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PART 20, 22, 24 & 27 MEASUREMENT REPORT

Applicant Name:
Wilson Electronics
3301 E. Deseret Drive
St. George, UT 84790
UNITED STATES

Date of Testing:
05/13 - 06/19/2024
Test Report Issue Date:
7/24/2024
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2406100049-01.PWO

FCC ID:	**PWO076**
IC:	**4726A-076**
APPLICANT:	**Wilson Electronics**

Application Type:	Certification
Model/HVIN:	460076, 461076
EUT Type:	Provider Specific Signal Booster
FCC Classification(s):	Part 20 Provider-Specific Consumer Booster (CMRS) (B2P)
FCC Rule Part(s):	2, 20, 22, 24, 27
ISED Specification:	RSS-132 Issue 4, RSS-133 Issue 6 Amendment 1, SRSP-510 Issue 5, RSS-130 Issue 2, RSS-139 Issue 4, RSS-131 Issue 4
Test Procedure(s):	ANSI C63.26-2015, KDB 935210 D04 v02r04

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

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Band	Bandwidth (MHz)	Frequency Range (MHz)	Modulation	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 4 (DL)	5	2110-2155	QPSK	0.001	-0.18	4M67G7D
LTE Band 4 (UL)		1710-1755	QPSK	0.294	24.68	4M67G7D
LTE Band 5 (DL)	5	869-894	QPSK	0.001	0.87	4M69G7D
LTE Band 5 (UL)		824-849	QPSK	0.284	24.54	4M65G7D
LTE Band 12 (DL)	5	729-746	QPSK	0.001	-0.34	4M67G7D
LTE Band 12 (UL)		699-716	QPSK	0.353	25.48	4M67G7D
LTE Band 13 (DL)	5	746-756	QPSK	0.001	-1.53	4M61G7D
LTE Band 13 (UL)		777-787	QPSK	0.590	27.71	4M64G7D
LTE Band 25/2 (DL)	5	1930-1995	QPSK	0.001	1.62	4M67G7D
LTE Band 25/2 (UL)		1850-1915	QPSK	0.363	25.60	4M67G7D

EUT Overview

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

1.2 Element Test Location

These measurement tests were conducted at the Element Laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Wilson Electronics Provider Specific Signal Booster FCC ID: PWO076 / IC: 4726A-076**. The test data contained in this report pertains only to the emissions due to the LTE operation. The test data contained in this report covers both uplink and downlink operation for the booster device.

This EUT is capable of transmitting boosted LTE signals and it has built-in bi-directional amplifier for the boosting signal. The EUT does not generate its own RF. The EUT supports any combination of bandwidths, number of carriers, and modulations as input signals from a signal generator connected to its input. The EUT will transmit all signals within the LTE band that are received.

The EUT has 3 donor ports and 4 server ports all with an impedance of 50 ohms. The server ports are tested by inputting uplink signal on server ports as input port and measured output signal from donor port as output port. The donor ports are tested by inputting downlink signal on donor ports as input port and measured output signal from server port as output port. Donor ports are configured to switch between MTT (multi-tower-targeting) ports and common ports as shown in the following Table 2-1.

Band	Donor Port Configuration	
	Common	MTT
LTE Band 4	Donor Port 2	Donor Port 2
LTE Band 5	Donor Port 2	Donor Port 1
LTE Band 12	Donor Port 2	Donor Port 3
LTE Band 13	Donor Port 2	Donor Port 3
LTE Band 25/2	Donor Port 2	Donor Port 2

Table 2-1. Donor Ports configuration

The EUT can be used with following two types of mount

1. Wall Mount – SKU: 460076
2. Rack Mount – SKU: 461076

Test Device Serial No.: 102211461

2.2 Device Capabilities

This device contains the following capabilities:

BAND 2, 4, 5, 12, 13, and 25

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015 and KDB 935210 D04 v02r04. See Section 7.0 of this test report for a description of the conducted and radiated tests. Conducted output power measurements were performed on all server and donor ports. After confirming power equivalency among all donor ports in Common and MTT modes as shown in the table above, all subsequent tests were performed on the common port. For the server ports, each port was dedicated to a specific band so all ports were tested for their corresponding supported bands.

All conducted testing was performed using a signal generator connected via coaxial cable to the input port of either donor or server ports. The corresponding output was measured on the opposite donor or server port. During testing, the unused ports that were not being tested were terminated with 50 ohm termination. All radiated testing was performed by using a signal generator connected to the input port to transmit and then measuring the radiated output transmission with terminated 50 ohm termination.

For both conducted and radiated testing, the signal generator was set to transmit representative LTE or AWGN signals as described in KDB 935210 D04.

2.4 Software and Firmware

The test was conducted with software/firmware version 5.1 installed on the EUT.

2.5 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

2.6 Antenna Information

The following antenna information is provided by the manufacturer and is used to determine compliance for relevant required test cases:

Band	Frequency Range (MHz)	Antenna Gain with Cable Loss (dBi)
LTE Band 4 (DL)	2110-2155	2.05
LTE Band 4 (UL)	1710-1755	2.05
LTE Band 5 (DL)	869-894	3.01
LTE Band 5 (UL)	824-849	3.01
LTE Band 12 (DL)	729-746	3.58
LTE Band 12 (UL)	699-716	3.58
LTE Band 13 (DL)	746-756	3.21
LTE Band 13 (UL)	777-787	3.21
LTE Band 25/2 (DL)	1930-1995	1.92
LTE Band 25/2 (UL)	1850-1915	1.92

Table 2-2. Antenna gain with Cable Loss

2.7 Mobile Station Coupling Loss

The following MSCL information has been provided by the manufacturer for this device:

Band	Uplink Center Frequency (MHz)	Path Loss (dB)	Polarity Loss (dB)	Inside Antenna Gain with Coax Loss (dBi)	MSCL
LTE Band 4	1732.5	42.49	3	-0.33	45.82
LTE Band 5	836.5	36.16	3	-2.79	41.95
LTE Band 12	707.5	34.72	3	-2.43	40.15
LTE Band 13	782	35.58	3	-1.69	40.27
LTE Band 25/2	1882.5	43.2	3	-1.29	47.49

Table 2-3. Mobile Station Coupling Loss

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the "American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services" (ANSI C63.26-2015) and KDB 935210 D04 were used in the measurement of the EUT**.**

Deviation from Measurement Procedure……..None

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$

And

$$EIRP_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8;$$ where D is the measurement distance in meters.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

Radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

3.3 Provider-Specific Consumer Booster (CMRS) Test Cases

Per the requirements of KDB 935210 D04 v02r04, the following test cases shall be investigated for Provider-Specific Consumer Boosters under FCC Part 20.21 and ISED RSS-131:

1. Authorized Frequency Band Verification
2. Authorized CMRS Provider Spectrum Blocks
3. Maximum Output Power
4. Spectrum Block Filtering
5. Maximum Booster Gain Computation
6. Intermodulation Product
7. Out-of-Band Emissions
8. Conducted Spurious Emissions
9. Noise Limits
10. Transmit Power Off Mode
11. Variable Noise Response Time
12. Uplink Inactivity
13. Variable Booster Gain
14. Variable Gain Timing
15. Occupied Bandwidth
16. Oscillation Detection
17. Radiated Spurious Emissions
18. Out-of-Band Gain

Note

1. Spectrum Block Filtering is not tested in this report. Following KDB 935210 D04 v02r04 Section 7.14(b), it is verified with uplink transmitter nosie power level.
2. Frequency stability is not tested in this report. Following KDB 935210 D04 v02r04 Section 7.16. Manufacture declared that this booster does not contain an oscillator, which frequency stability is not applicable

3.4 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to an accredited ISO/IEC 17025 calibration facility. Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	WL40-1	WLAN Cable Set (40GHz)	4/2/2024	Annual	4/2/2025	WL40-1
-	WL40-2	WLAN Cable Set (40GHz)	4/2/2024	Annual	4/2/2025	WL40-2
-	WL40-3	WLAN Cable Set (40GHz)	4/2/2024	Annual	4/2/2025	WL40-3
-	LTx4	Licensed Transmitter Cable Set	4/2/2024	Annual	4/2/2025	LTx4
-	LTx5	Licensed Transmitter Cable Set	4/2/2024	Annual	4/2/2025	LTx5
-	MVG-001	EMC Cable and Switch System	4/14/2024	Annual	4/14/2025	MVG-001
-	MVG-002	EMC Cable and Switch System	2/14/2024	Annual	2/14/2025	MVG-002
Fairview Microwave	SA3510SMA	10dB Step Attenuator	N/A	-	N/A	SA3510SMA
Keysight Technologies	N9030A	PXA Signal Analyzerk	8/7/2023	Annual	8/7/2024	MY54490576
Keysight Technologies	N9030A	50GHz PXA Signal Analyzer	4/23/2024	Annual	4/23/2025	US51350301
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	9/25/2023	Annual	9/25/2024	100342
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	3/15/2023	Biennial	3/15/2025	102136
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	3/15/2023	Biennial	3/15/2025	102132
Rohde & Schwarz	SMW200A	Vector Signal Generator	4/4/2024	Annual	4/4/2025	109456
Rohde & Schwarz	SMBV100A	Vector Signal Generator	8/11/2023	Annual	8/11/2024	263201
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/14/2023	Annual	8/14/2024	161662
Sunol Sciences	DRH-118	Horn (Small)	2/21/2024	Biennial	2/21/2026	A050307
Sunol Sciences	JB6	Bi-Log Antenna (30M-5GHz)	3/2/2023	Biennial	3/2/2025	A082816

Table 5-1. Test Equipment

Note:

The 10dB step attenuator is a passive component and is only used to trigger an oscillation event from the booster. Thus, it is not used for a calibrated measurement.

6.0 SAMPLE CALCULATIONS

Emission Designator

π/2 BPSK/ QPSK Modulation

Emission Designator = 800MG7D

BW = 800 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 802MW7D

BW = 802 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

7.0 TEST RESULTS

7.1 Summary

Company Name: Wilson Electronics

FCC ID: PWO076

IC: 4726A-076

FCC Classification(s): Part 20 Provider-Specific Consumer Booster (CMRS) (B2P)

FCC Rule Part	ISED Rule Part	KDB 935210 D04 Section	Test	Limit	Test Condition	Test Result	Reference
20.21(e)(3)	-	7.1.1	Authorized Frequency Band Verification	must only operate on the frequencies used for the provision of subscriber-based services	CONDUCTED	PASS	Section 7.2
20.21(e)(3), 20.21(e)(4)	-	7.1.2	Authorized CMRS Provider Spectrum Blocks	must only operate to the authorized CMRS Provider ID		PASS	Section 7.3
20.21(e)(9)(i)(D) 20.21(e)(9)(i)(B)	RSS-131 (6.1.2) RSS-131 (8.3)	7.2	Maximum Output Power	< 10dBm (DL); < 30dBm (UL)		PASS	Section 7.4
20.21(e)(9)(i)(B) 20.21(e)(3)	RSS-131 (6.2)	7.14	Spectrum Block Filtering	UL Attenuation > DL Attenuation		N/A	N/A
20.21(e)(9)(i)(C)	RSS-131 (6.2) RSS-131 (8.3)	7.3	Maximum Booster Gain Computation/ Bidirectional Capability	Consumer Boosters must be able to provide equivalent (within 9dB) uplink and downlink gain 19.5+20log(F_UL) MAX		PASS	Section 7.5
20.21(e)(9)(i)(G)	RSS-131 (8.6)	7.4	Intermodulation Product	-19dBm/3kHz		PASS	Section 7.6
20.21(e)(9)(i)(F) 22.917(a) 24.238(a) 27.53(g) 27.53(c) 27.53(f) 27.53(h)	RSS-130(4.7) RSS-131 (8.5) RSS-132(5.5) RSS-133(6.5) RSS-139(5.6)	7.5 & 7.6	Out-of-Band Emissions/ Conducted Spurious Emissions	-13dBm		PASS	Sections 7.7, 7.8
20.21(e)(9)(i)(A)	RSS-131 (8.1)	7.7.1	Noise Limits	-103dBm/MHz - RSSI (UL/DL); -102.5dBm/MHz+20log(F) (DL)		PASS	Section 7.9
20.21(e)(9)(i)(I)	RSS-131 (8.7)	7.7	Transmit Power Off Mode	-70dBm/MHz		PASS	Section 7.10
-	-	7.7.2	Variable Noise Response Time	< 3 seconds		PASS	Section 7.10
20.21(e)(9)(i)(J)	RSS-131 (8.8)	7.8	Uplink Inactivity	-70dBm/MHz after 5 minutes		PASS	Section 7.10
20.21(e)(9)(i)(C)(1)	RSS-131 (8.2)	7.9.1	Variable Booster Gain	BSCL-28dB - (40dB - MSCL) 19.5+20log(F_UL) MAX		PASS	Section 7.11
-	-	7.9.2	Variable Gain Timing	< 3 seconds		PASS	Section 7.12
2.1049	RSS-Gen (6.7)	7.10	Occupied Bandwidth	N/A		PASS	Section 7.12
20.21(e)(9)(ii)(A)	RSS-131 (6.1.1) RSS-131 (6.1.3)	7.11	Oscillation Detection	< 1 sec (DL); < 0.3 sec (UL)		PASS	Section 7.13
20.21(e)(9)(i)(E)	RSS-131 (8.4)	7.15	Out-of-Band Gain	Check mask in rule part		PASS	Section 7.15
2.1055 22.355 24.235 27.54	RSS-Gen (8.11), RSS-130 (4.5), RSS-132 (5.3), RSS-133 (6.3), RSS-139 (5.4)	7.16	Frequency Stability	Fundamental emissions stay within authorized frequency block **Carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm	RADIATED	N/A	N/A
2.1053	RSS-Gen (6.13), RSS-130 (4.7) RSS-132 (5.5), RSS-133 (6.5), RSS-139 (5.6)	7.13	Radiated Spurious Emissions	-13dBm (licensed) 15B limits for digital emissions		PASS	Section 7.14

Table 7-1. Summary of Radiated Test Results

Notes:

1. Per 2.1057(a)(2), spurious emissions were investigated up to the 10th harmonic of the highest transmitted frequency.
2. Testing was completed with a signal generator creating a representative LTE signal, various modulations including QPSK, and QAM.
3. The input signal was fed from the signal generator to the EUT via a coaxial cable and it was set at a level so as to produce the maximum output power of the AGC range.
4. Based upon investigations of all possible modulations, testing was mainly performed with QPSK modulation.

5. For conducted testing only, the EUT was fitted with waveguide-to-coax RF adapters that allowed for direct measurements. With the exception of radiated spurious emissions, all measurements were performed in a conducted test setup.
6. The Spectrum block filtering test case was not required because, per Section 7.14(b) and 7.14(c) of KDB 935210 D04, the EUT is compliant with the uplink transmitted noise power level and uplink variable gain test cases, respectively.
7. Frequency Stability testing was not required for this device since he manufacturer has declared that the EUT does not contain any oscillators and, thus, is exempt from requirements of Section 7.16 of the KDB.

7.2 Authorized Frequency Band Verification

Test Overview

Authorized Frequency Band Verification confirms that the signal booster only operates on the CMRS frequency bands authorized for use by the Network Protection Standard (NPS). In other words, the signal booster shall reject amplification of other signals outside of its passband.

Band	Downlink Frequency Range (MHz)	Uplink Frequency Range (MHz)
LTE Band 4	2110-2155	1710-1755
LTE Band 5	869-894	824-849
LTE Band 12	729-746	699-716
LTE Band 13	746-756	777-787
LTE Band 25/2	1930-1995	1850-1915

Table 7-2. Authorized Frequency Band

Test Procedure Used

KDB 935210 D04 Section 7.1.1

Test Settings

1. Connect the EUT to the test equipment either in test mode or normal mode and set the passband of the EUT to the lowest passband frequency of the booster in the CMRS band.
2. Set the spectrum analyzer resolution bandwidth (RBW) for 100 kHz with the video bandwidth (VBW) $\geq$ 3 x the RBW, using a PEAK detector with the MAX HOLD function.
3. Set the center frequency of the spectrum analyzer to the center of the operational band under test with a span of 5 MHz.
4. Set the signal generator for CW mode and tune to the center frequency of the operational band under test. Alternatively, for signal boosters that implement narrowband rejection protection capability, a 200 kHz or an AWGN signal with a 99% occupied bandwidth (OBW) of 4.1 MHz can be used, as appropriate.
5. Set the initial signal generator power to a level that is at least 6 dB below the AGC level specified by the manufacturer.
6. Slowly increase the signal generator power level until the output signal reaches the AGC operational level.
7. Reduce the signal generator power to a level that is 3 dB below the level noted above, then manually reset the EUT (e.g., cycle ac/dc power).
8. Reset the spectrum analyzer span to 2 x the width of the CMRS band under test. Adjust the tuned frequency of the signal generator to sweep 2 x the width of the CMRS band using the sweep function. The AGC must be deactivated throughout the entire sweep.
9. Using three markers, identify the CMRS band edges and the frequency with the highest power. Ensure that the values of all markers are visible on the display of the spectrum analyzer (e.g., marker table set to on).

10. Capture the spectrum analyzer trace for inclusion in the test report.
11. Repeat Step 3 to 10 for all operational uplink and downlink bands with the passband of the booster set to the center of the CMRS band and the highest and lowest passband frequencies of the booster in the CMRS band.

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

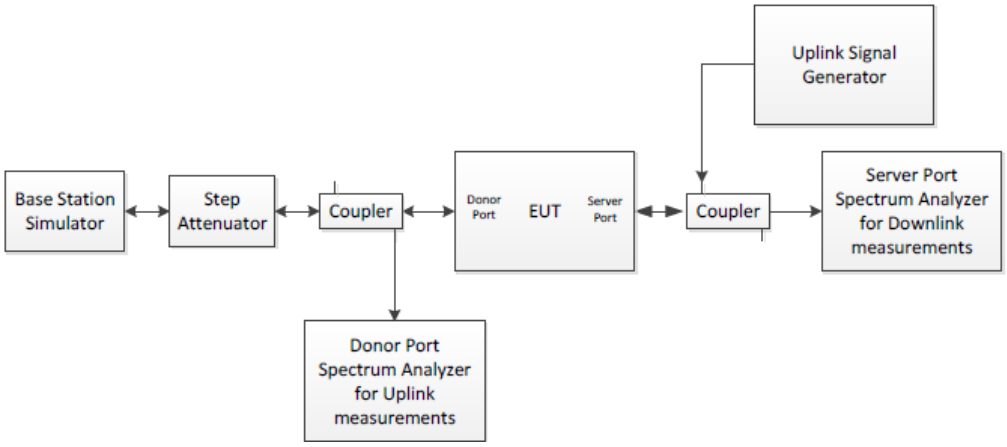


Figure 7-1. Test configuration in EUT normal operational mode

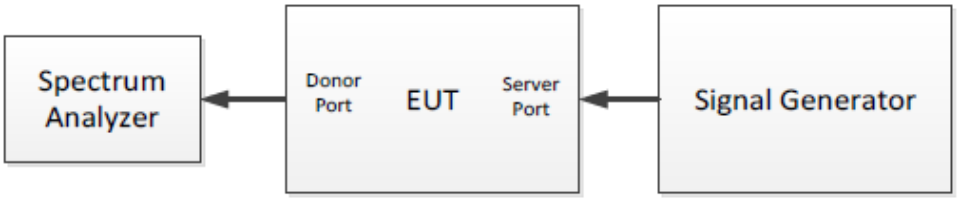


Figure 7-2. Uplink test configuration in EUT test mode

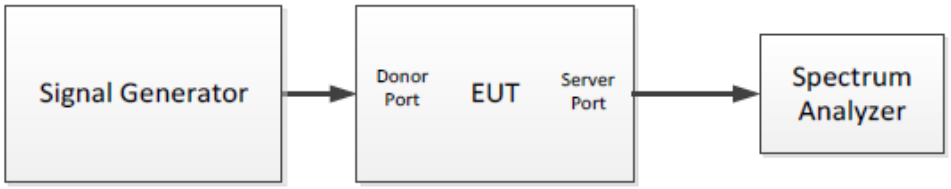
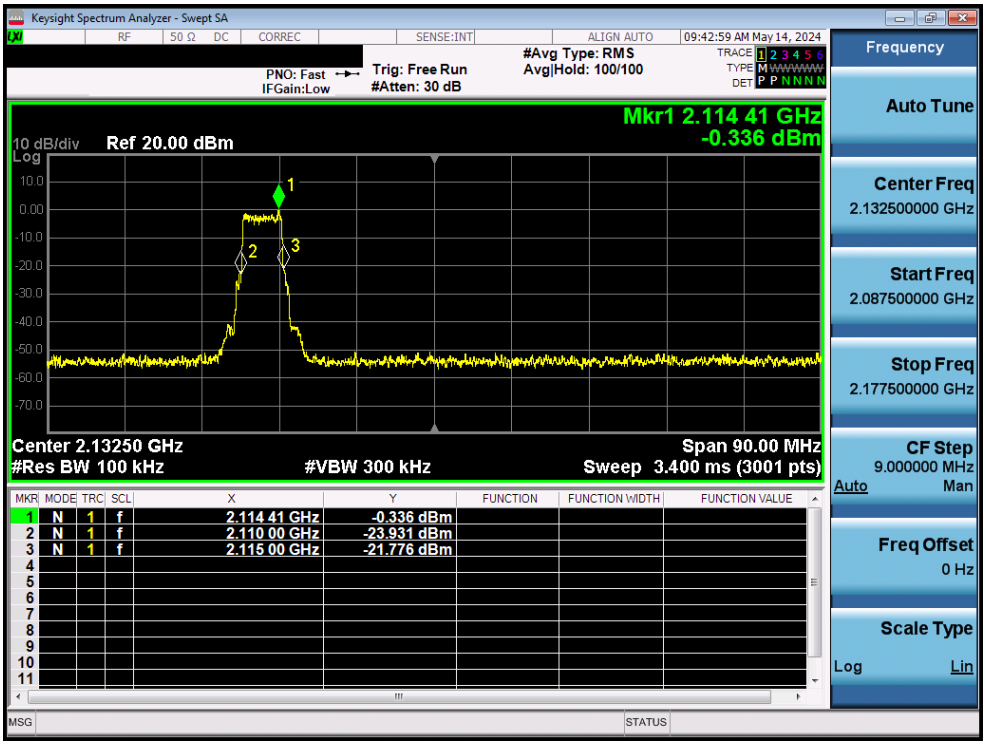


Figure 7-3. Downlink test configuration in EUT test mode

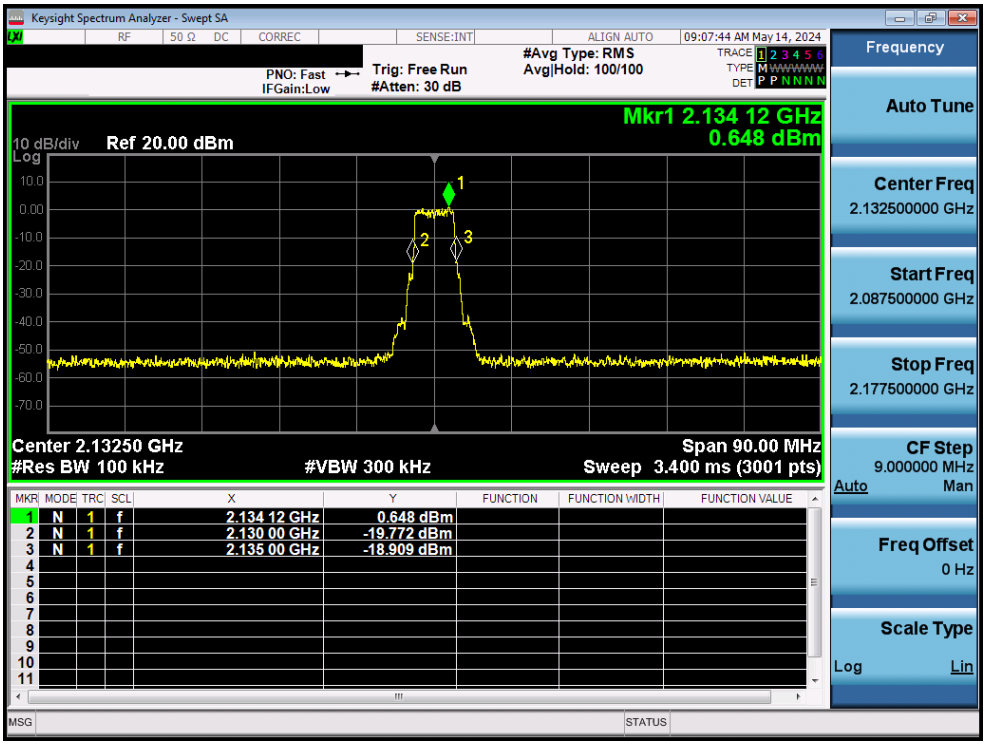
Test Notes

None.

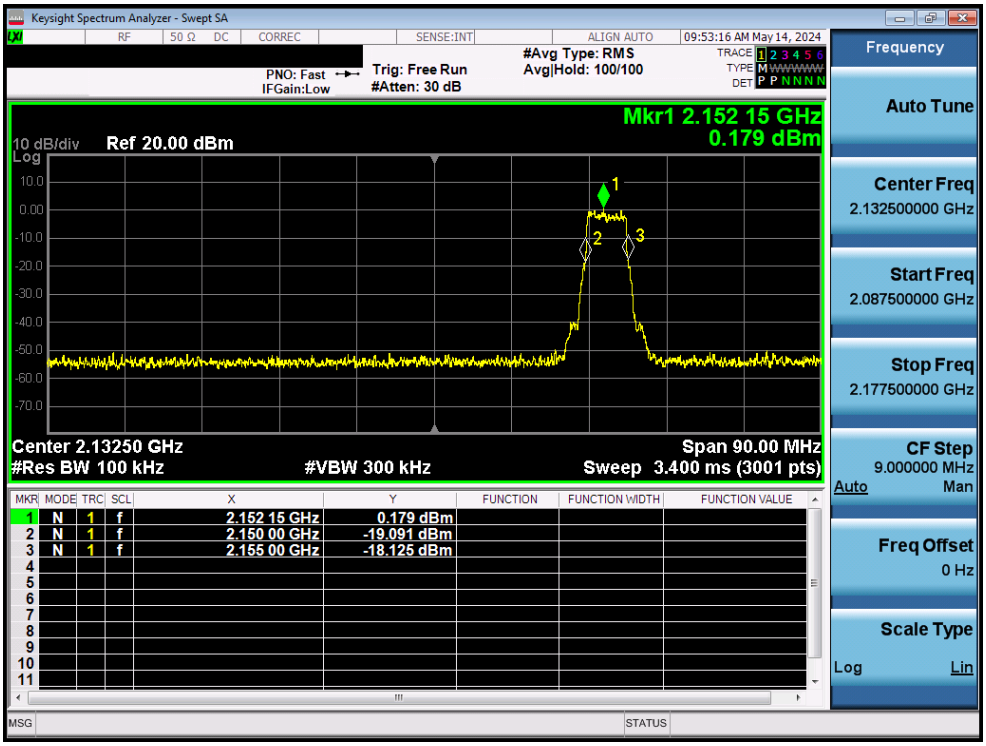
LTE BAND 4



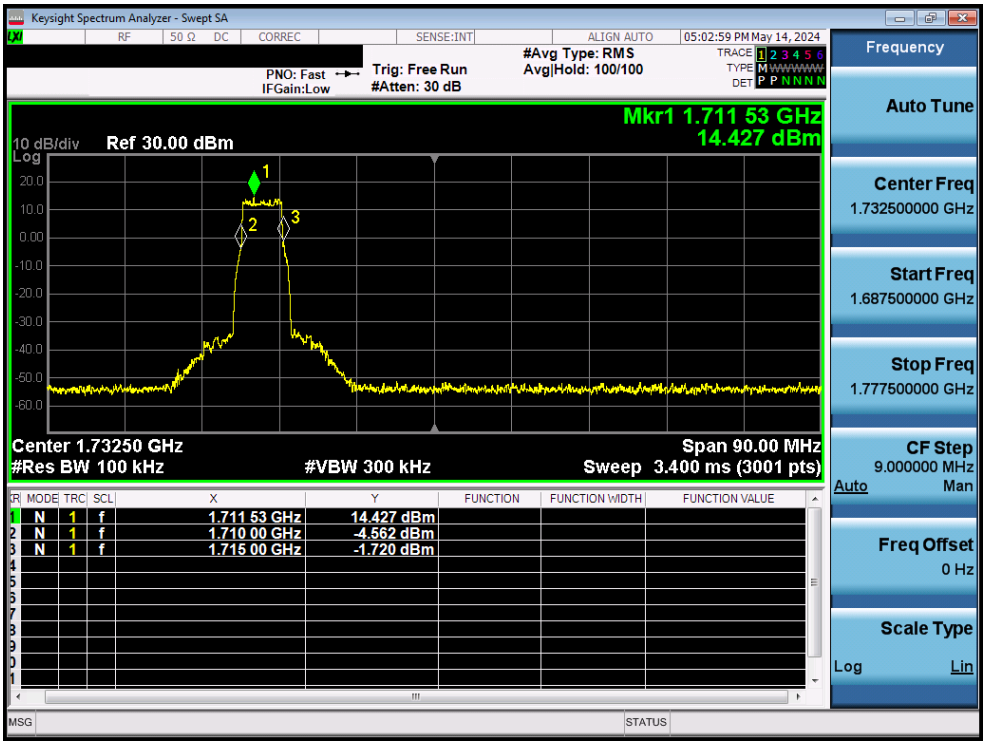
Plot 7-1. Authorized Frequency Band Verification – LTE Band 4 Downlink – Low Ch.



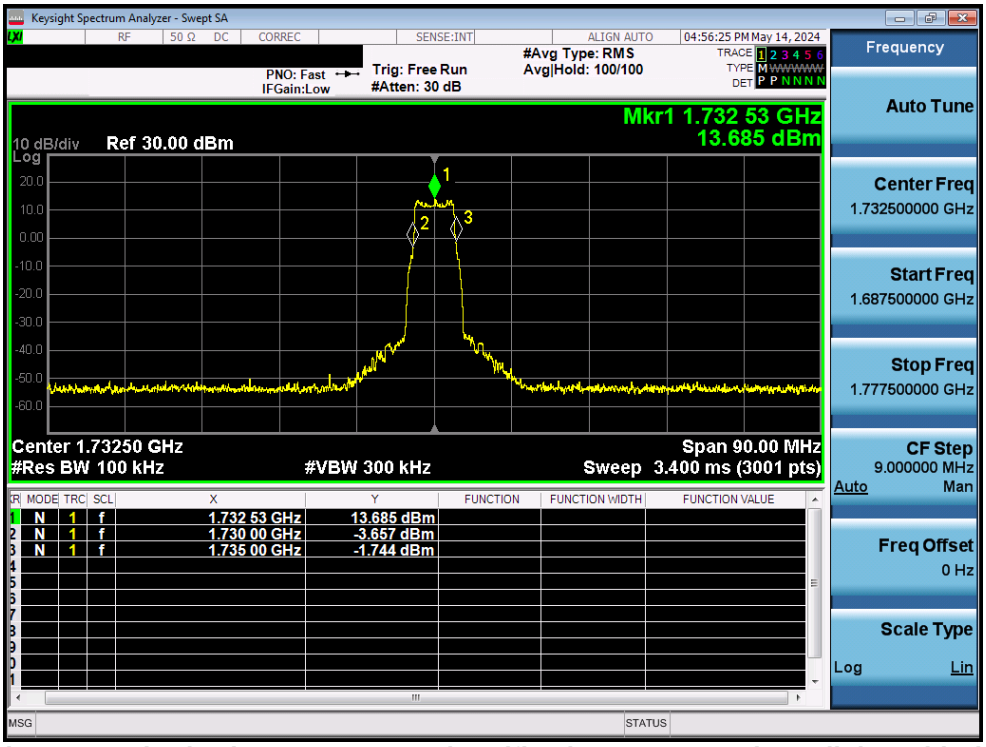
Plot 7-2. Authorized Frequency Band Verification – LTE Band 4 Downlink – Mid Ch.



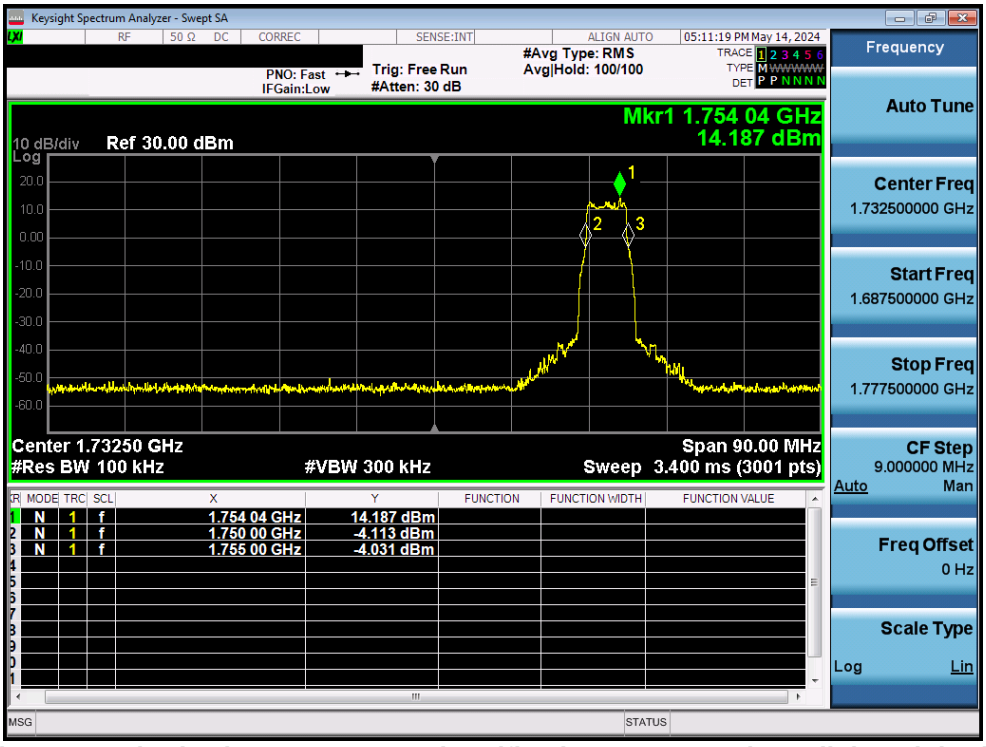
Plot 7-3. Authorized Frequency Band Verification – LTE Band 4 Downlink – High Ch.



Plot 7-4. Authorized Frequency Band Verification – LTE Band 4 Uplink – Low Ch.

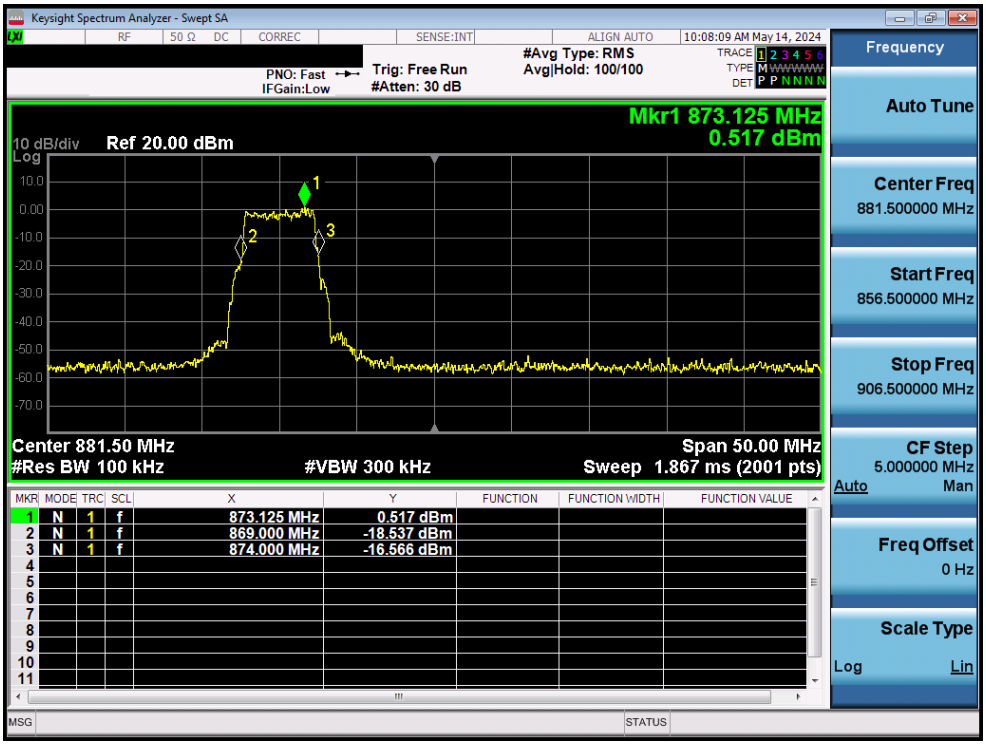


Plot 7-5. Authorized Frequency Band Verification – LTE Band 4 Uplink – Mid Ch.

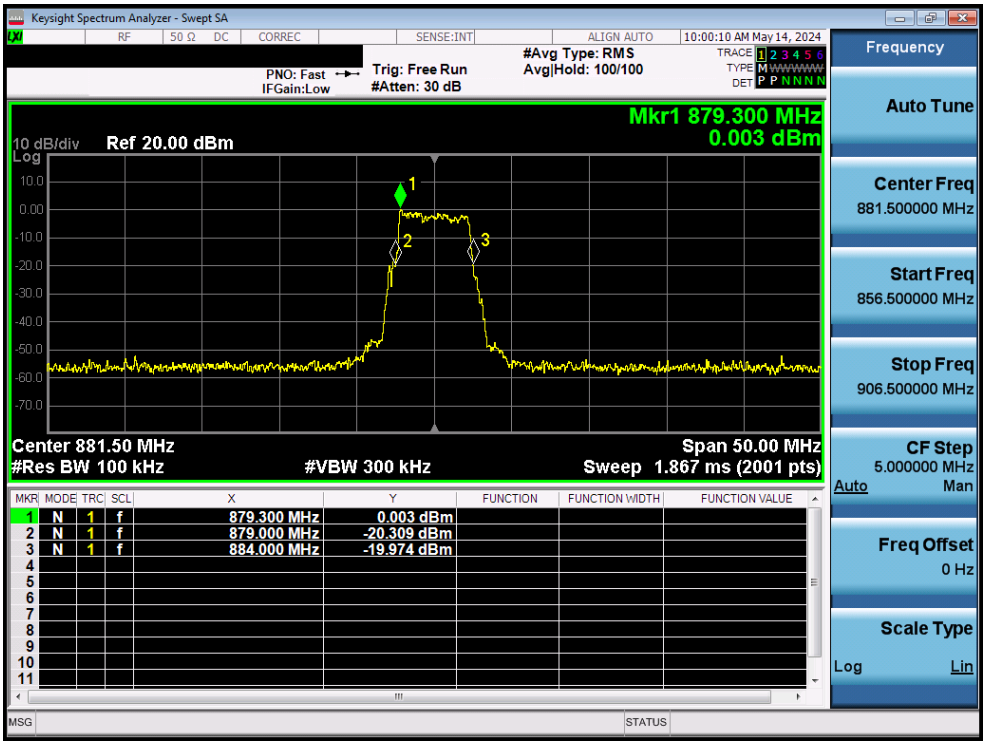


Plot 7-6. Authorized Frequency Band Verification – LTE Band 4 Uplink – High Ch.

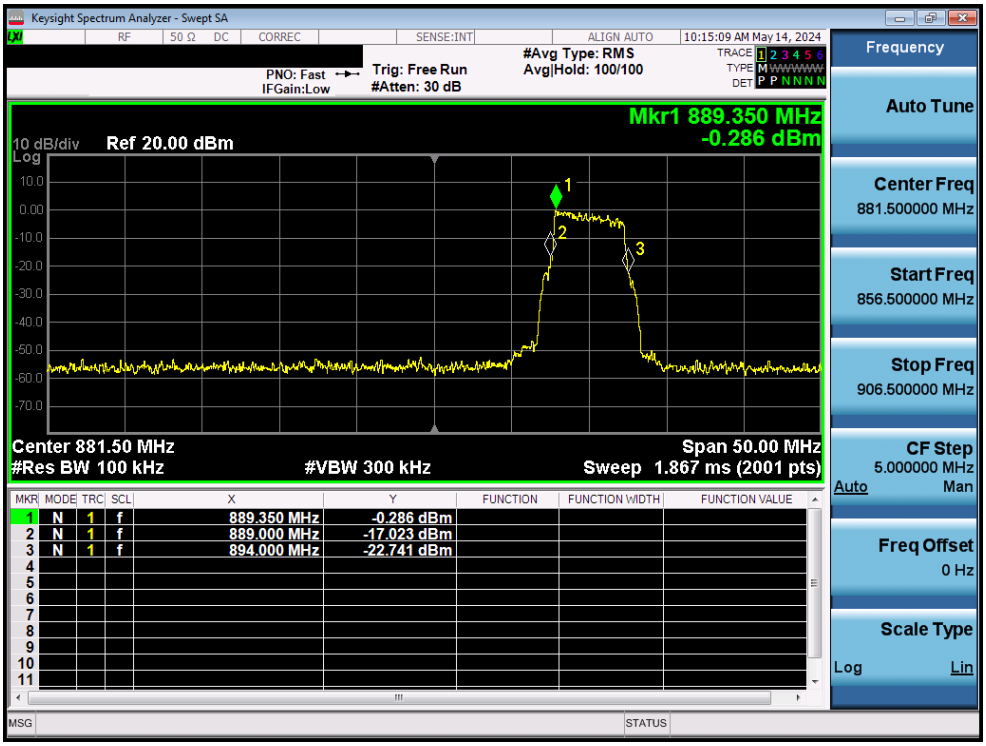
LTE BAND 5



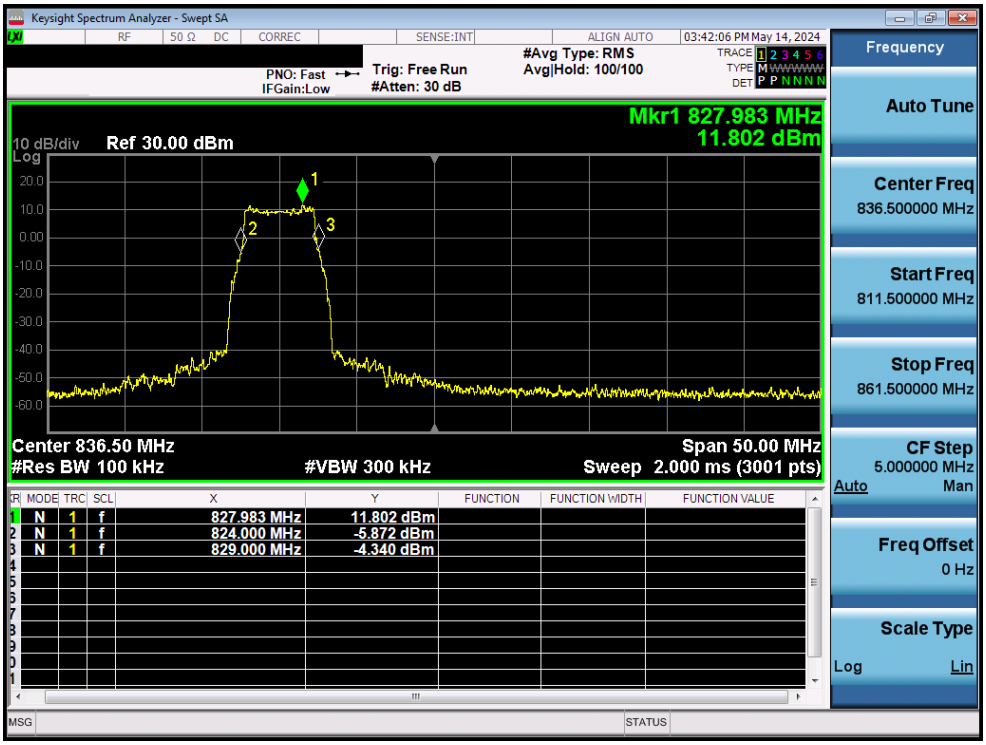
Plot 7-7. Authorized Frequency Band Verification – LTE Band 5 Downlink – Low Ch.



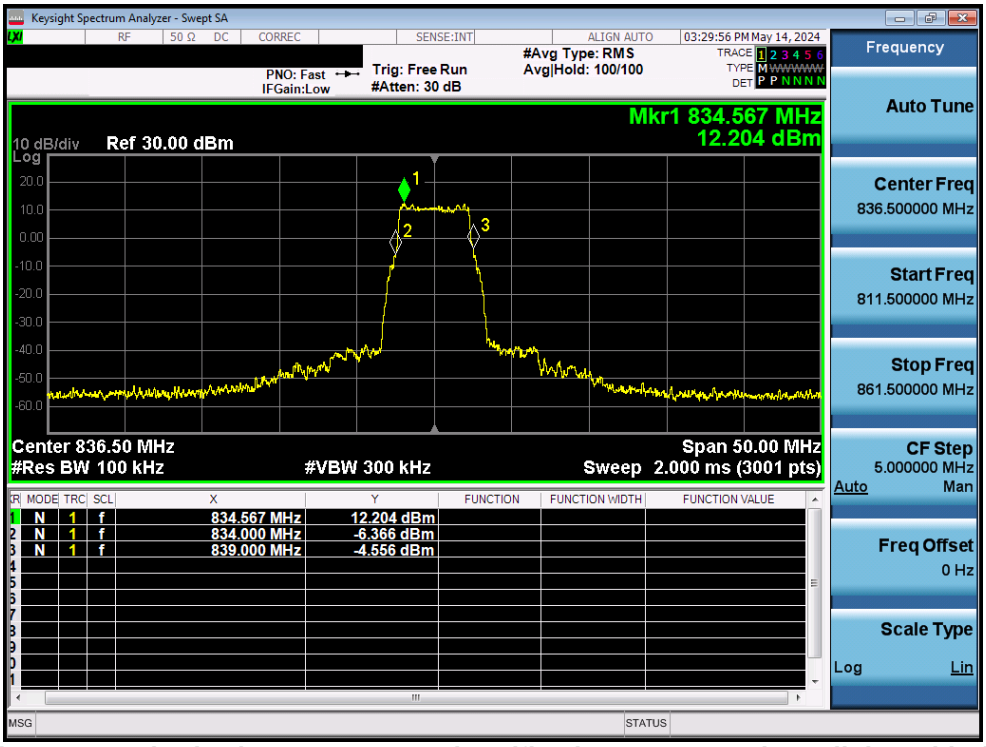
Plot 7-8. Authorized Frequency Band Verification – LTE Band 5 Downlink – Mid Ch.



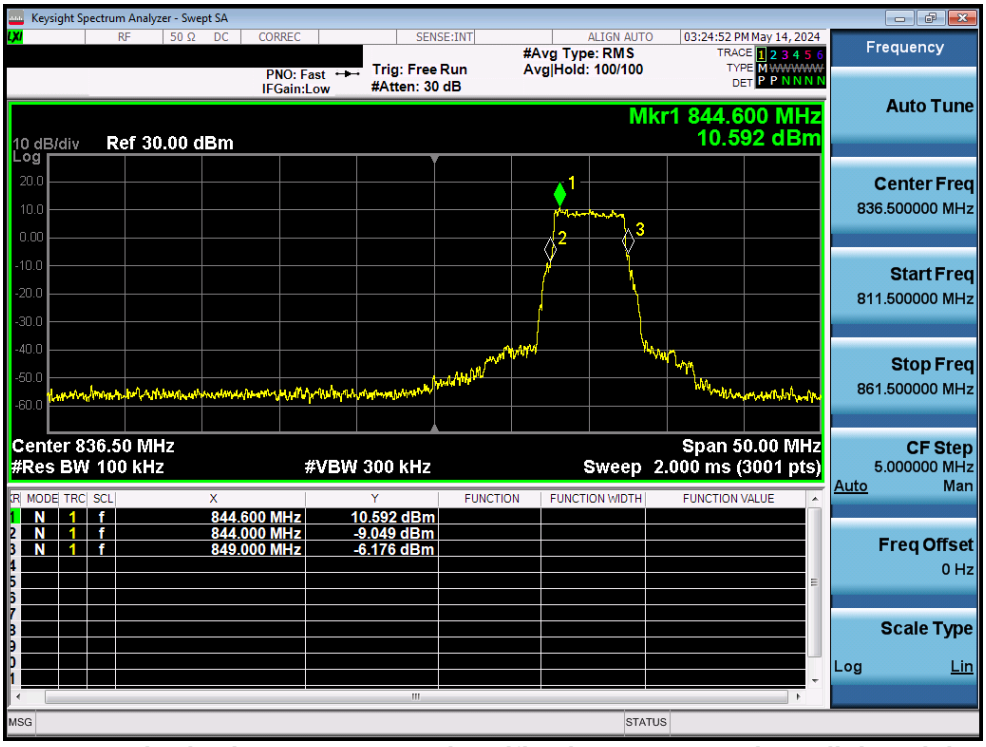
Plot 7-9. Authorized Frequency Band Verification – LTE Band 5 Downlink – High Ch.



Plot 7-10. Authorized Frequency Band Verification – LTE Band 5 Uplink – Low Ch.

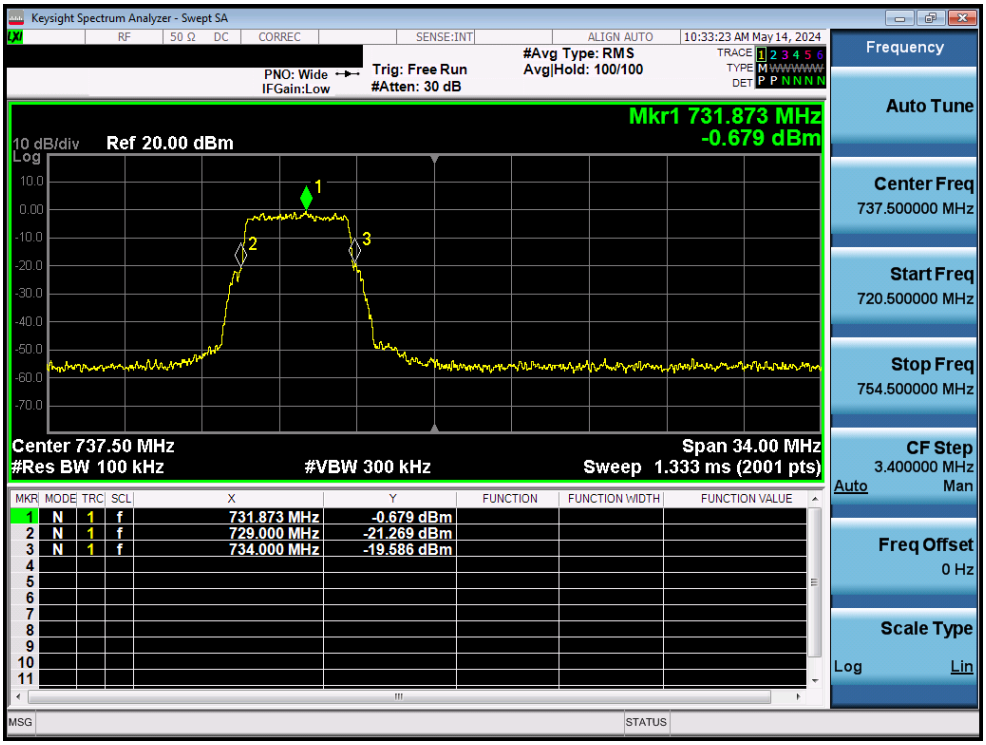


Plot 7-11. Authorized Frequency Band Verification – LTE Band 5 Uplink – Mid Ch.

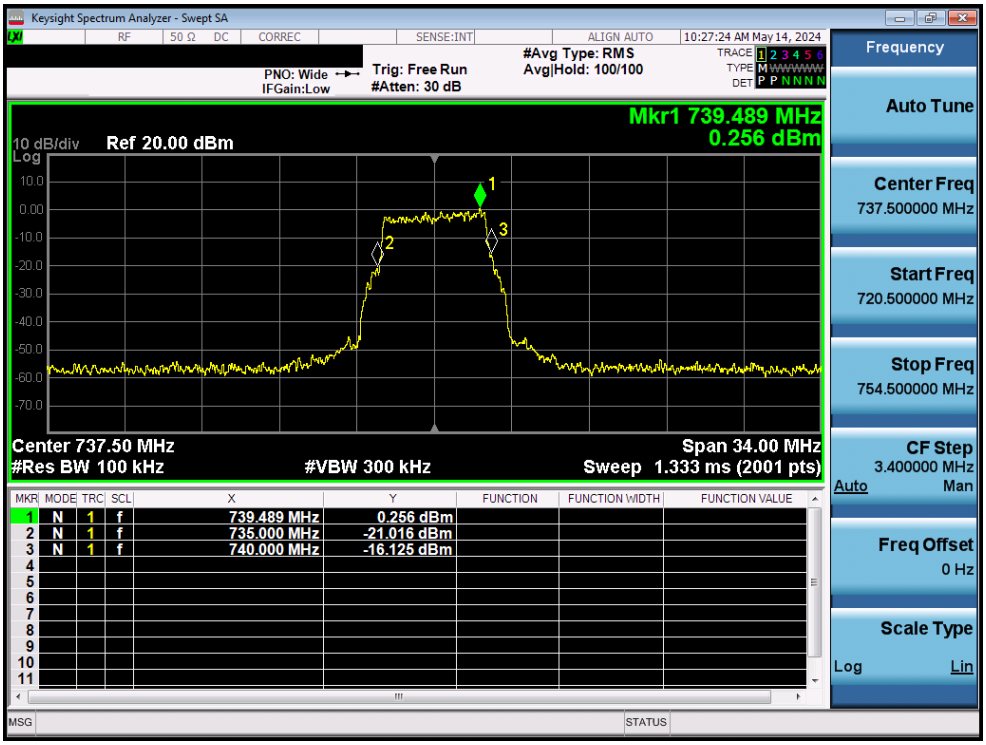


Plot 7-12. Authorized Frequency Band Verification – LTE Band 5 Uplink – High Ch.

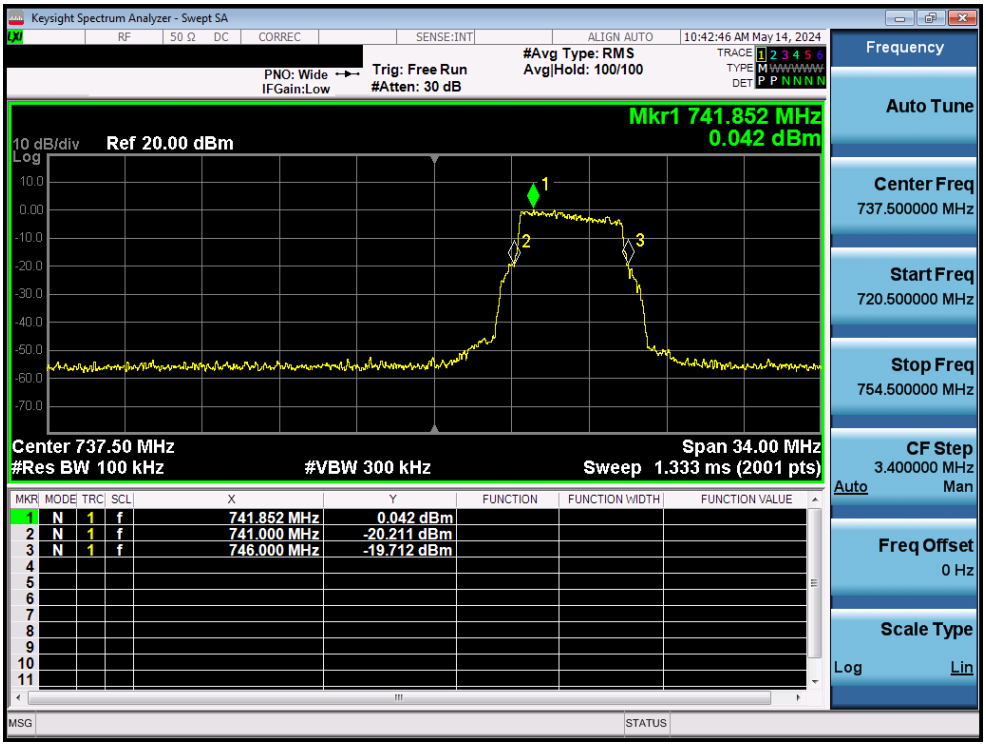
LTE BAND 12



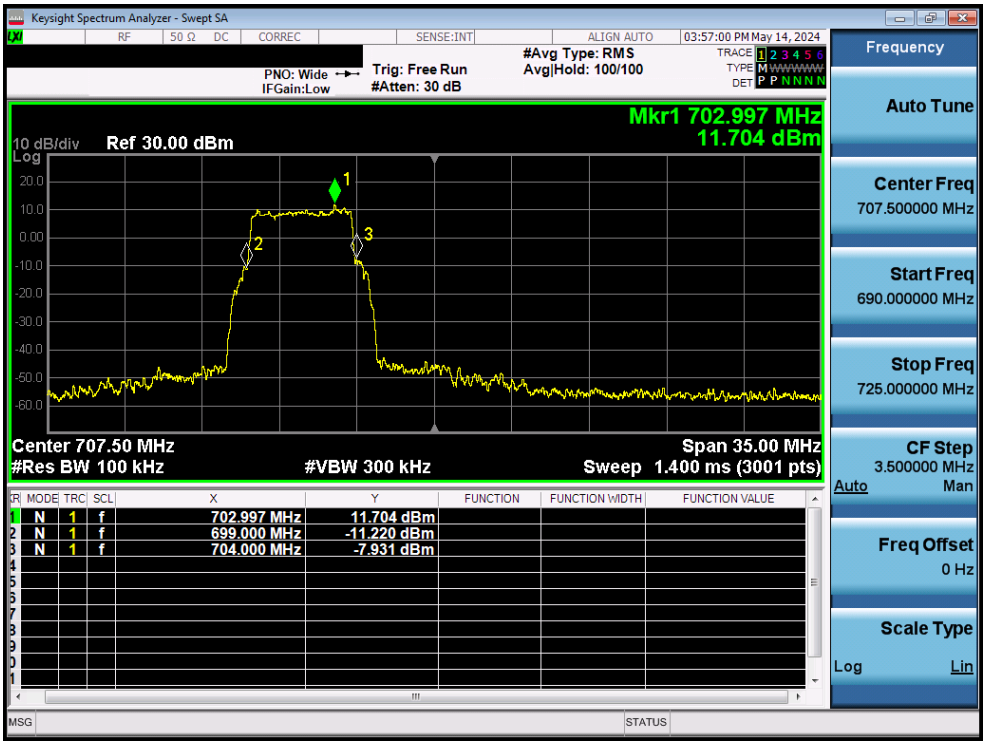
Plot 7-13. Authorized Frequency Band Verification – LTE Band 12 Downlink – Low Ch.



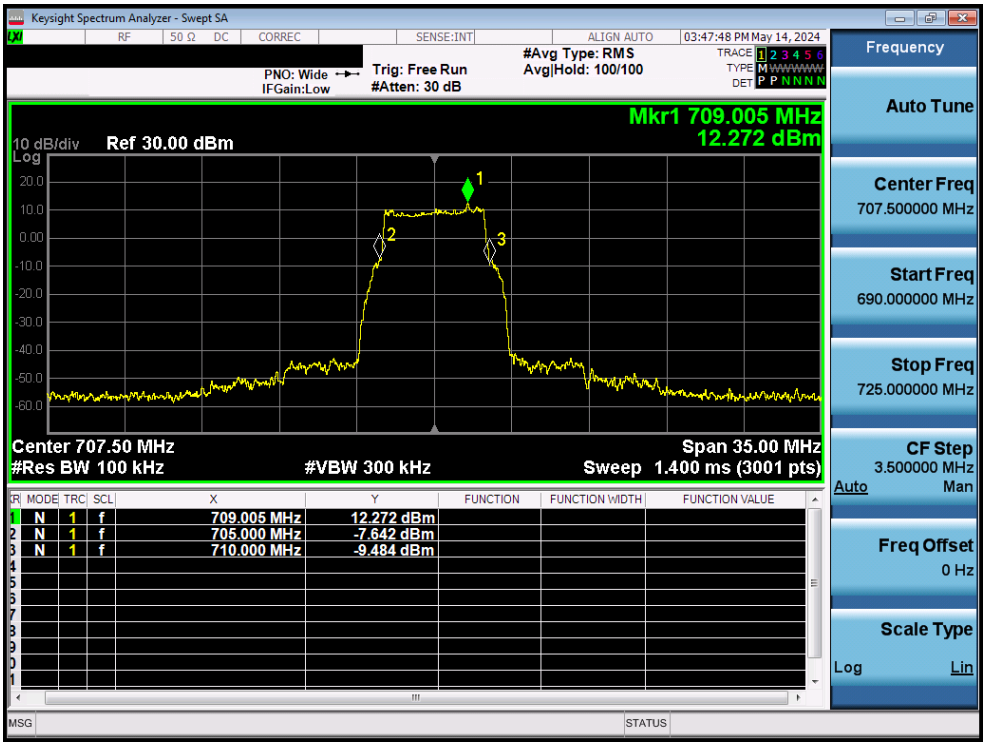
Plot 7-14. Authorized Frequency Band Verification – LTE Band 12 Downlink – Mid Ch.



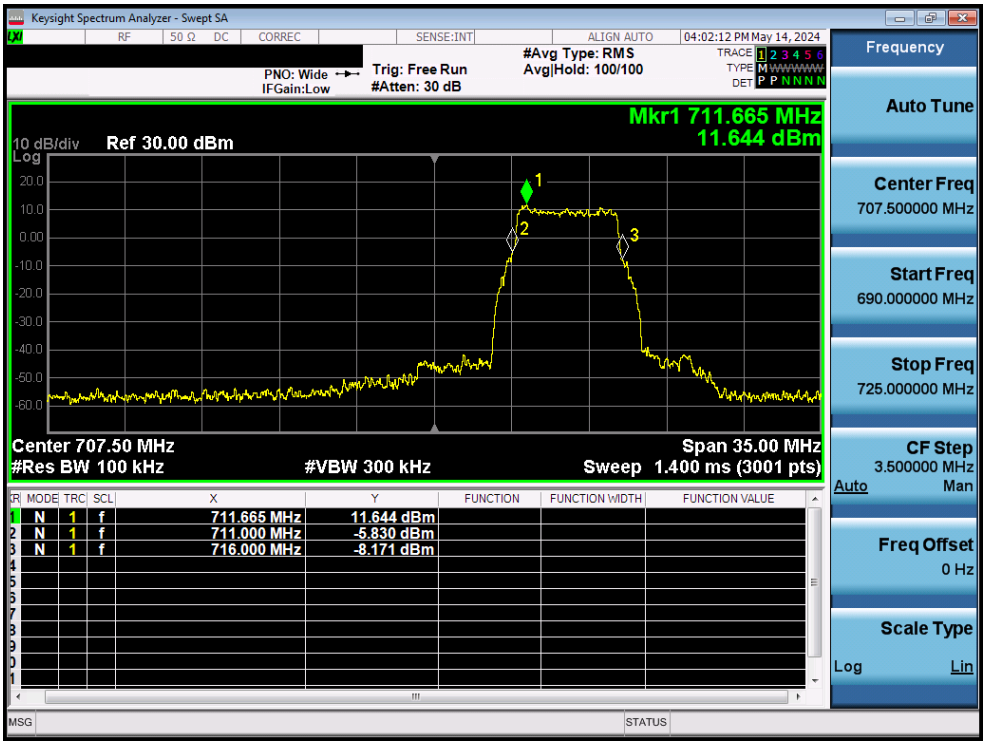
Plot 7-15. Authorized Frequency Band Verification – LTE Band 12 Downlink – High Ch.



Plot 7-16. Authorized Frequency Band Verification – LTE Band 12 Uplink – Low Ch.

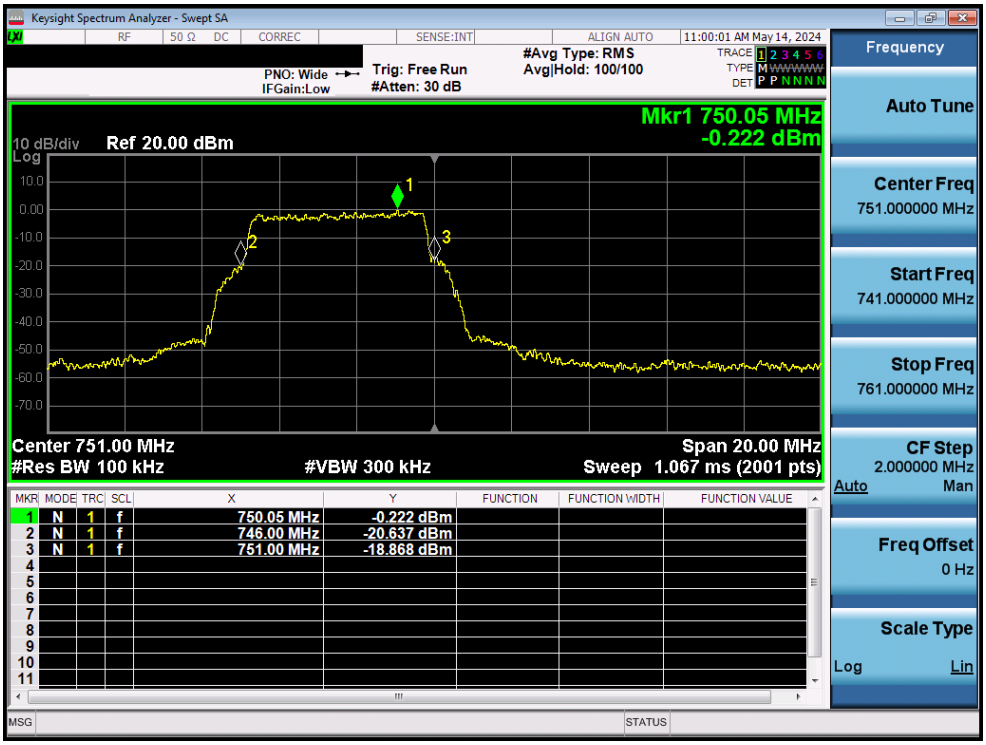


Plot 7-17. Authorized Frequency Band Verification – LTE Band 12 Uplink – Mid Ch.

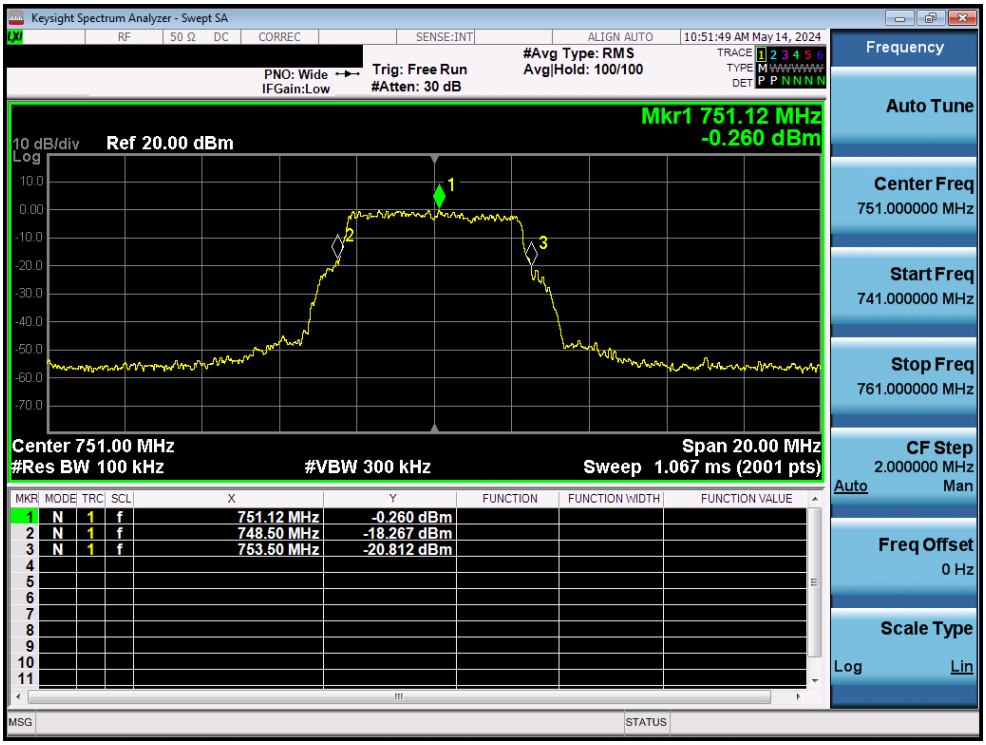


Plot 7-18. Authorized Frequency Band Verification – LTE Band 12 Uplink – High Ch.

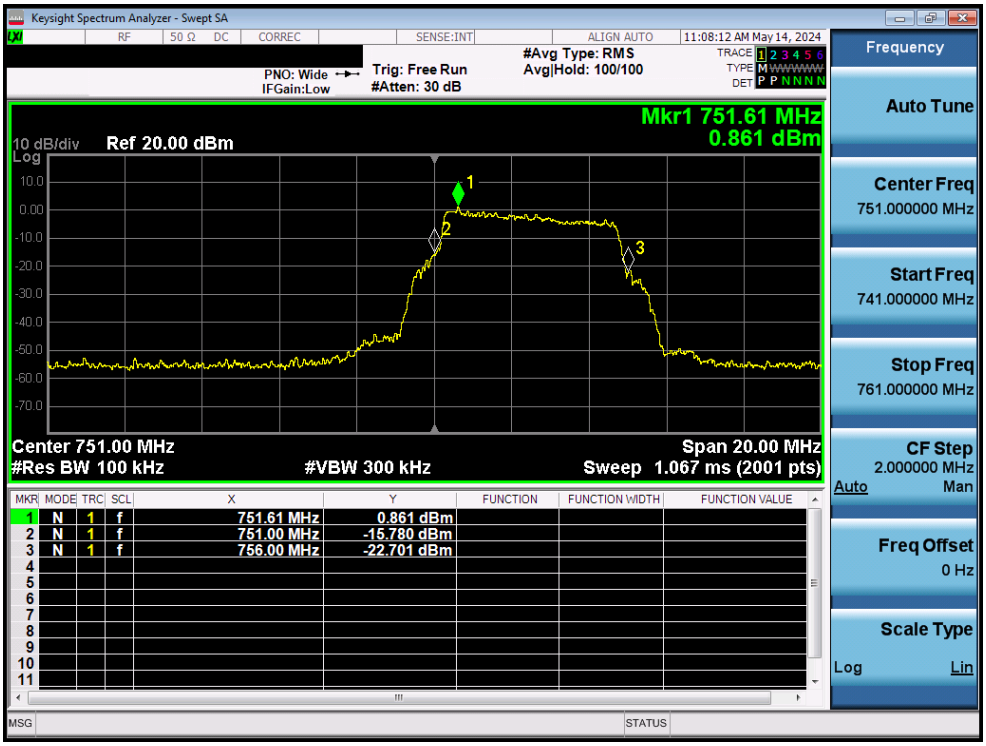
LTE BAND 13



Plot 7-19. Authorized Frequency Band Verification – LTE Band 13 Downlink – Low Ch.

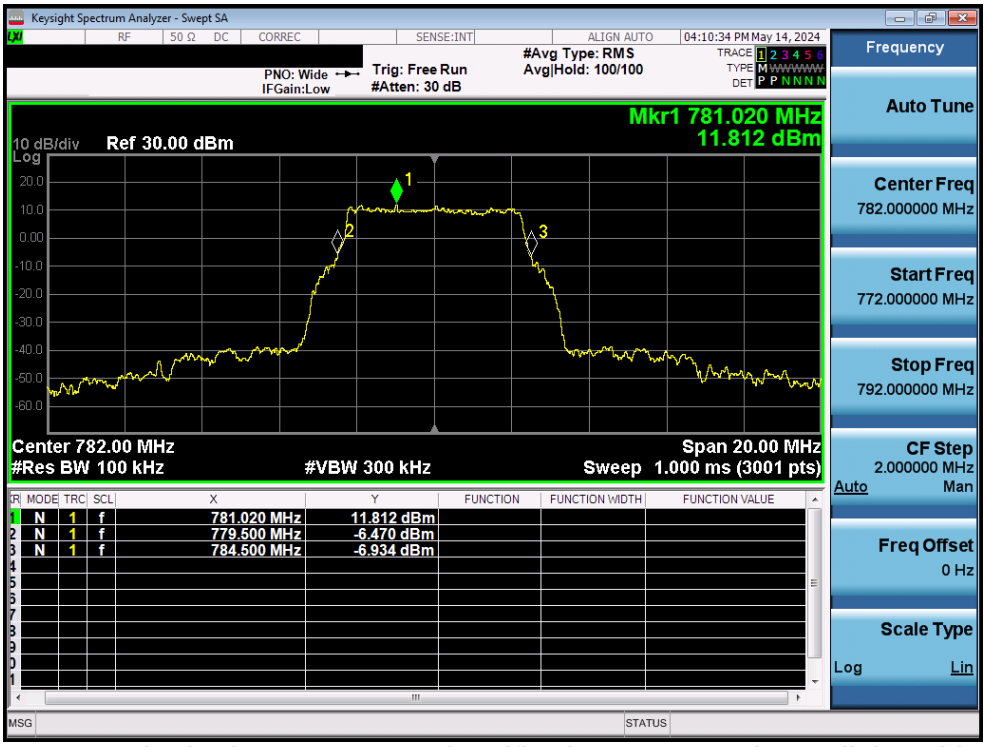


Plot 7-20. Authorized Frequency Band Verification – LTE Band 13 Downlink – Mid Ch.



Plot 7-21. Authorized Frequency Band Verification – LTE Band 13 Downlink – High Ch.

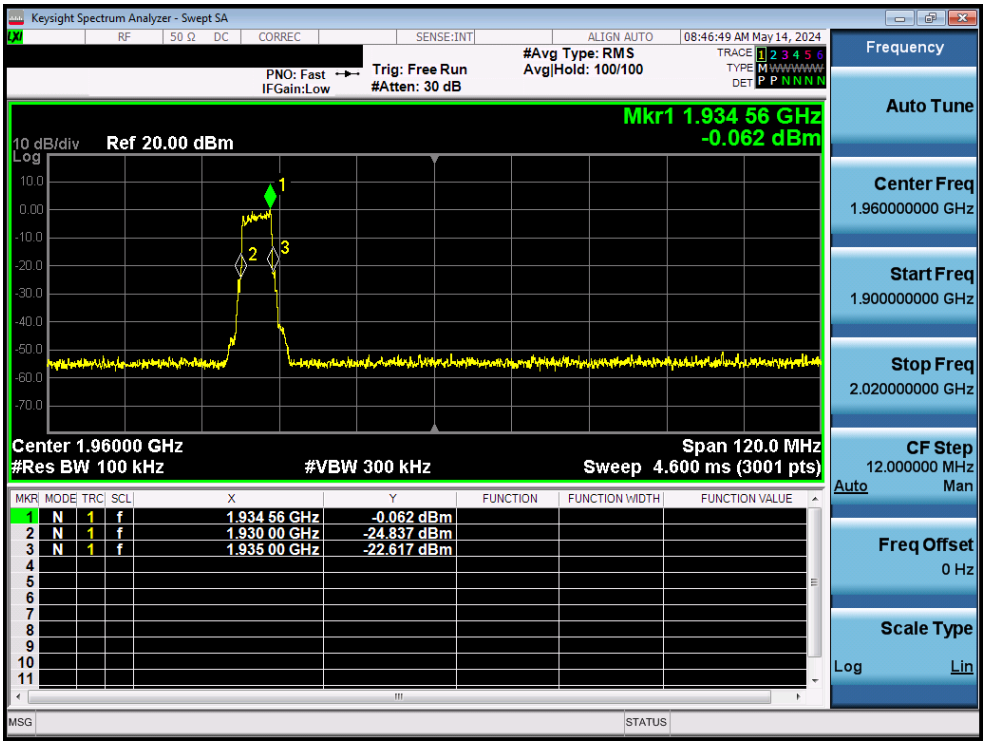
Plot 7-22. Authorized Frequency Band Verification – LTE Band 13 Uplink – Low Ch.



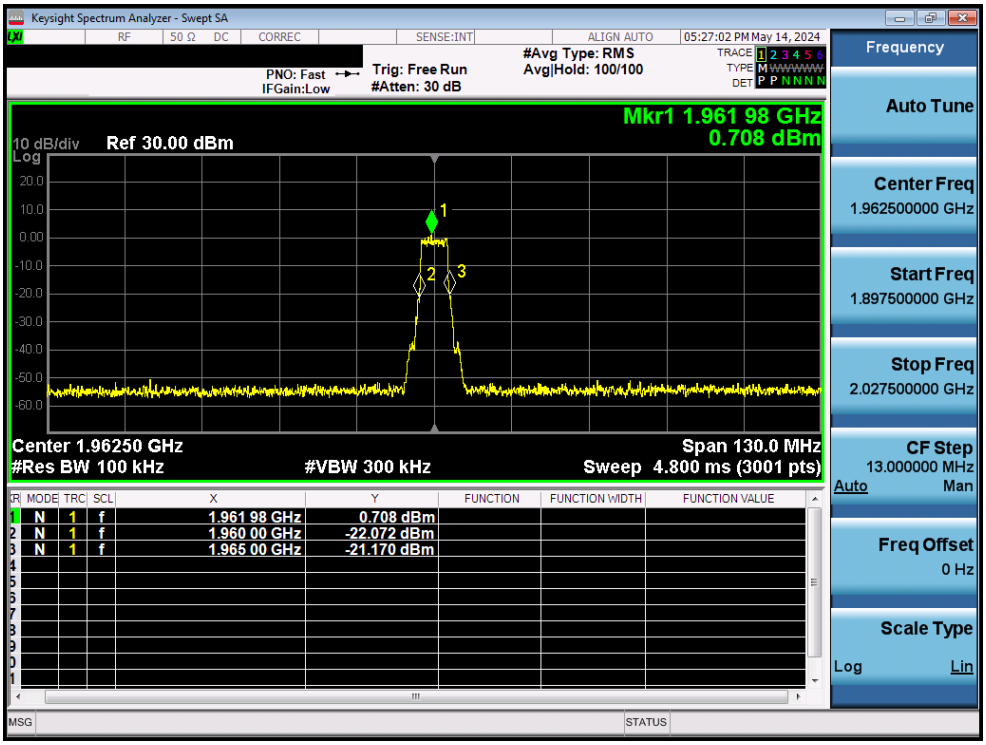
Plot 7-23. Authorized Frequency Band Verification – LTE Band 13 Uplink – Mid Ch.

Plot 7-24. Authorized Frequency Band Verification – LTE Band 13 Uplink – High Ch.

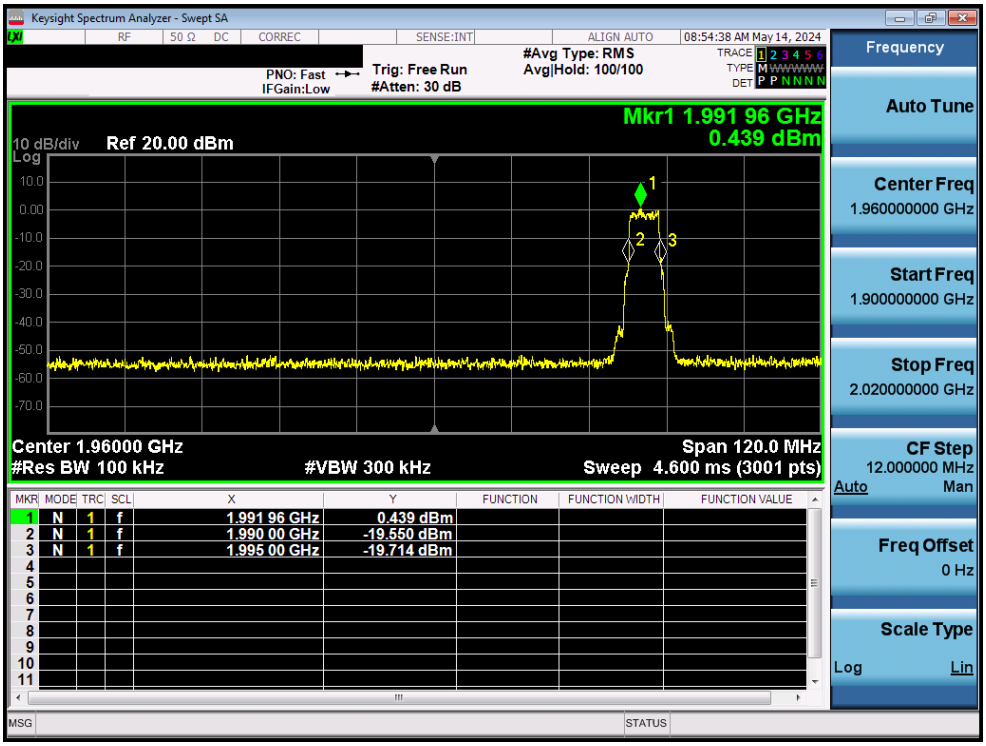
LTE BAND 25/2



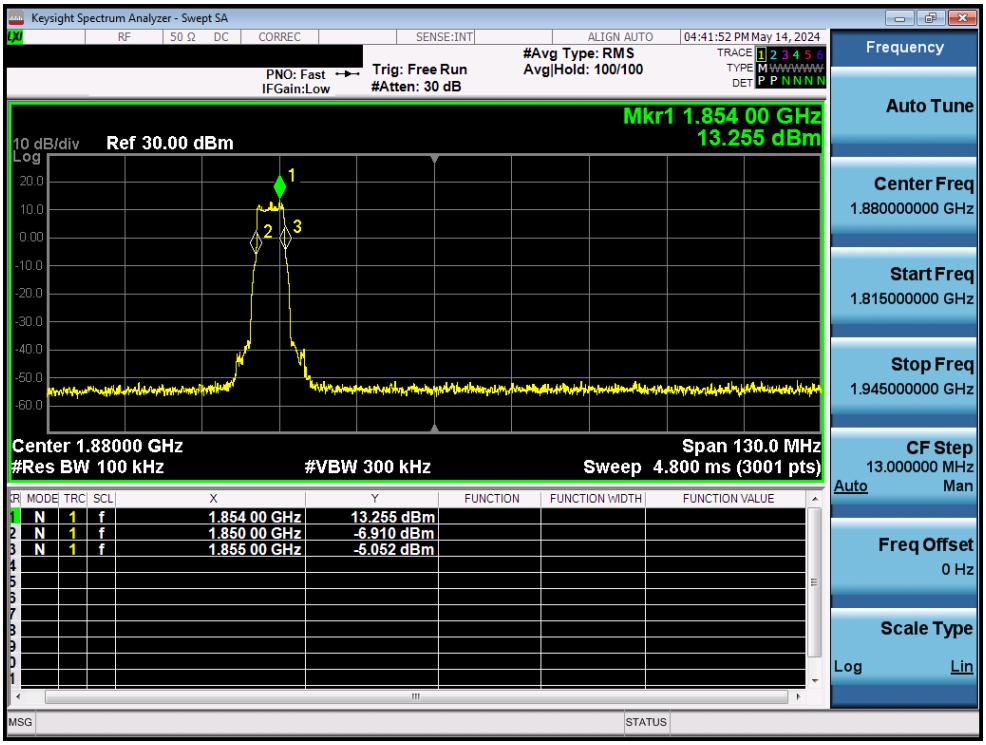
Plot 7-25. Authorized Frequency Band Verification – LTE Band 25/2 Downlink – Low Ch.



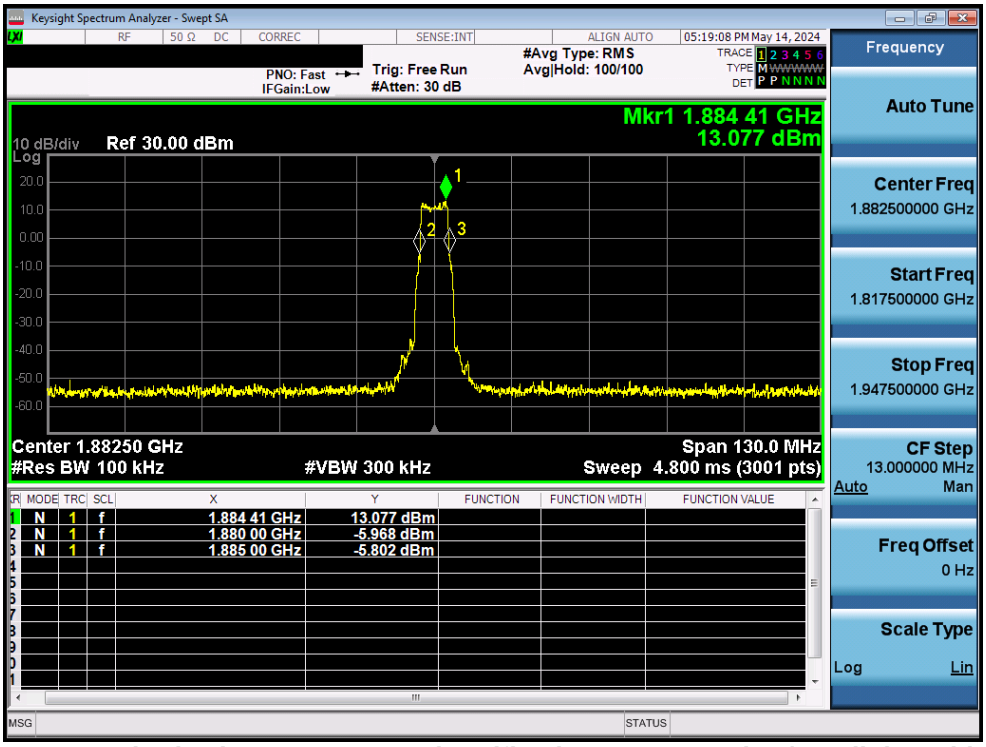
Plot 7-26. Authorized Frequency Band Verification – LTE Band 25/2 Downlink – Mid Ch.



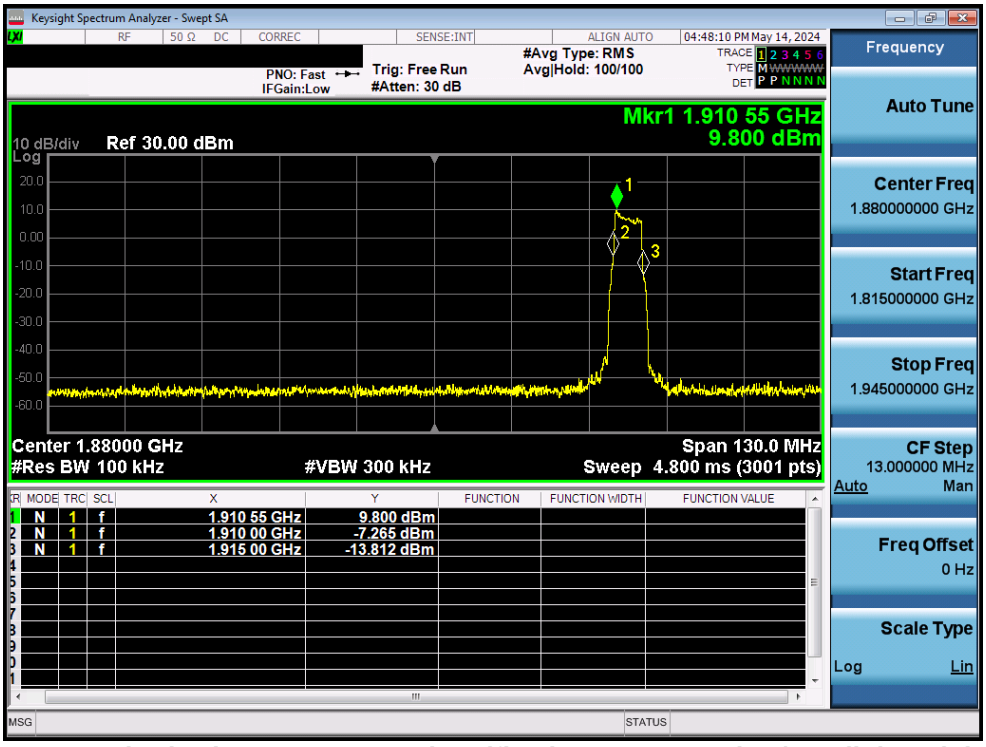
Plot 7-27. Authorized Frequency Band Verification – LTE Band 25/2 Downlink – High Ch.



Plot 7-28. Authorized Frequency Band Verification – LTE Band 25/2 Uplink – Low Ch.



Plot 7-29. Authorized Frequency Band Verification – LTE Band 25/2 Uplink – Mid Ch.



Plot 7-30. Authorized Frequency Band Verification – LTE Band 25/2 Uplink – High Ch.

7.3 Authorized CMRS Provider Spectrum Blocks

Test Overview

The booster restricts its operation only to the spectrum assigned to the CMRS provider supporting the equipment certification request.

Test Procedure Used

KDB 935210 D04 Section 7.1.2

Test Settings

1. Set up the booster in normal mode as shown in Figure 7-4, with the base station simulator transmitting an authorized CMRS provider signal to the booster. Span same as the frequency range of the signal generator
2. Set the level of the base station simulator such that the booster reaches maximum output power in the downlink direction.
3. Set the level of the base station simulator such that the booster reaches maximum output power in the downlink direction.
4. Set the center frequency of the donor port spectrum analyzer to the one of the authorized uplink spectrum blocks, and server port spectrum analyzer to the one of the authorized downlink spectrum blocks
5. Set the spectrum analyzer RBW to 1 MHz with the VBW $\geq$ 3 x RBW.
6. Select the power averaging (rms) detector and trace average over at least 100 traces.
7. Measure the transmit power levels in both the uplink and downlink directions.
8. Change the base station simulator signal to a non-authorized CMRS provider signal at the same center frequency.
9. Reset the EUT (e.g., cycle ac/dc power).
10. Measure the maximum transmitter noise power level in both the uplink and downlink directions.
11. Calculate the booster gain level in the uplink direction.
12. Save the spectrum analyzer plot as necessary for inclusion in the final test report.
13. Check compliance from reset condition (which includes the manufacturer's declared boot-up time) or change in provider code set [see 7.1.2h)] by verifying that the booster is inactive for at least 30 seconds after reset and is in compliance with the noise power and gain limits as specified in Section 20.21(e)(9)(i)(I) for all non-authorized spectrum block(s) within the CMRS band under test.
14. Repeat Step 8 through 13 for two additional non-authorized CMRS provider Signals.
15. Repeat Step 1 through 14 for all CMRS bands.

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

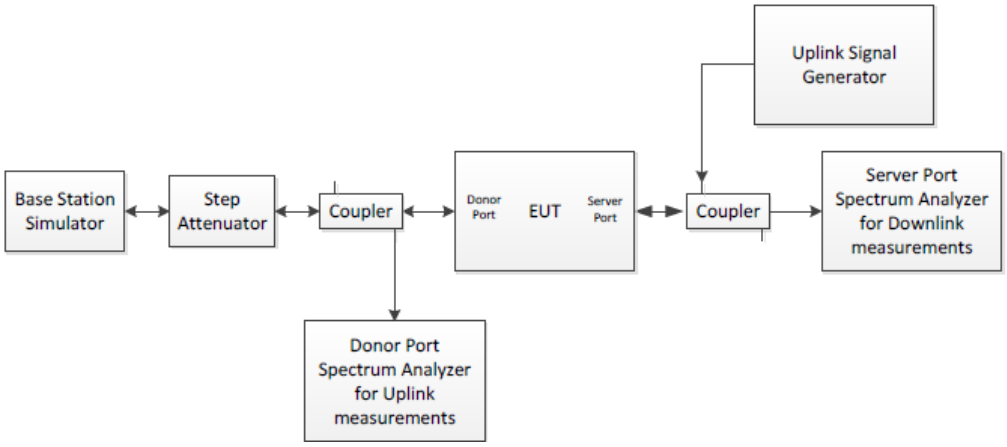


Figure 7-4. Test configuration in EUT normal operational mode

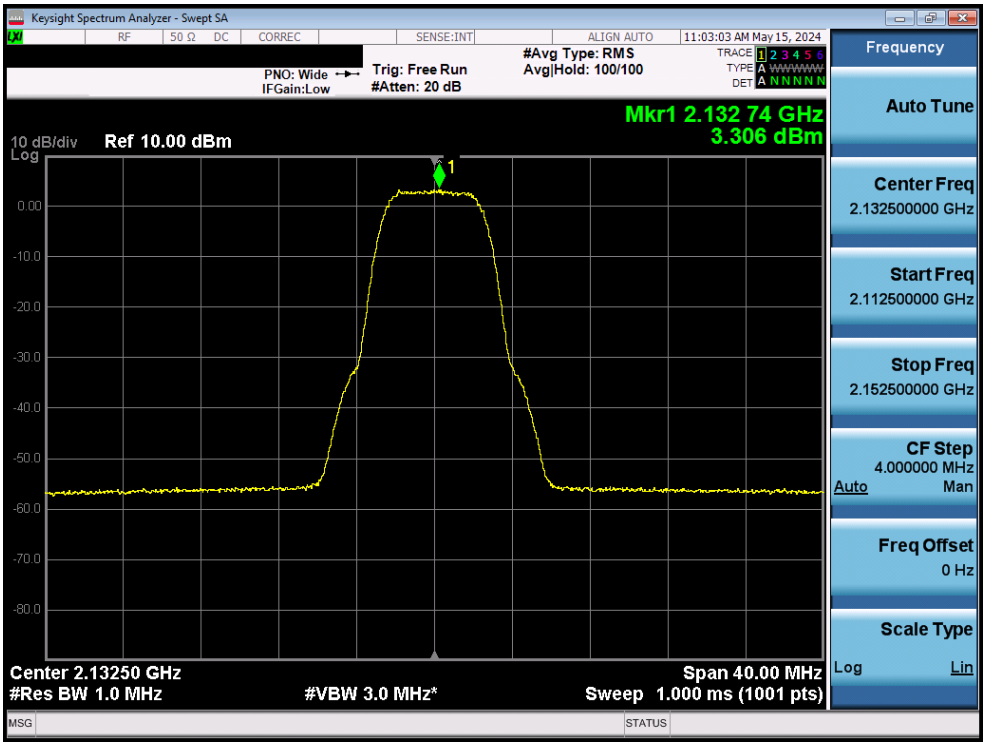
Test Notes

1. The EUT can be set authorized CMRS Provider information and ID. For Authorized CMRS Provider Spectrum Blocks testing, the EUT was assigned a temporary authorized CMRS Provider ID as following,

Authorized CMRS Provider ID	Unauthorized CMRS Provider ID
MCC/MNC: 310/01	MCC/MNC: 310/123
	MCC/MNC: 310/345
	MCC/MNC: 310/456

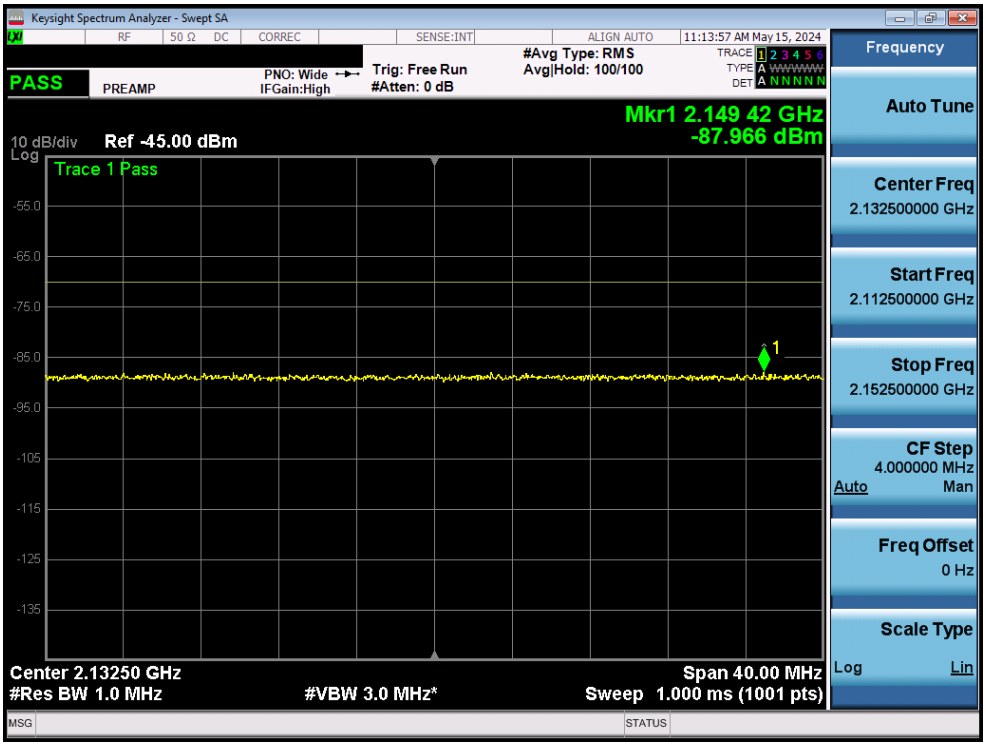
Table 7-3. MCC/MNC information for Authorized/Unauthorized CMRS Provider ID

LTE BAND 4

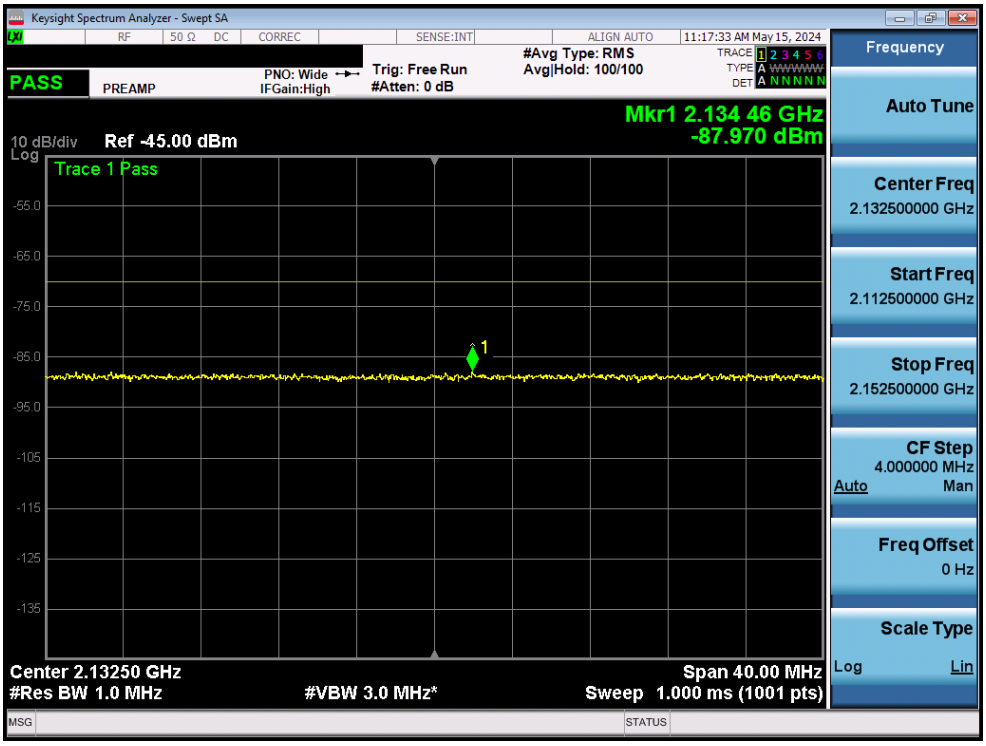


Plot 7-31. Authorized CMRS Provider Spectrum Blocks – Band 4 DL Authorized ID (MCC/MNC:310/01)

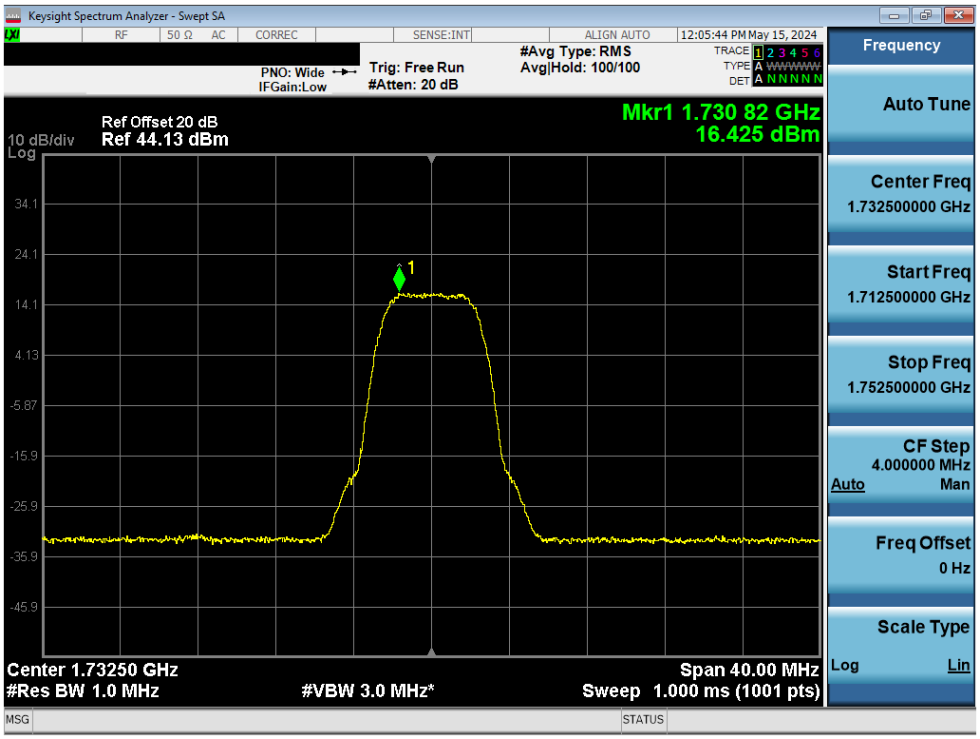
Plot 7-32. Authorized CMRS Provider Spectrum Blocks – Band 4 DL Unauthorized ID (MCC/MNC:310/123)



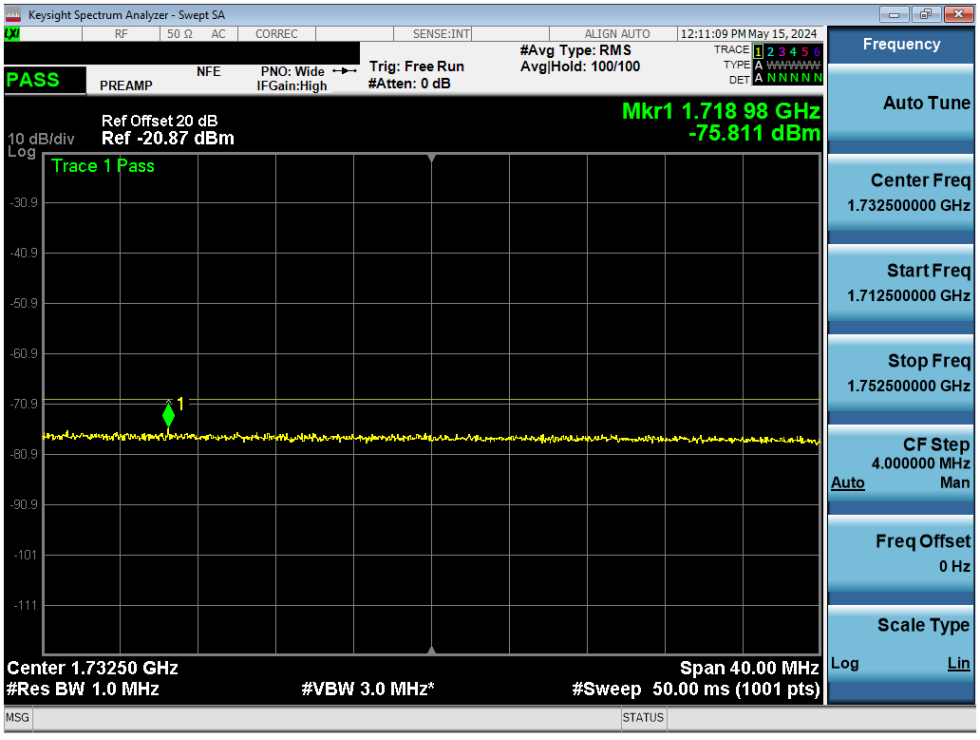
Plot 7-33. Authorized CMRS Provider Spectrum Blocks – Band 4 DL Unauthorized ID (MCC/MNC:310/345)



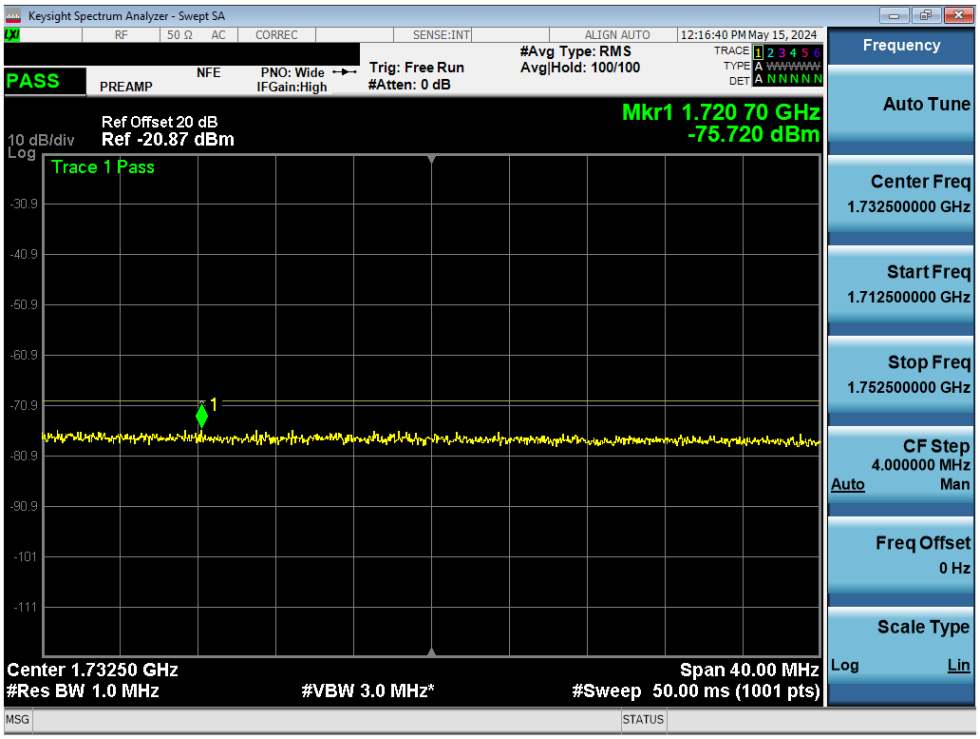
Plot 7-34. Authorized CMRS Provider Spectrum Blocks – Band 4 DL Unauthorized ID (MCC/MNC:310/456)



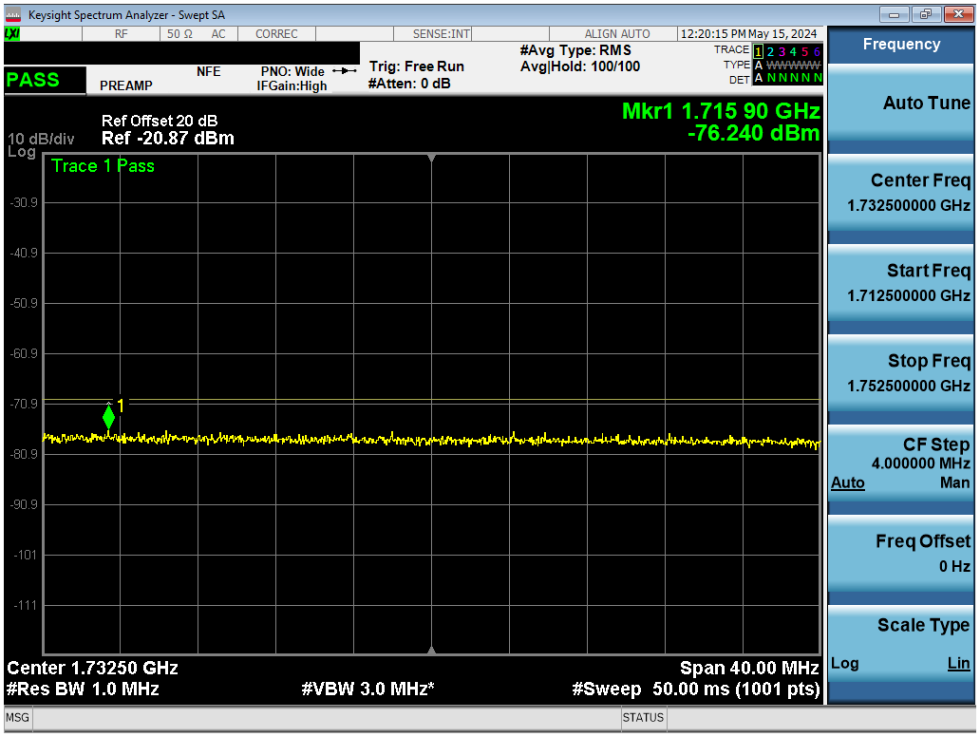
Plot 7-35. Authorized CMRS Provider Spectrum Blocks – Band 4 UL Authorized ID (MCC/MNC:310/01)



Plot 7-36. Authorized CMRS Provider Spectrum Blocks – Band 4 UL Unauthorized ID (MCC/MNC:310/123)

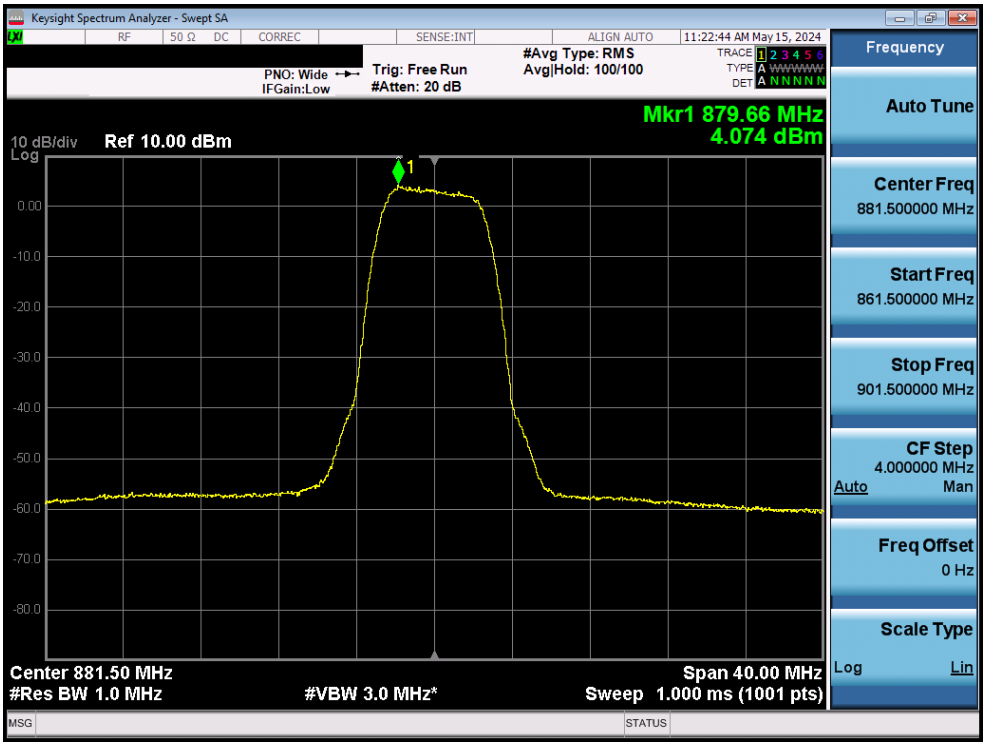


Plot 7-37. Authorized CMRS Provider Spectrum Blocks – Band 4 UL Unauthorized ID (MCC/MNC:310/345)

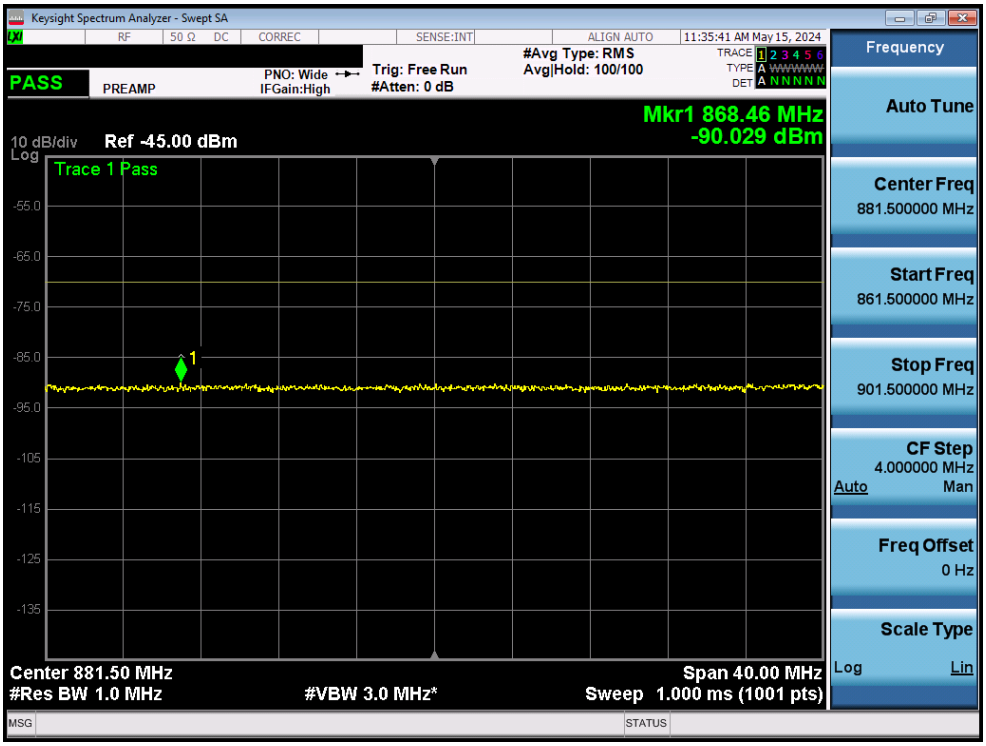


Plot 7-38. Authorized CMRS Provider Spectrum Blocks – Band 4 UL Unauthorized ID (MCC/MNC:310/456)

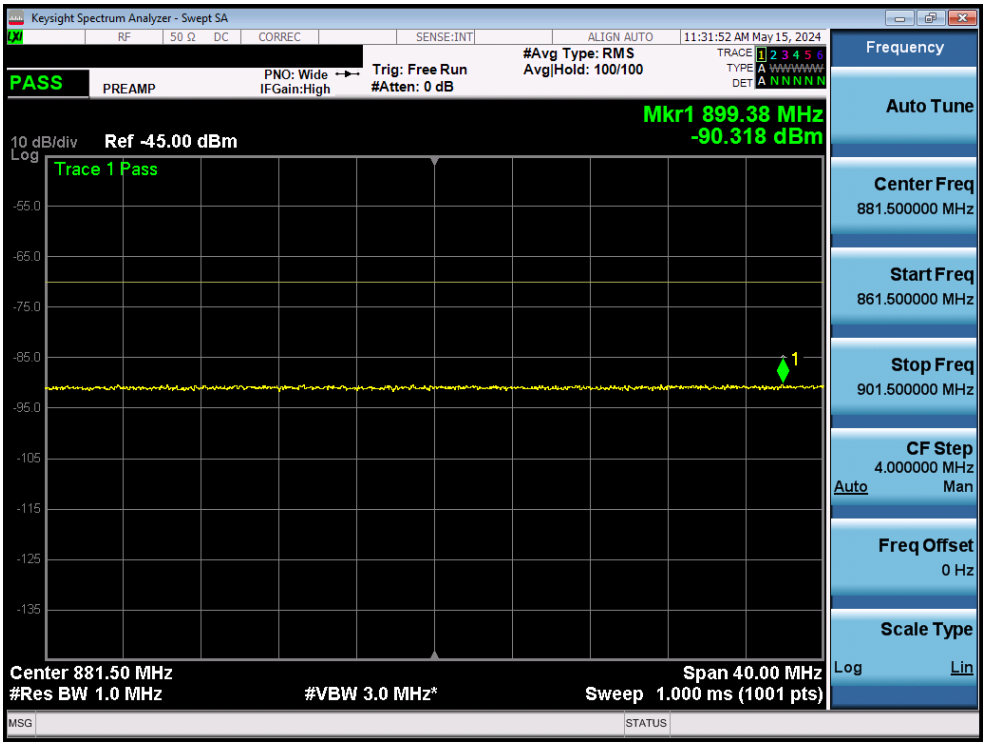
LTE BAND 5



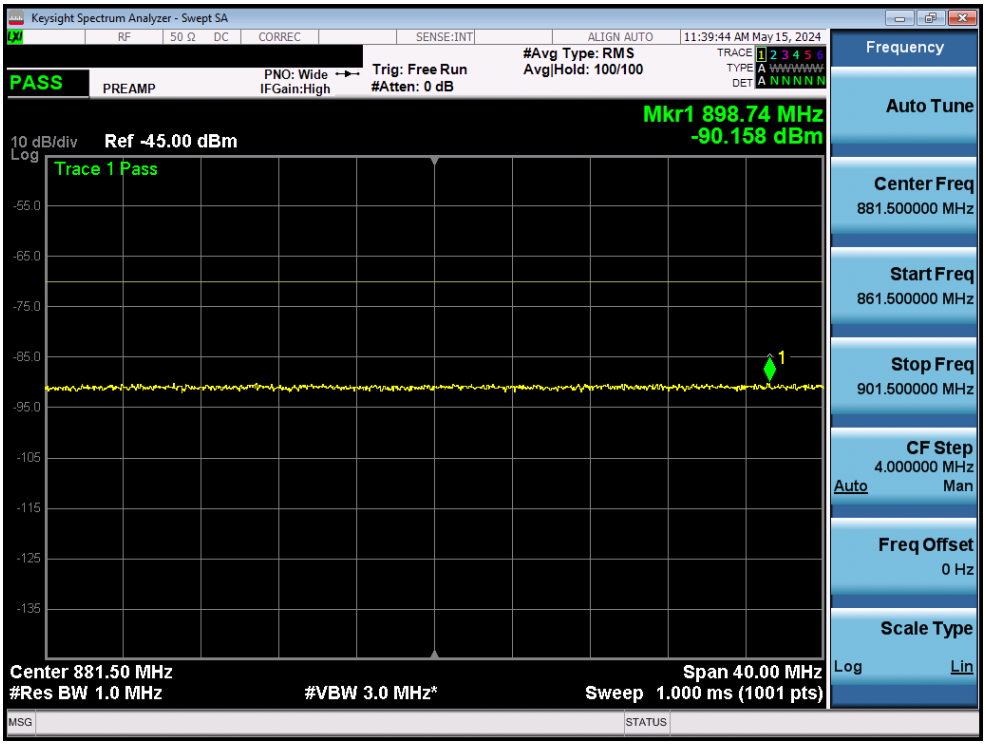
Plot 7-39. Authorized CMRS Provider Spectrum Blocks – Band 5 DL Authorized ID (MCC/MNC:310/01)



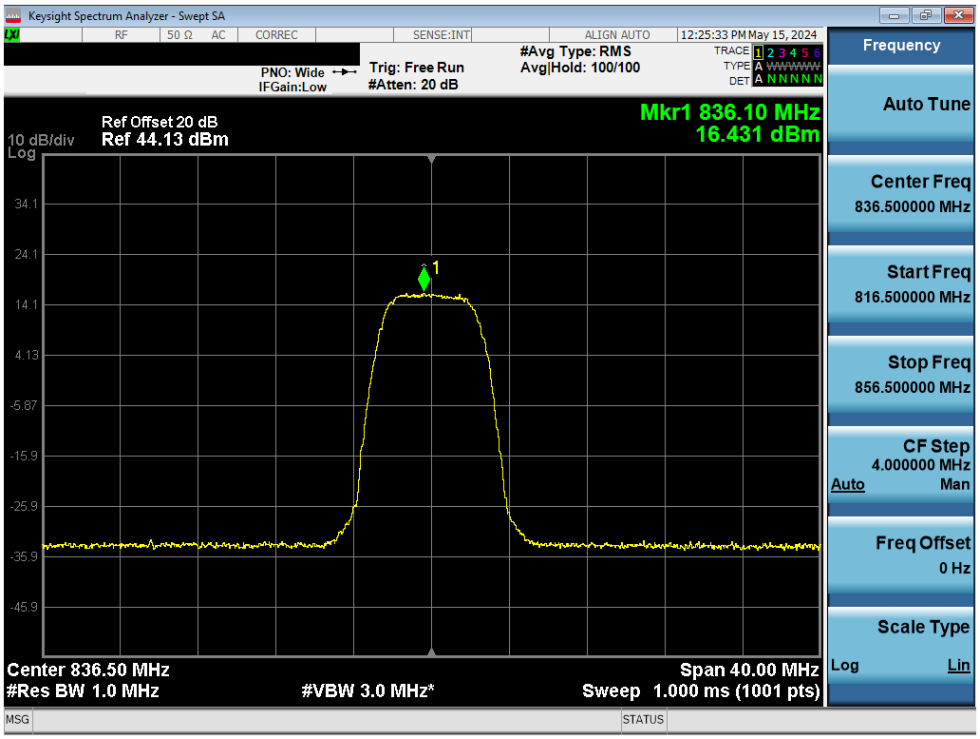
Plot 7-40. Authorized CMRS Provider Spectrum Blocks – Band 5 DL Unauthorized ID (MCC/MNC:310/123)



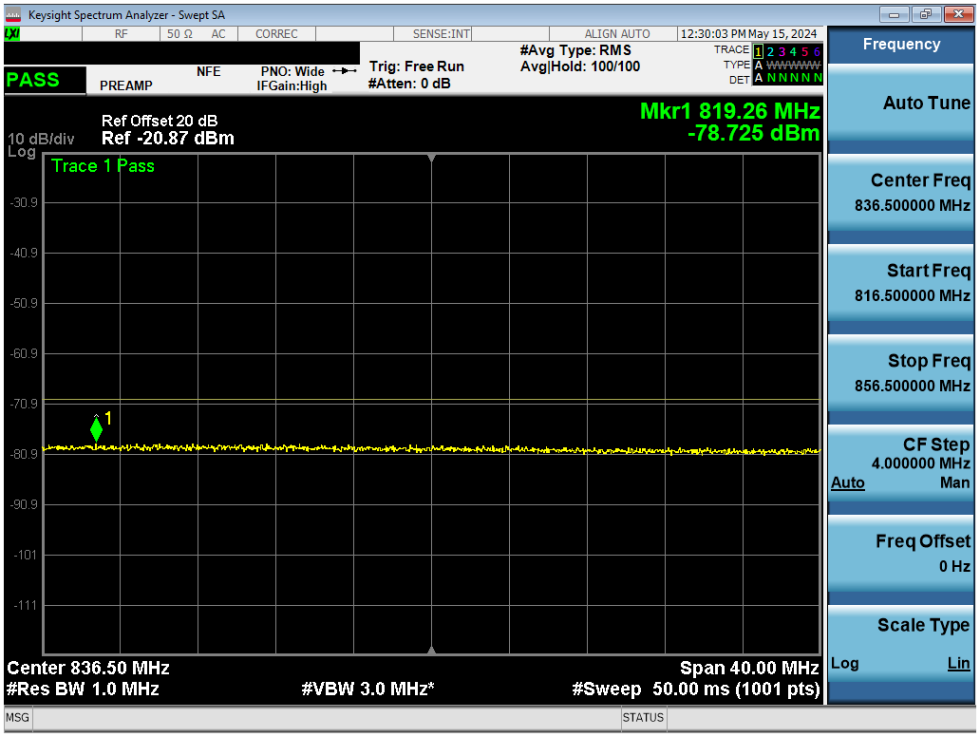
Plot 7-41. Authorized CMRS Provider Spectrum Blocks – Band 5 DL Unauthorized ID (MCC/MNC:310/345)



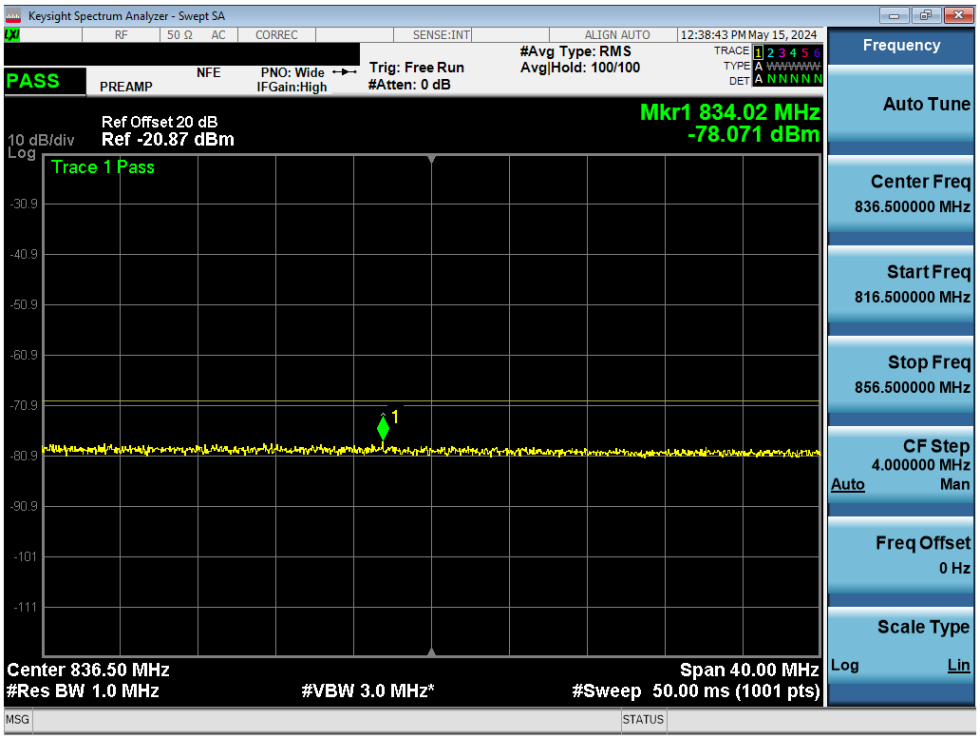
Plot 7-42. Authorized CMRS Provider Spectrum Blocks – Band 5 DL Unauthorized ID (MCC/MNC:310/456)



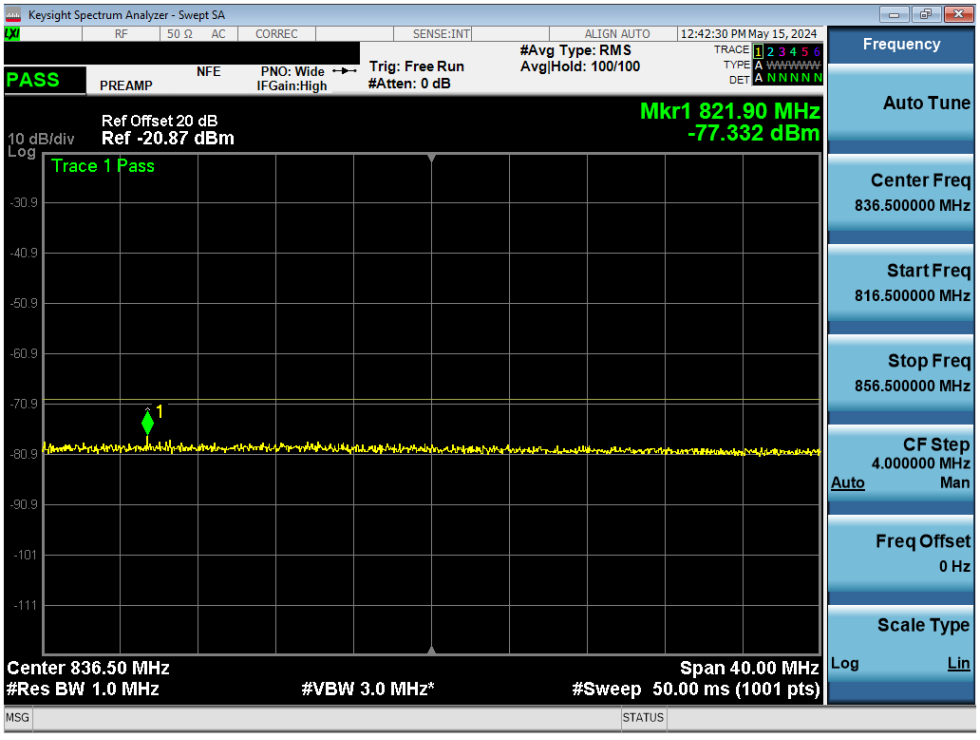
Plot 7-43. Authorized CMRS Provider Spectrum Blocks – Band 5 UL Authorized ID (MCC/MNC:310/01)



Plot 7-44. Authorized CMRS Provider Spectrum Blocks – Band 5 UL Unauthorized ID (MCC/MNC:310/123)

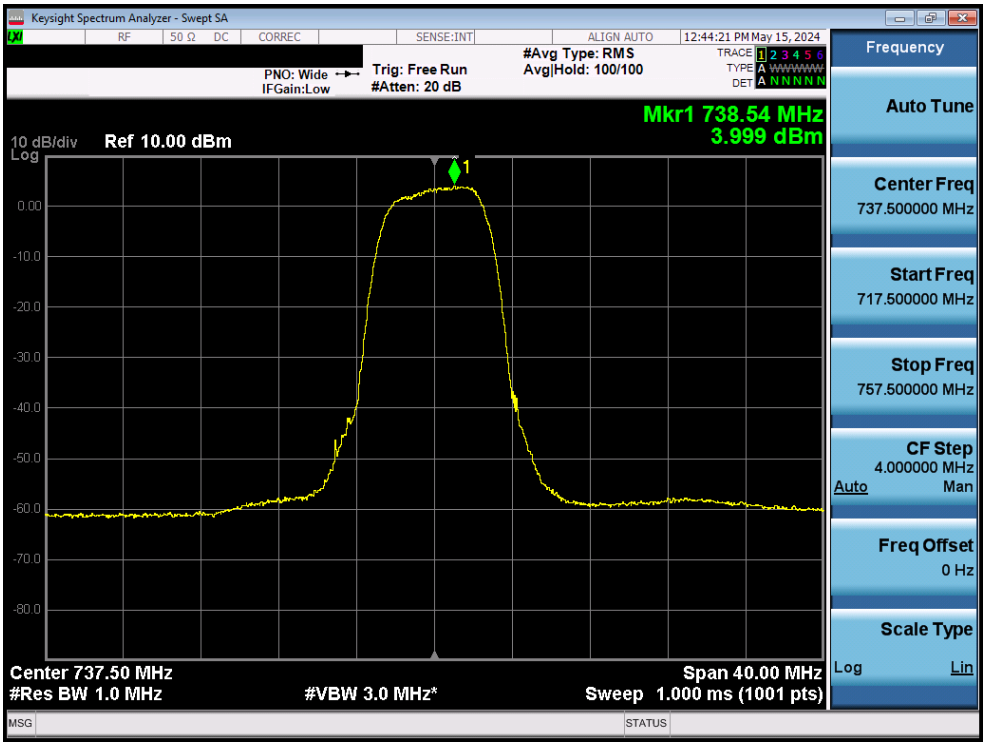


Plot 7-45. Authorized CMRS Provider Spectrum Blocks – Band 5 UL Unauthorized ID (MCC/MNC:310/345)

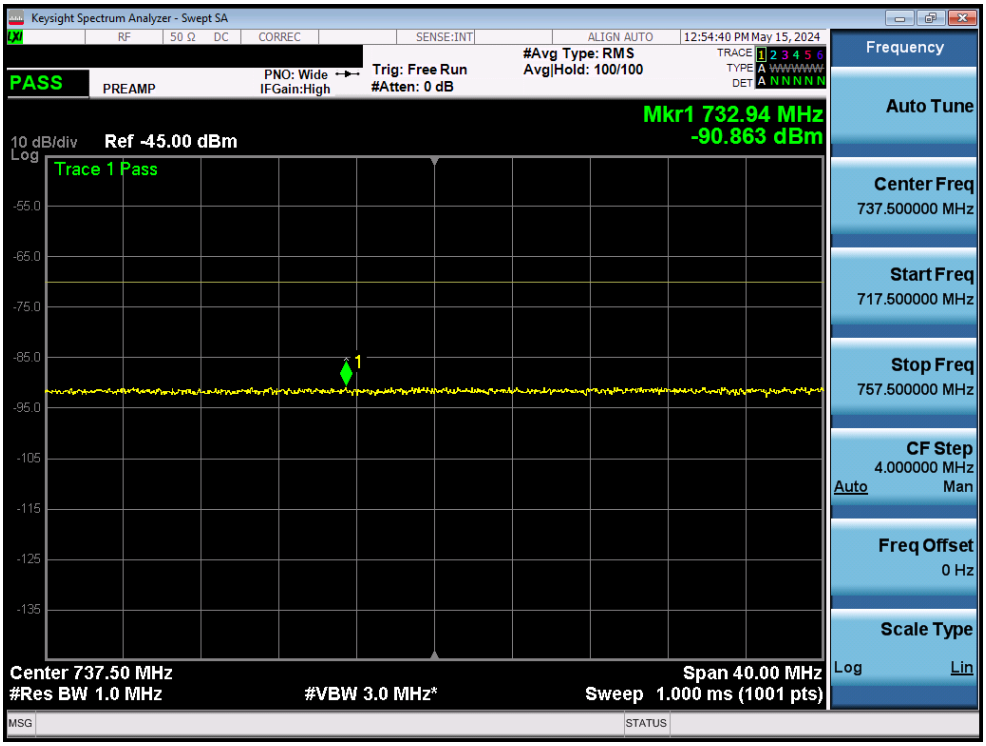


Plot 7-46. Authorized CMRS Provider Spectrum Blocks – Band 5 UL Unauthorized ID (MCC/MNC:310/456)

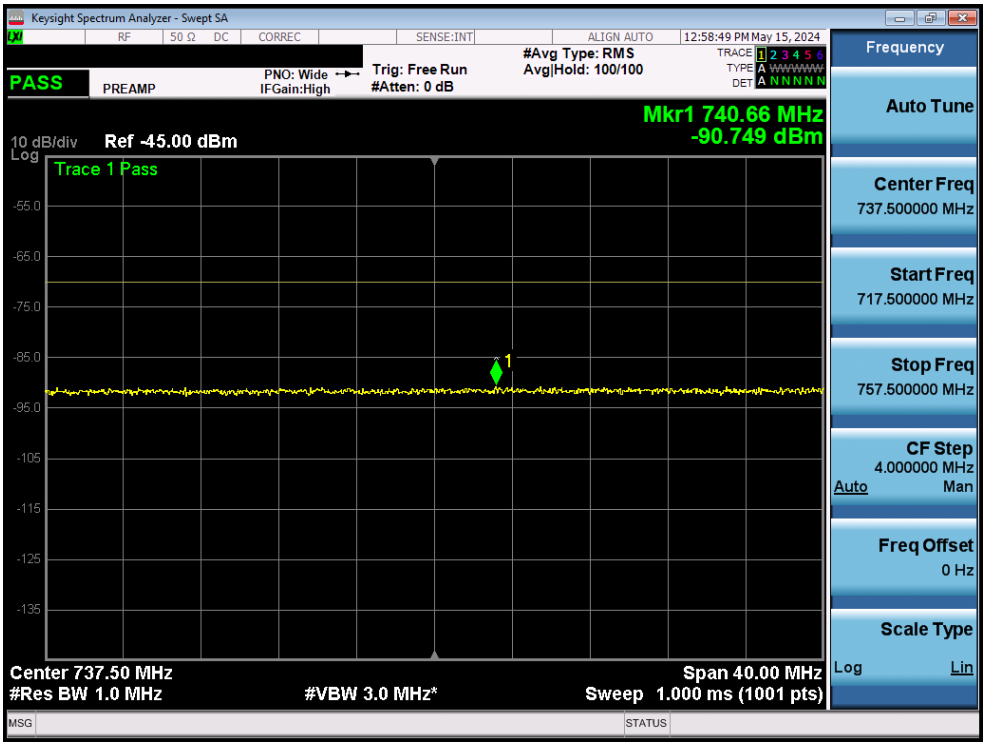
LTE BAND 12



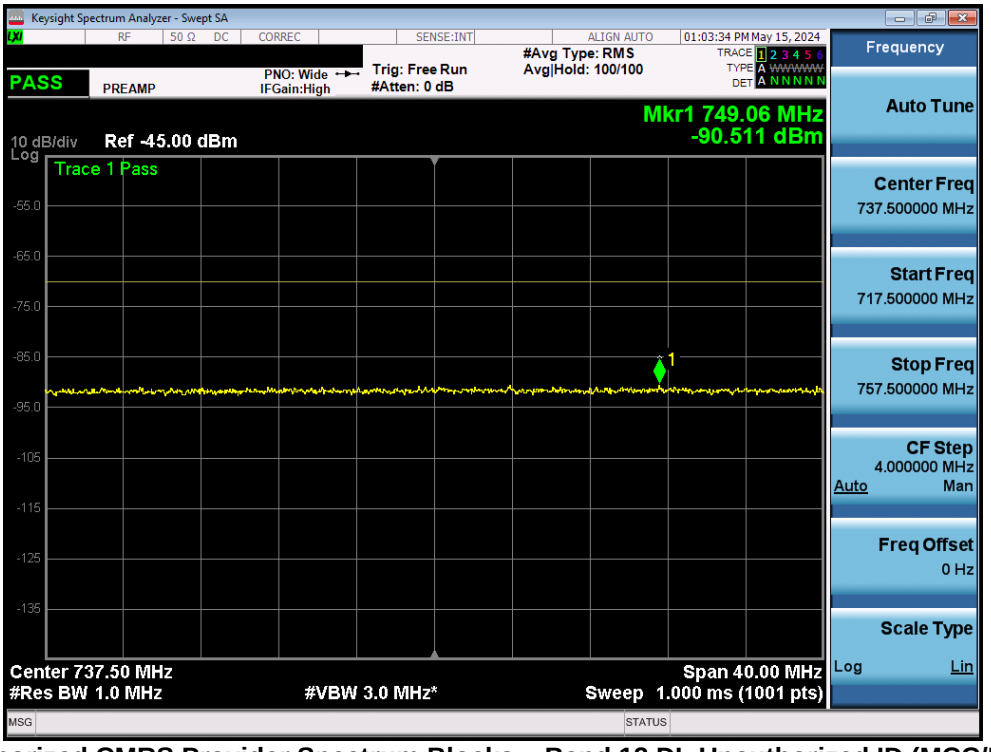
Plot 7-47. Authorized CMRS Provider Spectrum Blocks – Band 12 DL Authorized ID (MCC/MNC:310/01)



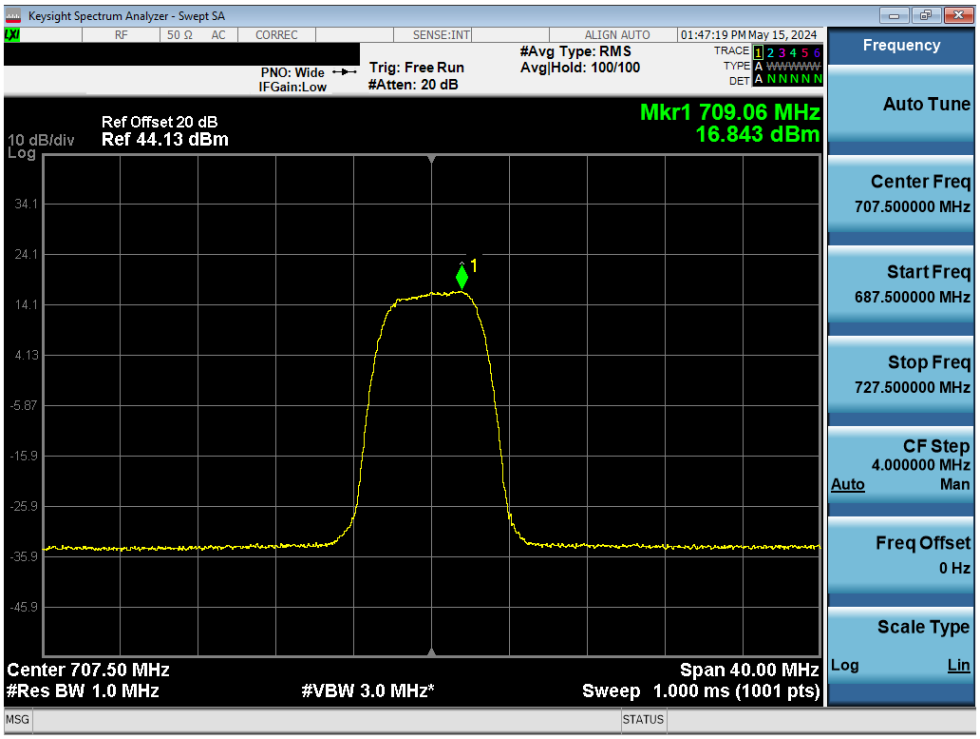
Plot 7-48. Authorized CMRS Provider Spectrum Blocks – Band 12 DL Unauthorized ID (MCC/MNC:310/123)



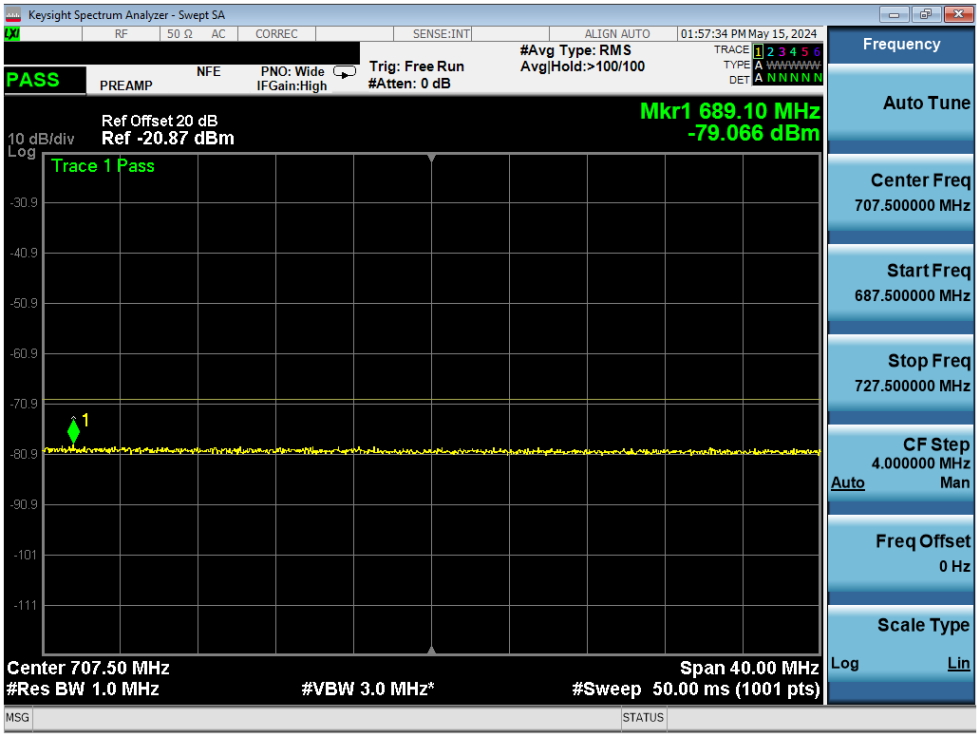
Plot 7-49. Authorized CMRS Provider Spectrum Blocks – Band 12 DL Unauthorized ID (MCC/MNC:310/345)



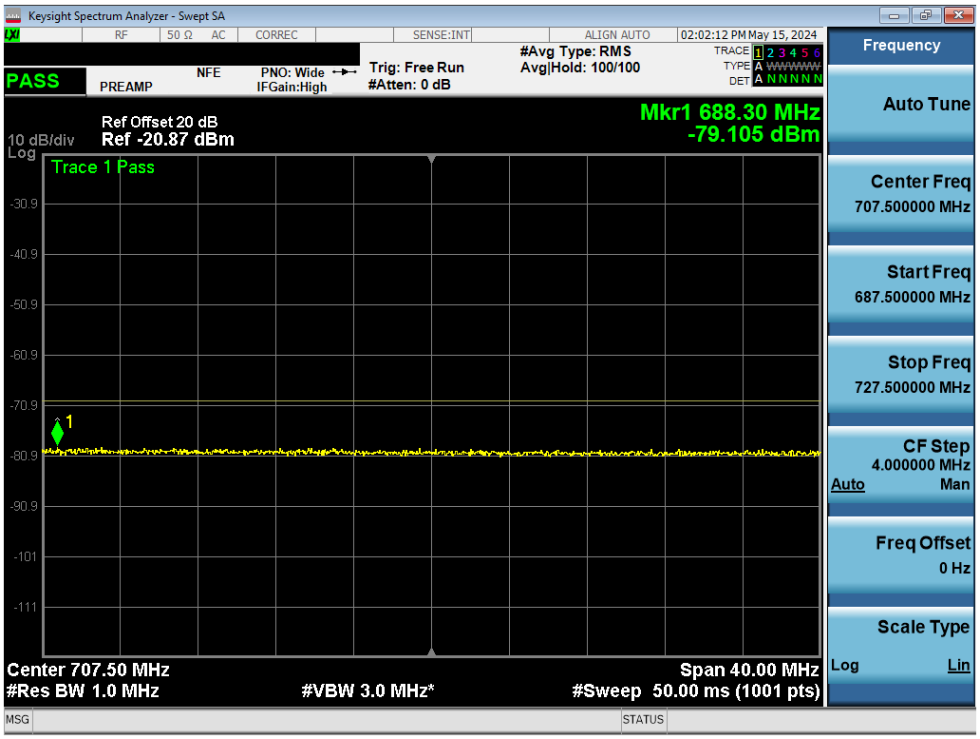
Plot 7-50. Authorized CMRS Provider Spectrum Blocks – Band 12 DL Unauthorized ID (MCC/MNC:310/456)



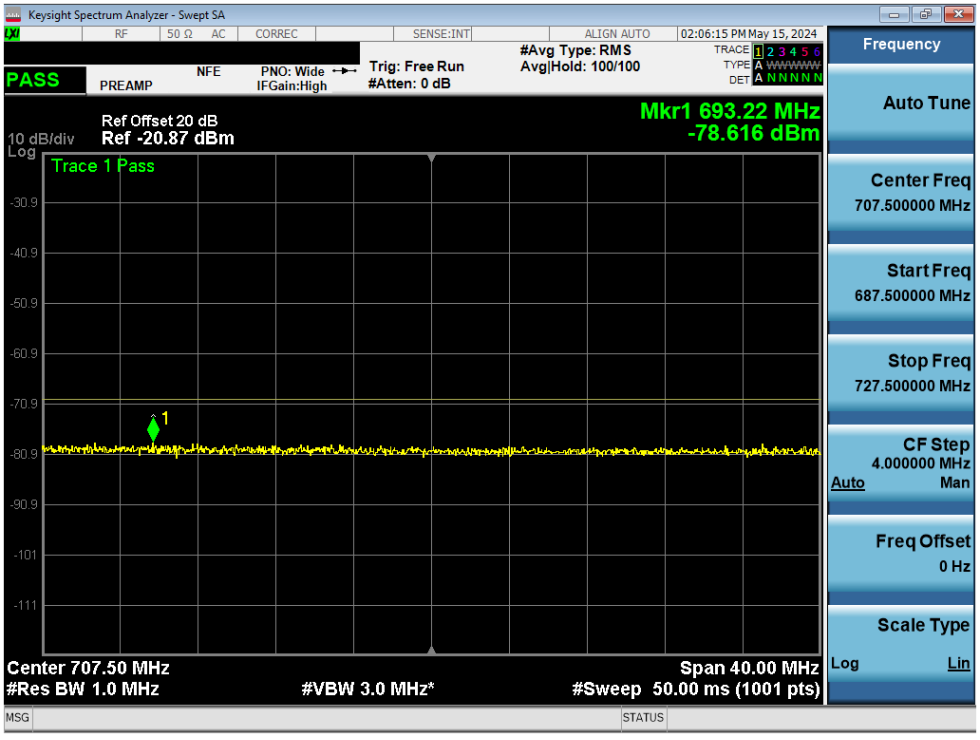
Plot 7-51. Authorized CMRS Provider Spectrum Blocks – Band 12 UL Authorized ID (MCC/MNC:310/01)



Plot 7-52. Authorized CMRS Provider Spectrum Blocks – Band 12 UL Unauthorized ID (MCC/MNC:310/123)

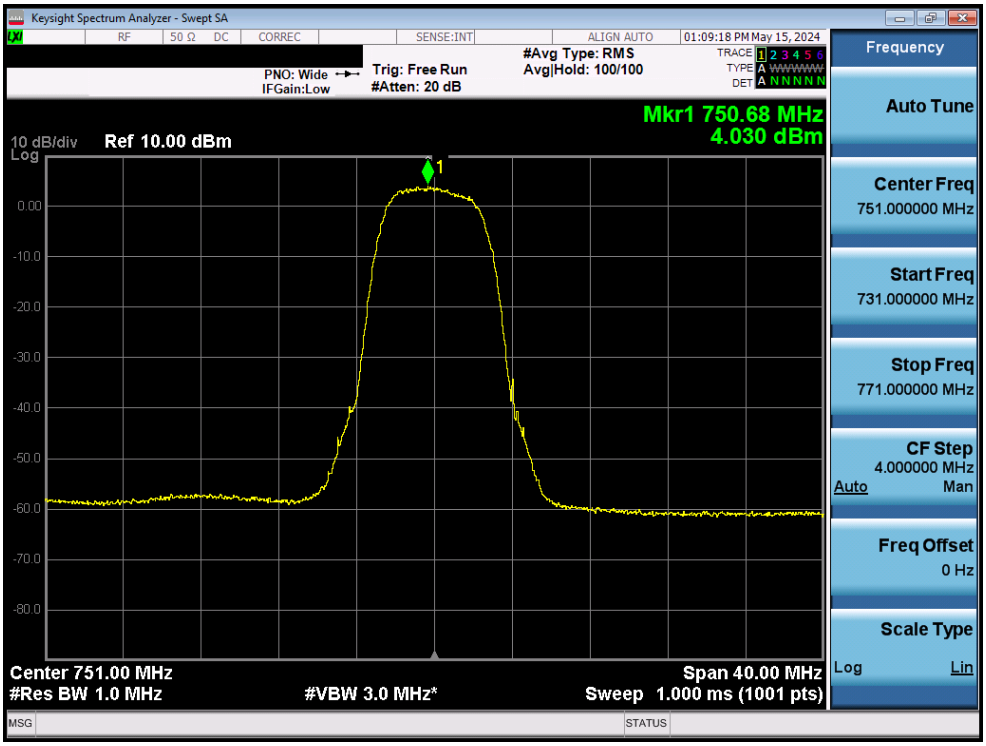


Plot 7-53. Authorized CMRS Provider Spectrum Blocks – Band 12 UL Unauthorized ID (MCC/MNC:310/345)



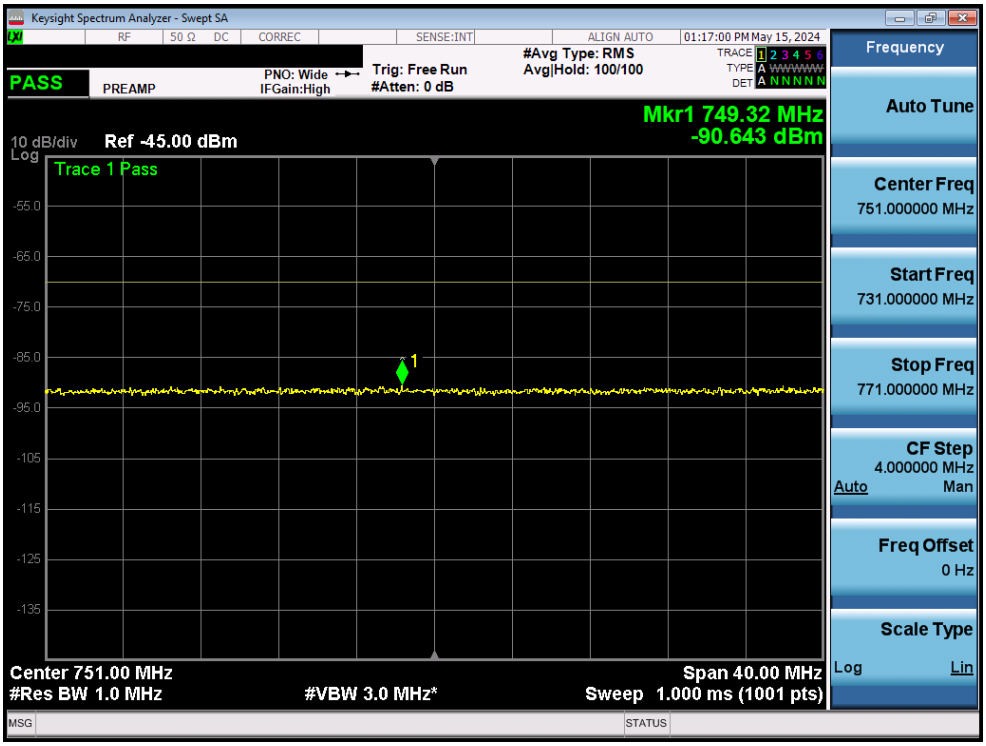
Plot 7-54. Authorized CMRS Provider Spectrum Blocks – Band 12 UL Unauthorized ID (MCC/MNC:310/456)

LTE BAND 13

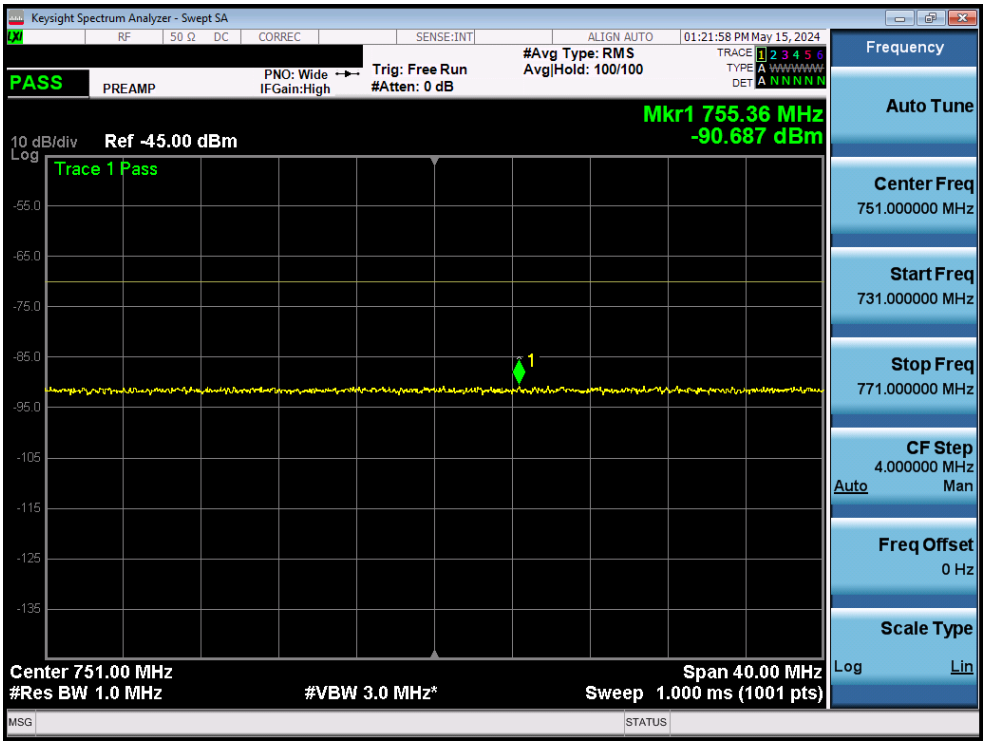


Plot 7-55. Authorized CMRS Provider Spectrum Blocks – Band 13 DL Authorized ID (MCC/MNC:310/01)

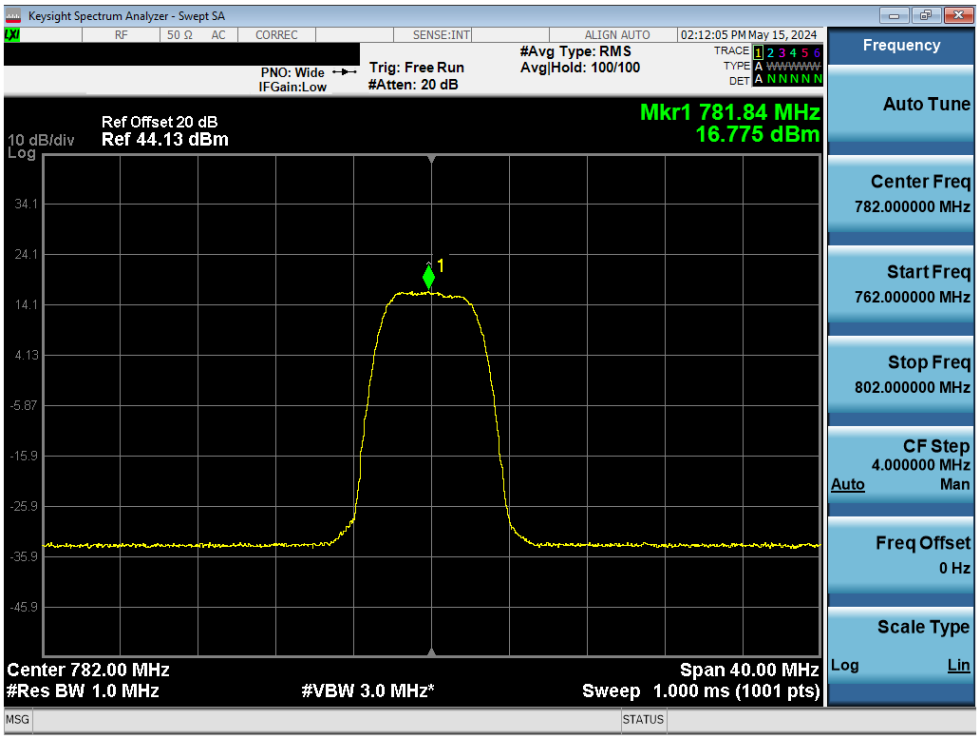
Plot 7-56. Authorized CMRS Provider Spectrum Blocks – Band 13 DL Unauthorized ID (MCC/MNC:310/123)



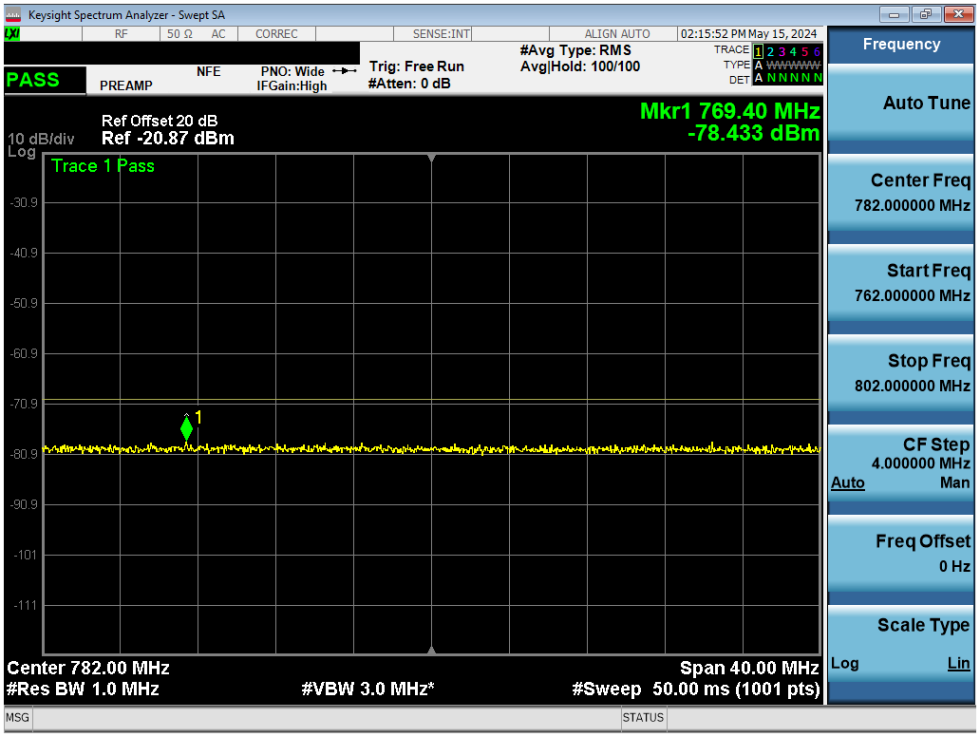
Plot 7-57. Authorized CMRS Provider Spectrum Blocks – Band 13 DL Unauthorized ID (MCC/MNC:310/345)



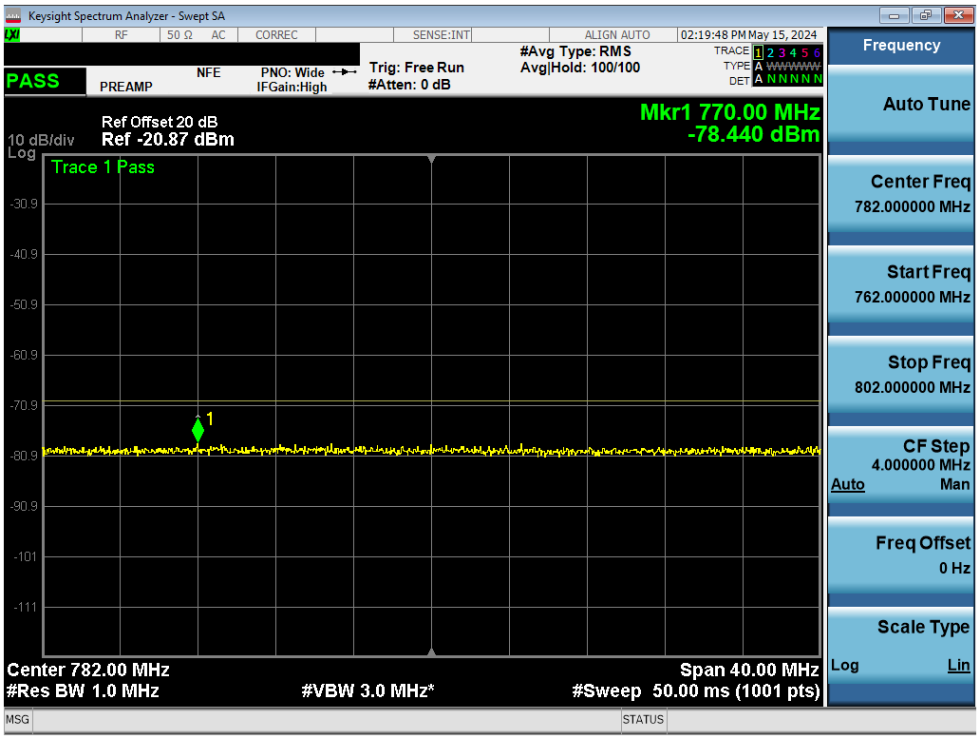
Plot 7-58. Authorized CMRS Provider Spectrum Blocks – Band 13 DL Unauthorized ID (MCC/MNC:310/456)



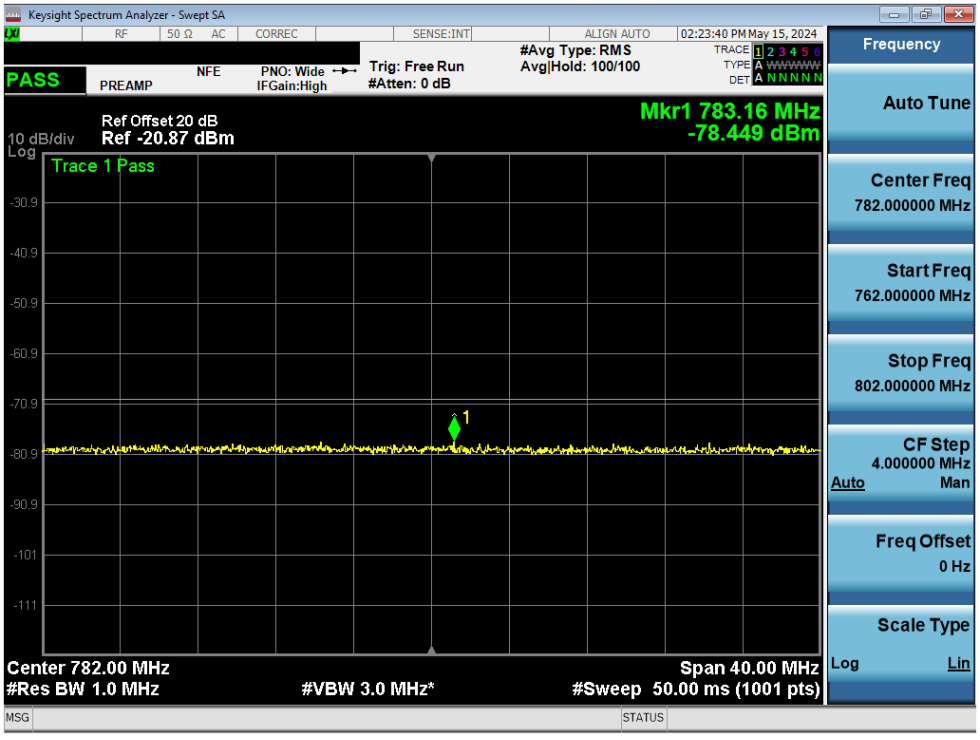
Plot 7-59. Authorized CMRS Provider Spectrum Blocks – Band 13 UL Authorized ID (MCC/MNC:310/01)



Plot 7-60. Authorized CMRS Provider Spectrum Blocks – Band 13 UL Unauthorized ID (MCC/MNC:310/123)

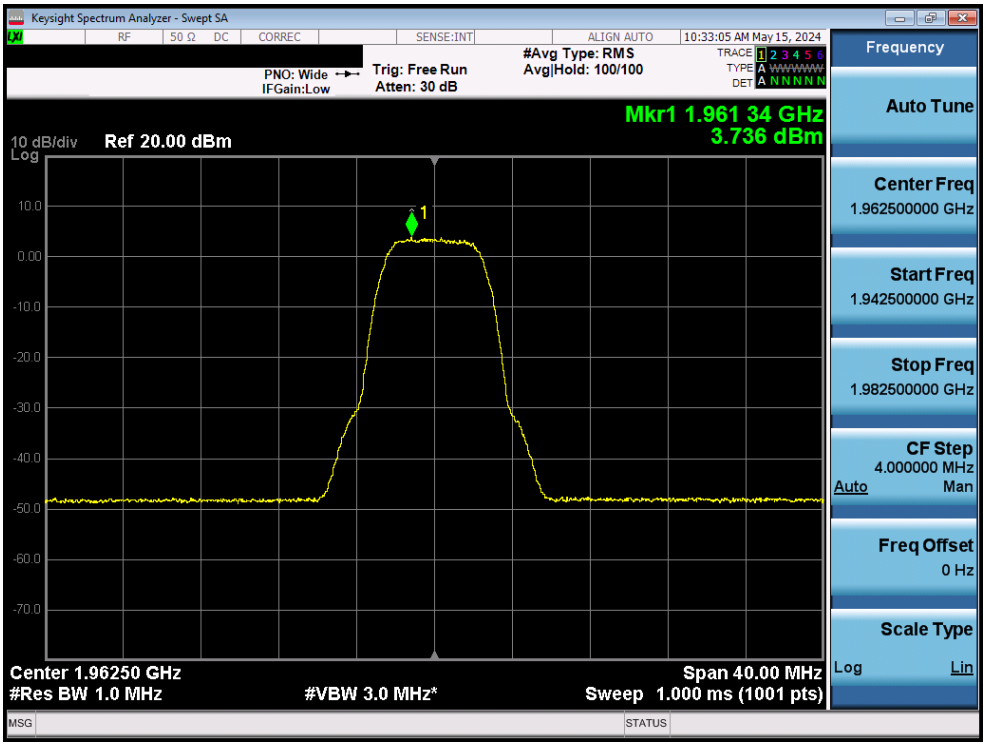


Plot 7-61. Authorized CMRS Provider Spectrum Blocks – Band 13 UL Unauthorized ID (MCC/MNC:310/345)



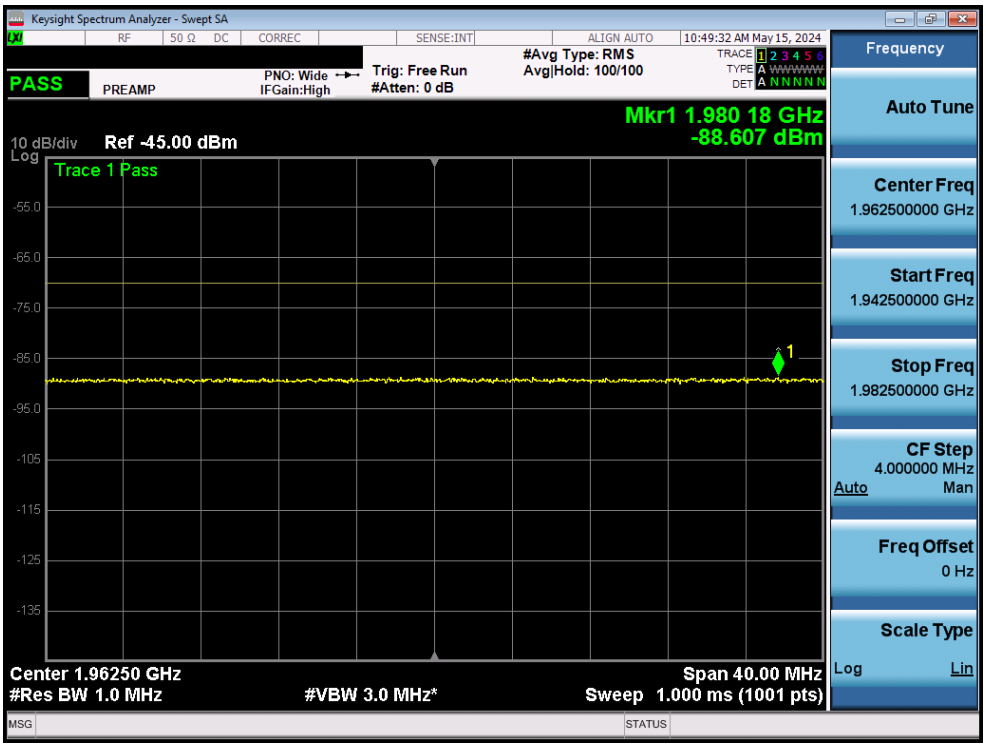
Plot 7-62. Authorized CMRS Provider Spectrum Blocks – Band 13 UL Unauthorized ID (MCC/MNC:310/456)

LTE BAND 25/2

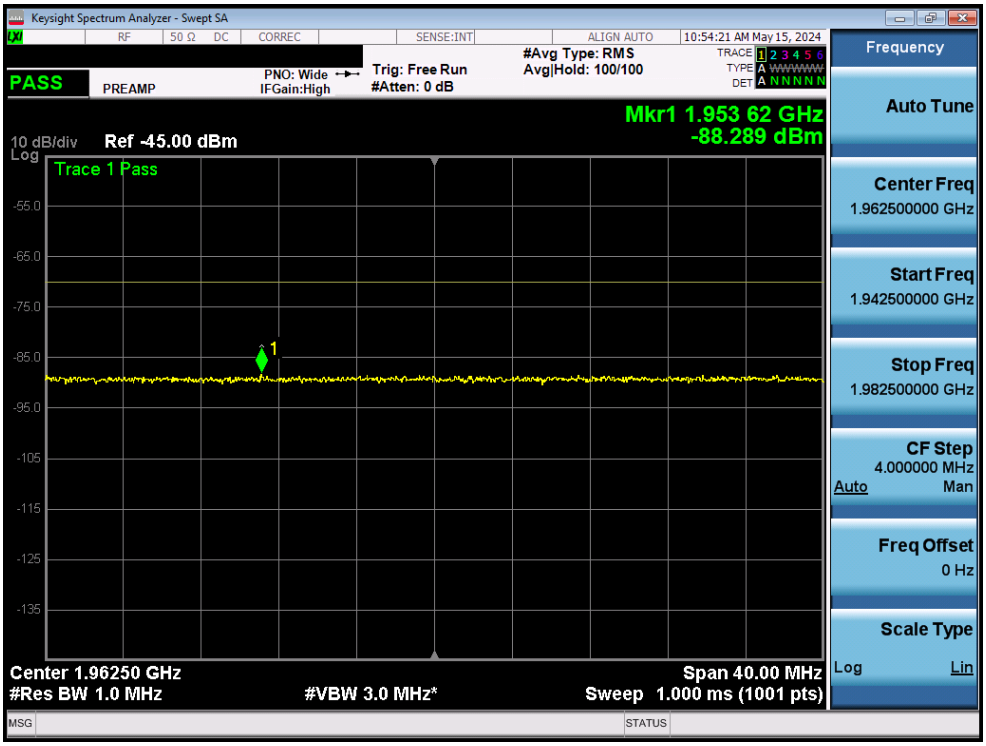


Plot 7-63. Authorized CMRS Provider Spectrum Blocks – Band 25/2 DL Authorized ID (MCC/MNC:310/01)

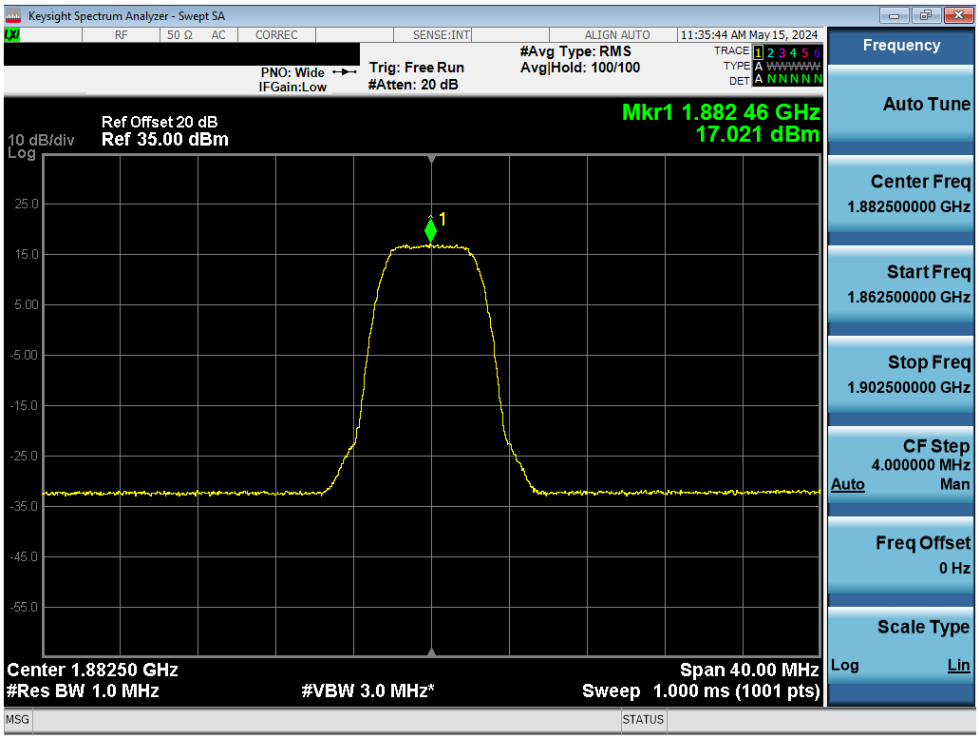
Plot 7-64. Authorized CMRS Provider Spectrum Blocks – Band 25/2 DL Unauthorized ID (MCC/MNC:310/123)



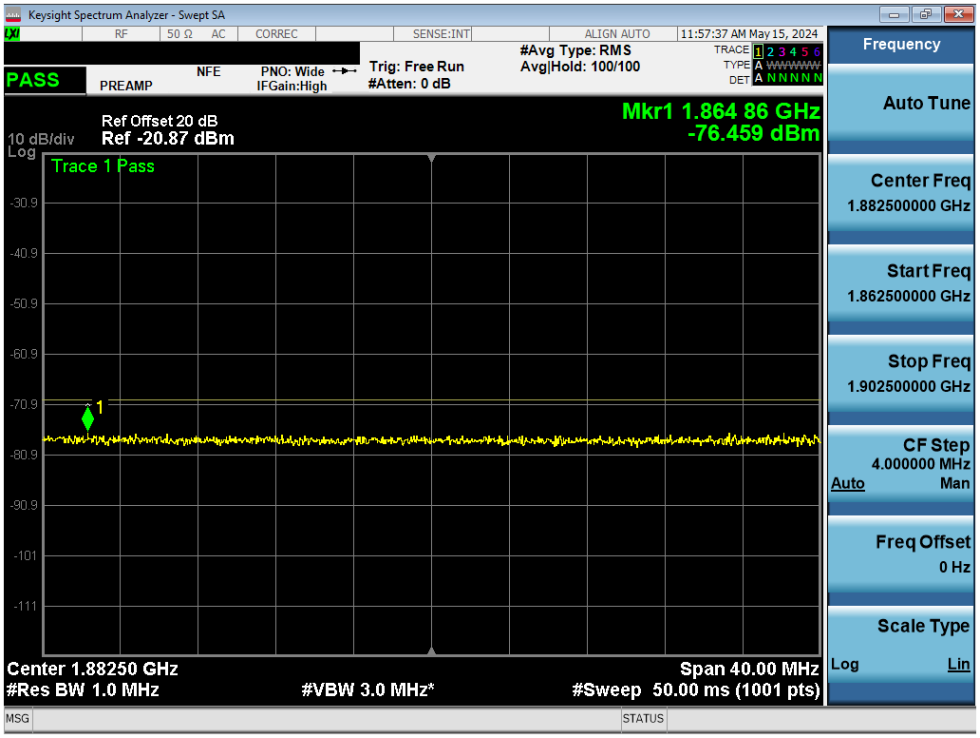
Plot 7-65. Authorized CMRS Provider Spectrum Blocks – Band 25/2 DL Unauthorized ID (MCC/MNC:310/345)



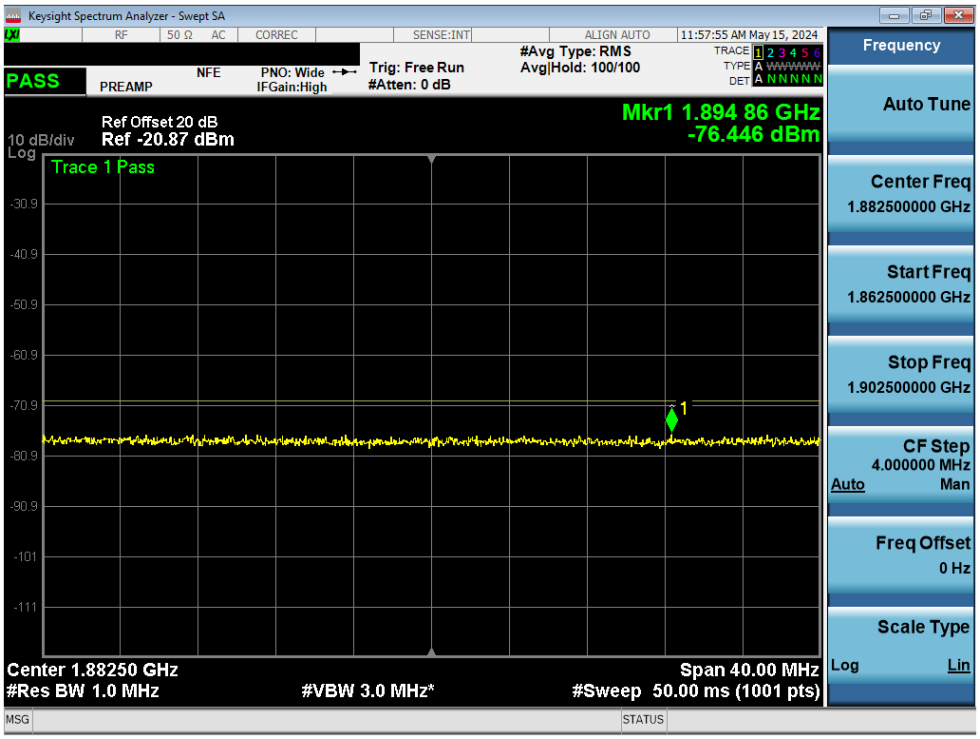
Plot 7-66. Authorized CMRS Provider Spectrum Blocks – Band 25/2 DL Unauthorized ID (MCC/MNC:310/456)



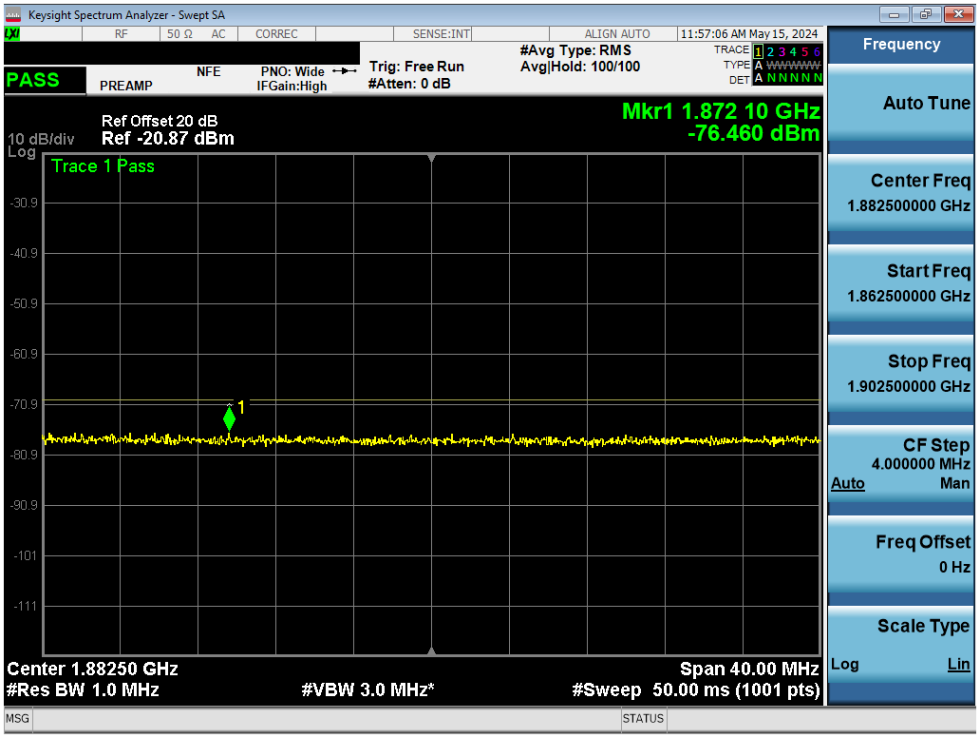
Plot 7-67. Authorized CMRS Provider Spectrum Blocks – Band 25/2 UL Authorized ID (MCC/MNC:310/01)



Plot 7-68. Authorized CMRS Provider Spectrum Blocks – Band 25/2 UL Unauthorized ID (MCC/MNC:310/123)



Plot 7-69. Authorized CMRS Provider Spectrum Blocks – Band 25/2 UL Unauthorized ID (MCC/MNC:310/345)



Plot 7-70. Authorized CMRS Provider Spectrum Blocks – Band 25/2 UL Unauthorized ID (MCC/MNC:310/456)

7.4 Maximum Output Power

Test Overview

A booster must compliance to the signal booster power limits and requirements as specified in Sections 20.21(e)(9)(i)(D) and 20.21(e)(9)(i)(B) for provider-specific consumer signal boosters. A booster's **uplink power must not exceed 1 watt (30dBm)** composite conducted power and equivalent isotropic radiated power (EIRP) for each band of operation. **Downlink power shall not exceed 0.05 watt (17 dBm) composite and 10 dBm** per channel conducted and EIRP for each band of operation. Compliance with power limits will use instrumentation calibrated in terms of RMS equivalent voltage.

Test Procedures Used

KDB 935210 D04 Section 7.2

Test Settings

Maximum Output Power

1. Connect the EUT in either normal mode or test mode.
2. Configure the signal generator and spectrum analyzer for operation on the frequency with the highest power level as determined in 7.1. Set for appropriate signal type as specified in 7.2.1e) and 7.2.1f).
3. Set the initial signal generator power to a level far below the AGC threshold level.
4. Slowly increase the signal generator power level until the output signal reaches the AGC threshold level as determined from observation of the signal behavior on the spectrum analyzer (i.e., no further increase in output power as input power is increased).
5. Reduce power sufficiently on the signal generator to ensure that the AGC is not limiting the output power.
6. Slowly increase the signal generator power to a level just below (and within 0.5 dB of) the AGC threshold without triggering the AGC. Note the signal generator power level as (P_{in}).
7. Measure the output power (Pout) with the spectrum analyzer as follows.
    a. Set RBW = 100 kHz for AWGN signal type, or 300 kHz for CW or GSM signal type.
    b. Set VBW $\geq$ 3 x RBW.
    c. Select either the BURST POWER or CHANNEL POWER measurement mode, as appropriate for each signal type. For AWGN, the channel power integration bandwidth shall be the 99% OBW of the 4.1 MHz signal.
    d. Select the power averaging (rms) detector.
    e. Affirm that the number of measurement points per sweep $\geq$ (2 x span)/RBW.
        i. NOTE–This requirement does not apply for BURST power measurement mode.
    f. Set sweep time = auto couple, or as necessary (but no less than auto couple value).
    g. Trace average at least 100 traces in power averaging (i.e., rms) mode.
    h. Record the measured power level Pout, with one set of results for the GSM or CW input stimulus, and another set of results for the AWGN input stimulus.

8. Repeat step 7.2.2g) while increasing the signal generator amplitude in 2 dB steps until the maximum input level indicated in 5.5 is reached. Ensure that the EUT maintains compliance with applicable power limits. The test report shall include either a statement describing that the device complies at 10 dB above AGC or at the 5.5 power levels, or a table showing compliance at the additional input power(s) required.
9. Repeat the procedure for each operational uplink and downlink frequency band supported by the booster.
10. Provide tabulated results in the test report.

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

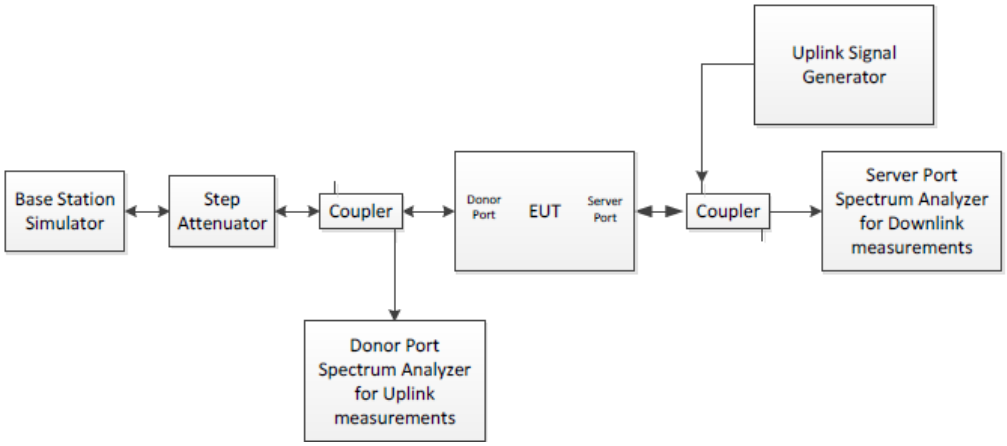


Figure 7-5. Test configuration in EUT normal operational mode

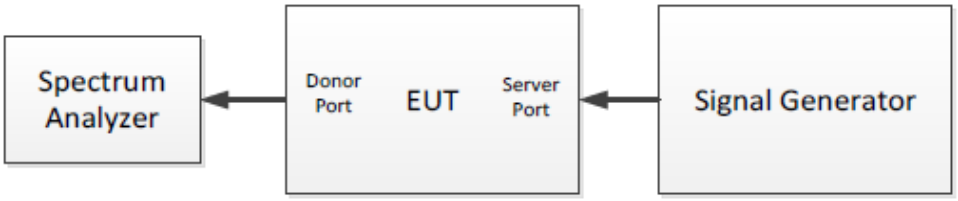


Figure 7-6. Uplink test configuration in EUT test mode

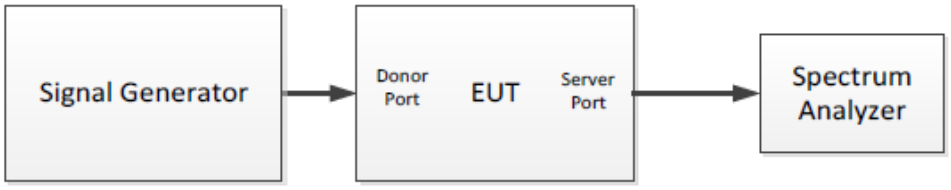


Figure 7-7. Downlink test configuration in EUT test mode

Test Notes

Uplink and downlink conducted powers were measured on all available ports for both the donor and server ports.

Common - Port 1

Power Output (Conducted /EIRP)								
Band	Bandwidth (MHz)	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain with Cable Loss (dBi)	Average EIRP (dBm)	Average EIRP FCC Part 20 Limit (dBm)	Margin
LTE Band 25/2 DL	5	8065	1932.5	-1.85	1.92	0.07	10	-9.93
		8365	1962.5	-1.41	1.92	0.51	10	-9.49
		8665	1992.5	-1.62	1.92	0.3	10	-9.7
LTE Band 25/2 UL	5	26065	1852.5	23.3	1.92	25.22	30	-4.78
		26365	1882.5	22.86	1.92	24.78	30	-5.22
		26665	1912.5	20.38	1.92	22.3	30	-7.7
LTE Band 4 DL	5	1975	2112.5	-4.75	2.05	-2.7	10	-12.7
		2175	2132.5	-2.83	2.05	-0.78	10	-10.78
		2375	2152.5	-3.96	2.05	-1.91	10	-11.91
LTE Band 4 UL	5	19975	1712.5	22.46	2.05	24.51	30	-5.49
		20175	1732.5	22.28	2.05	24.33	30	-5.67
		20375	1752.5	18.82	2.05	20.87	30	-9.13
LTE Band 5 DL	5	2425	871.5	-2.72	3.01	0.29	10	-9.71
		2525	881.5	-3.52	3.01	-0.51	10	-10.51
		2625	891.5	-4.31	3.01	-1.3	10	-11.3
LTE Band 5 UL	5	20425	826.5	21.53	3.01	24.54	30	-5.46
		20525	836.5	21.07	3.01	24.08	30	-5.92
		20625	846.5	17.12	3.01	20.13	30	-9.87
LTE Band 12 DL	5	5035	731.5	-5.13	3.58	-1.55	10	-11.55
		5095	737.5	-4.19	3.58	-0.61	10	-10.61
		5155	743.5	-5.28	3.58	-1.7	10	-11.7
LTE Band 12 UL	5	23035	701.5	19.63	3.58	23.21	30	-6.79
		23095	707.5	20.49	3.58	24.07	30	-5.93
		23155	713.5	20.43	3.58	24.01	30	-5.99
LTE Band 13 DL	5	5205	748.5	-5.38	3.21	-2.17	10	-12.17
		5230	751	-4.95	3.21	-1.74	10	-11.74
		5255	753.5	-5.34	3.21	-2.13	10	-12.13
LTE Band 13 UL	5	23205	779.5	22.68	3.21	25.89	30	-4.11
		23230	782	22.73	3.21	25.94	30	-4.06
		23255	784.5	22.11	3.21	25.32	30	-4.68

Table 7-4. Maximum Output Power – Common - Port 1

Common - Port 2

Power Output (Conducted /EIRP)								
Band	Bandwidth (MHz)	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain with Cable Loss (dBi)	Average EIRP (dBm)	Average EIRP FCC Part 20 Limit (dBm)	Margin
LTE Band 25/2 DL	5	8065	1932.5	-1.65	1.92	0.27	10	-9.73
		8365	1962.5	-0.81	1.92	1.11	10	-8.89
		8665	1992.5	-0.62	1.92	1.3	10	-8.7
LTE Band 25/2 UL	5	26065	1852.5	23.34	1.92	25.26	30	-4.74
		26365	1882.5	23.4	1.92	25.32	30	-4.68
		26665	1912.5	19.93	1.92	21.85	30	-8.15
LTE Band 4 DL	5	1975	2112.5	-4.37	2.05	-2.32	10	-12.32
		2175	2132.5	-2.32	2.05	-0.27	10	-10.27
		2375	2152.5	-3.52	2.05	-1.47	10	-11.47
LTE Band 4 UL	5	19975	1712.5	22.63	2.05	24.68	30	-5.32
		20175	1732.5	22.3	2.05	24.35	30	-5.65
		20375	1752.5	18.74	2.05	20.79	30	-9.21
LTE Band 5 DL	5	2425	871.5	-2.14	3.01	0.87	10	-9.13
		2525	881.5	-3.01	3.01	0	10	-10
		2625	891.5	-3.42	3.01	-0.41	10	-10.41
LTE Band 5 UL	5	20425	826.5	21.15	3.01	24.16	30	-5.84
		20525	836.5	21.11	3.01	24.12	30	-5.88
		20625	846.5	17.09	3.01	20.1	30	-9.9
LTE Band 12 DL	5	5035	731.5	-4.66	3.58	-1.08	10	-11.08
		5095	737.5	-3.92	3.58	-0.34	10	-10.34
		5155	743.5	-4.78	3.58	-1.2	10	-11.2
LTE Band 12 UL	5	23035	701.5	19.65	3.58	23.23	30	-6.77
		23095	707.5	20.5	3.58	24.08	30	-5.92
		23155	713.5	20.2	3.58	23.78	30	-6.22
LTE Band 13 DL	5	5205	748.5	-5.22	3.21	-2.01	10	-12.01
		5230	751	-4.81	3.21	-1.6	10	-11.6
		5255	753.5	-5.34	3.21	-2.13	10	-12.13
LTE Band 13 UL	5	23205	779.5	23.02	3.21	26.23	30	-3.77
		23230	782	22.8	3.21	26.01	30	-3.99
		23255	784.5	22.38	3.21	25.59	30	-4.41

Table 7-5. Maximum Output Power – Common - Port 2

Common - Port 3

Power Output (Conducted /EIRP)								
Band	Bandwidth (MHz)	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain with Cable Loss (dBi)	Average EIRP (dBm)	Average EIRP FCC Part 20 Limit (dBm)	Margin
LTE Band 25/2 DL	5	8065	1932.5	-2.02	1.92	-0.1	10	-10.1
		8365	1962.5	-1.55	1.92	0.37	10	-9.63
		8665	1992.5	-1.57	1.92	0.35	10	-9.65
LTE Band 25/2 UL	5	26065	1852.5	23.47	1.92	25.39	30	-4.61
		26365	1882.5	23.53	1.92	25.45	30	-4.55
		26665	1912.5	19.83	1.92	21.75	30	-8.25
LTE Band 4 DL	5	1975	2112.5	-6.81	2.05	-4.76	10	-14.76
		2175	2132.5	-3.99	2.05	-1.94	10	-11.94
		2375	2152.5	-5.58	2.05	-3.53	10	-13.53
LTE Band 4 UL	5	19975	1712.5	22.39	2.05	24.44	30	-5.56
		20175	1732.5	22.21	2.05	24.26	30	-5.74
		20375	1752.5	18.88	2.05	20.93	30	-9.07
LTE Band 5 DL	5	2425	871.5	-2.78	3.01	0.23	10	-9.77
		2525	881.5	-3.58	3.01	-0.57	10	-10.57
		2625	891.5	-3.9	3.01	-0.89	10	-10.89
LTE Band 5 UL	5	20425	826.5	21.31	3.01	24.32	30	-5.68
		20525	836.5	21.22	3.01	24.23	30	-5.77
		20625	846.5	17.12	3.01	20.13	30	-9.87
LTE Band 12 DL	5	5035	731.5	-5.14	3.58	-1.56	10	-11.56
		5095	737.5	-4.3	3.58	-0.72	10	-10.72
		5155	743.5	-5.28	3.58	-1.7	10	-11.7
LTE Band 12 UL	5	23035	701.5	19.54	3.58	23.12	30	-6.88
		23095	707.5	20.44	3.58	24.02	30	-5.98
		23155	713.5	20.15	3.58	23.73	30	-6.27
LTE Band 13 DL	5	5205	748.5	-5.6	3.21	-2.39	10	-12.39
		5230	751	-5.17	3.21	-1.96	10	-11.96
		5255	753.5	-5.83	3.21	-2.62	10	-12.62
LTE Band 13 UL	5	23205	779.5	22.89	3.21	26.1	30	-3.9
		23230	782	22.8	3.21	26.01	30	-3.99
		23255	784.5	22.31	3.21	25.52	30	-4.48

Table 7-6. Maximum Output Power – Common - Port 3

Common - Port 4

Power Output (Conducted /EIRP)								
Band	Bandwidth (MHz)	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain with Cable Loss (dBi)	Average EIRP (dBm)	Average EIRP FCC Part 20 Limit (dBm)	Margin
LTE Band 25/2 DL	5	8065	1932.5	-3.61	1.92	-1.69	10	-11.69
		8365	1962.5	-3.21	1.92	-1.29	10	-11.29
		8665	1992.5	-3.27	1.92	-1.35	10	-11.35
LTE Band 25/2 UL	5	26065	1852.5	22.82	1.92	24.74	30	-5.26
		26365	1882.5	22.91	1.92	24.83	30	-5.17
		26665	1912.5	19.55	1.92	21.47	30	-8.53
LTE Band 4 DL	5	1975	2112.5	-6.82	2.05	-4.77	10	-14.77
		2175	2132.5	-4.64	2.05	-2.59	10	-12.59
		2375	2152.5	-5.87	2.05	-3.82	10	-13.82
LTE Band 4 UL	5	19975	1712.5	22.5	2.05	24.55	30	-5.45
		20175	1732.5	22.35	2.05	24.4	30	-5.6
		20375	1752.5	19.04	2.05	21.09	30	-8.91
LTE Band 5 DL	5	2425	871.5	-3.37	3.01	-0.36	10	-10.36
		2525	881.5	-4.32	3.01	-1.31	10	-11.31
		2625	891.5	-4.36	3.01	-1.35	10	-11.35
LTE Band 5 UL	5	20425	826.5	21.44	3.01	24.45	30	-5.55
		20525	836.5	21.12	3.01	24.13	30	-5.87
		20625	846.5	17.24	3.01	20.25	30	-9.75
LTE Band 12 DL	5	5035	731.5	-5.38	3.58	-1.8	10	-11.8
		5095	737.5	-4.72	3.58	-1.14	10	-11.14
		5155	743.5	-5.43	3.58	-1.85	10	-11.85
LTE Band 12 UL	5	23035	701.5	19.7	3.58	23.28	30	-6.72
		23095	707.5	20.55	3.58	24.13	30	-5.87
		23155	713.5	20.32	3.58	23.9	30	-6.1
LTE Band 13 DL	5	5205	748.5	-5.61	3.21	-2.4	10	-12.4
		5230	751	-5.44	3.21	-2.23	10	-12.23
		5255	753.5	-5.53	3.21	-2.32	10	-12.32
LTE Band 13 UL	5	23205	779.5	22.84	3.21	26.05	30	-3.95
		23230	782	22.8	3.21	26.01	30	-3.99
		23255	784.5	22.21	3.21	25.42	30	-4.58

Table 7-7. Maximum Output Power – Common - Port 4

MTT - Port 1

Power Output (Conducted /EIRP)								
Band	Bandwidth (MHz)	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain with Cable Loss (dBi)	Average EIRP (dBm)	Average EIRP FCC Part 20 Limit (dBm)	Margin
LTE Band 25/2 DL	5	8065	1932.5	-1.72	1.92	0.2	10	-9.8
		8365	1962.5	-1.28	1.92	0.64	10	-9.36
		8665	1992.5	-1.35	1.92	0.57	10	-9.43
LTE Band 25/2 UL	5	26065	1852.5	23.53	1.92	25.45	30	-4.55
		26365	1882.5	22.88	1.92	24.8	30	-5.2
		26665	1912.5	20.46	1.92	22.38	30	-7.62
LTE Band 4 DL	5	1975	2112.5	-4.78	2.05	-2.73	10	-12.73
		2175	2132.5	-2.73	2.05	-0.68	10	-10.68
		2375	2152.5	-3.5	2.05	-1.45	10	-11.45
LTE Band 4 UL	5	19975	1712.5	22.32	2.05	24.37	30	-5.63
		20175	1732.5	22.01	2.05	24.06	30	-5.94
		20375	1752.5	21.7	2.05	23.75	30	-6.25
LTE Band 5 DL	5	2425	871.5	-2.86	3.01	0.15	10	-9.85
		2525	881.5	-3.77	3.01	-0.76	10	-10.76
		2625	891.5	-4.19	3.01	-1.18	10	-11.18
LTE Band 5 UL	5	20425	826.5	18.68	3.01	21.69	30	-8.31
		20525	836.5	18.56	3.01	21.57	30	-8.43
		20625	846.5	19.46	3.01	22.47	30	-7.53
LTE Band 12 DL	5	5035	731.5	-5.08	3.58	-1.5	10	-11.5
		5095	737.5	-4.3	3.58	-0.72	10	-10.72
		5155	743.5	-5.24	3.58	-1.66	10	-11.66
LTE Band 12 UL	5	23035	701.5	21.01	3.58	24.59	30	-5.41
		23095	707.5	21.83	3.58	25.41	30	-4.59
		23155	713.5	21.76	3.58	25.34	30	-4.66
LTE Band 13 DL	5	5205	748.5	-5.36	3.21	-2.15	10	-12.15
		5230	751	-4.97	3.21	-1.76	10	-11.76
		5255	753.5	-5.33	3.21	-2.12	10	-12.12
LTE Band 13 UL	5	23205	779.5	24.13	3.21	27.34	30	-2.66
		23230	782	24.2	3.21	27.41	30	-2.59
		23255	784.5	23.72	3.21	26.93	30	-3.07

Table 7-8. Maximum Output Power – MTT - Port 1

MTT - Port 2

Power Output (Conducted /EIRP)								
Band	Bandwidth (MHz)	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain with Cable Loss (dBi)	Average EIRP (dBm)	Average EIRP FCC Part 20 Limit (dBm)	Margin
LTE Band 25/2 DL	5	8065	1932.5	-1.35	1.92	0.57	10	-9.43
		8365	1962.5	-0.75	1.92	1.17	10	-8.83
		8665	1992.5	-0.3	1.92	1.62	10	-8.38
LTE Band 25/2 UL	5	26065	1852.5	23.55	1.92	25.47	30	-4.53
		26365	1882.5	23.65	1.92	25.57	30	-4.43
		26665	1912.5	20.03	1.92	21.95	30	-8.05
LTE Band 4 DL	5	1975	2112.5	-4.52	2.05	-2.47	10	-12.47
		2175	2132.5	-2.23	2.05	-0.18	10	-10.18
		2375	2152.5	-3.72	2.05	-1.67	10	-11.67
LTE Band 4 UL	5	19975	1712.5	22.6	2.05	24.65	30	-5.35
		20175	1732.5	22.06	2.05	24.11	30	-5.89
		20375	1752.5	21.55	2.05	23.6	30	-6.4
LTE Band 5 DL	5	2425	871.5	-2.27	3.01	0.74	10	-9.26
		2525	881.5	-3.23	3.01	-0.22	10	-10.22
		2625	891.5	-3.49	3.01	-0.48	10	-10.48
LTE Band 5 UL	5	20425	826.5	18.31	3.01	21.32	30	-8.68
		20525	836.5	18.36	3.01	21.37	30	-8.63
		20625	846.5	19.41	3.01	22.42	30	-7.58
LTE Band 12 DL	5	5035	731.5	-4.63	3.58	-1.05	10	-11.05
		5095	737.5	-4	3.58	-0.42	10	-10.42
		5155	743.5	-4.75	3.58	-1.17	10	-11.17
LTE Band 12 UL	5	23035	701.5	20.96	3.58	24.54	30	-5.46
		23095	707.5	21.76	3.58	25.34	30	-4.66
		23155	713.5	21.54	3.58	25.12	30	-4.88
LTE Band 13 DL	5	5205	748.5	-5.12	3.21	-1.91	10	-11.91
		5230	751	-4.74	3.21	-1.53	10	-11.53
		5255	753.5	-4.79	3.21	-1.58	10	-11.58
LTE Band 13 UL	5	23205	779.5	24.5	3.21	27.71	30	-2.29
		23230	782	24.37	3.21	27.58	30	-2.42
		23255	784.5	23.89	3.21	27.1	30	-2.9

Table 7-9. Maximum Output Power – MTT - Port 2

MTT - Port 3

Power Output (Conducted /EIRP)								
Band	Bandwidth (MHz)	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain with Cable Loss (dBi)	Average EIRP (dBm)	Average EIRP FCC Part 20 Limit (dBm)	Margin
LTE Band 25/2 DL	5	8065	1932.5	-1.88	1.92	0.04	10	-9.96
		8365	1962.5	-1.45	1.92	0.47	10	-9.53
		8665	1992.5	-1.33	1.92	0.59	10	-9.41
LTE Band 25/2 UL	5	26065	1852.5	23.64	1.92	25.56	30	-4.44
		26365	1882.5	23.68	1.92	25.6	30	-4.4
		26665	1912.5	19.89	1.92	21.81	30	-8.19
LTE Band 4 DL	5	1975	2112.5	-6.45	2.05	-4.4	10	-14.4
		2175	2132.5	-3.56	2.05	-1.51	10	-11.51
		2375	2152.5	-5.53	2.05	-3.48	10	-13.48
LTE Band 4 UL	5	19975	1712.5	22.46	2.05	24.51	30	-5.49
		20175	1732.5	22.11	2.05	24.16	30	-5.84
		20375	1752.5	21.72	2.05	23.77	30	-6.23
LTE Band 5 DL	5	2425	871.5	-2.62	3.01	0.39	10	-9.61
		2525	881.5	-3.45	3.01	-0.44	10	-10.44
		2625	891.5	-3.99	3.01	-0.98	10	-10.98
LTE Band 5 UL	5	20425	826.5	18.37	3.01	21.38	30	-8.62
		20525	836.5	18.55	3.01	21.56	30	-8.44
		20625	846.5	19.51	3.01	22.52	30	-7.48
LTE Band 12 DL	5	5035	731.5	-5.01	3.58	-1.43	10	-11.43
		5095	737.5	-4.4	3.58	-0.82	10	-10.82
		5155	743.5	-5.28	3.58	-1.7	10	-11.7
LTE Band 12 UL	5	23035	701.5	20.84	3.58	24.42	30	-5.58
		23095	707.5	21.77	3.58	25.35	30	-4.65
		23155	713.5	21.57	3.58	25.15	30	-4.85
LTE Band 13 DL	5	5205	748.5	-5.57	3.21	-2.36	10	-12.36
		5230	751	-5.2	3.21	-1.99	10	-11.99
		5255	753.5	-5.33	3.21	-2.12	10	-12.12
LTE Band 13 UL	5	23205	779.5	24.42	3.21	27.63	30	-2.37
		23230	782	24.17	3.21	27.38	30	-2.62
		23255	784.5	23.92	3.21	27.13	30	-2.87

Table 7-10. Maximum Output Power – MTT - Port 3

MTT - Port 4

Power Output (Conducted /EIRP)								
Band	Bandwidth (MHz)	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain with Cable Loss (dBi)	Average EIRP (dBm)	Average EIRP FCC Part 20 Limit (dBm)	Margin
LTE Band 25/2 DL	5	8065	1932.5	-3.48	1.92	-1.56	10	-11.56
		8365	1962.5	-3.03	1.92	-1.11	10	-11.11
		8665	1992.5	-3.03	1.92	-1.11	10	-11.11
LTE Band 25/2 UL	5	26065	1852.5	22.98	1.92	24.9	30	-5.1
		26365	1882.5	23.09	1.92	25.01	30	-4.99
		26665	1912.5	19.6	1.92	21.52	30	-8.48
LTE Band 4 DL	5	1975	2112.5	-6.35	2.05	-4.3	10	-14.3
		2175	2132.5	-4.25	2.05	-2.2	10	-12.2
		2375	2152.5	-5.81	2.05	-3.76	10	-13.76
LTE Band 4 UL	5	19975	1712.5	22.62	2.05	24.67	30	-5.33
		20175	1732.5	22.08	2.05	24.13	30	-5.87
		20375	1752.5	21.99	2.05	24.04	30	-5.96
LTE Band 5 DL	5	2425	871.5	-3.23	3.01	-0.22	10	-10.22
		2525	881.5	-4.23	3.01	-1.22	10	-11.22
		2625	891.5	-4.46	3.01	-1.45	10	-11.45
LTE Band 5 UL	5	20425	826.5	18.55	3.01	21.56	30	-8.44
		20525	836.5	18.36	3.01	21.37	30	-8.63
		20625	846.5	19.56	3.01	22.57	30	-7.43
LTE Band 12 DL	5	5035	731.5	-5.37	3.58	-1.79	10	-11.79
		5095	737.5	-4.84	3.58	-1.26	10	-11.26
		5155	743.5	-5.32	3.58	-1.74	10	-11.74
LTE Band 12 UL	5	23035	701.5	20.98	3.58	24.56	30	-5.44
		23095	707.5	21.9	3.58	25.48	30	-4.52
		23155	713.5	21.66	3.58	25.24	30	-4.76
LTE Band 13 DL	5	5205	748.5	-5.71	3.21	-2.5	10	-12.5
		5230	751	-5.34	3.21	-2.13	10	-12.13
		5255	753.5	-5.57	3.21	-2.36	10	-12.36
LTE Band 13 UL	5	23205	779.5	24.23	3.21	27.44	30	-2.56
		23230	782	24.11	3.21	27.32	30	-2.68
		23255	784.5	23.95	3.21	27.16	30	-2.84

Table 7-11. Maximum Output Power – MTT - Port 4

7.5 Maximum Booster Gain Computation

Test Overview

Consumer Boosters must be able to provide equivalent **(within 9dB)** uplink and downlink gain and conducted uplink power output that is at least 0.05 watts. One-way consumer boosters (i.e., uplink only, downlink only, uplink impaired, downlink impaired) are prohibited. Spectrum block filtering used must provide uplink filter attenuation not less than the downlink filter attenuation, and where RSSI is measured after spectrum block filtering is applied referenced to the booster's input port for each band of operation. The uplink and downlink maximum gain of a frequency selective consumer booster referenced to its input and output ports shall not exceed the following limits: Fixed Booster maximum gain shall **not exceed 19.5 dB + 20 Log_{10} (Frequency), or 100 dB** for systems having automatic gain adjustment based on isolation measurements between booster donor and server antennas.

Test Procedures Used

KDB 935210 D04 Section 7.3

Test Settings

1. Calculate the maximum gain of the booster as follows to demonstrate compliance to the applicable gain limits as specified.
2. For both the uplink and downlink in each supported frequency band, use each of the P_{OUT} and P_{IN} value pairs for all input signal types used in 7.2 in the following equation to determine the maximum gain, G:

   $G\ (dB) = P_{OUT}(dBm) - P_{IN}(dBm)$.
3. Record the maximum gain of the uplink and downlink paths for each supported frequency band and verify that the each gain value complies with the applicable limit.
4. Provide tabulated results in test report.

Test Notes

None.

Common - Port 1

Maximum Gain					
Band	Frequency Range (MHz)	Max Booster Gain (dB)	Gain Limit(dB)	UL vs DL Gain	UL vs DL Gain Limit(dB)
LTE Band 25/2 (DL)	1930-1995	70.72	100	-6.60	9
LTE Band 25/2 (UL)	1850-1915	64.12	100		
LTE Band 4 (DL)	2110-2155	69.72	100	-5.65	9
LTE Band 4 (UL)	1710-1755	64.06	100		
LTE Band 5 (DL)	869-894	59.67	100	-4.21	9
LTE Band 5 (UL)	824-849	55.46	100		
LTE Band 12 (DL)	729-746	59.48	100	-7.22	9
LTE Band 12 (UL)	699-716	52.26	100		
LTE Band 13 (DL)	746-756	60.42	100	-5.91	9
LTE Band 13 (UL)	777-787	54.51	100		

Table 7-12. Maximum Gain – Common - Port 1

Common - Port 2

Maximum Gain					
Band	Frequency Range (MHz)	Max Booster Gain (dB)	Gain Limit(dB)	UL vs DL Gain	UL vs DL Gain Limit(dB)
LTE Band 25/2 (DL)	1930-1995	71.32	100	-6.46	9
LTE Band 25/2 (UL)	1850-1915	64.86	100		
LTE Band 4 (DL)	2110-2155	70.23	100	-6.82	9
LTE Band 4 (UL)	1710-1755	63.40	100		
LTE Band 5 (DL)	869-894	60.25	100	-4.05	9
LTE Band 5 (UL)	824-849	56.20	100		
LTE Band 12 (DL)	729-746	59.75	100	-6.88	9
LTE Band 12 (UL)	699-716	52.87	100		
LTE Band 13 (DL)	746-756	60.66	100	-5.68	9
LTE Band 13 (UL)	777-787	54.98	100		

Table 7-13. Maximum Gain – Common - Port 2

Common - Port 3

Maximum Gain					
Band	Frequency Range (MHz)	Max Booster Gain (dB)	Gain Limit(dB)	UL vs DL Gain	UL vs DL Gain Limit(dB)
LTE Band 25/2 (DL)	1930-1995	70.58	100	-5.89	9
LTE Band 25/2 (UL)	1850-1915	64.69	100		
LTE Band 4 (DL)	2110-2155	68.56	100	-4.26	9
LTE Band 4 (UL)	1710-1755	64.29	100		
LTE Band 5 (DL)	869-894	59.41	100	-3.30	9
LTE Band 5 (UL)	824-849	56.11	100		
LTE Band 12 (DL)	729-746	59.37	100	-6.26	9
LTE Band 12 (UL)	699-716	53.11	100		
LTE Band 13 (DL)	746-756	60.30	100	-5.43	9
LTE Band 13 (UL)	777-787	54.87	100		

Table 7-14. Maximum Gain – Common - Port 3

Common - Port 4

Maximum Gain					
Band	Frequency Range (MHz)	Max Booster Gain (dB)	Gain Limit(dB)	UL vs DL Gain	UL vs DL Gain Limit(dB)
LTE Band 25/2 (DL)	1930-1995	68.92	100	-4.28	9
LTE Band 25/2 (UL)	1850-1915	64.64	100		
LTE Band 4 (DL)	2110-2155	67.91	100	-4.70	9
LTE Band 4 (UL)	1710-1755	63.20	100		
LTE Band 5 (DL)	869-894	58.82	100	-3.61	9
LTE Band 5 (UL)	824-849	55.21	100		
LTE Band 12 (DL)	729-746	58.95	100	-7.03	9
LTE Band 12 (UL)	699-716	51.92	100		
LTE Band 13 (DL)	746-756	60.03	100	-5.81	9
LTE Band 13 (UL)	777-787	54.22	100		

Table 7-15. Maximum Gain – Common - Port 4

MTT - Port 1

Maximum Gain					
Band	Frequency Range (MHz)	Max Booster Gain (dB)	Gain Limit(dB)	UL vs DL Gain	UL vs DL Gain Limit(dB)
LTE Band 25/2 (DL)	1930-1995	70.55	100	-6.50	9
LTE Band 25/2 (UL)	1850-1915	64.05	100		
LTE Band 4 (DL)	2110-2155	69.02	100	-5.39	9
LTE Band 4 (UL)	1710-1755	63.62	100		
LTE Band 5 (DL)	869-894	59.43	100	-6.58	9
LTE Band 5 (UL)	824-849	52.85	100		
LTE Band 12 (DL)	729-746	60.87	100	-7.27	9
LTE Band 12 (UL)	699-716	53.60	100		
LTE Band 13 (DL)	746-756	62.10	100	-6.12	9
LTE Band 13 (UL)	777-787	55.98	100		

Table 7-16. Maximum Gain – MTT - Port 1

MTT - Port 2

Maximum Gain					
Band	Frequency Range (MHz)	Max Booster Gain (dB)	Gain Limit(dB)	UL vs DL Gain	UL vs DL Gain Limit(dB)
LTE Band 25/2 (DL)	1930-1995	71.08	100	-5.91	9
LTE Band 25/2 (UL)	1850-1915	65.17	100		
LTE Band 4 (DL)	2110-2155	69.52	100	-6.61	9
LTE Band 4 (UL)	1710-1755	62.90	100		
LTE Band 5 (DL)	869-894	60.02	100	-6.47	9
LTE Band 5 (UL)	824-849	53.55	100		
LTE Band 12 (DL)	729-746	61.17	100	-6.94	9
LTE Band 12 (UL)	699-716	54.23	100		
LTE Band 13 (DL)	746-756	62.33	100	-5.88	9
LTE Band 13 (UL)	777-787	56.45	100		

Table 7-17. Maximum Gain – MTT - Port 2

MTT - Port 3

Maximum Gain					
Band	Frequency Range (MHz)	Max Booster Gain (dB)	Gain Limit(dB)	UL vs DL Gain	UL vs DL Gain Limit(dB)
LTE Band 25/2 (DL)	1930-1995	70.38	100	-5.22	9
LTE Band 25/2 (UL)	1850-1915	65.16	100		
LTE Band 4 (DL)	2110-2155	68.19	100	-4.32	9
LTE Band 4 (UL)	1710-1755	63.86	100		
LTE Band 5 (DL)	869-894	59.67	100	-6.23	9
LTE Band 5 (UL)	824-849	53.44	100		
LTE Band 12 (DL)	729-746	60.77	100	-6.33	9
LTE Band 12 (UL)	699-716	54.44	100		
LTE Band 13 (DL)	746-756	61.97	100	-5.67	9
LTE Band 13 (UL)	777-787	56.30	100		

Table 7-18. Maximum Gain – MTT - Port 3

MTT - Port 4

Maximum Gain					
Band	Frequency Range (MHz)	Max Booster Gain (dB)	Gain Limit(dB)	UL vs DL Gain	UL vs DL Gain Limit(dB)
LTE Band 25/2 (DL)	1930-1995	68.80	100	-4.30	9
LTE Band 25/2 (UL)	1850-1915	64.50	100		
LTE Band 4 (DL)	2110-2155	67.50	100	-4.67	9
LTE Band 4 (UL)	1710-1755	62.82	100		
LTE Band 5 (DL)	869-894	59.06	100	-6.61	9
LTE Band 5 (UL)	824-849	52.45	100		
LTE Band 12 (DL)	729-746	60.33	100	-7.06	9
LTE Band 12 (UL)	699-716	53.27	100		
LTE Band 13 (DL)	746-756	61.73	100	-6.12	9
LTE Band 13 (UL)	777-787	55.61	100		

Table 7-19. Maximum Gain – MTT - Port 4

7.6 Intermodulation product

Test Overview

The transmitted intermodulation products of a consumer booster at its uplink and downlink ports shall **not exceed the power level of −19 dBm/3kHz** for the supported bands of operation. Compliance with intermodulation limits will use boosters operating at maximum gain and maximum rated output power, with two continuous wave (CW) input signals spaced 600 kHz apart and centered in the pass band of the booster, and with a 3 kHz measurement bandwidth.

Test Procedures Used

KDB 935210 D04 Section 7.4

Test Settings

1. Connect the signal booster to the test equipment as shown in Figure 7-8 and configure it for operation in either normal mode or test mode.
2. Set the spectrum analyzer RBW = 3 kHz.
3. Set the VBW ≥ 3 x RBW.
4. Select the power averaging (rms) detector.
5. Set the spectrum analyzer center frequency to the center of the supported operational band under test.
6. Set the span to 5 MHz.
7. Configure the two signal generators for CW operation, with signal generator #1 tuned 300 kHz below the operational band center frequency, and signal generator #2 tuned 300 kHz above the operational band center frequency.
8. Set the signal generator amplitudes so that the power from each into the EUT is equivalent, then turn on the RF output.
9. Simultaneously increase the signal generators' amplitudes equally until just before the EUT begins AGC, then affirm that all intermodulation products (if any occur), are below the specified limit of −19 dBm.
10. Utilize the MAX HOLD function of the spectrum analyzer and wait for the trace to stabilize. Place a marker at the highest amplitude intermodulation product.
11. Record the maximum intermodulation product amplitude level that is observed.
12. Capture the spectrum analyzer trace for inclusion in the test report.
13. Increase the signal generator amplitude in 2 dB steps to 10 dB above the AGC threshold determined in Step 9, but to not to exceed the maximum input level specified in 5.5, to ensure that the EUT maintains compliance with the intermodulation limit. The test report shall include either a statement describing that the device complies at 10 dB above AGC or at the 5.5 power levels, or a table showing compliance at the additional input power(s) required.
14. Repeat Step 5 to 13 for all uplink and downlink operational bands.

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

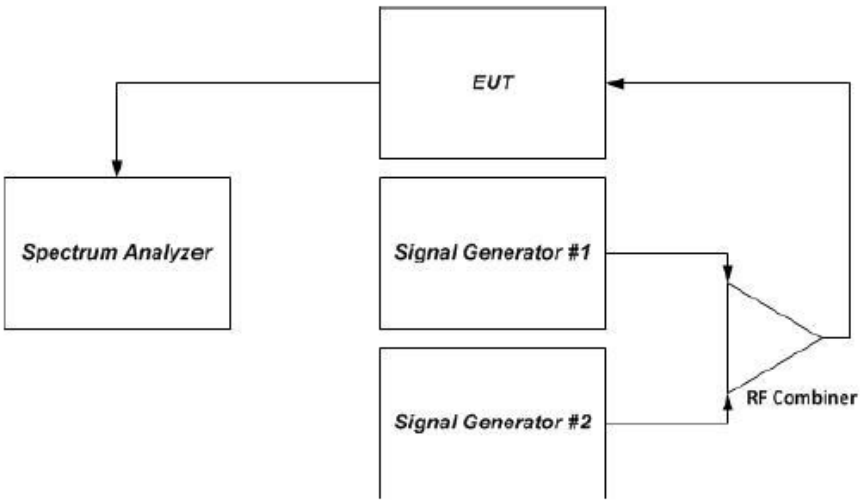
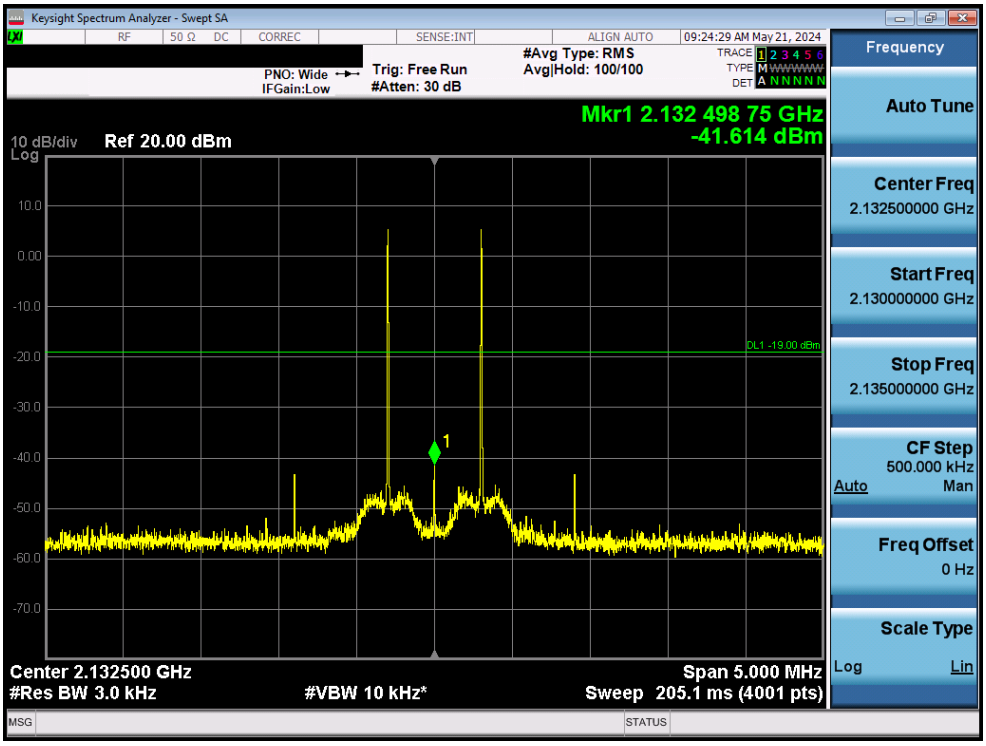


Figure 7-8. Intermodulation product instrumentation test setup

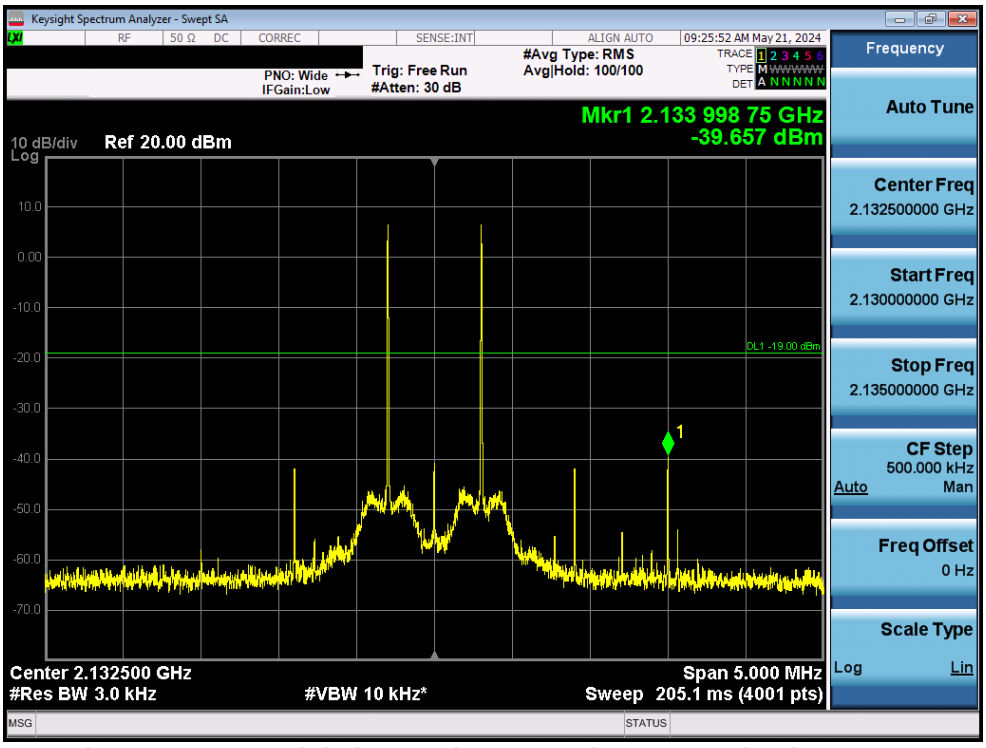
Test Notes

None

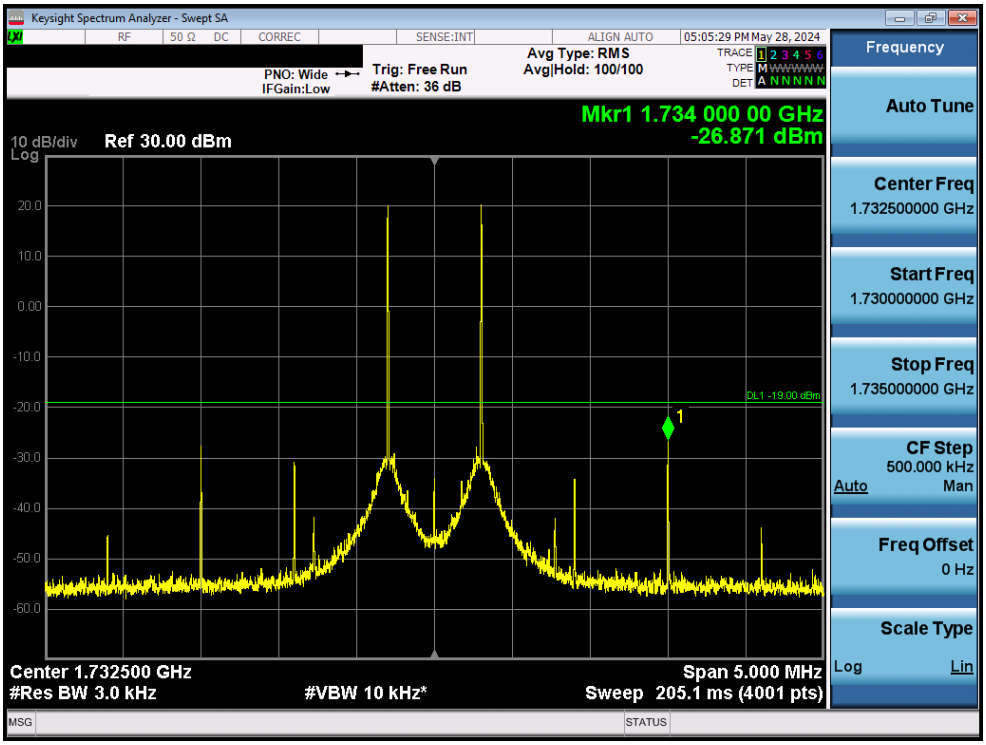
LTE Band 4



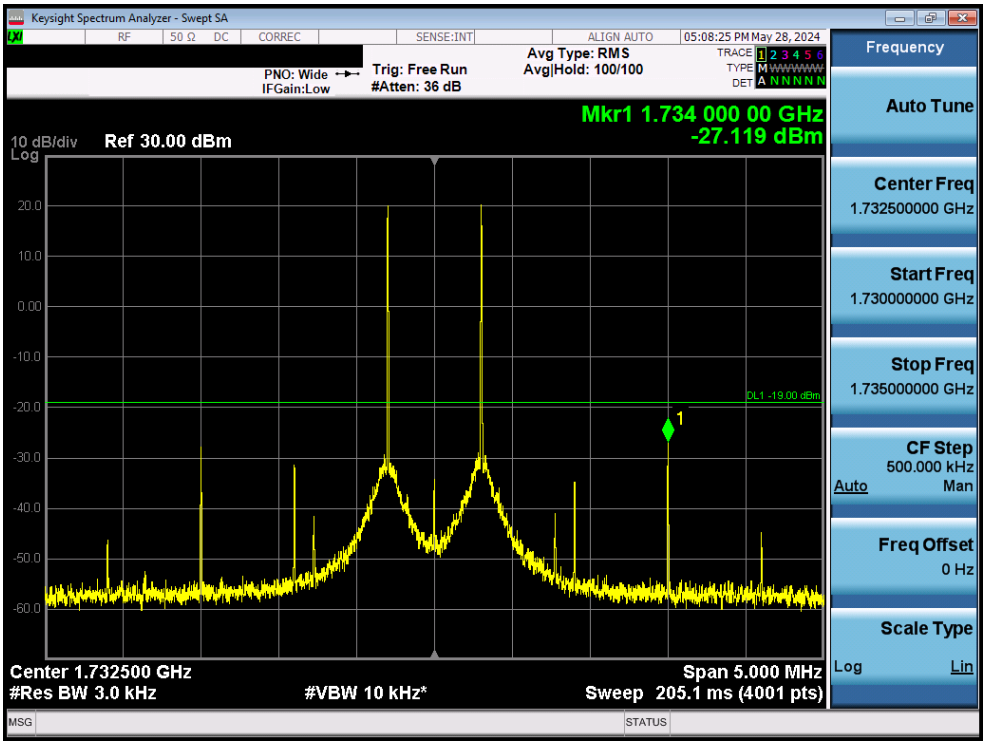
Plot 7-71. Intermodulation product – Band 4 DL @ AGC



Plot 7-72. Intermodulation product – Band 4 DL @ 10dB above AGC

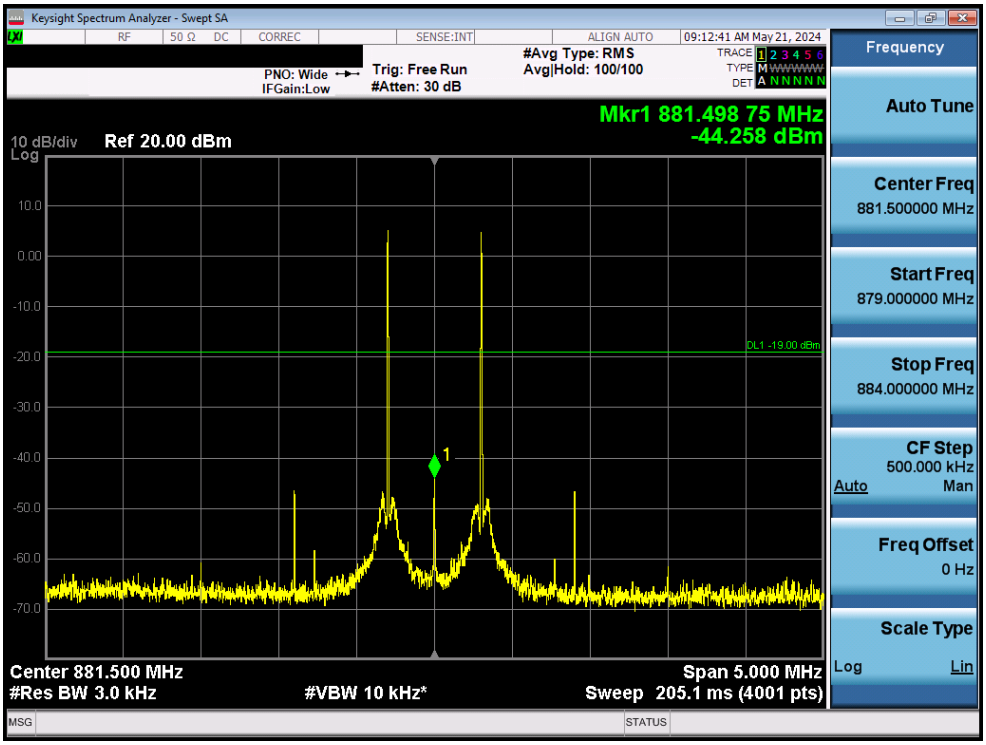


Plot 7-73. Intermodulation product – Band 4 UL @ AGC

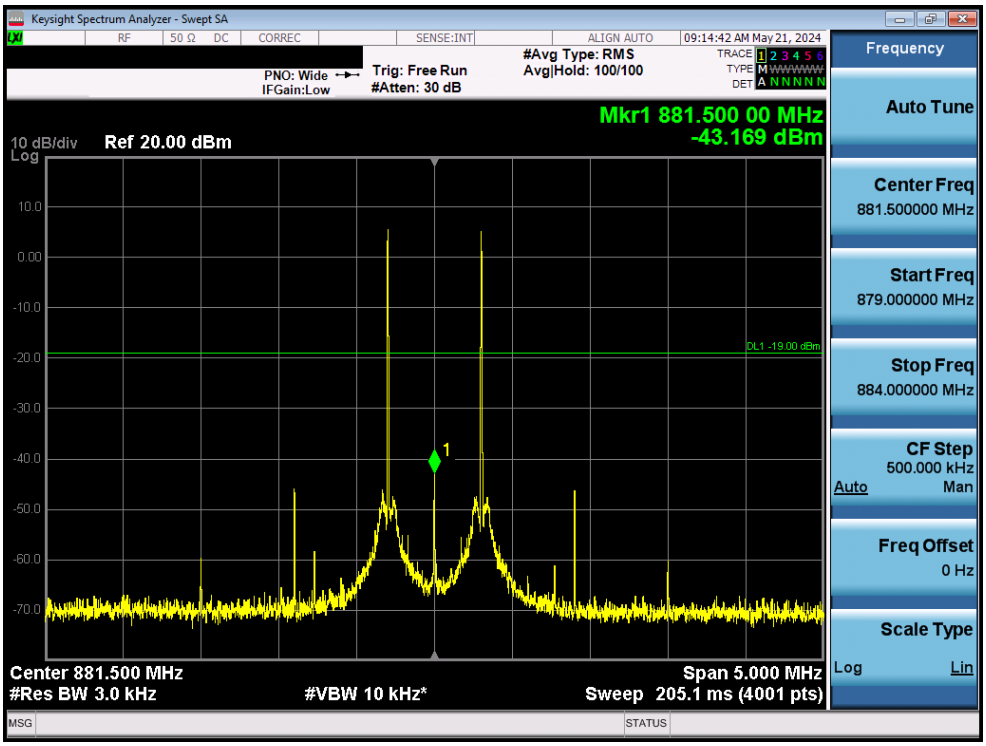


Plot 7-74. Intermodulation product – Band 4 UL @ 10dB above AGC

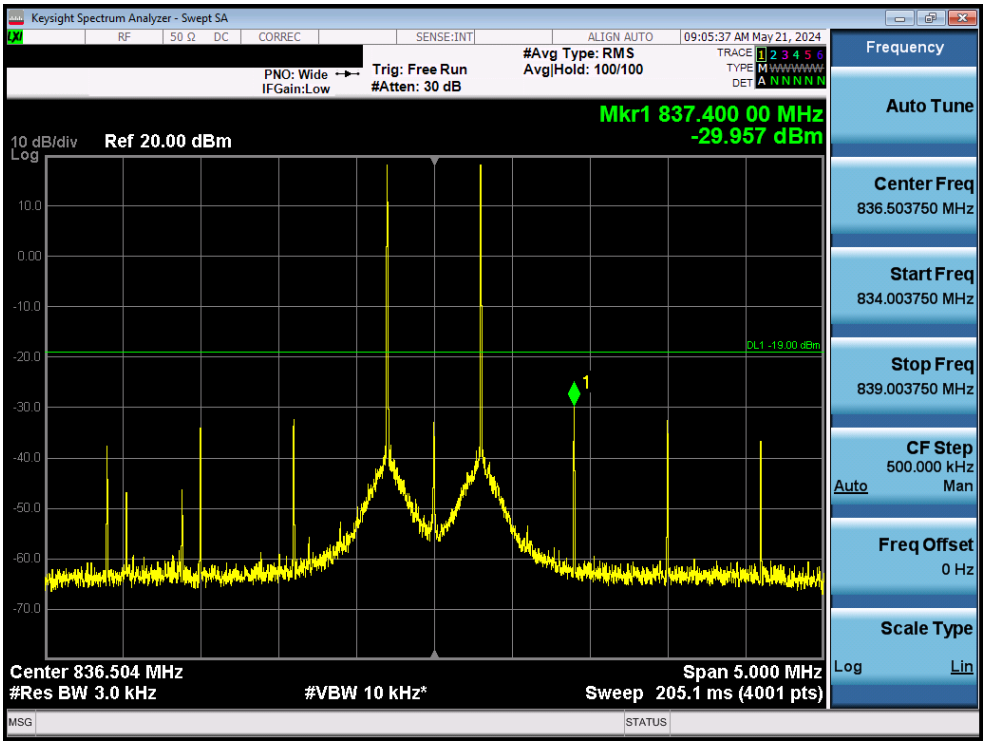
LTE Band 5



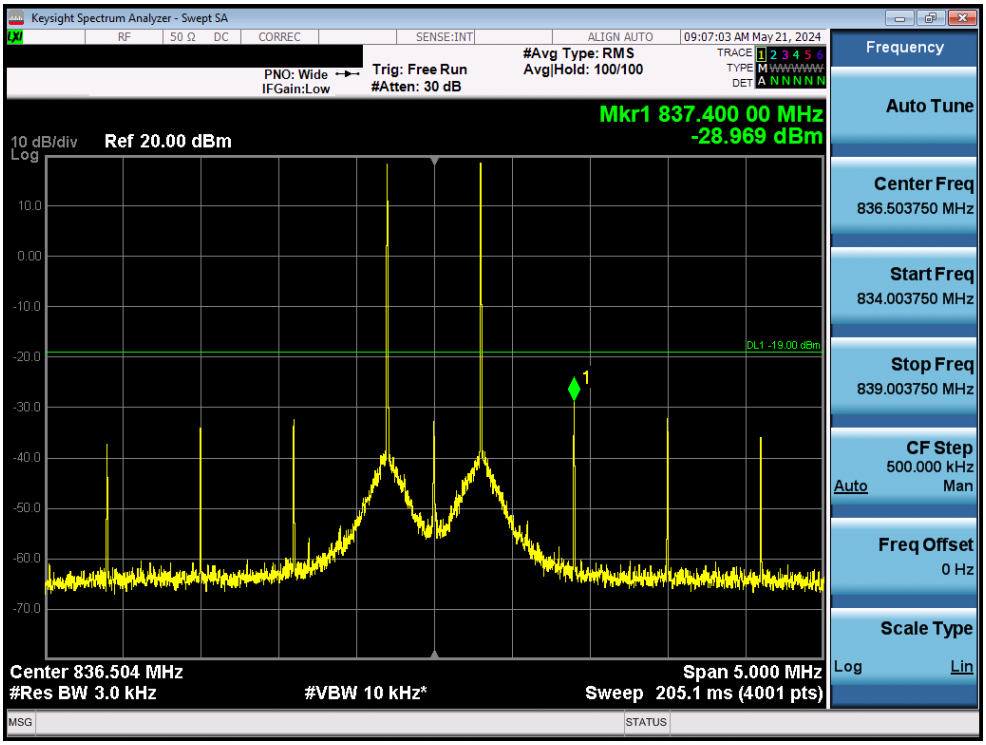
Plot 7-75. Intermodulation product – Band 5 DL @ AGC



Plot 7-76. Intermodulation product – Band 5 DL @ 10dB above AGC

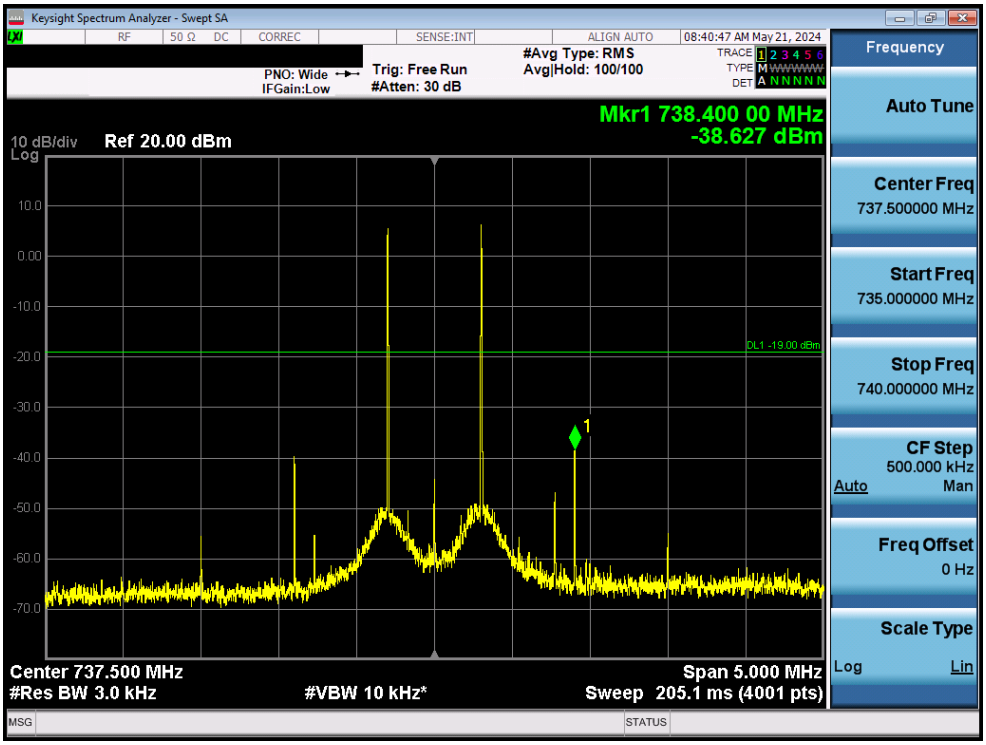


Plot 7-77. Intermodulation product – Band 5 UL @ AGC

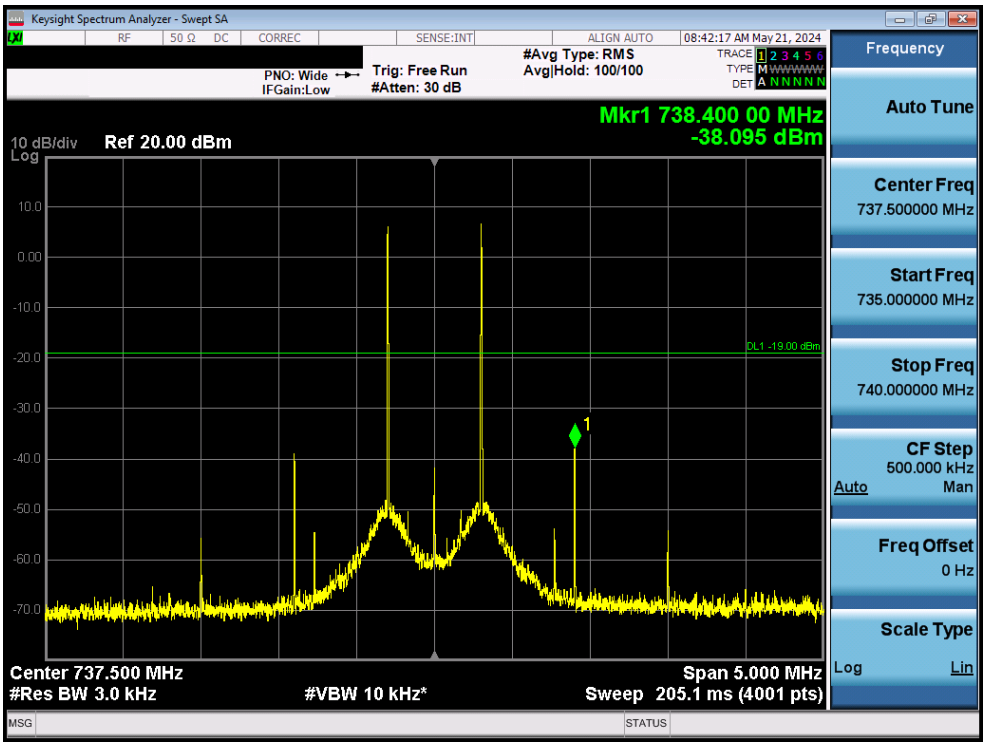


Plot 7-78. Intermodulation product – Band 5 UL @ 10dB above AGC

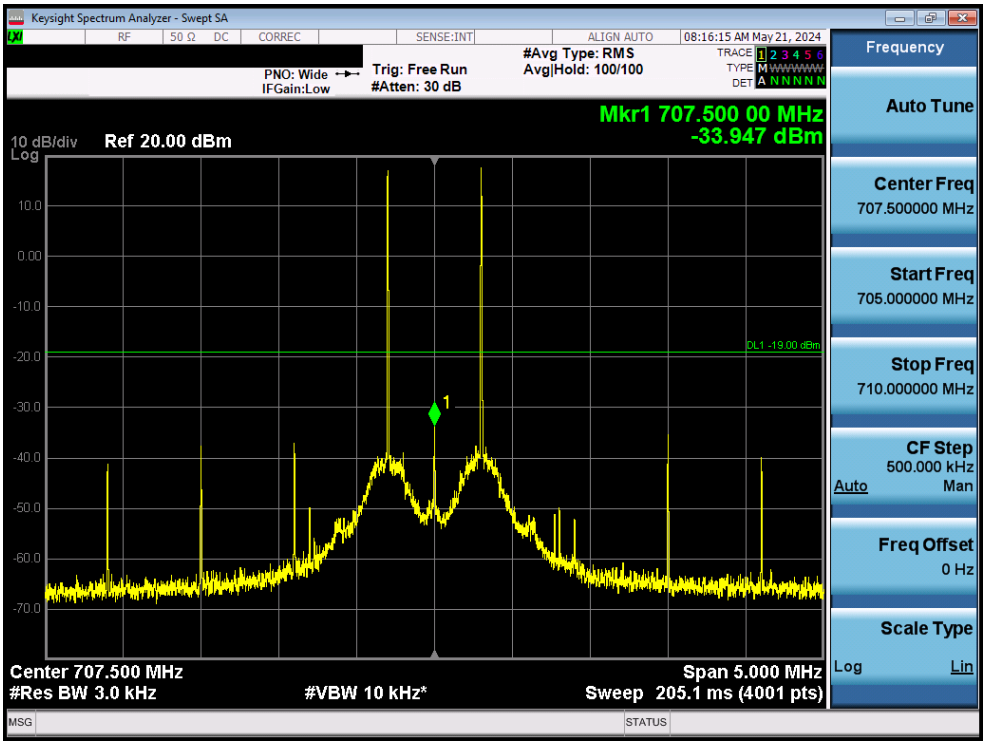
LTE Band 12



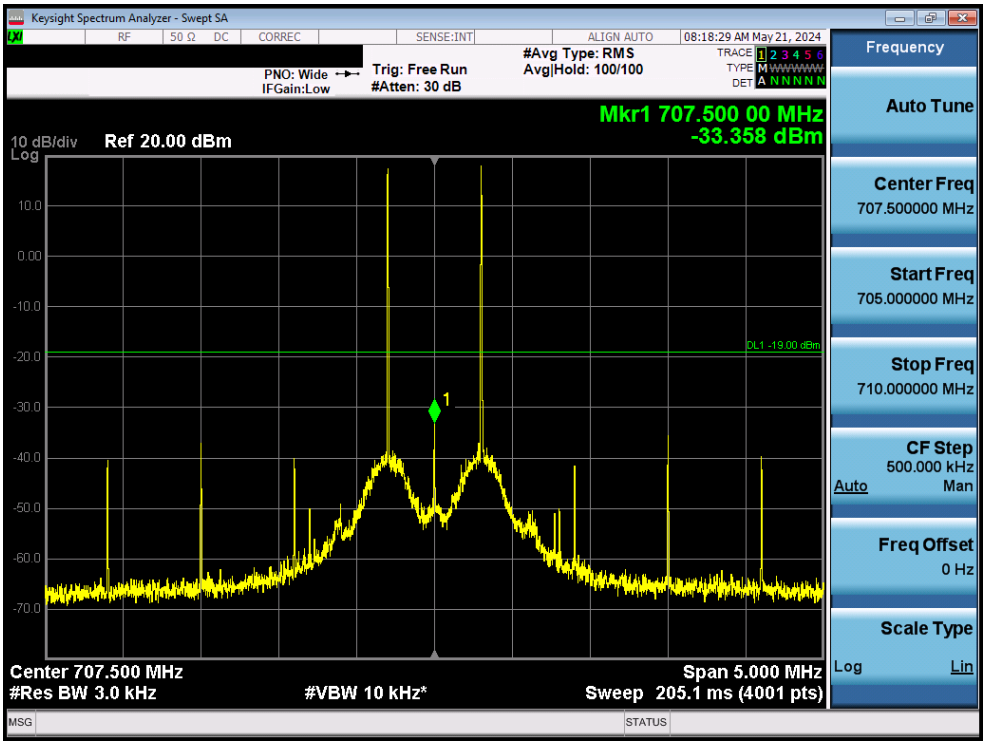
Plot 7-79. Intermodulation product – Band 12 DL @ AGC



Plot 7-80. Intermodulation product – Band 12 DL @ 10dB above AGC

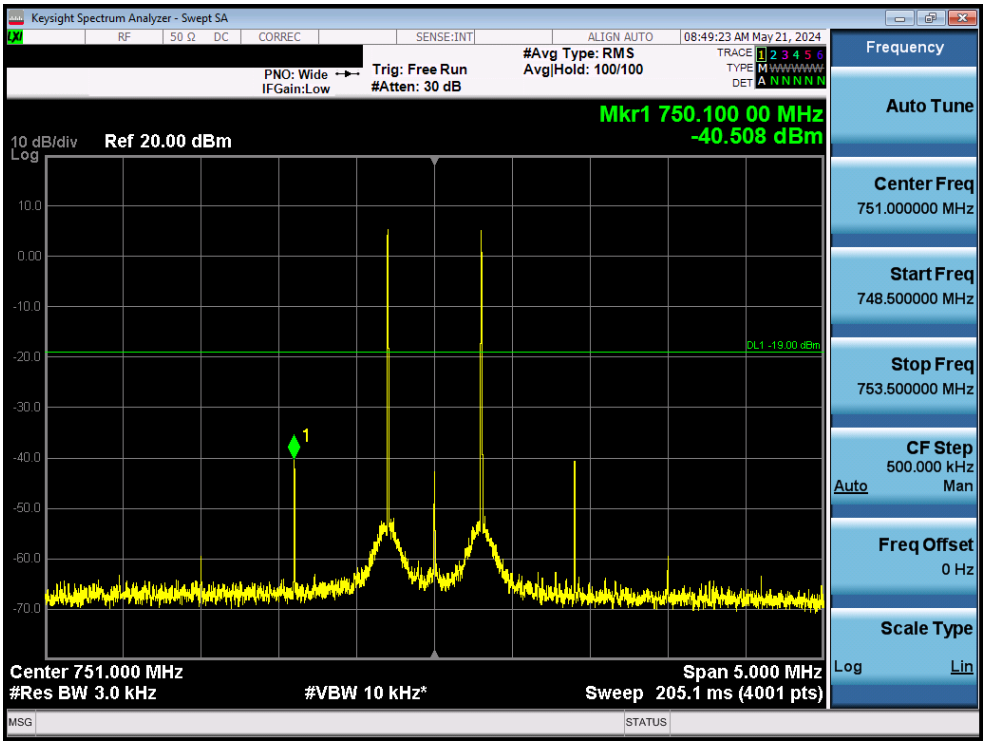


Plot 7-81. Intermodulation product – Band 12 UL @ AGC

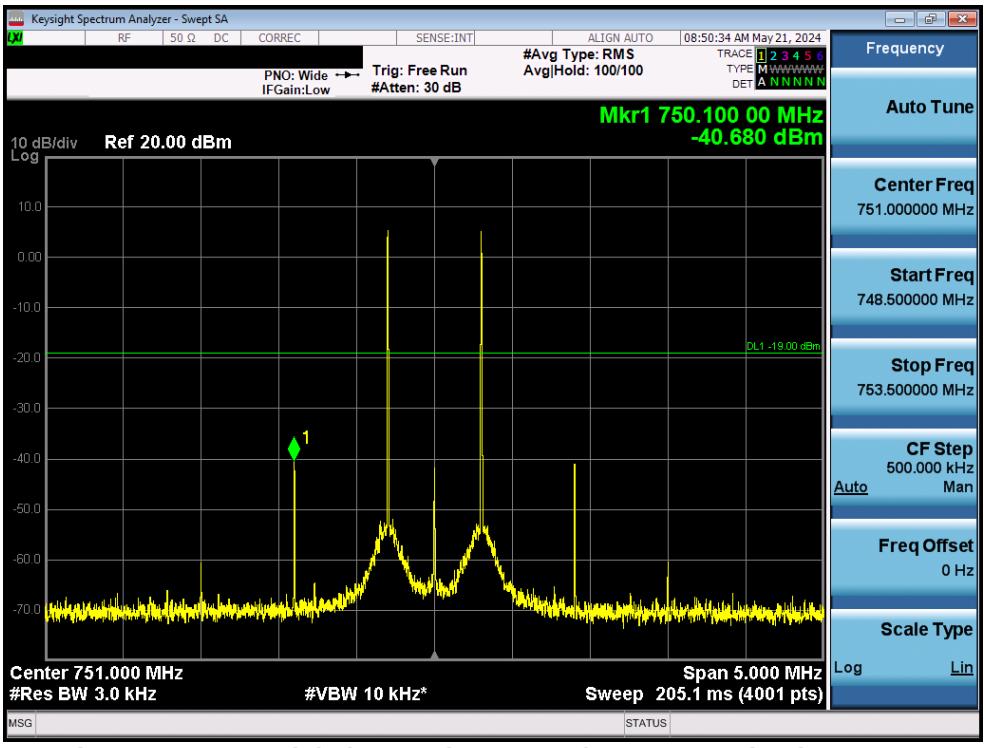


Plot 7-82. Intermodulation product – Band 12 UL @ 10dB above AGC

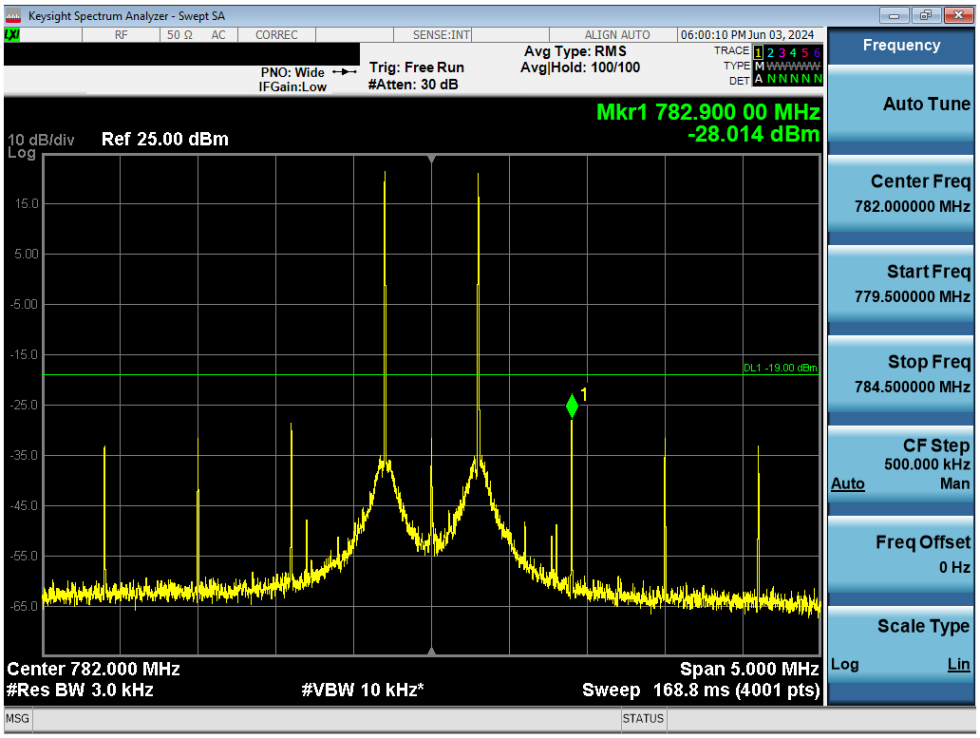
LTE Band 13



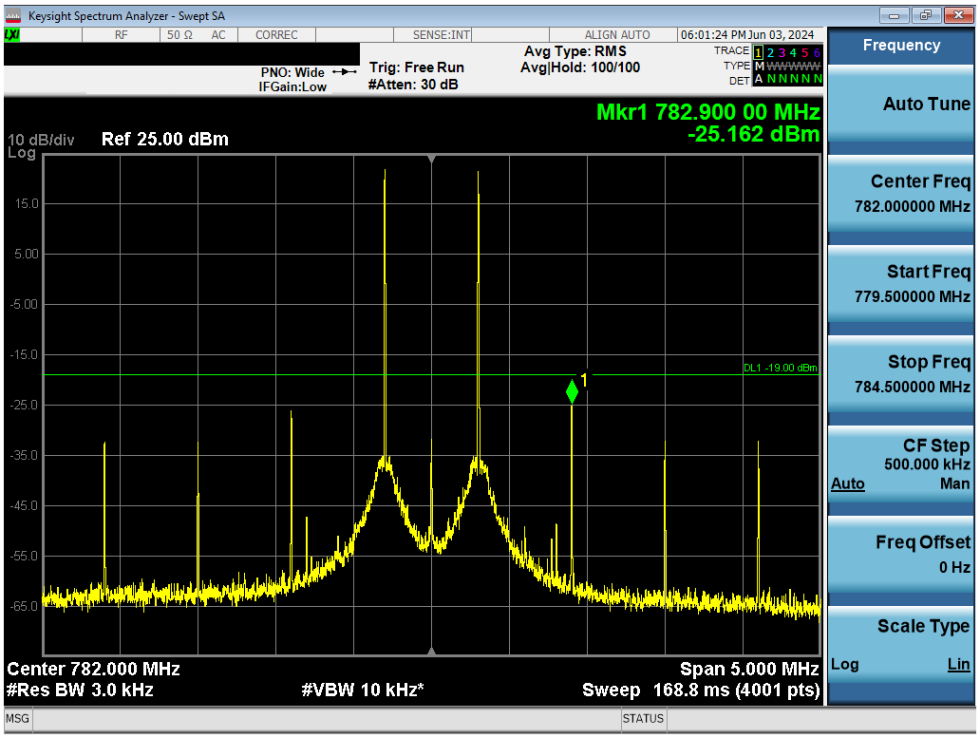
Plot 7-83. Intermodulation product – Band 13 DL @ AGC



Plot 7-84. Intermodulation product – Band 13 DL @ 10dB above AGC

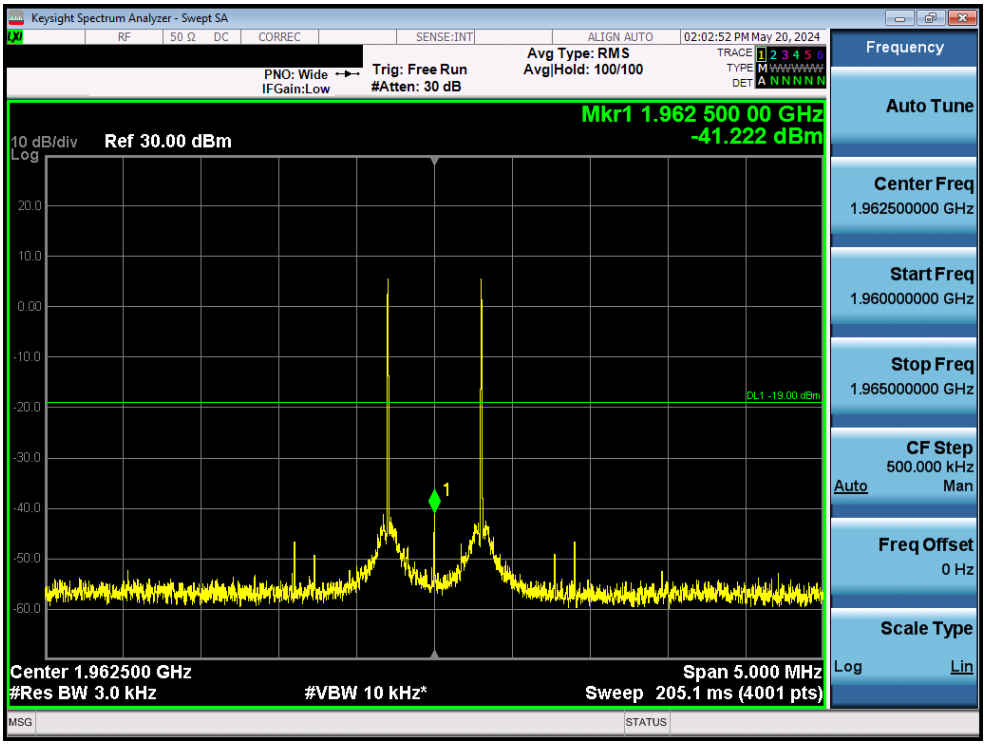


Plot 7-85. Intermodulation product – Band 13 UL @ AGC

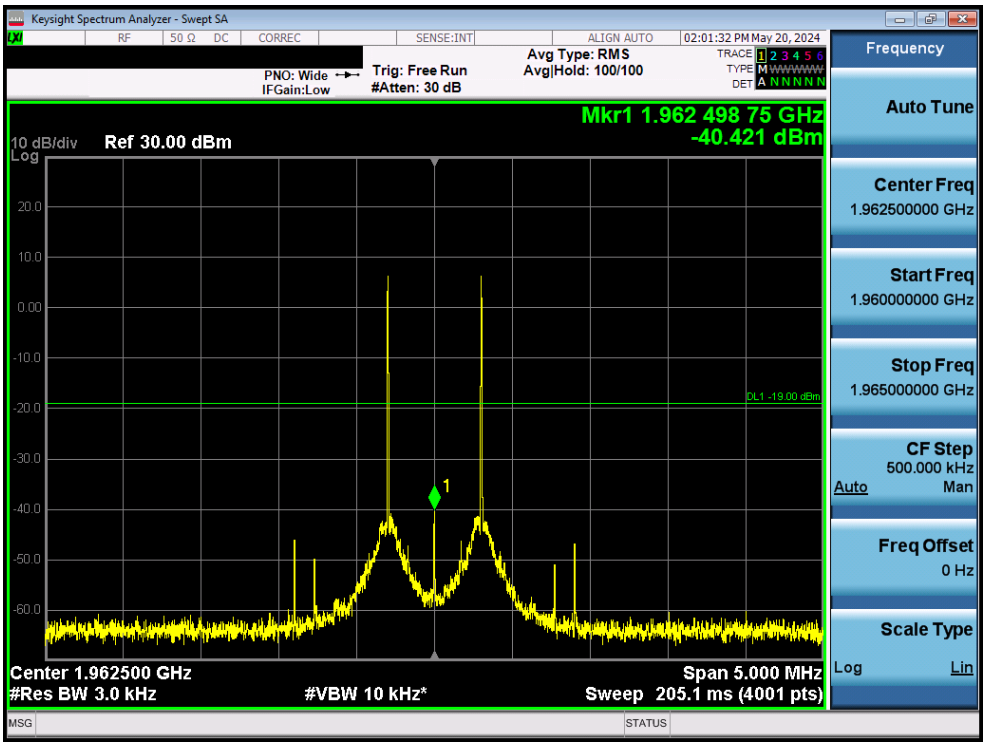


Plot 7-86. Intermodulation product – Band 13 UL @ 10dB above AGC

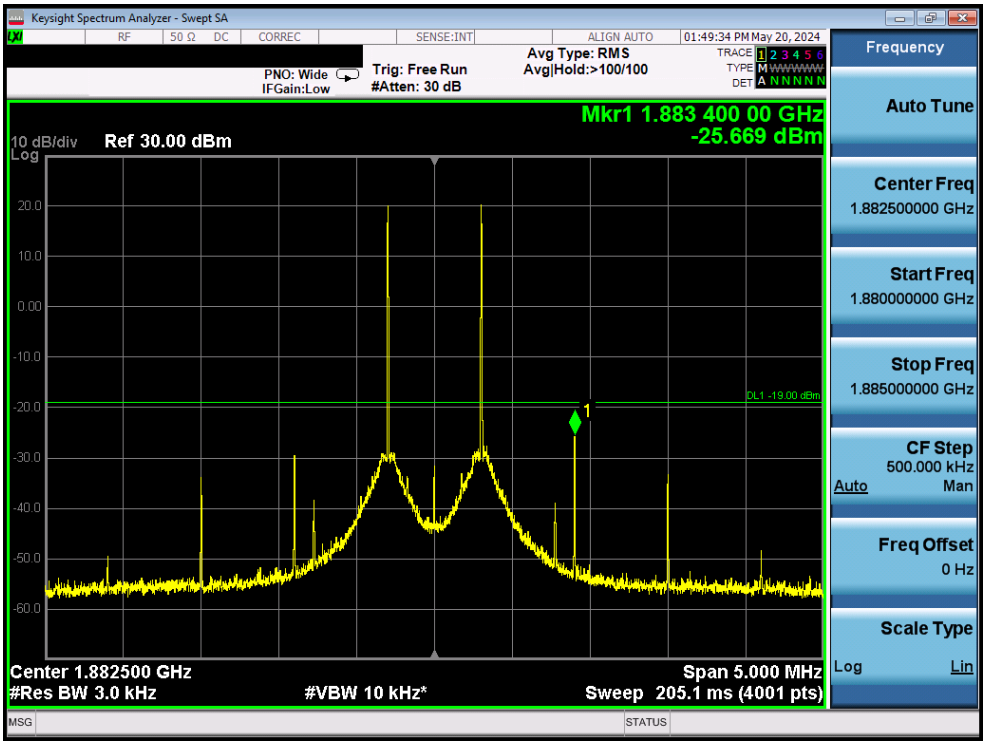
LTE Band 25/2



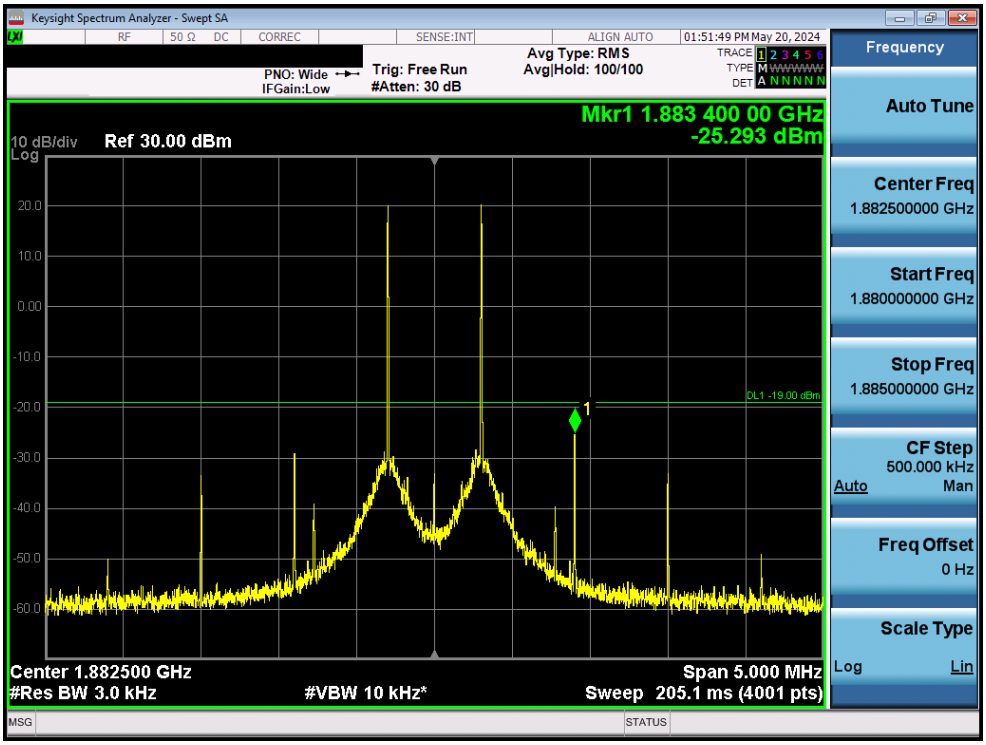
Plot 7-87. Intermodulation product – Band 25/2 DL @ AGC



Plot 7-88. Intermodulation product – Band 25/2 DL @ 10dB above AGC



Plot 7-89. Intermodulation product – Band 25/2 UL @ AGC



Plot 7-90. Intermodulation product – Band 25/2 UL @ 10dB above AGC

7.7 Out of Band Emissions

Test Overview

The booster will be configured to operate on frequencies associated with the highest and lowest spectrum blocks within the CMRS band under test. The out-of-band emissions are referenced to the licensee spectrum block. Booster out of band emissions (OOBE) shall meet the FCC's mobile emission limits for the supported bands of operation.

Test Procedures Used

KDB 935210 D04 Section 7.5

Test Settings

1. Connect the EUT in normal mode or test mode as shown in Figures 7-1 to 7-3. The EUT passband shall be configured for the highest and lowest authorized spectrum blocks within the CMRS band under test.
2. Configure the signal generator for the appropriate operation for all uplink and downlink bands:
   1) GSM: 0.2 MHz from upper and lower band edge.
   2) LTE (5 MHz): 2.5 MHz from upper and lower band edge.
   3) CDMA: 1.25 MHz from upper and lower band edge, except for cellular as follows (only the upper and lower frequencies need to be tested):
3. Set the signal generator amplitude to the maximum power level prior to the AGC threshold as determined from 7.2.2d) to 7.2.2f) of the power measurement procedure for the appropriate modulations.
4. Set RBW = reference bandwidth specified in the applicable rule section for the supported frequency band
5. Set VBW = 3 x RBW.
6. Select the power averaging (rms) detector.
7. Sweep time = auto-couple.
8. Set the analyzer start frequency to the upper band/block edge frequency and the stop frequency to the upper band/block edge frequency plus 300 kHz (when operational frequency is < 1 GHz), or 3 MHz (when operational frequency is ≥ 1 GHz).
9. Trace average at least 100 traces in power averaging (rms) mode.
10. Use peak marker function to find the maximum power level.
11. Capture the spectrum analyzer trace of the power level for inclusion in the test report.
12. Increase the signal generator amplitude in 2 dB steps until the maximum input level per 5.5 is reached. Affirm that the EUT maintains compliance with the OOBE limits. The test report shall include either a statement describing that the device complies at 10 dB above AGC or at the 5.5 power levels, or a table showing compliance at the additional input power(s) required.
13. Reset the analyzer start frequency to the lower band/block edge frequency minus: 300 kHz (when operational frequency is < 1 GHz), or 3 MHz (when operational frequency is ≥ 1 GHz), and the stop frequency to the lower band/block edge frequency, then repeat Step 9 to 12.

14. Repeat Step 2 through 13 for each uplink and downlink operational band.

Test Notes

None

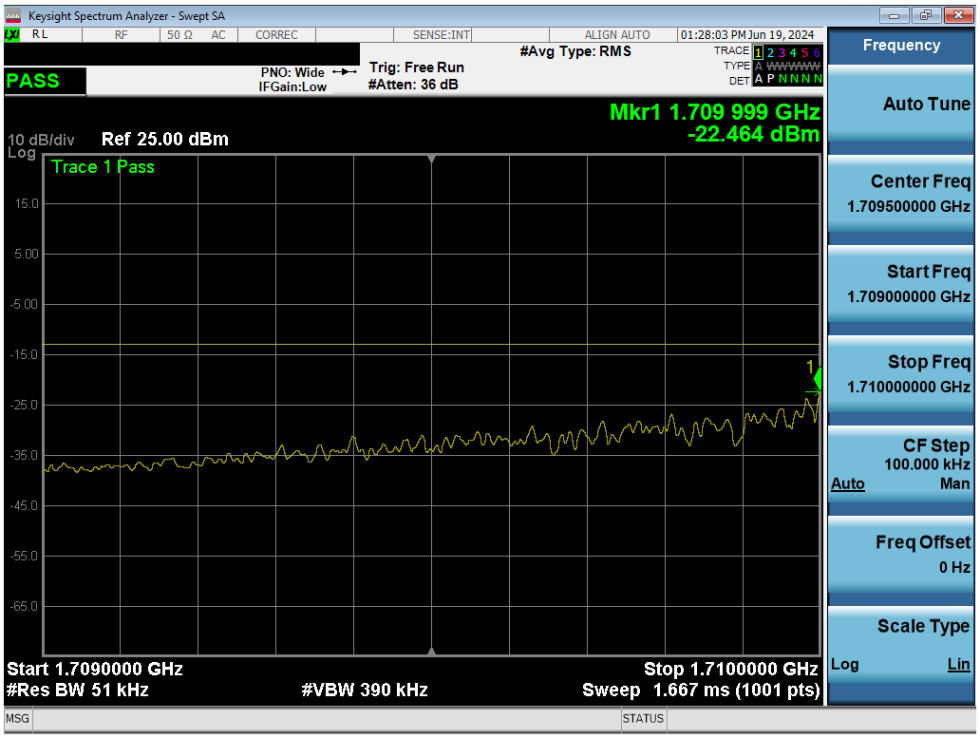
LTE Band 4

Plot 7-91. Out of Band Emissions – Band 4 DL Lower OOBE @ AGC

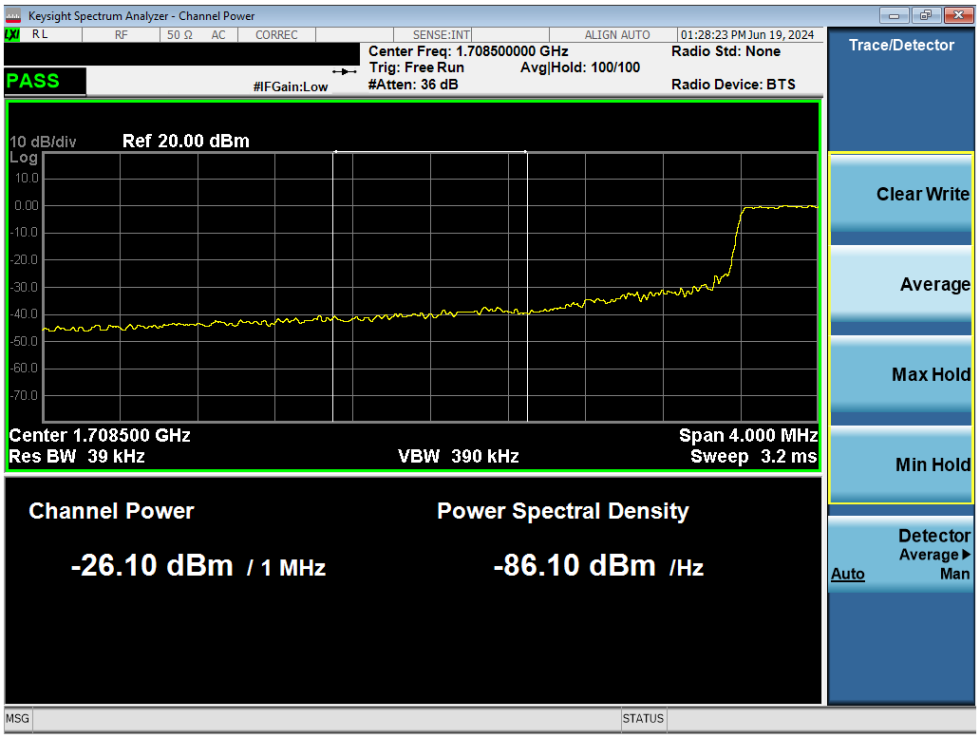
Plot 7-92. Out of Band Emissions – Band 4 DL Lower OOBE @ 10dB above AGC

Plot 7-93. Out of Band Emissions – Band 4 DL Upper OOBE @ AGC

Plot 7-94. Out of Band Emissions – Band 4 DL Upper OOBE @ 10dB above AGC



Plot 7-95. Out of Band Emissions – Band 4 UL Lower OOBE @ AGC



Plot 7-96. Out of Band Emissions – Band 4 UL Lower Extended OOBE @ AGC