CERTIFICATION TEST REPORT

Report Number. : 4790430333-E8V1

Applicant	:	SAMSUNG ELECTRONICS CO., LTD. 129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
Model	:	SM-T638U
FCC ID	:	A3LSMT638U
EUT Description	:	WCDMA/LTE/5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac/ax and NFC
Test Standard(s)	:	FCC CFR 47 PART 96

Date Of Issue:
2022-08-11

Prepared by:
UL Korea, Ltd.
26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea

Suwon Test Site: UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433

IAS ACCREDITED
Testing Laboratory
TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2022-08-11	Initial issue	Yeonhee Lim

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_96 (04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

TABLE OF CONTENTS

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_96 (04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	WCDMA/LTE/5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac/ax and NFC.
MODEL NUMBER:	SM-T638U
SERIAL NUMBER:	R32T60014XW (CONDUTED); R32T60014XW (RADIATED);
DATE TESTED:	2022-07-27 ~ 2022-08-11

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 96	Complies

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

Seokhwan Hong
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Yeonhee Lim
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 96.
3. ANSI TIA-603-E, 2016
4. ANSI C63.26, 2015
5. KDB 971168 D01 Power Meas License Digital Systems v03r01
6. KDB 412172 D01 Determining ERP and EIRP v01r01

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
☒ Chamber 1(3m semi-anechoic chamber)
☐ Chamber 2(3m semi-anechoic chamber)
☐ Chamber 3(3m semi-anechoic chamber)
☒ Chamber 4(3m Full-anechoic chamber)
☐ Chamber 5(3m Full-anechoic chamber)

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

EIRP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss(between the SG and substitution antenna) + Substitution Antenna Factor (dBi)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.02 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.78 dB
Radiated Disturbance, Above 18 GHz	5.58 dB

Uncertainty figures are valid to a confidence level of 95%.

4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2021.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a WCDMA/LTE/5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac/ax and NFC.
This test report addresses the WWAN operational mode.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The transmitter has a maximum average radiated EIRP output powers as follows:

LTE Band 48

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				Measured Pwr (dBm)			MPR	Tune-up Limit
				55340	55990	56640		
				3560 MHz	3625 MHz	3690 MHz		
20 MHz	QPSK	1	0	21.10	21.14	20.99	0.0	22.7
		1	49	21.09	21.13	20.92	0.0	22.7
		1	99	21.12	21.10	20.89	0.0	22.7
		50	0	19.95	20.09	19.92	1.0	21.7
		50	24	20.16	20.21	20.01	1.0	21.7
		50	50	20.10	20.19	19.81	1.0	21.7
		100	0	20.09	20.14	19.88	1.0	21.7
	16QAM	1	0	20.11	20.29	20.12	1.0	21.7
		1	49	20.10	20.31	20.04	1.0	21.7
		1	99	20.12	20.31	20.02	1.0	21.7
		50	0	18.97	19.18	18.98	2.0	20.7
		50	24	19.14	19.25	19.03	2.0	20.7
		50	50	19.10	19.22	18.89	2.0	20.7
		100	0	19.07	19.17	18.91	2.0	20.7
	64QAM	1	0	19.52	19.57	19.43	2.0	20.7
		1	49	19.57	19.64	19.35	2.0	20.7
		1	99	19.58	19.51	19.32	2.0	20.7
		50	0	18.02	18.15	17.98	3.0	19.7
		50	24	18.17	18.25	18.05	3.0	19.7
		50	50	18.15	18.19	17.88	3.0	19.7
		100	0	18.12	18.16	17.92	3.0	19.7
	256QAM	1	0	15.74	15.94	15.71	5.0	17.7
		1	49	16.19	16.28	16.04	5.0	17.7
		1	99	16.01	16.01	15.64	5.0	17.7
		50	0	16.00	16.14	15.97	5.0	17.7
		50	24	16.23	16.23	16.04	5.0	17.7
		50	50	16.20	16.18	15.89	5.0	17.7
		100	0	16.14	16.13	15.98	5.0	17.7

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BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
				55315	55990	56665		
				3557.5 MHz	3625 MHz	3692.5 MHz		
15 MHz	QPSK	1	0	21.01	21.07	20.93	0.0	22.7
		1	37	21.03	21.05	20.84	0.0	22.7
		1	74	21.08	21.09	20.83	0.0	22.7
		36	0	20.07	20.13	19.94	1.0	21.7
		36	20	20.13	20.17	19.99	1.0	21.7
		36	39	20.15	20.18	19.96	1.0	21.7
		75	0	20.08	20.15	19.94	1.0	21.7
	16QAM	1	0	20.03	20.13	19.94	1.0	21.7
		1	37	20.07	20.15	19.89	1.0	21.7
		1	74	20.09	20.10	19.88	1.0	21.7
		36	0	19.12	19.12	18.95	2.0	20.7
		36	20	19.15	19.20	19.02	2.0	20.7
		36	39	19.12	19.21	18.97	2.0	20.7
		75	0	19.08	19.15	18.95	2.0	20.7
	64QAM	1	0	18.65	18.69	18.62	2.0	20.7
		1	37	18.74	18.85	18.55	2.0	20.7
		1	74	18.78	18.72	18.48	2.0	20.7
		36	0	18.17	18.18	18.05	3.0	19.7
		36	20	18.24	18.25	18.10	3.0	19.7
		36	39	18.21	18.27	18.04	3.0	19.7
		75	0	18.10	18.16	17.98	3.0	19.7
	256QAM	1	0	15.89	16.06	15.97	5.0	17.7
		1	37	16.23	16.28	16.08	5.0	17.7
		1	74	16.15	16.18	15.88	5.0	17.7
		36	0	16.15	16.16	16.05	5.0	17.7
		36	20	16.25	16.24	16.08	5.0	17.7
		36	39	16.16	16.21	16.01	5.0	17.7
		75	0	16.15	16.18	16.04	5.0	17.7

BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
				55290	55990	56690		
				3555 MHz	3625 MHz	3695 MHz		
10 MHz	QPSK	1	0	21.15	21.22	21.02	0.0	22.7
		1	25	21.12	21.22	20.96	0.0	22.7
		1	49	21.22	21.24	21.07	0.0	22.7
		25	0	20.12	20.14	20.00	1.0	21.7
		25	12	20.27	20.29	20.17	1.0	21.7
		25	25	20.26	20.28	20.10	1.0	21.7
		50	0	20.19	20.16	20.08	1.0	21.7
	16QAM	1	0	20.25	20.32	20.13	1.0	21.7
		1	25	20.24	20.23	20.04	1.0	21.7
		1	49	20.23	20.30	20.07	1.0	21.7
		25	0	19.18	19.17	19.03	2.0	20.7
		25	12	19.28	19.30	19.16	2.0	20.7
		25	25	19.27	19.26	19.08	2.0	20.7
		50	0	19.25	19.20	19.07	2.0	20.7
	64QAM	1	0	18.85	18.86	18.66	2.0	20.7
		1	25	18.92	18.95	18.75	2.0	20.7
		1	49	18.87	18.88	18.70	2.0	20.7
		25	0	18.19	18.19	18.00	3.0	19.7
		25	12	18.34	18.33	18.18	3.0	19.7
		25	25	18.28	18.28	18.18	3.0	19.7
		50	0	18.23	18.22	18.05	3.0	19.7
	256QAM	1	0	16.11	16.09	15.92	5.0	17.7
		1	25	16.42	16.49	16.25	5.0	17.7
		1	49	16.27	16.24	16.15	5.0	17.7
		25	0	16.20	16.17	15.98	5.0	17.7
		25	12	16.32	16.33	16.21	5.0	17.7
		25	25	16.25	16.27	16.09	5.0	17.7
		50	0	16.28	16.26	16.10	5.0	17.7

BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
				55265	55990	56715		
				3552.5 MHz	3625 MHz	3697.5 MHz		
5 MHz	QPSK	1	0	20.97	21.02	20.96	0.0	22.7
		1	12	21.18	21.25	21.03	0.0	22.7
		1	24	21.14	21.14	21.02	0.0	22.7
		12	0	20.21	20.22	20.12	1.0	21.7
		12	7	20.31	20.35	20.18	1.0	21.7
		12	13	20.33	20.29	20.16	1.0	21.7
		25	0	20.27	20.24	20.11	1.0	21.7
	16QAM	1	0	20.19	20.02	19.86	1.0	21.7
		1	12	20.43	20.13	20.02	1.0	21.7
		1	24	20.34	20.18	19.92	1.0	21.7
		12	0	19.23	19.27	19.02	2.0	20.7
		12	7	19.36	19.39	19.19	2.0	20.7
		12	13	19.35	19.29	19.12	2.0	20.7
		25	0	19.26	19.25	19.12	2.0	20.7
	64QAM	1	0	18.87	18.83	19.08	2.0	20.7
		1	12	19.02	19.08	19.25	2.0	20.7
		1	24	18.95	18.94	19.19	2.0	20.7
		12	0	18.13	18.18	17.97	3.0	19.7
		12	7	18.33	18.36	18.08	3.0	19.7
		12	13	18.30	18.28	18.12	3.0	19.7
		25	0	18.32	18.27	17.98	3.0	19.7
	256QAM	1	0	16.36	16.36	16.05	5.0	17.7
		1	12	16.56	16.70	16.27	5.0	17.7
		1	24	16.57	16.49	16.16	5.0	17.7
		12	0	16.21	16.24	16.05	5.0	17.7
		12	7	16.31	16.36	16.18	5.0	17.7
		12	13	16.28	16.28	16.15	5.0	17.7
		25	0	16.24	16.24	16.07	5.0	17.7

LTE Band 48

FCC Part 96							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 48	3560 - 3690	20	QPSK	21.14	130.02	21.70	147.81
			16QAM	20.31	107.40	20.93	123.79
			64QAM	19.64	92.04		
			256QAM	16.28	42.46		
	3557.5 -3692.5	15	QPSK	21.09	128.53	**21.82**	**152.21**
			16QAM	20.15	103.51	21.50	141.40
			64QAM	18.85	76.74		
			256QAM	16.28	42.46		
	3555 - 3695	10	QPSK	21.24	133.05	21.68	147.39
			16QAM	20.32	107.65	21.11	129.26
			64QAM	18.95	78.52		
			256QAM	16.49	44.57		
	3552.5 - 3697.5	5	QPSK	**21.25**	**133.35**	21.70	147.91
			16QAM	20.43	110.41	21.55	142.89
			64QAM	19.25	84.14		
			256QAM	16.70	46.77		

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a internal antenna for the supported bands with a maximum peak gain as follow:

Frequency (MHz)	Peak Gain (dBi)
LTE Band 48 3550 ~ 3700 MHz	1.40

5.4. WORST-CASE ORIENTATION

Following modes should be considered as worst-case scenario for all other measurements.

For all LTE Band 48, 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. However, the out of band emissions and spurious radiation were only performed on bandwidth and RB offset(with RB size 1) with the highest power in QPSK and 16QAM results were worst case.

Highest power setting for each bands				
LTE Band	**Frequency (MHz)**	**Bandwidth (MHz)**	**RB size**	**RB offset**
48	3557.5	15	1	74
	3625.0		1	74
	3692.5		1	0

The fundamental and radiated spurious emission were investigated in three orthogonal orientations X, Y and Z, it was determined that below orientation was worst-case orientation for each band.

Band	**EIRP**			**RSE**		
	X	**Y**	**Z**	**X**	**Y**	**Z**
LTE B48	O	-	-	O	-	-

Note : For EIRP testing, the EUT didn't attached with travel adapter. But radiated spurious testing, the EUT attached with travel adapter for the worst case condition. The EUT is continuously communicated with the call box during the tests.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacture**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA200	R37N6K421B2SE3	N/A
Data Cable	SAMSUNG	EP-DT725BWE	GH39-02020A	N/A
Earphone	SAMSUNG	EP-TA800	R37N3MAH988DK3	N/A
Charger	SAMSUNG	EP-DN980	GH39-02115A	N/A
Data Cable	SAMSUNG	EP--DT725BWE	GH39-02020A	N/A

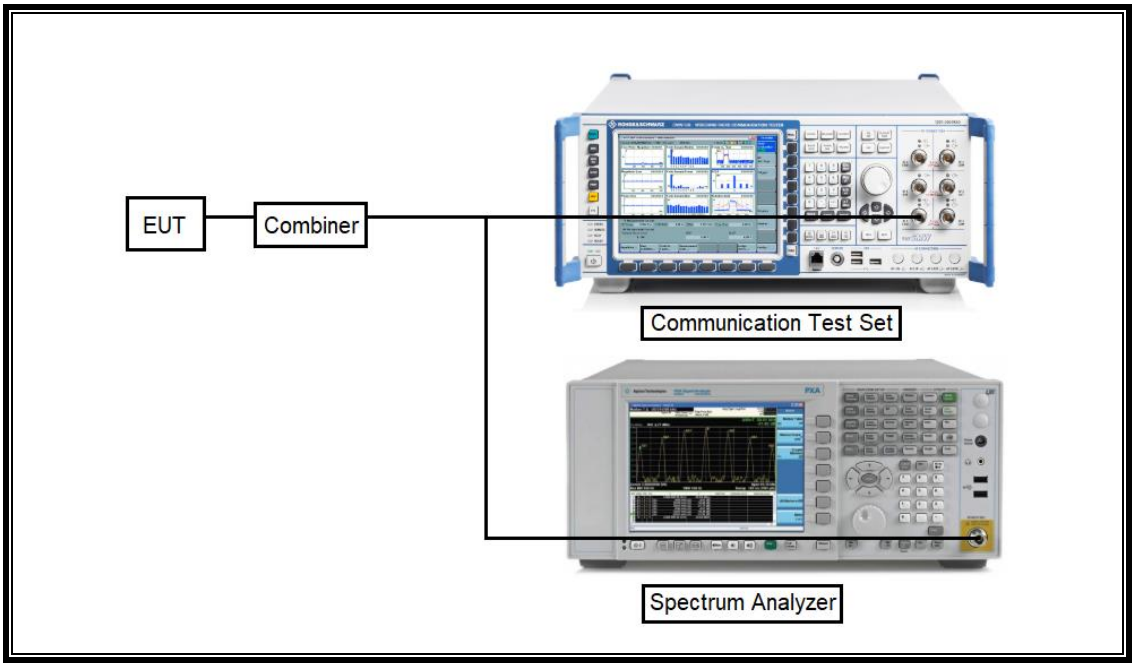
I/O CABLE

I/O Cable List						
Cable No.	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Power	1	C to C Type	Shielded	1.0 m	N/A
2	DC Power	1	C to A Type	Shielded	1.0 m	N/A
3	Audio	2	Mini-jack	Unshielded	0.7 m	N/A

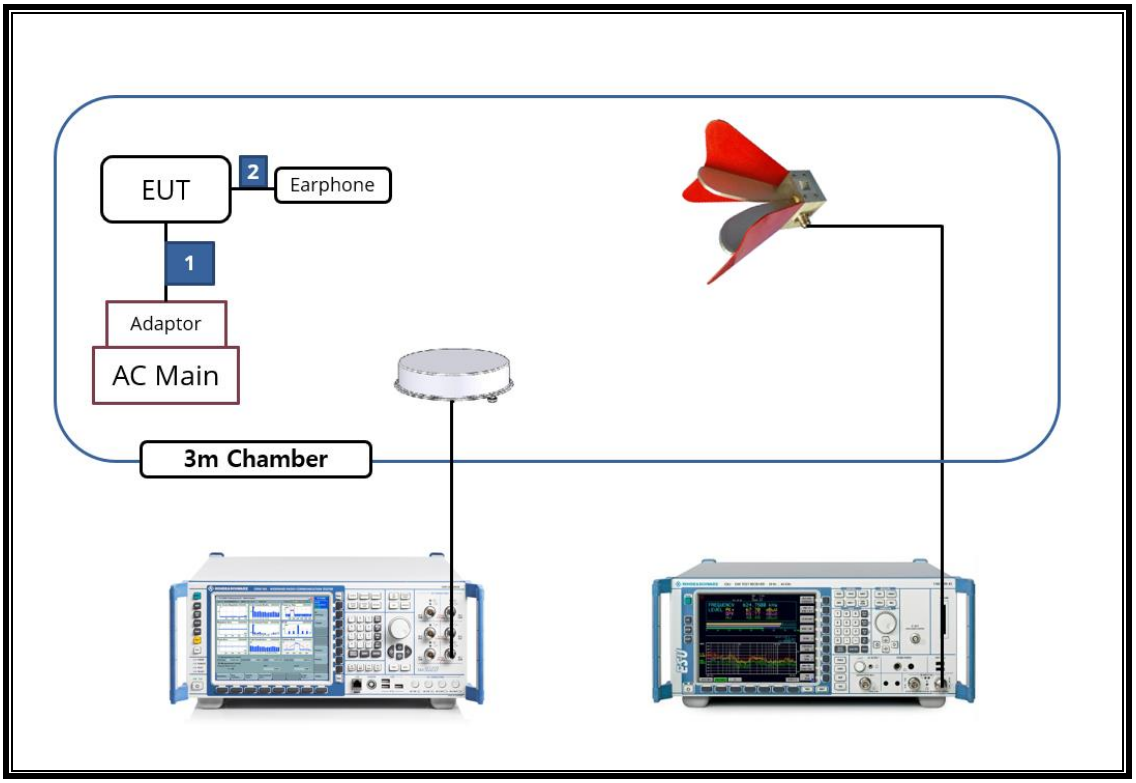
TEST SETUP

The EUT is continuously communicated with the call box during the tests.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121D DB4	00164753	2023-02-08
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	110367-0003	N/A
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
Antenna, Horn, 40 GHz	ETS	3116C	00168645	2023-10-13
Preamplifier	ETS	3116C-PA	00168841	2023-08-04
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2022-08-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2022-08-13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022-08-13
Antenna, Horn, 18 GHz	ETS	3115	00161451	2022-08-15
Antenna, Horn, 18 GHz	ETS	3117	00168717	2022-08-15
Communications Test Set	R&S	CMW500	169796	2023-01-07
DC Power Supply	Agilent / HP	E3640A	MY54226395	2023-08-02
Preamplifier, 1000 MHz	Sonoma	310N	341282	2023-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2023-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2023-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029168	2023-08-01
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2023-08-01
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2023-08-03
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2023-08-01
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2023-08-02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2023-07-29
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	2023-08-01
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	2023-08-01
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	2023-08-01
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	2023-08-01
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	2023-08-02
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	2023-08-01
Attenuator	PASTERNACK	PE7087-10	A009	2023-08-03
Attenuator	PASTERNACK	PE7087-10	A001	2023-08-03
Attenuator	PASTERNACK	PE7087-10	A008	2023-08-03
Attenuator	PASTERNACK	PE7004-10	2	2023-08-01
Attenuator	PASTERNACK	PE7395-10	A011	2023-08-03
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
Temperature Chamber	ESPEC	SH-642	93001109	2023-08-01
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2023-01-11
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2023-01-11
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	MY58120110	2023-01-07

UL Software			
Description	**Manufacturer**	**Model**	**Version**
Antenna port test software	UL	CLT	Ver 3.4
Radiated software	UL	UL EMC	Ver 9.5
Antenna port test software (5G NR FR1)	UL	UL iM	Ver 1.06

7. SUMMARY TABLE

FCC & IC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Bandwidth(99%)	N/A	Conducted	Pass
2.1046	Conducted output power	N/A		Pass
2.1051 96.41(e)(ii)	Out of band emissions	Section 9.2 & 9.3		Pass
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		Pass
96.47	End user device additional requirements (CBSD Protocol)	Section 9.5		Not performed[Note]
96.41(b)	Equivalent Isotropic Radiated Power	23 dBm	Radiated	Pass
2.1053 96.41(e)	Radiated Spurious Emission	-40 dBm		Pass

Note. Please refer to CBSD Protocol test report. See the Section 9.5

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8. RF OUTPUT POWER

8.1. CONDUCTED AND EIRP VERIFICATION

Rule Part(s)

FCC: §2.1046, §96.41

EIRP Limit

FCC: §96.41(b)

(b) Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table.

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
End User Device	23	n/a

Test Procedure

TIA-603-E Clause 2.2.17
KDB 971168 Section 5.6

$EIRP = P_{Meas} + G_T - L_C$
where:
EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas}, typically dBW or dBm);
P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;
G_T = gain of the transmitting antenna, in dBi (EIRP);
L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.2

RESULTS

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted and EIRP output powers as follows:

8.2. PEAK TO AVERAGE RATIO

Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v03r01;

Test Spec

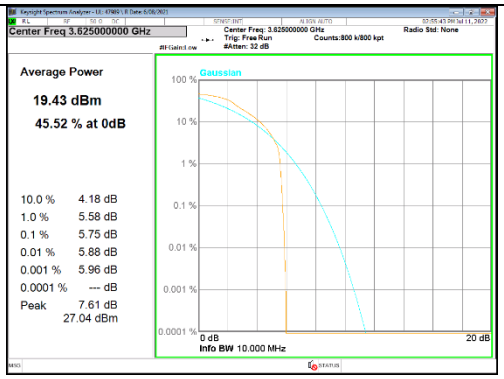
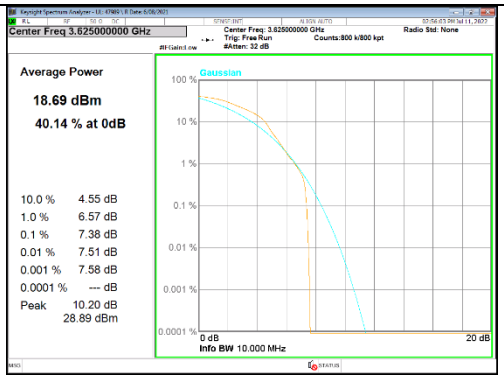
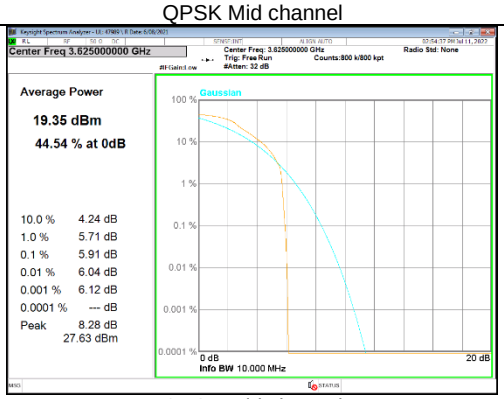
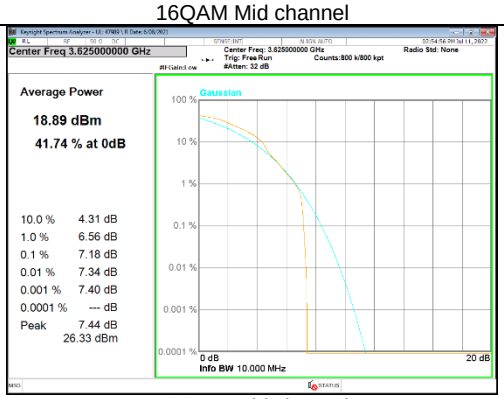
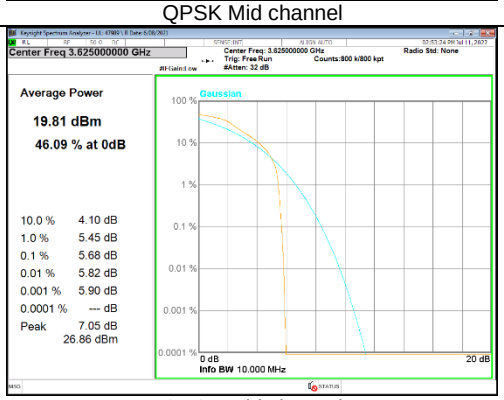
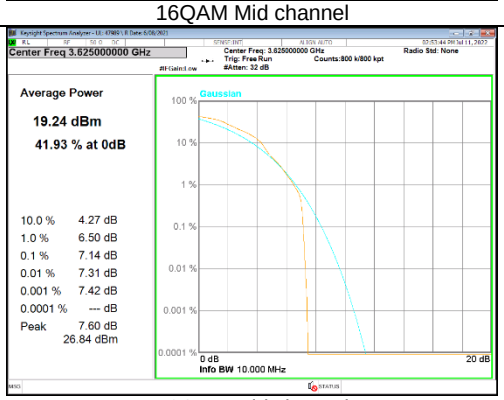
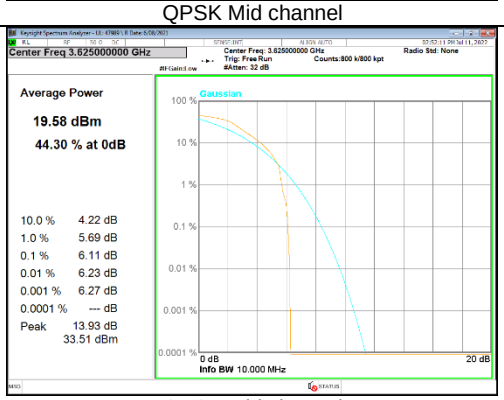
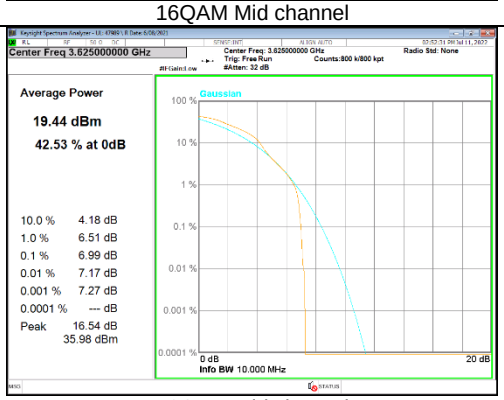
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

RESULTS

See the following pages.

8.2.1. CONDUCTED PEAK TO AVERAGE RESULT

LTE Band 48

20 MHz	 QPSK Mid channel	 16QAM Mid channel
15 MHz	 QPSK Mid channel	 16QAM Mid channel
10 MHz	 QPSK Mid channel	 16QAM Mid channel
5 MHz	 QPSK Mid channel	 16QAM Mid channel

9. LIMITS AND CONDUCTED RESULTS

9.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

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

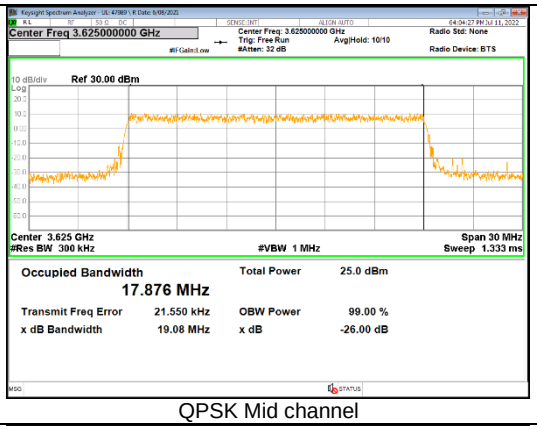
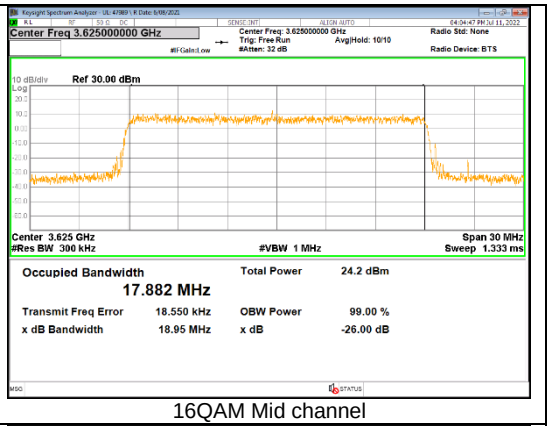
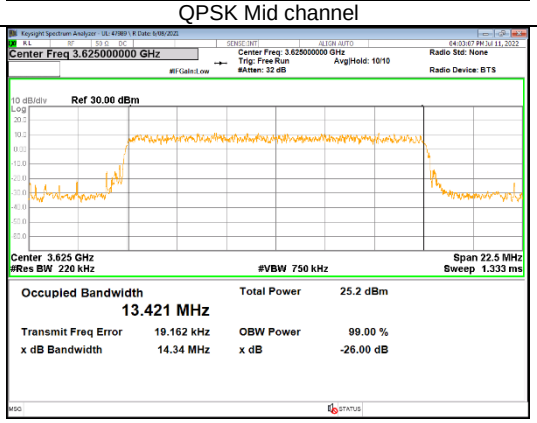
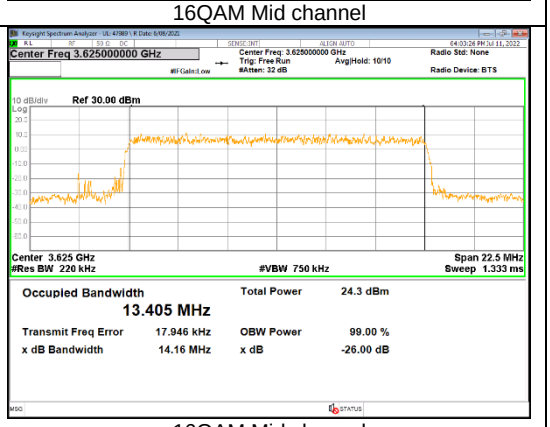
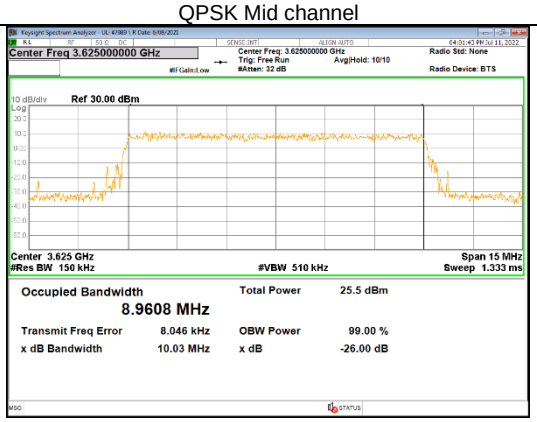
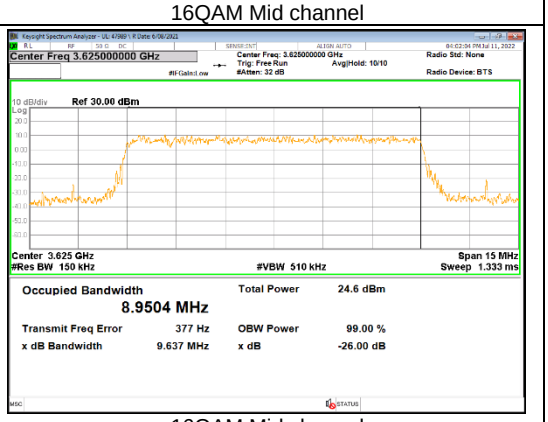
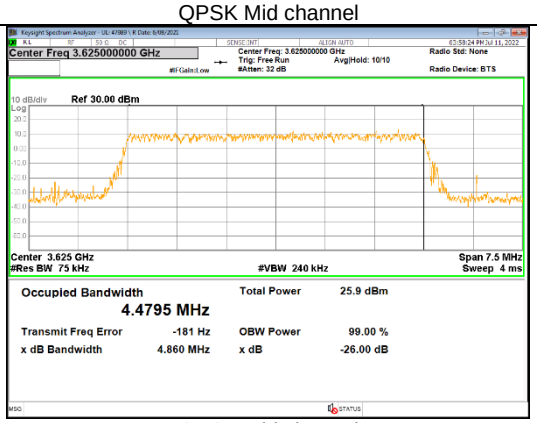
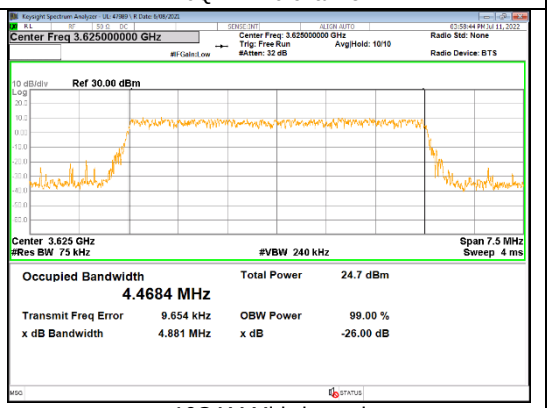
(KDB 971168 D01 Power Meas License Digital Systems v03r01)

OCCUPIED BANDWIDTH RESULTS

- LTE Band 48

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B48	20M	QPSK	3625.0	17.876	19.08
		16QAM		17.882	18.95
	15M	QPSK		13.421	14.34
		16QAM		13.405	14.16
	10M	QPSK		8.961	10.03
		16QAM		8.950	9.637
	5M	QPSK		4.480	4.860
		16QAM		4.468	4.881

LTE Band 48

20 MHz	 QPSK Mid channel	 16QAM Mid channel
15 MHz	 QPSK Mid channel	 16QAM Mid channel
10 MHz	 QPSK Mid channel	 16QAM Mid channel
5 MHz	 QPSK Mid channel	 16QAM Mid channel

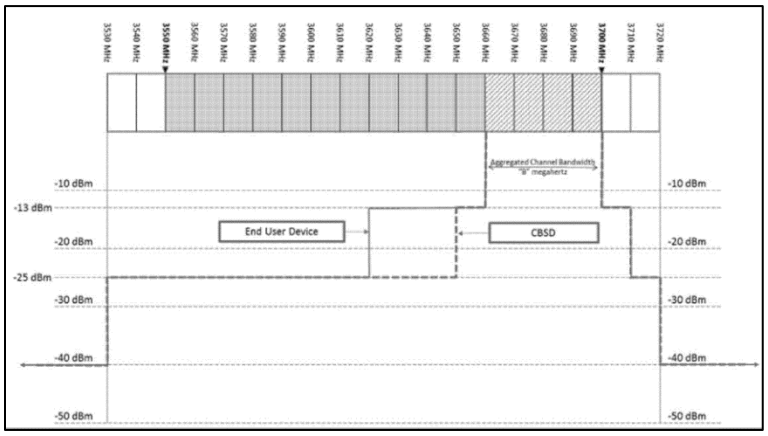
9.2. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §2.1051, §96.41(e)(ii)

LIMITS

For channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.
The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.



TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01
The transmitter output was connected to a CMW500 Test Set and E7515B configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

a) Set the RBW = 1 ~ 1.5 % of OBW(Typically limited to a minimum RBW of 1% of the OBW)
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = Auto;
e) Detector = RMS;
f) Ensure that the number of measurement points ≥ 2*Span/RBW;
g) Trace mode = Average (100);

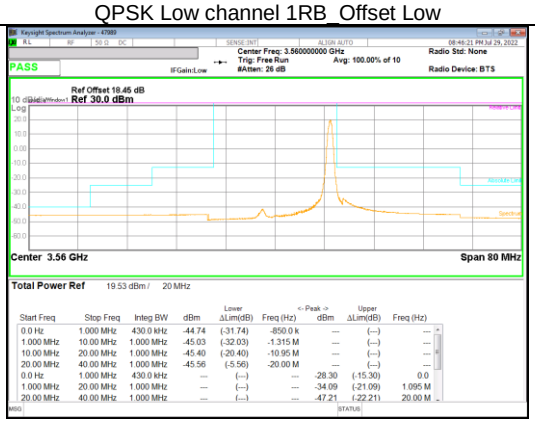
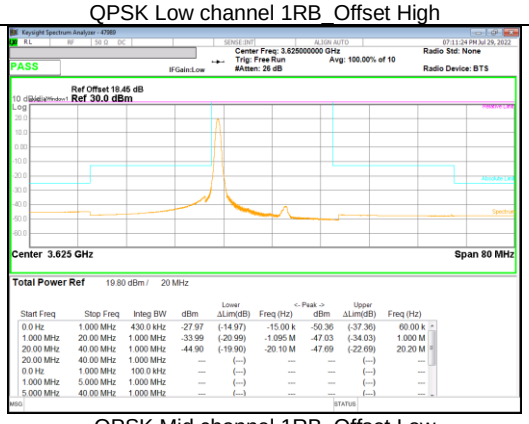
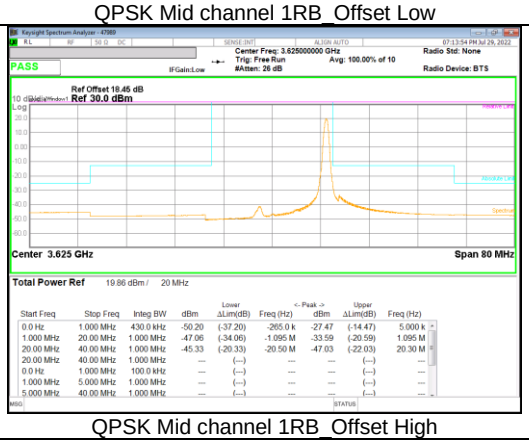
NOTE1

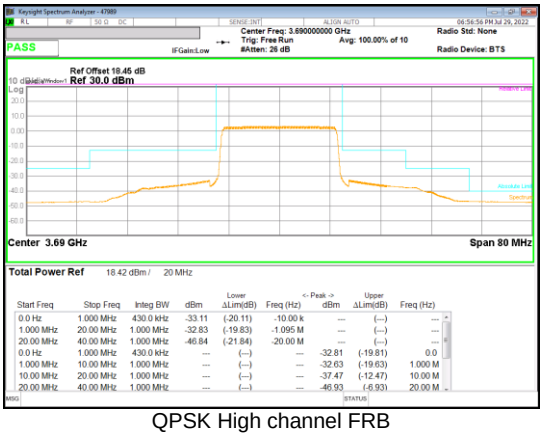
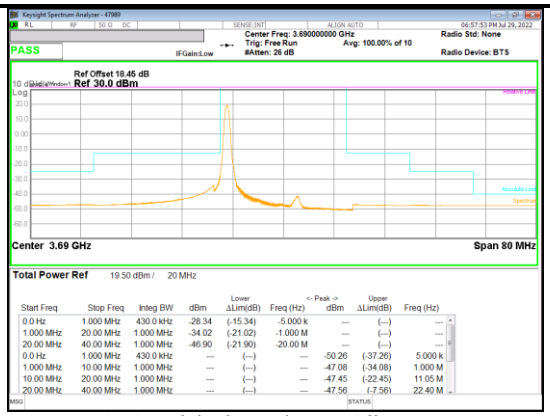
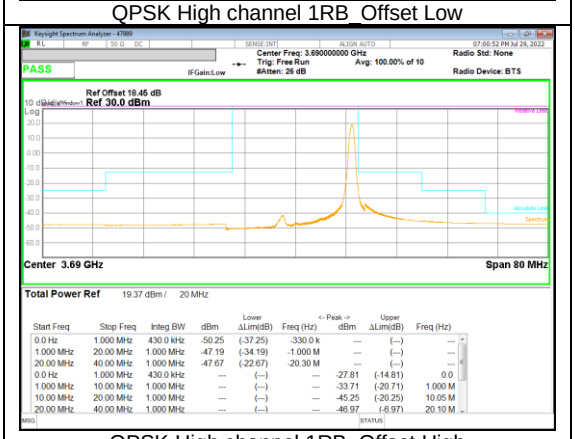
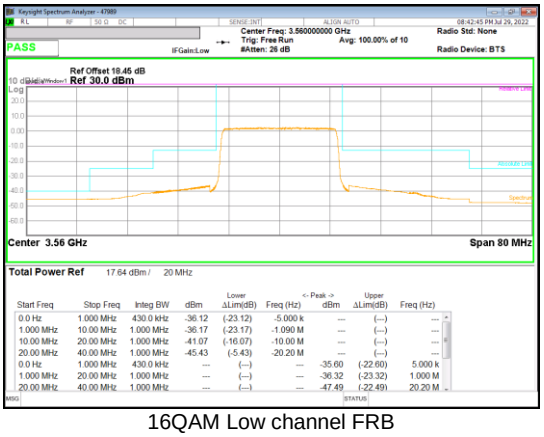
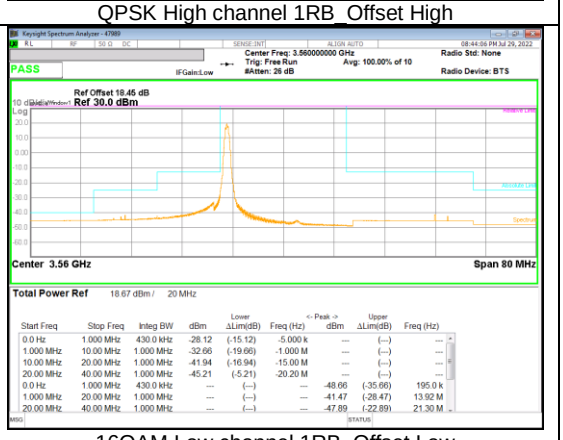
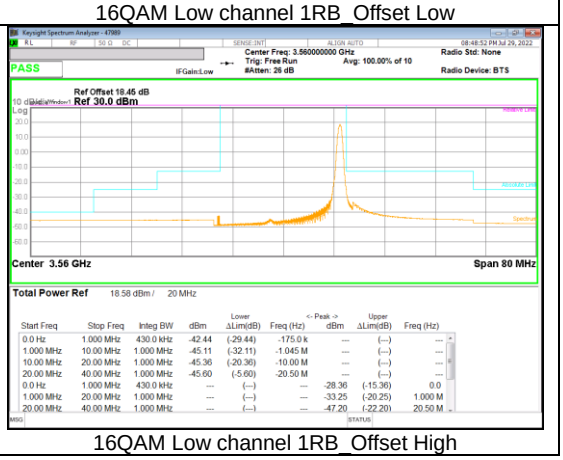
Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

RESULTS

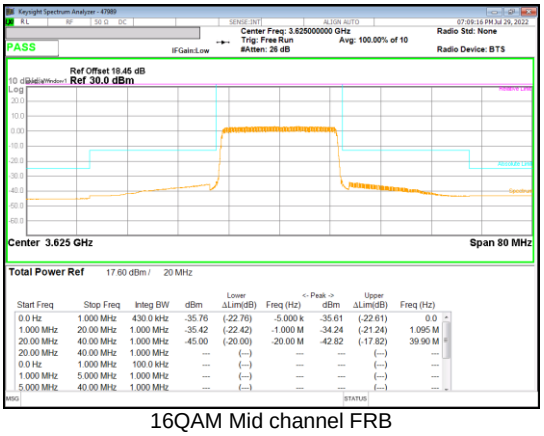
See the following pages.

LTE Band 48

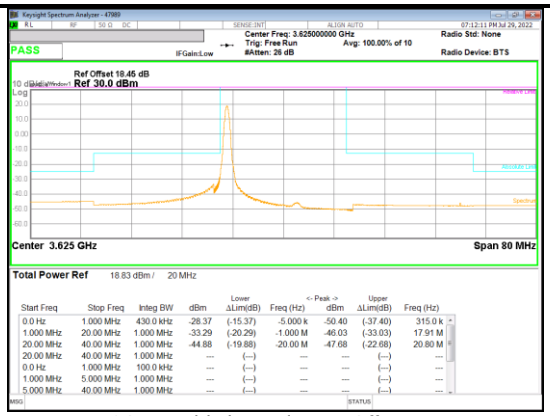
20MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low
		 QPSK Low channel 1RB_Offset High
	 QPSK Mid channel FRB	 QPSK Mid channel 1RB_Offset Low
		 QPSK Mid channel 1RB_Offset High

20MHz	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low
		 QPSK High channel 1RB_Offset High
20MHz	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low
		 16QAM Low channel 1RB_Offset High

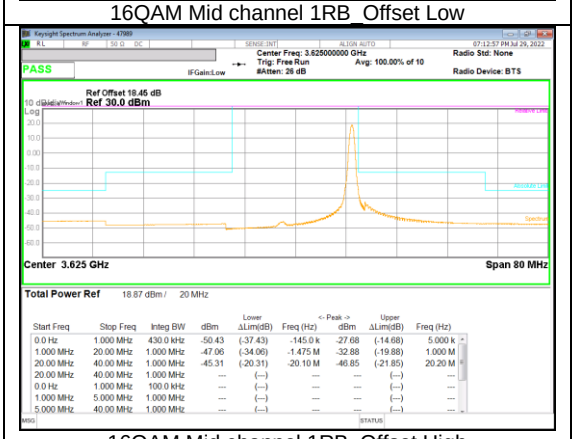
20MHz



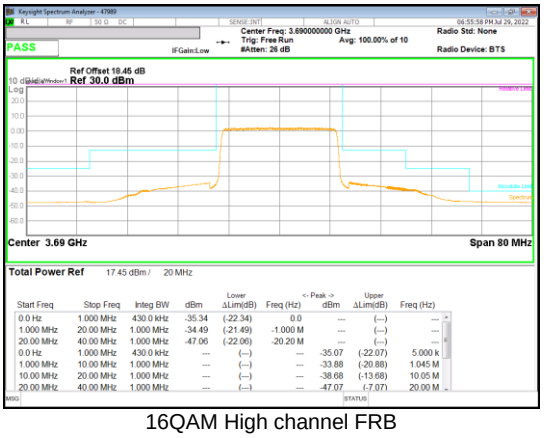
16QAM Mid channel FRB



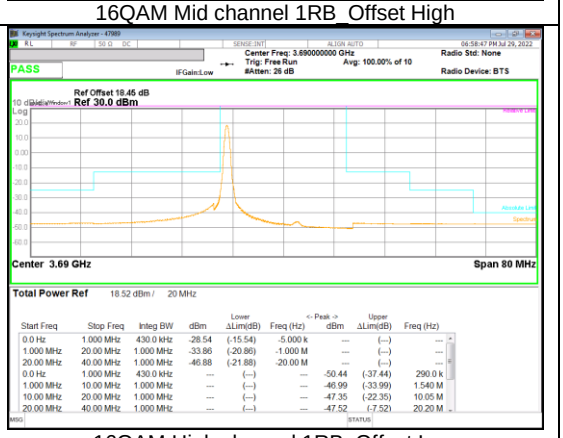
16QAM Mid channel 1RB_Offset Low



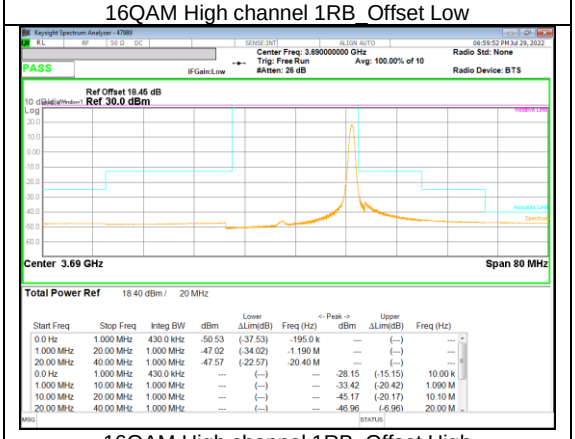
16QAM Mid channel 1RB_Offset High



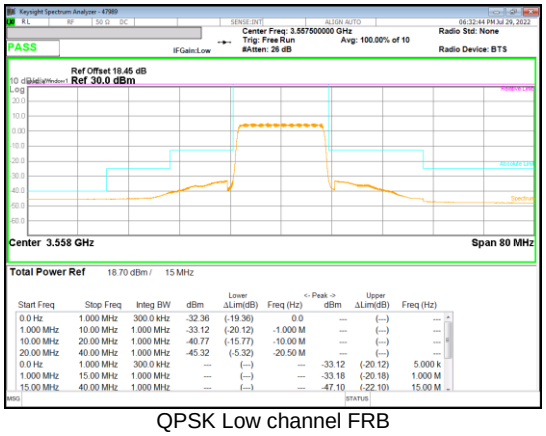
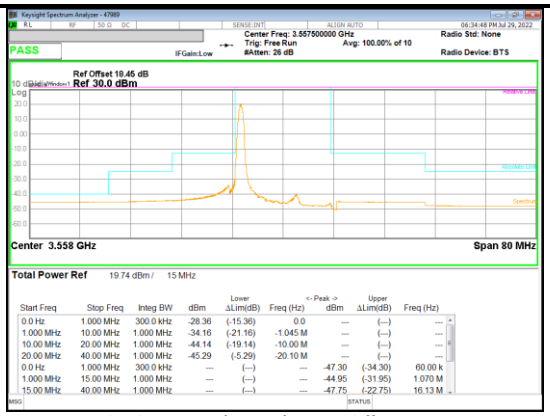
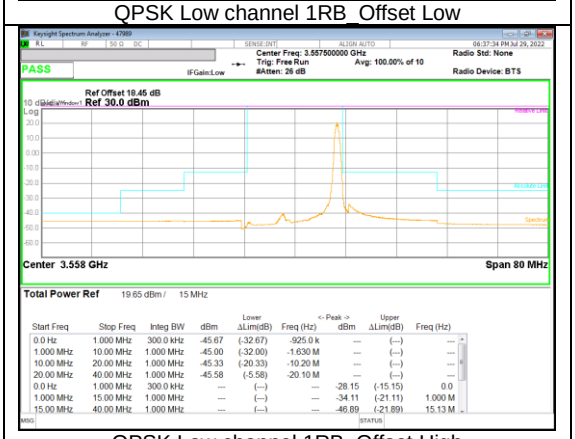
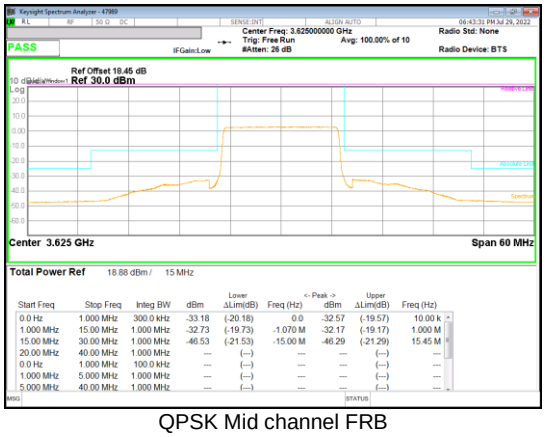
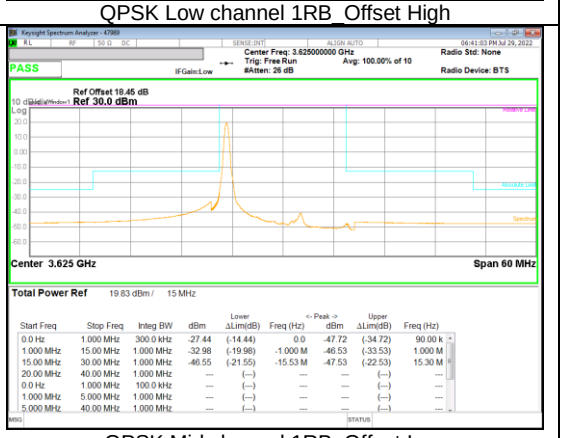
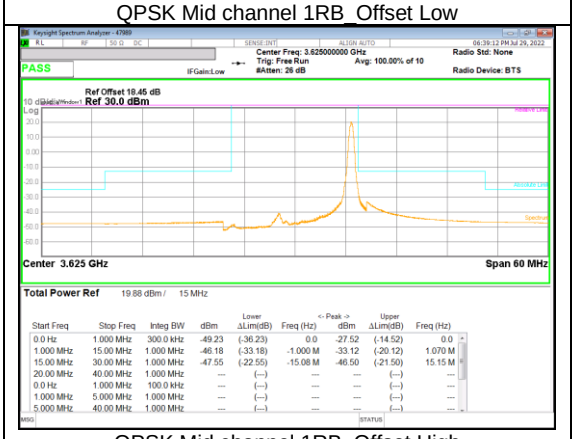
16QAM High channel FRB

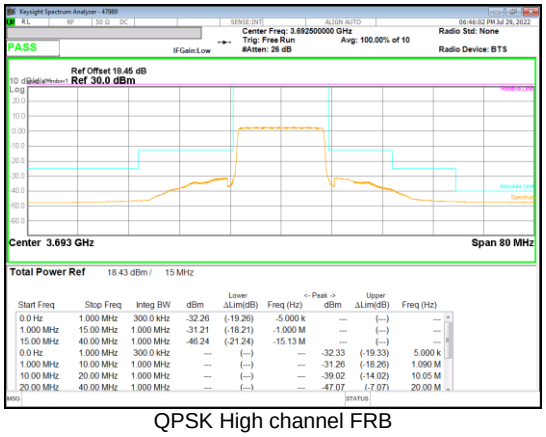
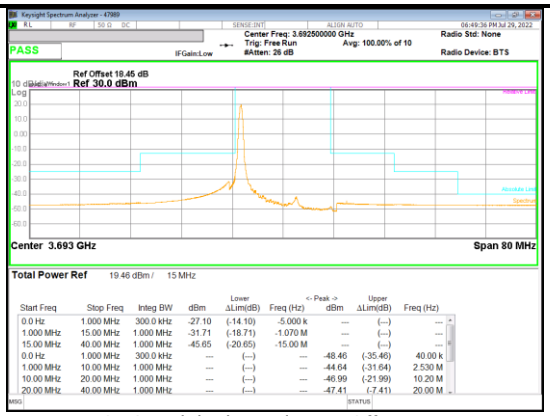
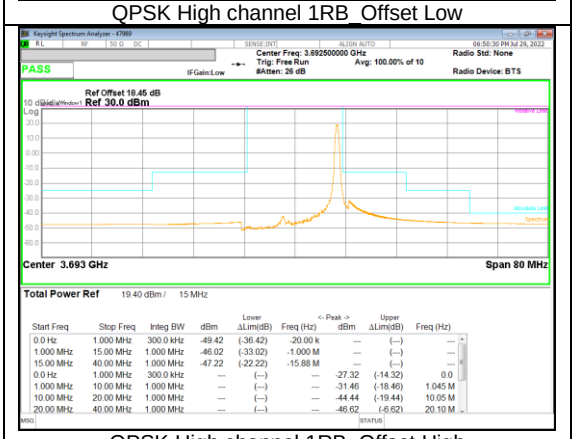
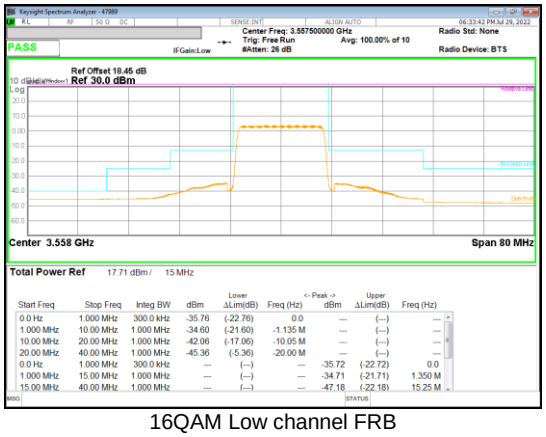
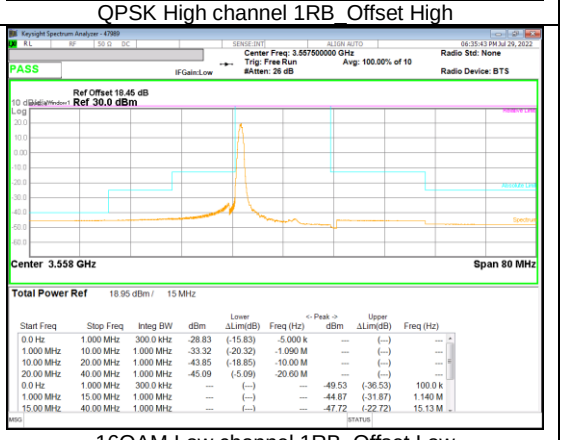
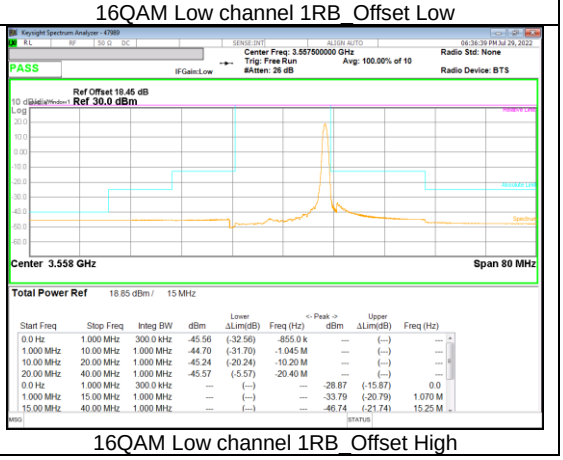


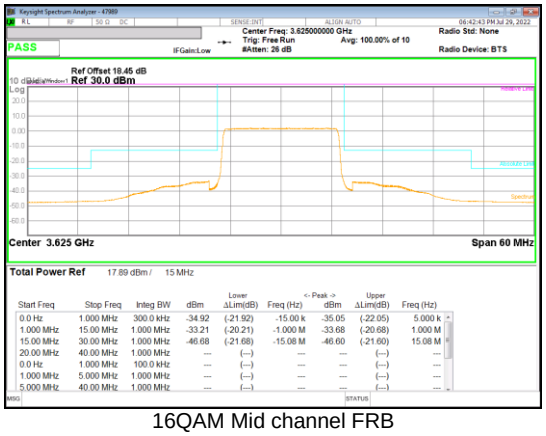
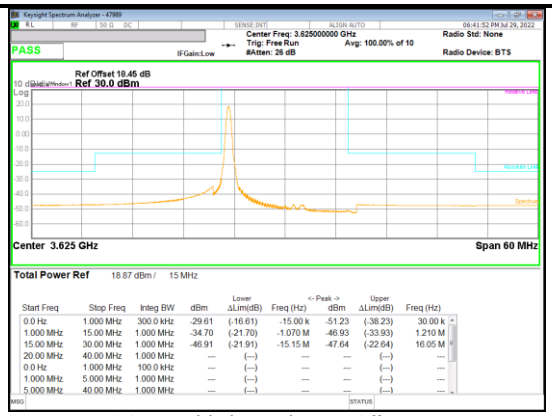
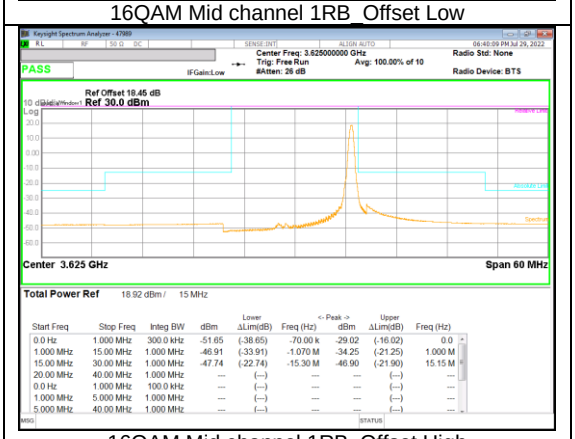
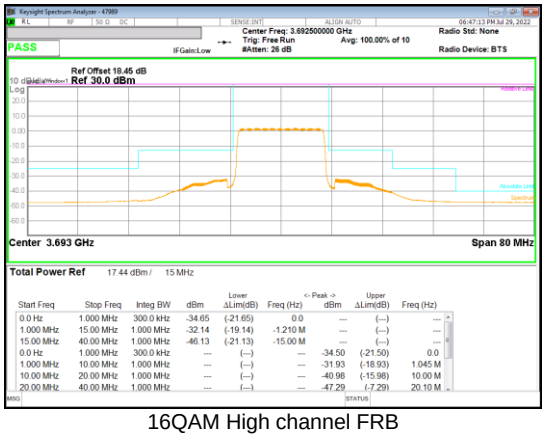
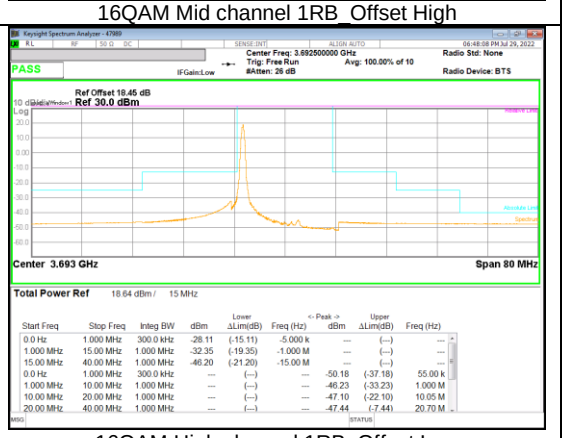
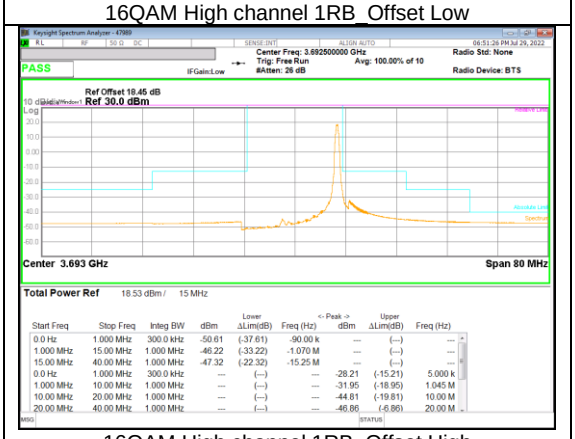
16QAM High channel 1RB_Offset Low

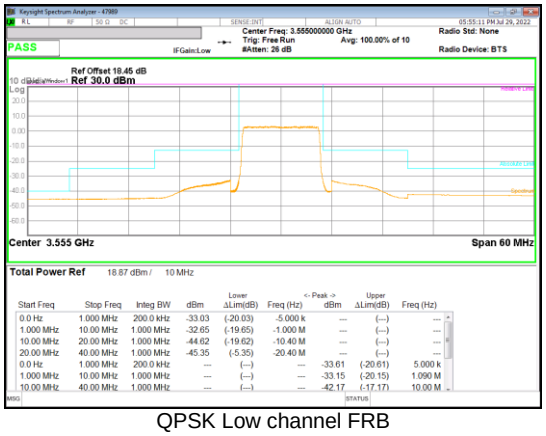
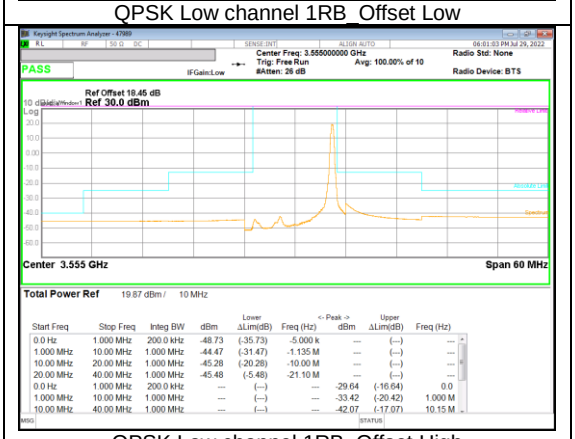
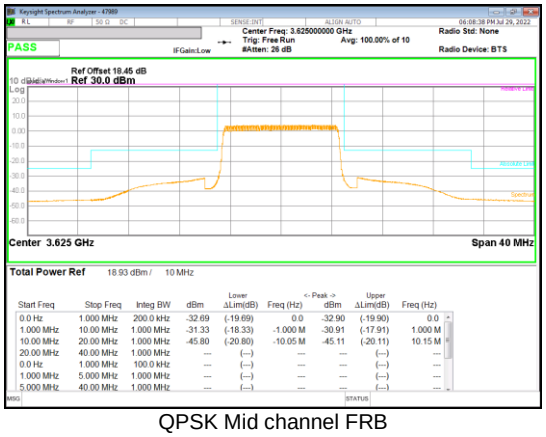
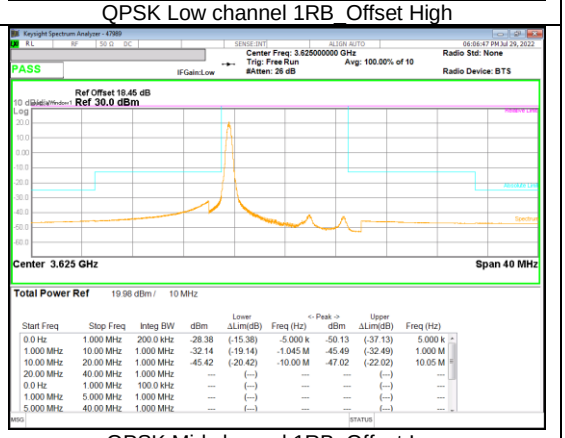
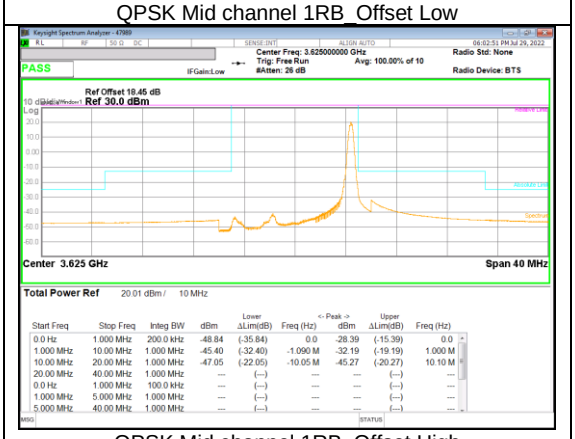


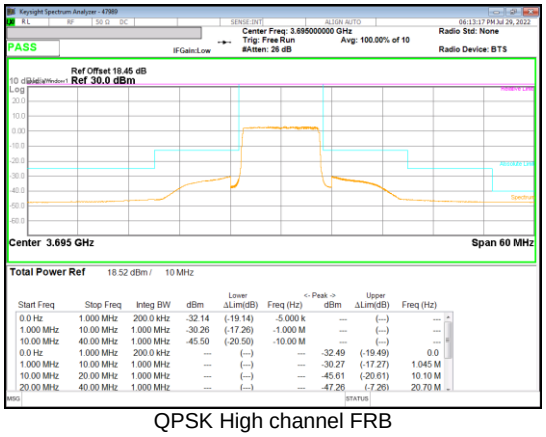
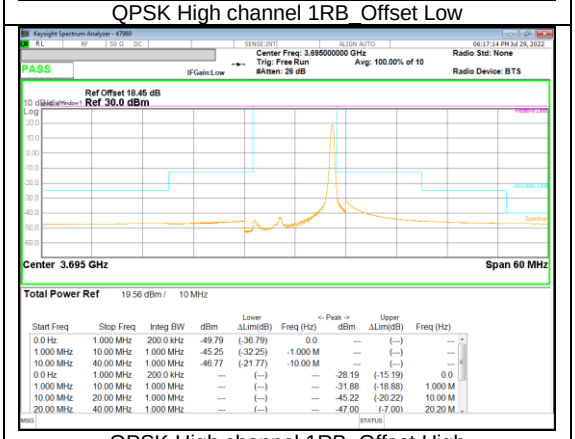
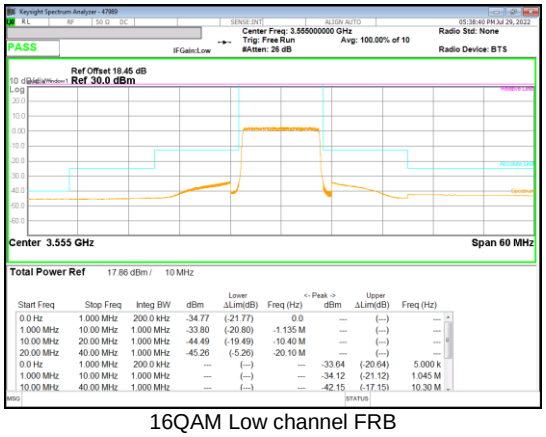
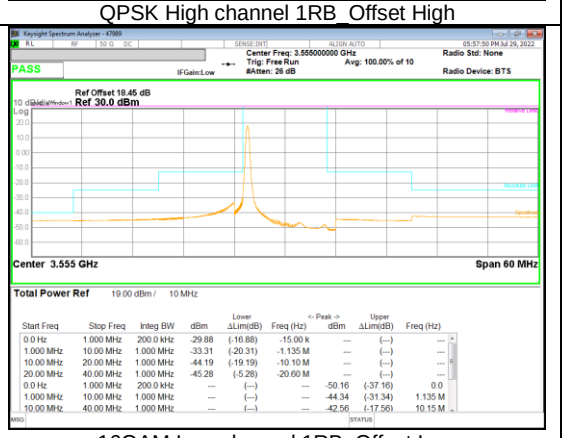
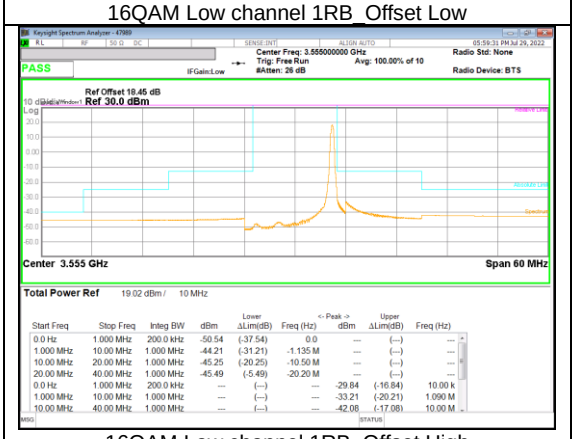
16QAM High channel 1RB_Offset High

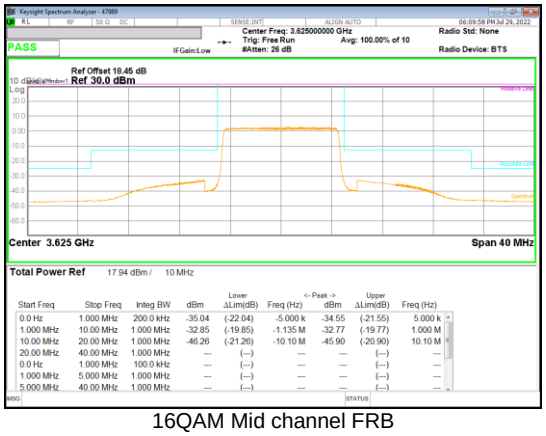
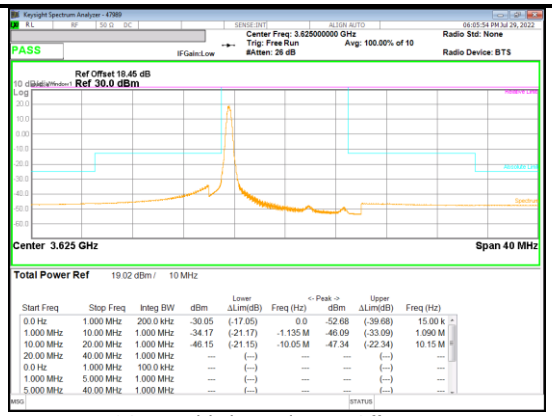
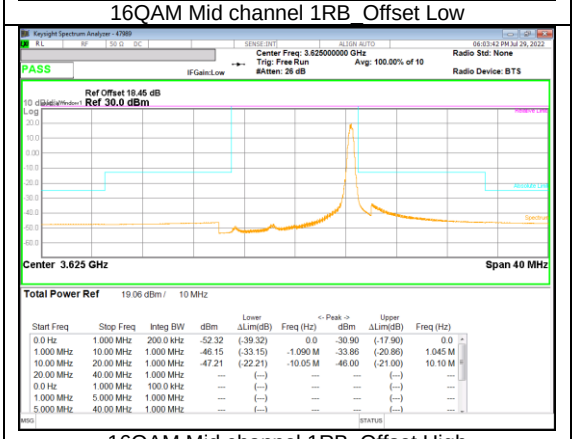
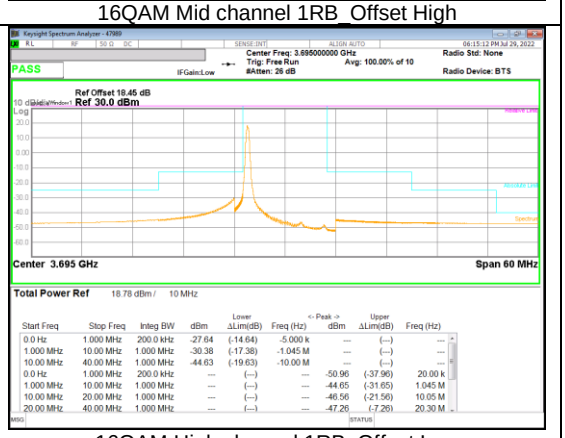
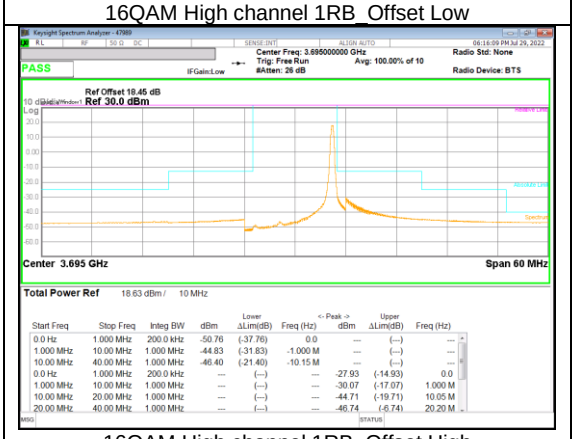
15MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low  QPSK Low channel 1RB_Offset High
	 QPSK Mid channel FRB	 QPSK Mid channel 1RB_Offset Low  QPSK Mid channel 1RB_Offset High

15MHz	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low
		 QPSK High channel 1RB_Offset High
	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low
		 16QAM Low channel 1RB_Offset High

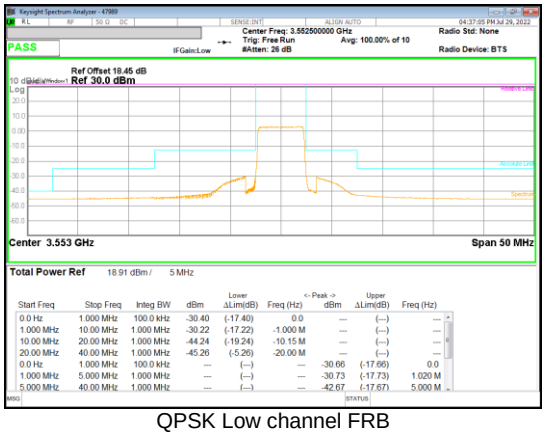
15MHz	 16QAM Mid channel FRB	 16QAM Mid channel 1RB_Offset Low
		 16QAM Mid channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low
		 16QAM High channel 1RB_Offset High

10MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB_Offset Low
		 QPSK Low channel 1RB_Offset High
	 QPSK Mid channel FRB	 QPSK Mid channel 1RB_Offset Low
		 QPSK Mid channel 1RB_Offset High

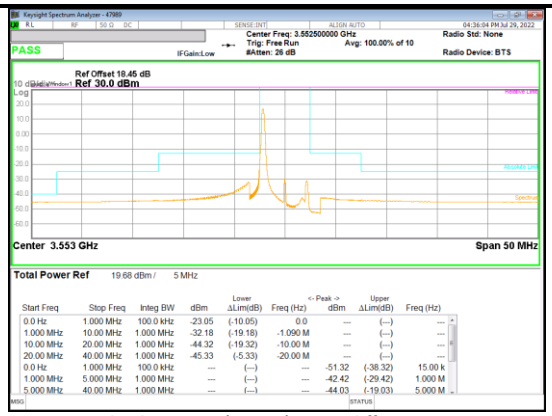
10MHz	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low  QPSK High channel 1RB_Offset High
10MHz	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low  16QAM Low channel 1RB_Offset High

10MHz	 16QAM Mid channel FRB	 16QAM Mid channel 1RB_Offset Low  16QAM Mid channel 1RB_Offset High
	 16QAM High channel FRB	 16QAM High channel 1RB_Offset Low  16QAM High channel 1RB_Offset High

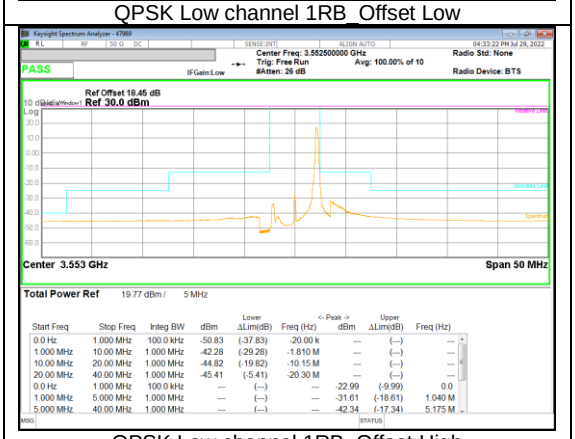
5MHz



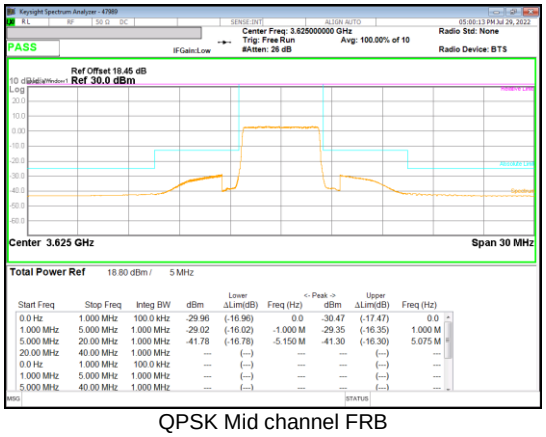
QPSK Low channel FRB



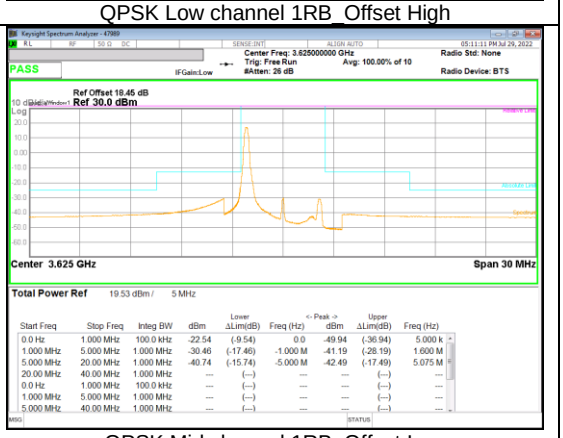
QPSK Low channel 1RB_Offset Low



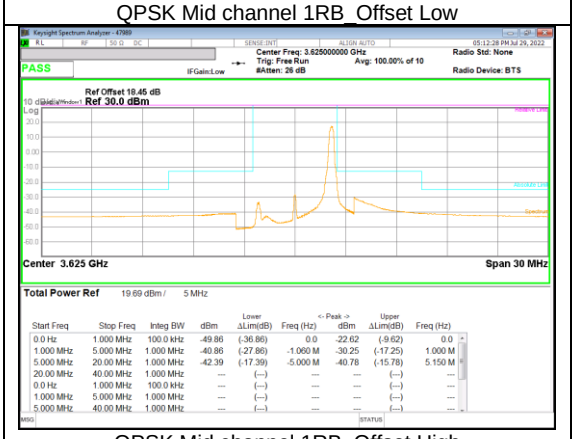
QPSK Low channel 1RB_Offset High



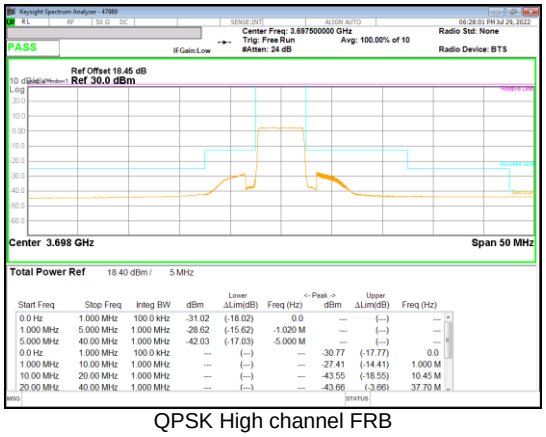
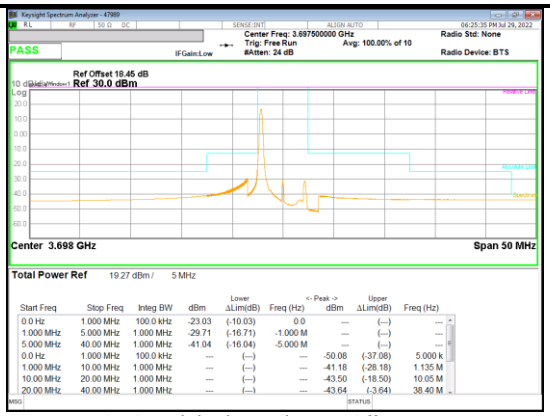
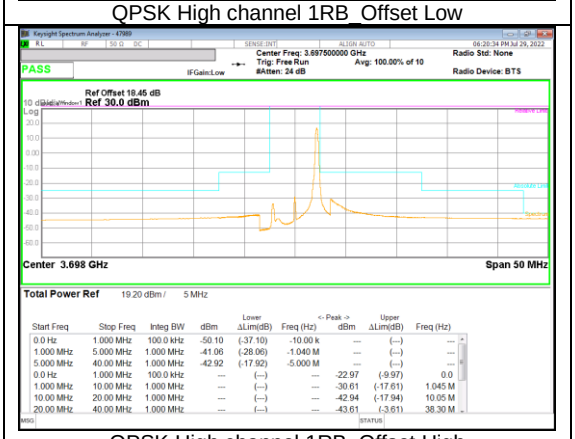
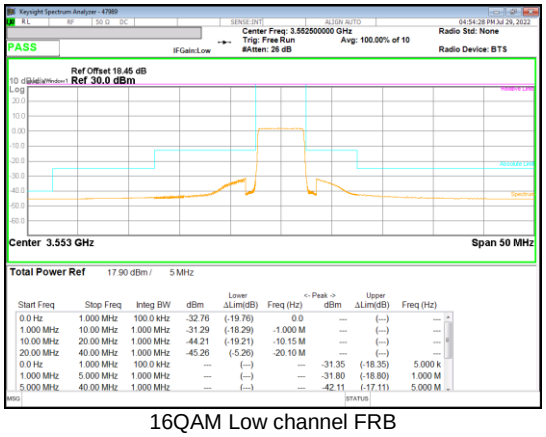
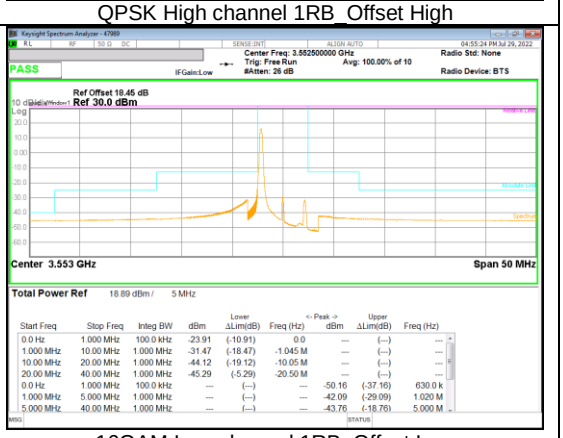
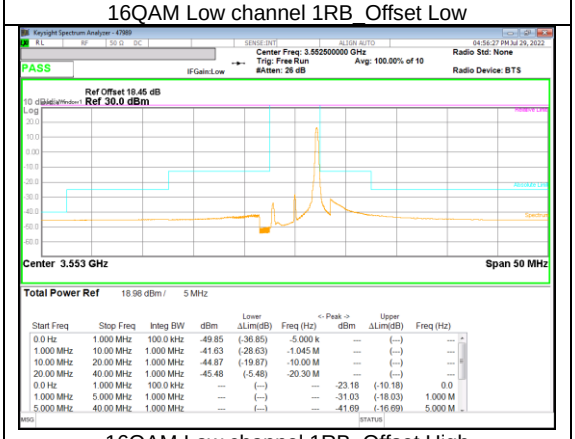
QPSK Mid channel FRB



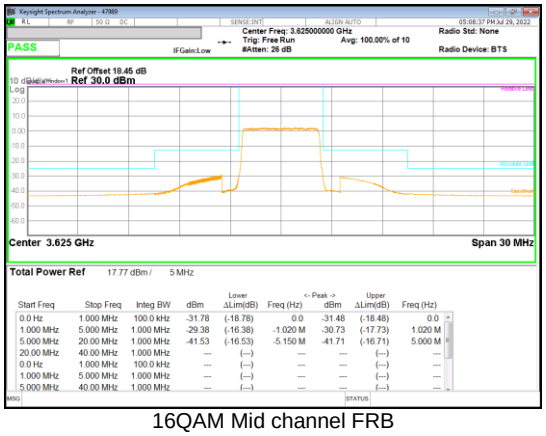
QPSK Mid channel 1RB_Offset Low



QPSK Mid channel 1RB_Offset High

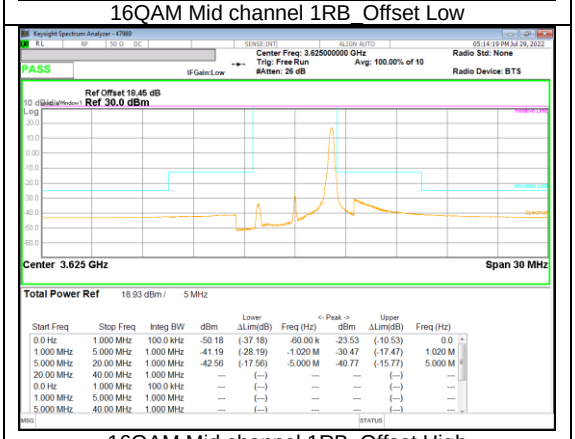
5MHz	 QPSK High channel FRB	 QPSK High channel 1RB_Offset Low  QPSK High channel 1RB_Offset High
5MHz	 16QAM Low channel FRB	 16QAM Low channel 1RB_Offset Low  16QAM Low channel 1RB_Offset High

5MHz

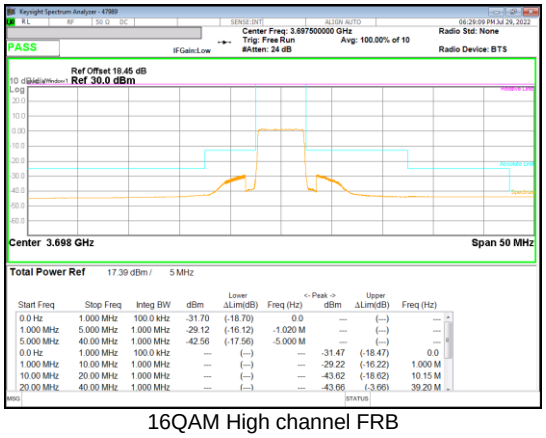


16QAM Mid channel FRB

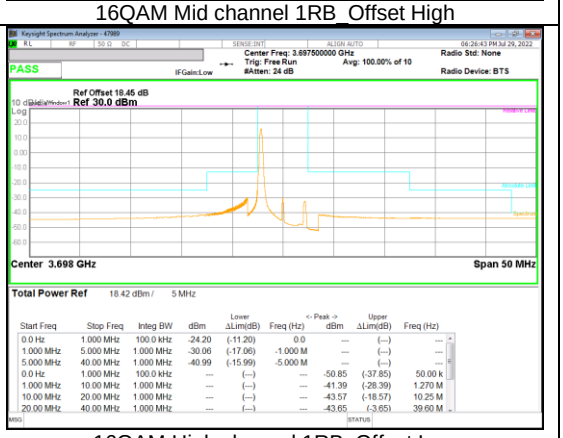
16QAM Mid channel 1RB_Offset Low



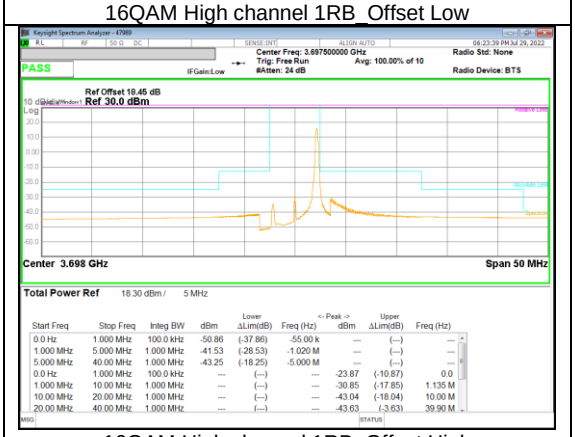
16QAM Mid channel 1RB_Offset High



16QAM High channel FRB



16QAM High channel 1RB_Offset Low



16QAM High channel 1RB_Offset High

9.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §96.41(e)

LIMITS

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

TEST PROCEDURE

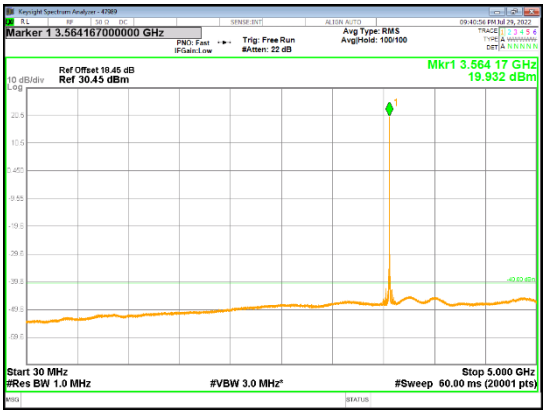
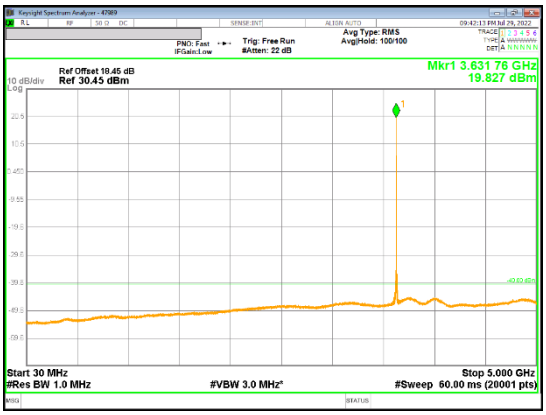
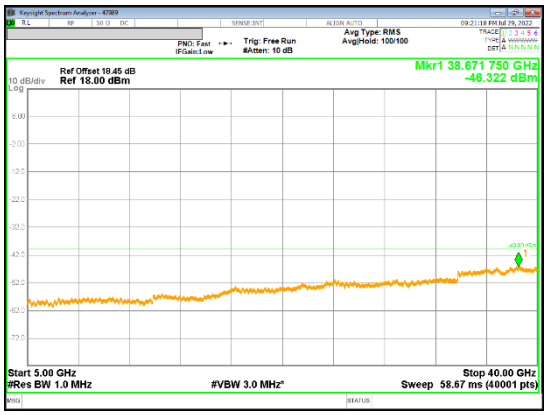
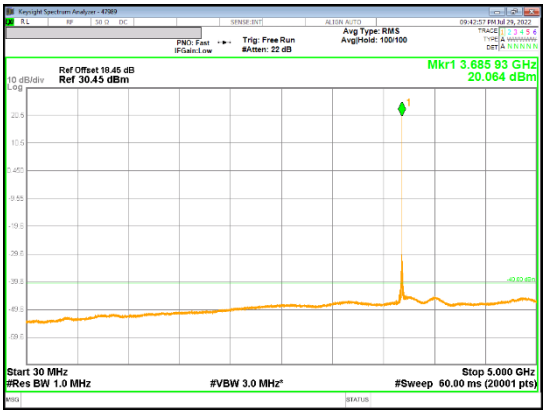
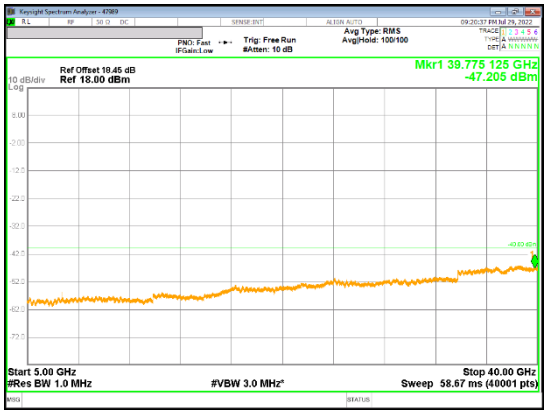
Per KDB 971168 D01 Power Meas License Digital Systems v03r01
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

a) Set the RBW = 1MHz for emissions above 1GHz (Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)
b) Set VBW ≥ 3 × RBW
c) Sweep time = auto couple;
d) Detector = RMS;
e) Ensure that the number of measurement points = Max (40001);
f) Trace mode = Average;

RESULTS

See the following pages.

LTE Band 48

5 MHz	 QPSK Low channel (30 MHz ~ 5 GHz)	 QPSK Low channel (5 GHz ~ 40 GHz)
	 QPSK Mid channel (30 MHz ~ 5 GHz)	 QPSK Mid channel (5 GHz ~ 40 GHz)
	 QPSK High channel (30 MHz ~ 20 GHz)	 QPSK High channel (20 GHz ~ 40 GHz)

9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055

LIMITS

For Part 96, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

RESULTS

See the following pages.

NOTE

Test were performed each lowest or highest frequency on the modulation condition of more wide bandwidth.(Please refer to section 9.1.1 OBW results)

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_96 (04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

LTE Band 48(Lowest Frequency: QPSK / Highest Frequency: QPSK)

Limit		3550	3700	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	3550.2550	3699.7398		
Extreme (50C)		3550.2550	3699.7398	11.0	0.003
Extreme (40C)		3550.2550	3699.7398	8.8	0.002
Extreme (30C)		3550.2550	3699.7398	11.1	0.003
Extreme (10C)		3550.2550	3699.7398	12.2	0.003
Extreme (0C)		3550.2550	3699.7398	14.0	0.004
Extreme (-10C)		3550.2550	3699.7398	14.0	0.004
Extreme (-20C)		3550.2550	3699.7398	13.5	0.004
Extreme (-30C)		3550.2550	3699.7398	12.5	0.003
20C	15%	3550.2550	3699.7398	13.0	0.004
	-15%	3550.2550	3699.7398	12.9	0.004
	End Point	3550.2550	3699.7398	21.3	0.006

9.5. END USER DEVICE(CBSD PROTOCOL)

RULE PART(S)

FCC: §96.47

LIMITS

End user devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.

An end user device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.

TEST PROCEDURE

KDB 940660 D01 Part 96 CBRS v03

RESULTS

Not performed.
Please refer to LTE B48 test report(Report number: - 4790430333-E9)

9.6. RADIATED POWER (EIRP)

RULE PART(S)

FCC: §96.41(b)

LIMITS

FCC: §96.41(b)

(b) Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table.

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
End User Device	23	n/a

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.17; ESU40 setting reference to 971168 D01 v03r01

For radiated output power measurement with a ESU40:

a) Set the RBW ≥ OBW;
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 2 x RBW;
d) Sweep time = auto couple;
e) Detector = rms;
f) Ensure that the number of measurement points ≥ 2 x span/RBW;
g) Trace mode = Average;

RESULTS

See the following pages.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_96 (04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

9.6.1. EIRP Results

LTE Band 48

BW (MHz)	Modulation	f (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB
5	QPSK	3552.50	17.09	H	6.40	10.73	21.43	139.00	23.00	-1.57	1/12
		3625.00	17.29	H	6.48	10.83	21.64	145.88	23.00	-1.36	1/12
		3697.50	17.42	H	6.54	10.82	21.70	147.91	23.00	-1.30	1/12
	16-QAM	3552.50	16.68	H	6.40	10.73	21.02	126.47	23.00	-1.98	1/12
		3625.00	17.09	H	6.48	10.83	21.44	139.32	23.00	-1.56	1/24
		3697.50	17.27	H	6.54	10.82	21.55	142.89	23.00	-1.45	1/12
10	QPSK	3555.00	17.36	H	6.41	10.74	21.68	147.23	23.00	-1.32	1/49
		3625.00	16.68	H	6.48	10.83	21.03	126.77	23.00	-1.97	1/49
		3695.00	17.04	H	6.54	10.82	21.32	135.52	23.00	-1.68	1/49
	16-QAM	3555.00	16.79	H	6.41	10.74	21.11	129.12	23.00	-1.89	1/0
		3625.00	16.64	H	6.48	10.83	20.99	125.60	23.00	-2.01	1/0
		3695.00	16.82	H	6.54	10.82	21.10	128.82	23.00	-1.90	1/0
15	QPSK	3557.50	17.01	H	6.40	10.74	21.35	136.46	23.00	-1.65	1/74
		3625.00	16.97	H	6.48	10.83	21.32	135.52	23.00	-1.68	1/74
		3692.50	17.54	H	6.53	10.82	21.82	152.05	23.00	-1.18	1/0
	16-QAM	3557.50	16.74	H	6.40	10.74	21.08	128.23	23.00	-1.92	1/74
		3625.00	16.62	H	6.48	10.83	20.97	125.03	23.00	-2.03	1/37
		3692.50	17.22	H	6.53	10.82	21.50	141.25	23.00	-1.50	1/0
20	QPSK	3560.00	16.30	H	6.41	10.74	20.63	115.61	23.00	-2.37	1/99
		3625.00	17.35	H	6.48	10.83	21.70	147.91	23.00	-1.30	1/0
		3690.00	16.86	H	6.53	10.82	21.16	130.62	23.00	-1.84	1/0
	16-QAM	3560.00	15.95	H	6.41	10.74	20.28	106.66	23.00	-2.72	1/99
		3625.00	16.58	H	6.48	10.83	20.93	123.88	23.00	-2.07	1/99
		3690.00	16.41	H	6.53	10.82	20.71	117.76	23.00	-2.29	1/0

9.7. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §96.41(e)

LIMIT

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01
For peak power measurement with a ESU40:

a) Set the RBW = 100 kHz for emission below 1GHz and 1MHz for emissions above 1GHz
b) Set VBW ≥ 3 × RBW;
c) Sweep time = auto couple;
d) Detector = rms;
e) Ensure that the number of measurement points ≥ span/RBW;
f) Trace mode = Average;

RESULTS

See the following pages.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_96 (04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

9.7.1. SPURIOUS RADIATION PLOTS

LTE Band 48

15MHz

QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company:	Samsung
Project #:	4790430333
Date:	7/28/2022
Test Engineer:	25546
Configuration:	EUT / Earphone, X-Position
Location:	Chamber 1
Mode:	LTE_QPSK Band 48 Harmonics, 15MHz Bandwidth
Test Votage:	AC 120 V, 60 Hz

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3557.5MHz									
7115.00	-11.3	V	3.0	44.7	1.0	-55.0	-40.0	-15.0	
10672.50	-16.3	V	3.0	42.8	1.0	-58.1	-40.0	-18.1	
14230.00	-13.8	V	3.0	45.1	1.0	-57.9	-40.0	-17.9	
7115.00	-15.0	H	3.0	44.7	1.0	-58.7	-40.0	-18.7	
10672.50	-15.9	H	3.0	42.8	1.0	-57.7	-40.0	-17.7	
14230.00	-14.1	H	3.0	45.1	1.0	-58.2	-40.0	-18.2	
Mid Ch, 3625MHz									
7250.00	-10.5	V	3.0	44.6	1.0	-54.2	-40.0	-14.2	
10875.00	-15.1	V	3.0	42.9	1.0	-57.0	-40.0	-17.0	
14500.00	-14.4	V	3.0	45.3	1.0	-58.8	-40.0	-18.8	
7250.00	-17.2	H	3.0	44.6	1.0	-60.9	-40.0	-20.9	
10875.00	-15.2	H	3.0	42.9	1.0	-57.1	-40.0	-17.1	
14500.00	-14.5	H	3.0	45.3	1.0	-58.9	-40.0	-18.9	
High Ch, 3692.5MHz									
7385.00	-13.1	V	3.0	44.6	1.0	-56.6	-40.0	-16.6	
11077.50	-16.2	V	3.0	42.9	1.0	-58.1	-40.0	-18.1	
14770.00	-13.9	V	3.0	45.5	1.0	-58.5	-40.0	-18.5	
7385.00	-16.9	H	3.0	44.6	1.0	-60.5	-40.0	-20.5	
11077.50	-16.0	H	3.0	42.9	1.0	-58.0	-40.0	-18.0	
14770.00	-13.6	H	3.0	45.5	1.0	-58.1	-40.0	-18.1	

END OF TEST REPORT

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