FCC TEST REPORT

Product Name:	Electronic Visitor Verification PDA
Trade Mark:	N/A
Model No.:	T5
Add. Model No.:	N/A
Report Number:	191226037RFM-1
Test Standards:	FCC 47 CFR Part 27
FCC ID:	2AU94T5
Test Result:	PASS
Date of Issue:	April 2, 2020

Prepared for:

Sandata Technologies, LLC
26 Harbor Park Drive, Port Washington, NY 11050

Prepared by:

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Date: April 2, 2020

Version

Version No.	Date	Description
V1.0	April 2, 2020	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Sandata Technologies, LLC
Address of Applicant:	26 Harbor Park Drive, Port Washington, NY 11050
Manufacturer:	Sandata Technologies, LLC
Address of Manufacturer:	26 Harbor Park Drive, Port Washington, NY 11050

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Electronic Visitor Verification PDA		
Model No.:	T5		
Add. Model No.:	N/A		
Trade Mark:	N/A		
DUT Stage:	Identical Prototype		
EUT Supports Function:	E-UTRA Bands:	FDD Band 4/ Band 13	
	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth 5.0	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n
Software Version:	Sandata_T5_20200102		
Hardware Version:	H5E3H_V2_20191109		
Sample Received Date:	March 5, 2020		
Sample Tested Date:	March 5, 2020 to March 25, 2020		

1.2.2 Description of Accessories

Adapter	
Model No.:	TPA-46B050100UU
Input:	100-240 V~50/60 Hz 0.2A
Output:	5.0 V⎓1000m A

Battery	
Model No.:	T5
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.8 Vdc
Limited Charge Voltage:	4.35 Vdc
Rated Capacity:	2000 mAh

Cable	
Description:	USB Micro-B Plug Cable
Cable Type:	Unshielded without ferrite

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Support Networks:	LTE	
Type of Modulation:	LTE Band 4/13:	QPSK, 16QAM
Antenna Type:	FPCB Antenna	
Antenna Gain:	LTE Band 4:	1.25 dBi
	LTE Band 13:	1.62dBi
Normal Test Voltage:	3.8 Vdc	
Extreme Test Voltage:	3.5 to 4.35Vdc	
Extreme Test Temperature:	-20 °C to +55 °C	

Summary of Results:

Bands	BW (MHz)	Modulation	Frequency Range (MHz)	Max RF Output Power (dBm) Conducted (Average)	Max RF Output Power (dBm) ERP/EIRP (Average)	EIRP (W)	99% BW (MHz)	Emission Designator
4	1.4	QPSK	1710.7-1754.3	23.25	25.14	0.32659	1.1073	1M11G7D
		16QAM		22.07	23.06	0.20230	1.0979	1M10W7D
	3	QPSK	1711.5-1753.5	22.89	24.14	0.25942	2.7071	2M71G7D
		16QAM		22.16	23.41	0.21928	2.7154	2M72W7D
	5	QPSK	1712.5-1752.5	22.81	24.06	0.25468	4.5240	4M52G7D
		16QAM		22.16	23.41	0.21928	4.5275	4M53W7D
	10	QPSK	1715-1750	22.78	24.03	0.25293	8.9757	8M98G7D
		16QAM		22.11	23.36	0.21677	8.9633	9M00W7D
	15	QPSK	1717.5-1747.5	22.86	24.11	0.25763	13.460	13M5G7D
		16QAM		22.13	23.38	0.21777	13.471	13M5W7D
	20	QPSK	1720-1745	22.92	24.17	0.26122	17.979	18M0G7D
		16QAM		22.17	23.42	0.21979	18.007	18M0W7D
13	5	QPSK	779.5-784.5	22.97	22.44	0.17539	4.5141	4M51G7D
		16QAM		22.07	21.54	0.14256	4.5214	4M52W7D
	10	QPSK	782.0-782.0	22.98	22.45	0.17579	8.9860	8M99G7D
		16QAM		22.07	21.54	0.14256	8.9661	8M97W7D

1.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested independently

1.5 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.6 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

1.7 DEVIATION FROM STANDARDS

None.

1.8 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.10 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 27 Test Cases (LTE Band 4)			
Test Item	**Test Requirement**	**Test Method**	**Result**
Equivalent Isotropic Radiated Power (EIRP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 27.50(d)(5)	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h) FCC 47 CFR Part 27.53(h)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(h)(1)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(h)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(h)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 27 Test Cases (LTE Band 13)			
Test Item	**Test Requirement**	**Test Method**	**Result**
Effective Radiated Power (ERP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(b)(10)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(b)(10)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 27.50(d)(5)	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 03, 2018	Dec. 03, 2021
☒	Receiver	R&S	ESIB26	100114	Nov. 24, 2019	Nov. 23, 2020
☐	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 24, 2019	Nov. 23, 2020
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 16, 2019	Nov. 15, 2020
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 16, 2019	Nov. 15, 2020
☒	Preamplifier	HP	8447F	2805A02960	Nov. 16, 2019	Nov. 15, 2020
☐	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	Nov. 24, 2019	Nov. 23, 2020
☐	6dB Attenuator	Talent	RA6A5-N-18	18103002	Nov. 24, 2019	Nov. 23, 2020
☐	Horn Antenna	ETS-LINDGREN	3117	00164202	Nov. 24, 2019	Nov. 23, 2020
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	Nov. 16, 2019	Nov. 15, 2020
☐	Horn Antenna	ETS-LINDGREN	3116C	00200180	May 18, 2019	May 18, 2020
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Jun. 23, 2019	Jun. 23, 2020
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

RF Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	Receiver	R&S	ESR7	1316.3003K07 -101181-K3	Nov. 24, 2019	Nov. 23, 2020
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 24, 2019	Nov. 23, 2020
☒	Wideband Radio Communication Tester	R&S	CMW500	120932	Jul. 19, 2019	Jul. 19, 2020
☐	Wideband Radio Communication Tester	R&S	CMW500	119583	Jul. 31, 2019	Jul. 31, 2020
☒	DC Source	KIKUSUI	PWR400L	LK003024	Sep. 09, 2019	Sep. 08, 2020
☐	Temp & Humidity chamber	Espec	GL(U)04K A(W)	16921H201P3	Sep. 09, 2019	Sep. 08, 2020
☒	Temp & Humidity chamber	Votisch	VT4002	58566133290 020	Jun. 05, 2018	Jun. 05, 2020

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

Test Environment	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
TN/VN	+15 to +35	3.8	20 to 75
TL/VL	-20	3.5	20 to 75
TH/VL	+55	3.5	20 to 75
TL/VH	-20	4.35	20 to 75
TH/VH	+55	4.35	20 to 75

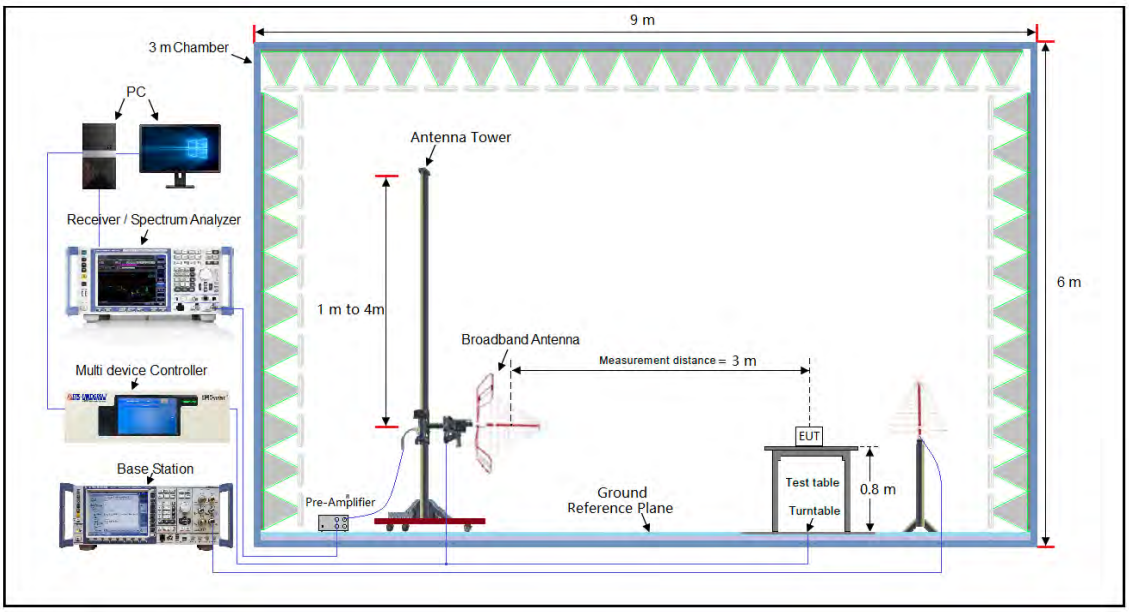
Remark:

1) The EUT just work in such extreme temperature of -20 °C to +55 °C and the extreme voltage of 3.5 V to 4.35 V, so here the EUT is tested in the temperature of -20 °C to +55 °C and the voltage of 3.5 V to 4.35 V.
2) VN: Normal Voltage; TN: Normal Temperature;
   TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
   VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

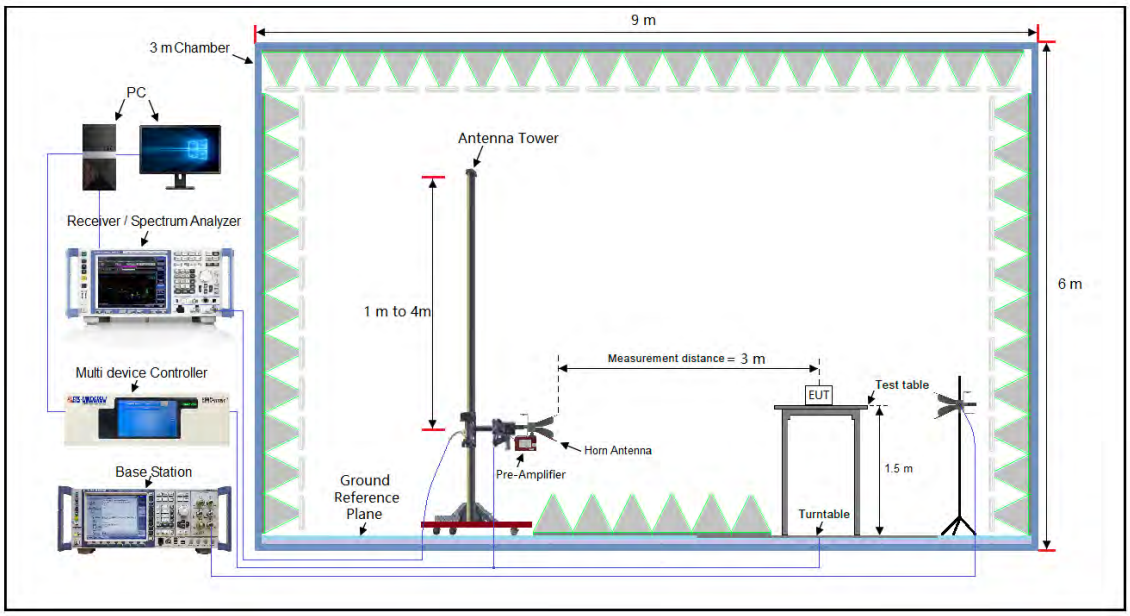
4.2 TEST SETUP

4.2.1 For Radiated Emissions test setup

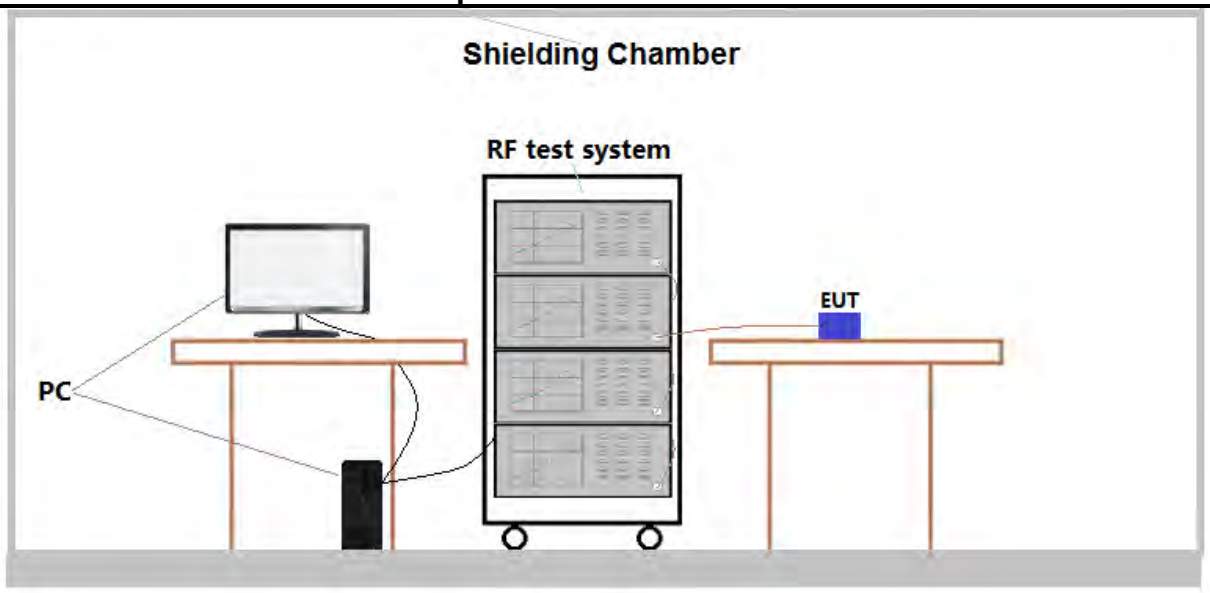
Radiated Emissions 30MHz to 1GHz Test setup



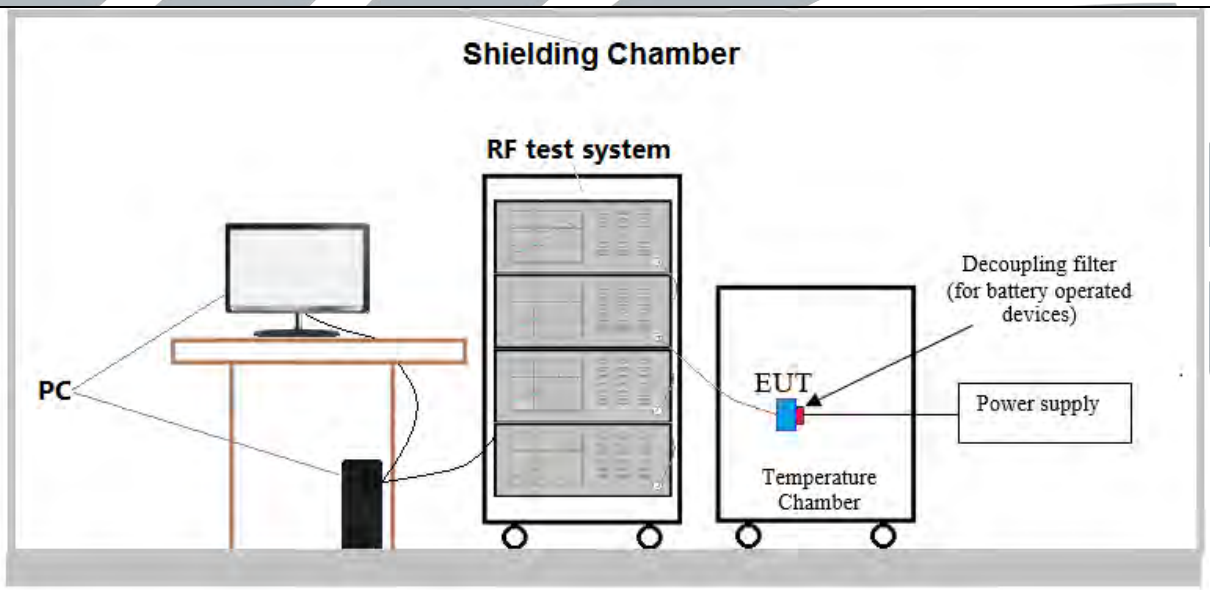
Radiated Emissions Above 1GHz Test setup



4.2.2 For Conducted RF test setup



Normal Environment



Extreme Environment

4.3 TEST CHANNELS

Band	Test Frequency ID	Bandwidth (MHz)	Number [UL]	Frequency of Uplink (MHz)
LTE Band 4 TX: 1710-1755MHz	Low Range	1.4	19957	1710.7
		3	19965	1711.5
		5	19975	1712.5
		10	20000	1715
		15	20025	1717.5
		20	20050	1720
	Middle Range	1.4/3/5/10/ 15/20	20175	1732.5
	High Range	1.4	20393	1754.3
		3	20385	1753.5
		5	20375	1752.5
		10	20350	1750
		15	20325	1747.5
		20	20300	1745
LTE Band 13 TX: 777-787MHz	Low Range	5	23205	779.5
		10	23230	782
	Middle Range	5/10	23230	782
	High Range	5	23255	784.5
		10	23230	782

4.4 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.8V battery. Only the worst case data were recorded in this test report.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, X/Y/Z axis, and antenna ports.
The worst case was found when positioned as the table below.

Band	Mode	Antenna Port	Worst-case axis positioning
LTE Band 4	1TX	Chain 0	Y axis
LTE Band 13	1TX	Chain 0	Y axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.5 PRE-SCAN

Pre-scan under all rate at lowest middle and highest channel, find the transmitter power as below.

4.5.1 LTE Band 4

LTE Band 4 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 1.4 MHz						Channel Bandwidth: 3 MHz				
QPSK	1	0	22.69	22.37	22.76	1	0	22.65	22.46	22.89
	1	2	22.63	22.37	22.67	1	7	22.75	22.31	22.68
	1	5	22.20	21.85	22.82	1	14	22.19	21.76	22.71
	3	0	22.91	22.92	23.25	8	0	21.99	21.94	22.19
	3	1	22.99	23.01	22.90	8	3	21.92	22.03	22.04
	3	3	23.05	22.88	22.88	8	7	21.95	21.90	21.83
	6	0	21.73	22.00	21.91	15	0	21.82	21.94	21.89
16QAM	1	0	21.76	22.07	21.96	1	0	21.83	22.16	21.98
	1	2	21.75	21.68	21.62	1	7	21.87	21.55	21.69
	1	5	21.75	21.68	21.32	1	14	21.71	21.69	21.31
	3	0	21.92	22.06	21.70	8	0	20.86	21.06	20.70
	3	1	21.91	22.06	21.77	8	3	20.92	21.03	20.88
	3	3	21.95	21.90	21.92	8	7	20.93	20.89	21.03
	6	0	21.08	20.96	21.05	15	0	21.24	20.99	21.08
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	22.69	22.34	22.81	1	0	22.69	22.34	22.78
	1	12	22.73	22.31	22.65	1	24	22.64	22.35	22.67
	1	24	22.24	21.92	22.81	1	49	22.24	21.75	22.73
	12	0	22.10	21.89	22.18	25	0	21.97	21.91	22.32
	12	6	21.87	21.97	22.01	25	12	21.87	21.92	22.02
	12	13	21.96	22.06	21.79	25	25	22.06	21.92	21.77
	25	0	21.78	21.94	21.96	50	0	21.73	21.86	21.92
16QAM	1	0	21.87	22.16	21.95	1	0	21.85	22.11	22.02
	1	12	21.71	21.73	21.63	1	24	21.74	21.58	21.75
	1	24	21.78	21.71	21.32	1	49	21.65	21.61	21.26
	12	0	20.88	21.13	20.85	25	0	20.92	21.11	20.84
	12	6	20.81	21.09	20.80	25	12	20.76	21.05	20.88
	12	13	20.93	20.94	21.06	25	25	20.93	20.94	21.01
	25	0	21.24	20.93	21.11	50	0	21.21	20.95	21.08
Channel Bandwidth: 15 MHz						Channel Bandwidth: 20 MHz				
QPSK	1	0	22.73	22.45	22.75	1	0	22.77	22.50	**22.92**
	1	37	22.58	22.42	22.74	1	50	22.75	22.47	22.78
	1	74	22.06	21.87	22.86	1	99	22.26	21.94	22.88
	37	0	21.92	21.85	22.29	50	0	22.10	22.03	22.32
	37	19	21.98	22.03	22.03	50	25	22.05	22.04	22.04
	37	39	21.93	21.97	21.86	50	50	22.07	22.07	21.89
	75	0	21.75	21.92	21.93	100	0	21.84	22.05	21.98
16QAM	1	0	21.75	22.13	21.98	1	0	21.92	22.17	22.08
	1	37	21.89	21.58	21.68	1	50	21.89	21.73	21.80
	1	74	21.74	21.60	21.41	1	99	21.82	21.74	21.44
	37	0	21.00	21.06	20.72	50	0	21.01	21.19	20.88
	37	19	20.81	21.02	20.88	50	25	20.96	21.20	20.93
	37	39	20.82	20.96	20.93	50	50	21.01	21.02	21.07
	75	0	21.06	21.04	20.95	100	0	21.25	21.05	21.11

4.5.2 LTE Band 13

LTE Band 13 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
	Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
QPSK	1	0	0.90	22.83	-0.02	1	0	/	22.86	/
	1	12	-0.05	22.63	-0.07	1	24	/	22.72	/
	1	24	-0.18	22.97	-0.09	1	49	/	**22.98**	/
	12	0	-0.15	22.18	-0.09	25	0	/	22.18	/
	12	6	-0.01	22.01	-0.14	25	12	/	22.13	/
	12	13	-0.07	21.81	-0.10	25	25	/	22.00	/
	25	0	-0.17	21.96	-0.07	50	0	/	22.11	/
16QAM	1	0	0.94	21.77	-0.05	1	0	/	21.87	/
	1	12	-0.16	22.07	-0.05	1	24	/	22.07	/
	1	24	-0.18	21.86	-0.07	1	49	/	21.89	/
	12	0	-0.16	20.85	-0.06	25	0	/	20.97	/
	12	6	-0.15	21.17	-0.01	25	12	/	21.25	/
	12	13	-0.03	20.75	-0.19	25	25	/	20.84	/
	25	0	-0.08	20.79	-0.01	50	0	/	20.82	/

Pre-scan all bandwidth and RB, find worse case mode are chosen to the report, the LTE worse case mode applicability and tested channel detail as below:

Item	Band	Bandwidth(MHz)						Modulation			RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
ERP/EIRP	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
	13	-	-	☒	☒	-	-	☒	☒	☒	☒	☐	☐	☒	☒	☒
Conducted output power	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
	13	-	-	☒	☒	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☒
99%&26dB Bandwidth	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒	☒
	13	-	-	☒	☒	-	-	☒	☒	☒	☐	☐	☒	☒	☒	☒
peak-to-average ratio	4	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☐	☒	☒	☐	☒
	13	-	-	☐	☒	-	-	☒	☒	☒	☒	☐	☒	☐	☒	☐
Band Edge at antenna terminals	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☐	☒
	13	-	-	☒	☒	-	-	☒	☒	☒	☒	☐	☒	☒	☐	☒
Spurious emissions at antenna terminals	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
	13	-	-	☒	☒	-	-	☒	☒	☒	☒	☐	☐	☒	☒	☒
Field strength of spurious radiation	4	☐	☐	☐	☐	☐	☒	☒	☐	☐	☒	☐	☐	☒	☒	☒
	13	-	-	☐	☒	-	-	☒	☐	☐	☒	☐	☐	☐	☒	☐
Frequency stability	4	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐
	13	-	-	☐	☒	-	-	☒	☐	☐	☐	☐	☒	☐	☒	☐

Remark:
The mark "☒" means is chosen for testing; The mark "☐" means is not chosen for testing;
The mark "-" means is not supported bandwidth

5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 27	Miscellaneous Wireless Communications Services
2	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
3	KDB 971168 D01	KDB 971168 D01 Power Meas License Digital Systems v03r01

5.2 ERP OR EIRP

Test Requirement: FCC 47 CFR Part 2.1046(a)
LTE Band 4: FCC 47 CFR Part 27.50(d)(4)
LTE Band 13: FCC 47 CFR Part 27.50(b)(10)

Test Method: KDB 971168 D01v03r01 Section 5.6 & ANSI C63.26-2015

Limit:

FCC 47 CFR Part 27.50(d)(4):
Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

FCC 47 CFR Part 27.50(b)(10):
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

Test Procedure:

$$\text{ERP or EIRP} = P_{Meas} + G_T - L_C$$

where:

ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

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

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

Test Setup: Refer to section 4.2.1 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: See table below

5.2.1 LTE Band 4

LTE Band 4 Maximum EIRP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 1.4MHz					
Lowest	25.14	23.03	/	30.00	Pass
Middle	25.11	23.21	/	30.00	Pass
Highest	24.99	23.06	/	30.00	Pass
Channel Bandwidth: 3MHz					
Lowest	23.90	23.08	/	30.00	Pass
Middle	23.71	23.41	/	30.00	Pass
Highest	24.14	23.23	/	30.00	Pass
Channel Bandwidth: 5MHz					
Lowest	23.49	23.12	/	30.00	Pass
Middle	23.17	23.41	/	30.00	Pass
Highest	24.06	23.20	/	30.00	Pass
Channel Bandwidth: 10MHz					
Lowest	23.94	23.10	/	30.00	Pass
Middle	23.59	23.36	/	30.00	Pass
Highest	24.03	23.27	/	30.00	Pass
Channel Bandwidth: 15MHz					
Lowest	23.31	23.00	/	30.00	Pass
Middle	23.12	23.38	/	30.00	Pass
Highest	24.11	23.23	/	30.00	Pass
Channel Bandwidth: 20MHz					
Lowest	24.02	23.17	/	30.00	Pass
Middle	23.75	23.42	/	30.00	Pass
Highest	24.17	23.33	/	30.00	Pass

5.2.2 LTE Band 13

LTE Band 13 Maximum ERP (dBm)					
Channel	QPSK; RB:1	16QAM; RB:1	64QAM; RB:1	Limit (dBm)	Result
Channel Bandwidth: 5MHz					
Lowest	-0.71	-0.69	/	34.77	Pass
Middle	22.44	21.54	/	34.77	Pass
Highest	-0.71	-0.69	/	34.77	Pass
Channel Bandwidth: 10MHz					
Lowest	/	/	/	34.77	Pass
Middle	22.45	21.54	/	34.77	Pass
Highest	/	/	/	34.77	Pass

5.3 CONDUCTED OUTPUT POWER

Test Requirement: FCC 47 CFR Part 2.1046(a)
LTE Band 4: FCC 47 CFR Part 27.50(d)(4)
LTE Band 13: FCC 47 CFR Part 27.50(b)(10)

Test Method: KDB 971168 D01v03r01 & ANSI C63.26-2015

Limit:

FCC 47 CFR Part 27.50(d)(4):
Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

FCC 47 CFR Part 27.50(b)(10):
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

Test Procedure:
The EUT was set up for the maximum power with LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.2.2 for details.
Instruments Used: Refer to section 3 for details
Test Mode: Link mode
Test Results: Pass
Test Data: The full result refer to section 4.5 for details.

5.4 PEAK-TO-AVERAGE RATIO

Test Requirement: **LTE Band 4:** FCC 47 CFR Part 27.50(d)(5)
LTE Band 13: FCC 47 CFR Part 27.50(d)(5)

Test Method: KDB 971168 D01v03r01 Section 5.7

Limit: In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

Test Procedure:

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.

a) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth
b) Set the number of counts to a value that stabilizes the measured CCDF curve
c) Record the maximum PAPR level associated with a probability of 0.1 %

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

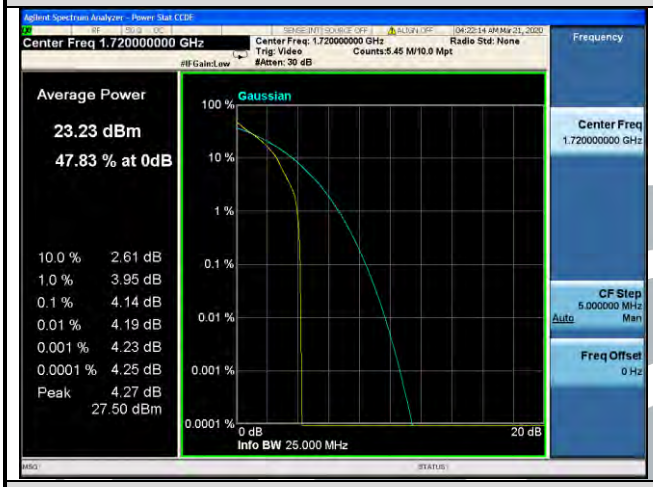
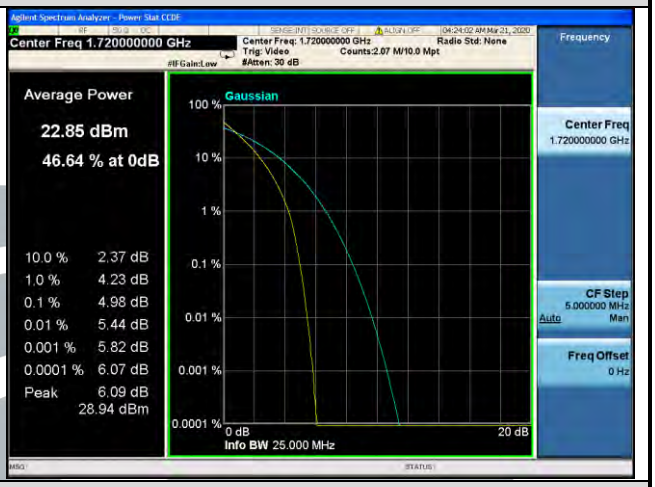
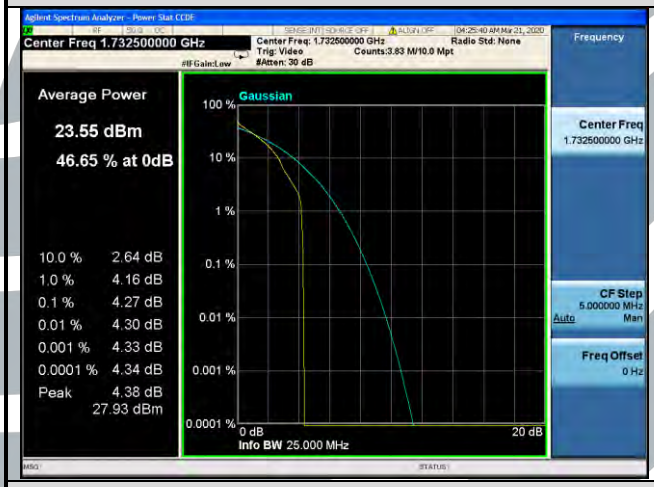
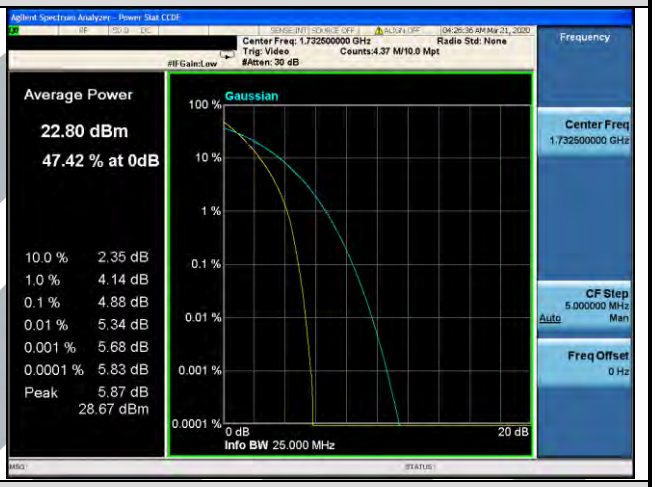
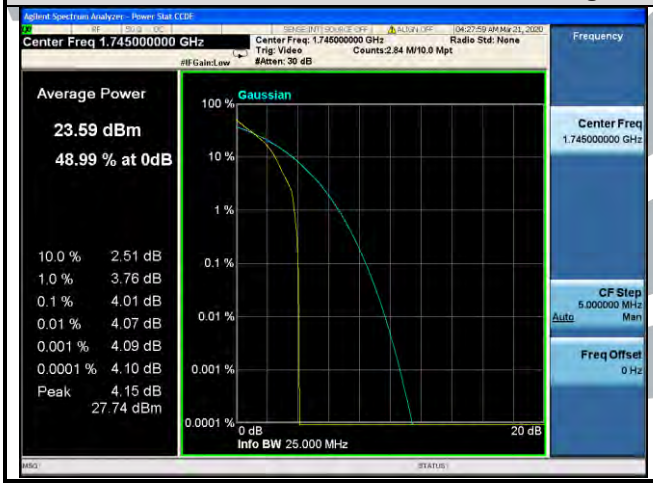
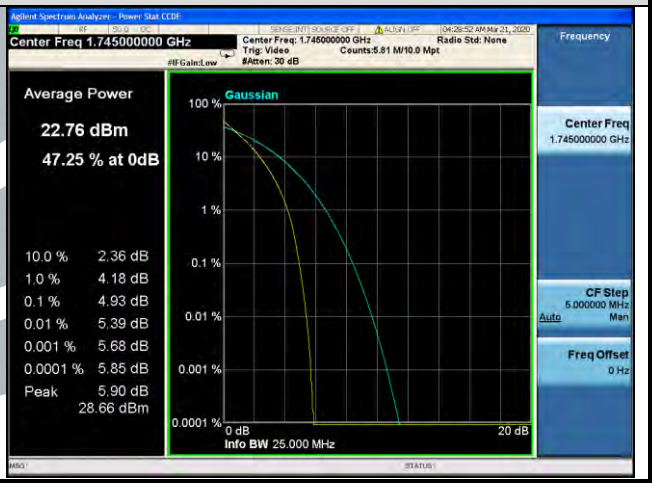
Test Mode: Link mode

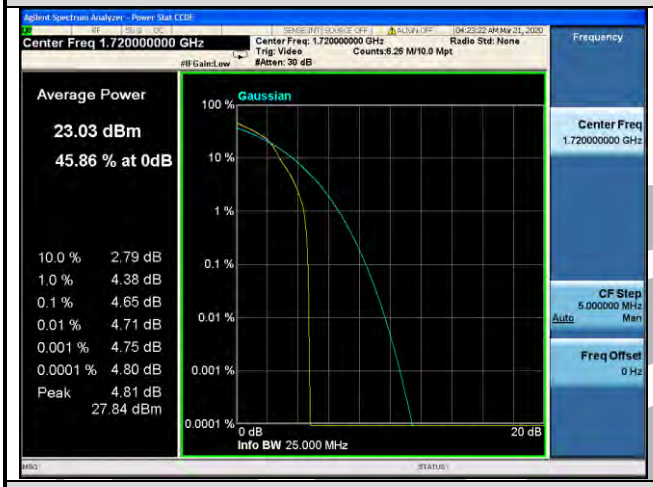
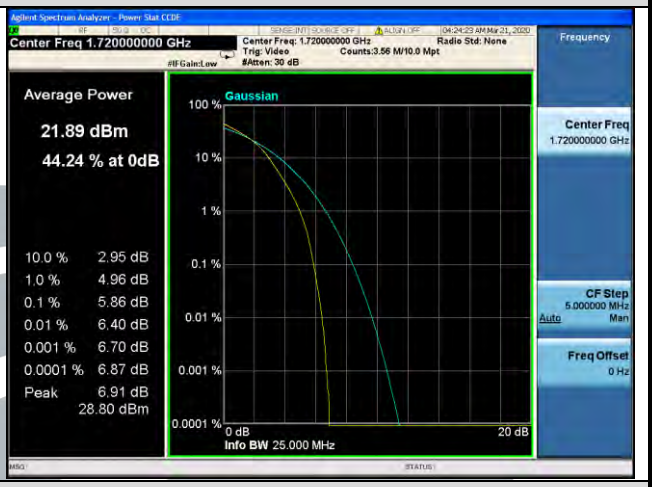
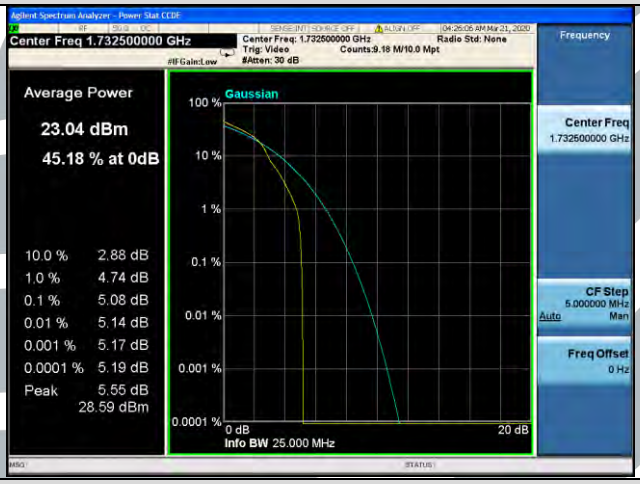
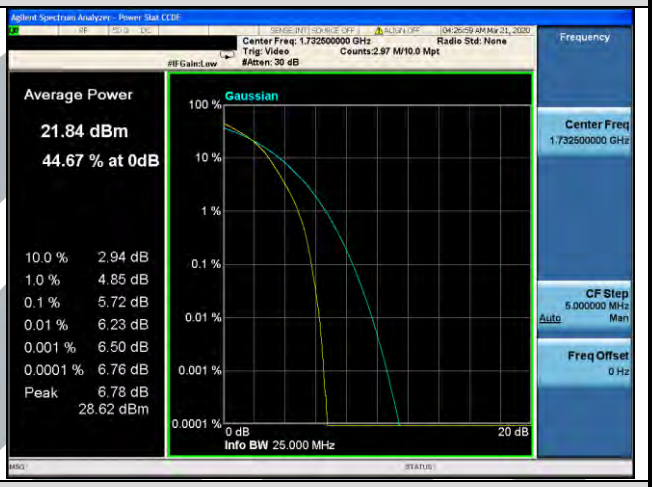
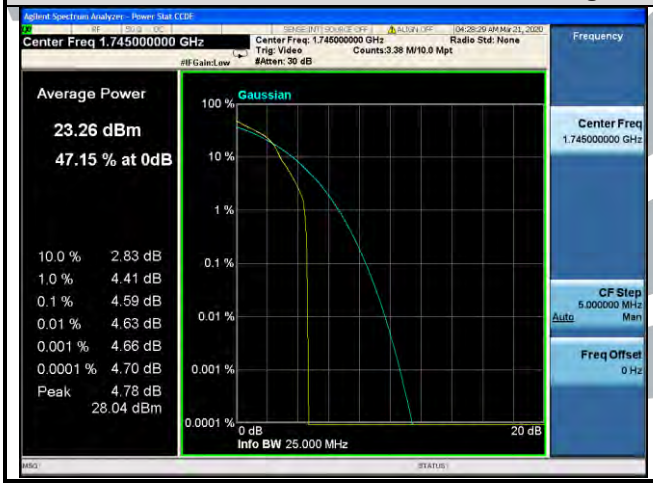
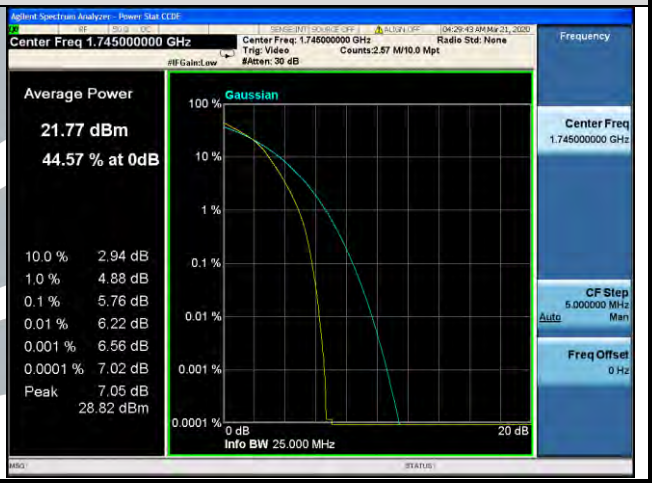
Test Results: Pass

Test Data: See table below

5.4.1 LTE Band 4

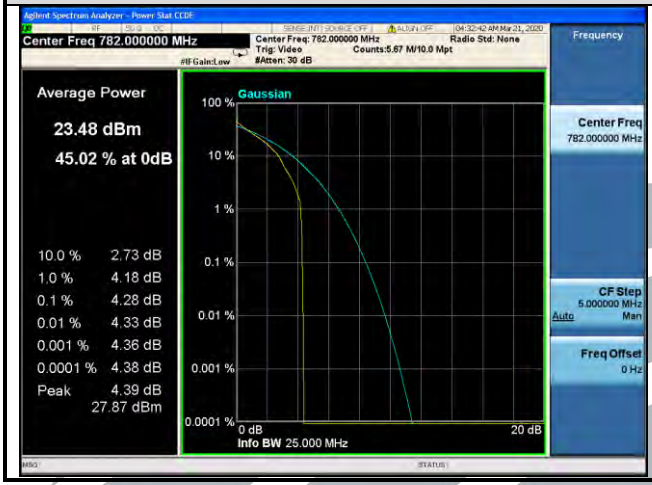
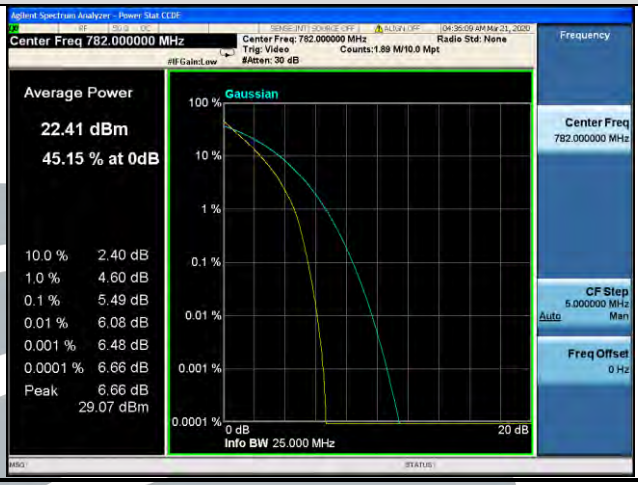
LTE Band 4 Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 20 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Lowest	1 RB	4.14	4.65	/	13	Pass
	Full RB	4.98	5.86	/	13	Pass
Middle	1 RB	4.27	5.08	/	13	Pass
	Full RB	4.88	5.72	/	13	Pass
Highest	1 RB	4.01	4.59	/	13	Pass
	Full RB	4.93	5.76	/	13	Pass

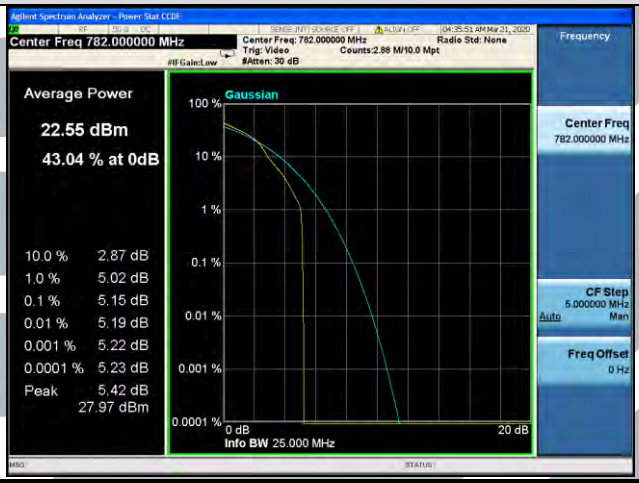
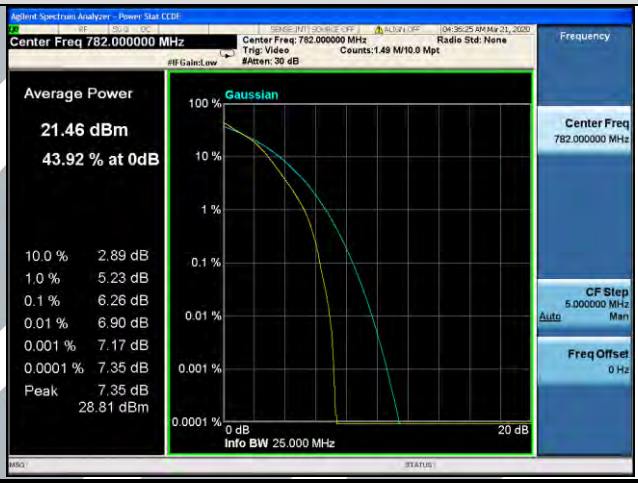
LTE Band 4 / 20MHz / QPSK	
1 RB	Full RB
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

LTE Band 4 / 20MHz / 16QAM	
1 RB	Full RB
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

5.4.2 LTE Band 13

LTE Band 13 Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 10 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Middle	1 RB	4.26	5.15	/	13	Pass
	Full RB	5.49	6.26	/	13	Pass

LTE Band 13 / 10MHz / QPSK	
1 RB	Full RB
Middle Channel	
	

LTE Band 13 / 10MHz / 16QAM	
1 RB	Full RB
Middle Channel	
	

5.5 99%&26DB BANDWIDTH

Test Requirement: FCC 47 CFR Part 2.1049(h)

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01 Section 4

Limit: No Limit, for reporting purposes only.

Test Procedure:

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

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

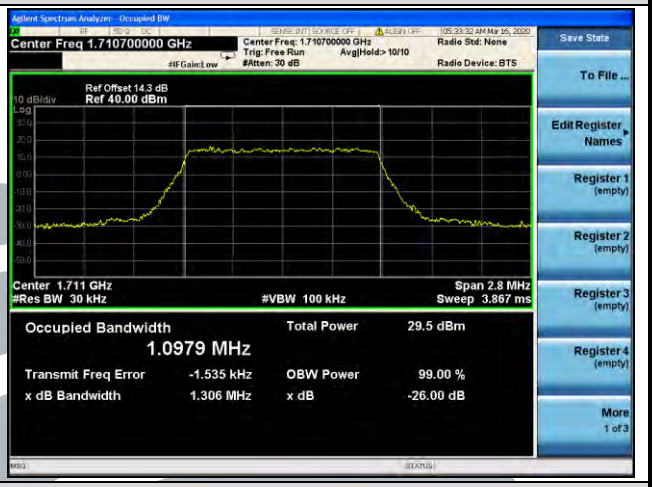
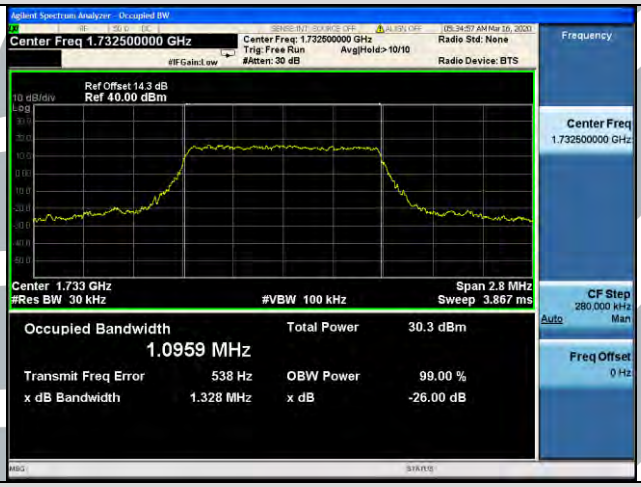
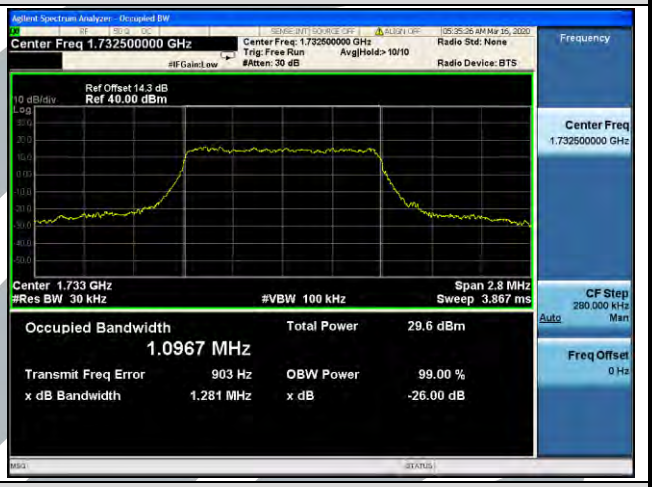
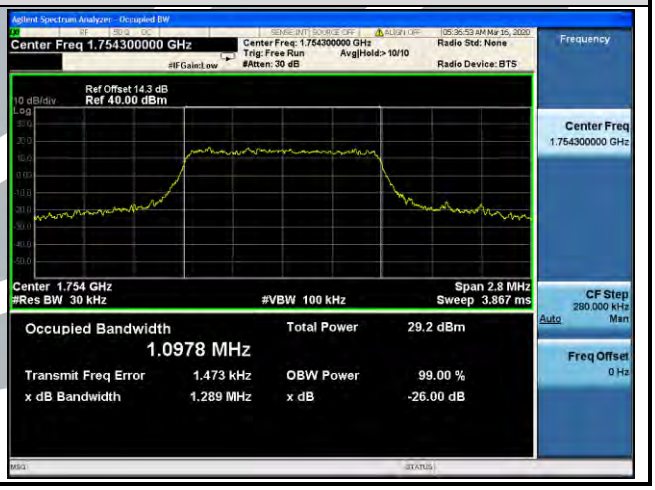
Test Mode: Link mode

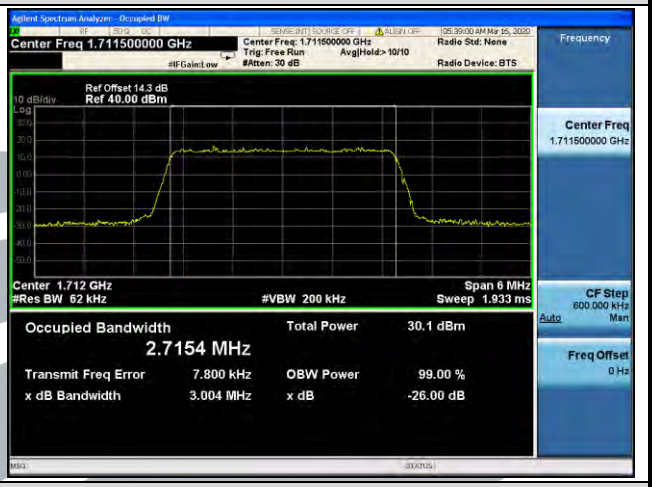
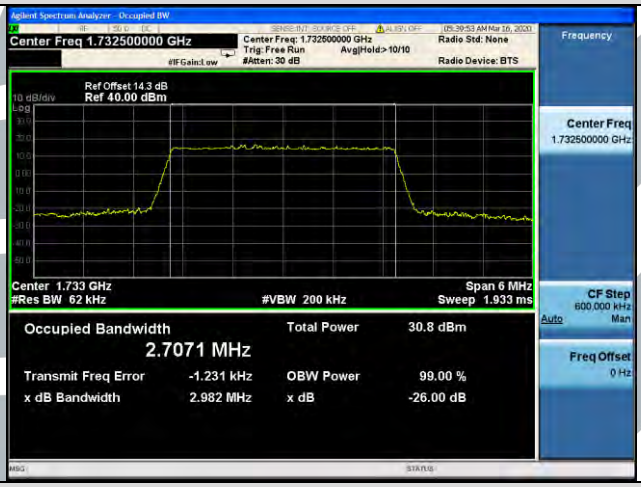
Test Results: Pass

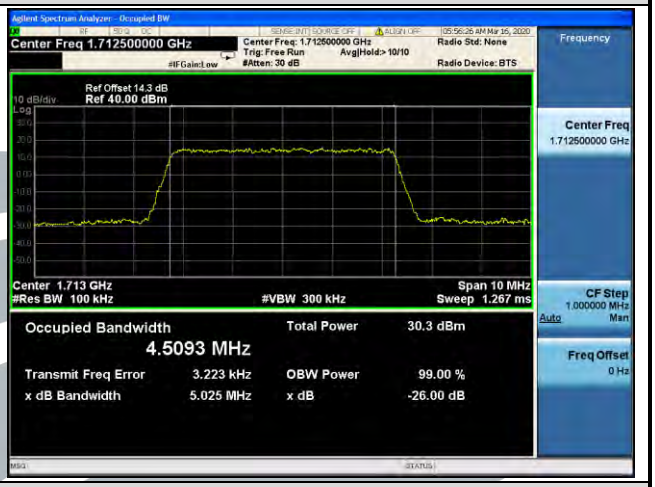
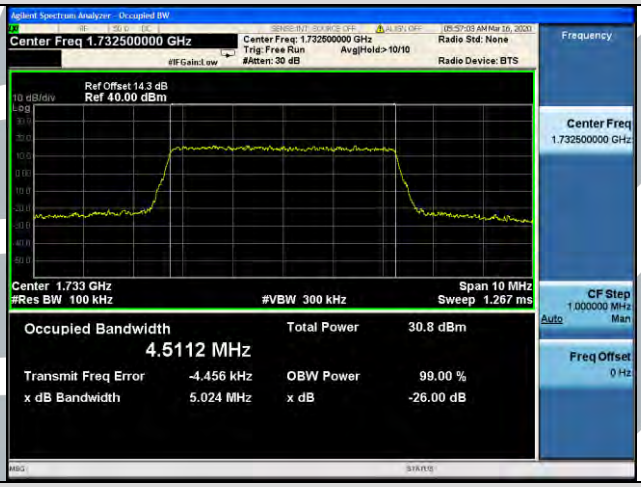
Test Data: See table below

5.5.1 LTE Band 4

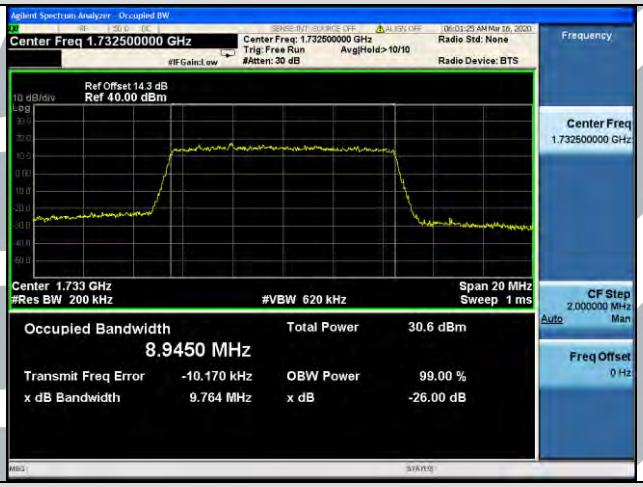
LTE Band 4								
Channel	RB Configuration		26 dB BW (MHz)			99% BW (MHz)		
	Size	Offset	QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
Channel Bandwidth: 1.4 MHz								
Lowest	6	0	1.300	1.306	/	1.0952	1.0979	/
Middle	6	0	1.328	1.281	/	1.0959	1.0967	/
Highest	6	0	1.298	1.289	/	1.1073	1.0978	/
Channel Bandwidth: 3 MHz								
Lowest	15	0	2.983	3.004	/	2.7065	2.7154	/
Middle	15	0	2.982	2.993	/	2.7071	2.7019	/
Highest	15	0	2.985	2.998	/	2.7063	2.6983	/
Channel Bandwidth: 5 MHz								
Lowest	25	0	5.032	5.025	/	4.5240	4.5093	/
Middle	25	0	5.024	5.007	/	4.5112	4.5275	/
Highest	25	0	5.010	5.025	/	4.5005	4.5093	/
Channel Bandwidth: 10 MHz								
Lowest	50	0	9.944	9.800	/	8.9764	8.9592	/
Middle	50	0	9.764	9.852	/	8.9450	8.9537	/
Highest	50	0	9.913	9.812	/	8.9757	8.9633	/
Channel Bandwidth: 15 MHz								
Lowest	75	0	14.74	14.59	/	13.440	13.446	/
Middle	75	0	14.57	14.54	/	13.386	13.415	/
Highest	75	0	14.71	14.74	/	13.460	13.471	/
Channel Bandwidth: 20 MHz								
Lowest	100	0	19.35	19.43	/	17.970	17.980	/
Middle	100	0	19.31	19.33	/	17.867	17.952	/
Highest	100	0	19.46	19.54	/	17.979	18.007	/

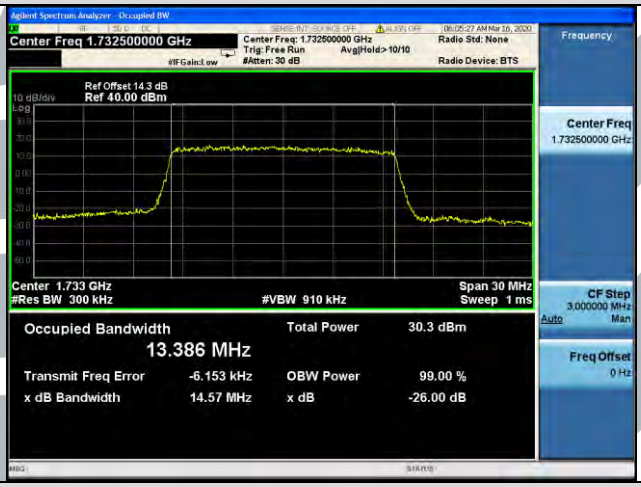
LTE Band 4_ Channel Bandwidth: 1.4 MHz	
QPSK	16QAM
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

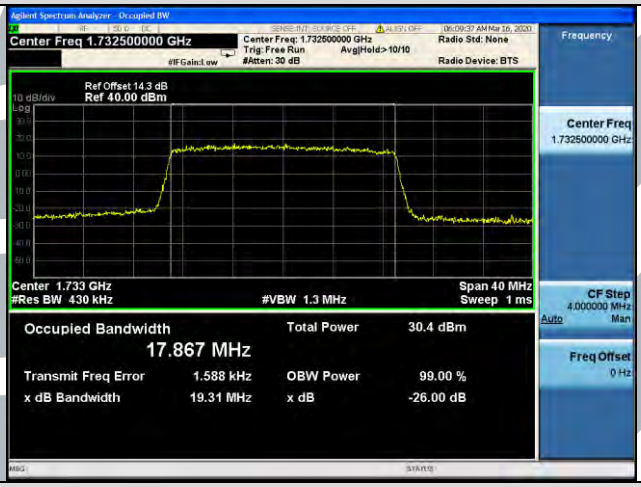
LTE Band 4_ Channel Bandwidth: 3 MHz	
QPSK	16QAM
Lowest Channel	
	
Middle Channel	
	
Highest Channel	

LTE Band 4_ Channel Bandwidth: 5 MHz	
QPSK	16QAM
Lowest Channel	
	
Middle Channel	
	
Highest Channel	

LTE Band 4_ Channel Bandwidth: 10 MHz

QPSK	16QAM
Lowest Channel	
Middle Channel	
	
Highest Channel	

LTE Band 4_ Channel Bandwidth: 15 MHz	
QPSK	16QAM
Lowest Channel	
Middle Channel	
	
Highest Channel	

LTE Band 4_ Channel Bandwidth: 20 MHz	
QPSK	**16QAM**
Lowest Channel	
Middle Channel	
	
Highest Channel	

5.5.2 LTE Band 13

LTE Band 13								
Channel	RB Configuration		26 dB BW (MHz)			99% BW (MHz)		
	Size	Offset	QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
Channel Bandwidth: 5 MHz								
Lowest	25	0	4.967	4.997	/	4.4925	4.4945	/
Middle	25	0	5.008	4.996	/	4.5133	4.5045	/
Highest	25	0	5.022	5.049	/	4.5141	4.5214	/
Channel Bandwidth: 10 MHz								
Lowest	50	0	9.944	9.767	/	8.9860	8.9661	/

LTE Band 13_ Channel Bandwidth: 5 MHz

QPSK	16QAM
Lowest Channel	
Middle Channel	
Highest Channel	

LTE Band 13_ Channel Bandwidth: 10 MHz	
QPSK	16QAM
Lowest Channel	

5.6 BAND EDGE AT ANTENNA TERMINALS

Test Requirement: **LTE Band 4:** FCC 47 CFR Part 27.53(h)(1)
LTE Band 13: FCC 47 CFR Part 27.53(c)(2)

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01

Limit:

FCC 47 CFR Part 27.53(h)(1):
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. The emission limit equal to -13 dBm.

FCC 47 CFR Part 27.53(c)(2):
On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

Test Procedure:
The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.
For each band edge measurement:
1) Set the spectrum analyzer span to include the block edge frequency.
2) Set a marker to point the corresponding band edge frequency in each test case.
3) Set display line at -13 dBm
4) Set resolution bandwidth to at least 1% of emission bandwidth.
5) Set spectrum analyzer with RMS detector.
6) Record the max trace plot into the test report

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.2.2 for details.

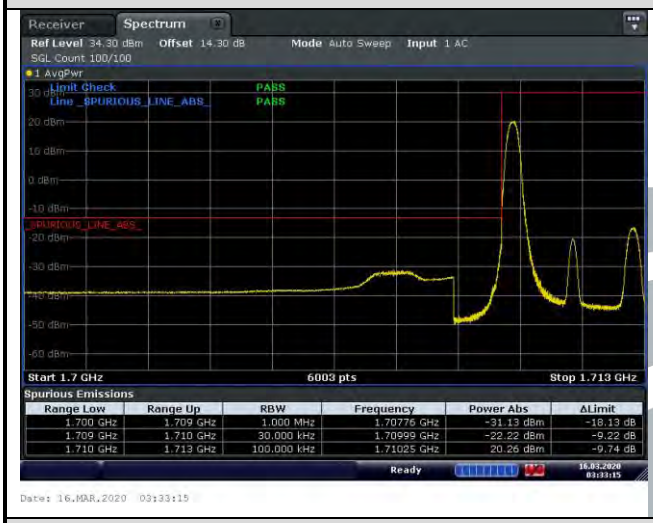
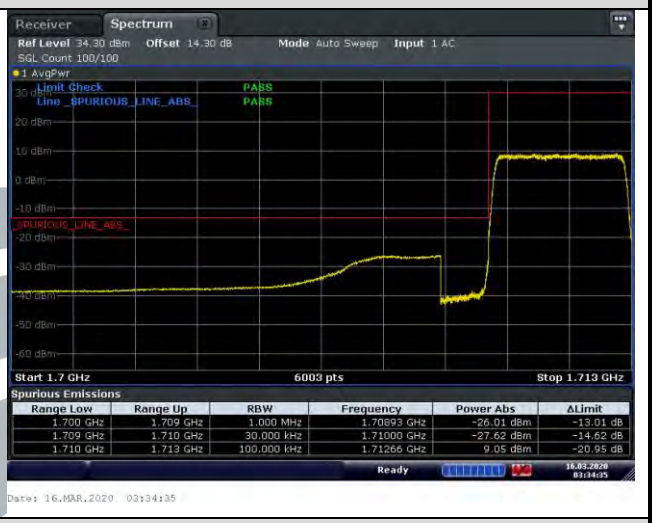
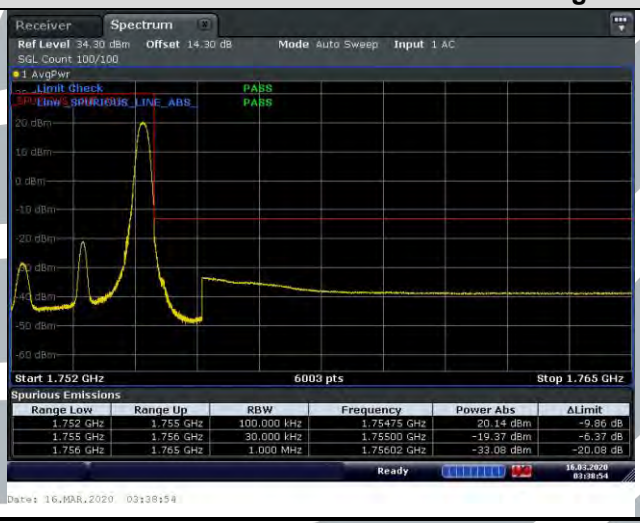
Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

5.6.1 LTE Band 4

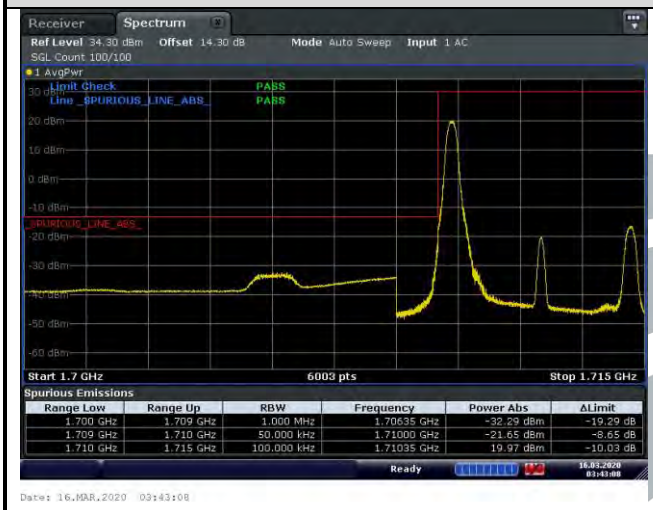
LTE Band 4 / 1.4 MHz / QPSK	
1 RB	**Full RB**
Lowest Channel	
Highest Channel	

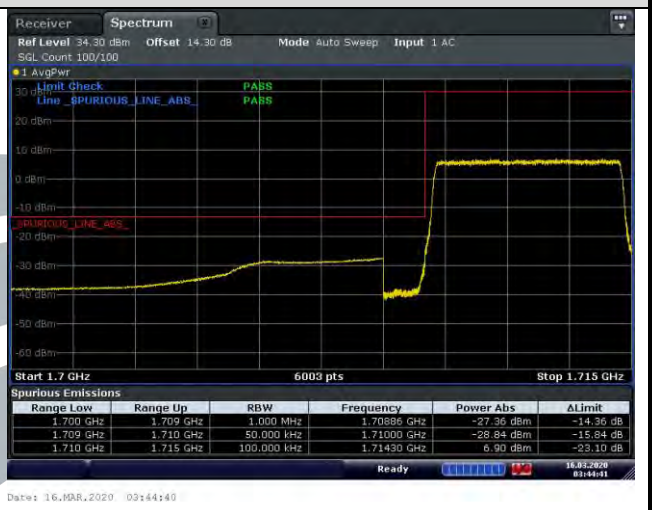
LTE Band 4 / 3 MHz / QPSK	
1 RB	Full RB
Lowest Channel	
	
Highest Channel	
	

LTE Band 4 / 5 MHz / QPSK

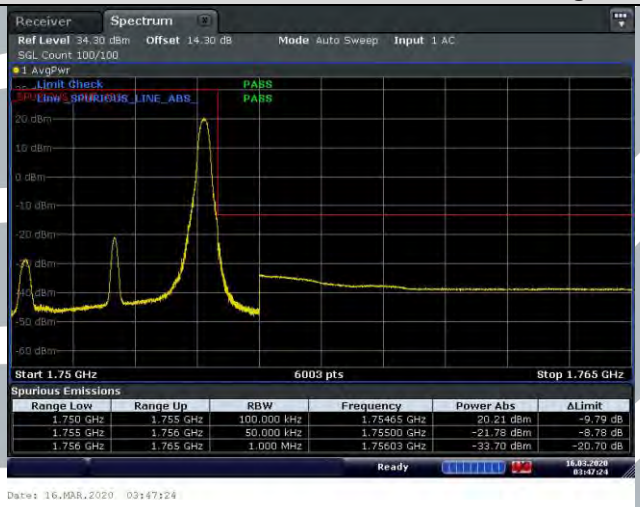
1 RB	Full RB

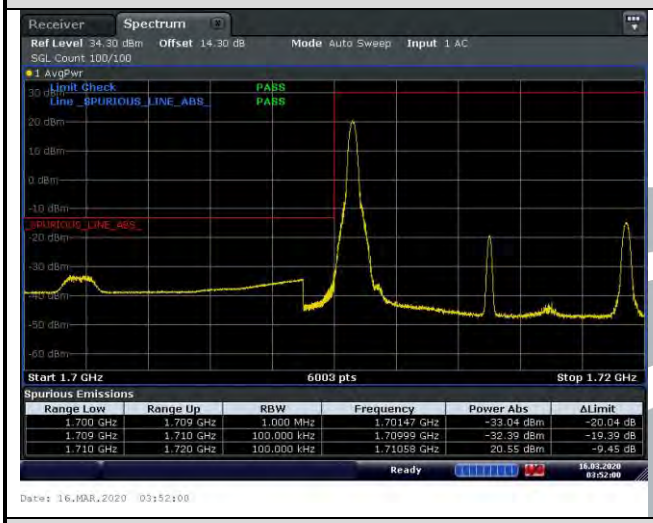
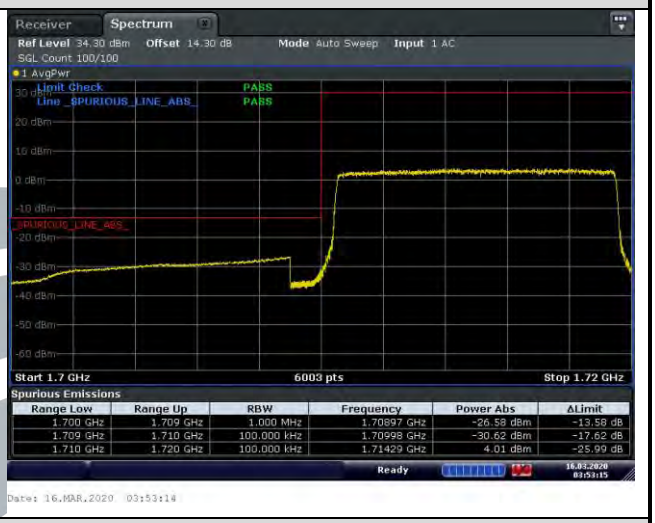
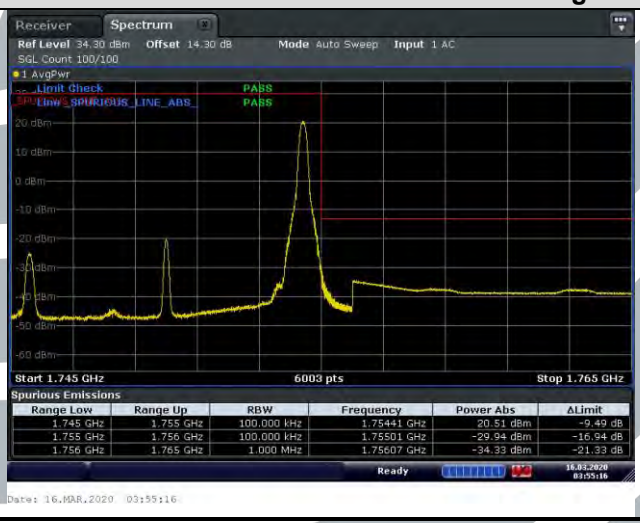
Lowest Channel

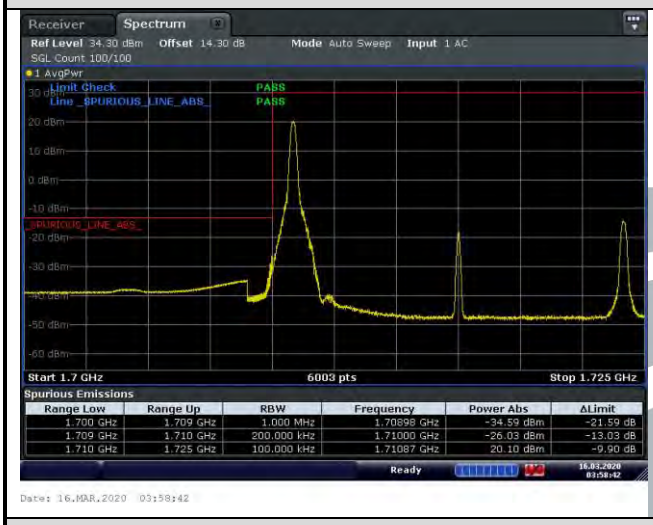
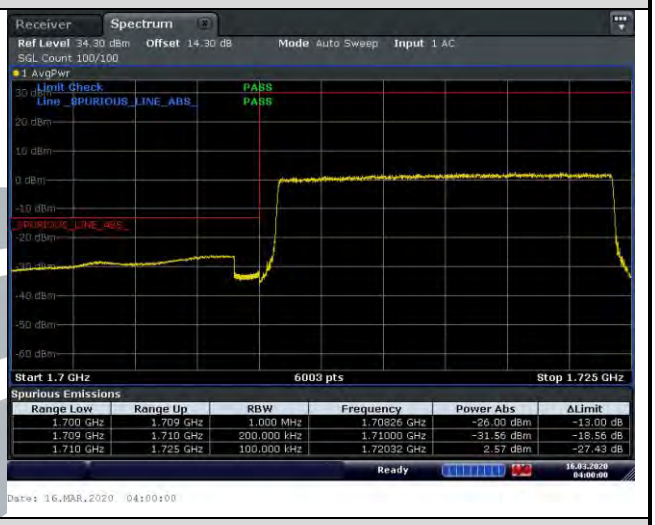
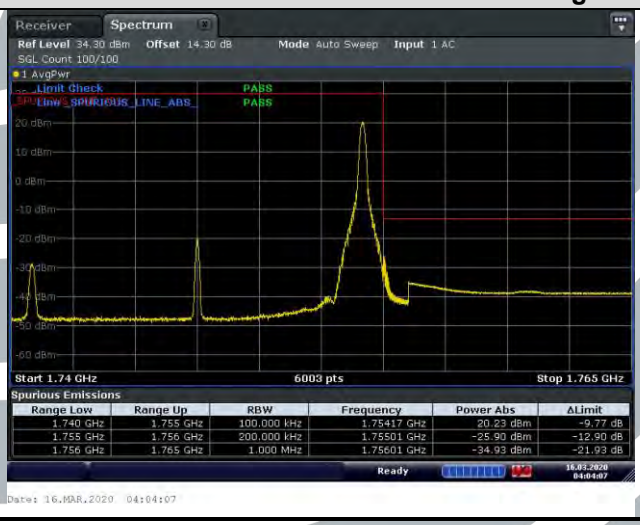




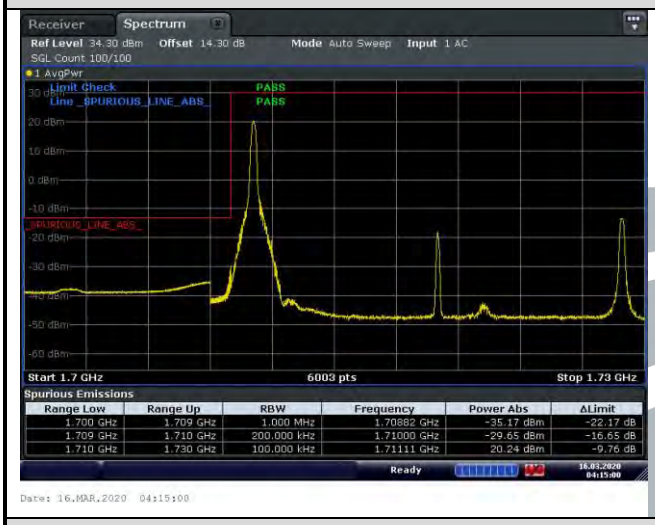
Highest Channel

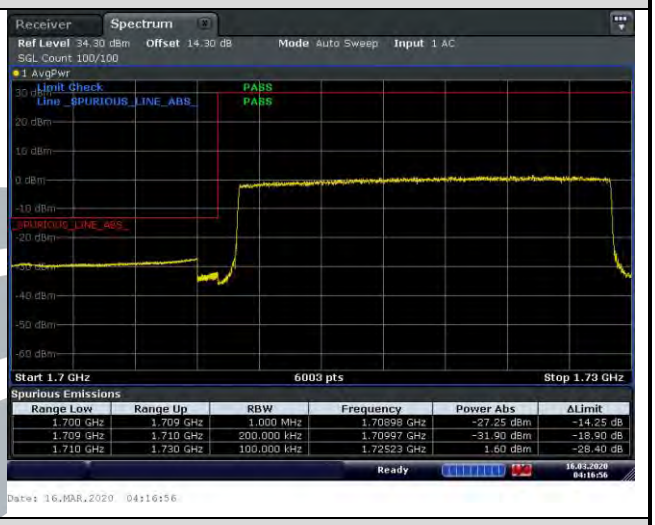


LTE Band 4 / 10 MHz / QPSK	
1 RB	Full RB
Lowest Channel	
	
Highest Channel	
	

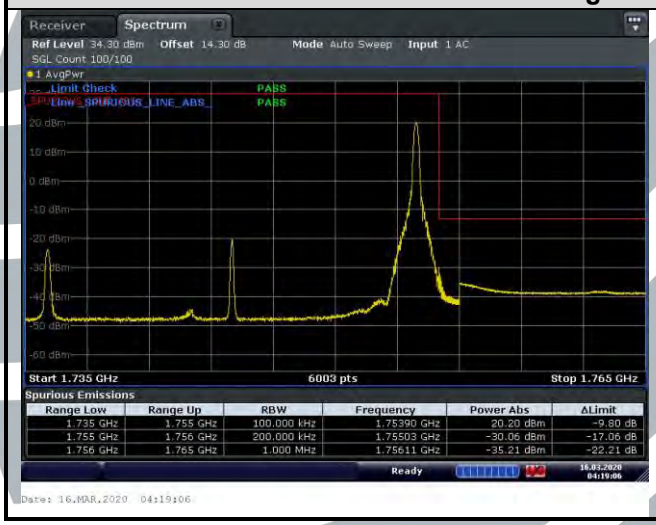
LTE Band 4 / 15 MHz / QPSK	
1 RB	Full RB
Lowest Channel	
	
Highest Channel	
	

LTE Band 4 / 20 MHz / QPSK	
1 RB	Full RB
Lowest Channel	





Highest Channel	



LTE Band 4 / 1.4 MHz / 16QAM

1 RB	Full RB

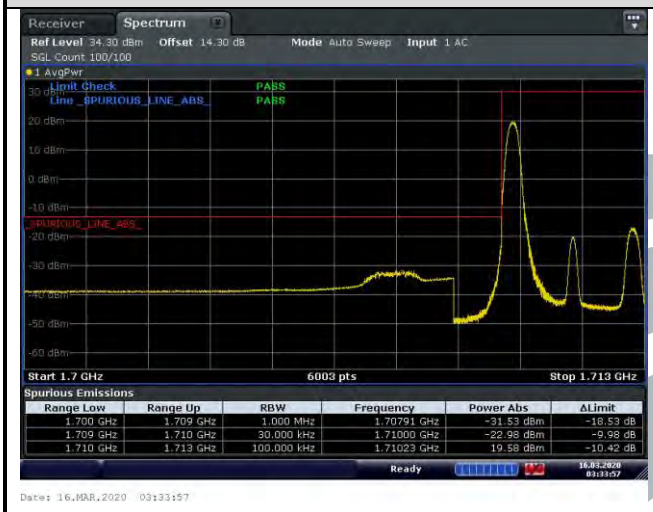
Lowest Channel

Highest Channel

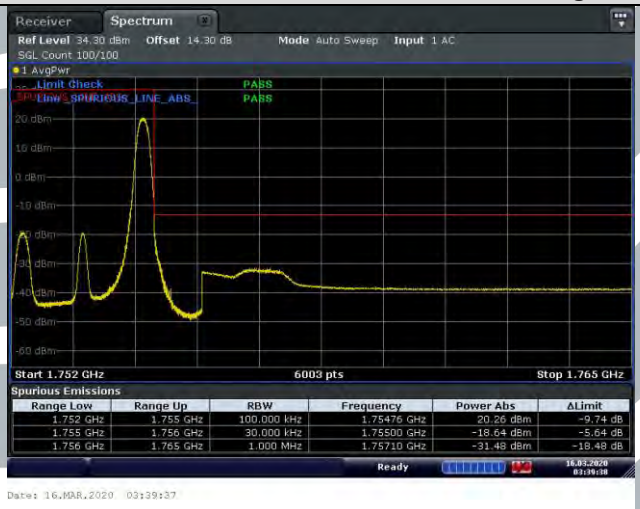
LTE Band 4 / 3 MHz / 16QAM

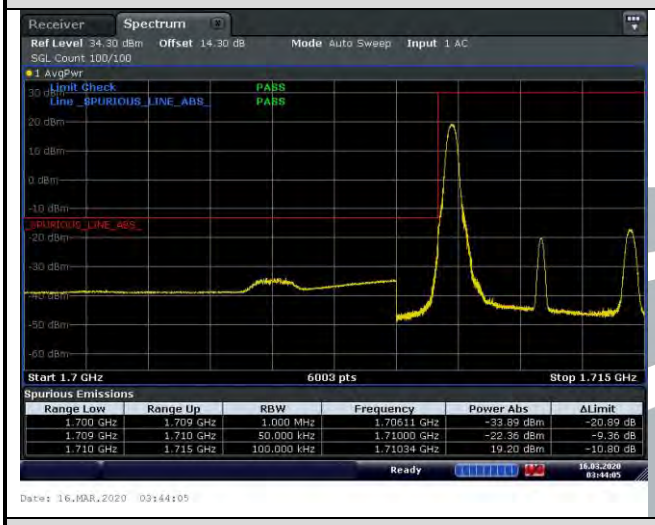
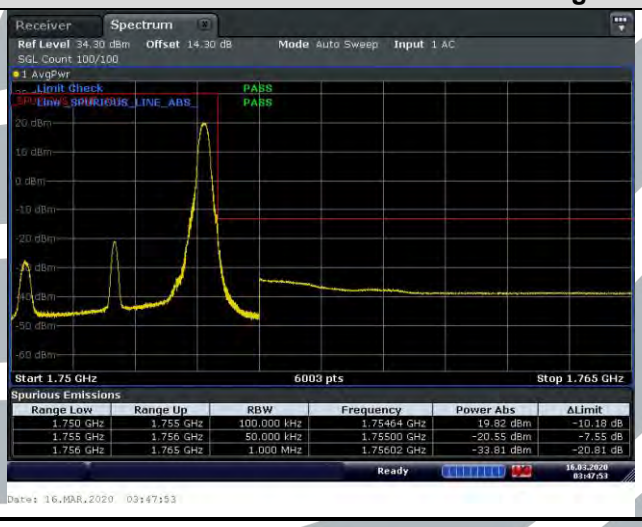
1 RB	Full RB

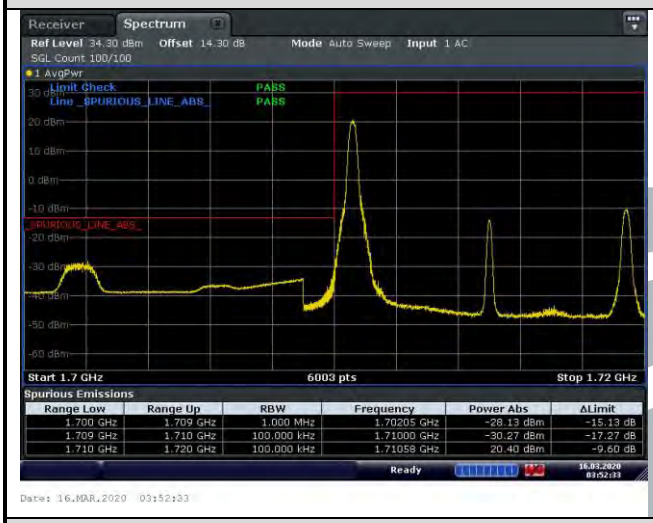
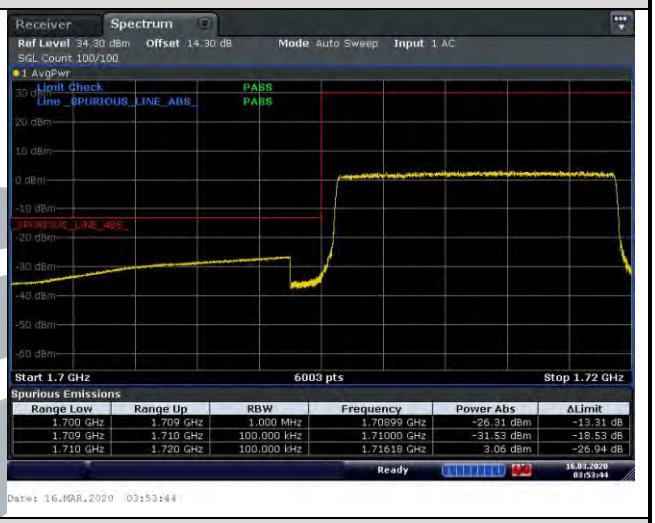
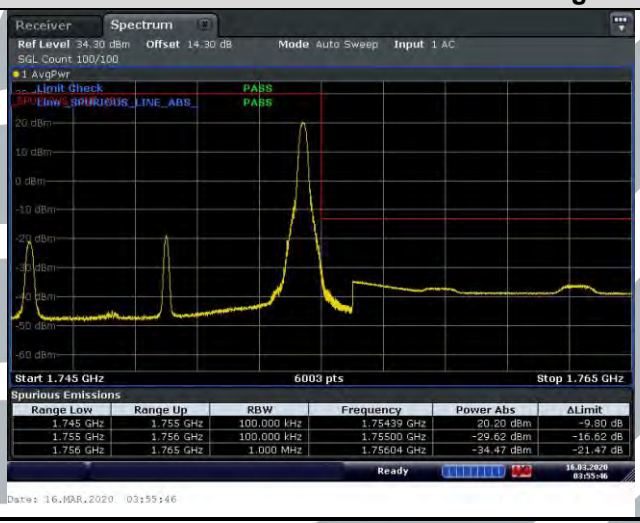
Lowest Channel

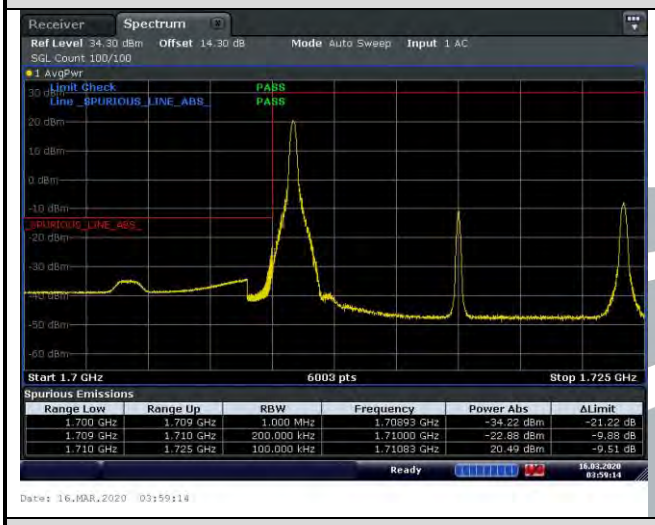
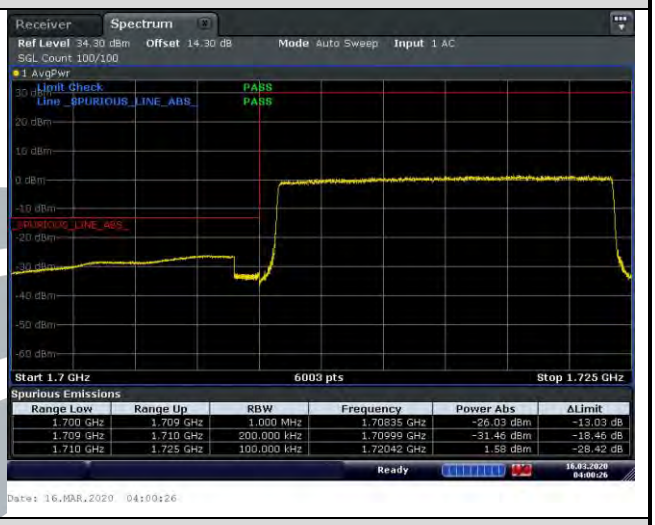
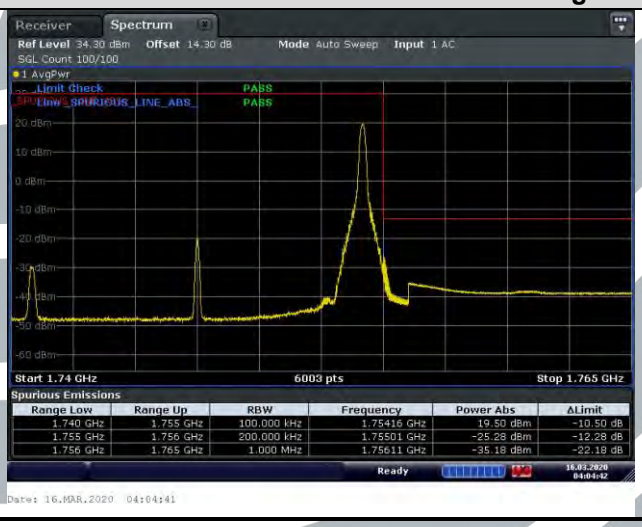


Highest Channel

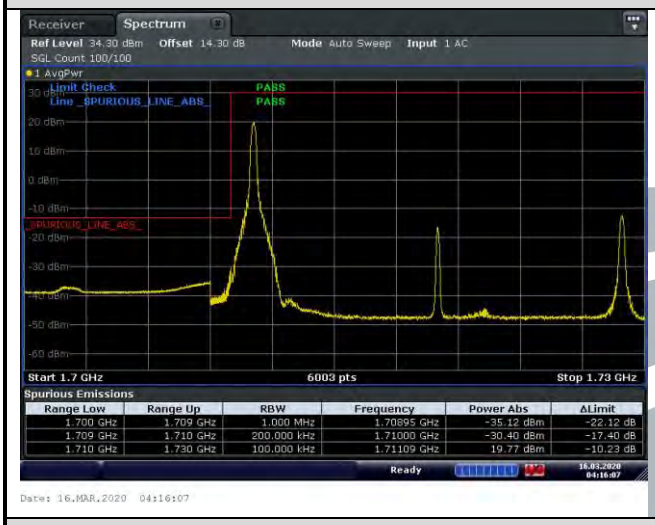


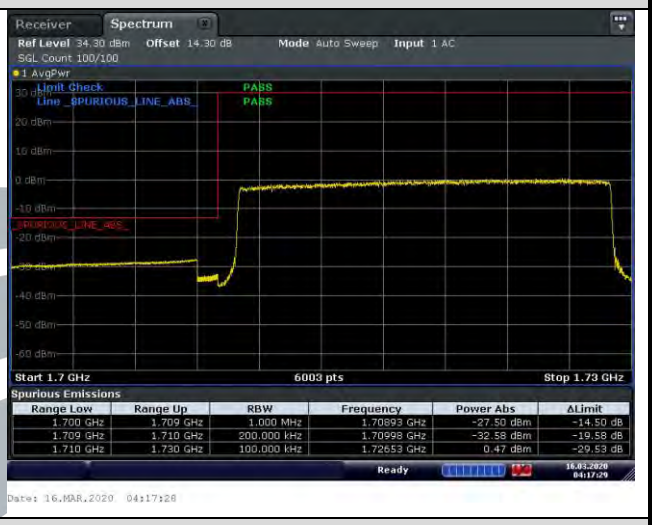
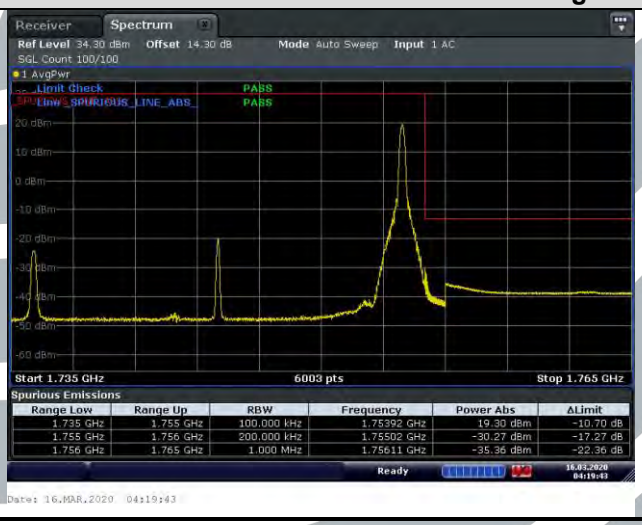
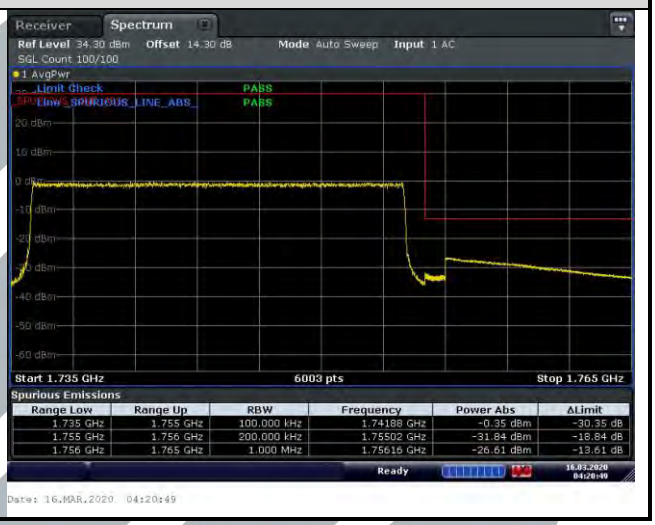
LTE Band 4 / 5 MHz / 16QAM	
1 RB	Full RB
Lowest Channel	
	
Highest Channel	
	

LTE Band 4 / 10 MHz / 16QAM	
1 RB	Full RB
Lowest Channel	
	
Highest Channel	
	

LTE Band 4 / 15 MHz / 16QAM	
1 RB	Full RB
Lowest Channel	
	
Highest Channel	
	

LTE Band 4 / 20 MHz / 16QAM	
1 RB	Full RB
Lowest Channel	





Highest Channel