TEST REPORT

Report Number. : R14639470-E4

Applicant	:	SONY CORPORATION 1-7-1 KONAN MINATO-KU TOKYO, 108-0075, JAPAN
FCC ID	:	PY7-03571V
EUT Description	:	GSM/WCDMA/LTE/5G Phone with BT, DTS/UNII a/b/g/n/ac/ax, GPS, WPT & NFC
Test Standard(s)	:	FCC CFR 47 Part 2, Part 22, Part 24, and Part 27.

Date Of Issue:
2023-03-30

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CERT #0751.06

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2023-03-24	Initial Review	Noah Bennett
V2	2023-03-28	TCB Feedback	Noah Bennett
V3	2023-03-29	TCB Feedback 2. Updated section 7.4 Clarified section 7.3 on full radiated testing.	Noah Bennett
V4	2023-03-30	Updated section 7.3 to clarify data being reused,	Noah Bennett

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Sony Corporation
1-7-1 Konan Minato-ku
Tokyo, 108-0075, Japan

EUT DESCRIPTION: GSM/WCDMA/LTE/5G Phone with BT, DTS/UNII a/b/g/n/ac/ax, GPS, WPT & NFC

SERIAL NUMBER: QV770090FR, QV7700ADFR, QV7700HTFR, QV77003JFR

SAMPLE RECEIPT DATE: 2023-02-13

DATE TESTED: 2023-02-27 to 2023-03-14

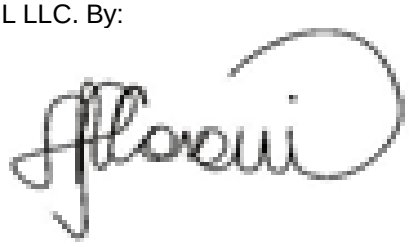
APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 2	Complies
CFR 47 Part 22	Complies
CFR 47 Part 24	Complies
CFR 47 Part 27	Complies

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 For
UL LLC. By:



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UL Verification Services Inc.

Prepared By:

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2. SUMMARY OF TEST RESULTS

This report contains data provided by the applicant which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer. Below is a list of the data provided by the customer:

1) Antenna gain and type (see section 6.4)
2) Cable loss (see section 6.2,8,9)
3) Supported bands and modulations (see section 6.5)
4) Model Differences (see section 7)

Requirement Description	Band	Requirement Clause Number (FCC)	Result	Remarks
Effective Radiated Power	GSM850, WCDMA5, LTE5	22.913 (a)(5)	Compliant	See Note 1.
	12	27.50 (c) (10)		
	13	27.50 (b) (10)		
Equivalent Isotropic Radiated Power	4	27.50 (d) (4)		
	41	27.50 (h) (2)		
	GSM1900	24.232 (b) (c)		
Requirement Description	**Requirement Clause Number (FCC)**		**Result**	**Remarks**
Occupied Bandwidth	2.1049		Compliant	None.
Band Edge and Emission Mask	2.1051, 22.917 (a), 27.53 (f), (c), (m)(4)			
Out of Band Emissions	2.1051, 22.917 (a), 27.53 (f), (c), (m)(4)			
Frequency Stability	2.1055, 22.355, 27.54,			
Peak-to-Average Ratio	22.913 (d)			
Field Strength of Spurious Radiation	2.1051, 22.917 (a), 27.53 (f), (c), (m)(4),			

Note 1: Bands GSM850/1900, WCDMA 2 and 4, and LTE Bands 4 and 12 are leveraged from previous test reports. Please see section 7 for reuse of test data, along with explanation and power spot checks.

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, Part 27, Part 90, and Part 96
- 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)
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 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

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE/5G Phone with BT, DTS/UNII a/b/g/n/ac/ax, GPS, WPT & NFC. This report covers WWAN testing.

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.

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 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	31.9	-5.51	7.0	24.24	0.265	242.63	243KGXW
	EGPRS	26.8			19.14	0.082	243.32	243KG7W
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	27.3	-3.46	2.0	23.84	0.242	245.05	245KGXW
	EGPRS	26.2			22.74	0.188	244.83	245KG7W

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	21.9	-5.51	7.0	14.24	0.027	4134	4M13F9W
	HSDPA	21.0			13.34	0.022	4135	4M14F9W

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	18.8	-3.46	2.0	15.34	0.034	4160	4M16F9W
	HSDPA	17.8			14.34	0.027	4161	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	17.8	-4.51	1.0	13.29	0.021	4158	4M16F9W
	HSDPA	16.8			12.29	0.017	4161	4M16F9W

LTE BAND 4

Part 27	
EIRP Limit (W)	1.00
Antenna Gain (dBi)	-4.51

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	18.0	13.49	0.022	1093	1M09G7W
	16QAM			18.1	13.59	0.023	1093	1M09D7W
3.0	QPSK	1711.5	1753.5	18.1	13.59	0.023	2700	2M70G7W
	16QAM			18.1	13.59	0.023	2707	2M71D7W
5.0	QPSK	1712.5	1752.5	18.2	13.69	0.023	4495	4M50G7W
	16QAM			18.2	13.69	0.023	4503	4M50D7W
10.0	QPSK	1715.0	1750.0	18.2	13.69	0.023	9010	9M01G7W
	16QAM			18.2	13.69	0.023	8997	9M00D7W
15.0	QPSK	1717.5	1747.5	18.0	13.49	0.022	13490	13M5G7W
	16QAM			18.0	13.49	0.022	13480	13M5D7W
20.0	QPSK	1720.0	1745.0	18.1	13.59	0.023	17940	17M9G7W
	16QAM			18.1	13.59	0.023	17980	18M0D7W

LTE BAND 5

Part 22H	
ERP Limit (W)	7.00
Antenna Gain (dBi)	-5.51

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	21.2	13.54	0.023	1091.7	1M09G7W
	16QAM			21.6	13.94	0.025	1093.6	1M09D7W
3.0	QPSK	825.5	847.5	21.2	13.54	0.023	2705.4	2M71G7W
	16QAM			21.6	13.94	0.025	2703.6	2M70D7W
5.0	QPSK	826.5	846.5	21.3	13.64	0.023	4499.7	4M50G7W
	16QAM			21.7	14.04	0.025	4498.8	4M50D7W
10.0	QPSK	829.0	844.0	21.3	13.64	0.023	9002	9M00G7W
	16QAM			21.6	13.94	0.025	8970.7	8M97D7W

LTE BAND 12

Part 27	
ERP Limit (W)	3.00
Antenna Gain (dBi)	-8.00

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	699.7	715.3	20.50	10.35	0.011	1091	1M09G7W
	16QAM			20.90	10.75	0.012	1098	1M10D7W
3.0	QPSK	700.5	714.5	20.50	10.35	0.011	2707	2M71G7W
	16QAM			20.90	10.75	0.012	2701	2M70D7W
5.0	QPSK	701.5	713.5	20.60	10.45	0.011	4506	4M51G7W
	16QAM			21.00	10.85	0.012	4505	4M51D7W
10.0	QPSK	704.0	711.0	20.50	10.35	0.011	8972	8M97G7W
	16QAM			20.90	10.75	0.012	8964	8M96D7W

LTE BAND 13

Part 27	
ERP Limit (W)	3.00
Antenna Gain (dBi)	-11.70

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	20.8	6.95	0.005	4498.7	4M50G7W
	16QAM			21.1	7.25	0.005	4502.2	4M50D7W
10.0	QPSK	782.0	782.0	20.7	6.85	0.005	8946.9	8M95G7W
	16QAM			21.1	7.25	0.005	8967.1	8M97D7W

LTE BAND 41

Part 27	
EIRP Limit (W)	2.00
Antenna Gain (dBi)	-3.95

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	19.3	15.35	0.034	4504.3	4M50G7W
	16QAM			19.3	15.35	0.034	4497.4	4M50D7W
10.0	QPSK	2501.0	2685.0	19.3	15.35	0.034	9005.0	9M01G7W
	16QAM			19.4	15.45	0.035	8951.1	8M95D7W
15.0	QPSK	2503.5	2682.5	19.1	15.15	0.033	13421.2	13M4G7W
	16QAM			19.2	15.25	0.033	13421.3	13M4D7W
20.0	QPSK	2506.0	2680.0	19.1	15.15	0.033	17891.1	17M9G7W
	16QAM			19.5	15.55	0.036	17876.1	17M9D7W

6.3. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 0.90 for conducted samples, and 0.88 for radiated samples.

6.4. MAXIMUM ANTENNA GAIN

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

LTE Bands	Frequency Range (MHz)	Main 1 Antenna Gain (dBi)	Main 2 Antenna Gain (dBi)
GSM850, WCDMA5, LTE5	824 – 849	-5.51	
GSM1900, WCDMA2, LTE2	1850 - 1910		-3.46
LTE Band 12	699 – 716	-8.00	
LTE Band 13	777 - 787	-11.70	
WCDMA4, LTE Band 4	1710 – 1780		-4.51
LTE Band 41	2496 - 2690		-3.95

6.5. WORST-CASE CONFIGURATION AND MODE

The EUT supports the following GSM, WCDMA, and LTE bands:
GSM850, GSM1900, WCDMA Band 2, WCDMA Band 4, WCDMA Band 5, LTE Band 4, LTE Band 12, LTE Band 13, LTE Band 17 and LTE Band 41.

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 conducted average power on different modulations. Output power measurements were measured on Rel 99, HSDPA and HSUPA for WCDMA, and QPSK, 16QAM, and 64QAM, modulations for LTE. It was found that Rel 99 and HSDPA were worst case for WCDMA, and QPSK and 16QAM were worst case for LTE. Therefore, all testing was done in these modes only.

The EUT was investigated in three orthogonal orientations X/Y/Z on both Low Band (Fundamental Below 1GHz) Mid Band (Fundamental between 1-3GHz) and High Band (Fundamental above 3GHz) for both the Main Antennas and the Sub antenna. For Sim Tx scans in which there are two or more Fc ranges with different WC orientations, scans were performed in both orientations, and the Worst-Case margin scan was reported as below:

Band (Frequency)	Antenna	Orientation
Low Band (Fc<1GHz)	Main	X
Mid Band (1GHz<Fc<3GHz)		Y
BT & 2.4 WLAN (For Sim Tx)	BT C0/C1	X
5 WLAN (For Sim Tx)	WLAN Main	Y

The EUT was tested while connected to AC Lines via charging cable and brick to represent worst case emissions.

Worst Case emissions from 9kHz-30Mhz, 30-1000MHz, and 18-26.5GHz were done on the modes with the highest conducted average power as follows:

Note: The spectrum above 18Ghz was investigated, and no emissions within 20dB were noted.

Technology	Band (Frequency)	Modulation
GSM	850	GPRS
WCDMA	Band 5	Rel 99
LTE	Band 5	16QAM

The following scans were investigated for simultaneous transmission:

Mode	Mode	Mode
LTE B4 1745MHz 20MHz RB1-0	2442MHz BT GFSK C0	5240MHz 11ax HE20 26T/0 MIMO
LTE B4 1745MHz 20MHz RB1-0	2442MHz BT GFSK C1	5240MHz 11ax HE20 26T/0 MIMO
LTE B4 1745MHz 20MHz RB1-0	2442MHz 11ax HE20 106T/54 MIMO	
LTE B4 1745MHz 20MHz RB1-0	5240MHz 11ax HE20 26T/0 MIMO	
LTE B12 704MHz 10MHz RB1-0	2462MHz 11ax HE20 106T/54 MIMO	

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adaptor	Sony	XQZ-UC1	1821W34209742	NA
Headphones	Sony	MDR-EX15AP	N/A	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-C	1	USB-C	Shielded	<3m	XQZ-UB1
2	Aux	1	AUX	Shielded	<3m	MDR-EX15AP

Test Setup

The EUT was connected to a base station simulator and set to transmit at max power for GSM/WCDMA/LTE testing.

Setup Diagram

Please see R14639470-EP5 for Setup Photos and Setup Diagrams.

7. REUSE OF TEST DATA

7.1. INTRODUCTION

According to the manufacturer, FCC ID: PY7-03571V (This Model) and FCC ID: PY7-83376C licensed radios are electrically identical. The FCC ID: PY7-83376C test data shall remain representative of FCC ID: PY7-03571V (This Model) so, FCC ID: PY7-03571V (This Model) leverages test data from FCC ID: PY7-83376C.

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

7.2. DEVICES DIFFERENCES

Difference between PY7-03571V (This Model) and PY7-83376C:

Sony Corporation hereby declares that the hardware of WWAN GSM, WCDMA and LTE is identical among PY7-03571V (This Model) and PY7-83376C. Regarding the licensed bands (equipment code PCE), both models share the same PCB Layout, antennas and components. The change is related to the cellular band configuration via software. Therefore, the following report/data of PY7-83376C may represent for PY7-03571V (This Model). The supported bands for PY7-83376C and PY7-03571V is defined by the SW and it is stated in the “PY7-03571V_TheoryOfOperation_AppendixB.pdf” document.

7.3. REFERENCE DETAIL

Equipment Class	Reference FCC ID	Report Title	Referenced Testing
Licensed (WWAN)	PY7-83376C	UL Report R14639481-E2 FCC WWAN REPORT – FINAL	Conducted Antenna port and Radiated Spurious emission data for GSM850 and 1900, WCDMA 2 and 4, and LTE Band 4 and 12.

*Note: Full radiated testing was done on all GSM, WCDMA and LTE Bands to confirm that the parent model data is representative for the variant model.

7.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device PY7-03571V 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. Highest average conducted power modes of the parent model were chosen to spot-check.

PY7-03571V SPOT CHECK RESULTS						
Technology	RB	Data Rate	Measured Frequency (MHz)	PY7-83376C	PY7-03571V (This Model)	Delta (dB) <+3dB
				Conducted Avg Power (dBm)	Conducted Avg Power (dBm)	Margin
GSM850	-	GPRS	836.6	32.3	31.9	0.4
		EGPRS	848.8	26.7	26.8	-0.1
GSM1900	-	GPRS	1909.8	27.6	27.3	0.3
		EGPRS		26.4	26.2	0.2
WCDMA2	-	Rel 99	1907.6	18.8	18.8	0.0
		HSDPA		17.8	17.8	0.0
WCDMA4	-	Rel 99	1732.6	17.8	17.8	0.0
		HSDPA		16.8	16.8	0.0
LTE 4	1-2	QPSK	1710.7	17.8	18.0	-0.2
	1-12	16QAM	1752.5	18.1	18.2	-0.1

LTE 12	25-12	QPSK	704	20.8	20.4	0.4
	1-12	16QAM	701.5	21.2	20.9	0.3

8. TEST AND MEASUREMENT EQUIPMENT

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

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

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
135144	Active Loop Antenna	ETS-Lindgren	6502	2023-01-17	2024-01-17
	30-1000 MHz				
90629 (AT0075)	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2023-01-06	2024-01-06
	1-18 GHz				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-05-24	2023-05-24
	18-40 GHz				
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-626	2022-07-11	2023-07-11
	Gain-Loss Chains				
207638	Gain-loss string: 0.009-30MHz	Various	Various	2022-05-20	2023-05-20
207639	Gain-loss string: 25-1000MHz	Various	Various	2022-05-20	2023-05-20
207640	Gain-loss string: 1-18GHz	Various	Various	2022-05-20	2023-05-20
225795	Gain-loss string: 18-40GHz	Various	Various	2022-10-12	2023-10-12
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-02-02	2024-02-02
SA0020	Spectrum Analyzer	Keysight Technologies	E4446A	2022-06-08	2023-06-08
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
21642	Environmental Meter	Fisher Scientific	15-077-963 (s/n 210701692)	2021-08-16	2023-08-16
208720	Wideband Radio Communications Tester	Rohde and Schwarz	CMW500	2022-05-02	2023-05-02
92492 (HPF012)	1GHz high-pass filter, 2W, F_{high} =18GHz	Micro-Tronics	HPM18129	2022-02-17	2023-02-28

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
169108 (BRF010)	1.85-1.97GHz notch filter, 2W, F_{high} = 9GHz	Micro-Tronics	BRM50714-01	2022-02-17	2023-02-28

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
76023 (EC0225)	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2023-01-20	2024-01-20
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
208720	Wideband Radio Communications Tester	Rohde and Schwartz	CMW500 (SN 170193)	2022-05-02	2023-05-02
MY58426145	DC Regulated Power Supply	Keysight Technologies	E3633A	NA	NA
212967	Wideband Radio Communications Tester	Rohde and Schwartz	CMW500	2022-12-14	2023-12-14
SA0027	Spectrum Analyzer	Keysight Technologies	N9030A	2022-05-24	2023-05-24
SA0020	Spectrum Analyzer	Keysight Technologies	E4446A	2022-06-08	2023-06-08
	Conducted Room 2				
HI0090	Environmental Meter	Fisher Scientific	15-088-963	2022-07-20	2023-07-20
MY62176088	DC Regulated Power Supply	Keysight Technologies	E3633A	NA	NA
MM0167 (PRE0126458)	True RMS Multimeter	Agilent	U1232A	2021-08-17	2023-08-17
76023 (EC0225)	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2022-05-24	2023-05-24
208720	Wideband Radio Communication Tester	Rohde and Schwarz	CMW500	2023-01-06	2024-01-06
226563	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2023-02-16	2024-02-16
CBL091	Micro-Coax UTiFLEX Cable Assembly, Low Loss,40Ghz	Carlisle Interconnect Technologies	UFA147A-2-0360-200200	2023-02-17	2024-02-17
CBL099	Micro-Coax UTiFLEX Cable Assembly, Low Loss,40Ghz, 39.3", Connectors 2	Carlisle Interconnect Technologies	UFA147A-0-0180-200200	2023-02-17	2024-02-17
CBL105	Micro-Coax UTiFLEX Cable Assembly, Low Loss	Carlisle Interconnect Technologies	UFB-197C-0-0160-300300	2023-02-17	2024-02-17

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

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
135144	Active Loop Antenna	ETS-Lindgren	6502	2023-01-17	2024-01-17
	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				
91975	Gain-loss string: 0.009-30MHz	Various	Various	2022-05-10	2023-05-10
91977	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
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
208720	Wideband Radio Communications Tester	Rohde and Schwarz	CMW500	2022-05-05	2023-05-05
200540	Environmental Meter	Fisher Scientific	15-077-963 s/n 181474409	2022-10-05	2023-10-05
92492 (HPF012)	1GHz high-pass filter, 2W, F_{high} =18GHz	Micro-Tronics	HPM18129	2023-02-15	2024-02-29
169106 (BRF008)	1710-1785MHz notch filter, 2W, F_{high} = 9GHz	Micro-Tronics	BRM50713-01	2023-02-15	2024-02-29
231408 (BRF011)	2.495-2.690GHz notch filter, 2W, F_{high} = 18GHz	Micro-Tronics	BRM50709-01	2023-02-15	2024-02-29
77412 (BRF001)	900MHz notch filter, 2W, F_{high} =6GHz	Micro-Tronics	BRM50706	2023-02-15	2024-02-29
169108 (BRF010)	1.85-1.97GHz notch filter, 2W, F_{high} = 9GHz	Micro-Tronics	BRM50714-01	2023-02-15	2024-02-29

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

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-05-11	2023-05-11
	18-40 GHz				
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-626	2022-07-11	2023-07-11
	Gain-Loss Chains				
91979	Gain-loss string: 1-18GHz	Various	Various	2022-12-02	2023-12-02
135999	Gain-loss string: 18-40GHz	Various	Various	2022-05-05	2023-05-05
	Receiver & Software				
72823	Spectrum Analyzer	Agilent	E4446A	2022-06-08	2023-06-08
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
200539	Environmental Meter	Fisher Scientific	15-077-963 s/n 18474341	2022-10-05	2023-10-05
213025	Wideband Radio Communications Tester	Rohde and Schwarz	CMW500	2022-09-13	2023-09-13
77836 (HPF004)	1GHz high-pass filter, 2W, F_{high} =18GHz	Micro-Tronics	HPM50115-01	2023-02-15	2024-02-29
169106 (BRF008)	1710-1785MHz notch filter, 2W, F_{high} = 9GHz	Micro-Tronics	BRM50713-01	2023-02-15	2024-02-29

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.

DUAL CARRIER HSDPA (DC-HSDPA (REL 8, CAT 24)

The following 4 Sub-tests were for DC-HSDPA were completed according to Release 8 procedures in table C08.1.12 of 3GPP TS 34.121-1. A summary of these settings are illustrated below:

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

HSPA+ REL 7

The following 1 Sub-test was completed according to Release 7 procedures in table C.11.1.4 of 3GPP TS34.121. A summary of these settings are illustrated below:

Table C.11.1.4: β **values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM**

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed}1$: 30/15 $\beta_{ed}2$: 30/15	$\beta_{ed}3$: 24/15 $\beta_{ed}4$: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

RESULT

9.1.1. WCDMA BAND 5

Test Engineer ID:	84740/44389	Test Date:	2023-03-09	Sample Used:	QV770090FR

Mode		UL Ch No.	Freq. (MHz)	Normal Average Power (dBm)	
				Measured Pwr	MPR
Release 99	Rel 99 (RMC, 12.2 kbps)	4132	826.4	21.9	N/A
		4183	836.6	21.9	
		4233	846.6	21.9	
HSDPA	Subtest 1	4132	826.4	20.9	0
		4183	836.6	21.0	
		4233	846.6	20.9	
	Subtest 2	4132	826.4	20.9	0
		4183	836.6	20.9	
		4233	846.6	20.9	
	Subtest 3	4132	826.4	20.4	0.5
		4183	836.6	20.4	
		4233	846.6	20.4	
	Subtest 4	4132	826.4	20.3	0.5
		4183	836.6	20.4	
		4233	846.6	20.3	
HSUPA	Subtest 1	4132	826.4	20.9	0
		4183	836.6	21.0	
		4233	846.6	20.9	
	Subtest 2	4132	826.4	18.9	2
		4183	836.6	19.0	
		4233	846.6	19.0	
	Subtest 3	4132	826.4	20.0	1
		4183	836.6	20.0	
		4233	846.6	20.0	
	Subtest 4	4132	826.4	18.9	2
		4183	836.6	19.0	
		4233	846.6	19.0	
	Subtest 5	4132	826.4	20.9	0
		4183	836.6	21.0	
		4233	846.6	20.9	

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. LTE5

Test Engineer ID:	27129/44389	Test Date:	2023-01-06	Sample Used:	QV77001RFA

OUTPUT POWER FOR LTE5 (1.4MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				20407	20525	20643
				824.7 MHz	836.5 MHz	848.3 MHz
1.4	QPSK	1	0	21.2	21.1	21.1
		1	2	**21.2**	21.1	21.1
		1	5	21.2	21.1	21.1
		3	0	21.2	21.1	21.1
		3	1	21.2	21.2	21.1
		3	2	21.2	21.1	21.1
		6	0	21.2	21.1	21.1
	16QAM	1	0	21.5	21.5	21.5
		1	2	**21.6**	21.5	21.5
		1	5	21.5	21.5	21.5
		3	0	21.4	21.3	21.3
		3	1	21.4	21.3	21.3
		3	2	21.4	21.3	21.3
		6	0	21.3	21.2	21.2
	64QAM	1	0	21.4	21.4	21.4
		1	2	**21.5**	21.4	21.4
		1	5	21.4	21.4	21.4
		3	0	21.3	21.2	21.3
		3	1	21.3	21.3	21.3
		3	2	21.3	21.3	21.3
		6	0	21.1	21.3	21.1

OUTPUT POWER FOR LTE5 (3MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				20415	20525	20635
				825.5 MHz	836.5 MHz	847.5 MHz
3.0	QPSK	1	0	21.1	21.1	21.2
		1	7	21.2	21.2	21.2
		1	14	21.1	21.1	21.1
		8	0	21.2	21.1	21.2
		8	4	21.2	21.2	21.2
		8	7	**21.2**	21.2	21.2
		15	0	21.2	21.2	21.2
	16QAM	1	0	21.5	21.5	21.4
		1	7	21.6	**21.6**	21.5
		1	14	21.5	21.4	21.3
		8	0	21.2	21.2	21.2
		8	4	21.3	21.2	21.2
		8	7	21.3	21.3	21.2
		15	0	21.2	21.2	21.2
	64QAM	1	0	21.4	21.4	21.3
		1	7	**21.6**	21.5	21.4
		1	14	21.4	21.4	21.3
		8	0	21.3	21.2	21.2
		8	4	21.3	21.2	21.3
		8	7	21.3	21.3	21.2
		15	0	21.3	21.2	21.2

OUTPUT POWER FOR LTE5 (5MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				20425	20525	20625
				826.5 MHz	836.5 MHz	846.5 MHz
5.0	QPSK	1	0	21.2	21.1	21.1
		1	12	21.3	**21.3**	21.3
		1	24	21.1	21.1	21.1
		12	0	21.2	21.1	21.1
		12	6	21.3	21.2	21.1
		12	11	21.2	21.2	21.2
		25	0	21.2	21.2	21.1
	16QAM	1	0	21.5	21.5	21.5
		1	12	**21.7**	21.7	21.6
		1	24	21.5	21.5	21.5
		12	0	21.3	21.2	21.2
		12	6	21.4	21.2	21.3
		12	11	21.3	21.3	21.3
		25	0	21.2	21.2	21.1
	64QAM	1	0	21.4	21.4	21.3
		1	12	21.5	**21.5**	21.5
		1	24	21.5	21.4	21.3
		12	0	21.3	21.1	21.2
		12	6	21.3	21.2	21.2
		12	11	21.3	21.2	21.3
		25	0	21.2	21.2	21.1

OUTPUT POWER FOR LTE5 (10MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				20450	20525	20600
				829.0 MHz	836.5 MHz	844.0 MHz
10.0	QPSK	1	0	21.3	21.2	21.3
		1	24	21.2	21.2	21.3
		1	49	21.3	21.2	21.2
		25	0	21.2	21.2	21.2
		25	12	**21.3**	21.3	21.2
		25	24	21.3	21.2	21.3
		50	0	21.3	21.2	21.2
	16QAM	1	0	21.6	**21.6**	21.6
		1	24	21.6	21.5	21.5
		1	49	21.6	21.6	21.5
		25	0	21.3	21.2	21.3
		25	12	21.3	21.3	21.3
		25	24	21.3	21.3	21.3
		50	0	21.3	21.2	21.2
	64QAM	1	0	**21.6**	21.4	21.6
		1	24	21.6	21.4	21.6
		1	49	21.6	21.4	21.5
		25	0	21.3	21.2	21.2
		25	12	21.3	21.3	21.3
		25	24	21.3	21.2	21.3
		50	0	21.3	21.3	21.3

9.2.2. LTE13

Test Engineer ID:	84740/44389	Test Date:	2023-03-09	Sample Used:	QV770090FR

OUTPUT POWER FOR LTE13 (5MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1 Conducted Average (dBm)		
				23205	23230	23255
				779.5 MHz	782.0 MHz	784.5 MHz
5.0	QPSK	1	0	20.6	20.6	20.6
		1	12	20.7	20.7	**20.8**
		1	24	20.6	20.6	20.6
		12	0	20.6	20.6	20.6
		12	6	20.7	20.6	20.6
		12	11	20.7	20.7	20.7
		25	0	20.7	20.6	20.6
	16QAM	1	0	21.1	20.9	21.0
		1	12	**21.1**	21.1	21.1
		1	24	21.0	20.9	20.9
		12	0	20.8	20.7	20.6
		12	6	20.9	20.7	20.7
		12	11	20.8	20.8	20.7
		25	0	20.7	20.7	20.6
	64QAM	1	0	20.9	20.9	20.9
		1	12	**21.0**	20.9	20.9
		1	24	20.9	20.9	20.9
		12	0	20.7	20.6	20.6
		12	6	20.7	20.7	20.6
		12	11	20.7	20.7	20.7
		25	0	20.7	20.6	20.6

OUTPUT POWER FOR LTE13 (10MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				N/A	23230	N/A
				N/A	782.0 MHz	N/A
10.0	QPSK	1	0		**20.7**	
		1	24		20.7	
		1	49		20.6	
		25	0		20.7	
		25	12		20.7	
		25	24		20.7	
		50	0		20.7	
	16QAM	1	0		**21.1**	
		1	24		21.0	
		1	49		20.9	
		25	0		20.7	
		25	12		20.7	
		25	24		20.7	
		50	0		20.7	
	64QAM	1	0		**21.1**	
		1	24		21.0	
		1	49		20.9	
		25	0		20.7	
		25	12		20.7	
		25	24		20.7	
		50	0		20.7	

9.2.3. LTE41

Test Engineer ID:	84740/44389	Test Date:	2023-03-09	Sample Used:	QV770090FR

OUTPUT POWER FOR LTE41 (5MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				39675	40620	41565
				2498.5 MHz	2593.0 MHz	2687.5 MHz
5.0	QPSK	1	0	19.2	19.1	19.1
		1	12	19.3	**19.3**	19.2
		1	24	19.1	19.2	19.1
		12	0	19.2	19.2	19.1
		12	6	19.3	19.3	19.2
		12	11	19.3	19.2	19.1
		25	0	19.2	19.2	19.1
	16QAM	1	0	19.2	19.2	19.1
		1	12	19.3	19.3	19.3
		1	24	19.1	19.2	19.1
		12	0	19.3	19.2	19.1
		12	6	**19.3**	19.2	19.2
		12	11	19.3	19.2	19.2
		25	0	19.2	19.3	19.2
	64QAM	1	0	19.2	19.2	19.2
		1	12	**19.3**	19.3	19.2
		1	24	19.2	19.2	19.1
		12	0	19.2	19.1	19.1
		12	6	19.2	19.3	19.2
		12	11	19.2	19.2	19.2
		25	0	19.2	19.2	19.2

OUTPUT POWER FOR LTE41 (10MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				39700	40620	41540
				2501.0 MHz	2593.0 MHz	2685.0 MHz
10.0	QPSK	1	0	19.2	19.2	19.1
		1	24	19.2	19.2	19.1
		1	49	19.1	19.2	19.1
		25	0	19.2	19.2	19.1
		25	12	19.2	**19.3**	19.1
		25	24	19.2	19.3	19.2
		50	0	19.2	19.3	19.1
	16QAM	1	0	19.2	19.2	19.2
		1	24	19.2	**19.4**	19.3
		1	49	19.3	19.3	19.2
		25	0	19.2	19.2	19.2
		25	12	19.2	19.3	19.2
		25	24	19.2	19.3	19.2
		50	0	19.2	19.3	19.1
	64QAM	1	0	19.2	19.2	19.1
		1	24	19.2	19.2	19.0
		1	49	19.2	19.2	19.0
		25	0	19.2	19.2	19.1
		25	12	19.3	**19.3**	19.1
		25	24	19.2	19.3	19.1
		50	0	19.2	19.3	19.1

OUTPUT POWER FOR LTE41 (15MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				39725	40620	41515
				2503.5 MHz	2593.0 MHz	2682.5 MHz
15.0	QPSK	1	0	19.0	19.1	19.0
		1	37	19.0	19.1	19.0
		1	74	19.0	19.1	19.0
		36	0	19.0	19.0	19.0
		36	16	19.1	19.1	19.0
		36	35	19.1	**19.1**	19.0
		75	0	19.1	19.1	18.9
	16QAM	1	0	19.0	19.1	19.0
		1	37	19.0	19.1	19.0
		1	74	19.0	19.1	19.0
		36	0	19.0	19.1	19.0
		36	16	19.1	19.1	19.0
		36	35	19.1	**19.2**	19.0
		75	0	19.1	19.1	19.0
	64QAM	1	0	19.1	19.0	19.0
		1	37	**19.2**	19.0	19.0
		1	74	19.1	19.0	19.0
		36	0	19.0	19.0	19.0
		36	16	19.1	19.1	19.0
		36	35	19.1	19.1	19.0
		75	0	19.1	19.1	19.0

OUTPUT POWER FOR LTE41 (20MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1		
				Conducted Average (dBm)		
				39750	40620	41490
				2506.0 MHz	2593.0 MHz	2680.0 MHz
20.0	QPSK	1	0	19.0	19.0	19.0
		1	49	19.0	19.0	19.0
		1	99	19.0	19.1	19.0
		50	0	19.0	19.0	19.0
		50	24	**19.1**	**19.1**	19.1
		50	49	19.1	19.1	19.1
		100	0	19.1	19.1	19.0
	16QAM	1	0	19.2	19.2	19.1
		1	49	**19.5**	19.3	19.1
		1	99	19.2	19.2	19.1
		50	0	19.0	19.0	19.0
		50	24	19.1	19.2	19.1
		50	49	19.1	19.2	19.1
		100	0	19.1	19.1	19.0
	64QAM	1	0	19.1	19.0	19.1
		1	49	19.2	19.1	**19.2**
		1	99	19.1	19.1	19.1
		50	0	19.0	19.0	19.0
		50	24	19.2	19.1	19.1
		50	49	19.1	19.1	19.1
		100	0	19.1	19.1	19.0

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.

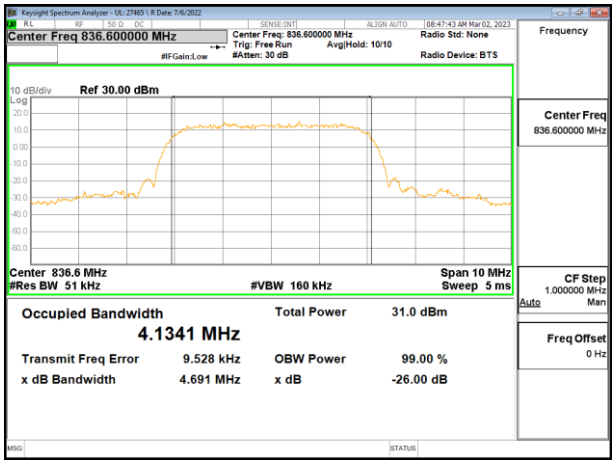
RESULTS

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.

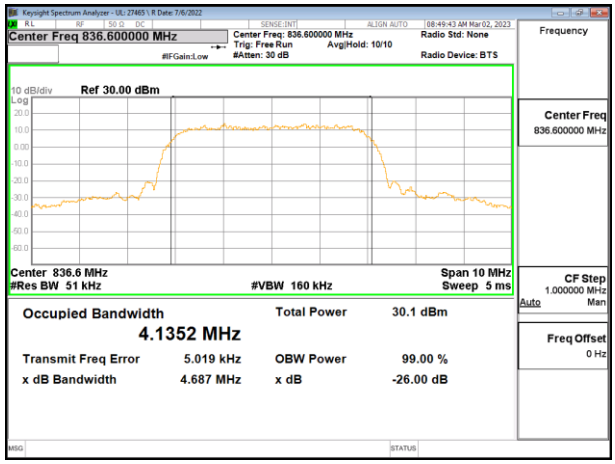
10.1.1. WCDMA

Test Engineer ID:	27465/44389	Test Date:	2023-03-02	Sample Used:	QV770090FR

Band	Modulation	Channel	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
BAND5	REL 99	4408	836.6	4.1341	4.691
	HSDPA			4.1352	4.687



BAND 5 Rel 99 MID Channel

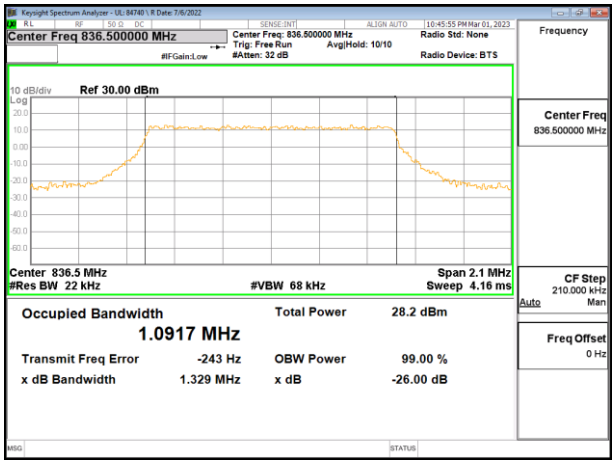


BAND 5 HSDPA MID Channel

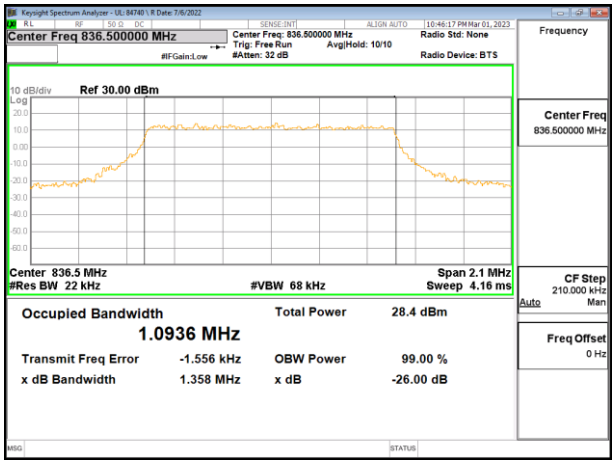
10.1.2. LTE5

Test Engineer ID:	84740/44389	Test Date:	2023-03-01	Sample Used:	QV7700ADFR

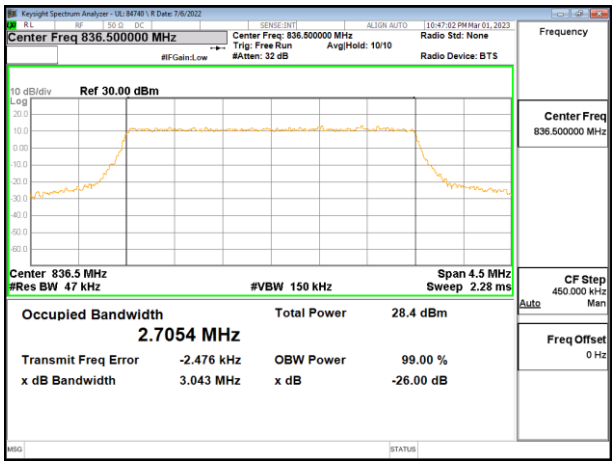
Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 5	1.4MHz, QPSK	6/0	836.5	1.097	1.329
	1.4MHz,16QAM			1.094	1.358
	3MHz, QPSK	15/0		2.705	3.043
	3MHz, 16QAM			2.704	3.068
	5MHz, QPSK	25/0		4.4997	5.050
	5MHz, 16QAM			4.499	5.076
	10MHz, QPSK	50/0		9.002	9.992
	10MHz, 16QAM			8.971	9.961



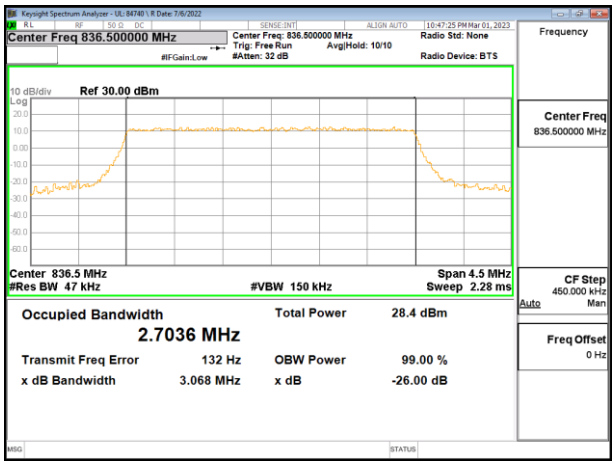
LTE5 1.4MHz QPSK MID Ch RB6-0



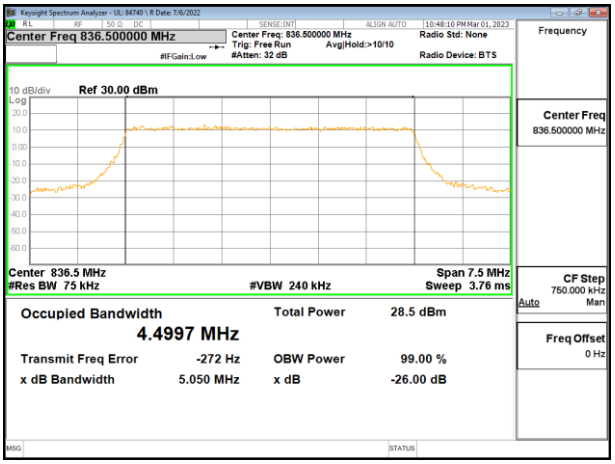
LTE5 1.4MHz 16QAM MID Ch RB6-0



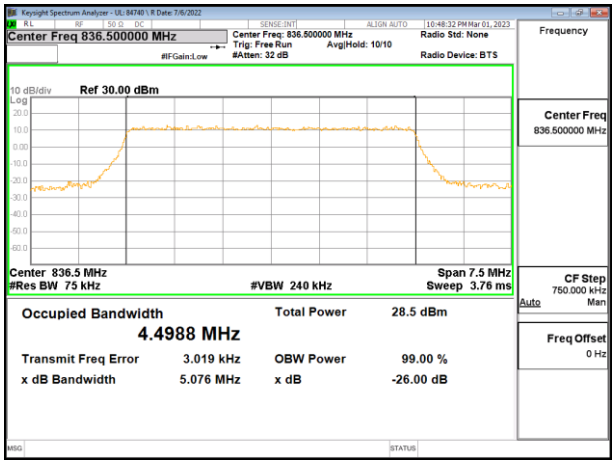
LTE5 3MHz QPSK MID Ch RB15-0



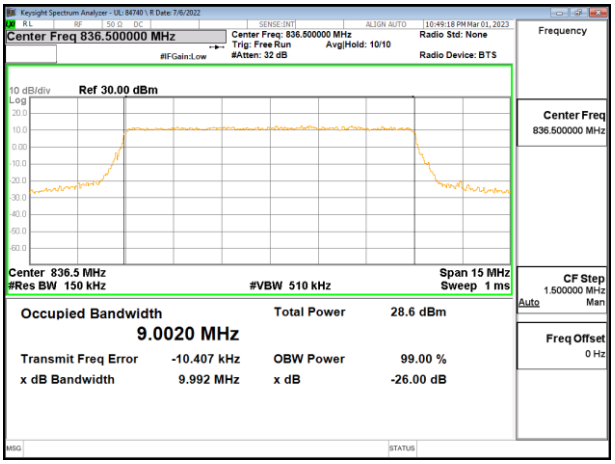
LTE5 3MHz 16QAM MID Ch RB15-0



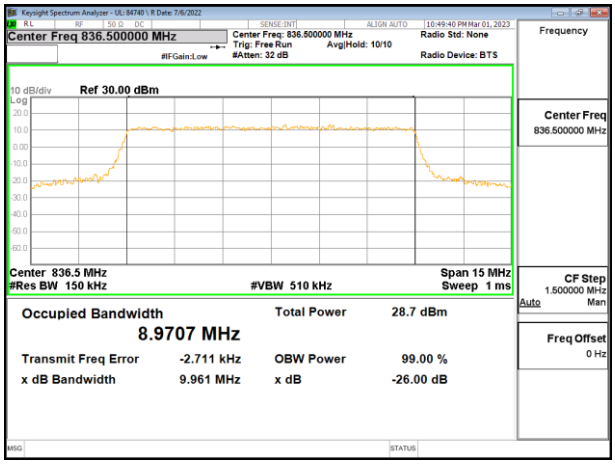
LTE5 5MHz QPSK MID Ch RB25-0



LTE5 5MHz 16QAM MID Ch RB25-0



LTE5 10MHz QPSK MID Ch RB50-0

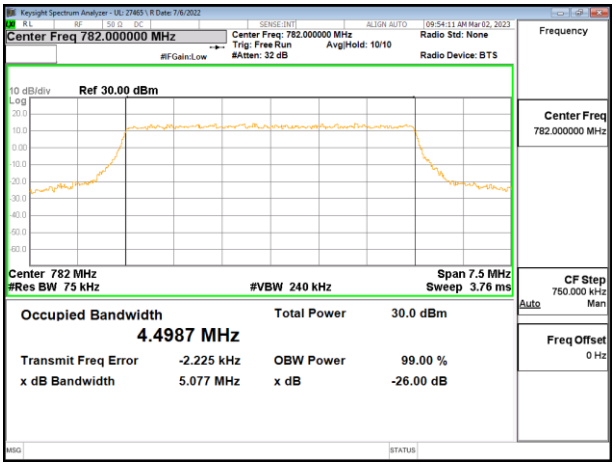


LTE5 10MHz 16QAM MID Ch RB50-0

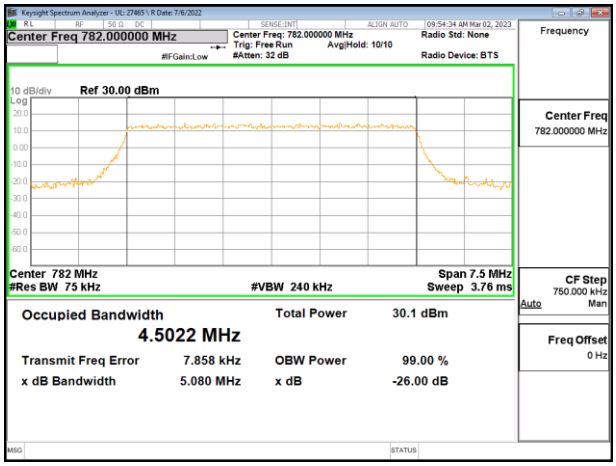
10.1.3. LTE13

Test Engineer ID:	27465/44389	Test Date:	2023-03-02	Sample Used:	QV7700ADFR

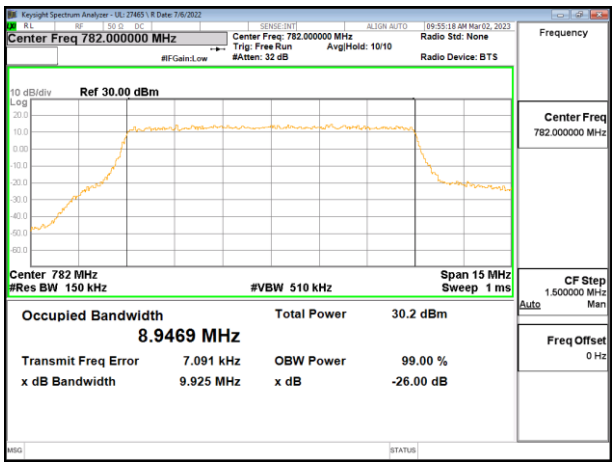
Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 13	5MHz, QPSK	25/0	782.0	4.499	5.077
	5MHz, 16QAM			4.502	5.080
	10MHz, QPSK	50/0		8.947	9.925
	10MHz, 16QAM			8.967	9.928



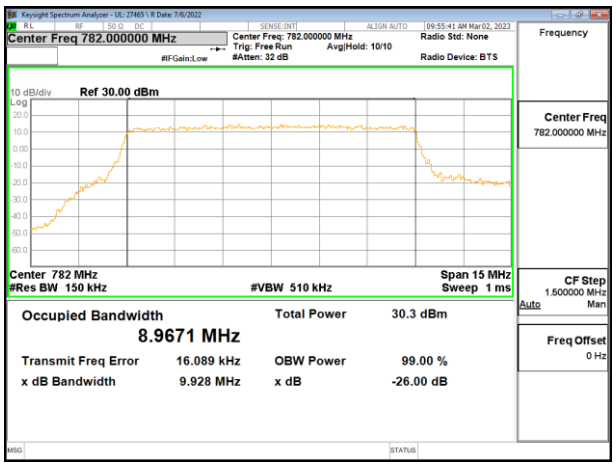
LTE13 5MHz QPSK MID Ch RB25-0



LTE13 5MHz 16QAM MID Ch RB25-0



LTE13 10MHz QPSK MID Ch RB50-0

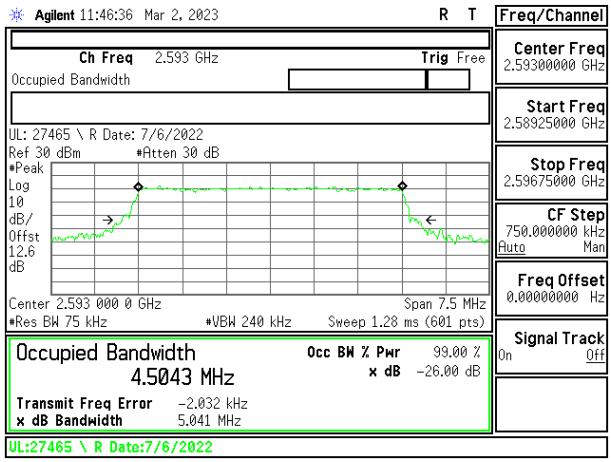


LTE13 10MHz 16QAM MID Ch RB50-0

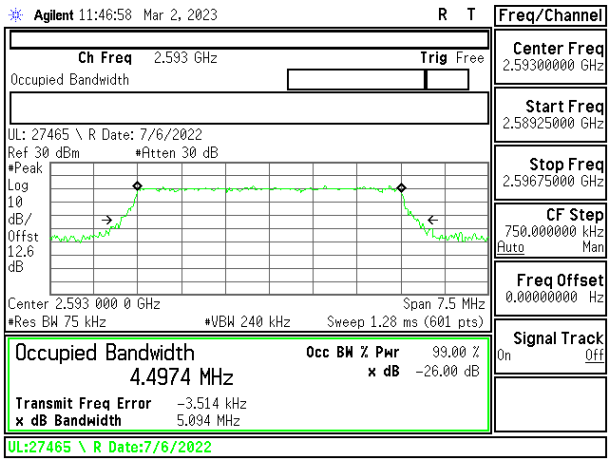
10.1.4. LTE41

Test Engineer ID:	27465/44389	Test Date:	2023-03-02	Sample Used:	QV7700ADFR

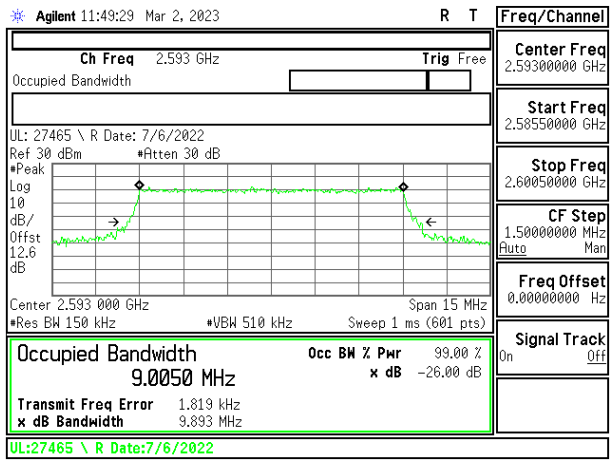
Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 41	5MHz, QPSK	25/0	2593.0	4.504	5.401
	5MHz, 16QAM			4.497	5.094
	10MHz, QPSK	50/0		9.005	9.893
	10MHz, 16QAM			8.951	9.700
	15MHz, QPSK	75/0		13.421	14.704
	15MHz, 16QAM			13.421	14.361
	20MHz, QPSK	100/0		17.891	19.441
	20MHz, 16QAM			17.876	19.368



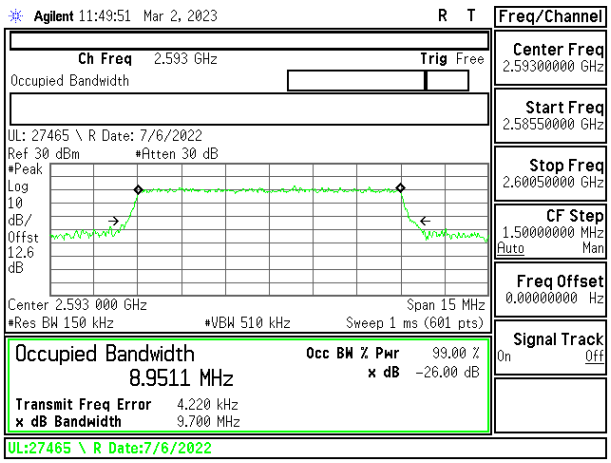
LTE41 5MHz QPSK MID Ch RB25-0



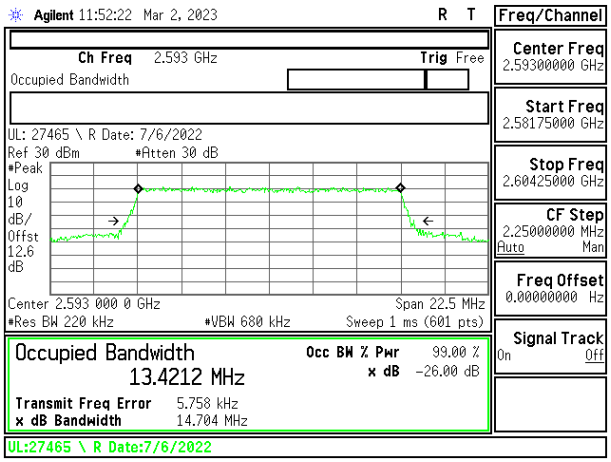
LTE41 5MHz 16QAM MID Ch RB25-0



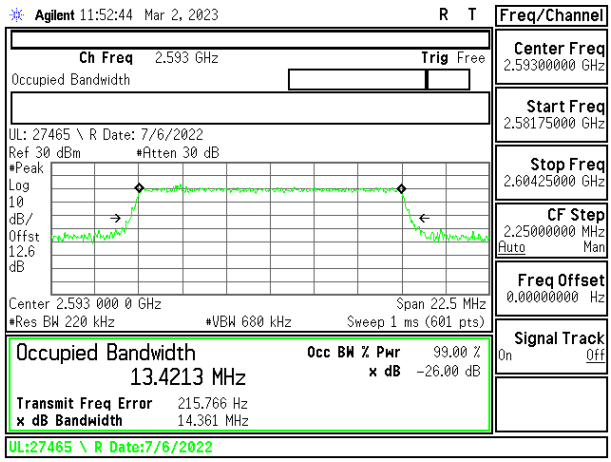
LTE41 10MHz QPSK MID Ch RB50-0



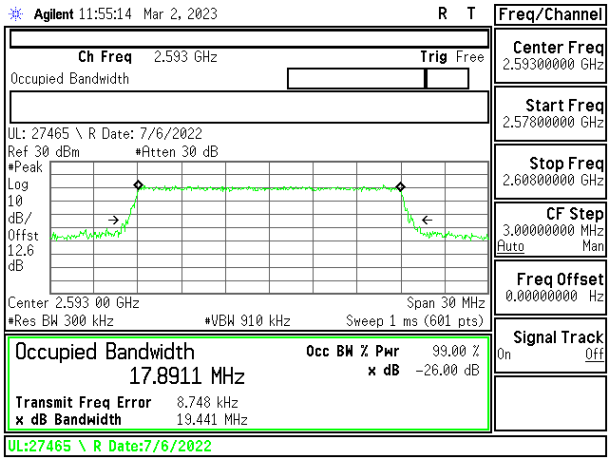
LTE41 10MHz 16QAM MID Ch RB50-0



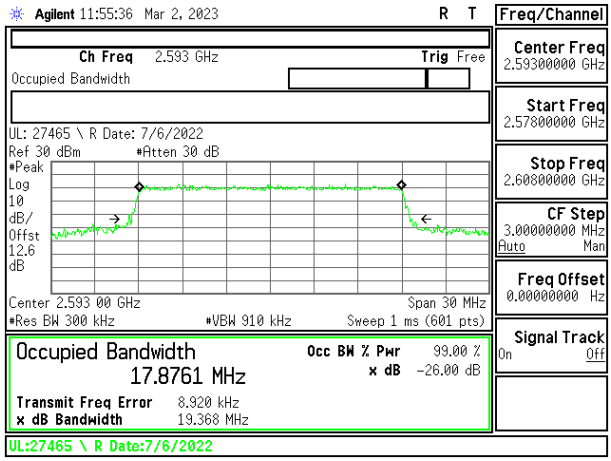
LTE41 15MHz QPSK MID Ch RB75-0



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

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.

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).

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.

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.

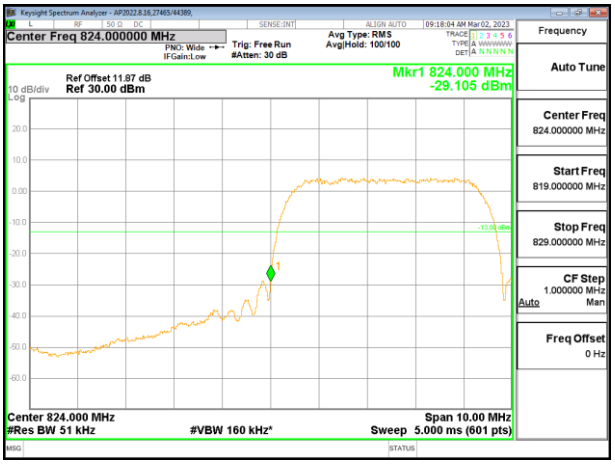
TEST PROCEDURE (FCC LTE BAND 41)

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.

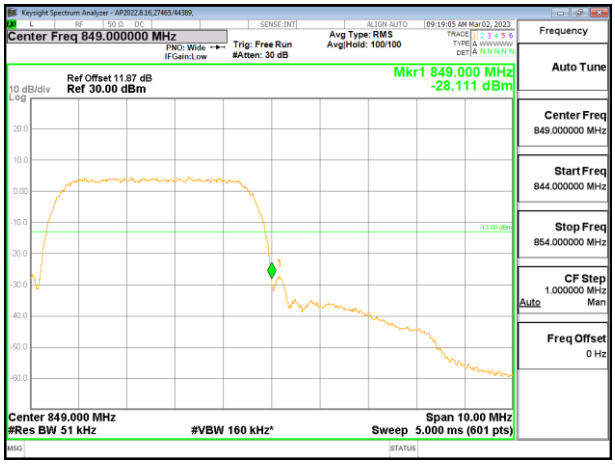
RESULTS

10.2.1. WCDMA BAND 5

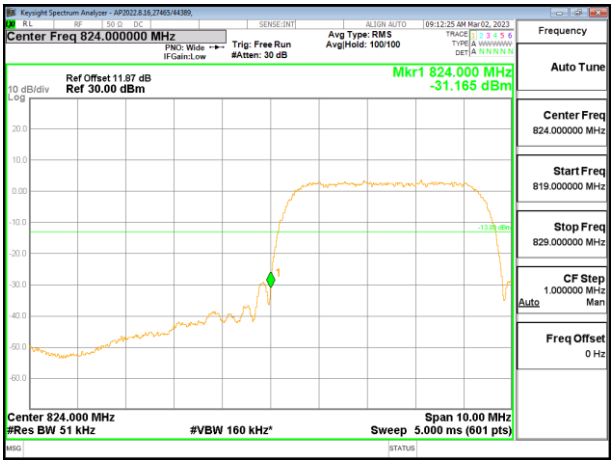
Test Engineer ID:	27465/44389	Test Date:	2023-03-02	Sample Used:	QV770090FR



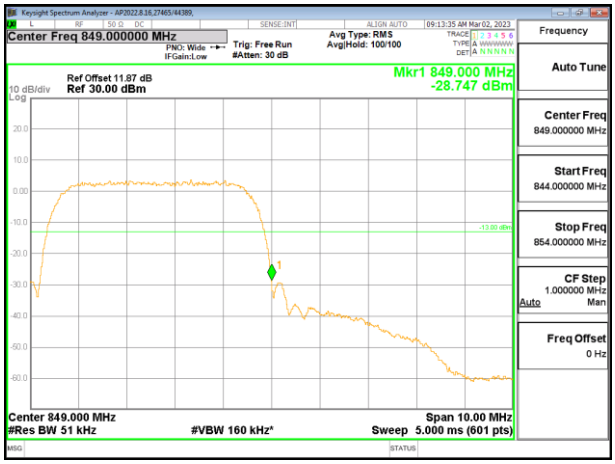
BAND 5 Rel 99 LOW Channel



BAND 5 Rel 99 HIGH Channel



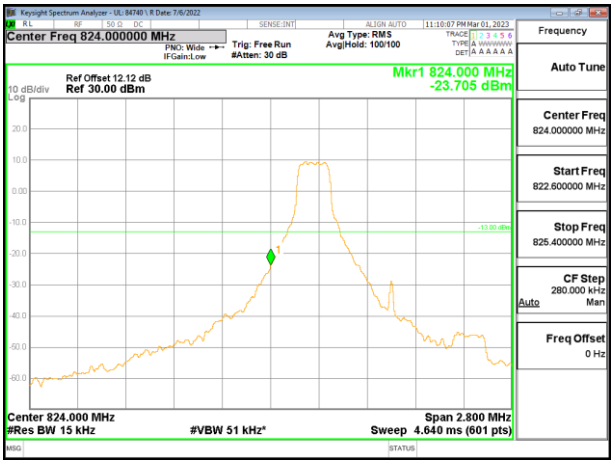
BAND 5 HSDPA LOW Channel



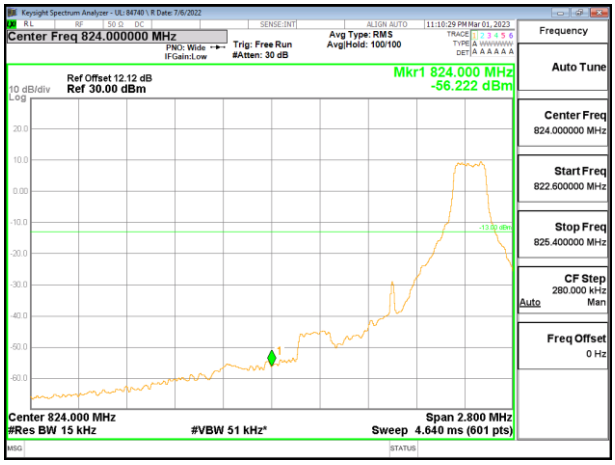
BAND 5 HSDPA HIGH Channel

10.2.2. LTE5

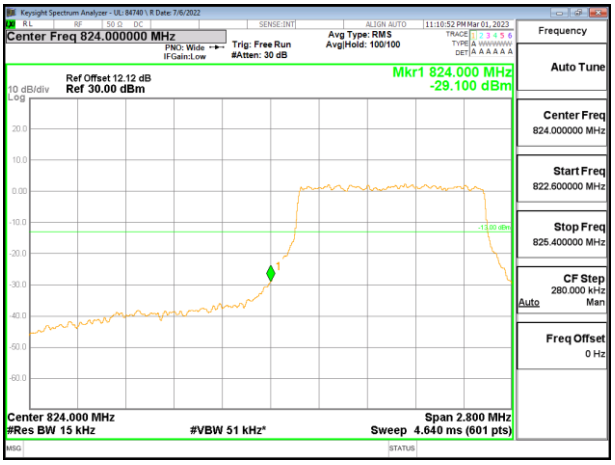
Test Engineer ID:	84740/44389	Test Date:	2023-03-01	Sample Used:	QV7700ADFR



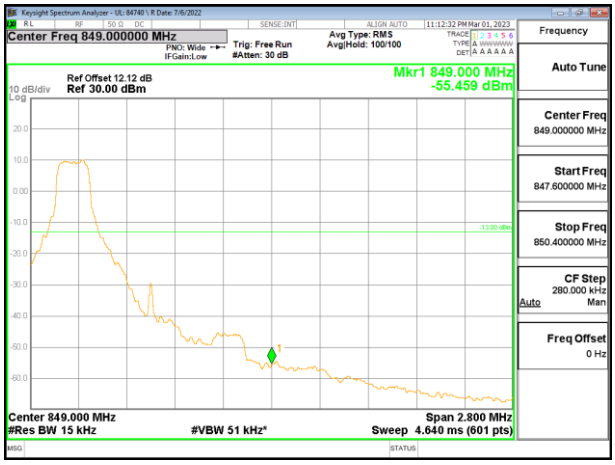
LTE5 1.4MHz QPSK LOW Ch RB1-0



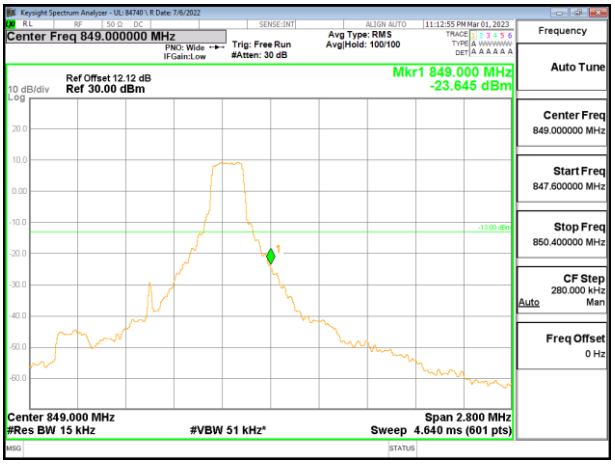
LTE5 1.4MHz QPSK LOW Ch RB1-5



LTE5 1.4MHz QPSK LOW Ch RB6-0



LTE5 1.4MHz QPSK HIGH Ch RB1-0



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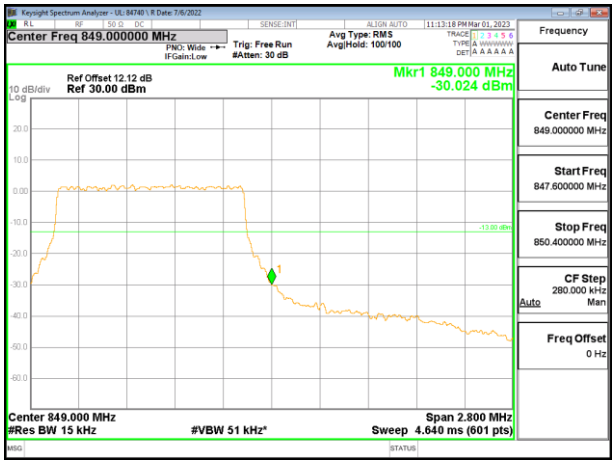

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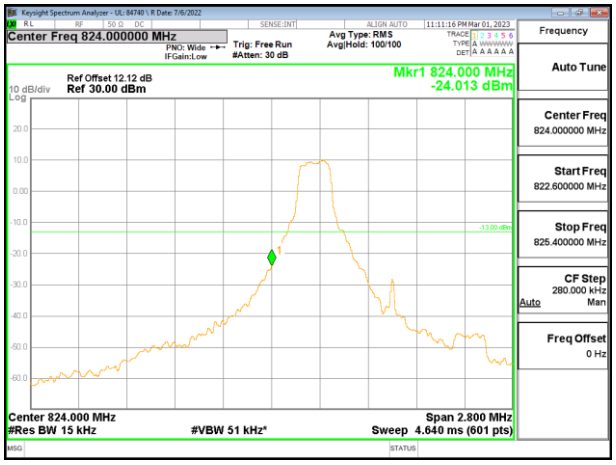
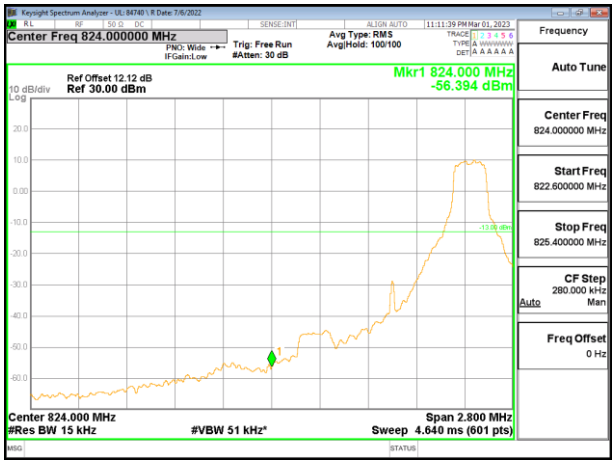


LTE5 1.4MHz 16QAM LOW Ch RB1-0



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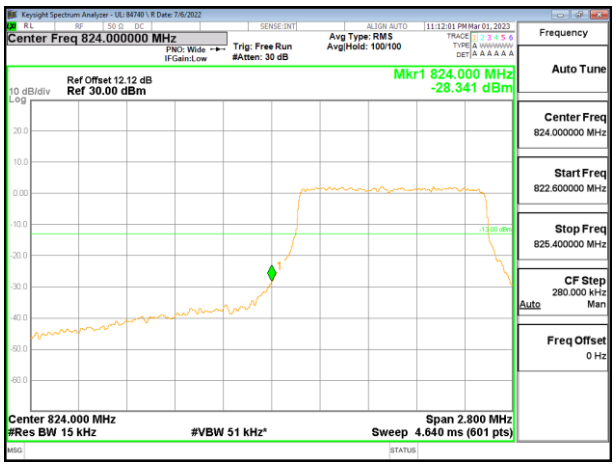

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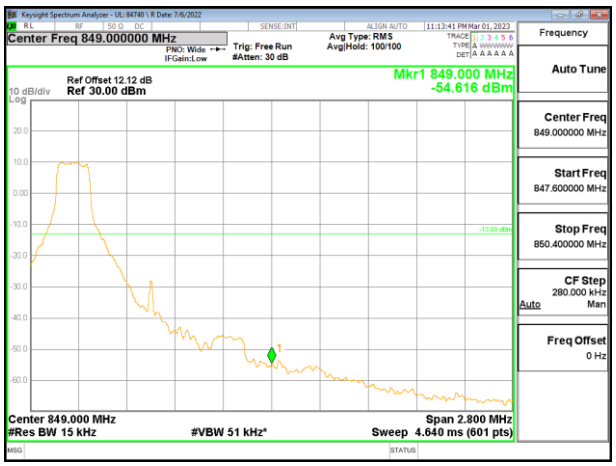
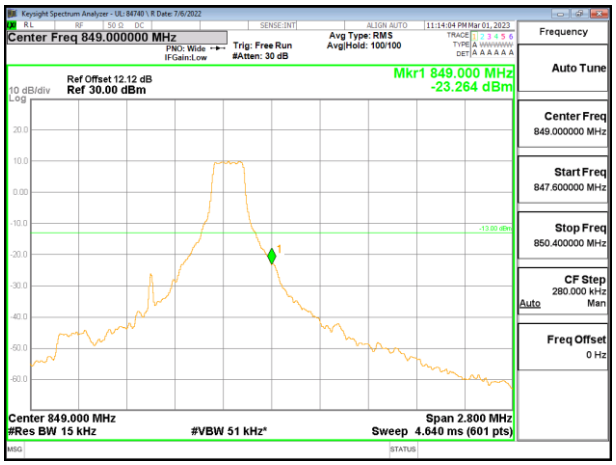
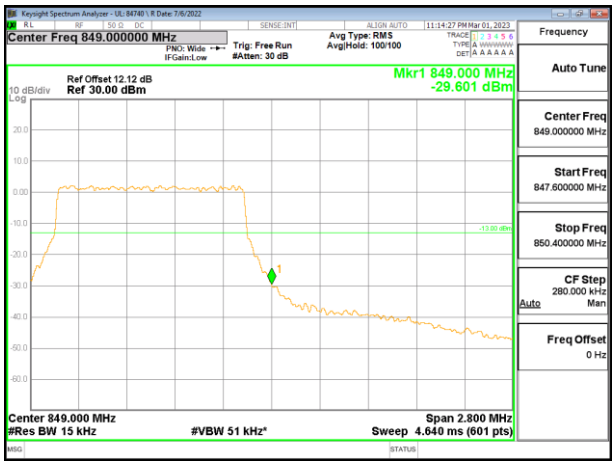


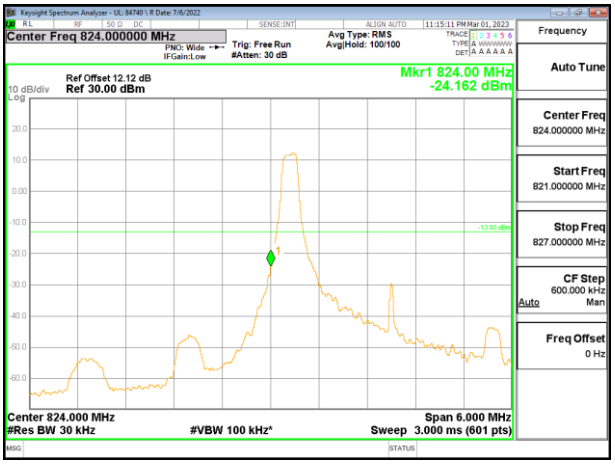
LTE5 1.4MHz 16QAM HIGH Ch RB1-0



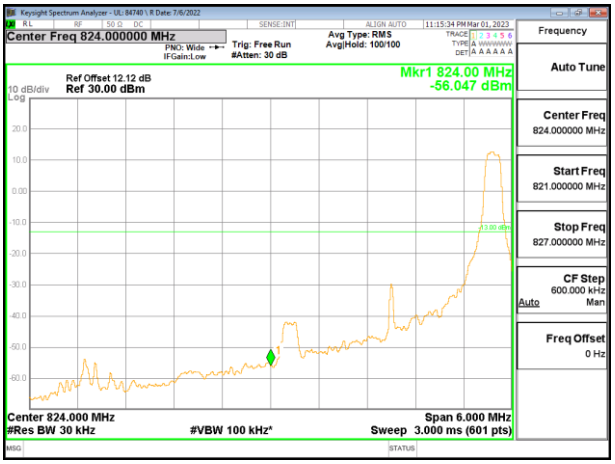
LTE5 1.4MHz 16QAM HIGH Ch RB1-5



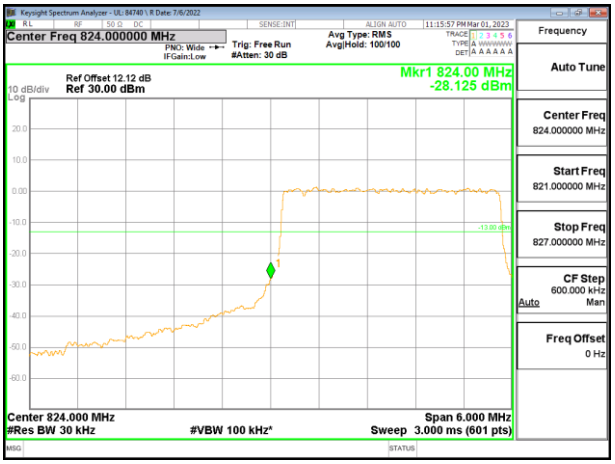
LTE5 1.4MHz 16QAM HIGH Ch RB6-0



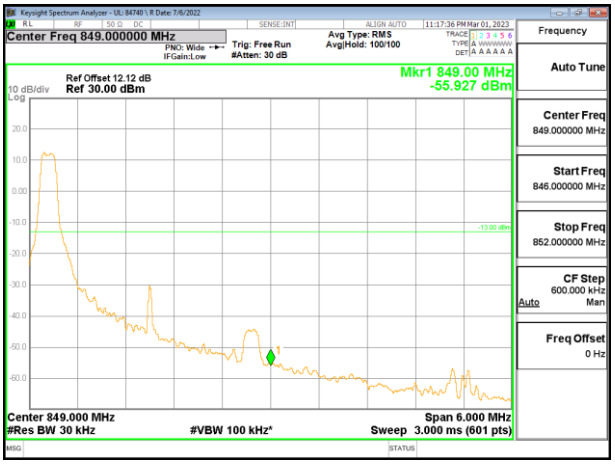
LTE5 3MHz QPSK LOW Ch RB1-0



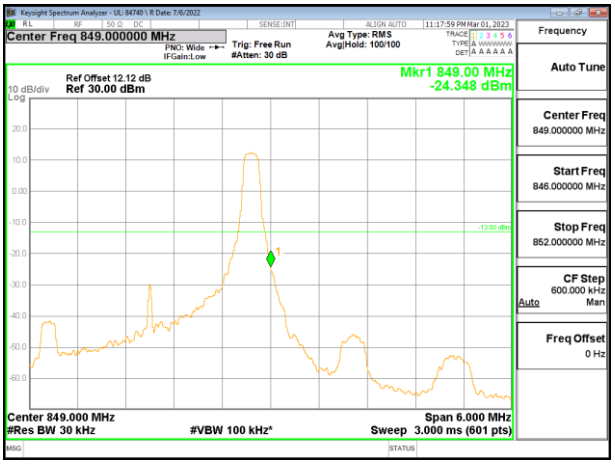
LTE5 3MHz QPSK LOW Ch RB1-14



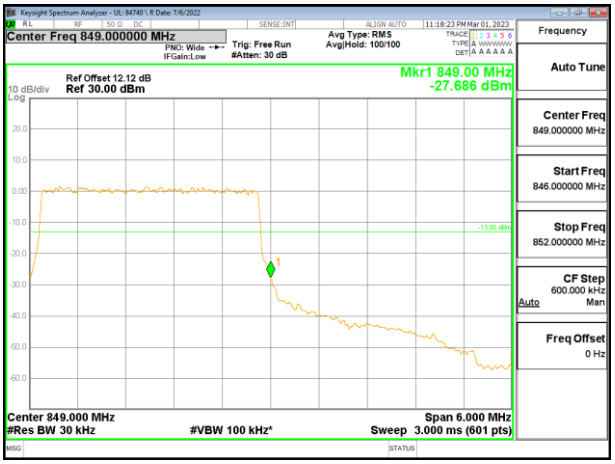
LTE5 3MHz QPSK LOW Ch RB15-0



LTE5 3MHz QPSK HIGH Ch RB1-0



LTE5 3MHz QPSK HIGH Ch RB1-14



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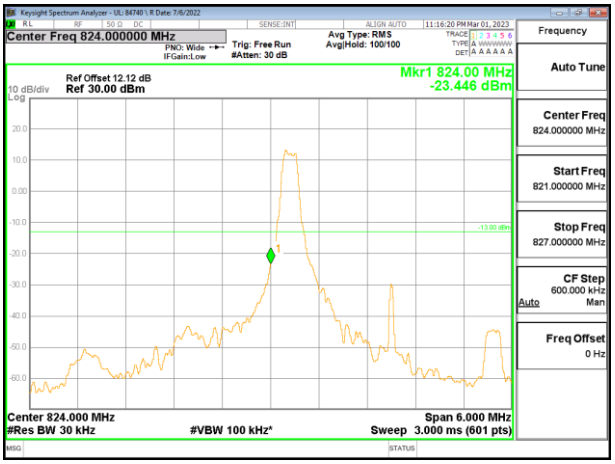
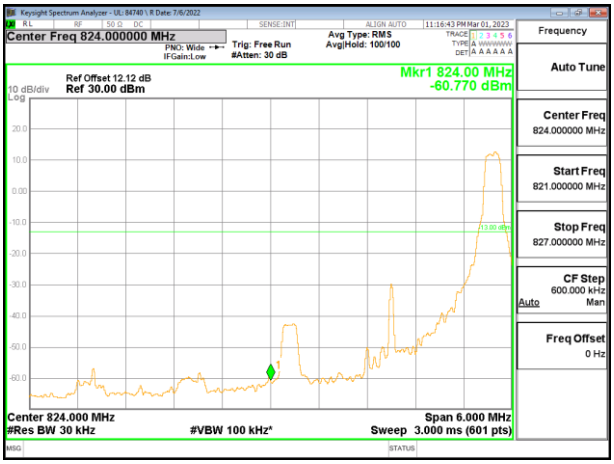
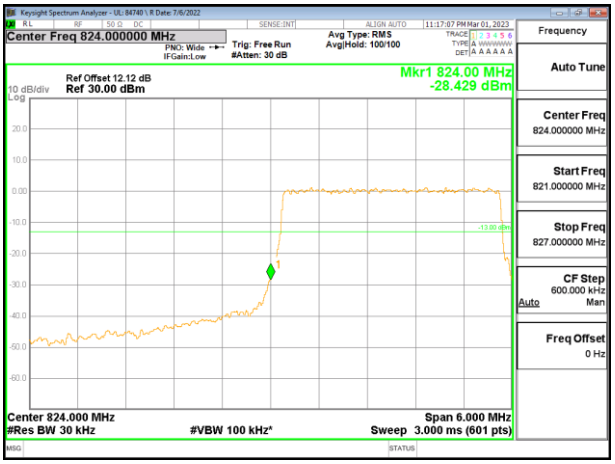


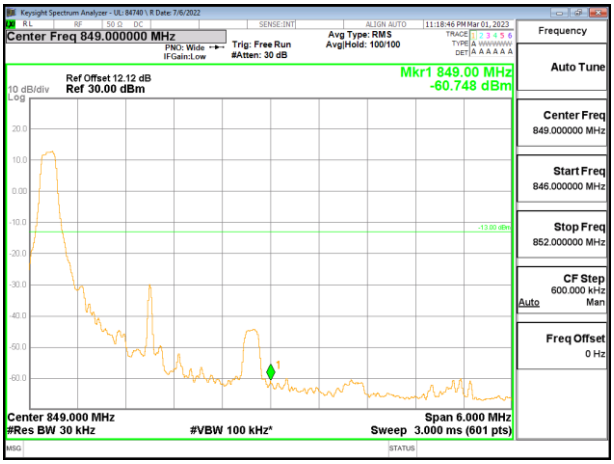
LTE5 3MHz 16QAM LOW Ch RB1-0



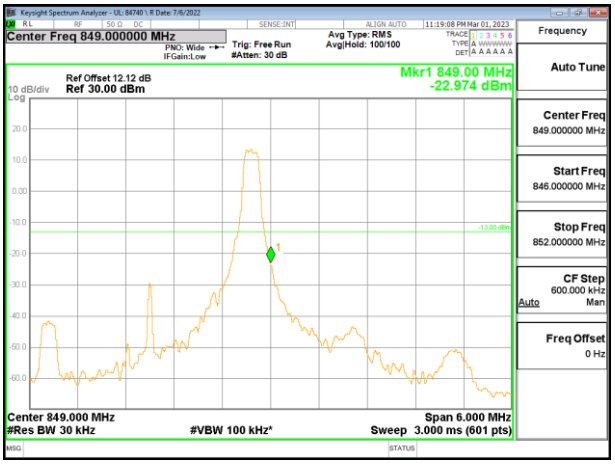
LTE5 3MHz 16QAM LOW Ch RB1-14



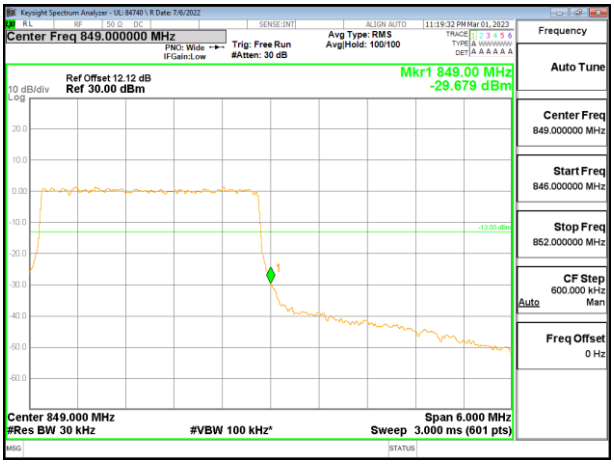
LTE5 3MHz 16QAM LOW Ch RB15-0



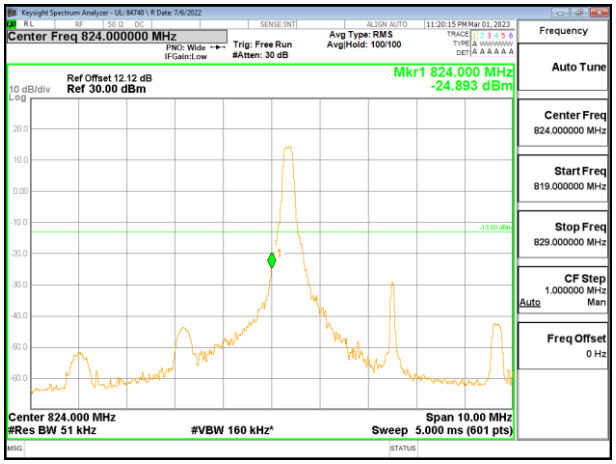
LTE5 3MHz 16QAM HIGH Ch RB1-0



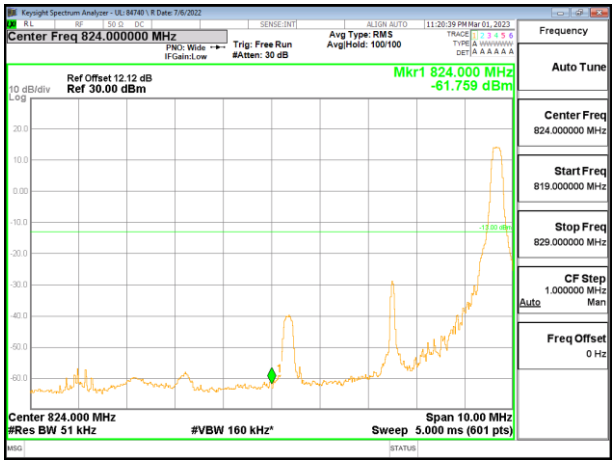
LTE5 3MHz 16QAM HIGH Ch RB1-14



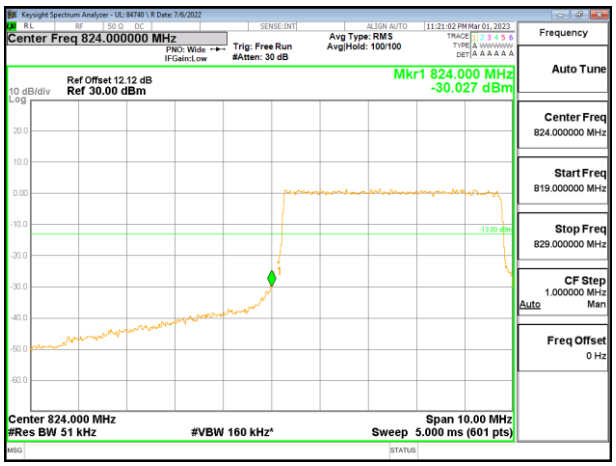
LTE5 3MHz 16QAM HIGH Ch RB15-0



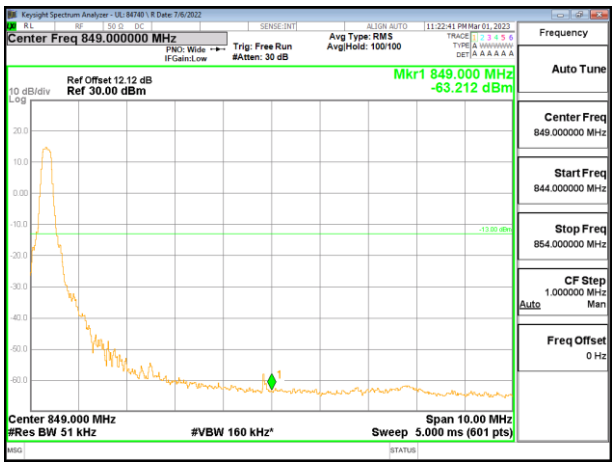
LTE5 5MHz QPSK LOW Ch RB1-0



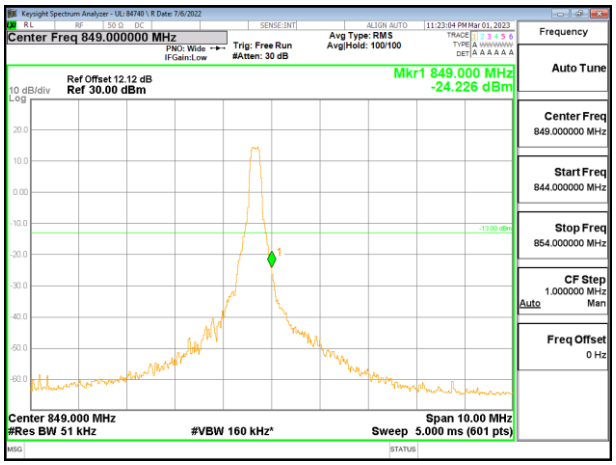
LTE5 5MHz QPSK LOW Ch RB1-24



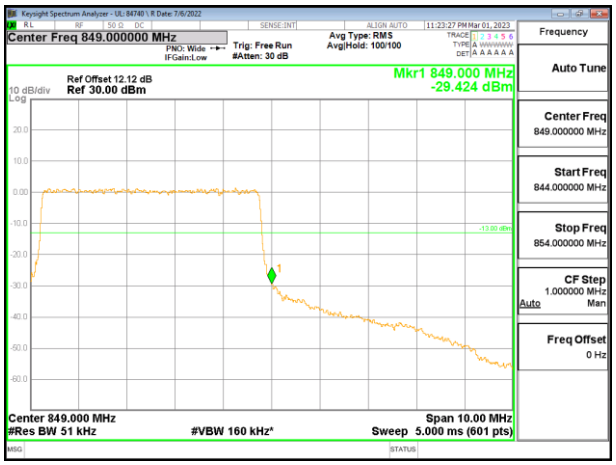
LTE5 5MHz QPSK LOW Ch RB25-0



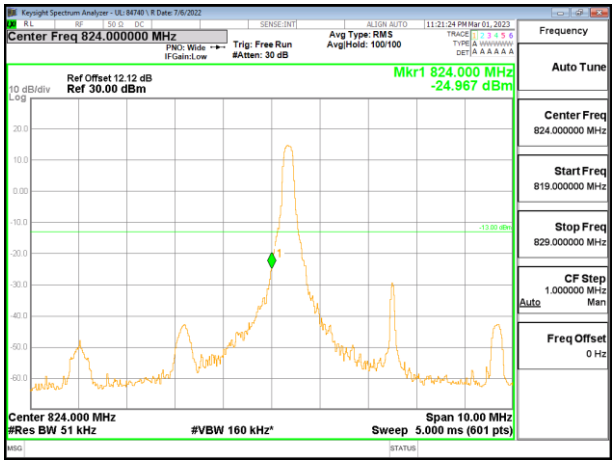
LTE5 5MHz QPSK HIGH Ch RB1-0



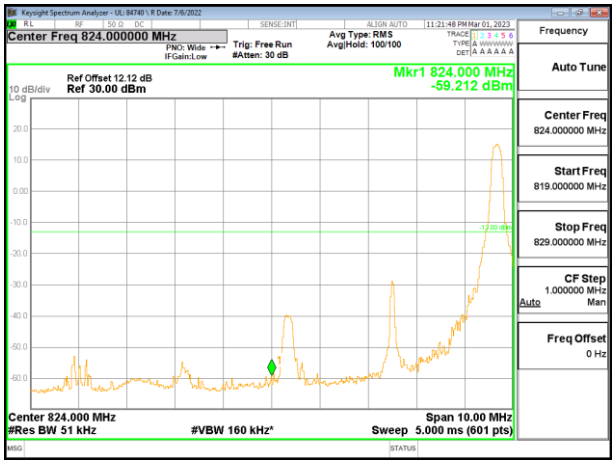
LTE5 5MHz QPSK HIGH Ch RB1-24



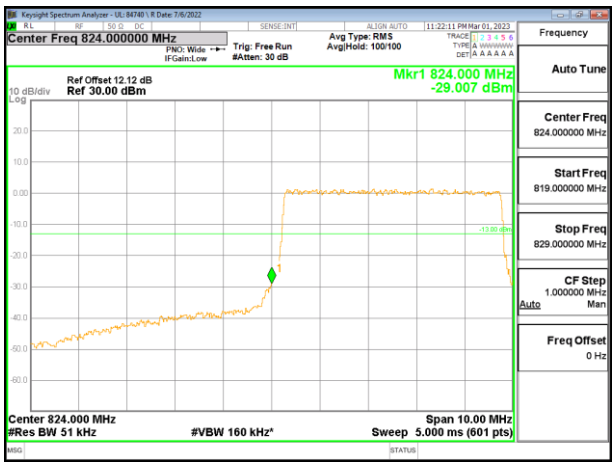
LTE5 5MHz QPSK HIGH Ch RB25-0



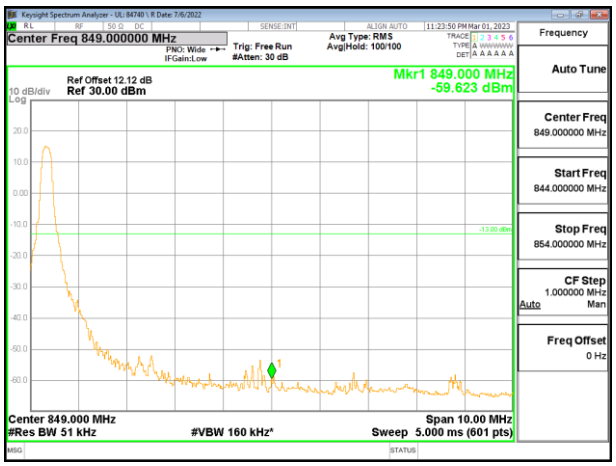
LTE5 5MHz 16QAM LOW Ch RB1-0



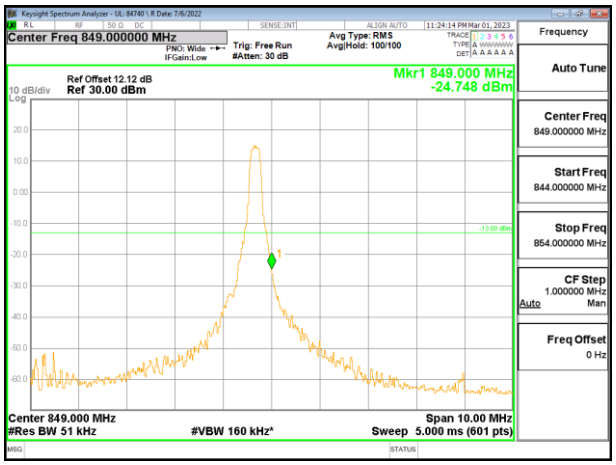
LTE5 5MHz 16QAM LOW Ch RB1-24



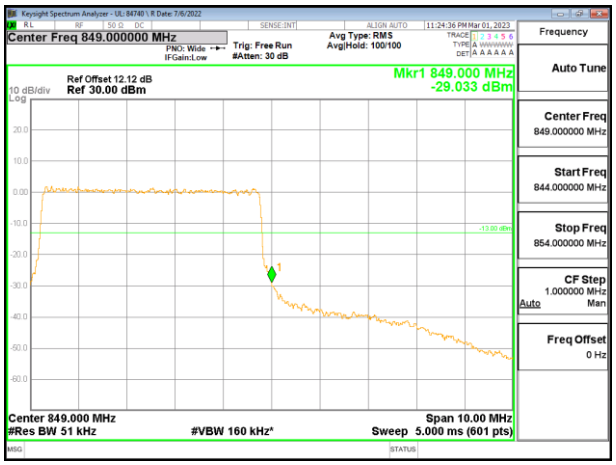
LTE5 5MHz 16QAM LOW Ch RB25-0



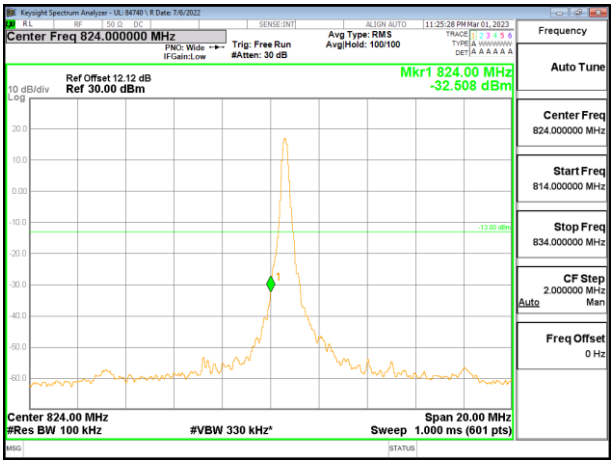
LTE5 5MHz 16QAM HIGH Ch RB1-0



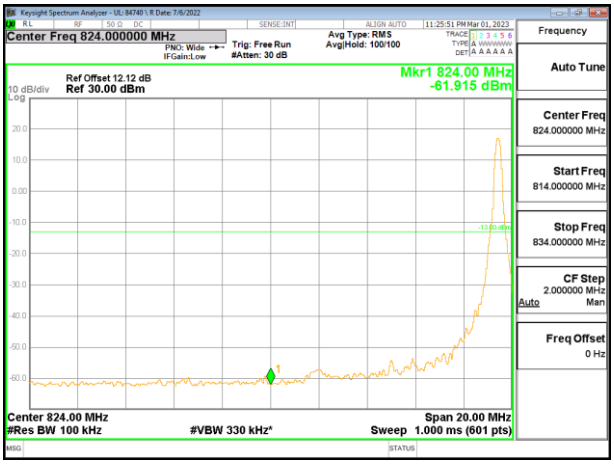
LTE5 5MHz 16QAM HIGH Ch RB1-24



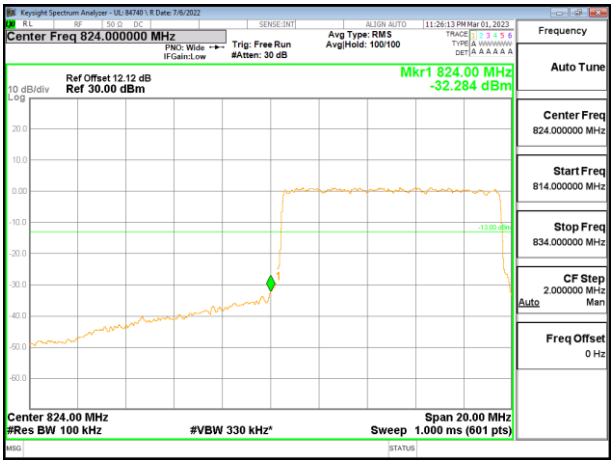
LTE5 5MHz 16QAM HIGH Ch RB25-0



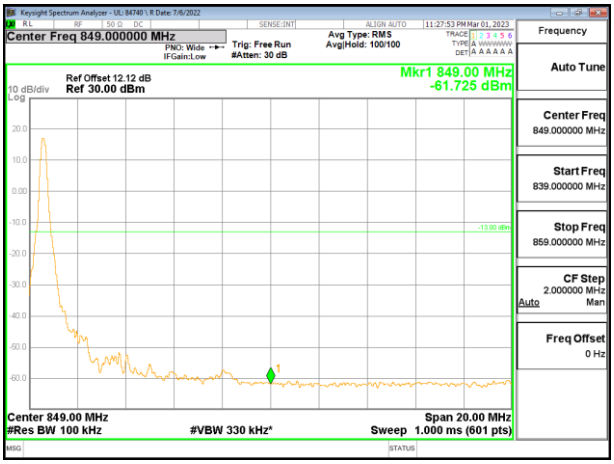
LTE5 10MHz QPSK LOW Ch RB1-0



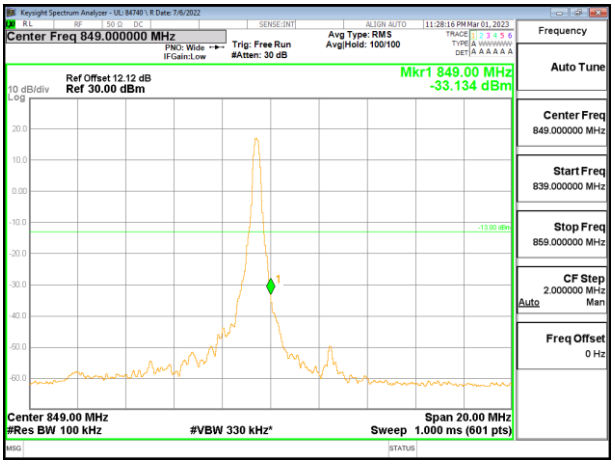
LTE5 10MHz QPSK LOW Ch RB1-49



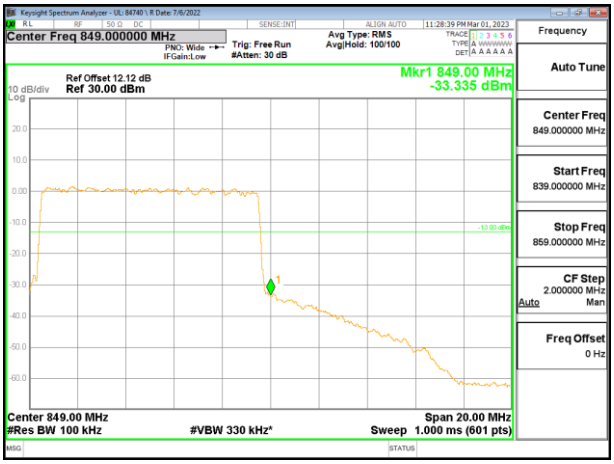
LTE5 10MHz QPSK LOW Ch RB50-0



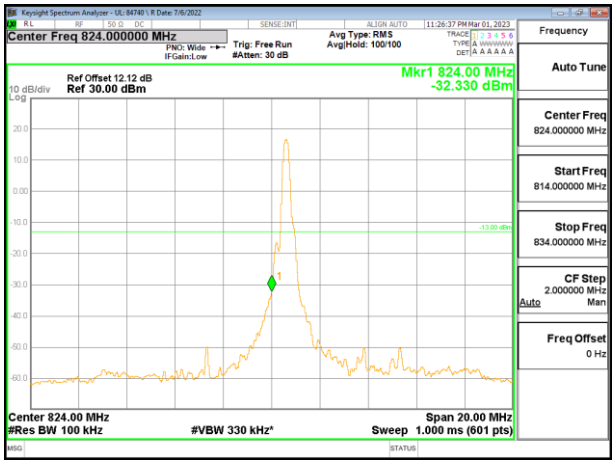
LTE5 10MHz QPSK HIGH Ch RB1-0



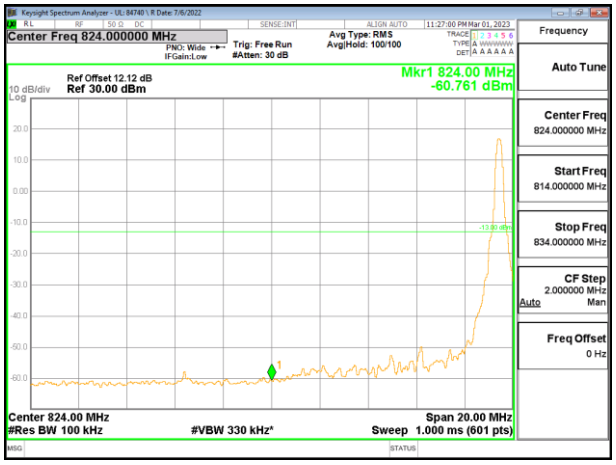
LTE5 10MHz QPSK HIGH Ch RB1-49



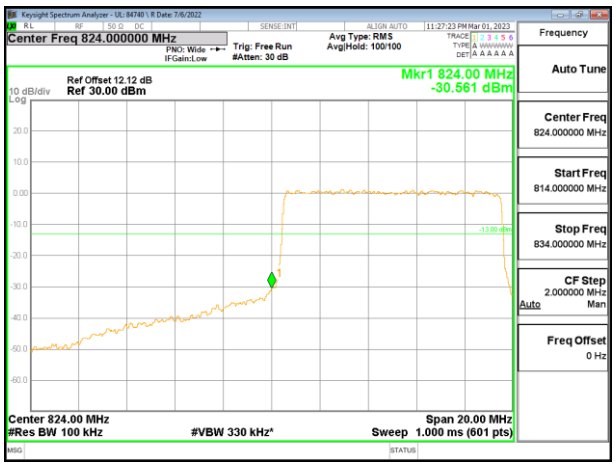
LTE5 10MHz QPSK HIGH Ch RB50-0



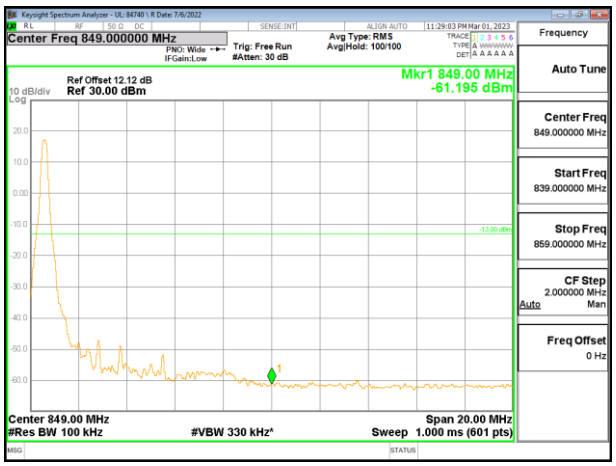
LTE5 10MHz 16QAM LOW Ch RB1-0



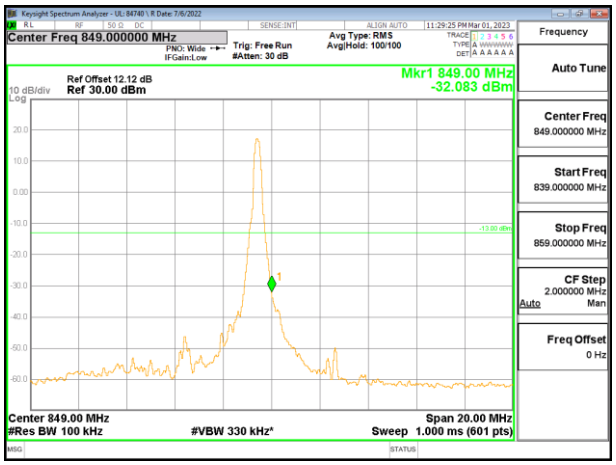
LTE5 10MHz 16QAM LOW Ch RB1-49



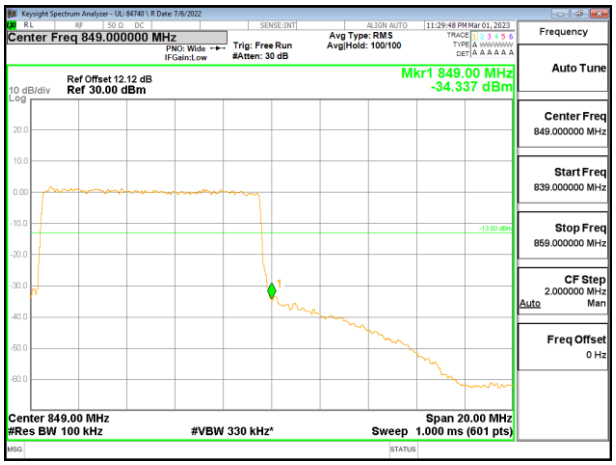
LTE5 10MHz 16QAM LOW Ch RB50-0



LTE5 10MHz 16QAM HIGH Ch RB1-0



LTE5 10MHz 16QAM HIGH Ch RB1-49



LTE5 10MHz 16QAM HIGH Ch RB50-0