

																															
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 / ISD TEST REPORT Report Revision : Rev.C																														
<table><tr><td>Date/s Tested</td><td>: 24-September-2024 - 16-January-2025</td></tr><tr><td>Report Issue Date</td><td>: 14-February-2025</td></tr><tr><td>Manufacturer/Location</td><td>: Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia</td></tr><tr><td>Requestor</td><td>: Tang Chee Leong</td></tr><tr><td>Product Type</td><td>: Body Worn Camera</td></tr><tr><td>Product Marketing Name (PMN)</td><td>: V200</td></tr><tr><td>Hardware Version Identification Number (HVIN)</td><td>: B20CJM2BE2AN</td></tr><tr><td>Frequency Band</td><td>: 2.402 - 2.480 GHz</td></tr><tr><td>Max RF Output Power</td><td>: 7.94 mWatts</td></tr><tr><td>Applicant Name</td><td>: Motorola Solutions Inc</td></tr><tr><td>Applicant Address</td><td>: Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia</td></tr><tr><td>FCC Registrations</td><td>: 461337</td></tr><tr><td>ISED Registrations</td><td>: MY0001</td></tr><tr><td>Firmware Version Identification Number (FVIN)</td><td>: (S/N: 663EAR0072, 663EAS0005) - PSS fs2-ARMV7A_PTF V24.4-ptf-V24.4-ptf-V200-1.8-1-g501bb5026c (S/N: 663EAS0005) - PSS fs2-ARMV7A_PTF V25.1.0.0-4-g62e56dc448</td></tr></table> The equipment was tested accordance to the requirement listed below: <table><tr><td>(2.4GHz BT LE) 47 CFR Part 15C ISED RSS 247 Issue 3 August 2023</td><td>PASS</td></tr></table>		Date/s Tested	: 24-September-2024 - 16-January-2025	Report Issue Date	: 14-February-2025	Manufacturer/Location	: Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia	Requestor	: Tang Chee Leong	Product Type	: Body Worn Camera	Product Marketing Name (PMN)	: V200	Hardware Version Identification Number (HVIN)	: B20CJM2BE2AN	Frequency Band	: 2.402 - 2.480 GHz	Max RF Output Power	: 7.94 mWatts	Applicant Name	: Motorola Solutions Inc	Applicant Address	: Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia	FCC Registrations	: 461337	ISED Registrations	: MY0001	Firmware Version Identification Number (FVIN)	: (S/N: 663EAR0072, 663EAS0005) - PSS fs2-ARMV7A_PTF V24.4-ptf-V24.4-ptf-V200-1.8-1-g501bb5026c (S/N: 663EAS0005) - PSS fs2-ARMV7A_PTF V25.1.0.0-4-g62e56dc448	(2.4GHz BT LE) 47 CFR Part 15C ISED RSS 247 Issue 3 August 2023	PASS
Date/s Tested	: 24-September-2024 - 16-January-2025																														
Report Issue Date	: 14-February-2025																														
Manufacturer/Location	: Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia																														
Requestor	: Tang Chee Leong																														
Product Type	: Body Worn Camera																														
Product Marketing Name (PMN)	: V200																														
Hardware Version Identification Number (HVIN)	: B20CJM2BE2AN																														
Frequency Band	: 2.402 - 2.480 GHz																														
Max RF Output Power	: 7.94 mWatts																														
Applicant Name	: Motorola Solutions Inc																														
Applicant Address	: Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia																														
FCC Registrations	: 461337																														
ISED Registrations	: MY0001																														
Firmware Version Identification Number (FVIN)	: (S/N: 663EAR0072, 663EAS0005) - PSS fs2-ARMV7A_PTF V24.4-ptf-V24.4-ptf-V200-1.8-1-g501bb5026c (S/N: 663EAS0005) - PSS fs2-ARMV7A_PTF V25.1.0.0-4-g62e56dc448																														
(2.4GHz BT LE) 47 CFR Part 15C ISED RSS 247 Issue 3 August 2023	PASS																														
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.																															
Prepared By:  Siti Nurhidayati Binti Abdul Halim Test Personnel	Approved Signatory:  Vincent Foong Chuen Kit Responsible Engineer																														

Table of Contents

1.0 General 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.....	6
6.0 Transmitter Test Parameters	7
6.1 6dB Channel Bandwidth.....	7
6.1.1 Test Setup	7
6.1.2 Test Limits.....	7
6.1.3 Test Data	7
6.2 Conducted RF Output Power	9
6.2.1 Test Setup	9
6.2.2 Test Limits.....	9
6.2.3 Test Data	10
6.3 Maximum Peak Power Spectral Density	11
6.3.1 Test Setup	11
6.3.2 Test Limits.....	11
6.3.3 Test Result.....	12
6.4 Conducted Spurious Emission	13
6.4.1 Test Setup	13
6.4.2 Test Limits.....	13
6.4.3 Test Result.....	13
6.5 Band edge Conducted Spurious Emission	20
6.5.1 Test Setup	20
6.5.2 Test Limits.....	20
6.5.3 Test Result.....	20
6.6 Radiated Emission within Restricted Bands	22
6.6.1 Test Setup	22
6.6.2 Test Limits.....	23
6.6.3 Test Results.....	24
6.7 AC Powerline Conducted Emission	43
6.7.1 Test Setup	43
6.7.2 Test Limits.....	43
6.7.3 Test Result.....	45

REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	20-January-2025	Hidayati
Rev. B	Update Model Number on Radiated Emission within Restricted Bands data	14-February-2025	Hidayati
Rev. C	Correction to HVIN sales model	17-March-2026	Vincent

1.0 General Information

EUT Description:

Technologies	2.4GHz BT LE
TX Frequency range	2402MHz – 2480MHz
Modulation Type	GFSK
Connector type	PROGRAMMING, TEST & ALIGNMENT CABLE
Antenna type	CHIP

The EUT contains following accessory devices and data cable:

Item	Brand	Model or P/N
BATTERY PACK,BATTERY PACK, BATT LIION 2500T	MOTOROLA	PMNN4578A
CABLE, DATA, USB-A TO USB-C, 1M	MOTOROLA	PMKN4294A

Channel number and frequency information:

40 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

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 (a)(2)	RSS 247 5.2 (a)	DTS & 99% Channel Bandwidth	Pass	Highest 99% OCB: 1.097 MHz (1M10F1D)	663EAR0072	Hidayati
15.247 (b)(3)	RSS 247 5.4 (d)	Conducted RF Output Power (Peak)	Pass	Highest output power: 8.077 dBm (6.42 mW)	663EAR0072	Hidayati
15.247(e)	RSS 247 5.2 (b)	Maximum Peak Power Spectral Density	Pass	Meet the limit requirement.	663EAR0072	Hidayati
15.247 (d)	RSS-247 5.5	Band-Edge Conducted Spurious Emission	Pass	Worst case emission: -41.90 dBm	663EAR0072	Hidayati
15.247 (b)	RSS-247 5.5	Conducted Spurious Emission	Pass	Worst case emission: -50.28 dBm	663EAR0072	Hidayati
15.205, 15.209, 15.247 (d)	RSS247 5.5	Radiated Emission within Restricted Bands	Pass	Worst case emission: RBE: 41.9266 dBμV/m (Margin: 12.0734 dBμV/m) RSE: 26.0575 dBμV/m (Margin: 19.9425 dBμV/m)	663EAS0005 & 952EAY0164	Nazrin, Fuad & Aiman
15.207	RSS-Gen 8.8	AC Power Line Conducted Spurious Emission	Pass	Meet the limit requirement.	952EAY0164	Shidee
15.203	-	Antenna Requirement	NA	Internal antenna is not accessible to the end-user	NA	NA

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
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.84
	18GHz ~ 40GHz	6.02
Conducted Spurious Emissions	9kHz ~ 12.75GHz	2.82

4.0 Equipment List

Bluetooth ATE # 1 (SW Version: Ate Main_3.1.12_R1)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
CHAMBER	SH-641	92003820	4-Jul-24	4-Jul-25
POWER SUPPLY	6652A	3640A02967	4-Oct-24	4-Oct-25
SPECTRUM ANALYZER	E4440A	MY46185415	5-Jan-24	5-Jan-25
PULSE POWER METER	ML2495A	1845014	20-Aug-24	20-Aug-25
PULSE SENSOR	MA2411B	1726287	20-Aug-24	20-Aug-25

Radiated Emission Station (SW Version: EMC FCC RE v1.6.5)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
EMI TEST RECEIVER	ESIB40	100307	23-Oct-24	23-Oct-25
3m Semi-anechoic Chamber	NA	888032	No Cal. Req'd	No Cal. Req'd
TURNTABLE FLUSH MOUNT 2M	T-200-S	N/A	No Cal. Req'd	No Cal. Req'd
PROGRAMMING CONTROLLER	MF-7802BS	N/A	No Cal. Req'd	No Cal. Req'd
POWER SUPPLY	6674A	3126A00133	13-Mar-24	13-Mar-25
SIGNAL ANALYZER	FSV40	101432	09-Aug-24	08-Aug-25
DATA LOGGER	SDL500	A.016800	26-Jun-24	26-Jun-25
BILOG ANTENNA	CBL6112D	55546	05-Jun-24	05-Jun-25
BILOG ANTENNA	CBL 6112B	2964	08-Oct-24	08-Oct-25
DRG HORN FREQ.	SAS-571	1027	01-Jul-24	01-Jul-25
DRG HORN FREQ.	SAS-571	720	18-Apr-23	18-Apr-25
PREAMPLIFIER	PAM-0118	427	15-Nov-24	15-Nov-25
SIGNAL GENERATOR	SMB100A	181117	06-Dec-21	06-Feb-25
LOOP ANTENNA	6502	00203479	06-Mac-24	06-Mac-25
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170255	13-Mar-24	13-Mar-25

AC Powerline Station (SW Version: EMC32 Ver.10.60.10)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
DATA LOGGER	DSB	16344143	5-Jul-2024	5-Jul-2025
V-NETWORK 2-LINE	ENV216V	101268	12-Jun-24	12-Jun-25
EMI TEST RECEIVER	ESCI	100225	8-May-2024	8-May-2025
PROGRAMMABLE AC SOURCE	61604	ABR000000926	5-Aug-2024	5-Aug-2025

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 Type	Environmental Conditions
Test Mode	0 to 39	0,19,39	GFSK	22.4°C, 67.9%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 Type	Environmental Conditions
Test Mode	0 to 39	0,19,39	GFSK	22.4°C, 67.9%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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Environmental Conditions
Application Mode	0 to 39	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).

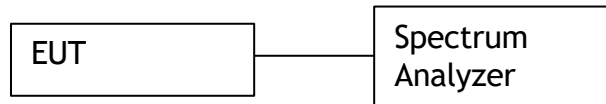
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Environmental Conditions
Test Mode	0 to 39	0,19,39	GFSK	25°C, 54.8%RH

6.0 Transmitter Test Parameters

6.1 6dB Channel Bandwidth

6.1.1 Test Setup



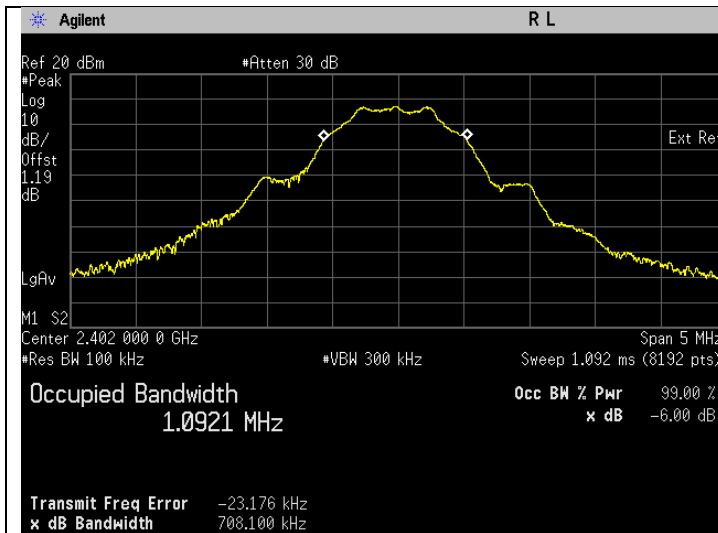
- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak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

6.1.2 Test Limits:

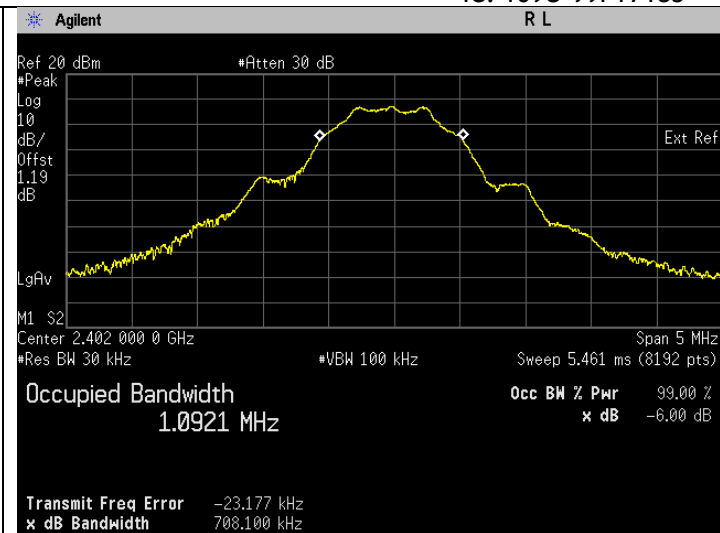
Normal Condition (25 ° C)
≥500 kHz

6.1.3 Test Data:

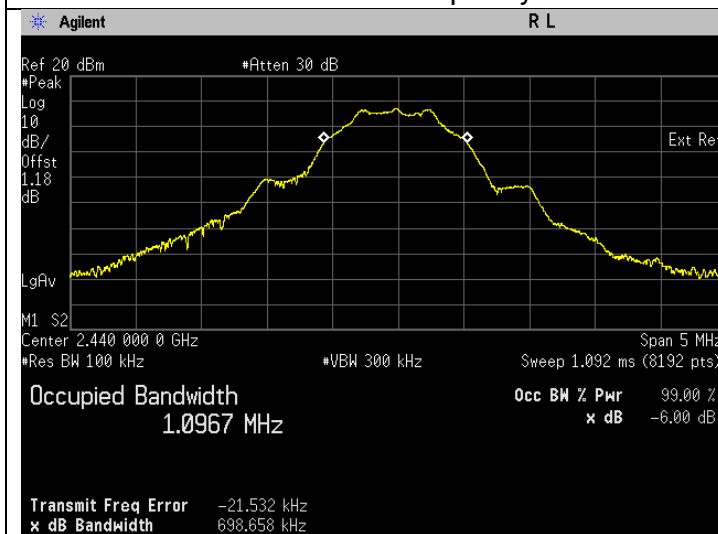
Test Conditions		Test Frequency	Results		
Standard	Modulation Type	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
Bluetooth L.E	GFSK	2402	0.708	1.092	Pass
Bluetooth L.E	GFSK	2440	0.699	1.097	Pass
Bluetooth L.E	GFSK	2480	0.704	1.096	Pass



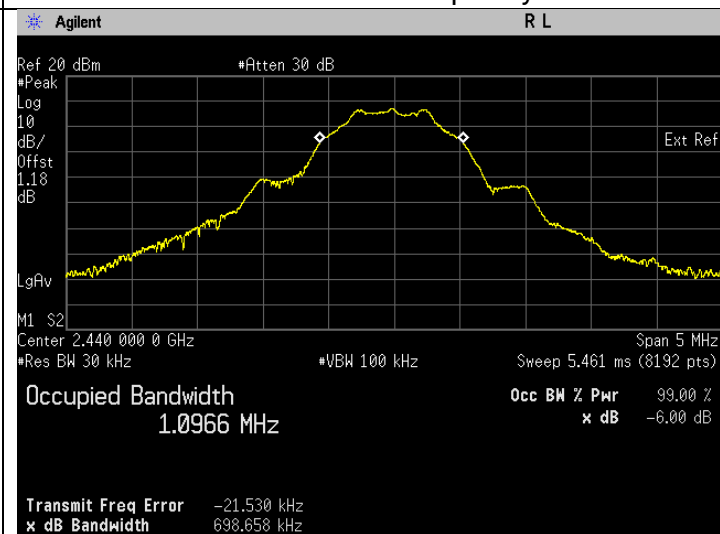
6dB Bandwidth. Bluetooth LE Frequency 2402 MHz



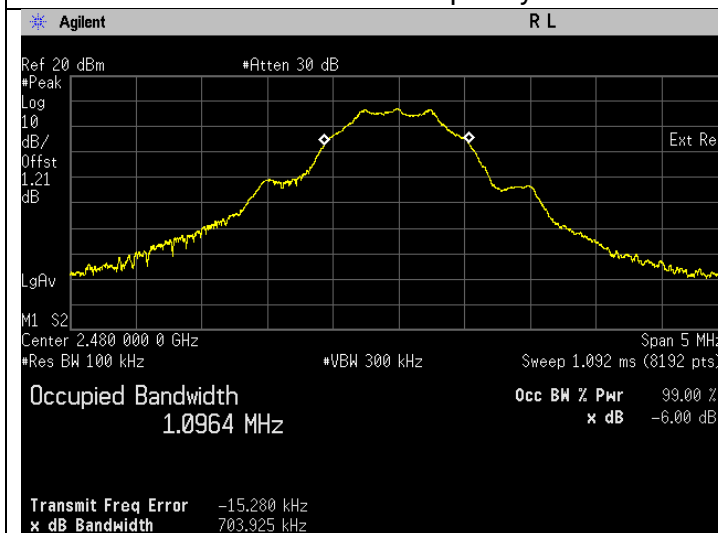
99% Bandwidth. Bluetooth LE Frequency 2402 MHz



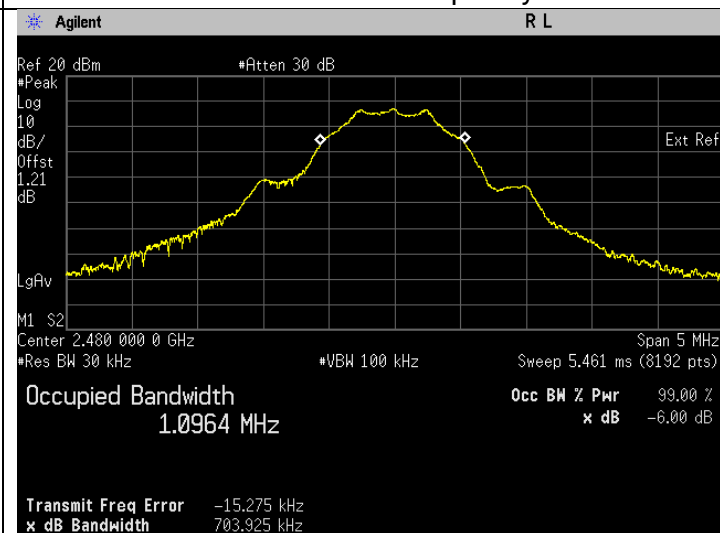
6dB Bandwidth. Bluetooth LE Frequency 2440 MHz



99% Bandwidth. Bluetooth LE Frequency 2440 MHz



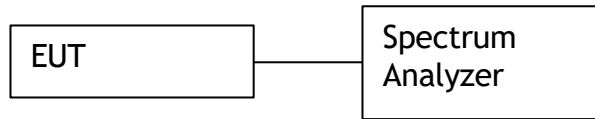
6dB Bandwidth. Bluetooth LE Frequency 2480 MHz



99% Bandwidth. Bluetooth LE Frequency 2480 MHz

6.2 Conducted RF Output Power

6.2.1 Test Setup



Peak

- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Measure the duty cycle of transmitter output signal.
- 4) Setting of Spectrum analyzer :
 - a. Set the RBW = 3 MHz.
 - b. Set the VBW = 50 MHz.
 - c. Set the span $\geq [1.5 \times \text{OBW bandwidth}]$.
 - d. Detector = Peak
 - e. Sweep time = auto couple.
 - f. Trace mode = max hold.
 - g. Allow trace to fully stabilize.

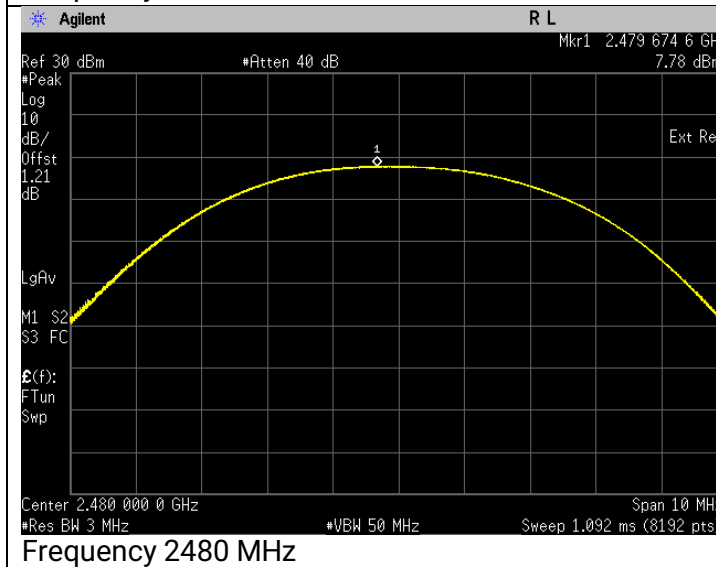
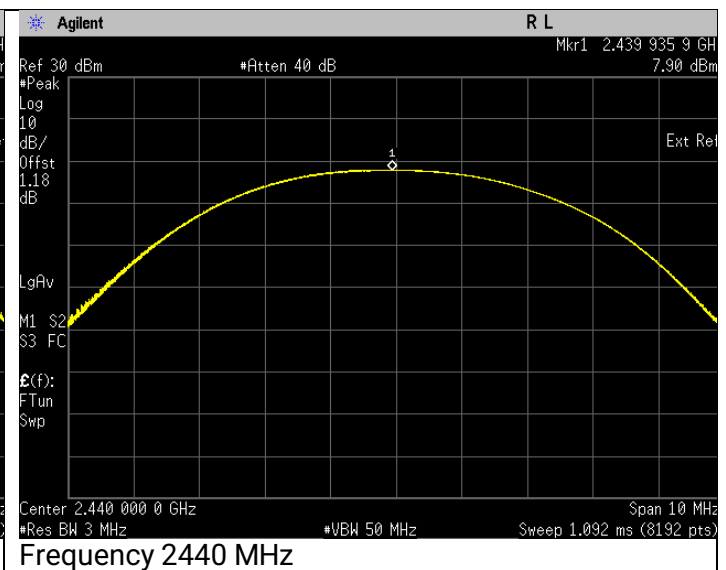
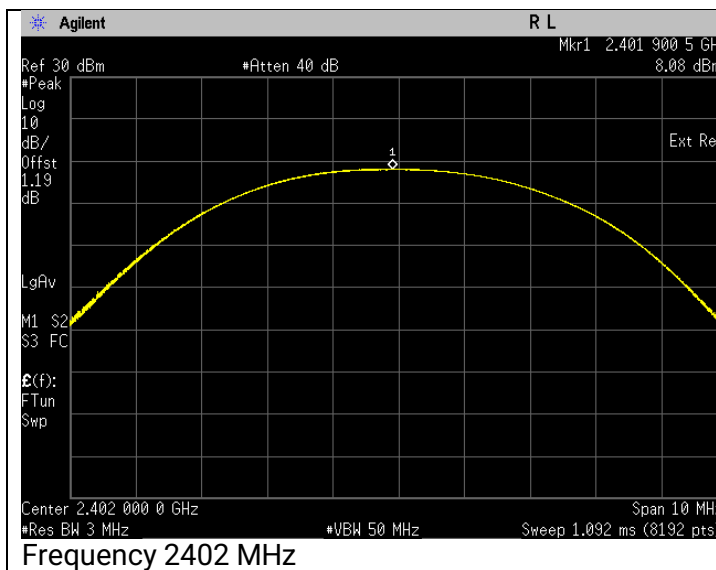
6.2.2 Test Limits:

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

6.2.3 Test Data:

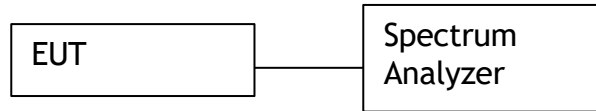
Test was conducted with peak power.

Test Conditions			Test Frequency	Results
Standard	Modulation Type	Tx (MHz)	Output Power (dBm)	Status
Bluetooth L.E	GFSK	2402	8.077	Pass
Bluetooth L.E	GFSK	2440	7.902	Pass
Bluetooth L.E	GFSK	2480	7.779	Pass



6.3 Maximum Peak Power Spectral Density

6.3.1 Test Setup



Maximum Peak

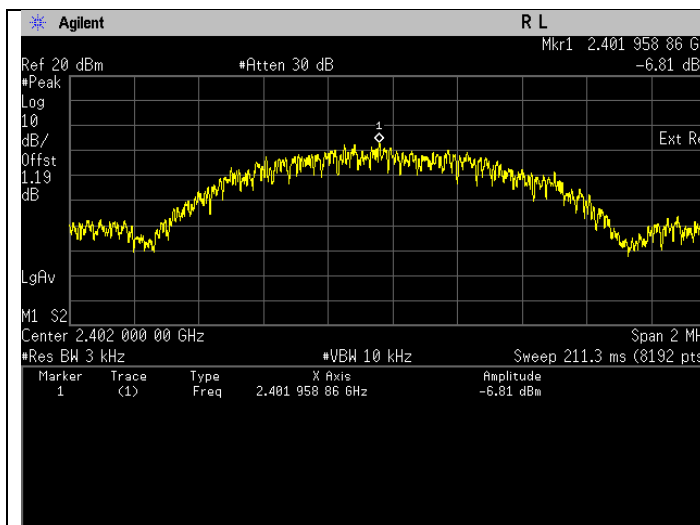
- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
 - a. Set analyzer center frequency to DTS channel center frequency.
 - b. Set the span to 1.5 times the DTS bandwidth.
 - c. Set the RBW to 3 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.

6.3.2 Test Limits:

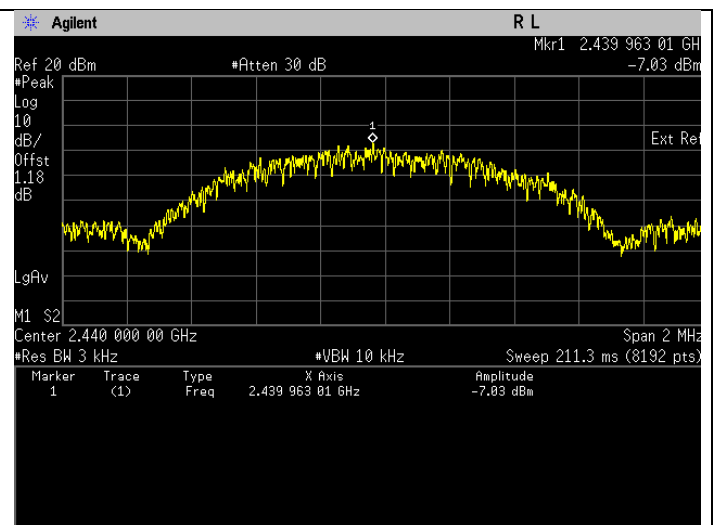
Normal Condition (25 ° C)
$\leq 8 \text{ dBm/3kHz}$

6.3.3 Test Result

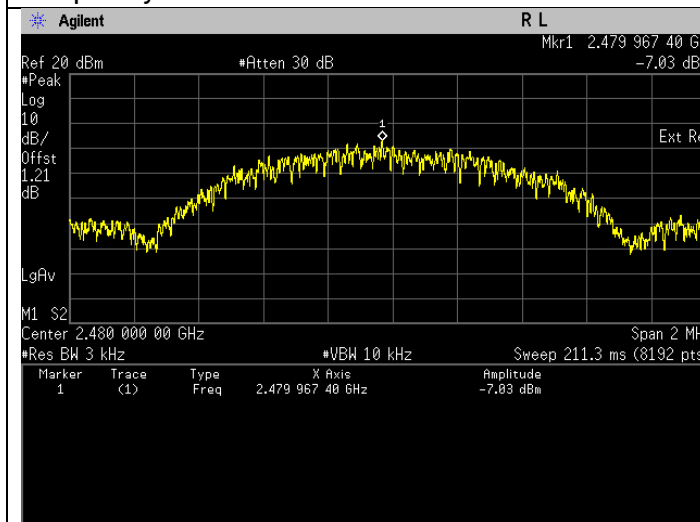
Test Conditions		Test Frequency	Results	
Standard	Modulation Type	Tx (MHz)	Power (dBm/3kHz)	Status
Bluetooth L.E.	GFSK	2402	-6.81	Pass
Bluetooth L.E.	GFSK	2440	-7.03	Pass
Bluetooth L.E.	GFSK	2480	-7.03	Pass



Maximum Power Spectral Density. Bluetooth LE Frequency 2402 MHz



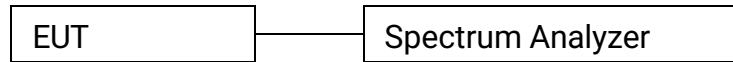
Maximum Power Spectral Density. Bluetooth LE Frequency 2440 MHz



Maximum Power Spectral Density. Bluetooth LE Frequency 2480 MHz

6.4 Conducted Spurious Emission

6.4.1 Test Setup



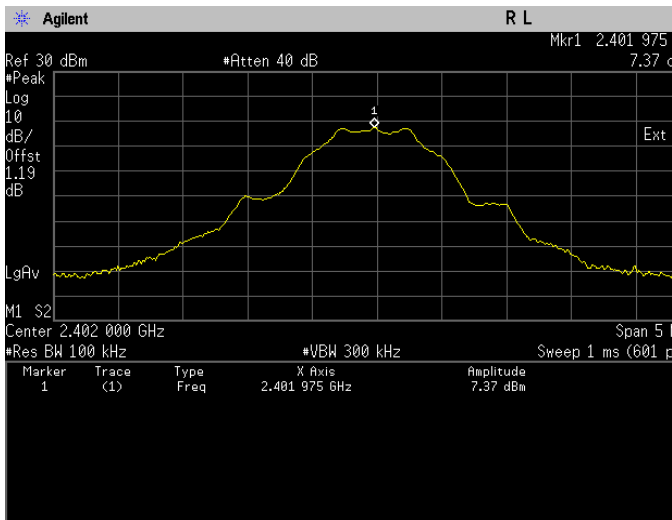
- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max Hold
 - e. Sweep = auto
- 5) Use the peak marker function to measure highest emission and scan up to 10th harmonic.

6.4.2 Test Limits:

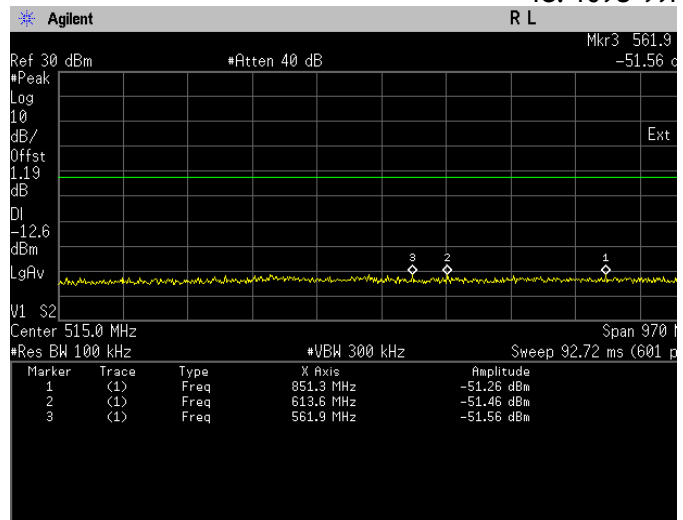
Normal Condition (25 ° C)
Shall be at least 20 dB below max power. (Peak detector)

6.4.3 Test Result

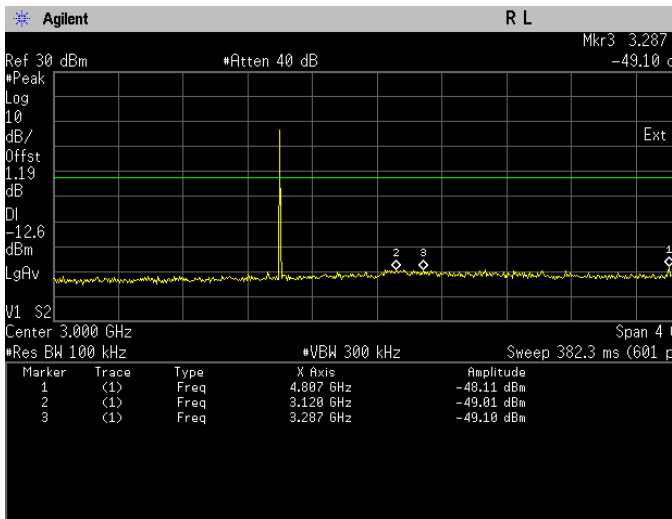
Test Conditions			Test Frequency	Results	
Standard	Modulation Type	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
Bluetooth L.E.	GFSK	2402	24700.00	-42.57	Pass
			24433.00	-42.71	Pass
			24925.00	-43.27	Pass
Bluetooth L.E.	GFSK	2440	25000.00	-41.90	Pass
			24550.00	-42.80	Pass
			24325.00	-43.09	Pass
Bluetooth L.E.	GFSK	2480	24733.00	-43.18	Pass
			24317.00	-43.26	Pass
			24300.00	-43.70	Pass



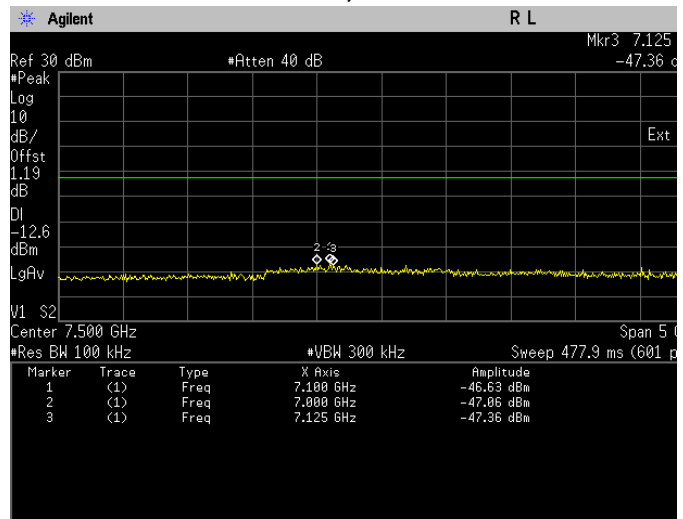
Conducted Emissions. Bluetooth LE, Frequency 2402 MHz Reference Level



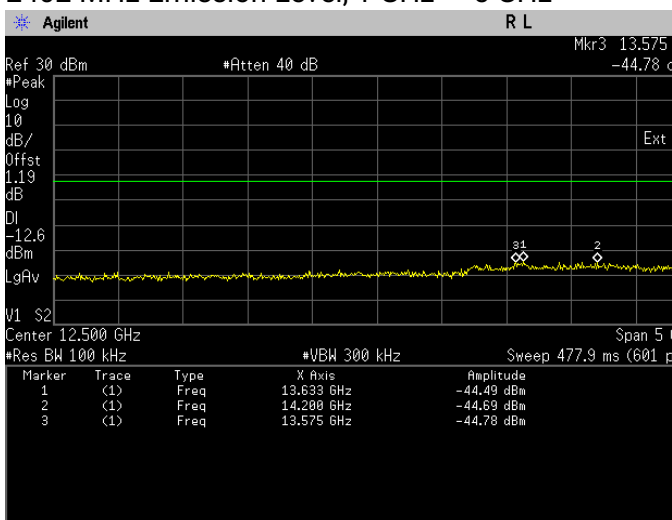
Conducted Emissions. Bluetooth LE, Frequency 2402 MHz Emission Level, 30 MHz -> 1 GHz



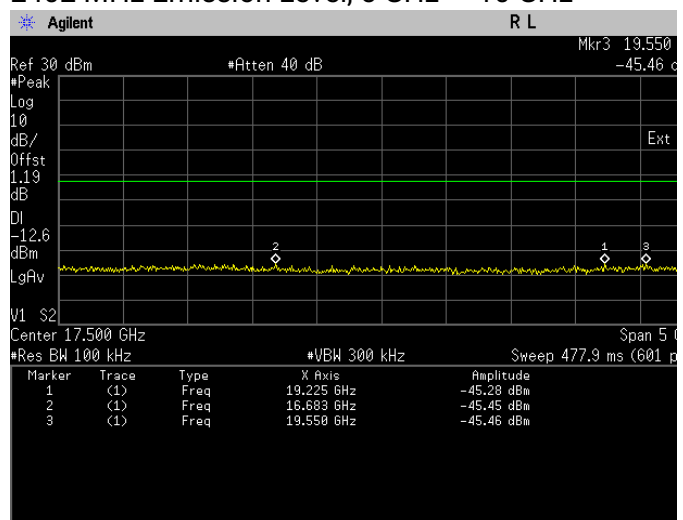
Conducted Emissions. Bluetooth LE, Frequency 2402 MHz Emission Level, 1 GHz -> 5 GHz



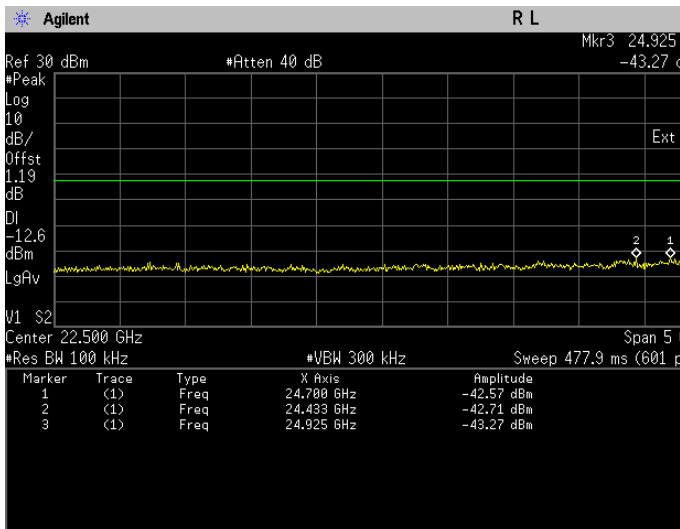
Conducted Emissions. Bluetooth LE, Frequency 2402 MHz Emission Level, 5 GHz -> 10 GHz



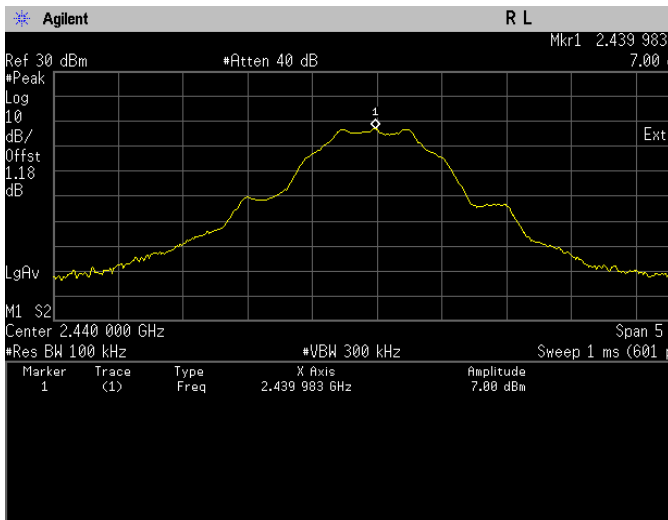
Conducted Emissions. Bluetooth LE, Frequency 2402 MHz Emission Level, 10 GHz -> 15 GHz



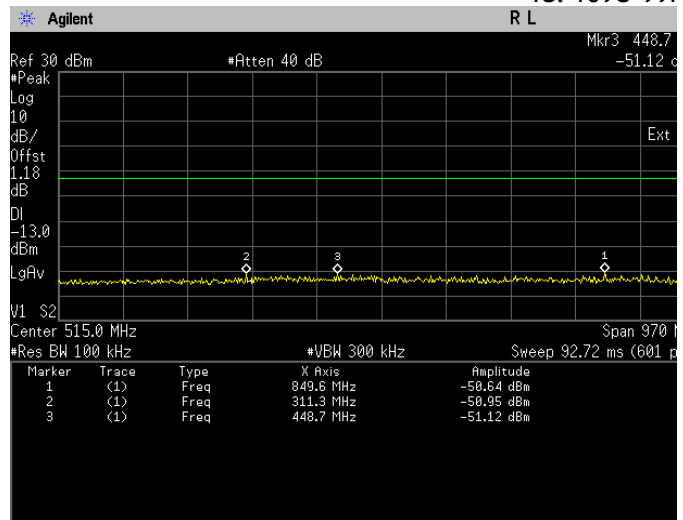
Conducted Emissions. Bluetooth LE, Frequency 2402 MHz Emission Level, 15 GHz -> 20 GHz



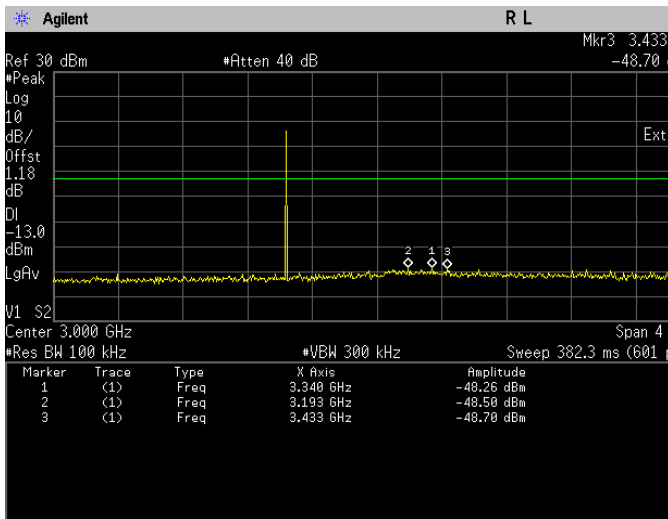
Conducted Emissions. Bluetooth LE, Frequency
2402 MHz Emission Level, 20 GHz -> 25 GHz



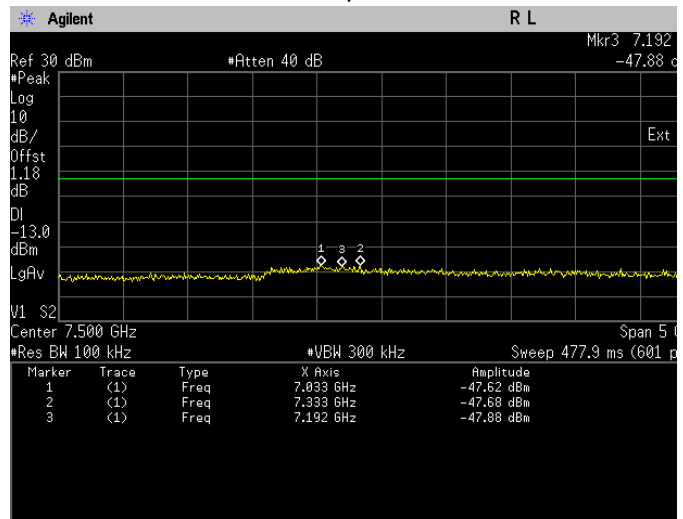
Conducted Emissions. Bluetooth LE, Frequency 2440 MHz Reference Level



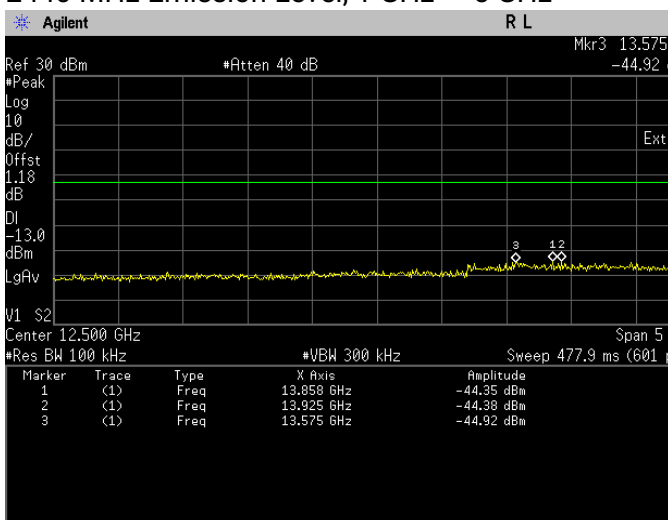
Conducted Emissions. Bluetooth LE, Frequency 2440 MHz Emission Level, 30 MHz -> 1 GHz



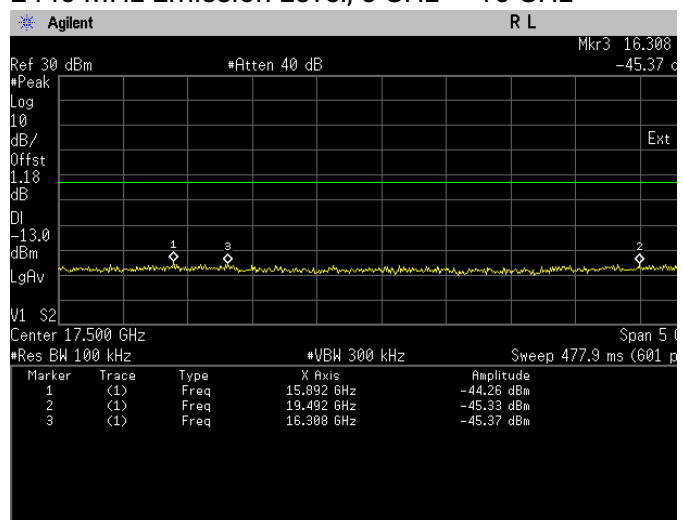
Conducted Emissions. Bluetooth LE, Frequency 2440 MHz Emission Level, 1 GHz -> 5 GHz



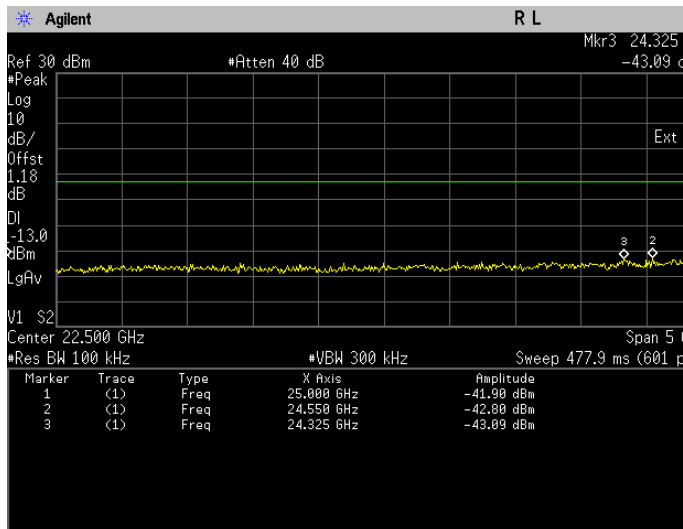
Conducted Emissions. Bluetooth LE, Frequency 2440 MHz Emission Level, 5 GHz -> 10 GHz



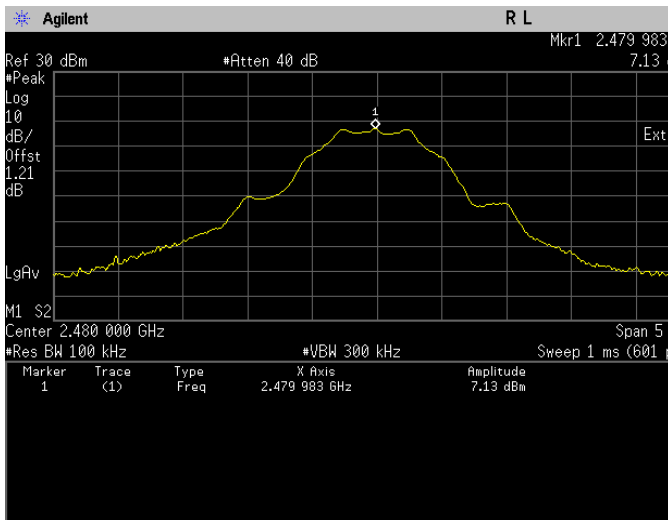
Conducted Emissions. Bluetooth LE, Frequency 2440 MHz Emission Level, 10 GHz -> 15 GHz



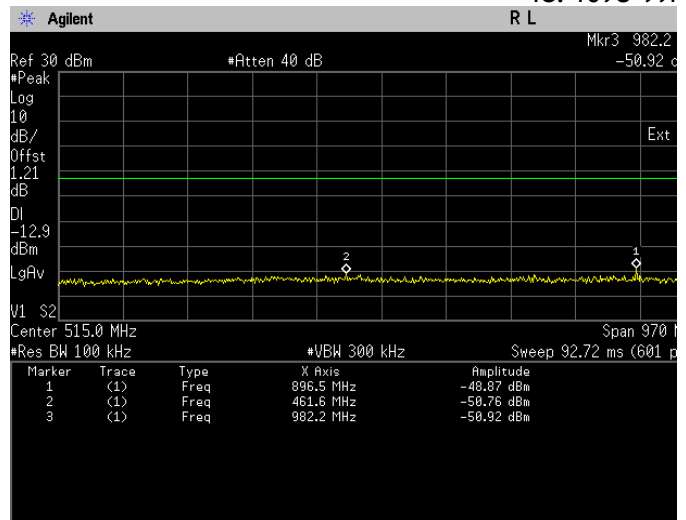
Conducted Emissions. Bluetooth LE, Frequency 2440 MHz Emission Level, 15 GHz -> 20 GHz



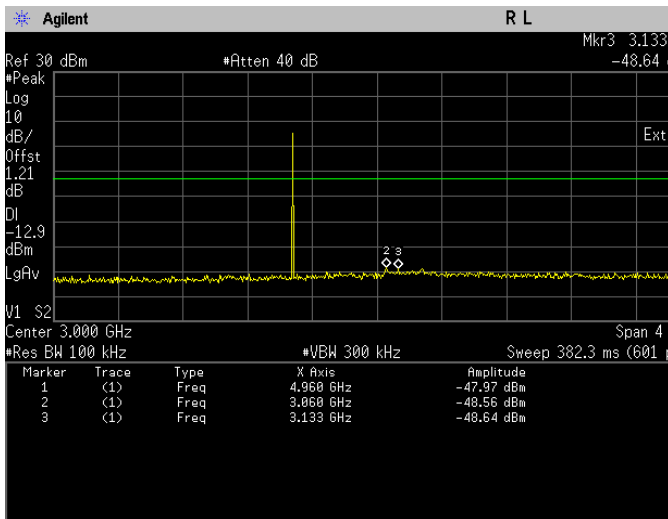
Conducted Emissions. Bluetooth LE, Frequency
2440 MHz Emission Level, 20 GHz -> 25 GHz



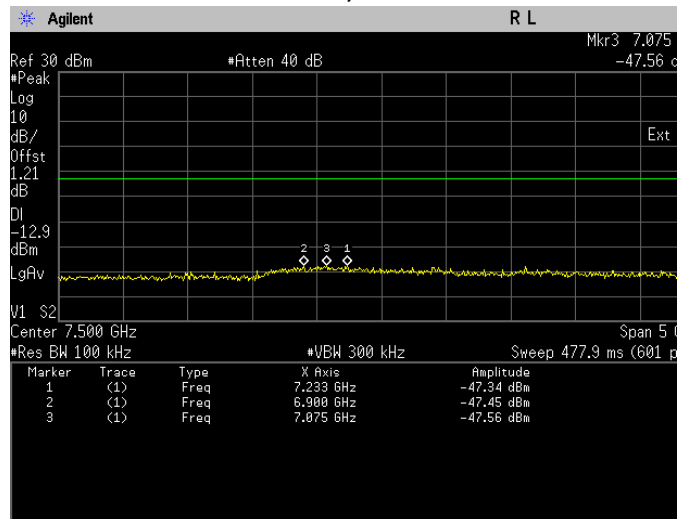
Conducted Emissions. Bluetooth LE, Frequency 2480 MHz Reference Level



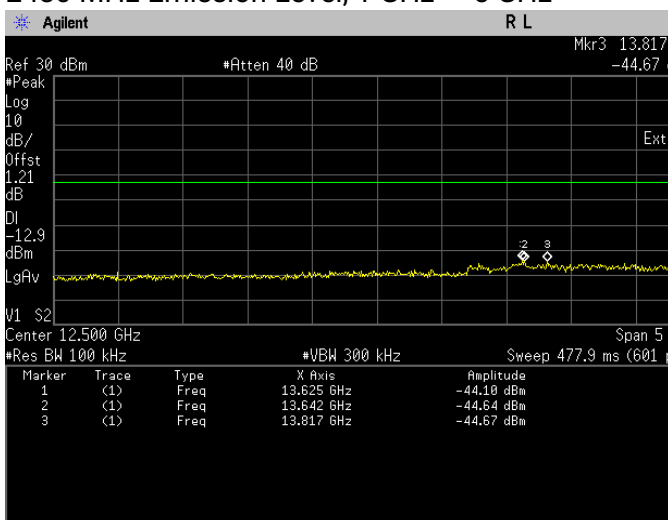
Conducted Emissions. Bluetooth LE, Frequency 2480 MHz Emission Level, 30 MHz -> 1 GHz



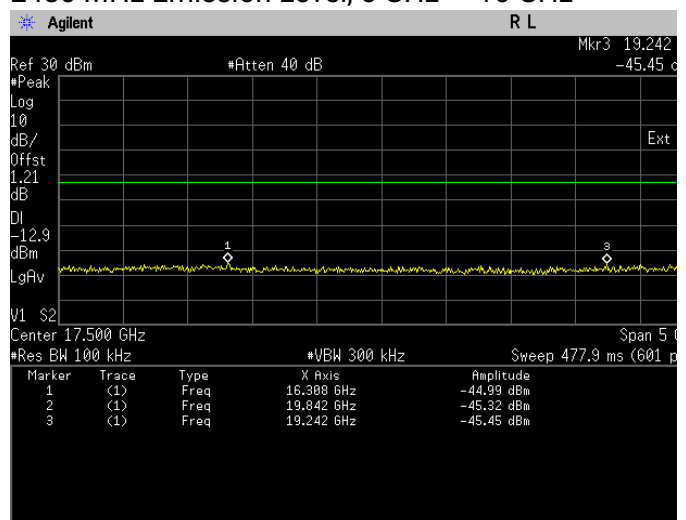
Conducted Emissions. Bluetooth LE, Frequency 2480 MHz Emission Level, 1 GHz -> 5 GHz



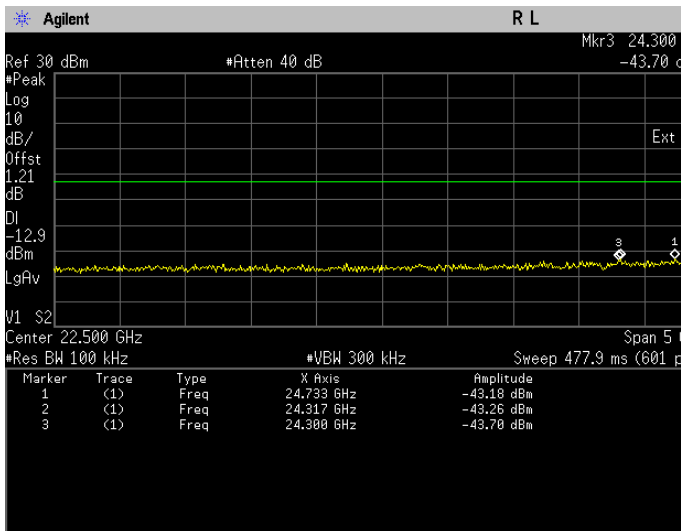
Conducted Emissions. Bluetooth LE, Frequency 2480 MHz Emission Level, 5 GHz -> 10 GHz



Conducted Emissions. Bluetooth LE, Frequency 2480 MHz Emission Level, 10 GHz -> 15 GHz



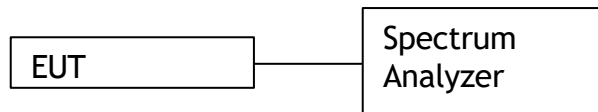
Conducted Emissions. Bluetooth LE, Frequency 2480 MHz Emission Level, 15 GHz -> 20 GHz



Conducted Emissions. Bluetooth LE, Frequency
2480 MHz Emission Level, 20 GHz -> 25 GHz

6.5 Band edge Conducted Spurious Emission

6.5.1 Test Setup



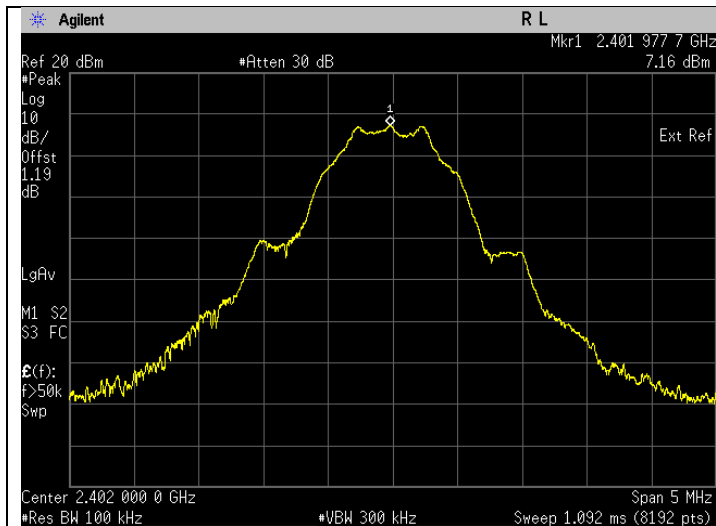
- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak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

6.5.2 Test Limits:

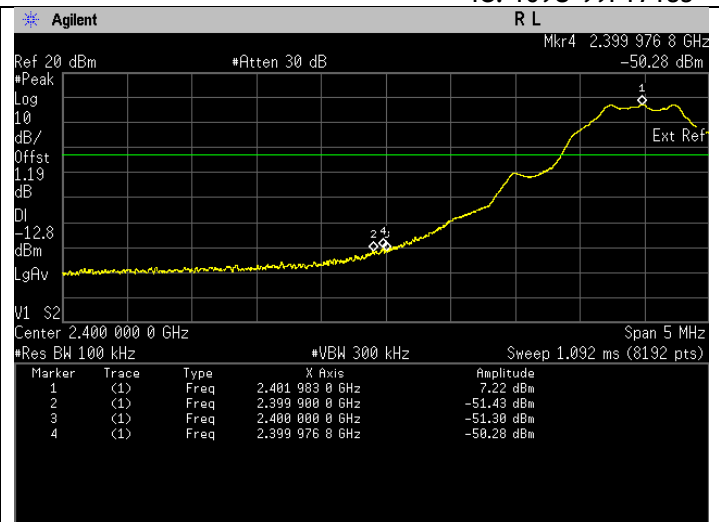
Normal Condition (25 ° C)
Shall be at least 20 dB below max power. (Peak detector)

6.5.3 Test Result

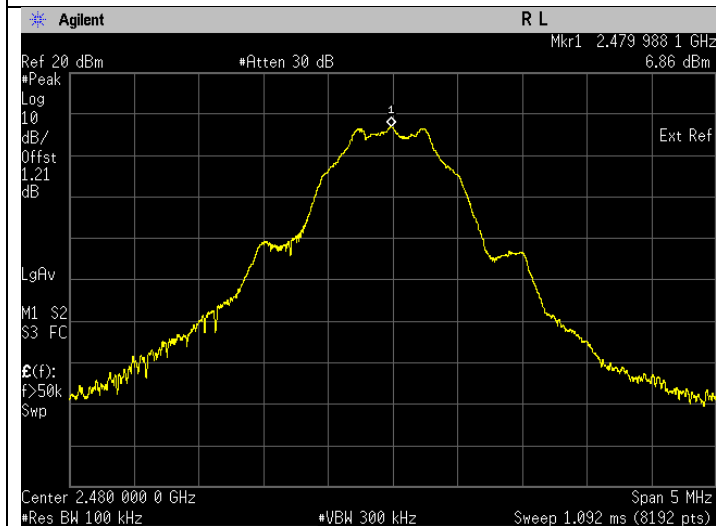
Test Conditions		Test Frequency	Results		
Standard	Modulation Type	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
Bluetooth L.E	GFSK	2402	2399.98	-50.28	Pass
Bluetooth L.E	GFSK	2480	2483.53	-56.73	Pass



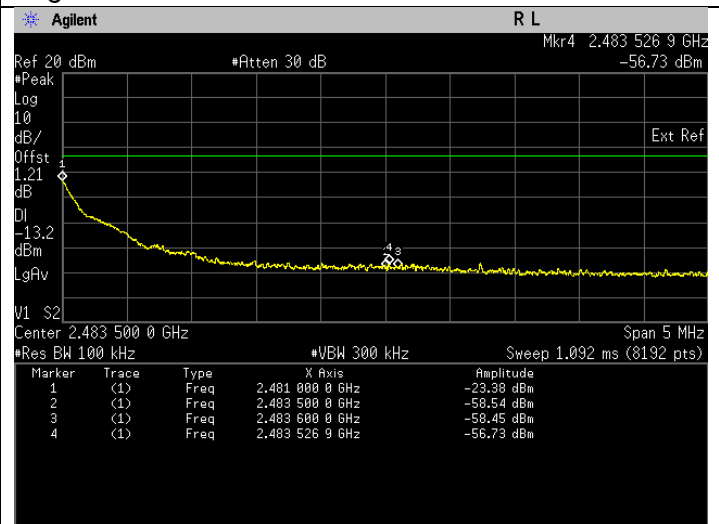
Band Edge. Bluetooth LE Frequency 2402 MHz
Reference Level



Band Edge. Bluetooth LE Frequency 2402 MHz Band
Edge



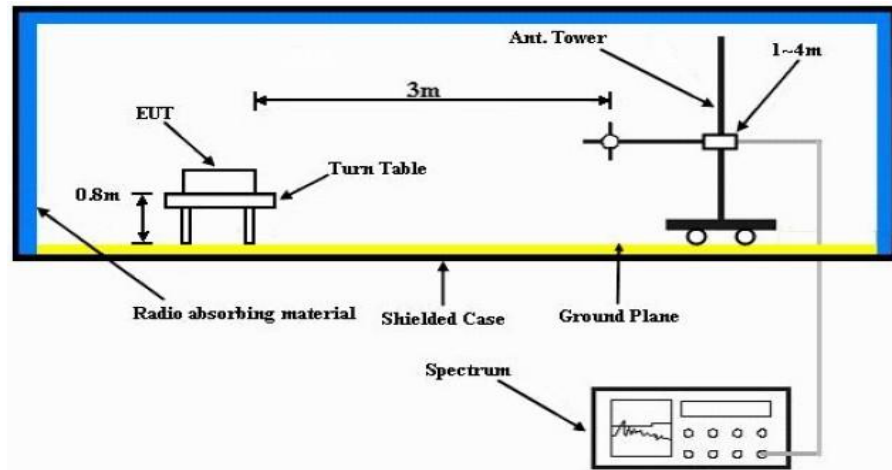
Band Edge. Bluetooth LE Frequency 2480 MHz
Reference Level



Band Edge. Bluetooth LE Frequency 2480 MHz Band
Edge

6.6 Radiated Emission within Restricted Bands

6.6.1 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.

3. All modes of operation were investigated and the worst-case emissions are reported.

6.6.2 Test Limits:

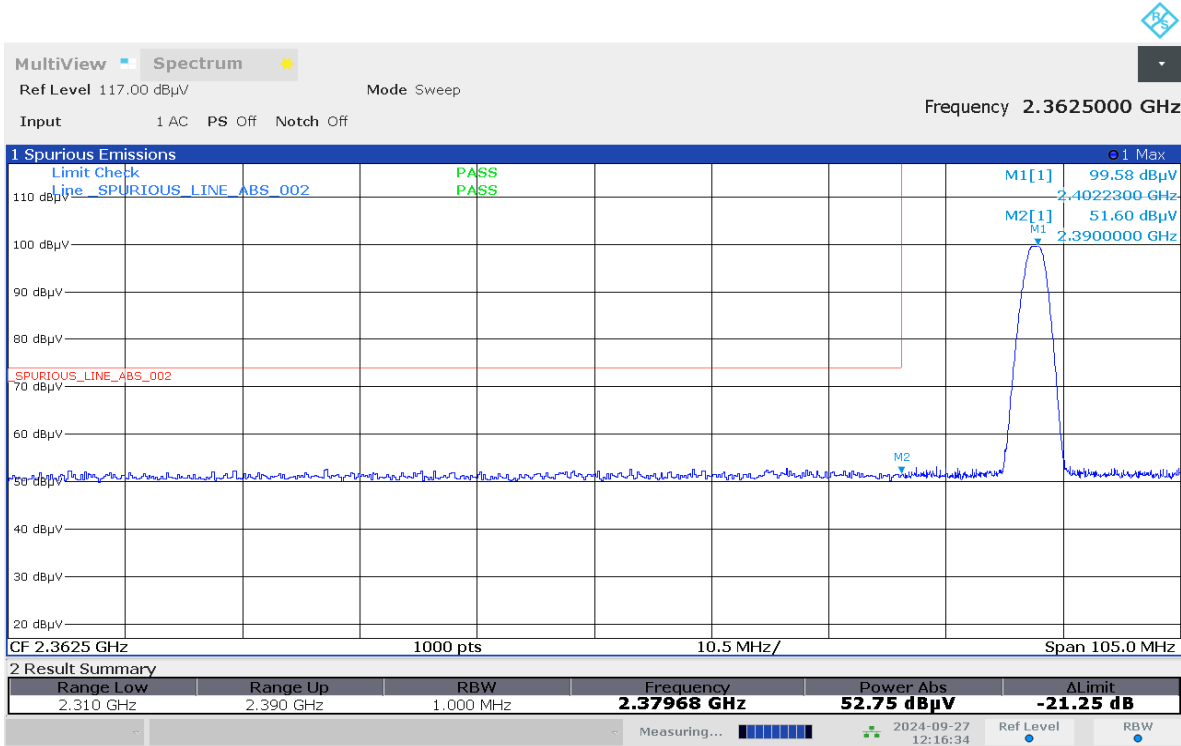
Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

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:

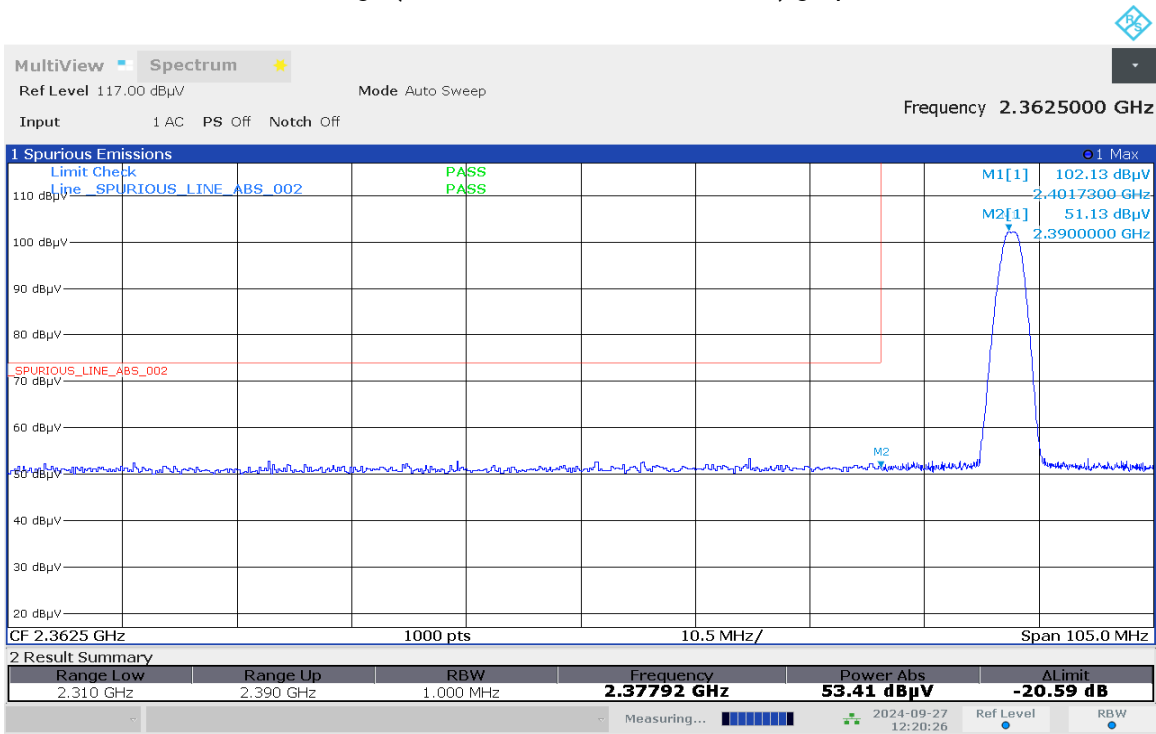
- 1) The lower limit shall apply at the transition frequencies.
- 2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 3) For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted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

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



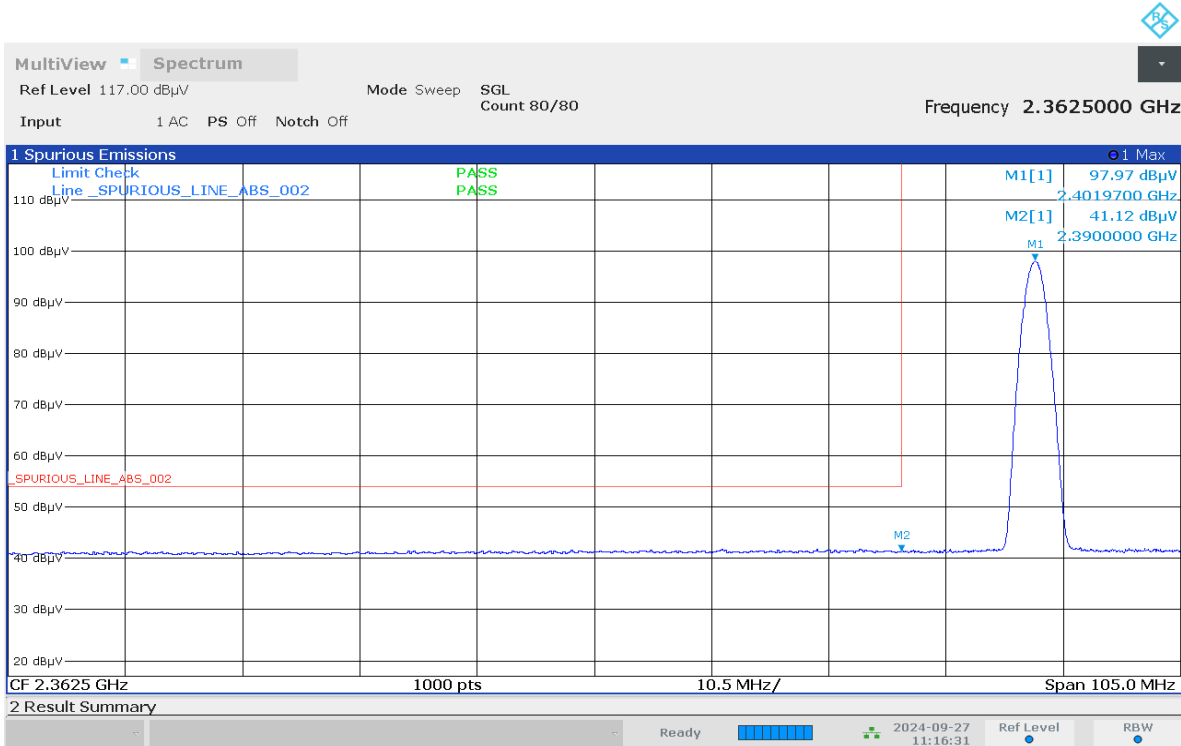
12:16:35 PM 09/27/2024

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



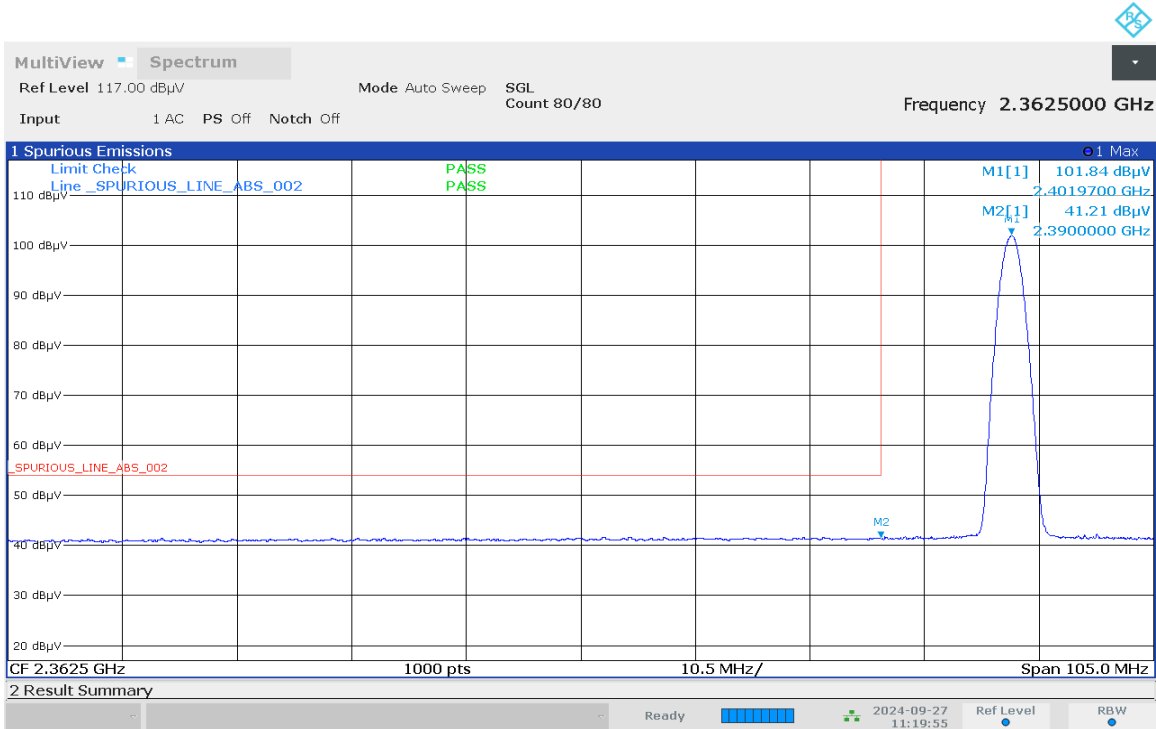
12:20:26 PM 09/27/2024

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



11:16:31 AM 09/27/2024

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



11:19:56 AM 09/27/2024

Test: Bluetooth SAC Restricted Band Edge		
Model Number: B20CJM2BE2AN	S/N: 663EAS0005	EMC SR ID#: 0572N00-EMC-00015
Battery: PMNN4578A	Softpot power (9dBm)	Accessory: NA
Test Channel: High	Test Frequency: 2480.0000 MHz	Test Standard: ANSI C63.10-2013 Worst Case Plane: Z-Plane (BTLE 1M)

Restricted Band Edge (High Channel) tabular data

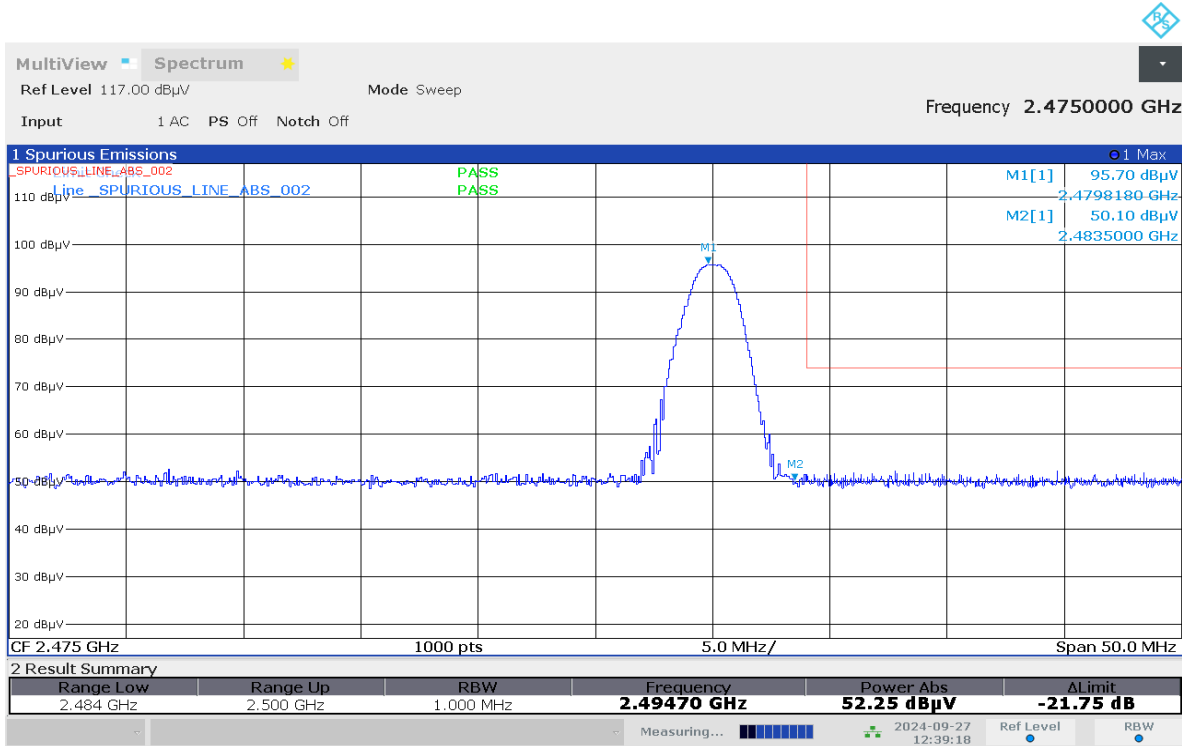
[illegible]

Remarks: Pass Result	Marginal Result	Fail Result
-------------------------	-----------------	-------------

Temperature (degC): 22.4
Test Performed by: Nazrin & Fuad
System MU: 5.84dB

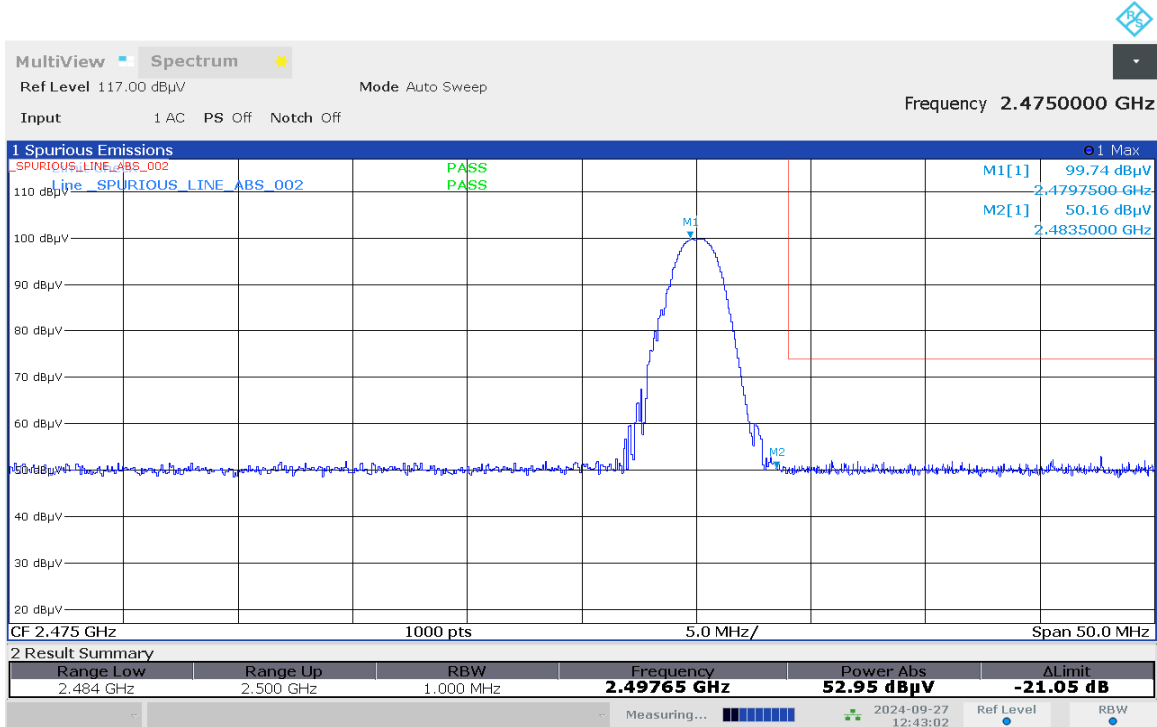
Humidity (%): 67.9
Test Date: Sun, 29 Sep, 2024

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



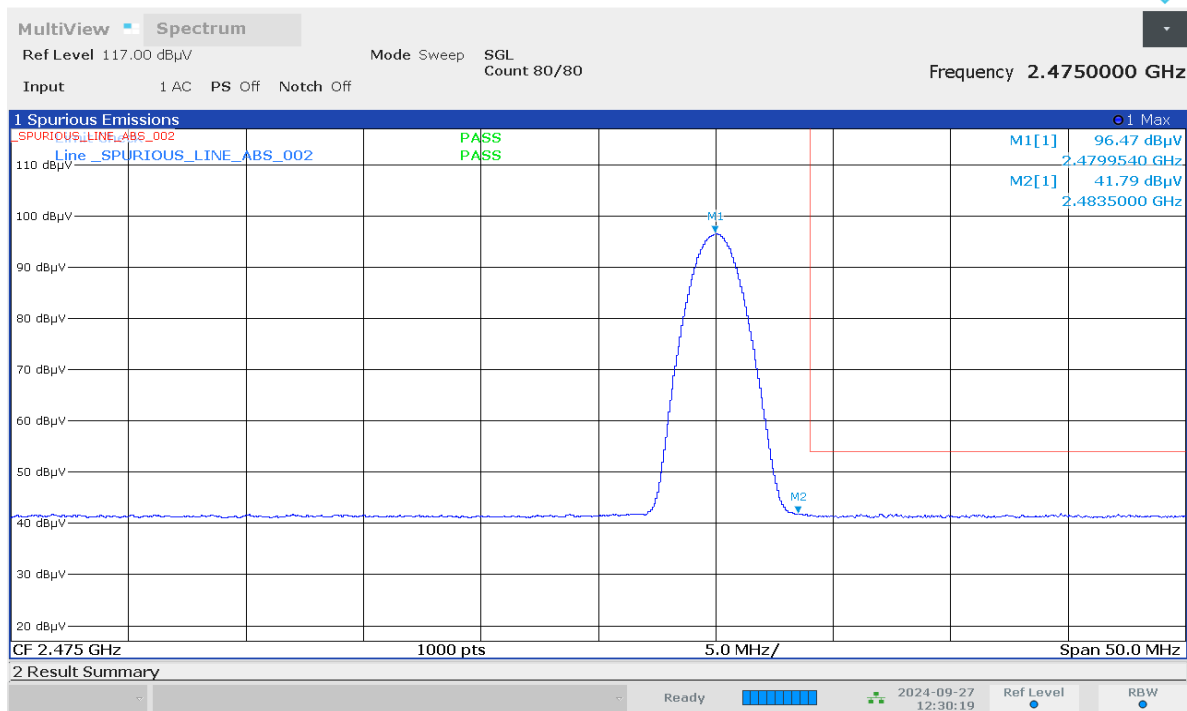
12:39:19 PM 09/27/2024

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



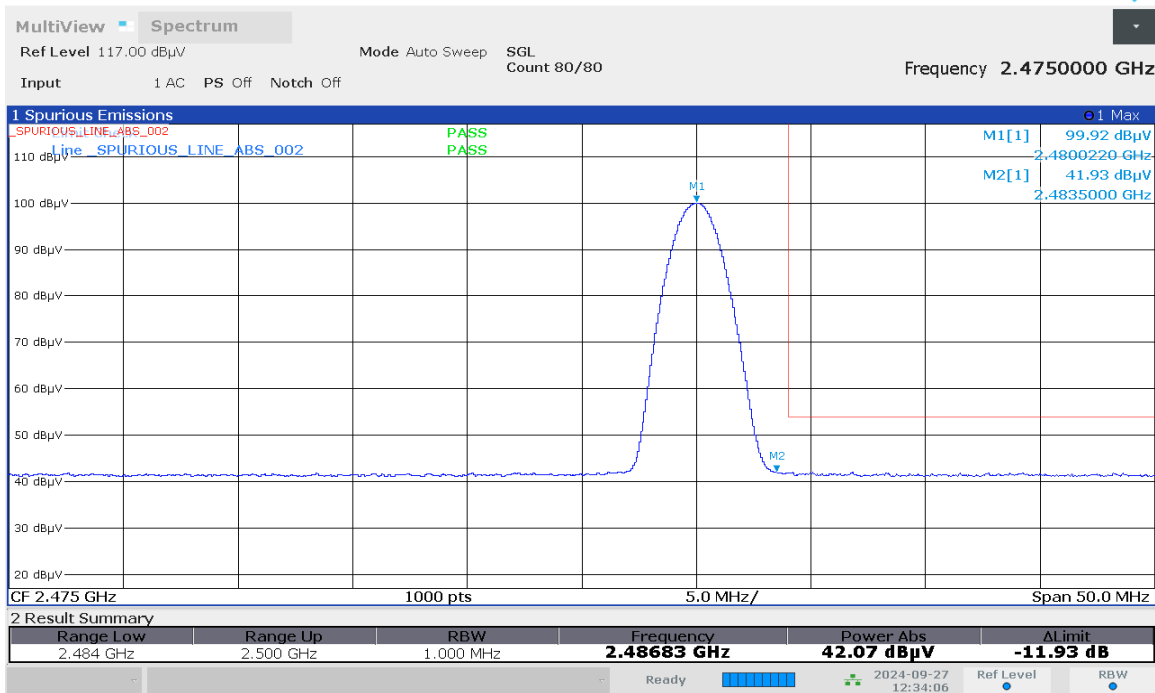
12:43:03 PM 09/27/2024

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



12:30:19 PM 09/27/2024

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



12:34:07 PM 09/27/2024

Model Number: B20CJM2BE2AN S/N: 663EAS0005 EMC SR ID#: 0572N00-EMC-00015
 Battery: PMNN4578A Softpot power (9dBm) Accessory: NA
 Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-
 2013 Worst Case Plane: Z-Plane (BTLE 1M)

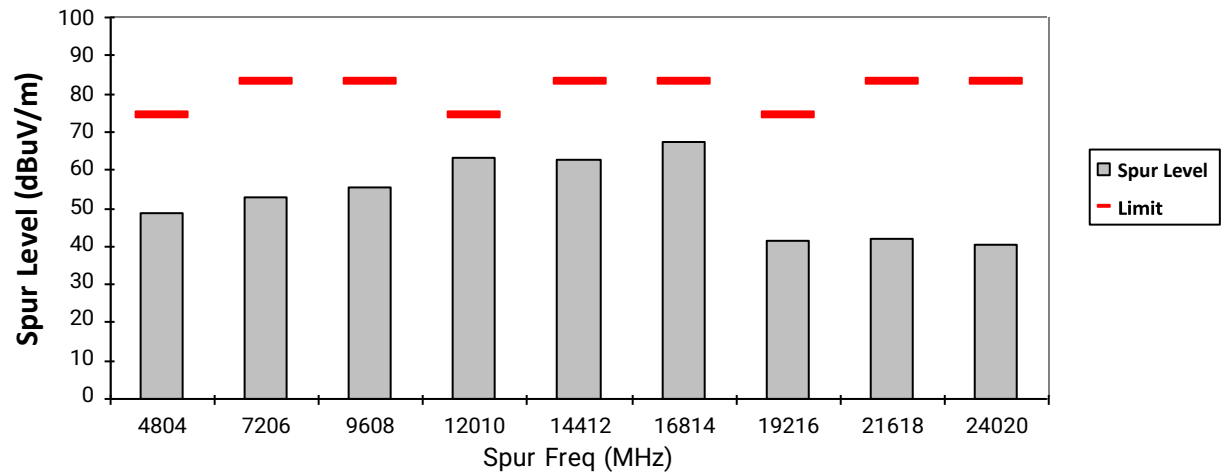
[illegible]

Remarks: Pass Result	Marginal Result	Fail Result
-------------------------	-----------------	-------------

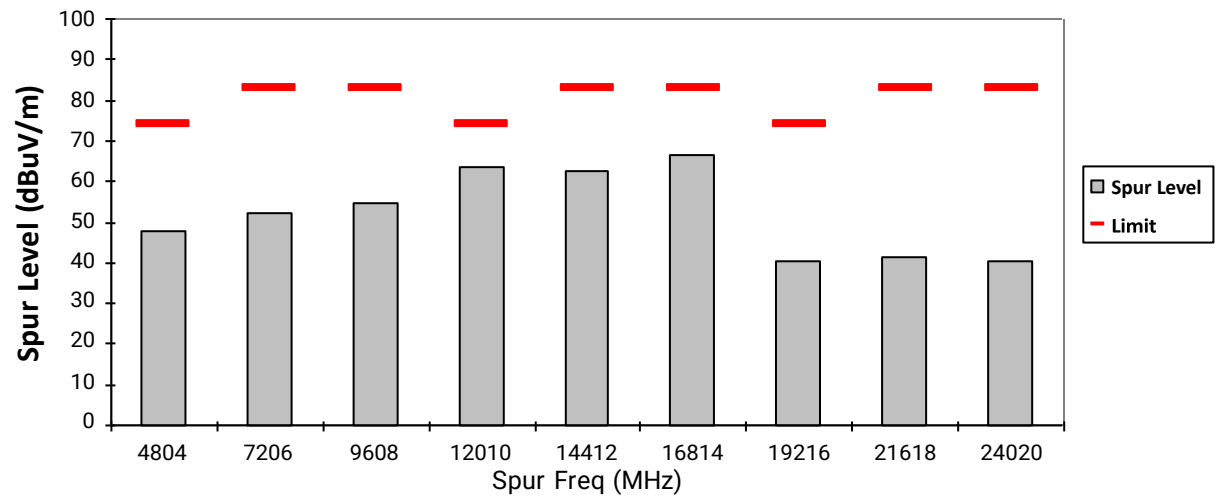
Temperature (degC): 22.4 Humidity (%): 67.9
Test Performed by: Nazrin & Fuad Test Date: Tue, 1 Oct, 2024
System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)

Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.
*Pursuant to CFR 47 Part 2.1057 (c), emissions attenuated more than 20 dB below the permissible limit are not reported.

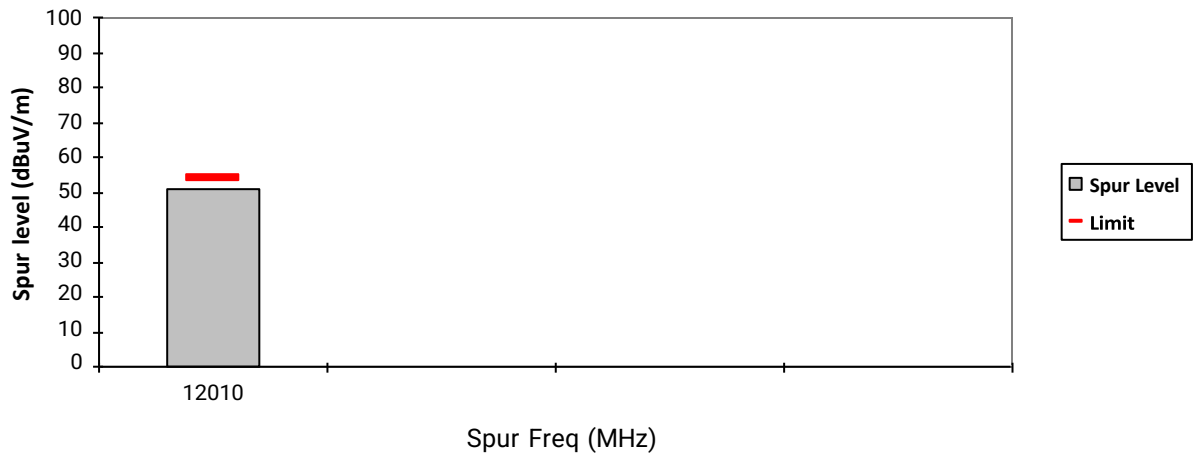
VERTICAL, PK



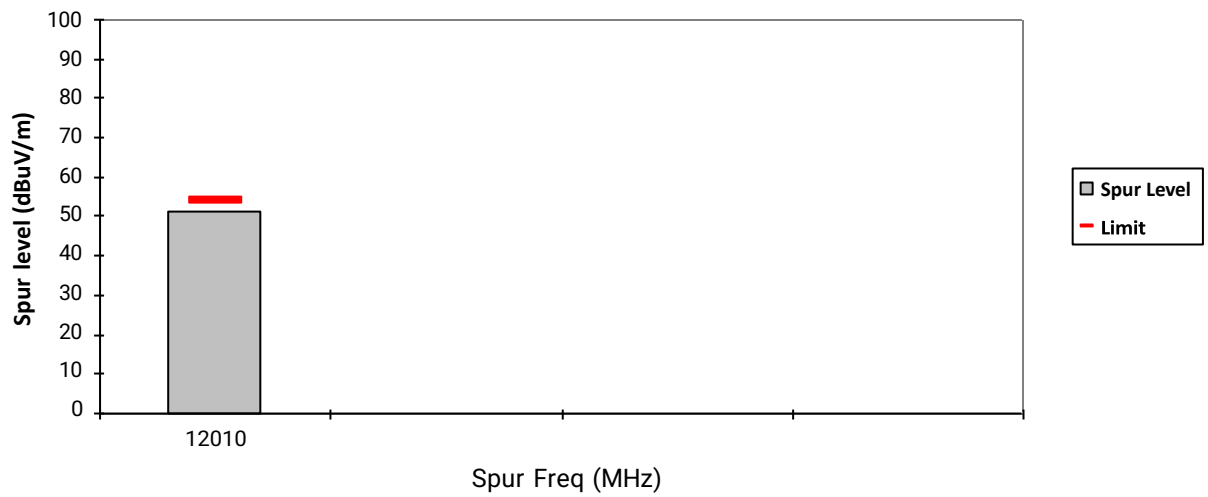
HORIZONTAL, PK



VERTICAL, AV



HORIZONTAL, AV



Test: Bluetooth SAC Transmitter Radiated Emission

Model Number: B20CJM2BE2AN S/N: 663EAS0005 EMC SR ID#: 0572N00-EMC-00015
Battery: PMNN4578A Softpot power (9dBm) Accessory: NA
Test Channel: Mid Test Frequency: 2440.0000 MHz Test Standard: ANSI C63.10-
2013 Worst Case Plane: Z-Plane (BTLE 1M)

Radiated Emission (Mid Channel) tabular data

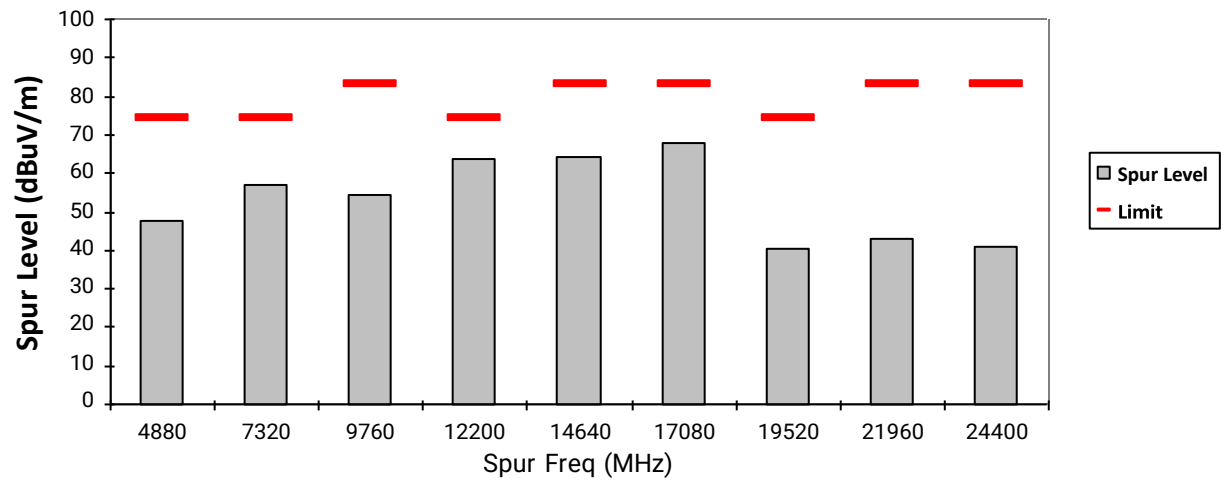
Vertical Radiated Emission Result										
Spur Freq (MHz)	Spur level QPK (dBμV/m)	Spur level PK (dBμV/m)	Spur level AV (dBμV/m)	Limit QPK (dBμV/m)	Limit PK (dBμV/m)	Limit AV (dBμV/m)	Margin QPK (dBμV/m)	Margin PK (dBμV/m)	Margin AV (dBμV/m)	Carrier PK Power (dBμV/m)
4880	-	47.4987**	-	-	74.0000	-	-	26.5013	-	-
7320	-	56.9266**	44.2244**	-	74.0000	54.0000	-	17.0734	9.7756	-
9760	-	54.4268**	-	-	82.9484	-	-	28.5216	-	102.9484
12200	-	63.5617**	51.0742**	-	74.0000	54.0000	-	10.4383	2.9258	-
14640	-	64.4348**	-	-	82.9484	-	-	18.5136	-	102.9484
17080	-	67.9854**	-	-	82.9484	-	-	14.9630	-	102.9484
19520	-	40.4410**	-	-	74.0000	-	-	33.5590	-	-
21960	-	42.9747**	-	-	82.9484	-	-	39.9737	-	102.9484
24400	-	40.9488**	-	-	82.9484	-	-	41.9996	-	102.9484
Horizontal Radiated Emission Result										
4880	-	47.1157**	-	-	74.0000	-	-	26.8843	-	-
7320	-	56.5332**	43.9726**	-	74.0000	54.0000	-	17.4668	10.0274	-
9760	-	55.6408**	-	-	82.9484	-	-	27.3076	-	102.9484
12200	-	63.4204**	50.9222**	-	74.0000	54.0000	-	10.5796	3.0778	-
14640	-	63.1538**	-	-	82.9484	-	-	19.7946	-	102.9484
17080	-	67.7086**	-	-	82.9484	-	-	15.2398	-	102.9484
19520	-	39.7355**	-	-	74.0000	-	-	34.2645	-	-
21960	-	41.6682**	-	-	82.9484	-	-	41.2802	-	102.9484
24400	-	40.9487**	-	-	82.9484	-	-	41.9997	-	102.9484

Remarks: Pass Result	Marginal Result	Fail Result
-------------------------	-----------------	-------------

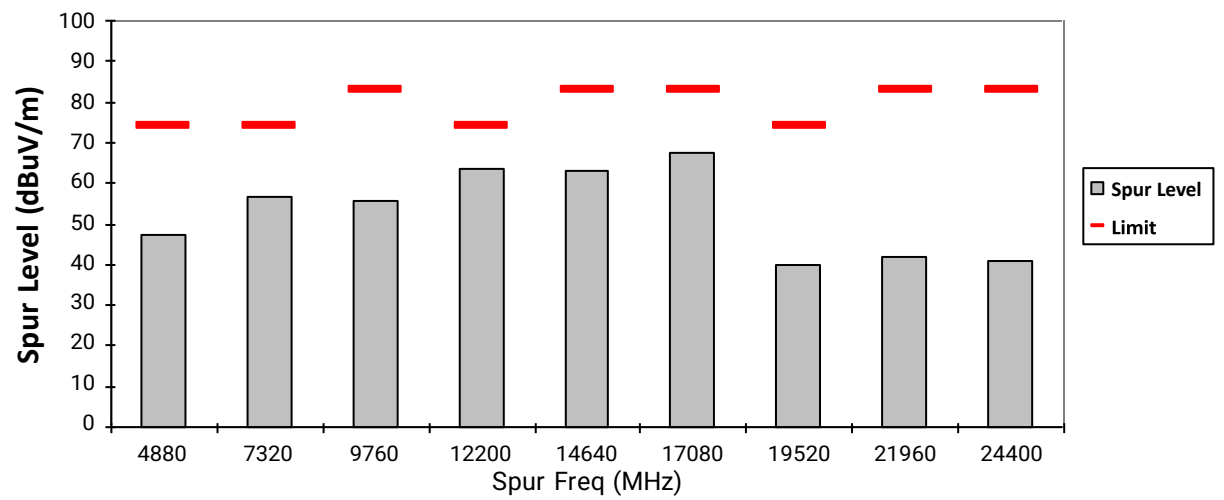
Temperature (degC): 22.4 Humidity (%): 67.9
Test Performed by: Nazrin & Fuad Test Date: Tue, 1 Oct, 2024
System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)

Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.
*Pursuant to CFR 47 Part 2.1057 (c), emissions attenuated more than 20 dB below the permissible limit are not reported.

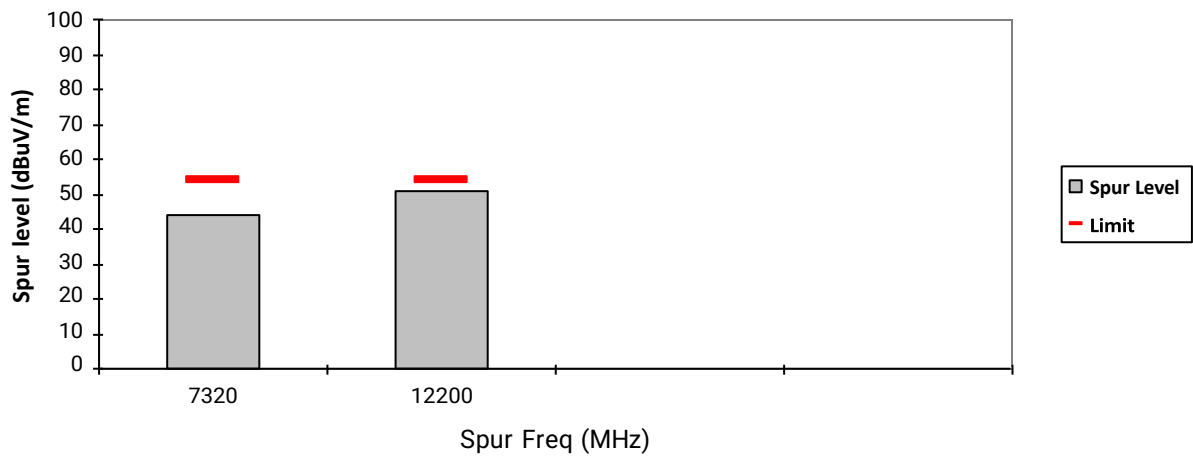
VERTICAL, PK



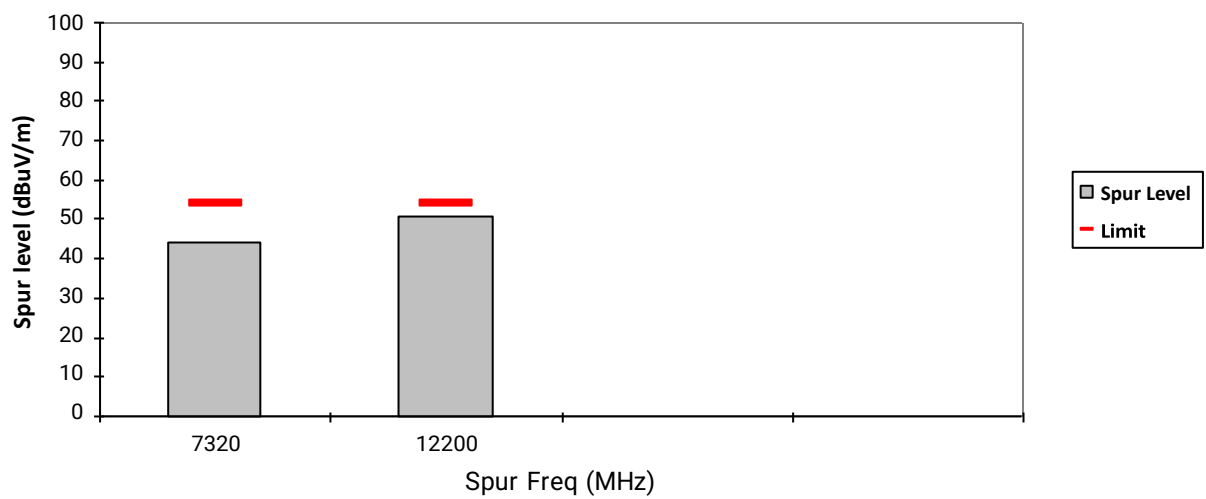
HORIZONTAL, PK



VERTICAL, AV



HORIZONTAL, AV



Model Number: B20CJM2BE2AN S/N: 663EAS0005 EMC SR ID#: 0572N00-EMC-00015
 Battery: PMNN4578A Softpot power (9dBm) Accessory: NA
 Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-
 2013 Worst Case Plane: Z-Plane (BTLE 1M)

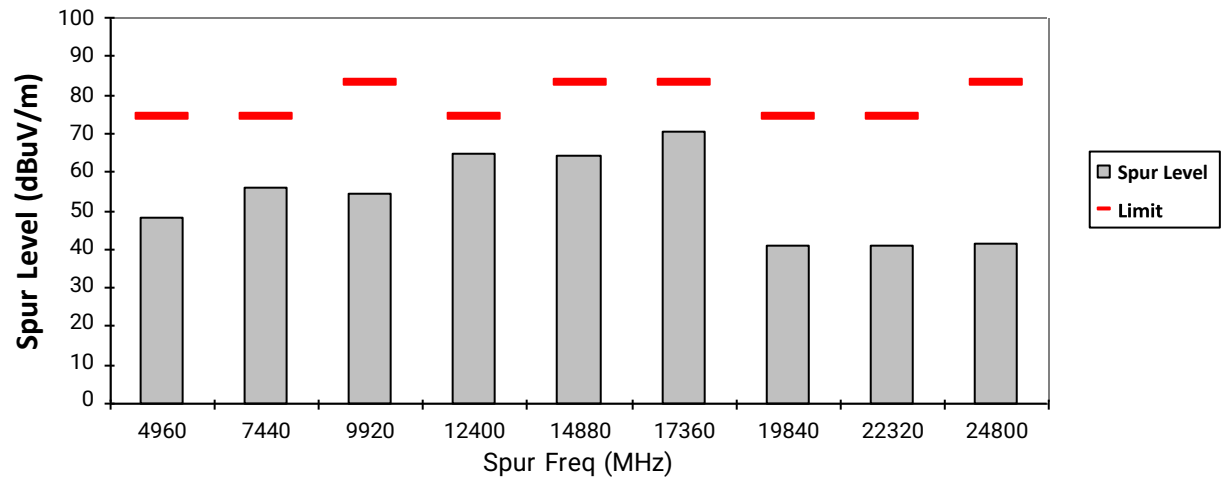
[illegible]

Remarks: Pass Result	Marginal Result	Fail Result
-------------------------	-----------------	-------------

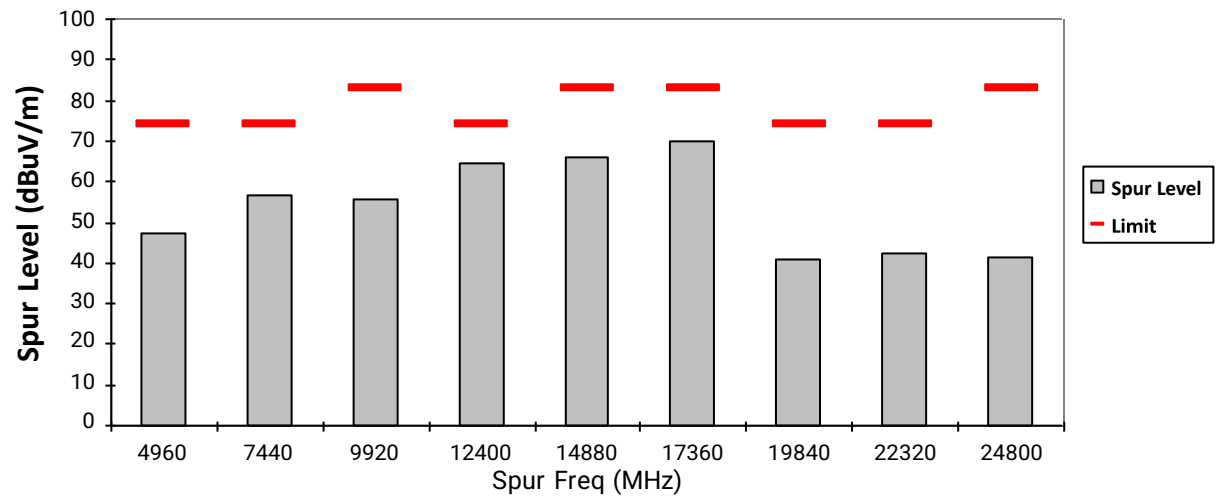
Temperature (degC): 22.4 Humidity (%): 67.9
Test Performed by: Nazrin & Fuad Test Date: Tue, 1 Oct, 2024
System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)

Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.
*Pursuant to CFR 47 Part 2.1057 (c), emissions attenuated more than 20 dB below the permissible limit are not reported.

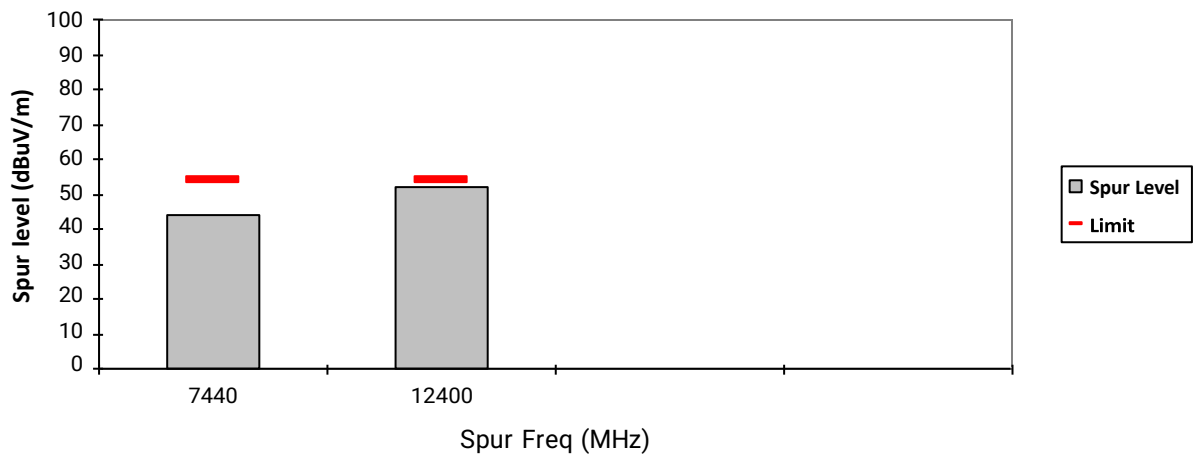
VERTICAL, PK



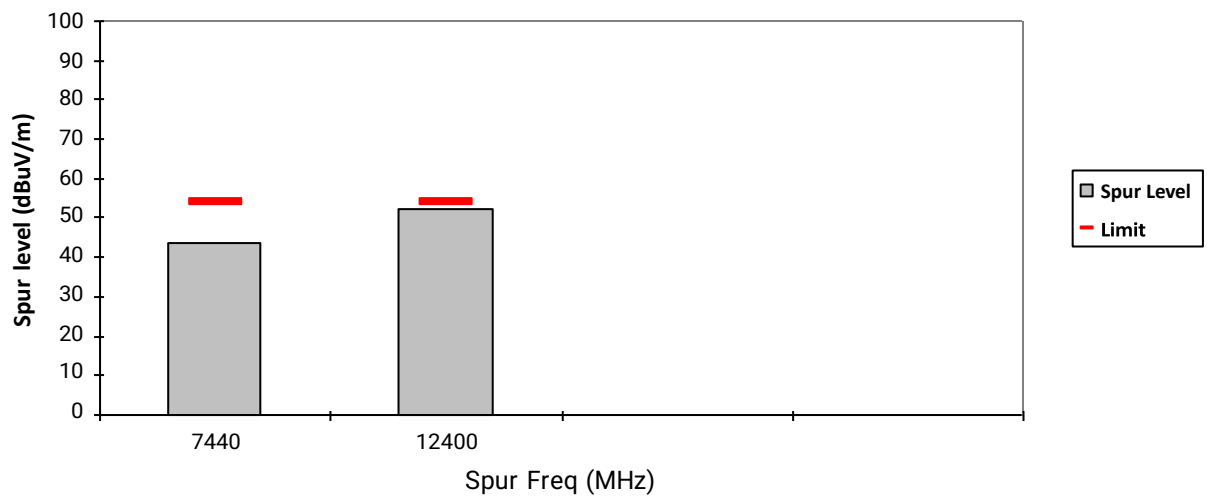
HORIZONTAL, PK



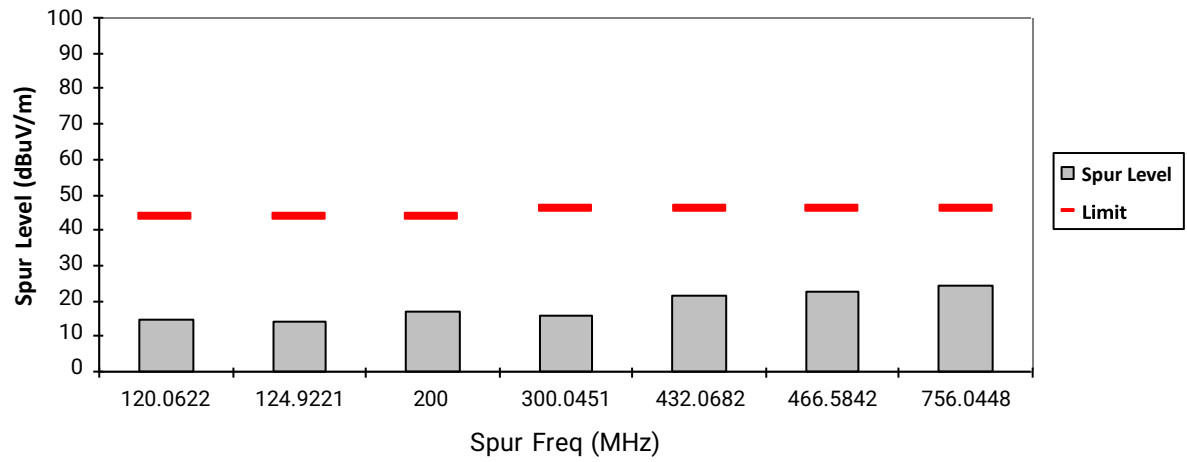
VERTICAL, AV



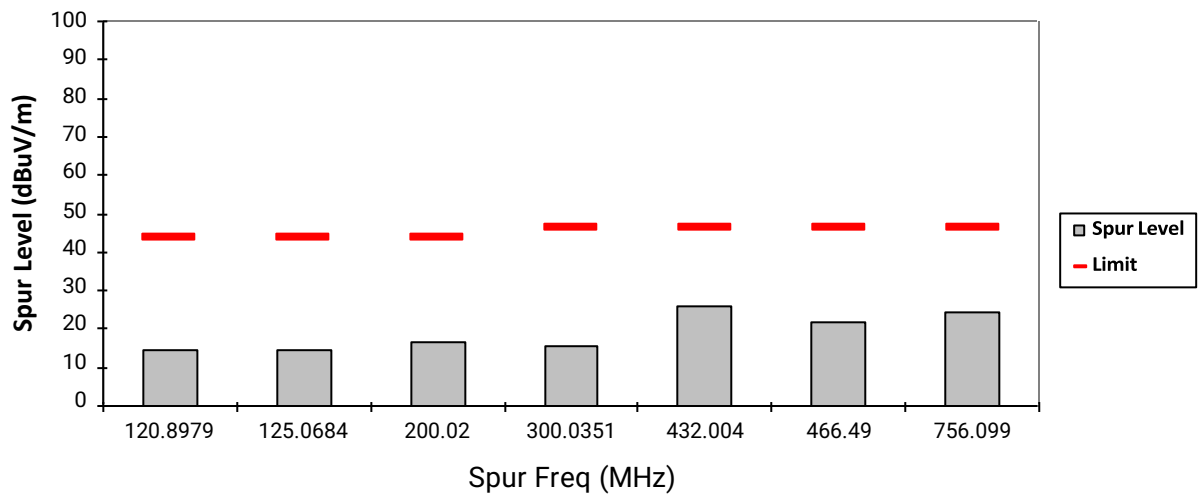
HORIZONTAL, AV



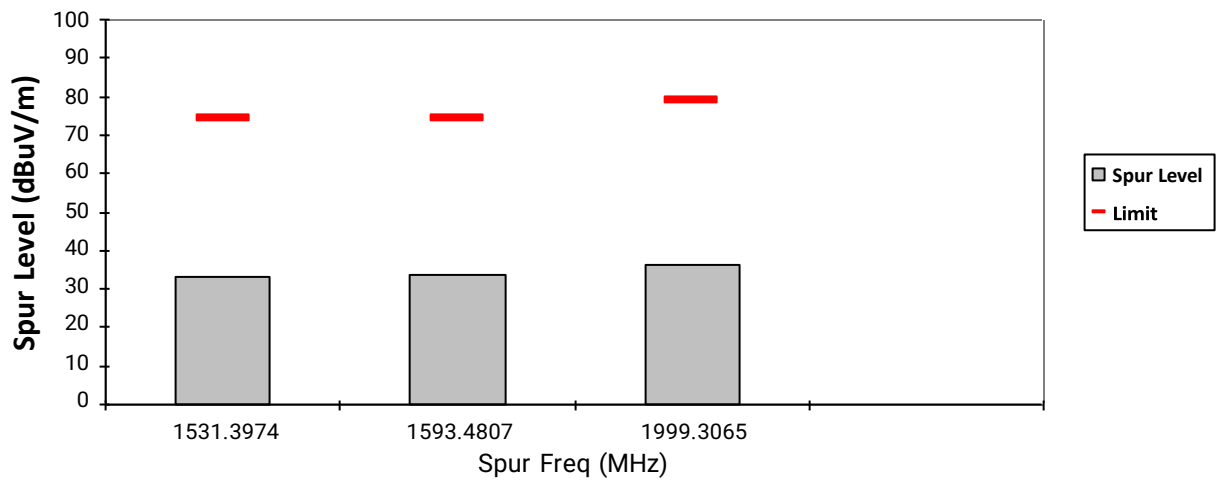
VERTICAL, QPK



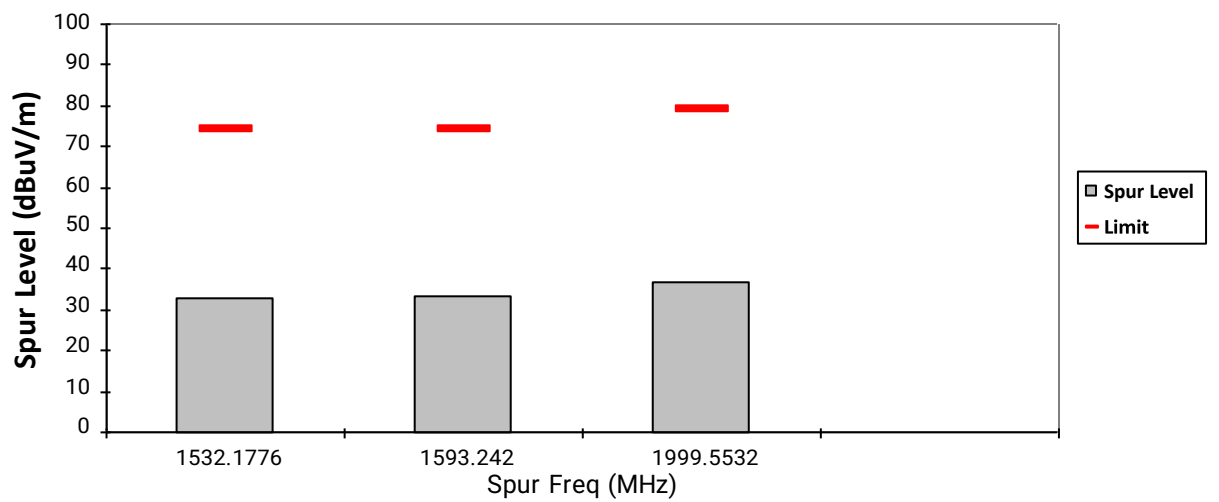
HORIZONTAL, QPK



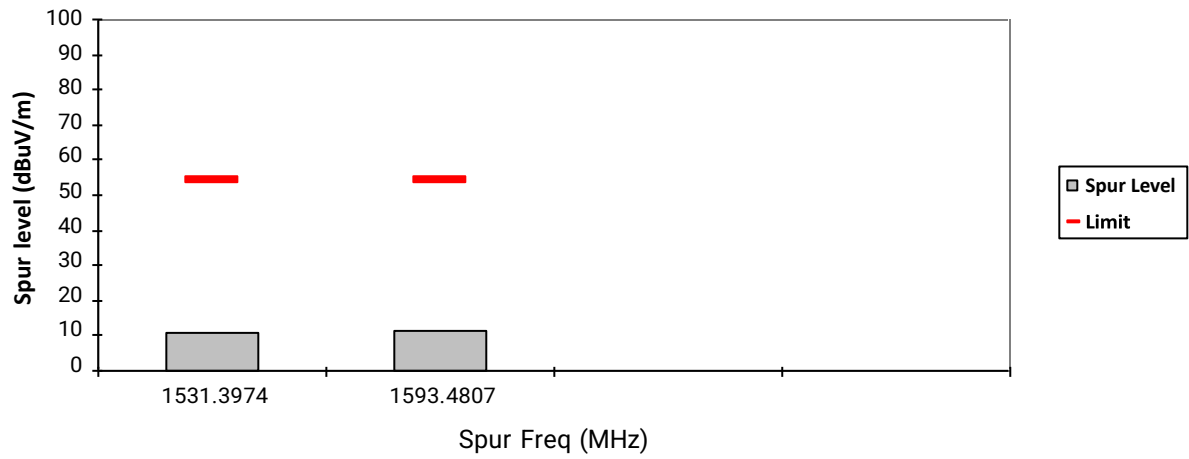
VERTICAL, PK



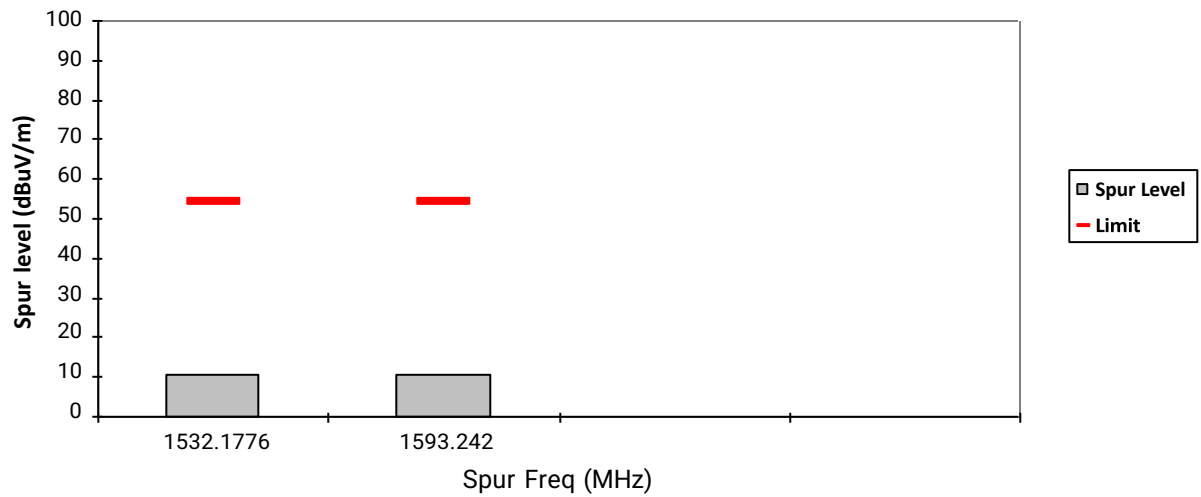
HORIZONTAL, PK



VERTICAL, AV

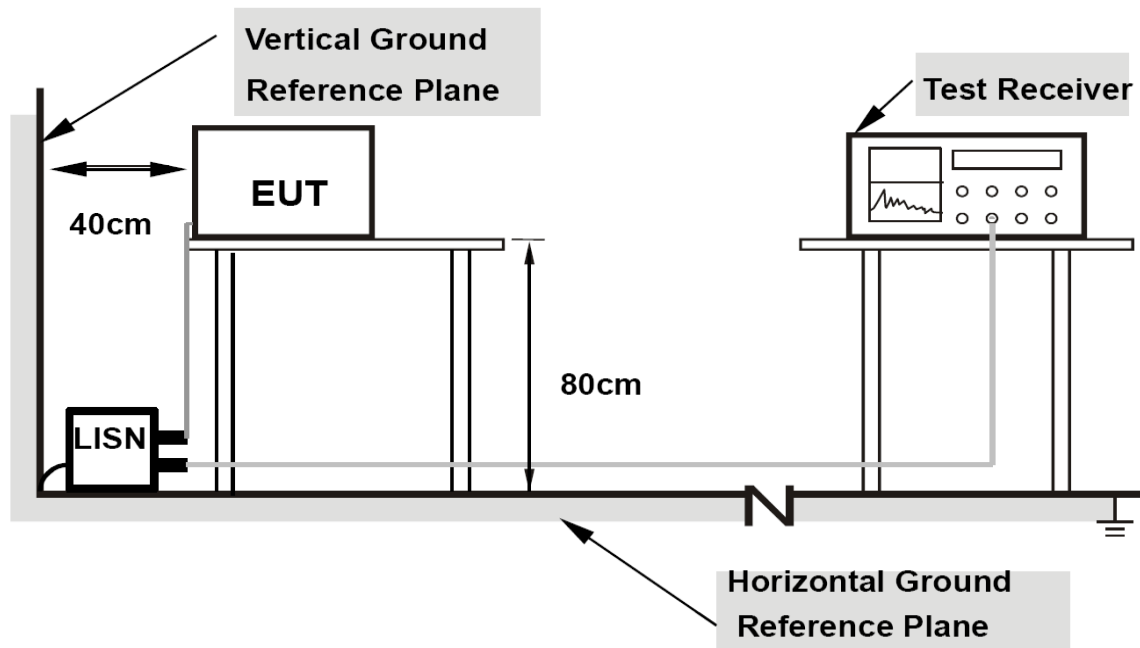


HORIZONTAL, AV



6.7 AC Powerline Conducted Emission

6.7.1 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.

6.7.2 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**

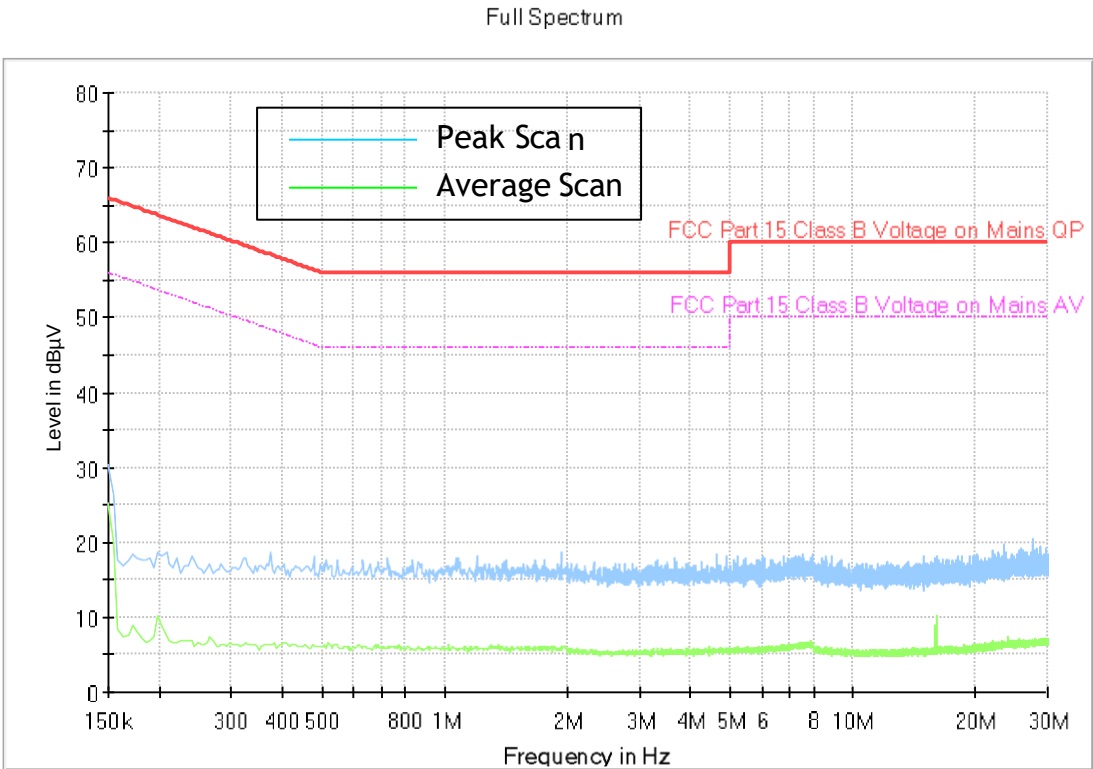
Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies.		
NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

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

6.7.3 Test Result

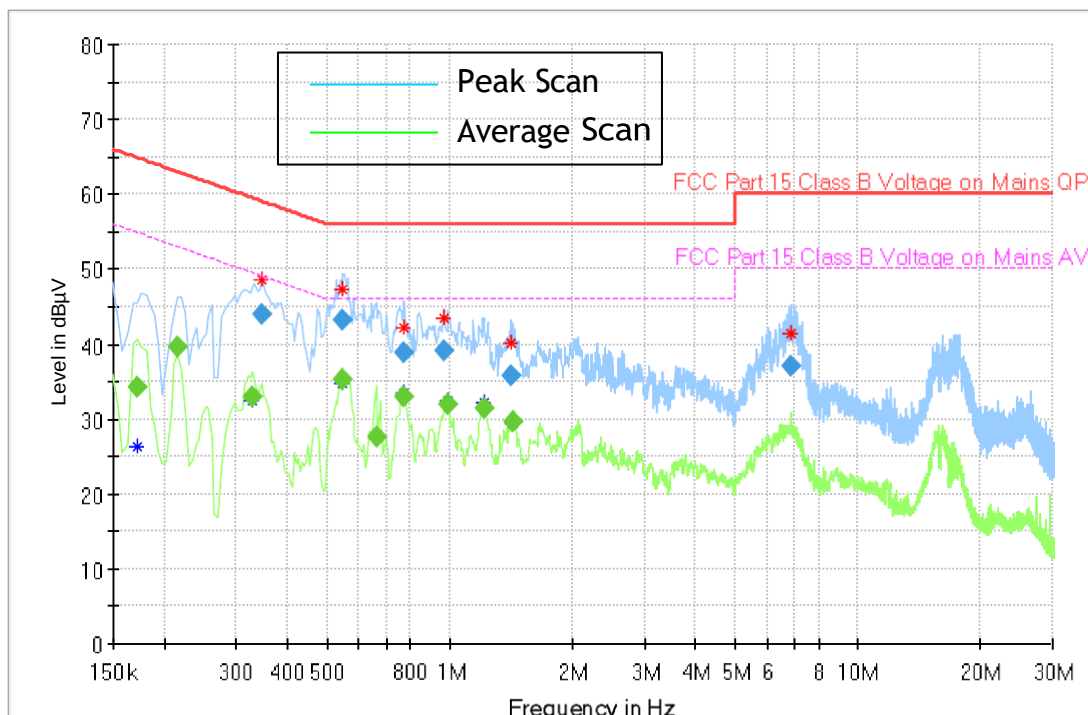
120VAC, 60HZ

1) Ambient



2) Ambient Laptop

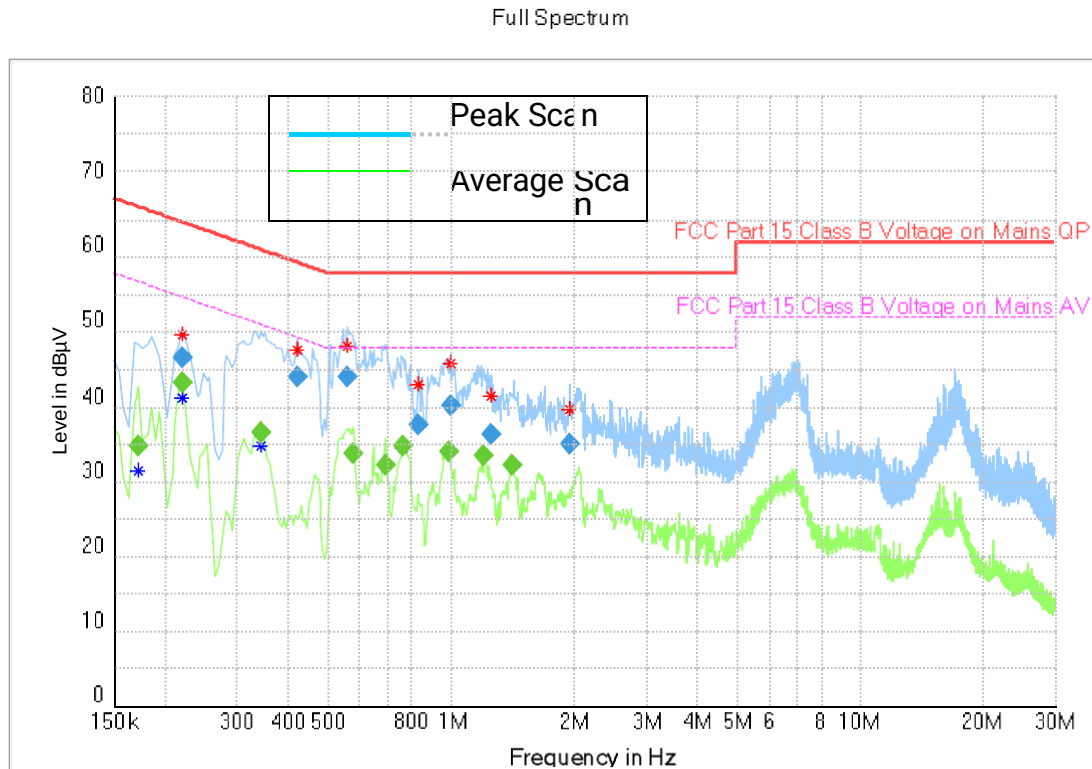
Full Spectrum



Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.172500	—	34.18	54.84	20.66	N	ON	10.8
0.217500	—	39.59	52.91	13.32	L1	ON	10.4
0.330000	—	33.00	49.45	16.45	N	ON	10.5
0.348000	43.97	—	59.01	15.04	N	ON	10.5
0.550500	—	35.19	46.00	10.81	N	ON	10.6
0.550500	43.20	—	56.00	12.80	N	ON	10.6
0.663000	—	27.67	46.00	18.33	L1	ON	10.5
0.771000	—	33.07	46.00	12.93	L1	ON	10.5
0.775500	38.96	—	56.00	17.04	L1	ON	10.5
0.969000	39.14	—	56.00	16.86	N	ON	10.4
0.991500	—	31.89	46.00	14.11	N	ON	10.4
1.216500	—	31.38	46.00	14.62	L1	ON	10.4
1.414500	35.66	—	56.00	20.34	N	ON	10.3
1.437000	—	29.65	46.00	16.35	L1	ON	10.3
6.841500	36.95	—	60.00	23.05	L1	ON	10.4

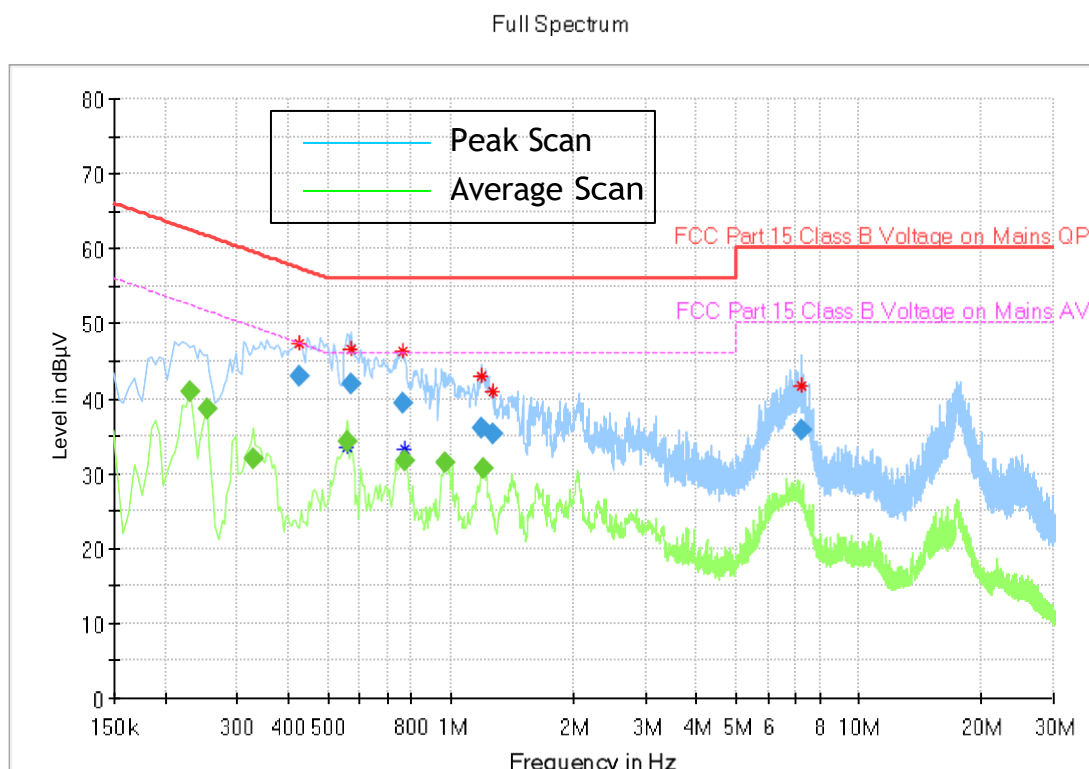
3) Laptop + Camera Standby



Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.172500	—	33.01	54.84	21.83	L1	ON	10.8
0.222000	—	41.31	52.74	11.43	N	ON	10.4
0.222000	44.66	—	62.74	18.08	N	ON	10.4
0.343500	—	34.79	49.12	14.33	N	ON	10.5
0.424500	42.26	—	57.36	15.10	N	ON	10.6
0.559500	42.25	—	56.00	13.75	N	ON	10.6
0.577500	—	31.89	46.00	14.11	N	ON	10.6
0.694500	—	30.41	46.00	15.59	N	ON	10.5
0.762000	—	32.96	46.00	13.04	N	ON	10.5
0.838500	35.73	—	56.00	20.27	N	ON	10.5
0.987000	—	32.17	46.00	13.83	N	ON	10.4
1.000500	38.24	—	56.00	17.76	N	ON	10.4
1.207500	—	31.76	46.00	14.24	L1	ON	10.4
1.261500	34.52	—	56.00	21.48	N	ON	10.3
1.419000	—	30.34	46.00	15.66	L1	ON	10.3
1.954500	33.18	—	56.00	22.82	L1	ON	10.3

4) Laptop + Camera TX BTLE 1M



Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.231000	—	40.78	52.41	11.64	N	ON	10.3
0.253500	—	38.62	51.64	13.02	N	ON	10.2
0.330000	—	31.86	49.45	17.60	N	ON	10.5
0.429000	43.05	—	57.27	14.22	N	ON	10.6
0.559500	—	34.26	46.00	11.74	L1	ON	10.6
0.573000	41.97	—	56.00	14.03	N	ON	10.6
0.766500	39.41	—	56.00	16.59	N	ON	10.5
0.771000	—	31.73	46.00	14.27	N	ON	10.5
0.973500	—	31.31	46.00	14.69	N	ON	10.4
1.189500	36.10	—	56.00	19.90	L1	ON	10.4
1.207500	—	30.56	46.00	15.44	L1	ON	10.4
1.266000	35.24	—	56.00	20.76	N	ON	10.3
7.237500	35.89	—	60.00	24.11	L1	ON	10.4

END OF TEST REPORT