


 MOTOROLA SOLUTIONS	 CERTIFICATE 2518.08   SAMM 825
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.	FCC / ISED TEST REPORT Report Revision : Rev.B
<p>Date/s Tested : 2-May-2023 - 20-May-2023 Report Issue Date : 20-June-2023 Manufacturer/Location : Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia</p> <p>Requestor : TANG, GARY Product Type : Hand-held Product Version (PMN) : APXN50 Model Number (HVIN) : H25KDF9PW6AN Frequency Band : 2.402 - 2.480 GHz Max RF Output Power : 14.79 mWatts Applicant Name : Motorola Solutions Inc Applicant Address : 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322</p> <p>FCC Registrations : 461337 IC Registrations : MY0001 Firmware Version (FVIN) : D30.80.88</p> <p>The equipment was tested accordance to the requirement listed below:</p> <p>(2.4GHz BT) FCC 47CFR Part 15C ISED RSS 247 Issue 2, February 2017 PASS</p>	
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REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	20-June-2023	Siti Nurhidayati
Rev. B	Update summary table	31-July-2023	Mahesh

1.0. General Information

EUT Description:

Technologies	2.4GHz BT
TX Frequency range	2402MHz – 2480MHz
Modulation Type	GFSK, Pi/4 DQPSK,8DPSK
Connector type	PROGRAMMING, TEST & ALIGNMENT CABLE
Antenna type	IFA BLUETOOTH/WIFI ANTENNA

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

Channel number and frequency information:

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

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	ISED Clause	Test Item	Result	Remark	Serial number tested	Tested by
15.247 (b)(1)	RSS-247 5.4(b)	Conducted RF Output Power (Peak)	Pass	Highest output power: 10.317 dBm (10.76mW)	287TZH0057	Hidayati
15.247 (a)(1)	RSS-247 5.1(a) RSS-247 5.1(b)	(1) 20dB Channel Bandwidth (2) Channel Separation	Pass	References data from AZ489FT7161 / ISED 109U-89FT7161	NA	NA
15.247(a)(1)(iii)	RSS-247 5.1(d)	Number of hopping Frequency used	Pass	References data from AZ489FT7161 / ISED 109U-89FT7161	NA	NA
15.247(a)(1)(iii)	RSS-247 5.1(d)	Dwell time on each channel	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
15.247 (d)	RSS-247 5.5	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: 44.2461 dBuV/m (margin: 9.7539 dB) RSE: 63.8820 dBuV/m (margin: 10.1180 dB), noise floor	287TZH0154	Nazrin&Qawiman
15.207	RSS-Gen 8.8	AC Powerline Conducted Emission	NA	Meet the limit requirement.	287TZH0154	Shidee
15.203	-	Antenna Requirement	NA	Internal antenna is not accessible to the end-user	NA	NA

***NOTE: The BT 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	Expanded 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
	9kHz ~ 12.75GHz	2.82

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
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

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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Environmental Conditions
Test Mode	0 to 78	0,39,78	FHSS	GFSK, Pi/4 DQPSK,8DPSK	22.8°C, 70.1%RH

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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Environmental Conditions
Test Mode	0 to 78	0,39,78	FHSS	GFSK, Pi/4 DQPSK,8DPSK	22.8°C, 70.1%RH

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.

NAEUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Environmental Conditions
Application Mode	0 to 78	AUTO	FHSS	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).

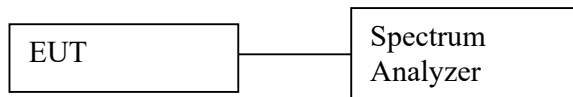
Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Environmental Conditions
Test Mode	0 to 78	0,39,78	FHSS	GFSK, Pi/4 DQPSK,8DPSK	25°C, 54.8%RH

6.0. Transmitter Test Parameters

6.1. Conducted RF Output Power (Peak)

6.1.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and set EUT to transmit maximum data rate with hopping disable.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = > 20 dB bandwidth
 - b. VBW = RBW
 - c. Detector mode = Peak
 - d. AMPLITUDE → Scale/Div = 10 dB
 - e. Trace = Max hold
 - f. Sweep = auto
- e) Measure the captured power within the band and recording the plot.
- f) Repeat above procedure with other different mode of operation.

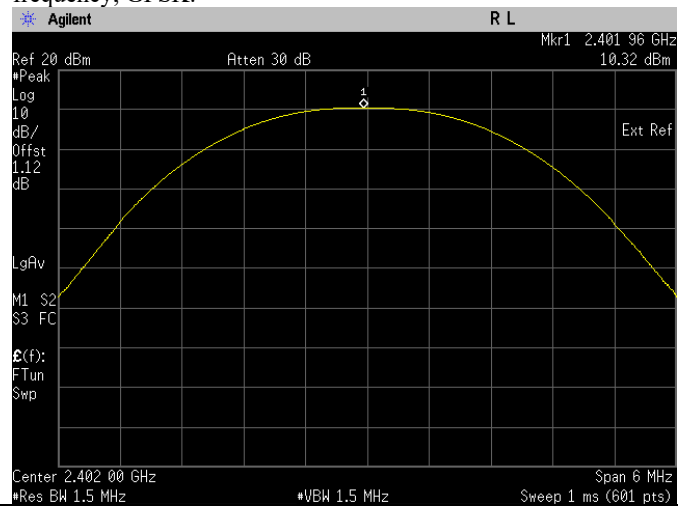
6.1.2. Test Limits:

Normal Condition (25 ° C)
≤ 125mW (or 20.9dBm)

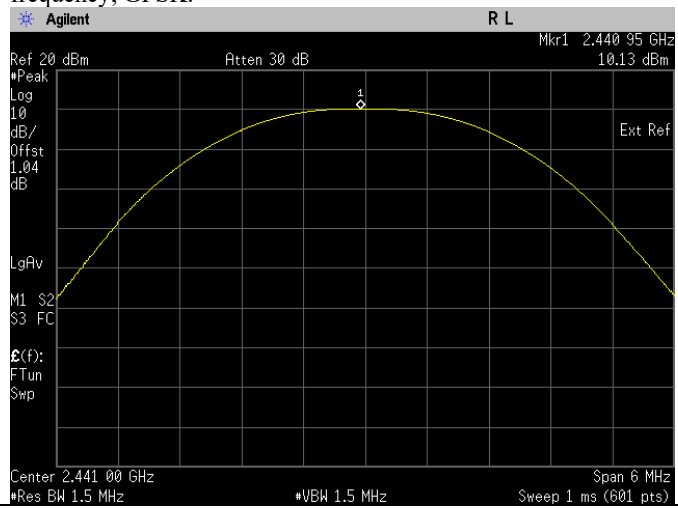
6.1.3. Test Data:

Test Conditions		Test Frequency (GHz)	Results	
Modulation	Voltage(V)		dBm	Status
GFSK	7.50	2.4020	10.317	Pass
		2.4410	10.127	Pass
		2.4800	9.917	Pass
Pi/4DQPSK	7.50	2.4020	6.542	Pass
		2.4410	6.333	Pass
		2.4800	6.113	Pass
8DPSK	7.50	2.4020	6.835	Pass
		2.4410	6.630	Pass
		2.4800	6.421	Pass

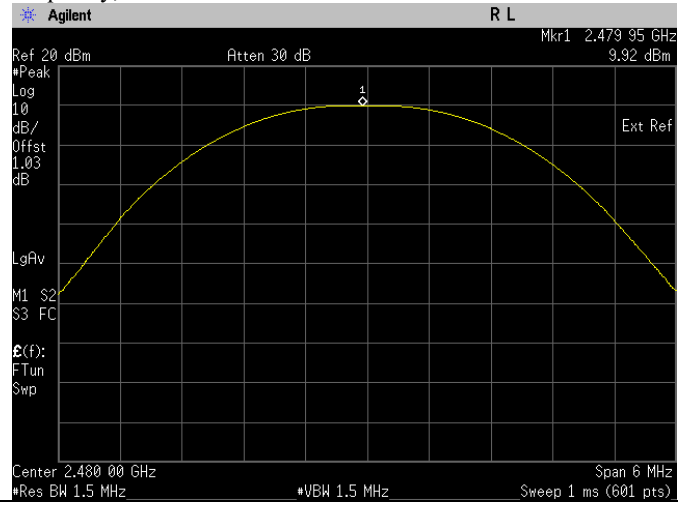
The Conducted RF Output Power test with result at low frequency, GFSK.



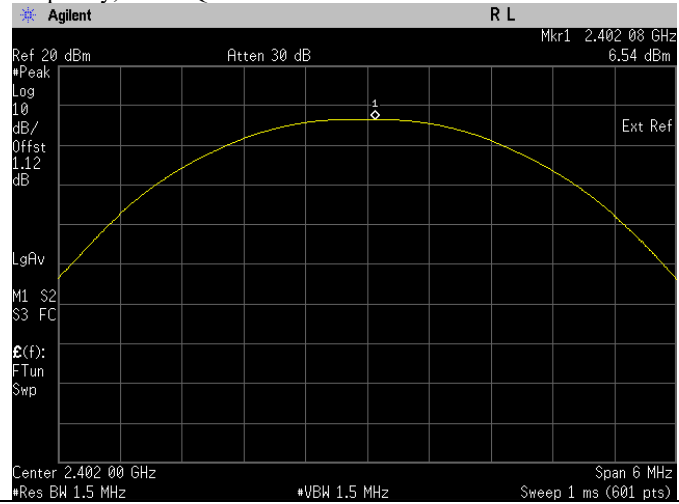
The Conducted RF Output Power test with result at mid frequency, GFSK.



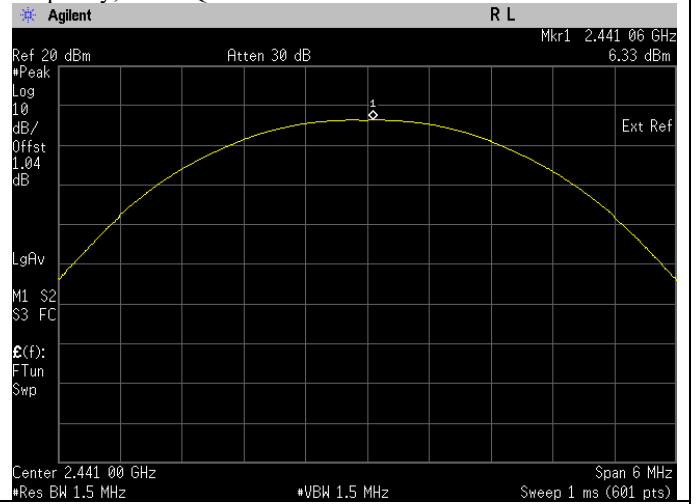
The Conducted RF Output Power test with result at high frequency, GFSK.



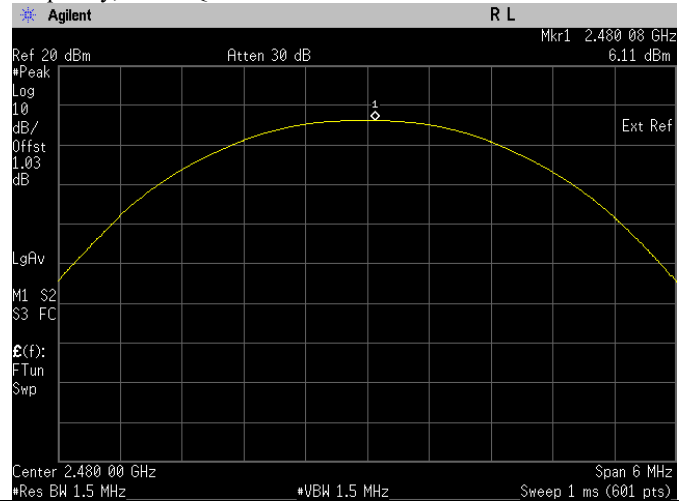
The Conducted RF Output Power test with result at low frequency, Pi/4 DQPSK.



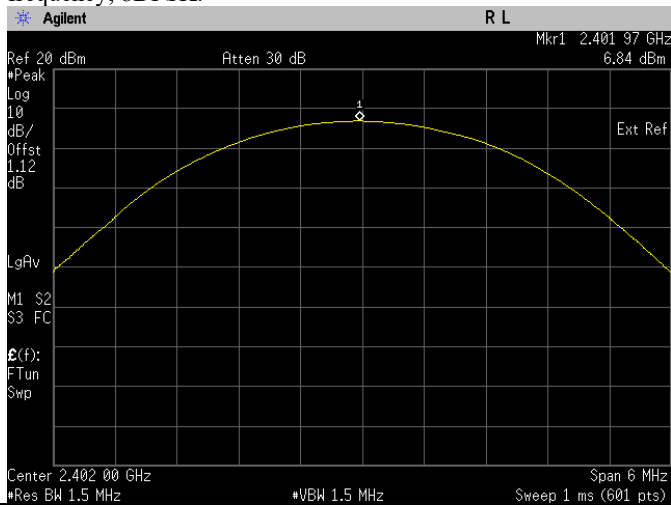
The Conducted RF Output Power test with result at mid frequency, Pi/4 DQPSK.



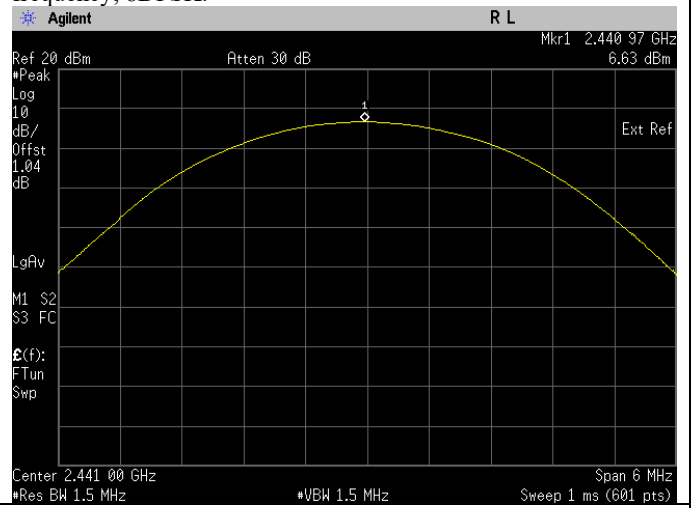
The Conducted RF Output Power test with result at high frequency, Pi/4 DQPSK.



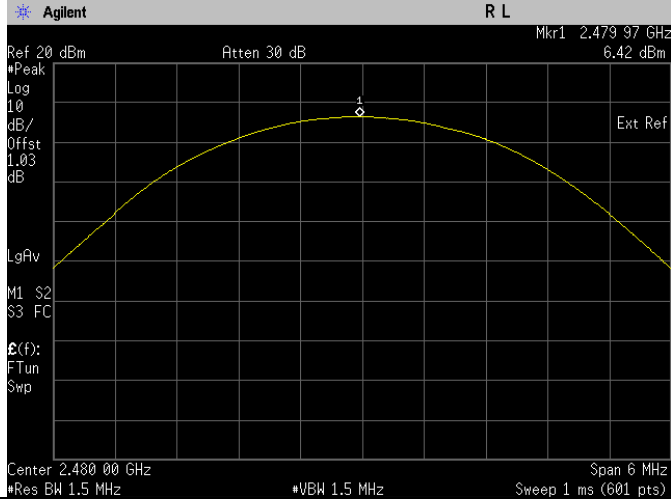
The Conducted RF Output Power test with result at low frequency, 8DPSK.



The Conducted RF Output Power test with result at mid frequency, 8DPSK.

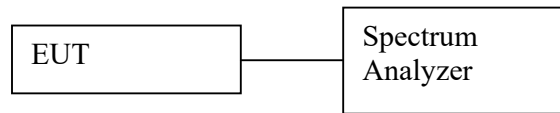


The Conducted RF Output Power test with result at high frequency, 8DPSK.



6.2. 20dB Channel Bandwidth

6.2.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and set EUT to transmit maximum data rate with hopping disable.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 30 kHz
 - b. VBW = 100 kHz
 - c. SPAN = 3 MHz, center on test frequency
 - d. AMPLITUDE → Scale/Div = 10 dB
 - e. Detector mode = Peak
 - f. Trace = Max hold
 - g. Sweep = auto
- e) Measure the freq different of two frequencies that were attenuated 20dB from peak of the emission & record the frequency difference as the emission bandwidth.
- f) Save the plot result from spectrum analyzer screen.
- g) Repeat above procedure with other different mode of operation.

6.2.2. Test Limits:

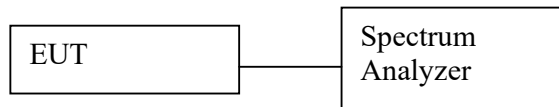
Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

6.2.3. Test Data:

Not Applicable

6.3. Band-edge Conducted Spurious Emission

6.3.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT'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. SPAN = 4 MHz (Low channel) or 6MHz(High Channel)
 - d. Detector mode = Peak
 - e. AMPLITUDE → Scale/Div = 10 dB
 - f. Trace = Max hold
 - g. Sweep = auto
- e) Measure the captured band edge emission result and recording the plot.
- f) Repeat above on EUT with hopping disable.
- g) Repeat above procedure with other different test frequency.

6.3.2. Test Limits

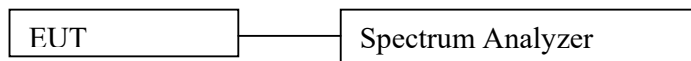
Normal Condition (25 ° C)
Shall be at least 20 dB below the peak power.

6.3.3. Test Result

Not Applicable

6.4. Dwell time on each channel

6.4.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT'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. SPAN = Zero SPAN, center on hopping frequency
 - d. Detector mode = Peak
 - e. Trace = Max hold
 - f. Sweep time = 5second
 - g. Sweep = Single
- e) Measure total numbers of transmissions occur in 5 second and save the plot.
- f) Change the setting of spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Sweep time = sufficient to capture dwell time for 1 transmission
 - d. Sweep = Single
- g) Measure dwell time for 1 transmission and save the plot.
- h) Calculate accumulate dwell time in a given period equal to number of hopping frequencies x 0.4
- i) Repeat above procedure with other different mode of operation.

6.4.2. Test Limits:

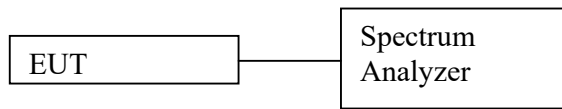
Normal Condition (25 ° C)
≤ 400ms

6.4.3. Test Result

Not Applicable

6.5. Number of hopping Frequency

6.5.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 300 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max hold
- e) Allow the trace to stabilized & save the plot result from spectrum analyzer screen.
- f) Count number of channel frequency in the operating.
- g) Repeat above procedure for other test frequency.

6.5.2. Test Limits:

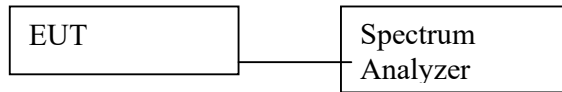
Normal Condition (25 ° C)
≥ 15

6.5.3. Test Result

Not Applicable

6.6. Channel Separation

6.6.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 300 kHz
 - b. VBW = 300 kHz
 - c. SPAN = 3 MHz, center on test frequency
 - d. AMPLITUDE → Scale/Div = 5 dB
 - e. Detector mode = Peak
 - f. Trace = Max hold
 - g. Sweep = auto
- e) Measure the frequency different of these two adjacent channels with marker delta function & record the measurement results.
- f) Repeat above procedure with other different mode of operation.

6.6.2. Test Limits:

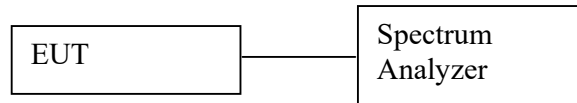
Normal Condition (25 ° C)
≥ 2/3 of 20dB Bandwidth

6.6.3. Test Result

Not Applicable

6.7. Conducted Spurious Emission

6.7.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and set EUT to transmit maximum data rate with hopping disable.
- c) Connect EUT'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. SPAN = Cover until 10th harmonic
 - d. Detector mode = Peak
 - e. AMPLITUDE → Scale/Div = 10 dB
 - f. Trace = Max hold
 - g. Sweep = auto
- e) Measure the captured spurious emission result and recording the plot.
- f) Repeat above procedure with other different mode of operation.

6.7.2. Test Limits:

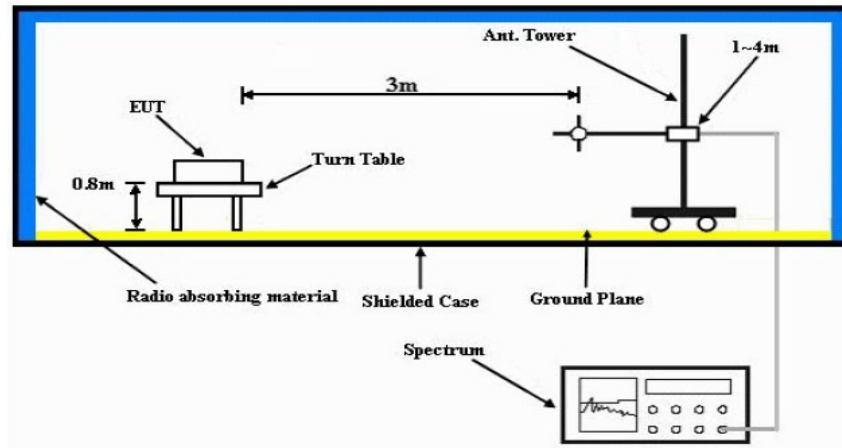
Normal Condition (25 ° C)
Shall be at least 20 dB below for peak power.

6.7.3. Test Data:

Not Applicable

6.8. Radiated Emission within restricted Bands

6.8.1. Test Setup



- The EUT is placed on the top of a rotating table 0.8m (<1GHz) or 1.5m (>1GHz) above the ground 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.

6.8.2. 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

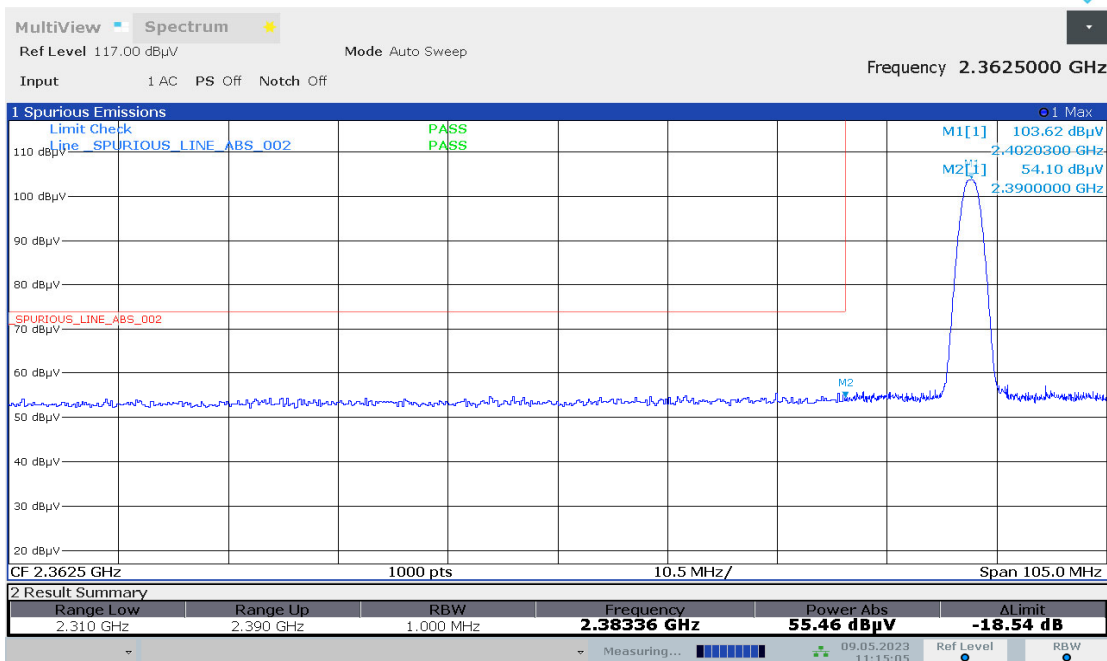
NOTE:

- 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



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

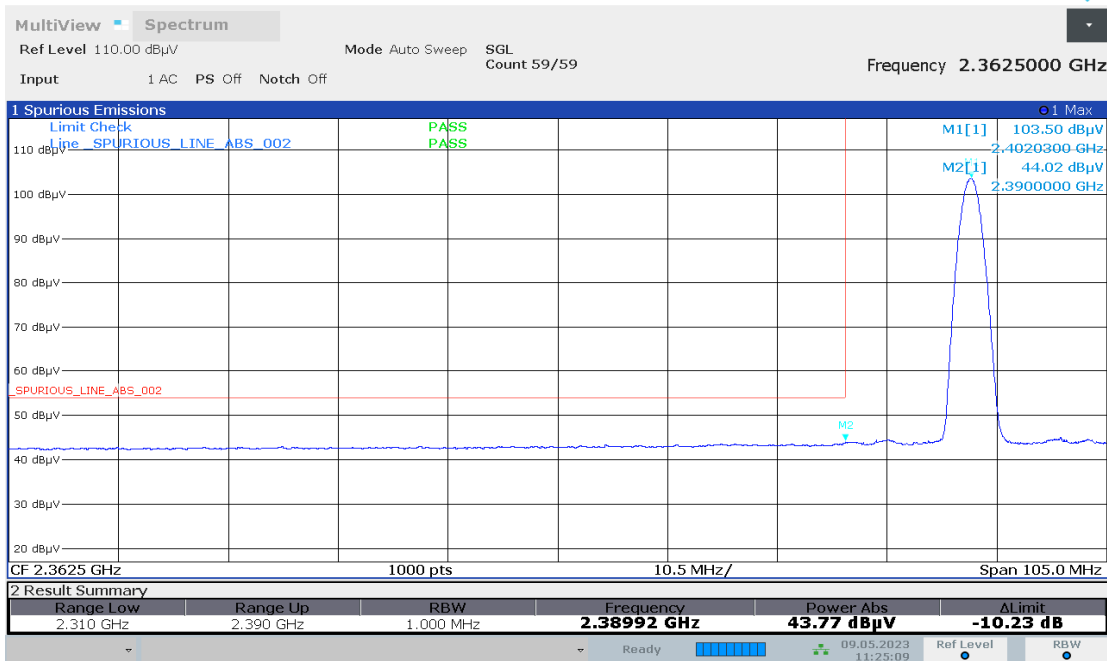


Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot



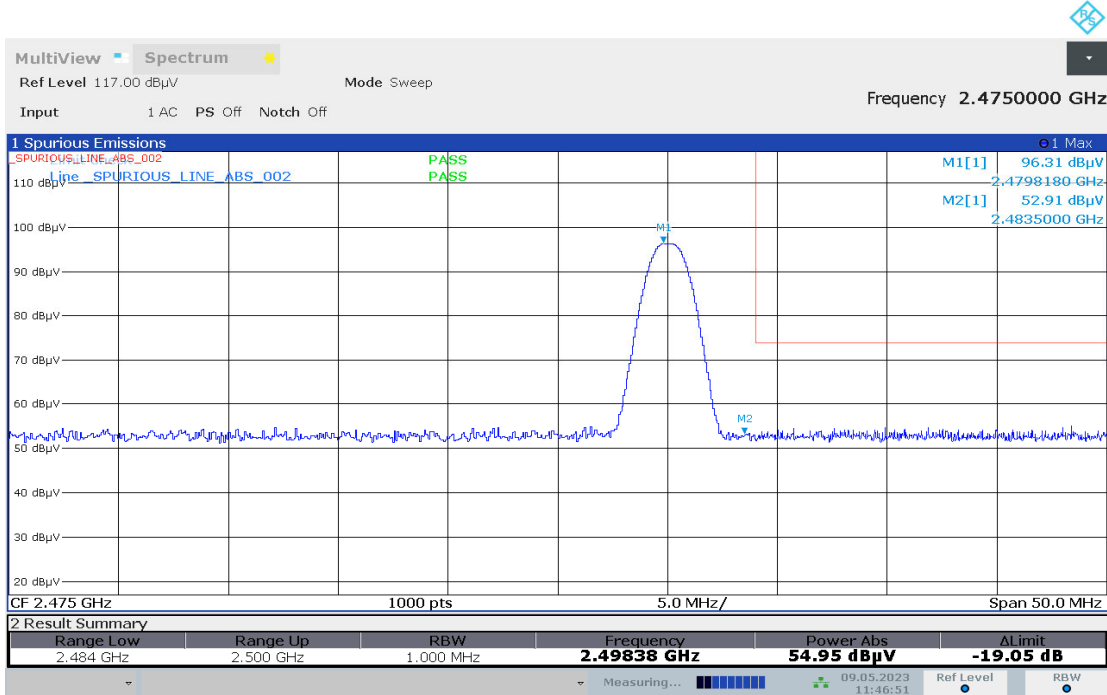
11:21:35 09.05.2023

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



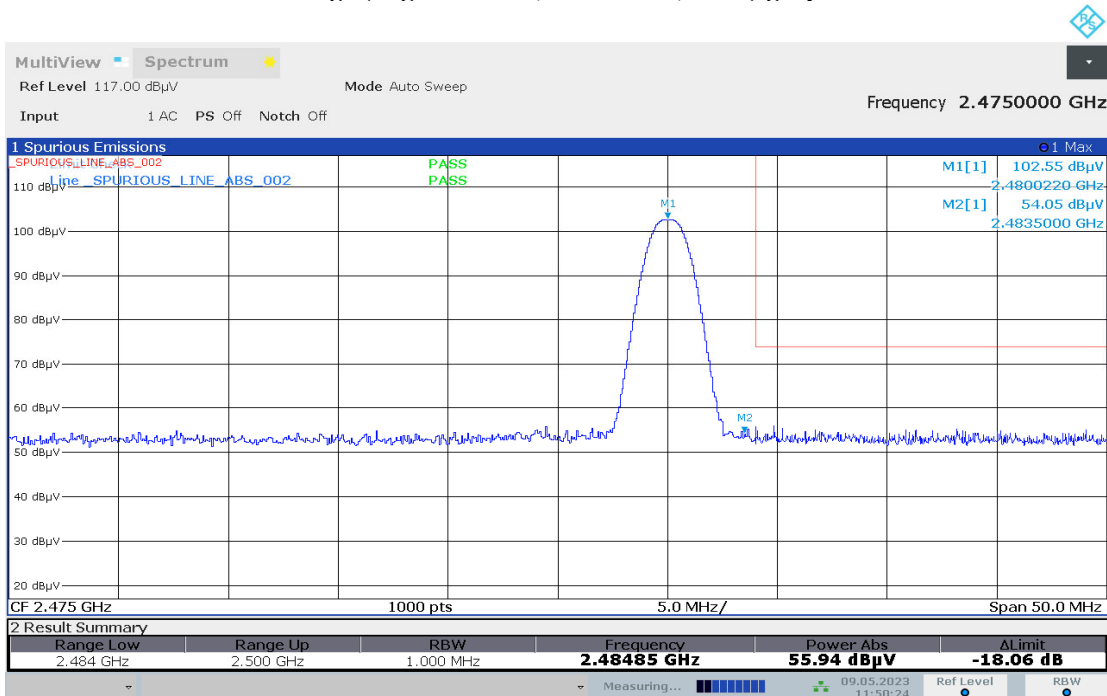
11:25:10 09.05.2023

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



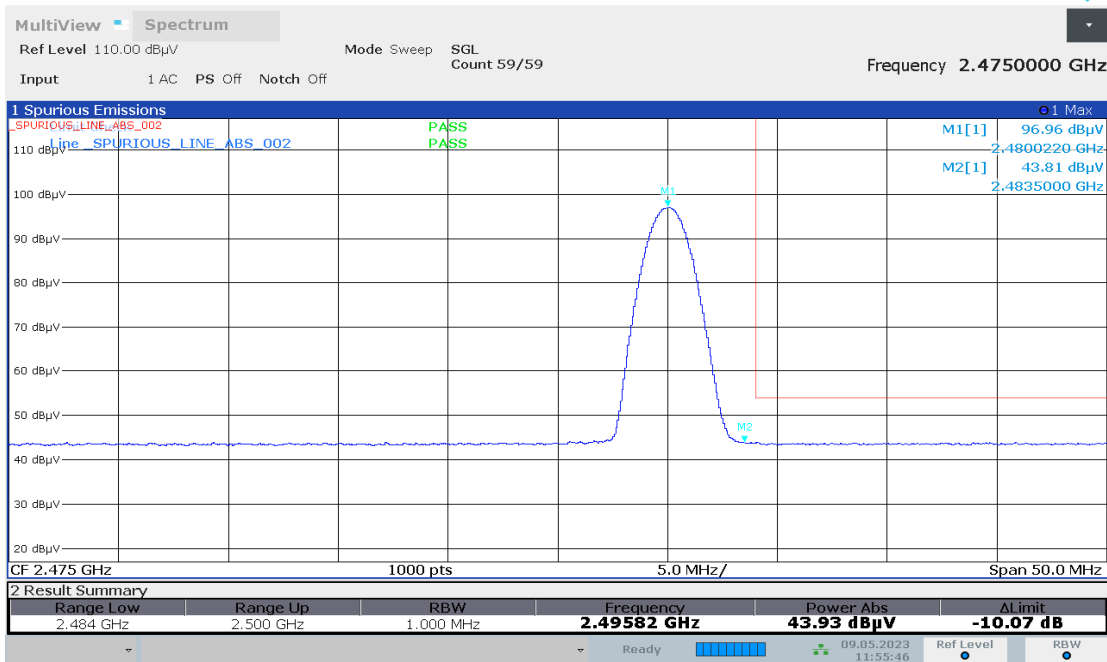
11:46:51 09.05.2023

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



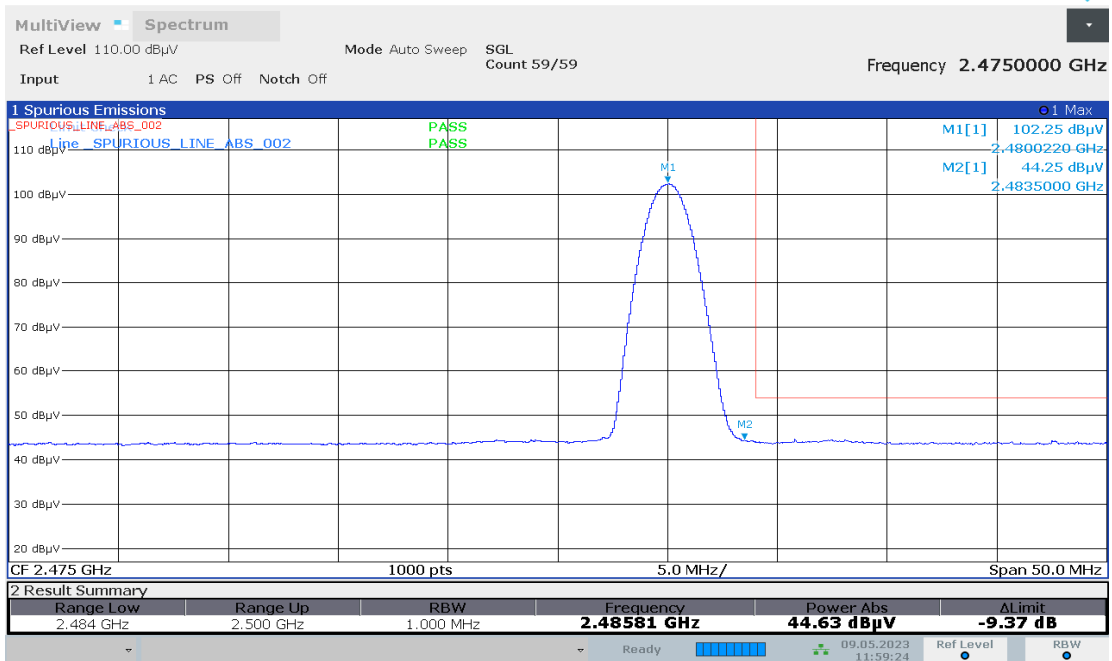
11:50:25 09.05.2023

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



11:55:46 09.05.2023

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



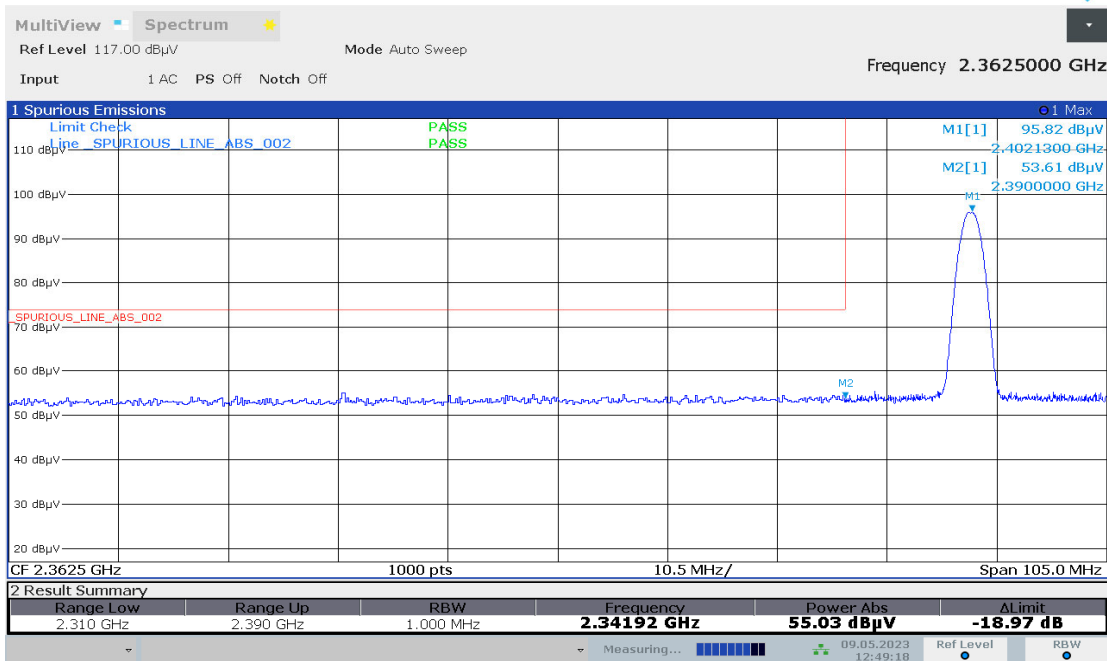
11:59:25 09.05.2023

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



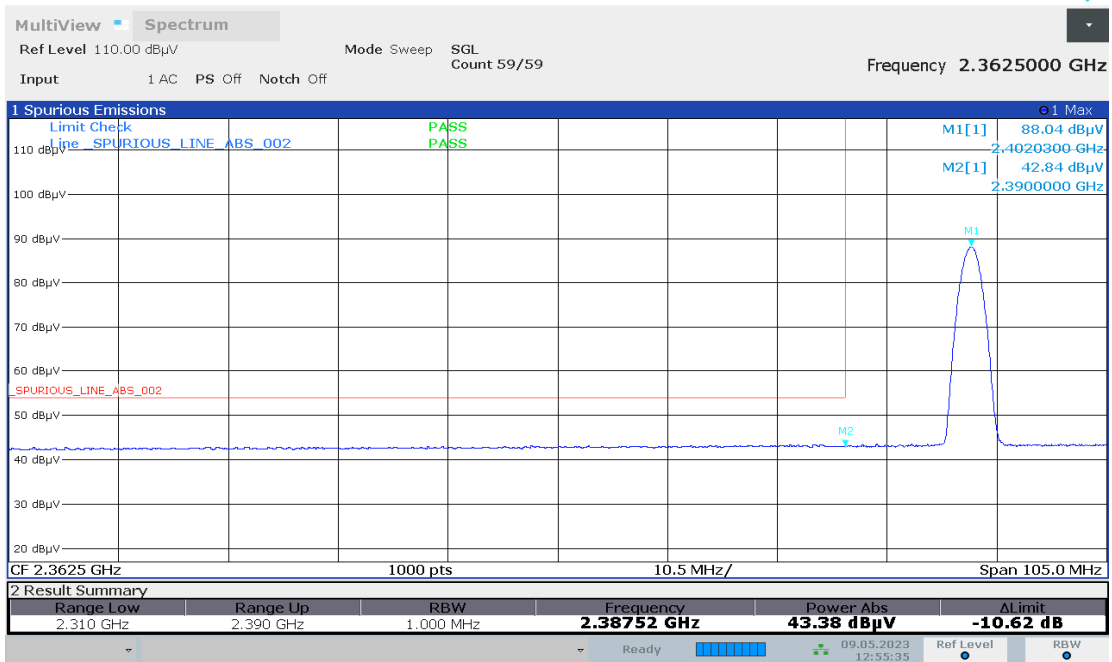
12:45:30 09.05.2023

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



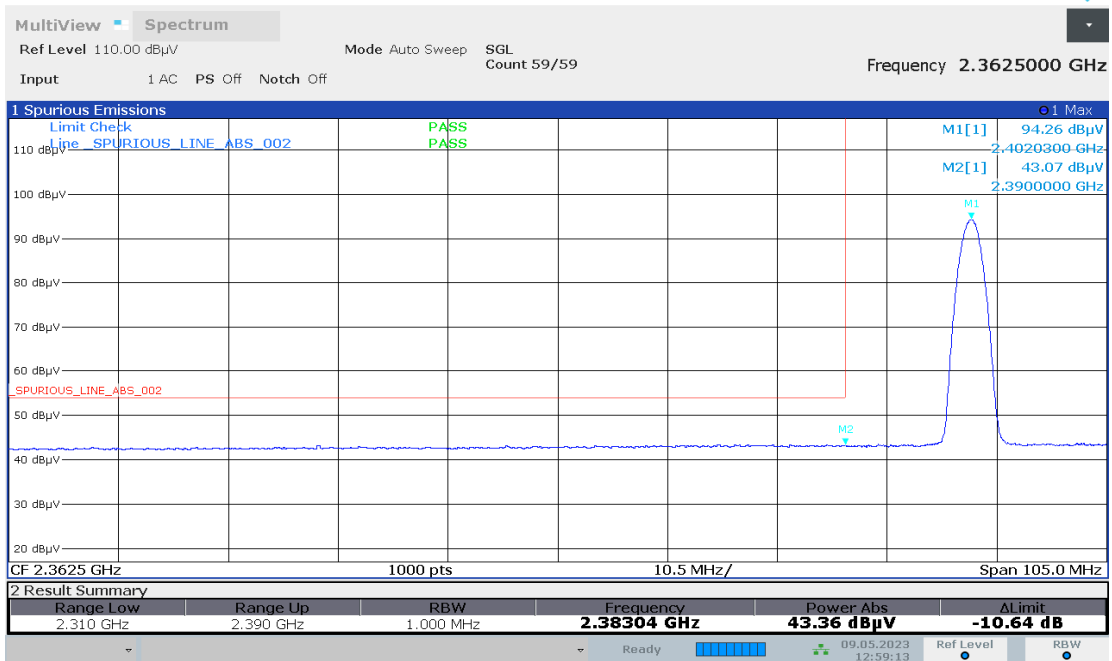
12:49:18 09.05.2023

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



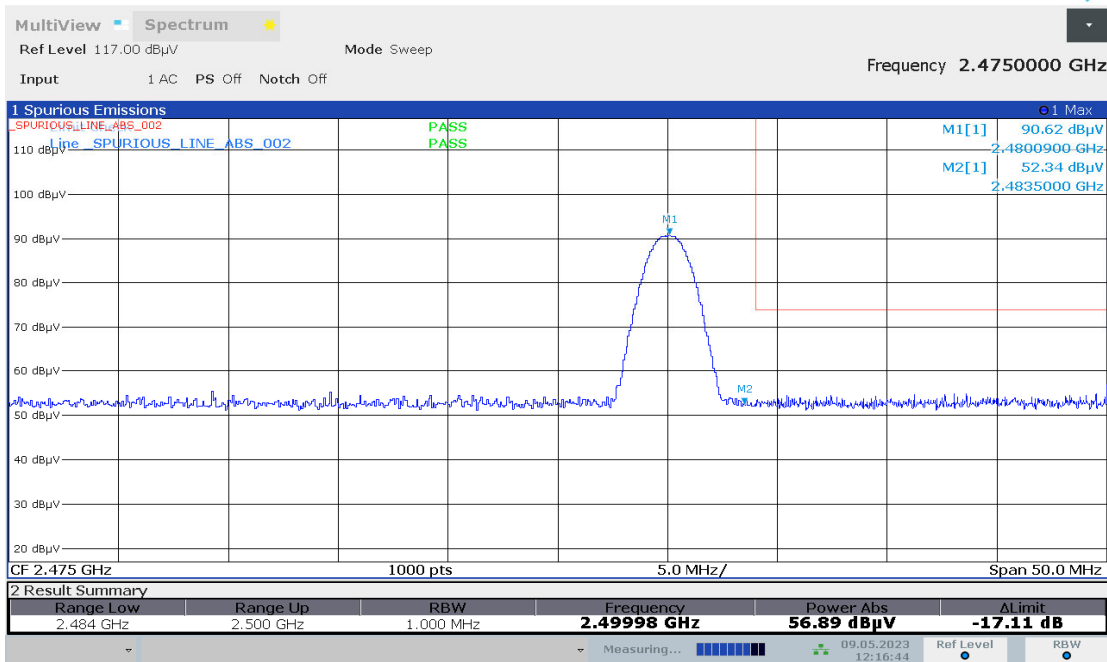
12:55:36 09.05.2023

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



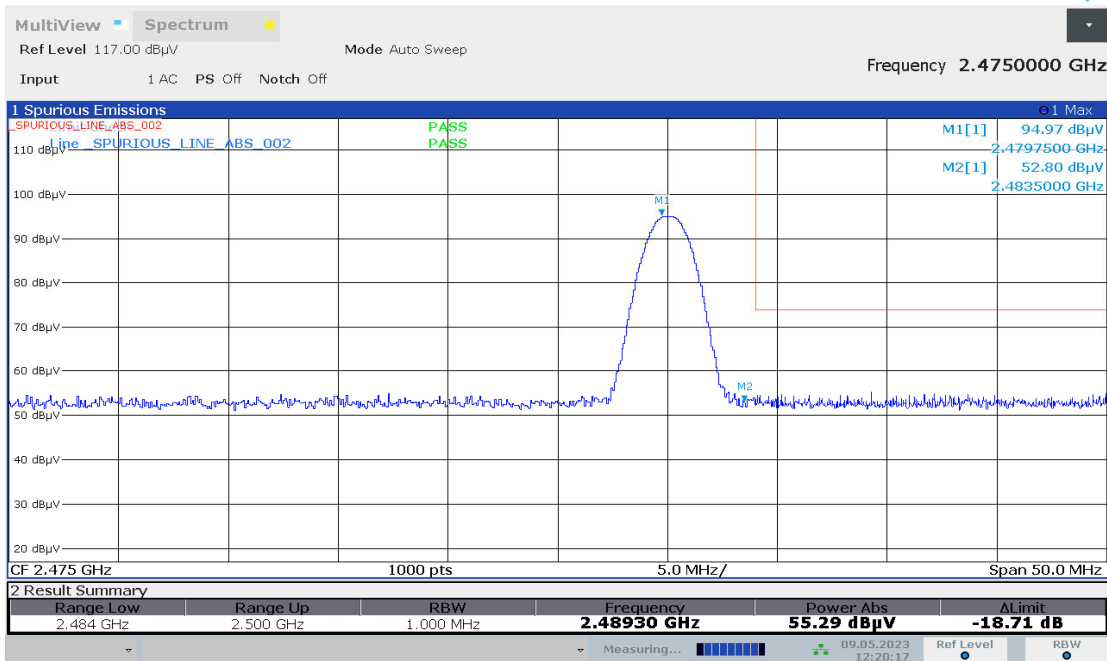
12:59:14 09.05.2023

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



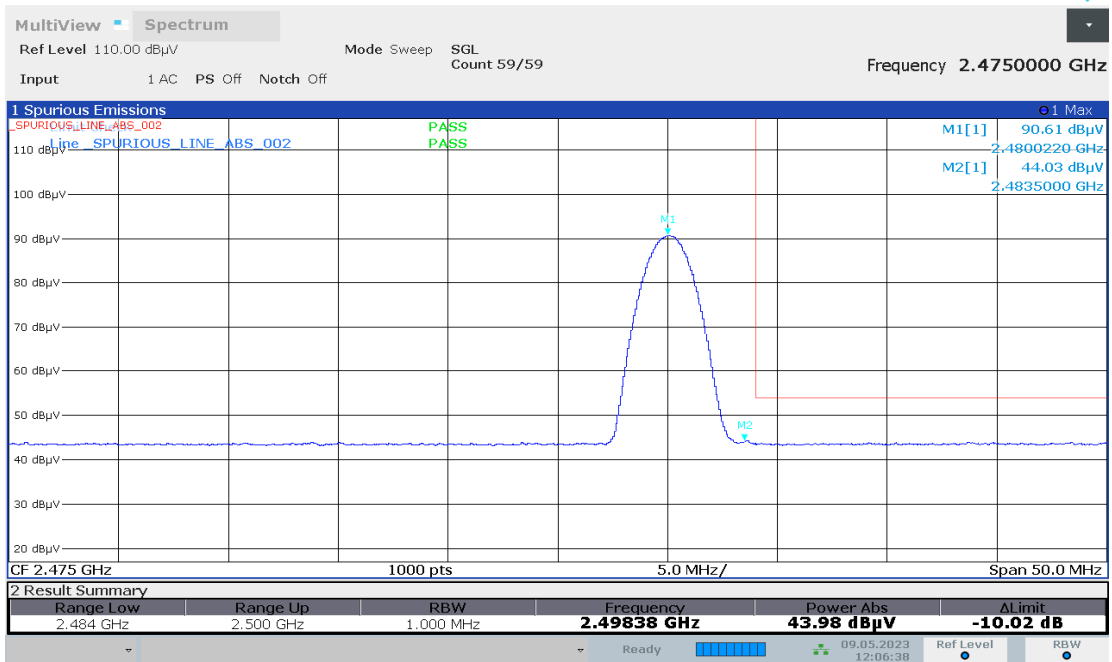
12:16:44 09.05.2023

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



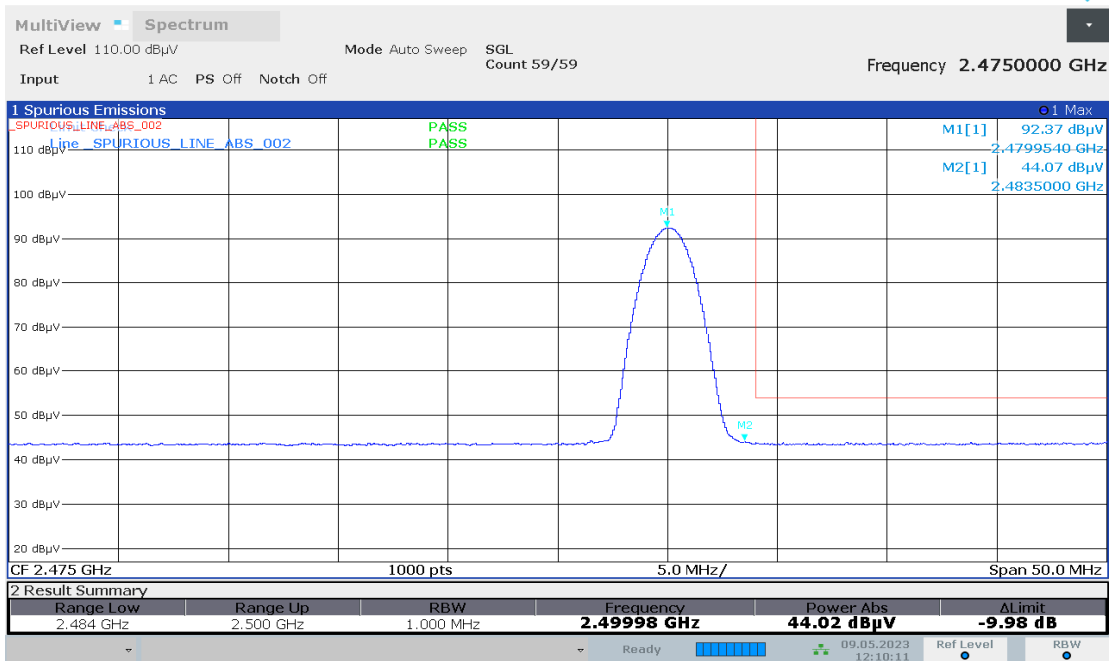
12:20:17 09.05.2023

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



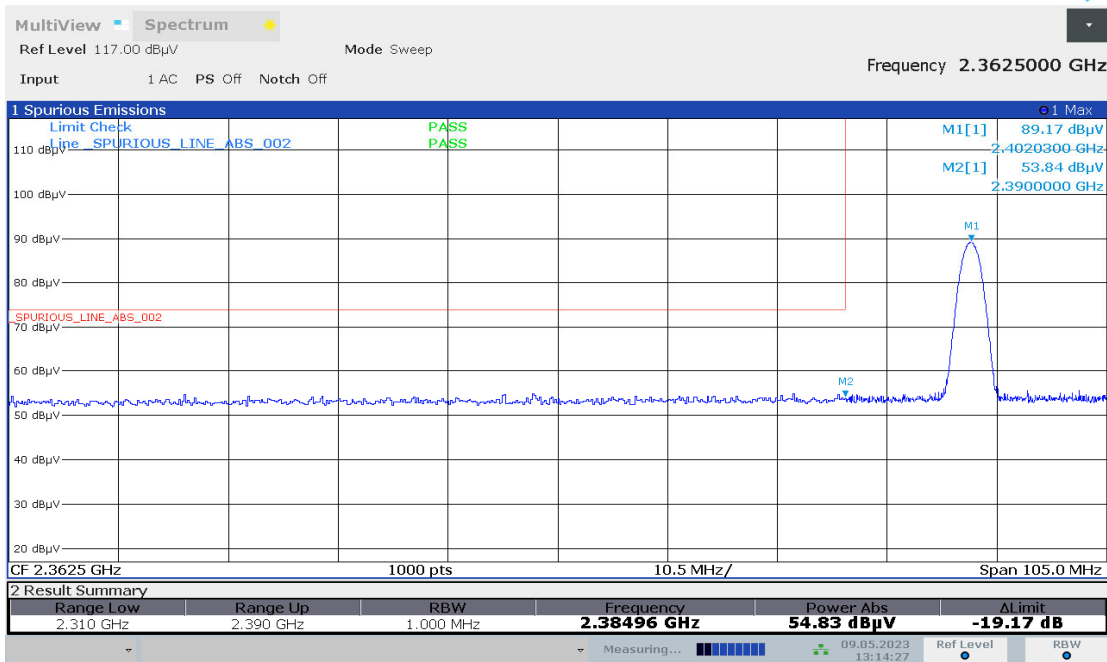
12:06:38 09.05.2023

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



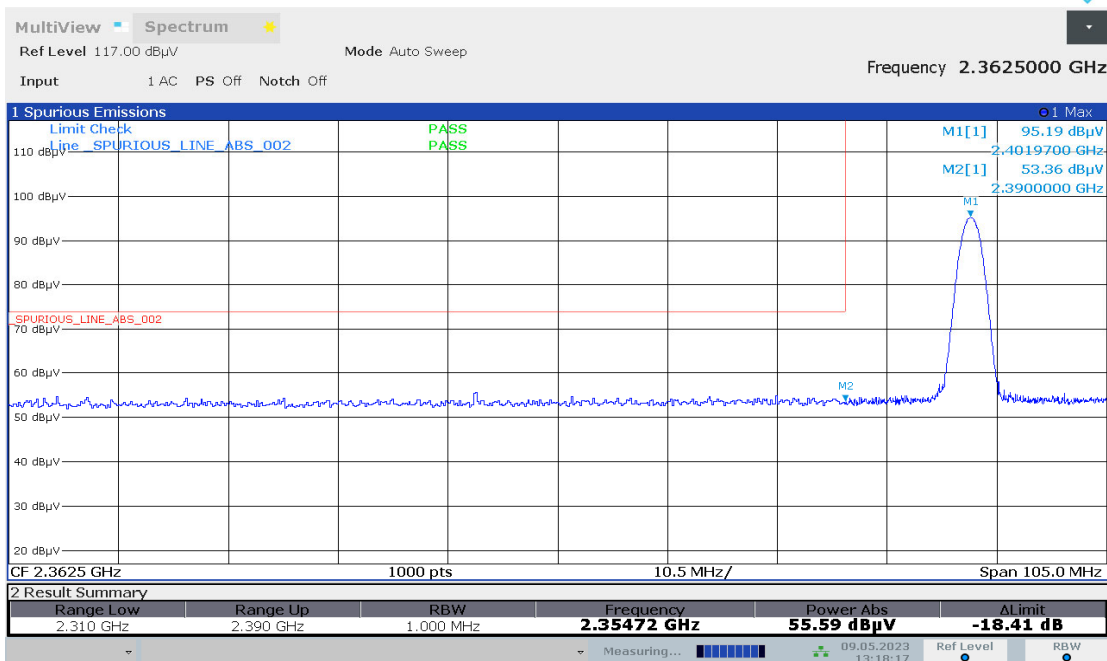
12:10:12 09.05.2023

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



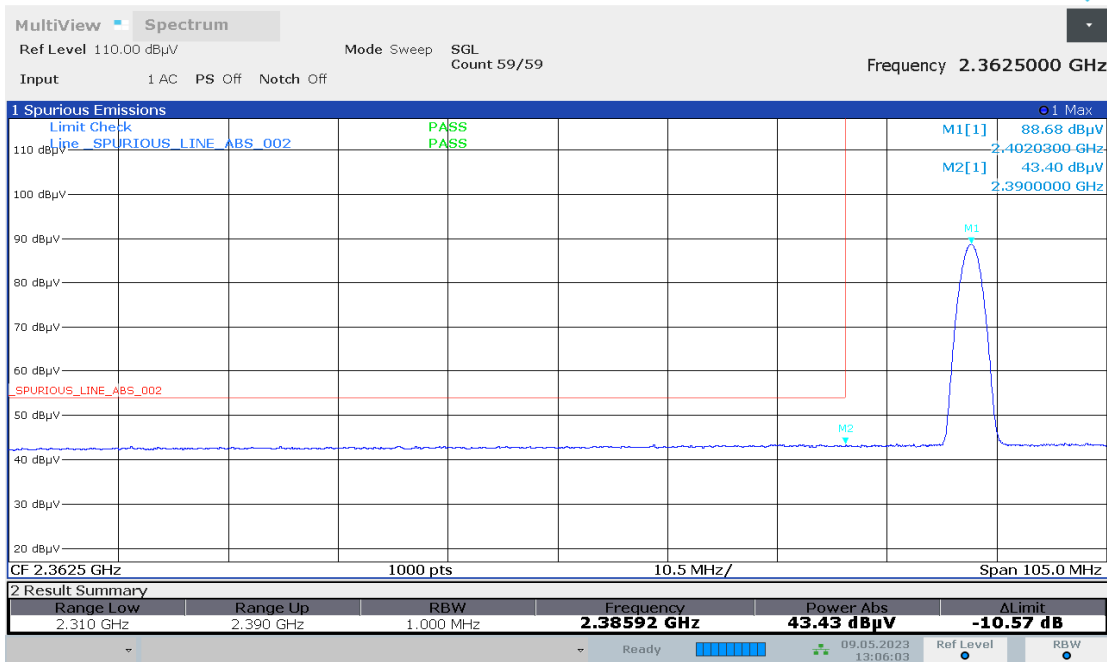
13:14:27 09.05.2023

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



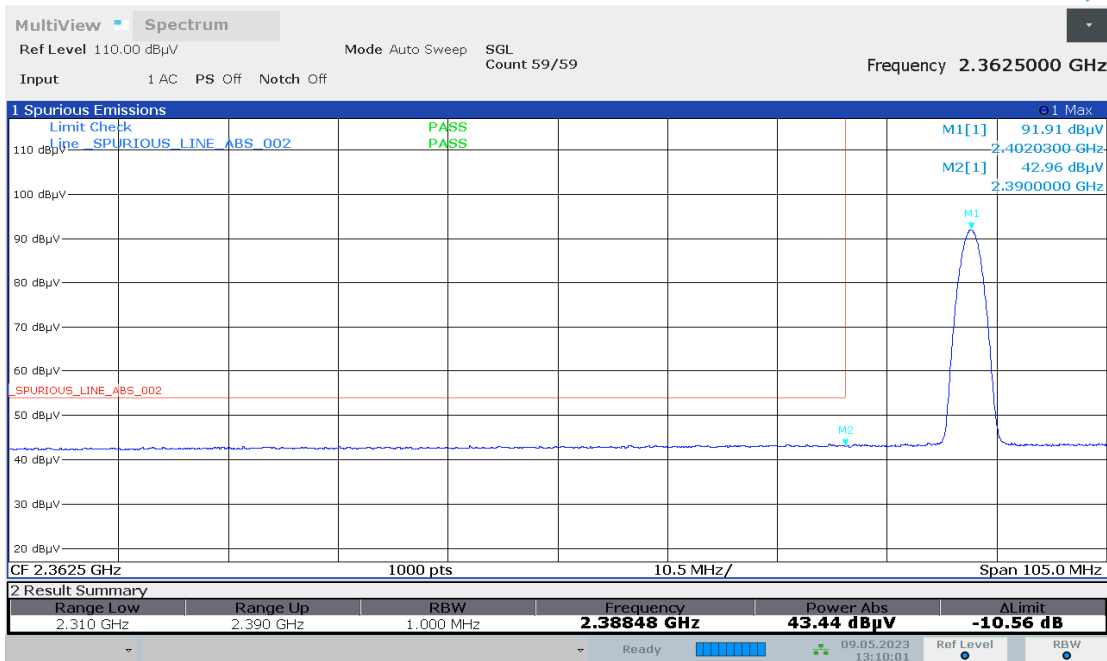
13:18:17 09.05.2023

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



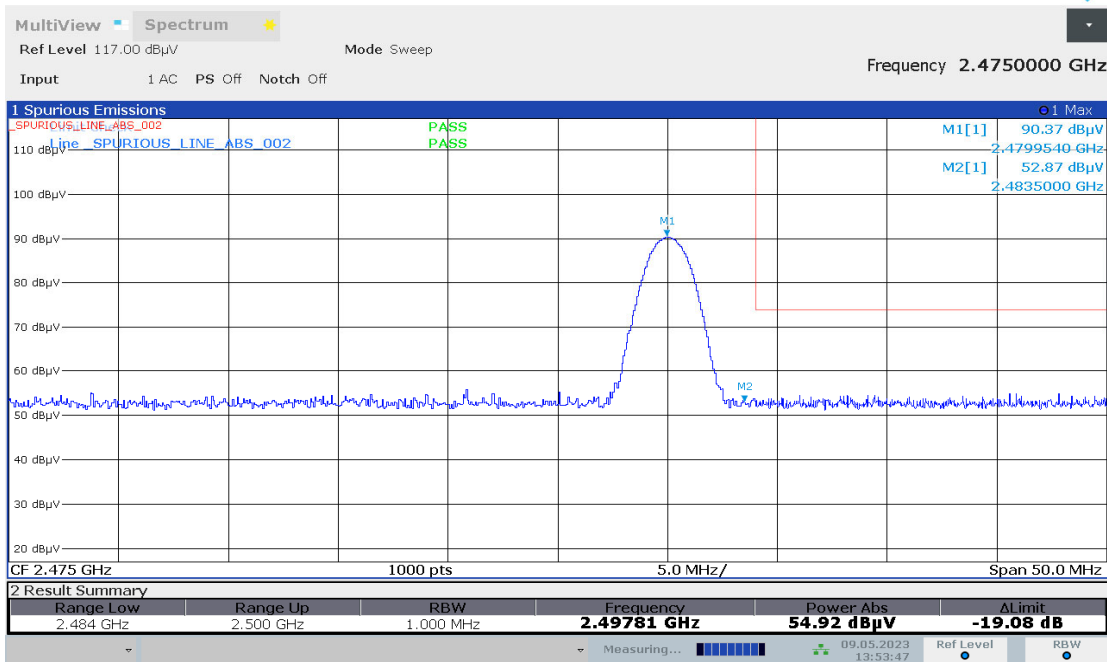
13:06:03 09.05.2023

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



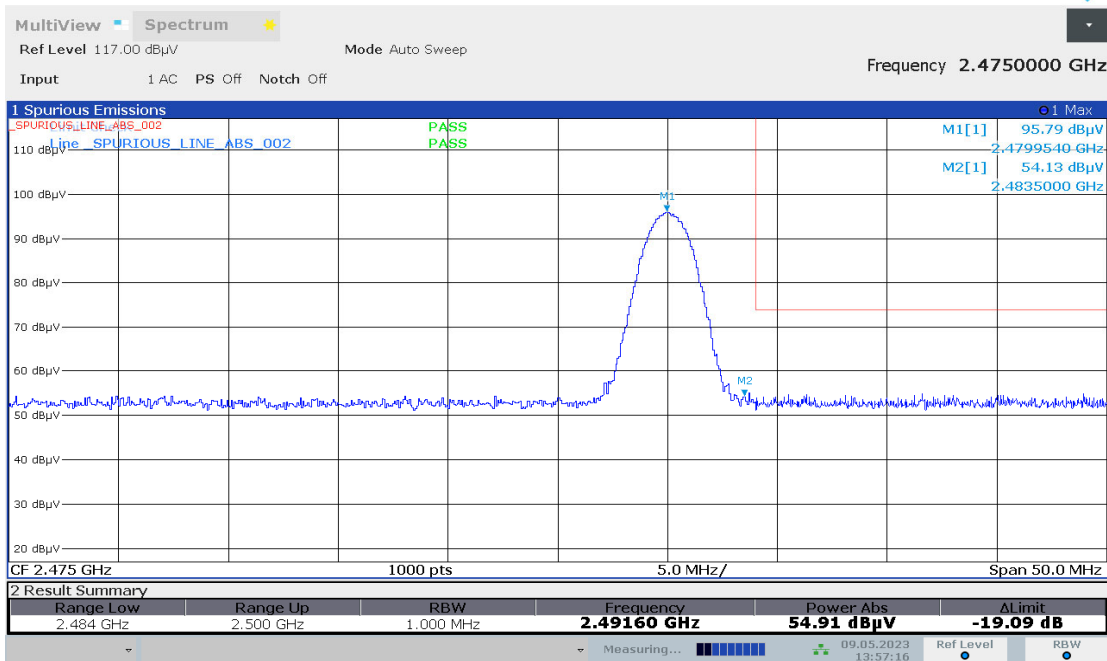
13:10:02 09.05.2023

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



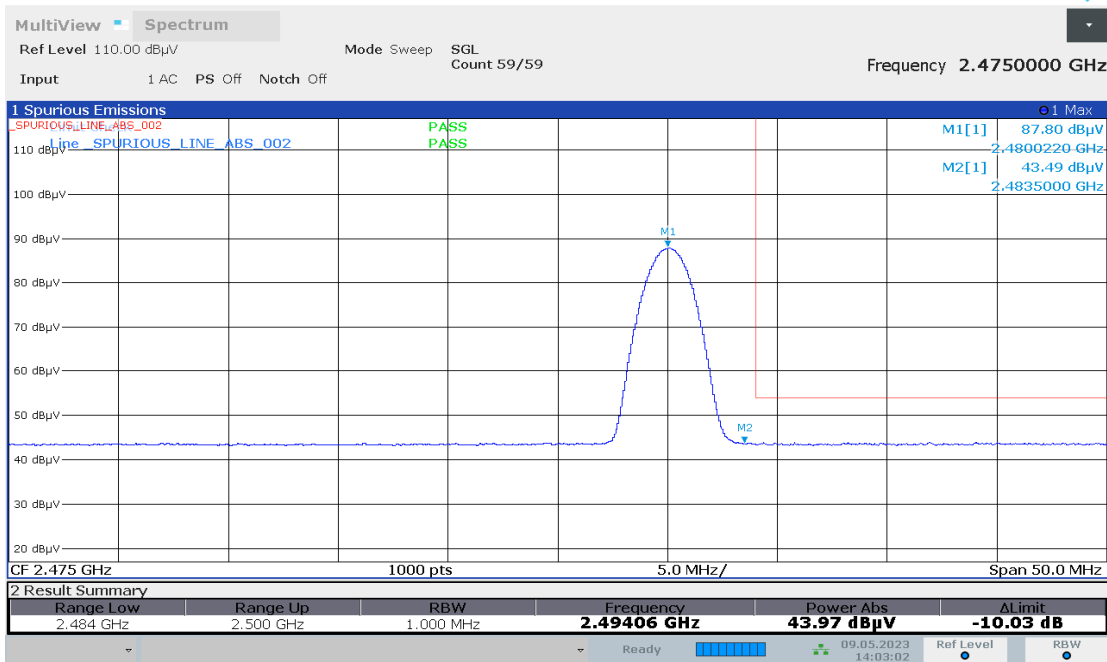
13:53:48 09.05.2023

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



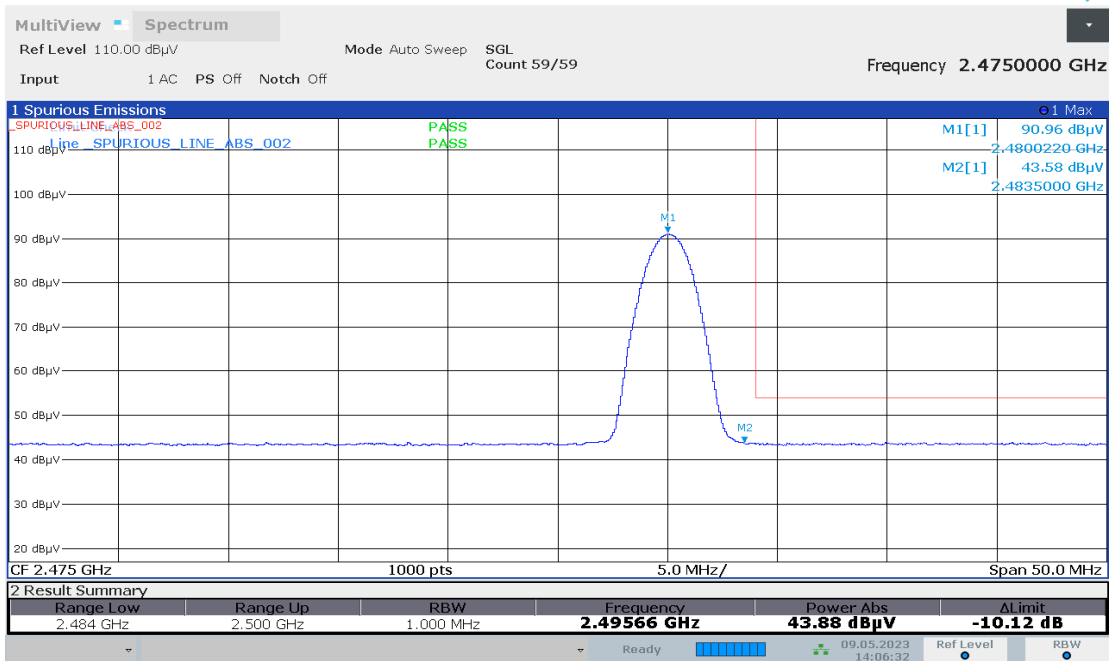
13:57:17 09.05.2023

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

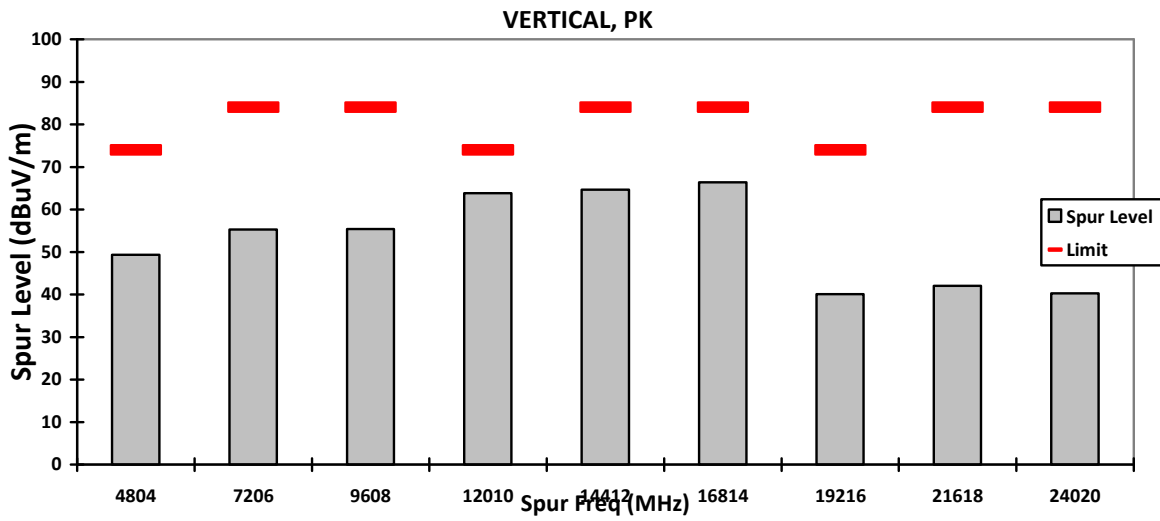
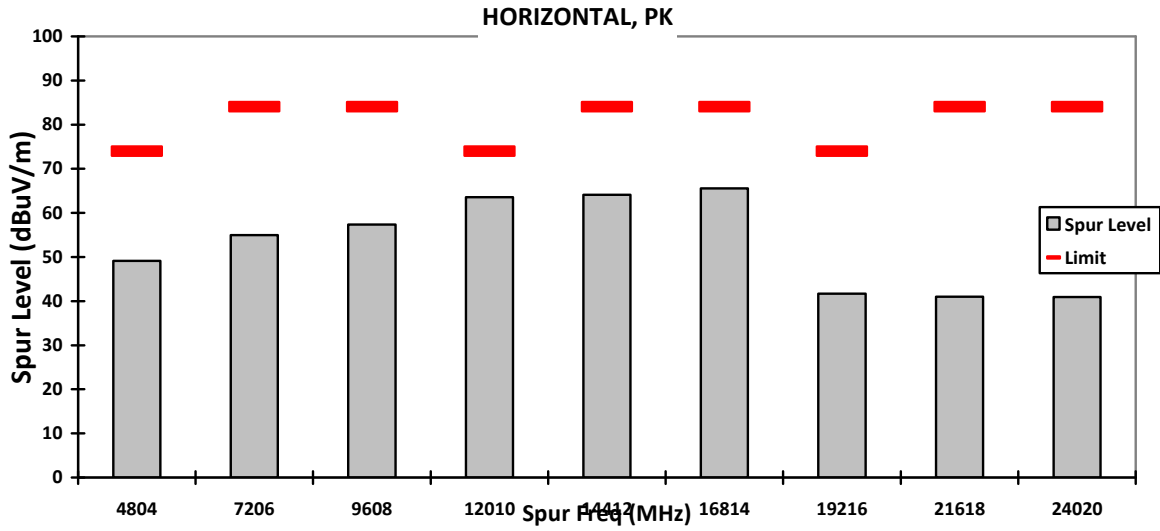


14:03:02 09.05.2023

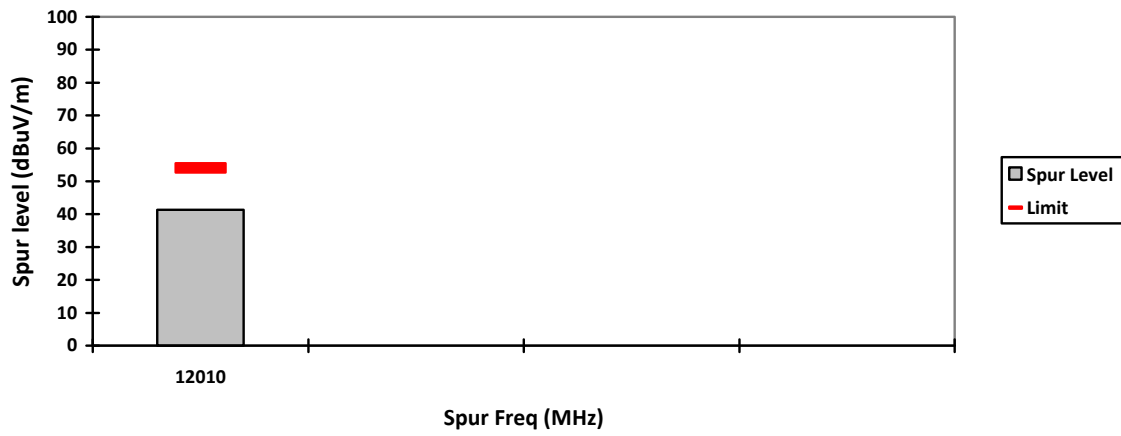
Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot



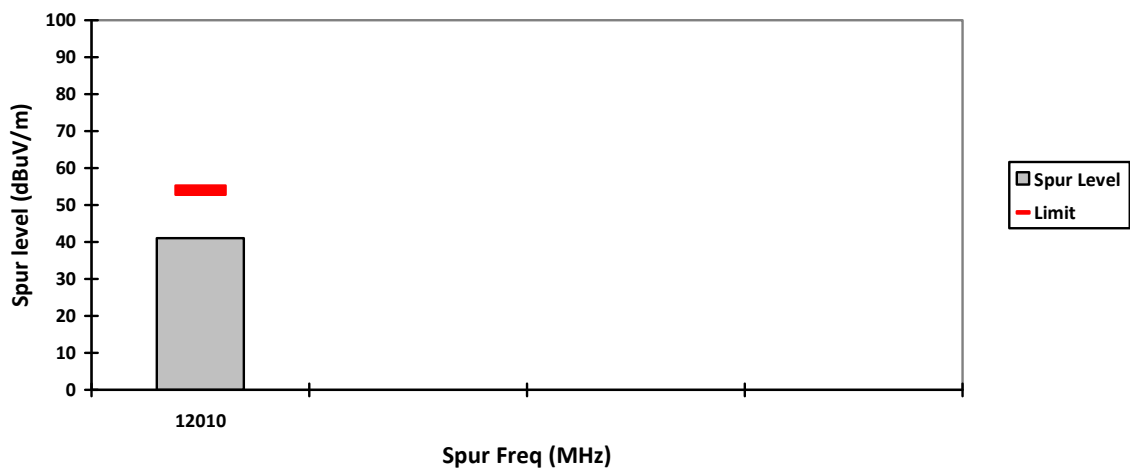
14:06:32 09.05.2023

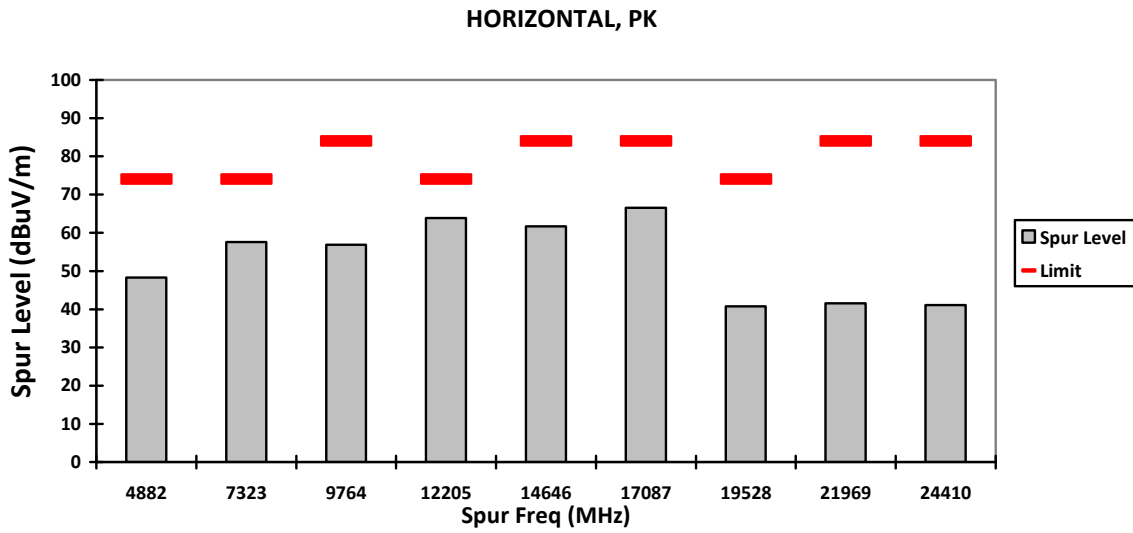
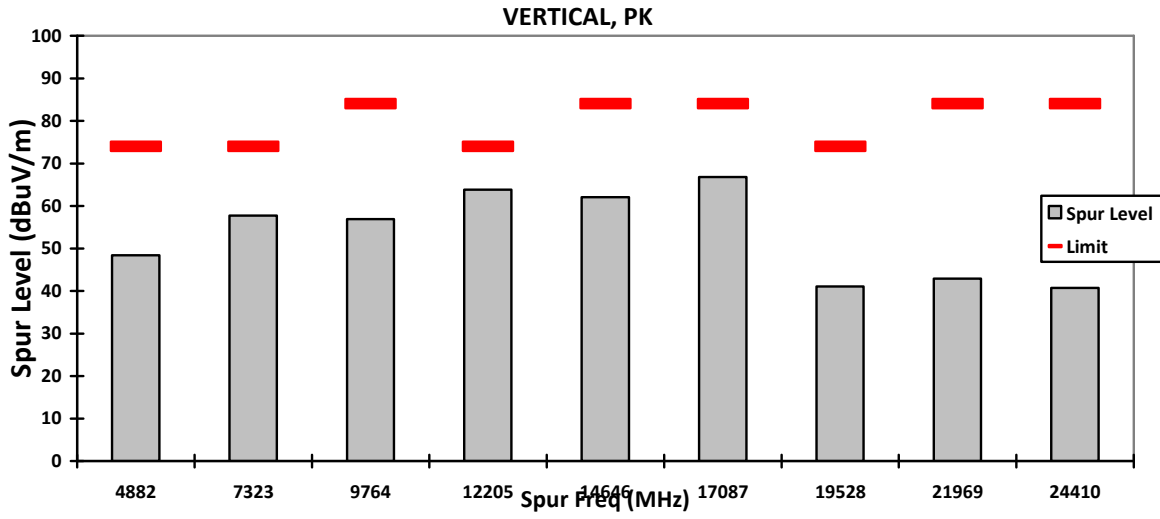


VERTICAL, AV

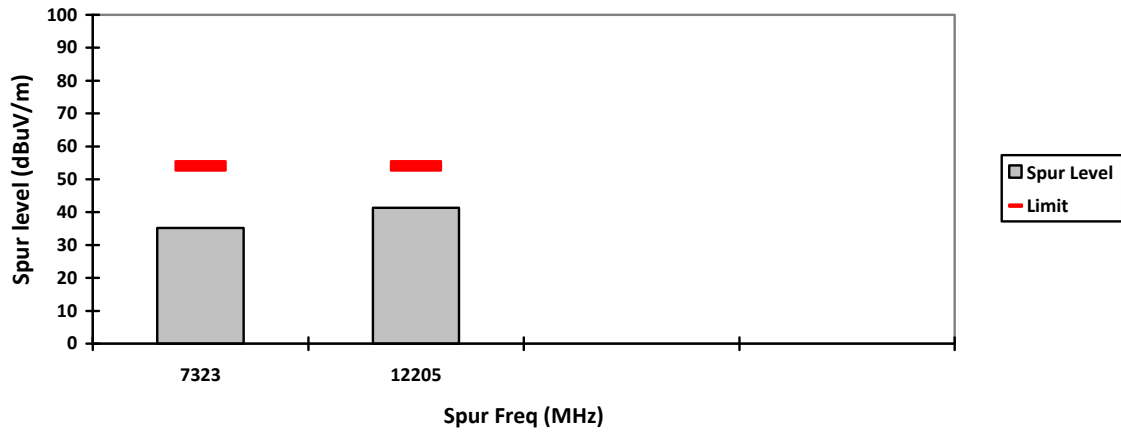


HORIZONTAL, AV

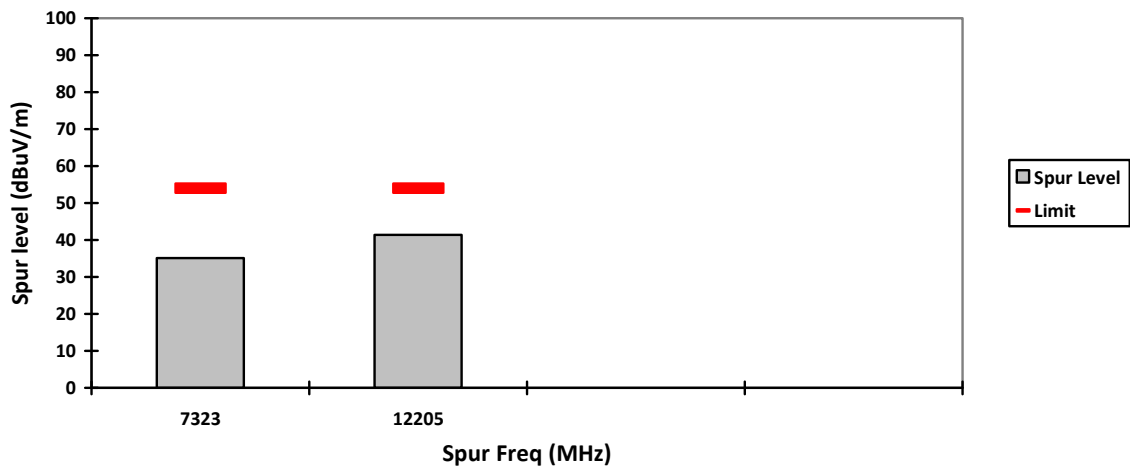


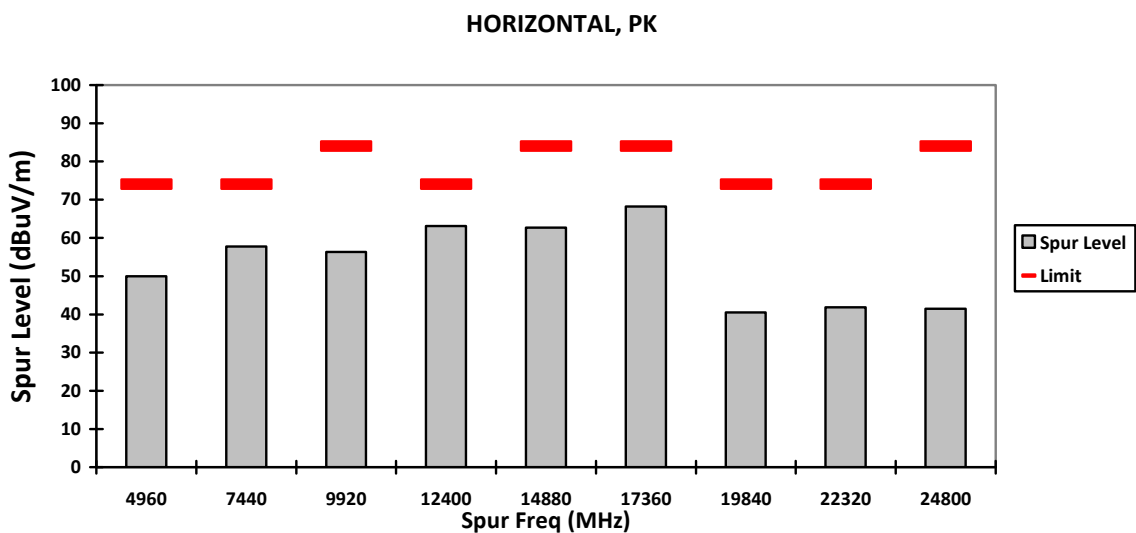
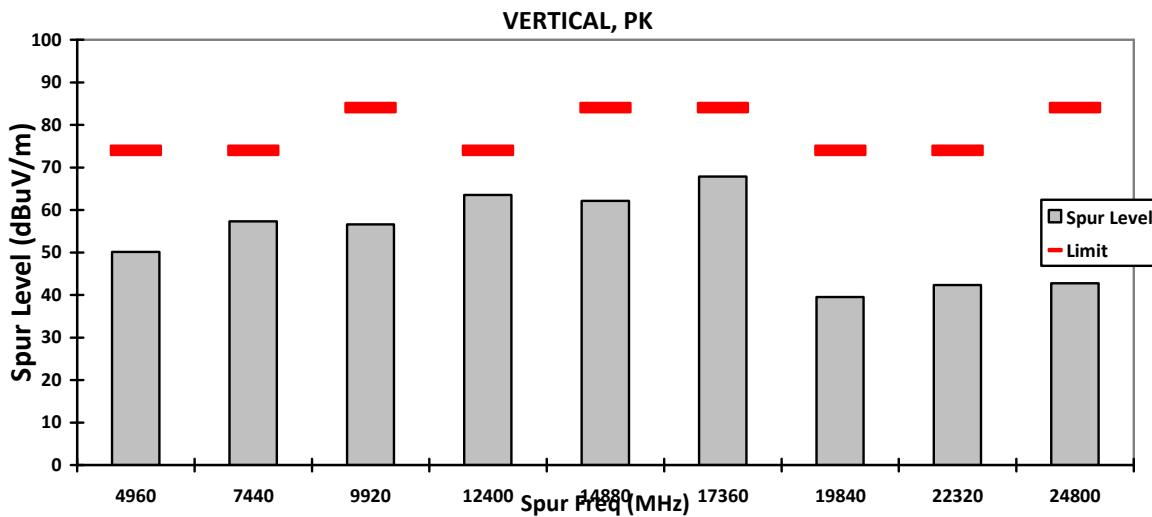


VERTICAL, AV

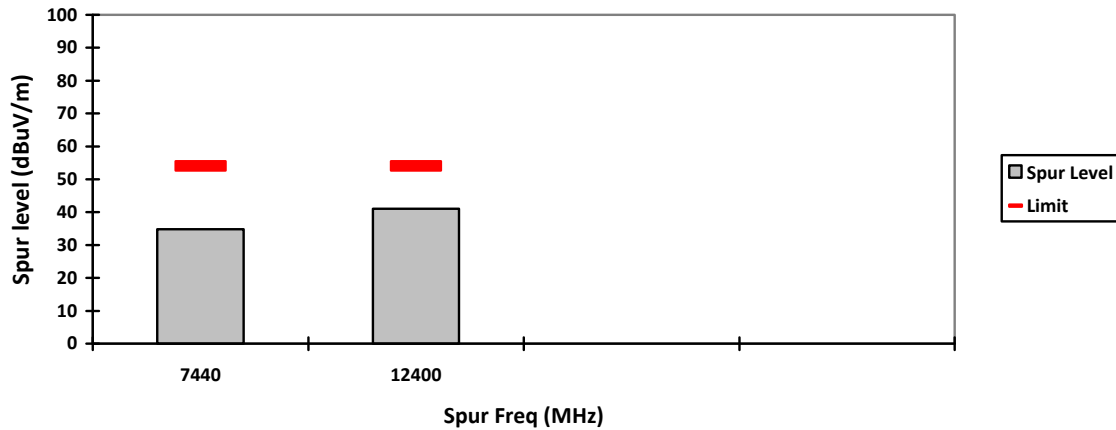


HORIZONTAL, AV

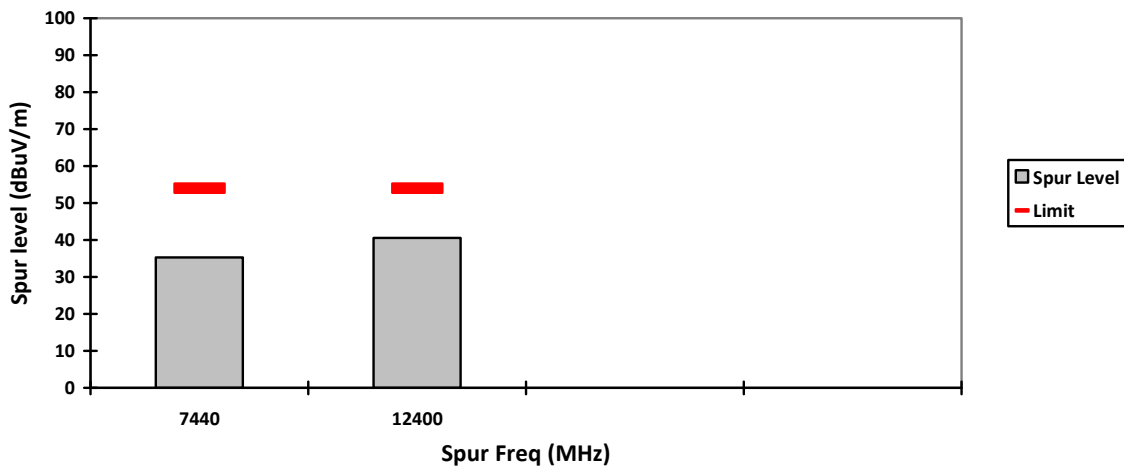




VERTICAL, AV



HORIZONTAL, AV

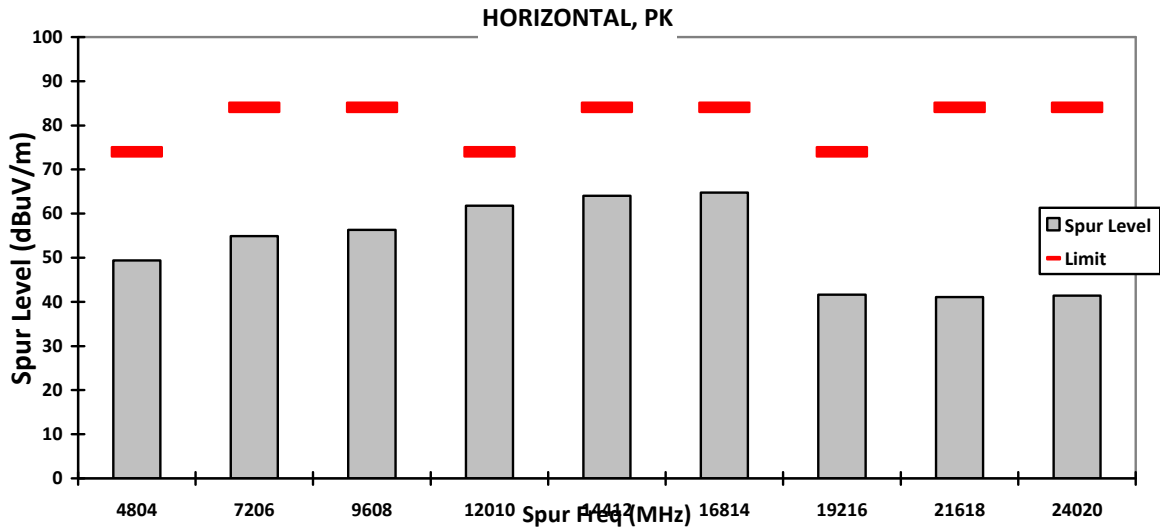
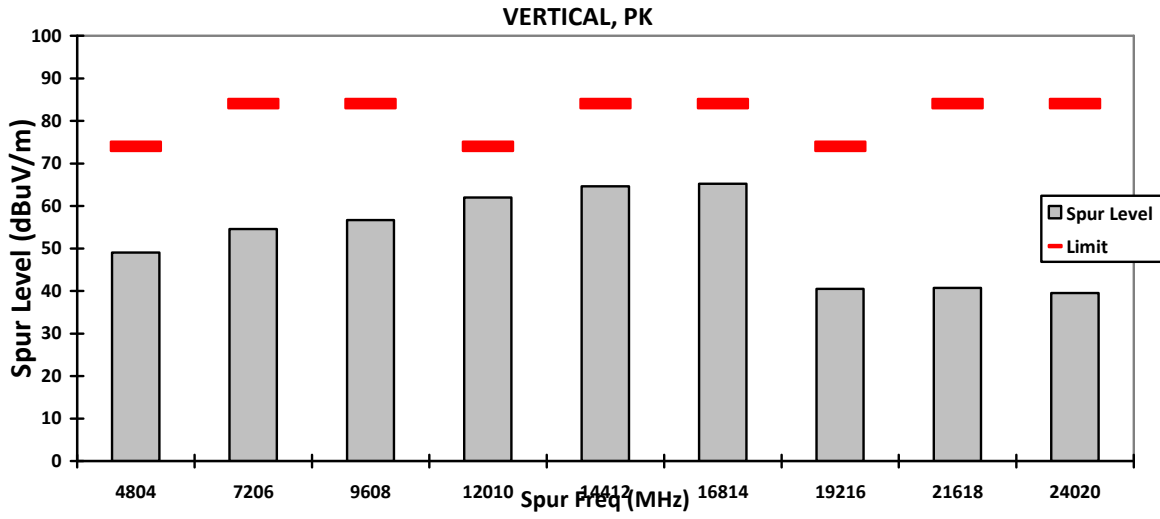


NOTE:

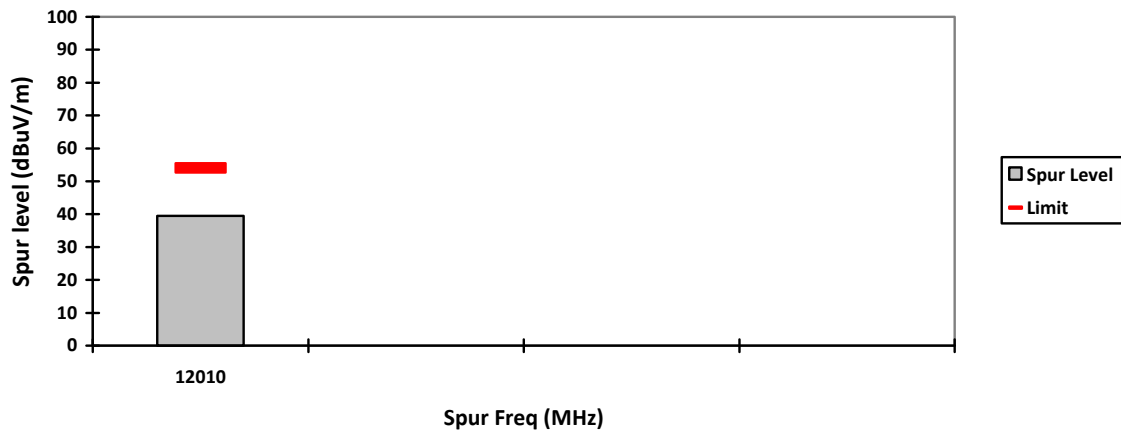
Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b,c)

Based on the Bluetooth Specification Version 2.1+EDR, and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

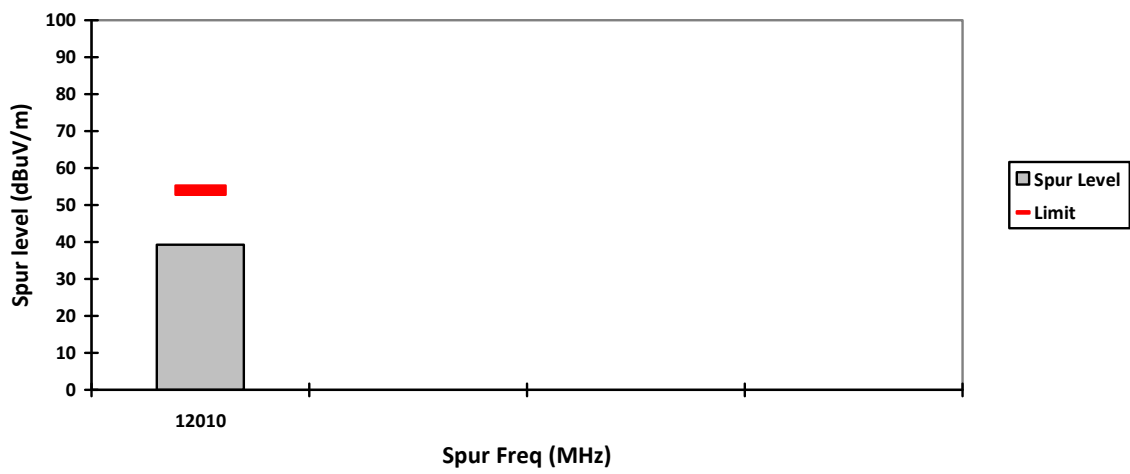
Channel hop rate = 800 hops/second (AFH Mode)
Adjusted channel hop rate for DH5 mode = 133.33 hops/second
Time per channel hop = $1 / 133.33 \text{ hops/second} = 7.5 \text{ ms}$
Time to cycle through all channels = $7.5 \times 20 \text{ channels} = 150 \text{ ms}$
Number of times transmitter hits on one channel = $100 \text{ ms} / 150 \text{ ms} = 1 \text{ time(s)}$
Worst case dwell time = 7.5 ms
Duty cycle connection factor = $20\log_{10} (7.5\text{ms} / 100\text{ms}) = -22.5 \text{ dB}$

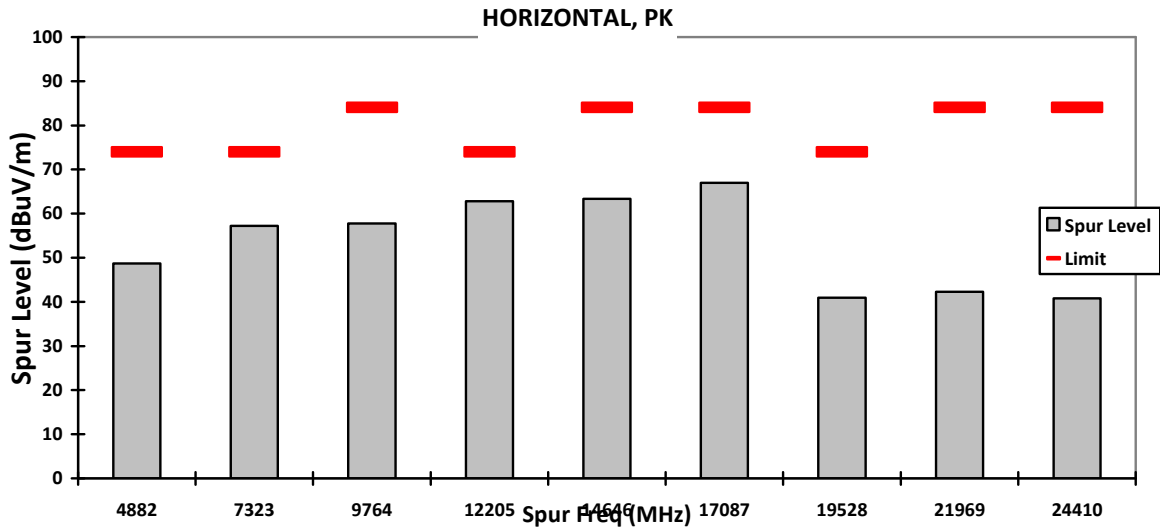
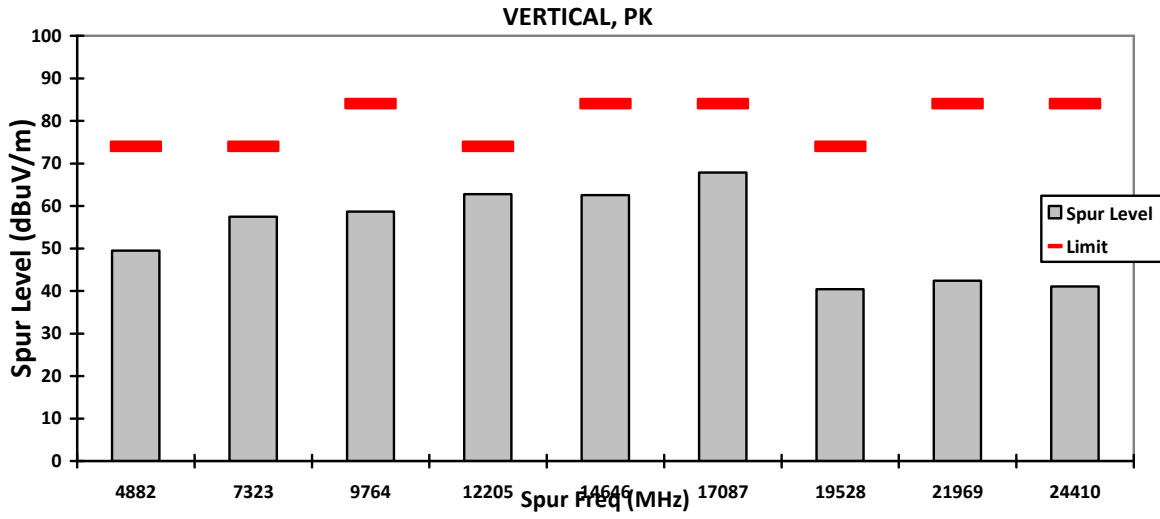


VERTICAL, AV

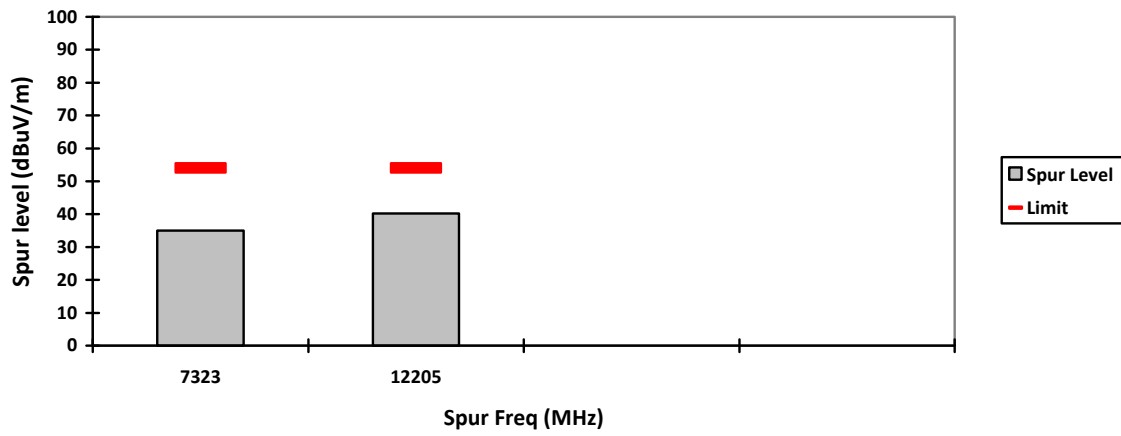


HORIZONTAL, AV

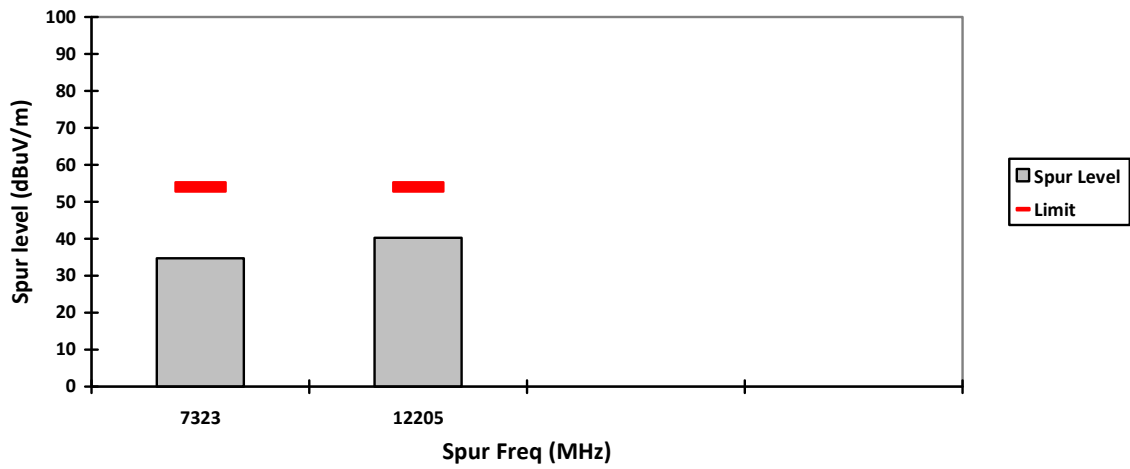


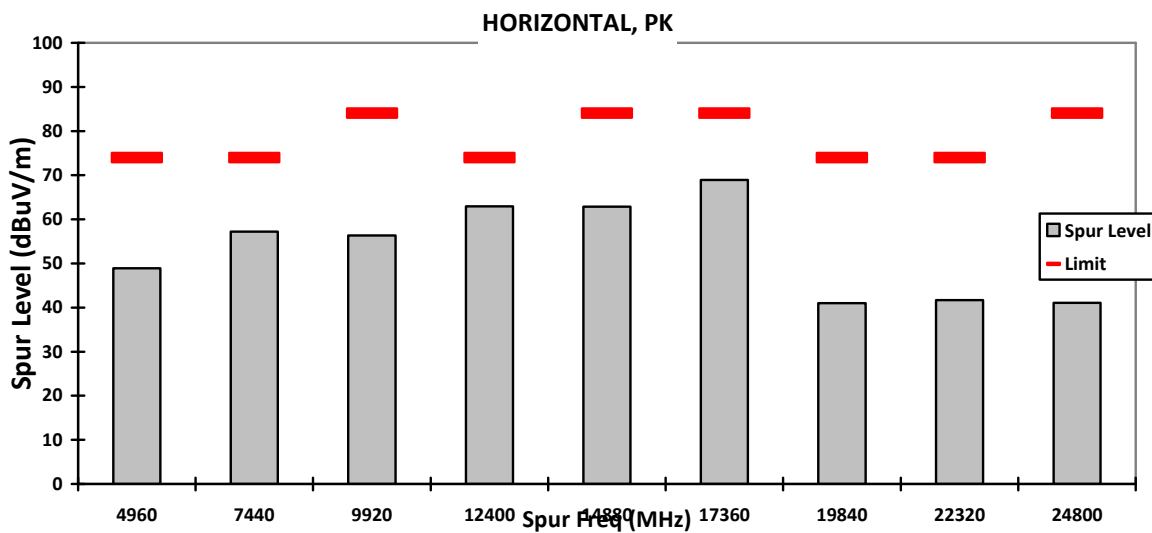
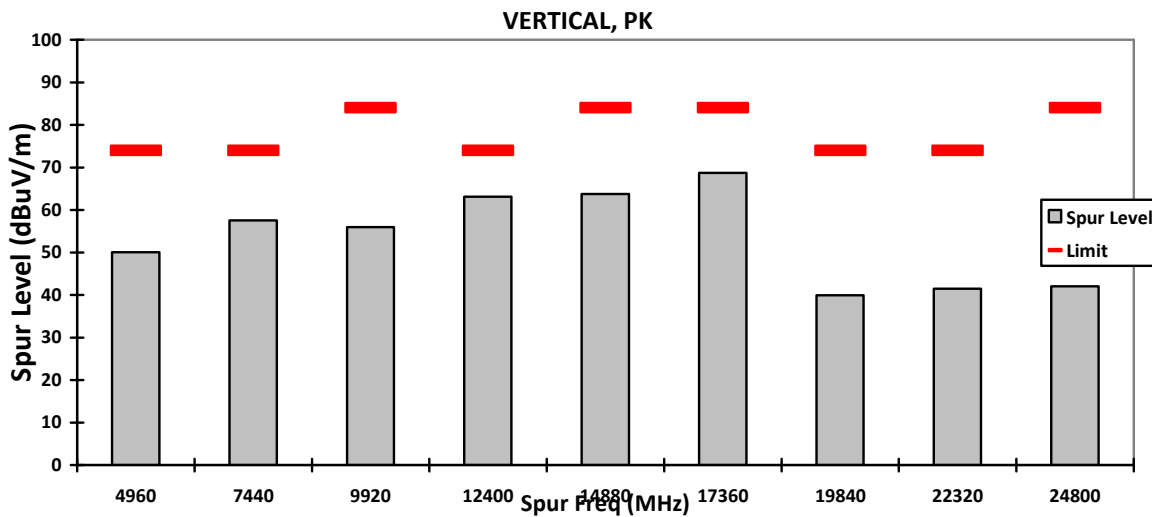


VERTICAL, AV

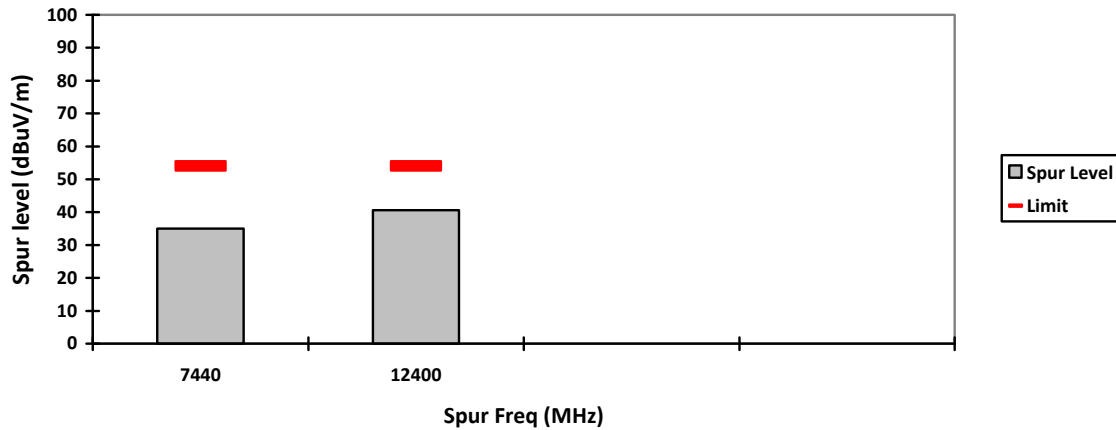


HORIZONTAL, AV

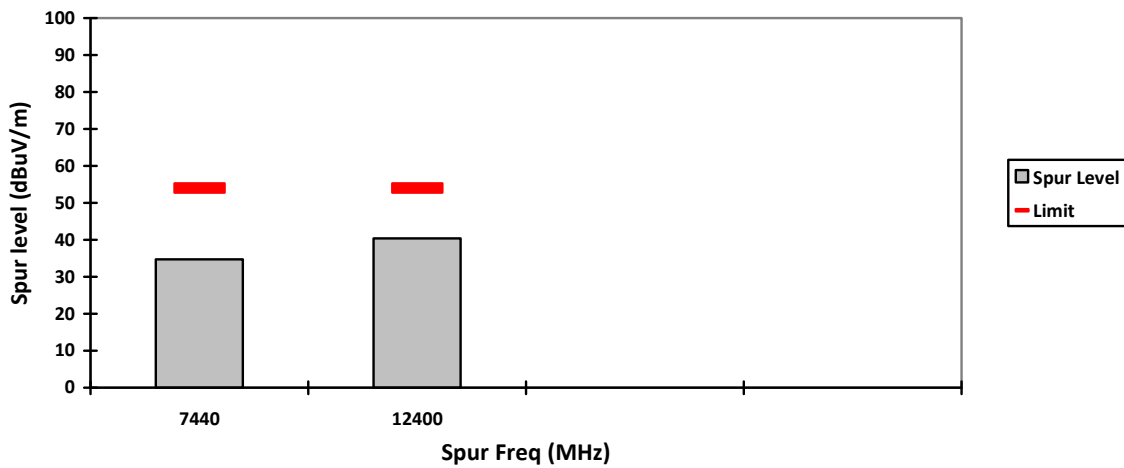




VERTICAL, AV



HORIZONTAL, AV

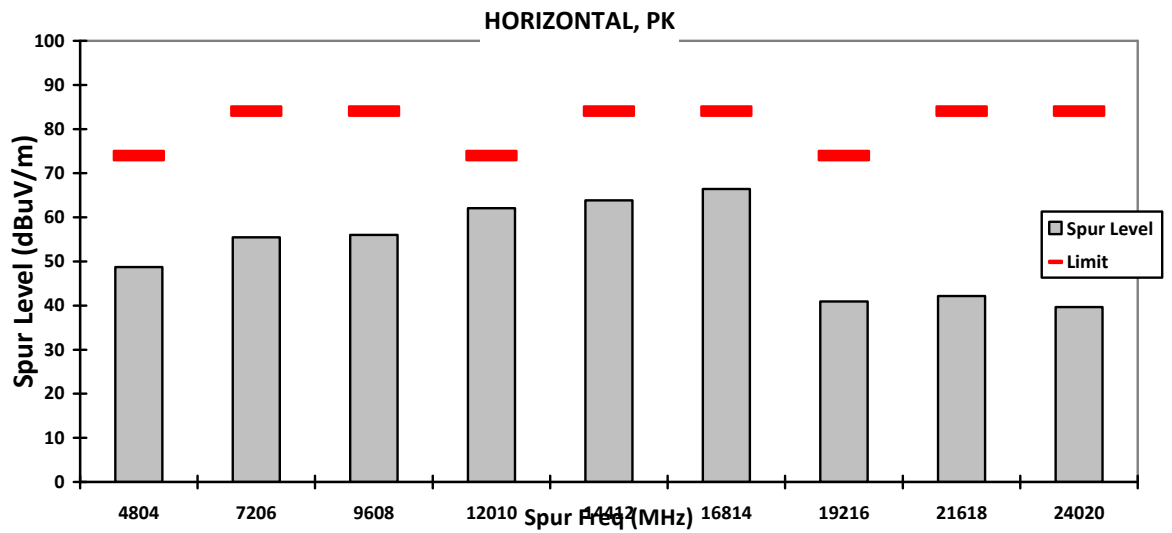
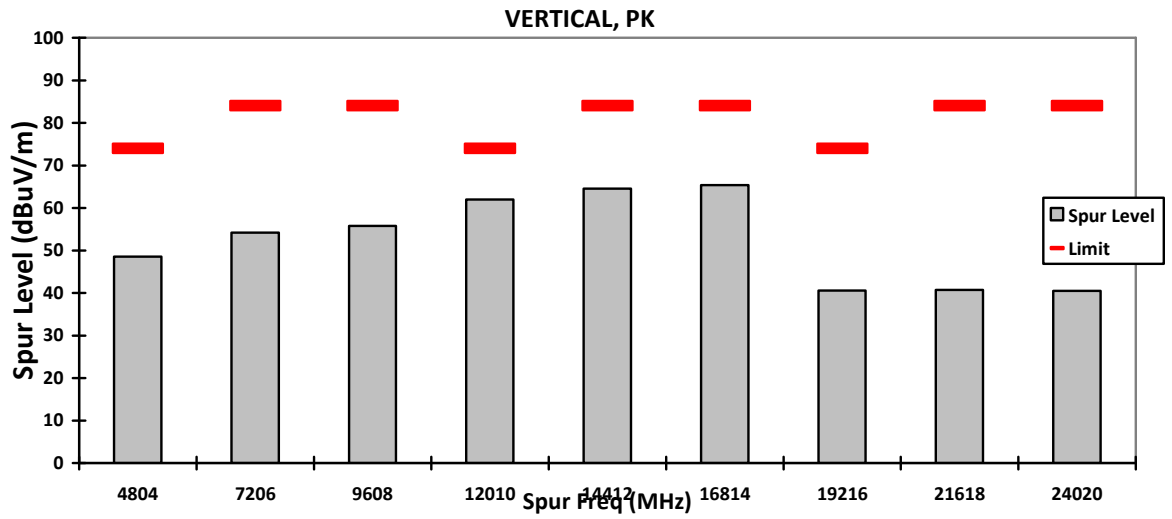


NOTE:

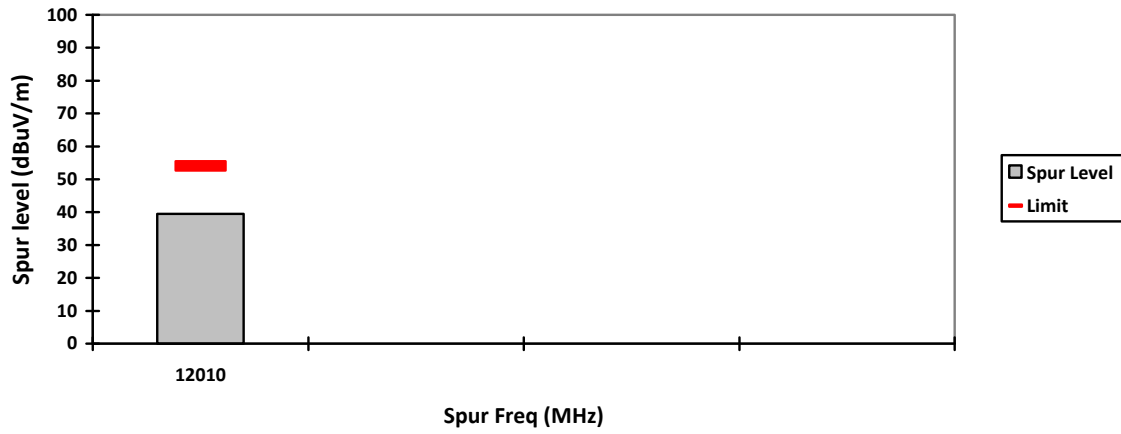
Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b,c)

Based on the Bluetooth Specification Version 2.1+EDR, and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

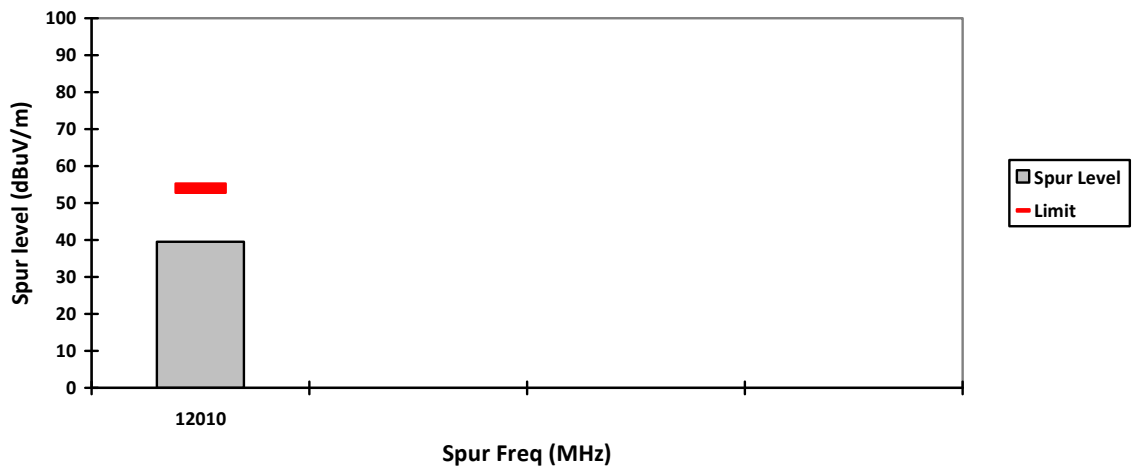
Channel hop rate = 800 hops/second (AFH Mode)
 Adjusted channel hop rate for DH5 mode = 133.33 hops/second
 Time per channel hop = 1 / 133.33 hops/second = 7.5 ms
 Time to cycle through all channels = 7.5 x 20 channels = 150 ms
 Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s)
 Worst case dwell time = 7.5 ms
 Duty cycle connection factor = $20\log_{10}(7.5\text{ms} / 100\text{ms}) = -22.5 \text{ dB}$

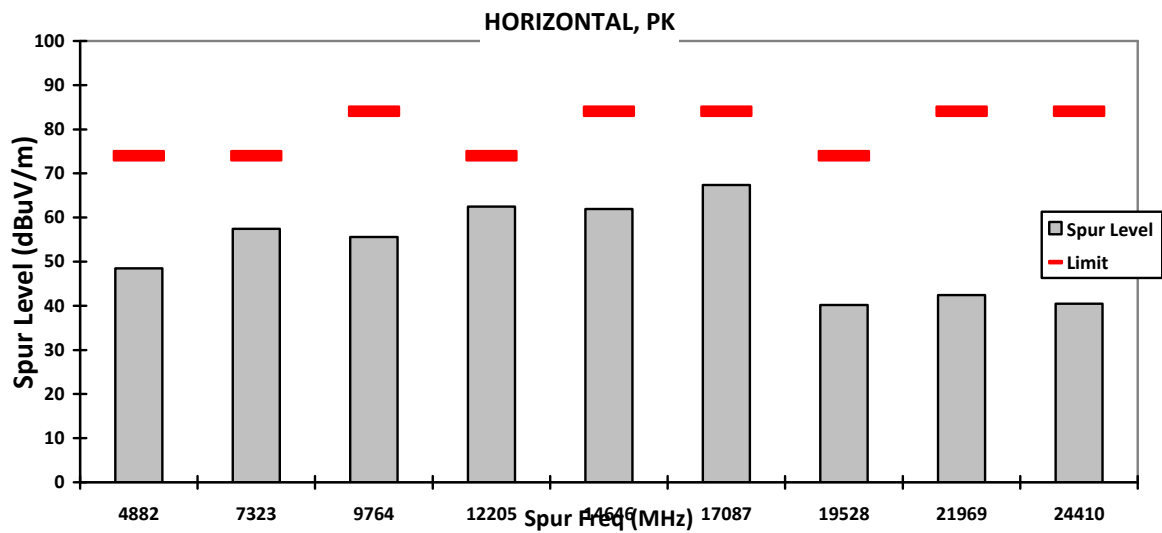
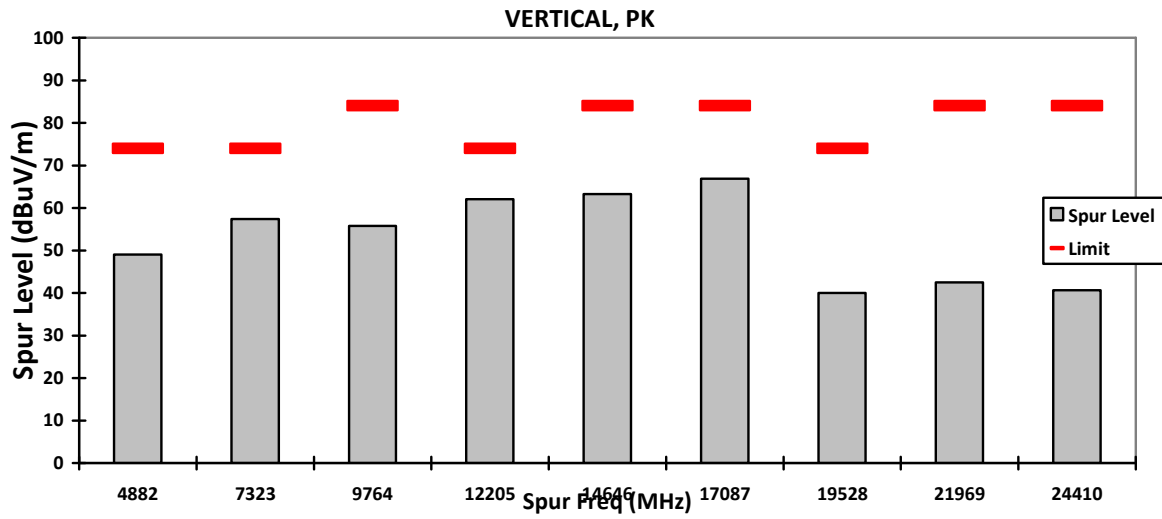


VERTICAL, AV

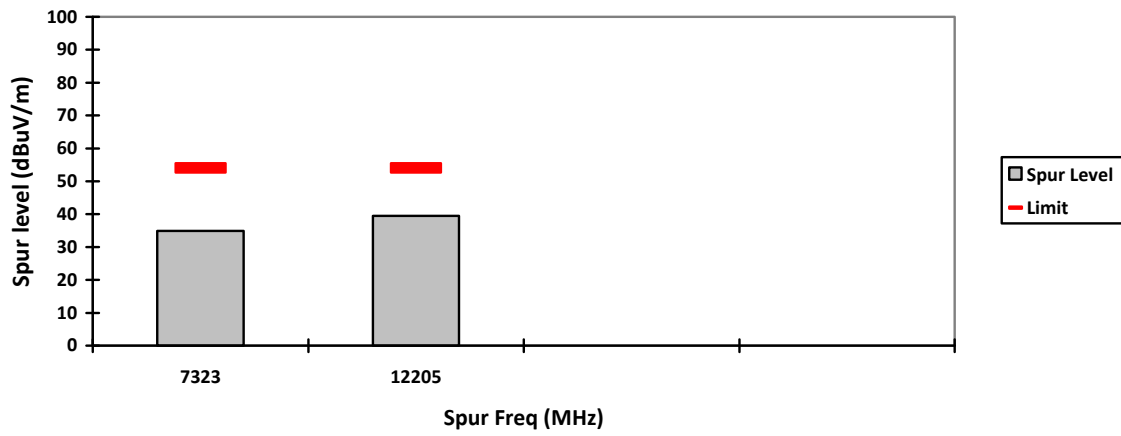


HORIZONTAL, AV

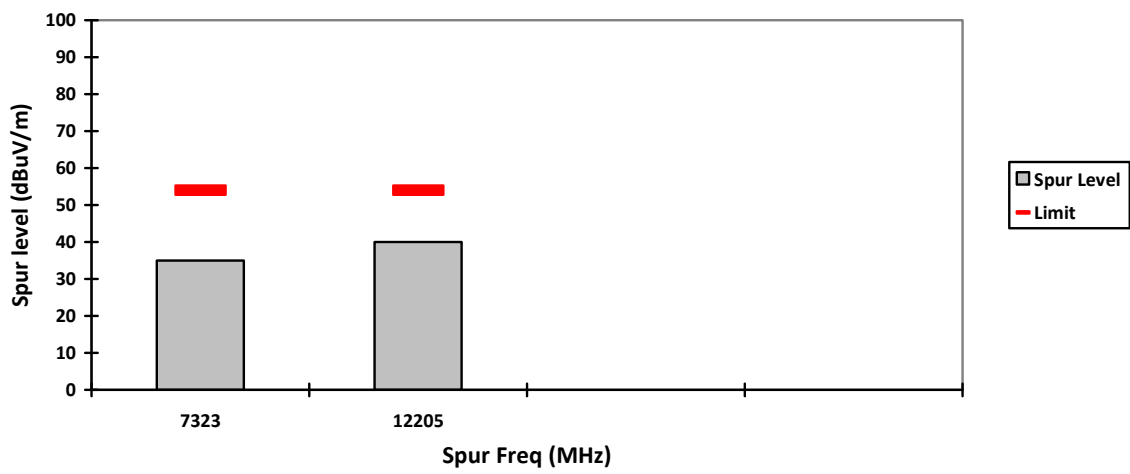


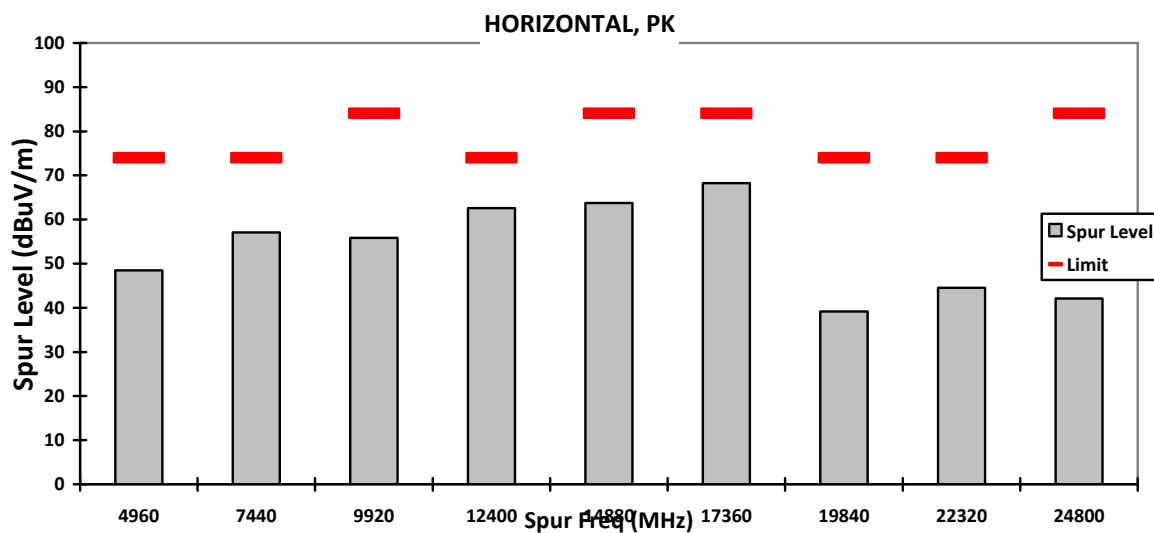
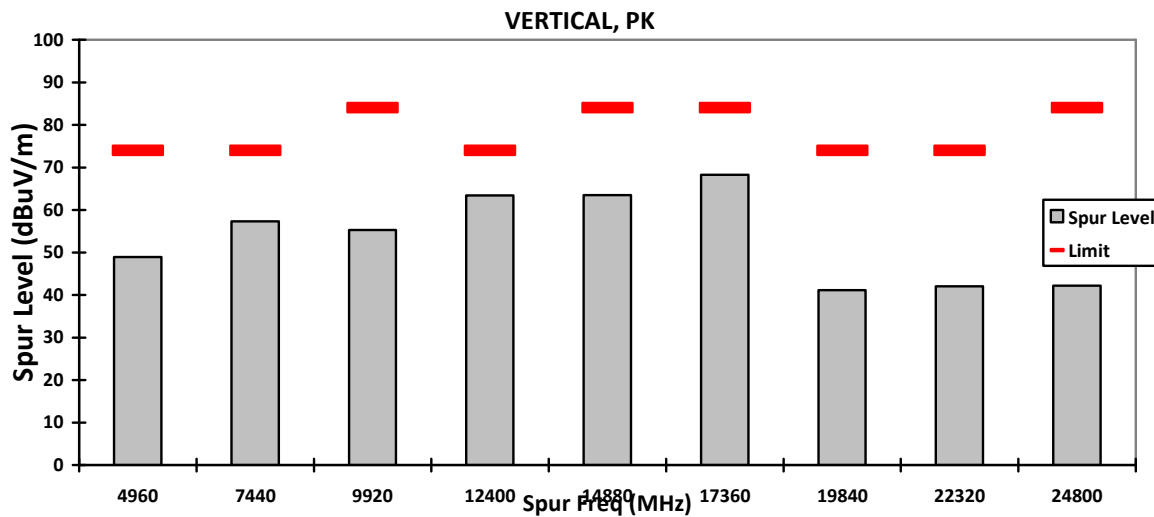


VERTICAL, AV

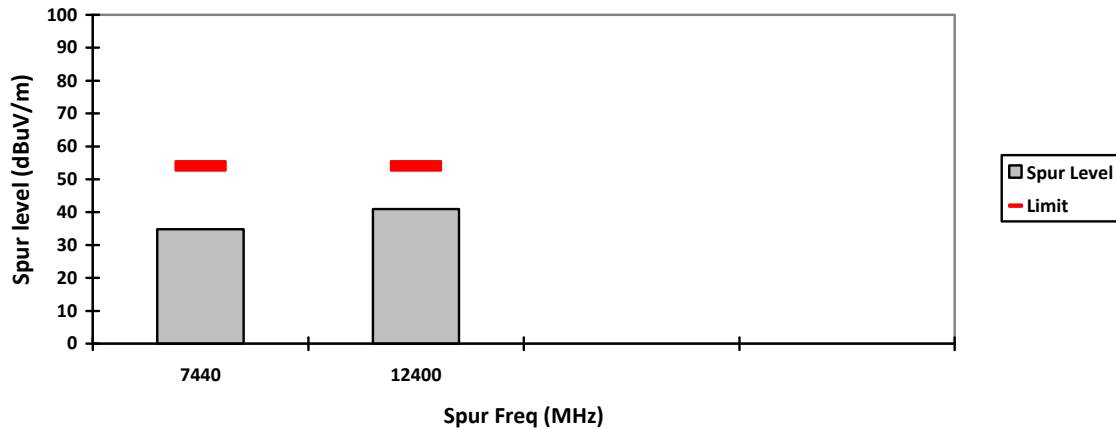


HORIZONTAL, AV

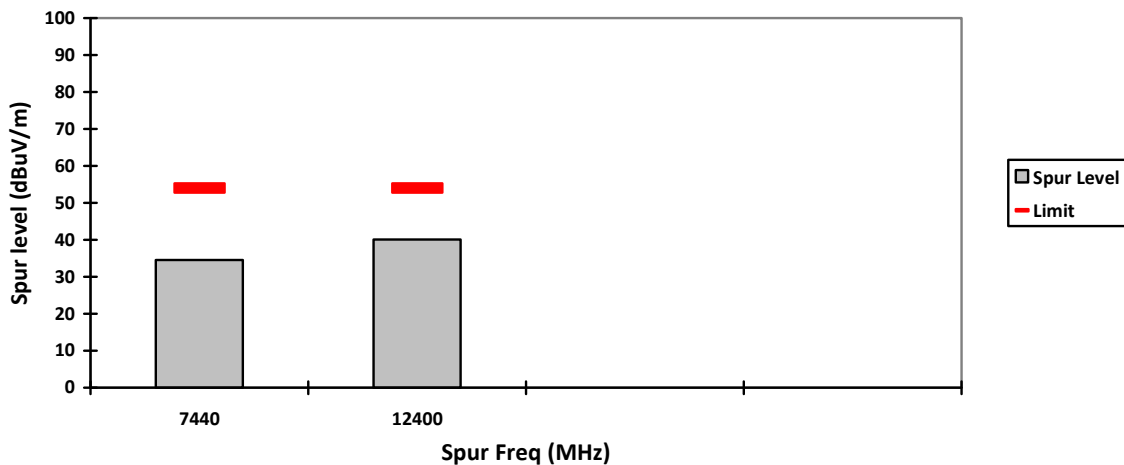




VERTICAL, AV



HORIZONTAL, AV



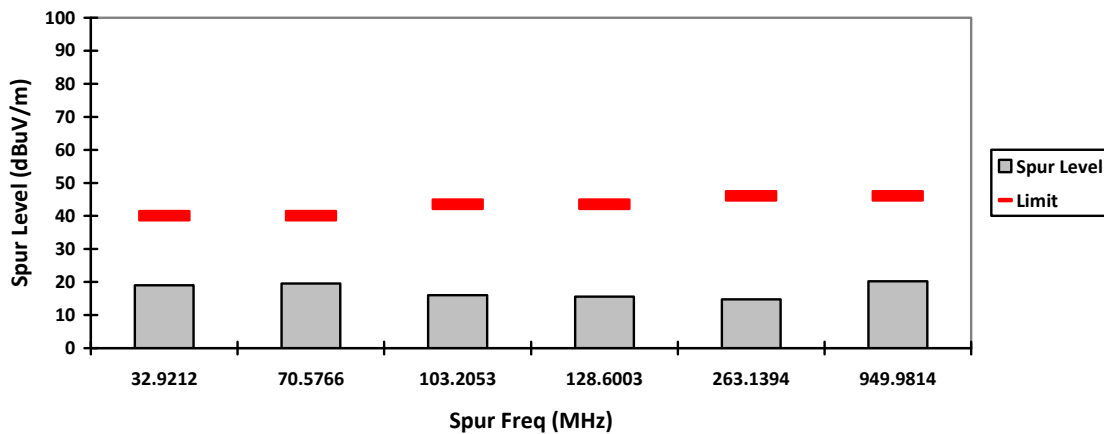
NOTE:

Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b,c)

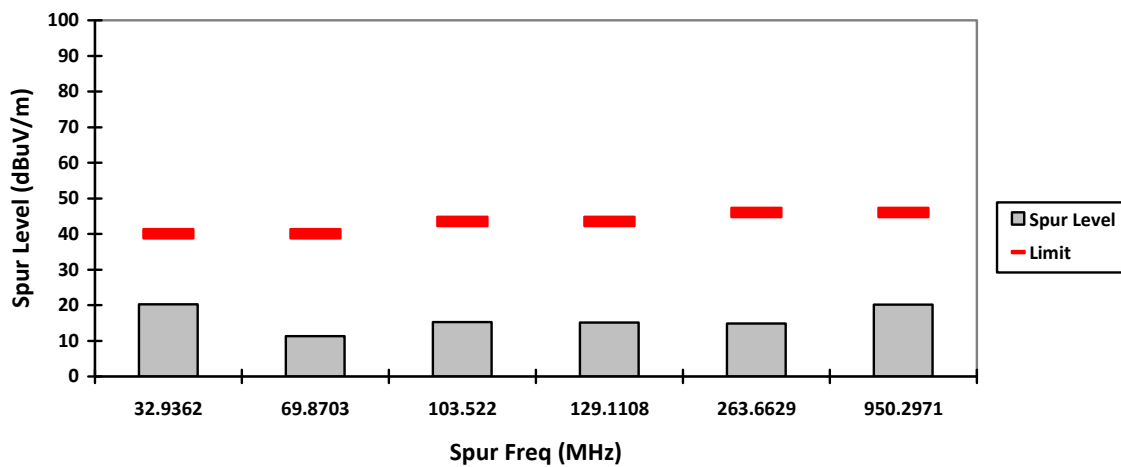
Based on the Bluetooth Specification Version 2.1+EDR, and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

Channel hop rate = 800 hops/second (AFH Mode)
 Adjusted channel hop rate for DH5 mode = 133.33 hops/second
 Time per channel hop = 1 / 133.33 hops/second = 7.5 ms
 Time to cycle through all channels = 7.5 x 20 channels = 150 ms
 Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s)
 Worst case dwell time = 7.5 ms
 Duty cycle connection factor = $20\log_{10} (7.5\text{ms} / 100\text{ms}) = -22.5 \text{ dB}$

VERTICAL, QPK

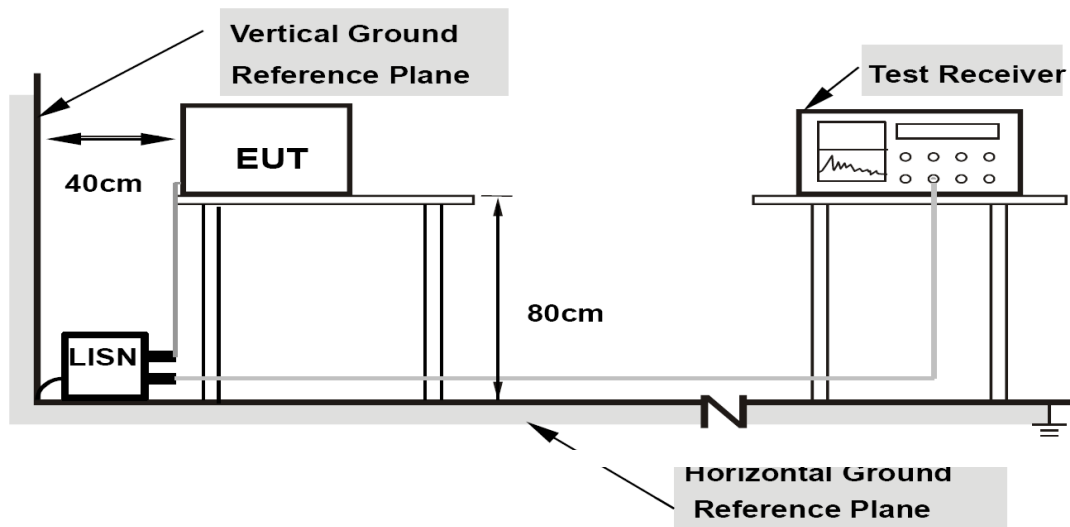


HORIZONTAL, QPK



6.9. AC Powerline Conducted Emission

6.9.1. 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.

6.9.2. 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(μV)	
	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(μV)	
	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

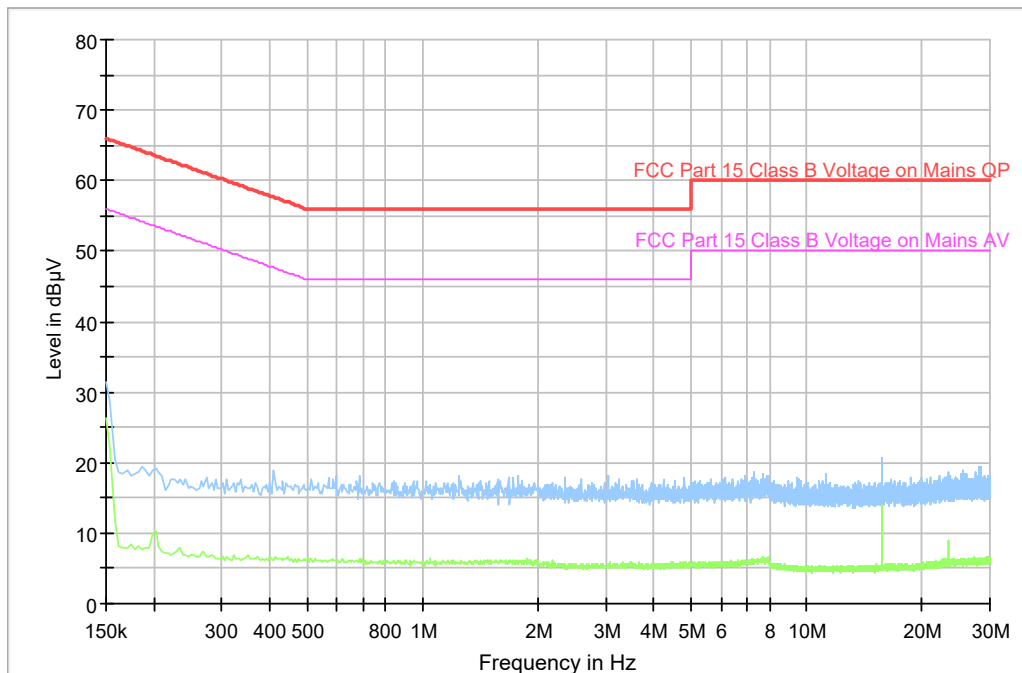
6.9.3. Test Result

Report ID.:	: 29844-EMC-00025
Ambient Temperature:	: 19.7 °C
Humidity:	: 57.6 %RH
Tester:	: Shidee
Date of test:	: 16 May 2023

120Vac SUC

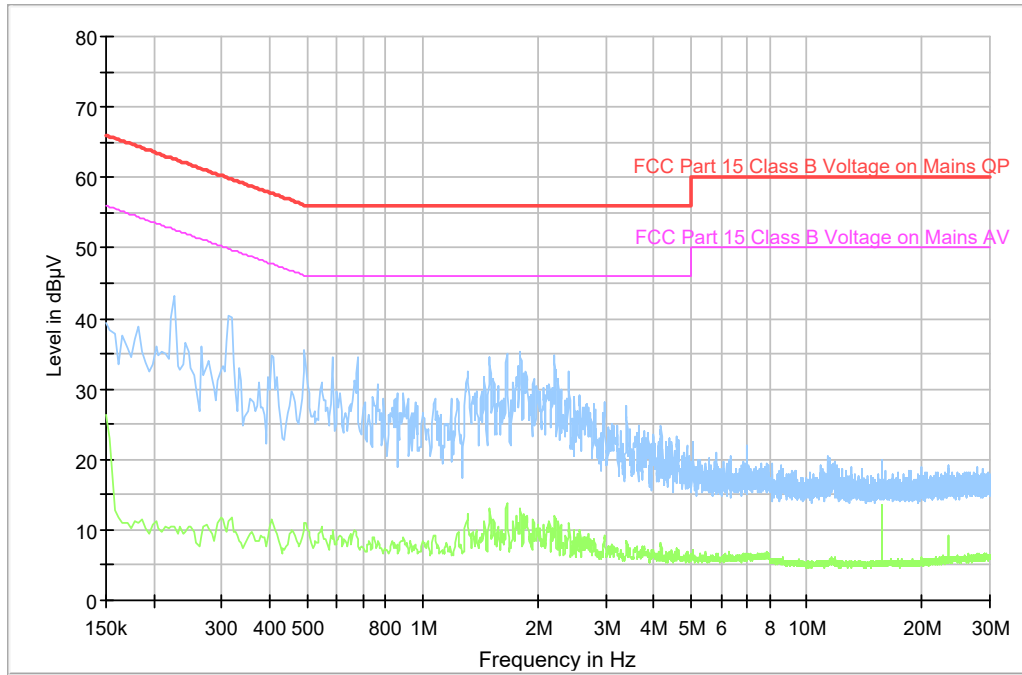
1) Ambient

Full Spectrum



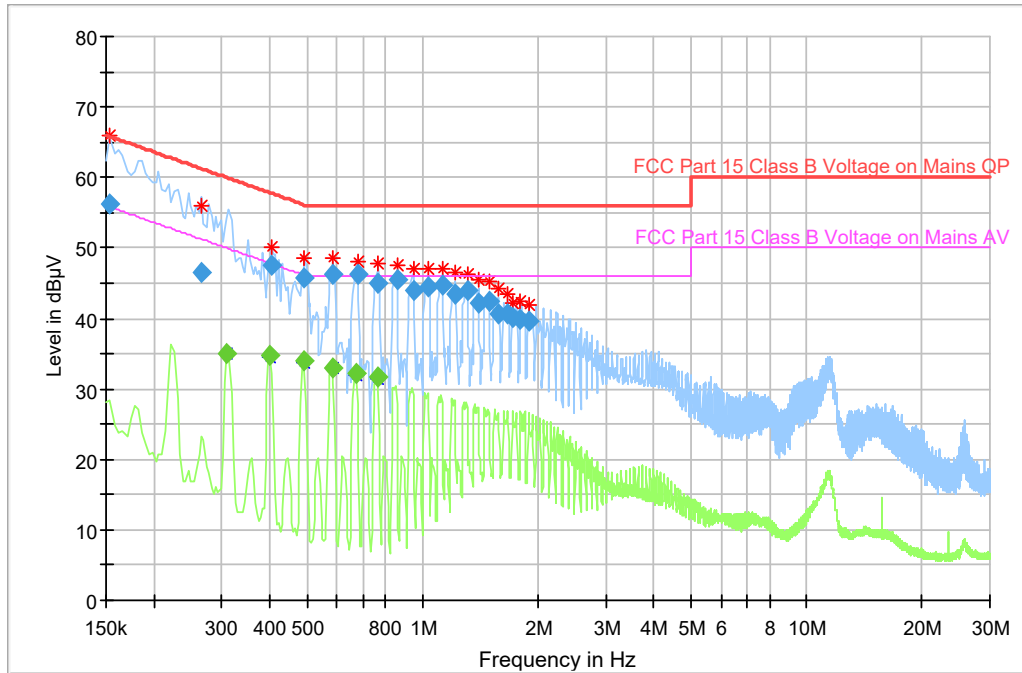
2) Charger Alone

Full Spectrum



3) Charger + Radio Off

Full Spectrum



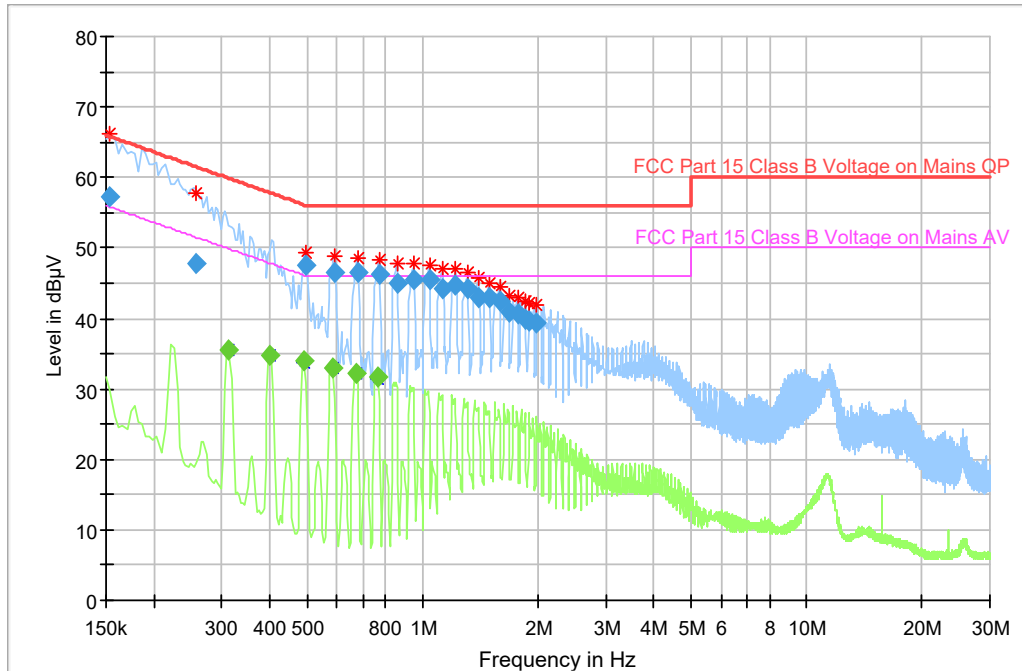
Quasipeak and Average Measurement

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



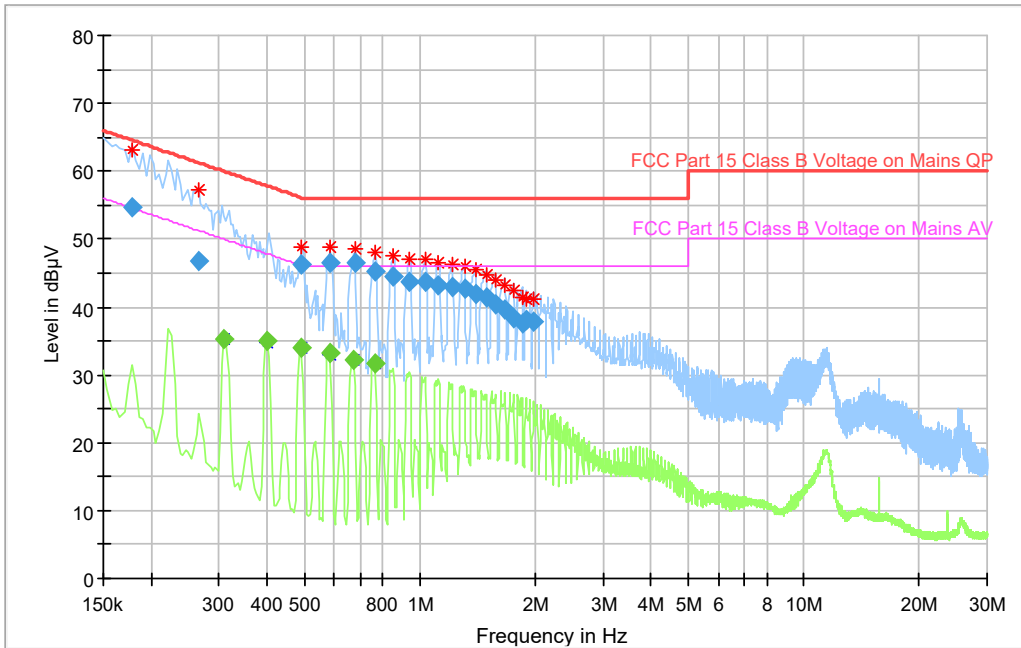
Quasipeak and Average Measurement

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 BT EDR

Full Spectrum



Quasipeak and Average Measurement

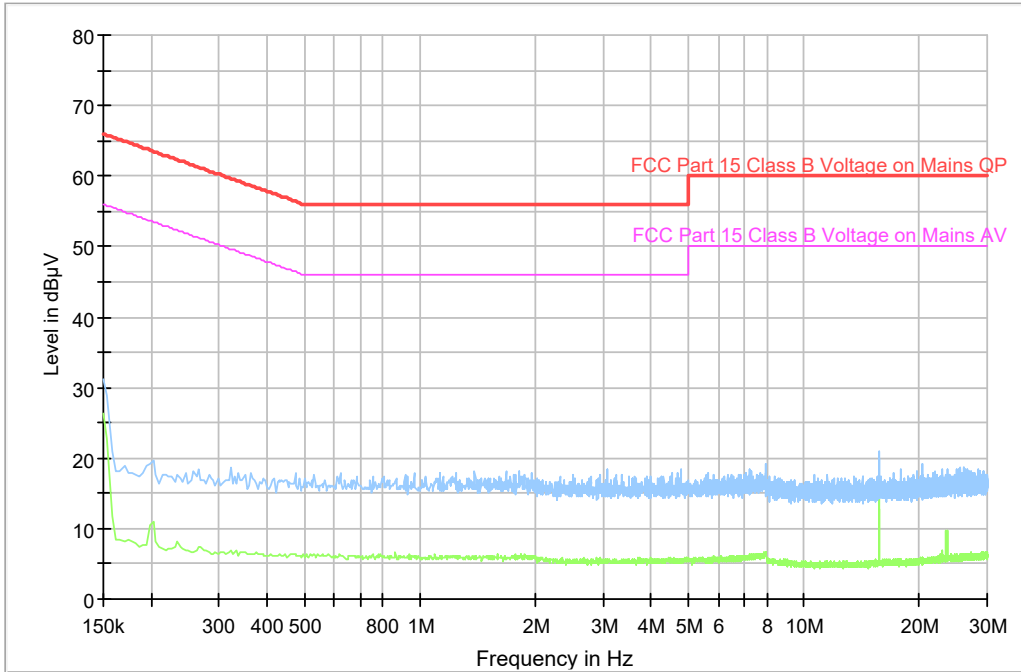
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.178000	54.80	---	64.58	9.78	1000.0	9.000	N	ON	10.6	Pass
0.266000	46.80	---	61.24	14.44	1000.0	9.000	L1	ON	10.2	Pass
0.310000	---	35.29	49.97	14.69	1000.0	9.000	L1	ON	10.3	Pass
0.402000	---	34.92	47.81	12.89	1000.0	9.000	L1	ON	10.3	Pass
0.490000	---	34.05	46.17	12.12	1000.0	9.000	L1	ON	10.3	Pass
0.494000	46.18	---	56.10	9.92	1000.0	9.000	N	ON	10.3	Pass
0.582000	---	33.20	46.00	12.80	1000.0	9.000	L1	ON	10.3	Pass
0.586000	46.58	---	56.00	9.42	1000.0	9.000	N	ON	10.3	Pass
0.670000	---	32.27	46.00	13.73	1000.0	9.000	L1	ON	10.3	Pass
0.678000	46.59	---	56.00	9.41	1000.0	9.000	N	ON	10.3	Pass
0.762000	---	31.78	46.00	14.22	1000.0	9.000	L1	ON	10.3	Pass
0.766000	45.20	---	56.00	10.80	1000.0	9.000	N	ON	10.3	Pass
0.854000	44.43	---	56.00	11.57	1000.0	9.000	N	ON	10.3	Pass
0.942000	43.70	---	56.00	12.30	1000.0	9.000	N	ON	10.3	Pass
1.034000	43.71	---	56.00	12.29	1000.0	9.000	N	ON	10.2	Pass
1.122000	43.10	---	56.00	12.90	1000.0	9.000	N	ON	10.2	Pass
1.214000	42.96	---	56.00	13.04	1000.0	9.000	N	ON	10.2	Pass
1.306000	42.72	---	56.00	13.28	1000.0	9.000	N	ON	10.2	Pass
1.394000	41.84	---	56.00	14.16	1000.0	9.000	N	ON	10.2	Pass
1.486000	41.34	---	56.00	14.66	1000.0	9.000	N	ON	10.2	Pass
1.574000	40.26	---	56.00	15.74	1000.0	9.000	N	ON	10.2	Pass
1.666000	39.55	---	56.00	16.45	1000.0	9.000	N	ON	10.2	Pass
1.754000	38.40	---	56.00	17.60	1000.0	9.000	N	ON	10.2	Pass
1.846000	37.68	---	56.00	18.32	1000.0	9.000	N	ON	10.2	Pass
1.886000	38.12	---	56.00	17.88	1000.0	9.000	L1	ON	10.2	Pass
1.974000	37.92	---	56.00	18.08	1000.0	9.000	L1	ON	10.2	Pass

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

120Vac MUC

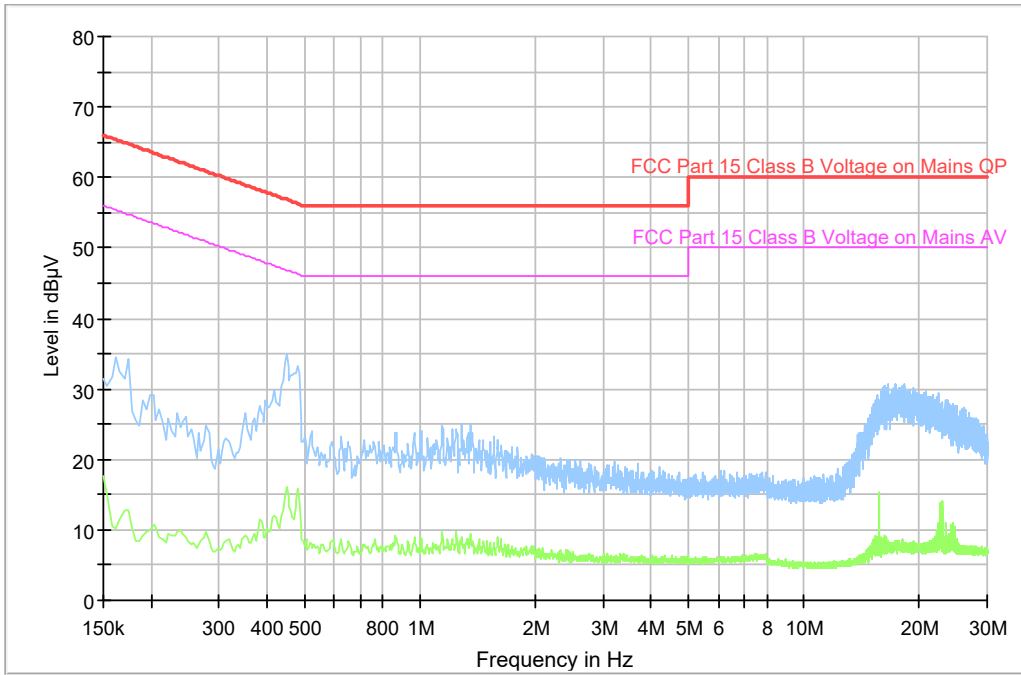
6) Ambient

Full Spectrum



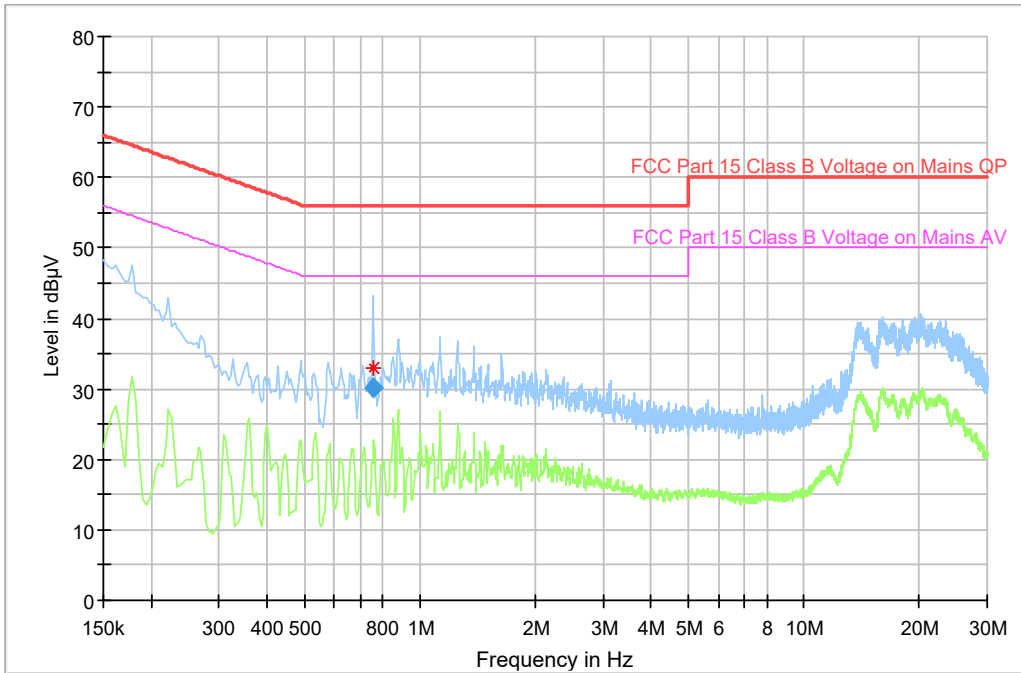
7) Charger Alone

Full Spectrum



8) Charger + Radio Off

Full Spectrum



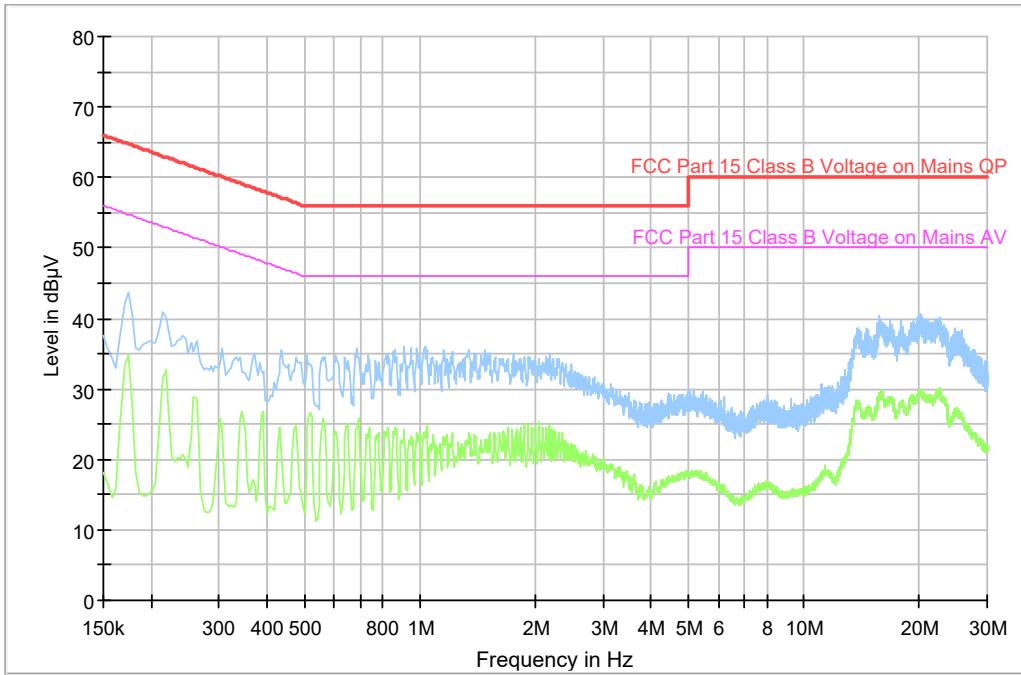
Quasipeak and Average Measurement

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

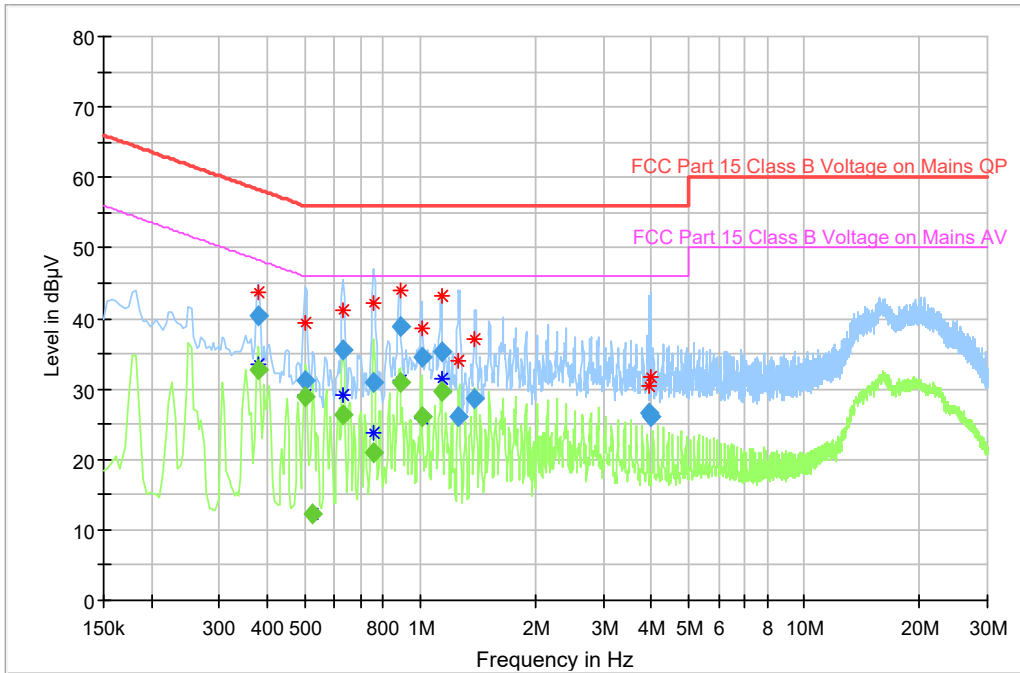
9) Charger + Radio Standby

Full Spectrum



10) Charger + Radio Tx with BT EDR

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
0.378000	---	32.70	48.32	15.62	1000.0	9.000	N	ON	10.3	Pass
0.378000	40.41	---	58.32	17.91	1000.0	9.000	N	ON	10.3	Pass
0.502000	---	28.76	46.00	17.24	1000.0	9.000	L1	ON	10.3	Pass
0.502000	31.29	---	56.00	24.71	1000.0	9.000	L1	ON	10.3	Pass
0.526000	---	12.19	46.00	33.81	1000.0	9.000	L1	ON	10.3	Pass
0.630000	---	26.45	46.00	19.55	1000.0	9.000	N	ON	10.3	Pass
0.630000	35.59	---	56.00	20.41	1000.0	9.000	L1	ON	10.3	Pass
0.754000	31.00	---	56.00	25.00	1000.0	9.000	N	ON	10.3	Pass
0.754000	---	21.06	46.00	24.94	1000.0	9.000	N	ON	10.3	Pass
0.886000	---	30.81	46.00	15.19	1000.0	9.000	N	ON	10.3	Pass
0.886000	38.74	---	56.00	17.26	1000.0	9.000	N	ON	10.3	Pass
1.010000	34.38	---	56.00	21.62	1000.0	9.000	L1	ON	10.2	Pass
1.010000	---	26.07	46.00	19.93	1000.0	9.000	L1	ON	10.2	Pass
1.138000	---	29.74	46.00	16.26	1000.0	9.000	L1	ON	10.2	Pass
1.138000	35.16	---	56.00	20.84	1000.0	9.000	L1	ON	10.2	Pass
1.258000	25.97	---	56.00	30.03	1000.0	9.000	N	ON	10.2	Pass
1.390000	28.57	---	56.00	27.43	1000.0	9.000	N	ON	10.2	Pass
3.954000	26.54	---	56.00	29.46	1000.0	9.000	L1	ON	10.3	Pass
3.998000	25.98	---	56.00	30.02	1000.0	9.000	L1	ON	10.3	Pass

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

END OF TEST REPORT