Intertek
731 Enterprise Drive
Lexington, KY 40510

Tel 859 226 1000
Fax 859 226 1040

www.intertek.com

Murata Electronics North America TEST REPORT

SCOPE OF WORK
EMC TESTING –

REPORT NUMBER
103652106LEX-007

ISSUE DATE

5/13/2019

PAGES
103

DOCUMENT CONTROL NUMBER
Non-Specific EMC Report Shell Rev. December 2017

EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 103652106LEX-007
Project Number: G103652106

Report Issue Date: 5/13/2019

Product Tested: Type 1SC LTE CATM1 Module

Standards: FCC Part 22, 24, 27, 90
RSS-119 Issue 1, RSS-130 Issue 2,
RSS-132 Issue 3, RSS-133 Issue 6,
RSS-139 Issue 3, RSS-140 Issue 1

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Dr.
Lexington, KY 40510
USA

Client:
Murata Electronics North America
2200 Lake Park Dr
Smyrna, GA 30080
USA

Report prepared by

Ben Coolbear, Engineer

Report reviewed by

Bryan Taylor, Team Leader

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Page	Test Name	Result
10	Output Power	Pass
13	Occupied Bandwidth	Pass
43	Conducted Spurious Emissions and Band Edge at Antenna Terminals	Pass
79	Radiated Output Power	Pass
81	Radiated Spurious Emissions (Transmitter)	Pass
92	Frequency Stability	Pass

3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Murata Electronics North America
Address:	2200 Lake Park Dr Smyrna, GA 30080 USA
Contact:	Ryan Anderson
Telephone:	1 (678) 684-2004
Email:	randerson@murata.com
Manufacturer Information	
Manufacturer Name:	Murata Electronics North America
Manufacturer Address:	2200 Lake Park Dr Smyrna, GA 30080 USA

4 Description of Equipment under Test and Variant Models

Equipment Under Test					
Product Name	Type 1SC LTE CATM1 Module				
Model Number	LBAD0XX1SC				
Receive Date	8/6/2018				
Test Start Date	8/6/2018				
Test End Date	9/27/2018				
Device Received Condition	Good				
Test Sample Type	Production				
Rated Voltage	3.3VDC				
Rated Frequency	DC				
Software Version	ES2				
Hardware Version	RK_02_01_01_00_32				
Modulation Type(s)	QPSK, 16QAM				
Frequency Bands and Maximum Output Power (dBm)		**QPSK**		**16QAM**	
	Band	**Peak (dBm)**	**Average (dBm)**	**Peak (dBm)**	**Average (dBm)**
	Band 2	25.91	22.80	26.22	22.80
	Band 4	26.96	22.97	27.07	22.75
	Band 5	27.70	22.46	28.01	22.42
	Band 12	27.69	20.85	27.10	19.75
	Band 13	27.96	20.71	28.20	20.67
	Band 14	28.05	21.51	28.2	21.51
	Band 17	29.16	22.94	29.88	22.85
	Band 25	25.64	21.11	25.66	20.82
	Band 26	27.62	20.85	27.23	19.87
Description of Equipment Under Test (provided by client)					
The Type 1SC LTE CATM1 Module is an LTE CATM1 modem designed to be used in IoT monitoring and control applications.					

4.1 Variant Models:

There were no variants included as part of this evaluation.

4.2 Bands Supported:

Band	Name	Downlink (Receive) (MHz)			Bandwidth	Uplink (Transmit) (MHz)			Duplex spacing
		Low	Middle	High	DL/UL (MHz)	Low	Middle	High	(MHz)
		Channel Number				Channel Number			
2	1900 PCS	1930	**1960**	1990	60	1850	**1880**	1910	80
		600	**900**	1199		18600	**18900**	19199	
4	AWS-1	2110	**2132.5**	2155	45	1710	**1732.5**	1755	400
		1950	**2175**	2399		19950	**20175**	20399	
5	850	869	**881.5**	894	25	824	**836.5**	849	45
		2400	**2525**	2649		20400	**20525**	20649	
12	700 a	729	**737.5**	746	17	699	**707.5**	716	30
		5010	**5095**	5179		23010	**23095**	23179	
13	700 c	746	**751**	756	10	777	**782**	787	-31
		5180	**5230**	5279		23180	**23230**	23279	
14	700 PS	758	**763**	768	10	788	**793**	798	-30
		5280	**5330**	5379		23280	**23330**	23379	
17	700 b	734	**740**	746	12	704	**710**	716	30
		5730	**5790**	5849		23730	**23790**	23849	
25	1900+	1930	**1962.5**	1995	65	1850	**1882.5**	1915	80
		8040	**8365**	8689		26040	**26365**	26689	
26	850+	859	**876.5**	894	35	814	**831.5**	849	45
		8690	**8865**	9039		26690	**26865**	27039	

5 System Setup and Method

5.1 Method:

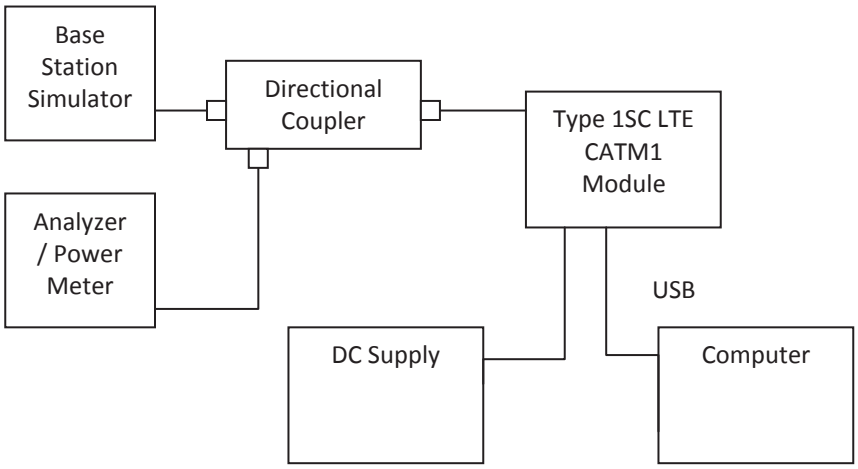
Configuration as required by ANSI C63.26: 2015

No.	Descriptions of EUT Exercising
1	Transmitting LTE CAT M1 Signal
2	Idle, not transmitting. External DC supply used in lieu of battery for testing.

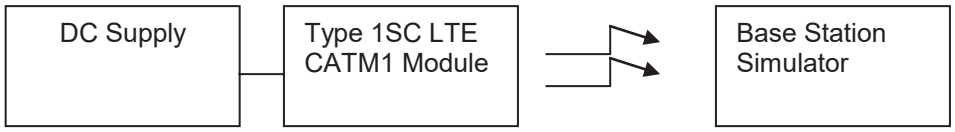
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	DC Supply	2	No	No	Bare Wire
2	USB-Serial Debug Cable	2	No	No	USB
3	RF Cable	2	No	No	Instrument

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
DC Supply	HP	-	-
Computer	Dell	-	-

5.2 EUT Block Diagram:



Setup for conducted measurements



Setup for radiated measurements

6 Output Power

6.1 Test Limits

§ 22.913

(a)(5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

§ 24.232

(c)Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications

§ 27.50

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

§ 27.50

(c)(10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP

§ 27.50

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

§ 90.541

(d) The transmitting power of a portable (hand-held) unit must not exceed 3 watts ERP.

§ 90.635

(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw)

RSS-130(4.6.3)

The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.

RSS-132(5.4)

The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts.

RSS-133(4.1)

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

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

RSS-139(6.5)

The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. The e.i.r.p.

RSS-119(4.3)

The equivalent radiated power (e.r.p.) for control and mobile equipment shall not exceed 30 W. The e.r.p. for portable equipment including handheld devices shall not exceed 3 W.

RSS-140(4.3)

The equivalent radiated power (e.r.p.) for control and mobile equipment shall not exceed 30 W. The e.r.p. for portable equipment including handheld devices shall not exceed 3 W.

6.2 Test Method

The transmitter output was connected to a coaxial cable, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed into a call and the power was measured. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the power reading. Tests were performed at three frequencies (low, middle, and high channels) and on the highest power levels, which can be setup on the transmitters. The peak to average power ratio (PAPR) was also measured and recorded.

6.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	2327	Rohde & Schwarz	ESI26	9/20/2017	9/20/2018
LTE CAT M1 Base Station	3917	Rohde & Schwarz	CMW500	9/20/2017	9/20/2018
Spectrum Analyzer	3099	Rohde & Schwarz	FSP 7	9/20/2018	9/20/2019

6.4 Test Results

The device was found to be **compliant**. The average output power was less than 1W. The peak to average power ratio was less than 13dB.

6.5 Test Conditions

Test Personnel:	Ben Coolbear	Test Date:	08/16/2018
Supervising/Reviewing Engineer: (Where Applicable)	Bryan Taylor	Limit Applied:	See Section 7.1
Product Standard:	ANSIC63.26	Ambient Temperature:	22.7°C
Input Voltage:	3.6VDC	Relative Humidity:	50.2%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	985.4

6.6 Test Data

Band	Channel	Channel Number	Center Freq.	RB	NB	QPSK			16-QAM		
						Avg (dBm)	PK (dBm)	PAPR (dB)	Avg (dBm)	PK (dBm)	PAPR (dB)
2	Low	18650	1851.04	6	0	22.80	25.70	2.90	22.80	26.00	3.20
	Mid	18900	1880.54	6	4	22.65	25.91	3.26	22.50	25.88	3.38
	High	19150	1908.87	6	7	22.46	25.70	3.24	22.27	26.22	3.95
4	Low	20000	1711.04	6	0	22.97	26.96	3.99	22.75	27.07	4.32
	Mid	20175	1732.86	6	4	22.75	25.95	3.20	22.69	26.95	4.26
	High	20350	1753.96	6	7	22.76	26.17	3.41	22.75	25.94	3.19
5	Low	20450	825.04	6	0	22.46	27.61	5.15	22.42	27.95	5.53
	Mid	20525	836.86	6	4	22.46	27.65	5.19	22.29	28.01	5.72
	High	20600	847.87	6	7	22.44	27.70	5.26	22.22	27.86	5.64
12	Low	23035	699.79	6	0	20.85	27.69	6.84	19.70	26.88	7.18
	Mid	23095	707.68	6	2	20.75	27.56	6.81	19.75	27.10	7.35
	High	23155	715.66	6	3	20.81	27.31	6.50	19.65	26.41	6.76
13	Low	23230	778.04	6	0	20.55	27.96	7.41	20.45	27.66	7.21
	Mid	23230	782.36	6	4	20.62	27.81	7.19	20.52	28.17	7.65
	High	23230	785.96	6	7	20.71	27.96	7.25	20.67	28.2	7.53
14	Low	23330	789.25	6	0	21.51	28.05	6.54	21.51	27.86	6.35
	Mid	23330	793.54	6	4	21.45	27.92	6.47	21.45	28.28	6.83
	High	23330	796.79	6	7	21.38	27.83	6.45	21.32	28.19	6.87
17	Low	23780	705.17	6	0	22.94	28.63	4.20	22.9	29.66	4.84
	Mid	23790	710.59	6	4	22.89	28.67	4.32	22.84	28.83	5.19
	High	23800	714.36	6	7	22.92	29.16	4.60	22.85	29.88	4.91
25	Low	26065	1850.8	6	0	21.11	25.31	6.69	20.82	25.66	7.36
	Mid	26365	1883.12	6	2	21.08	25.40	7.09	19.86	25.05	7.49
	High	26665	1884.17	6	3	21.04	25.64	6.82	19.93	24.84	7.38
26	Low	26715	814.79	6	0	20.85	27.54	2.90	19.87	27.23	3.20
	Mid	26865	832.18	6	2	20.53	27.62	3.26	19.54	27.03	3.38
	High	27015	848.22	6	3	20.61	27.43	3.24	19.61	26.99	3.95

7 Occupied Bandwidth

7.1 Test Limits

Per FCC 2.1049 and RSS-GEN (6.6) The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

7.2 Test Method

Tests are performed in accordance with ANSI C63.26: 2015 (5.4.3)

7.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	2327	Rohde & Schwarz	ESI26	9/20/2017	9/20/2018
LTE CAT M1 Base Station	3917	Rohde & Schwarz	CMW500	9/20/2017	9/20/2018
Spectrum Analyzer	3099	Rohde & Schwarz	FSP 7	9/20/2018	9/20/2019

7.4 Test Results

The device was found to be **compliant**. The bandwidth measurements are shown below.

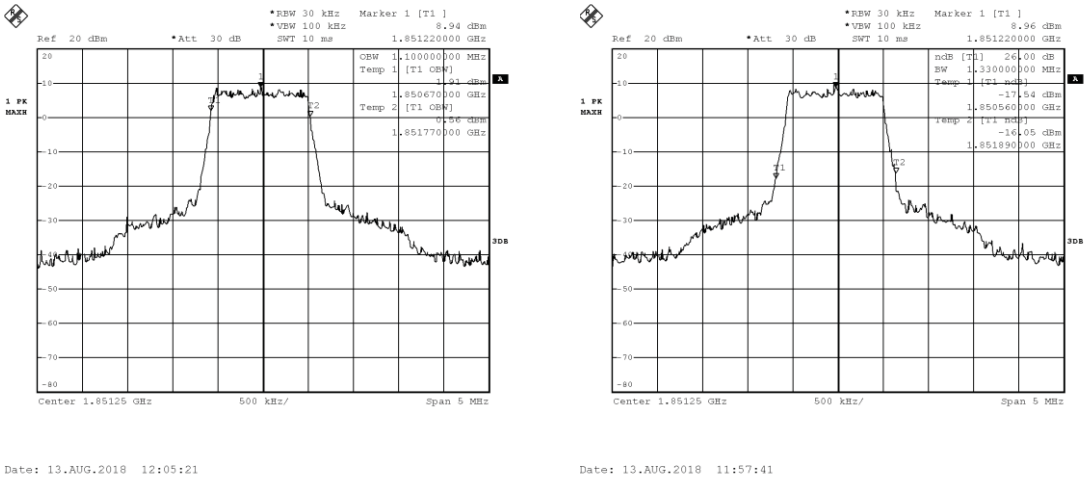
7.5 Test Conditions

Test Personnel:	Ben Coolbear	Test Date:	8/27/2018
Supervising/Reviewing Engineer: (Where Applicable)	Bryan Taylor	Limit Applied:	99% and 26db BW Measured
Product Standard:	ANSI C63.26	Ambient Temperature:	22.9 °C
Input Voltage:	3.6 VDC	Relative Humidity:	48%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	988.83 mbar

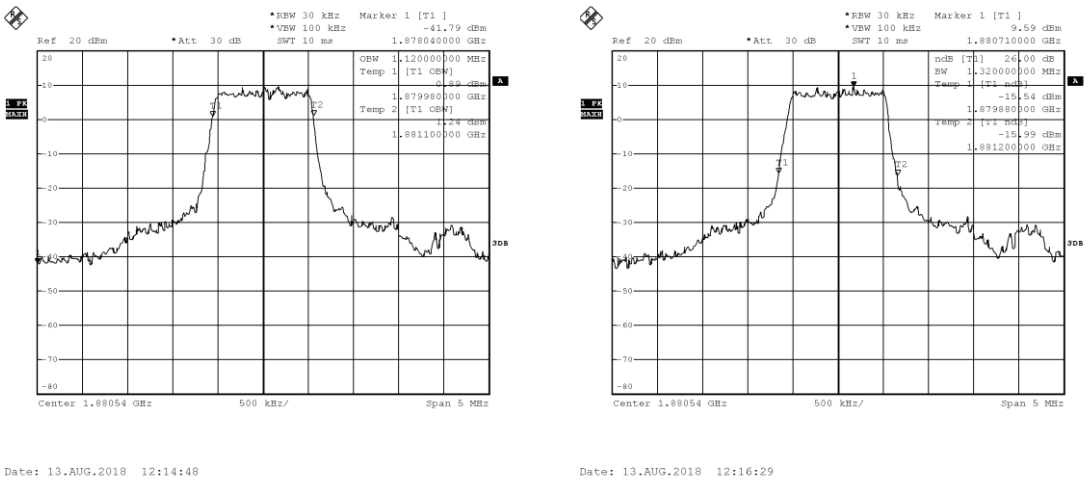
7.6 Test Data

Band	Channel	Channel Number	Center Freq (MHz)	RB	NB	QPSK		16-QAM	
						26 dB BW (MHz)	99% BW (MHz)	26 dB BW (MHz)	99% BW (MHz)
2	Low	18650	1851	6	0	1.34	1.11	1.3	0.96
	Mid	18900	1880.5	6	4	1.32	1.12	1.3	0.99
	High	19150	1908.9	6	7	1.33	1.11	1.32	0.99
4	Low	20000	1711	6	0	1.32	1.12	1.36	0.95
	Mid	20175	1732.9	6	4	1.34	1.12	1.29	0.96
	High	20350	1754	6	7	1.32	1.11	1.31	0.96
5	Low	20450	825.04	6	0	1.33	1.11	1.31	0.95
	Mid	20525	836.86	6	4	1.33	1.11	1.3	0.97
	High	20600	847.87	6	7	1.33	1.11	1.31	0.95
12	Low	23035	699.79	6	0	1.32	1.11	1.34	0.95
	Mid	23095	707.68	6	2	1.32	1.12	1.33	0.96
	High	23155	715.66	6	3	1.31	1.11	1.28	0.95
13	Low	23230	778.04	6	0	1.33	1.12	1.31	0.96
	Mid	23230	782.36	6	4	1.33	1.11	1.32	0.97
	High	23230	785.96	6	7	1.32	1.11	1.32	0.98
14	Low	23330	789.25	6	0	1.33	1.12	1.3	0.95
	Mid	23330	793.54	6	4	1.35	1.11	1.32	0.99
	High	23330	796.79	6	7	1.32	1.11	1.32	0.96
17	Low	23780	705.17	6	0	1.33	1.12	1.31	0.95
	Mid	23790	710.59	6	4	1.33	1.1	1.31	0.95
	High	23800	714.36	6	7	1.32	1.1	1.3	0.96
25	Low	26065	1850.8	6	0	1.34	1.11	1.33	0.95
	Mid	26365	1883.1	6	2	1.33	1.11	1.27	0.94
	High	26665	1884.2	6	3	1.32	1.11	1.3	0.94
26	Low	26715	814.79	6	0	1.32	1.11	1.31	0.94
	Mid	26865	832.18	6	2	1.33	1.11	1.32	0.96
	High	27015	848.22	6	3	1.31	1.11	1.3	0.95

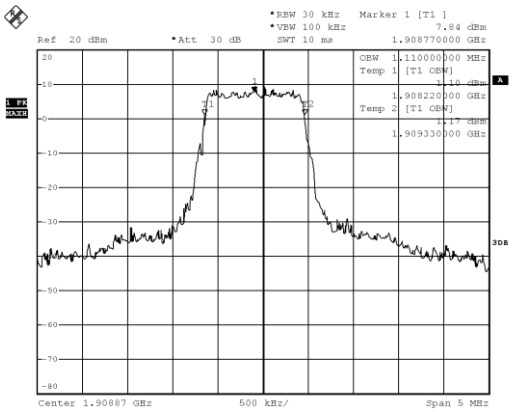
7.7 Occupied Bandwidth Plots (QPSK)

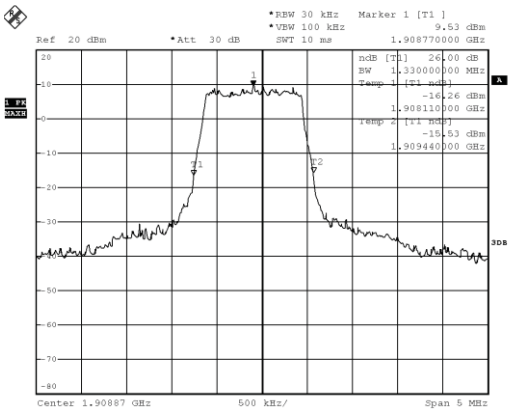


QPSK Band 2 Low Channel (99% bandwidth, 26dB Bandwidth)

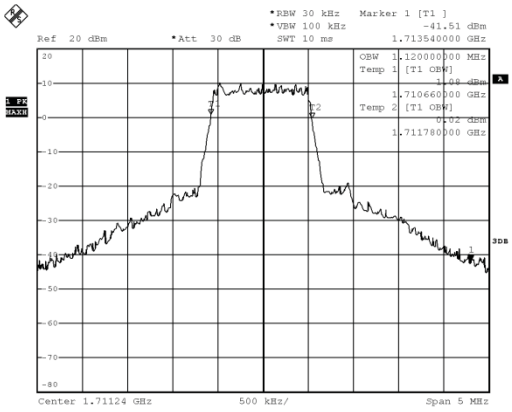


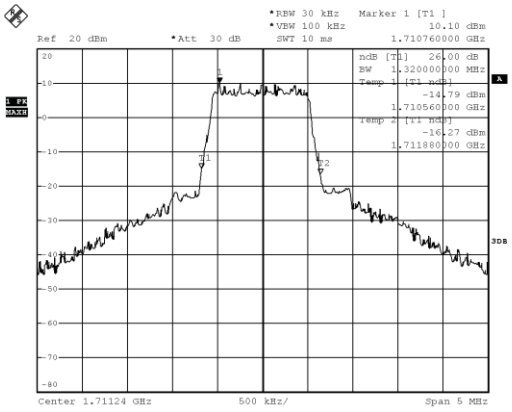
QPSK Band 2 Mid Channel (99% bandwidth, 26dB Bandwidth)



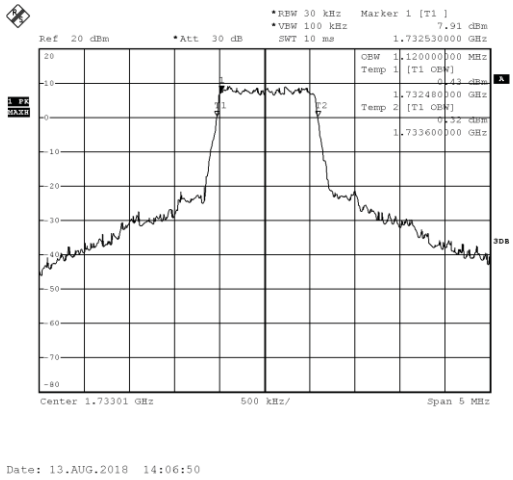


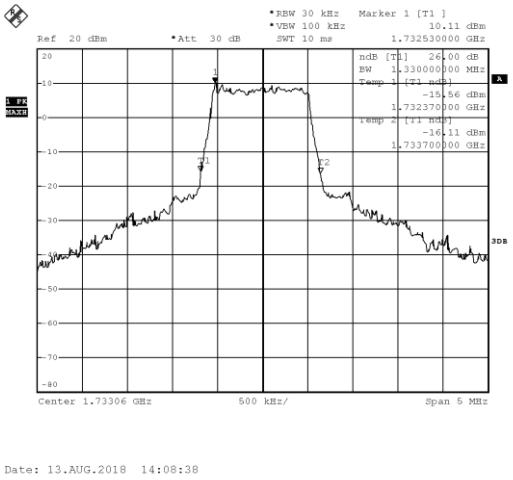
QPSK Band 2 High Channel (99% bandwidth, 26dB Bandwidth)



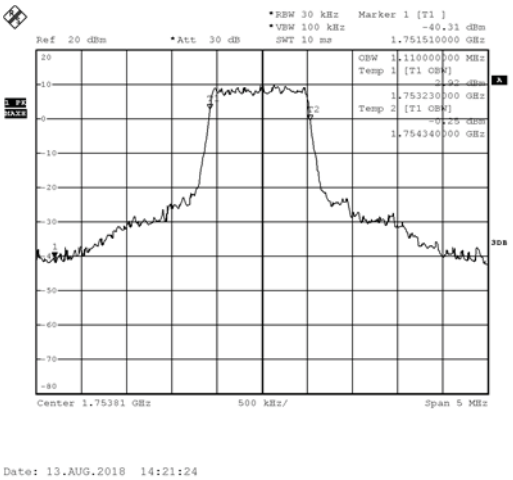


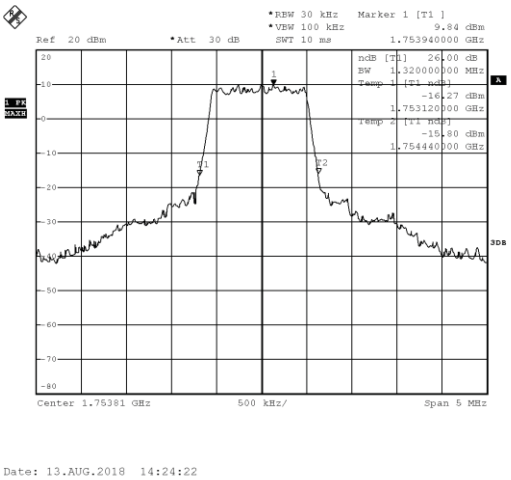
QPSK Band 4 Low Channel (99% bandwidth, 26dB Bandwidth)



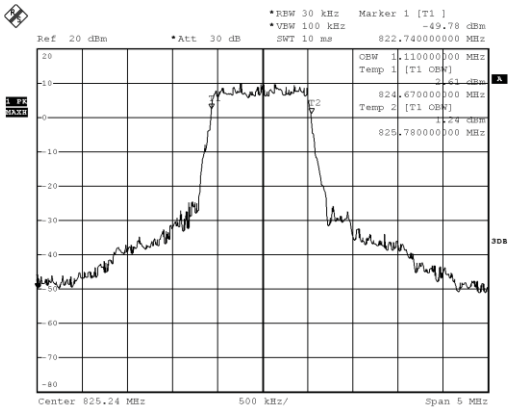


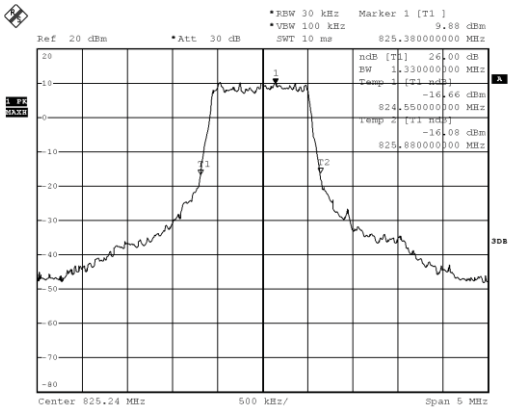
QPSK Band 4 Mid Channel (99% bandwidth, 26dB Bandwidth)



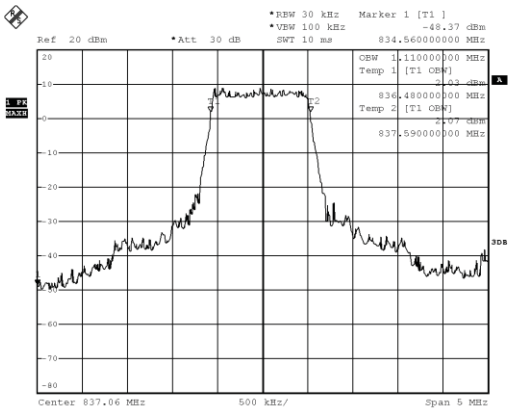


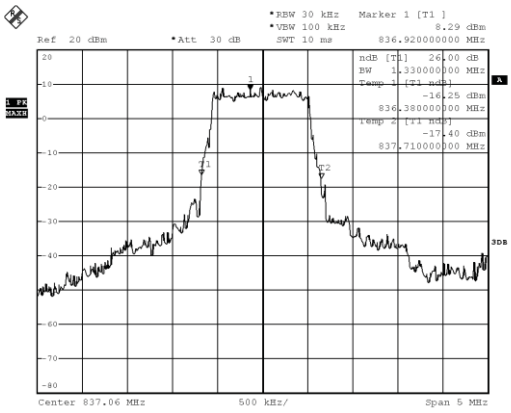
QPSK Band 4 High Channel (99% bandwidth, 26dB Bandwidth)



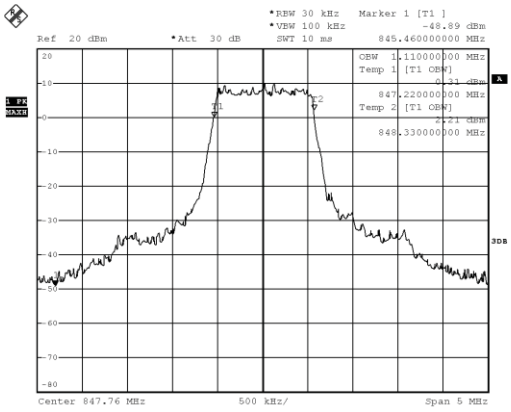


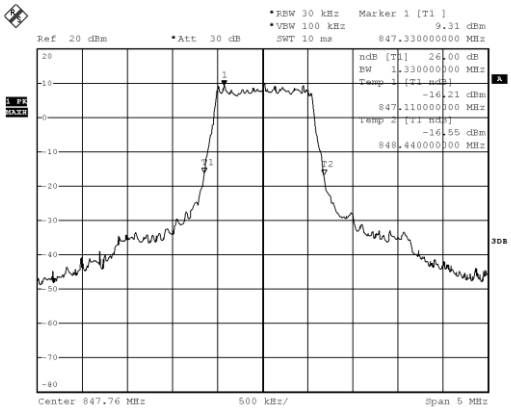
QPSK Band 5 Low Channel (99% bandwidth, 26dB Bandwidth)



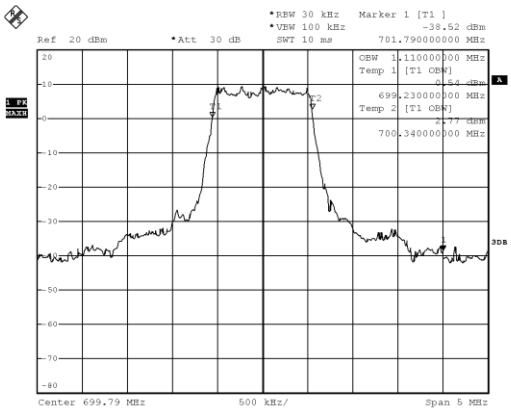


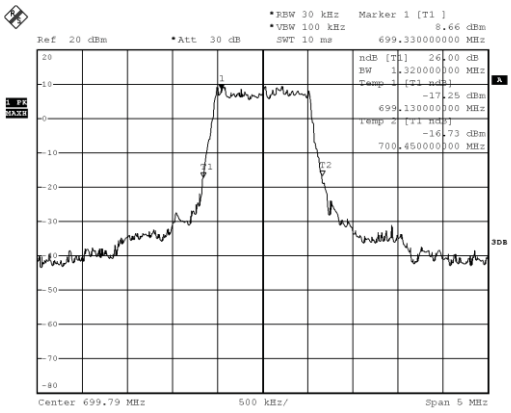
QPSK Band 5 Mid Channel (99% bandwidth, 26dB Bandwidth)



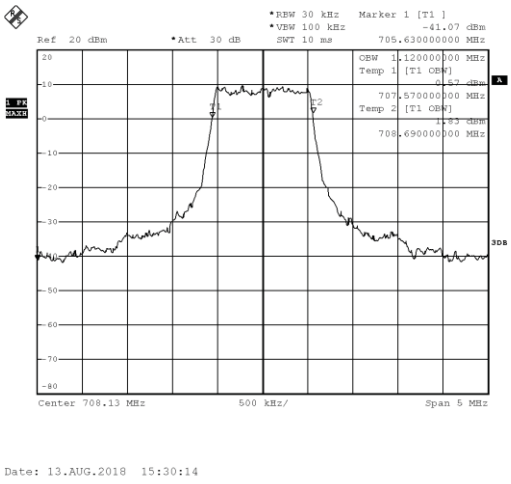


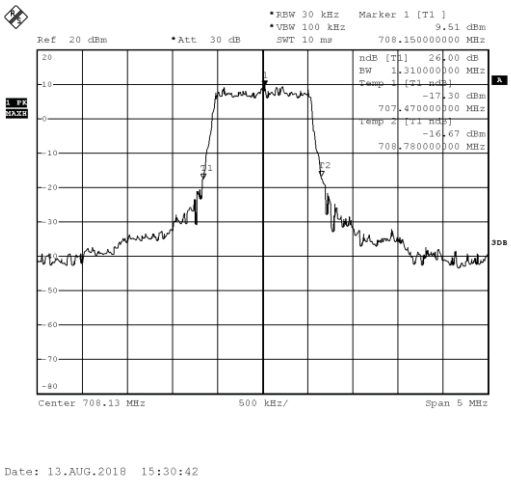
QPSK Band 5 High Channel (99% bandwidth, 26dB Bandwidth)



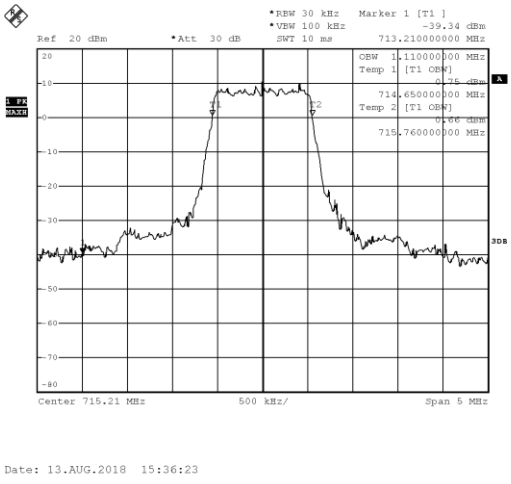


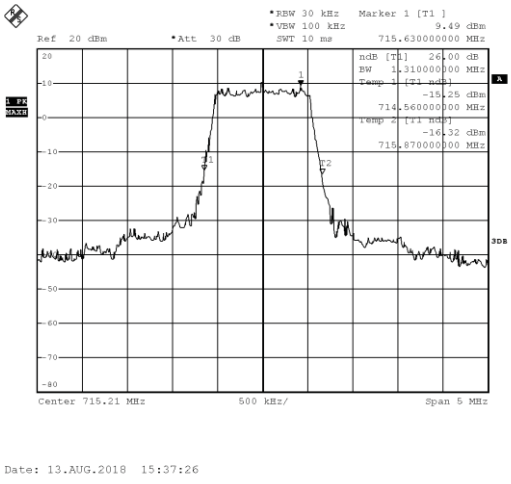
QPSK Band 12 Low Channel (99% bandwidth, 26dB Bandwidth)



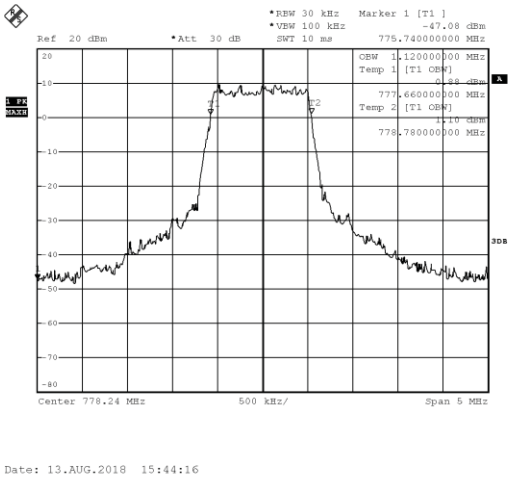


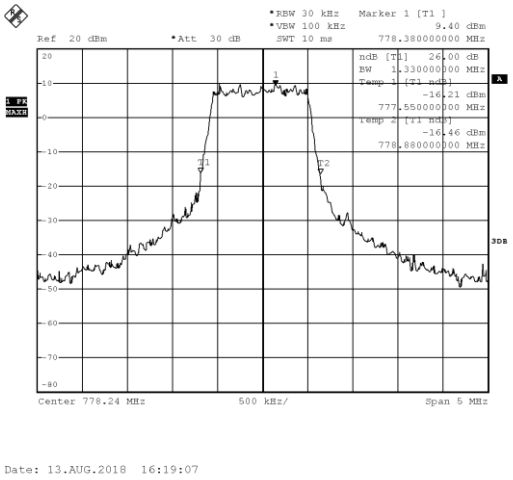
QPSK Band 12 Mid Channel (99% bandwidth, 26dB Bandwidth)



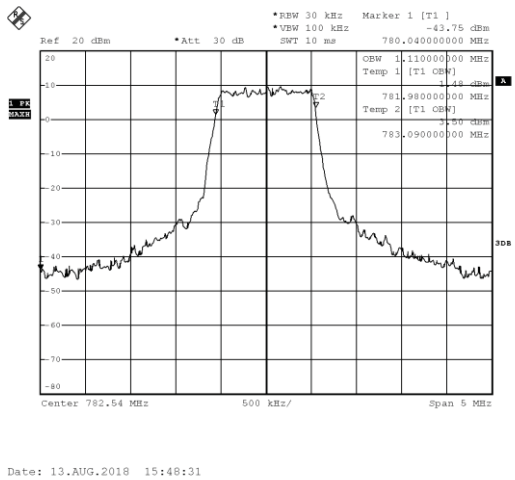


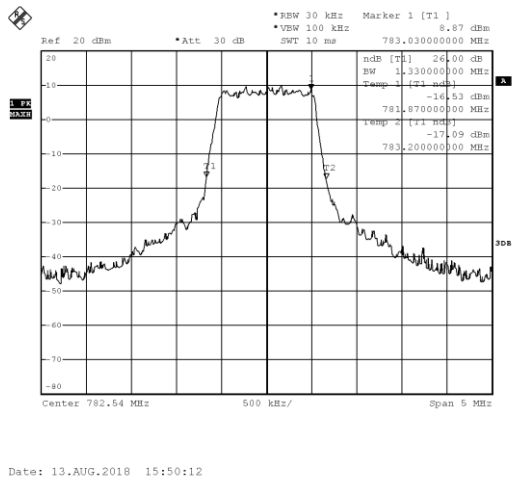
QPSK Band 12 High Channel (99% bandwidth, 26dB Bandwidth)



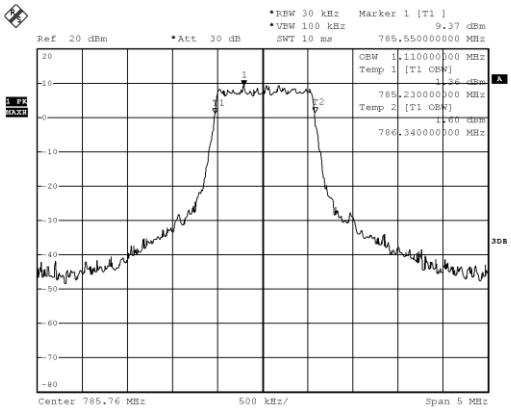


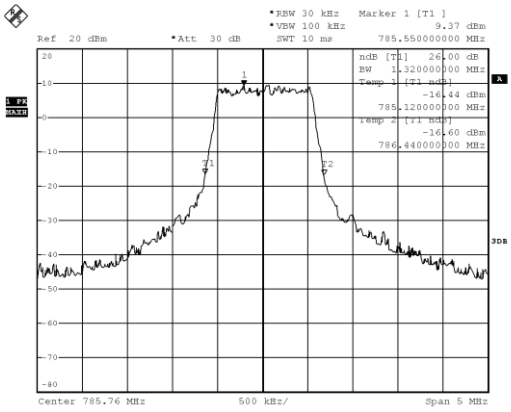
QPSK Band 13 Low Channel (99% bandwidth, 26dB Bandwidth)



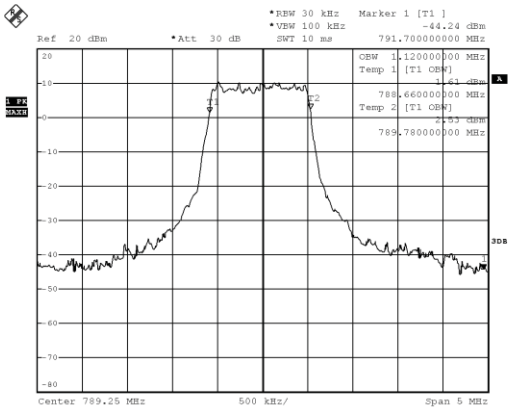


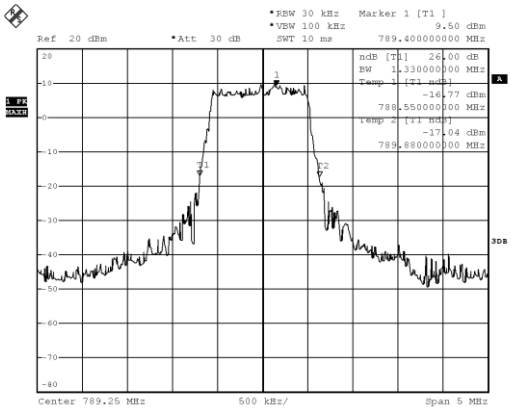
QPSK Band 13 Mid Channel (99% bandwidth, 26dB Bandwidth)



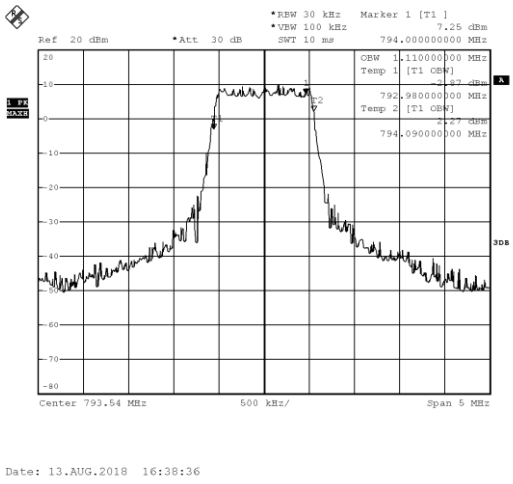


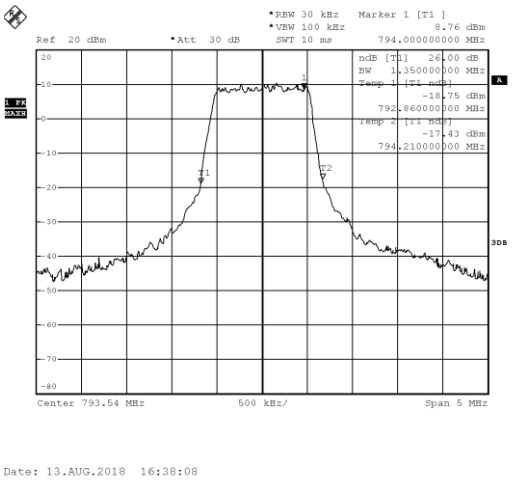
QPSK Band 13 High Channel (99% bandwidth, 26dB Bandwidth)



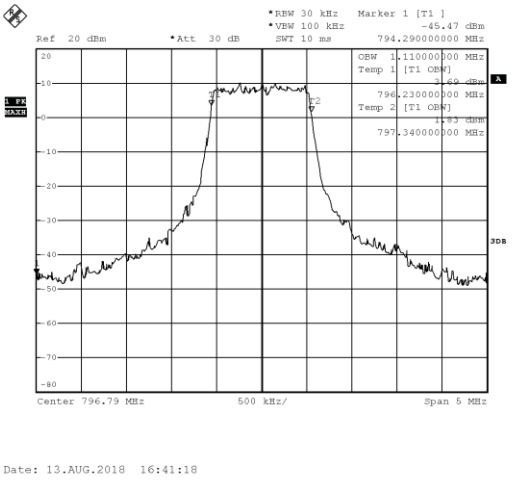


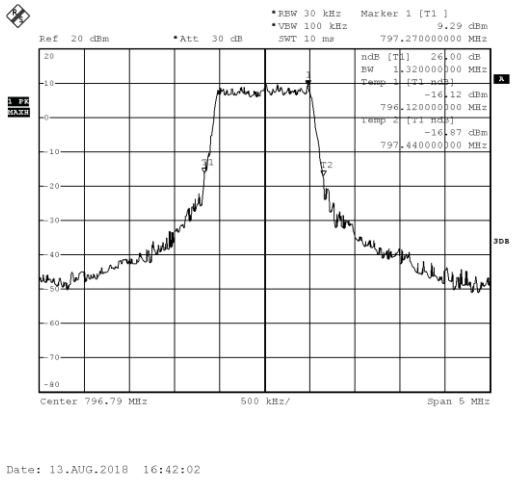
QPSK Band 14 Low Channel (99% bandwidth, 26dB Bandwidth)



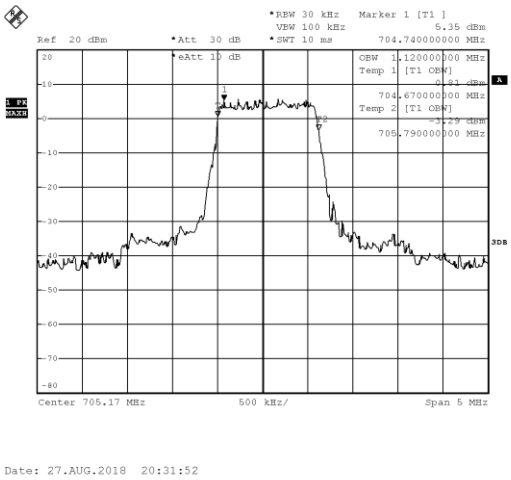


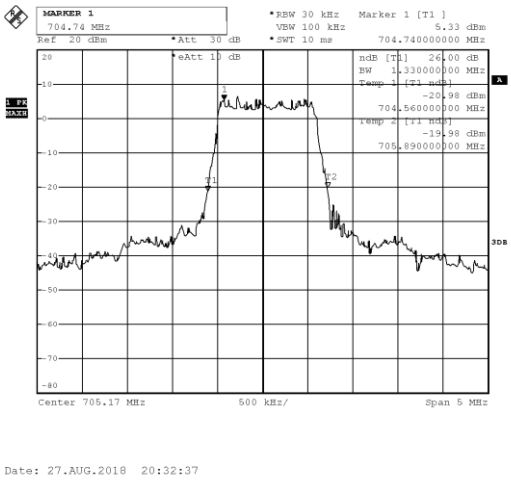
QPSK Band 14 Mid Channel (99% bandwidth, 26dB Bandwidth)



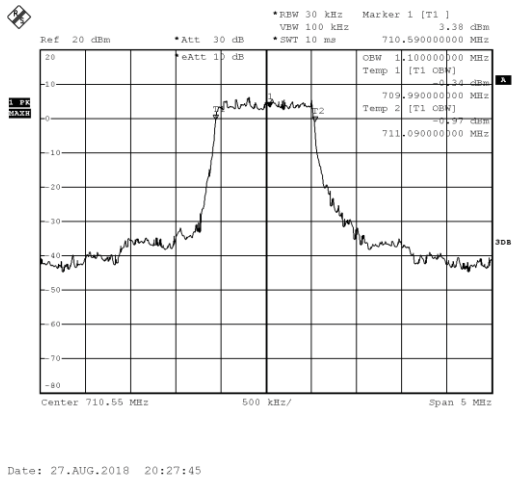


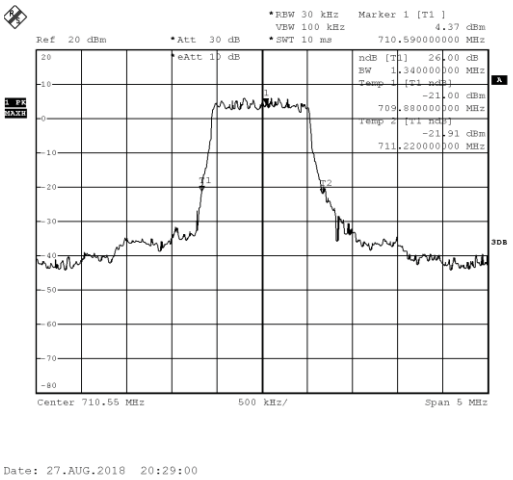
QPSK Band 14 High Channel (99% bandwidth, 26dB Bandwidth)





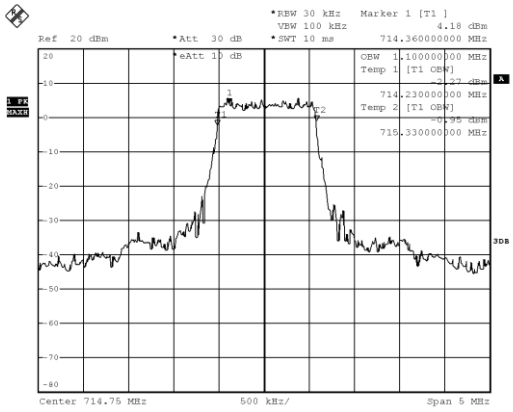
QPSK Band 17 Low Channel (99% bandwidth, 26dB Bandwidth)

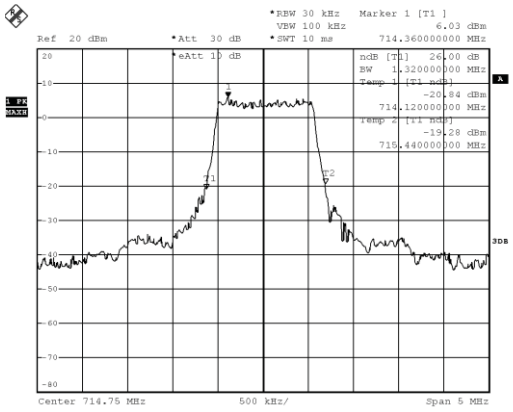




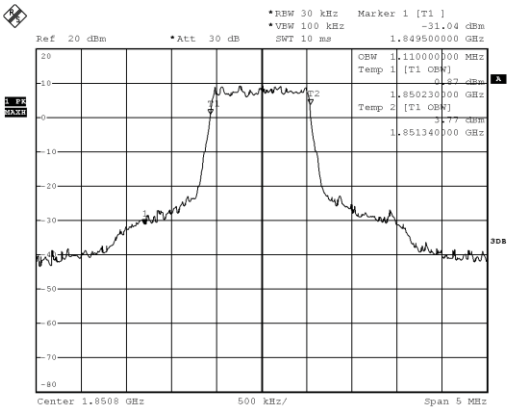
QPSK Band 17 Mid Channel (99% bandwidth, 26dB Bandwidth)

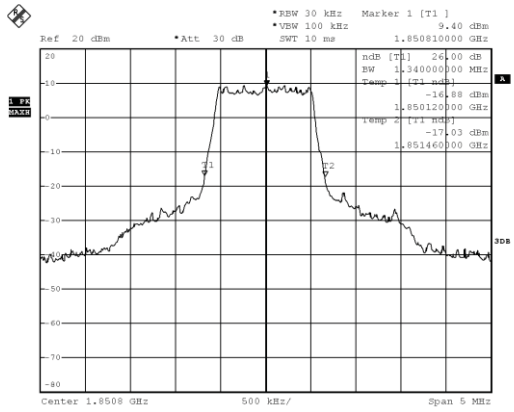
44



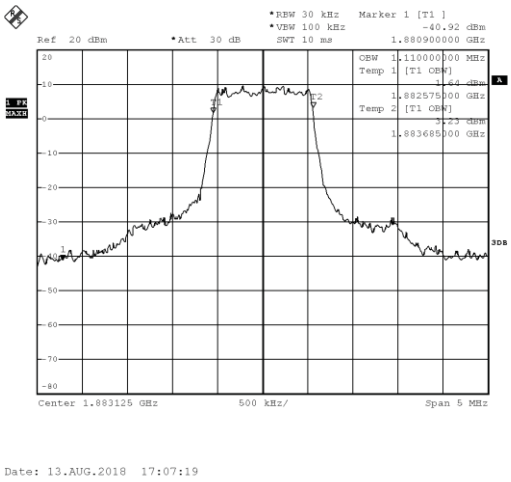


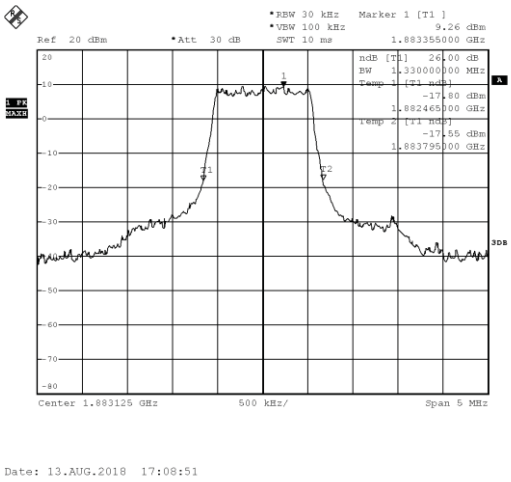
QPSK Band 17 High Channel (99% bandwidth, 26dB Bandwidth)



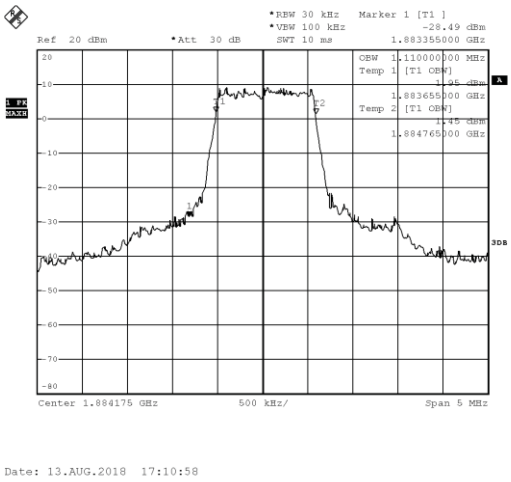


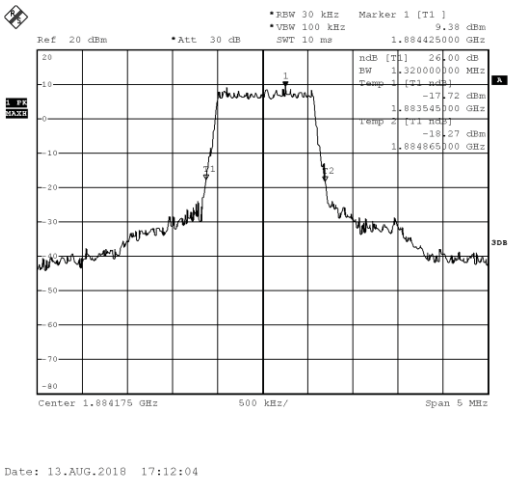
QPSK Band 25 Low Channel (99% bandwidth, 26dB Bandwidth)



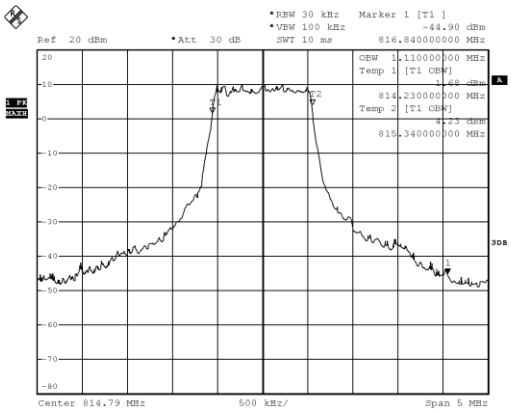


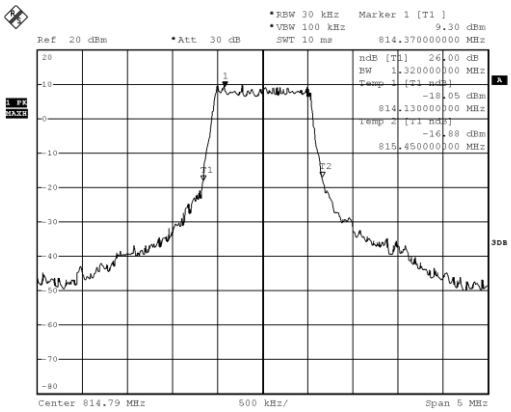
QPSK Band 25 Mid Channel (99% bandwidth, 26dB Bandwidth)



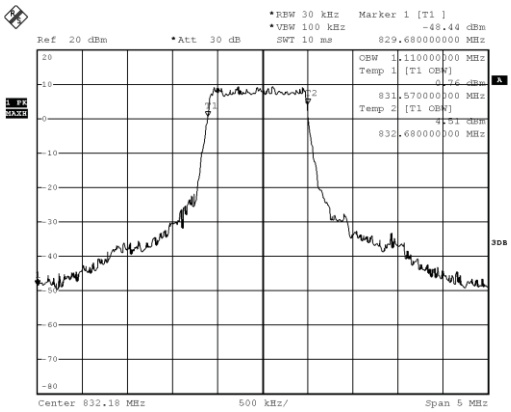


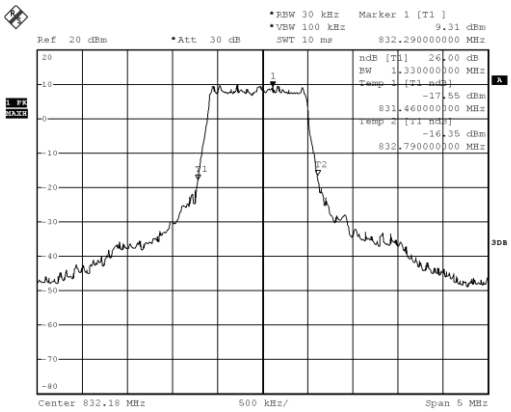
QPSK Band 25 High Channel (99% bandwidth, 26dB Bandwidth)



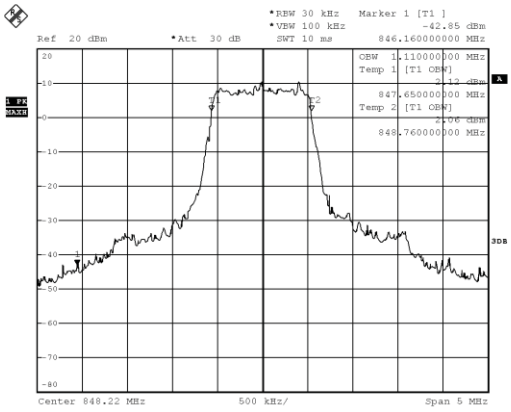


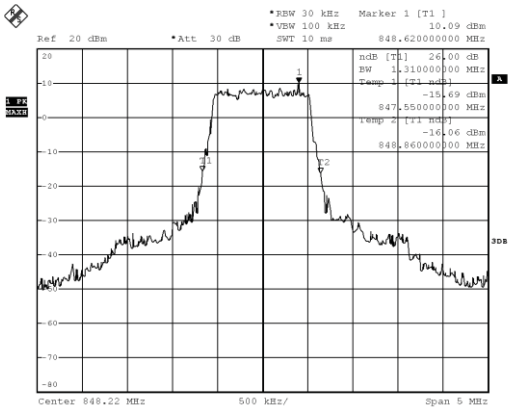
QPSK Band 26 Low Channel (99% bandwidth, 26dB Bandwidth)





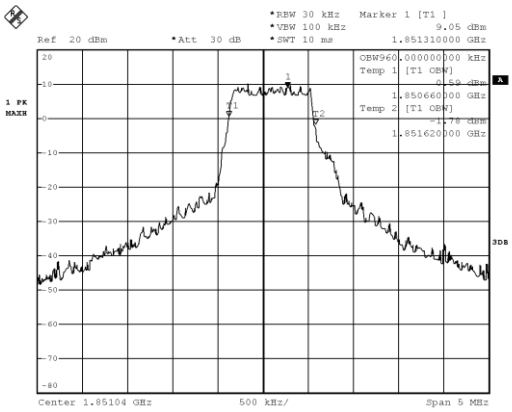
QPSK Band 26 Mid Channel (99% bandwidth, 26dB Bandwidth)



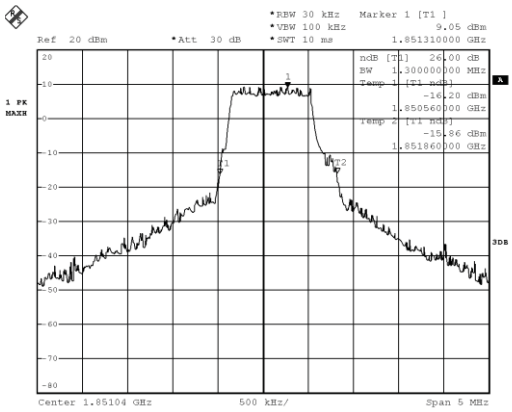


QPSK Band 26 High Channel (99% bandwidth, 26dB Bandwidth)

7.8 Occupied Bandwidth Plots (16QAM)

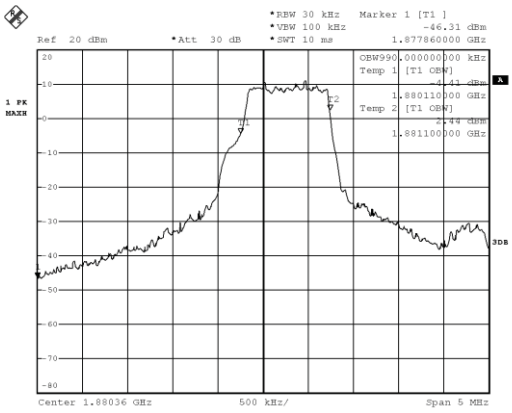


Date: 14.AUG.2018 17:01:34

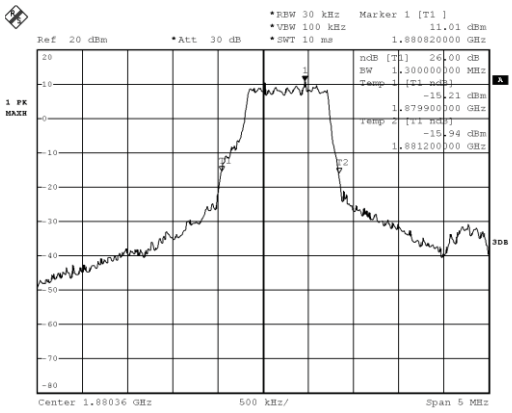


Date: 14.AUG.2018 17:00:18

16QAM Band 2 Low Channel (99% bandwidth, 26dB Bandwidth)

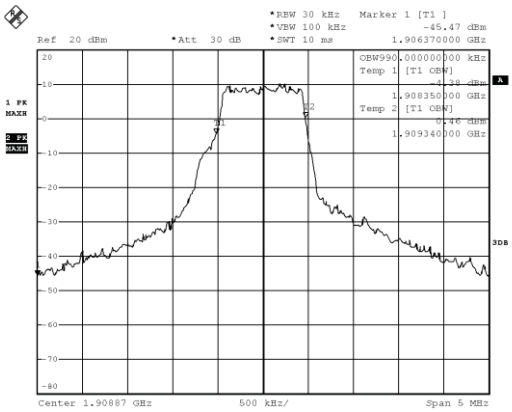


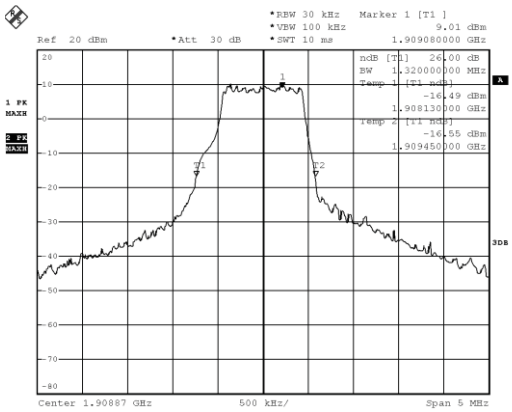
Date: 14.AUG.2018 16:50:26



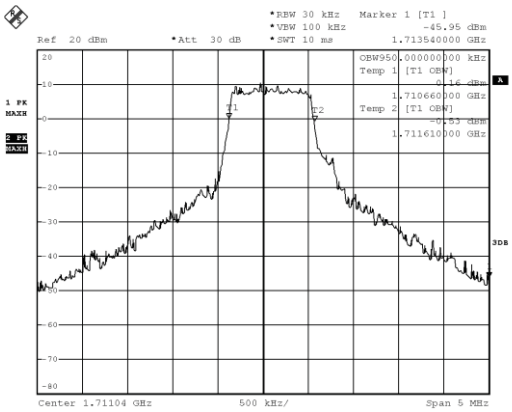
Date: 14.AUG.2018 16:56:46

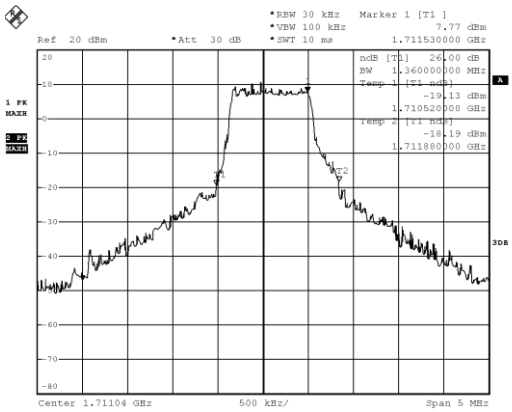
16QAM Band 2 Mid Channel (99% bandwidth, 26dB Bandwidth)



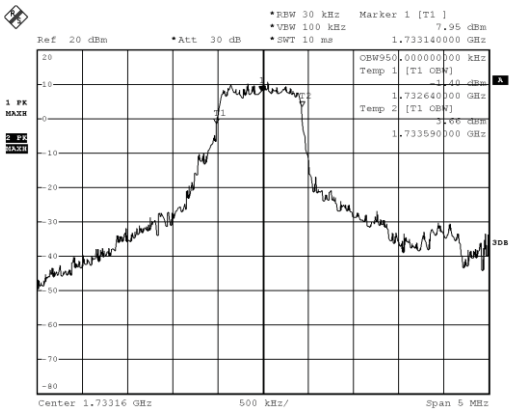


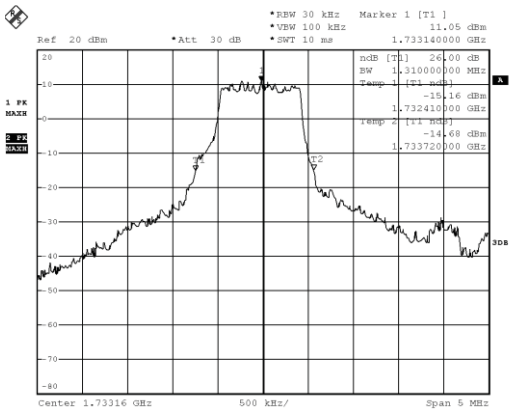
16QAM Band 2 High Channel (99% bandwidth, 26dB Bandwidth)



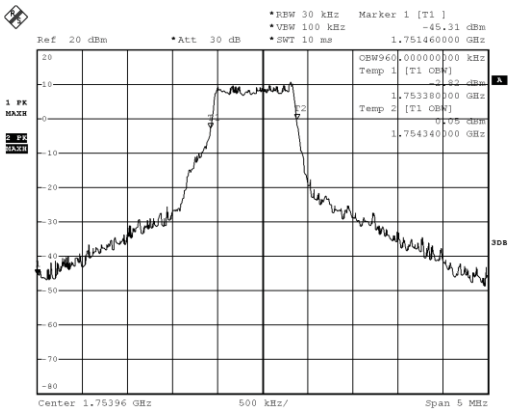


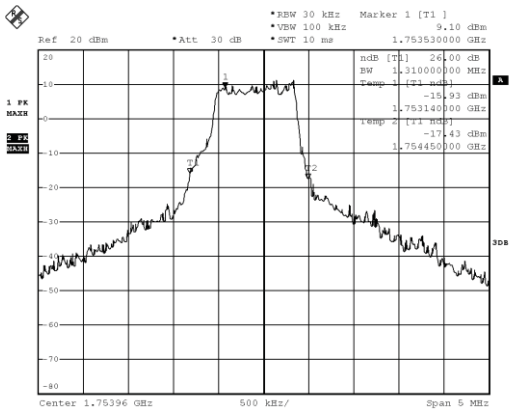
16QAM Band 4 Low Channel (99% bandwidth, 26dB Bandwidth)



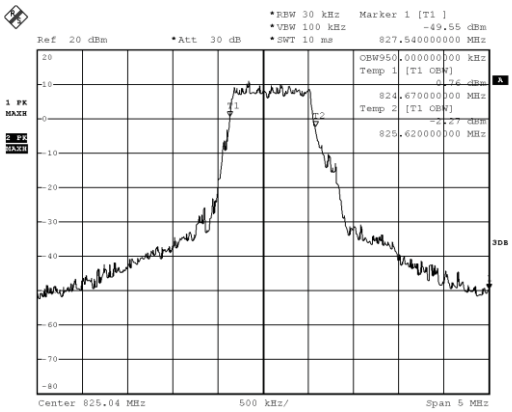


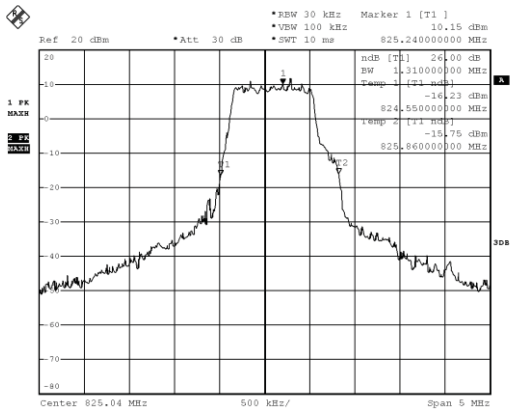
16QAM Band 4 Mid Channel (99% bandwidth, 26dB Bandwidth)



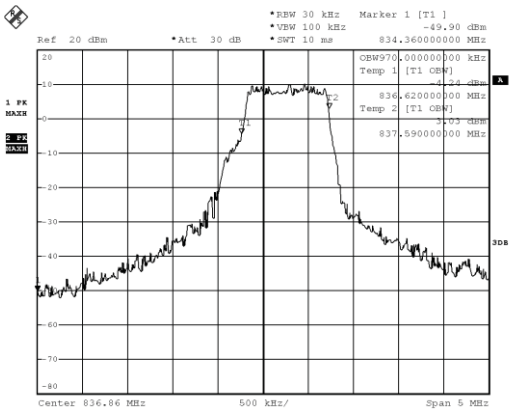


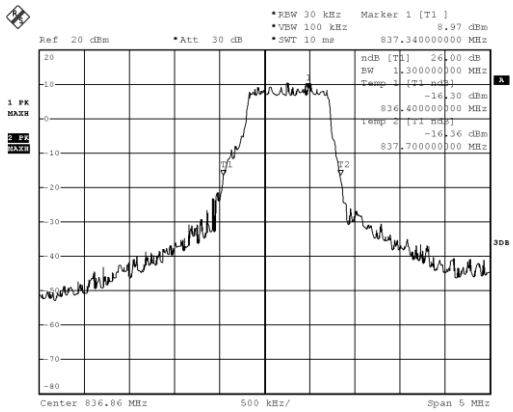
16QAM Band 4 High Channel (99% bandwidth, 26dB Bandwidth)



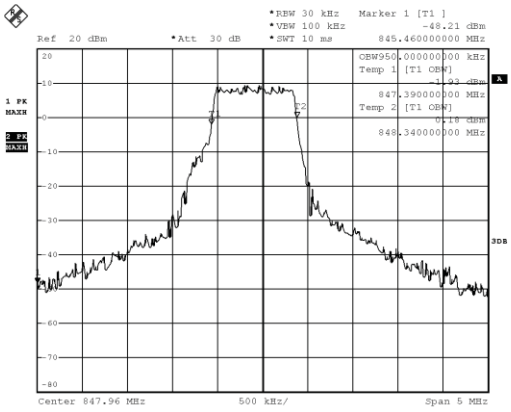


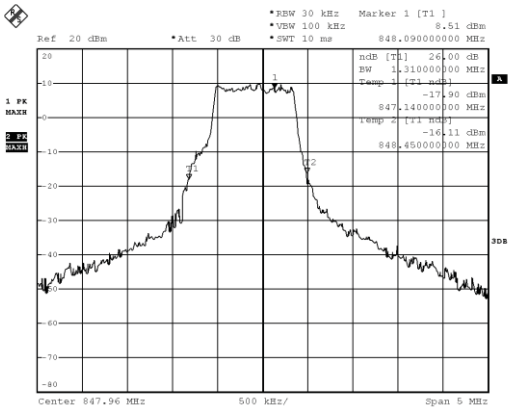
16QAM Band 5 Low Channel (99% bandwidth, 26dB Bandwidth)



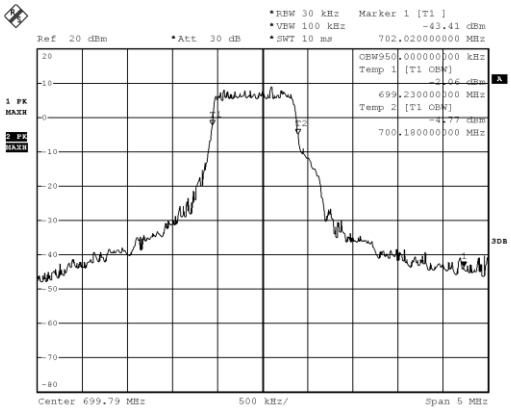


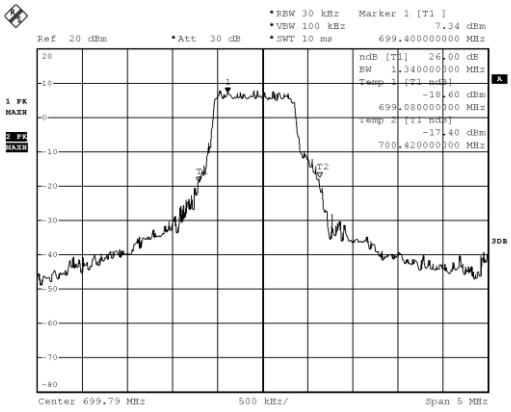
16QAM Band 5 Mid Channel (99% bandwidth, 26dB Bandwidth)



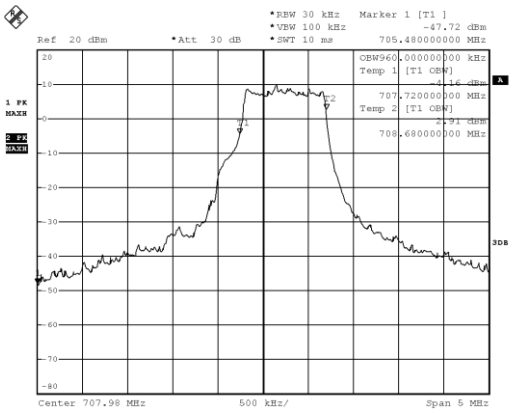


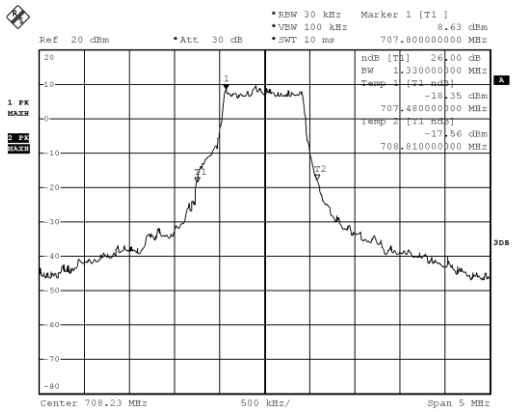
16QAM Band 5 High Channel (99% bandwidth, 26dB Bandwidth)



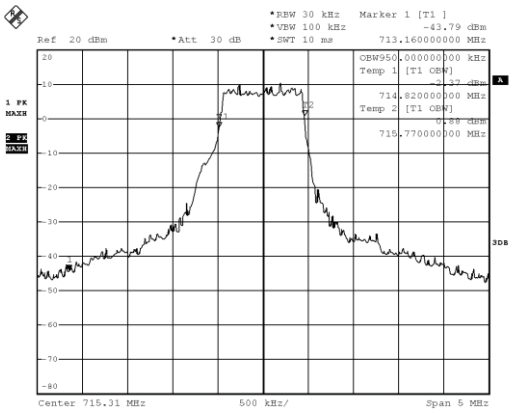


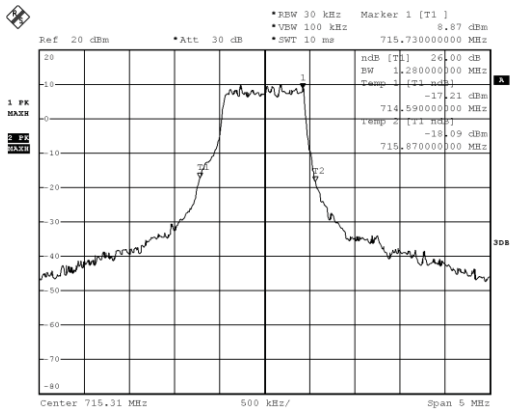
16QAM Band 12 Low Channel (99% bandwidth, 26dB Bandwidth)



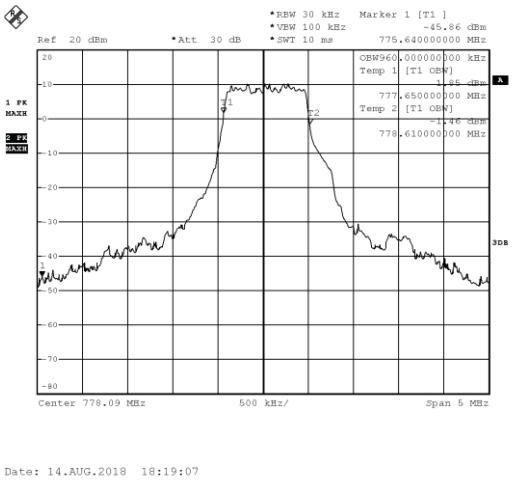


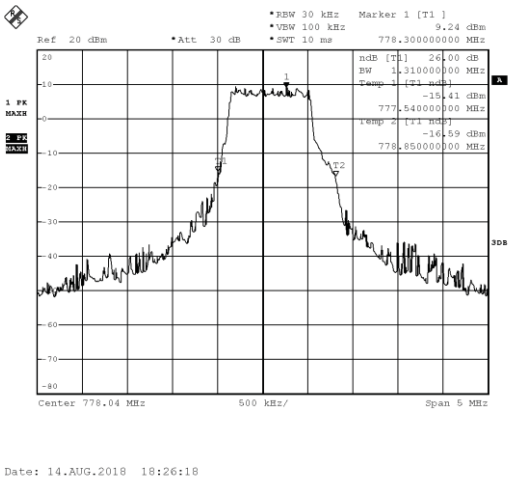
16QAM Band 12 Mid Channel (99% bandwidth, 26dB Bandwidth)



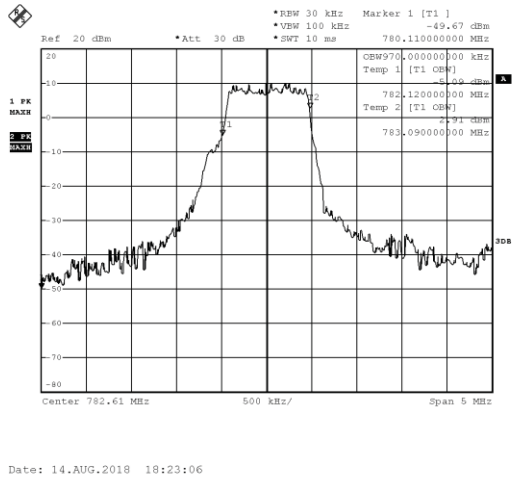


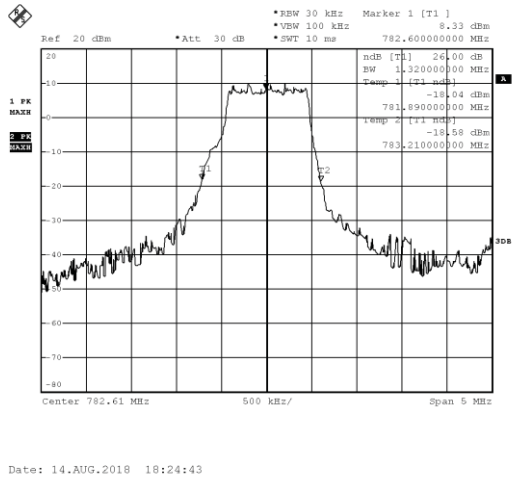
16QAM Band 12 High Channel (99% bandwidth, 26dB Bandwidth)



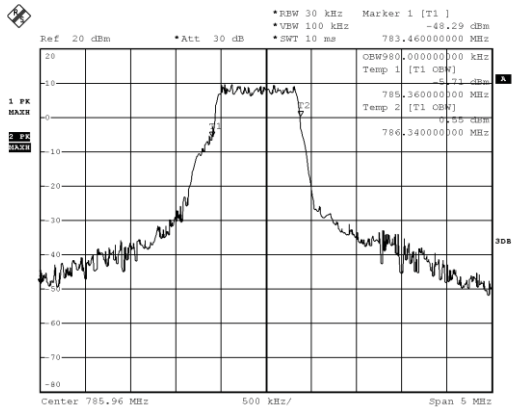


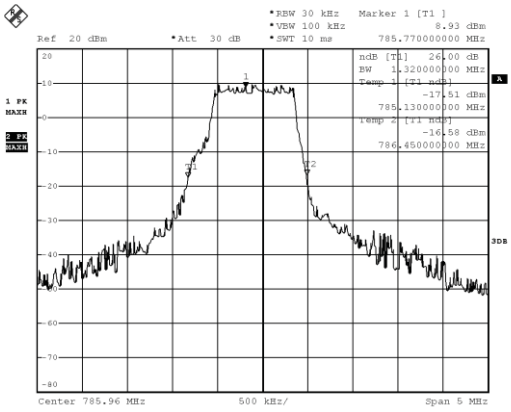
16QAM Band 13 Low Channel (99% bandwidth, 26dB Bandwidth)



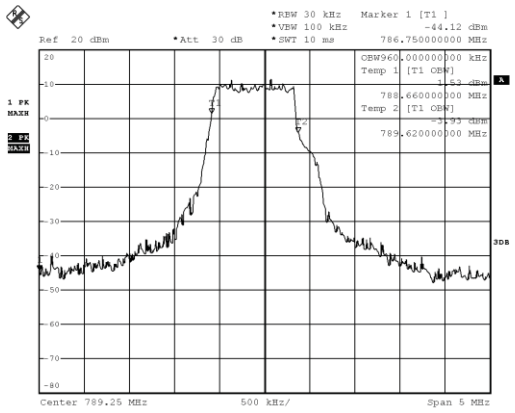


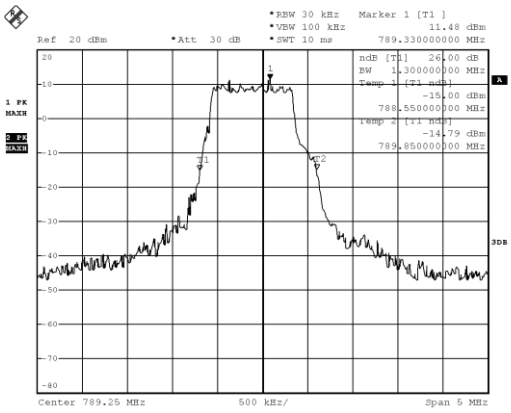
16QAM Band 13 Mid Channel (99% bandwidth, 26dB Bandwidth)



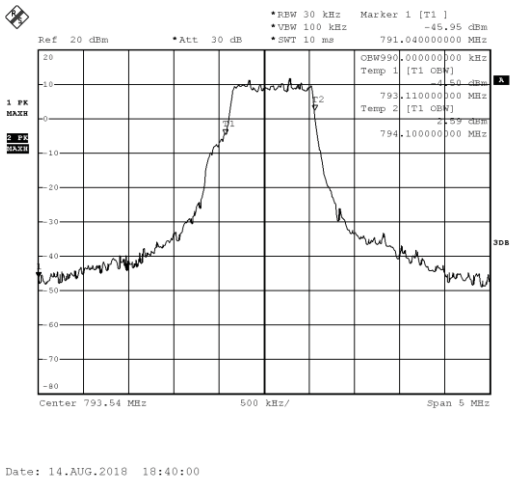


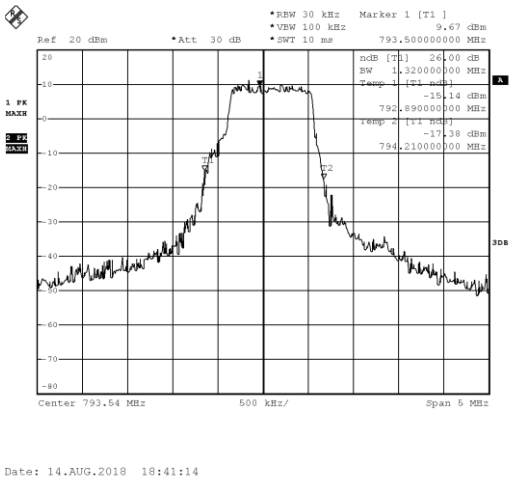
16QAM Band 13 High Channel (99% bandwidth, 26dB Bandwidth)



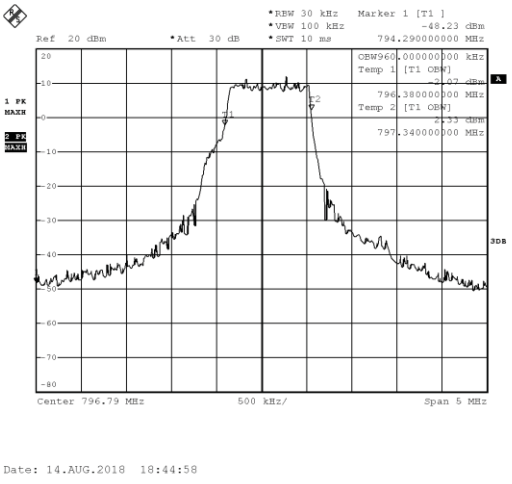


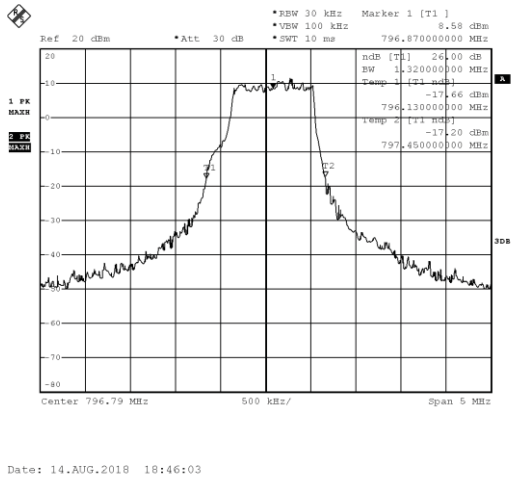
16QAM Band 14 Low Channel (99% bandwidth, 26dB Bandwidth)



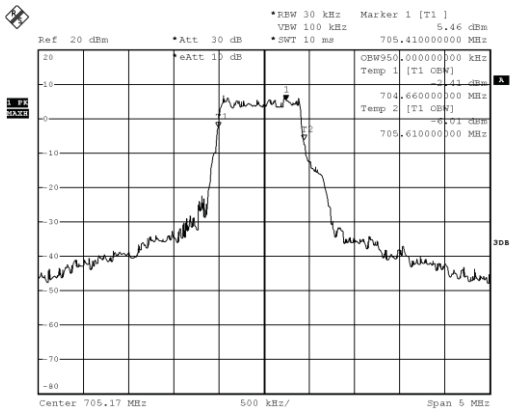


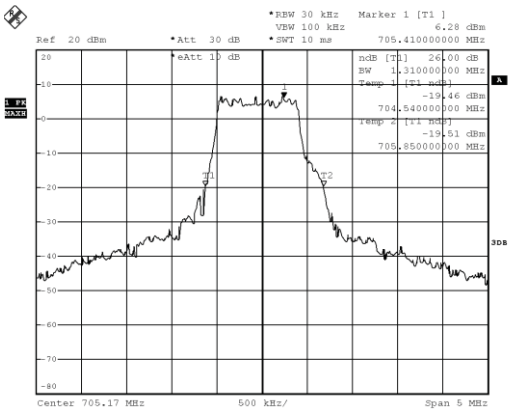
16QAM Band 14 Mid Channel (99% bandwidth, 26dB Bandwidth)



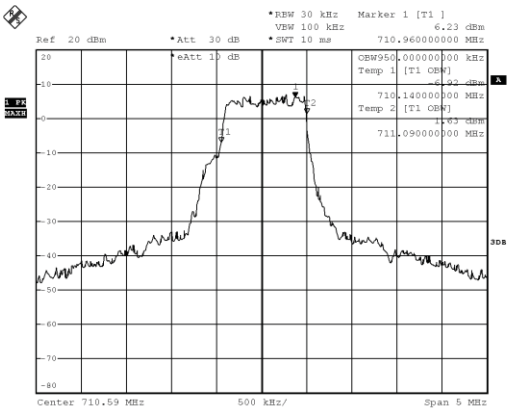


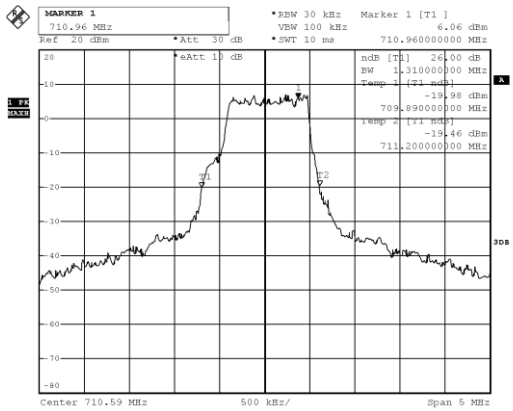
16QAM Band 14 High Channel (99% bandwidth, 26dB Bandwidth)



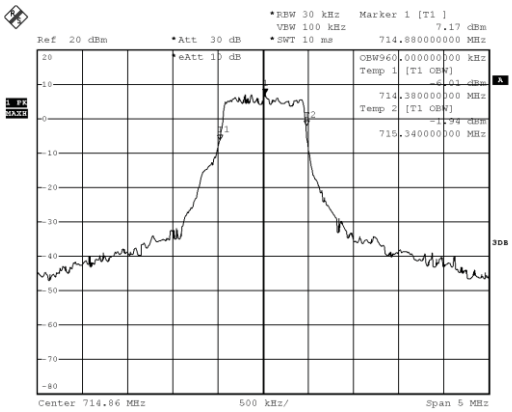


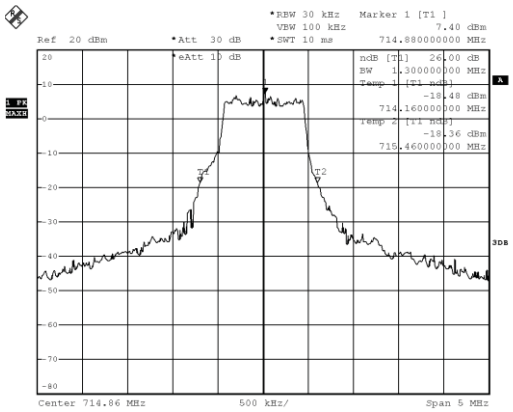
16QAM Band 17 Low Channel (99% bandwidth, 26dB Bandwidth)



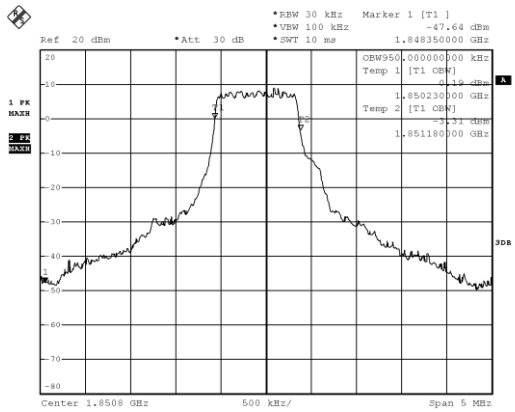


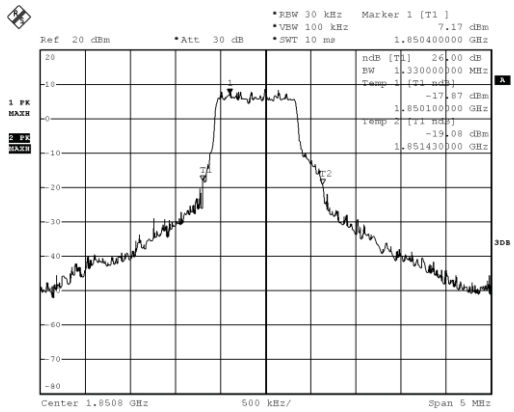
16QAM Band 17 Mid Channel (99% bandwidth, 26dB Bandwidth)



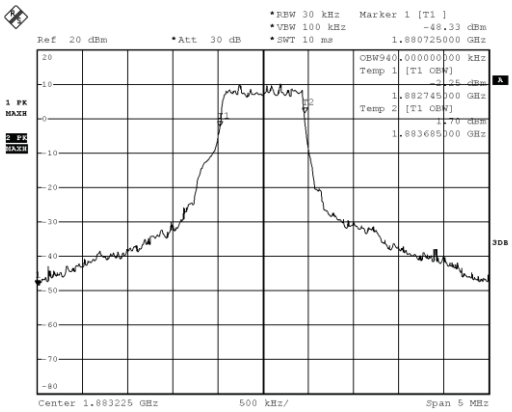


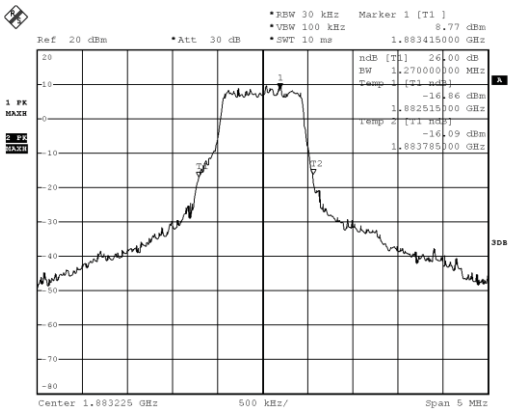
16QAM Band 17 High Channel (99% bandwidth, 26dB Bandwidth)



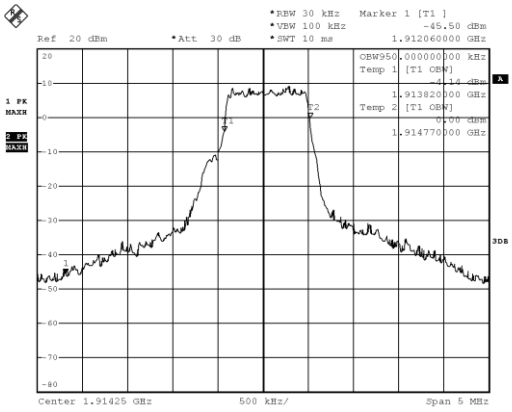


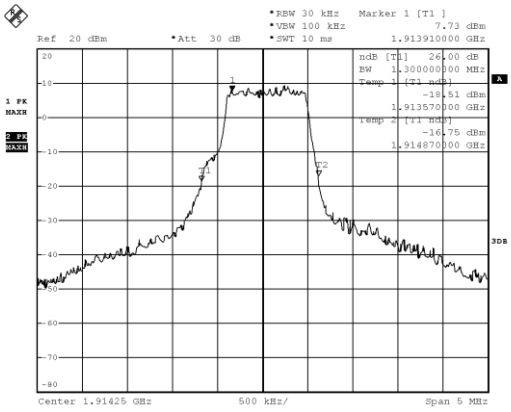
16QAM Band 25 Low Channel (99% bandwidth, 26dB Bandwidth)



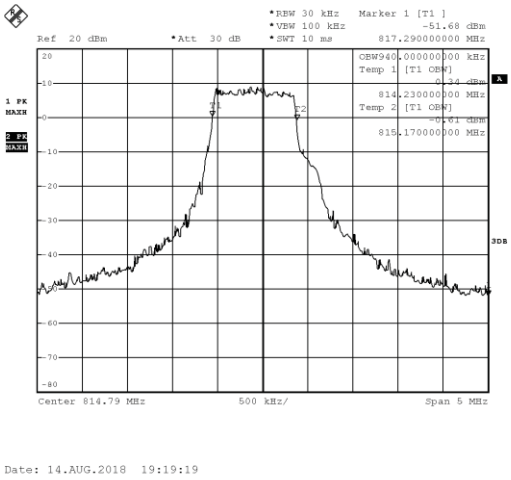


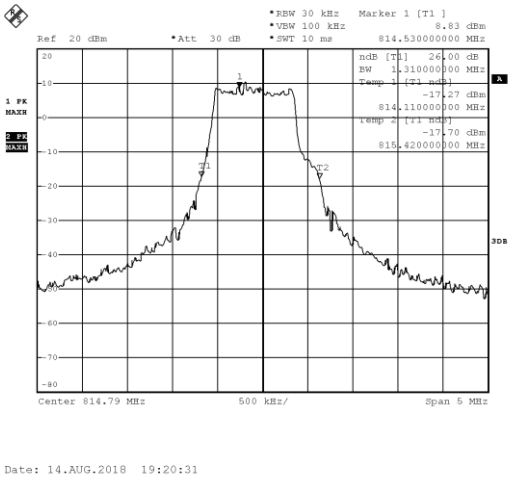
16QAM Band 25 Mid Channel (99% bandwidth, 26dB Bandwidth)



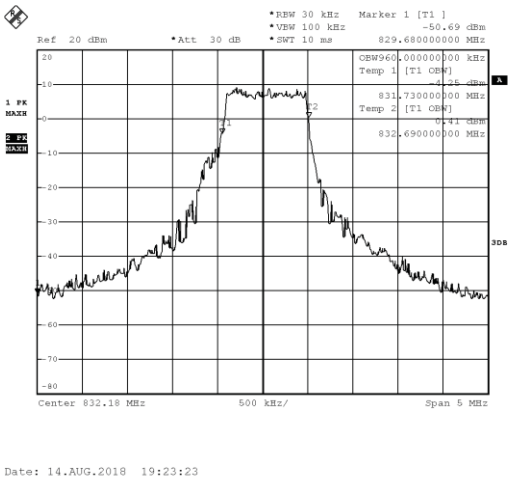


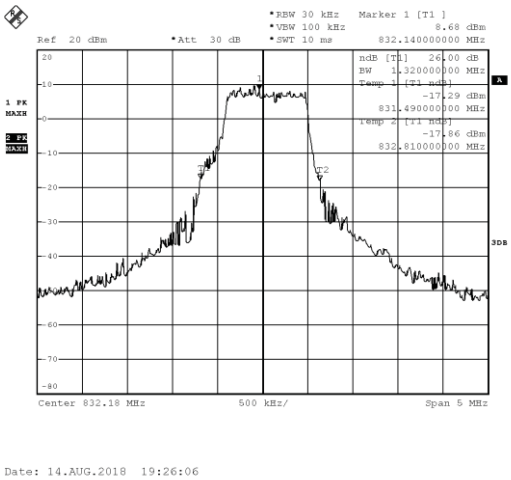
16QAM Band 25 High Channel (99% bandwidth, 26dB Bandwidth)



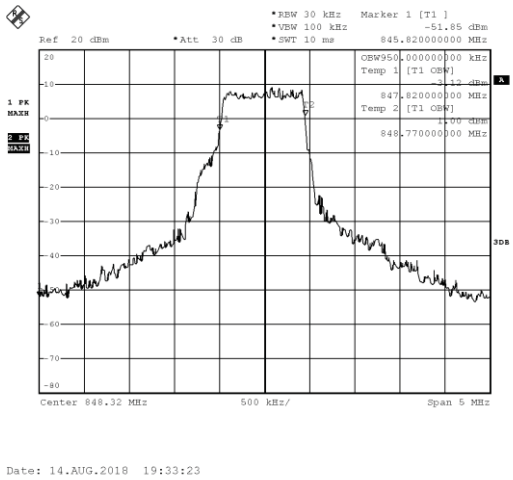


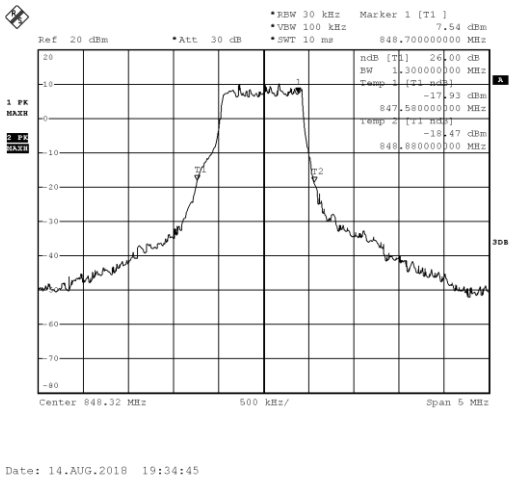
16QAM Band 26 Low Channel (99% bandwidth, 26dB Bandwidth)





16QAM Band 26 Mid Channel (99% bandwidth, 26dB Bandwidth)





16QAM Band 26 High Channel (99% bandwidth, 26dB Bandwidth)

8 Conducted Spurious Emissions and Band Edge at Antenna Terminals

8.1 Test Limits

The power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

Additionally equipment operating in bands 746 – 756MHz and 777 – 787MHz shall also comply with the following restrictions:

a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

(i) 76 + 10 log10 p (watts), dB, for base and fixed equipment, and
(ii) 65 + 10 log10 p (watts), dB, for mobile and portable equipment.

b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

8.2 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The base station simulator was set to force the EUT to its maximum power setting. The resolution bandwidth of the spectrum analyzer was set at 100kHz or 1MHz depending on the transmit band and the detector was set to peak detection for general scans up to the 10th harmonic. Emissions scans near the fundamental were measured using an RMS detector. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

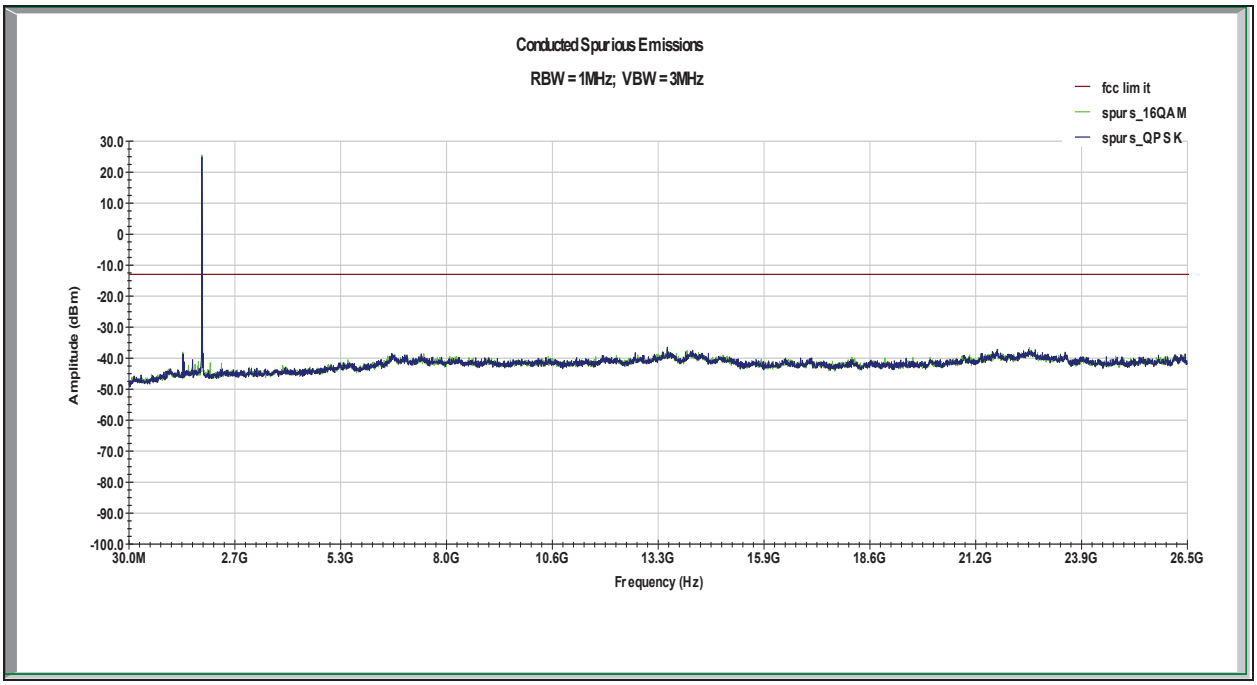
8.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	2327	Rohde & Schwarz	ESI26	9/20/2017	9/20/2018
LTE CAT M1 Base Station	3917	Rohde & Schwarz	CMW500	9/20/2017	9/20/2018
Spectrum Analyzer	3099	Rohde & Schwarz	FSP 7	9/20/2018	9/20/2019
Power Divider	E18106	Weinschell Engineering	1506A	Time of Use	Time of Use

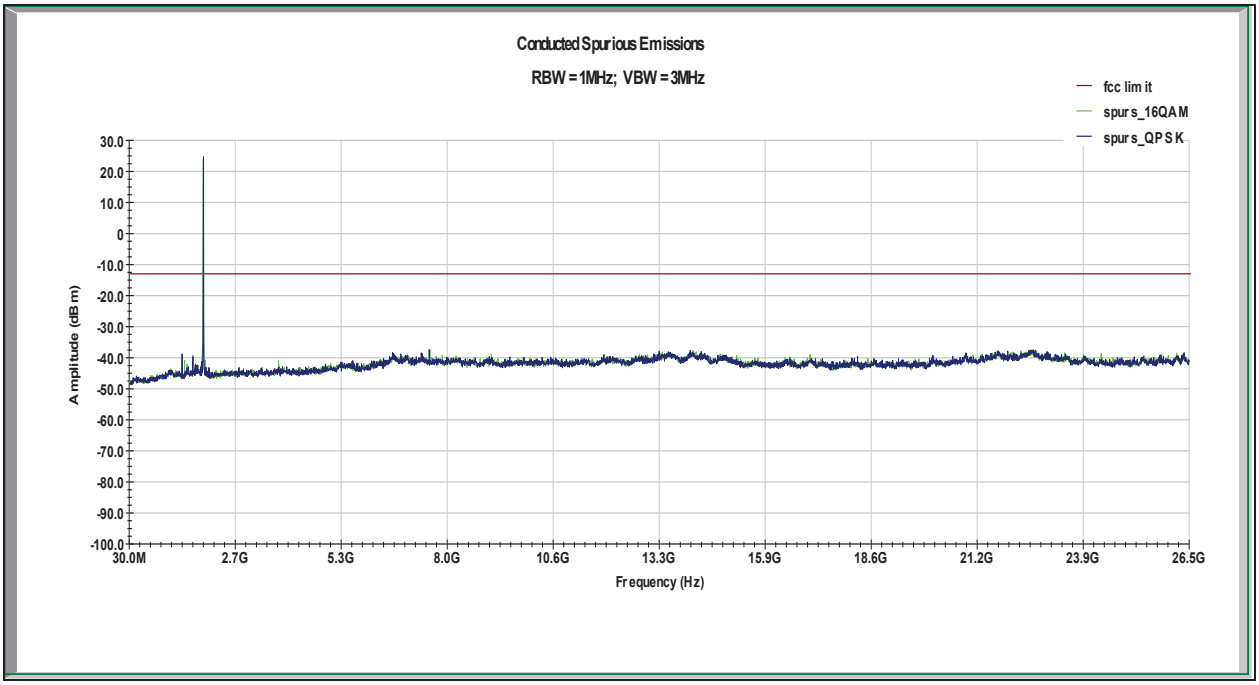
8.4 Results:

The following plots show that all spurious emissions are attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Plots for emissions within 1MHz of the transmit block edge as well as for emission outside of this range are shown.

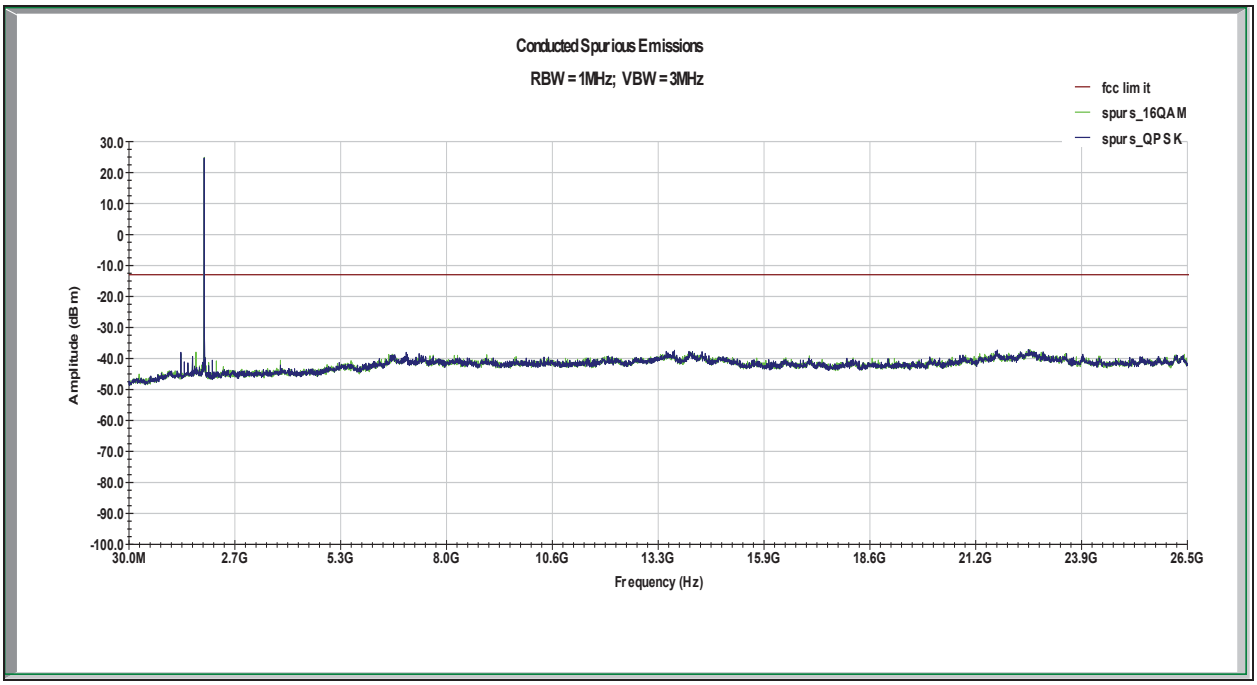
8.1 Conducted Spurious Emission Plots:



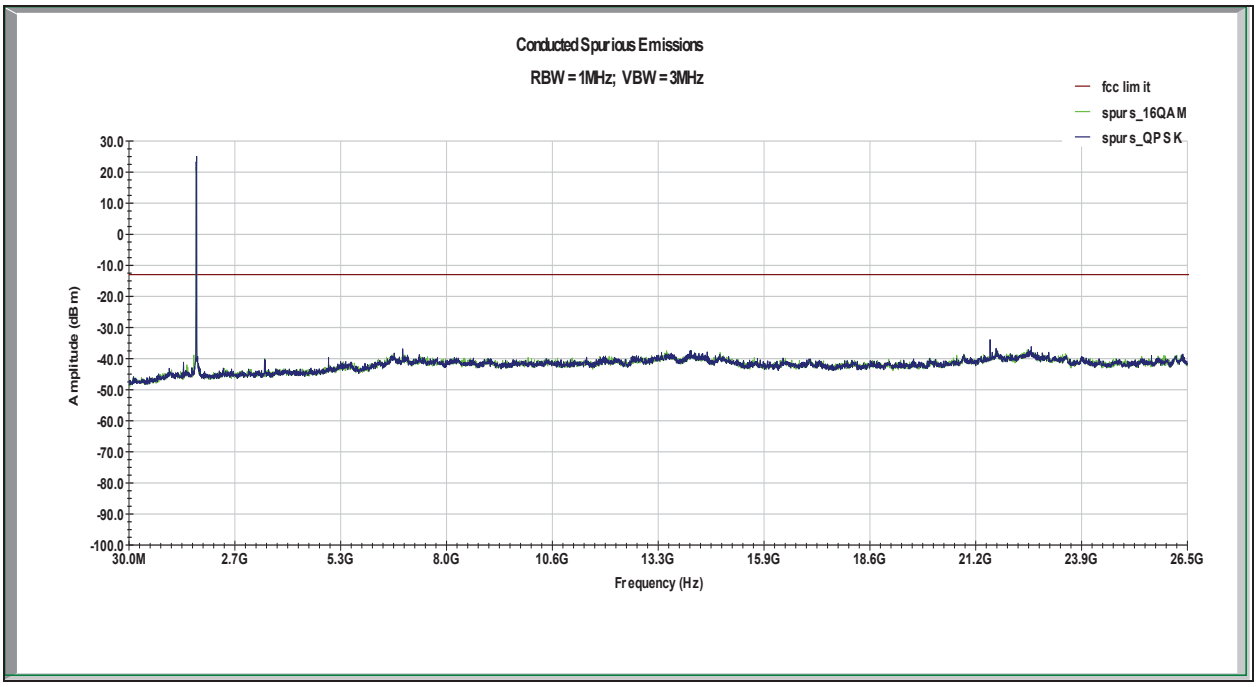
Band 2 Low QPSK and 16-QAM



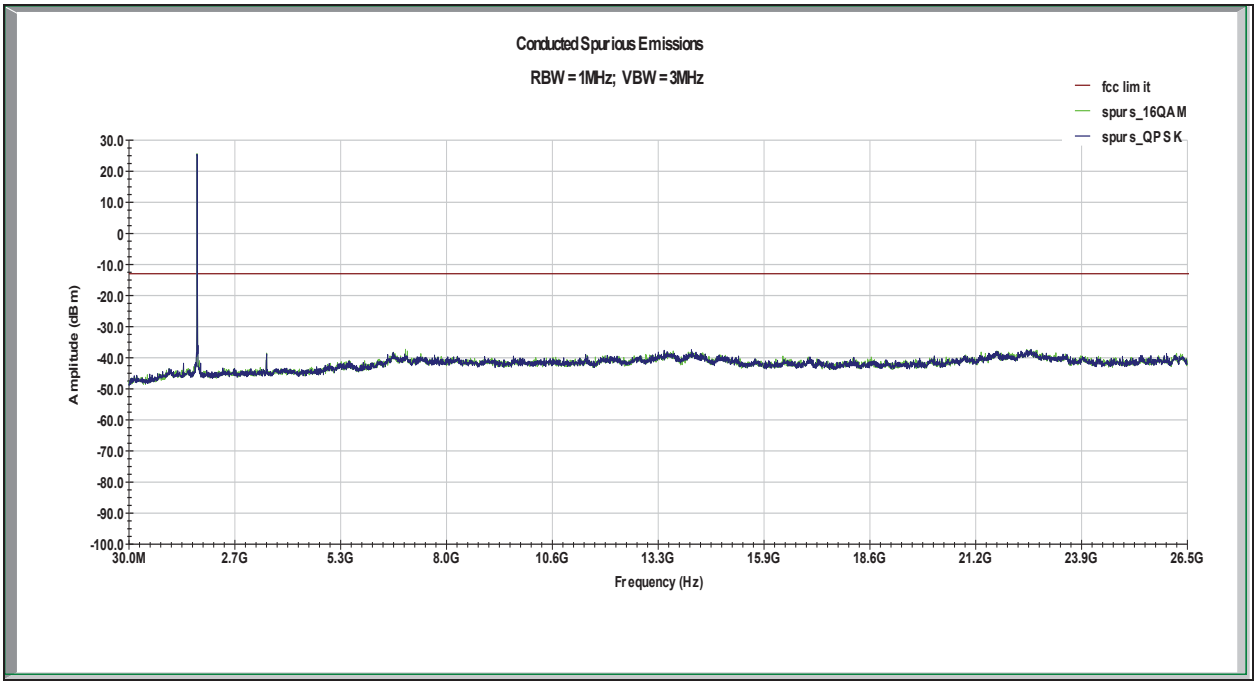
Band 2 Mid QPSK and 16-QAM



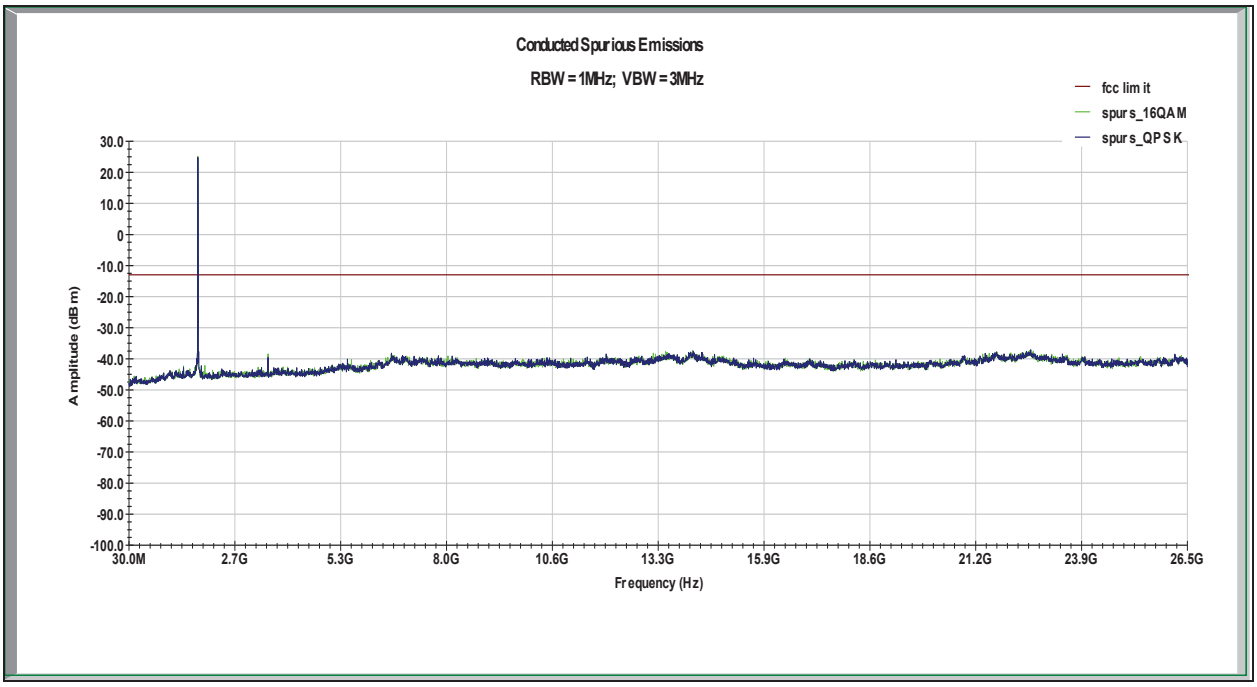
Band 2 High QPSK and 16-QAM



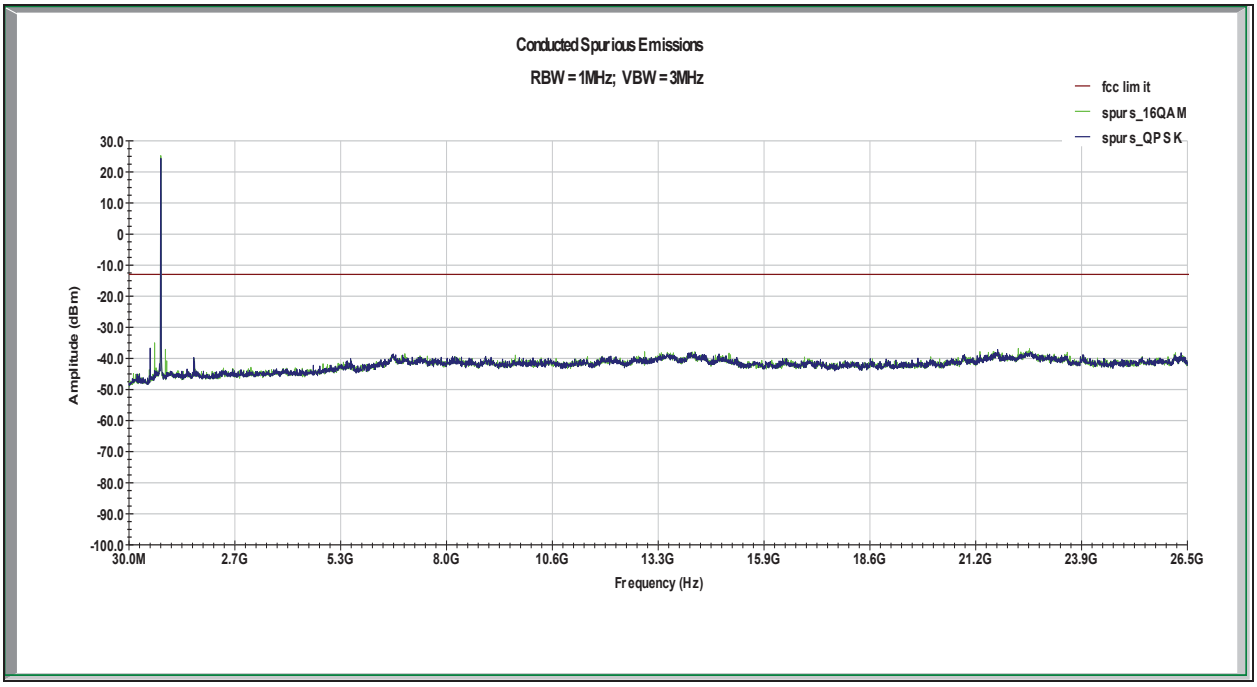
Band 4 Low QPSK and 16-QAM



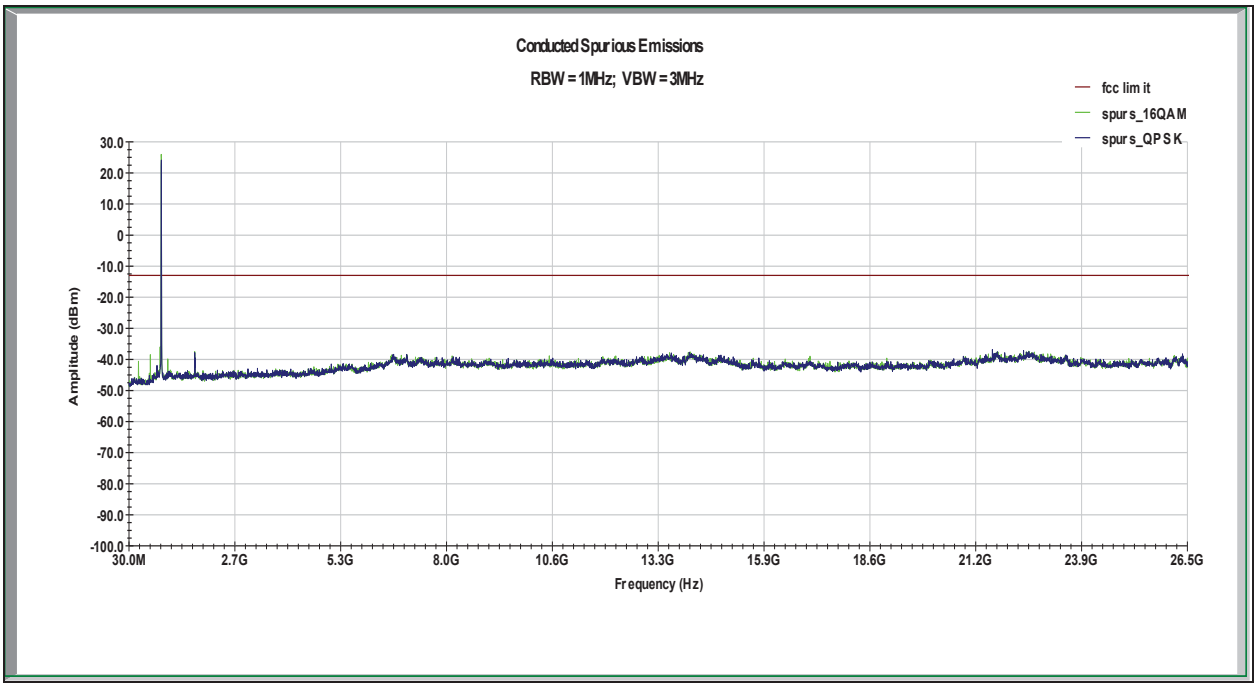
Band 4 Mid QPSK and 16-QAM



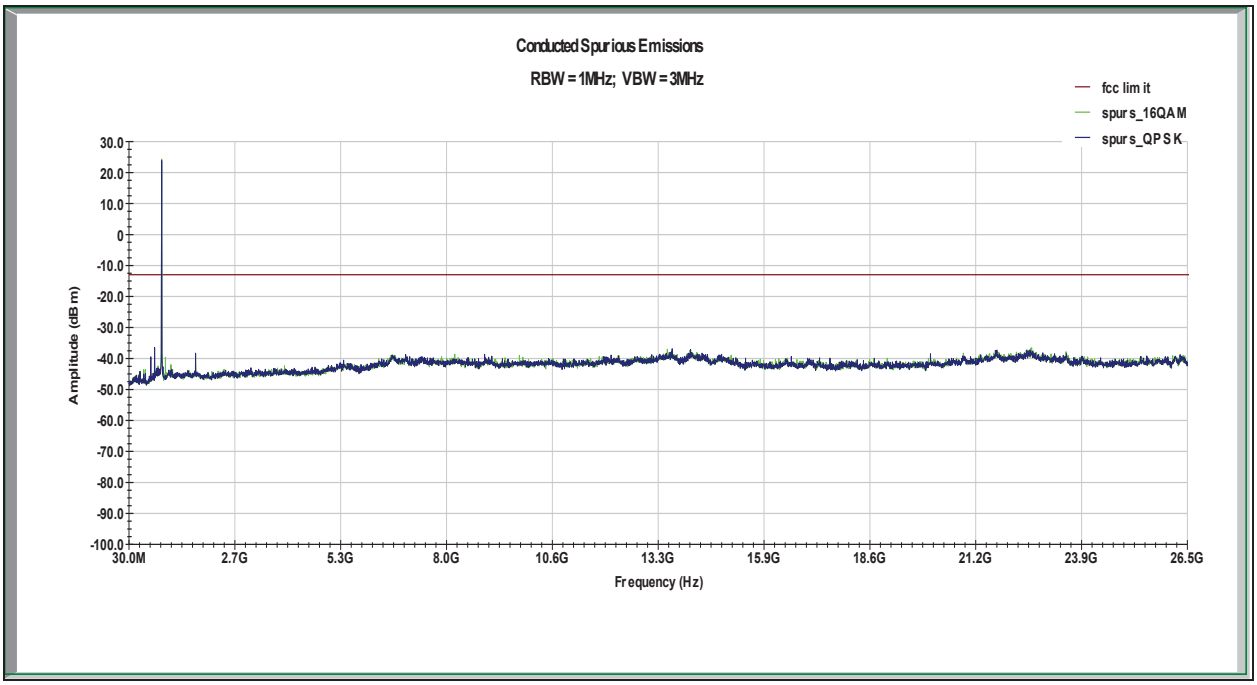
Band 4 High QPSK and 16-QAM



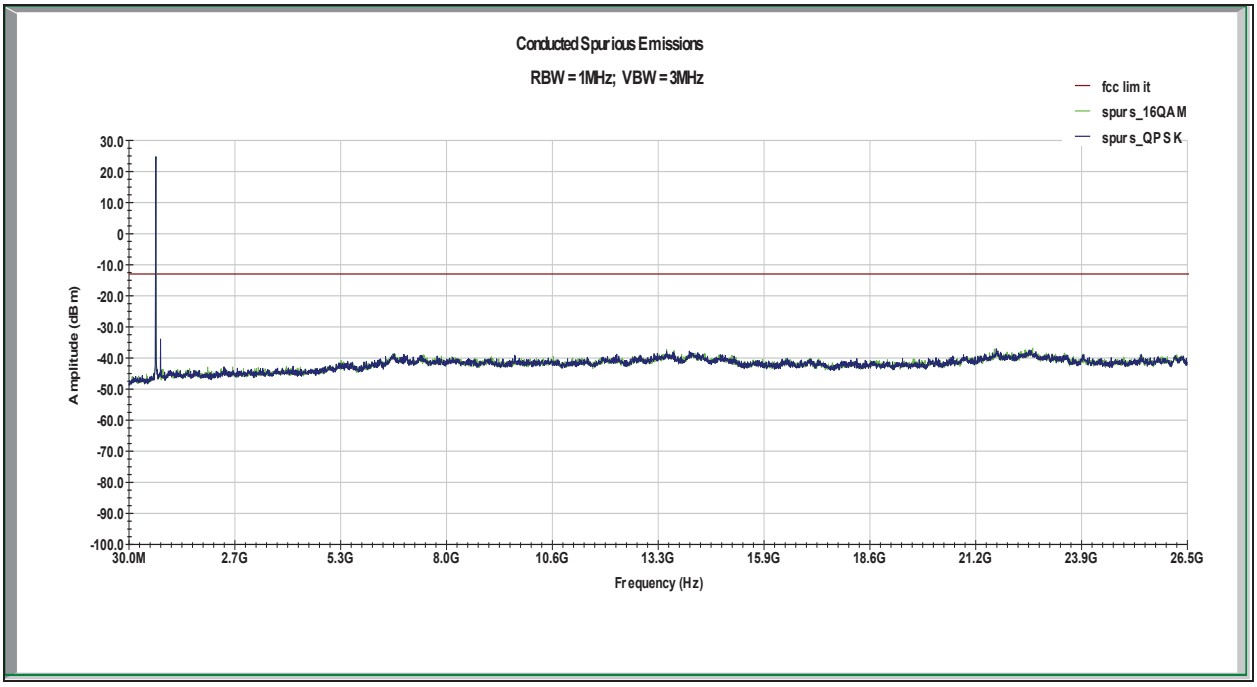
Band 5 Low QPSK and 16-QAM



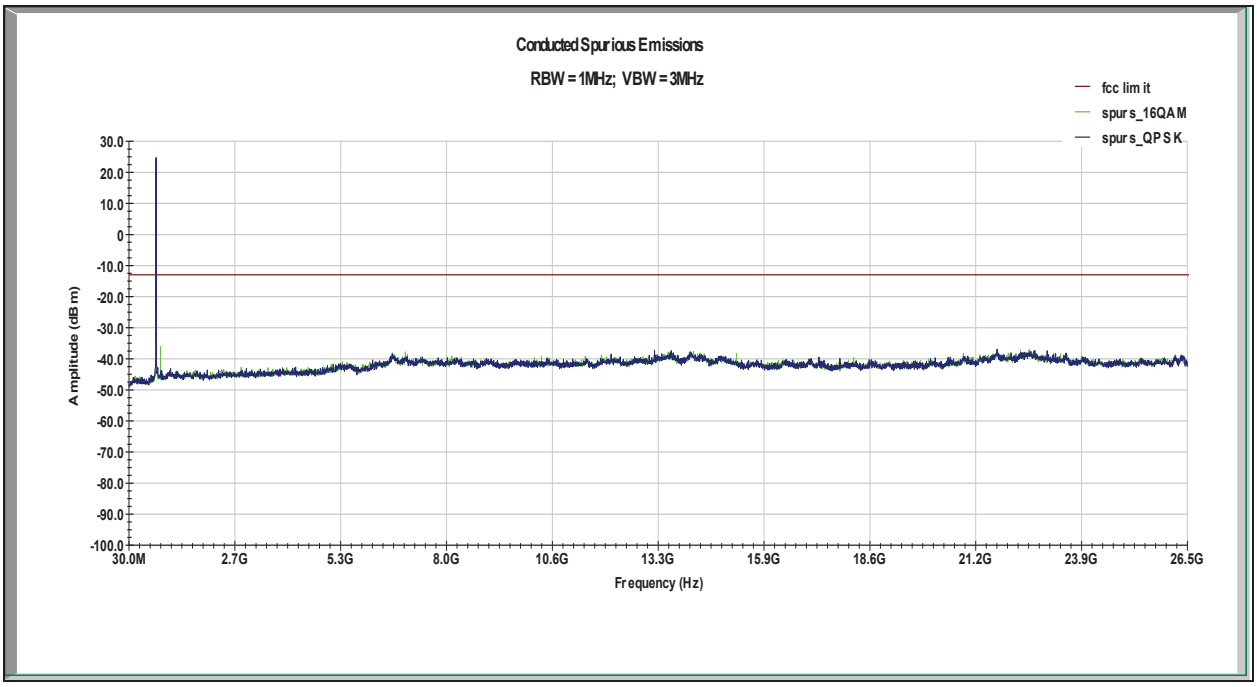
Band 5 Mid QPSK and 16-QAM



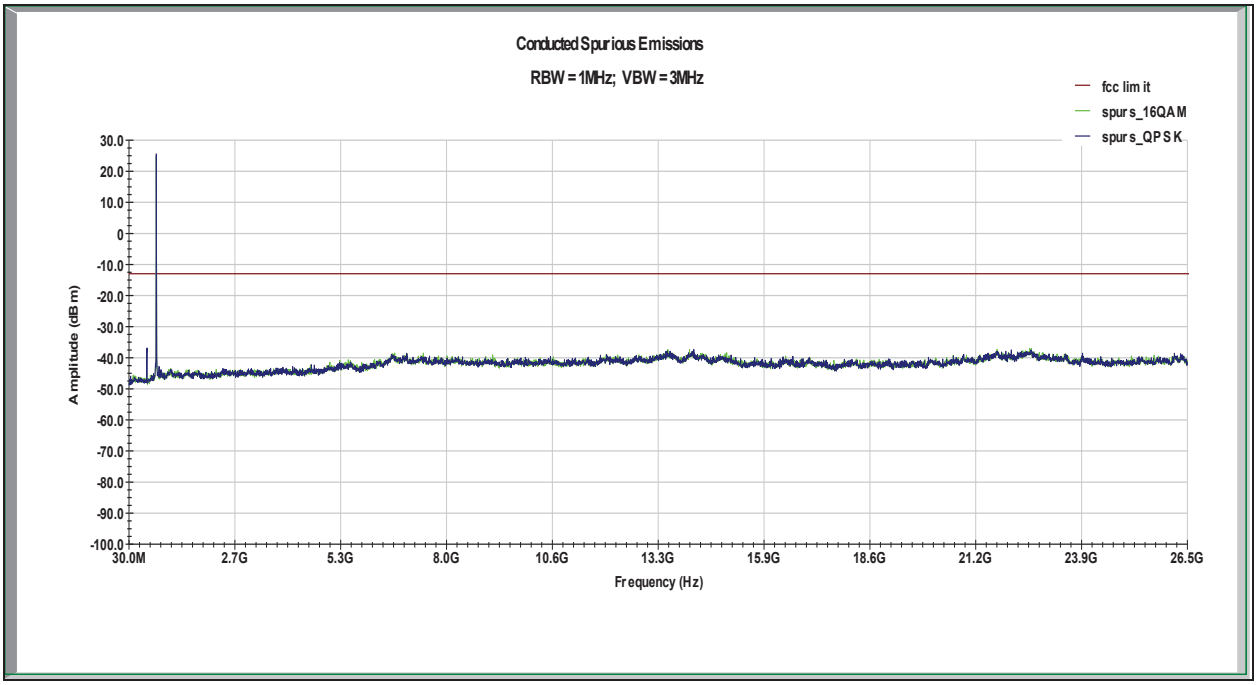
Band 5 High QPSK and 16-QAM



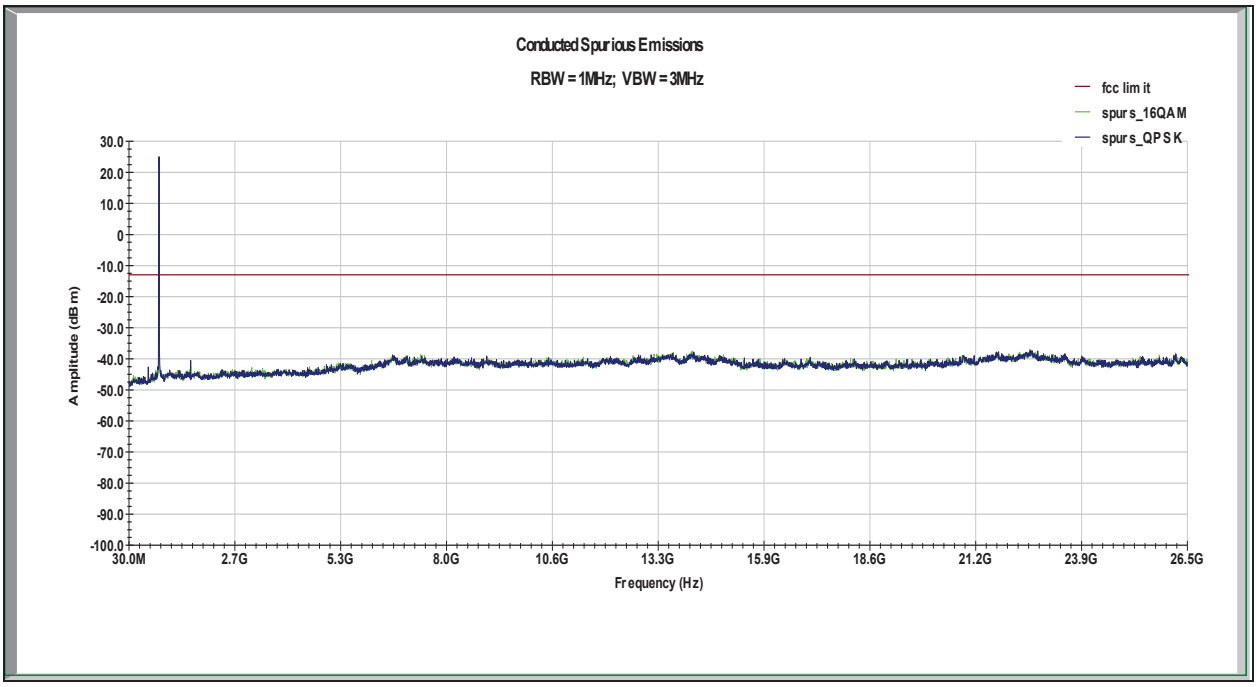
Band 12 Low QPSK and 16-QAM



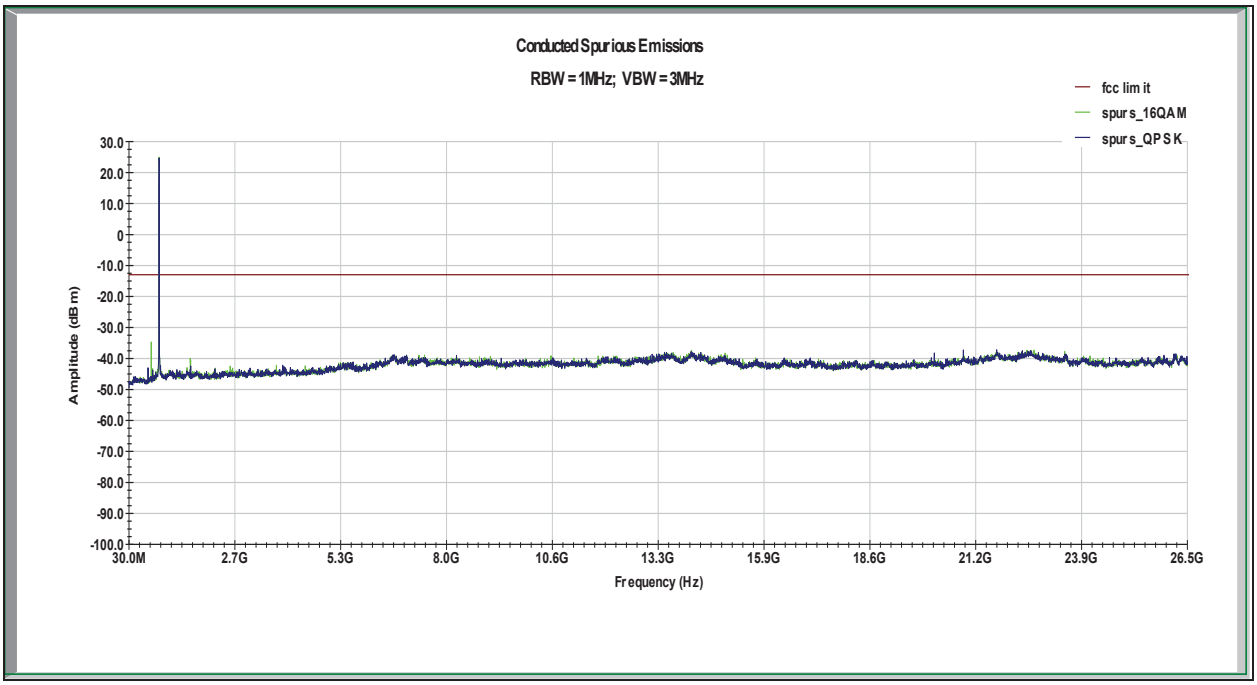
Band 12 Mid QPSK and 16-QAM



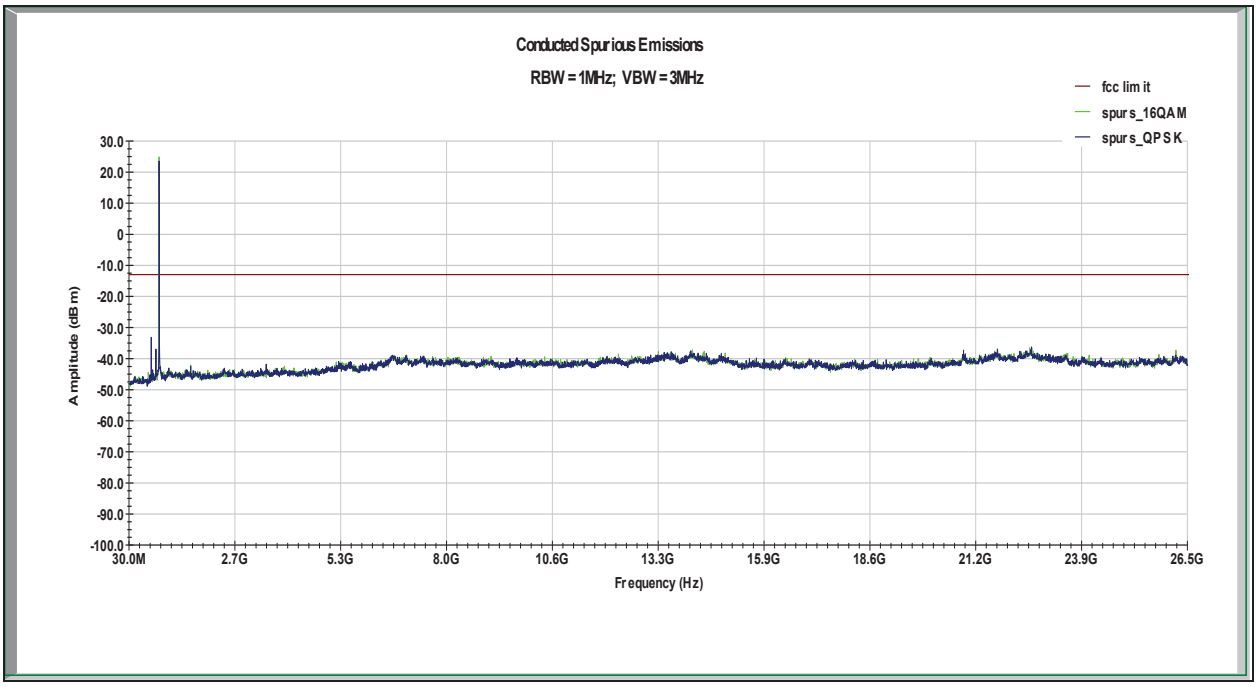
Band 12 High QPSK and 16-QAM



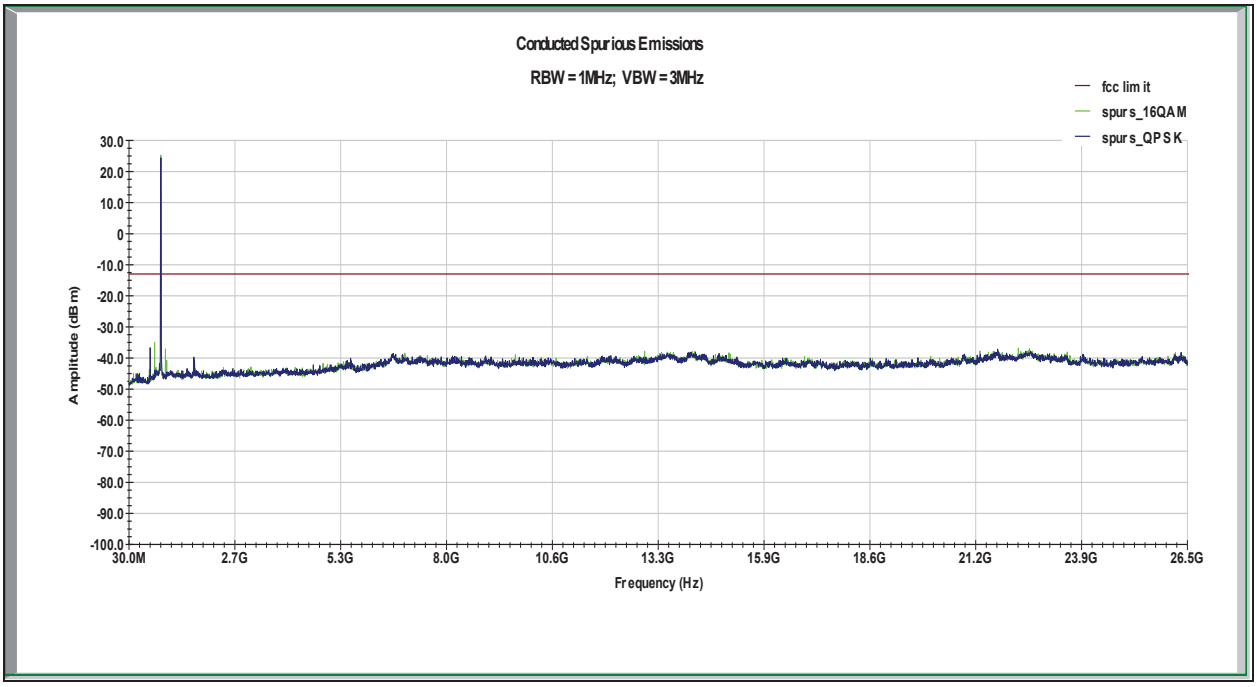
Band 13 Low QPSK and 16-QAM



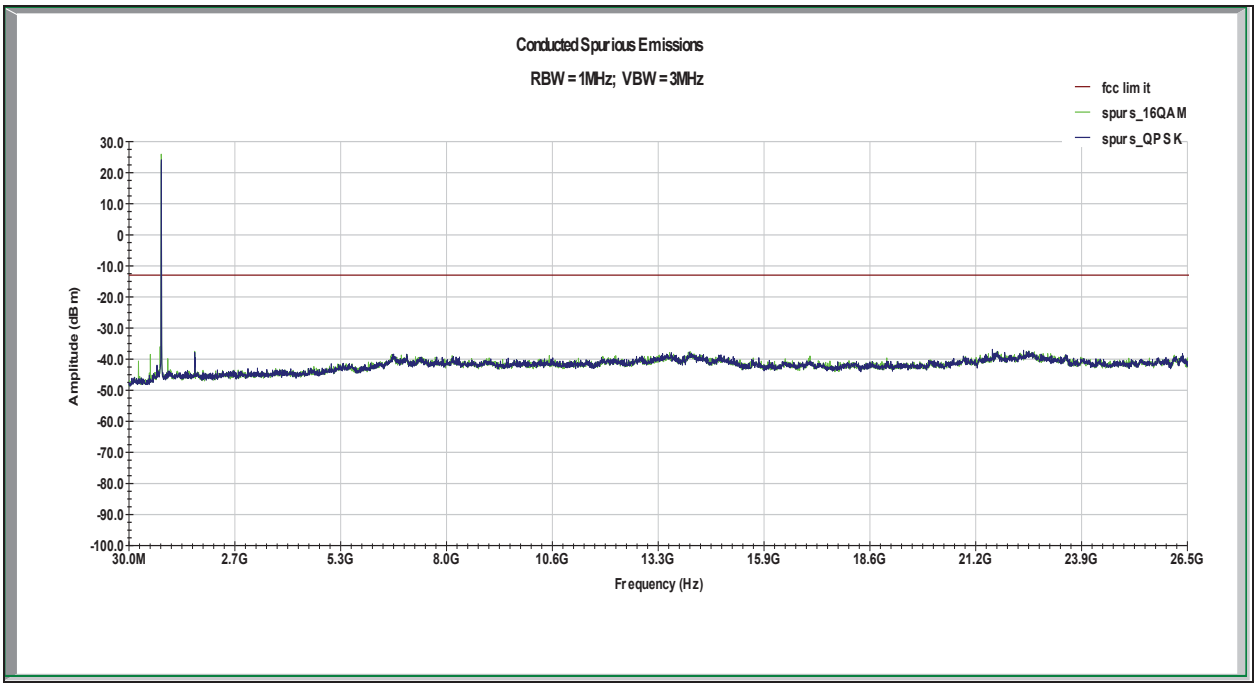
Band 13 Mid QPSK and 16-QAM



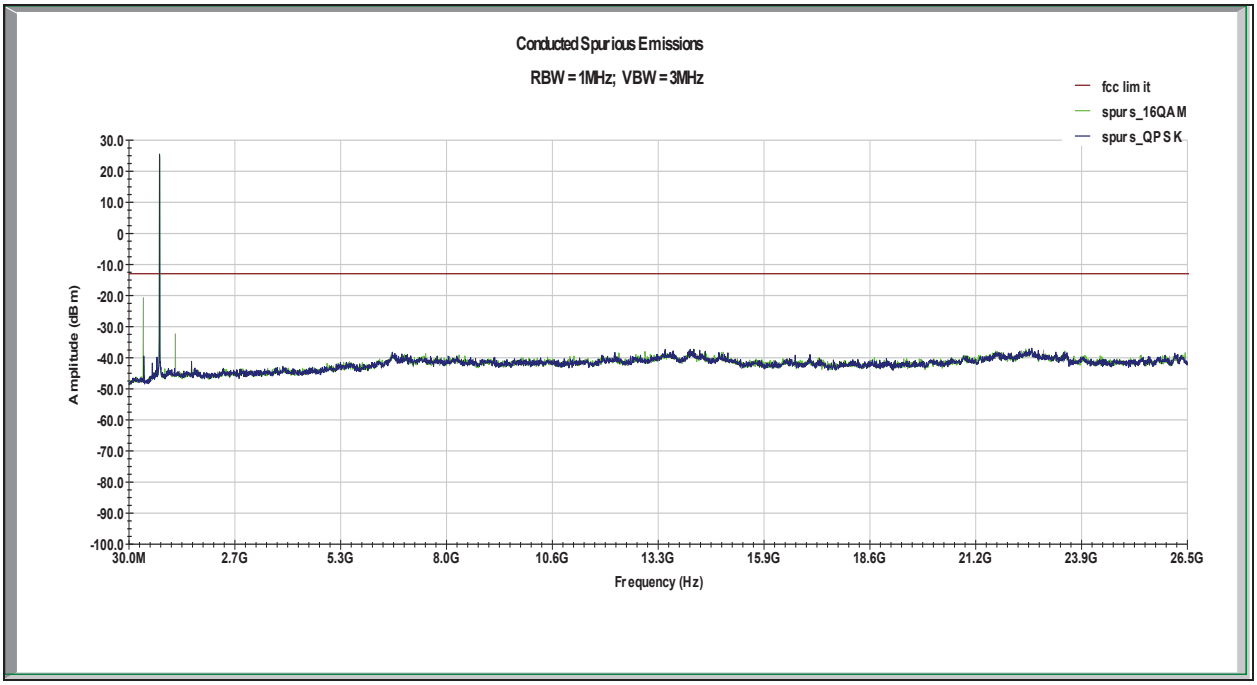
Band 13 High QPSK and 16-QAM



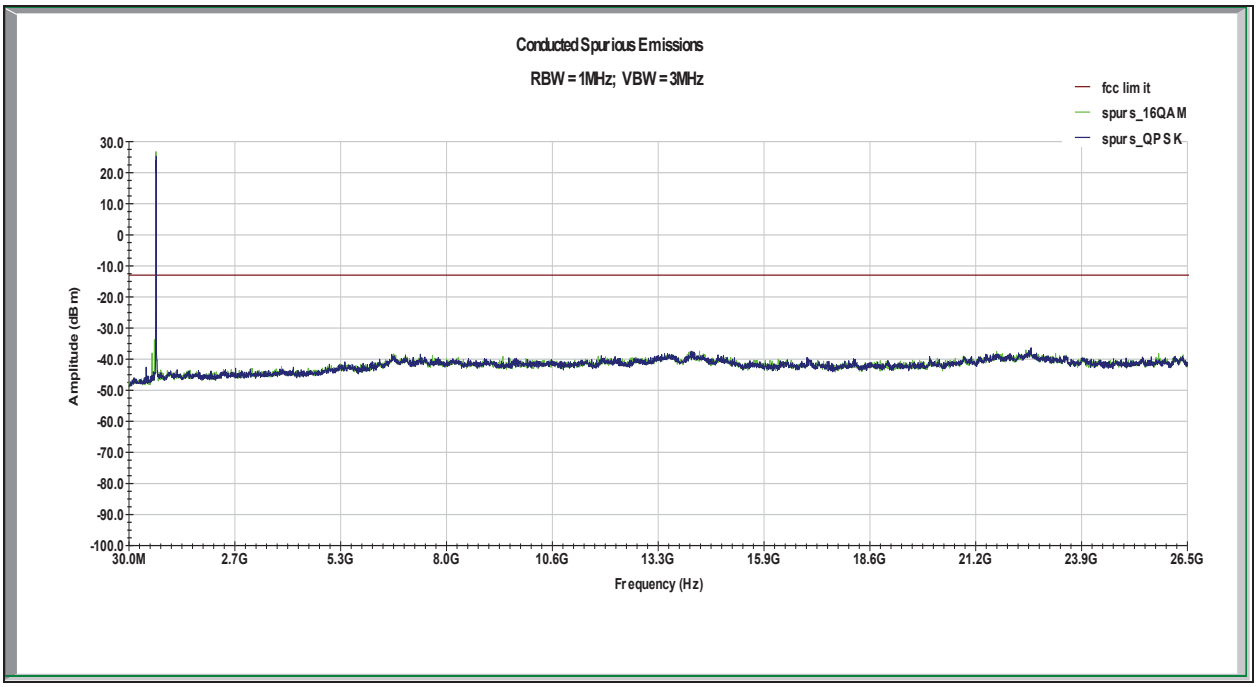
Band 14 Low QPSK and 16-QAM



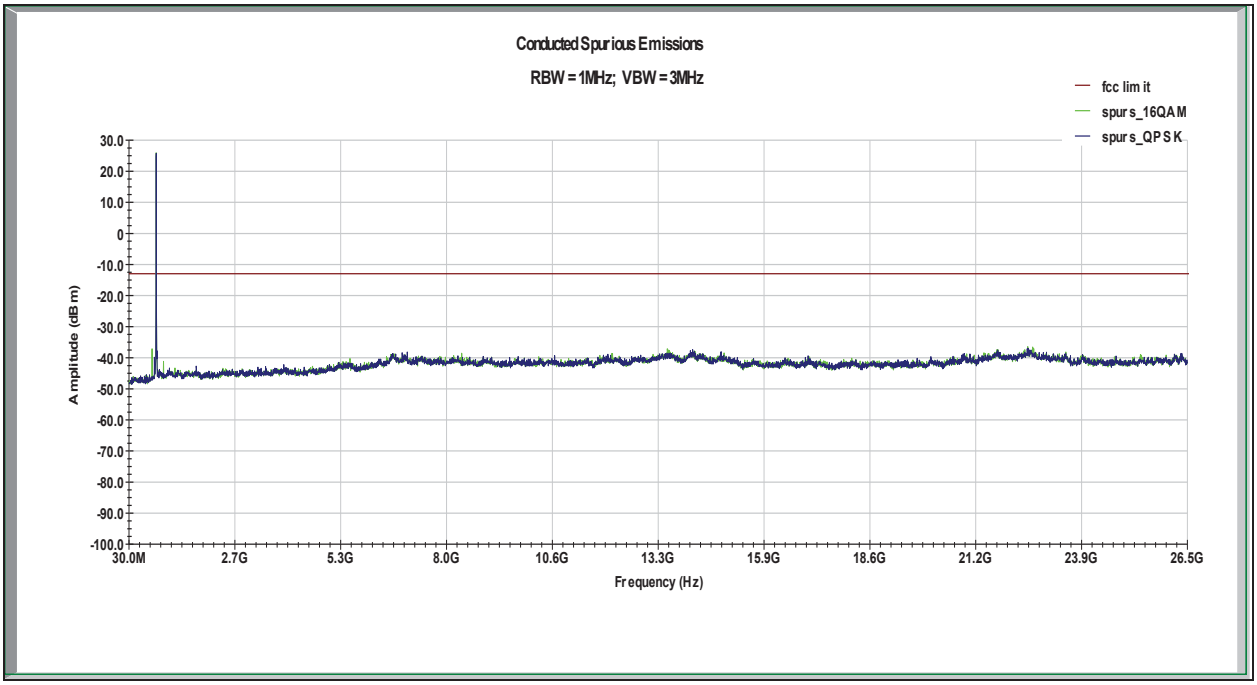
Band 14 Mid QPSK and 16-QAM



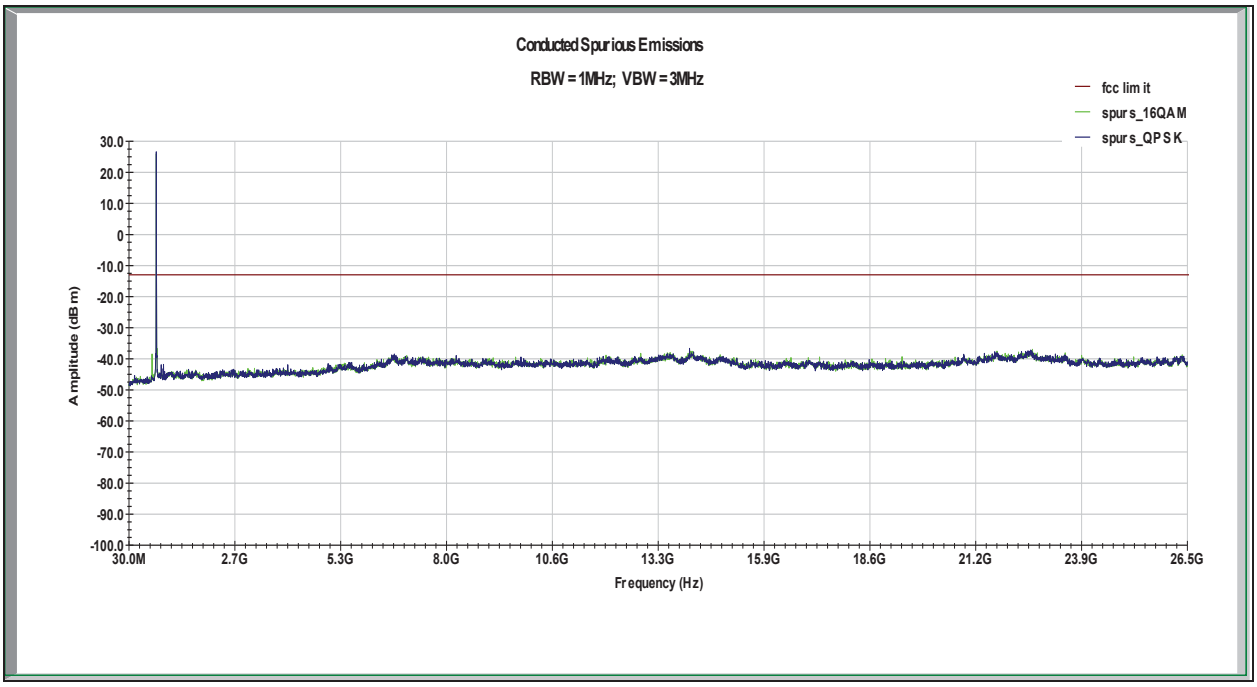
Band 14 High QPSK and 16-QAM



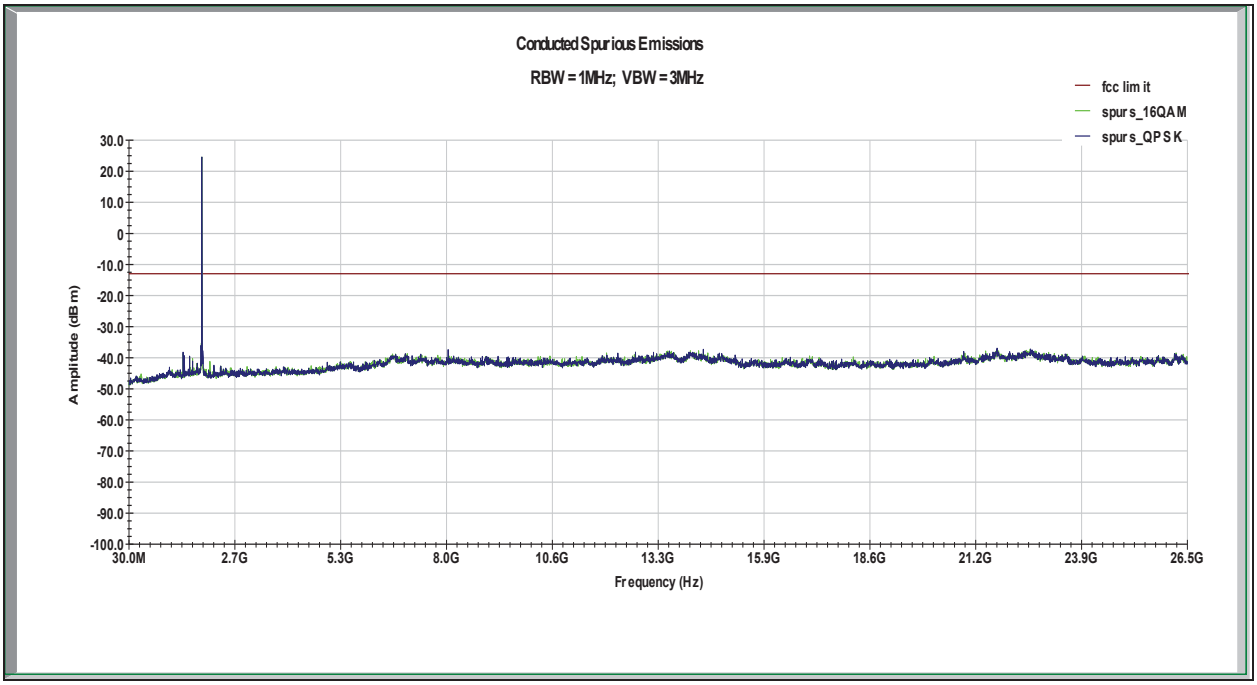
Band 17 Low QPSK and 16-QAM



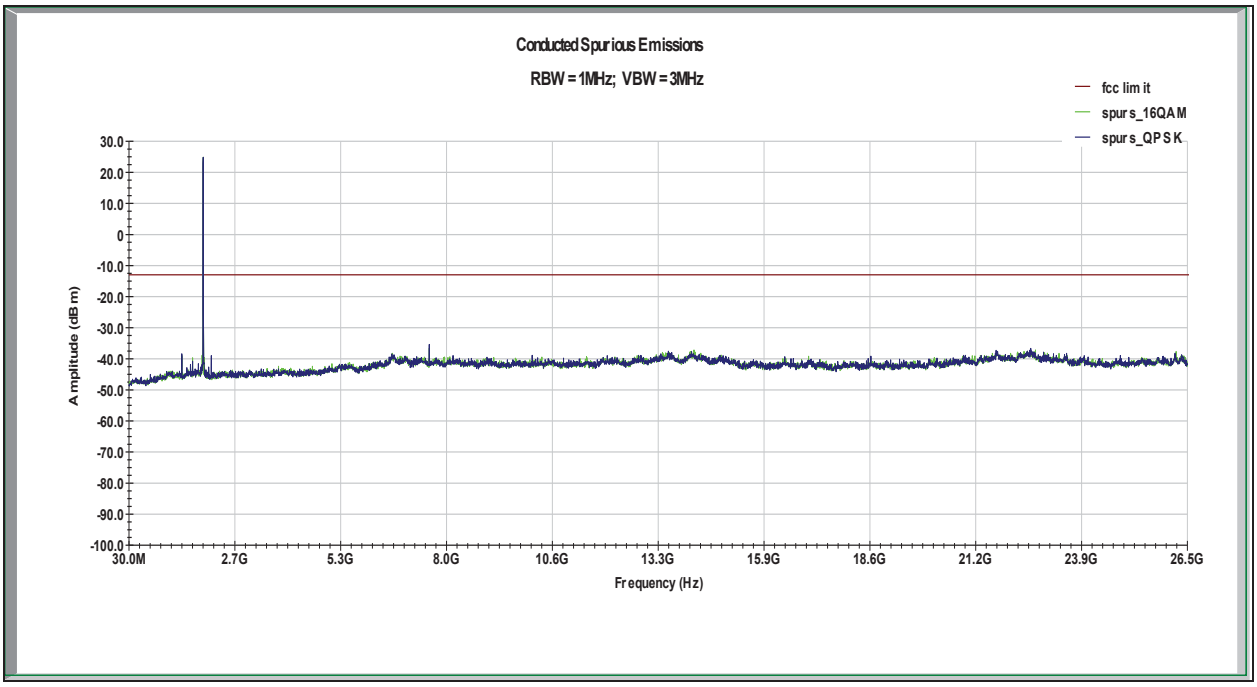
Band 17 Mid QPSK and 16-QAM



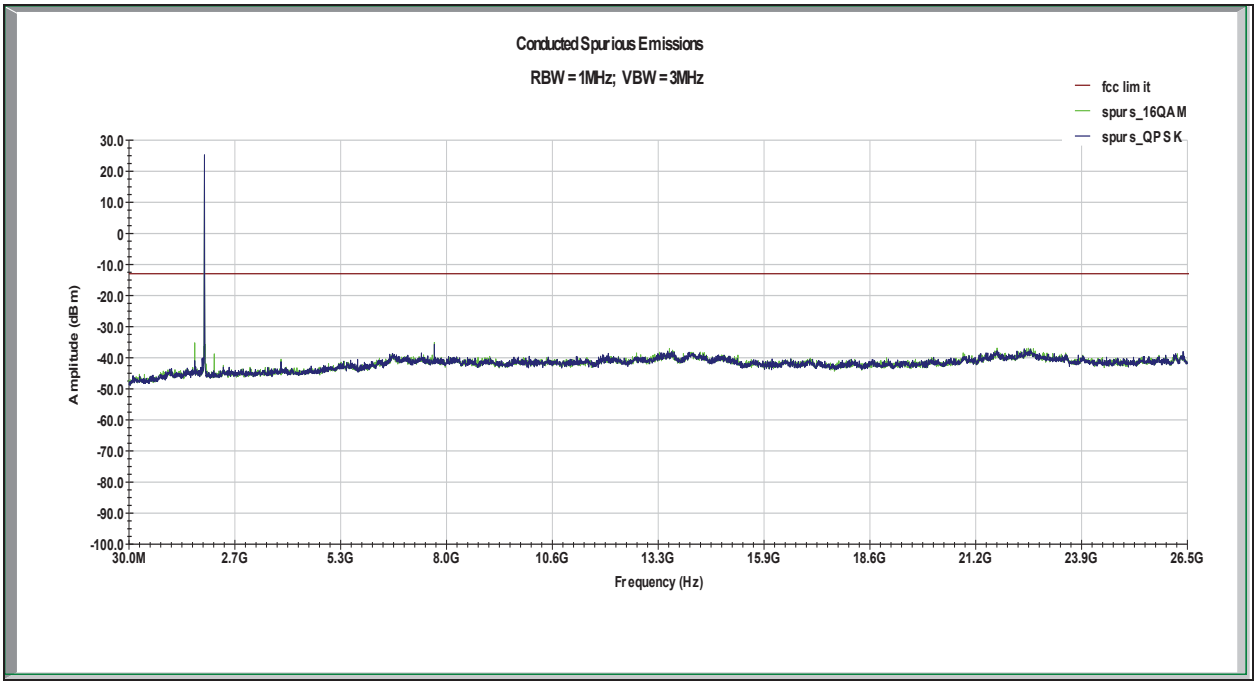
Band 17 High QPSK and 16-QAM



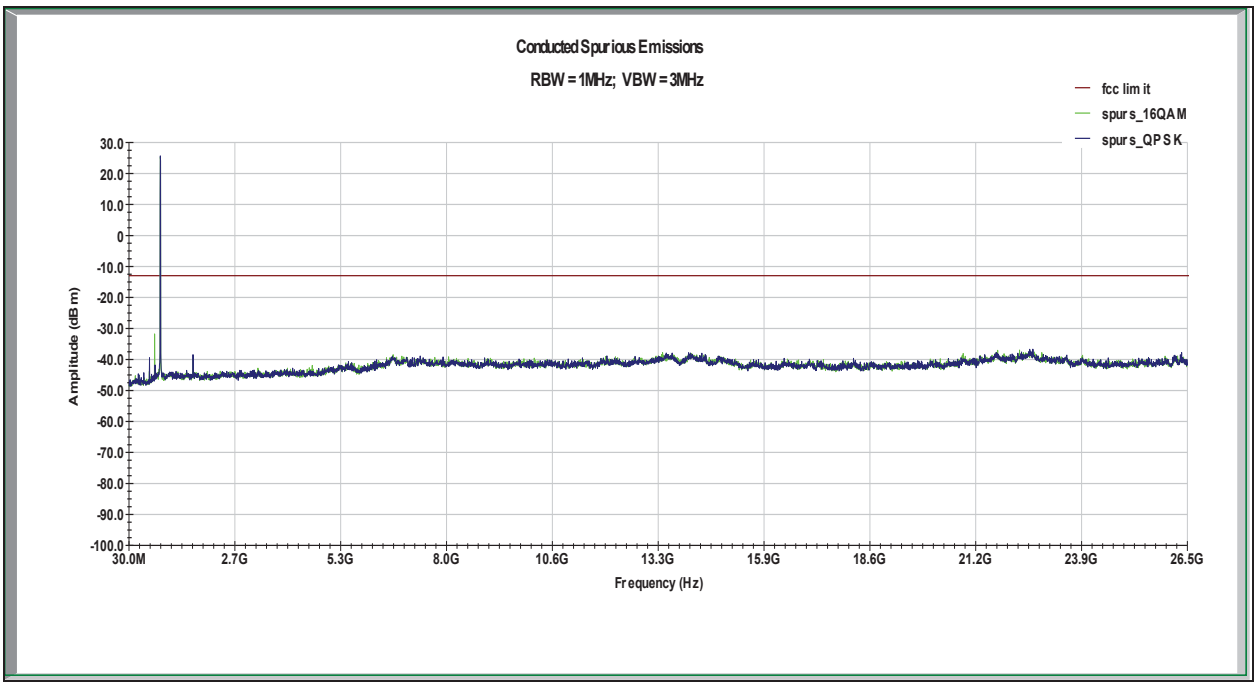
Band 25 Low QPSK and 16-QAM



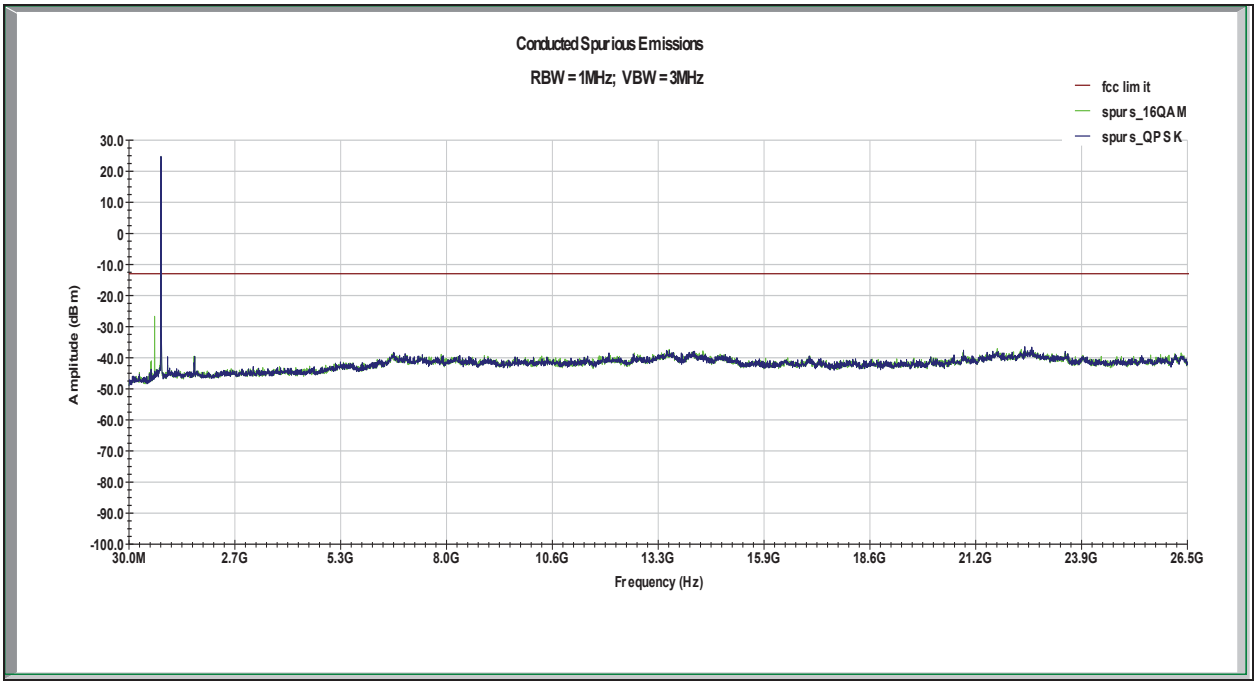
Band 25 Mid QPSK and 16-QAM



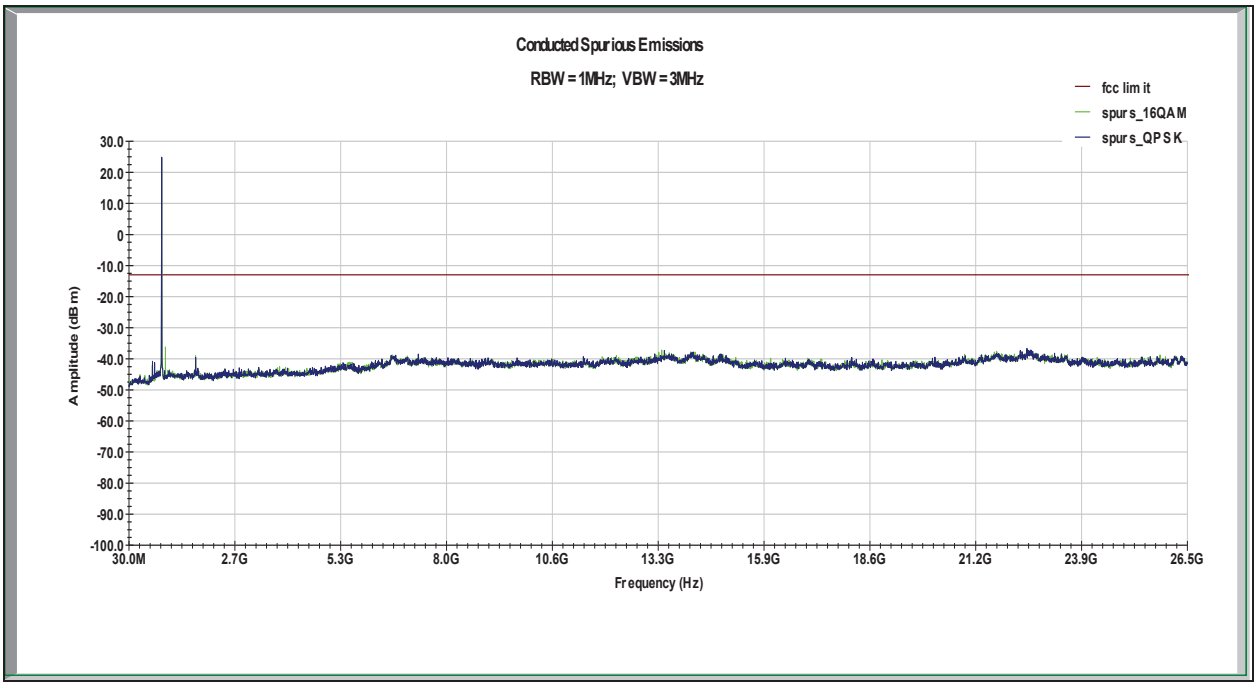
Band 25 High QPSK and 16-QAM



Band 26 Low QPSK and 16-QAM

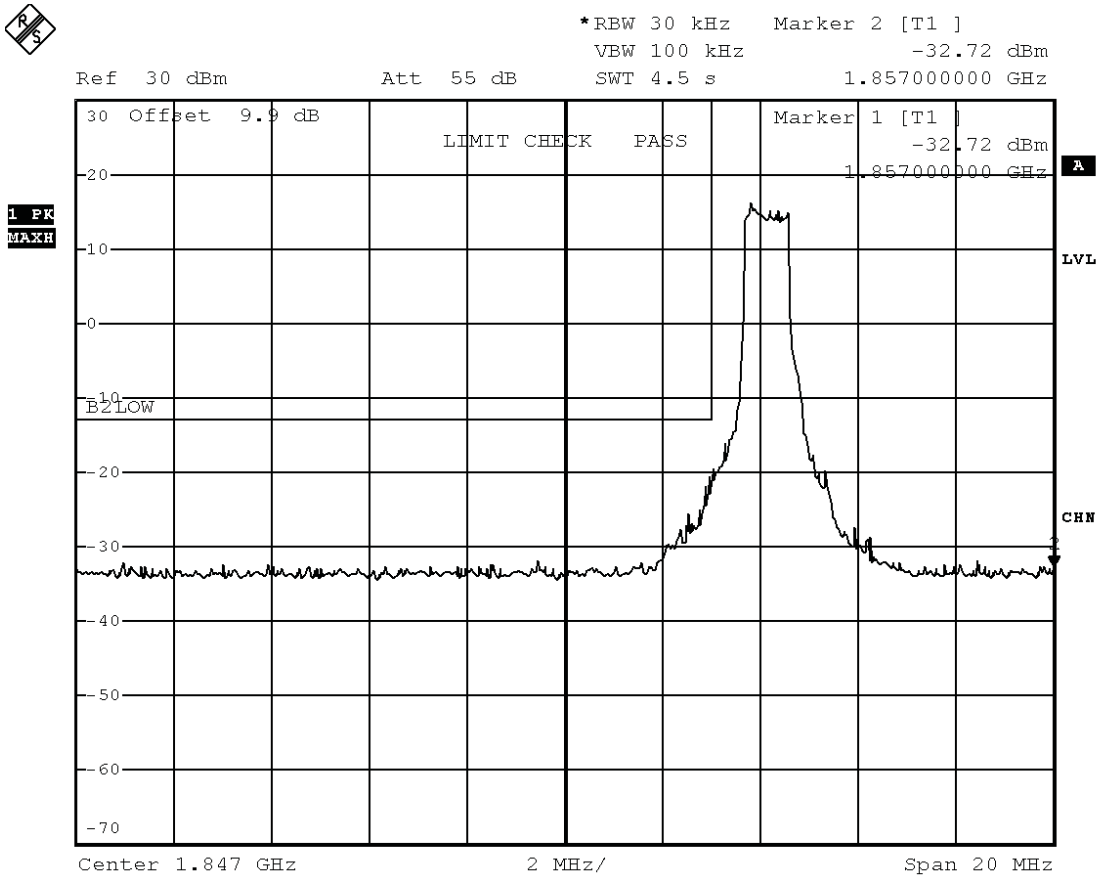


Band 26 Mid QPSK and 16-QAM



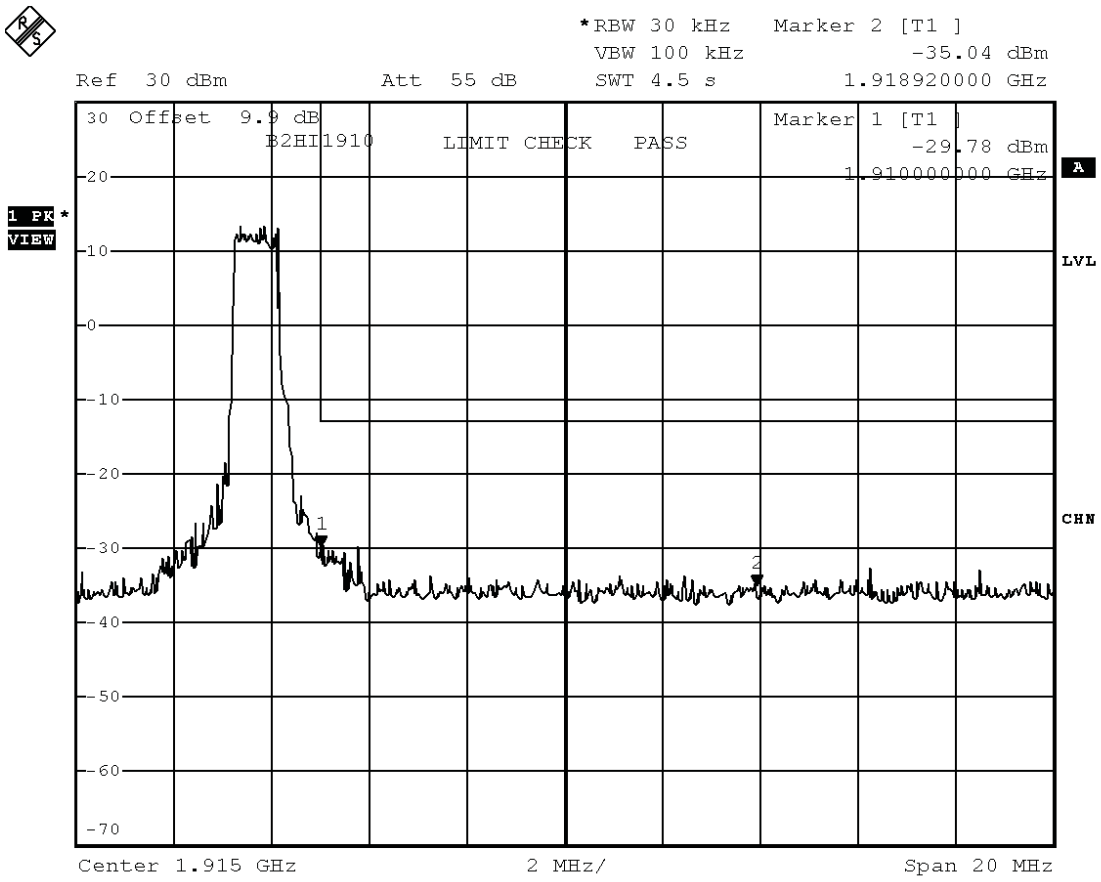
Band 26 High QPSK and 16-QAM

8.1 Band Edge Emission Plots (worst case QPSK and 16QAM):



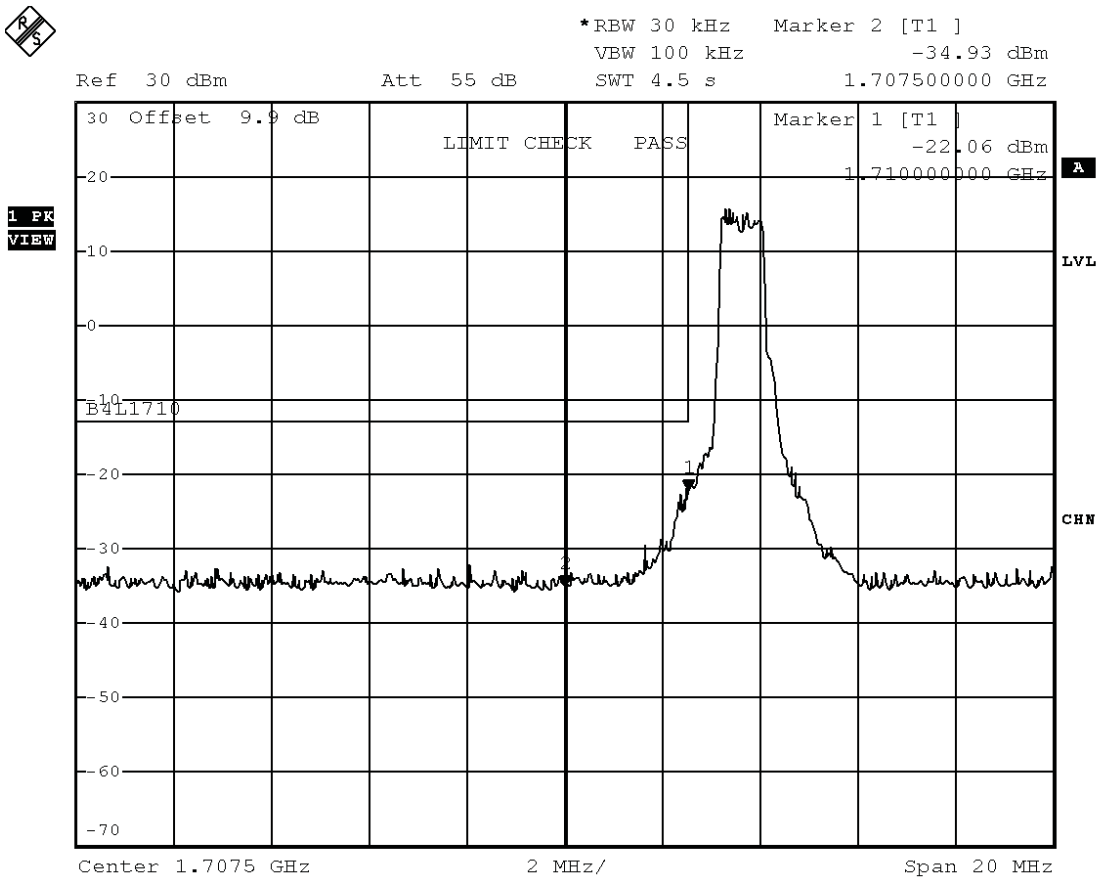
Date: 23.AUG.2018 18:18:47

Band 2 low, 1850 MHz



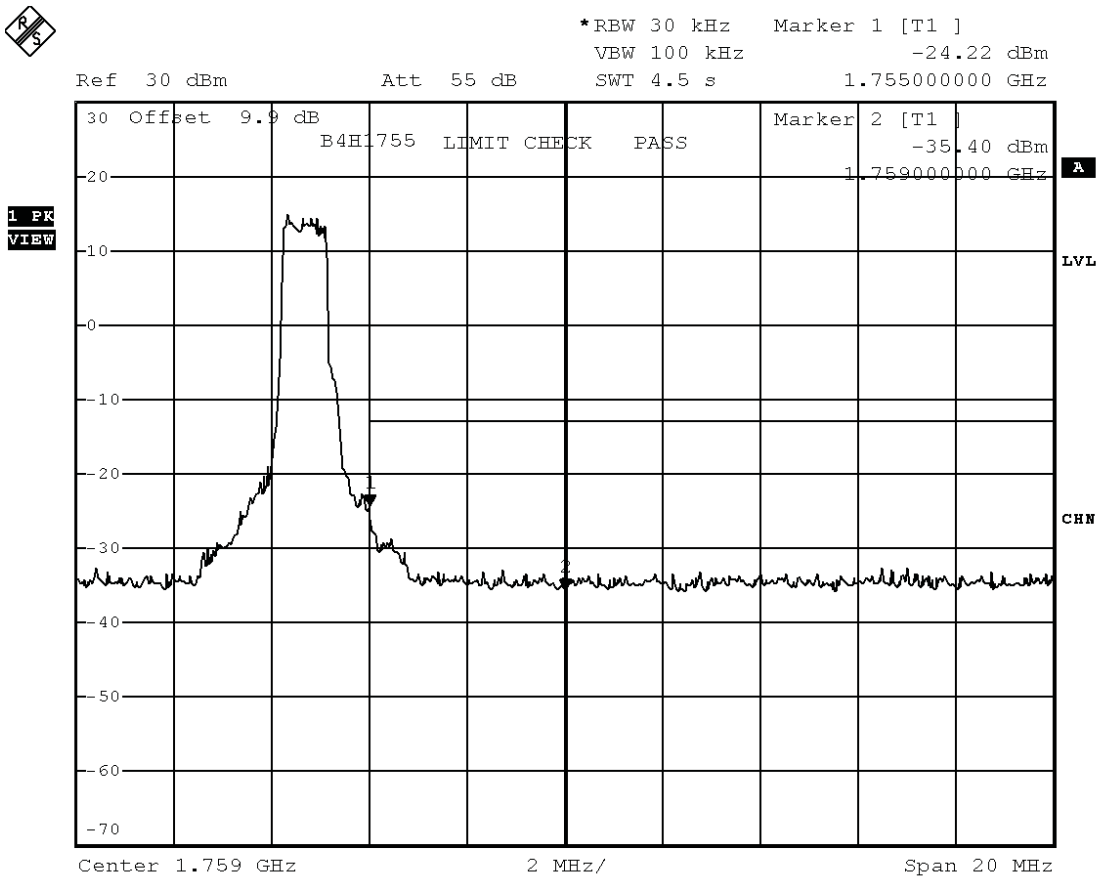
Date: 23.AUG.2018 18:00:05

Band 2 high, 1910 MHz



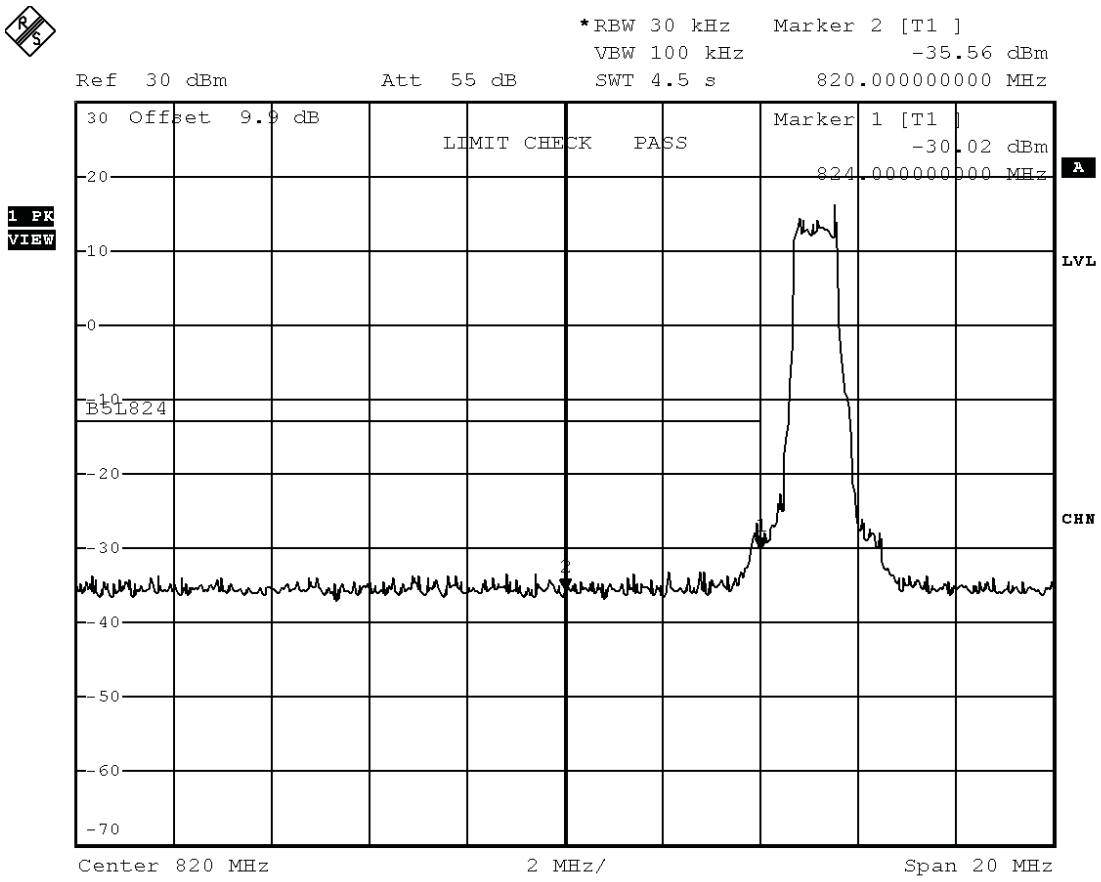
Date: 23.AUG.2018 18:40:38

Band 4 Low, 1710 MHz



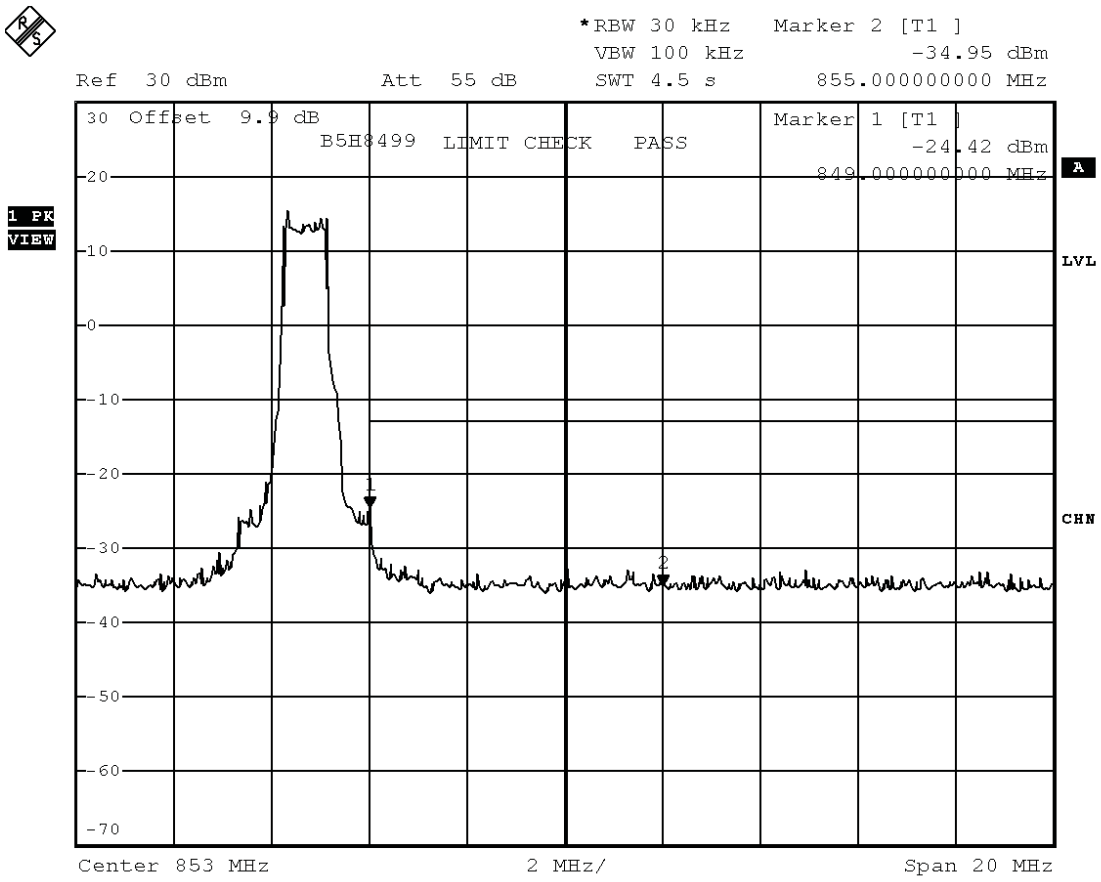
Date: 23.AUG.2018 20:23:36

Band 4, 1755 MHz



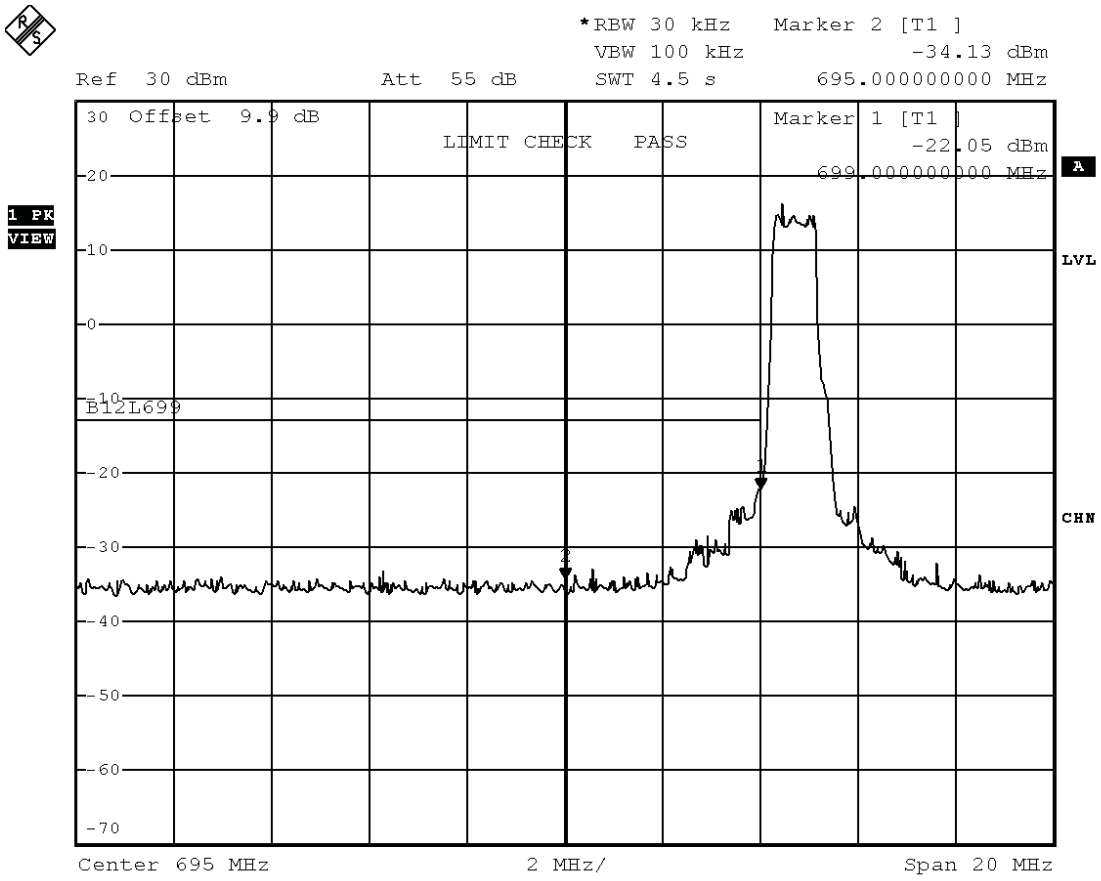
Date: 27.AUG.2018 14:27:55

Band 5 low, 824 MHz



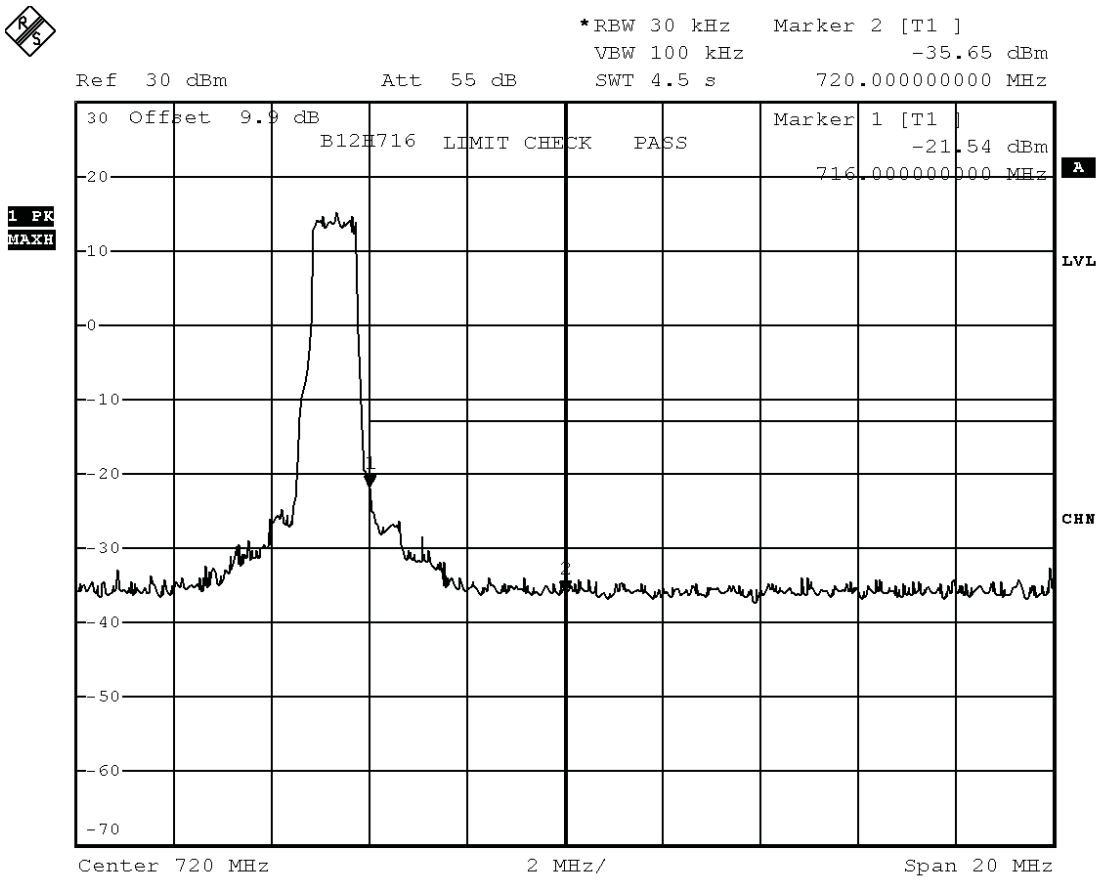
Date: 27.AUG.2018 14:39:39

Band 5 High, 849 MHz



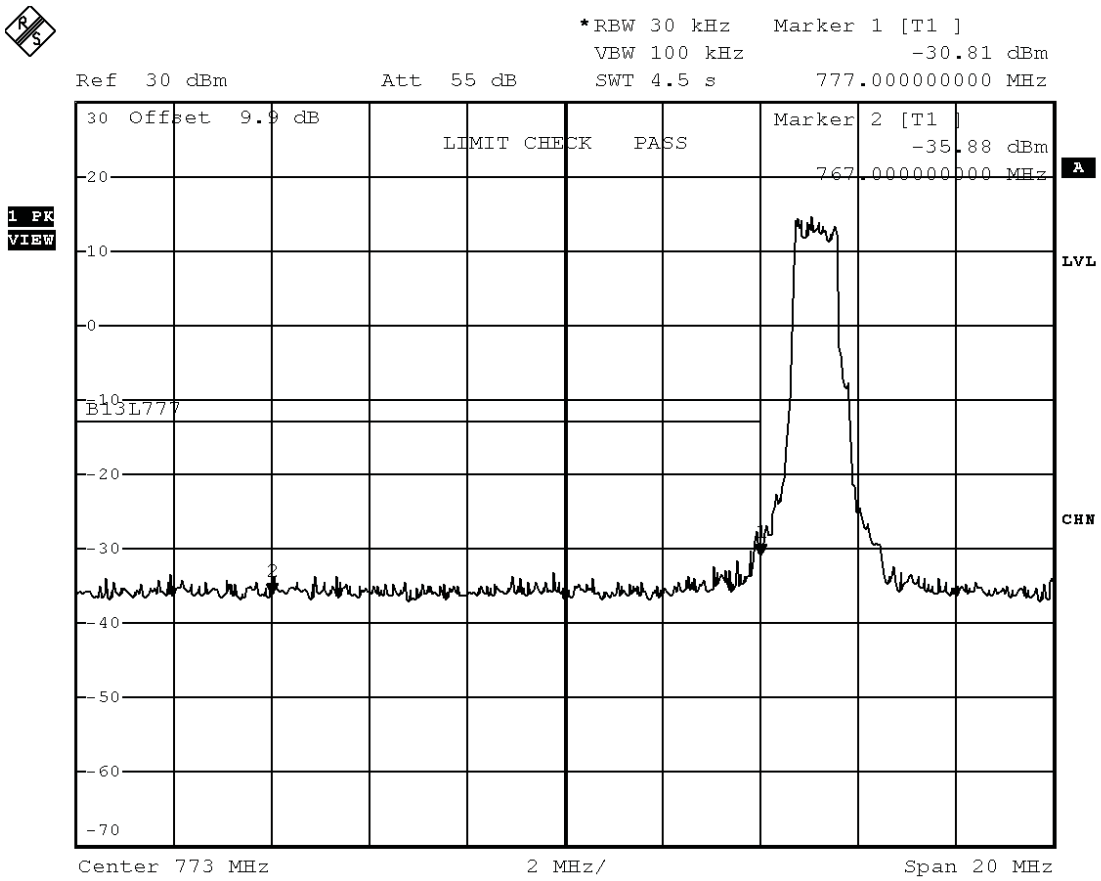
Date: 27.AUG.2018 15:09:21

Band 12 Low, 699 MHz



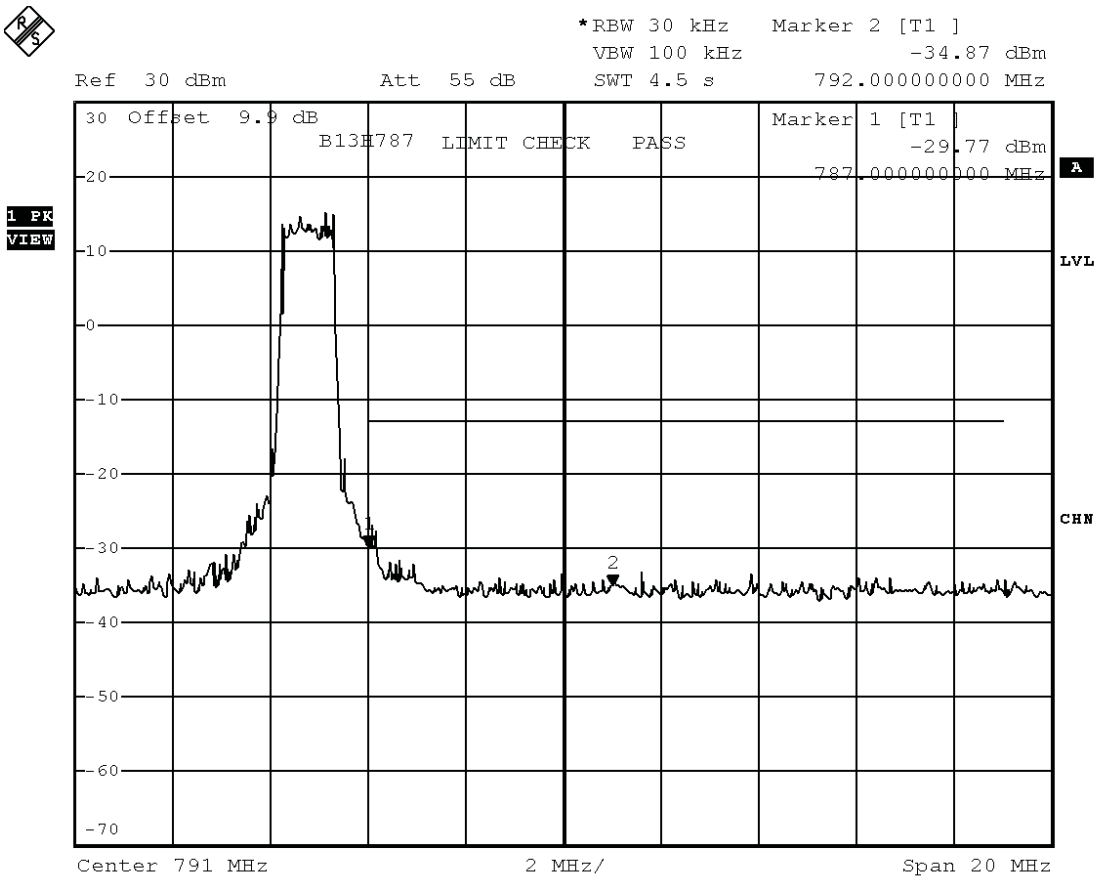
Date: 27.AUG.2018 15:24:57

Band 12 High, 716 MHz



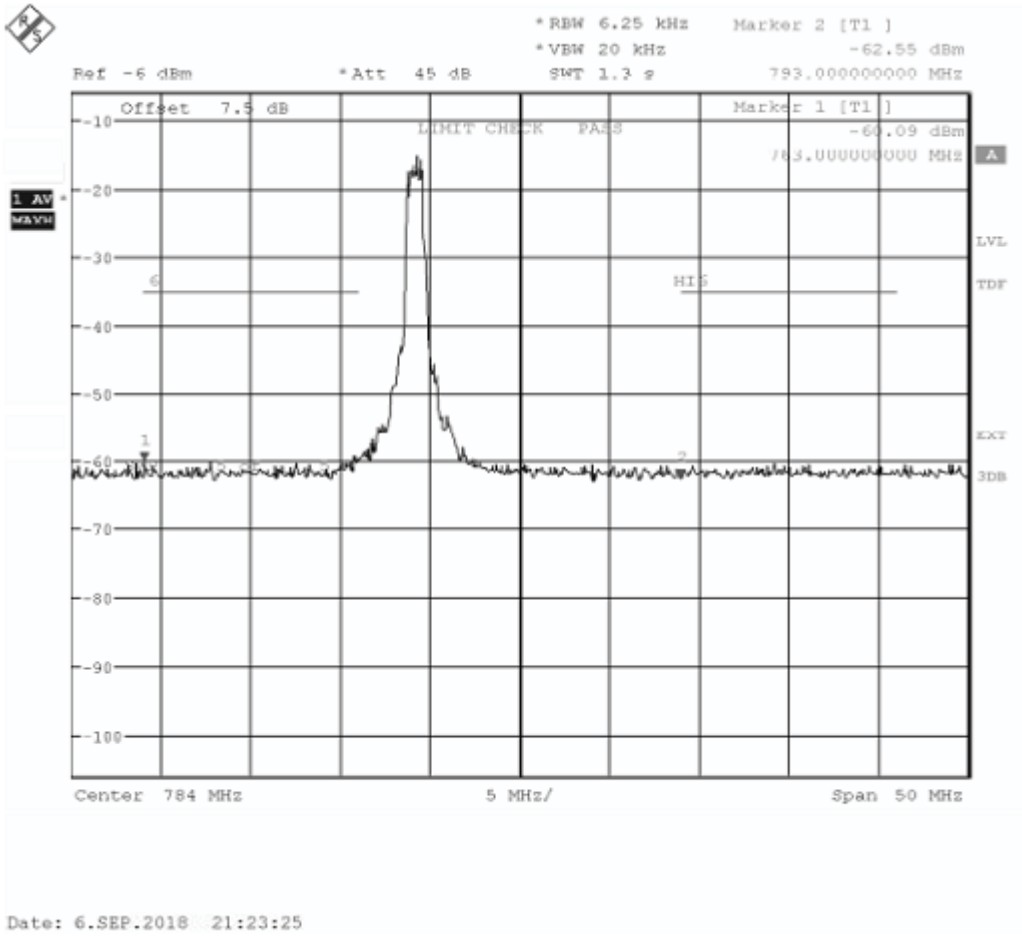
Date: 27.AUG.2018 16:54:50

Band 13 low, 777 MHz

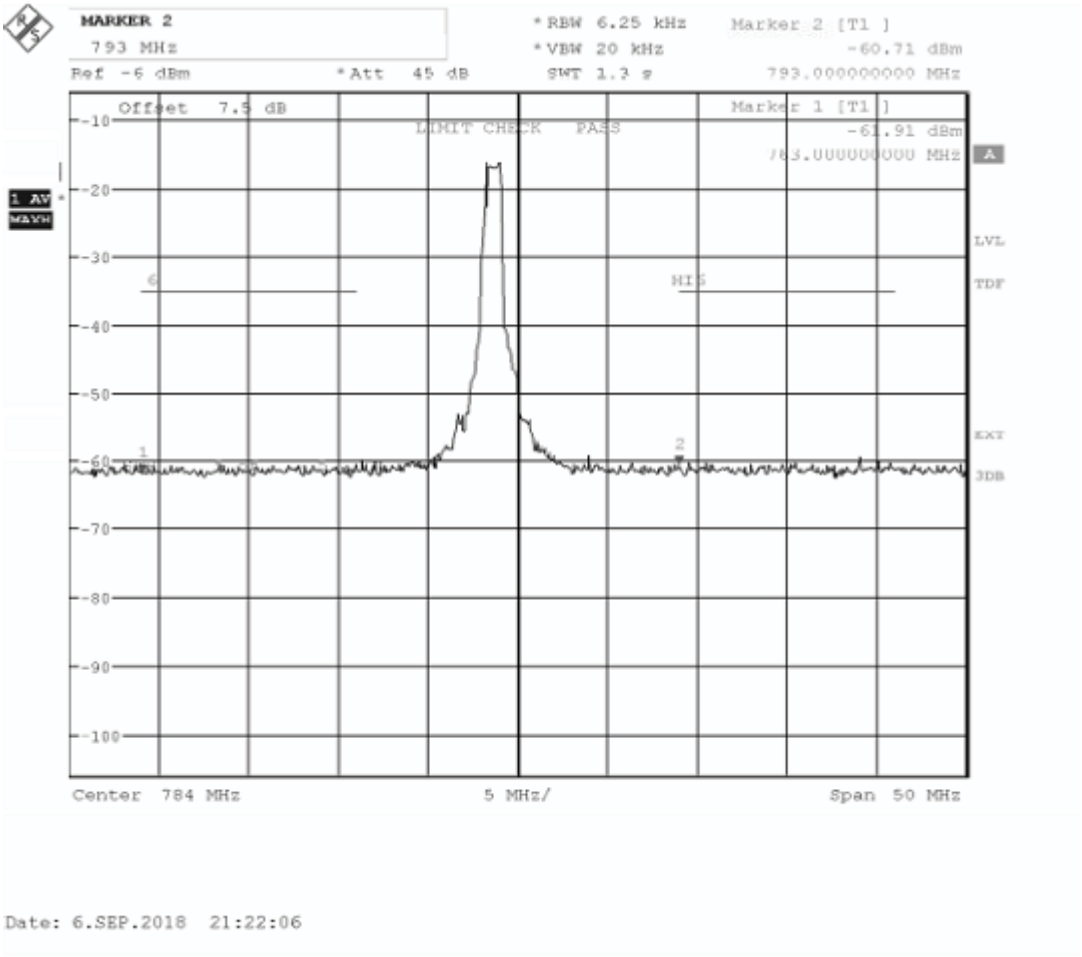


Date: 27.AUG.2018 17:11:22

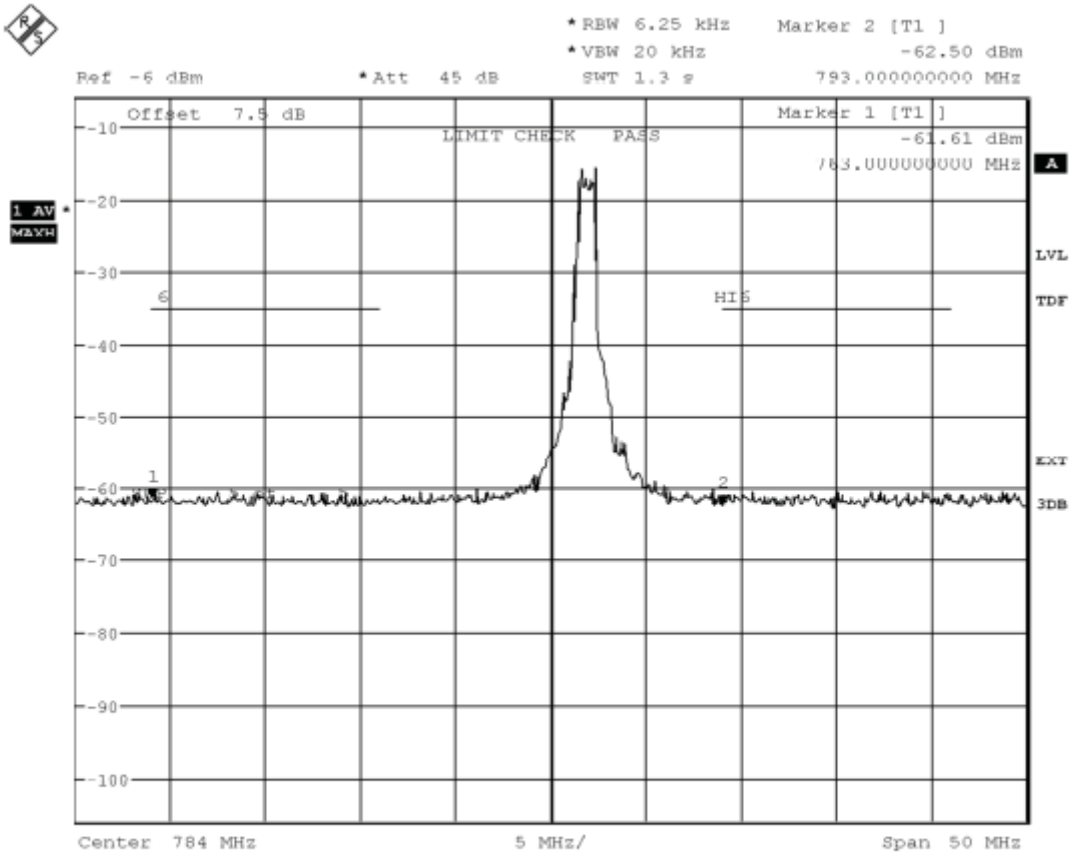
Band 13 Hi gh, 787 MHz



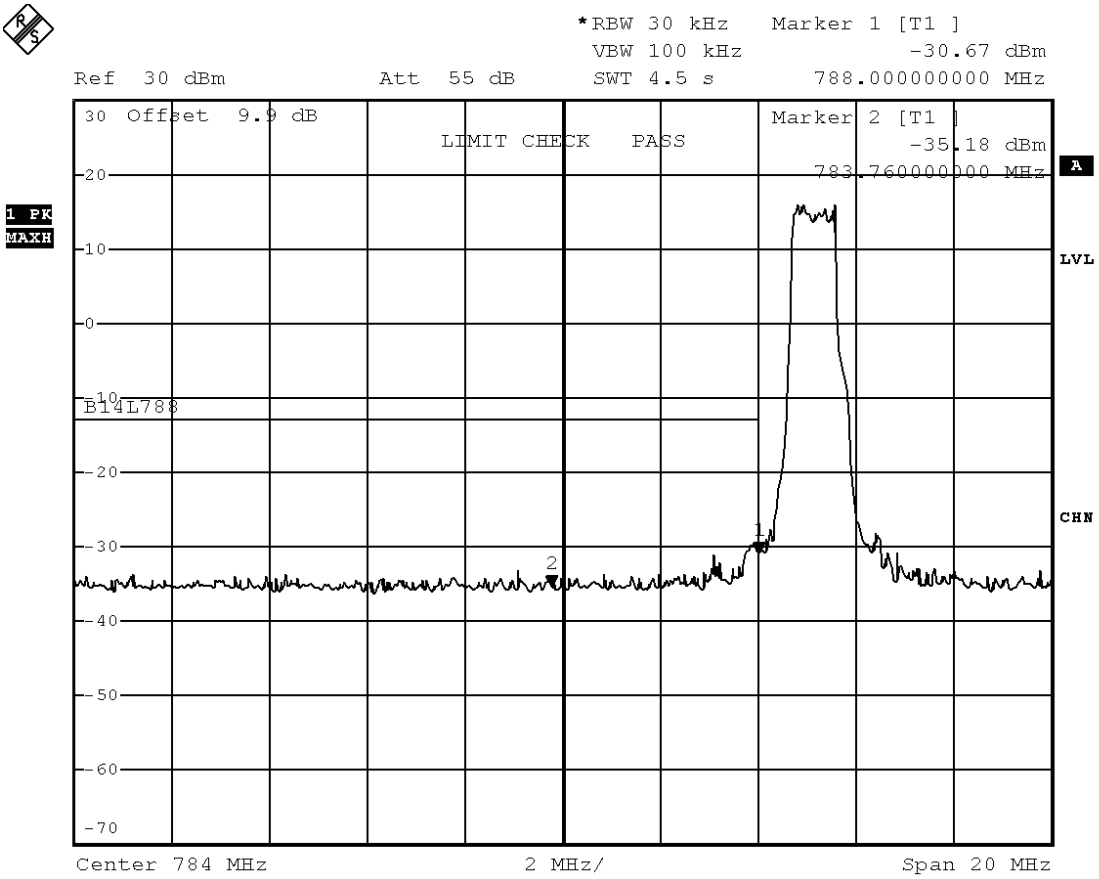
Band 13 Low (6.25kHz Plot)



Band 13 Mid (6.25kHz Plot)

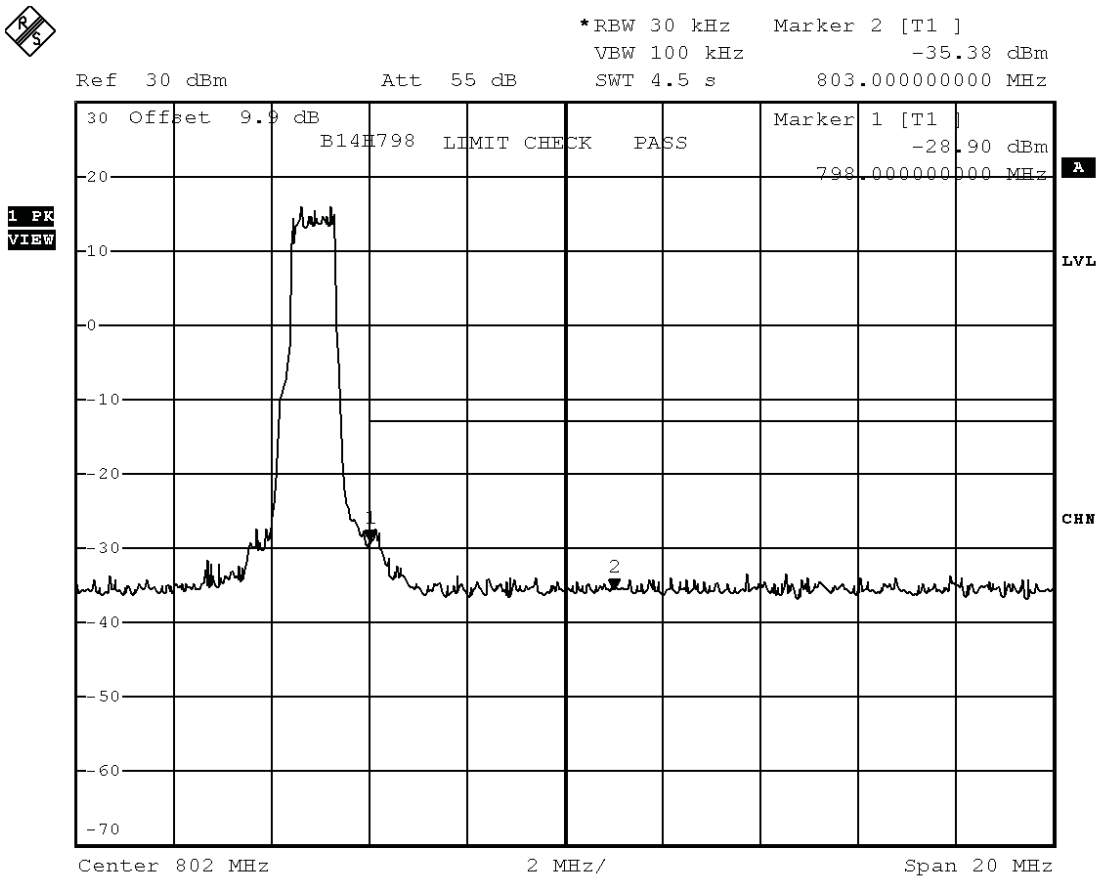


Band 13 High (6.25kHz Plot)



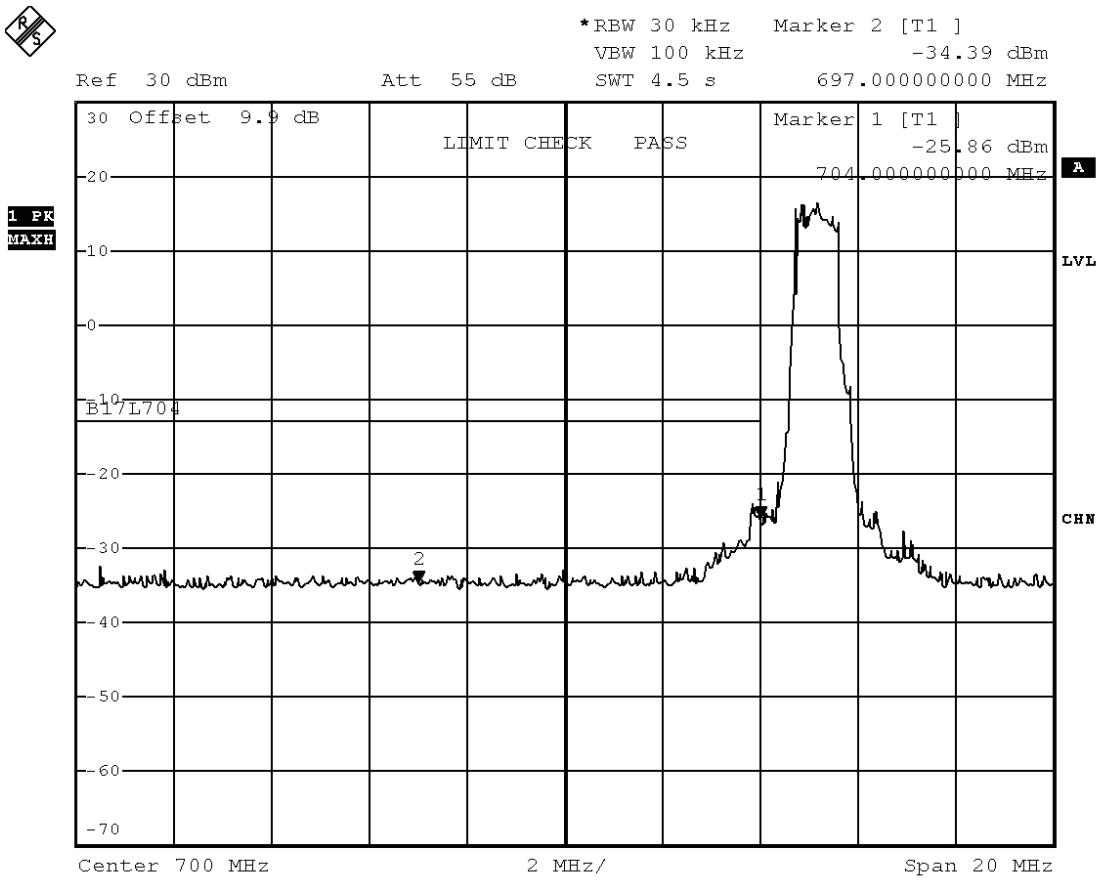
Date: 27.AUG.2018 17:28:26

Band 14 low, 788 MHz



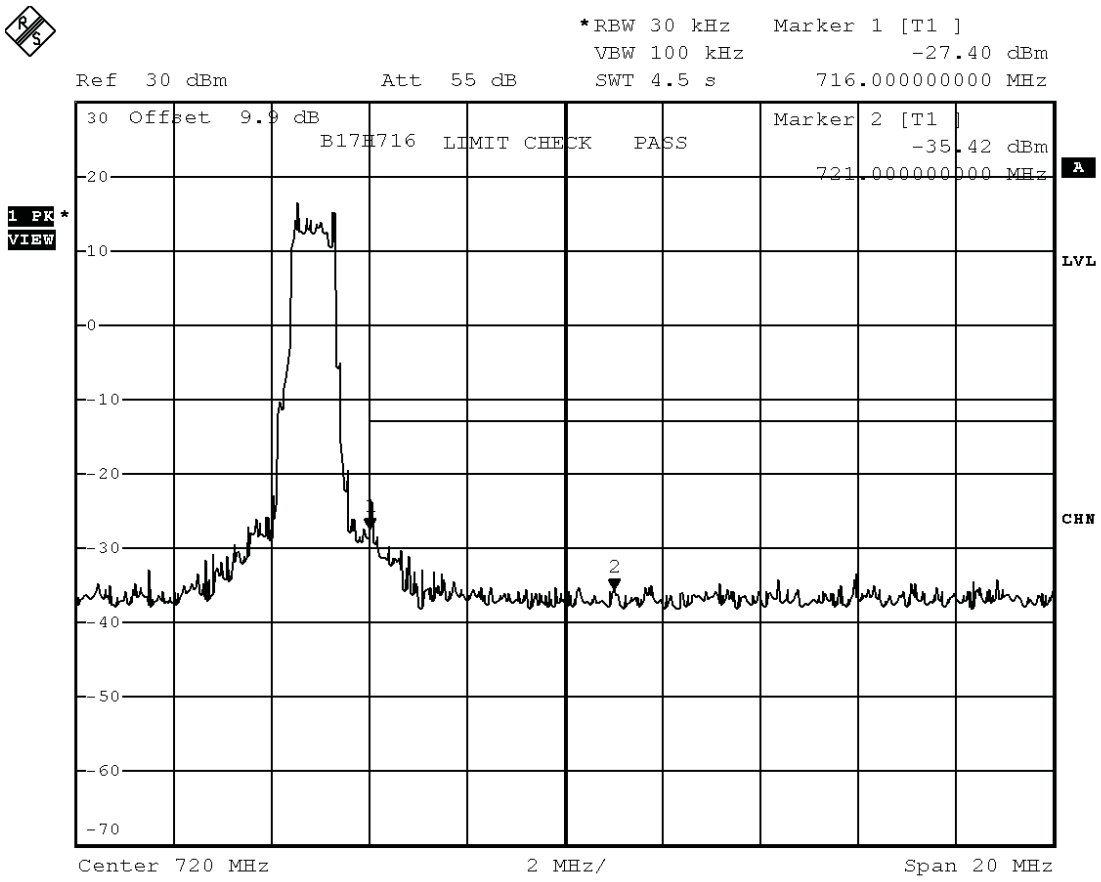
Date: 27.AUG.2018 17:32:24

Band 14 High, 798 MHz



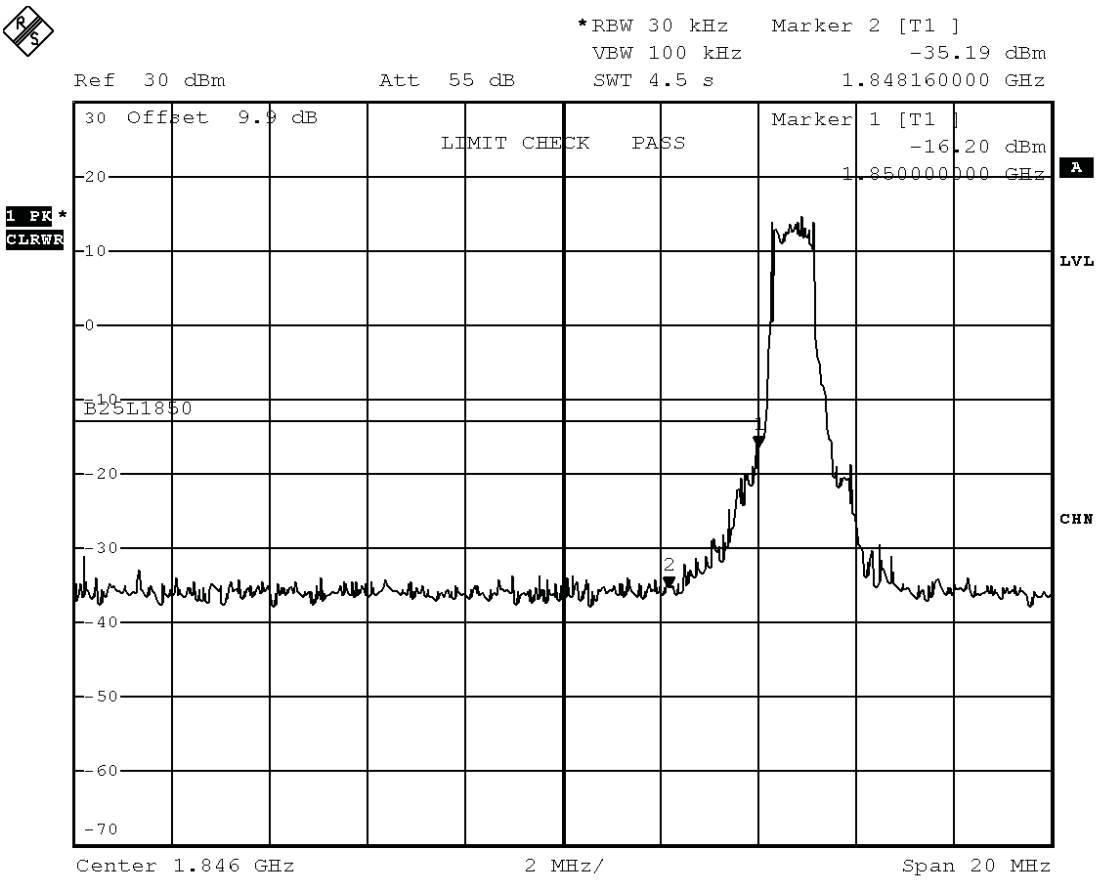
Date: 27.AUG.2018 17:52:56

Band 17 low, 704 MHz



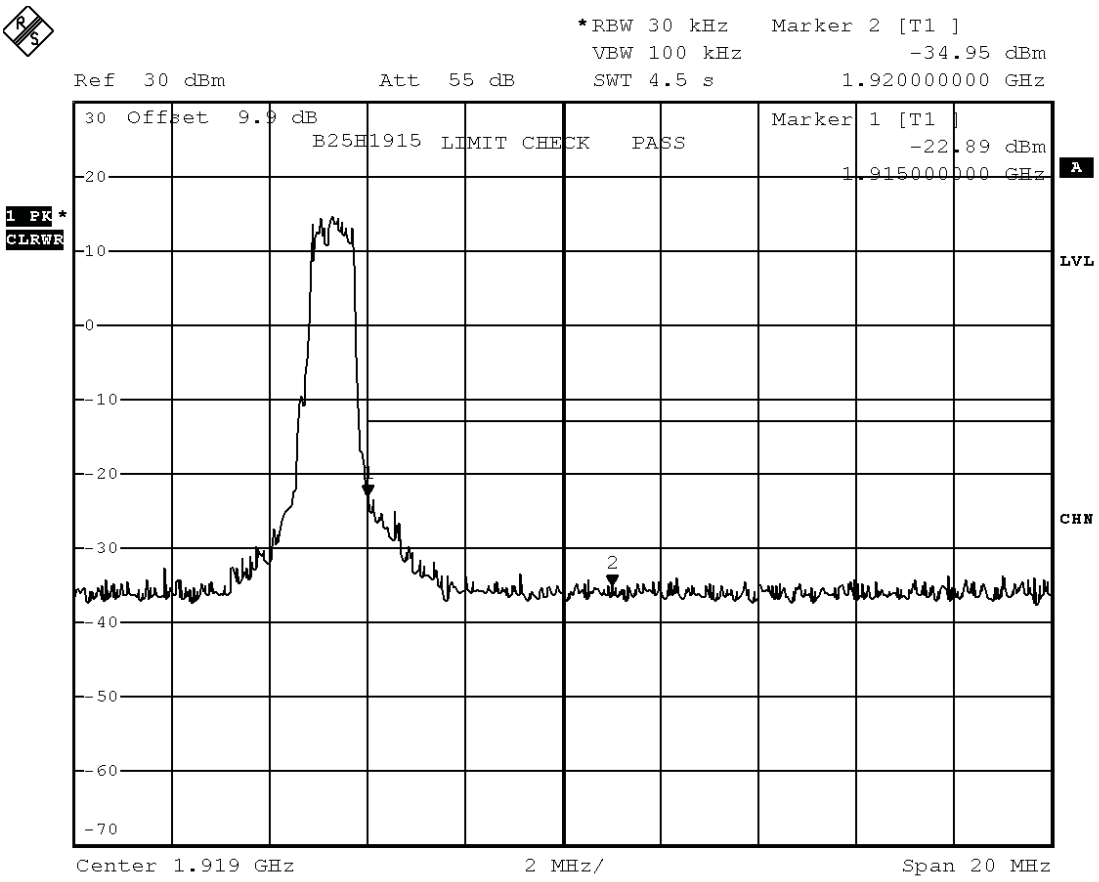
Date: 27.AUG.2018 18:00:50

Band 17 High, 716 MHz



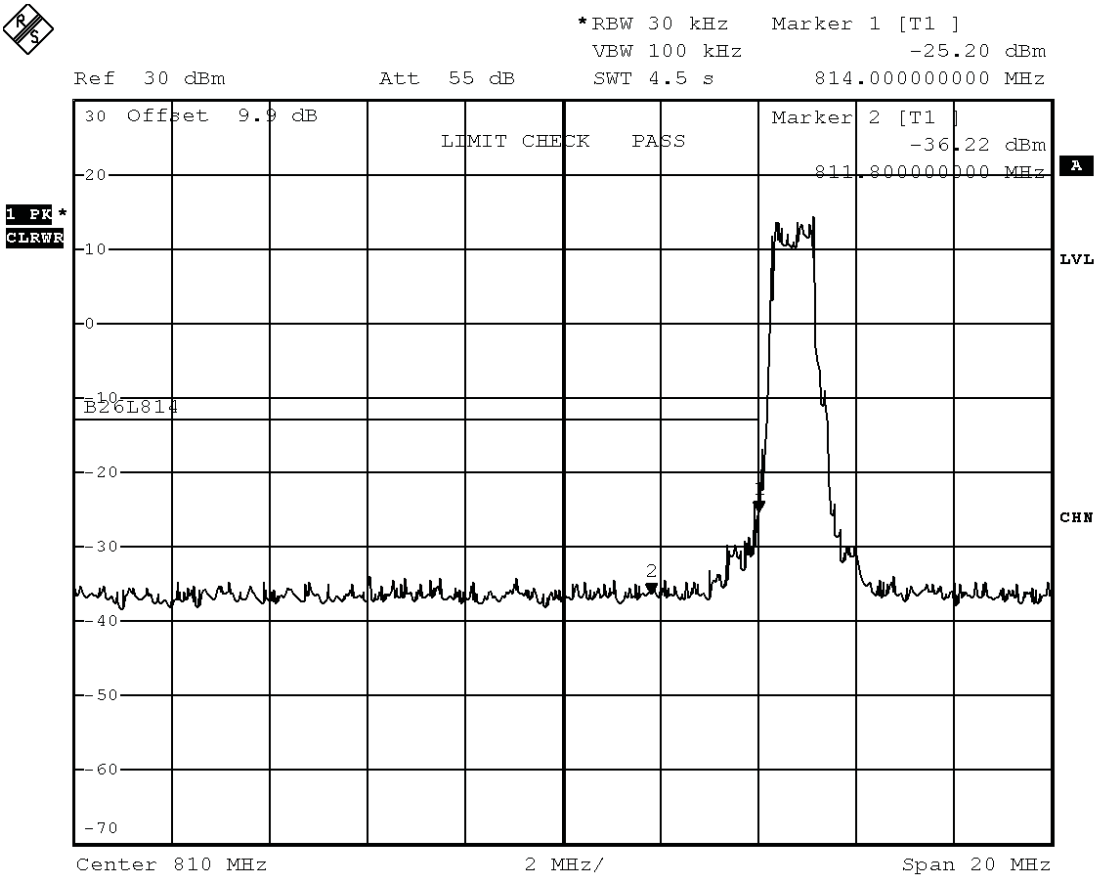
Date: 27.AUG.2018 18:35:53

Band 25 low, 1850 MHz



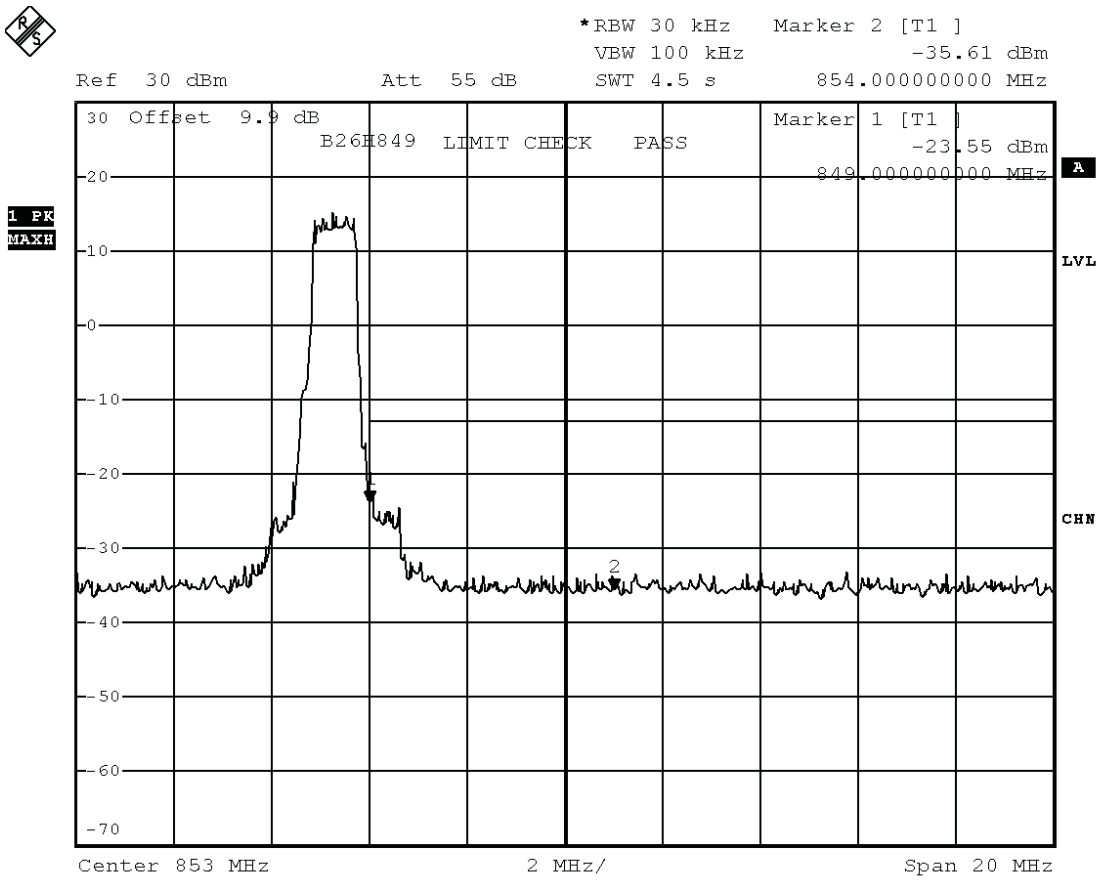
Date: 27.AUG.2018 18:41:50

Band 25 High, 1915 MHz



Date: 27.AUG.2018 19:16:19

Band 26 low, 814 MHz



Date: 27.AUG.2018 19:26:07

Band 26 High, 849 MHz

9 Radiated Output Power

9.1 Test Limits

§ 22.913

(a)(5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

§ 24.232

(c)Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications

§ 27.50

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

§ 27.50

(c)(10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP

§ 27.50

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

§ 90.541

(d) The transmitting power of a portable (hand-held) unit must not exceed 3 watts ERP.

§ 90.635

(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw)

RSS-130(4.6.3)

The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.

RSS-132(5.4)

The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts.

RSS-133(4.1)

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

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

RSS-139(6.5)

The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. The e.i.r.p.

RSS-119(4.3)

The equivalent radiated power (e.r.p.) for control and mobile equipment shall not exceed 30 W. The e.r.p. for portable equipment including handheld devices shall not exceed 3 W.

RSS-140(4.3)

The equivalent radiated power (e.r.p.) for control and mobile equipment shall not exceed 30 W. The e.r.p. for portable equipment including handheld devices shall not exceed 3 W.

9.2 Test Procedure

The radiated output power was determined by adding the peak antenna gain (in dBi) to the highest declared conducted output power to determine the maximum effective radiated power. The maximum allowable antenna gain was calculated so as to meet the ERP / EIRP limits as well as the Maximum Permissible Exposure (MPE) limits at 20cm.

For frequencies below 1GHz the power limits are in terms of ERP. The output power was converted to ERP by subtracting 2.15dB from the EIRP value as shown below.

$$ERP = ConductedOutputPower\,(dBm) + AntennaGain(dBi) - 2.15$$

$$EIRP = ConductedOutputPower\,(dBm) + AntennaGain(dBi)$$

9.3 Results:

The Type 1SC LTE CATM1 Module meets the radiated power requirements. The ERP / EIRP results are shows as well as the MPE calculations used to determine the maximum allowable gain for each frequency band. The maximum allowed antenna gain was chosen so as to meet both the MPE limits (at 20cm) and the radiated output power limitations for each applicable rule part.

9.4 Test Data (FCC)

Operating Mode	Frequecy (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Maximum Allowed Antenna Gain (dBi)	MPE Value (mW/cm^2)	MPE Limit (mW/cm^2)	Maximum Power ERP or EIRP (W)	ERP or EIRP Limit (W)
LTE Band 2	1850	23	10.00	0.40	1.00	1.9953	2.0000
LTE Band 4	1710	23	7.00	0.20	1.00	1.0000	1.0000
LTE Band 5	824	23	11.41	0.33	0.55	1.6831	7.0000
LTE Band 12	699	23	10.70	0.28	0.47	1.4278	3.0000
LTE Band 13	777	23	11.16	0.32	0.52	1.5871	3.0000
LTE Band 14	788	23	11.22	0.32	0.53	1.6096	3.0000
LTE Band 17	704	23	10.73	0.29	0.47	1.4380	3.0000
LTE Band 25	1850	23	10.00	0.40	1.00	1.9953	2.0000
LTE Band 26	814	23	11.36	0.33	0.54	1.6627	100.0000

Note: Bands 2, 4, and 25 powers are in terms of EIRP

9.5 Test Data (ISED)

Operating Mode	Frequecy (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Antenna Gain (dBi)	MPE Value (W/m^2)	MPE Limit (W/m^2)	Maximum Power ERP or EIRP (W)	ERP or EIRP Limit (W)
LTE Band 2	1850	23	10.00	0.40	4.48	1.9953	2.0000
LTE Band 4	1710	23	7.00	0.20	4.24	1.0000	1.0000
LTE Band 5	824	23	18.12	1.57	2.58	5.7413	11.5000
LTE Band 12	699	23	13.90	0.59	2.30	2.9854	3.0000
LTE Band 13	777	23	13.90	0.59	2.47	2.9854	3.0000
LTE Band 14	788	23	13.90	0.59	2.50	2.9854	3.0000
LTE Band 17	704	23	13.90	0.59	2.31	2.9854	3.0000
LTE Band 25	1850	23	10.00	0.40	4.48	1.9953	2.0000
LTE Band 26	814	23	13.90	0.59	2.55	2.9854	3.0000

Note: Bands 2, 4, and 25 powers are in terms of EIRP

10 Radiated Spurious Emissions (Transmitter)

10.1 Test Limits

The power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

10.2 Test Procedure

The EUT was placed on a non-conductive turntable. The measurement antenna was placed at a distance of 3 meters from the EUT. The EUT was forced to transmit at its maximum output power setting. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic was investigated in order to identify the spurious emission.
As allowable by ANSI C63.26: 2015 section 5.2.7, the output power of unwanted emissions can be calculated from a field strength measurement. The transmitter measurements that follow in this report have applied the following calculation to the -13dBm limit to arrive an equivalent field strength limit at 3 meters as follows:

E (dBµV/m) = EIRP (dBm) − 20log(D) + 104.8; where D is the measurement distance (in the far field region) in m.

Example:
Limit (dBuV/m) = -13 -20log(3) + 104.8 = 82.25dBuV/m

10.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde&Schwarz	ESU40	9/20/2017	9/20/2018
Bilog Antenna(JB6)	7088	SunAR	JB6	7/24/2018	7/24/2019
Horn Antenna	3780	ETS	3117	6/11/2018	6/11/2019
Horn Antenna	3779	ETS	3116c	6.7.2018	6/7/2019
Preamplifier	3921	Rohde&Schwarz	TS-PR-40	11/29/2017	11/29/2018
System Controller	4096	ETS Lindgren	2090	Verify at Time of Use	Verify at Time of Use
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
3m Cable Antenna→Preamp	3074			11/29/2017	11/29/2018
3m Cable Preamplifier	3918	TS-PR18	122005	11/29/2017	11/29/2018
3m Cable Preamp→Chamber	2588			11/29/2017	11/29/2018
3m Cable Chamber→Control Room	2593			11/29/2017	11/29/2018
3m Cable Control Room→Receiver	2592			11/29/2017	11/29/2018

10.4 Results:

All radiated spurious emissions were attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB which is equivalent to -13dBm or 82.5dBuV/m at a measurement distance of 3m.

10.5 Test Data (Band 2)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
64.821000	28.70	82.25	53.55	120.000	100.4	V	319.0	15.3
65.277000	27.86	82.25	54.39	120.000	177.4	V	120.0	15.4
89.779000	23.03	82.25	59.22	120.000	100.6	V	110.0	15.5
140.780000	28.34	82.25	53.91	120.000	157.3	V	73.0	21.2
199.160000	33.94	82.25	48.31	120.000	105.3	V	28.0	21.4
222.960000	28.92	82.25	53.33	120.000	109.8	V	338.0	19.8
321.640000	32.14	82.25	50.11	120.000	229.8	H	185.0	23.6
383.840000	33.35	82.25	48.90	120.000	104.3	V	82.0	25.2
707.710000	39.90	82.25	42.35	120.000	249.5	V	56.0	32.1
968.800000	44.63	82.25	37.62	120.000	259.8	H	8.0	35.6

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3752.800000	30.27	82.25	51.98	1000.000	410.0	V	303.0	5.9
5628.400000	36.38	82.25	45.87	1000.000	206.0	V	0.0	8.7
7505.600000	32.09	82.25	50.16	1000.000	219.0	V	289.0	10.9
9380.800000	32.62	82.25	49.63	1000.000	410.0	V	268.0	12.4
13115.400000	37.09	82.25	45.16	1000.000	410.0	H	0.0	17.3
16719.000000	40.57	82.25	41.68	1000.000	410.0	H	290.0	21.5

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3761.876000	29.07	82.25	53.18	1000.000	350.0	H	100.0	5.9
5644.419500	29.92	82.25	52.33	1000.000	350.0	V	9.0	8.7
7536.811000	31.75	82.25	50.50	1000.000	350.0	V	341.0	10.8
9421.866500	32.99	82.25	49.26	1000.000	199.0	H	321.0	12.6
16878.430500	40.79	82.25	41.46	1000.000	350.0	H	50.0	21.8

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3767.800000	32.23	82.25	50.02	1000.000	410.0	V	336.0	6.0
4719.200000	30.63	82.25	51.62	1000.000	410.0	H	137.0	8.1
5650.800000	37.85	82.25	44.40	1000.000	387.0	V	298.0	8.7
7535.600000	31.67	82.25	50.58	1000.000	410.0	V	159.0	10.8
9419.600000	32.93	82.25	49.32	1000.000	410.0	V	242.0	12.5
16837.800000	40.66	82.25	41.59	1000.000	410.0	V	264.0	21.8

High

10.6 Test Data (Band 4)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
64.342000	26.63	82.25	55.62	120.000	170.7	V	338.0	15.3
64.457000	30.56	82.25	51.69	120.000	217.8	V	0.0	15.3
139.080000	29.01	82.25	53.24	120.000	130.4	V	220.0	21.3
199.900000	34.03	82.25	48.22	120.000	109.7	V	27.0	21.5
481.400000	35.55	82.25	46.70	120.000	331.7	H	100.0	28.3
522.530000	36.46	82.25	45.79	120.000	213.0	V	340.0	28.9
694.840000	39.54	82.25	42.71	120.000	100.6	H	237.0	31.8
777.520000	41.23	82.25	41.02	120.000	400.1	H	220.0	33.2
893.700000	43.47	82.25	38.78	120.000	260.1	V	275.0	34.9
995.320000	44.96	82.25	37.29	120.000	286.2	V	249.0	35.8

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3458.200000	27.34	82.25	54.91	1000.000	410.0	V	169.0	4.7
4585.200000	29.97	82.25	52.28	1000.000	370.0	V	129.0	7.9
5186.400000	31.00	82.25	51.25	1000.000	410.0	V	138.0	7.4
6915.600000	36.76	82.25	45.49	1000.000	100.0	V	0.0	9.7
8642.800000	31.74	82.25	50.51	1000.000	410.0	V	132.0	11.6
16792.200000	40.47	82.25	41.78	1000.000	370.0	H	317.0	21.6

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3465.919000	34.47	82.25	47.78	1000.000	350.0	V	34.0	4.8
5198.361000	29.90	82.25	52.35	1000.000	350.0	V	220.0	7.5
6933.051000	33.17	82.25	49.08	1000.000	350.0	V	10.0	9.7
10902.517500	34.17	82.25	48.08	1000.000	205.0	H	322.0	14.8
15365.640000	37.93	82.25	44.32	1000.000	350.0	H	160.0	18.6
16955.100000	40.24	82.25	42.01	1000.000	189.0	V	0.0	21.7

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3472.600000	27.85	82.25	54.40	1000.000	221.0	V	158.0	5.0
5208.400000	31.19	82.25	51.06	1000.000	340.0	V	267.0	7.6
6945.200000	34.31	82.25	47.94	1000.000	410.0	V	255.0	9.7
10418.800000	33.67	82.25	48.58	1000.000	410.0	V	259.0	13.9
13890.000000	37.69	82.25	44.56	1000.000	369.0	V	304.0	17.0
16908.000000	40.74	82.25	41.51	1000.000	335.0	V	291.0	21.7

High

10.7 Test Data (Band 5)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
64.468000	28.26	82.25	53.99	120.000	203.5	V	19.0	15.3
129.520000	31.20	82.25	51.05	120.000	101.4	V	154.0	21.7
130.980000	30.97	82.25	51.28	120.000	165.6	V	211.0	21.6
211.840000	32.89	82.25	49.36	120.000	101.8	V	9.0	19.4
296.040000	30.88	82.25	51.37	120.000	100.9	V	64.0	23.2
404.580000	45.87	82.25	36.38	120.000	103.9	H	330.0	25.9
436.200000	34.21	82.25	48.04	120.000	109.8	H	191.0	27.0
536.120000	36.62	82.25	45.63	120.000	333.3	V	18.0	29.2
595.030000	39.01	82.25	43.24	120.000	104.8	V	128.0	30.1
946.600000	44.22	82.25	38.03	120.000	324.4	H	210.0	35.4

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1487.906500	23.39	82.25	58.86	1000.000	350.0	V	135.0	-2.1
1504.103000	21.16	82.25	61.09	1000.000	192.0	V	351.0	-2.1
1665.101500	26.96	82.25	55.29	1000.000	210.0	V	259.0	-1.0
2433.073000	27.41	82.25	54.84	1000.000	350.0	H	37.0	3.4
2437.361500	26.63	82.25	55.62	1000.000	317.0	H	64.0	3.4
2470.150000	25.89	82.25	56.36	1000.000	350.0	V	50.0	3.3
12668.433000	36.36	82.25	45.89	1000.000	350.0	V	1.0	16.7
15354.424500	37.97	82.25	44.28	1000.000	240.0	V	8.0	18.8
15527.191500	37.81	82.25	44.44	1000.000	350.0	H	28.0	18.7
17004.922500	40.44	82.25	41.81	1000.000	350.0	H	114.0	22.0

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1415.938500	26.15	82.25	56.10	1000.000	350.0	H	214.0	-1.6
1476.060000	25.11	82.25	57.14	1000.000	214.0	H	168.0	-2.0
1674.070000	25.66	82.25	56.59	1000.000	237.0	V	238.0	-0.9
2412.723000	25.65	82.25	56.60	1000.000	350.0	V	99.0	3.2
9981.435000	33.70	82.25	48.55	1000.000	244.0	H	326.0	13.6
12601.413000	36.43	82.25	45.82	1000.000	350.0	H	138.0	16.6
17128.435500	40.57	82.25	41.68	1000.000	350.0	V	296.0	21.8

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1350.654500	21.73	82.25	60.52	1000.000	350.0	V	177.0	-1.1
1680.688000	26.87	82.25	55.38	1000.000	281.0	V	262.0	-0.9
2411.696500	25.64	82.25	56.61	1000.000	350.0	V	58.0	3.2
2433.602000	26.04	82.25	56.21	1000.000	350.0	H	302.0	3.4
2440.677000	26.74	82.25	55.51	1000.000	206.0	H	213.0	3.4
16000.878000	39.14	82.25	43.11	1000.000	350.0	V	125.0	20.7
16809.843000	40.72	82.25	41.53	1000.000	350.0	V	321.0	21.7

High

10.8 Test Data (Band 12)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
67.025000	29.63	82.25	52.62	120.000	103.7	V	9.0	15.4
127.040000	29.21	82.25	53.04	120.000	206.1	V	238.0	21.8
162.600000	28.69	82.25	53.56	120.000	104.8	V	17.0	21.1
234.820000	32.26	82.25	49.99	120.000	400.1	H	156.0	20.5
277.260000	29.90	82.25	52.35	120.000	110.8	V	64.0	22.8
353.080000	32.06	82.25	50.19	120.000	216.8	H	173.0	24.4
472.940000	39.04	82.25	43.21	120.000	101.6	H	202.0	28.1
473.080000	36.05	82.25	46.20	120.000	108.9	V	82.0	28.1
473.180000	38.04	82.25	44.21	120.000	109.6	H	202.0	28.1
586.830000	39.45	82.25	42.80	120.000	118.2	V	128.0	30.0

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1872.443000	25.21	82.25	57.04	1000.000	350.0	V	131.0	1.2
1878.549000	23.81	82.25	58.44	1000.000	350.0	V	133.0	1.2
2110.976500	25.91	82.25	56.34	1000.000	204.0	V	70.0	2.1
2421.466000	25.68	82.25	56.57	1000.000	350.0	V	0.0	3.2
2432.555500	26.20	82.25	56.05	1000.000	350.0	V	104.0	3.3
2435.753000	27.04	82.25	55.21	1000.000	350.0	V	200.0	3.3
7057.477500	31.28	82.25	50.97	1000.000	350.0	V	11.0	9.8
16753.209000	40.39	82.25	41.86	1000.000	243.0	V	16.0	21.3

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1415.989500	24.03	82.25	58.22	1000.000	350.0	V	242.0	-2.1
1463.934000	25.91	82.25	56.34	1000.000	227.0	V	267.0	-2.3
1876.799000	23.84	82.25	58.41	1000.000	228.0	H	249.0	1.3
1878.726500	23.74	82.25	58.51	1000.000	315.0	V	137.0	1.2
2463.654000	26.15	82.25	56.10	1000.000	350.0	V	82.0	3.3
4876.373500	29.74	82.25	52.51	1000.000	350.0	H	268.0	6.9
6021.131000	30.65	82.25	51.60	1000.000	190.0	H	301.0	8.8
16785.190500	40.80	82.25	41.45	1000.000	190.0	H	170.0	21.6

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1423.455500	21.75	82.25	60.50	1000.000	350.0	V	134.0	-2.2
2434.664000	25.86	82.25	56.39	1000.000	246.0	V	110.0	3.3
2434.949000	26.03	82.25	56.22	1000.000	253.0	V	158.0	3.3
2435.991500	26.61	82.25	55.64	1000.000	259.0	V	35.0	3.3
2551.525000	25.68	82.25	56.57	1000.000	350.0	H	154.0	3.4
13129.894500	36.89	82.25	45.36	1000.000	350.0	H	52.0	17.2
16954.423500	40.59	82.25	41.66	1000.000	350.0	V	186.0	21.7

High

10.9 Test Data (Band 13)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.880000	26.49	82.25	55.76	120.000	100.4	V	0.0	15.2
72.219000	25.90	82.25	56.35	120.000	102.6	V	18.0	15.3
198.720000	32.82	82.25	49.43	120.000	109.5	V	0.0	21.3
274.600000	29.61	82.25	52.64	120.000	346.9	H	138.0	22.7
386.960000	32.47	82.25	49.78	120.000	224.4	H	8.0	25.3
390.720000	33.49	82.25	48.76	120.000	105.3	H	340.0	25.5
390.860000	32.67	82.25	49.58	120.000	299.4	V	274.0	25.5
391.680000	33.58	82.25	48.67	120.000	99.9	H	340.0	25.6
393.720000	32.93	82.25	49.32	120.000	204.7	H	19.0	25.7
589.710000	37.85	82.25	44.40	120.000	213.3	H	348.0	30.1

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1168.815000	20.71	82.25	61.54	1000.000	350.0	V	140.0	-2.3
1403.888000	23.20	82.25	59.05	1000.000	350.0	H	184.0	-1.6
1557.266500	21.55	82.25	60.70	1000.000	350.0	V	0.0	-1.9
2335.359000	26.52	82.25	55.73	1000.000	100.0	V	76.0	2.9
2432.742000	25.89	82.25	56.36	1000.000	350.0	V	302.0	3.3
2436.871500	26.51	82.25	55.74	1000.000	350.0	H	178.0	3.4
2437.498500	27.30	82.25	54.95	1000.000	350.0	H	178.0	3.4
16959.892500	40.54	82.25	41.71	1000.000	268.0	V	5.0	21.8

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1172.438000	21.30	82.25	60.95	1000.000	350.0	V	247.0	-2.2
1451.896000	26.55	82.25	55.70	1000.000	350.0	H	204.0	-1.9
1565.027000	22.63	82.25	59.62	1000.000	350.0	V	38.0	-1.9
2347.461000	27.27	82.25	54.98	1000.000	229.0	V	8.0	2.9
2464.596500	26.08	82.25	56.17	1000.000	212.0	H	256.0	3.5
4727.187500	30.32	82.25	51.93	1000.000	293.0	V	0.0	7.9
8140.598500	32.28	82.25	49.97	1000.000	350.0	V	284.0	11.2
16806.553500	40.75	82.25	41.50	1000.000	350.0	H	320.0	21.7

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1184.451500	21.43	82.25	60.82	1000.000	207.0	V	2.0	-2.1
1537.112000	21.13	82.25	61.12	1000.000	350.0	V	202.0	-1.9
1572.134500	23.47	82.25	58.78	1000.000	209.0	V	1.0	-1.8
3920.173000	28.69	82.25	53.56	1000.000	281.0	V	117.0	6.3
8661.541500	31.49	82.25	50.76	1000.000	350.0	V	245.0	11.5
9401.470000	32.27	82.25	49.98	1000.000	350.0	V	213.0	12.5
10163.167500	34.04	82.25	48.21	1000.000	192.0	H	140.0	13.9
16768.075500	40.65	82.25	41.60	1000.000	350.0	H	295.0	21.5

High

10.10 Test Data (Band 14)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.882000	31.80	82.25	50.45	120.000	99.6	V	10.0	15.2
72.095000	26.29	82.25	55.96	120.000	100.9	V	0.0	15.3
116.140000	30.71	82.25	51.54	120.000	105.5	V	121.0	21.4
130.080000	29.05	82.25	53.20	120.000	104.0	V	212.0	21.7
198.960000	33.38	82.25	48.87	120.000	105.5	V	18.0	21.4
244.060000	28.14	82.25	54.11	120.000	100.8	V	100.0	20.8
395.820000	32.73	82.25	49.52	120.000	225.5	H	8.0	25.7
607.330000	42.52	82.25	39.73	120.000	152.6	H	321.0	30.3
671.850000	39.25	82.25	43.00	120.000	218.1	V	184.0	31.5
728.090000	40.45	82.25	41.80	120.000	130.2	H	175.0	32.4

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1182.268000	20.60	82.25	61.65	1000.000	350.0	H	127.0	-2.6
1319.063500	22.13	82.25	60.12	1000.000	350.0	V	50.0	-1.2
1578.100500	24.13	82.25	58.12	1000.000	243.0	V	254.0	-1.8
2436.814000	26.65	82.25	55.60	1000.000	187.0	V	28.0	3.3
2443.143000	25.76	82.25	56.49	1000.000	350.0	V	229.0	3.3
10164.510500	33.88	82.25	48.37	1000.000	350.0	H	150.0	13.9
11041.987500	34.26	82.25	47.99	1000.000	350.0	V	69.0	14.9
12705.276000	36.56	82.25	45.69	1000.000	205.0	V	277.0	16.9
17131.131000	40.76	82.25	41.49	1000.000	350.0	H	211.0	22.0

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1186.689500	25.40	82.25	56.85	1000.000	336.0	V	291.0	-2.1
1186.988000	21.26	82.25	60.99	1000.000	350.0	V	50.0	-2.1
1475.931500	26.85	82.25	55.40	1000.000	350.0	H	204.0	-2.0
1631.772000	21.90	82.25	60.35	1000.000	100.0	V	142.0	-1.3
2381.495000	27.18	82.25	55.07	1000.000	243.0	V	9.0	3.1
7130.605500	31.56	82.25	50.69	1000.000	325.0	V	9.0	10.0
9315.221000	32.36	82.25	49.89	1000.000	203.0	V	222.0	12.2
17138.782500	40.80	82.25	41.45	1000.000	350.0	H	22.0	22.1

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1591.295000	21.63	82.25	60.62	1000.000	350.0	H	290.0	-1.8
1624.107500	21.68	82.25	60.57	1000.000	350.0	H	302.0	-1.4
2389.556000	26.70	82.25	55.55	1000.000	350.0	V	17.0	3.2
2442.991000	25.76	82.25	56.49	1000.000	350.0	V	126.0	3.3
4683.019000	30.07	82.25	52.18	1000.000	350.0	H	106.0	7.9
6276.999500	30.97	82.25	51.28	1000.000	350.0	V	110.0	9.4
9582.778000	32.45	82.25	49.80	1000.000	256.0	H	322.0	13.0
11546.154500	34.99	82.25	47.26	1000.000	350.0	H	236.0	15.2
12898.342500	36.66	82.25	45.59	1000.000	350.0	H	302.0	17.4
16939.983000	40.64	82.25	41.61	1000.000	252.0	H	286.0	21.7

High

10.11 Test Data (Band 17)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.896000	31.45	82.25	50.80	120.000	109.8	V	9.0	15.2
49.934000	29.14	82.25	53.11	120.000	104.4	V	16.0	15.2
71.578000	24.17	82.25	58.08	120.000	104.5	V	127.0	15.4
118.100000	30.35	82.25	51.90	120.000	104.7	V	128.0	21.6
130.340000	29.26	82.25	52.99	120.000	104.7	V	172.0	21.7
166.520000	30.84	82.25	51.41	120.000	104.7	V	9.0	20.9
203.140000	32.59	82.25	49.66	120.000	104.8	V	45.0	20.8
492.060000	37.54	82.25	44.71	120.000	104.7	V	55.0	28.5
668.070000	42.30	82.25	39.95	120.000	177.3	V	121.0	31.5
728.760000	53.05	82.25	29.20	120.000	129.9	H	166.0	32.4

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1416.000000	25.07	82.25	57.18	1000.000	100.0	V	322.0	-2.1
2125.400000	25.27	82.25	56.98	1000.000	234.0	V	147.0	2.1
2833.400000	26.31	82.25	55.94	1000.000	410.0	V	343.0	3.7

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1421.200000	21.88	82.25	60.37	1000.000	334.0	V	273.0	-2.2
2131.200000	25.13	82.25	57.12	1000.000	410.0	V	210.0	2.1
2840.000000	25.62	82.25	56.63	1000.000	225.0	V	0.0	3.7

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1427.700000	24.52	82.25	57.73	1000.000	335.0	H	252.0	-1.7
2141.000000	25.02	82.25	57.23	1000.000	410.0	V	195.0	2.1
2855.400000	26.32	82.25	55.93	1000.000	410.0	V	306.0	3.7

High

10.12 Test Data (Band 25)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.920000	30.07	82.25	52.18	120.000	104.3	V	8.0	15.2
67.683000	24.21	82.25	58.04	120.000	99.6	V	18.0	15.4
113.780000	29.81	82.25	52.44	120.000	101.0	V	137.0	21.2
117.340000	31.08	82.25	51.17	120.000	101.0	V	130.0	21.5
136.040000	29.33	82.25	52.92	120.000	122.8	V	146.0	21.4
171.280000	29.28	82.25	52.97	120.000	104.7	V	10.0	20.5
195.460000	32.52	82.25	49.73	120.000	101.0	V	27.0	20.6
495.100000	35.75	82.25	46.50	120.000	190.5	V	10.0	28.4
676.410000	39.39	82.25	42.86	120.000	399.9	H	328.0	31.6
969.600000	44.65	82.25	37.60	120.000	189.3	H	310.0	35.6

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3774.000000	29.85	82.25	52.40	1000.000	222.0	V	315.0	6.0
5636.000000	32.03	82.25	50.22	1000.000	212.0	V	133.0	8.7
5660.800000	35.29	82.25	46.96	1000.000	353.0	V	303.0	8.7
7547.600000	31.60	82.25	50.65	1000.000	100.0	H	305.0	10.9
16877.400000	40.74	82.25	41.51	1000.000	410.0	V	122.0	21.8
17610.000000	40.06	82.25	42.19	1000.000	410.0	H	156.0	20.9

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3766.543500	32.59	82.25	49.66	1000.000	350.0	H	89.0	6.0
5649.707500	36.44	82.25	45.81	1000.000	350.0	V	0.0	8.7
7531.158000	32.33	82.25	49.92	1000.000	350.0	V	74.0	10.8
9416.133000	33.10	82.25	49.15	1000.000	192.0	V	4.0	12.6
12727.401000	36.62	82.25	45.63	1000.000	291.0	V	339.0	17.0
16835.217000	40.71	82.25	41.54	1000.000	350.0	H	150.0	21.8

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3772.600000	30.79	82.25	51.46	1000.000	215.0	H	303.0	6.0
5658.400000	39.88	82.25	42.37	1000.000	410.0	V	323.0	8.7
7545.200000	33.10	82.25	49.15	1000.000	253.0	V	141.0	10.8
9430.800000	32.86	82.25	49.39	1000.000	410.0	V	258.0	12.5
13398.000000	36.52	82.25	45.73	1000.000	410.0	H	213.0	16.8
16861.200000	40.57	82.25	41.68	1000.000	394.0	V	300.0	21.7

High

Test Data (Band 26)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.887000	31.52	82.25	50.73	120.000	110.5	V	0.0	15.2
57.614000	25.31	82.25	56.94	120.000	104.9	V	0.0	14.8
81.639000	22.72	82.25	59.53	120.000	111.7	V	55.0	14.9
113.860000	28.29	82.25	53.96	120.000	221.1	V	100.0	21.2
272.120000	29.63	82.25	52.62	120.000	265.6	H	36.0	22.7
288.680000	30.01	82.25	52.24	120.000	141.9	H	0.0	23.0
292.780000	32.12	82.25	50.13	120.000	104.8	H	148.0	23.1
781.110000	41.54	82.25	40.71	120.000	130.1	H	0.0	33.2
829.500000	57.07	82.25	25.18	120.000	110.9	H	0.0	34.1
944.120000	56.24	82.25	26.01	120.000	110.3	H	10.0	35.4

Low, Mid, and High

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1188.000000	24.74	82.25	57.51	1000.000	410.0	V	-1.0	-2.1
1499.300000	21.42	82.25	60.83	1000.000	251.0	H	236.0	-2.0
1655.600000	23.77	82.25	58.48	1000.000	410.0	V	205.0	-1.1
1871.500000	23.62	82.25	58.63	1000.000	410.0	H	0.0	1.3
1874.400000	30.60	82.25	51.65	1000.000	410.0	H	314.0	1.3
1878.400000	23.98	82.25	58.27	1000.000	264.0	H	233.0	1.3
2435.800000	26.79	82.25	55.46	1000.000	410.0	H	239.0	3.4
2439.000000	27.56	82.25	54.69	1000.000	316.0	H	236.0	3.4
16773.600000	40.68	82.25	41.57	1000.000	380.0	H	170.0	21.6

Low

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1415.121500	21.42	82.25	60.83	1000.000	350.0	V	197.0	-2.1
1664.724500	25.57	82.25	56.68	1000.000	230.0	V	256.0	-1.0
2442.000500	26.06	82.25	56.19	1000.000	350.0	V	85.0	3.3
2469.573000	25.80	82.25	56.45	1000.000	350.0	V	262.0	3.3
2476.489000	26.05	82.25	56.20	1000.000	322.0	H	176.0	3.5
11630.032000	34.99	82.25	47.26	1000.000	249.0	V	98.0	15.4
13445.997000	36.59	82.25	45.66	1000.000	203.0	V	324.0	16.7
13728.273000	35.82	82.25	46.43	1000.000	256.0	V	50.0	16.5
17170.300500	40.84	82.25	41.41	1000.000	350.0	H	326.0	22.2

Mid

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1671.199500	25.95	82.25	56.30	1000.000	100.0	V	312.0	-1.0
2432.242000	26.33	82.25	55.92	1000.000	350.0	H	266.0	3.4
2432.886500	26.32	82.25	55.93	1000.000	194.0	V	83.0	3.3
2459.493500	26.25	82.25	56.00	1000.000	100.0	H	10.0	3.5
12232.042500	36.22	82.25	46.03	1000.000	350.0	H	122.0	16.5
13898.877000	36.55	82.25	45.70	1000.000	350.0	V	219.0	17.0
16401.316500	39.51	82.25	42.74	1000.000	223.0	H	300.0	20.4
16820.860500	40.84	82.25	41.41	1000.000	350.0	H	38.0	21.8

High

11 Frequency Stability

11.1 Test Limits

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen or ±2.5ppm tolerance.

11.2 Test Procedure

The equipment under test was connected to a DC power source and the RF output was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for that purpose. After the temperature stabilized for approximately 30 minutes, the frequency error was read from the base station simulator. At 20C the input voltage was varied from 85% to 115% and the frequency stability vs input voltage was recorded.

11.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
LTE CAT M1 Base Station	3917	Rohde & Schwarz	CMW500	9/28/2017	9/28/2018
Environmental Chamber	32692	Thermotron	SM-8C	1/4/2018	1/4/2019
Multimeter	1694	Fluke	115	2/28/2018	2/28/2019
Power Supply	3513	Gwinstek	GPS1850	NCR	NCR

11.4 Results:

The tables below show the frequency stability data. In all cases the test sample met the ±2.5ppm.

Frequency Stability in LTE Band 2, Channel 18900, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	10.33	0.0000005	0.0055
100	3.6	-20	4.61	0.0000002	0.0025
100	3.6	-10	-10.4	-0.0000006	-0.0055
100	3.6	0	5.48	0.0000003	0.0029
100	3.6	10	-4.81	-0.0000003	-0.0026
100	3.6	20	-2.88	-0.0000002	-0.0015
100	3.6	30	-10.26	-0.0000005	-0.0055
100	3.6	40	-1.46	-0.0000001	-0.0008
100	3.6	50	-10.59	-0.0000006	-0.0056
100	3.6	60	-8.78	-0.0000005	-0.0047
115	4.14	20	-5.24	-0.0000003	-0.0028
85	3.06	20	2.2	0.0000001	0.0012

Frequency Stability in LTE Band 2, Channel 18900, 16-Qam Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-3.69	-0.0000002	-0.0020
100	3.6	-20	1.82	0.0000001	0.0010
100	3.6	-10	-14.46	-0.0000008	-0.0077
100	3.6	0	4.21	0.0000002	0.0022
100	3.6	10	-10.49	-0.0000006	-0.0056
100	3.6	20	-4.61	-0.0000002	-0.0025
100	3.6	30	-10.2	-0.0000005	-0.0054
100	3.6	40	3.75	0.0000002	0.0020
100	3.6	50	-10.67	-0.0000006	-0.0057
100	3.6	60	-1.06	-0.0000001	-0.0006
115	4.14	20	-7.74	-0.0000004	-0.0041
85	3.06	20	3.53	0.0000002	0.0019

Frequency Stability in LTE Band 4, Channel 20175, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-11.04	-0.0000006	-0.0064
100	3.6	-20	-6.12	-0.0000004	-0.0035
100	3.6	-10	-16.91	-0.0000010	-0.0098
100	3.6	0	-3.12	-0.0000002	-0.0018
100	3.6	10	-6.02	-0.0000003	-0.0035
100	3.6	20	-10.91	-0.0000006	-0.0063
100	3.6	30	-12.5	-0.0000007	-0.0072
100	3.6	40	-7.04	-0.0000004	-0.0041
100	3.6	50	-13.62	-0.0000008	-0.0079
100	3.6	60	-3.5	-0.0000002	-0.0020
115	4.14	20	-10.13	-0.0000006	-0.0058
85	3.06	20	1.24	0.0000001	0.0007

Frequency Stability in LTE Band 4, Channel 20175, 16-Qam Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-7.7	-0.0000004	-0.0044
100	3.6	-20	-10.07	-0.0000006	-0.0058
100	3.6	-10	-11.14	-0.0000006	-0.0064
100	3.6	0	-4.28	-0.0000002	-0.0025
100	3.6	10	-3.33	-0.0000002	-0.0019
100	3.6	20	-7.48	-0.0000004	-0.0043
100	3.6	30	-8.05	-0.0000005	-0.0046
100	3.6	40	-8.54	-0.0000005	-0.0049
100	3.6	50	-18	-0.0000010	-0.0104
100	3.6	60	-4.22	-0.0000002	-0.0024
115	4.14	20	-11.74	-0.0000007	-0.0068
85	3.06	20	0.07	0.0000000	0.0000

Frequency Stability in LTE Band 5, Channel 20525, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	10.34	0.0000012	0.0124
100	3.6	-20	0.7	0.0000001	0.0008
100	3.6	-10	-10.43	-0.0000012	-0.0125
100	3.6	0	-2.13	-0.0000003	-0.0025
100	3.6	10	-1.06	-0.0000001	-0.0013
100	3.6	20	-10.37	-0.0000012	-0.0124
100	3.6	30	8.68	0.0000010	0.0104
100	3.6	40	7.55	0.0000009	0.0090
100	3.6	50	-8.04	-0.0000010	-0.0096
100	3.6	60	-6.45	-0.0000008	-0.0077
115	4.14	20	-11.82	-0.0000014	-0.0141
85	3.06	20	-7.34	-0.0000009	-0.0088

Frequency Stability in LTE Band 5, Channel 20525, 16 QAM Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	1.79	0.0000002	0.0021
100	3.6	-20	3.06	0.0000004	0.0037
100	3.6	-10	-19.05	-0.0000023	-0.0228
100	3.6	0	-3.09	-0.0000004	-0.0037
100	3.6	10	1.53	0.0000002	0.0018
100	3.6	20	-2.92	-0.0000003	-0.0035
100	3.6	30	10.71	0.0000013	0.0128
100	3.6	40	6.38	0.0000008	0.0076
100	3.6	50	-2.98	-0.0000004	-0.0036
100	3.6	60	-6.72	-0.0000008	-0.0080
115	4.14	20	-4.45	-0.0000005	-0.0053
85	3.06	20	-1.4	-0.0000002	-0.0017

Frequency Stability in LTE Band 12, Channel 23095, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-3.62	-0.0000005	-0.0051
100	3.6	-20	2.76	0.0000004	0.0039
100	3.6	-10	-7.77	-0.0000011	-0.0110
100	3.6	0	1.56	0.0000002	0.0022
100	3.6	10	4.13	0.0000006	0.0058
100	3.6	20	-8.8	-0.0000012	-0.0124
100	3.6	30	-6.17	-0.0000009	-0.0087
100	3.6	40	12.3	0.0000017	0.0174
100	3.6	50	-5.46	-0.0000008	-0.0077
100	3.6	60	-0.53	-0.0000001	-0.0007
115	4.14	20	-11.2	-0.0000016	-0.0158
85	3.06	20	-3.73	-0.0000005	-0.0053

Frequency Stability in LTE Band 12, Channel 23095, 16-Qam Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-6.77	-0.0000010	-0.0096
100	3.6	-20	2.13	0.0000003	0.0030
100	3.6	-10	-4.28	-0.0000006	-0.0060
100	3.6	0	-15.74	-0.0000022	-0.0222
100	3.6	10	-4.84	-0.0000007	-0.0068
100	3.6	20	1.67	0.0000002	0.0024
100	3.6	30	-4.66	-0.0000007	-0.0066
100	3.6	40	0.93	0.0000001	0.0013
100	3.6	50	-0.24	0.0000000	-0.0003
100	3.6	60	-9.4	-0.0000013	-0.0133
115	4.14	20	-0.47	-0.0000001	-0.0007
85	3.06	20	4.79	0.0000007	0.0068

Frequency Stability in LTE Band 13, Channel 23230, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	5.82	0.0000007	0.0074
100	3.6	-20	1.66	0.0000002	0.0021
100	3.6	-10	-1.43	-0.0000002	-0.0018
100	3.6	0	9.6	0.0000012	0.0123
100	3.6	10	-9.97	-0.0000013	-0.0127
100	3.6	20	-6.79	-0.0000009	-0.0087
100	3.6	30	-6.91	-0.0000009	-0.0088
100	3.6	40	11.53	0.0000015	0.0147
100	3.6	50	-3.6	-0.0000005	-0.0046
100	3.6	60	-7.94	-0.0000010	-0.0101
115	4.14	20	-9.07	-0.0000012	-0.0116
85	3.06	20	-3.72	-0.0000005	-0.0048

Frequency Stability in LTE Band 13, Channel 23230, 16-Qam Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-7.28	-0.0000009	-0.0093
100	3.6	-20	4.36	0.0000006	0.0056
100	3.6	-10	-3.43	-0.0000004	-0.0044
100	3.6	0	9.43	0.0000012	0.0121
100	3.6	10	-6.65	-0.0000008	-0.0085
100	3.6	20	-3.81	-0.0000005	-0.0049
100	3.6	30	-17.44	-0.0000022	-0.0223
100	3.6	40	4.68	0.0000006	0.0060
100	3.6	50	-8.44	-0.0000011	-0.0108
100	3.6	60	-8.93	-0.0000011	-0.0114
115	4.14	20	-6.82	-0.0000009	-0.0087
85	3.06	20	0.03	0.0000000	0.0000

Frequency Stability in LTE Band 14, Channel 23330, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	7.98	0.0000010	0.0101
100	3.6	-20	-2.26	-0.0000003	-0.0028
100	3.6	-10	-4.31	-0.0000005	-0.0054
100	3.6	0	2.66	0.0000003	0.0034
100	3.6	10	-12.29	-0.0000015	-0.0155
100	3.6	20	-6.68	-0.0000008	-0.0084
100	3.6	30	4.88	0.0000006	0.0061
100	3.6	40	17.04	0.0000021	0.0215
100	3.6	50	-3.79	-0.0000005	-0.0048
100	3.6	60	-16.74	-0.0000021	-0.0211
115	4.14	20	-9.87	-0.0000012	-0.0124
85	3.06	20	-15.06	-0.0000019	-0.0190

Frequency Stability in LTE Band 14, Channel 23330, 16-Qam Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	4.98	0.0000006	0.0063
100	3.6	-20	-1.59	-0.0000002	-0.0020
100	3.6	-10	-1.9	-0.0000002	-0.0024
100	3.6	0	4.12	0.0000005	0.0052
100	3.6	10	4.76	0.0000006	0.0060
100	3.6	20	-8.75	-0.0000011	-0.0110
100	3.6	30	4.53	0.0000006	0.0057
100	3.6	40	8.87	0.0000011	0.0112
100	3.6	50	-16.87	-0.0000021	-0.0213
100	3.6	60	0.44	0.0000001	0.0006
115	4.14	20	-11.07	-0.0000014	-0.0140
85	3.06	20	-4.98	-0.0000006	-0.0063

Frequency Stability in LTE Band 17, Channel 23790, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	5.75	0.0000008	0.0081
100	3.6	-20	-4.01	-0.0000006	-0.0056
100	3.6	-10	3.38	0.0000005	0.0048
100	3.6	0	-3.5	-0.0000005	-0.0049
100	3.6	10	-13.05	-0.0000018	-0.0184
100	3.6	20	-3.49	-0.0000005	-0.0049
100	3.6	30	-19.23	-0.0000027	-0.0271
100	3.6	40	-4.01	-0.0000006	-0.0056
100	3.6	50	-2.8	-0.0000004	-0.0039
100	3.6	60	-8.28	-0.0000012	-0.0117
115	4.14	20	-7.24	-0.0000010	-0.0102
85	3.06	20	-10.93	-0.0000015	-0.0154

Frequency Stability in LTE Band 17, Channel 23790, 16-Qam Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-3.96	-0.0000006	-0.0056
100	3.6	-20	-0.33	0.0000000	-0.0005
100	3.6	-10	4.28	0.0000006	0.0060
100	3.6	0	-3.76	-0.0000005	-0.0053
100	3.6	10	-11.92	-0.0000017	-0.0168
100	3.6	20	-6.91	-0.0000010	-0.0097
100	3.6	30	-18.21	-0.0000026	-0.0256
100	3.6	40	10.26	0.0000014	0.0144
100	3.6	50	-2.09	-0.0000003	-0.0029
100	3.6	60	-9.37	-0.0000013	-0.0132
115	4.14	20	-8.15	-0.0000011	-0.0115
85	3.06	20	-2.32	-0.0000003	-0.0033

Frequency Stability in LTE Band 25, Channel 26365, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-6.85	-0.0000004	-0.0036
100	3.6	-20	6.09	0.0000003	0.0032
100	3.6	-10	-13.15	-0.0000007	-0.0070
100	3.6	0	5.19	0.0000003	0.0028
100	3.6	10	-11.43	-0.0000006	-0.0061
100	3.6	20	-12.8	-0.0000007	-0.0068
100	3.6	30	-0.92	0.0000000	-0.0005
100	3.6	40	6.01	0.0000003	0.0032
100	3.6	50	-15.69	-0.0000008	-0.0083
100	3.6	60	-8.93	-0.0000005	-0.0047
115	4.14	20	-2.3	-0.0000001	-0.0012
85	3.06	20	-11.12	-0.0000006	-0.0059

Frequency Stability in LTE Band 25, Channel 26365, 16-Qam Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	12.04	0.0000006	0.0064
100	3.6	-20	3.5	0.0000002	0.0019
100	3.6	-10	-11.89	-0.0000006	-0.0063
100	3.6	0	-9.34	-0.0000005	-0.0050
100	3.6	10	8.84	0.0000005	0.0047
100	3.6	20	-0.96	-0.0000001	-0.0005
100	3.6	30	1.6	0.0000001	0.0008
100	3.6	40	3.78	0.0000002	0.0020
100	3.6	50	-7.42	-0.0000004	-0.0039
100	3.6	60	-7.04	-0.0000004	-0.0037
115	4.14	20	-6.37	-0.0000003	-0.0034
85	3.06	20	6.07	0.0000003	0.0032

Frequency Stability in LTE Band 26, Channel 26865, QPSK Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-8.28	-0.0000010	-0.0099
100	3.6	-20	-4.09	-0.0000005	-0.0049
100	3.6	-10	5.99	0.0000007	0.0072
100	3.6	0	2.2	0.0000003	0.0026
100	3.6	10	19.01	0.0000023	0.0228
100	3.6	20	-6.97	-0.0000008	-0.0084
100	3.6	30	-6.24	-0.0000007	-0.0075
100	3.6	40	-4.82	-0.0000006	-0.0058
100	3.6	50	-7.24	-0.0000009	-0.0087
100	3.6	60	-8.3	-0.0000010	-0.0100
115	4.14	20	-12.66	-0.0000015	-0.0152
85	3.06	20	-14.28	-0.0000017	-0.0172

Frequency Stability in LTE Band 26, Channel 26865, 16-Qam Mode

Voltage (%)	Voltage (DC)	Temp (C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100	3.6	-30	-13.9	-0.0000017	-0.0167
100	3.6	-20	-1.09	-0.0000001	-0.0013
100	3.6	-10	6.78	0.0000008	0.0081
100	3.6	0	-3.36	-0.0000004	-0.0040
100	3.6	10	14.55	0.0000017	0.0175
100	3.6	20	-11.27	-0.0000014	-0.0135
100	3.6	30	-4.71	-0.0000006	-0.0057
100	3.6	40	-2.36	-0.0000003	-0.0028
100	3.6	50	-8.81	-0.0000011	-0.0106
100	3.6	60	-5.76	-0.0000007	-0.0069
115	4.14	20	-13.49	-0.0000016	-0.0162
85	3.06	20	-8.4	-0.0000010	-0.0101

12 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of k = 2, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty	Notes
Radiated emissions, 30 to 1000 MHz	±3.9dB	
Radiated emissions, 1 to 18 GHz	±4.2dB	
Radiated emissions, 18 to 40 GHz	±4.3dB	
Power Port Conducted emissions, 150kHz to 30 MHz	+2.8dB	

13 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
001	5/13/2019	103652106LEX-007	JC	BCT	