

SUPPLEMENTAL “UP LINK CARRIER AGGREGATION” TEST REPORT

OF

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/2020/30084

FCC ID MSQI003D

IC: 3568A-I003D

FCC Rule Part: 2, 22H & 24E & 27C

ISED Rule: RSS-130, 132, 133, 139, 199

Issue Date: Sep. 04, 2020

Date of Test: Jun. 01, 2020 ~ Jul. 21, 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

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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2020/30084	Rev.00	Original.	Sep. 04, 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.

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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: AOHA1
IMEI:	355306110093970 / 355306110093988 (Conducted) 355306110094390 (Radiated)	

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1.2 Operation Frequency Range

LTE Band	BW (MHz)	Operation Frequency (MHz)	LTE Band	BW (MHz)	Operation Frequency (MHz)
2	1.4	1850.7 - 1909.3	38	5	2572.5 - 2617.5
	3	1851.5 - 1908.5		10	2575.0 - 2615.0
	5	1852.5 - 1907.5		15	2577.5 - 2612.5
	10	1855.0 - 1905.0		20	2580.0 - 2610.0
	15	1857.5 - 1902.5	41	5	2498.5 - 2687.5
	20	1860.0 - 1900.0		10	2501.0 - 2685.0
4	1.4	1710.7 - 1754.3		15	2503.5 - 2682.5
	3	1711.5 - 1753.5	66	20	2506.0 - 2680.0
	5	1712.5 - 1752.5		1.4	1710.7 - 1779.3
	10	1715.0 - 1750.0		3	1711.5 - 1778.5
	15	1717.5 - 1747.5		5	1712.5 - 1777.5
	20	1720.0 - 1745.0		10	1715.0 - 1775.0
5	1.4	824.7 - 848.3		15	1717.5 - 1772.5
	3	825.5 - 847.5		20	1720.0 - 1770.0
	5	826.5 - 846.5			
	10	829.0 - 844.0			
7	5	2502.5 - 2567.5			
	10	2505.0 - 2565.0			
	15	2507.5 - 2562.5			
	20	2510.0 - 2560.0			
12	1.4	699.7 - 715.3			
	3	700.5 - 714.5			
	5	701.5 - 713.5			
	10	704.0 - 711.0			

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1.3 Antenna Designation

Antenna Type	Antenna Model No.
PIFA	Ant0
	Ant1
	Ant2
Note: The EUT equipped with 7 WWAN antennas, however, transmission of 4G LTE bands are available by Ant0, Ant1, Ant2 and Ant3.	

Operating Frequency (MHz)		Ant 0 Peak Gain (dBi)	Ant 1 Peak Gain (dBi)	Ant 2 Peak Gain (dBi)
LTE-Band 2	1850.7 ~ 1909.3	N/A	-1.0	N/A
LTE-Band 4	1710.7 ~ 1754.3	N/A	0.7	N/A
LTE-Band 5	824.7 ~ 848.3	-1.8	N/A	-2.2
LTE-Band 7	2502.5 ~ 2567.5	N/A	-0.5	N/A
LTE-Band 12	699.7 ~ 715.3	-3.8	N/A	-5.3
LTE-Band 38	2572.5 ~ 2617.5	N/A	-2.3	N/A
LTE-Band 41	2498.5 ~ 2687.5	N/A	-3.0	N/A
LTE-Band 66	1710.7 ~ 1779.3	N/A	-1.1	N/A

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

1.4.1 Intra-Band

LTE Band	BW	Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
5B	15	QPSK	19.54	ERP	0.090	13.895	13M9G7D
		16QAM	18.52	ERP	0.071	13.841	13M8D7W
		64QAM	17.54	ERP	0.057	13.836	13M8D7W
		256QAM	14.53	ERP	0.028	13.835	13M8D7W
5B	20	QPSK	19.54	ERP	0.090	18.929	18M9G7D
		16QAM	18.50	ERP	0.071	18.936	18M9D7W
		64QAM	17.21	ERP	0.053	18.813	18M8D7W
		256QAM	14.35	ERP	0.027	18.804	18M8D7W

LTE Band	BW	Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
7C	30	QPSK	22.99	EIRP	0.199	27.802	27M8G7D
		16QAM	21.92	EIRP	0.156	27.802	27M8D7W
		64QAM	20.99	EIRP	0.126	27.771	27M8D7W
		256QAM	19.76	EIRP	0.095	27.812	27M8D7W
7C	40	QPSK	22.95	EIRP	0.197	37.549	37M5G7D
		16QAM	21.99	EIRP	0.158	37.606	37M6D7W
		64QAM	20.56	EIRP	0.114	37.512	37M5D7W
		256QAM	17.97	EIRP	0.063	37.541	37M5D7W

LTE Band	BW	Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
38C	30	QPSK	22.11	EIRP	0.163	28.295	28M3G7D
		16QAM	21.03	EIRP	0.127	28.331	28M3D7W
		64QAM	20.04	EIRP	0.101	28.266	28M3D7W
		256QAM	17.18	EIRP	0.052	28.301	28M3D7W
38C	40	QPSK	22.15	EIRP	0.164	37.574	37M6G7D
		16QAM	21.18	EIRP	0.131	37.475	37M5D7W
		64QAM	20.12	EIRP	0.103	37.498	37M5D7W
		256QAM	17.07	EIRP	0.051	37.474	37M5D7W

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LTE Band	BW	Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
41C	25	QPSK	21.47	EIRP	0.140	22.887	22M9G7D
		16QAM	20.39	EIRP	0.109	22.907	22M9D7W
		64QAM	19.43	EIRP	0.088	22.883	22M9D7W
		256QAM	16.46	EIRP	0.044	22.900	22M9D7W
41C	40	QPSK	21.47	EIRP	0.140	37.487	37M5G7D
		16QAM	20.44	EIRP	0.111	37.616	37M6D7W
		64QAM	19.31	EIRP	0.085	37.517	37M5D7W
		256QAM	16.36	EIRP	0.043	37.529	37M5D7W

1.4.2

Inter-Band

Please refer to section 6.6.2 of this report.

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1.5 Test Methodology of Applied Standards

FCC 47 CFR Part 2, 22H, 24E, 27C.

ISED RSS-130 Issue 2 Feb. 2019,

ISED RSS-132 Issue 3 Jan. 2013

ISED RSS-133 Issue 6, Amendment 1 Jan. 18, 2018

ISED RSS-139 Issue 3 July 16, 2015

ISED RSS-199 Issue 3 Dec. 2016

ANSI C63.26-2015

KDB971168 D01 Power Meas license Digital System v03r01

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)
Low Band (Below 1GHz)	3.8	10	13.8
High Band (Above 1 GHz)	4.4	10	14.4

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2.5 Final Amplifier Voltage and Current Information:

Test Mode	DC voltage (V)	DC current (mA)
LTE Band 5B	3.85	571
LTE Band 7C		592
LTE Band 38C		588
LTE Band 41C		596

2.6 Configuration of Tested System

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

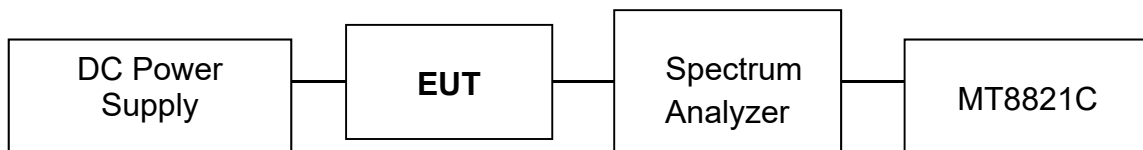


Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)

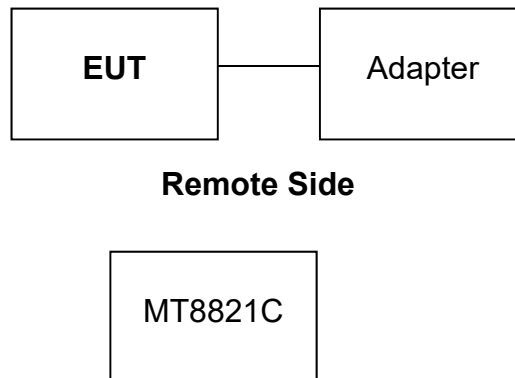


Table 2-1 Equipment Used in

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Radio Communication Analyzer	Anritsu	MT8821C	6261786084	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
§22.913(a)(5) §24.232(c) §27.50(c)(10) §27.50(h)(2) §27.50(d)(4)	RSS-130 §4.6 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §6.5 RSS-199 §4.4	ERP/ EIRP measurement	Compliant
§2.1049(h)	RSS-GEN §6.7	99% & 26dB Occupied Bandwidth	Compliant
§2.1051 §22.917(a) §24.238(a) §27.53(g) §27.53(h) §27.53(m)(4)(6)	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §6.5 RSS-139 §6.6 RSS-199 §4.5	Out of Band Emissions at Antenna Terminals and Band Edge / Emission mask requirements	Compliant
§2.1053 §22.917(a) §24.238(a) §27.53(g) §27.53(h) §27.53(m)(4)	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §6.5 RSS-139 §6.6 RSS-199 §4.5	Field Strength of Spurious Radiation	Compliant
§24.232(d) §27.50((B)	RSS-130 §4.6.1 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §6.4 RSS-199 §4.4	Peak to Average Ratio	Compliant
§2.1055(a)(1) §22.355 §24.235 §27.54	RSS-130 §4.5 RSS-132 §5.3 RSS-133 §6.3 RSS-139 §6.5 RSS-199 §4.3	Frequency Stability	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 The Test Channel Details

This device is ASUS Phone (Mobile Phone) that supports with carrier aggregation (two carrier) uplink, Intra-Band contiguous and Inter-Band non-contiguous specification as below:

E-UTRA Intra-Band CA configuration / Bandwidth combination set				
E-UTRA CA configuration	Component carriers in order of increasing carrier frequency		Maximum aggregated bandwidth [MHz]	Bandwidth combination set
	Channel bandwidth for carrier [MHz]	Channel bandwidth for carrier [MHz]		
CA_5B	5,10	10	20	0
	10	5		
CA_7C	15	15	40	0
	20	20		
	10	20		
	15	15,20	40	1
	20	10,15,20		
	15	10,15		
	20	15,20	40	2
CA_38C	5,10,15,20	20		
	20	5,10,15		
CA_41C	10	20	40	0
	15	15,20		
	20	10,15,20		
	5,10	20		
	15	15,20	40	1
	20	5,10,15,20		
	10	15,20		
	15	10,15,20		
	20	10,15,20	40	2
	10	20		
	20	20		
	20	20		

Intra-Band Test Mode	Band	Description
1	5B	CA_PCC Ant0 Band 5_ SCC Ant 0 Band 5
2	7C	CA_PCC Ant0 Band 7_ SCC Ant 0 Band 7
3	38C	CA_PCC Ant0 Band 38_ SCC Ant 0 Band 38
4	41C	CA_PCC Ant0 Band 41_ SCC Ant 0 Band 41

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E-UTRA Inter-Band CA configuration / Bandwidth combination set									
Uplink CA configurations (NOTE 4)	E-UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combination set
CA_2A-5A	2			Yes	Yes	Yes	Yes	30	0
	5			Yes	Yes				
	2			Yes	Yes			20	1
	5			Yes	Yes				
CA_2A_12A	2			Yes	Yes	Yes	Yes	30	0
	12			Yes	Yes				
	2			Yes	Yes	Yes	Yes	30	1
	12		Yes	Yes	Yes				
	2			Yes	Yes			20	2
	12			Yes	Yes				
CA_4A-5A	4			Yes	Yes			20	0
	5			Yes	Yes				
	4			Yes	Yes	Yes	Yes	30	1
	5			Yes	Yes				
CA_4A-12A	4	Yes	Yes	Yes	Yes			20	0
	12			Yes	Yes				
	4	Yes	Yes	Yes	Yes	Yes	Yes	30	1
	12			Yes	Yes				
	4			Yes	Yes	Yes	Yes	30	2
	12		Yes	Yes	Yes				
	4			Yes	Yes			20	3
	12			Yes	Yes				
	4			Yes	Yes	Yes	Yes	30	4
	12			Yes	Yes				
	4			Yes	Yes	Yes		20	5
	12			Yes					
CA_12A-66A	12			Yes	Yes			20	0
	66	Yes	Yes	Yes	Yes				
	12			Yes	Yes			30	1
	66	Yes	Yes	Yes	Yes	Yes	Yes		
	12		Yes	Yes	Yes			30	2
	66			Yes	Yes	Yes	Yes		
	12			Yes	Yes			20	3
	66			Yes	Yes				
	12			Yes	Yes			30	4
	66			Yes	Yes	Yes	Yes		
	12			Yes				20	5
	66			Yes	Yes	Yes			

Inter-Band Test Mode	PCC & SCC Bands
1	CA_PCC Ant1 Band 2_ SCC Ant 0 Band 5
2	CA_PCC Ant1 Band 2_ SCC Ant 0 Band 12
3	CA_PCC Ant1 Band 4_ SCC Ant 0 Band 5
4	CA_PCC Ant1 Band 4_ SCC Ant 0 Band 12
5	CA_PCC Ant0 Band 12_ SCC Ant 1 Band 66

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4.2 The Worst-Case Test Modes and Details

1. Transmissions of each frequency bands are available by 4 antennas below, only one antenna can be enabled at any given time by each band, the EUT does not support MIMO mode.
2. Evaluation has been done on Upper and Lower antennas and the Lower antenna results higher EIRP and Emissions, therefore, only measurement results of the Lower antenna are demonstrated in this test report.

Mode	Bands	Upper Antenna	Lower Antenna
LTE	Band 2	3	1
	Band 4	3	1
	Band 5	2	0
	Band 7	3	1
	Band 12	2	0
	Band 38	3	1
	Band 41	3	1
	Band 66	3	1

3. This EUT is UE LTE 4G 1Tx/2Rx device for single carrier that can support uplink Band 2/4/5/7/12/38/41/66. For operation of uplink carrier aggregation (CA) mode, the transmitter enabled by 2Tx/2Rx mode.
4. The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on QPSK, 16QAM, 64QAM and 256QAM modulations. It was found that QPSK results the highest, hence all testing was performed using QPSK modulations to represent the worst case.
5. For occupied bandwidth, frequency stability and conducted unwanted emission measurements, due to each single LTE Band standalone transmission generates higher power than the **Inter-band** transmissions, the test results are only demonstrated for each single LTE band standalone transmission in test report ER/2020/30083 as the worst case scenarios.
In addition, the radiated unwanted emissions of **inter-band** has been evaluated as no noticeable emissions, therefore, the conducted unwanted emissions was not tested.
6. For Band Edge and Emission Mask: The widest and narrowest BW combinations were tested. Combinations of same BW is considered equivalent. The RB combinations were selected as the signal activated closest to the band limit for determining the worst case scenario.
7. For Out of Band Emissions: The widest and narrowest combinations was tested. The RB combination generates the highest power was determined as the worst case scenario.
8. For peak to average ratio measurements, due to each single LTE Band standalone transmission generates higher power than the **Inter-band** transmissions, the test results are only demonstrated for each single LTE band standalone transmission in test report ER/2020/30083 as the worst case scenarios.

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9. Pre-Scan has been conducted to determine the worst-case mode from all possible positions of X(E1)Y(E2)Z(H) axis for radiated emission. The worst case was found as E1 plan.

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4.2.1 Intra-Band

For uplink Intra-Band CA, evaluation has been done for contiguous and non-contiguous channel and bandwidth, configurations that generates highest output power in standalone transmission have been selected for the final test.

Test Items	Band	Test Channel			Bandwidth (MHz)						Modulation				RB #						
		L	M	H	15	20	25	30	35	40	QPSK	16QAM	64QAM	256QAM	Edge left	+	Edge right	Edge right	+	Edge left	Full
Max. Output Power	5B	V	V	V	V							V	V	V	V				V		V
		V	V	V	V							V	V	V	V				V		V
		V	V	V		V						V	V	V	V				V		V
	7C	V	V	V				V				V	V	V	V				V		V
		V	V	V				V				V	V	V	V	V			V		V
		V	V	V						V		V	V	V	V	V			V		V
	41C	V	V	V				V				V	V	V	V				V		V
		V	V	V				V				V	V	V	V	V			V		V
		V	V	V						V		V	V	V	V	V			V		V
	38C	V	V	V				V				V	V	V	V				V		V
V		V	V						V		V	V	V	V	V			V		V	
Frequency Stability	5B		V		V						V										V
			V			V						V									V
	7C		V					V				V									V
			V							V		V									V
	41C		V				V					V									V
			V							V		V									V
	38C		V					V				V									V
		V							V		V									V	
Test Items	Band	Test Channel			Bandwidth (MHz)						Modulation				RB #						
		L	M	H	15	20	25	30	35	40	QPSK	16QAM	64QAM	256QAM	Edge left	+	Edge right	Edge right	+	Edge left	Full
26dB and 99% Bandwidth	5B		V		V							V	V	V	V						V
			V		V							V	V	V	V						V
			V			V						V	V	V	V						V
	7C		V					V				V	V	V	V						V
			V					V				V	V	V	V						V
			V							V		V	V	V	V						V
	41C		V				V					V	V	V	V						V
			V				V					V	V	V	V						V
			V							V		V	V	V	V						V
	38C		V					V				V	V	V	V						V
		V							V		V	V	V	V						V	
Peak-to-Average Ratio	5B		V		V									V							V
			V		V									V							V
			V			V								V							V
	7C		V					V						V							V
			V					V						V							V
			V							V				V							V
	41C		V				V							V							V
			V				V							V							V
			V							V				V							V
	38C		V					V						V							V
			V							V				V							V
			V							V				V							V

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Test Items	Band	Test Channel			Bandwidth (MHz)						Modulation				RB #							
		L	M	H	15	20	25	30	35	40	QPSK	16QAM	64QAM	256QAM	Edge left	+	Edge left	Edge right	+	Edge right	Full	
Band Edge	5B	v		v	v						v					v			v		v	
		v		v		v					v					v			v		v	
Test Items	Band	Test Channel			Bandwidth (MHz)						Modulation				RB #							
		L	M	H	15	20	25	30	35	40	QPSK	16QAM	64QAM	256QAM	Edge left	+	Edge right	Edge right	+	Edge left	Full	
Mask	7C	v		v				v			v					v					v	
		v		v						v	v					v					v	
	41C	v		v			v				v					v					v	
		v		v						v	v					v					v	
	38C	v		v				v			v					v					v	
		v		v						v	v					v						v
Test Items	Band	Test Channel			Bandwidth (MHz)						Modulation				RB #							
		L	M	H	15	20	25	30	35	40	QPSK	16QAM	64QAM	256QAM	Edge left	+	Edge right	Edge right	+	Edge left	Full	
Conducted Emission	5B	v	v	v	v						v								v			
		v	v	v		v					v								v			
	7C	v	v	v				v			v								v			
		v	v	v						v	v								v			
	41C	v	v	v			v				v								v			
		v	v	v						v	v								v			
	38C	v	v	v				v			v								v			
		v	v	v						v	v								v			

Radiated Emission

E-UTRA Band	Test Channel	Channel Band-width (MHz)	Modulation	Resource Block Allocation	
				RBs allocated	RB Start
5B	Low	10+5	QPSK	1/49+1/0	
7C	Low	20+20	QPSK	1/99+1/0	
41C	High	20+5	QPSK	1/99+1/0	
38C	Mid	20+20	QPSK	1/99+1/0	

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4.2.2 Inter-Band

For uplink Inter-Band CA configurations, following configurations have been selected for the final test.

E-UTRA Band	Test Channel	Channel Band-width (MHz)	Modulation	Resource Block Allocation	
				RBs allocated	RB Start
2A_5A	Low	5+5	QPSK	FULL	
2A_12A	Mid	20+10	QPSK	FULL	
4A_5A	High	20+5	QPSK	FULL	
4A_12A	Mid	20+10	QPSK	FULL	
12A_66A	Mid	5+1.4	QPSK	FULL	

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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
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

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 22.913(a)

(5) mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

FCC 24.232(c)

Mobile and portable stations are limited to 2 W EIRP.

FCC 27.50(c)

(10) Portable stations (hand-held devices) are limited to 3 watts ERP.

FCC 27.50(d)

(4) Mobile, and portable (hand-held) stations operating in the 1710-1755 MHz, 1695-1710 MHz and 1755-1780 MHz bands are limited to 1W EIRP.

FCC 27, 50(h)

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

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RSS-130 §4.6

The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment operating in 698-756 and 777-787 MHz.

RSS-132 §5.4

The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment in operating in the Bands 824-849 and 869-894MHz shall not exceed 11.5 watts.

RSS-133 §6.4

The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.

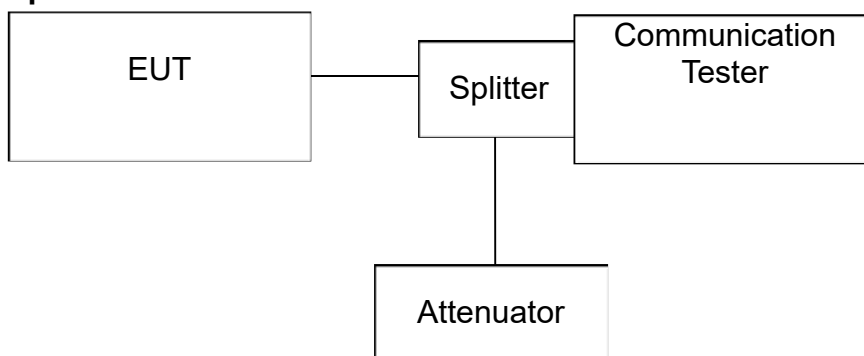
According to section 5.1.2 of SRSP-510, Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. The equipment shall employ means to limit the power to the minimum necessary for successful communication.

RSS-139 §6.5

The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters in the Bands 1710-1780MHz shall not exceed one watt.

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

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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.

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)²), 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.
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/21/2020	04/20/2021
Radio Communication Analyzer	Anritsu	MT8821C	6261786084	01/18/2020	01/17/2021
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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6.6.1 Intra-Band

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[illegible]

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Antenna gain (dBi)							-2.3																			
38C							+							Power(dBm)												
	Range	Modulation	BW (MHz)	Channel	Freq.	RB Size / RB Office		Range	Modulation	BW (MHz)	Channel	Freq.	RB Size / RB Office	PCC	SCC	Total	ERP Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dBm)						
Low		QPSK	15	37825	2577.5	1/75			QPSK	15	37975	2592.5	1/0	23.8	17	24.64	20.19	22.34	33.00	-10.66						
		QPSK				1/75			15.5				8.74	16.34	11.89	14.04	33.00	-18.96								
		QPSK				Full			QPSK				Full	21	18.1	22.81	18.36	20.51	33.00	-12.49						
		16QAM				1/75			16QAM				1/0	23.3	16	24.08	19.63	21.78	33.00	-11.22						
		16QAM				1/0			16QAM				1/75	16.2	8.8	16.92	12.47	14.62	33.00	-18.38						
		16QAM				Full			16QAM				Full	21	14.2	21.83	17.38	19.53	33.00	-13.47						
		64QAM				1/75			64QAM				1/0	22.1	14.5	22.80	18.35	20.50	33.00	-12.50						
		64QAM				1/0			64QAM				1/75	15.8	8.55	16.58	12.13	14.28	33.00	-18.72						
		64QAM				Full			64QAM				Full	20.9	14.2	21.75	17.3	19.45	33.00	-13.55						
		256QAM				1/75			256QAM				1/0	19.1	11.8	19.86	15.41	17.56	33.00	-15.44						
		256QAM				1/0			256QAM				1/75	15.8	8.62	16.55	12.1	14.25	33.00	-18.75						
		256QAM				Full			256QAM				Full	19	12.1	19.83	15.38	17.53	33.00	-15.47						
		QPSK	20	37850	2580	1/99			QPSK	20	38048	2599.8	1/0	23.8	16.8	24.61	20.16	22.31	33.00	-10.69						
		QPSK				1/0			QPSK				1/99	15.6	8.58	16.39	11.94	14.09	33.00	-18.91						
		QPSK				Full			QPSK				Full	22	15	22.77	18.32	20.47	33.00	-12.53						
		16QAM				1/99			16QAM				1/0	23.4	16	24.12	19.67	21.82	33.00	-11.18						
		16QAM				1/0			16QAM				1/99	16.2	8.56	16.90	12.45	14.60	33.00	-18.40						
		16QAM				Full			16QAM				Full	21	14.1	21.84	17.39	19.54	33.00	-13.46						
		64QAM				1/99			64QAM				1/0	22.1	14.7	22.82	18.37	20.52	33.00	-12.48						
		64QAM				1/0			64QAM				1/99	15.9	8.42	16.60	12.15	14.30	33.00	-18.70						
		64QAM				Full			64QAM				Full	21	14.1	21.79	17.34	19.49	33.00	-13.51						
		256QAM				1/99			256QAM				1/0	19.1	11.7	19.85	15.4	17.55	33.00	-15.45						
		256QAM				1/0			256QAM				1/99	15.9	8.45	16.59	12.14	14.29	33.00	-18.71						
		256QAM				Full			256QAM				Full	19	12	19.82	15.37	17.52	33.00	-15.48						
	Mid	QPSK	15	37925	2587.5	1/75			Mid	QPSK	15	38075	2602.5	1/0	23.8	17	24.60	20.15	22.30	33.00	-10.70					
		QPSK				1/0				QPSK				1/75	15.4	8.62	16.26	11.81	13.96	33.00	-19.04					
		QPSK				Full				QPSK				Full	22.1	14.9	22.83	18.38	20.53	33.00	-12.47					
		16QAM				1/75				16QAM				1/0	23.3	16.1	24.02	19.57	21.72	33.00	-11.28					
		16QAM				1/0				16QAM				1/75	16	8.7	16.76	12.31	14.46	33.00	-18.54					
		16QAM				Full				16QAM				Full	21	14.1	21.83	17.38	19.53	33.00	-13.47					
		64QAM				1/75				64QAM				1/0	22.1	14.6	22.83	18.38	20.53	33.00	-12.47					
		64QAM				1/0				64QAM				1/75	15.8	8.47	16.54	12.09	14.24	33.00	-18.76					
		64QAM				Full				64QAM				Full	21	14.1	21.79	17.34	19.49	33.00	-13.51					
		256QAM				1/75				256QAM				1/0	19.1	11.7	19.86	15.41	17.56	33.00	-15.44					
		256QAM				1/0				256QAM				1/75	15.8	8.44	16.51	12.06	14.21	33.00	-18.79					
		256QAM				Full				256QAM				Full	19	12.1	19.83	15.38	17.53	33.00	-15.47					
		QPSK	20	37901	2585.1	1/99			QPSK	20	38099	2604.9	1/0	23.9	17	24.67	20.22	22.37	33.00	-10.63						
		QPSK				1/0			QPSK				1/99	15.5	8.42	16.31	11.86	14.01	33.00	-18.99						
		QPSK				Full			QPSK				Full	22	14.9	22.75	18.30	20.45	33.00	-12.55						
		16QAM				1/99			16QAM				1/0	23.3	16.1	24.08	19.63	21.78	33.00	-11.22						
		16QAM				1/0	16QAM	1/99	16.2				8.66	16.86	12.41	14.56	33.00	-18.44								
High	16QAM	15	38025	2597.5	Full		High	16QAM	15	38175	2612.5	Full	21.1	14.1	21.85	17.40	19.55	33.00	-13.45							
	64QAM				1/99			64QAM				1/0	22.1	14.1	21.85	17.40	19.55	33.00	-13.45							
	64QAM				1/0			64QAM				1/75	15.8	8.24	16.52	12.07	14.22	33.00	-18.78							
	64QAM				Full			64QAM				Full	21	14.1	21.81	17.36	19.51	33.00	-13.49							
	256QAM				1/75			256QAM				1/0	19.1	12	19.89	15.44	17.59	33.00	-15.41							
	256QAM				1/0			256QAM				1/75	15.8	8.32	16.48	12.03	14.18	33.00	-18.82							
	256QAM				Full			256QAM				Full	19.1	11.9	19.83	15.38	17.53	33.00	-15.47							
	QPSK				20			37952				2590.2	1/99	QPSK	20	38150	2610	1/0	23.6	16.8	24.45	20.00	22.15	33.00	-10.85	
	QPSK												1/0	QPSK				1/99	15.5	8.47	16.29	11.84	13.99	33.00	-19.01	
	QPSK												Full	QPSK				Full	21	18	22.80	18.35	20.50	33.00	-12.50	
	16QAM												1/99	16QAM				1/0	23.4	16.1	24.13	19.68	21.83	33.00	-11.17	
	16QAM												1/0	16QAM				1/99	16.1	8.62	16.84	12.39	14.54	33.00	-18.46	
	16QAM	Full	16QAM	Full			21		14.1	21.78	17.33		19.48	33.00				-13.52								
	64QAM	1/99	64QAM	1/0			22		14.6	22.73	18.28		20.43	33.00				-12.57								
	64QAM	1/0	64QAM	1/99			15.8		8.28	16.52	12.07		14.22	33.00				-18.78								
	64QAM	Full	64QAM	Full			21		14.1	21.76	17.31		19.46	33.00				-13.54								
	256QAM	1/99	256QAM	1/0			19.1		12	19.88	15.43		17.58	33.00				-15.42								
	256QAM	1/0	256QAM	1/99			15.9		8.26	16.55	12.10		14.25	33.00				-18.75								
	256QAM	Full	256QAM	Full			19		11.9	19.75	15.30		17.45	33.00				-15.55								

6.6.2 Inter-Band

Antenna Gain		-1.0																				
2A-5A	First Band							+	Second Band							Power(dBm)			EIRP (dBm)	EIRP Limit (dBm)		Margin (dBm)
	Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB		Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB	PCC	SCC	Total	(dBm)	PCC	SCC	
	2	Low	QPSK	5 MHz	18625	1852.5	1		5	Mid	Low	QPSK	5 MHz	20425	826.5	1	24.25	20.63	25.82	24.82	33	
QPSK		5 MHz	18900	1880	1	QPSK	5 MHz	20525			836.5	1	24.19	19.87	25.56	24.56	8.44					
QPSK		5 MHz	18900	1880	1	QPSK	10 MHz	20525			836.5	1	23.15	19.37	24.67	23.67	9.33					
QPSK		20 MHz	18900	1880	1	QPSK	5 MHz	20525			836.5	1	24.21	18.78	25.30	24.30	8.70					
QPSK		20 MHz	18900	1880	1	QPSK	10 MHz	20525			836.5	1	24.39	20.09	25.76	24.76	8.24					
High		QPSK	5 MHz	19175	1907.5	1	High	QPSK			5 MHz	20625	846.5	1	23.74	16.54	24.50	23.50	9.50			
Antenna Gain		-1.0																				
2A-12A	First Band							+	Second Band							Power(dBm)			EIRP (dBm)	EIRP Limit (dBm)		Margin (dBm)
	Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB		Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB	PCC	SCC	Total	(dBm)	PCC	SCC	
	2	Low	QPSK	20 MHz	18700	1860	1		12	Mid	Low	QPSK	5 MHz	23035	701.5	1	24.28	20.24	25.72	24.72	33	
QPSK		5 MHz	18900	1880	1	QPSK	5 MHz	23095			707.5	1	23.85	20.56	25.52	24.52	8.48					
QPSK		5 MHz	18900	1880	1	QPSK	10 MHz	23095			707.5	1	23.89	20.92	25.66	24.66	8.34					
QPSK		20 MHz	18900	1880	1	QPSK	5 MHz	23095			707.5	1	24	20.28	25.54	24.54	8.46					
QPSK		20 MHz	18900	1880	1	QPSK	10 MHz	23095			707.5	1	24.06	21.13	25.85	24.85	8.15					
High		QPSK	20 MHz	19100	1900	1	High	QPSK			5 MHz	23155	713.5	1	23.61	20.08	25.20	24.20	8.80			
Antenna Gain		0.7																				
4A-5A	First Band							+	Second Band							Power(dBm)			EIRP (dBm)	EIRP Limit (dBm)		Margin (dBm)
	Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB		Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB	PCC	SCC	Total	(dBm)	PCC	SCC	
	4	Low	QPSK	20 MHz	20050	1720	1		5	Mid	Low	QPSK	5 MHz	20425	826.5	1	23.67	20.45	25.36	26.06	30	
QPSK		5 MHz	20175	1732.5	1	QPSK	5 MHz	20525			836.5	1	23.48	19.89	25.06	25.76	4.24					
QPSK		5 MHz	20175	1732.5	1	QPSK	10 MHz	20525			836.5	1	23.37	20.84	25.30	26.00	4.00					
QPSK		20 MHz	20175	1732.5	1	QPSK	5 MHz	20525			836.5	1	23.67	21.17	25.61	26.31	3.69					
QPSK		20 MHz	20175	1732.5	1	QPSK	10 MHz	20525			836.5	1	23.64	20.96	25.51	26.21	3.79					
High		QPSK	20 MHz	20300	1745	1	High	QPSK			5 MHz	20625	846.5	1	23.75	21.17	25.66	26.36	3.64			
Antenna Gain		0.7																				
4A-12A	First Band							+	Second Band							Power(dBm)			EIRP (dBm)	EIRP Limit (dBm)		Margin (dBm)
	Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB		Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB	PCC	SCC	Total	(dBm)	PCC	SCC	
	4	Low	QPSK	20 MHz	20050	1720	1		12	Mid	Low	QPSK	10 MHz	23060	704	1	22.78	21.57	25.23	25.93	30	
QPSK		1.4 MHz	20175	1732.5	1	QPSK	5 MHz	23095			707.5	1	22.47	21.47	25.01	25.71	4.29					
QPSK		1.4 MHz	20175	1732.5	1	QPSK	10 MHz	23095			707.5	1	22.51	21.35	24.98	25.68	4.32					
QPSK		20 MHz	20175	1732.5	1	QPSK	5 MHz	23095			707.5	1	22.67	21.32	25.06	25.76	4.24					
QPSK		20 MHz	20175	1732.5	1	QPSK	10 MHz	23095			707.5	1	22.87	21.48	25.24	25.94	4.06					
High		QPSK	20 MHz	20300	1745	1	High	QPSK			10 MHz	23130	711	1	22.61	21.46	25.08	25.78	4.22			
Antenna Gain		-1.1																				
12A-66A	First Band							+	Second Band							Power(dBm)			EIRP (dBm)	EIRP Limit (dBm)		Margin (dBm)
	Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB		Band	Range	Modulation	Band width	Channel	Freq. (MHz)	RB	PCC	SCC	Total	(dBm)	PCC	SCC	
	12	Low	QPSK	5 MHz	23035	701.5	1		66	Mid	Low	QPSK	20 MHz	132072	1720	1	23.51	19.61	24.99	23.89	34.77	
QPSK		5 MHz	23095	707.5	1	QPSK	1.4 MHz	132322			1745	1	23.78	21.14	25.67	24.57	5.43					
QPSK		5 MHz	23095	707.5	1	QPSK	20 MHz	132322			1745	1	23.51	21.43	25.60	24.50	5.50					
QPSK		10 MHz	23095	707.5	1	QPSK	1.4 MHz	132322			1745	1	23.45	20.37	25.19	24.09	5.91					
QPSK		10 MHz	23095	707.5	1	QPSK	20 MHz	132322			1745	1	23.74	21.03	25.60	24.50	5.50					
High		QPSK	5 MHz	23155	713.5	1	High	QPSK			20 MHz	132572	1770	1	23.48	21.34	25.55	24.45	5.55			

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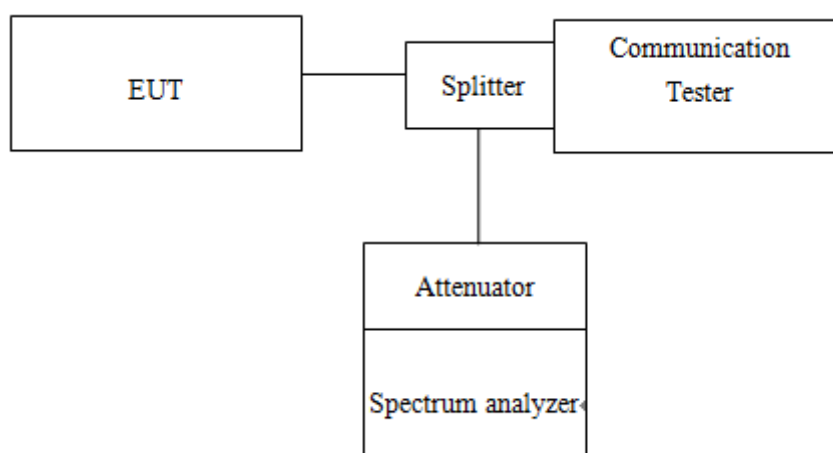
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7 OCCUPIED BANDWIDTH MEASUREMENT

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.
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/21/2020	04/20/2021
Radio Communication Analyzer	Anritsu	MT8821C	6261786084	01/18/2020	01/17/2021
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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7.5 Measurement Result

LTE CA BAND 5						
Bandwidth (MHz)	Modulation	RB Size / RB Offset	Channel	Frequency (MHz)	99% BW (MHz)	26 dB BW (MHz)
5MHz + 10MHz	QPSK	25/0 + 50/0	20525	836.5	13.753	14.570
	16QAM				13.801	14.520
	64QAM				13.801	14.490
	256QAM				13.789	14.510
10Mz + 5MHz	QPSK	50/0 + 25/0			13.895	14.700
	16QAM				13.841	14.590
	64QAM				13.836	14.670
	256QAM				13.835	14.680
10MHz + 10MHz	QPSK	50/0 + 50/0			18.929	28.000
	16QAM				18.936	29.290
	64QAM				18.813	22.070
	256QAM				18.804	19.950
LTE CA BAND 7						
Bandwidth (MHz)	Modulation	RB Size / RB Offset	Channel	Frequency (MHz)	99% BW (MHz)	26 dB BW (MHz)
10MHz + 20MHz	QPSK	50/0 + 100/0	21100	2535.0	27.741	29.400
	16QAM				27.744	29.200
	64QAM				27.653	29.230
	256QAM				27.694	29.270
20Mz + 10MHz	QPSK	100/0 + 50/0			27.802	29.500
	16QAM				27.802	29.460
	64QAM				27.771	29.480
	256QAM				27.812	29.440
20MHz + 20MHz	QPSK	100/0 + 100/0			37.549	39.930
	16QAM				37.606	39.710
	64QAM				37.512	39.680
	256QAM				37.541	39.660

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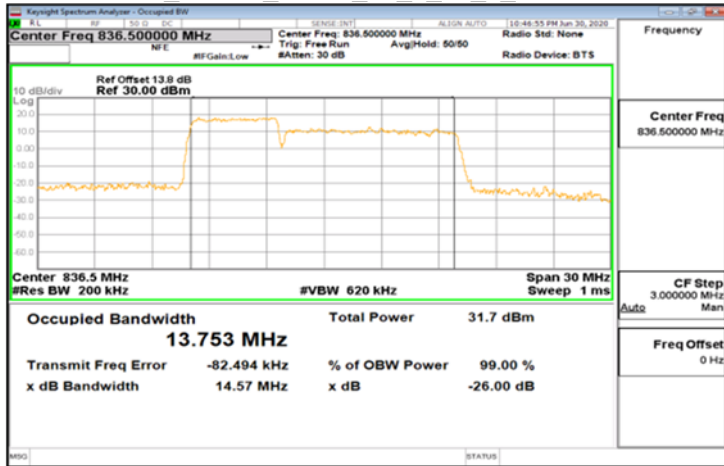
LTE CA BAND 38						
Bandwidth (MHz)	Modulation	RB Size / RB Offset	Channel	Frequency (MHz)	99% BW (MHz)	26 dB BW (MHz)
15MHz + 15MHz	QPSK	75/0 + 75/0	38000	2595.0	28.295	30.070
	16QAM				28.331	30.000
	64QAM				28.266	29.970
	256QAM				28.301	29.960
20Mz + 20MHz	QPSK	100/0 + 100/0			37.574	39.860
	16QAM				37.475	39.550
	64QAM				37.498	39.670
	256QAM				37.474	39.650
LTE CA BAND 41						
Bandwidth (MHz)	Modulation	RB Size / RB Offset	Channel	Frequency (MHz)	99% BW (MHz)	26 dB BW (MHz)
5MHz + 20MHz	QPSK	25/0 + 100/0	40620	2593.0	22.780	23.990
	16QAM				22.829	24.050
	64QAM				22.883	24.100
	256QAM				22.792	24.120
20Mz + 5MHz	QPSK	100/0 + 25/0			22.887	24.350
	16QAM				22.907	24.140
	64QAM				22.873	24.190
	256QAM				22.900	24.210
20MHz + 20MHz	QPSK	100/0 + 100/0			37.487	39.680
	16QAM				37.616	39.600
	64QAM				37.517	39.760
	256QAM				37.529	39.500

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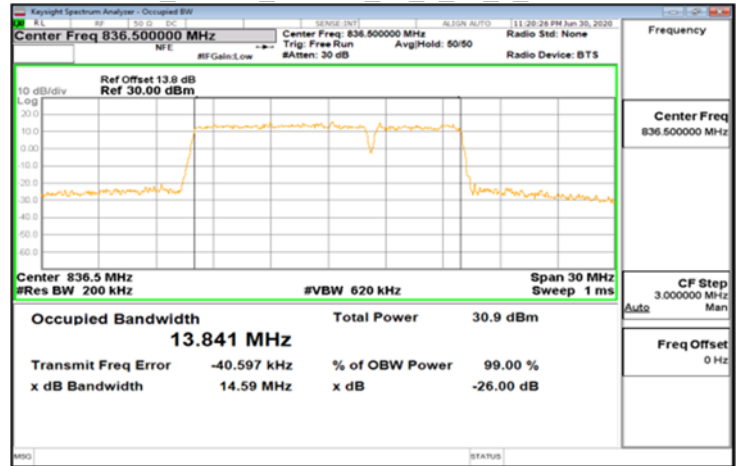
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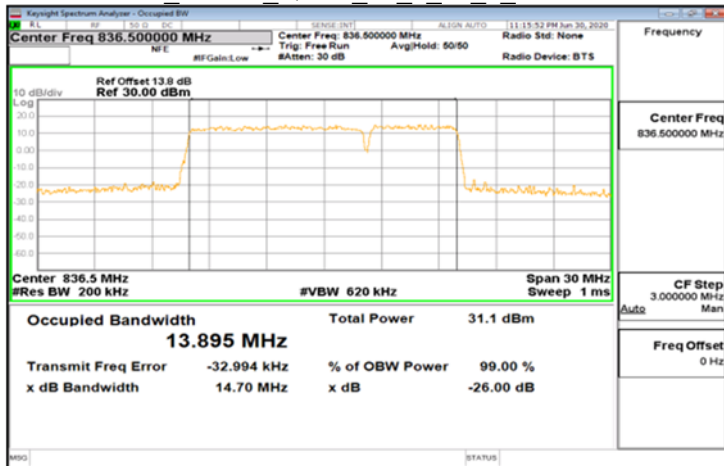
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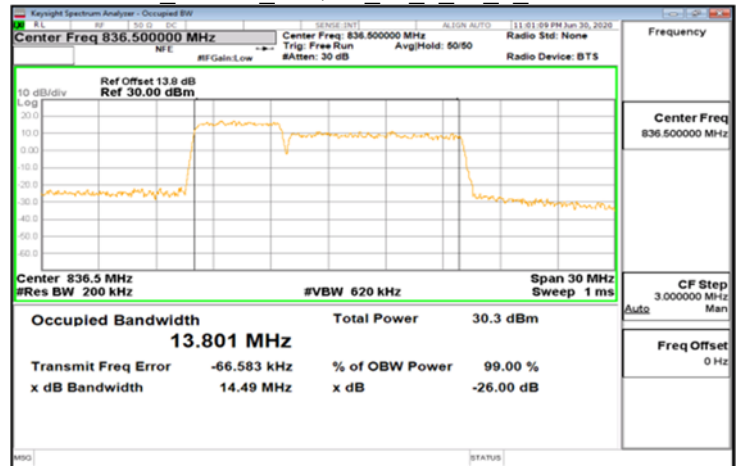
Band5 15MHz 16QAM 50 0 25 0 Mid836.5



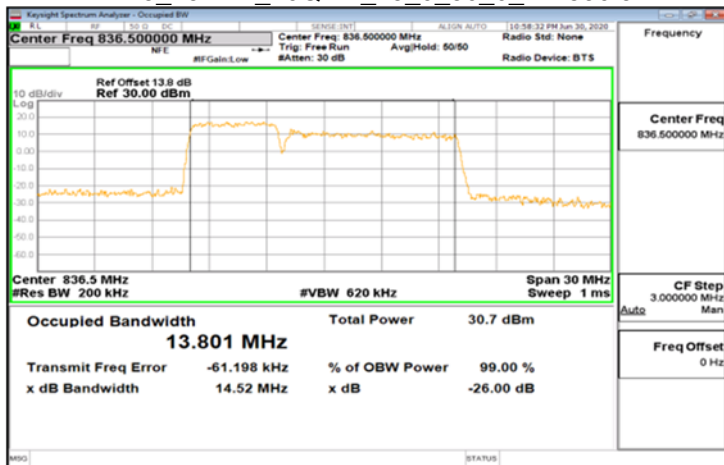
Band5 15MHz QPSK 50 0 25 0 Mid836.5



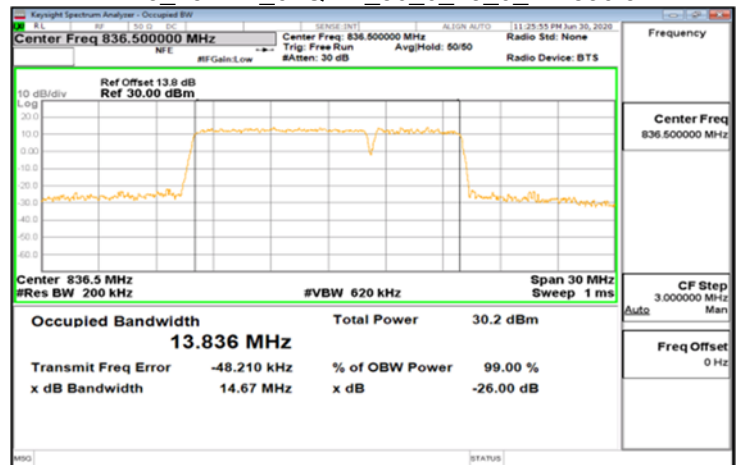
Band5 15MHz 64QAM 25 0 50 0 Mid836.5



Band5 15MHz 16QAM 25 0 50 0 Mid836.5



Band5 15MHz 64QAM 50 0 25 0 Mid836.5

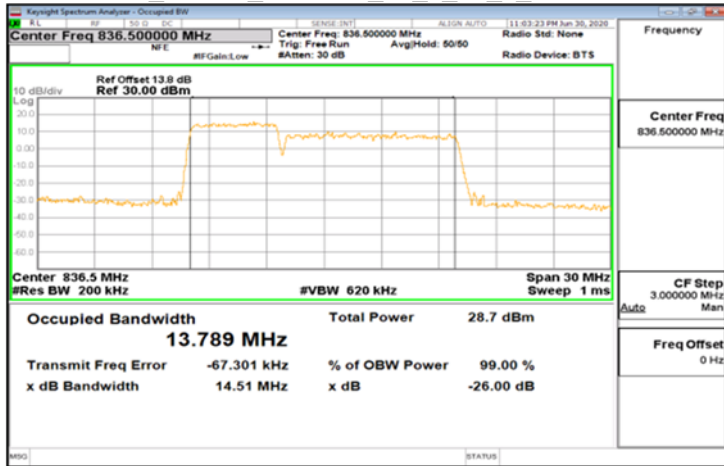


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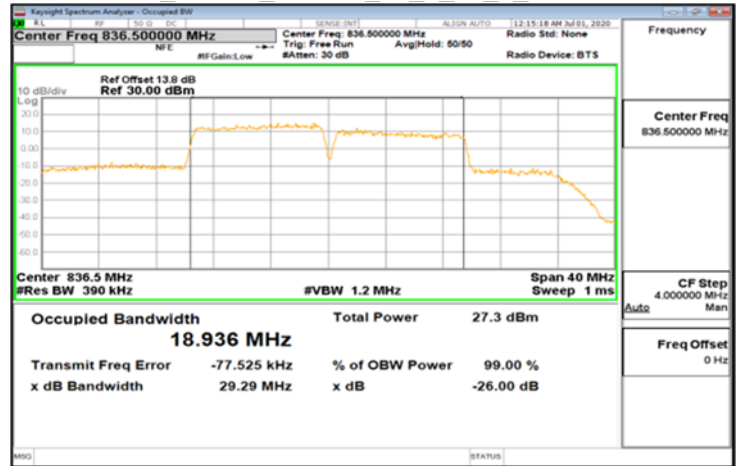
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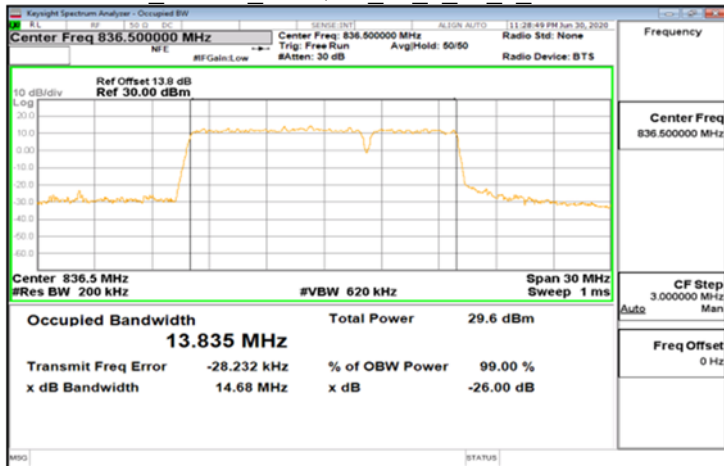
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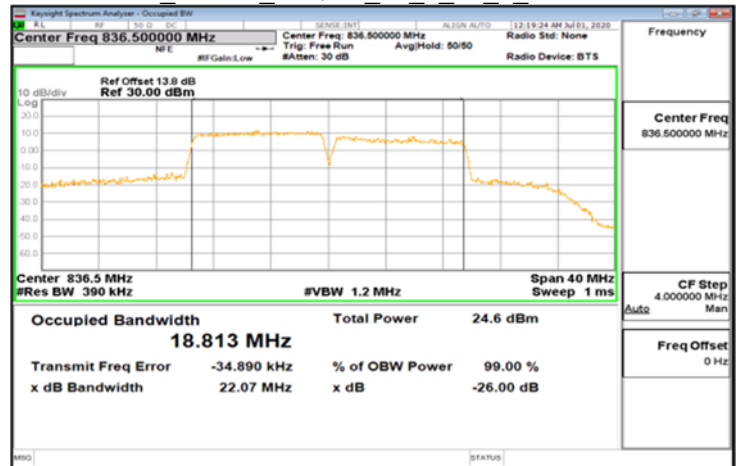
Band5 20MHz 16QAM 50 0 50 0 Mid836.5



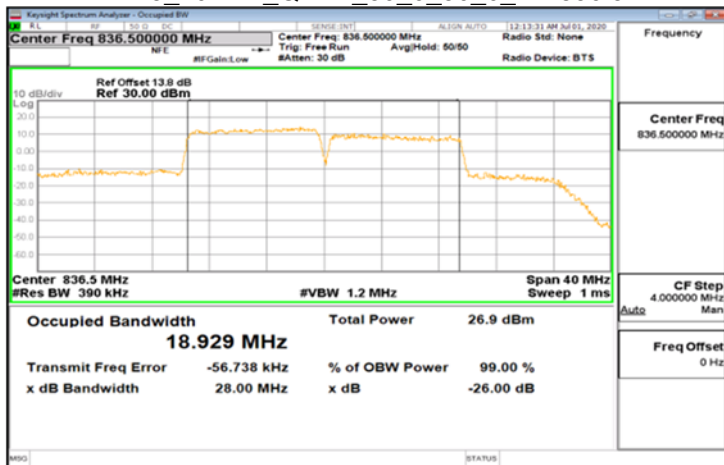
Band5 15MHz 256QAM 50 0 25 0 Mid836.5



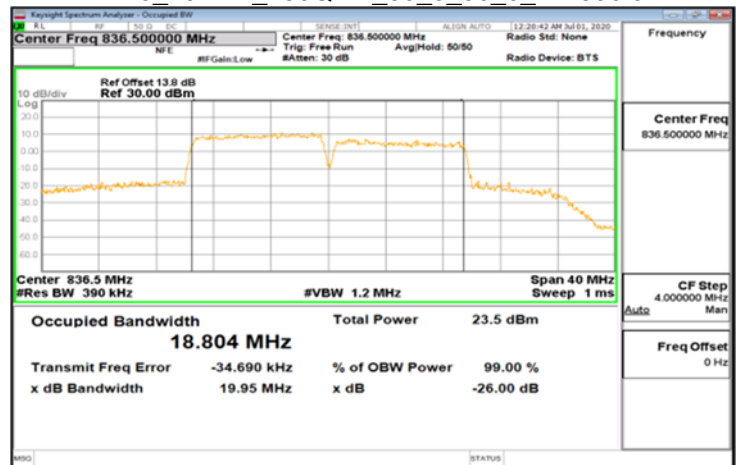
Band5 20MHz 64QAM 50 0 50 0 Mid836.5



Band5 20MHz QPSK 50 0 50 0 Mid836.5



Band5 20MHz 256QAM 50 0 50 0 Mid836.5

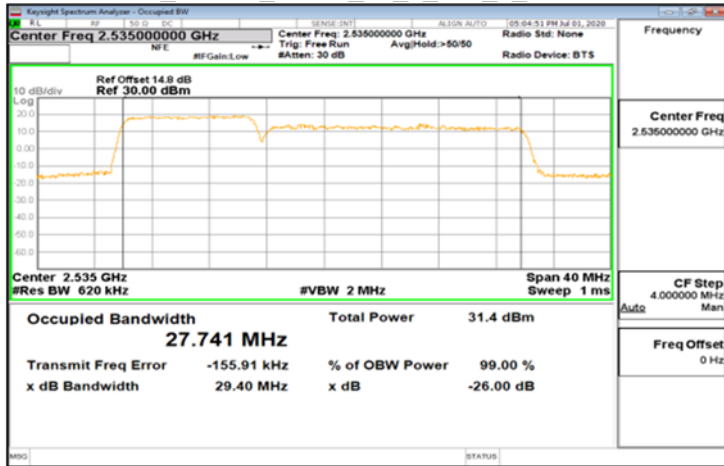


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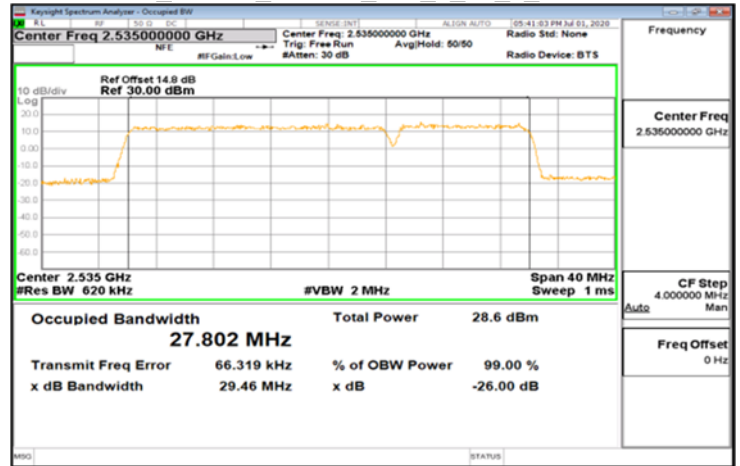
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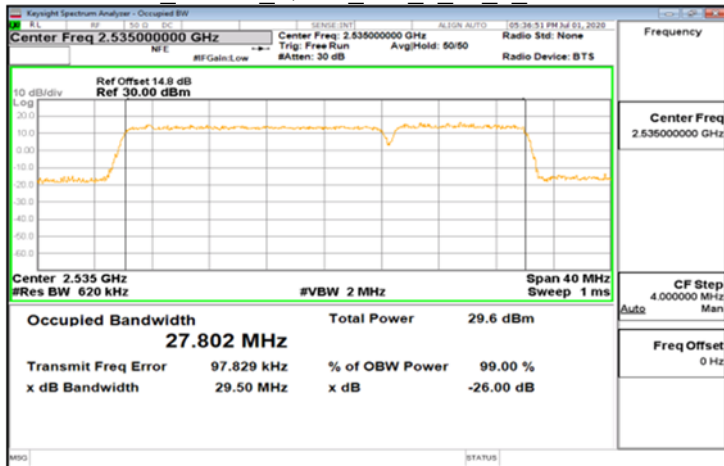
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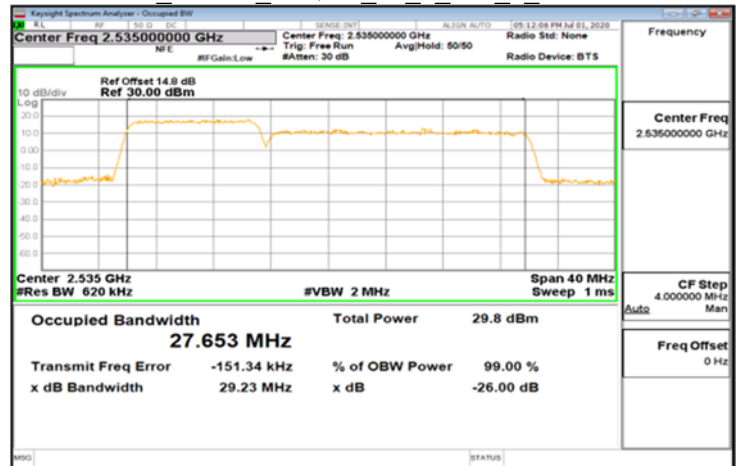
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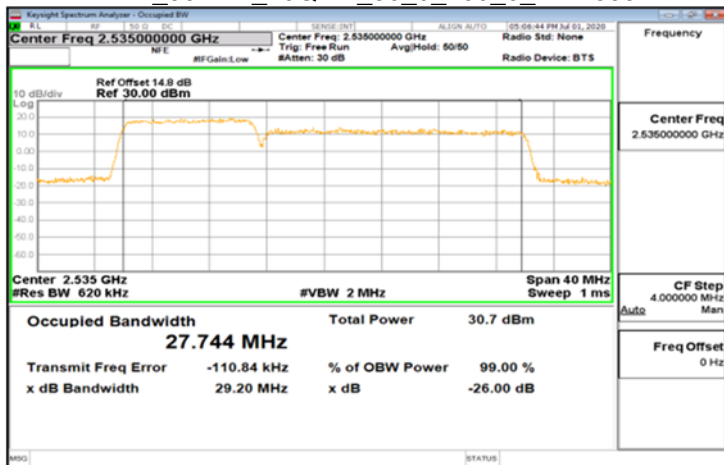
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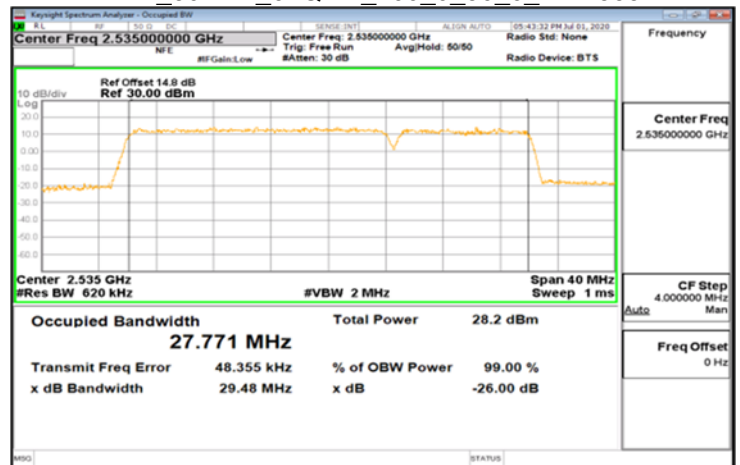
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Band7 30MHz 16QAM 50 0 100 0 Mid2535



Band7 30MHz 64QAM 100 0 50 0 Mid2535

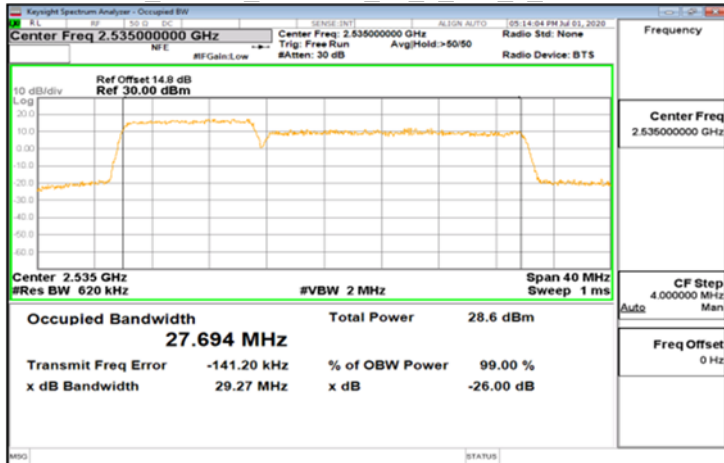


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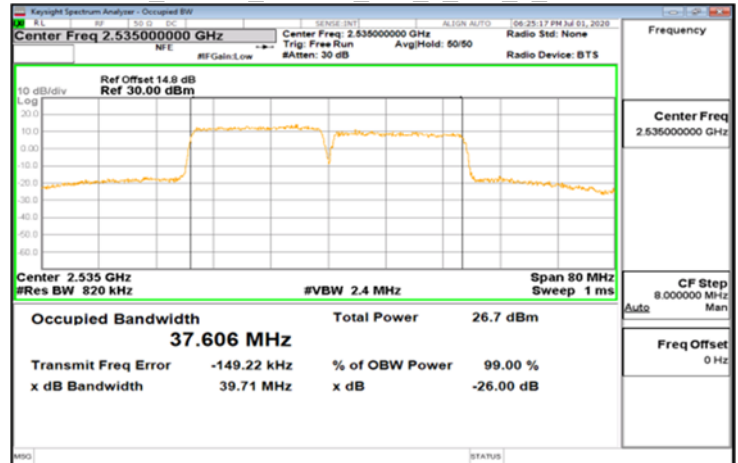
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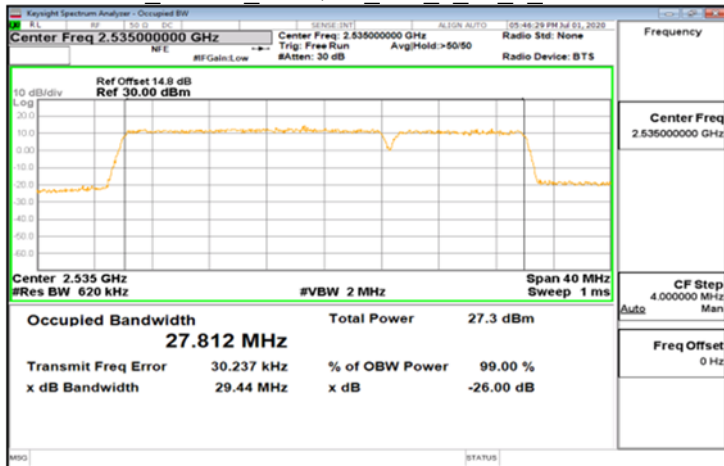
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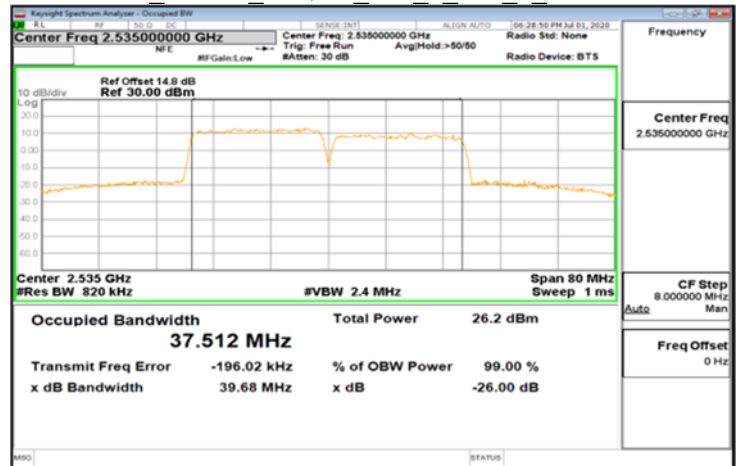
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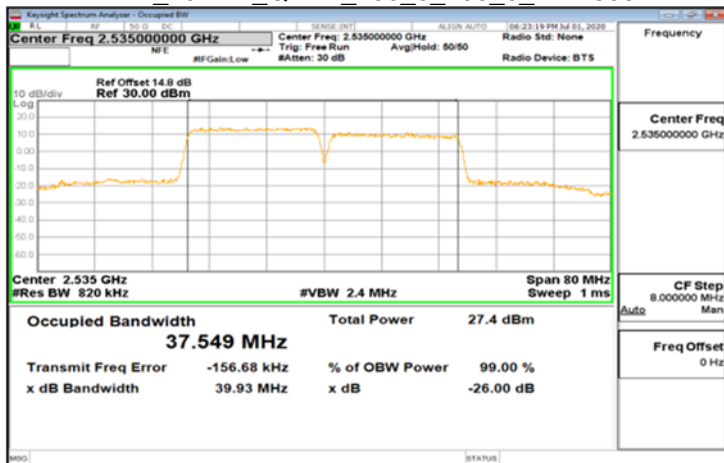
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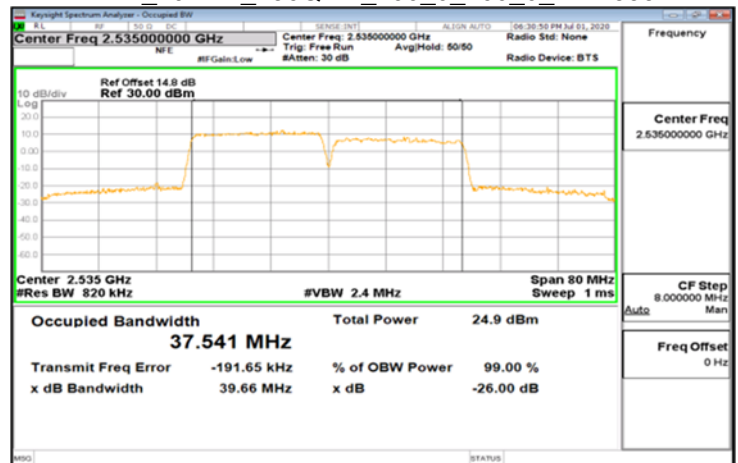
Band7 40MHz 64QAM 100 0 100 0 Mid2535



Band7 40MHz QPSK 100 0 100 0 Mid2535



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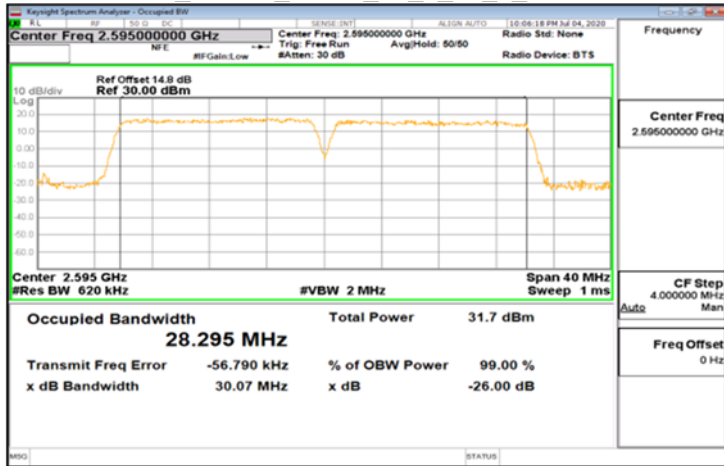


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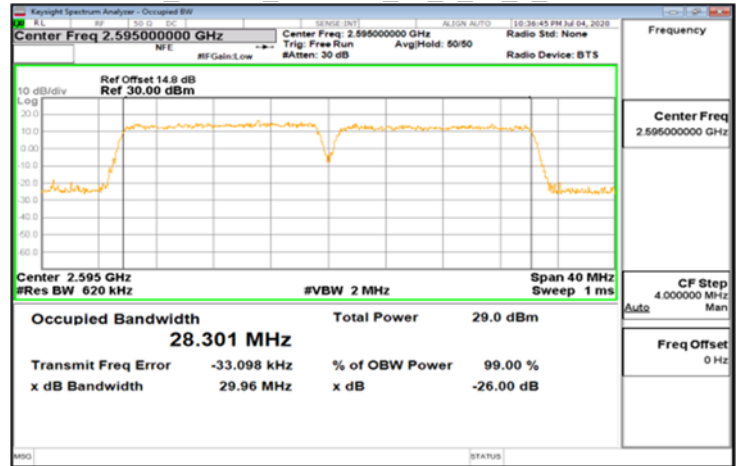
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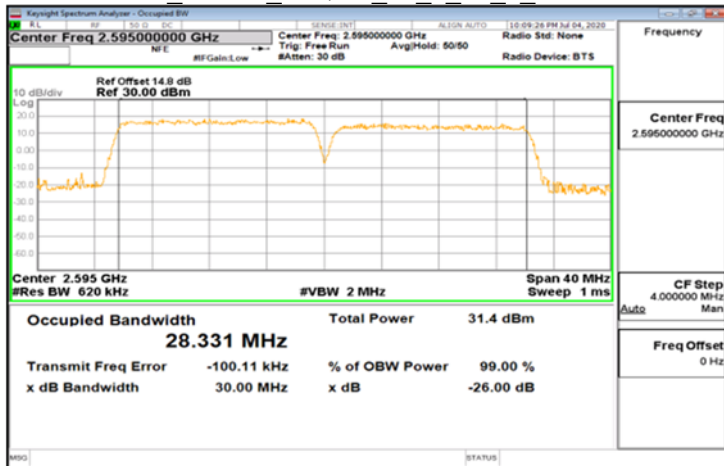
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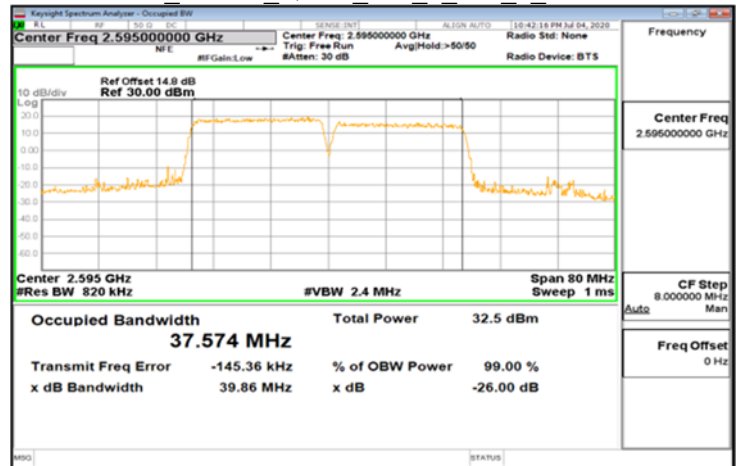
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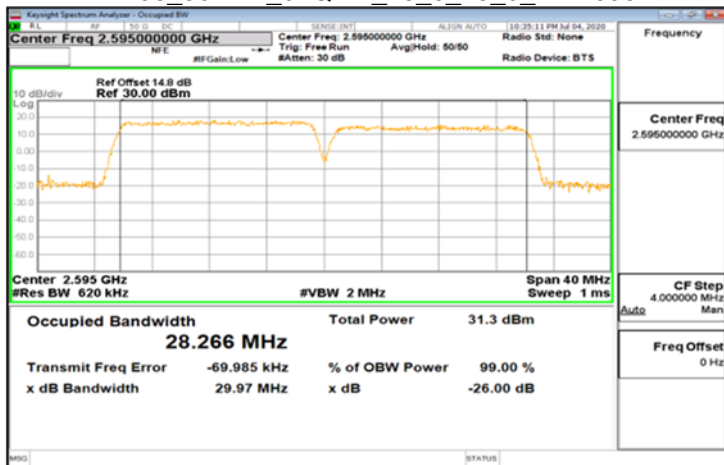
Band38 30MHz 16QAM 75 0 75 0 Mid2595



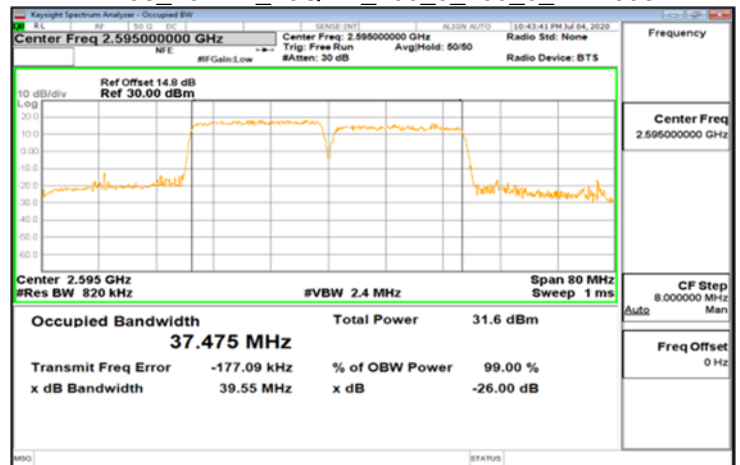
Band38 40MHz QPSK 100 0 100 0 Mid2595



Band38 30MHz 64QAM 75 0 75 0 Mid2595



Band38 40MHz 16QAM 100 0 100 0 Mid2595

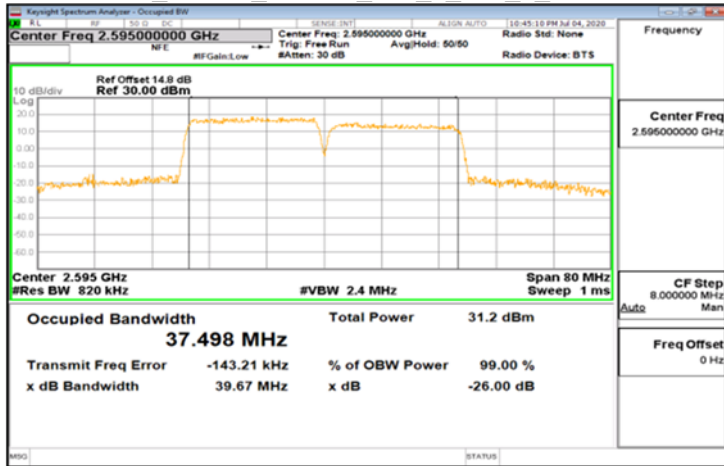


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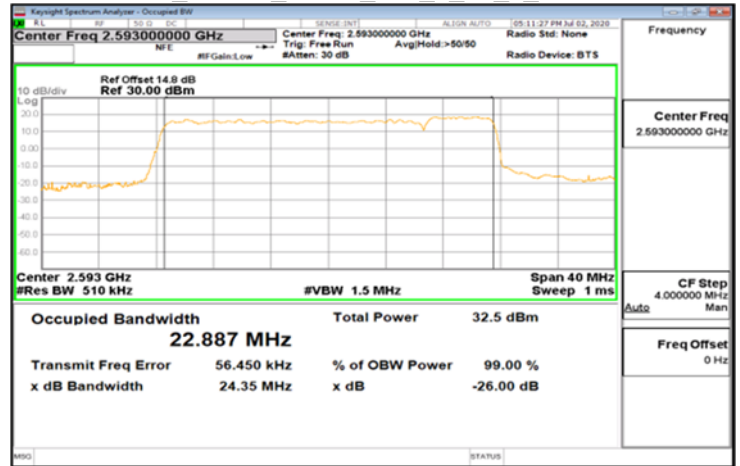
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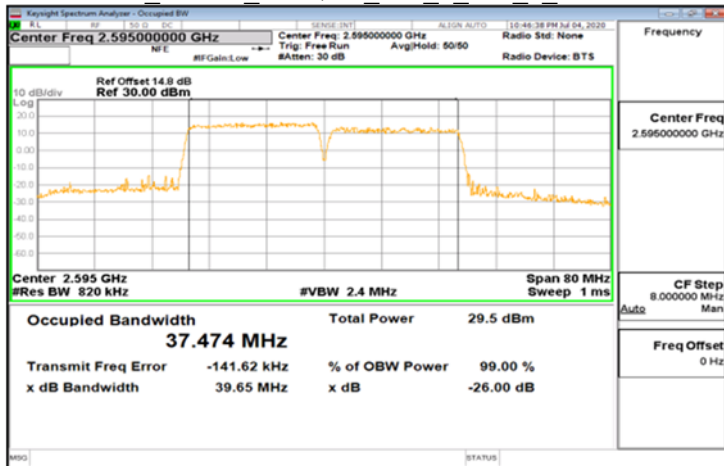
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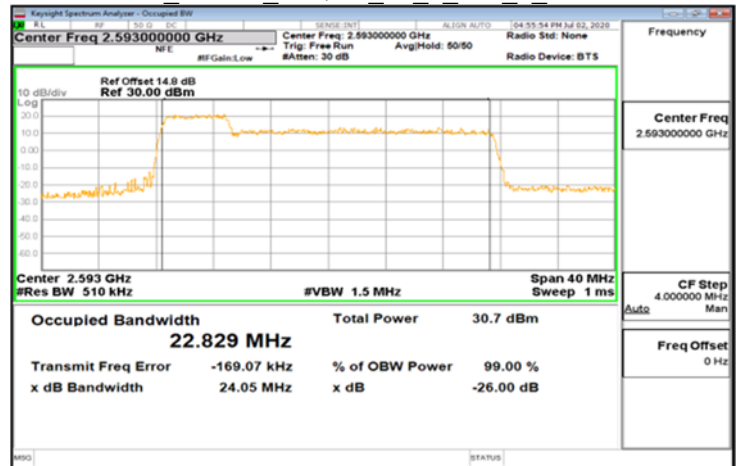
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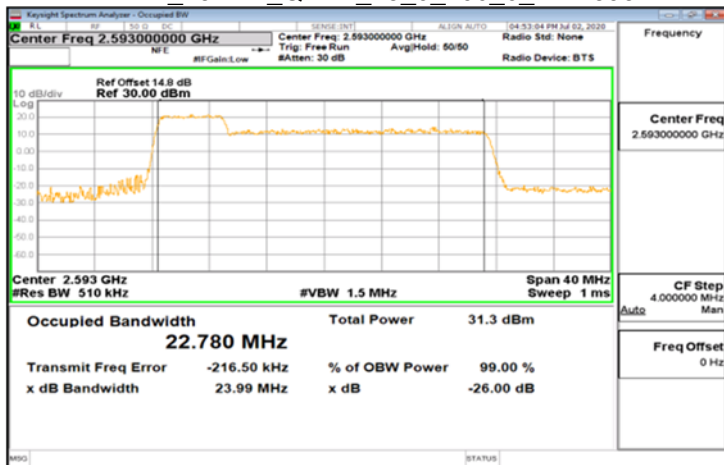
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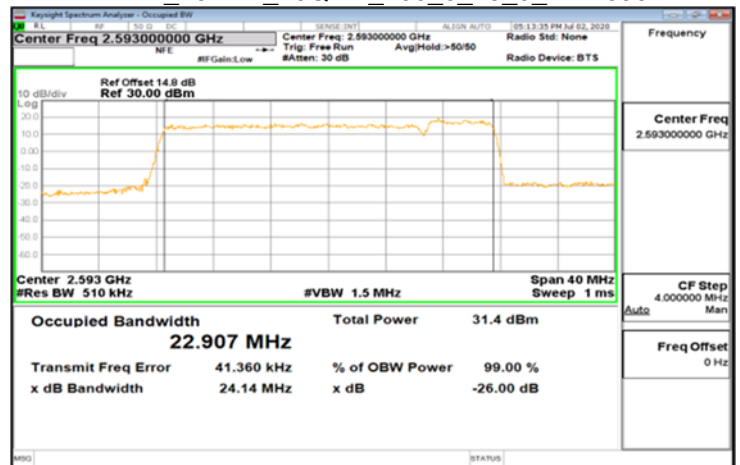
Band41 25MHz 16QAM 25 0 100 0 Mid2593



Band41 25MHz QPSK 25 0 100 0 Mid2593



Band41 25MHz 16QAM 100 0 25 0 Mid2593

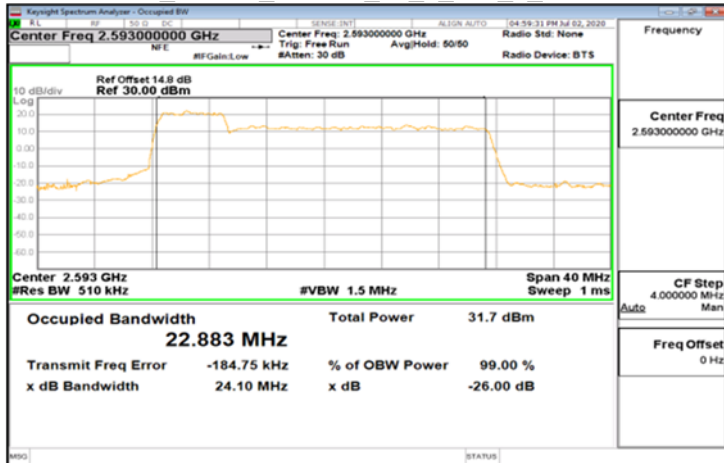


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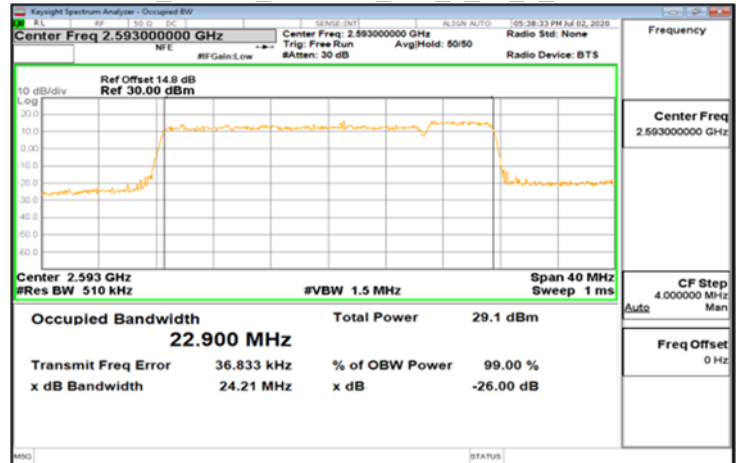
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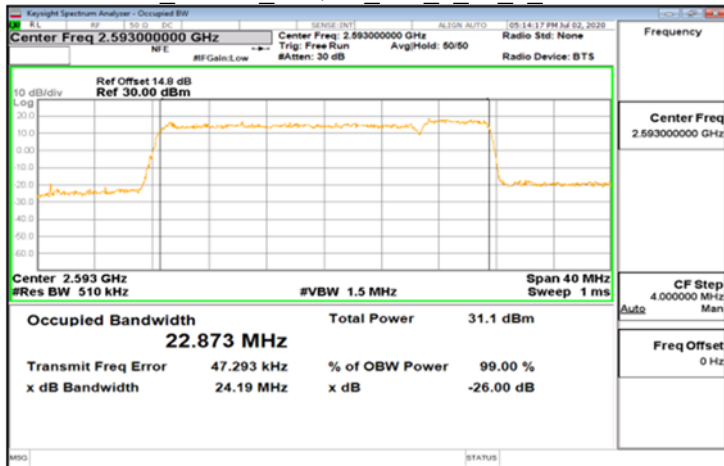
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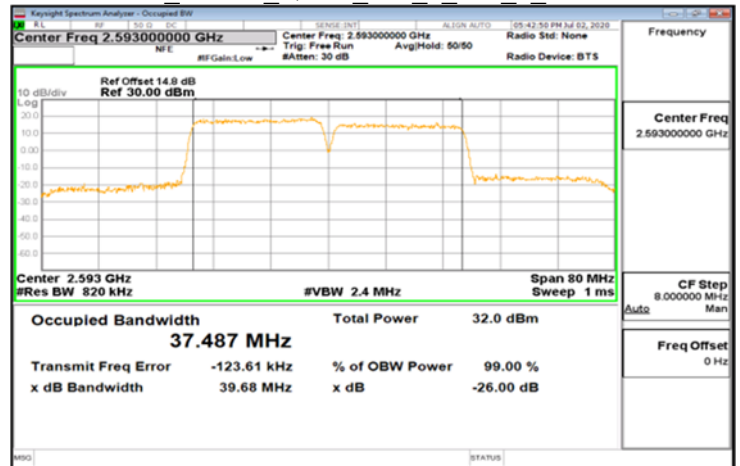
Band41 25MHz 256QAM 100 0 25 0 Mid2593



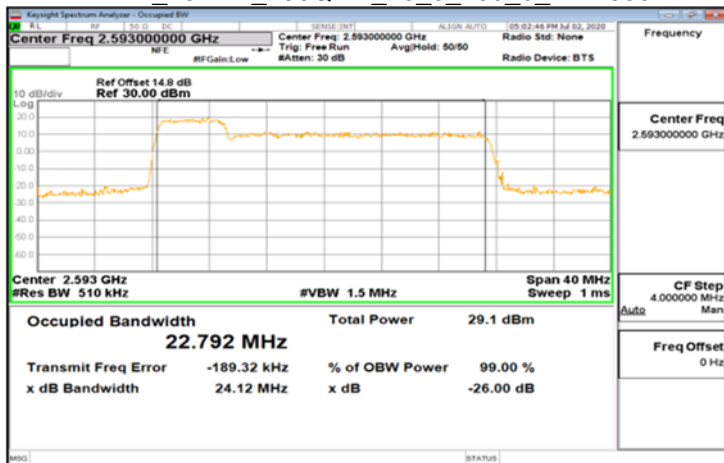
Band41 25MHz 64QAM 100 0 25 0 Mid2593



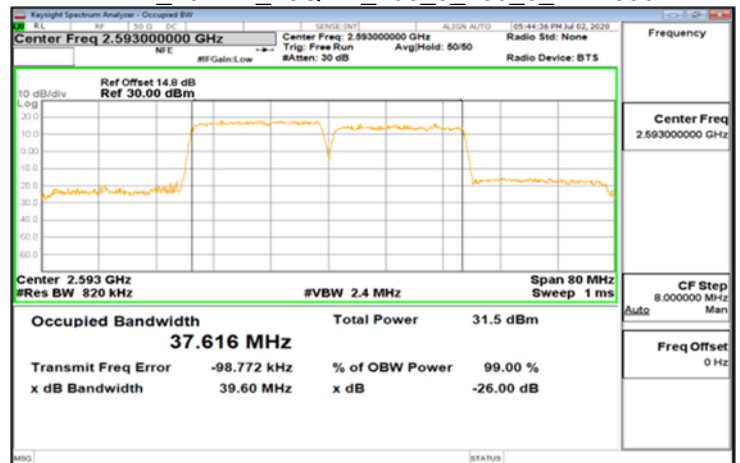
Band41 40MHz QPSK 100 0 100 0 Mid2593



Band41 25MHz 256QAM 25 0 100 0 Mid2593



Band41 40MHz 16QAM 100 0 100 0 Mid2593

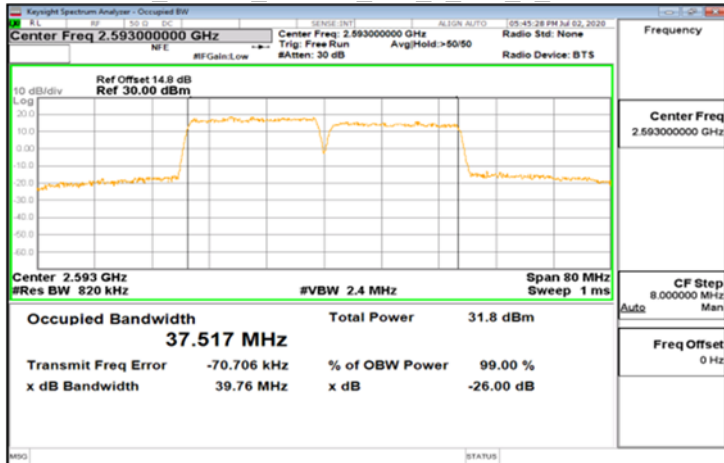


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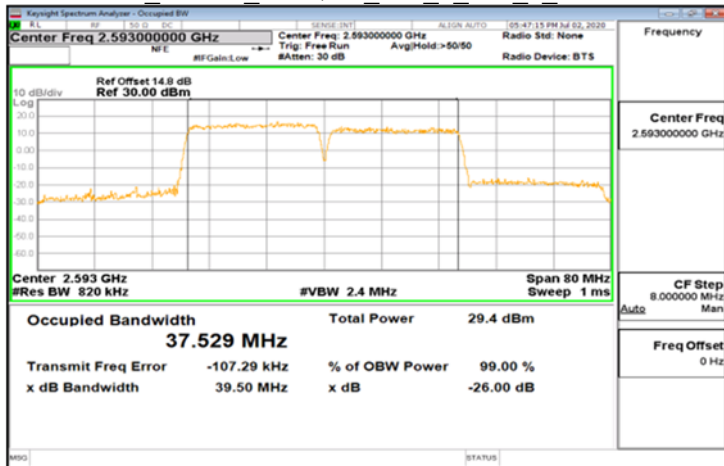
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Band41 40MHz 64QAM 100 0 100 0 Mid2593



Band41 40MHz 256QAM 100 0 100 0 Mid2593



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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-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(g) for LTE B12

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.

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.

FCC §27.53(m) (4) (6) for LTE B7, B38, 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-130 §4.7.1 for LTE B12

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.

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.

RSS-199 §4.5 for LTE B7, 38, 41

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:

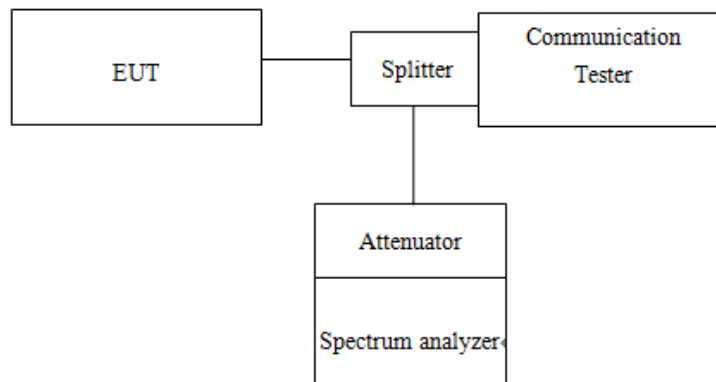
$40 + 10 \log_{10} p$ from the channel edges to 5 MHz away

$43 + 10 \log_{10} p$ 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.

8.2 Test SET-UP

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

8.4 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/21/2020	04/20/2021
Radio Communication Analyzer	Anritsu	MT8821C	6261786084	01/18/2020	01/17/2021
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

8.5 Measurement Result:

Refer to next pages.

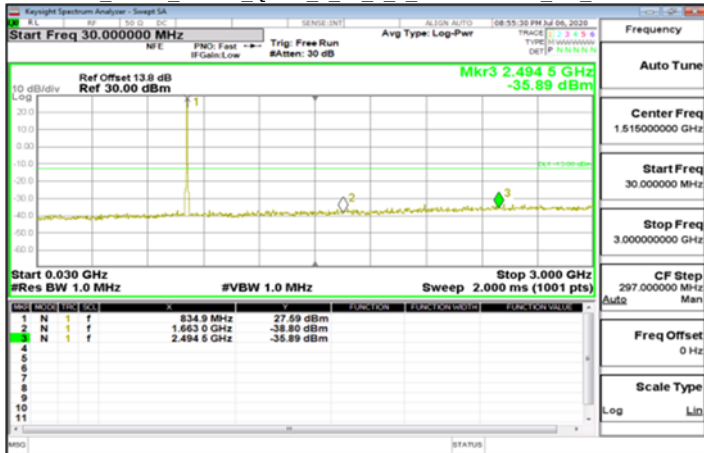
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Out of Band Emission

Emission Band5 15MHz QPSK 1 49 1 0 30MHz~3GHz CH Low831.5



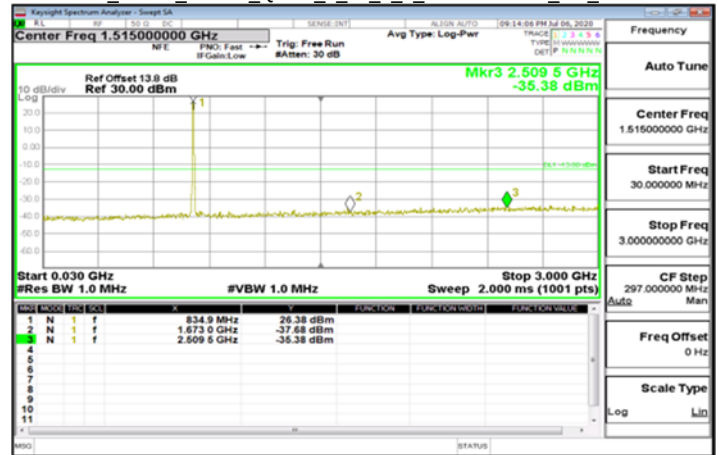
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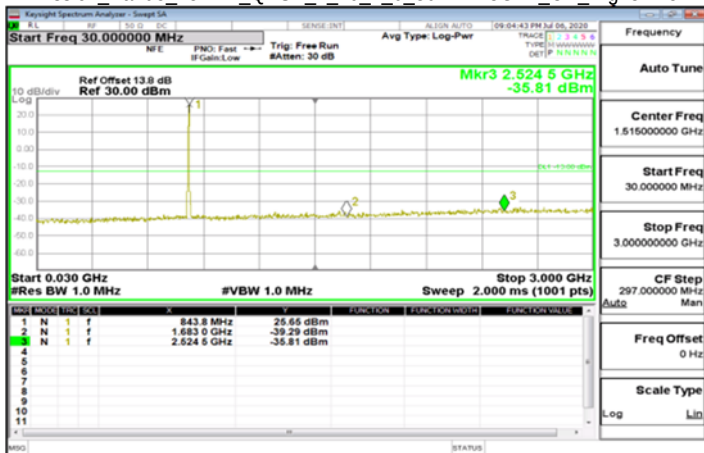
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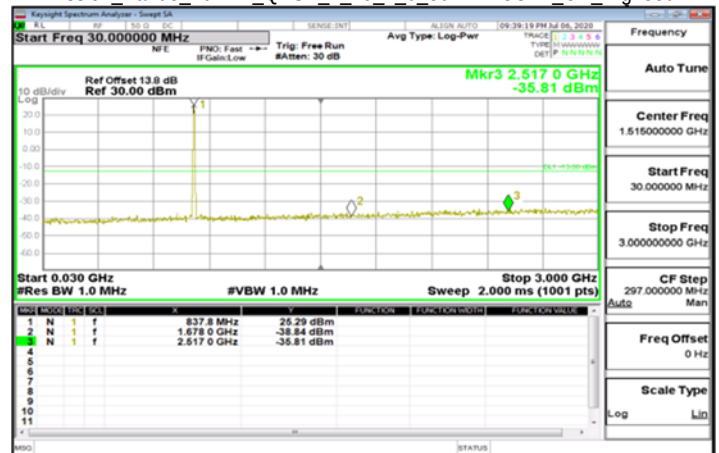
Emission Band5 20MHz QPSK 1 49 1 0 30MHz~3GHz CH Mid836.5



Emission Band5 15MHz QPSK 1 49 1 0 30MHz~3GHz CH High841.5



Emission Band5 20MHz QPSK 1 49 1 0 30MHz~3GHz CH High839

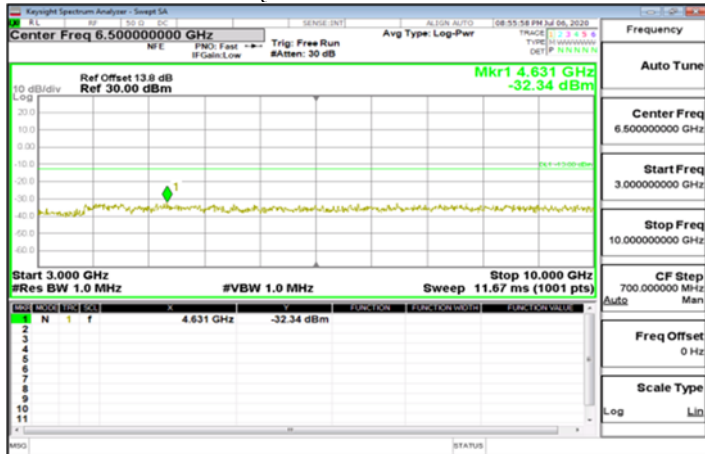


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Emission Band5 15MHz QPSK 1 49 1 0 3GHz~26GHz CH Low831.5



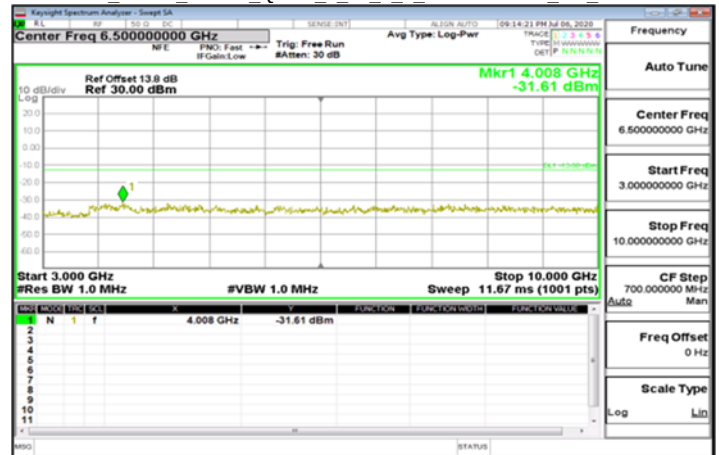
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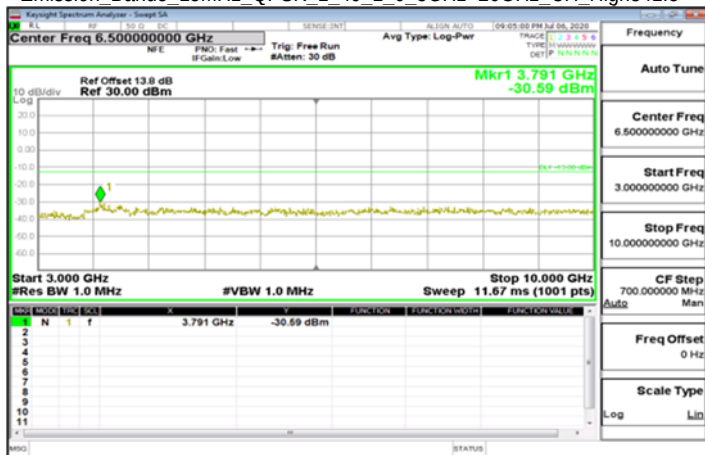
Emission Band5 15MHz QPSK 1 49 1 0 3GHz~26GHz CH Mid836.5



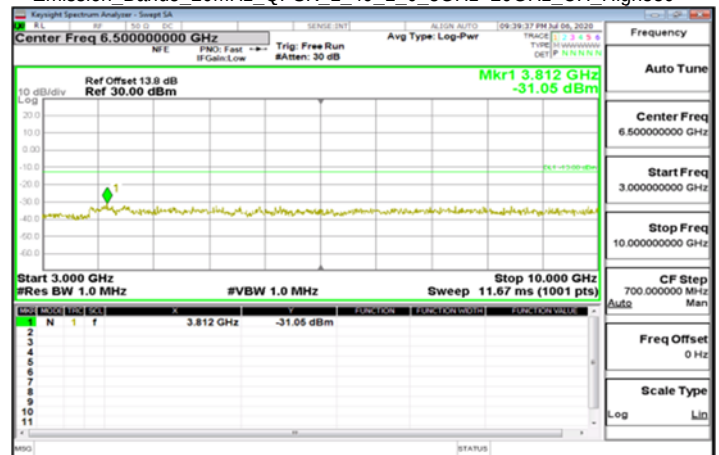
Emission Band5 20MHz QPSK 1 49 1 0 3GHz~26GHz CH Mid836.5



Emission Band5 15MHz QPSK 1 49 1 0 3GHz~26GHz CH High841.5



Emission Band5 20MHz QPSK 1 49 1 0 3GHz~26GHz CH High839



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