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PART 24 MEASUREMENT REPORT

Applicant Name:
Tecore Networks
7030 Hi Tech Drive
Hanover, MD 21076
United States

Date of Testing:
06/28/2022 - 07/07/2022
Test Report Issue Date:
07/12/2022
Test Site/Location:
Element Lab., Columbia, MD, USA
Test Report Serial No.:
1M2206100071-01-R1.QLJ

FCC ID:	**QLJNIB-002**
Applicant Name:	**Tecore Networks**

Application Type:	Class II Permissive Change
Model:	iCore NIB-002
EUT Type:	Band 2 iCore NIB
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part:	24
Test Procedure(s):	ANSI C63.26-2015, KDB 971168 D01 v03r01
Original Grant Date:	06/06/2022
Class II Permissive Change	See FCC Change Document

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.

Note: This revised Test Report (S/N: 1M2206100071-01-R1.QLJ) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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-1					
Mode	Modulation	Tx Frequency Range [MHz]	Conducted Power		Emission Designator
			Max. Power [W]	Max. Power [dBm]	
WCDMA	QPSK	1932.4 - 1987.6	21.727	43.37	4M18F9W
	16QAM	1932.4 - 1987.6	21.777	43.38	4M24F9W

EUT Overview

Antenna-2					
Mode	Modulation	Tx Frequency Range [MHz]	Conducted Power		Emission Designator
			Max. Power [W]	Max. Power [dBm]	
WCDMA	QPSK	1932.4 - 1987.6	21.878	43.40	4M20F9W
	16QAM	1932.4 - 1987.6	22.029	43.43	4M20F9W

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 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.

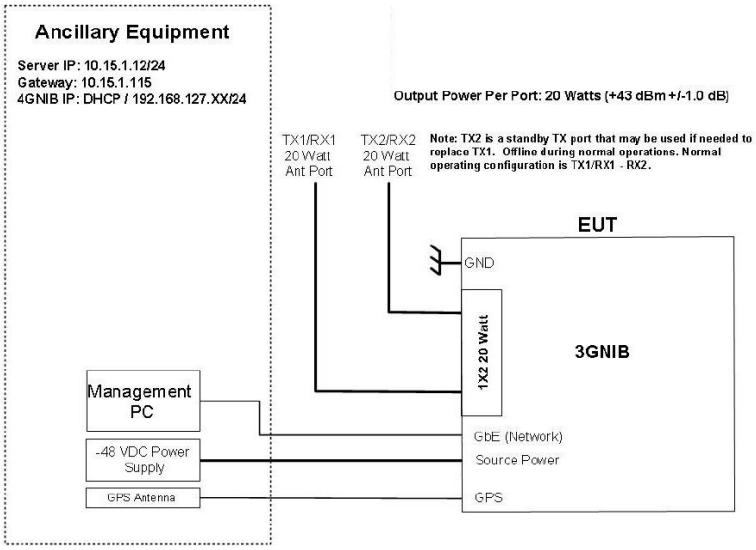
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Tecore Networks Band 2 iCore NIB FCC ID: QLJNIB-002**. 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. The EUT generates WCDMA signal using QPSK and 16-QAM modulations. The signal output level is set to 20W output per port with only one Tx port transmitting the WCDMA signal at any given time, and it is fed via a low loss cable to the input of a spectrum analyzer or a 50Ω load, depending on the type of testing performed. EUT was set up to operate as shown below with a -48 VDC power source. Server equipment was used to control the RF functions of the EUT.

Test Device Serial No.: 21400002



2.2 Device Capabilities

This device contains the following capabilities:

LTE, WCDMA

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Sections 3 and 7 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 Software and Firmware

Testing was performed on device(s) using BBU software version 8.0 and RRH firmware version 015 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 with both of its Tx/Rx RF ports terminated in 50Ω loads 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 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.

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
-	ETS-001	EMC Cable and Switch System	12/9/2021	Annual	12/9/2022	ETS-001
-	ETS-002	EMC Cable and Switch System	12/9/2021	Annual	12/9/2022	ETS-002
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
Espec	SCP-220	Environmental Chamber	5/25/2022	Biennial	5/25/2024	OCPS5H0612K05
Hewlett Packard	6032A	Adjustable DC Power Supply (0-60 V / 0-50 A)	N/A	N/A	N/A	US38322463
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2022	Annual	3/15/2023	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer	1/6/2022	Annual	1/6/2023	MY55410501
Keysight Technologies	N9038A	MXE EMI Receiver	1/21/2022	Annual	1/21/2023	MY51210133
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	5/25/2021	Annual	7/25/2022	100348
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	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

WCDMA Emission Designator

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

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: Tecore Networks

FCC ID: QLJNIB-002

FCC Classification: PCS Licensed Transmitter (PCB)

Mode(s): WCDMA

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power	2.1046	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	PASS	Section 7.8
RADIATED	Radiated Spurious Emissions	2.1053, 24.238(a)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	PASS	Section 7.7

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 and attenuators while the other antenna port was terminated in a 50Ω load.
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 v1.1.

7.2 Transmitter Conducted Output Power Data

Test Overview

The EUT was set to transmit in QPSK and 16-QAM modulations of WCDMA mode at the maximum output power of 20W per Tx port for this band or as applicable for the channel through a management server. One of the two output terminals of the EUT was connected through a calibrated cable and 30 dB of external attenuation to a signal analyzer and the other output terminal was terminated with a 50Ω load. This step was repeated with the measurement ports reversed to measure the output power of the second terminal. The signal analyzers' "Channel Power" function was used to measure the conducted output powers in accordance with the guidance of KDB 971168 D01 v03r01.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.2.1

Test Settings

1. Power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. Span = 2 - 3 times the OBW
3. RBW = 1 – 5% of the expected OBW
4. VBW ≥ 3 x RBW
5. No. of sweep points > 2 x span / RBW
6. Sweep time = auto-couple
7. Detector = RMS
8. Trigger is set to "free run" for signals with continuous operation.
9. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
10. Trace mode = trace averaging (RMS) over 100 sweeps
11. The trace was allowed to stabilize

Test Setup

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

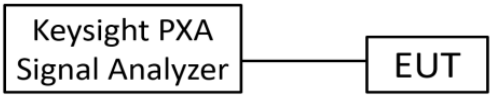


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

WCDMA PCS

Bandwidth	Modulation	Channel	Frequency [MHz]	Conducted Power [dBm]	Conducted Power [Watts]
5 MHz	QPSK	9662	1932.4	43.15	20.65
		9800	1960.0	43.12	20.51
		9938	1987.6	43.37	21.73
	16-QAM	9662	1932.4	43.19	20.84
		9800	1960.0	43.05	20.18
		9938	1987.6	43.38	21.78

Table 7-2. Transmitter Conducted Output Power (WCDMA PCS – Ant1)

Bandwidth	Modulation	Channel	Frequency [MHz]	Conducted Power [dBm]	Conducted Power [Watts]
5 MHz	QPSK	9662	1932.4	43.08	20.32
		9800	1960.0	43.00	19.95
		9938	1987.6	43.40	21.88
	16-QAM	9662	1932.4	43.08	20.32
		9800	1960.0	43.04	20.14
		9938	1987.6	43.43	22.03

Table 7-3. Transmitter Conducted Output Power (WCDMA PCS – 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.

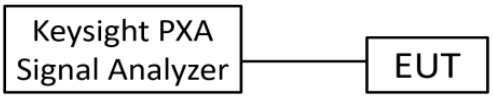
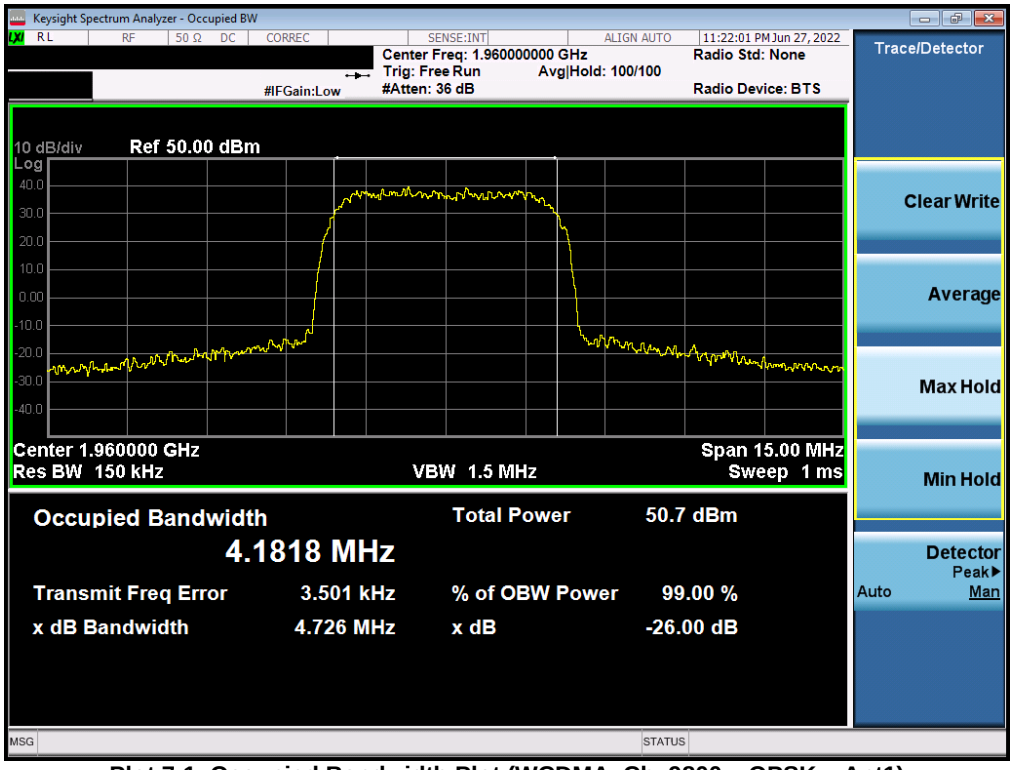


Figure 7-2. Test Instrument & Measurement Setup

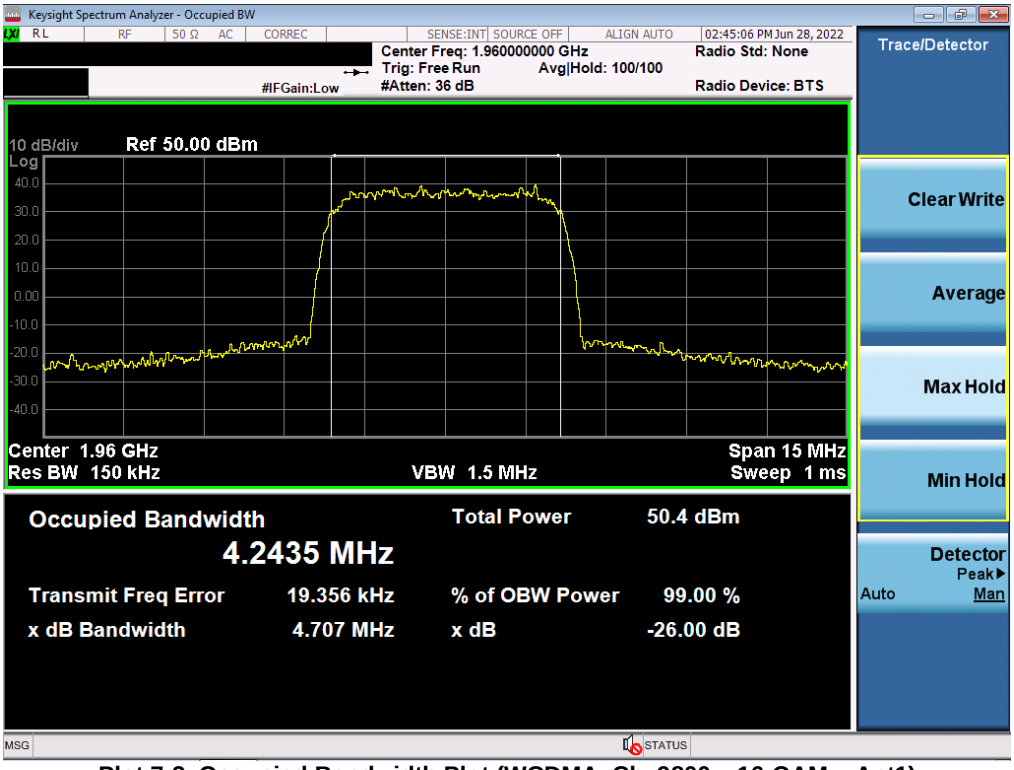
Test Notes

None.

WCDMA PCS – Ant1

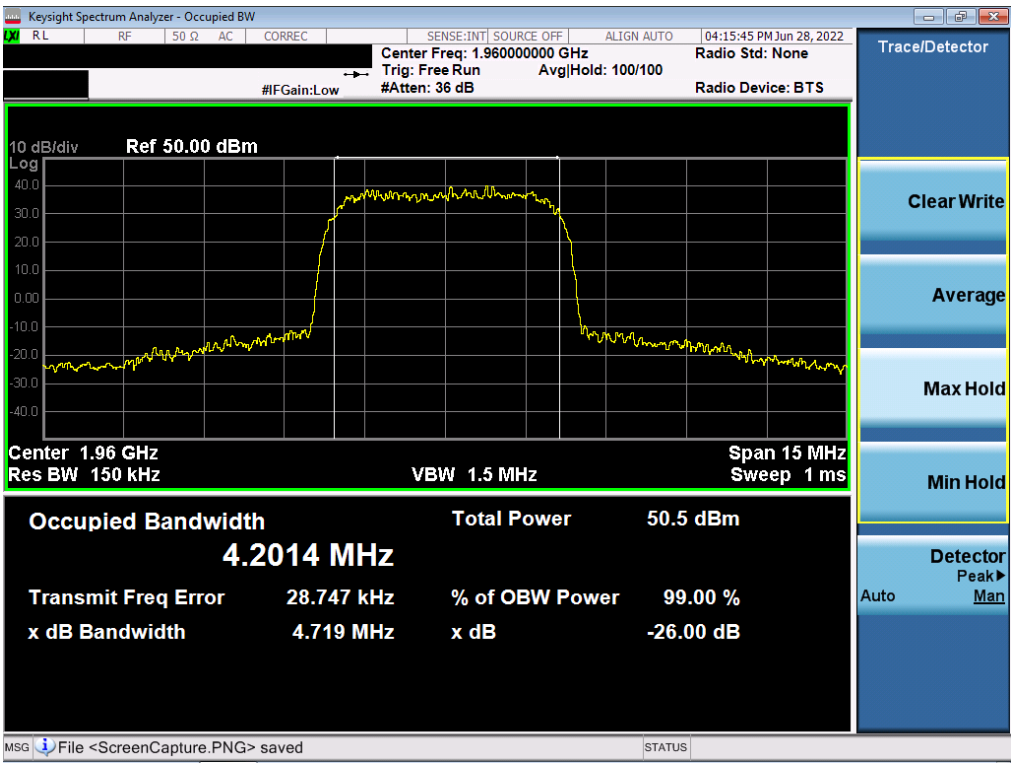


Plot 7-1. Occupied Bandwidth Plot (WCDMA, Ch. 9800 – QPSK – Ant1)

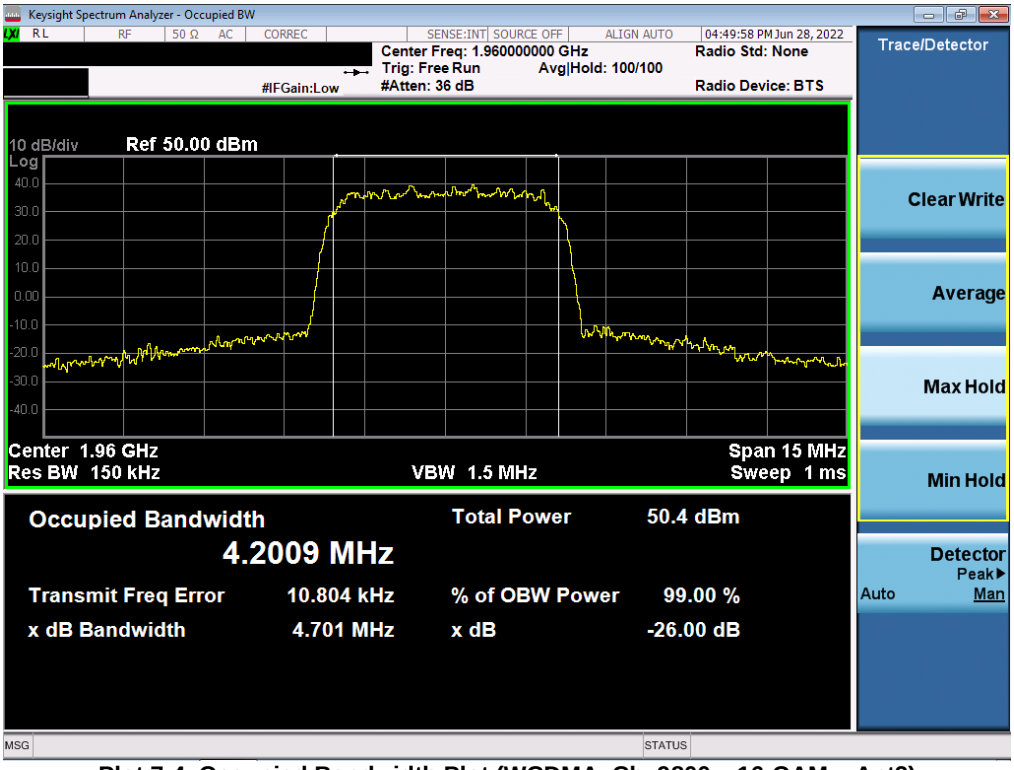


Plot 7-2. Occupied Bandwidth Plot (WCDMA, Ch. 9800 – 16-QAM – Ant1)

WCDMA PCS – Ant2



Plot 7-3. Occupied Bandwidth Plot (WCDMA, Ch. 9800 – QPSK – Ant2)



Plot 7-4. Occupied Bandwidth Plot (WCDMA, Ch. 9800 – 16-QAM – 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.

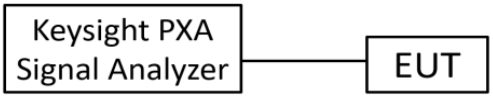


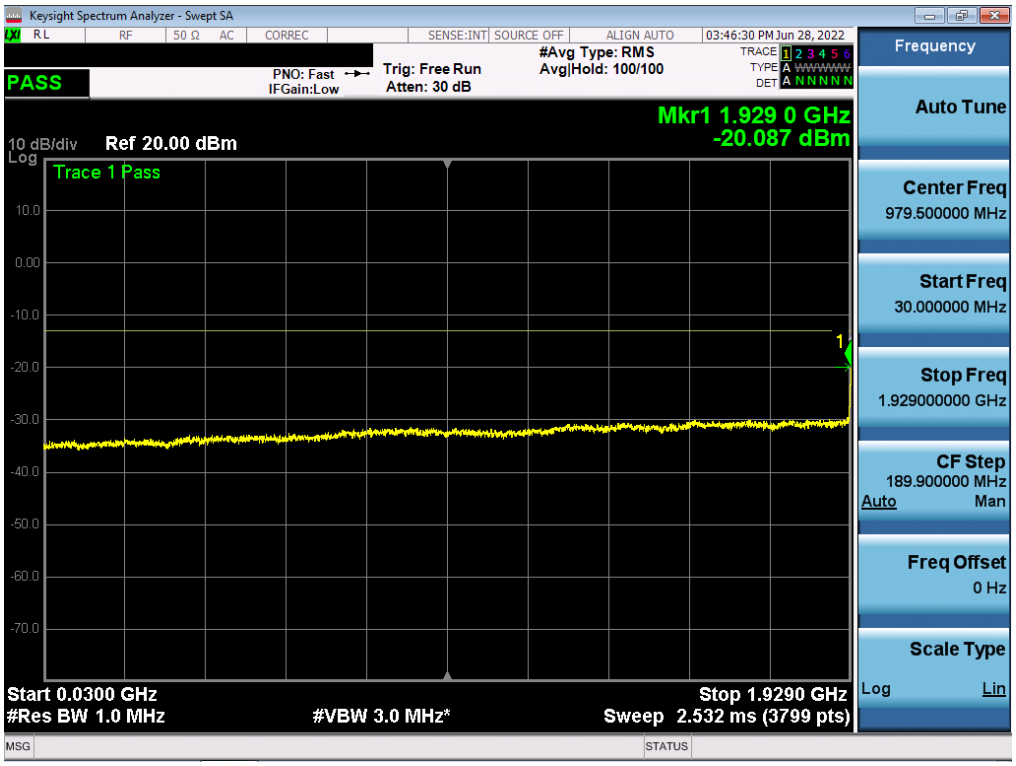
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

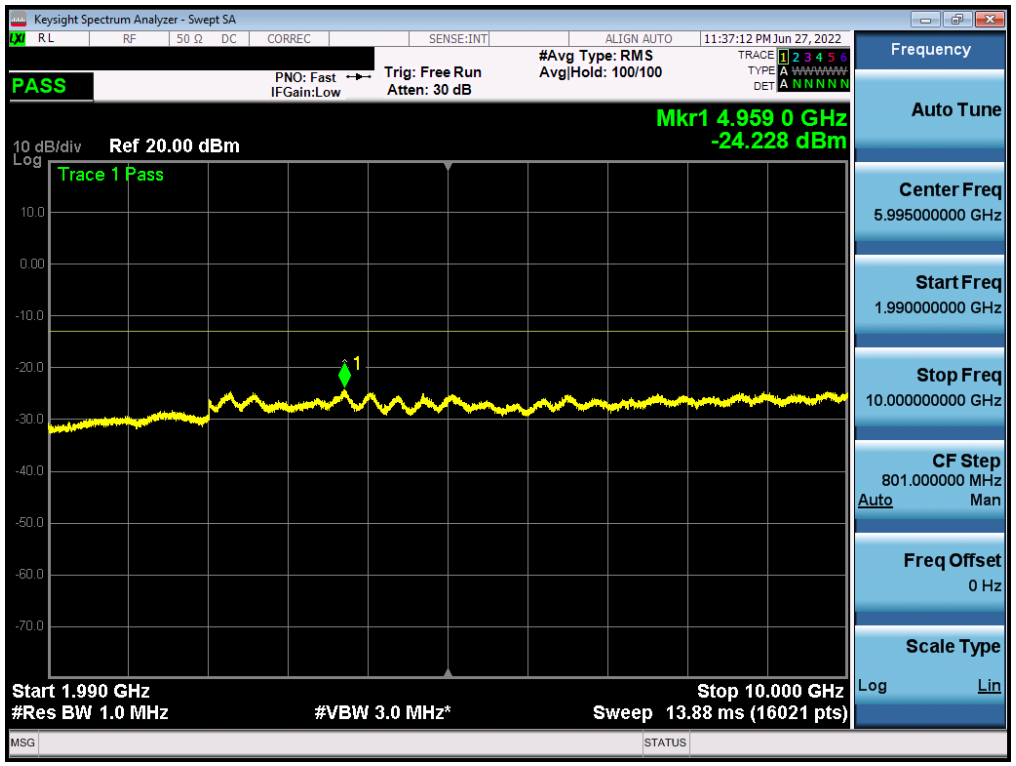
1. Per Part 24, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

2. The spurious emissions were evaluated for both QPSK and 16-QAM modulations and only the worst case emissions are reported below.

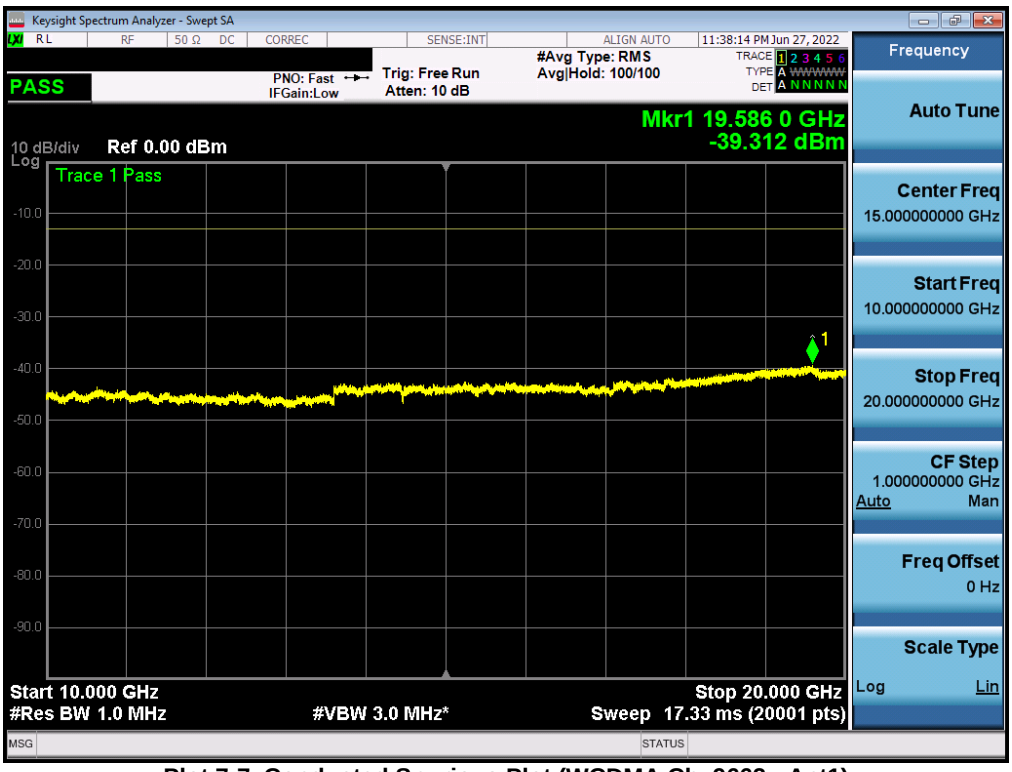
WCDMA PCS – Ant1



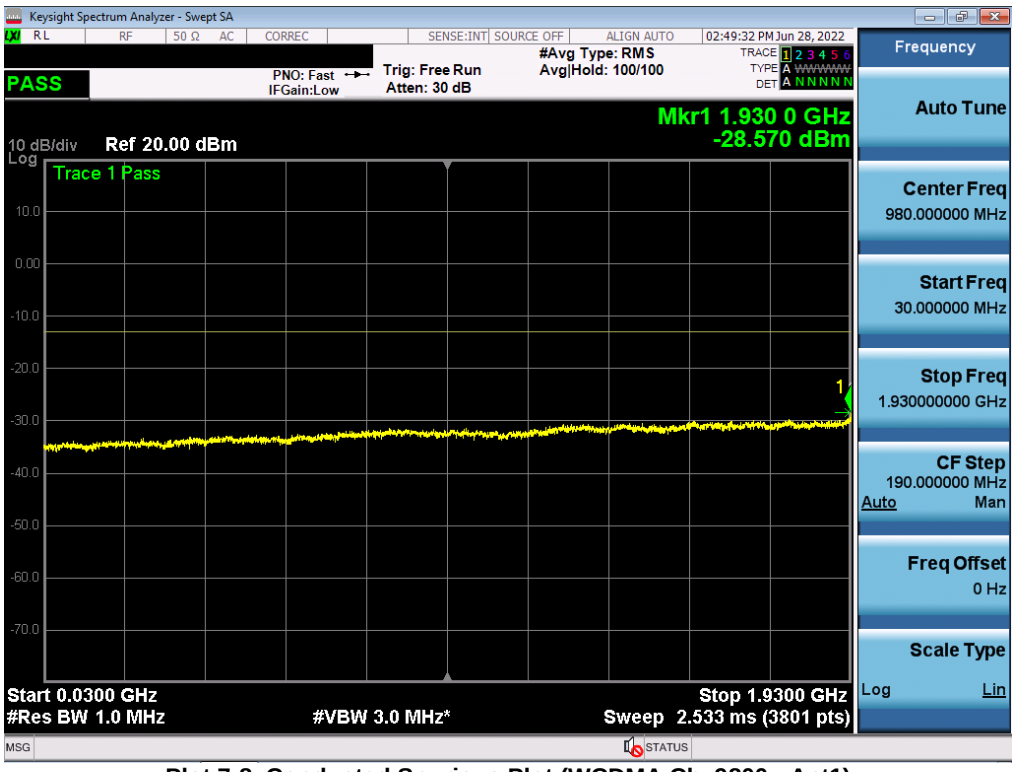
Plot 7-5. Conducted Spurious Plot (WCDMA Ch. 9662 - Ant1)



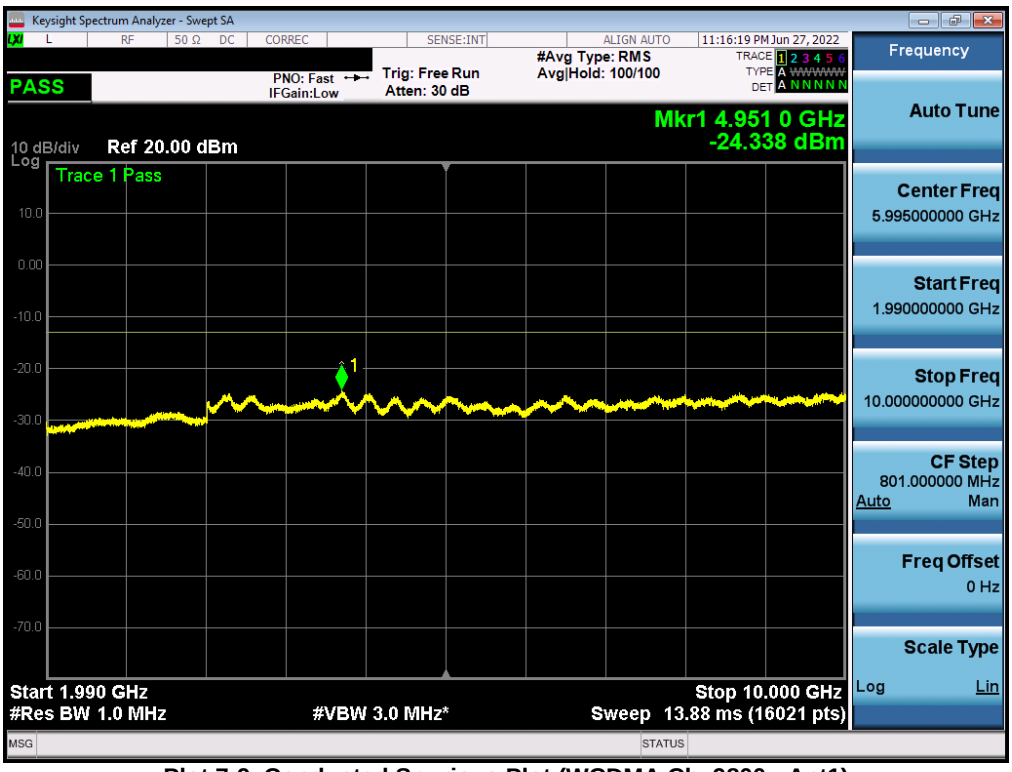
Plot 7-6. Conducted Spurious Plot (WCDMA Ch. 9662 - Ant1)



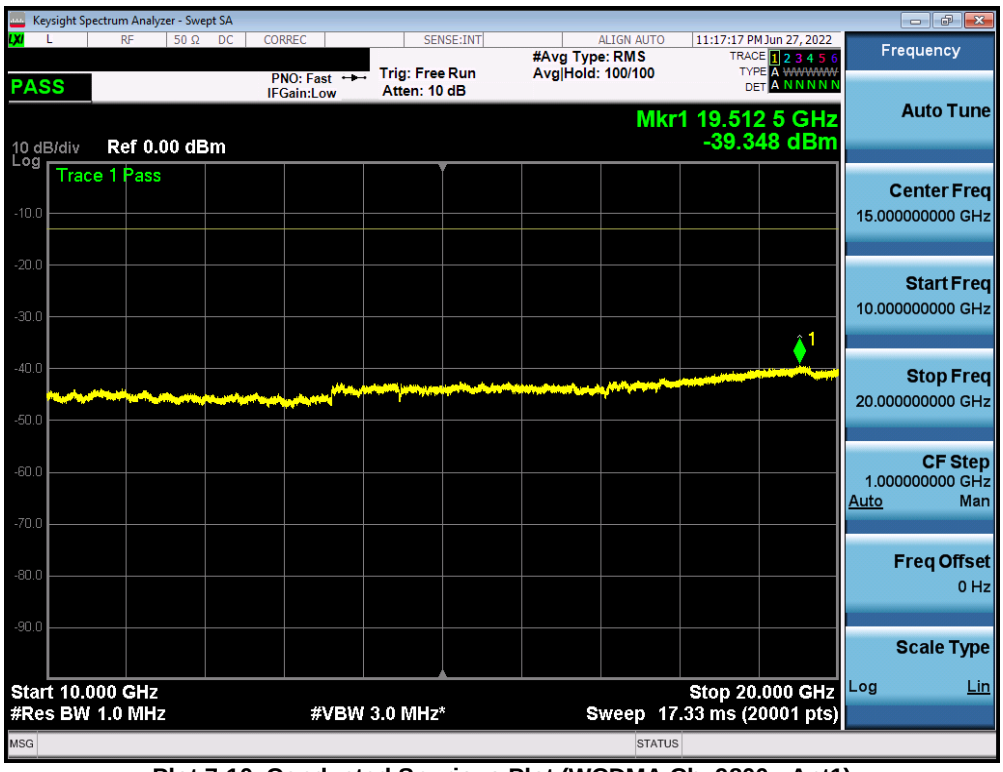
Plot 7-7. Conducted Spurious Plot (WCDMA Ch. 9662 - Ant1)



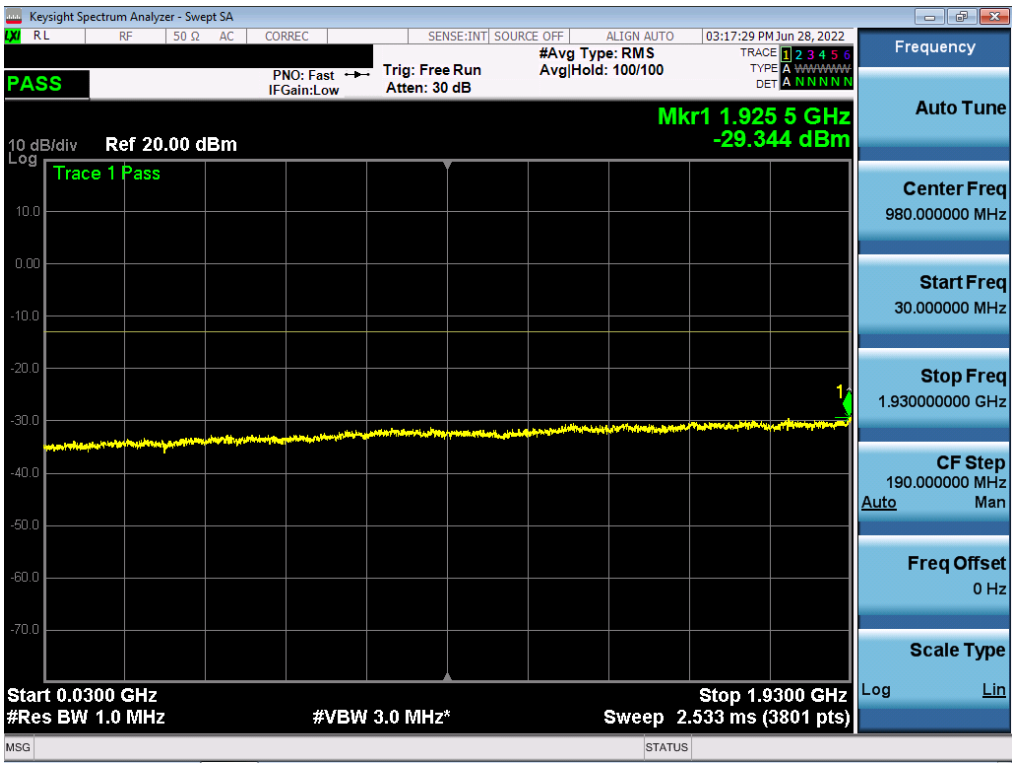
Plot 7-8. Conducted Spurious Plot (WCDMA Ch. 9800 - Ant1)



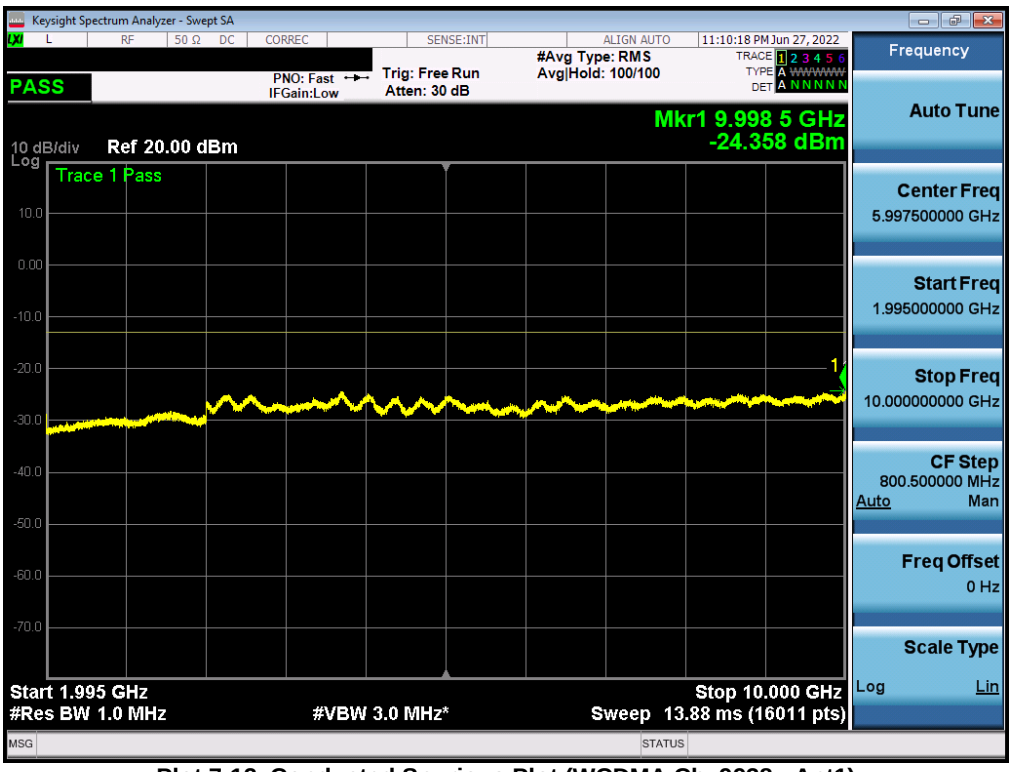
Plot 7-9. Conducted Spurious Plot (WCDMA Ch. 9800 - Ant1)



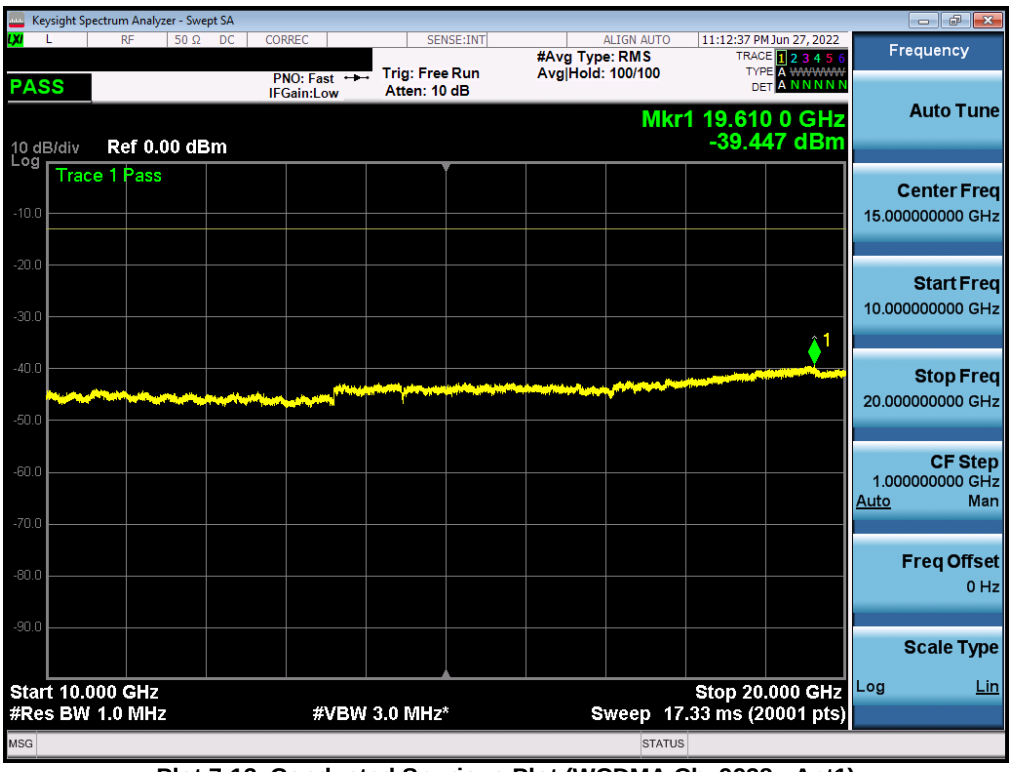
Plot 7-10. Conducted Spurious Plot (WCDMA Ch. 9800 - Ant1)



Plot 7-11. Conducted Spurious Plot (WCDMA Ch. 9938 - Ant1)

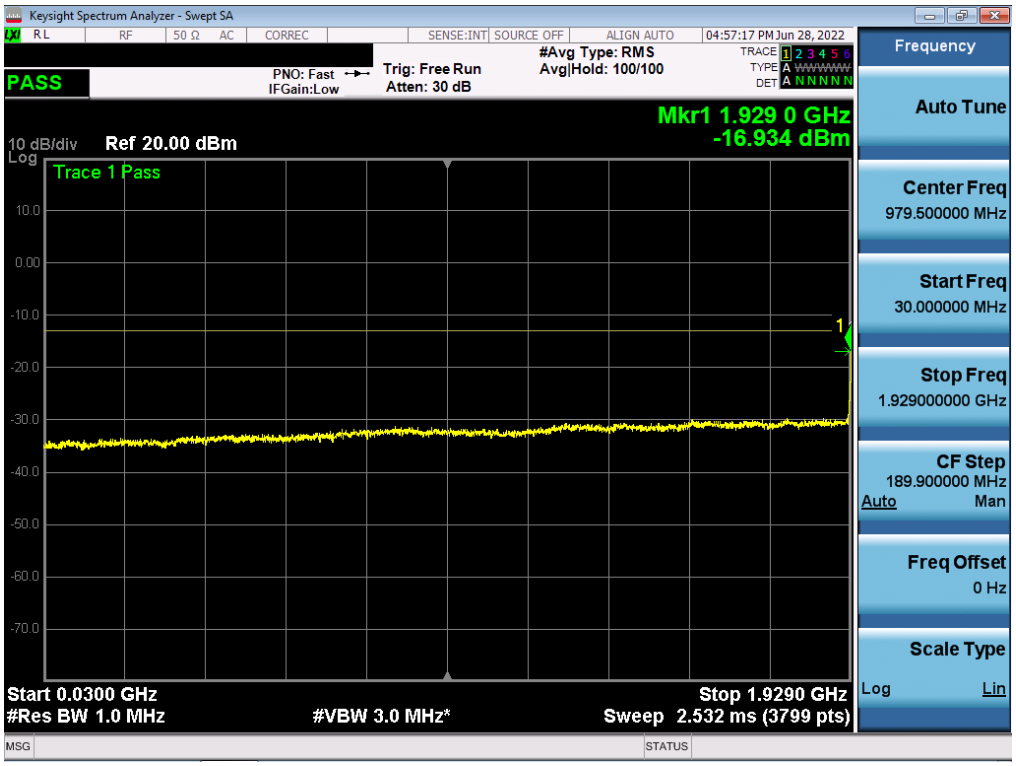


Plot 7-12. Conducted Spurious Plot (WCDMA Ch. 9938 - Ant1)

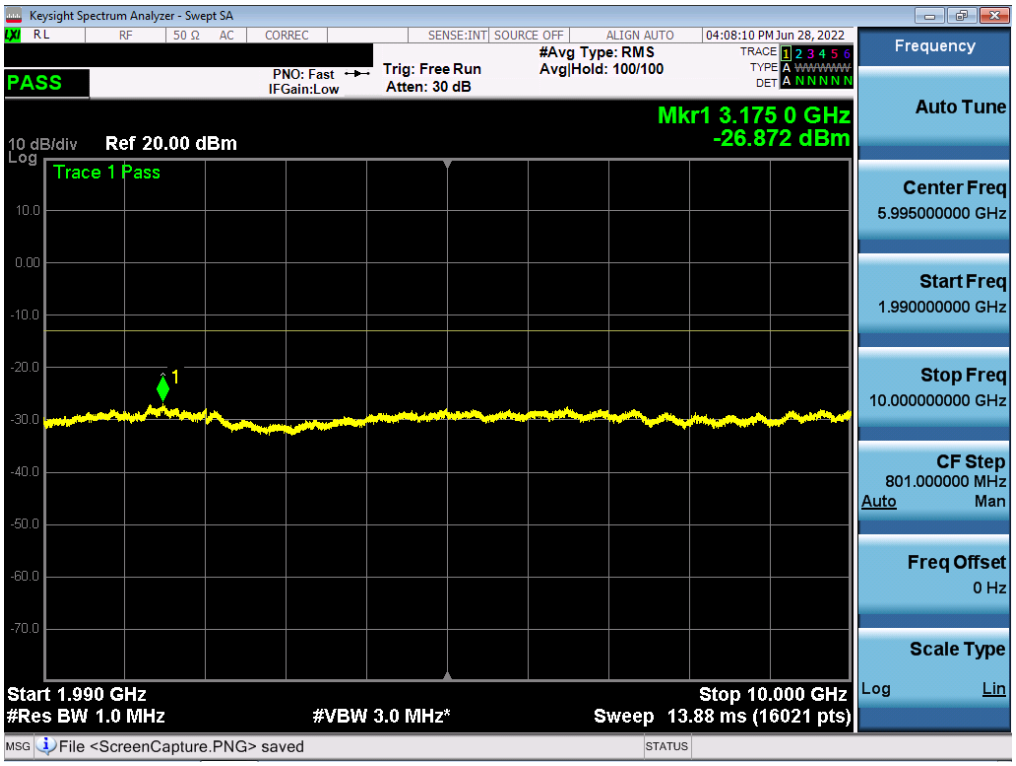


Plot 7-13. Conducted Spurious Plot (WCDMA Ch. 9938 - Ant1)

WCDMA PCS – Ant2



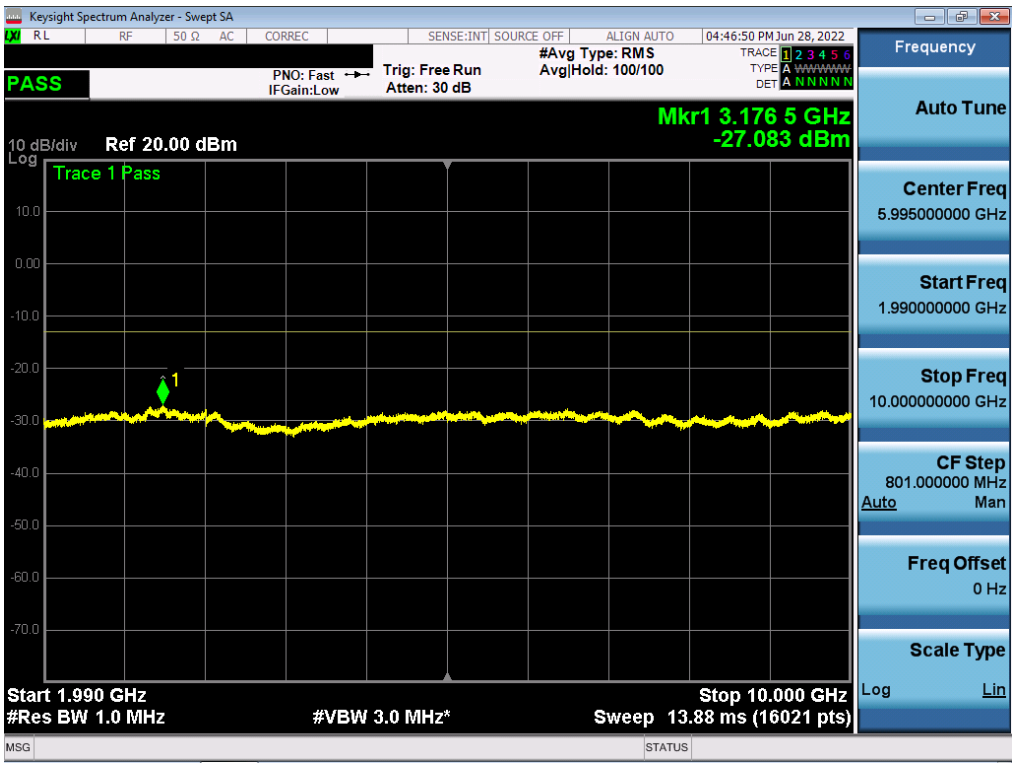
Plot 7-14. Conducted Spurious Plot (WCDMA Ch. 9662 – Ant2)



Plot 7-15. Conducted Spurious Plot (WCDMA Ch. 9662 – Ant2)

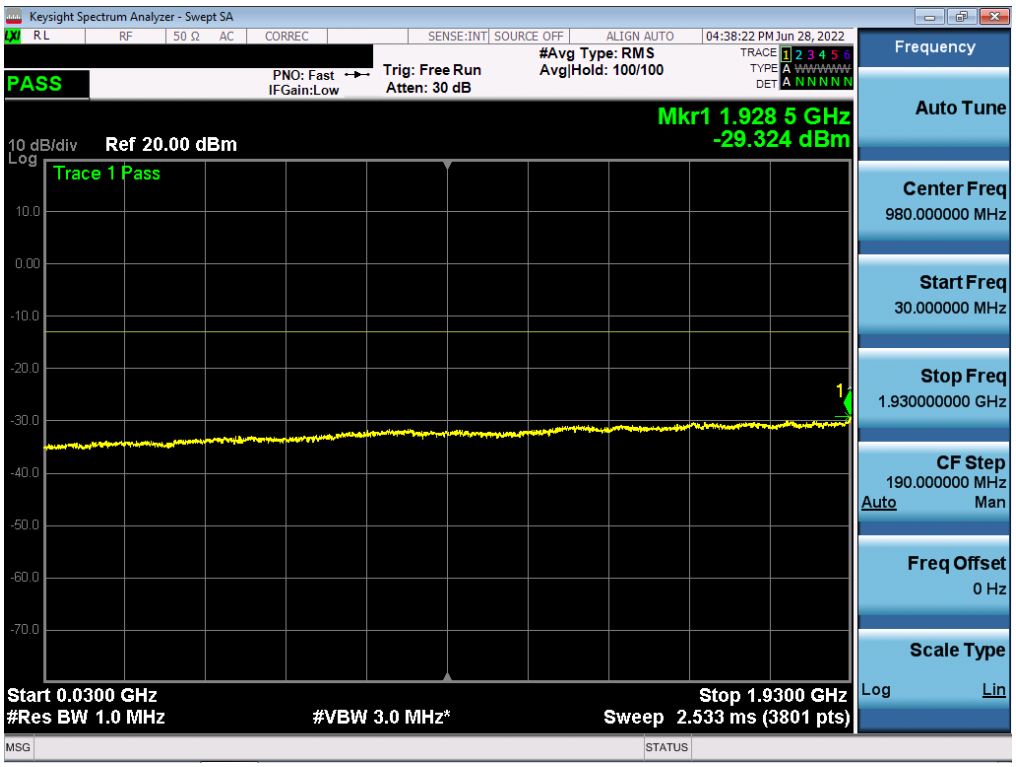
Plot 7-16. Conducted Spurious Plot (WCDMA Ch. 9662 – Ant2)

Plot 7-17. Conducted Spurious Plot (WCDMA Ch. 9800 – Ant2)



Plot 7-18. Conducted Spurious Plot (WCDMA Ch. 9800 – Ant2)

Plot 7-19. Conducted Spurious Plot (WCDMA Ch. 9800 – Ant2)



Plot 7-20. Conducted Spurious Plot (WCDMA Ch. 9938 – Ant2)

Plot 7-21. Conducted Spurious Plot (WCDMA Ch. 9938 – Ant2)

Plot 7-22. Conducted Spurious Plot (WCDMA Ch. 9938 – 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.

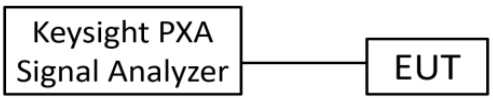


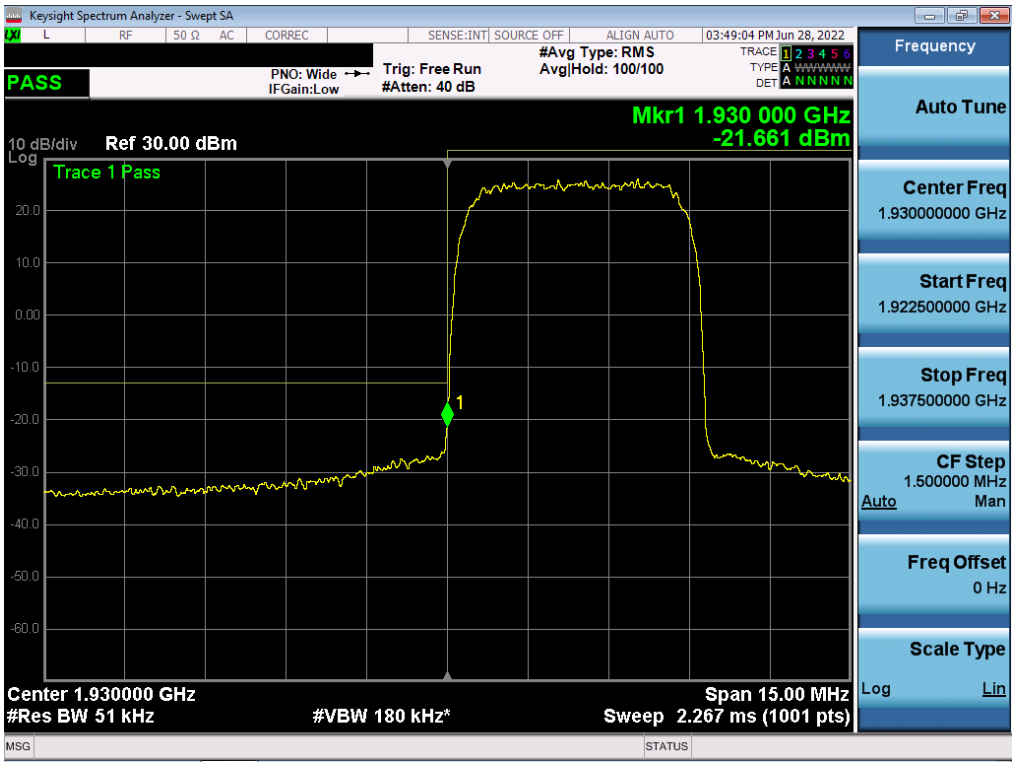
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

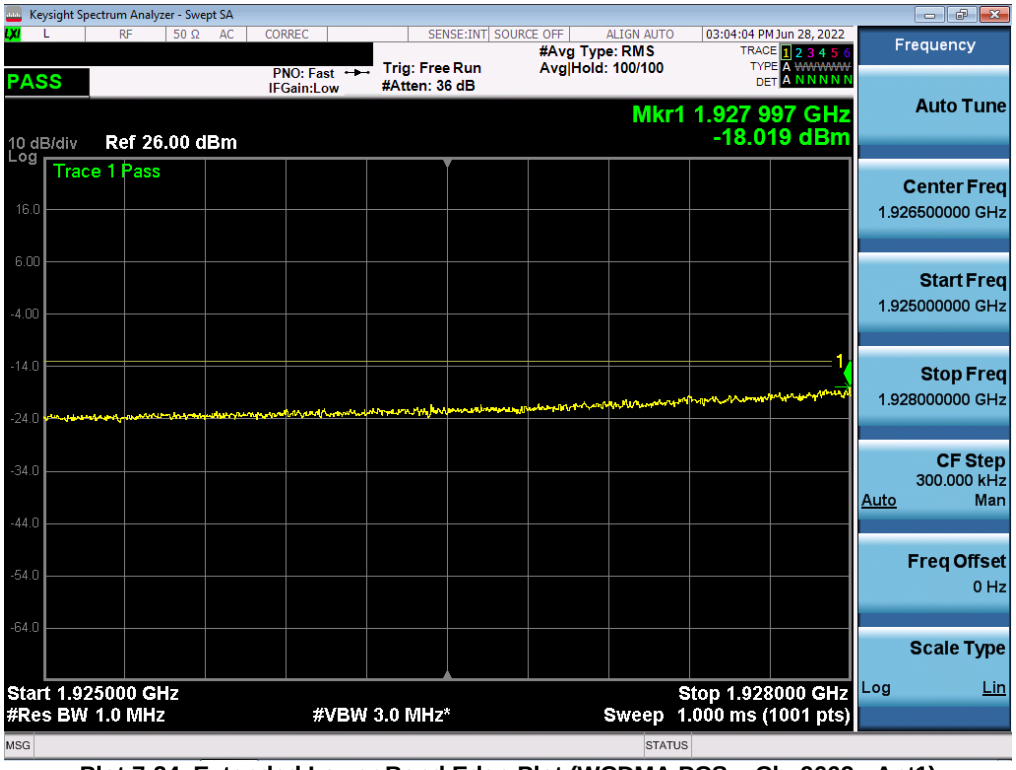
1. Per 24.238(b), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission 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.

2. The band edge emissions were evaluated for both QPSK and 16-QAM modulations and only the worst cases are reported below.

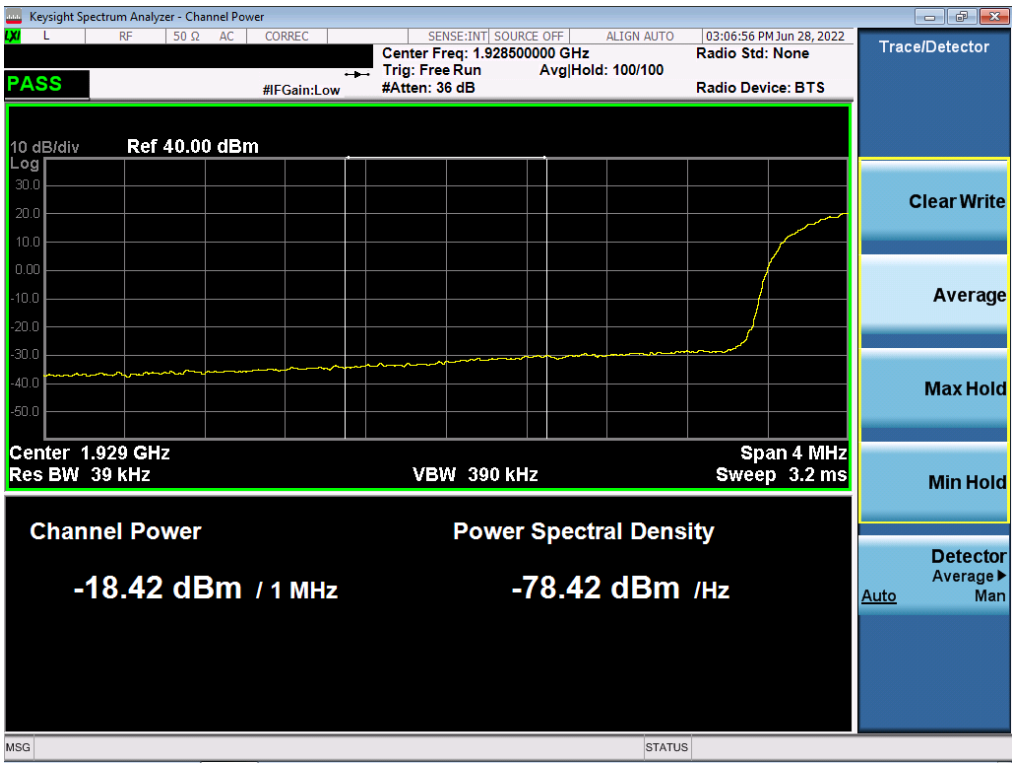
WCDMA PCS – Ant1



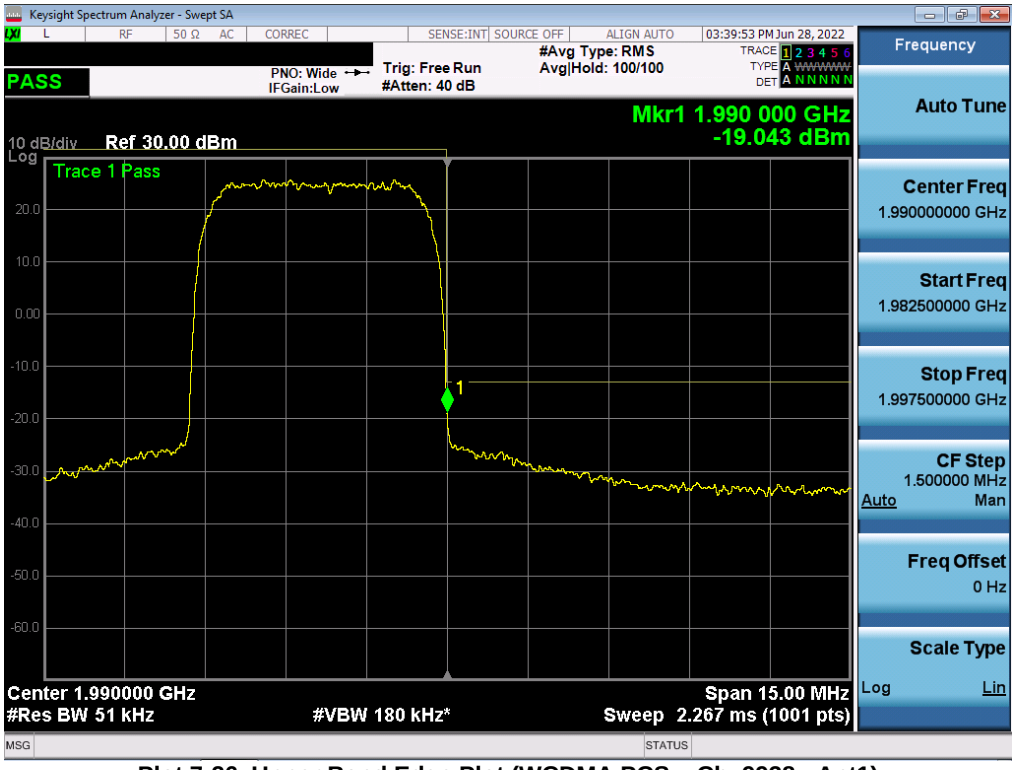
Plot 7-23. Lower Band Edge Plot (WCDMA PCS – Ch. 9662 - Ant1)



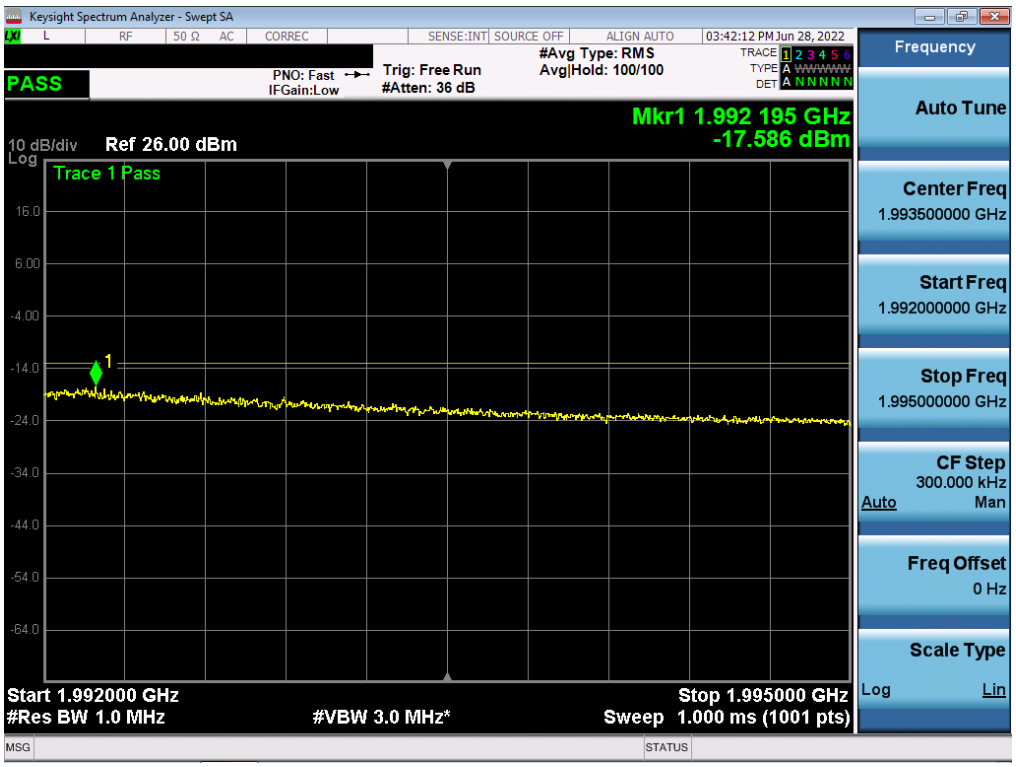
Plot 7-24. Extended Lower Band Edge Plot (WCDMA PCS – Ch. 9662 - Ant1)



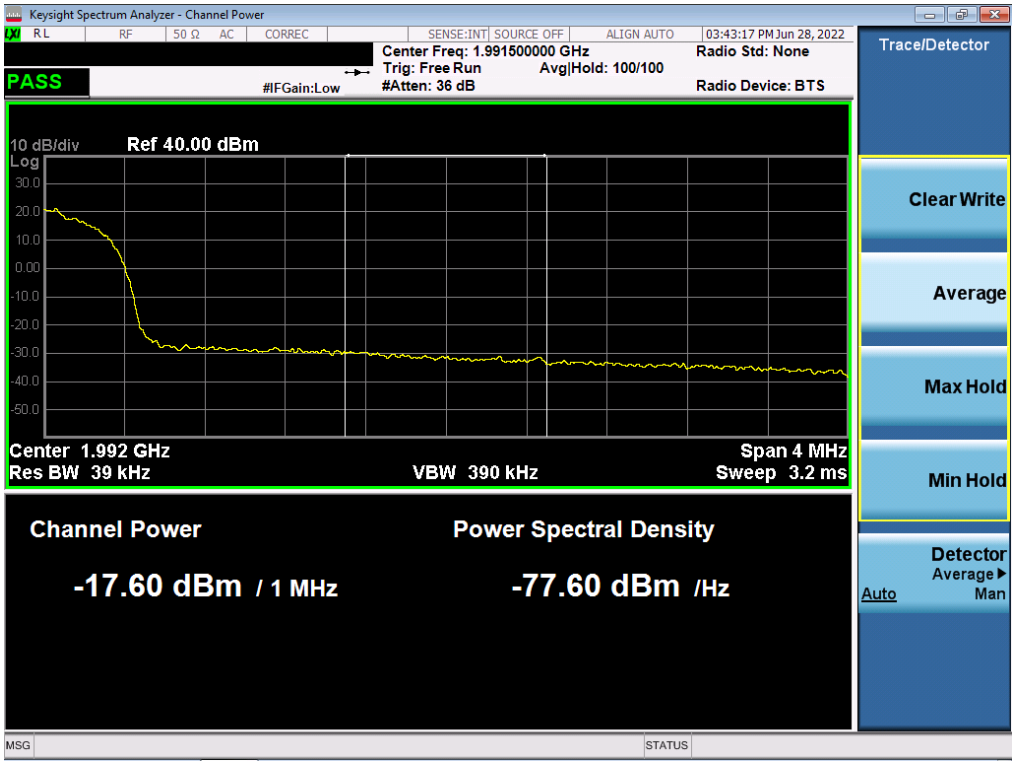
Plot 7-25. Extended Lower Band Edge Plot (WCDMA PCS – Ch. 9662 - Ant1)



Plot 7-26. Upper Band Edge Plot (WCDMA PCS – Ch. 9938 - Ant1)

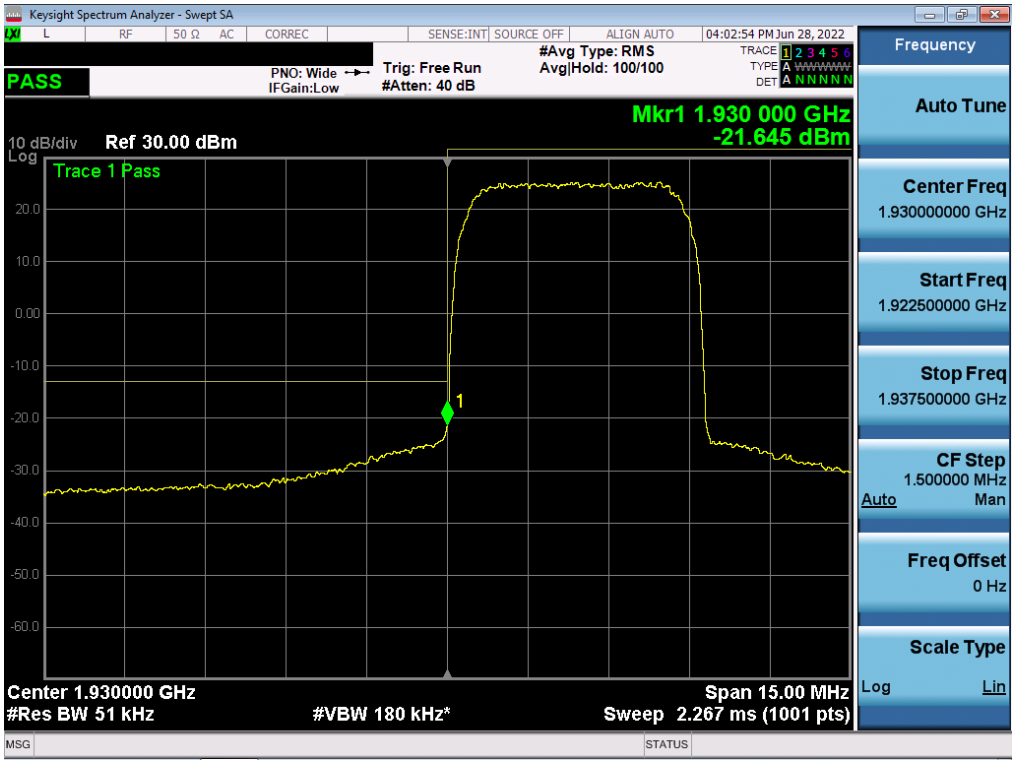


Plot 7-27. Extended Upper Band Edge Plot (WCDMA PCS – Ch. 9938 - Ant1)

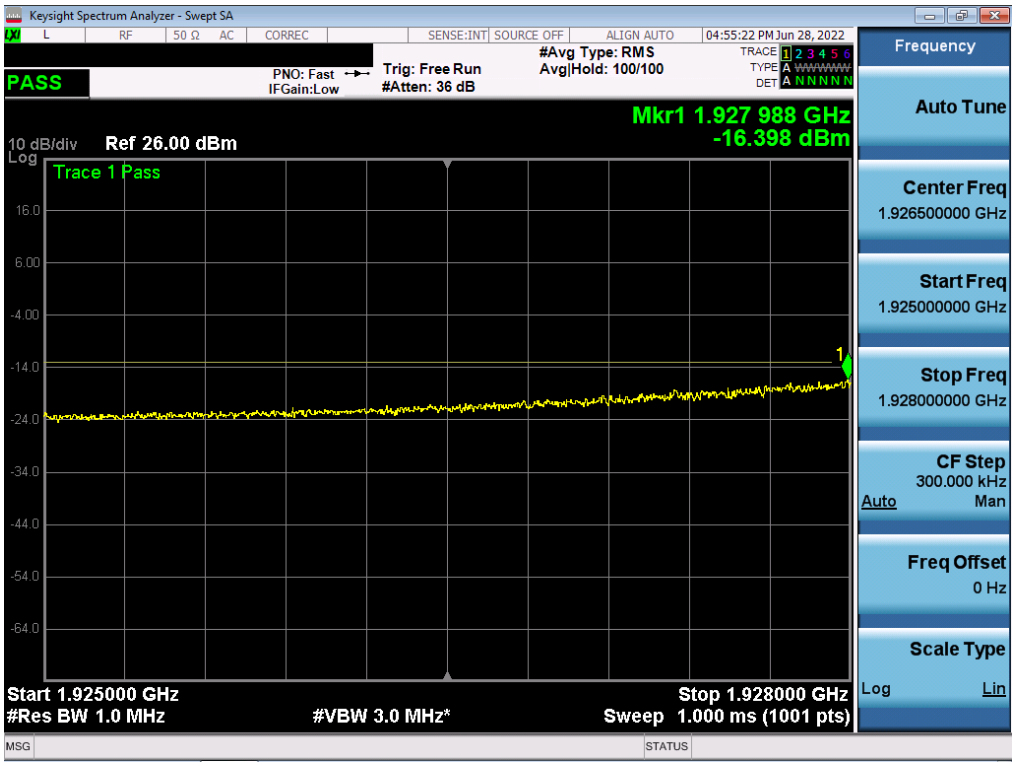


Plot 7-28. Extended Upper Band Edge Plot (WCDMA PCS – Ch. 9938 - Ant1)

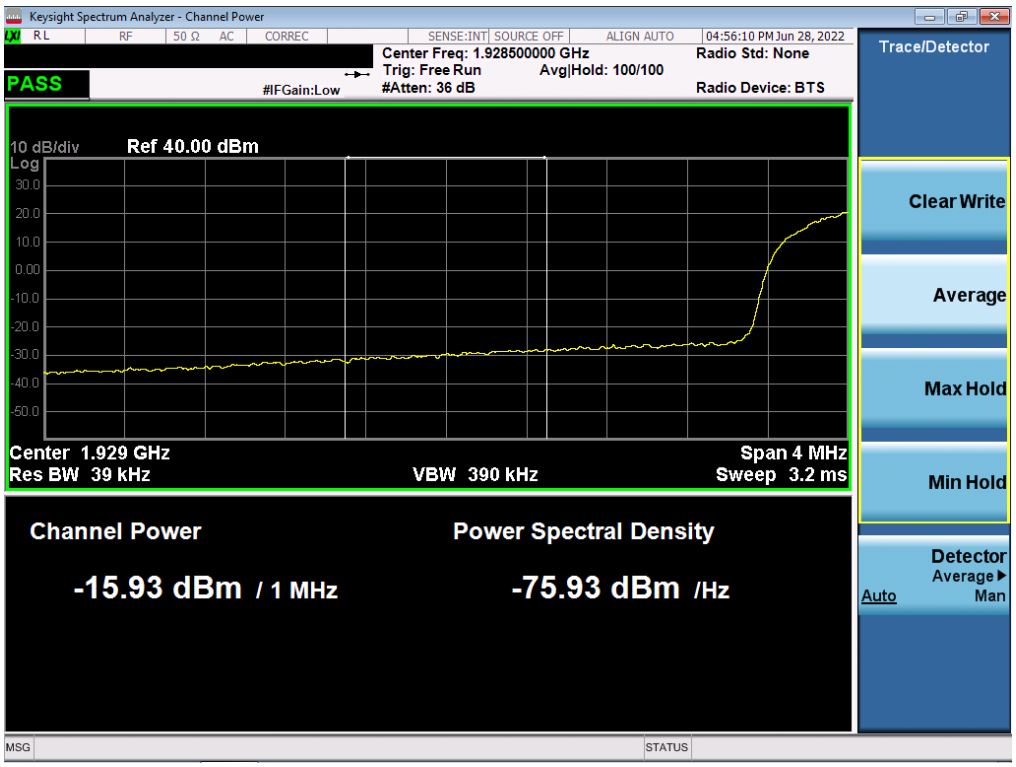
WCDMA PCS – Ant2



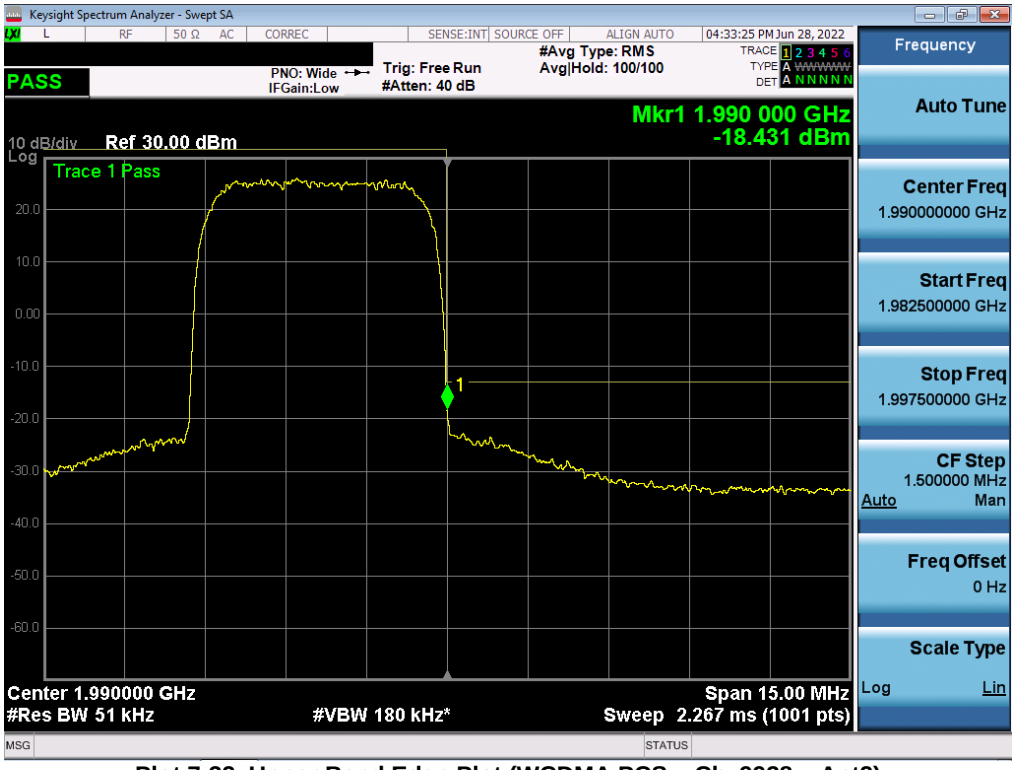
Plot 7-29. Lower Band Edge Plot (WCDMA PCS – Ch. 9662 – Ant2)



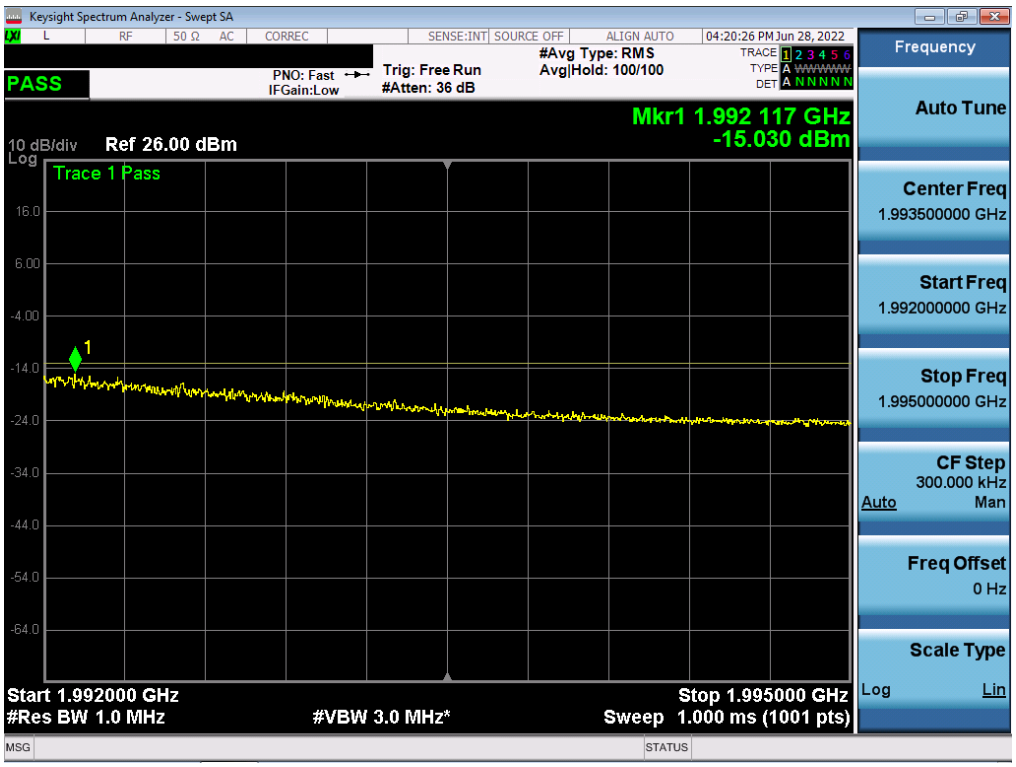
Plot 7-30. Extended Lower Band Edge Plot (WCDMA PCS – Ch. 9662 – Ant2)



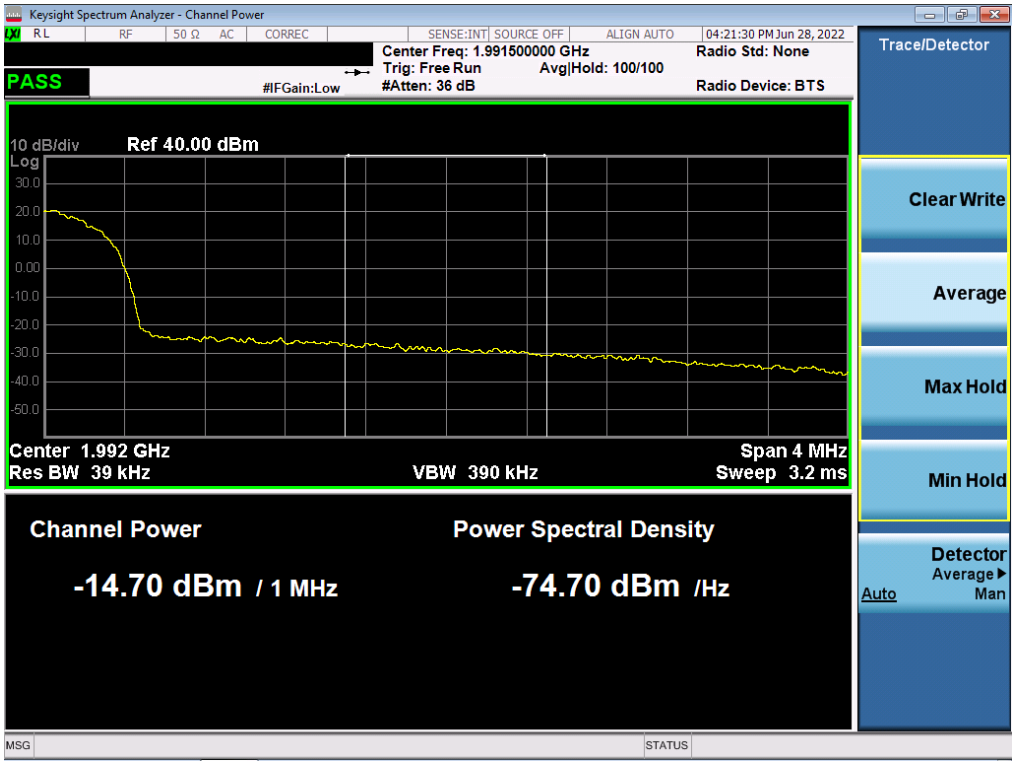
Plot 7-31. Extended Lower Band Edge Plot (WCDMA PCS – Ch. 9662 – Ant2)



Plot 7-32. Upper Band Edge Plot (WCDMA PCS – Ch. 9938 – Ant2)



Plot 7-33. Extended Upper Band Edge Plot (WCDMA PCS – Ch. 9938 – Ant2)



Plot 7-34. Extended Upper Band Edge Plot (WCDMA PCS – Ch. 9938 – 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.

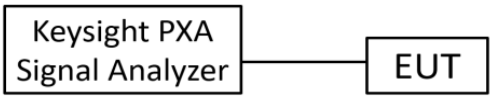
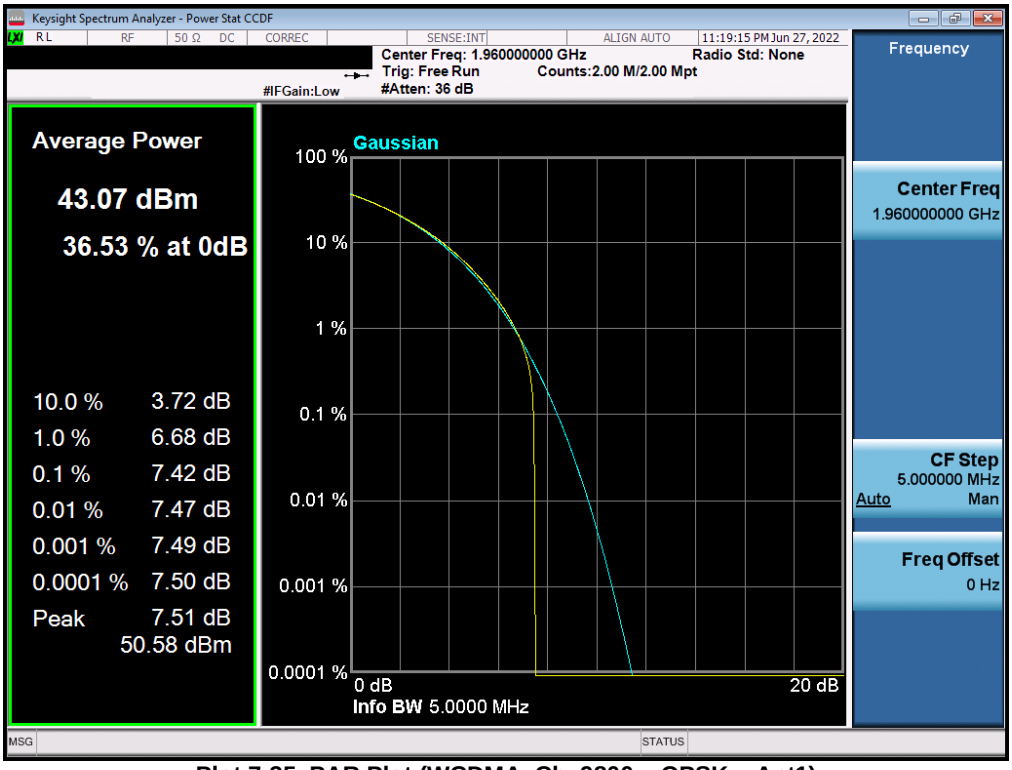


Figure 7-5. Test Instrument & Measurement Setup

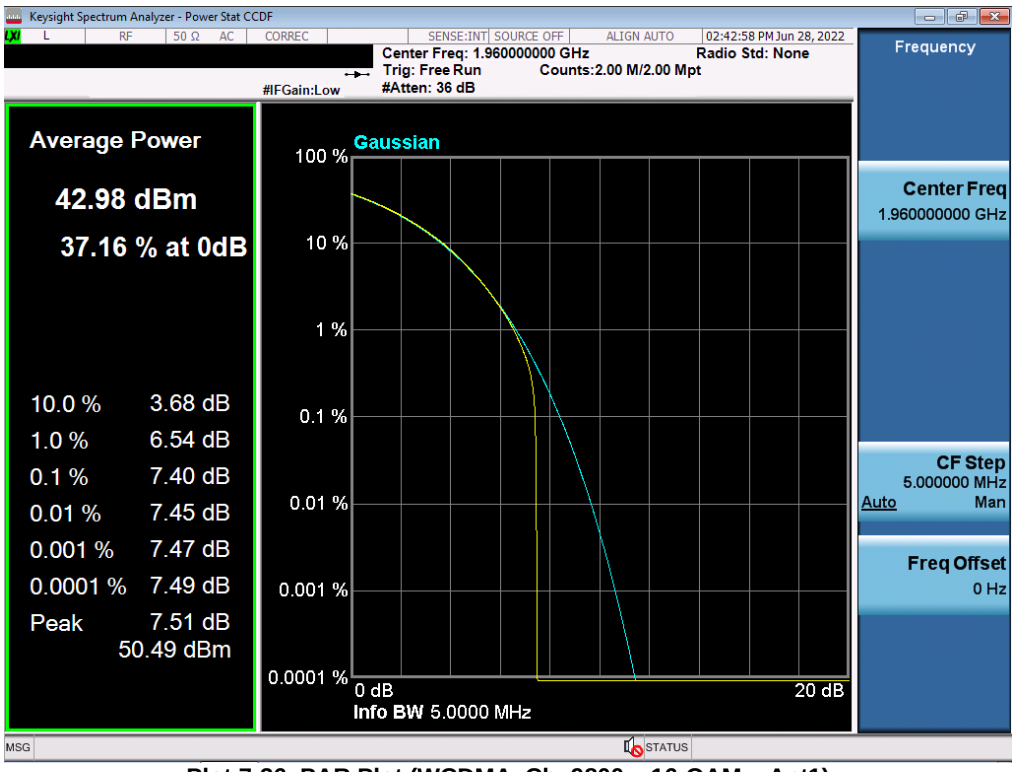
Test Notes

None.

WCDMA PCS – Ant1

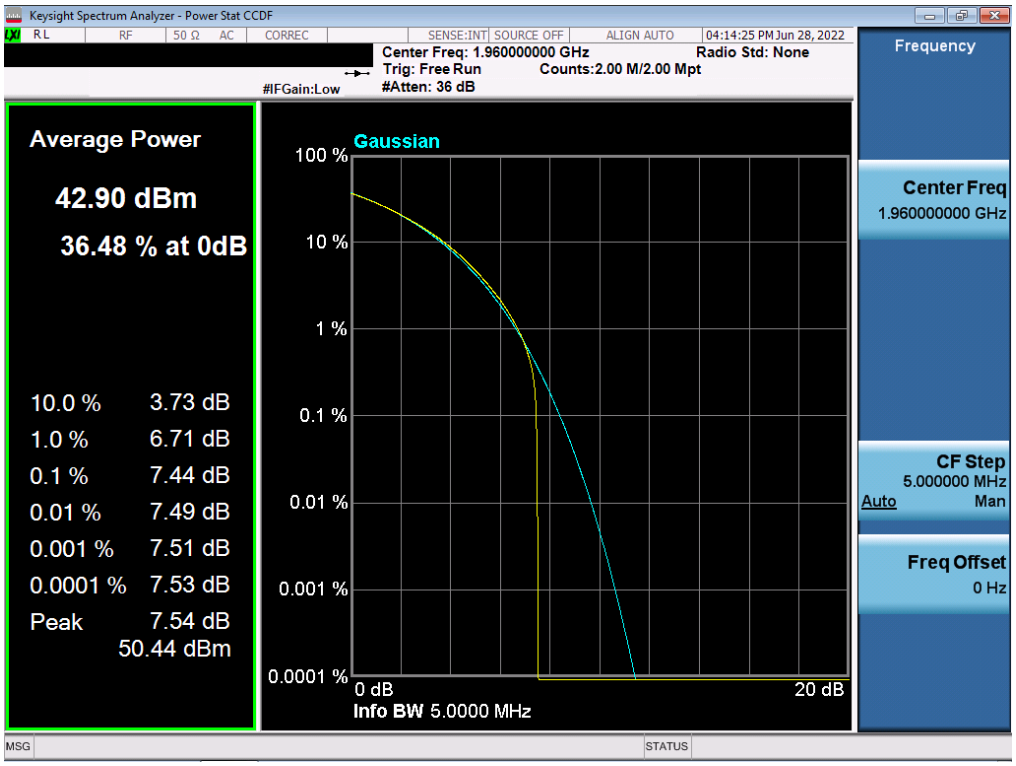


Plot 7-35. PAR Plot (WCDMA, Ch. 9800 – QPSK – Ant1)

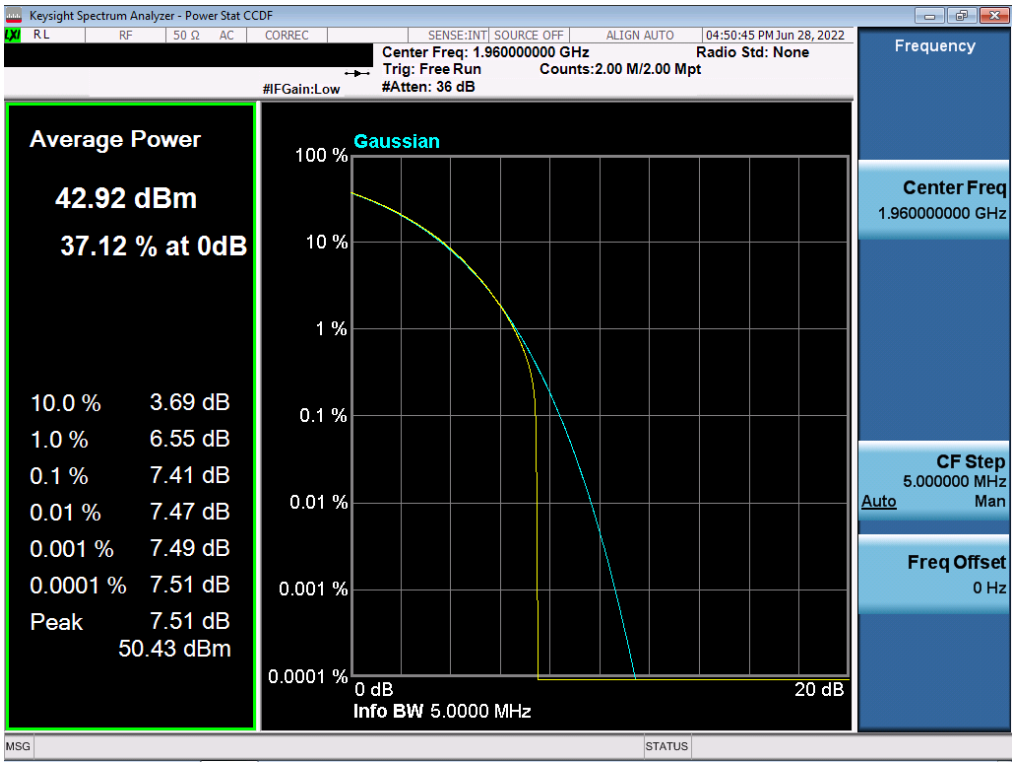


Plot 7-36. PAR Plot (WCDMA, Ch. 9800 – 16-QAM – Ant1)

WCDMA PCS – Ant2



Plot 7-37. PAR Plot (WCDMA, Ch. 9800 – QPSK – Ant2)



Plot 7-38. PAR Plot (WCDMA, Ch. 9800 – 16-QAM – Ant2)

7.7 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 a 50Ω termination on each antenna port. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antenna. 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.

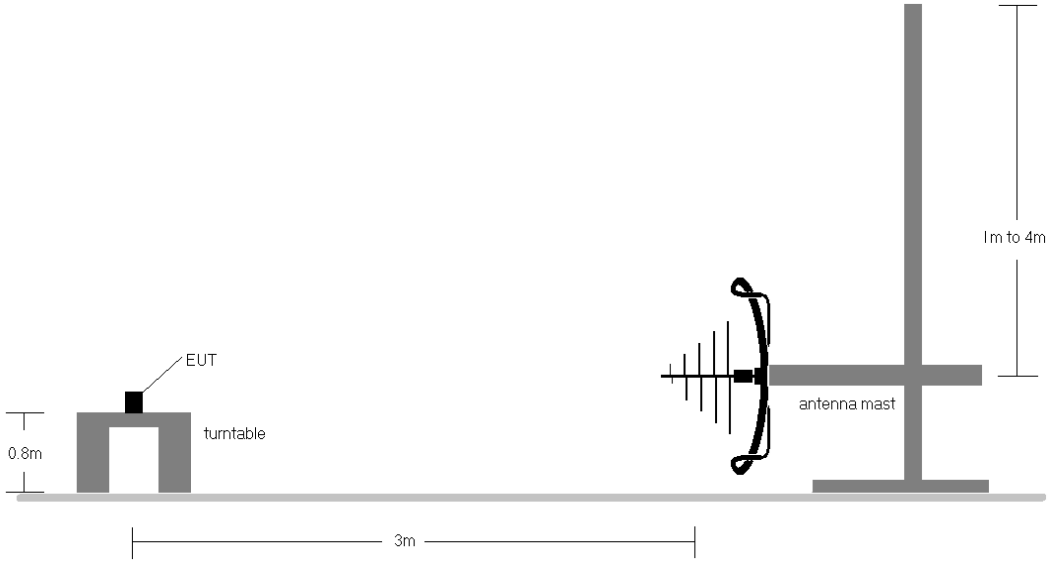


Figure 7-6. Test Instrument & Measurement Setup < 1GHz

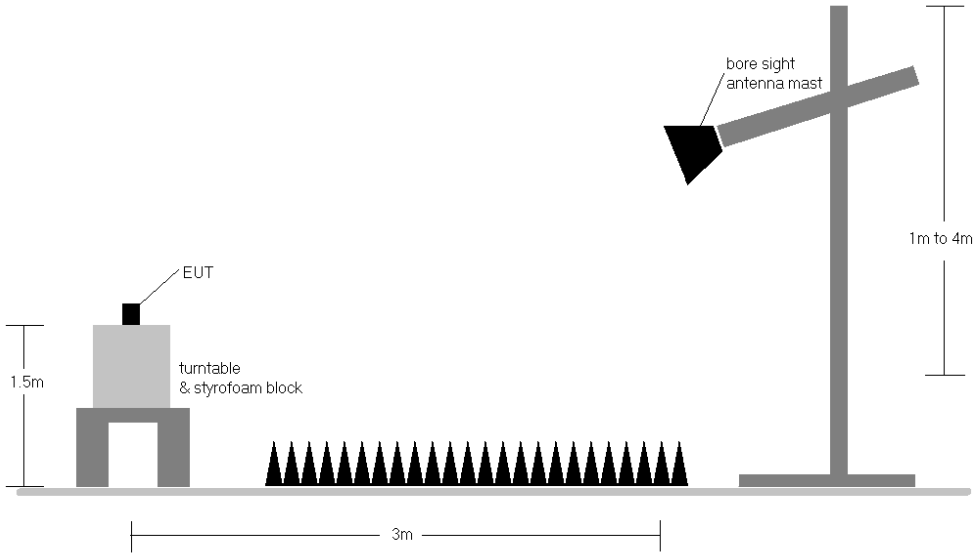


Figure 7-7. Test Instrument & Measurement Setup >1 GHz

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 UMTS technology with WCDMA capabilities. The EUT was tested under QPSK and 16-QAM modulations and the highest emissions are reported below.

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 shown in the tables below.

4) This unit was tested while powered by a -48 VDC power source.

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

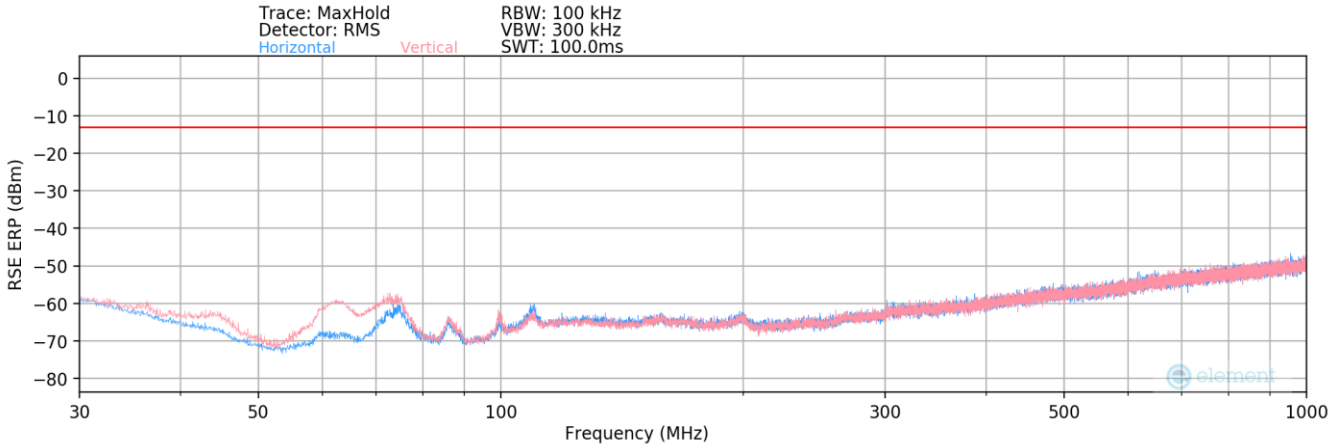
6) Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.

7) The 30MHz – 1GHz pre-scans use RBW = 100kHz and VBW = 300kHz, however, the RSE measurements in this frequency range were made with RBW = 1MHz and VBW = 3MHz.

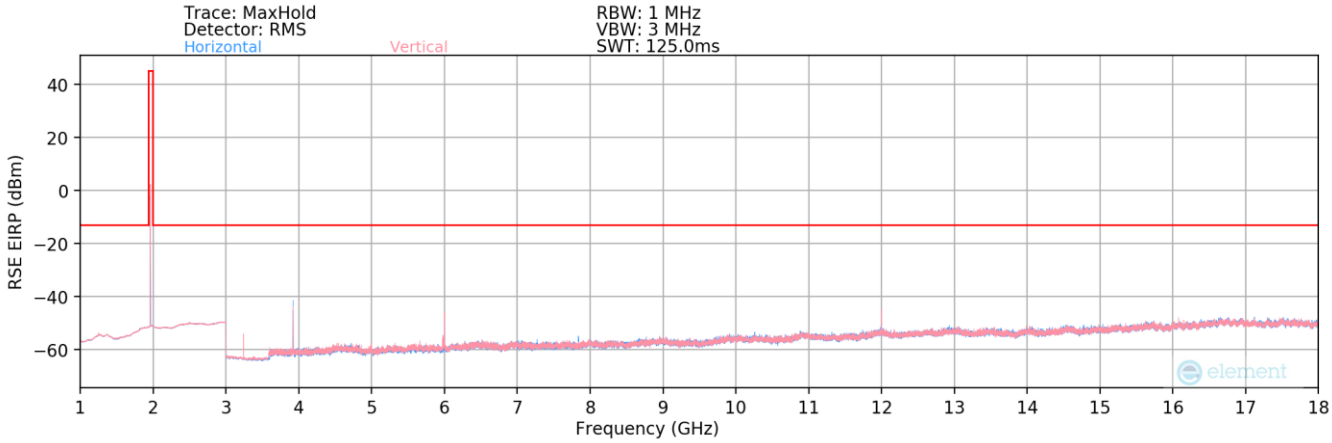
8) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

9) The Radiated Emissions were investigated for both Tx antenna ports. Data is included in the section below.

WCDMA PCS – Ant1



Plot 7-39. Radiated Spurious Plot <1GHz (WCDMA PCS - Ant1)



Plot 7-40. Radiated Spurious Plot >1GHz (WCDMA PCS - Ant1)

Mode:	WCDMA RMC
Channel:	9938
Frequency (MHz):	1987.6

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]
62.0	V	126	115	-69.50	14.26	51.76	-45.65	-13.00	-32.65
74.6	V	134	48	-72.98	15.10	49.12	-48.29	-13.00	-35.29
86.1	V	136	301	-78.40	14.42	43.02	-54.39	-13.00	-41.39
99.3	V	112	336	-82.42	17.16	41.74	-55.67	-13.00	-42.67
109.4	H	148	94	-81.13	19.57	45.44	-51.97	-13.00	-38.97

Table 7-4. Radiated Spurious Data <1GHz (WCDMA PCS – High Channel - Ant1)

Mode:	WCDMA RMC
Channel:	9662
Frequency (MHz):	1932.4

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]
3864.8	H	152	202	-51.74	3.03	58.29	-36.97	-13.00	-23.97
5797.2	H	-	-	-78.67	5.26	33.59	-61.67	-13.00	-48.67
7729.6	H	283	223	-75.59	6.93	38.34	-56.92	-13.00	-43.92
9662.0	H	-	-	-79.87	9.63	36.76	-58.50	-13.00	-45.50
11594.4	H	-	-	-80.44	12.47	39.03	-56.23	-13.00	-43.23
13526.8	H	-	-	-80.29	13.91	40.62	-54.64	-13.00	-41.64

Table 7-5. Radiated Spurious Data (WCDMA PCS – Low Channel - Ant1)

Mode:	WCDMA RMC
Channel:	9800
Frequency (MHz):	1960

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]
3300.0	V	-	-	-77.11	2.60	32.49	-62.77	-13.00	-49.77
3920.0	H	251	216	-53.92	3.10	56.18	-39.07	-13.00	-26.07
5880.0	V	-	-	-78.50	5.52	34.02	-61.24	-13.00	-48.24
6000.0	V	169	78	-60.61	6.46	52.85	-42.40	-13.00	-29.40
7840.0	H	151	200	-77.37	7.76	37.39	-57.87	-13.00	-44.87
9800.0	H	-	-	-80.22	10.36	37.14	-58.11	-13.00	-45.11
11760.0	H	-	-	-80.44	12.90	39.46	-55.79	-13.00	-42.79
12000.0	V	132	69	-64.99	13.45	55.46	-39.79	-13.00	-26.79
13720.0	H	-	-	-80.47	13.98	40.51	-54.75	-13.00	-41.75
15680.0	H	-	-	-80.62	16.64	43.02	-52.24	-13.00	-39.24

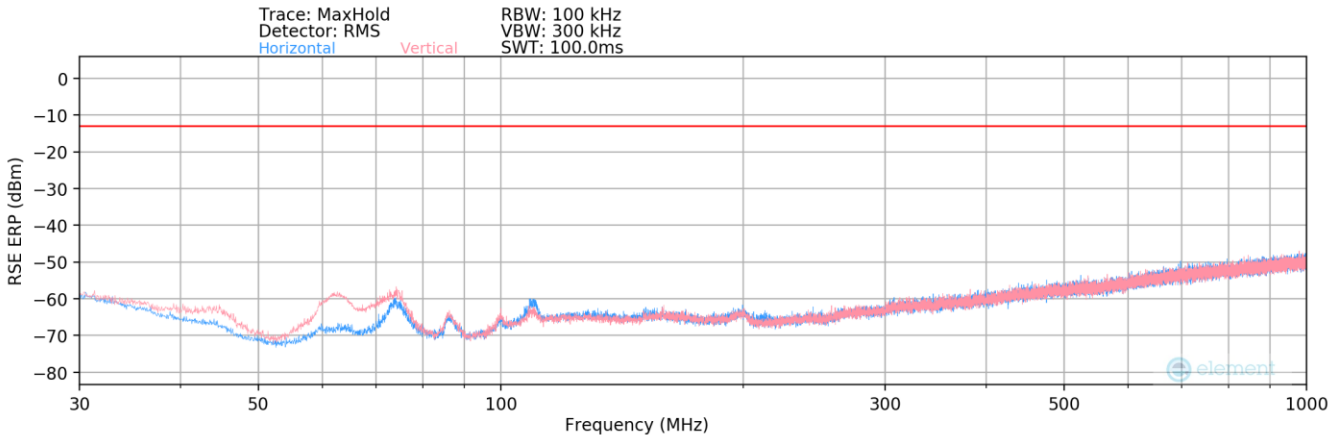
Table 7-6. Radiated Spurious Data (WCDMA PCS – Mid Channel - Ant1)

Mode:	WCDMA RMC
Channel:	9938
Frequency (MHz):	1987.6

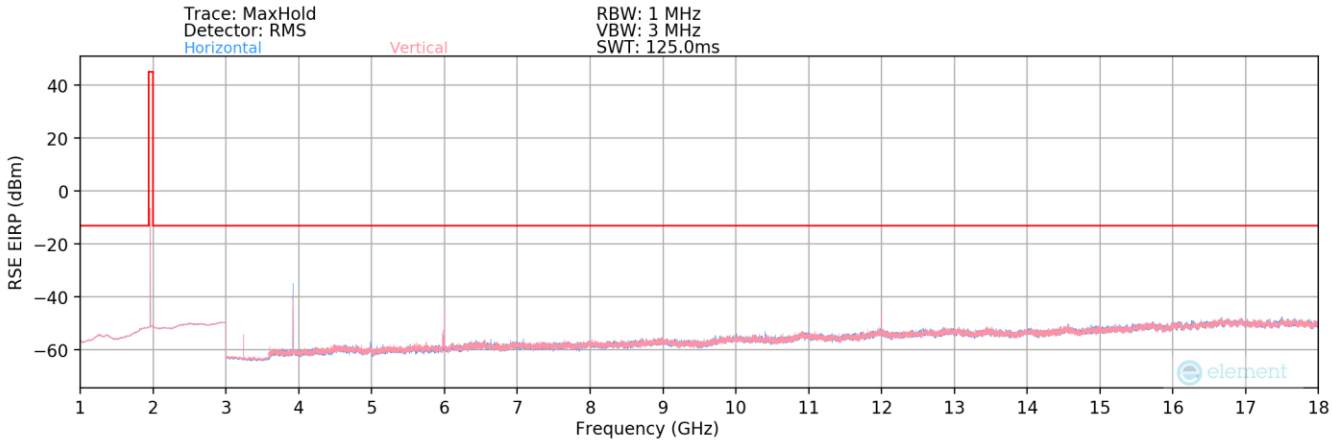
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3975.2	H	141	221	-47.29	3.35	63.06	-32.20	-13.00	-19.20
5962.8	H	121	162	-73.47	5.99	39.52	-55.74	-13.00	-42.74
7950.4	H	152	194	-76.65	8.04	38.39	-56.86	-13.00	-43.86
9938.0	H	-	-	-79.87	10.73	37.86	-57.40	-13.00	-44.40
11925.6	H	-	-	-80.35	13.35	40.00	-55.26	-13.00	-42.26
13913.2	H	-	-	-80.50	14.04	40.54	-54.72	-13.00	-41.72

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

WCDMA PCS – Ant2



Plot 7-41. Radiated Spurious Plot <1GHz (WCDMA PCS – Ant2)



Plot 7-42. Radiated Spurious Plot >1GHz (WCDMA PCS – Ant2)

Mode:	WCDMA RMC
Channel:	9938
Frequency (MHz):	1987.6

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]
61.6	V	112	140	-69.11	14.19	52.08	-45.33	-13.00	-32.33
72.7	V	128	20	-70.36	14.89	51.53	-45.88	-13.00	-32.88
86.0	V	123	11	-75.92	14.39	45.47	-51.94	-13.00	-38.94
99.9	V	150	125	-86.73	17.27	37.54	-59.87	-13.00	-46.87
114.8	H	119	146	-83.43	20.41	43.98	-53.43	-13.00	-40.43

Table 7-8. Radiated Spurious Data <1GHz (WCDMA PCS – High Channel – Ant2)

Mode:	WCDMA RMC
Channel:	9662
Frequency (MHz):	1932.4

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]
3864.8	H	148	203	-54.14	3.03	55.89	-39.37	-13.00	-26.37
5797.2	H	147	157	-77.30	5.26	34.96	-60.30	-13.00	-47.30
7729.6	H	284	222	-74.03	6.93	39.90	-55.36	-13.00	-42.36
9662.0	H	-	-	-79.88	9.63	36.75	-58.51	-13.00	-45.51
11594.4	H	-	-	-80.44	12.47	39.03	-56.23	-13.00	-43.23
13526.8	H	-	-	-80.49	13.91	40.42	-54.84	-13.00	-41.84

Table 7-9. Radiated Spurious Data (WCDMA PCS – Low Channel – Ant2)

Mode:	WCDMA RMC
Channel:	9800
Frequency (MHz):	1960

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]
3920.0	H	144	201	-47.91	3.10	62.19	-33.06	-13.00	-20.06
5880.0	H	150	157	-76.26	5.52	36.26	-59.00	-13.00	-46.00
7840.0	H	127	168	-77.10	7.76	37.66	-57.60	-13.00	-44.60
9800.0	H	-	-	-79.94	10.36	37.42	-57.83	-13.00	-44.83
11760.0	H	-	-	-80.44	12.90	39.46	-55.79	-13.00	-42.79
13720.0	H	-	-	-80.46	13.98	40.52	-54.74	-13.00	-41.74

Table 7-10. Radiated Spurious Data (WCDMA PCS – Mid Channel – Ant2)

Mode:	WCDMA RMC
Channel:	9938
Frequency (MHz):	1987.6

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]
3975.2	H	228	159	-38.23	3.35	72.12	-23.14	-13.00	-10.14
5962.8	H	154	161	-73.50	5.99	39.49	-55.77	-13.00	-42.77
7950.4	H	146	191	-76.56	8.04	38.48	-56.77	-13.00	-43.77
9938.0	H	-	-	-79.77	10.73	37.96	-57.30	-13.00	-44.30
11925.6	H	-	-	-80.29	13.35	40.06	-55.20	-13.00	-42.20
13913.2	H	-	-	-80.52	14.04	40.52	-54.74	-13.00	-41.74

Table 7-11. Radiated Spurious Data (WCDMA PCS – High Channel – Ant2)

7.8 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

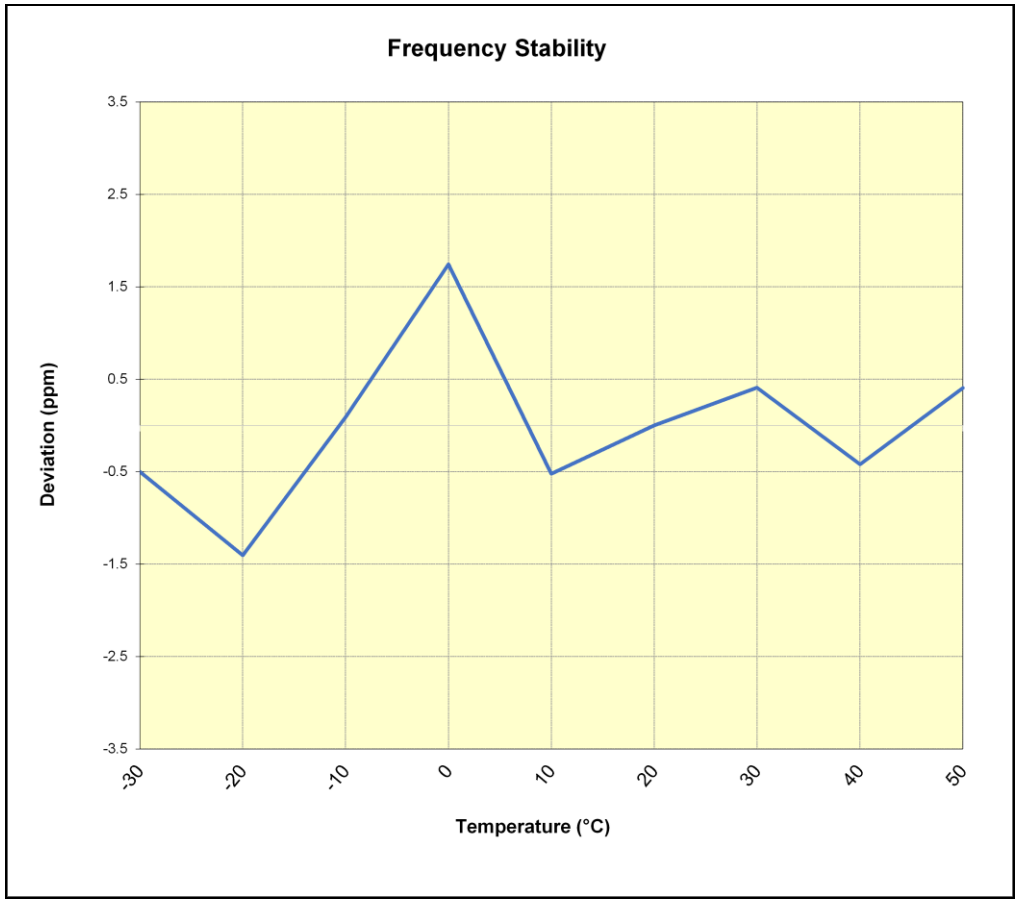
None

WCDMA PCS

Operating Frequency (Hz):	1,960,000,000
Ref. Voltage (VDC):	-48.00

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	-48.00	- 30	1,960,008,535	-986	-0.0000503
		- 20	1,960,006,766	-2,755	-0.0001406
		- 10	1,960,009,697	176	0.0000090
		0	1,960,012,936	3,415	0.0001742
		+ 10	1,960,008,495	-1,026	-0.0000523
		+ 20 (Ref)	1,960,009,521	0	0.0000000
		+ 30	1,960,010,324	803	0.0000410
		+ 40	1,960,008,697	-824	-0.0000420
		+ 50	1,960,010,317	796	0.0000406
85 %	-40.80	+ 20	1,960,008,316	-1,205	-0.0000615
115 %	-55.20	+ 20	1,960,013,125	3,604	0.0001839

Table 7-12. WCDMA PCS Frequency Stability Data



Plot 7-43. WCDMA PCS Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Tecore Networks Band 2 iCore NIB FCC ID: QLJNIB-002** complies with all the requirements of Part 24 of the FCC rules.