TEST REPORT

Report Number: R14311587-E1

Applicant	:	Sony Corporation 1-7-1 Konan Minato-ku Tokyo, 108-0075, Japan
FCC ID	:	PY7-53752E
EUT Description	:	GSM/WCDMA/LTE PHONE WITH BT, DTS/UNII A/B/G/N/AC/AX, GPS, WPT & NFC
Test Standard(s)	:	FCC CFR47 Part 2, Part 22, Part 24, Part 27

Date Of Issue:
2022-08-24

Prepared by:
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ACCREDITED
CERT #0751.06

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2022-08-17	Initial Review	Noah Bennett
V2	2022-08-24	-Updated PCS Antenna Gain -Revised Power table to have consistent number of significant digits.	Noah Bennett
V3	2022-08-25	-Updated Section 2 with ERP/EIRP rule parts for data-reuse bands -Updated section 6.2 -Updated section 6.4 -Updated Section 7 -Added limit to section 10.5.1	Noah Bennett

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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	SONY CORPORATION 1-7-1 KONAN MINATO-KU TOKYO, 108-0075, JAPAN
FCC ID	PY7-53752E
EUT Description	GSM/WCDMA/LTE PHONE WITH BT, DTS/UNII A/B/G/N/AC/AX, GPS, WPT & NFC
Serial Number	QV7700DND8, QV770070D8, QV7700CBD8, QV77007ZD8, QV7700DJD8
Sample Receipt Date	2022-06-27 and 2022-07-05
Date Tested	2022-07-28 to 2022-08-08
Applicable Standards	FCC CFR47 Part 2, Part 22, Part 24, Part 27
Test Results	COMPLIES

UL LLC. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL LLC. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC. will constitute fraud and shall nullify the document.

Approved & Released By:	Prepared By:
	
Dan Coronia Operations Leader UL Verification Services Inc.	Noah Bennett Electrical Engineer UL LLC.

2. SUMMARY OF TEST RESULTS

This report contains data provided by the customer which can impact the validity of results. UL LLC Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

Requirement Description	Band	Requirement Clause Number (FCC)	Result	Remarks
Equivalent Radiated Power	LTE 5, WCDMA 5, GSM 850	22.913 (a)(5)	Pass	None
	LTE 12, LTE 13	27.50 (c) (10), 27.50 (b) (10)		
Equivalent Isotropic Radiated Power	LTE 41	27.50 (h) (2)		
	GSM 1900, WCDMA 2	24.232 (c)		
	WCDMA 4, LTE 4	27.50 (d) (4)		

Requirement Description	Requirement Clause Number (FCC)	Result	Remarks
Occupied Bandwidth	2.1049	Pass	None
Band Edge and Emission Mask	2.1051, 22.917 (a), 27.53 (m)(4) & (m) (6), 27.53 (c) (f),	Pass	None
Out of Band Emissions	2.1051, 22.917 (a), 27.53 (m)(4) & (m) (6), 27.53 (c) (f)	Pass	None
Frequency Stability	2.1055, 22.355, 27.54	Pass	None
Peak-to-Average Ratio	22.913 (d)	Pass	None
Field Strength of Spurious Radiation	2.1053, 22.917 (a), 24.238 (a), 27.53 (m)(4) & (m) (6), 27.53 (g) (c) (f), 27.53 (h)	Pass	None

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the following:

- ANSI C63.26:2015
- FCC CFR 47 Part 2, Part 22, Part 24, and Part 27.
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01. Determining ERP and EIRP

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, Certificate Number 0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☒	Building 2800 Suite Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%

Uncertainty figures are valid to a confidence level of 95%.

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac/ax, GPS, WPT & NFC. This report covers GSM/WCDMA/LTE.

6.2. MAXIMUM OUTPUT POWER

EIRP/ERP TEST PROCEDURE

ANSI C63.26:2015
KDB 971168 D01 Section 5.6

ERP/EIRP = PMeas + GT − LC
where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
PMeas = measured transmitter output power or PSD, in dBm or dBW;
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

The transmitter has a maximum average conducted and ERP / EIRP output powers as follows:

GSM MODES

Part 22 850MHz

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	Limit (W)	ERP		99% BW (kHz)	Emission Designator
					(dBm)	(W)		
824.2-848.8	GPRS	32.6	-7.00	7.0	23.48	0.223	240.3	240KGXW
	EGPRS	27.2			18.01	0.063	245.1	245KG7W

Part 24 1900MHz

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	Limit (W)	EIRP		99% BW (kHz)	Emission Designator
					(dBm)	(W)		
1850.2-1909.8	GPRS	26.9	-4.70	2.0	22.20	0.166	238.3	238KGXW
	EGPRS	26.4			21.70	0.148	244	244KG7W

WCDMA MODE

Part 22 Band 5

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	Limit (W)	ERP		99% BW (kHz)	Emission Designator
					(dBm)	(W)		
826.4-846.6	REL 99	22.1	-7.00	7.0	12.95	0.020	4153	4M15F9W
	HSDPA	21.1			11.95	0.016	4145	4M15F9W

Part 24 Band 2

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	Limit (W)	EIRP		99% BW (kHz)	Emission Designator
					(dBm)	(W)		
1852.4-1907.6	REL 99	18.5	-4.70	2.0	13.80	0.024	4150	4M15F9W
	HSDPA	17.7			13.00	0.020	4164	4M16F9W

Part 27 Band 4

Frequency range (MHz)	Modulation	Conducted (Average) (dBm)	Antenna Gain (dBi)	Limit (W)	EIRP		99% BW (kHz)	Emission Designator
					(dBm)	(W)		
1712.4-1752.6	REL 99	17.3	-5.30	1.0	12.00	0.016	4159	4M16F9W
	HSDPA	16.3			11.00	0.013	4161	4M16F9W

LTE BAND 4

Part 27	
EIRP Limit (W)	1.00
Antenna Gain (dBi)	-5.30

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
1.4	QPSK	1710.7	1754.3	18.2	12.90	0.019	1090	1M09G7W
	16QAM			18.5	13.20	0.021	1090	1M09D7W
3.0	QPSK	1711.5	1753.5	18.3	13.00	0.020	2700	2M70G7W
	16QAM			18.5	13.20	0.021	2700	2M70D7W
5.0	QPSK	1712.5	1752.5	18.3	13.00	0.020	4490	4M49G7W
	16QAM			18.6	13.30	0.021	4490	4M49D7W
10.0	QPSK	1715.0	1750.0	18.3	13.00	0.020	8970	8M97G7W
	16QAM			18.5	13.20	0.021	8980	8M98D7W
15.0	QPSK	1717.5	1747.5	18.0	12.70	0.019	13460	13M5G7W
	16QAM			18.4	13.10	0.020	13450	13M5D7W
20.0	QPSK	1720.0	1745.0	18.2	12.90	0.019	17940	17M9G7W
	16QAM			18.3	13.00	0.020	17940	17M9D7W

LTE BAND 5

Part 22H	
ERP Limit (W)	7.00
Antenna Gain (dBi)	-7.00

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	ERP Average (dBm)	ERP Average (W)	99% BW (kHz)	Emission Designator
1.4	QPSK	824.7	848.3	20.8	11.64	0.015	1090	1M09G7W
	16QAM			21.1	11.98	0.016	1080	1M08D7W
3.0	QPSK	825.5	847.5	20.8	11.65	0.015	2690	2M69G7W
	16QAM			21.0	11.89	0.015	2700	2M70D7W
5.0	QPSK	826.5	846.5	20.8	11.63	0.015	4490	4M49G7W
	16QAM			21.2	12.00	0.016	4490	4M49D7W
10.0	QPSK	829.0	844.0	20.8	11.69	0.015	8970	8M97G7W
	16QAM			21.2	12.01	0.016	8960	8M96D7W

LTE BAND 12

Part 27	
ERP Limit (W)	3.00
Antenna Gain (dBi)	-6.70

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	ERP Average (dBm)	ERP Average (W)	99% BW (kHz)	Emission Designator
1.4	QPSK	699.7	715.3	21.2	12.35	0.017	1080	1M08G7W
	16QAM			21.6	12.75	0.019	1080	1M08D7W
3.0	QPSK	700.5	714.5	21.3	12.43	0.017	2700	2M70G7W
	16QAM			21.6	12.77	0.019	2690	2M69D7W
5.0	QPSK	701.5	713.5	21.3	12.47	0.018	4490	4M49G7W
	16QAM			21.7	12.80	0.019	4490	4M49D7W
10.0	QPSK	704.0	711.0	21.3	12.40	0.017	8970	8M97G7W
	16QAM			21.6	12.79	0.019	8960	8M96D7W

LTE BAND 13

Part 27	
ERP Limit (W)	3.00
Antenna Gain (dBi)	-7.10

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	ERP Average (dBm)	ERP Average (W)	99% BW (kHz)	Emission Designator
5.0	QPSK	779.5	784.5	21.1	11.85	0.015	4490	4M49G7W
	16QAM			21.6	12.35	0.017	4490	4M49D7W
10.0	QPSK	782.0	782.0	20.8	11.55	0.014	8950	8M95G7W
	16QAM			21.2	11.95	0.016	8950	8M95D7W

LTE BAND 41

Part 27	
EIRP Limit (W)	2.00
Antenna Gain (dBi)	-2.90

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
5.0	QPSK	2498.5	2687.5	19.2	16.34	0.043	4500	4M50G7W
	16QAM			19.3	16.39	0.044	4510	4M51D7W
10.0	QPSK	2501.0	2685.0	19.3	16.36	0.043	8960	8M96G7W
	16QAM			19.3	16.37	0.043	8980	8M98D7W
15.0	QPSK	2503.5	2682.5	19.0	16.14	0.041	13440	13M4G7W
	16QAM			19.1	16.15	0.041	13400	13M4D7W
20.0	QPSK	2506.0	2680.0	19.1	16.19	0.042	17850	17M9G7W
	16QAM			19.3	16.43	0.044	17930	17M9D7W

6.3. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 0.42.

6.4. MAXIMUM ANTENNA GAIN

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

Antenna	Supported Band(s)	Frequency Range (MHz)	Peak Gain (dBi)
Main Antenna 1	GSM850, WCDMA 5, LTE B5	824-849	-7.0
	LTE B12, B17	699-716	-6.7
	LTE B13	777-787	-7.1
Main Antenna 2	LTE B41	2496-2690	-2.9
	GSM1900, WCDMA 2	1850-1910	-4.7
	WCDMA 4, LTE B4	1710-1755	-5.3

6.5. WORST-CASE CONFIGURATION AND MODE

The EUT supports LTE Bands of:
Band 4, Band 5, Band 12, Band 13, Band 17, and Band 41.

The EUT supports WCDMA Bands of:
WCDMA 2, WCDMA 4, WCDMA 5.

LTE Band 17 (704-716MHz, 5/10MHz bandwidth) is covered by LTE Band 12 because it is a subset of LTE band 12 and they have the same output power.

The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on QPSK, 16QAM and 64QAM modulations. It was found that QPSK and 16QAM results were worst case. All testing was performed using QPSK and 16QAM modulations to represent the worst case. Radiated testing was performed at max bandwidth at 1RB to represent worst case.

The EUT was investigated in three orthogonal orientations X/Y/Z for Low Band and Mid Band frequency ranges. See the below table for WC Orientations:

Antenna	Frequency Band (MHz)	Orientation
Main 1	Low Band (Fc<1000MHz)	Y
Main 2	Mid Band (1000MHz<Fc<3000MHz)	Y

The Worst-Case scenarios for below 1GHz and above 18GHz are as follows:

Technology	Frequency Band	Modulation
GSM	850	GPRS
WCDMA	Band 5	Rel 99
LTE	Band 12	16-QAM

Simultaneous transmission worst-case modes were selected as follows:

- LTE Band 4, 20300, 1745MHz, 20MHz, 1RB and 2442MHz 11ax HE20 26T/8 C0/C1 and 5240MHz C0/C1 HE20 26T/0
- LTE Band 4, 20300, 1745MHz, 20MHz, 1RB and 2442MHz 11ax HE20 106T/R54 C0/C1
- LTE Band 4, 20300, 1745MHz, 20MHz, 1RB and 5240MHz 11ax HE20 26T/0 C0/C1
- LTE Band 12, 23060, 704MHz, 10MHz, 1RB and 11ax HE20 2462MHz 106T/R54 C0/C1

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	Sony	XQZ-UC11-010-236-21	1821W34209742	NA
AC Adapter	Sony	XQZ-UC11-010-236-21	1821W34209856	NA
Laptop	Asus	X515J	M8N0CX14J687338	N/A

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	USB-C	Non-Shielded	<3m	Connected to Power Supply
2	3.5mm	1	3.5mm Audio	Non-Shielded	<1m	Connected to headphones

TEST SETUP

The EUT is connected to the Test support laptop and configured to transmit at each test frequency and mode.

For Conducted Testing the EUT was powered via external DC Power Supply.

For Radiated Testing the EUT was connected to AC Mains via ACDC Adaptor and headphones were

SETUP DIAGRAMS

Please see Photos Exhibit R14311587-EP1 FCC WWAN SETUP PHOTOS EXHIBIT for Setup Diagrams and Photos.

7. REUSE OF TEST DATA

7.1. INTRODUCTION

According to the manufacturer the major change between FCC ID: PY7-17565F (Lead Model), and FCC ID: PY7-53752E (This Model) is changing band configuration by software. The FCC ID: PY7-17565F (Lead Model) conducted test data shall remain representative of FCC ID: PY7-53752E so, FCC ID: PY7-53752E leverages conducted test data from FCC ID: PY7-17565F.

The applicant takes full responsibility that the test data as referenced in this section represents compliance for this FCC ID.

7.2. DEVICE DIFFERENCES

Difference between PY7-17565F (Lead Model), and FCC ID: PY7-53752E (This Model):

Sony Corporation hereby declares that the PCB layout and the components except for antenna for licensed band (GSM, WCDMA and LTE) is identical between PY7-17565F (lead model), and PY7-53752E (This Model). Therefore, the conducted test data of licensed band for PY7-17565F can be re-used to PY7-53752E except for LTE B5, LTE B13 and LTE B41.

7.3. REFERENCE DETAIL

Equipment Class	Reference FCC ID	Report Title	Referenced Testing
Licensed (WWAN)	PY7-17565F	R14311589-E1 FCC WWAN REPORT - FINAL	Conducted Antenna port data for LTE Band 4, Band 12, WCDMA Band 2, WCDMA Band 4, GSM 850 and GSM1900 only.

*Notes:
1. Full radiated testing was done on all LTE, WCDMA and GSM Bands.
2. ERP/EIRP is updated in this report due to changes in antenna gain. ERP/EIRP is based on conducted power plus antenna gain.

7.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device PY7-53752E for Conducted output power. The data from the application has been verified through appropriate spot checks to demonstrate compliance for this device as shown in the summary.

PY7-53752E SPOT CHECK RESULTS						
Technology	RB	Data Rate	Measured Frequency (MHz)	PY7-17565F	PY7-53752E	Delta (dB) <+3dB
				Conducted Output Power (dBm)	Conducted Output Power (dBm)	Margin
LTE Band 12	50-0	QPSK	707.5 MHz	21.2	20.9	0.30
		16QAM		21.0	21.0	0.00
LTE Band 4	100-0	QPSK	1732.5 MHz	17.9	17.7	0.20
		16QAM		17.9	17.7	0.20
WCDMA 2	-	Rel 99	1880 MHz	18.4	18.6	-0.20
		HSDPA		17.4	17.7	-0.30
WCDMA 4	-	Rel 99	1732.5 MHz	17.2	17.6	-0.40
		HSDPA		16.2	16.6	-0.40
GSM 850	-	GPRS	836.6 MHz	32.2	32.4	-0.20
		EGPRS		27.2	27.1	0.10
GSM 1900	-	GPRS	1880 MHz	26.9	27.1	-0.20
		EGPRS		26.3	26.4	-0.10

8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used – Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
	Conducted Room 1				
HI0092	Environmental Meter	Fisher Scientific	14-650-118	2022-03-17	2023-03-17
212967	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	2021-11-15	2022-11-15
SA0025	Spectrum Analyzer	Keysight Technologies	N9030A	2022-05-02	2023-05-02
MY51100032	Spectrum Analyzer	Agilent Technologies	E4446A	2022-03-03	2024-03-03
-	DC Power Supply	Keysight Technologies	E3633A	-	-
MM0167	True RMS Multimeter	Keysight Technologies	U1232A	2021-08-17	2023-08-17
SOFTEMI	Conducted Licensed Test Software	UL	Version 3.0A (2020-12-10)		
SOFTEMI	Power Verification Software	UL	Version 3.4.1 (2021-05-20)		
	Conducted Room 2				
HI0092	Environmental Meter	Fisher Scientific	14-650-118	2022-03-17	2023-03-17
208720	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	2022-05-02	2023-05-02
MY58426145	DC Power Supply	Keysight Technologies	E3633A	-	-
SOFTEMI	Power Verification Software	UL	Version 3.4.1 (2021-05-20)	-	-
76023 (EC0225)	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2022-05-24	2023-05-24

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2021-11-04	2022-11-04
	Gain-Loss Chains				
C1-SAC04	Gain-loss string: 18-40GHz	Various	Various	2022-05-05	2023-05-05
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-04-14	2023-04-14
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
210922	Environmental Meter	Fisher Scientific	181474341	2021-09-27	2022-09-27
PS216	AC Power Source	Elgar	CW2501M (s/n 1045A04231)	NA	NA
BRF001	900MHz notch filter, 2W, F_{high} =6GHz	Micro-Tronics	BRM50706	2022-05-27	2023-05-27

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	30-1000 MHz				
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2021-08-30	2022-08-30
	1-18 GHz				
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-03-21	2023-03-21
	Gain-Loss Chains				
C2-SAC03	Gain-loss string: 1-18GHz	Various	Various	2022-05-10	2023-05-10
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-03-08	2023-03-08
SA0020	Spectrum Analyzer	Agilent	E4446A	2022-06-08	2023-06-08
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
HPF012	1GHz high-pass filter, 2W, F_{high} =18GHz	Micro-Tronics	HPM18129	2022-02-17	2023-02-17
BRF010	1.85-1.97GHz notch filter, 2W, F_{high} = 9GHz	Micro-Tronics	BRM50714-01	2022-02-17	2023-02-17
BRF008	1710-1785MHz notch filter, 2W, F_{high} = 9GHz	Micro-Tronics	BRM50713-01	2022-02-17	2023-02-17
200540	Environmental Meter	Fisher Scientific	15-077-963	2021-09-27	2022-09-27
213025	Wideband Radio Communications Tester	Rohde and Schwarz	CMW500	2021-11-18	2022-11-18

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	30-1000 MHz				
AT0081	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2021-12-08	2022-12-08
	1-18 GHz				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-05-24	2023-05-24
	Gain-Loss Chains				
C4-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2022-05-20	2023-05-20
C4-SAC03	Gain-loss string: 1-18GHz	Various	Various	2022-05-20	2023-05-20
	Receiver & Software				
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-02-15	2023-02-15
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
210642	Environmental Meter	Fisher Scientific	15-077-963	2021-08-16	2023-08-16
207620	Wideband Radio Communications Tester	Anritsu	MT8821C	2022-08-07	2023-08-07
213025	Wideband Radio Communications Tester	Rohde and Schwarz	CMW500	2021-11-18	2022-11-18
BRF001	900MHz notch filter, 2W, F_{high} =6GHz	Micro-Tronics	BRM50706	2022-05-27	2023-05-27

NOTES:

1. * Testing is completed before equipment expiration date.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

9. RF OUTPUT POWER VERIFICATION

9.1. WCDMA

TEST PROCEDURE

The transmitter output was connected to the input terminal of Directional Coupler via calibrated coaxial cable. The output coupling terminal of the Directional Coupler was directly connected to a spectrum analyzer while the output through terminal connected to the communication test set via calibrated coaxial cable.

The output power was measured with the spectrum analyzer at the low, middle and high channel in each band.

- Set the spectrum analyzer span wide enough or greater than the modulated signal BW.
- Set a spectrum analyzer at peak detection mode with VBW ≥ RBW.≥ 26dB BW, typically 5MHz.
- Set a marker to point the corresponding peak value.

REL 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

HSDPA REL 5

The following 4 Sub-tests were completed according to Release 5 procedures in table C.10.1.4 of 3GPP TS 34.121-1 A summary of these settings are illustrated below:

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1, Note 2)*	**CM** (dB) *(Note 3)*	**MPR** (dB) *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

HSPA REL 6 (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in table C.11.1.3 of 3GPP TS 34.121-1. A summary of these settings are illustrated below:

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c. For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with β_{hs} = 5/15 * β_c.

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

RESULT

9.1.1. WCDMA BAND 5

Test Engineer ID:	27465/44389	Test Date:	2022-07-28

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	4132	826.4	22.0	N/A	22.7
		4183	836.6	22.1		
		4233	846.6	22.1		
HSDPA	Subtest 1	4132	826.4	21.0	0	22.0
		4183	836.6	21.1		
		4233	846.6	21.1		
	Subtest 2	4132	826.4	21.0	0	22.0
		4183	836.6	21.0		
		4233	846.6	21.1		
	Subtest 3	4132	826.4	20.5	0.5	21.5
		4183	836.6	20.5		
		4233	846.6	20.6		
	Subtest 4	4132	826.4	20.5	0.5	21.5
		4183	836.6	20.5		
		4233	846.6	20.6		
HSUPA	Subtest 1	4132	826.4	21.0	0	22.0
		4183	836.6	21.1		
		4233	846.6	21.0		
	Subtest 2	4132	826.4	18.9	2	20.0
		4183	836.6	19.0		
		4233	846.6	19.1		
	Subtest 3	4132	826.4	19.9	1	21.0
		4183	836.6	20.0		
		4233	846.6	20.1		
	Subtest 4	4132	826.4	18.9	2	20.0
		4183	836.6	19.0		
		4233	846.6	19.1		
	Subtest 5	4132	826.4	21.0	0	22.0
		4183	836.6	21.0		
		4233	846.6	21.1		

9.2. LTE

CONDUCTED OUTPUT POWER MEASUREMENT PROCEDURE

All LTE bands conducted average power is obtained from the CMW500 telecommunication test set.

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS136.101 specification.

UE Power Class: 3 (23 +/- 2dBm).The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS136.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS136.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	N/A
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36, 66, 70	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2, 6.6.3.3.19	41	5, 10, 15, 20	Table 6.2.4-4, Table 6.2.4-4a	

RESULTS

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted output powers as follows:

9.2.1. LTE BAND 5

Test Engineer ID:	84740/44389	Test Date:	2022-07-28

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20450	20525	20600		
				829 MHz	836.5 MHz	844 MHz		
10 MHz	QPSK	1	0	20.7	20.7	20.8	0	22
		1	25	20.6	20.7	20.8	0	22
		1	49	20.7	20.6	20.7	0	22
		25	0	20.6	20.7	20.8	0	22
		25	12	20.7	20.7	20.8	0	22
		25	25	20.7	20.6	20.8	0	22
		50	0	20.7	20.7	20.8	0	22
	16QAM	1	0	21.0	21.0	21.1	0	22
		1	25	20.9	21.1	21.2	0	22
		1	49	21.0	20.9	21.1	0	22
		25	0	20.7	20.6	20.8	0	22
		25	12	20.7	20.7	20.8	0	22
		25	25	20.7	20.7	20.9	0	22
		50	0	20.7	20.7	20.8	0	22
	64QAM	1	0	21.1	20.9	21.0	0	22
		1	25	21.1	20.9	21.1	0	22
		1	49	21.1	20.9	21.0	0	22
		25	0	20.7	20.7	20.8	0	22
		25	12	20.8	20.6	20.8	0	22
		25	25	20.8	20.8	20.9	0	22
		50	0	20.8	20.7	20.8	0	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20425	20525	20625		
				826.5 MHz	836.5 MHz	846.5 MHz		
5 MHz	QPSK	1	0	20.7	20.6	20.7	0	22
		1	12	20.8	20.8	20.8	0	22
		1	24	20.7	20.6	20.7	0	22
		12	0	20.8	20.7	20.7	0	22
		12	7	20.7	20.6	20.7	0	22
		12	13	20.6	20.8	20.8	0	22
		25	0	20.7	20.7	20.7	0	22
	16QAM	1	0	21.0	21.0	21.1	0	22
		1	12	21.1	21.2	21.2	0	22
		1	24	20.9	21.0	21.0	0	22
		12	0	20.6	20.8	20.8	0	22
		12	7	20.6	20.8	20.7	0	22
		12	13	20.6	20.7	20.8	0	22
		25	0	20.8	20.7	20.7	0	22
	64QAM	1	0	21.0	21.0	20.9	0	22
		1	12	21.0	21.1	21.0	0	22
		1	24	21.1	21.0	20.9	0	22
		12	0	20.7	20.7	20.8	0	22
		12	7	20.8	20.8	20.7	0	22
		12	13	20.8	20.8	20.9	0	22
		25	0	20.7	20.6	20.7	0	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20415	20525	20635		
				825.5 MHz	836.5 MHz	847.5 MHz		
3 MHz	QPSK	1	0	20.5	20.6	20.6	0	22
		1	8	20.7	20.7	20.7	0	22
		1	14	20.5	20.6	20.6	0	22
		8	0	20.7	20.7	20.7	0	22
		8	4	20.7	20.6	20.6	0	22
		8	7	20.7	20.8	20.8	0	22
		15	0	20.7	20.6	20.6	0	22
	16QAM	1	0	20.9	20.9	20.9	0	22
		1	8	21.0	21.0	21.0	0	22
		1	14	21.0	20.9	20.9	0	22
		8	0	20.8	20.6	20.6	0	22
		8	4	20.8	20.7	20.7	0	22
		8	7	20.8	20.8	20.8	0	22
		15	0	20.7	20.7	20.7	0	22
	64QAM	1	0	20.9	20.8	20.8	0	22
		1	8	21.0	21.0	21.0	0	22
		1	14	20.9	21.0	21.0	0	22
		8	0	20.7	20.7	20.7	0	22
		8	4	20.7	20.7	20.7	0	22
		8	7	20.7	20.7	20.7	0	22
		15	0	20.7	20.7	20.7	0	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20407	20525	20643		
				824.7 MHz	836.5 MHz	848.3 MHz		
1.4 MHz	QPSK	1	0	20.6	20.6	20.8	0	22
		1	3	20.6	20.8	20.7	0	22
		1	5	20.6	20.7	20.8	0	22
		3	0	20.7	20.6	20.7	0	22
		3	1	20.6	20.7	20.7	0	22
		3	3	20.7	20.7	20.8	0	22
		6	0	20.6	20.7	20.7	0	22
	16QAM	1	0	20.7	21.1	21.0	0	22
		1	3	20.9	21.1	21.1	0	22
		1	5	20.8	21.1	21.0	0	22
		3	0	20.8	20.9	20.8	0	22
		3	1	20.8	20.9	20.9	0	22
		3	3	20.7	20.9	20.9	0	22
		6	0	20.8	20.8	20.8	0	22
	64QAM	1	0	20.9	20.9	21.0	0	22
		1	3	21.0	21.0	21.0	0	22
		1	5	21.0	21.0	21.0	0	22
		3	0	20.8	20.7	20.8	0	22
		3	1	20.8	20.8	20.9	0	22
		3	3	20.9	20.8	20.9	0	22
		6	0	20.7	20.8	20.9	0	22

9.2.2. LTE BAND 13

Test Engineer ID:	84740/44389	Test Date:	2022-07-28

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)		
				23230 / 782 MHz	MPR	Tune-up Limit
10 MHz	QPSK	1	0	20.8	0	22
		1	25	20.8	0	22
		1	49	20.7	0	22
		25	0	20.8	0	22
		25	12	20.7	0	22
		25	25	20.8	0	22
		50	0	20.8	0	22
	16QAM	1	0	21.2	0	22
		1	25	21.2	0	22
		1	49	21.1	0	22
		25	0	21.0	0	22
		25	12	20.9	0	22
		25	25	20.9	0	22
		50	0	20.8	0	22
	64QAM	1	0	21.1	0	22
		1	25	21.1	0	22
		1	49	21.1	0	22
		25	0	21.0	0	22
		25	12	20.9	0	22
		25	25	20.9	0	22
		50	0	20.8	0	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				23205	23230	23255		
				779.5 MHz	782 MHz	784.5 MHz		
5 MHz	QPSK	1	0	21.0	20.7	21.0	0	22
		1	12	21.1	20.9	21.0	0	22
		1	24	21.0	20.8	20.9	0	22
		12	0	21.0	20.8	20.9	0	22
		12	7	21.0	20.8	21.1	0	22
		12	13	21.0	20.8	21.0	0	22
		25	0	20.9	20.8	21.0	0	22
	16QAM	1	0	21.3	21.1	21.3	0	22
		1	12	21.6	21.2	21.5	0	22
		1	24	21.3	21.1	21.3	0	22
		12	0	21.0	20.8	20.9	0	22
		12	7	21.0	20.9	21.0	0	22
		12	13	21.1	20.9	21.0	0	22
		25	0	21.0	20.7	21.0	0	22
	64QAM	1	0	21.3	21.1	21.3	0	22
		1	12	21.3	21.3	21.3	0	22
		1	24	21.2	21.1	21.3	0	22
		12	0	21.0	20.8	21.0	0	22
		12	7	21.0	20.8	21.1	0	22
		12	13	21.0	20.7	21.0	0	22
		25	0	21.0	20.8	21.0	0	22

9.2.3. LTE BAND 41

Test Engineer ID:	85502/44389	Test Date:	2022-07-29

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
20 MHz	QPSK	1	0	19.0	18.2	18.4	18.1	18.7	0	20
		1	49	19.0	18.2	18.4	18.0	18.7	0	20
		1	99	18.9	18.1	18.4	18.1	18.7	0	20
		50	0	19.1	18.3	18.4	18.1	18.8	0	20
		50	24	19.1	18.3	18.5	18.1	18.8	0	20
		50	50	19.1	18.2	18.5	18.0	18.7	0	20
		100	0	19.1	18.3	18.5	18.0	18.8	0	20
	16QAM	1	0	19.1	18.3	18.5	18.2	18.9	0	20
		1	49	19.3	18.4	18.5	18.2	18.9	0	20
		1	99	19.0	18.2	18.5	18.1	18.8	0	20
		50	0	19.1	18.3	18.4	18.1	18.8	0	20
		50	24	19.1	18.3	18.5	18.1	18.8	0	20
		50	50	19.1	18.3	18.5	18.1	18.7	0	20
		100	0	19.1	18.3	18.5	18.1	18.8	0	20
	64QAM	1	0	18.6	18.3	18.1	18.0	18.9	0	20
		1	49	18.7	18.3	18.1	18.0	18.9	0	20
		1	99	18.5	18.1	18.1	18.0	18.8	0	20
		50	0	18.7	18.3	18.0	18.1	18.8	0	20
		50	24	18.7	18.3	18.1	18.1	18.8	0	20
		50	50	18.7	18.3	18.1	18.1	18.7	0	20
		100	0	18.7	18.3	18.1	18.1	18.8	0	20

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
15 MHz	QPSK	1	0	19.0	18.4	18.5	18.9	18.8	0	20
		1	37	19.0	18.4	18.5	18.9	18.7	0	20
		1	74	18.9	18.4	18.5	18.9	18.7	0	20
		36	0	19.0	18.4	18.5	18.9	18.8	0	20
		36	20	19.0	18.4	18.6	18.9	18.8	0	20
		36	39	19.0	18.4	18.5	18.9	18.7	0	20
		75	0	19.0	18.4	18.5	18.9	18.7	0	20
	16QAM	1	0	19.0	18.4	18.5	19.0	18.6	0	20
		1	37	18.9	18.4	18.5	19.0	18.6	0	20
		1	74	18.9	18.4	18.6	19.0	18.6	0	20
		36	0	19.1	18.5	18.5	19.0	18.8	0	20
		36	20	19.1	18.5	18.6	18.9	18.8	0	20
		36	39	19.0	18.4	18.5	19.0	18.7	0	20
		75	0	19.1	18.4	18.5	18.9	18.8	0	20
	64QAM	1	0	18.7	18.4	18.4	18.9	18.8	0	20
		1	37	18.6	18.3	18.4	18.8	18.7	0	20
		1	74	18.6	18.4	18.5	19.0	18.7	0	20
		36	0	18.7	18.5	18.4	19.0	18.8	0	20
		36	20	18.7	18.5	18.5	19.0	18.8	0	20
		36	39	18.7	18.4	18.5	19.0	18.7	0	20
		75	0	18.7	18.5	18.5	18.9	18.8	0	20

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
10 MHz	QPSK	1	0	19.2	19.1	18.6	18.4	18.5	0	20
		1	25	19.2	19.1	18.7	18.4	18.5	0	20
		1	49	19.2	19.0	18.7	18.3	18.5	0	20
		25	0	19.3	19.1	18.8	18.4	18.6	0	20
		25	12	19.3	19.2	18.8	18.5	18.6	0	20
		25	25	19.2	19.1	18.8	18.4	18.6	0	20
		50	0	19.3	19.1	18.8	18.4	18.6	0	20
	16QAM	1	0	19.2	19.2	18.7	18.4	18.6	0	20
		1	25	19.1	19.2	18.8	18.5	18.6	0	20
		1	49	19.1	19.1	18.8	18.4	18.6	0	20
		25	0	19.3	19.2	18.8	18.4	18.6	0	20
		25	12	19.3	19.2	18.8	18.5	18.6	0	20
		25	25	19.2	19.2	18.8	18.5	18.6	0	20
		50	0	19.3	19.1	18.8	18.4	18.6	0	20
	64QAM	1	0	18.8	18.5	18.7	18.4	18.5	0	20
		1	25	18.8	18.5	18.7	18.4	18.4	0	20
		1	49	18.7	18.5	18.7	18.3	18.4	0	20
		25	0	18.8	18.6	18.8	18.4	18.5	0	20
		25	12	18.8	18.6	18.8	18.4	18.6	0	20
		25	25	18.8	18.6	18.8	18.4	18.5	0	20
		50	0	18.8	18.6	18.8	18.4	18.5	0	20

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
5 MHz	QPSK	1	0	19.2	19.1	19.0	19.1	18.9	0	20
		1	12	19.2	19.1	19.2	19.2	18.9	0	20
		1	24	19.1	19.0	19.1	19.1	18.8	0	20
		12	0	19.2	19.1	19.1	19.1	18.9	0	20
		12	7	19.2	19.2	19.2	19.1	18.9	0	20
		12	13	19.2	19.2	19.1	19.1	18.9	0	20
		25	0	19.2	19.1	19.1	19.1	18.9	0	20
	16QAM	1	0	19.2	19.1	19.2	19.1	18.9	0	20
		1	12	19.3	19.2	19.3	19.3	19.0	0	20
		1	24	19.1	19.1	19.1	19.1	18.9	0	20
		12	0	19.3	19.2	19.1	19.1	18.9	0	20
		12	7	19.3	19.2	19.2	19.1	19.0	0	20
		12	13	19.3	19.2	19.1	19.1	18.9	0	20
		25	0	19.2	19.1	19.2	19.1	18.9	0	20
	64QAM	1	0	19.3	19.1	19.1	19.0	18.9	0	20
		1	12	19.3	19.1	19.2	19.1	18.9	0	20
		1	24	19.2	19.1	19.1	19.1	18.8	0	20
		12	0	19.3	19.1	19.1	19.1	18.8	0	20
		12	7	19.3	19.2	19.3	19.1	18.9	0	20
		12	13	19.2	19.1	19.1	19.1	18.9	0	20
		25	0	19.2	19.1	19.1	19.1	18.8	0	20

10. CONDUCTED TEST RESULTS

10.1. OCCUPIED BANDWIDTH

RULE PART(S)
FCC: §2.1049

LIMITS
For reporting purposes only.

TEST PROCEDURE
The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the middle channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

RESULTS
There is no limit required and power is the same for low, middle and high channel; therefore, only middle channel was tested. Worst-case plots (highest bandwidth) are reported only.

WCDMA

Band	Modulation	Channel	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
BAND5	REL 99	4408	836.6	4.153	4.712
	HSDPA			4.145	4.709

LTE5

Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 5	1.4MHz, QPSK	6/0	836.5	1.08	1.3
	1.4MHz,16QAM			1.08	1.3
	3MHz, QPSK	15/0		2.69	2.95
	3MHz, 16QAM			2.7	2.95
	5MHz, QPSK	25/0		4.49	4.9
	5MHz, 16QAM			4.49	4.87
	10MHz, QPSK	50/0		8.97	9.57
	10MHz, 16QAM			8.96	9.56

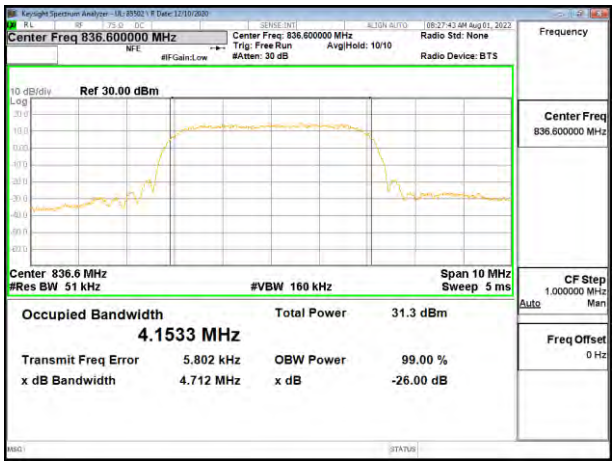
LTE13

Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 13	5MHz, QPSK	25/0	782.0	4.49	4.88
	5MHz, 16QAM			4.49	4.88
	10MHz, QPSK	50/0		8.95	9.6
	10MHz, 16QAM			8.95	9.53

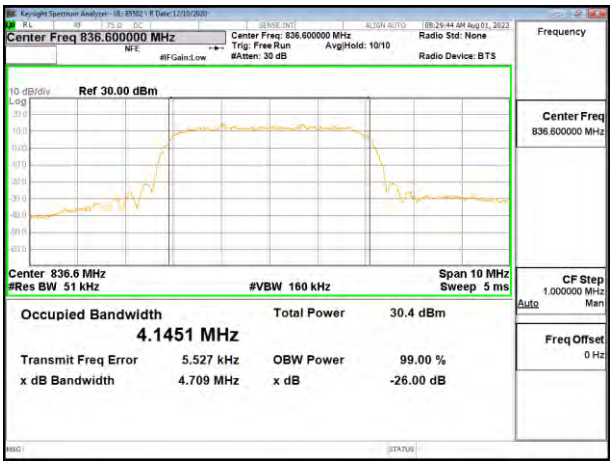
LTE41

Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 41	5MHz, QPSK	25/0	2593.0	4.5	5.11
	5MHz, 16QAM			4.51	5.14
	10MHz, QPSK	50/0		8.96	9.63
	10MHz, 16QAM			8.98	9.95
	15MHz, QPSK	75/0		13.44	14.62
	15MHz, 16QAM			13.4	14.62
	20MHz, QPSK	100/0		17.85	19.5
	20MHz, 16QAM			17.93	20.52

10.1.1. WCDMA

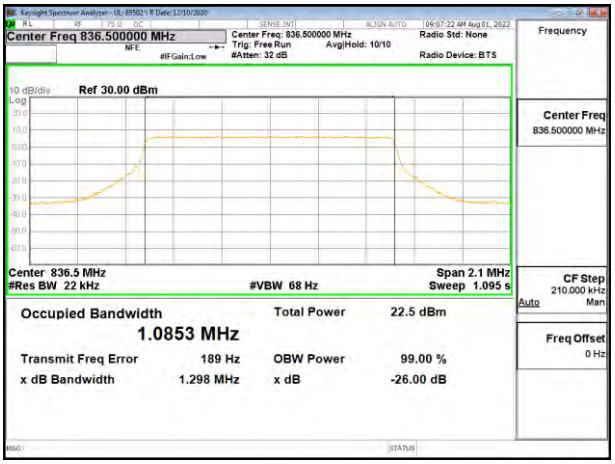


BAND 5 Rel 99 MID Channel

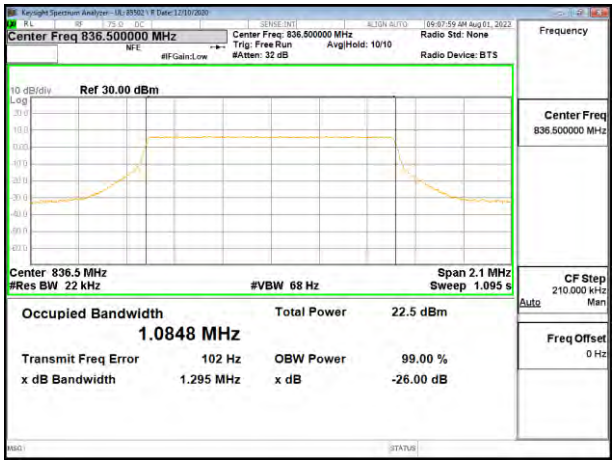


BAND 5 HSDPA MID Channel

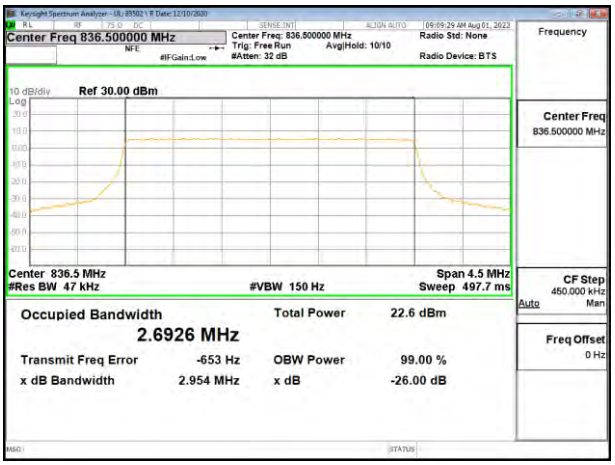
10.1.2. LTE BAND 5



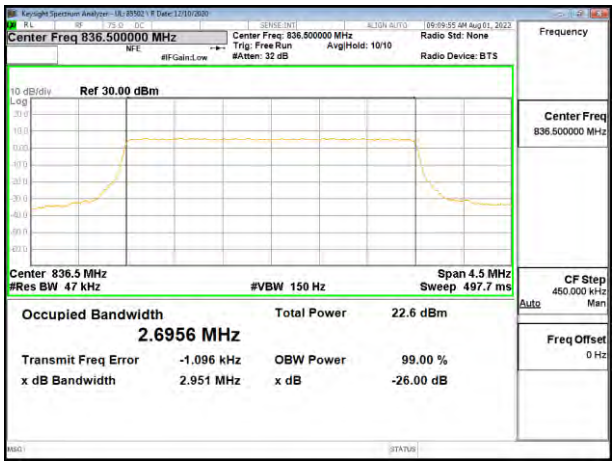
LTE5 1.4MHz QPSK MID Ch RB6-0



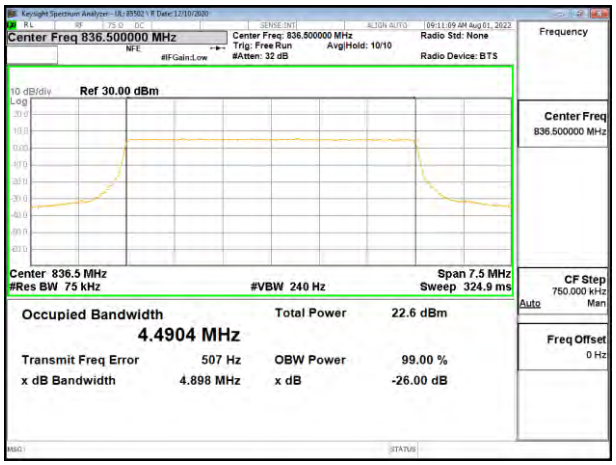
LTE5 1.4MHz 16QAM MID Ch RB6-0



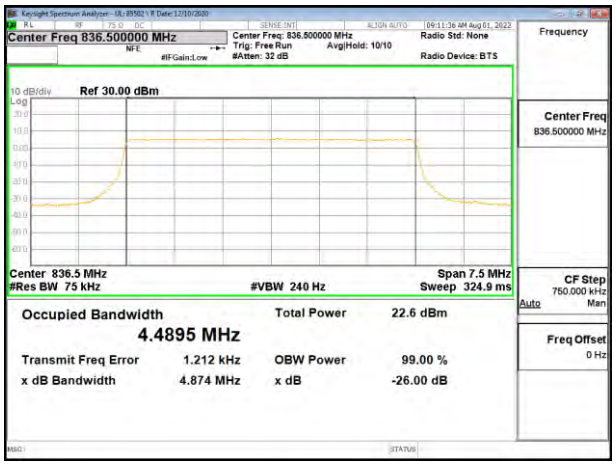
LTE5 3MHz QPSK MID Ch RB15-0



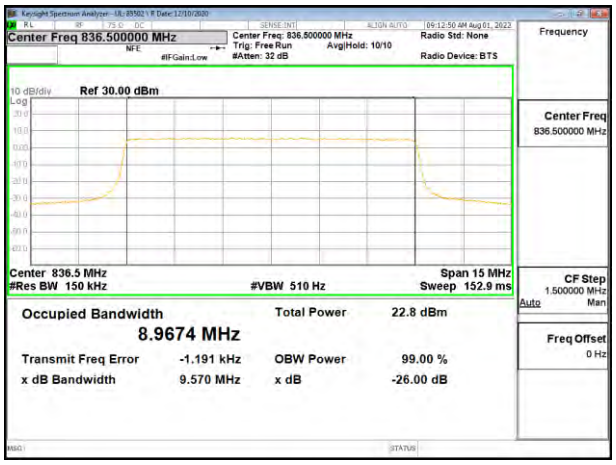
LTE5 3MHz 16QAM MID Ch RB15-0



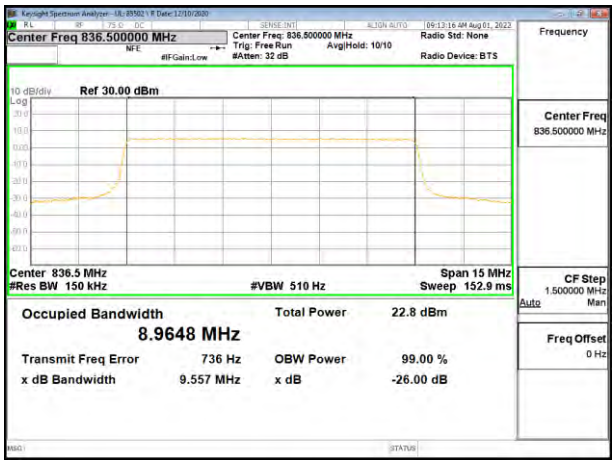
LTE5 5MHz QPSK MID Ch RB25-0



LTE5 5MHz 16QAM MID Ch RB25-0

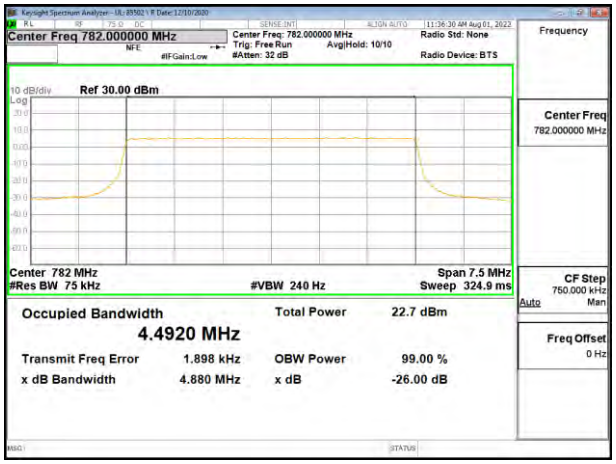


LTE5 10MHz QPSK MID Ch RB50-0

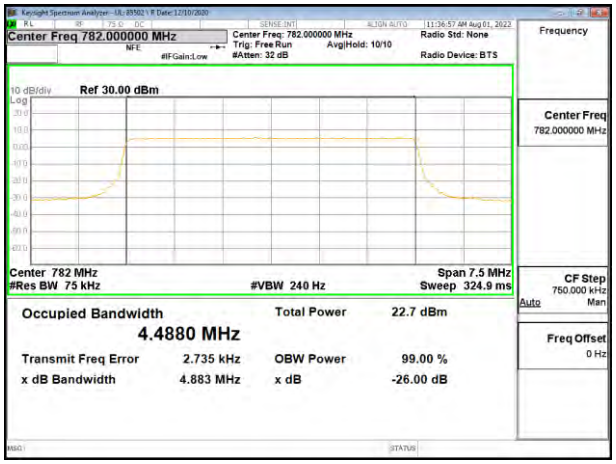


LTE5 10MHz 16QAM MID Ch RB50-0

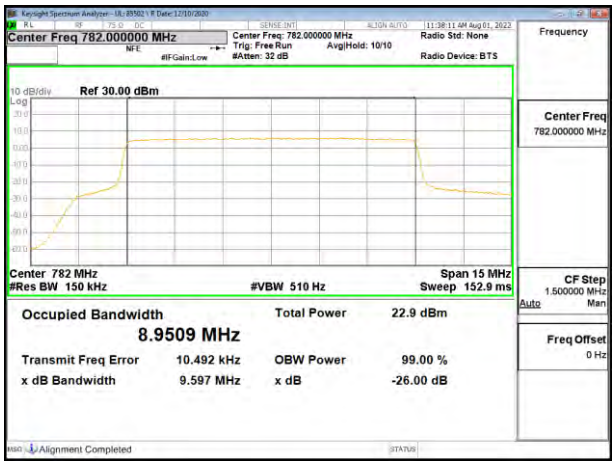
10.1.3. LTE BAND 13



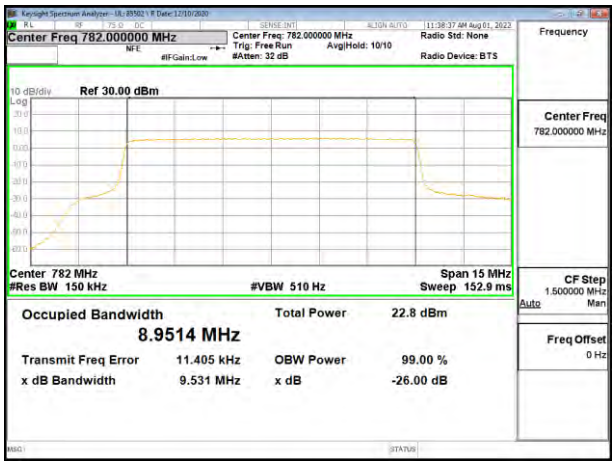
LTE13 5MHz QPSK MID Ch RB25-0



LTE13 5MHz 16QAM MID Ch RB25-0

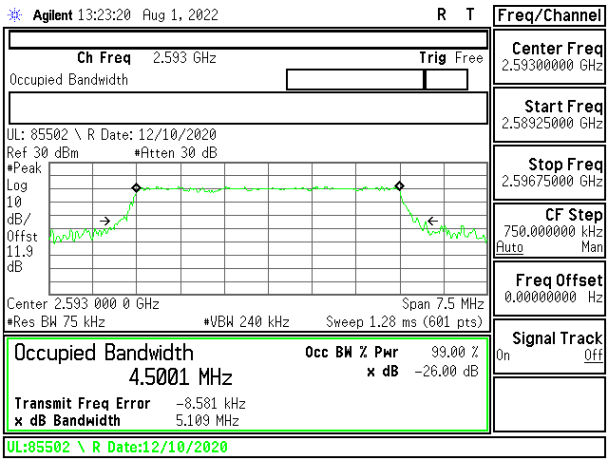


LTE13 10MHz QPSK MID Ch RB50-0

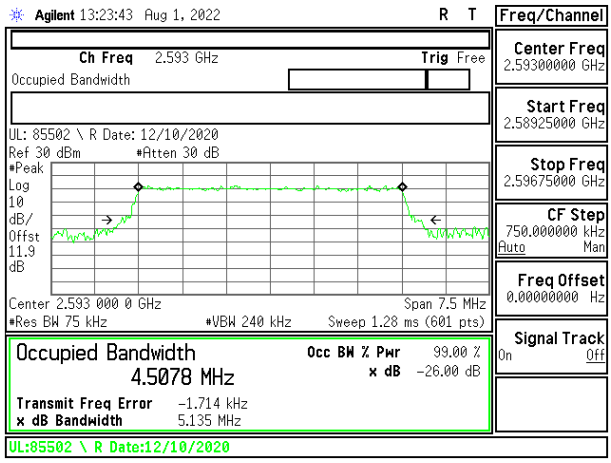


LTE13 10MHz 16QAM MID Ch RB50-0

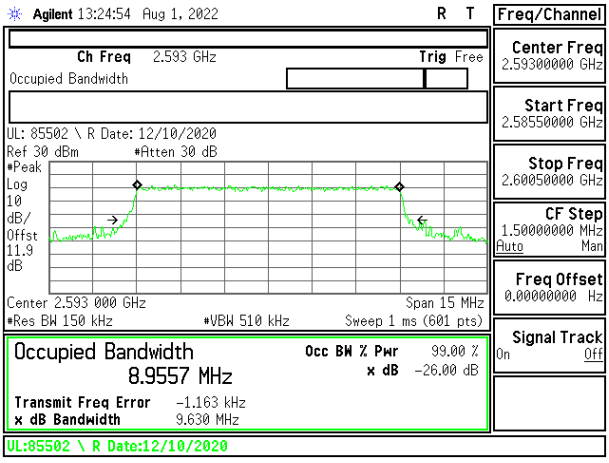
10.1.4. LTE BAND 41



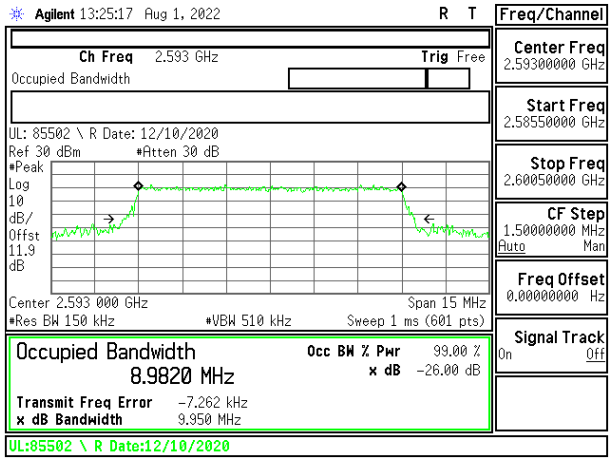
LTE41 5MHz QPSK MID Ch RB25-0



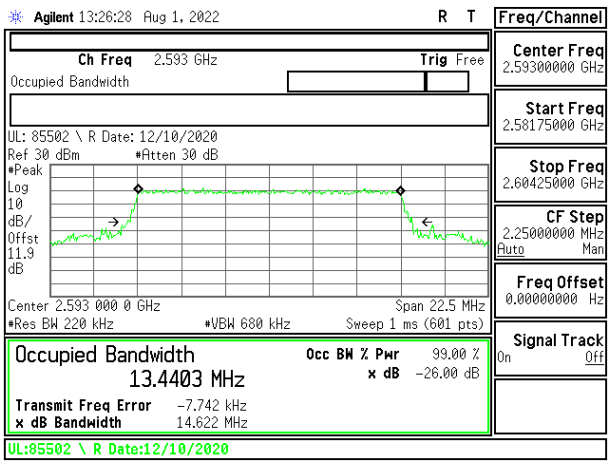
LTE41 5MHz 16QAM MID Ch RB25-0



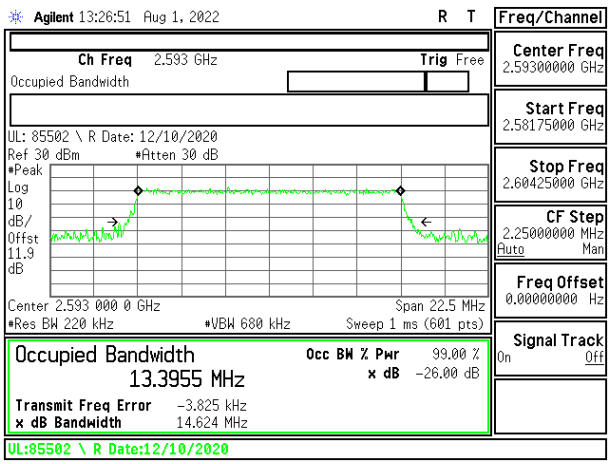
LTE41 10MHz QPSK MID Ch RB50-0



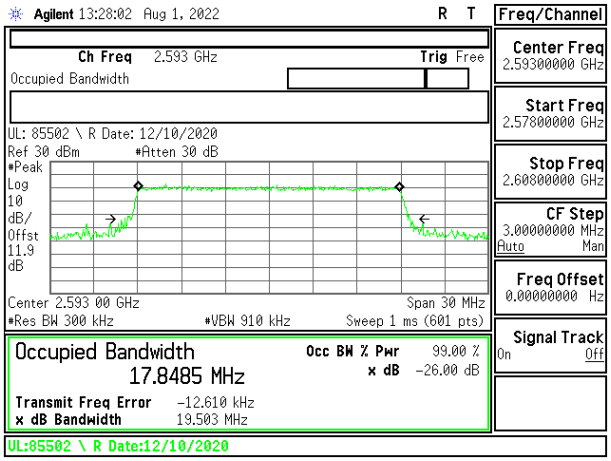
LTE41 10MHz 16QAM MID Ch RB50-0



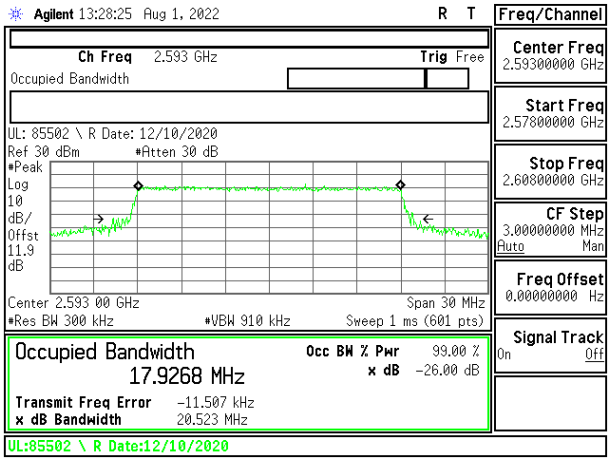
LTE41 15MHz QPSK MID Ch RB75-0



LTE41 15MHz 16QAM MID Ch RB75-0



LTE41 20MHz QPSK MID Ch RB100-0



LTE41 20MHz 16QAM MID Ch RB100-0

10.2. BAND EDGE AND EMISSION MASK

TEST PROCEDURE

The transmitter output was connected to a CMW500Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

(i) Set the spectrum analyzer span to include the block edge frequency.
(ii) Set a marker to point the corresponding band edge frequency in each test case.
(iii) Set display line at -13 dBm
(iv) Set resolution bandwidth to at least 1% of emission bandwidth.

TEST PROCEDURE (FCC LTE BAND 7, 41)

(m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, 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; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). 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 emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

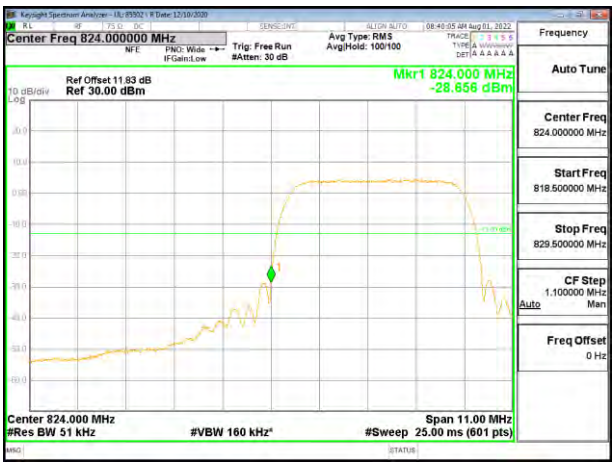
RESULTS

10.2.1. WCDMA BAND 5

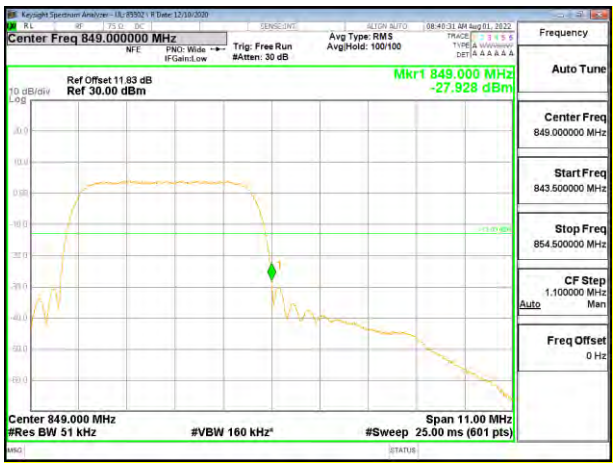
LIMITS

FCC: §22.917

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

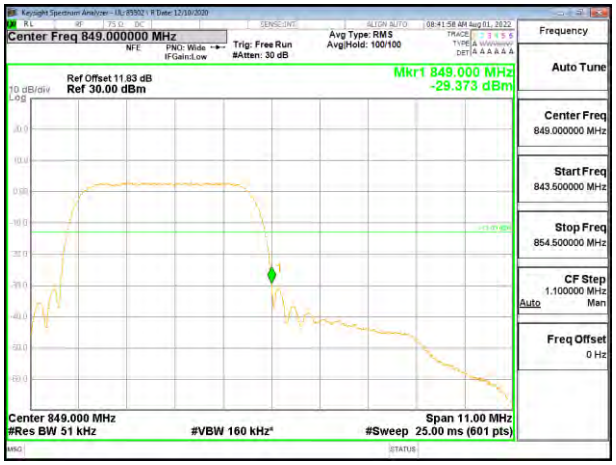


BAND 5 Rel 99 LOW Channel



BAND 5 Rel 99 HIGH Channel

BAND 5 HSDPA LOW Channel



BAND 5 HSDPA HIGH Channel

10.2.2. LTE BAND 5

LIMITS

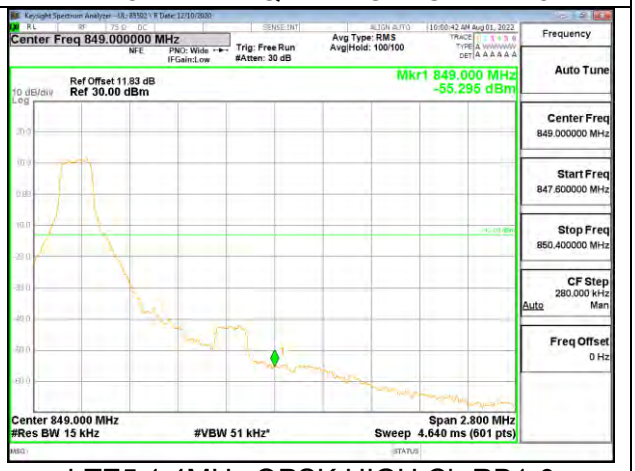
FCC: §22.917

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

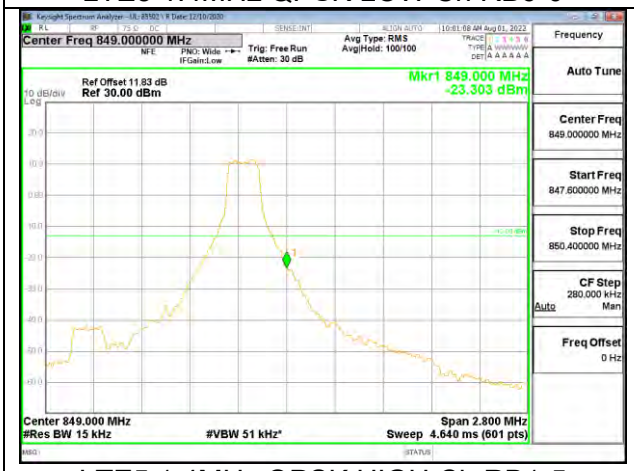
LTE5 1.4MHz QPSK LOW Ch RB1-0

LTE5 1.4MHz QPSK LOW Ch RB1-5

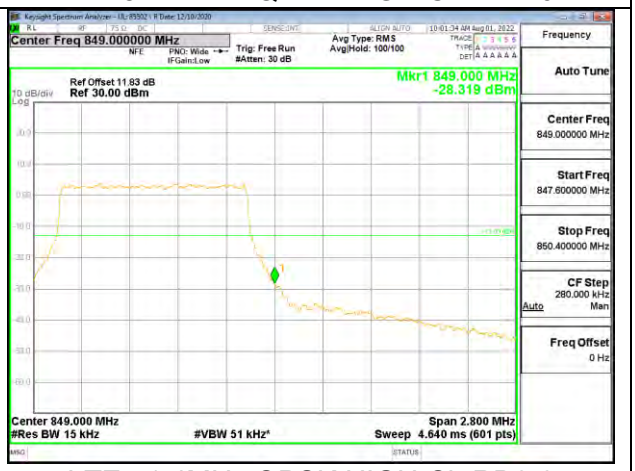
LTE5 1.4MHz QPSK LOW Ch RB6-0



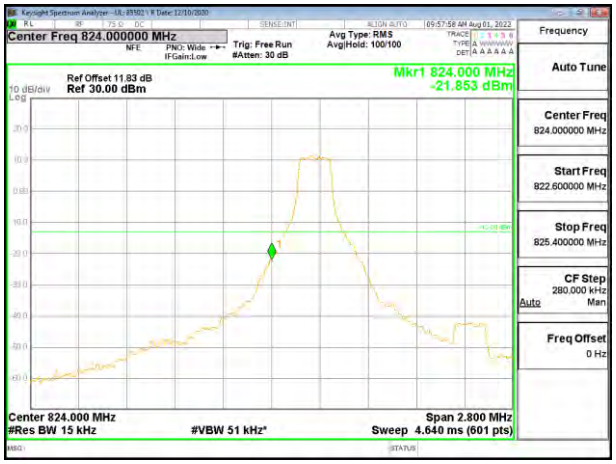
LTE5 1.4MHz QPSK HIGH Ch RB1-0



LTE5 1.4MHz QPSK HIGH Ch RB1-5

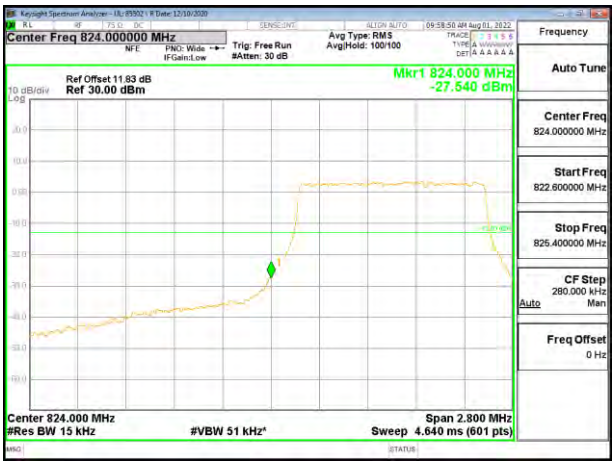


LTE5 1.4MHz QPSK HIGH Ch RB6-0

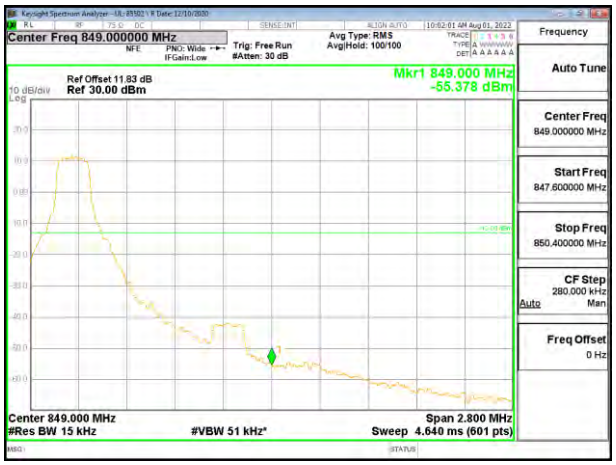


LTE5 1.4MHz 16QAM LOW Ch RB1-0

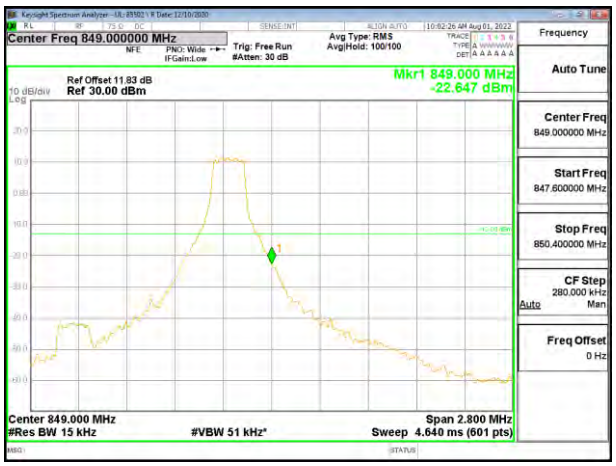
LTE5 1.4MHz 16QAM LOW Ch RB1-5



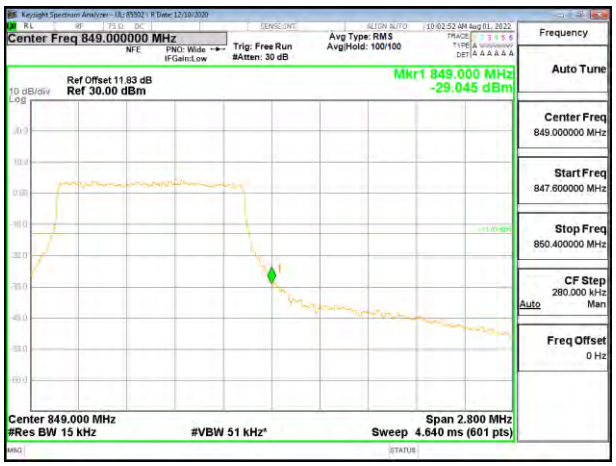
LTE5 1.4MHz 16QAM LOW Ch RB6-0



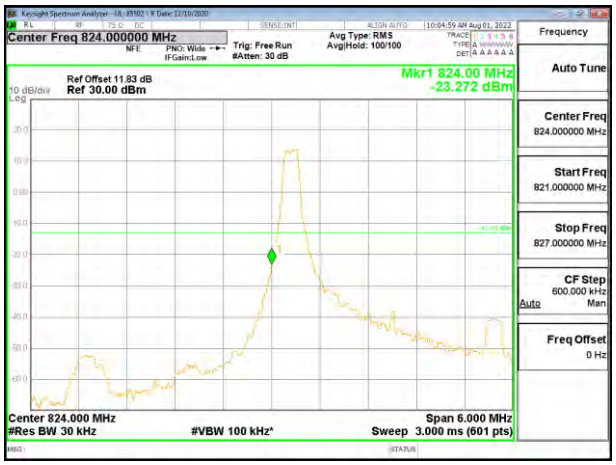
LTE5 1.4MHz 16QAM HIGH Ch RB1-0



LTE5 1.4MHz 16QAM HIGH Ch RB1-5

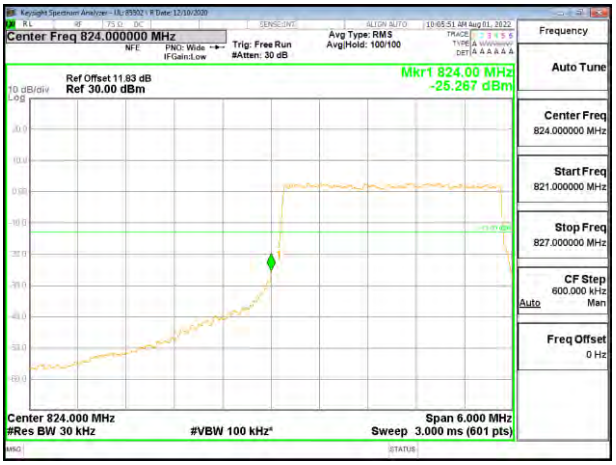


LTE5 1.4MHz 16QAM HIGH Ch RB6-0

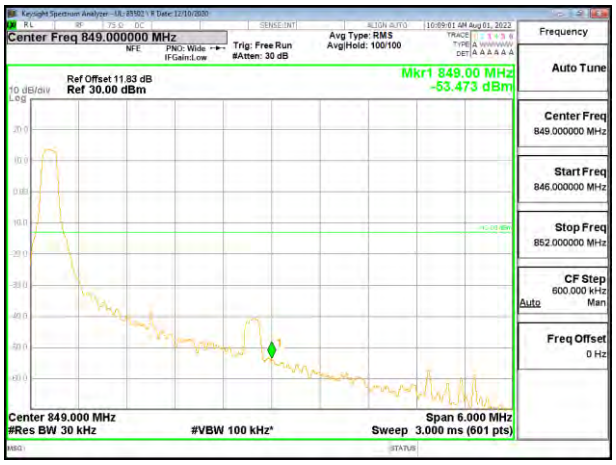


LTE5 3MHz QPSK LOW Ch RB1-0

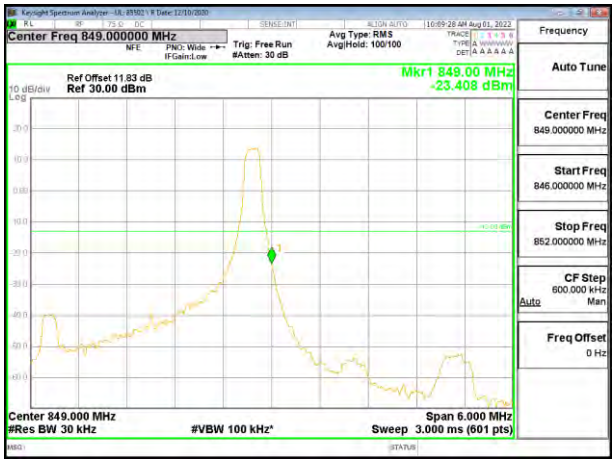
LTE5 3MHz QPSK LOW Ch RB1-14



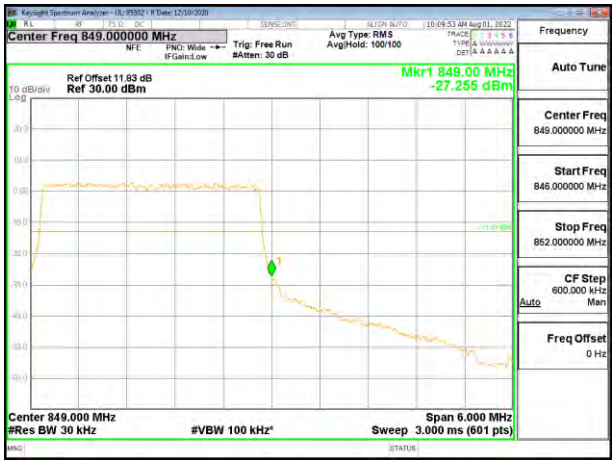
LTE5 3MHz QPSK LOW Ch RB15-0



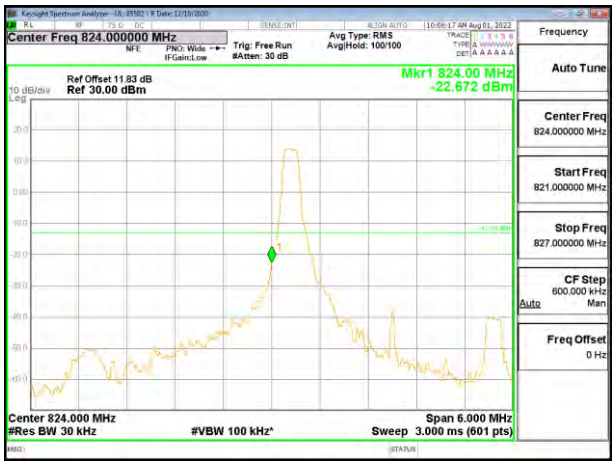
LTE5 3MHz QPSK HIGH Ch RB1-0



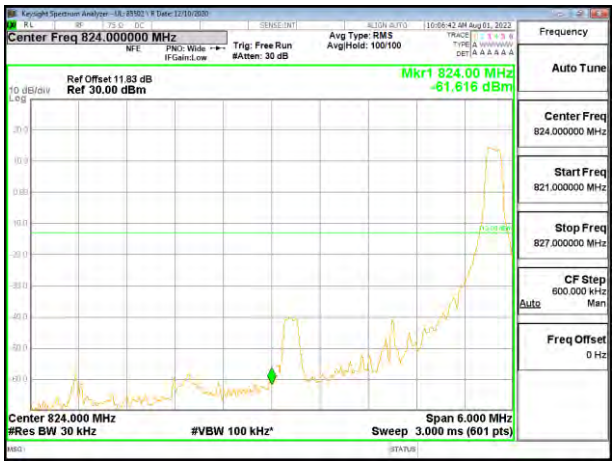
LTE5 3MHz QPSK HIGH Ch RB1-14



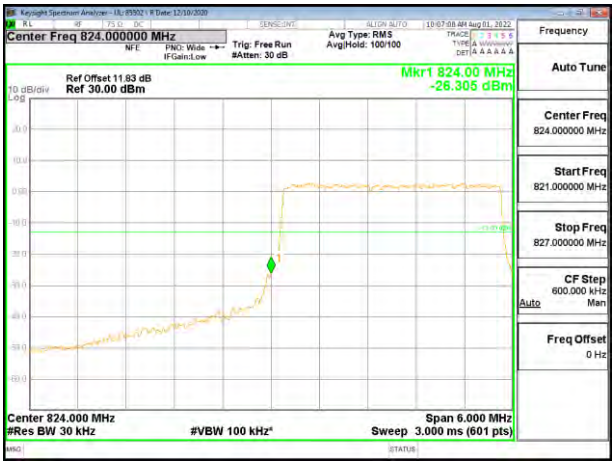
LTE5 3MHz QPSK HIGH Ch RB15-0



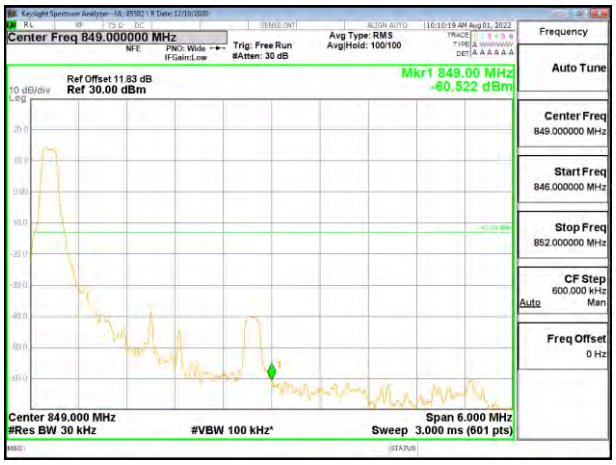
LTE5 3MHz 16QAM LOW Ch RB1-0



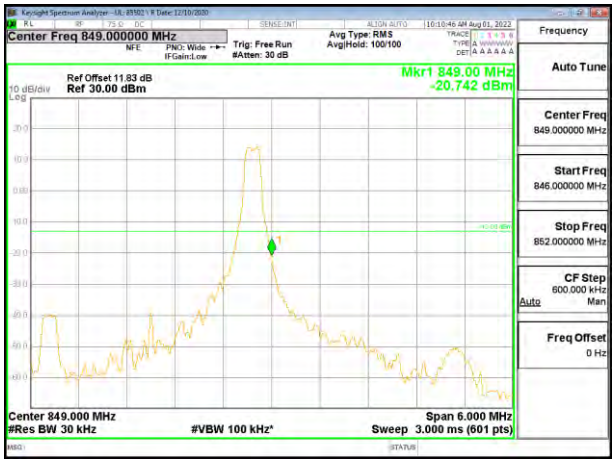
LTE5 3MHz 16QAM LOW Ch RB1-14



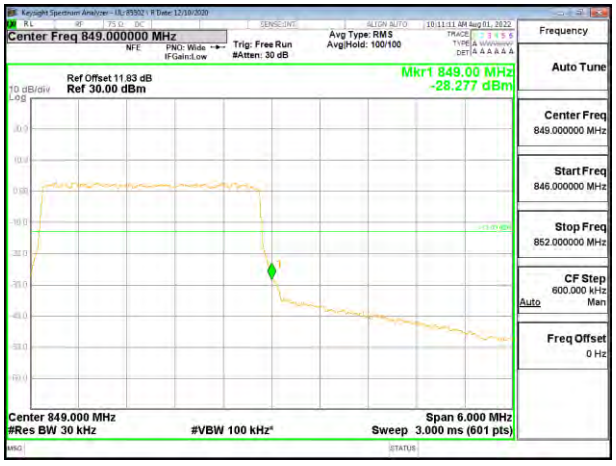
LTE5 3MHz 16QAM LOW Ch RB15-0



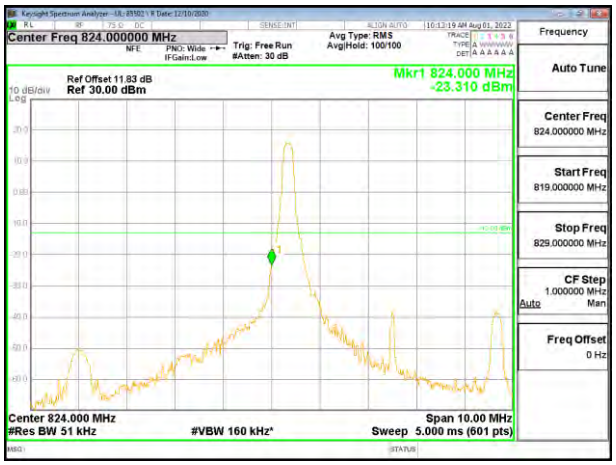
LTE5 3MHz 16QAM HIGH Ch RB1-0



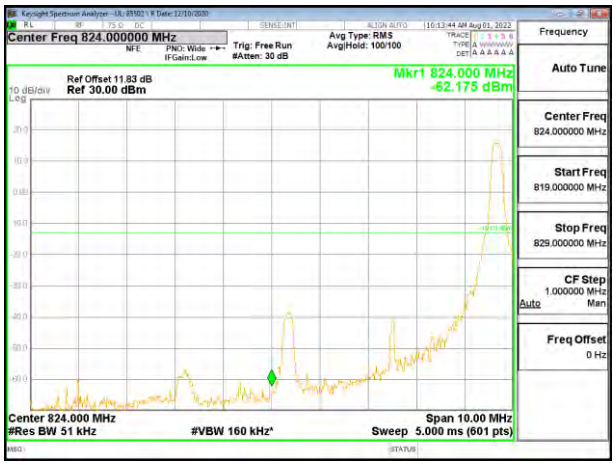
LTE5 3MHz 16QAM HIGH Ch RB1-14



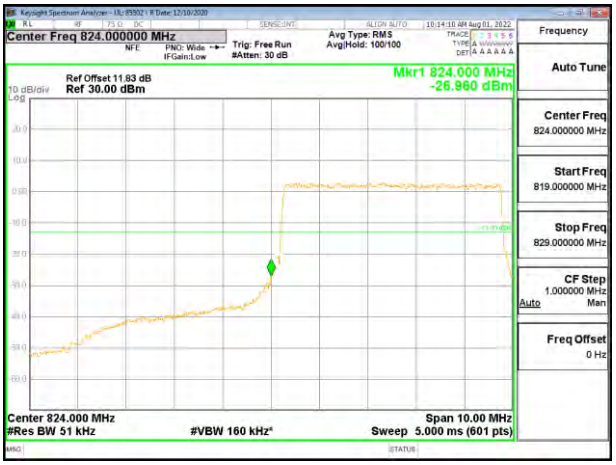
LTE5 3MHz 16QAM HIGH Ch RB15-0



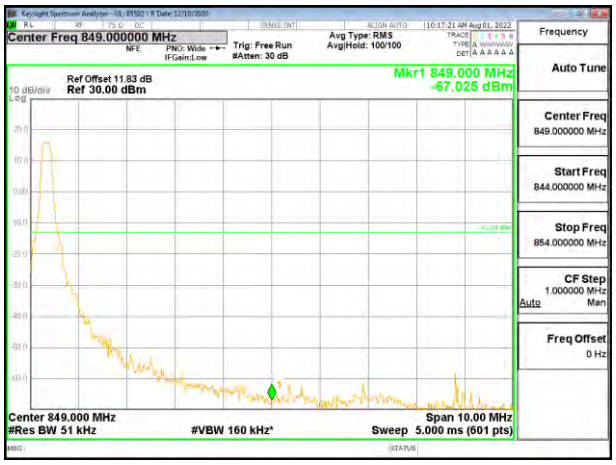
LTE5 5MHz QPSK LOW Ch RB1-0



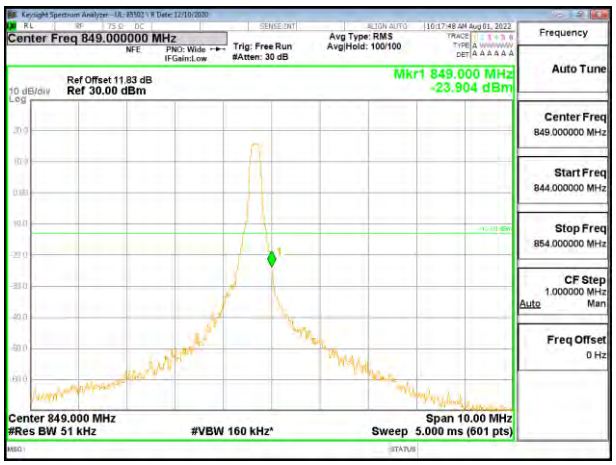
LTE5 5MHz QPSK LOW Ch RB1-24



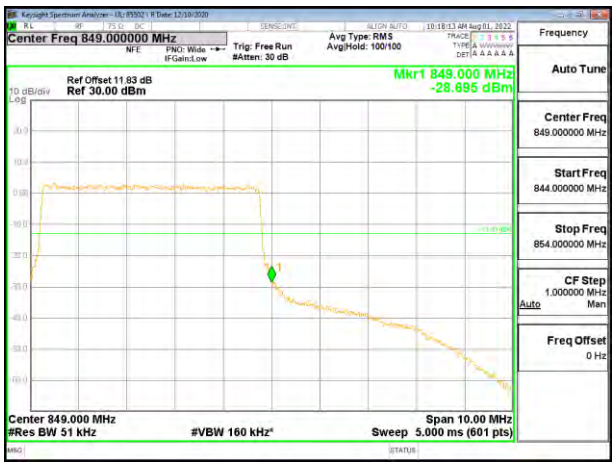
LTE5 5MHz QPSK LOW Ch RB25-0



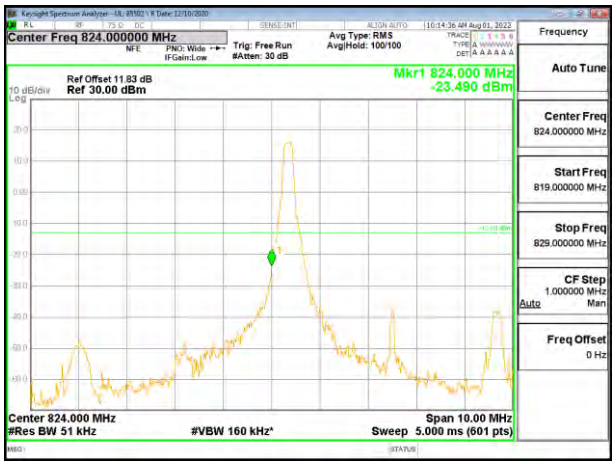
LTE5 5MHz QPSK HIGH Ch RB1-0



LTE5 5MHz QPSK HIGH Ch RB1-24

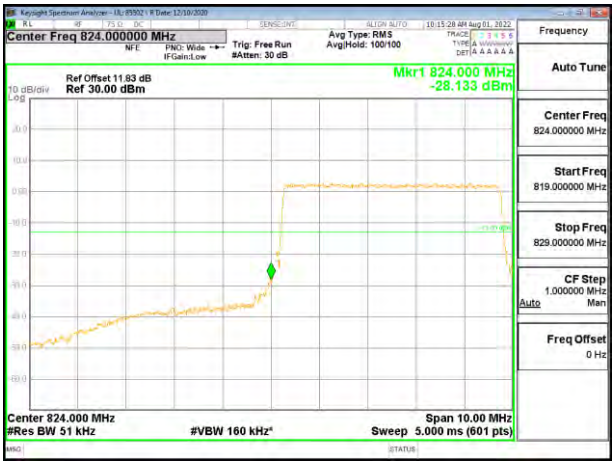


LTE5 5MHz QPSK HIGH Ch RB25-0

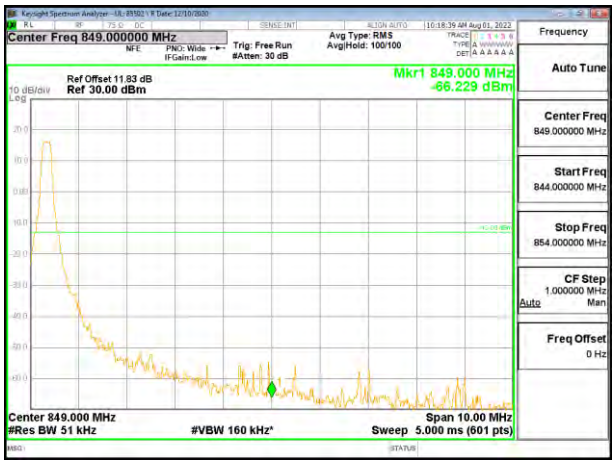


LTE5 5MHz 16QAM LOW Ch RB1-0

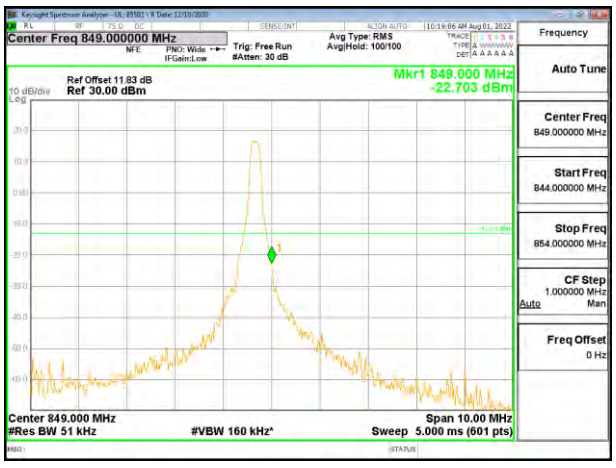
LTE5 5MHz 16QAM LOW Ch RB1-24



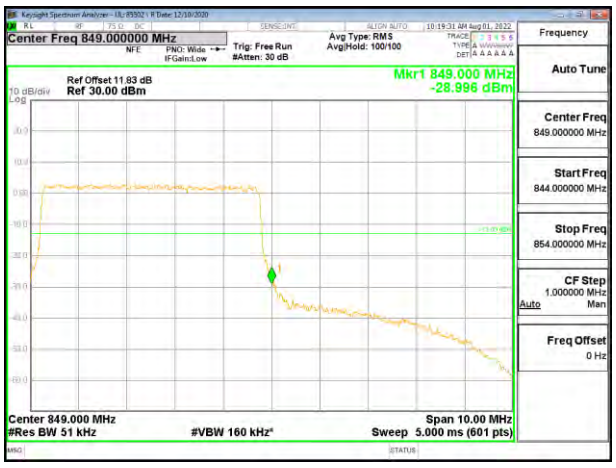
LTE5 5MHz 16QAM LOW Ch RB25-0



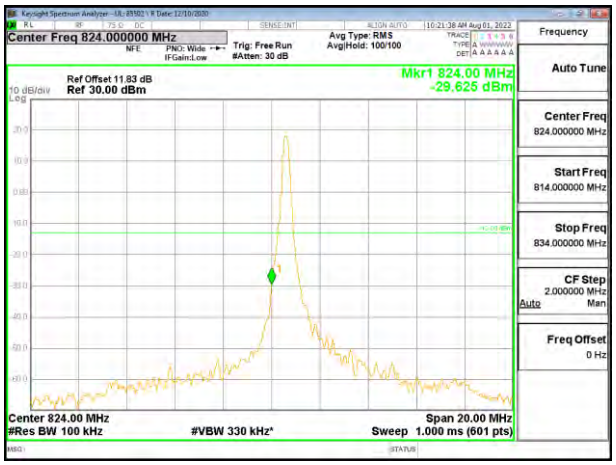
LTE5 5MHz 16QAM HIGH Ch RB1-0



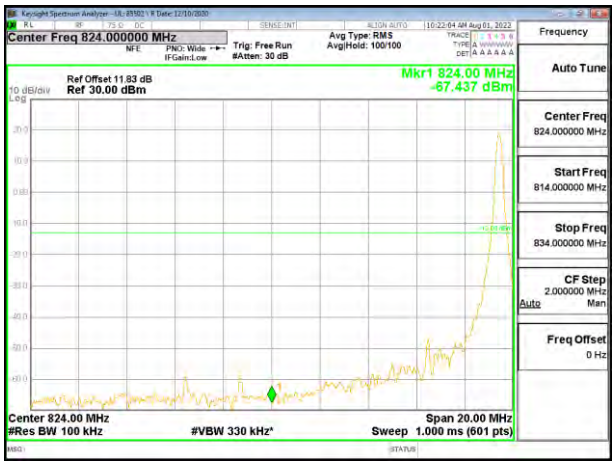
LTE5 5MHz 16QAM HIGH Ch RB1-24



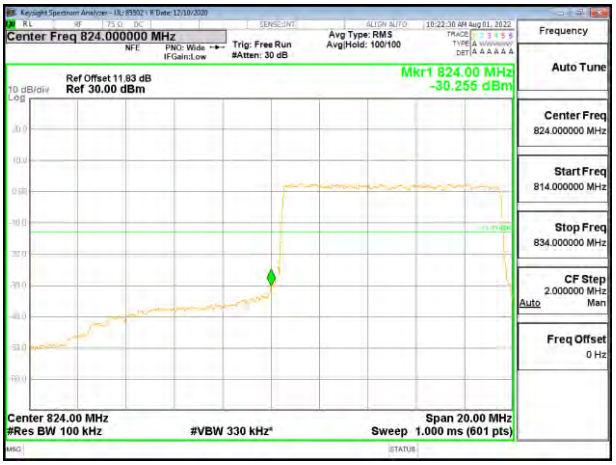
LTE5 5MHz 16QAM HIGH Ch RB25-0



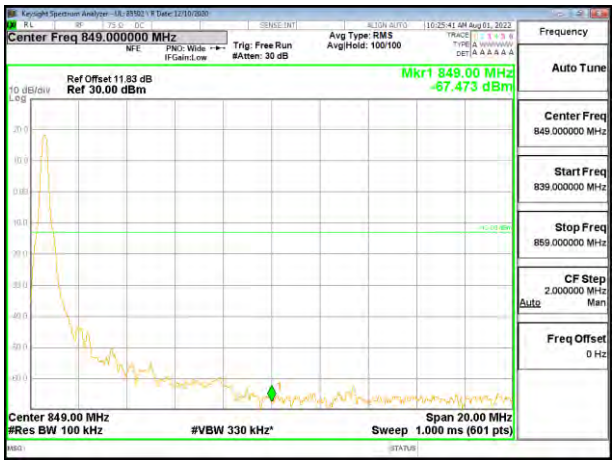
LTE5 10MHz QPSK LOW Ch RB1-0



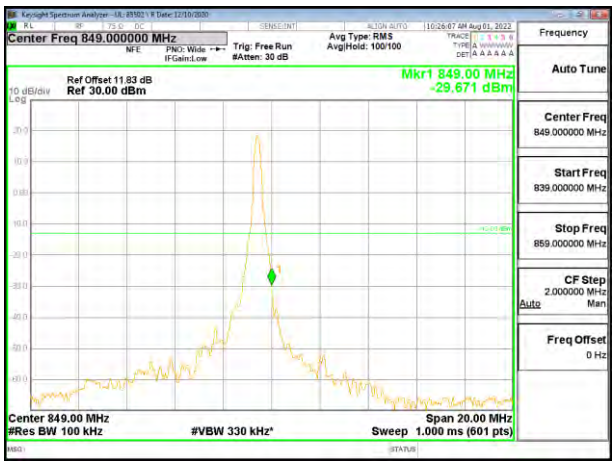
LTE5 10MHz QPSK LOW Ch RB1-49



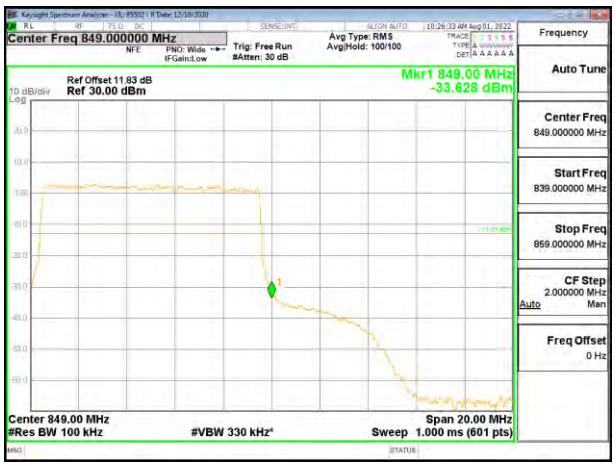
LTE5 10MHz QPSK LOW Ch RB50-0



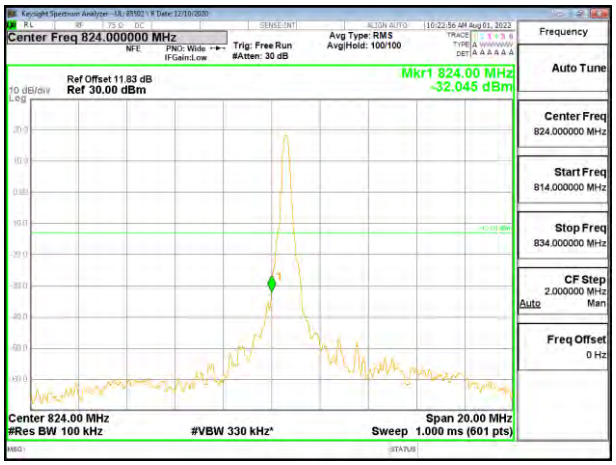
LTE5 10MHz QPSK HIGH Ch RB1-0



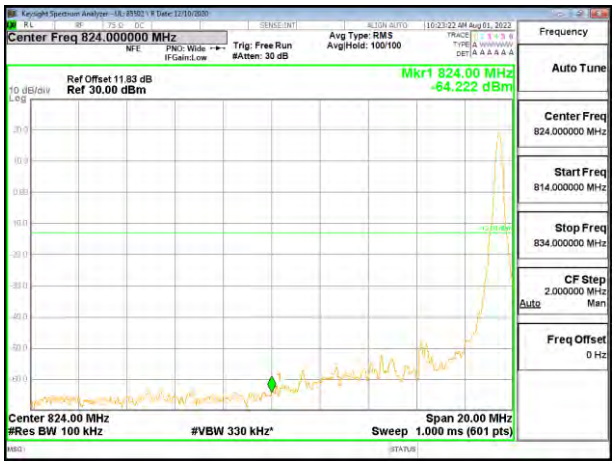
LTE5 10MHz QPSK HIGH Ch RB1-49



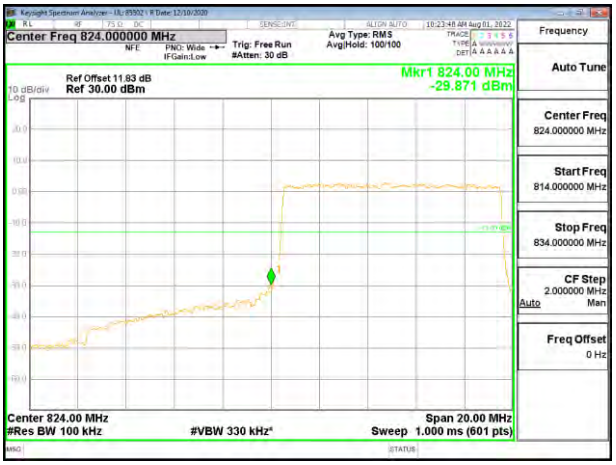
LTE5 10MHz QPSK HIGH Ch RB50-0



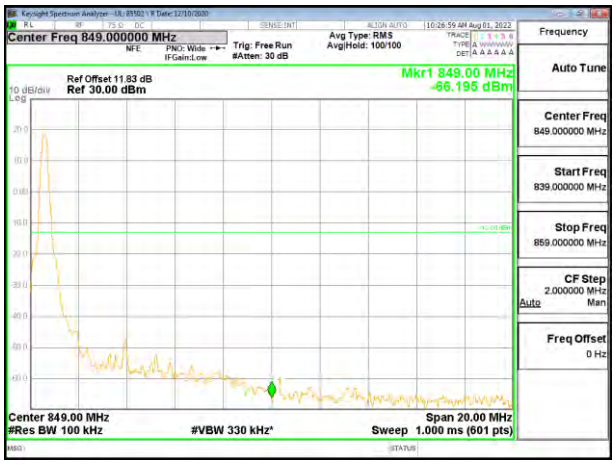
LTE5 10MHz 16QAM LOW Ch RB1-0



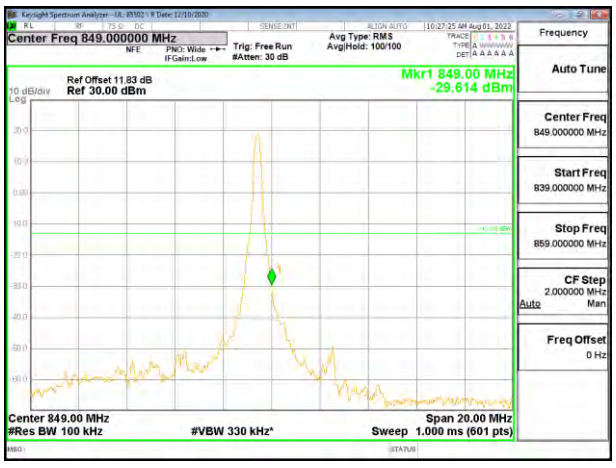
LTE5 10MHz 16QAM LOW Ch RB1-49



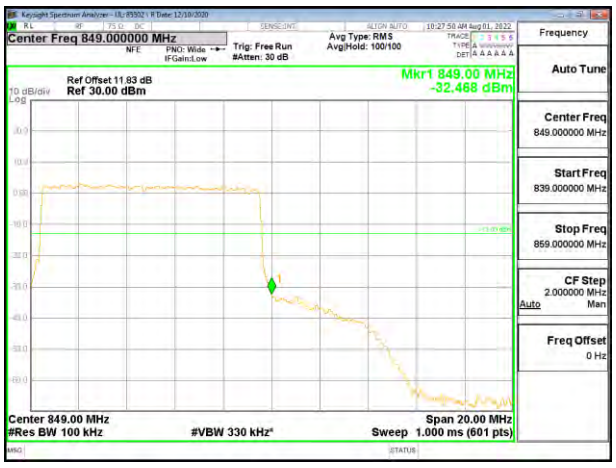
LTE5 10MHz 16QAM LOW Ch RB50-0



LTE5 10MHz 16QAM HIGH Ch RB1-0



LTE5 10MHz 16QAM HIGH Ch RB1-49



LTE5 10MHz 16QAM HIGH Ch RB50-0

10.2.3. LTE BAND 13

LIMITS

FCC: §27.53
(c)For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

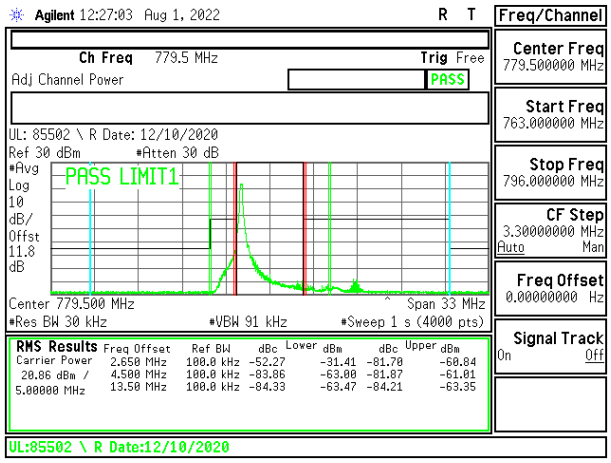
(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

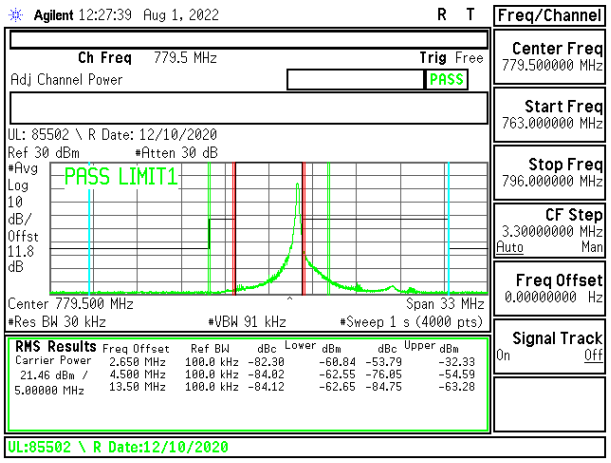
(5) Compliance with the provisions of paragraphs (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

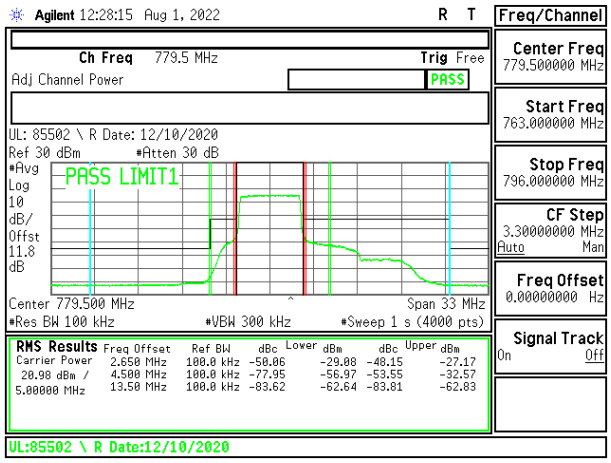
(f) Emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals. (-70 dBW/MHz = -40dBm/MHz).



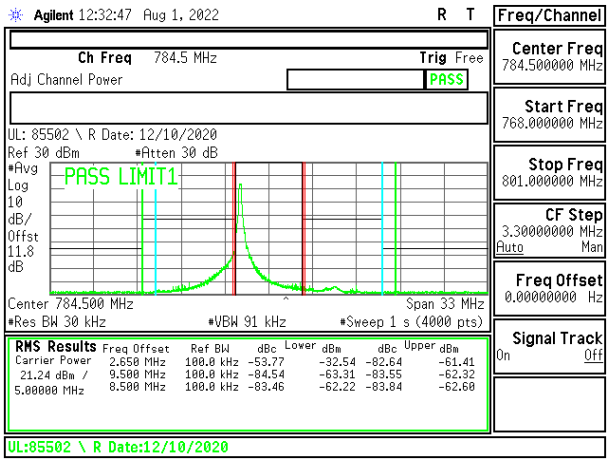
LTE13 5MHz QPSK LOW Ch RB1-0



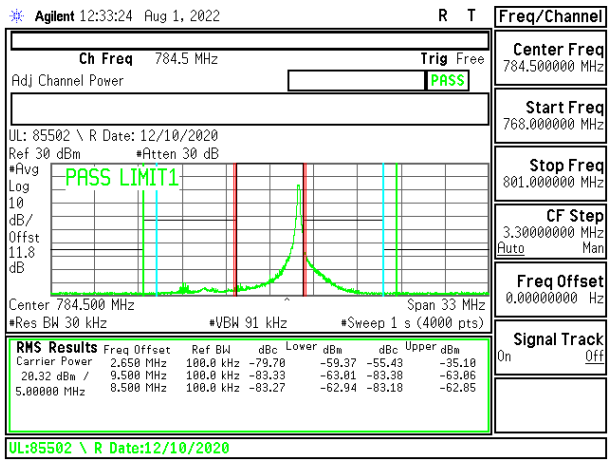
LTE13 5MHz QPSK LOW Ch RB1-24



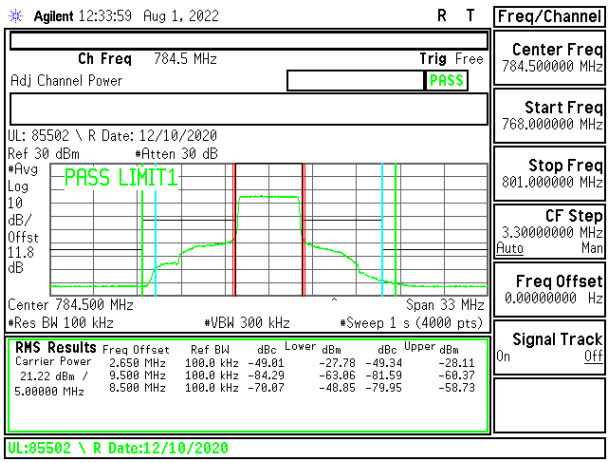
LTE13 5MHz QPSK LOW Ch RB25-0



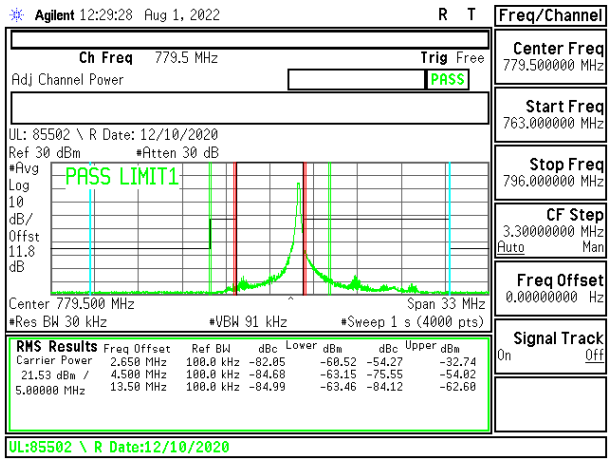
LTE13 5MHz QPSK HIGH Ch RB1-0



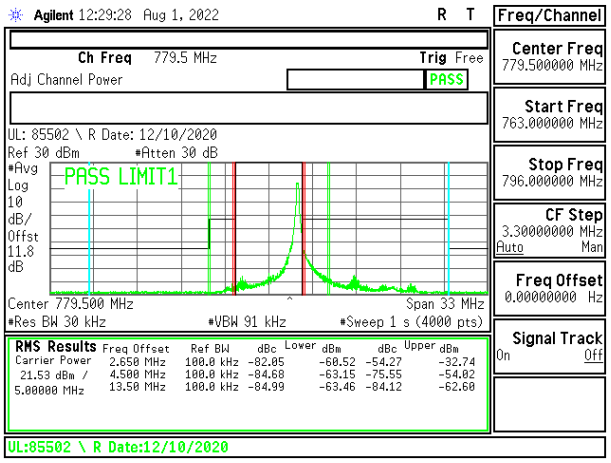
LTE13 5MHz QPSK HIGH Ch RB1-24



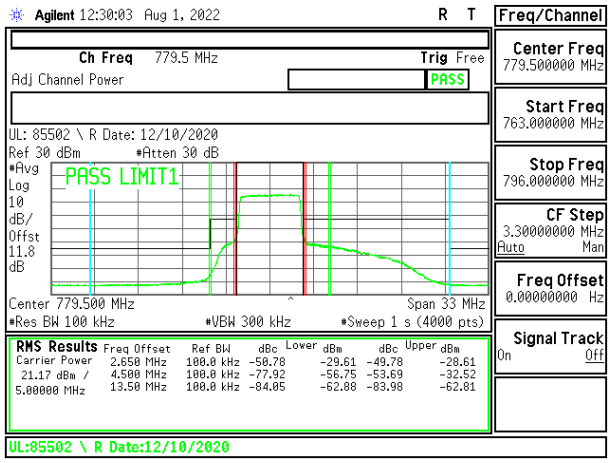
LTE13 5MHz QPSK HIGH Ch RB25-0



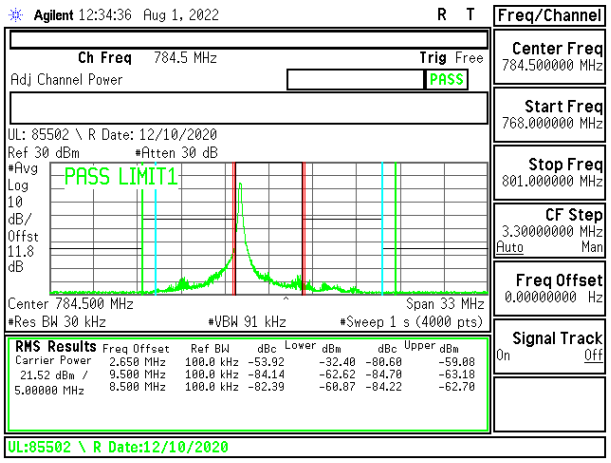
LTE13 5MHz 16QAM LOW Ch RB1-0



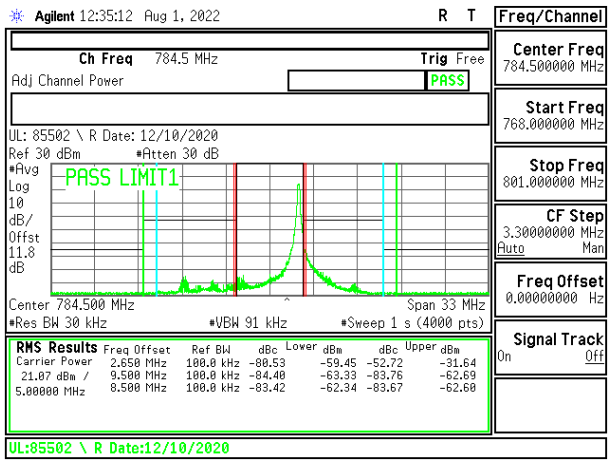
LTE13 5MHz 16QAM LOW Ch RB1-24



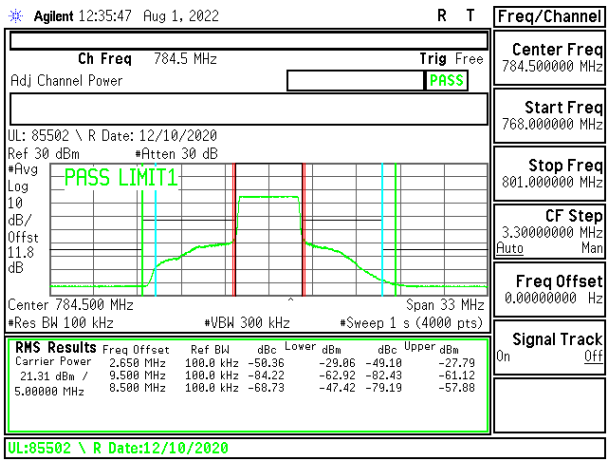
LTE13 5MHz 16QAM LOW Ch RB25-0



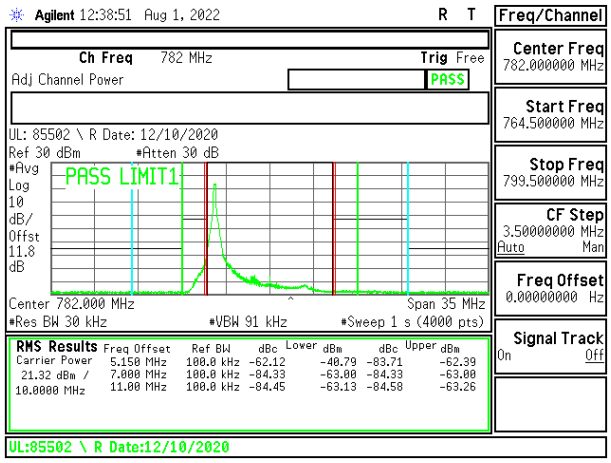
LTE13 5MHz 16QAM HIGH Ch RB1-0



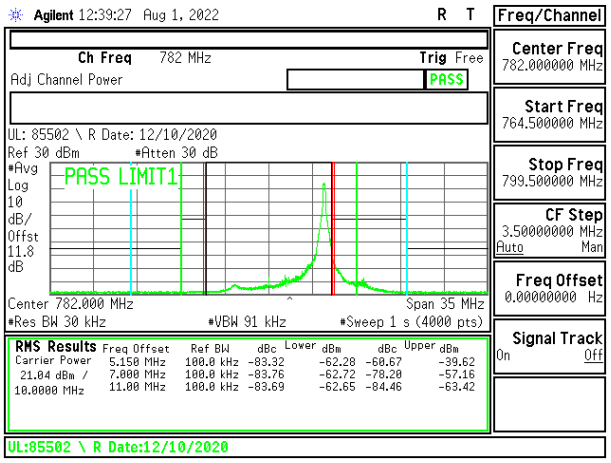
LTE13 5MHz 16QAM HIGH Ch RB1-24



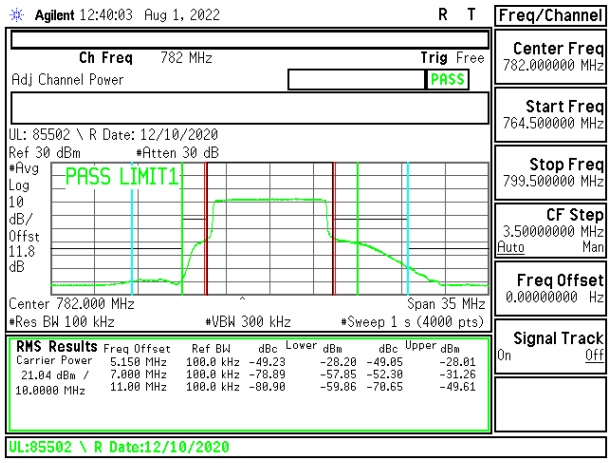
LTE13 5MHz 16QAM HIGH Ch RB25-0



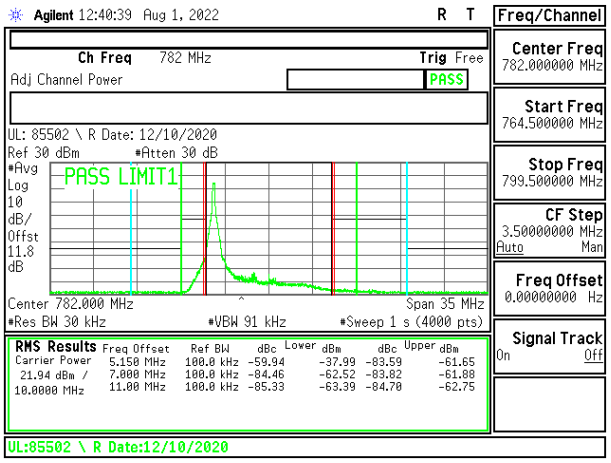
LTE13 10MHz QPSK MID Ch RB1-0



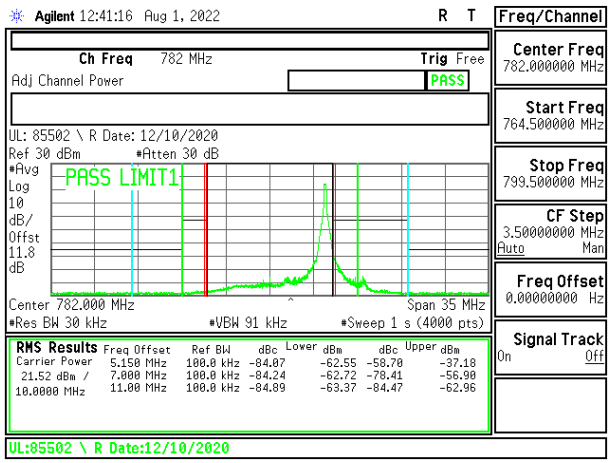
LTE13 10MHz QPSK MID Ch RB1-49



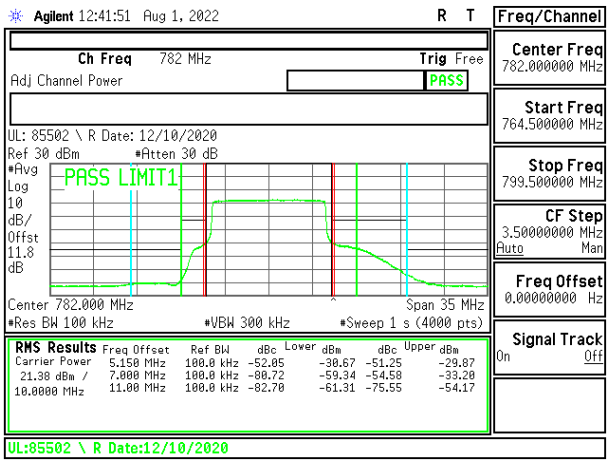
LTE13 10MHz QPSK MID Ch RB50-0



LTE13 10MHz 16QAM MID Ch RB1-0



LTE13 10MHz 16QAM MID Ch RB1-49

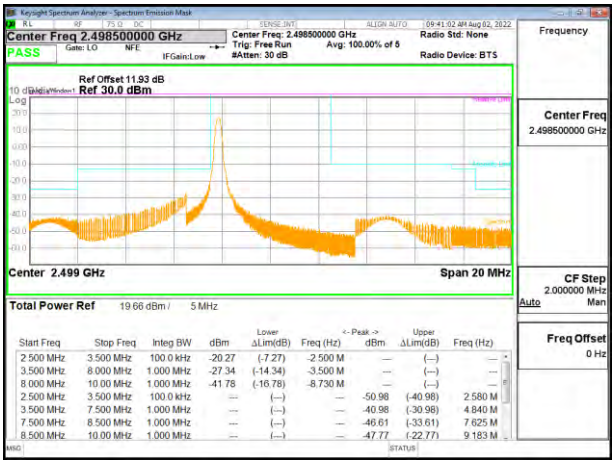


LTE13 10MHz 16QAM MID Ch RB50-0

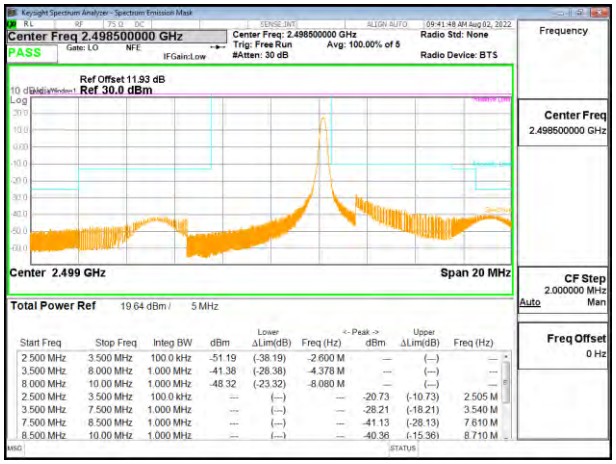
10.2.4. LTE BAND 41

LIMITS

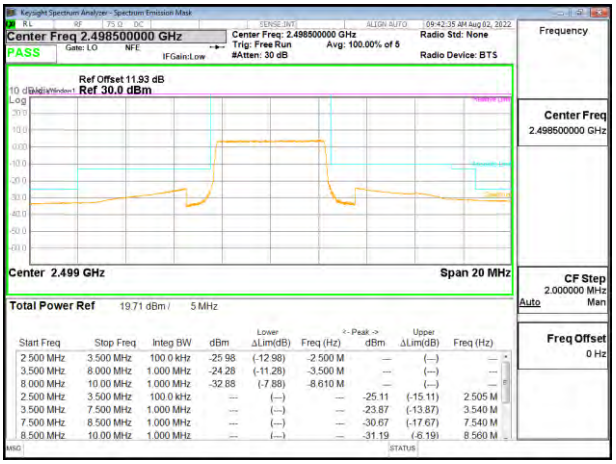
FCC: §27.53
(m)(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.



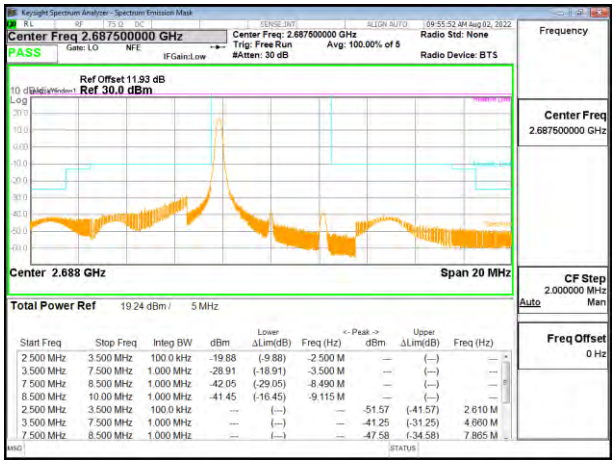
LTE41 5MHz QPSK LOW Ch RB1-0



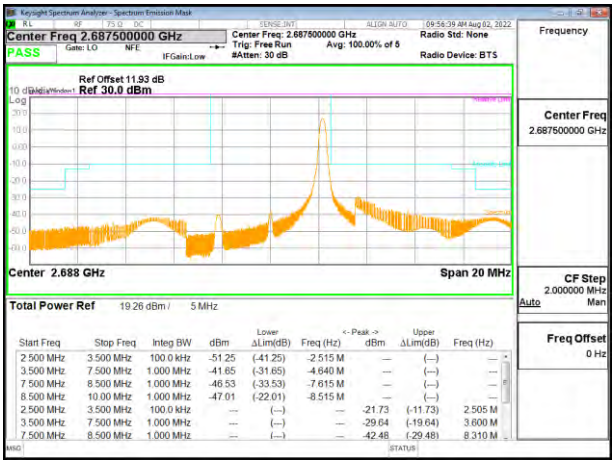
LTE41 5MHz QPSK LOW Ch RB1-24



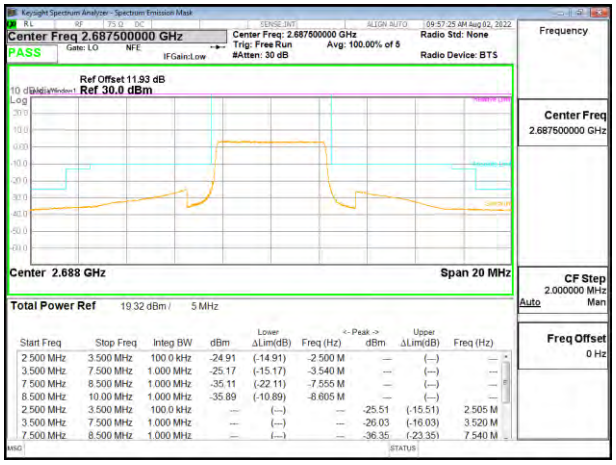
LTE41 5MHz QPSK LOW Ch RB25-0



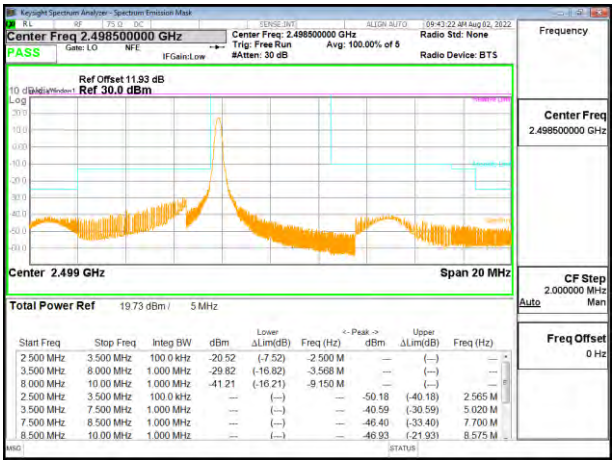
LTE41 5MHz QPSK HIGH Ch RB1-0



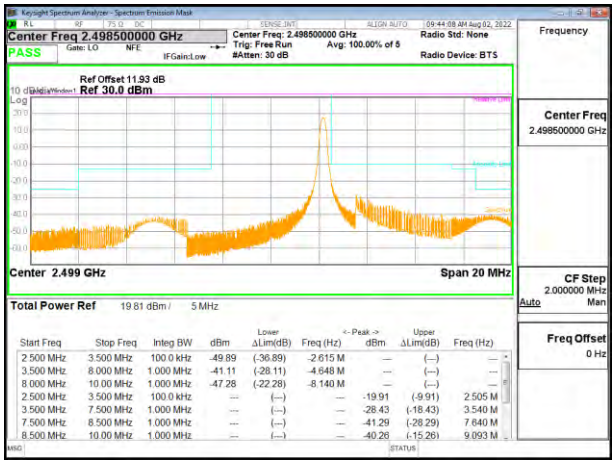
LTE41 5MHz QPSK HIGH Ch RB1-24



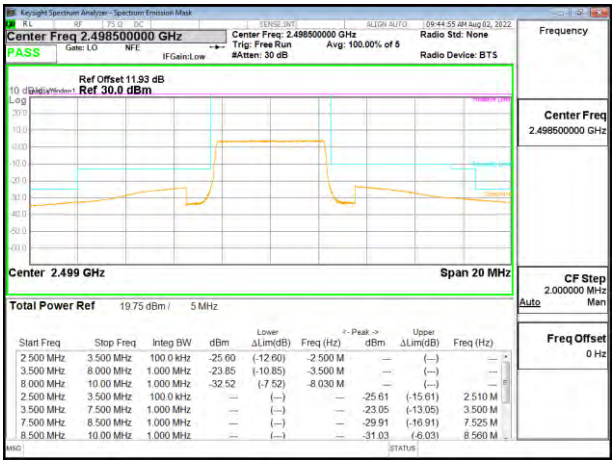
LTE41 5MHz QPSK HIGH Ch RB25-0



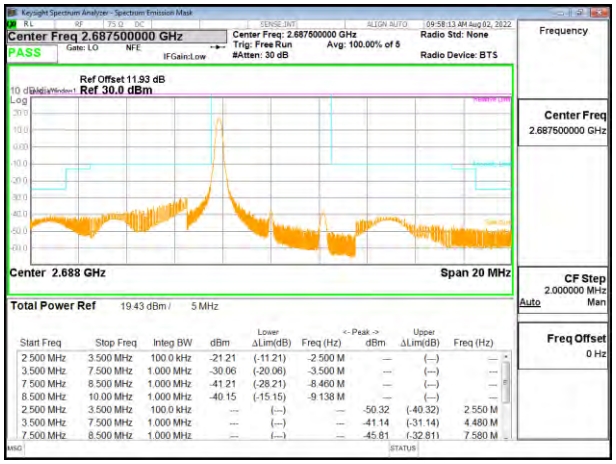
LTE41 5MHz 16QAM LOW Ch RB1-0



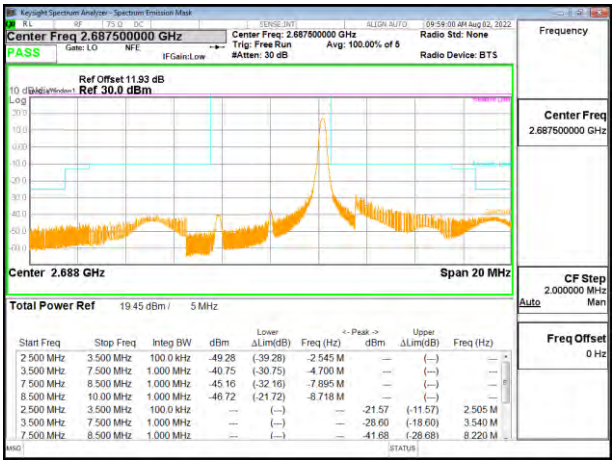
LTE41 5MHz 16QAM LOW Ch RB1-24



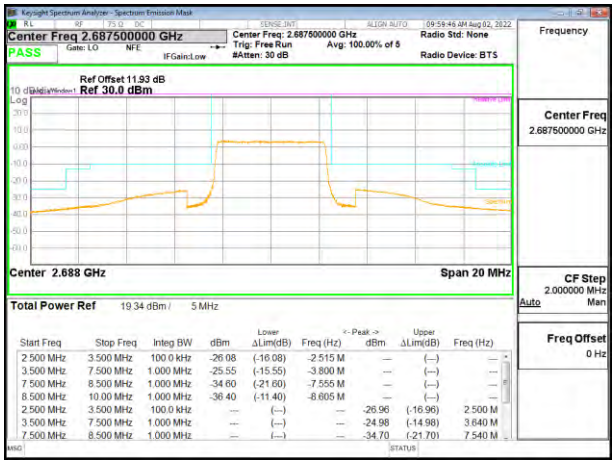
LTE41 5MHz 16QAM LOW Ch RB25-0



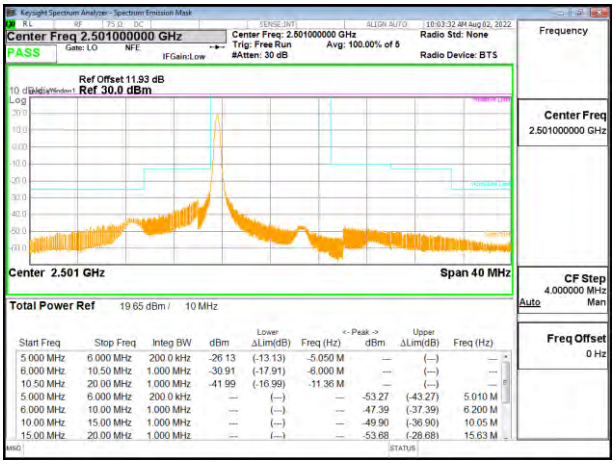
LTE41 5MHz 16QAM HIGH Ch RB1-0



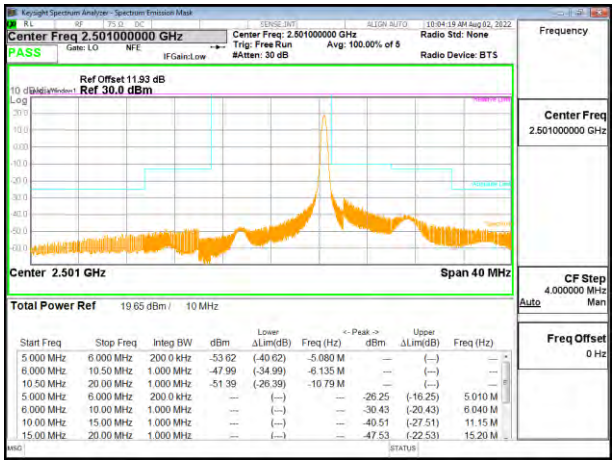
LTE41 5MHz 16QAM HIGH Ch RB1-24



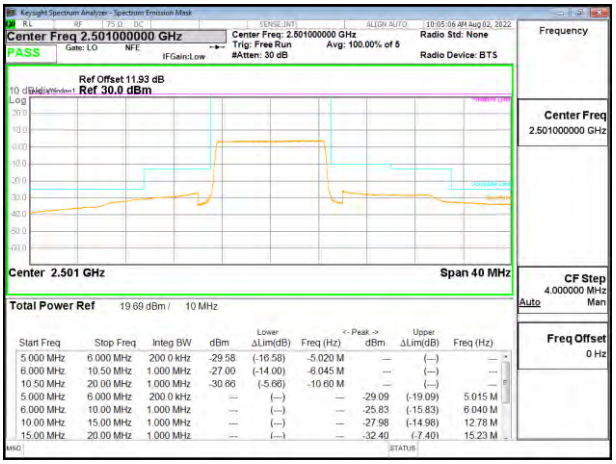
LTE41 5MHz 16QAM HIGH Ch RB25-0



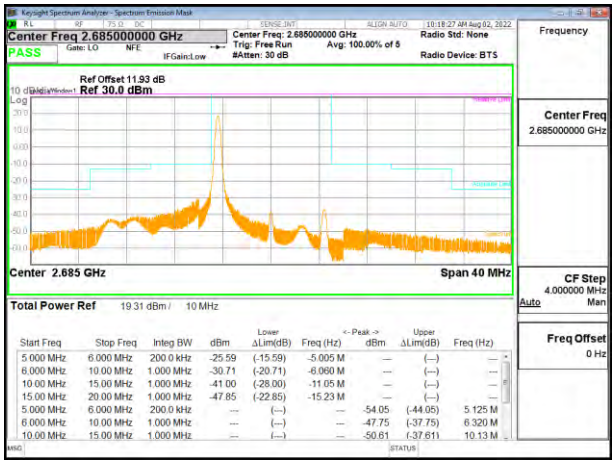
LTE41 10MHz QPSK LOW Ch RB1-0



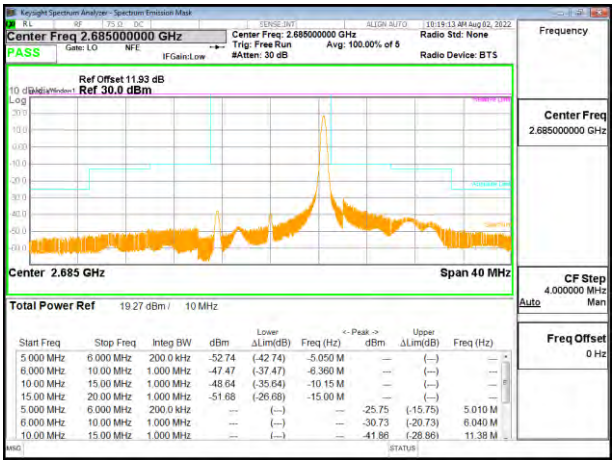
LTE41 10MHz QPSK LOW Ch RB1-49



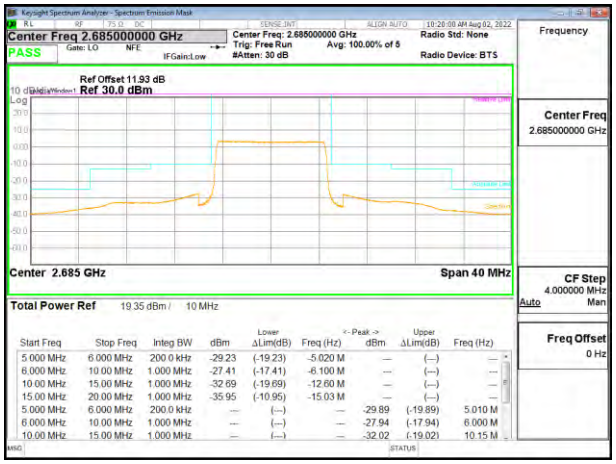
LTE41 10MHz QPSK LOW Ch RB50-0



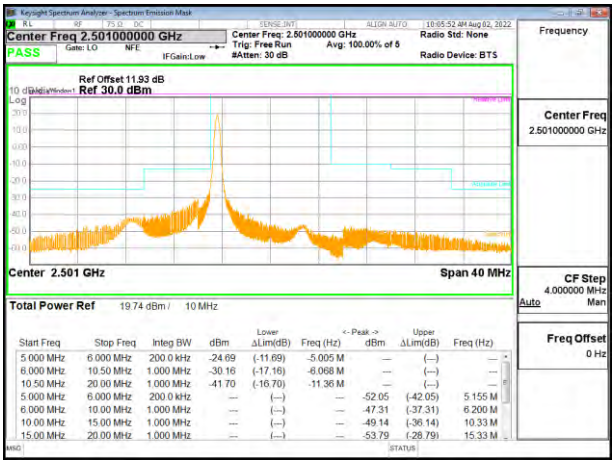
LTE41 10MHz QPSK HIGH Ch RB1-0



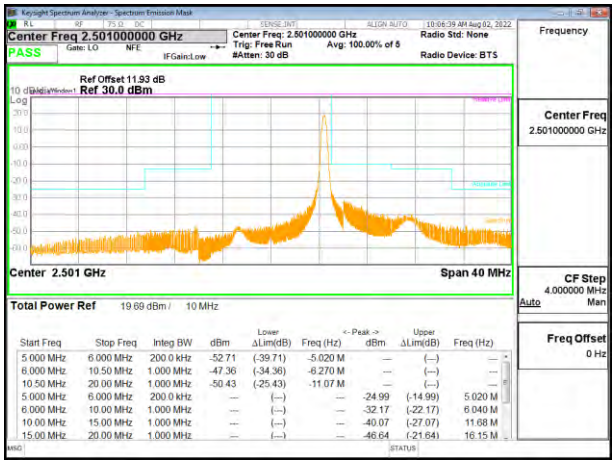
LTE41 10MHz QPSK HIGH Ch RB1-49



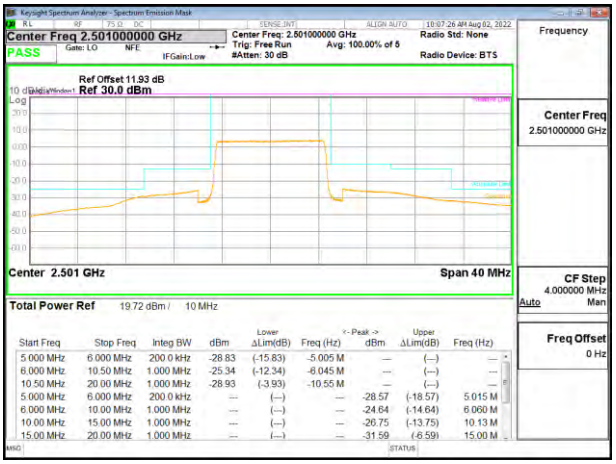
LTE41 10MHz QPSK HIGH Ch RB50-0



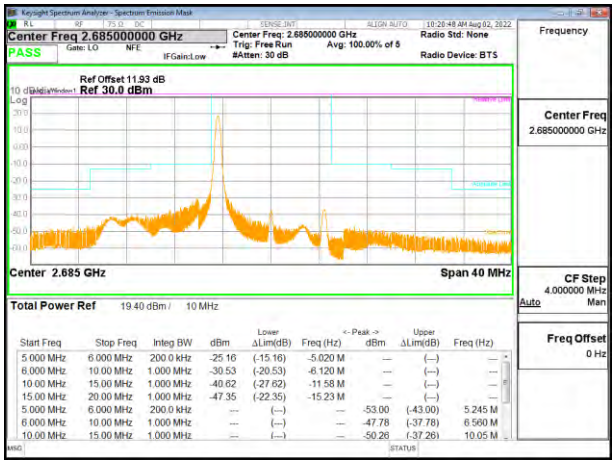
LTE41 10MHz 16QAM LOW Ch RB1-0



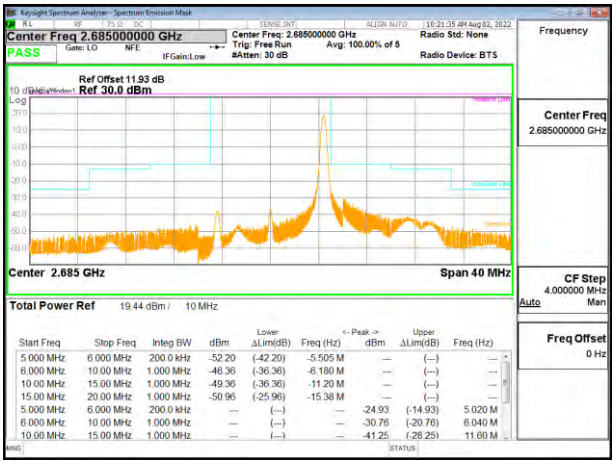
LTE41 10MHz 16QAM LOW Ch RB1-49



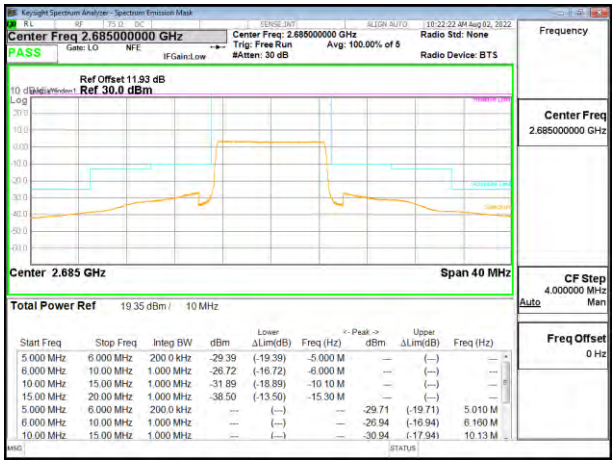
LTE41 10MHz 16QAM LOW Ch RB50-0



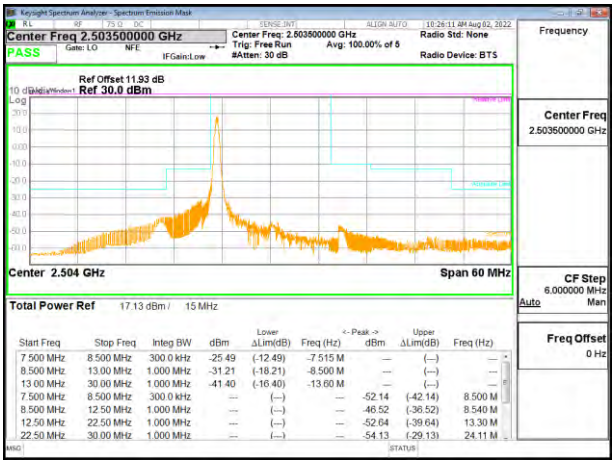
LTE41 10MHz 16QAM HIGH Ch RB1-0



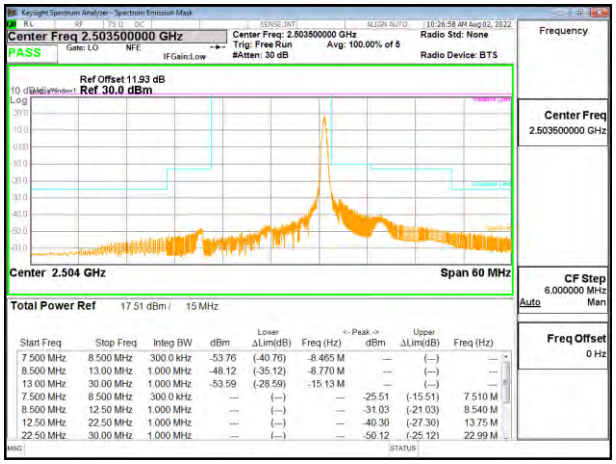
LTE41 10MHz 16QAM HIGH Ch RB1-49



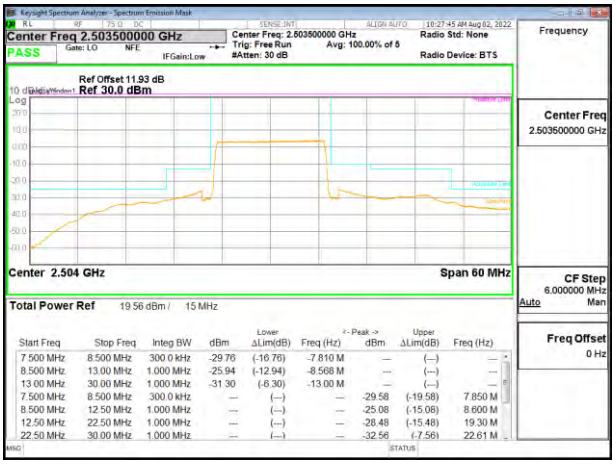
LTE41 10MHz 16QAM HIGH Ch RB50-0



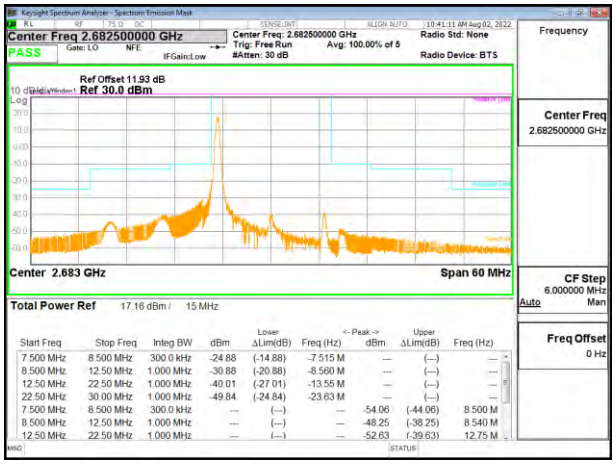
LTE41 15MHz QPSK LOW Ch RB1-0



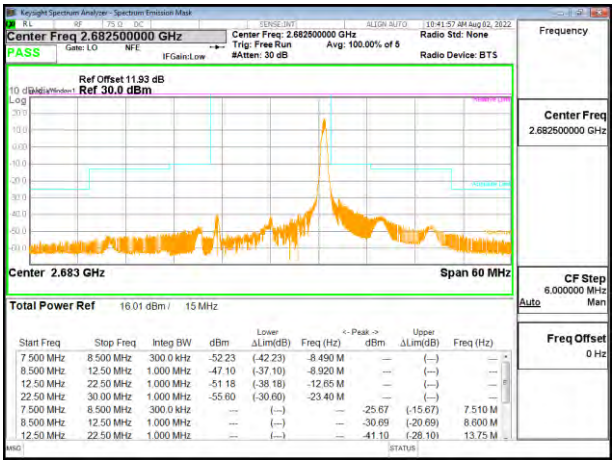
LTE41 15MHz QPSK LOW Ch RB1-74



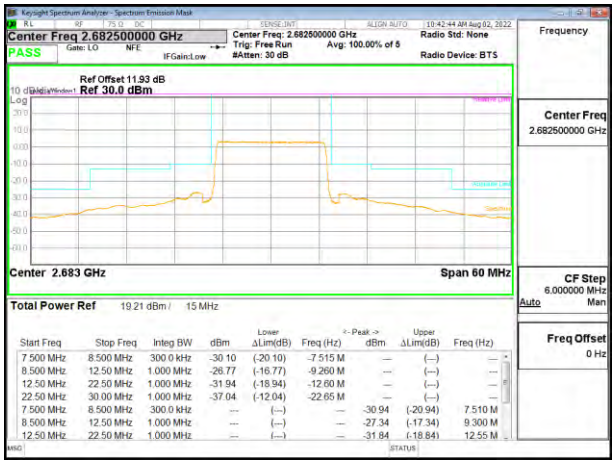
LTE41 15MHz QPSK LOW Ch RB75-0



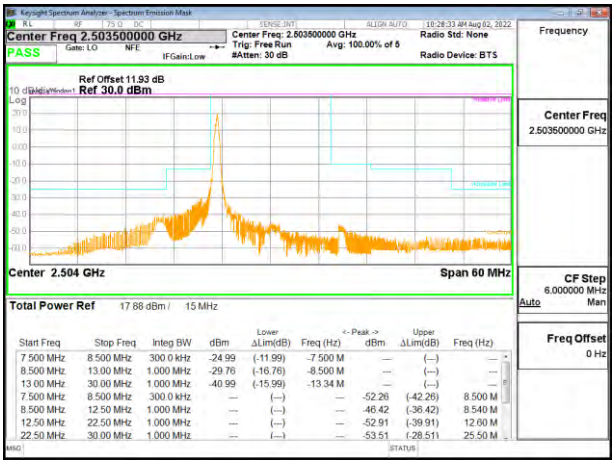
LTE41 15MHz QPSK HIGH Ch RB1-0



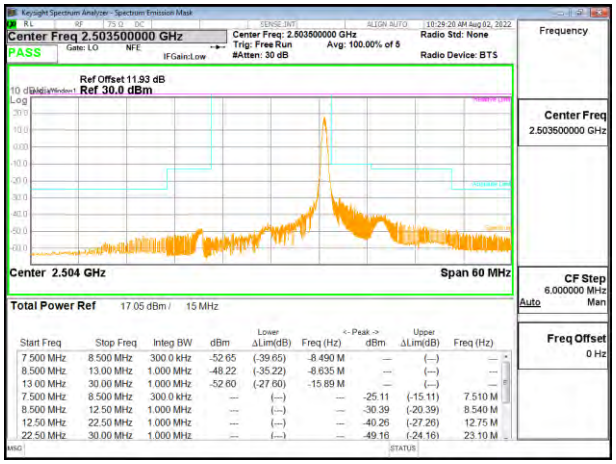
LTE41 15MHz QPSK HIGH Ch RB1-74



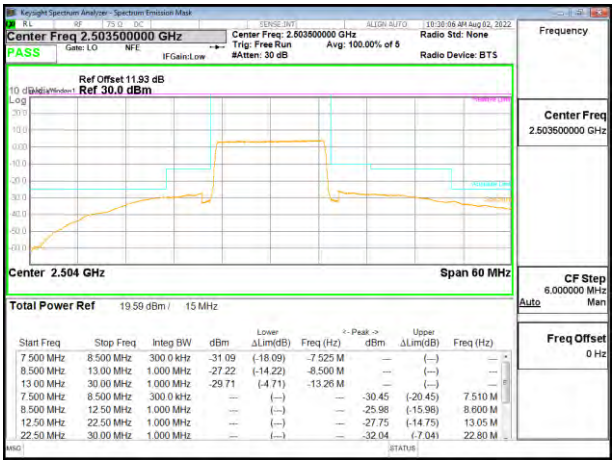
LTE41 15MHz QPSK HIGH Ch RB75-0



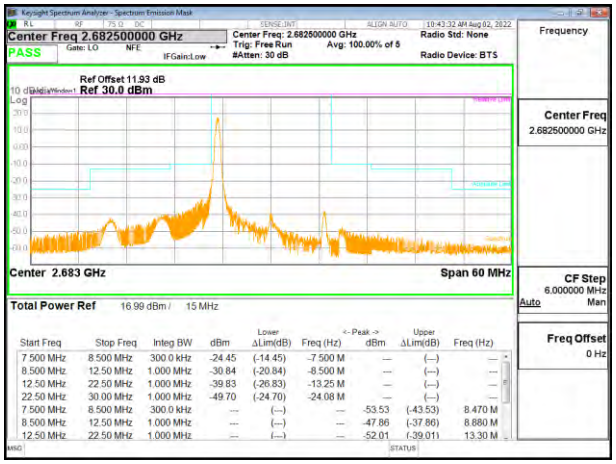
LTE41 15MHz 16QAM LOW Ch RB1-0



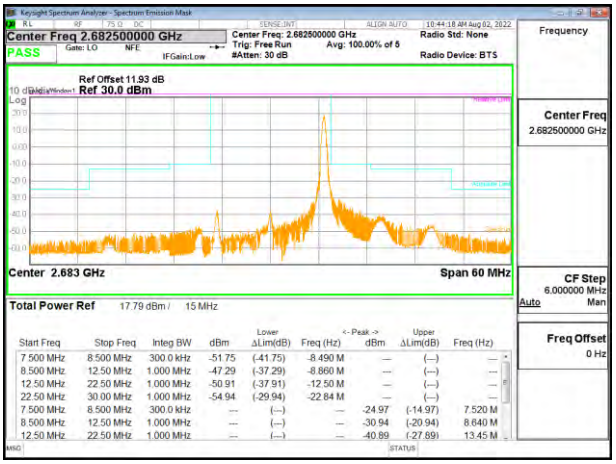
LTE41 15MHz 16QAM LOW Ch RB1-74



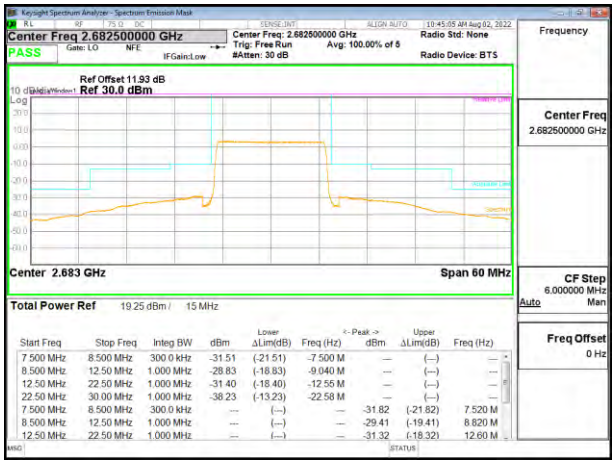
LTE41 15MHz 16QAM LOW Ch RB75-0



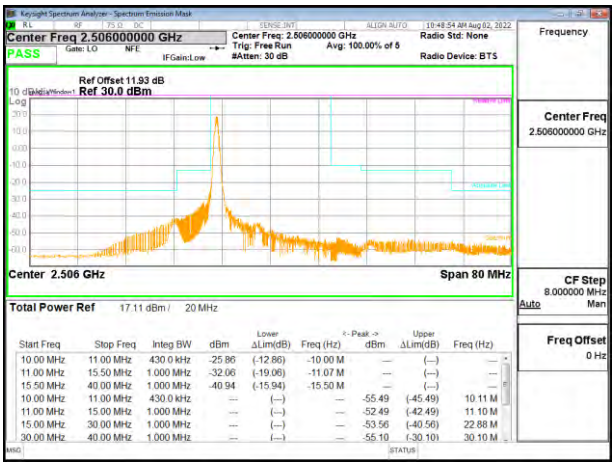
LTE41 15MHz 16QAM HIGH Ch RB1-0



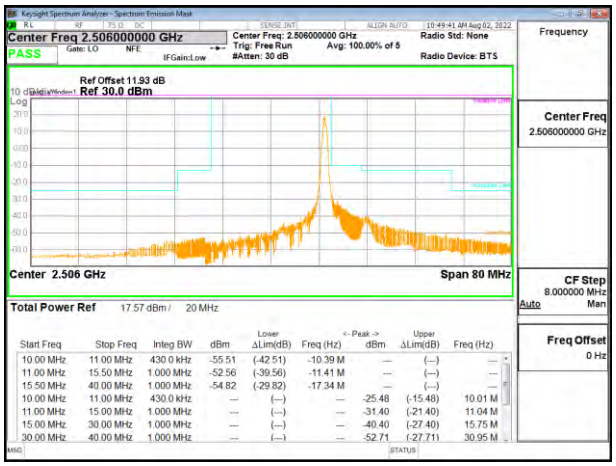
LTE41 15MHz 16QAM HIGH Ch RB1-74



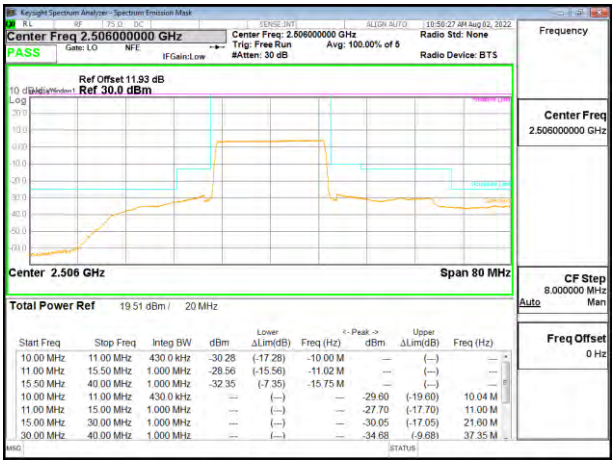
LTE41 15MHz 16QAM HIGH Ch RB75-0



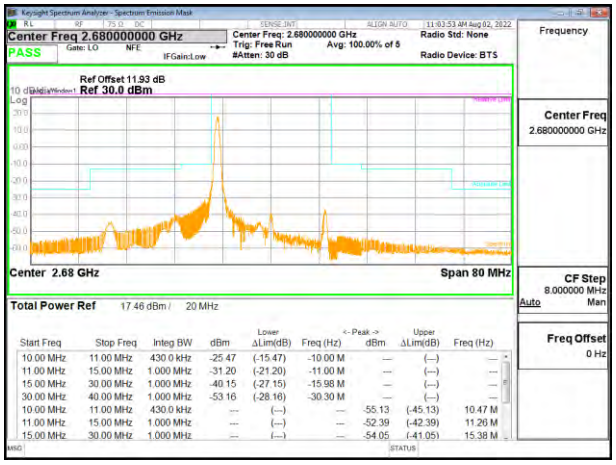
LTE41 20MHz QPSK LOW Ch RB1-0



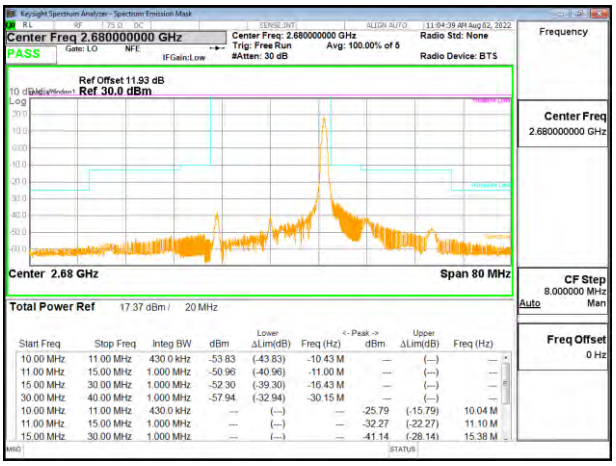
LTE41 20MHz QPSK LOW Ch RB1-99



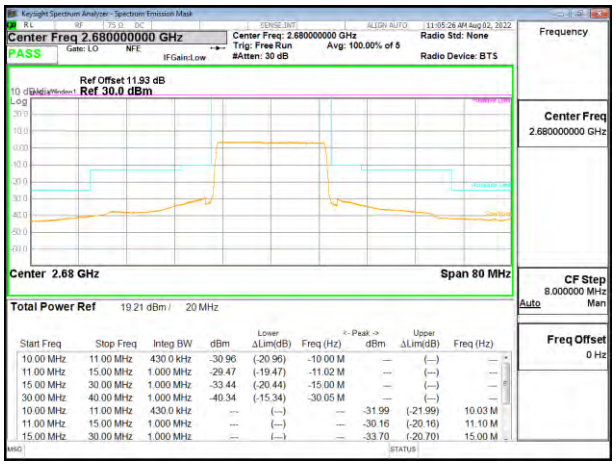
LTE41 20MHz QPSK LOW Ch RB100-0



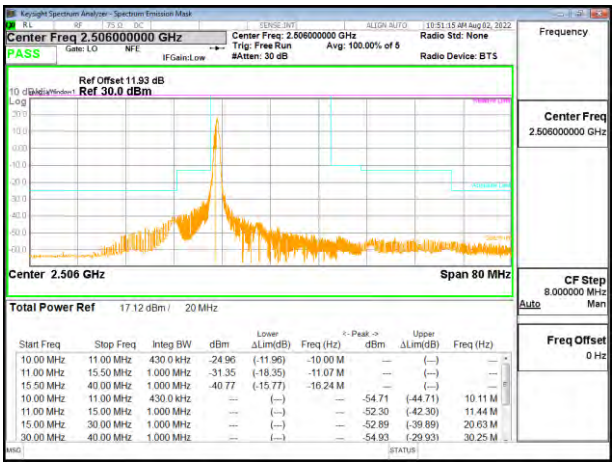
LTE41 20MHz QPSK HIGH Ch RB1-0



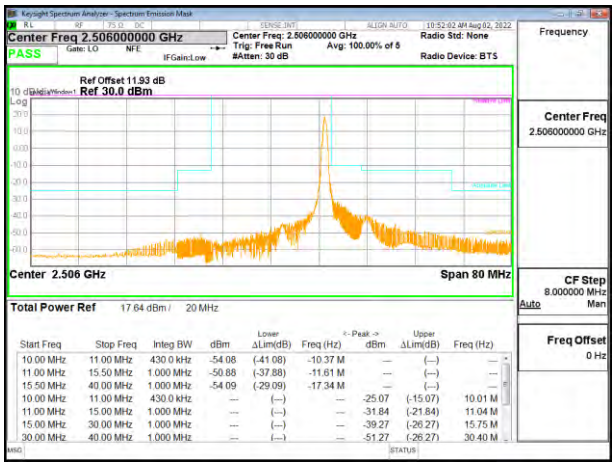
LTE41 20MHz QPSK HIGH Ch RB1-99



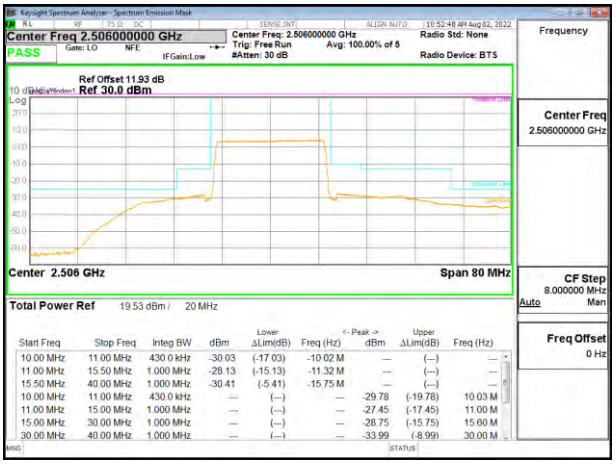
LTE41 20MHz QPSK HIGH Ch RB100-0



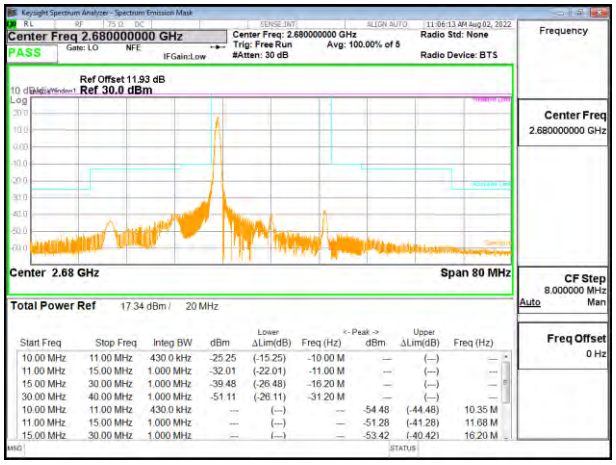
LTE41 20MHz 16QAM LOW Ch RB1-0



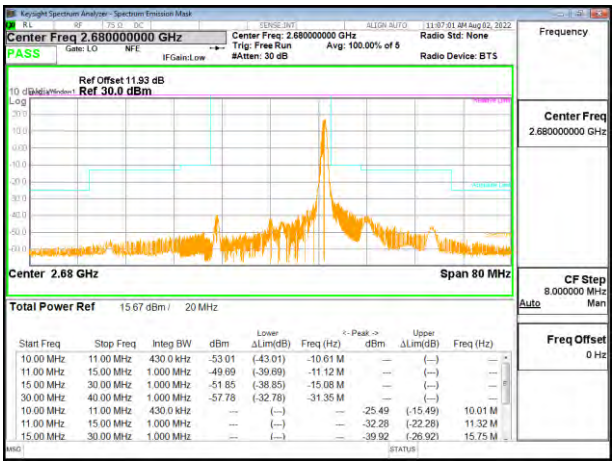
LTE41 20MHz 16QAM LOW Ch RB1-99



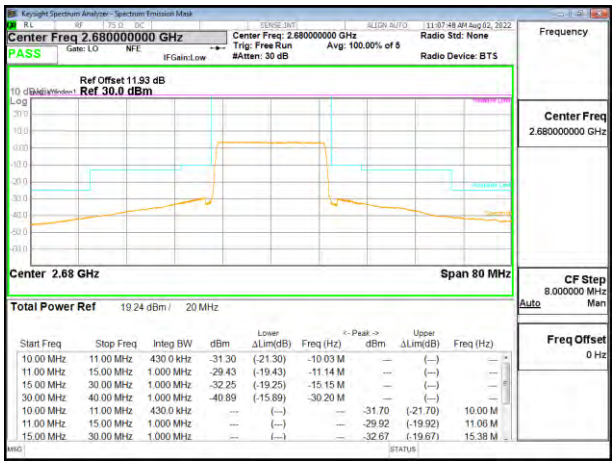
LTE41 20MHz 16QAM LOW Ch RB100-0



LTE41 20MHz 16QAM HIGH Ch RB1-0



LTE41 20MHz 16QAM HIGH Ch RB1-99



LTE41 20MHz 16QAM HIGH Ch RB100-0

10.3. OUT OF BAND EMISSIONS

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

(v) Set display line at -13 dBm, -25dBm and -40dBm according to the band Limit

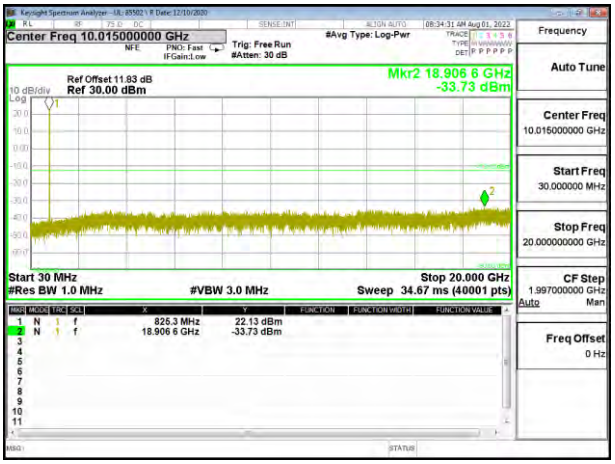
(vi) Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

RESULTS

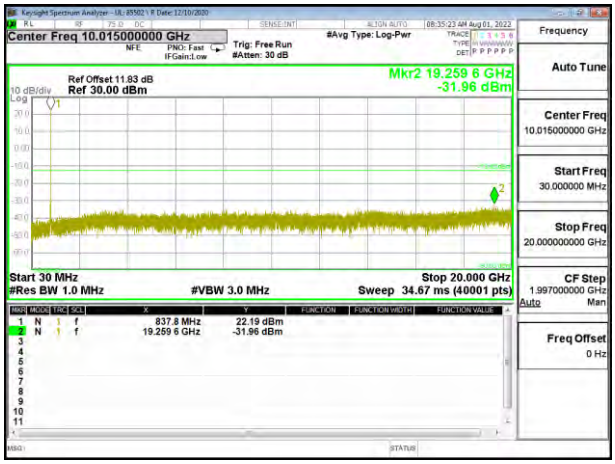
10.3.1. WCDMA BAND 5

LIMITS

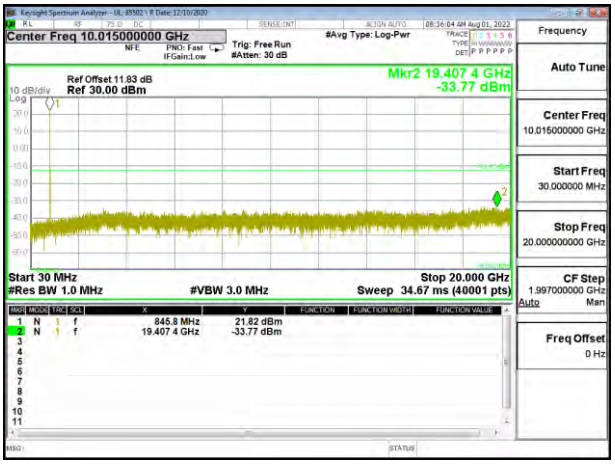
FCC: §22.917
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



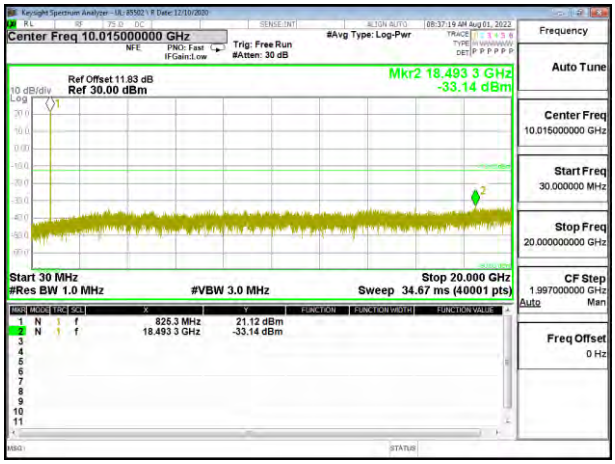
BAND 5 Rel 99 LOW Channel



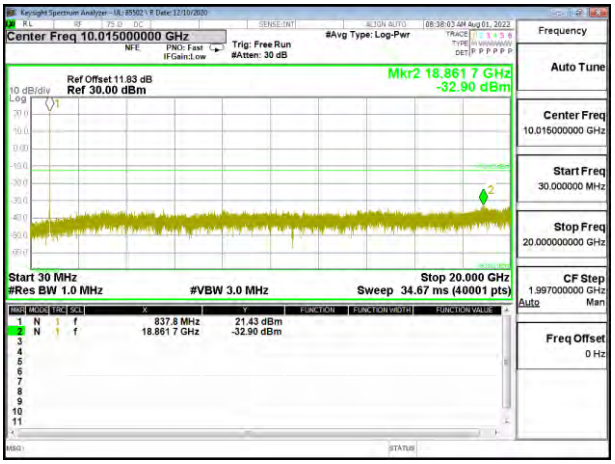
BAND 5 Rel 99 MID Channel



BAND 5 Rel 99 HIGH Channel



BAND 5 HSDPA LOW Channel



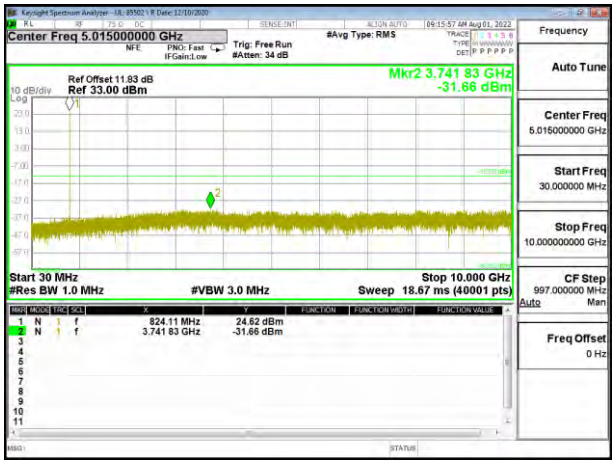
BAND 5 HSDPA MID Channel

BAND 5 HSDPA HIGH Channel

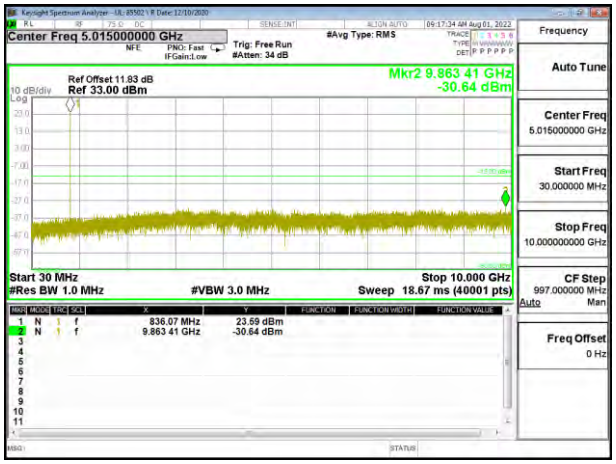
10.3.2. LTE BAND 5

LIMITS

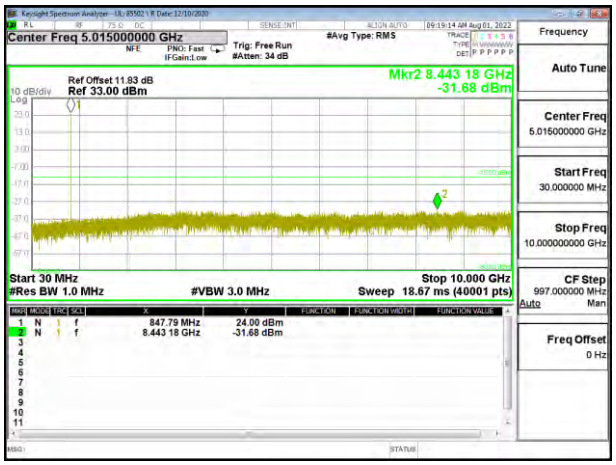
FCC: §22.917
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



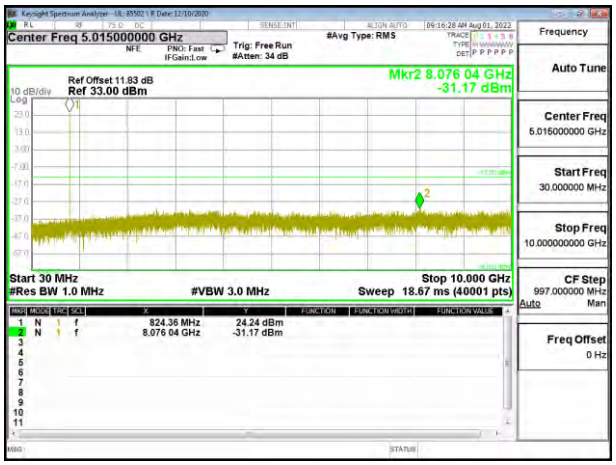
LTE5 1.4MHz QPSK LOW Ch RB1-0



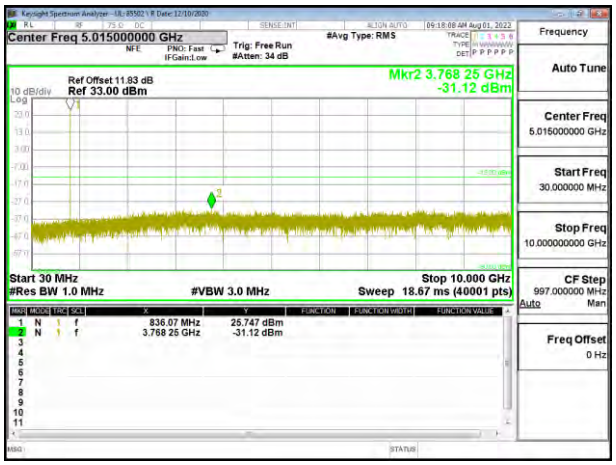
LTE5 1.4MHz QPSK MID Ch RB1-0



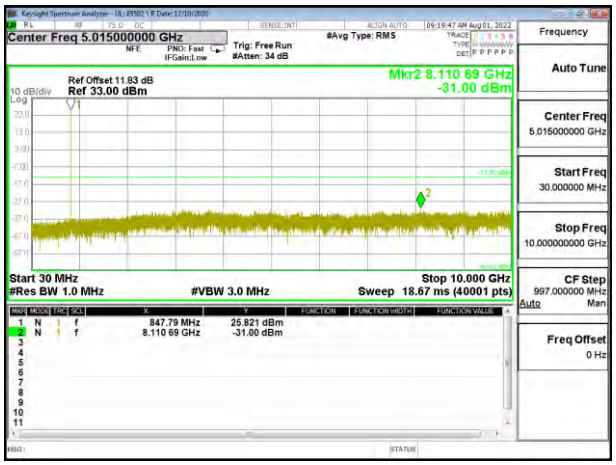
LTE5 1.4MHz QPSK HIGH Ch RB1-0



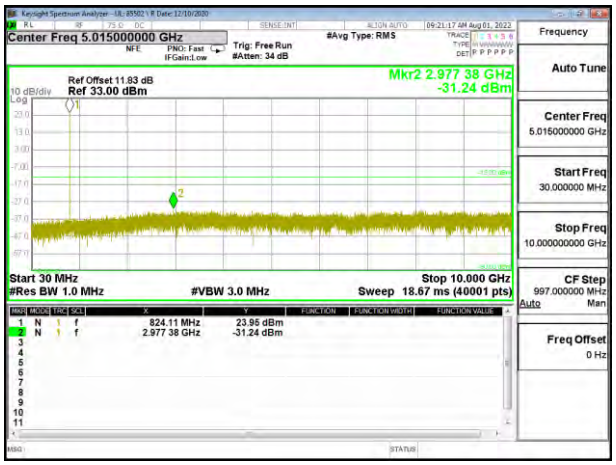
LTE5 1.4MHz 16QAM LOW Ch RB1-0



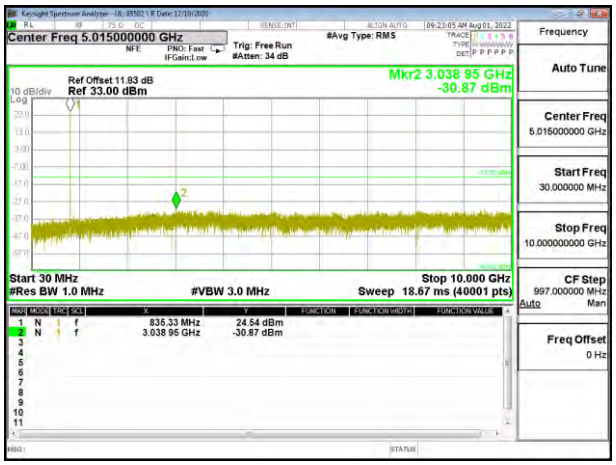
LTE5 1.4MHz 16QAM MID Ch RB1-0



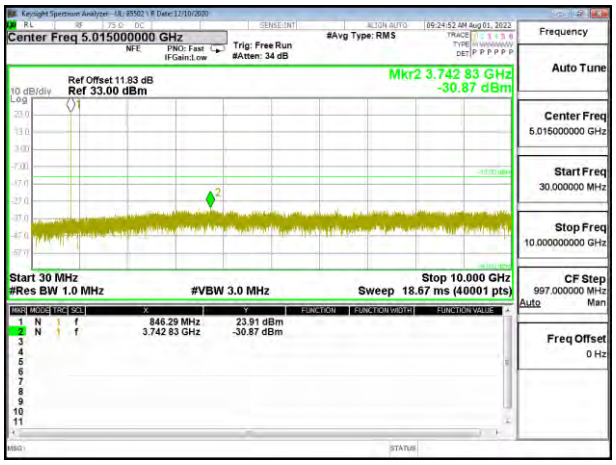
LTE5 1.4MHz 16QAM HIGH Ch RB1-0



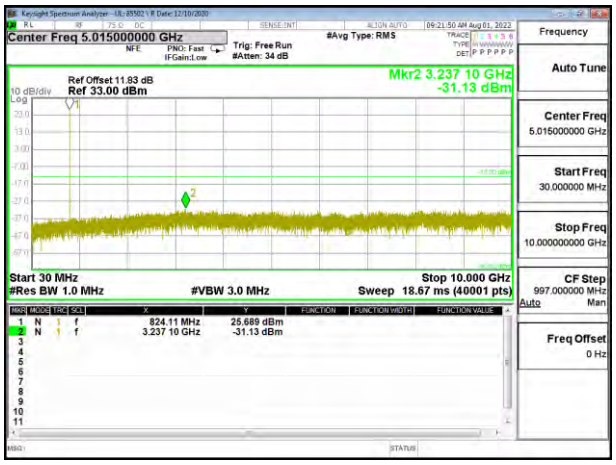
LTE5 3MHz QPSK LOW Ch RB1-0



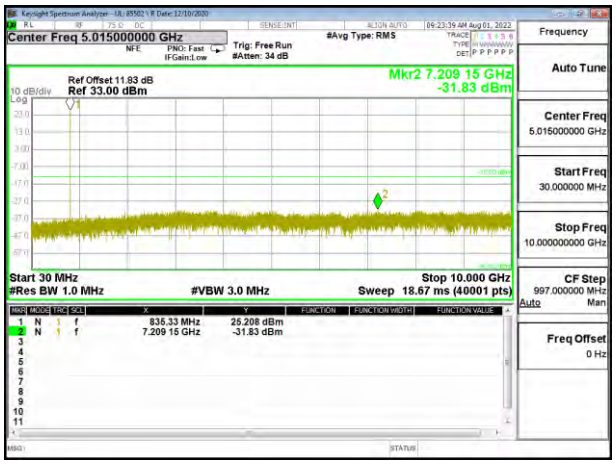
LTE5 3MHz QPSK MID Ch RB1-0



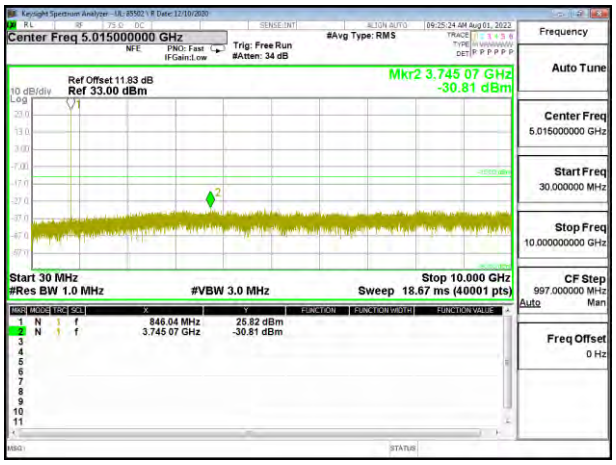
LTE5 3MHz QPSK HIGH Ch RB1-0



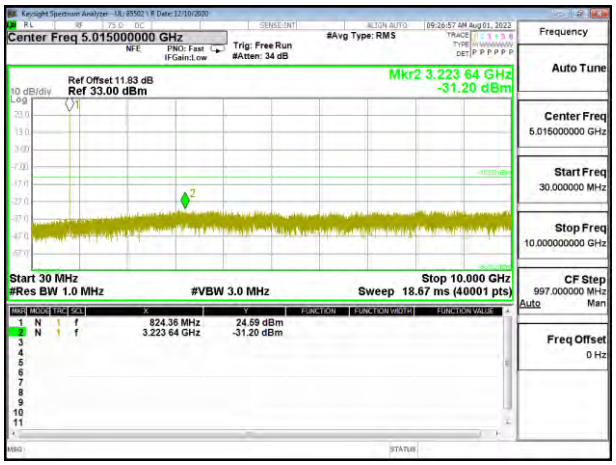
LTE5 3MHz 16QAM LOW Ch RB1-0



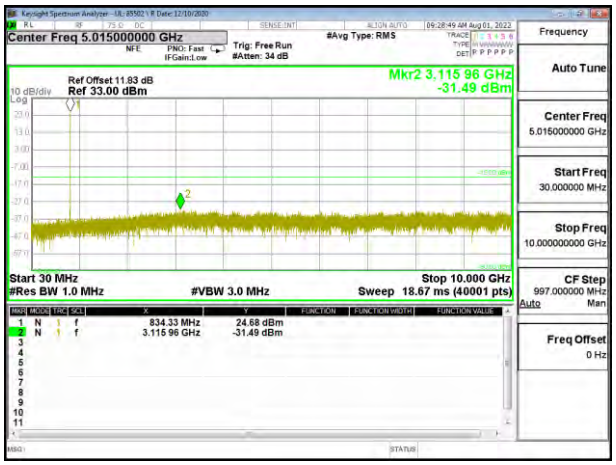
LTE5 3MHz 16QAM MID Ch RB1-0



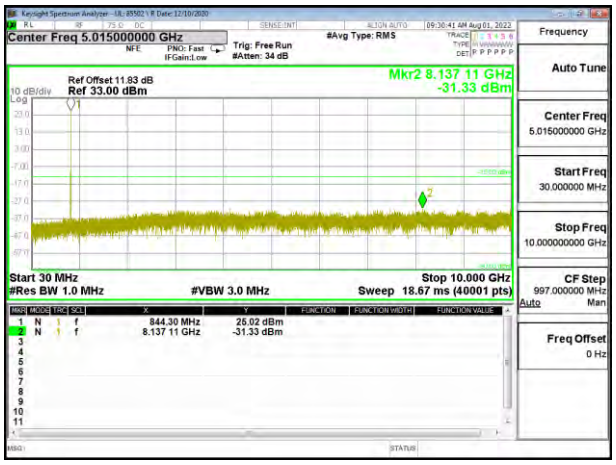
LTE5 3MHz 16QAM HIGH Ch RB1-0



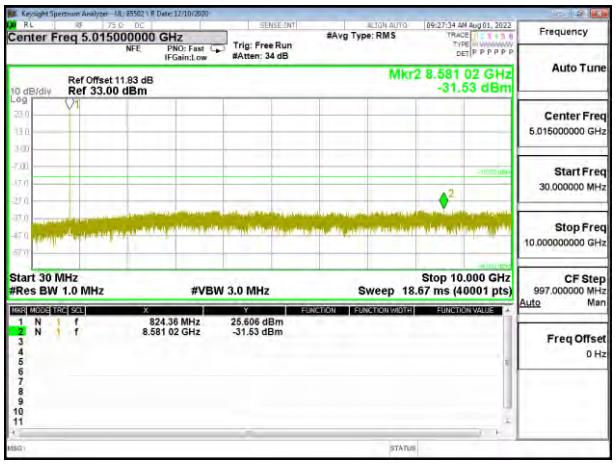
LTE5 5MHz QPSK LOW Ch RB1-0



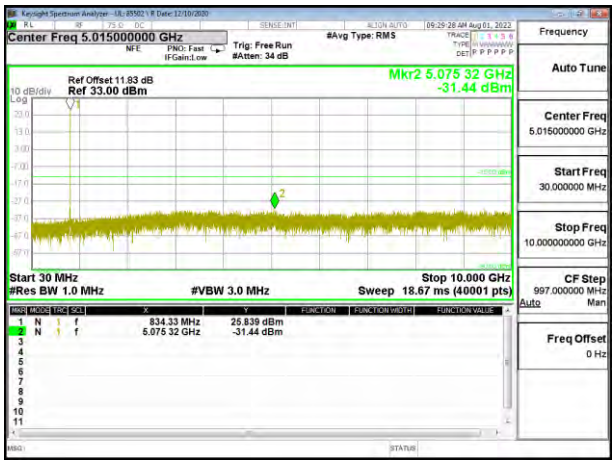
LTE5 5MHz QPSK MID Ch RB1-0



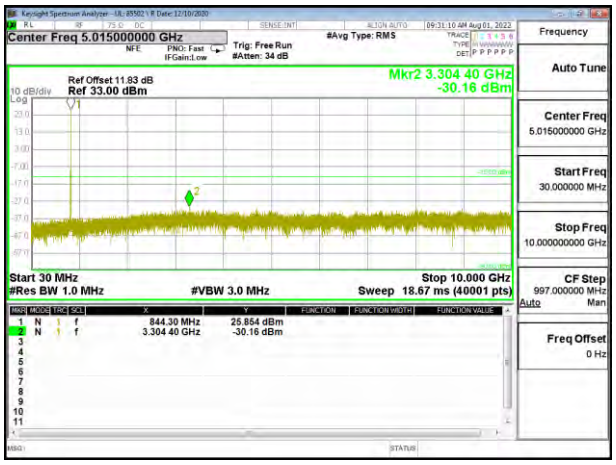
LTE5 5MHz QPSK HIGH Ch RB1-0



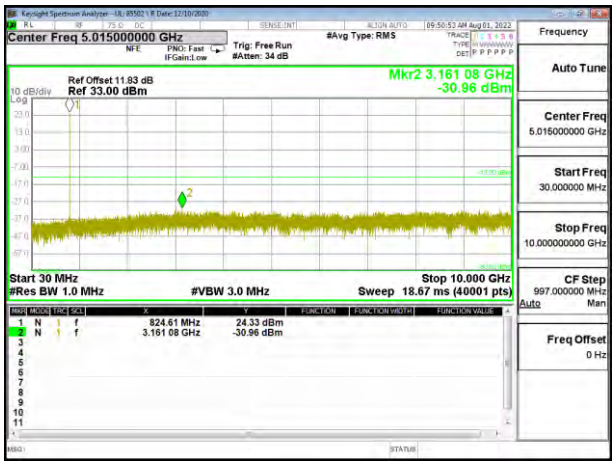
LTE5 5MHz 16QAM LOW Ch RB1-0



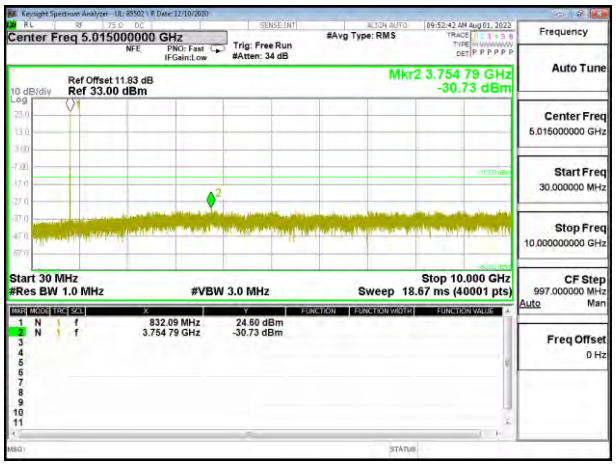
LTE5 5MHz 16QAM MID Ch RB1-0



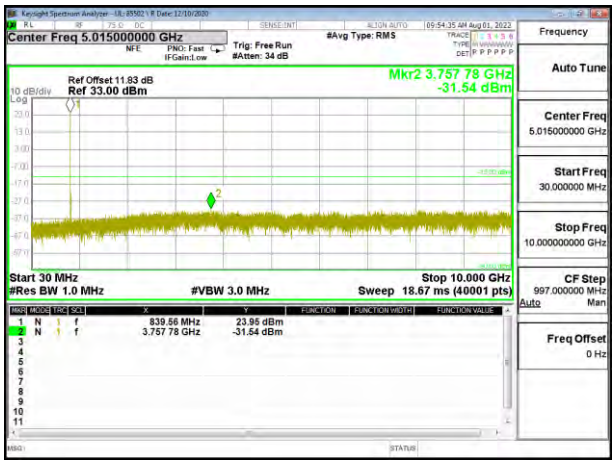
LTE5 5MHz 16QAM HIGH Ch RB1-0



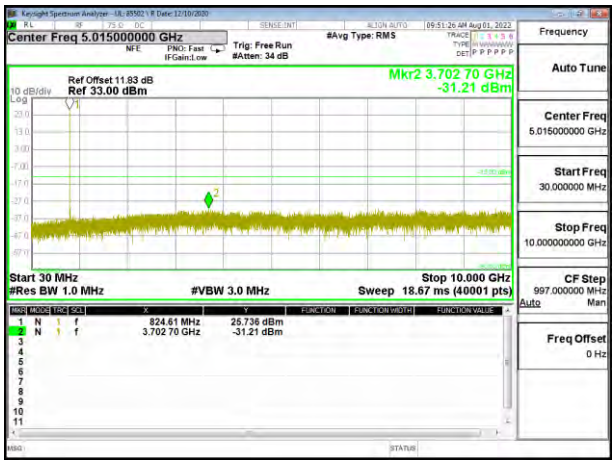
LTE5 10MHz QPSK LOW Ch RB1-0



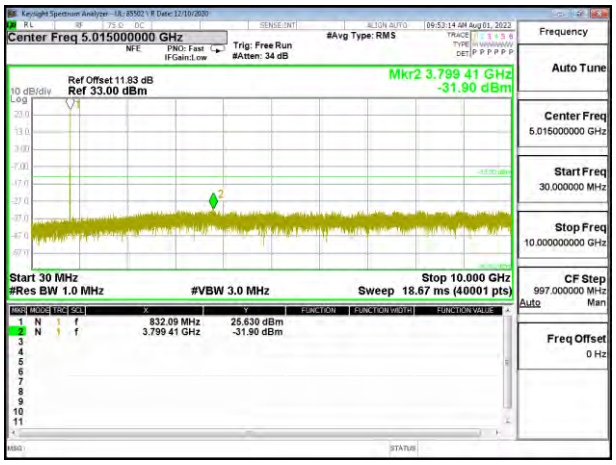
LTE5 10MHz QPSK MID Ch RB1-0



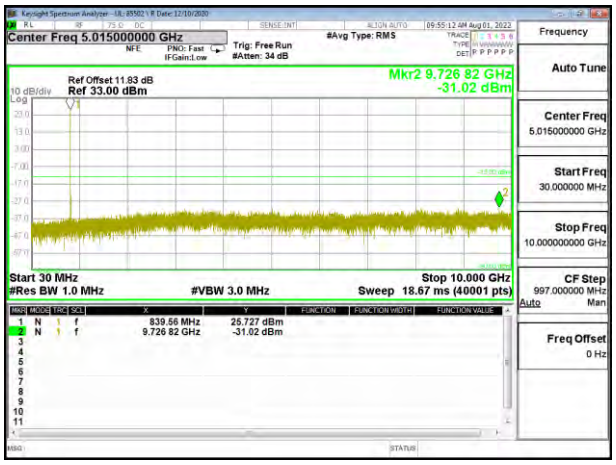
LTE5 10MHz QPSK HIGH Ch RB1-0



LTE5 10MHz 16QAM LOW Ch RB1-0



LTE5 10MHz 16QAM MID Ch RB1-0

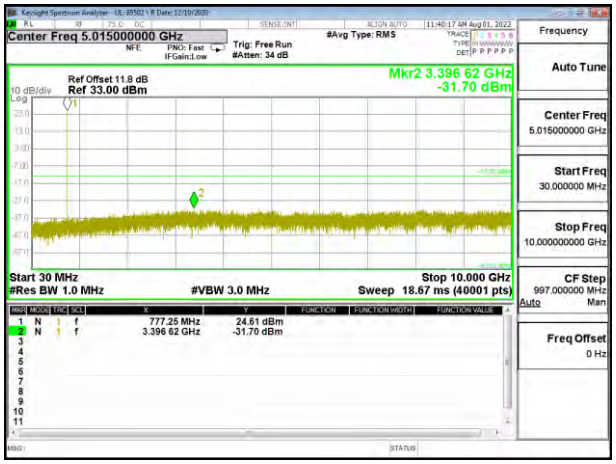


LTE5 10MHz 16QAM HIGH Ch RB1-0

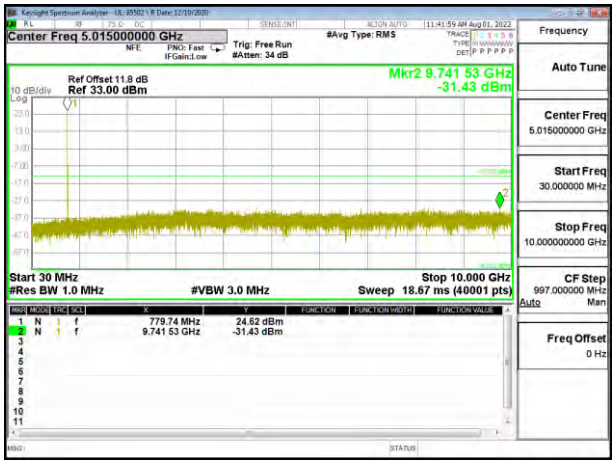
10.3.3. LTE BAND 13

LIMITS

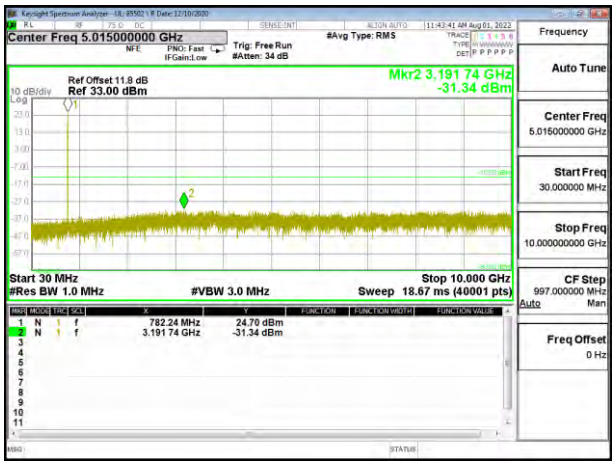
FCC: §27.53 (c), (f)
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts. The band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. Note: Radiated data in section 9.1.6 confirms a compliance for the emissions in GPS 1559 - 1610 MHz band were wideband emissions therefore the - 40dBm / MHz limit was used.



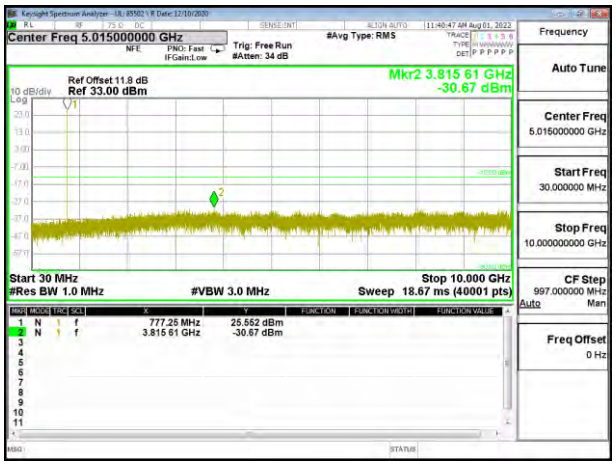
LTE13 5MHz QPSK LOW Ch RB1-0



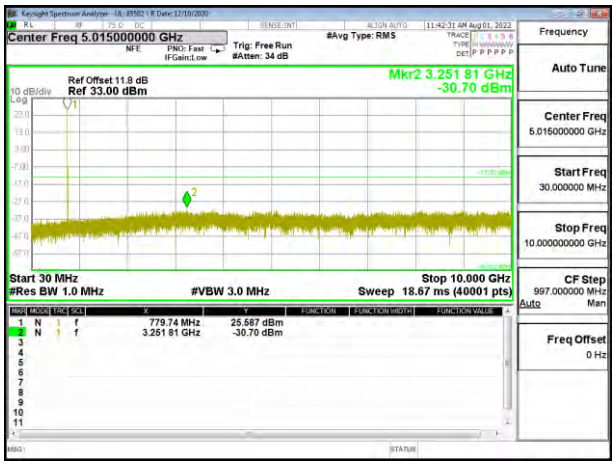
LTE13 5MHz QPSK MID Ch RB1-0



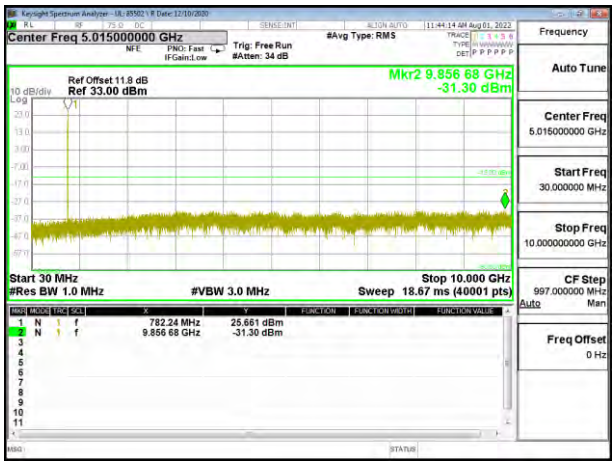
LTE13 5MHz QPSK HIGH Ch RB1-0



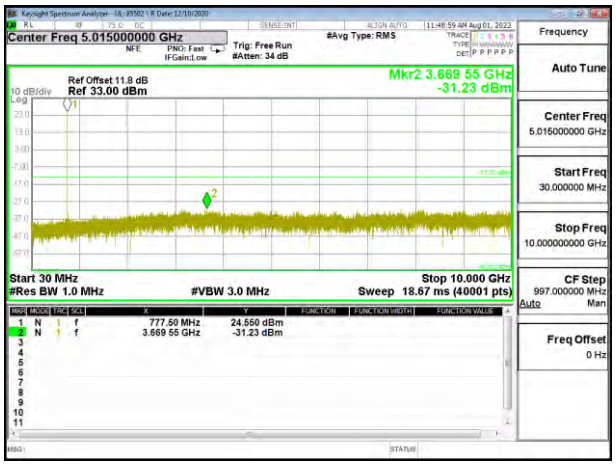
LTE13 5MHz 16QAM LOW Ch RB1-0



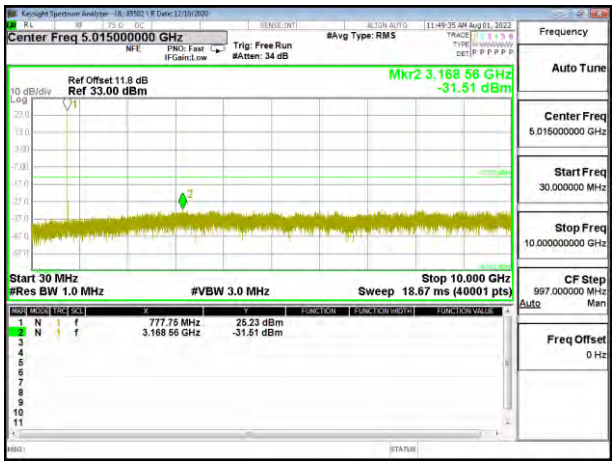
LTE13 5MHz 16QAM MID Ch RB1-0



LTE13 5MHz 16QAM HIGH Ch RB1-0



LTE13 10MHz QPSK MID Ch RB1-0

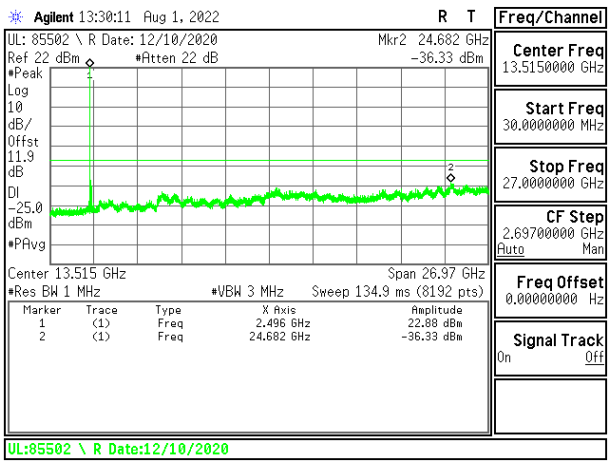


LTE13 10MHz 16QAM MID Ch RB1-0

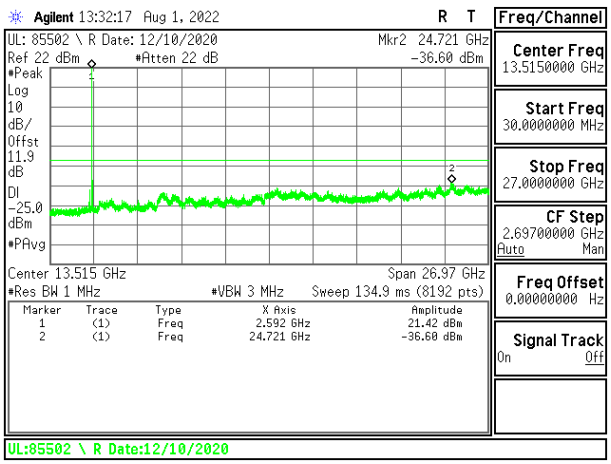
10.3.4. LTE BAND 41

LIMITS

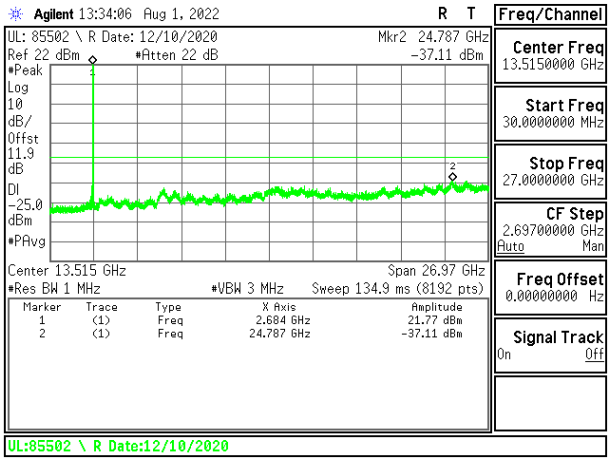
FCC: §27.53 (m)
The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.



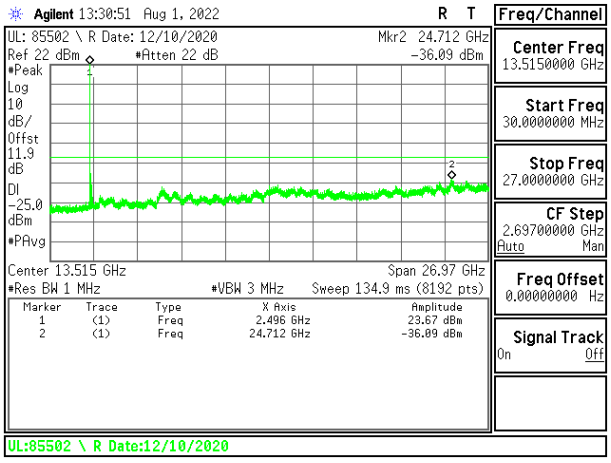
LTE41 5MHz QPSK LOW Ch RB1-0



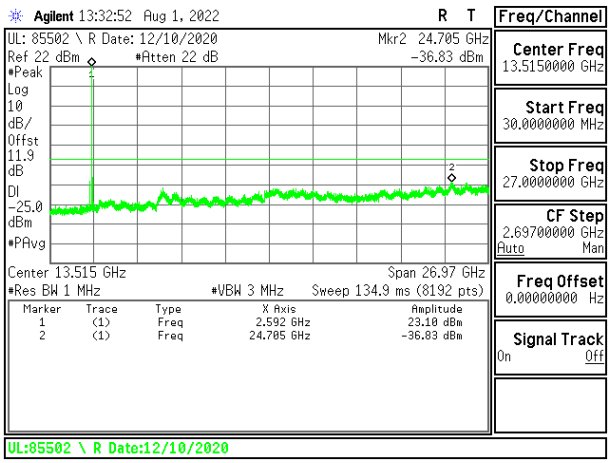
LTE41 5MHz QPSK MID Ch RB1-0



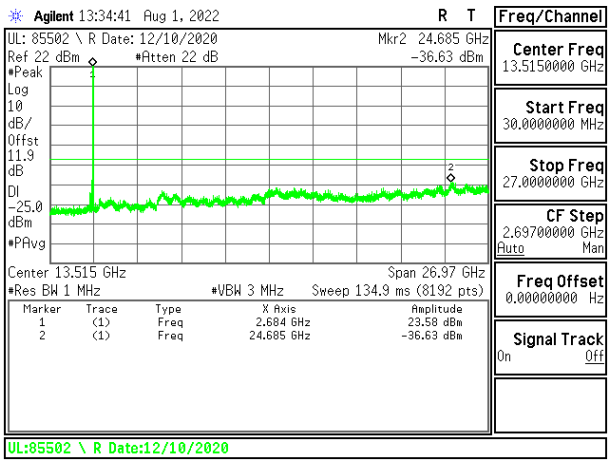
LTE41 5MHz QPSK HIGH Ch RB1-0



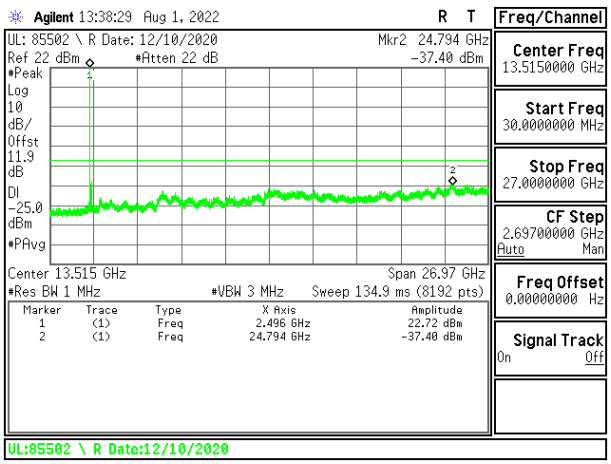
LTE41 5MHz 16QAM LOW Ch RB1-0



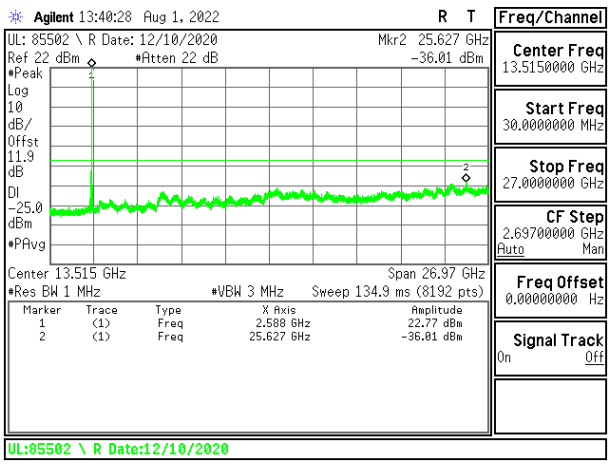
LTE41 5MHz 16QAM MID Ch RB1-0



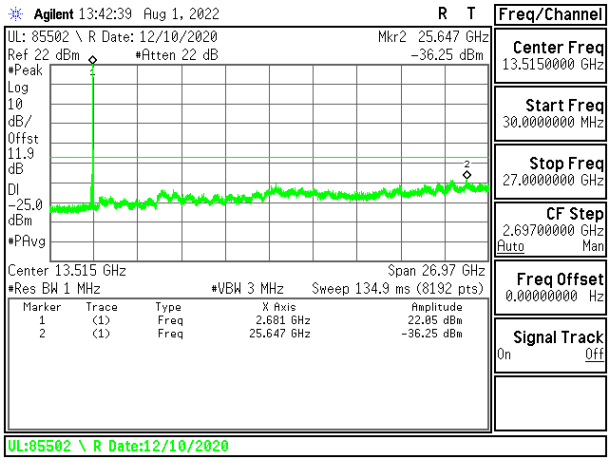
LTE41 5MHz 16QAM HIGH Ch RB1-0



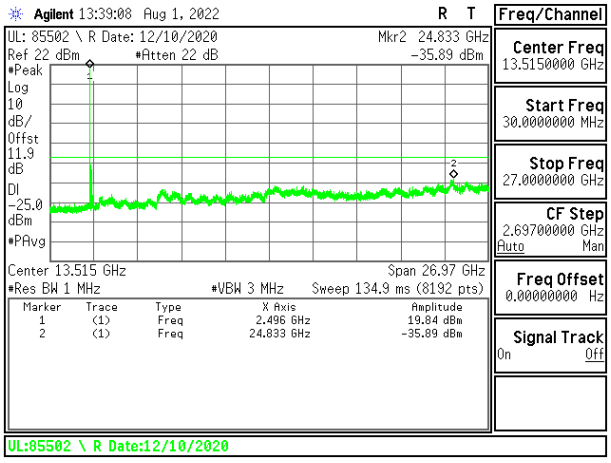
LTE41 10MHz QPSK LOW Ch RB1-0



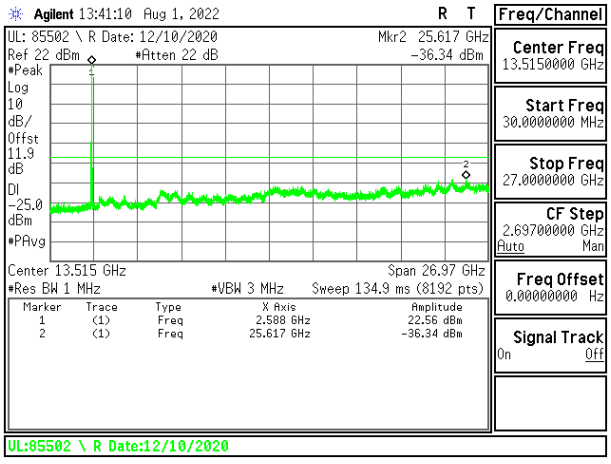
LTE41 10MHz QPSK MID Ch RB1-0



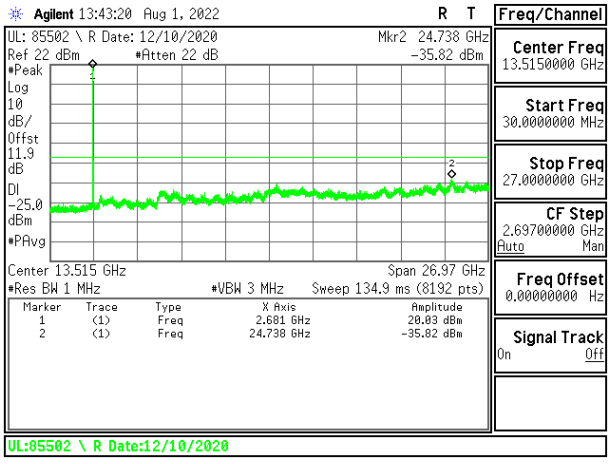
LTE41 10MHz QPSK HIGH Ch RB1-0



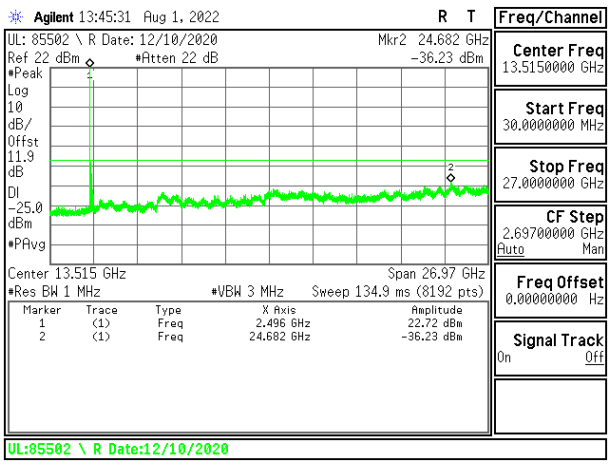
LTE41 10MHz 16QAM LOW Ch RB1-0



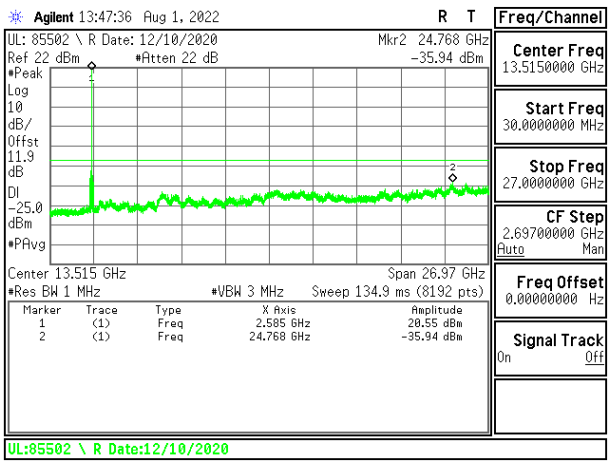
LTE41 10MHz 16QAM MID Ch RB1-0



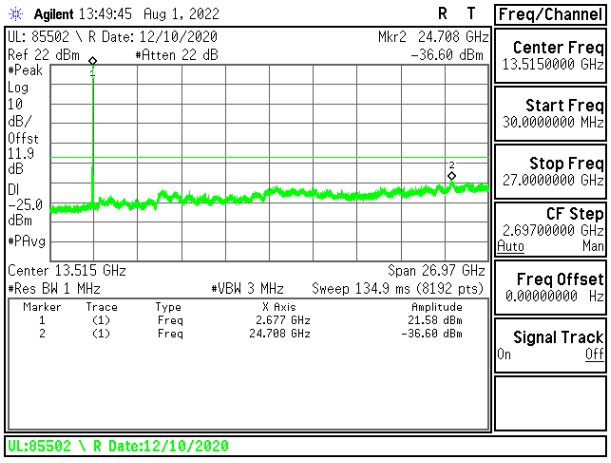
LTE41 10MHz 16QAM HIGH Ch RB1-0



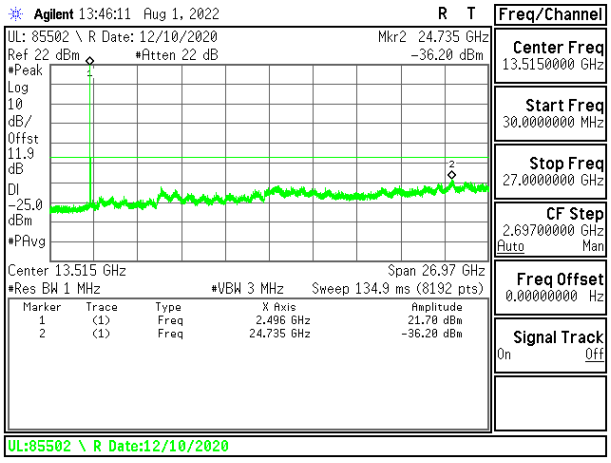
LTE41 15MHz QPSK LOW Ch RB1-0



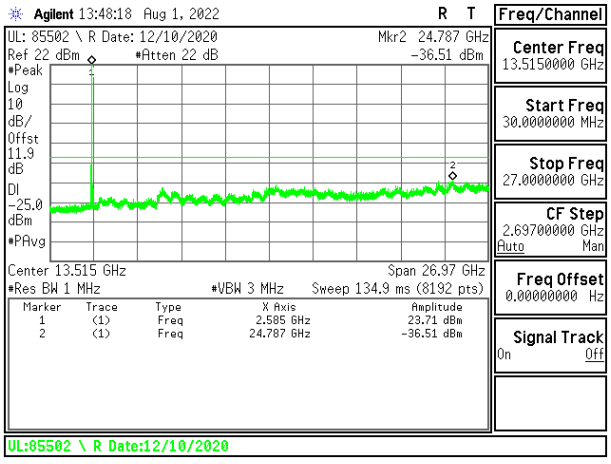
LTE41 15MHz QPSK MID Ch RB1-0



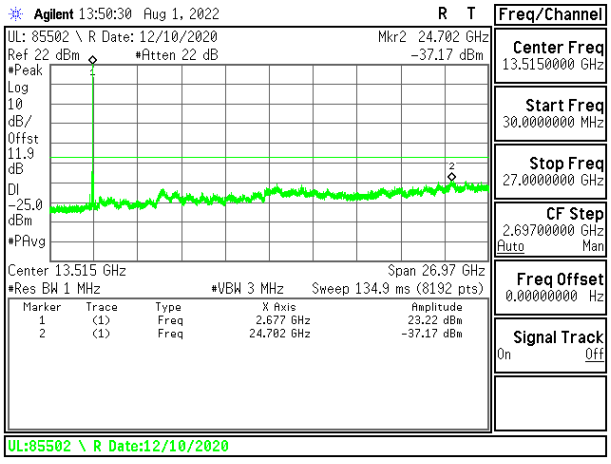
LTE41 15MHz QPSK HIGH Ch RB1-0



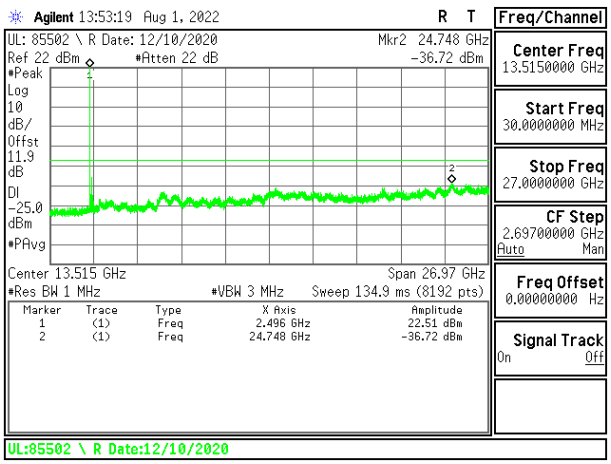
LTE41 15MHz 16QAM LOW Ch RB1-0



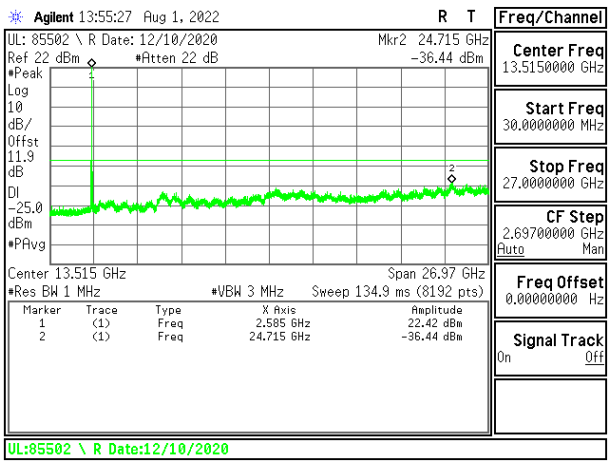
LTE41 15MHz 16QAM MID Ch RB1-0



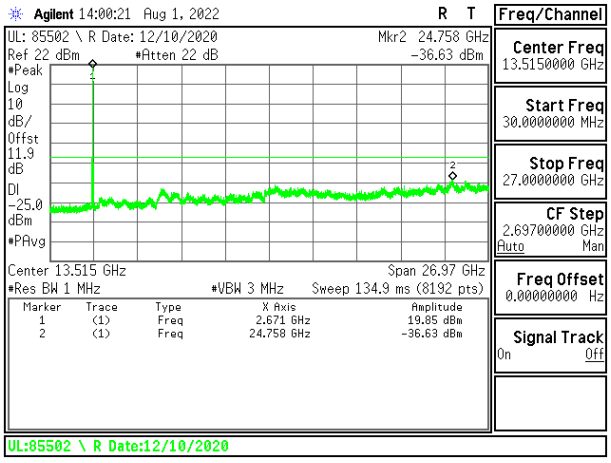
LTE41 15MHz 16QAM HIGH Ch RB1-0



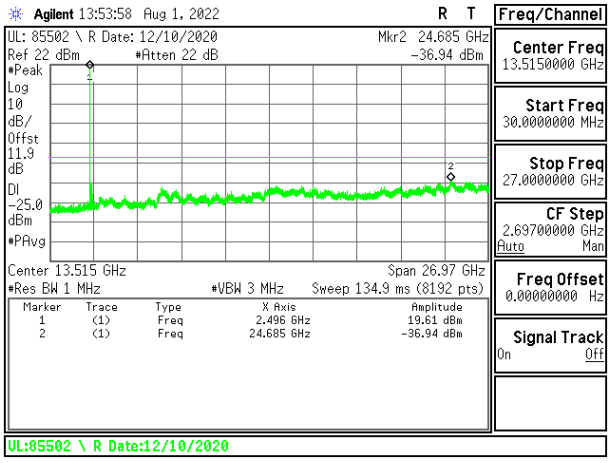
LTE41 20MHz QPSK LOW Ch RB1-0



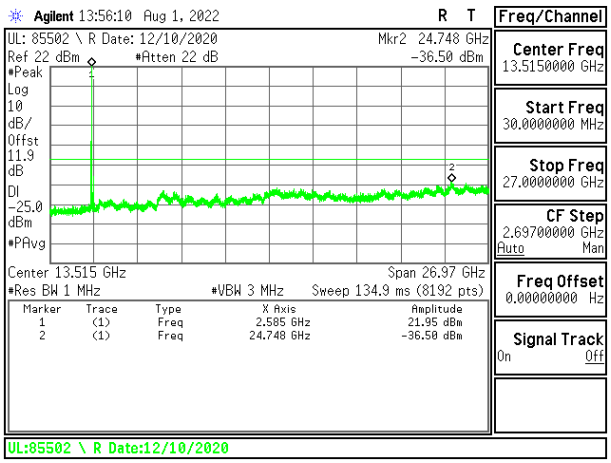
LTE41 20MHz QPSK MID Ch RB1-0



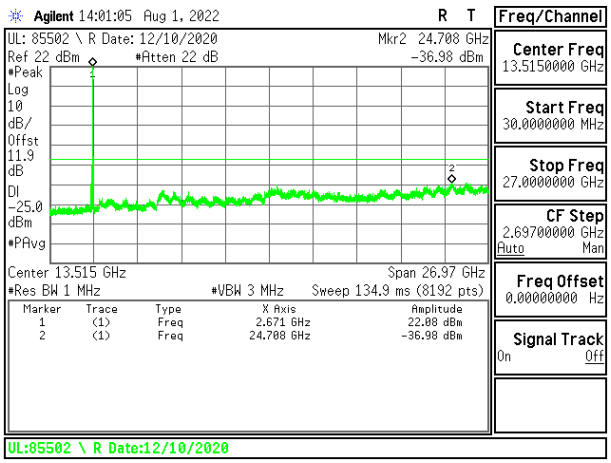
LTE41 20MHz QPSK HIGH Ch RB1-0



LTE41 20MHz 16QAM LOW Ch RB1-0



LTE41 20MHz 16QAM MID Ch RB1-0



LTE41 20MHz 16QAM HIGH Ch RB1-0

10.4. PEAK TO AVERAGE RATIO

LIMIT

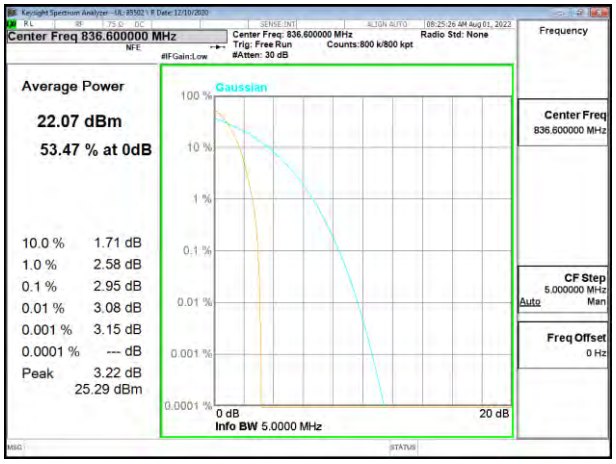
FCC 22.913 (d)

In addition, the peak to average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

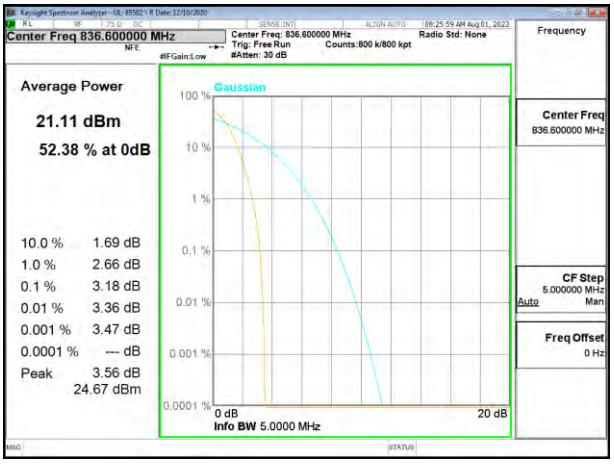
RESULTS

Antenna 1 was used to measure as the worst case; full resource block (FRB) for each bandwidth was used to measure as the worst case. The results from all CCDF measurements are passed with 13dB peak-to-average power ratio criteria.

10.4.1. WCDMA

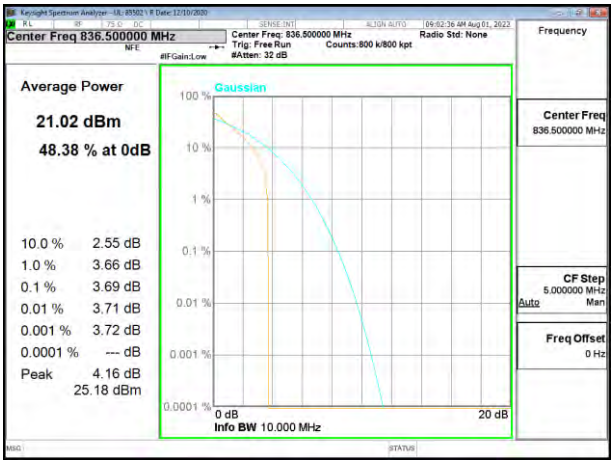


BAND 5 Rel 99 MID Channel

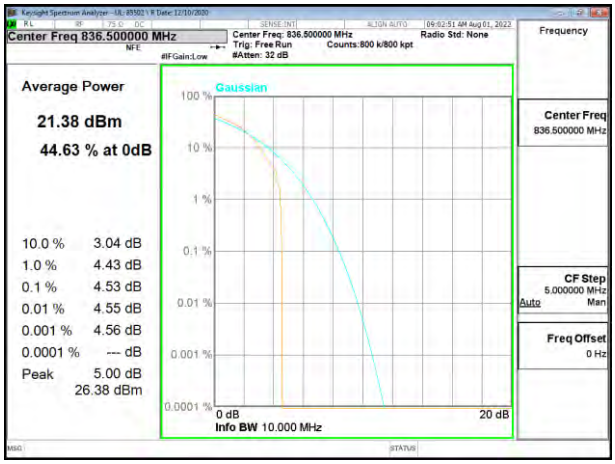


BAND 5 HSDPA MID Channel

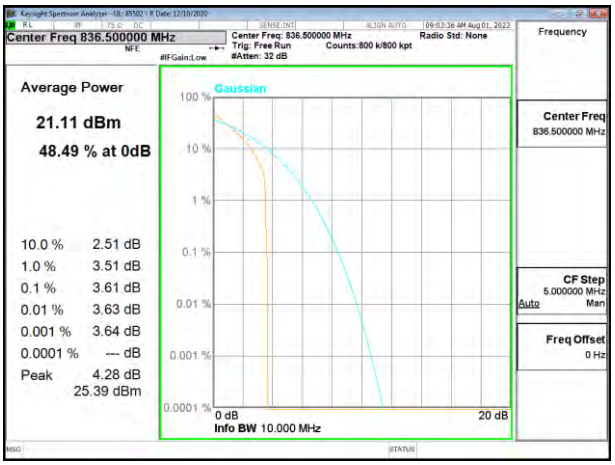
10.4.2. LTE BAND 5



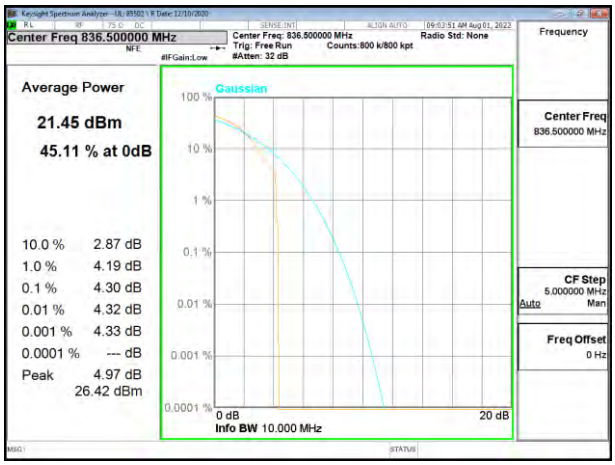
LTE5 1.4MHz QPSK MID Ch RB6-0



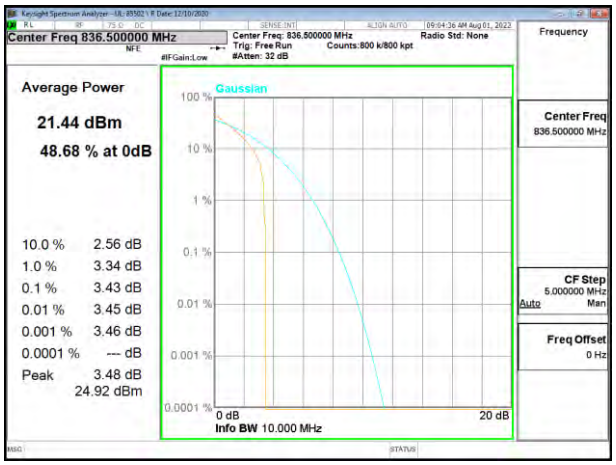
LTE5 1.4MHz 16QAM MID Ch RB6-0



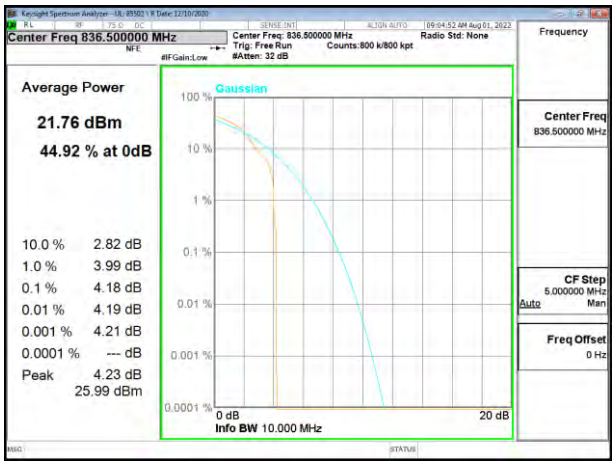
LTE5 3MHz QPSK MID Ch RB15-0



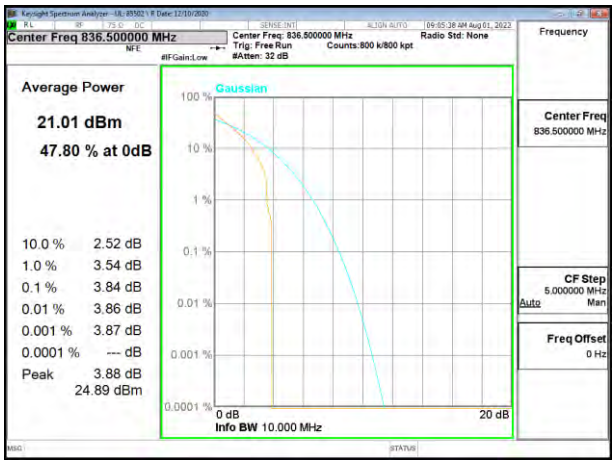
LTE5 3MHz 16QAM MID Ch RB15-0



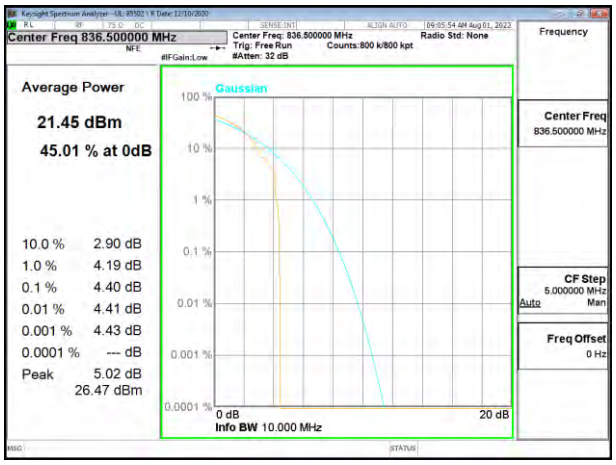
LTE5 5MHz QPSK MID Ch RB25-0



LTE5 5MHz 16QAM MID Ch RB25-0



LTE5 10MHz QPSK MID Ch RB50-0



LTE5 10MHz 16QAM MID Ch RB50-0

10.5. FREQUENCY STABILITY

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

(vii) Temp. = −30°C to +50°C

(viii) Voltage = (85% - 115%)

Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.

End Voltage, 3.2VDC.

Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

RESULTS

10.5.1. WCDMA 5

LIMITS

FCC: §22.355
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

Test Engineer ID:	27465/44389	Test Date:	2022-07-29

Limit		824	849	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	826.4000	846.6000				
Extreme (50C)		826.4000	846.6000	1.7	-2.3	0.00	-0.01
Extreme (40C)		826.4000	846.6000	2.0	-1.8	0.00	0.00
Extreme (30C)		826.4000	846.6000	0.6	-1.2	0.00	0.00
Extreme (10C)		826.4000	846.6000	-1.0	1.5	0.00	0.00
Extreme (0C)		826.4000	846.6000	-1.4	1.8	0.00	0.00
Extreme (-10C)		826.4000	846.6000	-1.7	2.5	0.00	0.01
Extreme (-20C)		826.4000	846.6000	3.4	2.8	0.01	0.01
Extreme (-30C)		826.4000	846.6000	-0.3	1.9	0.00	0.00
20C	End Point	826.4000	846.6000	0.7	-0.6	0.00	0.00

10.5.2. LTE BAND 5

LIMITS

FCC: §22.355
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

Test Engineer ID:	27465/44389	Test Date:	2022-07-29

Limit		824	849	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	829.0000	844.0000				
Extreme (50C)		829.0000	844.0000	0.2	-0.8	0.00	0.00
Extreme (40C)		829.0000	844.0000	0.1	-0.7	0.00	0.00
Extreme (30C)		829.0000	844.0000	0.4	-0.2	0.00	0.00
Extreme (10C)		829.0000	844.0000	0.5	0.2	0.00	0.00
Extreme (0C)		829.0000	844.0000	-0.3	0.5	0.00	0.00
Extreme (-10C)		829.0000	844.0000	-0.1	-0.8	0.00	0.00
Extreme (-20C)		829.0000	844.0000	0.0	0.2	0.00	0.00
Extreme (-30C)		829.0000	844.0000	0.2	-0.8	0.00	0.00
20C	End Point	829.0000	844.0000	-0.3	0.1	0.00	0.00

10.5.3. LTE BAND 13

LIMITS

FCC: §27.54
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Engineer ID:	84740/44389	Test Date:	2022-07-29

Limit		777	787	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)		779.5000	784.5000				
Extreme (50C)		779.5000	784.5000	0.6	1.0	0.00	0.00
Extreme (40C)		779.5000	784.5000	0.9	0.6	0.00	0.00
Extreme (30C)		779.5000	784.5000	-1.3	1.9	0.00	0.00
Extreme (10C)	Normal	779.5000	784.5000	1.1	-0.9	0.00	0.00
Extreme (0C)		779.5000	784.5000	-0.1	3.1	0.00	0.01
Extreme (-10C)		779.5000	784.5000	1.7	0.1	0.00	0.00
Extreme (-20C)		779.5000	784.5000	1.1	1.8	0.00	0.00
Extreme (-30C)		779.5000	784.5000	2.1	1.1	0.01	0.00
20C	End Point	779.5000	784.5000	3.2	0.1	0.01	0.00

10.5.4. LTE BAND 41

LIMITS

FCC: §27.54
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Engineer ID:	27465/44389	Test Date:	2022-08-01

Limit		2496	2690	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)		2506.0000	2680.0000				
Extreme (50C)		2506.0000	2680.0000	-0.4	-0.6	0.00	0.00
Extreme (40C)		2506.0000	2680.0000	1.0	0.4	0.00	0.00
Extreme (30C)		2506.0000	2680.0000	1.0	-0.2	0.00	0.00
Extreme (10C)	Normal	2506.0000	2680.0000	-0.8	1.0	0.00	0.00
Extreme (0C)		2506.0000	2680.0000	-1.6	-1.1	0.00	0.00
Extreme (-10C)		2506.0000	2680.0000	-1.0	0.4	0.00	0.00
Extreme (-20C)		2506.0000	2680.0000	-0.8	-1.8	0.00	0.00
Extreme (-30C)		2506.0000	2680.0000	-0.2	-0.5	0.00	0.00
20C	End Point	2506.0000	2680.0000	0.8	-0.9	0.00	0.00

11. RADIATED TEST RESULTS

11.1. FIELD STRENGTH OF SPURIOUS RADIATION ABOVE 1GHz

TEST PROCEDURE

KDB 971168 D01 v03r01/D02 v02/r01

All tests above 1GHz were done with a Resolution Bandwidth of 1MHz, and a Video Bandwidth of 3MHz.

RESULTS

11.1.1. GSM850

LIMITS

FCC: §22.917 (a)
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.