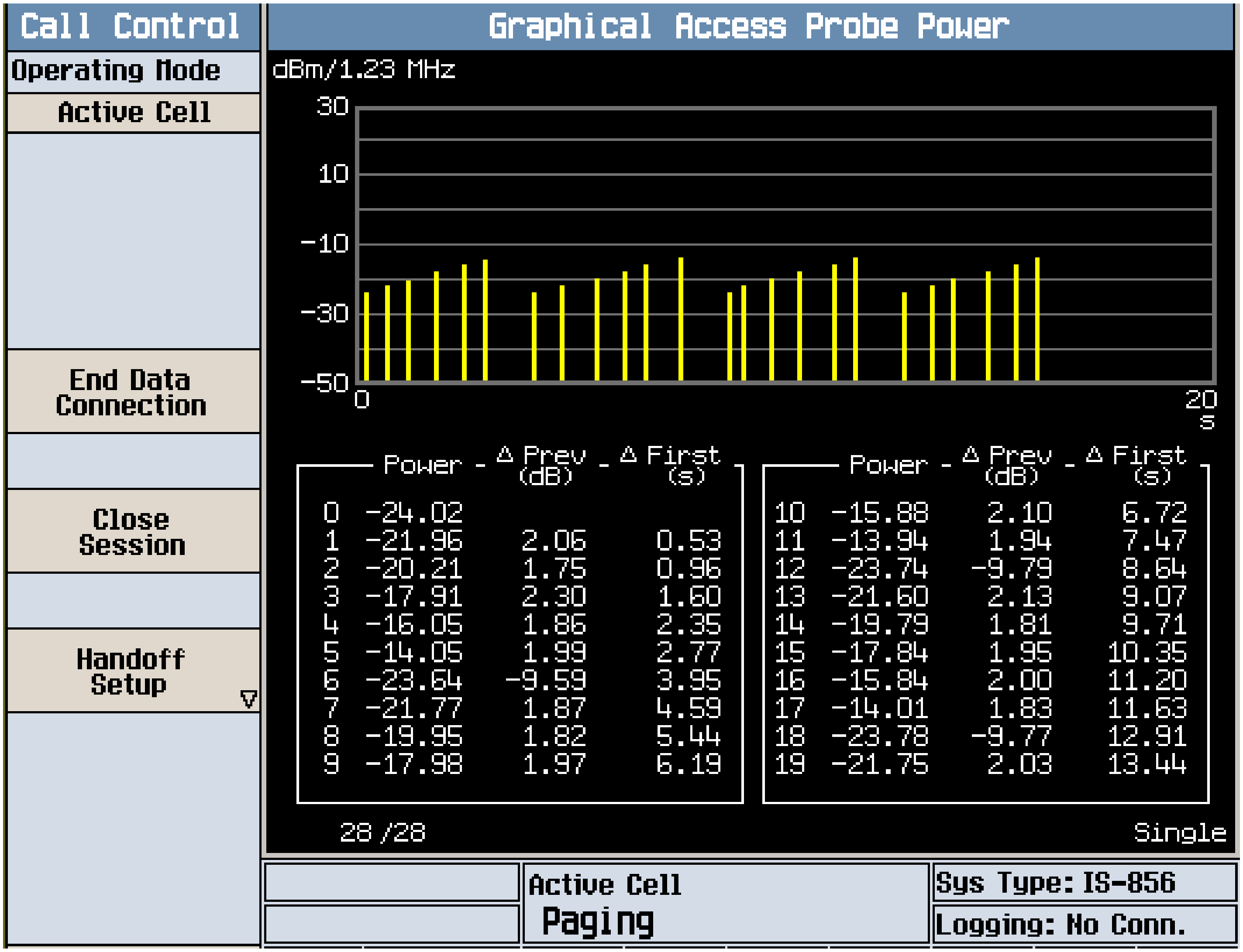
Set call limit mode back to off when you have finished measuring access probe power.

6. Press the **START SINGLE** key to arm the measurement. The measurement result will not be returned until you complete step 7.

IMPORTANT The measurement will not operate until you arm it by pressing the **Start Single** key.

7. In order to perform the graphical access probe power measurement, the access terminal must send access probes. The easiest way to induce this is to page the AT (open a connection) by selecting `Start Data Connection` (**F3** on the `Call Control 2 of 2` menu).

8. When the AT sends access probes as specified in step 3, their power levels will be measured and displayed. As shown below, the measurement results are displayed in both a tabular and a bar graph formats.



9. (Optional) To adjust the display view, see “Set Up the Graphical View” .

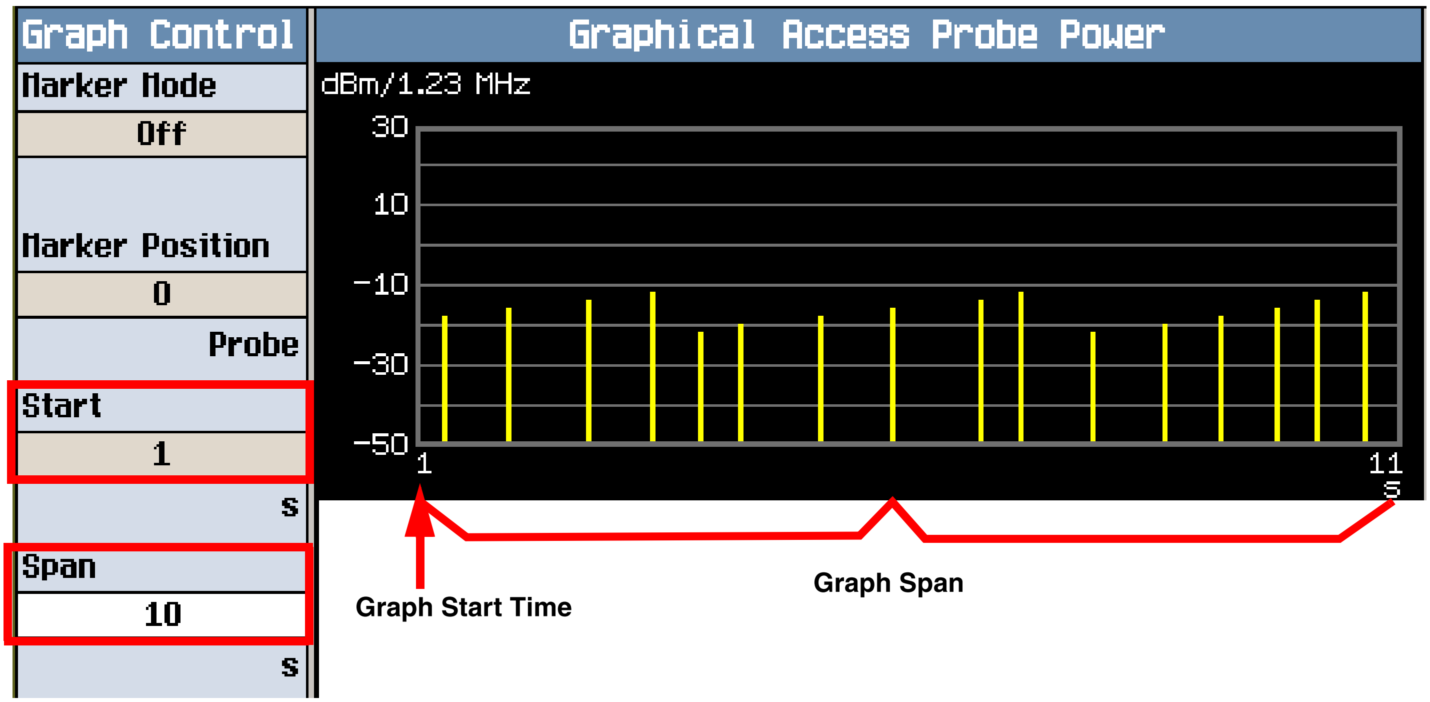
10.After finishing the measurements:

- End the connection attempt by selecting `End Data Connection` (**F3** on the `Control 2 of 2` menu).
- Turn the `Call Limit Mode` back to `Off`.
- Turn the graphical access probe power measurement off by pressing the **Measurement selection** key, selecting `Graphical Access Probe Power`, then `Close Measurement` (**F4**).

IMPORTANT If the access probe power measurement is on and waiting to measure a probe, all other measurements will not be able to execute. It is therefore recommended that you turn off the graphical access probe power measurement before attempting any other measurements.

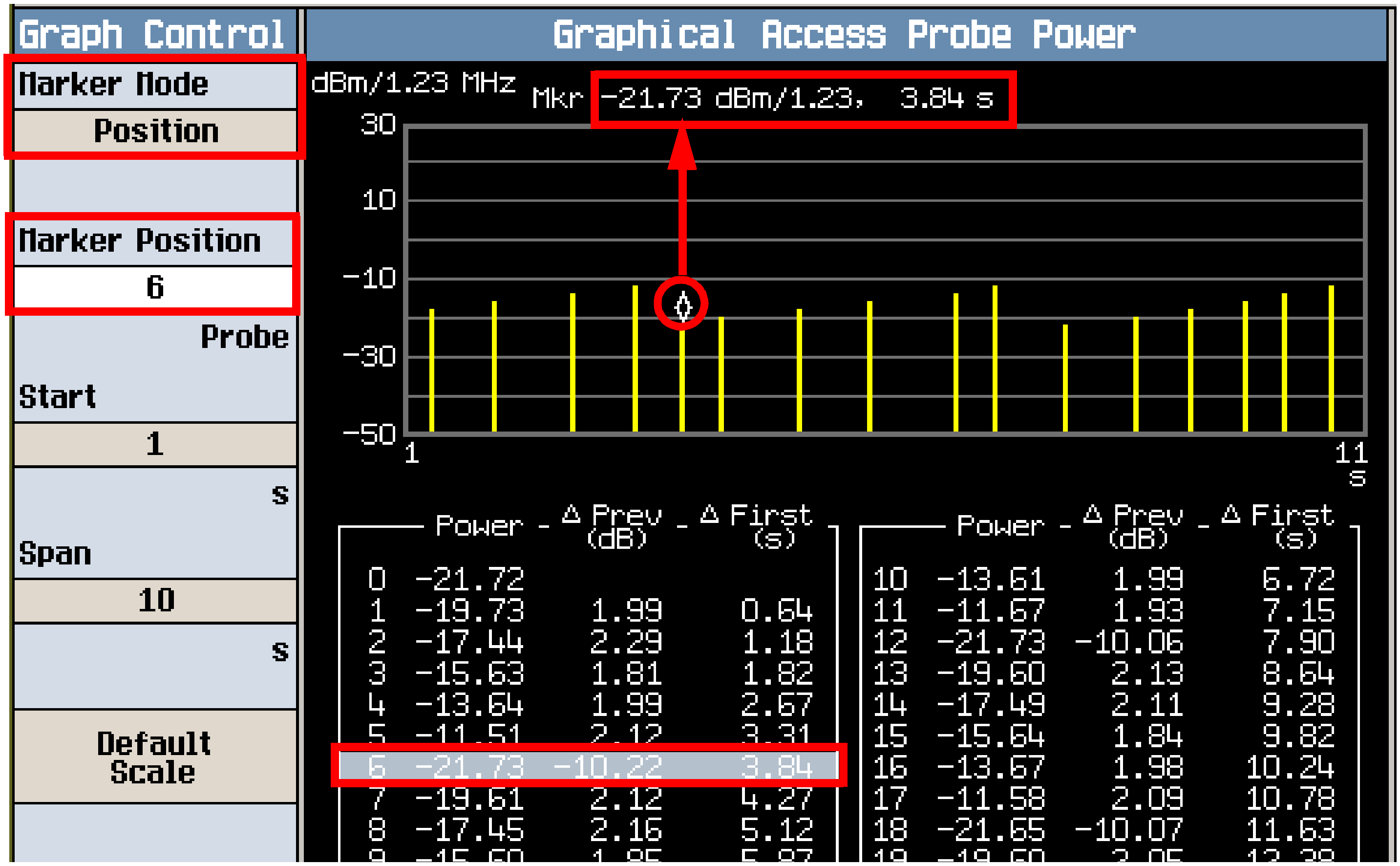
Set Up the Graphical View

1. Press the **More** key on the left side of the display `until 1 of 2` is displayed.
2. Press the `Graph Control` (**F2**) key.
3. Select the `Start` (**F3**) and `Span` (**F4**) to adjust the span of the graph display. The graph window can be adjusted to include the entire 120 second range or only a portion of the 120 second time period of particular interests. The graph can display up to 60 access probes, labeled 0 through 59.

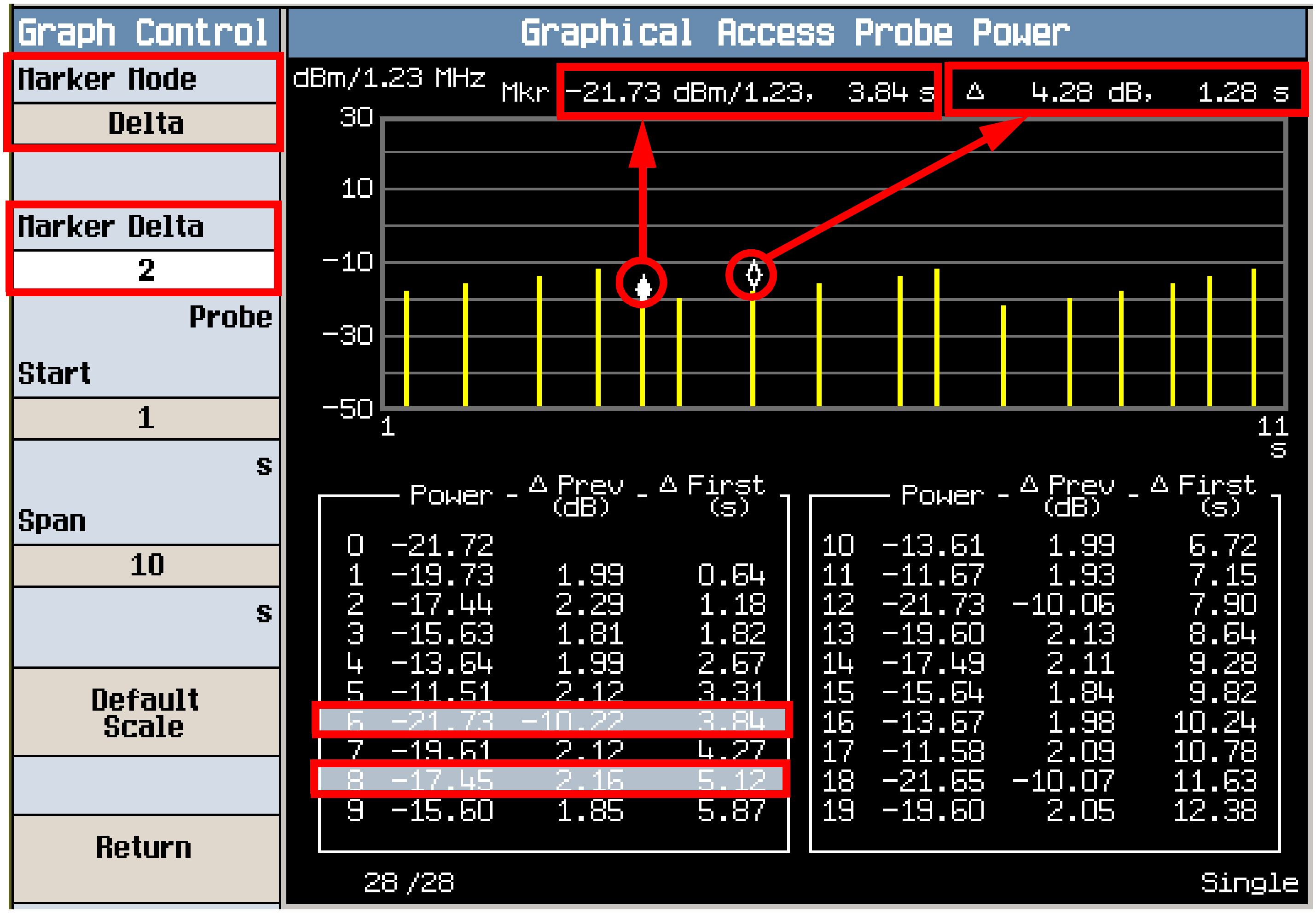


4. The `Marker Mode` (**F1**) sets the mode of the active marker.
   - When `Position` is selected, use the `Marker Position` (**F2**) to position the marker at any bar across the current span of the graph. Measurement results that correspond with the bar at the position marker (in this example, the power levels for the 7th access probe and the time offset relative to the 1st access

probe) are displayed above the graph and become highlighted in the table below the graph.



- When `Delta` is selected, it first freezes the current position marker and uses it as a reference marker. A second marker is created at the position specified by the `Delta Position` (**F2**) offset from that of the position marker. Any change in power between the second marker and the position marker is calculated as delta values. Measurement results that correspond with the position marker and the delta marker (in this example, the two values to the right of the "Mkr" indicates the power levels for the 7th access probe and the time offset relative to the 1st access probe, and the two values to the right of the delta symbol indicates the delta power and time between the 9th access probe and the 7th access probe) are displayed above the graph and become highlighted in the table below the graph.



5. (Optional) Press the **MEASUREMENT RESET** key to clear the display.

Testing 4.3.1 Range of Open Loop Output Power

For details on performing the steps below, see the “General Procedure” on page 17 above. The 4.3.1 test can also be performed with Access Probe Power measurement, see “Measuring Access Probe Power” on page 13.

1. This test specifies using Default Access Channel MAC Protocol and Access Parameter message. See “To Configure the Test Set to Default Access Channel MAC Subtype” on page 86 for detailed procedure.
2. Set the `Cell Band` and `Channel` as needed and wait for access terminal automatically opening a session.
3. Initialize the graphical access probe measurement.
4. Set `Probe Power Step` to `0 dB`. This ensures that all access probes in the probe sequence will transmit at the same power level, rather than incrementing in power.
5. Set `Probe Sequence Max` to `1`.
6. Set `Preamble Length` to `7`.

7. Set `Open Loop Adjust` to `78 dB` or `81 dB`, depending upon band class (for example, use 78 for US Cellular band, or use 81 for US PCS band).
8. C.S0033 specifies to set the AN forward packet activity to 100%. Forward packet activity is fixed in the test set, always set to 100%.
9. Set the access network to ignore all access attempts by setting `Call Limit Mode` to `On`.
10. Set $\hat{I}_{or}$ (`Cell Power`) to `-25, -65` or approximately `-95 dBm/1.23 MHz` (value depends on band class and access terminal class) for tests 1-3 as specified by C.S0033.
11. Press the **Start Single** key to arm the measurement.

IMPORTANT The measurement will not operate until you arm it by pressing the **Start Single** key.

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12. Send a page to the access terminal by selecting `Start Data Connection`.
13. Measure access probe power.
14. Stop the page to the access terminal by selecting `Stop Data Connection`.
15. Perform steps 10-14 for tests 1-3.

Measuring Time Response of Open Loop Power Control (TROLPC)

- "General Procedure"
- "Testing 4.3.2 Time Response of Open Loop Power Control"

General Procedure

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the TROLPC measurement.

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on.
2. Wait for the access terminal to open a session and then open an RTAP (for subtype 0 physical layer) or RETAP (for subtype 2 physical layer) data connection for AT's transmitter test. See "How Do I Open a Session and Test Data Connection?" on page 72 for detailed procedure.
3. Set the `RTAP Rate` (**F12**) on the `Call Parms 1 of 3` menu as needed if during an RTAP connection, or set the `R-Data Pkt Size` (**F12**) on the `Call Parms 1 of 3` menu as needed if during an RETAP connection.
4. C.S0033 does not specify that the R-ACK Channel must be active for 4.3.2 Time Response of Open Loop Power Control. If the R-ACK Channel is active during this test, the access terminal's power may fall outside of the mask specifications. To help ensure that your access terminal does not fail this test, you should disable the R-ACK Channel by setting the following parameters from the `Application Config` (**F10** on the `Call Parms 1 of 3`):
   - Set `ACK Channel Bit Fixed Mode Attribute` to `Off`.
   - Set `AT Directed Packets` to `0%`.

IMPORTANT After completing TROLPC testing, you must return ACK Channel Bit Fixed Mode Attribute to on and set AT Directed Packets to a non-zero value, if needed.

5. Initialize the TROLPC measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Time Response of Open Loop Power Control` measurement and press the knob.

NOTE If any measurements are open during initiation of a TROLPC, the test set will automatically close them and display an error message indicating the last measurement that was closed.

6. Select `Time Response of OLPC Setup` (**F1**) to access the `Time Response of OLPC Setup` menu. You

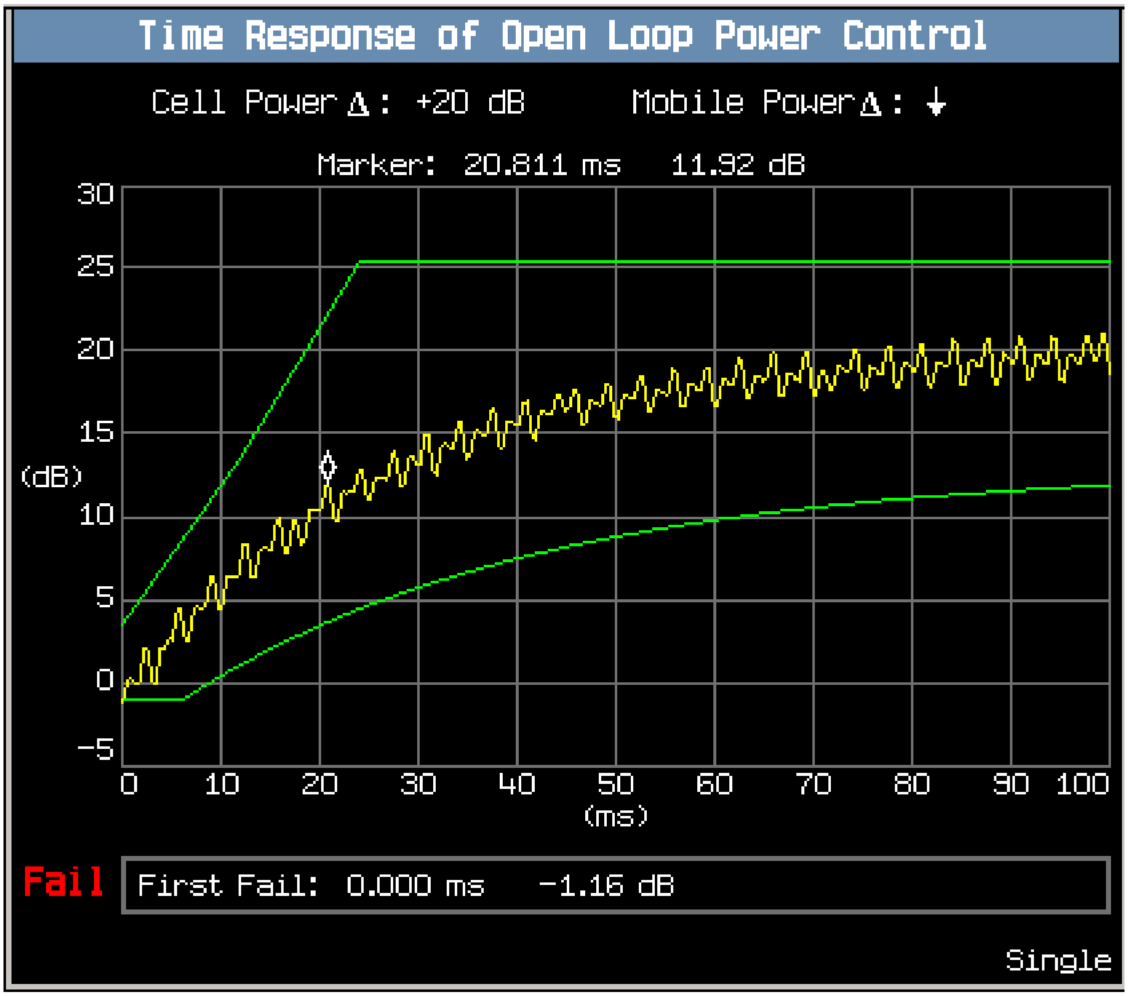
can also configure AT directed packets and ACK channel bit fixed mode attribute from this menu.

Time Response of OLPC Setup	Value
AT Directed Packets	50 %
ACK Channel Bit Fixed Mode Attribute	Off
Measurement Timeout	Off

7. Select `Close Menu` (**F6**) to close the `Time Response of OLPC Setup` window.
8. From the `Call Parms` menu, configure `Cell Power` (**F7**), as needed.
9. Measure TROLPC:
   - Select `Start Meas Up` (**F2**), which automatically increases `Cell Power` by 20 dB and captures the resulting access terminal output power for 100 ms, or
   - Select `Start Meas Down` (**F3**) which automatically decreases `Cell Power` by 20 dB and captures the resulting access terminal output power for 100 ms.
   - You may also select START SINGLE to start the measurement. The cell power will increase by 20 dB if Start Meas Up was last performed (or if the test set is in a preset state), or decrease by 20 dB if Start Meas Down was last performed.
10. After the measurement has completed, select `Marker` (**F4**) and turn the knob to display power at points along the access terminal output power trace. If the test failed, next to the word “Fail,” the first data point at which the test failed is displayed.

NOTE As specified by C.S0033, the AT output power level curve is shown in absolute terms. The delta expressions above the display indicate the direction of power change.

An example of a “Fail” test result is shown below.



IMPORTANT After completing TROLPC testing, you must return ACK Channel Bit Fixed Mode Attribute to on and set AT Directed Packets to a non-zero value appropriate for your test setup.

Testing 4.3.2 Time Response of Open Loop Power Control

For details on performing the steps below, see the “General Procedure” on page 24 above.

1. For Subtype 0 or 1 Physical Layer, set up a Test Application session and open an RTAP connection with the `RTAP Rate` set to `9.6 kbps`. For detailed procedure on how to open an RTAP session and connection, see “How Do I Open a Session and Test Data Connection?” on page 72.

   For Subtype 2 Physical Layer, set up a Test Application session and open an RETAP connection with the following setups. For detailed procedure on how to open an RETAP session and connection, see “How Do I Open a Session and Test Data Connection?” on page 72.

   - Set the `R-Data Pkt Size` (**F12** on `Call Parms 1 of 3`) to 256 bits.
   - Set the `Reverse Data Transmission Mode` under the `Application Config` (**F10** on `Call Parms 1 of`

3) menu to High Capacity.

- From the Power Parameters Info menu (see “How Do I Change Channel Gain/Traffic Info Parameters?” on page 88 for how to access), set the 256-bit High Capacity Termination Target to 3 (4 sub-frames, 16 slots). (NOTE: You do not need to set these settings unless the default value (3) of these settings are changed. Changing these setting results in an open data connection closed because these settings are configured during session negotiation. Once this happen, you need to re-open the connection.)

2. Configure the Test Application FTAP (for Subtype 0 or 1 Physical Layer) or FETAP (for Subtype 2 Physical Layer) so that the ACK Channel is not transmitted by the access terminal, by setting ACK Channel Bit Fixed Mode Attribute to Off and AT Directed Packets to 0% under the Application Config (**F10** on Call Parms 1 of 3) menu.
3. Initialize the TROLPC measurement.
4. Set $\hat{I}_{or}$ (Cell Power) to -60 dBm/1.23 MHz.
5. C.S0033 specifies to send alternating ‘0’ and ‘1’ power control bits on the Forward Traffic Channel. When you start the TROLPC measurement, the test set automatically sends alternating closed loop power control bits during the test.
6. Measure TROLPC:
   - Select Start Meas Up (**F2**), (cell power transitions to -40 dBm/1.23 MHz), and note the pass/fail result.
   - Select Start Meas Down (**F3**), (cell power transitions to -60 dBm/1.23 MHz), and note the pass/fail result.
   - Select Start Meas Down (**F3**), (cell power transitions to -80 dBm/1.23 MHz), and note the pass/fail result.
   - Select Start Meas Up (**F2**), (cell power transitions to -60 dBm/1.23 MHz), and note the pass/fail result.

Measuring Digital Average Power

General Procedure

NOTE Digital average power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed.

---

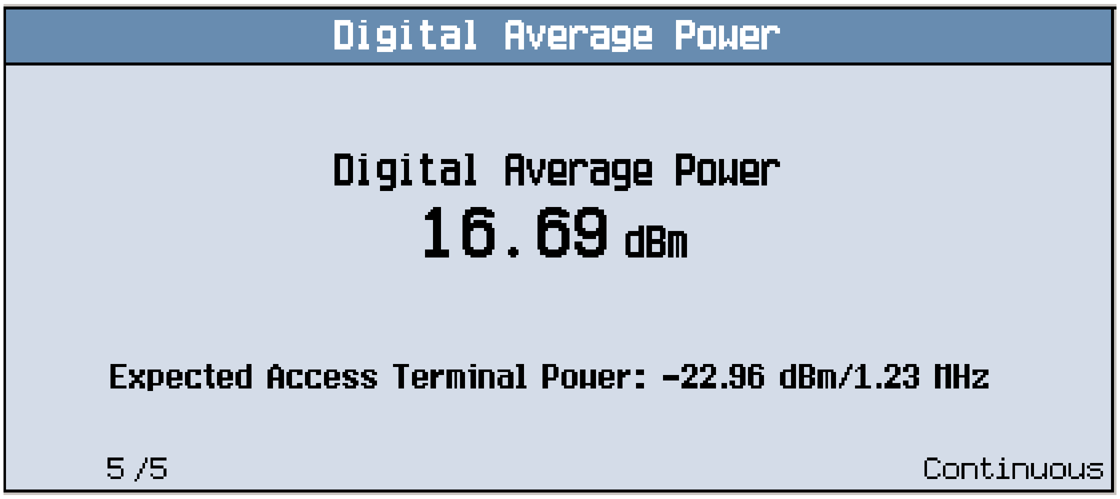
1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on.
2. Wait for the access terminal to open a session and then open an RTAP (for subtype 0 physical layer) or RETAP (for subtype 2 physical layer) data connection for AT's transmitter test. See "How Do I Open a Session and Test Data Connection?" on page 72 for detailed procedure.
3. Set the `RTAP Rate` (**F12**) or `FTAP Rate` (**F11**) on the `Call Parms 1 of 3` menu as needed if during an RTAP connection, or set the `R-Data Pkt Size` (**F12**) or `F-Traffic Format` (**F11**) on the `Call Parms 1 of 3` menu as needed if during an RETAP connection.
4. Initialize the digital average power measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Digital Average Power` measurement and press the knob.
5. Select `Digital Average Power Setup` (**F1**) to access the `Digital Average Power Setup` menu. From this menu you can configure measurement parameters such as `Multi-Measurement Count` and `Trigger Arm`. For statistical measurement results, highlight the `Multi-Measurement Count` parameter and press the **ON** key. The number of averages will default to 10. You can change the number as desired.

Digital Average Power Setup	Value
Multi-Measurement Count	5
Trigger Arm	Single
Measurement Timeout	1.0 s

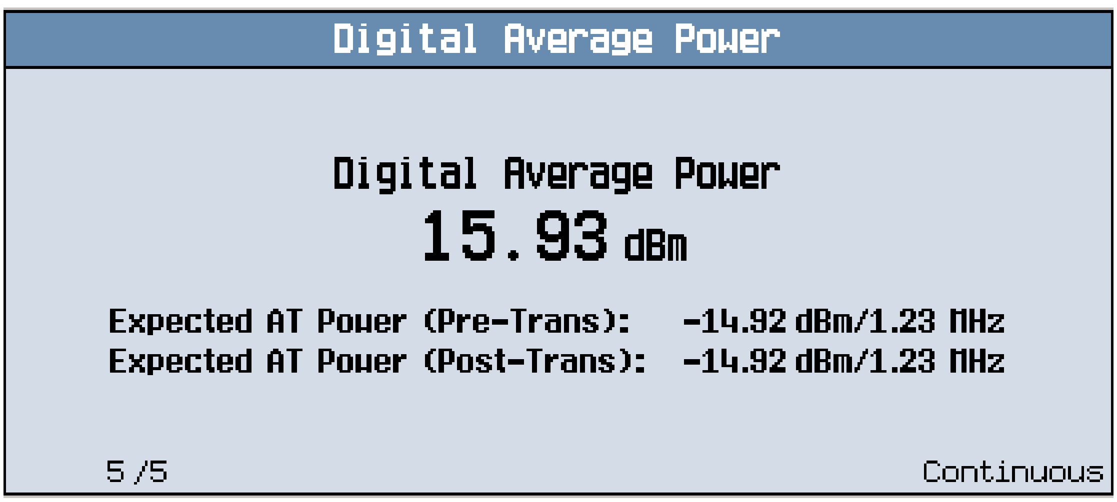
6. Select `Close Menu` (**F6**) to close the `Digital Average Power Setup` window.

7. From the `Call Parms` menu, configure `Cell Power` (**F7**), as needed.
8. Measure digital average power:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous`, the measurement began executing as soon as you initialized it in step 3.

A typical measurement result (for subtype 0 physical layer) is shown below:



A typical measurement result (for subtype 2 physical layer) is shown below:



Testing 4.3.4 Maximum RF Output Power

For details on performing the steps below, see the “General Procedure” on page 28 above.

1. Initialize the digital average power measurement.
2. Set the following access parameters (see “How Do I Change Access Parameters?” on page 85):
   - Set `Open Loop Adjust` to 81 dB or 84 dB, depending upon band class. (for example, 81 for US Cellular band or 84 for US PCS band)

- Set Probe Initial Adjust to 15 dB.
- Set Probe Power Step to 7.5 dB/step.

3. For Subtype 0 or 1 Physical Layer, set up a Test Application session and open an RTAP connection with the RTAP Rate set to 153.6 kbps. For detailed procedure on how to open an RTAP session and connection, see "How Do I Open a Session and Test Data Connection?" on page 72.

   For Subtype 2 Physical Layer, set up a Test Application session and open an RETAP connection with the following setups. For detailed procedure on how to open an RETAP session and connection, see "How Do I Open a Session and Test Data Connection?" on page 72.

   - Set the R-Data Pkt Size (**F12** on Call Parms 1 of 3) to 4096 bits.
   - Set the Reverse Data Transmission Mode under the Application Config (**F10** on Call Parms 1 of 3) menu to High Capacity.
   - From the Power Parameters Info menu (see "How Do I Change Channel Gain/Traffic Info Parameters?" on page 88 for how to access), set the 4096-bit High Capacity Termination Target to 3 (4 sub-frames, 16 slots). (NOTE: You do not need to set these settings unless the default value (3) of these settings are changed. Changing these setting results in an open data connection closed because these settings are configured during session negotiation. Once this happen, you need to re-open the connection.)

4. C.S0033 specifies to configure the Test Application FTAP (for Subtype 0 or 1 Physical Layer) or FETAP (for Subtype 2 Physical Layer) with a Forward Traffic Channel rate of 307.2 kbps (2-slot version) and the ACK Channel is transmitted at all the slots.
   To do this, set the FTAP Rate (**F11** on Call Parms 1 of 3) to 307.2 (2 Slot) if during subtype 0 physical layer test or set the F-Traffic Format (**F11** on Call Parms 1 of 3) to 4 (1024, 2, 128) if during subtype 2 physical layer test, and set ACK Channel Bit Fixed Mode to On from Application Config (**F10** on Call Parms 1 of 3).
5. Set $\hat{I}_{or}$ (Cell Power) to -60 dBm/1.23 MHz.
6. Set Rvs Power Ctrl to All Up bits (**F7** on the Call Parms 2 of 3 menu) to transmit continuous up power control bits.
7. Measure digital average power.
8. When you have finished testing, be sure to set the Rvs Power Ctrl back to Active bits to ensure that subsequent signalling is successful.

Measuring Channel Power

- "General Procedure"
- "Testing 4.3.5 Minimum Controlled Output Power"

General Procedure

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed.

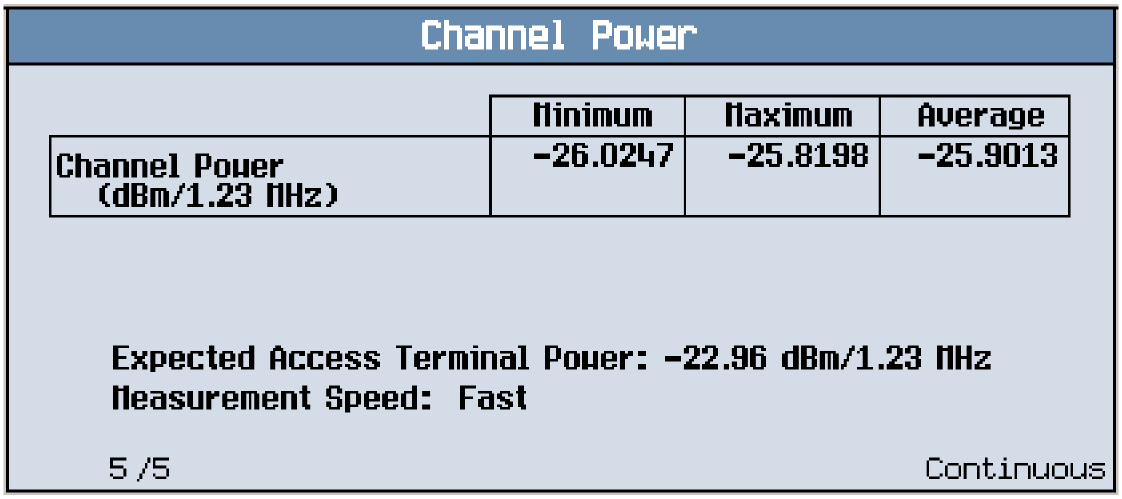
1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on.
2. Wait for the access terminal to open a session and then open an RTAP (for subtype 0 physical layer) or RETAP (for subtype 2 physical layer) data connection for AT's transmitter test.
3. Set the `RTAP Rate` (**F12**) on the `Call Parms 1 of 3` menu as needed if during an RTAP connection, or set the `R-Data Pkt Size` (**F12**) on the `Call Parms 1 of 3` menu as needed if during an RETAP connection.
4. Initialize the channel power measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Channel Power` measurement and press the knob.
5. Select `Channel Power Setup` (**F1**) to access the `Channel Power Setup` menu. From this menu you can configure measurement parameters such as `Multi-Measurement Count`, `Trigger Arm`, etc. For statistical measurement results, highlight the `Multi-Measurement Count` parameter and press the **ON** key. The number of averages will default to 10. You can change the number as desired.

Channel Power Setup	Value
Multi-Measurement Count	5
Trigger Arm	Continuous
Measurement Speed	Fast
Measurement Timeout	Off

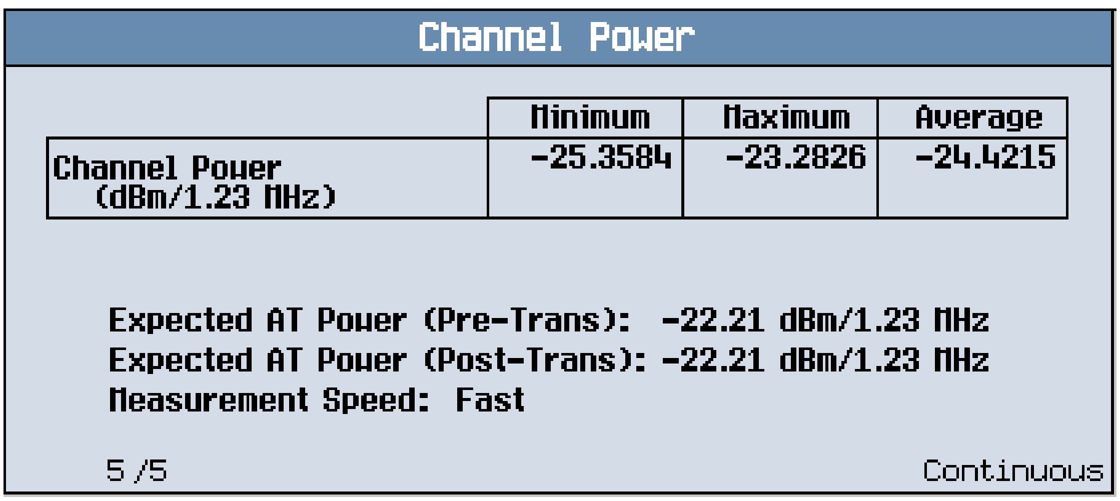
6. Select `Close Menu` (**F6**) to close the `Channel Power Setup` window.
7. From the `Call Parms` menu, configure `Cell Power` (**F7**), as needed.
8. Measure channel power:

- If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
- If the `Trigger Arm` field is set to `Continuous` the measurement began executing as soon as you initialized it in step 3.

A typical measurement result (for subtype 0 physical layer) is shown below:



A typical measurement result (for subtype 2physical layer) is shown below:



Testing 4.3.5 Minimum Controlled Output Power

For details on performing the steps below, see the “General Procedure” on page 31 above.

1. For Subtype 0 or 1 Physical Layer, set up a Test Application session and open an RTAP connection with the `RTAP Rate` set to `9.6 kbps`. For detailed procedure on how to open an RTAP session and connection, see “How Do I Open a Session and Test Data Connection?” on page 72

   For Subtype 2 Physical Layer, set up a Test Application session and open an RETAP connection with the following setups. For detailed procedure on how to open an RETAP session and connection, see “How Do I Open a Session and Test Data Connection?” on page 72.

   - Set the `R-Data Pkt Size` (**F12** on `Call Parms 1 of 3`) to 256 bits.

- Set the Reverse Data Transmission Mode under the Application Config (**F10** on Call Parms 1 of 3) menu to High Capacity.
- From the Power Parameters Info menu (see "How Do I Change Channel Gain/Traffic Info Parameters?" on page 88 for how to access), set the 256-bit High Capacity Termination Target to 3 (4 sub-frames, resulting in 16 slots). (NOTE: You do not need to set this parameter unless its default value (3) is changed. Changing the setting results in an open data connection closed and a session re-negotiation. Once this happen, you need to re-open the connection.)

2. Initialize the channel power measurement.
3. Set the Call Drop Timer to Off (**F9** on the Call Parms 2 of 3 menu) to keep the test set from closing the connection based on the very low output power level of the access terminal.
4. Set $\hat{I}_{or}$ (Cell Power, **F7** on the Call Parms 1 of 3 menu) to -25 dBm/1.23 MHz.
5. Set Rvs Power Ctrl to All Down bits (**F7** on the Call Parms 2 of 3 menu) to transmit continuous down ('1') power control bits.
6. Measure channel power.

NOTE If Under Range is posted, it indicates that the measured power is below -61 dBm or is less than -9 dB below the expected power level of the receiver. When this happens, you should manually adjust the test sets receiver power and then repeat the test. (Setup procedure: on Call Parms 1 of 3 menu, select Manual in the Rcvr Power Ctrl (**F8**), then set the Receiver Power (**F9**) to a value close to the measured value being displayed on the Channel Power measurement screen.)

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7. When you have finished the testing, be sure to set the Call Drop Timer back to On and the Rvs Power Ctrl back to Active Bits to ensure that subsequent operation is successful.

Measuring Waveform Quality + Code Domain Power

Last updated: July 21, 2006

General Procedure

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the waveform quality + code domain measurement.

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on.
2. Wait for the access terminal to open a session and then open an RTAP (for subtype 0 physical layer) or RETAP (for subtype 2 physical layer) data connection for AT's transmitter test. See "How Do I Open a Session and Test Data Connection?" on page 72 for detailed procedure.
3. Set the `RTAP Rate` (**F12**) or `FTAP Rate` (**F11**) on the `Call Parms 1 of 3` menu as needed if during an RTAP connection, or set the `R-Data Pkt Size` (**F12**) or `F-Traffic Format` (**F11**) on the `Call Parms 1 of 3` menu as needed if during an RETAP connection.
4. Initialize the waveform quality + code domain measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Waveform Quality + Code Domain` measurement and press the knob.
5. Select `Waveform Quality + Code Domain Setup` (**F1**) to access the `Waveform Quality + Code Domain Setup` menu. From this menu you can configure measurement parameters such as `Slots to Measure`, `DRC Channel Gain`, etc. For statistical measurement results, highlight the

`Multi-Measurement Count` parameter and press the **ON** key. The number of averages will default to 10.

For Subtype 0 Physical Layer

Waveform Quality Setup	Value
Multi-Measurement Count	Off
Slots To Measure	1
Ack Channel Gain	3.0 dB
DRC Channel Gain	3.0 dB
Trigger Arm	Continuous
Measurement Timeout	Off

For Subtype 2 Physical Layer

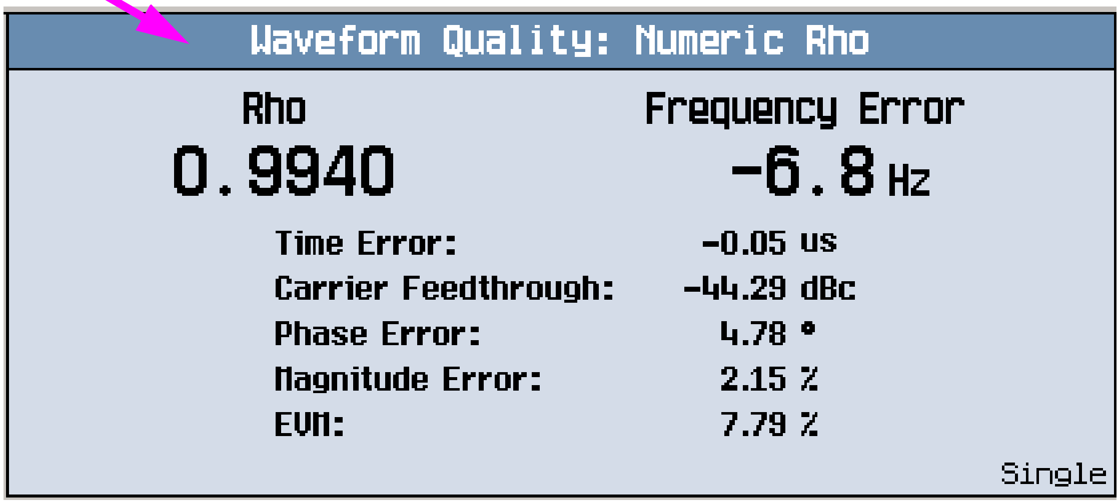
Waveform Quality Setup	Value
Multi-Measurement Count	Off
Slots To Measure	1
ACK Channel Gain	3.0 dB
DRC Channel Gain	3.0 dB
DSC Channel Gain	-9.0 dB
Trigger Arm	Continuous
Measurement Timeout	Off

This parameter (DSC Channel Gain) is only available for Subtype 2 Physical Layer.

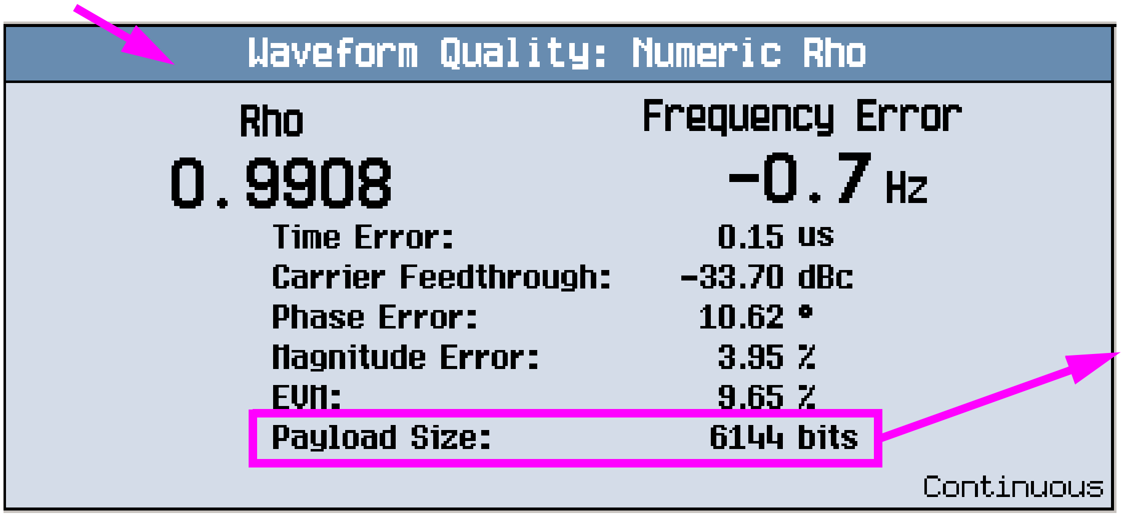
6. Select `Close Menu` (**F6**) to close the `Waveform Quality + Code Domain Setup` window.
7. If needed, set the `RTAP Rate` (**F12**) or `FTAP Rate` (**F11**) on the `Call Parms 1 of 3` menu when during an RTAP connection test, or set the `R-Data Pkt Size` (**F12**) or `F-Traffic Format` (**F11**) on the `Call Parms 1 of 3` menu when during an RETAP connection test.
8. Measure waveform quality and code domain power:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous`, the measurement began executing as soon as you initialized it in step 3.

9. Select `Numeric Rho` (**F2**) to view the waveform quality results. A typical display is shown below.

Subtype 0 Physical Layer Waveform Quality Numeric Rho Result Display



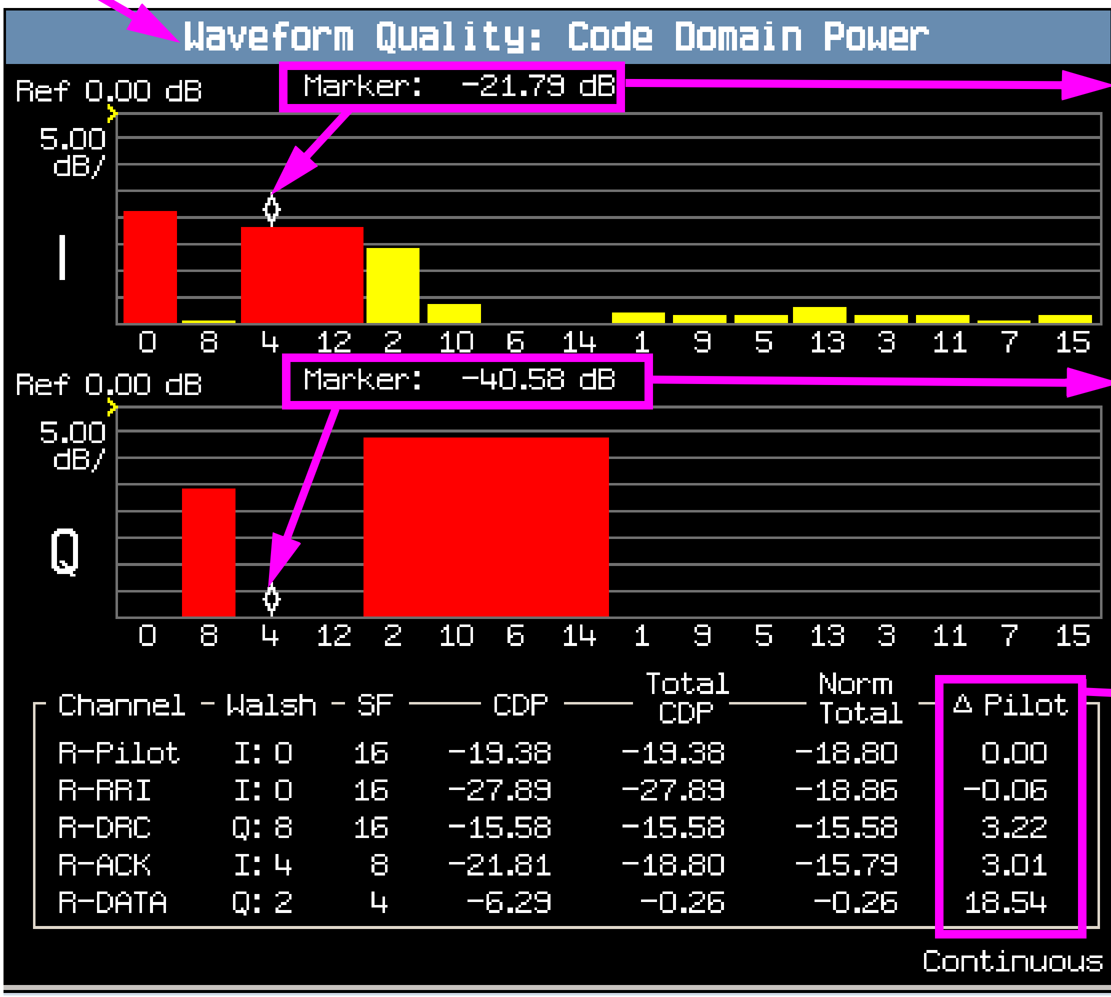
Subtype 2 Physical Layer Waveform Quality Numeric Rho Result Display



This result is only available for Subtype 2 Physical Layer.

10. Select `Code Domain Power` (**F3**) to view the code domain results. A typical display is shown below. When viewing the code domain results, you can select `Marker Position` (**F6**) and turn the knob to select a Walsh code and display its power.

Subtype 0 Physical Layer Code Domain Power Result Display

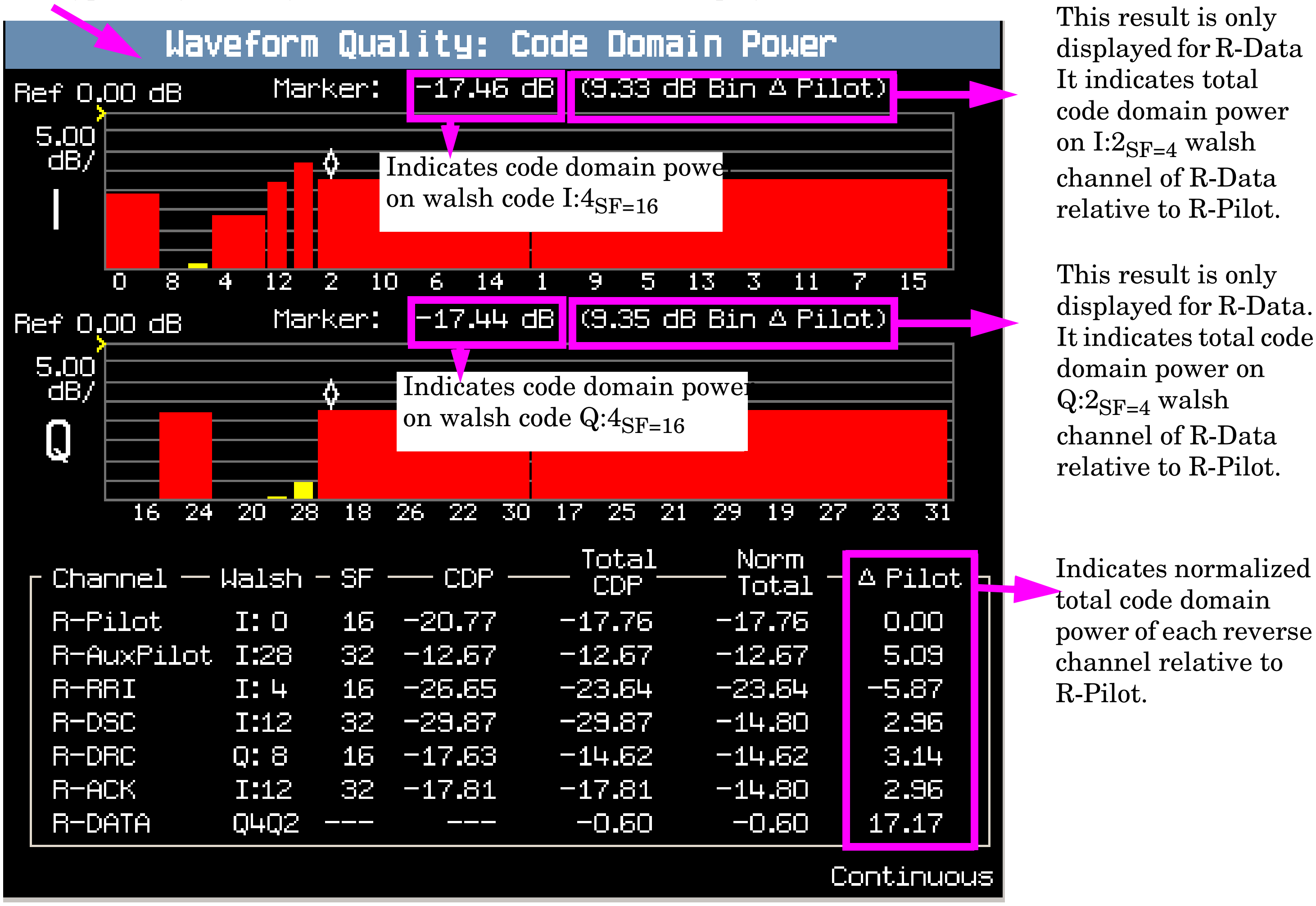


Indicates code domain power on walsh code I:$4_{SF=16}$.

Indicates code domain power on walsh code Q:$4_{SF=16}$.

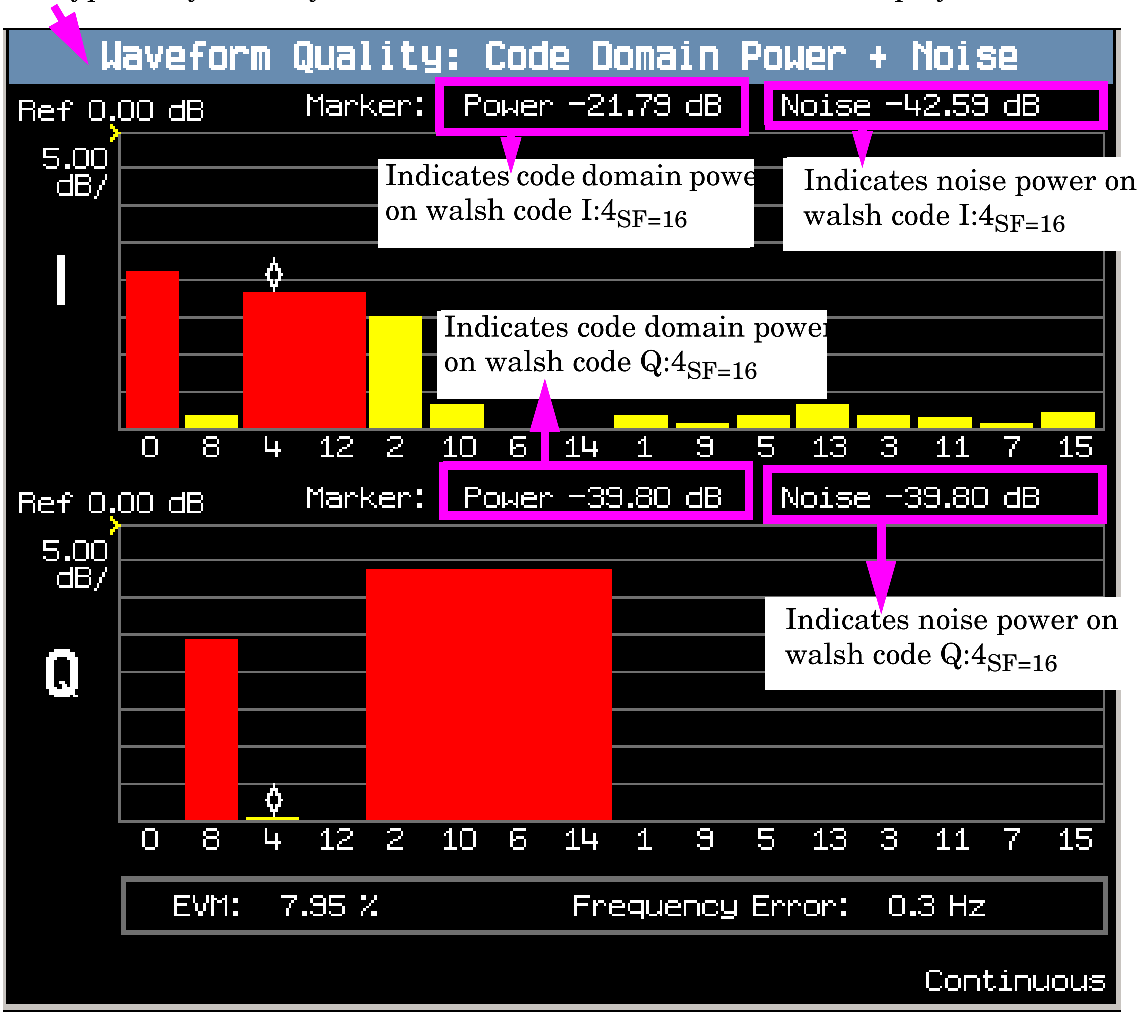
Indicates normalized total code domain power of each reverse channel relative to R-Pilot.

Subtype 2 Physical Layer Code Domain Power Result Display

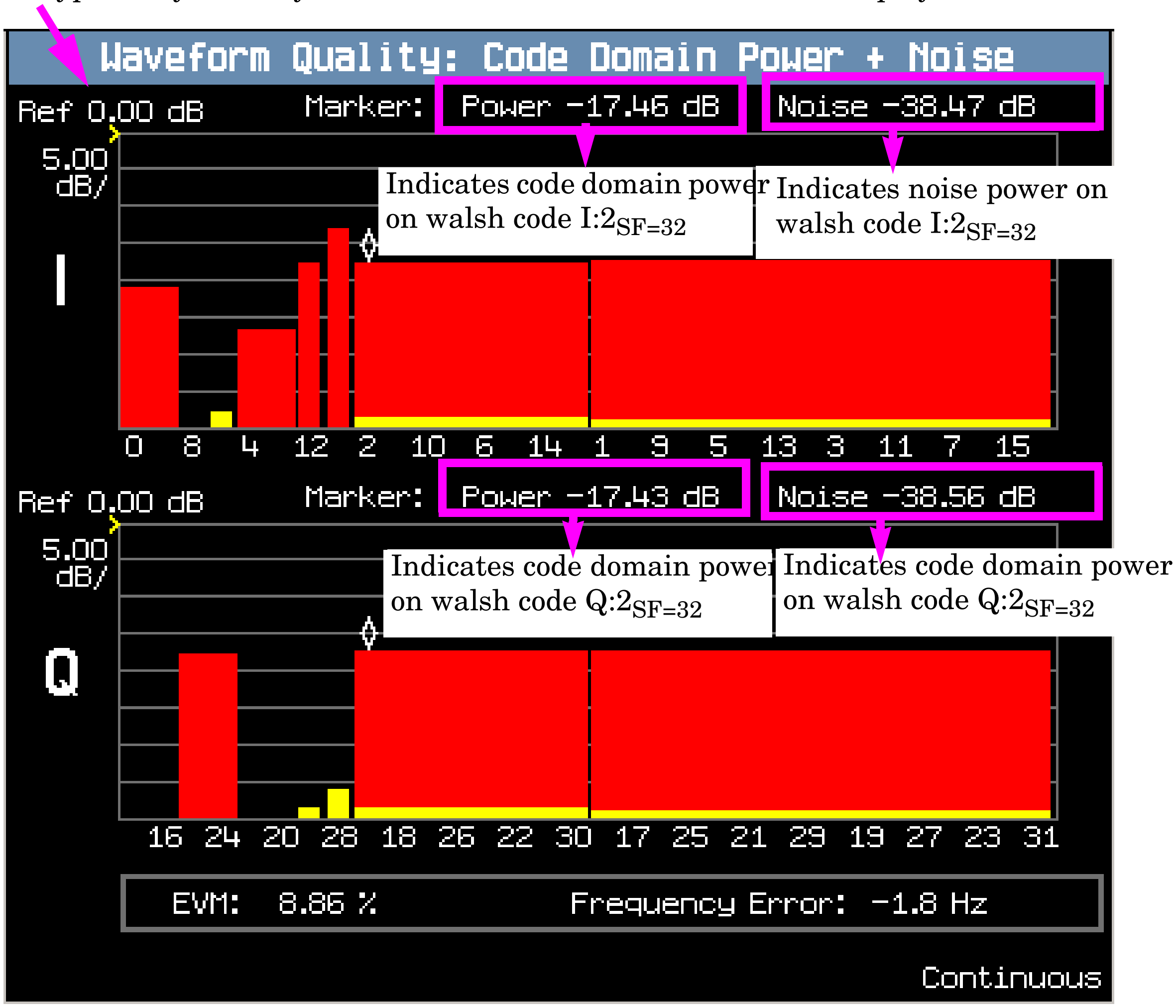


11.Select `Code Domain Power + Noise` (**F4**) to view the code domain + noise results. A typical display is shown below. When viewing the code domain + noise results, you can select `Marker Position` (**F6**) and turn the knob to select a Walsh code and display its power.

Subtype 0 Physical Layer Code Domain Power + Noise Result Display



Subtype 2 Physical Layer Code Domain Power + Noise Result Display



Testing 4.2.2 Waveform Quality and Frequency Accuracy

For details on performing the steps below, see the "General Procedure" on page 34 above.

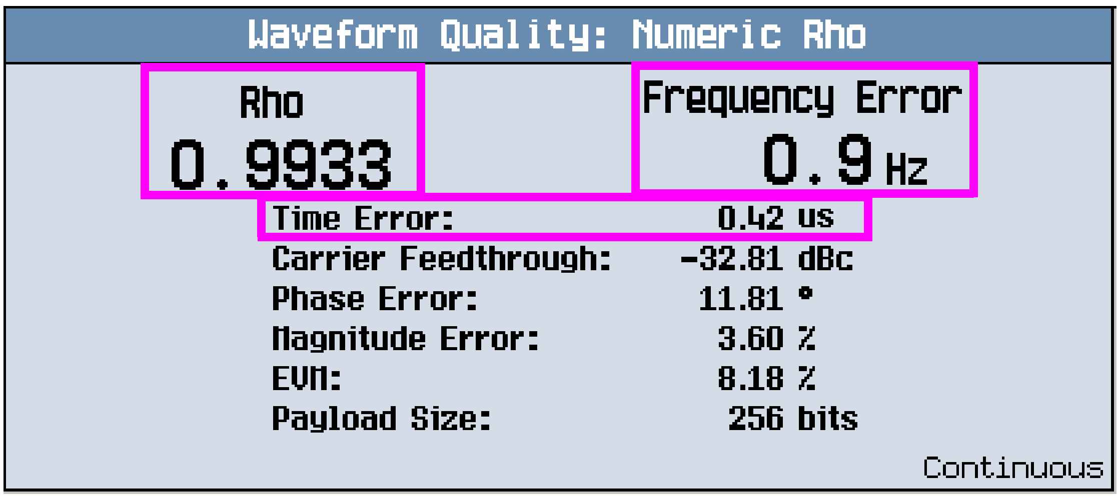
1. For Subtype 0 or 1 Physical Layer, set up a Test Application session and open an RTAP connection with the `RTAP Rate` set to `9.6 kbps`. For detailed procedure on how to open an RTAP session and connection, see "How Do I Open a Session and Test Data Connection?" on page 72.

   For Subtype 2 Physical Layer, set up a Test Application session and open an RETAP connection with the following setups. For detailed procedure on how to open an RETAP session and connection, see "How Do I Open a Session and Test Data Connection?" on page 72.

   - Set the `R-Data Pkt Size` (**F12** on `Call Parms 1 of 3`) to 256 bits.
   - Set the `Reverse Data Transmission Mode` under the `Application Config` (**F10** on `Call Parms 1 of 3`) menu to `High Capacity`.
   - From the Power Parameters Info menu (see "How Do I Change Channel Gain/Traffic Info Parameters?"

on page 88 for how to access), set the `256-bit High Capacity Termination Target` to `3` (4 sub-frames, 16 slots). (NOTE: You do not need to set these settings unless the default value (3) of these settings are changed. Changing these setting results in an open data connection closed because these settings are configured during session negotiation. Once this happen, you need to re-open the connection.)

2. C.S0033 specifies to configure the FTAP or FETAP such that the ACK Channel is transmitted at all the slots. To do this, set the `ACK Channel Bit Fixed Mode` to `On` from `Application Config` (**F10** under `Call Parms 1 of 3`).
3. Initialize the waveform quality + code domain measurement. Set `Slots to Measure` to 1.
4. Set $\hat{I}_{or}$ (`Cell Power`) to `-75 dBm/1.23 MHz`.
5. Measure waveform quality + code domain.
6. Select `Numeric Rho` (**F2**) to view the `Rho`, `Frequency Error` and `Time Error` results. A typical measurement result is shown below.



Testing 4.3.7 RRI Channel Output Power

For details on performing the steps below, see the “General Procedure” on page 34 above.

1. Test 1: Set up a Test Application session and open an RTAP connection (for Subtype 0 or 1 Physical Layer).
2. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
3. Initialize the waveform quality + code domain measurement.
4. Set `Slots to Measure` to 8.
5. Measure waveform quality + code domain.
6. Select `Code Domain Power` (**F3**) to view the R-RRI Δ Pilot result (available in the last column of the table of data).
7. Test 2: Set up an RETAP session (for Subtype 2 Physical Layer) with the following parameters and then open an RETAP connection. For detailed procedure on how to open an RETAP session and connection, see “How Do I Open a Session and Test Data Connection?” on page 72. (NOTE: It is recommended set the parameters prior to opening the session and connection because some of these settings are configured

during session negotiation state)

- Set the `R-Data Pkt Size` (**F12** on `Call Parms 1 of 3`) to 256 bits.
- Set the `Reverse Data Transmission Mode` under the `Application Config` (**F10** on `Call Parms 1 of 3`) menu to `High Capacity`.
- From the Power Parameters Info menu (see “How Do I Change Channel Gain/Traffic Info Parameters?” on page 88 for how to access), set the `256-bit High Capacity T2P Transition` to `3` (4 sub-frames) and `256-bit High Capacity Termination Target` to `3` (4 sub-frames). (NOTE: You do not need to set these settings unless the default value (3) of these settings are changed. Changing these setting results in an open data connection closed because these settings are configured during session negotiation. Once this happen, you need to re-open the connection.)
- From the RRI Gain Parameters Info menu (see “How Do I Change Channel Gain/Traffic Info Parameters?” on page 88 for how to access), set the `RRI Channel Gain Pre-Transition 3` to `-6 dB` and `256-bit High Capacity Termination Target` to `3` (4 sub-frames). (NOTE: You do not need to set these settings unless the default value (3) of these settings are changed. Changing these setting results in an open data connection closed because these settings are configured during session negotiation. Once this happen, you need to re-open the connection.)

8. Set `Slots to Measure` to 1.
9. Measure waveform quality + code domain.
10. Select `Code Domain Power` (**F3**) to view the R-RRI Δ Pilot result (available in the last column of the table of data).
11. A typical measurement result for test 2 is shown below.

Channel	Walsh	SF	CDP	Total CDP	Norm Total	Δ Pilot
R-Pilot	I: 0	16	-11.23	-8.22	-8.22	0.00
R-AuxPilot	---	---	-----	-----	-----	-----
R-RRI	I: 4	16	-17.27	-14.26	-14.26	-6.04
R-DSC	I:12	32	-20.30	-20.30	-5.15	3.06
R-DRC	Q: 8	16	-8.34	-5.33	-5.33	2.89
R-ACK	I:12	32	-8.17	-8.17	-5.15	3.06
R-DATA	Q: 2	4	-13.58	-4.55	-4.55	3.67

Verify that this result should be within +/- 0.25 dB of the RRI Channel Gain Pre-Transition 3 setting.

Testing 4.3.8 Code Domain Power

For details on performing the steps below, see the “General Procedure” on page 34 above.

- “Testing 4.3.8.1 DRC Channel Output Power” on page 43
- “Testing 4.3.8.2 ACK Channel Output Power” on page 43
- “Testing 4.3.8.3 Data Channel Output Power” on page 44
- “Testing 4.3.8.4 DSC Channel Output Power” on page 46

Testing 4.3.8.1 DRC Channel Output Power

1. Set up a Test Application session and open an RTAP (for Subtype 0 or 1 Physical Layer) or an RETAP (for Subtype 2 Physical Layer) connection. See “How Do I Open a Session and Test Data Connection?” on page 72 for detailed procedure.
2. C.S0033 specifies to configure the FTAP or FETAP such that the ACK Channel is transmitted at all the slots. To do this, set the `ACK Channel Bit Fixed Mode` to `On` from `Application Config` (**F10** under `Call Parms 1 of 3`).
3. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
4. Initialize the waveform quality + code domain measurement. Set the `Slots to Measure` to 2 if during a RTAP connection (for subtype 0 physical layer test) or set the `Slots to Measure` to 1 if during a RETAP connection (for subtype 2 physical layer test).
5. Set `DRC Channel Gain` to 0 dB.
6. Measure waveform quality + code domain.
7. Select `Code Domain Power` (**F3**) to view the R-DRC Δ Pilot result (available in the last column of the table of data).
8. Set `DRC Channel Gain` to 3 dB and repeat steps 6 and 7.
9. A typical measurement result is shown below.

Channel	Walsh	SF	CDP	Total CDP	Norm Total	Δ Pilot
R-Pilot	I: 0	16	-11.23	-8.22	-8.22	0.00
R-AuxPilot	---	---	-----	-----	-----	-----
R-RRI	I: 4	16	-17.27	-14.26	-14.26	-6.04
R-DSC	I:12	32	-20.30	-20.30	-5.15	3.06
R-DRC	Q: 8	16	-8.34	-5.33	-5.33	2.89
R-ACK	I:12	32	-8.17	-8.17	-5.15	3.06
R-DATA	Q: 2	4	-13.58	-4.55	-4.55	3.67

Verify that this result should be within +/- 0.25 dB of the DRC Channel Gain setting.

Testing 4.3.8.2 ACK Channel Output Power

1. Set up a Test Application session and open an RTAP (for Subtype 0 or 1 Physical Layer) or an RETAP (for Subtype 2 Physical Layer) connection. See “How Do I Open a Session and Test Data Connection?” on page 72 for detailed procedure.
2. C.S0033 specifies to configure the FTAP or FETAP such that the ACK Channel is transmitted at all the slots. To do this, set the `ACK Channel Bit Fixed Mode` to `On` from `Application Config` (**F10** under `Call Parms 1 of 3`).
3. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
4. Initialize the waveform quality + code domain measurement. Set `Slots to Measure` to 2.
5. Set `ACK Channel Gain` to 0 dB.
6. Measure waveform quality + code domain.

7. Select `Code Domain Power` (**F3**) to view the R-ACK Δ Pilot result (available in the last column of the table of data).
8. Set `ACK Channel Gain` to 3 dB and repeat steps 6 and 7.
9. A typical measurement result is shown below.

Channel	Walsh	SF	CDP	Total CDP	Norm Total	Δ Pilot
R-Pilot	I: 0	16	-11.23	-8.22	-8.22	0.00
R-AuxPilot	---	---	-----	-----	-----	-----
R-RRI	I: 4	16	-17.27	-14.26	-14.26	-6.04
R-DSC	I:12	32	-20.30	-20.30	-5.15	3.06
R-DRC	Q: 8	16	-8.34	-5.33	-5.33	2.89
R-ACK	I:12	32	-8.17	-8.17	-5.15	3.06
R-DATA	Q: 2	4	-13.58	-4.55	-4.55	3.67

Verify that this result should be within +/- 0.25 dB of the ACK Channel Gain setting.

Testing 4.3.8.3 Data Channel Output Power

The test set currently does not support tests 6 and 7 for measuring the capsule portion of each Access Channel probe.

1. For Subtype 0 or 1 Physical Layer, set up a Test Application session and open an RTAP connection with the `RTAP Rate` set to `9.6 kbps`. For detailed procedure on how to open an RTAP session and connection, see "How Do I Open a Session and Test Data Connection?" on page 72.

   For Subtype 2 Physical Layer, set up a Test Application session and open an RETAP connection with the following setups. For detailed procedure on how to open an RETAP session and connection, see "How Do I Open a Session and Test Data Connection?" on page 72.

   - Set the `R-Data Pkt Size` (**F12** on `Call Parms 1 of 3`) to 256 bits.
   - Set the `Reverse Data Transmission Mode` under the `Application Config` (**F10** on `Call Parms 1 of 3`) menu to `High Capacity`.
   - From the Power Parameters Info menu (see "How Do I Change Channel Gain/Traffic Info Parameters?" on page 88 for how to access), set the `256-bit High Capacity Termination Target` to `3` (4 sub-frames, resulting in 16 slots). (NOTE: You do not need to set this parameter unless its default value (3) is changed. Changing the setting results in an open data connection closed and a session re-negotiation. Once this happen, you need to re-open the connection.)
2. C.S0033 specifies to configure the FTAP (for Subtype 0 or 1 Physical Layer) or FETAP (for Subtype 2 Physical Layer) such that the ACK Channel is transmitted at all the slots. To do this, set the `ACK Channel Bit Fixed Mode` to `On` from `Application Config` (**F10** under `Call Parms 1 of 3`).
3. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
4. Initialize the waveform quality + code domain measurement.
5. Set `Slots to Measure` to 2 (for subtype 0 physical layer) or 1 (for subtype 2 physical layer).
6. Measure waveform quality + code domain.
7. Select `Code Domain Power` (**F3**) to view the R-Data Δ Pilot result and R-AuxPilot Δ Pilot results available in the last column of the table of data (R-Aux Pilot is only applicable to tests 8-10). In addition, for

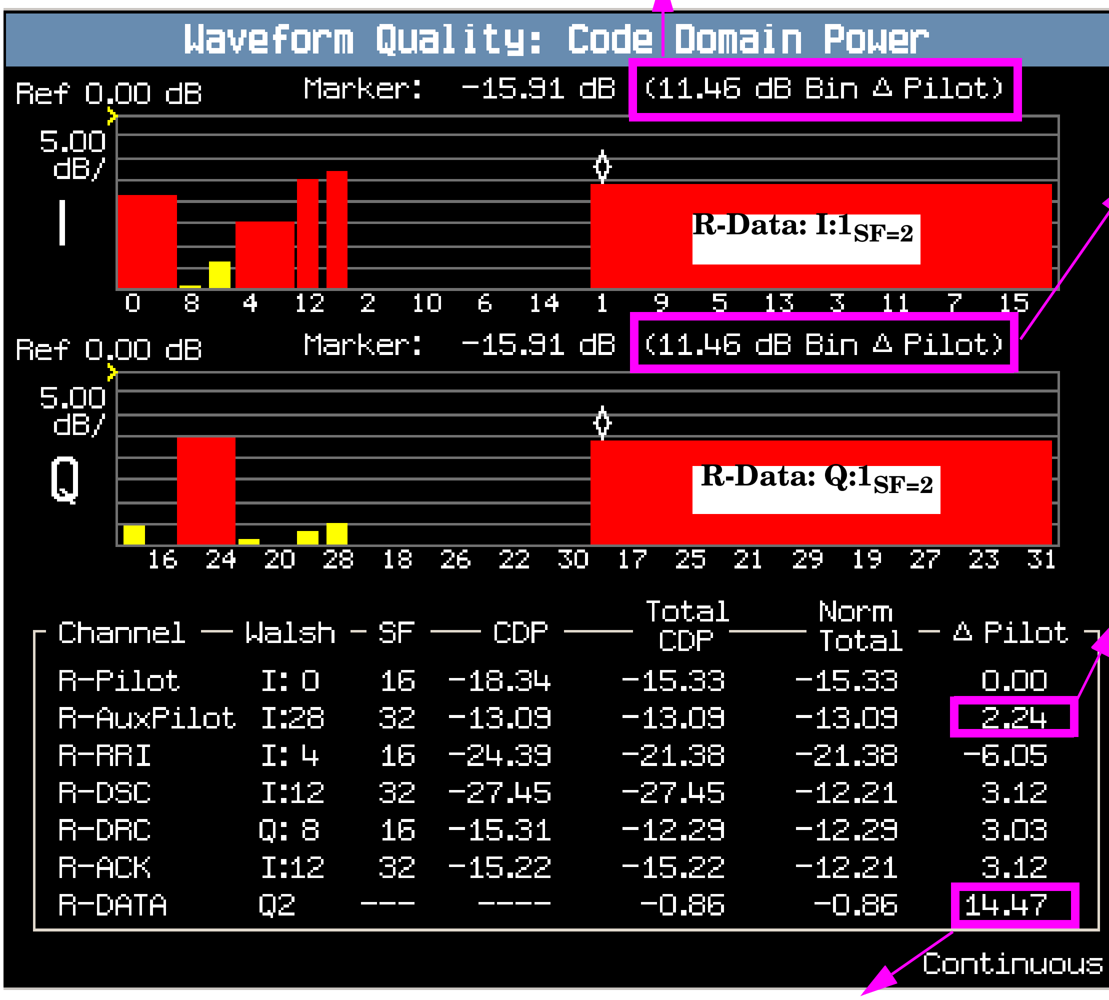
test 5, the power in all inactive Walsh codes can be obtained by placing a marker on the inactive walsh channel, then view the Marker power result. For tests 5, 8-10 during subtype 2 physical layer tests, the Δ Pilot power of individual walsh channels constituting the R-Data (such as I:$2_{SF=4}$, Q:$2_{SF=4}$, etc.) can be obtained by placing a marker on the walsh channel, then view the Bin Δ Pilot result following the Marker power result).

8. Tests 2-5: Repeat steps 6-7 with RTAP rates of 19.2, 38.4, 76.8, 153.6 kbps (for subtype 0 physical layer) or with R-Data packet size of 512, 1024, 2048, 4096 bits and termination target of 16 slots (for subtype 2 physical layer).

9. Tests 8-10: (only applicable to subtype 2 physical layer) Repeat steps 6-7 with R-Data packet size of 3072, 6144, 12288 bits and termination target of 16 slots. (In order for the R-Aux Pilot Channel to be active for the test, the `Auxiliary Pilot Channel Min Payload` accessed from the `Enhanced Traffic Parameters` menu (see “How Do I Change Channel Gain/Traffic Info Parameters?” for how to access) must be set to a value no greater than the current R-Data payload size. NOTE: You do not need to set this parameter unless its default value (3072 bits) is changed. Changing the setting results in an open data connection closed and a session re-negotiation. Once this happen, you need to re-open the connection.)

10.A typical measurement result for test 8 is shown below.

It is the power of I:$1_{SF=2}$ walsh channel of R-Data relative to R-Pilot. This result should be within +/- 0.25 dB of its T2P component (11.24 dB for test 8) as defined in the C.S0033-A standard (click here for specification).



It is the power of Q:$1_{SF=2}$ walsh channel of R-Data relative to R-Pilot. This result should be within +/- 0.25 dB of its T2P component (11.24 dB for test 8) as defined in the C.S0033-A standard (click here for specification).

It is the power of Auxiliary Pilot channel relative to R-Pilot. Verify that this result should be within +/- 0.25 dB of the specification (2.25 dB for test 8) as defined in the C.S0033-A standard (click here for specification).

It is the power of R-Data relative to R-Pilot. Verify that this result should be within +/- 0.25 dB of the TxT2P Gain setting (14.25 dB for test 8) s defined in the C.S0033-A standard (click here for specification).

Testing 4.3.8.4 DSC Channel Output Power

1. Set up an RETAP session (for Subtype 2 Physical Layer) with the following setups and then open an RETAP connection. For detailed procedure on how to open an RETAP session and connection, see "How Do I Open a Session and Test Data Connection?" on page 72. (NOTE: It is recommended set the parameters prior to opening the session and connection because some of these settings are configured during session negotiation state)
   - Set the `R-Data Pkt Size` (**F12** on `Call Parms 1 of 3`) to 256 bits.
   - Set the `Reverse Data Transmission Mode` under the `Application Config` (**F10** on `Call Parms`

1 of 3) menu to High Capacity.

- From the Power Parameters Info menu (see “How Do I Change Channel Gain/Traffic Info Parameters?” on page 88 for how to access), set the 256-bit High Capacity Termination Target to 3 (4 sub-frames, resulting in 16 slots).

2. C.S0033 specifies to configure the FETAP such that the ACK Channel is transmitted at all the slots. To do this, set the ACK Channel Bit Fixed Mode to On from Application Config (**F10** under Call Parms 1 of 3).
3. Set $\hat{I}_{or}$ (Cell Power) to -75 dBm/1.23 MHz.
4. Initialize the waveform quality + code domain measurement. Set Slots to Measure to 2.
5. Set DSC Channel Gain to -9 dB.
6. Measure waveform quality + code domain.
7. Select Code Domain Power (**F3**) to view the R-DSC Δ Pilot result (available in the last column of the table of data).
8. Set DSC Channel Gain to -12 dB and repeat steps 6-7.
9. A typical measurement result is shown below.

Channel	Walsh	SF	CDP	Total CDP	Norm Total	Δ Pilot
R-Pilot	I: 0	16	-11.23	-8.22	-8.22	0.00
R-AuxPilot	---	---	-----	-----	-----	-----
R-RRI	I: 4	16	-17.27	-14.26	-14.26	-6.04
R-DSC	I:12	32	-20.30	-20.30	-5.15	3.06
R-DRC	Q: 8	16	-8.34	-5.33	-5.33	2.89
R-ACK	I:12	32	-8.17	-8.17	-5.15	3.06
R-DATA	Q: 2	4	-13.58	-4.55	-4.55	3.67

Verify that this result should be within +/- 0.25 dB of the DSC Channel Gain setting.

Measuring TX Spurious Emissions

- "General Procedure"
- "Testing 4.4.1 Conducted Spurious Emissions"

General Procedure

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the TX spurious emissions measurement.

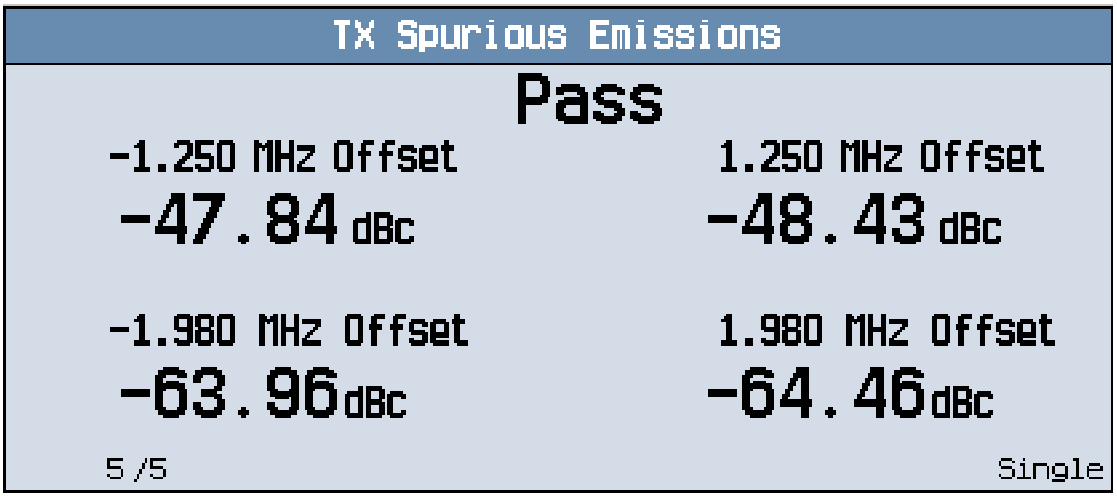
1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on.
2. Wait for the access terminal to open a session and then open an RTAP (for subtype 0 physical layer) or RETAP (for subtype 2 physical layer) data connection for AT's transmitter test.
3. Set the `RTAP Rate` (**F12**) and `FTAP Rate` (**F11**) on the `Call Parms 1 of 3` menu as needed if during an RTAP connection, or set the `R-Data Pkt Size` (**F12**) and `F-Traffic Format` (**F11**) on the `Call Parms 1 of 3` menu as needed if during an RETAP connection.
4. Initialize the TX spurious emissions measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `TX Spurious Emissions` measurement and press the knob.
5. Select `TX Spurious Emissions Setup` (**F1**) to access the `TX Spurious Emissions Setup` menu. From this menu you can configure measurement parameters such as `Mask Control` and `Adjacent Limit` and `Alternate Limit`. (These parameters are only available when `Mask Control` is set to `Manual`.) For statistical measurement results, highlight the `Multi-Measurement Count` parameter and press the **ON** key. The number of averages will default to 10. You can change the value as desired.

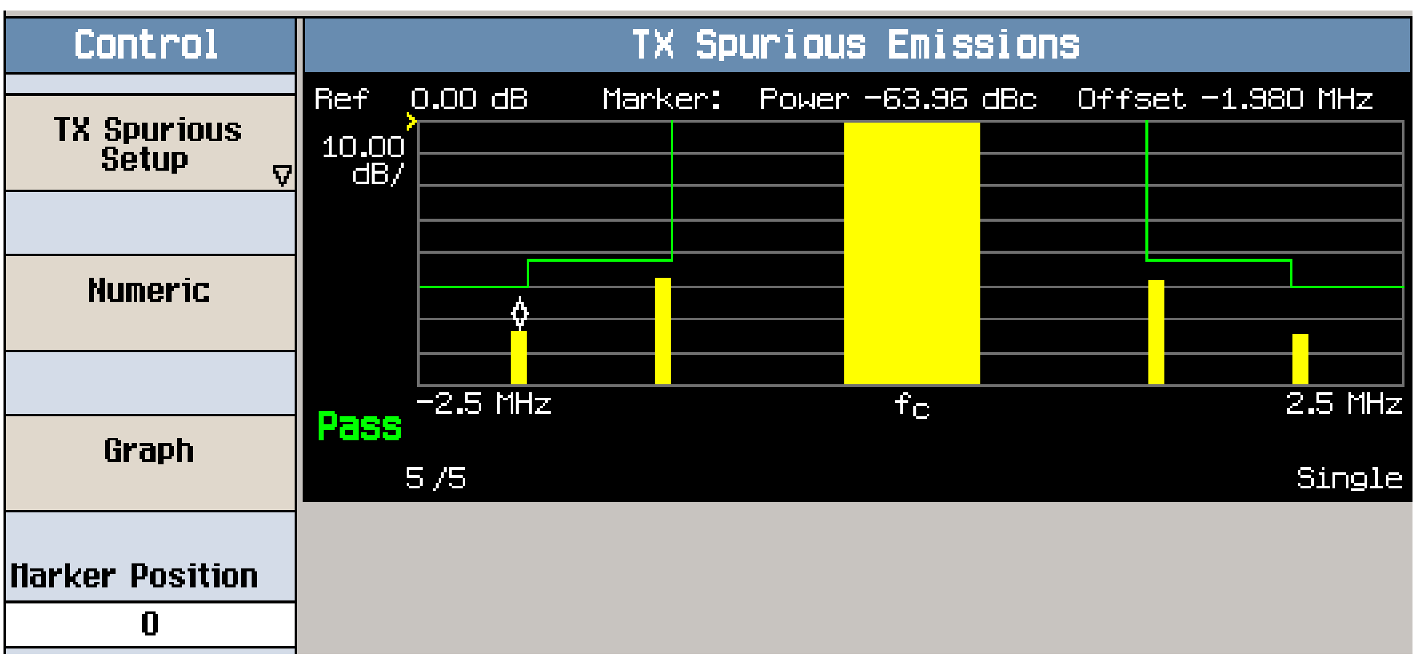
TX Spurious Emissions Setup	Value
Multi-Measurement Count	5
Open Loop Adjust	81 dB
Mask Control	Auto
Adjacent Limit	-42.00 dB
Alternate Limit	-50.00 dB
Trigger Arm	Single
Measurement Timeout	5.0 s

6. Select `Close Menu` (**F6**) to close the `TX Spurious Emissions Setup` window.

7. From the `Call Parms` menu, configure `Cell Power` (**F7**), as needed.
8. Measure TX spurious emissions:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous`, the measurement began executing as soon as you initialized it in step 3.
9. Select `Graph` (**F3**) to display a graphical view of the results, or `Numeric` (**F2**) to display numeric results.
10. When viewing the graphical display, you can select `Marker Position` (**F4**) and turn the knob to display the spurious emissions levels at each of the frequency offsets.

Typical numeric and graphical measurement results are shown below:





Testing 4.4.1 Conducted Spurious Emissions

For details on performing the steps below, see the “General Procedure” on page 48 above.

1. Initialize the TX spurious emissions measurement.
2. Set the following access parameters (see “How Do I Change Access Parameters?” on page 85):
   - Set `Open Loop Adjust` to 81 dB or 84 dB, depending upon band class.
   - Set `Probe Initial Adjust` to 15 dB.
   - Set `Probe Power Step` to 7.5 dB/step.
3. For Subtype 0 or 1 Physical Layer, set up a Test Application session and open an RTAP connection with the `RTAP Rate` (**F12** on the `Call Parms 1 of 3` menu) set to `153.6 kbps`. For detailed procedure on how to open an RTAP session and connection, see “How Do I Open a Session and Test Data Connection?” on page 72.

   For Subtype 2 Physical Layer, set up a Test Application session and open an RETAP connection with the following setups. For detailed procedure on how to open an RETAP session and connection, see “How Do I Open a Session and Test Data Connection?” on page 72.
   - Set the `R-Data Pkt Size` (**F12** on `Call Parms 1 of 3`) to 4096 bits.
   - Set the `Reverse Data Transmission Mode` under the `Application Config` (**F10** on `Call Parms 1 of 3`) menu to `High Capacity`.
   - From the Power Parameters Info menu (see “How Do I Change Channel Gain/Traffic Info Parameters?” on page 88 for how to access), set the `4096-bit High Capacity Termination Target` to `3` (4 sub-frames, 16 slots). (NOTE: You do not need to set these settings unless the default value (3) of these settings are changed. Changing these setting results in an open data connection closed because these settings are configured during session negotiation. Once this happen, you need to re-open the connection.)
4. C.S0033 specifies to configure the Test Application FTAP (for Subtype 0 or 1 Physical Layer) or FETAP (for Subtype 2 Physical Layer) with a Forward Traffic Channel rate of 307.2 kbps (2-slot version) and the ACK Channel is transmitted at all the slots.
   To do this, set the `FTAP Rate` (**F11** on `Call Parms 1 of 3`) to `307.2 (2 Slot)` if during subtype 0 physical layer test or set the `F-Traffic Format` (**F11** on `Call Parms 1 of 3`) to `4 (1024, 2, 128)` if during subtype 2 physical layer test, and set `ACK Channel Bit Fixed Mode` to `On` from `Application Config` (**F10** on `Call Parms 1 of 3`).
5. Set $\hat{I}_{or}$ (`Cell Power`) to -60 dBm/1.23 MHz.
6. Set `Rvs Power Ctrl` to `All Up bits` (**F7** on the `Call Parms 2 of 3` menu) to transmit continuous up power control bits.
7. Measure TX Spurious Emissions, and note the pass/fail result.
8. When you have finished testing, be sure to set the `Rvs Power Ctrl` back to `Active bits` to ensure that subsequent signalling is successful.

TX Dynamic Power Measurement Description

How is a TX Dynamic Power Measurement Made?

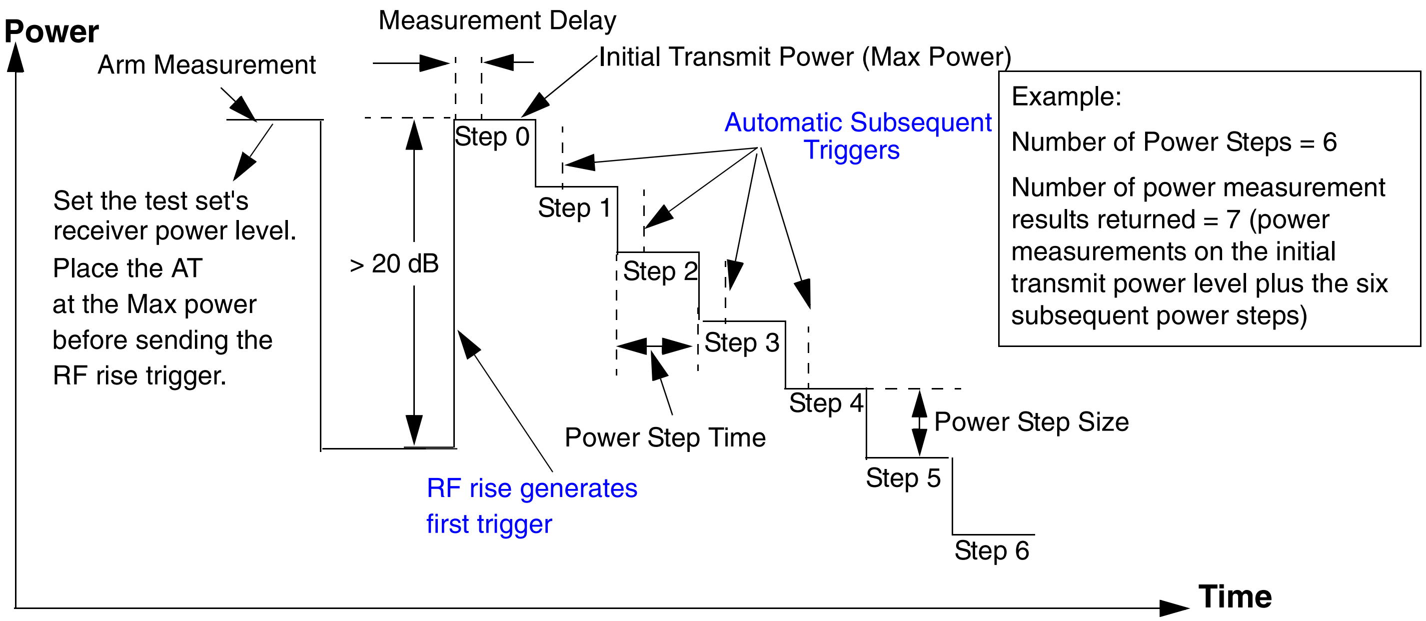
The TX dynamic power measurement provides a fast power calibration method for your AT. It is available in Active Cell and IS-856 Test operating modes.

The measurement is not performed with a call established between the test set and AT. Rather, you must place your AT into a test mode which controls the AT to transmit a power sequence of successive down steps of fixed size and duration. An example AT output power sequence for TX Dynamic Power Measurement is shown in the figure below.

Before starting the TX dynamic power measurement, you must set the test set's receiver using manual control, with the power set to match the initial transmit power of the AT's power sequence, and with the frequency set to match the AT's transmit frequency. This is required for the test set to tune its receiver properly for the initial measurement.

Typically, the dynamic power range of an AT is 90 dB, from -60dBm to +30 dBm. The TX dynamic power measurement can measure the AT's output power sequence ranging from -61 dBm to +37 dBm, in up to 99 steps. The `Power Step Time` may be 20, 40 or 80 ms in duration.

Figure 1. AT Output Power Profile for TX Dynamic Power Measurement



The TX dynamic power measurement is firstly triggered by an RF rise impulse from the AT (a positive change in power from 20 dB below the initial transmit power). To ensure successful triggering, it is recommended that you first command the AT to transmit continuously at the initial transmit power level, initiate the measurement, then command the AT to drop and then raise its output power by more than 20 dB to create the RF rise trigger.

Once triggered, the TX dynamic power measurement performs a series of channel power measurements in `Very Fast` speed one at each step of the power sequence. The AT's initial transmit power (step 0) is measured at 6 ms, or 16 ms, or 36 ms (corresponding to the Power Step Time set to 20ms, 40ms or 80ms) after receiving the RF rise trigger. This is to ensure that the measurements always sample the stable portions of the data record. The test set then tunes its receiver to the proper level before performing each subsequent channel power measurement based on the measured power of the prior step and the Power Step Size setting. Each subsequent channel power measurement is automatically triggered at every 20, 40, or 80 ms (depending on the Power Step Time setting). The AT must step its power down and then hold its power constant at each step for Power Step Time duration. After completing the measurements at all of the requested power steps the test set returns power results for the initial AT transmit power (step 0) and each of the down steps.

So, the general procedure for making a TX dynamic power measurement is:

1. Set the test set's receiver in manual control with the power set to match the initial transmit power of the AT's power sequence, and with the frequency set to match the AT's transmit frequency.
2. Set the `Power Step Size`, `Number Of Power Steps` and `Power Step Time` parameters to match the power sequence to be transmitted by the AT.
3. Place your AT into the test mode required for performing TX dynamic power and command it to transmit continuously at the initial transmit power level (for example, the maximum power).
4. Arm the TX Dynamic Power measurement by the INIT command or by pressing the **START SINGLE** key.
5. Using the AT test mode interface, command the AT to generate an RF rise impulse (with a positive change in power from 20 dB below the initial transmit power) to trigger the measurement, and then transmit a power sequence of successive down steps of expected size and duration.
6. The test set measures the AT's initial transmit power and all of the requested power steps, then displays the measurement results in graphical "Bars" and numeric values.

Operating Considerations

- The TX dynamic power measurement is re-ranged and re-triggered for every step in the AT's power sequence. To prevent from missing an internal trigger at each step of a power sequence measurement, it is recommended that you do not send any GPIB commands to the test set or press any front panel keys until the measurement has completed. If the measurement misses a trigger, it aborts and returns Integrity Indicator `30: Missed Trigger`
- The dynamic power measurement is not available in a multi-measurement mode.
- The TX dynamic power measurement is expected to only be used when data connection status is Idle as the AT must be operating in a test mode to transmit the required power sequence.
- The TX dynamic power measurement does not run concurrently with any other measurements. If any measurements are running when TX dynamic power measurement is initiated, they are closed and a message is displayed to indicate that they were closed. Likewise, if any other measurements are initiated while a TX dynamic power measurement is running, the TX dynamic power measurement is closed and a message is displayed.

TX Dynamic Power Measurement Parameters

- Power Step Size

  Sets the power change (in dB) that the test set expects the AT to decrease between power steps. The test set re-ranges its receiver for each step power measurement based on the measured power of the prior step and this setting.

  GPIB command: SETup:CTDPower:STEP[:LEVel]

- Number of Power Steps

  Sets the number of power steps (steps down since its initial transmit power) that the test set expects the AT to transmit. The total number of power results returned will be the number of this setting plus one and can be queried using the FETCh:CTDPower:COUNt[:STEP]?.

GPIB command: SETup:CTDPower:STEP:COUNt

- Power Step Time

  Sets the duration (20, 40 or 80 ms) of each power measurement. The test set expects the AT to hold its power constant during each power step. The test set triggers each channel power measurement relative to the first RF rise trigger based on this setting.

  GPIB command: SETup:CTDPower:STEP:TIME

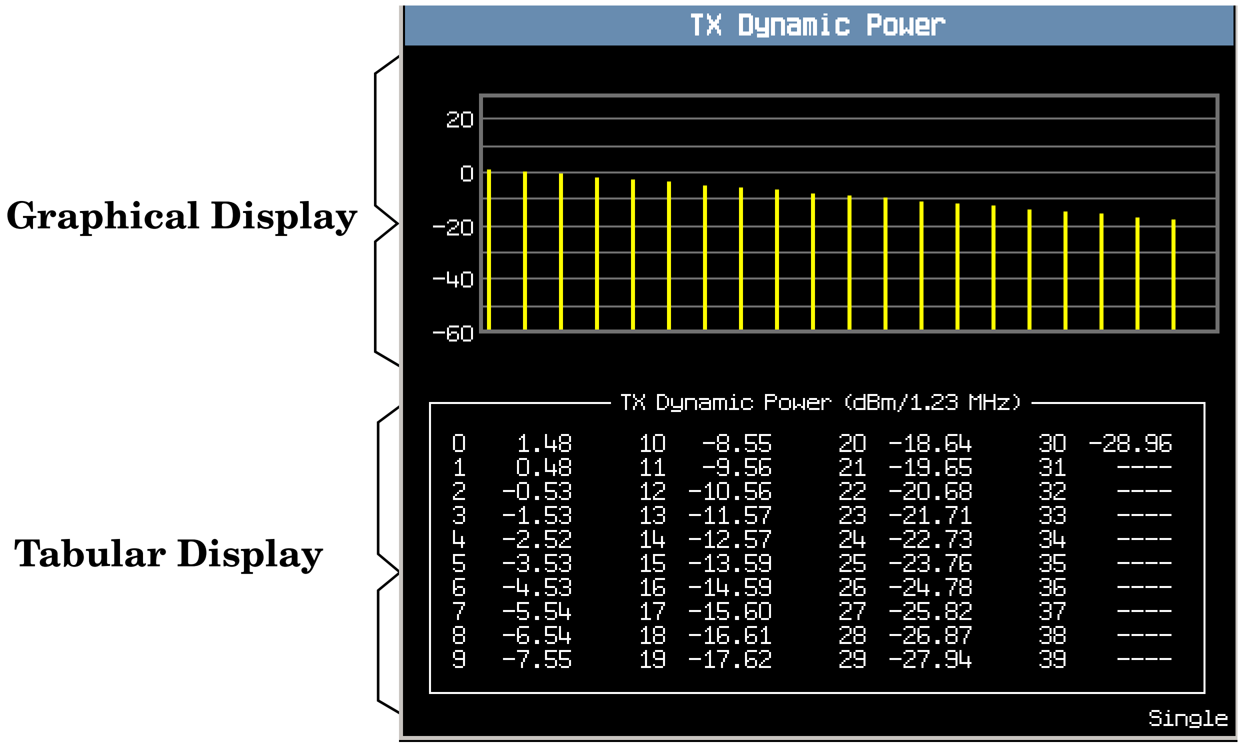
- Measurement Timeout. Ensure that you set the `Measurement Timeout` to a value great enough to allow you to command the AT to transmit its power sequence and for the test set to measure the power sequence.

TX Dynamic Power Measurement Results

- Integrity Indicator.
- Power Results - Power (dBm/1.23 MHz) are returned for the AT’s initial transmit power (step 0) and each down step of the AT’s transmit power sequence. The total number of power results returned is 1 + “Number of Power Steps” and can be queried using the FETCh:CTDPower:COUNt[:STEP]? command.

The TX dynamic power measurement result is displayed in both a tabular and a bar graph format. .

Figure 2. TX Dynamic Power Measurement Display



0	1.48	10	-8.55	20	-18.64	30	-28.96
1	0.48	11	-9.56	21	-19.65	31	----
2	-0.53	12	-10.56	22	-20.68	32	----
3	-1.53	13	-11.57	23	-21.71	33	----
4	-2.52	14	-12.57	24	-22.73	34	----
5	-3.53	15	-13.59	25	-23.76	35	----
6	-4.53	16	-14.59	26	-24.78	36	----
7	-5.54	17	-15.60	27	-25.82	37	----
8	-6.54	18	-16.61	28	-26.87	38	----
9	-7.55	19	-17.62	29	-27.94	39	----

Graphical Display

The graphical display shows the measurement result for each step with a graphical “Bar”. The x-axis graph represents the number of the power steps and y-axis represents the absolute power of the measurement step in units of dBm/1.23 MH. Up to 100 steps of the measurement results can be displayed on the graph. The view window can be adjusted to include a view of the entire 100 power step range, or reduced to include only the measurement steps of particular interest by the Graph Control softkeys.

NOTE The number of displayed bars equals the value of `Number of Power Steps` plus one. For example, when Number of Power Steps is set to 3, the display shows 4 yellow bars in one measurement.

- `Marker` (**F1**) - sets a marker position across the current span of the graph. The measurement result that corresponds with the marker position is highlighted in the table below the graphical display. This setting also controls the table scrolling.

- Start Step (**F3**) - sets the first measurement step displayed on the graph. It is used to adjust the view window together with the Span (**F4**).
- Span (**F4**) - sets the number of measurement steps displayed on the graph. It is used to adjust the view window together with the Start Step (**F3**).
- Default Scale (**F5**) - sets the Graph Marker, Start Step, and Span to their default values.

Tabular Display

A table below the graphical display lists the absolute power of each step measurement in units of dBm/1.23 MHz. The table has the capacity to display 40 steps of measurement results. To scroll through the table adjust the setting in Marker field.

TX Dynamic Power Input Signal Requirements

Input Signal Requirements

Calibrating the TX Dynamic Power Measurement

The TX dynamic power measurement is automatically calibrated during a channel power calibration. Follow the channel power calibration schedule and the TX dynamic power measurement will be properly calibrated.

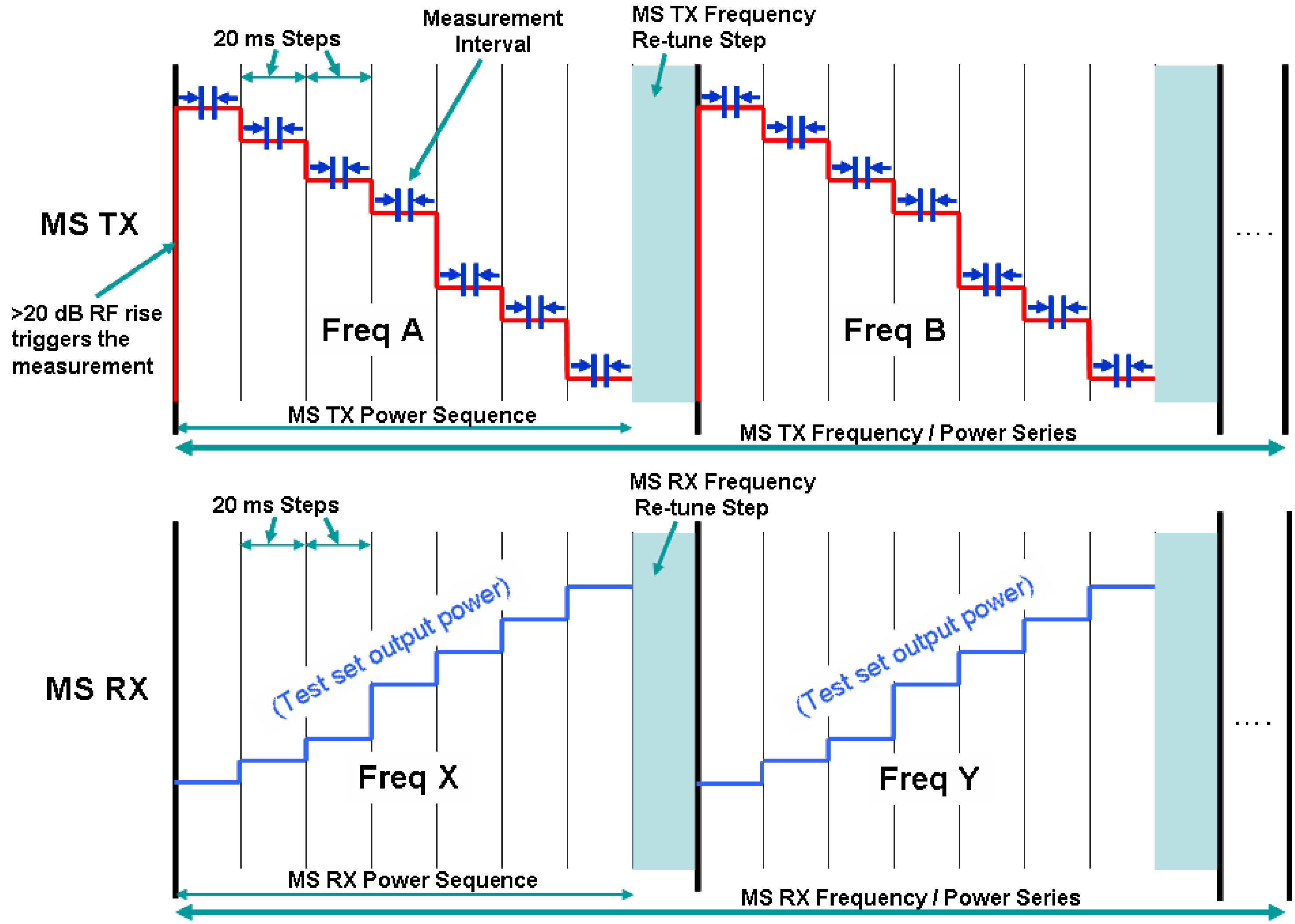
Fast Device Tune Measurement Description

This section is only applicable to the lab application and to a test application with the required feature license.

How is a Fast Device Tune Measurement Made?

The Fast Device Tune measurement allows you to simultaneously calibrate your mobile station's transmitter (TX) output power and receiver (RX) input level across level and frequency in a single sweep (per frequency band range). The measurement is not performed with a call established between the test set and mobile station (MS). Rather, you must place your MS into a test mode which forces it to transmit a predefined series of power steps at various frequencies, and forces it to simultaneously tune its receiver to perform measurements of the test set's signal (to determine RSSI, for example) at various frequencies and power levels.

Figure 3. Example MS TX and MS RX Frequency/Power Series for Fast Device Tune Measurement



Before initiating the measurement, you must specify the power sequence that the MS will transmit (MS TX Power Sequence), and the frequencies at which the MS will transmit the power sequence (MS TX Frequency Sequence). You must also specify the power sequence you want the test set to transmit (MS RX Power Sequence), and the frequencies at which you want the test set to transmit the power sequence (MS RX Frequency Sequence).

Configuring the MS TX Frequency/Power Series

The MS TX Power Sequence may include up to 20 steps (of 20 ms duration) that span some or all of the measurement's input range (the levels can step up or down with varying magnitudes of change, as long as the first step in the sequence provides a 20 dB rise to trigger the measurement). The MS TX Frequency Sequence may include up to 20 frequencies (within one frequency band range).

The test set can measure a total of 400 power points in one measurement cycle (20 power values at 20 different frequencies). However, the measurement allows you to enter up to 40 "MS TX Power Step Levels" and 40 "MS TX Frequency Step Values" (indexed from 0 to 39). You must then use the "MS TX Power Step Start Index" and "Number of Power Steps" settings to specify which power steps comprise the MS TX Power Sequence, and the "MS TX Frequency Step Start Index" and "Number of Frequency Steps" settings to specify which frequency steps comprise the MS TX Frequency Sequence. See "Frequency/Power Series Example" on page 60 for an example illustrating how to utilize this flexibility.

The test set uses the values in the MS TX Power Sequence and the MS TX Frequency Sequence to build the MS TX Frequency/Power Series, which drives how the test set's receiver is tuned throughout the measurement cycle. To build the MS TX Frequency/Power Series, the test set simply repeats the MS TX Power Sequence at each of the frequencies in the MS TX Frequency Sequence, and inserts a frequency re-tune step in between each repetition of the power sequence (to allow the test set and MS to re-tune to the new frequency; no measurements are performed by the test set during the frequency re-tune steps). During the frequency re-tune steps, the test set tunes its receiver to the power and frequency values required for the first step in the next power sequence. The frequency re-tune steps are the same step length as the power sequence steps (20 ms).

Before initiating the measurement, you must ensure that your MS is set to transmit the MS TX Frequency/Power Series you've set in the test set, including the frequency re-tune steps.

Configuring the MS RX Frequency/Power Series

While the test set is measuring the MS TX Power Sequence, it also transmits a MS RX Power Sequence for the MS to measure. This MS RX Power Sequence must include the same number of power steps as the MS TX Power Sequence (up to 20 steps of 20 ms duration). These steps can be at any power level in the test set's Cell Power output range.

The test set transmits its MS RX Power Sequence at each of the frequencies in the MS RX Frequency Sequence. The MS RX Frequency Sequence may include up to 20 frequencies within one frequency band range (which does not have to be the same frequency band range as the MS TX Frequency Sequence). The number of frequencies in the MS RX Frequency Sequence must match the number of frequency steps in the MS TX Frequency Sequence.

If you do not want the MS to measure test set power at as many power levels or frequencies as you want the test set to measure from the MS, simply place "dummy" power levels or frequencies at the end of the MS RX Power Sequence and MS RX Frequency Sequence (for example, simply repeat the final power level or frequency). You can then ignore the mobile station's measurement results for these "dummy" points. Likewise, if you need more measurement points in the MS RX Frequency/Power Series than in the MS TX Frequency/Power Series, you can place "dummy" power levels and frequencies in the MS TX Frequency/Power Series, but note that the test set will still measure and report power for these "dummy" points. You must simply ignore these results.

As with the MS TX Frequency/Power Series, the test set can transmit a total of 400 power points in one measurement cycle (20 power values at 20 different frequencies), but the measurement allows you to enter up to 40 "MS RX Power Step Levels" and 40 "MS RX Frequency Step Values" (indexed from 0 to 39). You must then use the "MS RX Power Step Start Index" and "Number of Power Steps" settings to specify which power steps comprise the MS RX Power Sequence, and the "MS RX Frequency Step Start Index" and "Number of Frequency Steps" settings to specify which frequency steps comprise the MS RX Frequency Sequence. See "Frequency/Power Series Example" on page 60 for an example illustrating how to utilize this flexibility.

As with the MS TX Frequency/Power Series, the test set uses the values in the MS RX Power Sequence and the MS RX Frequency Sequence to build the MS RX Frequency/Power Series, which drives how the test set's generator is tuned throughout the measurement cycle. To build the MS RX Frequency/Power Series, the test set simply repeats the MS RX Power Sequence at each of the frequencies in the MS RX Frequency Sequence, and inserts a frequency re-tune step in between each repetition of the power sequence (to allow the test set and MS to re-tune to the new frequency; the MS should not perform any measurements on the test set's signal during this time, or if a measurement is performed, you should ignore the measurement results). During the frequency re-tune steps, the test set moves its generator to the power and frequency values required for the first step in the next power sequence. The frequency re-tune steps are the same step length as the power sequence steps (20 ms).

Before initiating the measurement, you must ensure that your MS is set to measure the MS RX Frequency/Power Series you've set in the test set, and that its tuning profile includes the frequency re-tune steps. Your mobile station should be configured to measure the test set's signal 5 ms after the start of each step, to allow the test set's source to settle.

Frequency/Power Series Example

The test set can measure/transmit 400 power points in one measurement cycle (20 power values at 20 different frequencies). However, you can enter up to 40 power values and 40 frequencies for both the MS TX and MS RX sequences. This flexibility is present to make it more efficient for you to test different power sequences over different sets of frequencies or, more commonly, to test the same power sequence over different bands. You must load in the superset of power levels and frequency values once. Then for each measurement cycle, you simply change the start index and number of steps as needed and initiate the measurement.

For example, to measure a MS TX sequence of 14 power step levels in both the US Cellular and US PCS frequency bands:

- MS transmit power levels (dBm): 20, 16, 12, 8, 4, 0,-4, -8, -12, -16, -20, -30, -40, -50
- US Cellular band, frequencies (MHz): 826.2, 829.2, 835.2, 838.2, 841.2, 847.2
- US PCS band, frequencies (MHz): 1852.5, 1856.5, 1860.5, 1864.5, 1870.5, 1874.5, 1878.5, 1882.5, 1886.5, 1890.5, 1894.5, 1898.5, 1902.5

and to transmit a MS RX sequence of 8 power step levels for the mobile station to measure:

- Test set transmit power levels (dBm): -90, -80, -70, -60, -50, -40, -30, -20
- US Cellular band, frequencies (MHz): 871.2, 874.2, 880.2, 883.2, 886.2, 892.2
- US PCS band, frequencies (MHz): 1932.5, 1936.5, 1940.5, 1944.5 1950.5, 1954.5, 1958.5, 1962.5, 1966.5, 1970.5, 1974.5, 1978.5, 1982.5

for multiple US Cellular/US PCS mobile stations, set the following:

1. `MS TX Power Step Levels` = 20, 16, 12, 8, 4, 0,-4, -8, -12, -16, -20, -30, -40, -50
   `MS RX Power Step Levels` = -90, -80, -70, -60, -50, -40, -30, -20, -75, -75, -75, -75, -75, -75 (note that the last six values "-75" are "dummy" values required so that there are an equal number of power steps in the MS TX and MS RX sequences)
   `MS TX Frequency Step Values` = 826.2, 829.2, 835.2, 838.2, 841.2, 847.2, 1852.5, 1856.5, 1860.5, 1864.5, 1870.5, 1874.5, 1878.5, 1882.5, 1886.5, 1890.5, 1894.5, 1898.5, 1902.5
   `MS RX Frequency Step Values` = 871.2, 874.2, 880.2, 883.2, 886.2, 892.2, 1932.5, 1936.5, 1940.5, 1944.5 1950.5, 1954.5, 1958.5, 1962.5, 1966.5, 1970.5, 1974.5, 1978.5, 1982.5
2. `MS TX Power Step Start Index` = 0
   `MS RX Power Step Start Index` = 0
   `Number of Power Steps` = 14
3. Mobile station #1:
   - `MS TX Frequency Step Start Index` = 0
     `MS RX Frequency Step Start Index` = 0

`Number of Frequency Steps` = 6
Initiate the measurement, query INITiate:CFDTune:ARMed?, fetch the results

- `MS TX Frequency Step Start Index` = 6
  `MS RX Frequency Step Start Index` = 6
  `Number of Frequency Steps` = 13
  Initiate the measurement, query INITiate:CFDTune:ARMed?, fetch the results

4. Mobile station #2: repeat step 3
5. Mobile station #3: repeat step 3
6. ...

Triggering the Fast Device Tune Measurement

The MS must trigger the measurement with a positive change in power of at least 20 dB (the mobile station's power must rise from 20 dB below the level of the first step in the MS TX Power Sequence to within 9 dB of the level of the first step).

To ensure successful triggering, it is recommended that you do the following:

1. Order the MS to transmit continuously at >20 dB below the power level of the first step in the MS TX Power Sequence.
   Note: If your MS TX Power Sequence starts at a power level that is less than 20 dB above the minimum transmit power of your MS, then you must include a trigger pulse as the first step in the MS TX Power Sequence. The power level of this trigger pulse will be measured by the test set as one of the steps in the sequence.
2. Initiate the Fast Device Tune measurement (this prepares the test set's hardware to execute the frequency/power series you've specified and arms the measurement's RF rise trigger).
3. Send the INITiate:CFDTune:ARMed? query and wait for it to return a value of `1`, indicating that the measurement is armed and ready to be triggered (or wait ~2 seconds if running the measurement from the front panel).
4. Order the MS to begin transmission of its MS TX Frequency/Power Series (the MS should then increase its output power by more than 20 dB to reach the first step in the series, which triggers the measurement with an RF rise).

Once triggered, the Fast Device Tune measurement performs a series of channel power measurements, one near the center of each step of the MS TX Power Sequence (while simultaneously transmitting the MS RX Power Sequence you've specified), then repeats the measurements at the next specified MS TX frequency (while simultaneously transmitting the MS RX Power Sequence at the next specified MS RX frequency). The test set tunes its receiver for each step according to the power levels you've specified for the MS TX Power Sequence. The MS must step its power according to the MS TX Power Sequence (and be within +/- 9 dB of the expected power level for each step) and hold its power constant for the duration of the measurement interval (312.5 us, 7 ms after the start of each step). After completing a measurement at each step of the MS TX Frequency/Power Series, the measurement returns power results for all of the measured steps.

Required Initial Conditions

- `Operating Mode` must be set to `IS-856 Test`.
- `Rcvr Power Ctrl` must be set to `Manual` and `Meas Frequency` must be set to manual control. To set `Meas Frequency` to manual control from the front panel, press the **OFF/MANUAL** key. This sets `Meas`

Frequency to the last frequency value that this parameter was set to. The Fast Device Tune measurement ignores the specific value that Meas Frequency is set to, so it can be set to any supported input frequency; the measurement simply requires that Meas Frequency be in manual control mode

- RF Gen Freq Ctrl must be set to Manual.
- AWGN Power must be Off. If in the *Lab Application*, also make sure no external fading is applied.
- The Fast Device Tune measurement is only supported on the **RF IN/OUT** port. If your test set includes an **RF OUT ONLY** port, RF Output Port (**F6** on the System Config screen) must be set to **RF IN/OUT**.
- You must configure the MS TX Frequency/Power Series to match the pattern of power levels to be transmitted by the MS and configure the MS RX Frequency/Power Series to match the pattern of power levels to be measured by the MS.

Operating Considerations

The Fast Device Tune measurement must re-range and re-trigger for every step in the MS TX Power Sequence. To ensure that this process is not interrupted by other operations, it is recommended that you not send any GPIB commands to the test set or press any front panel keys until the measurement has completed. If the measurement misses a trigger, it aborts and returns Integrity Indicator 30: Missed Trigger.

No other measurements can be running when a Fast Device Tune measurement is performed. If any measurements are running when a Fast Device Tune measurement is initiated, they are closed and a message is displayed to indicate that they were closed. Likewise, if any other measurements are initiated while a Fast Device Tune measurement is running, the Fast Device Tune measurement is closed and a message is displayed.

Measurement results (and the RF generator output level) are affected by any RF IN/OUT Amplitude Offsets that are entered.

Fast Device Tune Measurement Parameters

Fast Device Tune Setup

- Measurement Timeout

  Ensure that you set the Measurement Timeout to a value great enough to allow you to command the MS to transmit its MS TX Frequency/Power Series and for the test set to measure the MS TX Frequency/Power Series. For example, measuring the maximum allowable number of 400 power points can take more than 10 seconds (400 steps plus the 19 re-tune steps: 419 x 20 ms = 8.4 seconds, plus ~ 2 seconds required for the measurement to prepare for triggering).

  GPIB command: SETup:CDFTune:TIMeout[:STIMe]

- MS TX Power Step Start Index

  Indicates which of the MS TX Power Step Levels is the first step in the MS TX Power Sequence.

  This parameter can be set to any integer value between 0 and 39. However, MS TX Power Step Start Index + Number of Power Steps” must not exceed 40.

  Also, you must ensure that the range of values selected by MS TX Power Step Start Index and Number of Power Steps do not include any NANs (9.91E+37) or values that are outside of the input range for the current application format (considering the amplitude offset settings).

GPIB command: SETup:CDFTune:MS:TX:POWer:STEP:STARt:[INDex]

- MS TX Frequency Step Start Index

  Indicates which of the MS TX Frequency Step Values is the first frequency in the MS TX Frequency Sequence.

  This parameter can be set to any integer value between 0 and 39. However, `MS TX Frequency Step Start Index` + Number of Frequency Steps must not exceed 40.

  Also, the frequencies indicated by `MS TX Frequency Step Start Index` and `Number of Frequency Steps` must be within one frequency band range (and must not include any NANs (9.91E+37)).

  GPIB command: SETup:CDFTune:MS:TX:FREQuency:STEP:STARt:[INDex]

- MS RX Power Step Start Index

  Indicates which of the MS RX Power Step Levels is the first step in the MS RX Power Sequence.

  This parameter can be set to any integer value between 0 and 39. However, `MS RX Power Step Start Index` + Number of Power Steps must not exceed 40.

  Also, you must ensure that the range of values selected by `MS RX Power Step Start Index` and `Number of Power Steps` do not include any NANs (9.91E+37) or values that are outside of the output range for the current application format (considering the amplitude offset settings).

  GPIB command: SETup:CDFTune:MS:RX:POWer:STEP:STARt:[INDex]

- MS RX Frequency Step Start Index

  Indicates which of the MS RX Frequency Step Values is the first frequency in the MS RX Frequency Sequence.

  This parameter can be set to any integer value between 0 and 39. However, `MS RX Frequency Step Start Index` + Number of Frequency Steps must not exceed 40.

  Also, the frequencies indicated by `MS RX Frequency Step Start Index` and `Number of Frequency Steps` must be within one frequency band range (and must not include any NANs (9.91E+37)).

  GPIB command: SETup:CDFTune:MS:RX:FREQuency:STEP:STARt:[INDex]

- Number of Power Steps

  Indicates how many (consecutive) MS TX Power Step Levels are used for the MS TX Power Sequence, and how many (consecutive) MS RX Power Step Levels are used for the MS RX Power Sequence.

  This parameter can be set to any integer value between 1 and 20, but MS TX Power Step Start Index + `Number of Power Steps` and MS RX Power Step Start Index + `Number of Power Steps` must not exceed 40.

  Also, you must ensure that the range of power values selected by `MS TX Power Step Start Index, MS RX Power Step Start Index` and `Number of Power Steps` do not include any NANs (9.91E+37) or values that are outside of the input or output ranges for the current application format (considering the amplitude offset settings).

  GPIB command: SETup:CDFTune:POWer:STEP:COUNt

- Number of Frequency Steps

  Indicates how many (consecutive) MS TX Frequency Step Values are used for the MS TX Frequency Sequence, and how many (consecutive) MS RX Frequency Step Values are used for the MS RX Frequency

Sequence.

This parameter can be set to any integer value between 1 and 20, but MS TX Frequency Step Start Index + `Number of Frequency Steps` and MS RX Frequency Step Start Index + `Number of Frequency Steps` must not exceed 40.

Note that the frequencies indicated by `MS TX Frequency Step Start Index` and `Number of Frequency Steps` must be within one frequency band range. Likewise, the frequencies indicated by `MS RX Frequency Step Start Index` and `Number of Frequency Steps` must be within one frequency band range, but do not have to be in the same frequency band range as the MS TX Frequency Sequence. Ensure that none of the frequency values you've selected are NANs (9.91E+37)).

GPIB command: SETup:CDFTune:FREQuency:STEP:COUNt

Fast Device Tune MS TX/RX Parameters

- MS TX Power Step Levels

  You can specify up to 40 mobile station output power levels (indexed from 0 up to 39). You must use the MS TX Power Step Start Index" and Number of Power Steps settings to specify which of these (consecutive) power levels (up to 20) are used for the MS TX Power Sequence.

  Although you can enter any power levels between -129 and +80 dBm (because this measurement is common to the W-CDMA/HSDPA, 1xEV-DO and cdma2000 formats), when running the Fast Device Tune measurement in the 1xEV-DO application/format, you can only measure power levels in the range of -79 to +30 dBm and the measurement is only specified for power levels in the range of -61 to +30 dBm (these ranges assume an amplitude offset of 0; the ranges change as you change amplitude offsets.)

  GPIB command: SETup:CDFTune:MS:TX:POWer:STEP[:LEVels]

- MS TX Frequency Step Values

  You can specify up to 40 mobile station uplink frequencies (indexed from 0 up to 39). You must use the "MS TX Frequency Step Start Index" and Number of Frequency Steps settings to specify which of these (consecutive) frequencies (up to 20) are used for the MS TX Frequency Sequence.

  Although you can enter any frequencies between 411 and 1980 MHz, when running the Fast Device Tune measurement in the 1xEV-DO application/format, you can only test frequencies within a single 1xEV-DO frequency band range:

  — 411 to 479 MHz (Band: NMT-450)

  — 806 to 924 MHz (Bands: US Cellular, Japan CDMA, China Cellular, and Secondary 800)

  — 1750 to 1780 MHz (Band: Korean PCS)

  — 1920 to 1980 MHz (Band: IMT-2000)

  — 1850 to 1915 (Bands: US PCS and US PCS 1900)

  GPIB command: SETup:CDFTune:MS:TX:FREQuency:STEP[:VALues]

- MS RX Power Step Levels

  You can specify up to 40 test set output power levels (indexed from 0 up to 39). You must use the MS RX Power Step Start Index and Number of Power Steps settings to specify which of these (consecutive) power levels (up to 20) are used for the MS RX Power Sequence.

  Although you can enter any power levels between -165 and 37 dBm, when running the Fast Device Tune measurement in the 1xEV-DO application/format, the test set can only transmit test power levels in the range of -120 to -13 dBm (this range assumes an amplitude offset of 0; the allowable range changes as you change amplitude offsets.)

GPIB command: SETup:CDFTune:MS:RX:POWer:STEP[:LEVels]

- MS RX Frequency Step Values

  You can specify up to 40 test set downlink frequencies (indexed from 0 up to 39). You must use the MS RX Frequency Step Start Index and Number of Frequency Steps settings to specify which of these (consecutive) frequencies (up to 20) are used for the MS RX Frequency Sequence.

  Although you can enter any frequencies between 421 and 2170 MHz, when running the Fast Device Tune measurement in the 1xEV-DO application/format, you can only test frequencies within a single 1xEV-DO frequency band range:

  — 421 to 489 MHz (Band: NMT-450)

  — 800 to 960 MHz (Bands: US Cellular, Japan CDMA, China Cellular, and Secondary 800)

  — 1840 to 1870 MHz (Band: Korean PCS)

  — 2110 to 2170 MHz (Band: IMT-2000)

  — 1930 to 1995 (Bands: US PCS and US PCS 1900)

  GPIB command: SETup:CDFTune:MS:RX:FREQuency:STEP[:VALues]

Fast Device Tune Measurement Results

The Fast Device Tune measurement results are currently only available via GPIB command. Measurement results are not available on the front panel screen.

- Integrity Indicator
- Power

  The test set performs a channel power measurement near the center of each step (7 ms after the start of the step), with a measurement interval of 312.5 us (1/4 timeslot). Power (dBm/1.23 MHz) is returned for each step in the MS TX Frequency/Power Series (except for the frequency re-tune steps). The total number of results returned by the measurement is always 400 (Number of Power Steps x Number of Frequency Steps power result values are returned, followed by 9.91E+37 (NAN) for all remaining values up to 400). The power results for the first frequency in the MS TX Frequency Sequence are returned first, then the power results for the second frequency in the MS TX Frequency Sequence, etc., followed by NANs if fewer than 400 points were measured.

Note that the test set does not report the mobile station’s measurement results (for example, RSSI). You must capture the mobile station’s measurement results so that you can compare its measurements with the test set’s actual transmission levels.

Fast Device Tune Input Signal Requirements

The Fast Device Tune measurement meets specifications when the following input signal requirements are met:

- Frequency: 411 to 420 MHz, 450 to 484 MHz, 824 to 934 MHz, 1750 to 1780 MHz, 1850 to 1980 MHz

- Input level: -61 dBm to +30 dBm (the measurement can accept power within the range of -79 dBm to +30 dBm)

Calibrating the Fast Device Tune Measurement

You must calibrate this measurement using the `Calibrate Measurements` procedure.

Appendix

This Appendix includes some general setup procedures that are required to perform the tests, and other helpful information:

Test Adherence to Standards

Standards Table

Unless otherwise indicated, the capabilities shown in the tables apply to both the E1966A and the E6706A applications.

Table 1. Support of C.S0033-A Tests

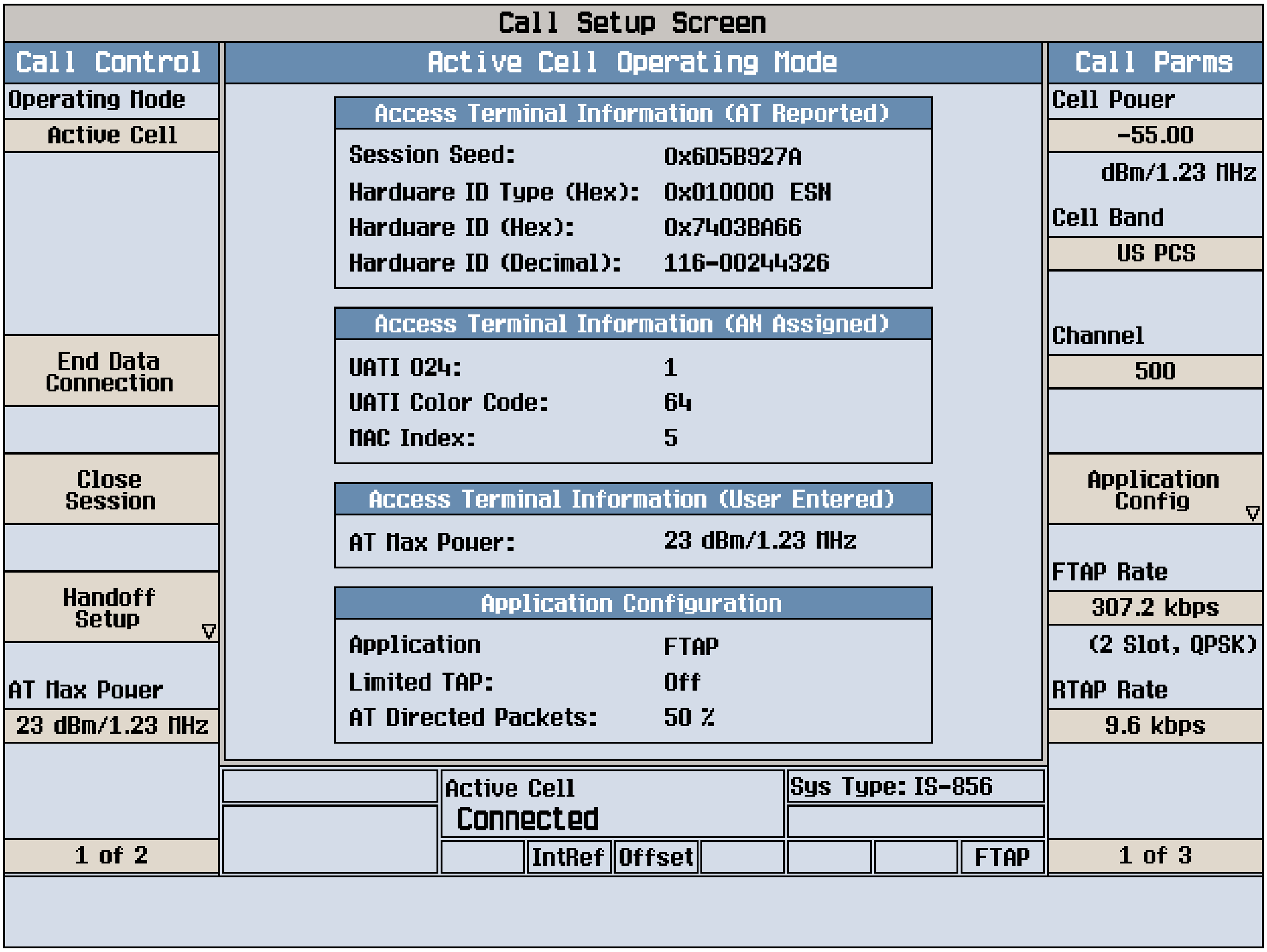
C.S0033-A Test	Supported by Test Set?	Comments
3. Receiver Tests		
3.1 Frequency Coverage Requirements	Yes	Supports Band Classes 0, 1, 3, 4, 5, 6, 10 and 14.
3.2.2 Demodulation of Forward Traffic Channel in Multipath Fading	Yes	See “Testing 3.2.1 Demodulation of Forward Traffic Channel in AWGN” on page 9.
3.2.2 Demodulation of Forward Traffic Channel in Multipath Fading	Yes. (*Lab Application Only*)	Requires external fader and AWGN generator. For example, the E5515C Fading Solution, see “Digital Bus Information” for reference information. (*Lab Application Only*)
3.2.3 Decision of Power Control Bit for Channels Belonging to Different Power Control Sets During Soft Handoff	No	Requires soft handoff capability.
3.2.4 Decision of Power Control Bit for Channels Belonging to the Same Power Control Set	No	Requires soft handoff capability.
3.2.5 Demodulation of Reverse Power Control Channel During Soft Handoff	No	Requires soft handoff capability.
3.2.6 Demodulation of ARQ Channel	No	
3.2.7 Demodulation of Broadcast Channel	No	
3.3.1 Receiver Sensitivity and Dynamic Range	Yes	See “Testing 3.3.1 Receiver Sensitivity and Dynamic Range” on page 12.
3.3.2 Single Tone Desensitization	Partially	Requires external CW signal generator.
3.3.3 Intermodulation Spurious Response Attenuation	Partially	Requires two external CW signal generators.
3.3.4 Adjacent Channel Selectivity	Partially	Requires external HRPD (1xEV-DO) and CDMA sources.
3.3.5 Receiver Blocking Characteristics	Partially	Requires external CW signal generator.
3.4.1 Conducted Spurious Emissions	No	Requires full spectrum analyzer
3.4.2 Radiated Spurious Emissions	No	Requires full spectrum analyzer

Table 1. Support of C.S0033-A Tests

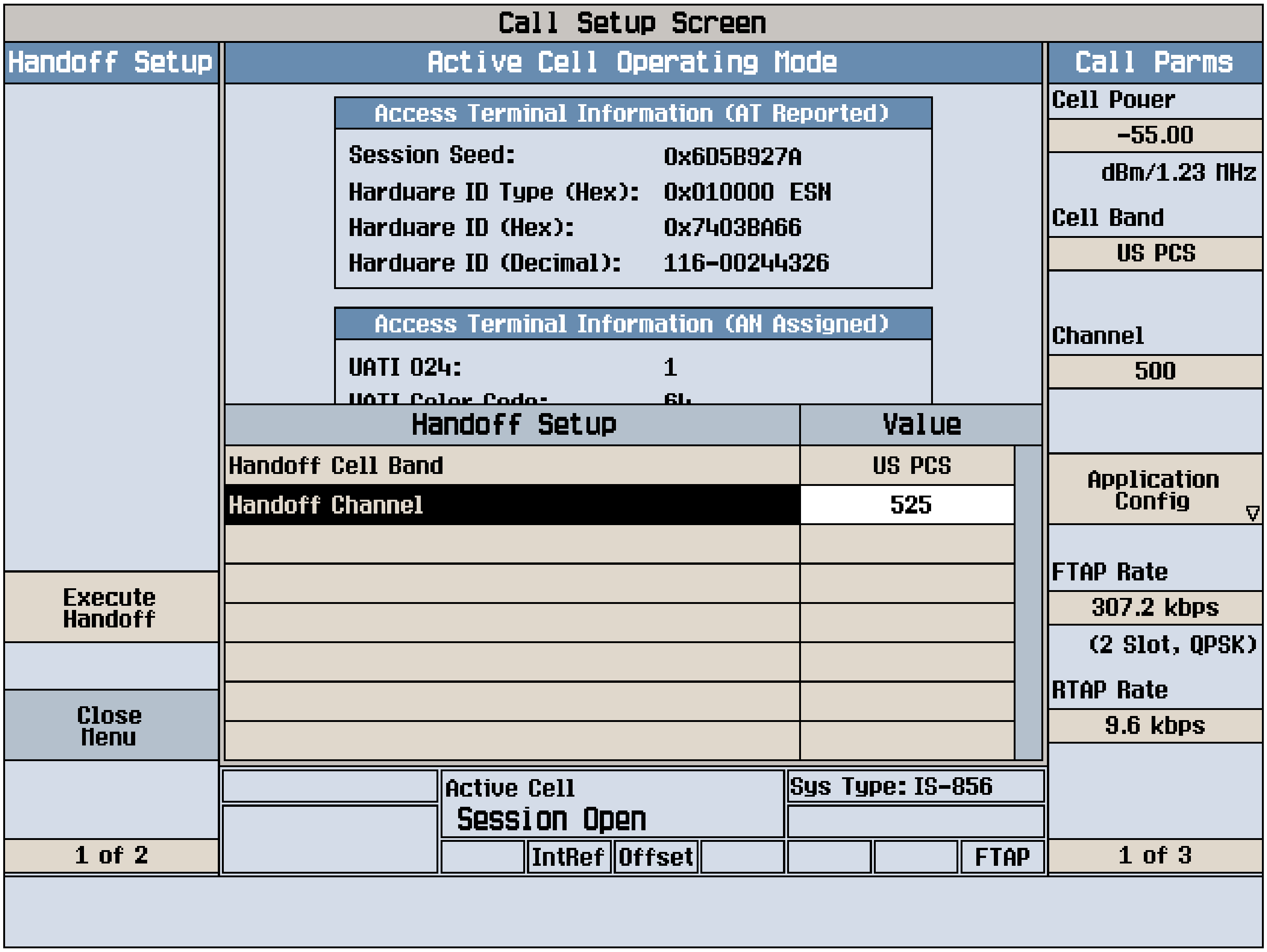
C.S0033-A Test	Supported by Test Set?	Comments
4. Transmitter Tests		
4.1.1 Frequency Coverage	Yes	Supports Band Classes 0, 1, 3, 4, 5, 6, 10 and 14.
4.1.2 Frequency Accuracy	Yes	See “Testing 4.2.2 Waveform Quality and Frequency Accuracy” on page 40.
4.2.1 Time Reference	Partially	Supports static time reference only.
4.2.2 Waveform Quality and Frequency Accuracy	Yes	See “Testing 4.2.2 Waveform Quality and Frequency Accuracy” on page 40.
4.3.1 Range of Open Loop Output Power	Partially	Supports 100% forward packet activity only. If you want to view the access probe sequence graphically, use “Measuring Graphical Access Probe Power” on page 17 (*Lab Application Only*).
4.3.2 Time Response of Open Loop Power Control	Yes	See “Testing 4.3.2 Time Response of Open Loop Power Control” on page 26
4.3.3 Range of Closed Loop Power Control	Partially	Supports tests 1 and 3-11, Minimum Standard (a) only, by remote program only.
3.1.2.3.4 Maximum RF Output Power	Yes	See “Testing 4.3.4 Maximum RF Output Power” on page 29
4.3.5 Minimum Controlled Output Power	Yes	See “Testing 4.3.5 Minimum Controlled Output Power” on page 32
4.3.6 Standby Output Power	Partially	Supports idle standby output power fully. Supports measurement of standby power between access probe bursts by remote program only.
3.1.2.3.7 RRI Channel Output Power	Yes	See “Testing 4.3.7 RRI Channel Output Power” on page 41
4.3.8.1 DRC Channel Output Power	Yes	See “Testing 4.3.8 Code Domain Power” on page 42
4.3.8.2 ACK Channel Output Power	Yes	See “Testing 4.3.8 Code Domain Power” on page 42
4.3.8.3 Data Channel Output Power	Partially	Supports tests 1-5, 8-10. See “Testing 4.3.8 Code Domain Power” on page 42
4.3.8.4 DSC Channel Output Power	Yes	This test is only used for subtype 2 physical layer testing. See “Testing 4.3.8 Code Domain Power” on page 42
4.4.1 Conducted Spurious Emissions	Yes	Supports adjacent and alternate channels only. “Testing 4.4.1 Conducted Spurious Emissions” on page 50
4.4.2 Radiated Spurious Emissions	Partially	Requires external spectrum analyzer.
4.4.3 Occupied Bandwidth	Partially	Requires external spectrum analyzer.

How Do I Perform a Handoff?

1. Press the **CALL SETUP** key.



2. Select `Handoff Setup` (**F5**).



3. Highlight `Handoff Cell Band` and select the desired band.
4. Highlight `Handoff Channel` and select the desired channel.
5. Select `Execute Handoff` (**F5**) to complete the handoff, or `Close Menu` (**F6**) to abort the handoff.
6. Check for `Connected` in the `Active Cell` field.

You can also simply change `Cell Band` and/or `Channel` from the `Call Parms` menu and the test set immediately negotiates the connection to the new cell band and/or channel.

How Do I Open a Session and Test Data Connection?

To allow testing of access terminal (AT) minimum performance operating at subtype 0 physical layer, an FTAP or RTAP data connection must be established between the test set and the AT. To allow testing of access terminal (AT) minimum performance operating at subtype 2 physical layer, an FETAP or RETAP data connection must be established between the test set and the AT.

A. Configure Call Parameters

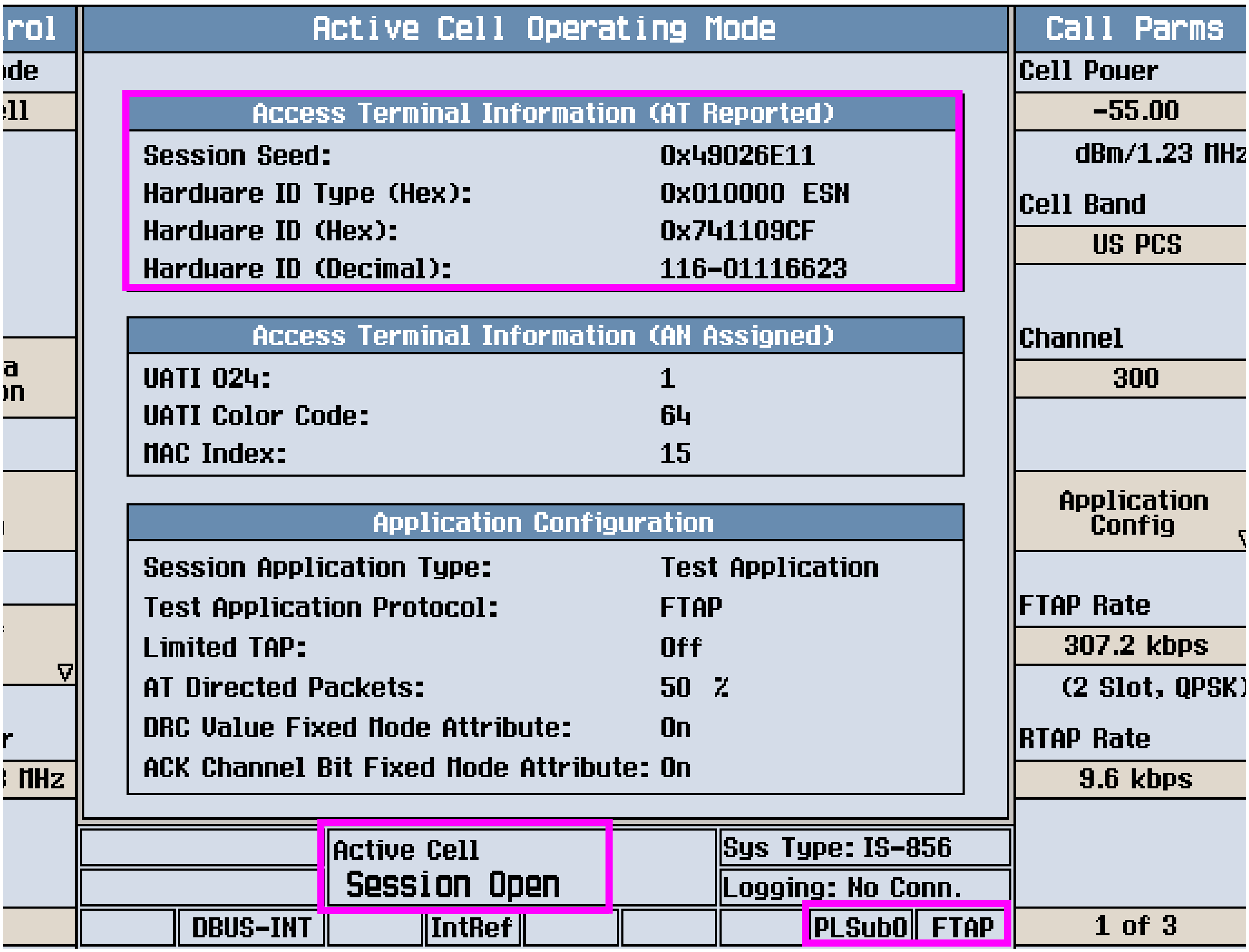
1. Press the **CALL SETUP** key.
2. Select `Operating Mode` (**F1**) and set the operating mode to `Active Cell`.
3. Configure the parameters necessary for your access terminal to find service with the test set, such as `Cell Power`, `Cell Band` and `Channel` (see "How Do I Change Call Parameters?" on page 77).
4. If you were using the *Lab Application*, prior to opening a test application session, verify that the `Session Application Type` accessed from the `Application Config` (**F10** on the `Call Parms` menu) is set to `Test Application`.
5. If you plan to open a TAP test data connection, configure the test set to subtype 0 physical layer. See "To Configure the Test Set to Subtype 0 Physical Layer" for detailed procedure.

   If you plan to open an ETAP data connection, configure the test set to subtype 2 physical layer. See "To Configure the Test Set to Subtype 2 Physical Layer" for detailed procedure.

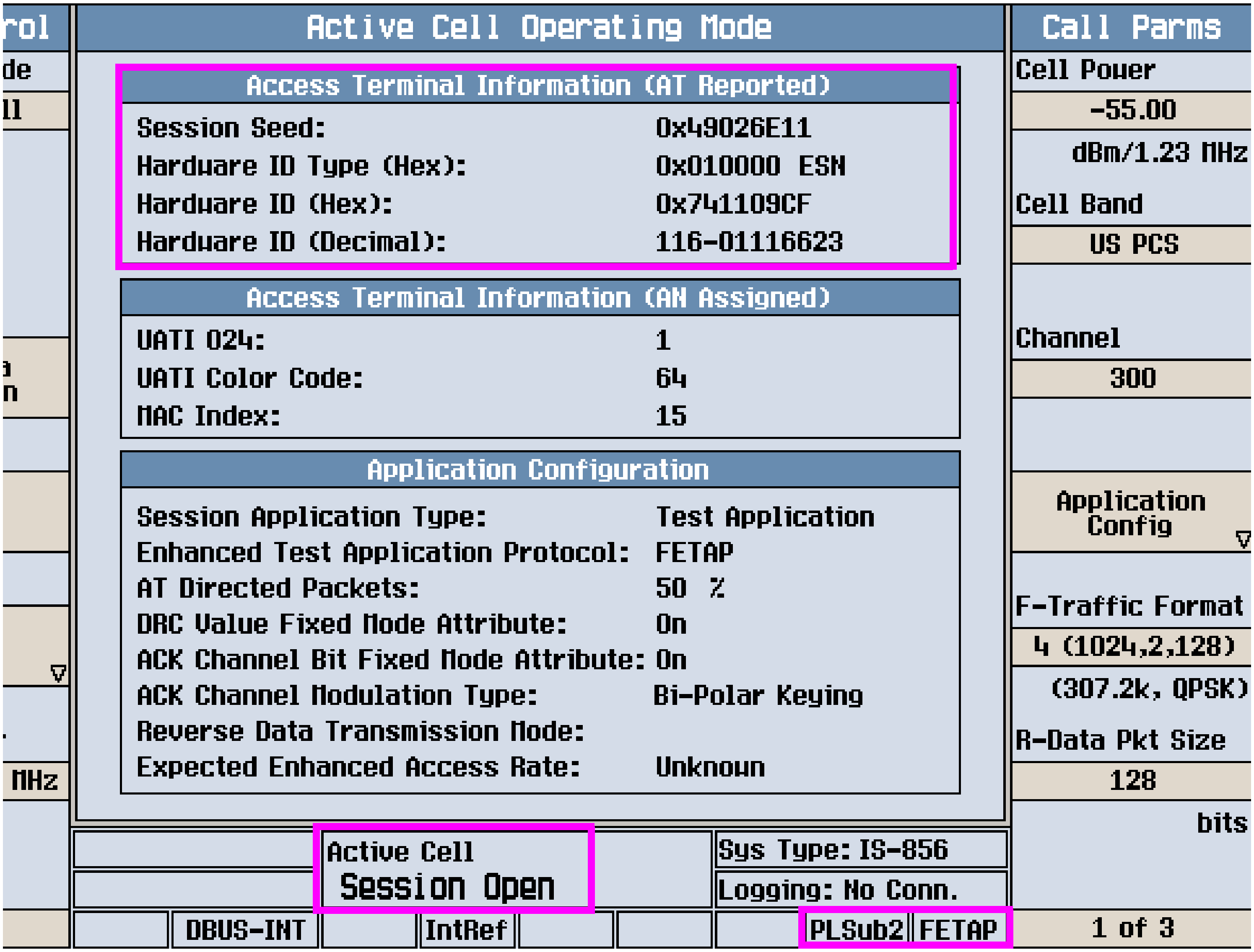
B. Open a Session

A session can only be established from the access terminal. The test set can not open a session.

1. Turn on the access terminal and wait for it to open a session.
2. Check for `Session Open` in the `Active Cell` status field and AT reported information displayed on the Call Setup Screen.
   - If you've set the test set to subtype 0 physical layer, a typical display after a session open is as below.



- If you've set the test set to subtype 2 physical layer, a typical display after a session open is as below.

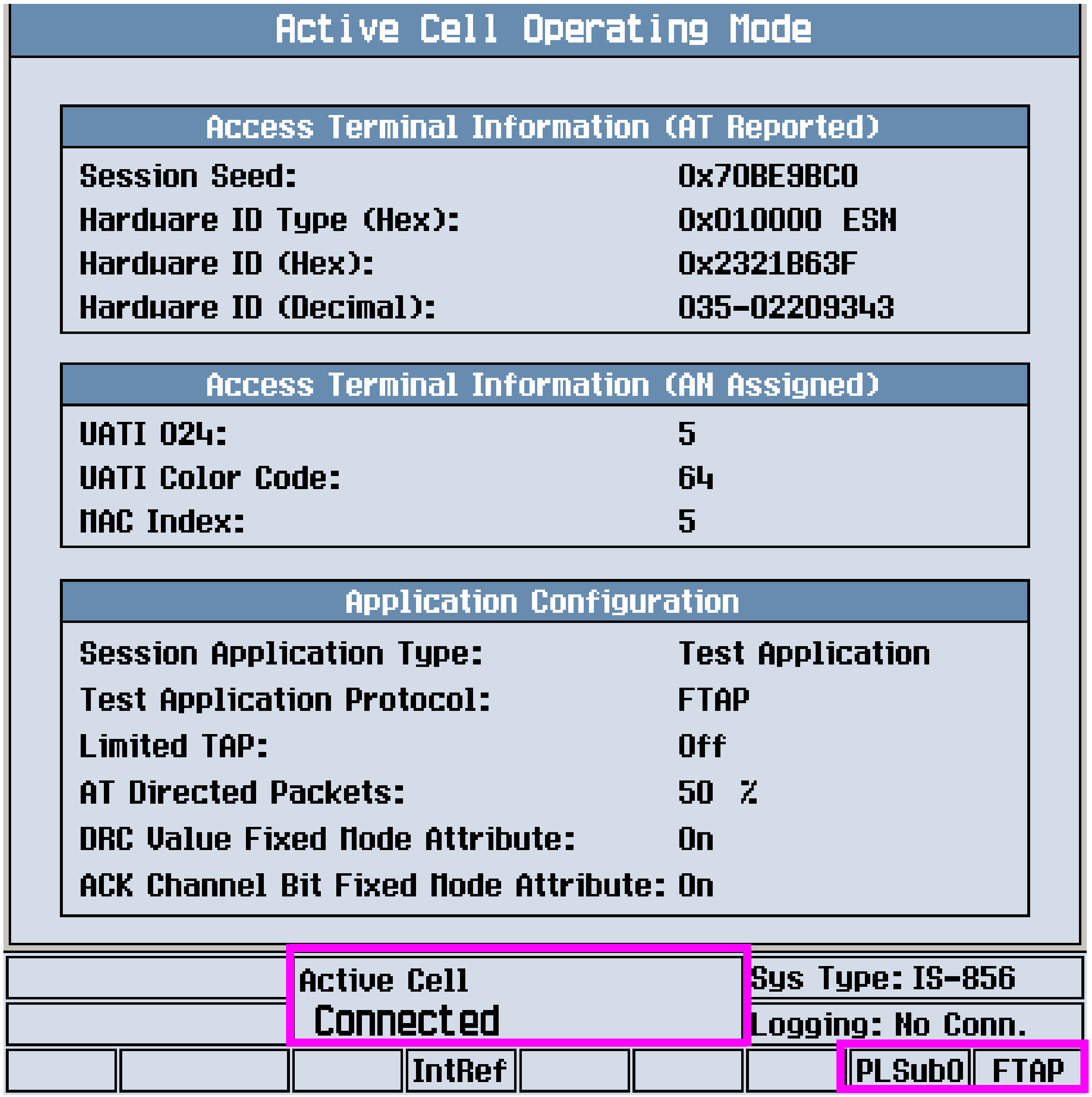


C. Open a Test Application Connection

1. If you've set the test set to subtype 0 physical layer, you can open an FTAP or RTAP connection for AT's receiver and transmitter tests.:
   - Select `Application Config` (**F10** on the `Call Parms 1 of 3` menu).
   - Set `Test Application Protocol` to `FTAP` or `RTAP`. Select `Close Menu` (**F6**)
   - Set `FTAP Rate` (**F11**) or `RTAP Rate` (**F12**) on the `Call Parms 1 of 3` menu, as needed.

   If you've set the test set to subtype 2 physical layer, you can open an FETAP or RETAP connection for AT's receiver and transmitter tests.:
   - Select `Application Config` (**F10** on the `Call Parms` menu).
   - Set `Enhanced Test Application Protocol` to `FETAP` or `RETAP`. Select `Close Menu` (**F6**)
   - Set `F-Traffic Format` (**F11**) or `R-Data Pkt Size` (**F12**) on the `Call Parms 1 of 3` menu, as needed.
2. Select `Start Data Connection` (**F3** on `Call Control` menu) to page the access terminal.
3. Check for `Connected` in the `Active Cell` status field. Also, the type of test application (FTAP, RTAP, FETAP or RETAP) and physical layer subtype (PLSub0 or PLSub2) being configured for the current connection is also indicated at the right bottom of the status area. An example display after an FTAP test

data connection is shown as below.



4. You can change the application type between FTAP and RTAP as well as the associated forward and reverse data rate as needed during a TAP data connection, or change the application type between FETAP and RETAP as well as the associated forward and reverse transmission format (data rate) as needed during an ETAP data connection. If required, change other parameters (such as `AT Directed Packets`, etc.).

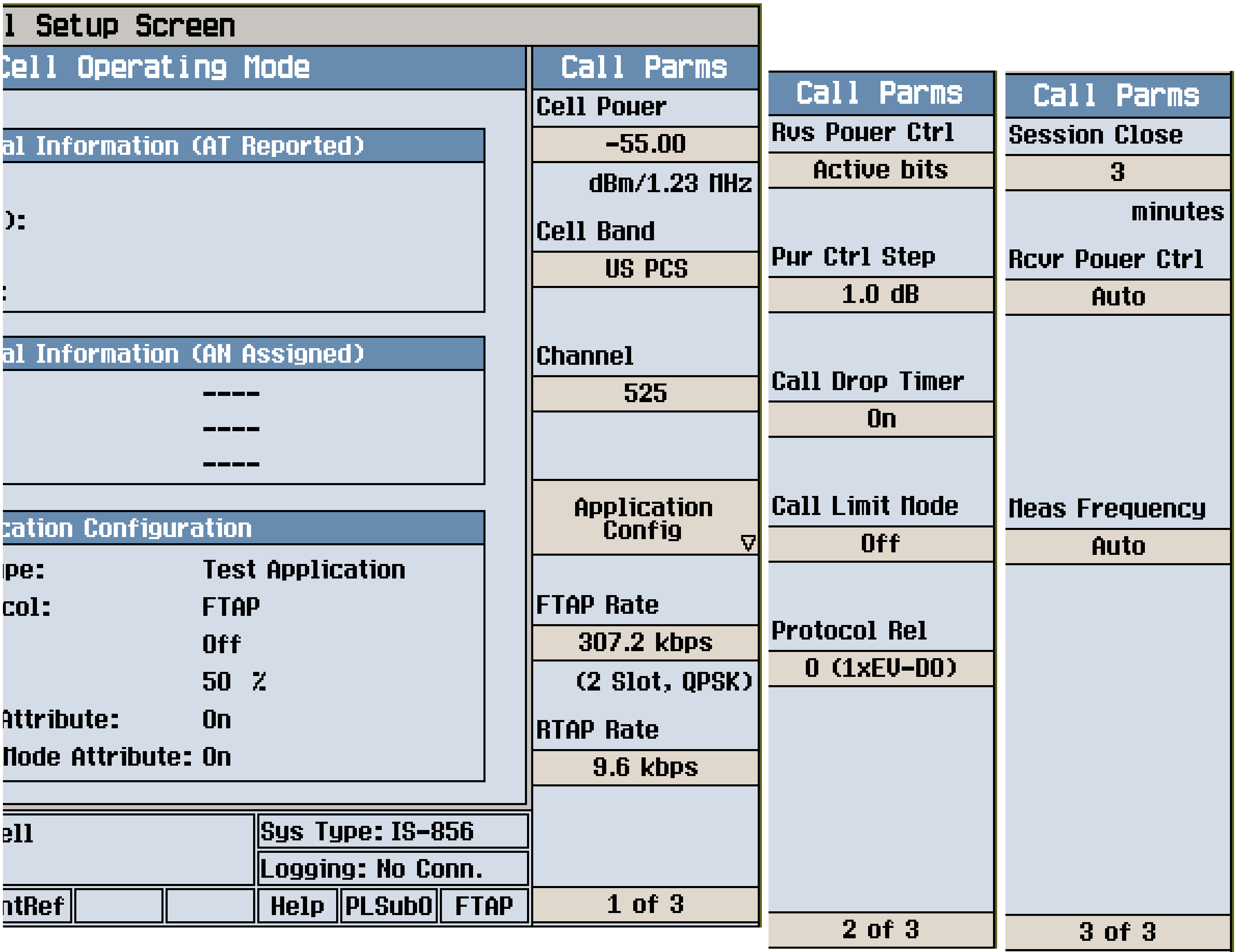
How Do I Change Call Parameters?

General Procedure

1. Press the **CALL SETUP** key.
2. Select any `Call Parms` softkey (**F7** to **F12**) to select a parameter.
3. Change the parameter as needed using the knob and/or keypad.
4. Select **More** `(1 of 3)` under `Call Parms` for additional call parameters.
5. Depending upon the current setting of the physical layer subtype, the Call Parms menus are different.
   - When the test set is configured to subtype 0 physical layer a typical display for Call Parms menu is shown as below.

Figure 4. Call Parms Menu (for Subtype 0 Physical Layer)

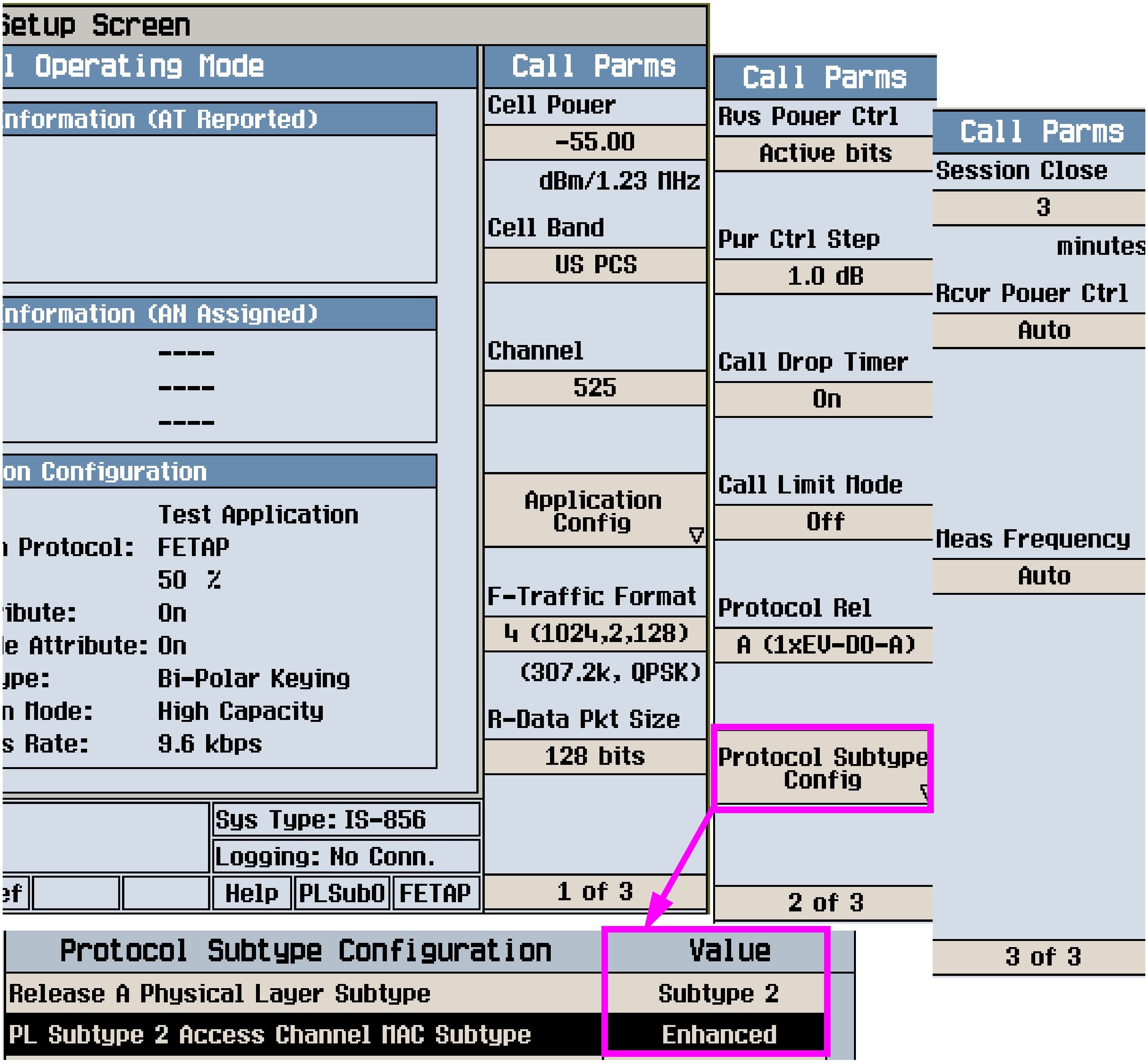
If you want to know more about the specific parameters, clock here.



- When the test set is configured to subtype 2 physical layer (see "To Configure the Test Set to Subtype 2 Physical Layer" for detailed procedure), a typical display for Call Parms menu is shown as below.

Figure 5. Call Parms Menu (for Subtype 2 Physical Layer)

If you want to know more about the specific parameters, clock here.

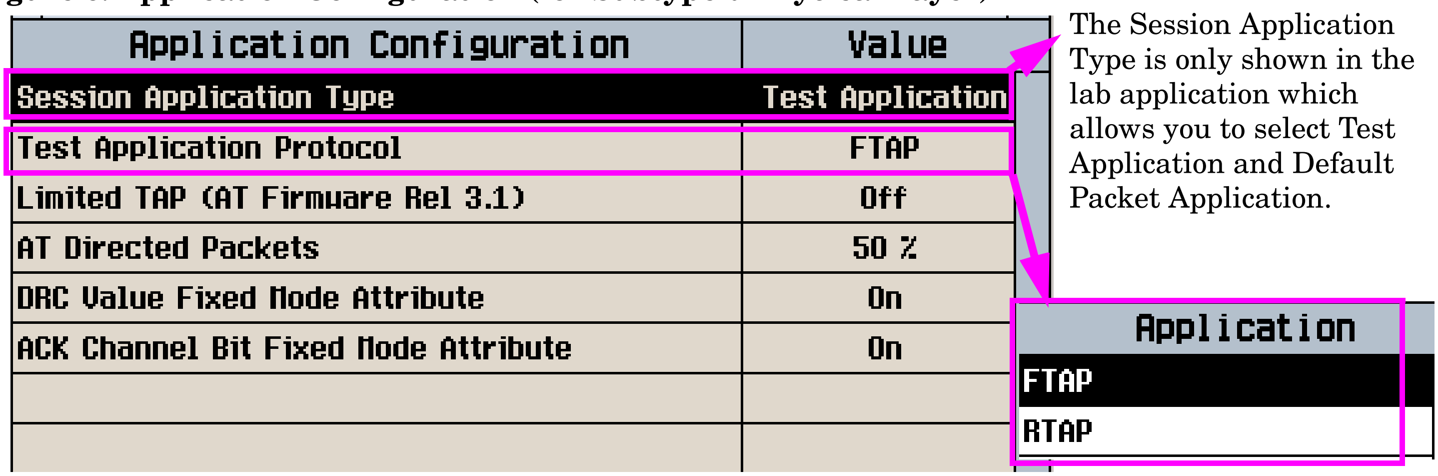


NOTE: The Protocol Subtype Configuration is shown only when Protocol Rel is set to A (1xEV-DO-A).

To Configure the Test Set to FTAP/RTAP Protocols

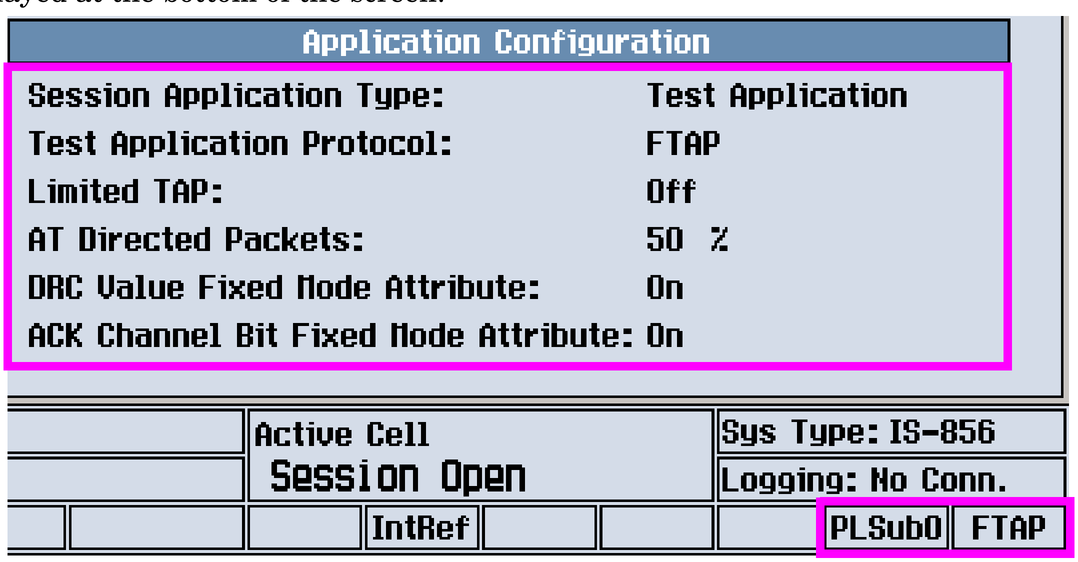
When the test set is configured to subtype 0 physical layer, the following parameters can be configured from the Application Configuration Window by selecting the `Application Config` (**F10** on `Call Parms 1 of 3`).

Figure 6. Application Configuration (for Subtype 0 Physical Layer)



- To establish an FTAP connection for AT's receiver test in subtype 0 physical layer, you should set `Test Application Protocol` to `FTAP`. Change other parameters as needed for your tests.
- To establish an RTAP connection for AT's transmitter test in subtype 0 physical layer, you should set `Test Application Protocol` to `RTAP`. Change other parameters as needed for your tests.
- (*Lap Application Only*) To establish a DPA connection for data application test, you should set `Session Application Type` to `Default Packet Application`.

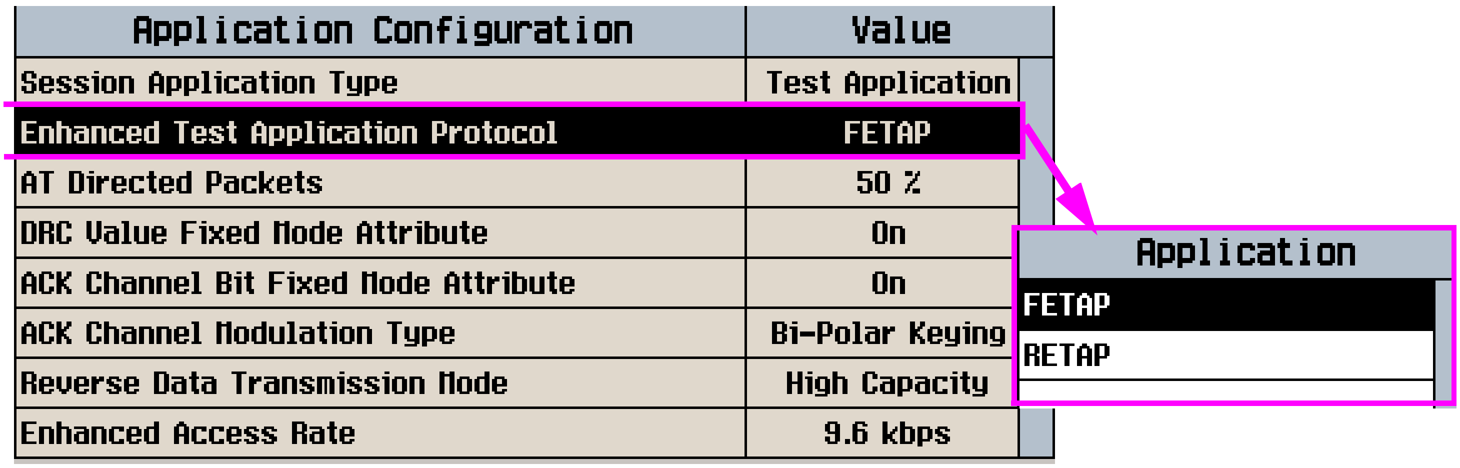
Your settings are displayed in the `Application Configuration` window on the `Call Setup` screen. Also, the application (`FTAP`, `RTAP` or `DPkt`) and physical layer subtype (`PLSub0`) currently configured in the test set are displayed at the bottom of the screen.



To Configure the Test Set to FETAP/RETAP Protocols

When the test set is configured to subtype 2 physical layer, the following parameters can be configured from the Application Configuration Window by selecting the `Application Config` (**F10** on `Call Parms 1 of 3`).

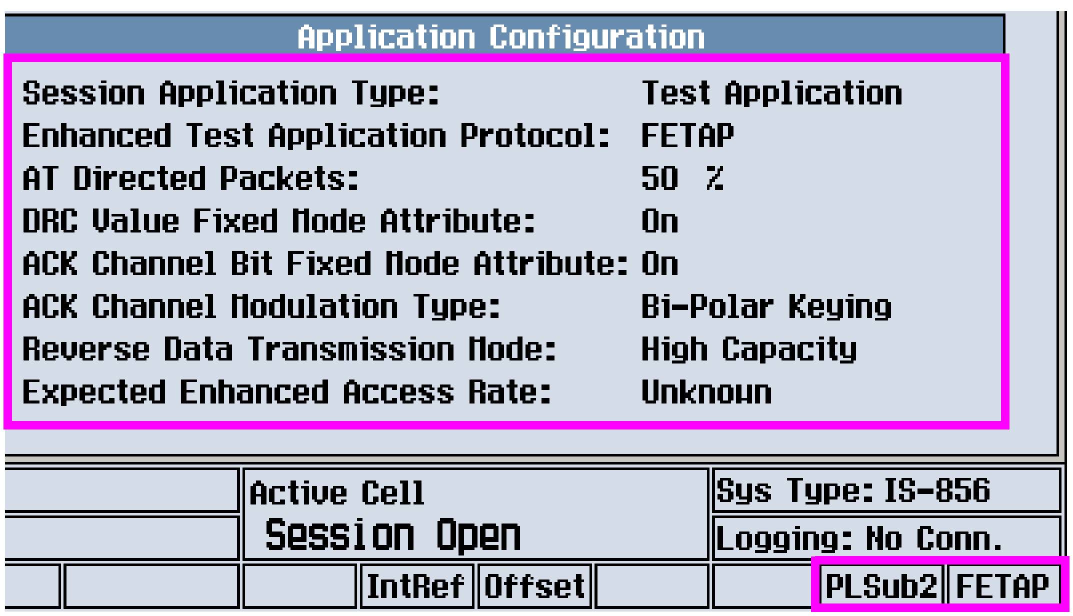
Figure 7. Application Configuration (for Subtype 2 Physical Layer)



Application Configuration	Value
Session Application Type	Test Application
Enhanced Test Application Protocol	FETAP
AT Directed Packets	50 %
DRC Value Fixed Mode Attribute	On
ACK Channel Bit Fixed Mode Attribute	On
ACK Channel Modulation Type	Bi-Polar Keying
Reverse Data Transmission Mode	High Capacity
Enhanced Access Rate	9.6 kbps

- To establish an FETAP connection for AT's receiver test in subtype 2 physical layer, you should set `Enhanced Test Application Protocol` to `FETAP`. Change other parameters as needed for your tests.
- To establish an RETAP connection for AT's transmitter test in subtype 2 physical layer, you should set `Enhanced Test Application Protocol` to `RETAP`. Change other parameters as needed for your tests.
- (*Lap Application Only*) The test set currently does not support DPA test in subtype 2 physical layer.

Your settings are displayed in the `Application Configuration` window on the `Call Setup` screen. Also, the application (`FETAP` or `RETAP`) and physical layer subtype (`PLSub0` or `PLSub2`) being configured in the test set are displayed at the bottom of the screen.

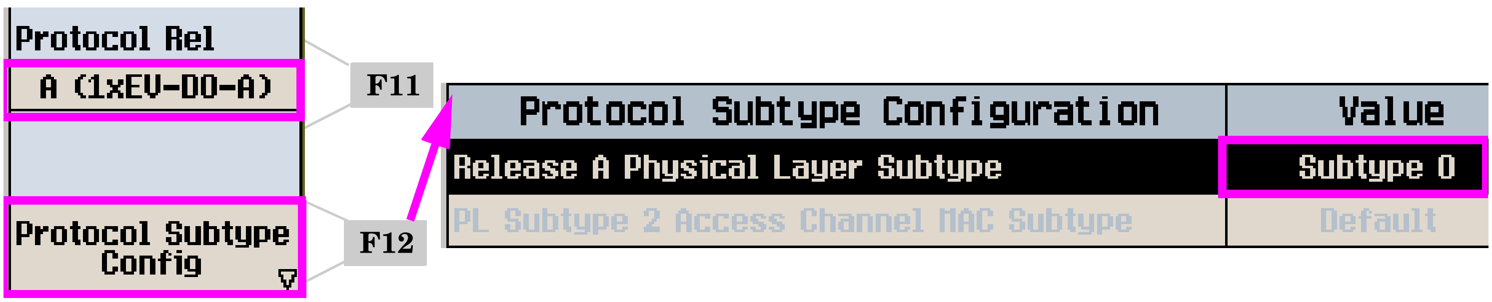


To Configure the Test Set to Subtype 0 Physical Layer

To configure the test set to subtype 0 physical layer,

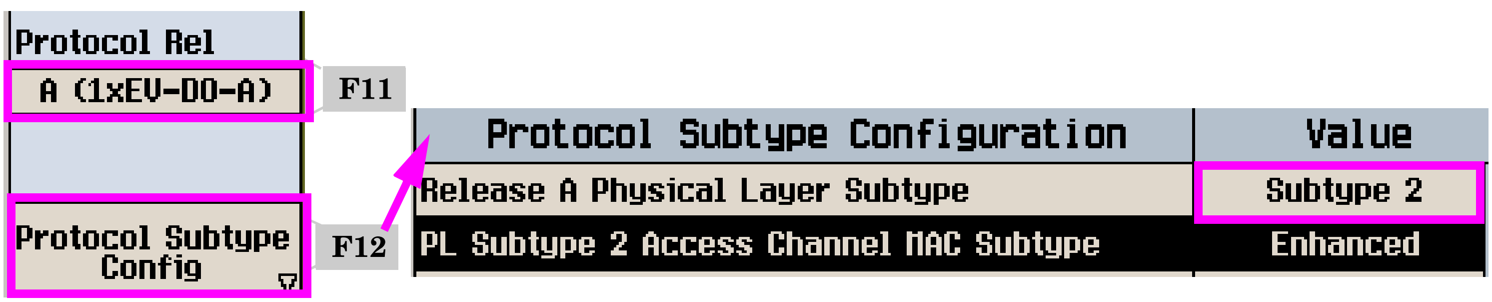
- set the `Protocol Rel` (**F11** on Call Parms 2 of 3) to `0 (1xEV-DO)`, or
- set the `Protocol Rel` (**F11** on Call Parms 2 of 3) to `A (1xEV-DO-A)` and set the `Release A Physical Layer Subtype` to `Subtype 0` from the `Protocol Subtype Configuration` menu by pressing the **F12** (`Protocol Subtype Config`).

or,



To Configure the Test Set to Subtype 2 Physical Layer

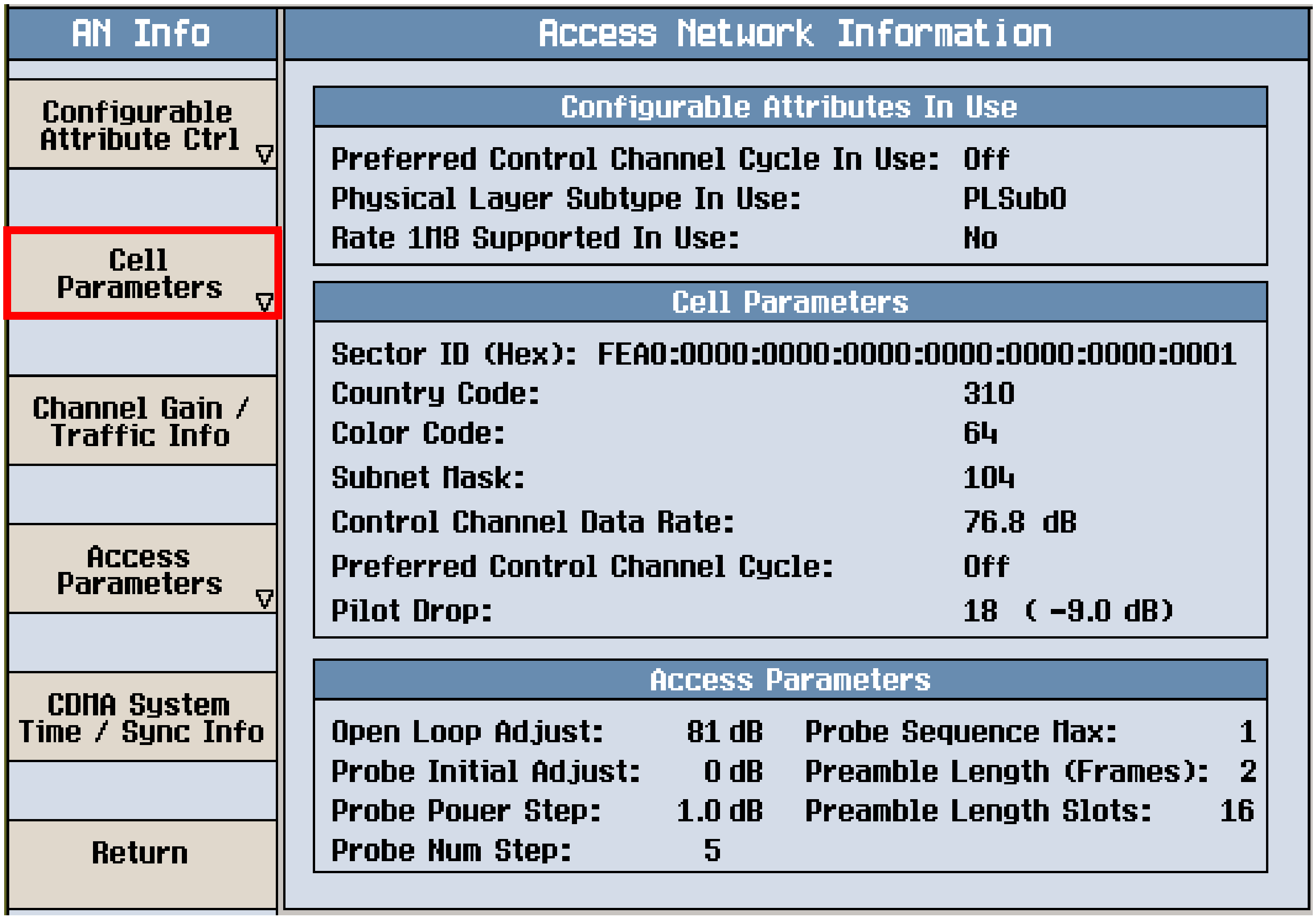
To configure the test set to subtype 2 physical layer, set the `Protocol Rel` (**F11** on Call Parms 2 of 3) to `A (1xEV-DO-A)` and set the `Release A Physical Layer Subtype` (**F12** on Call Parms 2 of 3) to `Subtype 2` from the `Protocol Subtype Configuration` menu by pressing the **F12** (`Protocol Subtype Config`).



How Do I Change Cell Parameters?

A. Select the Cell Parameters Menu.

1. Press the **CALL SETUP** key.
2. Press the left **More** key, go to `Call Control 2 of 2` (in the Test Application) or `Call Control 2 of 3` (in the Lab Application).
3. Select `Access Network Info` (**F2**), go to `AN Info` menu.
4. Select `Cell Parameters` (**F2**).



B. Set a Cell Parameter.

1. Turn the knob to highlight a parameter and then press the knob.

Cell Parameters	Value
Sector ID, Lower Middle (Hex)	00000000
Sector ID, Lower (Hex)	00000001
Country Code	310
Color Code	64
Subnet Mask	104
Control Channel Data Rate	76.8 kbps
Preferred Control Channel Cycle	Off
Pilot Drop	18

2. Enter a value or selection and press the knob.
3. Select `Close Menu` (**F6**).

How Do I Change Access Parameters?

- "General Procedure"
- "To Configure the Test Set to Default Access Channel MAC Subtype"
- "To Configure the Test Set to Enhanced Access Channel MAC Subtype"

General Procedure

A. Select the Access Parameters Menu.

1. Press the **CALL SETUP** key.
2. Press the left **More** key, go to `Call Control 2 of 2` (in the Test Application) or `Call Control 2 of 3` (in the Lab Application).
3. Select `Access Network Info` (**F2**), go to AN Info menu.
4. All access parameters are available by pressing the **F4** on `AN Info` menu. Depending upon the current setting of the Access Channel MAC Subtype, the **F4** is labeled as either `Access Parameters` or `Enhanced Access Parameters` .
   - When the test set is configured to Default Access Channel MAC Subtype the **F4** is labeled as `Access Parameters`.
   - When the test set is configured to Enhanced Access Channel MAC Subtype for detailed procedure), the **F4** is labeled as `Enhanced Access Parameters`.

5. Select **F4**. A typical display for the Access Parameters menu or the Enhanced Access Parameters menu is shown as below.

Access Parameters	Value
Open Loop Adjust	81 dB
Probe Initial Adjust	0 dB
Probe Power Step	1.0 dB
Probe Num Step	5
Probe Sequence Max	1
Preamble Length (Frames)	2

Enhanced Access Parameters	Value
Open Loop Adjust	81 dB
Probe Initial Adjust	0 dB
Probe Power Step	1.0 dB
Probe Num Step	5
Probe Sequence Max	1
Preamble Length (Frames)	2

B. Set an Access Parameter.

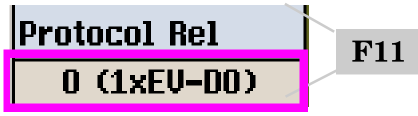
1. Turn the knob to highlight a parameter and then press the knob.
2. Enter a value or selection and press the knob.
3. Select `Close Menu` (**F6**).

To Configure the Test Set to Default Access Channel MAC Subtype

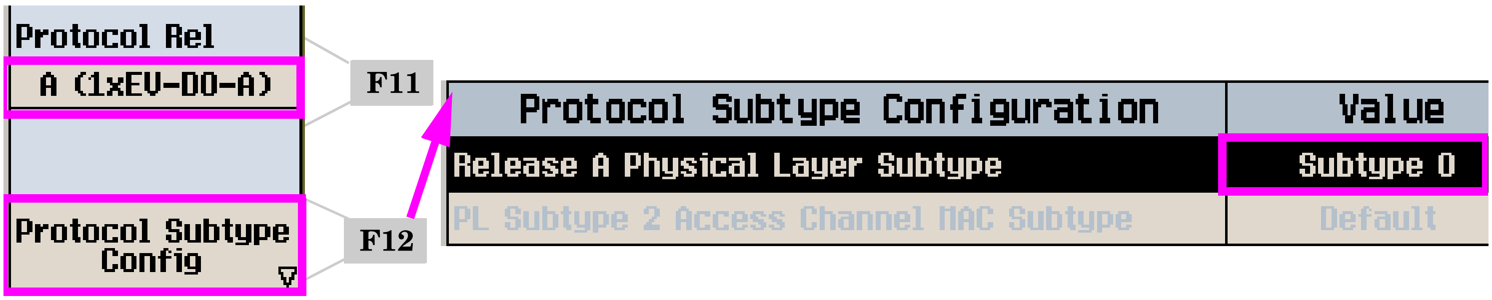
To configure the test set to Default Access Channel MAC Subtype,

- set the `Protocol Rel` (**F11** on Call Parms 2 of 3) to `0 (1xEV-DO)`, or
- set the `Protocol Rel` (**F11** on Call Parms 2 of 3) to `A (1xEV-DO-A)` and set the `Release A Physical Layer Subtype` to `Subtype 0` from the `Protocol Subtype Configuration` menu by pressing the **F12** (`Protocol Subtype Config`).

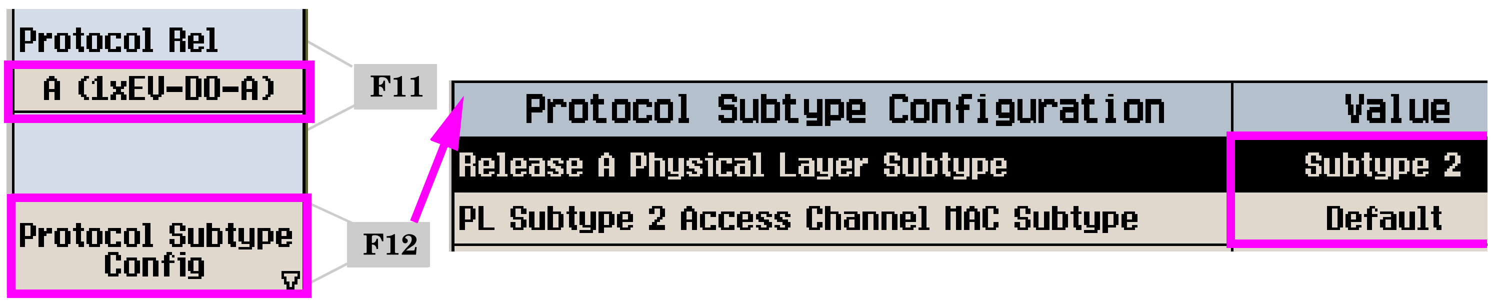
- set the `Protocol Rel` (**F11**) to `A (1xEV-DO-A)`, set the `Release A Physical Layer Subtype` to `Subtype 2` and `PL Subtype 2 Access Channel MAC Subtype` to `Default` from the `Protocol Subtype Configuration` menu by pressing the **F12** (`Protocol Subtype Config`).



or,

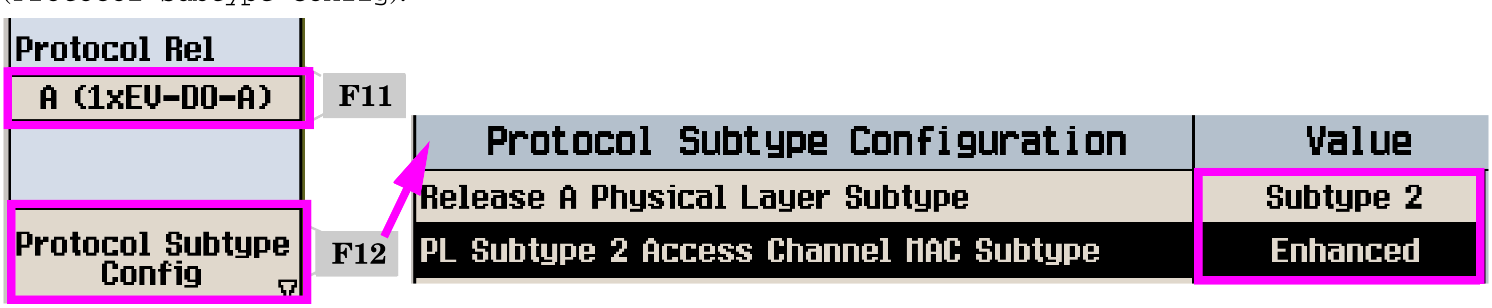


or,



To Configure the Test Set to Enhanced Access Channel MAC Subtype

To configure the test set to Enhanced Access Channel MAC Subtype, set the `Protocol Rel` (**F11**) to `A (1xEV-DO-A)`, set the `Release A Physical Layer Subtype` to `Subtype 2` and `PL Subtype 2 Access Channel MAC Subtype` to `Enhanced` from the `Protocol Subtype Configuration` menu by pressing the **F12** (`Protocol Subtype Config`).



How Do I Change Channel Gain/Traffic Info Parameters?

A. Select the Channel Gain Info or Channel Gain/Traffic Info menu

1. Press the **CALL SETUP** key.
2. Press the left **More** key, go to `Call Control 2 of 2` (in the Test Application) or `Call Control 2 of 3` (in the Lab Application).
3. Select `Access Network Info` (**F2**), go to AN Info menu.
4. Depending upon the current setting of the physical layer subtype, the **F3** on AN Info menu is labeled as either `Channel Gain Info` (for subtype 0 physical layer) or `Channel Gain / Traffic Info` (for subtype 2 physical layer) which allows you to access different parameters. For detailed procedure on how to configure the physical layer subtype, see "To Configure the Test Set to Subtype 0 Physical Layer" and "To Configure the Test Set to Subtype 0 Physical Layer" respectively.
   - Press the **F3** (`Channel Gain Info`), set the parameters as demonstrated at "B1. Set parameters accessed from F3 (Channel Gain Info)"
   - Press the **F3** (`Channel Gain / Traffic Info`), set the parameters as demonstrated at "B2. Set parameters accessed from F3 (Channel Gain/Traffic Info)"

B1. Set parameters accessed from F3 (Channel Gain Info)

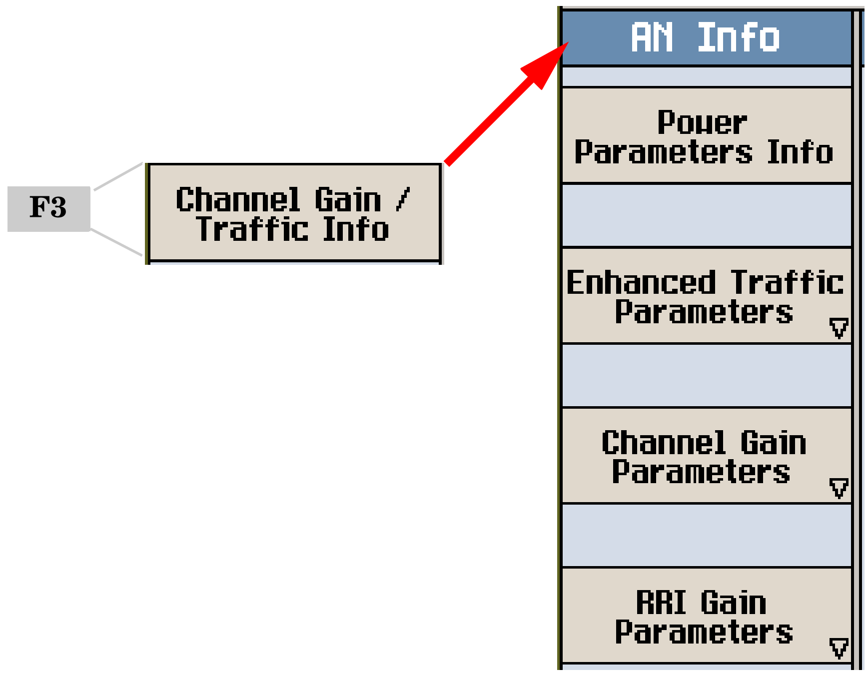
1. When the **F3** (`Channel Gain Info`) is pressed, the channel gain parameters can be accessed.
2. Select `Channel Gain Parameters` (**F3**).

Channel Gain Parameters	Value
Data Offset Nom	0.0 dB
Data Offset 9k6	0.00 dB
Data Offset 19k2	0.00 dB
Data Offset 38k4	0.00 dB
Data Offset 76k8	0.00 dB
Data Offset 153k6	0.00 dB
ACK Channel Gain	3.0 dB
DRC Channel Gain	3.0 dB

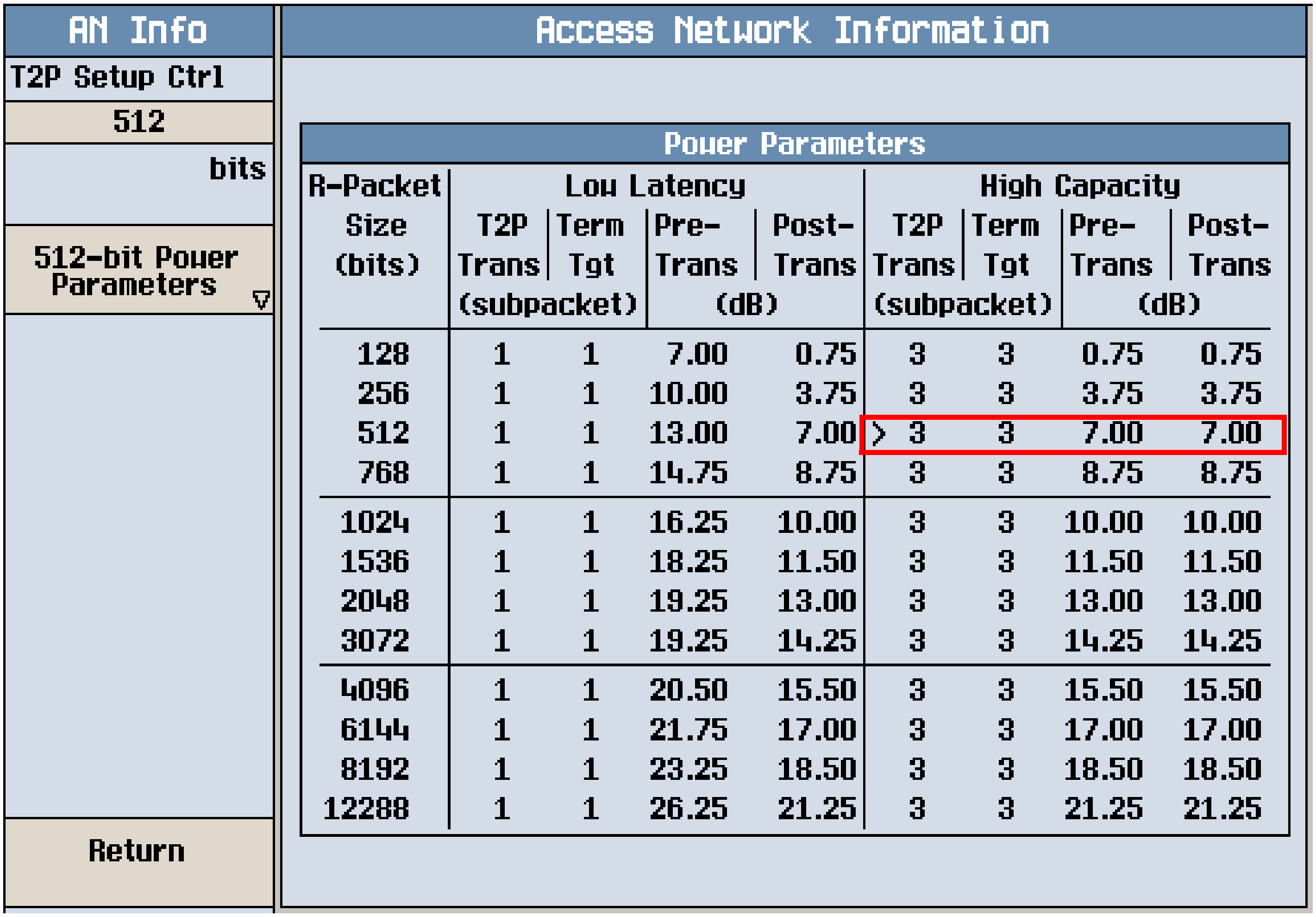
3. Turn the knob to highlight a parameter and then press the knob.
4. Enter a value or selection and press the knob.
5. Select `Close Menu` (**F6**).

B2. Set parameters accessed from F3 (Channel Gain/Traffic Info)

1. When the **F3** (`Channel Gain / Traffic Info`) is pressed, more parameters relating to subtype 2 physical layer can be accessed.



- To set subtype 2 physical layer T2P related parameters, select `Power Parameters Info` (**F1**). A typical display is shown as below. Note that all of the T2P parameters for each data packet size and transmission mode are displayed on the Power Parameters screen. Which set of T2P parameters being applied in the test set (current values) is identified by a '>' indicator.



R-Packet Size (bits)	Low Latency T2P Trans (subpacket)	Low Latency Term Tgt (subpacket)	Low Latency Pre-Trans (dB)	Low Latency Post-Trans (dB)	High Capacity T2P Trans (subpacket)	High Capacity Term Tgt (subpacket)	High Capacity Pre-Trans (dB)	High Capacity Post-Trans (dB)
128	1	1	7.00	0.75	3	3	0.75	0.75
256	1	1	10.00	3.75	3	3	3.75	3.75
512	1	1	13.00	7.00	3	3	7.00	7.00
768	1	1	14.75	8.75	3	3	8.75	8.75
1024	1	1	16.25	10.00	3	3	10.00	10.00
1536	1	1	18.25	11.50	3	3	11.50	11.50
2048	1	1	19.25	13.00	3	3	13.00	13.00
3072	1	1	19.25	14.25	3	3	14.25	14.25
4096	1	1	20.50	15.50	3	3	15.50	15.50
6144	1	1	21.75	17.00	3	3	17.00	17.00
8192	1	1	23.25	18.50	3	3	18.50	18.50
12288	1	1	26.25	21.25	3	3	21.25	21.25

— Press **F1** (`T2P Setup Ctrl`), select a R-Data packet size (for example, `512 bits`). **F2** is labeled according to the F1 setting (in this example, `512-bit Power Parameters` is labeled for **F2**).

— Press **F2**, set the T2P parameters (such as T2P Transition value, Termination Target value, TxT2P Pre-Transition and Post-Transition gain values) for the specified packet size.

512-bit Power Parameters	Value
512-bit Low Latency T2P Transition	1
512-bit Low Latency Termination Target	1
512-bit Low Latency TxT2P Pre-Transition	13.00 dB
512-bit Low Latency TxT2P Post-Transition	7.00 dB
512-bit High Capacity T2P Transition	3
512-bit High Capacity Termination Target	3
512-bit High Capacity TxT2P Pre-Transition	7.00 dB
512-bit High Capacity TxT2P Post-Transition	7.00 dB

- To set the following enhanced parameters for subtype 2 physical layer, select `Enhanced Traffic Parameters` (**F2**).

Enhanced Traffic Parameters	Value
Auxiliary Pilot Channel Min Payload	3072 bits
DSC Length	64 slots
Short Packets Enabled Threshold	2048 bits

- To set the subtype 2 reverse channel gain, select `Channel Gain Parameters` (**F3**). Note that the R-Data channel gains are set from the Power Parameters Info menu and the RRI channel gains are set from the RRI Gain Parameters menu.

Channel Gain Parameters	Value
Data Offset Nom	0.0 dB
Data Offset 9k6	0.00 dB
Data Offset 19k2	0.00 dB
Data Offset 38k4	0.00 dB
ACK Channel Gain	3.0 dB
DRC Channel Gain	3.0 dB
DSC Channel Gain	-9.0 dB
Auxiliary Pilot Channel Gain	-12 dB

- To set the subtype 2 R-RRI channel gain, select `RRI Gain Parameters` (**F4**).

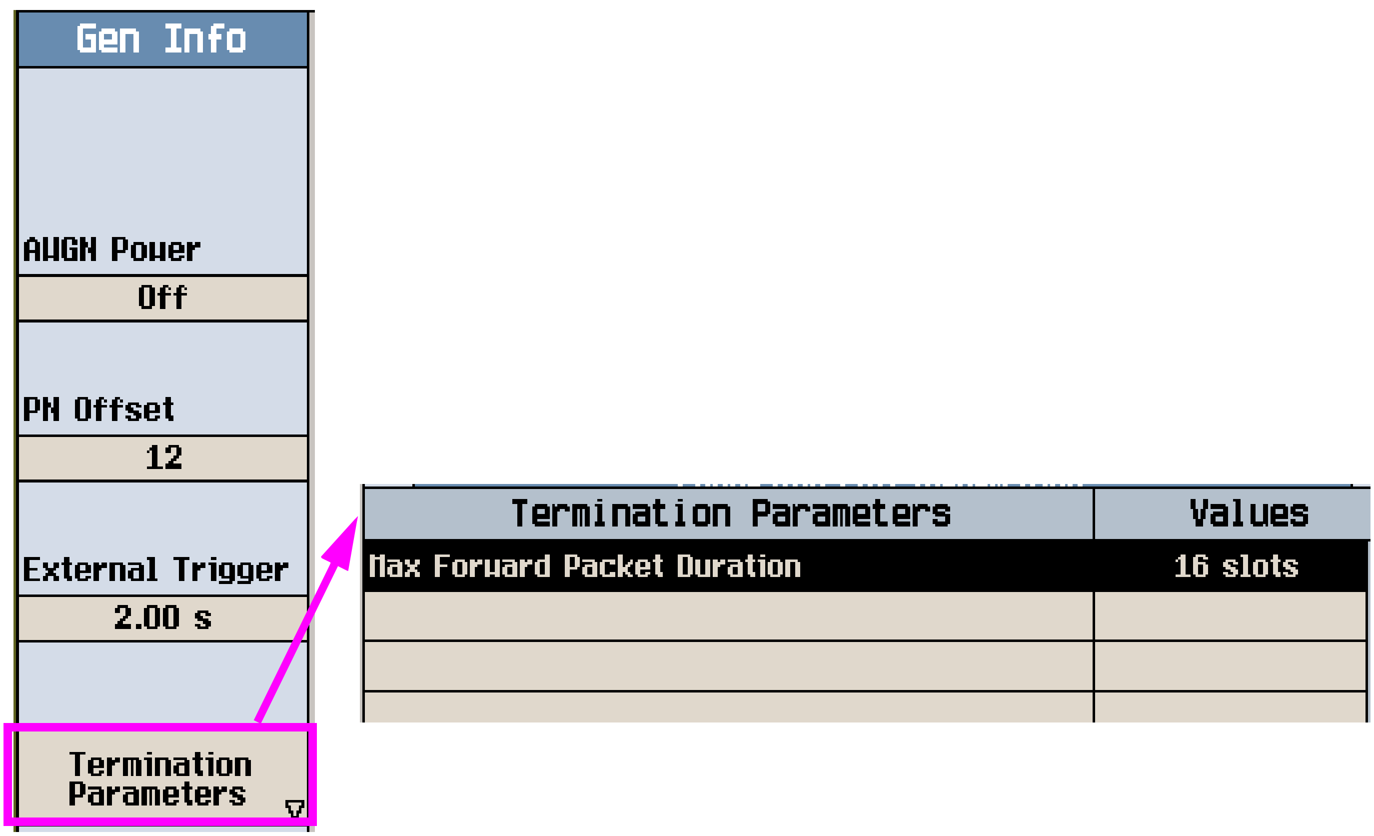
RRI Channel Gain Parameters	Value
RRI Channel Gain Pre-Transition 0	0 dB
RRI Channel Gain Post-Transition 0	-6 dB
RRI Channel Gain Pre-Transition 1	0 dB
RRI Channel Gain Post-Transition 1	-6 dB
RRI Channel Gain Pre-Transition 2	-6 dB
RRI Channel Gain Post-Transition 2	-6 dB
RRI Channel Gain Pre-Transition 3	-6 dB

2. Turn the knob to highlight a parameter and then press the knob.
3. Enter a value or selection and press the knob.
4. Select `Close Menu` (**F6**).

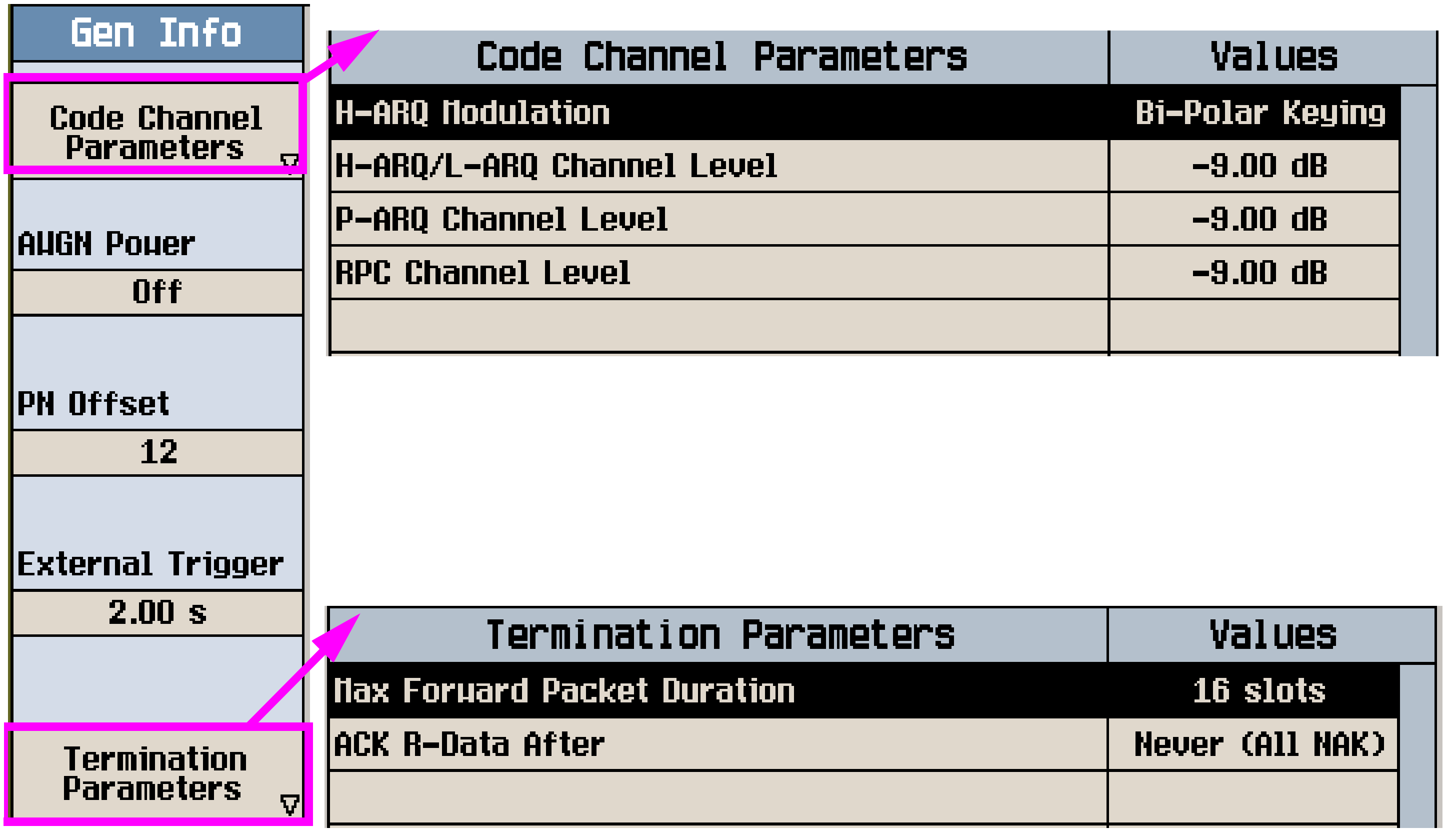
How Do I Change Generator Information?

A. Select the Generator Info Menu.

1. Press the **CALL SETUP** key.
2. Press the left **More** key, go to `Call Control 2 of 2` (in the Test Application) or `Call Control 2 of 3` (in the Lab Application).
3. Select `Generator Info` (**F3**) go to Gen Info menu.
4. Depending upon the current physical layer subtype, the Generator Info menu provides different parameters for your access.
   - When the test set is configured to subtype 0 physical layer (see "To Configure the Test Set to Subtype 0 Physical Layer" for detailed procedure), a typical display for `Gen Info` menu is shown as below.



- When the test set is configured to subtype 2 physical layer (see “To Configure the Test Set to Subtype 2 Physical Layer” for detailed procedure), a typical display for `Gen Info` menu is shown as below.



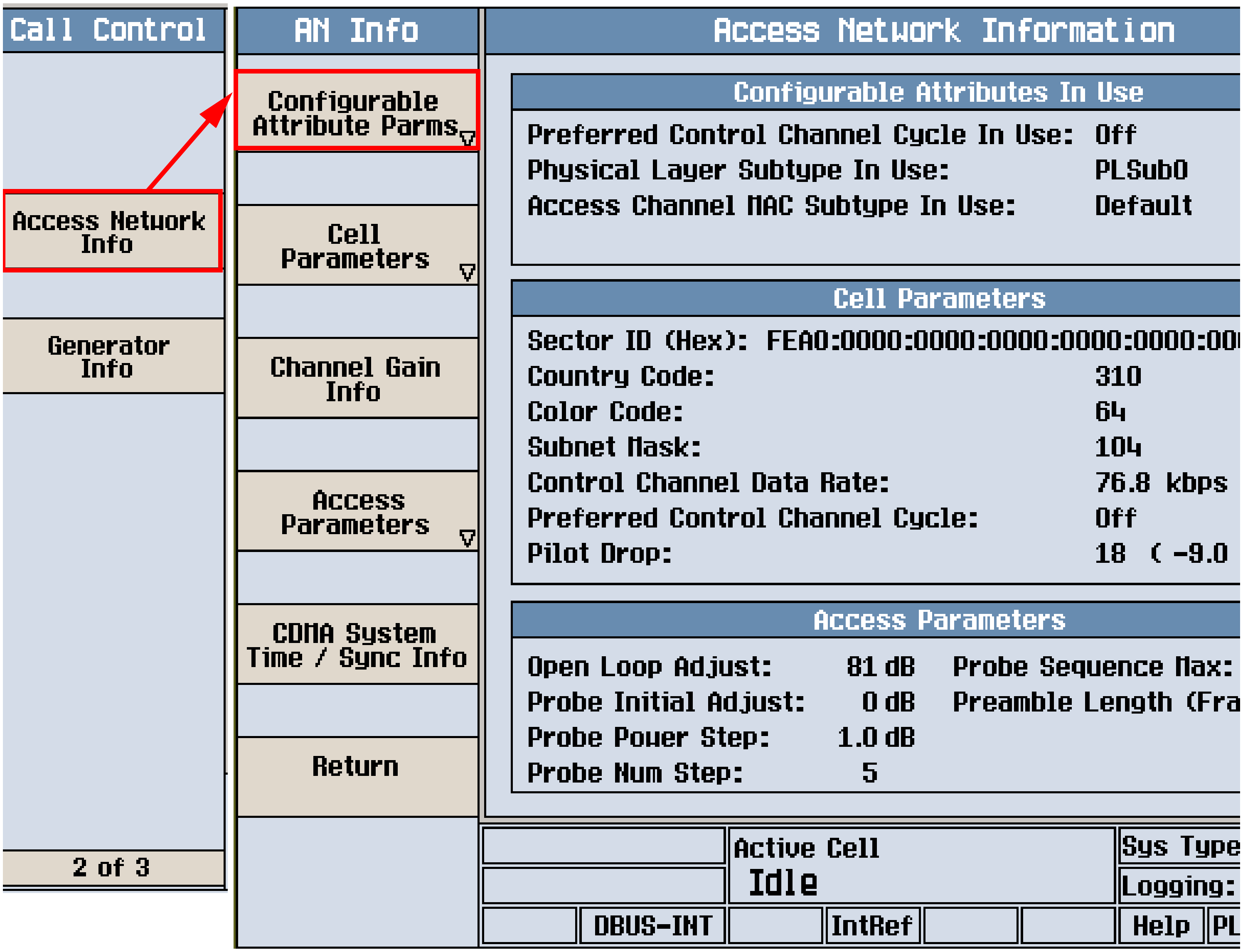
B. Set parameters on Gen Info menu.

1. Select any `Gen Info` softkey (**F1** to **F5**) to select a parameter.
2. Change the parameter as needed using the knob and/or keypad.

How Do I Change Configurable Attribute Control Mode?

A. Select the Configurable Attribute Control Menu.

1. Press the **CALL SETUP** key.
2. Press the left **More** key, go to `Call Control 2 of 2` (in the Test Application) or `Call Control 2 of 3` (in the Lab Application).
3. Select `Access Network Info` (**F2**).
4. Select `Configurable Attribute Parms` (**F1**).



5. The parameters under `Configurable Attribute Control` menu are different depending upon the current physical layer subtype.

How Do I Change Configurable Attribute Control Mode?

- When the test set is configured to subtype 0 physical layer (see "To Configure the Test Set to Subtype 0 Physical Layer" for detailed procedure), a typical display for `Configurable Attribute Control` menu is shown as below.

Configurable Attribute Control	Value
Preferred Control Channel Cycle Control	AN Specified

- When the test set is configured to subtype 2 physical layer (see "To Configure the Test Set to Subtype 0 Physical Layer" for detailed procedure), a typical display for `Configurable Attribute Control` menu is shown as below.

Configurable Attribute Control	Value
Preferred Control Channel Cycle Control	AN Specified
Rate 1/8 Supported Control	AN Specified

B. Set the Control Mode for a Configurable Attribute.

IMPORTANT You can not change the session negotiation control mode for a configurable attribute when a session is open and Call Limit Mode is on (because the test set would not be able to establish a traffic connection to re-negotiate the value when call limit mode is on).

1. Turn the knob to highlight a parameter and then press the knob.
2. Enter a value or selection and press the knob.
3. Select `Close Menu` (**F6**).

Calibrating the Test Set

Description

- "Calibration Process Requirements"
- "Recommended Calibration Intervals"
- "Calibration Descriptions"
  - "IQ Calibrations"
  - "Burst Mod Offset 1 Calibration"
  - "Digital Average Power Calibration"
  - "Spectrum Monitor Calibration"
  - "Calibrate Measurements"
  - "Channel Power Calibration"

Various calibration routines must be run periodically to ensure measurement accuracy, source accuracy and allow the most robust demodulation of the device-under-test's signal. This document describes the various calibrations available in the test set and when they should be performed.

Calibration Process Requirements

IMPORTANT Before performing any calibrations on your test set:

- *Ensure that the calibration is necessary* - running calibrations more often than necessary wastes your time and effort, and if the calibration is performed incorrectly, could actually result in degraded test set performance.
- *Ensure that the test set is in its ambient operating environment* - in other words, ensure that the test set has warmed up (at least 30 minutes) and is in a location similar to the one it will be used in. For example, if you are going to be using the test set in a racked test system, then you must calibrate the test set while it is in that test system, and all of the equipment has reached a stable operating temperature.
- *Ensure that no power is present at the front panel RF connectors* - remove any cables or connectors from the RF IN/OUT and RF OUT ONLY connectors. If you are operating in a high RF environment, it is recommended that you also terminate the RF connectors with a 50 Ohm load.

Recommended Calibration Intervals

This section indicates when the test set calibrations should be performed. Procedures are given for test sets that include *Option 003: Flexible Radio Link* and test sets that do not. Refer to "Calibration Descriptions" on page 100 for details about the calibrations and how to perform them.

- Once every year you must perform a full calibration by following steps 1-6 of the "Calibration Procedure for Test Sets with Option 003" (or steps 1-2 of the "Calibration Procedure for Test Sets without Option 003" if your test set does not include option 003).
- You must also perform steps 1-6 of the "Calibration Procedure for Test Sets with Option 003" (or steps 1-2 of the "Calibration Procedure for Test Sets without Option 003" if your test set does not include option 003) if any of the following events occur:
  - When you receive the test set, before using it for the first time (regardless of whether the test set is new, being returned from service, or on loan from a colleague).
  - After adding a NEW application or format to the test set.
    Note: *upgrading firmware* in the test set does not typically require running the calibration procedures. However, when upgrading firmware, it is advisable to check the release notes for any major feature changes that require re-calibration of the test set.
  - After you perform any kind of repair or service on your test set.
- It is recommended that once every month you perform steps 4-6 of the "Calibration Procedure for Test Sets with Option 003" (or step 2 of the "Calibration Procedure for Test Sets without Option 003" if your test set does not include option 003).
- You must also perform steps 4-6 of the "Calibration Procedure for Test Sets with Option 003" (or step 2 of the "Calibration Procedure for Test Sets without Option 003" if your test set does not include option 003) if any of the following events occur:
  - The operating environment for your test set changes significantly (for example, the temperature changes by more than 10 degrees C or the test set is moved from a racked test system to a bench top).
  - A measurement returns integrity indicator `19 (Uncalibrated Due to Temperature)`.

IMPORTANT Ensure that your test set has warmed up at least 30 minutes and that no power is present at the front panel RF connectors before performing any calibrations.

Calibration Procedure for Test Sets with Option 003

<table>
<tr><th></th><th colspan="3">Calibration Interval = 1 year</th><th colspan="3">Calibration Interval = 1 month</th></tr>
<tr><th>Application or Format</th><th>IQ Calibrations
(See Note 1)</th><th>Burst Mod Offset 1 Calibration</th><th>Digital Average Power Calibration</th><th>Spectrum Monitor Calibration</th><th>Channel Power Calibration</th><th>Calibrate Measurements</th></tr>
<tr><td>cdma2000/ IS-95/AMPS</td><td rowspan="3">**Step 1**
Perform IQ1and IQ2 once from one of these applications or formats</td><td rowspan="3">**Step 2**
Perform once from one of these applications or formats</td><td rowspan="2">**Step 3A**
Perform once from one of these applications or formats
Step 3B
Cycle Power</td><td rowspan="2">**Step 4**
Perform once from one of these applications or formats</td><td rowspan="2">Covered by Step 4
(See Note 2)</td><td rowspan="2"></td></tr>
<tr><td>1xEV-DO</td></tr>
<tr><td>W-CDMA</td><td rowspan="3"></td><td>**Step 5**
Perform once from this application</td><td rowspan="3"></td><td>Covered by Step 5
(See Note 2)</td></tr>
<tr><td>GSM/GPRS/ EGPRS</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">**Step 6**
Perform once from one of these applications or formats</td><td rowspan="2"></td></tr>
<tr><td>AMPS/136</td></tr>
<tr><td colspan="7">*Note 1 – Calibrate Second IQ Modulator only applies to instruments with Option 002: RF Source 2.*
Note 2 – You do not need to run this calibration if Spectrum Monitor calibration is run first.</td></tr>
</table>

Calibration Procedure for Test Sets without Option 003

	Calibration Interval = 1 year	Calibration Interval = 1 month
Application or Format	**IQ Calibrations** *(See Note 1)*	**Spectrum Monitor Calibration**
GSM/GPRS/EGPRS	**Step 1** Perform IQ1and IQ2 once from one of these applications or formats	**Step 2** Perform once from one of these applications or formats
AMPS/136		
Note 1 – Calibrate Second IQ Modulator only applies to instruments with Option 002: RF Source 2.		

Calibration Descriptions

IQ Calibrations When performed from a GSM/GPRS/EGPRS or AMPS/136 application or format, the `First IQ Modulator` calibration sends a signal from the Baseband Generator 1 module to the RF Source 1 module to optimize the phase accuracy of RF Source 1 as a function of frequency. The optimization data is then stored in the test set and accessed whenever the RF Source frequency is set. The `Second IQ Modulator` calibration performs a similar procedure for RF Source 2 (RF Source 2 is only present if the test set includes option 002: RF Source 2).

When performed from a W-CDMA, cdma2000/IS-95/AMPS or 1xEV-DO application or format (which require option 003: Flexible Radio Link), the IQ calibrations perform the same phase optimizations explained above. Additionally, a signal is sent from the Flexible Radio Link Subsystem to the RF sources to calibrate phase accuracy for those alternative paths as well. This additional calibration data is written to the same calibration data file as above, but in a different area of the calibration table.

The IQ calibrations ensure that the test set accurately generates IQ-modulated signals. If the test set's IQ modulators have not been properly calibrated, the test set's output power (when producing an IQ-modulated signal) will be inaccurate, which may result in degraded receiver test results.

If you perform the IQ calibrations from a W-CDMA, cdma2000/IS-95/AMPS or 1xEV-DO application or format, you do not need to perform them from any other application or format. However, note that if you perform the IQ calibrations from a GSM/GPRS/EGPRS or AMPS/136 application/format, you must still perform them once from a W-CDMA, cdma2000/IS-95/AMPS or 1xEV-DO application or format.

The IQ calibrations do not need to be run frequently. See “Recommended Calibration Intervals” on page 97.

To initiate the IQ calibrations from the front panel, press **SYSTEM CONFIG**, press the right **More** `(1 of 2)` key, select `Service` (**F7**), then select `Cal. first IQ Modulator` or `Cal. second IQ Modulator`. To initiate the IQ calibrations from a remote program, use the `CALibration:IQ[1]|2?` queries.

Each IQ calibration takes 5-6 minutes to execute.

Burst Mod Offset 1 Calibration This calibration is only applicable to W-CDMA, cdma2000/IS-95/AMPS, and 1xEV-DO applications and formats. This calibration is only required when using the test set to generate an `AM` or `DSB-SC` test signal (select (**F9**) `Test Signal` when in `CW Operating Mode`). These test signals are used for calibrating Zero Intermediate Frequency (Zero IF) devices which utilize Qualcomm's radioOne™

architecture.

You do not have to perform the Burst Mod Offset 1 calibration for each application/format in your test set; performing it from one application/format provides calibration data to all relevant applications and formats.

The Burst Mod Offset 1 calibration does not need to be run frequently. See "Recommended Calibration Intervals" on page 97.

The Burst Mod Offset 1 calibration calibrates the noise and signal level of RF Source 1 (as a function of frequency) to most accurately produce the AM and DSB-SC test signals required for Zero IF device calibration. The calibration is performed by generating the modulated test signals and adjusting RF Source 1 to optimize gain and minimize the noise floor. The optimization data is then stored in the test set and accessed whenever the RF Source frequency is set.

To initiate the Burst Mod Offset 1 calibration from the front panel, press **SYSTEM CONFIG**, press the right **More** (1 of 2) key, select Service (**F7**), then select Cal. Burst Mod Offset 1. To initiate the Burst Mod Offset 1 calibration from a remote program, use the CALibration:BMOFfset? query.

The Burst Mod Offset 1 calibration takes less than 1 minute to execute.

Digital Average Power Calibration The Digital Average Power calibration is only applicable to the cdma2000/IS-95/AMPS and 1xEV-DO applications/formats.

You do not have to perform the Digital Average Power calibration for each application/format in your test set; performing it from one application/format provides calibration data to all relevant applications and formats.

The Digital Average Power calibration does not need to be run frequently. See "Recommended Calibration Intervals" on page 97.

IMPORTANT You *must* cycle the test set's power after the Digital Average Power calibration is complete in order to complete the calibration (the calibration data is not available to the test set until it has been restarted).

The Digital Average Power calibration generates calibration data for the Fast Power Detector for use by cdma2000/IS-95/AMPS and 1xEV-DO applications and formats. The calibration is performed by generating a CW signal at a given power level, measuring it using the Fast Power Detector, then generating and measuring a CDMA-modulated signal at the same power level and noting the difference. This is repeated for several power levels.

The Digital Average Power calibration provides calibration data for the following measurements:

- Digital Average Power
- Maximum/Minimum Power

To initiate the Digital Average Power calibration from the front panel, press **Measurement selection**, select Digital Average Power, then select Calibrate Digital Avg Pwr **(F4)**. To initiate the Digital Average Power calibration from a remote program, use the CALibration:DAPower? query.

The Digital Average Power calibration takes approximately 9 minutes to execute.

Spectrum Monitor Calibration Performing the Spectrum Monitor calibration from one application/format does not provide calibration data to all relevant applications and formats. The calibration data files are shared as follows:

- cdma2000/IS-95/AMPS and 1xEV-DO share the same `Spectrum Monitor` calibration data file.
- W-CDMA has its own `Spectrum Monitor` calibration data file.
- GSM/GPRS/EGPRS and AMPS/136 share the same `Spectrum Monitor` calibration data file.

Thus, if you perform the `Spectrum Monitor` calibration from a 1xEV-DO application/format, you do not need to perform it from a cdma2000/IS-95/AMPS application/format. However you do still need to perform it from a W-CDMA application/format and then again from either a GSM/GPRS/EGPRS or AMPS/136 application/format.

The `Spectrum Monitor` calibration should be run monthly, or whenever the test set's operating environment changes. See "Recommended Calibration Intervals" on page 97.

Performing the `Spectrum Monitor` calibration from a cdma2000/IS-95/AMPS or 1xEV-DO application/format executes the same routine as performing the "Channel Power Calibration" on page 103.

Performing the `Spectrum Monitor` calibration from a W-CDMA application/format executes the same routine as performing the "Calibrate Measurements" on page 102 routine.

Performing the `Spectrum Monitor` calibration from a GSM/GPRS/EGPRS or AMPS/136 application/format calibrates the IF signal path in the Measurement Downconverter, using a CW signal.

To initiate the `Spectrum Monitor` calibration from the front panel, press **Instrument selection**, select `Spectrum Monitor`, select `Trigger Setup` (**F4**), then select `Calibrate Measurement` (**F11**). To initiate the `Spectrum Monitor` calibration from a remote program, use the `CALibration:SMONitor?` query.

The `Spectrum Monitor` calibration takes between 45 seconds and 3 minutes to execute, depending upon which application/format it is executed from.

Calibrate Measurements The `Calibrate Measurements` routine is only applicable to W-CDMA applications/formats.

The `Calibrate Measurements` routine should be run monthly, or whenever the test set's operating environment changes. See "Recommended Calibration Intervals" on page 97.

The `Calibrate Measurements` routine calibrates the signal paths through the Measurement Downconverter and Demod Downconverter using both a CW signal and a modulated signal. The calibration is performed by comparing measured signals through the MDC and DDC to measurements made using the Fast Power Detector (which is calibrated at the factory and temperature controlled for stability). During the `Calibrate Measurements` calibration, the internal temperature of the test set is measured and stored with the calibration data. If the internal temperature of the test set drifts by more than +/- 10 C since the last calibration, measurements utilizing this calibration will return integrity indicator 19 (`Uncalibrated Due to Temperature`).

The `Calibrate Measurements` routine provides calibration data for the following measurements:

- Adjacent Channel Leakage Ratio
- Channel Power
- Change of TFC (lab application only)
- Code Domain
- Dynamic Power Analysis
- Fast Device Tune (*lab application or feature-licensed test application only*)

- Inner Loop Power
- IQ Tuning
- Occupied Bandwidth
- Phase Discontinuity
- PRACH Preamble Analysis (lab application only)
- PRACH Transmit On/Off Power
- Spectrum Emission Mask
- Spectrum Monitor
- TX Dynamic Power
- Waveform Quality

Performing the `Calibrate Measurements` routine executes the same routine as performing the "Spectrum Monitor Calibration" on page 101 from a W-CDMA application/format.

To initiate the `Calibrate Measurements` routine from the front panel, initiate any of the measurements listed above and select `Calibrate Measurements` **(F4)**. To initiate the `Calibrate Measurements` routine from a remote program, use the `CALibration:MEASurements?` query.

The `Calibrate Measurements` routine takes approximately 3 minutes to execute.

Channel Power Calibration The `Channel Power` calibration is applicable to the cdma2000/IS-95/AMPS and 1xEV-DO applications/formats.

You do not have to perform the `Channel Power` calibration for each application/format in your test set; performing it from one application/format provides calibration data to all relevant applications and formats.

The `Channel Power` calibration should be run monthly, or whenever the test set's operating environment changes. See "Recommended Calibration Intervals" on page 97.

The `Channel Power` calibration calibrates the signal paths through the Measurement Downconverter and Demod Downconverter using both a CW signal and a modulated signal. The calibration is performed by comparing measured signals through the MDC and DDC to measurements made using the Fast Power Detector (which is calibrated at the factory and temperature controlled for stability). During the `Calibrate Measurements` calibration, the internal temperature of the test set is measured and stored with the calibration data. If the internal temperature of the test set drifts by more than +/- 10 C since the last calibration, measurements utilizing this calibration will return integrity indicator 19 (`Uncalibrated Due to Temperature`).

The `Channel Power` calibration provides calibration data for the following measurements:

- Access Probe Power
- Channel Power
- Code Channel Time/Phase Error
- Fast Device Tune (*lab application or feature-licensed test application only*)
- Gated Power
- Graphical Access Probe Power (*lab application only*)

- Handoff Waveform Quality
- Maximum/Minimum Power
- Time Response of Open Loop Power Control
- TX Dynamic Power
- TX Spurious Emissions
- Waveform Quality + Code Domain
- Spectrum Monitor

Performing the `Channel Power` calibration executes the same routine as performing the "Spectrum Monitor Calibration" on page 101 from a cdma2000/IS-95/AMPS or 1xEV-DO application/format.

To initiate the `Channel Power` calibration from the front panel, initiate any of the measurements listed above and select `Calibrate Channel Power` **(F4)**. To initiate the `Channel Power` calibration from a remote program, use the `CALibration:CPOWer?` query.

The `Channel Power` calibration takes approximately 2 minutes to execute.

Amplitude Offset

Description

Amplitude offsets compensate for loss or gain between the test set's RF IN/OUT front panel connector and the mobile station's RF connector.

To access the amplitude offset feature, press the **SYSTEM CONFIG** key, followed by the `RF IN/OUT Amptd Offset` (**F5**) key.

Amplitude offset settings are preserved during power cycles or instrument preset.

Setting Up Amplitude Offsets and Frequency Points

Up to 20 frequency points can be assigned an amplitude offset. Negative amplitude offset values should be entered when there is a loss through the RF cabling and test fixtures and positive values should be entered when there is a gain.

The RF IN/OUT Amplitude Offset table displays the current (on/off) state of the amplitude offset feature. There are also 20 rows for entering frequencies and 20 rows for entering corresponding offset values. To enter values in the table use the RF IN/OUT Amplitude Offset Setup menu.

To set up amplitude offsets remotely, one comma-separated string is sent to set up frequency points and another comma-separated string assigns the corresponding amplitudes.

GPIB Commands

```
OUTPUT 714;"SYSTEM:CORRECTION:SFREQUENCY 1710.2 MHZ,1805.2 MHZ,1784.8 MHZ,1879.8 MHZ"
!sets the first 4 frequencies in the amplitude offset table.

OUTPUT 714;"SYSTEM:CORRECTION:SGAIN -2.55,-3.12,-3.68,-4.23"
!sets the first 4 amplitude offsets in the amplitude offset table.
```

Turning amplitude offsets on/off

When the RF IN/OUT Amplitude Offset State is on, all offsets that are not individually turned off are applied and the word "Offset" appears in the Instrument Status Area of the test set's display.

If the RF IN/OUT Amplitude Offset State is off, none of the amplitude offsets are applied.

GPIB Command

```
OUTPUT 714;"SYSTEM:CORRECTION:STATE ON"
!Sets the RF IN/OUT Amplitude Offset State to On
```

NOTE If the RF IN/OUT Amplitude Offset State is turned off , none of the amplitude offsets are on, even if values are entered for the individual offsets.

Examples of Amplitude Offset Behavior

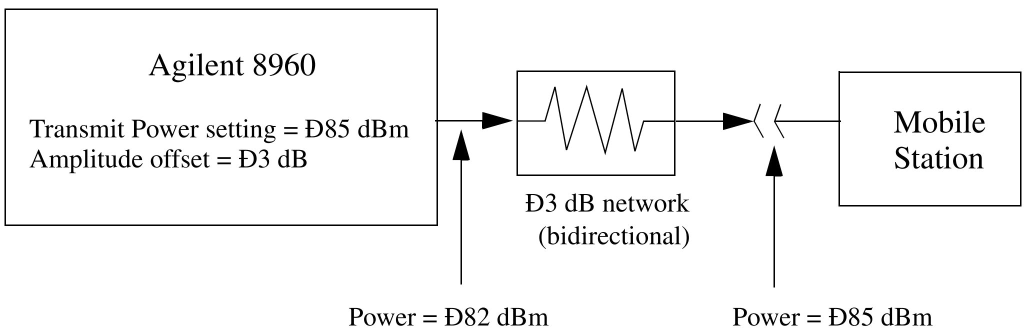
When the amplitude offset table entries accurately represent the loss in all components (cabling, connectors, and test fixturing) in the signal path between the test set and the mobile station, the test set will make the necessary adjustments in both receiver and transmitter measurements.

Mobile Station Receiver Example

When you set a transmit power level, the test set uses the amplitude offset value to adjust the power so that the test set's transmit power level refers to the power level received at the mobile station.

As shown in Figure 8. "Amplitude Offset Mobile Station Receiver Example", with the test set's transmit power set to -85 dBm and a -3 dB amplitude offset the actual power level transmitted from the test set will be automatically offset to -82 dBm. With a 3 dB loss in the signal path the mobile station will receive -85 dBm, the actual setting.

Figure 8. Amplitude Offset Mobile Station Receiver Example



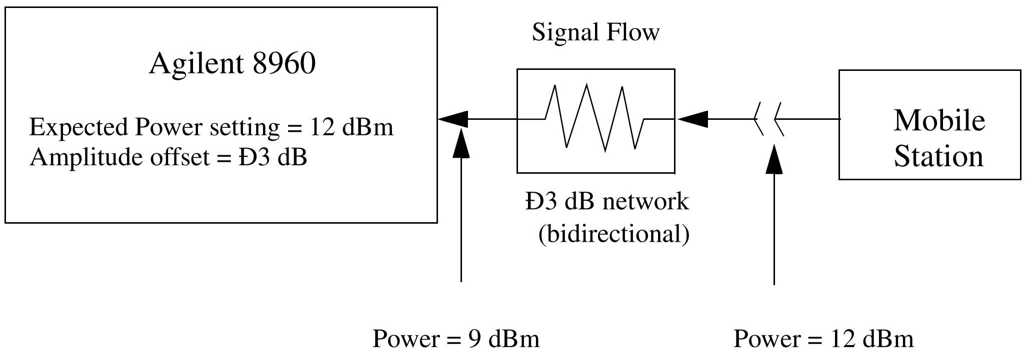
Mobile Station Transmitter Example

When you measure power from the mobile station, the displayed and queried values are offset to show the level at the mobile station.

As shown in Figure 9. "Amplitude Offset Mobile Station Transmitter Example", with the mobile station transmitting 12 dBm and a -3 dB amplitude offset is entered, the measured power at the test set would be 9 dBm. The displayed power level is automatically adjusted to 12 dBm to show the level at the mobile station.

If the expected power, which can be set manually or automatically is 12 dBm, the test set's internal hardware adjusts itself to receive 9 dBm which is the actual power from the mobile station after 3 dB loss in the network.

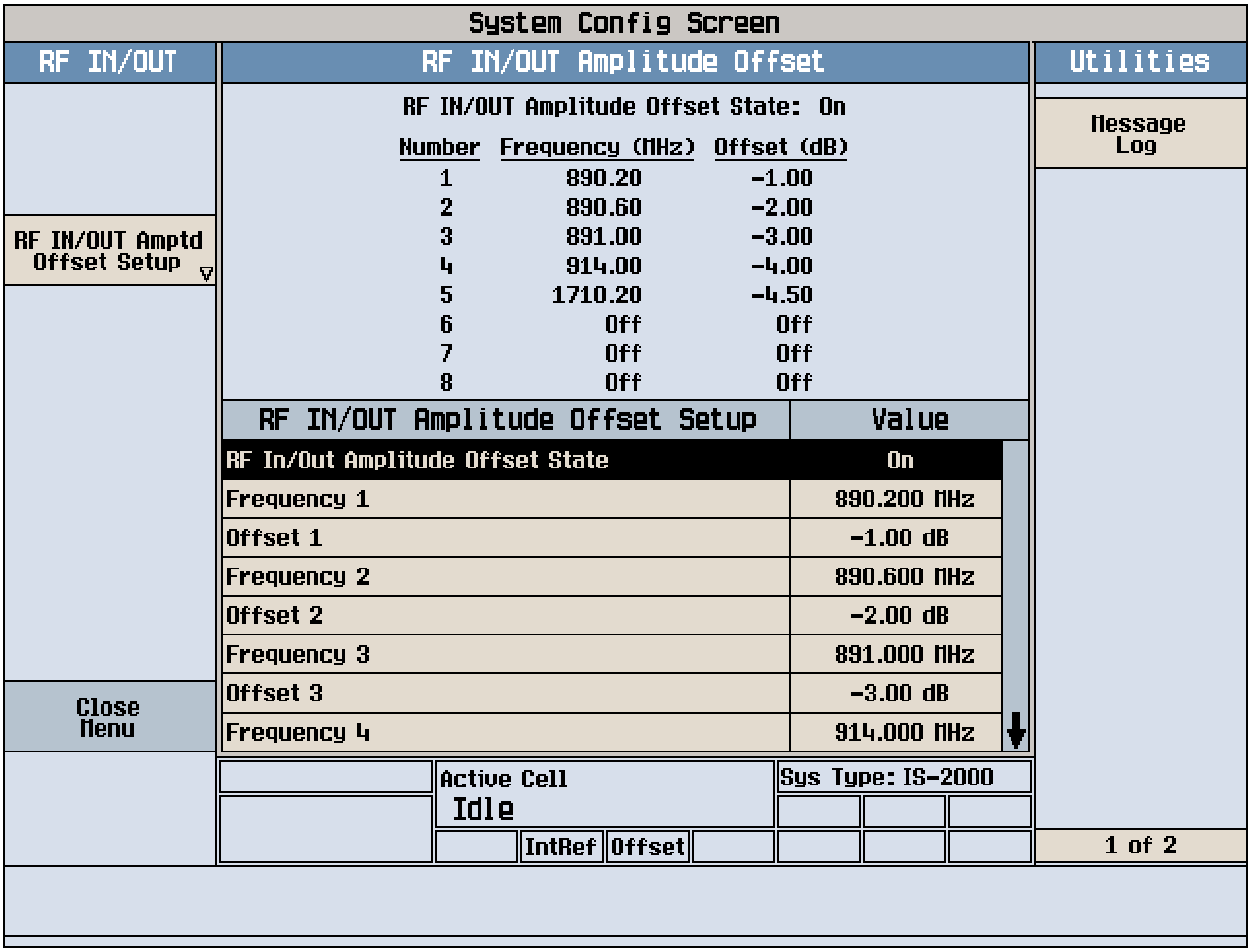
Figure 9. Amplitude Offset Mobile Station Transmitter Example



Amplitude Offsets Between Frequency Settings

If mobile station testing is performed at frequencies that do not have amplitude offsets assigned to them, the test set will estimate an amplitude offset based on the nearest settings. For example, the following screen shows five amplitude offsets for frequencies ranging from 890.2 MHz to 1710.2 MHz.

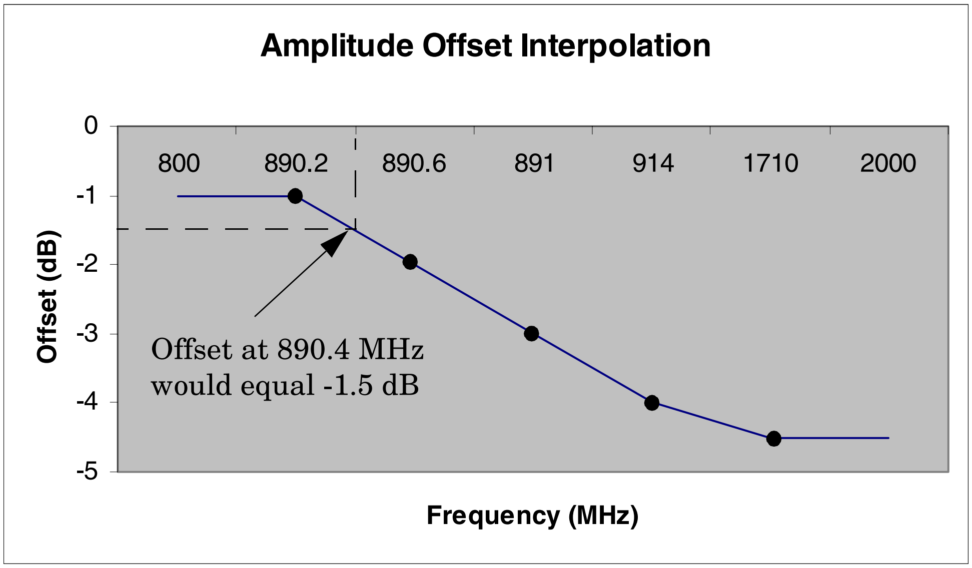
Figure 10. RF IN/OUT Amplitude Offset Setup



For test frequencies between the lowest (890.2 MHz) and highest (1710.2 MHz) frequency points that are not entered in the table, the test set will calculate offsets using piece-wise linear interpolation.

The graph shown in Figure 11. "Amplitude Offset Interpolation" is a conceptual representation of the test set's amplitude offset configuration using the settings from the RF IN/OUT Amplitude Offset table in Figure 10. "RF IN/OUT Amplitude Offset Setup". Each of the five points are shown on a non-scaled frequency versus amplitude offset graph. At a test frequency of 890.4 MHz, which is midway between point number one (-1 dB) and point number two (-2 dB) the test set applies an offset of -1.5 dB. Be aware that since amplitude offsets are in units of dB, this piece-wise linear interpolation does not produce a linear transition from point to point.

Figure 11. Amplitude Offset Interpolation



If testing is done outside the range of frequencies bounded by the lowest and highest frequency entries, the test set simply uses the amplitude offset that is paired with the nearest frequency point.

IMPORTANT It is highly recommended that amplitude offsets are set up for each test frequency. This eliminates inaccuracies due to the mismatch between the test set's linear interpolation and the actual frequency response of the RF path between the test set and mobile station.