
<p>MOTOROLA PENANG ADV. COMM. LABORATORY Motorola Solutions Malaysia Sdn. Bhd. Plot 2A Medan Bayan Lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia.</p>	<p>FCC / ISED TEST REPORT Report Revision : Rev.C</p>
<p>Date/s Tested : 02-May-2023 - 21-May-2023 Report Issue Date : 04-August-2023 Manufacturer/Location : Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900, Bayan Lepas, Penang, Malaysia Requestor : TANG, GARY Product Type : Hand-held Product Version (PMN) : APX N50 Model Number (HVIN) : H25KDF9PW6AN Frequency Band : 2.412-2.462 GHz Max RF Output Power : 802.11b - 79.4 mWatts 802.11g - 282 mWatts 802.11n - 282 mWatts Applicant Name : Motorola Solutions Inc Applicant Address : 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322 FCC Registrations : 461337 ISED Registrations : MY0001 Firmware Version (FVIN) : D30.80.88 The equipment was tested accordance to the requirement listed below: (2.4GHz Wifi) PASS 47CFR Part 15C ISED RSS 247 Issue 2 February 2017</p>	
<p>This report shall not be reproduced without written approval from an officially designated representative of the Motorola Penang Adv. Comm. Laboratory. The results and statements contained in this report pertain only to the device(s) evaluated.</p>	
<p>Prepared By: <i>hidayati</i> _____ SITI NURHIDAYATI BINTI ABDUL HALIM Test Personnel</p>	<p>Approved Signatory: <i>MAHESHVARAN</i> _____ MAHESHVARAN A/L RAJAGOPAL Responsible Engineer</p>

Table of Contents

1.0. General Information.....	3
1.1. Channel number and frequency information:	3
2.0. Summary of Test Results	4
3.0. Measurement Uncertainty	4
4.0. Equipment List.....	5
5.0. Test Mode Applicability and Test Channel Detail	5
6.0. Transmitter Test Parameters	9
6.1. 6dB Channel Bandwidth	9
6.1.1. Test Setup	9
6.1.2. Test Limits:	9
6.1.3. Test Data:	9
6.2. Conducted RF Output Power	10
6.2.1. Test Setup	10
6.2.2. Test Limits:	10
6.2.3. Test Data:	11
6.3. Duty Cycle of the test signal	12
6.3.1. Test Setup	12
6.3.2. Test Data	13
6.4. Maximum Peak Power Spectral Density	16
6.4.1. Test Setup	16
6.4.2. Test Limits	16
6.4.3. Test Result	16
6.5. Conducted Spurious Emission	17
6.5.1. Test Setup	17
6.5.2. Test Limits:	17
6.5.3. Test Result	17
6.6. Band edge Conducted Spurious Emission	17
6.6.1. Test Setup	18
6.6.2. Test Limits:	18
6.6.3. Test Result	18
6.7. Radiated Emission within restricted Bands	19
6.7.1. Test Setup	19
6.7.2. Test Limits:	20
6.7.3. Test Data:	21
6.8. AC Powerline Conducted Emission.....	68
6.8.1. Test Setup	68
6.8.2. Test Limits:	68
6.8.3. Test Result	70

REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	22-June-2023	Siti Nurhidayati
Rev. B	Update summary table	31-July-2023	Siti Nurhidayati
Rev. C	Update 6.2.1 Conducted RF Output Power test setup block diagram	04-August-2023	Siti Nurhidayati

1.0. General Information

EUT Description:

Technologies	2.4GHz Wi-Fi
TX Frequency range	2412MHz – 2462MHz
Modulation Type	DSSS, OFDM
Connector type	PROGRAMMING, TEST & ALIGNMENT CABLE
Antenna type	IFA BLUETOOTH/WIFI ANTENNA

1.1. Channel number and frequency information:

There are two bandwidth systems.

For 20MHz Bandwidth systems (802.11b, 802.11g, 802.11n), use channel 1 ~ channel 11

For 40MHz Bandwidth systems (802.11n), use channel 3 ~ channel 9

Channel	Frequency	Channel	Frequency
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

The EUT contains following accessory devices and data cable:

Item	Brand	Model or P/N
Cable, Port Prog, Test And Align Cable PSA	MOTOROLA	PMKN4231A
Antenna, Whip, Antenna, Whip, VHF, 18CM 136 - 174 MHz	MOTOROLA	AN000421A01
Batt Liion Impres 2 IP68 2850T	MOTOROLA	PMNN4813A
Chgr desktop single unit impres 2 base only	MOTOROLA	PMPN4819A
Chgr desktop multi unit impres 2 1 displays base only	MOTOROLA	PMPN4593A

General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

FCC 47 CFR Part 15 Subpart C
KDB 558074 D01 15.247 Meas Guidance v05
ANSI C63.10-2013

Deviation from standard

Not applicable as no deviation from standard test method

Modifications to EUT

For RF conducted measurements a pigtail was soldered out of the board while for radiated measurements there were no modifications to the device

2.0. Summary of Test Results

FCC Clause	IC Clause	Test Item	Result	Remark	Serial number tested	Tested by
15.247 (a)(2)	RSS-247 5.2(a)	DTS & 99% Channel Bandwidth	Pass	References data from AZ489FT7161 / ISED 109U-89FT7161	NA	NA
15.247 (b)(3)	RSS-247 5.4(d)	Conducted RF Output Power (Peak)	Pass	Highest output power: 802.11b: 18.60 dBm (72.44 mW) 802.11g: 24.48 dBm(280.54 mW) 802.11n: 24.48 dBm(280.54 mW)	287TZH0057	Hidayati
15.247(e)	RSS-247 5.2(b)	Maximum Power Spectral Density	Pass	References data from AZ489FT7161 / ISED 109U-89FT7161	NA	NA
15.247(d)	RSS-247 5.5	Conducted Spurious Emissions	Pass	References data from AZ489FT7161 / ISED 109U-89FT7161	NA	NA
15.247 (d)	RSS-247 5.5	Band edge Conducted Spurious Emission	Pass	References data from AZ489FT7161 / ISED 109U-89FT7161	NA	NA
15.205, 15.209, 15.247 (d)	RSS-247 5.5	Radiated Emission within Restricted Bands	Pass	Worst case emission: RBE: 66.8963 dBuV/m (margin: 7.1037 dB) RSE: 67.261 dBuV/m (margin: 0.7875 dB), noise floor	287TZH0154	Nazrin & Qawiman
15.207	RSS-Gen 8.8	AC Power Line Conducted Emission	NA	Meet the limit requirement.	287TZH0154	Shidee
15.203		Antenna requirement	NA	Internal antenna is not accessible to the enduser	NA	NA

NA → Not Available

***NOTE: The WiFi chipset is identical to FCC ID AZ489FT7161 / ISED 109U-89FT7161. The rest of conducted measurements are by similarity. Configurations of radiated emissions based on FCC ID AZ489FT7162 / ISED 109U-89FT7162 are tested. As per KDB 484596 D01v01, the applicant takes full responsibility that data referenced represents compliance to the relevant rules for this current FCC ID.**

3.0. Measurement Uncertainty

Measurement	Frequency	Expended Uncertainty (k=1.96) (±dB)
AC Power Line Conducted Spurious Emission	150KHz ~ 30MHz	3.48
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	5.88
	1GHz ~ 18GHz	5.84
Radiated Emissions above 1 GHz	18GHz ~ 40GHz	6.02
	Conducted Spurious Emissions	9kHz ~ 12.75GHz

4.0. Equipment List

Bluetooth ATE # 1 (SW Version: Ate Main_3.1.11)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
CHAMBER	SH-641	92003820	8-Jul-22	8-Jul-23
ANALYZER SPECTRUM	E4440A	US45303111	22-Jul-22	22-Jul-23
PULSE POWER METER	ML2495A	1845014	3-May-22	3-May-23
PULSE SENSOR	MA2411B	1726287	3-May-22	3-May-23
POWER SUPPLY	6652A	3640A02967	19-Oct-22	19-Oct-23

Radiated Spurious Emission (SW Version: EMC_FCC_RE_v1.6.5)

Description	Model #	Serial Number	Calibration Date	Calibration Due Date
DRG HORN FREQ.	SAS-571	1143	8-Mar-23	8-Mar-25
DRG HORN FREQ.	SAS-571	1027	3-Jun-22	3-Jun-23
DC POWER SUPPLY	N7976A	MY53410110	30-Jun-22	30-Jun-23
SIGNAL GENERATOR	SMB 100A	182511	4-Jun-21	4-Jun-24
EMI TEST RECEIVER	ESW44	101731	5-Oct-22	5-Oct-23
5m SEMI-ANECHOIC CHAMBER	S800-HX	J2308	No Cal. Req'd	No Cal. Req'd
BILOG ANTENNA	CBL6112B	2863	22-Jun-22	22-Jun-23
BILOG ANTENNA	CBL6112D	55546	23-Jun-22	23-Jun-23
DATA LOGGER THERMOHYGROMETER	SDL500	A.016785	23-Jun-22	23-Jun-23
SYSTEM CONTROLLER	SC104V	050806-1	No Cal. Req'd	No Cal. Req'd
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	No Cal. Req'd	No Cal. Req'd
ANTENNA POSITIONING TOWER	TLT2	NA	No Cal. Req'd	No Cal. Req'd
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170143	18-Aug-22	18-Aug-23
PREAMPLIFIER 18-40GHz	Miteq Hi Gain Sucoflex	2	No Cal. Req'd	No Cal. Req'd
PREAMPLIFIER	PAM-0118P	361	11-Sep-20	11-Sep-23
LOOP ANTENNA	6502	208416	12-Oct-22	12-Oct-23

AC Power Line Conducted Spurious Emission (SW Version: Ver. 10.60.10)

Description	Model #	Serial Number	Calibration Date	Calibration Due Date
DATA LOGGER	DSB	16344143	13-Jun-22	13-Jun-23
V-NETWORK 2-LINE	ENV216	101268	15-Aug-22	15-Aug-23
EMI TEST RECEIVER	ESCI	100225	9-Aug-22	9-Aug-23
PROGRAMMABLE AC SOURCE	61604	ABR000000926	30-Jun-22	30-Jun-23

5.0. Test Mode Applicability and Test Channel Detail

The device employs MIMO technology. Below are the possible configurations.

WLAN Configurations		Mode					
		SISO		Spatial Diversity Multiplexing (MIMO)		Cyclic Delay Diversity (MIMO)	
	Antenna	Primary	Secondary	Primary	Secondary	Primary	Secondary
2.4GHz	802.11b	√	√	x	x	x	x
	802.11g	√	√	x	x	x	x
	802.11n (HT20)	√	√	x	x	x	x
	802.11n (HT40)	x	x	x	x	x	x

√ = **Support**;
 x = **NOT Support**

Note: This Device supports simultaneous transmission operation, which allows for two SISO or two MIMO channels to operate independent of one another in the 2.4GHz band on each antenna. 802.11n mode is capable of transmitting simultaneously on two antennas using Cyclic Delay Diversity and Spatial Diversity Multiplexing (2x2 MIMO).

The following tables show the worst case configurations determined during testing. The data for these configurations is contained in this test report.

Radiated Emission Test (Above 1GHz)

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	QPSK	2	SISO	22.8°C, 70.1%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	22.8°C, 70.1%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	22.8°C, 70.1%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	6.5	SISO CDD (MIMO)	NA

Radiated Emission Test (Below 1GHz)

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	QPSK	2	SISO	22.8°C, 70.1%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	22.8°C, 70.1%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	22.8°C, 70.1%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	6.5	SISO CDD (MIMO)	NA

Power Line Conducted Emission Test

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Environmental Conditions
Application Mode	802.11bgn mixed	1 to 11	AUTO	DSSS, OFDM	AUTO	AUTO	NA

Antenna Port Conducted Measurement:

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Data Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	QPSK	2	SISO	25°C, 54.8%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	25°C, 54.8%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	25°C, 54.8%RH
Test Mode	802.11n (HT40)	1 to 11	3,6,9	OFDM	BPSK	6.5	SISO CDD (MIMO)	NA

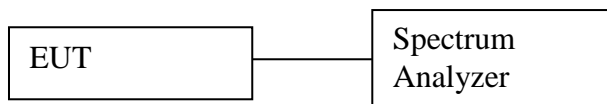
Duty Cycle of Test Signal

802.11b, 802.11g and 802.11n : Duty cycle of test signal is $\geq 98\%$. (Refer to Clause 6.3 for duty cycle test signal)

6.0. Transmitter Test Parameters

6.1. 6dB Channel Bandwidth

6.1.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max hold
 - e. Sweep = auto
- e) Measure the freq different of two frequencies that were attenuated 6dB from peak of the emission & record the frequency difference as the emission bandwidth.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

6.1.2. Test Limits:

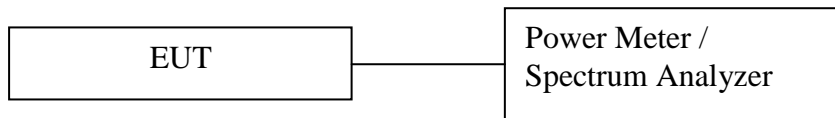
Normal Condition (25 ° C)
≥500 kHz

6.1.3. Test Data:

Not Applicable

6.2. Conducted RF Output Power

6.2.1. Test Setup



- a) Check and ensure the power meter well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Setting of Power Meter :
 - a. Set Trigger Source = Internal, Rising Edge
 - b. Set Frequency = Test Frequency
 - c. Record peak measurement data
- d) Setting of Spectrum analyzer :
 - a. Set the RBW = 300 kHz.
 - b. Set the VBW $\geq [3 \times \text{RBW}]$.
 - c. Set the span $\geq [1.5 \times \text{OBW bandwidth}]$.
 - d. Detector = average.
 - e. Sweep time = auto couple.
 - f. Trace mode = free run.
 - g. Allow trace to fully stabilize.
 - h. Add in duty cycle correction into final test result.
 - i. Duty cycle correction is calculated as : $10\log (1/x)$
- e) Measure every antenna port by repeat the step above for MIMO measurement.

6.2.2. Test Limits:

Normal Condition (25 ° C)
≤ 1 Watt(30 dBm)

6.2.3. Test Data:

Note: All conducted RF output power measurement is measured using Power Meter/ Peak measurement.

802.11b

Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11b	DSSS	DBPSK	1	2412	18.60	Pass
802.11b	DSSS	DBPSK	1	2437	18.55	Pass
802.11b	DSSS	DBPSK	1	2462	18.34	Pass

802.11g

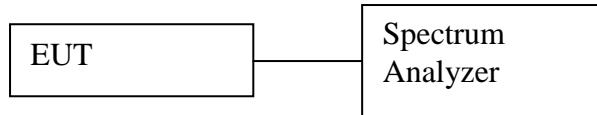
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11g	OFDM	BPSK	6	2412	24.14	Pass
802.11g	OFDM	BPSK	6	2437	24.48	Pass
802.11g	OFDM	BPSK	6	2462	24.12	Pass

802.11n (HT20)

Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11n20	OFDM	BPSK	6.5	2412	24.48	Pass
802.11n20	OFDM	BPSK	6.5	2437	24.46	Pass
802.11n20	OFDM	BPSK	6.5	2462	24.42	Pass

6.3.Duty Cycle of the test signal

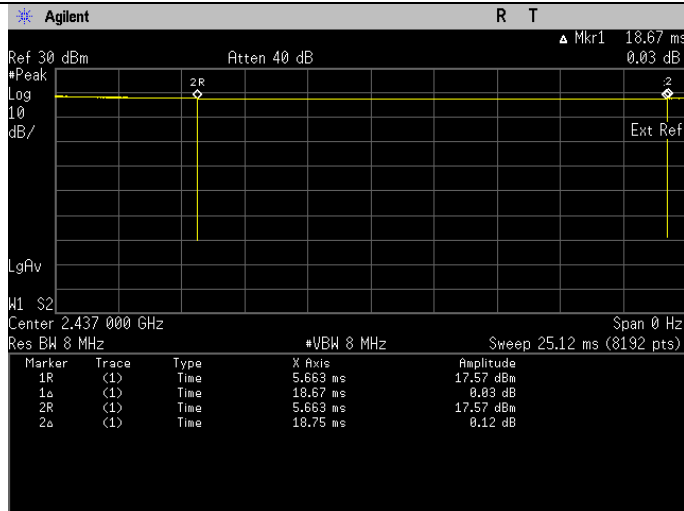
6.3.1. Test Setup



- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
 - a. Set the RBW = 10 MHz or the highest RBW available on spectrum analyzer.
 - b. Set the VBW \geq RBW.
 - c. Set the span \geq [1.5 \times DTS bandwidth].
 - d. Detector = Peak.
 - e. Sweep time = 10ms or others that allow to measure accurate duty cycle.
 - f. Trace mode = max hold.
 - g. Allow trace to fully stabilize.
- 5) Record the duty cycle as X and save the plot.
- 6) Measure every antenna port by repeat the step above for MIMO measurement.

6.3.2. Test Data

802.11b



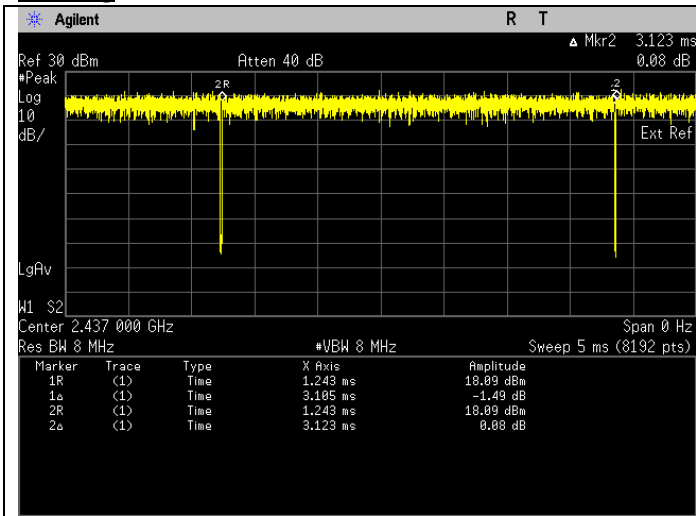
Duty Cycle

On time (ms)	18.67
On + Off Time (ms)	18.75
Duty cycle	0.9957
Duty Cycle factor	0.019

*Duty cycle = On time/ On +off time

*Duty Cycle factor = 10*log(1/Duty Cycle)

802.11g



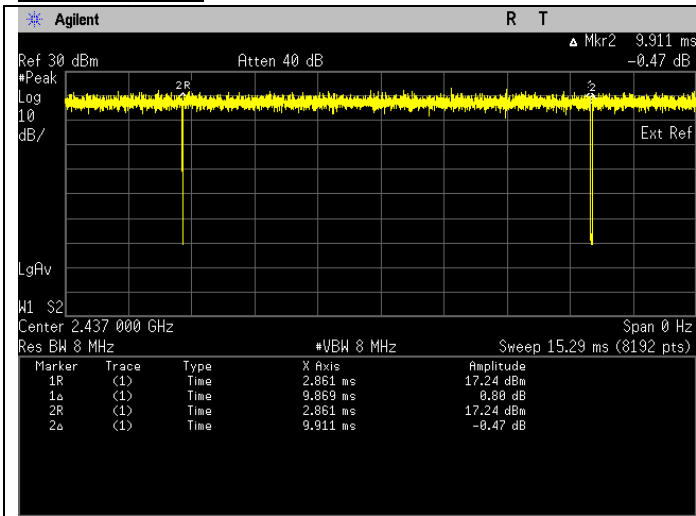
Duty Cycle

On time (ms)	3.105
On + Off Time (ms)	3.123
Duty cycle	0.9942
Duty Cycle factor	0.025

*Duty cycle = On time/ On +off time

*Duty Cycle factor = $10 \cdot \log(1/\text{Duty Cycle})$

802.11n (HT20)



Duty Cycle

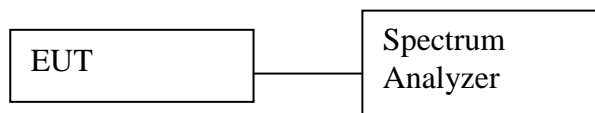
On time (ms)	9.869
On + Off Time (ms)	9.911
Duty cycle	0.9958
Duty Cycle factor	0.018

*Duty cycle = On time/ On +off time

*Duty Cycle factor = 10*log(1/Duty Cycle)

6.4. Maximum Peak Power Spectral Density

6.4.1. Test Setup



Maximum Peak

- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. Set analyzer center frequency to DTS channel center frequency.
 - b. Set the span to 1.5 times the DTS bandwidth.
 - c. Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - d. Set the VBW $\geq [3 \times \text{RBW}]$.
 - e. Detector = peak.
 - f. Sweep time = auto couple.
 - g. Trace mode = max hold.
 - h. Allow trace to fully stabilize.
 - i. Use the peak marker function to determine the maximum amplitude level within the RBW.
 - j. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
- e) Measure every antenna port by repeat the step above for MIMO measurement.

6.4.2. Test Limits

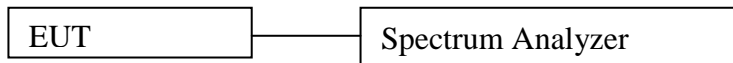
Normal Condition (25 ° C)
$\leq 8 \text{ dBm/3kHz}$

6.4.3. Test Result

Not Applicable

6.5. Conducted Spurious Emission

6.5.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max Hold
 - e. Sweep = auto
- e) Use the peak marker function to measure highest emission and scan up to 10th harmonic.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

6.5.2. Test Limits:

Normal Condition (25 ° C)

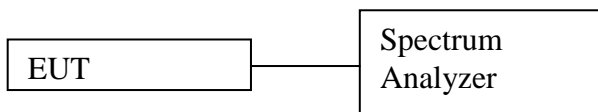
Shall be at least 30 dB below peak (max) power.
--

6.5.3. Test Result

Not Applicable

6.6. Band edge Conducted Spurious Emission

6.6.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max Hold
 - e. Sweep = auto
- e) Use the peak marker function to measure highest emission.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

6.6.2. Test Limits:

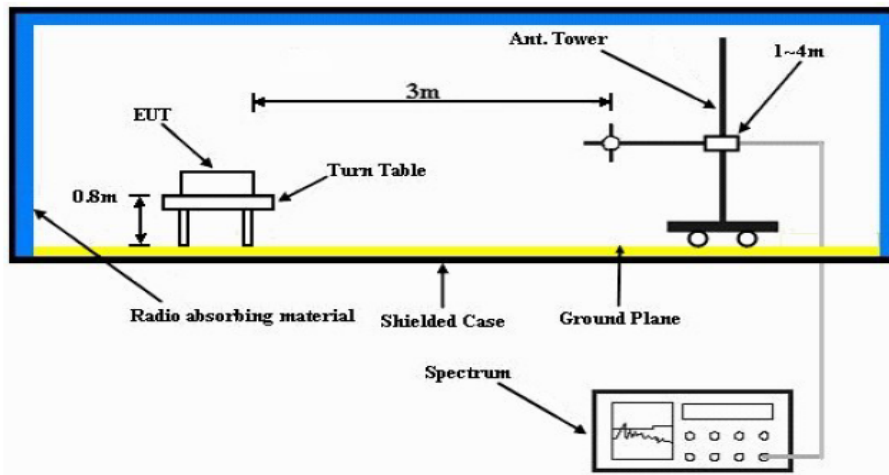
Normal Condition (25 ° C)
Shall be at least 30 dB below peak (max) power.

6.6.3. Test Result

Not Applicable

6.7. Radiated Emission within restricted Bands

6.7.1. Test Setup



- The EUT is placed on the top of a rotating table 0.8m above the ground (<1GHz) and 1.5m above the ground (>1GHz) at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
- The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

6.7.2. Test Limits:

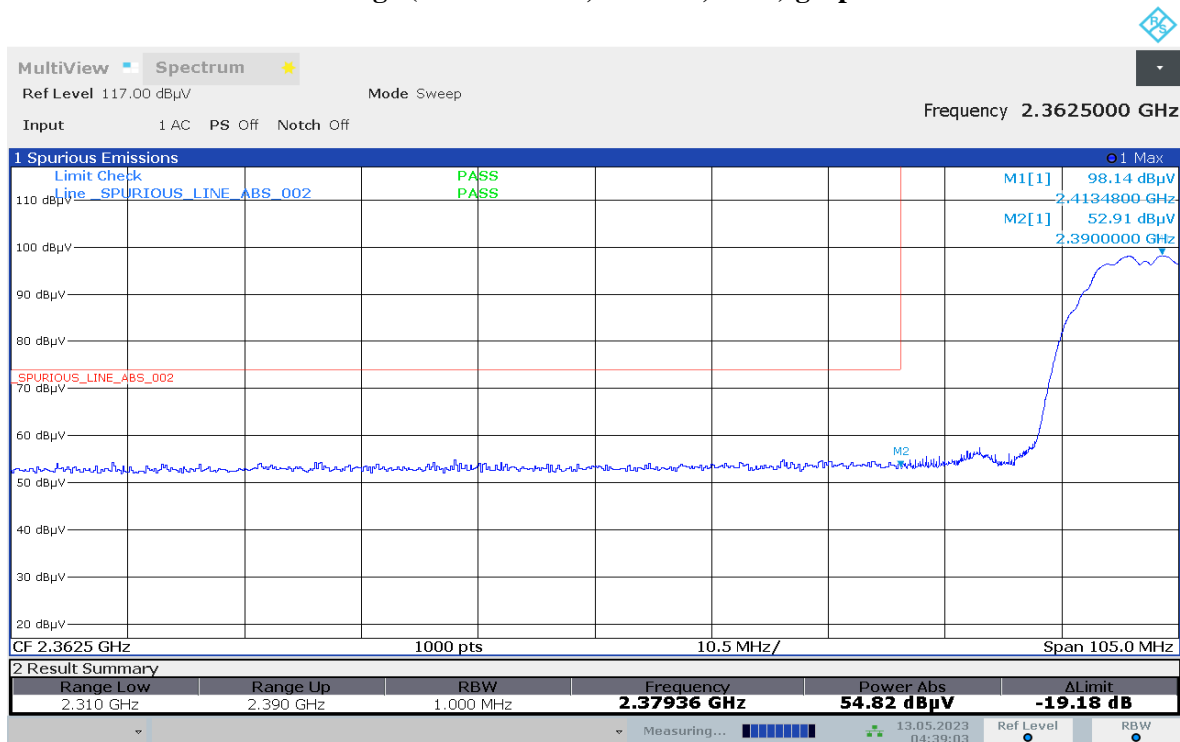
Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

NOTE:

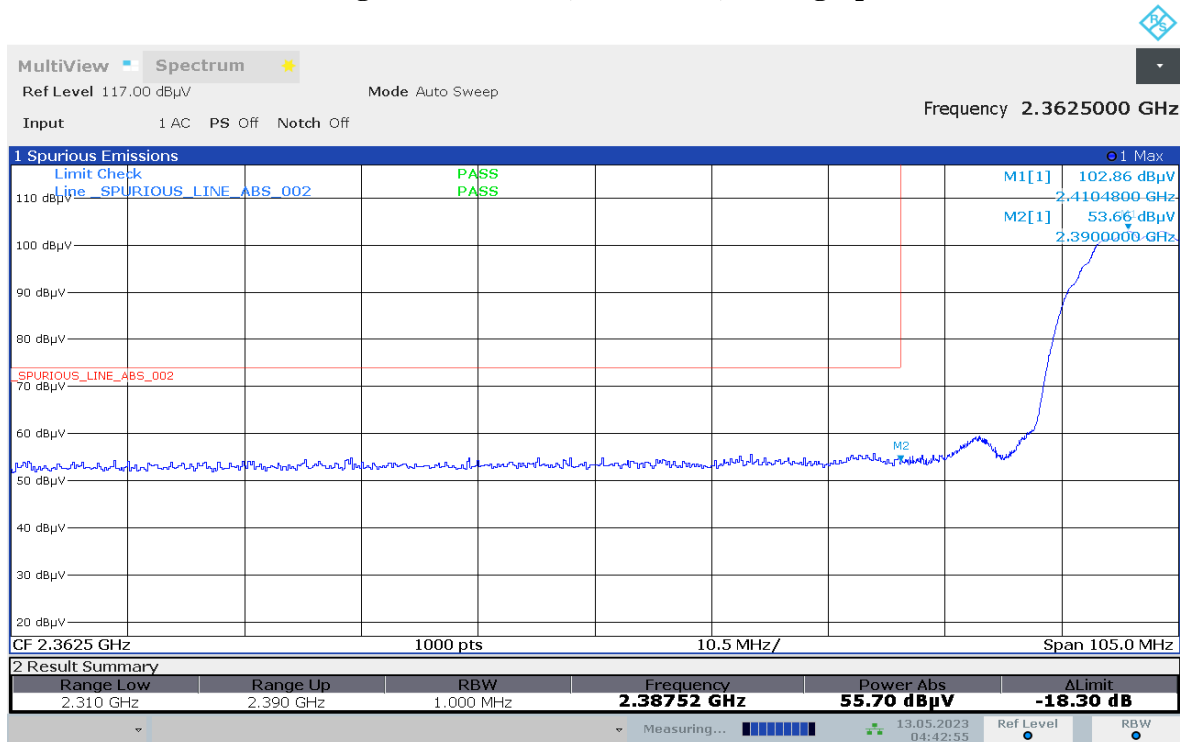
- a. The lower limit shall apply at the transition frequencies.
- b. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- c. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



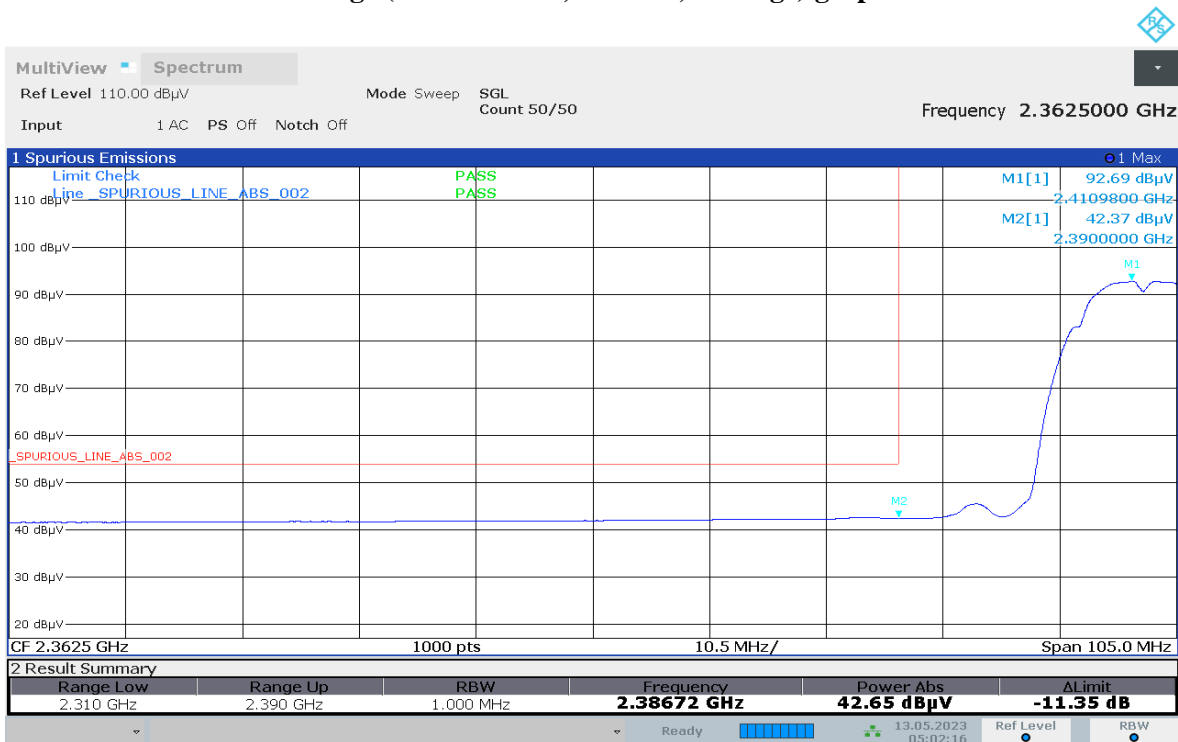
04:39:04 13.05.2023

Restricted Band Edge (Low Channel, Horizontal, Peak) graphical screen shot



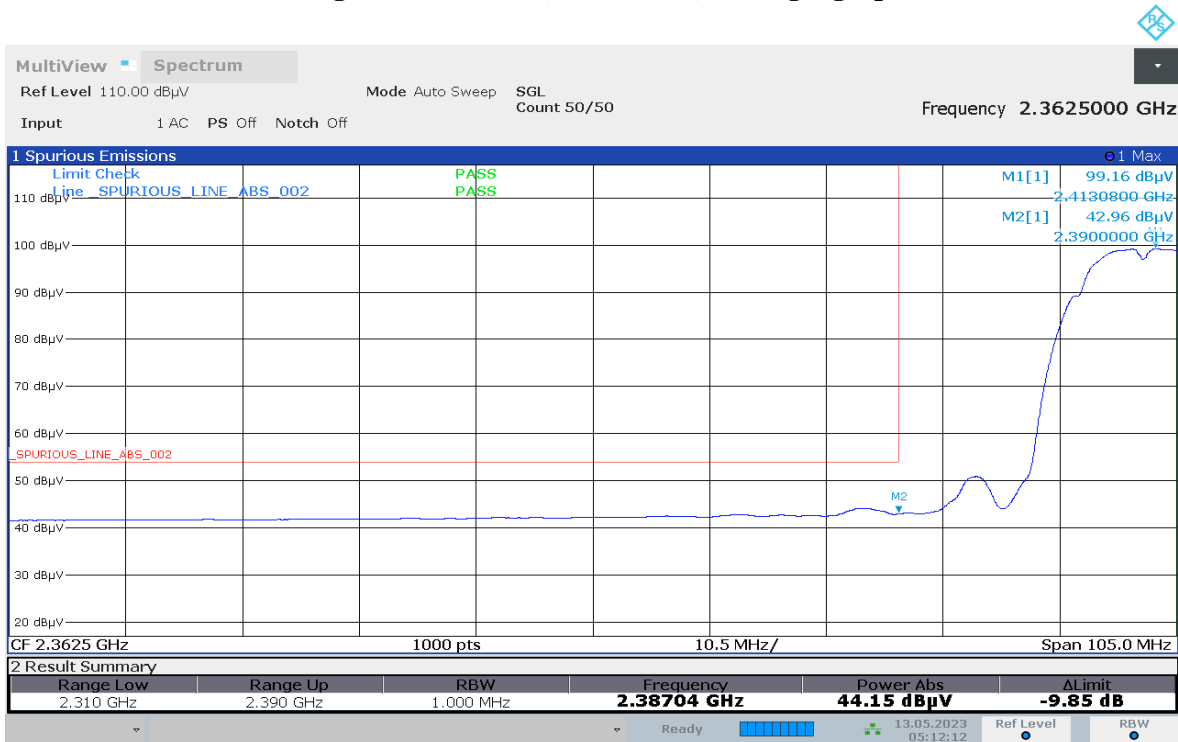
04:42:55 13.05.2023

Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot



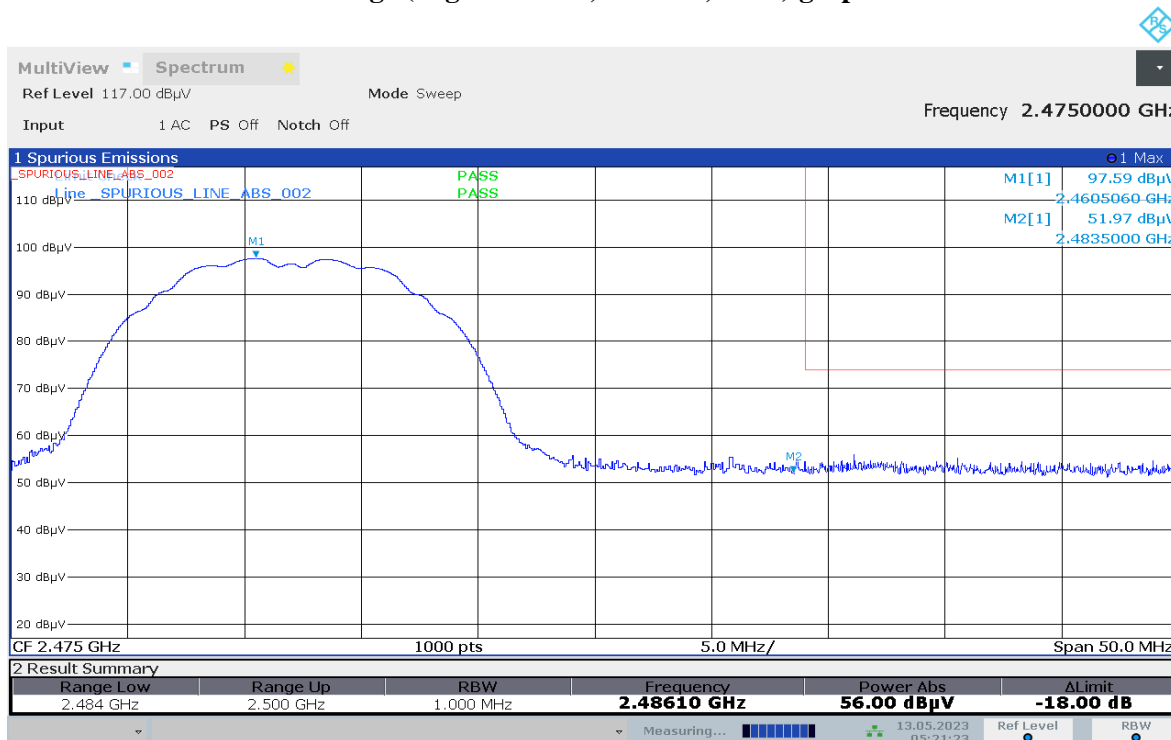
05:02:16 13.05.2023

Restricted Band Edge (Low Channel, Horizontal, Average) graphical screen shot

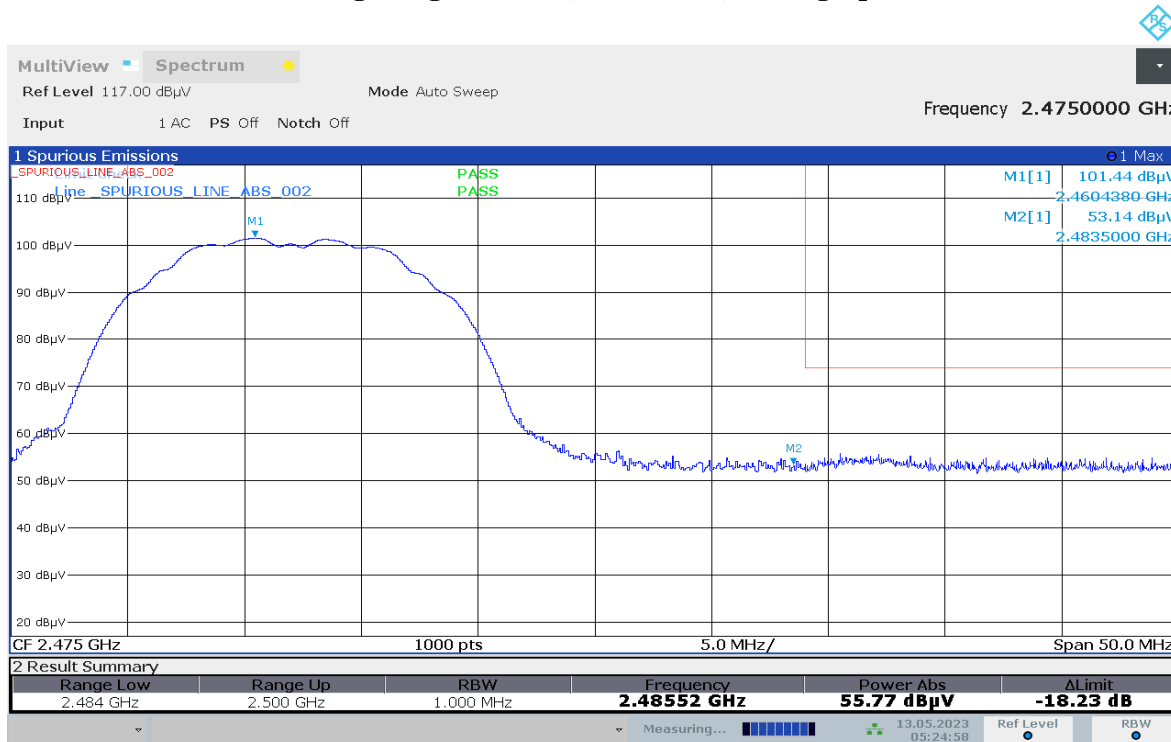


05:12:12 13.05.2023

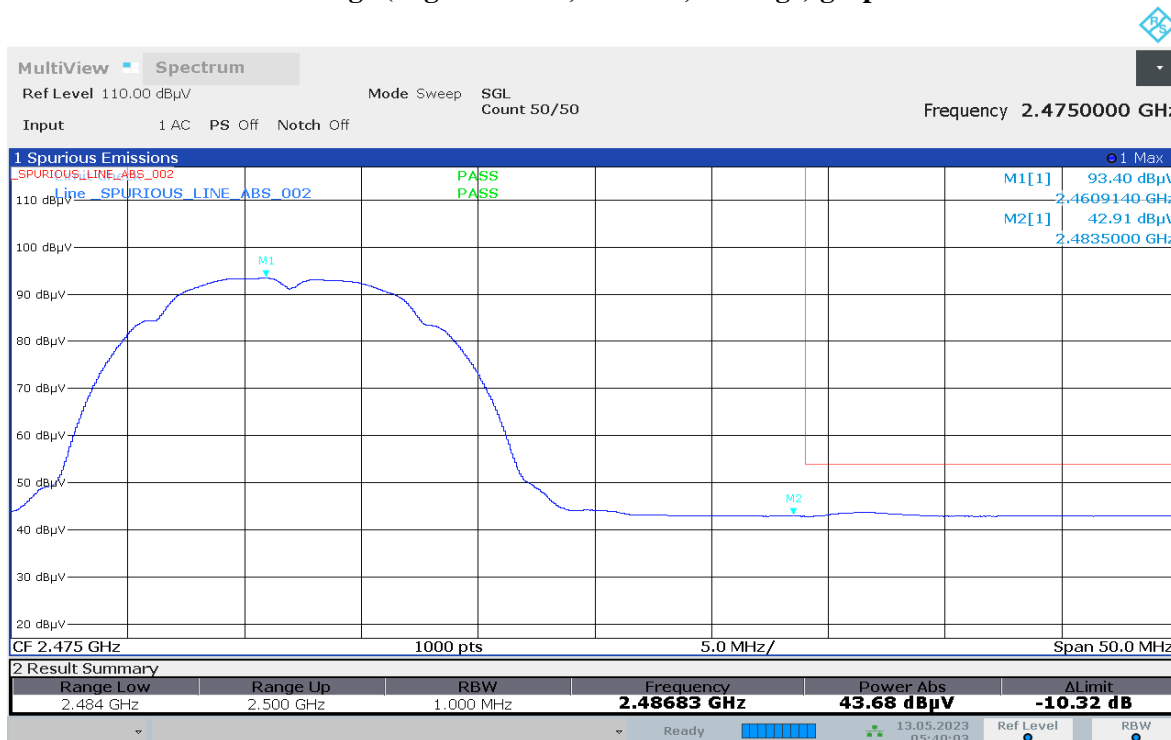
Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot

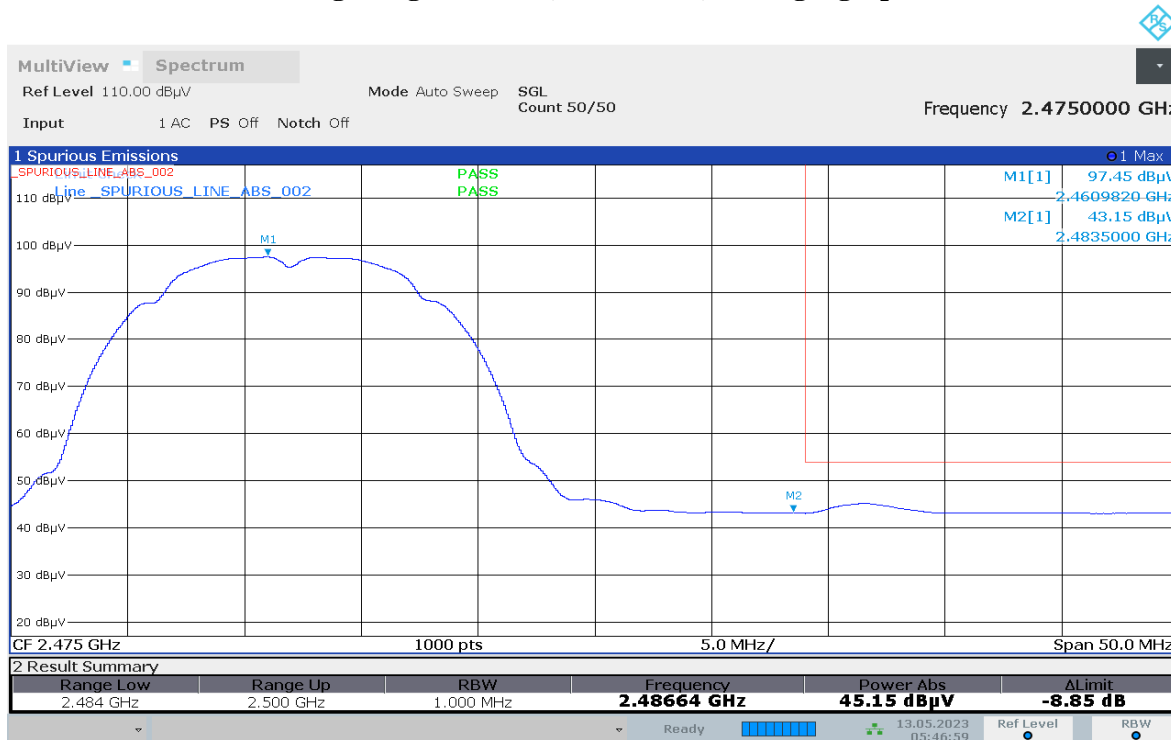


Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot



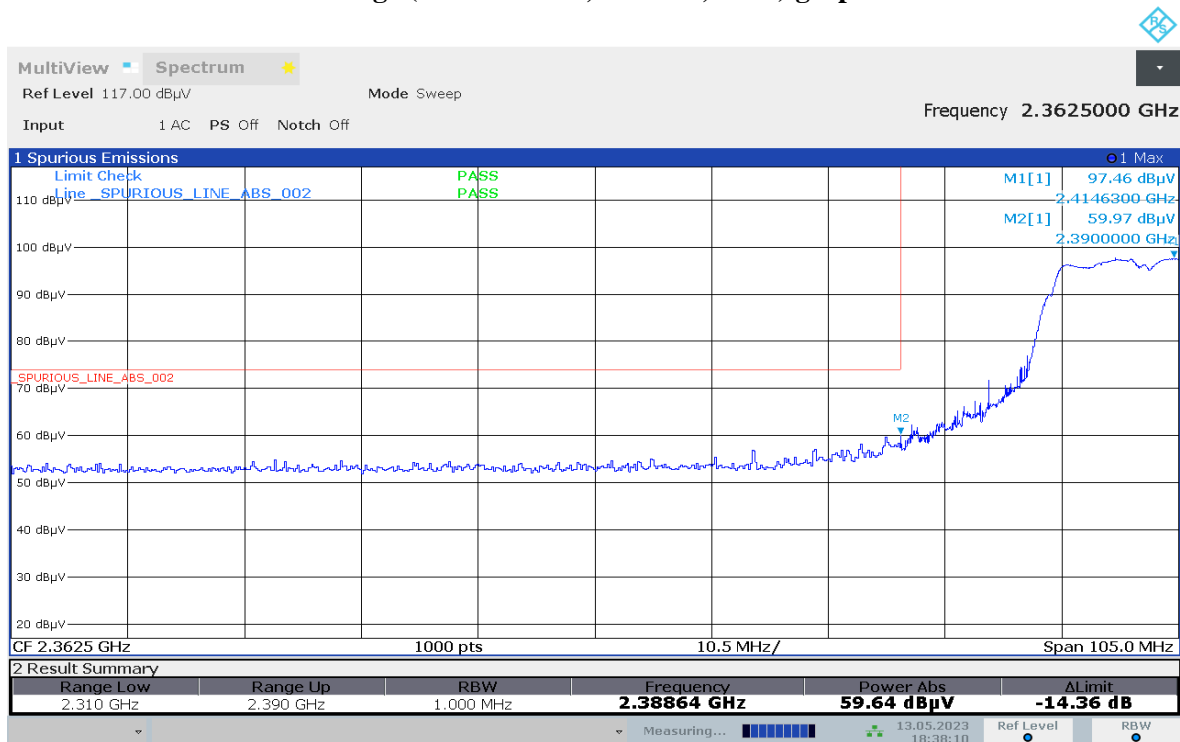
05:40:04 13.05.2023

Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot



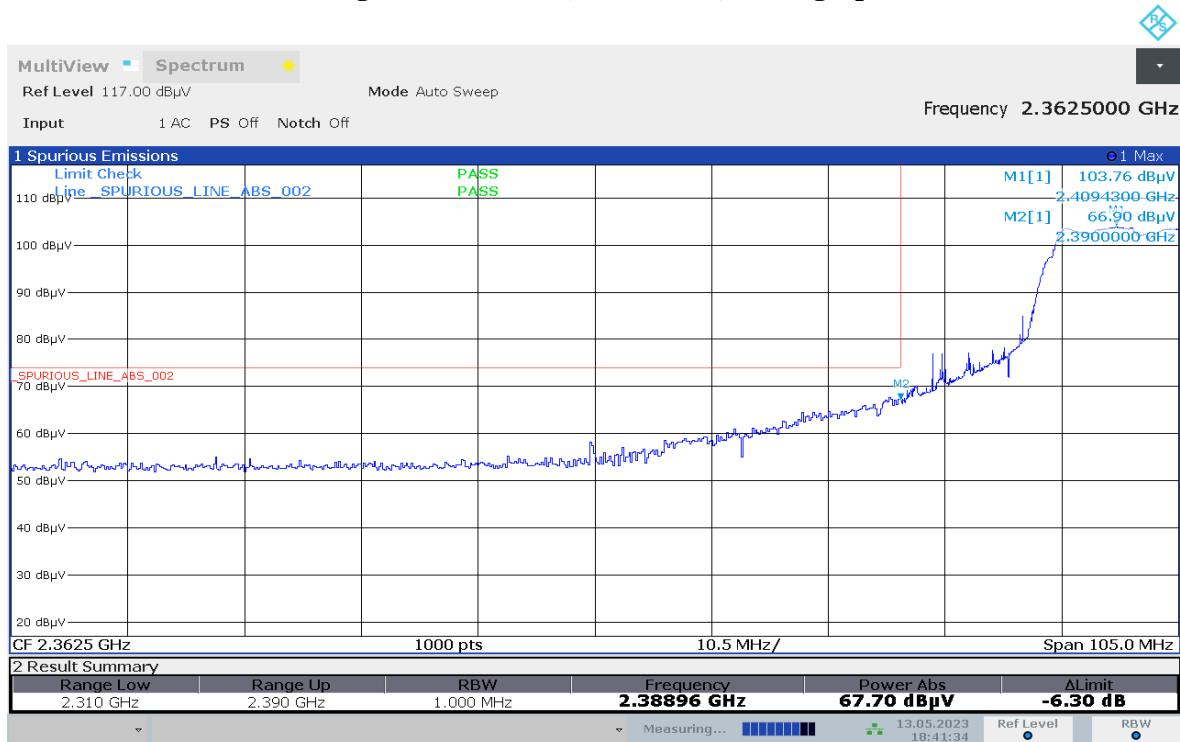
05:47:00 13.05.2023

Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



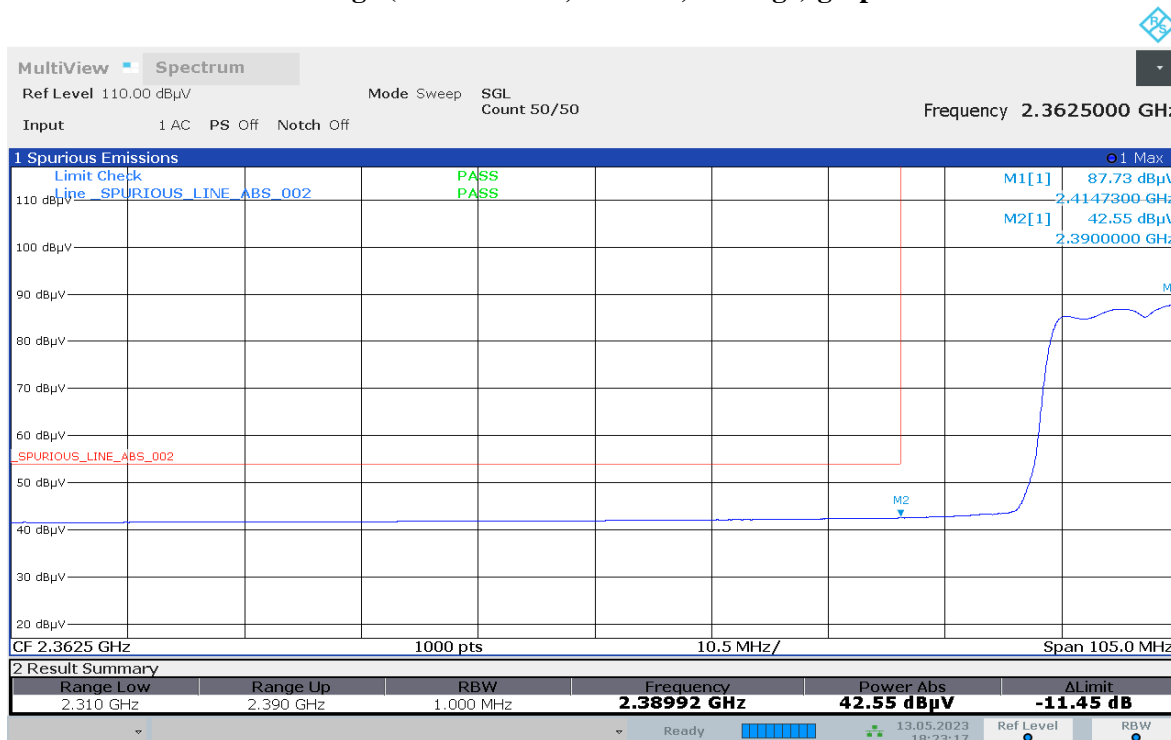
18:38:10 13.05.2023

Restricted Band Edge (Low Channel, Horizontal, Peak) graphical screen shot



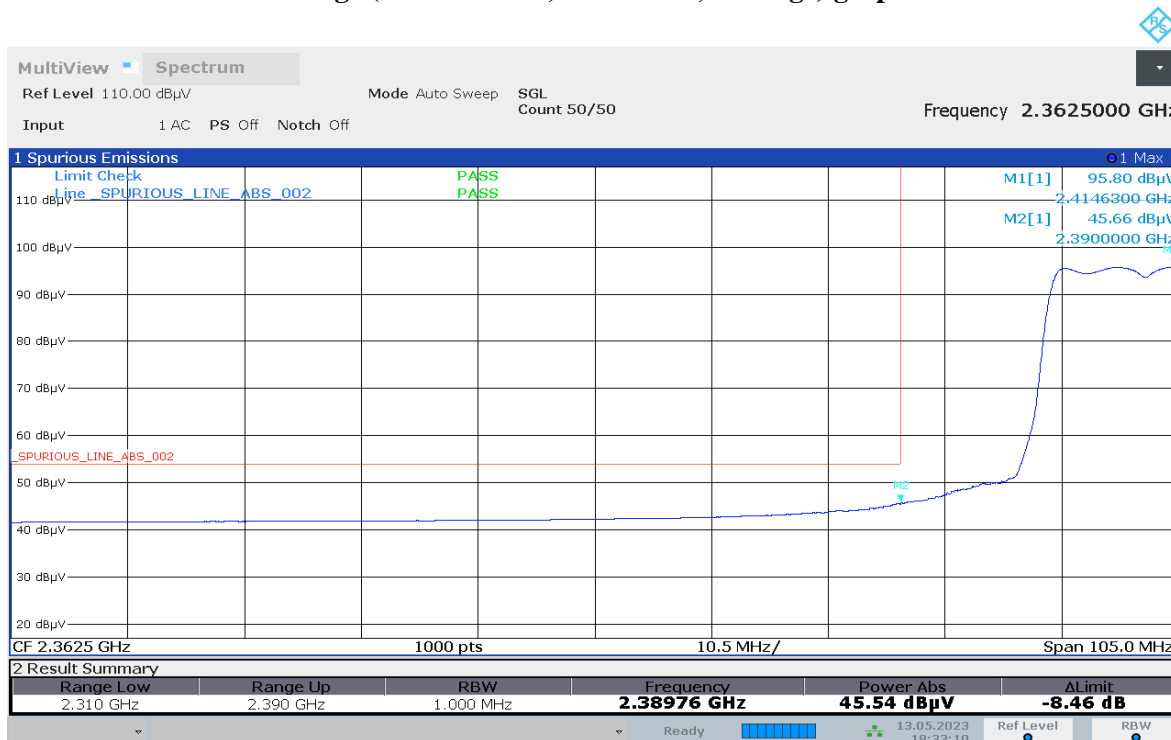
18:41:34 13.05.2023

Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot



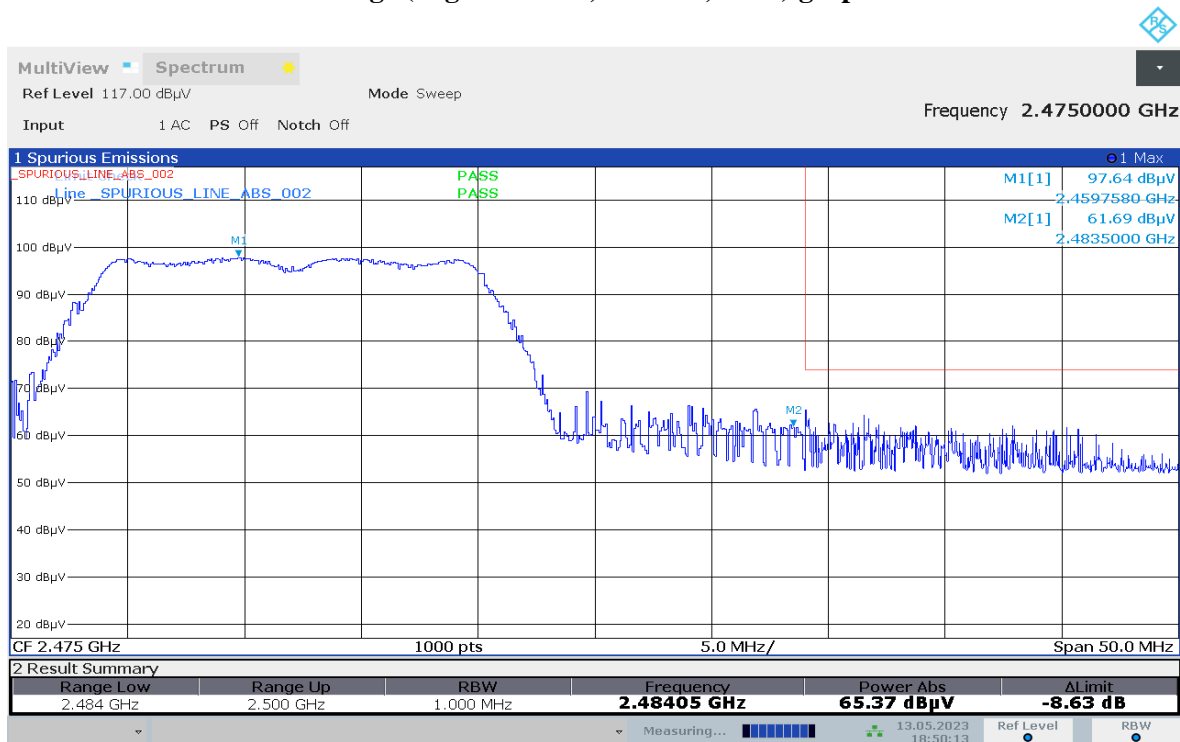
18:23:18 13.05.2023

Restricted Band Edge (Low Channel, Horizontal, Average) graphical screen shot



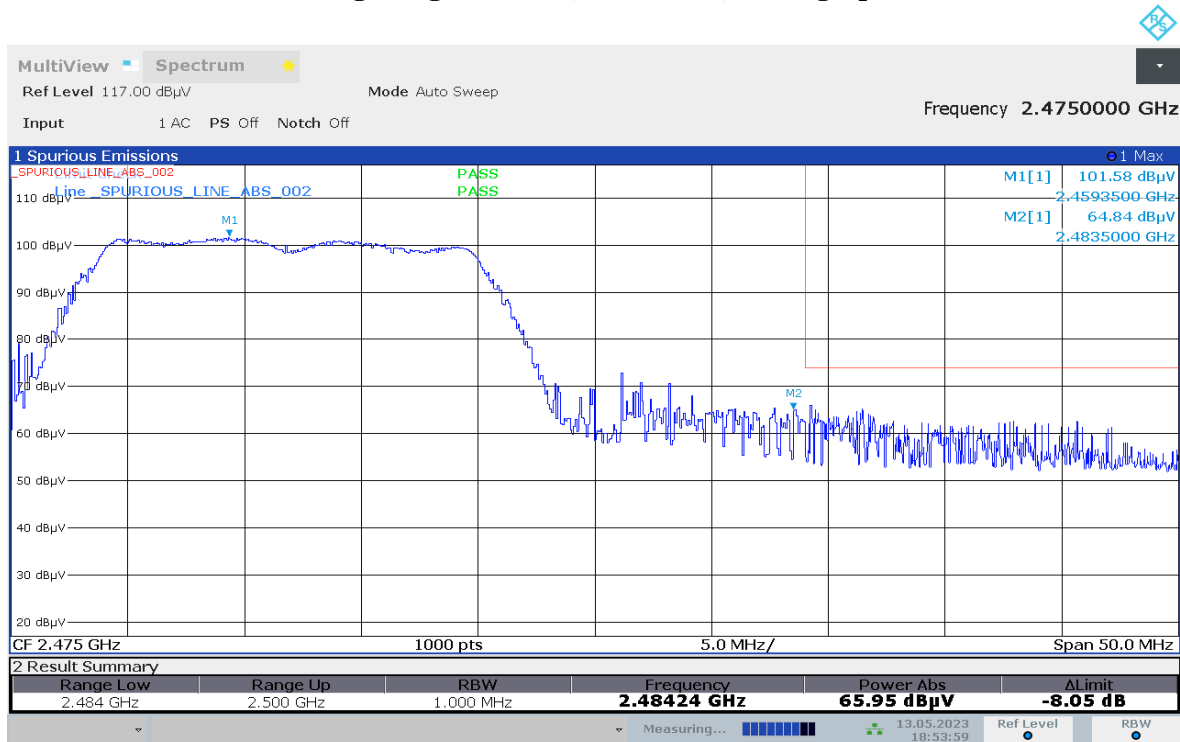
18:33:10 13.05.2023

Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



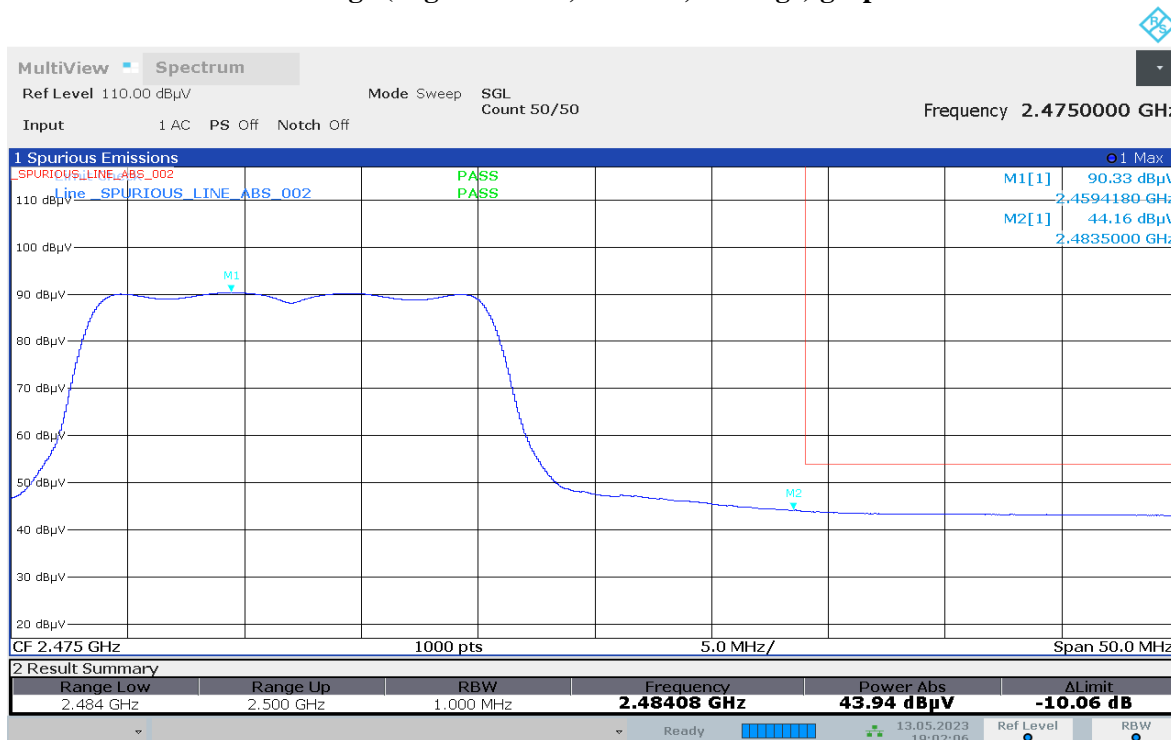
18:50:13 13.05.2023

Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



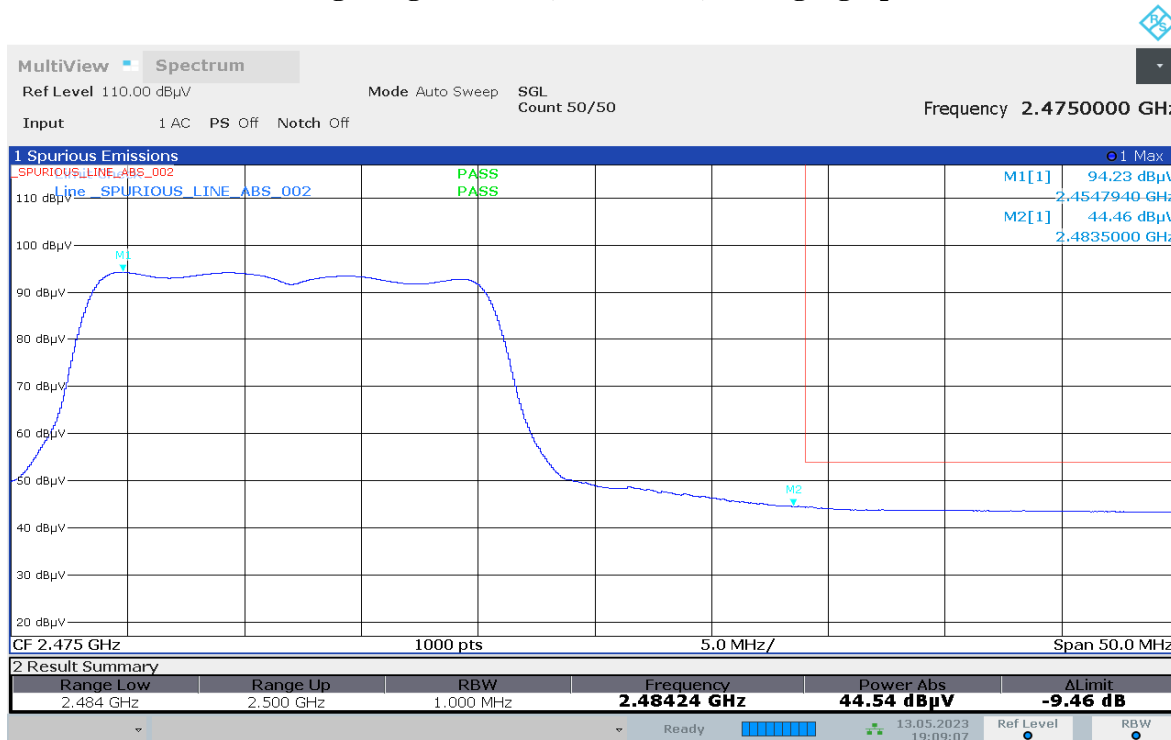
18:53:59 13.05.2023

Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot



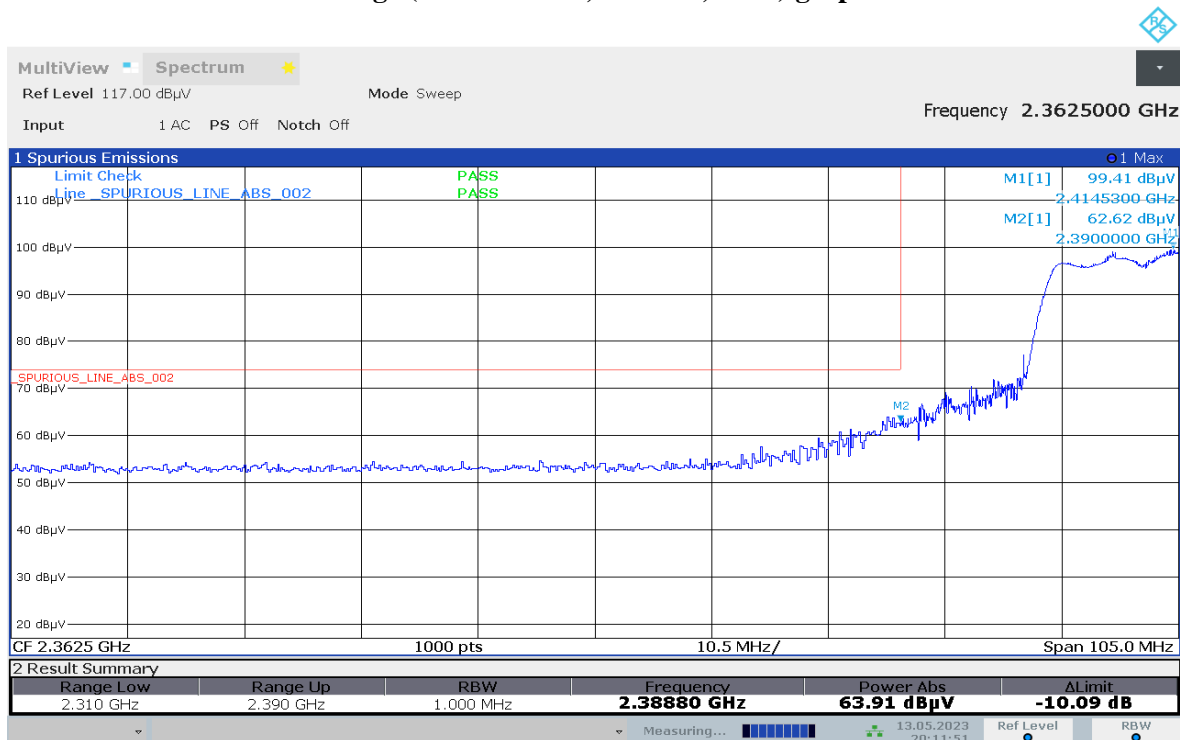
19:02:06 13.05.2023

Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot



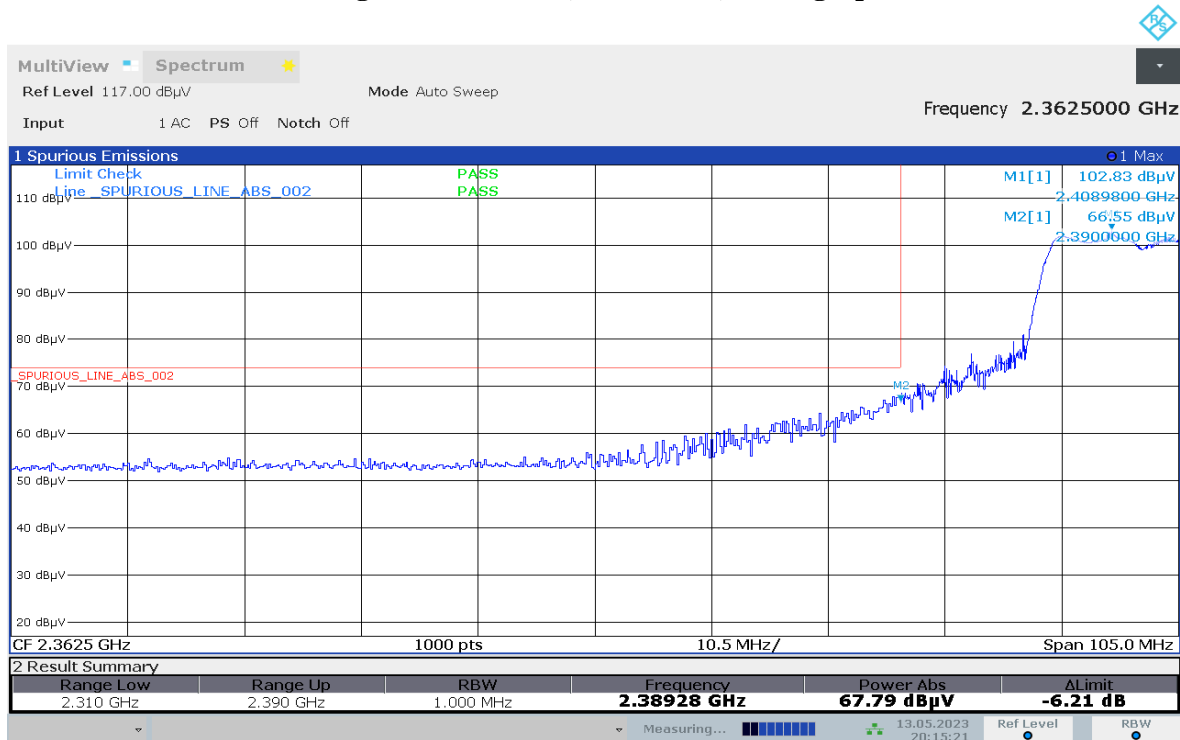
19:09:08 13.05.2023

Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



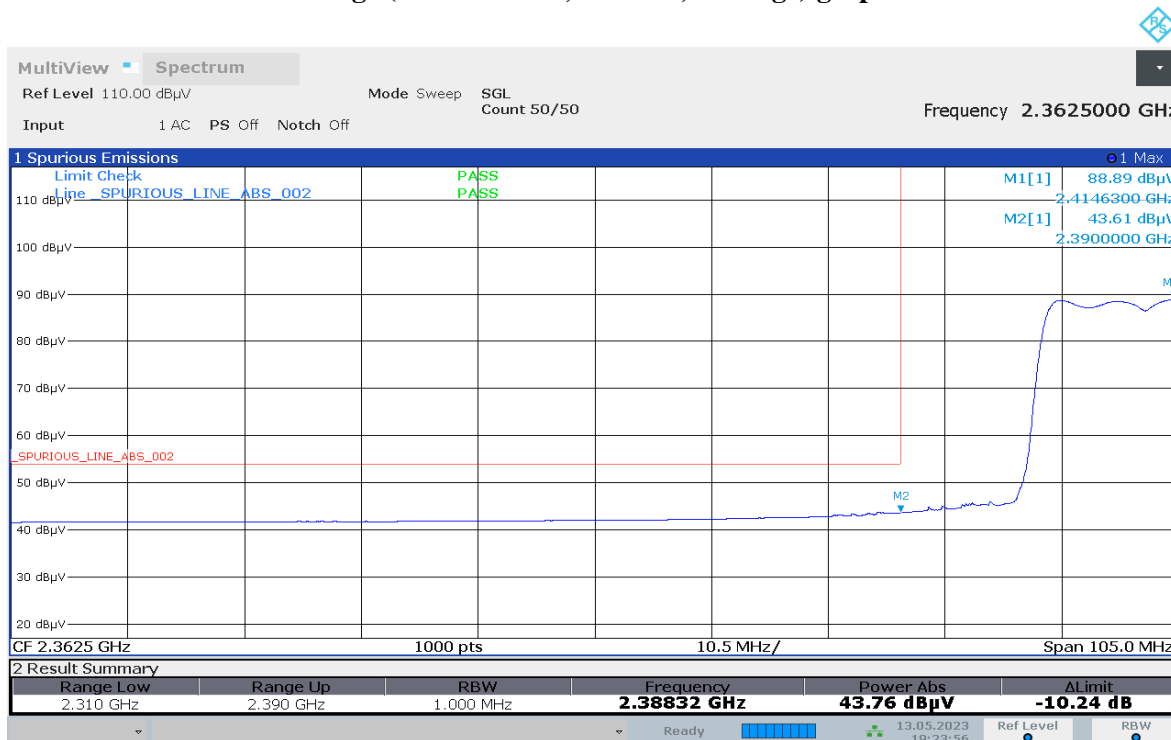
20:11:52 13.05.2023

Restricted Band Edge (Low Channel, Horizontal, Peak) graphical screen shot



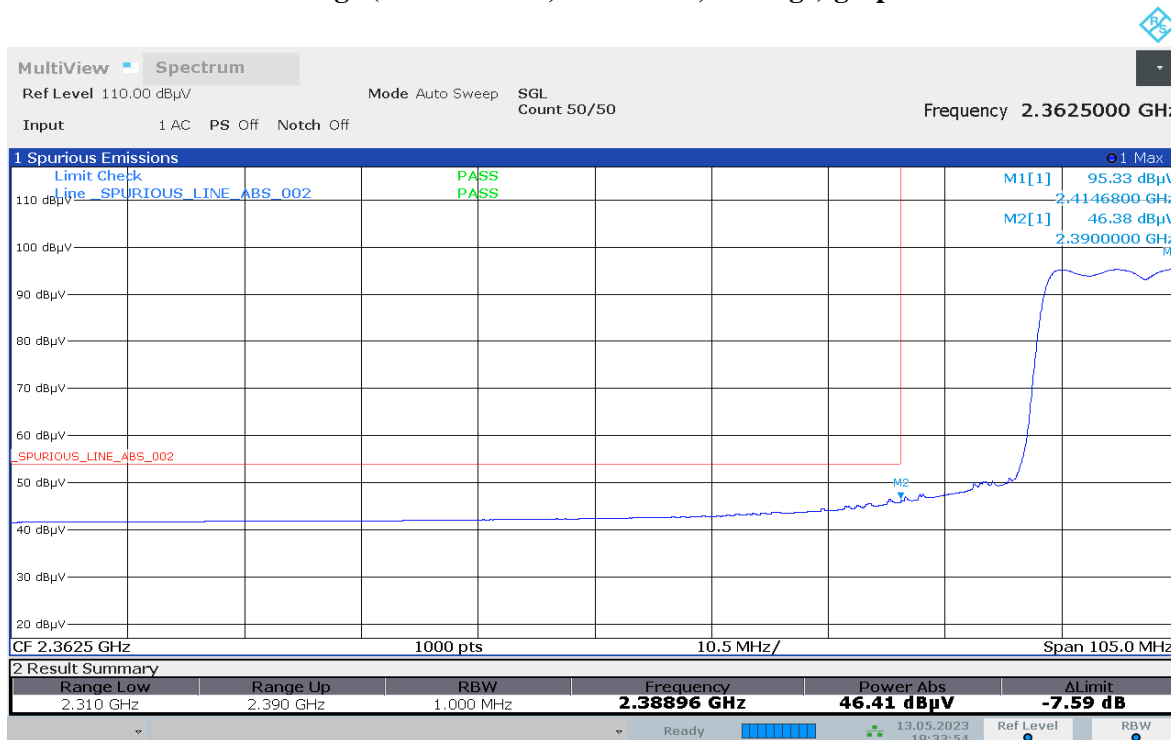
20:15:22 13.05.2023

Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot



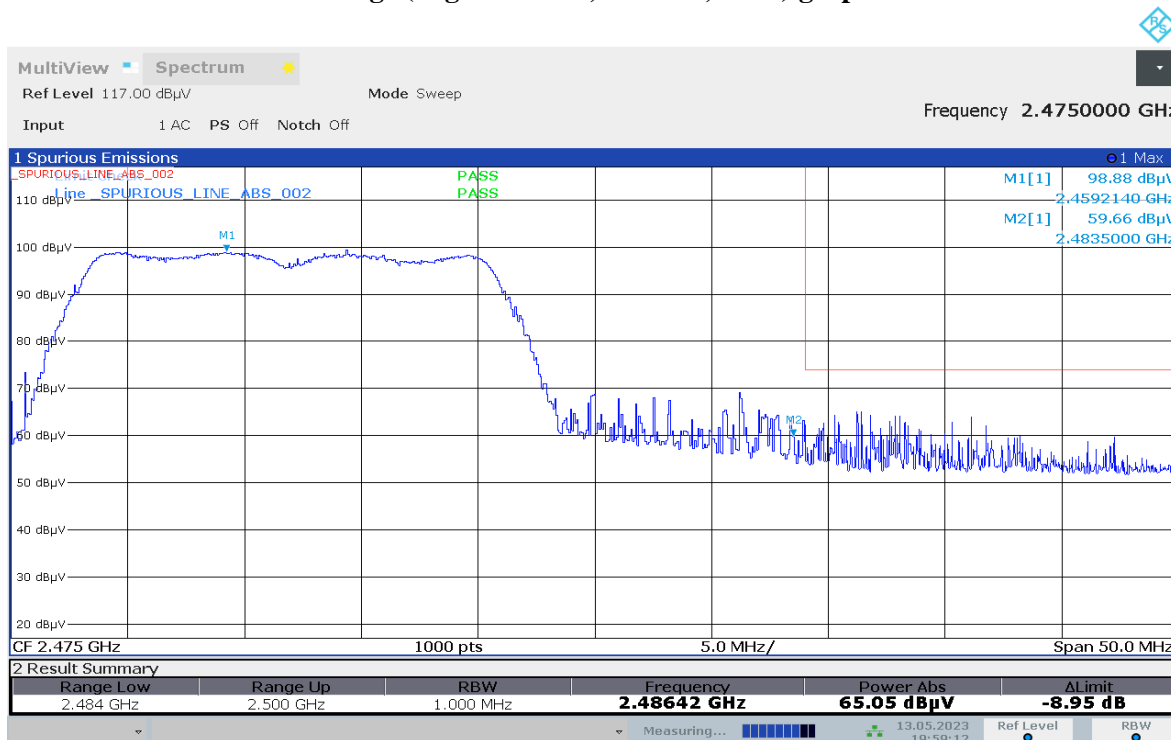
19:23:57 13.05.2023

Restricted Band Edge (Low Channel, Horizontal, Average) graphical screen shot



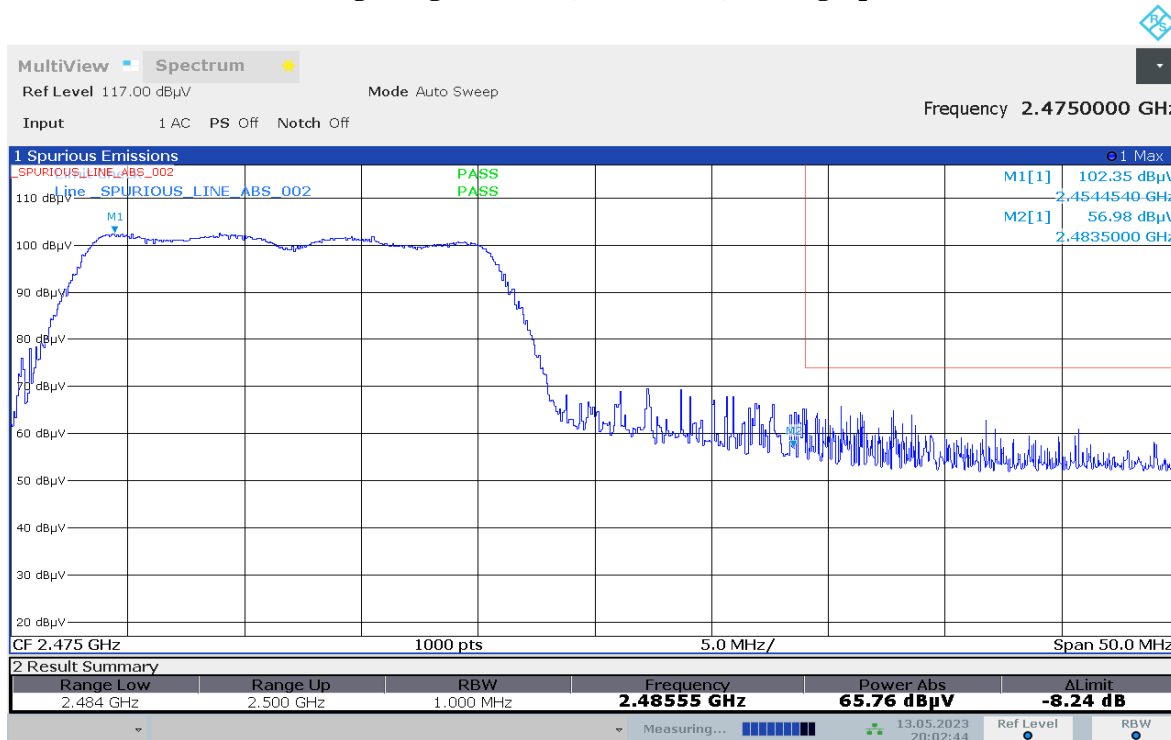
19:33:54 13.05.2023

Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



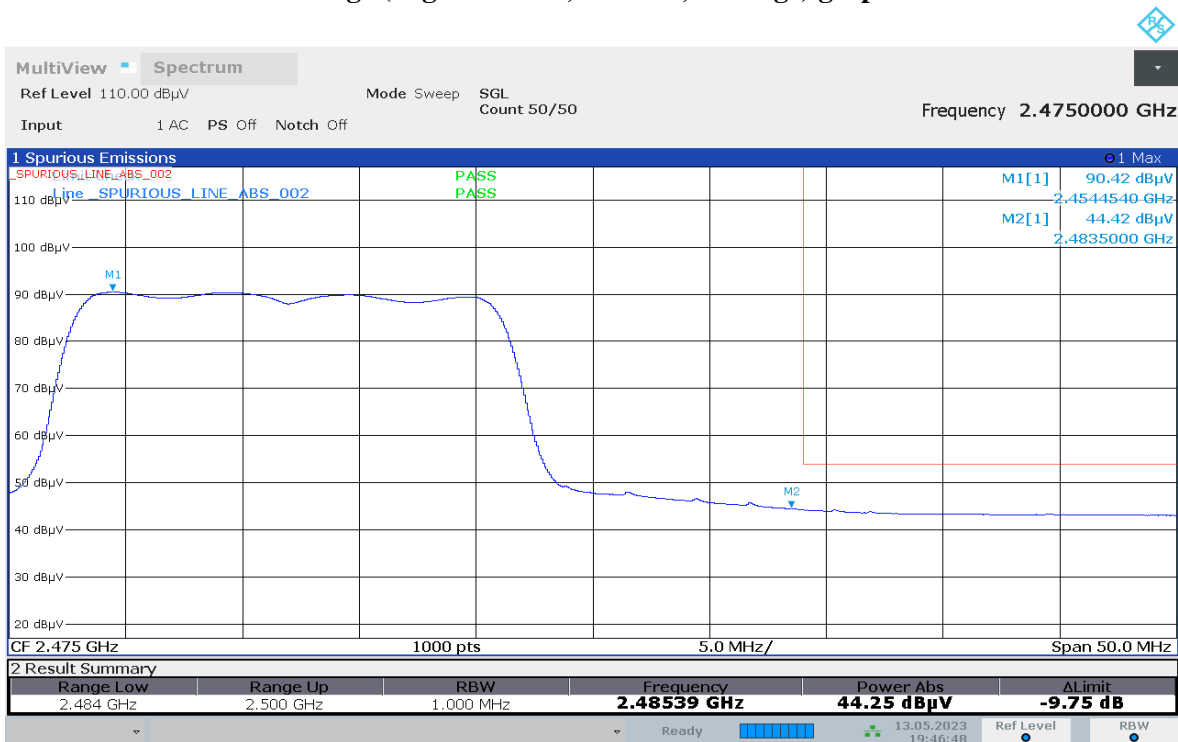
19:59:12 13.05.2023

Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



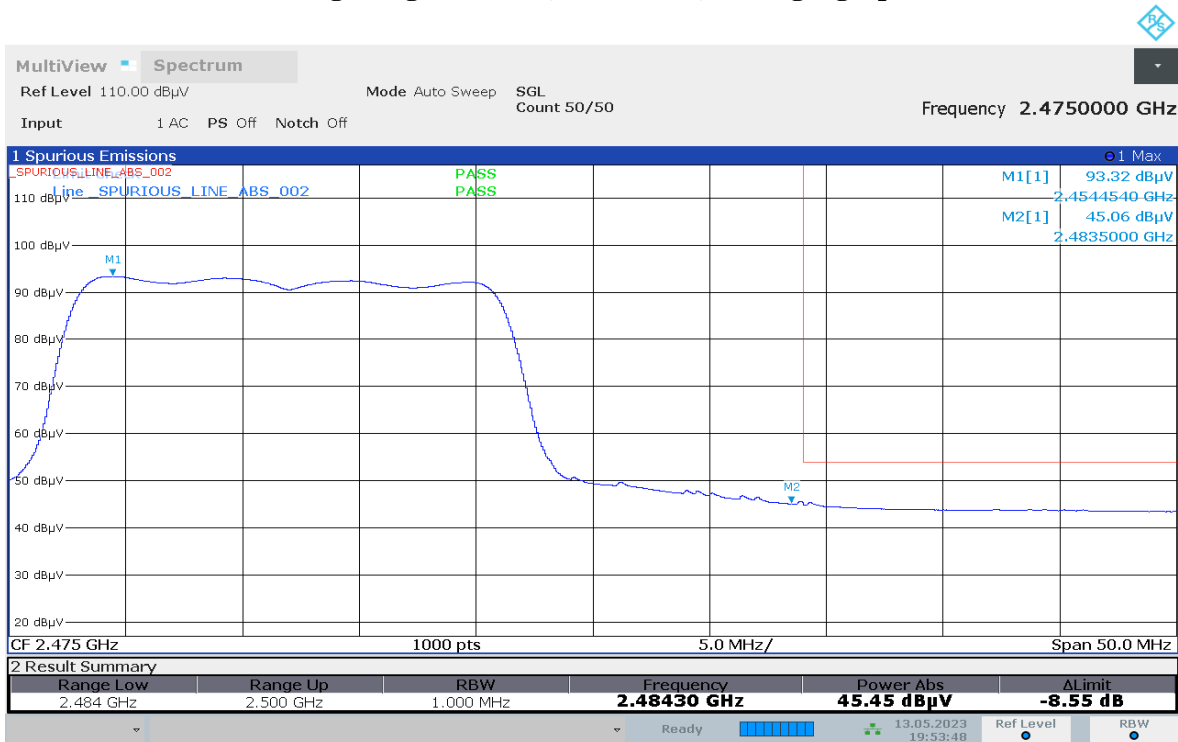
20:02:45 13.05.2023

Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot



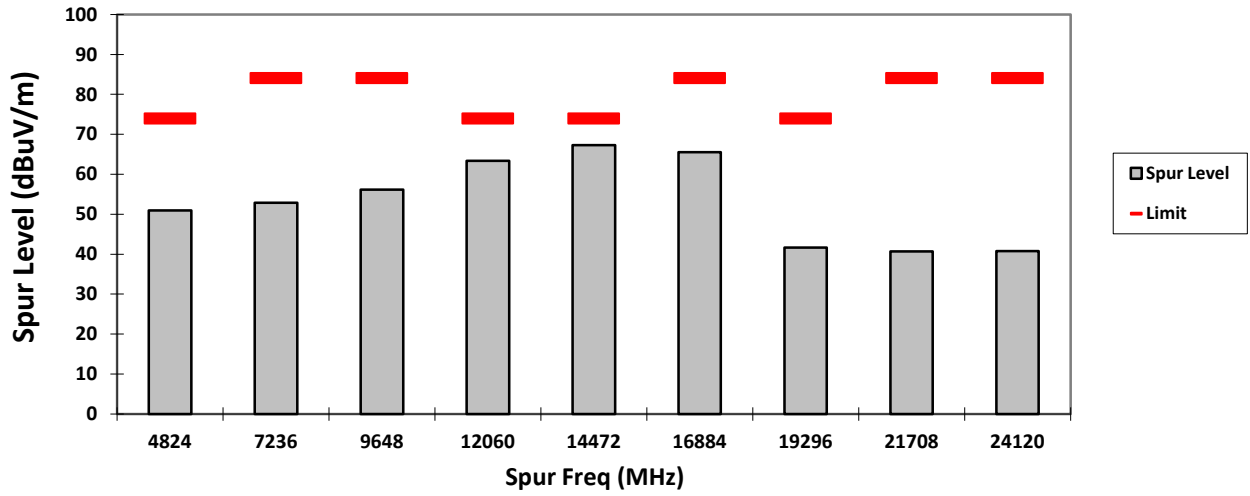
19:46:48 13.05.2023

Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot

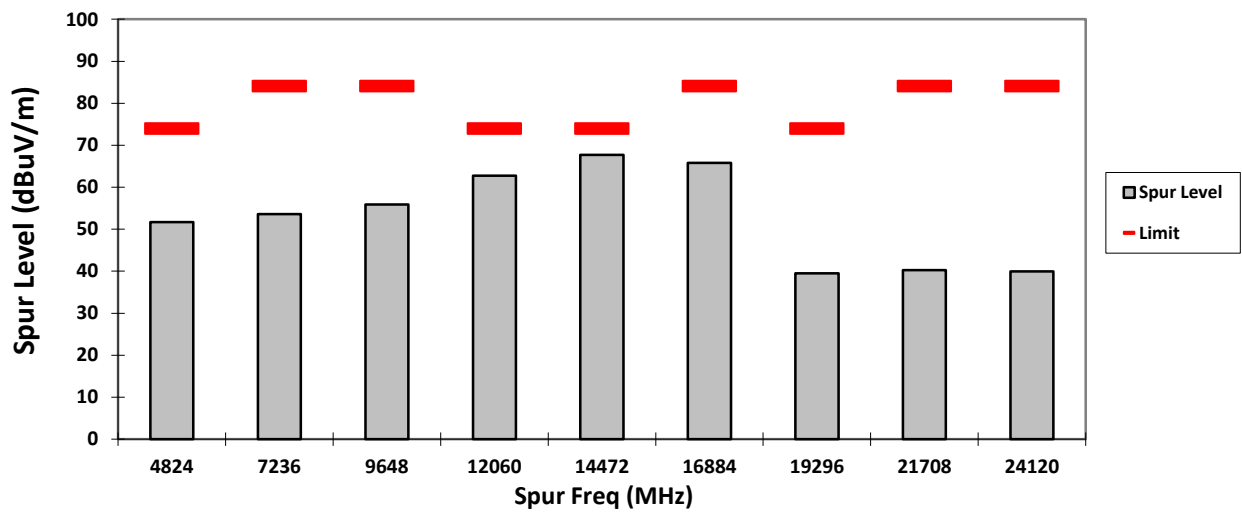


19:53:49 13.05.2023

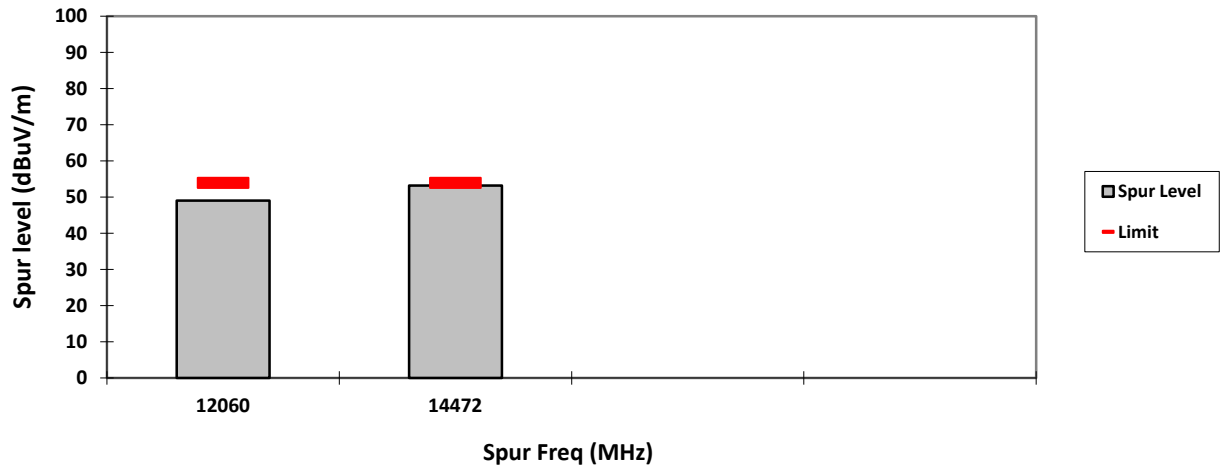
VERTICAL, PK



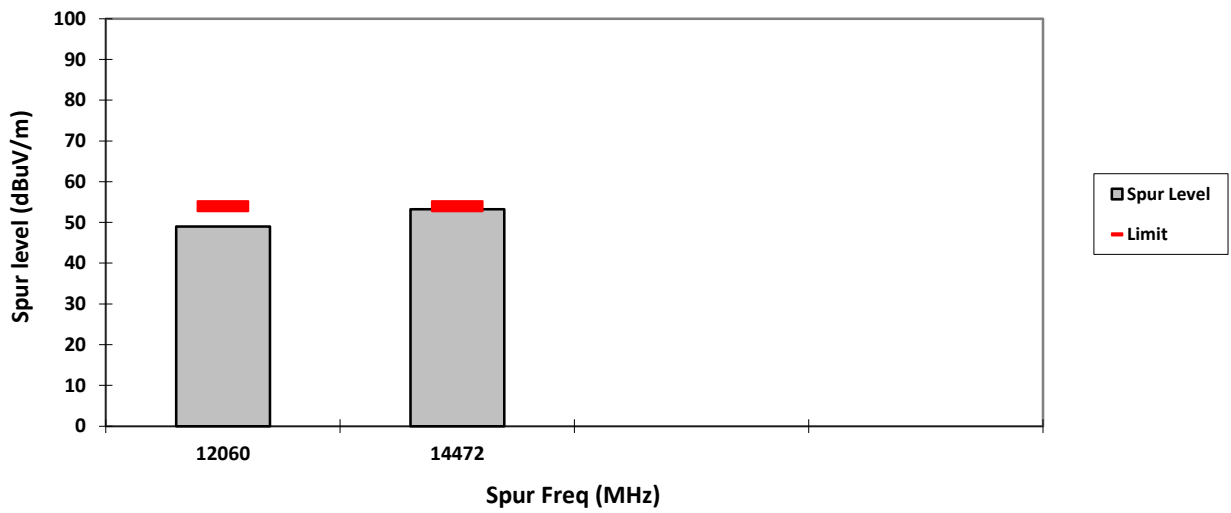
HORIZONTAL, PK



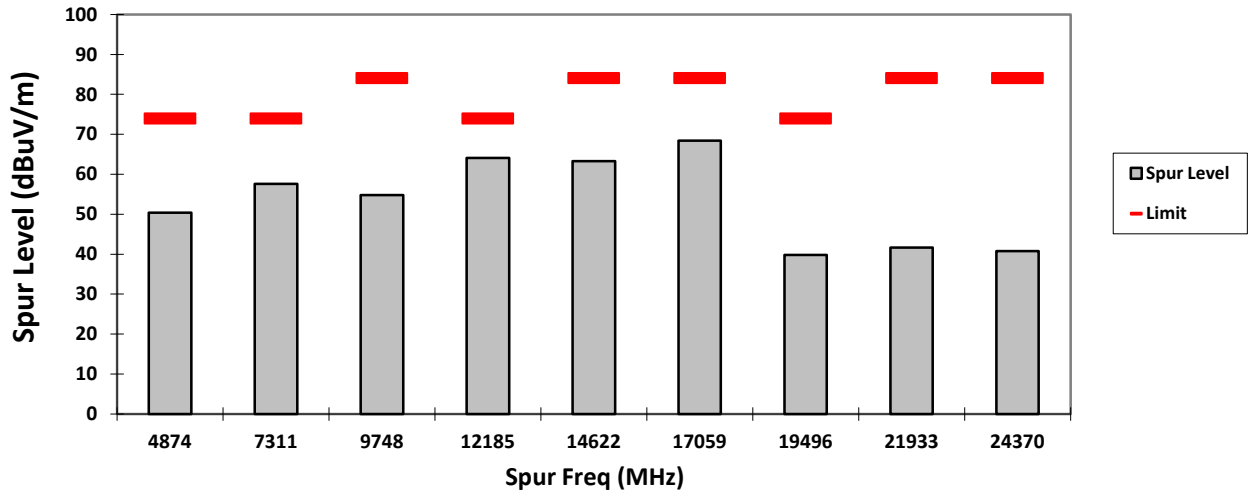
VERTICAL, AV



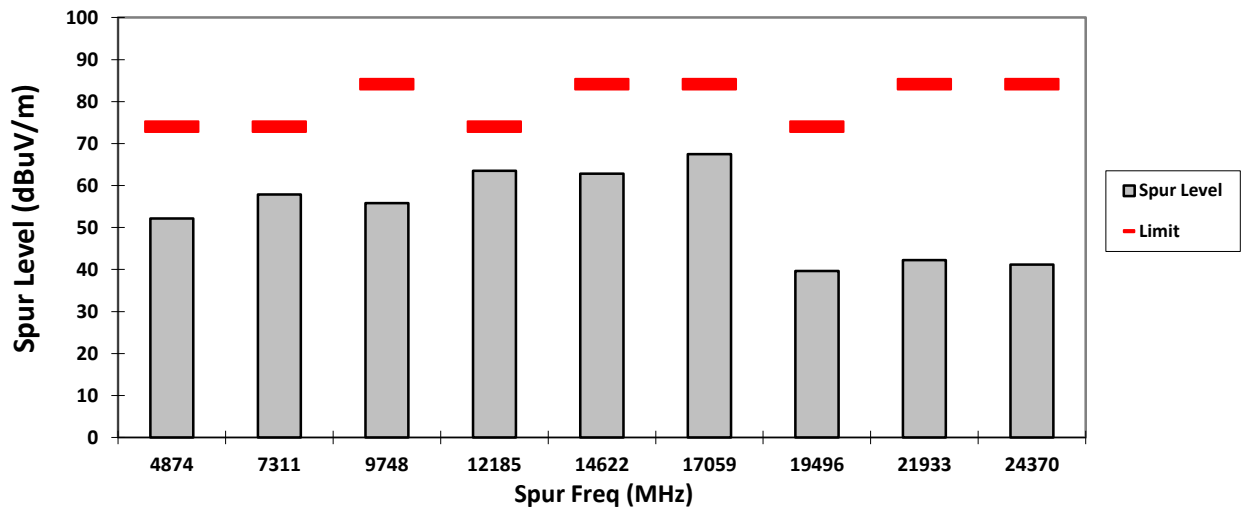
HORIZONTAL, AV



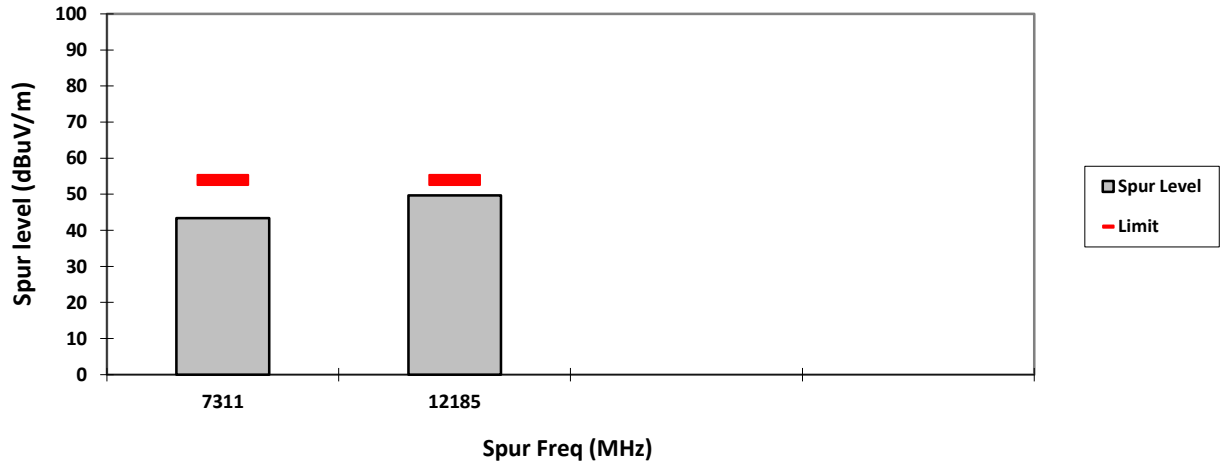
VERTICAL, PK



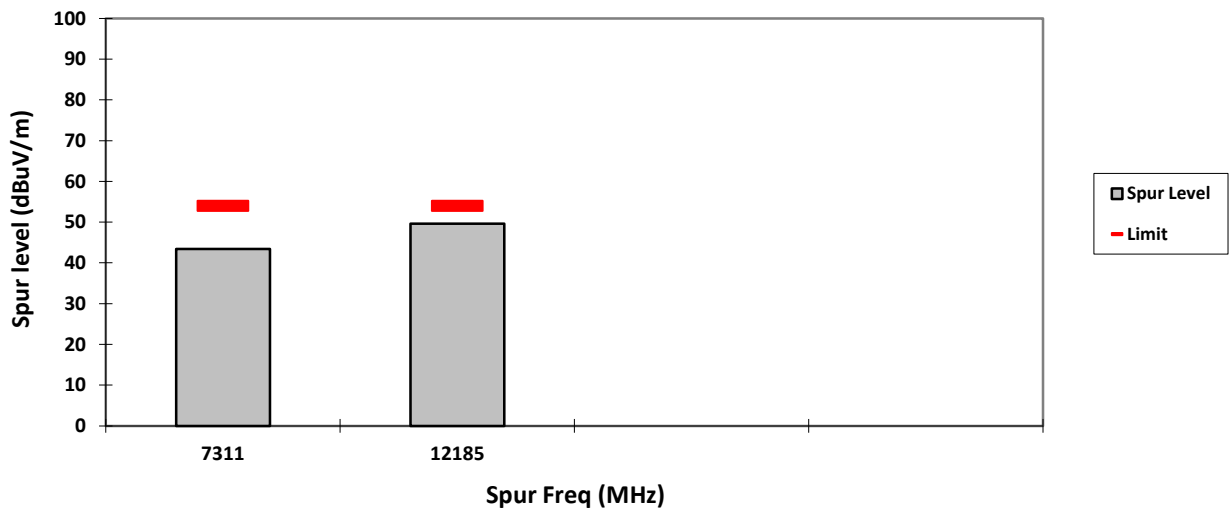
HORIZONTAL, PK



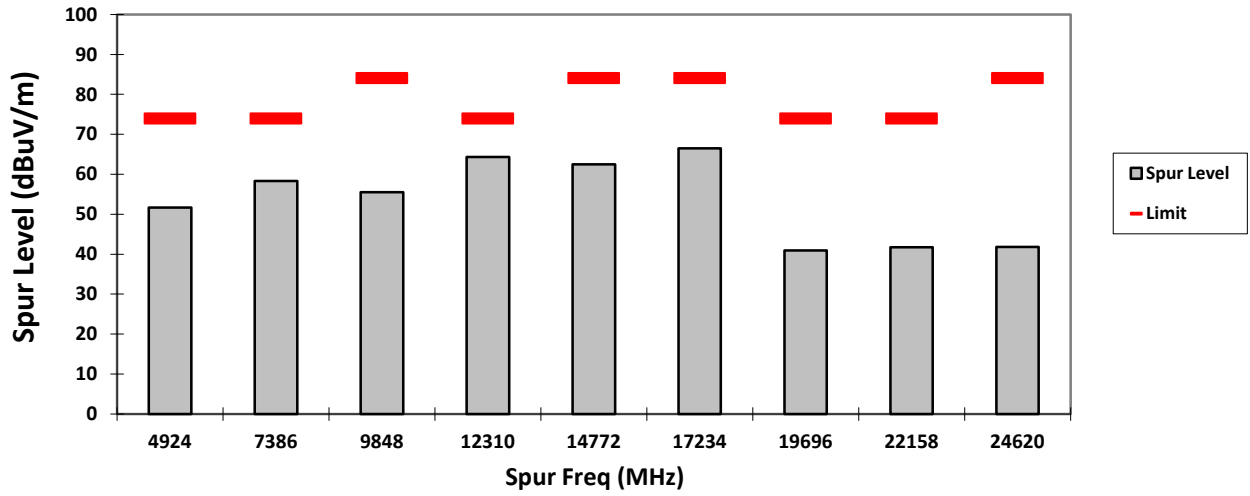
VERTICAL, AV



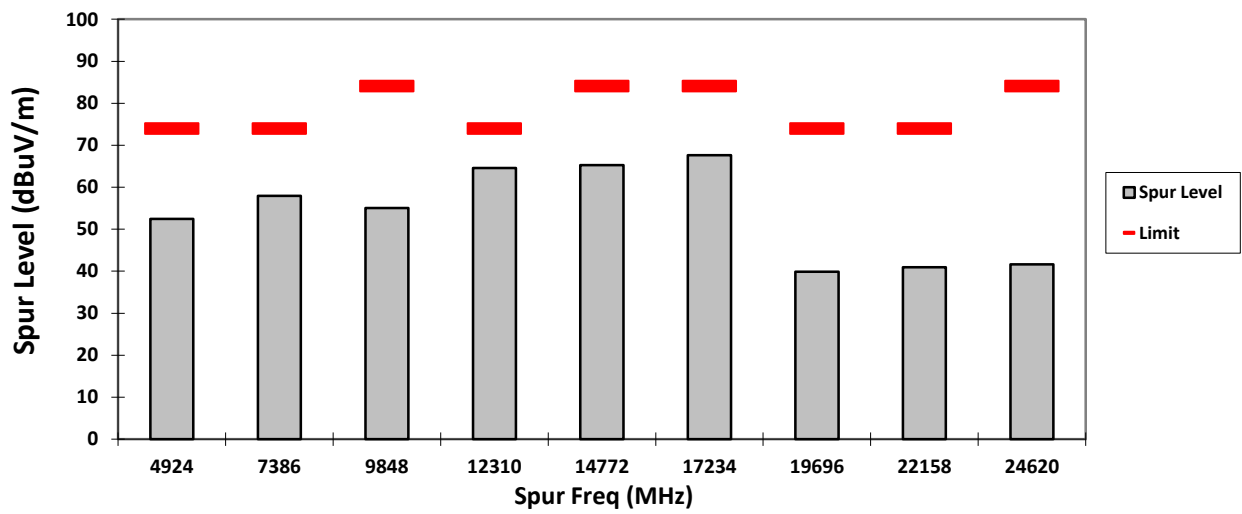
HORIZONTAL, AV



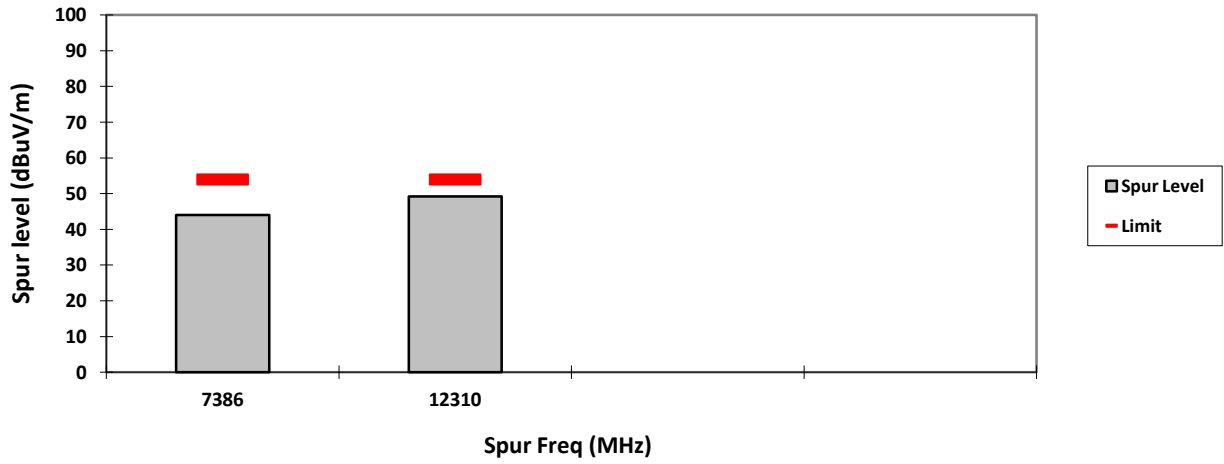
VERTICAL, PK



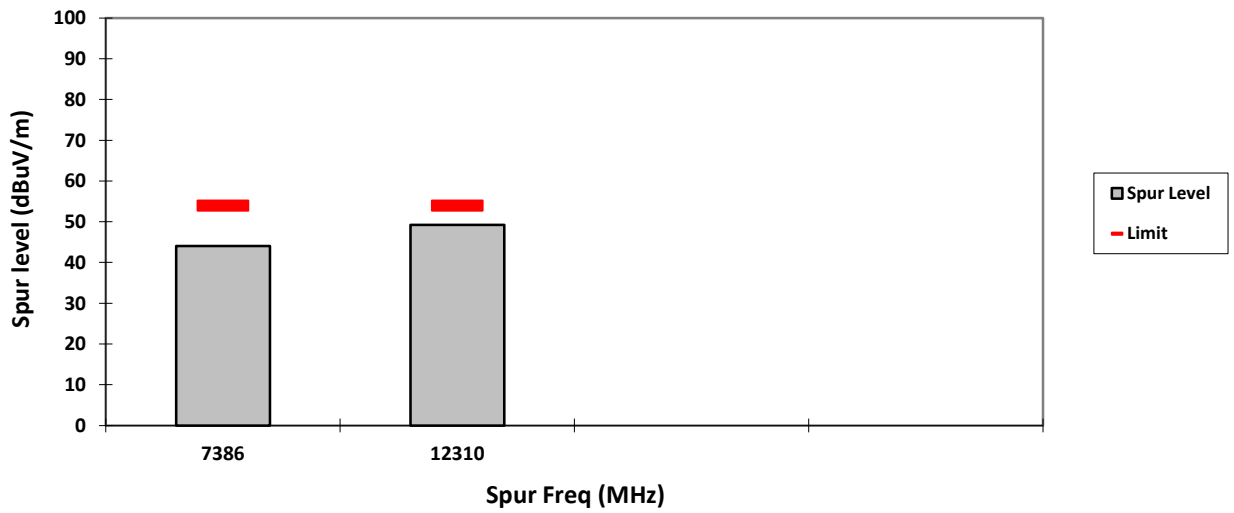
HORIZONTAL, PK



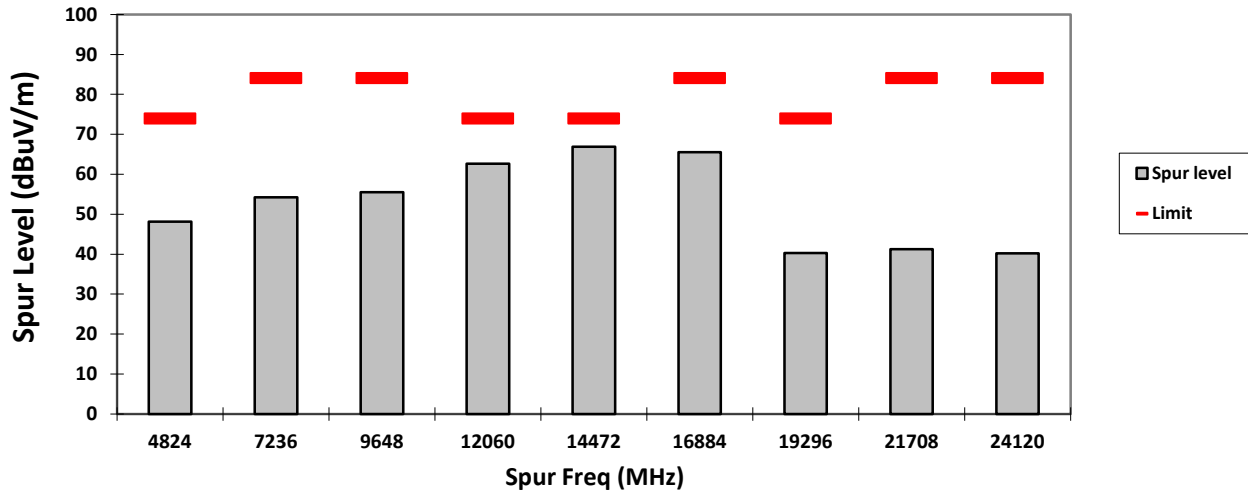
VERTICAL, AV



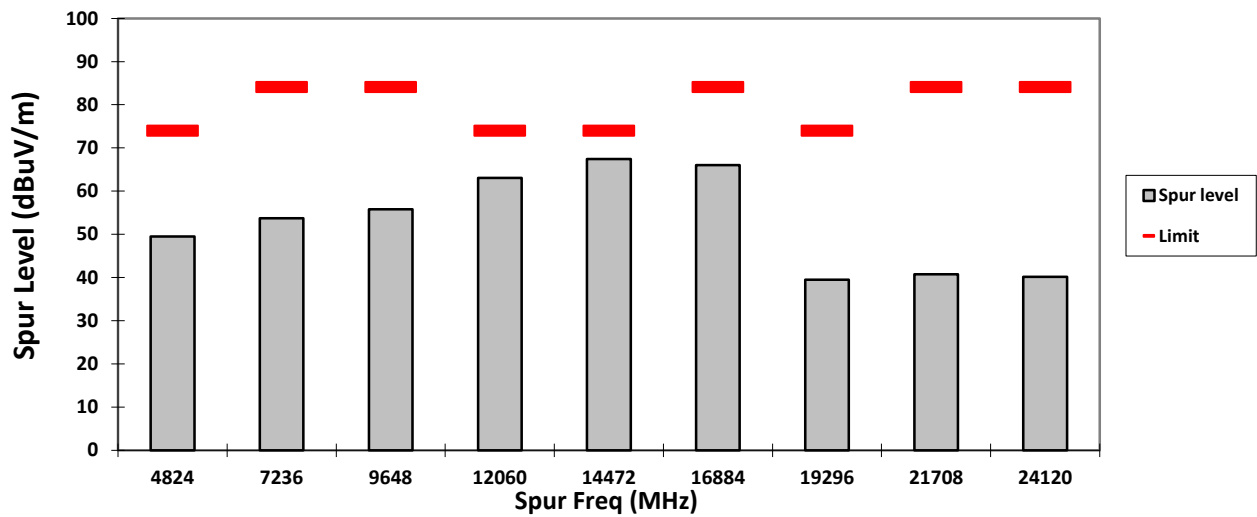
HORIZONTAL, AV



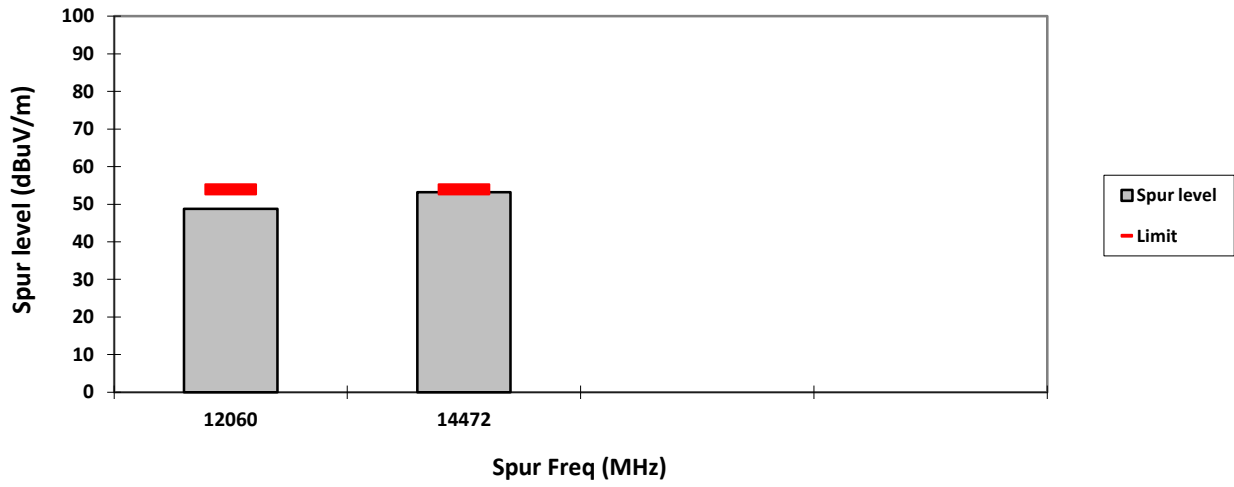
VERTICAL, PK



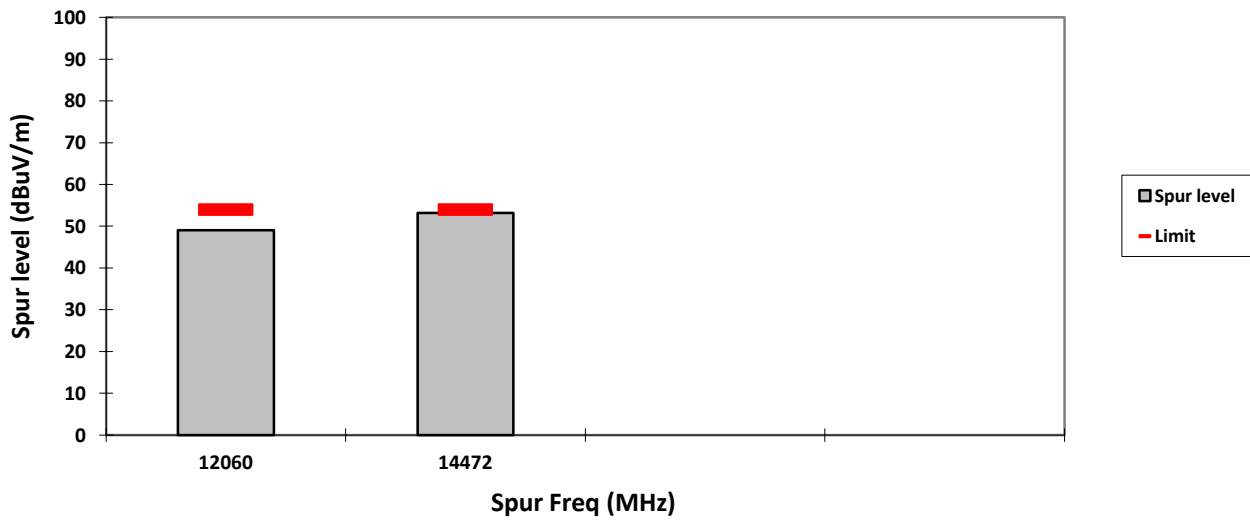
HORIZONTAL, PK



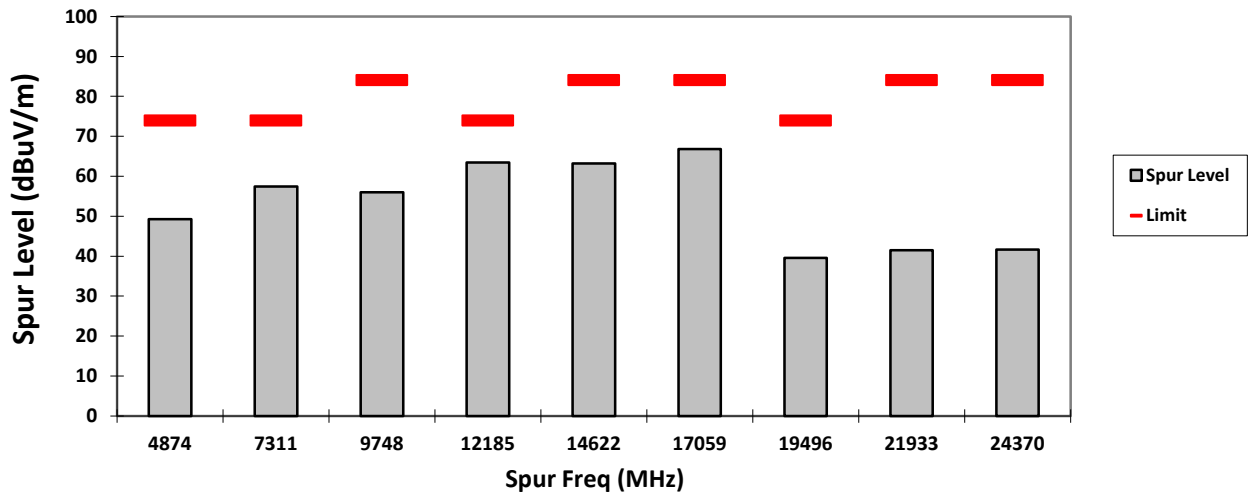
VERTICAL, AV



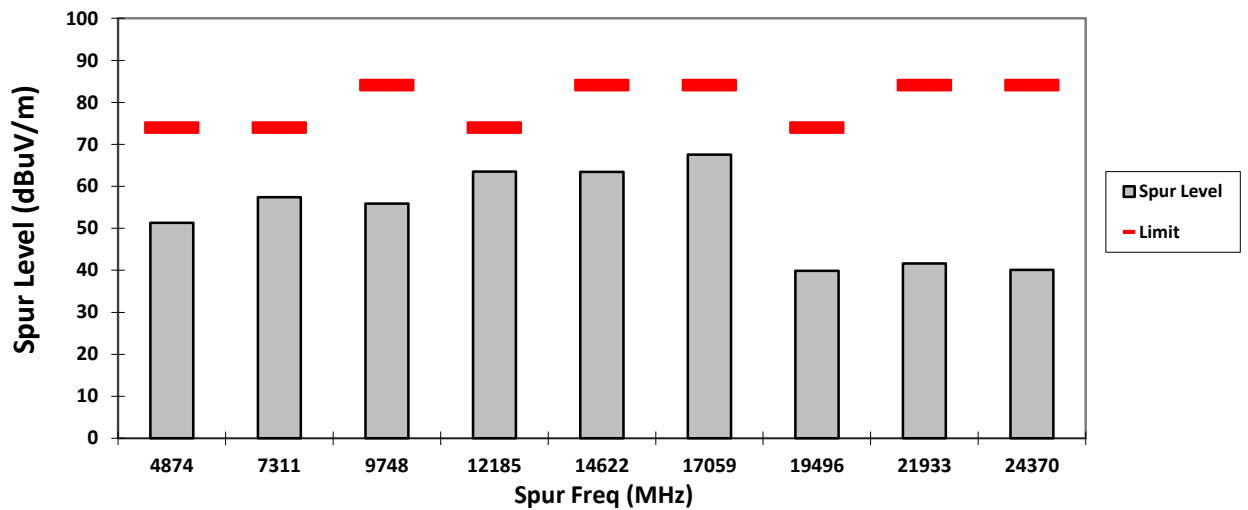
HORIZONTAL, AV



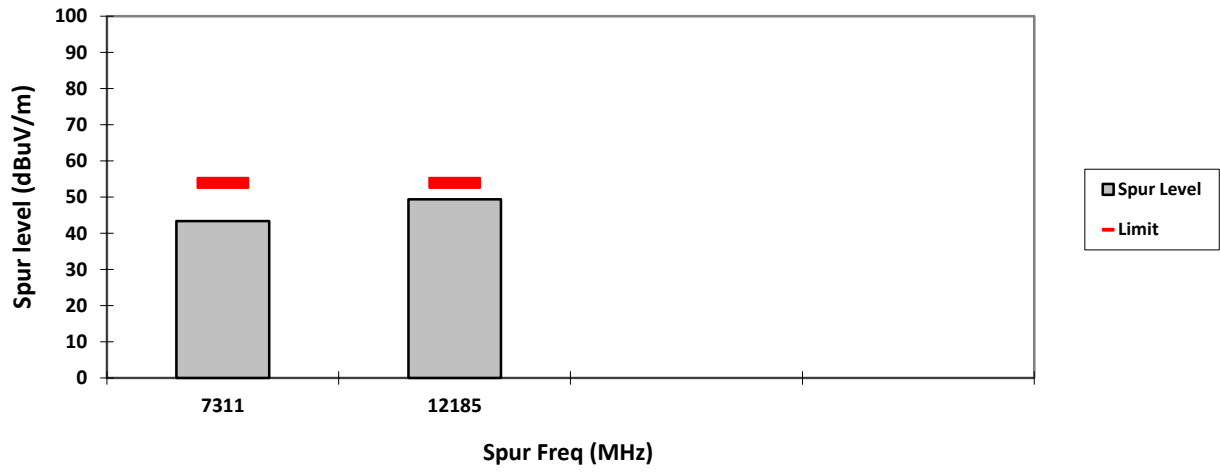
VERTICAL, PK



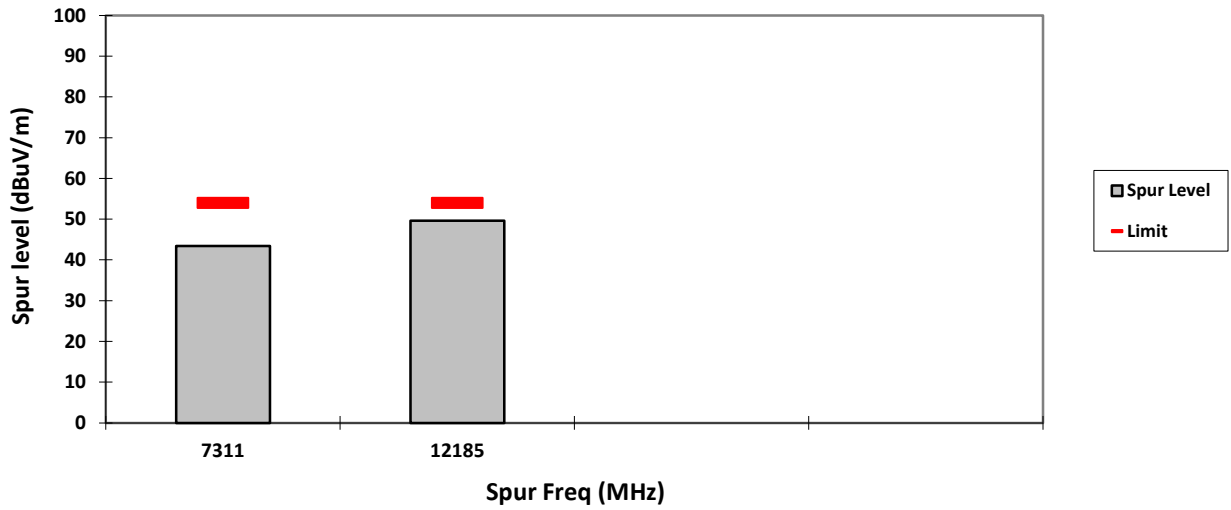
HORIZONTAL, PK



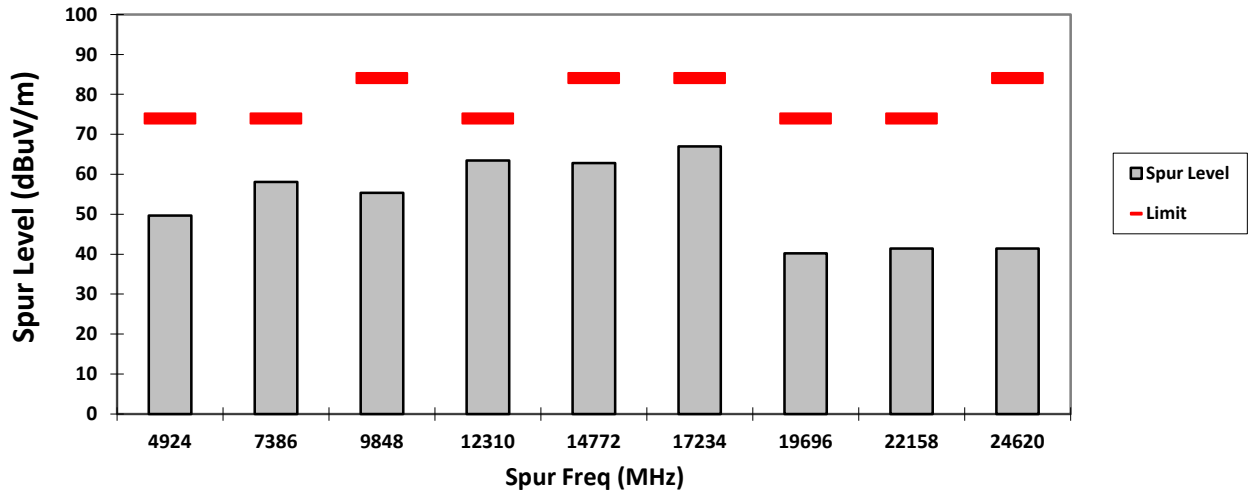
VERTICAL, AV



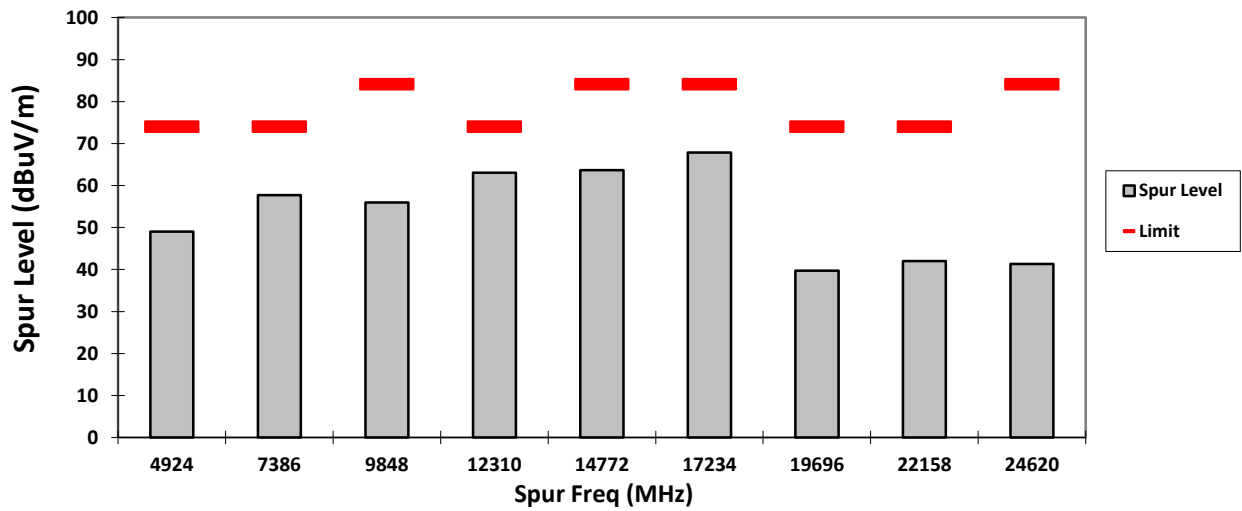
HORIZONTAL, AV



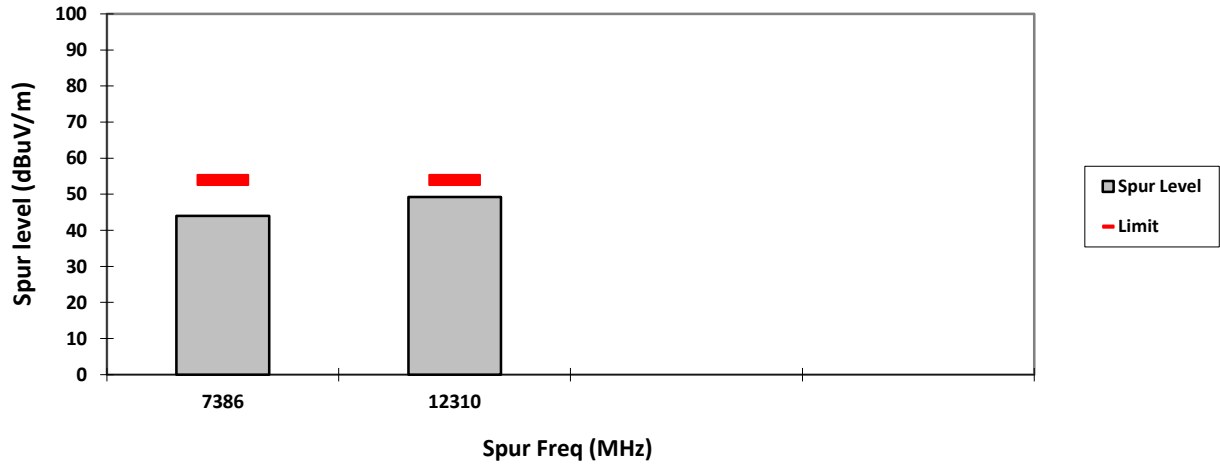
VERTICAL, PK



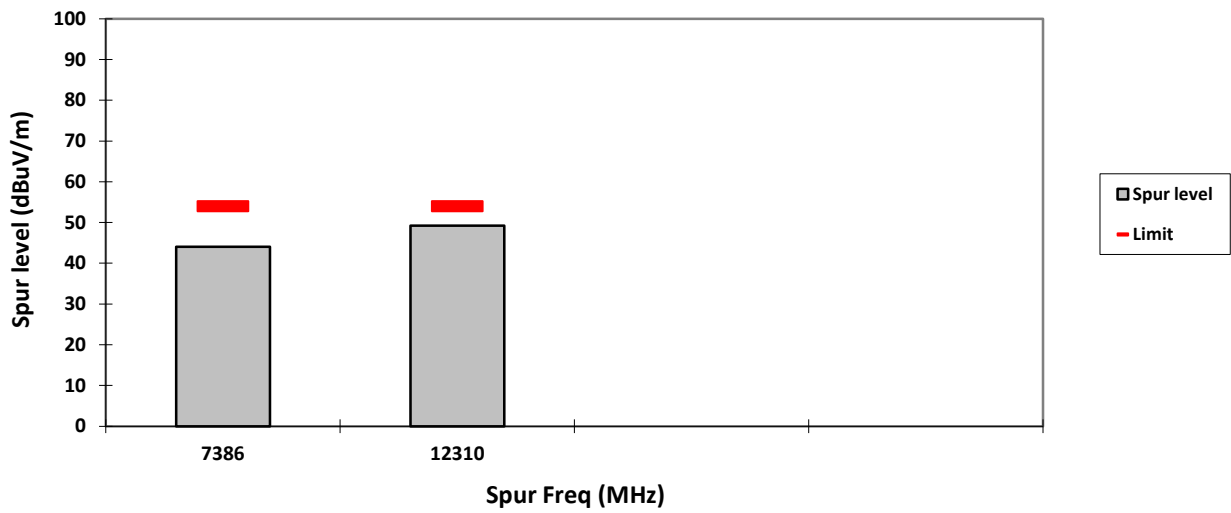
HORIZONTAL, PK



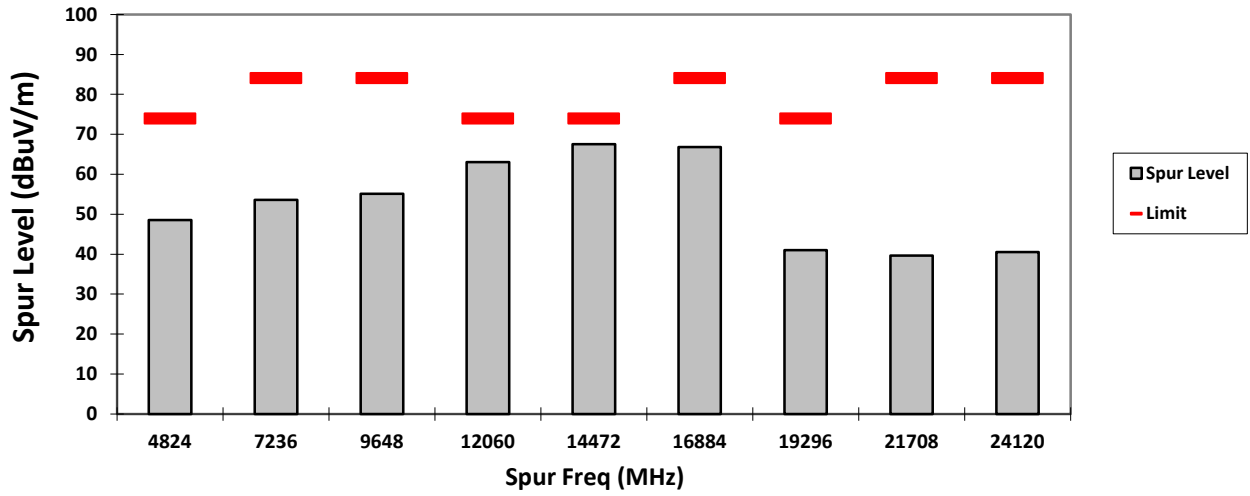
VERTICAL, AV



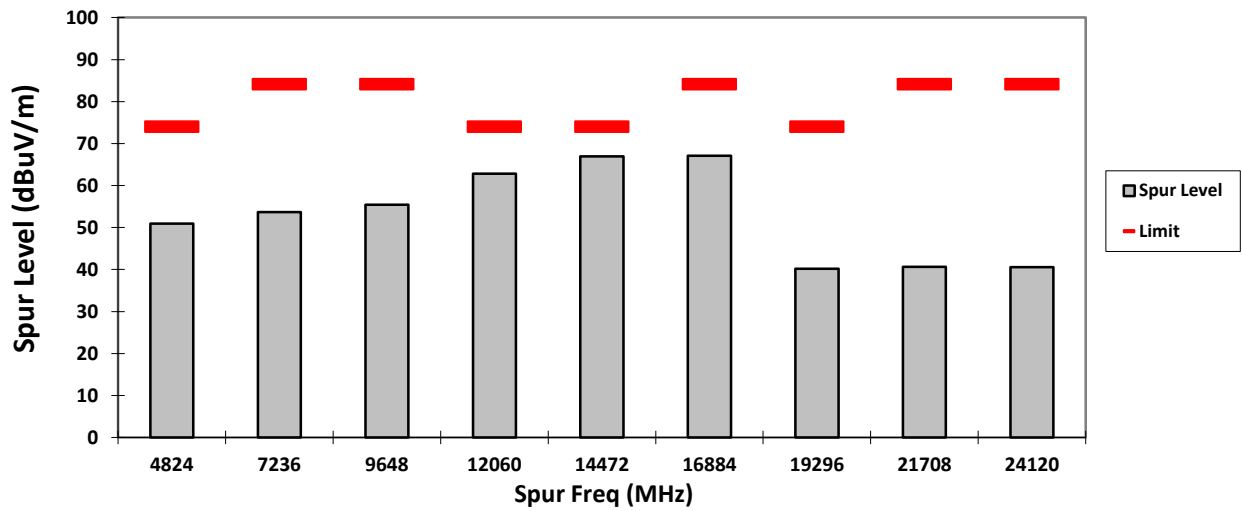
HORIZONTAL, AV



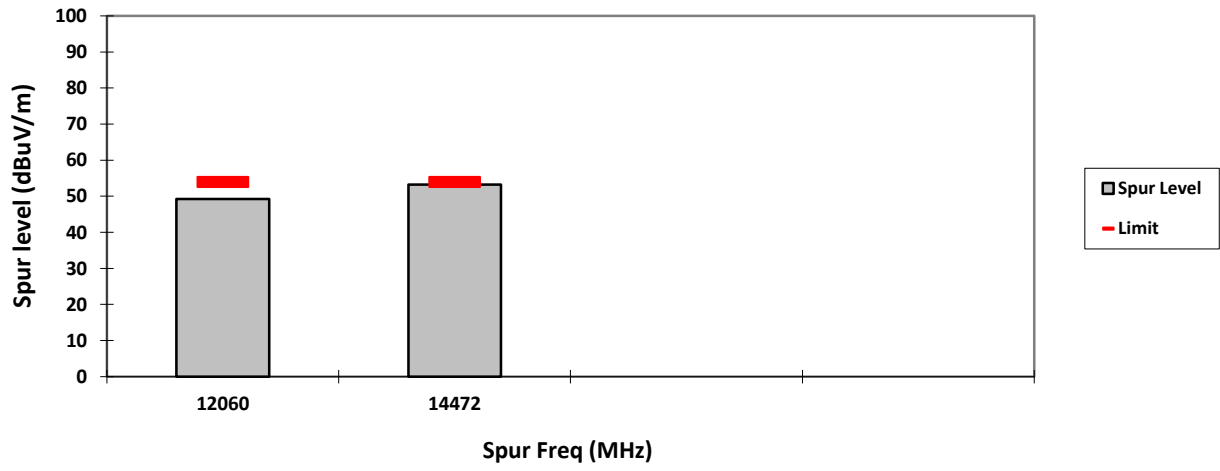
VERTICAL, PK



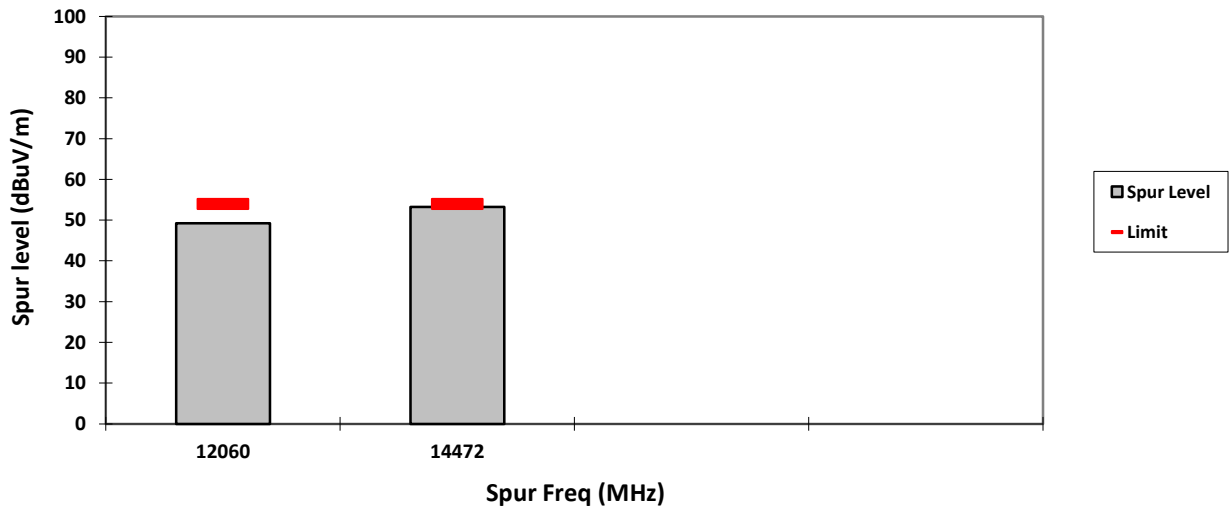
HORIZONTAL, PK



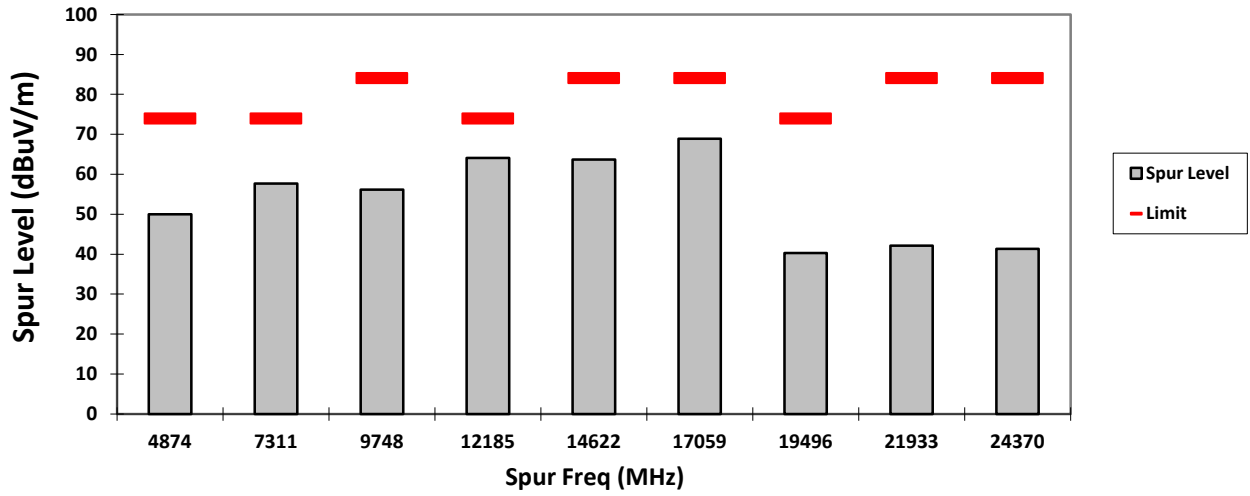
VERTICAL, AV



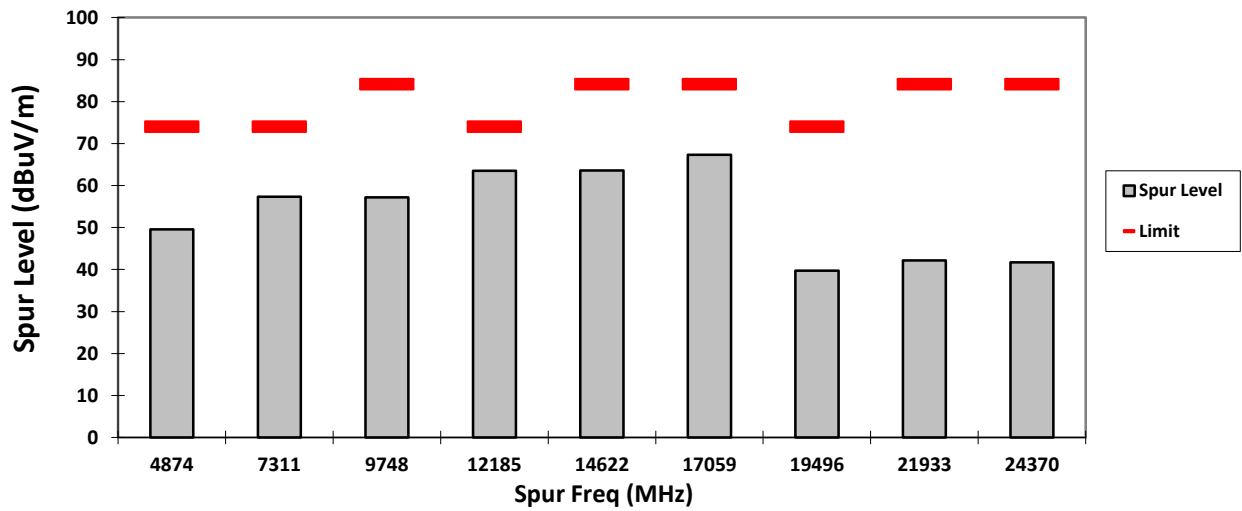
HORIZONTAL, AV



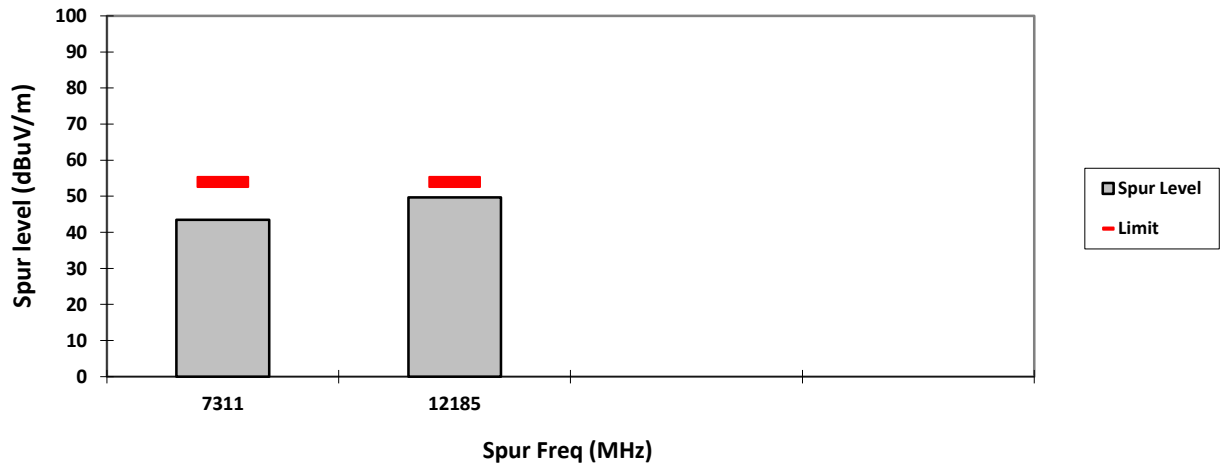
VERTICAL, PK



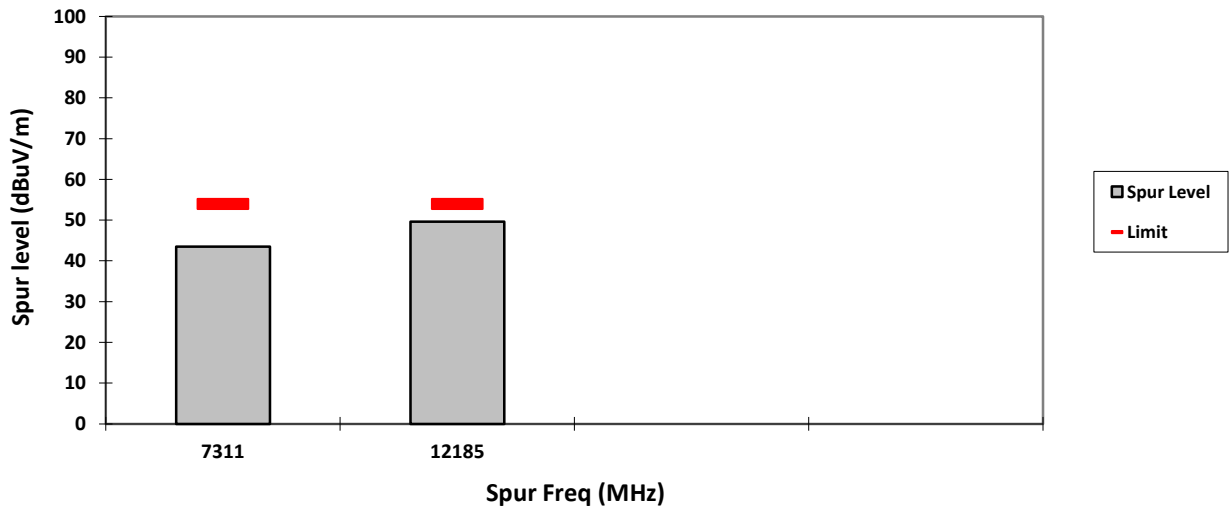
HORIZONTAL, PK



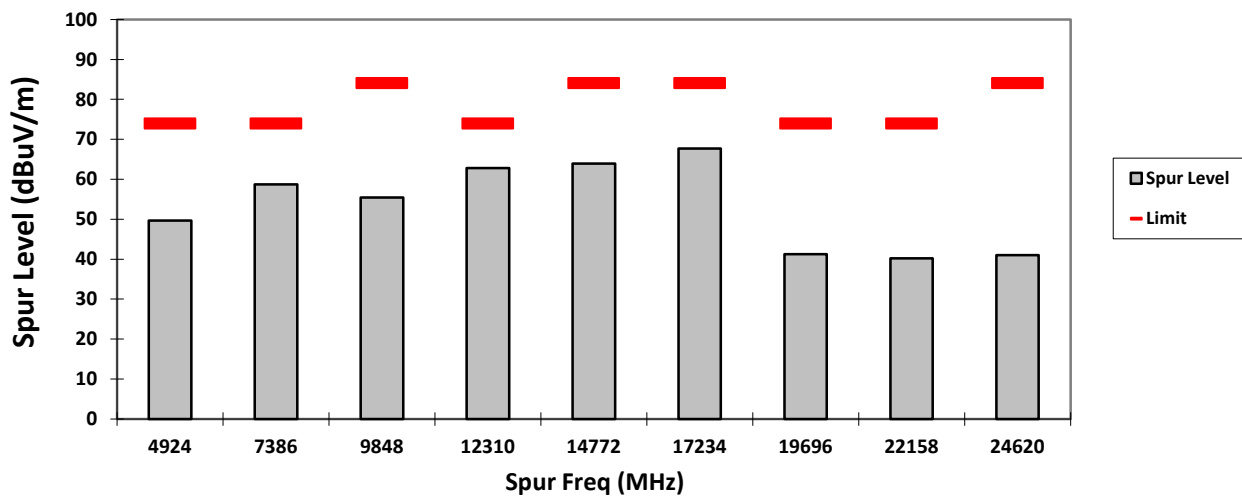
VERTICAL, AV



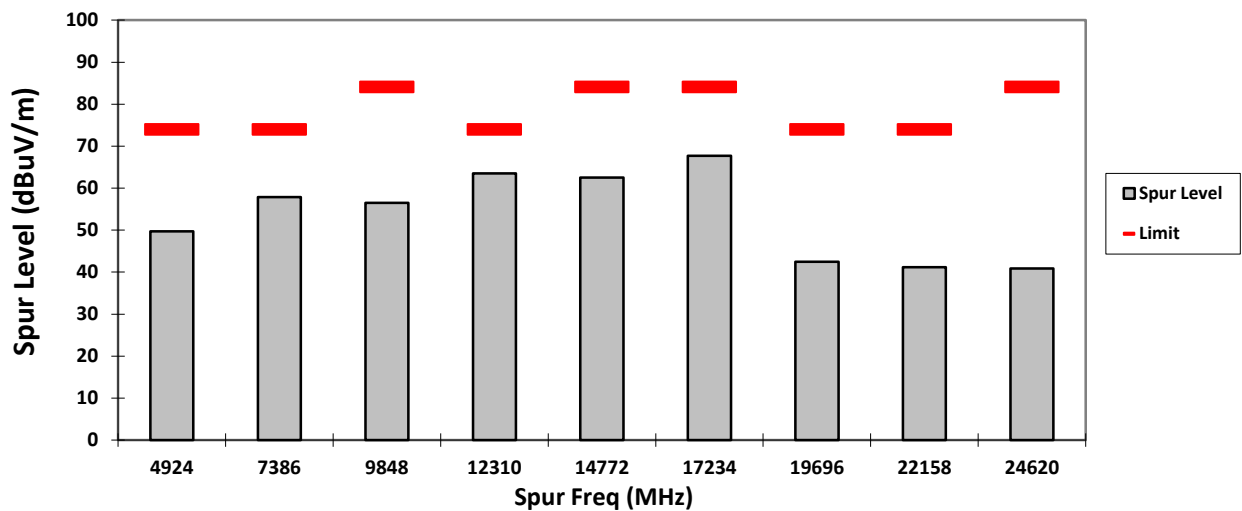
HORIZONTAL, AV



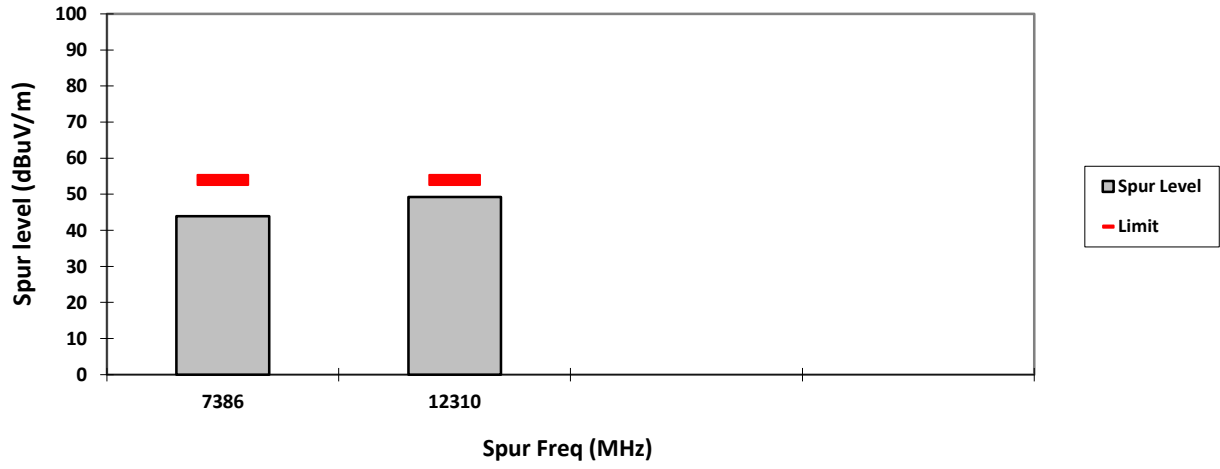
VERTICAL, PK



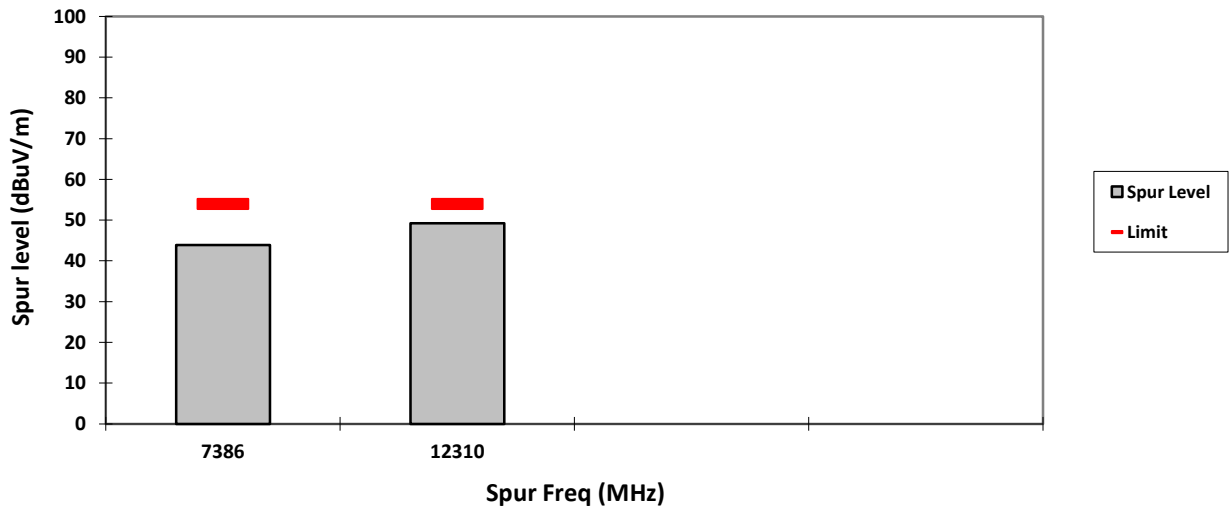
HORIZONTAL, PK



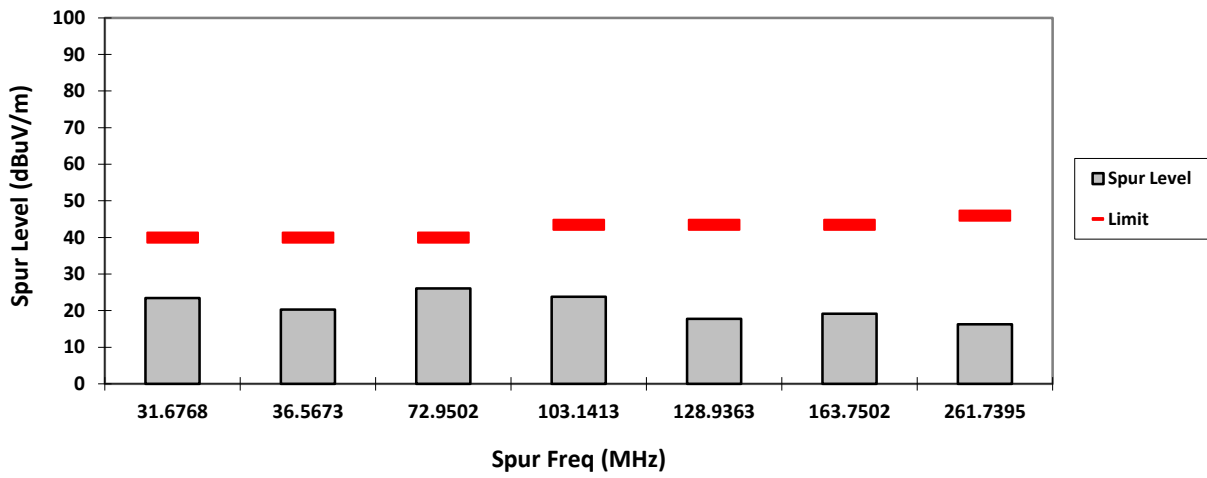
VERTICAL, AV



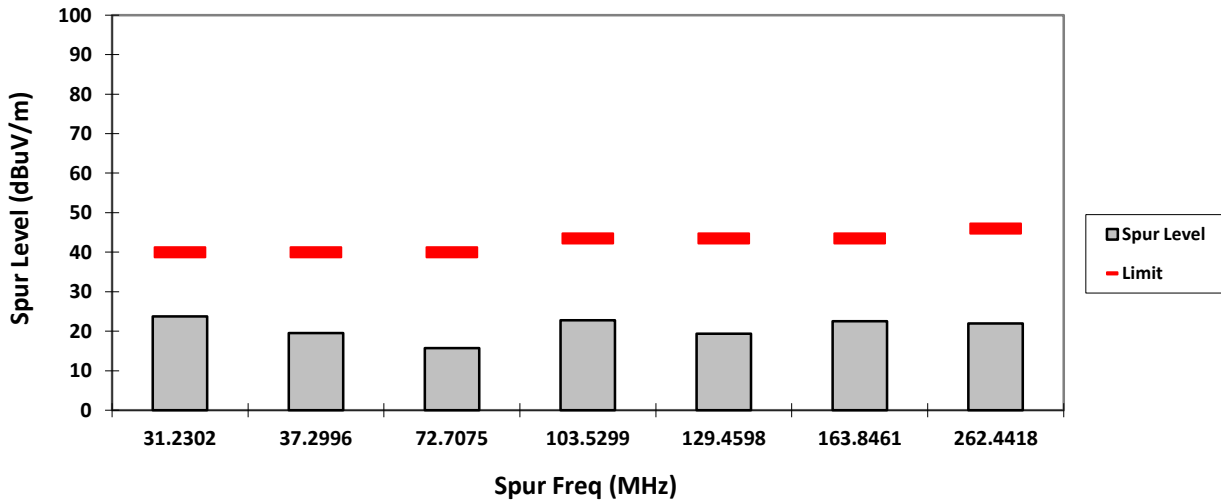
HORIZONTAL, AV



VERTICAL, QPK

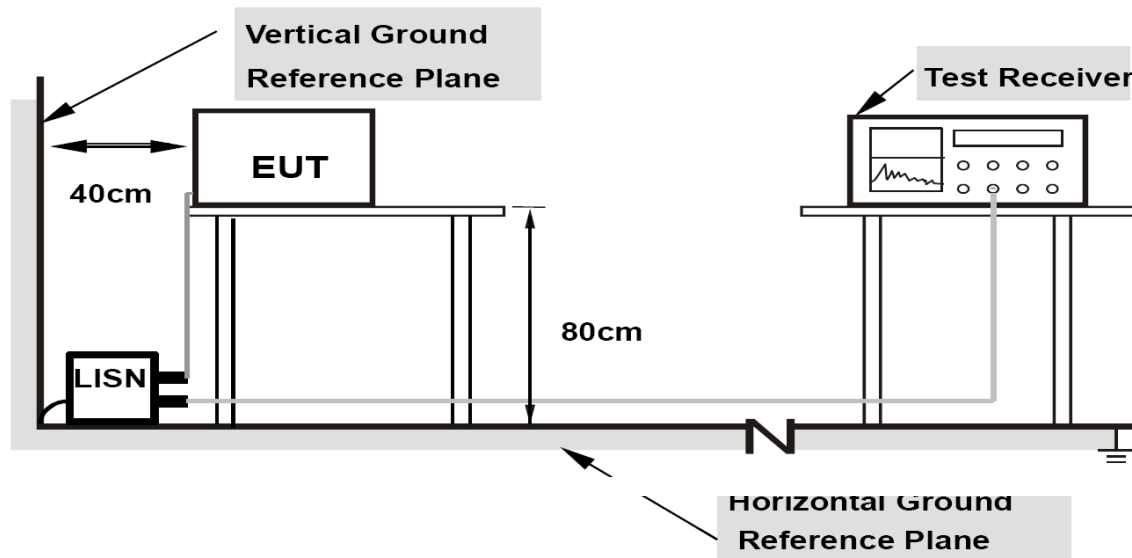


HORIZONTAL, QPK



6.8. AC Powerline Conducted Emission

6.8.1. Test Setup



- 1) Tests were conducted for both Receive and Transmit Mode of the EUT.
- 2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- 3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 4) The frequency range from 150 kHz to 30MHz was measured.

6.8.2. Test Limits:

For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.

Limits for conducted disturbance at the mains ports
of class A ITE

Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	79	66
0,50 to 30	73	60

NOTE The lower limit shall apply at the transition frequency.

Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.

**Limits for conducted disturbance at the mains ports
of class B ITE**

Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

NOTE 1 The lower limit shall apply at the transition frequencies.
NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.

Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE

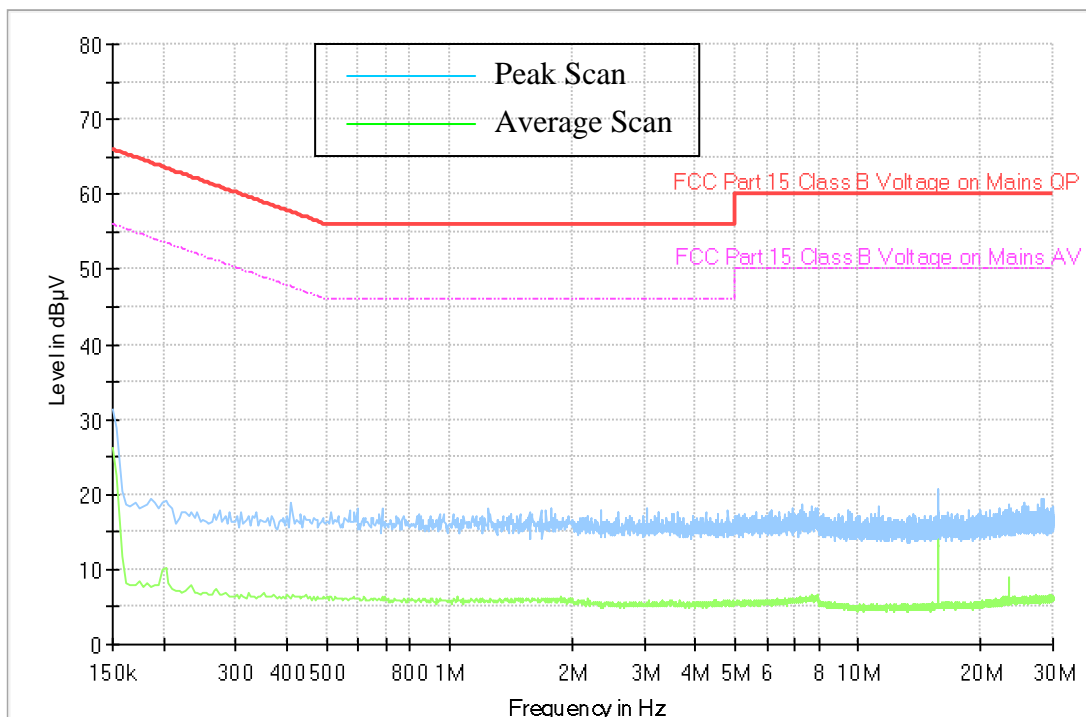
6.8.3. Test Result

Report ID.:	: 29844-EMC-00027
Ambient Temperature:	: 19.7 °C
Humidity:	: 57.6 %RH
Tester:	: Shidee
Date of test:	: 16 May 2023

120Vac SUC

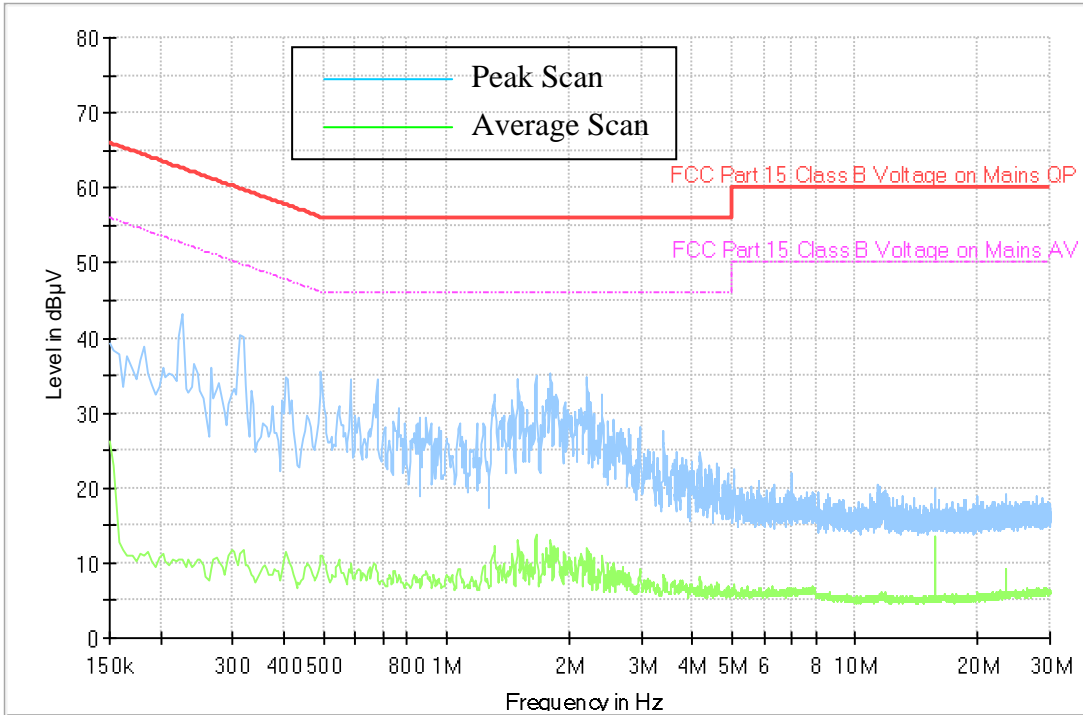
1) Ambient

Full Spectrum



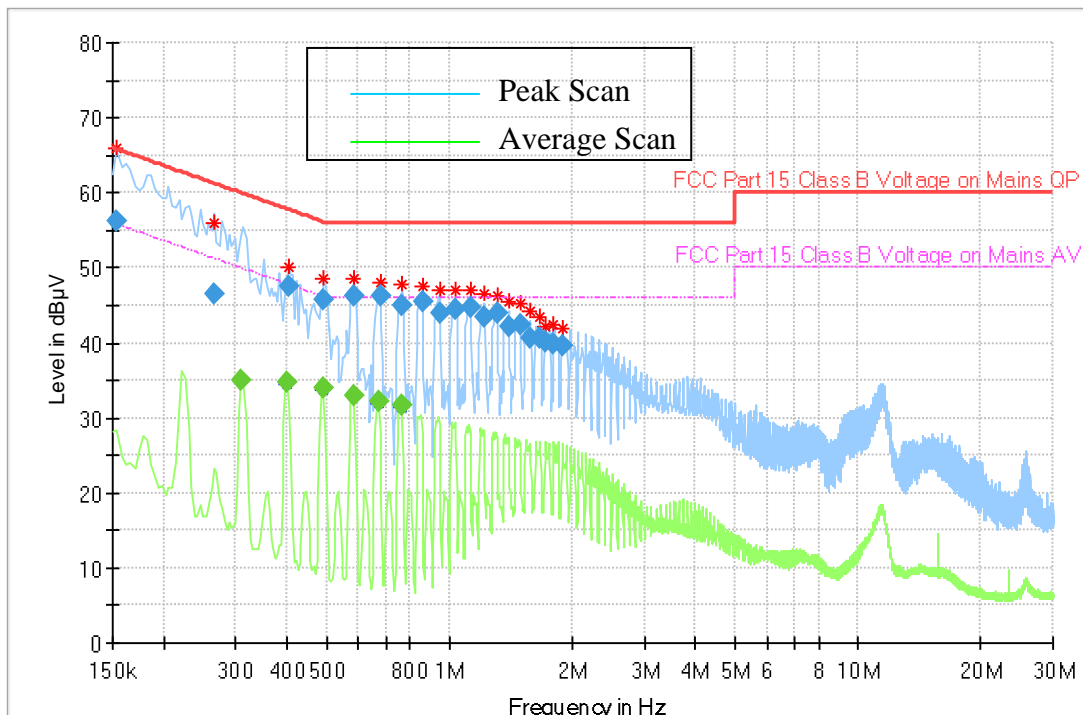
2) Charger Alone

Full Spectrum



3) Charger + Radio Off

Full Spectrum



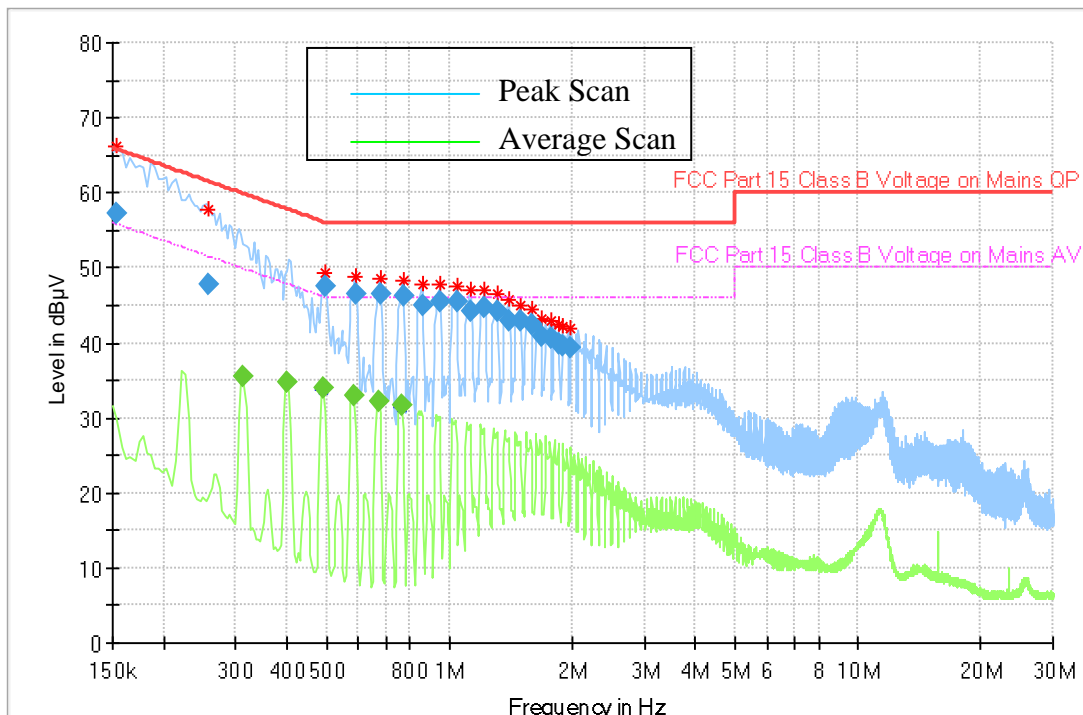
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.154000	56.31	---	65.78	9.47	1000.0	9.000	L1	ON	10.4	Pass
0.266000	46.59	---	61.24	14.65	1000.0	9.000	N	ON	10.2	Pass
0.310000	---	35.03	49.97	14.94	1000.0	9.000	L1	ON	10.3	Pass
0.402000	---	34.77	47.81	13.04	1000.0	9.000	L1	ON	10.3	Pass
0.406000	47.55	---	57.73	10.18	1000.0	9.000	N	ON	10.3	Pass
0.490000	---	33.90	46.17	12.27	1000.0	9.000	L1	ON	10.3	Pass
0.494000	45.83	---	56.10	10.27	1000.0	9.000	N	ON	10.3	Pass
0.582000	---	33.02	46.00	12.98	1000.0	9.000	L1	ON	10.3	Pass
0.586000	46.31	---	56.00	9.69	1000.0	9.000	N	ON	10.3	Pass
0.670000	---	32.11	46.00	13.89	1000.0	9.000	L1	ON	10.3	Pass
0.678000	46.22	---	56.00	9.78	1000.0	9.000	N	ON	10.3	Pass
0.762000	---	31.60	46.00	14.40	1000.0	9.000	L1	ON	10.3	Pass
0.766000	44.98	---	56.00	11.02	1000.0	9.000	N	ON	10.3	Pass
0.858000	45.48	---	56.00	10.52	1000.0	9.000	N	ON	10.3	Pass
0.946000	44.07	---	56.00	11.93	1000.0	9.000	N	ON	10.3	Pass
1.038000	44.54	---	56.00	11.46	1000.0	9.000	N	ON	10.2	Pass
1.130000	44.82	---	56.00	11.18	1000.0	9.000	N	ON	10.2	Pass
1.218000	43.53	---	56.00	12.47	1000.0	9.000	N	ON	10.2	Pass
1.310000	43.94	---	56.00	12.06	1000.0	9.000	N	ON	10.2	Pass
1.398000	42.29	---	56.00	13.71	1000.0	9.000	N	ON	10.2	Pass
1.490000	42.39	---	56.00	13.61	1000.0	9.000	N	ON	10.2	Pass
1.578000	40.74	---	56.00	15.26	1000.0	9.000	N	ON	10.2	Pass
1.670000	40.56	---	56.00	15.44	1000.0	9.000	N	ON	10.2	Pass
1.714000	40.07	---	56.00	15.93	1000.0	9.000	L1	ON	10.2	Pass
1.802000	39.93	---	56.00	16.07	1000.0	9.000	L1	ON	10.2	Pass
1.890000	39.70	---	56.00	16.30	1000.0	9.000	L1	ON	10.2	Pass

* Expanded Uncertainty (U) = +/- 3.48dB

4) Charger + Radio Standby

Full Spectrum



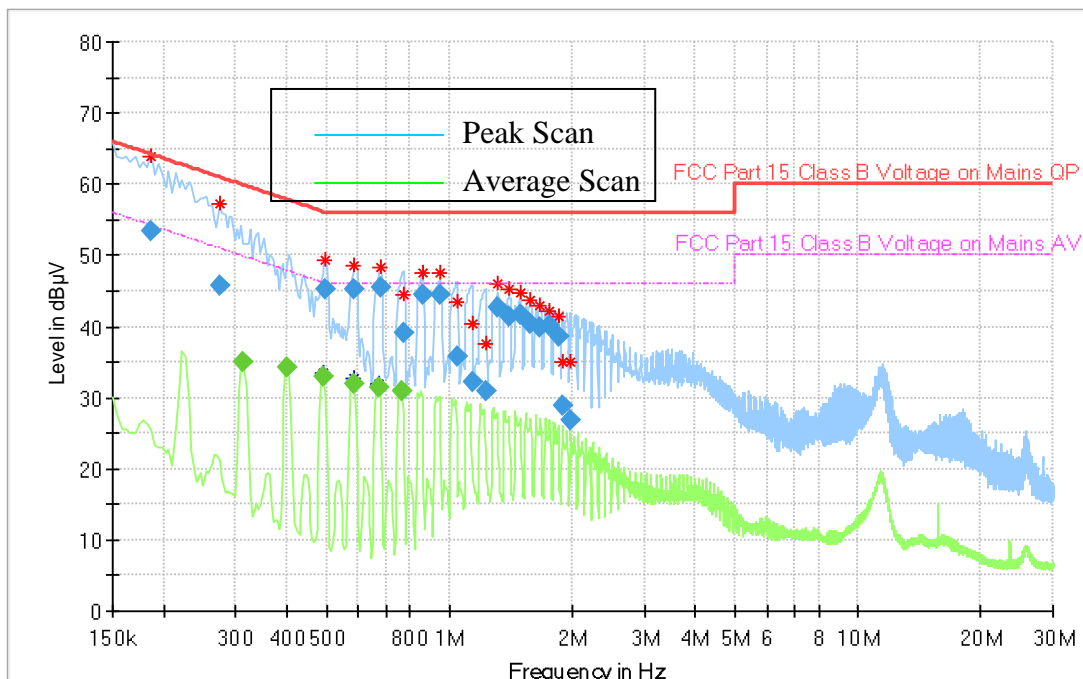
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.154000	57.16	---	65.78	8.62	1000.0	9.000	N	ON	10.4	Pass
0.258000	47.68	---	61.50	13.82	1000.0	9.000	N	ON	10.2	Pass
0.314000	---	35.50	49.86	14.37	1000.0	9.000	L1	ON	10.3	Pass
0.402000	---	34.87	47.81	12.94	1000.0	9.000	L1	ON	10.3	Pass
0.490000	---	33.97	46.17	12.20	1000.0	9.000	L1	ON	10.3	Pass
0.498000	47.48	---	56.03	8.55	1000.0	9.000	N	ON	10.3	Pass
0.582000	---	33.08	46.00	12.92	1000.0	9.000	L1	ON	10.3	Pass
0.590000	46.57	---	56.00	9.43	1000.0	9.000	N	ON	10.3	Pass
0.674000	---	32.29	46.00	13.71	1000.0	9.000	L1	ON	10.3	Pass
0.678000	46.40	---	56.00	9.60	1000.0	9.000	N	ON	10.3	Pass
0.762000	---	31.59	46.00	14.41	1000.0	9.000	L1	ON	10.3	Pass
0.770000	46.30	---	56.00	9.71	1000.0	9.000	N	ON	10.3	Pass
0.858000	44.99	---	56.00	11.01	1000.0	9.000	N	ON	10.3	Pass
0.950000	45.46	---	56.00	10.54	1000.0	9.000	N	ON	10.3	Pass
1.042000	45.41	---	56.00	10.59	1000.0	9.000	N	ON	10.2	Pass
1.130000	44.29	---	56.00	11.71	1000.0	9.000	N	ON	10.2	Pass
1.222000	44.61	---	56.00	11.39	1000.0	9.000	N	ON	10.2	Pass
1.314000	44.32	---	56.00	11.68	1000.0	9.000	N	ON	10.2	Pass
1.402000	42.98	---	56.00	13.02	1000.0	9.000	N	ON	10.2	Pass
1.494000	42.91	---	56.00	13.09	1000.0	9.000	N	ON	10.2	Pass
1.586000	42.35	---	56.00	13.65	1000.0	9.000	N	ON	10.2	Pass
1.674000	40.83	---	56.00	15.17	1000.0	9.000	N	ON	10.2	Pass
1.766000	40.60	---	56.00	15.40	1000.0	9.000	N	ON	10.2	Pass
1.858000	39.98	---	56.00	16.02	1000.0	9.000	N	ON	10.2	Pass
1.890000	39.58	---	56.00	16.42	1000.0	9.000	L1	ON	10.2	Pass
1.978000	39.32	---	56.00	16.68	1000.0	9.000	L1	ON	10.2	Pass

* Expanded Uncertainty (U) = +/- 3.48dB

5) Charger + Radio Tx with WiFi 2.4 b

Full Spectrum



Quasipeak and Average Measurement

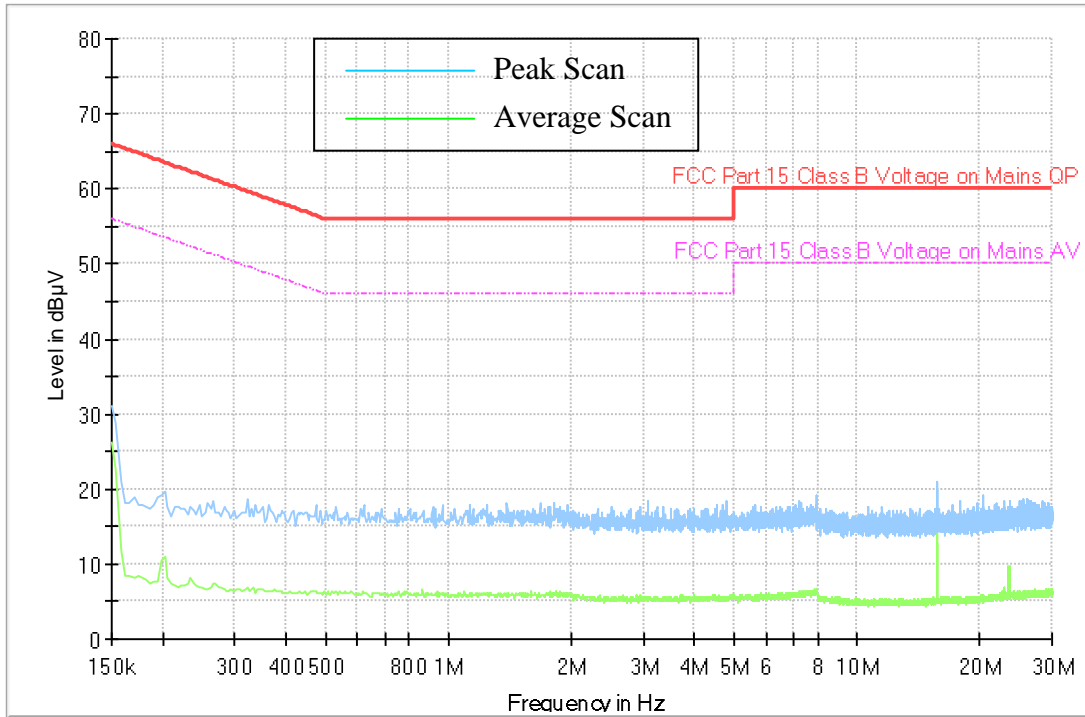
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.186000	53.52	---	64.21	10.69	1000.0	9.000	N	ON	10.5	Pass
0.274000	45.82	---	61.00	15.18	1000.0	9.000	N	ON	10.2	Pass
0.314000	---	34.93	49.86	14.94	1000.0	9.000	L1	ON	10.3	Pass
0.402000	---	34.30	47.81	13.51	1000.0	9.000	L1	ON	10.3	Pass
0.490000	---	33.08	46.17	13.09	1000.0	9.000	L1	ON	10.3	Pass
0.498000	45.33	---	56.03	10.71	1000.0	9.000	N	ON	10.3	Pass
0.582000	---	32.07	46.00	13.93	1000.0	9.000	L1	ON	10.3	Pass
0.586000	45.24	---	56.00	10.76	1000.0	9.000	N	ON	10.3	Pass
0.674000	---	31.46	46.00	14.54	1000.0	9.000	L1	ON	10.3	Pass
0.678000	45.41	---	56.00	10.59	1000.0	9.000	N	ON	10.3	Pass
0.762000	---	30.92	46.00	15.08	1000.0	9.000	L1	ON	10.3	Pass
0.774000	39.11	---	56.00	16.89	1000.0	9.000	N	ON	10.3	Pass
0.858000	44.39	---	56.00	11.61	1000.0	9.000	N	ON	10.3	Pass
0.950000	44.52	---	56.00	11.48	1000.0	9.000	N	ON	10.3	Pass
1.046000	35.67	---	56.00	20.33	1000.0	9.000	N	ON	10.2	Pass
1.138000	32.12	---	56.00	23.88	1000.0	9.000	N	ON	10.2	Pass
1.230000	31.04	---	56.00	24.96	1000.0	9.000	L1	ON	10.2	Pass
1.310000	42.78	---	56.00	13.22	1000.0	9.000	N	ON	10.2	Pass
1.398000	41.50	---	56.00	14.50	1000.0	9.000	N	ON	10.2	Pass
1.490000	41.57	---	56.00	14.43	1000.0	9.000	N	ON	10.2	Pass
1.578000	40.31	---	56.00	15.69	1000.0	9.000	N	ON	10.2	Pass
1.670000	39.94	---	56.00	16.06	1000.0	9.000	N	ON	10.2	Pass
1.762000	40.06	---	56.00	15.94	1000.0	9.000	N	ON	10.2	Pass
1.850000	38.65	---	56.00	17.35	1000.0	9.000	N	ON	10.2	Pass
1.886000	28.80	---	56.00	27.20	1000.0	9.000	L1	ON	10.2	Pass
1.974000	26.82	---	56.00	29.18	1000.0	9.000	L1	ON	10.2	Pass

* Expanded Uncertainty (U) = +/- 3.48dB

120Vac MUC

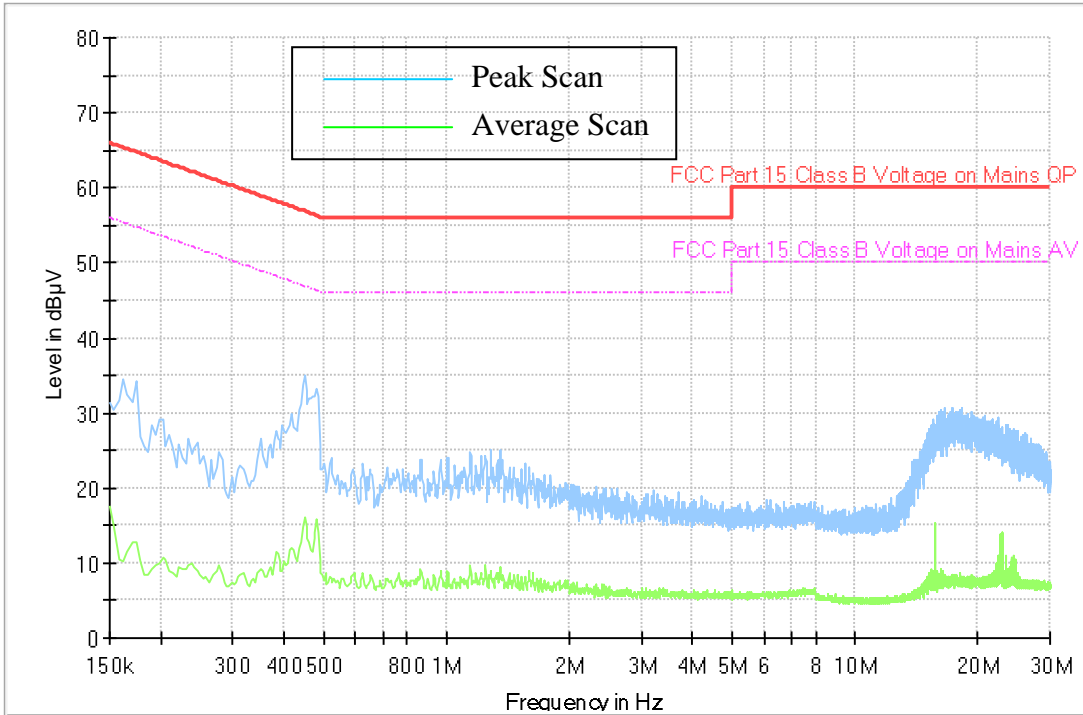
6) Ambient

Full Spectrum



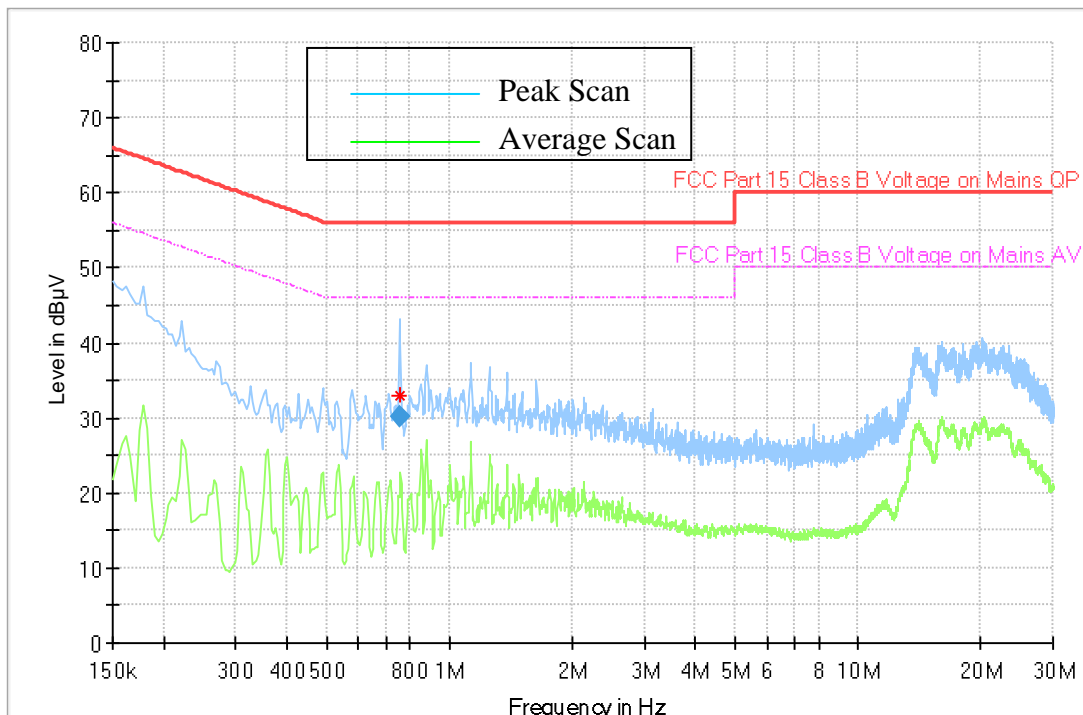
7) Charger Alone

Full Spectrum



8) Charger + Radio Off

Full Spectrum



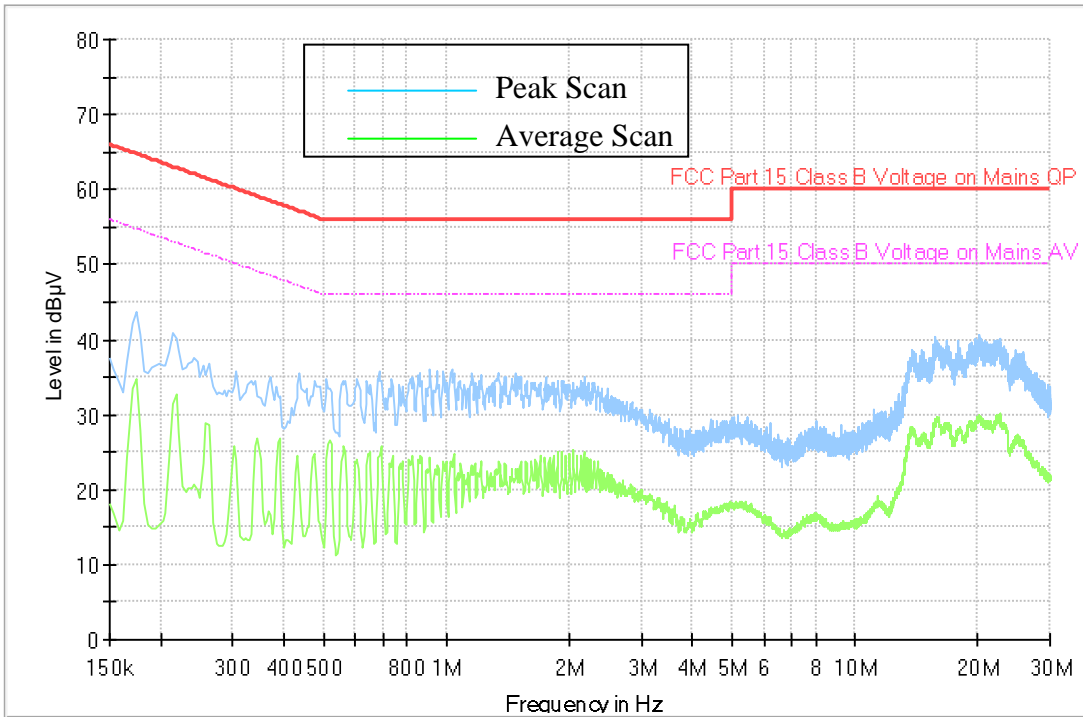
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.754000	30.11	---	56.00	25.89	1000.0	9.000	L1	ON	10.3	Pass

* Expanded Uncertainty (U) = +/- 3.48dB

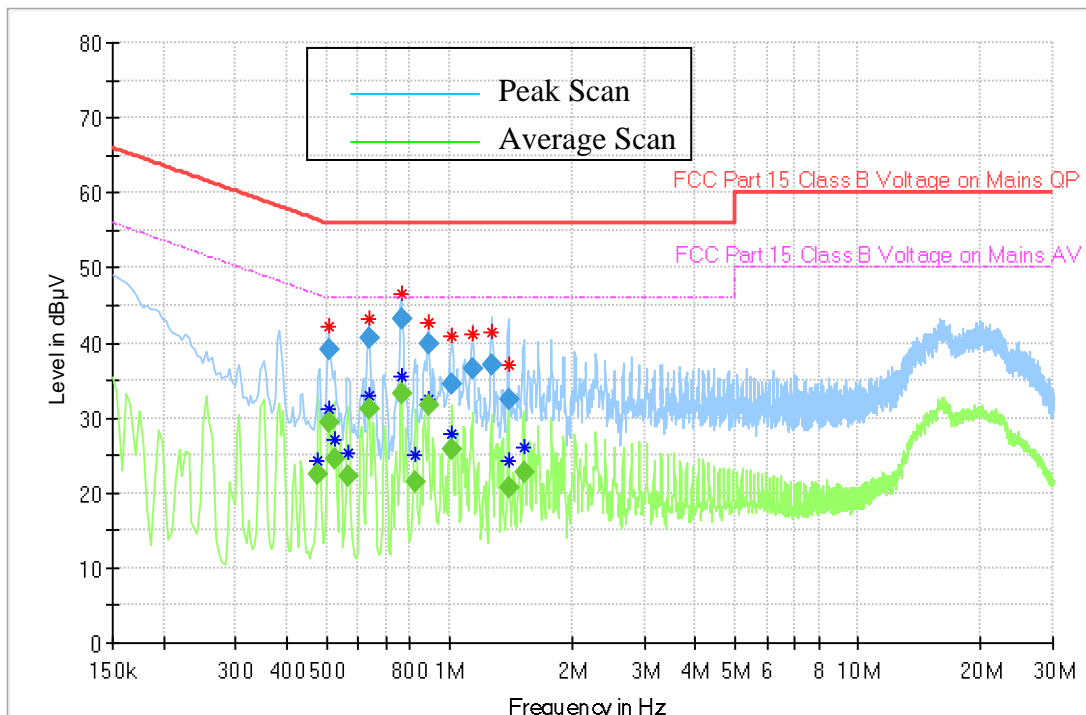
9) Charger + Radio Standby

Full Spectrum



10) Charger + Radio Tx with WiFi 2.4 b

Full Spectrum



Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.478000	---	22.52	46.37	23.85	1000.0	9.000	L1	ON	10.3	Pass
0.506000	39.05	---	56.00	16.95	1000.0	9.000	N	ON	10.3	Pass
0.506000	---	29.50	46.00	16.50	1000.0	9.000	N	ON	10.3	Pass
0.522000	---	24.60	46.00	21.40	1000.0	9.000	L1	ON	10.3	Pass
0.566000	---	22.22	46.00	23.78	1000.0	9.000	L1	ON	10.3	Pass
0.634000	---	31.06	46.00	14.94	1000.0	9.000	N	ON	10.3	Pass
0.634000	40.74	---	56.00	15.26	1000.0	9.000	N	ON	10.3	Pass
0.762000	43.07	---	56.00	12.93	1000.0	9.000	N	ON	10.3	Pass
0.762000	---	33.19	46.00	12.81	1000.0	9.000	N	ON	10.3	Pass
0.826000	---	21.36	46.00	24.64	1000.0	9.000	L1	ON	10.3	Pass
0.890000	---	31.63	46.00	14.37	1000.0	9.000	L1	ON	10.3	Pass
0.890000	39.87	---	56.00	16.13	1000.0	9.000	N	ON	10.3	Pass
1.014000	34.58	---	56.00	21.42	1000.0	9.000	N	ON	10.2	Pass
1.014000	---	25.93	46.00	20.07	1000.0	9.000	L1	ON	10.2	Pass
1.142000	36.65	---	56.00	19.35	1000.0	9.000	L1	ON	10.2	Pass
1.270000	37.06	---	56.00	18.94	1000.0	9.000	L1	ON	10.2	Pass
1.394000	32.52	---	56.00	23.48	1000.0	9.000	L1	ON	10.2	Pass
1.394000	---	20.61	46.00	25.39	1000.0	9.000	L1	ON	10.2	Pass
1.522000	---	22.74	46.00	23.26	1000.0	9.000	L1	ON	10.2	Pass

* Expanded Uncertainty (U) = +/- 3.48dB

END OF TEST REPORT