

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 96 SUBPART E REQUIREMENT

OF

Applicant: Compal Electronics, Inc
No.581 & 581-1, Ruiguang Rd., Neihu District, Taipei,
(114) Taiwan

Product Name: 5G M.2 Module

Brand Name: Compal

Model No.: RXM-G1

Model Difference: N/A

FCC ID: GKRRXMG1

Report Number: E2/2019/A0030

Issue Date: Jul. 02, 2020

Date of Test: Nov. 28, 2019 ~ Jun. 22, 2020

Date of EUT Received: Oct. 31, 2019

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.26-2015 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Approved By:

CHUN-CHIEH, CHEN

Chun Chieh Chen / Supervisor



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Revision History

Report Number	Revision	Description	Issue Date	Remark
E2/2019/A0030	Rev.00	Original.	Jul. 02, 2020	Revised By: Karen Huang

Note:

1、Disclaimer

Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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1. GENERAL PRODUCT INFORMATION

1.1. Product Description

General:

Product Name:	5G M.2 Module
Brand Name:	Compal
Model No.:	RXM-G1
Model Difference:	N/A
Hardware Version:	DVT-1
Software Version:	RXMG1.00.00.036
Power Supply:	DC 3.3V
IMEI:	359047100009060

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1.2. LTE: Cellular Phone Standards Frequency Range 3500~3700Mhz

LTE Band	BW (MHz)	Operation Frequency (MHz)	
48	5	3552.5	3697.5
	10	3555.0	3695.0
	15	3557.5	3692.5
	20	3560.0	3690.0

Antenna Designation

Vendor	Type	Model Name	Modulation	Frequency (MHz)			Peak Antenna Gain (dBi)
Pulse	PIFA	ANT2	LTE Band 48	3550	~	3700	-2dBi

1.3. Type of Emission & Max ERP/EIRP Power Measurement Result:

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm/10MHz)		(W)	99%	Type of Emission
48	5	3552.5	3697.5	QPSK	21.82	EIRP	0.152	4.5348	4M53G7D
				16QAM	20.86	EIRP	0.122	4.5177	4M52D7W
				64QAM	20.12	EIRP	0.103	4.5197	4M52D7W
				256QAM	16.83	EIRP	0.048	4.5669	4M57D7W
48	10	3555.0	3695.0	QPSK	21.94	EIRP	0.156	9.0583	9M06G7D
				16QAM	21.13	EIRP	0.130	9.0627	9M06D7W
				64QAM	20.07	EIRP	0.102	9.0342	9M03D7W
				256QAM	16.95	EIRP	0.050	9.8718	9M87D7W
48	15	3557.5	3692.5	QPSK	22.92	EIRP	0.196	13.504	13M5G7D
				16QAM	22.04	EIRP	0.160	13.582	13M6D7W
				64QAM	21.00	EIRP	0.126	13.475	13M5D7W
				256QAM	17.17	EIRP	0.052	13.609	13M6D7W
48	20	3560.0	3690.0	QPSK	22.62	EIRP	0.183	18.017	18M0G7D
				16QAM	22.09	EIRP	0.162	18.044	18M0D7W
				64QAM	21.02	EIRP	0.126	18.039	18M0D7W
				256QAM	16.74	EIRP	0.047	19.302	19M3D7W

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1.4. Test Methodology of Applied Standards

FCC 47 CFR Part 2, Part 96E

ANSI C63.26-2015

ANSI/ITA C603-E.2016

KDB 971168 D01 Power Meas license Digital System v03r01

KDB 940660 D01 Part 96 CBRS Eqpt v02

KDB 412172 D01 Determining ERP and EIRP V01r01

Note: All test items have been performed and record as per the above standards.

1.5. Test Facility

SGS Taiwan Ltd. Central RF Lab (TAF code 3702)

No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333

FCC Registration Numbers: TW0028

1.6. Special Accessories

No special accessories were used during testing.

1.7. Equipment Modifications

There were no modifications incorporated into the EUT.

1.8. Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Measurement at Antenna Port

According to measurement procured ANSI C63.26-2015, the EUT is placed on a turn table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

2.3.2 Radiated Emissions (ERP/EIRP)

According to measurement procured ANSI C63.26-2015, The EUT is a placed on as turn table, for emission measurements below 1 GHz is 0.8 m above ground plane, for emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13.

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2.4. Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Following shows an offset computation in physical test.

	RF cable loss (dB)	Attenuation factor(dB)	offset(dB)
Low Band (Below 1GHz)	3.6	10	13.6
High Band (Above 1 GHz)	3.8	10	13.8

2.5. Final Amplifier Voltage and Current Information:

Test Mode	DC voltage (V)	DC current (mA)
LTE Band B48 3625Mhz	3.3	490

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2.6. Configuration of Tested System

Fig. 2-1 Configuration of Tested System (Fixed Channel-Conducted)

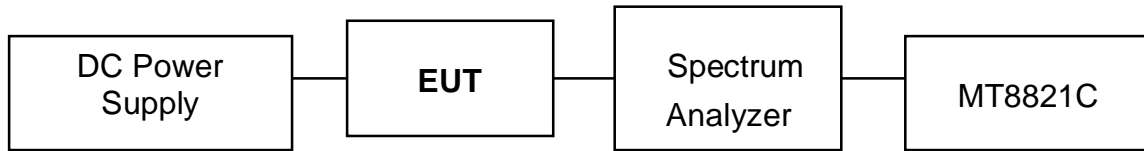
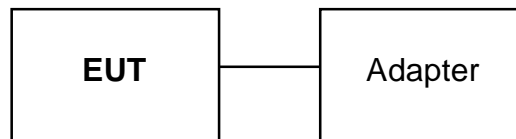


Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)



Remote Side

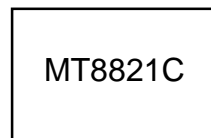


Table 2-1 Equipment Used in

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Radio Communication Analyer	Anritsu	MT8821C	6262044739	shielded	Un-shielded

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3. SUMMARY OF TEST RESULTS

3.1. Decision rules

Reported measurement data comply with ANSI C63.26-2015:

Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

3.2. Summary of test results

FCC Rules	Description Of Test	Result
§2.1046(a) §96.41(b)	Maximum Power Output	Compliant
§2.1046, §96.41(b)	Maximum Power Density	Compliant
§2.1053, §96.41(e)	FIELD STRENGTH OF SPU- RIOUS RADIATION	Compliant
§2.1051 §96.41(e)	OUT OF BAND EMISSION AT ANTENNA	Compliant
§2.1049,(h)	OCCUPIED BANDWIDTH	Compliant
§2.1055(a)	Frequency Stability	Compliant
§96.41(g)	Peak to Average Ratio	Compliant

3.3. Reporting statements of conformity

The conformity statement in this report is based solely on the test results, measurement uncertainty is excluded.

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4. DESCRIPTION OF TEST MODES

4.1. The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, X(E1)Y(E2)Z(H) axis and antenna ports. The worst case was found as listed below. Following channel(s) was (were) selected for the final test as listed below:

BAND	RADIATED EMISSION
LTE Band48	E2-plane

Note: The device does not support MIMO transmitting mode.

4.2. Measurement Configuration

LTE Band 48 MODE

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
EIRP	56765 to 58215	56765, 55990, 58215	5MHz	QPSK, 16QAM, 64QAM, 256QAM	Full RB
	55290 to 56690	55290, 55990, 56690	10MHz	QPSK, 16QAM, 64QAM, 256QAM	Full RB
	55315 to 56665	55315, 55990, 56665	15MHz	QPSK, 16QAM, 64QAM, 256QAM	Full RB
	55340 to 56640	55340, 55990, 56640	20MHz	QPSK, 16QAM, 64QAM, 256QAM	Full RB
FREQUENCY STABILITY	55290 to 56690	55290, 55990, 56690	10MHz	QPSK	Full RB
OCCUPIED BANDWIDTH	56765 to 58215	56765, 55990, 58215	5MHz	QPSK, 16QAM, 64QAM, 256QAM	Full RB
	55290 to 56690	55290, 55990, 56690	10MHz	QPSK, 16QAM, 64QAM, 256QAM	Full RB
	55315 to 56665	55315, 55990, 56665	15MHz	QPSK, 16QAM, 64QAM, 256QAM	Full RB
	55340 to 56640	55340, 55990, 56640	20MHz	QPSK, 16QAM, 64QAM, 256QAM	Full RB
PEAK TO AVERAGE RATIO	56765 to 58215	56765, 55990, 58215	5MHz	256QAM	Full RB
	55290 to 56690	55290, 55990, 56690	10MHz	256QAM	Full RB
	55315 to 56665	55315, 55990, 56665	15MHz	256QAM	Full RB
	55340 to 56640	55340, 55990, 56640	20MHz	256QAM	Full RB
BAND EDGE	56765 to 58215	56765, 58215	5MHz	QPSK	1 RB/ 0,24 RB Offest Full RB
	55290 to 56690	55290, 56690	10MHz	QPSK	1 RB/ 0,49 RB Offest Full RB
	55315 to 56665	55315, 56665	15MHz	QPSK	1 RB/ 0,74 RB Offest Full RB
	55340 to 56640	55340, 56640	20MHz	QPSK	1 RB/ 0,99 RB Offest Full RB
CONDCUDED ETED EMIS- SION	56765 to 58215	56765, 55990, 58215	5MHz	QPSK	1 RB, 0 RB Offest
	55290 to 56690	55290, 55990, 56690	10MHz	QPSK	1 RB, 0 RB Offest
	55315 to 56665	55315, 55990, 56665	15MHz	QPSK	1 RB, 0 RB Offest
	55340 to 56640	55340, 55990, 56640	20MHz	QPSK	1 RB, 0 RB Offest
RADIATED EMISSION	56765 to 58215	56765, 55990, 58215	20MHz	QPSK	1 RB, 0 RB Offest

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
Maximum Power Output	+/- 1.10 dB
Maximum Power Density	+/- 1.10 dB
Occupied Bandwidth	+/- 5.19 Hz
Out of Band Emissions at Antenna Terminals	+/- 0.70 dB
Frequency Stability vs. Temperature	+/- 5.19 Hz
Frequency Stability vs. Voltage	+/- 5.19 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6. MAXIMUM OUTPUT POWER MEASUREMENT

6.1. Standard Applicable

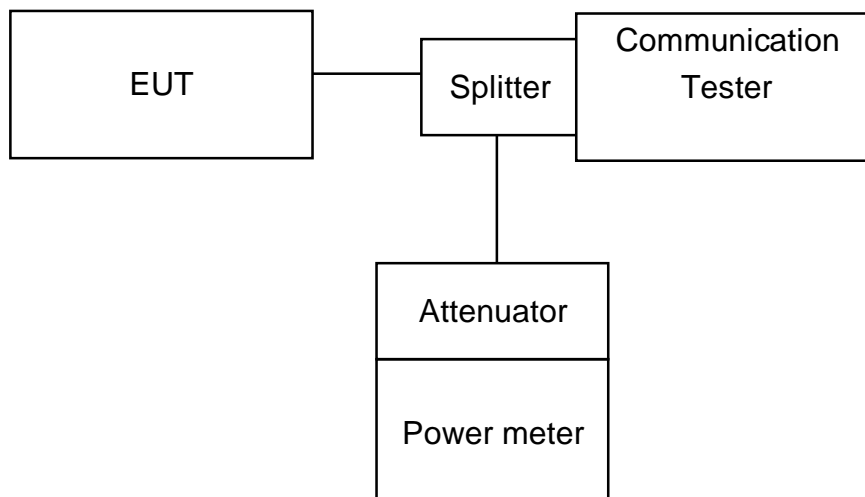
FCC §2.1046 & 96.41

- (a) FCC 96.41(a) Digital modulation. Systems operating in the Citizens Broadband Radio Service must use digital modulation techniques.
- (b) FCC 96.41(b) Power limits. Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph (b):

Device	Maximum EIRP (dBm/10 megahertz)
End User Device	23
Category A CBSD	30
Category B CBSD ¹	47

Category B CBSDs will only be authorized for use after an ESC is approved and commercially deployed consistent with §§96.15 and 96.67.

6.2. Test Set-up



Note: Measurement setup for testing on Antenna connector

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6.3. Measurement Procedure

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

Determining ERP and/or EIRP from conducted RF output power measurements

$$ERP/EIRP = P_{Meas} + GT-LC$$

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas} , typically dBW or dBm);

P_{Meas} = 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.

6.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/06/2019	03/05/2020
Radio Communication Analyer	Anritsu	MT8821C	6262044739	12/06/2019	12/05/2020
Attenuator	Marvelous	MVE2213-10	RF30	11/20/2019	11/19/2020
DC Block	PASTERNAK	PE8210	RF32	11/20/2019	11/19/2020
Splitter	Woken	DOM35LW1 A2	RF83	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A 185C	RF229	11/20/2019	11/19/2020

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/17/2020	03/16/2021

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

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6.5. Measurement Result

RF Conducted Output Power

LTE MODE: Results:

Antenna gain (dBi) -2

LTE Band 48 Uplink frequency band : 3550 to 3700 MHz									
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB Size	RB Offset	Conducted Average (dBm/10MHz)	EIRP Average (dBm/10MHz)	EIRP Limit (dBm/10MHz)	Margin (dBm/10MHz)
5	56765	3552.5	QPSK	1	0	23.01	21.01	23	-1.99
				1	24	22.90	20.90	23	-2.1
				12	6	22.06	20.06	23	-2.94
				25	0	21.96	19.96	23	-3.04
	55990	3625	QPSK	1	0	23.76	21.76	23	-1.24
				1	24	23.82	21.82	23	-1.18
				12	6	22.88	20.88	23	-2.12
				25	0	22.90	20.90	23	-2.1
	58215	3697.5	QPSK	1	0	23.56	21.56	23	-1.44
				1	24	23.51	21.51	23	-1.49
				12	6	22.61	20.61	23	-2.39
				25	0	22.63	20.63	23	-2.37
	56765	3552.5	16QAM	1	0	22.26	20.26	23	-2.74
				1	24	22.23	20.23	23	-2.77
				12	6	21.08	19.08	23	-3.92
				25	0	21.06	19.06	23	-3.94
	55990	3625	16QAM	1	0	22.63	20.63	23	-2.37
				1	24	22.63	20.63	23	-2.37
				12	6	21.93	19.93	23	-3.07
				25	0	21.45	19.45	23	-3.55
	58215	3697.5	16QAM	1	0	22.86	20.86	23	-2.14
				1	24	22.79	20.79	23	-2.21
				12	6	21.70	19.70	23	-3.3
				25	0	21.63	19.63	23	-3.37
	56765	3552.5	64QAM	1	0	22.12	20.12	23	-2.88
				1	24	22.08	20.08	23	-2.92
				12	6	21.08	19.08	23	-3.92
				25	0	21.02	19.02	23	-3.98
	55990	3625	64QAM	1	0	21.84	19.84	23	-3.16
				1	24	21.93	19.93	23	-3.07
				12	6	21.36	19.36	23	-3.64
				25	0	21.34	19.34	23	-3.66
	58215	3697.5	64QAM	1	0	21.59	19.59	23	-3.41
				1	24	21.53	19.53	23	-3.47
				12	6	20.80	18.80	23	-4.2
				25	0	20.75	18.75	23	-4.25
	56765	3552.5	256QAM	1	0	18.57	16.57	23	-6.43
				1	24	18.50	16.50	23	-6.5
				12	6	18.67	16.67	23	-6.33
				25	0	18.48	16.48	23	-6.52
	55990	3625	256QAM	1	0	18.25	16.25	23	-6.75
				1	24	18.22	16.22	23	-6.78
				12	6	18.45	16.45	23	-6.55
				25	0	18.29	16.29	23	-6.71
	58215	3697.5	256QAM	1	0	18.77	16.77	23	-6.23
				1	24	18.79	16.79	23	-6.21
				12	6	18.83	16.83	23	-6.17
				25	0	18.73	16.73	23	-6.27

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Antenna gain (dBi) -2

LTE Band 48 Uplink frequency band : 3550 to 3700 MHz									
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB Size	RB Offset	Conducted Average (dBm/10MHz)	EIRP Average (dBm/10MHz)	EIRP Limit (dBm/10MHz)	Margin (dBm/10MHz)
10	55290	3555	QPSK	1	0	23.23	21.23	23	-1.77
				1	49	23.12	21.12	23	-1.88
				25	12	22.37	20.37	23	-2.63
				50	0	22.38	20.38	23	-2.62
	55990	3625	QPSK	1	0	23.86	21.86	23	-1.14
				1	49	23.94	21.94	23	-1.06
				25	12	22.91	20.91	23	-2.09
				50	0	22.95	20.95	23	-2.05
	56690	3695	QPSK	1	0	23.50	21.50	23	-1.5
				1	49	23.46	21.46	23	-1.54
				25	12	22.70	20.70	23	-2.3
				50	0	22.69	20.69	23	-2.31
	55290	3555	16QAM	1	0	22.62	20.62	23	-2.38
				1	49	22.47	20.47	23	-2.53
				25	12	21.48	19.48	23	-3.52
				50	0	21.52	19.52	23	-3.48
	55990	3625	16QAM	1	0	23.13	21.13	23	-1.87
				1	49	22.93	20.93	23	-2.07
				25	12	22.01	20.01	23	-2.99
				50	0	21.98	19.98	23	-3.02
	56690	3695	16QAM	1	0	23.09	21.09	23	-1.91
				1	49	22.85	20.85	23	-2.15
				25	12	21.49	19.49	23	-3.51
				50	0	21.72	19.72	23	-3.28
	55290	3555	64QAM	1	0	21.56	19.56	23	-3.44
				1	49	21.48	19.48	23	-3.52
				25	12	20.45	18.45	23	-4.55
				50	0	20.49	18.49	23	-4.51
	55990	3625	64QAM	1	0	22.07	20.07	23	-2.93
				1	49	22.04	20.04	23	-2.96
				25	12	21.06	19.06	23	-3.94
				50	0	21.04	19.04	23	-3.96
	56690	3695	64QAM	1	0	21.80	19.80	23	-3.2
				1	49	21.71	19.71	23	-3.29
				25	12	20.74	18.74	23	-4.26
				50	0	20.63	18.63	23	-4.37
	55290	3555	256QAM	1	0	18.61	16.61	23	-6.39
				1	49	18.34	16.34	23	-6.66
				25	12	18.67	16.67	23	-6.33
				50	0	18.72	16.72	23	-6.28
	55990	3625	256QAM	1	0	18.22	16.22	23	-6.78
				1	49	18.26	16.26	23	-6.74
				25	12	18.26	16.26	23	-6.74
				50	0	18.41	16.41	23	-6.59
	56690	3695	256QAM	1	0	18.68	16.68	23	-6.32
				1	49	18.95	16.95	23	-6.05
				25	12	18.77	16.77	23	-6.23
				50	0	18.86	16.86	23	-6.14

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Antenna gain (dBi) -2

LTE Band 48 Uplink frequency band : 3550 to 3700 MHz									
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB Size	RB Offset	Conducted Average (dBm/10MHz)	EIRP Average (dBm/10MHz)	EIRP Limit (dBm/10MHz)	Margin (dBm/10MHz)
15	55315	3557.5	QPSK	1	0	24.33	22.33	23	-0.67
				1	74	24.50	22.50	23	-0.50
				36	18	23.69	21.69	23	-1.31
				75	0	22.43	20.43	23	-2.57
	55990	3625	QPSK	1	0	24.92	22.92	23	-0.08
				1	74	24.53	22.53	23	-0.47
				36	18	23.82	21.82	23	-1.18
				75	0	22.52	20.52	23	-2.48
	56665	3692.5	QPSK	1	0	24.91	22.91	23	-0.09
				1	74	24.16	22.16	23	-0.84
				36	18	24.08	22.08	23	-0.92
				75	0	22.74	20.74	23	-2.26
	55315	3557.5	16QAM	1	0	24.04	22.04	23	-0.96
				1	74	24.01	22.01	23	-0.99
				36	18	22.74	20.74	23	-2.26
				75	0	21.47	19.47	23	-3.53
	55990	3625	16QAM	1	0	23.76	21.76	23	-1.24
				1	74	23.73	21.73	23	-1.27
				36	18	22.82	20.82	23	-2.18
				75	0	21.64	19.64	23	-3.36
	56665	3692.5	16QAM	1	0	23.58	21.58	23	-1.42
				1	74	23.57	21.57	23	-1.43
				36	18	23.20	21.20	23	-1.80
				75	0	21.78	19.78	23	-3.22
	55315	3557.5	64QAM	1	0	22.23	20.23	23	-2.77
				1	74	23.00	21.00	23	-2.00
				36	18	21.79	19.79	23	-3.21
				75	0	20.40	18.40	23	-4.60
	55990	3625	64QAM	1	0	22.81	20.81	23	-2.19
				1	74	22.84	20.84	23	-2.16
				36	18	21.91	19.91	23	-3.09
				75	0	20.38	18.38	23	-4.62
	56665	3692.5	64QAM	1	0	22.22	20.22	23	-2.78
				1	74	22.68	20.68	23	-2.32
				36	18	22.33	20.33	23	-2.67
				75	0	20.91	18.91	23	-4.09
	55315	3557.5	256QAM	1	0	18.56	16.56	23	-6.44
				1	74	18.49	16.49	23	-6.51
				36	18	18.59	16.59	23	-6.41
				75	0	18.62	16.62	23	-6.38
	55990	3625	256QAM	1	0	18.29	16.29	23	-6.71
				1	74	18.51	16.51	23	-6.49
				36	18	18.50	16.50	23	-6.50
				75	0	18.48	16.48	23	-6.52
	56665	3692.5	256QAM	1	0	18.75	16.75	23	-6.25
				1	74	19.17	17.17	23	-5.83
				36	18	19.09	17.09	23	-5.91
				75	0	18.88	16.88	23	-6.12

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LTE Band 48 Uplink frequency band : 3550 to 3700 MHz									
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB Size	RB Offset	Conducted Average (dBm/10MHz)	EIRP Average (dBm/10MHz)	EIRP Limit (dBm/10MHz)	Margin (dBm/10MHz)
20	55340	3560	QPSK	1	0	24.49	22.49	23	-0.51
				1	99	24.47	22.47	23	-0.53
				50	25	23.39	21.39	23	-1.61
				100	0	21.19	19.19	23	-3.81
	55990	3625	QPSK	1	0	24.62	22.62	23	-0.38
				1	99	24.57	22.57	23	-0.43
				50	25	23.70	21.70	23	-1.30
				100	0	21.35	19.35	23	-3.65
	56640	3690	QPSK	1	0	24.54	22.54	23	-0.46
				1	99	24.51	22.51	23	-0.49
				50	25	23.53	21.53	23	-1.47
				100	0	21.12	19.12	23	-3.88
	55340	3560	16QAM	1	0	23.76	21.76	23	-1.24
				1	99	23.85	21.85	23	-1.15
				50	25	22.43	20.43	23	-2.57
				100	0	20.17	18.17	23	-4.83
	55990	3625	16QAM	1	0	23.79	21.79	23	-1.21
				1	99	23.70	21.70	23	-1.30
				50	25	22.74	20.74	23	-2.26
				100	0	20.27	18.27	23	-4.73
	56640	3690	16QAM	1	0	23.80	21.80	23	-1.20
				1	99	23.77	21.77	23	-1.23
				50	25	22.52	20.52	23	-2.48
				100	0	24.09	22.09	23	-0.91
	55340	3560	64QAM	1	0	22.66	20.66	23	-2.34
				1	99	23.02	21.02	23	-1.98
				50	25	21.33	19.33	23	-3.67
				100	0	19.08	17.08	23	-5.92
	55990	3625	64QAM	1	0	22.81	20.81	23	-2.19
				1	99	22.93	20.93	23	-2.07
				50	25	21.74	19.74	23	-3.26
				100	0	19.39	17.39	23	-5.61
	56640	3690	64QAM	1	0	22.68	20.68	23	-2.32
				1	99	22.76	20.76	23	-2.24
				50	25	21.55	19.55	23	-3.45
				100	0	19.06	17.06	23	-5.94
	55340	3560	256QAM	1	0	18.72	16.72	23	-6.28
				1	99	18.43	16.43	23	-6.57
				50	25	18.74	16.74	23	-6.26
				100	0	18.71	16.71	23	-6.29
	55990	3625	256QAM	1	0	18.33	16.33	23	-6.67
				1	99	18.47	16.47	23	-6.53
				50	25	18.53	16.53	23	-6.47
				100	0	18.52	16.52	23	-6.48
	56640	3690	256QAM	1	0	18.24	16.24	23	-6.76
				1	99	18.31	16.31	23	-6.69
				50	25	18.32	16.32	23	-6.68
				100	0	18.38	16.38	23	-6.62

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7. MAXIMUM POWER DENSITY MEASUREMENT

7.1. Standard Applicable

FCC §2.1046 & 96.41

- (a) FCC 96.41(a) Digital modulation. Systems operating in the Citizens Broadband Radio Service must use digital modulation techniques.
- (b) FCC 96.41(b) Power limits. Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph (b):

Device	Maximum PSD (dBm/MHz)
End User Device	n/a
Category A CBSD	20
Category B CBSD ¹	37

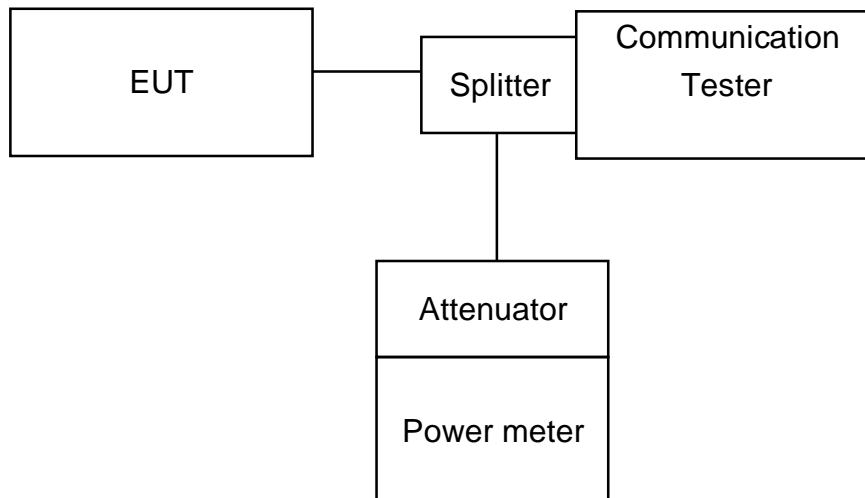
Category B CBSDs will only be authorized for use after an ESC is approved and commercially deployed consistent with §§96.15 and 96.67.

- (c) Power management. CBSDs and End User Devices shall limit their operating power to the minimum necessary for successful operations
 - (1) CBSDs must support transmit power control capability and the capability to limit their maximum EIRP and the maximum EIRP of associated End User Devices in response to instructions from an SAS.
 - (2) End User Devices shall include transmit power control capability and the capability to limit their maximum EIRP in response to instructions from their associated CBSDs.

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7.2. Test Set-up



Note: Measurement setup for testing on Antenna connector

7.3. Measurement Procedure

1. Set instrument center frequency to OBW center frequency.
2. Set span to at least 1.5 times the OBW.
3. Set the RBW to the specified reference bandwidth (often 1 MHz).
4. Set VBW $\geq 3 \times$ RBW.
5. Detector = RMS (power averaging).
6. Ensure that the number of measurement points in the sweep $\geq 2 \times$ span/RBW.
7. Sweep time = auto couple.
8. Employ trace averaging (RMS) mode over a minimum of 100 traces.
9. Use the peak marker function to determine the maximum amplitude level within the reference bandwidth (PSD).
10. Determine the EIRP by adding the effective antenna gain to the adjusted power level.

7.4. Measurement Equipment Used

N/A

7.5. Measurement Result

Peak Power Density Results:

N/A, this is an End user device.

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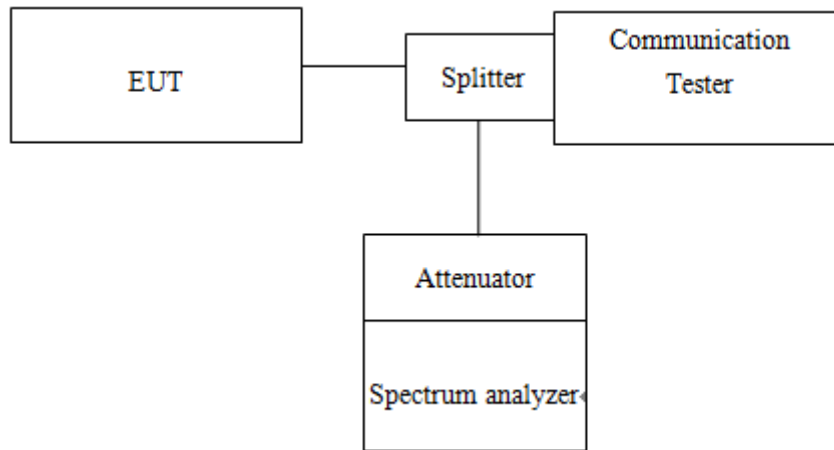
8. OCCUPIED BANDWIDTH MEASUREMENT

8.1. Standard Applicable

FCC Part 2.1049(h)

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power.

8.2. Test Set-up



8.3. Measurement Procedure

99% & 26dB Bandwidth with detector peak

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display line was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

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8.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/06/2019	03/05/2020
Radio Communication Analyzer	Anritsu	MT8821C	6262044739	12/06/2019	12/05/2020
Attenuator	Marvelous	MVE2213-10	RF30	11/20/2019	11/19/2020
DC Block	PASTERNAK	PE8210	RF32	11/20/2019	11/19/2020
Splitter	Woken	DOM35LW1A2	RF83	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF229	11/20/2019	11/19/2020

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/17/2020	03/16/2021

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

8.5. Measurement Result

LTE BAND 48 Channel bandwidth: 5MHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3552.5	56765	4.5348	4.5035	4.4968	4.5669	4.969	4.854	4.930	7.255
3625.0	55990	4.5134	4.5052	4.5031	4.4907	4.902	5.013	4.901	6.167
3697.5	58215	4.4977	4.5177	4.5197	4.4850	4.748	4.851	4.895	4.885

LTE BAND 48 Channel bandwidth: 10MHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3555.0	55290	9.0583	9.0627	9.0342	9.8718	18.600	20.0000	14.580	14.870
3625.0	55990	8.9956	9.0397	9.0098	8.9771	9.491	9.8270	12.320	12.960
3695.0	56690	8.9948	9.0236	9.0095	8.9703	9.542	10.6800	9.579	9.644

LTE BAND 48 Channel bandwidth: 15MHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3557.5	55315	13.504	13.582	13.475	13.609	14.280	14.300	14.410	22.040
3625.0	55990	13.468	13.509	13.474	13.498	14.540	14.140	14.320	19.080
3692.5	56665	13.470	13.417	13.425	13.486	14.200	14.530	14.630	14.300

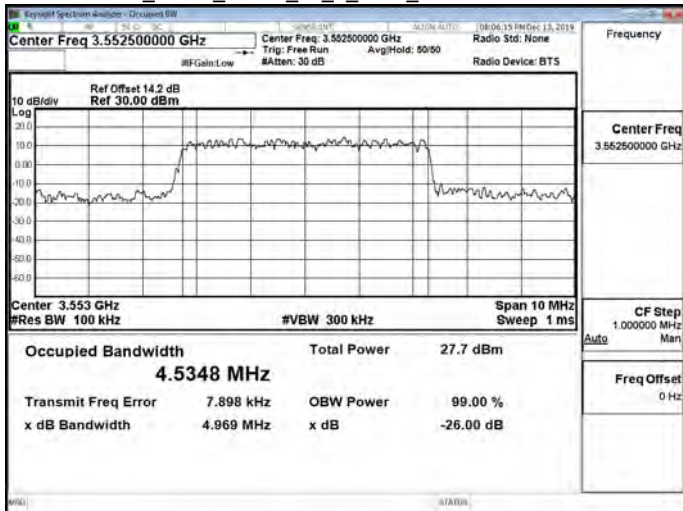
LTE BAND 48 Channel bandwidth: 20MHz									
Freq. (MHz)	CH	99% BW (MHz)				26 dB BW (MHz)			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
3650.0	55340	18.017	18.044	18.039	19.302	35.690	36.050	35.950	29.460
3625.0	55990	17.927	17.953	17.986	18.066	19.090	19.340	19.140	29.280
3690.0	56640	17.944	17.885	17.999	17.959	19.080	19.520	23.060	19.400

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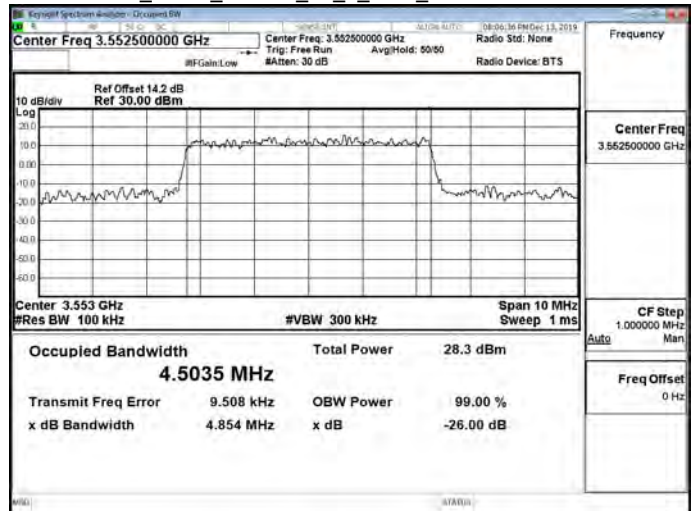
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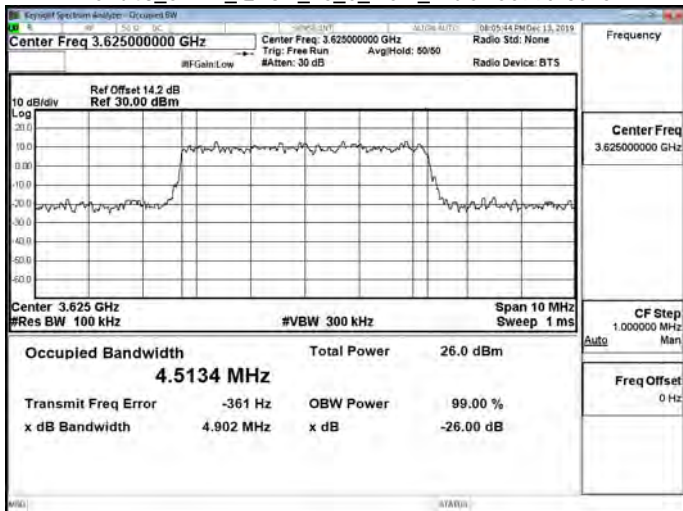
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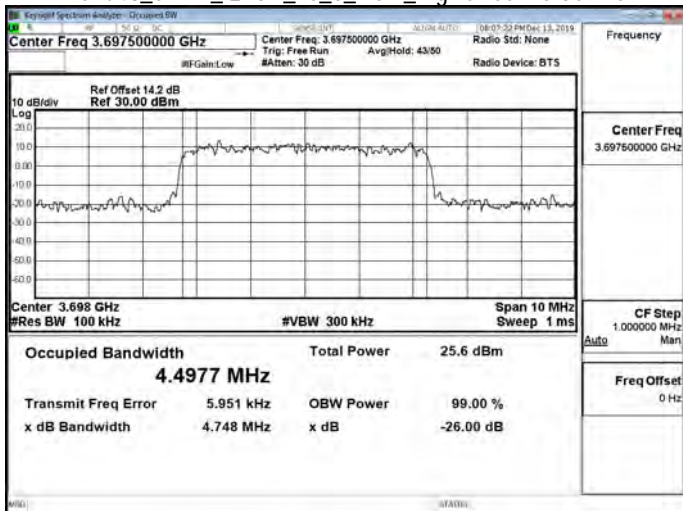
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Band48_5MHz_16QAM_25_0_Main_MidCH55990-3625



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Band48_5MHz_16QAM_25_0_Main_HighCH56715-3697.5

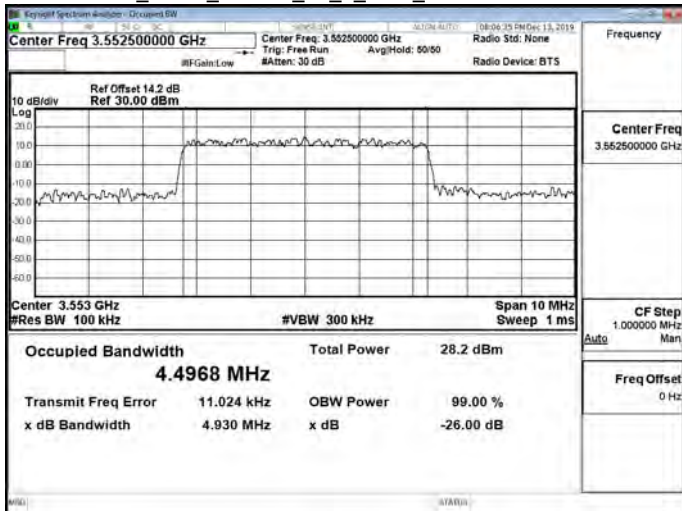


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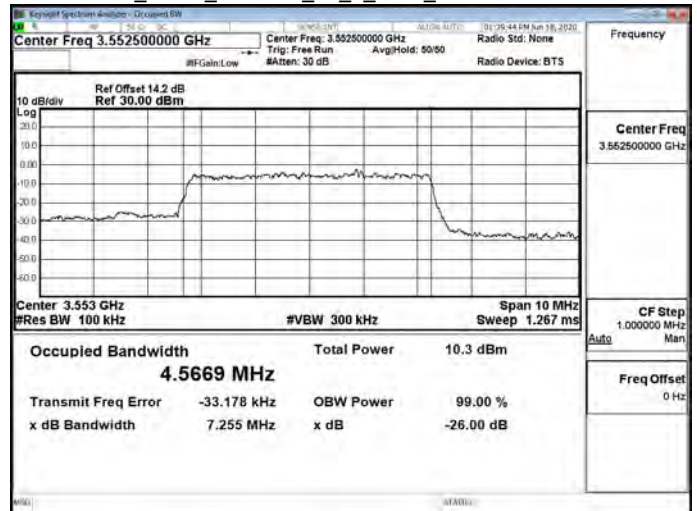
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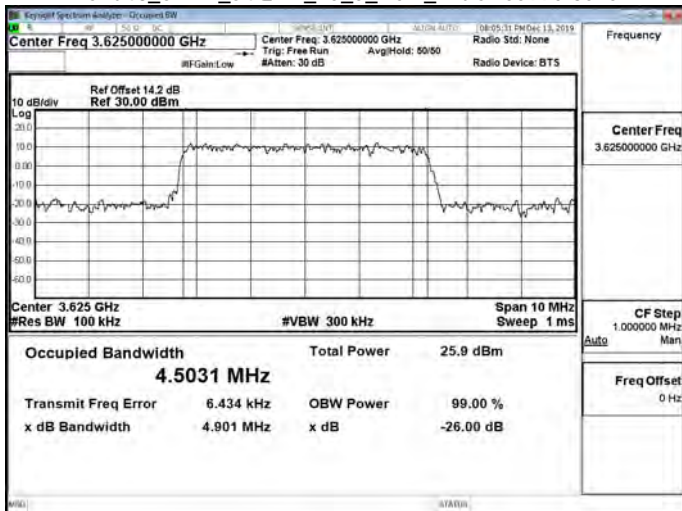
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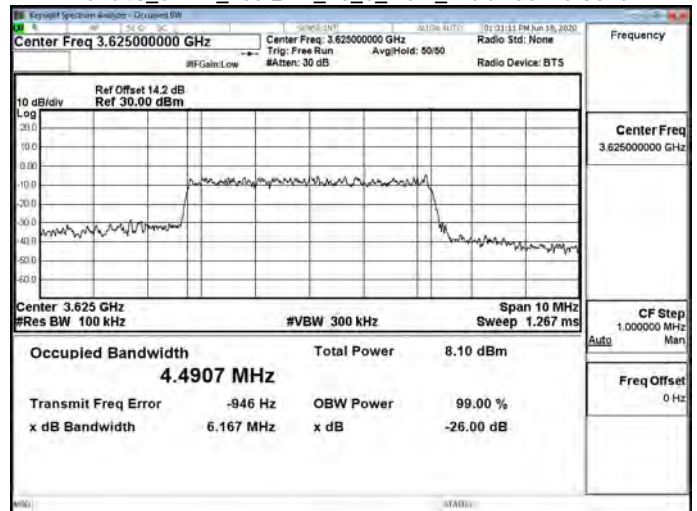
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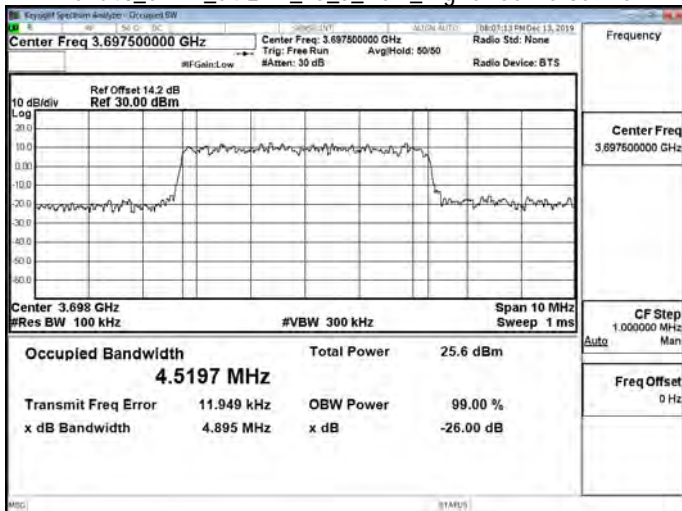
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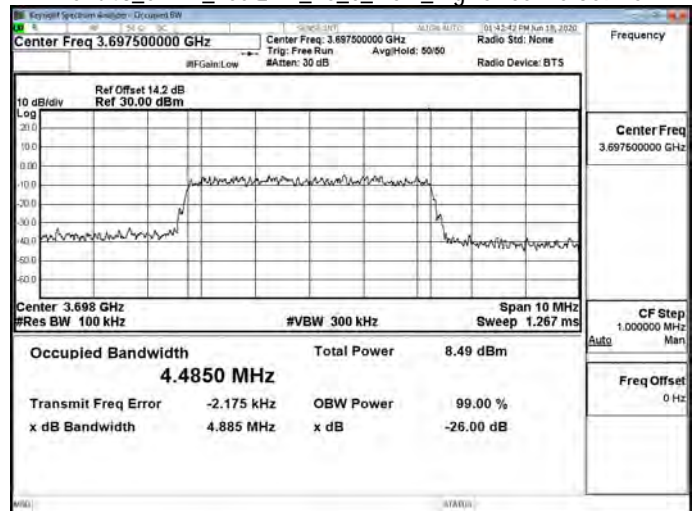
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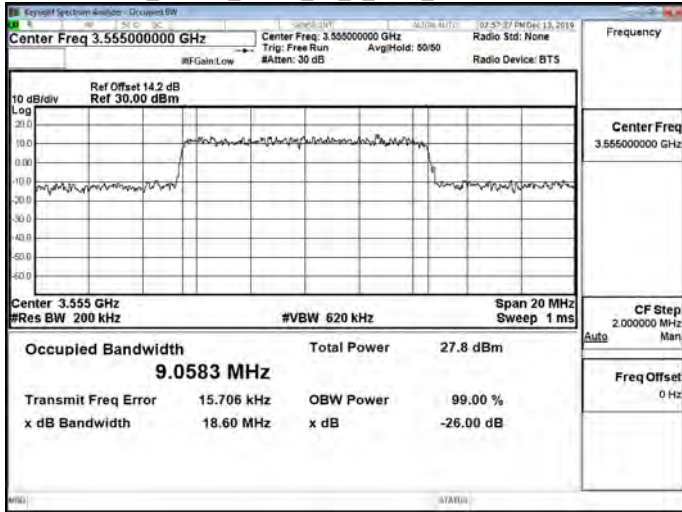


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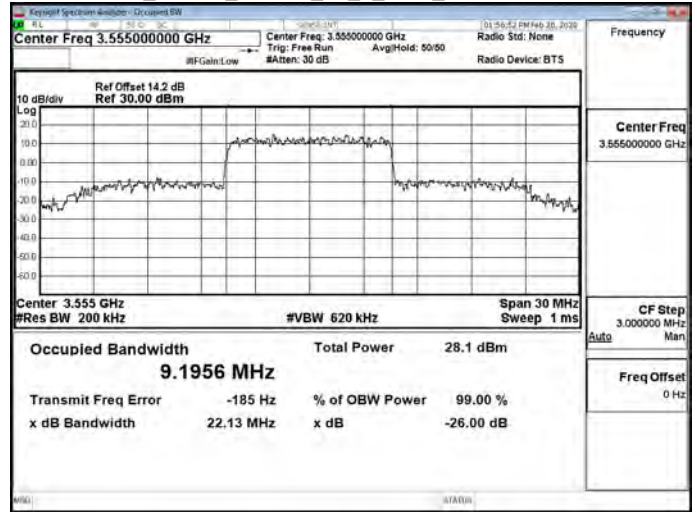
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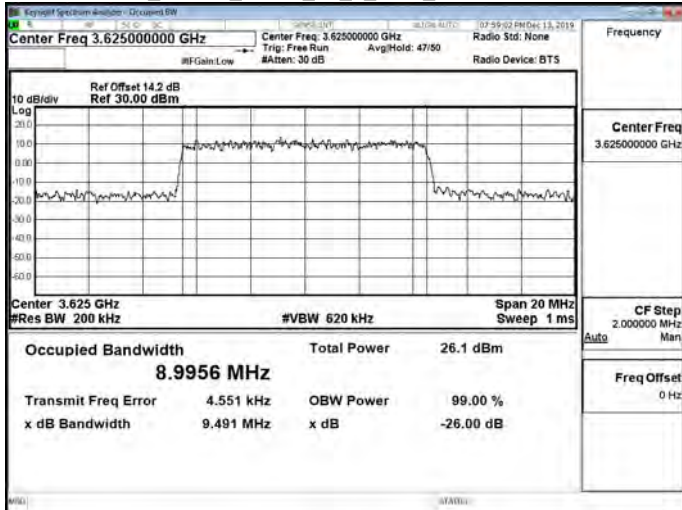
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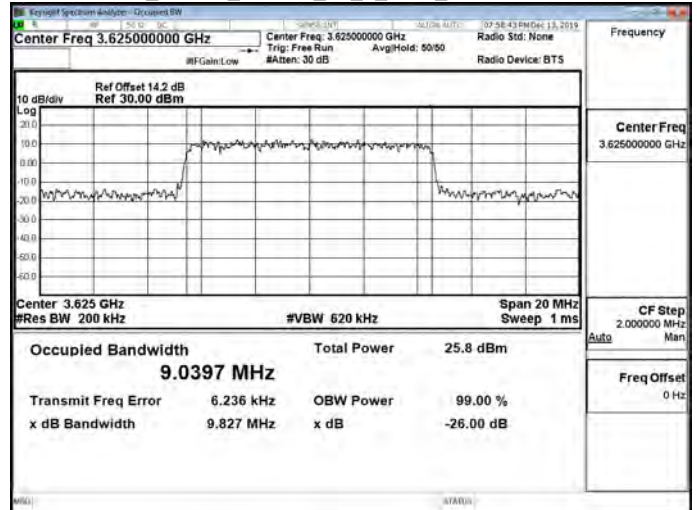
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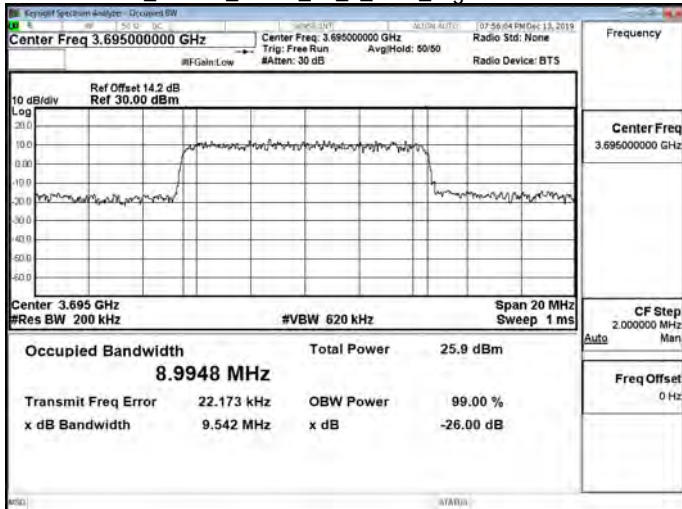
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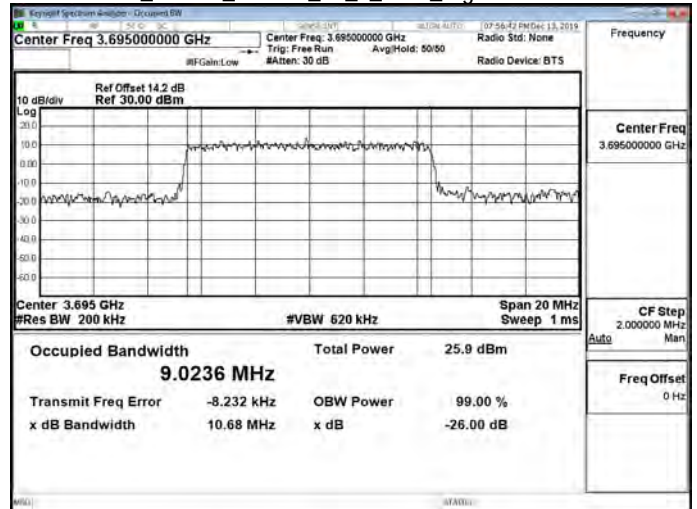
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Band48_10MHz_QPSK_50_0_Main_HighCH56690-3695



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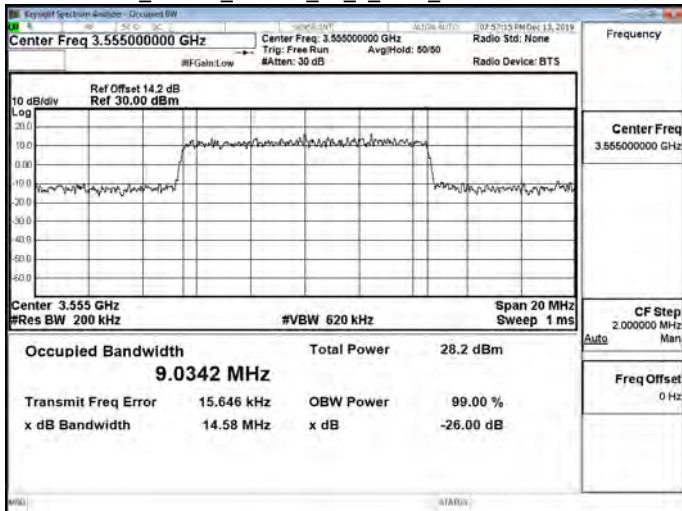


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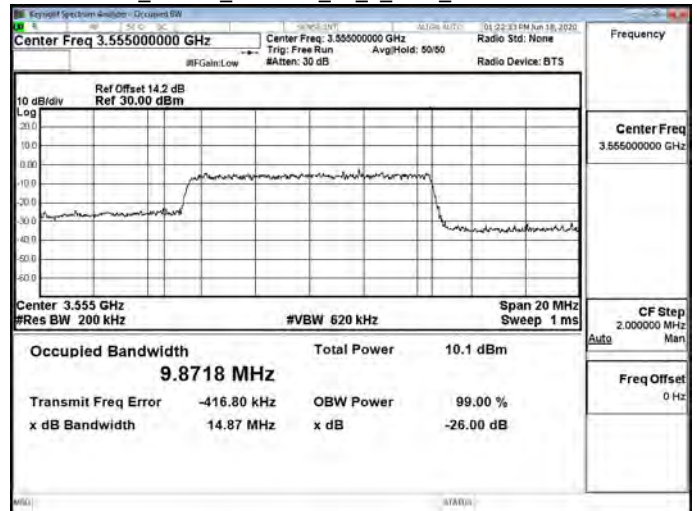
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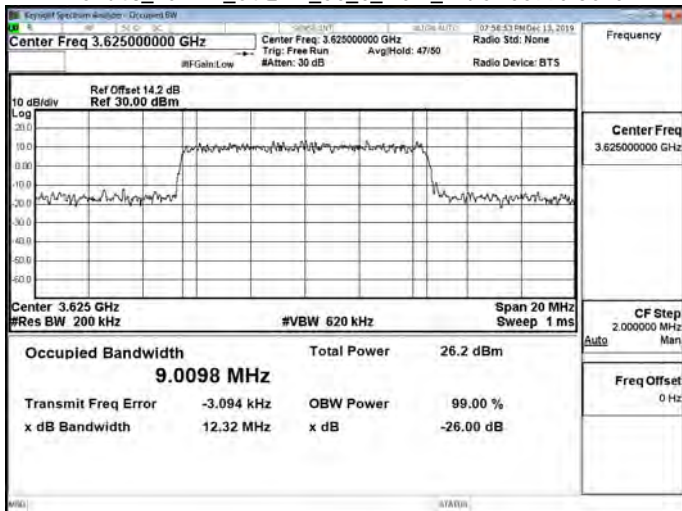
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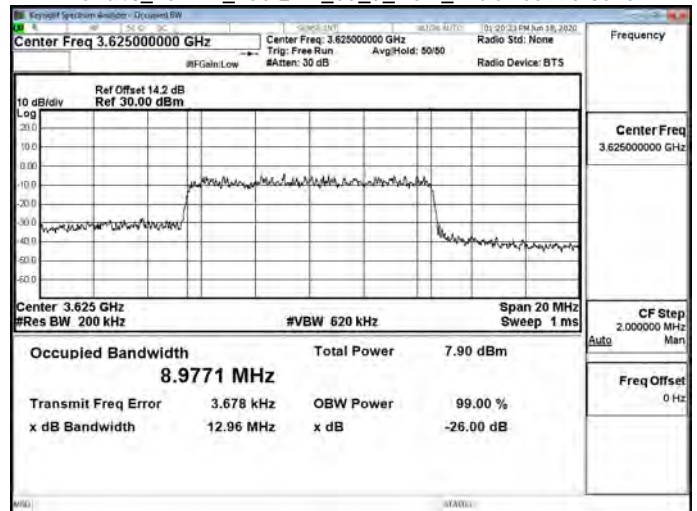
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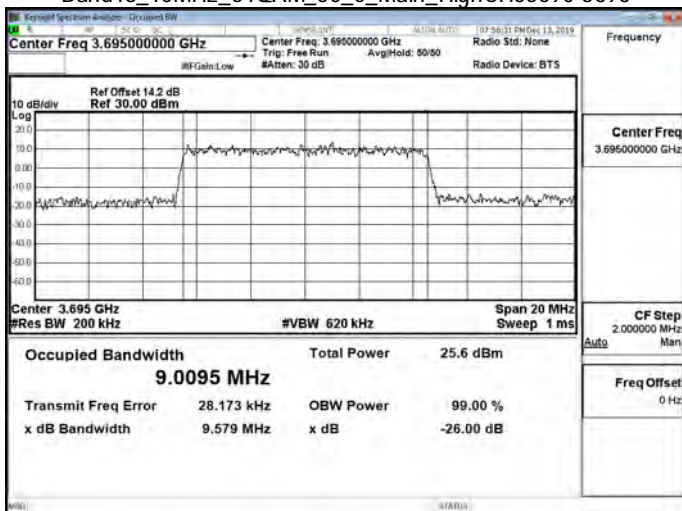
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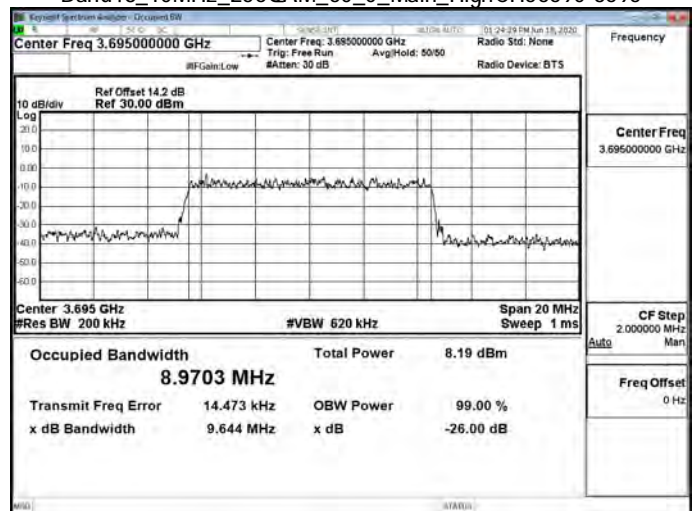
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Band48_10MHz_64QAM_50_0_Main_HighCH56690-3695



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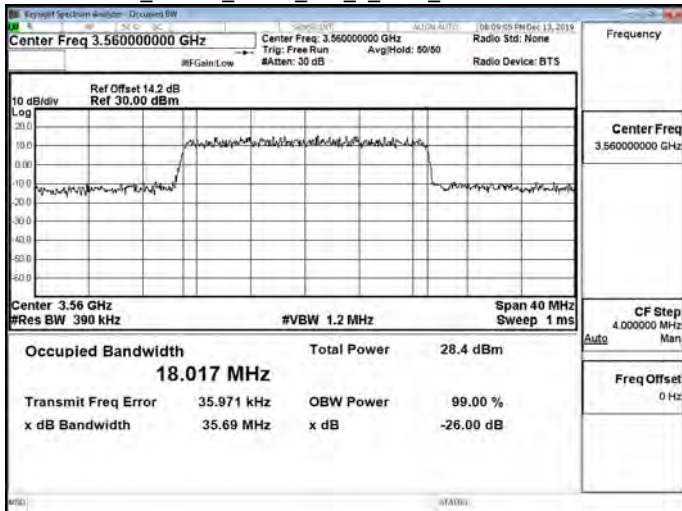


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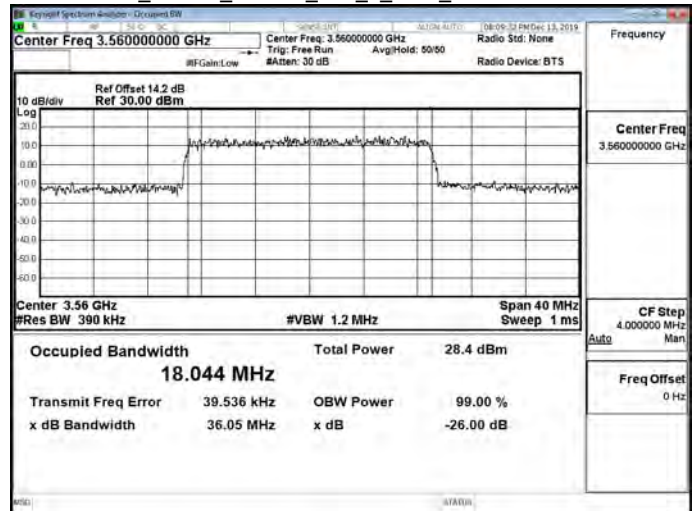
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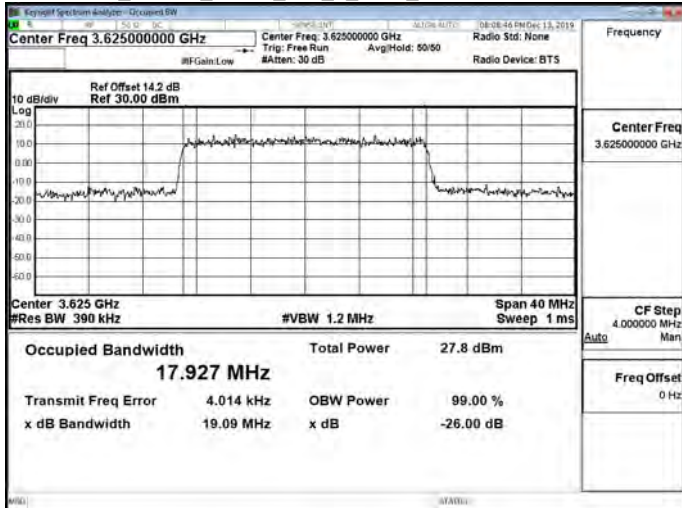
Band48_20MHz_QPSK_100_0_Main_LowCH5340-3560



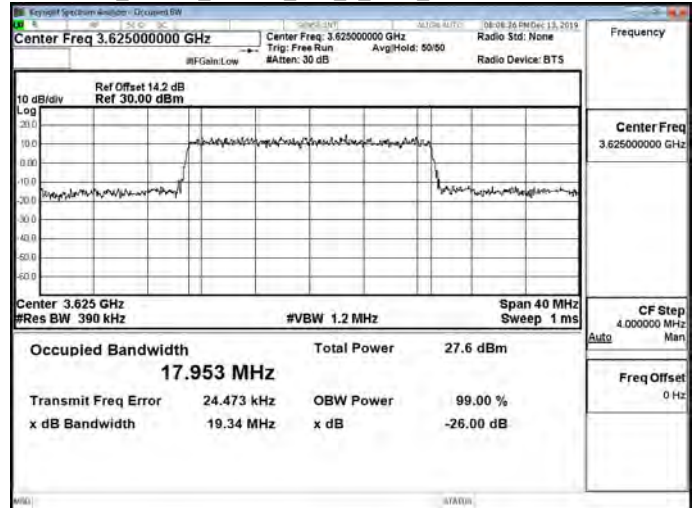
Band48_20MHz_16QAM_100_0_Main_LowCH5340-3560



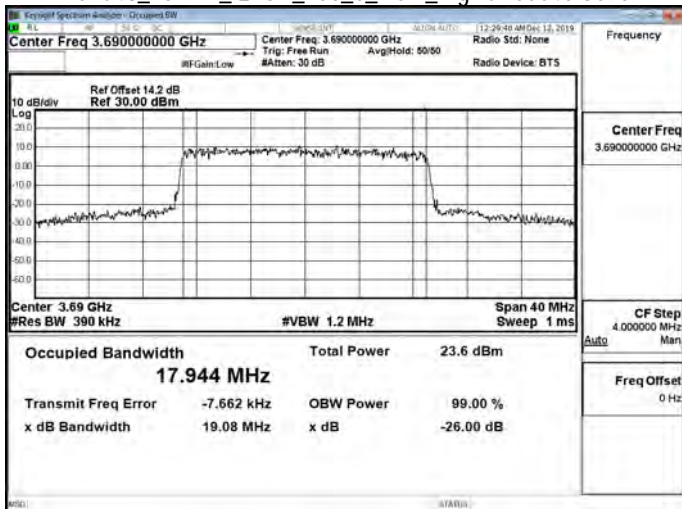
Band48_20MHz_QPSK_100_0_Main_MidCH5990-3625PNG



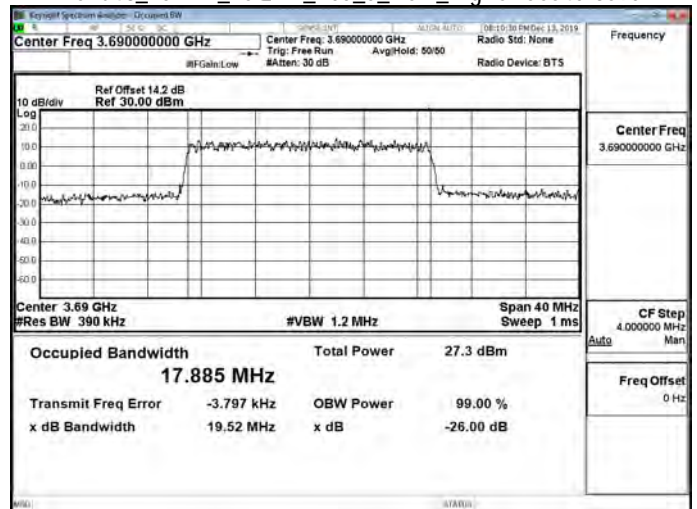
Band48_20MHz_16QAM_100_0_Main_MidCH5990-3625PNG



Band48_20MHz_QPSK_100_0_Main_HighCH56640-3690



Band48_20MHz_16QAM_100_0_Main_HighCH56640-3690



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9. OUT OF BAND EMISSION AT ANTENNA TERMINALS

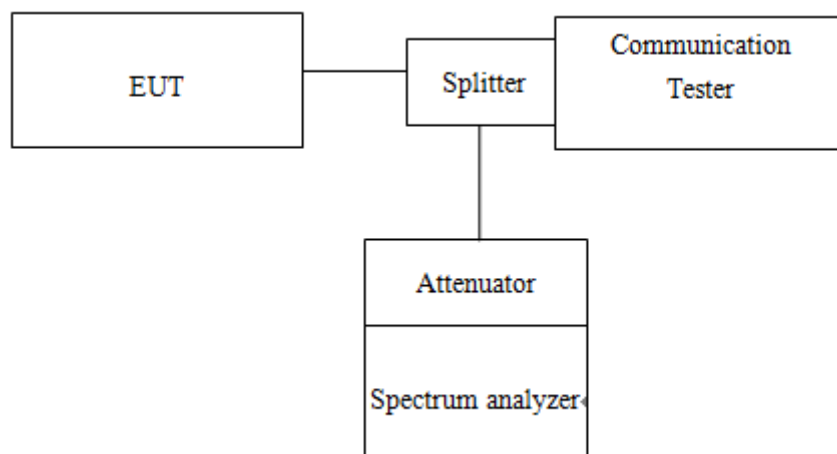
9.1. Standard Applicable

FCC Part 2.1051, Part 96.41 , C63.26 Clause 5.7.

For channel and frequency assignments made by the SAS to CBSDs, the conducted power of any CBSD emission outside the fundamental emission bandwidth as specified in paragraph (e)(3) of this section (whether the emission is inside or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any CBSD emission shall not exceed -25 dBm/MHz. The upper and lower SAS assigned channel edges are the upper and lower limits of any channel assigned to a CBSD by an SAS, or in the case of multiple contiguous channels, the upper and lower limits of the combined contiguous channels.

For CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed -25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.

9.2. Test SET-UP



9.3. Measurement Procedure

Conducted Emission

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

To connect Antenna Port of EUT to Spectrum.

Set RBW = 1MHz & VBW = 1MHz on Spectrum.

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Allow trace to fully stabilize

Repeat above procedures until all default test channel measured were complete.

Band Edge

1. To connect Antenna Port of EUT to Spectrum.
2. The band edge of low and high channels for the highest RF powers was measured. Setting RBW \geq 1% EBW.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

9.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/06/2019	03/05/2020
Radio Communication Analyer	Anritsu	MT8821C	6262044739	12/06/2019	12/05/2020
Attenuator	Marvelous	MVE2213-10	RF30	11/20/2019	11/19/2020
DC Block	PASTERNAK	PE8210	RF32	11/20/2019	11/19/2020
Splitter	Woken	DOM35LW1A2	RF83	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF229	11/20/2019	11/19/2020

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/17/2020	03/16/2021

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

Measurement Result:

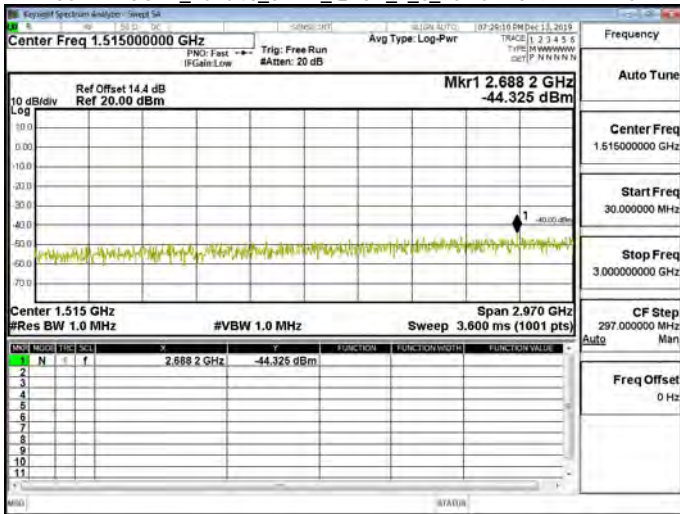
NOTE: The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

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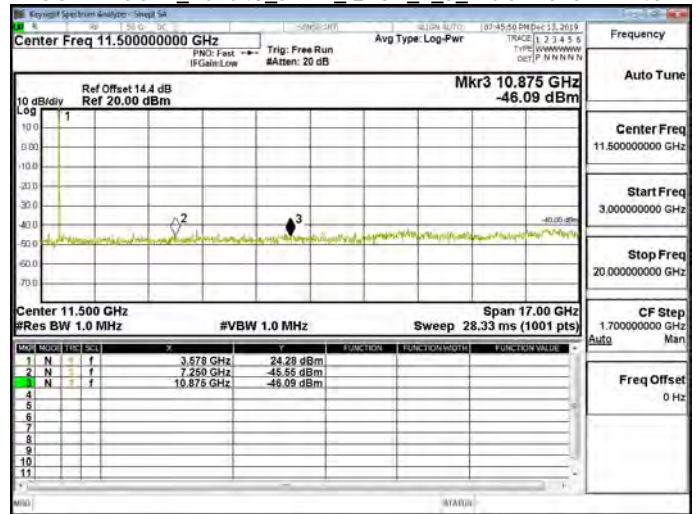
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Conducted Emission:

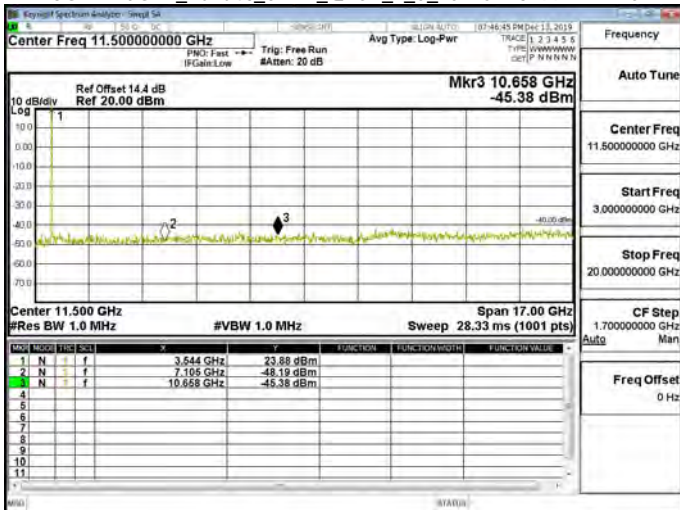
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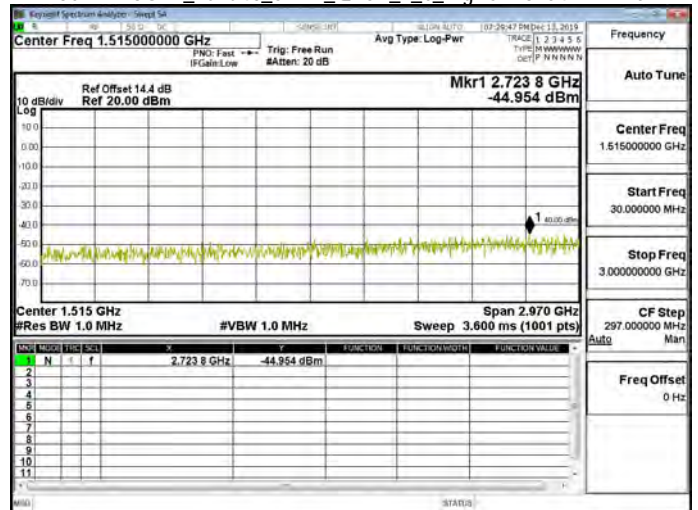
3GHz-10GHz_Band48_5MHz_QPSK_1_0_MidCH132322-1745



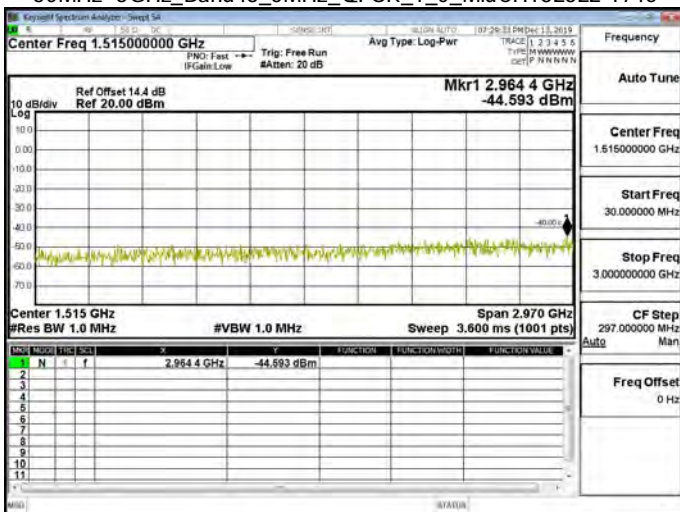
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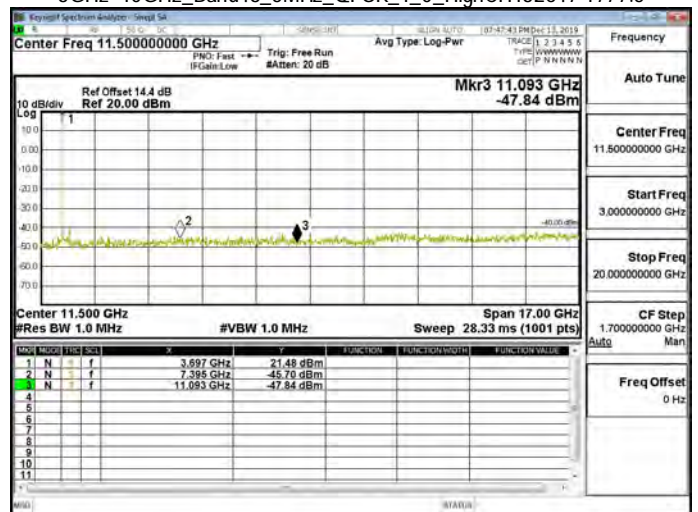
30MHz-3GHz_Band48_5MHz_QPSK_1_0_HighCH132647-1777.5



30MHz-3GHz_Band48_5MHz_QPSK_1_0_MidCH132322-1745



3GHz-10GHz_Band48_5MHz_QPSK_1_0_HighCH132647-1777.5



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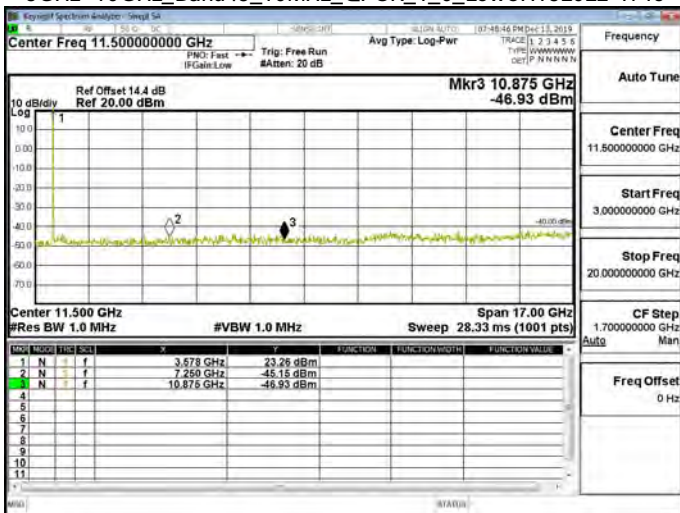
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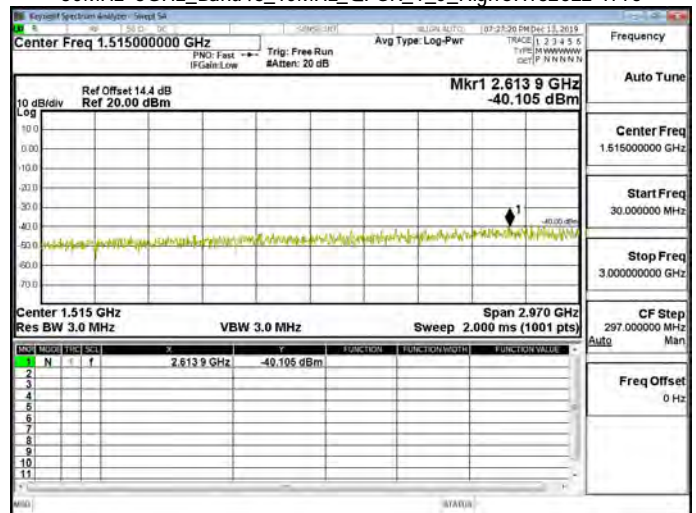
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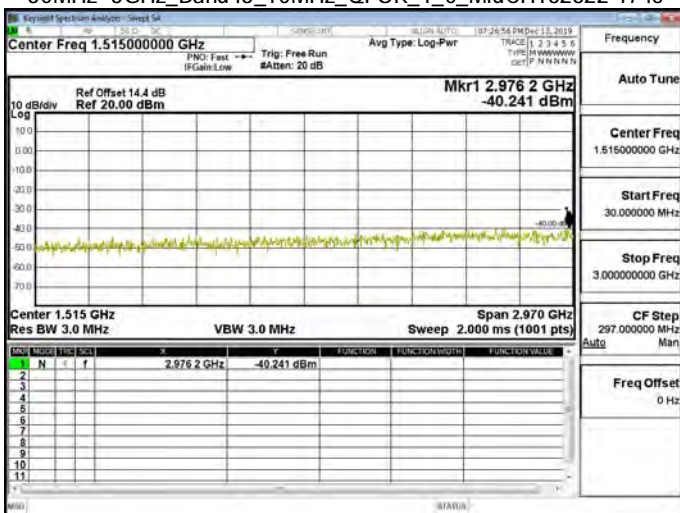
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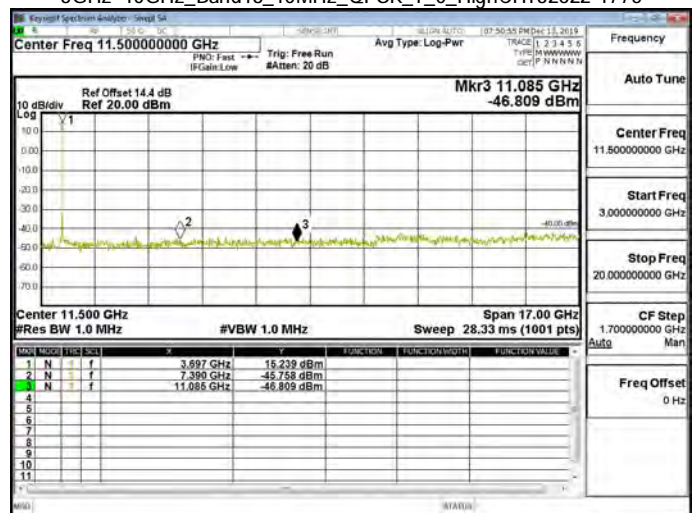
30MHz-3GHz_Band48_10MHz_QPSK_1_0_HighCH132622-1775



30MHz-3GHz_Band48_10MHz_QPSK_1_0_MidCH132322-1745



3GHz-10GHz_Band48_10MHz_QPSK_1_0_HighCH132622-1775

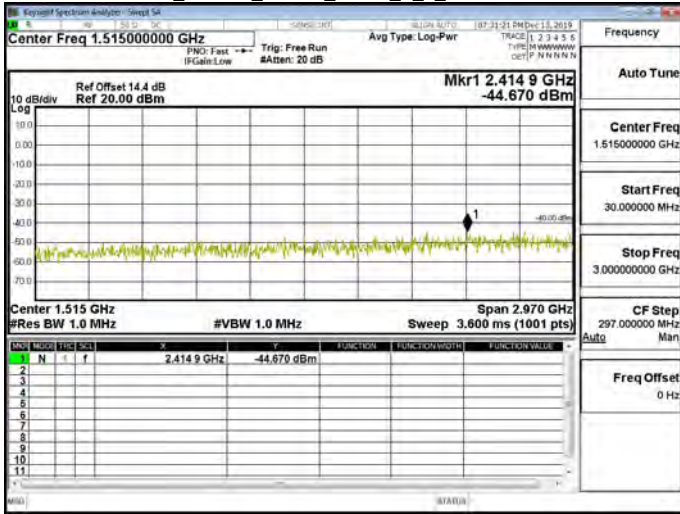


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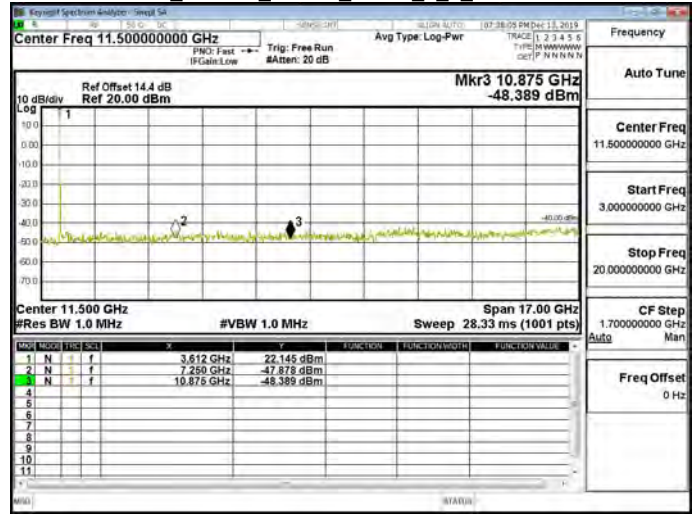
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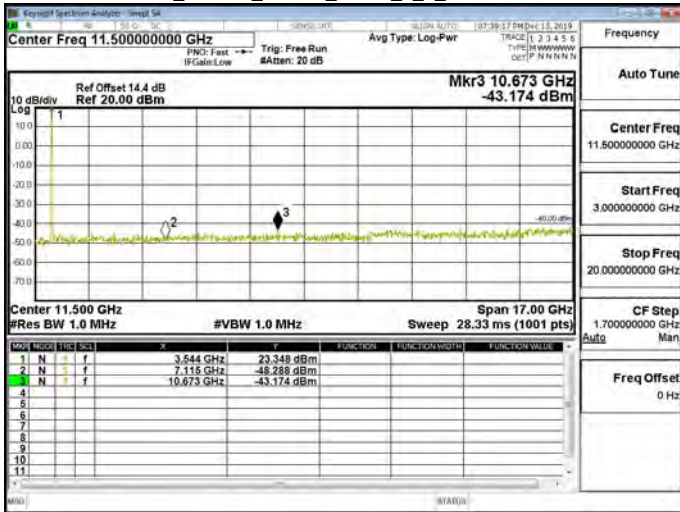
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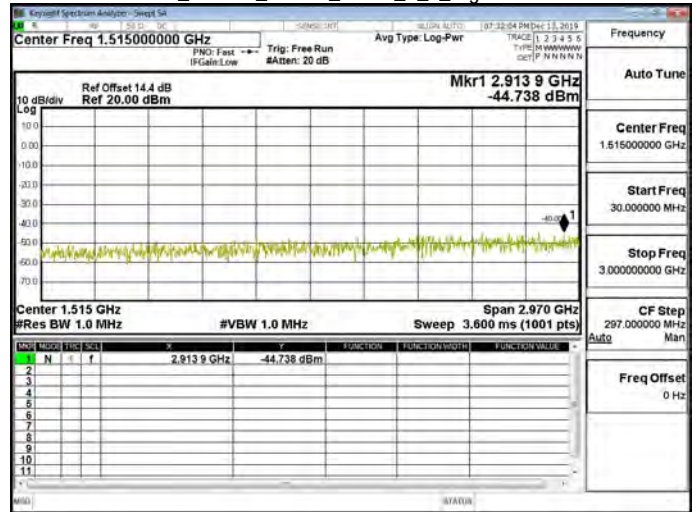
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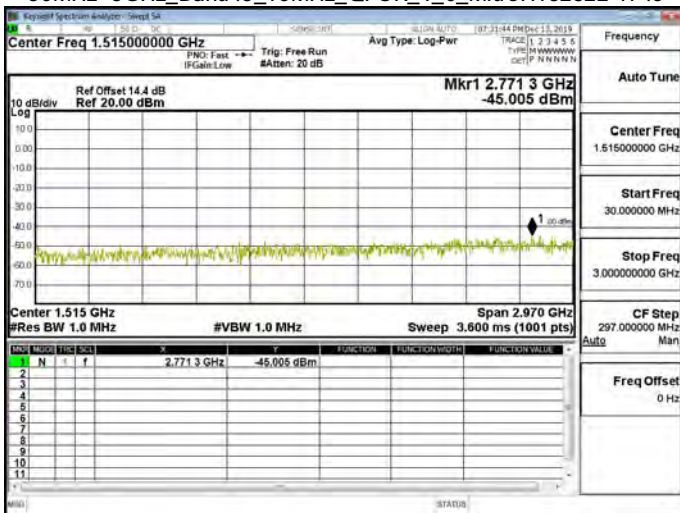
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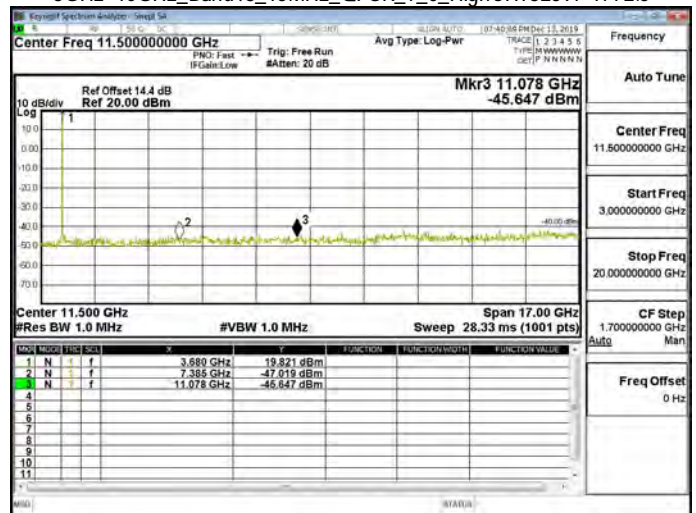
30MHz-3GHz_Band48_15MHz_OPSK_1_0_HighCH132597-1772.5



30MHz-3GHz_Band48_15MHz_OPSK_1_0_MidCH132322-1745



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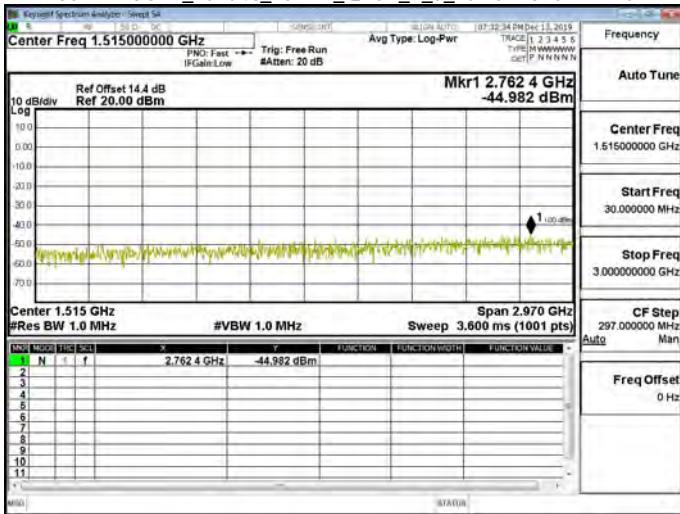


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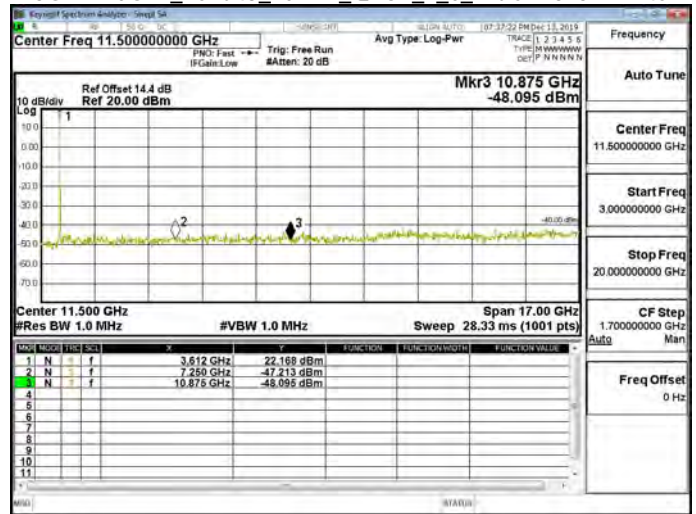
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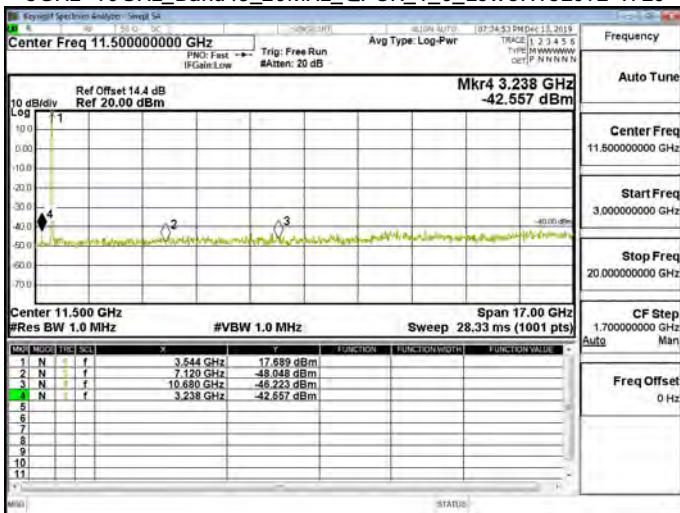
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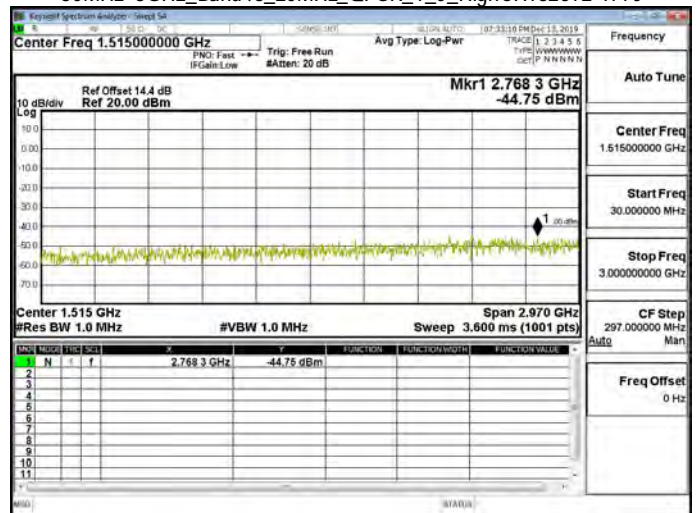
3GHz-10GHz_Band48_20MHz_QPSK_1_0_MidCH132322-1745



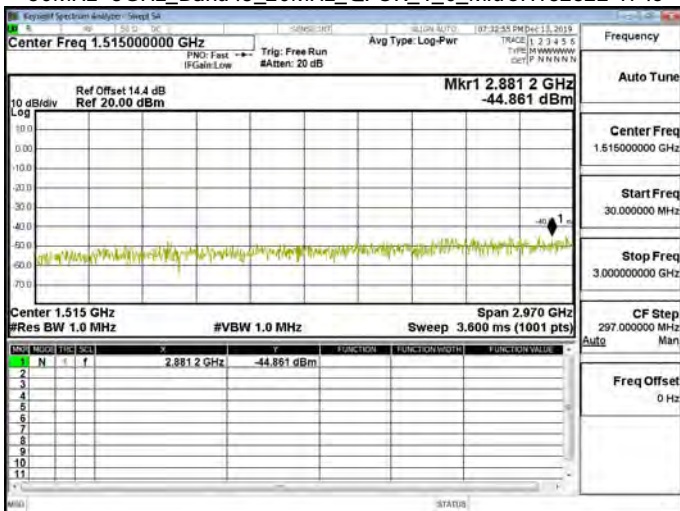
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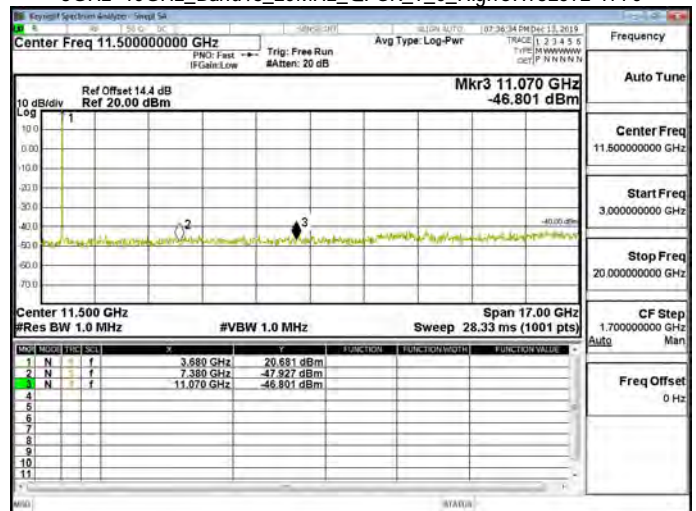
30MHz-3GHz_Band48_20MHz_QPSK_1_0_HighCH132572-1770



30MHz-3GHz_Band48_20MHz_QPSK_1_0_MidCH132322-1745



3GHz-10GHz_Band48_20MHz_QPSK_1_0_HighCH132572-1770

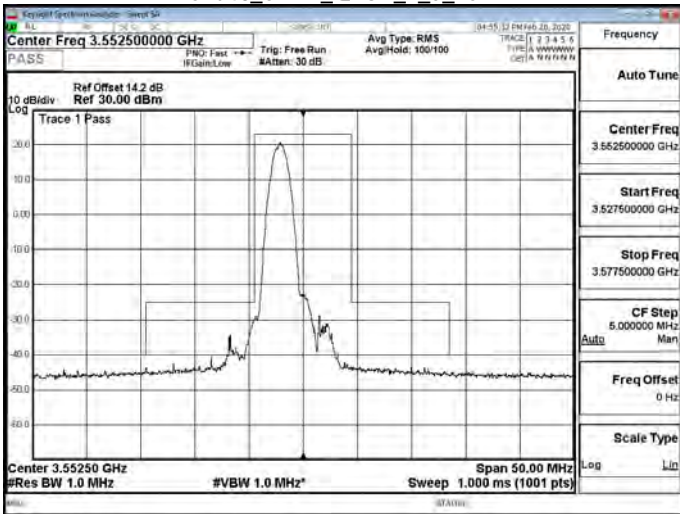


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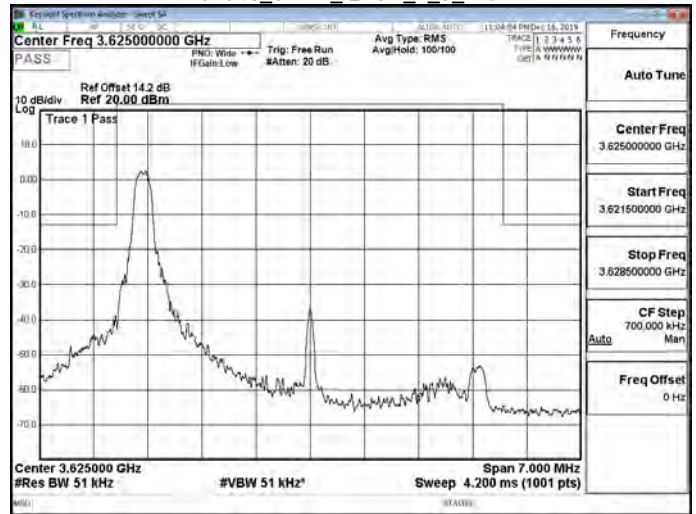
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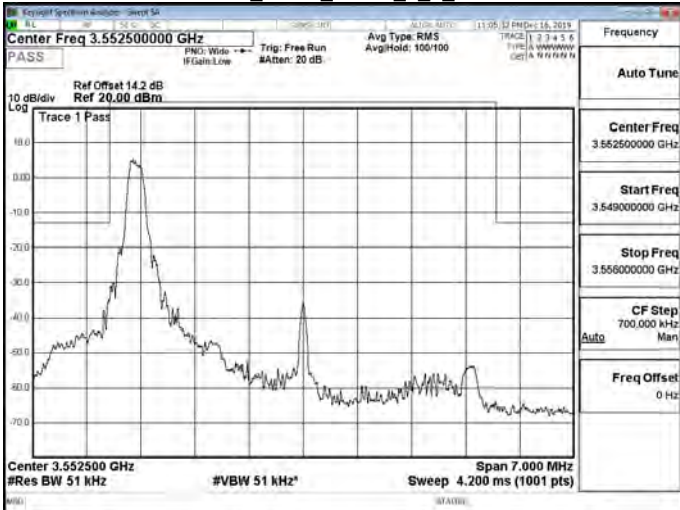
Band Edge:
Band48_5MHz_QPSK_1_0_Low-1



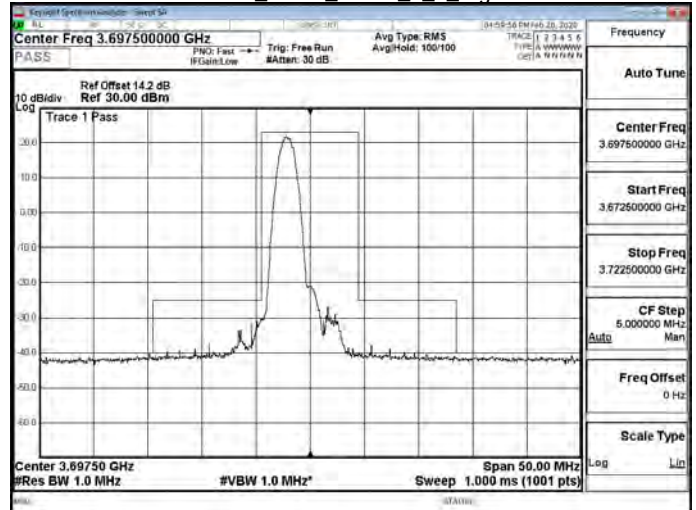
Band48_5MHz_QPSK_1_0_Mid-2



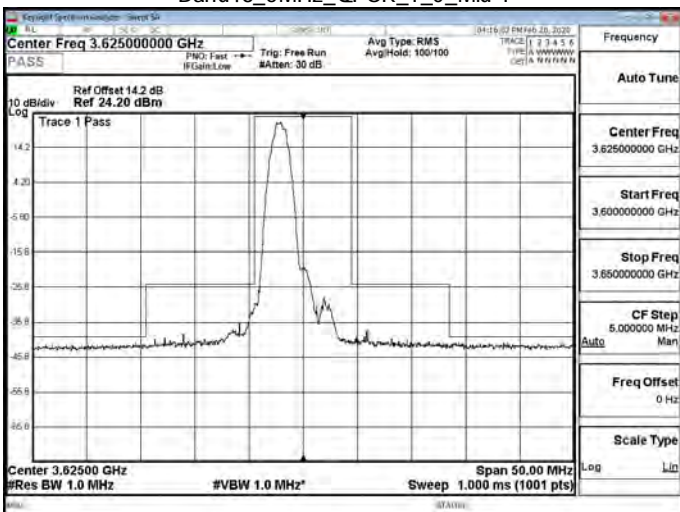
Band48_5MHz_QPSK_1_0_Low-2



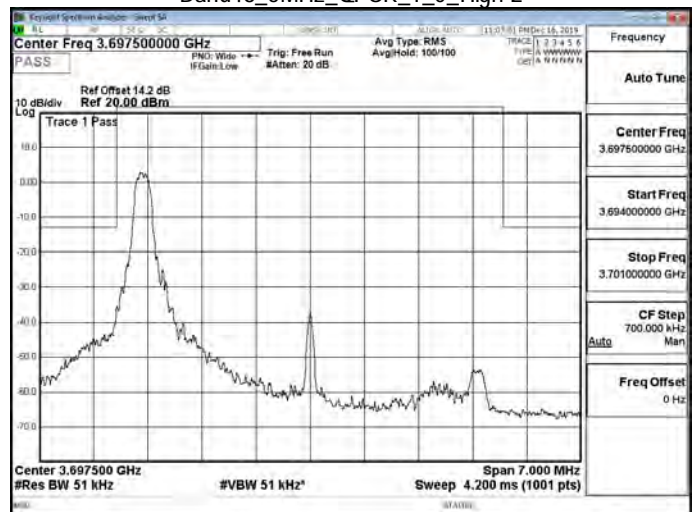
Band48_5MHz_QPSK_1_0_High-1



Band48_5MHz_QPSK_1_0_Mid-1



Band48_5MHz_QPSK_1_0_High-2

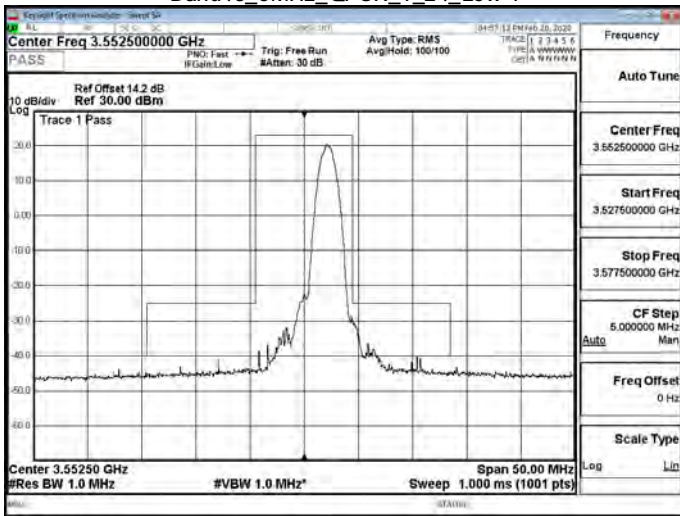


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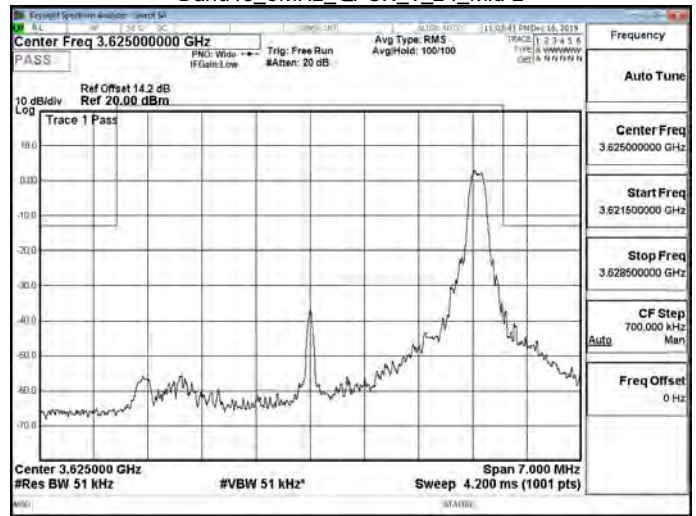
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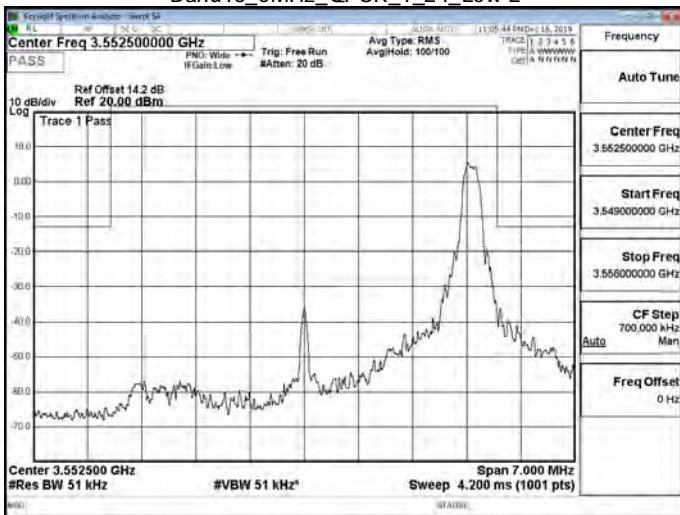
Band48_5MHz_QPSK_1_24_Low-1



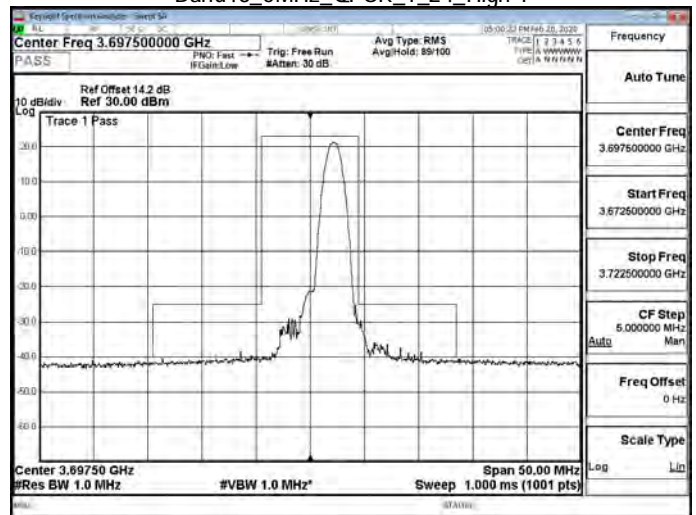
Band48_5MHz_QPSK_1_24_Mid-2



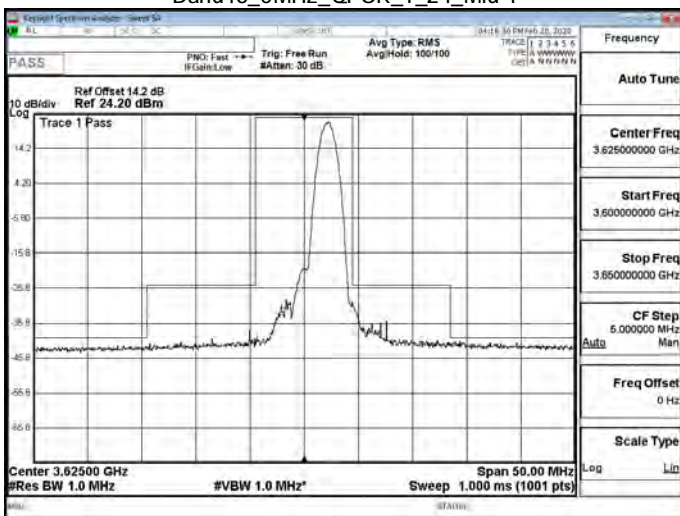
Band48_5MHz_QPSK_1_24_Low-2



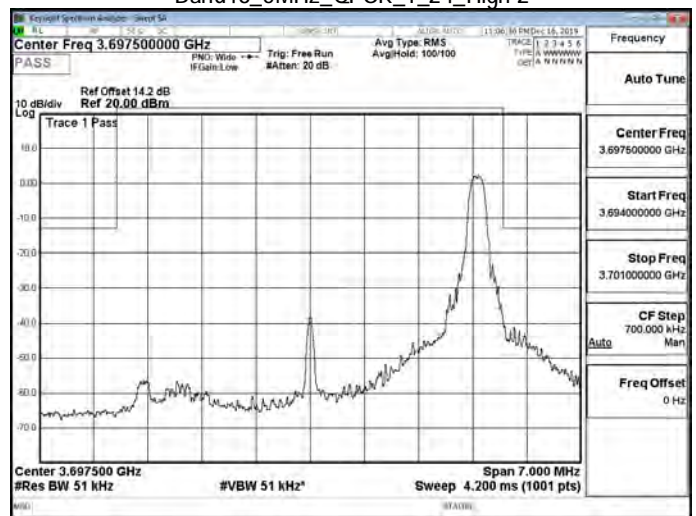
Band48_5MHz_QPSK_1_24_High-1



Band48_5MHz_QPSK_1_24_Mid-1



Band48_5MHz_QPSK_1_24_High-2

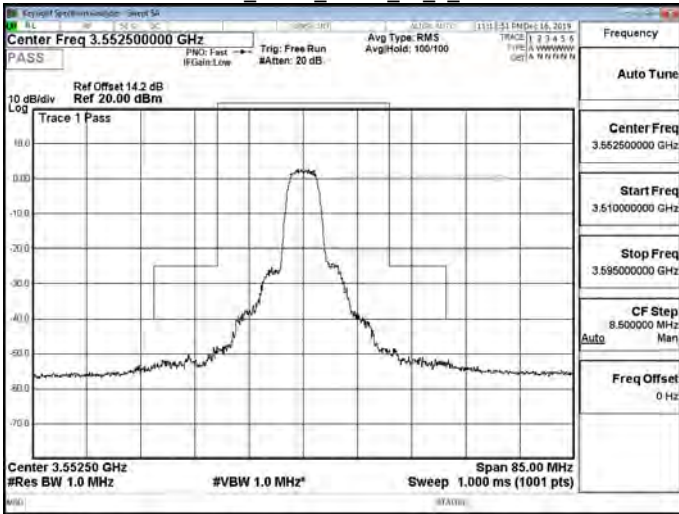


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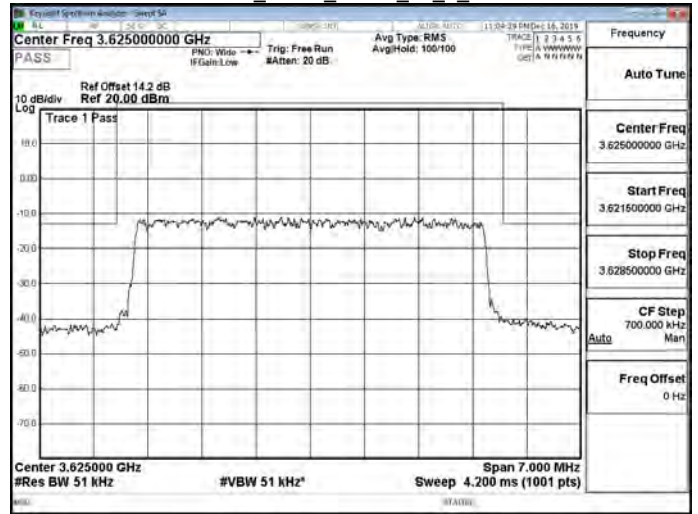
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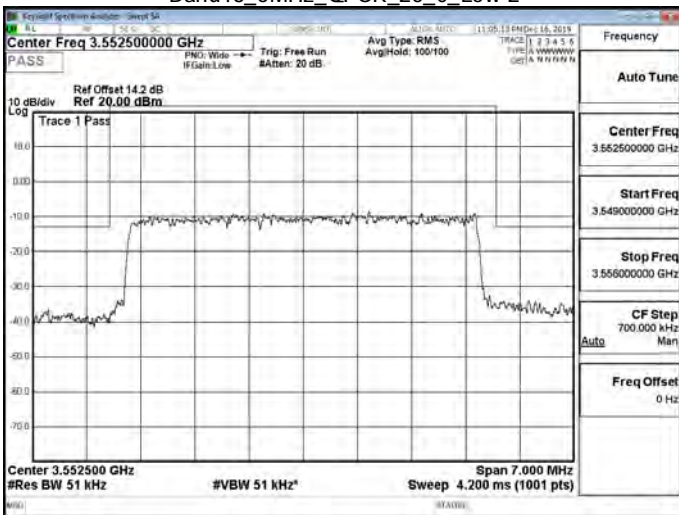
Band48_5MHz_QPSK_25_0_Low-1



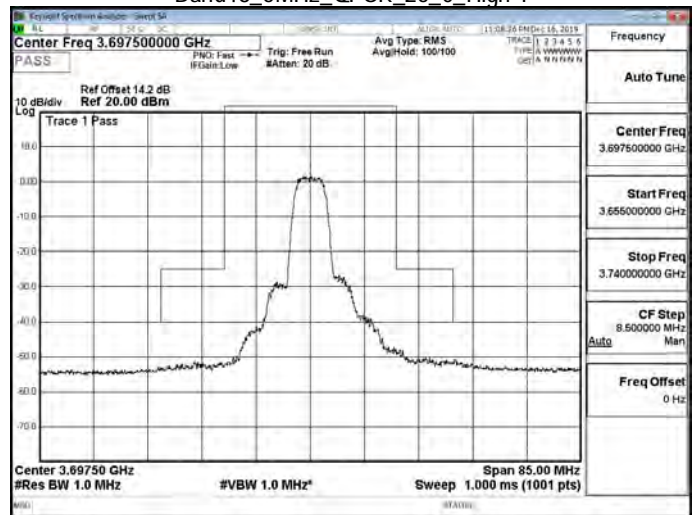
Band48_5MHz_QPSK_25_0_Mid-2



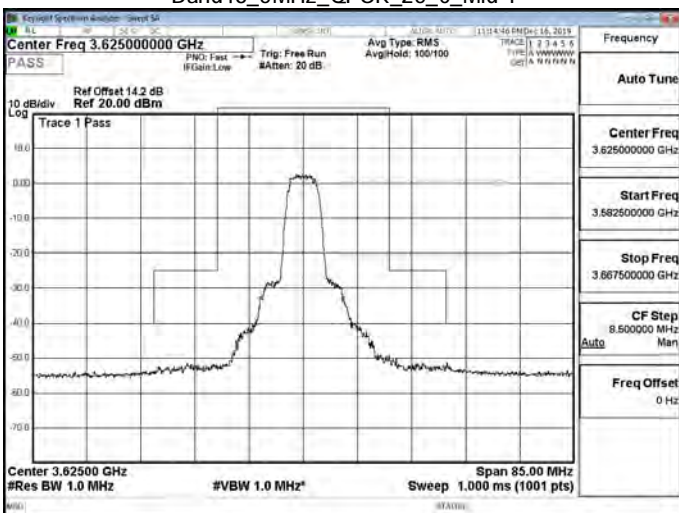
Band48_5MHz_QPSK_25_0_Low-2



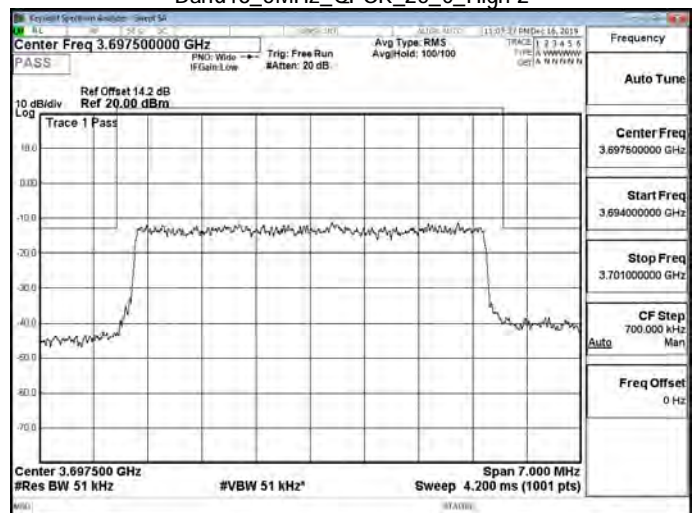
Band48_5MHz_QPSK_25_0_High-1



Band48_5MHz_QPSK_25_0_Mid-1



Band48_5MHz_QPSK_25_0_High-2

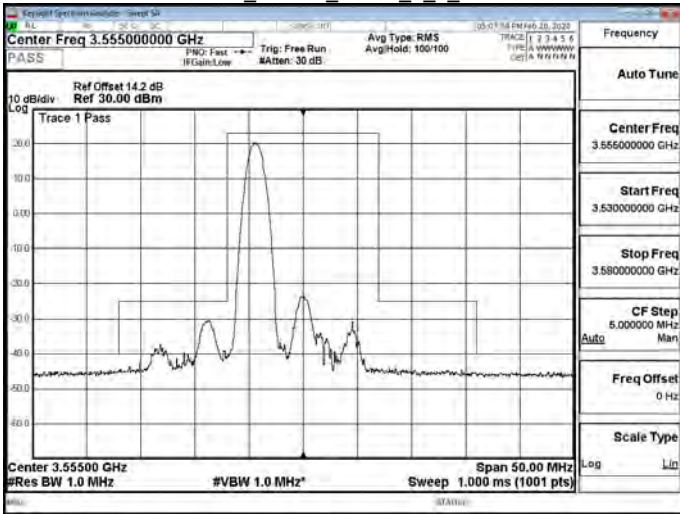


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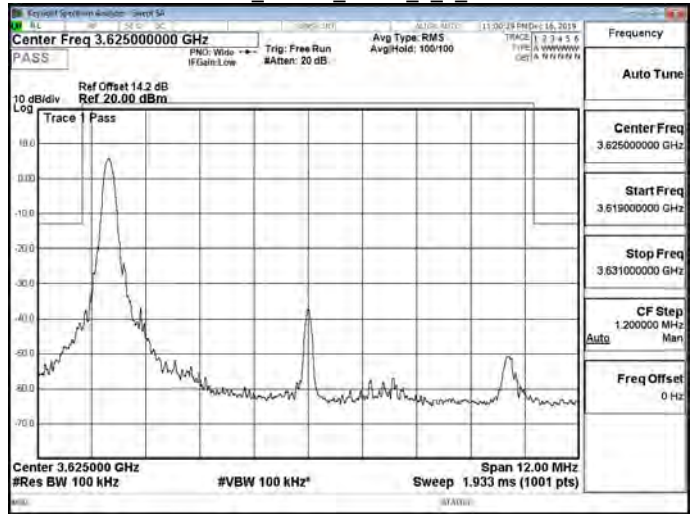
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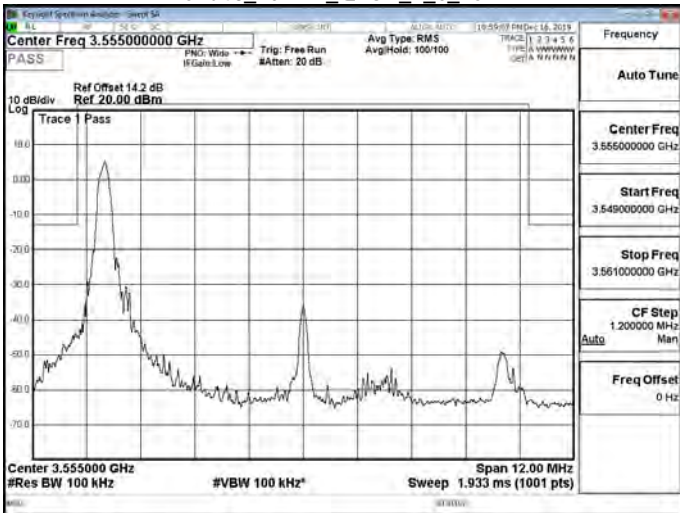
Band48_10MHz_QPSK_1_0_Low-1



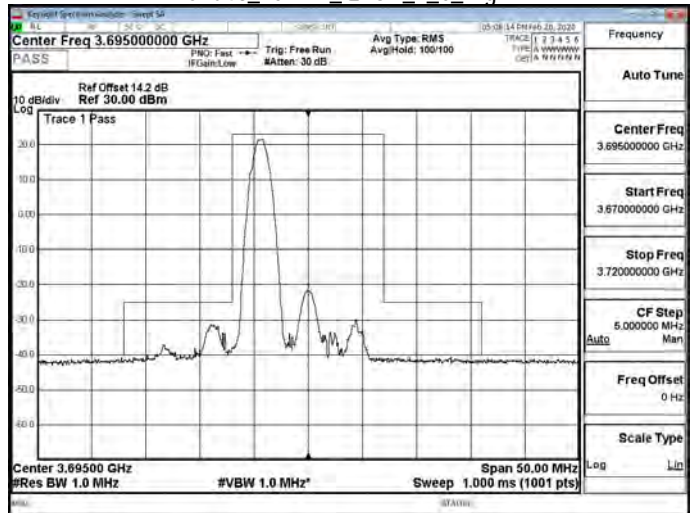
Band48_10MHz_QPSK_1_0_Mid-2



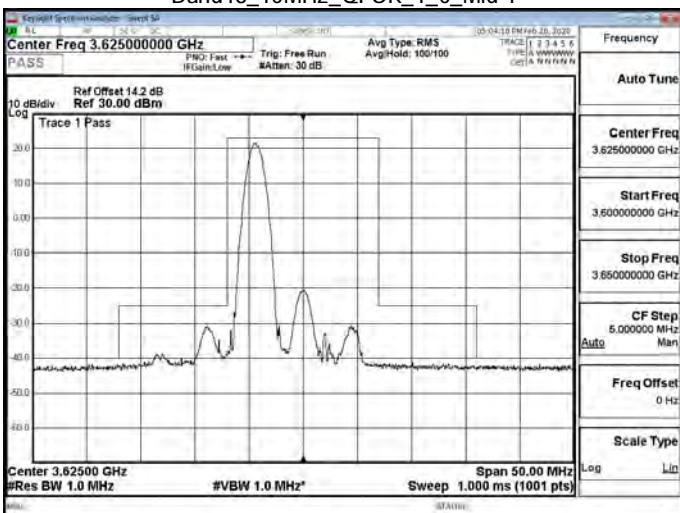
Band48_10MHz_QPSK_1_0_Low-2



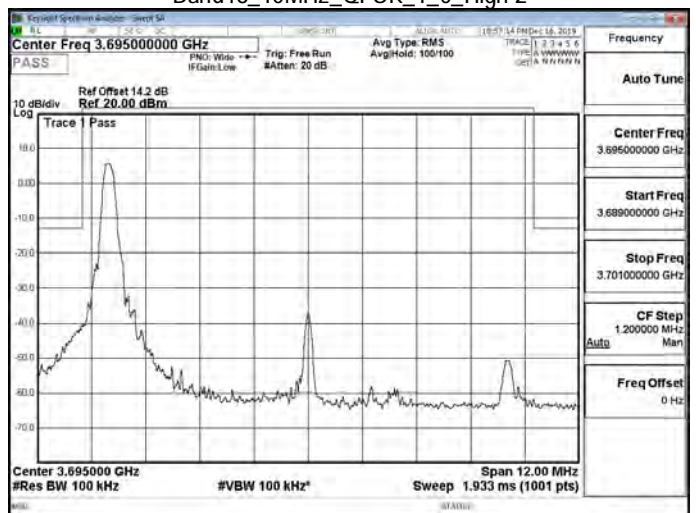
Band48_10MHz_QPSK_1_0_High-1



Band48_10MHz_QPSK_1_0_Mid-1



Band48_10MHz_QPSK_1_0_High-2

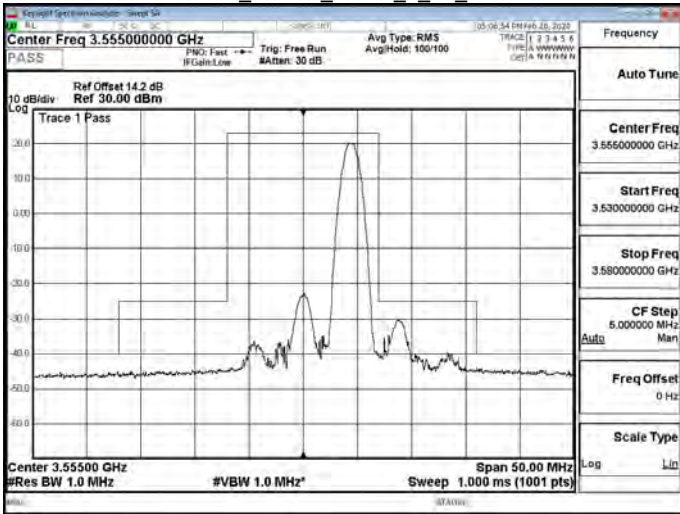


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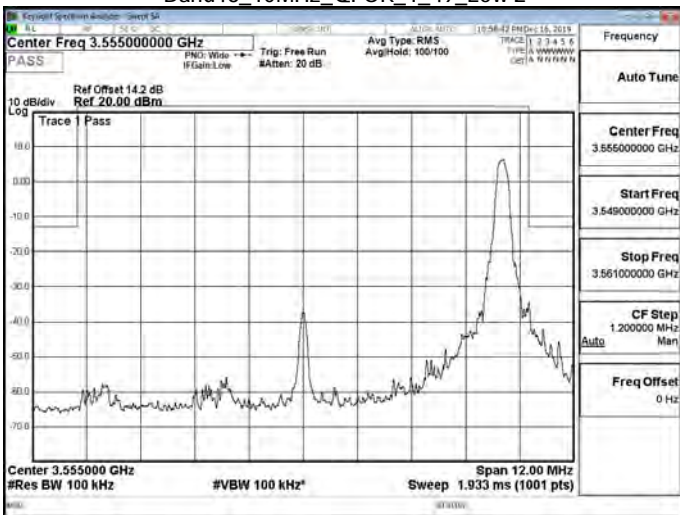
Band48_10MHz_QPSK_1_49_Low-1



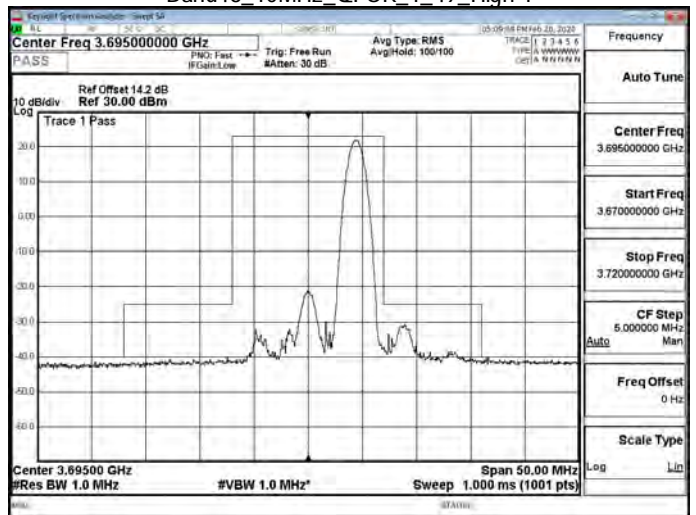
Band48_10MHz_QPSK_1_49_Mid-2



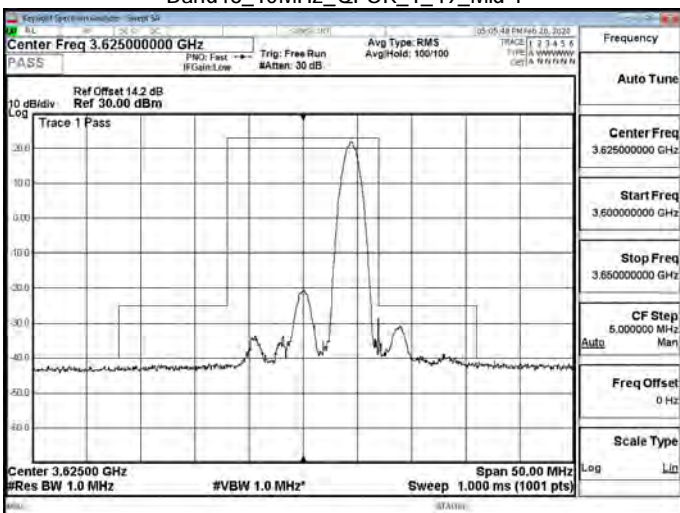
Band48_10MHz_QPSK_1_49_Low-2



Band48_10MHz_QPSK_1_49_High-1



Band48_10MHz_QPSK_1_49_Mid-1



Band48_10MHz_QPSK_1_49_High-2

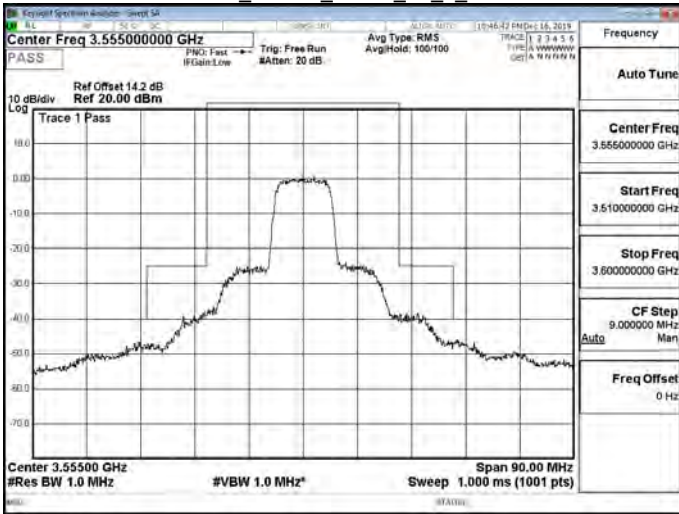


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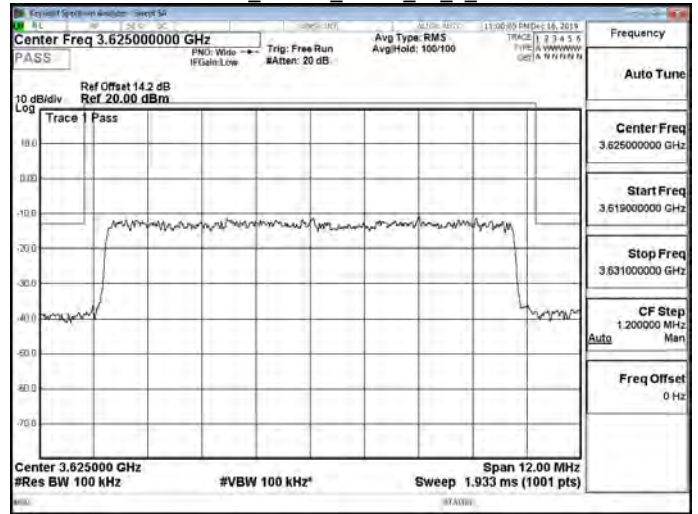
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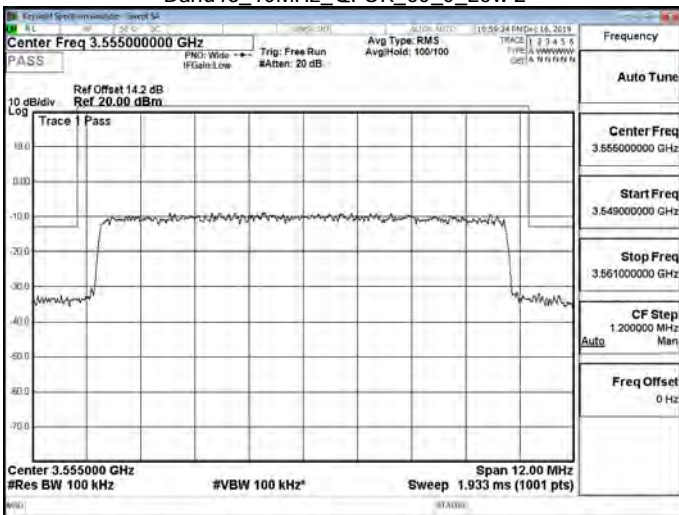
Band48_10MHz_QPSK_50_0_Low-1



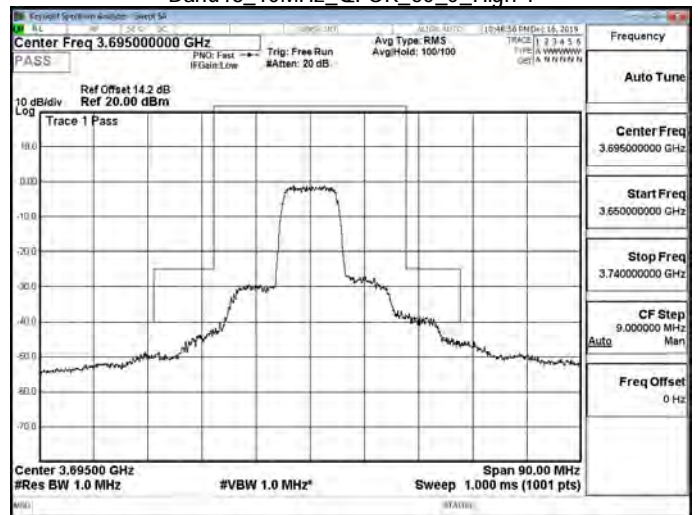
Band48_10MHz_QPSK_50_0_Mid-2



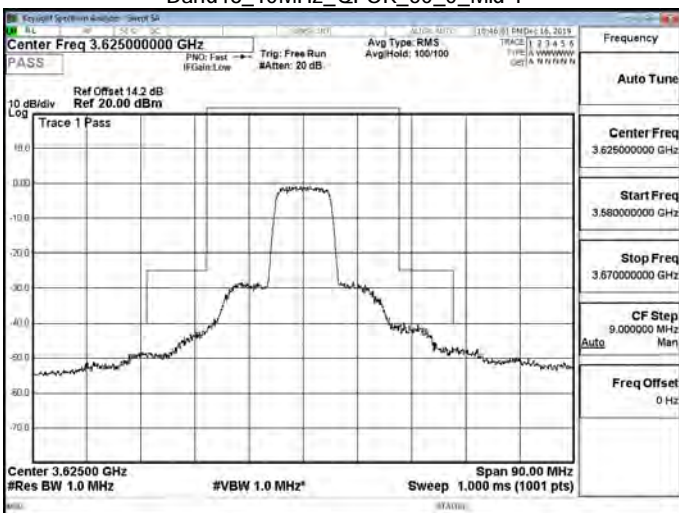
Band48_10MHz_QPSK_50_0_Low-2



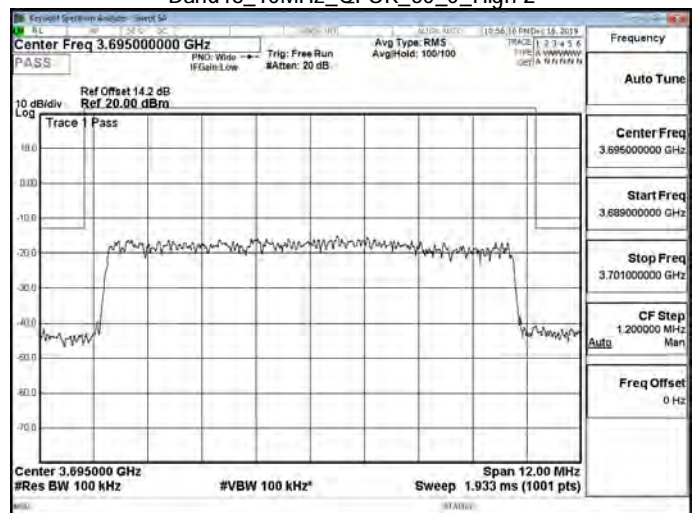
Band48_10MHz_QPSK_50_0_High-1



Band48_10MHz_QPSK_50_0_Mid-1



Band48_10MHz_QPSK_50_0_High-2

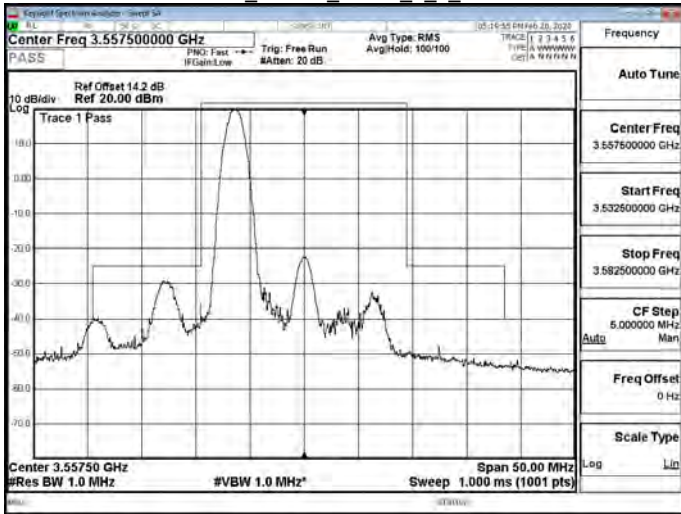


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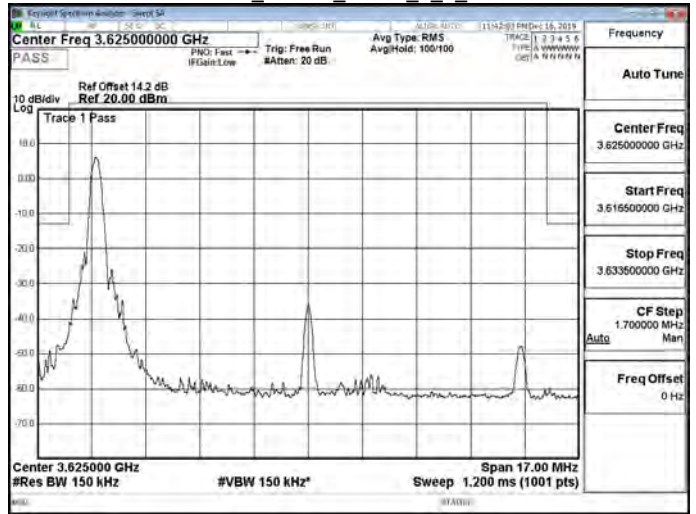
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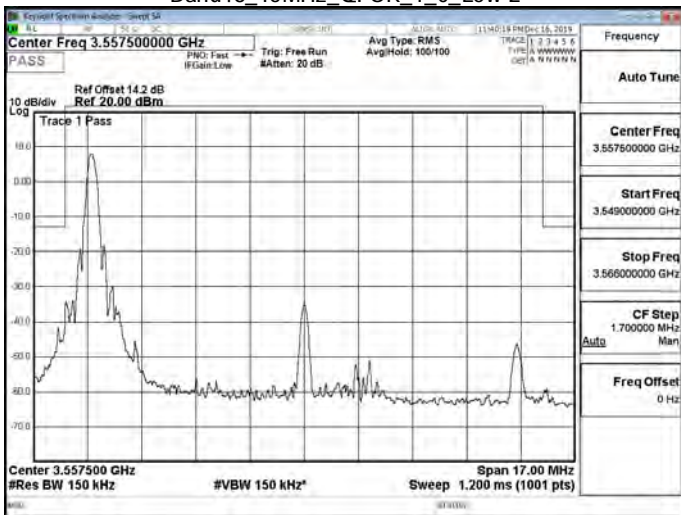
Band48_15MHz_QPSK_1_0_Low-1



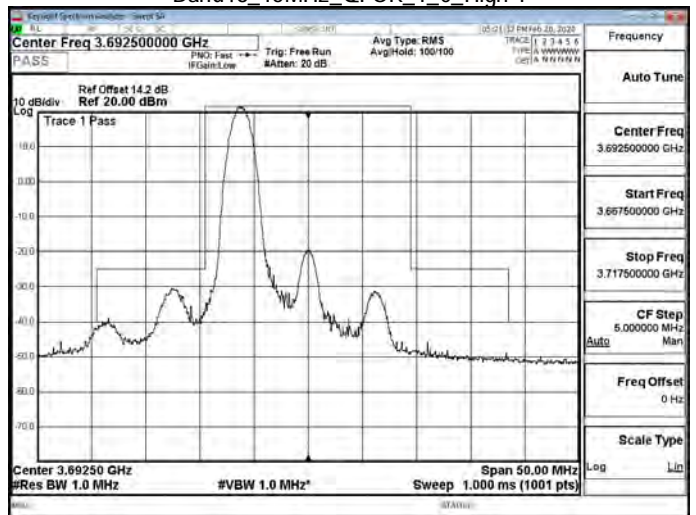
Band48_15MHz_QPSK_1_0_Mid-2



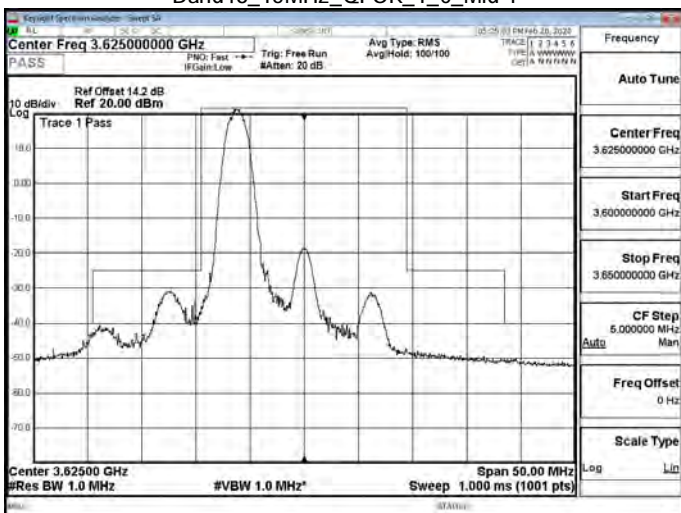
Band48_15MHz_QPSK_1_0_Low-2



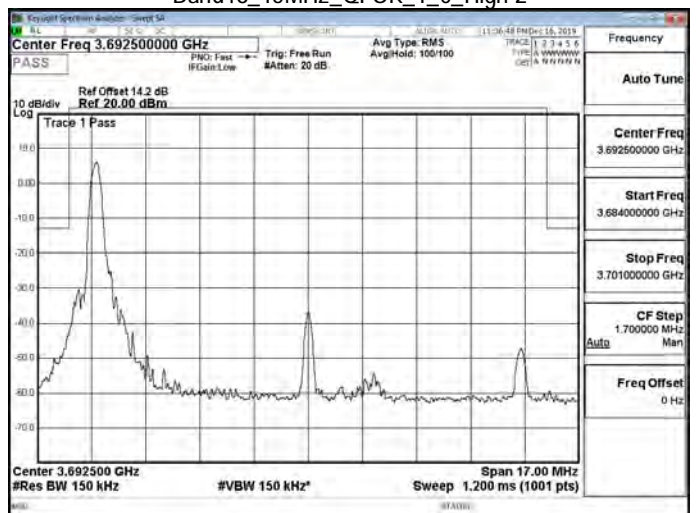
Band48_15MHz_QPSK_1_0_High-1



Band48_15MHz_QPSK_1_0_Mid-1



Band48_15MHz_QPSK_1_0_High-2

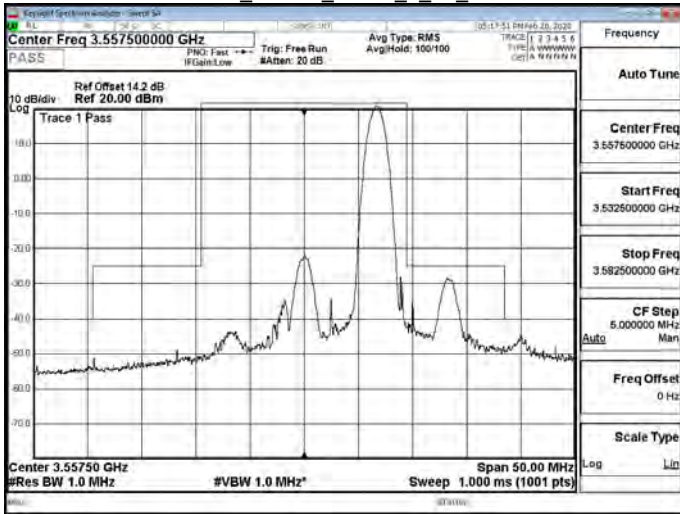


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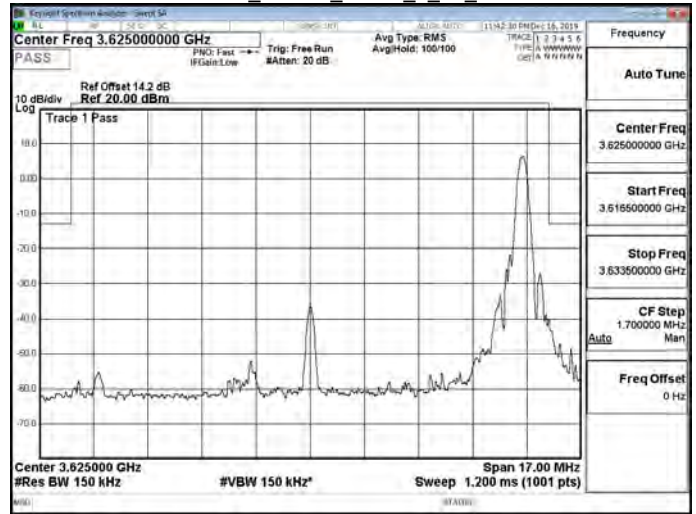
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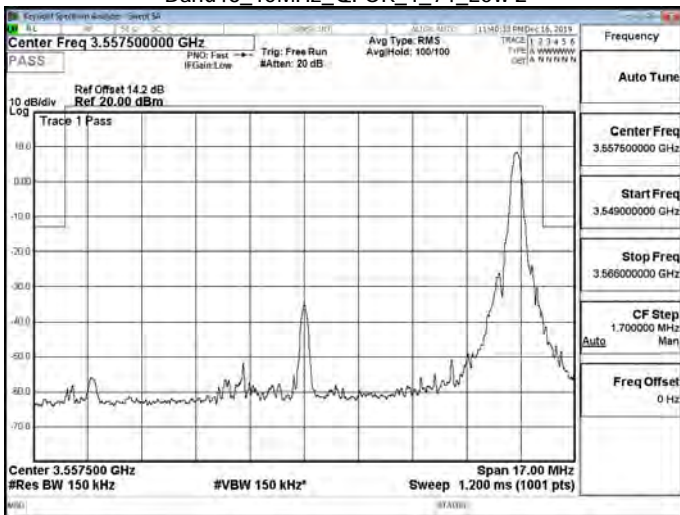
Band48_15MHz_QPSK_1_74_Low-1



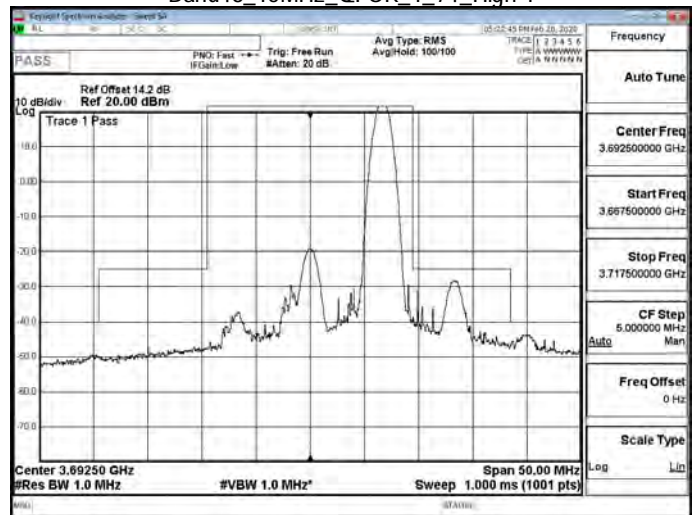
Band48_15MHz_QPSK_1_74_Mid-2



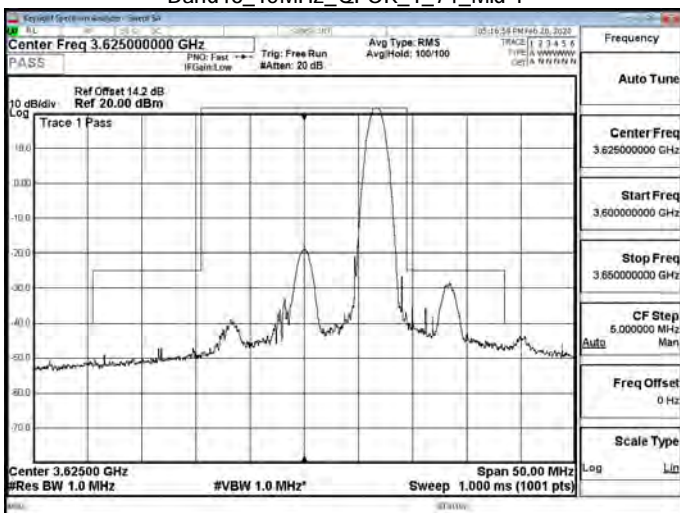
Band48_15MHz_QPSK_1_74_Low-2



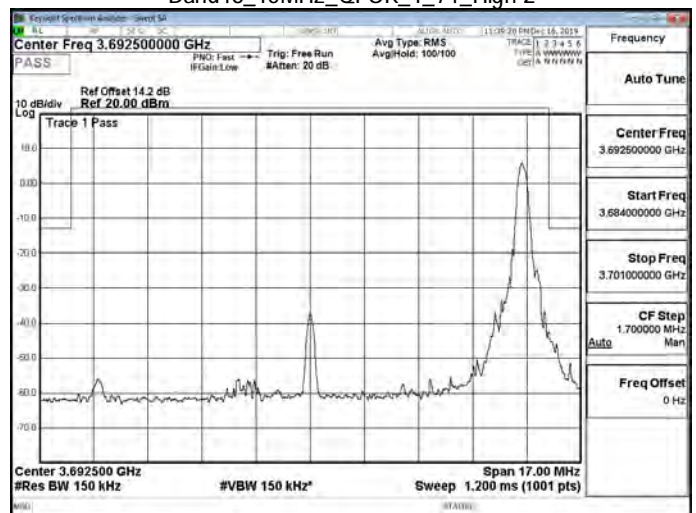
Band48_15MHz_QPSK_1_74_High-1



Band48_15MHz_QPSK_1_74_Mid-1



Band48_15MHz_QPSK_1_74_High-2

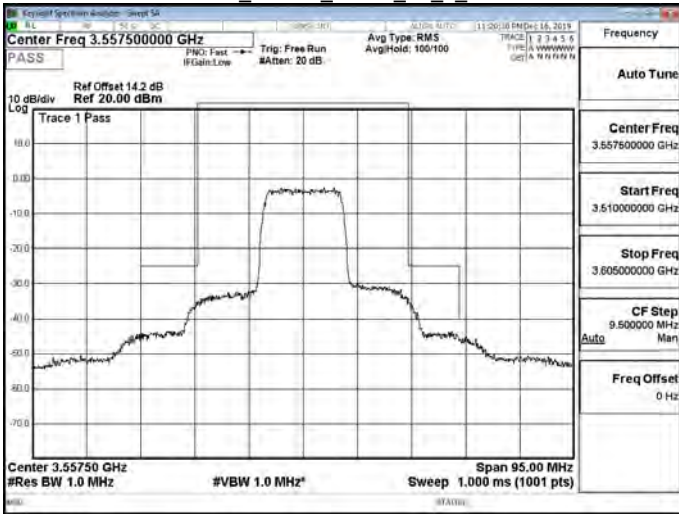


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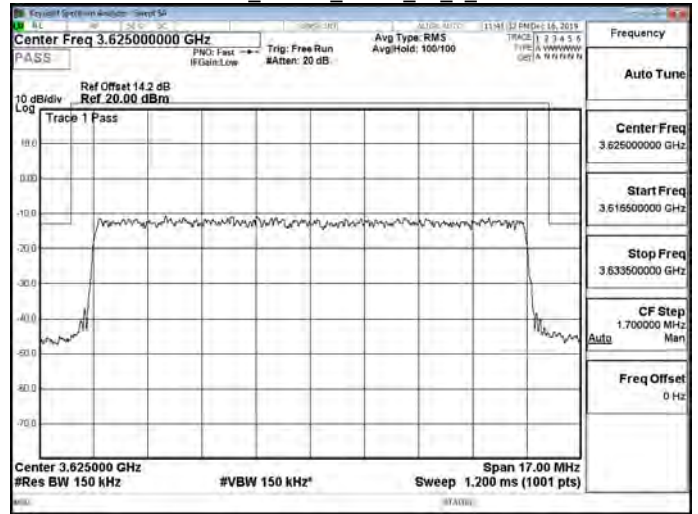
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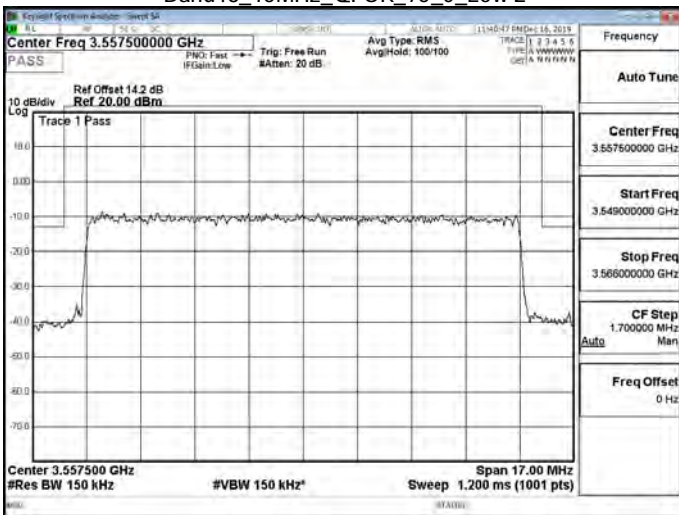
Band48_15MHz_QPSK_75_0_Low-1



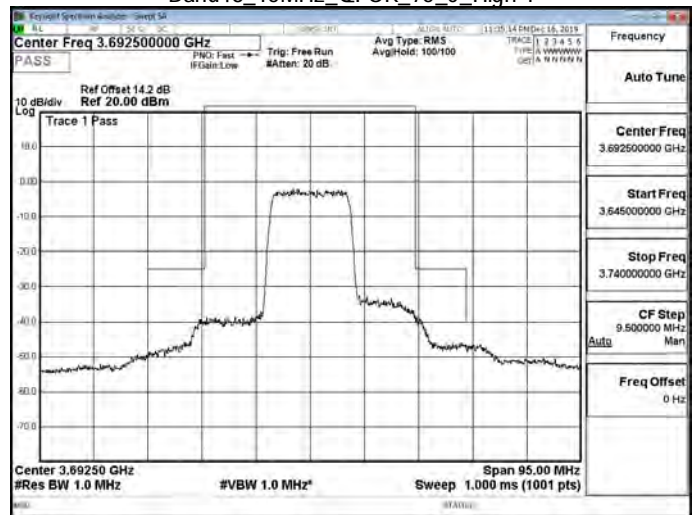
Band48_15MHz_QPSK_75_0_Mid-2



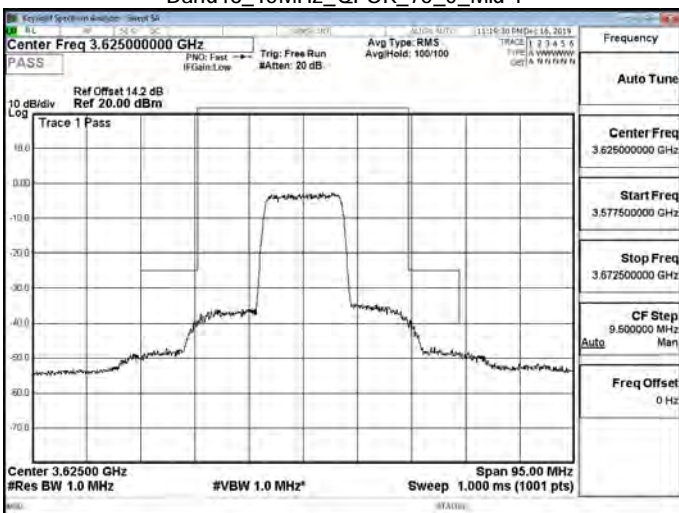
Band48_15MHz_QPSK_75_0_Low-2



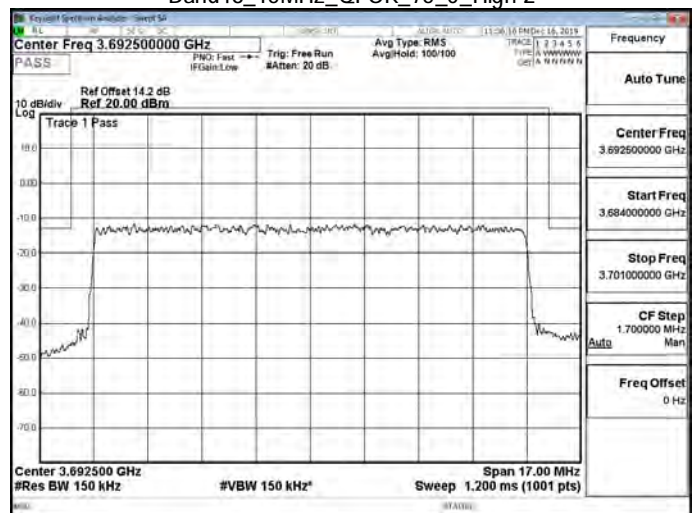
Band48_15MHz_QPSK_75_0_High-1



Band48_15MHz_QPSK_75_0_Mid-1



Band48_15MHz_QPSK_75_0_High-2

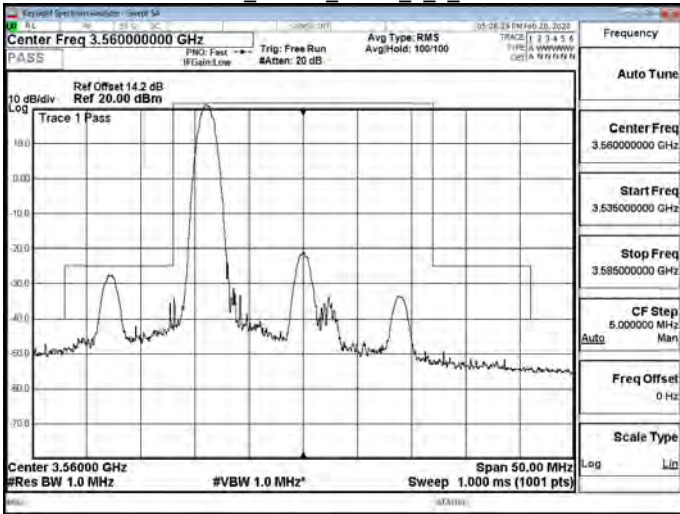


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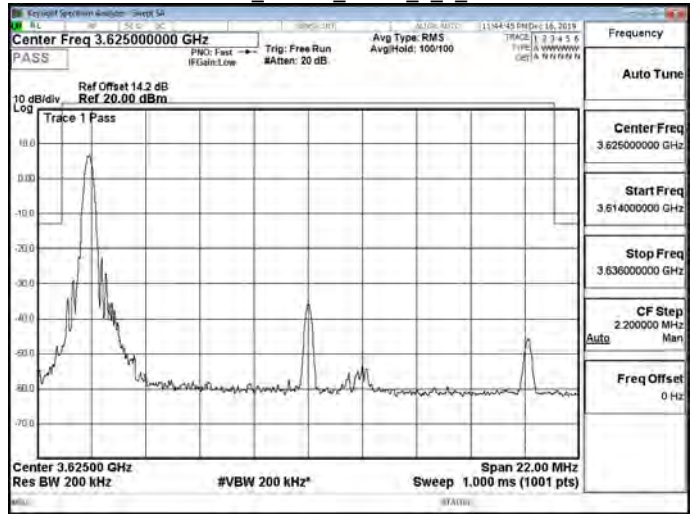
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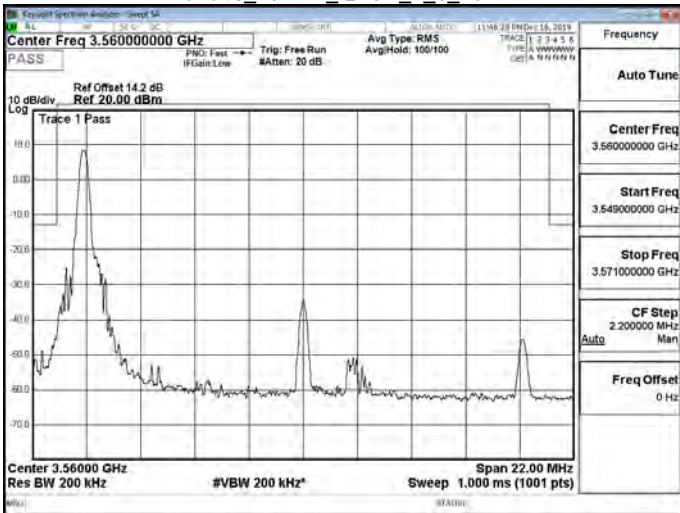
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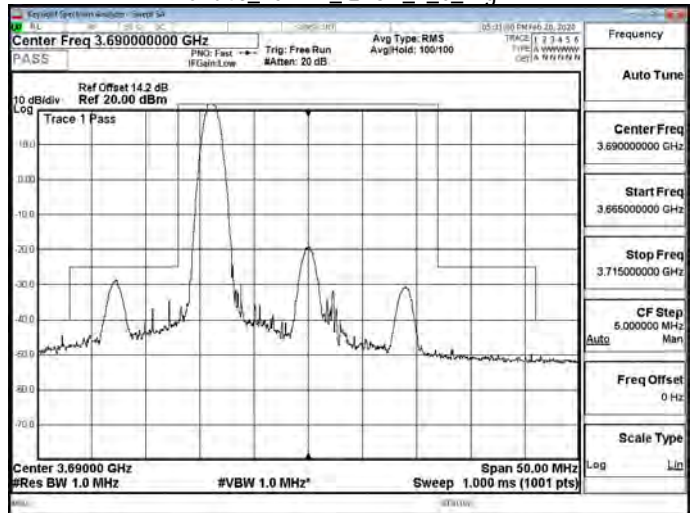
Band48_20MHz_QPSK_1_0_Mid-2



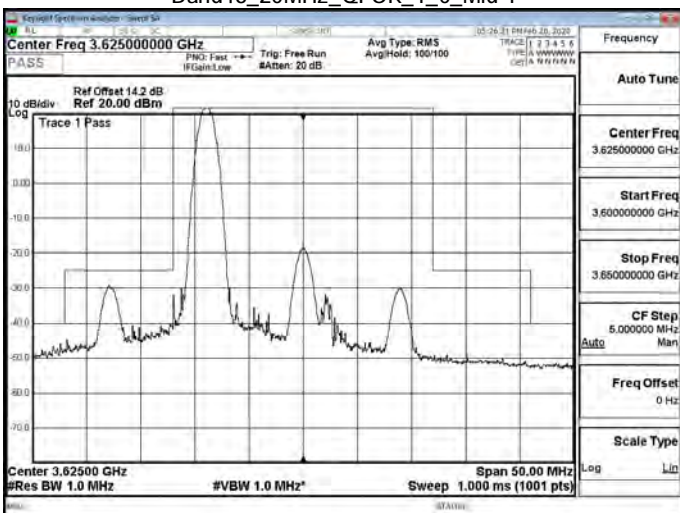
Band48_20MHz_QPSK_1_0_Low-2



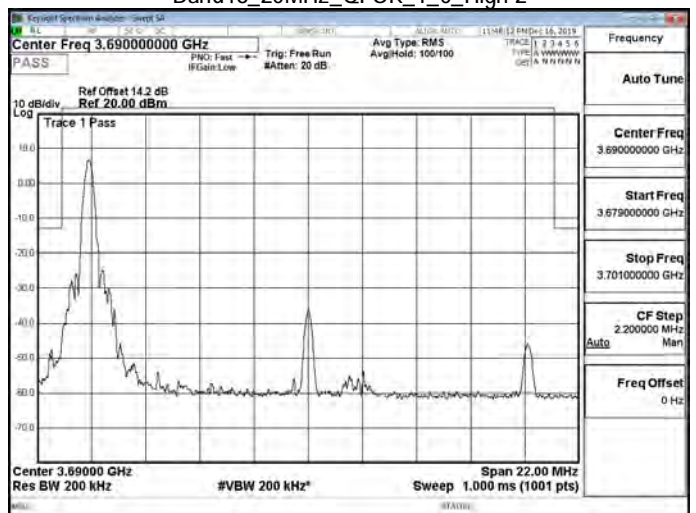
Band48_20MHz_QPSK_1_0_High-1



Band48_20MHz_QPSK_1_0_Mid-1



Band48_20MHz_QPSK_1_0_High-2

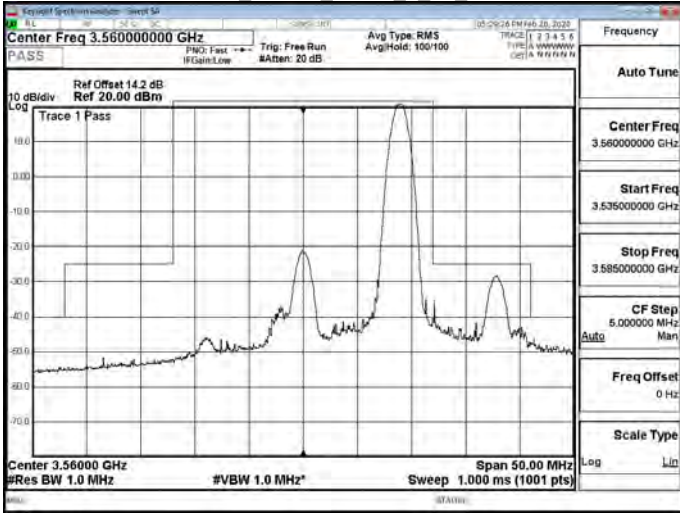


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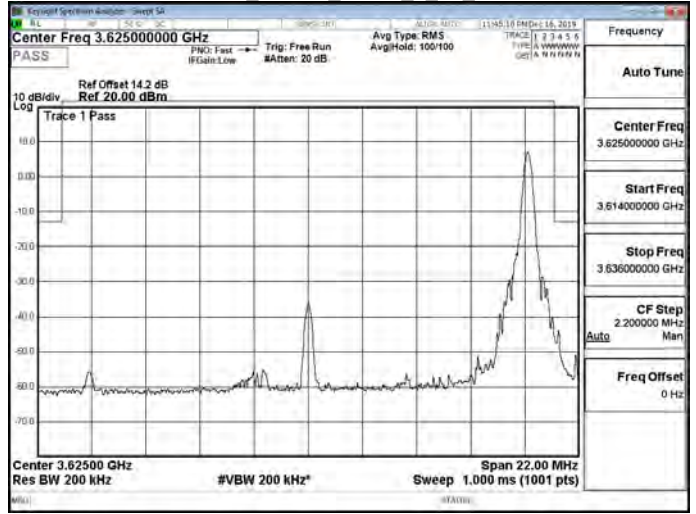
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Band48_20MHz_QPSK_1_99_Low-1



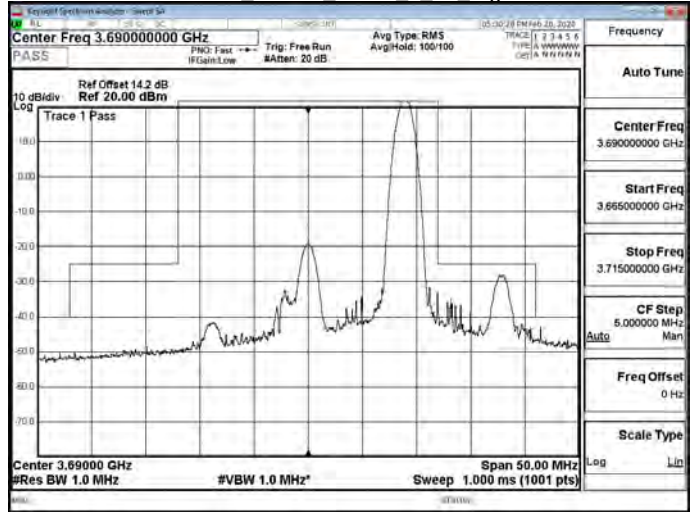
Band48_20MHz_QPSK_1_99_Mid-2



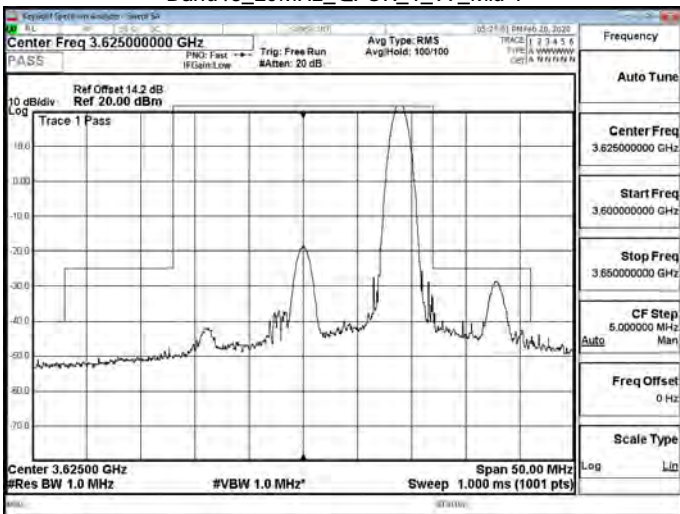
Band48_20MHz_QPSK_1_99_Low-2



Band48_20MHz_QPSK_1_99_High-1



Band48_20MHz_QPSK_1_99_Mid-1



Band48_20MHz_QPSK_1_99_High-2

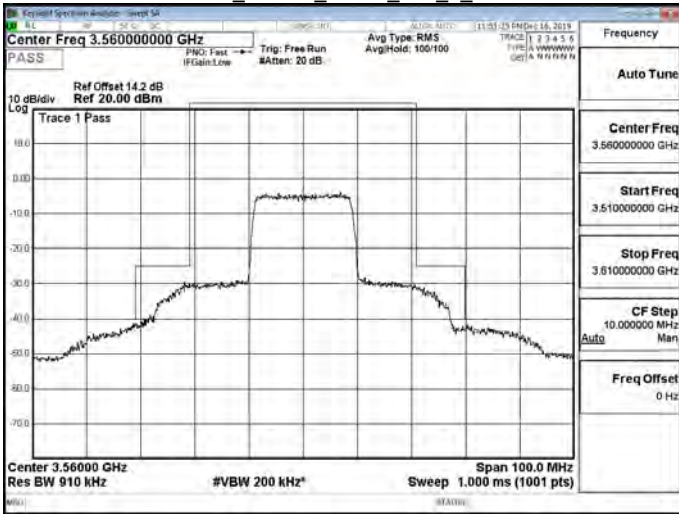


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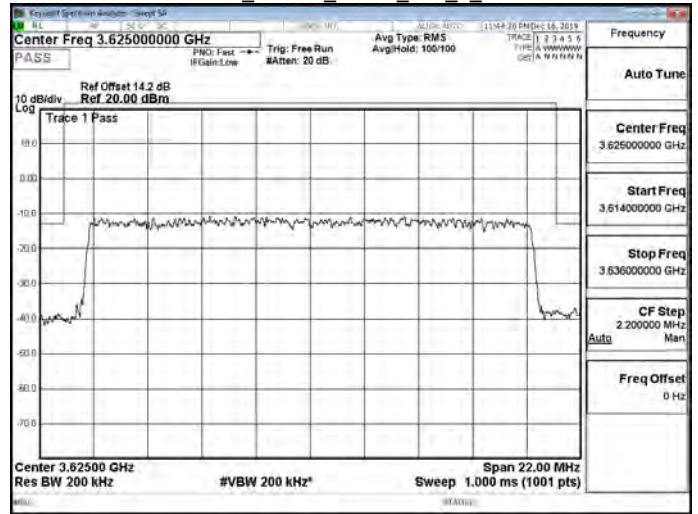
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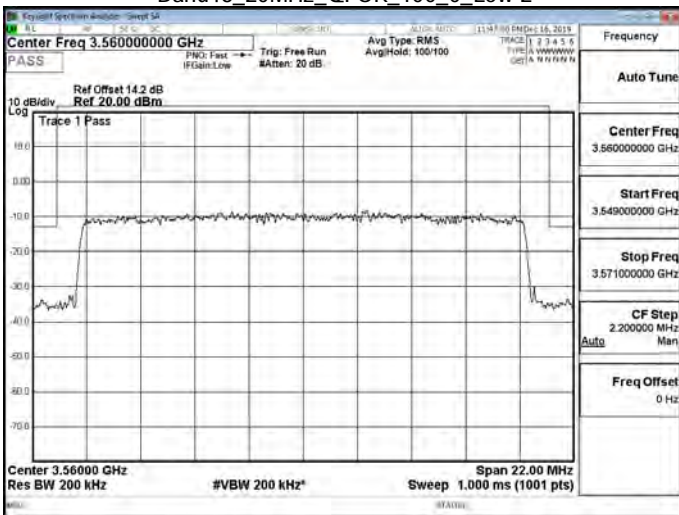
Band48_20MHz_QPSK_100_0_Low-1



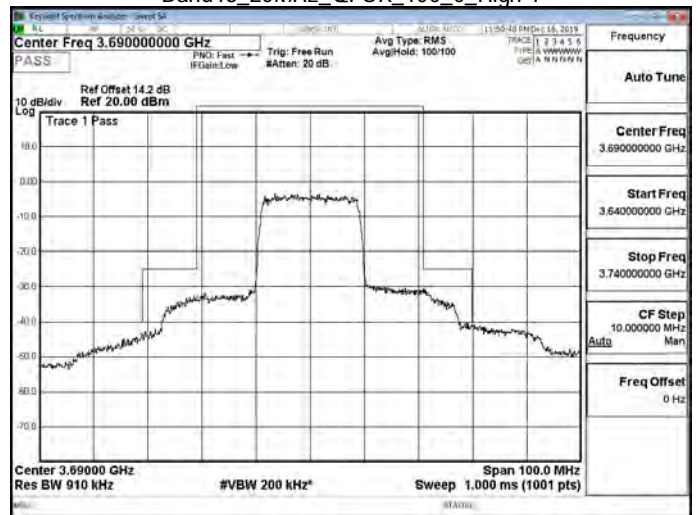
Band48_20MHz_QPSK_100_0_Mid-2



Band48_20MHz_QPSK_100_0_Low-2



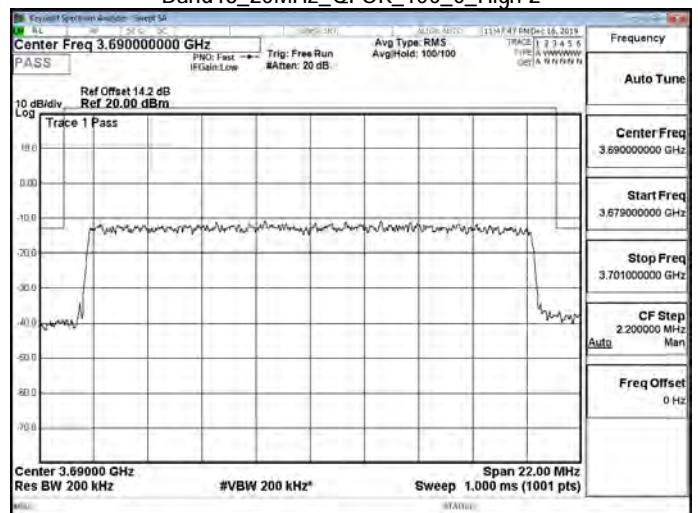
Band48_20MHz_QPSK_100_0_High-1



Band48_20MHz_QPSK_100_0_Mid-1



Band48_20MHz_QPSK_100_0_High-2



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10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

10.1. Standard Applicable

FCC Part 2.1053, Part 96.41 , C63.26 Clause 5.7

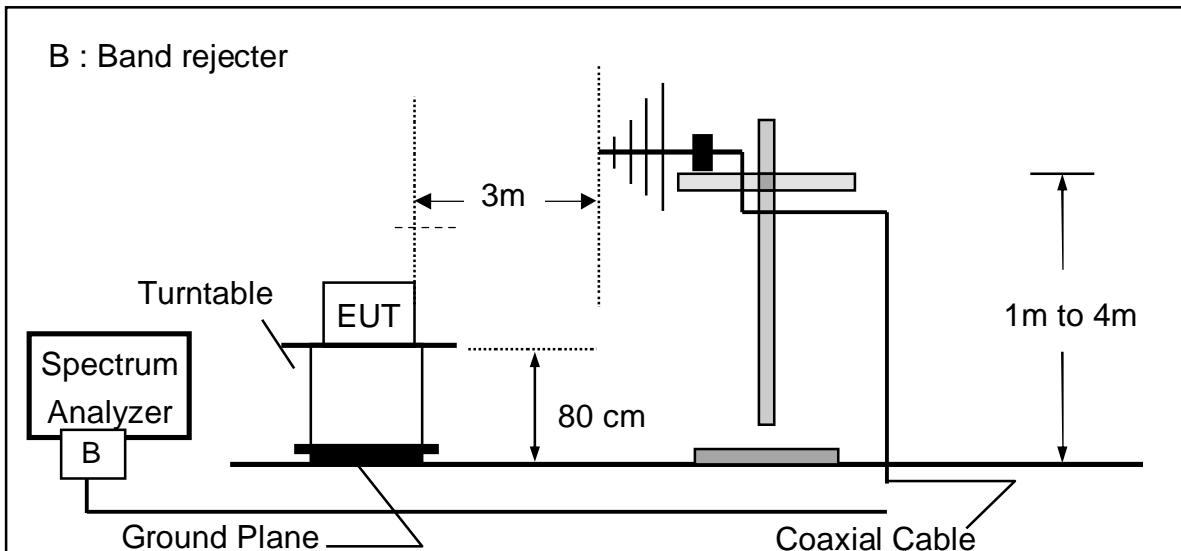
1. within 0 MHz to 10 MHz above and below the **assigned channel** ≤ -13 dBm/MHz
2. greater than 10 MHz above and below the **assigned channel** ≤ -25 dBm/MHz
3. any emission below 3530 MHz and above 3720 MHz ≤ -40 dBm/MHz

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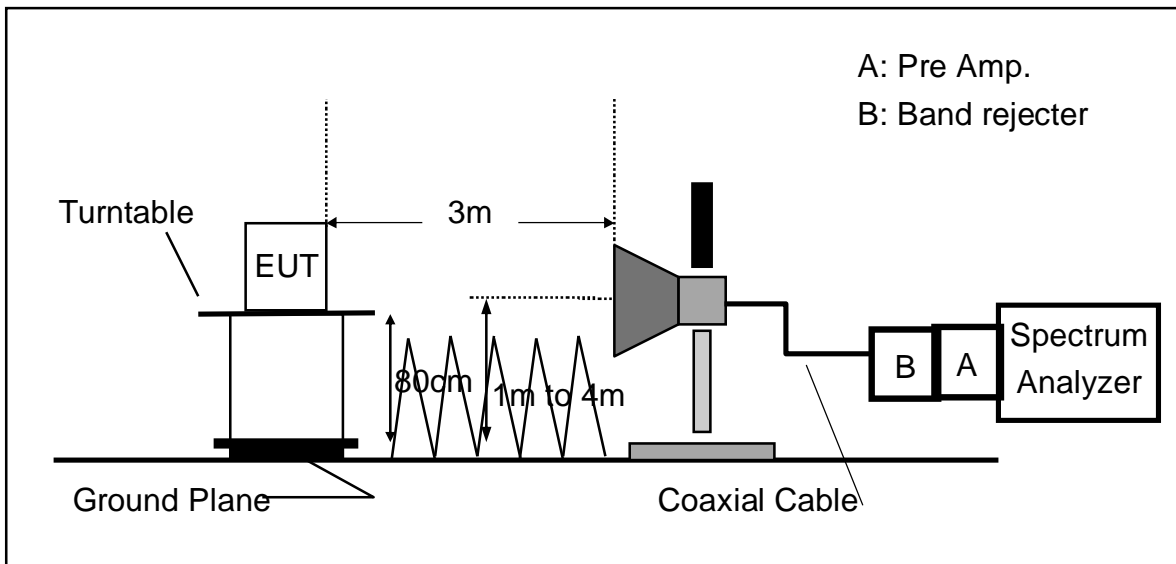
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10.2. EUT Setup

Radiated Emission Test Set-Up, Frequency Below 1000MHz



Radiated Emission Test Set-UP Frequency Over 1 GHz



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10.3. Measurement Procedure:

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

ERP (dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

EIRP (dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

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10.4. Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35240	09/09/2019	09/08/2020
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/09/2019	01/08/2020
Horn Antenna	SCHWAZBECK	BBHA9170	184	12/27/2018	12/26/2019
Loop Antenna	ETS.LINDGREN	6502	143303	04/25/2019	04/24/2020
EMI Test Receiver	R&S	ESU 40	100363	04/15/2019	04/14/2020
Radio Communication Analyser	Anritsu	MT8821C	6262044739	12/06/2019	12/05/2020
Pre-Amplifier	EMC Instruments	EMC330	980096	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instruments	EMC0011830	980199	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	11/20/2019	11/19/2020
Notch Filter	Woken	EWT-54-0037	RF54	11/20/2019	11/19/2020
Notch Filter	Woken	EWT-54-0038	RF55	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	11/20/2019	11/19/2020

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t (886-2) 2299-3279

f (886-2) 2298-0488

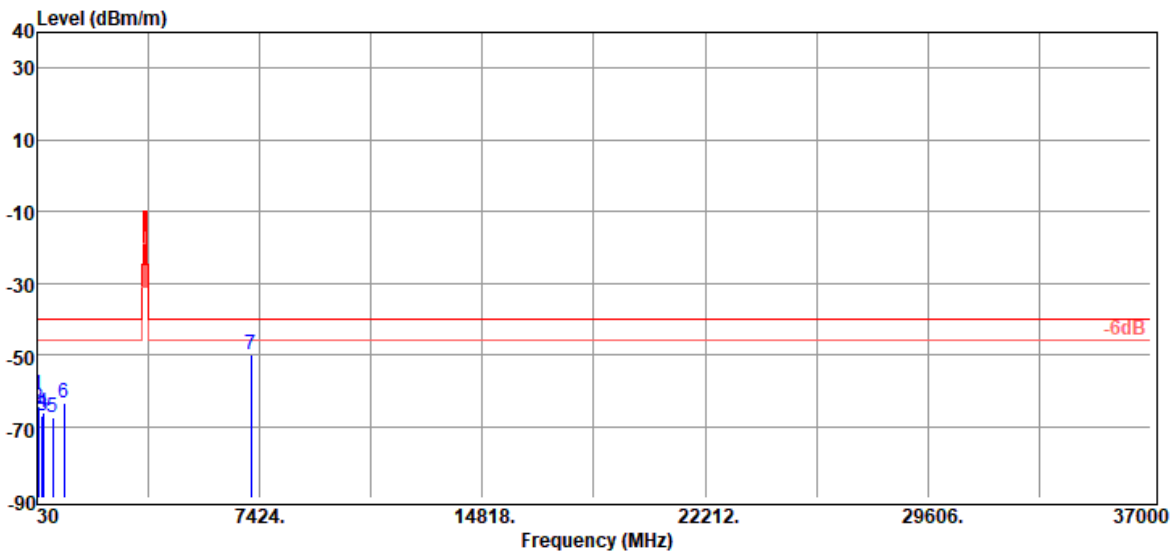
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10.5. Measurement Result:

Radiated Spurious Emission Measurement Result: LTE Band 48 3625MHz Mode

Report Number	:E2/2019/90045	Test Date	:2019-11-28
Operation Mode	:LTE B48	Temp./Humi.	:22.7/58
Test Mode	:TX CH LOW	Antenna Pol.	:VERTICAL
EUT Pol	:E2 Plan	Engineer	:Ashton
Test Channel	:3560 MHz		



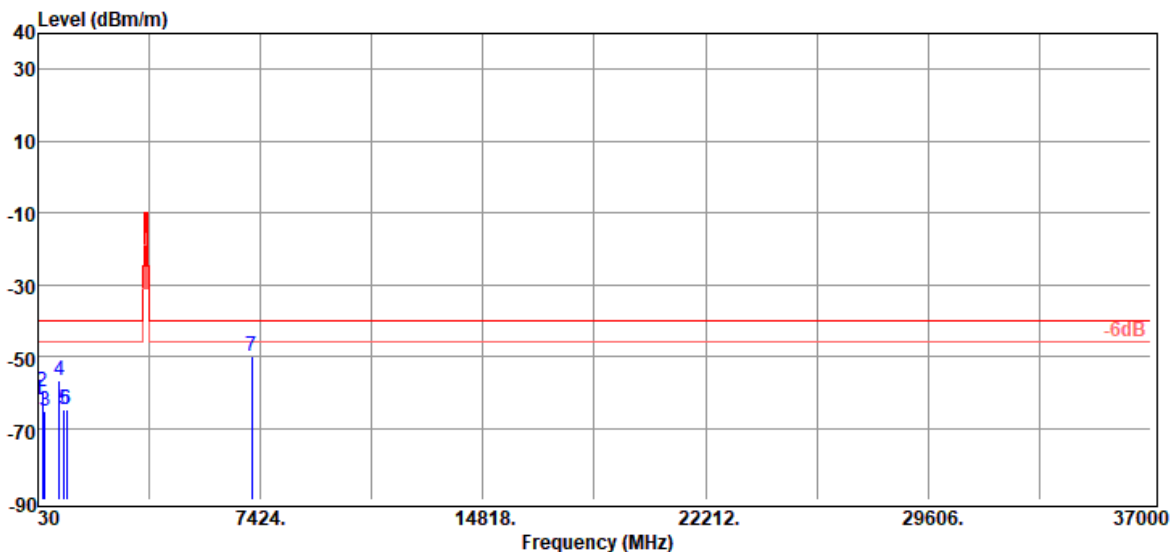
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
53.28	-61.20	-43.38	-16.91	-0.91	-40.00	-21.20
72.68	-64.92	-52.94	-10.94	-1.04	-40.00	-24.92
203.63	-66.88	-62.84	-1.96	-2.08	-40.00	-26.88
226.91	-65.96	-62.49	-1.28	-2.19	-40.00	-25.96
539.25	-67.47	-63.04	-1.19	-3.24	-40.00	-27.47
929.19	-63.46	-56.89	-1.68	-4.89	-40.00	-23.46
7120.00	-50.14	-49.22	11.30	-12.22	-40.00	-10.14

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Report Number :E2/2019/90045
Operation Mode :LTE B48
Test Mode :TX CH LOW
EUT Pol :E2 Plan
Test Channel :3560 MHz

Test Date :2019-11-28
Temp./Humi. :22.7/58
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
31.94	-62.28	-41.26	-20.36	-0.66	-40.00	-22.28
164.83	-59.69	-51.38	-6.60	-1.71	-40.00	-19.69
247.28	-65.27	-61.36	-1.68	-2.23	-40.00	-25.27
729.37	-56.79	-51.05	-1.46	-4.28	-40.00	-16.79
902.03	-64.66	-58.65	-1.38	-4.63	-40.00	-24.66
984.48	-64.61	-58.22	-1.48	-4.91	-40.00	-24.61
7120.00	-49.80	-48.88	11.30	-12.22	-40.00	-9.80

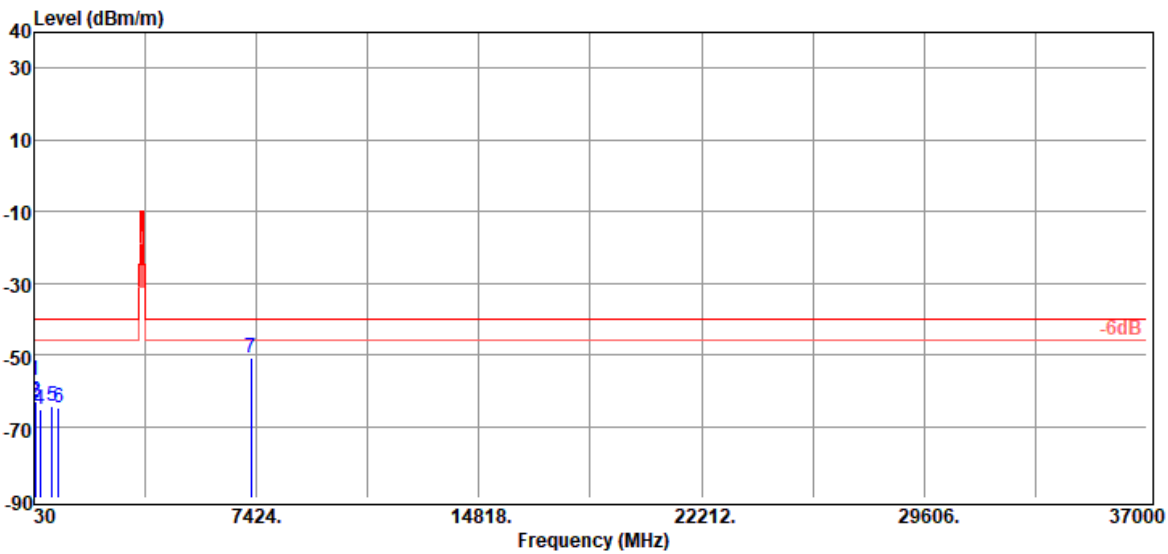
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Report Number :E2/2019/90045
 Operation Mode :LTE B48
 Test Mode :TX CH MID
 EUT Pol :E2 Plan
 Test Channel :3625 MHz

Test Date :2019-11-28
 Temp./Humi. :22.7/58
 Antenna Pol. :VERTICAL
 Engineer :Ashton



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
53.28	-57.35	-39.53	-16.91	-0.91	-40.00	-17.35
73.65	-63.32	-51.76	-10.50	-1.06	-40.00	-23.32
105.66	-62.88	-54.65	-6.83	-1.40	-40.00	-22.88
229.82	-65.38	-61.79	-1.40	-2.19	-40.00	-25.38
633.34	-64.26	-59.01	-1.50	-3.75	-40.00	-24.26
851.59	-64.65	-58.77	-1.37	-4.51	-40.00	-24.65
7250.00	-51.04	-49.84	11.20	-12.40	-40.00	-11.04

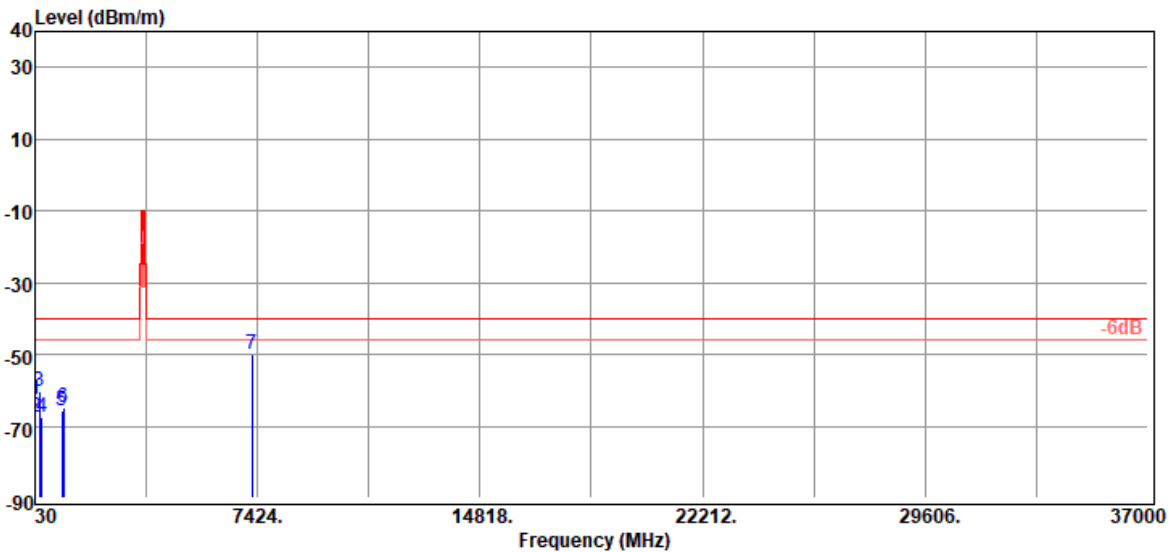
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Report Number :E2/2019/90045
 Operation Mode :LTE B48
 Test Mode :TX CH MID
 EUT Pol :E2 Plan
 Test Channel :3625 MHz

Test Date :2019-11-28
 Temp./Humi. :22.7/58
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
39.70	-62.52	-42.53	-19.14	-0.85	-40.00	-22.52
53.28	-67.51	-49.69	-16.91	-0.91	-40.00	-27.51
164.83	-60.22	-51.91	-6.60	-1.71	-40.00	-20.22
261.83	-67.47	-63.65	-1.55	-2.27	-40.00	-27.47
931.13	-65.83	-59.27	-1.68	-4.88	-40.00	-25.83
981.57	-65.01	-58.60	-1.50	-4.91	-40.00	-25.01
7250.00	-50.02	-48.82	11.20	-12.40	-40.00	-10.02

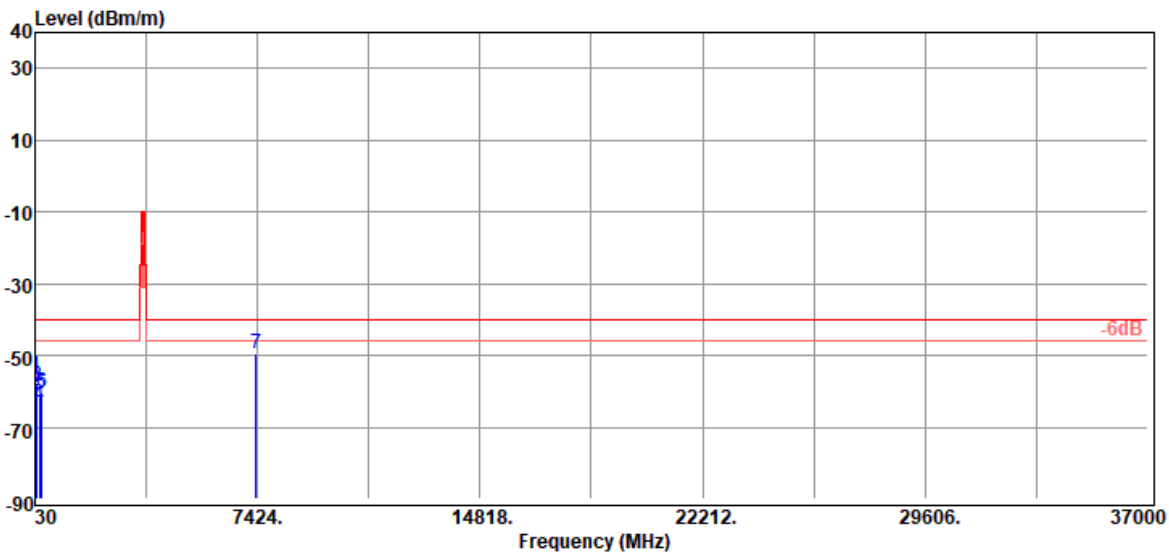
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Report Number :E2/2019/90045
 Operation Mode :LTE B48
 Test Mode :TX CH HIGH
 EUT Pol :E2 Plan
 Test Channel :3690 MHz

Test Date :2019-11-28
 Temp./Humi. :22.7/58
 Antenna Pol. :VERTICAL
 Engineer :Ashton



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
52.31	-56.00	-37.97	-17.14	-0.89	-40.00	-16.00
73.65	-59.83	-48.27	-10.50	-1.06	-40.00	-19.83
104.69	-58.66	-50.49	-6.78	-1.39	-40.00	-18.66
164.83	-63.95	-55.64	-6.60	-1.71	-40.00	-23.95
211.39	-60.88	-57.24	-1.54	-2.10	-40.00	-20.88
245.34	-60.26	-56.28	-1.75	-2.23	-40.00	-20.26
7380.00	-49.35	-47.79	11.16	-12.72	-40.00	-9.35

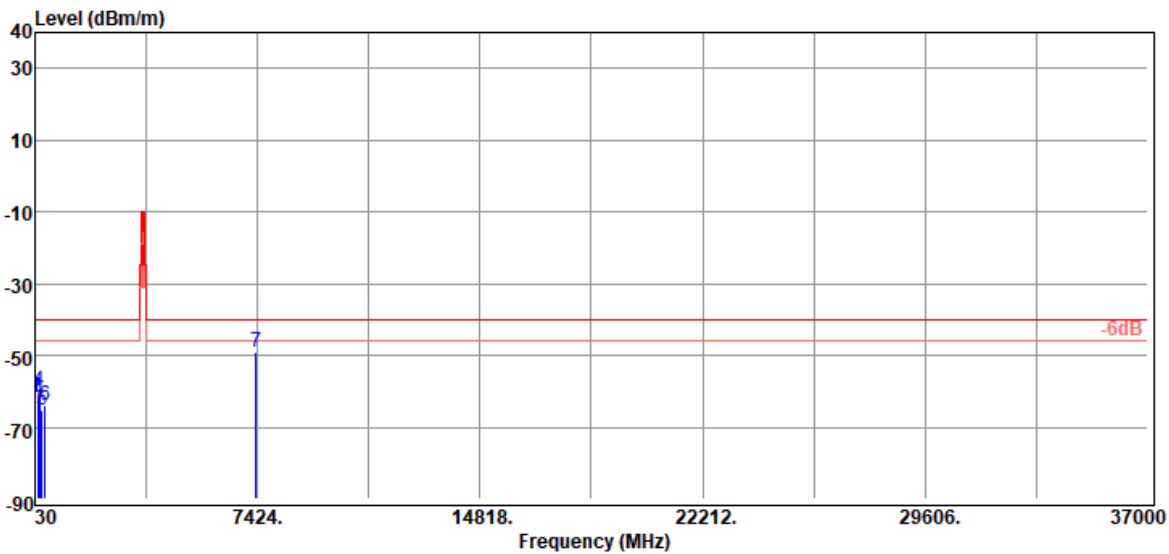
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Report Number :E2/2019/90045
 Operation Mode :LTE B48
 Test Mode :TX CH HIGH
 EUT Pol :E2 Plan
 Test Channel :3690 MHz

Test Date :2019-11-28
 Temp./Humi. :22.7/58
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
39.70	-61.86	-41.87	-19.14	-0.85	-40.00	-21.86
53.28	-61.76	-43.94	-16.91	-0.91	-40.00	-21.76
131.85	-61.68	-52.70	-7.32	-1.66	-40.00	-21.68
166.77	-59.71	-51.49	-6.50	-1.72	-40.00	-19.71
247.28	-65.13	-61.22	-1.68	-2.23	-40.00	-25.13
355.92	-63.83	-59.90	-1.35	-2.58	-40.00	-23.83
7380.00	-49.15	-47.59	11.16	-12.72	-40.00	-9.15

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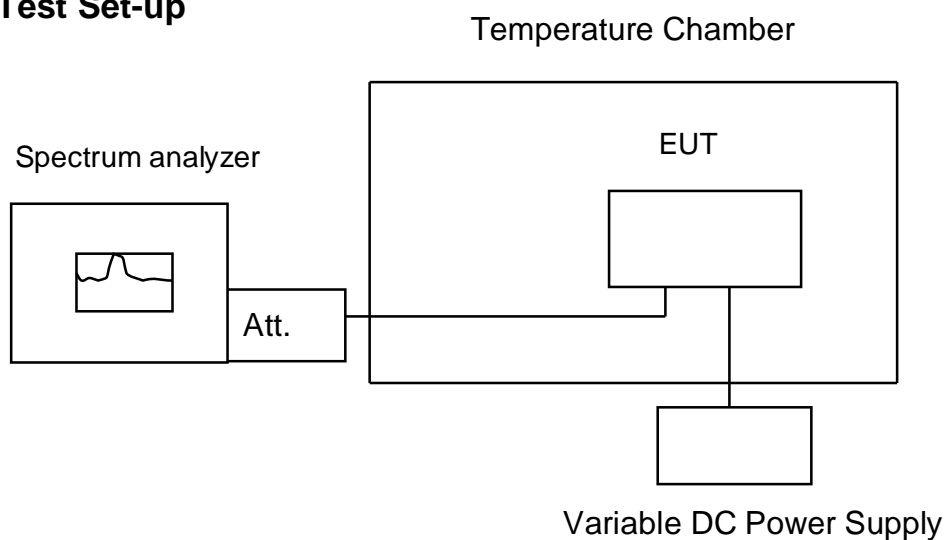
11. FREQUENCY STABILITY MEASUREMENT

11.1. Standard Applicable

FCC §2.1055(a)

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency band. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency.

11.2. Test Set-up



Note: Measurement setup for testing on Antenna connector

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11.3. Measurement Procedure

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Set chamber temperature to 25°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint as declared by the manufacturer, record the maximum frequency change.

11.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/06/2019	03/05/2020
Radio Communication Analyser	Anritsu	MT8821C	6262044739	12/06/2019	12/05/2020
Attenuator	Marvelous	MVE2213-10	RF30	11/20/2019	11/19/2020
DC Block	PASTERNAK	PE8210	RF32	11/20/2019	11/19/2020
Splitter	Woken	DOM35LW1A2	RF83	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF229	11/20/2019	11/19/2020

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/17/2020	03/16/2021

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

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11.5. Measurement Result

Reference Freq.:		LTE B48 Mid Channel		3625	MHz 10M QPSK CH 55990
Power Supply Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit = +/- 2.5 ppm (Hz)	
Freq. ERROR vs. VOLTAGE					
3.465	25	3625.000009	9	6488	
3.3	25	3625.000012	12	6488	
3.135	25	3625.000008	8	6488	
2.9 (End Point)	25	3625.000006	6	6488	
Freq. ERROR vs. Temp.					
3.3	-30	3624.999987	-13	6488	
3.3	-20	3624.999991	-9	6488	
3.3	-10	3624.999996	-4	6488	
3.3	0	3625.000001	1	6488	
3.3	10	3625.000005	5	6488	
3.3	20	3625.000007	7	6488	
3.3	30	3625.000012	12	6488	
3.3	40	3625.000016	16	6488	
3.3	50	3625.000007	7	6488	

Note: The battery is rated 3.3Vdc

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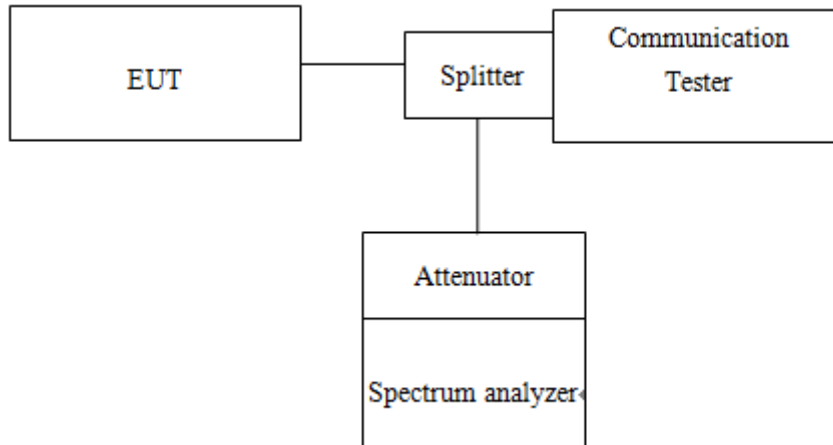
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12. PEAK TO AVERAGE RATIO

12.1. Standard Applicable

The peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

12.2. Test SET-UP



12.3. Measurement Procedure

1. KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly:
2. Set resolution/measurement bandwidth \geq signal's occupied bandwidth; & internal = 1ms
3. Set the number of counts to a value that stabilizes the measured CCDF curve.

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12.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/06/2019	03/05/2020
Radio Communication Analyer	Anritsu	MT8821C	6262044739	12/06/2019	12/05/2020
Attenuator	Marvelous	MVE2213-10	RF30	11/20/2019	11/19/2020
DC Block	PASTERNAK	PE8210	RF32	11/20/2019	11/19/2020
Splitter	Woken	DOM35LW1 A2	RF83	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A 185C	RF229	11/20/2019	11/19/2020

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/17/2020	03/16/2021

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

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12.5. Measurement Result

LTE BAND 48							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		256QAM	Limit			256QAM	Limit
3552.5	56765	7.70	13	3555.0	55290	7.14	13
3625.0	55990	7.69	13	3625.0	55990	7.70	13
3697.5	58215	7.16	13	3695.0	56690	7.51	13

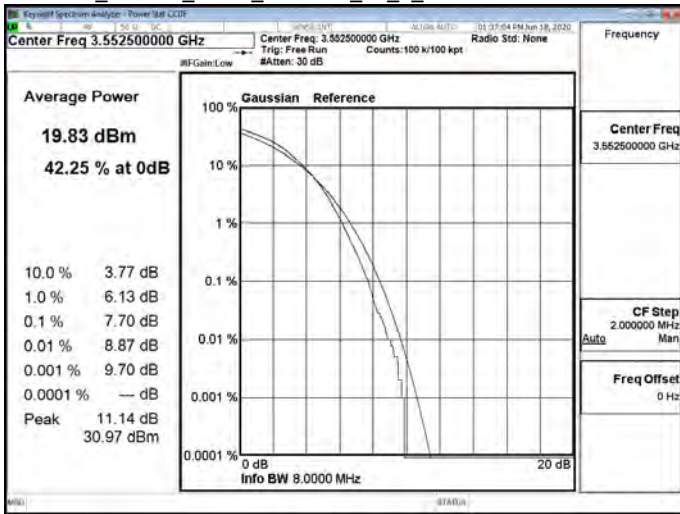
LTE BAND 48							
Channel bandwidth: 15MHz				Channel bandwidth: 20MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		256QAM	Limit			256QAM	Limit
3557.5	55315	7.15	13	3650.0	55340	8.32	13
3625.0	55990	7.95	13	3625.0	55990	8.11	13
3692.5	56665	7.55	13	3690.0	56640	8.19	13

Please refer to next page.

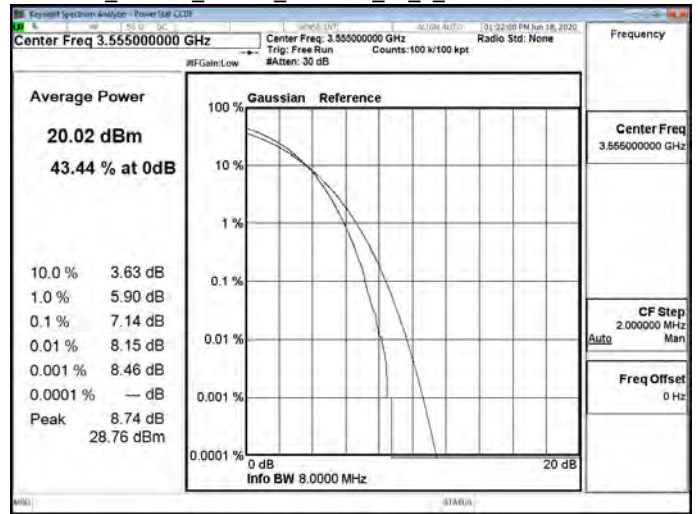
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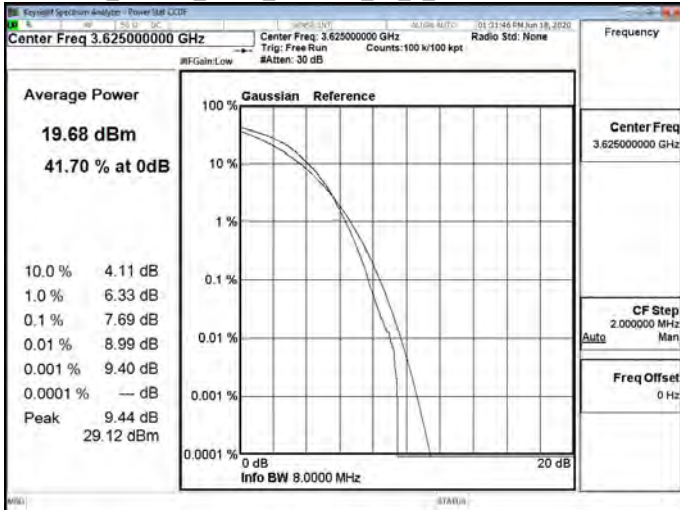
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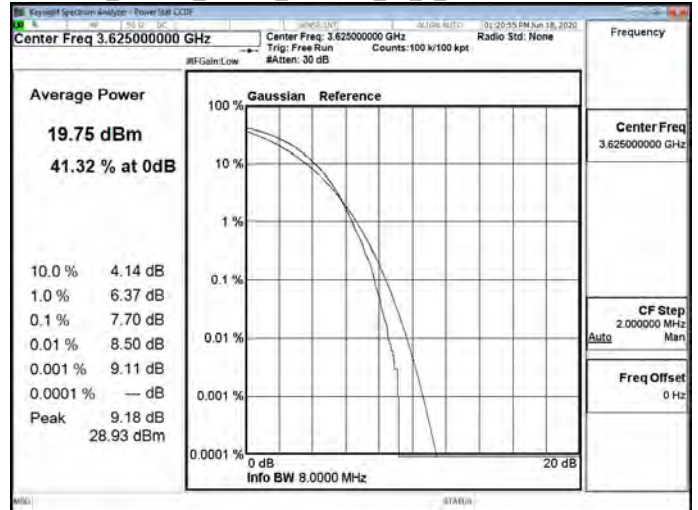
LTE_Band48_10MHz_256QAM_50_0_Low CH55290-3555



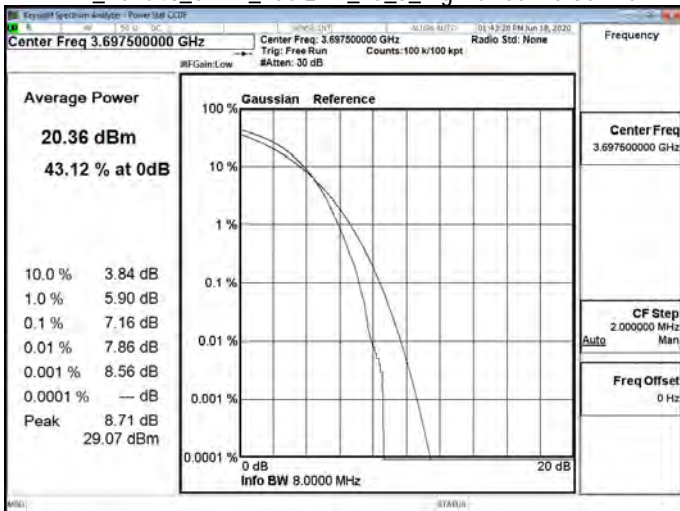
LTE_Band48_5MHz_256QAM_25_0_Mid CH55990-3625



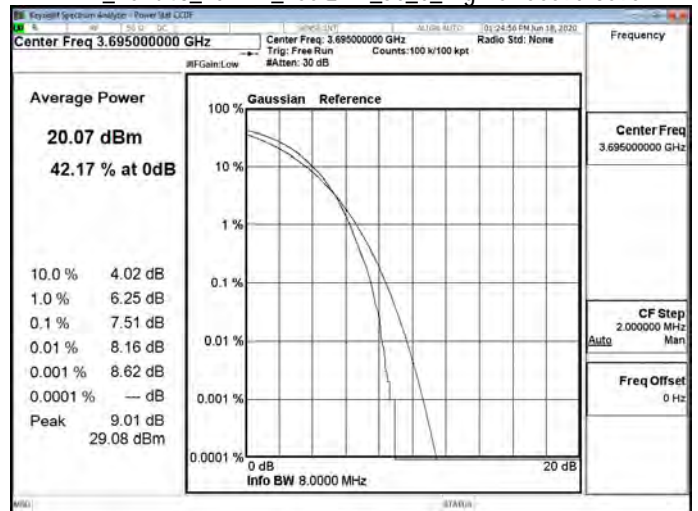
LTE_Band48_10MHz_256QAM_50_0_Mid CH55990-3625



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LTE_Band48_10MHz_256QAM_50_0_High CH56690-3695

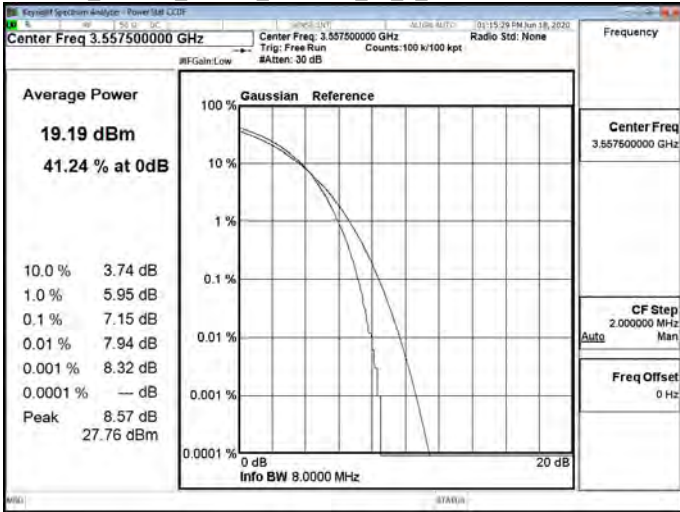


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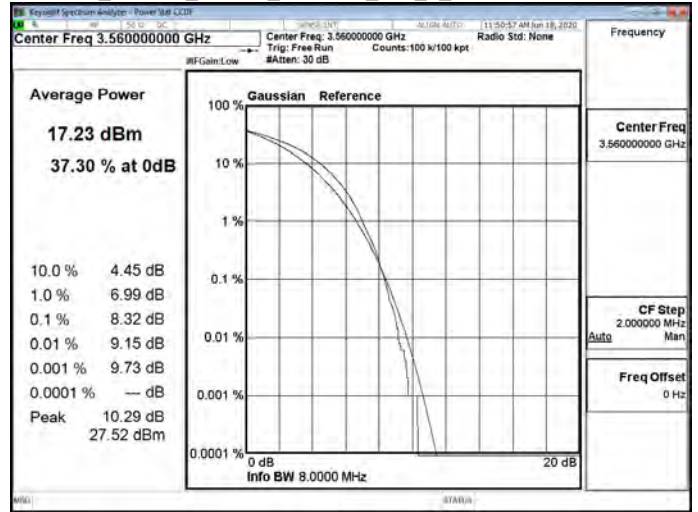
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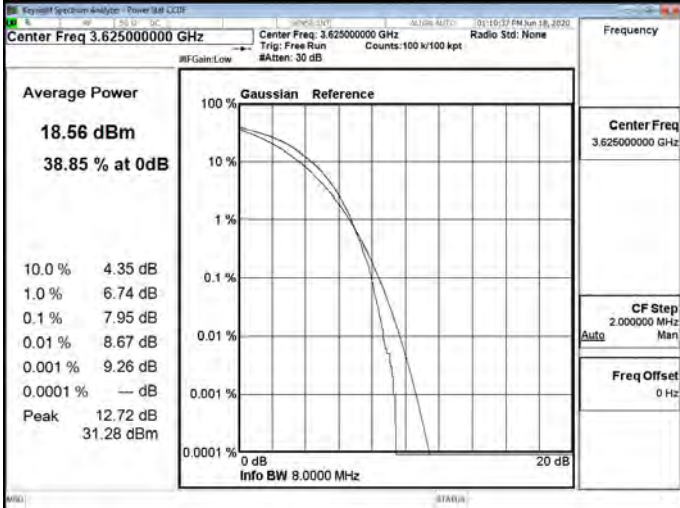
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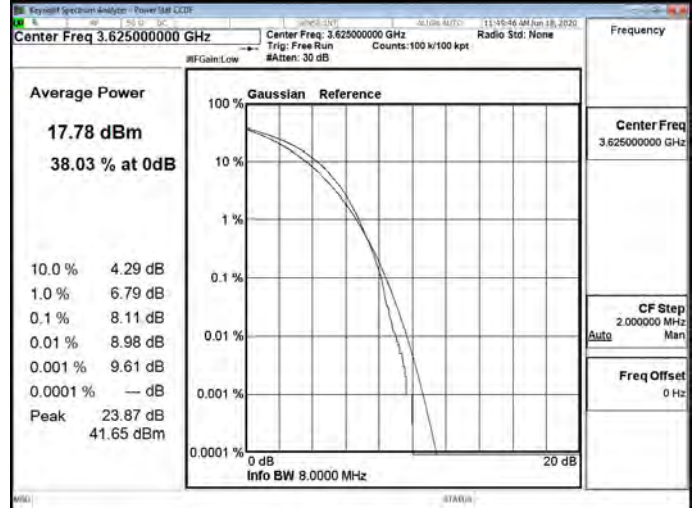
LTE_Band48_20MHz_256QAM_100_0_Low CH55340-3560



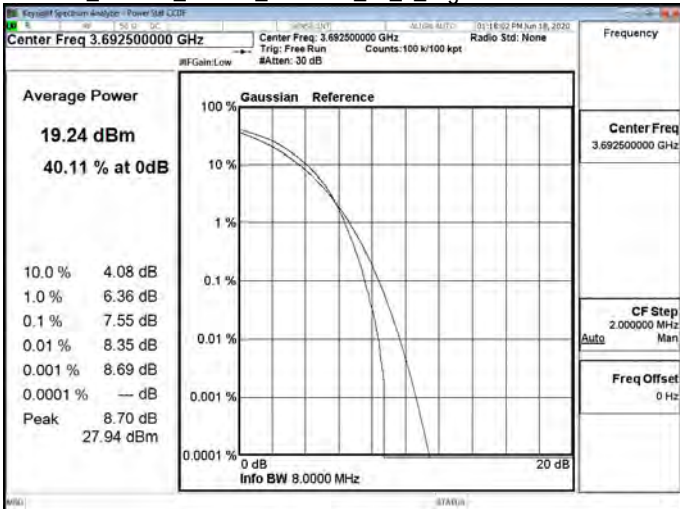
LTE_Band48_15MHz_256QAM_75_0_Mid CH55990-3625



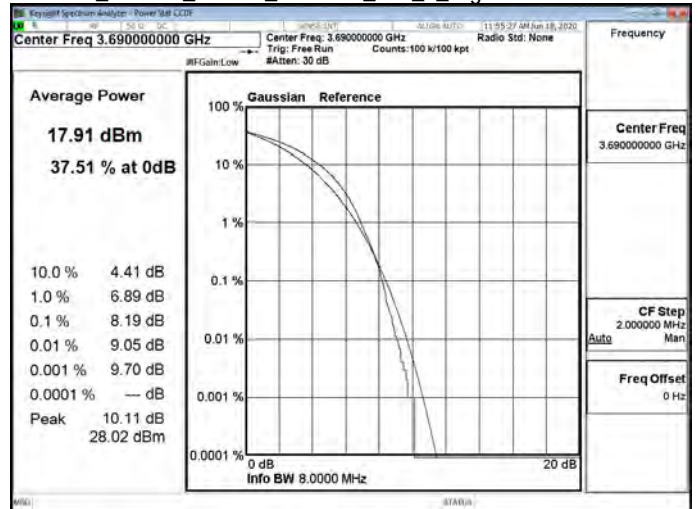
LTE_Band48_20MHz_256QAM_100_0_Mid CH55990-3625



LTE_Band48_15MHz_256QAM_75_0_High CH56665-3692.5



LTE_Band48_20MHz_256QAM_100_0_High CH56640-3690



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