Measurement Guide

Electromagnetic Field (EMF) Measurements Option 444

Note	Option 444 requires an Anritsu Isotropic Antenna. Supported frequency ranges are: 9 kHz to 300 MHz (Antenna 2000-1800-R) 30 MHz to 3 GHz (Antenna 2000-1792-R) 700 MHz to 6 GHz (Antenna 2000-1791-R)

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Chapter 1 — General Information

1-1 Introduction

This Measurement Guide describes Electromagnetic Field (EMF) measurement functions available as Option 444 on Anritsu RF and Microwave Handheld Instruments. Option 444 must be used in conjunction with an Anritsu isotropic antenna, at a frequency range that is within specification of the instrument and antenna used.

EMF test functions are available in the following measurement modes:

- Spectrum Analyzer
- Over-the-Air LTE and TD-LTE
- Over-the-Air W-CDMA

Note	Not all instrument models offer every option. Refer to the Technical Data Sheet of your instrument for available options.

1-2 Product Information, Compliance, and Safety

Read the Handheld Instruments Product Information, Compliance, and Safety Guide (PN: 10100-00065) for important safety, legal, and regulatory notices before operating the equipment. For additional information and literature covering your product, visit the product page of your instrument on http://www.anritsu.com/ and select the Library tab.

Not all instrument models offer every option. Please refer to the Technical Data Sheet of your instrument for available options.

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Search for the product model number. The latest documentation is on the product page under the Library tab.

1-4 Selecting a Measurement Mode

To switch to another measurement mode, or application:

1. Press the **Shift** front panel key, followed by **Mode** (9). The Mode Selector dialog opens.
2. Use the arrow keys or rotary knob, or press the touch screen to highlight the desired measurement mode. The list of available applications depends on the options that are installed and activated on your instrument. See Figure 1-1.
3. Press **Enter**.

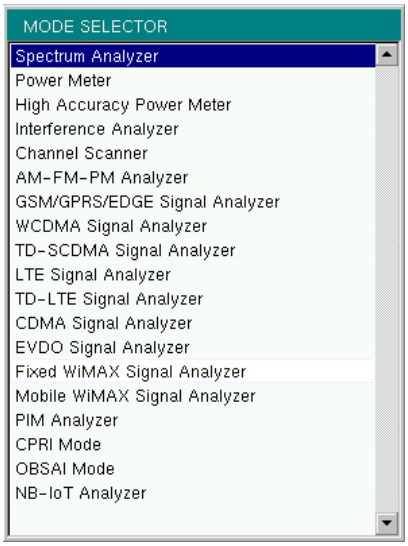


Figure 1-1. Mode Selector Dialog Box

On instruments that have a front panel **Menu** key, an alternate method of changing the measurement mode is to press **Menu**, then press the appropriate application icon on the touch screen.

Figure 1-2. Menu Key Screen - Application Icons and User-Defined Shortcuts

1-5 Connecting the Antenna

1. Connect the antenna RF connector to the **Analyzer/RF In** port on the instrument. See Figure 1-3. The antenna connector must be *finger* tight.
2. Connect the antenna USB connector to one of the USB Type A ports on the instrument.

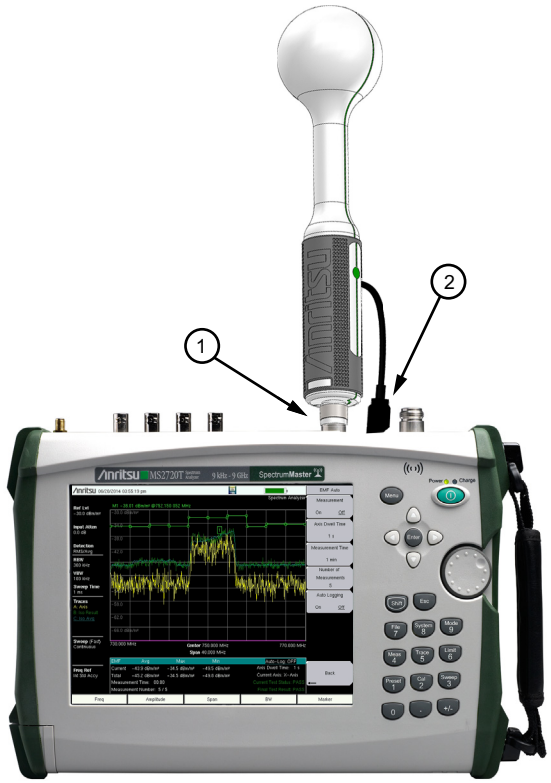


Figure 1-3. Connecting the Anritsu Isotropic Antenna

3. Press Measurements>OTA>EMF to start EMF measuring. The instrument displays "Downloading Antenna Factors. Please do not disconnect the Antenna."
4. When that message goes away, the antenna factors are downloaded and the instrument is ready to commence measuring.

Chapter 2 — Spectrum Analyzer

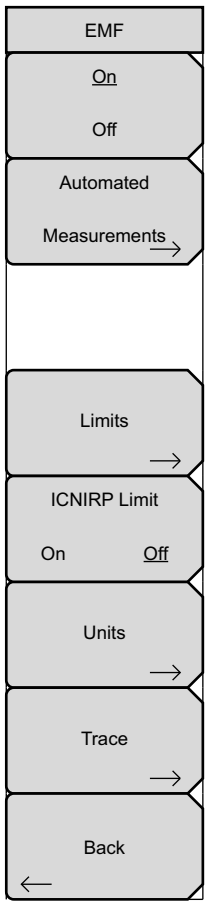
2-1 Introduction

Connect the antenna. Refer to "Connecting the Antenna" on page 1-4.

Note	For general spectrum analyzer measurement setup information, refer to the *Spectrum Analyzer Measurement Guide* (PN: 10580-00349).

2-2 Spectrum Analysis EMF Menu

Key Sequence: **Shift** > **Measure** (**4**) key > Power and Bandwidth > EMF Measurement



On/Off: This is the main EMF Measurement On/Off button. Press this key to switch EMF On and Off. The start and stop frequencies must be within the range of the spectrum analyzer and isotropic antenna used, and the antenna must be connected. The detection type is automatically changed to RMS/Avg when EMF is On. It is restored to the previous detection setting when EMF is Off.

Note: You are prompted with warning messages if the antenna is not connected or if the frequency span of the analyzer is outside the antenna range.

Automated Measurements: Opens the "EMF Auto Menu" on page 2-2 where you can set up EMF parameters and start the measurement. EMF must be turned On.

Limits: This is a shortcut to the standard spectrum analyzer **Limits** menu (**Shift** > **Limit** (**6**)). For EMF measurements, only the upper limit line is used for testing the pass/fail condition. Multi-segment limit lines can also be created.

ICNIRP Limit On/Off: Turning this On creates a limit line consistent with the guidelines of the International Commission on Non-Ionizing Radiation Protection. Trace C contains the averaged isotropic result and is tested against this limit line, and then the Pass/Fail status is updated.

Units: The unit choices are dBm/m^2, dBV/m, dBmV/m, dBuV/m, V/m, W/m^2, dBW/m^2, A/m, dBA/m, W/cm^2. dBm/m^2 is the default.

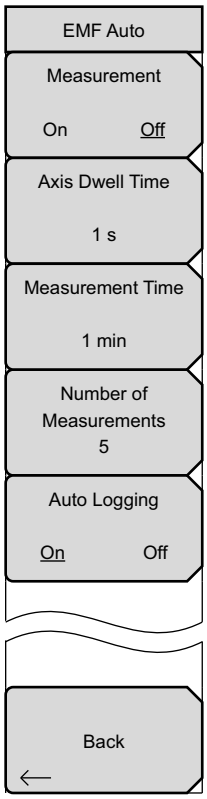
Trace: Opens the "Trace Menu" on page 2-3.

Back: Returns to the Power and BW Menu.

Figure 2-1. EMF Menu

EMF Auto Menu

Key Sequence: **Shift** > **Measure** (**4**) key > Power and Bandwidth > EMF Measurement > Automated Measurements



Measurement On/Off: Starts the EMF Measurement. The Dwell Time, Measurement Time, and other related parameters must be set before starting the measurement. This button is useful for stopping or restarting measurements when settings need to be changed. When the measurement is in progress, access to other menus and key presses are blocked. The Measurement On/Off key is then the only key that can be accessed.

Measurement/Setup save is not permitted when EMF Automated Measurement is turned On. At the end of the measurement, the button will automatically be updated to Off and access to all menus restored.

Axis Dwell Time: Specifies the time spent on each axis. The sweeps are averaged and saved for further computation.

Measurement Time: Sets the duration of each EMF measurement from one minute up to 30 minutes. The default is 6 min. For example, if Axis Dwell Time is set to 1 s and Measurement Time is 1 min, you will get one isotropic result after 3 s and approximately 20 at the end of the one-minute measurement.

The Current row in the summary table at the bottom of the screen displays a running average, max and min of these isotropic results every 3 s. The displayed values are computed from all measurements completed thus far within the measurement time. At the end of the measurement time, the Current row is cleared and the Total row is updated with the max, min, and running average of all isotropic results (20 in this example).

Number of Measurements: Sets the number of EMF measurements to complete from 1 up to 10,000. The EMF test is fully executed when the specified number of measurements have completed.

Auto Logging On/Off: Auto Logging is On by default. This must be selected prior to starting the measurements for the results to be logged. The average, max, and min values of each isotropic set of three axes, the isotropic trace data, and the computed total average, max, and min values are saved in a tab delimited text file in internal memory.

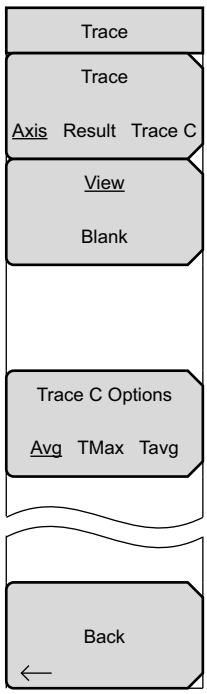
The location of this log file is a new folder named with the current time stamp followed by _1, and created in “/Internal Memory/EMF/”. The folder can hold 100 files. Each file holds five measurements. The 101st file and the files created thereafter are stored in a new folder with the same time stamp as the first, followed by _2 (then _3, and so on). Each file has its own time stamp.

Back: Returns to the “Spectrum Analysis EMF Menu” on page 2-1.

Figure 2-2. EMF Auto Menu

Trace Menu

Key Sequence: **Shift** > **Measure** (**4**) key > Power and Bandwidth > EMF Measurement > Trace



Trace: Selects one of three traces, each holding a different result.

Axis: Holds the sweep result for the currently selected axis.

Result: The isotropic result $(X^2+Y^2+Z^2)^{0.5}$ at the end of an X, Y, Z sweep.

Trace C: Selects Trace C for view and Options setting.

View/Blank: Toggles the selected trace between **View** and **Blank** state. Two or all three traces can be viewed simultaneously by selecting each trace and setting its state to **View**. Selecting **Blank** will blank the currently selected trace.

Trace C Options: Toggles Trace C Options:

Avg: Holds the average values of the isotropic results from trace averaging (volts on a linear scale). This is the running average of the individual isotropic measurements completed within the specified measurement time.

TMax: Holds the maximum values of the isotropic results over the total EMF measurement period (measurement time x number of measurements). During an active measurement period, the running maximum values are displayed.

Tavg: Holds the average values of the isotropic results over the total EMF measurement period (measurement time x number of measurements). During the measurement period, the running average values are displayed.

Back: Returns to the “Spectrum Analysis EMF Menu” on page 2-1.

Figure 2-3. Trace Menu

2-3 Measurement Results

After completing the data collection for the three axes, the Isotropic Result is calculated and displayed. In addition to the three traces displayed on the user interface (Axis Sweep Data, Current Isotropic Result, and Average Isotropic Result/Measurement), the max, min, and average values of the Isotropic Result traces are also computed and displayed in the table below the graph region. See Figure 2-4. The average value is computed as:

sum of the 551 trace point amplitudes / 551

The Current row displays values computed for all measurements completed thus far, as indicated by Measurement Number (2/5, for example) at the bottom of the table. At the end of the specified measurement time, the current max, min, and average values are copied to the Total row. The Current row is then cleared for the next measurement. The Isotropic Results are updated until the set number of measurements have completed or you stop the measurements by pressing the Measurement On/Off key.

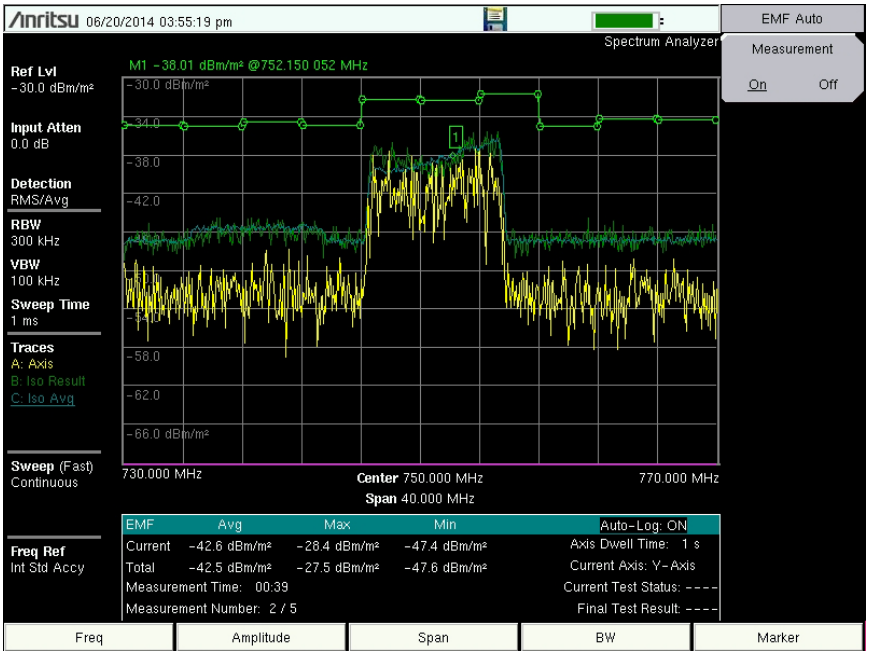


Figure 2-4. EMF Measurement Display

Pass/Fail

The limit check is done at the end of each measurement and determines the Pass/Fail status of the tests. The limit line, if selected, is applied against the Iso Avg trace. To show or hide the Current Test Status and Final Test Result, press the Limits submenu key in the EMF menu (see Figure 2-1 on page 2-1), then press the On/Off key.

At the end of the specified measurement time and if the trace exceeds the selected limit, a FAIL is recorded and the Current Test Status in the summary table is updated to FAIL. In that case, the Final Test Result is immediately displayed as a FAIL. If the Average Isotropic Result does not cross the limit line, then the Current Test Status is updated to PASS and stays this way for a few sweeps. The Current Test Status is then updated to "--". See Figure 2-4 on page 2-4. If all of the measurements pass, the Final Test Result is updated to PASS. See Figure 2-5.

If Auto Logging is set to On prior to starting the measurements, Pass/Fail results are saved in a log file with the Isotropic Results. Refer to "EMF Auto Menu" on page 2-2.

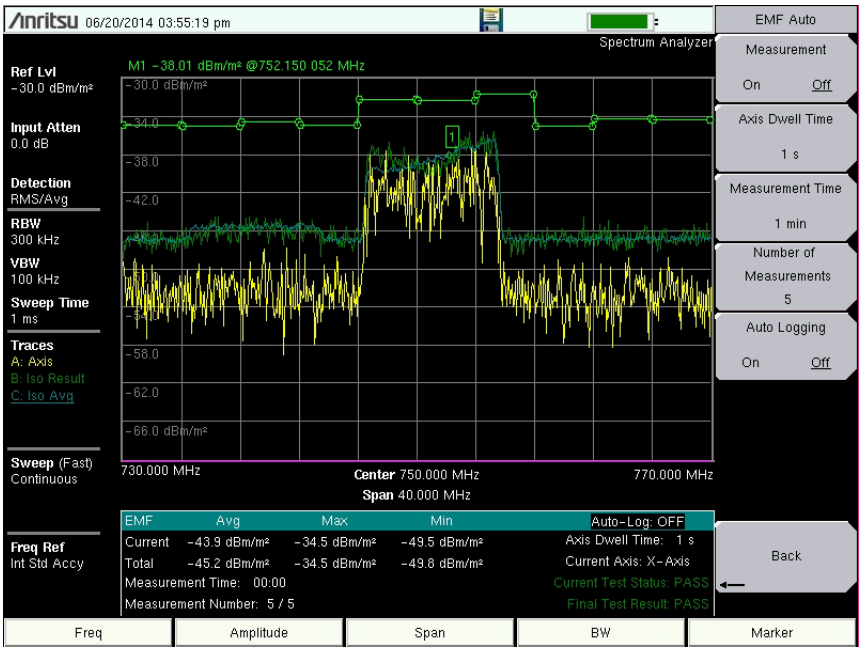


Figure 2-5. EMF Test Pass/Fail Status

Chapter 3 — LTE/TD-LTE OTA

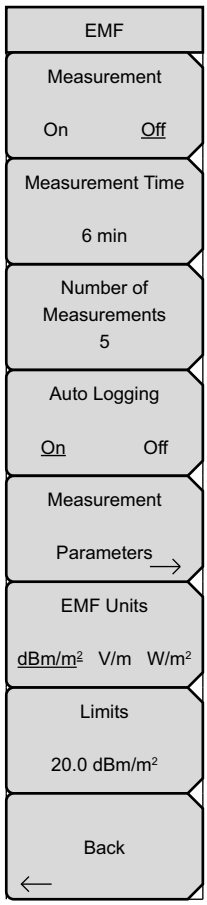
3-1 Introduction

Connect the antenna. Refer to "Connecting the Antenna" on page 1-4.

Note	For general LTE and TD-LTE Over-the-Air measurement setup information, refer to the *3GPP Signal Analyzer Measurement Guide* (PN: 10580-00234).

3-2 LTE/TD-LTE EMF Menu

Key Sequence: **Measurements** > Over-the-Air > EMF



Measurement On/Off: Starts the EMF Measurement and removes access to all other menu buttons. The measurement turns On only if the Center Frequency is set within the valid range and the Anritsu Isotropic Antenna is connected.

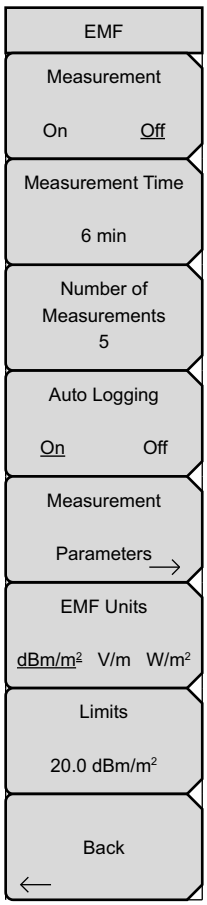
Note that the Measurement Time and other related parameters must be set before starting the measurement. This button is useful for stopping or restarting measurements when settings need to be changed. When the measurement is in progress, access to other menus and key presses are blocked.

Measurement Time: Sets the duration of each EMF measurement from one minute up to 30 minutes. The default is 6 min. The instrument captures over-the-air data for the X axis when a valid sync signal is found and a valid Cell ID exists, then moves to the Y and Z axes. There is no axis dwell time parameter. You will get as many isotropic results for the set of three axes as can be obtained within the specified Measurement Time.

When no valid sync signal is found for the current axis, data captured for this axis will be excluded from the measurement results and the instrument moves to the next axis. Refer to "Measurement Results (LTE/TD-LTE)" on page 3-7.

Number of Measurements: Sets the number of EMF measurements to complete from 1 up to 10,000. The EMF test is fully executed when the specified number of measurements have completed.

Figure 3-1. LTE/TD-LTE EMF Menu (1 of 2)



Auto Logging On/Off: Auto Logging is On by default. This must be selected prior to starting the measurements for the results to be logged. The average, max, and min values of each isotropic set of three axes, the isotropic trace data, and the computed total average, max, and min values are saved in a tab delimited text file in internal memory.

The location of this log file is a new folder named with the current time stamp followed by _1, and created in "/Internal Memory/EMF/". The folder can hold 100 files. Each file holds five measurements. The 101st file and the files created thereafter are stored in a new folder with the same time stamp as the first, followed by _2 (then _3, and so on). Each file has its own time stamp.

Measurement Parameters: Opens the "Meas Params Menu (LTE/TD-LTE)" on page 3-3.

EMF Units: dBm/m^2, V/m, and W/m^2 are the currently supported units. V/m is the default unit.

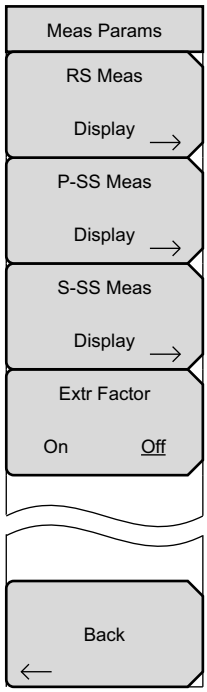
Limits: A single number can be entered. The Field Strength (Avg) value is the running average for the current Measurement Time and should stay below this limit (default 6 V/m) for the test to pass. When the Extrapolation Factor is On (refer to "Meas Params Menu (LTE/TD-LTE)" on page 3-3), the Field Strength (Avg) is extrapolated and the computed value should stay below the limit for the test to pass.

Back: Returns to the previous menu.

Figure 3-2. LTE/TD-LTE EMF Menu (2 of 2)

Meas Params Menu (LTE/TD-LTE)

Key Sequence: **Measurements** > Over-the-Air > EMF > Measurement Parameters



RS Meas Display: Opens the “RS Display Menu” on page 3-4.

P-SS Meas Display: Opens the “P-SS Display Menu” on page 3-5.

S-SS Meas Display: Opens the “S-SS Display Menu” on page 3-6.

Extr Factor On/Off: Toggles On/Off the Extrapolation Factor. The extrapolation factor, if turned On, displays the extrapolated field strength number for the selected capture bandwidth.

Back: Returns to the “LTE/TD-LTE EMF Menu” on page 3-1.

Figure 3-3. LTE/TD-LTE Meas Params Menu

RS Display Menu

Key Sequence: **Measurements** > Over-the-Air > EMF > Measurement Parameters > RS Meas Display

The displayed **Reference Signal** parameters below can be changed at the start or at the end of the measurement cycle. All of the parameters are always computed and stored. Once the measurement is complete, any combination of parameters can be viewed (three at a time and in any one of the desired units).

RS Act: Selects the display of Actual Value (current isotropic number).

RS Total Min: Selects the display of Total Min, which is the minimum value for the entire measurement period (Measurement Time × Number of Measurements).

RS Total Max: Selects the display of Total Max, which is the maximum value for the entire measurement period.

RS Avg/Meas: Selects the display of Avg/Meas, which is the running average for the current Measurement Time. This is the default selection.

RS Total Avg: Selects the display of Total Avg, which is the running average for the entire measurement period.

Back: Returns to the “Meas Params Menu (LTE/TD-LTE)” on page 3-3.

Figure 3-4. RS Display Menu

P-SS Display Menu

Key Sequence: **Measurements** > Over-the-Air > EMF > Measurement Parameters > P-SS Meas Display

The displayed **Primary Synchronization Signal** parameters below can be changed at the start or at the end of the measurement cycle. All of the parameters are always computed and stored. Once the measurement is complete, any combination of parameters can be viewed (three at a time and in any one of the desired units).

P-SS Act: Selects the display of Actual Value (current isotropic number).

P-SS Total Min: Selects the display of Total Min, which is the minimum value for the entire measurement period (Measurement Time × Number of Measurements).

P-SS Total Max: Selects the display of Total Max, which is the maximum value for the entire measurement period.

P-SS Avg/Meas: Selects the display of Avg/Meas, which is the running average for the current Measurement Time. This is the default selection.

P-SS Total Avg: Selects the display of Total Avg, which is the running average for the entire measurement period.

Back: Returns to the "Meas Params Menu (LTE/TD-LTE)" on page 3-3.

Figure 3-5. P-SS Display Menu

S-SS Display Menu

Key Sequence: **Measurements** > Over-the-Air > EMF > Measurement Parameters > S-SS Meas Display

The displayed **Secondary Synchronization Signal** parameters below can be changed at the start or at the end of the measurement cycle. All the parameters are always computed and stored. Once the measurement is complete, any combination of parameters can be viewed (three at a time and in any one of the desired units).

S-SS Act: Selects the display of Actual Value (current isotropic number).

S-SS Total Min: Selects the display of Total Min, which is the minimum value for the entire measurement period (Measurement Time × Number of Measurements).

S-SS Total Max: Selects the display of Total Max, which is the maximum value for the entire measurement period.

S-SS Avg/Meas: Selects the display of Avg/Meas, which is the running average for the current Measurement Time. This is the default selection.

S-SS Total Avg: Selects the display of Total Avg, which is the running average for the entire measurement period.

Back: Returns to the "Meas Params Menu (LTE/TD-LTE)" on page 3-3.

Figure 3-6. S-SS Display Menu

3-3 Measurement Results (LTE/TD-LTE)

The measurement starts by setting the antenna's X axis and capturing over-the-air data. If a sync signal is found and a valid Cell ID exists, then the following parameters are detected and stored: the channel power in 1.4 MHz bandwidth, the Cell ID, RS, P-SS, and S-SS (all per Resource Element). This is repeated for Y and Z axes. If any one of the axes has a valid Cell ID, the isotropic result (for example, $(RS^2_X + RS^2_Y + RS^2_Z)^{0.5}$) for each of the above parameters is displayed as the Actual result.

The Measurement Parameters submenu (refer to page 3-3) lets you choose which computed result is displayed in the measurements table, in each of the RS, P-SS, and S-SS columns. See Figure 3-7. The choices of display parameters are: Actual, Total Min, Total Max, Avg/Meas (the default), and Total Avg.

Total Min, Total Max, and Total Avg are the min, max, and average values computed from all measurements completed thus far within the measurement period (Measurement Time × Number of Measurements). Avg/Meas is the running average of the isotropic results computed from all measurements completed thus far within the specified Measurement Time.

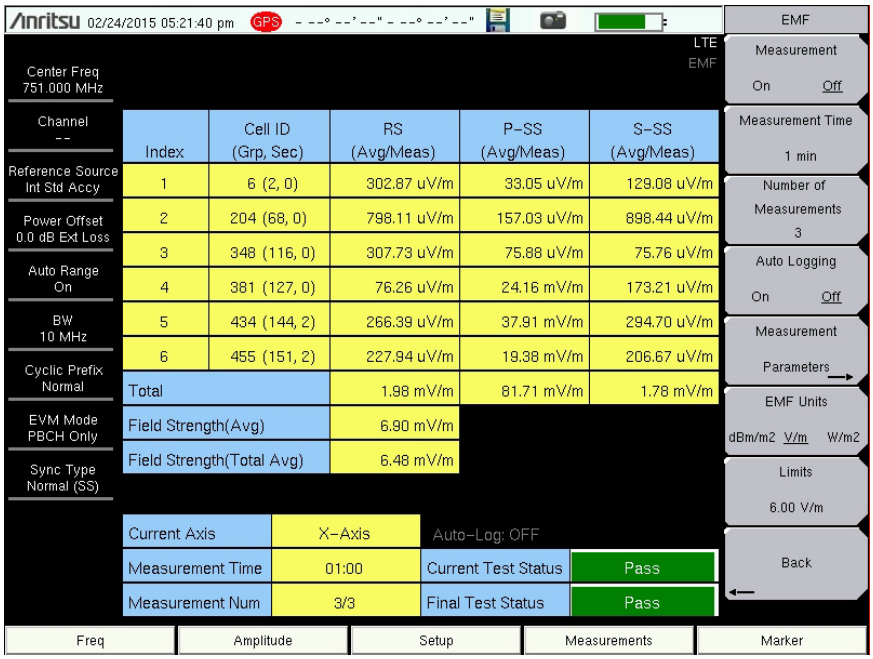


Figure 3-7. LTE EMF Measurement Results

There is no axis dwell time parameter. If a sync signal is not found within a specific time, data for the current axis is excluded and the instrument switches to the next axis. The Field Strength number is still computed and compared with the specified limit to determine the Pass or Fail status at the end of the measurement period (Measurement Time × Number of Measurements).

Field Strength (Avg) is the running average for the current Measurement Time. Field Strength (Total Avg) is the running average for all measurements completed thus far within the measurement period.

When the extrapolation factor is turned Off, the Field Strength number is the measured Channel Power in a 1.4 MHz bandwidth. Changing the bandwidth (BW) setting in the Setup menu does not change this number.

If the extrapolation factor is On, the Field Strength (E_{max}) is computed as follows:

$$E_{max} = E_{cp} \times N_{cp}$$

where E_{cp} is the RMS value of the channel power recorded in each axis and N_{cp} is the number of subcarriers divided by 72. The number of subcarriers can be provided by the network operator or can be calculated from Table 3-1. The selected channel bandwidth (BW key in the instrument Setup main menu) determines the number of subcarriers. The default BW is 1.4 MHz.

Table 3-1. Field Strength Numbers

Channel Bandwidth (MHz)	Subcarriers
1.4	72
3	180
5	300
10	600
15	900
20	1200

Assuming that all subcarriers in the BW setup are at the same power level, the Field Strength value for other BW setups can be extrapolated based on the Channel Power in 1.4 MHz BW. The Field Strength cell labels in the table are updated with an *Ex*, such as Field Strength (Ex Avg), to indicate the extrapolation factor has been applied. See Figure 3-8 on page 3-9.

The displayed values are measurement results from the BW setup made prior to starting the measurement. Changing the BW setup, hence the extrapolation factor, after the measurement is complete has no effect on the currently displayed values.

If a valid Cell ID is obtained even once during the entire measurement period, an entry will be made in the table. "--" indicates an invalid result. A maximum of six cell IDs can be detected. The Total row sums the isotropic numbers for the selected display parameter across Cell IDs.

Pass/Fail

The limit check is done at the end of each Measurement Time. If the Field Strength (Avg), with or without extrapolation, exceeds the set limit, the Current and the Final Test Status are marked as Fail in red. If the Field Strength (Avg) does not exceed the limit, the Current Test Status is marked as Pass in green. In the example in Figure 3-8, the extrapolated Field Strength (Ex Avg) is 22.22 mV/m.

If all of the measurements pass, the Final Test Status is updated to Pass in green.

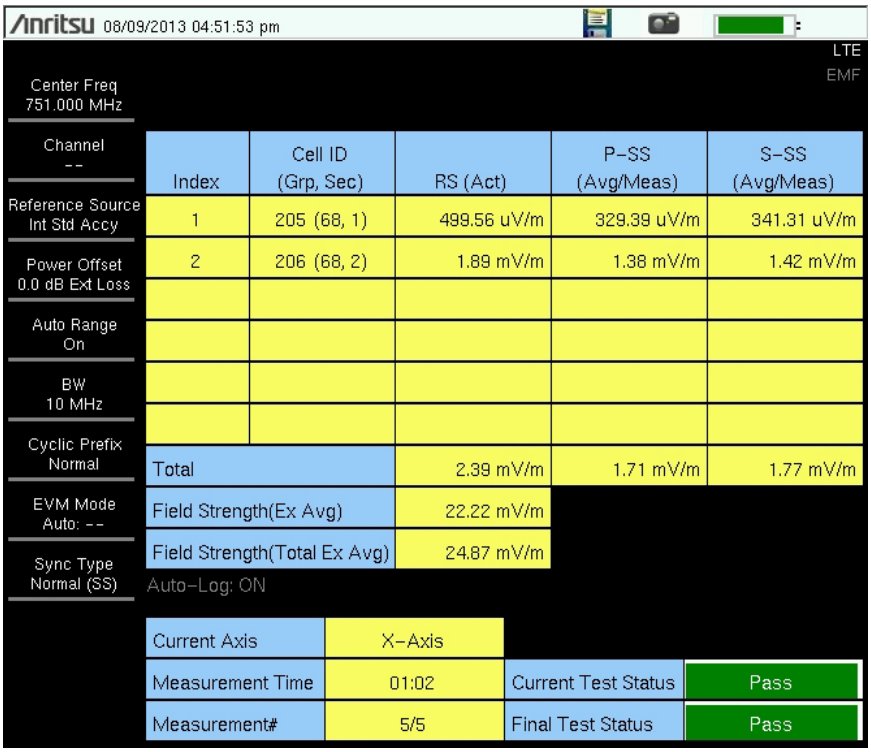


Figure 3-8. LTE/TD-LTE EMF Measurement Display

Chapter 4 — W-CDMA OTA

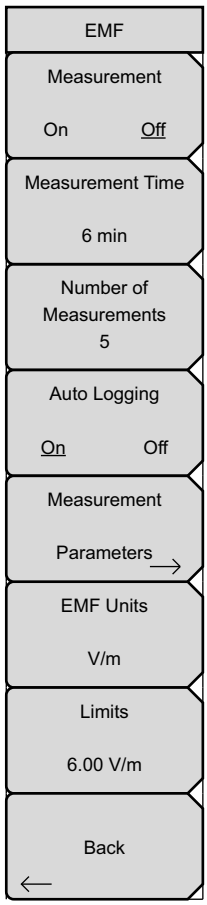
4-1 Introduction

Connect the antenna. Refer to "Connecting the Antenna" on page 1-4.

Note	For general W-CDMA Over-the-Air measurement setup information, refer to the *3GPP Signal Analyzer Measurement Guide* (PN: 10580-00234).

4-2 W-CDMA EMF Menu

Key Sequence: **Measurements** > OTA > EMF



Measurement On/Off: Starts the EMF Measurement and removes access to all other menu buttons. The measurement turns On only if the Center Frequency is set within the valid range and the Anritsu Isotropic Antenna is connected.

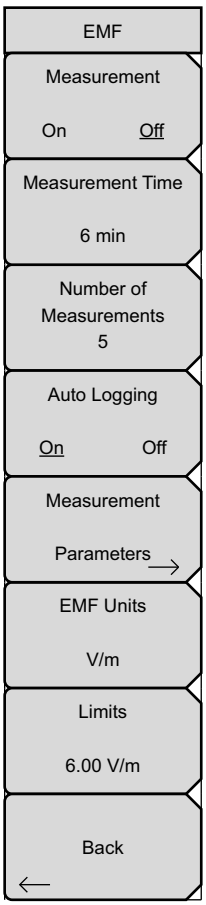
Note that the Measurement Time and other related parameters must be set before starting the measurement. This button is useful for stopping or restarting measurements when settings need to be changed. When the measurement is in progress, access to other menus and key presses are blocked.

Measurement Time: Sets the duration of each EMF measurement from one minute up to 30 minutes. The default is 6 min. The instrument captures over-the-air data for the X axis when a sync signal is found and there is a valid scrambling code, then moves to the Y and Z axes. There is no axis dwell time parameter. You will get as many isotropic results for the set of three axes as can be obtained within the specified Measurement Time.

When no valid sync signal is found for the current axis, data captured for this axis will be excluded from the measurement results and the instrument moves to the next axis. Refer to "Measurement Results (W-CDMA)" on page 4-5.

Number of Measurements: Sets the number of EMF measurements to complete from 1 up to 10,000. The EMF test is fully executed when the specified number of measurements have completed.

Figure 4-1. W-CDMA EMF Menu (1 of 2)



Auto Logging On/Off: Auto Logging is On by default. This must be selected prior to starting the measurements for the results to be logged. The PCPICH (Primary Common Pilot Channel) and Field Strength actual and average values of the current measurement are stored. The maximum, minimum, and total average values stored are not per measurement, but for all the values captured until that point.

The location of the saved log file is a new folder named with the current time stamp followed by _1, and created in "/Internal Memory/EMF/". The folder can hold 100 files. Each file holds five measurements. The 101st file and the files created thereafter are stored in a new folder with the same time stamp as the first, followed by _2 (then _3, and so on). Each file has its own time stamp.

Measurement Parameters: Opens the "Meas Params Menu (W-CDMA)" on page 4-3.

EMF Units: The unit choices are dBm/m^2, V/m, W/m^2, % of Limit (V/m), and % of Limit (W/m^2). V/m is the default unit.

% of Limit (V/m) and % of Limit (W/m^2) display the measured numbers as a percentage of the selected limit. The submenu key shows the currently selected EMF unit. If the selected base unit is in V/m or % of Limit (V/m), the averaging over the selected period is done in Volt units; if any of the other units are selected, the measurements are performed in power (Watt) units. If you change the EMF units at the end of the measurement, the values displayed are converted from the base units used during the measurement.

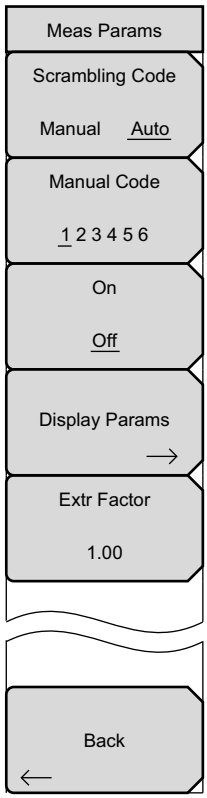
Limits: A single number can be entered. The Field Strength (Avg) value should stay below this limit (default 6 V/m) for the test to pass.

Back: Returns to the previous menu.

Figure 4-2. W-CDMA EMF Menu (2 of 2)

Meas Params Menu (W-CDMA)

Key Sequence: **Measurements** > OTA > EMF > Measurement Parameters



Scrambling Code: Press this key to toggle between Auto or Manual scrambling code. Auto scrambling code determines the scrambling code automatically.

The choice of Auto or Manual scrambling codes and the code lock/reset options function in the same manner as Scrambling Code in W-CDMA OTA measurement mode.

Manual Code: Press this submenu key to select a scrambling code index, 1 through 6. The key is active only in Manual mode, which is selected using the Scrambling Code submenu key.

On Off: Switches On/Off the manual codes.

Display Params: Opens the "Display Menu" on page 4-4. Enter this submenu to select the parameter you want displayed in the rightmost column of the measurement results table.

Extr Factor: The extrapolation factor, when turned On (> 1), displays the extrapolated P-CPICH numbers. The field strength values are not extrapolated.

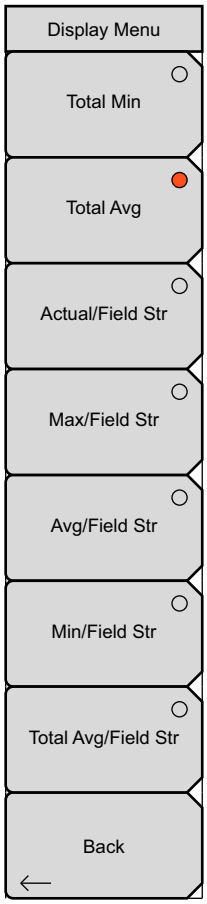
This parameter can be set between 1 and 100 (the network operator can provide this number). It can be used to provide a safety margin in case of an increase in transmit power from an LTE station. The fine tuning may be based on operator input (system setup/power ratio) and/or per regulatory requirements (margins). Refer to "Measurement Results (W-CDMA)" on page 4-5.

Back: Returns to the "W-CDMA EMF Menu" on page 4-1.

Figure 4-3. W-CDMA Meas Params Menu

Display Menu

Key Sequence: **Measurements** > OTA > EMF > Measurement Parameters > Display Params



Press one of the keys in this submenu to select which parameter is displayed in the rightmost column of the measurement results table. The default selection is Total Avg. See Figure 4-5 on page 4-5.

The parameter to be displayed can be changed at the start or at the end of the measurement cycle. All the parameters are always computed and stored. Once the measurement is complete, any parameter can be viewed in the desired units and with the desired extrapolation factor.

Total Min is the minimum value computed from all measurements completed thus far within the measurement period (Measurement Time × Number of Measurements).

Total Avg is the average value computed from all measurements completed thus far within the measurement period.

The remaining choices are coverage measurements computed as a ratio of common pilot signal to the channel power (5 MHz bandwidth):

Actual/Field Str

Max/Field Str

Avg/Field Str

Min/Field Str

Total Avg/Field Str

Back: Returns to the “Meas Params Menu (W-CDMA)” on page 4-3.

Figure 4-4. W-CDMA Display Menu

4-3 Measurement Results (W-CDMA)

The measurement starts by setting the antenna's X axis and capturing over-the-air data. If a sync signal is found and there is a valid scrambling code, the PCPICH and Channel Power in 5 MHz bandwidth are stored. This is repeated for Y and Z axes. If any one of the axes has a valid scrambling code, the isotropic result (for example, $(PCPICH^2_X + PCPICH^2_Y + PCPICH^2_Z)^{0.5}$) for each of the above parameters is displayed as the Actual result.

The PCPICH Actual, Total Max, and Avg/Meas parameters are displayed as fixed columns in the measurement results table. See Figure 4-5. Total Max is the max value computed from all measurements completed thus far within the measurement period (Measurement Time × Number of Measurements). Avg/Meas is the running average of the isotropic results computed from all measurements completed thus far within the specified Measurement Time.

Using the Display Params submenu, you can select the computed result to display in the rightmost table column. Refer to "Display Menu" on page 4-4.

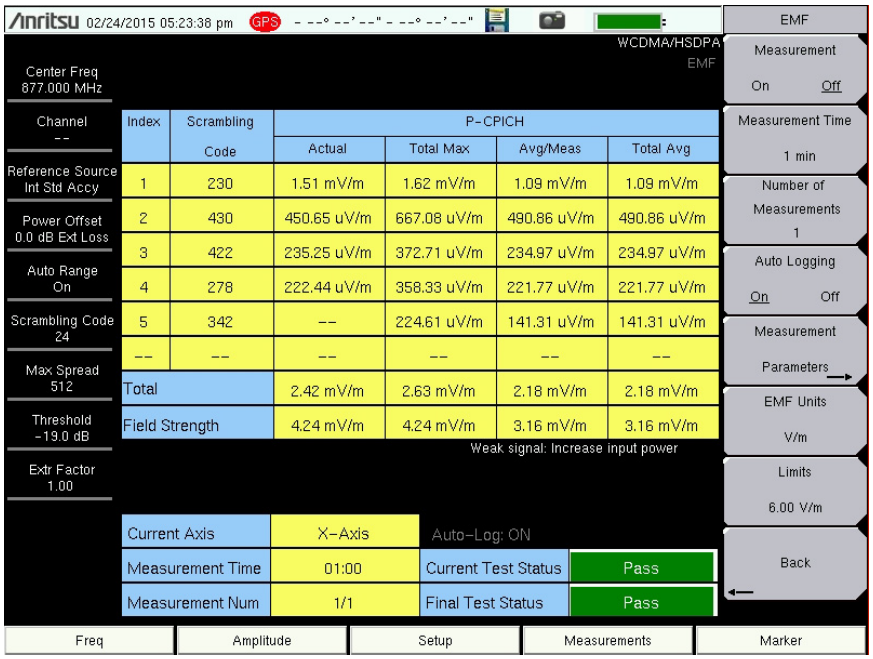


Figure 4-5. W-CDMA EMF Measurement Results

There is no axis dwell time parameter. If a sync signal is not found within a specific time, data for the current axis is excluded and the instrument switches to the next axis.

The Field Strength number is the measured Channel Power in a 5 MHz bandwidth.

If the extrapolation factor is turned On, the E_{max} value is the extrapolated PCPICH for Total Max, Total Min, Total Avg, or Avg/Meas, and is computed as follows:

$$E_{max} = E_{pcpich} \times \sqrt{k}$$

where E_{pcpich} is the root sum square (rss) value of the common pilot signal recorded in each axis and k is the extrapolation factor provided by the network operator. For example:

$$E_{max\ (pcpich\ total\ max)} = E_{pcpich\ total\ max} \times \sqrt{k}$$

Note	The extrapolation factor k is the ratio of the maximum total output power at the base station to the power of PCPICH at the base station. If there is a power boosting factor (BF), k = (max total output power ÷ P(PCPICH)) ÷ BF. Changing the extrapolation factor immediately updates the displayed values, except for Field Strength. Refer to "Meas Params Menu (W-CDMA)" on page 4-3.

If a valid scrambling code is obtained even once during the entire measurement period, an entry is made in the table. A maximum of 6 scrambling codes can be detected. The Total row sums the isotropic numbers for the selected display parameter across scrambling codes.

If no valid scrambling code is detected for any of the three axes, the isotropic numbers are excluded from all measurement results (Total Max, Total Min, Total Avg, Avg/Meas). In this case, the display shows "--".

Pass/Fail

The limit check is performed at the end of each Measurement Time. If the Field Strength (Avg/Meas) exceeds the set limit, the Current and Final Test Status are marked as Fail in red. If the Field Strength (Avg/Meas) does not exceed the limit, the Current Test Status is marked as Pass in green. In the example in Figure 4-6, the Field Strength (Avg Meas) is 5.05 mV/m.

If all of the measurements pass, the Final Test Status is updated to Pass in green.

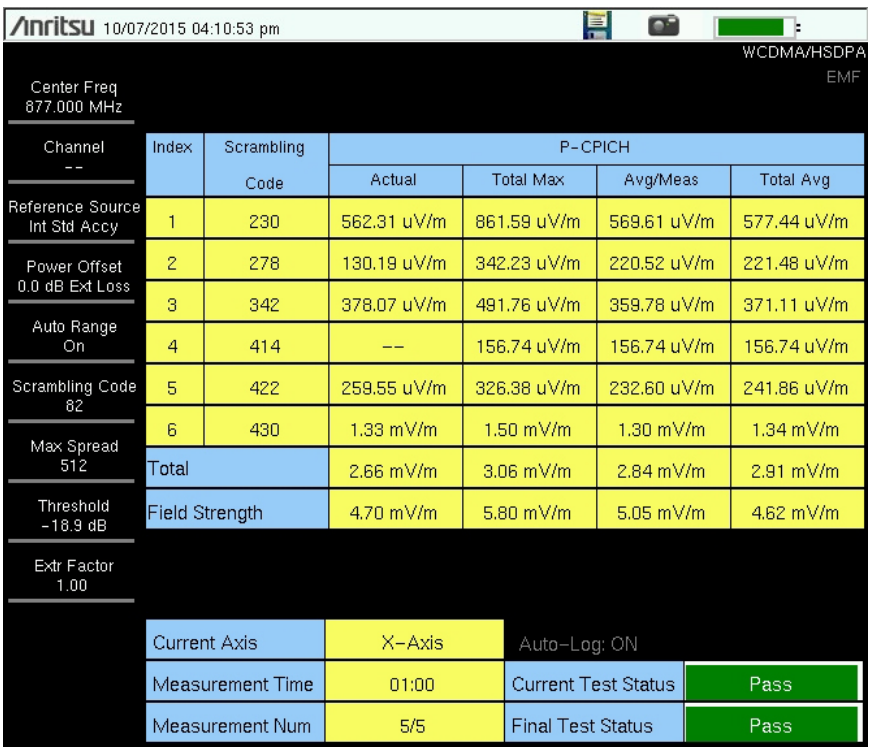


Figure 4-6. W-CDMA EMF Measurement Display

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