Electromagnetic Compatibility
Test Report

Test Report No: WAD 110716 Rev.2
Issued on: September 05, 2016

Product Name
NXPRO

Tested According to
FCC 47 CFR, Part 15.247
IC Canada RSS -247 Issue 1

Tests Performed for
Waves Audio Ltd.
Azrieli Center 3, The Triangle Tower, 32nd Floor,
132 Derech Begin, Tel-Aviv 67023, Israel
Tel: 972-3-6084000

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Certificate 1633.01
Electrical Testing

Test Personnel

Tests Performed By: ----------

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Test Report details:

Test commencement date: 31.01.2016

Test completion date: 01.02.2016

Customer's Representative: Zohar Blau

Issued on: 05.09.2016

Revision details:

Version	Date	Details/Reasons
Rev. 1	11.07.2016	-
Rev. 2	05.09.2016	Incorporated modifications/corrections per ACB requirements

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	Result
47 CFR §15.247 (a) (2) & RSS 247 ,section 5.4 (4)	DTS Bandwidth	Pass
47 CFR §15.247 (b) (3) (4) & RSS 247,section 5.2 (1)	Fundamental Emission Output Power	Pass
47 CFR §15.247 (e) & RSS 247,section 5.2 (2)	Maximum Power Spectral Density Level in the Fundamental Emission	Pass
47 CFR §15.247 (d) & RSS 247,section 5.5	Emissions in Non-Restricted Frequency Bands	Pass
47 CFR §15.247 (d), & §15.205, & §15.209(a) & RSS-Gen Issue 4,section 8.11	Emissions in Restricted Frequency Bands	Pass
47 CFR §15.247 (d) & RSS 247 ,section 5.5	Band-edge Measurements	Pass
47 CFR §15.203 & RSS-Gen Issue 4	Antenna Connector Requirements	NA

Table of Contents

1. General

1.1. Referenced documents:

ANSI C63.4-2014	Limits and Methods of Measurement for Conducted and Radiated Emissions of Information Technology Equipment
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-247	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.2. Description of the EUT system/test Item:

Product name: NXIMU010
FCC ID: 2AIYP-41610

IC: 21654-41610

Description:

NXIMU010 is a small Bluetooth device latches on to headphones and tracks head movements in order to augment the immersive 3D audio experience created by Nx technology by transmitting this data to a PC or to a handheld device running the Nx plugin software.

Frequency range: 2402 – 2480 MHz

Type of Modulation: GFSK

Antenna Gain: 3.6 dBi

1.3. Conducted RF Measurements:

The RF output of the transmitter under test was directly connected to the input of the Spectrum analyzer through a specialized antenna connector provided by the manufacturer, and an attenuator as specified. The external attenuator and cable loss were added to the reading. Worst-case results of the various modulation modes (where applicable) were reported.

For PSD, emission peak was zoomed within the pass band with spectrum analyzer's settings as reported (Sweep time=Span/3 kHz)

For Maximum Conducted Output Power an Average Power Meter was used.

For spurious emissions measurement, the spectrum from 9 kHz to 40 GHz was investigated with the transmitter set to the lowest, middle and highest channel frequencies.

For bandedge measurement allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section. Submit this plot.

Radiated Emissions Measurements in the restricted bands:

For radiated emissions, which fall in the restricted bands the spectrum from 1MHz to 25GHz was investigated following the guidelines in ANSI C63.4-2014, with the transmitter set to the lowest, middle and highest channel frequencies. Measurements were performed with peak detector and repeated averaged with VBW=10 Hz. Only Peak detection plots are presented. Worst-case results of the various modulation modes (where applicable) were reported.

1.4. Radiated Emission measurements:

Measurements were performed at a 3-meter measurement distance in the semi-anechoic chamber in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table/support, 0.8m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions. The test program of exercising the equipment ensured that various parts of the EUT were exercised to permit detection of all EUT disturbances.
An appropriate antenna depending upon the frequency range, per ANSI C63.4-2014 clause 4.1.5 was used. While the turntable was being rotated, the height of the antenna was varied from 1 to 4m for the frequency range of 30MHz to 1GHz. The highest radiated emission was detected by manipulating the EUT through three axis(x,y,z) and system cables, a worst-case results are reported by max hold function
This process was repeated for both antenna polarizations. The spectrum up to 40 GHz was investigated for spurious emissions, using a band-reject filter where appropriate.
The amplitudes of worst-case emission were measured with the detector modes and resolution bandwidths over various frequency ranges according to the requirements of ANSI C63.4-2014 clause 4.2.

1.5. Worst Case Results:

In order to determine the worst case emissions for all modes/data rates/tests, all modes/data rates were investigated for each required test to determine which produces the worst- case data and then full testing was performed in that mode/data rate

2. Test Facility & Uncertainty of Measurement

Accreditation/ Registration reference:

- *A2LA Certificate Number: 1633.01*
- *IC Canada: Site# 4808A-1*

2.1. Test Facility description

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

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

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 Emerson and Cuming absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	±3.9dB, 30MHz to 200MHz ±3dB, 200MHz to 1000MHz
Transmission Loss measured at 5 positions, at 1.5m height	±3dB, 1GHz to 18GHz

2.2. Uncertainty of Measurement:

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements ". Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Test Name	**Test Method & Range**	**Uncertainty**	
		Combined std. Uc(y)	**Expanded U**
Radiated Emission	30MHz÷230MHz, Horiz. polar. 30MHz÷230MHz, Ver. polar. 230MHz÷1000MHz, Horiz. polar. 230MHz÷1000MHz, Vert. polar.	[dB] 1.8 1.967 1.487 1.499	[dB] 3.6 3.934 2.973 2.998
Conducted Emission	9 kHz÷150 kHz 150 kHz÷30MHz	[dB] 1.378 1.095	[dB] 2.756 2.190
Radio frequency	Up to 18 GHz	$\pm 1*10^{-6}$	$< \pm 1*10^{-5}$
Total Conducted RF Power	Up to 18 GHz	±1.378 dB	< ±1.5dB
Conducted Power density	Up to 18 GHz	±1.378 dB	< ±3dB
Temperature	23.6 °C	±0.6°C	< ±2°C
Humidity	54.9%	±3.1%	< ±5%
DC Voltage	0-60 VDC	±0.3%	< ±3%

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%.

3. Report of Measurements and Examinations

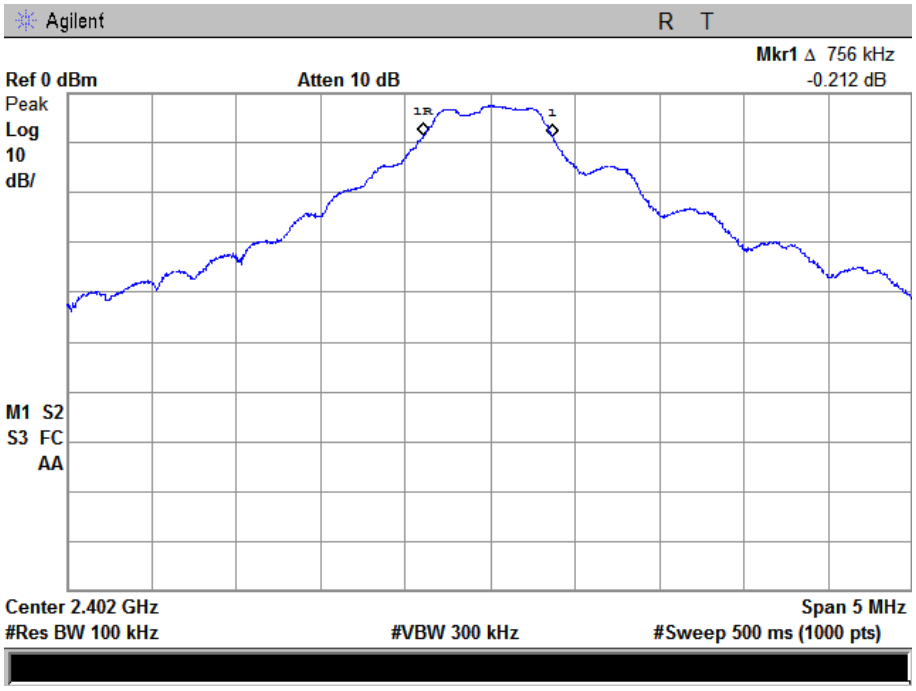
3.1. 6dB DTS Bandwidth

Reference document:	**47 CFR §15.247 (a)(2) & RSS 247 ,section 5.4 (4)**		
Test Requirements:	Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725–5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.		
Method of testing:	KDB 558074 D01 v03r05, Sec.8.1 Conducted	**Pass**	
Operating conditions:	Under normal test conditions Modulation: GFSK, PRBS9		
S.A. Settings:	RBW: 100 kHz, VBW: 300 KHz		
Environment conditions:	Ambient Temperature: 24°C	Relative Humidity: 55%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.1.1 – Plot 3.1.3	

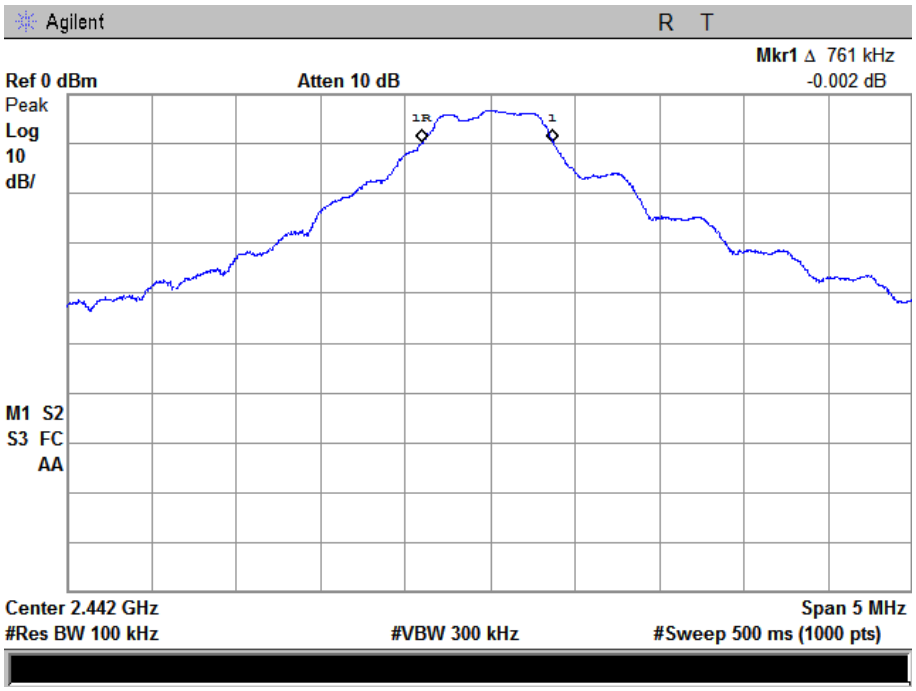
Test results:

Fundamental Frequency, [MHz]	6 dB DTS Bandwidth, [kHz]	Minimum Bandwidth, [kHz]	Margin, [kHz]	99% DTS Bandwidth, [kHz]	Result
2402.000	756.000	500.000	256.000	1100.5	Pass
2442.000	761.000	500.000	261.000	1112.0	Pass
2480.000	771.000	500.000	271.000	1142.5	Pass

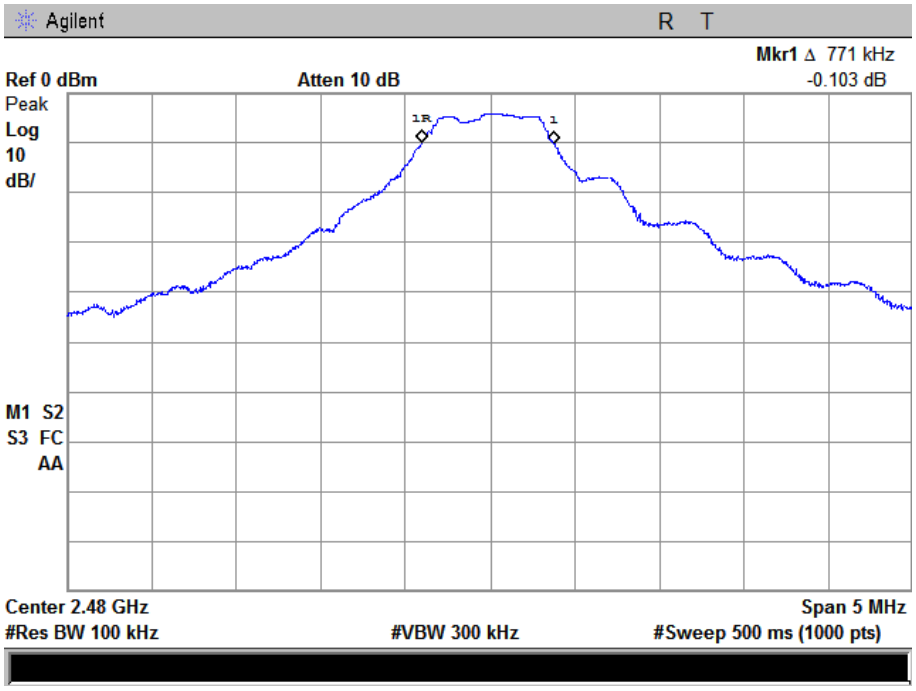
Plot 3.1.1: 6 dB DTS Bandwidth, Fc = 2402MHz



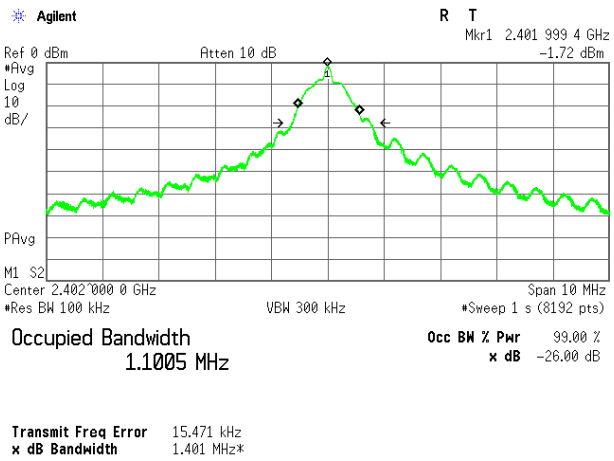
Plot 3.1.2 6 dB DTS Bandwidth, Fc = 2442MHz



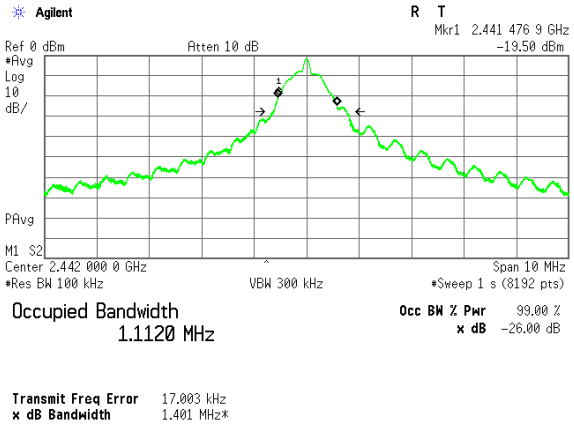
Plot 3.1.3 6 dB DTS Bandwidth, Fc = 2480MHz



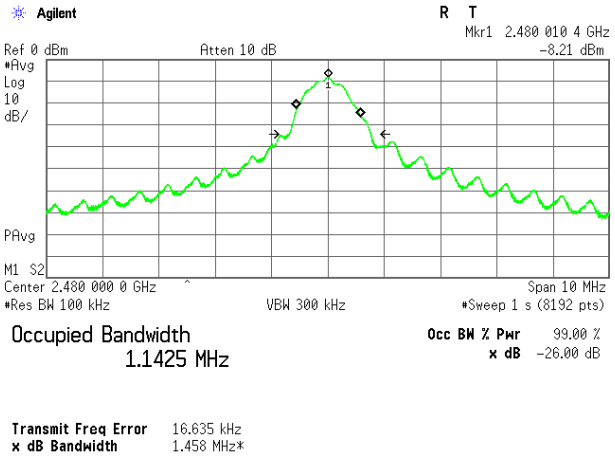
Plot 3.1.4 99% DTS Bandwidth, Fc = 2402 MHz



Plot 3.1.5 99% DTS Bandwidth, Fc = 2442 MHz



Plot 3.1.6 99% DTS Bandwidth, Fc = 2480 MHz



3.2. Fundamental Emission Output Power

Reference document:	**47 CFR §15.247 (b)(3)(4) & RSS 247,section 5.2 (1)**		
Test Requirements:	The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands shall not exceed 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted (average) output power. The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.		
Method of testing:	KDB 558074 D01 v03r05, Sec.9.1.2, Conducted PKPM1	**Pass**	
Operating conditions:	Under normal test conditions Modulation: GFSK, PRBS9		
Settings:	Triggered/signal-gated broadband power meter		
Environment conditions:	Ambient Temperature: 22.2°C	Relative Humidity:54.5 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	--	

Test Results:

Fundamental Frequency, [MHz]	Fundamental Emission Output Power		Limit, [mW]	Delta*, [mW]	Pass/Fail
	dBm	mW			
2402	-2.02	0.628	1000.0	-999.372	Pass
2442	-2.61	0.548	1000.0	-999.452	Pass
2480	-3.27	0.471	1000.0	-999.529	Pass

*Delta = Fundamental Emission Output Power [mW] – Limit [mW]

3.3. Maximum Power Spectral Density Level in the Fundamental Emissions

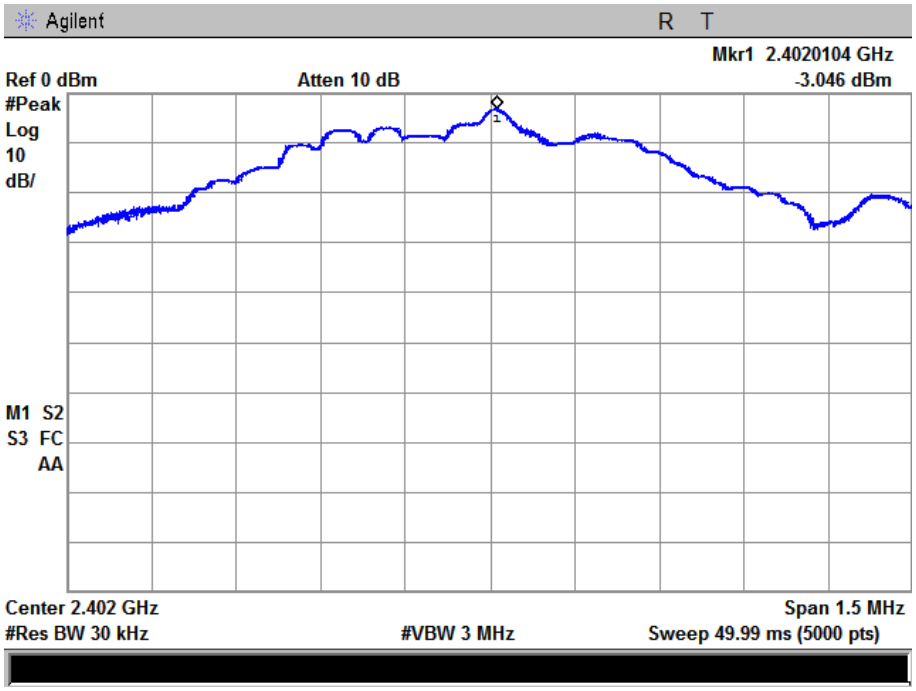
Reference document:	**47 CFR §15.247 (e) & RSS 247, section 5.2 (2)**		
Test Requirements:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.		
Method of testing:	KDB 558074 D01 v03r05, Sec.10.2 Conducted, PKPSD method	**Pass**	
Operating conditions:	Under normal test conditions Modulation: GFSK, PRBS9		
S.A. Settings:	RBW: 30 kHz, VBW: 3 MHz		
Environment conditions:	Ambient Temperature: 21 °C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.3.1 - Plot 3.3.3	

Test Results:

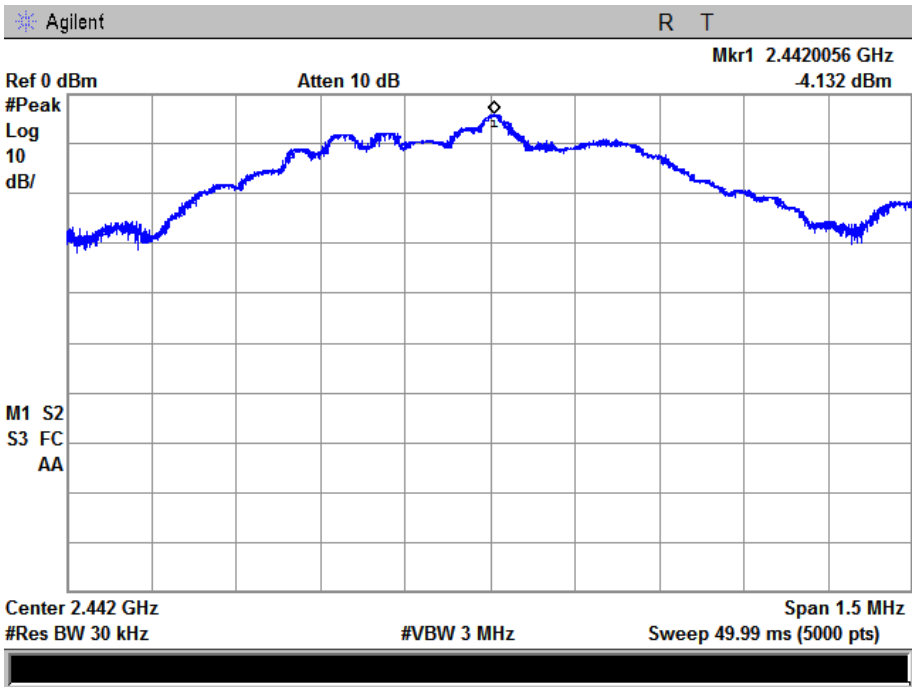
Fundamental Frequency, [MHz]	PSD Measured, [dBm/30kHz]	PSD Limit, [dBm/3kHz]	Delta*, [dB]	Pass/Fail
2402.000	-3.04	8.00	-11.04	Pass
2442.000	-4.13	8.00	-12.13	Pass
2480.000	-4.84	8.00	-12.84	Pass

*Delta = PSD Measured – PSD Limit

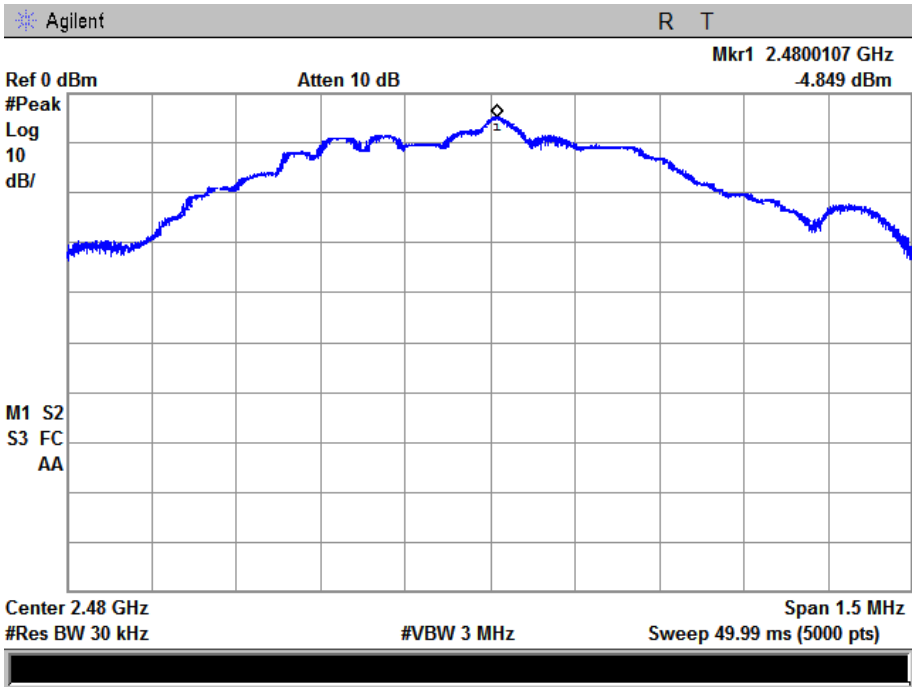
Plot 3.3.1 Maximum Power Spectral Density test results, Fc = 2402MHz



Plot 3.3.2 Maximum Power Spectral Density test results, Fc = 2442MHz



Plot 3.3.3 Maximum Power Spectral Density test results, Fc = 2480MHz



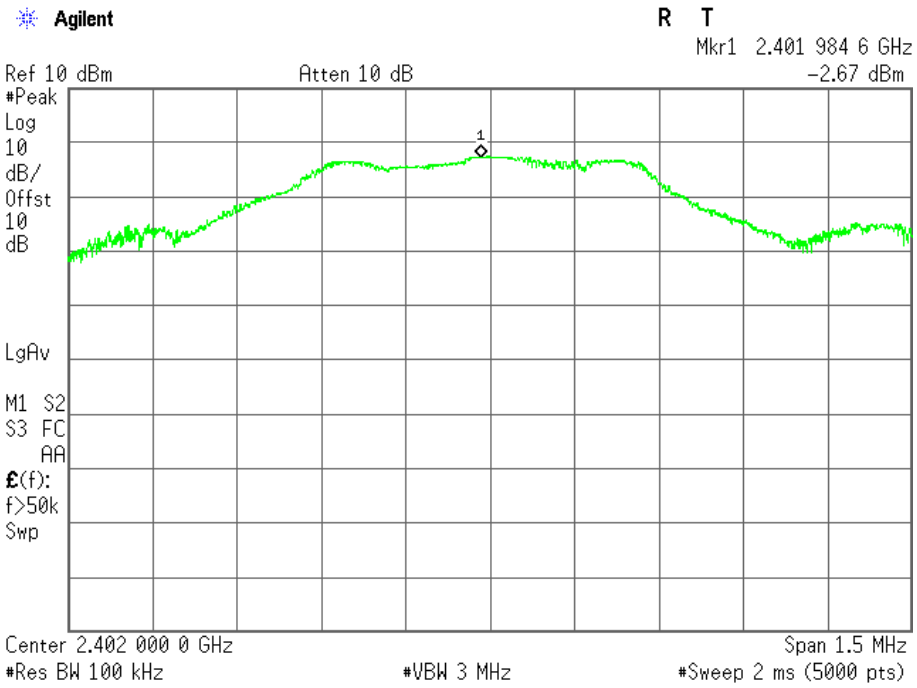
3.4. Emissions in Non-Restricted Frequency Bands

Reference document:	**47 CFR §15.247 (d) & RSS 247,section 5.5**		
Test Requirements:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (See §15.205(c)).		
Method of testing:	KDB 558074 D01 v03r05 Sec.11.1, a) Conducted	Pass	
Operating conditions:	Under normal test conditions Modulation: GFSK, PRBS9		
S.A. Settings:	RBW: 100 kHz, VBW:3 MHz		
Environment conditions:	Ambient Temperature: 22.9°C	Relative Humidity: 54.6%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.4.1- Plot 3.4.9	

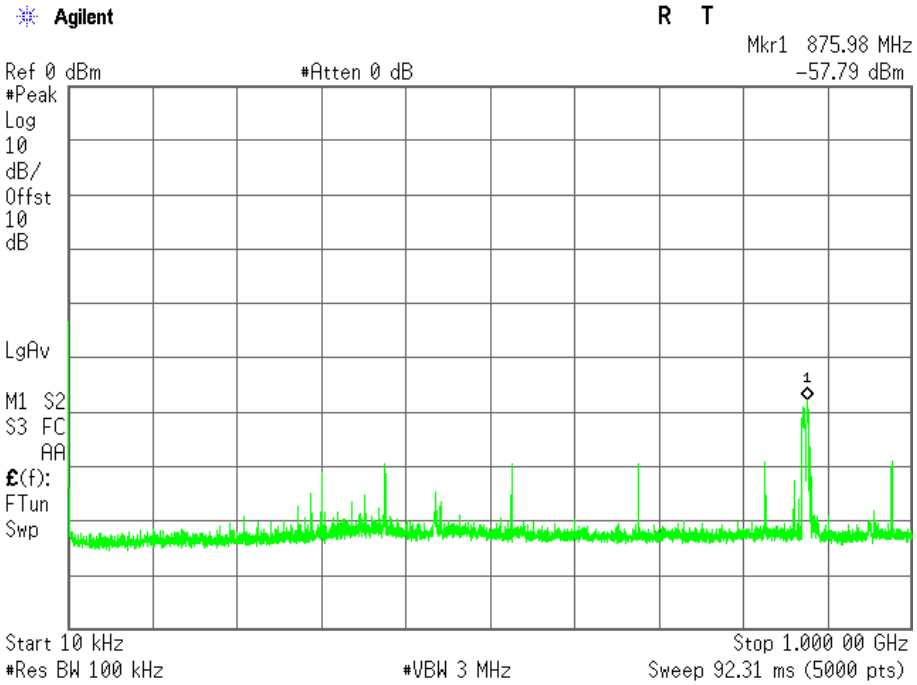
Test results:

Fundamental Frequency, [MHz]	Fundamental Emission Reference Level, [dBm]	Unwanted Emissions Frequency, [MHz]	Unwanted Emissions Level, [dBm]	Attenuation Below Fundamental, [dB]	Minimum Attenuation Below Fundamental, [dB]	Margin, [dB]	Pass/Fail
2402.000	-2.67	875.980	-57.72	55.05	≥ 20.00	-35.05	Pass
		1202.000	-49.51	46.84	≥ 20.00	-26.84	Pass
		2330.000	-45.82	43.15	≥ 20.00	-23.15	Pass
		2387.000	-47.99	45.32	≥ 20.00	-25.32	Pass
		4802.000	-37.71	35.04	≥ 20.00	-15.04	Pass
		5302.000	-55.48	52.81	≥ 20.00	-32.81	Pass
		7208.000	-47.21	44.54	≥ 20.00	-24.54	Pass
		9608.000	-48.75	46.08	≥ 20.00	-26.08	Pass
2442.000	-3.33	875.980	-58.28	54.95	≥ 20.00	-34.95	Pass
		1221.000	-50.54	47.21	≥ 20.00	-27.21	Pass
		4884.000	-39.99	36.66	≥ 20.00	-16.66	Pass
		7328.000	-52.25	48.92	≥ 20.00	-28.92	Pass
		9771.000	-61.69	58.36	≥ 20.00	-38.36	Pass
2480.000	-4.05	876.980	-59.04	54.99	≥ 20.00	-34.99	Pass
		1240.000	-50.60	46.55	≥ 20.00	-26.55	Pass
		2508.000	-48.58	44.53	≥ 20.00	-24.53	Pass
		4961.000	-42.51	38.46	≥ 20.00	-18.46	Pass
		7448.000	-51.82	47.77	≥ 20.00	-27.77	Pass
		9920.000	-65.30	61.25	≥ 20.00	-41.25	Pass

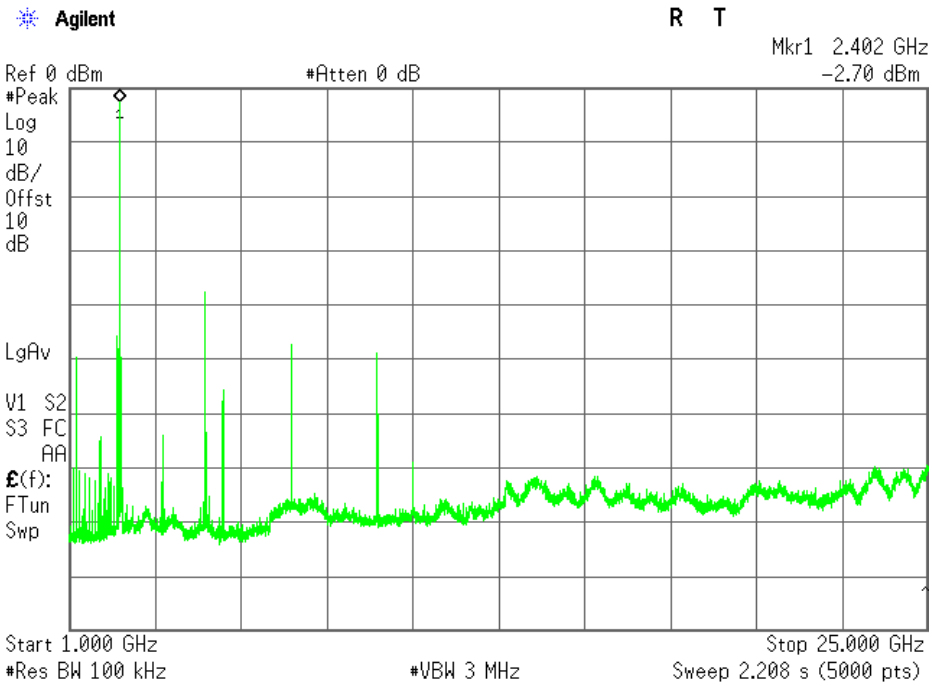
Plot 3.4.1 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results, Fundamental Emission Reference Level, Fc = 2402 MHz



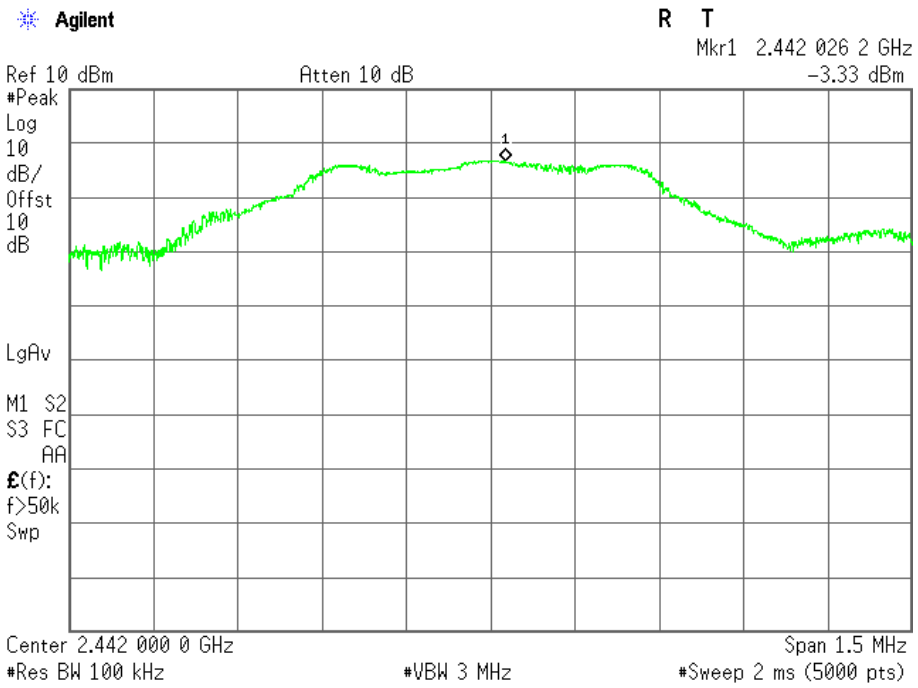
Plot 3.4.2 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results in 9 kHz – 1 GHz frequency range, Fc = 2402 MHz



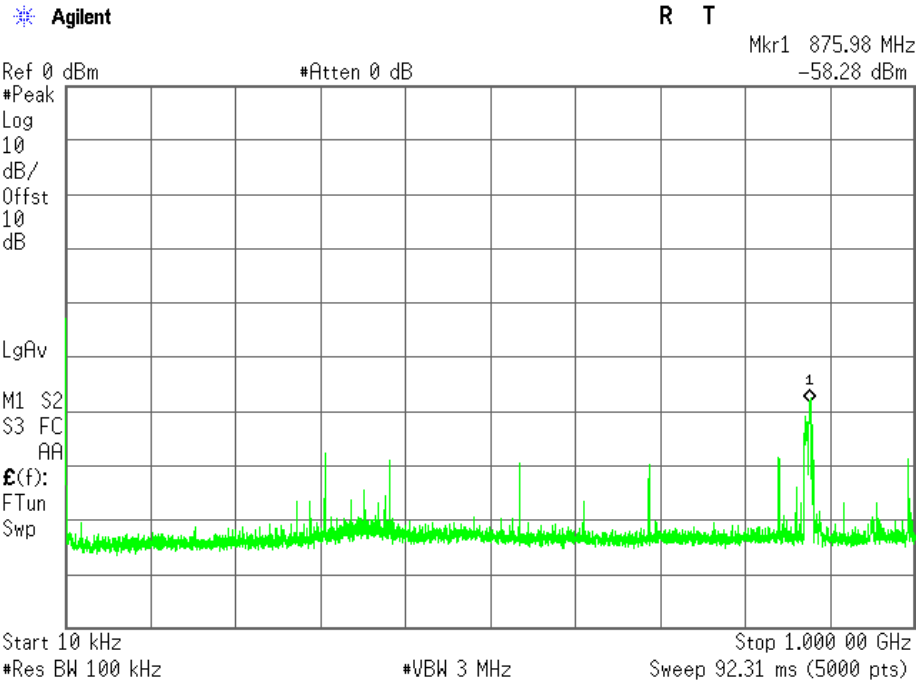
Plot 3.4.3 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results in 1 GHz – 25 GHz frequency range, Fc = 2402 MHz-



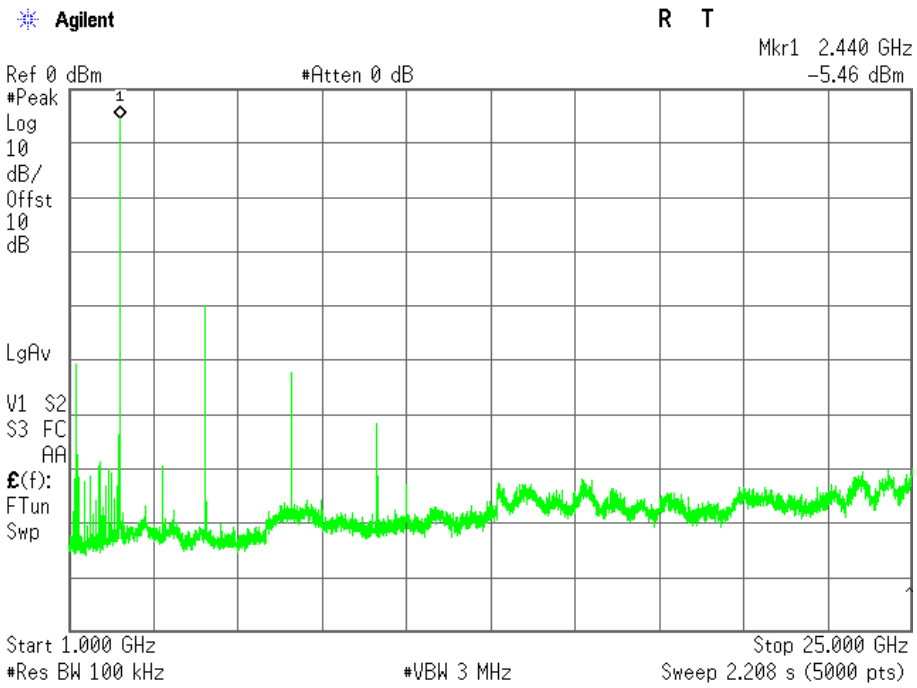
Plot 3.4.4 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results, Fundamental Emission Reference Level, Fc = 2442 MHz



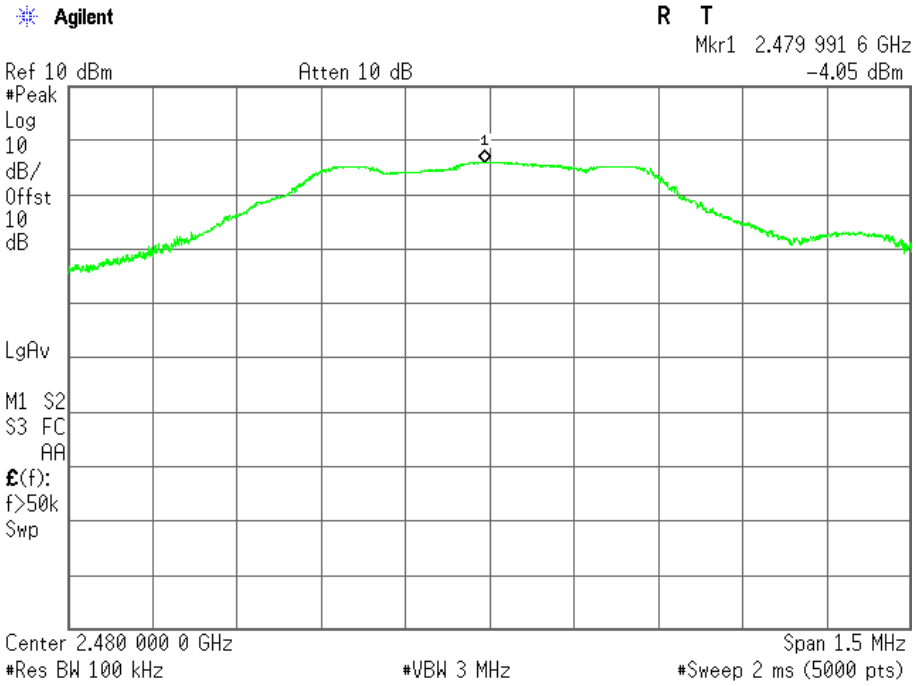
Plot 3.4.5 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results in 9 kHz – 1 GHz frequency range, Fc = 2442 MHz



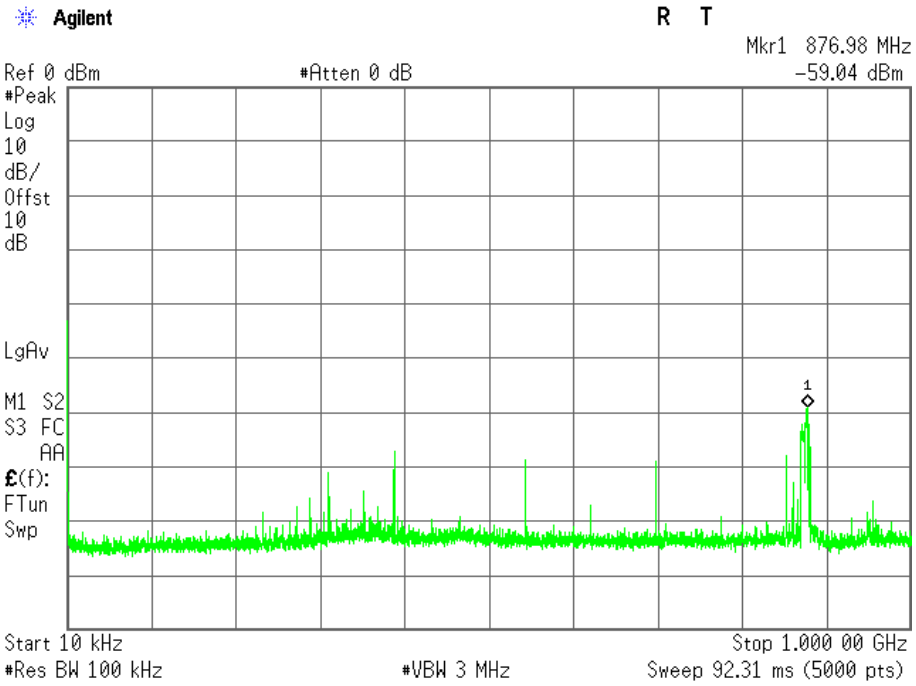
Plot 3.4.6 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results in 1 GHz – 25 GHz frequency range, Fc = 2442 MHz



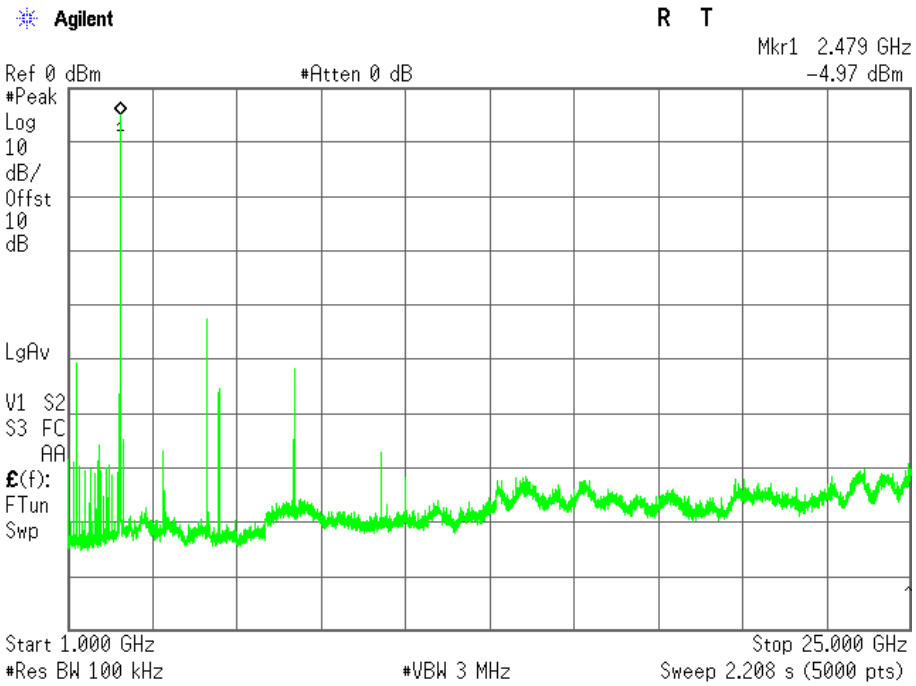
Plot 3.4.7 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results, Fundamental Emission Reference Level, Fc = 2480 MHz



Plot 3.4.8 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results in 9 kHz – 1 GHz frequency range, Fc = 2480 MHz



Plot 3.4.9 Unwanted Conducted Emissions into Non-Restricted Frequency Bands test results in 1 GHz – 25 GHz frequency range, Fc = 2480 MHz



3.5. Emissions in restricted frequency bands

Reference document:	**47 CFR §15.247 (d), & §15.205, & §15.209(a) & RSS-Gen Issue 4, section 8.11**		
Test Requirements:	Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emissions limits specified in §15.209(a) (see §15.205(c)).		
Method of testing:	KDB 558074 D01 v03r05, Sec.12.1 Radiated emissions	**Pass**	
Operating conditions:	Under normal test conditions Modulation: GFSK, PRBS9		
S.A. Settings:	According to KDB 558074 D01 v03r05		
Environment conditions:	Ambient Temperature: 21°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.5.1 - Plot 3.5.34	

Limits:

30MHz to 1GHz frequency range:

Frequency [MHz]	QP Limit [dBµV /m] Class A	QP Limit [dBµV /m] Class B
30÷88	49.5	40.0
88÷216	54.0	43.5
216÷960	57.0	46.0
960÷1000	60.0	54.0

Above 1GHz frequency range:

Frequency [GHz]	AVR Limit [dBµV m] Class A	AVR Limit [dBµV /m] Class B
Above 1GHz	74	54

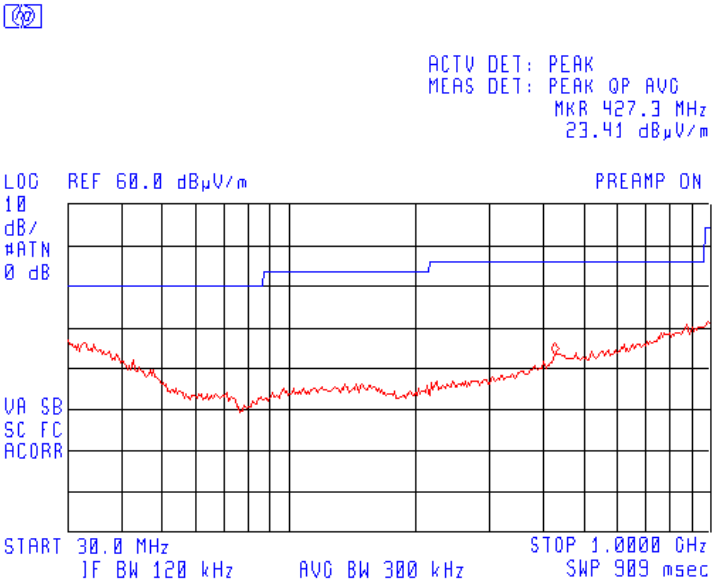
Test results below 1GHz (Radiated Spurious emissions):

Fundamental Frequency, MHz	Unwanted Emission Frequency, MHz	Antenna Polarization	QP Measured Emission, dBµV/m	QP Limit, dBµV/m	Delta, dB	Pass/ Fail
No emissions were found						Pass

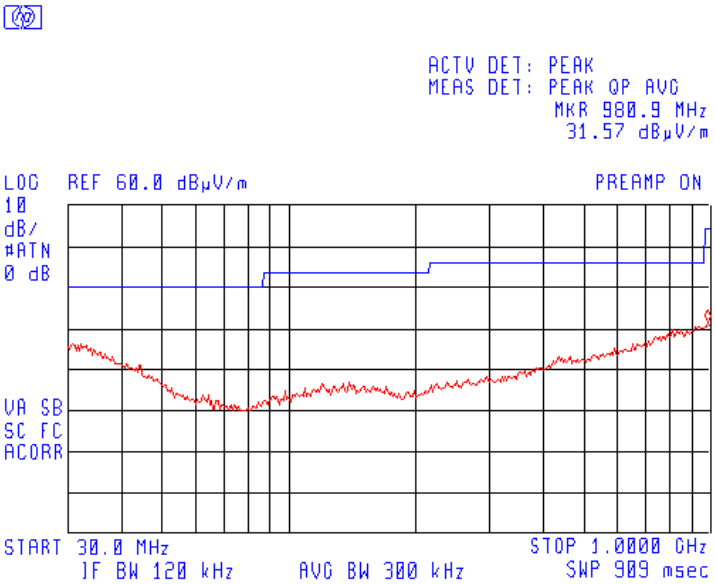
Test results above 1GHz (Radiated Spurious emissions):

Fundamental Frequency, MHz	Unwanted Emission Frequency, MHz	Antenna Polarization	Measured Emission, dBµV/m		Limit, dBµV/m		Delta, dB		Pass/ Fail
			Peak	AVG	Peak	AVG	Peak	AVG	
2402	2381.000	H	56.9	25.2	74.0	54.0	-17.1	-28.8	Pass
	2325.000	H	56.0	23.7	74.0	54.0	-18.0	-30.3	Pass
	2440.000	V	57.7	35.5	74.0	54.0	-16.3	-18.5	Pass
	2378.000	H	59.0	35.8	74.0	54.0	-15.0	-18.2	Pass
	2323.000	H	59.2	35.7	74.0	54.0	-14.8	-18.3	Pass
	4803.000	V	50.2	40.6	74.0	54.0	-23.8	-13.4	Pass
	7205.000	H	57.9	47.5	74.0	54.0	-16.1	-6.5	Pass
2442	2468.000	V	54.7	35.5	74.0	54.0	-19.3	-18.5	Pass
	7325.000	H	56.4	45.2	74.0	54.0	-17.6	-8.8	Pass
	4887.000	H	50.3	40.7	74.0	54.0	-23.7	-13.3	Pass
2480	2483.500	H	57.9	36.3	74.0	54.0	-16.1	-17.7	Pass
	2497.000	H	52.0	22.0	74.0	54.0	-22.0	-32.0	Pass
	2441.000	H	58.0	36.1	74.0	54.0	-16.0	-17.9	Pass
	4960.000	H	47.3	34.8	74.0	54.0	-26.7	-19.2	Pass
	7440.000	H	56.6	44.8	74.0	54.0	-17.4	-9.2	Pass

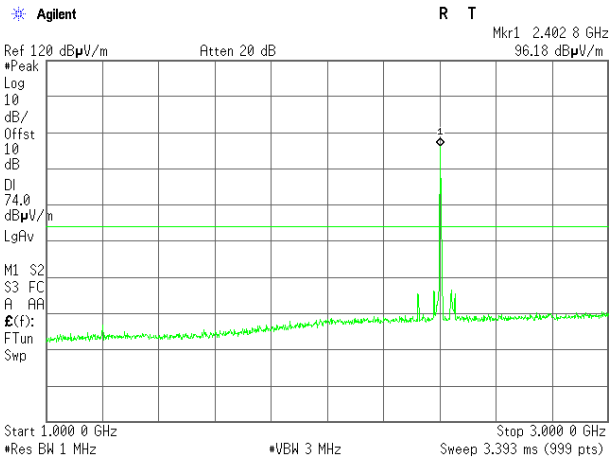
3.5.1: Emissions in restricted frequency bands test results, 30 MHz – 1 GHz range, Vertical polarization, Fc = 2402 MHz



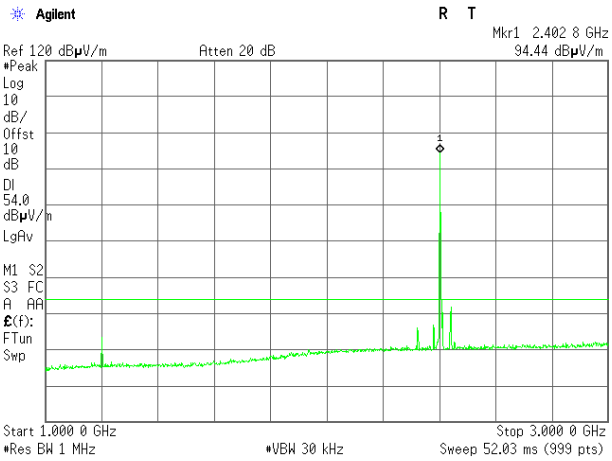
3.5.2: Emissions in restricted frequency bands test results, 30 MHz – 1 GHz range, Horizontal polarization, Fc = 2402 MHz



3.5.3: Emissions in restricted frequency bands test results, 1.0 – 3.0 GHz range, Vertical, Fc = 2402 MHz

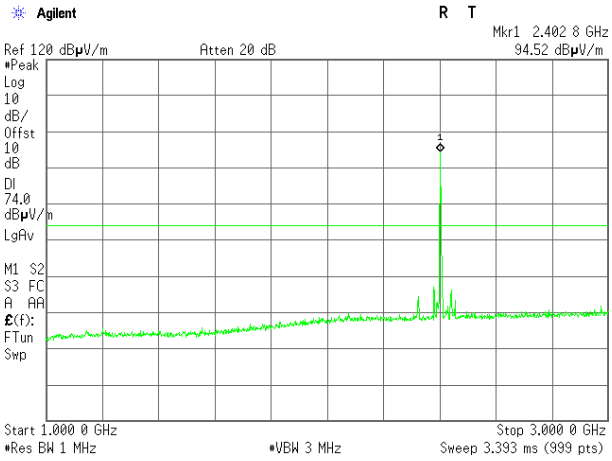


Peak

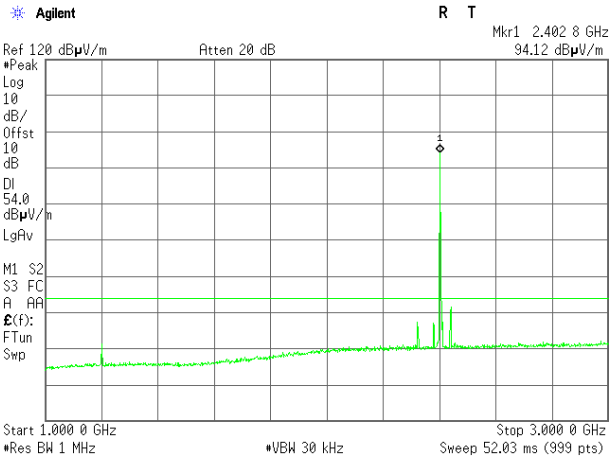


Average

3.5.4: Emissions in restricted frequency bands test results, 1.0 – 3.0 GHz range, Horizontal, Fc = 2402 MHz

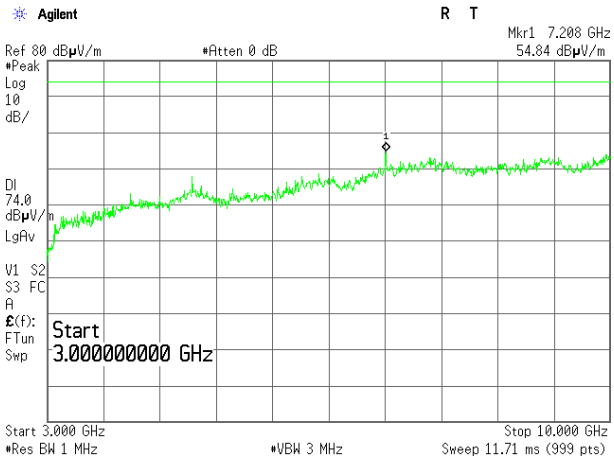


Peak

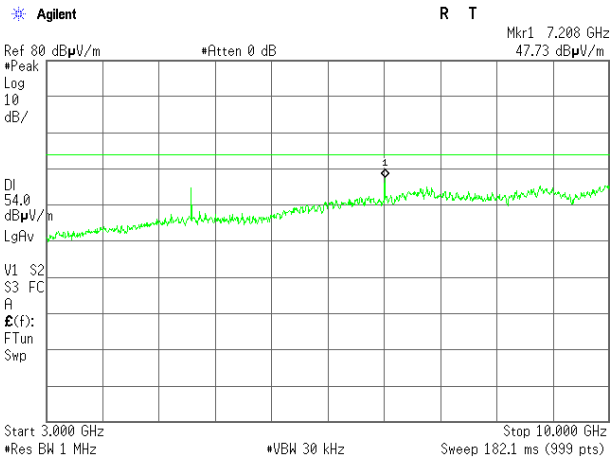


Average

3.5.5 Emissions in restricted frequency bands test results, 3.0 – 10.0 GHz range, Vertical, Fc = 2402 MHz (with 2400 – 2500 MHz band stop filter)

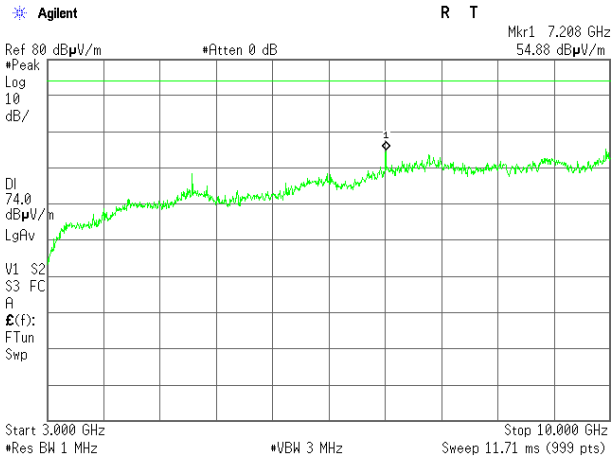


Peak

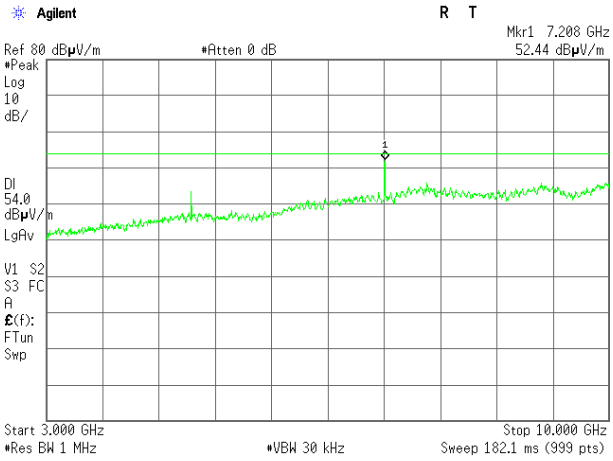


Average

3.5.6: Emissions in restricted frequency bands test results, 3.0 – 10.0 GHz range, Horizontal, Fc = 2402 MHz (with 2400 – 2500 MHz band stop filter)

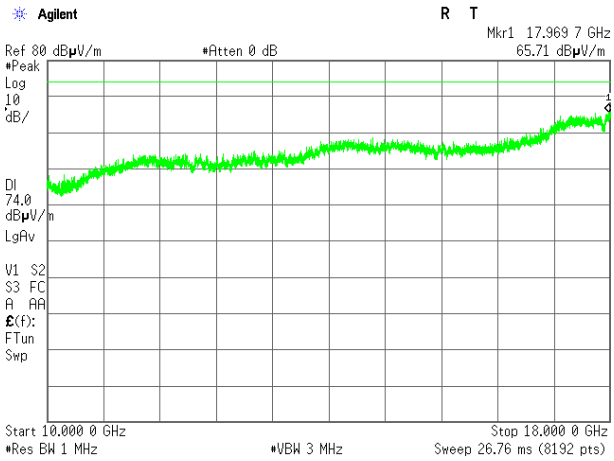


Peak

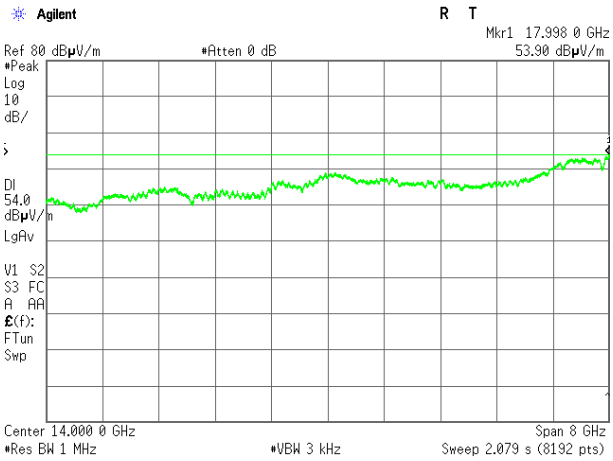


Average

3.5.7: Emissions in restricted frequency bands test results, 10.0 – 18.0 GHz range, Vertical, Fc = 2402 MHz (with 2400 – 2500 MHz band stop filter)

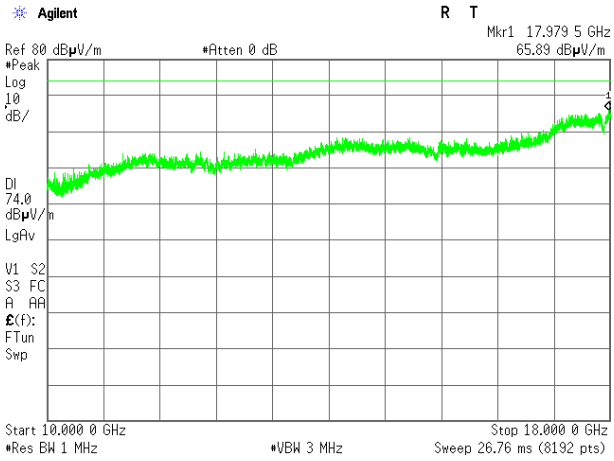


Peak

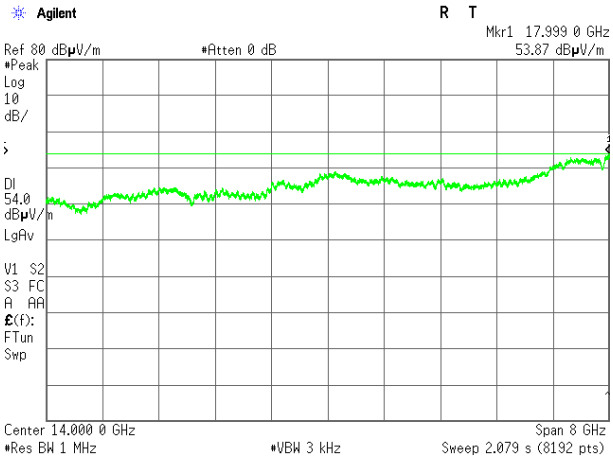


Average

3.5.8: Emissions in restricted frequency bands test results, 10.0 – 18.0 GHz range, Horizontal, Fc = 2402 MHz (with 2400 – 2500 MHz band stop filter)

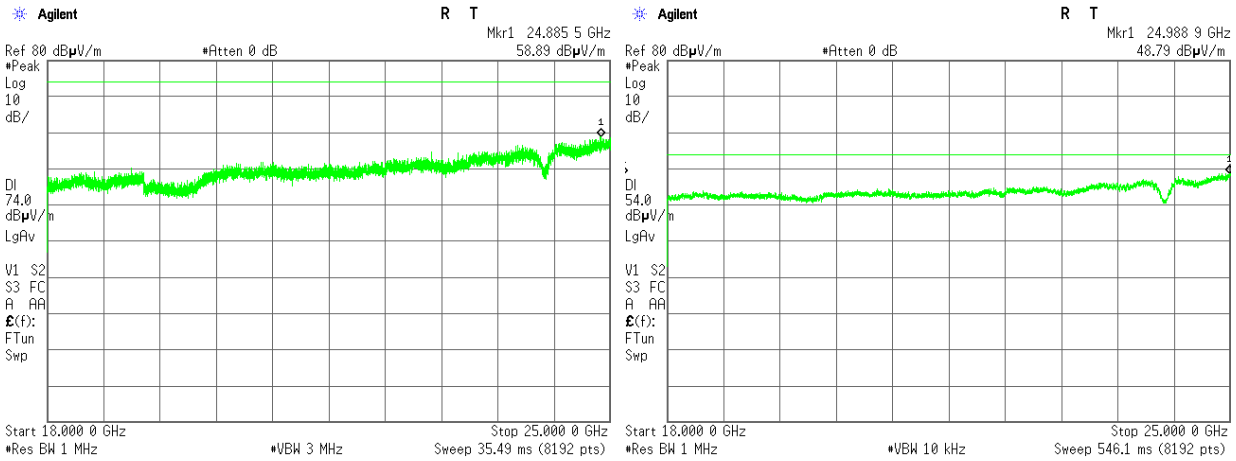


Peak



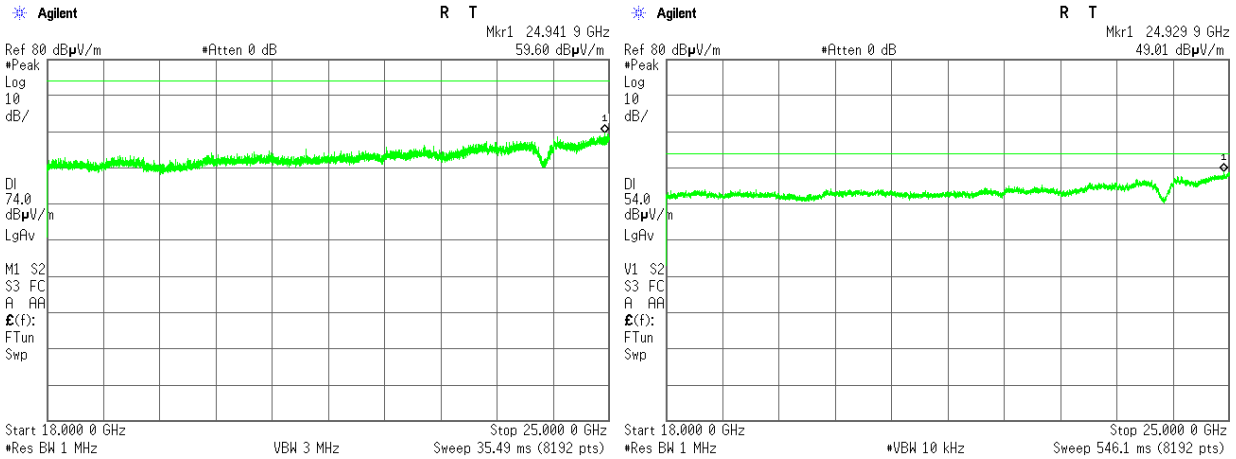
Average

3.5.9: Emissions in restricted frequency bands test results, 18.0 – 25.0 GHz range, Vertical, Fc = 2402 MHz



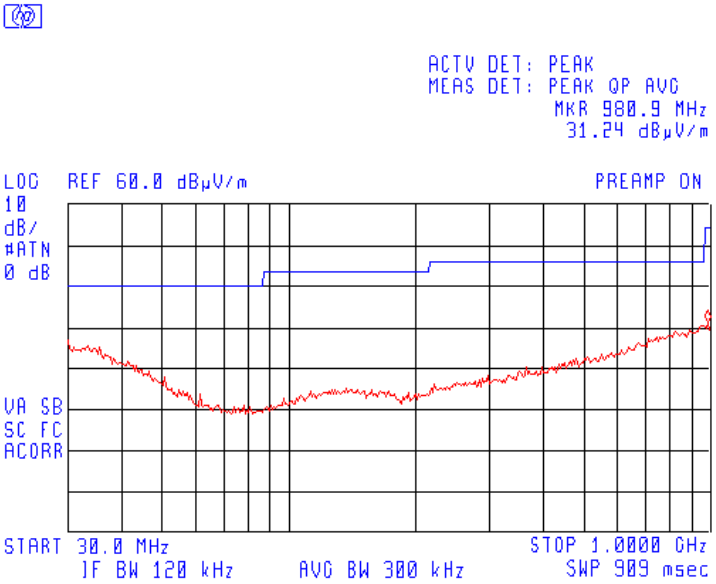
Peak Average

3.5.10: Emissions in restricted frequency bands test results, 18.0 – 25.0 GHz range, Horizontal, Fc = 2402 MHz

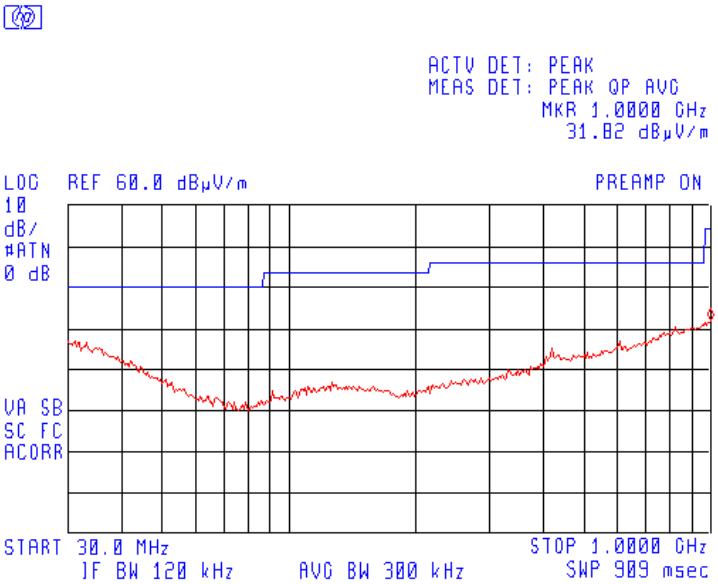


Peak Average

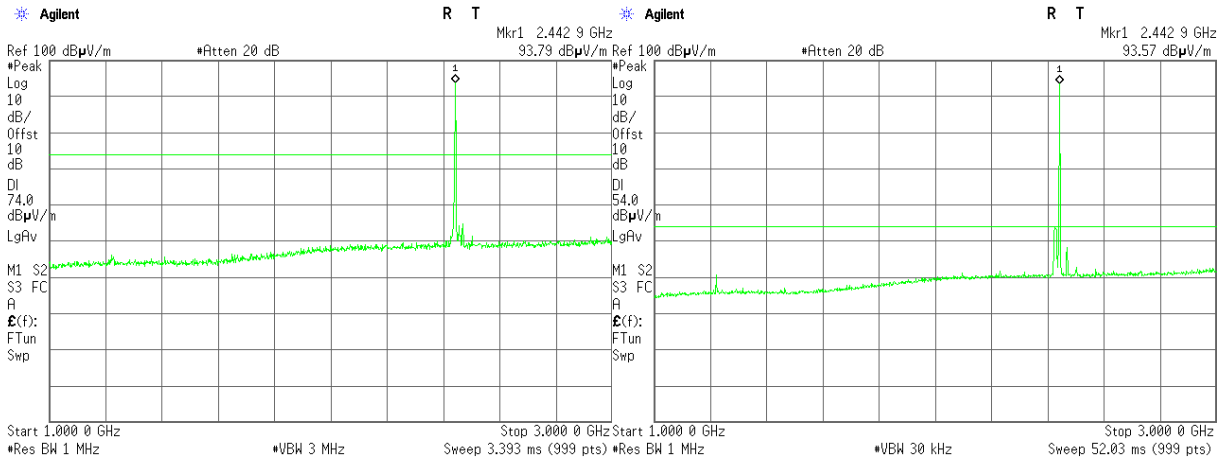
3.5.11: Emissions in restricted frequency bands test results, 30 MHz – 1 GHz range, Vertical polarization, Fc = 2442 MHz



3.5.12: Emissions in restricted frequency bands test results, 30 MHz – 1 GHz range, Horizontal polarization, Fc = 2442 MHz

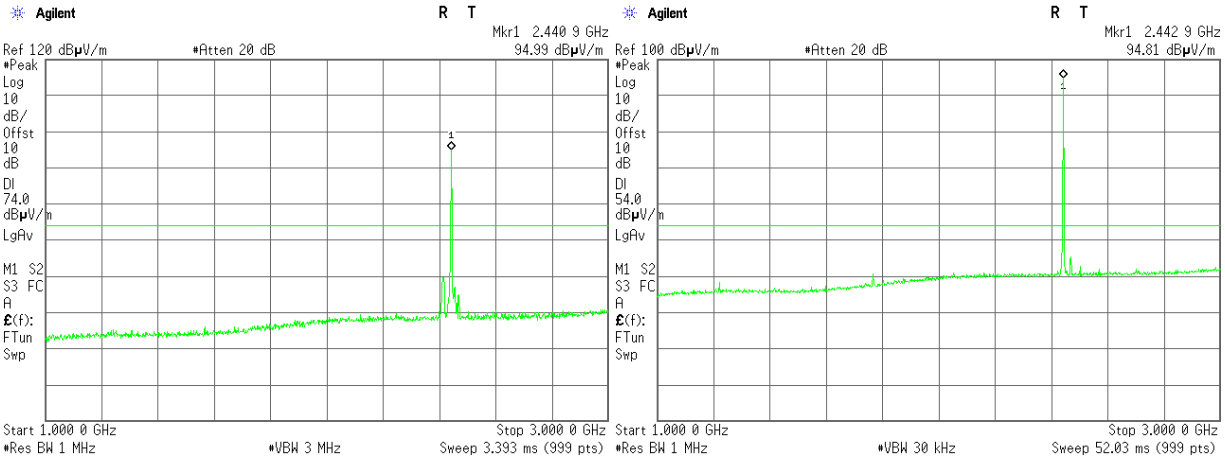


3.5.13: Emissions in restricted frequency bands test results, 1.0 – 3.0 GHz range, Vertical, Fc = 2442 MHz



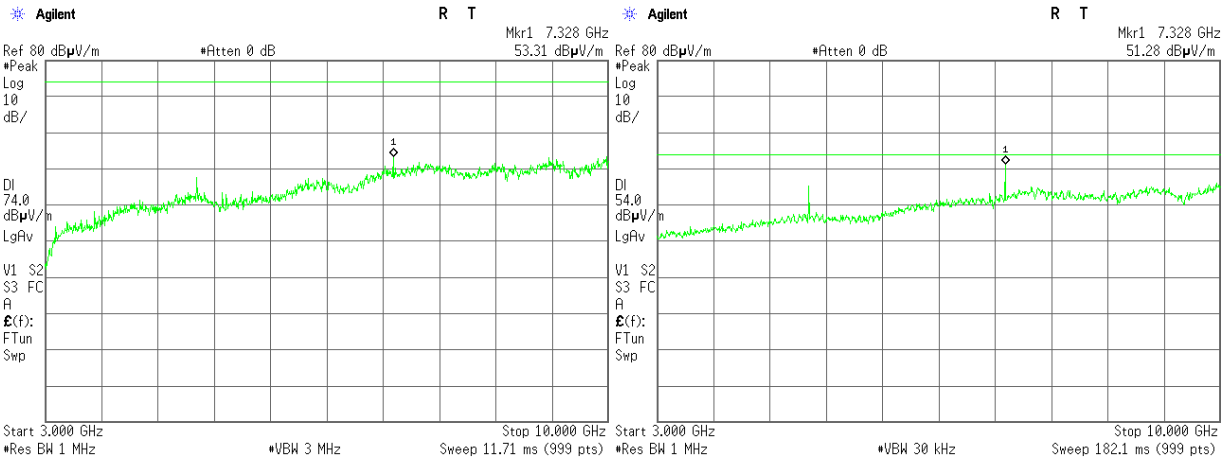
Peak Average

3.5.14: Emissions in restricted frequency bands test results, 1.0 – 3.0 GHz range, Horizontal, Fc = 2442 MHz



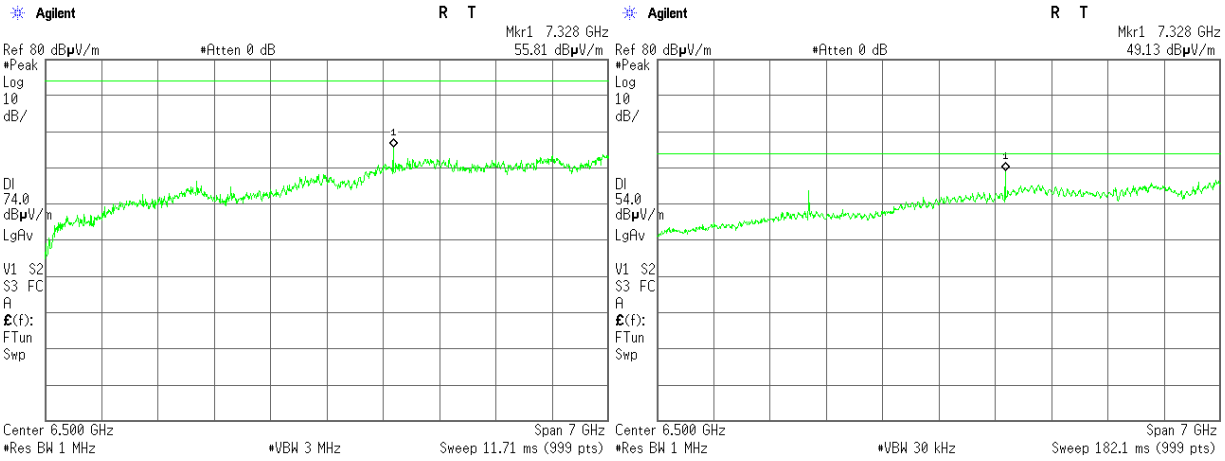
Peak Average

3.5.15: Emissions in restricted frequency bands test results, 3.0 – 10.0 GHz range, Vertical, Fc = 2442 MHz (with 2400 – 2500 MHz band stop filter)



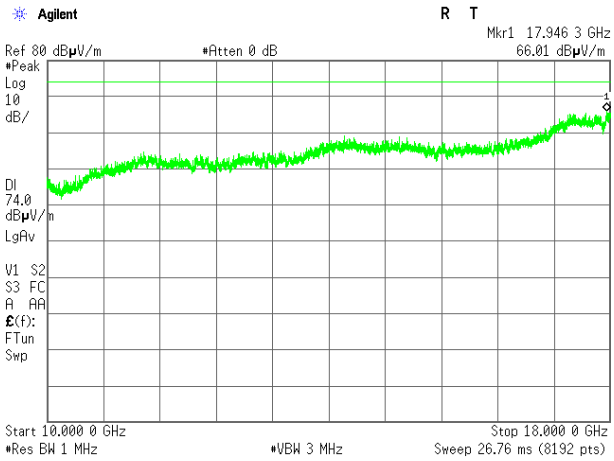
Peak Average

3.5.16: Emissions in restricted frequency bands test results, 3.0 – 10.0 GHz range, Horizontal, Fc = 2442 MHz (with 2400 – 2500 MHz band stop filter)

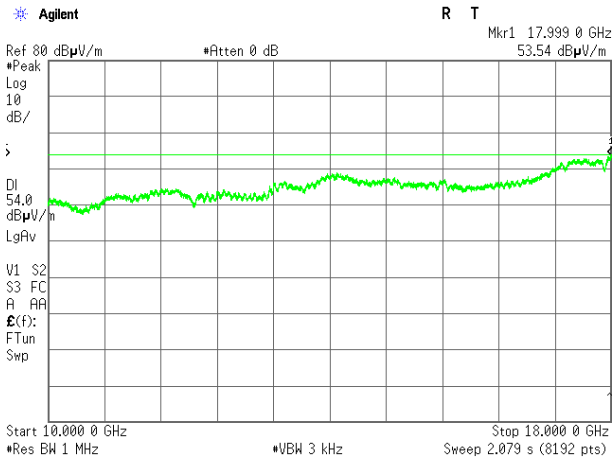


Peak Average

3.5.17: Emissions in restricted frequency bands test results, 10.0 – 18.0 GHz range, Vertical, Fc = 2442 MHz (with 2400 – 2500 MHz band stop filter)

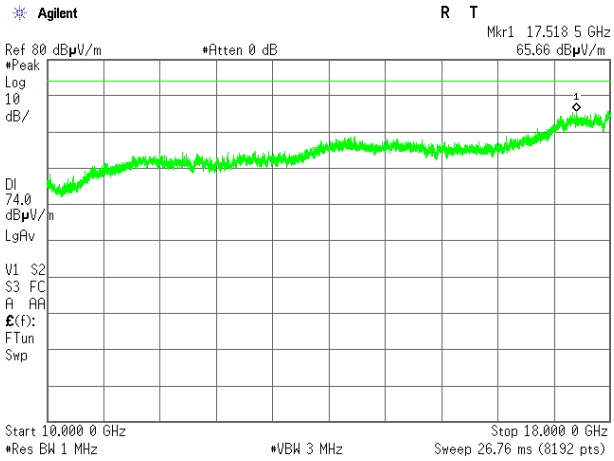


Peak

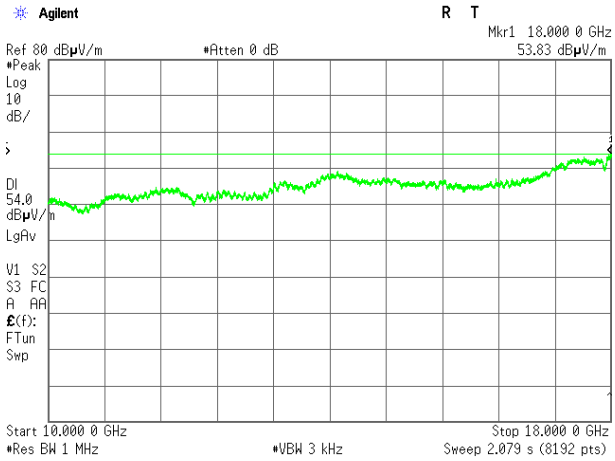


Average

3.5.18: Emissions in restricted frequency bands test results, 10.0 – 18.0 GHz range, Horizontal, Fc = 2442 MHz (with 2400 – 2500 MHz band stop filter)

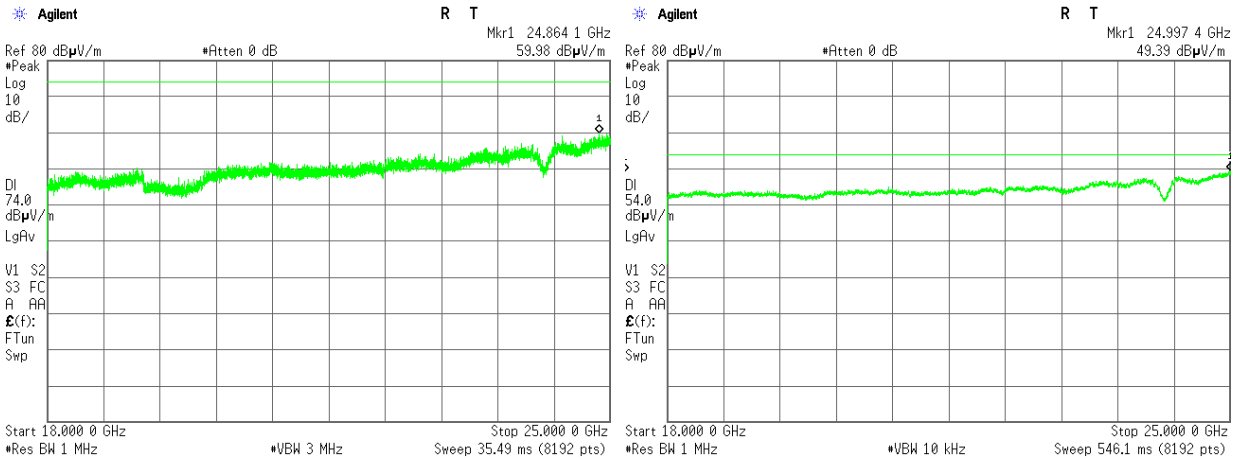


Peak



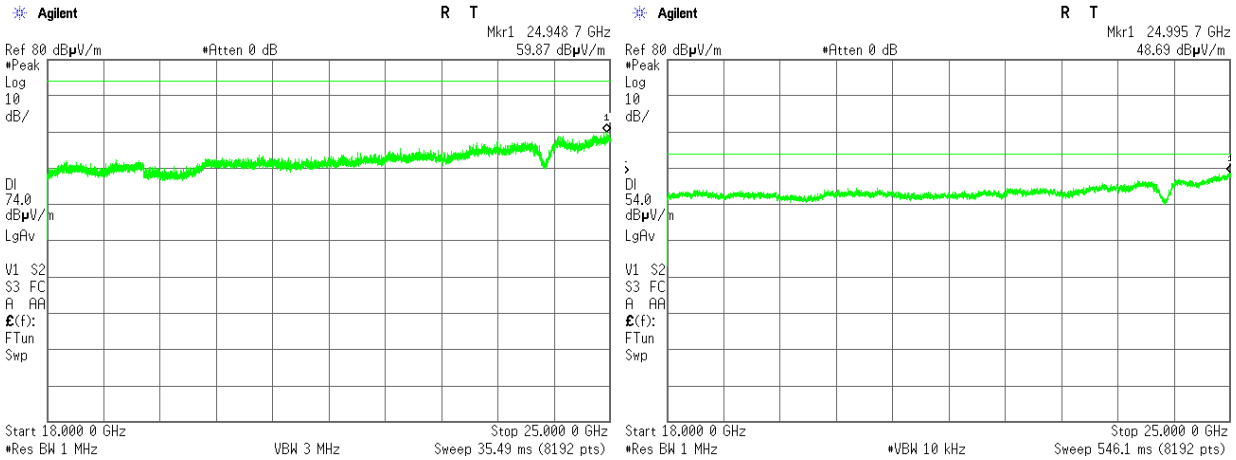
Average

3.5.19: Emissions in restricted frequency bands test results, 18.0 – 25.0 GHz range, Vertical, Fc = 2442 MHz



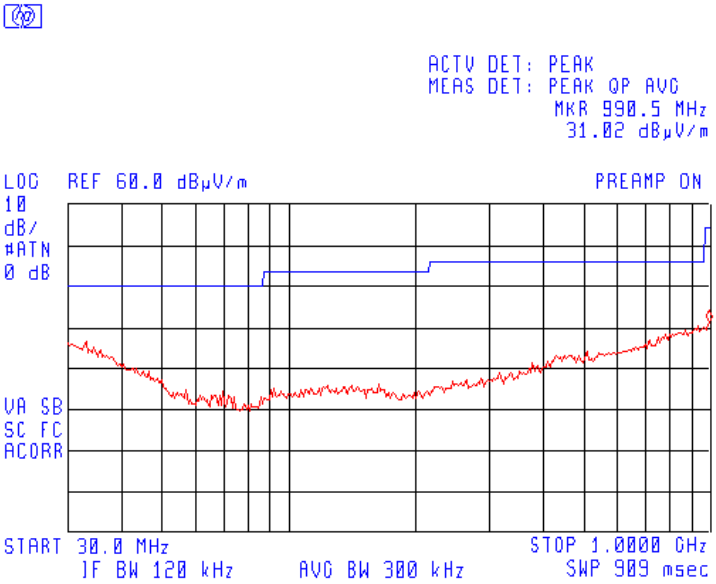
Peak Average

3.5.20: Emissions in restricted frequency bands test results, 18.0 – 25.0 GHz range, Horizontal, Fc = 2442 MHz

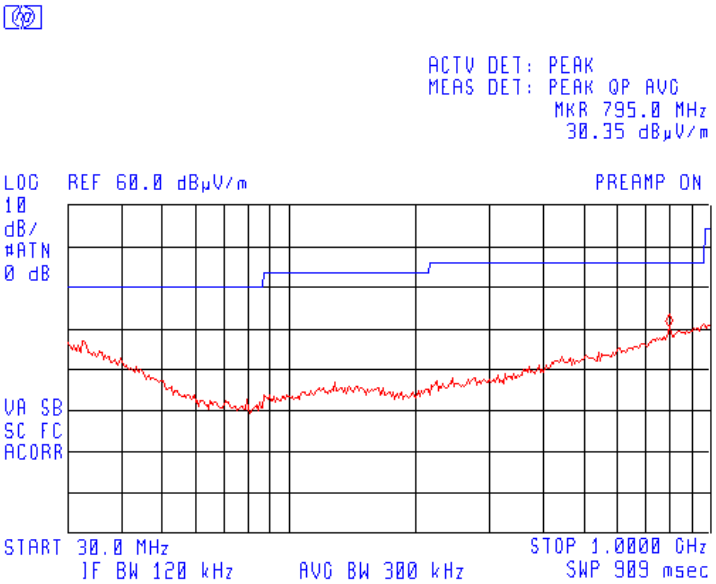


Peak Average

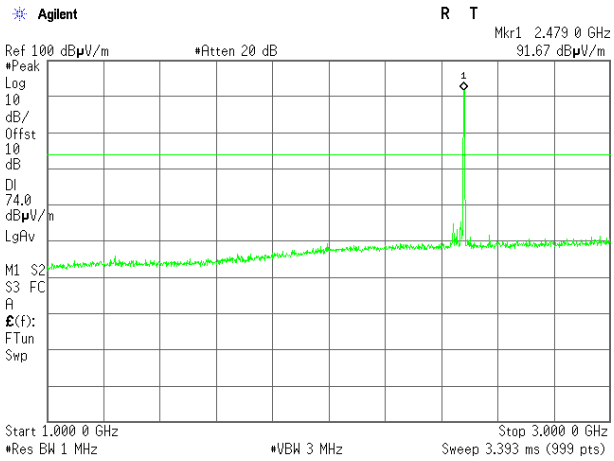
3.5.23: Emissions in restricted frequency bands test results, 30 MHz – 1 GHz range, Vertical polarization, Fc = 2480 MHz



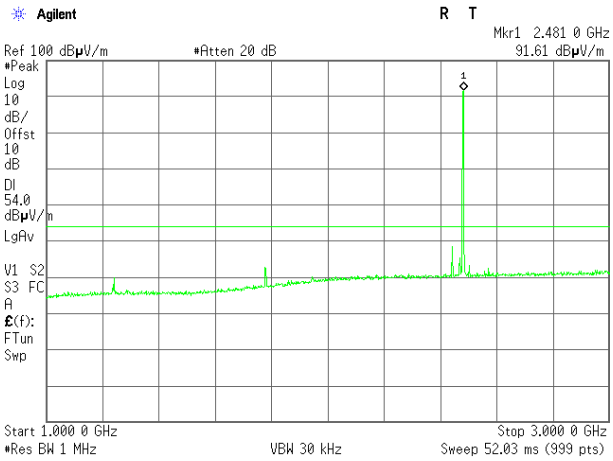
3.5.24: Emissions in restricted frequency bands test results, 30 MHz – 1 GHz range, Horizontal polarization, Fc = 2480 MHz



3.5.21: Emissions in restricted frequency bands test results, 1.0 – 3.0 GHz range, Vertical, Fc = 2480 MHz

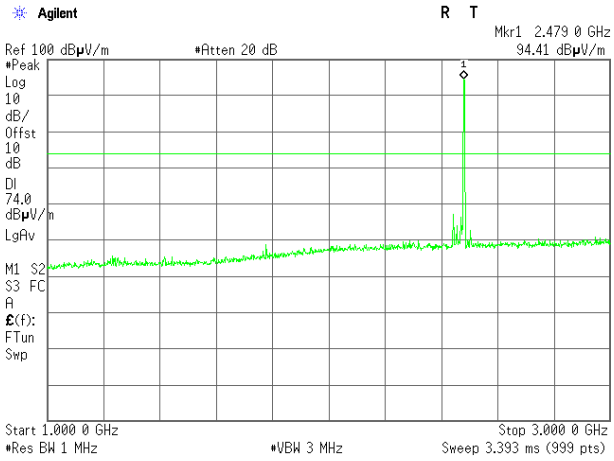


Peak

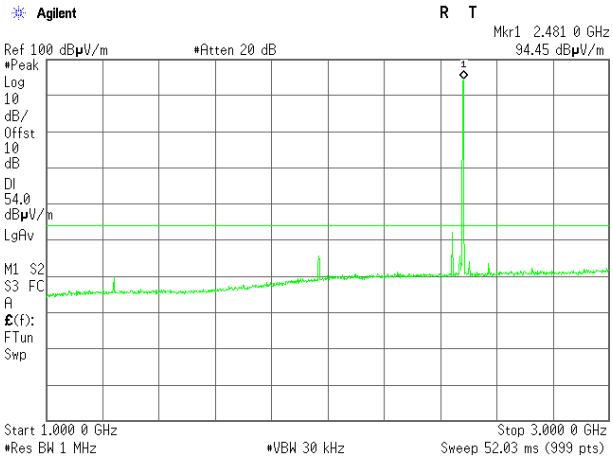


Average

3.5.22: Emissions in restricted frequency bands test results, 1.0 – 3.0 GHz range, Horizontal, Fc = 2480 MHz

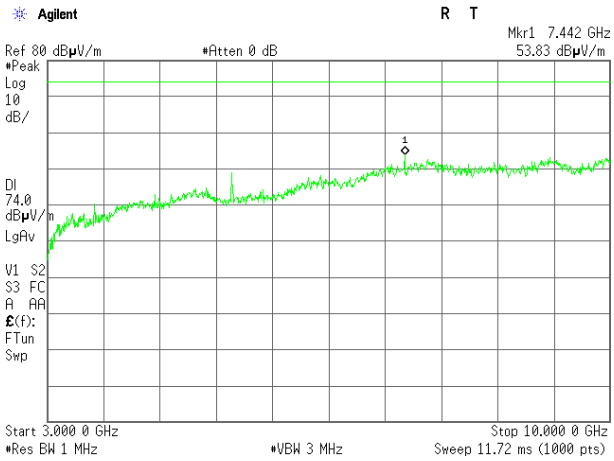


Peak

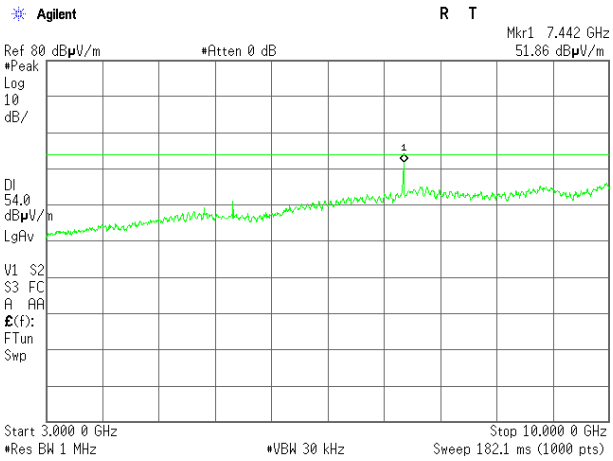


Average

3.5.25: Emissions in restricted frequency bands test results, 3.0 – 10.0 GHz range, Vertical, Fc = 2480 MHz (with 2400 – 2500 MHz band stop filter)

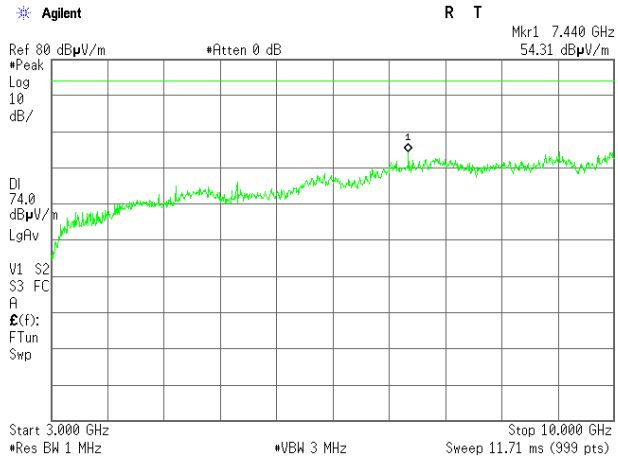


Peak

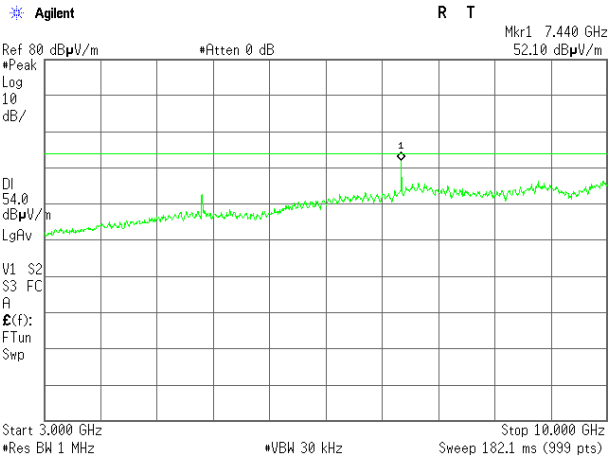


Average

3.5.26: Emissions in restricted frequency bands test results, 3.0 – 10.0 GHz range, Horizontal, Fc = 2480 MHz (with 2400 – 2500 MHz band stop filter)

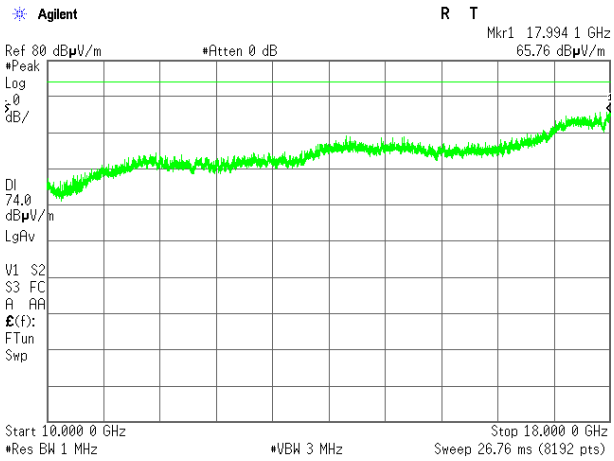


Peak

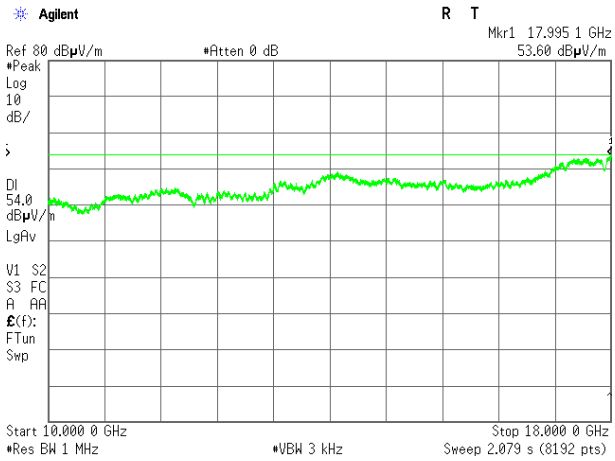


Average

3.5.27: Emissions in restricted frequency bands test results, 10.0 – 18.0 GHz range, Vertical, Fc = 2480 MHz (with 2400 – 2500 MHz band stop filter)

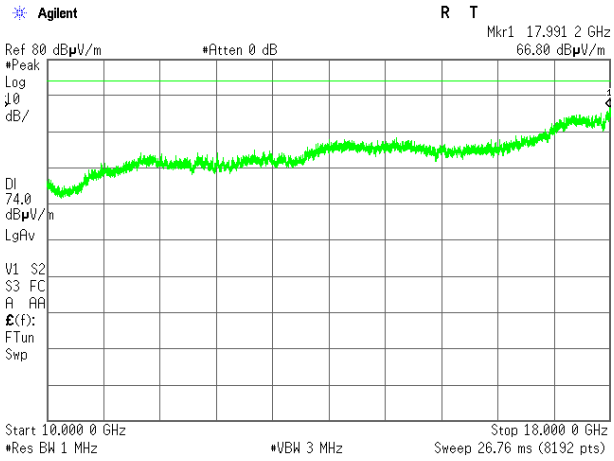


Peak

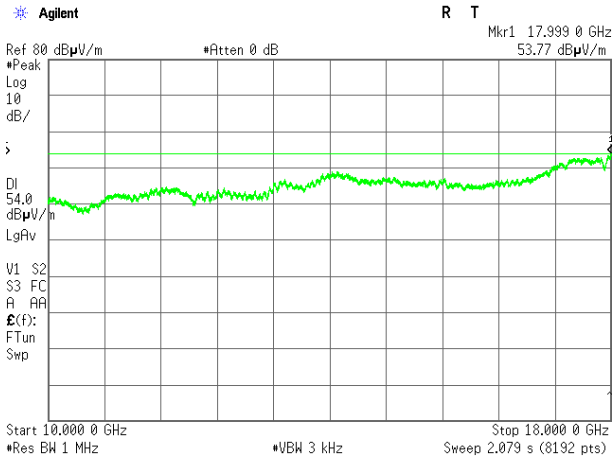


Average

3.5.28: Emissions in restricted frequency bands test results, 10.0 – 18.0 GHz range, Horizontal, Fc = 2480 MHz (with 2400 – 2500 MHz band stop filter)

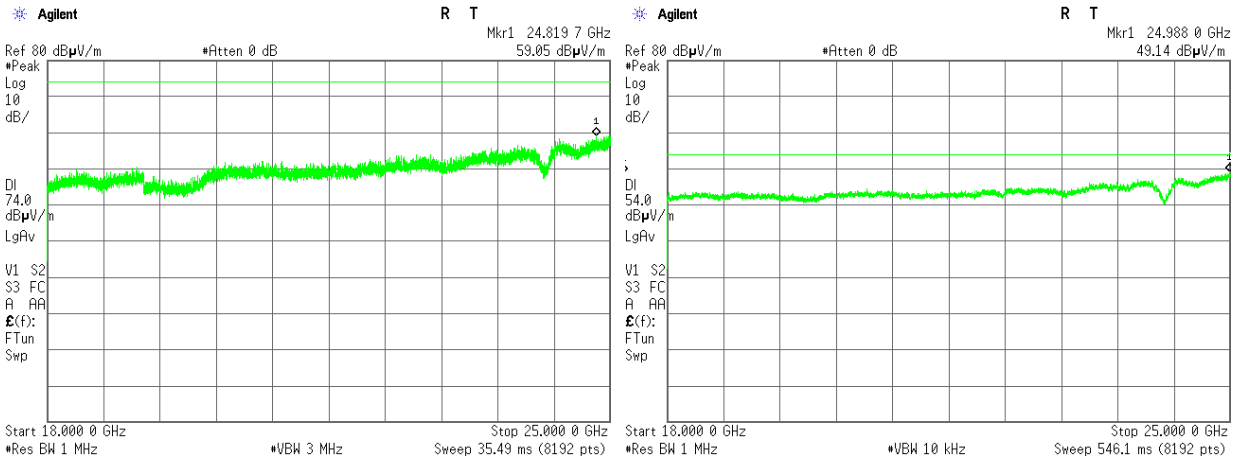


Peak



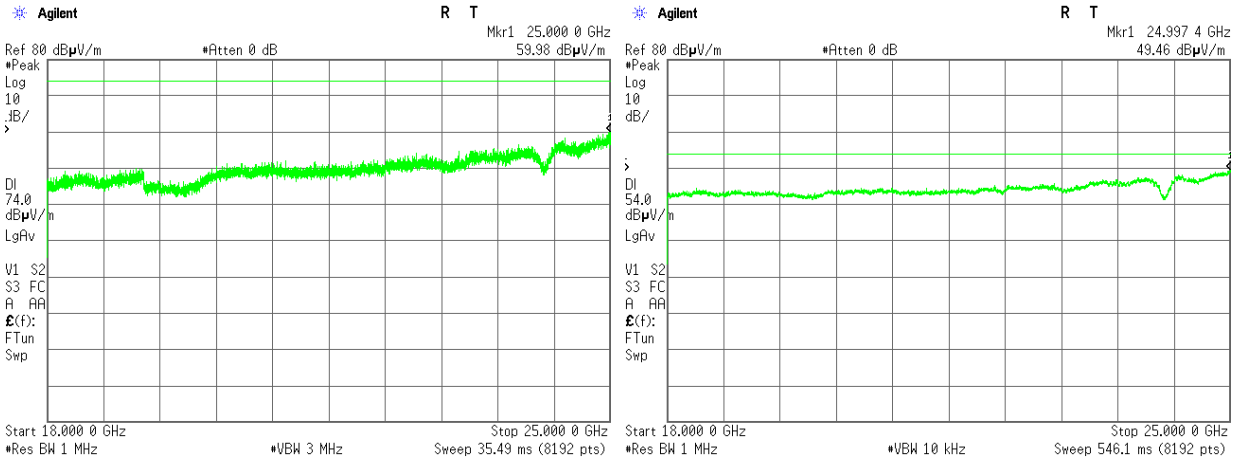
Average

3.5.29: Emissions in restricted frequency bands test results, 18.0 – 25.0 GHz range, Vertical, Fc = 2480 MHz



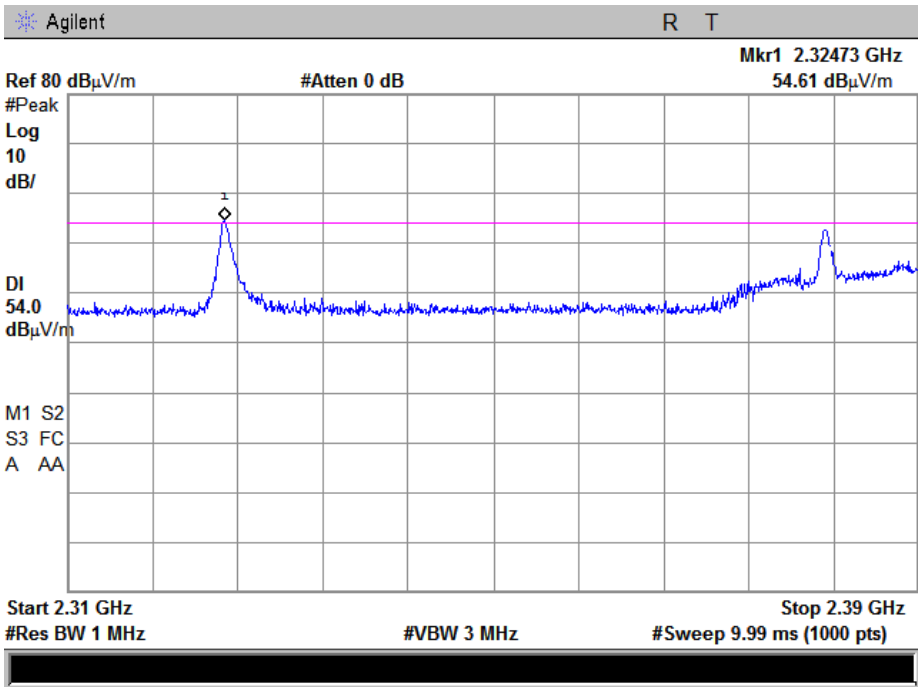
Peak Average

3.5.30: Emissions in restricted frequency bands test results, 18.0 – 25.0 GHz range, Horizontal, Fc = 2480 MHz

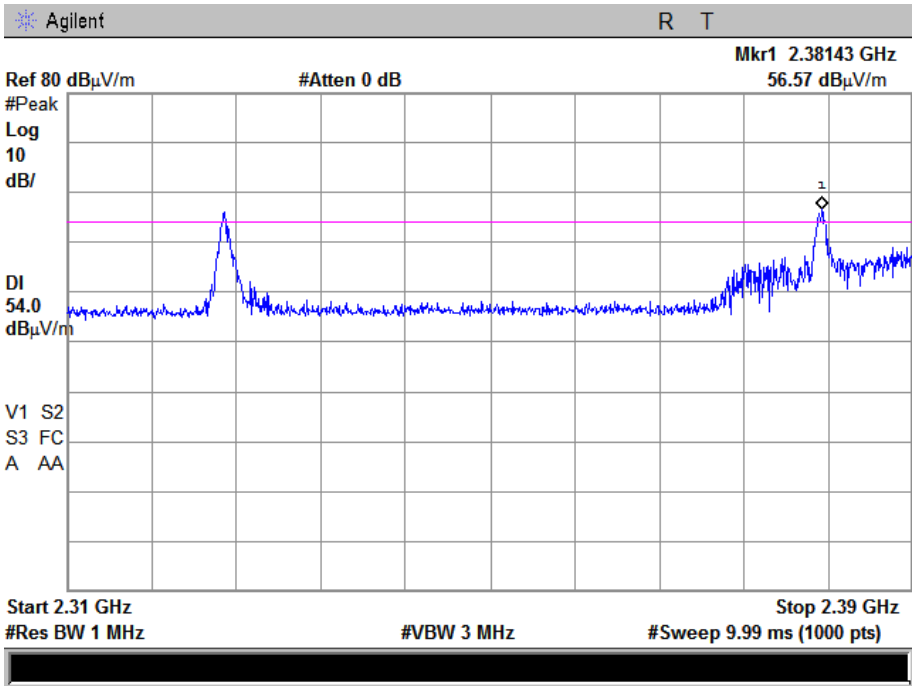


Peak Average

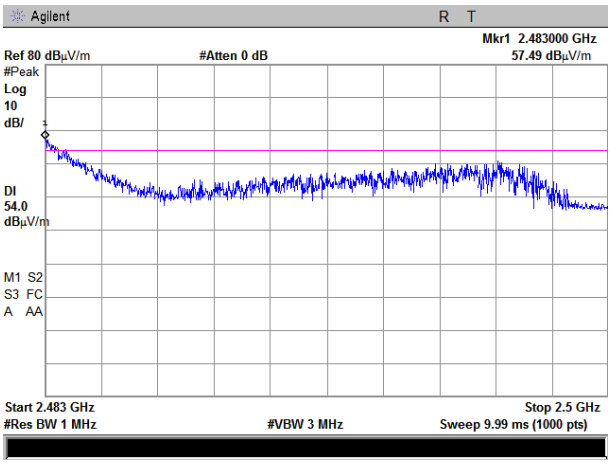
3.5.31: Plot 3.5.27 Emissions in restricted frequency bands test results, 2310 – 2390 MHz band, Vertical polarization, Fc = 2402 MHz



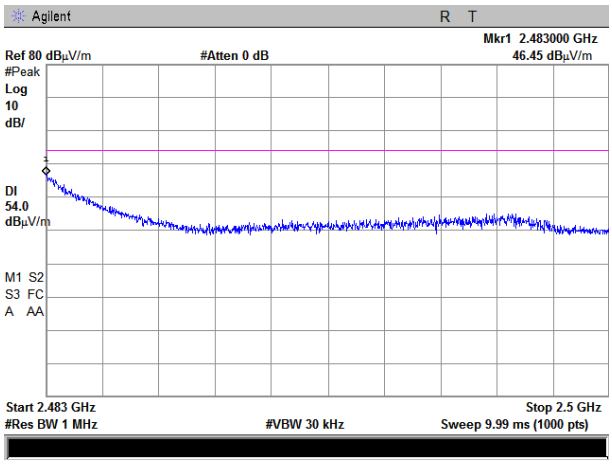
Plot 3.5.32 Emissions in restricted frequency bands test results, 2310 – 2390 MHz band, Horizontal polarization, Fc = 2402 MHz



Plot 3.5.33 Emissions in restricted frequency bands test results, 2483.5 – 2500 MHz band, Vertical polarization, Fc = 2480 MHz

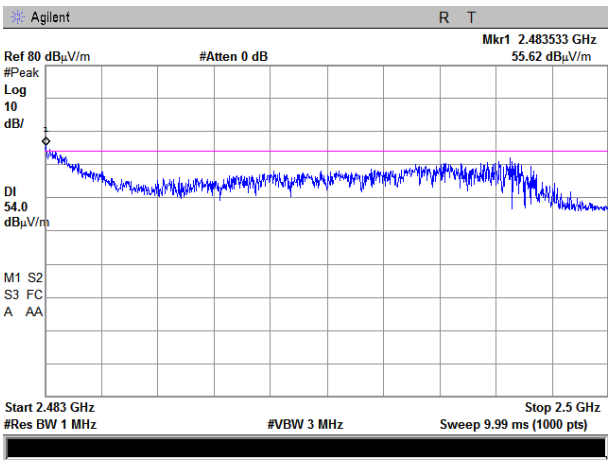


Peak

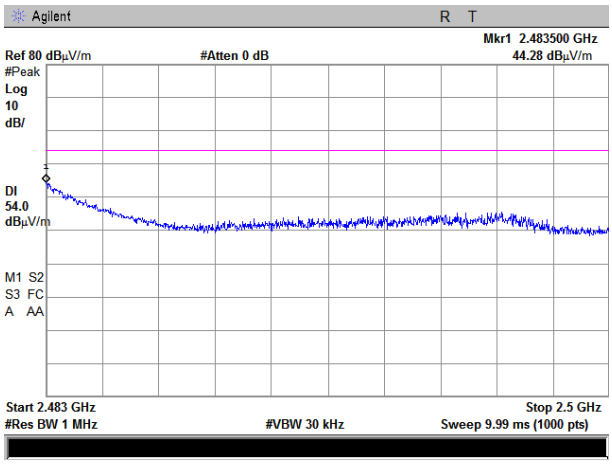


Average

Plot 3.5.34 Emissions in restricted frequency bands test results, 2483.5 – 2500 MHz band, Horizontal polarization, Fc = 2480 MHz



Peak



Average

3.6. Band edge measurements

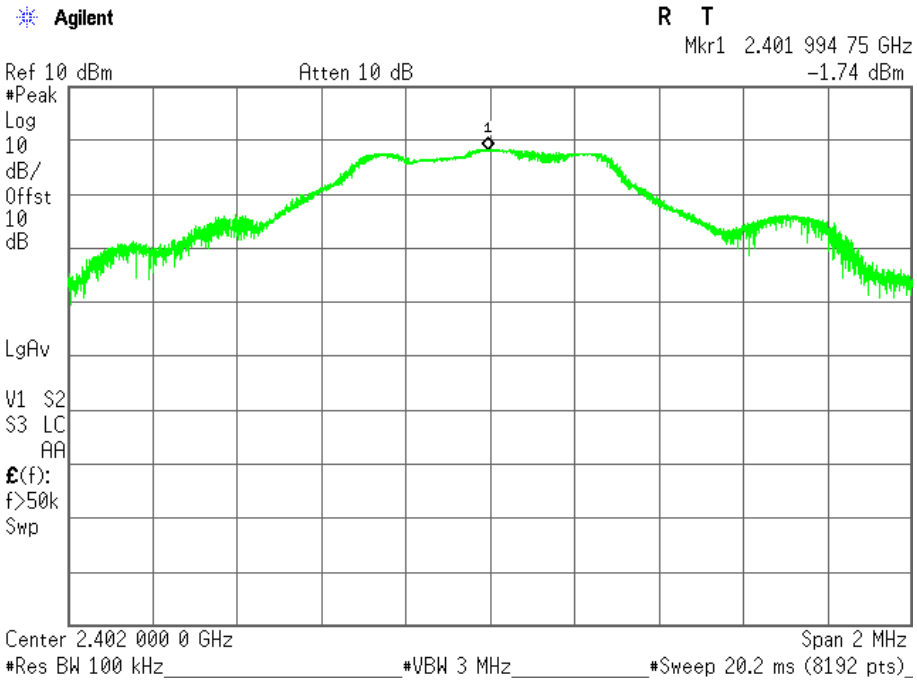
Reference document:	**47 CFR §15.247 (d) & RSS 247, section 5.5**		
Test Requirements:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (See §15.205(c)).		
Method of testing:	KDB 558074 D01 v03r02, Sec.13.3.2 Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100 kHz, VBW: ≥3×RBW		
Environment conditions:	Ambient Temperature: 21 °C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.6.1 - Plot 3.6.4	

Test results:

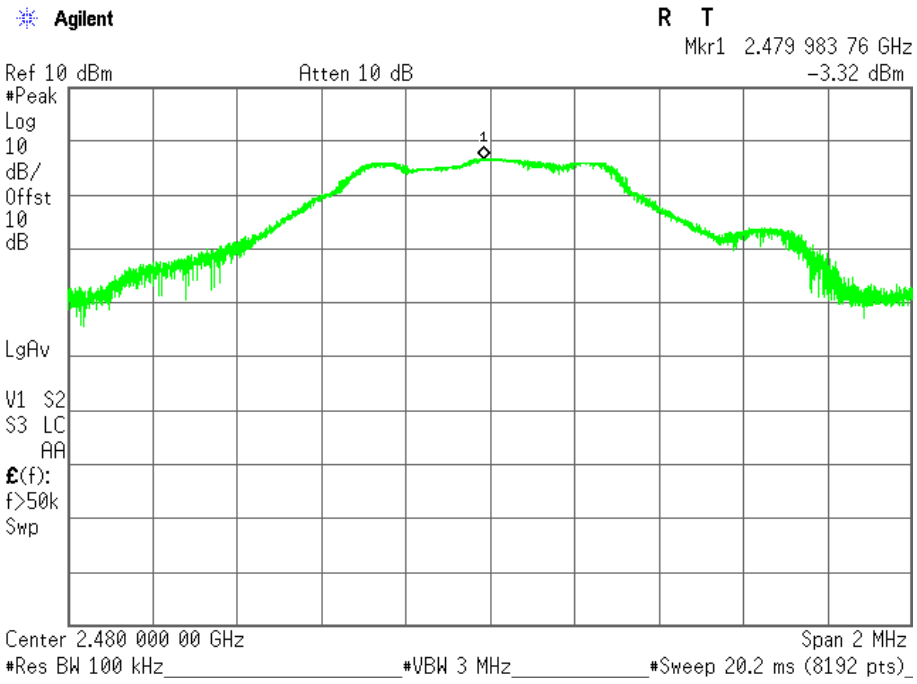
Fundamental Frequency, [MHz]	Fundamental Emission Reference Level, [dBm]	Measured Average Power, [dBm]	Duty Cycle Correction Factor	Calculated Average Power, [dBm]	Attenuation Below Fundamental, [dB]	Minimum Attenuation Below Fundamental, [dB]	Margin, [dB]	Pass/ Fail
2402.000	-1.74	-51.49	1.67	-49.82	48.08	20.00	28.08	Pass
2480.000	-3.32	-60.05	1.67	-58.38	55.06	20.00	35.06	Pass

Duty Cycle Correction Factor = 10log(1/X) = 10log(1/0.6777) = 1.67, X is transmit Duty Cycle [1/100%]

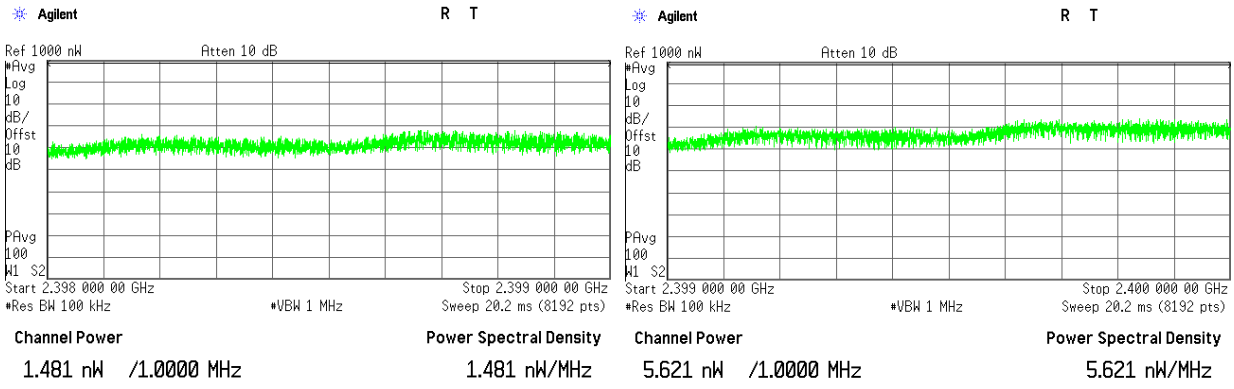
Plot 3.6.1 Band-Edge test results, Fundamental Emission Reference Level, Fc = 2402 MHz



Plot 3.6.2 Band-Edge test results, Fundamental Emission Reference Level, Fc = 2480 MHz

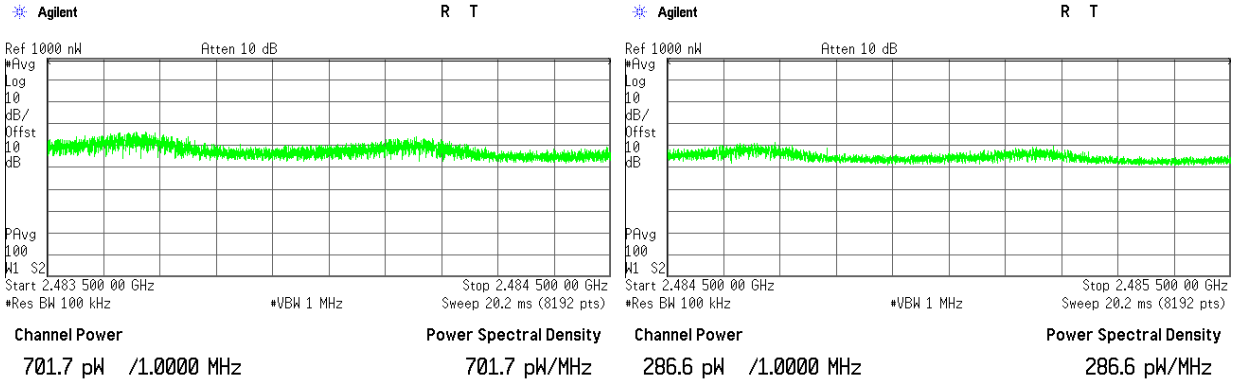


Plot 3.6.3 Band-Edge test results, Fc = 2402 MHz



Power = 1.481[nW] + 5.621[nW] = 7.102[nW] = -51.49[dBm]

Plot 3.6.4 Band-Edge test results, Fc = 2480 MHz



Power = 701.7[pW] + 286.6[pW] = 988.3[pW] = -60.05[dBm]

3.7. Antenna Connector Requirements

Reference document:	**47 CFR §15.203 & RSS-Gen Issue 4**	
Test Requirements:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with provisions of this section.	
Test Result:	The EUT contains a permanent antenna – on board printed antenna – no any antenna connector.	**NA**

4. Appendix:

Appendix A: List of test equipment used

Description	Manufacturer	Model	Serial No.	Last Cal	Cal Due
Bilog Antenna	Teseq	CBL 6141B	34119	03/07/2016	03/07/2017
Horn Antenna 1-18GHz	A.R.A	DRG-118/A	17188	18/05/2016	18/05/2017
Horn Antenna 15-40 GHz	Schwarzbeck	BBHA 9170	BBHA9170214	06/03/2015	06/03/2018
Spectrum Analyzer 3Hz-44GHz	Agilent	E4446A	MY46180602	13/11/2014	13/11/2016
EMC Analyzer	Agilent	E7405A	US41160436	02/06/2015	02/06/2016
RF Filter Section (2.9GHz)	HP	85460A	3448A00282	23/05/2016	23/05/2017
EMI Receiver (2.9GHz)	HP	8546A	3617A00318	23/05/2016	23/05/2017
RF Filter Section (6.5GHz)	HP	85460A	3704A00366	09/02/2016	09/02/2017
EMI Receiver (6.5GHz)	HP	8546A	3710A00392	09/02/2016	09/02/2017
LNA Amplifier 1 GHz to 18 GHz	AMP	7D-010180-30-10P-GW	618653	23/02/2016	23/02/2017
Low-Noise Amplifier 18 - 26.5 GHz	Miteq	AMF-5F-18002650-30-10P	945372	23/02/2016	23/02/2017

Appendix B: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

QUALITECH

Petah-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 28th day of June 2016.

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 1633.01
Valid to June 30, 2018

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

End of the Test Report