



Electromagnetic Compatibility Test Report

Test Report No: MOT 300414 Rev.2

Issued on: June 17, 2014

Product Name

VML700 Model: F4080A

VML750 Model: FLN0058A

Tested According to

FCC 47 CFR, Part 90

Industry Canada & RSS 119

(LTE band 14)

Tests Performed for

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Test Report details:

Test commencement date: 22.04.2014
Test completion date: 24.04.2014
Customer's representative: Moti Rachmilov
Issued on: 29.04.2014

Revision details:

Version	Date	Details/Reasons
Rev. 1	30.04.2014	-
Rev.2	17.06.2014	The frequencies measurement were revised according to actual measurement,pages # 18 & 39.

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	Remarks
Conducted RF Power Output	Pass
Occupied bandwidth	Pass
Conducted Spurious Emissions	Pass
Conducted Spurious Emissions between 769-775 MHz and 799-805 MHz	Pass
Field Strength of Spurious Radiation	Pass
Field Strength of Spurious Radiation between 769-775 MHz and 799-805 MHz	Pass
Field Strength of Spurious Radiation in the band 1559-1610 MHz	Pass
Frequency Stability	Pass

Table of Contents

1.	GENERAL DESCRIPTION.....	6
2.	METHOD OF MEASUREMENTS	7
2.1.	Conducted RF Measurements:	7
2.2.	Field Strength of Spurious Radiation Measurements:	8
2.3.	Frequency stability measurements:	9
2.4.	Worst Case Results:	9
3.	TEST FACILITY & UNCERTAINTY OF MEASUREMENT	10
3.1.	Accreditation/ Registration reference:	10
3.2.	Test Facility description	10
3.3.	Uncertainty of Measurement:	11
4.	MEASUREMENTS.....	12
4.1.	Conducted RF Power Output.....	12
4.2.	Occupied bandwidth	13
4.3.	Conducted Spurious Emissions.....	18
4.4.	Conducted Spurious Emissions between 769-775 MHz and 799-805 MHz	39
4.5.	Field Strength of Spurious Radiation.....	48
4.6.	Field Strength of Spurious Radiation between 769-775 MHz and 799-805 MHz	59
4.7.	Field Strength of Spurious Radiation in the band 1559-1610 MHz	62
4.8.	Frequency Stability	67
5.	APPENDIX	68

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 BC 13, LTE BC 14 , EVDO Rev A (CDMA) , WiFi 802.11b/g/n

Product Name: VML750

Model: FLN0058A

FCC ID: AZ492FT7060

IC: 109U-92FT7060

Description: Its basic purpose is used for communication the VML750 consists of LTE BC 13, LTE BC 14 , WiFi 802.11b/g/n

Maximum Peak Output Power: 25.7 dBm

Nominal Output Power: 23.5 dBm

Frequency Range: LTE BC14 Tx:788MHz-798MHz ; Rx 758MHz-768MHz

Transmit Data Rate:

Protocol	Rate [Mbps]
UE- Category 3	Up to 28Mbps (peak)

Type of Modulation:

Protocol	Modulation
LTE	QPSK
LTE	16QAM

Antenna Specification:

Type: Elevated feed dipole

Gain: VML700: Gain (including 12ft coaxial cable): 0.1 dBi

VML750: Gain: 5 dBi

2. Method of Measurements

2.1. Conducted RF Measurements:

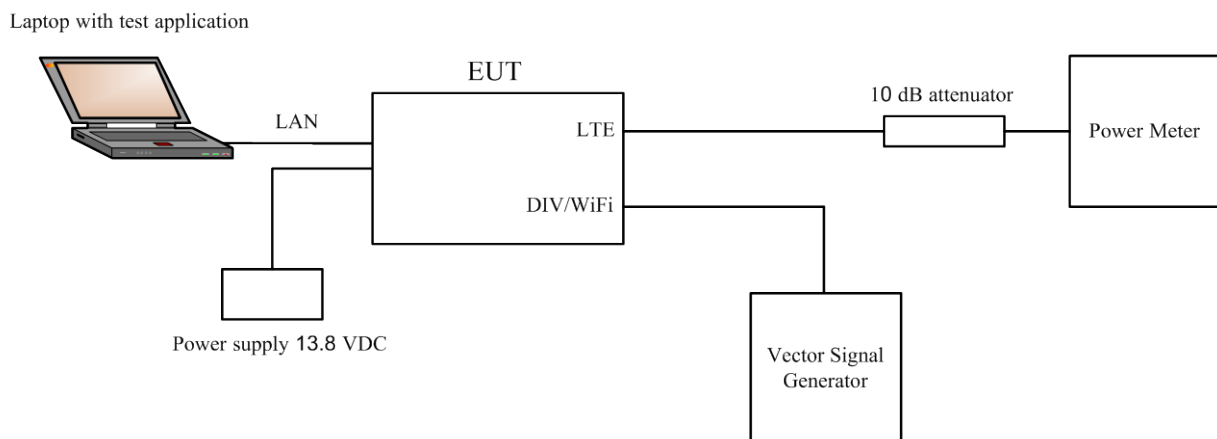
During Conducted RF Power Output verification test, the transmitter's output was connected to the power meter through an attenuator. The external attenuations were taken into account to correct the reading. Worst-case results of the various operation & modulation modes were reported (where applicable).

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

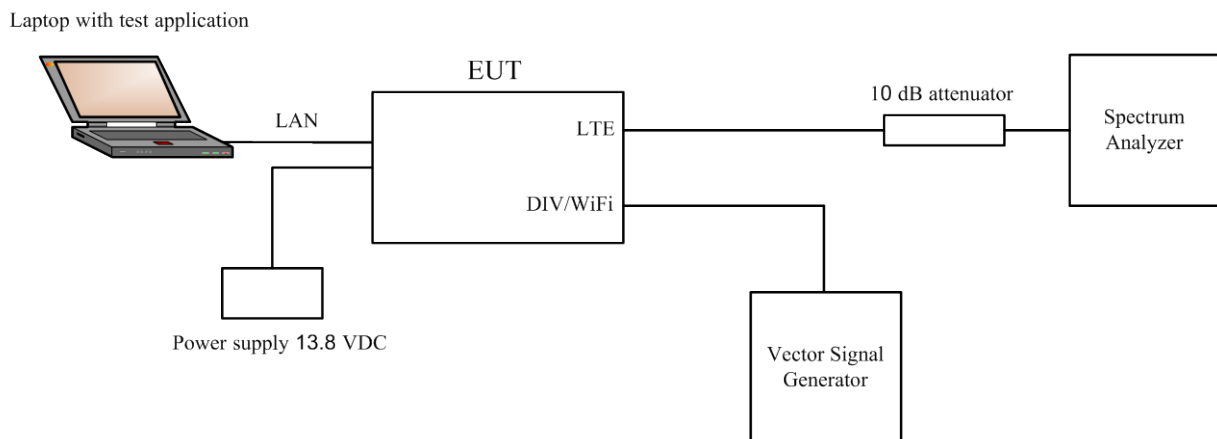
For Out of Band emissions measurement, the spectrum was investigated from 9 kHz up to at least the tenth harmonic of the highest fundamental frequency. Multiple sweeps were recorded in max hold mode using a peak detector to ensure that the worst-case emissions were caught.

Test Setups:

RF Power Output verification



Out of Band Emissions



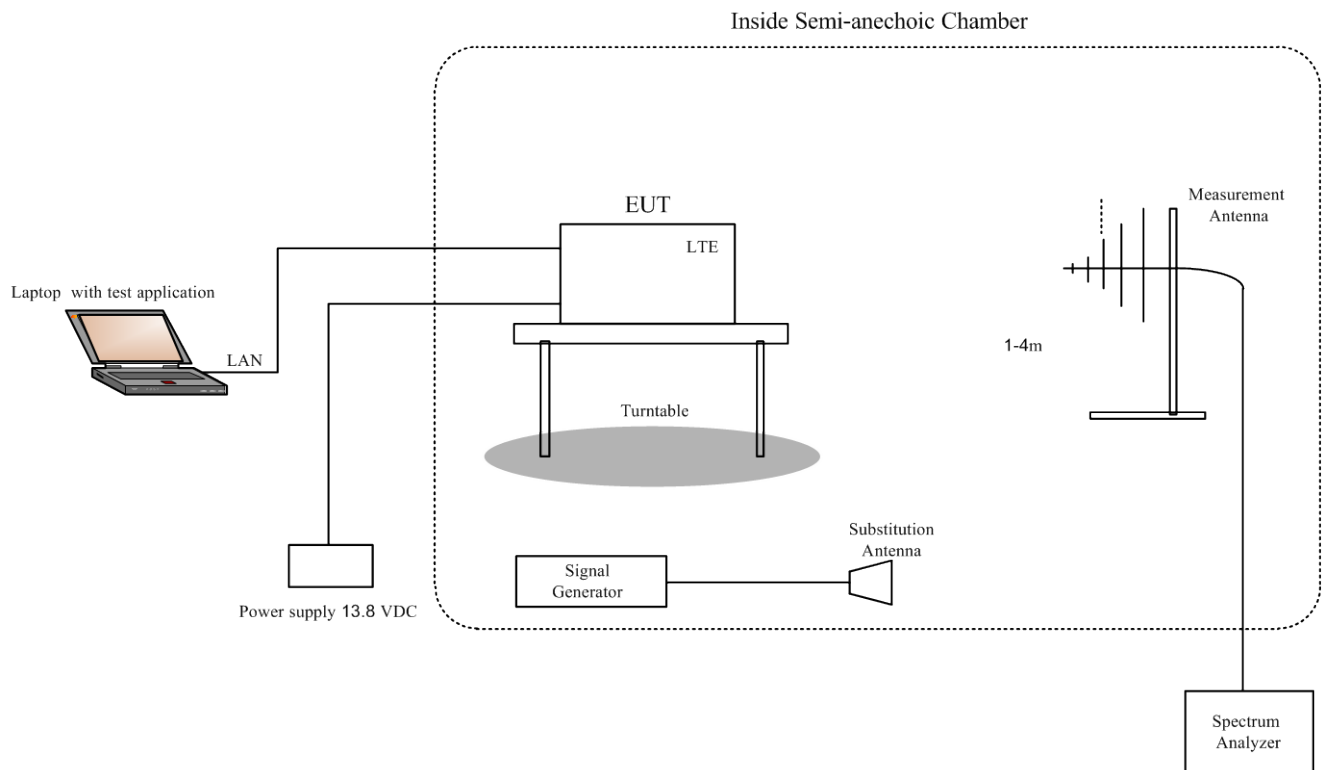
2.2. Field Strength of Spurious Radiation Measurements:

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:

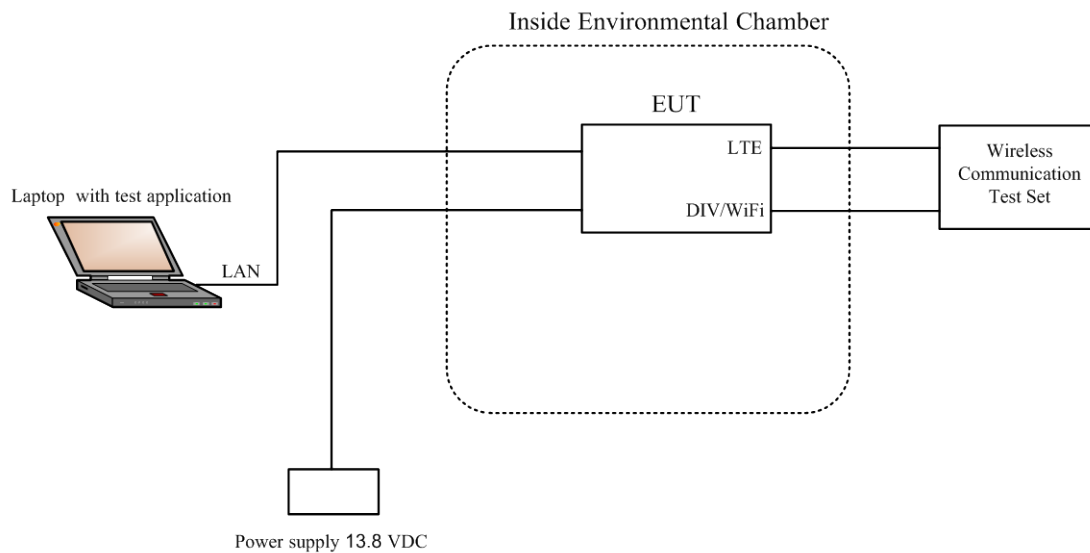


2.3. Frequency stability measurements:

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

Address: 30, Hasivim St., Petah Tikva, Israel.
Tel: 972-3-926-6994

3m Anechoic Chamber:

Two 3m-screened chambers are used in two configurations: the semi-anechoic chamber for Radiated Emission measurements and the full-anechoic chamber 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 ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Emerson and Cuming absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	± 3.9 dB, 30MHz to 200MHz ± 3 dB, 200MHz to 1000MHz
Transmission Loss measured at 5 positions, at 1.5m height	± 3 dB, 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 ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB 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	± 3 dB 80MHz to 18GHz

3.3. Uncertainty of Measurement:

Test Name	Test Method & Range	Uncertainty	
		Expanded U	Ucisp
Radiated Emission	30MHz÷230MHz, Horiz. polar.	[dB]	[dB]
	30MHz÷230MHz, Ver. polar.	4.92	5.06
	230MHz÷1000MHz, Horiz. polar.	5.06	5.07
	230MHz÷1000MHz, Vert. polar.	5.30	5.34
	1.0GHz -6.0GHz	5.30	5.34
	6.0GHz-18.0GHz	4.28	5.18
		5.10	5.48
Conducted Emission	9 kHz÷150 kHz	[dB]	[dB]
	150 kHz÷30MHz	3.5	3.83
		3.06	3.44

Note: Note: QualiTech EMC labs expanded measurement instrumentation has less uncertainty than the industry norm and compliance is deemed to occur as no measured disturbance exceeds the disturbance limit.

Note: The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

4. Measurements

4.1. Conducted RF Power Output

Reference document:	47 CFR §90.542(a)(7) & §2.1046		
Test Requirements:	Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 30W (44.77dBm) 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: 24.3°C	Relative Humidity: 41.5 %	Atmospheric Pressure: hPa
Test Result:	See below		

Test Results:

Frequency [MHz]	Resource Block Size	Resource Block Offset	Output Power* [dBm]	Antenna Gain** [dBd]	ERP***, [dBm]	Limit [dBm]	Delta [dB]	Pass/Fail
QPSK								
793.0	1	0	24.20	2.85	28.05	44.77	-16.72	Pass
	1	49	24.70	2.85	28.55	44.77	-16.22	Pass
	25	12	24.30	2.85	28.15	44.77	-16.62	Pass
	50	0	24.16	2.85	28.01	44.77	-16.76	Pass
16 QAM								
793.0	1	0	24.60	2.85	28.45	44.77	-16.32	Pass
	1	49	25.30	2.85	29.15	44.77	-15.62	Pass
	25	12	24.30	2.85	28.15	44.77	-16.62	Pass
	50	0	24.14	2.85	27.99	44.77	-16.78	Pass

* Corrected for external attenuations.

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

***ERP = Power Output +Antenna Gain

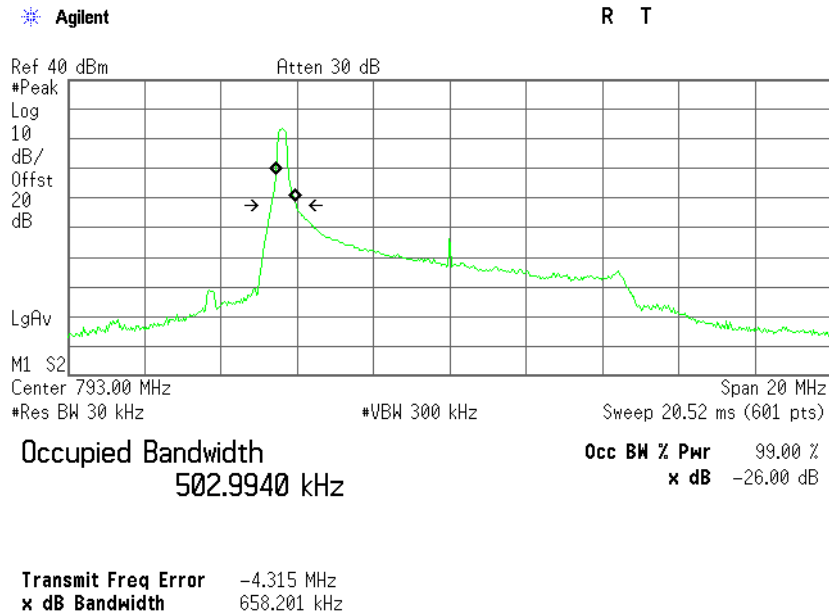
4.2. Occupied bandwidth

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 49 RBW: 100 kHz, VBW: 300 kHz for RBS 25 & RBO 12, RBS 50 & RBO 0		
Environment conditions:	Ambient Temperature: 23°C	Relative Humidity: 42 %	Atmospheric Pressure: hPa
Test Result:	See below	See Plots 4.2.1 - 4.2.8	

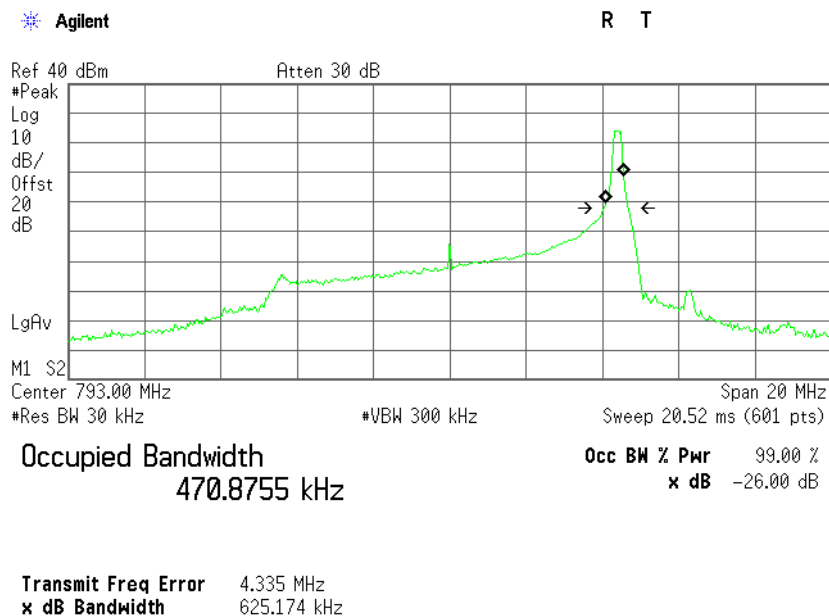
Test results:

Frequency [MHz]	Resource Block Size	Resource Block Offset	Occupied BW 99% Power [MHz]	26 dB Bandwidth [MHz]	Pass/Fail
QPSK					
793.0	1	0	0.503	0.658	Pass
	1	49	0.471	0.625	Pass
	25	12	4.574	6.481	Pass
	50	0	8.940	9.550	Pass
16 QAM					
793.0	1	0	0.498	0.673	Pass
	1	49	0.603	0.702	Pass
	25	12	4.583	6.444	Pass
	50	0	8.932	9.569	Pass

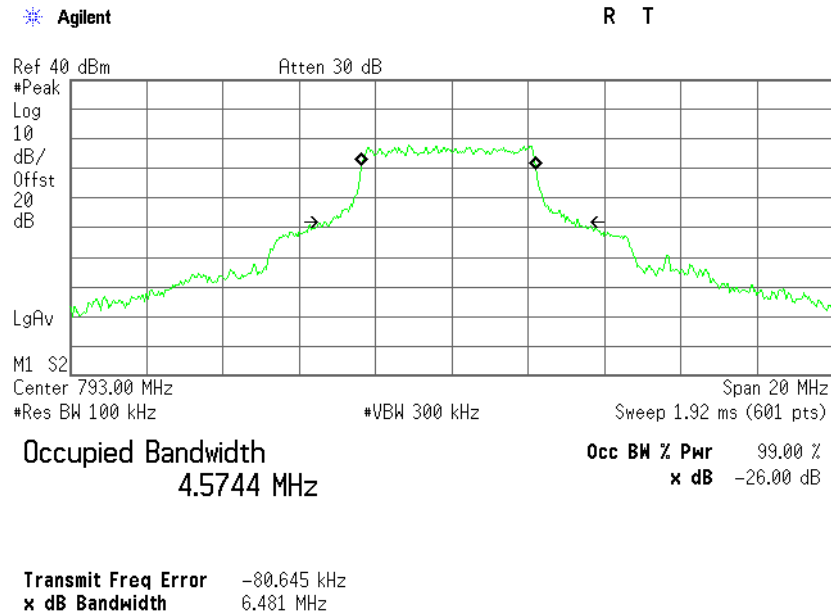
Plot 4.1.1 Occupied bandwidth test results, QPSK, RB size 1, RB offset 0, Fc = 793.0MHz



Plot 4.1.2 Occupied bandwidth test results, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz

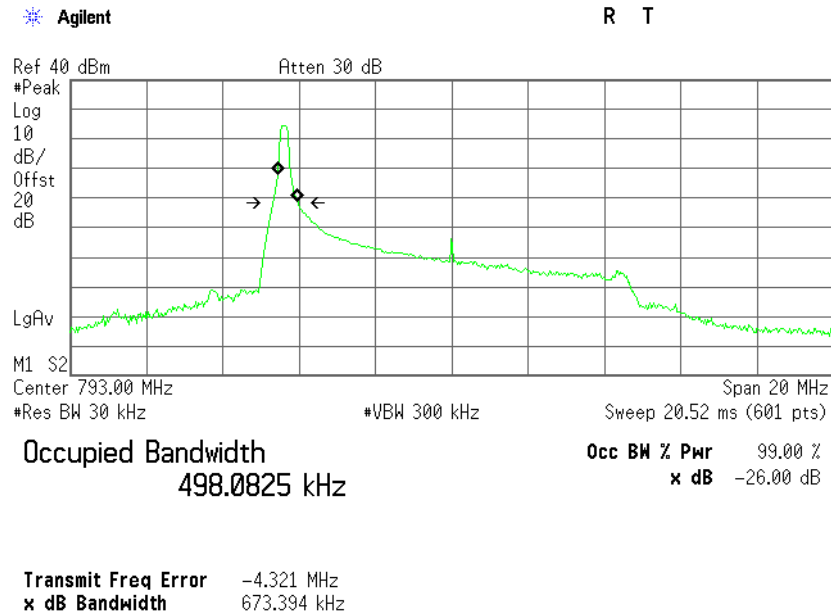


Plot 4.1.3 Occupied bandwidth test results, QPSK, RB size 25, RB offset 12, Fc = 793.0MHz

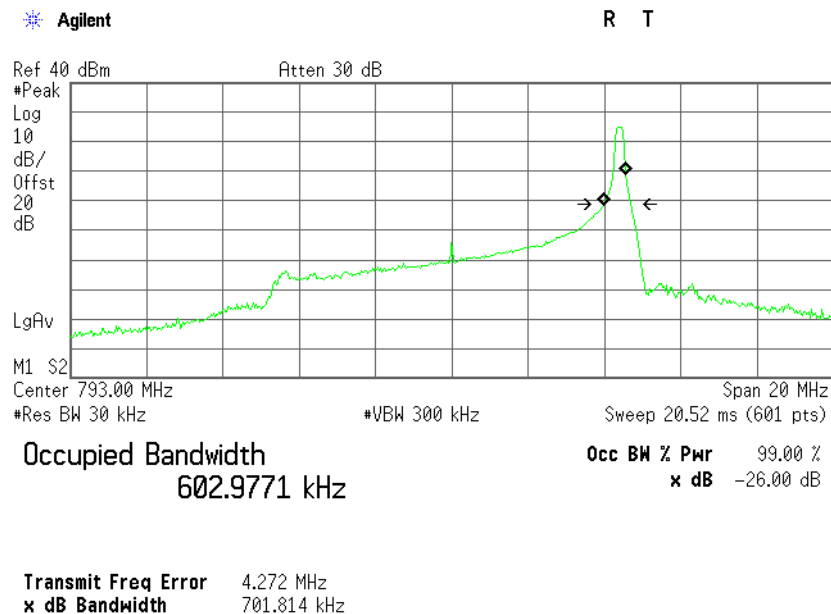


Plot 4.1.4 Occupied bandwidth test results, QPSK, RB size 50, RB offset 0, Fc = 793.0MHz

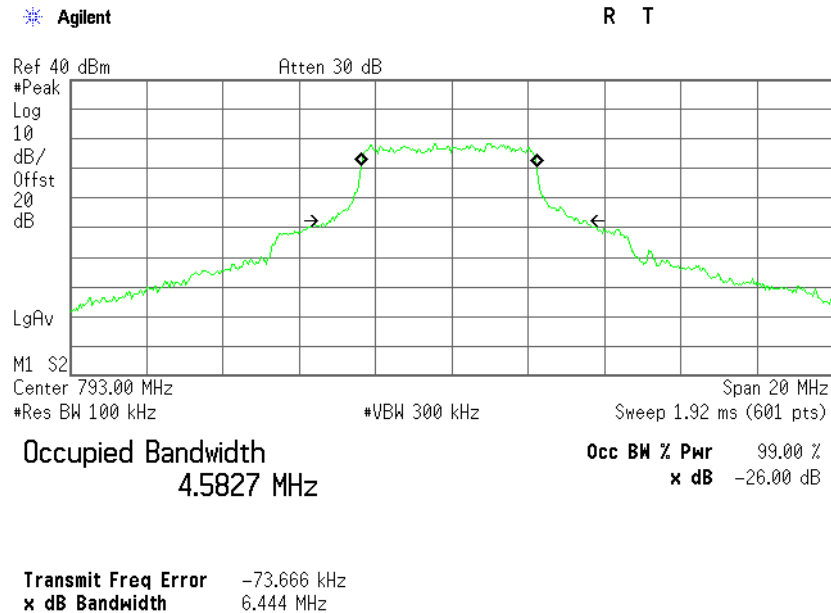
Plot 4.1.5 Occupied bandwidth test results, 16QAM, RB size 1, RB offset 0, Fc = 793.0MHz



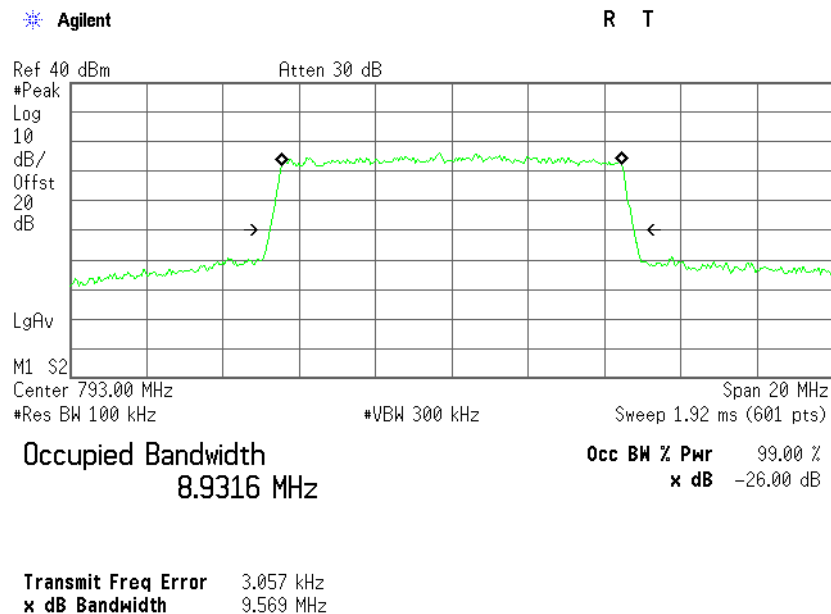
Plot 4.1.6 Occupied bandwidth test results, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz



Plot 4.1.7 Occupied bandwidth test results, 16QAM, RB size 25, RB offset 12, Fc = 793.0MHz



Plot 4.1.8 Occupied bandwidth test results, 16QAM, RB size 50, RB offset 0, Fc = 793.0MHz



4.3. Conducted Spurious Emissions

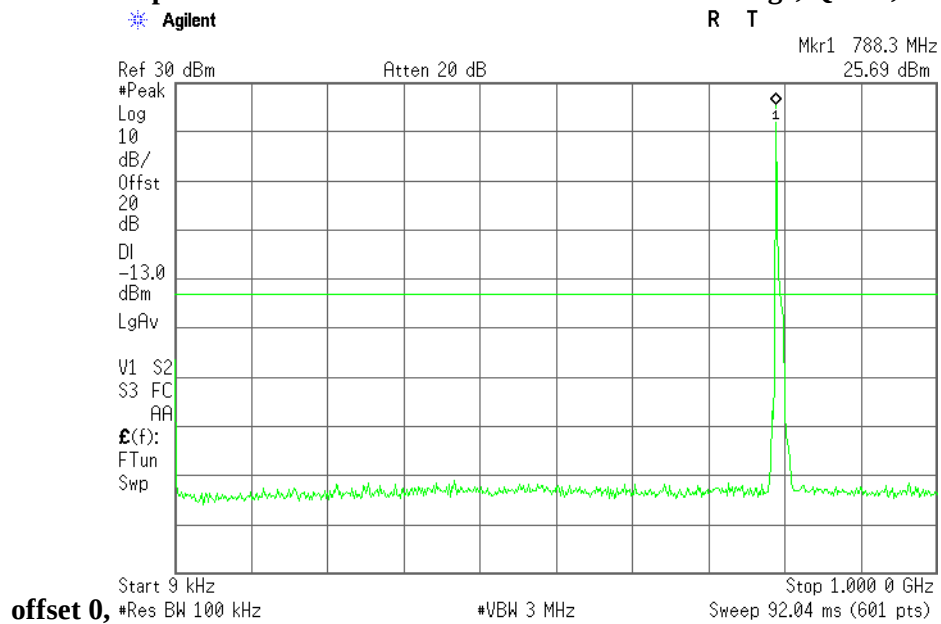
Reference document:	47 CFR §90.543 (c)		
Test Requirements:	On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ dB* measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 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:	f <1GHz: RBW: 100 kHz, VBW: 3 MHz f >1GHz: RBW: 1 MHz, VBW: 3 MHz		
Environment conditions:	Ambient Temperature: 22 °C	Relative Humidity: 48 %	Atmospheric Pressure: hPa
Test Result:	See below	See Plots 4.3.1- 4.3.40	

*It translates to a limit of -13dBm

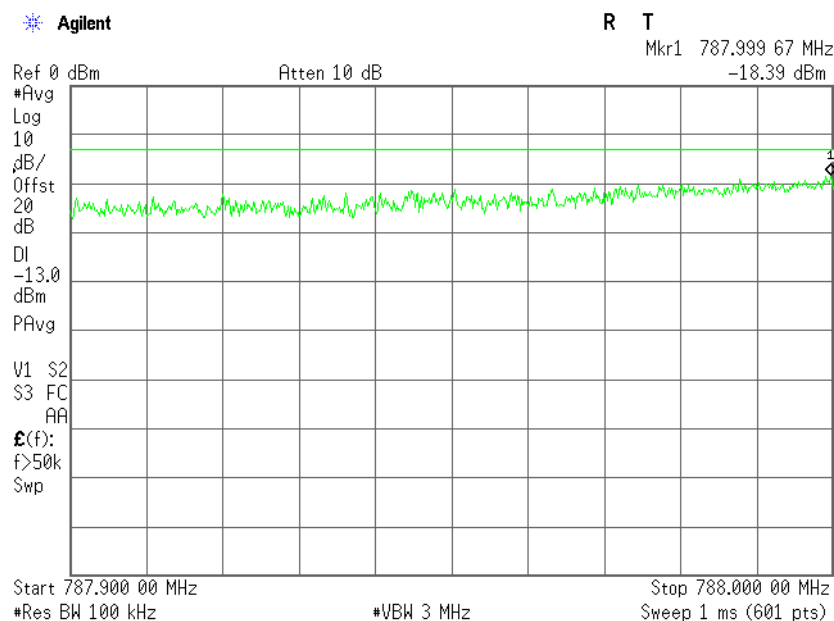
Test results:

Frequency [MHz]	Resource Block Size	Resource Block Offset	Spurious Emission Frequency [MHz]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]	Pass/Fail
QPSK							
788.59	1	0	787.99967	-18.39	-13.00	-5.39	Pass
797.41	1	49	798.00271	-16.51	-13.00	-3.51	Pass
792.91	25	12	787.91761	-22.41	-13.00	-9.41	Pass
793	50	0	798.00538	-20.91	-13.00	-7.91	Pass
16 QAM							
788.59	1	0	787.99967	-13.81	-13.00	-0.81	Pass
797.41	1	49	798.00421	-14.14	-13.00	-1.14	Pass
792.91	25	12	787.91125	-19.65	-13.00	-6.65	Pass
793	50	0	787.96384	-19.47	-13.00	-6.47	Pass

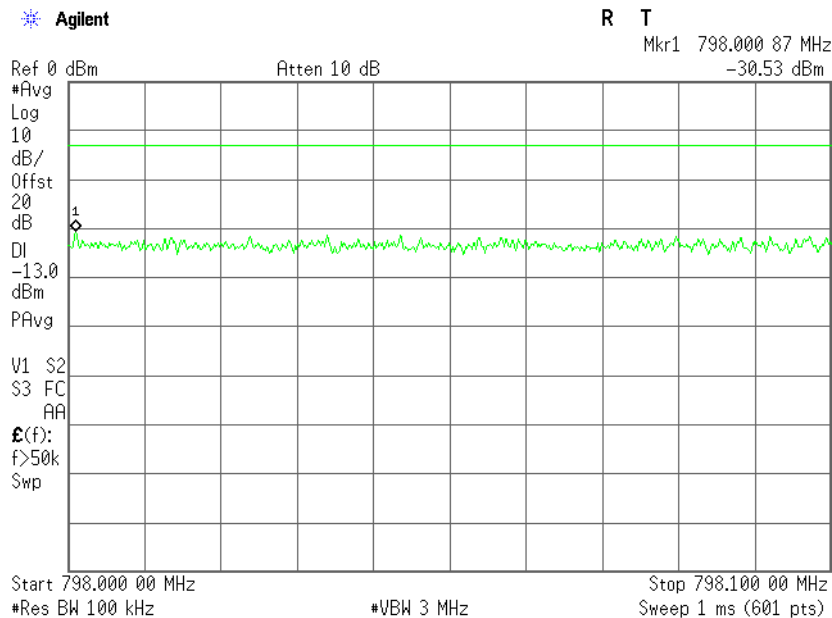
Plot 4.3.1 Conducted spurious emission test results in 9kHz – 1GHz range, QPSK, RB size 1, RB



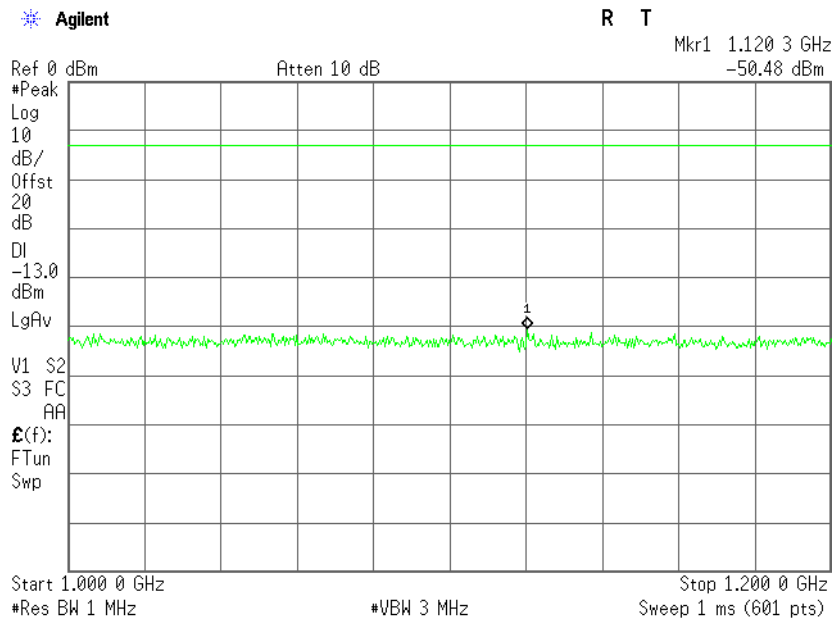
Plot 4.3.2 Conducted spurious emission test results in 787.9MHz – 788.0MHz range, QPSK, RB size 1, RB offset 0



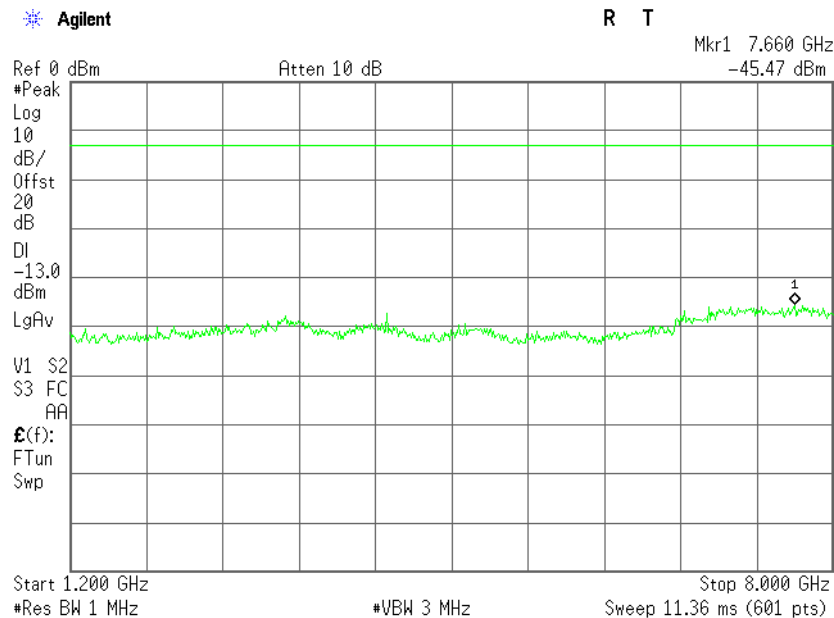
Plot 4.3.3 Conducted spurious emission test results in 798.0MHz – 798.1MHz range, QPSK, RB size 1, RB offset 0



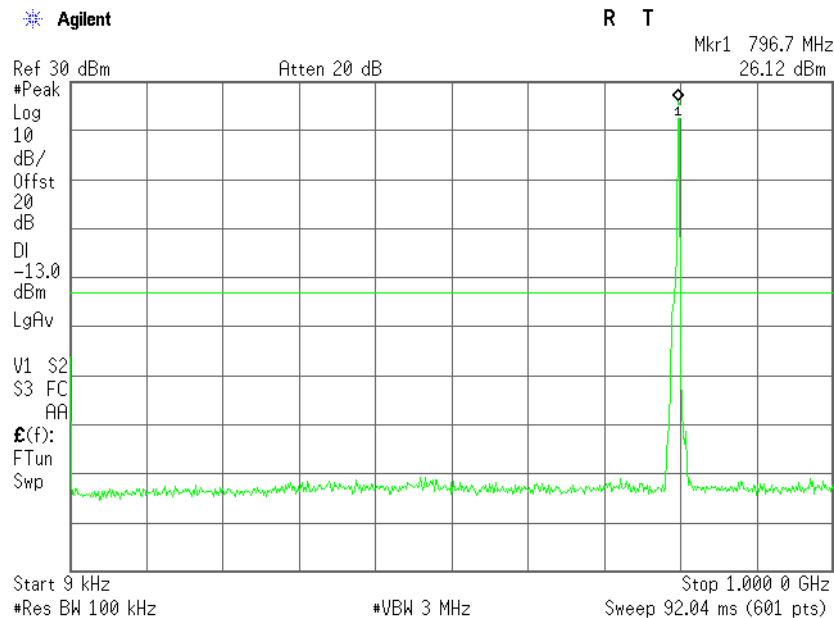
Plot 4.3.4 Conducted spurious emission test results in 1GHz – 1.2GHz range, QPSK, RB size 1, RB offset 0



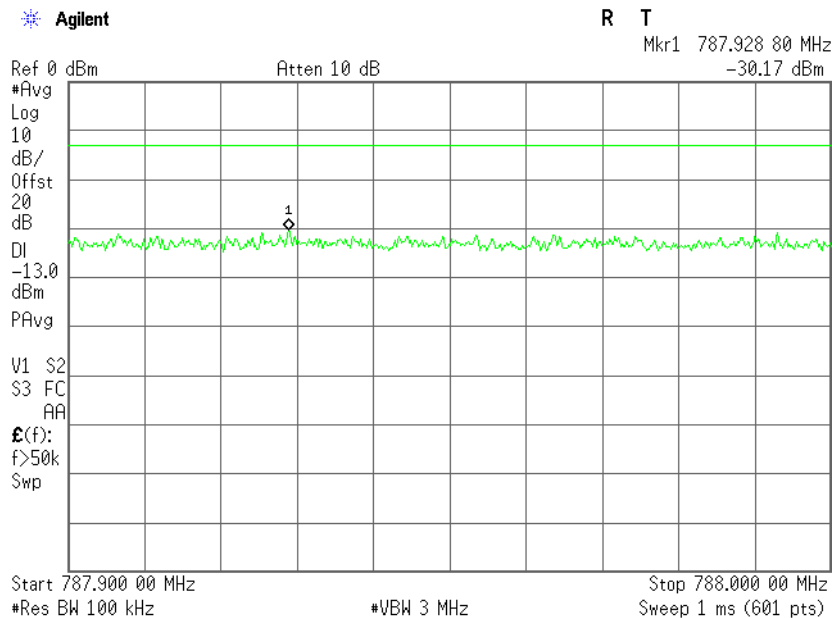
Plot 4.3.5 Conducted spurious emission test results in 1.2GHz – 8.0GHz range, QPSK, RB size 1, RB offset 0 Fc



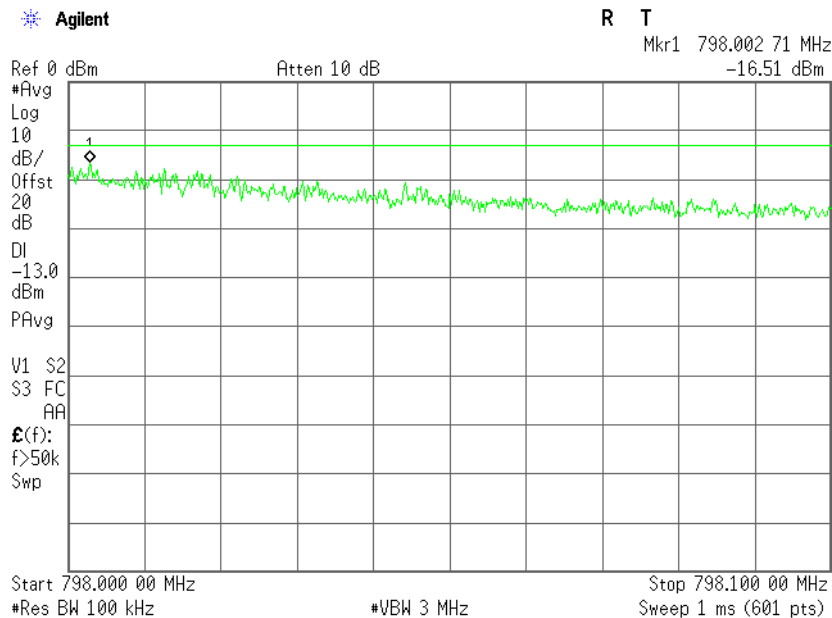
Plot 4.3.6 Conducted spurious emission test results in 9kHz – 1GHz range, QPSK, RB size 1, RB offset 49



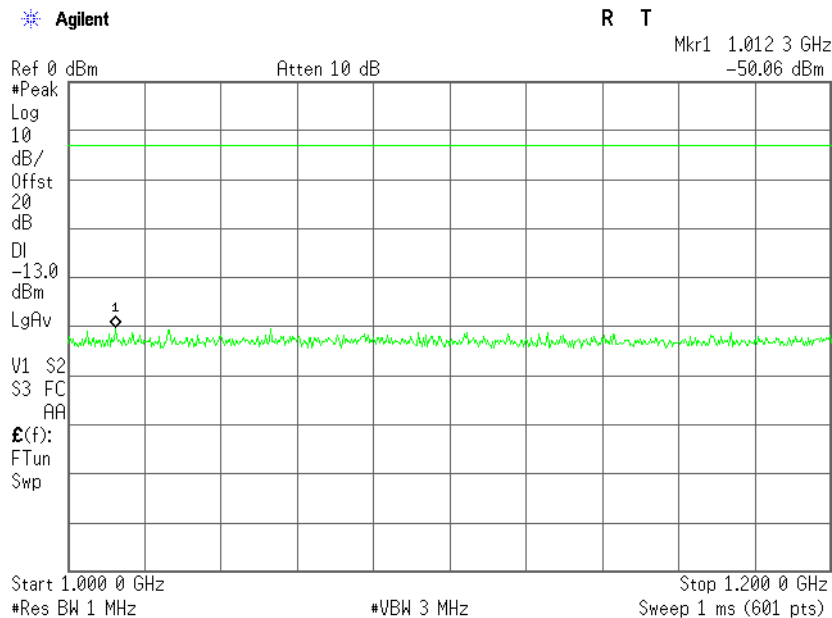
Plot 4.3.7 Conducted spurious emission test results in 787.9MHz – 788.0MHz range, QPSK, RB size 1, RB offset 49



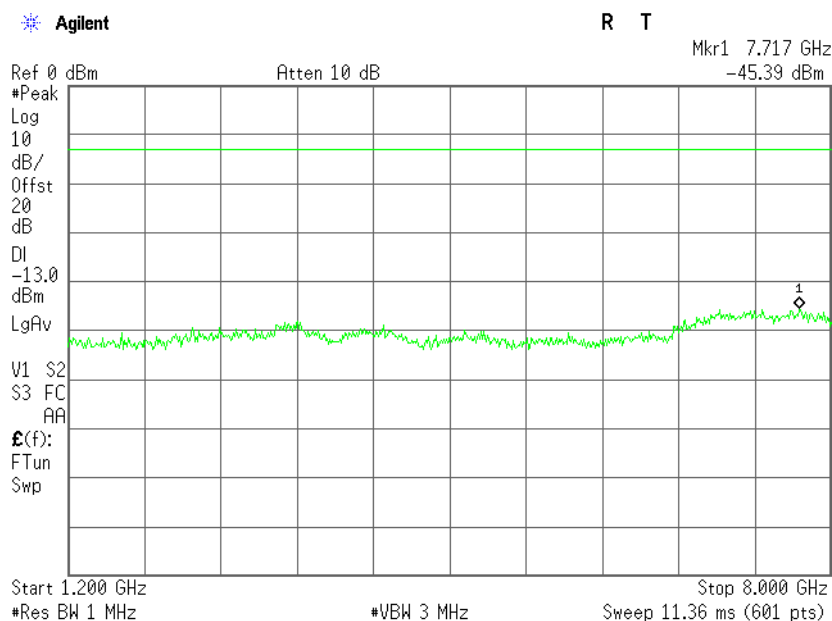
Plot 4.3.8 Conducted spurious emission test results in 798.0MHz – 798.1MHz range, QPSK, RB size 1, RB offset 49



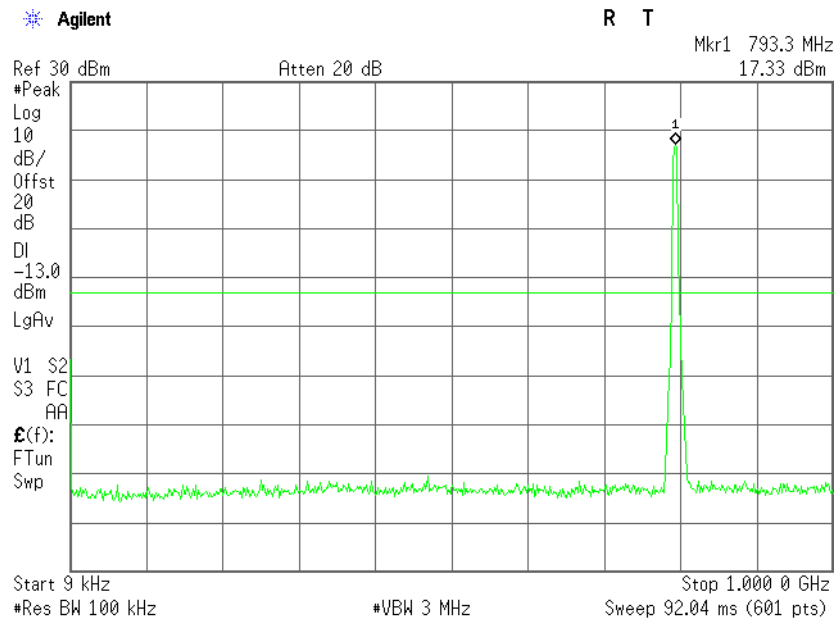
Plot 4.3.9 Conducted spurious emission test results in 1GHz – 1.2GHz range, QPSK, RB size 1, RB offset 49



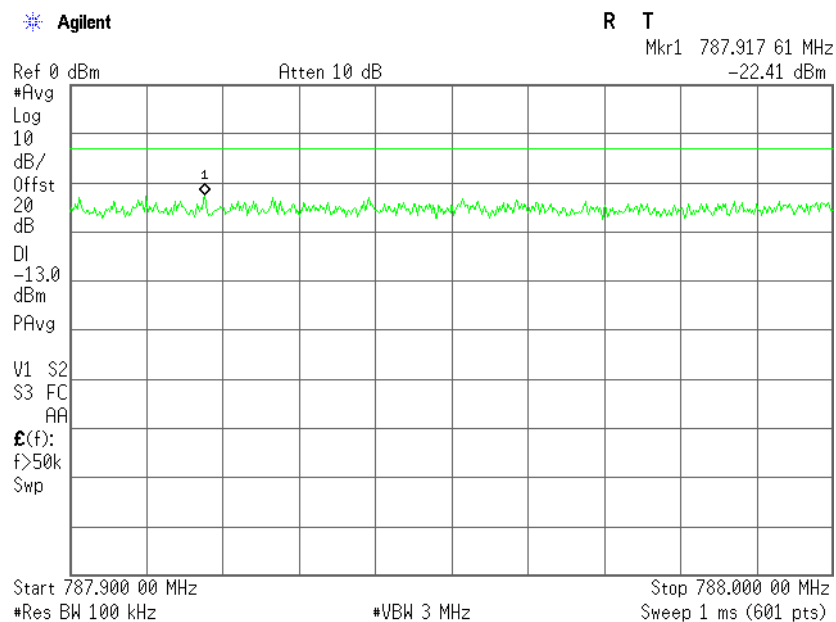
Plot 4.3.10 Conducted spurious emission test results in 1.2GHz – 8.0GHz range, QPSK, RB size 1, RB offset 49



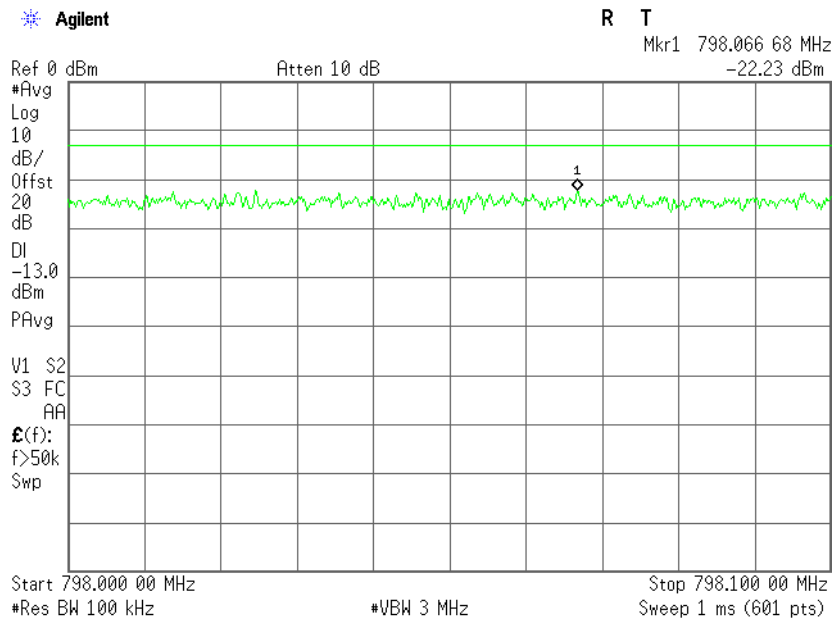
Plot 4.3.11 Conducted spurious emission test results in 9kHz – 1GHz range, QPSK, RB size 25, RB offset 12



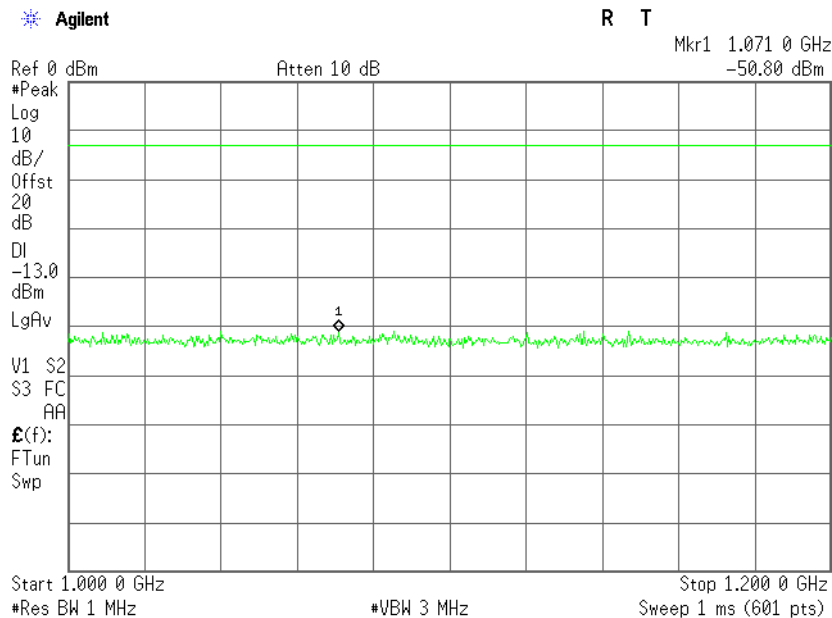
Plot 4.3.12 Conducted spurious emission test results in 787.9MHz – 788.0MHz range, QPSK, RB size 25, RB offset 12



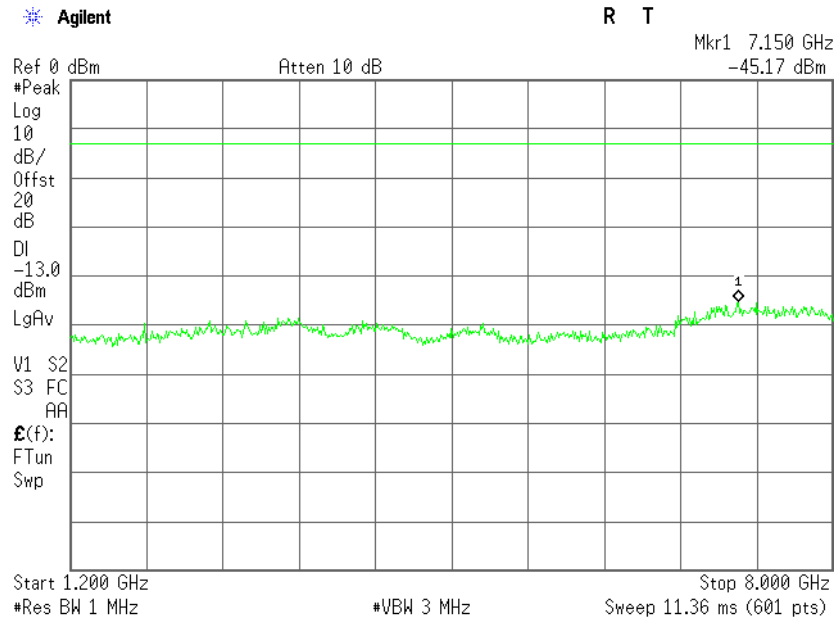
Plot 4.3.13 Conducted spurious emission test results in 798.0MHz – 798.1MHz range, QPSK, RB size 25, RB offset 12



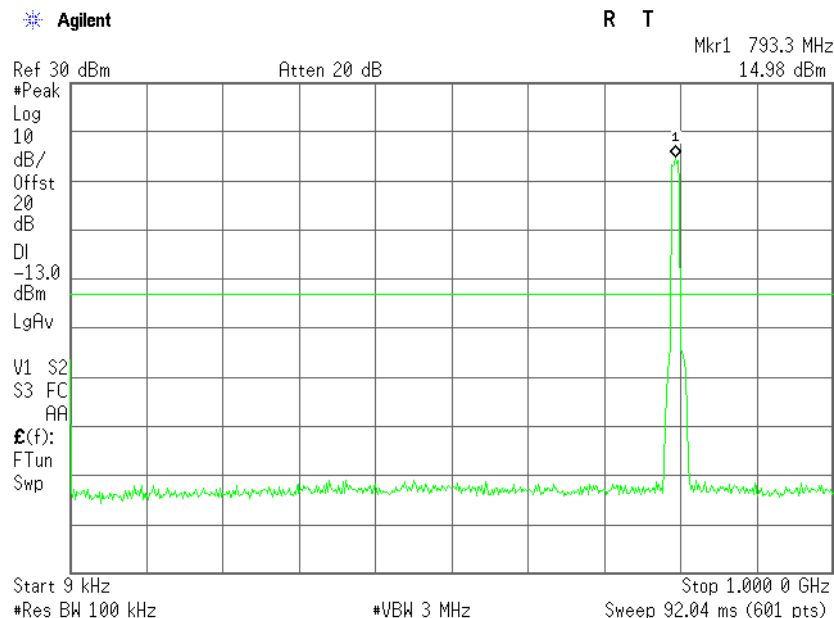
Plot 4.3.14 Conducted spurious emission test results in 1GHz – 1.2GHz range, QPSK, RB size 25, RB offset 12



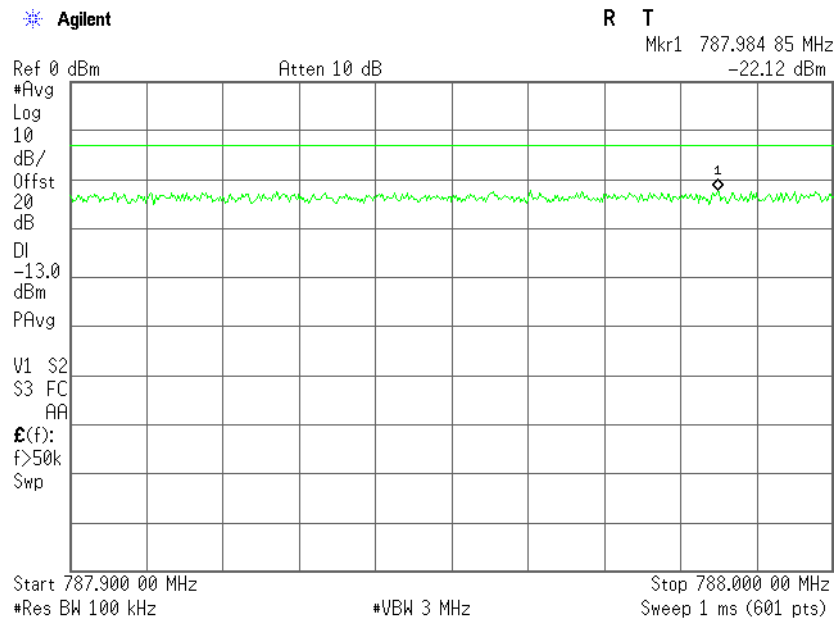
Plot 4.3.15 Conducted spurious emission test results in 1.2GHz – 8.0GHz range, QPSK, RB size 25, RB offset 12



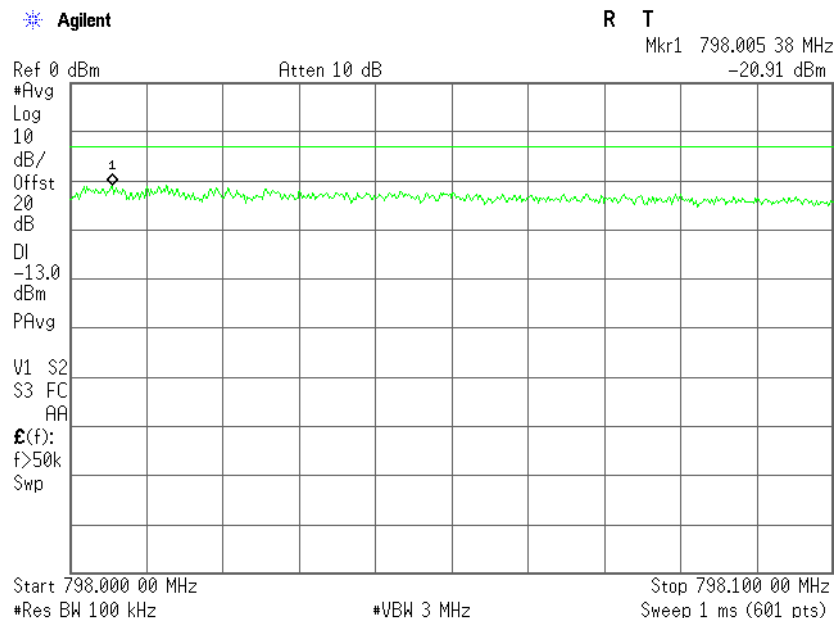
Plot 4.3.16 Conducted spurious emission test results in 9kHz – 1GHz range, QPSK, RB size 50, RB offset 0



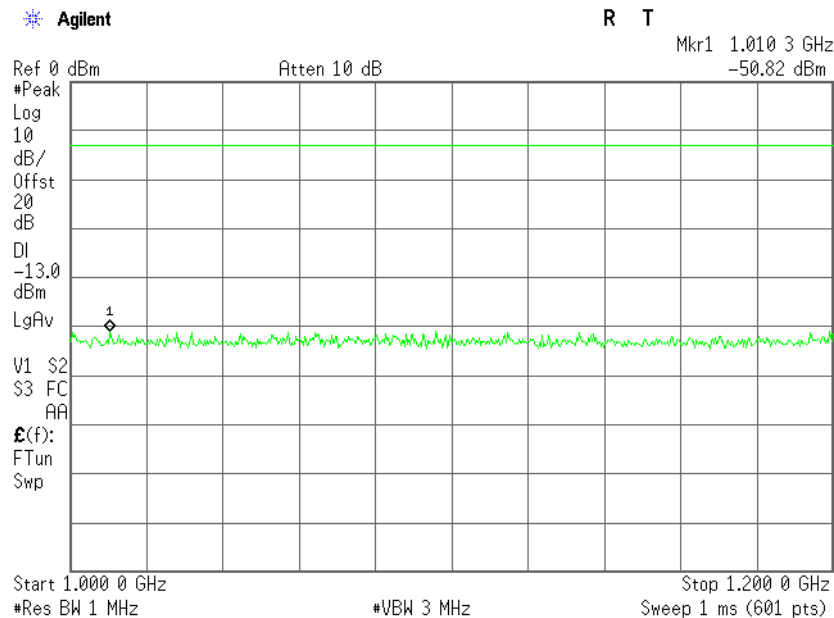
Plot 4.3.17 Conducted spurious emission test results in 787.9MHz – 788.0MHz range, QPSK, RB size 50, RB offset 0



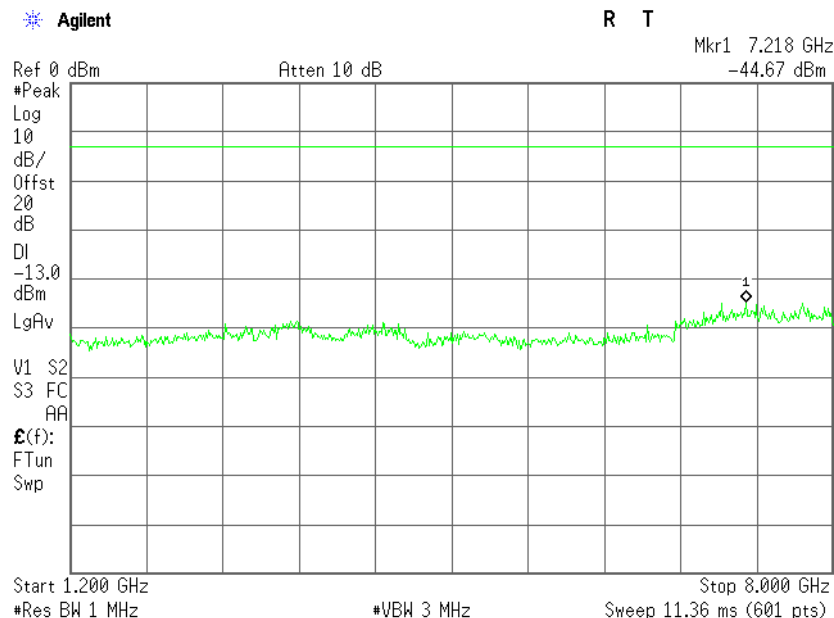
Plot 4.3.18 Conducted spurious emission test results in 798.0MHz – 798.1MHz range, QPSK, RB size 50, RB offset 0



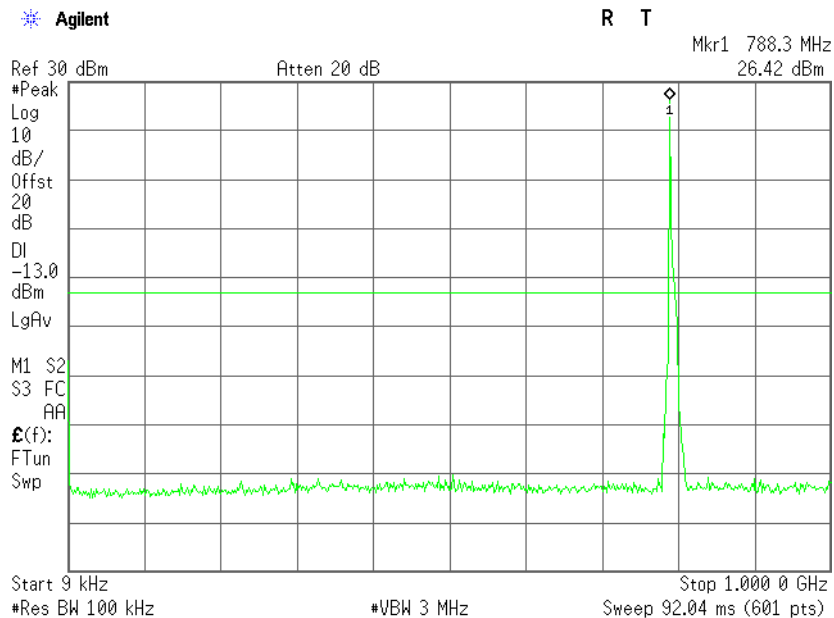
Plot 4.3.19 Conducted spurious emission test results in 1GHz – 1.2GHz range, QPSK, RB size 50, RB offset 0



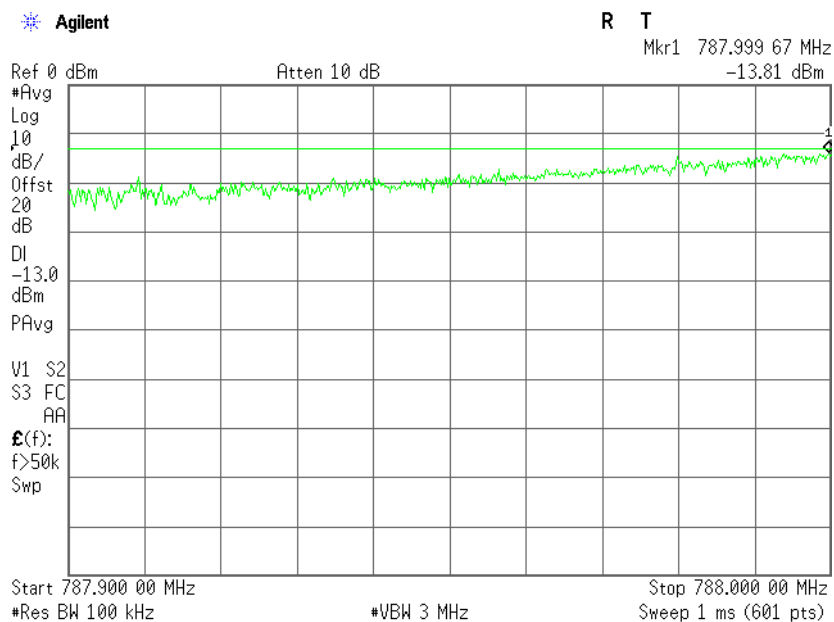
Plot 4.3.20 Conducted spurious emission test results in 1.2GHz – 8.0GHz range, QPSK, RB size 50, RB offset 0



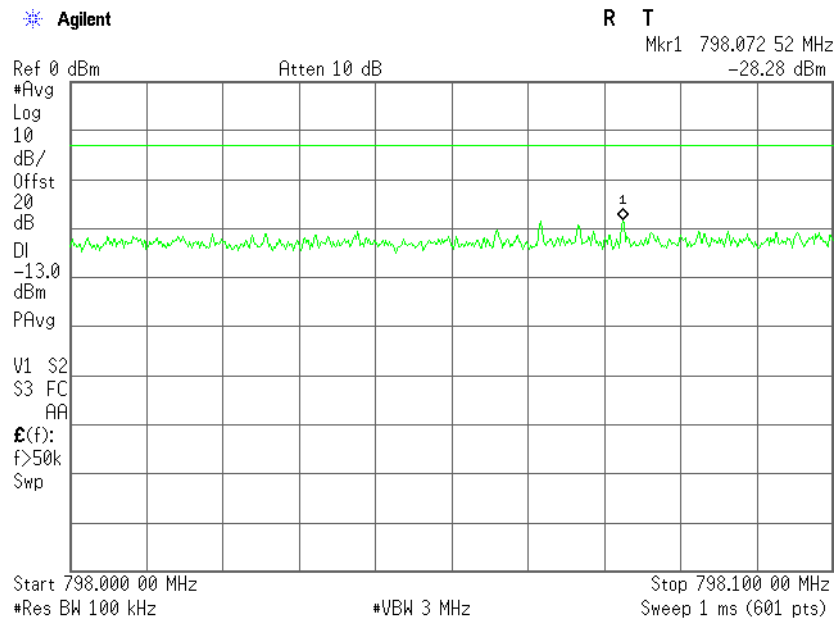
Plot 4.3.21 Conducted spurious emission test results in 9kHz – 1GHz range, 16QAM, RB size 1, RB offset 0



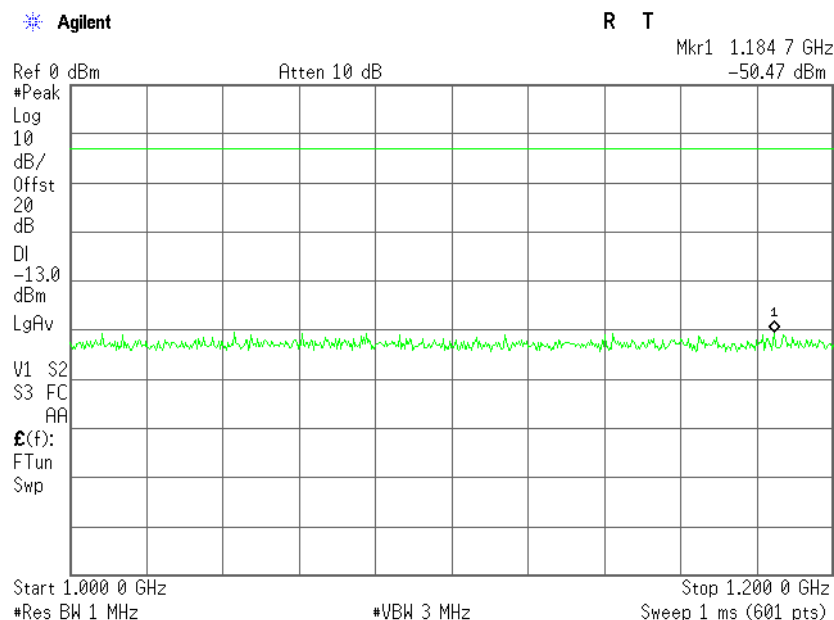
Plot 4.3.22 Conducted spurious emission test results in 787.9MHz – 788.0MHz range, 16QAM, RB size 1, RB offset 0



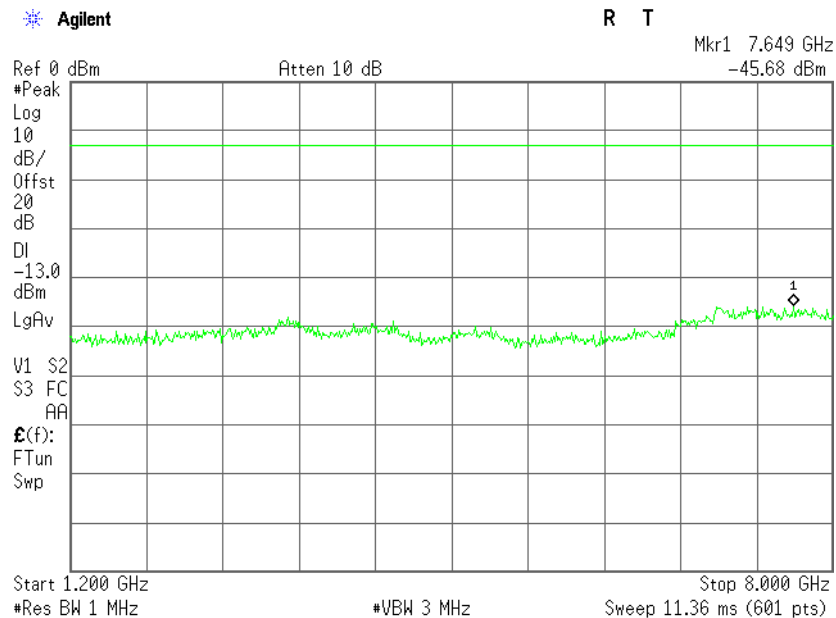
Plot 4.3.23 Conducted spurious emission test results in 798.0MHz – 798.1MHz range, 16QAM, RB size 1, RB offset 0



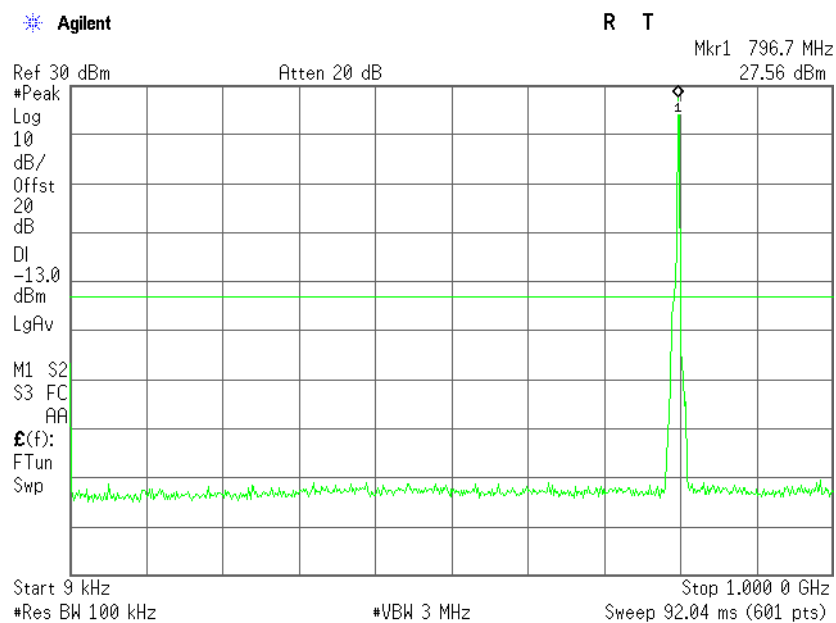
Plot 4.3.24 Conducted spurious emission test results in 1GHz – 1.2GHz range, 16QAM, RB size 1, RB offset 0



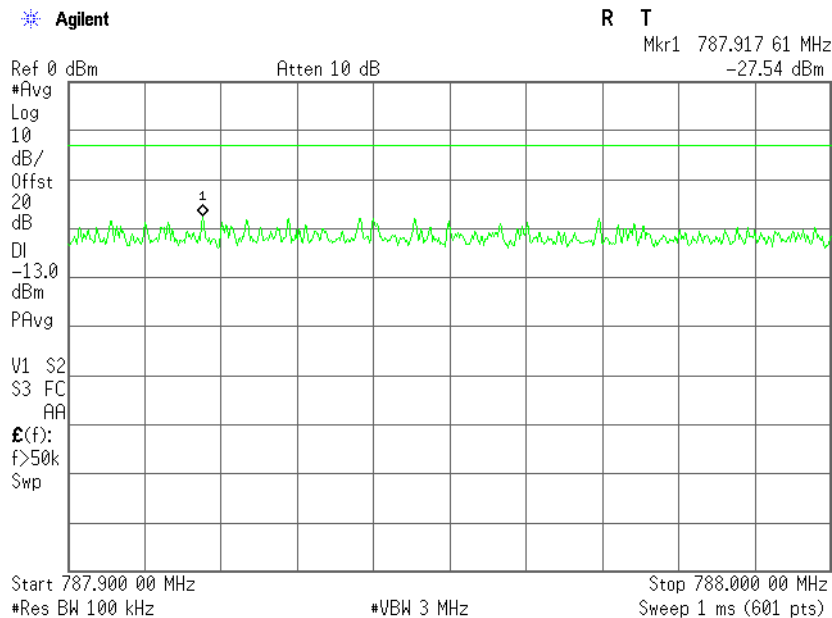
Plot 4.3.25 Conducted spurious emission test results in 1.2GHz – 8.0GHz range, 16QAM, RB size 1, RB offset 0



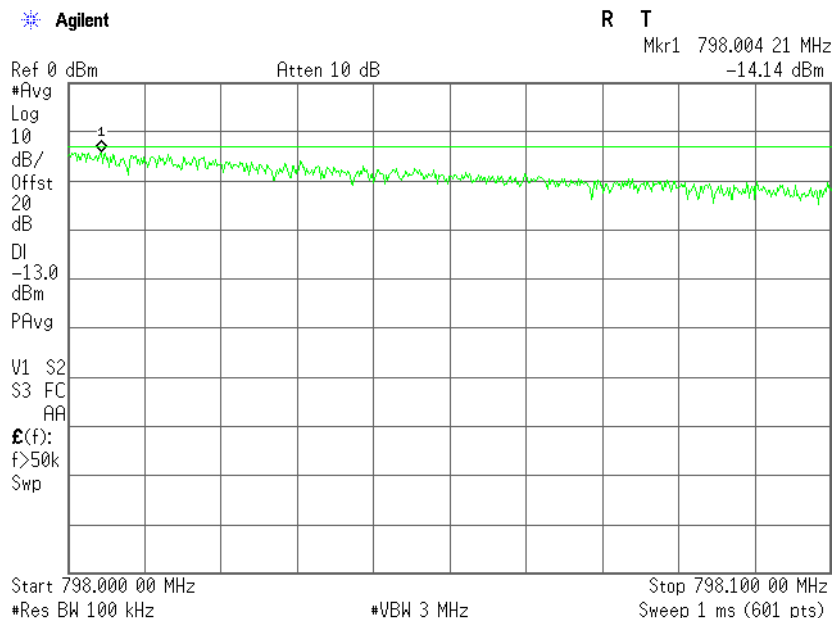
Plot 4.3.26 Conducted spurious emission test results in 9kHz – 1GHz range, 16QAM, RB size 1, RB offset 49



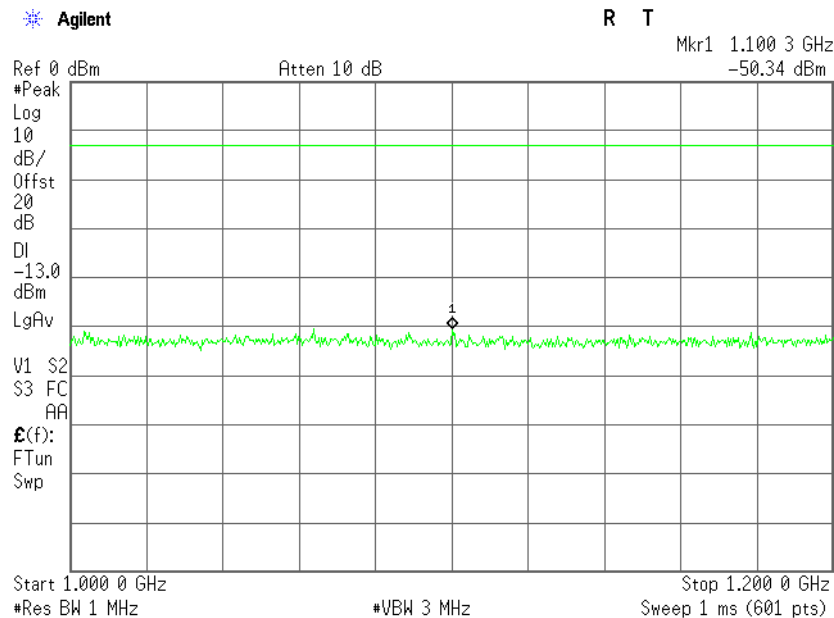
Plot 4.3.27 Conducted spurious emission test results in 787.9MHz – 788.0MHz range, 16QAM, RB size 1, RB offset 49



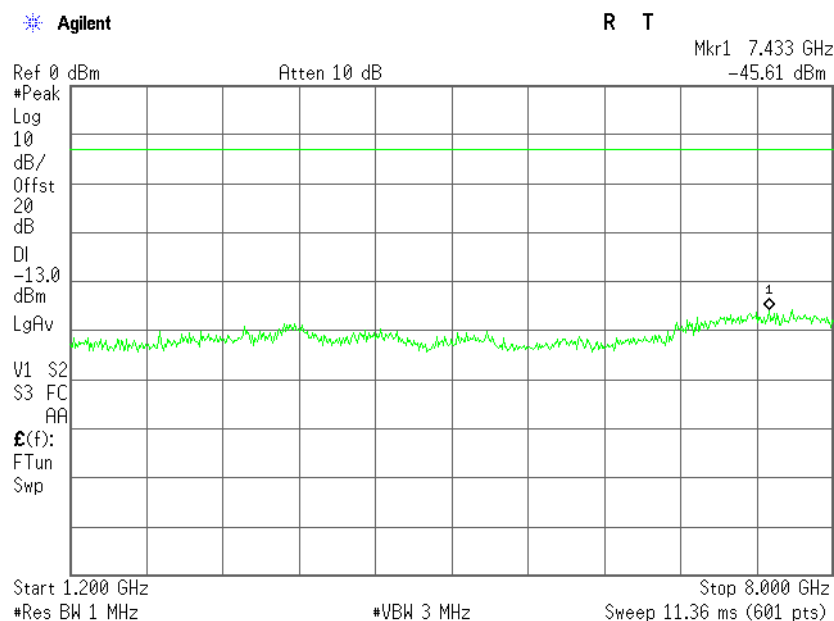
Plot 4.3.28 Conducted spurious emission test results in 798.0MHz – 798.1MHz range, 16QAM, RB size 1, RB offset 49



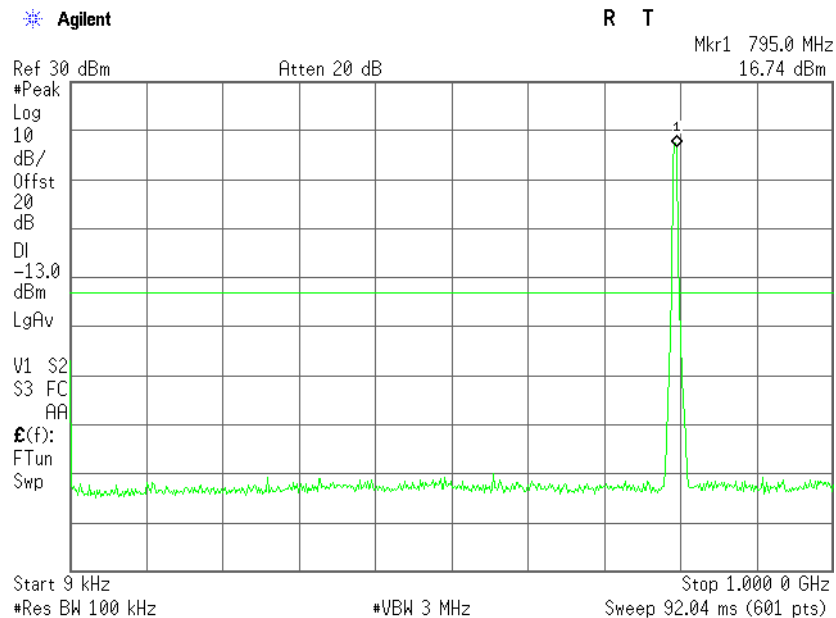
Plot 4.3.29 Conducted spurious emission test results in 1GHz – 1.2GHz range, 16QAM, RB size 1, RB offset 49



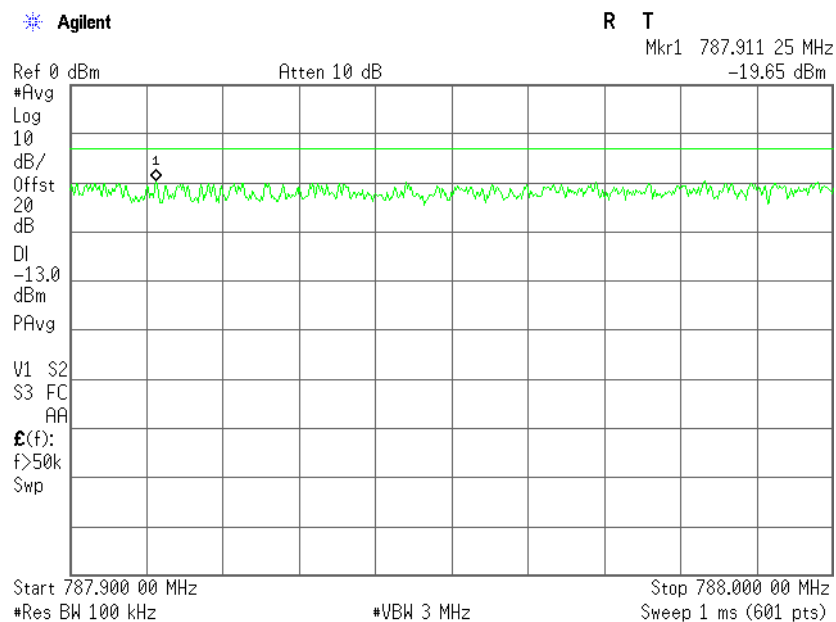
Plot 4.3.30 Conducted spurious emission test results in 1.2GHz – 8.0GHz range, 16QAM, RB size 1, RB offset 49



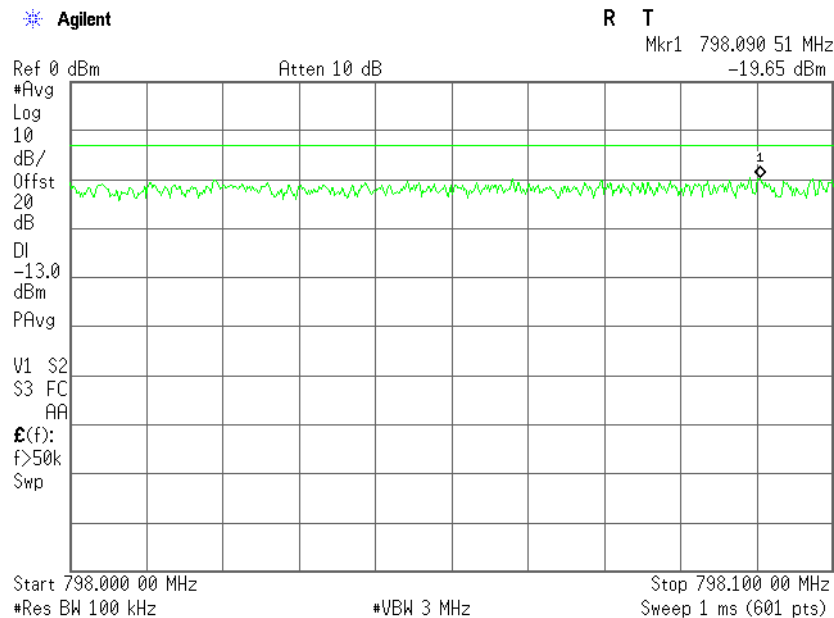
Plot 4.3.31 Conducted spurious emission test results in 9kHz – 1GHz range, 16QAM, RB size 25, RB offset 12



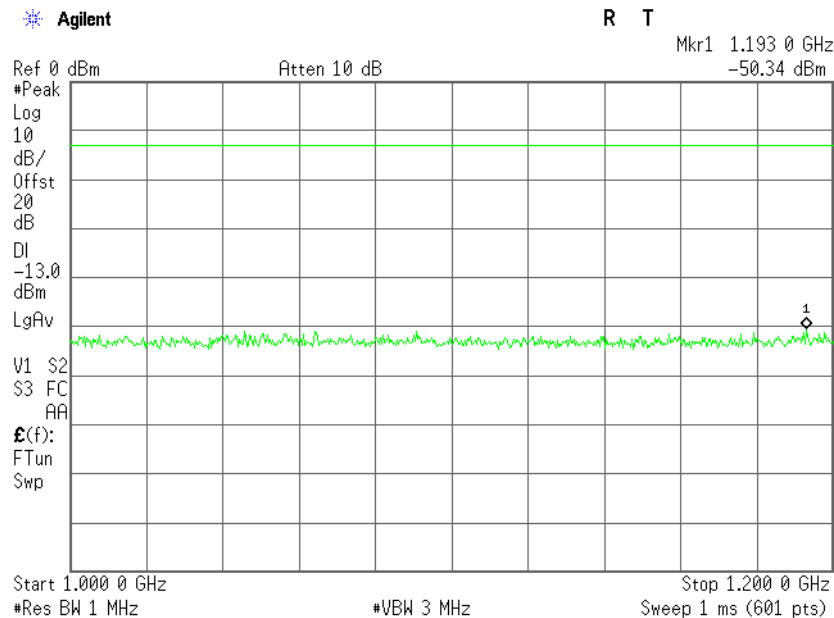
Plot 4.3.32 Conducted spurious emission test results in 787.9MHz – 788.0MHz range, 16QAM, RB size 25, RB offset 12



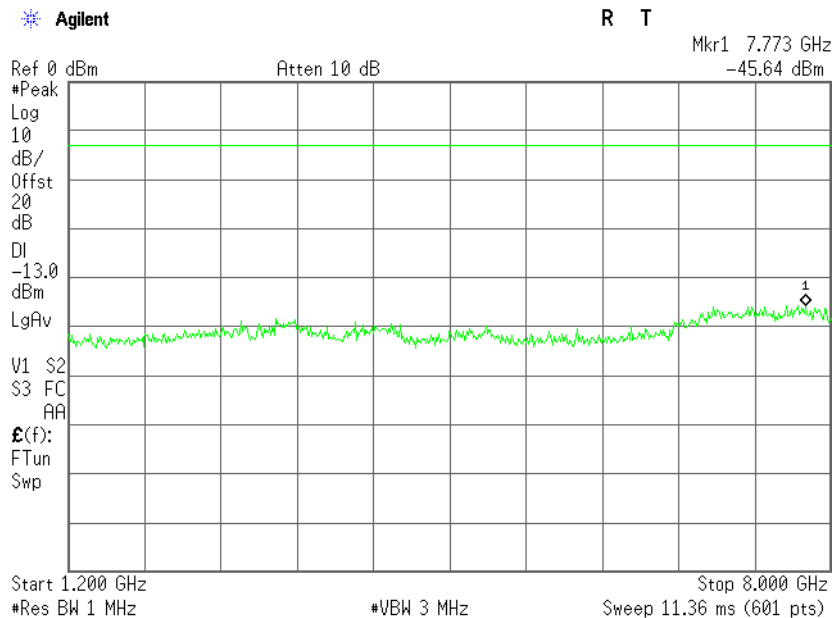
Plot 4.3.33 Conducted spurious emission test results in 798.0MHz – 798.1MHz range, 16QAM, RB size 25, RB offset 12



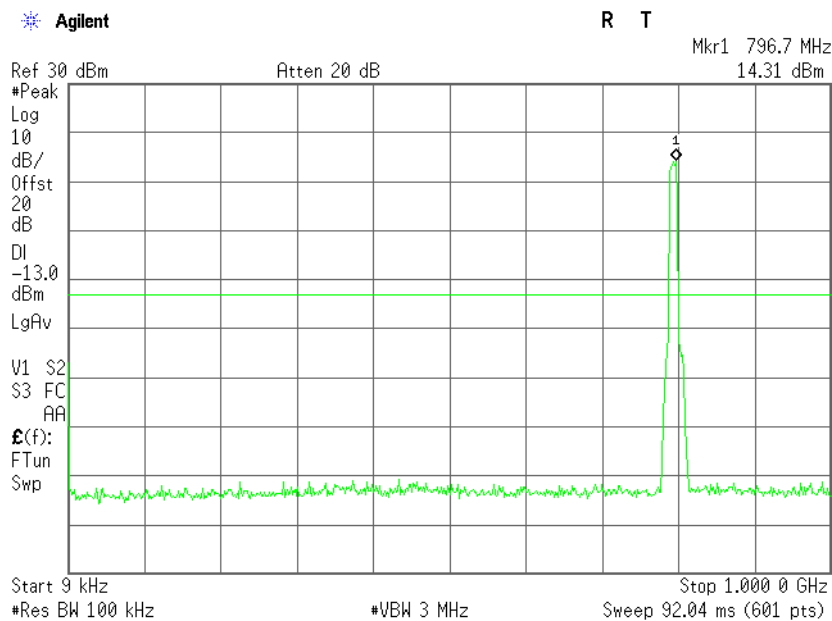
Plot 4.3.34 Conducted spurious emission test results in 1GHz – 1.2GHz range, 16QAM, RB size 25, RB offset 12



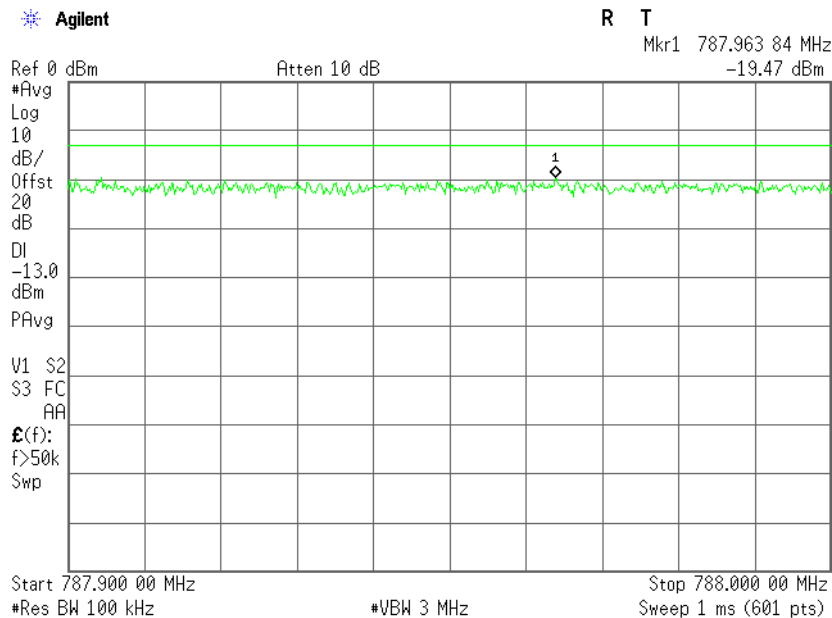
Plot 4.3.35 Conducted spurious emission test results in 1.2GHz – 8.0GHz range, 16QAM, RB size 25, RB offset 12



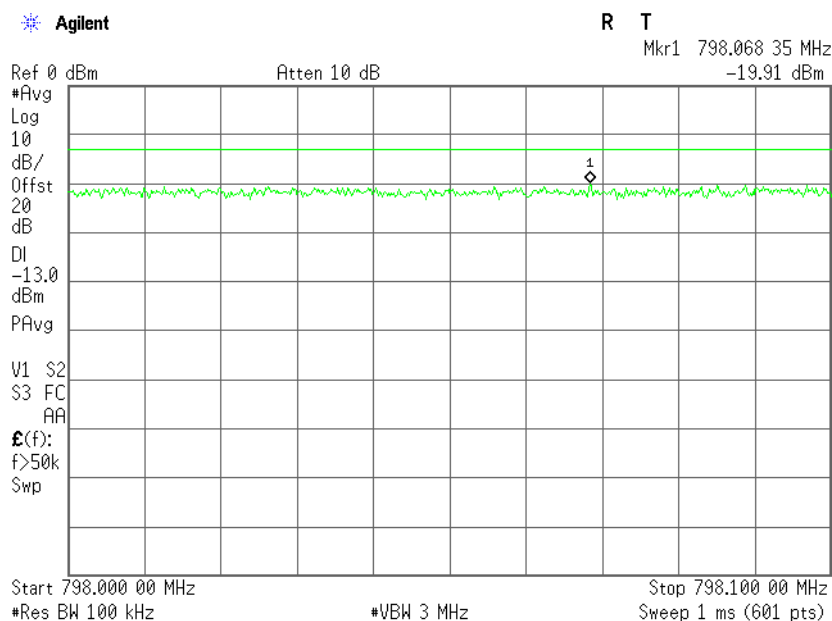
Plot 4.3.36 Conducted spurious emission test results in 9kHz – 1GHz range, 16QAM, RB size 50, RB offset 0



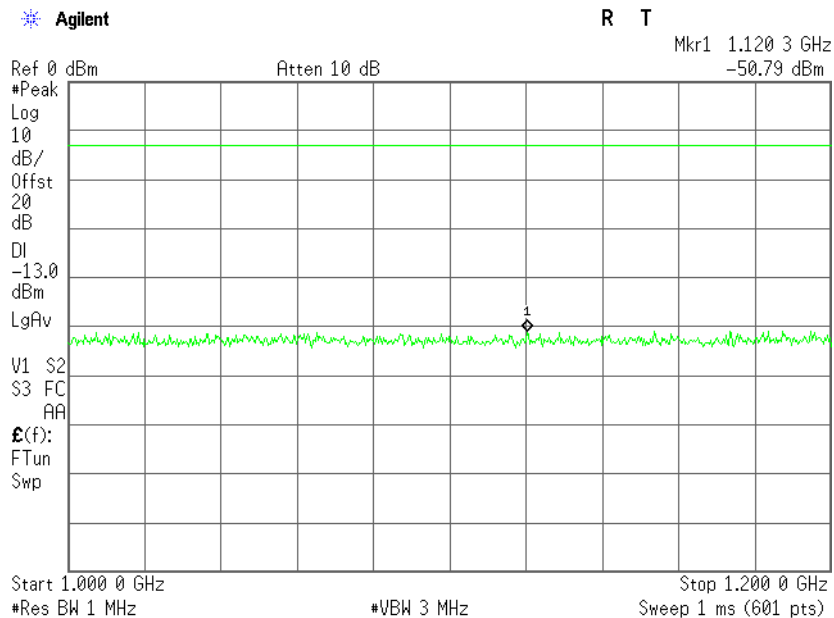
Plot 4.3.37 Conducted spurious emission test results in 787.9MHz – 788.0MHz range, 16QAM, RB size 50, RB offset 0, Fc = 793.0MHz



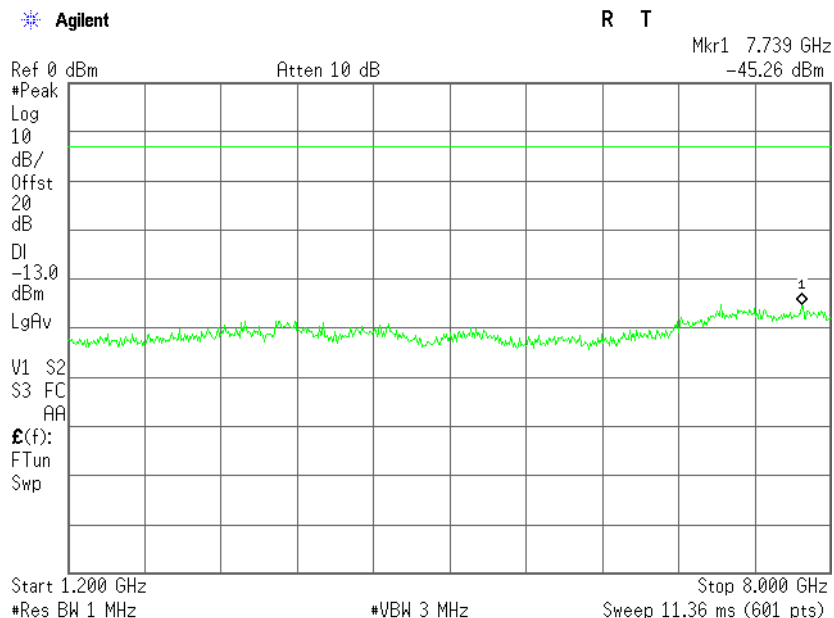
Plot 4.3.38 Conducted spurious emission test results in 798.0MHz – 798.1MHz range, 16QAM, RB size 50, RB offset 0



Plot 4.3.39 Conducted spurious emission test results in 1GHz – 1.2GHz range, 16QAM, RB size 50, RB offset 0



Plot 4.3.40 Conducted spurious emission test results in 1.2GHz – 8.0GHz range, 16QAM, RB size 50, RB offset 0



4.4. 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: 21°C	Relative Humidity: 48%	Atmospheric Pressure: hPa
Test Result:	See below	See Plots 4.4.1- 4.4.16	

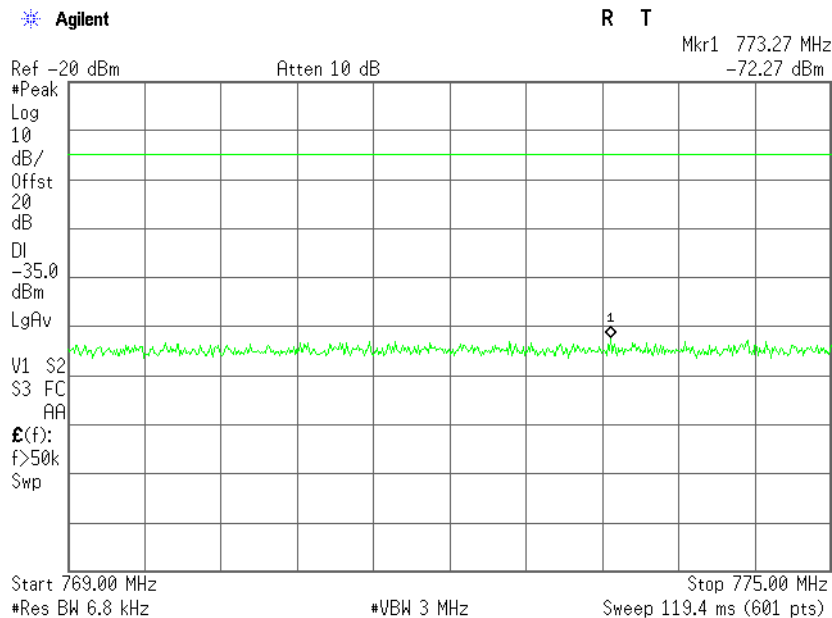
*It translates to a limit of -35dBm

Test results:

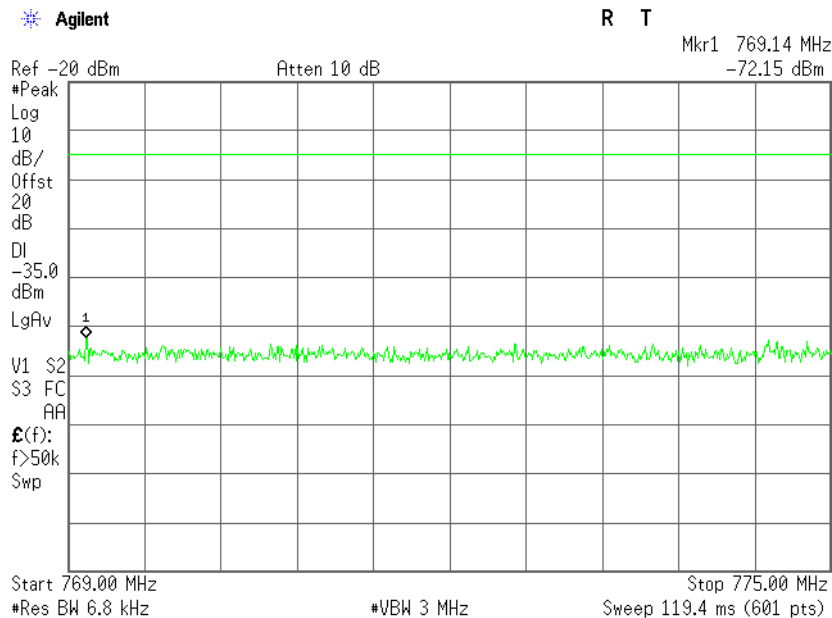
Frequency [MHz]	Resource Block Size	Resource Block Offset	Spurious Emission Frequency [MHz]	Spurious Emission Levels [dBm]	Limit [dBm]	Margin [dB]	Results
QPSK - Spurious emissions between 769-775 MHz							
788.59	1	0	*	*	-35.00	*	Pass
797.41	1	49	*	*	-35.00	*	Pass
792.91	25	12	*	*	-35.00	*	Pass
793	50	0	*	*	-35.00	*	Pass
QPSK - Spurious emissions between 799-805 MHz							
788.59	1	0	799.030	-52.83	-35.00	-17.83	Pass
797.41	1	49	799.240	-41.92	-35.00	-6.92	Pass
792.91	25	12	799.470	-41.32	-35.00	-6.32	Pass
793	50	0	799.000	-40.84	-35.00	-5.84	Pass
16 QAM - Spurious emissions between 769-775 MHz							
788.59	1	0	*	*	-35.00	*	Pass
797.41	1	49	*	*	-35.00	*	Pass
792.91	25	12	*	*	-35.00	*	Pass
793	50	0	*	*	-35.00	*	Pass
16 QAM - Spurious emissions between 799-805 MHz							
788.59	1	0	799.010	-52.17	-35.00	-17.17	Pass
797.41	1	49	799.360	-41.93	-35.00	-6.93	Pass
792.91	25	12	799.150	-41.52	-35.00	-6.52	Pass
793	50	0	800.370	-39.06	-35.00	-4.06	Pass

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

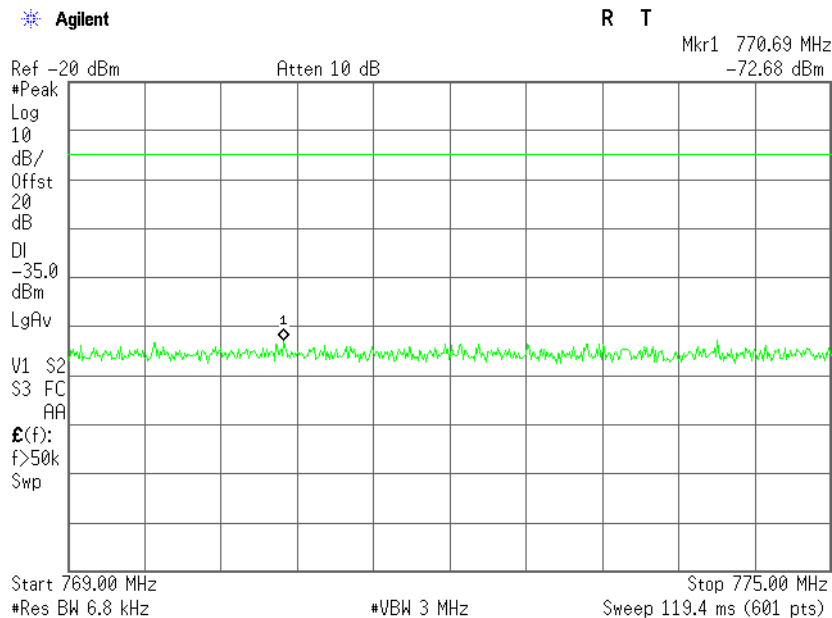
Plot 4.4.1 Conducted spurious emission test results in 769MHz – 775MHz range, QPSK, RB size 1, RB offset 0



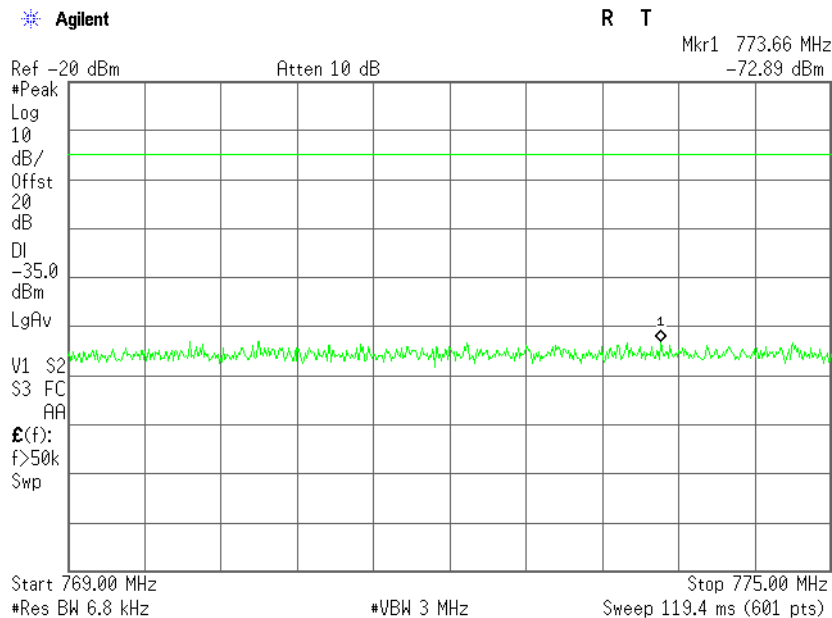
Plot 4.4.2 Conducted spurious emission test results in 769MHz – 775MHz range, QPSK, RB size 1, RB offset 49



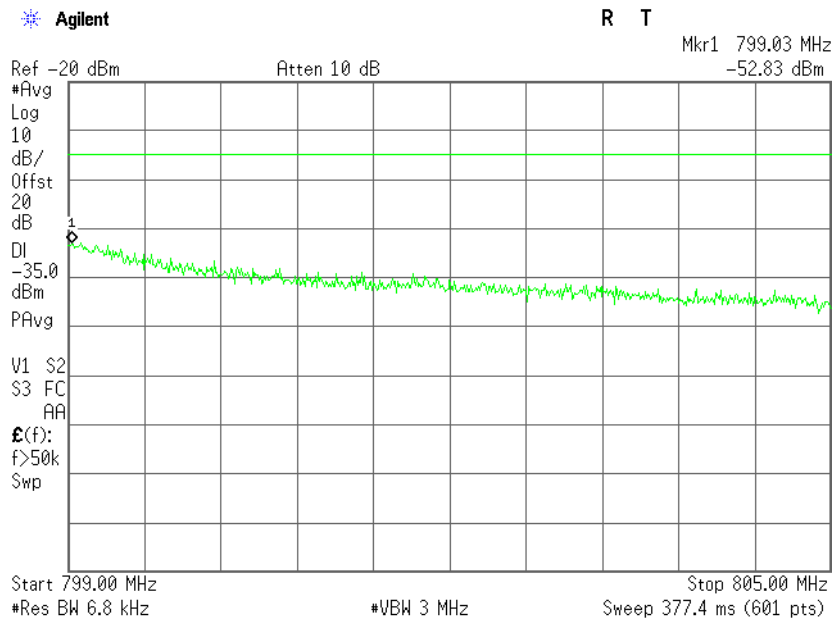
Plot 4.4.3 Conducted spurious emission test results in 769MHz – 775MHz range, QPSK, RB size 25, RB offset 12



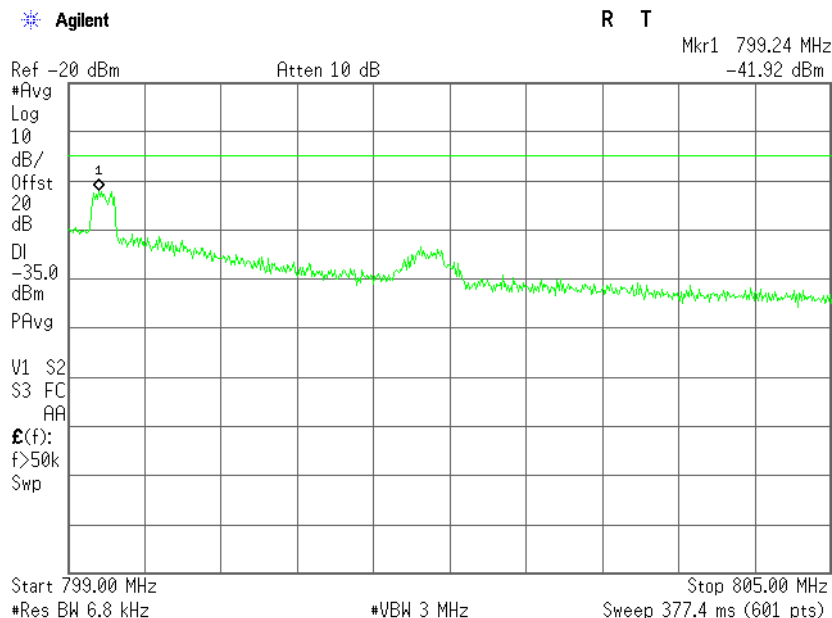
Plot 4.4.4 Conducted spurious emission test results in 769MHz – 775MHz range, QPSK, RB size 50, RB offset 0



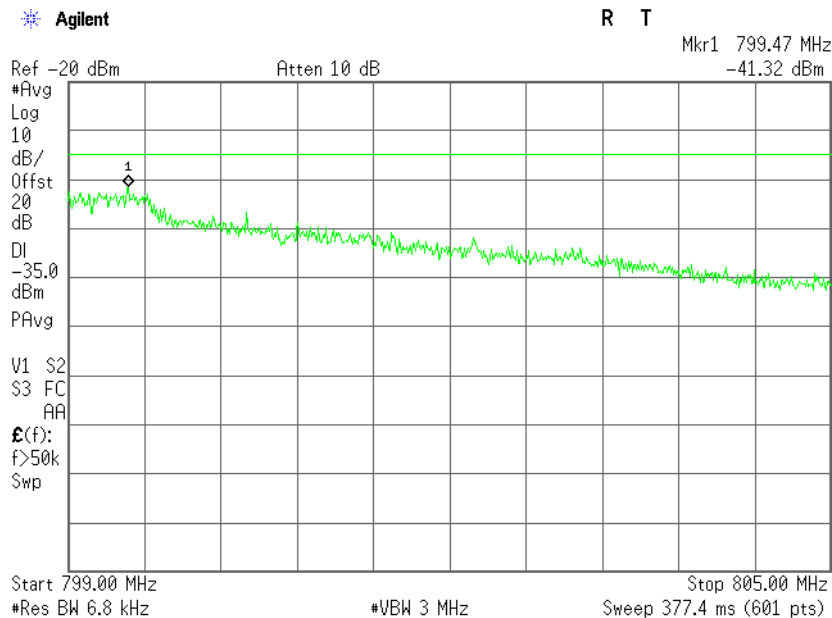
Plot 4.4.5 Conducted spurious emission test results in 799MHz – 805MHz range, QPSK, RB size 1, RB offset 0,



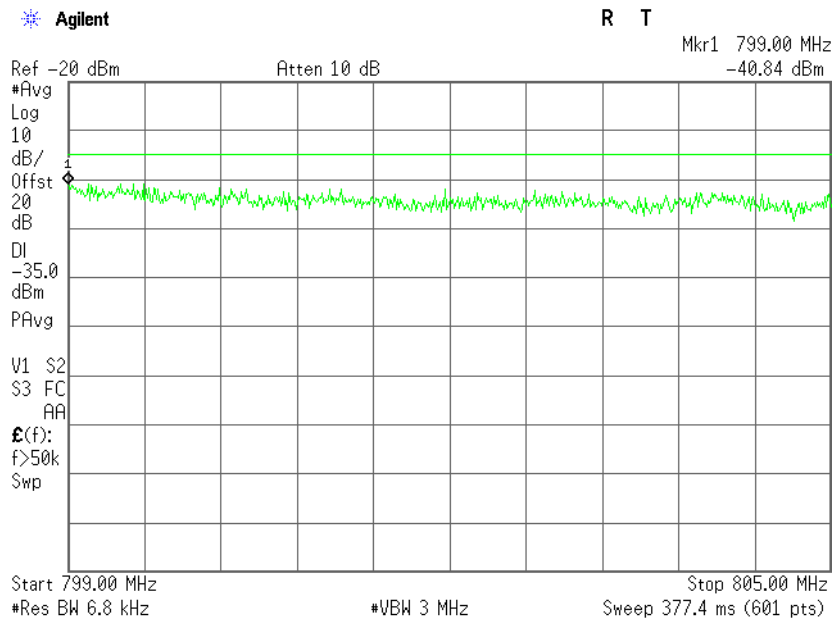
Plot 4.4.6 Conducted spurious emission test results in 799MHz – 805MHz range, QPSK, RB size 1, RB offset 49



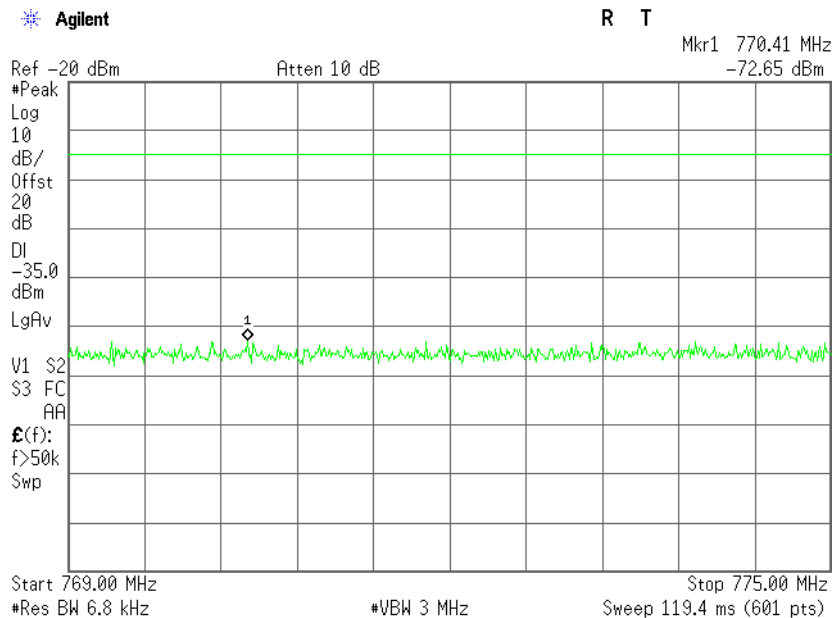
Plot 4.4.7 Conducted spurious emission test results in 799MHz – 805MHz range, QPSK, RB size 25, RB offset 12



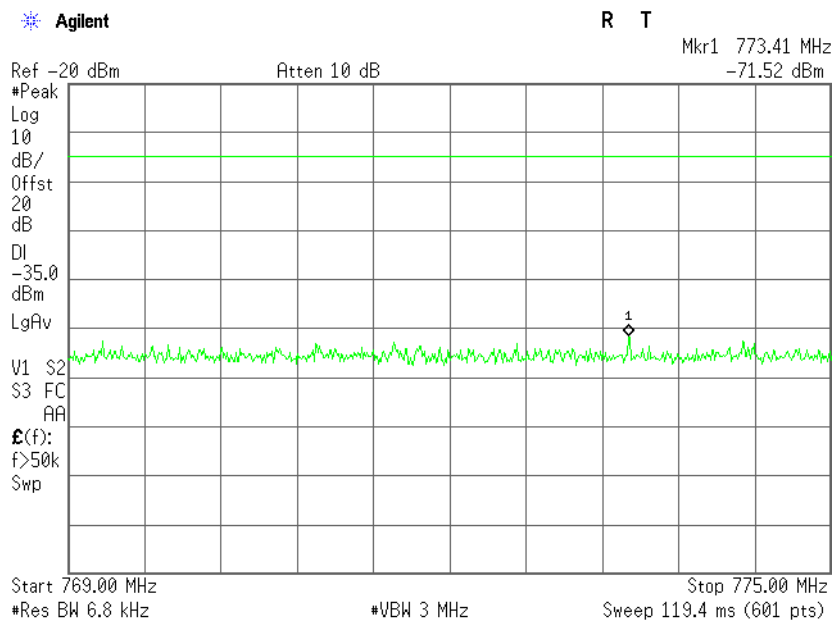
Plot 4.4.8 Conducted spurious emission test results in 799MHz – 805MHz range, QPSK, RB size 50, RB offset 0



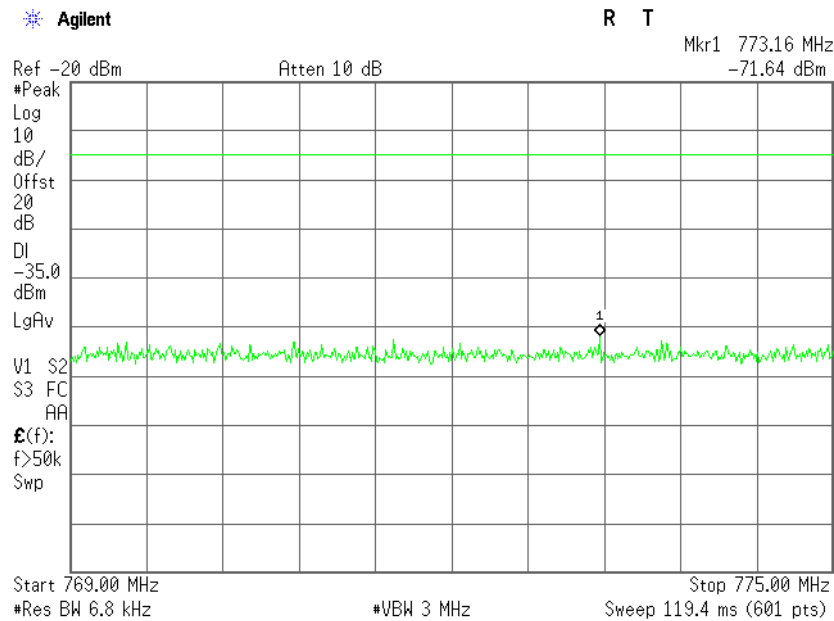
Plot 4.4.9 Conducted spurious emission test results in 769MHz – 775MHz range, 16QAM, RB size 1, RB offset 0



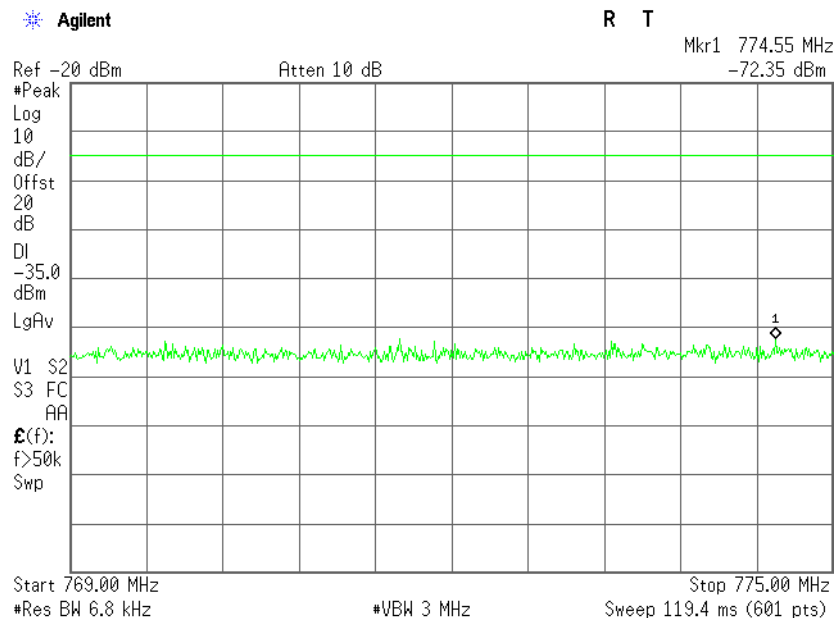
Plot 4.4.10 Conducted spurious emission test results in 769MHz – 775MHz range, 16QAM, RB size 1, RB offset 49



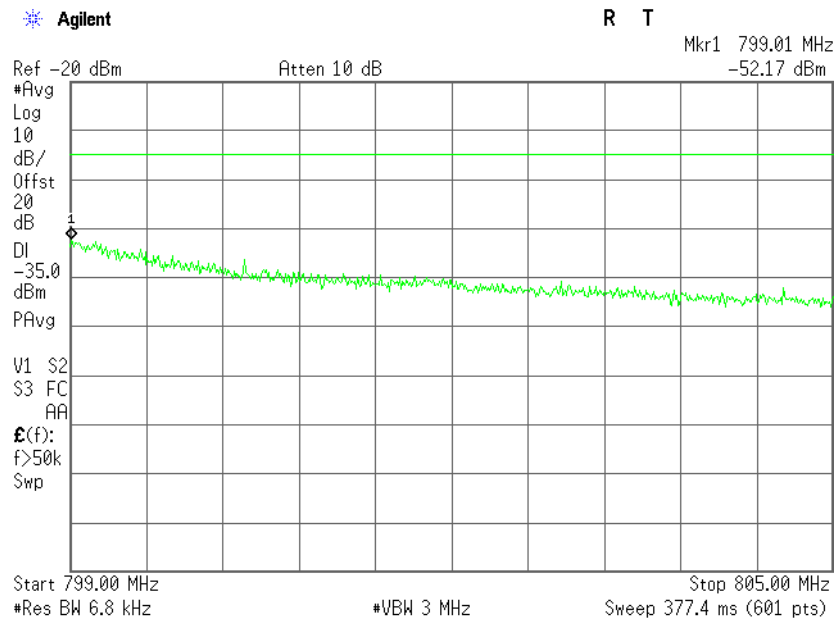
Plot 4.4.11 Conducted spurious emission test results in 769MHz – 775MHz range, 16QAM, RB size 25, RB offset 12



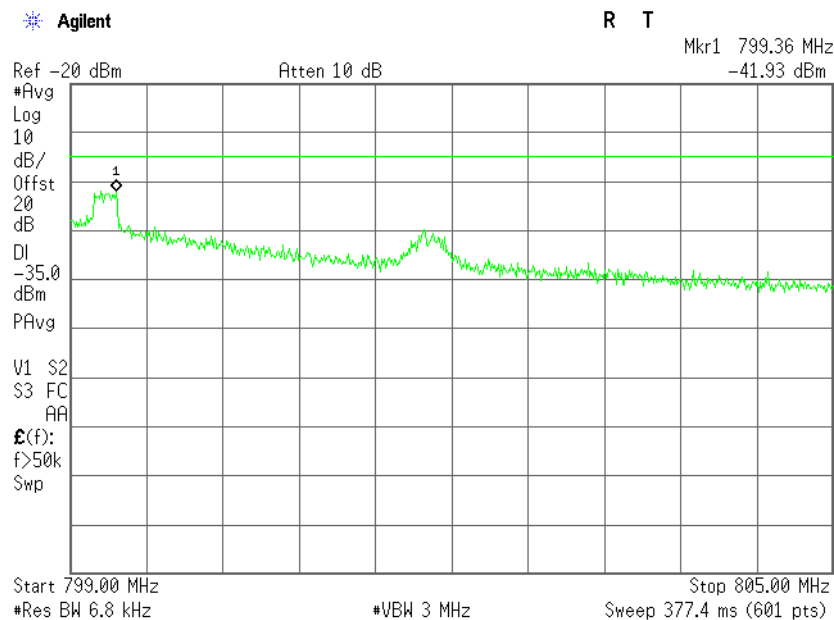
Plot 4.4.12 Conducted spurious emission test results in 769MHz – 775MHz range, 16QAM, RB size 50, RB offset 0



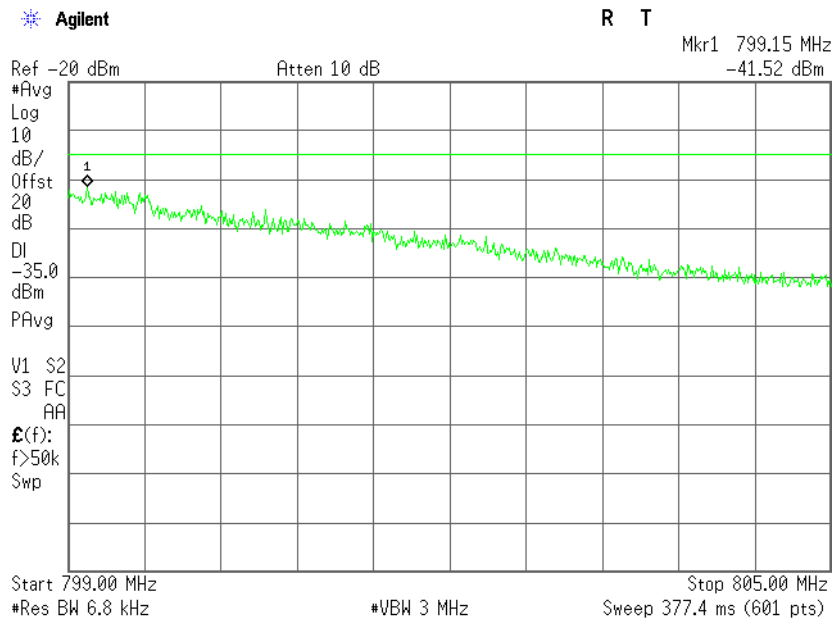
Plot 4.4.13 Conducted spurious emission test results in 799MHz – 805MHz range, 16QAM, RB size 1, RB offset 0



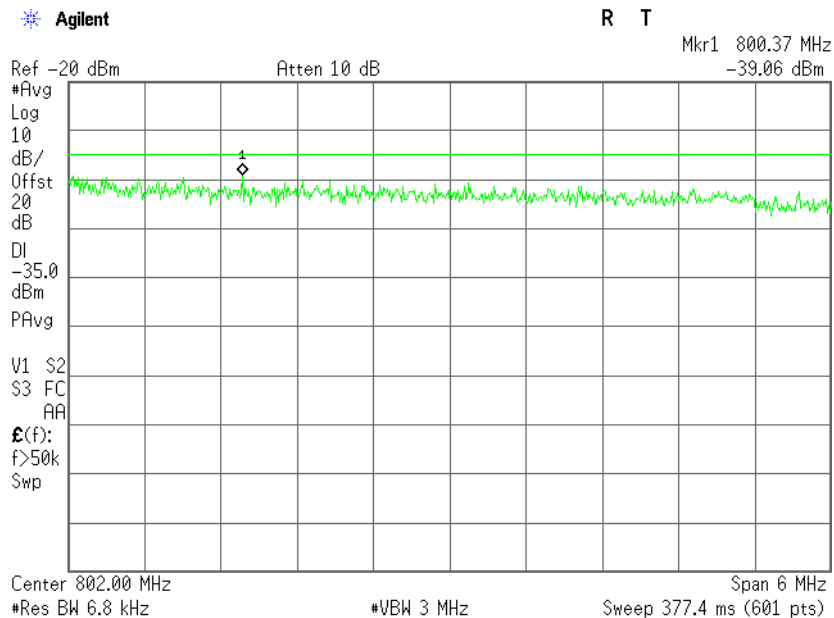
Plot 4.4.14 Conducted spurious emission test results in 799MHz – 805MHz range, 16QAM, RB size 1, RB offset 49



Plot 4.4.15 Conducted spurious emission test results in 799MHz – 805MHz range, 16QAM, RB size 25, RB offset 12



Plot 4.4.16 Conducted spurious emission test results in 799MHz – 805MHz range, 16QAM, RB size 50, RB offset 0



4.5. 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 $43 + 10\log(P)$ dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 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: 24 °C	Relative Humidity: 58%	Atmospheric Pressure: hPa
Test Result:	See below	See Plots 4.6.1- 4.6.20	

*It translates to a limit of -13dBm

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
784.040(QPSK)	78.75	V	NA	NA	NA	-13.00	NA	NA*
784.040(16QAM)	80.12	V	NA	NA	NA	-13.00	NA	NA*

* Carrier frequency.

* 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.

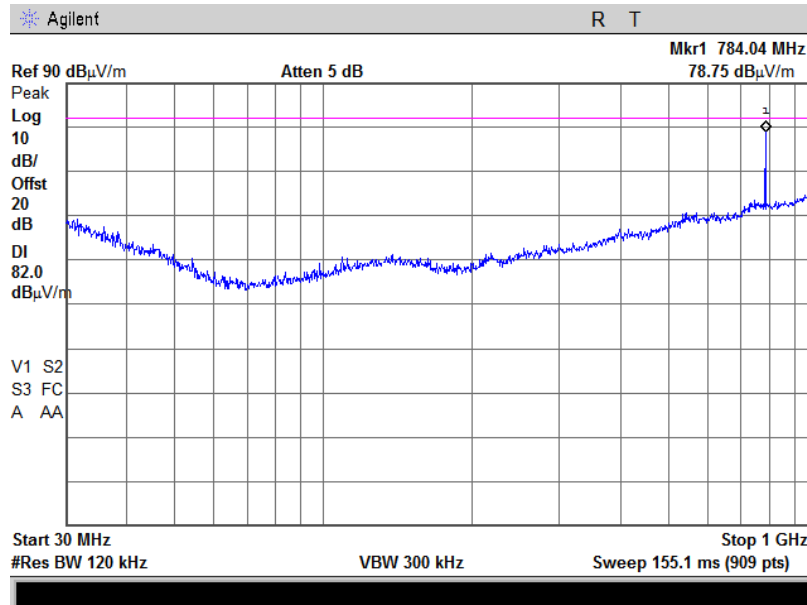
Test results above 1GHz:

Spurious Emission Frequency [MHz]	Max Reading [dBμV/m]	Antenna Polarization	Signal Generator Level [dBm]	Antenna Gain [dBd]	Emission power calculated [dBm]	Limit [dBm]	Margin [dB]	Pass/Fail
793.0 MHz - QPSK - RB size 1, RB Offset 49								
*	*	*	*	*	*	-13	*	Pass
793.0 MHz - 16 QAM - RB size 1, RB Offset 49								
*	*	*	*	*	*	-13	*	Pass

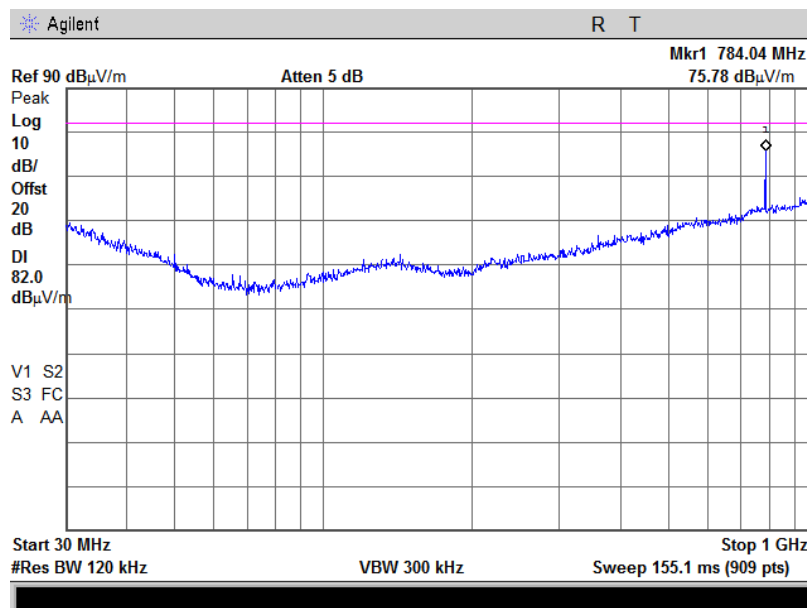
* All readings were at least 15 dB below the limit.

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

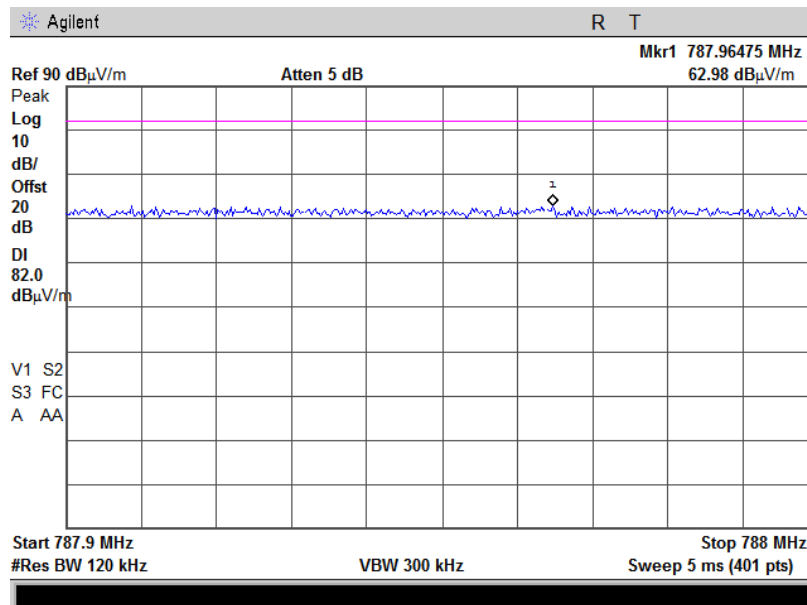
Plot 4.6.1 Field Strength of Spurious Radiation test results in 30MHz – 1GHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



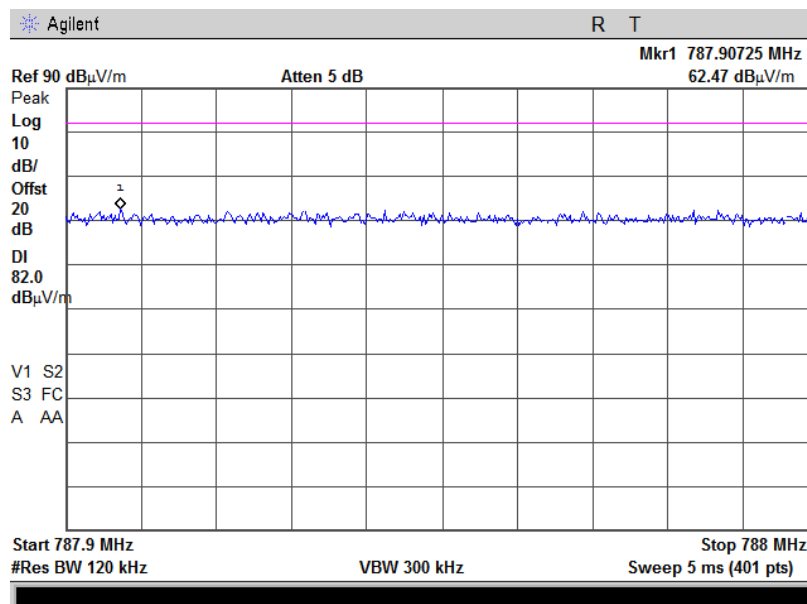
Plot 4.6.2 Field Strength of Spurious Radiation test results in 30MHz – 1GHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



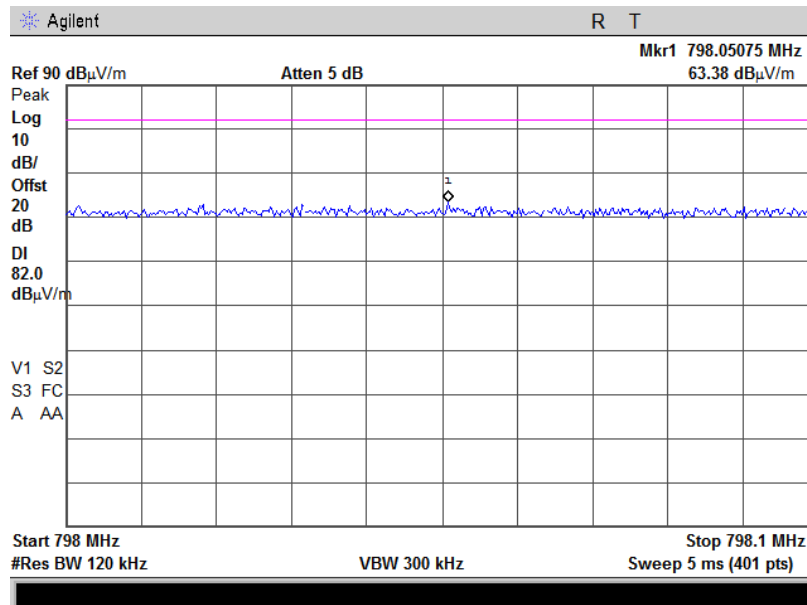
Plot 4.6.3 Field Strength of Spurious Radiation test results in 787.9MHz – 788MHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



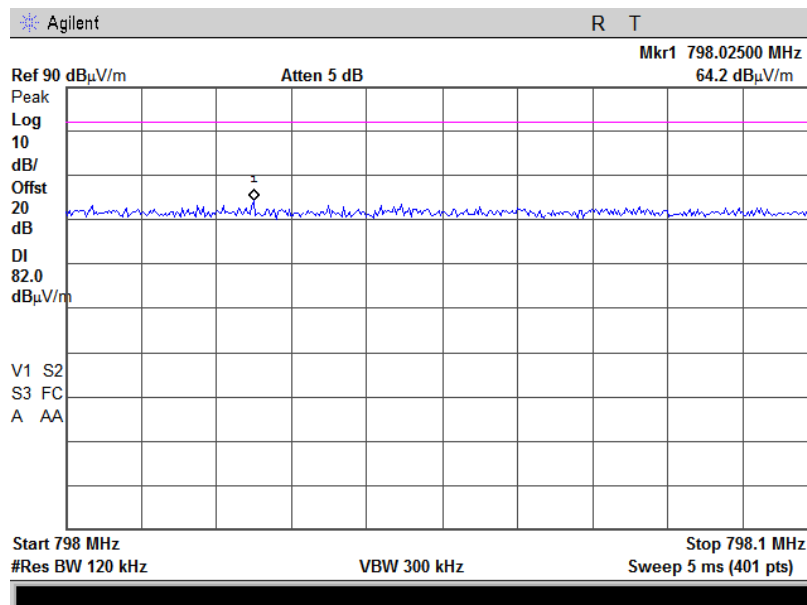
Plot 4.6.4 Field Strength of Spurious Radiation test results in 787.9MHz – 788MHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



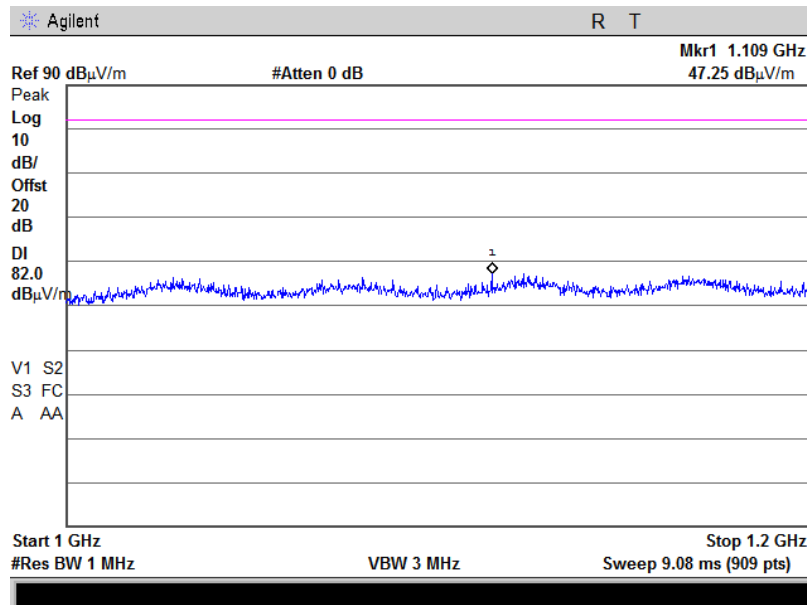
Plot 4.6.5 Field Strength of Spurious Radiation test results in 798.0MHz – 798.1MHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



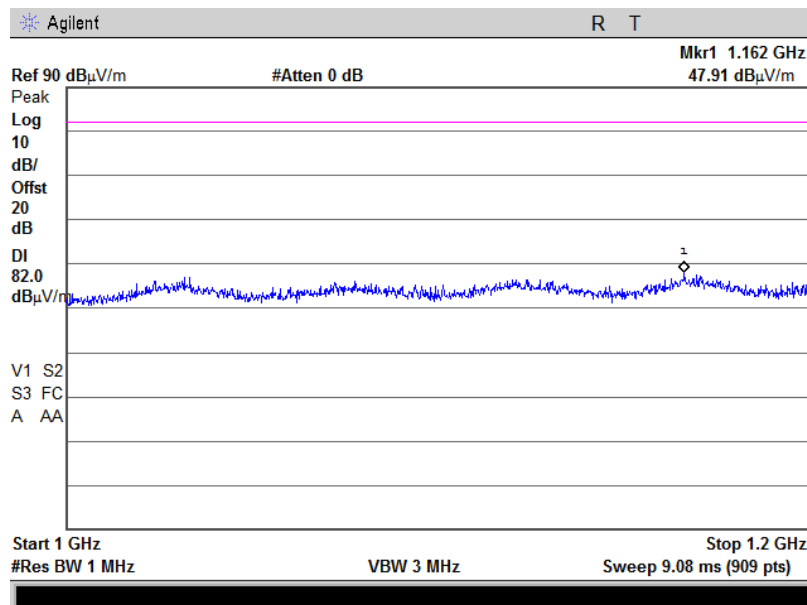
Plot 4.6.6 Field Strength of Spurious Radiation test results in 798.0MHz – 798.1MHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



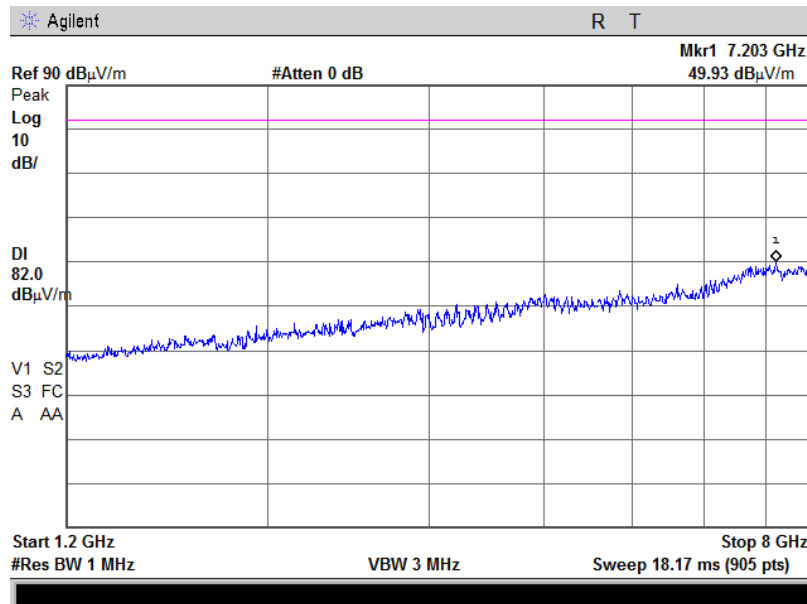
Plot 4.6.7 Field Strength of Spurious Radiation test results in 1GHz – 1.2GHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



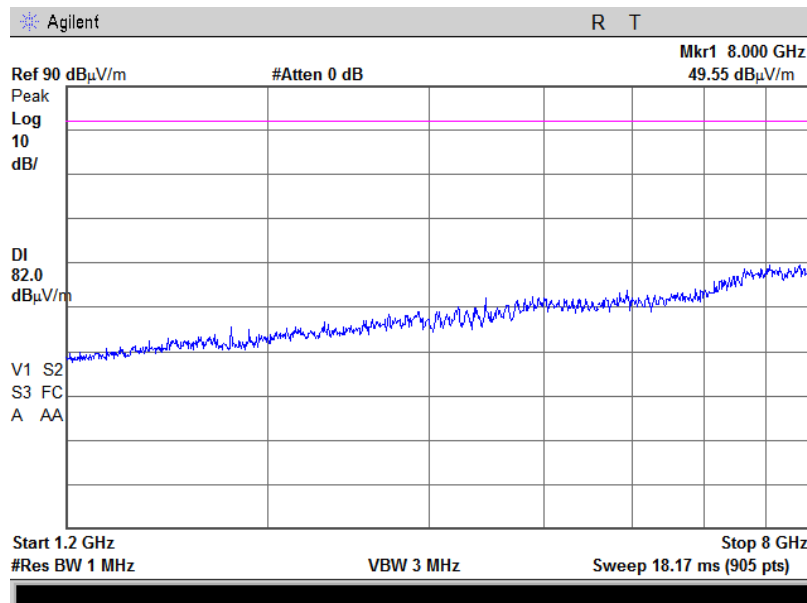
Plot 4.6.8 Field Strength of Spurious Radiation test results in 1GHz – 1.2GHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



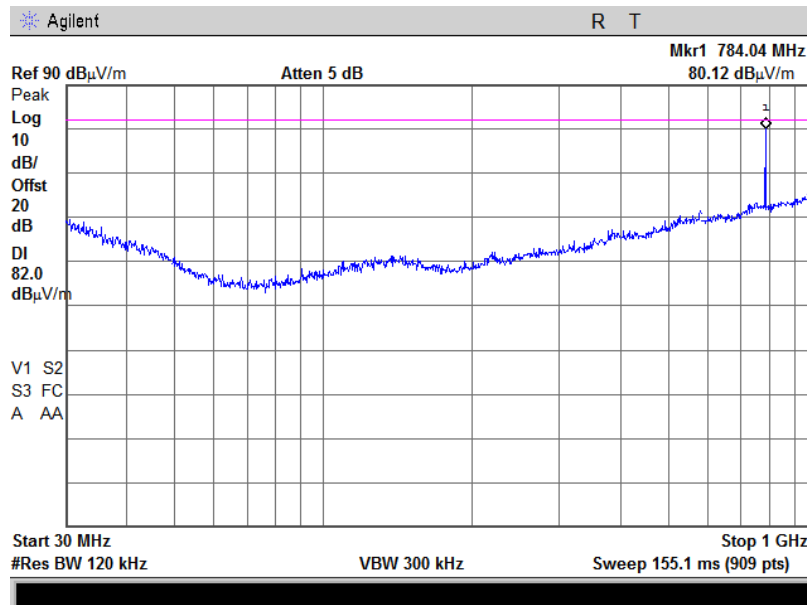
Plot 4.6.9 Field Strength of Spurious Radiation test results in 1.2GHz – 8GHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



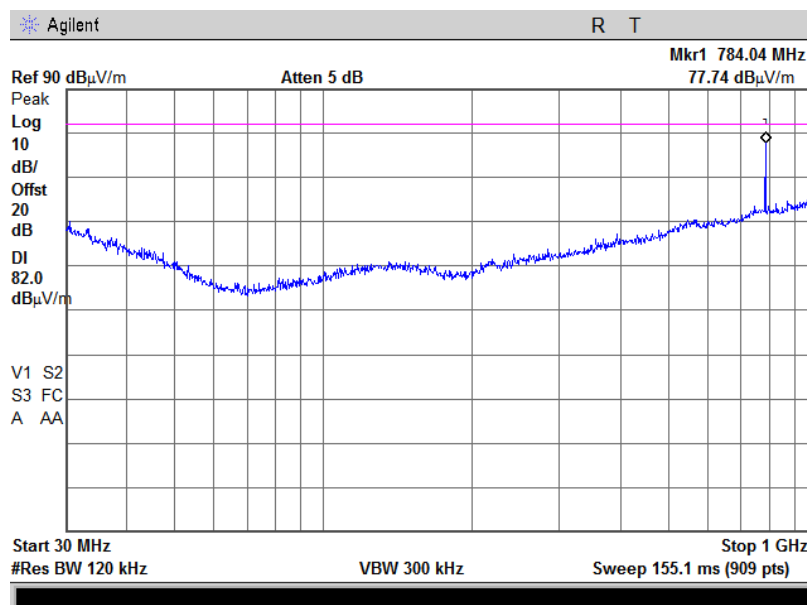
Plot 4.6.10 Field Strength of Spurious Radiation test results in 1.2GHz – 8GHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



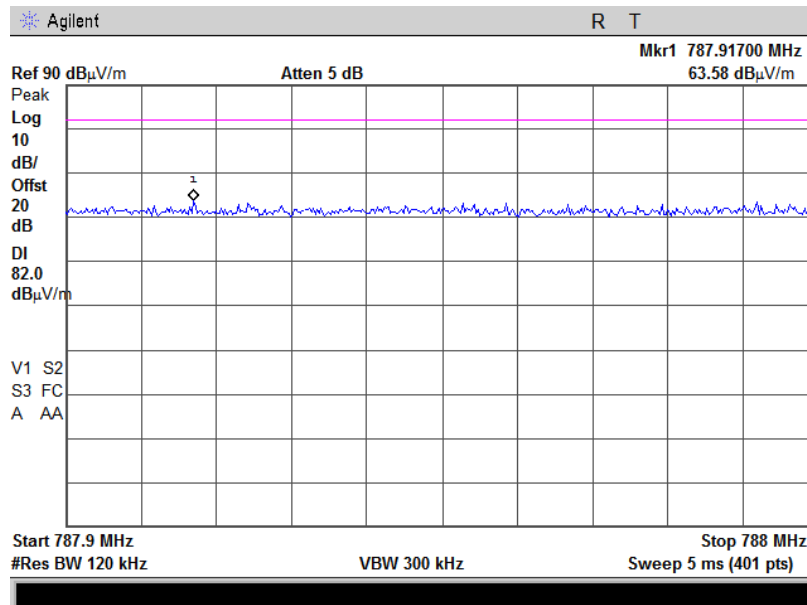
Plot 4.6.11 Field Strength of Spurious Radiation test results in 30MHz – 1GHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



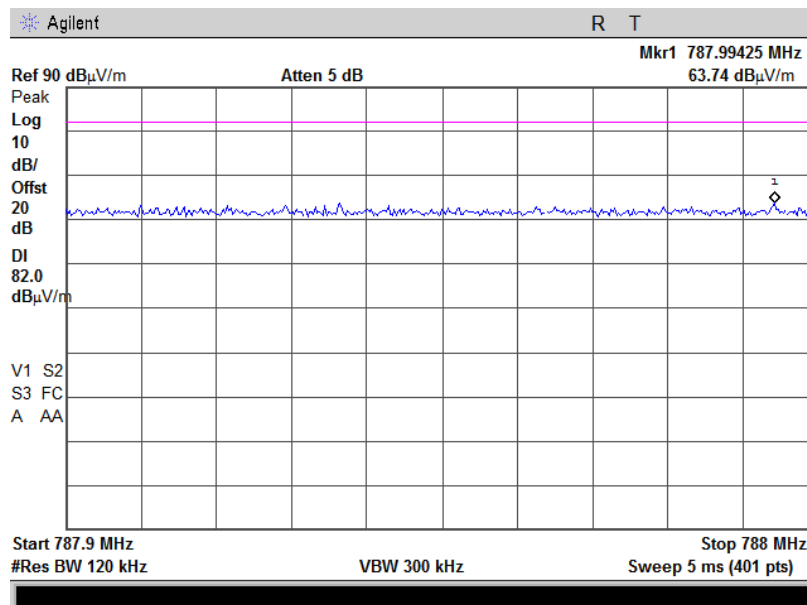
Plot 4.6.12 Field Strength of Spurious Radiation test results in 30MHz – 1GHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



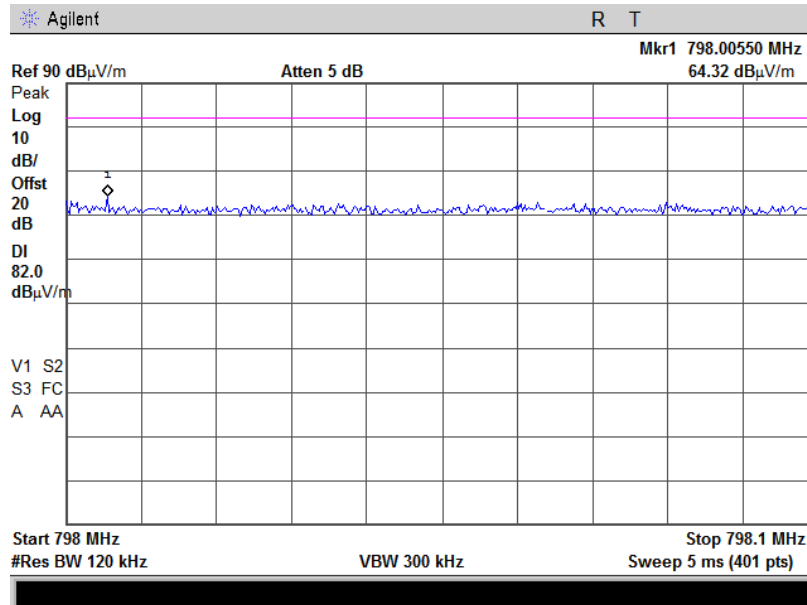
Plot 4.6.13 Field Strength of Spurious Radiation test results in 787.9MHz – 788MHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



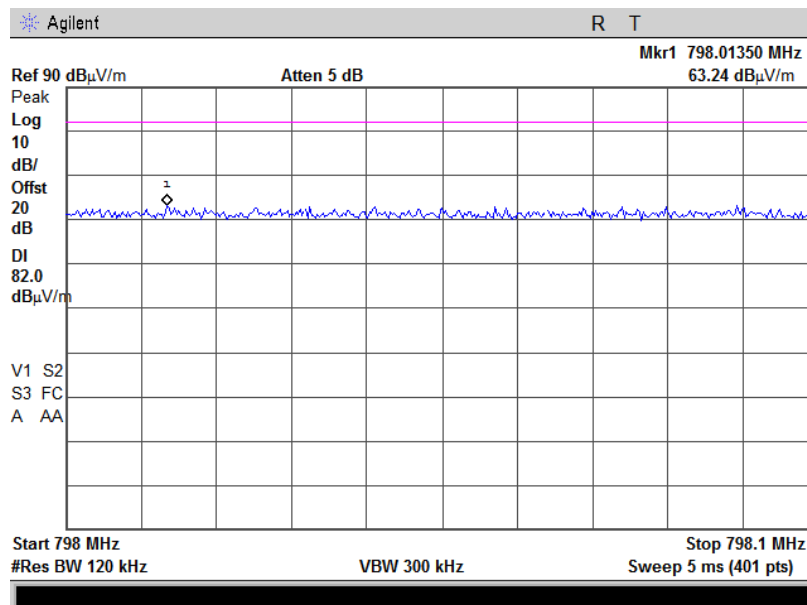
Plot 4.6.14 Field Strength of Spurious Radiation test results in 787.9MHz – 788MHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



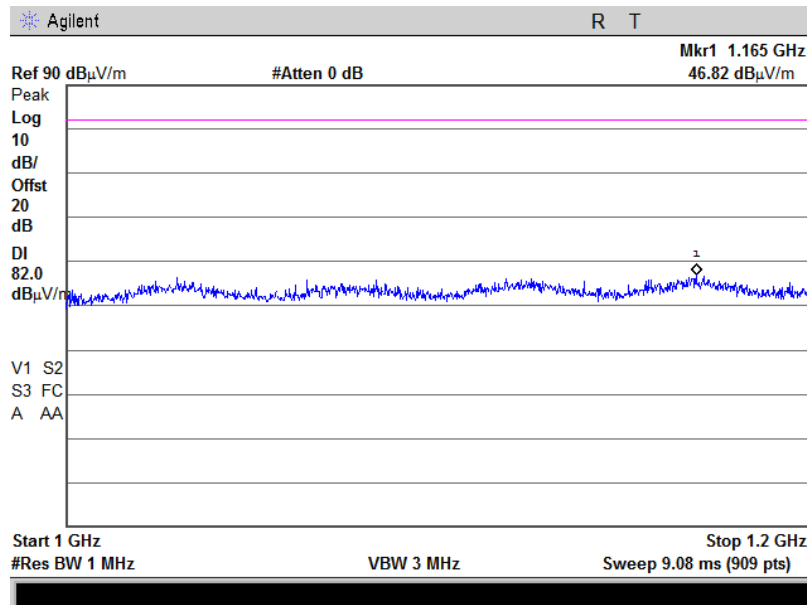
Plot 4.6.15 Field Strength of Spurious Radiation test results in 798.0MHz – 798.1MHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



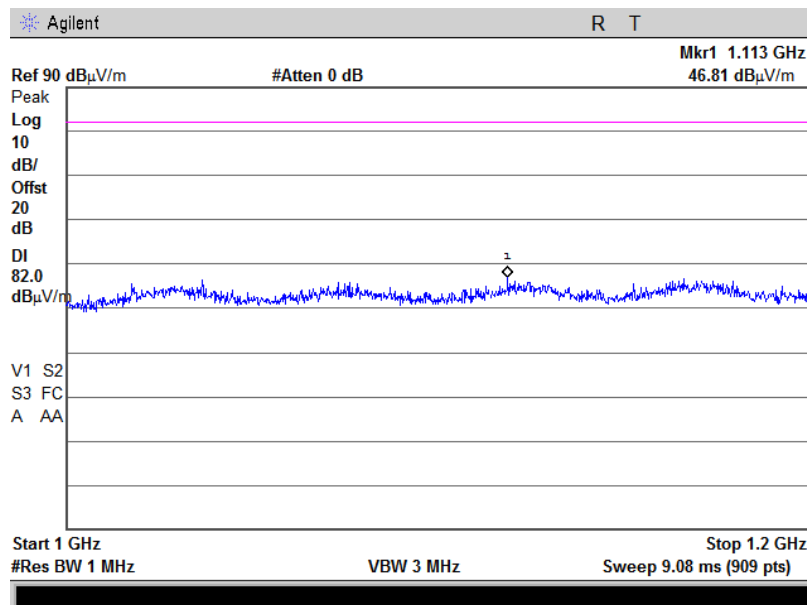
Plot 4.6.16 Field Strength of Spurious Radiation test results in 798.0MHz – 798.1MHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



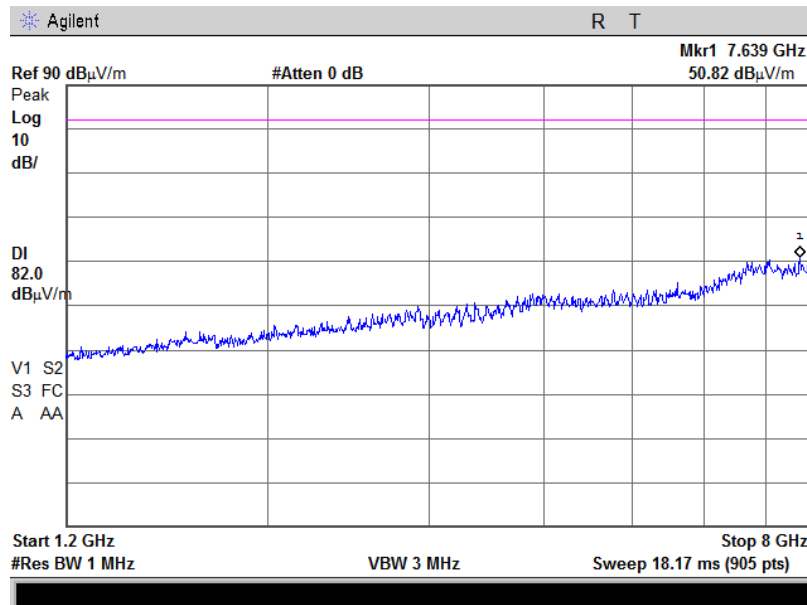
Plot 4.6.17 Field Strength of Spurious Radiation test results in 1GHz – 1.2GHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



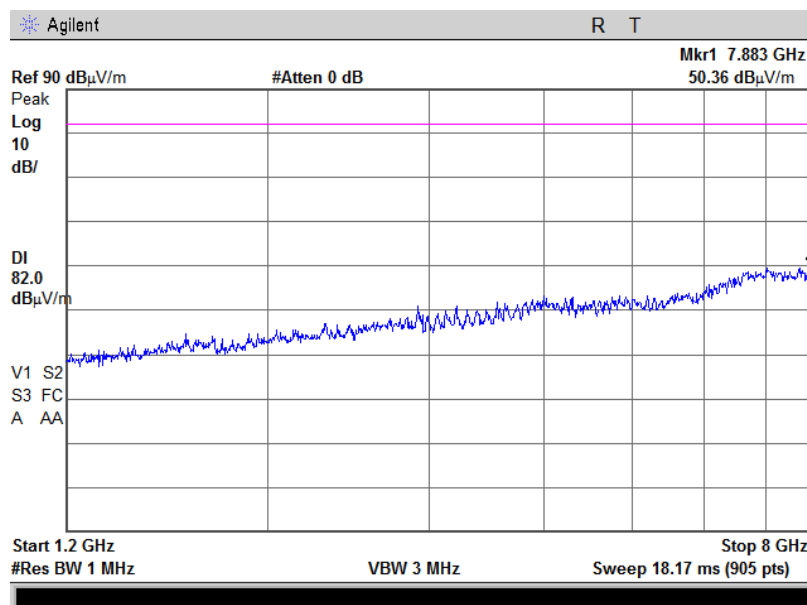
Plot 4.6.18 Field Strength of Spurious Radiation test results in 1GHz – 1.2GHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



Plot 4.6.19 Field Strength of Spurious Radiation test results in 1.2GHz – 8GHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical



Plot 4.6.20 Field Strength of Spurious Radiation test results in 1.2GHz – 8GHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Horizontal



4.6. 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: 23°C	Relative Humidity: 52%	Atmospheric Pressure: hPa
Test Result:	See below	See Plots 4.7.1- 4.7.4	

*It translates to a limit of -35dBm

Test results:

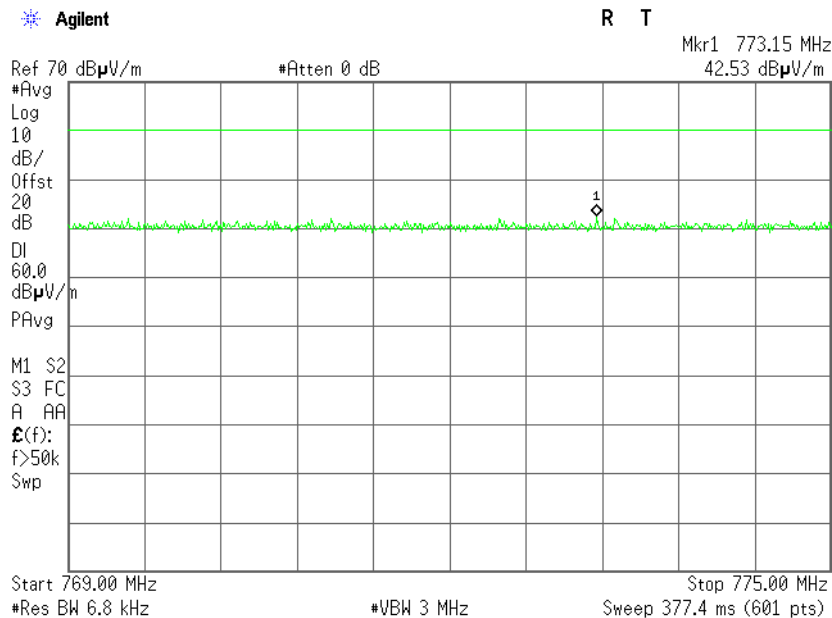
Spurious Emission Frequency [MHz]	Max Reading [dBμV/m]	Antenna Polarization	Signal Generator Level [dBm]	Antenna Gain [dBd]	Emission power calculated [dBm]	Limit [dBm]	Margin [dB]	Pass/Fail
QPSK - Spurious emissions between 769-775 MHz, RB size 50, RB offset 0, Fc = 793.0MHz								
773.150	42.53	H&V	*	*	*	-34.60	*	Pass
QPSK - Spurious emissions between 799-805 MHz, RB size 50, RB offset 0, Fc = 793.0MHz								
799.450	58.79	H&V	-43.00	4.75	-38.25	-34.60	-3.65	Pass
16 QAM - Spurious emissions between 769-775 MHz, RB size 50, RB offset 0, Fc = 793.0MHz								
769.390	42.46	H&V	*	*	*	-34.60	*	Pass
16 QAM - Spurious emissions between 799-805 MHz, RB size 50, RB offset 0, Fc = 793.0MHz								
799.250	58.91	H&V	-43.10	4.75	-38.35	-34.60	-3.75	Pass

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

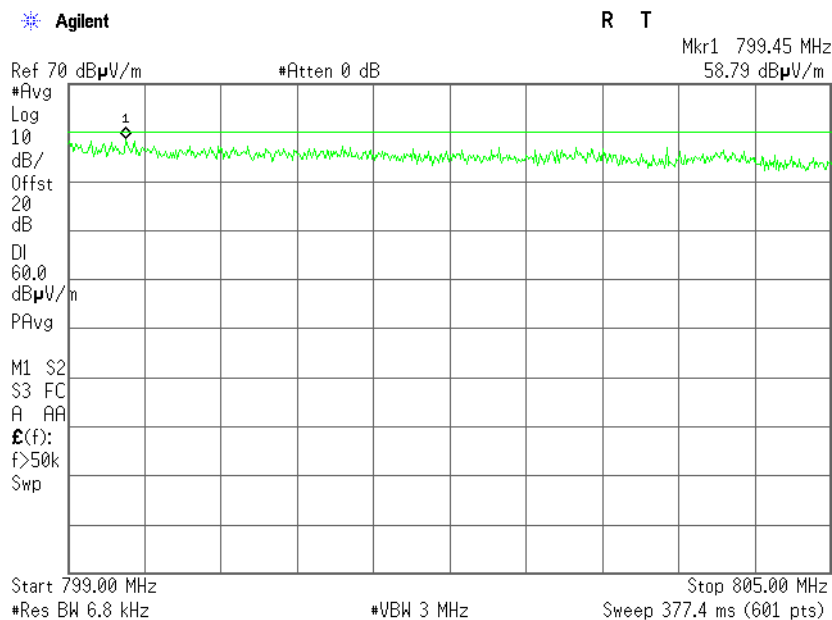
** Corrected for cable loss

*** Limit is equal to -35 dBm in a 6.25 kHz band segment. Measurements were made by using 6.8 kHz resolution bandwidth.
The correction factor of $10 \times \log(6.8 \text{ kHz}/6.25 \text{ kHz}) = 0.4 \text{ dB}$ was added to the limit.
Corrected Limit = $-35 + 0.4 = -34.60 \text{ dBm}$.

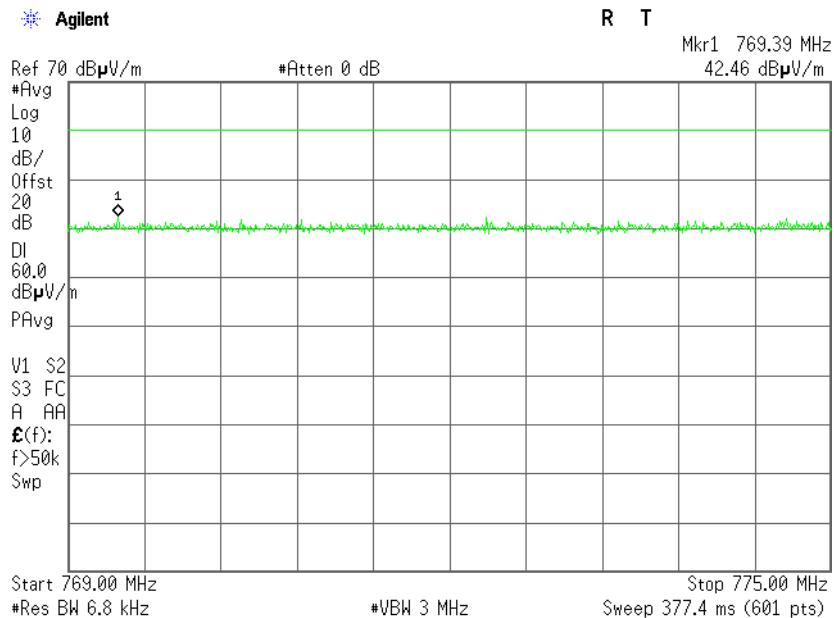
Plot 4.7.1 Field Strength of Spurious Radiation test results in 769MHz – 775MHz range, QPSK, RB size 50, RB offset 0, Fc = 793.0MHz, Vertical&Horizontal



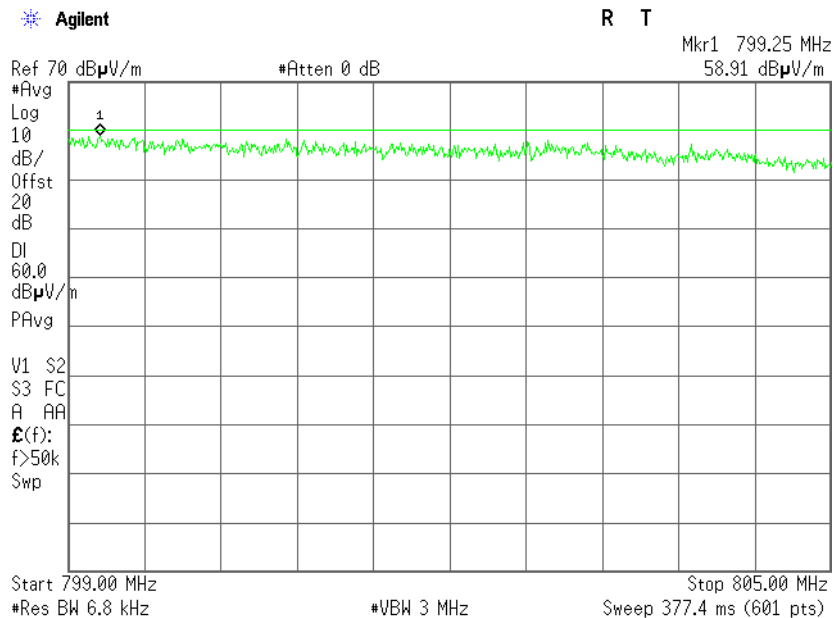
Plot 4.7.2 Field Strength of Spurious Radiation test results in 799MHz – 805MHz range, QPSK, RB size 50, RB offset 0, Fc = 793.0MHz, Vertical&Horizontal



Plot 4.7.3 Field Strength of Spurious Radiation test results in 769MHz – 775MHz range, 16QAM, RB size 50, RB offset 0, Fc = 793.0MHz, Vertical&Horizontal



Plot 4.7.4 Field Strength of Spurious Radiation test results in 799MHz – 805MHz range, QPSK, RB size 50, RB offset 0, Fc = 793.0MHz, Vertical&Horizontal



4.7. 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: 23°C	Relative Humidity: 52%	Atmospheric Pressure: hPa
Test Result:	See below	See plots 4.8.1 – 4.8.6	

*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]	Antenna Polarization	Signal Generator Level [dBm]	Antenna Gain [dBi]	Limit [dBm]	EIRP calculated [dBm]	Margin [dB]	Pass/Fail
793.0 MHz - QPSK - RB size 1, RB Offset 0									
*	BB	*	H & V	*	*	-40	*	*	Pass
*	NB	*		*	*	-50	*		Pass
793.0 MHz - QPSK - RB size 1, RB Offset 49									
*	BB	*	H & V	*	*	-40	*	*	Pass
*	NB	*		*	*	-50	*		Pass
793.0 MHz - QPSK - RB size 50, RB Offset 0									
*	BB	*	H & V	*	*	-40	*	*	Pass
*	NB	*		*	*	-50	*		Pass
793.0 MHz – 16 QAM - RB size 1, RB Offset 0									
*	BB	*	H & V	*	*	-40	*	*	Pass
*	NB	*		*	*	-50	*		Pass
793.0 MHz - 16 QAM - RB size 1, RB Offset 49									
*	BB	*	H & V	*	*	-40	*	*	Pass
*	NB	*		*	*	-50	*		Pass

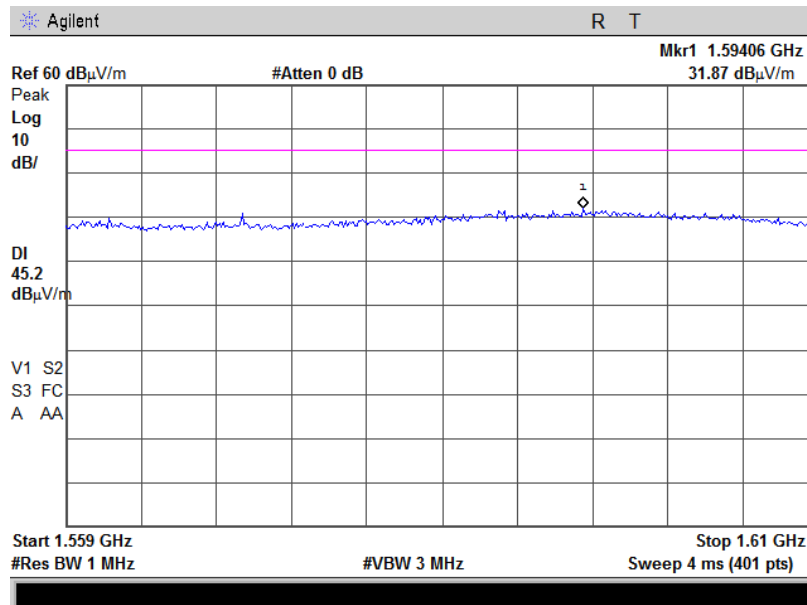
*All readings were at least 10 dB below the limit.

Test results (continued):

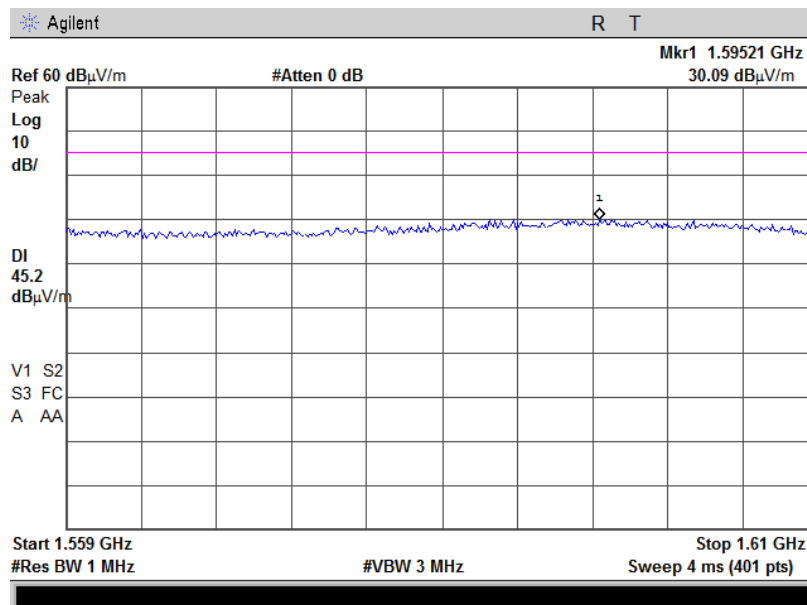
Spurious Emission Frequency [MHz]	Emission, narrowband or broadband	Max Reading [dBμV/m]	Antenna Polarization	Signal Generator Level [dBm]	Antenna Gain [dBi]	Limit [dBm]	EIRP calculated [dBm]	Margin [dB]	Pass/Fail
793.0 MHz - 16 QAM - RB size 50, RB Offset 0									
*	BB	*	H & V	*	*	-40	*	*	Pass
*	NB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

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

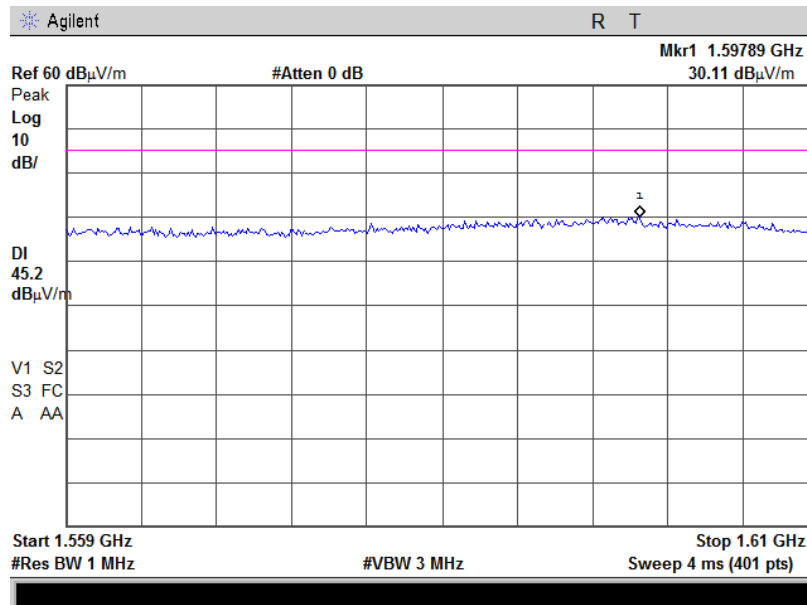
Plot 4.8.1 Field Strength of Spurious Radiation test results in 1559MHz – 1610MHz range, QPSK, RB size 1, RB offset 0, Fc = 793.0MHz, Vertical&Horizontal



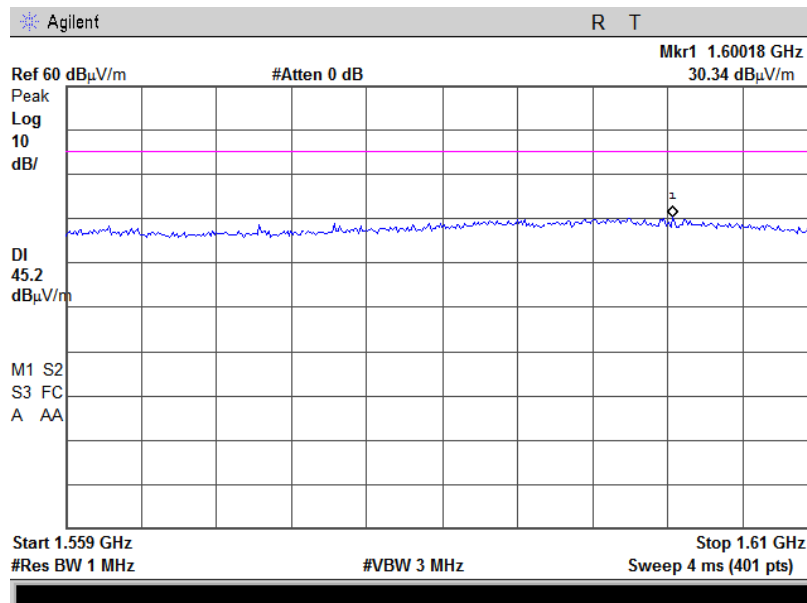
Plot 4.8.2 Field Strength of Spurious Radiation test results in 1559MHz – 1610MHz range, QPSK, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical&Horizontal



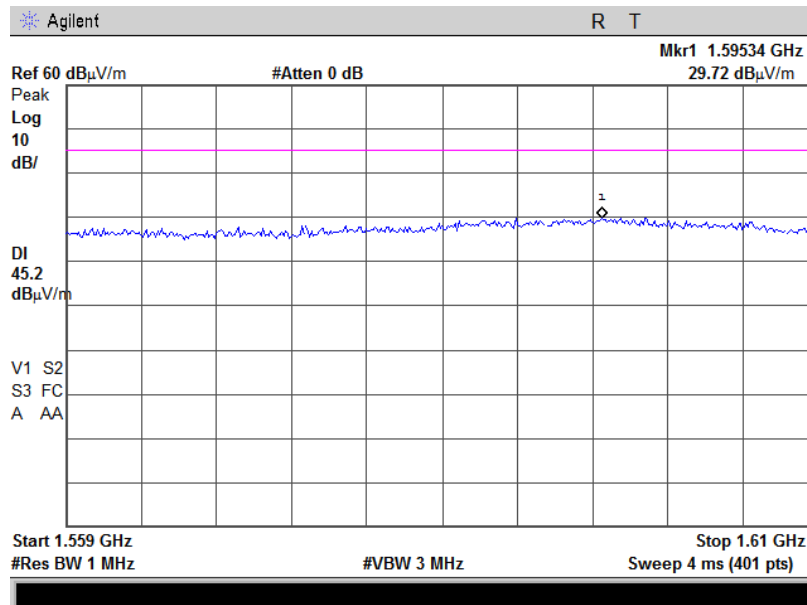
Plot 4.8.3 Field Strength of Spurious Radiation test results in 1559MHz – 1610MHz range, QPSK, RB size 50, RB offset 0, Fc = 793.0MHz, Vertical&Horizontal



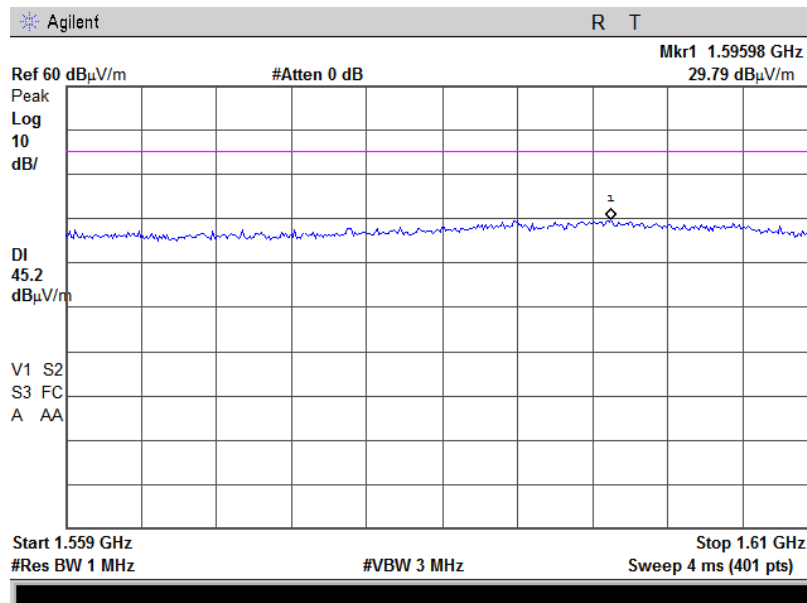
Plot 4.8.4 Field Strength of Spurious Radiation test results in 1559MHz – 1610MHz range, 16QAM, RB size 1, RB offset 0, Fc = 793.0MHz, Vertical&Horizontal



Plot 4.8.5 Field Strength of Spurious Radiation test results in 1559MHz – 1610MHz range, 16QAM, RB size 1, RB offset 49, Fc = 793.0MHz, Vertical&Horizontal



Plot 4.8.6 Field Strength of Spurious Radiation test results in 1559MHz – 1610MHz range, 16QAM, RB size 50, RB offset 0, Fc = 793.0MHz, Vertical&Horizontal



4.8. 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: 52 °C	Relative Humidity: 23%	Atmospheric Pressure: 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]
793.0 MHz -QPSK - RB size 20 up, RB Offset 0, RB size 50 down			
11.7	15.70	0.00000198	0.019798235
13.8	16.50	0.00000208	0.020807062
15.9	14.50	0.00000183	0.018284994

Frequency error vs. Temperature

Temperature [°C]	Frequency Error* [Hz]	Frequency Error [%]	Frequency Error [ppm]
793.0 MHz -QPSK - RB size 20 up, RB Offset 0, RB size 50 down			
-30	15.02	0.00000189	0.018940731
-20	8.91	0.00000112	0.011235813
-10	15.25	0.00000192	0.019205549
0	11.66	0.00000147	0.014703657
10	14.75	0.00000186	0.018600252
20	16.42	0.00000207	0.020706179
30	16.51	0.00000208	0.020819672
40	10.30	0.00000130	0.012988651
50	8.20	0.00000103	0.010340479
60	13.35	0.00000168	0.016834805

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

Note: For this test Wideband Radio Communication tester manufactured by Rohde & Schwgrz was used

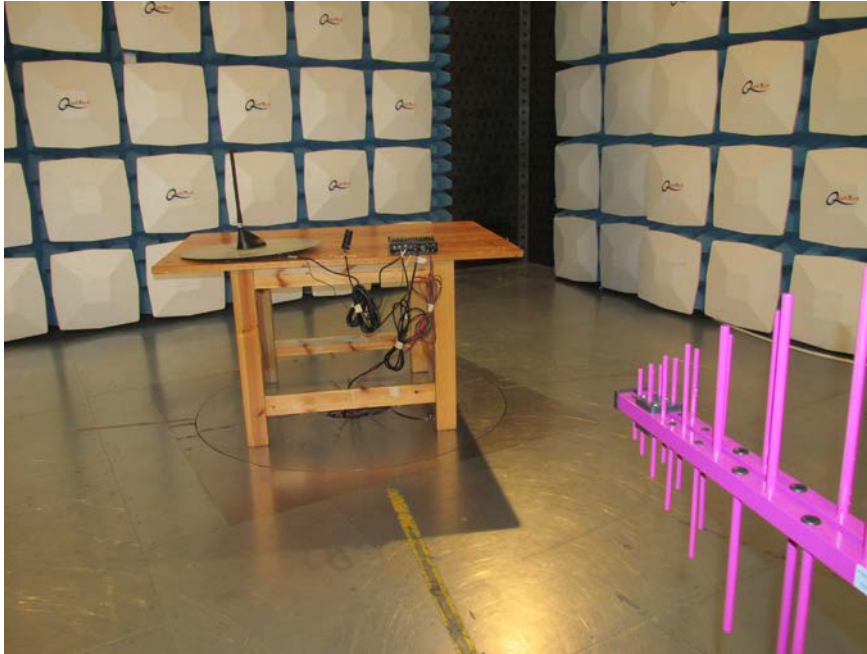
5. Appendix

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	30-06-2014
Spectrum Analyzer, 9 kHz - 22 GHz	HP 8593EM	3536A00131	30-06-2014
Spectrum Analyzer, 100 Hz - 26.5 GHz	Agilent E7405A	US41160436	30-06-2014
Spectrum Analyzer, 3 Hz - 44 GHz	Agilent E4446A	MY46180602	30-06-2014
Power Meter	Agilent N1911A	MY45100784	30-06-2014
Wideband power sensor	Agilent N1921A	MY45241242	30-06-2014
Low-Noise Amplifier, 0.1 - 18 GHz	MITEQ, AMF-7D-00101800-30-10P	1544443	30-06-2014
Low-Noise Amplifier, 18 - 26.5 GHz	MITEQ, AMF-5F-18002650-30-10P	945372	16-06-2014
Biconical Antenna, 20 - 200 MHz	Schwarzbeck VHBB 9124	9124/0255	16-06-2014
Log-Periodic Antenna, 200 - 1000 MHz	Schwarzbeck VUSLP 9111	VUSLP 9111184	16-06-2014
Double Ridged Guide Antenna, 1 - 18 GHz	A.R.A., DRG-118/A	17188	30-06-2014
SHF-EHF Horn, 15 - 40 GHz	Schwarzbeck BBHA 9170	BBHA9170214	30-06-2014
Turn table	HD 100	100/693	-
Antenna Mast	HD 100	100/693	-
LISN	Fischer 50/250-25-2	9705	30-06-2014
Transient Limiter, 9 kHz ÷ 200 MHz	HP 11947A	3107A04119	30-06-2014
Notch Filter	Micro-Tronics, BRM50702-05	0001	16-06-2014
Tunable Bandreject Filter	K&L, 3TNF-800/1000-0.2-N/N	336	16-06-2014
Tunable Bandreject Filter	K&L, 5TNF-1700/2000-0.1-N/N	212	16-06-2014
Highpass Filter, 1.2 ÷ 15 GHz	WAINWRIGHT, WHK1.2/15G-10EF	SN 3	16-06-2014
Highpass Filter, 2.4 ÷ 18 GHz	WAINWRIGHT, WHK2.4/18G-10EF	SN 1	16-06-2014
Highpass Filter, 7 ÷ 18 GHz	WAINWRIGHT, WHKX7.0/18G-8SS	SN 12	16-06-2014

Appendix B: Test Photographs

Photograph 1



Photograph 2



Photograph 3



Photograph 4.4



Photograph 4.5



Appendix B: Accreditation Certificate



End of the Test Report