



FCC & IC TEST REPORT

FCC ID: SY4-A02032

On Behalf of

Shanghai Huace Navigation Technology Ltd.

Unmanned Surface Vessel

Model No.: APACHE 3

Prepared for : Shanghai Huace Navigation Technology Ltd.
Address : Building D, 599 Gaojing Road, Qingpu District, Shanghai,
China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,
518103, Shenzhen, Guangdong, China

Report Number : A2109128-C01-R06
Date of Receipt : September 7, 2021
Date of Test : September 7, 2021 – October 13, 2021
Date of Report : October 14, 2021
Version Number : V0

Contents

Page

1	TEST SUMMARY	5
2	GENERAL INFORMATION	7
2.1	GENERAL DESCRIPTION OF EUT	7
2.2	RELATED SUBMITTAL(S) / GRANT (S)	8
2.3	TEST FACILITY	8
2.4	MEASUREMENT UNCERTAINTY	8
3	TEST INSTRUMENTS LIST	9
4	SYSTEM TEST CONFIGURATION	10
4.1	TEST MODE	10
4.2	CONFIGURATION OF TESTED SYSTEM	10
4.3	CONDUCTED OUTPUT POWER	11
4.4	PEAK-TO-AVERAGE RATIO	19
4.5	OCCUPY BANDWIDTH	23
4.6	MODULATION CHARACTERISTIC	32
4.7	OUT OF BAND EMISSION AT ANTENNA TERMINALS	32
4.8	ERP, EIRP MEASUREMENT	66
4.9	FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT	72
4.10	FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT	82
4.11	FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT	85

TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology Ltd.
 Address : Building D, 599 Gaojing Road, Qingpu District, Shanghai, China
 Manufacturer : Shanghai Huace Navigation Technology Ltd.
 Address : Building D, 599 Gaojing Road, Qingpu District, Shanghai, China
 EUT Description : Unmanned Surface Vessel
 (A) Model No. : APACHE 3
 (B) Trademark : 

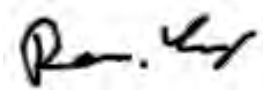
Measurement Standard Used:

- | | |
|--|--------------------------------------|
| FCC CFR Title 47 Part 2 | RSS-132 issue 3 January 2013 |
| FCC CFR Title 47 Part22 Subpart H | RSS-133 issue 6 January 2018 |
| FCC CFR Title 47 Part24 Subpart E | RSS-139 Issue 3, July 2015 |
| FCC CFR Title 47 Part27 | RSS-199 issue 3 December 2016 |
| ANSI C63.26:2015 | RSS-Gen Issue5, April 2018 |
| | TIA/EIA-603-E:2016 |

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Reak Yang
 Project Engineer 

Approved by (name + signature).....: Simple Guan
 Project Manager 

Date of issue..... : October 14, 2021

Revision History

Revision	Issue Date	Revisions	Revised By
V0	October 14, 2021	Initial released Issue	Reak Yang

1 Test Summary


Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 2.1310 Part 2.1091 RSS-102 Issue 5	Pass* (Please refer to SAR Report)
RF Output Power	Part 2.1046 part22.913(a) Part 24.232 (c) Part 27.50 (d)(4) Part 27.50 (h)(2) RSS-132 (5.4) RSS-133 (6.4) RSS-139(6.5) RSS-199(4.4)	Pass
Peak-To-Average Ratio	Part 2.1046 Part 27.50 (a) ANSI/TIA-603-E	Pass
Modulation Characteristics	Part 2.1047 ANSI/TIA-603-E RSS-132 (5.2) RSS-133 (6.2) RSS-139(6.2) RSS-199(4.1)	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 part22.913(a) Part 24.238 Part 27.53(a)(m) RSS-132 (3.1) RSS-133 (3.1) RSS-139(3.1) RSS-199(4.2)	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 part22.913(a) Part 24.238 (a) Part 27.53 (h)(m) RSS-132 (5.5) RSS-133 (6.5.1) RSS-139(6.6) RSS-199(4.5)	Pass

Field Strength of Spurious Radiation	Part 2.1053 part22.913(a) Part 24.238 (a) Part 27.53 (h)(m) RSS-132 (5.5) RSS-133 (6.5.1) RSS-139(6.6) RSS-199(4.5)	Pass
Out of band emission, Band Edge	part22.913(a) Part 24.238 (a) Part 27.53(h)(m) RSS-132 (5.5) RSS-133 (6.5.1) RSS-139(6.6) RSS-199(4.5)	Pass
Frequency stability vs. temperature	Part 2.1055(a)(1)(b) RSS-132 (5.3) RSS-133 (6.3) RSS-139(6.4) RSS-199(4.3)	Pass
Frequency stability vs. voltage	Part 2.1055(d)(1)(2) RSS-132 (5.3) RSS-133 (6.3) RSS-139(6.4) RSS-199(4.3)	Pass

Pass: The EUT complies with the essential requirements in the standard.

2 General Information

2.1 General Description of EUT

Description/PMN:	: Unmanned Surface Vessel
Model Number /HVIN(s)	: APACHE 3
DIFF.	: N/A
Trademark	: 
Support Networks	: LTE
Support Bands	: LTE Band 2, LTE Band 4, LTE Band 5, LTE Band 7
Channel Bandwidth	: LTE Band 2: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5: 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz
TX Frequency:	: LTE Band 2: 1852.5 MHz ~ 1907.5 MHz LTE Band 4: 1712.5 MHz ~ 1752.5 MHz LTE Band 5: 826.5 MHz ~ 846.5 MHz LTE Band 7: 2502.5MHz-2567.5MHz
Modulation type:	: QPSK, 16QAM
Antenna type	: Rod antenna
Antenna gain	: Maximum Gain is 4dBi
Power supply	: DC 18V from battery
Software version	: V1.0
Hardware version/FVIN	: V1.0

Remark 1: The worst-case simultaneous transmission configuration was evaluated with no non-compliance found. Results in this report are only for 4G function, and there is no other transmitter involved.

2.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with Section Part 22 subpart H, Part 24 subpart E, Part 27 of the FCC CFR 47 Rules and RSS-132, RSS-133, RSS-139 and RSS-199 Rules.

2.3 Test Facility

Shenzhen Alpha Product Testing Co., Ltd
Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

Designation Number: CN1236

July 15, 2019 Certificated by IC

Registration Number: 12135A

2.4 Measurement Uncertainty

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

3 Test Instruments list

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2020.09.02	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	102137	2021.08.25	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2021.08.25	1Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2021.08.25	1Year
Receiver	R&S	ESCI	101165	2021.08.25	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2020.04.12	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2021.08.30	2Year
RF Cable	Resenberger	Cable 1	RE1	2021.08.25	1Year
RF Cable	Resenberger	Cable 2	RE2	2021.08.25	1Year
RF Cable	Resenberger	Cable 3	CE1	2021.08.25	1Year
Pre-amplifier	HP	HP8347A	2834A00455	2021.08.25	1Year
Pre-amplifier	Agilent	8449B	3008A02664	2021.08.25	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126-466	2021.08.25	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2021.08.25	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	00946	2021.08.30	2 Year
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2021.08.25	1 Year
Power Meter	Agilent	E9300A	MY41496628	2021.08.25	1 Year
Power Sensor	DARE	RPR3006W	15100041SNO91	2021.08.25	1 Year
Temp. & Humid. Chamber	Weihuang	WHTH-1000-40-880	100631	2021.04.21	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2021.08.25	1 Year
CMW500	ROHDE&SCHWARZ	CMW500	1201.0002K50-117239-sM	2021.08.25	1 Year
10dB Attenuator	Mini-Circuits	N/A	N/A	N/A	N/A
Adjustable attenuator	MWRfTest	N/A	N/A	N/A	N/A

4 System test configuration

4.1 Test mode

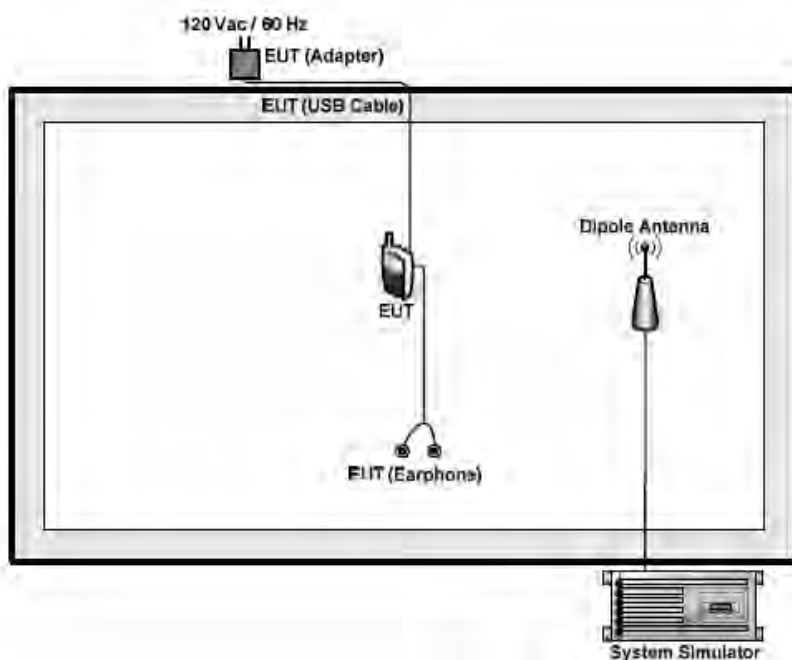
During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Band	Test modes	
	Radiated	Conducted
LTE Band 2	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 4	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 5	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 7	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link

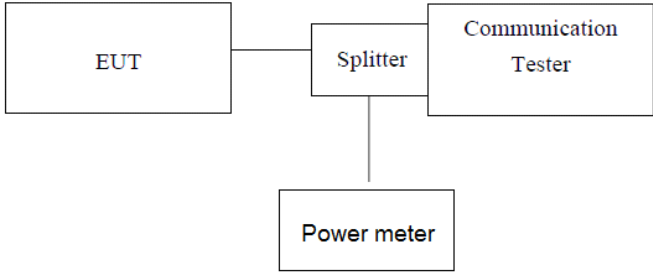
Note: Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas License Digital Systems v03r1 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

4.2 Configuration of Tested System



4.3 Conducted Output Power

Test Requirement:	FCC part22.913(a), FCC part24.232(b), FCC part 27.50 and RSS-132 (5.4), RSS-133 (6.4), RSS-139(6.5) and RSS-199(4.4)
Test Method:	KDB 971168 D01 v03r1 clause 5.1, FCC part2.1046, ANSI/TIA-603-E, ANSI C63.26 clause 5.2.3
Test setup:	 <pre> graph LR EUT[EUT] --- Splitter[Splitter] Splitter --- CT[Communication Tester] Splitter --- PM[Power meter] </pre> <p><i>Note: Measurement setup for testing on Antenna connector</i></p>
Test Procedure:	<ol style="list-style-type: none"> 1. The transmitter output port was connected to base station. 2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement. 3. Set EUT at maximum power through base station. 4. Select lowest, middle, and highest channels for each band and different modulation. 5. Measure the maximum burst average power.
Test Instruments:	Refer to section 3 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Measurement Data

LTE Band2

BW (MHz)	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
5	1852.5	1	0	23.57	23.89
		1	12	23.46	23.55
		1	24	23.34	23.32
		12	0	22.74	22.87
		12	6	22.65	22.71
		12	13	22.12	22.27
		25	0	22.01	22.07
	1880.0	1	0	23.52	23.88
		1	12	23.44	23.51
		1	24	23.27	23.27
		12	0	22.74	22.84
		12	6	22.58	22.62
		12	13	22.09	22.20
		25	0	21.98	22.05
	1907.5	1	0	23.55	23.89
		1	12	23.43	23.51
		1	24	23.28	23.23
		12	0	22.65	22.77
		12	6	22.61	22.64
		12	13	22.05	22.21
		25	0	21.94	22.04
10	1855.0	1	0	23.55	23.81
		1	24	23.37	23.48
		1	49	23.32	23.31
		25	0	22.65	22.82
		25	12	22.58	22.64
		25	25	22.03	22.21
		50	0	21.96	21.99
	1880.0	1	0	23.46	23.81
		1	24	23.37	23.48
		1	49	23.26	23.23
		25	0	22.65	22.86
		25	12	22.56	22.63
		25	25	22.03	22.18
		50	0	21.96	22.03
	1905.0	1	0	23.53	23.86
		1	24	23.40	23.46
		1	49	23.27	23.23
		25	0	22.60	22.78
		25	12	22.58	22.62
		25	25	22.01	22.25
		50	0	21.89	22.04
15	1857.5	1	0	23.48	23.88
		1	37	23.46	23.49
		1	74	23.26	23.22

		37	0	22.66	22.82
		37	18	22.63	22.70
		37	38	22.12	22.22
		75	0	21.92	22.05
	1880.0	1	0	23.50	23.82
		1	37	23.38	23.53
		1	74	23.18	23.31
		37	0	22.71	22.83
		37	18	22.48	22.68
		37	38	22.00	22.19
		75	0	21.97	22.04
	1902.5	1	0	23.52	23.88
		1	37	23.41	23.49
		1	74	23.26	23.31
		37	0	22.58	22.87
		37	18	22.51	22.61
		37	38	21.99	22.20
75		0	21.92	22.04	
20	1860.0	1	0	23.49	23.80
		1	49	23.42	23.52
		1	99	23.30	23.26
		50	0	22.69	22.84
		50	25	22.61	22.63
		50	50	22.05	22.21
		100	0	21.92	21.97
	1880.0	1	0	23.45	23.81
		1	49	23.37	23.50
		1	99	23.26	23.25
		50	0	22.66	22.86
		50	25	22.57	22.69
		50	50	22.05	22.27
		100	0	21.96	22.04
	1900.0	1	0	23.53	23.80
		1	49	23.34	23.47
		1	99	23.25	23.24
		50	0	22.63	22.85
		50	25	22.58	22.63
		50	50	22.00	22.24
		100	0	21.91	21.97

LTE Band4

BW (MHz)	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
5	1712.5	1	0	24.11	24.24
		1	12	23.55	23.65
		1	24	23.34	23.21
		12	0	23.53	23.18
		12	6	22.70	23.14
		12	13	22.61	23.02
		25	0	22.35	22.78
	1732.5	1	0	24.05	24.14
		1	12	23.49	23.60
		1	24	23.28	23.13
		12	0	23.49	23.14
		12	6	22.63	23.05
		12	13	22.55	23.00
		25	0	22.25	22.77
	1752.5	1	0	24.09	24.22
		1	12	23.50	23.57
		1	24	23.25	23.18
		12	0	23.53	23.13
		12	6	22.65	23.08
		12	13	22.53	22.94
		25	0	22.30	22.69
10	1715.0	1	0	24.03	24.15
		1	24	23.50	23.56
		1	49	23.25	23.11
		25	0	23.52	23.16
		25	12	22.68	23.14
		25	25	22.61	23.00
		50	0	22.34	22.73
	1732.5	1	0	24.09	24.18
		1	24	23.45	23.59
		1	49	23.26	23.20
		25	0	23.52	23.11
		25	12	22.62	23.11
		25	25	22.55	23.02
		50	0	22.35	22.72
	1750.0	1	0	24.02	24.21
		1	24	23.46	23.65
		1	49	23.28	23.17
		25	0	23.53	23.09
		25	12	22.69	23.10
		25	25	22.59	23.02
		50	0	22.29	22.74
15	1717.5	1	0	24.02	24.20
		1	37	23.47	23.62
		1	74	23.34	23.12

		37	0	23.45	23.15
		37	18	22.62	23.13
		37	38	22.56	23.02
		75	0	22.28	22.73
	1732.5	1	0	24.07	24.21
		1	37	23.48	23.64
		1	74	23.25	23.11
		37	0	23.46	23.13
		37	18	22.69	23.04
		37	38	22.57	22.99
		75	0	22.34	22.69
	1747.5	1	0	24.06	24.22
		1	37	23.48	23.59
		1	74	23.24	23.13
		37	0	23.52	23.14
		37	18	22.63	23.08
		37	38	22.57	23.02
75		0	22.26	22.77	
20	1720.0	1	0	24.08	24.16
		1	49	23.45	23.57
		1	99	23.33	23.20
		50	0	23.49	23.10
		50	25	22.61	23.10
		50	50	22.54	22.98
		100	0	22.33	22.73
	1732.5	1	0	24.02	24.22
		1	49	23.52	23.65
		1	99	23.25	23.13
		50	0	23.50	23.14
		50	25	22.63	23.04
		50	50	22.53	22.97
		100	0	22.27	22.71
	1745.0	1	0	24.05	24.18
		1	49	23.48	23.63
		1	99	23.31	23.21
		50	0	23.50	23.12
		50	25	22.69	23.09
		50	50	22.52	23.00
		100	0	22.33	22.76

LTE Band5

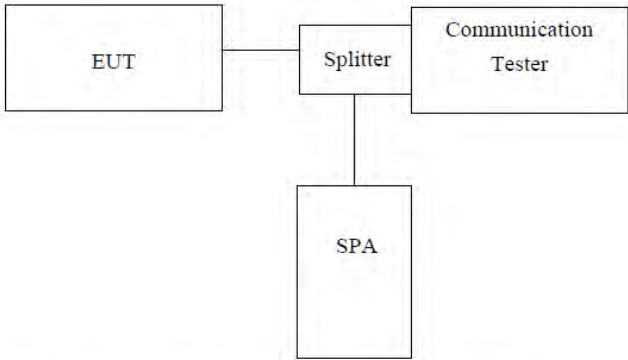
BW (MHz)	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
5	826.5	1	0	23.40	23.61
		1	12	23.35	23.41
		1	24	23.31	23.33
		12	0	22.96	23.02
		12	6	22.89	22.97
		12	13	22.81	22.93
		25	0	22.73	22.82
	836.5	1	0	23.30	23.53
		1	12	23.31	23.32
		1	24	23.29	23.29
		12	0	22.88	23.02
		12	6	22.80	22.90
		12	13	22.71	22.84
		25	0	22.72	22.75
	846.5	1	0	23.37	23.53
		1	12	23.33	23.40
		1	24	23.29	23.32
		12	0	22.88	22.95
		12	6	22.89	22.90
		12	13	22.78	22.85
		25	0	22.70	22.79
10	829.0	1	0	23.34	23.58
		1	24	23.27	23.41
		1	49	23.24	23.32
		25	0	22.87	22.95
		25	12	22.82	22.94
		25	25	22.75	22.87
		50	0	22.70	22.78
	836.5	1	0	23.38	23.54
		1	24	23.29	23.32
		1	49	23.27	23.31
		25	0	22.95	22.92
		25	12	22.81	22.90
		25	25	22.80	22.90
		50	0	22.70	22.74
	844.0	1	0	23.31	23.54
		1	24	23.33	23.33
		1	49	23.21	23.32
		25	0	22.90	22.94
		25	12	22.83	22.96
		25	25	22.76	22.88
		50	0	22.71	22.74

LTE Band7

BW (MHz)	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
5	2502.5	1	0	23.64	23.57
		1	12	23.59	23.56
		1	24	23.55	23.44
		12	0	23.13	23.11
		12	6	23.04	22.97
		12	13	22.89	22.89
		25	0	22.48	22.33
	2535.0	1	0	23.58	23.49
		1	12	23.51	23.51
		1	24	23.46	23.35
		12	0	23.09	23.08
		12	6	23.01	22.89
		12	13	22.87	22.84
		25	0	22.40	22.27
	2567.5	1	0	23.58	23.50
		1	12	23.56	23.49
		1	24	23.50	23.44
		12	0	23.05	23.08
		12	6	23.00	22.94
		12	13	22.81	22.82
		25	0	22.44	22.27
10	2505.0	1	0	23.59	23.48
		1	24	23.51	23.50
		1	49	23.51	23.34
		25	0	23.07	23.09
		25	12	23.04	22.93
		25	25	22.82	22.85
		50	0	22.39	22.30
	2535.0	1	0	23.55	23.50
		1	24	23.52	23.50
		1	49	23.48	23.44
		25	0	23.12	23.04
		25	12	23.00	22.88
		25	25	22.85	22.84
		50	0	22.41	22.30
	2565.0	1	0	23.56	23.49
		1	24	23.50	23.46
		1	49	23.49	23.35
		25	0	23.05	23.11
		25	12	23.03	22.91
		25	25	22.85	22.84
		50	0	22.45	22.26
15	2507.5	1	0	23.62	23.54
		1	37	23.53	23.50
		1	74	23.48	23.40

		37	0	23.12	23.03
		37	18	22.96	22.95
		37	38	22.84	22.82
		75	0	22.40	22.29
	2535.0	1	0	23.58	23.48
		1	37	23.53	23.54
		1	74	23.48	23.35
		37	0	23.06	23.10
		37	18	23.01	22.96
		37	38	22.79	22.86
		75	0	22.46	22.24
		2562.5	1	0	23.61
	1		37	23.54	23.52
	1		74	23.51	23.37
	37		0	23.10	23.02
	37		18	22.94	22.88
	37		38	22.84	22.84
	75		0	22.46	22.27
	20	2510.0	1	0	23.57
1			49	23.55	23.51
1			99	23.51	23.39
50			0	23.10	23.03
50			25	22.94	22.88
50			50	22.88	22.82
100			0	22.47	22.24
2535.0		1	0	23.61	23.51
		1	49	23.52	23.52
		1	99	23.46	23.36
		50	0	23.06	23.01
		50	25	22.99	22.90
		50	50	22.86	22.82
		100	0	22.41	22.29
2560		1	0	23.63	23.51
		1	49	23.55	23.49
		1	99	23.51	23.34
		50	0	23.03	23.02
		50	25	23.01	22.91
		50	50	22.85	22.83
		100	0	22.46	22.25

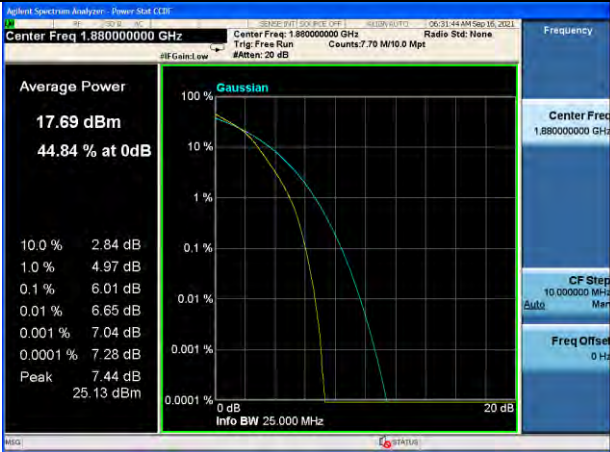
4.4 Peak-to-Average Ratio

Test Requirement:	Part 22.913(d), FCC part24.232(d), FCC part27.50(d)(5), RSS-132 (5.4), RSS-133 (6.4), RSS-139(6.5), RSS-199(4.4)
Test Method:	FCC part2.1046, ANSI/TIA-603-E, ANSI C63.26 Clause 5.2.3.4 FCC KDB971168 D01 v03r01 Section 5.7
Test Limit:	Used complementary cumulative distribution function (CCDF) of analyzer to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time
Test setup:	 <pre> graph LR EUT[EUT] --- Splitter[Splitter] Splitter --- CT[Communication Tester] Splitter --- SPA[SPA] </pre> <p><i>Note: Measurement setup for testing on Antenna connector</i></p>
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.7.. 2. The EUT was connected to spectrum and system simulator via a power divider 3. Using the CCDF measurement of spectrum analyzer; 4. Set $RBW \geq OBW$ or specified reference bandwidth; 5. Set the number of counts to a value that stabilizes the measured CCDF curve; 6. Set the measurement interval as 1ms 7. Record the maximum PAPR level associated with a probability of 0.1%.
Test Instruments:	Refer to section 3 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

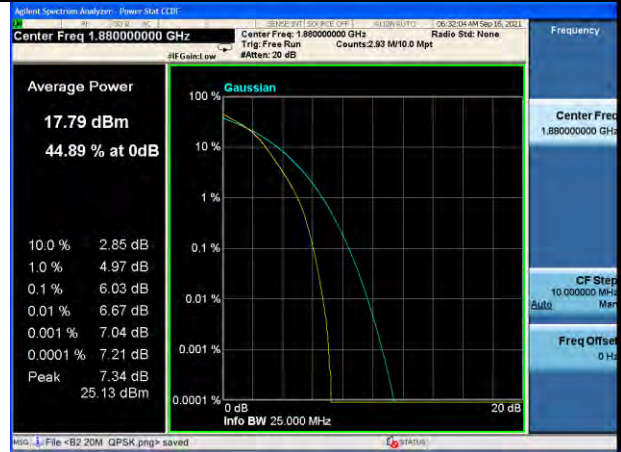
Test plots are listed as below:

Test mode	Peak to Average Ratio (dB)	Limit (dB)	Result
LTE Band 2 Middle channel/20MHz/QPSK	6.01	13	PASS
LTE Band 2 Middle channel/20MHz/16-QAM	6.03	13	PASS
LTE Band 4 Middle channel/20MHz/QPSK	6.06	13	PASS
LTE Band 4 Middle channel/20MHz/16-QAM	6.06	13	PASS
LTE Band 5 Middle channel/10MHz/QPSK	6.12	13	PASS
LTE Band 5 Middle channel/10MHz/16-QAM	6.10	13	PASS
LTE Band 7 Middle channel/20MHz/QPSK	6.04	13	PASS
LTE Band 7 Middle channel/20MHz/16-QAM	6.04	13	PASS

Test Mode: LTE Band 2
Middle channel/20MHz/QPSK



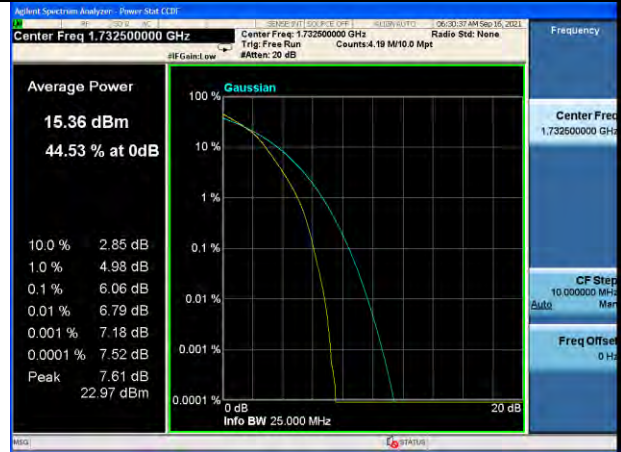
Test Mode: LTE Band 2
Middle channel/20MHz/16-QAM



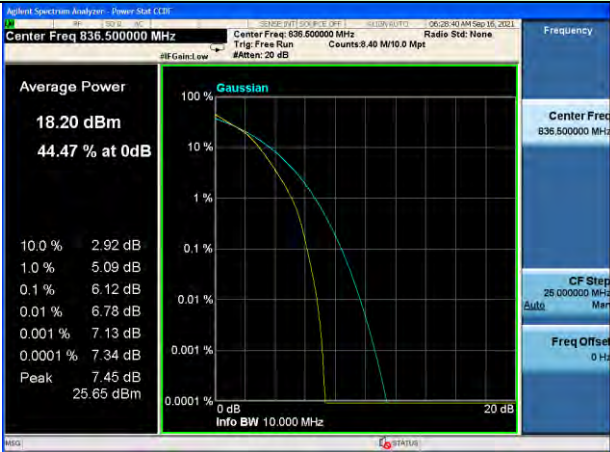
Test Mode: LTE Band 4
Middle channel/20MHz/QPSK



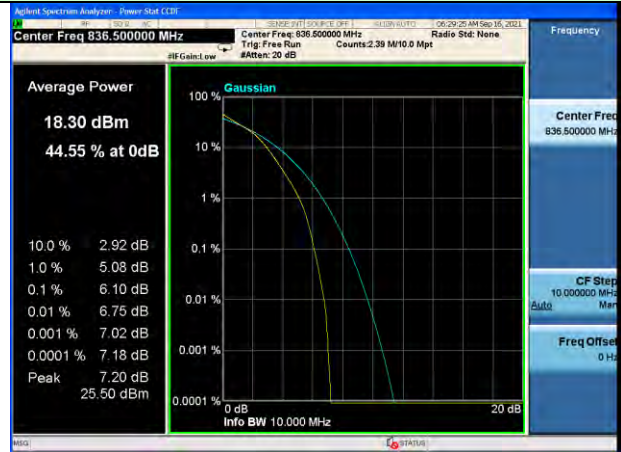
Test Mode: LTE Band 4
Middle channel/20MHz/16-QAM

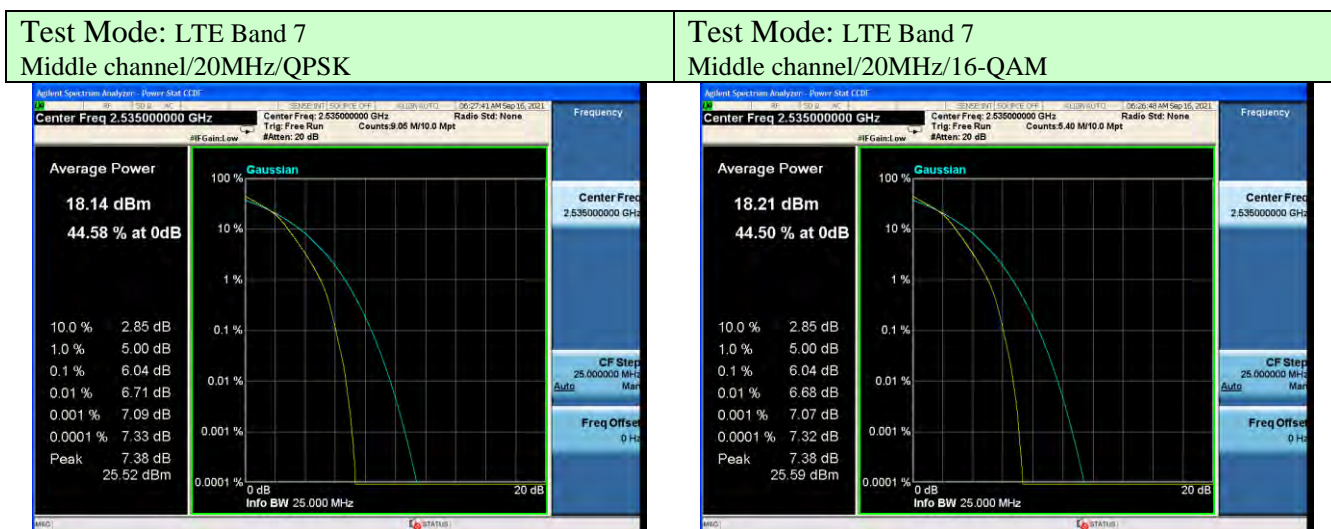


Test Mode: LTE Band 5
Middle channel/10MHz/QPSK



Test Mode: LTE Band 5
Middle channel/10MHz/16-QAM





Note: All bandwidth and modulation are tested, only the worst results are reported.

4.5 Occupy Bandwidth

Test Requirement:	FCC Part 2.1049, FCC part22.913(a), FCC part24.232(b) and FCC part27.53(a), RSS-132 (3.1), RSS-133 (3.1), RSS-139(3.1) and RSS-199(4.2)
Test Method:	KDB 971168 D01 v03r1 clause 4, FCC part2.1049, ANSI/TIA-603-E, ANSI C63.26 clause 5.4, RSS-Gen Section 6.7.
Test setup:	<p><i>Note: Measurement setup for testing on Antenna connector</i></p>
Test Procedure:	<ol style="list-style-type: none"> 1.The EUT's output RF connector was connected with a short cable to the spectrum analyzer, set center frequency to channel center frequency. 2.RBW was set to about 1%-5% of emission OBW, $VBW \geq 3 \times RBW$. 3.Set spectrum analyzer detection mode to peak, and the trace mode to max hold. 4. Use the 99% OBW function, The 99% power OBW can be found on the plot, determine the "-26dB amplitude" as equal to reference value -26dB.
Test Instruments:	Refer to section 3 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Measurement Data

EUT Mode	Channel Bandwidth	Mode	RB Configure		99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
			RB Size	RB Offset		
LTE Band 2	5MHz	QPSK	25	0	4520.9	4983
		16-QAM	25	0	4512.0	5036
	10MHz	QPSK	50	0	9024.0	9930
		16-QAM	50	0	9033.6	10000
	15MHz	QPSK	75	0	13493.0	14740
		16-QAM	75	0	13492.0	14610
	20MHz	QPSK	100	0	17888.0	19100
		16-QAM	100	0	17933.0	19130

EUT Mode	Channel Bandwidth	Mode	RB Configure		99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
			RB Size	RB Offset		
LTE Band 4	5MHz	QPSK	25	0	4526.6	5031
		16-QAM	25	0	4520.8	5034
	10MHz	QPSK	50	0	8929.2	9652
		16-QAM	50	0	8921.0	9633
	15MHz	QPSK	75	0	13455.0	14710
		16-QAM	75	0	13429.0	14680
	20MHz	QPSK	100	0	17910.0	19190
		16-QAM	100	0	17898.0	19330

EUT Mode	Channel Bandwidth	Mode	RB Configure		99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
			RB Size	RB Offset		
LTE Band 5	5MHz	QPSK	25	0	4522.0	5023
		16-QAM	25	0	4522.2	5001
	10MHz	QPSK	50	0	8942.2	9592
		16-QAM	50	0	8921.2	9646

EUT Mode	Channel Bandwidth	Mode	RB Configure		99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
			RB Size	RB Offset		
LTE Band 7	5MHz	QPSK	25	0	4524.9	5030
		16-QAM	25	0	4517.2	5004
	10MHz	QPSK	50	0	8921.4	9660
		16-QAM	50	0	8939.9	9629
	15MHz	QPSK	75	0	13452.0	14680
		16-QAM	75	0	13415.0	14570
	20MHz	QPSK	100	0	17858.0	19070
		16-QAM	100	0	17850.0	19280

Note: All bandwidth and modulation are tested, only the worst results are reported.

Test plot as follows:

Test Mode: LTE Band 2 Channel Bandwidth: 5MHz	Test Mode: LTE Band 2 Channel Bandwidth: 10MHz
--	---



QPSK



QPSK

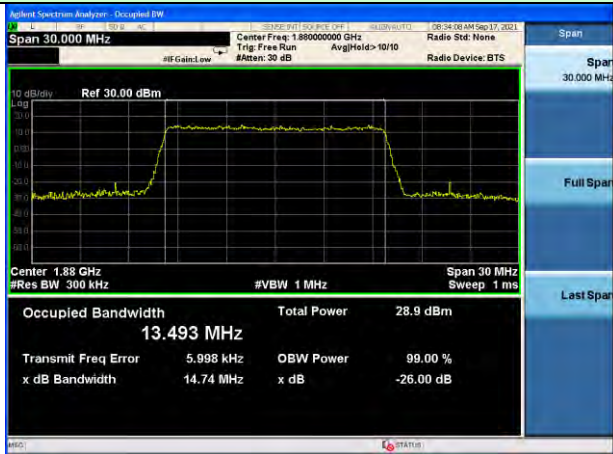


16-QAM



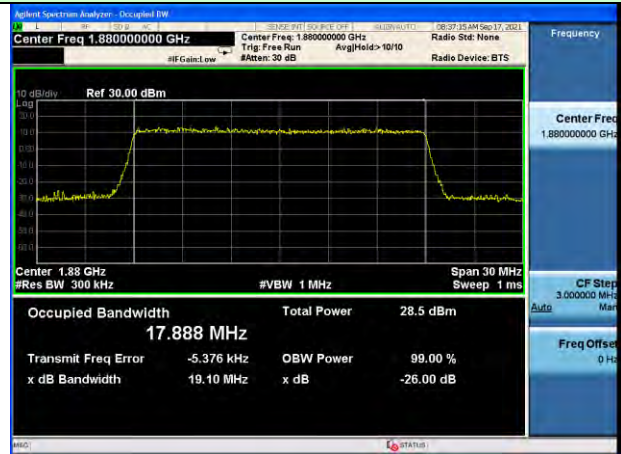
16-QAM

Test Mode: LTE Band 2 Channel Bandwidth: 15MHz



QPSK

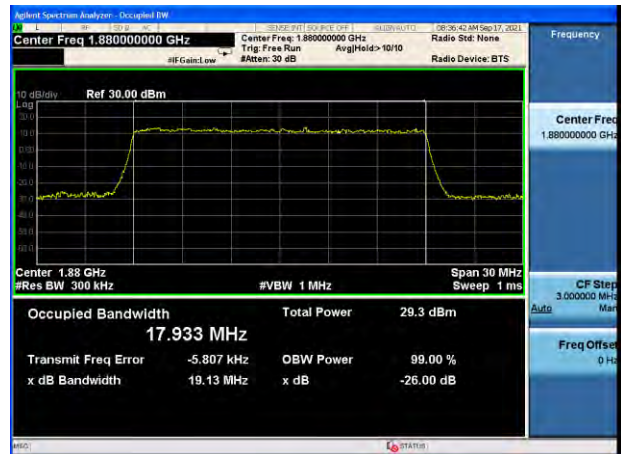
Test Mode: LTE Band 2 Channel Bandwidth: 20MHz



QPSK



16-QAM



16-QAM

Test Mode: LTE Band 4
Channel Bandwidth: 5MHz



QPSK

Test Mode: LTE Band 4
Channel Bandwidth: 10MHz



QPSK



16-QAM



16-QAM

Test Mode: LTE Band 4 Channel Bandwidth: 15MHz	Test Mode: LTE Band 4 Channel Bandwidth: 20MHz
---	---



QPSK



QPSK



16-QAM



16-QAM

Test Mode: LTE Band 5
Channel Bandwidth: 5MHz



QPSK

Test Mode: LTE Band 5
Channel Bandwidth: 10MHz



QPSK



16-QAM



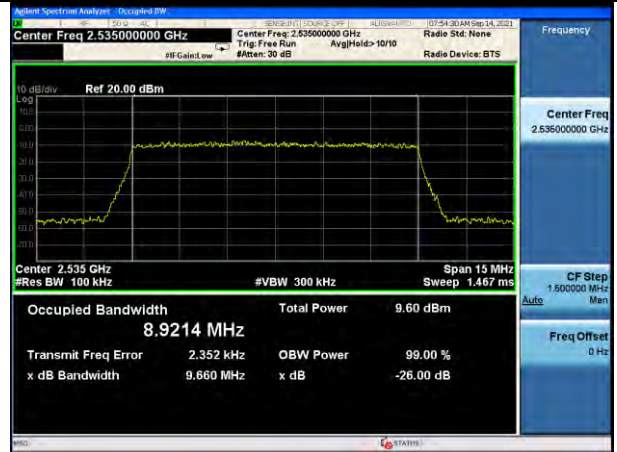
16-QAM

Test Mode: LTE Band 7
Channel Bandwidth: 5MHz



QPSK

Test Mode: LTE Band 7
Channel Bandwidth: 10MHz



QPSK



16-QAM



16-QAM

Test Mode: LTE Band 7
Channel Bandwidth: 15MHz

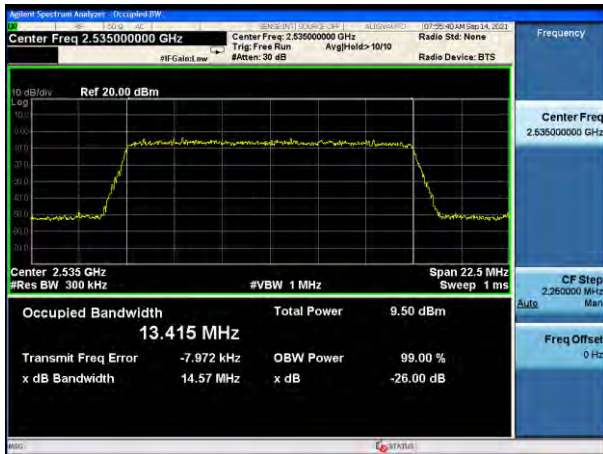


QPSK

Test Mode: LTE Band 7
Channel Bandwidth: 20MHz



QPSK



16-QAM



16-QAM

Note: All bandwidth and modulation are tested, only the worst results are reported.

4.6 MODULATION CHARACTERISTIC

According to FCC §2.1047(d), Part 22H, Part 24E, Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

According to RSS-132, RSS-133, RSS-139, RSS-199 the equipment certified under these standards shall employ digital modulation, but there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

4.7 Out of band emission at antenna terminals

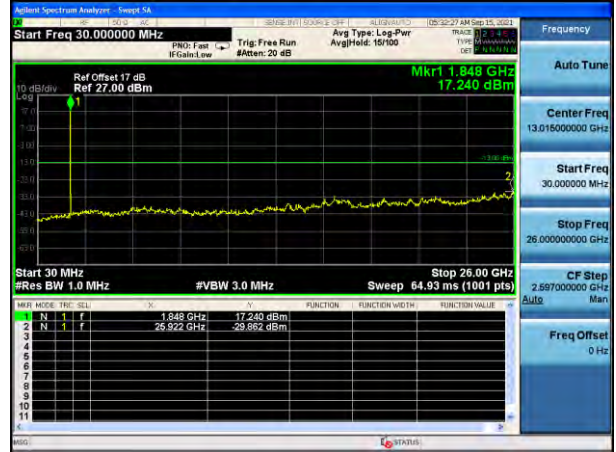
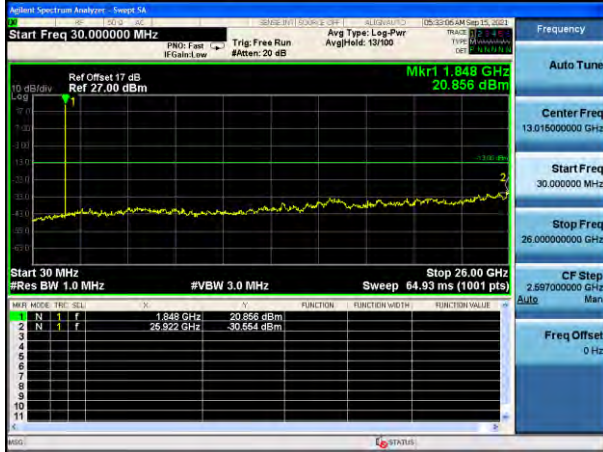
Test Requirement:	FCC part22.913(a), FCC part24.238(a), FCC part27.53(h) and RSS-132 (5.5), RSS-133 (6.5.1), RSS-139(6.6) and RSS-199(4.5)
Test Method:	KDB 971168 D01 v03r1 clause 6, FCC part2.1051, ANSI/TIA-603-E, ANSI C63.26 clause 5.7
Limit:	-13dBm(Band 7/13/26 request additional limit) Band 7 Additional Limit refer to RSS-199(4.5) and FCC part 27.53 Band 13 Additional Limit refer to FCC part 27.53
Test setup:	<p><i>Note: Measurement setup for testing on Antenna connector</i></p>
Test Procedure:	<ol style="list-style-type: none"> 1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic. 3 For the out of band: Set the RBW=1MHz, VBW = 3MHz, Start=30MHz, Stop= 10th harmonic. 4 Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.
Test Instruments:	Refer to section 3 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Test plot as follows:

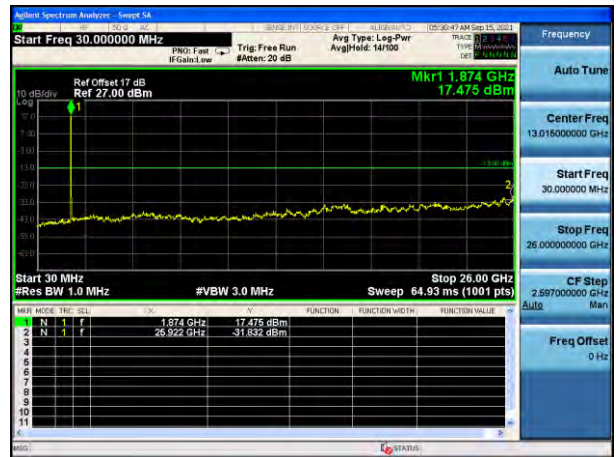
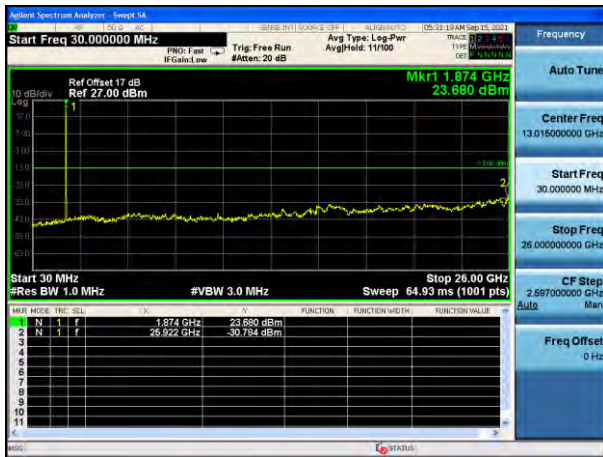
Conducted Spurious Emission:

Test Mode: LTE Band 2 / 5MHz /1RB

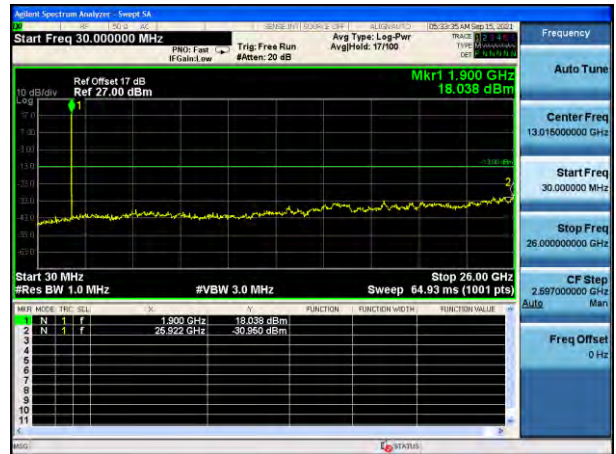
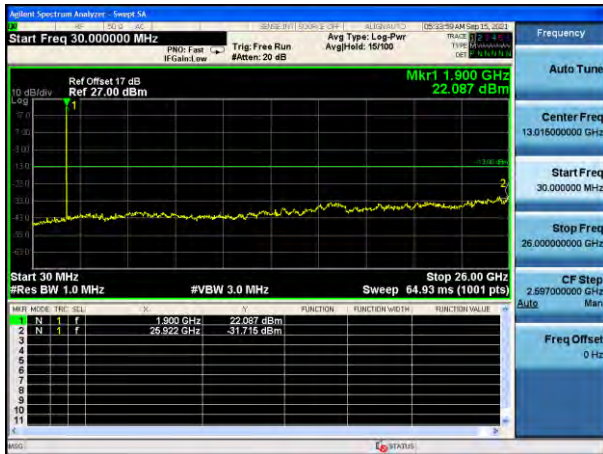
Test Mode: LTE Band 2 / 5MHz /25RB



Lowest channel

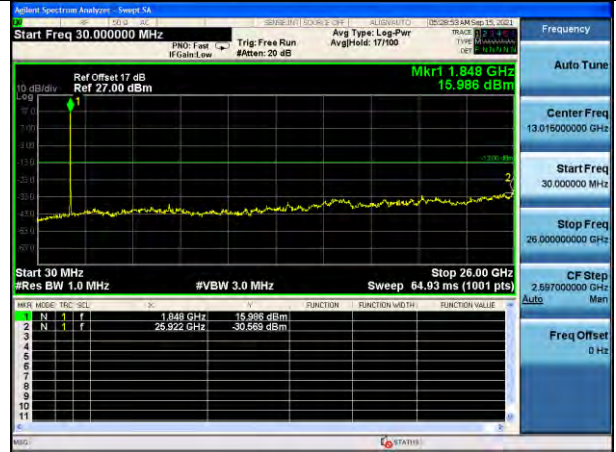
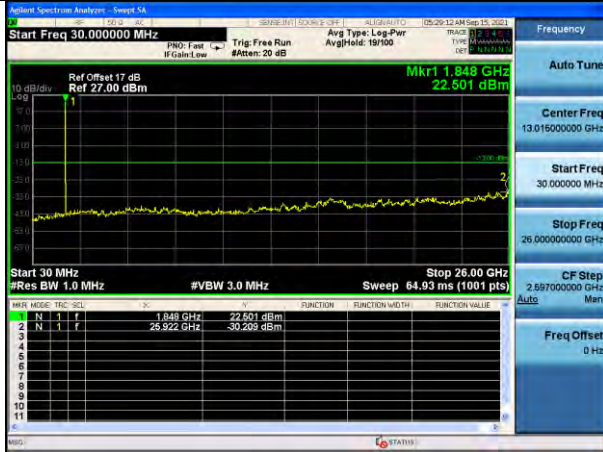


Middle channel

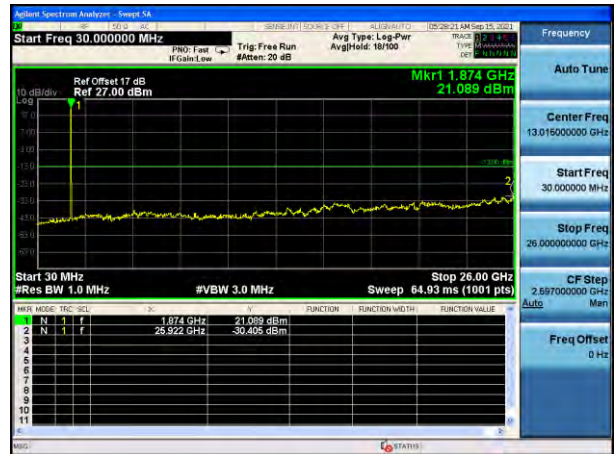
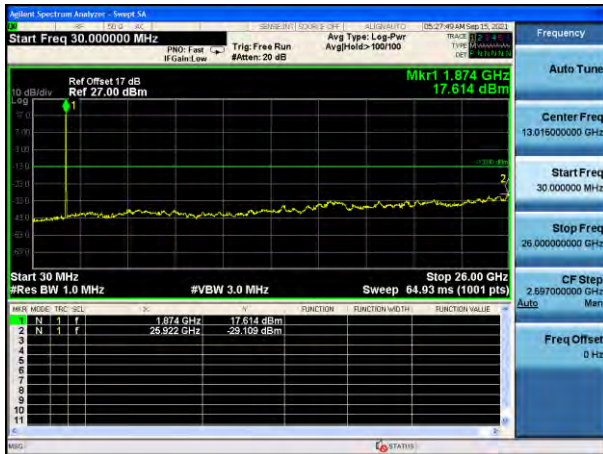


Highest channel

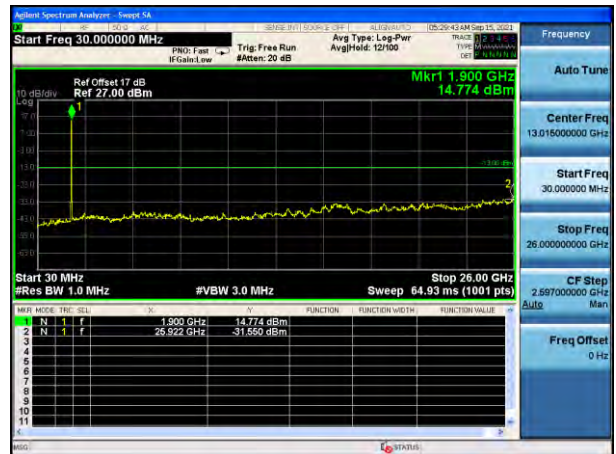
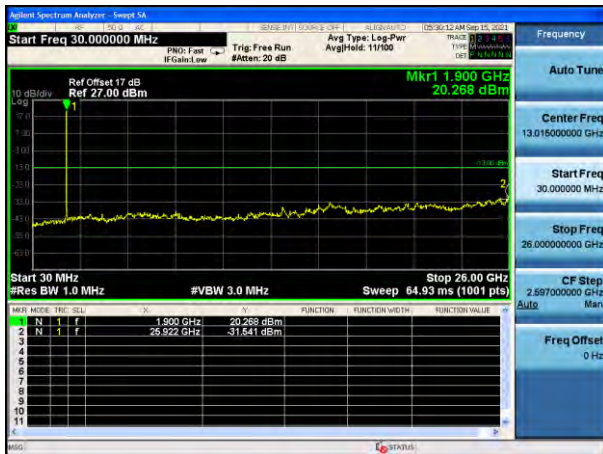
Test Mode: LTE Band 2 / 10MHz /1RB Test Mode: LTE Band 2 / 10MHz /50RB



Lowest channel



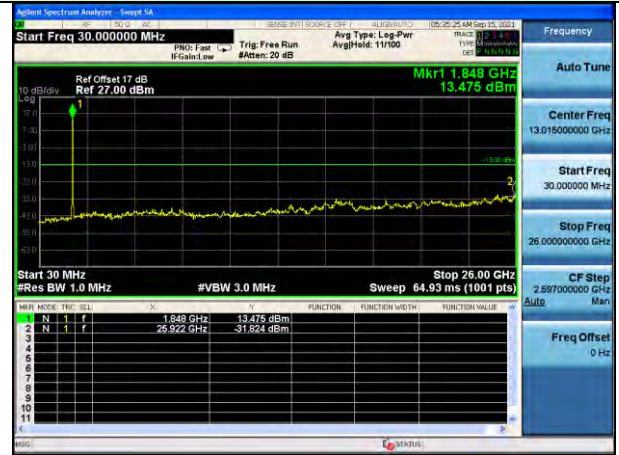
Middle channel



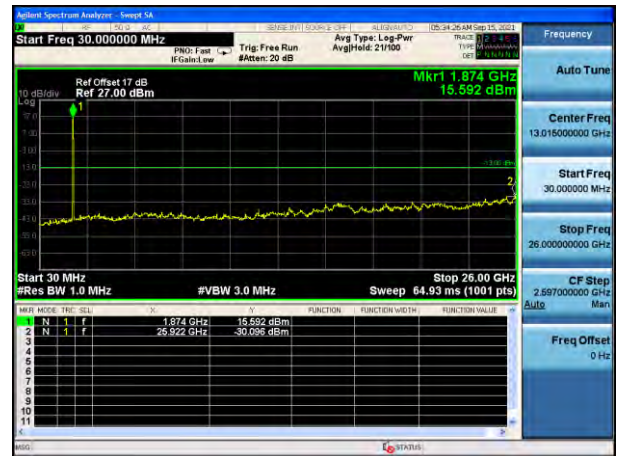
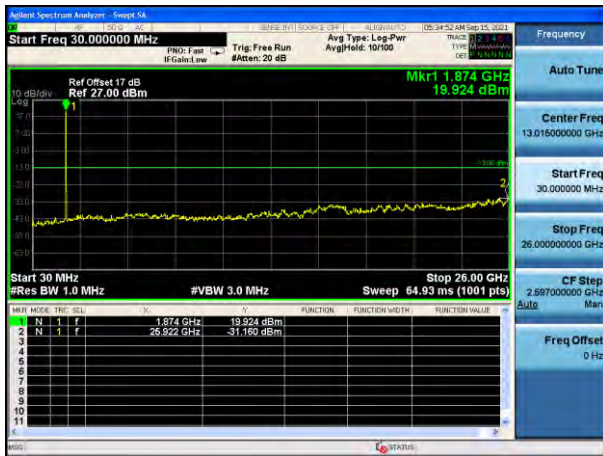
Highest channel

Test Mode: LTE Band 2 / 15MHz /1RB

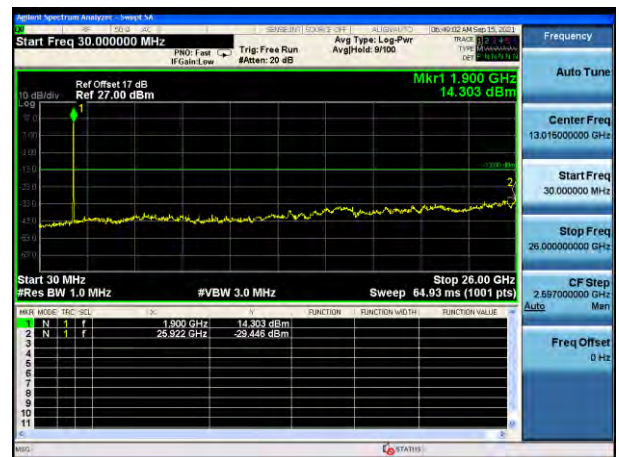
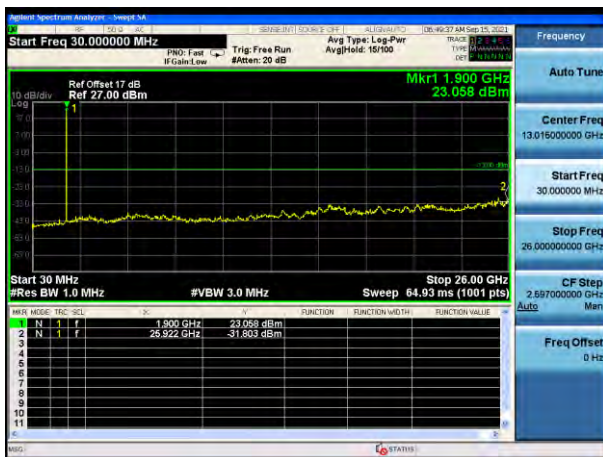
Test Mode: LTE Band 2 / 15MHz /75RB



Lowest channel

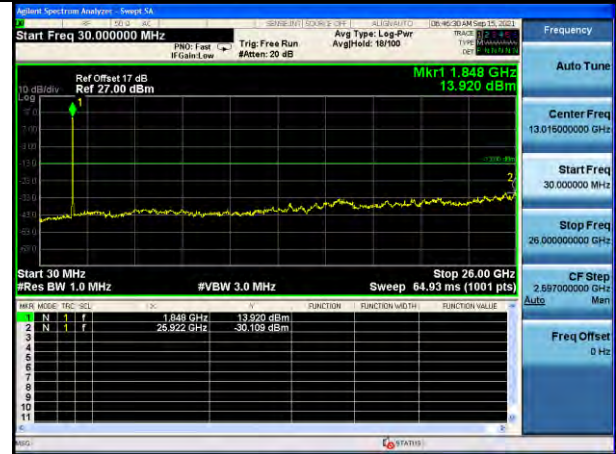
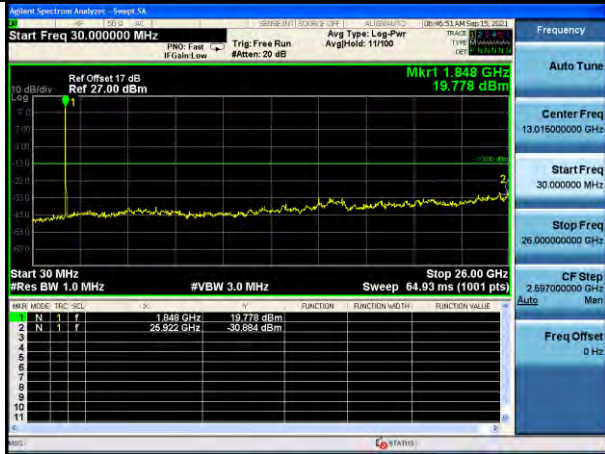


Middle channel

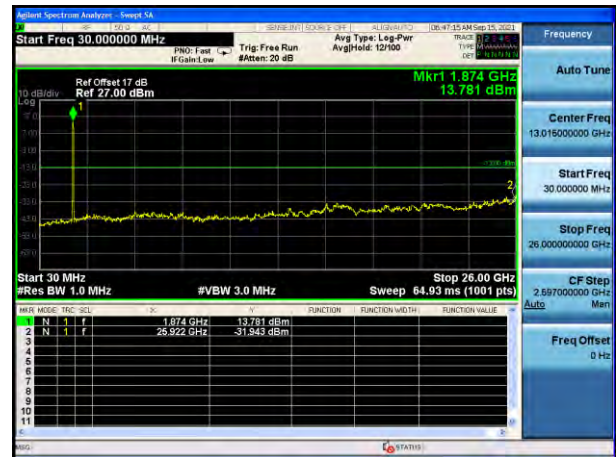
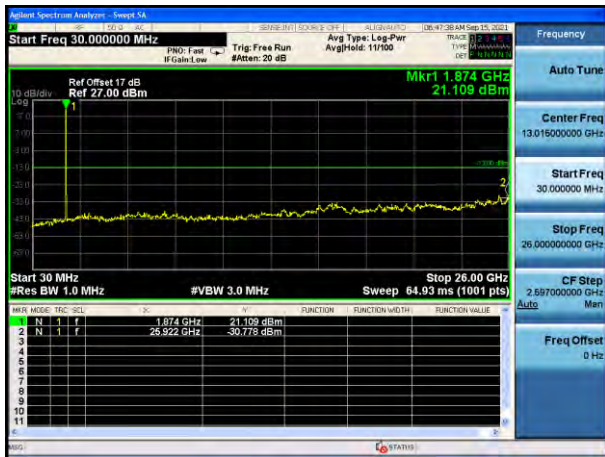


Highest channel

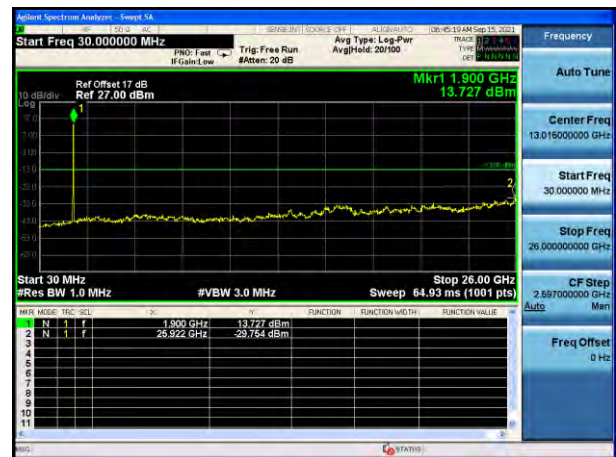
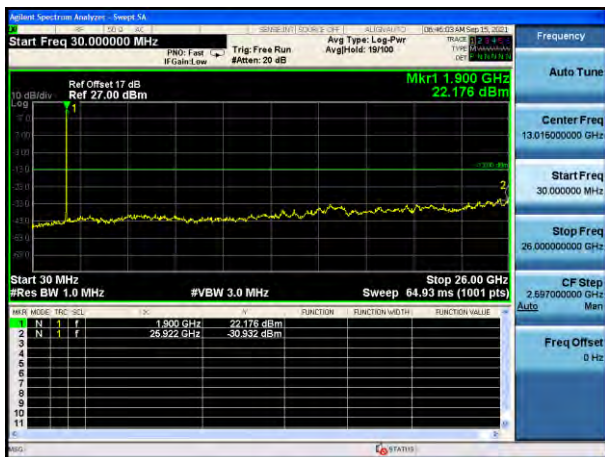
Test Mode: LTE Band 2 / 20MHz /1RB Test Mode: LTE Band 2 / 20MHz /100RB



Lowest channel



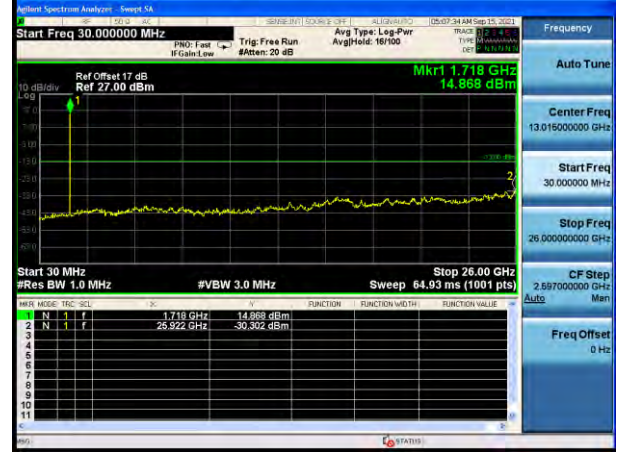
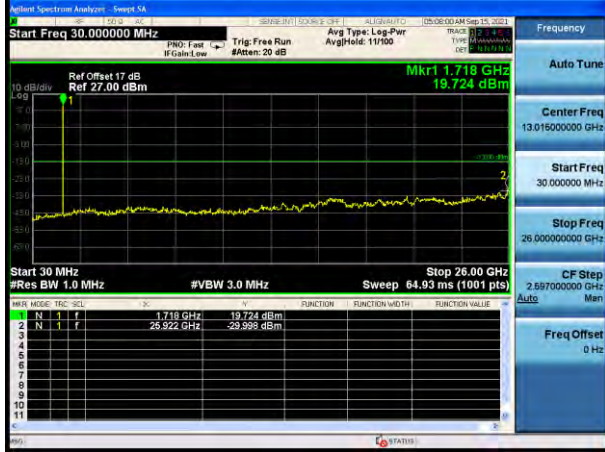
Middle channel



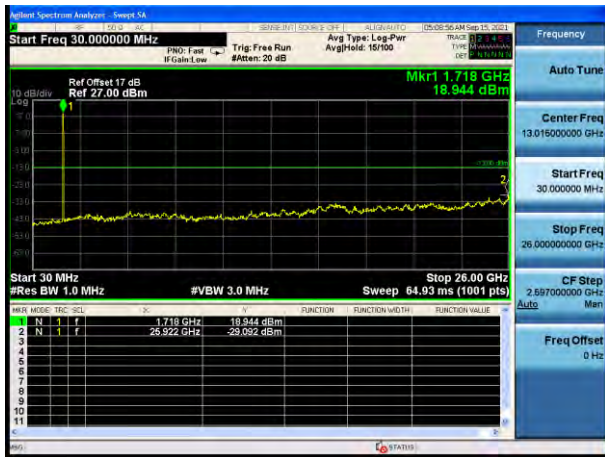
Highest channel

Test Mode: LTE Band 4 / 5MHz / 1RB

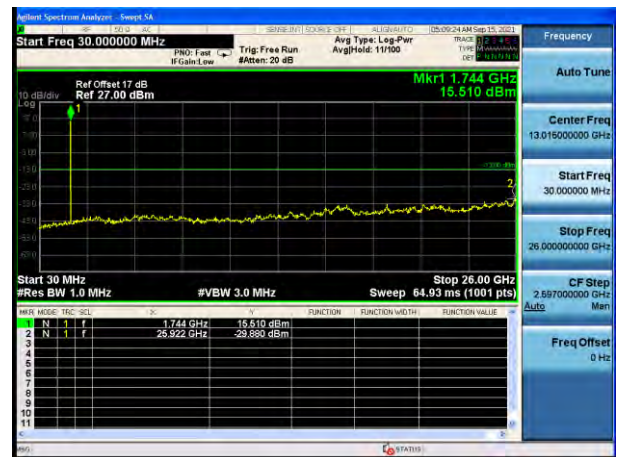
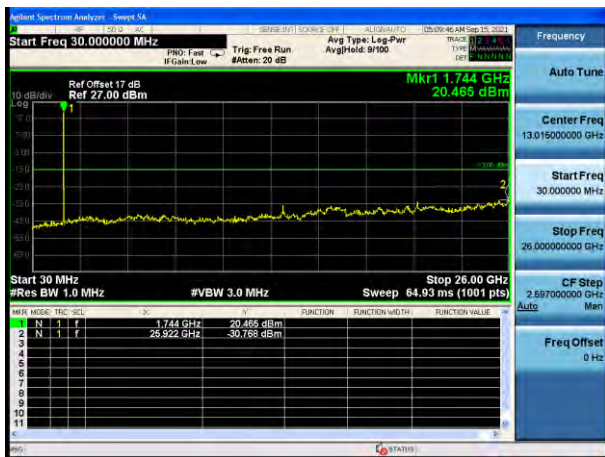
Test Mode: LTE Band 4 / 5MHz / 25RB



Lowest channel

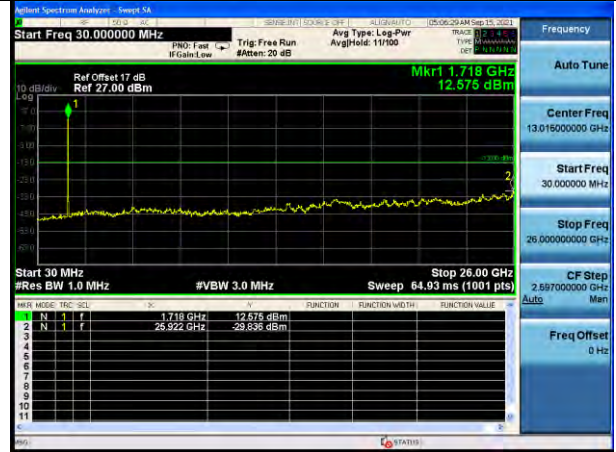
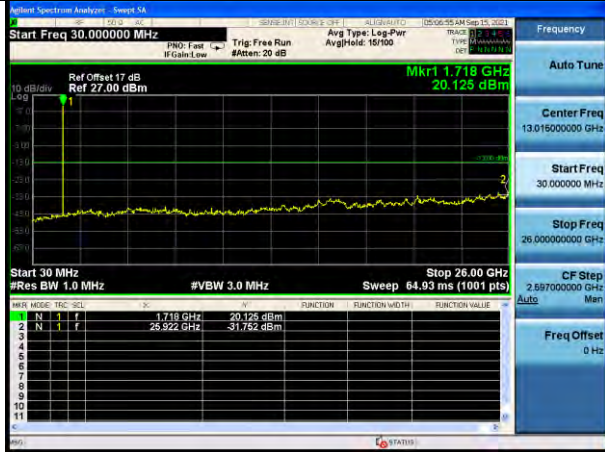


Middle channel

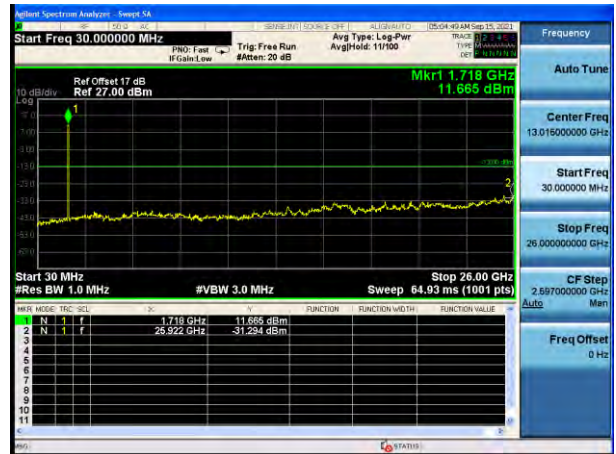
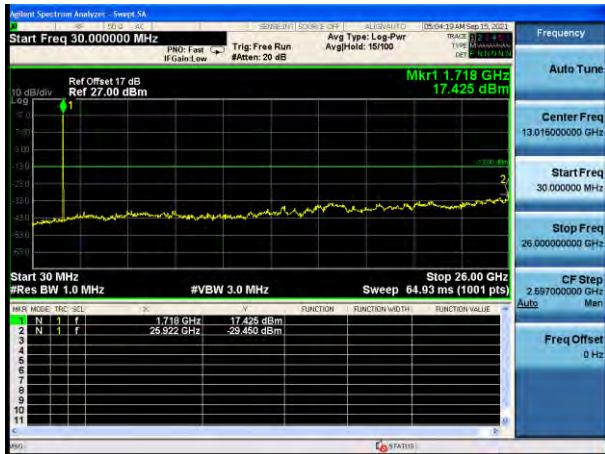


Highest channel

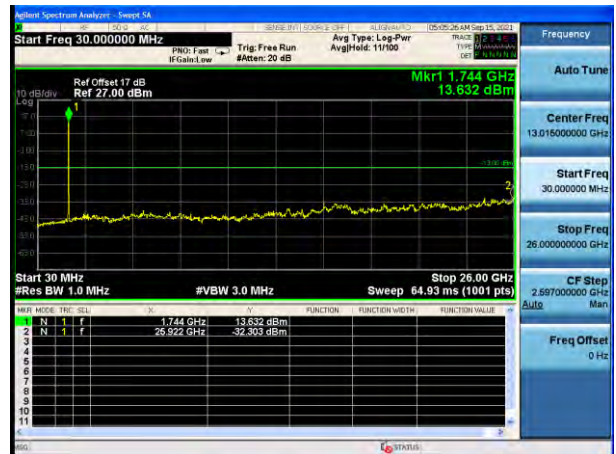
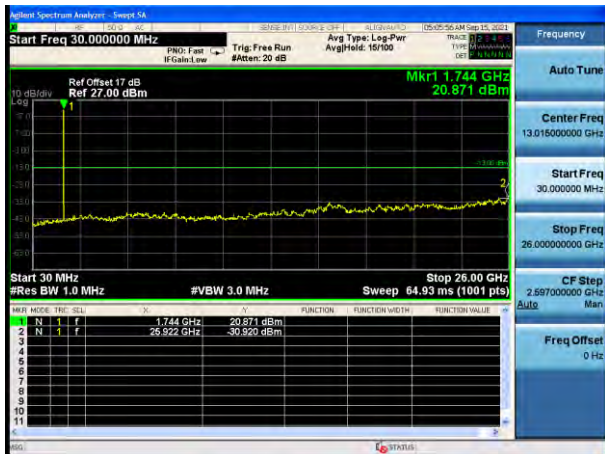
Test Mode: LTE Band 4 / 10MHz /1RB Test Mode: LTE Band 4 / 10MHz /50RB



Lowest channel



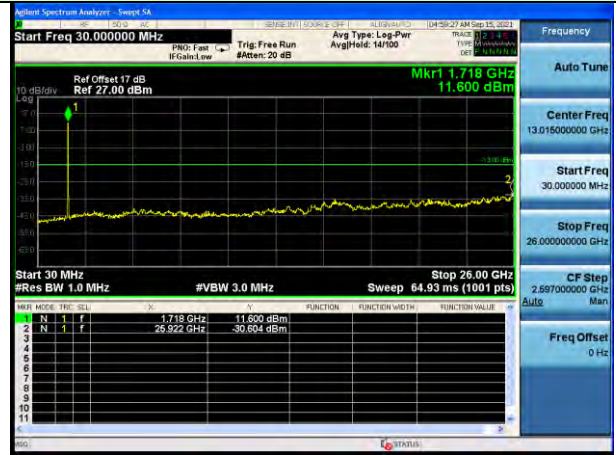
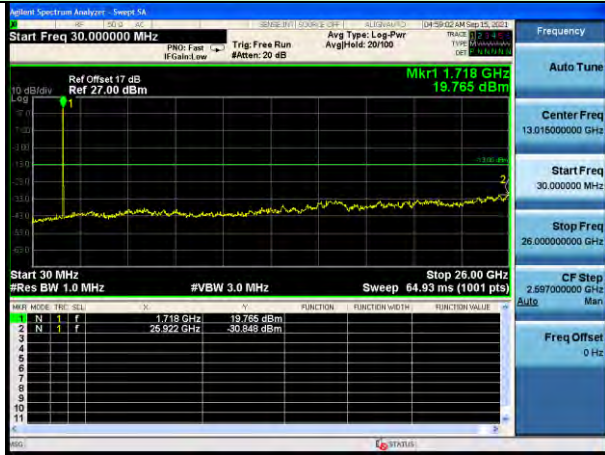
Middle channel



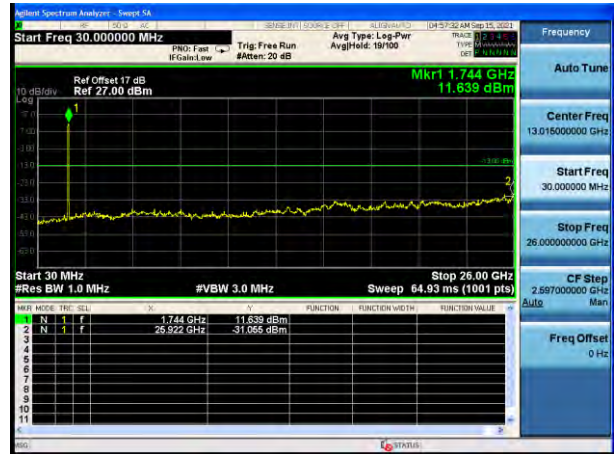
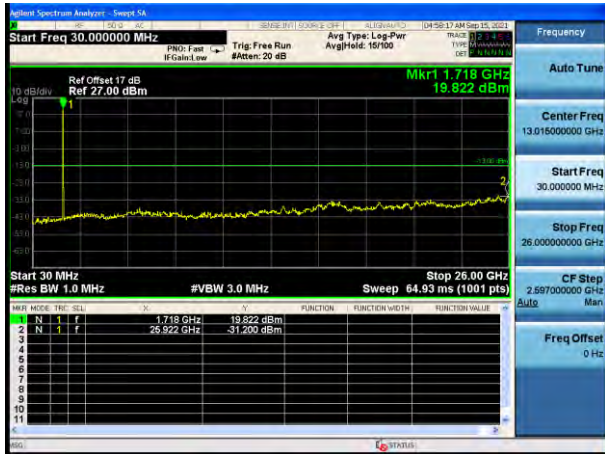
Highest channel

Test Mode: LTE Band 4 / 15MHz /1RB

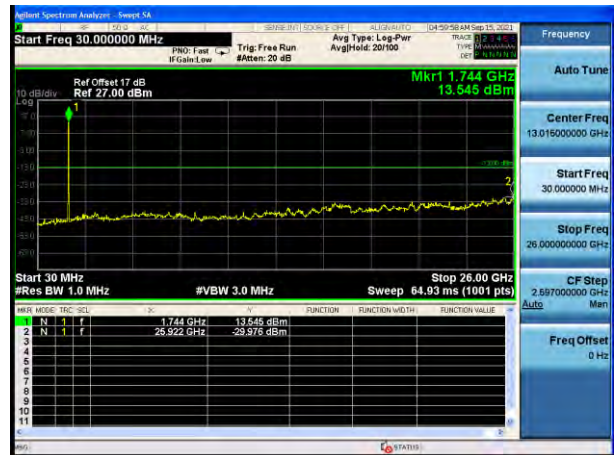
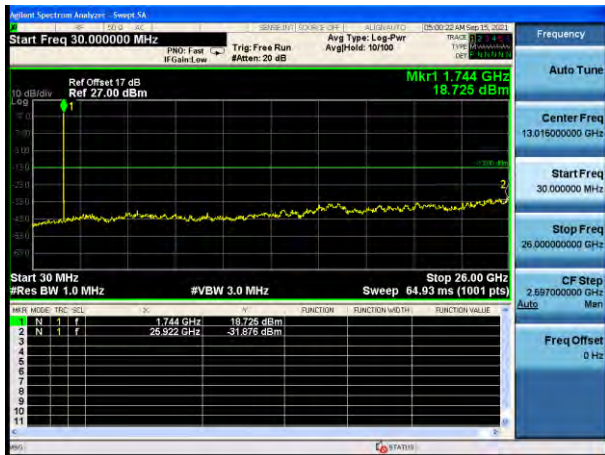
Test Mode: LTE Band 4 / 15MHz /75RB



Lowest channel



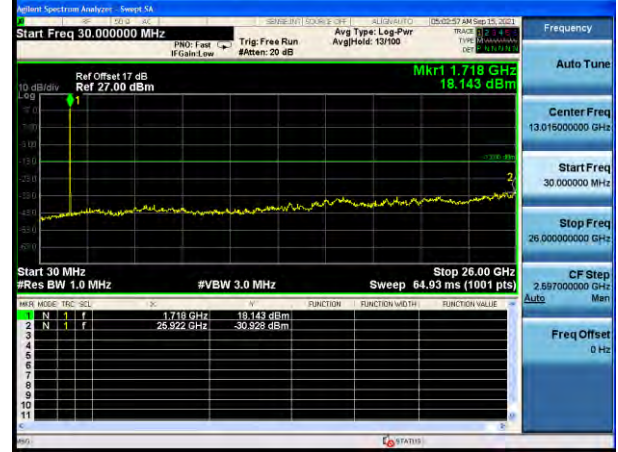
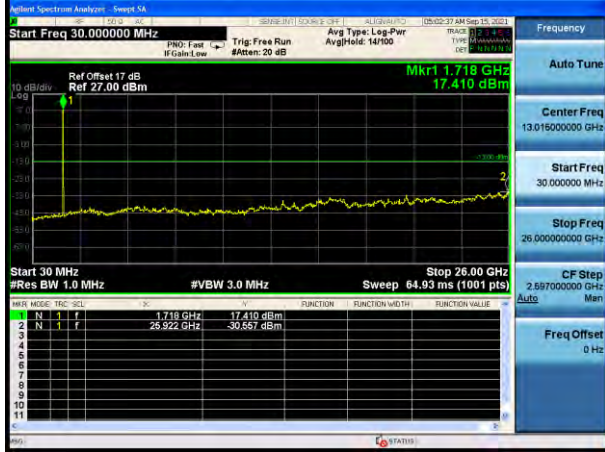
Middle channel



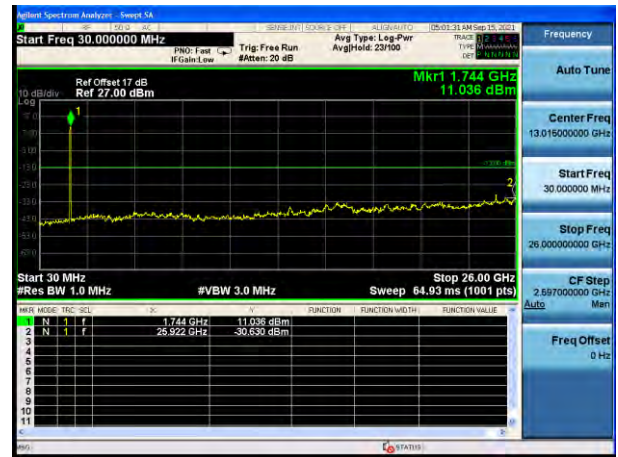
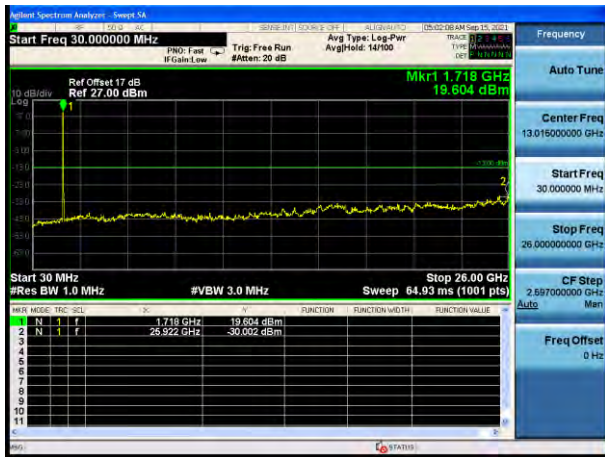
Highest channel

Test Mode: LTE Band 4 / 20MHz /1RB

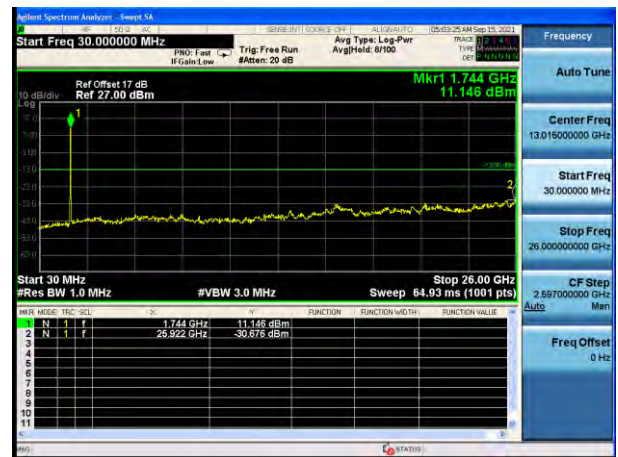
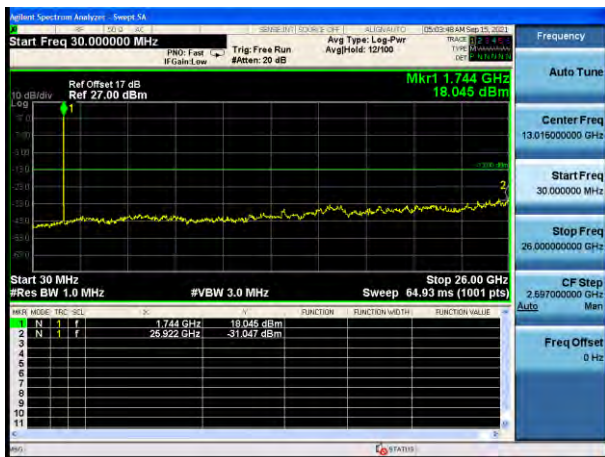
Test Mode: LTE Band 4 / 20MHz /100RB



Lowest channel



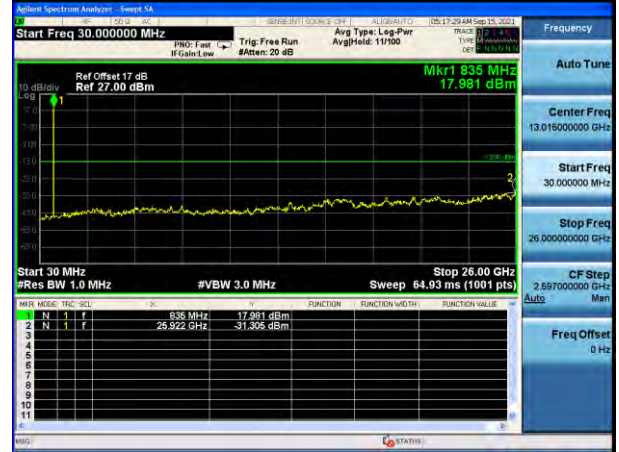
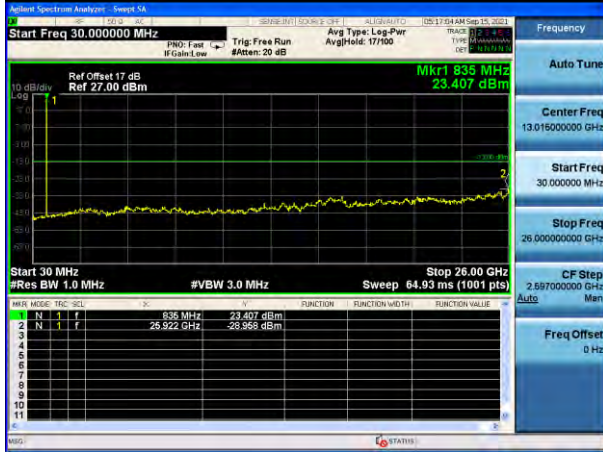
Middle channel



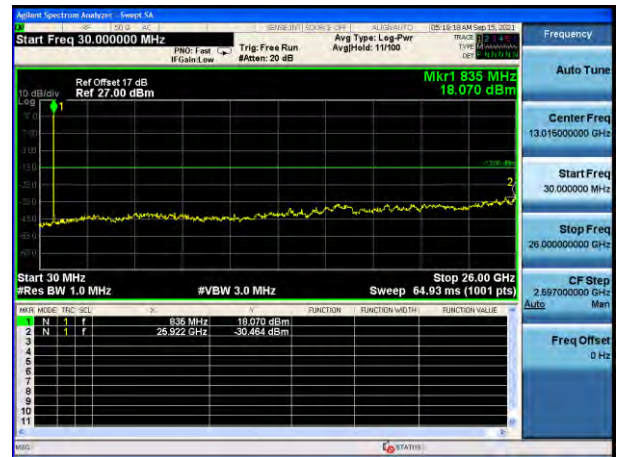
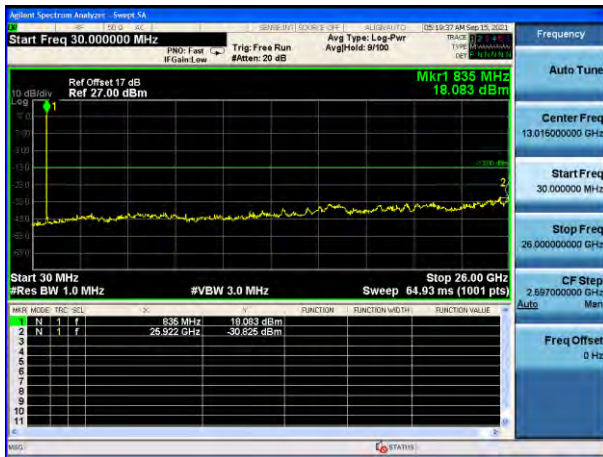
Highest channel

Test Mode: LTE Band 5 / 5MHz /1RB

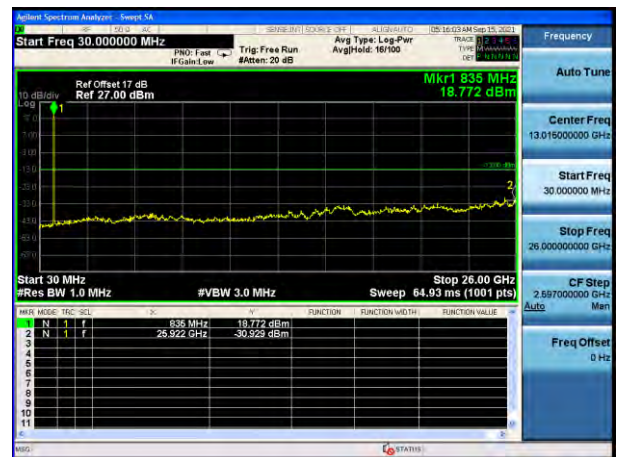
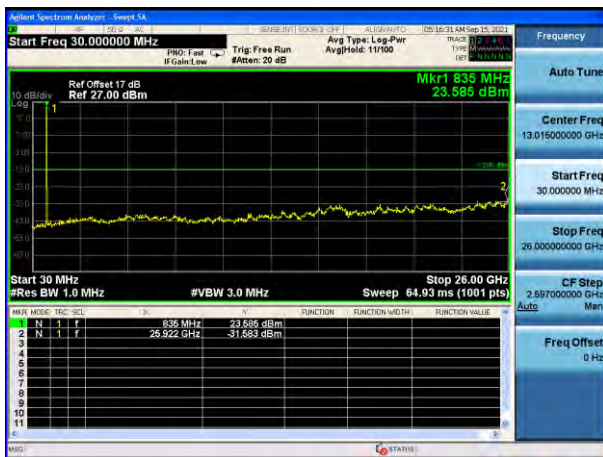
Test Mode: LTE Band 5 / 5MHz /25RB



Lowest channel



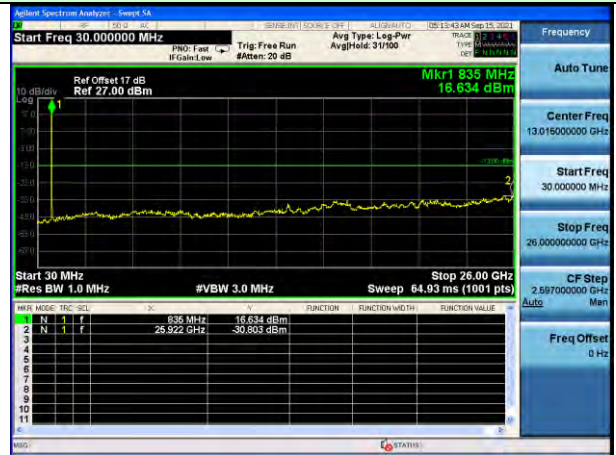
Middle channel



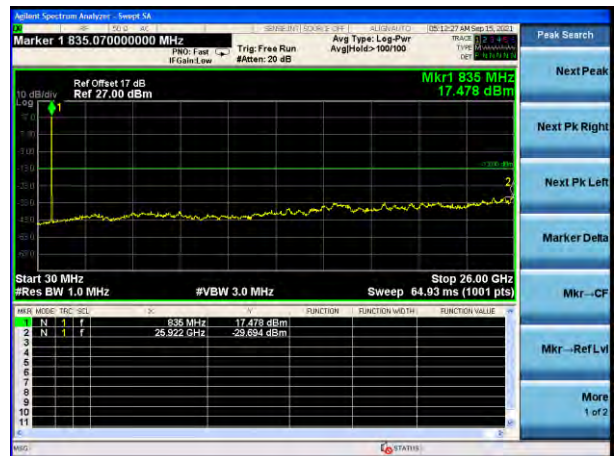
Highest channel

Test Mode: LTE Band 5/ 10MHz /1RB

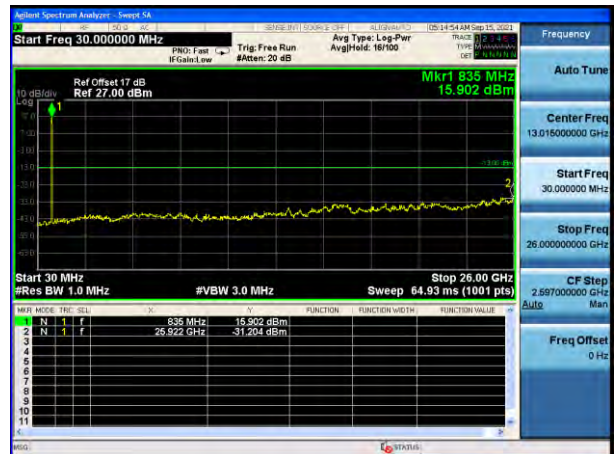
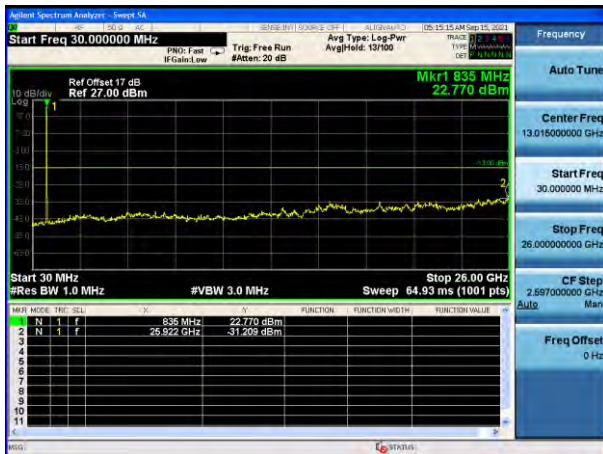
Test Mode: LTE Band 5/ 10MHz /50RB



Lowest channel



Middle channel



Highest channel

Test Mode: LTE Band 7 / 5MHz /1RB

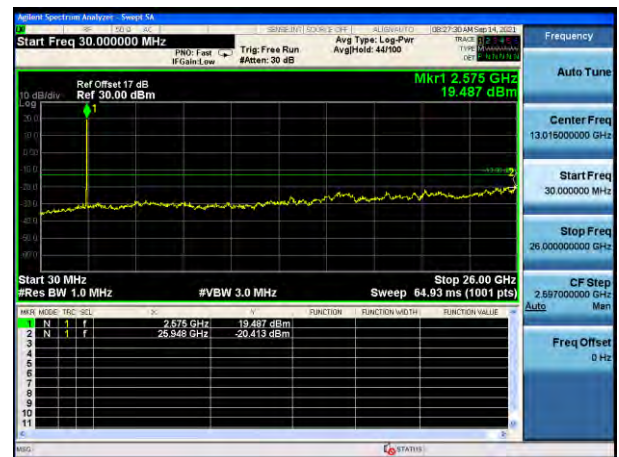
Test Mode: LTE Band 7 / 5MHz /25RB



Lowest channel



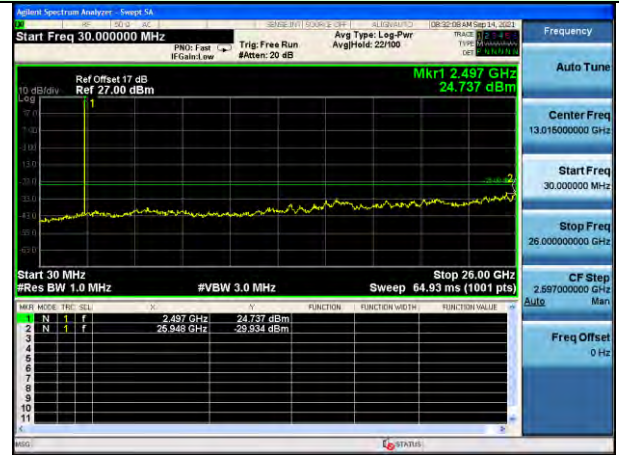
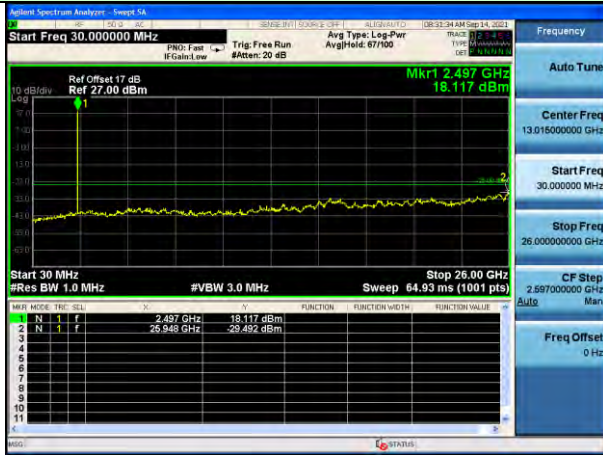
Middle channel



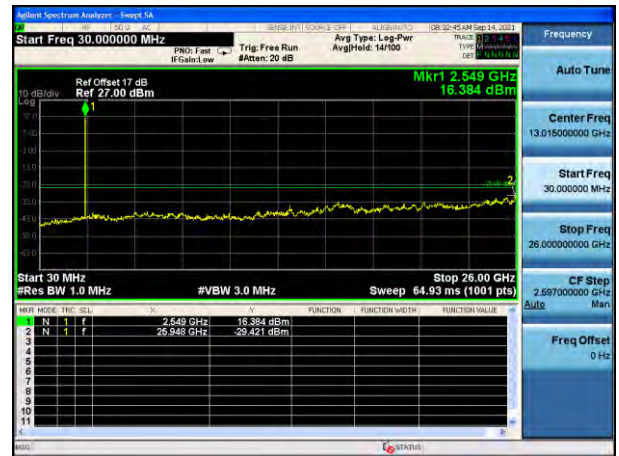
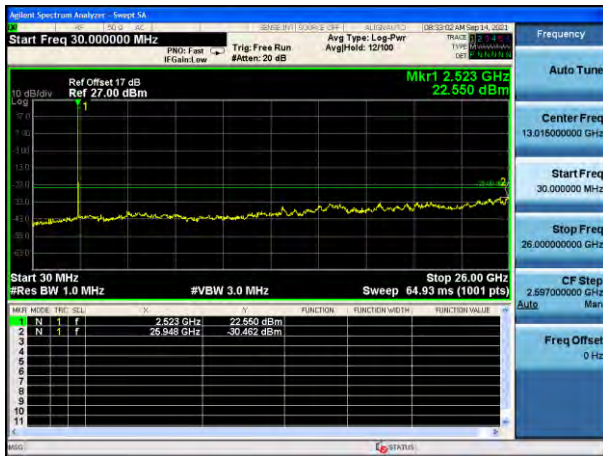
Highest channel

Test Mode: LTE Band 7 / 10MHz /1RB

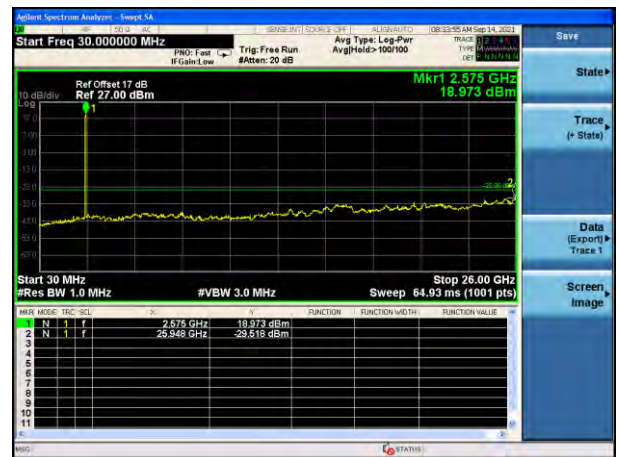
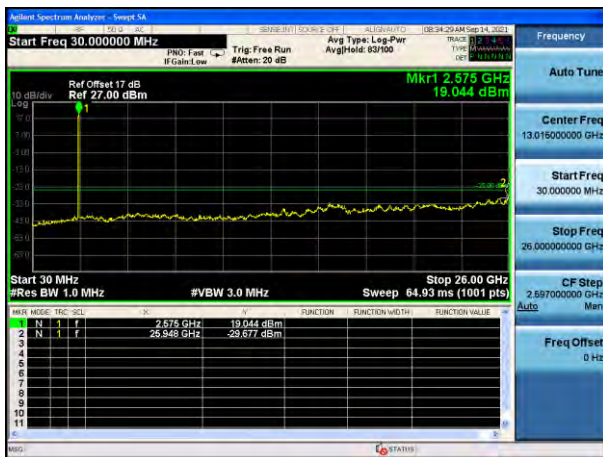
Test Mode: LTE Band 7 / 10MHz /50RB



Lowest channel



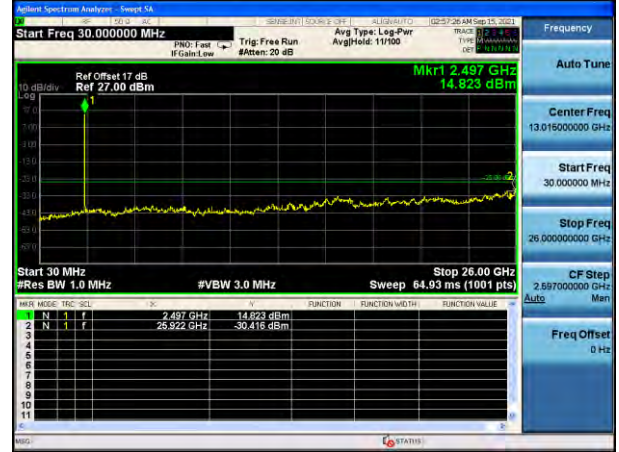
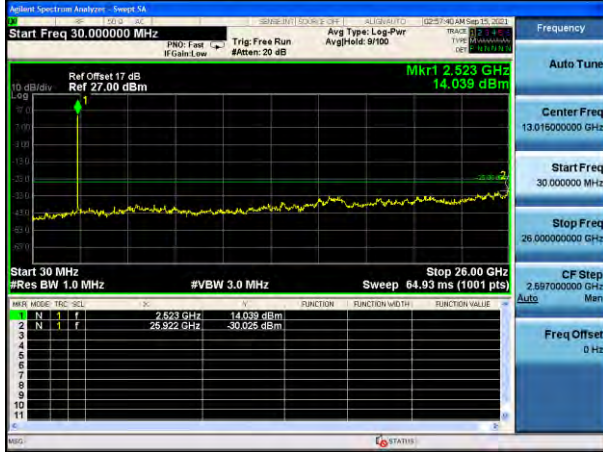
Middle channel



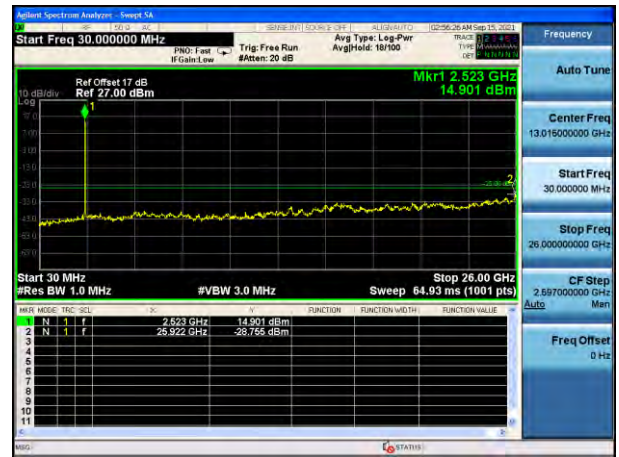
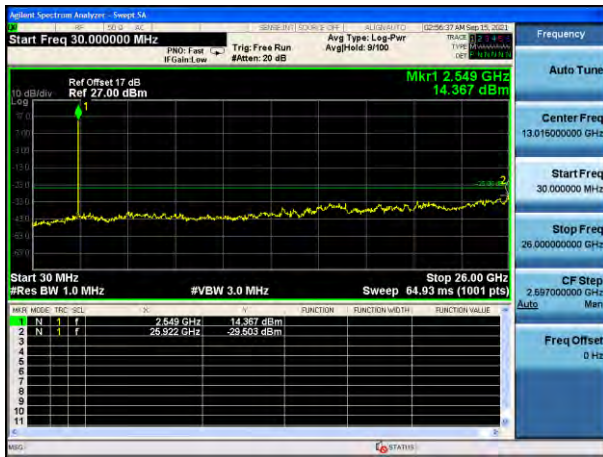
Highest channel

Test Mode: LTE Band 7 / 15MHz /1RB

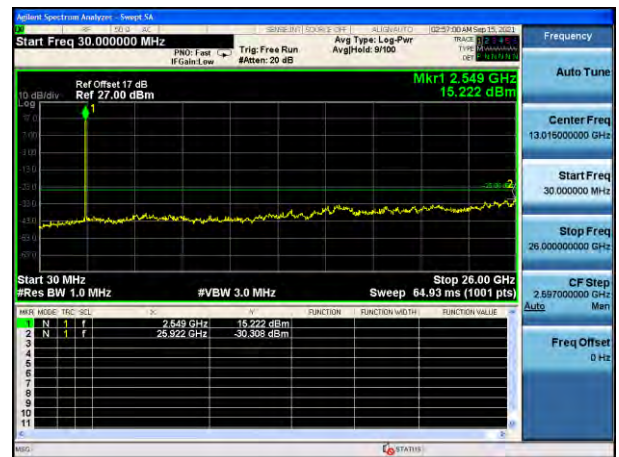
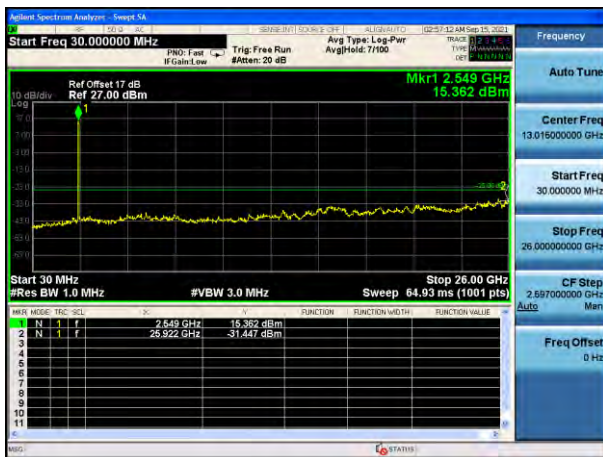
Test Mode: LTE Band 7 / 15MHz /75RB



Lowest channel

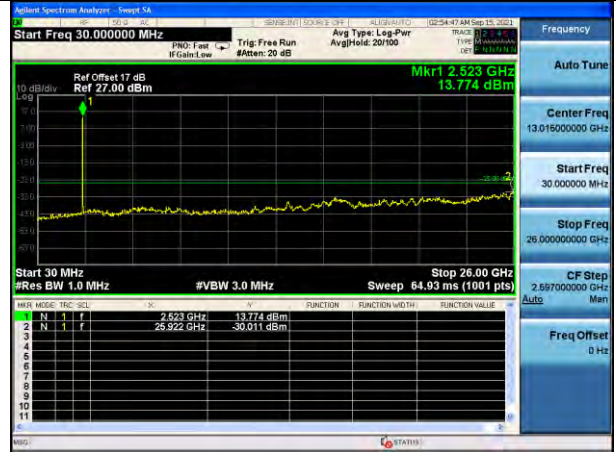
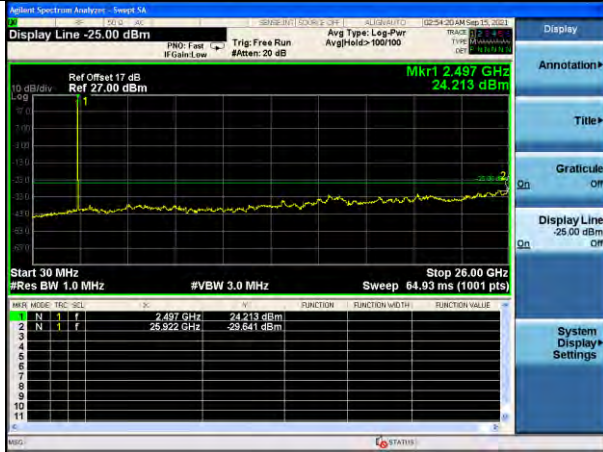


Middle channel

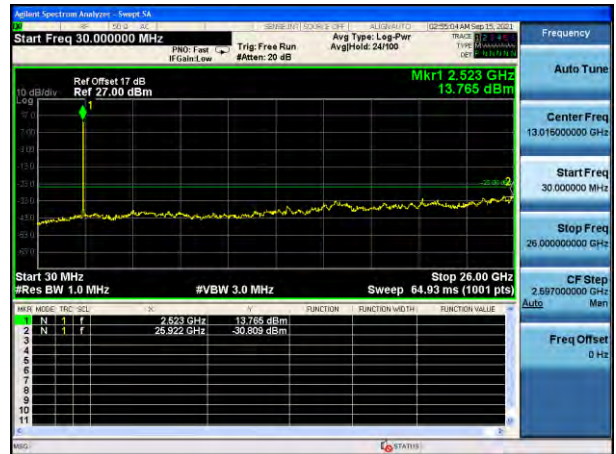
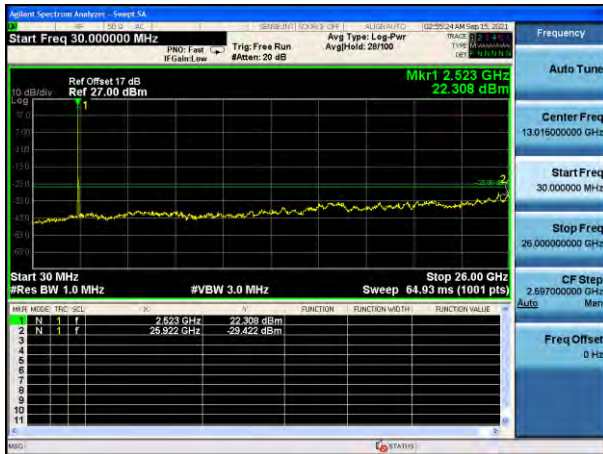


Highest channel

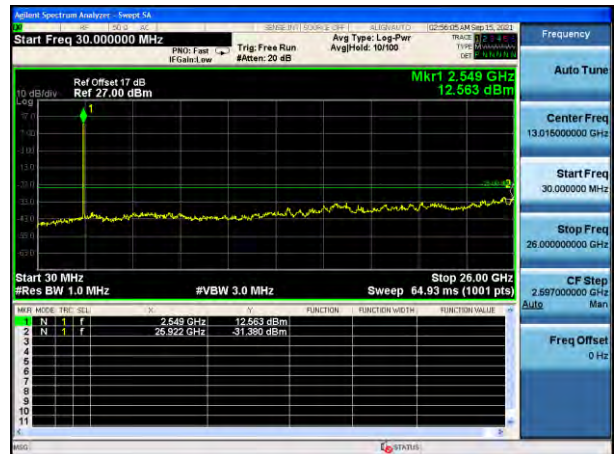
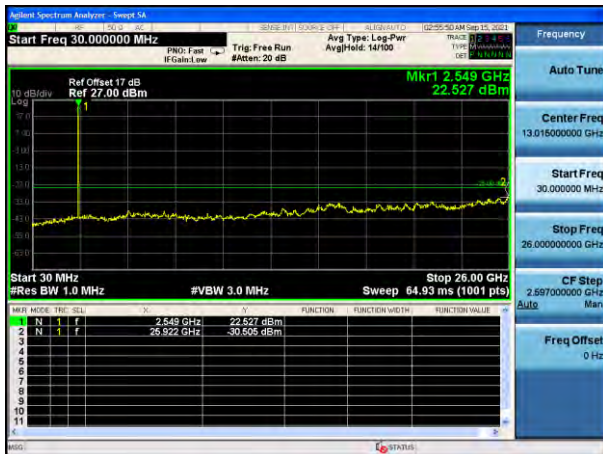
Test Mode: LTE Band 7 / 20MHz / 1RB Test Mode: LTE Band 7 / 20MHz / 100RB



Lowest channel



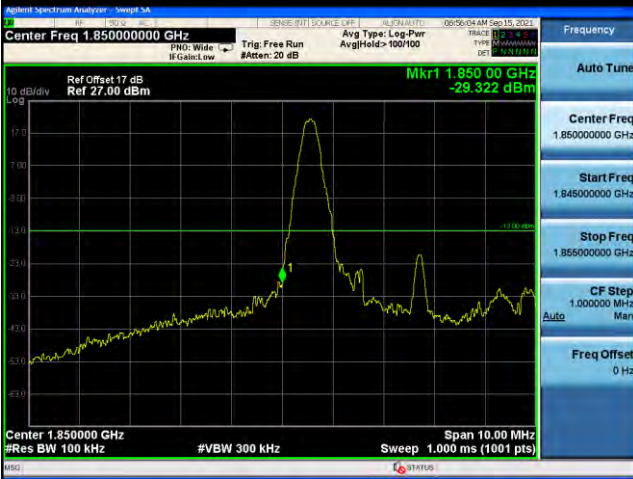
Middle channel



Highest channel

Band Edge

Test Mode: LTE Band 2 / 5MHz / 1RB / QPSK



Lowest channel



Highest channel

Test Mode: LTE Band 2 / 5MHz / 25RB / QPSK



Lowest channel

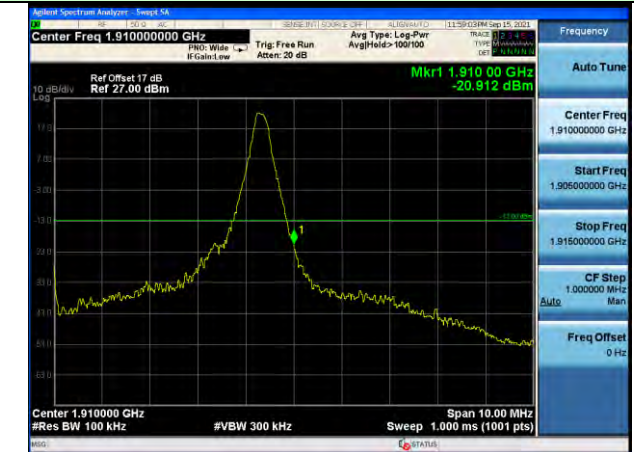


Highest channel

Test Mode: LTE Band 2 / 10MHz / 1RB / QPSK

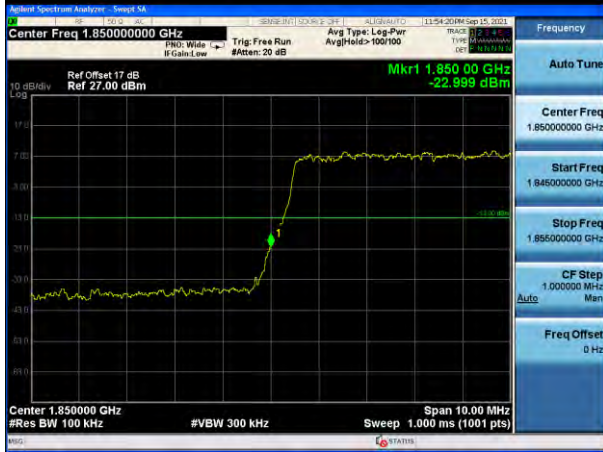


Lowest channel

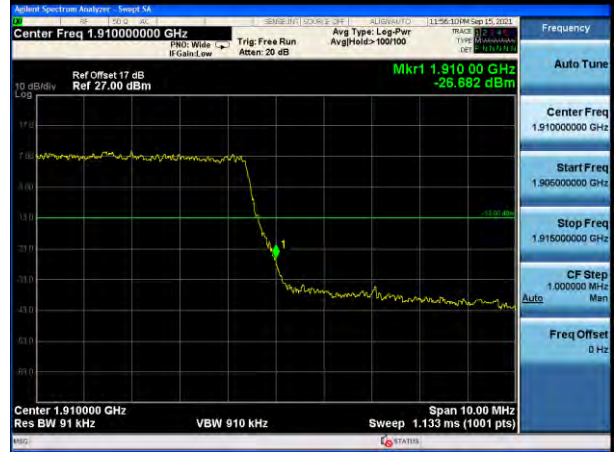


Highest channel

Test Mode: LTE Band 2 / 10MHz / 50RB / QPSK



Lowest channel



Highest channel

Test Mode: LTE Band 2 / 15MHz / 1RB / QPSK



Lowest channel



Highest channel

Test Mode: LTE Band 2 / 15MHz / 75RB / QPSK

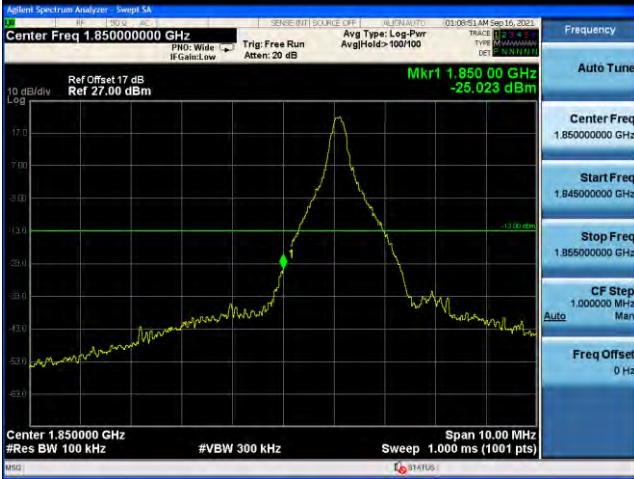


Lowest channel



Highest channel

Test Mode: LTE Band 2 / 20MHz / 1RB / QPSK



Lowest channel



Highest channel

Test Mode: LTE Band 2 / 20MHz / 100RB / QPSK



Lowest channel



Highest channel

Test Mode: LTE Band 2 / 5MHz / 1RB / 16-QAM



Lowest channel



Highest channel

Test Mode: LTE Band 2 / 5MHz / 25RB / 16-QAM



Lowest channel



Highest channel

Test Mode: LTE Band 2 / 10MHz / 1RB / 16-QAM



Lowest channel



Highest channel

Test Mode: LTE Band 2 / 10MHz / 50RB / 16-QAM



Lowest channel



Highest channel