

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

**Applicant:** ASUSTeK COMPUTER INC.  
1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

**Product Name:** ASUS Phone (Mobile Phone)

**Brand Name:** ASUS

**Model No.:** ASUS\_I003D

**Model Difference:** N/A

**Report Number:** ER/2020/30174-01

**FCC ID** MSQI003D

**IC:** 3568A-I003D

**FCC Rule Part:** 2, 27

**ISED Rule:** RSS-199

**Issue Date:** Sep. 30, 2020

**Date of Test:** Jul. 16, 2020 ~ Jul. 22, 2020

**Date of EUT Received:** May 06, 2020

**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:

Jazz Huang

Jazz Huang / Asst. Supervisor



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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## Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2020/30174	Rev.00	Original.	Sep. 07, 2020	Revised By: Violetta Tang
ER/2020/30174-01	Rev.01	Update information of test facility.	Sep. 30, 2020	Revised By: Violetta Tang

**Note:**

- 1、Disclaimer  
Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
- 2、The original test report ER/2020/30174 is superseded by this test report, the issued date of this test report presented as the date of withdrawal of the original one, the original report will no longer effective since the date of withdrawal.

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## 1 GENERAL PRODUCT INFORMATION

### 1.1 Product Description

General:

Product Name:	ASUS Phone (Mobile Phone)	
Brand Name:	ASUS	
Model No.:	ASUS_I003D	
Model Difference:	N/A	
Hardware Version:	R2.0B	
Software Version:	Android Q	
AJ Dongle:	Model No.: F370002, Supplier: MEILU	
Fan Dongle:	Model No.: I003, Supplier: ASUS	
USB Cable:	Model No.: LA9U2015-CS-R, Supplier: ASAP	
Power Supply:	3.85Vdc from Rechargeable Li-polymer Battery or 5V / 9V / 12V / 15V / 20V from AC/DC Adapter	
	Battery:	Model No.: C11P1903, Supplier: SCUD
	Adapter:	Model No.: A299-200150U-US, Supplier: AOHAI
IMEI:	355306110093970 / 355306110093988 (Conducted) 355306110094390 (Radiated)	

### 1.2 Operation Frequency Range

Band	BW (MHz)	Operation Frequency (MHz)	
41A_n41	60	2506.2	- 2649.90
	80	2506.2	- 2639.91
	100	2506.2	- 2629.89
	120	2506.2	- 2619.90

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### 1.3 Antenna Designation

Antenna Type	Antenna Model No.
PIFA	Ant1
	Ant9
	Ant11
<b>Note:</b> The EUT equipped with 7 WWAN antennas, however, transmission of 5G NR bands are available by Ant1, Ant9 and Ant11.	

Operating Frequency (MHz)		Ant 1 Peak Gain (dBi)	Ant 9 Peak Gain (dBi)	Ant 11 Peak Gain (dBi)
LTE-Band 41	2496 ~ 2690	-3.0	N/A	N/A
NR Band 41	2496 ~ 2690	N/A	-2.9	-3.8

### 1.4 Type of Emission & Max ERP/EIRP Power Measurement Result:

Band	Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission	
41A_n41	DFT	BPSK	20.37	EIRP	<b>0.109</b>	117.230	117MG7W
		QPSK	20.15	EIRP	<b>0.104</b>	118.080	118MG7W
		16QAM	19.86	EIRP	<b>0.097</b>	118.390	118MD7W
		64QAM	19.69	EIRP	<b>0.093</b>	118.400	118MD7W
		256QAM	19.09	EIRP	<b>0.081</b>	118.550	119MD7W
	CP	QPSK	19.67	EIRP	0.093	117.410	117MG7W
		16QAM	19.58	EIRP	0.091	117.300	117MD7W
		64QAM	19.47	EIRP	0.089	117.350	117MD7W
256QAM		18.83	EIRP	0.076	117.360	117MD7W	

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## 1.5 Test Methodology of Applied Standards

FCC 47 CFR Part 2, 27.

ISED RSS-199 Issue 3 Dec. 2016

ANSI C63.26-2015

KDB971168 D01 Power Meas license Digital System v03r01

KDB412172 D01 Determining ERP and EIRP v01r01

## 1.6 Test Facility

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

No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

FCC Designation number: TW0027

ISED CAB identifier: TW3702

## 1.7 Special Accessories

No special accessories were used during testing.

## 1.8 Equipment Modifications

There was no modifications incorporated into the EUT.

## 1.9 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

The EUT is placed on a 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)

The EUT is placed on a 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.

### 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)
1.4	10	11.4

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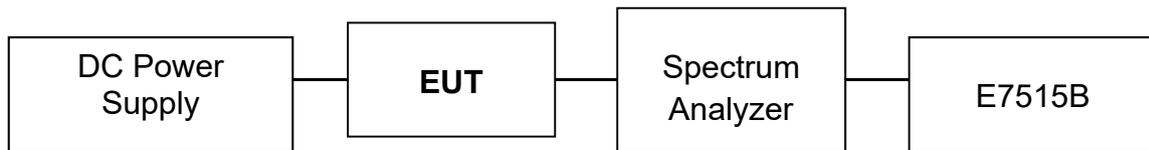
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**2.5 Final Amplifier Voltage and Current Information:**

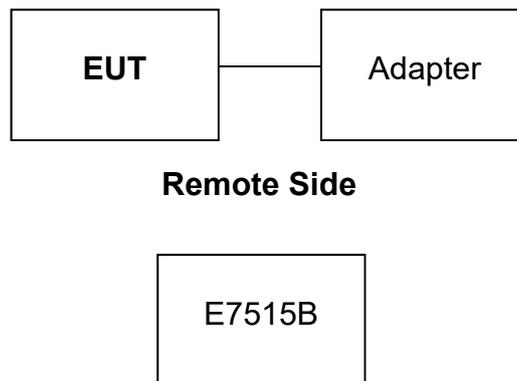
Band	DC voltage (V)	DC current (mA)
41A_n41	3.85	577

**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)**



**Table 2-1 Equipment Used in**

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	UXM 5G	KEYSIGHT	E7515B	MY59321561	shielded	Un-shielded

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§2.1046(a)	RSS-GEN §6.12	RF Power Output	Compliant
§27.50(h)(2)	RSS-199 §4.4	ERP/ EIRP measurement	Compliant
§2.1049(h)	RSS-GEN §6.7	99% & 26dB Occupied Bandwidth	Compliant
§2.1051 §27.53(m)(4)	RSS-GEN §6.13 RSS-199 §4.5	Out of Band Emissions at Antenna Terminals and Band Edge / Emission mask requirements	Compliant
§2.1053 §27.53(m)(4)	RSS-GEN §6.13 RSS-199 §4.5	Field Strength of Spurious Radiation	Compliant
§27.50(a)(1)(B)	RSS-199 §4.4	Peak to Average Ratio	Compliant
§2.1055(a)(1) §27.54	RSS-199 §4.3	Frequency Stability	Compliant

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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 Evaluation has been done on all antennas in below table,
  - a. For LTE B41 the Ant. 1 results higher emissions,
  - b. For 5G NR n41 the Ant. 9 results higher emissions
 therefore, only measurement results of the Lower antenna are demonstrated in this test report.

Mode	Bands	Upper Antenna	Lower Antenna
LTE	Band 41	N/A	1
5G NR	n41	11	9

- 3 The EUT only supports with below SCS and Bandwidth in each 5G NR Band.

BAND	SCS (kHz)	Bandwidth (MHz)
41A_n41	30	60, 80, 100, 120

- 4 Due to each single LTE Band transmission generates higher power than the LTE transmission in ENDC mode, the test results of each single LTE band transmission are demonstrated in the test report ER/2020/30083 as the worst case scenarios.
- 5 Due to n41 Band standalone mode (SA) transmission generates higher power than the ENDC mode, the test results of n41 SA mode transmission is demonstrated in the test report ER/2020/30085 as the worst case scenarios.
- 6 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	H PLAN	E1 PLAN	E2 PLAN
41A_n41		V	

- 7 The worst case scenarios are determined by the ENDC combinations that generate the highest output power, the peak to average ratio and unwanted emission test results are only be presented with the ENDC combinations of the worst case.
- 8 ENDC RSE test results are only demstrated with the worst case determined by the EIRP test result in section 6.6.1 of this report.
- 9 Each available modulation and channel combination have been evaluated and the DFT-s-OFDM Pi/2 BPSK and DFT-s-OFDM QPSK with middle channel combination result higher EIRP, therefore, the intra-band non-contiguous EIRP results are demonstrated with the 2 modulations.
- 10 PAR is presented with worst case scenario that determined by single LTE Band transmission and SA mode transmission of n41 in test report ER/2020/30083 and ER/2020/30085.

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## 4.2 Measurement Configuration

### 4.2.1 ENDC conducted measurements

Test Items	Band	Test Channel			Bandwidth (MHz)				CP-OFDM Modulation				DFT-OFDM Modulation				RB #			
		L	M	H	60	80	100	120	QPSK	16QAM	64QAM	256QAM	BPSK	QPSK	16QAM	64QAM	256QAM	Edge left	Edge right	Full
Max. Output Power	41A_n41	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Frequency Stability	41A_n41		v					v	v											v
Test Items	Band	Test Channel			Bandwidth (MHz)				CP-OFDM Modulation				DFT-OFDM Modulation				RB #			
		L	M	H	60	80	100	120	QPSK	16QAM	64QAM	256QAM	BPSK	QPSK	16QAM	64QAM	256QAM	Edge left	Edge right	Full
26dB and 99% Bandwidth	41A_n41	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v			v
Peak-to-Average Ratio	41A_n41		v					v				v								v
Test Items	Band	Test Channel			Bandwidth (MHz)				CP-OFDM Modulation				DFT-OFDM Modulation				RB #			
		L	M	H	60	80	100	120	QPSK	16QAM	64QAM	256QAM	BPSK	QPSK	16QAM	64QAM	256QAM	Edge left	Edge right	Full
Mask	41A_n41	v		v	v	v	v	v	v				v					v	v	v
Test Items	Band	Test Channel			Bandwidth (MHz)				CP-OFDM Modulation				DFT-OFDM Modulation				RB #			
		L	M	H	60	80	100	120	QPSK	16QAM	64QAM	256QAM	BPSK	QPSK	16QAM	64QAM	256QAM	Edge left	Edge right	Full
Conducted Emission	41A_n41	v	v	v			v						v					v		v

### 4.2.2 ENDC Radiated Emission

41A_n41(intra-band contiguous)						
E-UTRA Band	SCS	Test Channel	Channel Bandwidth (MHz)	Modulation	Resource Block Allocation	
					RBs allocated	RB Start
41A_n41	30K	41021+516618	20+80	DFT-S-OFDM Pi/2 BPSK	Full	
41A_n41(intra-band non-contiguous)						
E-UTRA Band	SCS	Test Channel	Channel Bandwidth (MHz)	Modulation	Resource Block Allocation	
					RBs allocated	RB Start
41A_n41	30K	41489+507240	20+40	DFT-S-OFDM Pi/2 BPSK	Full	

### 4.2.3 Frequency Band

List of frequency bands mentioned in the measurement configuration, for comparison with 3GPP, please refer to the following table.

Band	3GPP inter-EN-DC configuration in FR1
41A_n41	DC_41A_n41A

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
RF Power Output	+/- 1.10 dB
ERP/ EIRP measurement	Vertical Polarization = +/- 4.74dB Horizontal Polarization = +/- 4.62dB
Occupied Bandwidth	+/- 5.19 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 0.70 dB
Peak to Average Ratio	+/- 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 : <b>Vertical</b> )	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 : <b>Horizontal</b> )	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

### 6.1 Standard Applicable

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

#### 6.1.1 ERP/EIRP LIMIT

According to FCC §2.1046

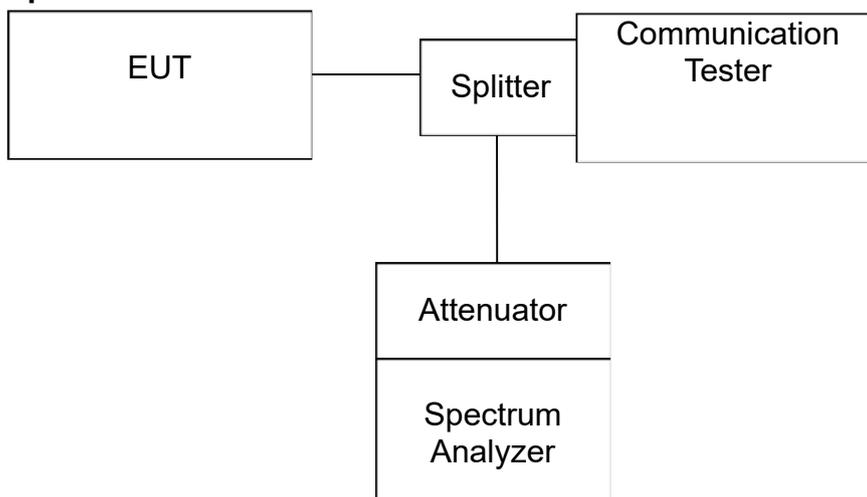
##### FCC 27.50(h)

(2) Mobile and other user stations transmitting in the BRS and EBS bands are limited to 2 W EIRP.

##### RSS-199 §4.4

For mobile subscriber equipment operating in the Band 2500-2690MHz, the e.i.r.p. shall not exceed 2 W.

### 6.2 Test Set-up



**Note:** Measurement setup for testing on Antenna connector

### 6.3 Output Power Measurement Applicable Guidance

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.

The Procedure of KDB941225 (SAR Measurement Procedures for 3G devices, (WCDMA/HSPA) was used for EUT and Base station setting. RMC 12.2kps is used for this testing, and KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results.

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

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

According to KDB 412172 D01 Power Approach,

$$EIRP = P_T + G_T - L_C,$$

$$ERP = EIRP - 2.15,$$

Where:

ERP or EIRP = effective radiated power or equivalent isotropically radiated power (expressed in the same units as  $P_T$ , typically dBW, dBm, or power spectral density (PSD)<sup>2</sup>), relative to either a dipole antenna (ERP) or an isotropic antenna (EIRP);

$P_T$  = transmitter output power, expressed in dBW, dBm, or PSD;

$G_T$  = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

$L_C$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

#### 6.5 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	12/22/2020
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/20/2020	02/19/2021
UXM 5G	KEYSIGHT	E7515B	MY59321561	12/16/2019	12/15/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	01/01/2021
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	01/01/2021
Splitter	RF-LAMBDA	RFLT2W1G18G	11-JSPF412-018	01/02/2020	01/01/2021

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## 6.6 Measurement Results:

### 6.6.1 ENDC Mode

Antenna gain (dBi)											
-2.9											
41A + n41A(intra-band contiguous)											
Modulation	BW	SCS	RB	41 CH	n41CH	Power 41	Power N41	Total power	EIRP	EIRP limit	Margin
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.92	19.49	23.27	20.37	33	-12.63
DFT-S-OFDM QPSK	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.88	18.99	23.05	20.15	33	-12.85
DFT-S-OFDM 16QAM	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.89	18.19	22.76	19.86	33	-13.14
DFT-S-OFDM 64QAM	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.9	17.66	22.59	19.69	33	-13.31
DFT-S-OFDM 256QAM	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.91	15.40	21.99	19.09	33	-13.91
CP-OFDM QPSK	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.94	17.53	22.57	19.67	33	-13.33
CP-OFDM 16QAM	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.9	17.33	22.48	19.58	33	-13.42
CP-OFDM 64QAM	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.89	16.97	22.37	19.47	33	-13.53
CP-OFDM 256QAM	LTE 20 + NR Max	30K	FULL	Mid CH41120	Mid CH516600	20.9	14.13	21.73	18.83	33	-14.17
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR Max	30K	1RB Left	Mid CH41120	Mid CH516600	20.88	16.97	22.36	19.46	33	-13.54
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR Max	30K	1RB Righth	Mid CH41120	Mid CH516600	20.91	16.37	22.22	19.32	33	-13.68
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR 80	30K	FULL	Mid CH41021	Mid CH516618	20.98	20.81	23.91	21.01	33	-11.99
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR 60	30K	FULL	Mid CH40919	Mid CH516582	20.94	19.99	23.50	20.60	33	-12.40
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR 40	30K	FULL	Mid CH40820	Mid CH516600	20.95	20.69	23.83	20.93	33	-12.07
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR 80	30K	FULL	Low CH39752	Low CH511242	20.91	20.55	23.74	20.84	33	-12.16
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR 80	30K	FULL	High CH41489	High CH525978	20.92	20.51	23.73	20.83	33	-12.17
41A _ n41(intra-band non-contiguous)											
Modulation	BW	SCS	RB	41A CH	n41CH	Power 41A	Power N41	Total power	EIRP	EIRP limit	Margin
DFT-S-OFDM Pi/2 BPSK	NR 100 + LTE 20	30K	FULL	High CH 41489	Low CH 513240	21.01	20.06	23.57	20.67	33	-12.33
DFT-S-OFDM Pi/2 BPSK	NR 80 + LTE 20	30K	FULL	High CH 41489	Low CH 511242	20.94	20.57	23.77	20.87	33	-12.13
DFT-S-OFDM QPSK	NR 60 + LTE 20	30K	FULL	High CH 41489	Low CH 509238	20.95	20.04	23.53	20.63	33	-12.37
DFT-S-OFDM QPSK	NR 40 + LTE 20	30K	FULL	High CH 41489	Low CH 507240	20.93	20.85	23.90	21.00	33	-12.00
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR 100	30K	FULL	Low CH 39752	High CH 523980	20.95	20.47	23.73	20.83	33	-12.17
DFT-S-OFDM Pi/2 BPSK	LTE 20 + NR 80	30K	FULL	Low CH 39752	High CH 525978	20.9	20.19	23.57	20.67	33	-12.33
DFT-S-OFDM QPSK	LTE 20 + NR 60	30K	FULL	Low CH 39752	High CH 527982	20.92	20.21	23.59	20.69	33	-12.31
DFT-S-OFDM QPSK	LTE 20 + NR 40	30K	FULL	Low CH 39752	High CH 529980	20.94	20.34	23.66	20.76	33	-12.24

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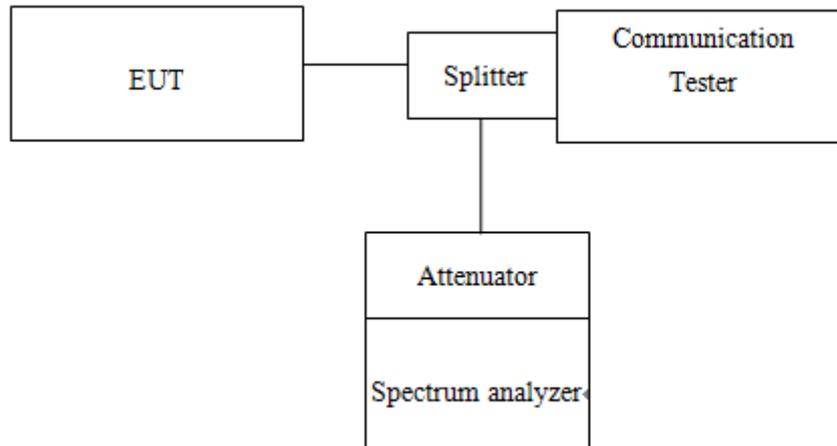
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## 7 OCCUPIED BANDWIDTH MEASUREMENT

### 7.1 Standard Applicable

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.

### 7.2 Test Set-up



### 7.3 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%.

#### 99% Bandwidth with detector sample

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% ~ 5% of emission BW, VBW= 3 times RBW, -20dBc display line was placed on the screen (or 20dB bandwidth). Set RBW to 99% bandwidth, RBW= 1% ~ 5%, VBW= 3 RBW, with span > 2 \* Signal BW, set % Power = 99%.

### 7.4 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	12/22/2020
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/20/2020	02/19/2021
UXM 5G	KEYSIGHT	E7515B	MY59321561	12/16/2019	12/15/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	01/01/2021
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	01/01/2021
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-018	01/02/2020	01/01/2021

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### 7.5 Measurement Result

Each bandwidth has been evaluated with the modulation that generated highest output power.

5G NR 41A_n41								
DFT-S-OFDM_SCS 30 kHz								
Bandwidth (MHz)		RB Size / RB Offset		Frequency (MHz)		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	100 / 0	2506.2	2536.20	BPSK	55.317	57.32
				2613.0	2583.00		57.220	<b>59.82</b>
				2679.9	2649.90		57.554	59.64
20	60	100 / 0	162 / 0	2506.2	2546.19	BPSK	77.265	<b>80.34</b>
				2622.9	2582.91		77.222	80.20
				2679.9	2639.91		77.308	80.25
20	80	100 / 0	216 / 0	2506.2	2556.21	BPSK	96.657	99.86
				2633.1	2583.09		97.182	<b>100.40</b>
				2679.9	2629.89		97.054	100.30
20	100	100 / 0	270 / 0	2506.2	2566.20	BPSK	116.120	119.30
				2643.0	2583.00		117.230	<b>120.70</b>
				2679.9	2619.90		117.010	120.50
5G NR 41A_n41								
DFT-S-OFDM_SCS 30 kHz								
Bandwidth		RB Size / RB Offset		Frequency		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	100 / 0	2506.2	2536.20	QPSK	55.402	57.74
				2613.0	2583.00		57.600	59.94
				2679.9	2649.90		57.634	<b>60.07</b>
20	60	100 / 0	162 / 0	2506.2	2546.19	QPSK	77.167	79.92
				2622.9	2582.91		77.331	<b>80.15</b>
				2679.9	2639.91		77.482	80.11
20	80	100 / 0	216 / 0	2506.2	2556.21	QPSK	96.498	99.95
				2633.1	2583.09		97.300	<b>100.50</b>
				2679.9	2629.89		97.212	<b>100.50</b>
20	100	100 / 0	270 / 0	2506.2	2566.20	QPSK	115.770	119.20
				2643.0	2583.00		117.120	<b>122.80</b>
				2679.9	2619.90		118.080	120.70

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5G NR 41A_n41								
DFT-S-OFDM_SCS 30 kHz								
Bandwidth		RB Size / RB Offset		Frequency		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	100 / 0	2506.2	2536.20	16QAM	55.402	57.58
				2613.0	2583.00		57.375	59.81
				2679.9	2649.90		57.626	<b>59.97</b>
20	60	100 / 0	162 / 0	2506.2	2546.19	16QAM	77.157	80.02
				2622.9	2582.91		77.572	<b>80.36</b>
				2679.9	2639.91		77.510	<b>80.36</b>
20	80	100 / 0	216 / 0	2506.2	2556.21	16QAM	96.543	99.95
				2633.1	2583.09		97.347	<b>100.80</b>
				2679.9	2629.89		97.167	100.40
20	100	100 / 0	270 / 0	2506.2	2566.20	16QAM	115.260	119.20
				2643.0	2583.00		118.390	<b>120.50</b>
				2679.9	2619.90		118.210	<b>120.50</b>
5G NR 41A_n41								
DFT-S-OFDM_SCS 30 kHz								
Bandwidth		RB Size / RB Offset		Frequency		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	100 / 0	2506.2	2536.20	64QAM	55.233	57.58
				2613.0	2583.00		57.408	<b>59.87</b>
				2679.9	2649.90		57.548	59.85
20	60	100 / 0	162 / 0	2506.2	2546.19	64QAM	77.331	80.27
				2622.9	2582.91		77.476	80.17
				2679.9	2639.91		77.481	<b>80.39</b>
20	80	100 / 0	216 / 0	2506.2	2556.21	64QAM	96.831	100.10
				2633.1	2583.09		97.309	100.50
				2679.9	2629.89		97.182	<b>100.70</b>
20	100	100 / 0	270 / 0	2506.2	2566.20	64QAM	115.400	119.10
				2643.0	2583.00		118.400	120.20
				2679.9	2619.90		118.090	<b>120.40</b>

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5G NR 41A_n41								
DFT-S-OFDM_SCS 30 kHz								
Bandwidth		RB Size / RB Offset		Frequency		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	100 / 0	2506.2	2536.20	256QAM	54.994	57.55
				2613.0	2583.00		57.539	<b>59.84</b>
				2679.9	2649.90		57.592	59.71
20	60	100 / 0	162 / 0	2506.2	2546.19	256QAM	77.359	80.01
				2622.9	2582.91		77.641	<b>80.47</b>
				2679.9	2639.91		77.480	80.27
20	80	100 / 0	216 / 0	2506.2	2556.21	256QAM	96.603	100.00
				2633.1	2583.09		97.606	100.50
				2679.9	2629.89		97.526	<b>100.60</b>
20	100	100 / 0	270 / 0	2506.2	2566.20	256QAM	114.140	119.00
				2643.0	2583.00		118.460	<b>120.50</b>
				2679.9	2619.90		118.550	120.50

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5G NR 41A_n41								
CP-OFDM_SCS 30 kHz								
Bandwidth (MHz)		RB Size / RB Offset		Frequency (MHz)		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	106 / 0	2506.2	2536.20	QPSK	57.475	<b>60.03</b>
				2613.0	2583.00		57.460	59.97
				2679.9	2649.90		57.535	59.82
20	60	100 / 0	162 / 0	2506.2	2546.19	QPSK	77.484	<b>80.34</b>
				2622.9	2582.91		77.452	80.24
				2679.9	2639.91		77.465	79.94
20	80	100 / 0	217 / 0	2506.2	2556.21	QPSK	97.006	100.50
				2633.1	2583.09		97.348	<b>100.90</b>
				2679.9	2629.89		97.250	100.50
20	100	100 / 0	273 / 0	2506.2	2566.20	QPSK	116.270	120.30
				2643.0	2583.00		117.410	<b>120.70</b>
				2679.9	2619.90		117.120	120.60
5G NR 41A_n41								
CP-OFDM_SCS 30 kHz								
Bandwidth		RB Size / RB Offset		Frequency		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	106 / 0	2506.2	2536.20	16QAM	57.527	59.64
				2613.0	2583.00		57.483	59.88
				2679.9	2649.90		57.628	<b>60.04</b>
20	60	100 / 0	162 / 0	2506.2	2546.19	16QAM	77.317	80.21
				2622.9	2582.91		77.622	<b>80.57</b>
				2679.9	2639.91		77.557	80.27
20	80	100 / 0	217 / 0	2506.2	2556.21	16QAM	97.002	100.60
				2633.1	2583.09		97.573	<b>100.90</b>
				2679.9	2629.89		97.187	100.70
20	100	100 / 0	273 / 0	2506.2	2566.20	16QAM	116.000	120.10
				2643.0	2583.00		117.140	<b>120.60</b>
				2679.9	2619.90		117.300	120.50

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5G NR 41A_n41								
CP-OFDM_SCS 30 kHz								
Bandwidth		RB Size / RB Offset		Frequency		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	106 / 0	2506.2	2536.20	64QAM	57.512	59.65
				2613.0	2583.00		57.460	<b>59.86</b>
				2679.9	2649.90		57.544	59.70
20	60	100 / 0	162 / 0	2506.2	2546.19	64QAM	77.389	79.94
				2622.9	2582.91		77.543	<b>80.69</b>
				2679.9	2639.91		77.458	80.33
20	80	100 / 0	217 / 0	2506.2	2556.21	64QAM	97.107	100.50
				2633.1	2583.09		97.374	100.50
				2679.9	2629.89		97.247	<b>100.70</b>
20	100	100 / 0	273 / 0	2506.2	2566.20	64QAM	115.890	120.10
				2643.0	2583.00		117.210	120.50
				2679.9	2619.90		117.350	<b>120.70</b>
5G NR 41A_n41								
CP-OFDM_SCS 30 kHz								
Bandwidth		RB Size / RB Offset		Frequency		Modulation	99% BW (MHz)	26 dB BW (MHz)
LTE	NR	LTE	NR	LTE	NR			
20	40	100 / 0	106 / 0	2506.2	2536.20	256QAM	57.517	<b>59.98</b>
				2613.0	2583.00		57.556	59.69
				2679.9	2649.90		57.633	59.81
20	60	100 / 0	162 / 0	2506.2	2546.19	256QAM	77.521	80.11
				2622.9	2582.91		77.649	80.32
				2679.9	2639.91		77.544	<b>80.35</b>
20	80	100 / 0	217 / 0	2506.2	2556.21	256QAM	96.965	100.30
				2633.1	2583.09		97.544	100.40
				2679.9	2629.89		97.430	<b>100.80</b>
20	100	100 / 0	273 / 0	2506.2	2566.20	256QAM	114.380	120.00
				2643.0	2583.00		117.360	<b>120.70</b>
				2679.9	2619.90		117.170	120.50

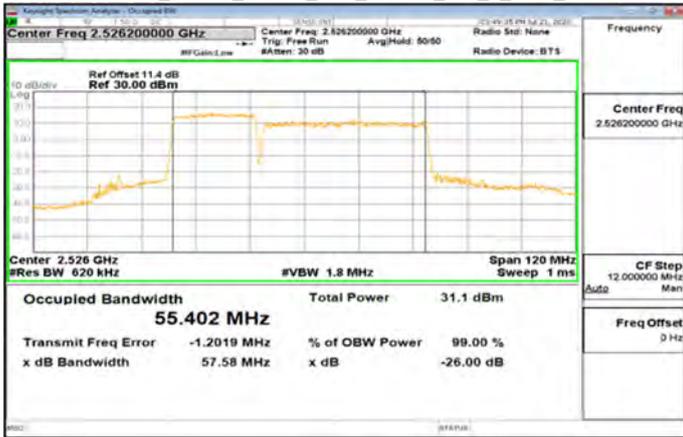
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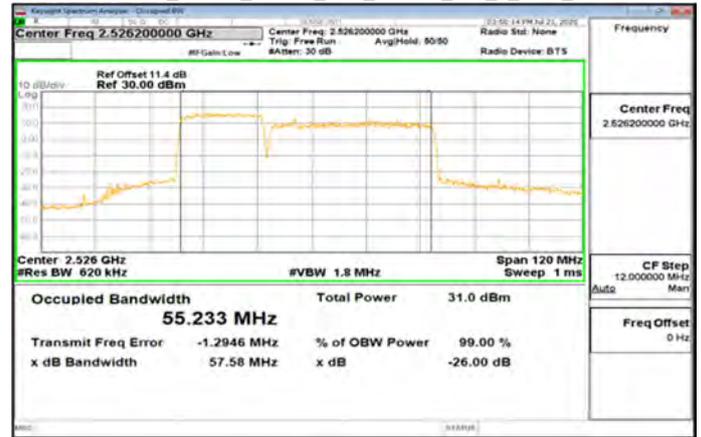
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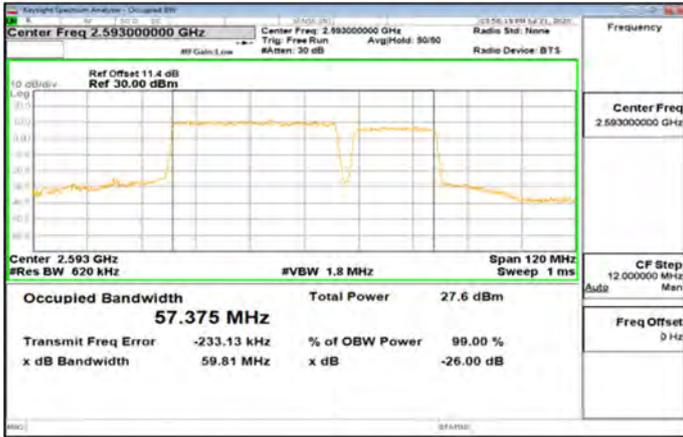
Band41\_20MHz\_40MHz\_DFT\_16QAM\_100\_0\_Main\_Low



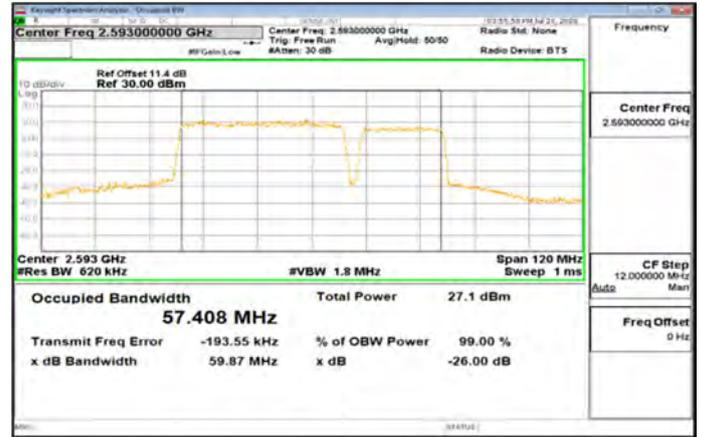
Band41\_20MHz\_40MHz\_DFT\_64QAM\_100\_0\_Main\_Low



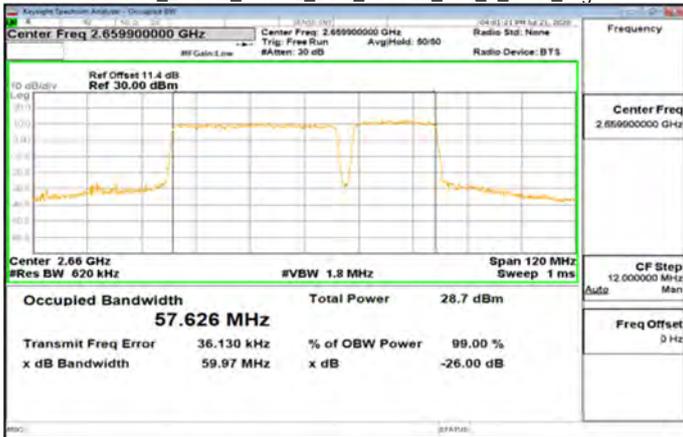
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Band41\_20MHz\_40MHz\_DFT\_64QAM\_100\_0\_Main\_Mid



Band41\_20MHz\_40MHz\_DFT\_16QAM\_100\_0\_Main\_High



Band41\_20MHz\_40MHz\_DFT\_64QAM\_100\_0\_Main\_High

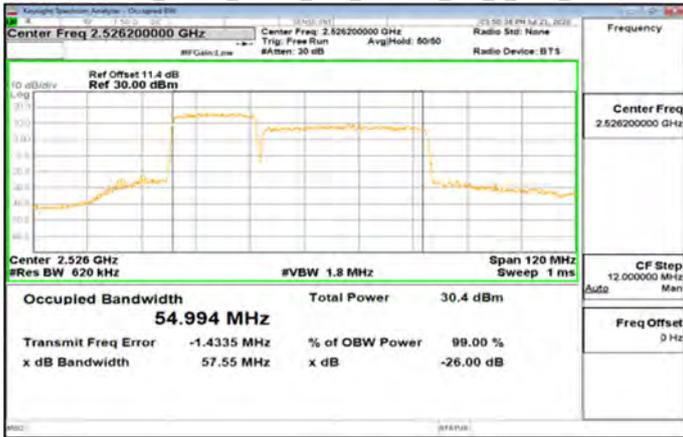


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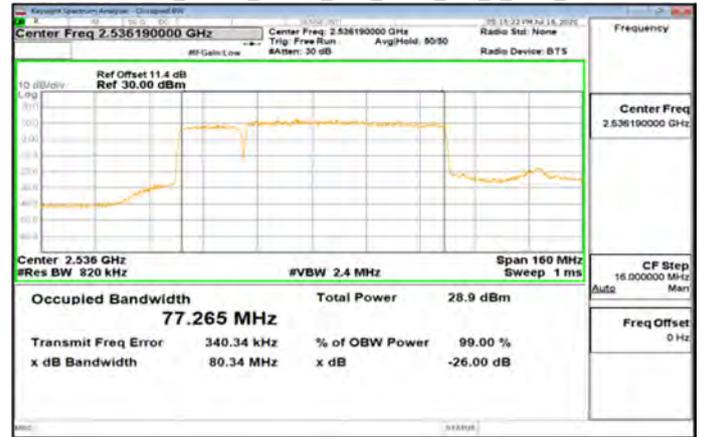
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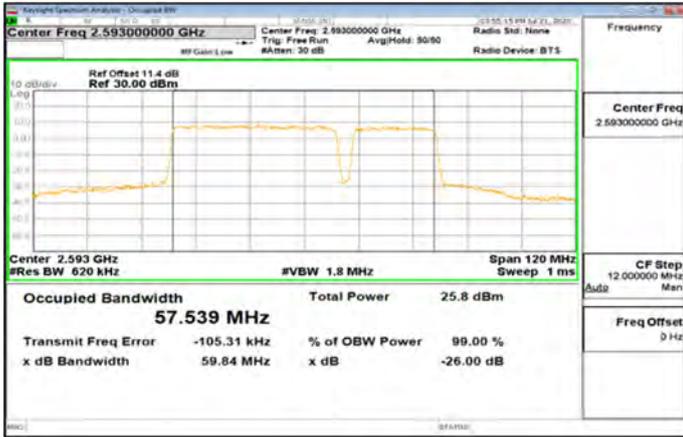
Band41\_20MHz\_40MHz\_DFT\_256QAM\_100\_0\_Main\_Low



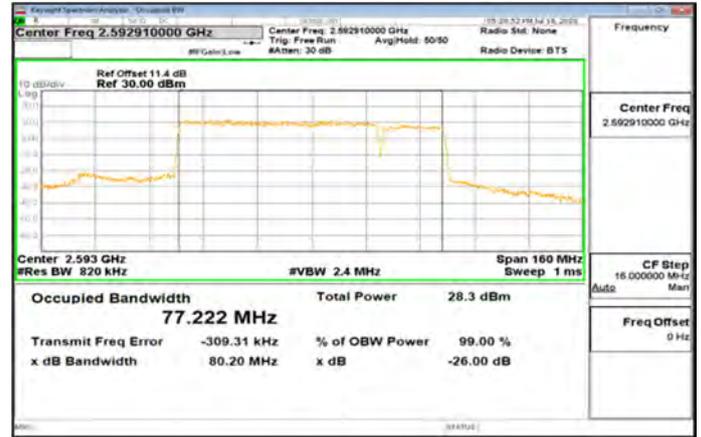
Band41\_20MHz\_60MHz\_DFT\_BPSK\_162\_0\_Main\_Low



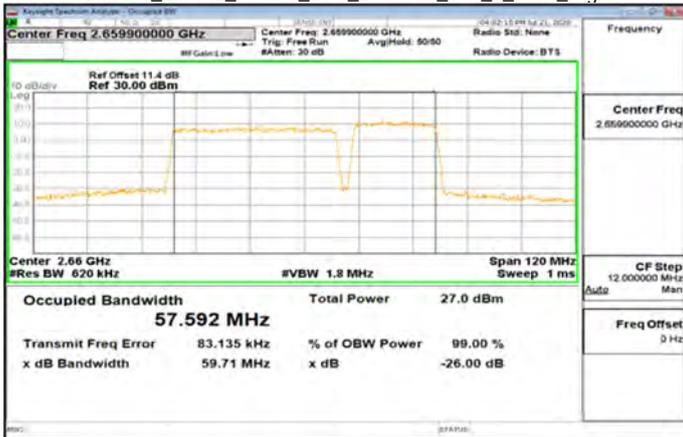
Band41\_20MHz\_40MHz\_DFT\_256QAM\_100\_0\_Main\_Mid



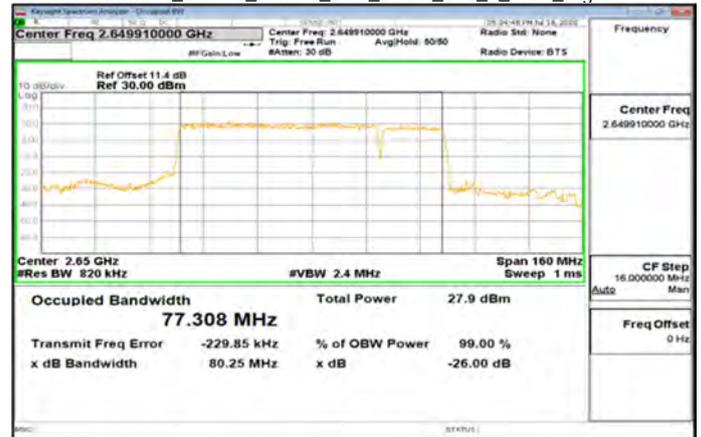
Band41\_20MHz\_60MHz\_DFT\_BPSK\_162\_0\_Main\_Mid



Band41\_20MHz\_40MHz\_DFT\_256QAM\_100\_0\_Main\_High



Band41\_20MHz\_60MHz\_DFT\_BPSK\_162\_0\_Main\_High



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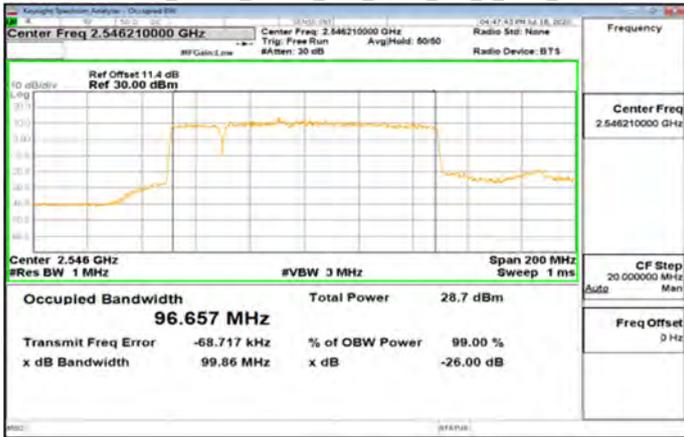
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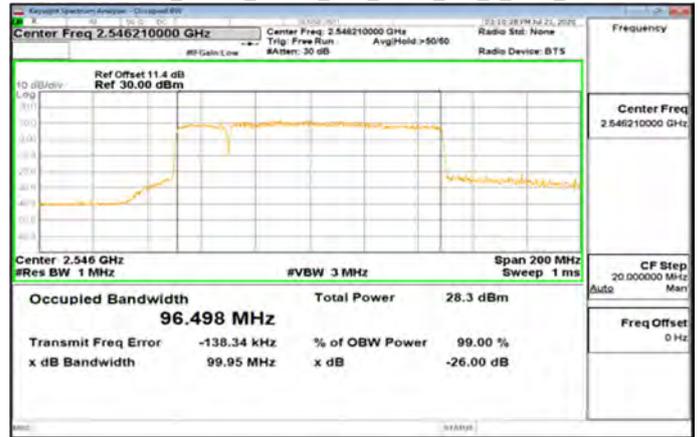




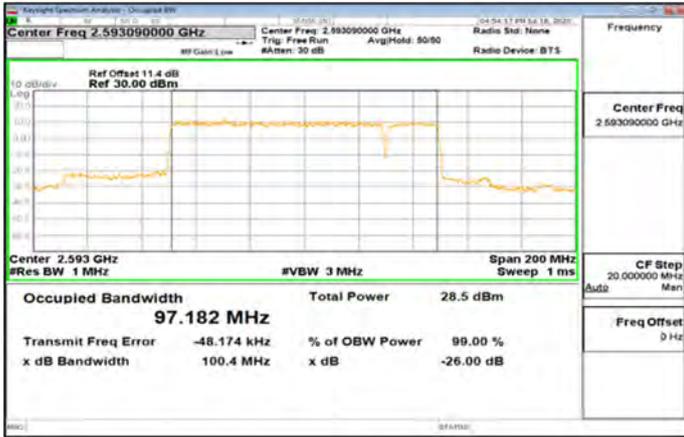
Band41\_20MHz\_80MHz\_DFT\_BPSK\_216\_0\_Main\_Low



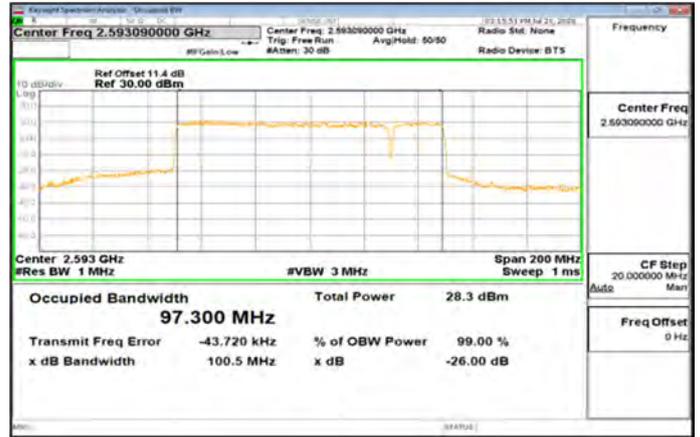
Band41\_20MHz\_80MHz\_DFT\_QPSK\_216\_0\_Main\_Low



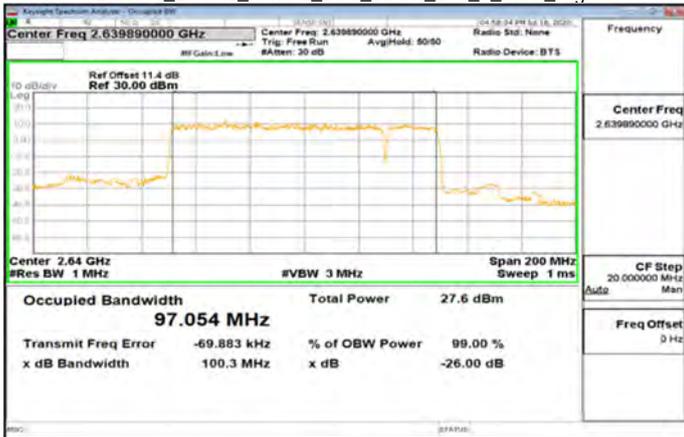
Band41\_20MHz\_80MHz\_DFT\_BPSK\_216\_0\_Main\_Mid



Band41\_20MHz\_80MHz\_DFT\_QPSK\_216\_0\_Main\_Mid



Band41\_20MHz\_80MHz\_DFT\_BPSK\_216\_0\_Main\_High



Band41\_20MHz\_80MHz\_DFT\_QPSK\_216\_0\_Main\_High

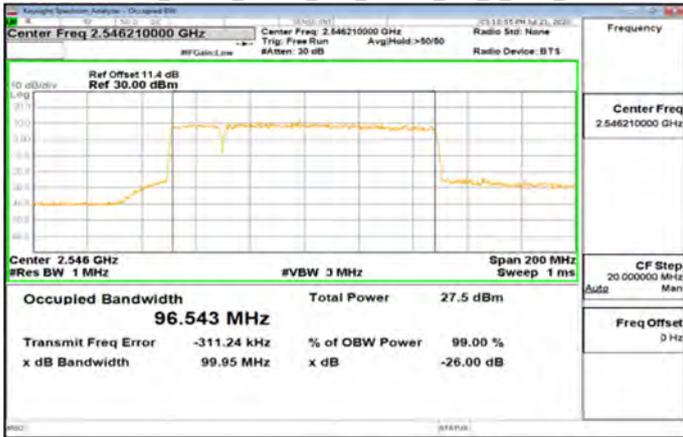


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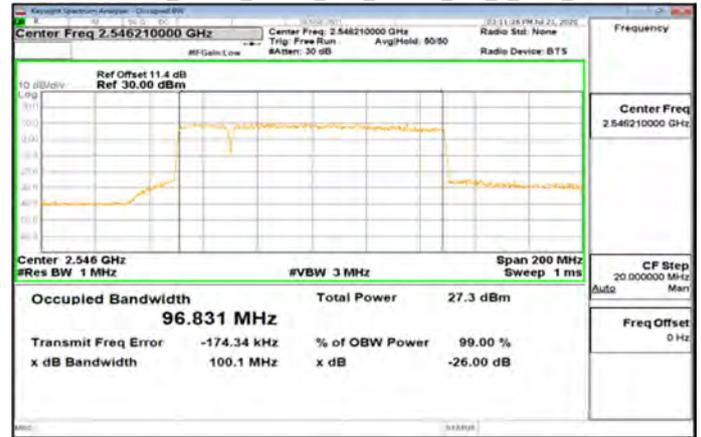
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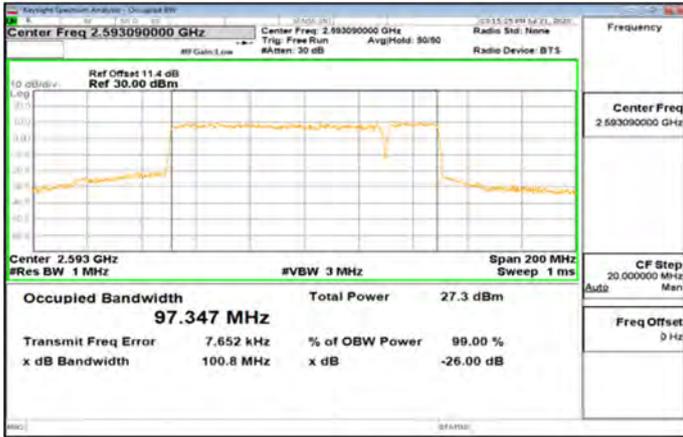
Band41\_20MHz\_80MHz\_DFT\_16QAM\_216\_0\_Main\_Low



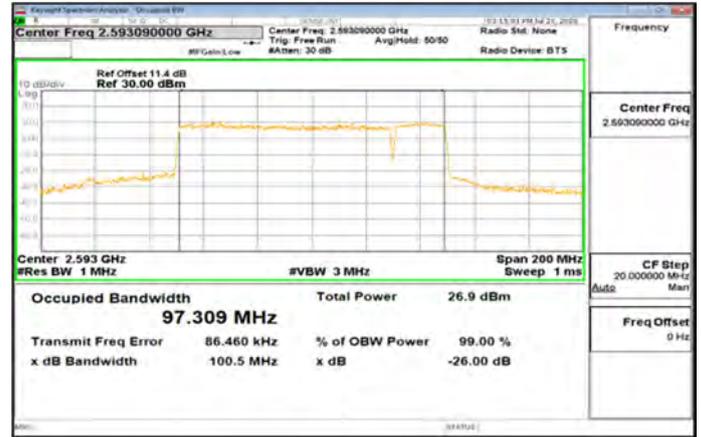
Band41\_20MHz\_80MHz\_DFT\_64QAM\_216\_0\_Main\_Low



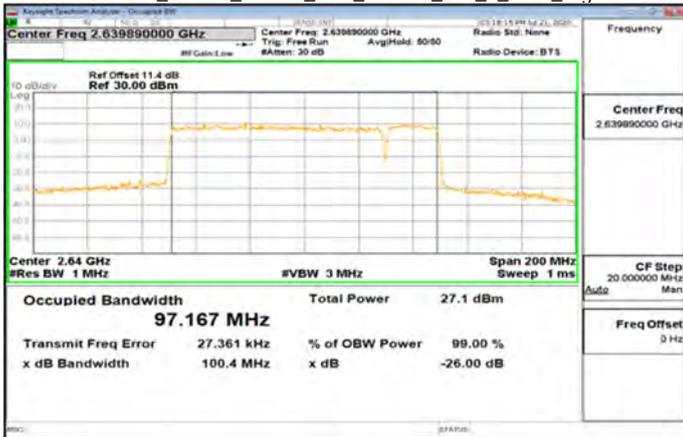
Band41\_20MHz\_80MHz\_DFT\_16QAM\_216\_0\_Main\_Mid



Band41\_20MHz\_80MHz\_DFT\_64QAM\_216\_0\_Main\_Mid



Band41\_20MHz\_80MHz\_DFT\_16QAM\_216\_0\_Main\_High



Band41\_20MHz\_80MHz\_DFT\_64QAM\_216\_0\_Main\_High

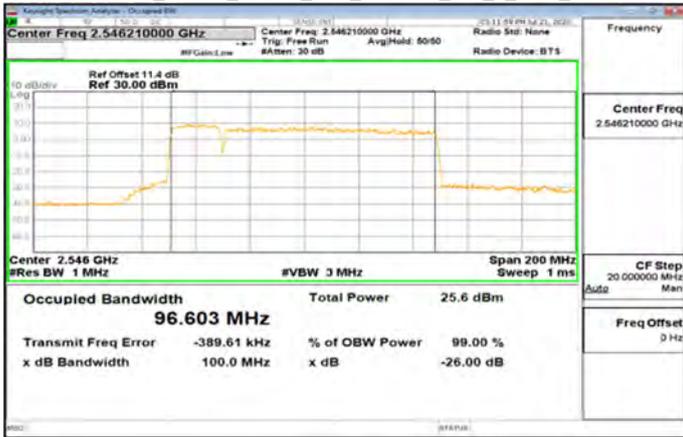


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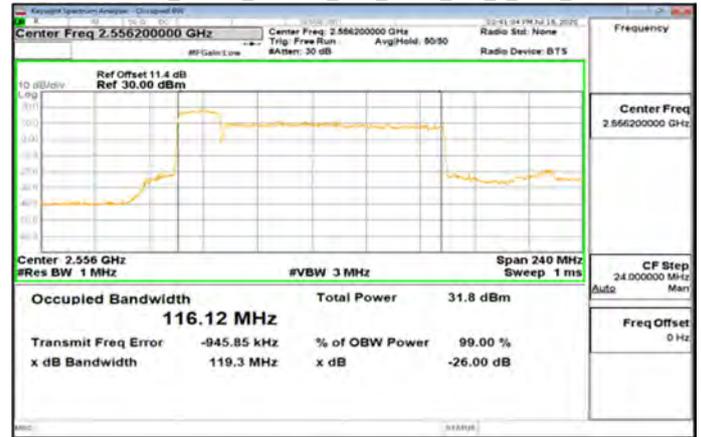
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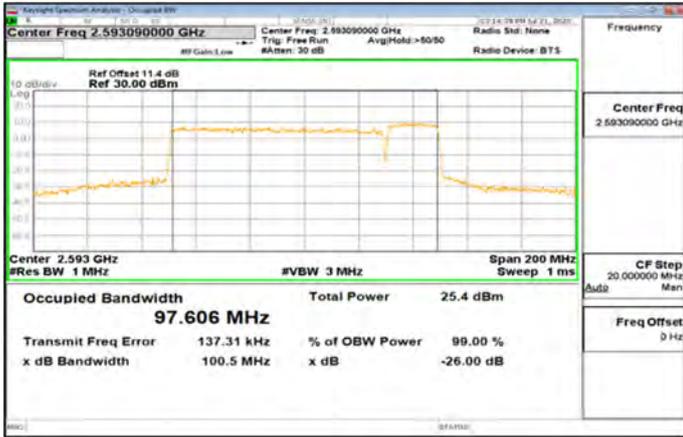
Band41\_20MHz\_80MHz\_DFT\_256QAM\_216\_0\_Main\_Low



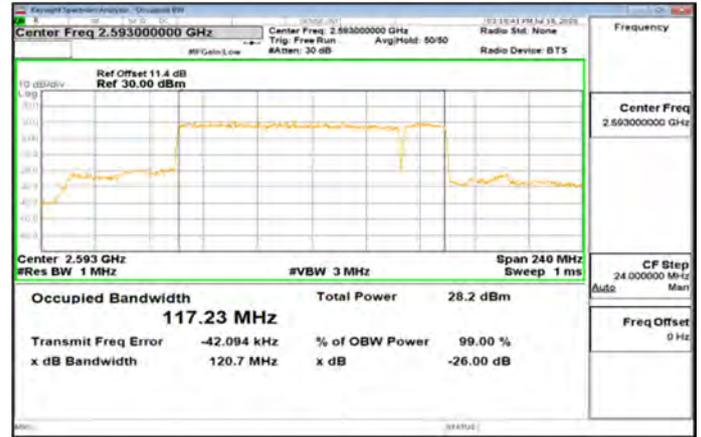
Band41\_20MHz\_100MHz\_DFT\_BPSK\_270\_0\_Main\_Low



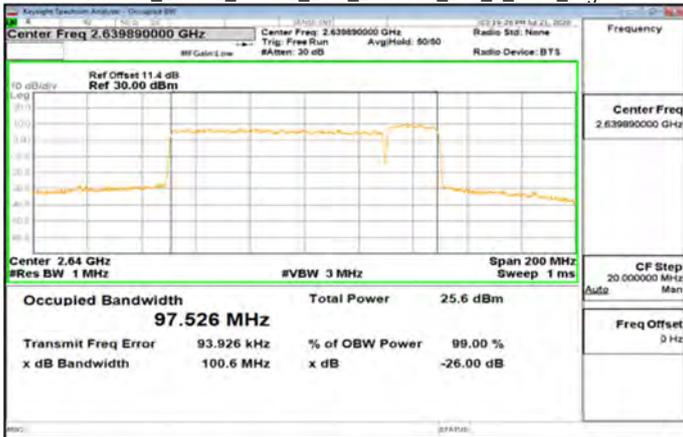
Band41\_20MHz\_80MHz\_DFT\_256QAM\_216\_0\_Main\_Mid



Band41\_20MHz\_100MHz\_DFT\_BPSK\_270\_0\_Main\_Mid



Band41\_20MHz\_80MHz\_DFT\_256QAM\_216\_0\_Main\_High



Band41\_20MHz\_100MHz\_DFT\_BPSK\_270\_0\_Main\_High

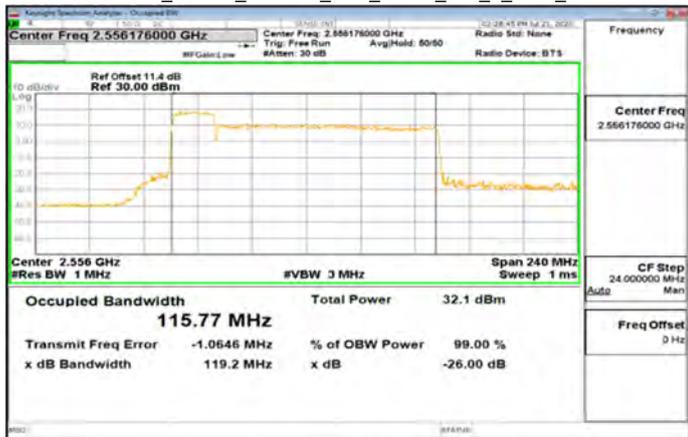


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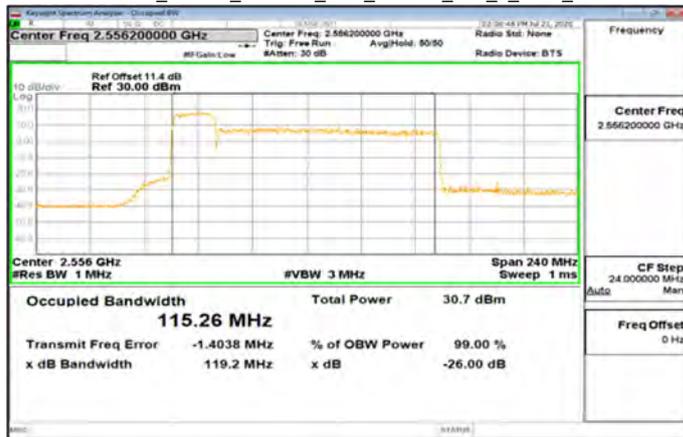
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Band41\_20MHz\_100MHz\_DFT\_QPSK\_270\_0\_Main\_Low



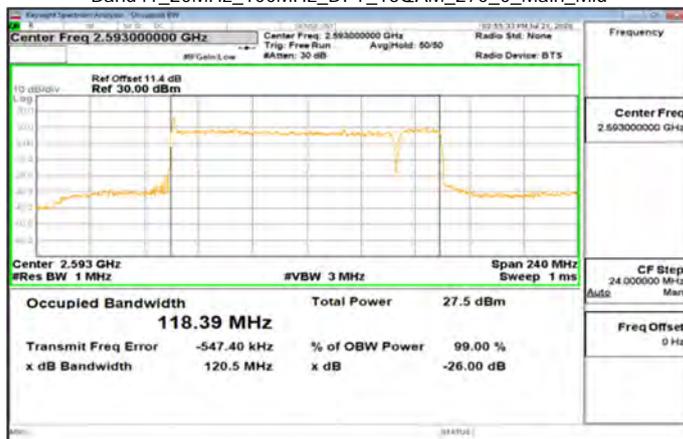
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Band41\_20MHz\_100MHz\_DFT\_QPSK\_270\_0\_Main\_Mid



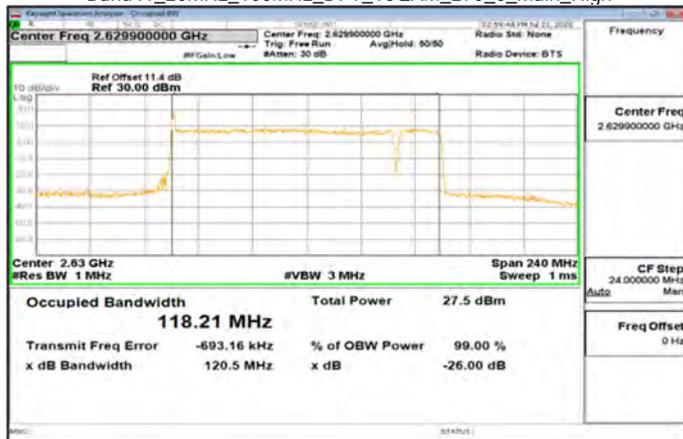
Band41\_20MHz\_100MHz\_DFT\_16QAM\_270\_0\_Main\_Mid



Band41\_20MHz\_100MHz\_DFT\_QPSK\_270\_0\_Main\_High



Band41\_20MHz\_100MHz\_DFT\_16QAM\_270\_0\_Main\_High

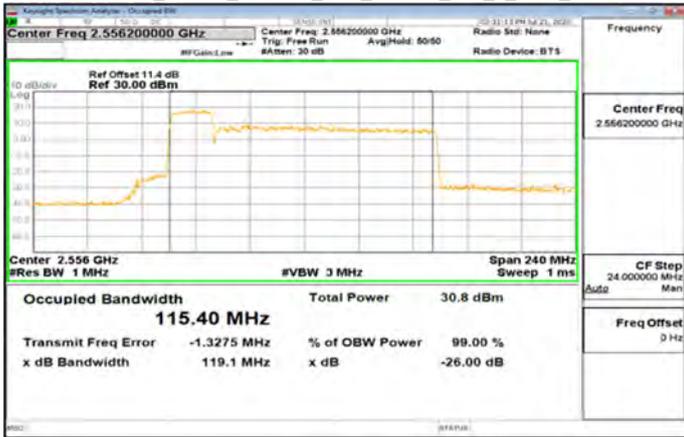


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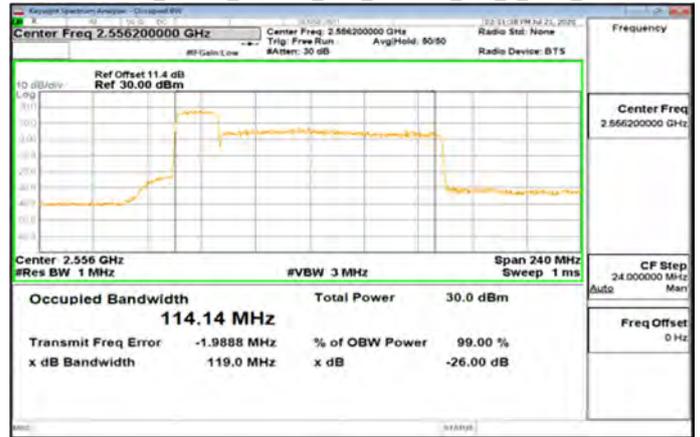
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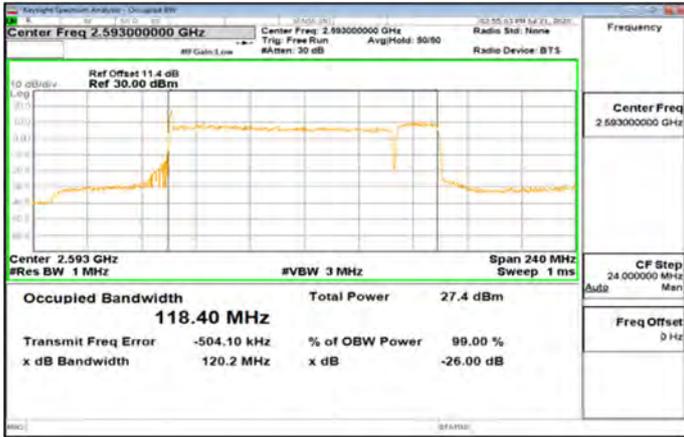
Band41\_20MHz\_100MHz\_DFT\_64QAM\_270\_0\_Main\_Low



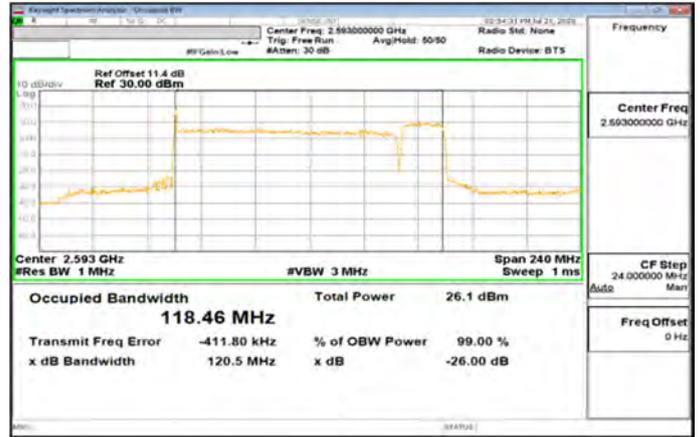
Band41\_20MHz\_100MHz\_DFT\_256QAM\_270\_0\_Main\_Low



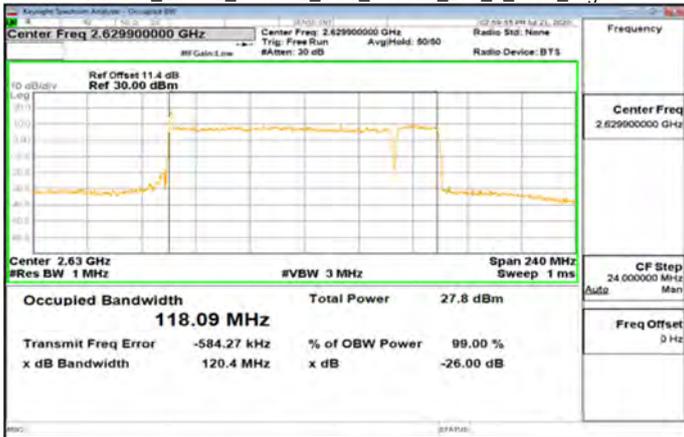
Band41\_20MHz\_100MHz\_DFT\_64QAM\_270\_0\_Main\_Mid



Band41\_20MHz\_100MHz\_DFT\_256QAM\_270\_0\_Main\_Mid



Band41\_20MHz\_100MHz\_DFT\_64QAM\_270\_0\_Main\_High



Band41\_20MHz\_100MHz\_DFT\_256QAM\_270\_0\_Main\_High

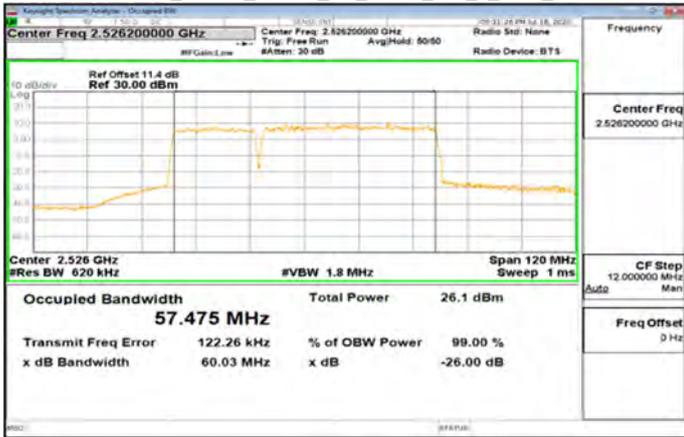


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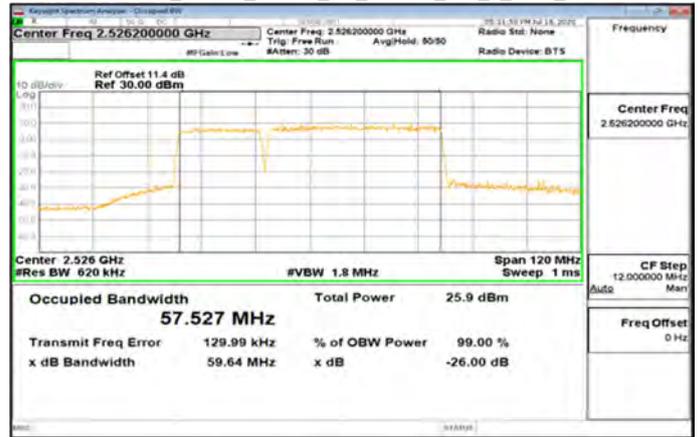
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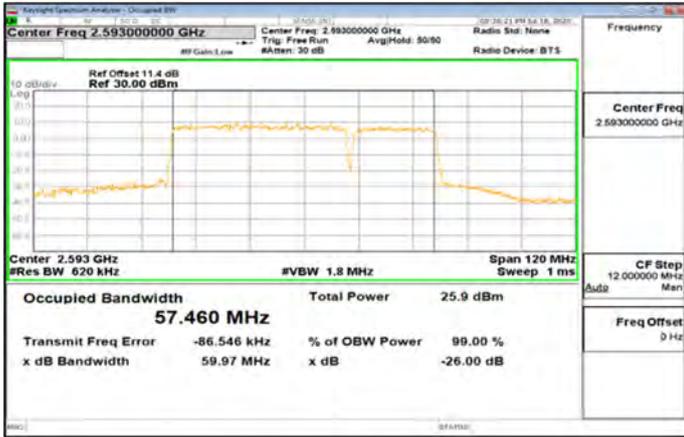
Band41\_20MHz\_40MHz\_CP\_OPSK\_106\_0\_Main\_Low



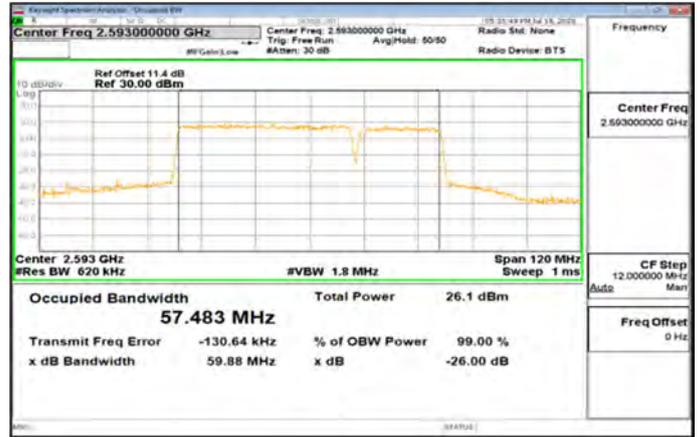
Band41\_20MHz\_40MHz\_CP\_16QAM\_106\_0\_Main\_Low



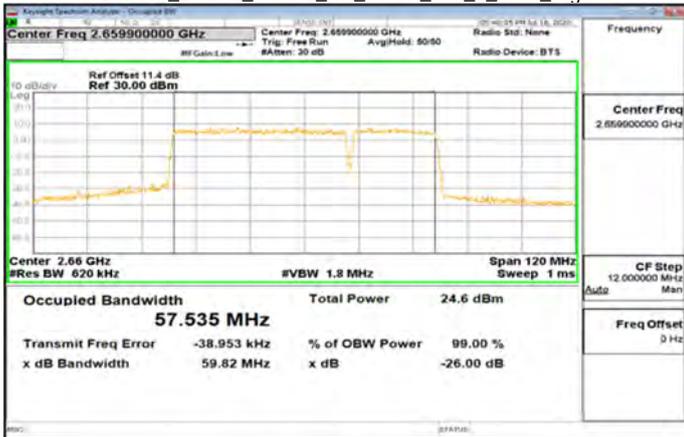
Band41\_20MHz\_40MHz\_CP\_OPSK\_106\_0\_Main\_Mid



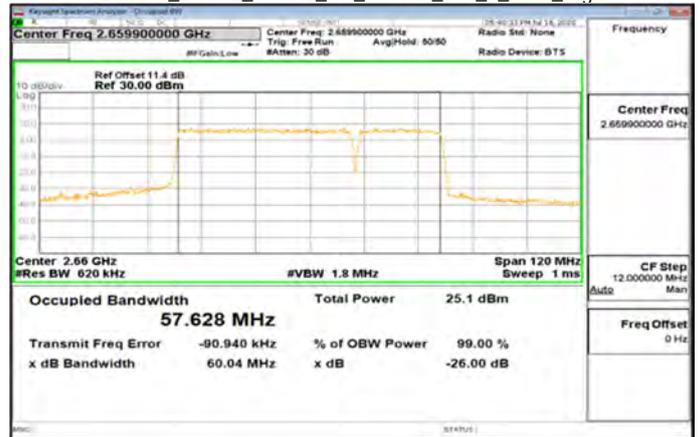
Band41\_20MHz\_40MHz\_CP\_16QAM\_106\_0\_Main\_Mid



Band41\_20MHz\_40MHz\_CP\_OPSK\_106\_0\_Main\_High



Band41\_20MHz\_40MHz\_CP\_16QAM\_106\_0\_Main\_High



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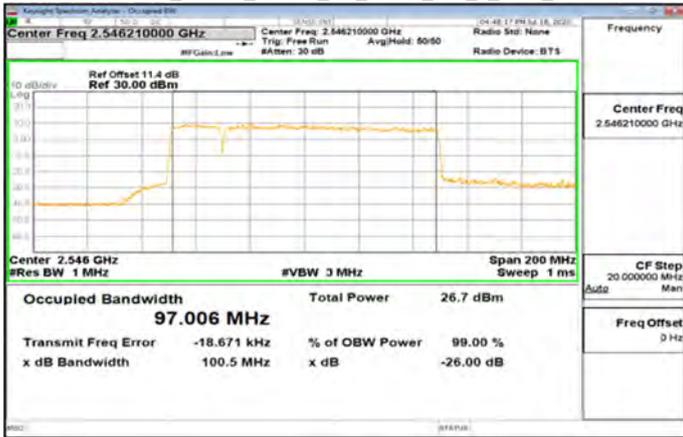
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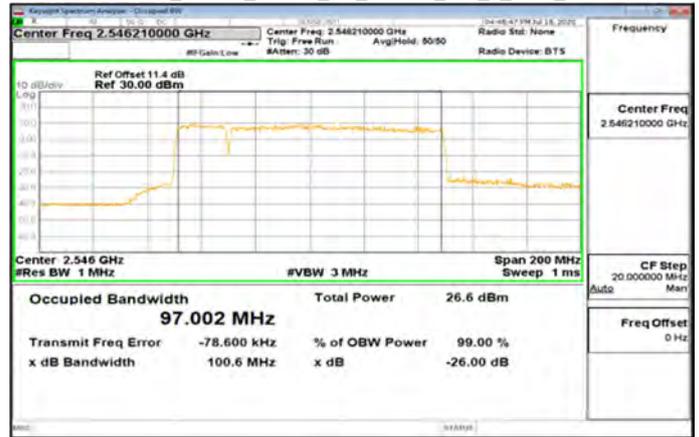




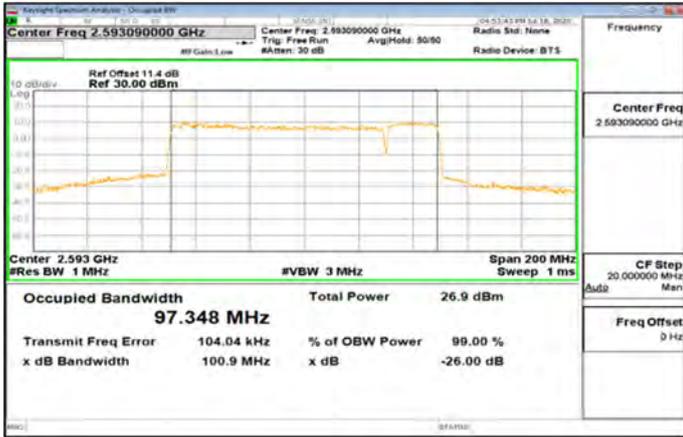
Band41\_20MHz\_80MHz\_CP\_OPSK\_217\_0\_Main\_Low



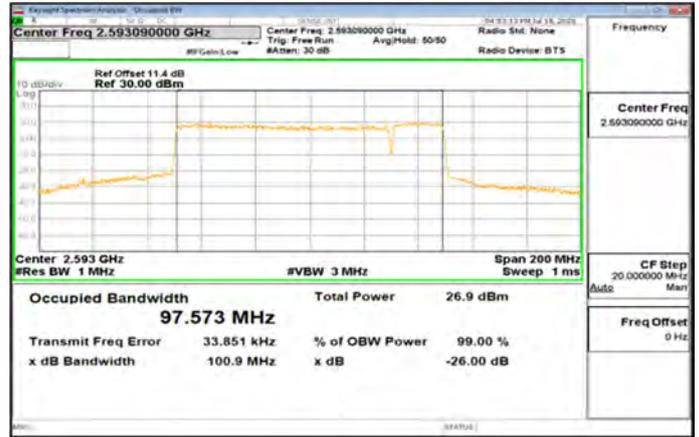
Band41\_20MHz\_80MHz\_CP\_16QAM\_217\_0\_Main\_Low



Band41\_20MHz\_80MHz\_CP\_OPSK\_217\_0\_Main\_Mid



Band41\_20MHz\_80MHz\_CP\_16QAM\_217\_0\_Main\_Mid



Band41\_20MHz\_80MHz\_CP\_OPSK\_217\_0\_Main\_High



Band41\_20MHz\_80MHz\_CP\_16QAM\_217\_0\_Main\_High

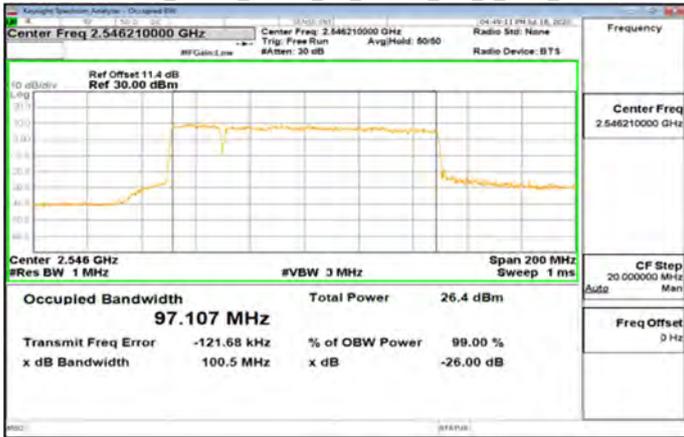


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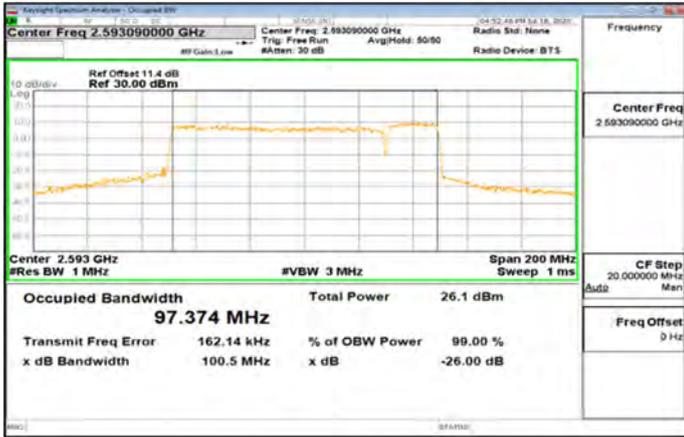
Band41\_20MHz\_80MHz\_CP\_64QAM\_217\_0\_Main\_Low



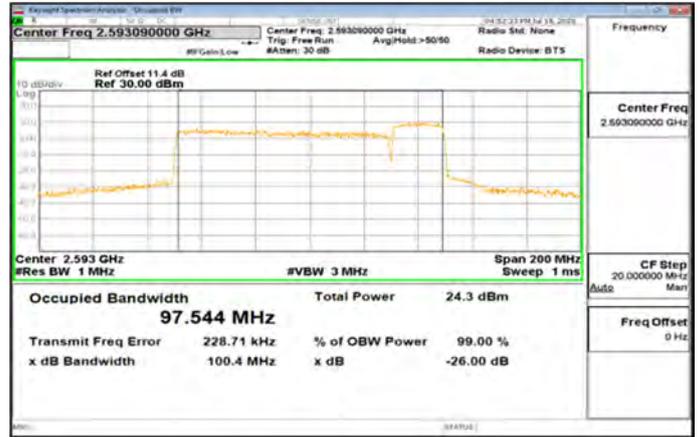
Band41\_20MHz\_80MHz\_CP\_256QAM\_217\_0\_Main\_Low



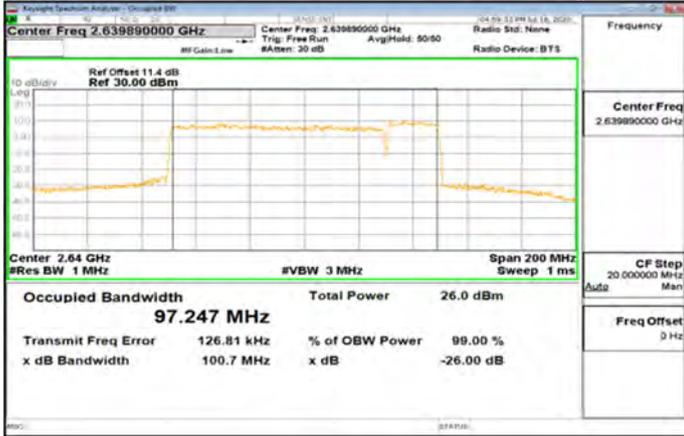
Band41\_20MHz\_80MHz\_CP\_64QAM\_217\_0\_Main\_Mid



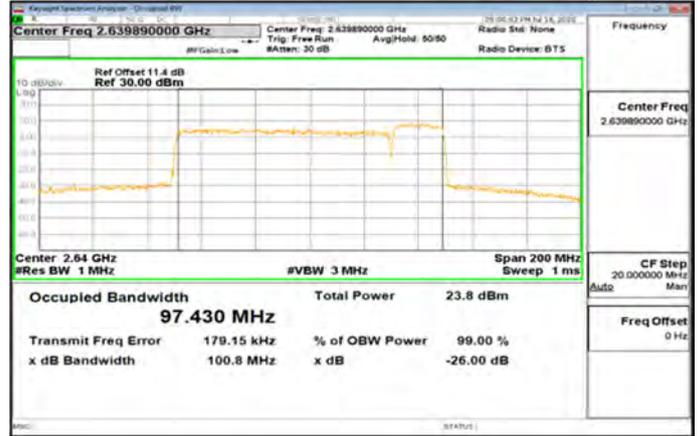
Band41\_20MHz\_80MHz\_CP\_256QAM\_217\_0\_Main\_Mid



Band41\_20MHz\_80MHz\_CP\_64QAM\_217\_0\_Main\_High



Band41\_20MHz\_80MHz\_CP\_256QAM\_217\_0\_Main\_High

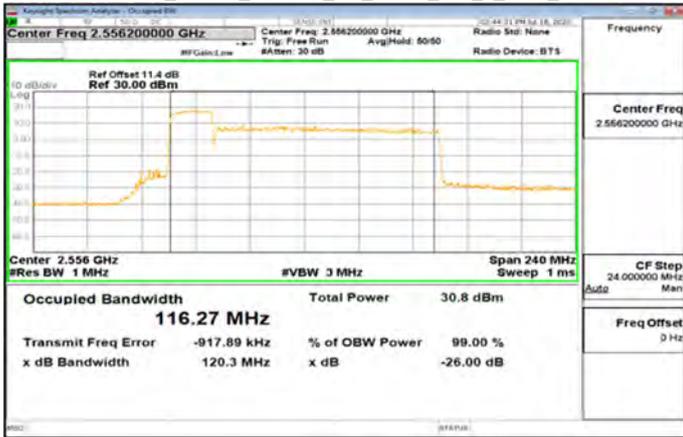


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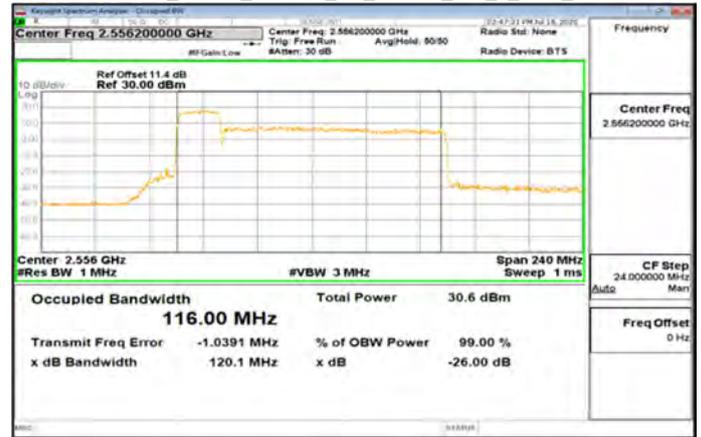
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Band41\_20MHz\_100MHz\_CP\_QPSK\_273\_0\_Main\_Low



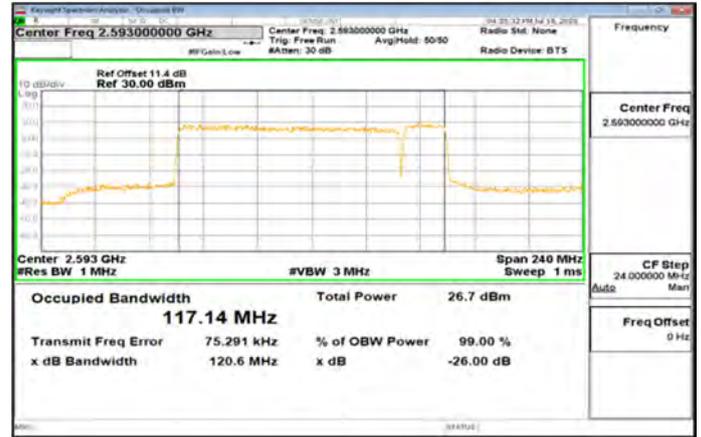
Band41\_20MHz\_100MHz\_CP\_16QAM\_273\_0\_Main\_Low



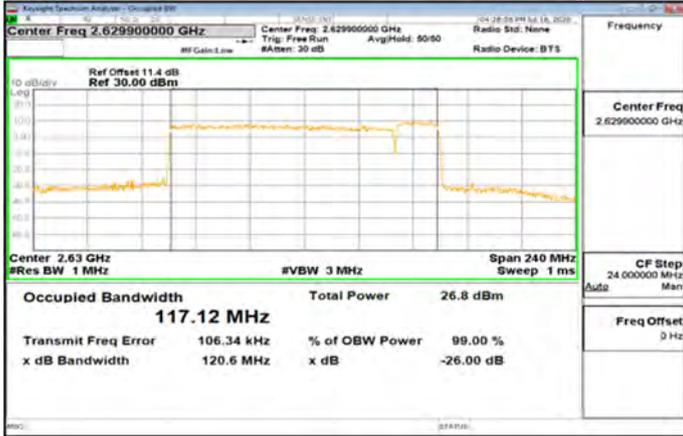
Band41\_20MHz\_100MHz\_CP\_QPSK\_273\_0\_Main\_Mid



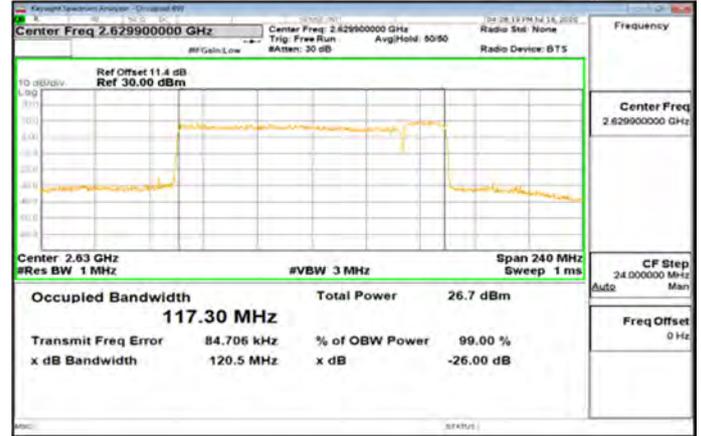
Band41\_20MHz\_100MHz\_CP\_16QAM\_273\_0\_Main\_Mid



Band41\_20MHz\_100MHz\_CP\_QPSK\_273\_0\_Main\_High



Band41\_20MHz\_100MHz\_CP\_16QAM\_273\_0\_Main\_High



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## 8 OUT OF BAND EMISSION AT ANTENNA TERMINALS

### 8.1 Standard Applicable

FCC §22.917(a), §24.238(a), §27.53(h)

RSS-130 §4.7, RSS-132 §5.5, RSS-133 §6.5.1, RSS-139 §6.5, RSS-130 §6.6, RSS-199 §4.5

Out of band emissions. 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) (5) & FCC §27.53(g) for LTE B71

Compliance for operations in the 600 MHz, 698-746 MHz, 746-758 MHz and the 776-788 MHz band with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

#### ISED RSS-130 §4.7.1 for LTE B71

Compliance for operations in the 617-652 MHz, 663-698 MHz, 698-756 MHz and the 777-787 MHz band, the unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least  $43 + 10 \log_{10} p$  (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

#### FCC §27.53(h)(3) for LTE B4, 66

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.

#### RSS-139 §6.6 for LTE B4, 66

In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, Footnote 2 which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least  $43 + 10 \log_{10} p$  (watts) dB.

After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least  $43 + 10 \log_{10} p$  (watts) dB.

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**FCC §27.53(m) (4) (6) for LTE B41**

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 than  $43 + 10 \log (P)$  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.

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

**RSS-199 §4.5 for LTE B41**

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least  $43 + 10 \log_{10} p$  for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

$40 + 10 \log_{10} p$  from the channel edges to 5 MHz away

$43 + 10 \log_{10} p$  between 5 MHz and X MHz from the channel edges, and

$55 + 10 \log_{10} p$  at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than  $43 + 10 \log_{10} p$  on all frequencies between 2490.5 MHz and 2496 MHz, and  $55 + 10 \log_{10} p$  at or below 2490.5 MHz.

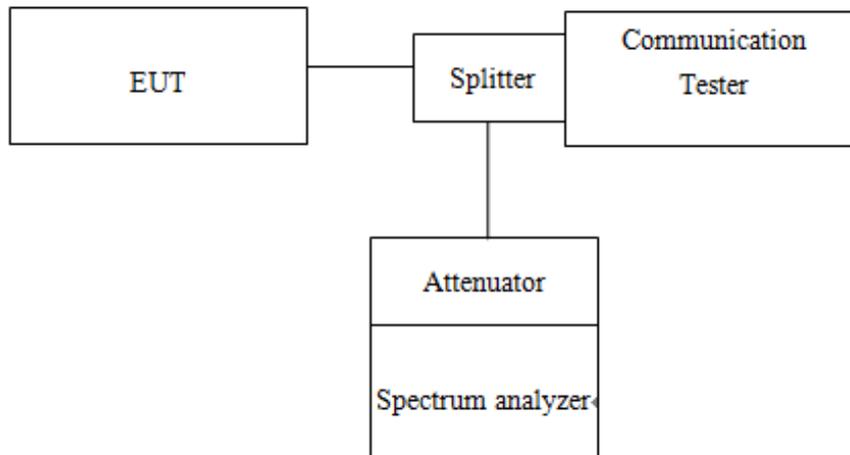
In (a) and (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

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## 8.2 Test SET-UP



## 8.3 Measurement Procedure

### 8.3.1 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.

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

### 8.3.2 Band Edge or Mask

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. The only N41 Band used RBW offset method and describe in C63.26 section 5.7.2 the correction factor is following:

$$\text{Correction factor} = 10 \log \left[ \frac{\text{reference bandwidth } 1\text{MHz}}{\text{measurement bandwidth } 100\text{KHz}} \right] = 10\text{dB}$$

4. Allow trace to fully stabilize
5. Repeat above procedures until all default test channel measured were complete.

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#### 8.4 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	12/22/2020
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/20/2020	02/19/2021
UXM 5G	KEYSIGHT	E7515B	MY59321561	12/16/2019	12/15/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	01/01/2021
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	01/01/2021
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-018	01/02/2020	01/01/2021

#### 8.5 Measurement Result:

Refer to next pages.

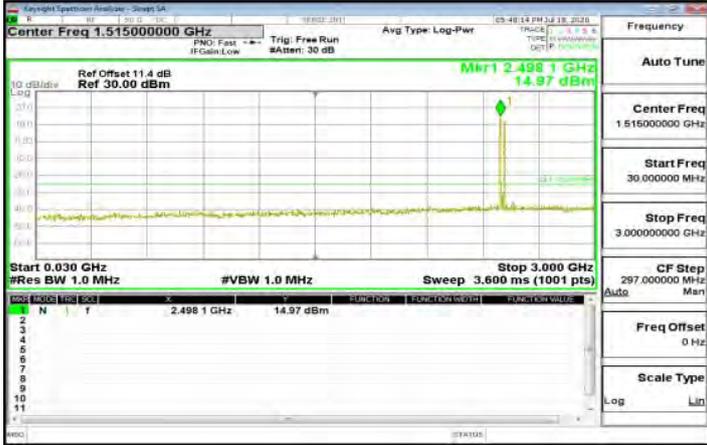
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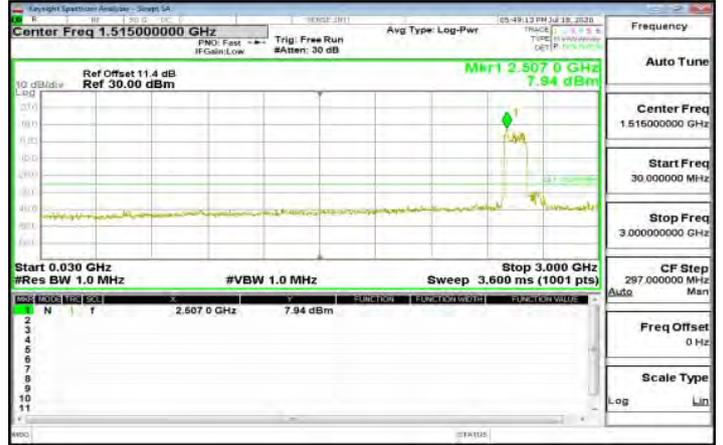
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Out of Band Emission

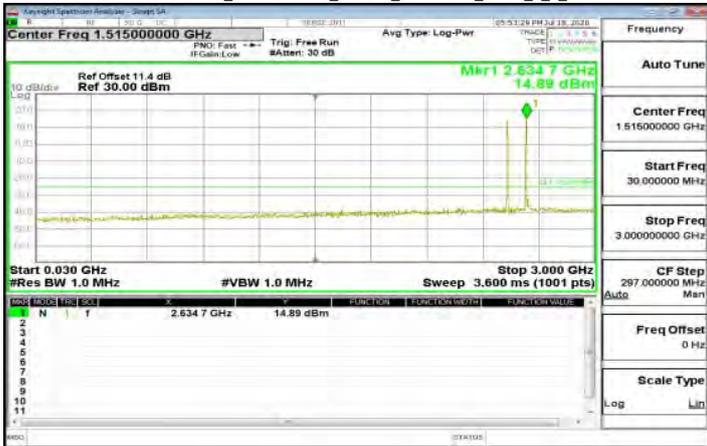
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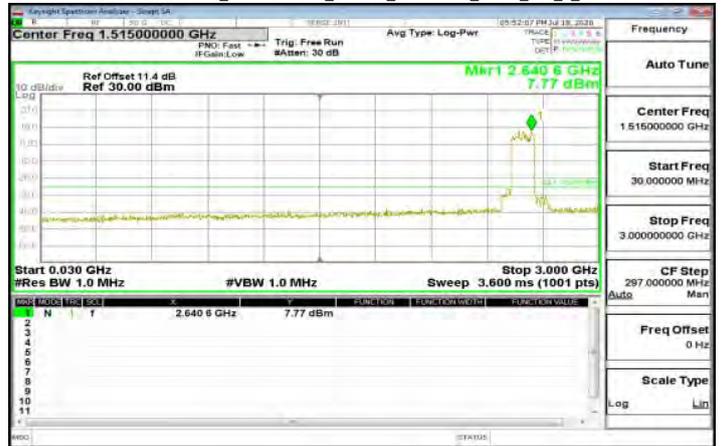
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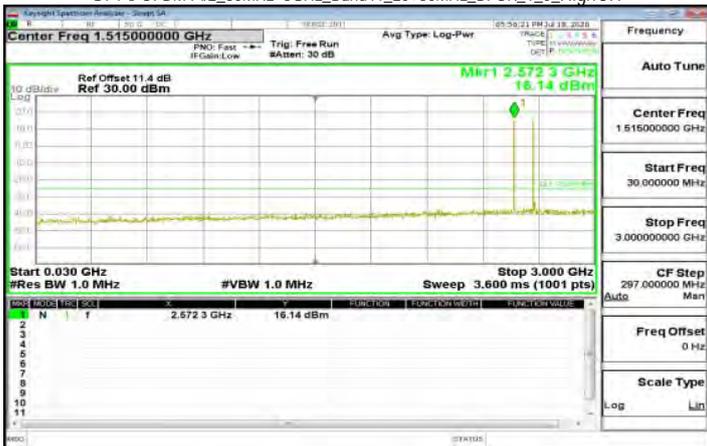
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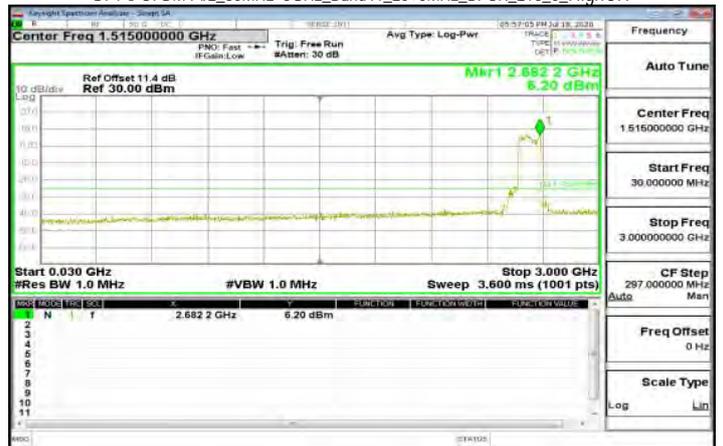
DFT-s-OFDM Pi/2\_30MHz-3GHz\_Band41\_20+80MHz\_BPSK\_216\_0\_MidCH



DFT-s-OFDM Pi/2\_30MHz-3GHz\_Band41\_20+80MHz\_BPSK\_1\_0\_HighCH



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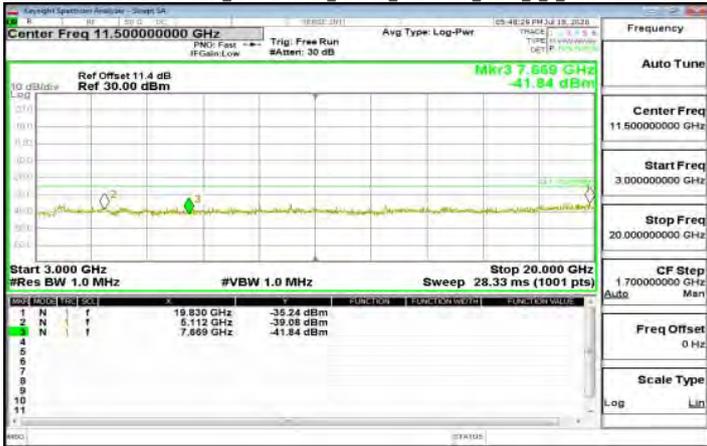


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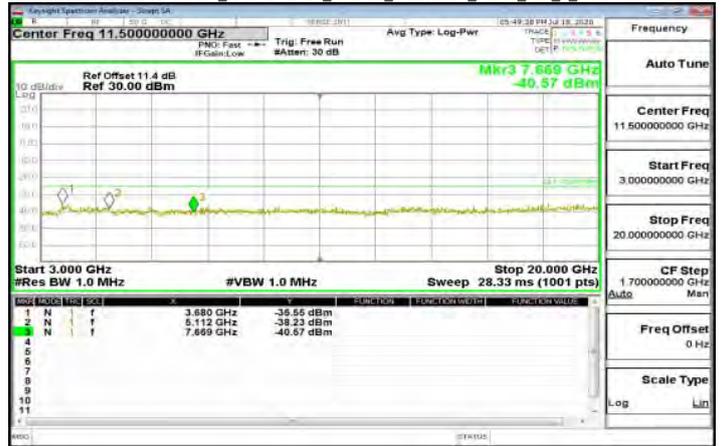
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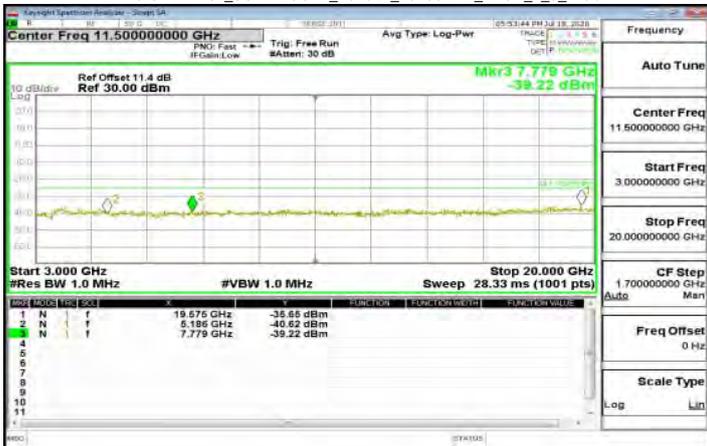
DFT-s-OFDM Pi/2\_3GHz-26GHz\_Band41\_20+80MHz\_BPSK\_1\_0\_LowCH



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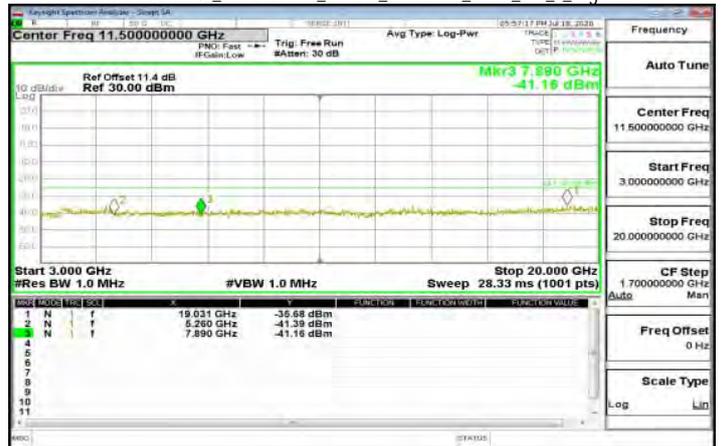
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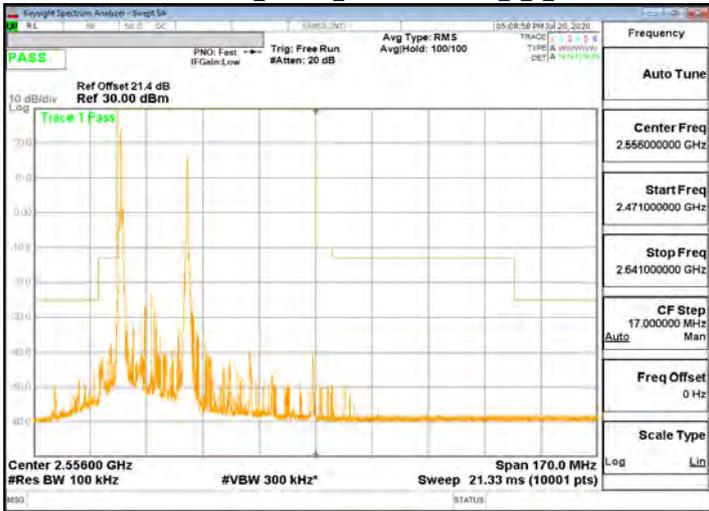
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Mask

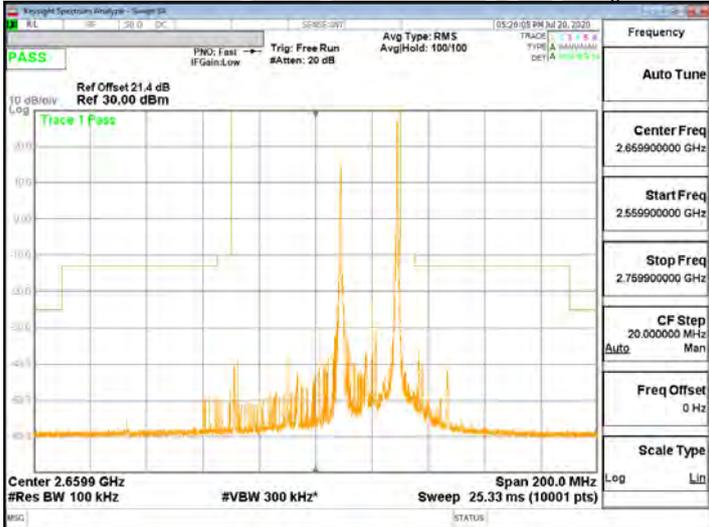
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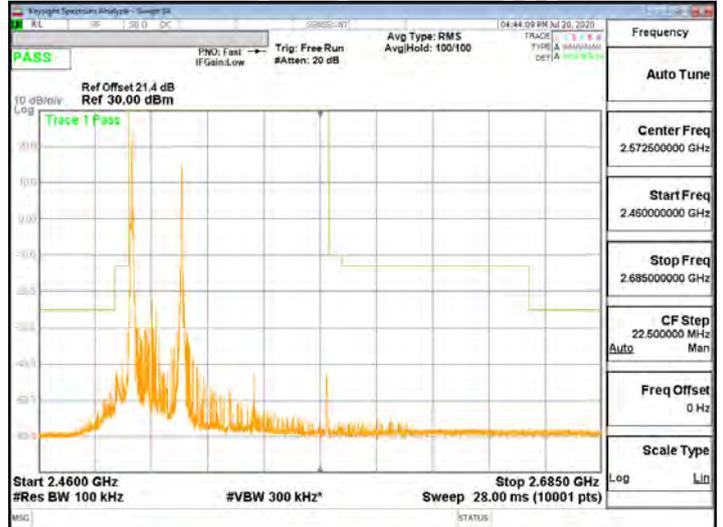
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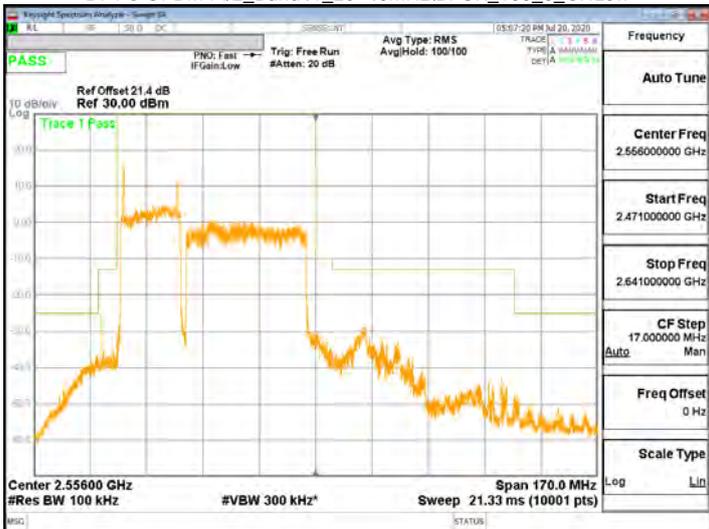
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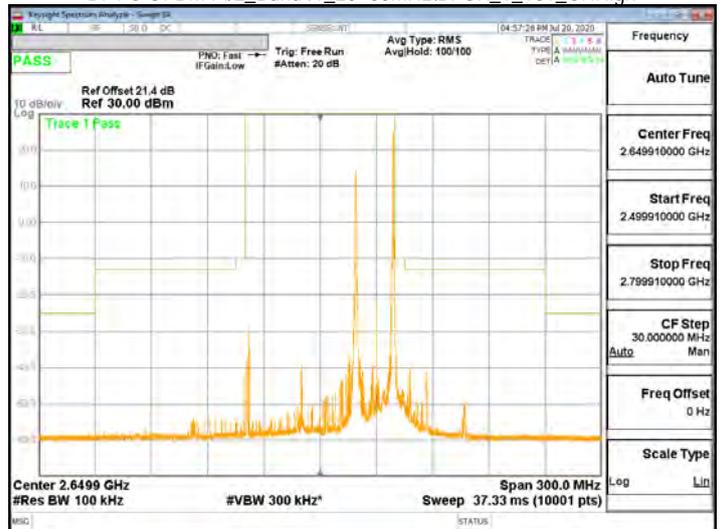
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DFT-s-OFDM Pi/2\_Band41\_20+60MHzBPSK\_1\_161\_CHHigh



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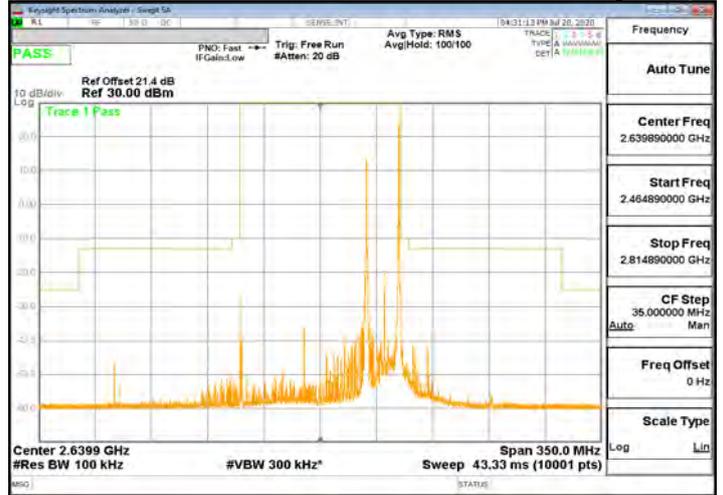
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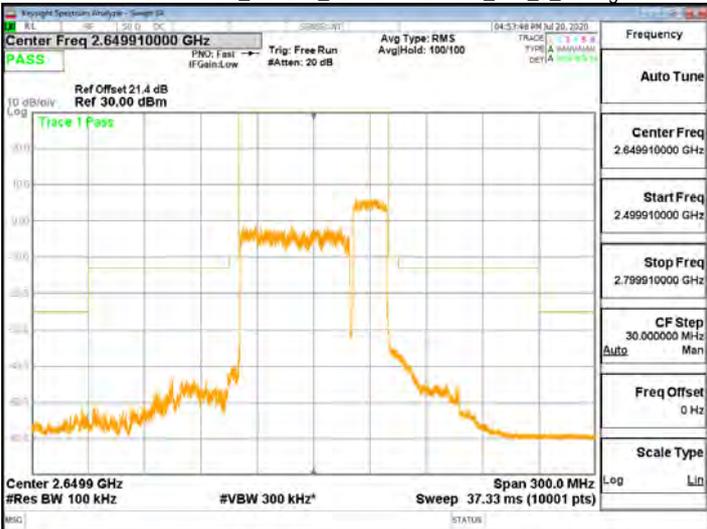
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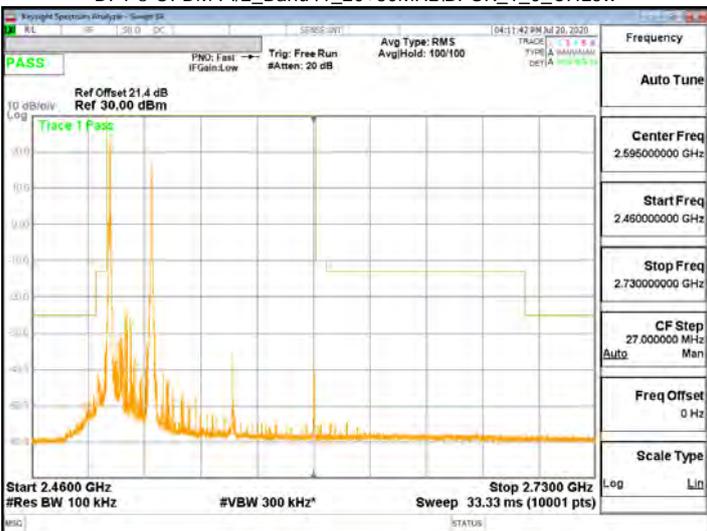
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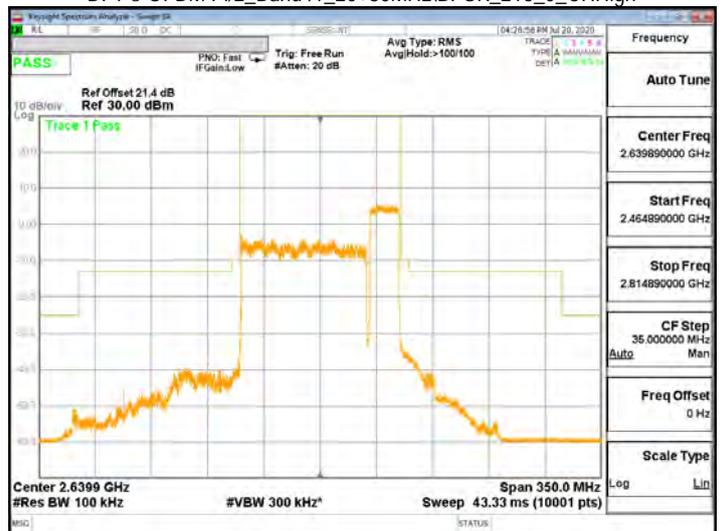
DFT-s-OFDM Pi/2\_Band41\_20+80MHzBPSK\_216\_0\_CHLow



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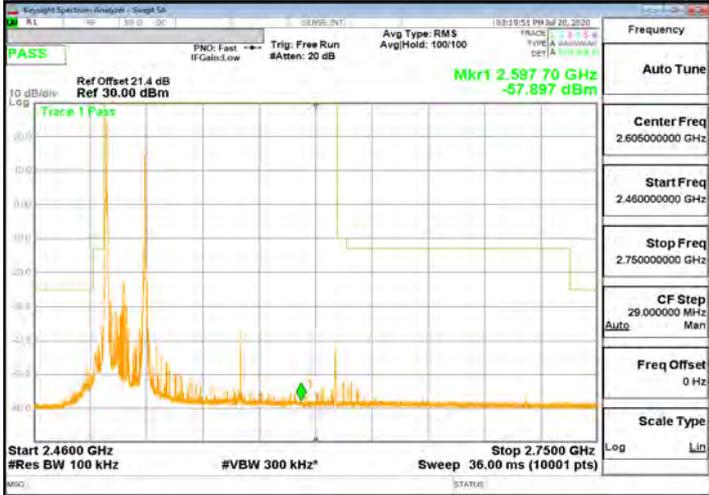


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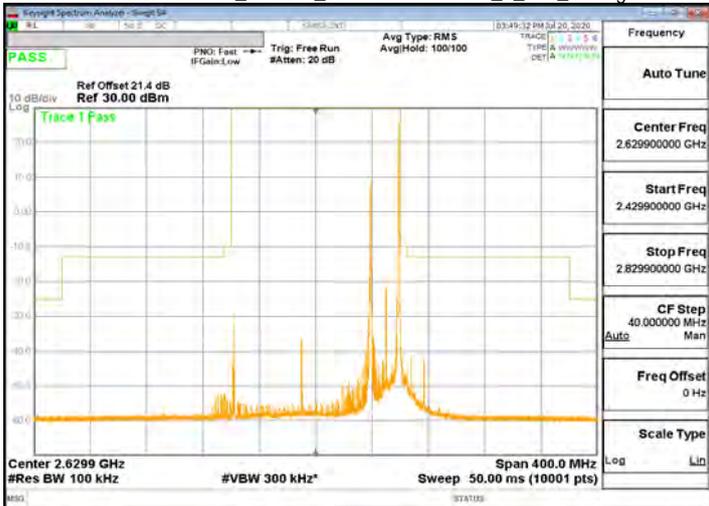
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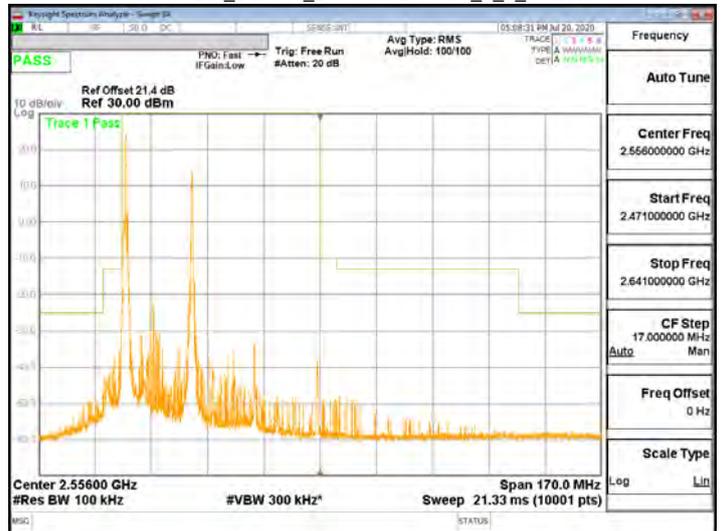
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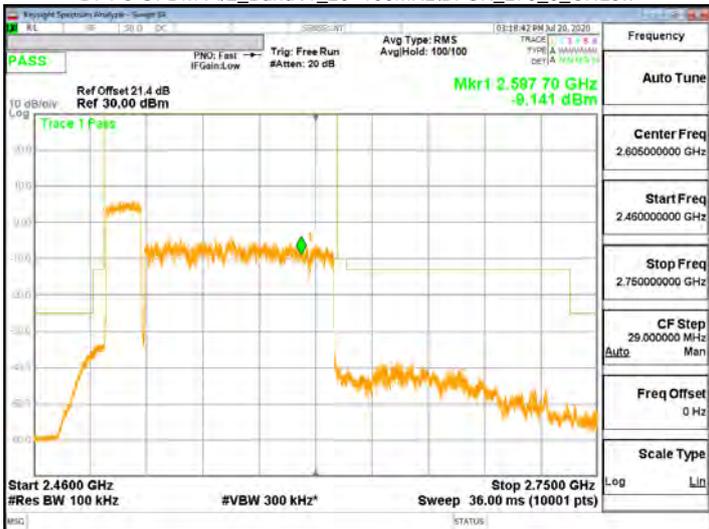
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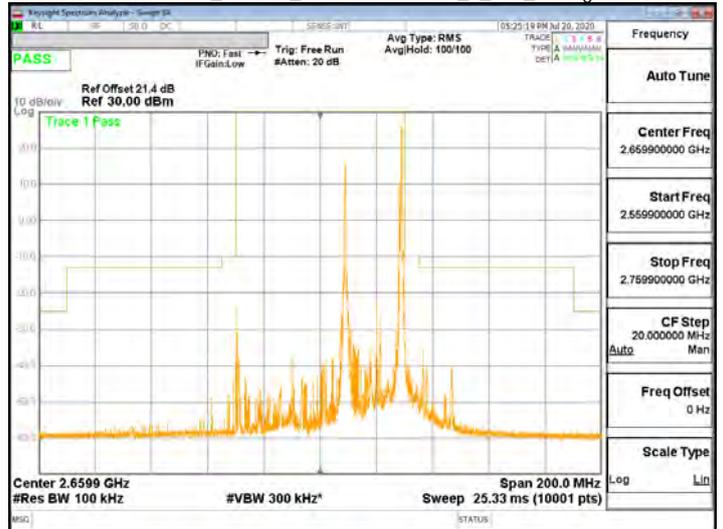
CP-OFDM\_Band41\_20+40MHz\QPSK\_1\_0\_CHLow



DFT-s-OFDM Pi/2\_Band41\_20+100MHz\BPSK\_270\_0\_CHLow



CP-OFDM\_Band41\_20+40MHz\QPSK\_1\_105\_CHHigh



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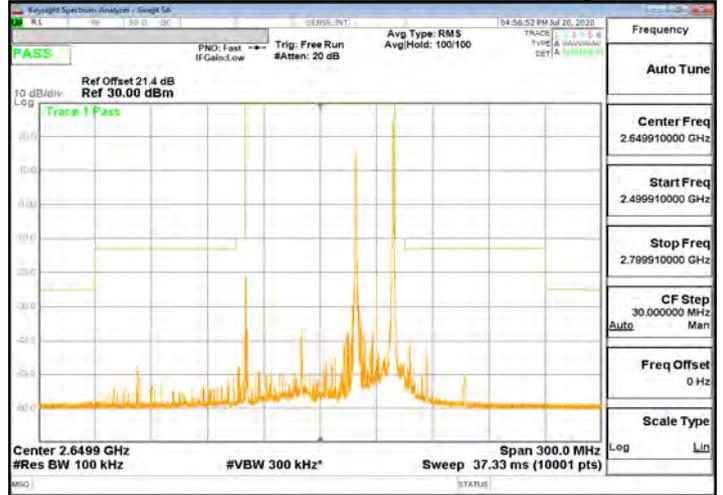
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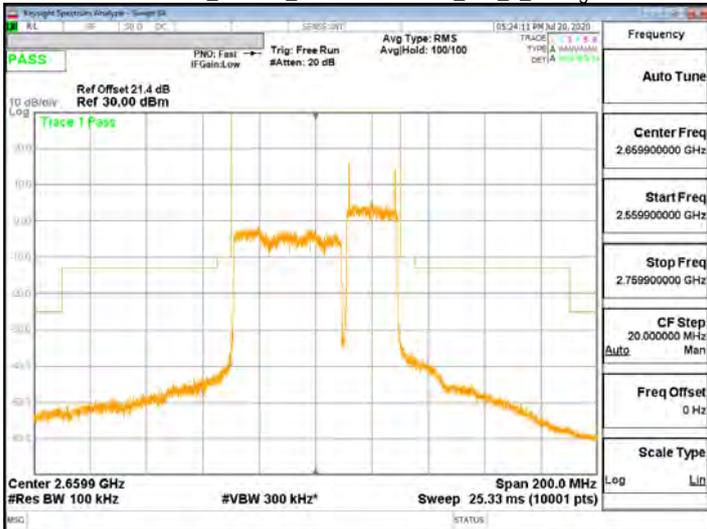
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CP-OFDM\_Band41\_20+60MHzQPSK\_1\_161\_CHHigh



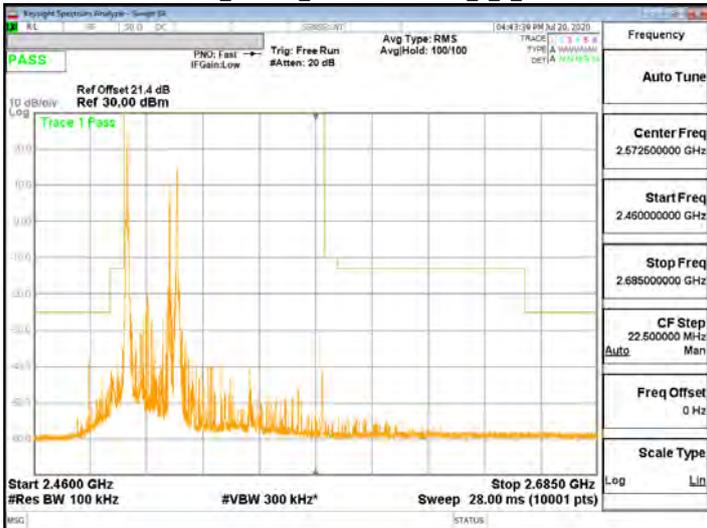
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CP-OFDM\_Band41\_20+60MHzQPSK\_162\_0\_CHLow



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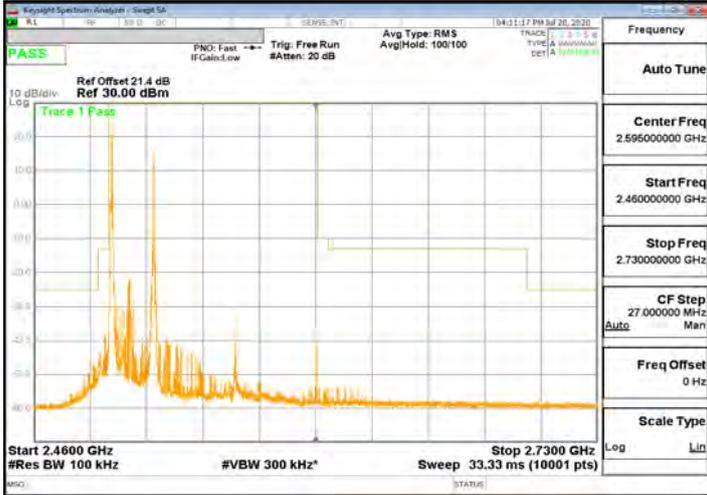


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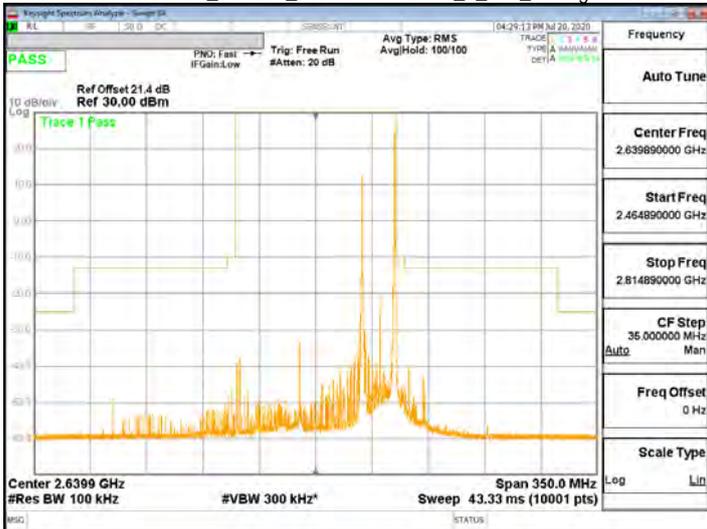
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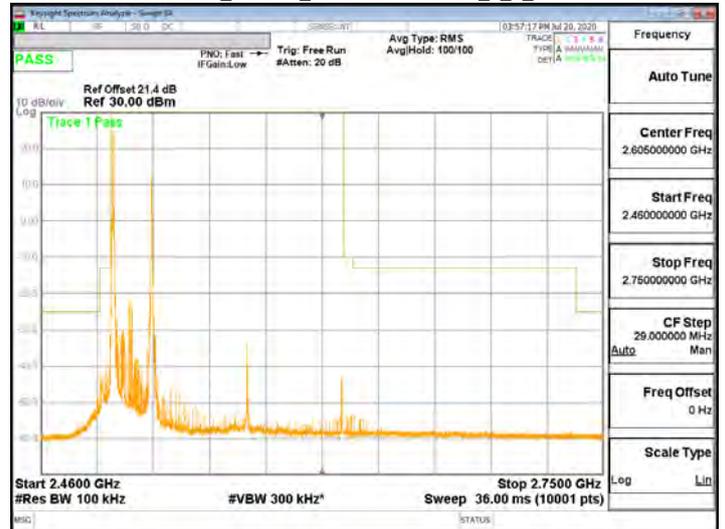
CP-OFDM\_Band41\_20+80MHzQPSK\_217\_0\_CHHigh



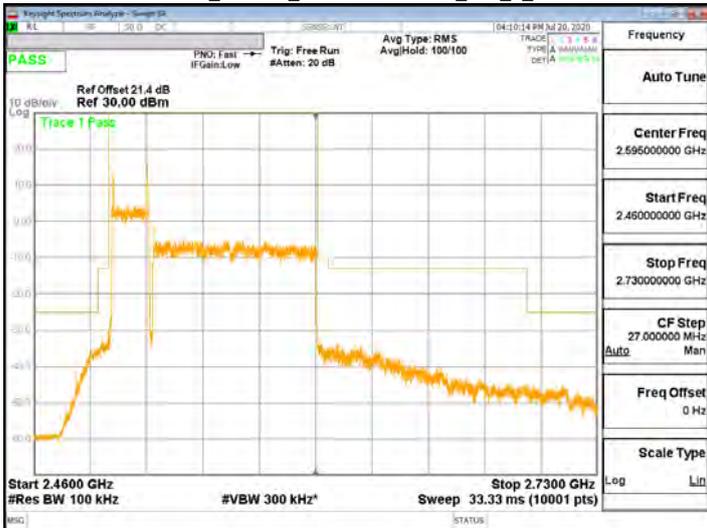
CP-OFDM\_Band41\_20+80MHzQPSK\_1\_216\_CHHigh



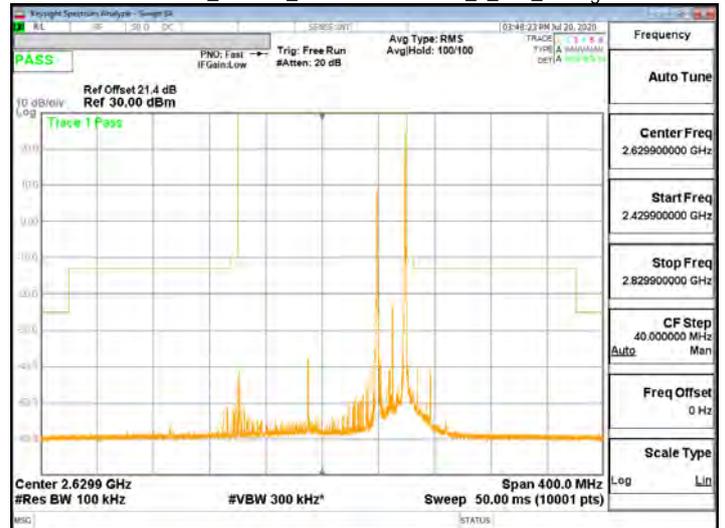
CP-OFDM\_Band41\_20+100MHzQPSK\_1\_0\_CHLow



CP-OFDM\_Band41\_20+80MHzQPSK\_217\_0\_CHLow



CP-OFDM\_Band41\_20+100MHzQPSK\_1\_272\_CHHigh



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CP-OFDM\_Band41\_20+100MHz\QPSK\_273\_0\_CHLow



CP-OFDM\_Band41\_20+100MHz\QPSK\_273\_0\_CHHigh



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## 9 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

### 9.1 Standard Applicable

According to FCC §2.1053,  
**RSS-199 §4.5**

Out of band emissions. 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(m) (4) (6) for LTE B41**

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 than  $43 + 10 \log(P)$  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.

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

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**RSS-199 §4.5 for LTE B41**

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least  $43 + 10 \log_{10} p$  for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

$40 + 10 \log_{10} p$  from the channel edges to 5 MHz away

$43 + 10 \log_{10} p$  between 5 MHz and X MHz from the channel edges, and

$55 + 10 \log_{10} p$  at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than  $43 + 10 \log_{10} p$  on all frequencies between 2490.5 MHz and 2496 MHz, and  $55 + 10 \log_{10} p$  at or below 2490.5 MHz.

In (a) and (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

**Table 2 — Unwanted Emissions for Mobile, Portable and Low-Power Fixed Subscriber Equipment**

Frequency (MHz)	Attenuation (dB)
<2200	$43 + 10 \log_{10}(p)$
2200 - 2288	$70 + 10 \log_{10}(p)$
2288 - 2292	$67 + 10 \log_{10}(p)$
2292 - 2296	$61 + 10 \log_{10}(p)$
2296 - 2300	$55 + 10 \log_{10}(p)$
2300 - 2305	$43 + 10 \log_{10}(p)$
2305 - 2320	$43 + 10 \log_{10}(p)$ <sup>Note</sup>
2320 - 2324	$55 + 10 \log_{10}(p)$
2324 - 2328	$61 + 10 \log_{10}(p)$
2328 - 2337	$67 + 10 \log_{10}(p)$
2337 - 2341	$61 + 10 \log_{10}(p)$
2341 - 2345	$55 + 10 \log_{10}(p)$
2345 - 2360	$43 + 10 \log_{10}(p)$ <sup>Note</sup>
2360 - 2365	$43 + 10 \log_{10}(p)$
2365 - 2395	$70 + 10 \log_{10}(p)$
>2395	$43 + 10 \log_{10}(p)$

**Note:** Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 1.2 for the permitted frequency ranges for various equipment types.

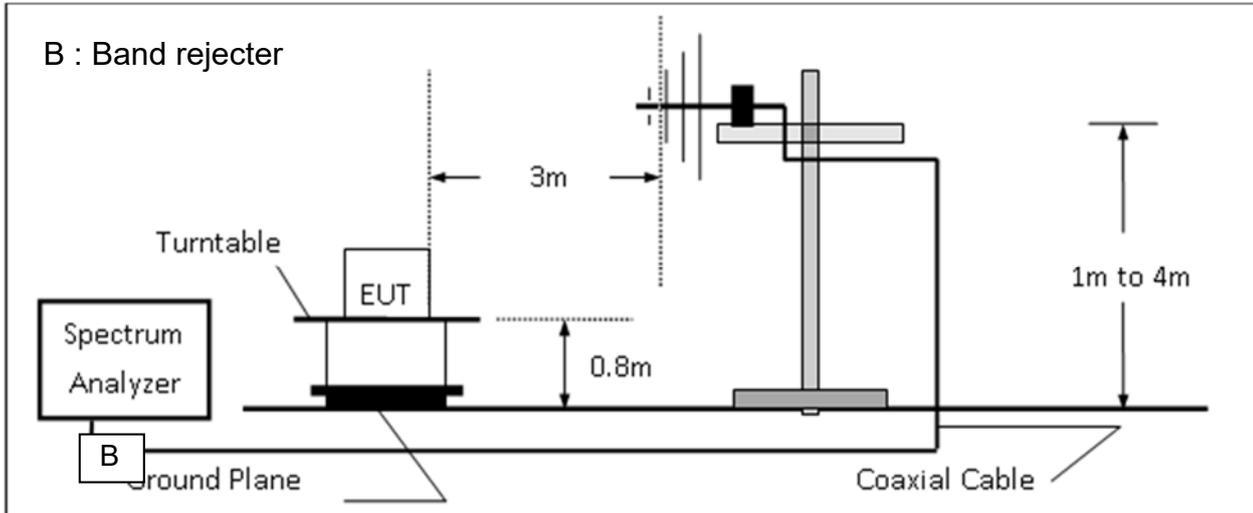
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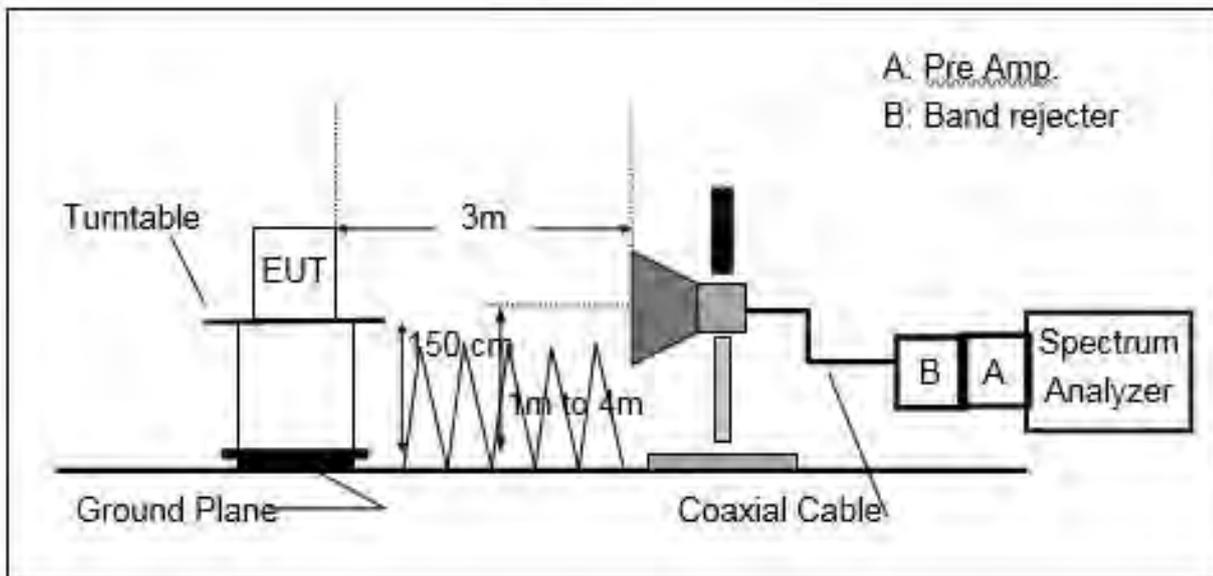
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## 9.2 EUT Setup

### Radiated Emission Test Set-Up, Frequency Below 1000MHz



### Radiated Emission Test Set-UP Frequency Over 1 GHz



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### 9.3 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.

$$\text{ERP (dBm)} = \text{SG Level(dBm)} + \text{Antenna Gain(dBd)} + \text{Cable Loss(dB)}$$

$$\text{EIRP (dBm)} = \text{SG Level(dBm)} + \text{Antenna Gain(dBi)} + \text{Cable Loss(dB)}$$

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9.4 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	Schwarzbeck	BBHA9170	185	08/07/2019	08/06/2020
Horn Antenna	Schwarzbeck	BBHA9120D	D803	12/20/2019	12/19/2020
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	01/13/2020	01/12/2021
Spectrum Analyzer	Agilent	E4446A	MY51100003	10/23/2019	10/22/2020
EMI Test Receiver	R&S	ESCI 7	100759	07/13/2020	07/12/2021
UXM 5G	KEYSIGHT	E7515B	MY59321561	12/16/2019	12/15/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	01/02/2020	01/01/2021
Pre-Amplifier	EMC Instruments	EMC051825	980152	01/02/2020	01/01/2021
Pre-Amplifier	HP	8447D	2944A09469	01/02/2020	01/01/2021
Filter 800-1000	Micro-Tronics	EWT	M1	01/02/2020	01/01/2021
Filter 1700-2000	Micro-Tronics	EWT	M3	01/02/2020	01/01/2021
Filter 2240-2700	Micro-Tronics	WI	2	01/02/2020	01/01/2021
High Pass Filter	WI	WHKX4.0/18G-10SS	22	01/02/2020	01/01/2021
1GHz High Pass Filter	Micro-Tronics	HPM50108	32	01/02/2020	01/01/2021
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	EMC 104-SM-SM-2000	160123	01/02/2020	01/01/2021

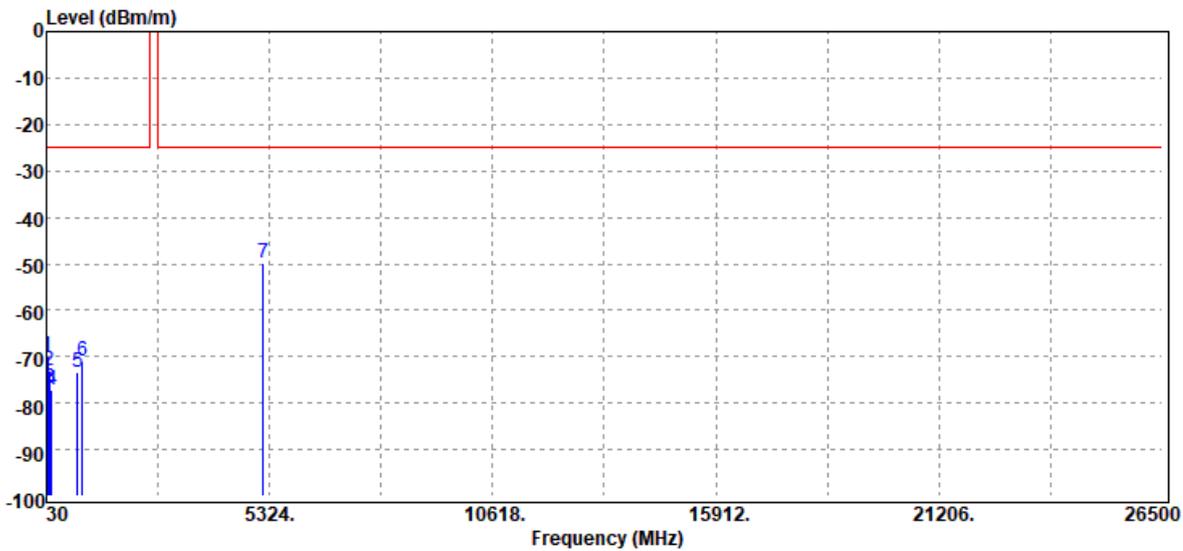
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### 9.5 Measurement Result:

Report Number	:ER/2020/30084	Test Site	:SAC I Chamber
Operation Mode	:41A_n41 (Contiguous)	Test Date	:2020-07-21
Test Mode	:Tx CH Mid	Temp./Humi.	:26.4/67
EUT Pol	:E1 Plane	Antenna Pol.	:VERTICAL
Test Frequency	:2633.1_2583.09 MHz	Engineer	:Neo



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
62.01	-69.80	-54.66	-14.38	-0.76	-25.00	-44.80
90.14	-73.01	-66.30	-5.81	-0.90	-25.00	-48.01
109.54	-76.79	-68.70	-7.09	-1.00	-25.00	-51.79
159.01	-77.03	-68.82	-7.00	-1.21	-25.00	-52.03
765.26	-73.32	-69.15	-1.77	-2.40	-25.00	-48.32
890.39	-70.86	-66.46	-1.45	-2.95	-25.00	-45.86
5166.18	-49.88	-55.65	12.80	-7.03	-25.00	-24.88

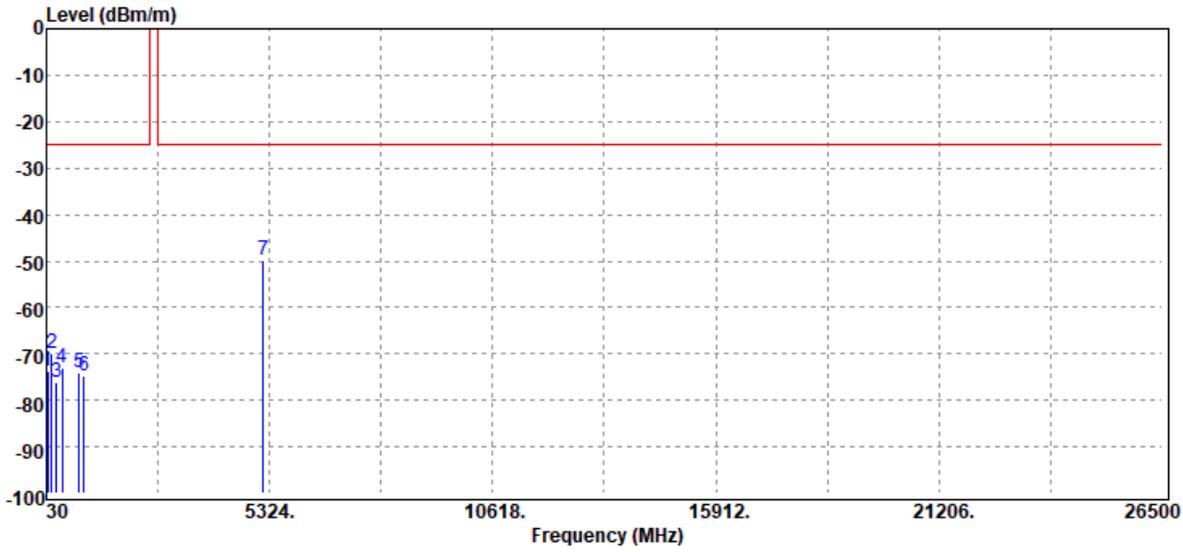
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Report Number :ER/2020/30084  
 Operation Mode :41A\_n41 (Contiguous)  
 Test Mode :Tx CH Mid  
 EUT Pol :E1 Plane  
 Test Frequency :2633.1\_2583.09 MHz

Test Site :SAC I Chamber  
 Test Date :2020-07-21  
 Temp./Humi. :26.4/67  
 Antenna Pol. :HORIZONTAL  
 Engineer :Neo



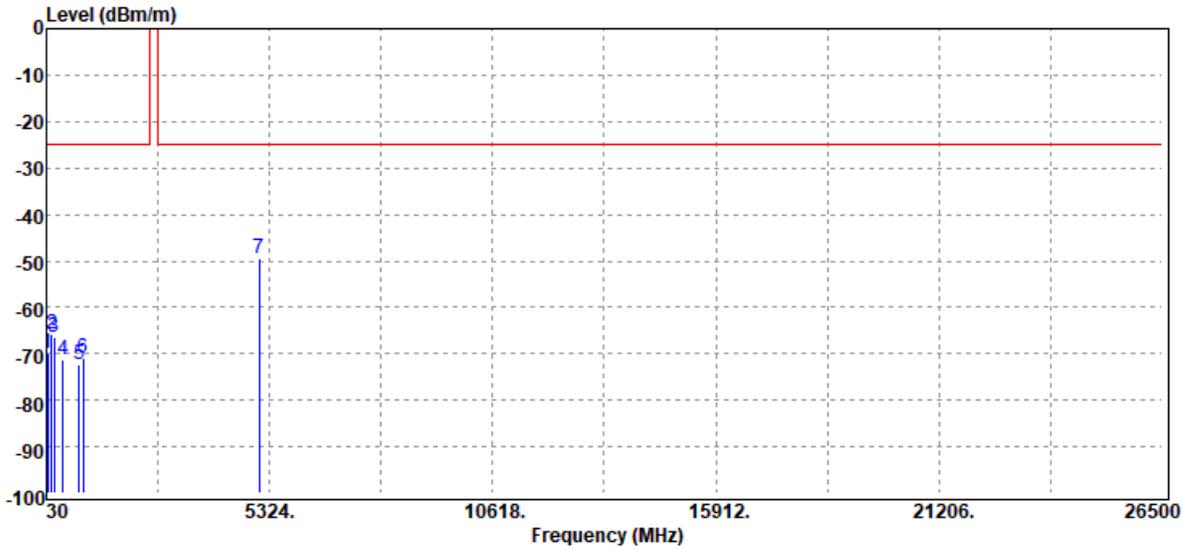
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
62.01	-73.56	-58.42	-14.38	-0.76	-25.00	-48.56
153.19	-69.84	-61.30	-7.32	-1.22	-25.00	-44.84
277.35	-76.27	-72.91	-1.81	-1.55	-25.00	-51.27
410.24	-73.05	-69.79	-1.38	-1.88	-25.00	-48.05
796.30	-74.07	-69.69	-1.61	-2.77	-25.00	-49.07
924.34	-74.63	-69.92	-1.90	-2.81	-25.00	-49.63
5166.18	-49.67	-55.44	12.80	-7.03	-25.00	-24.67

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Report Number	:ER/2020/30084	Test Site	:SAC I Chamber
Operation Mode	:41A_n41 (Non-Contiguous)	Test Date	:2020-07-21
Test Mode	:Tx CH Low	Temp./Humi.	:26.4/67
EUT Pol	:E1 Plane	Antenna Pol.	:VERTICAL
Test Frequency	:2679.9_2536.2 MHz	Engineer	:Neo



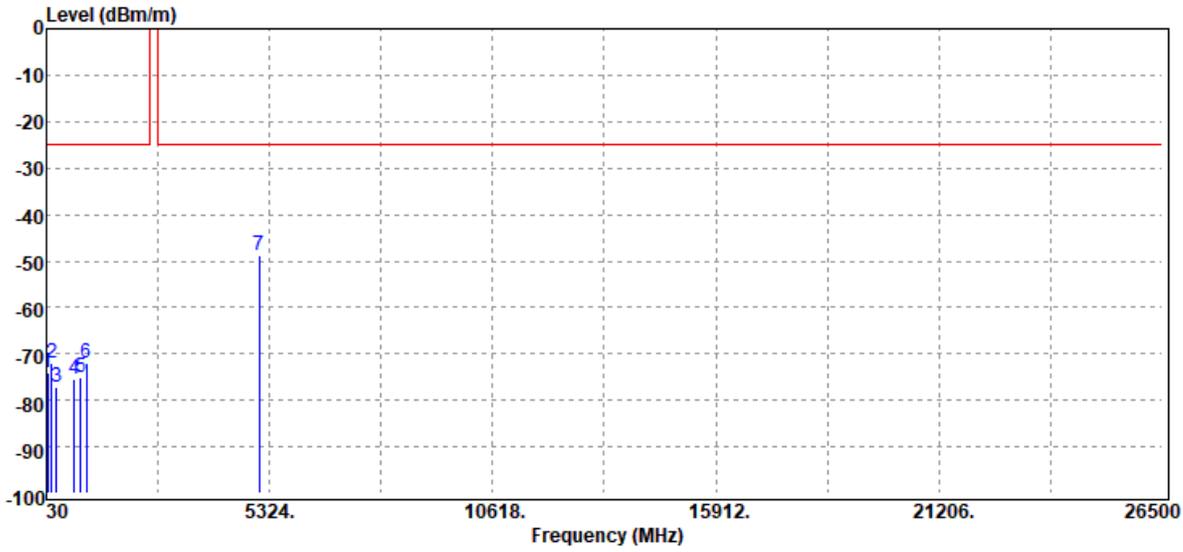
Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
65.89	-70.04	-56.16	-13.09	-0.79	-25.00	-45.04
156.10	-65.59	-57.21	-7.17	-1.21	-25.00	-40.59
207.51	-66.27	-63.12	-1.79	-1.36	-25.00	-41.27
413.15	-71.28	-67.91	-1.43	-1.94	-25.00	-46.28
799.21	-72.31	-67.93	-1.57	-2.81	-25.00	-47.31
898.15	-71.09	-66.49	-1.62	-2.98	-25.00	-46.09
5072.40	-49.51	-55.28	12.56	-6.79	-25.00	-24.51

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Test Mode	:Tx CH Low	Temp./Humi.	:26.4/67
EUT Pol	:E1 Plane	Antenna Pol.	:HORIZONTAL
Test Frequency	:2679.9_2536.2 MHz	Engineer	:Neo



Freq. MHz	EIRP/ERP dBm	SG Output Level dBm	Antenna Gain dBi/dBd	Cable Loss dB	Limit dBm	Margin dB
62.98	-74.04	-59.22	-14.05	-0.77	-25.00	-49.04
160.95	-71.86	-63.85	-6.80	-1.21	-25.00	-46.86
275.41	-77.22	-73.93	-1.75	-1.54	-25.00	-52.22
681.84	-75.50	-71.77	-1.45	-2.28	-25.00	-50.50
852.56	-75.21	-71.30	-1.56	-2.35	-25.00	-50.21
980.60	-71.95	-66.93	-1.88	-3.14	-25.00	-46.95
5072.40	-48.70	-54.47	12.56	-6.79	-25.00	-23.70

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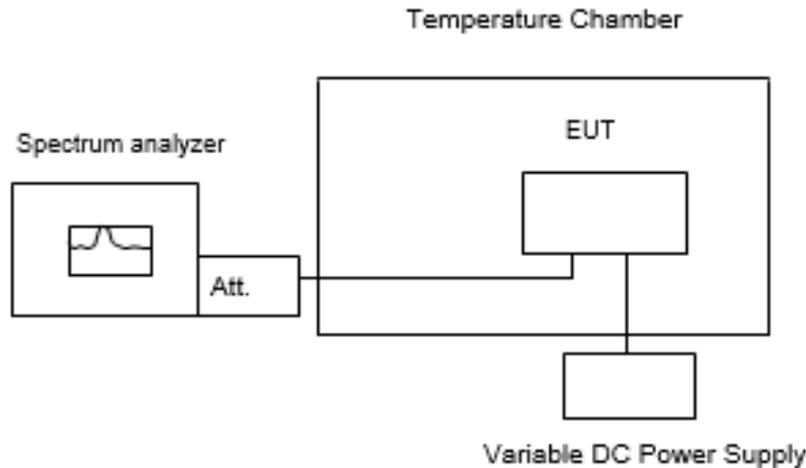
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## 10 FREQUENCY STABILITY MEASUREMENT

### 10.1 Standard Applicabl

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

### 10.2 Test Set-up



**Note:** Measurement setup for testing on Antenna connector

### 10.3 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.

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#### 10.4 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	12/22/2020
Temperature Chamber	TERCHY	MHG-120LF	911009	05/20/2020	05/19/2021
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/20/2020	02/19/2021
UXM 5G	KEYSIGHT	E7515B	MY59321561	12/16/2019	12/15/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	01/01/2021
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	01/01/2021
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-018	01/02/2020	01/01/2021

#### 10.5 Measurement Result

5G NR 41A_n41				
Reference Freq.:	CP-OFDM_SCS 30 kHz		2593	MHz 20M+100M QPSK
Power Supply Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit = +/- 2.5 ppm (Hz)
Freq. ERROR vs. VOLTAGE				
4.35	25	2593.000010	10	6482.5
3.85	25	2592.999985	-15	6482.5
3.65	25	2593.000027	27	6482.5
3.35	25	2592.999989	-11	6482.5
(End Point)				
Freq. ERROR vs. Temp.				
3.85	-30	2593.000009	9	6482.5
3.85	-20	2593.000013	13	6482.5
3.85	-10	2592.999976	-24	6482.5
3.85	0	2592.999992	-8	6482.5
3.85	10	2593.000017	17	6482.5
3.85	20	2593.000031	31	6482.5
3.85	30	2593.000029	29	6482.5
3.85	40	2592.999998	-2	6482.5
3.85	50	2593.000018	18	6482.5

**Note:** The battery is rated 3.85V dc.

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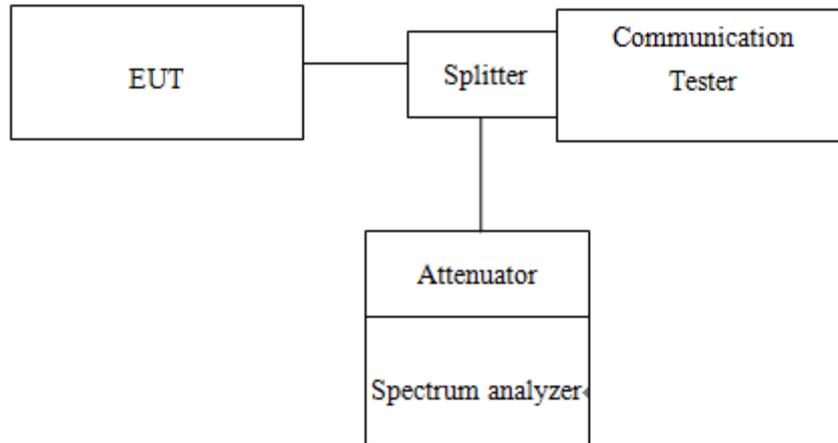
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## 11 PEAK TO AVERAGE RATIO

### 11.1 Standard Applicable

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

### 11.2 Test SET-UP



### 11.3 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.

### 11.4 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	12/22/2020
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/20/2020	02/19/2021
UXM 5G	KEYSIGHT	E7515B	MY59321561	12/16/2019	12/15/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	01/01/2021
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	01/01/2021
Splitter	RF-LAMBDA	RFLT2W1G18G	11-JSPF412-018	01/02/2020	01/01/2021

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### 11.5 Measurement Result

5G NR 41A_n41									
CP-OFDM_SCS 30 kHz									
Modulation	LTE			NR			Frequency (MHz)	PAPR(dBm)	Limit
	Bandwidth (MHz)	RB Size	RB Office	Bandwidth (MHz)	RB Size	RB Office			
256QAM	20MHz	100	0	100MHz	273	0	2556.2	10.63	13
	20MHz	100	0	100MHz	273	0	2593.0	10.69	13
	20MHz	100	0	100MHz	273	0	2629.9	10.64	13

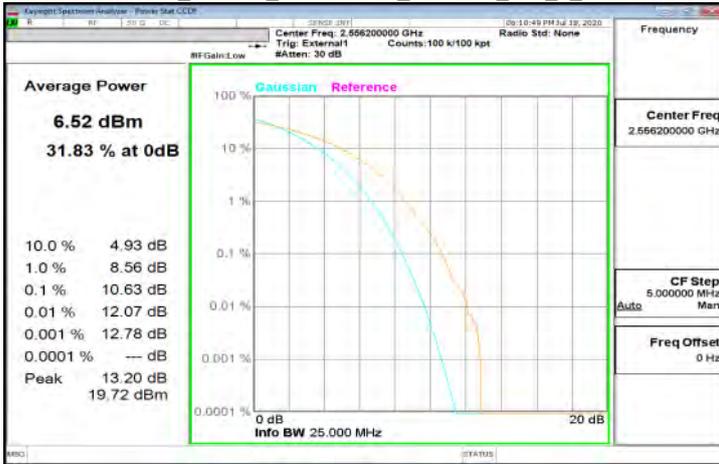
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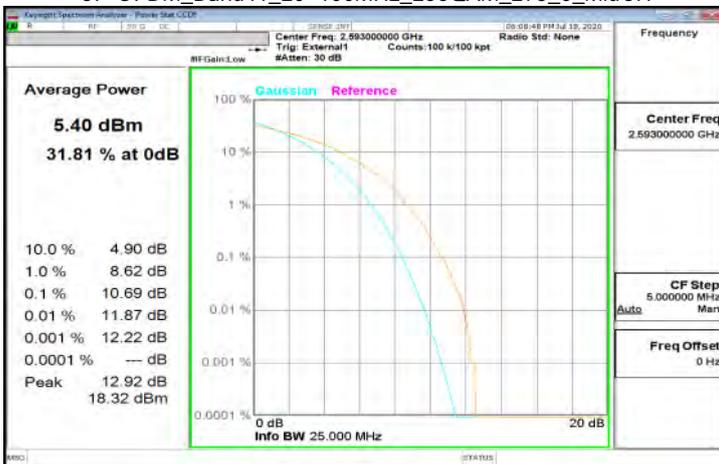
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CP-OFDM\_Band41\_20+100MHz\_256QAM\_273\_0\_LowCH

~ End of Report ~



CP-OFDM\_Band41\_20+100MHz\_256QAM\_273\_0\_MidCH



CP-OFDM\_Band41\_20+100MHz\_256QAM\_273\_0\_HighCH



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