ELEMENT WASHINGTON DC LLC
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.element.com

PART 24 MEASUREMENT REPORT

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
5/30/2023 - 8/9/2023
Test Report Issue Date:
8/9/2023
Test Site/Location:
Element Lab., Columbia, MD, USA
Test Report Serial No.:
1M2304260063-05.A3L

FCC ID:	**A3LSMS711B**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-S711B/DS
Additional Model(s):	SM-S711B
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	24
Test Procedure(s):	ANSI C63.26-2015, KDB 648474 D03 v01r04

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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Antenna-A						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	1850.2 - 1909.8	0.844	29.26	245KGXW
EDGE	N/A	8-PSK	1850.2 - 1909.8	0.273	24.36	250KG7W
WCDMA	N/A	Spread Spectrum	1852.4 - 1907.6	0.183	22.62	4M20F9W
LTE Band 2	20 MHz	QPSK	1860 - 1900	0.164	22.15	18M1G7D
		16QAM	1861 - 1900	0.133	21.23	18M0W7D
	15 MHz	QPSK	1857.5 - 1902.5	0.164	22.16	13M5G7D
		16QAM	1857.5 - 1902.5	0.138	21.39	13M5W7D
	10 MHz	QPSK	1855 - 1905	0.160	22.04	9M05G7D
		16QAM	1855 - 1905	0.130	21.13	9M08W7D
	5 MHz	QPSK	1852.5 - 1907.5	0.164	22.15	4M54G7D
		16QAM	1852.5 - 1907.5	0.126	21.00	4M54W7D
	3 MHz	QPSK	1851.5 - 1908.5	0.158	22.00	2M72G7D
		16QAM	1851.5 - 1908.5	0.125	20.98	2M73W7D
	1.4 MHz	QPSK	1850.7 - 1909.3	0.155	21.90	1M11G7D
		16QAM	1850.7 - 1909.3	0.126	21.00	1M11W7D

Antenna-F						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 2	20 MHz	QPSK	1860 - 1900	0.072	18.57	17M9G7D
		16QAM	1861 - 1900	0.057	17.58	17M9W7D
	15 MHz	QPSK	1857.5 - 1902.5	0.073	18.65	13M4G7D
		16QAM	1857.5 - 1902.5	0.071	18.52	13M5W7D
	10 MHz	QPSK	1855 - 1905	0.073	18.63	9M02G7D
		16QAM	1855 - 1905	0.059	17.68	9M02W7D
	5 MHz	QPSK	1852.5 - 1907.5	0.074	18.68	4M51G7D
		16QAM	1852.5 - 1907.5	0.061	17.83	4M51W7D
	3 MHz	QPSK	1851.5 - 1908.5	0.071	18.52	2M73G7D
		16QAM	1851.5 - 1908.5	0.061	17.82	2M72W7D
	1.4 MHz	QPSK	1850.7 - 1909.3	0.070	18.47	1M10G7D
		16QAM	1850.7 - 1909.3	0.058	17.66	1M10W7D

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 and the Innovation, Science and Economic Development Canada.

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 **Samsung Portable Handset FCC ID: A3LSMS711B**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 24 and RSS-133.

Test Device Serial No.: 0168M, 0073M, 1056M, 0874M, 1050, 0974M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" condition where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

Band	Ant1	Ant2
B2	ANT A	ANT F
GSM/GPRS PCS	ANT A	
WCDMA PCS	ANT A	

Table 2-1. Antenna Naming Convention

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) Model: EP-N5100 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version S711BXXU_0627_0900_devFull 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.

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) 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 power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]};$$

where P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\ [dBm]}$ – cable loss $_{[dB]}$.

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

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 the National Institute of Standards and Technology (NIST). 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
-	AP2-001	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	AP2-001
-	AP2-002	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	AP2-002
-	ETS-001	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-001
-	ETS-002	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-002
-	LTX1	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX1
-	LTX2	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX2
-	LTX3	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX3
-	LTX4	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX4
-	LTX5	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX5
Anritsu	MT8821C	Radio Communication Analyzer	N/A			620152694
EMCO	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
EMCO	3116	Horn Antenna (18-40GHz)	7/20/2021	Biennial	8/30/2023	9203-2178
Keysight Technologies	N9030A	PXA Signal Analyzer (3Hz-26.5GHz)	9/6/2022	Annual	9/6/2023	MY54490576
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	3/15/2023	Annual	3/15/2024	MY52350166
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	9/28/2022	Biennial	9/28/2024	101058
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/29/2022	Annual	8/29/2023	100342
Rohde & Schwarz	ESW44	EMI Test Receiver (2Hz-44GHz)	3/1/2023	Annual	3/1/2024	101716
Rohde & Schwarz	VULB9162	Bi-Log Antenna	2/21/2023	Biennial	2/21/2025	00301
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	8/30/2022	Biennial	8/30/2024	A051107

Table 5-1. Test Equipment

Notes:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

2. Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.

6.0 SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW
GSM BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 250KG7W
EDGE BW = 250 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M16F9W
WCDMA BW = 4.16 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 8M62G7D
LTE BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D
LTE BW = 8.45 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm – (-24.80) = 50.3 dBc.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMS711B

FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)

Mode(s): GSM/GPRS/EDGE/WCDMA/LTE

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power*	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(a)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio	24.232(d)	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 24.235	Fundamental emissions stay within authorized frequency block **Carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm	PASS	Section 7.9
RADIATED	Equivalent Isotropic Radiated Power	24.232(c)	< 2 Watts max. EIRP	PASS	Section 7.7
	Radiated Spurious Emissions	2.1053, 24.238(a)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power **Spurious emissions from receivers shall not exceed the limits detailed in RSS-Gen(7.3)	PASS	Section 7.8

* The only transmitter output conducted powers included in this report are those where the Pmax value, per the tune-up document, is higher than any of the DSI power levels. For the remaining conducted power measurements, see the **RF Exposure Report**.

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.0.

7.2 Conducted Output Power Data

Test Overview

All emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2

Test Settings

1. Detector = RMS
2. Trace mode = trace average for continuous emissions, max hold for pulse emissions
3. Sweep time = auto couple
4. The trace was allowed to stabilize
5. Please see test notes below for RBW and VBW settings

Test Setup

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

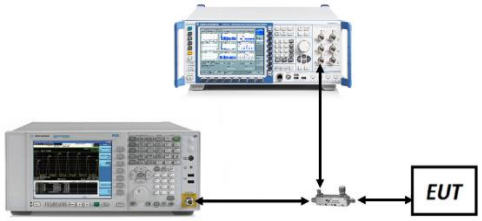


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. Conducted power measurements were evaluated using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.

2. All other conducted power measurements are contained in the RF exposure report for this filing.

3GPP Release Version	Mode	3GPP 34.121 Subtest	PCS Band [dBm]		
			9262	9400	9538
99	WCDMA	12.2 kbps RMC	23.84	23.93	23.42

Table 7-2. WCDMA-PCS Conducted Powers

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	18700	1860.0	1 / 0	24.26
		18900	1880.0	1 / 0	24.12
	16-QAM	18700	1860.0	1 / 0	23.36
15 MHz	QPSK	18675	1857.5	1 / 74	24.26
		18900	1880.0	1 / 0	24.27
		19125	1902.5	1 / 0	24.29
	16-QAM	18675	1857.5	1 / 74	23.52
10 MHz	QPSK	18650	1855.0	1 / 49	24.15
		18900	1880.0	1 / 0	24.20
		19150	1905.0	1 / 0	24.26
	16-QAM	18650	1855.0	1 / 49	23.26
5 MHz	QPSK	18625	1852.5	1 / 12	24.25
		18900	1880.0	1 / 0	24.18
		19175	1907.5	1 / 12	24.15
	16-QAM	18625	1852.5	1 / 0	23.13
3 MHz	QPSK	18615	1851.5	1 / 7	24.10
		18900	1880.0	1 / 14	24.07
		19185	1908.5	1 / 14	24.05
	16-QAM	18615	1851.5	1 / 0	23.11
1.4 MHz	QPSK	18607	1850.7	1 / 5	24.01
		18900	1880.0	1 / 0	24.06
		19193	1909.3	1 / 5	24.03
	16-QAM	18607	1850.7	1 / 5	23.14

Table 7-3. LTE Conducted Powers – Band 2 – Ant1

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	18700	1860.0	1 / 0	22.96
		18900	1880.0	100 / 0	22.91
		19100	1900.0	100 / 0	22.97
	16-QAM	18900	1880.0	100 / 0	21.89
15 MHz	QPSK	18675	1857.5	75 / 0	22.96
		18900	1880.0	1 / 0	23.00
		19125	1902.5	75 / 0	23.07
	16-QAM	18900	1880.0	1 / 0	22.83
10 MHz	QPSK	18650	1855.0	1 / 0	22.98
		18900	1880.0	50 / 0	22.98
		19150	1905.0	50 / 0	23.11
	16-QAM	18900	1880.0	50 / 0	22.00
5 MHz	QPSK	18625	1852.5	25 / 0	22.89
		18900	1880.0	1 / 12	23.03
		19175	1907.5	1 / 24	23.04
	16-QAM	18900	1880.0	1 / 24	22.15
3 MHz	QPSK	18615	1851.5	1 / 14	22.83
		18900	1880.0	1 / 7	22.86
		19185	1908.5	15 / 0	22.92
	16-QAM	18900	1880.0	1 / 14	22.14
1.4 MHz	QPSK	18607	1850.7	1 / 5	22.76
		18900	1880.0	1 / 0	22.82
		19193	1909.3	1 / 0	22.89
	16-QAM	18900	1880.0	1 / 0	21.97

Table 7-4. LTE Conducted Powers – Band 2 – Ant2

7.3 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst-case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.4.4

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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

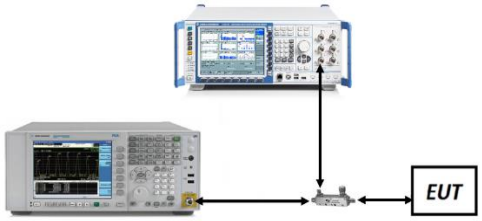


Figure 7-2. Test Instrument & Measurement Setup

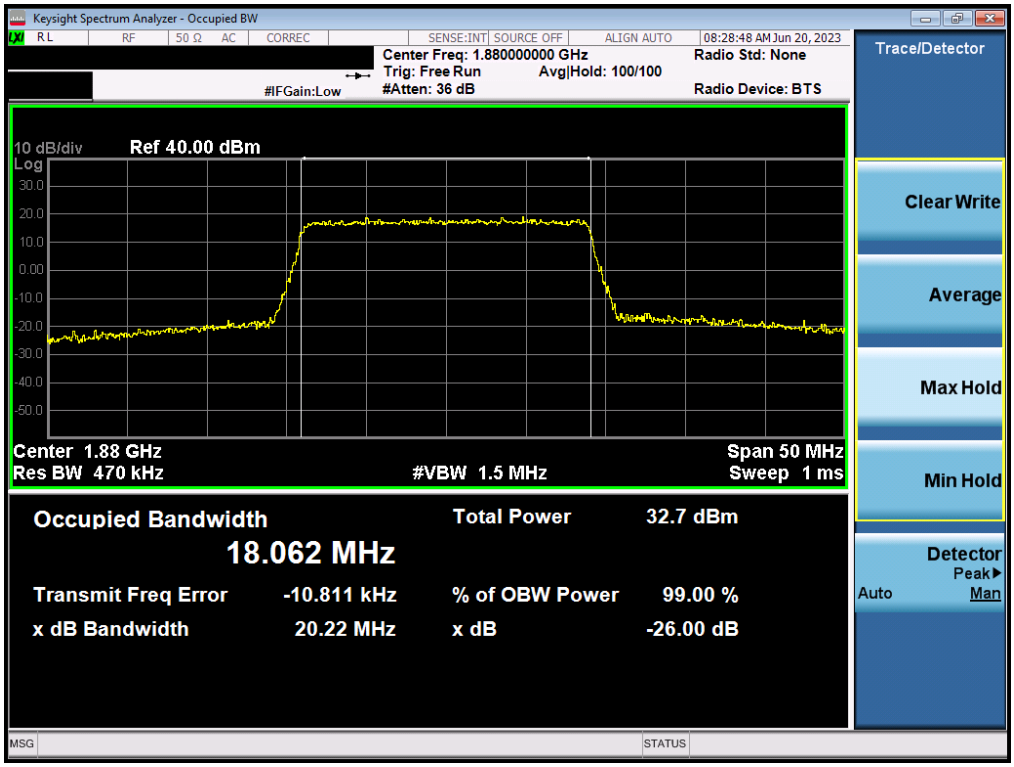
Test Notes

None.

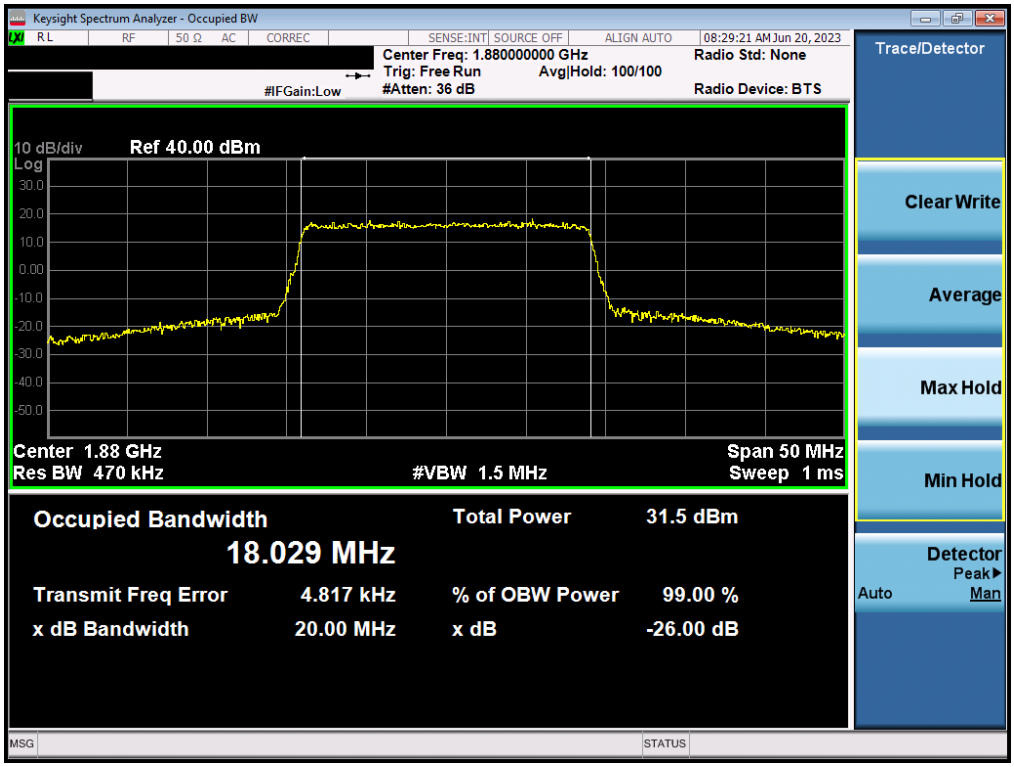
Mode	Bandwidth	Modulation	OBW [MHz]
GSM-PCS	N/A	GMSK	0.245
GSM-PCS	N/A	8-PSK	0.250
WCDMA-PCS	N/A	Spread Spectrum	4.20
LTE-B2	20 MHz	QPSK	18.06
		16QAM	18.03
	15 MHz	QPSK	13.53
		16QAM	13.51
	10 MHz	QPSK	9.05
		16QAM	9.08
	5 MHz	QPSK	4.54
		16QAM	4.54
	3 MHz	QPSK	2.72
		16QAM	2.73
	1.4 MHz	QPSK	1.11
		16QAM	1.11

Table 7-5. Occupied Bandwidth Results – Ant1

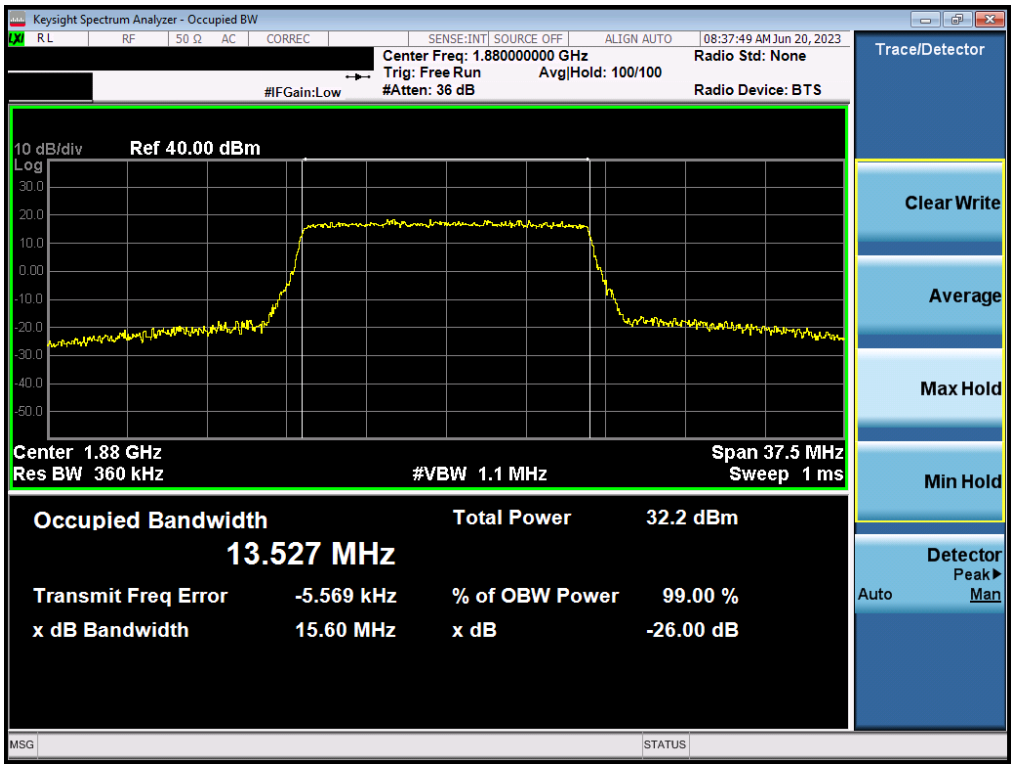
LTE Band 2 – Ant1



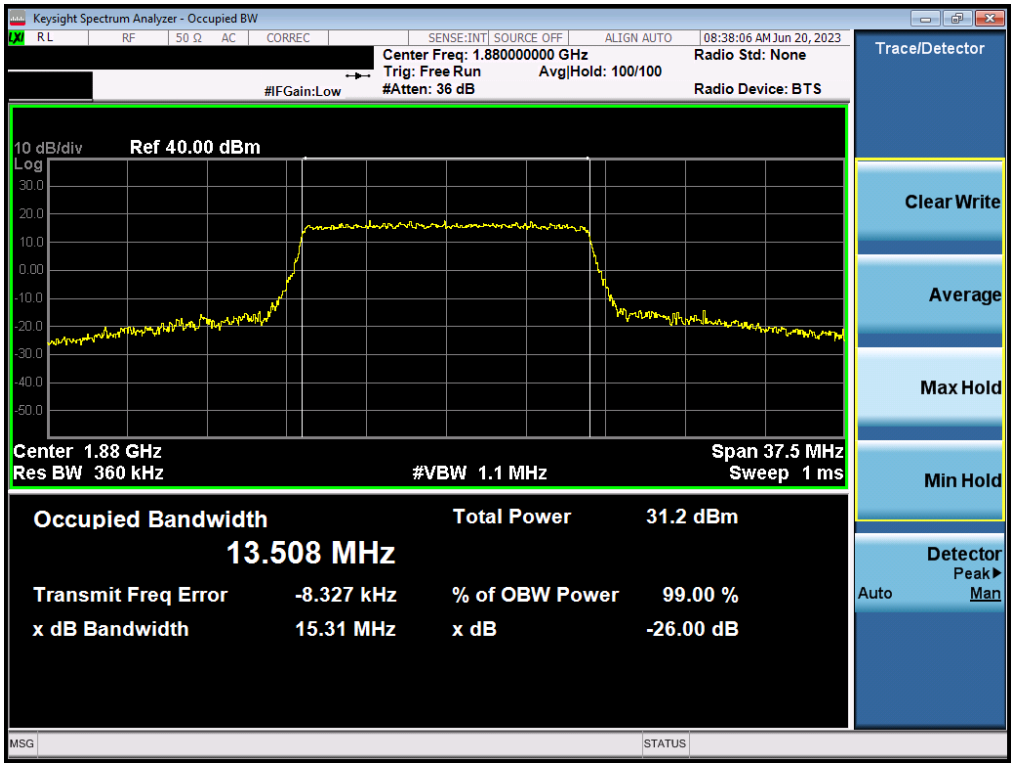
Plot 7-1. Occupied Bandwidth Plot (LTE Band 2 - 20MHz QPSK - Full RB - Ant1)



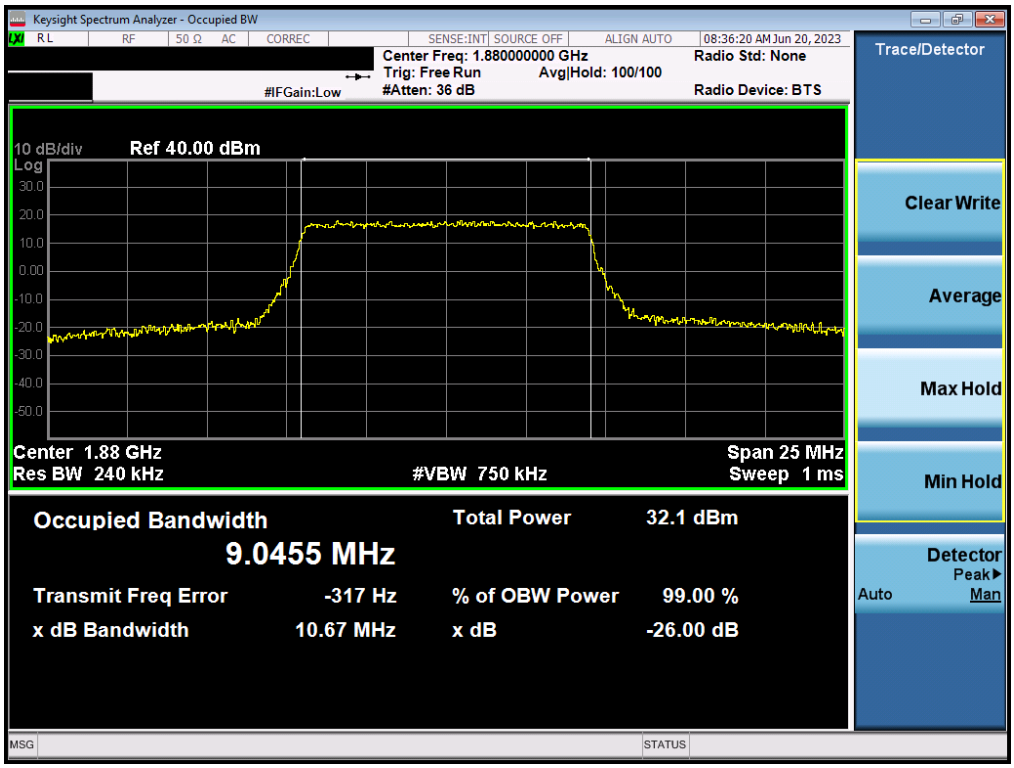
Plot 7-2. Occupied Bandwidth Plot (LTE Band 2 - 20MHz 16-QAM - Full RB - Ant1)



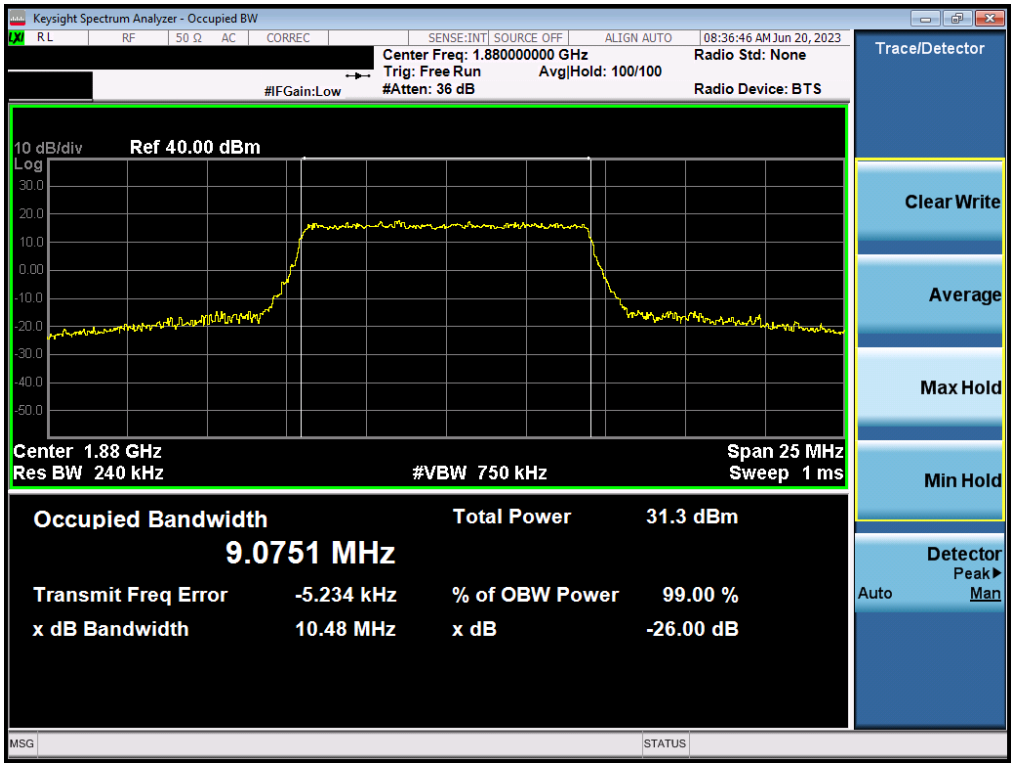
Plot 7-3. Occupied Bandwidth Plot (LTE Band 2 - 15MHz QPSK - Full RB - Ant1)



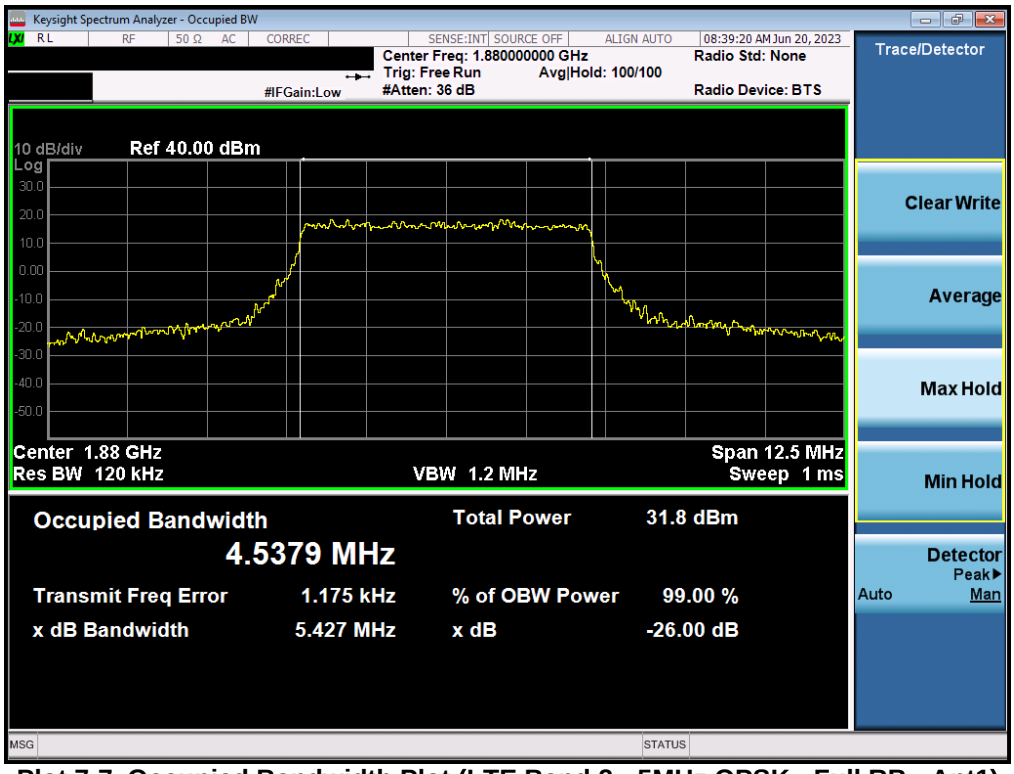
Plot 7-4. Occupied Bandwidth Plot (LTE Band 2 - 15MHz 16-QAM - Full RB - Ant1)



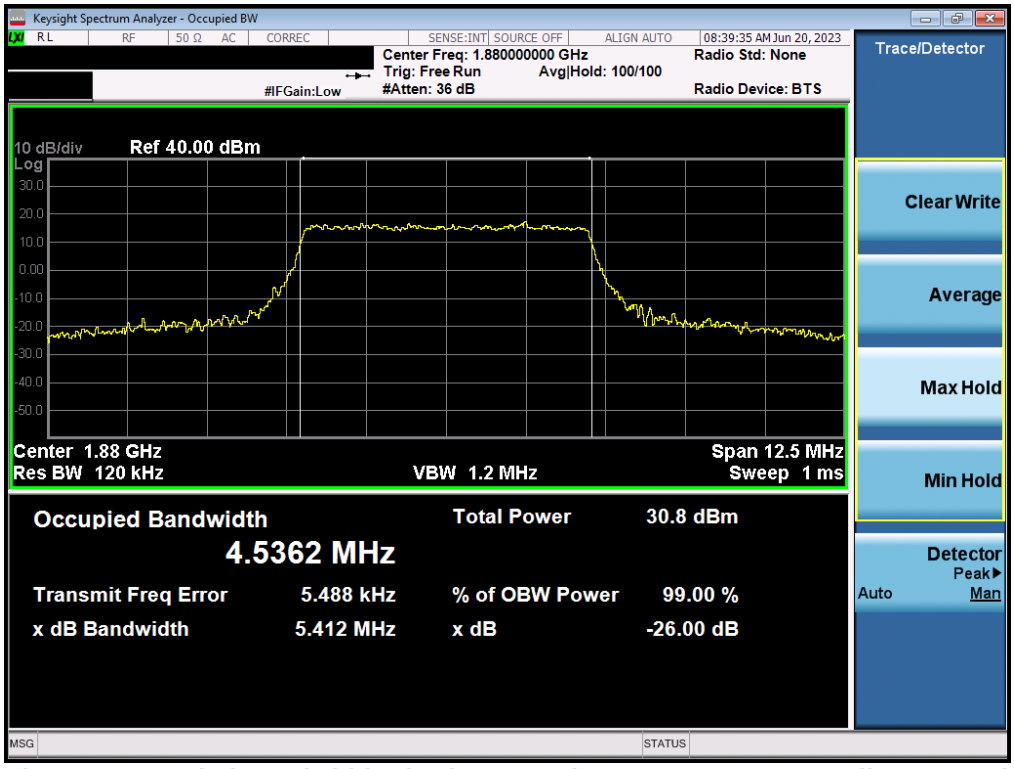
Plot 7-5. Occupied Bandwidth Plot (LTE Band 2 - 10MHz QPSK - Full RB - Ant1)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 2 - 10MHz 16-QAM - Full RB - Ant1)

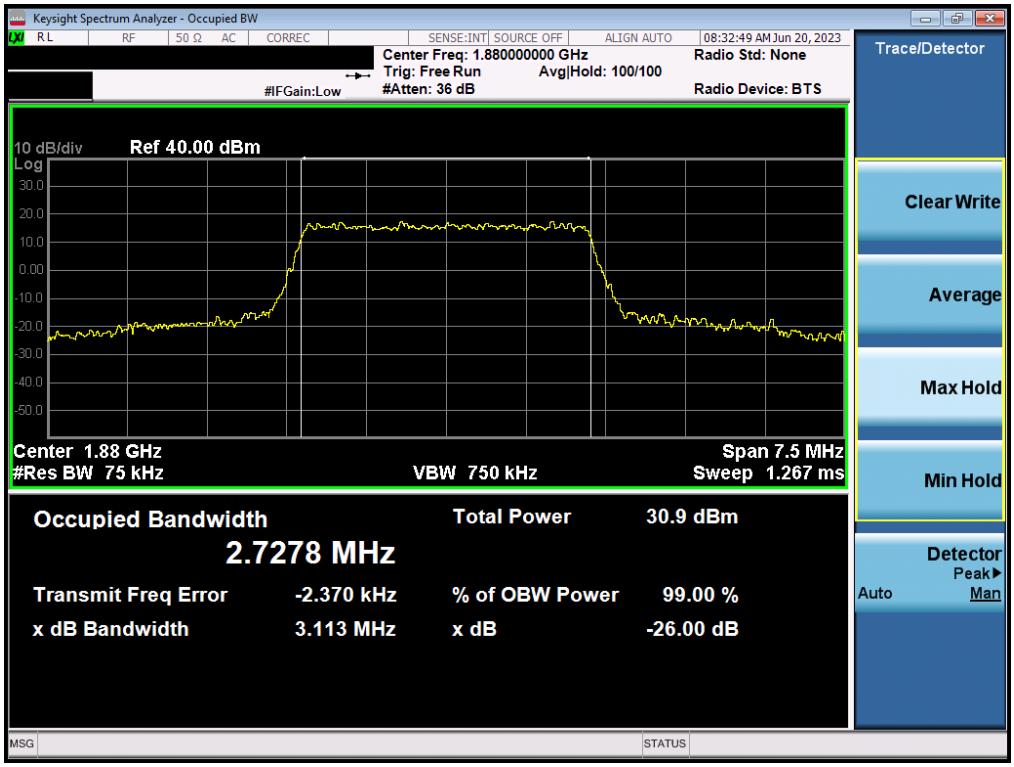


Plot 7-7. Occupied Bandwidth Plot (LTE Band 2 - 5MHz QPSK - Full RB - Ant1)

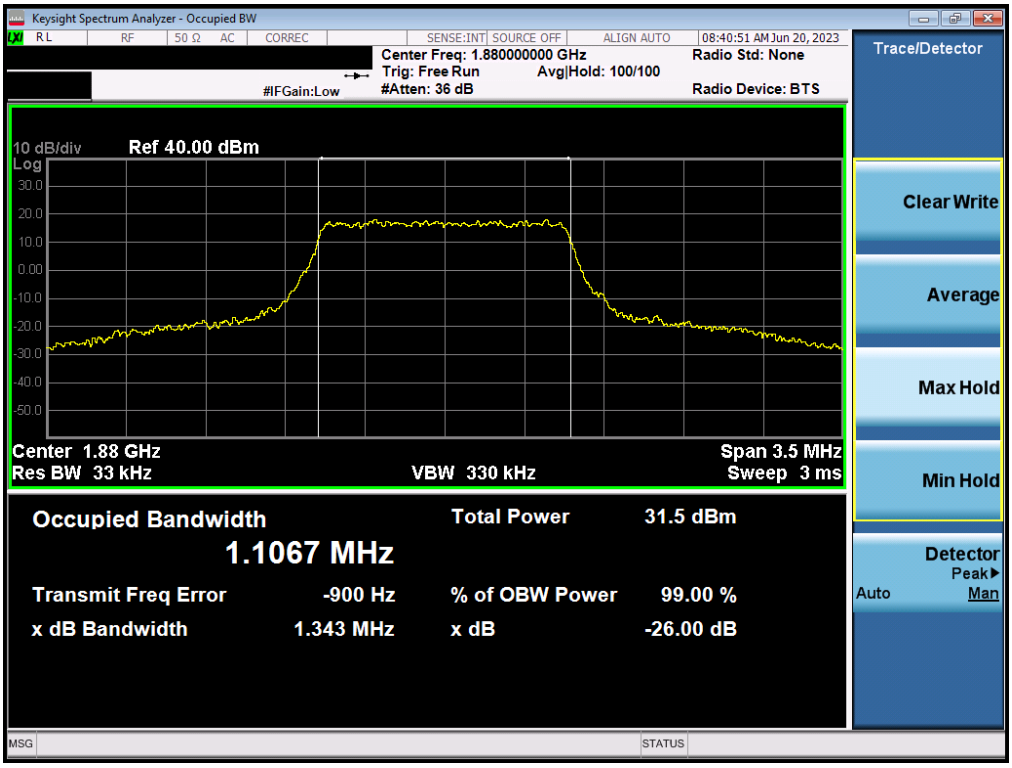


Plot 7-8. Occupied Bandwidth Plot (LTE Band 2 - 5MHz 16-QAM - Full RB - Ant1)

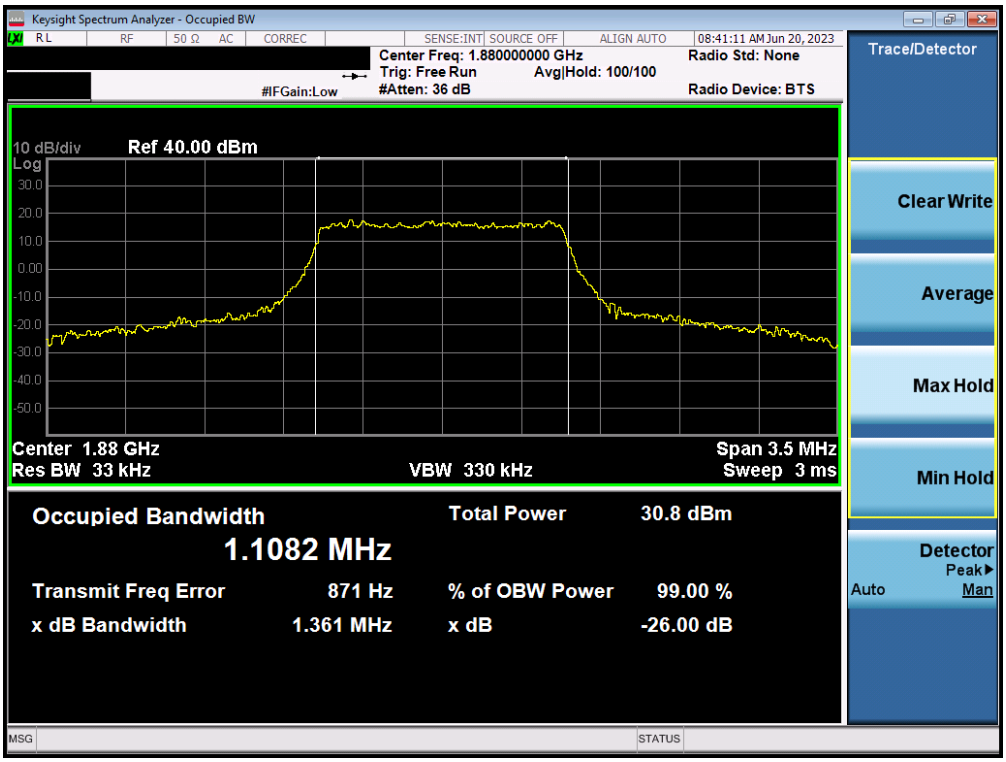
Plot 7-9. Occupied Bandwidth Plot (LTE Band 2 - 3MHz QPSK - Full RB - Ant1)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 2 - 3MHz 16-QAM - Full RB - Ant1)

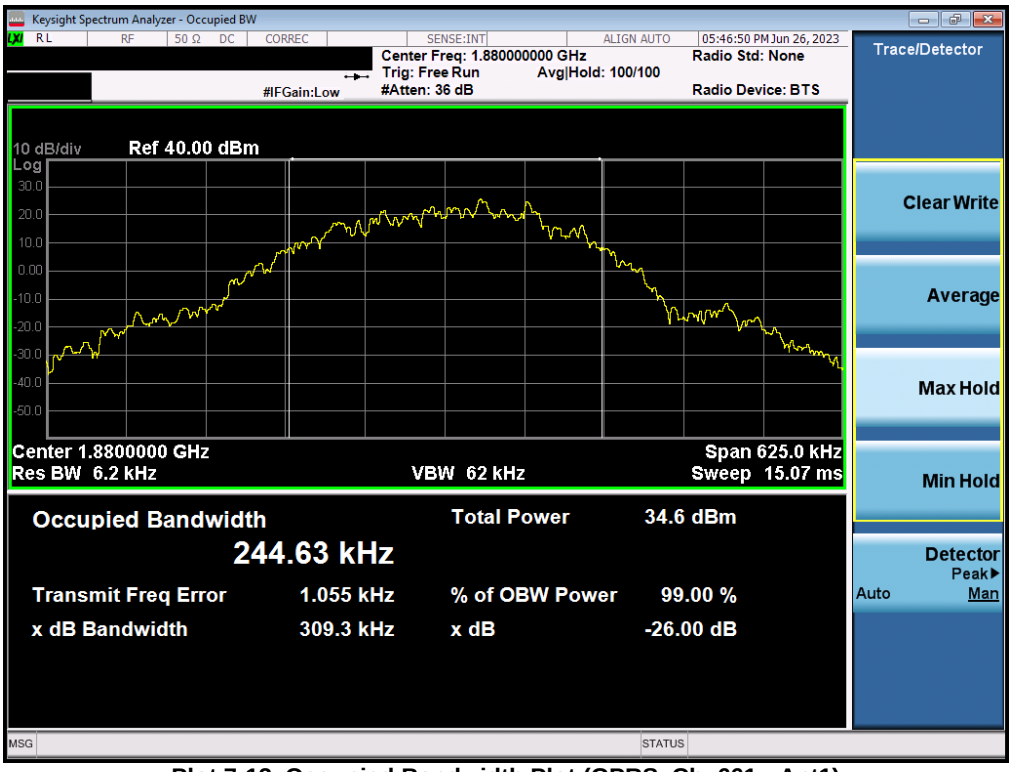


Plot 7-11. Occupied Bandwidth Plot (LTE Band 2 - 1.4MHz QPSK - Full RB - Ant1)

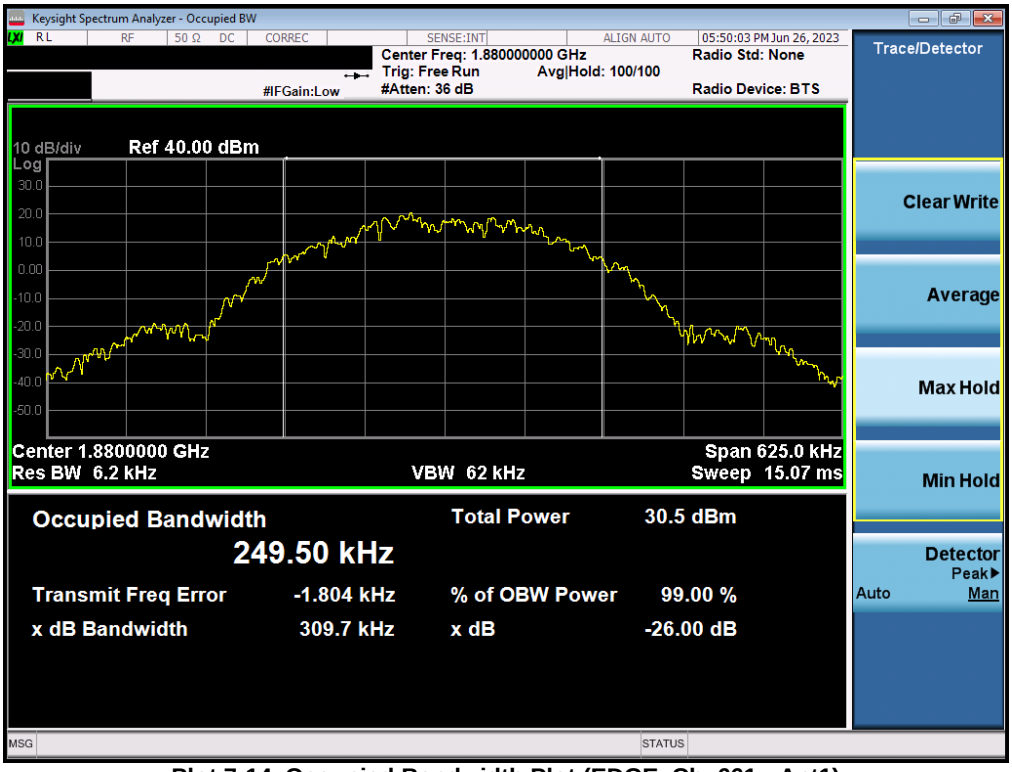


Plot 7-12. Occupied Bandwidth Plot (LTE Band 2 - 1.4MHz 16-QAM - Full RB - Ant1)

GSM/GPRS PCS – Ant1

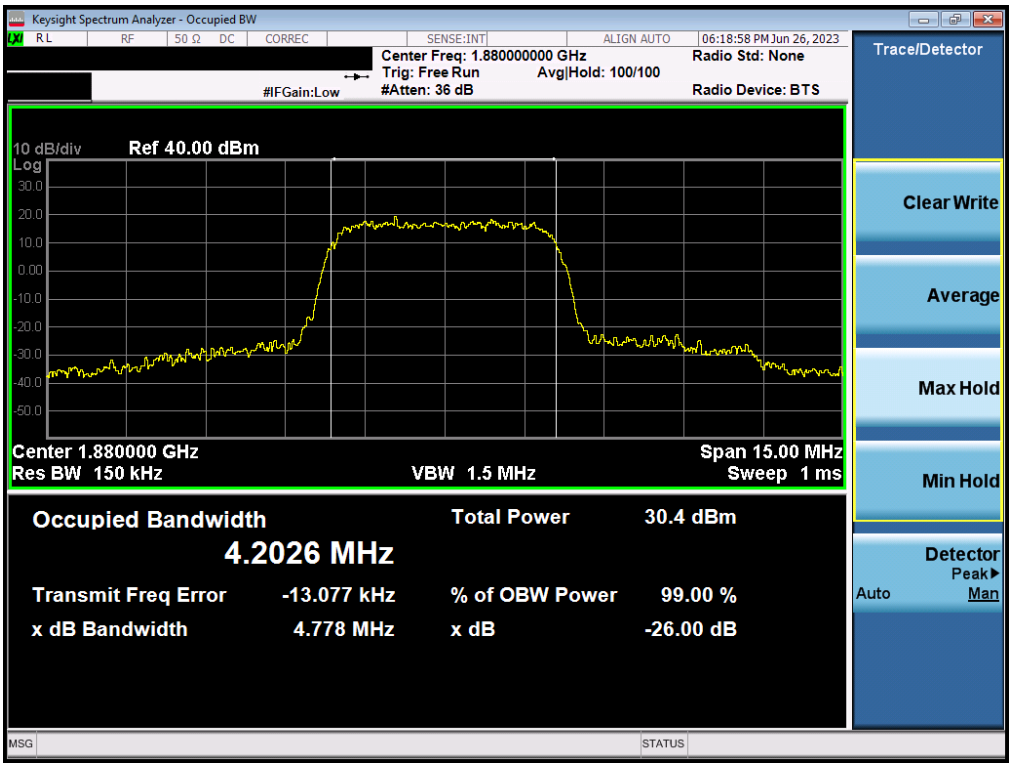


Plot 7-13. Occupied Bandwidth Plot (GPRS, Ch. 661 - Ant1)



Plot 7-14. Occupied Bandwidth Plot (EDGE, Ch. 661 - Ant1)

WCDMA PCS – Ant1

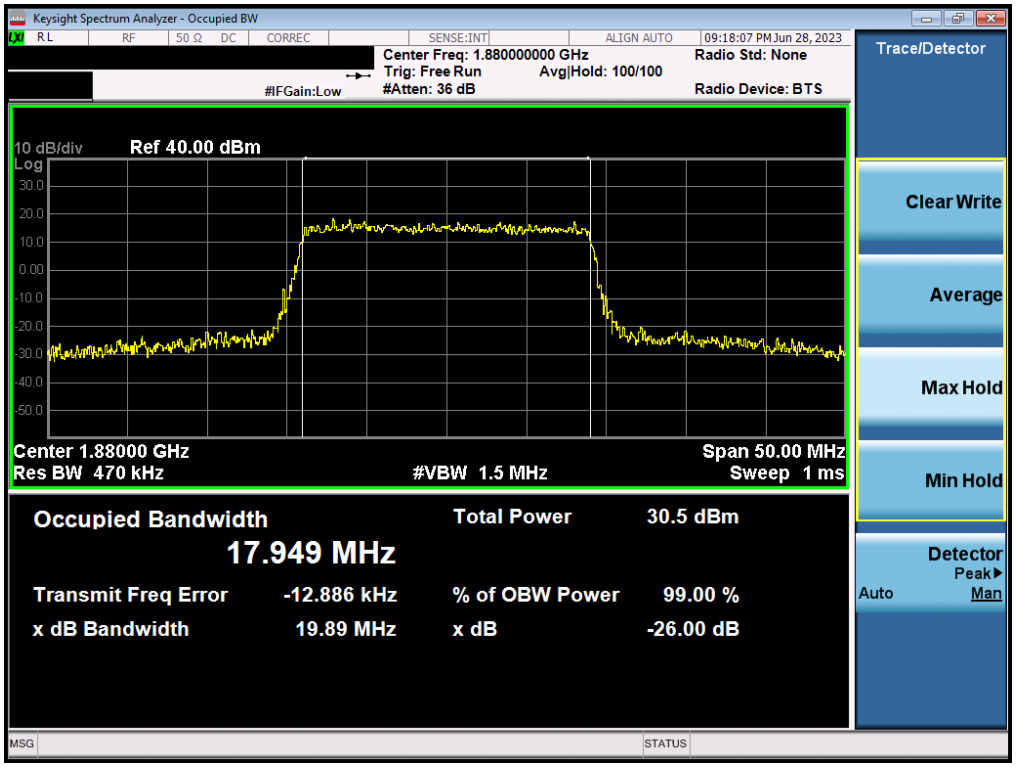


Plot 7-15. Occupied Bandwidth Plot (WCDMA, Ch. 9400 - Ant1)

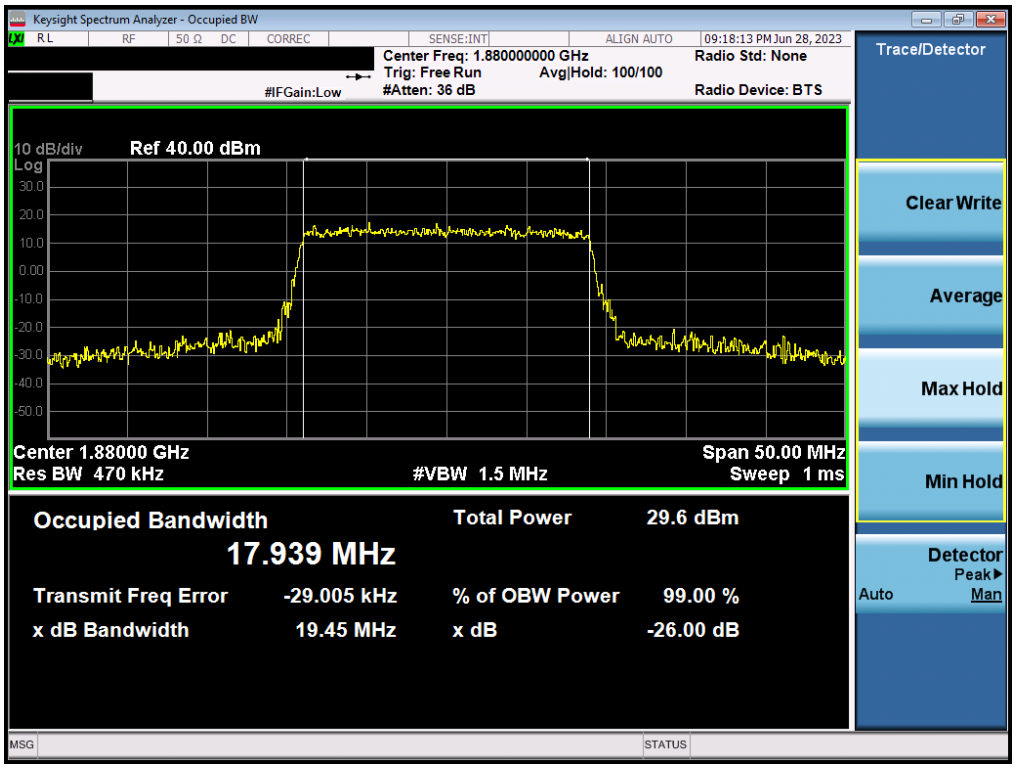
Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B2	20 MHz	QPSK	17.95
		16QAM	17.94
	15 MHz	QPSK	13.44
		16QAM	13.54
	10 MHz	QPSK	9.02
		16QAM	9.02
	5 MHz	QPSK	4.51
		16QAM	4.51
	3 MHz	QPSK	2.73
		16QAM	2.72
	1.4 MHz	QPSK	1.10
		16QAM	1.10

Table 7-6. Occupied Bandwidth Result – Ant2

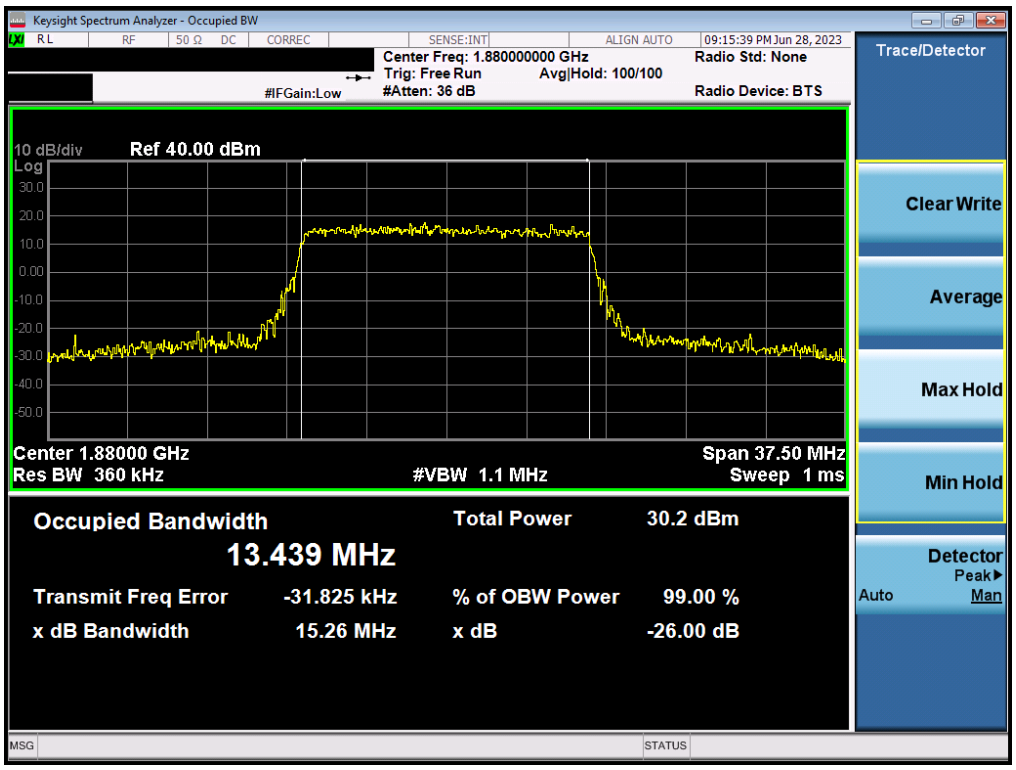
LTE Band 2 – Ant2



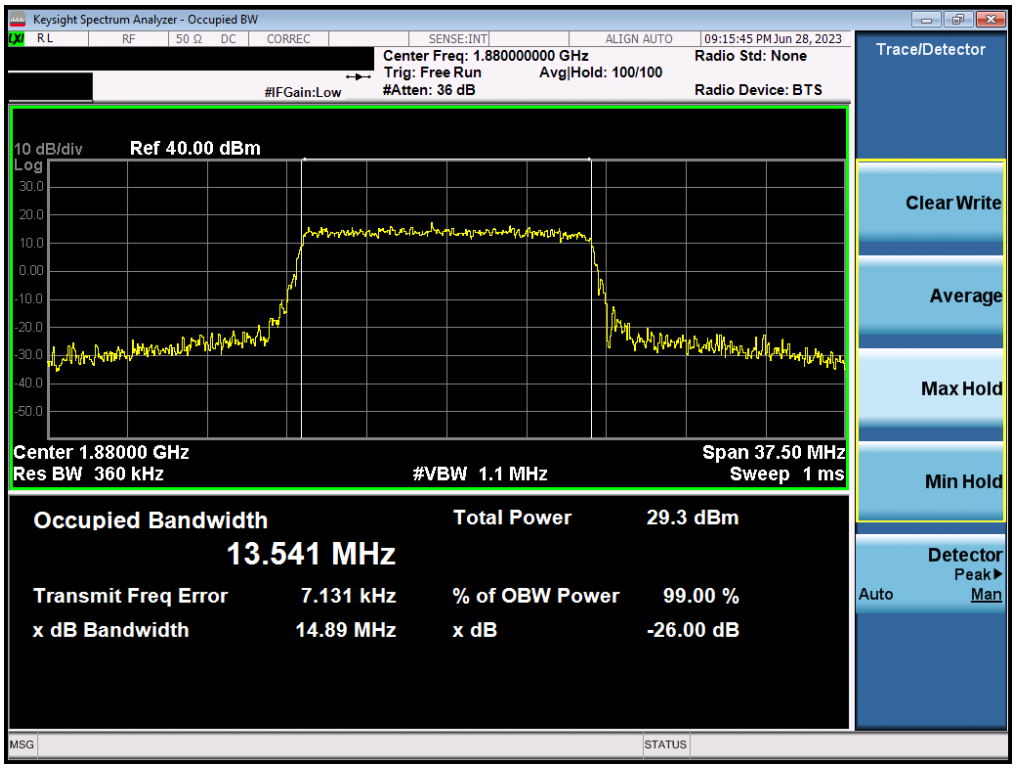
Plot 7-16. Occupied Bandwidth Plot (LTE Band 2 - 20MHz QPSK - Full RB - Ant2)



Plot 7-17. Occupied Bandwidth Plot (LTE Band 2 - 20MHz 16-QAM - Full RB - Ant2)



Plot 7-18. Occupied Bandwidth Plot (LTE Band 2 - 15MHz QPSK - Full RB - Ant2)

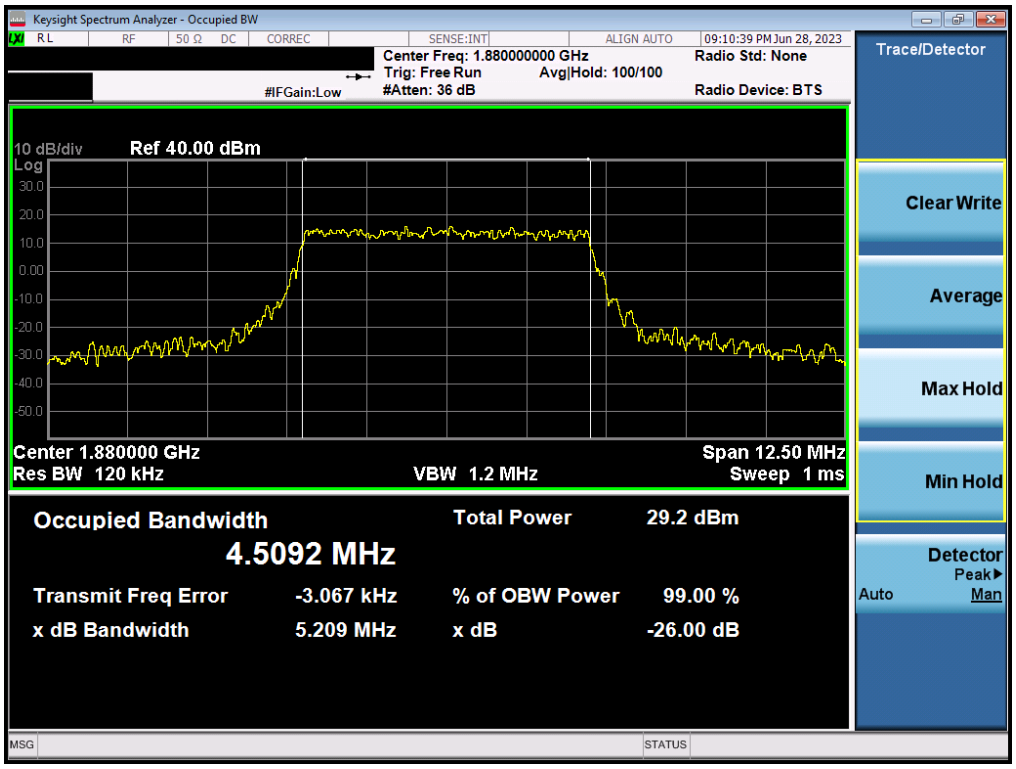


Plot 7-19. Occupied Bandwidth Plot (LTE Band 2 - 15MHz 16-QAM - Full RB - Ant2)

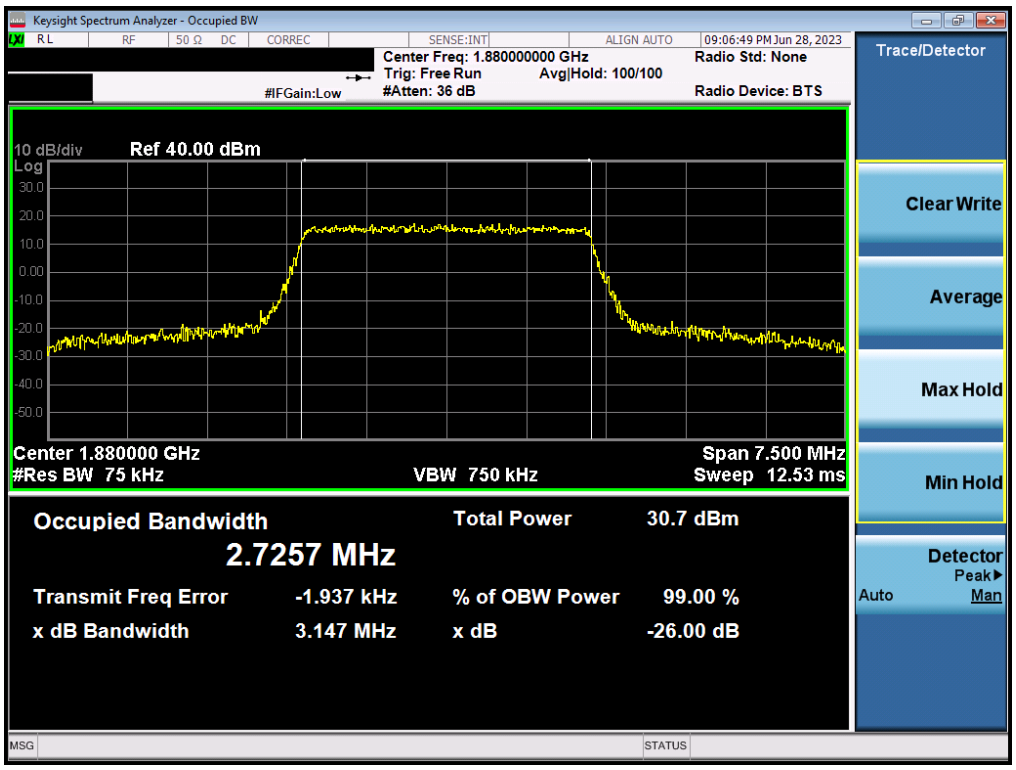
Plot 7-20. Occupied Bandwidth Plot (LTE Band 2 - 10MHz QPSK - Full RB - Ant2)

Plot 7-21. Occupied Bandwidth Plot (LTE Band 2 - 10MHz 16-QAM - Full RB - Ant2)

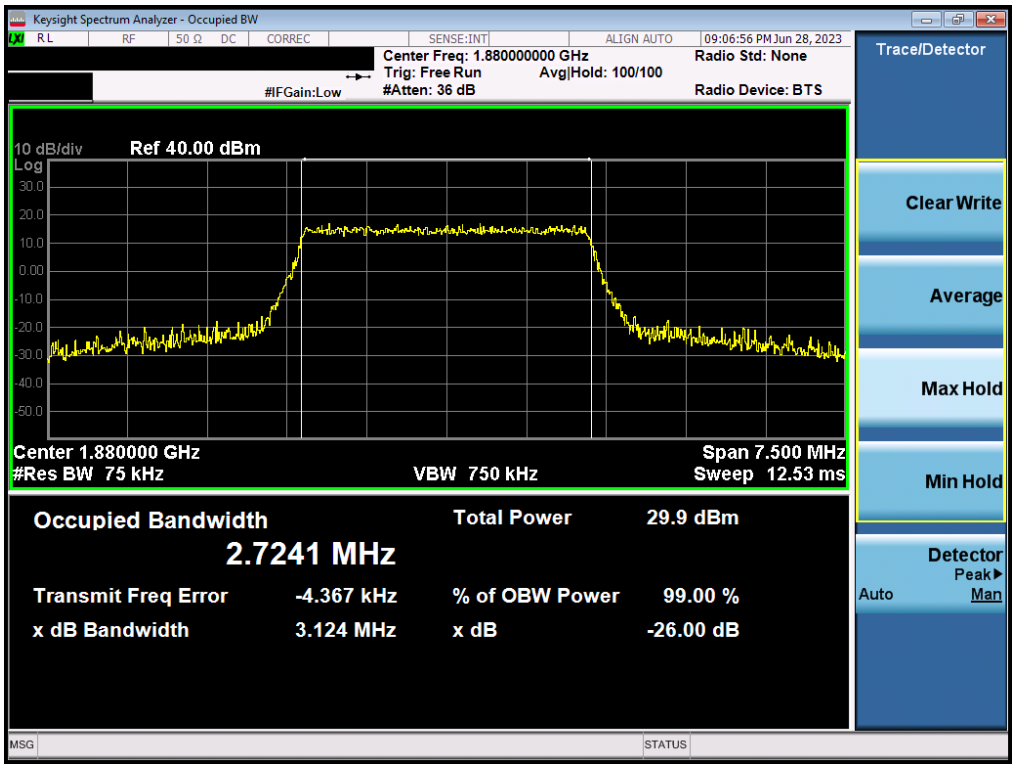
Plot 7-22. Occupied Bandwidth Plot (LTE Band 2 - 5MHz QPSK - Full RB - Ant2)



Plot 7-23. Occupied Bandwidth Plot (LTE Band 2 - 5MHz 16-QAM - Full RB - Ant2)

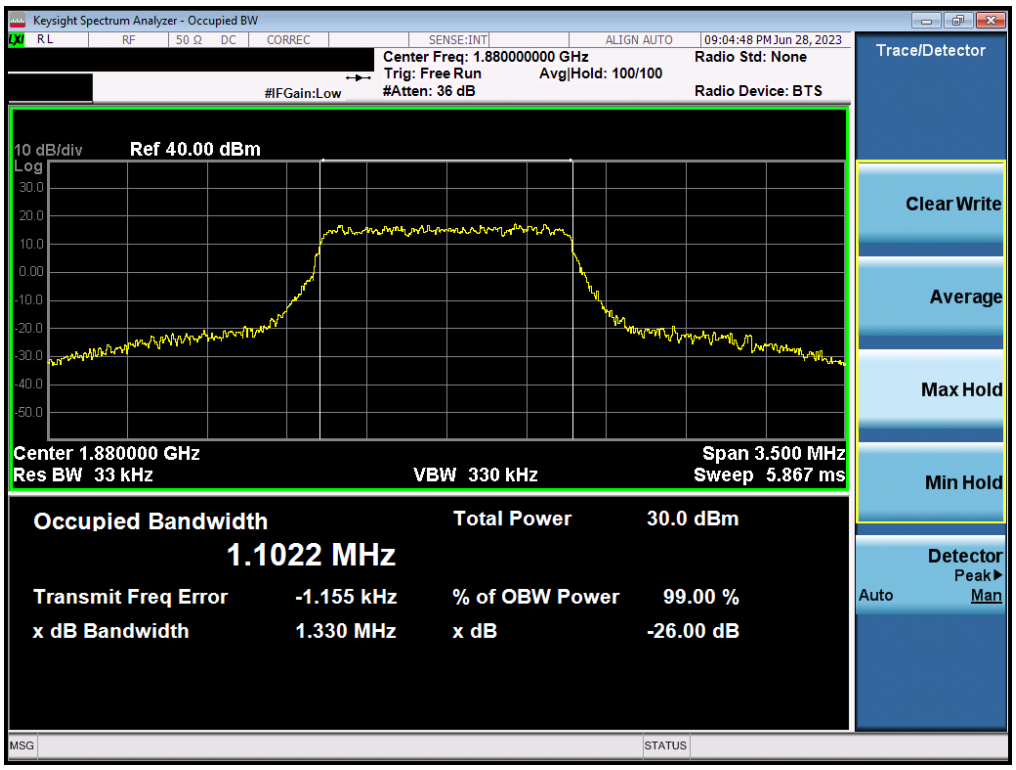


Plot 7-24. Occupied Bandwidth Plot (LTE Band 2 - 3MHz QPSK - Full RB - Ant2)

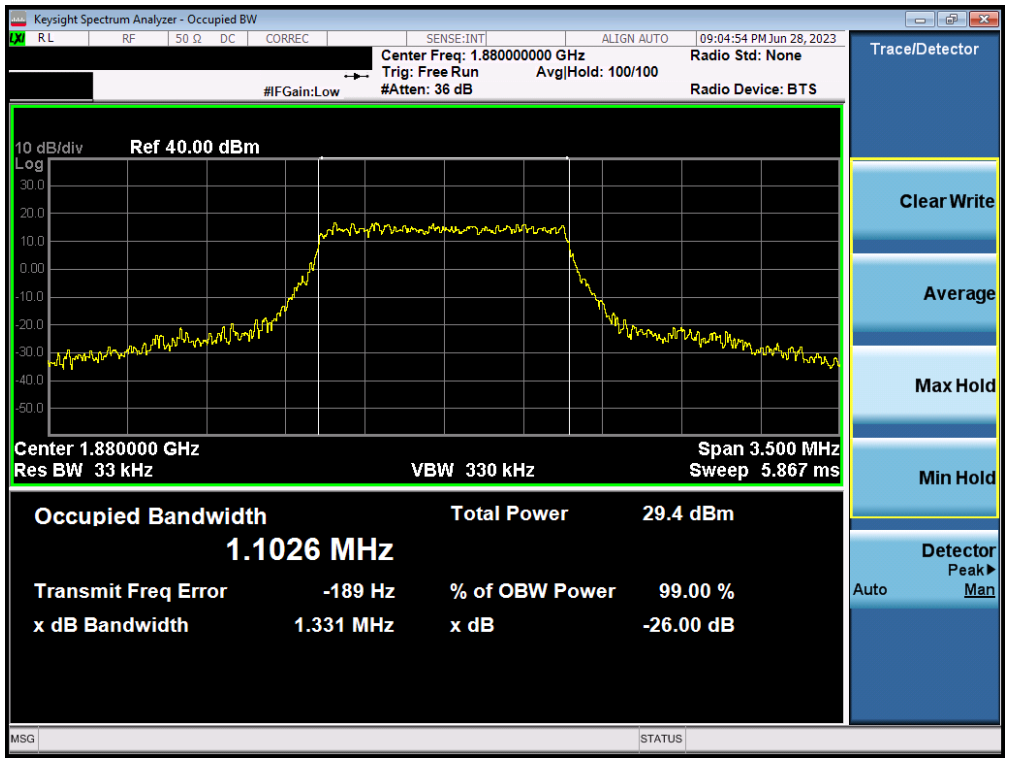


Plot 7-25. Occupied Bandwidth Plot (LTE Band 2 - 3MHz 16-QAM - Full RB - Ant2)

RB - Ant2)



Plot 7-26. Occupied Bandwidth Plot (LTE Band 2 - 1.4MHz QPSK - Full RB - Ant2)



Plot 7-27. Occupied Bandwidth Plot (LTE Band 2 - 1.4MHz 16-QAM - Full RB - Ant2)

7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 20GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

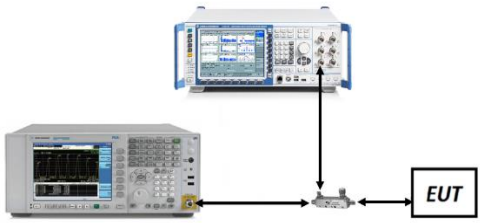


Figure 7-3. Test Instrument & Measurement Setup

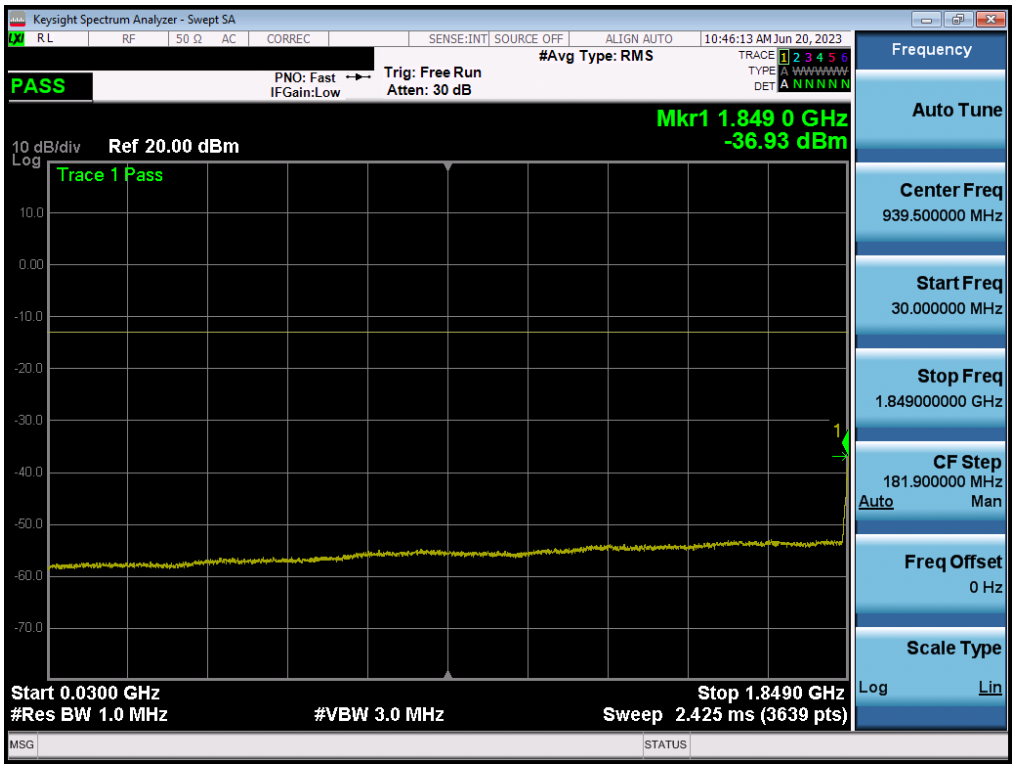
Test Notes

1. Per Part 24, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.

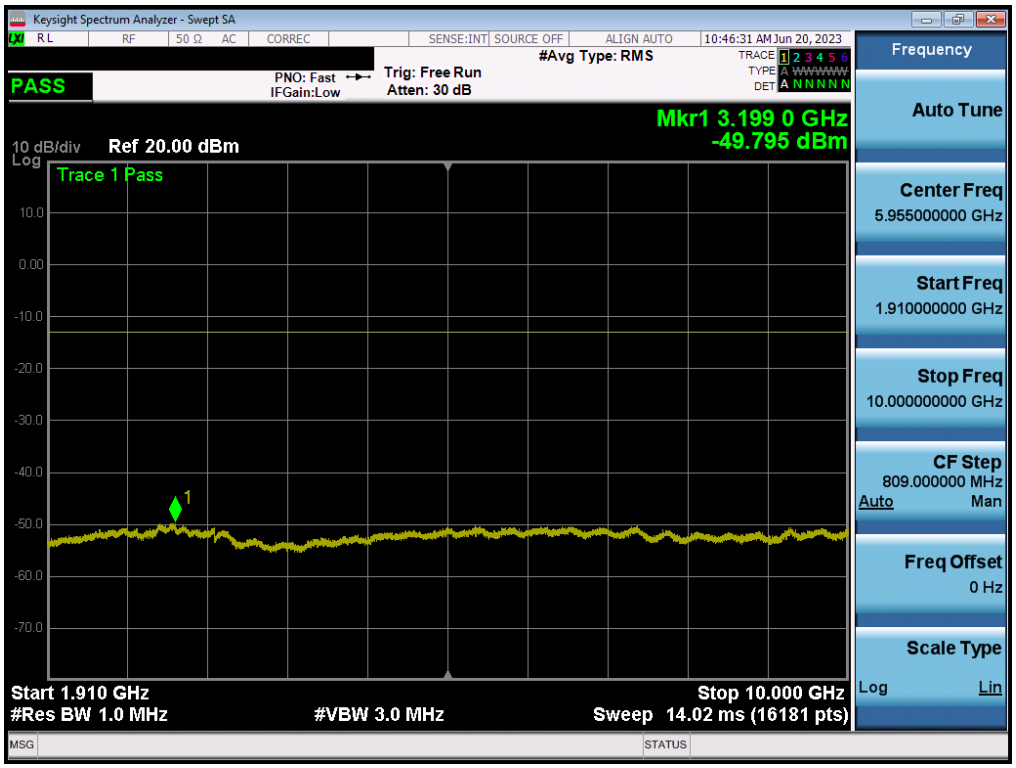
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
GSM-PCS	250kHz	Low	30.0 - 1845.0	-33.81	-13.0	-20.81
		Low	1910.0 - 10000.0	-39.14	-13.0	-26.14
		Low	10000.0 - 20000.0	-55.03	-13.0	-42.03
		Mid	30.0 - 1850.0	-45.32	-13.0	-32.32
		Mid	1910.0 - 10000.0	-39.35	-13.0	-26.34
		Mid	10000.0 - 20000.0	-54.28	-13.0	-41.28
		High	30.0 - 1850.0	-45.25	-13.0	-32.25
		High	1915.0 - 10000.0	-34.81	-13.0	-21.81
		High	10000.0 - 20000.0	-54.05	-13.0	-41.05
WCDMA-PCS	5MHz	Low	30.0 - 1845.0	-36.86	-13.0	-23.86
		Low	1910.0 - 10000.0	-46.85	-13.0	-33.85
		Low	10000.0 - 20000.0	-62.22	-13.0	-49.22
		Mid	30.0 - 1850.0	-53.78	-13.0	-40.78
		Mid	1910.0 - 10000.0	-46.78	-13.0	-33.78
		Mid	10000.0 - 20000.0	-62.23	-13.0	-49.23
		High	30.0 - 1850.0	-53.83	-13.0	-40.83
		High	1915.0 - 10000.0	-38.50	-13.0	-25.49
		High	10000.0 - 20000.0	-61.75	-13.0	-48.75
LTE-B2	20MHz	Low	30.0 - 1849.0	-36.93	-13.0	-23.93
		Low	1910.0 - 10000.0	-49.80	-13.0	-36.80
		Low	10000.0 - 20000.0	-63.57	-13.0	-50.57
		Mid	30.0 - 1850.0	-51.34	-13.0	-38.34
		Mid	1910.0 - 10000.0	-49.53	-13.0	-36.52
		Mid	10000.0 - 20000.0	-63.36	-13.0	-50.36
		High	30.0 - 1850.0	-52.84	-13.0	-39.84
		High	1911.0 - 10000.0	-39.21	-13.0	-26.21
		High	10000.0 - 20000.0	-63.39	-13.0	-50.39

Table 7-7. Conducted Spurious Emission Test Results – Ant1

LTE Band 2 – Ant1



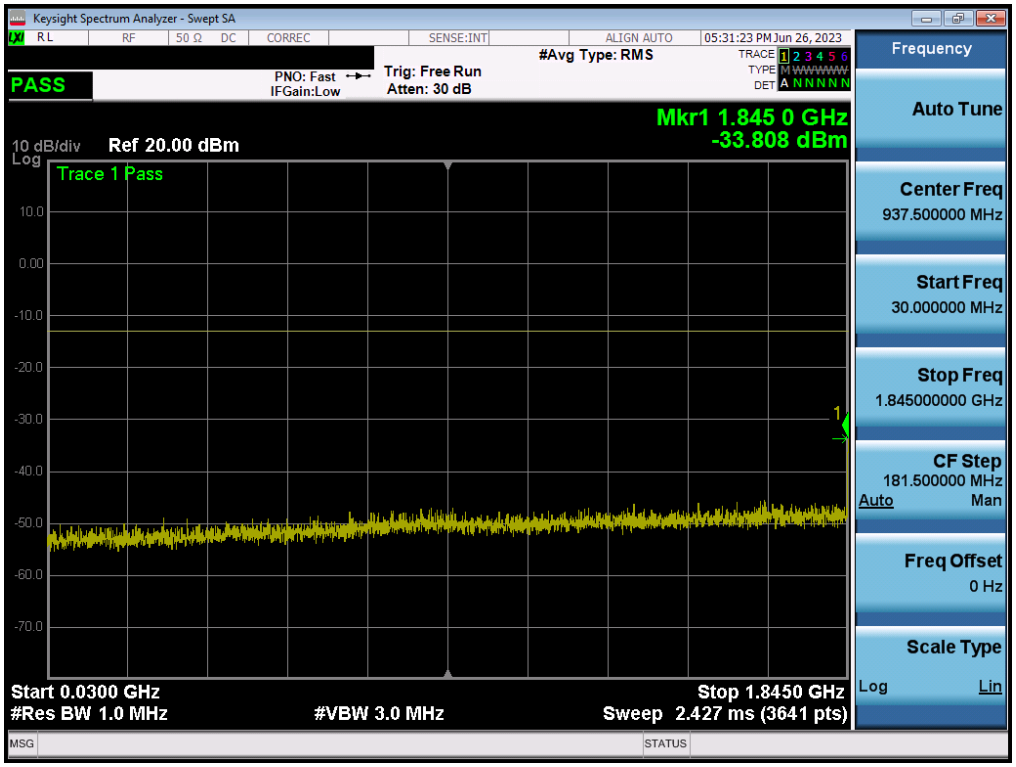
Plot 7-28. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - Low Channel - Ant1)



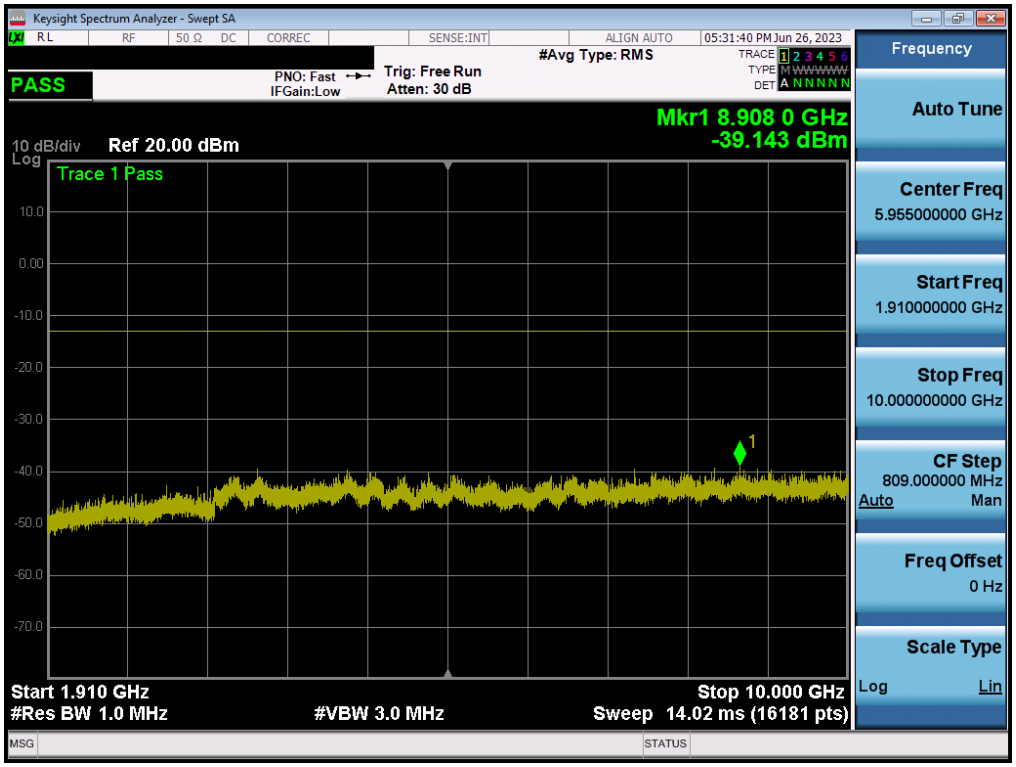
Plot 7-29. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - Low Channel - Ant1)

Plot 7-30. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - Low Channel - Ant1)

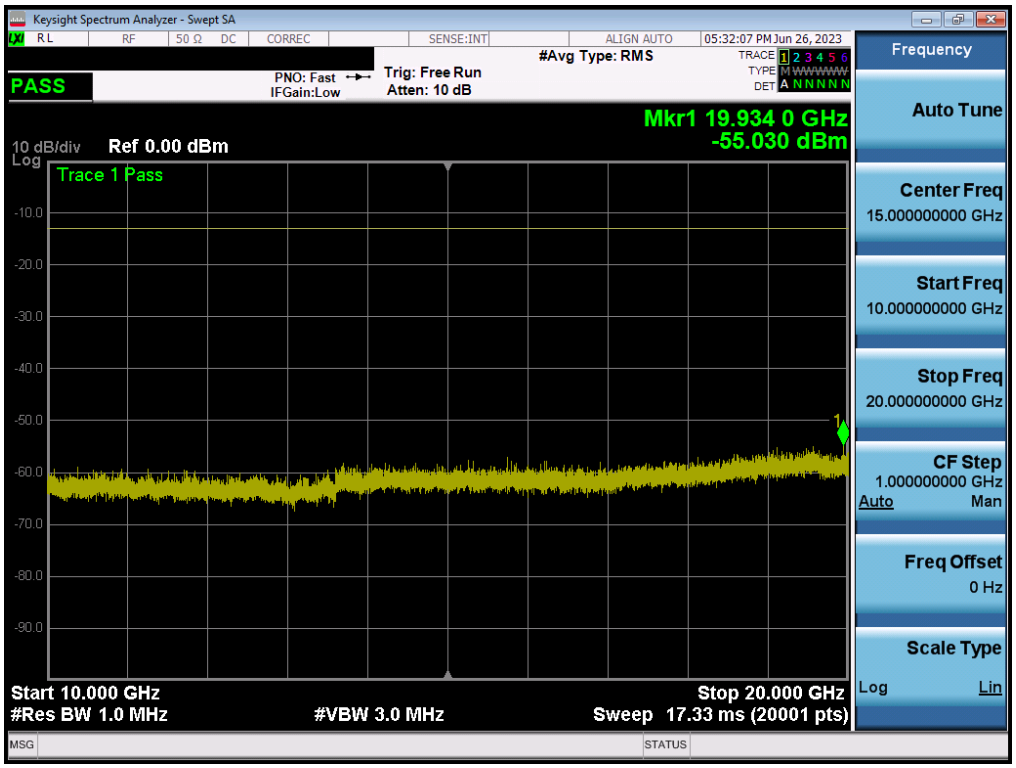
GSM/GPRS PCS – Ant1



Plot 7-31. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)

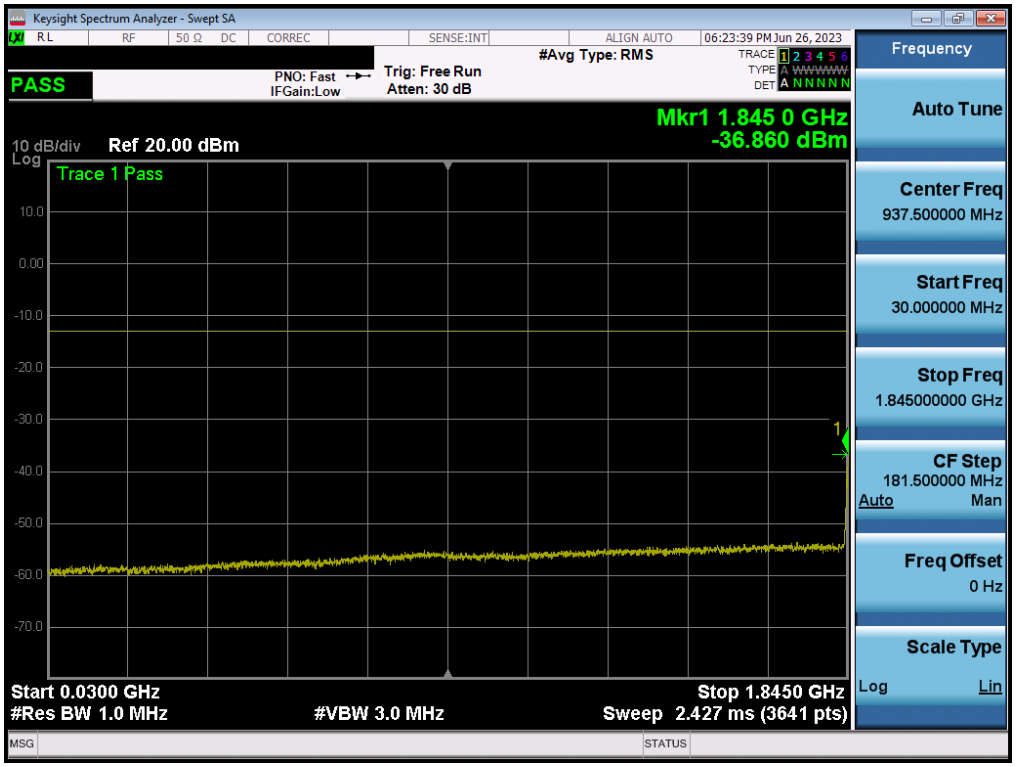


Plot 7-32. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)

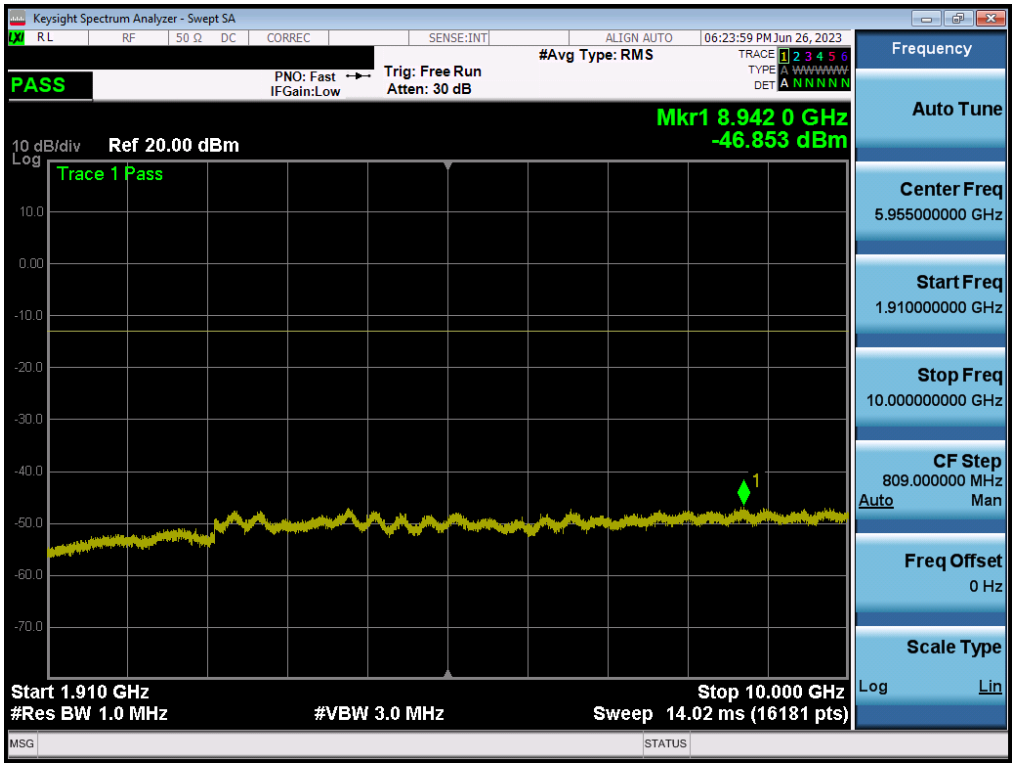


Plot 7-33. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)

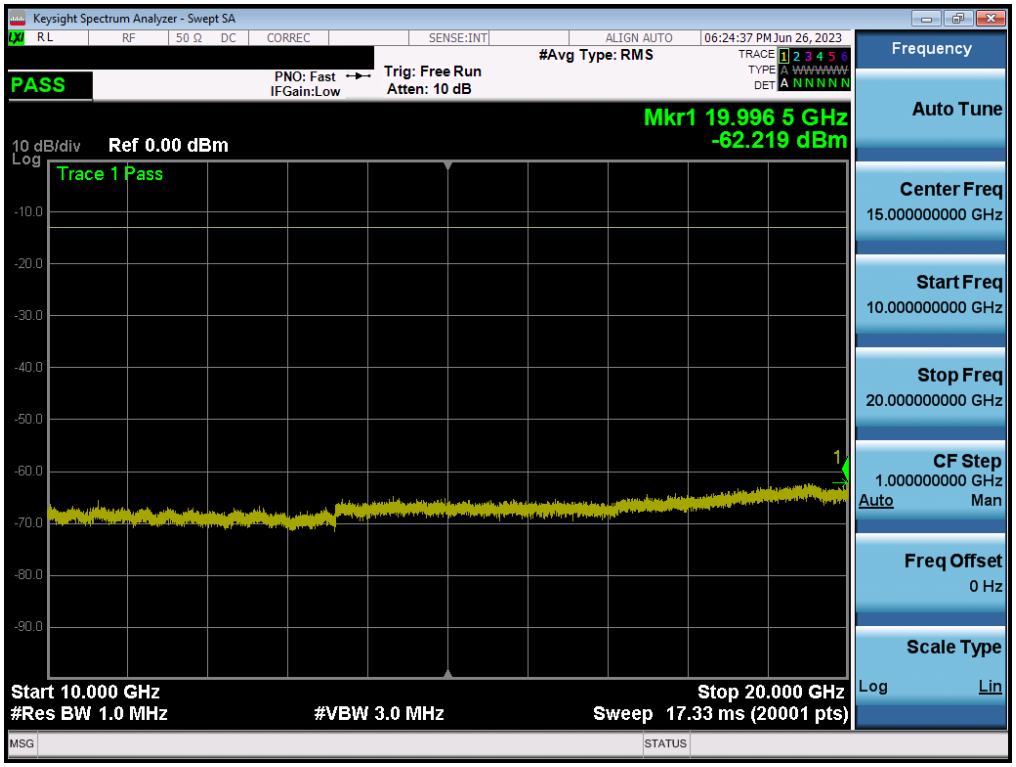
WCDMA PCS – Ant1



Plot 7-34. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)



Plot 7-35. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)



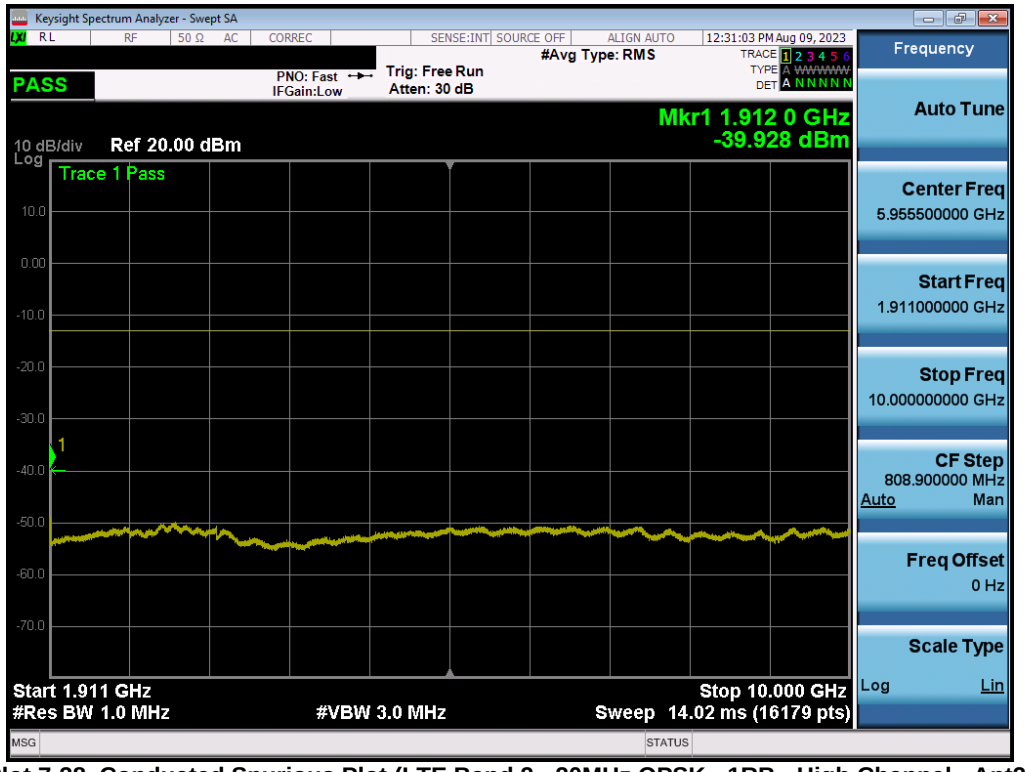
Plot 7-36. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)

Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
LTE-B2	20MHz	Low	30.0 - 1849.0	-40.31	-13.0	-27.31
		Low	1910.0 - 10000.0	-49.77	-13.0	-36.77
		Low	10000.0 - 20000.0	-63.62	-13.0	-50.62
		Mid	30.0 - 1850.0	-52.59	-13.0	-39.59
		Mid	1910.0 - 10000.0	-49.51	-13.0	-36.51
		Mid	10000.0 - 20000.0	-63.41	-13.0	-50.41
		High	30.0 - 1850.0	-53.12	-13.0	-40.12
		High	1911.0 - 10000.0	-39.93	-13.0	-26.93
		High	10000.0 - 20000.0	-63.67	-13.0	-50.67

Table 7-8. Conducted Spurious Emission Test Results – Ant2

LTE Band 2 – Ant2

Plot 7-37. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - High Channel - Ant2)



Plot 7-38. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - High Channel - Ant2)

Plot 7-39. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - High Channel - Ant2)

7.5 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

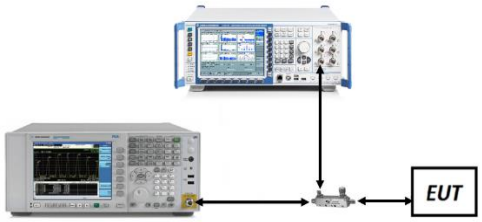


Figure 7-4. Test Instrument & Measurement Setup

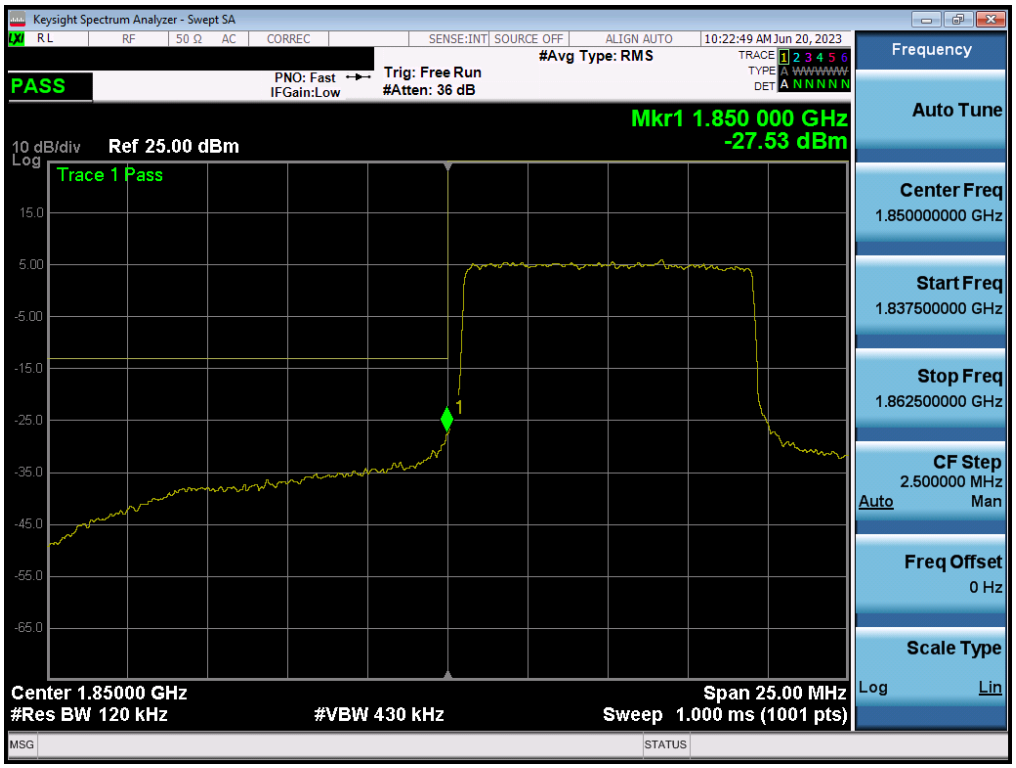
Test Notes

1. Per 24.238(b), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

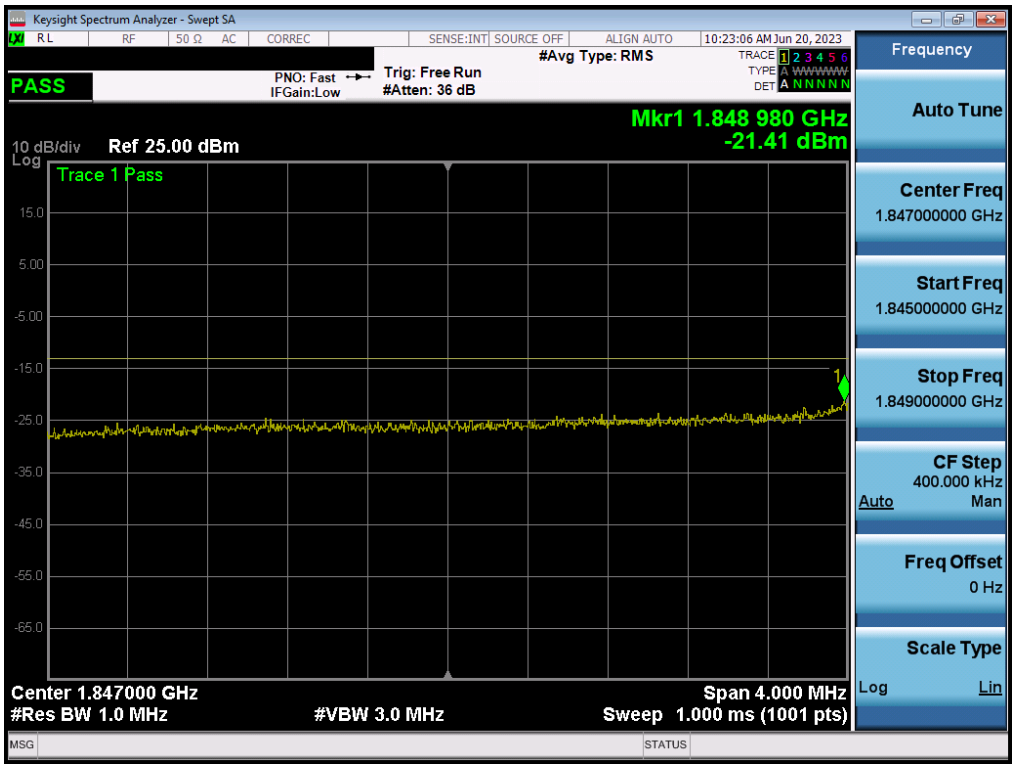
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
GSM-PCS	250kHz	Low	Band Edge	-14.93	-13.0	-1.93
		Low	Extended	-47.04	-13.0	-34.04
		High	Band Edge	-18.30	-13.0	-5.30
		High	Extended	-45.40	-13.0	-32.40
WCDMA-PCS	5MHz	Low	Band Edge	-21.03	-13.0	-8.03
		Low	Extended	-15.58	-13.0	-2.58
		High	Band Edge	-20.14	-13.0	-7.14
		High	Extended	-16.00	-13.0	-3.00
LTE-B2	20MHz	Low	Band Edge	-30.40	-13.0	-17.40
		Low	Extended	-26.52	-13.0	-13.52
		High	Band Edge	-32.25	-13.0	-19.25
		High	Extended	-28.87	-13.0	-15.87
	15MHz	Low	Band Edge	-31.03	-13.0	-18.02
		Low	Extended	-25.40	-13.0	-12.39
		High	Band Edge	-30.88	-13.0	-17.88
		High	Extended	-27.68	-13.0	-14.68
	10MHz	Low	Band Edge	-27.53	-12.8	-14.70
		Low	Extended	-21.41	-13.0	-8.41
		High	Band Edge	-27.34	-13.0	-14.34
		High	Extended	-20.56	-13.0	-7.56
	5MHz	Low	Band Edge	-24.09	-13.0	-11.09
		Low	Extended	-25.57	-13.0	-12.57
		High	Band Edge	-23.77	-13.0	-10.77
		High	Extended	-22.54	-13.0	-9.54
	3MHz	Low	Band Edge	-25.32	-13.0	-12.32
		Low	Extended	-24.91	-13.0	-11.91
		High	Band Edge	-23.32	-13.0	-10.32
		High	Extended	-21.68	-13.0	-8.68
	1.4MHz	Low	Band Edge	-27.44	-13.0	-14.44
		Low	Extended	-28.29	-13.0	-15.29
		High	Band Edge	-25.83	-13.0	-12.83
		High	Extended	-26.90	-13.0	-13.90

Table 7-9. Conducted Band Edge Test Results – Ant1

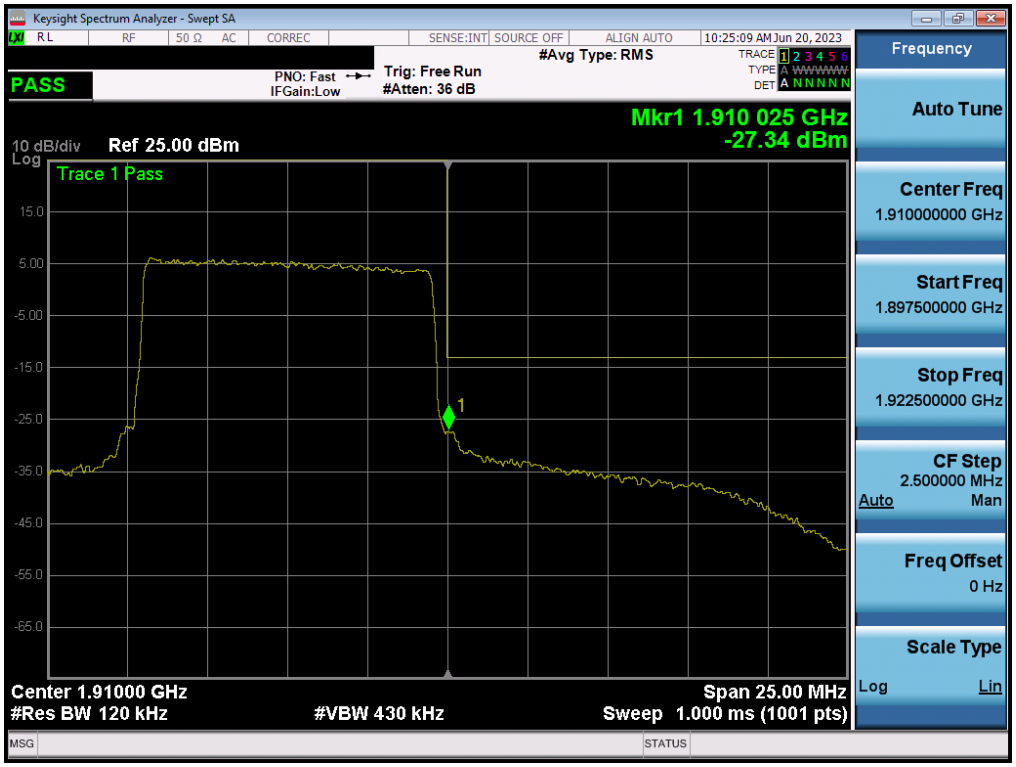
LTE Band 2 – Ant1



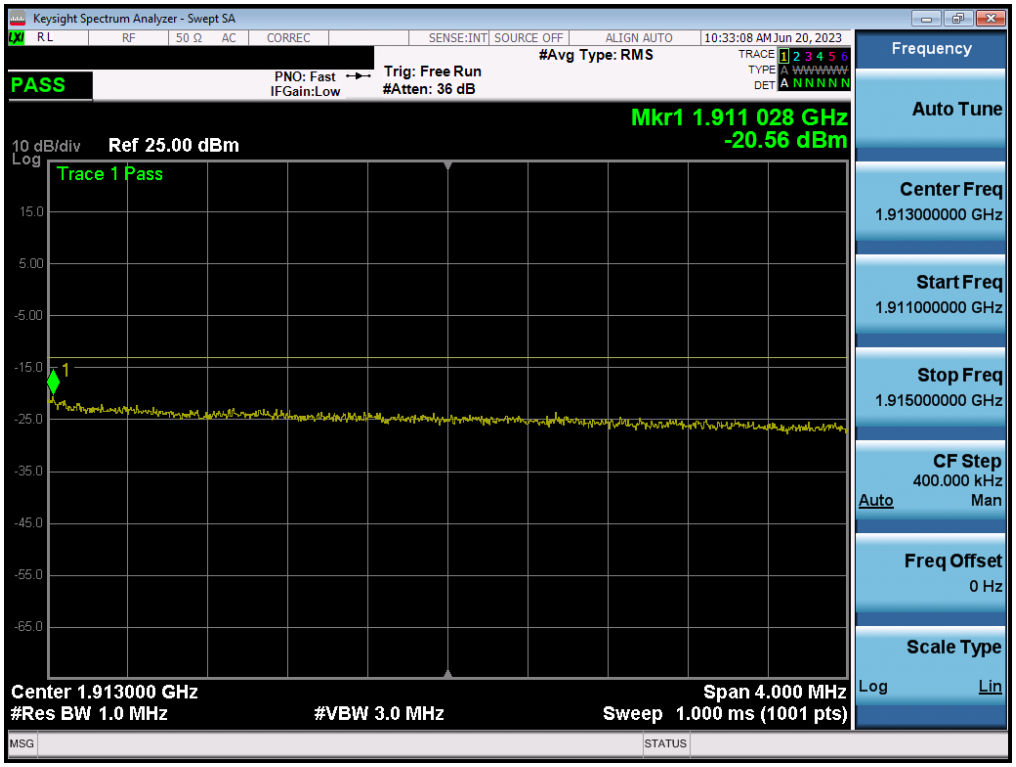
Plot 7-40. Lower Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant1)



Plot 7-41. Extended Lower Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant1)

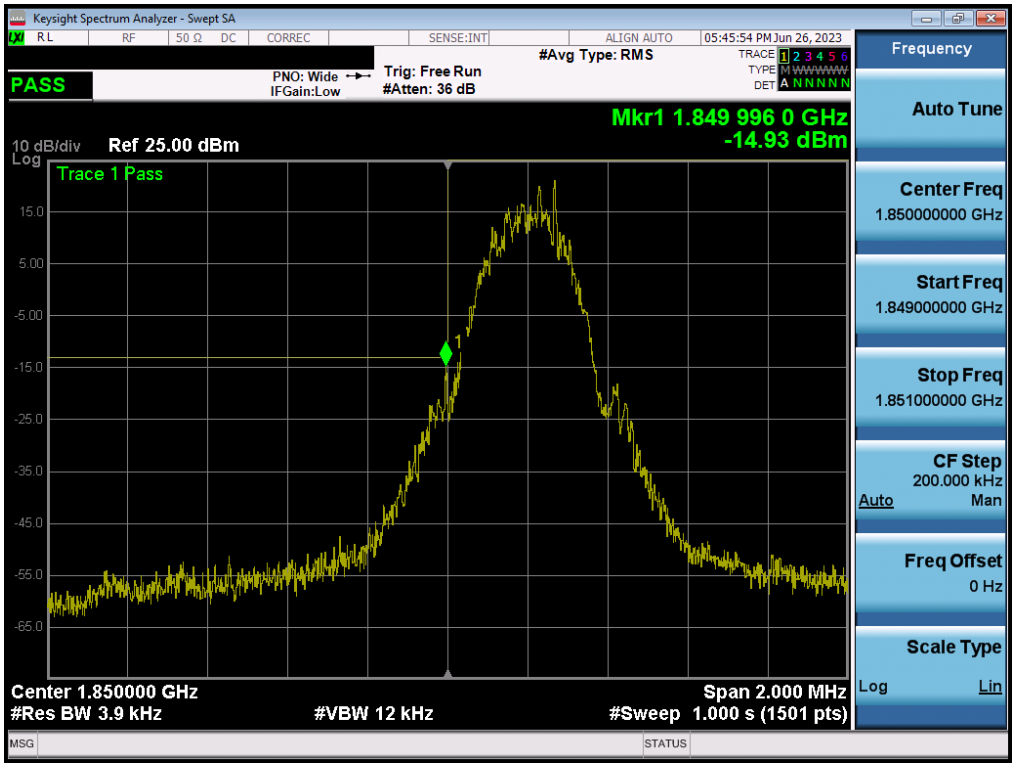


Plot 7-42. Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant1)

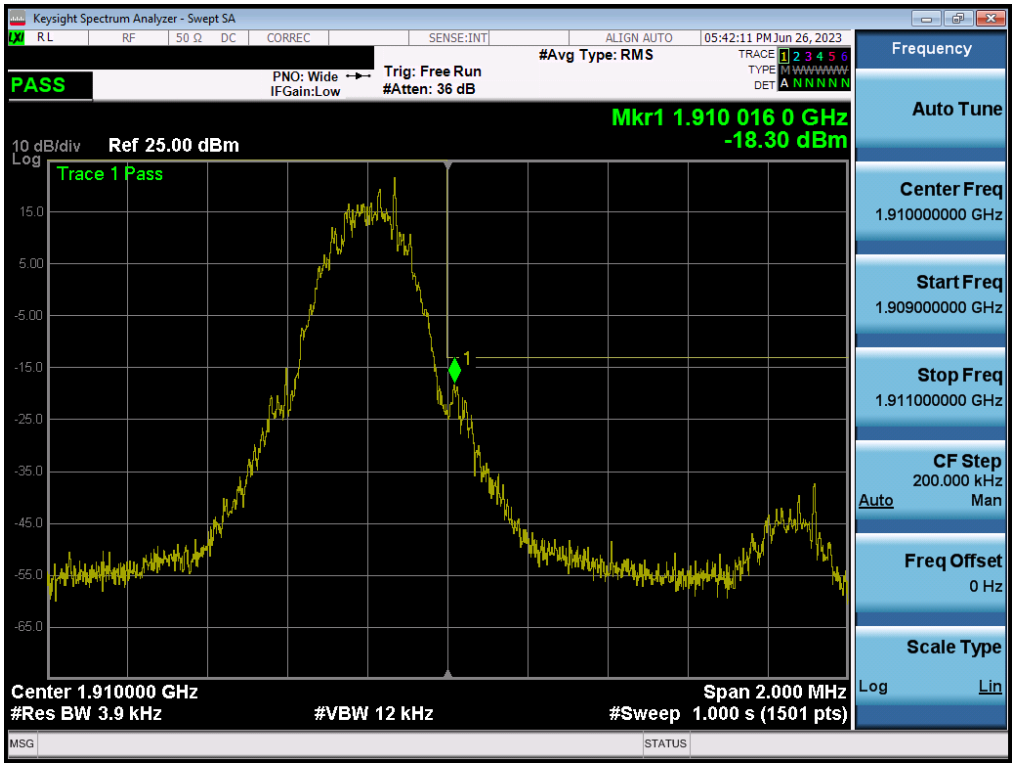


Plot 7-43. Extended Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant1)

GSM/GPRS PCS – Ant1

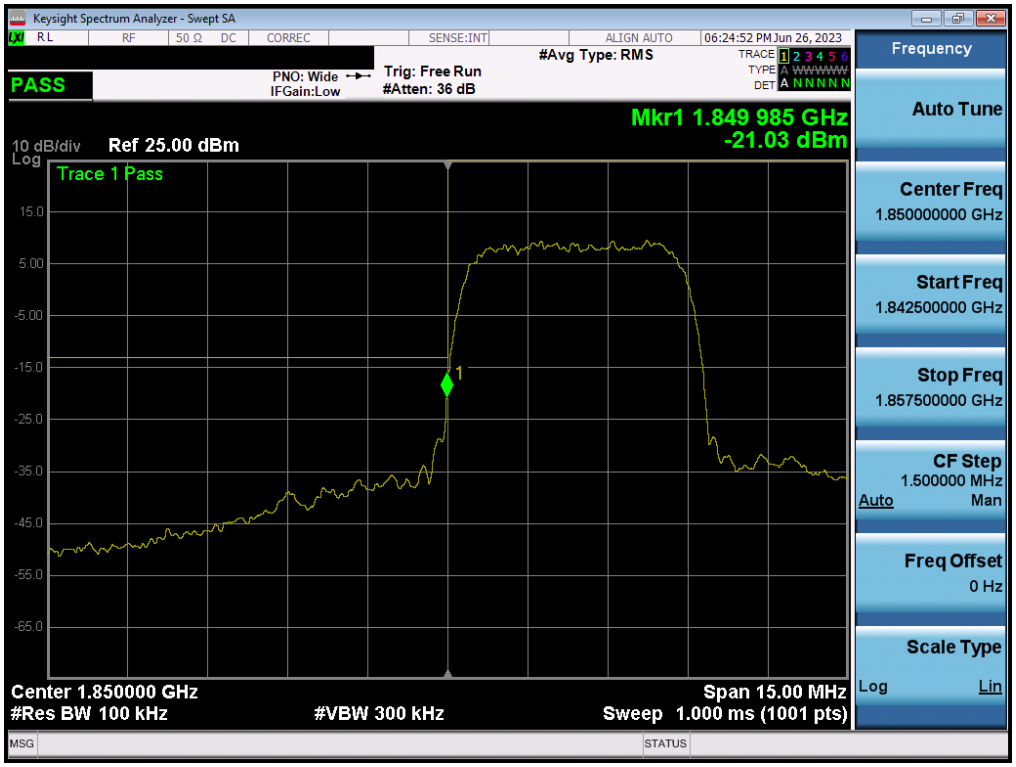


Plot 7-44. Lower Band Edge Plot (GPRS PCS – Ch. 512 - Ant1)

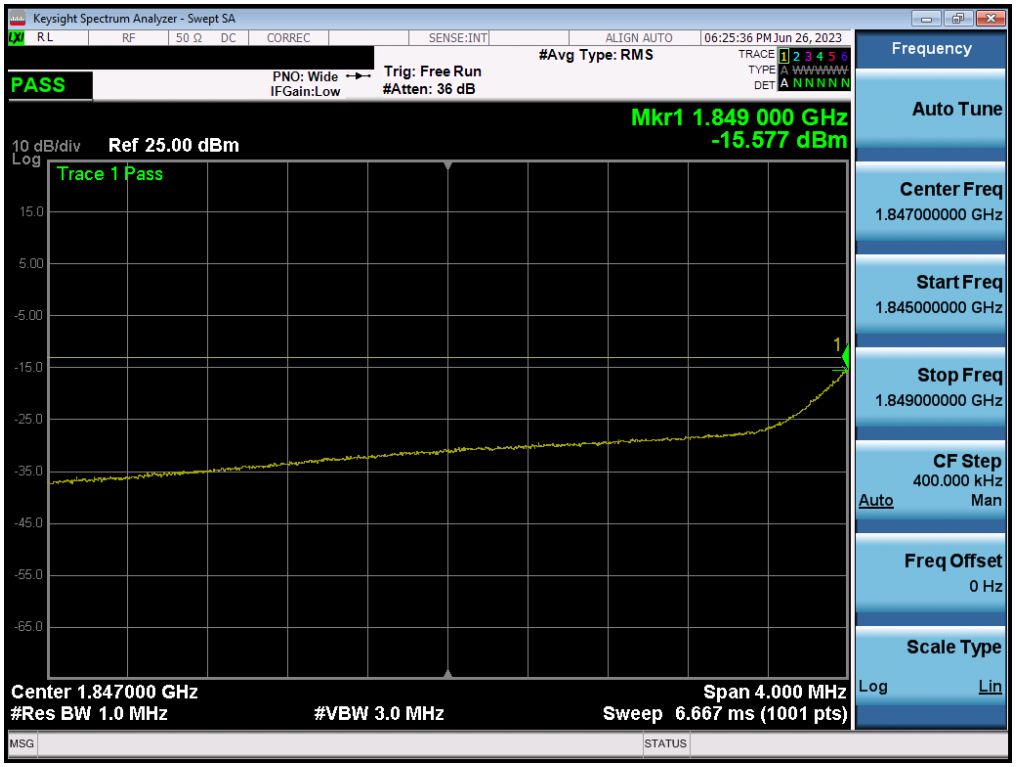


Plot 7-45. Upper Band Edge Plot (GPRS PCS – Ch. 810 - Ant1)

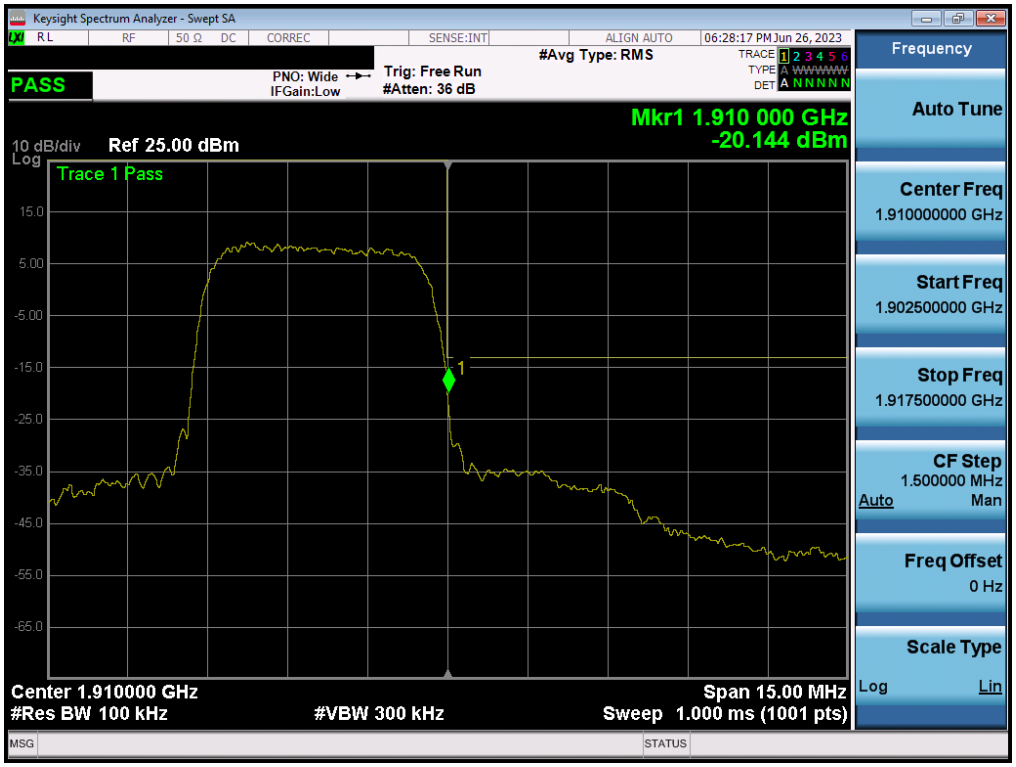
WCDMA PCS – Ant1



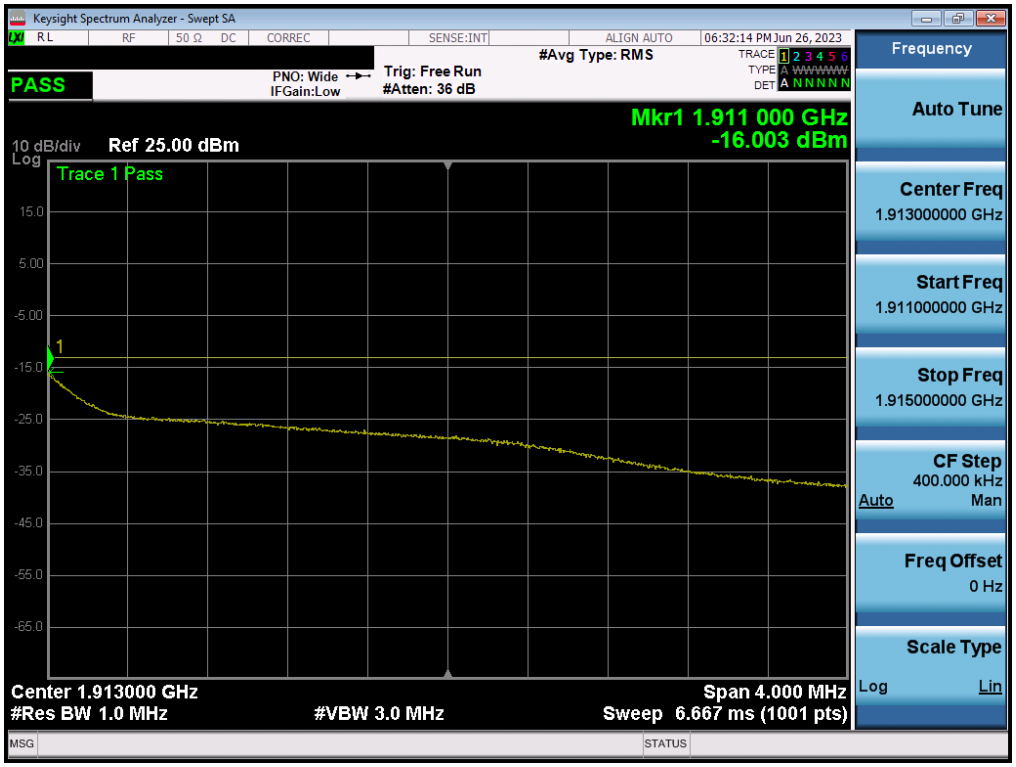
Plot 7-46. Lower Band Edge Plot (WCDMA PCS – Ch. 9262 - Ant1)



Plot 7-47. Extended Lower Band Edge Plot (WCDMA PCS – Ch. 9262 - Ant1)



Plot 7-48. Upper Band Edge Plot (WCDMA PCS – Ch. 9538 - Ant1)



Plot 7-49. Extended Upper Band Edge Plot (WCDMA PCS – Ch. 9538 - Ant1)

Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
LTE-B2	20MHz	Low	Band Edge	-32.40	-13.0	-19.40
		Low	Extended	-28.56	-13.0	-15.56
		High	Band Edge	-31.27	-13.0	-18.27
		High	Extended	-26.66	-13.0	-13.66
	15MHz	Low	Band Edge	-28.94	-13.0	-15.94
		Low	Extended	-27.06	-13.0	-14.06
		High	Band Edge	-29.08	-13.0	-16.08
		High	Extended	-24.90	-13.0	-11.90
	10MHz	Low	Band Edge	-26.33	-13.0	-13.33
		Low	Extended	-23.26	-13.0	-10.26
		High	Band Edge	-27.85	-13.0	-14.85
		High	Extended	-20.65	-13.0	-7.65
	5MHz	Low	Band Edge	-25.53	-13.0	-12.53
		Low	Extended	-28.58	-13.0	-15.58
		High	Band Edge	-23.27	-13.0	-10.27
		High	Extended	-21.07	-13.0	-8.07
	3MHz	Low	Band Edge	-23.16	-13.0	-10.16
		Low	Extended	-27.35	-13.0	-14.35
		High	Band Edge	-21.95	-13.0	-8.95
		High	Extended	-21.03	-13.0	-8.03
	1.4MHz	Low	Band Edge	-27.14	-13.0	-14.14
		Low	Extended	-29.75	-13.0	-16.75
		High	Band Edge	-25.84	-13.0	-12.84
		High	Extended	-28.36	-13.0	-15.36

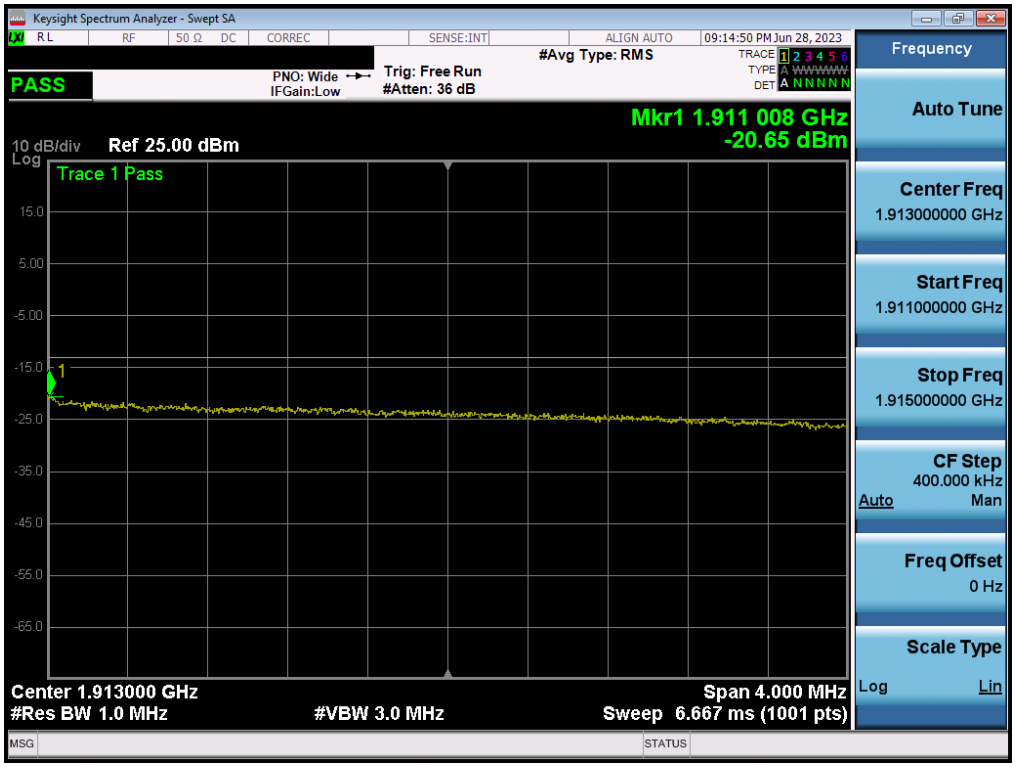
Table 7-10. Conducted Band Edge Test Result – Ant2

LTE Band 2 – Ant2

Plot 7-50. Lower Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant2)

Plot 7-51. Extended Lower Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant2)

Plot 7-52. Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant2)



Plot 7-53. Extended Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB - Ant2)

7.6 Peak-Average Ratio

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2.3.4

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

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

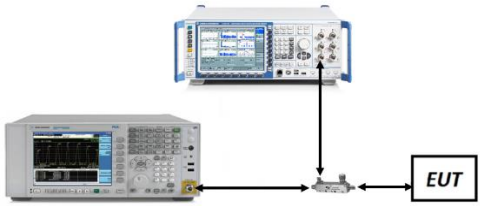


Figure 7-5. Test Instrument & Measurement Setup

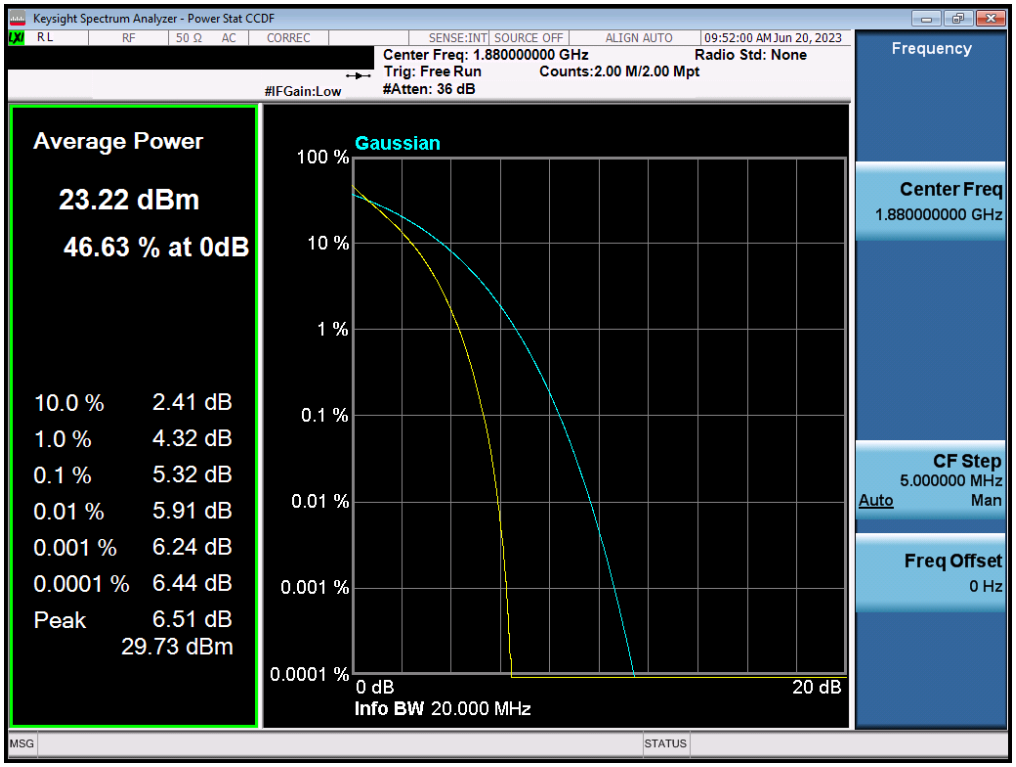
Test Notes

None.

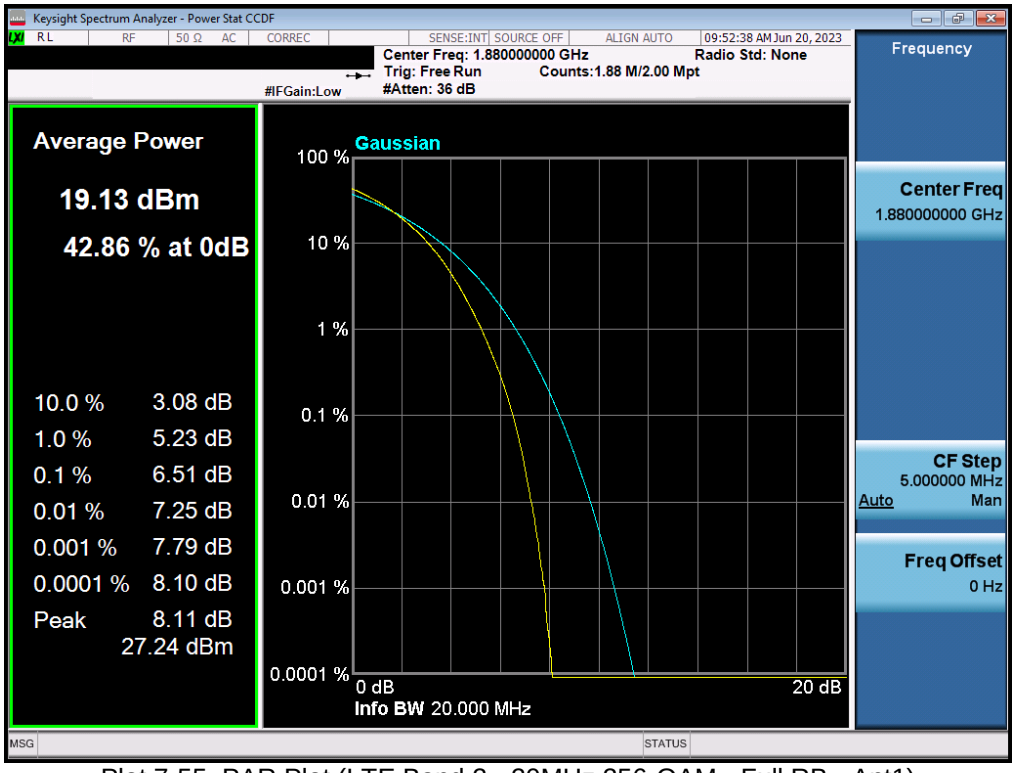
Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
GSM-PCS	N/A	GMSK	29.59	0.44	13.0	-12.56
GSM-PCS		8-PSK	22.99	5.57	13.0	-7.43
WCDMA-PCS		Spread Spectrum	23.21	3.07	13.0	-9.93
LTE-B2	20 MHz	QPSK	23.22	5.32	13.0	-7.68
		256QAM	19.13	6.52	13.0	-6.48
	15 MHz	QPSK	22.93	5.33	13.0	-7.67
		256QAM	19.09	6.47	13.0	-6.53
	10 MHz	QPSK	23.21	5.42	13.0	-7.58
		256QAM	19.07	6.48	13.0	-6.52
	5 MHz	QPSK	23.12	5.40	13.0	-7.60
		256QAM	18.58	6.48	13.0	-6.52
	3 MHz	QPSK	22.61	5.42	13.0	-7.58
		256QAM	18.59	6.49	13.0	-6.51
	1.4 MHz	QPSK	22.52	5.18	13.0	-7.82
		256QAM	18.55	6.41	13.0	-6.59

Table 7-11. Peak-Average Ratio Test Results – Ant1

LTE Band 2 – Ant1

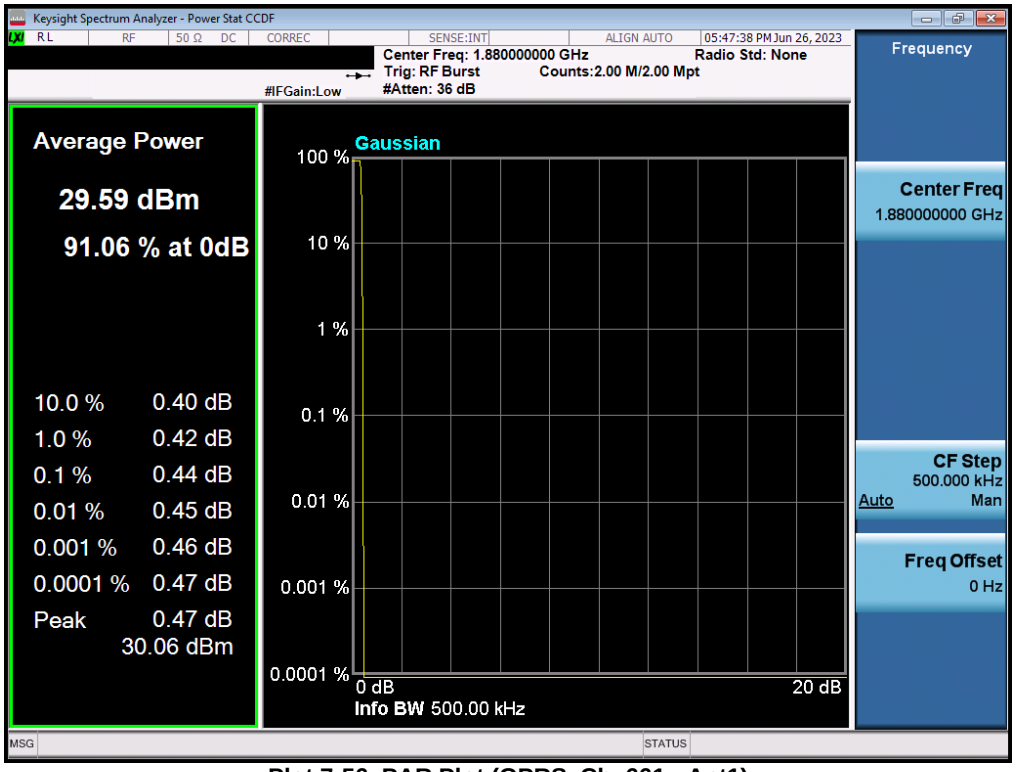


Plot 7-54. PAR Plot (LTE Band 2 - 20MHz QPSK - Full RB - Ant1)

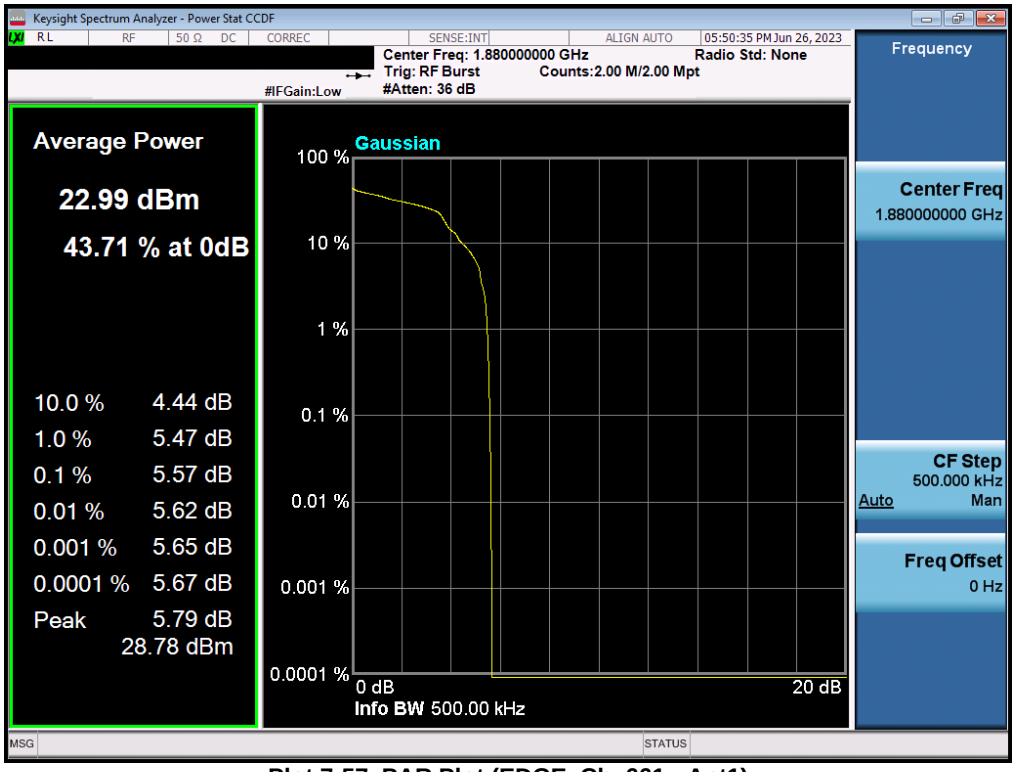


Plot 7-55. PAR Plot (LTE Band 2 - 20MHz 256-QAM - Full RB - Ant1)

GSM/GPRS PCS – Ant1

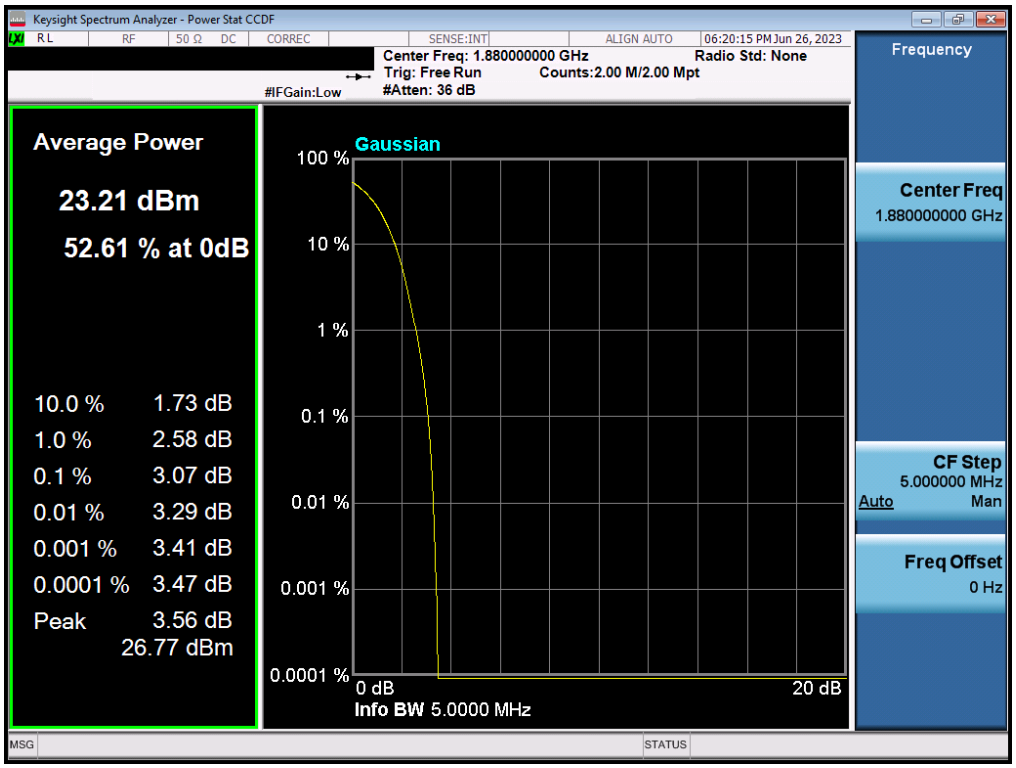


Plot 7-56. PAR Plot (GPRS, Ch. 661 - Ant1)



Plot 7-57. PAR Plot (EDGE, Ch. 661 - Ant1)

WCDMA PCS – Ant1

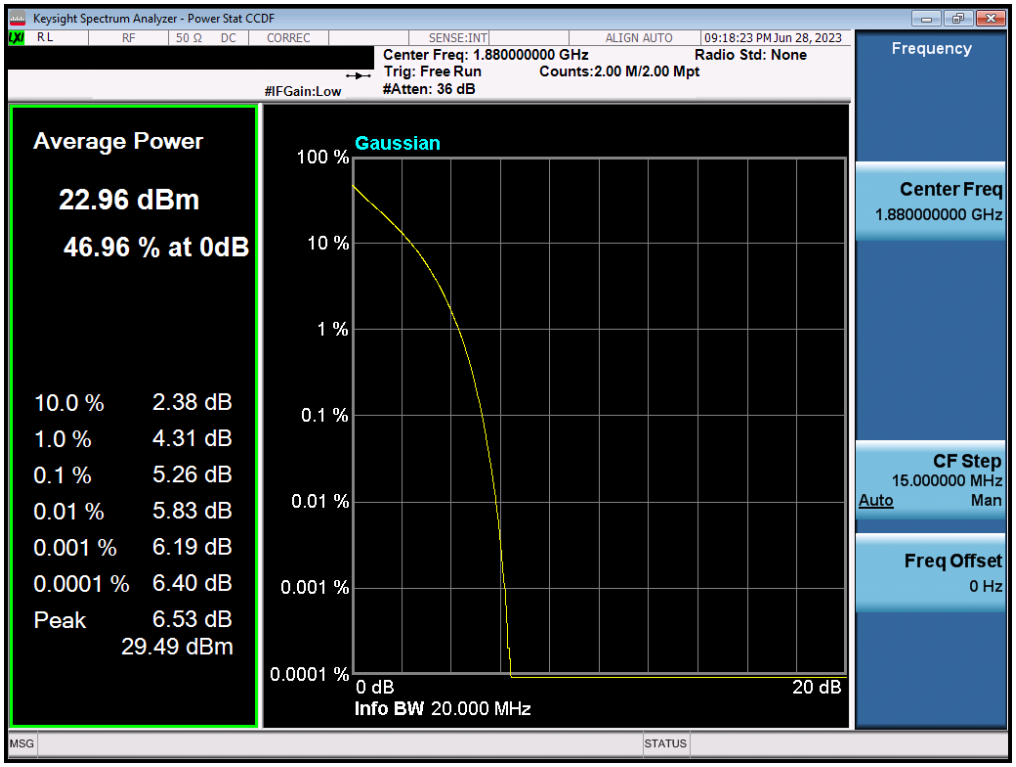


Plot 7-58. PAR Plot (WCDMA, Ch. 9400 - Ant1)

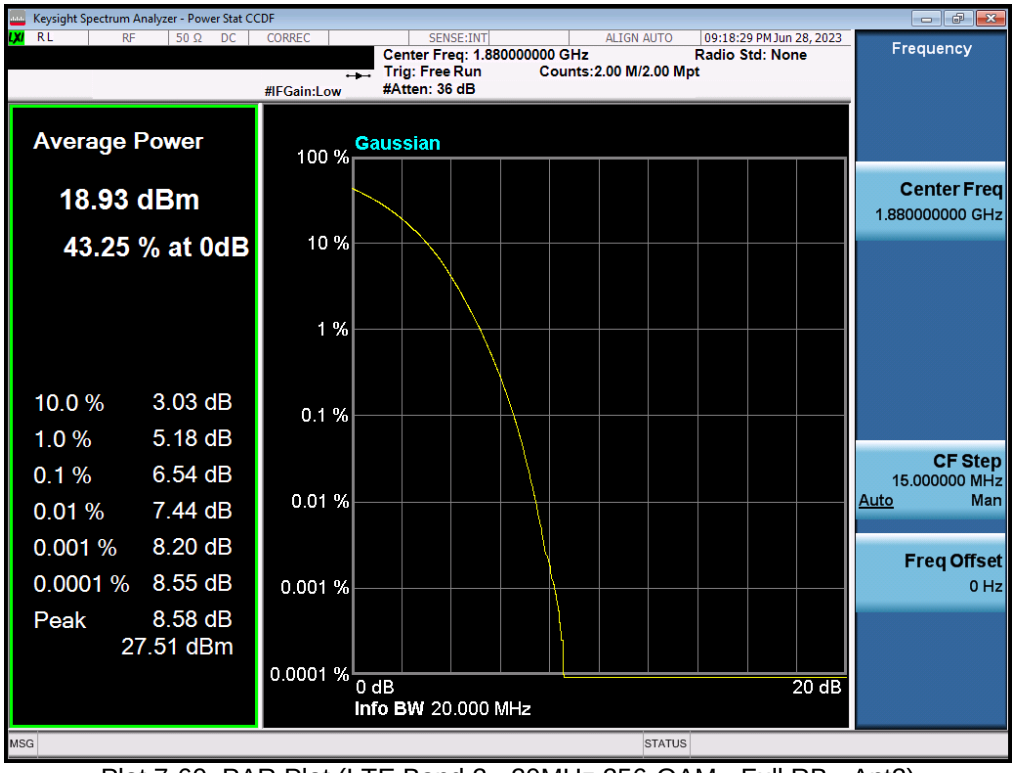
Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
LTE-B2	20 MHz	QPSK	22.96	5.26	13.00	-7.74
		256QAM	18.93	6.54	13.00	-6.46
	15 MHz	QPSK	22.93	5.24	13.00	-7.76
		256QAM	18.91	6.53	13.00	-6.47
	10 MHz	QPSK	22.99	5.38	13.00	-7.62
		256QAM	18.90	6.50	13.00	-6.50
	5 MHz	QPSK	22.92	5.35	13.00	-7.65
		256QAM	18.90	6.53	13.00	-6.47
	3 MHz	QPSK	22.87	5.41	13.00	-7.59
		256QAM	18.87	6.57	13.00	-6.43
	1.4 MHz	QPSK	22.86	5.19	13.00	-7.81
		256QAM	18.85	6.45	13.00	-6.55

Table 7-12. Peak-Average Ratio Test Results – Ant2

LTE Band 2 – Ant2



Plot 7-59. PAR Plot (LTE Band 2 - 20MHz QPSK - Full RB - Ant2)



Plot 7-60. PAR Plot (LTE Band 2 - 20MHz 256-QAM - Full RB - Ant2)

7.7 Radiated Power (EIRP)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.2.4.4

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration.
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize.

Test Setup

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

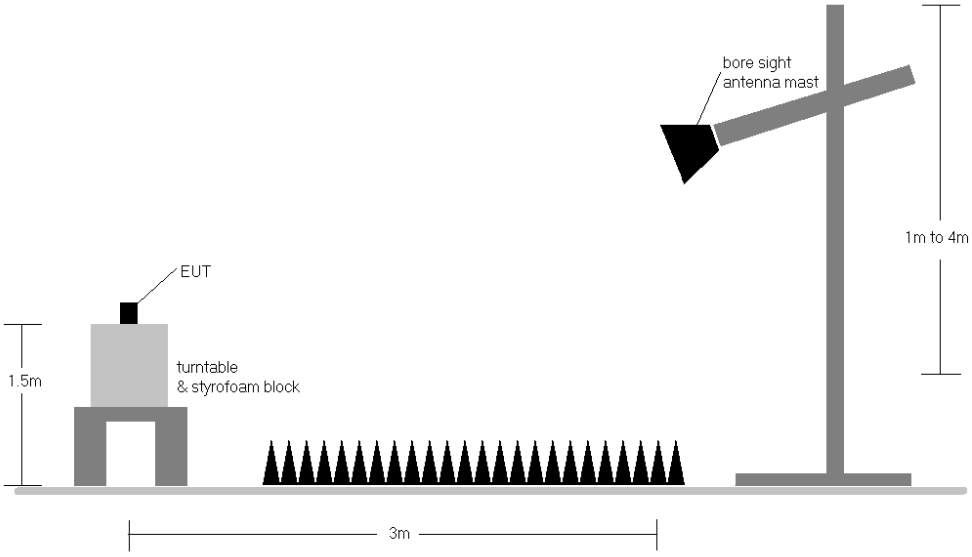


Figure 7-6. Radiated Test Setup >1GHz

Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers are reported in GPRS mode while transmitting with one slot active.

2) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest powers are reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".

3) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

4) This unit was tested with its standard battery.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1860.0	V	137	215	2.53	1 / 50	19.62	**22.15**	0.164	33.01	-10.86
	QPSK	1880.0	V	220	337	2.34	1 / 0	19.12	21.46	0.140	33.01	-11.55
	16-QAM	1860.0	V	137	215	2.53	1 / 50	18.70	21.23	0.133	33.01	-11.78
15 MHz	QPSK	1857.5	V	137	215	2.55	1 / 74	19.60	**22.16**	0.164	33.01	-10.85
	QPSK	1880.0	V	220	337	2.34	1 / 0	19.26	21.60	0.145	33.01	-11.41
	QPSK	1902.5	V	205	333	2.17	1 / 0	19.12	21.29	0.135	33.01	-11.72
	16-QAM	1857.5	V	137	215	2.55	1 / 74	18.84	21.39	0.138	33.01	-11.62
10 MHz	QPSK	1855.0	V	137	215	2.58	1 / 49	19.46	**22.04**	0.160	33.01	-10.97
	QPSK	1880.0	V	220	337	2.34	1 / 0	19.20	21.54	0.142	33.01	-11.47
	QPSK	1905.0	V	205	333	2.19	1 / 0	19.08	21.26	0.134	33.01	-11.75
	16-QAM	1855.0	V	137	215	2.58	1 / 49	18.55	21.13	0.130	33.01	-11.88
5 MHz	QPSK	1852.5	V	137	215	2.60	1 / 12	19.54	**22.15**	0.164	33.01	-10.86
	QPSK	1880.0	V	220	337	2.34	1 / 0	19.18	21.51	0.142	33.01	-11.50
	QPSK	1907.5	V	205	333	2.20	1 / 12	18.95	21.15	0.130	33.01	-11.86
	16-QAM	1852.5	V	137	215	2.60	1 / 0	18.40	21.00	0.126	33.01	-12.01
3 MHz	QPSK	1851.5	V	137	215	2.61	1 / 7	19.39	**22.00**	0.158	33.01	-11.01
	QPSK	1880.0	V	220	337	2.34	1 / 14	19.07	21.41	0.138	33.01	-11.60
	QPSK	1908.5	V	205	333	2.21	1 / 14	18.84	21.05	0.127	33.01	-11.96
	16-QAM	1851.5	V	137	215	2.61	1 / 0	18.37	20.98	0.125	33.01	-12.03
1.4 MHz	QPSK	1850.7	V	137	215	2.62	1 / 5	19.28	**21.90**	0.155	33.01	-11.11
	QPSK	1880.0	V	220	337	2.34	1 / 0	19.06	21.39	0.138	33.01	-11.62
	QPSK	1909.3	V	205	333	2.22	1 / 5	18.82	21.03	0.127	33.01	-11.98
	16-QAM	1850.7	V	137	215	2.62	1 / 5	18.38	21.00	0.126	33.01	-12.01
20 MHz	WCP	1860.0	V	146	21	2.53	1 / 50	16.41	18.94	0.078	33.01	-14.07

Table 7-13. EIRP Data (LTE Band 2 – Ant1)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1860.0	H	208	299	2.79	1 / 0	15.51	18.30	0.068	33.01	-14.71
	QPSK	1880.0	H	189	303	2.67	1 / 50	15.90	**18.57**	0.072	33.01	-14.45
	QPSK	1900.0	H	328	296	2.54	1 / 99	15.37	17.91	0.062	33.01	-15.10
	16-QAM	1880.0	H	189	303	2.67	1 / 50	14.91	17.58	0.057	33.01	-15.44
15 MHz	QPSK	1857.5	H	208	299	2.81	75 / 0	15.49	18.30	0.068	33.01	-14.71
	QPSK	1880.0	H	189	303	2.67	1 / 0	15.99	**18.65**	0.073	33.01	-14.36
	QPSK	1902.5	H	328	296	2.54	75 / 0	15.46	18.00	0.063	33.01	-15.01
	16-QAM	1880.0	H	189	303	2.67	1 / 0	15.85	18.52	0.071	33.01	-14.49
10 MHz	QPSK	1855.0	H	208	299	2.82	1 / 0	15.49	18.32	0.068	33.01	-14.69
	QPSK	1880.0	H	189	303	2.67	50 / 0	15.97	**18.63**	0.073	33.01	-14.38
	QPSK	1905.0	H	328	296	2.54	50 / 0	15.50	18.04	0.064	33.01	-14.97
	16-QAM	1880.0	H	189	303	2.67	50 / 0	15.02	17.68	0.059	33.01	-15.33
5 MHz	QPSK	1852.5	H	208	299	2.84	25 / 0	15.40	18.24	0.067	33.01	-14.77
	QPSK	1880.0	H	189	303	2.67	1 / 12	16.02	**18.68**	0.074	33.01	-14.33
	QPSK	1907.5	H	328	296	2.54	1 / 24	15.43	17.98	0.063	33.01	-15.03
	16-QAM	1880.0	H	189	303	2.67	1 / 24	15.17	17.83	0.061	33.01	-15.18
3 MHz	QPSK	1851.5	H	208	299	2.85	1 / 14	15.32	18.17	0.066	33.01	-14.84
	QPSK	1880.0	H	189	303	2.67	1 / 7	15.85	**18.52**	0.071	33.01	-14.49
	QPSK	1908.5	H	328	296	2.55	15 / 0	15.31	17.86	0.061	33.01	-15.15
	16-QAM	1880.0	H	189	303	2.67	1 / 14	15.16	17.82	0.061	33.01	-15.19
1.4 MHz	QPSK	1850.7	H	208	299	2.85	1 / 5	15.25	18.10	0.065	33.01	-14.91
	QPSK	1880.0	H	189	303	2.67	1 / 0	15.80	**18.47**	0.070	33.01	-14.54
	QPSK	1909.3	H	328	296	2.55	1 / 0	15.28	17.83	0.061	33.01	-15.18
	16-QAM	1880.0	H	189	303	2.67	1 / 0	14.99	17.66	0.058	33.01	-15.35
20 MHz	WCP	1880.0	H	143	325	2.67	1 / 0	14.96	17.63	0.058	33.01	-15.39

Table 7-14. EIRP Data (LTE Band 2 – Ant2)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1850.20	GSM1900	V	176.00	333.00	26.64	2.62	**29.26**	**0.844**	33.01	-3.75
1880.00	GSM1900	V	137.00	326.00	26.31	2.34	28.65	0.733	33.01	-4.36
1909.80	GSM1900	V	159.00	197.00	25.32	2.22	27.54	0.567	33.01	-5.47
1850.20	EDGE1900	V	176.00	333.00	21.74	2.62	**24.36**	0.273	33.01	-8.65
1850.20	GSM1900 (WCP)	V	143.00	38.00	22.04	2.62	24.66	0.293	33.01	-8.35

Table 7-15. EIRP Data (GPRS PCS – Ant1)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1852.40	WCDMA1900	V	170.00	323.00	20.02	2.60	**22.62**	**0.183**	33.01	-10.39
1880.00	WCDMA1900	V	140.00	334.00	19.87	2.34	22.21	0.166	33.01	-10.80
1907.60	WCDMA1900	V	159.00	214.00	19.27	2.20	21.47	0.140	33.01	-11.54
1852.40	WCDMA1900 (WCP)	V	176.00	23.00	16.77	2.34	19.11	0.081	33.01	-13.90

Table 7-16. EIRP Data (WCDMA PCS – Ant1)

7.8 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

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

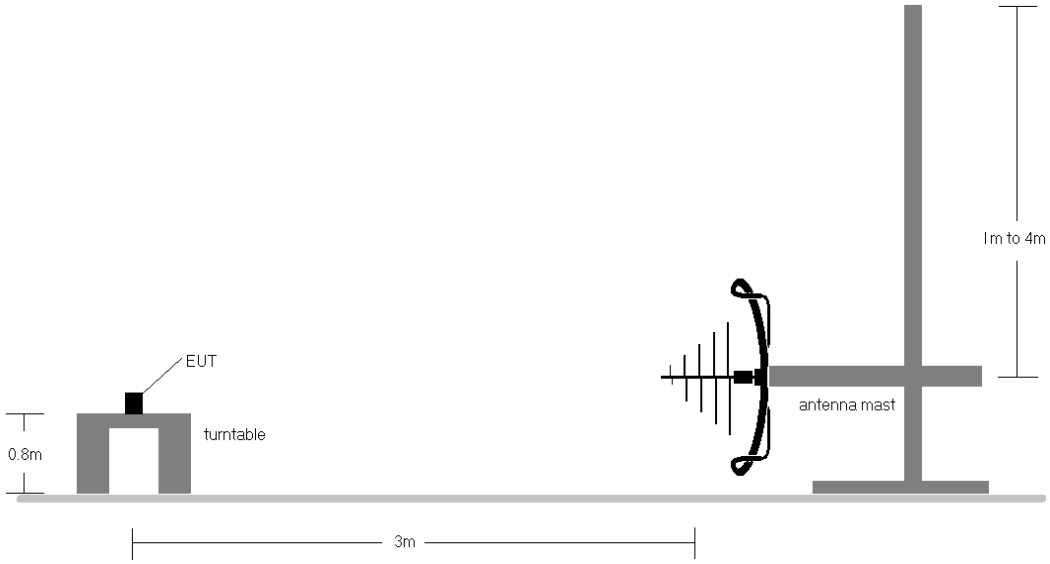


Figure 7-7. Test Instrument & Measurement Setup < 1GHz

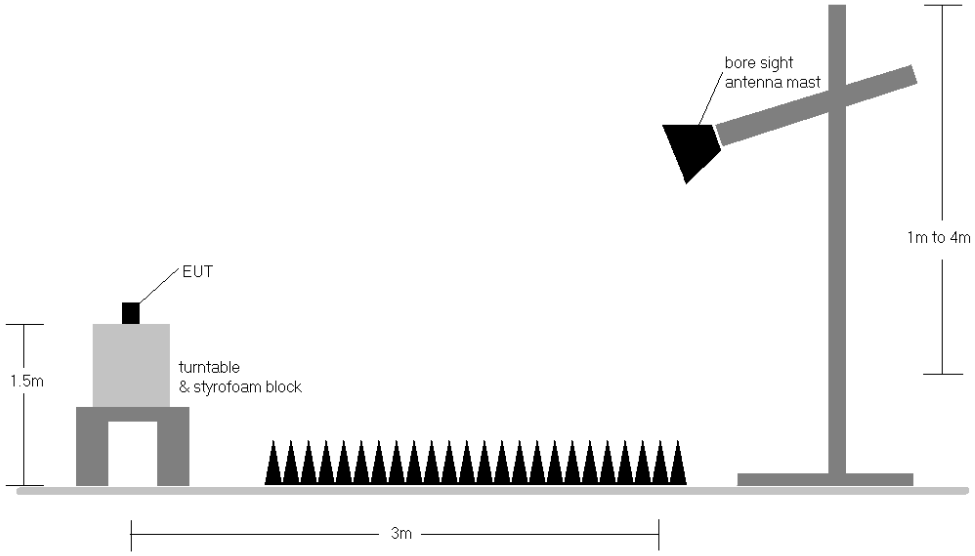


Figure 7-8. Test Instrument & Measurement Setup >1 GHz

Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
   a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers are reported in GPRS mode while transmitting with one slot active.

3) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest powers are reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.

4) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

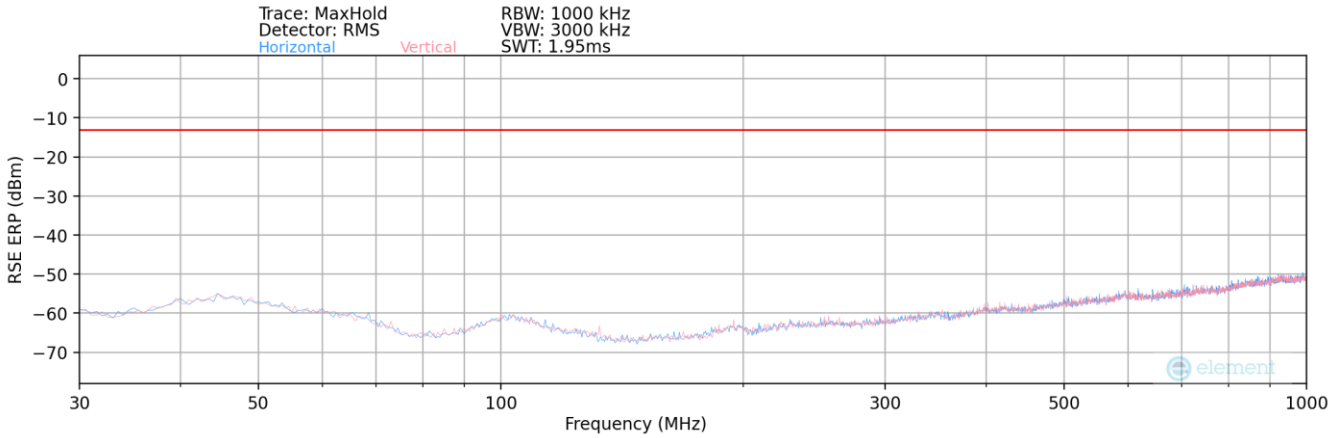
5) This unit was tested with its standard battery.

6) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

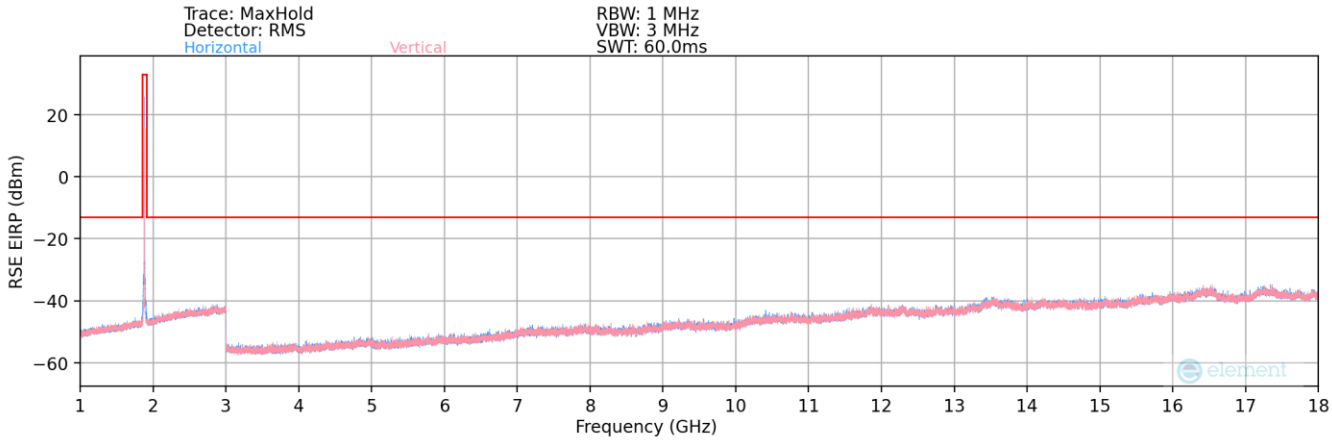
7) Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

8) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

LTE Band 2 – Ant1



Plot 7-61. Radiated Spurious Plot (LTE Band 2 - Ant1) – Below 1GHz



Plot 7-62. Radiated Spurious Plot (LTE Band 2 - Ant1)

Bandwidth (MHz):	20
Frequency (MHz):	1880
RB / Offset:	1 / 50
Detector / Trace Mode:	RMS / Average
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
175.96	H	-	-	-71.80	-13.20	22.00	-73.26	-13.00	-60.26

Table 7-17. Radiated Spurious Data (LTE Band 2 – Mid Channel - Ant1 – Below 1GHz)

Bandwidth (MHz):	20
Frequency (MHz):	1860
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3720.00	H	-	-	-79.92	7.35	34.43	-60.83	-13.00	-47.83
5580.00	H	-	-	-80.50	11.36	37.86	-57.39	-13.00	-44.39
7440.00	H	-	-	-82.39	15.12	39.73	-55.53	-13.00	-42.53

Table 7-18. Radiated Spurious Data (LTE Band 2 – Low Channel - Ant1)

Bandwidth (MHz):	20
Frequency (MHz):	1880
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	H	-	-	-79.98	7.58	34.60	-60.66	-13.00	-47.66
5640.00	H	-	-	-80.70	11.31	37.61	-57.65	-13.00	-44.65
7520.00	H	-	-	-82.43	15.46	40.03	-55.22	-13.00	-42.22

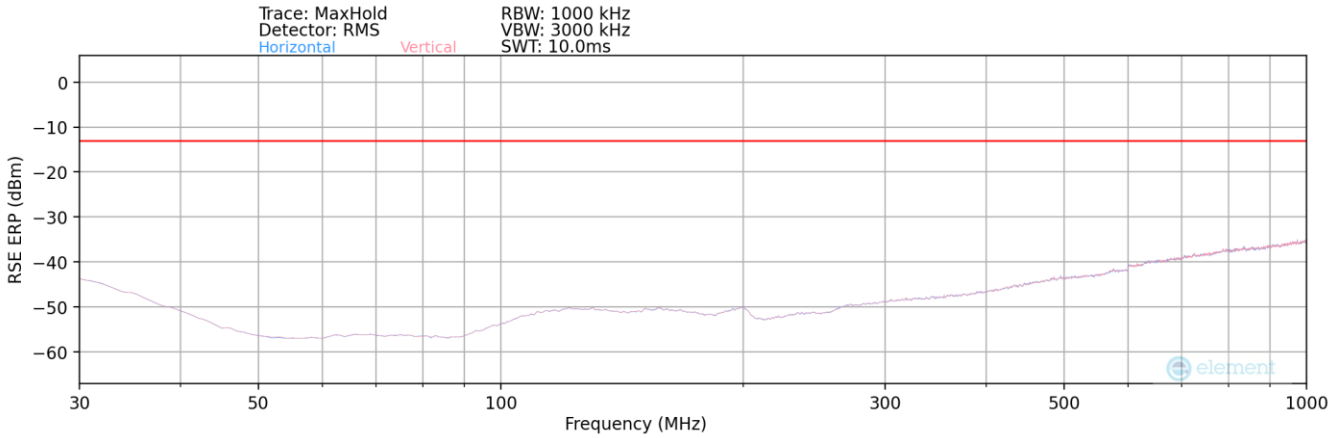
Table 7-19. Radiated Spurious Data (LTE Band 2 – Mid Channel - Ant1)

Bandwidth (MHz):	20
Frequency (MHz):	1900
RB / Offset:	1 / 50

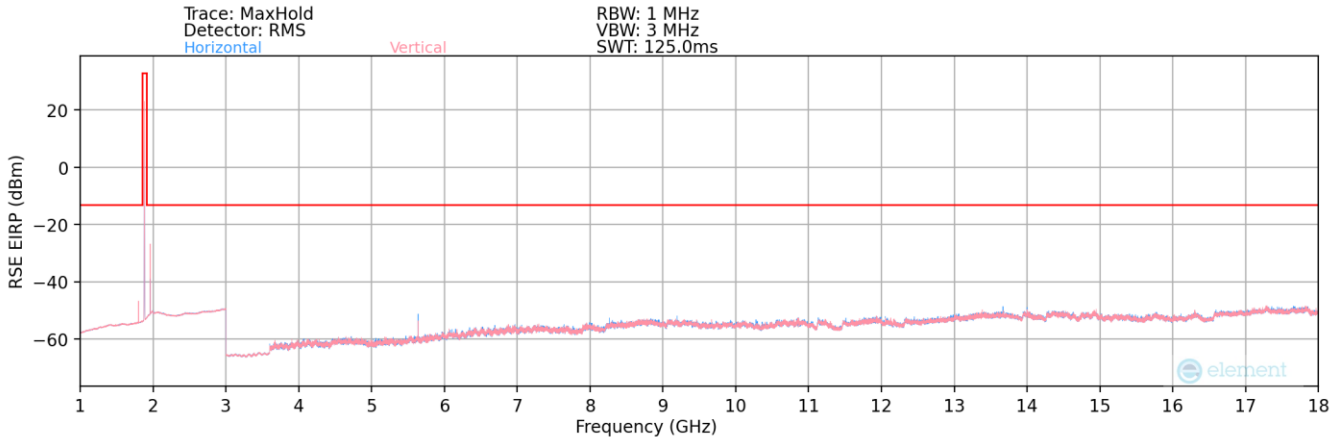
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3800.00	H	-	-	-80.29	7.92	34.63	-60.62	-13.00	-47.62
5700.00	H	-	-	-81.29	10.92	36.63	-58.62	-13.00	-45.62
7600.00	H	-	-	-82.52	15.50	39.98	-55.28	-13.00	-42.28

Table 7-20. Radiated Spurious Data (LTE Band 2 – High Channel - Ant1)

GSM/GPRS PCS – Ant1



Plot 7-63. Radiated Spurious Plot (GPRS PCS - Ant1) – Below 1GHz



Plot 7-64. Radiated Spurious Plot (GPRS PCS - Ant1)

Mode:	GPRS 1 Tx Slot
Channel:	661
Frequency (MHz):	1880
Detector / Trace Mode:	RMS / Max Hold
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
970.32	H	-	-	-94.59	31.58	43.99	-51.27	-13.00	-38.27

Table 7-21. Radiated Spurious Data (GPRS PCS – Mid Channel - Ant1 – Below 1GHz)

Mode:	GPRS 1 Tx Slot
Channel:	512
Frequency (MHz):	1850.2

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3700.40	H	122	237	-68.31	1.04	39.73	-55.53	-13.00	-42.53
5550.60	H	109	306	-66.11	4.01	44.90	-50.36	-13.00	-37.36
7400.80	H	-	-	-76.27	9.05	39.78	-55.48	-13.00	-42.48
9251.00	H	-	-	-76.75	10.71	40.96	-54.30	-13.00	-41.30
11101.20	H	-	-	-77.60	11.99	41.39	-53.86	-13.00	-40.86

Table 7-22. Radiated Spurious Data (GPRS PCS – Low Channel - Ant1)

Mode:	GPRS 1 Tx Slot
Channel:	661
Frequency (MHz):	1880

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	H	118	163	-70.64	0.97	37.33	-57.93	-13.00	-44.93
5640.00	H	110	306	-65.69	4.29	45.60	-49.66	-13.00	-36.66
7520.00	H	-	-	-76.01	8.91	39.90	-55.36	-13.00	-42.36
9400.00	H	-	-	-77.66	11.70	41.04	-54.22	-13.00	-41.22
11280.00	H	-	-	-78.09	12.11	41.02	-54.23	-13.00	-41.23

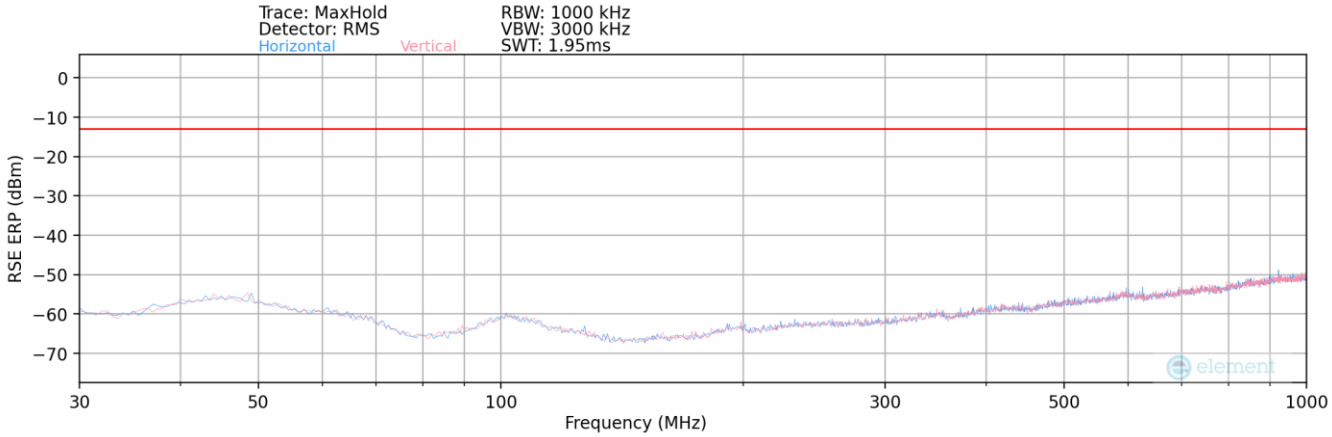
Table 7-23. Radiated Spurious Data (GPRS PCS – Mid Channel - Ant1)

Mode:	GPRS 1 Tx Slot
Channel:	810
Frequency (MHz):	1909.8

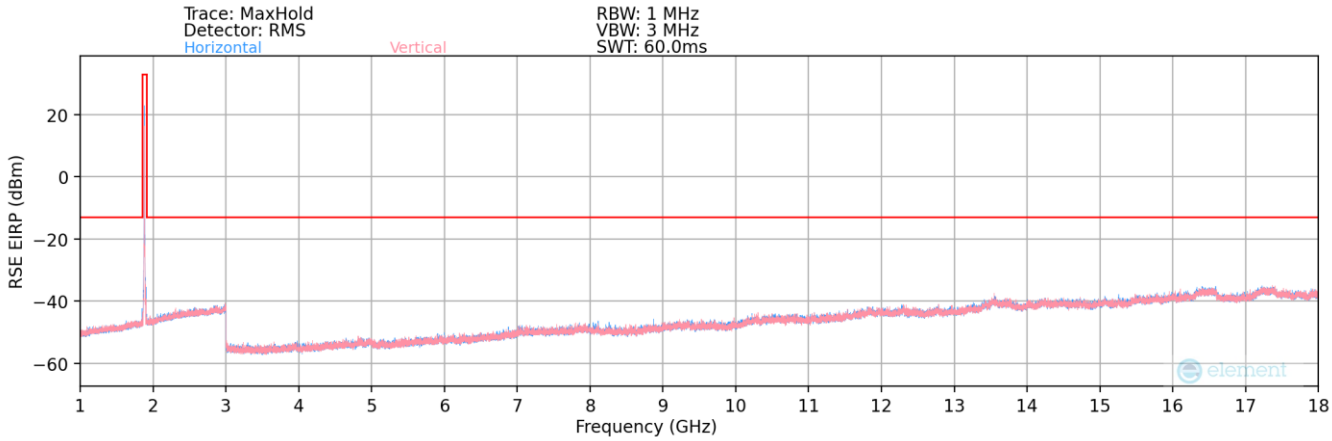
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3819.60	H	138	167	-69.89	1.02	38.13	-57.13	-13.00	-44.13
5729.40	H	114	133	-69.19	4.40	42.21	-53.05	-13.00	-40.05
7639.20	H	-	-	-76.68	9.12	39.44	-55.82	-13.00	-42.82
9549.00	H	-	-	-77.61	11.31	40.70	-54.56	-13.00	-41.56
11458.80	H	-	-	-77.90	12.81	41.91	-53.34	-13.00	-40.34

Table 7-24. Radiated Spurious Data (GPRS PCS – High Channel - Ant1)

WCDMA PCS – Ant1



Plot 7-65. Radiated Spurious Plot (WCDMA PCS - Ant1) – Below 1GHz



Plot 7-66. Radiated Spurious Plot (WCDMA PCS - Ant1)

Sample #:	0974M
Mode:	WCDMA RMC
Channel:	9400
Frequency (MHz):	1880
Detector / Trace Mode:	RMS / Average
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
631.12	H	-	-	-76.62	-2.13	28.25	-67.01	-13.00	-54.01

Table 7-25. Radiated Spurious Data (WCDMA PCS – Low Channel - Ant1)

Mode:	WCDMA RMC
Channel:	9400
Frequency (MHz):	1880

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	H	-	-	-80.03	7.58	34.55	-60.71	-13.00	-47.71
5640.00	H	-	-	-81.27	11.31	37.04	-58.22	-13.00	-45.22
7520.00	H	-	-	-82.53	15.46	39.93	-55.32	-13.00	-42.32

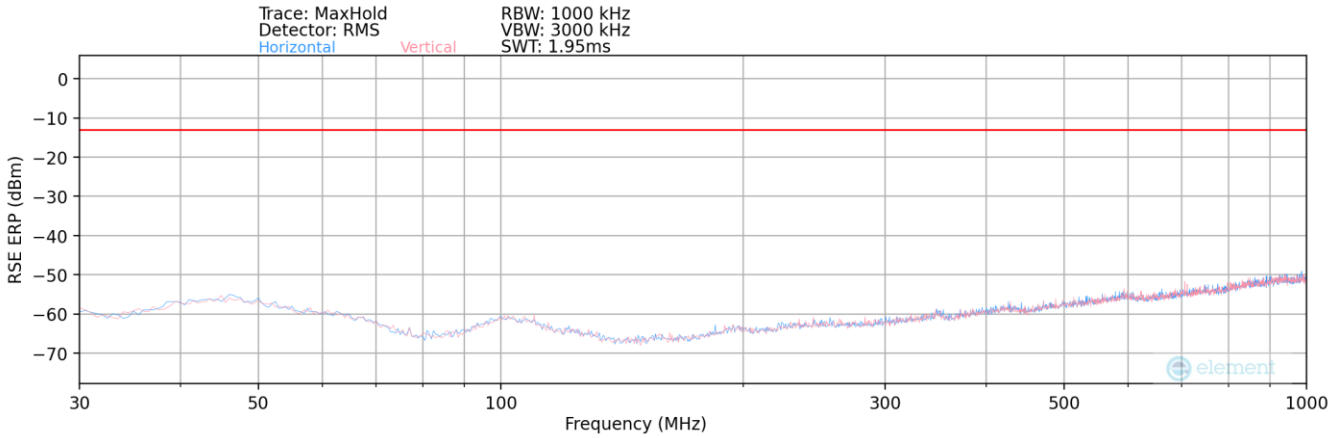
Table 7-26. Radiated Spurious Data (WCDMA PCS – Mid Channel - Ant1)

Mode:	WCDMA RMC
Channel:	9538
Frequency (MHz):	1907.6

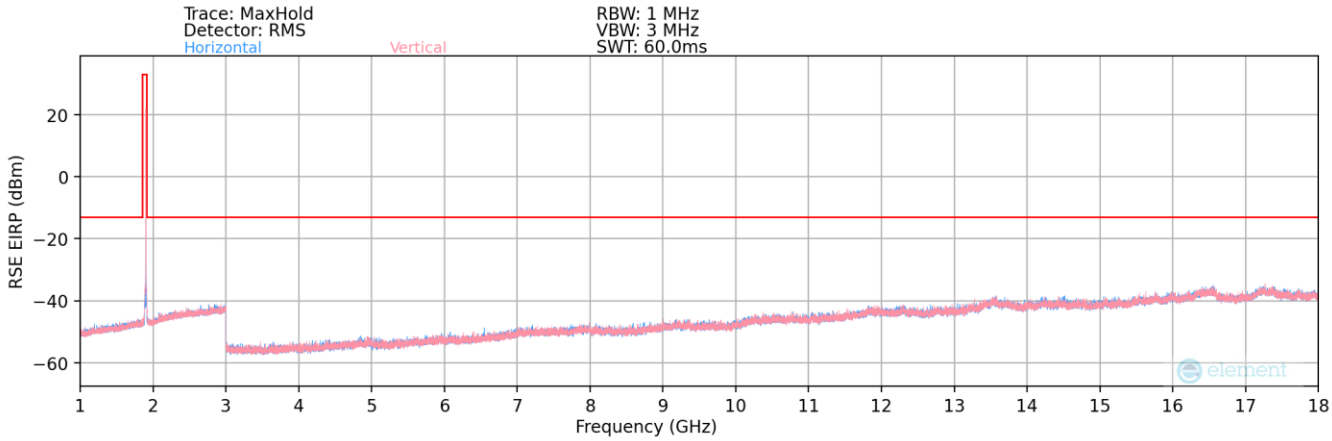
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3815.20	H	-	-	-79.69	7.76	35.07	-60.19	-13.00	-47.19
5722.80	H	-	-	-81.42	11.40	36.98	-58.27	-13.00	-45.27
7630.40	H	-	-	-82.42	15.67	40.25	-55.00	-13.00	-42.00

Table 7-27. Radiated Spurious Data (WCDMA PCS – High Channel - Ant1)

LTE Band 2 – Ant2



Plot 7-67. Radiated Spurious Plot (LTE Band 2 - Ant2) – Below 1GHz



Plot 7-68. Radiated Spurious Plot (LTE Band 2 - Ant2)

Bandwidth (MHz):	20
Frequency (MHz):	1900
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
345.00	H	-	-	-74.37	-7.08	25.55	-69.70	-13.00	-56.70

Table 7-28. Radiated Spurious Data (LTE Band 2 – High Channel – Ant2 – Below 1GHz)

Bandwidth (MHz):	20
Frequency (MHz):	1860
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3720.00	H	371.00	316.00	-78.20	7.35	36.15	-59.11	-13.00	-46.11
5580.00	H	-	-	-81.31	11.36	37.05	-58.20	-13.00	-45.20
7440.00	H	-	-	-82.29	15.12	39.83	-55.43	-13.00	-42.43
9300.00	H	-	-	-82.76	17.61	41.85	-53.41	-13.00	-40.41

Table 7-29. Radiated Spurious Data (LTE Band 2 – Low Channel - Ant2)

Bandwidth (MHz):	20
Frequency (MHz):	1880
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	H	271.00	19.00	-79.31	7.58	35.27	-59.99	-13.00	-46.99
5640.00	H	-	-	-81.33	11.31	36.98	-58.28	-13.00	-45.28
7520.00	H	-	-	-82.48	15.46	39.98	-55.27	-13.00	-42.27
9400.00	H	-	-	-83.15	17.69	41.54	-53.71	-13.00	-40.71

Table 7-30. Radiated Spurious Data (LTE Band 2 – Mid Channel - Ant2)

Bandwidth (MHz):	20
Frequency (MHz):	1900
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3800.00	H	278.00	322.00	-77.80	7.92	37.12	-58.13	-13.00	-45.13
5700.00	H	-	-	-81.32	10.92	36.60	-58.65	-13.00	-45.65
7600.00	H	-	-	-82.39	15.50	40.11	-55.15	-13.00	-42.15
9500.00	H	-	-	-83.31	17.99	41.68	-53.58	-13.00	-40.58

Table 7-31. Radiated Spurious Data (LTE Band 2 – High Channel - Ant2)

7.9 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 24, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI C63.26-2015 – Section 5.6

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

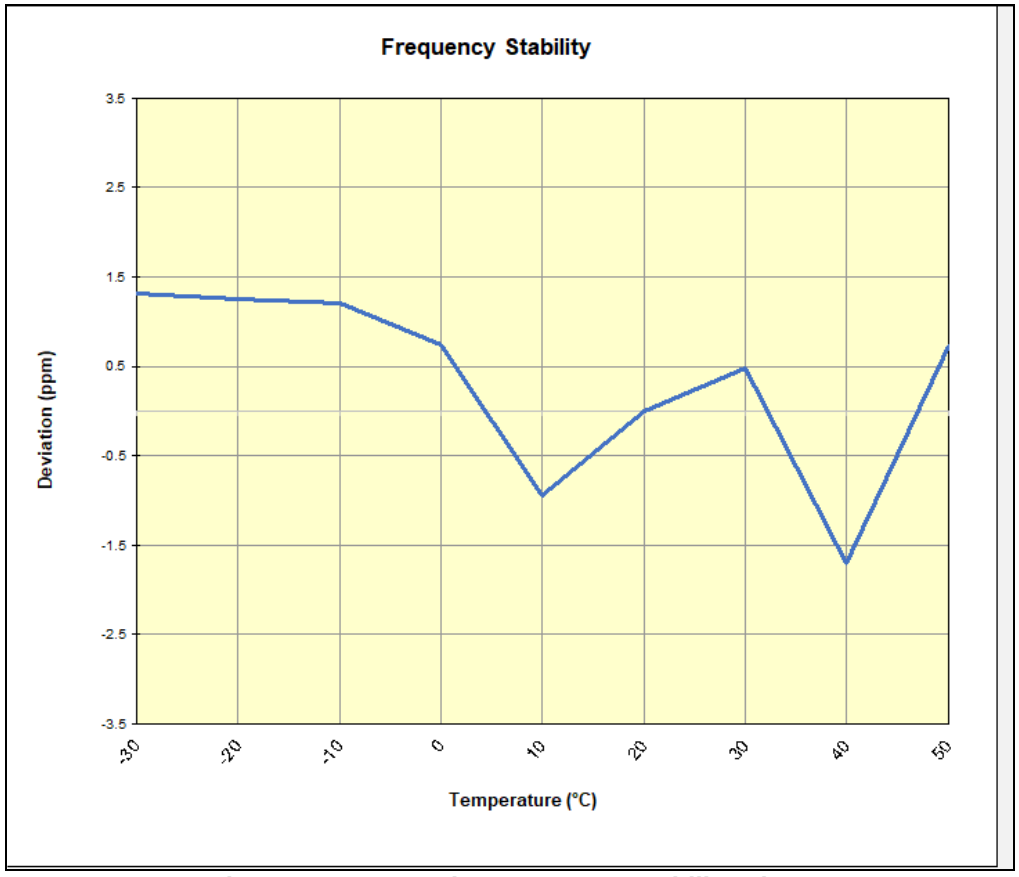
None

LTE Band 2

Operating Frequency (Hz):	1,880,000,000
Ref. Voltage (VDC):	4.43

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.43	- 30	1,880,292,771	2,460	0.0001308
		- 20	1,880,292,669	2,358	0.0001254
		- 10	1,880,292,586	2,275	0.0001210
		0	1,880,291,699	1,388	0.0000738
		+ 10	1,880,288,547	-1,764	-0.0000938
		+ 20 (Ref)	1,880,290,311	0	0.0000000
		+ 30	1,880,291,211	900	0.0000479
		+ 40	1,880,287,121	-3,190	-0.0001697
		+ 50	1,880,291,669	1,358	0.0000722
Battery Endpoint	3.27	+ 20	1,880,291,400	1,089	0.0000579

Table 7-32. LTE Band 2 Frequency Stability Data



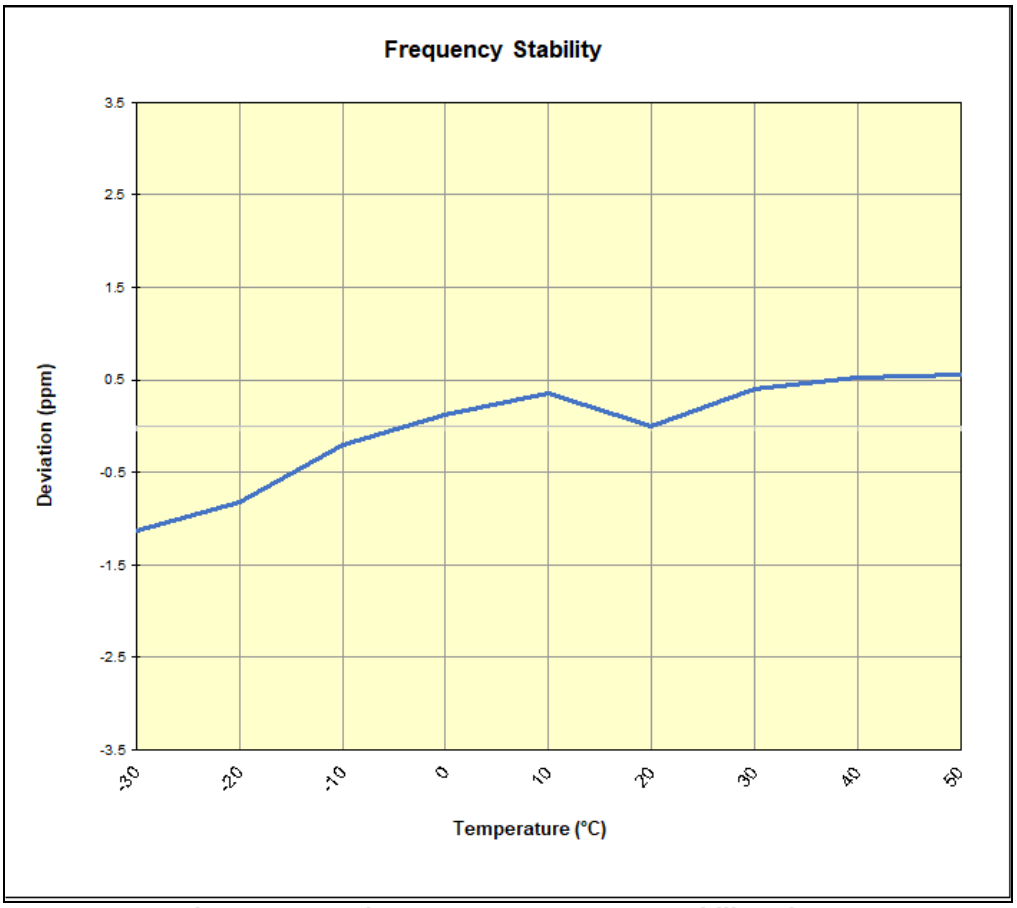
Plot 7-69. LTE Band 2 Frequency Stability Chart

GSM/GPRS PCS

Operating Frequency (Hz):	1,880,000,000
Ref. Voltage (VDC):	4.43

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.43	- 30	1,880,449,350	-2,120	-0.0001127
		- 20	1,880,449,923	-1,547	-0.0000823
		- 10	1,880,451,104	-366	-0.0000195
		0	1,880,451,715	245	0.0000130
		+ 10	1,880,452,136	666	0.0000354
		+ 20 (Ref)	1,880,451,470	0	0.0000000
		+ 30	1,880,452,224	754	0.0000401
		+ 40	1,880,452,466	996	0.0000530
		+ 50	1,880,452,512	1,042	0.0000554
Battery Endpoint	3.27	+ 20	1,880,457,017	5,547	0.0002950

Table 7-33. GSM/GPRS PCS Frequency Stability Data



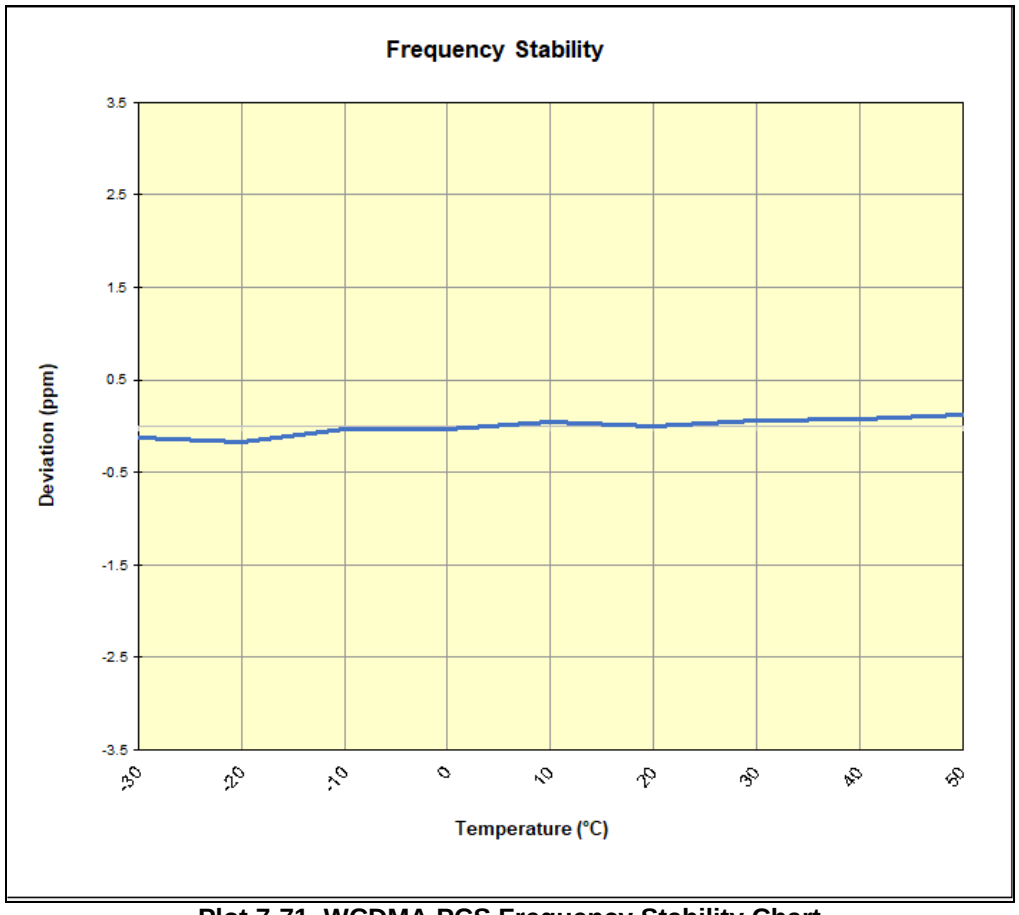
Plot 7-70. GSM/GPRS PCS Frequency Stability Chart

WCDMA PCS

Operating Frequency (Hz):	1,880,000,000
Ref. Voltage (VDC):	4.43

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.43	- 30	1,880,221,233	-245	-0.0000130
		- 20	1,880,221,154	-324	-0.0000172
		- 10	1,880,221,421	-57	-0.0000030
		0	1,880,221,412	-66	-0.0000035
		+ 10	1,880,221,579	101	0.0000054
		+ 20 (Ref)	1,880,221,478	0	0.0000000
		+ 30	1,880,221,580	102	0.0000054
		+ 40	1,880,221,637	159	0.0000085
		+ 50	1,880,221,725	247	0.0000131
Battery Endpoint	3.27	+ 20	1,880,221,533	55	0.0000029

Table 7-34. WCDMA PCS Frequency Stability Data



Plot 7-71. WCDMA PCS Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMS711B** complies with all the requirements of Part 24 of the FCC rules.