Electromagnetic Compatibility
Test Report

Test Report No: MOT 030711
Issued on: July 03, 2011

Product Name
VML700
Model: F4080A

Tested According to
FCC 47 CFR, Part 90
Industry Canada & RSS 119
(LTE band 14)

Tests Performed for
Motorola Solutions Inc.
One Motorola Plaza, Holtsville, N.Y 11742, USA

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ELECTRICAL TESTING
CERT #1633.01

Test Personnel

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Test Report details:

Test commencement date:	01.06.2011
Test completion date:	24.06.2011
Customer's representative:	Oren Ratzon
Issued on:	03.07.2011

Assessment information:

This report contains an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was set up and exercised using the configuration, modes of operation and arrangements defined in this report only.

Modifications:

Modifications made to the EUT

None

Modifications made to the Test Standard

None

Summary of Compliance Status

Test Spec. Clause	Test Case	Remarks
Conducted RF Power Output	47 CFR §90.542 (a)(6) & §2.1046 & RSS 119,5.4.5	Comply
Occupied bandwidth	47 CFR §2.1049 & RSS 119,5.5.5	Comply
Emission Mask C	47 CFR §90.210(c) & RSS 119,5.8.2	Comply
Conducted Spurious Emissions	47 CFR §90.543 (c) & RSS 119,5.8.9.2	Comply
Conducted Spurious Emissions between 769-775 MHz and 799-805 MHz	47 CFR §90.543 (e)(2) & RSS 119,5.8.9.2	Comply
Radiated Peak Power Output	47 CFR §90.542 (a)(6) & RSS 119,5.8.9.2	Comply
Field Strength of Spurious Radiation	47 CFR §90.543 (c) & RSS 119,5.8.9.2	Comply
Field Strength of Spurious Radiation between 769-775 MHz and 799-805 MHz51	47 CFR §90.543 (e)(2) & RSS 119,5.8.9.2	Comply
Field Strength of Spurious Radiation in the band 1559-1610 MHz	47 CFR §90.543 (f) & RSS 119,5.8.9.2	Comply
Frequency Stability	47 CFR §2.1055 & 47 CFR §90.5393 (e) & RSS 119,5.3	Comply

Table of Contents

1. General Description

Description of the EUT System/Test Item: LTE User Equipment (Modem)

Product Name: VML700

Model: F4080A

FCC ID: AZ492FT7045

IC: 109U-92FT7045

Description: Its basic purpose is used for communication the VML700 consists of LTE band 13 , LTE band 14* , EVDO Rev A (CDNA) , WiFi 802.11b/g

In case of no coverage in LTE band the device will switch automatically to CDMA/EVDO cellular band (BC0 /BC1)

The EUT is pre-production samples intentionally calibrated with transmit power higher than the nominal factory set points to represent worst case data for manufactured modules.

Maximum Peak Output Power: 25.7dBm

Nominal Output Power: 23.5dBm

Frequency Range: LTE BC 14 Tx: 788MHz-798MHz Rx: 758MHz-768MHz

Transmit Data Rate:

Protocol	Rate [Mbps]
UE- Category 3	Up to 10Mbps (peak)

Type of Modulation:

Protocol	Modulation
LTE	QPSK
LTE	16QAM

Antenna Specification:

Type: Elevated feed Dipole

Gain (including 12ft coaxial cable): 0.1dBi

*part 90 refers to band 14 only

2. Method of Measurements

2.1. Conducted RF Measurements:

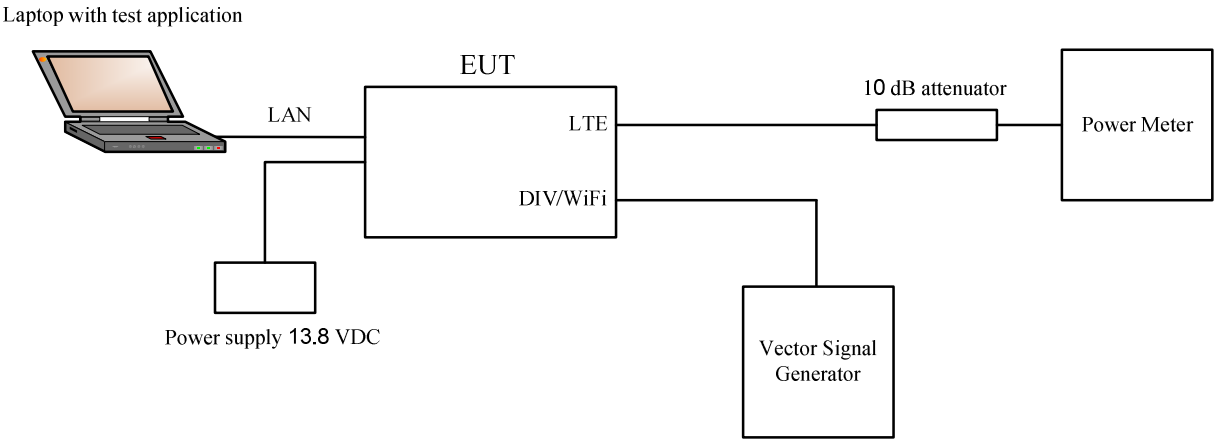
During Conducted RF Power Output verification test, the transmitter's output was connected to the power meter through an attenuator. The external attenuations were taken into account to correct the reading. Worst-case results of the various operation & modulation modes were reported (where applicable).

For Occupied Bandwidth measurement, the Spectrum Analyzer with appropriate integrated feature was employed.

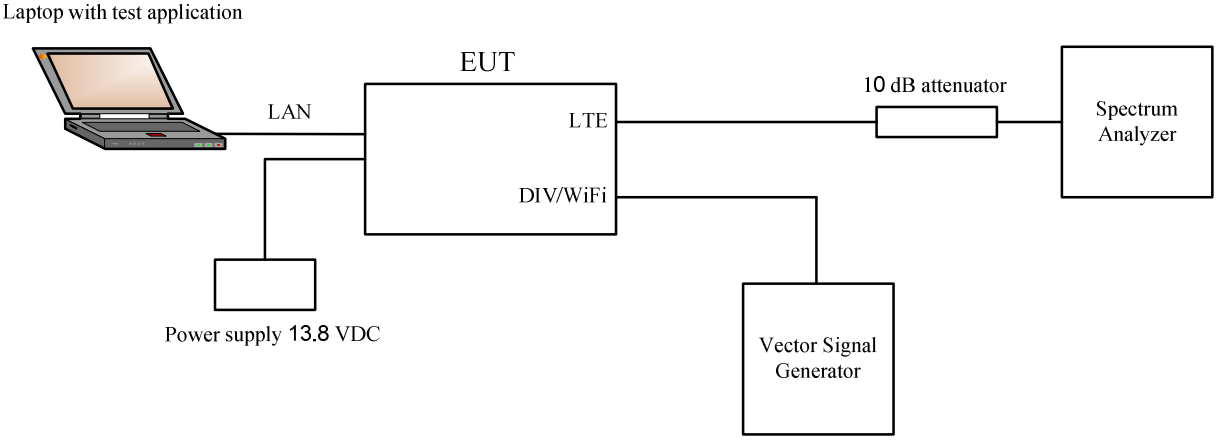
For Out of Band emissions measurement, the spectrum was investigated from 9 kHz up to at least the tenth harmonic of the highest fundamental frequency. Multiple sweeps were recorded in max hold mode using a peak detector to ensure that the worst-case emissions were caught.

Test Setups:

RF Power Output verification



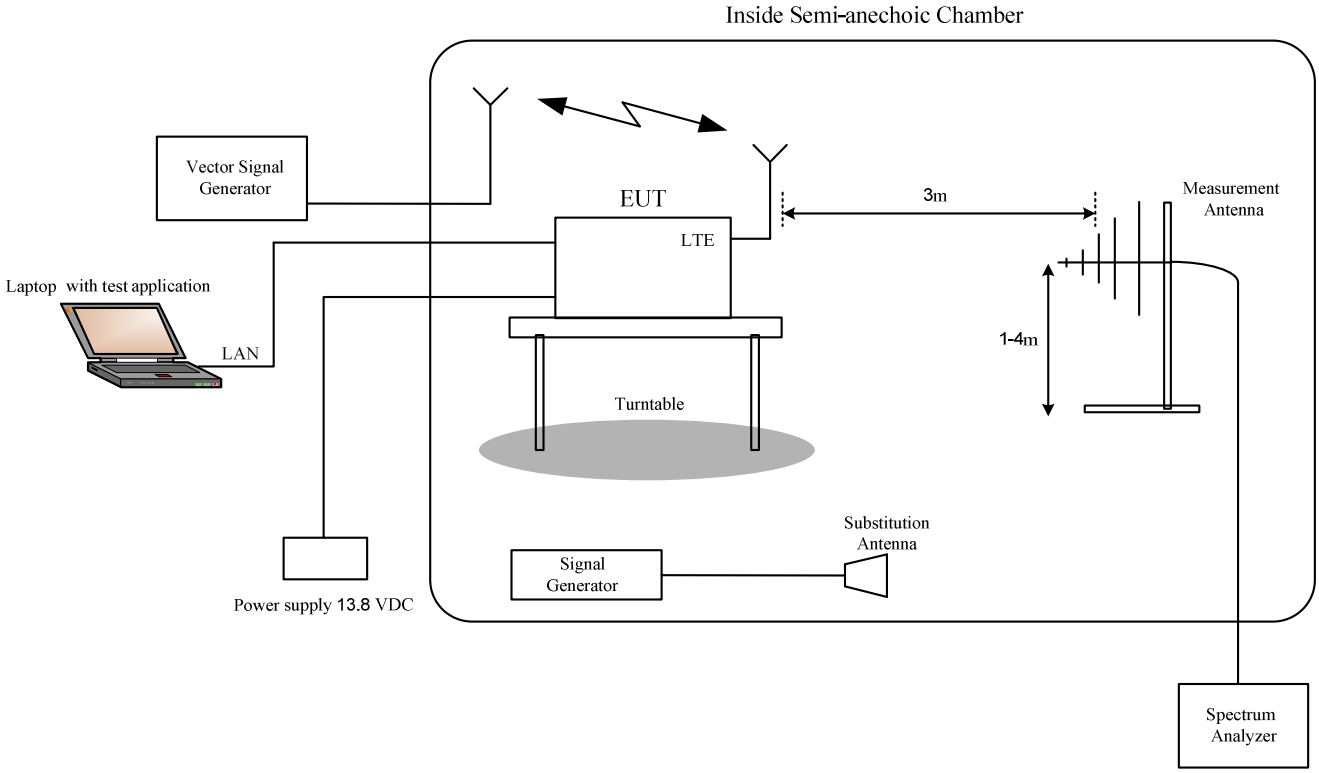
Out of Band Emissions



2.2. Field Strength of Spurious Radiation Measurements:

Measurements were performed in a semi-anechoic chamber at a 3-meter measurement distance in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table, 0.8 m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions. The test program of exercising equipment ensured that various parts of the EUT were exercised to permit detection of all EUT disturbances.
While the turntable was being rotated around 360 degrees, the height of the antenna was varied from 1 to 4 m for the frequency range from 30 MHz up to at least the tenth harmonic of the highest fundamental frequency. Measurements were performed for vertical and horizontal polarization.
Using the Substitution Method in accordance to ANSI/TIA-603, an antenna with a known gain substituted the EUT, and an RF signal source was connected to the antenna input. The signal source level was adjusted until the previously recorded maximum reading was obtained. The power source reading was corrected for the cable loss and the antenna gain was added to obtain the calculated ERP/EIRP peak power. Measurements were made at the low, middle and high channels (where applicable).

Test Setup:

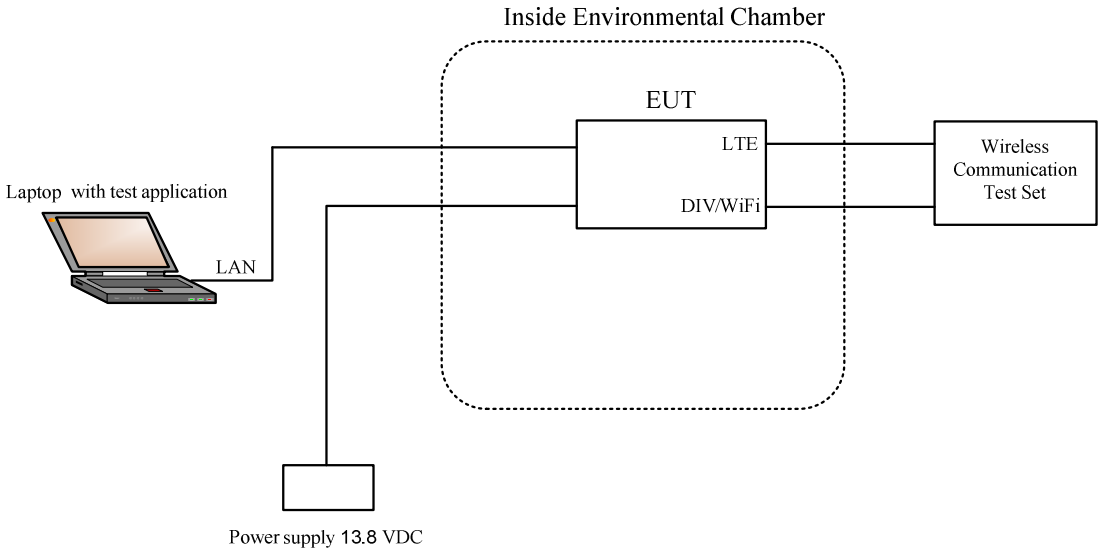


2.3. Frequency stability measurements:

The EUT was placed inside an environmental chamber and the frequency stability was measured with variations of ambient temperatures from -30°C to +60°C. Frequency measurements were made at the extremes of the specified temperature range and at intervals of 10°C through the range.

The frequency stability was measured also with variations of primary supply voltage from 85 to 115 percent of the nominal value.

Test Setup:



2.4. Worst Case Results:

Worst case result is determined for applicable modulation types and data rates. Pre-scan has been conducted to determine the worst-case.

3. Test Facility & Uncertainty of Measurement

3.1. Accreditation/ Registration reference:

- *A2LA Certificate Number: 1633.01*

3.2. Test Facility description

The tests were performed at the EMC Laboratory, QualiTech Division, ECI Telecom Group

Address: 30, Hasivim St., Petah Tikva, Israel.
Tel: 972-3-926-8443

3m Anechoic Chamber:

The 3m-screened chamber is used in two configurations: the semi-anechoic configuration for Radiated Emission measurements and the full-anechoic configuration for Radiated Immunity tests.

Semi Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	9.5m x 6.5m x 5.2m
Antenna height	1 - 4m
Shielding Effectiveness	Magnetic field ≥80dB at 15 kHz ≥90dB at 100 kHz Electric field >120dB from 1MHz to 1GHz >110dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Frankonia hybrid absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	±3.49dB, 30MHz to 1GHz
Transmission Loss measured at 5 positions, at 1.5m height	±3dB, 1GHz to 18GHz

Full-Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	7m x 4m x 3m
Antenna height	1.55m at Horizontal & Vertical polarizations
Shielding Effectiveness	Magnetic field ≥80dB at 15 kHz ≥90dB at 100 kHz Electric field >120dB from 1MHz to 1GHz >110dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Frankonia hybrid absorbing material in selected positions on the walls and floor
Field Uniformity to EN61000-4-3	±3dB 80MHz to 18GHz

3.3. Uncertainty of Measurement:

Test Name	Test Method & Range	Uncertainty	
		Combined std. Uc(y) [dB]	**Expanded U** [dB]
Radiated Emission	30MHz-230MHz, Horiz. polar. 30MHz-230MHz, Ver. polar. 230MHz-1000MHz, Horiz. polar. 230MHz-1000MHz, Vert. polar.	1.8 2.0 1.5 1.5	3.6 3.9 3.0 3.0
Conducted Emission	9 kHz-150 kHz 150 kHz-30MHz	1.4 1.1	2.8 2.2

4. Measurements

4.1. Conducted RF Power Output

Reference document:	47 CFR §90.542 (a)(6) & §2.1046		
Test Requirements:	Mobile stations transmitting in the 793-798 MHz band are limited to 30 watts ERP.		
Test setup:	See sec 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
Power meter Settings:	AVG		
Environment conditions:	Ambient Temperature: 22.1°C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	---	

Test Results:

Frequency [MHz]	Resource Block Size	Resource Block Offset	Output Power* [dBm]	Antenna Gain** [dBd]	ERP calculated [dBm]	Limit [dBm]	Margin [dB]	Results
QPSK								
795.5	1	0	24.99	-2.05	22.94	44.77	-21.83	Pass
	1	24	25.07	-2.05	23.02	44.77	-21.75	Pass
	12	6	24.72	-2.05	22.67	44.77	-22.10	Pass
	25	0	24.83	-2.05	22.78	44.77	-21.99	Pass
16 QAM								
795.5	1	0	25.32	-2.05	23.27	44.77	-21.50	Pass
	1	24	25.51	-2.05	23.46	44.77	-21.31	Pass
	12	6	24.81	-2.05	22.76	44.77	-22.01	Pass
	25	0	24.91	-2.05	22.86	44.77	-21.91	Pass

* Corrected for external attenuations.

**As provided by the manufacture (maximum antenna gain including cable loss).

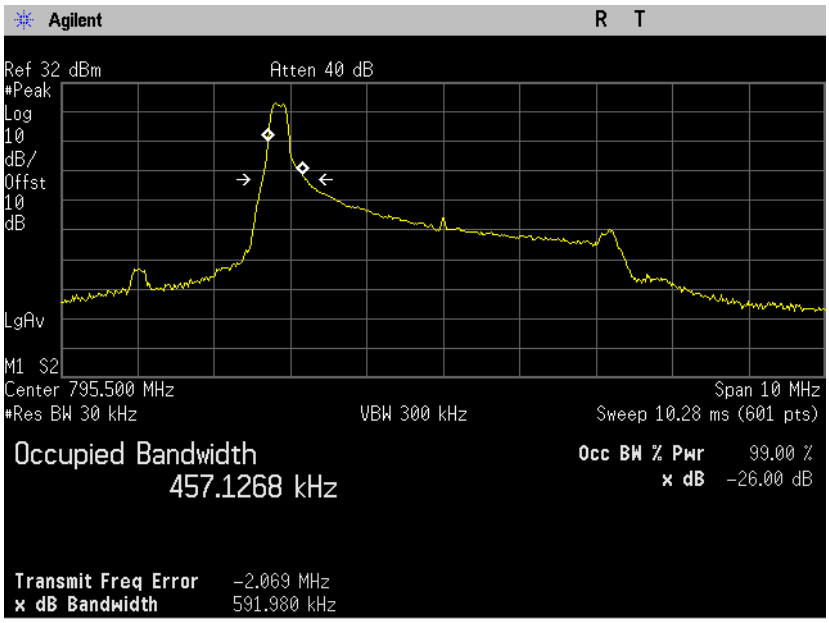
4.2. Occupied bandwidth

Reference document:	47 CFR §2.1049		
Test Requirements:	The occupied bandwidth, that 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.		
Test setup:	See sec 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 30 kHz, VBW: 300 kHz for RBS 1 & RBO 0, RBS 1 & RBO 24, RBS 12 & RBO 6 RBW: 51 kHz, VBW: 510 kHz for RBS 25 & RBO 0		
Environment conditions:	Ambient Temperature: 22.1°C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plots 4.2.1 - 4.2.8	

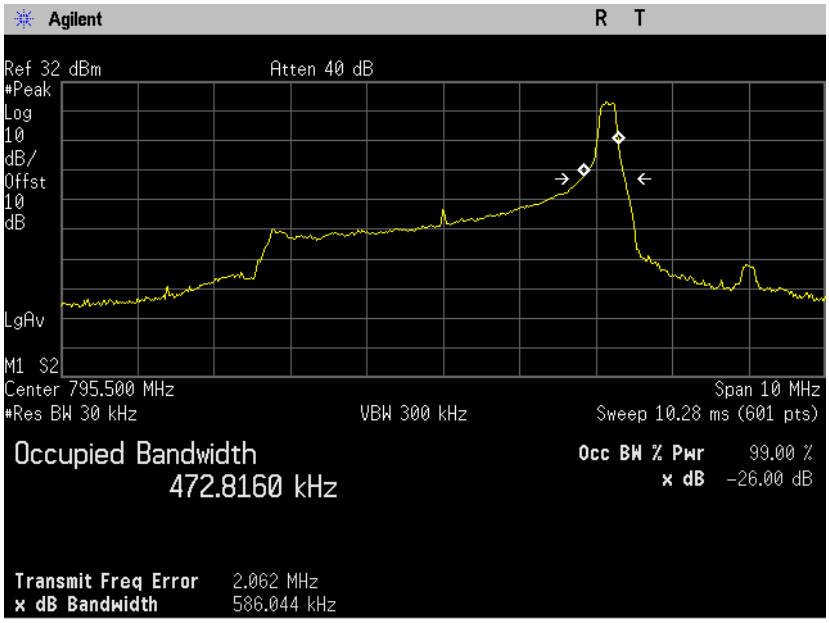
Test results:

Frequency [MHz]	Resource Block Size	Resource Block Offset	Occupied BW 99% Power [MHz]	26 dB Bandwidth [MHz]	Reference Plots
QPSK					
795.5	1	0	0.4571268	0.591980	4.2.1
	1	24	0.4728160	0.586044	4.2.2
	12	6	2.1866	2.919	4.2.3
	25	0	4.4713	4.832	4.2.4
16 QAM					
795.5	1	0	0.4527077	0.581968	4.2.5
	1	24	0.4703467	0.583412	4.2.6
	12	6	2.1869	2.971	4.2.7
	25	0	4.4732	4.813	4.2.8

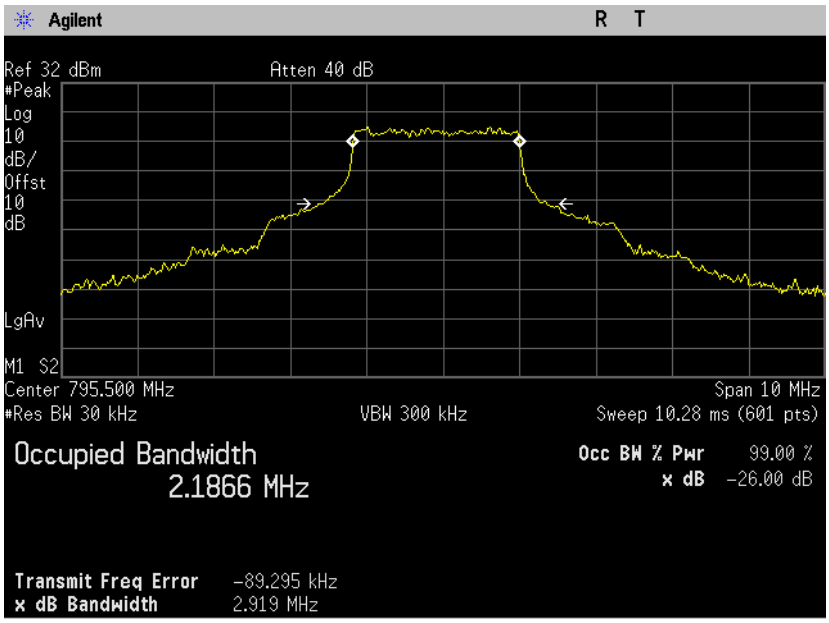
795.5 MHz
QPSK - RB size 1, RB Offset 0
Plot 4.2.1



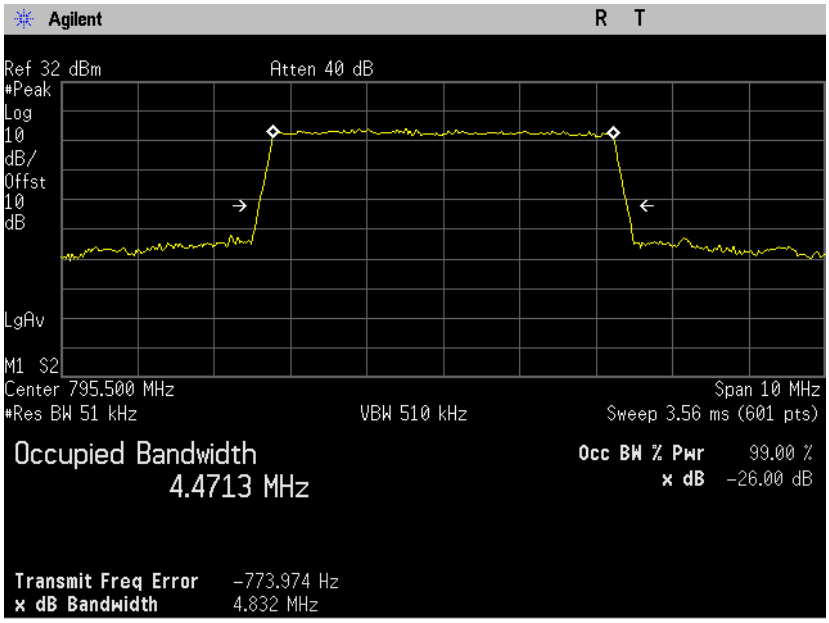
795.5 MHz
QPSK - RB size 1, RB Offset 24
Plot 4.2.2



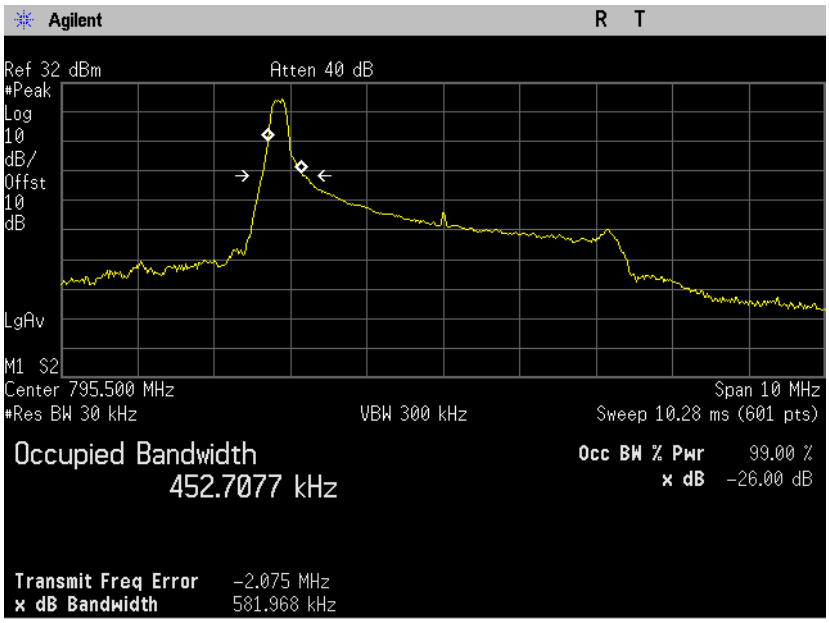
795.5 MHz
QPSK - RB size 12, RB Offset 6
Plot 4.2.3



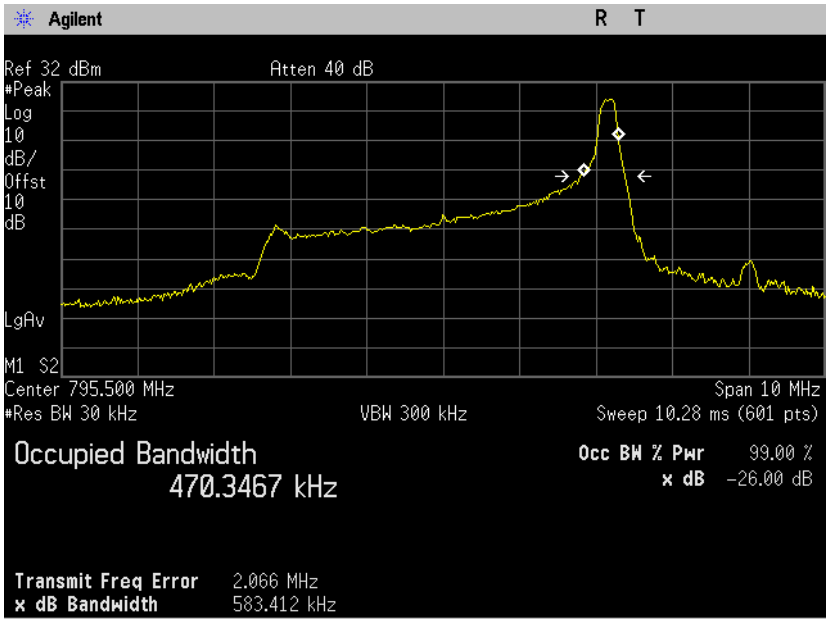
795.5 MHz
QPSK - RB size 25, RB Offset 0
Plot 4.2.4



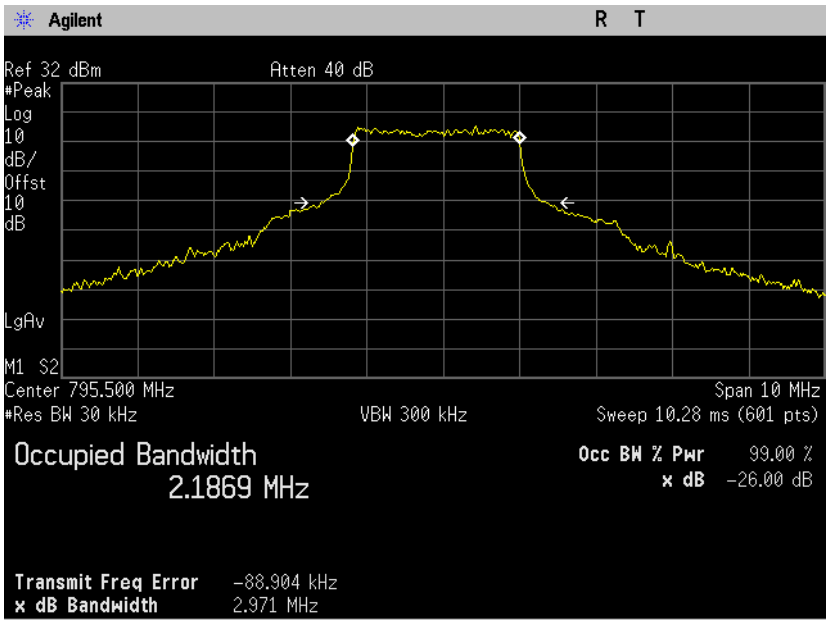
795.5 MHz
16 QAM - RB size 1, RB Offset 0
Plot 4.2.5



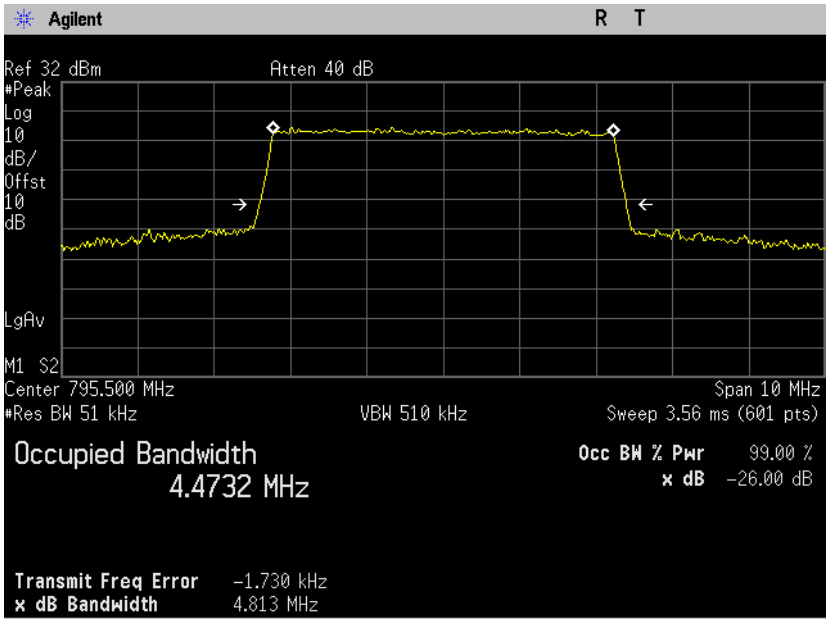
795.5 MHz
16 QAM - RB size 1, RB Offset 24
Plot 4.2.6



795.5 MHz
16 QAM - RB size 12, RB Offset 6
Plot 4.2.7



795.5 MHz
16 QAM - RB size 25, RB Offset 0
Plot 4.2.8

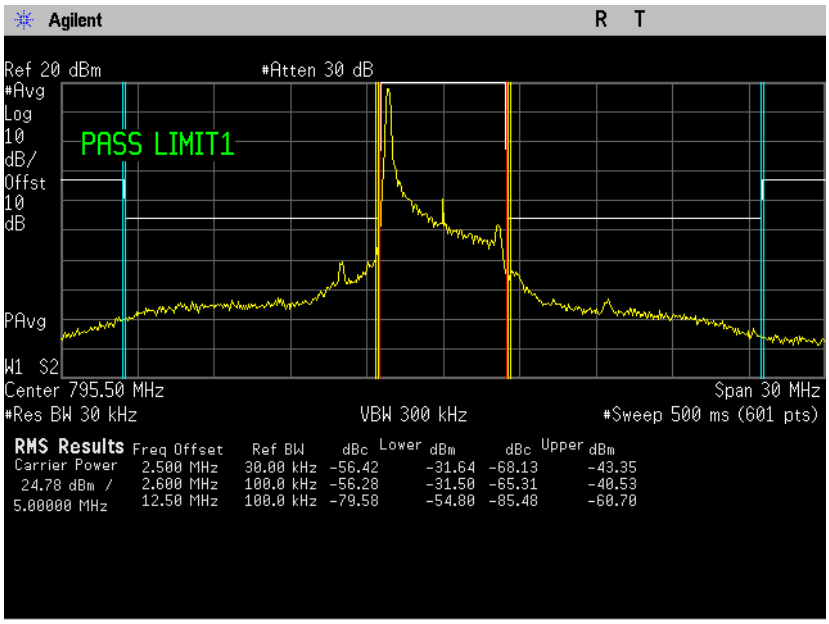


4.3. Emission Mask C

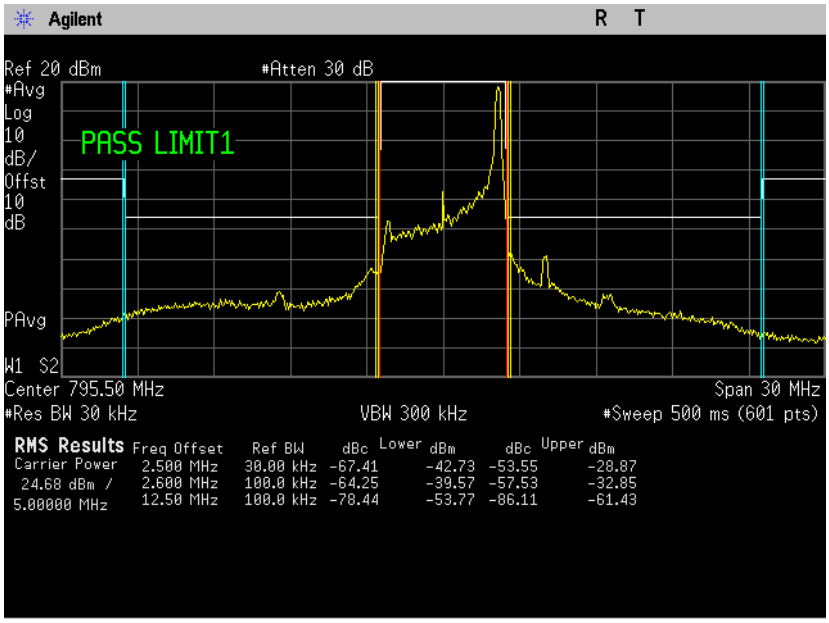
Reference document:	47 CFR §90.210(c)		
Test Requirements:	For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows: (1) on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but no more than 10 kHz: At least 83 log (fd/5) dB. (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but no more than 250 % of the authorized bandwidth: At least 29 log ($fd^2/11$) dB or 50 dB, whichever is the lesser attenuation. (3) On any frequency removed from the center of the authorized bandwidth by more than 250 % of the authorized bandwidth: At least 43 + 10 log (P) dB. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth.		
Test setup:	See Sec. 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 30 kHz, VBW: 300 kHz, Span: 30 MHz, Sweep: 500 ms		
Environment conditions:	Ambient Temperature: 22.1 °C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Results:	See below	see plots Plot 4.3.1 –4.3.8	

Test results: All readings below the emission mask.

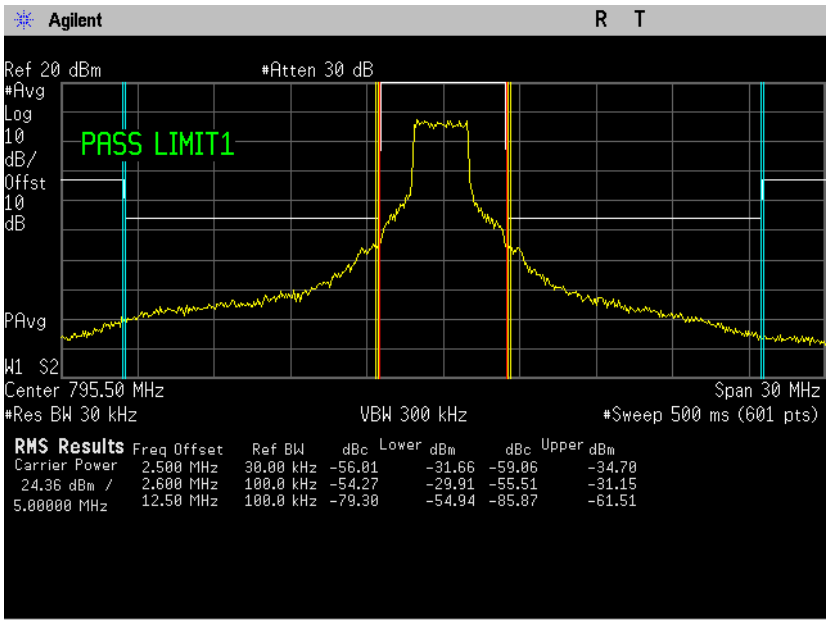
Emission Mask C
Frequency 795.5 MHz
QPSK - RB size 1, RB Offset 0
Plot 4.3.1



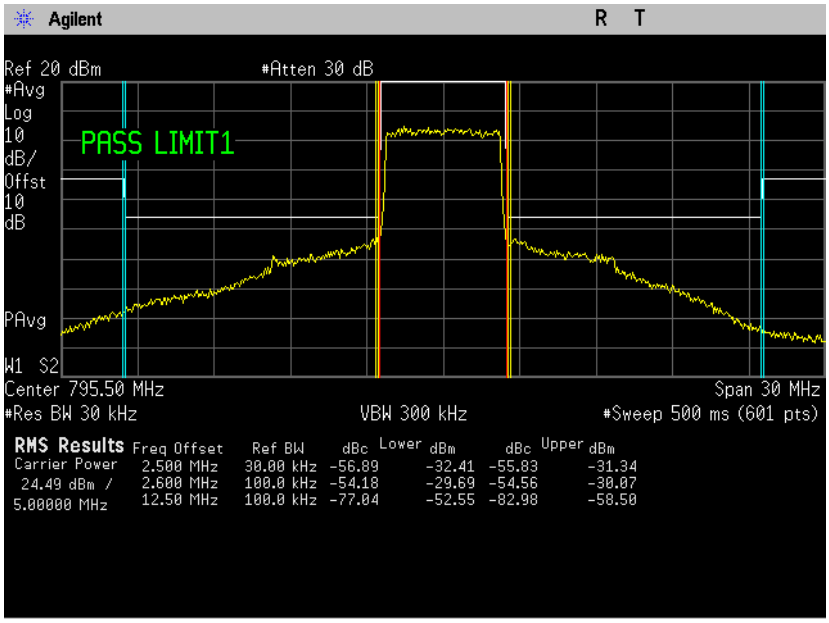
Emission Mask C
Frequency 795.5 MHz
QPSK - RB size 1, RB Offset 24
Plot 4.3.2



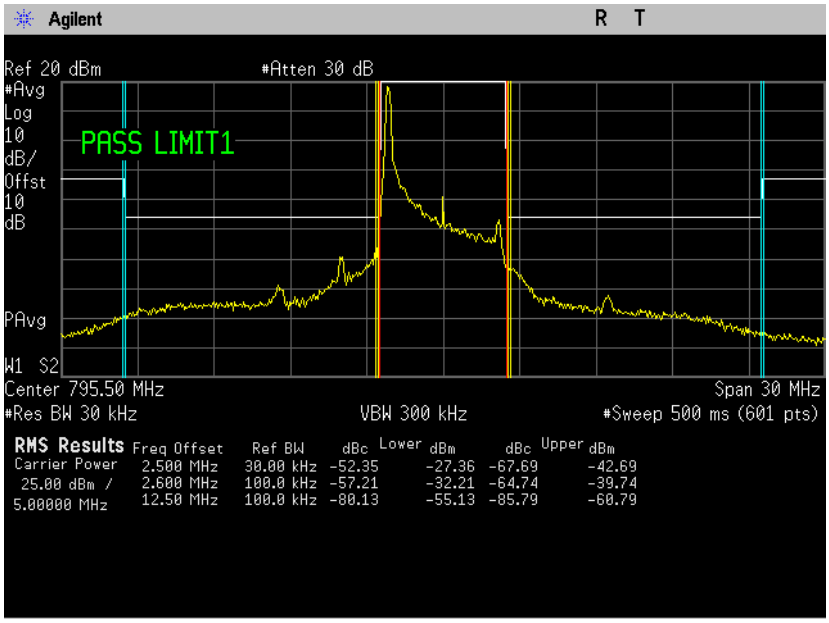
Emission Mask C
Frequency 795.5 MHz
QPSK - RB size 12, RB Offset 6
Plot 4.3.3



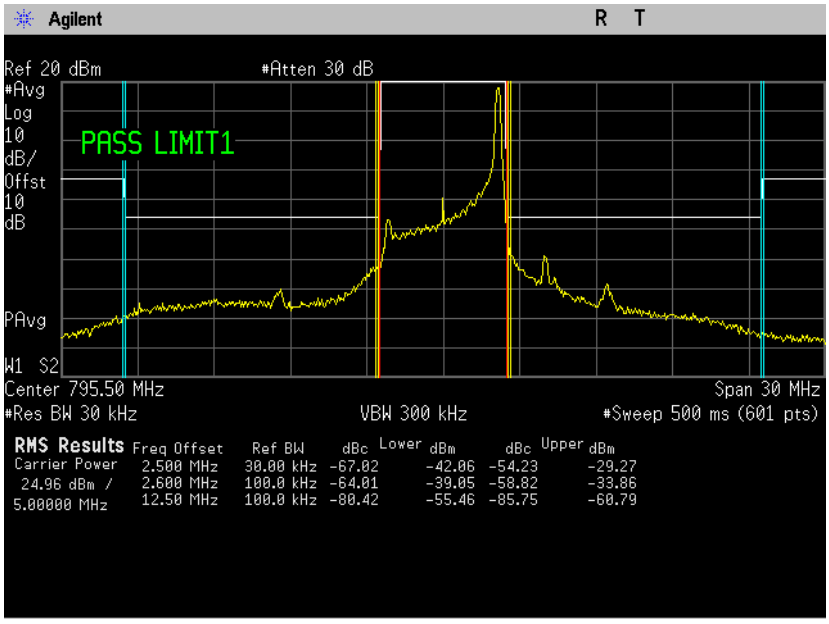
Emission Mask C
Frequency 795.5 MHz
QPSK - RB size 25, RB Offset 0
Plot 4.3.4



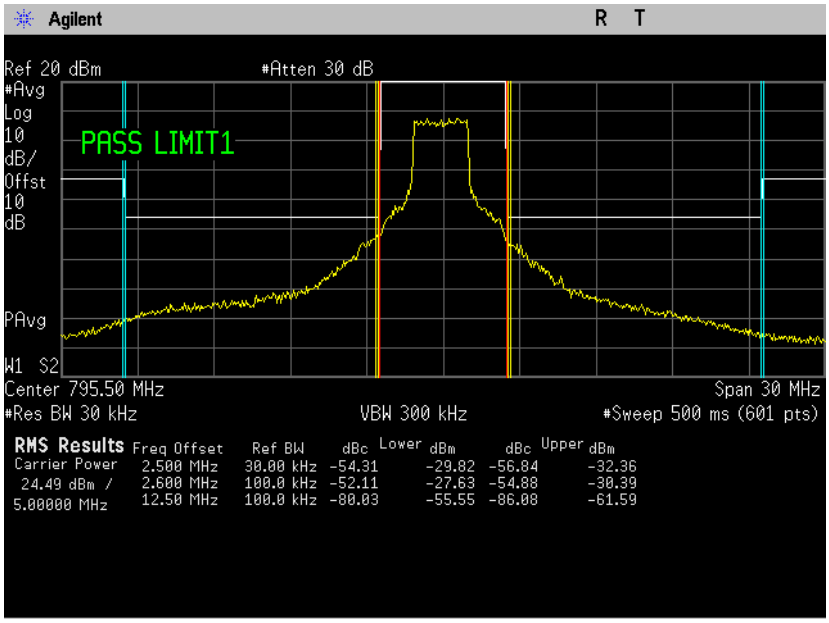
Emission Mask C
Frequency 795.5 MHz
16 QAM - RB size 1, RB Offset 0
Plot 4.3.5



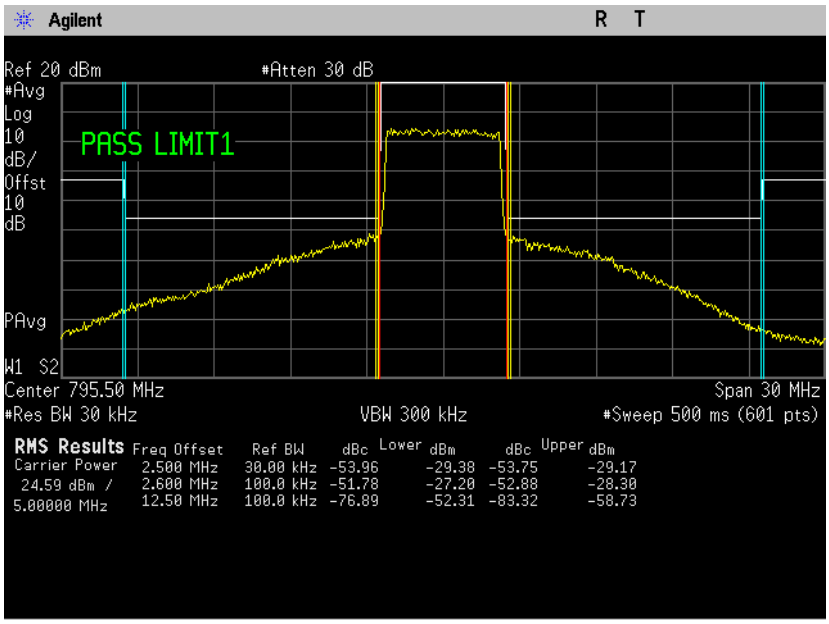
Emission Mask C
Frequency 795.5 MHz
16 QAM - RB size 1, RB Offset 24
Plot 4.3.6



Emission Mask C
Frequency 795.5 MHz
16 QAM - RB size 12, RB Offset 6
Plot 4.3.7



Emission Mask C
Frequency 795.5 MHz
16 QAM - RB size 25, RB Offset 0
Plot 4.3.8



4.4. Conducted Spurious Emissions

Reference document:	47 CFR §90.543 (c)		
Test Requirements:	On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and ina 1 MHz bandwidth for frequencies greater than 1 GHz.		
Test setup:	See sec 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1 MHz, VBW: 3 MHz		
Environment conditions:	Ambient Temperature: 22.1°C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plots 4.4.1- 4.4.16	

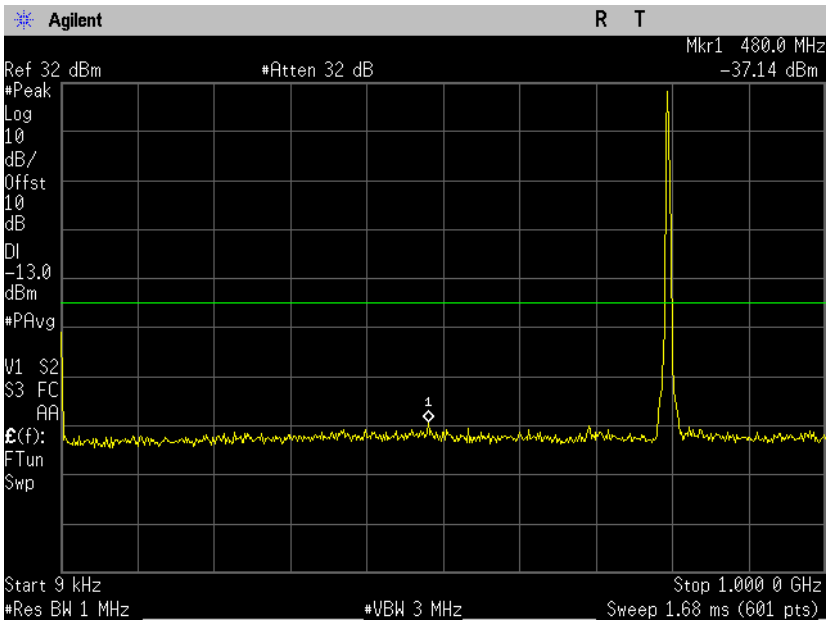
*It translates to a limit of –13dBm

Test results:

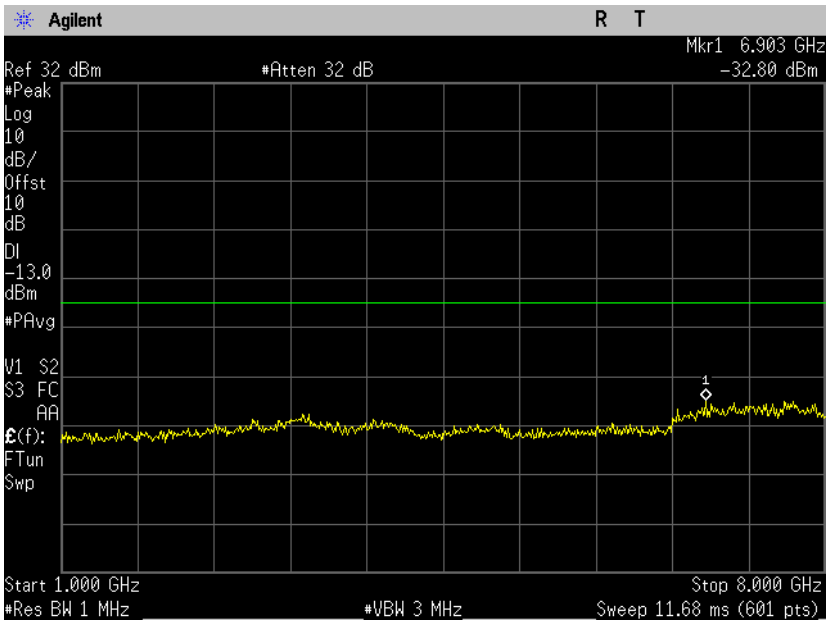
Frequency [MHz]	Resource Block Size	Resource Block Offset	Spurious Emission Frequency [MHz]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]	Reference Plots	Results
QPSK								
795.5	1	0	*	*	-13	*	4.4.1 – 4.4.2	Pass
	1	24	*	*	-13	*	4.4.3 – 4.4.4	Pass
	12	6	*	*	-13	*	4.4.5 – 4.4.6	Pass
	25	0	*	*	-13	*	4.4.7 – 4.4.8	Pass
16 QAM								
795.5	1	0	*	*	-13	*	4.4.9– 4.4.10	Pass
	1	24	*	*	-13	*	4.4.11– 4.4.12	Pass
	12	6	*	*	-13	*	4.4.13– 4.4.14	Pass
	25	0	*	*	-13	*	4.4.15 – 4.4.16	Pass

* All spurious emissions were at least 15 dB below the limit.

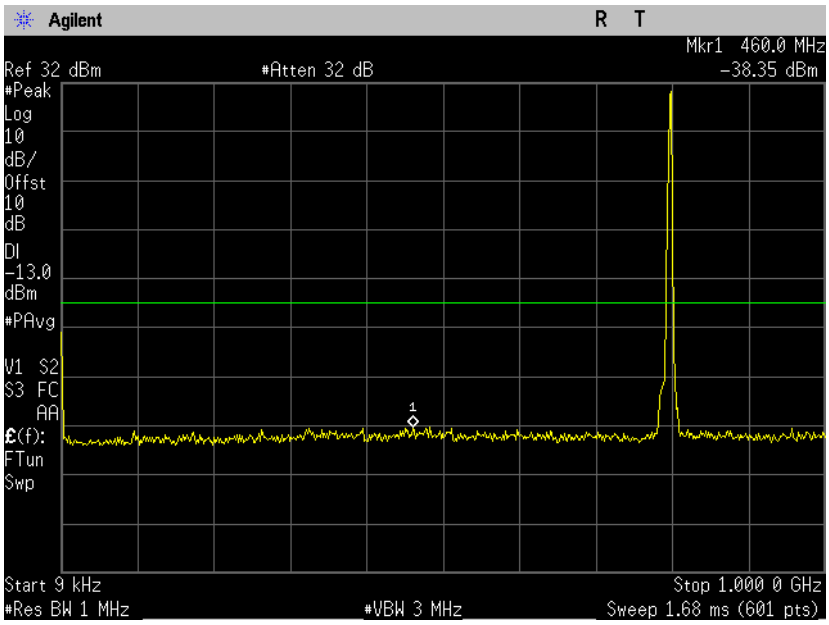
795.5 MHz
QPSK - RB size 1, RB Offset 0
Plot 4.4.1



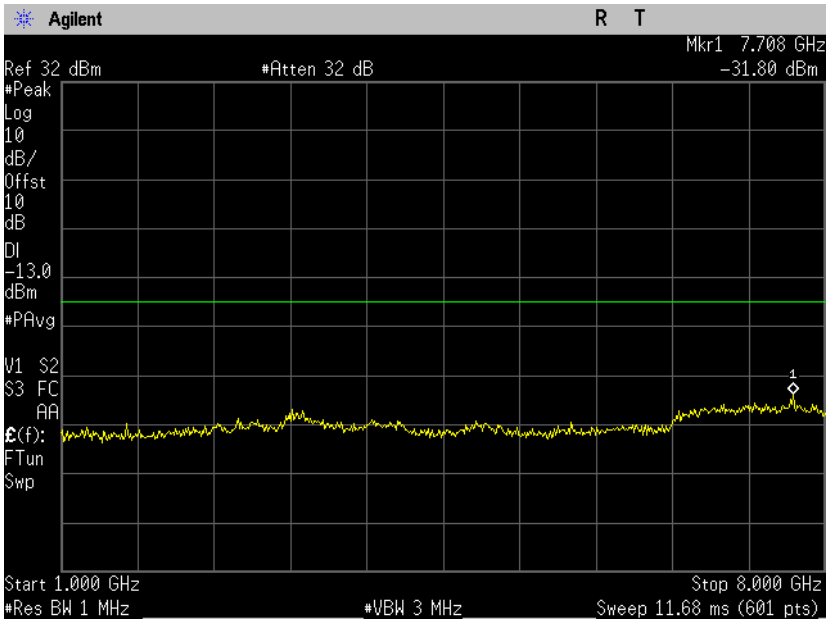
Plot 4.4.2



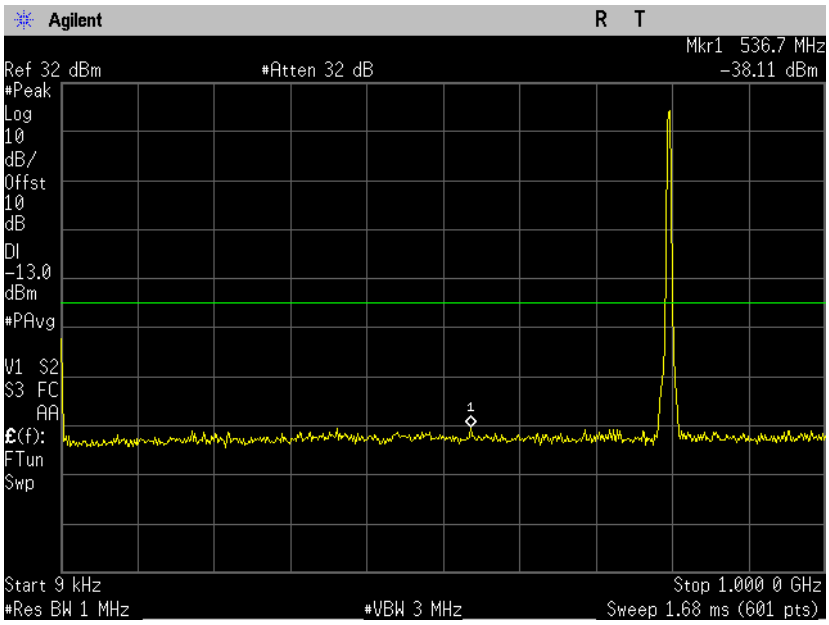
795.5 MHz
QPSK - RB size 1, RB Offset 24
Plot 4.4.3



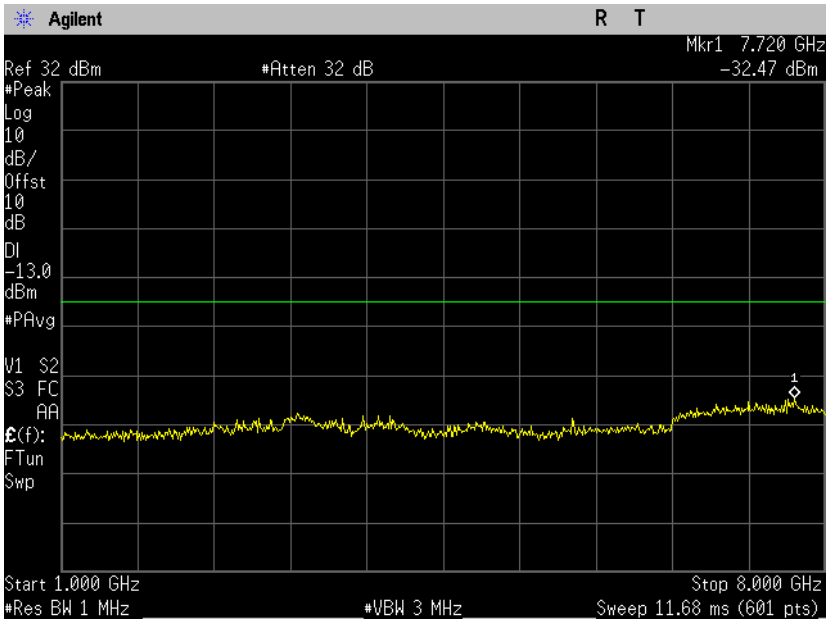
Plot 4.4.4



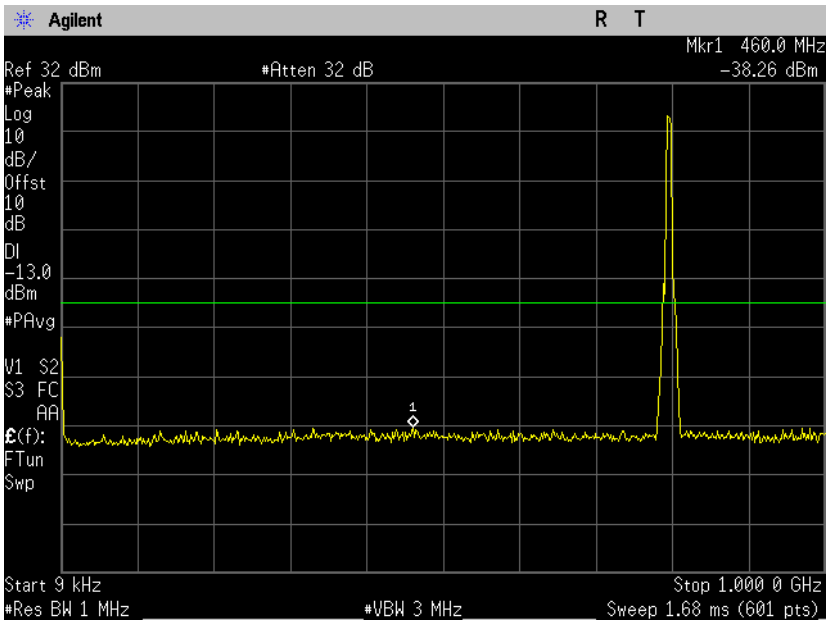
795.5 MHz
QPSK - RB size 12, RB Offset 6
Plot 4.4.5



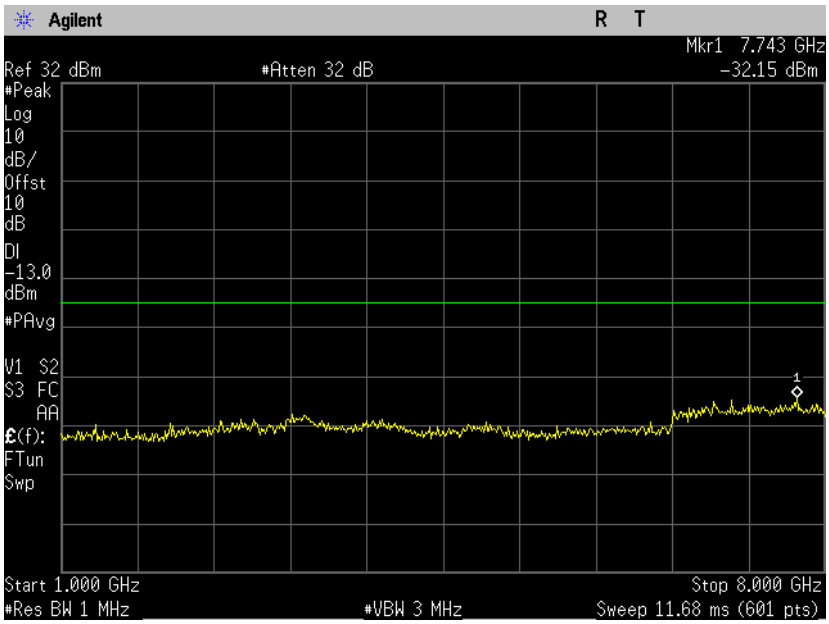
Plot 4.4.6



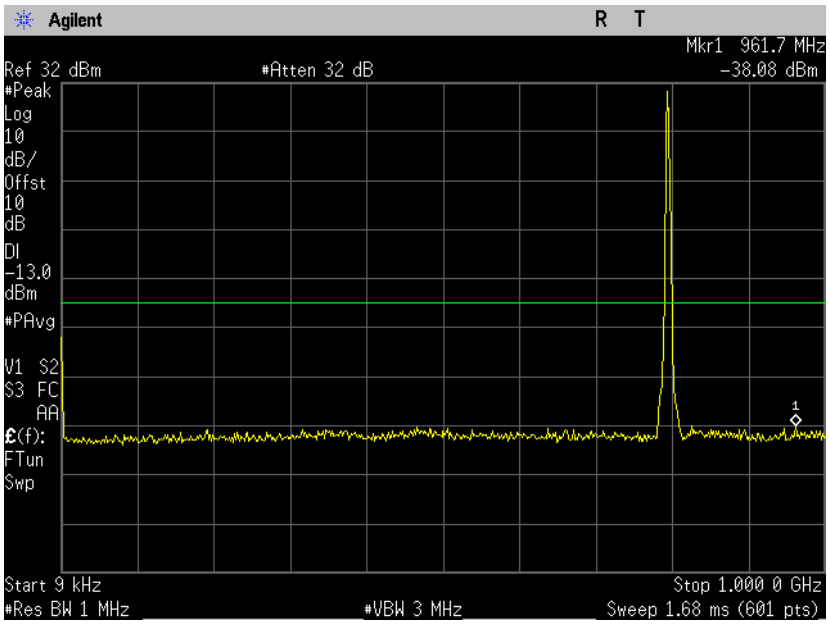
795.5 MHz
QPSK - RB size 25, RB Offset 0
Plot 4.4.7



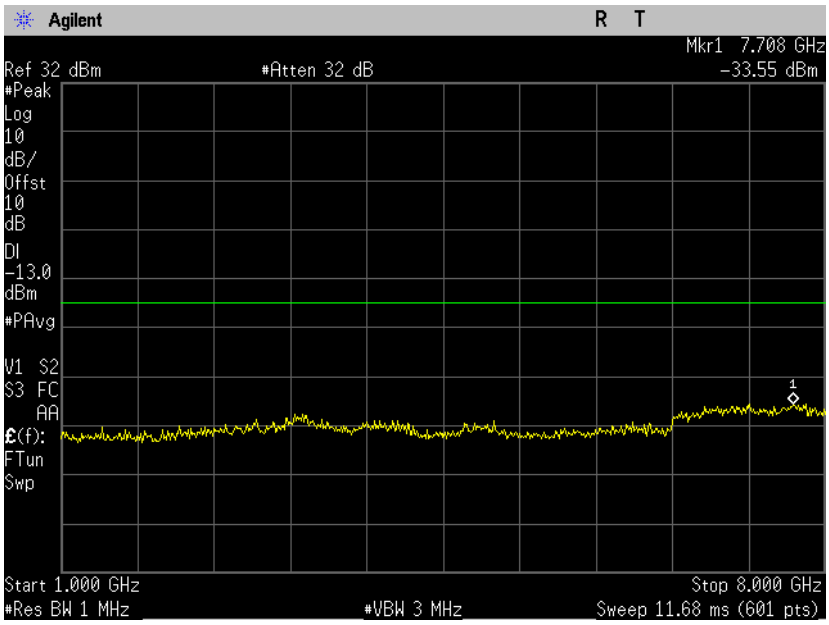
Plot 4.4.8



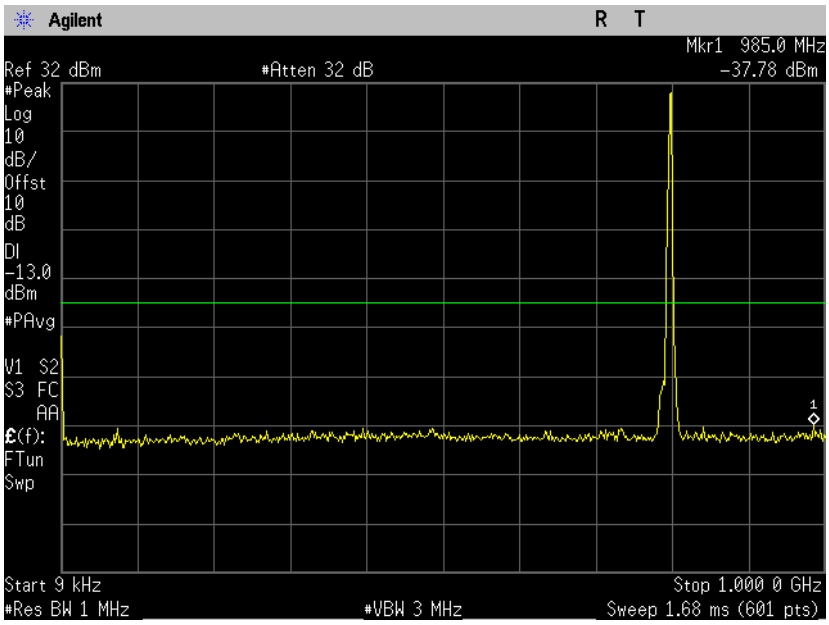
795.5 MHz
16 QAM - RB size 1, RB Offset 0
Plot 4.4.9



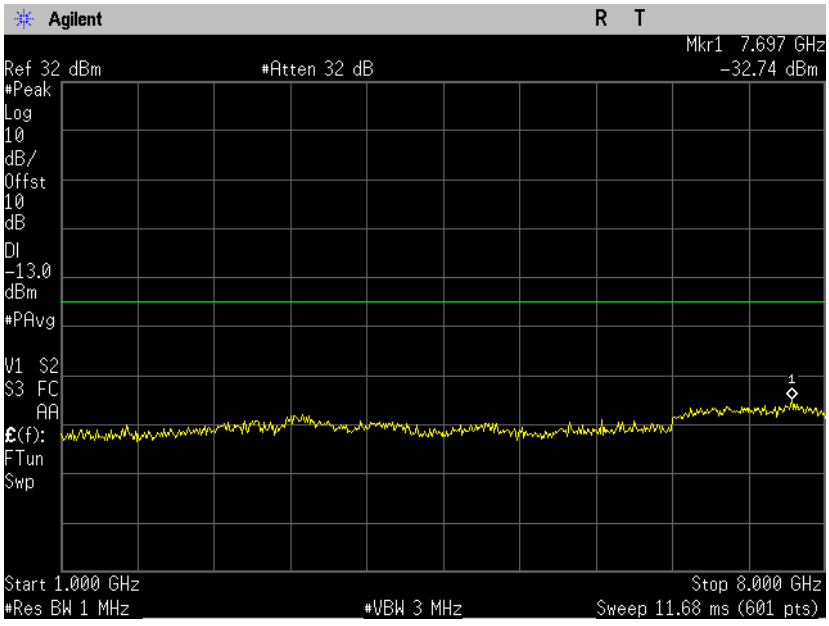
Plot 4.4.10



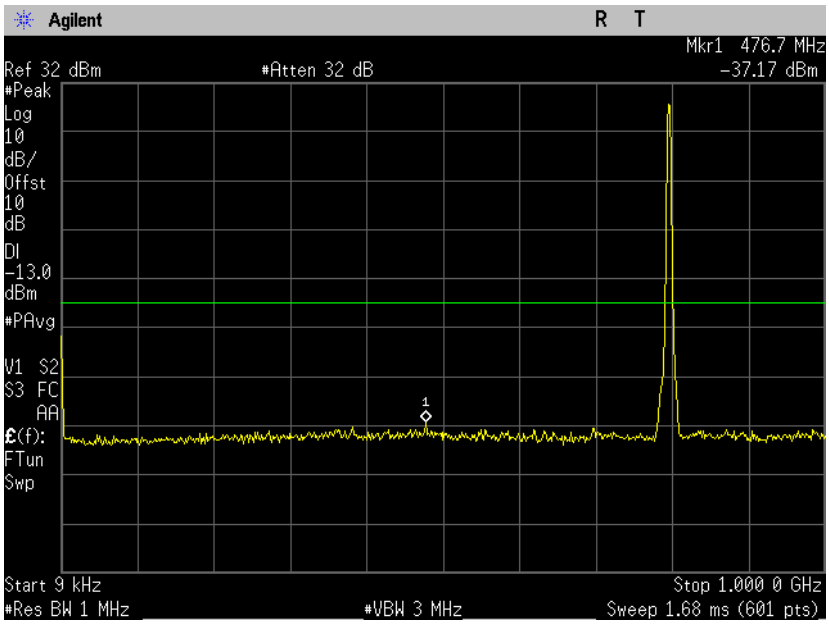
795.5 MHz
16 QAM - RB size 1, RB Offset 24
Plot 4.4.11



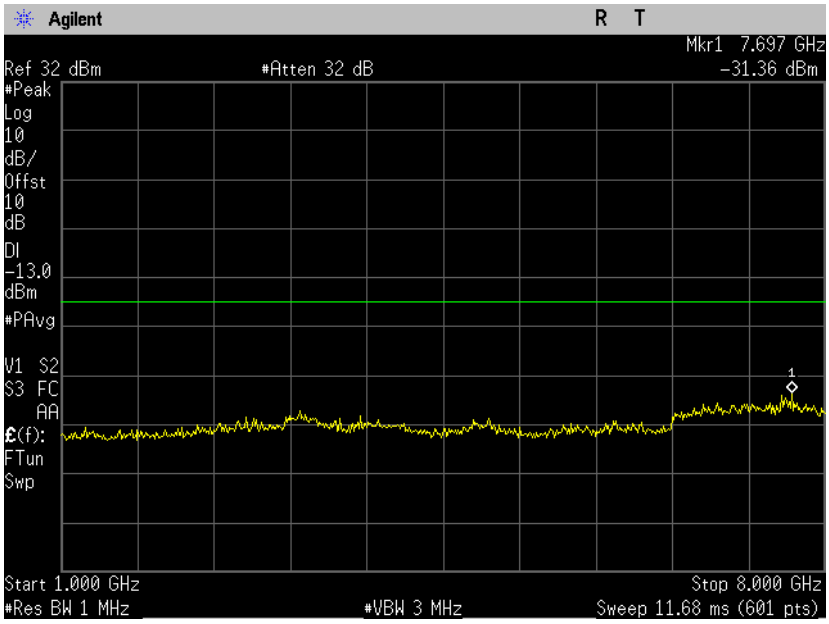
Plot 4.4.12



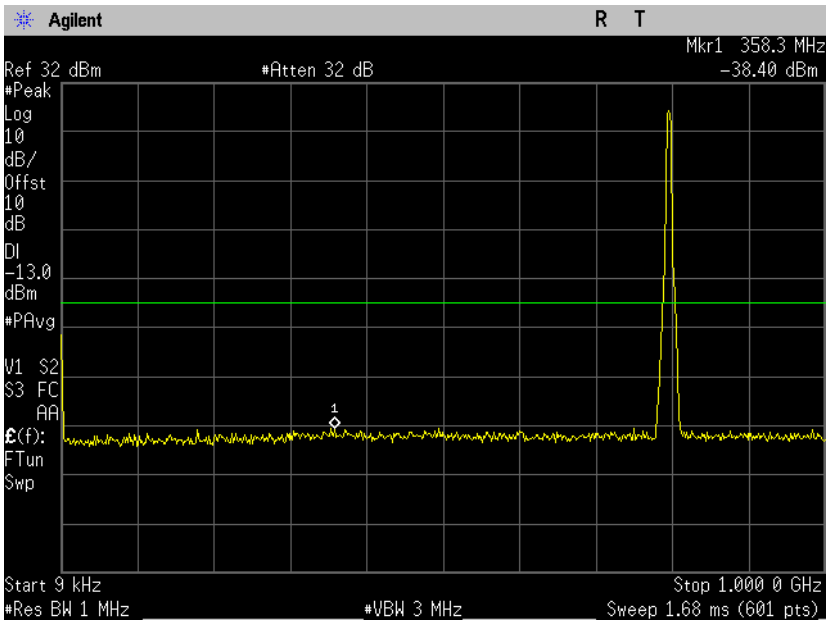
795.5 MHz
16 QAM - RB size 12, RB Offset 6
Plot 4.4.13



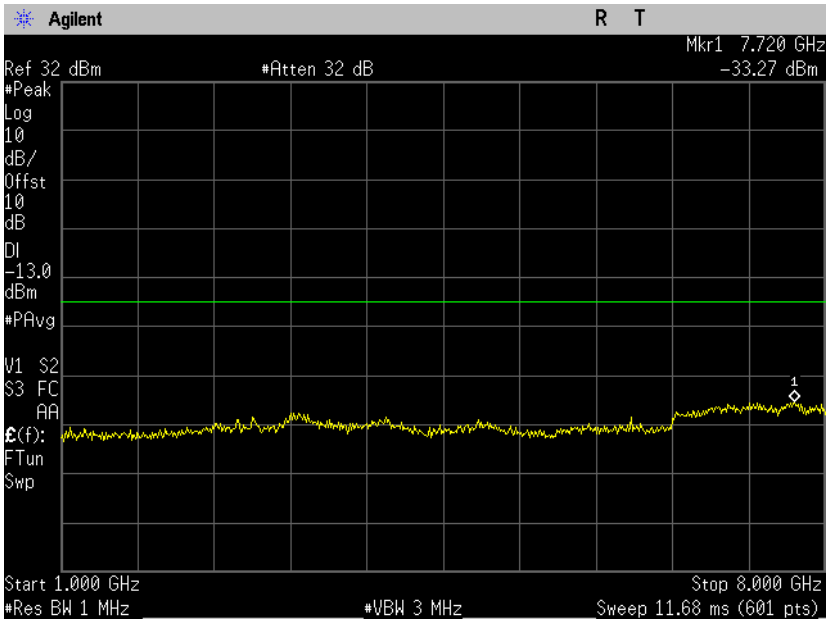
Plot 4.4.14



795.5 MHz
16 QAM - RB size 25, RB Offset 0
Plot 4.4.15



Plot 4.4.16



4.5. Conducted Spurious Emissions between 769-775 MHz and 799-805 MHz

Reference document:	47 CFR §90.543 (e)(2)		
Test Requirements:	For operations in the 793-798 MHz band, the power of any emission on all frequencies between 769-775 MHz and 799-805 MHz shall be attenuated below the transmitter power (P) by a factor not less than 65 +10 log (P) dB* in a 6.25 kHz band segment, for mobile and portable stations.		
Test setup:	See sec 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 6.8 kHz, VBW:1 MHz		
Environment conditions:	Ambient Temperature: 22.1°C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plots 4.5.1- 4.5.16	

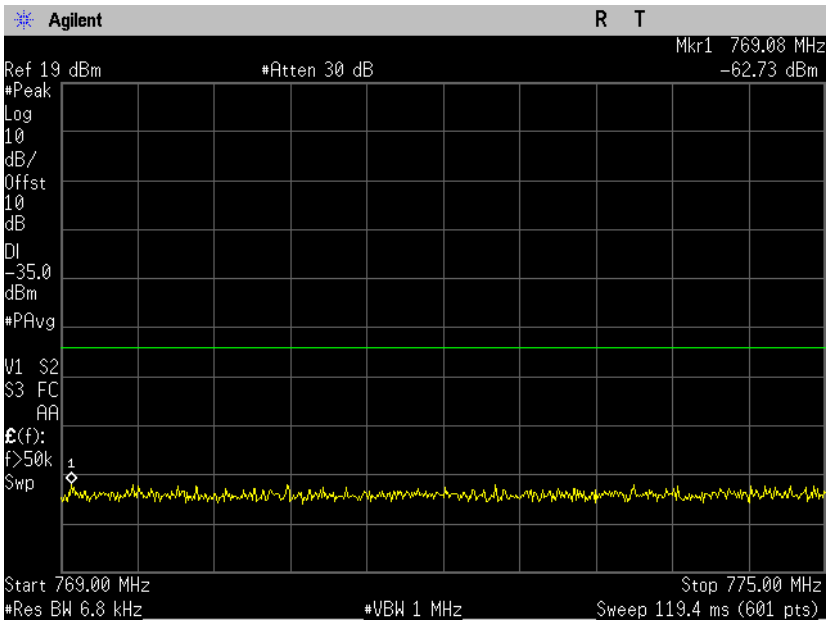
*It translates to a limit of –35dBm

Test results:

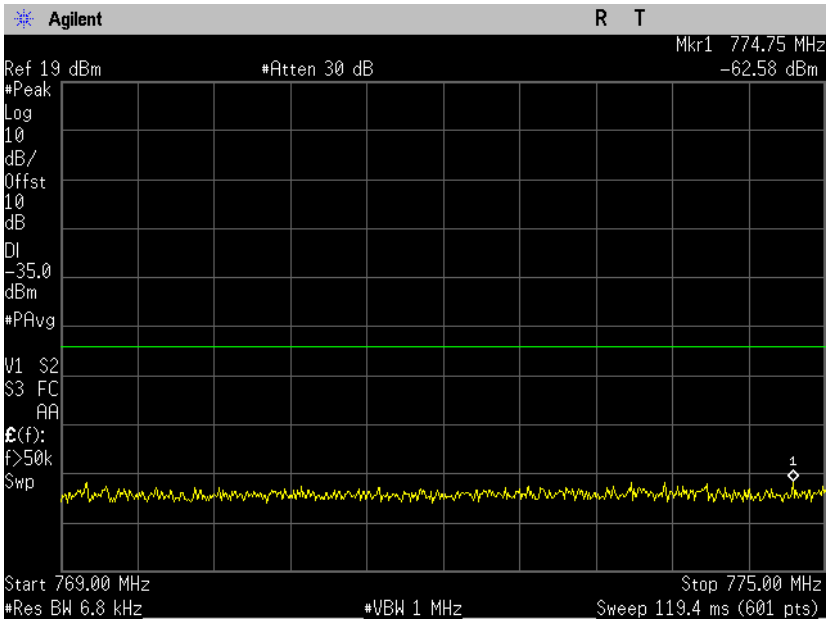
Frequency [MHz]	Resource Block Size	Resource Block Offset	Spurious Emission Frequency [MHz]	Spurious Emission Levels [dBm]	Limit [dBm]	Margin [dB]	Reference Plots	Results
QPSK - Spurious emissions between 769-775 MHz								
795.5	1	0	*	*	-35	*	4.5.1	Pass
	1	24	*	*	-35	*	4.5.2	Pass
	12	6	*	*	-35	*	4.5.3	Pass
	25	0	*	*	-35	*	4.5.4	Pass
QPSK - Spurious emissions between 799-805 MHz								
795.5	1	0	799.02	-54.20	-35	-19.20	4.5.5	Pass
	1	24	799.49	-40.18	-35	-5.18	4.5.6	Pass
	12	6	799.00	-45.97	-35	-10.97	4.5.7	Pass
	25	0	799.11	-38.41	-35	-3.41	4.5.8	Pass
16 QAM - Spurious emissions between 769-775 MHz								
795.5	1	0	*	*	-35	*	4.5.9	Pass
	1	24	*	*	-35	*	4.5.10	Pass
	12	6	*	*	-35	*	4.5.11	Pass
	25	0	*	*	-35	*	4.5.12	Pass
16 QAM - Spurious emissions between 799-805 MHz								
795.5	1	0	799.01	-53.04	-35	-18.04	4.5.13	Pass
	1	24	799.50	-41.71	-35	-6.71	4.5.14	Pass
	12	6	799.10	-43.93	-35	-8.93	4.5.15	Pass
	25	0	799.00	-35.77	-35	-0.77	4.5.16	Pass

* All spurious emissions were at least 20 dB below the limit.

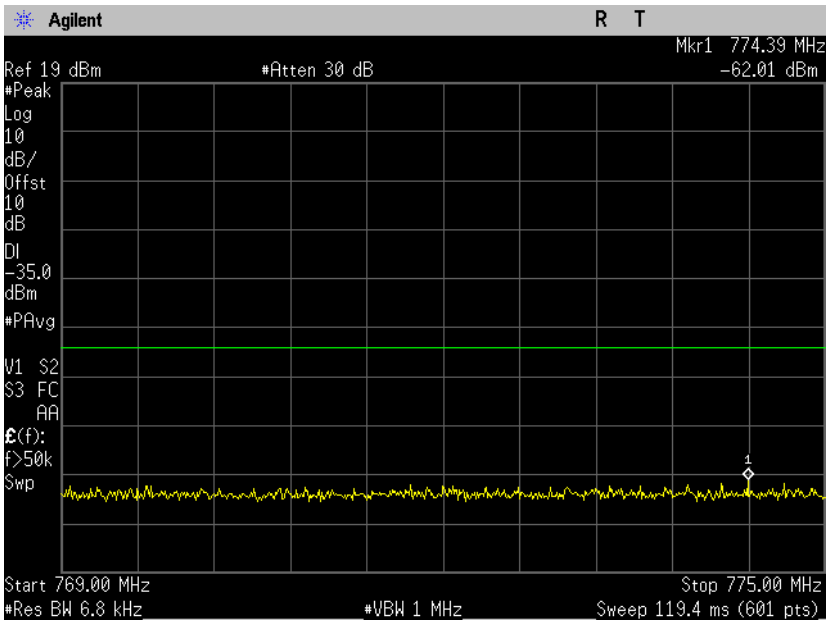
795.5 MHz
QPSK - RB size 1, RB Offset 0
Spurious emissions between 769-775 MHz
Plot 4.5.1



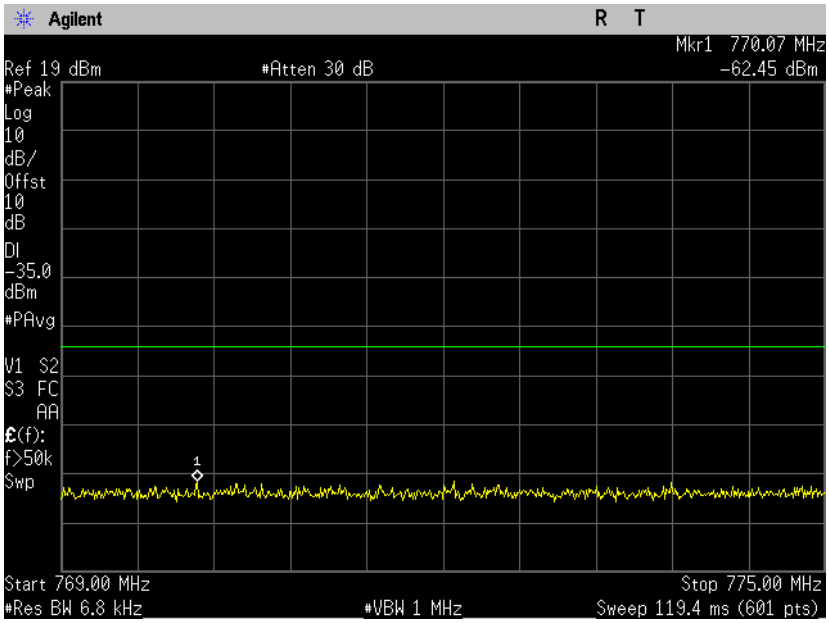
795.5 MHz
QPSK - RB size 1, RB Offset 24
Spurious emissions between 769-775 MHz
Plot 4.5.2



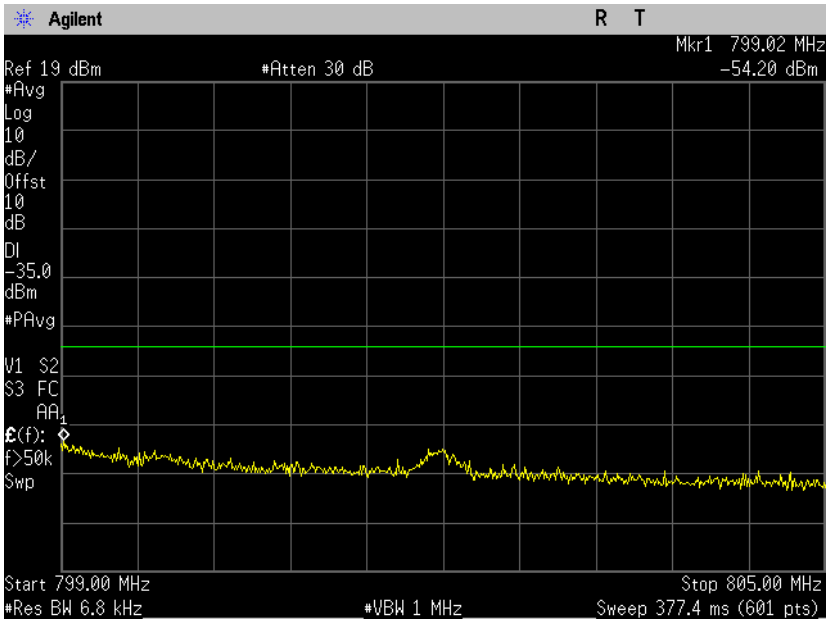
795.5 MHz
QPSK - RB size 12, RB Offset 6
Spurious emissions between 769-775 MHz
Plot 4.5.3



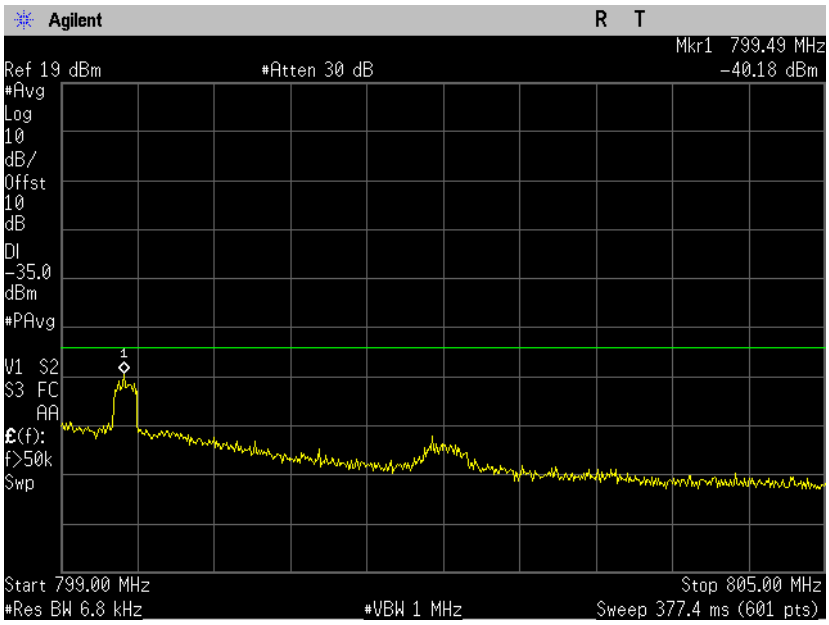
795.5 MHz
QPSK - RB size 25, RB Offset 0
Spurious emissions between 769-775 MHz
Plot 4.5.4



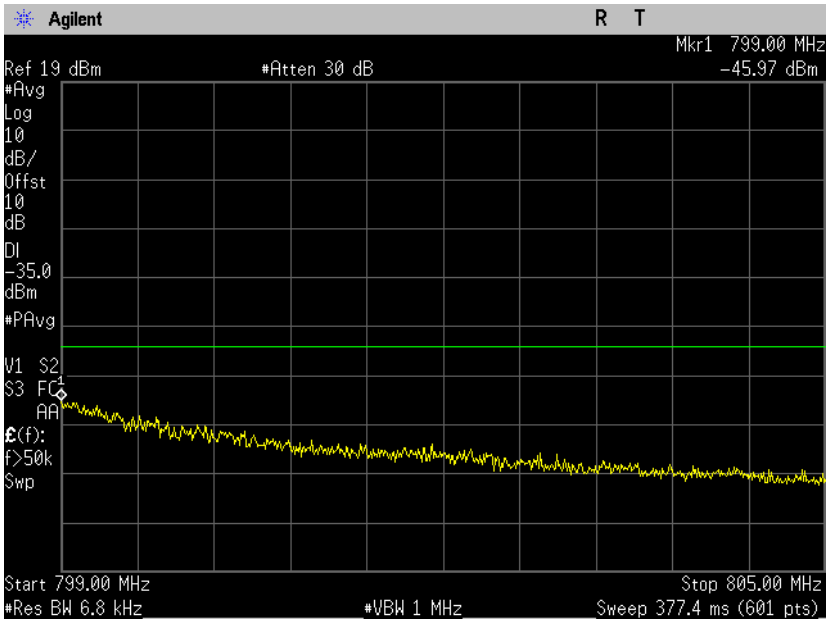
795.5 MHz
QPSK - RB size 1, RB Offset 0
Spurious emissions between 799-805 MHz
Plot 4.5.5



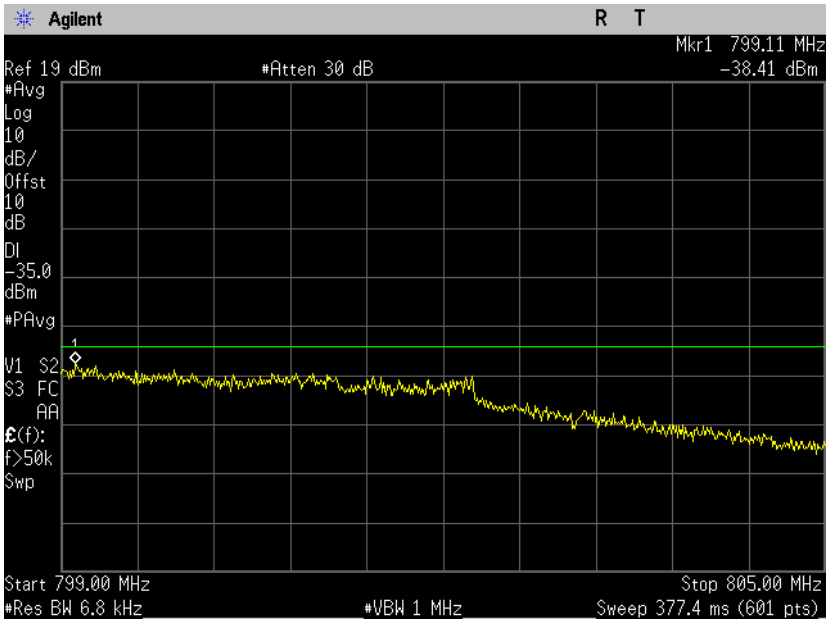
795.5 MHz
QPSK - RB size 1, RB Offset 24
Spurious emissions between 799-805 MHz
Plot 4.5.6



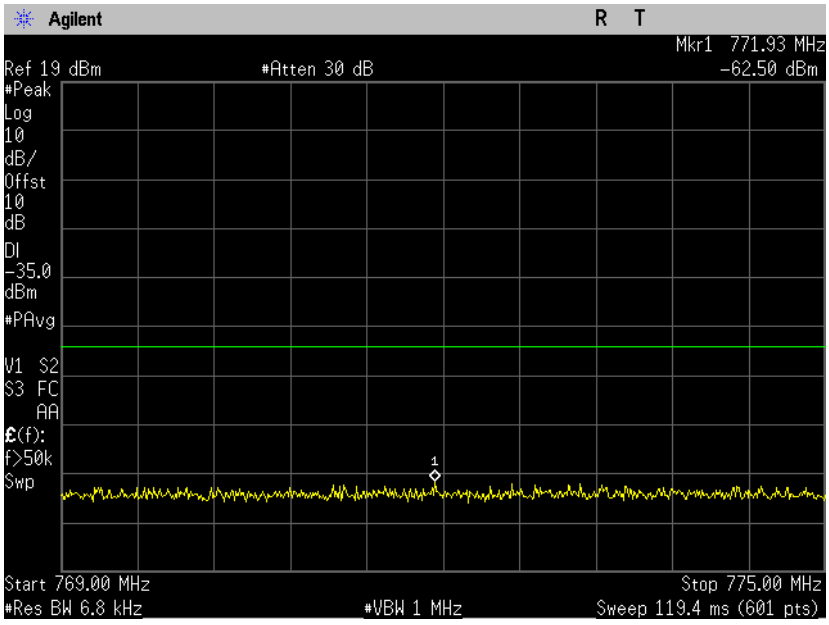
795.5 MHz
QPSK - RB size 12, RB Offset 6
Spurious emissions between 799-805 MHz
Plot 4.5.7



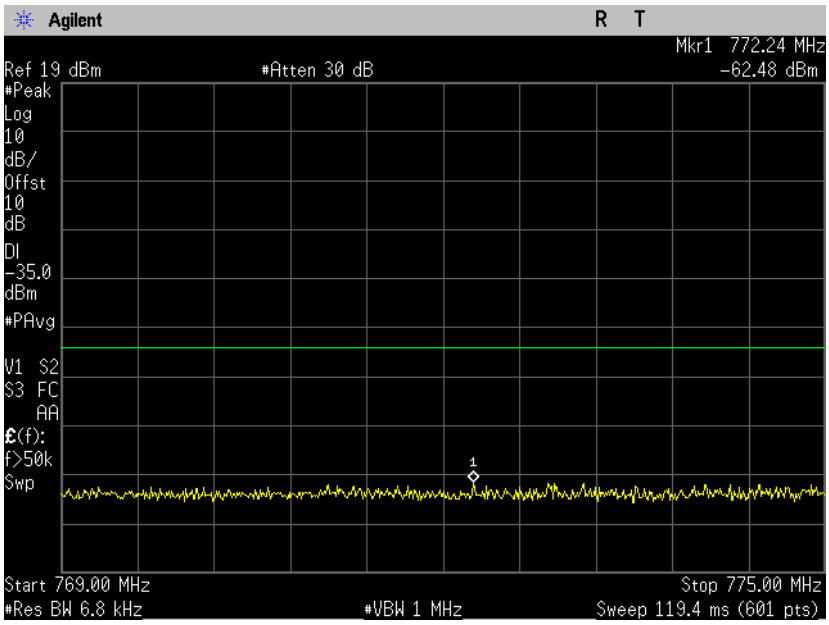
795.5 MHz
QPSK - RB size 25, RB Offset 0
Spurious emissions between 799-805 MHz
Plot 4.5.8



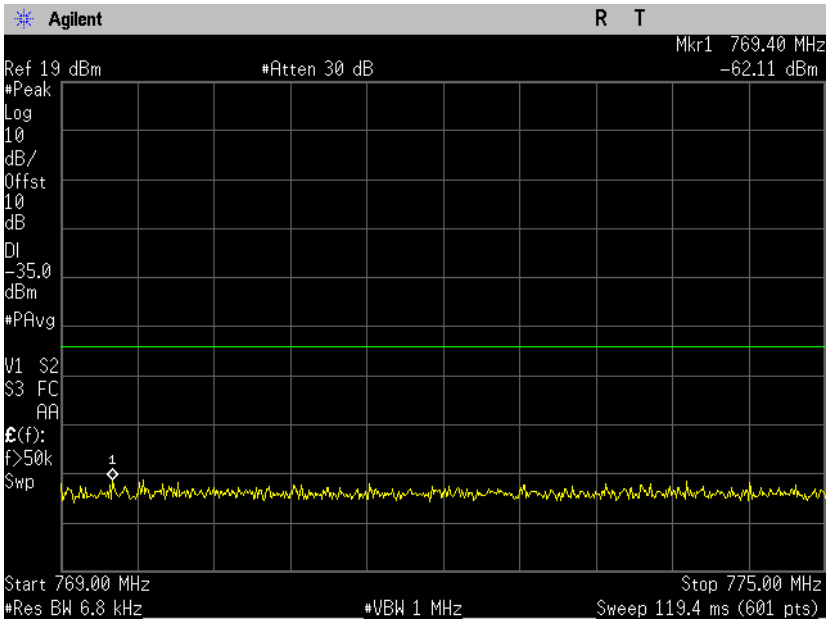
795.5 MHz
16 QAM - RB size 1, RB Offset 0
Spurious emissions between 769-775 MHz
Plot 4.5.9



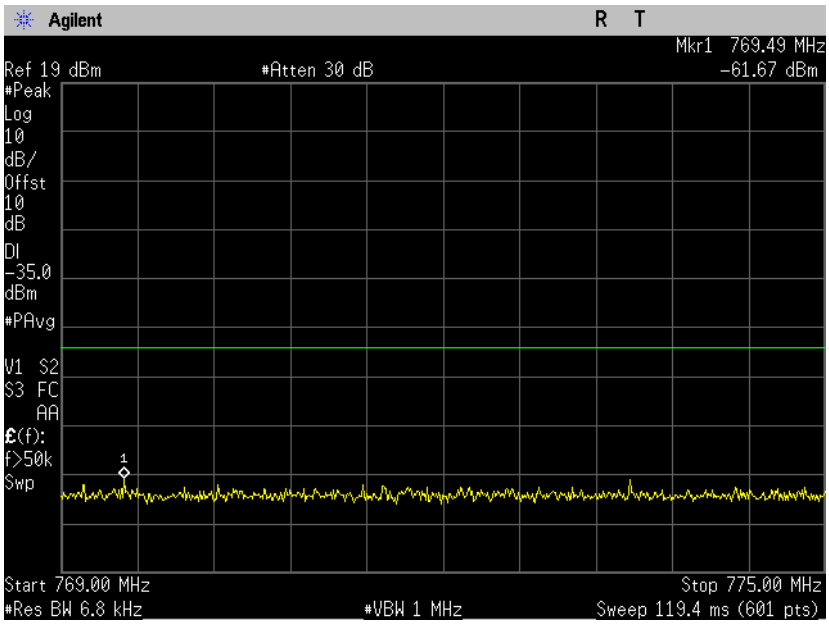
795.5 MHz
16 QAM - RB size 1, RB Offset 24
Spurious emissions between 769-775 MHz
Plot 4.5.10



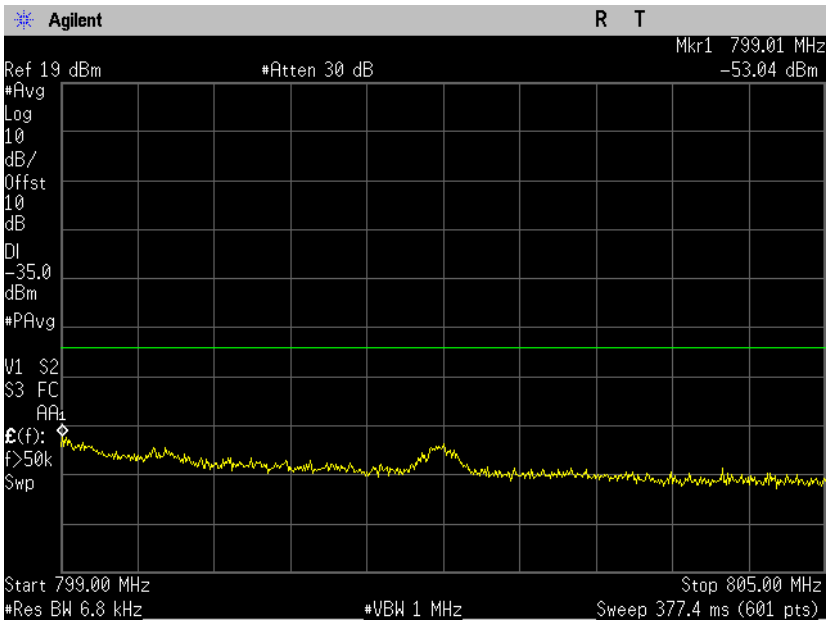
795.5 MHz
16 QAM - RB size 12, RB Offset 6
Spurious emissions between 769-775 MHz
Plot 4.5.11



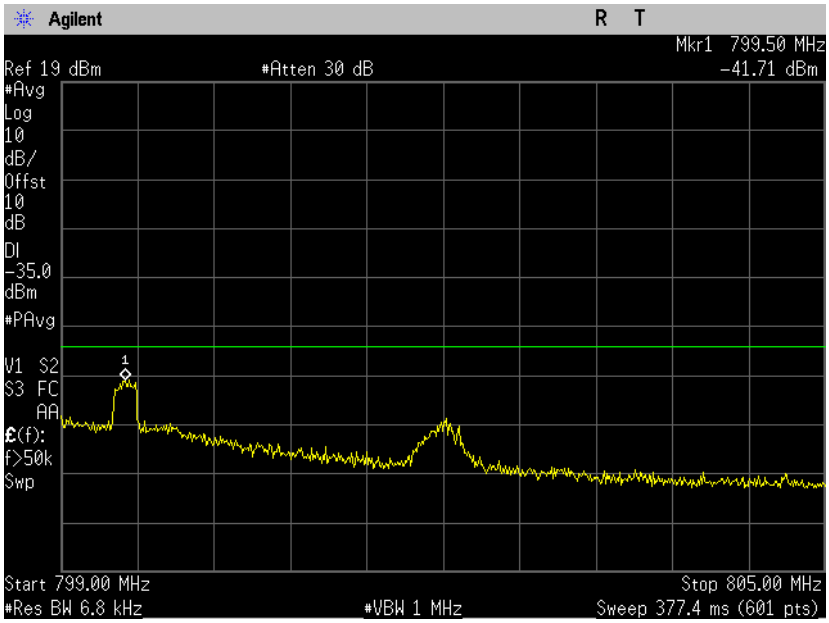
795.5 MHz
16 QAM - RB size 25, RB Offset 0
Spurious emissions between 769-775 MHz
Plot 4.5.12



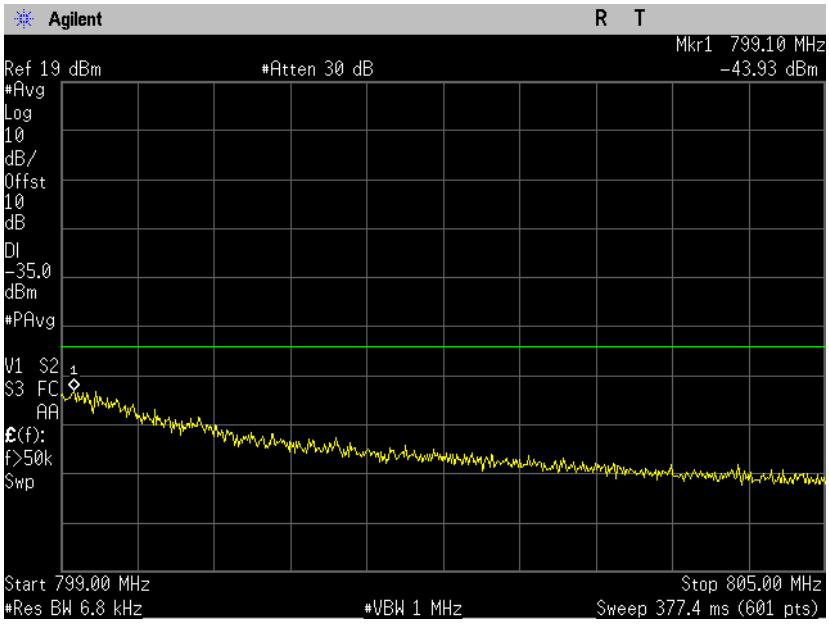
795.5 MHz
16 QAM - RB size 1, RB Offset 0
Spurious emissions between 799-805 MHz
Plot 4.5.13



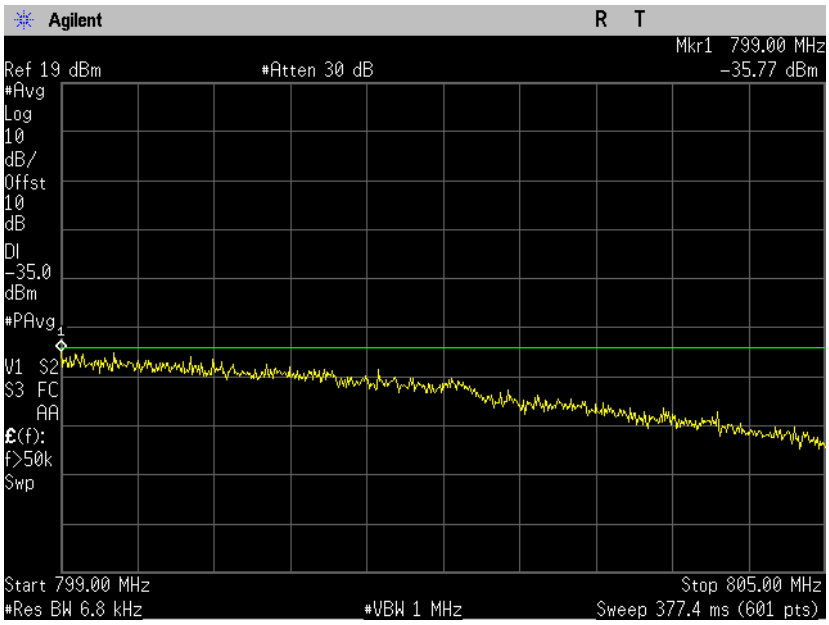
795.5 MHz
16 QAM - RB size 1, RB Offset 24
Spurious emissions between 799-805 MHz
Plot 4.5.14



795.5 MHz
16 QAM - RB size 12, RB Offset 6
Spurious emissions between 799-805 MHz
Plot 4.5.15



795.5 MHz
16 QAM - RB size 25, RB Offset 0
Spurious emissions between 799-805 MHz
Plot 4.5.16



4.6. Radiated Peak Power Output

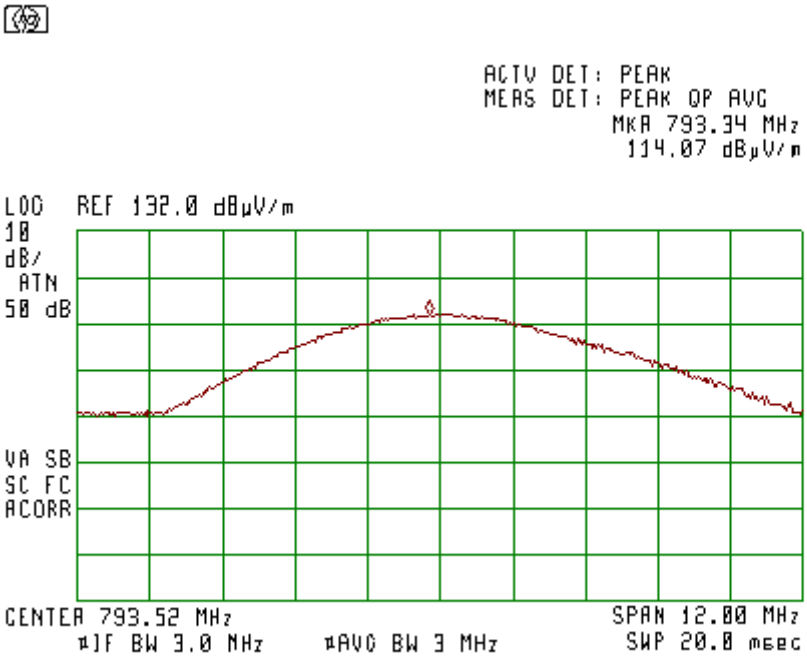
Reference document:	47 CFR §90.542 (a)(6)		
Test Requirements:	Mobile stations transmitting in the 776-793 MHz band are limited to 30 watts ERP.		
Test setup:	See sec 2.2	**Pass**	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3 MHz, VBW: 3 MHz		
Environment conditions:	Ambient Temperature: 22.1°C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plots 4.6.1 – 4.6.4	

Test results:

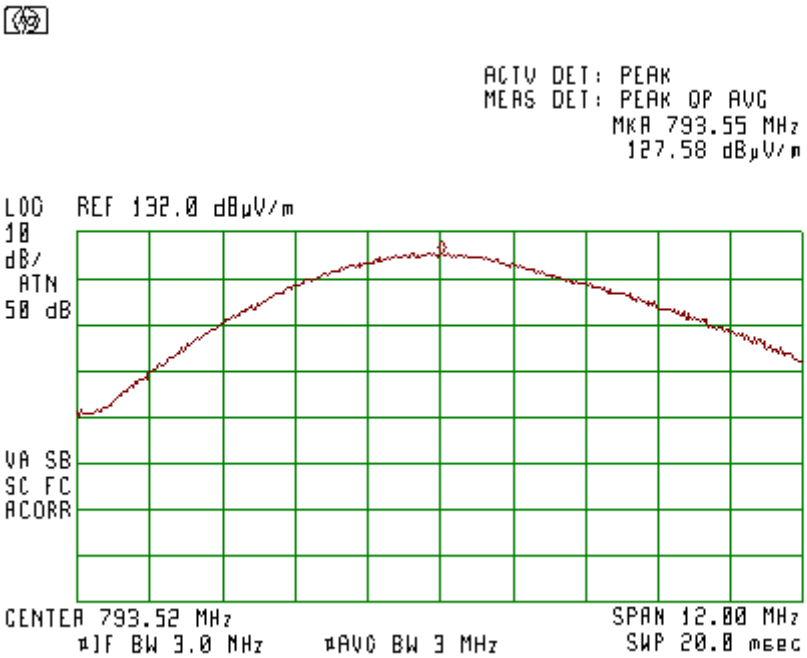
Emission Frequency [MHz]	Max Reading [dBµV/m]	Polarization [H/V]	*Signal Generator Level [dBm]	Antenna Gain [dBd]	ERP calculated [dBm]	Limit [dBm]	Margin [dB]	Reference Plots	Results
795.5 MHz - QPSK - RB size 1, RB Offset 0									
793.55	127.58	V & H	22.26	4.73	26.99	44.77	-17.78	4.6.1-4.6.2	Pass
795.5 MHz - 16 QAM - RB size 1, RB Offset 0									
793.25	127.93	V & H	22.61	4.73	27.34	44.77	-17.43	4.6.3-4.6.4	Pass

*Corrected for cable loss

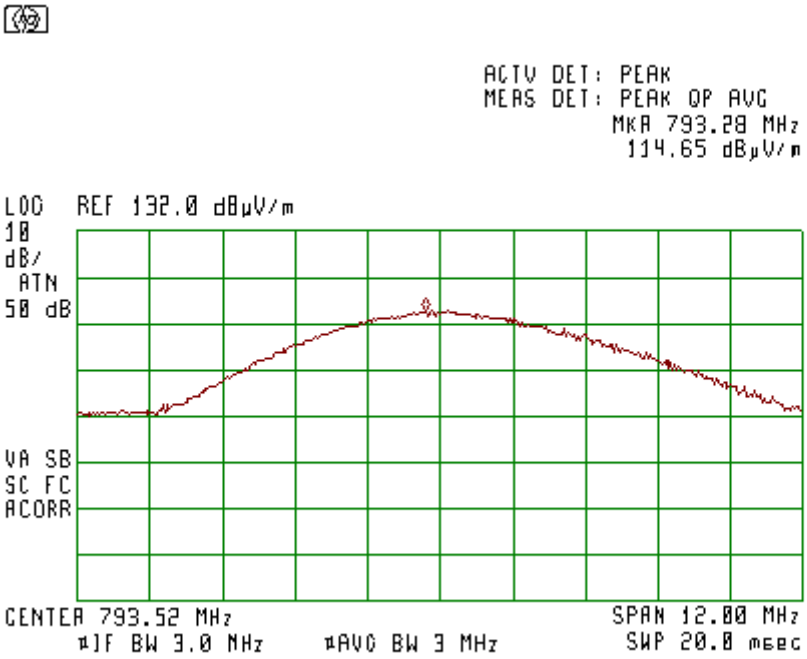
790.5 MHz
QPSK - RB size 1, RB Offset 0
Horizontal Polarization
Plot 4.6.1



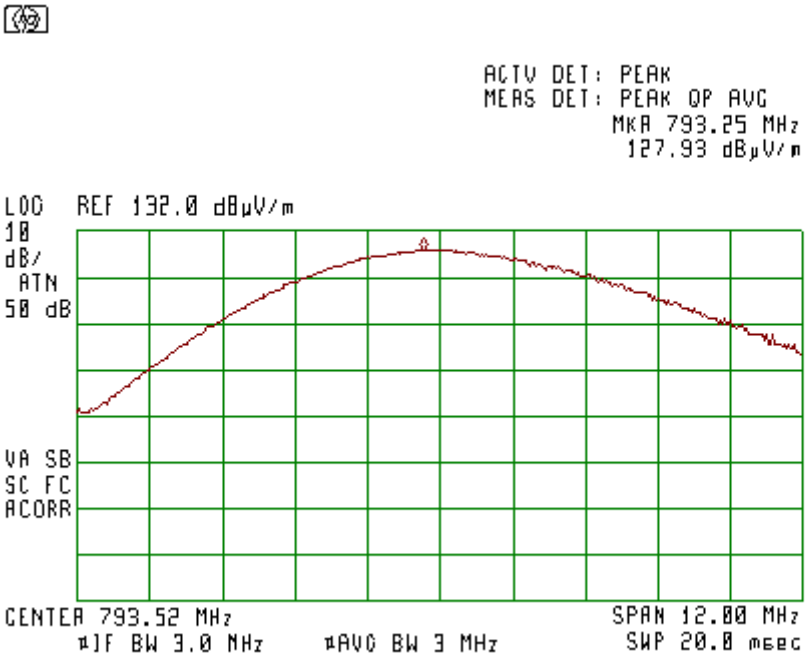
Vertical Polarization
Plot 4.6.2



790.5 MHz
16 QAM - RB size 1, RB Offset 0
Horizontal Polarization
Plot 4.6.3



Vertical Polarization
Plot 4.6.4



4.7. Field Strength of Spurious Radiation

Reference document:	47 CFR §90.543 (c)		
Test Requirements:	On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and ina 1 MHz bandwidth for frequencies greater than 1 GHz.		
Test setup:	See sec 2.2	**Pass**	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	f <1GHz: RBW: 120 kHz, VBW: 300 kHz f >1GHz: RBW: 1 MHz, VBW**:** 3 MHz		
Environment conditions:	Ambient Temperature: 22.1°C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plots 4.7.1- 4.7.8	

*It translates to a limit of –13dBm

Test results:

Spurious Emission Frequency [MHz]	Max Reading [dBµV/m]	Polarization [H/V]	Signal Generator Level [dBm]	Antenna Gain [dBd]	Emission power calculated [dBm]	Limit [dBm]	Margin [dB]	Reference Plots	Results
795.5 MHz - QPSK - RB size 1, RB Offset 0									
*	*	*	*	*	*	-13	*	4.7.1-4.7.3	Pass
795.5 MHz - 16 QAM - RB size 1, RB Offset 0									
*	*	*	*	*	*	-13	*	4.7.4-4.7.6	Pass

* All readings were at least 15 dB below the limit.

Note: Measurements were taken using a high pass filter (where appropriate) at the spectrum analyzer input.

Test results below 1GHz:

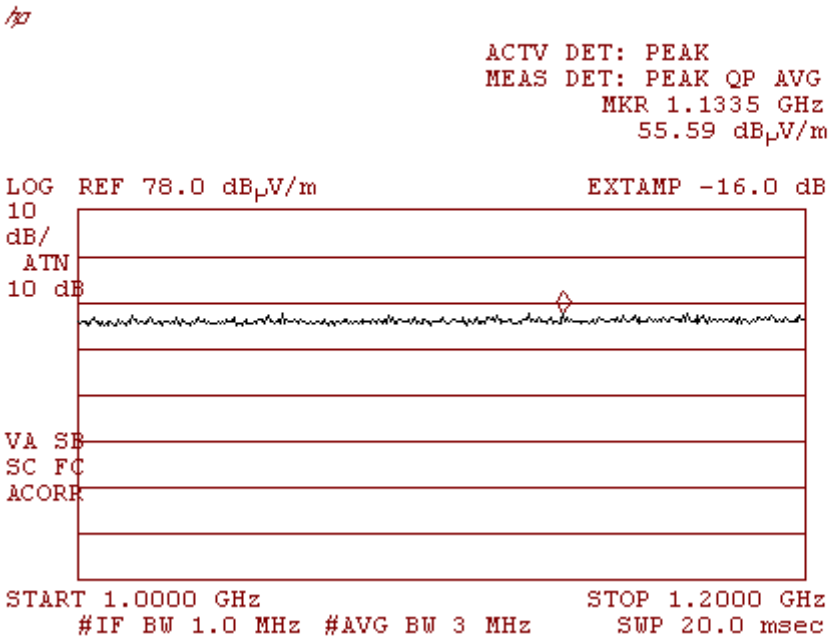
All measurements were done in horizontal and vertical polarizations; the results show the worst-case for all modulations.

Spurious Emission Frequency [MHz]	Max Reading [dBµV/m]	Polarization [H/V]	*Signal Generator Level [dBm]	Antenna Gain [dBd]	Emission power calculated [dBm]	Limit [dBm]	Margin [dB]	Result
*	*	*	*	*	*	-13	4.7.7-4.7.8	Pass

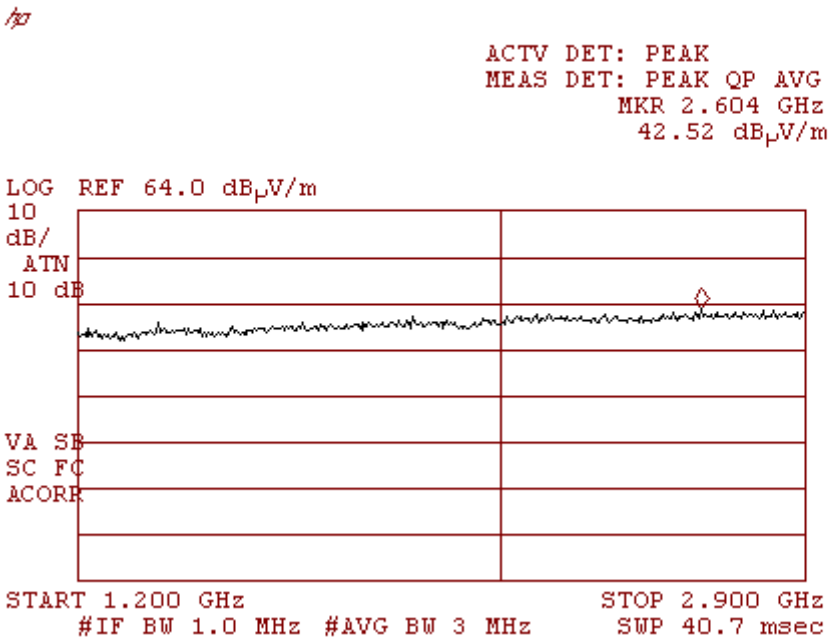
* All readings were at least 15 dB below the limit.

Note: Measurements were taken using a band reject filter (where appropriate) at the spectrum analyzer input.

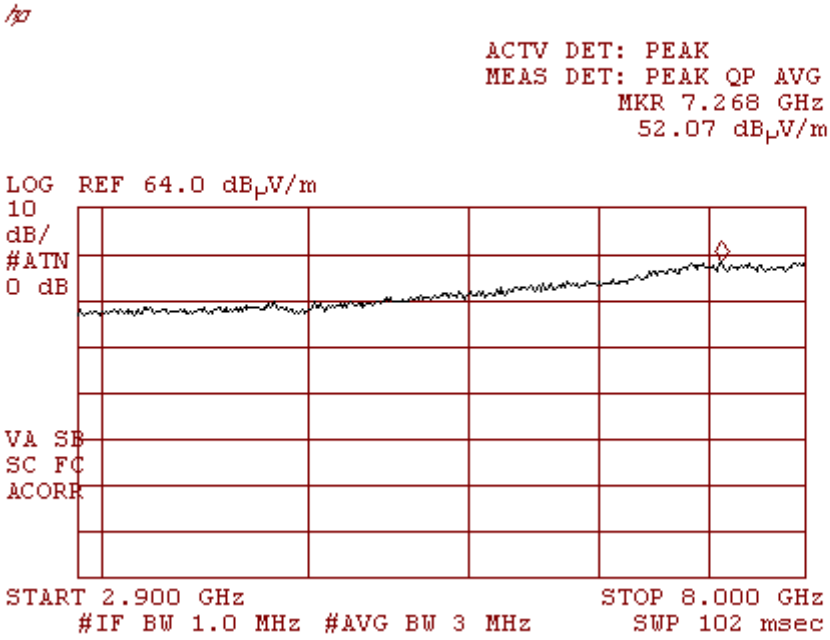
795.5 MHz
QPSK - RB size 1, RB Offset 0
Horizontal & Vertical Polarization
Plot 4.7.1



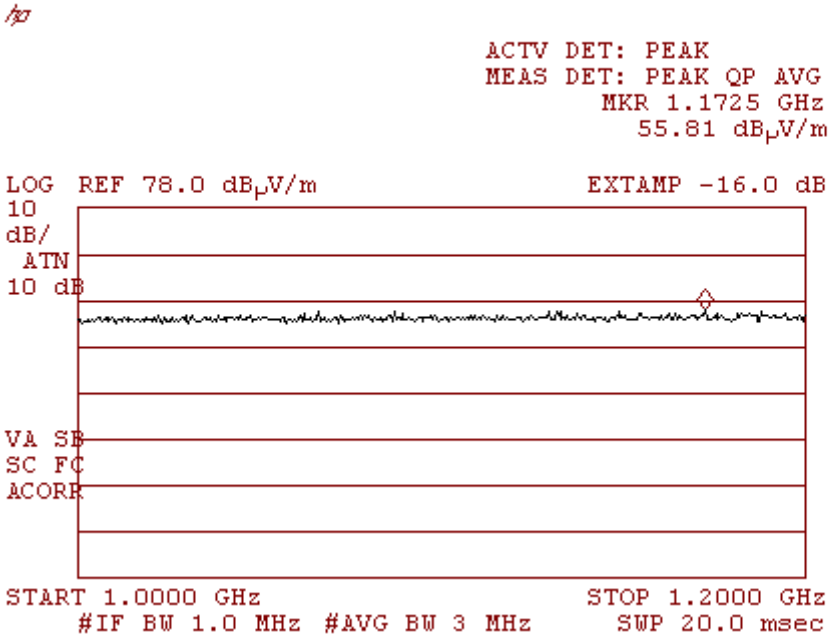
Horizontal & Vertical Polarization
Plot 4.7.2



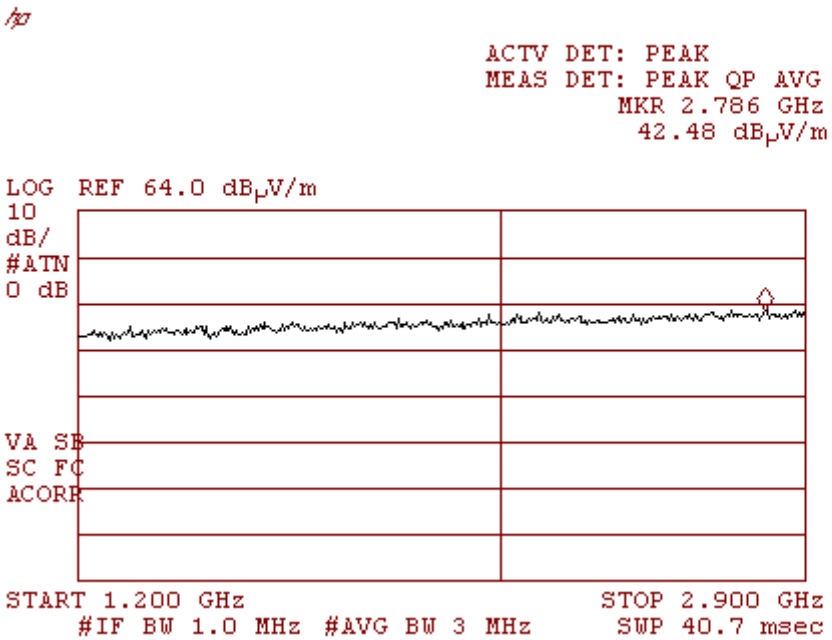
Horizontal & Vertical Polarization
Plot 4.7.3



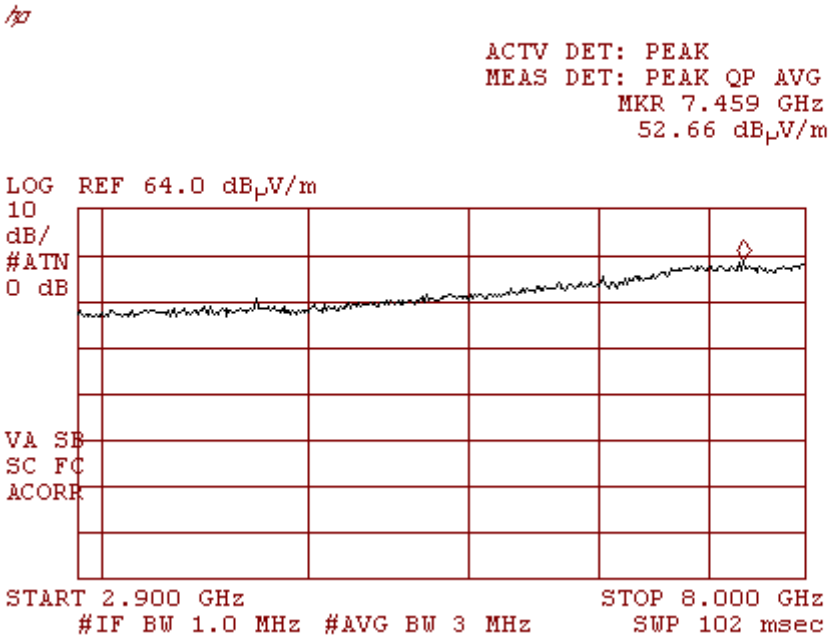
795.5 MHz
16 QAM - RB size 1, RB Offset 0
Horizontal & Vertical Polarization
Plot 4.7.4



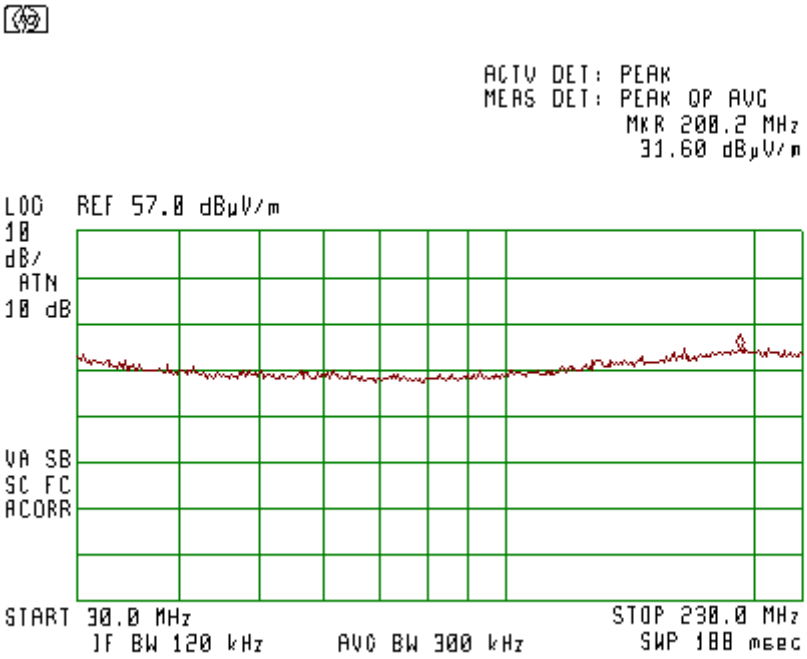
Horizontal & Vertical Polarization
Plot 4.7.5



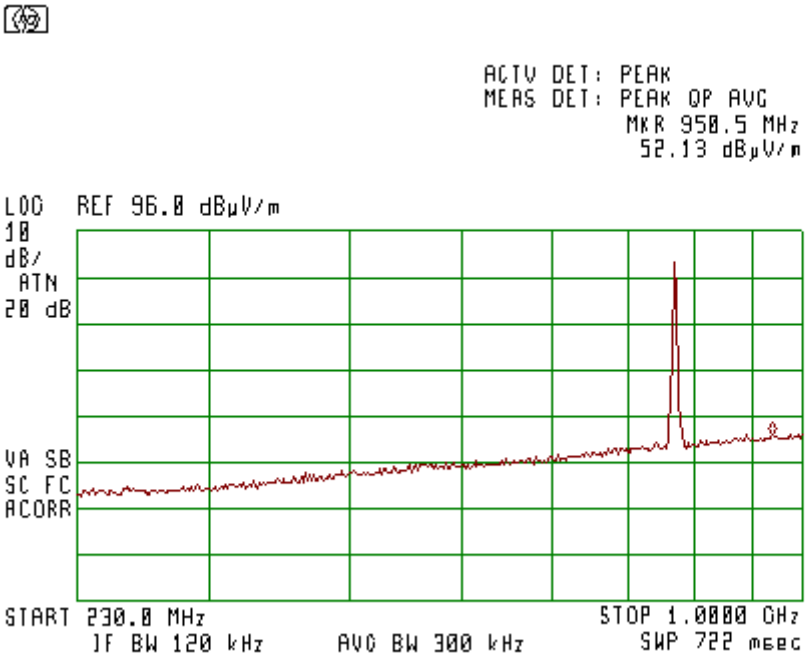
Horizontal & Vertical Polarization
Plot 4.7.6



Below 1 GHz
Worst-case for all modulations
Horizontal & Vertical Polarization
Plot 4.7.7



Horizontal & Vertical Polarization
Plot 4.7.8



4.8. Field Strength of Spurious Radiation between 769-775 MHz and 799-805 MHz

Reference document:	47 CFR §90.543 (e)(2)		
Test Requirements:	For operations in the 793-798 MHz band, the power of any emission on all frequencies between 769-775 MHz and 799-805 MHz shall be attenuated below the transmitter power (P) by a factor not less than 65 +10 log (P) dB* in a 6.25 kHz band segment, for mobile and portable stations.		
Test setup:	See sec 2.2	**Pass**	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 10 kHz, VBW:100 kHz		
Environment conditions:	Ambient Temperature: 22.1°C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plots 4.8.1- 4.8.8	

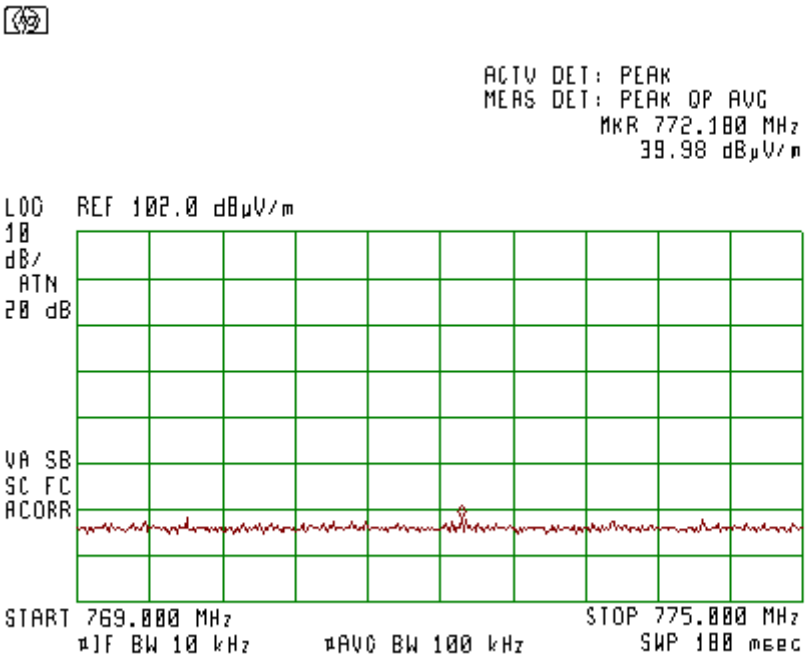
*It translates to a limit of –35dBm

Test results:

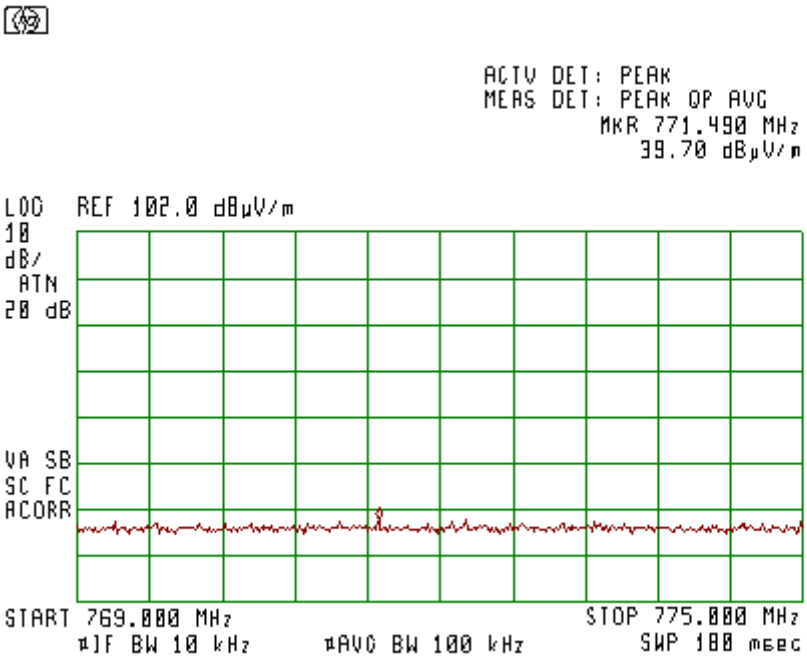
Spurious Emission Frequency [MHz]	Max Reading [dBµV/m]	Polarization [H/V]	**Signal Generator Level [dBm]	Antenna Gain [dBd]	Emission power calculated [dBm]	Limit*** [dBm]	Margin [dB]	Reference Plots	Results
795.5 MHz – QPSK – RB size 25, RB Offset 0 Spurious radiation between 769-775 MHz									
*	*	H & V	*	*	*	-32.96	*	4.8.1-4.8.2	Pass
795.5 MHz – QPSK – RB size 25, RB Offset 0 Spurious radiation between 799-805 MHz									
799.06	67.22	H & V	-39.85	4.71	-35.14	-32.96	-2.18	4.8.3-4.8.4	Pass
795.5 MHz – 16 QAM – RB size 25, RB Offset 0 Spurious radiation between 769-775 MHz									
*	*	H & V	*	*	*	-32.96	*	4.8.5-4.8.6	Pass
795.5 MHz – 16 QAM – RB size 25, RB Offset 0 Spurious radiation between 799-805 MHz									
799.27	68.91	V	-38.16	4.71	-33.45	-32.96	-0.49	4.8.7-4.8.8	Pass

* All readings were at least 15 dB below the limit.
** Corrected for cable loss
*** Limit is equal to -35 dBm in a 6.25 kHz band segment. Measurements were made by using 10 kHz resolution bandwidth.
The correction factor of 10×log(10 kHz/6.25 kHz) = 2.04 dB was added to the limit.
Corrected Limit = -35+2.04 = -32.96 dBm.

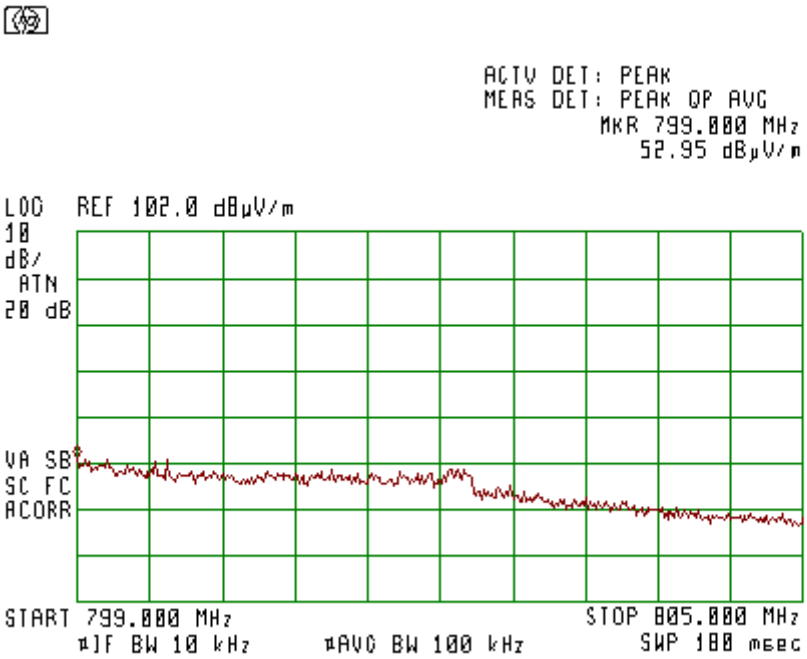
795.5 MHz
QPSK - RB size 25, RB Offset 0
Spurious radiation between 769-775 MHz
Horizontal Polarization
Plot 4.8.1



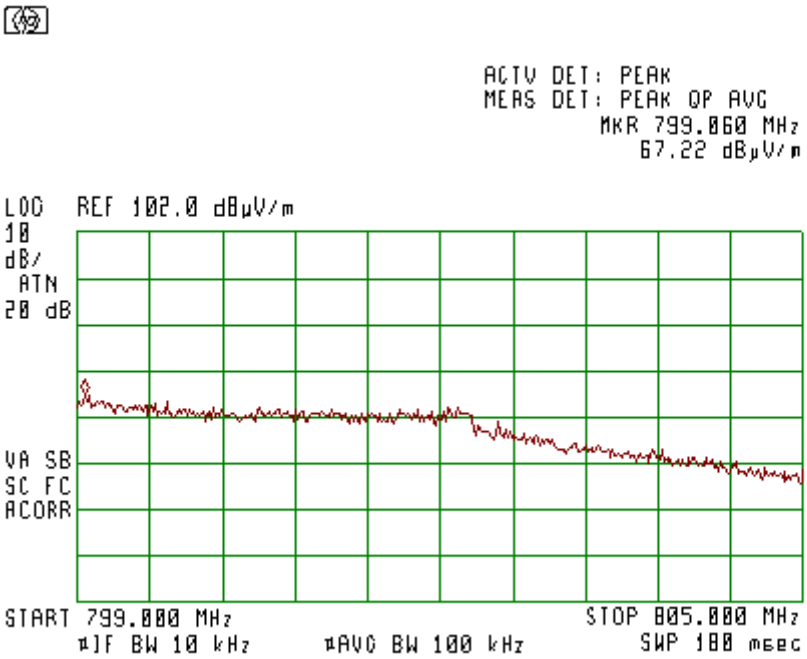
Vertical Polarization
Plot 4.8.2



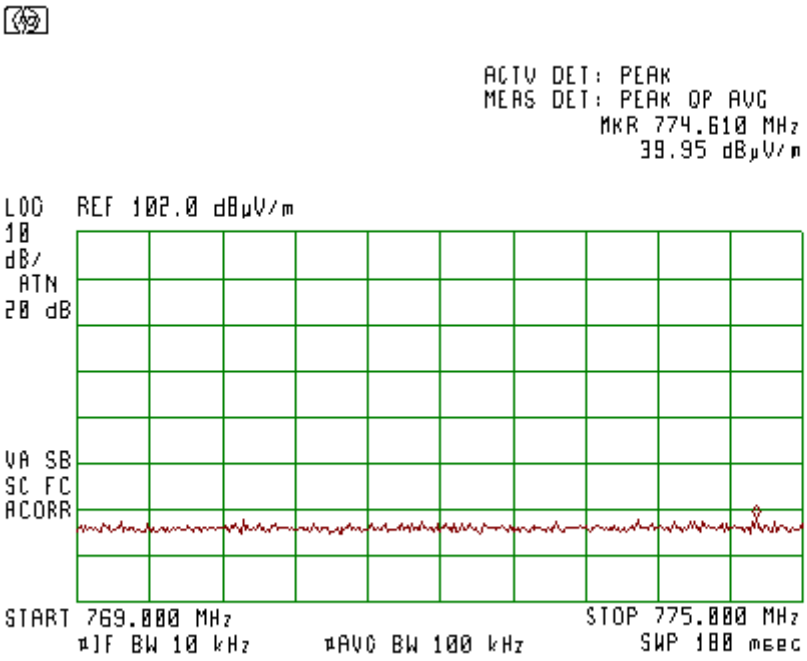
795.5 MHz
QPSK - RB size 25, RB Offset 0
Spurious radiation between 799-805 MHz
Horizontal Polarization
Plot 4.8.3



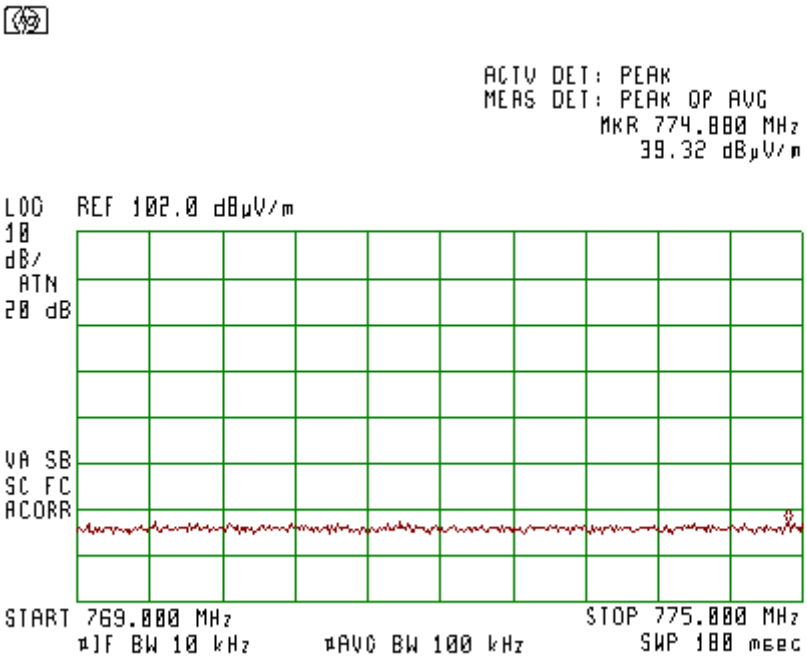
Vertical Polarization
Plot 4.8.4



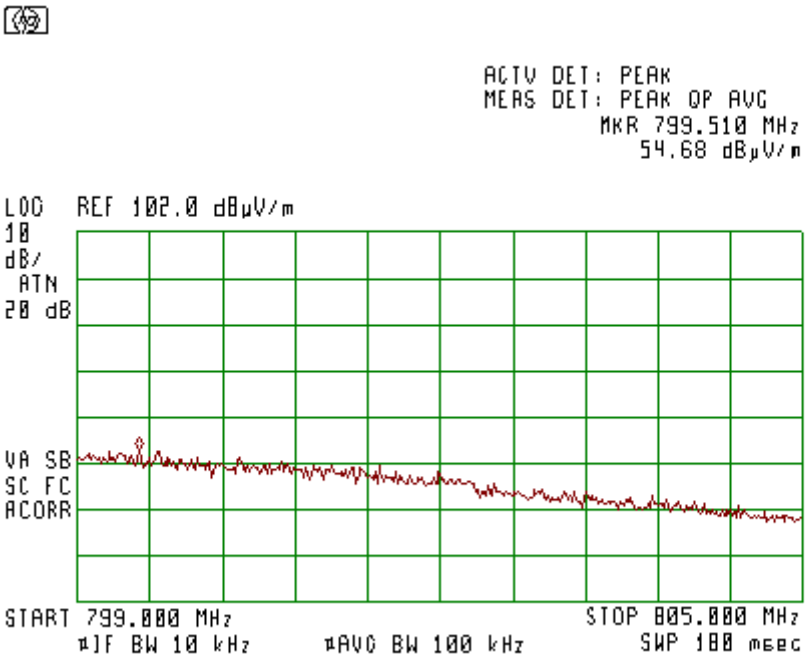
795.5 MHz
16 QAM - RB size 25, RB Offset 0
Spurious radiation between 769-775 MHz
Horizontal Polarization
Plot 4.8.5



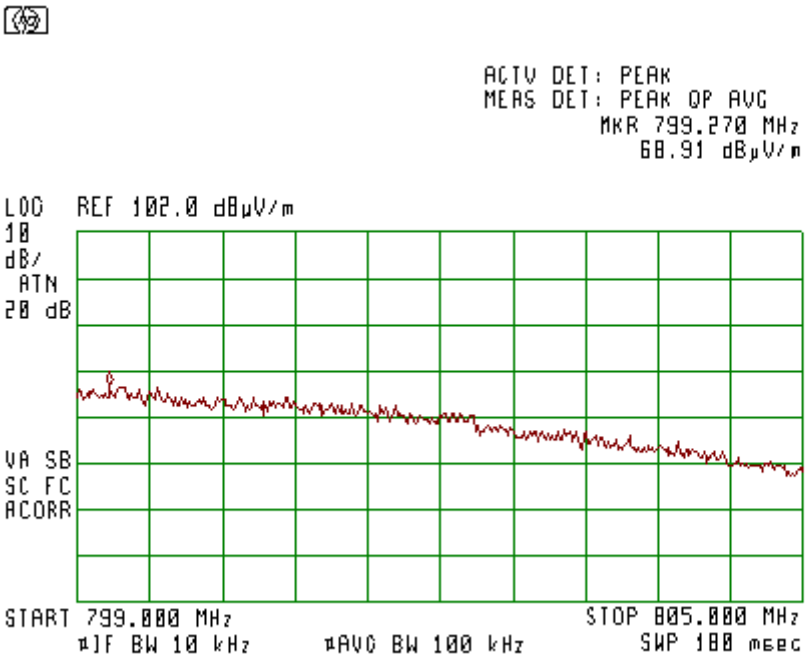
Vertical Polarization
Plot 4.8.6



795.5 MHz
16 QAM - RB size 25, RB Offset 0
Spurious radiation between 799-805 MHz
Horizontal Polarization
Plot 4.8.7



Vertical Polarization
Plot 4.8.8



4.9. Field Strength of Spurious Radiation in the band 1559-1610 MHz

Reference document:	47 CFR §90.543 (f)		
Test Requirements:	For operations in the 793-805 MHz band, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz* equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW** EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.		
Test setup:	See Sec. 2.2	**Pass**	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1 MHz, VBW: 3 MHz		
Environment conditions:	Ambient Temperature: 22.1 °C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See plots 4.9.1 – 4.9.2	

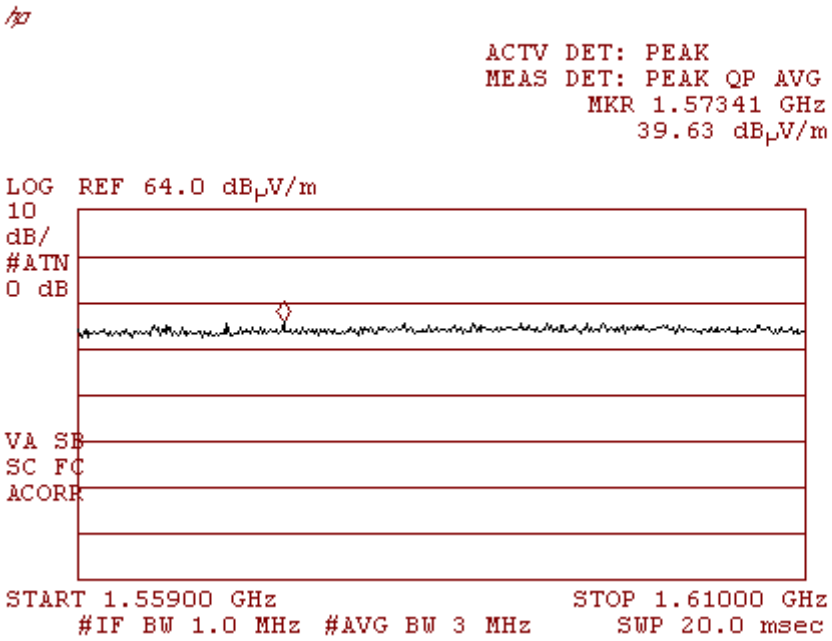
*It translates to a limit of – 40 dBm
**It translates to a limit of – 50 dBm

Test results:

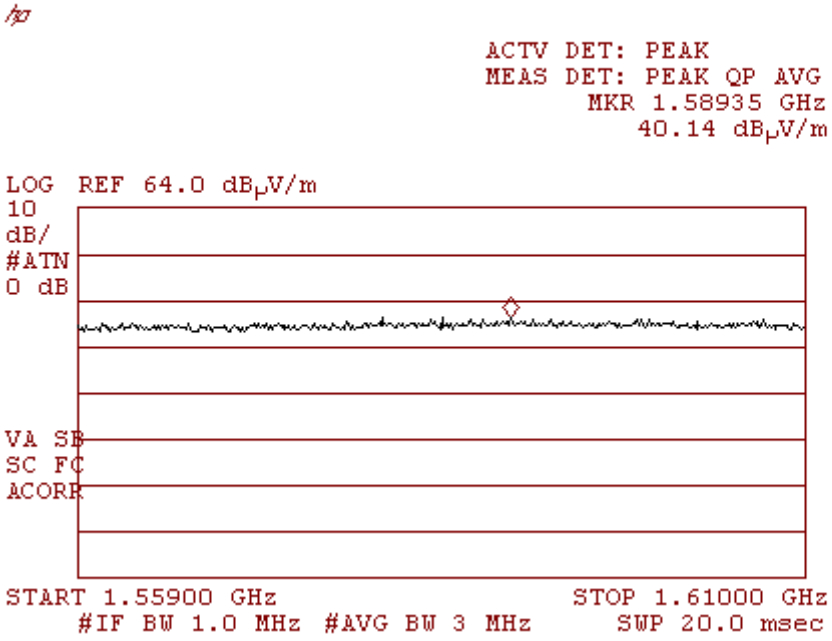
Spurious Emission Frequency [MHz]	Emission, narrowband or broadband	Max Reading [dBµV/m]	Polarization [H/V]	Signal Generator Level [dBm]	Antenna Gain [dBi]	Limit [dBm]	EIRP calculated [dBm]	Margin [dB]	Results
795.5 MHz - QPSK - RB size 1, RB Offset 0									
*	BB	*	H & V	*	*	-40	*	4.9.1	Pass
*	NB	*		*	*	-50	*		Pass
795.5 MHz - 16 QAM - RB size 1, RB Offset 0									
*	BB	*	H & V	*	*	-40	*	4.9.2	Pass
*	NB	*		*	*	-50	*		Pass

*All readings were at least 10 dB below the limit.

795.5 MHz
QPSK - RB size 1, RB Offset 0
Horizontal & Vertical Polarization
Plot 4.9.1



795.5 MHz
16 QAM - RB size 1, RB Offset 0
Horizontal & Vertical Polarization
Plot 4.9.2



4.10. Frequency Stability

Reference document:	47 CFR §2.1055 & 47 CFR §90.5393 (e)		
Test Requirements:	The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.		
Test setup:	See Sec. 2.3	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22.1°C	Relative Humidity: 45.4 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	Pass<1.25 p.p.m		

Test results:

Frequency error vs. Voltage

Voltage [Vdc]	Frequency Error* [Hz]	Frequency Error [%]	Frequency Error [ppm]
795.5 MHz -16 QAM - RB size 25, RB Offset 0			
11.7	23.12	0.00000291	0.029063482
13.8	15.98	0.00000201	0.020087995
15.9	23.99	0.00000302	0.030157134

Frequency error vs. Temperature

Temperature [°C]	Frequency Error* [Hz]	Frequency Error [%]	Frequency Error [ppm]
795.5 MHz -16 QAM - RB size 25, RB Offset 0			
-30	19.11	0.00000240	0.024022627
-20	18.79	0.00000236	0.023620365
-10	19.21	0.00000241	0.024148334
0	18.03	0.00000227	0.022664991
10	20.17	0.00000254	0.025355123
20	15.97	0.00000201	0.020075424
30	14.52	0.00000183	0.018252671
40	17.79	0.00000224	0.022363294
50	18.23	0.00000229	0.022916405
60	18.77	0.00000236	0.023595223

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

5. Appendix

Appendix A: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR 16 EMI Receiver, 9 kHz - 6.5 GHz	HP 8546A	3710A00392	30-06-2012
Spectrum Analyzer, 9 kHz - 22 GHz	HP 8593EM	3536A00131	30-06-2012
Spectrum Analyzer, 100 Hz - 26.5 GHz	Agilent E7405A	US41160436	30-06-2012
Spectrum Analyzer, 3 Hz - 44 GHz	Agilent E4446A	MY46180602	30-06-2012
Power Meter	Agilent N1911A	MY45100784	30-06-2012
Wideband power sensor	Agilent N1921A	MY45241242	30-06-2012
Low-Noise Amplifier, 0.1 - 18 GHz	MITEQ, AMF–7D-00101800-30-10P	1544443	30-06-2012
Low-Noise Amplifier, 18 - 26.5 GHz	MITEQ, AMF-5F-18002650-30-10P	945372	16-05-2012
Biconical Antenna, 20 - 200 MHz	Schwarzbeck VHBB 9124	9124/0255	16-05-2012
Log-Periodic Antenna, 200 - 1000 MHz	Schwarzbeck VUSLP 9111	VUSLP 9111184	16-05-2012
Double Ridged Guide Antenna, 1 - 18 GHz	A.R.A., DRG-118/A	17188	30-06-2012
SHF-EHF Horn, 15 – 40 GHz	Schwarzbeck BBHA 9170	BBHA9170214	30-06-2012
Turn table	HD 100	100/693	-
Antenna Mast	HD 100	100/693	-
LISN	Fischer 50/250-25-2	9705	30-06-2012
Transient Limiter, 9 kHz ÷ 200 MHz	HP 11947A	3107A04119	30-06-2012
Notch Filter	Micro-Tronics, BRM50702-05	0001	16-05-2012
Tunable Bandreject Filter	K&L, 3TNF-800/1000-0.2-N/N	336	16-05-2012
Tunable Bandreject Filter	K&L, 5TNF-1700/2000-0.1-N/N	212	16-05-2012
Highpass Filter, 1.2 ÷ 15 GHz	WAINWRIGHT, WHK1.2/15G-10EF	SN 3	16-05-2012
Highpass Filter, 2.4 ÷ 18 GHz	WAINWRIGHT, WHK2.4/18G-10EF	SN 1	16-05-2012
Highpass Filter, 7 ÷ 18 GHz	WAINWRIGHT, WHKX7.0/18G-8SS	SN 12	16-05-2012

Appendix B: Accreditation Certificate

ilac-MRA

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

QUALITECH (ECI TELECOM)

Petach-Tikva, ISRAEL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 22nd day of March 2011.

President & CEO
For the Accreditation Council
Certificate Number 1633.01
Valid to September 30, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

End of the Test Report