
 <p>CERTIFICATE 2518.08</p> <p>MS ISO/IEC 17025 TESTING SAMM NO. 0825</p>
<p>MOTOROLA PENANG ADV. COMM. LABORATORY Motorola Solutions Malaysia Sdn. Bhd. Plot 2A Medan Bayan Lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia.</p>	<p>FCC / ISED TEST REPORT Report Revision : Rev.A</p>
<p>Date/s Tested : 06-Feb-2022 - 16-Feb-2022 Report Issue Date : 28-Feb-2022 Manufacturer/Location : Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia Requestor : ISMAIL, ABDUL HAKIM Product Type : Hand-held Product Version (PMN) : APX N50 Model Number (HVIN) : H25UCF9PW6AN 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 FCC Registrations : 461337 IC Registrations : MY0001 Firmware Version (FVIN) : S27.50.08</p> <p>The equipment was tested accordance to the requirement listed below:</p> <p>(2.4GHz BT) PASS FCC 47CFR Part 15C ISED RSS 247 Issue 2</p>	
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<p>Prepared By:</p>  <hr/> <p>GAN BOON TEONG Test Personnel</p>	<p>Approved Signatory:</p> <hr/> <p>VINCENT FOONG CHUEN KIT Responsible Engineer</p>

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REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	28-Feb-2022	Gan Boon Teong

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	Integral Antenna

The EUT contains following accessory devices and data cable:

Item	Brand	Model or P/N
BATT LIION IMPRES 2 IP68 2850T	MOTOROLA	PMNN4813A
CABLE,PORT PROG,TEST AND ALIGN CABLE PSA	MOTOROLA	PMKN4231A
7/800 Whip Antenna (762-870MHz)	MOTOROLA	AN000411A01

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

Test configuration of EUT

All relevant configurations involving radio models and accessories (including chargers, batteries, antennas) were assessed. Only worst case configurations will be included in this report.

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: 11.404 dBm (13.82 mW)	657TYB0678	Gan
15.247 (a)(1)	RSS-247 5.1(a) RSS-247 5.1(b)	(1) 20dB Channel Bandwidth (2) Channel Separation	Pass	GFSK – 0.860 MHz 860KF1D Pi/4 DQPSK – 1.148 MHz 1M15G1D 8DPSK – 1.190 MHz 1M19G1D	657TYB0678	Gan
15.247(a)(1)(iii)	RSS-247 5.1(d)	Number of hopping Frequency used	Pass	Meet the limit requirement.	657TYB0678	Gan
15.247(a)(1)(iii)	RSS-247 5.1(d)	Dwell time on each channel	Pass	Meet the limit requirement.	657TYB0678	Gan
15.247 (d)	RSS-247 5.5	Band Edge Conducted Spurious Emission	Pass	Worst case emission: -47.44 dB	657TYB0678	Gan
15.247 (d)	RSS-247 5.5	Conducted Spurious Emission	Pass	Worst case emission: -41.82 dBm	657TYB0678	Gan
15.205, 15.209, 15.247 (d)	RSS-247 5.5	Radiated Emission within Restricted Bands	Pass	Worst case emission: RBE: 44.8387 dBuV/m (margin 9.1613 dB, noise floor)	657TYB0771	Qawiman&Nazrin
15.207	RSS-Gen 8.8	AC Powerline Conducted Emission	NA	Worst case emission: CE: 58.98 dBuV. (margin 7.02 dB)	657TYB0771	Alif
15.203	-	Antenna Requirement	NA	Internal antenna is not accessible to the end-user	NA	NA

3.0. Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=1.96) (±)
AC Power Line Conducted Spurious Emission	150kHz ~ 30MHz	3.48 dB
Radiated Emissions up to 1 GHz (Field Strength)	30MHz ~ 1000MHz	5.88 dB
Radiated Emissions above 1 GHz (Field Strength)	1GHz ~ 18GHz	5.84 dB
	18GHz ~ 40GHz	6.02 dB
Conducted Spurious Emissions	9kHz ~ 12.75GHz	2.82 dB

4.0. Equipment List

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

Description	Model	Serial Number	Calibration Date	Calibration Due Date
ANALYZER SPECTRUM	E4440A	US45303111	14-Jul-21	14-Jul-22
CHAMBER	SH-641	92003820	14-Jul-21	14-Jul-22
POWER SUPPLY	6652A	MY40001436	22-Nov-21	22-Nov-22
PULSE POWER METER	ML2495A	1845014	19-Jan-22	19-Jan-23
N to N RF Cable # 1	SF126/11N/11N	NA	NA	NA

Radiated Emission Station (SW Version: EMC FCC RE v1.6.2)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
DRG HORN FREQ.	SAS-571	720	06-Apr-21	06-Apr-23
DRG HORN FREQ.	SAS-571	719	13-Sep-21	13-Sep-22
POWER SUPPLY	N7976A	MY53410110	24-May-21	24-May-22
SIGNAL GENERATOR	SMB 100A	182511	4-Jun-21	4-Jun-24
EMI TEST RECEIVER	ESW44	101731	5-Nov-21	5-Nov-22
EMI TEST RECEIVER	ESIB26	827769/009	11-Mar-21	11-Mar-22
5m SEMI-ANECHOIC CHAMBER	S800-HX	J2308	Not Required	Not Required
BILOG ANTENNA	CBL6112D	55546	06-Jun-21	06-Jun-22
BILOG ANTENNA	CBL6112B	2964	4-May-21	4-May-22
HYGRO-THERMOMETER	SDL500	A.016800	18-May-21	18-May-22
SYSTEM CONTROLLER	SC104V	050806-1	Not Required	Not Required
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	Not Required	Not Required
ANTENNA POSITIONING TOWER	TLT2	NA	Not Required	Not Required
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170143	3-Aug-21	3-Aug-22
PREAMPLIFIER 18-40GHz	BBV9721	9721-007	Not Required	Not Required
PREAMPLIFIER	PAM-0118P	361	11-Sep-20	11-Sep-23
LOOP ANTENNA	6502	00208416	8-Oct-21	8-Oct-22

Radiated Emission Station (SW Version: EMC 32 V10.60.10)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
TEMPERATURE & HUMIDITY LOGGER	DSB	16344143	29-May-21	29-May-22
V-NETWORK 2-LINE	ENV216V	101268	19-Aug-21	19-Aug-22
EMI TEST RECEIVER	ESCI	10025	5-Feb-21	5-Apr-22
PROGRAMMABLE AC SOURCE	61604	ABR000000926	14-Jul-21	14-Jul-22

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	22.6°C, 69.3%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	22.6°C, 69.3%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	19.5°C, 65.9%RH

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).

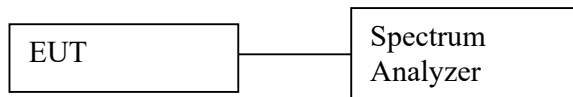
Following channel(s) was (were) selected for the final test as listed below.

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.

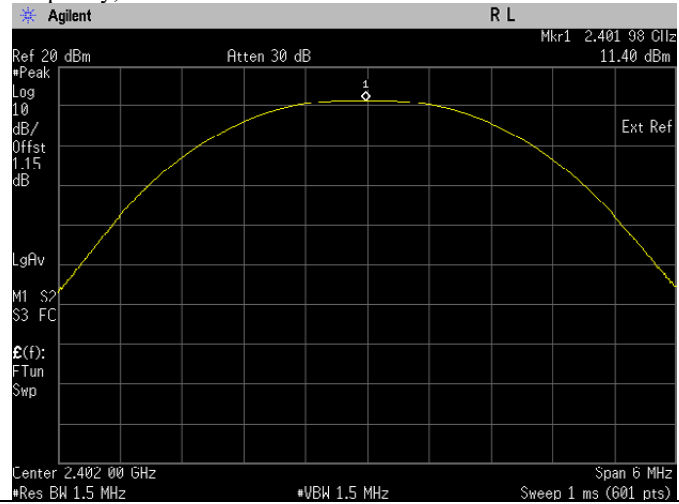
6.1.2. Test Limits:

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

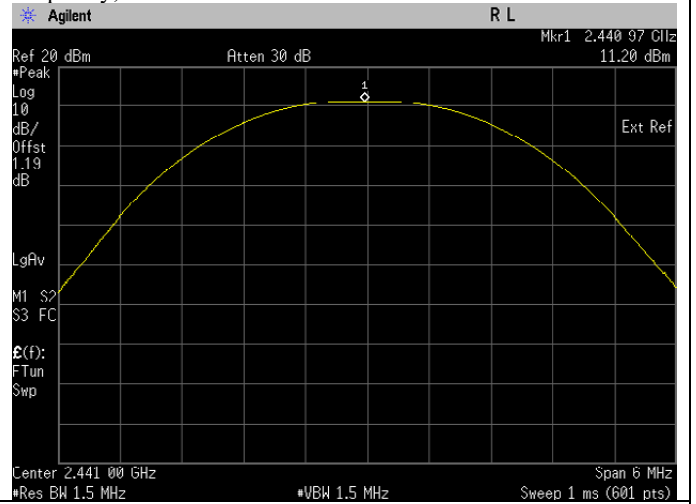
6.1.3. Test Data:

Test Conditions		Test Frequency (GHz)	Results	
Modulation	Voltage(V)		dBm	Status
GFSK	7.50	2.4020	11.404	Pass
		2.4410	11.201	Pass
		2.4800	10.843	Pass
Pi/4DQPSK	7.50	2.4020	7.605	Pass
		2.4410	7.484	Pass
		2.4800	7.200	Pass
8DPSK	7.50	2.4020	7.882	Pass
		2.4410	7.790	Pass
		2.4800	7.506	Pass

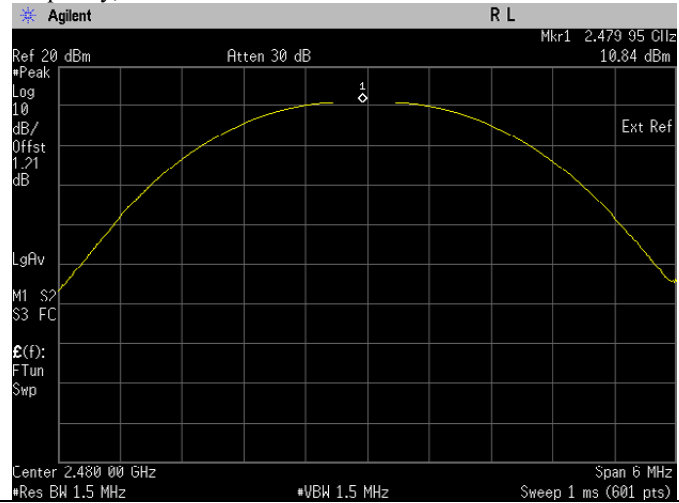
The Conducted RF Output Power test with result at low frequency, GFSK.



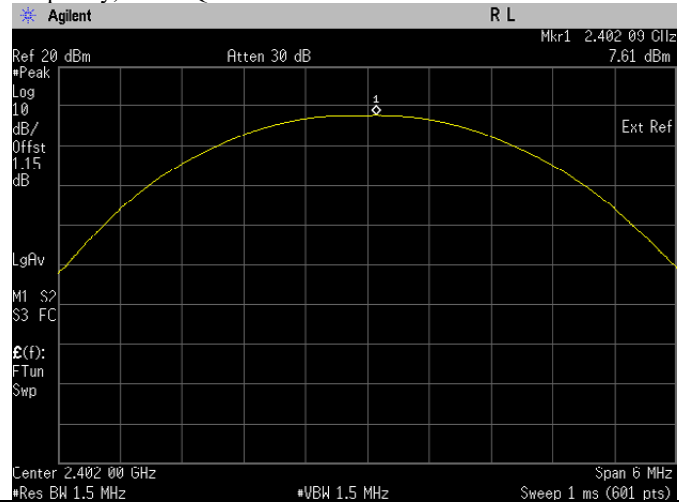
The Conducted RF Output Power test with result at mid frequency, GFSK.



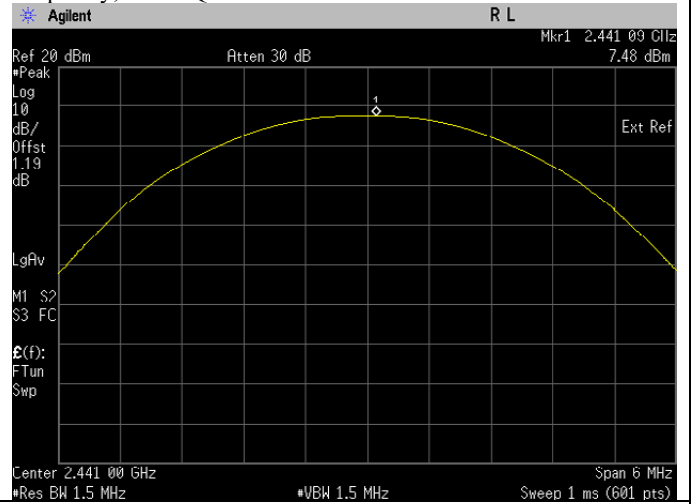
The Conducted RF Output Power test with result at high frequency, GFSK.



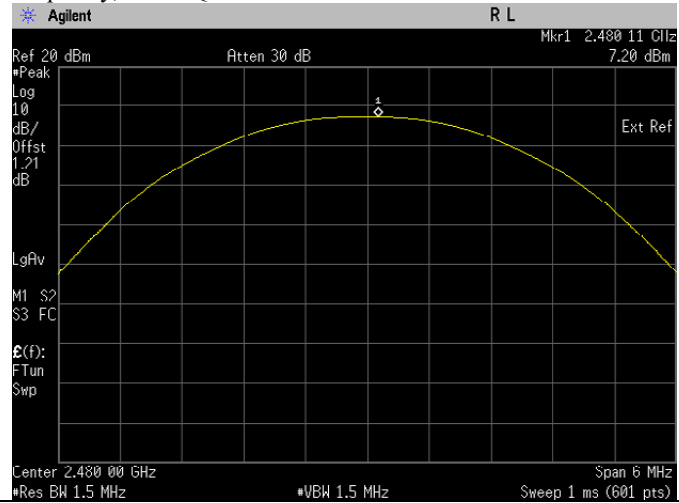
The Conducted RF Output Power test with result at low frequency, Pi/4 DQPSK.



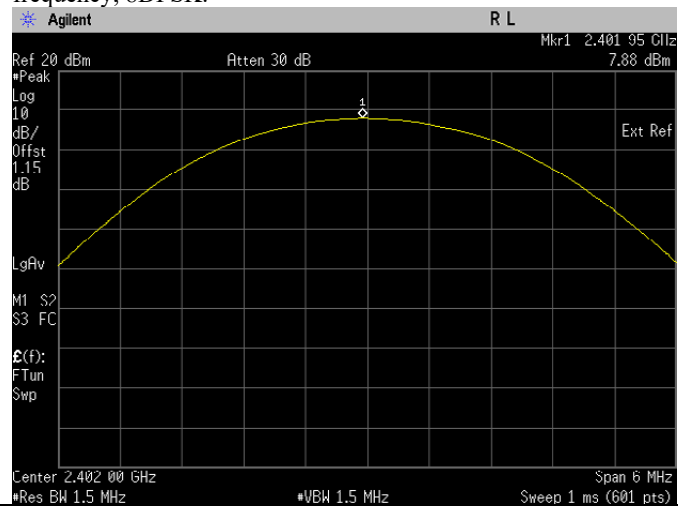
The Conducted RF Output Power test with result at mid frequency, Pi/4 DQPSK.



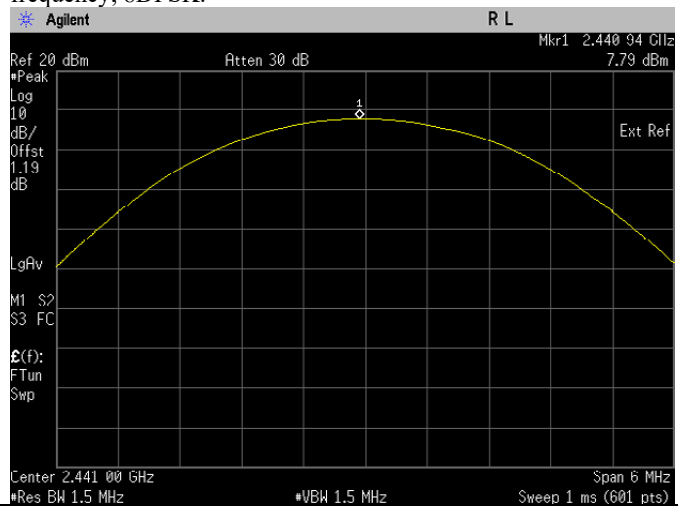
The Conducted RF Output Power test with result at high frequency, Pi/4 DQPSK.



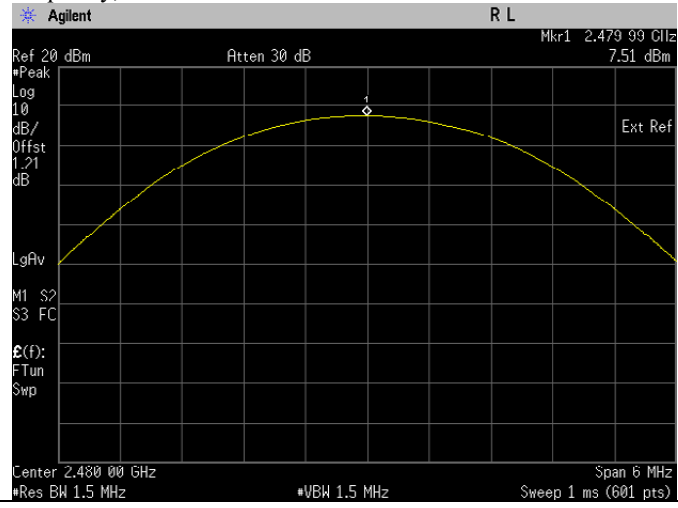
The Conducted RF Output Power test with result at low frequency, 8DPSK.



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

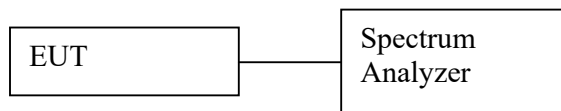


The Conducted RF Output Power test with result at high frequency, 8DPSK.



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.

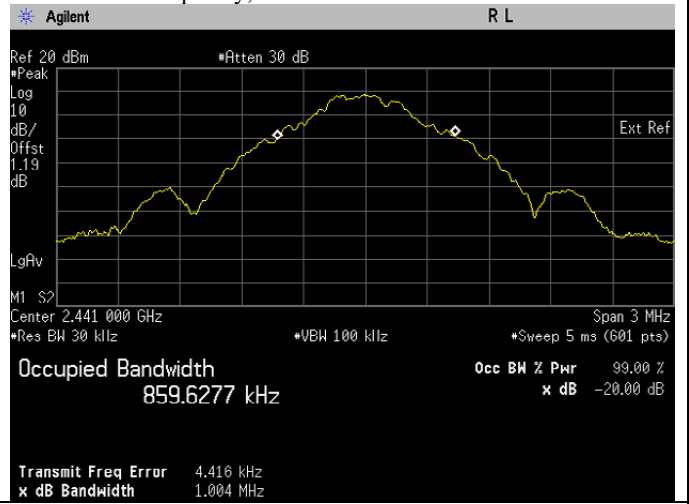
6.2.3. Test Data:

Test Conditions		Test Frequency TX (GHz)	Results (MHz)		
Modulation Type	Voltage(V)		20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Status
GFSK	7.50	2.4020	1.002	0.855	Pass
		2.4410	1.004	0.860	Pass
		2.4800	1.001	0.857	Pass
Pi/4 DQPSK	7.50	2.4020	1.277	1.148	Pass
		2.4410	1.277	1.147	Pass
		2.4800	1.279	1.146	Pass
8DPSK	7.50	2.4020	1.270	1.190	Pass
		2.4410	1.270	1.189	Pass
		2.4800	1.270	1.189	Pass

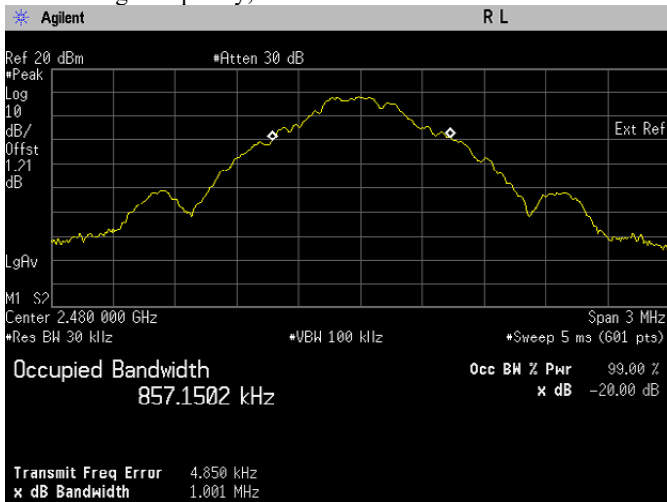
i. The 20 dB BW & occupied bandwidth test with result at low frequency, GFSK.



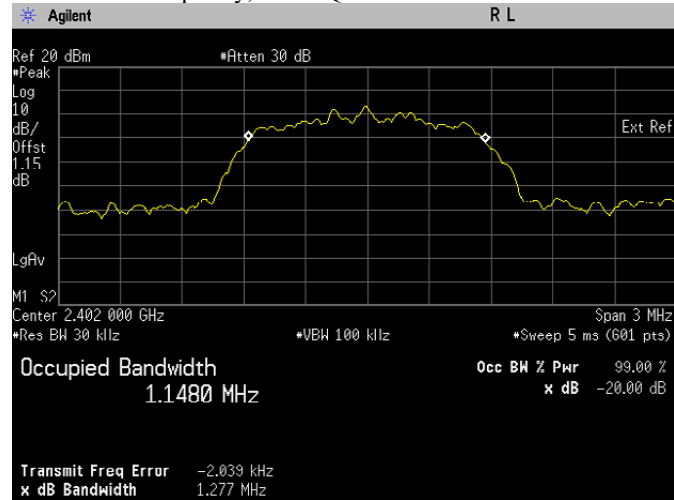
ii. The 20 dB BW & occupied bandwidth test with result at mid frequency, GFSK.



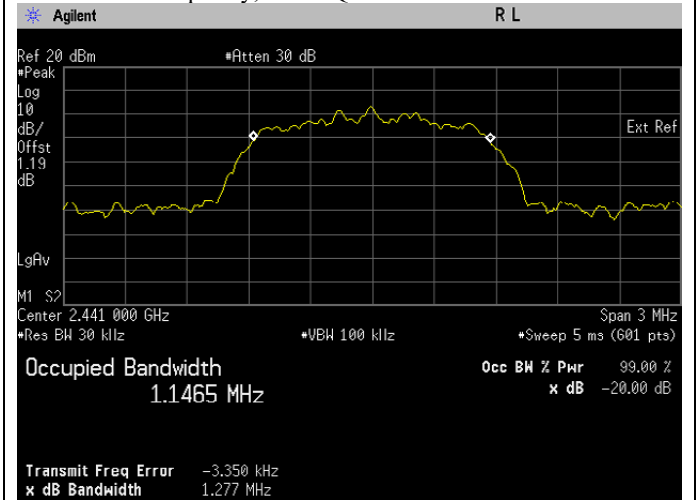
iii. The 20 dB BW & occupied bandwidth test with result at high frequency, GFSK.



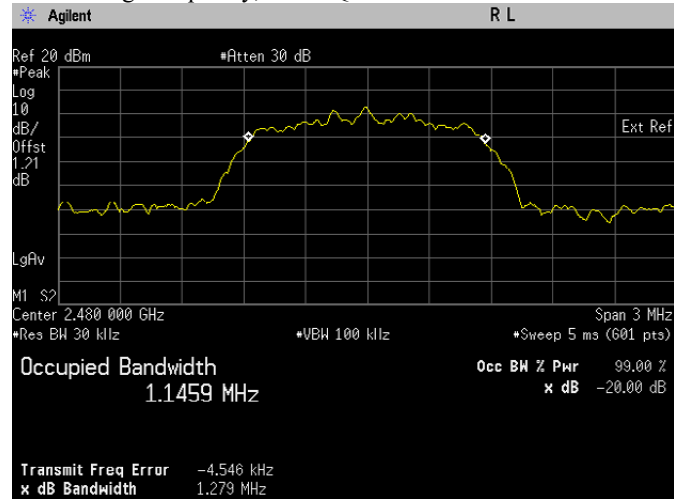
i. The 20 dB BW & occupied bandwidth test with result at low frequency, Pi/4 DQPSK.



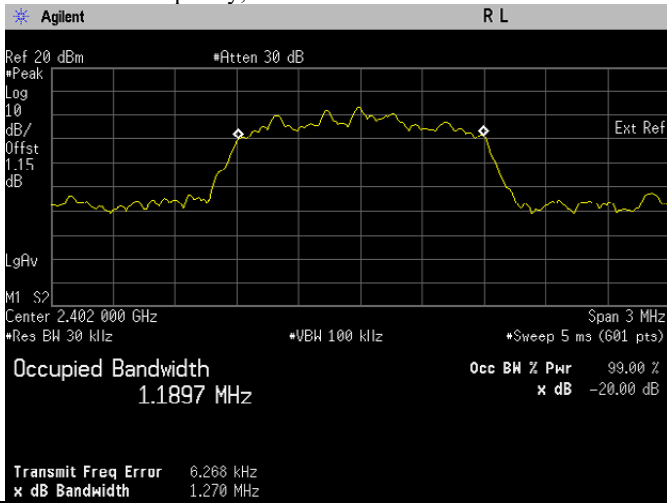
ii. The 20 dB BW & occupied bandwidth test with result at mid frequency, Pi/4 DQPSK.



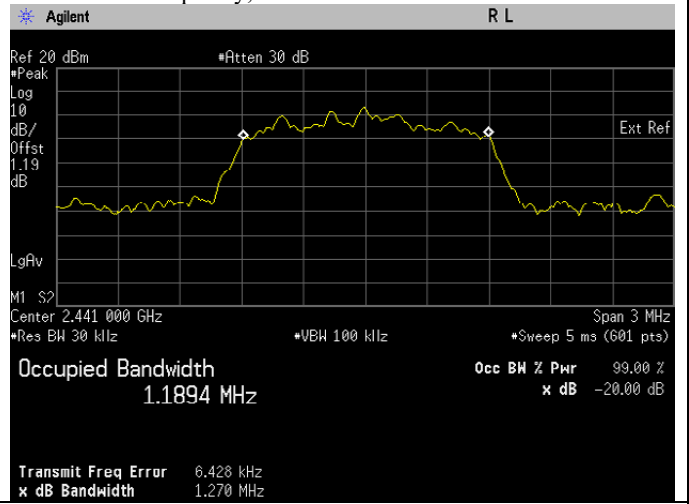
iii. The 20 dB BW & occupied bandwidth test with result at high frequency, Pi/4 DQPSK.



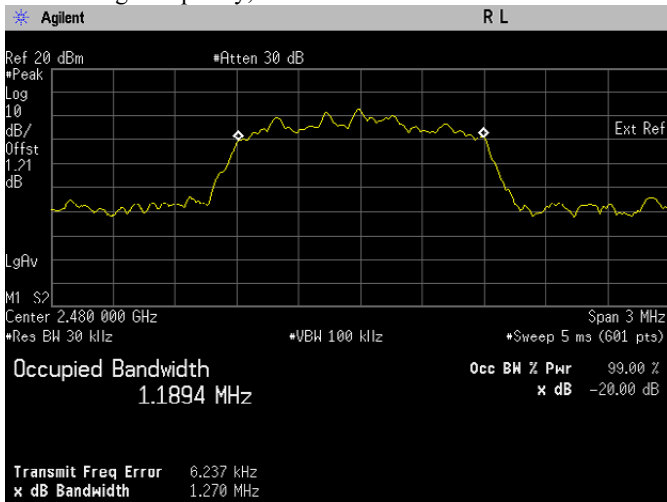
i. The 20 dB BW & occupied bandwidth test with result at low frequency, 8DPSK.



ii. The 20 dB BW & occupied bandwidth test with result at mid frequency, 8DPSK.

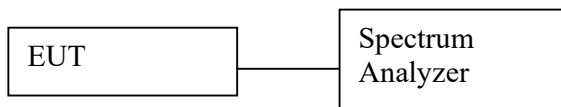


iii. The 20 dB BW & occupied bandwidth test with result at high frequency, 8DPSK.



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.

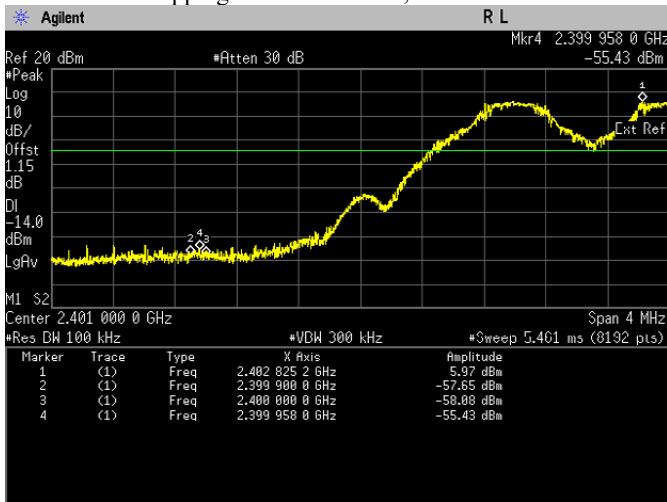
6.3.2. Test Limits

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

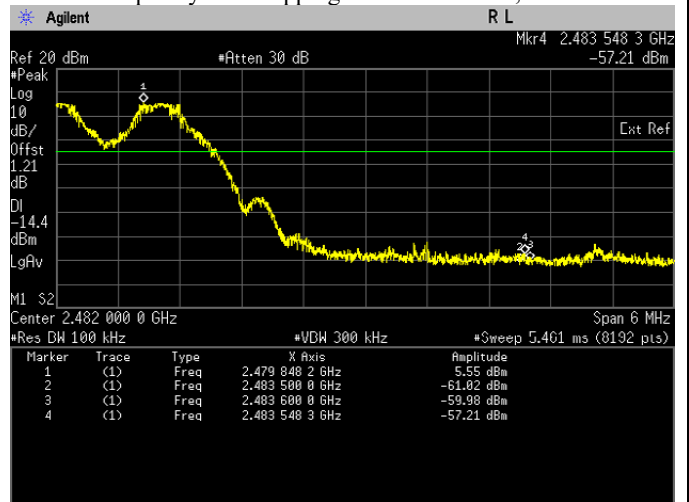
6.3.3. Test Result

Test Conditions		Hopping Method	Test Frequency(GHz)	Results	
Modulation	Voltage(V)			dB	Status
GFSK	7.50	Enabled (continuously)	2.4020	-55.43	Pass
			2.4800	-57.21	Pass
		Disabled (constantly)	2.4020	-47.44	Pass
			2.4800	-54.83	Pass
Pi/4 DQPSK	7.50	Enabled (continuously)	2.4020	-55.80	Pass
			2.4800	-59.30	Pass
		Disabled (constantly)	2.4020	-51.07	Pass
			2.4800	-56.87	Pass
8DPSK	7.50	Enabled (continuously)	2.4020	-52.03	Pass
			2.4800	-56.47	Pass
		Disabled (constantly)	2.4020	-49.17	Pass
			2.4800	-55.13	Pass

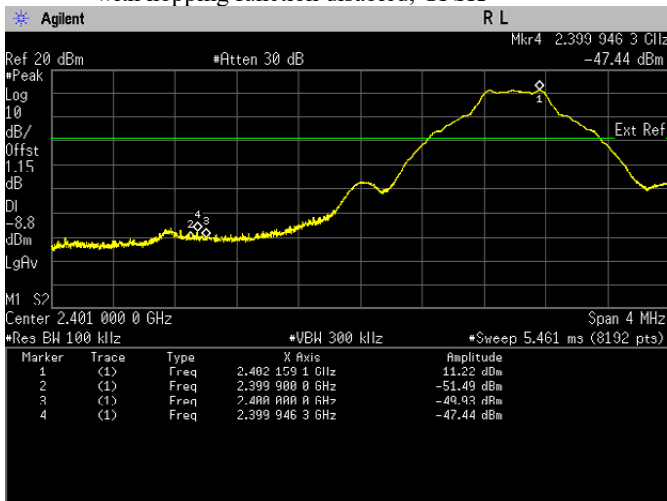
i. The highest band edge emission at low carrier frequency with hopping function enabled, GFSK



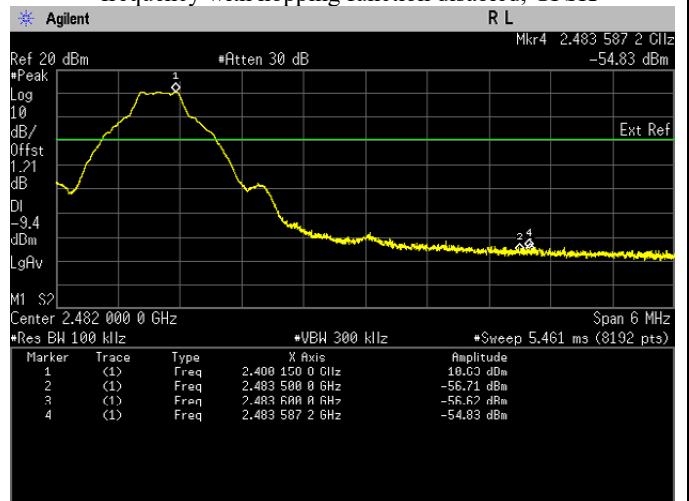
ii. The highest band edge emission at high carrier frequency with hopping function enabled, GFSK



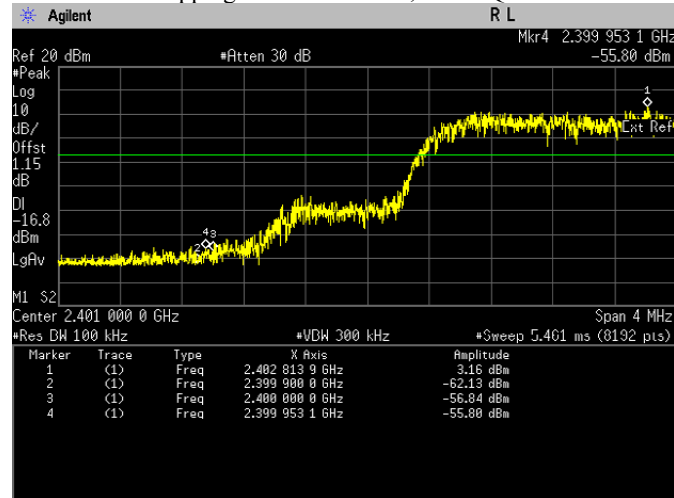
iii. The highest band edge emission at low carrier frequency with hopping function disabled, GFSK



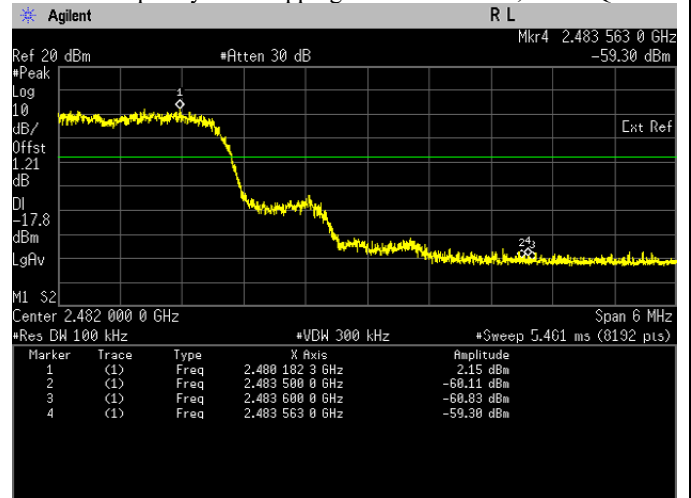
iv. The highest band edge emission at high carrier frequency with hopping function disabled, GFSK



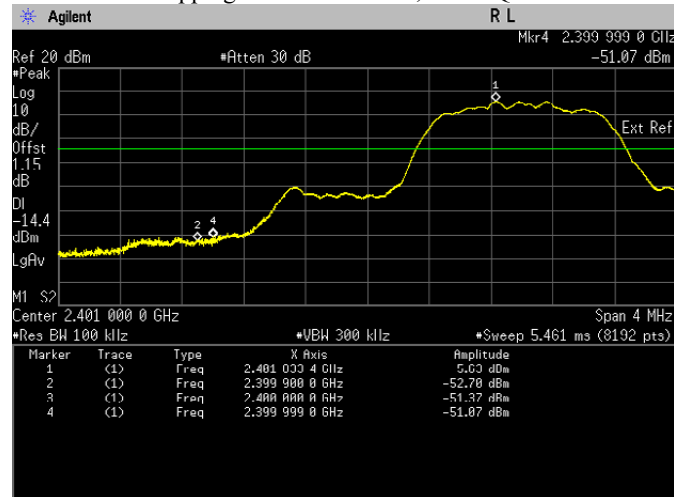
i. The highest band edge emission at low carrier frequency with hopping function enabled, Pi/4 DQPSK



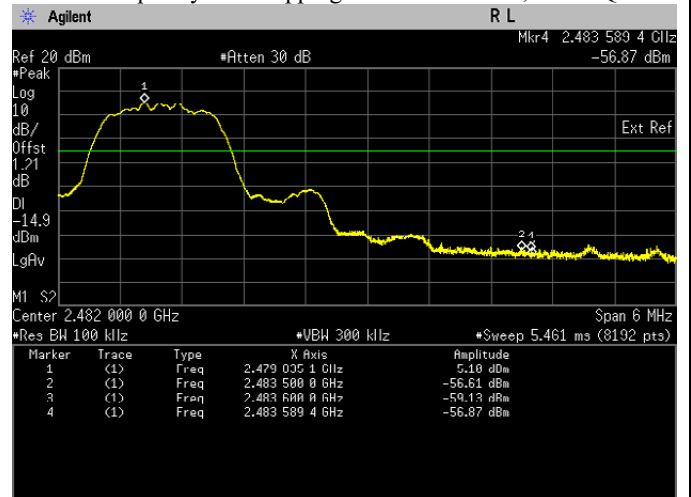
ii. The highest band edge emission at high carrier frequency with hopping function enabled, Pi/4 DQPSK



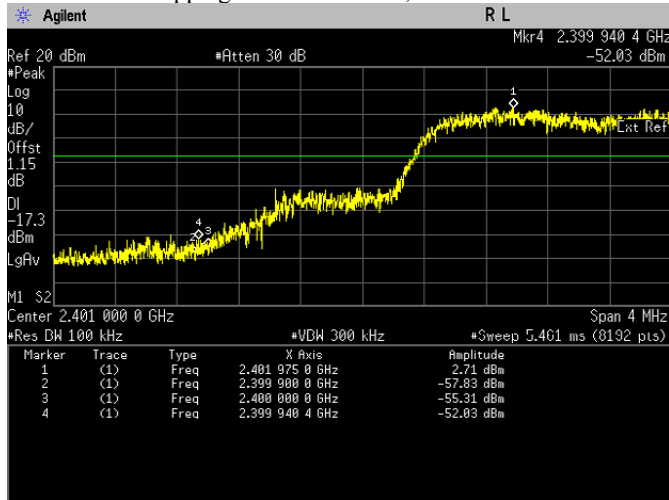
iii. The highest band edge emission at low carrier frequency with hopping function disabled, Pi/4 DQPSK



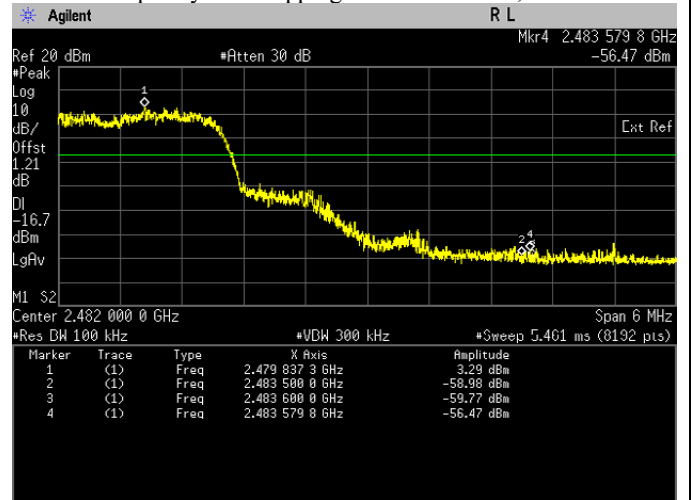
iv. The highest band edge emission at high carrier frequency with hopping function disabled, Pi/4 DQPSK



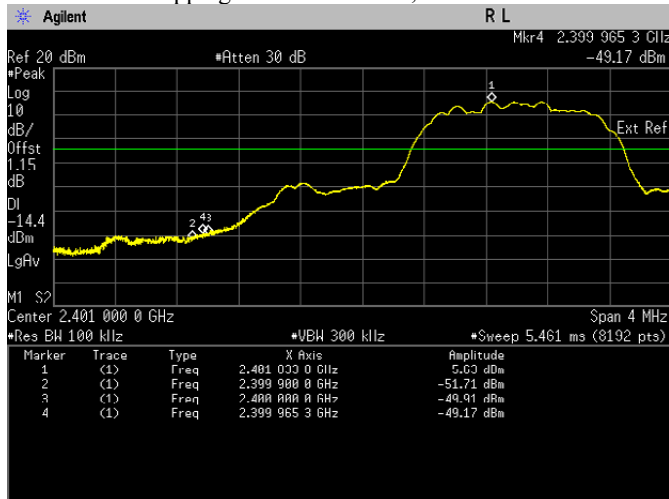
i. The highest band edge emission at low carrier frequency with hopping function enabled, 8DPSK



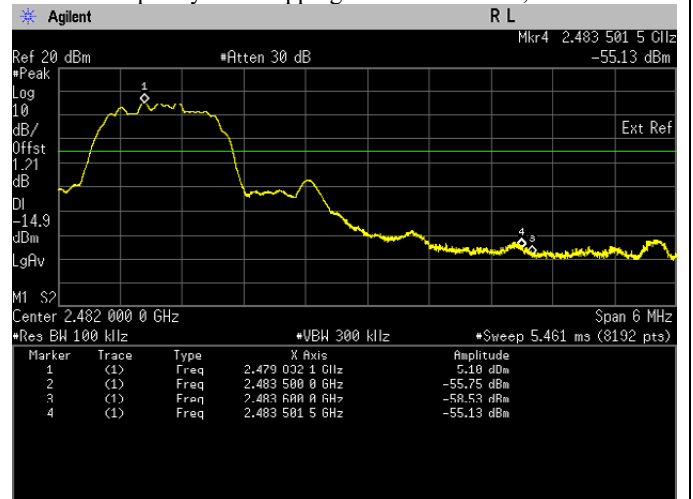
ii. The highest band edge emission at high carrier frequency with hopping function enabled, 8DPSK



iii. The highest band edge emission at low carrier frequency with hopping function disabled, 8DPSK

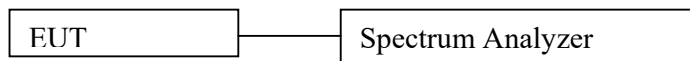


iv. The highest band edge emission at high carrier frequency with hopping function disabled, 8DPSK



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:

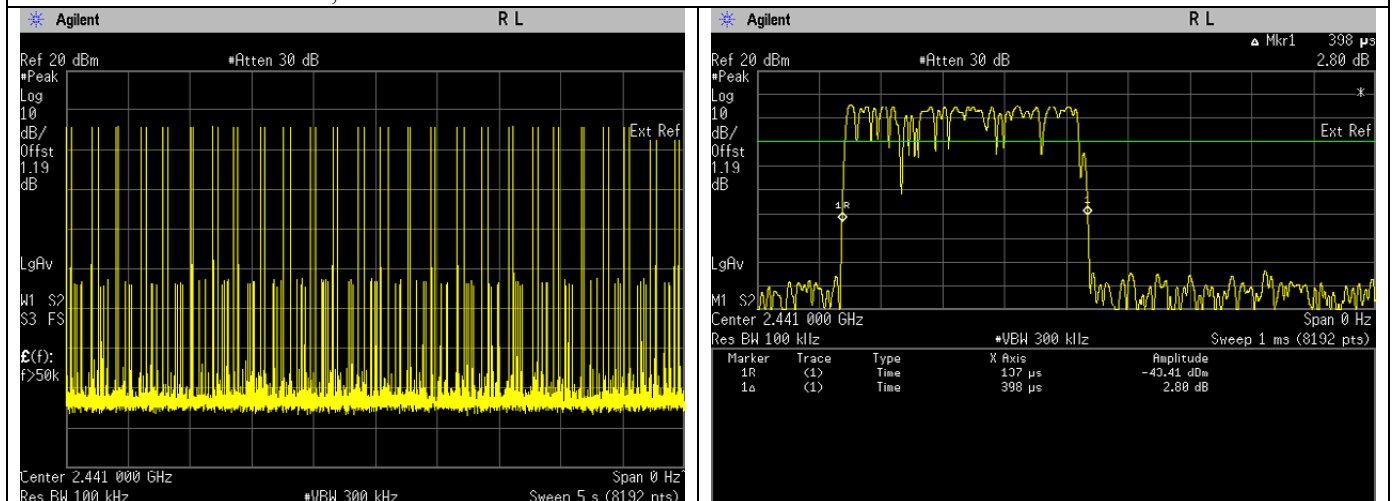
Normal Condition (25 ° C)
≤ 400ms

6.4.3. Test Result

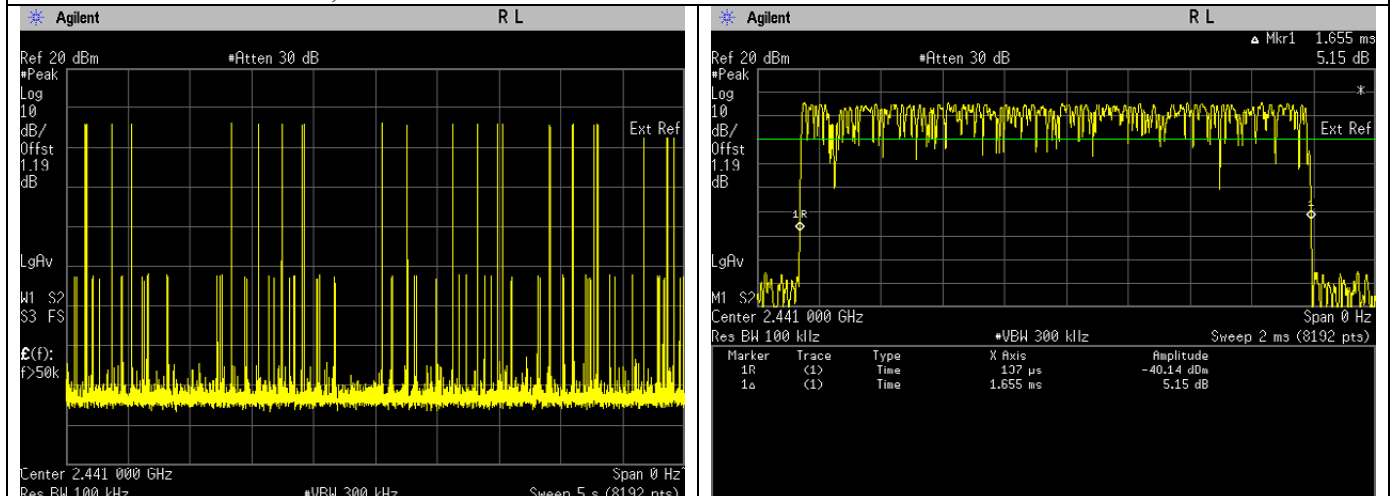
Test Conditions			Data Package	Results			
Modulation	Voltage (V)	Test Frequency (GHz)		No. of transmission in 5s (a)	Dwell time in one transmission (b) (msec)	Total accumulate dwell time in 31.6s. (c) (msec)	Status
GFSK	7.50	2.4410	DH1	53	0.398	133.314080	Pass
			DH3	23	1.655	240.570800	Pass
			DH5	17	2.903	311.898320	Pass
Pi/4 DQPSK	7.50		DH1	52	0.401	131.784640	Pass
			DH3	30	1.653	313.408800	Pass
			DH5	20	2.901	366.686400	Pass
8 DPSK	7.50		DH1	51	0.401	129.250320	Pass
			DH3	22	1.652	229.694080	Pass
			DH5	18	2.903	330.245280	Pass

**Note: Total dwell time 31.6s (79Hopping*0.4), (c) = (a) x 6.32 x (b)

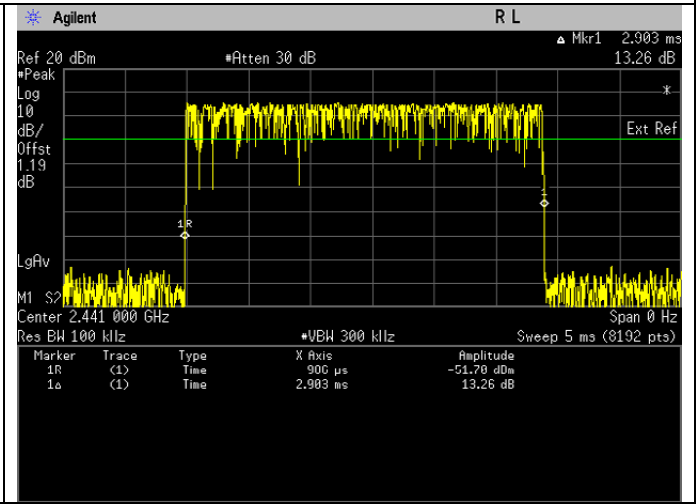
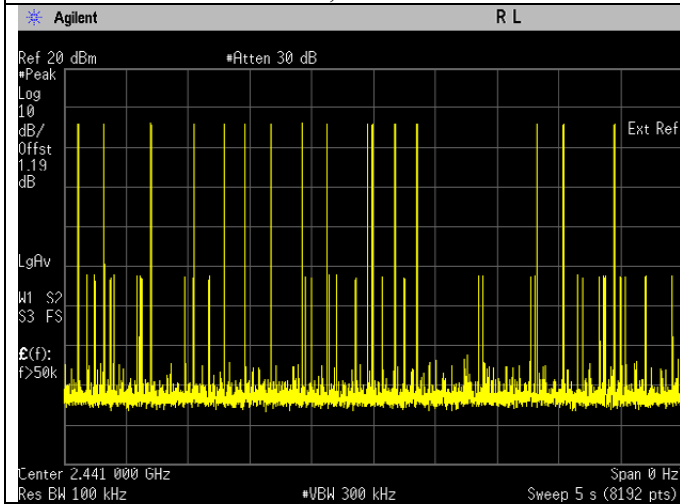
i. Dwell Time at DH1, GFSK



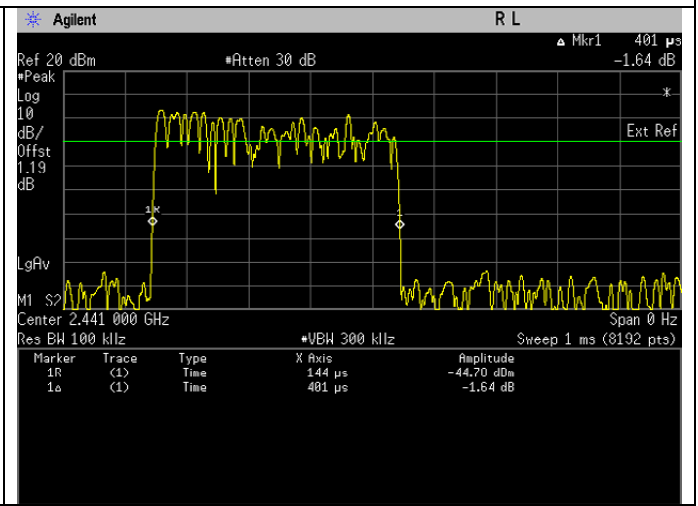
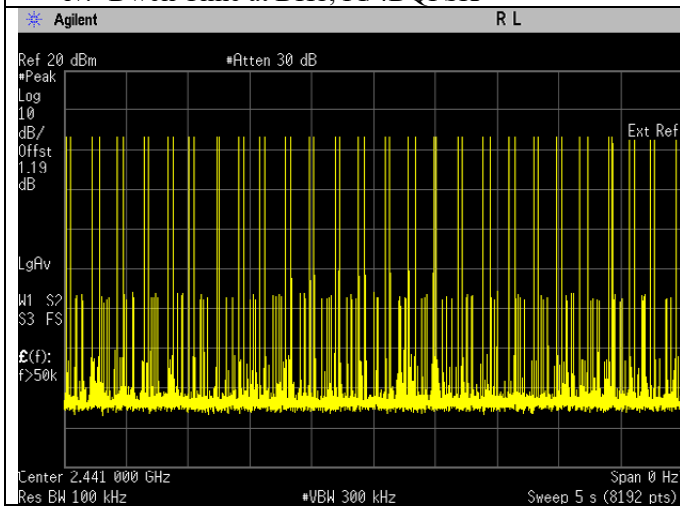
ii. Dwell Time at DH3, GFSK



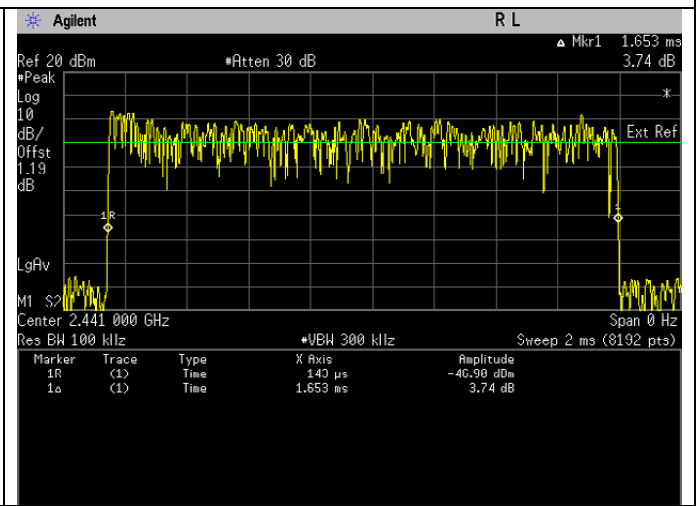
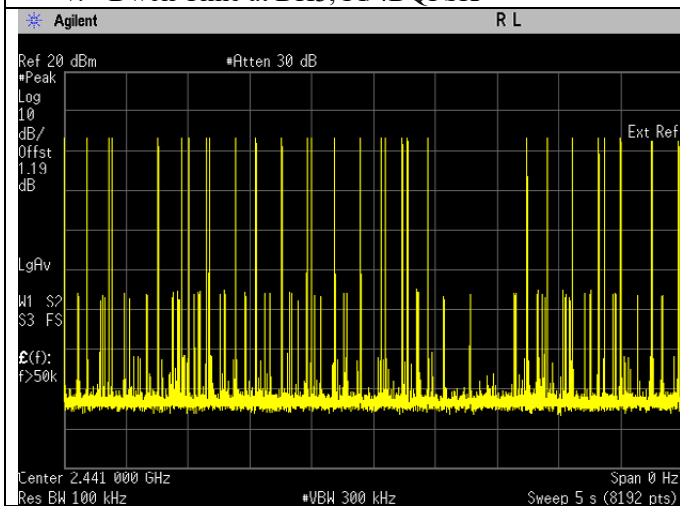
iii. Dwell Time at DH5, GFSK



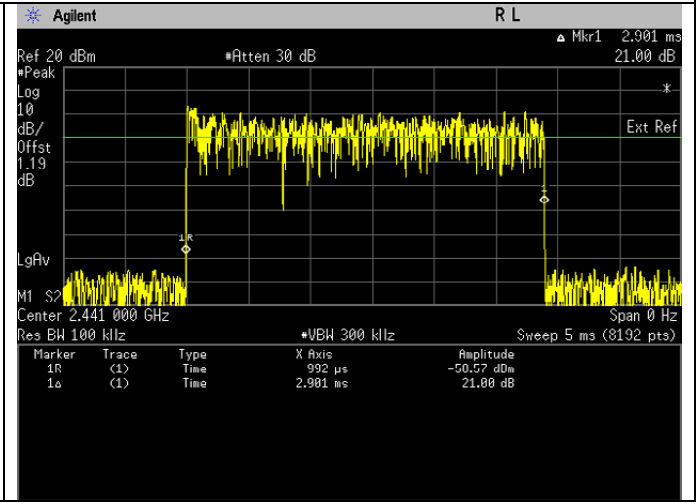
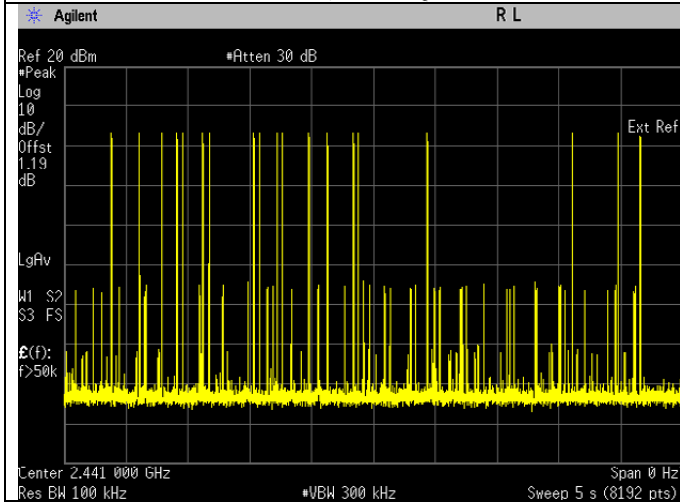
iv. Dwell Time at DH1, PI/4DQPSK



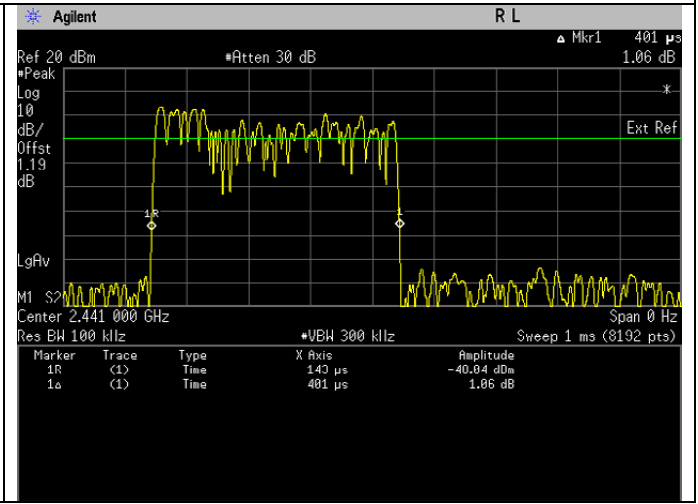
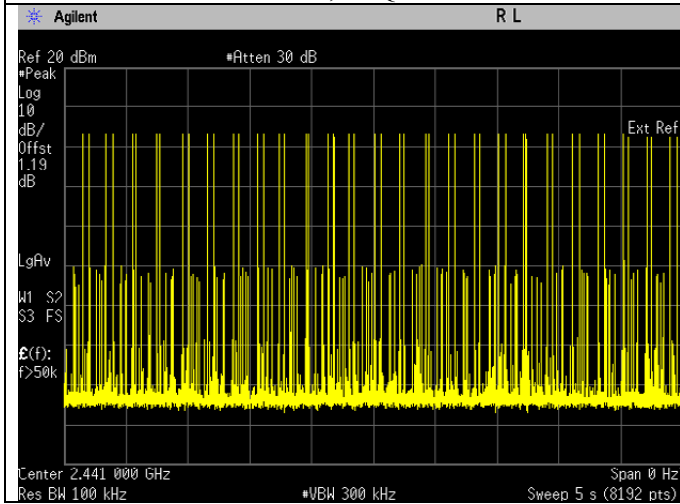
v. Dwell Time at DH3, PI/4DQPSK



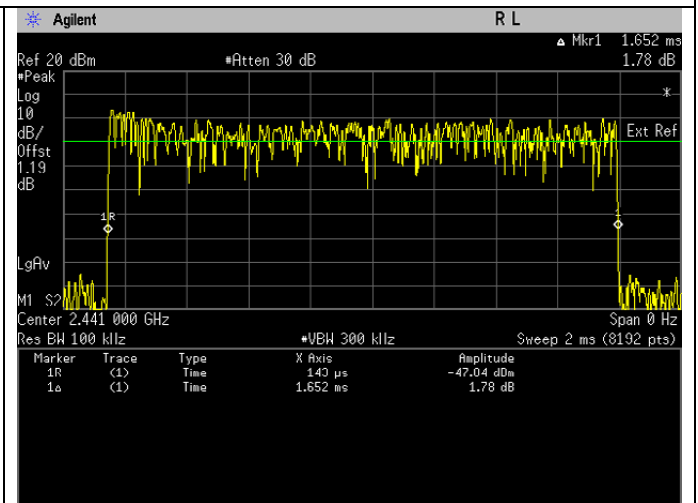
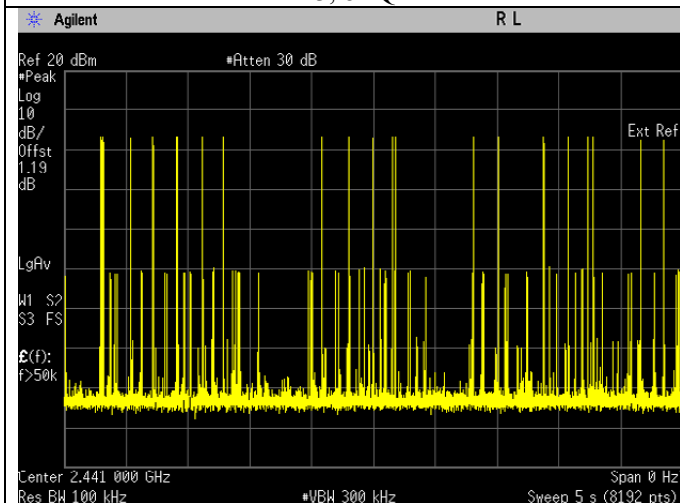
vi. Dwell Time at DH5, PI/4DQPSK



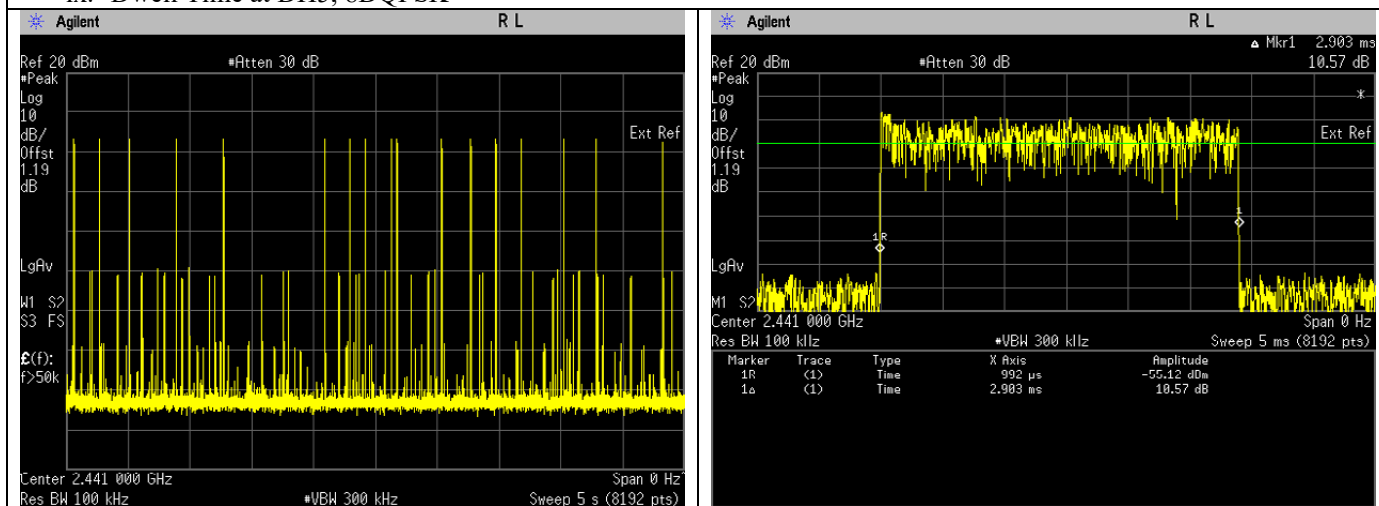
vii. Dwell Time at DH1, 8DQPSK



viii. Dwell Time at DH3, 8DQPSK

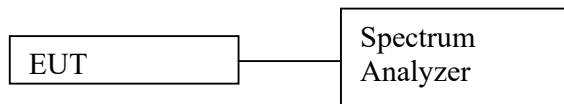


ix. Dwell Time at DH5, 8DQPSK



6.5. Number of hopping Frequency

6.5.1. Test Setup



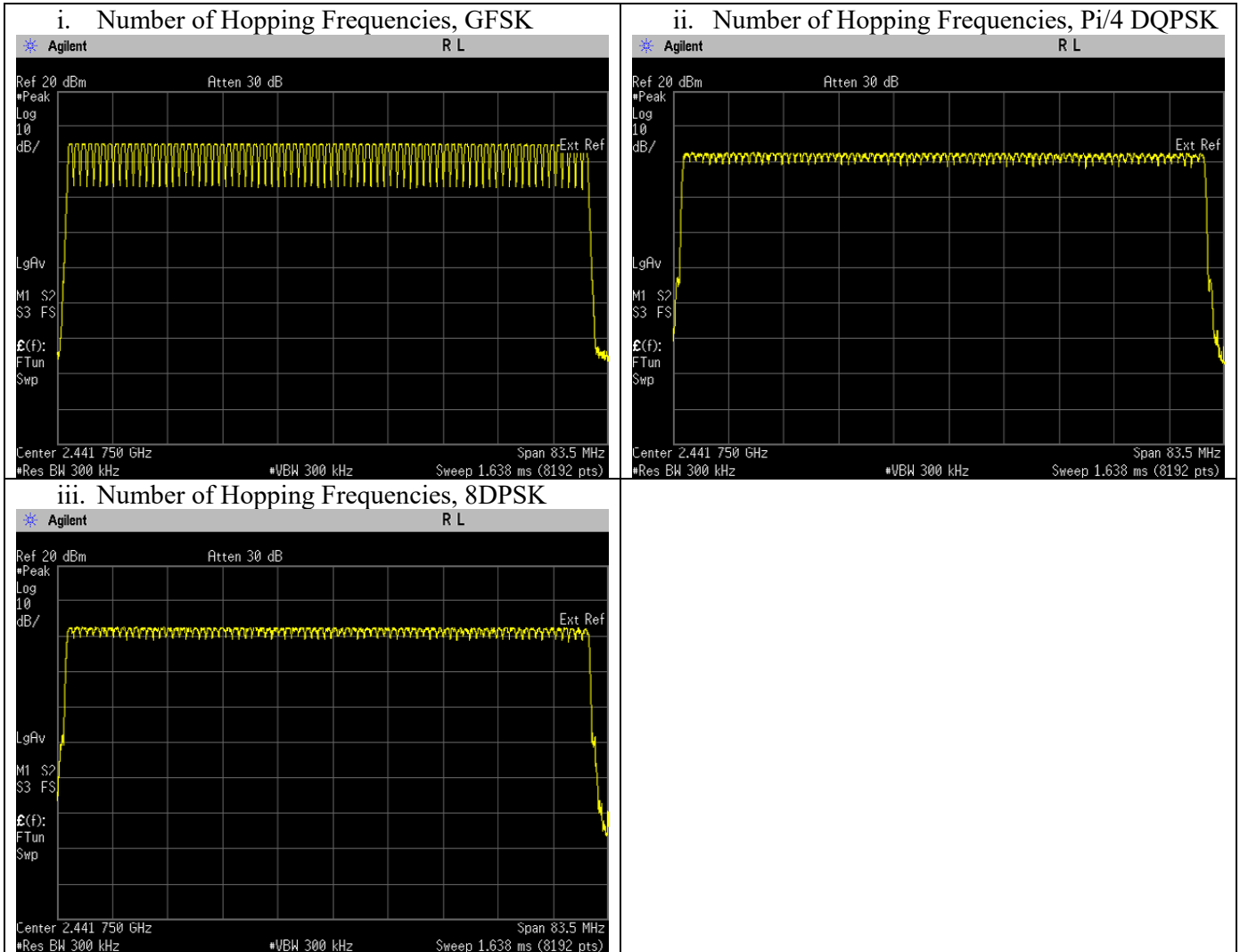
- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 300 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - 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

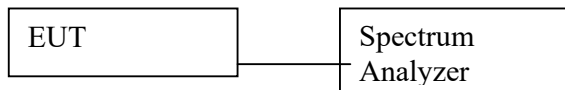
6.5.3. Test Result

Test Conditions		Sweep Range (GHz)	Results	
Modulation	Voltage(V)		No. of Hopping Frequencies	Status
GFSK	7.50	2.4000-2.4835	79	Pass
Pi/4DQPSK	7.50	2.4000-2.4835	79	Pass
8DPSK	7.50	2.4000-2.4835	79	Pass



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.

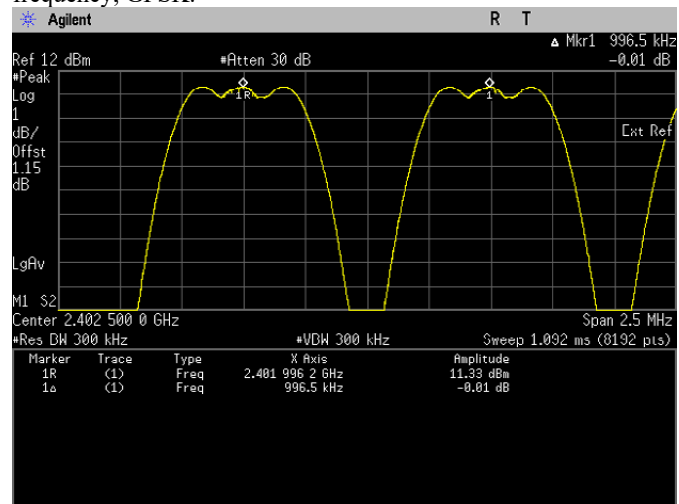
6.6.2. Test Limits:

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

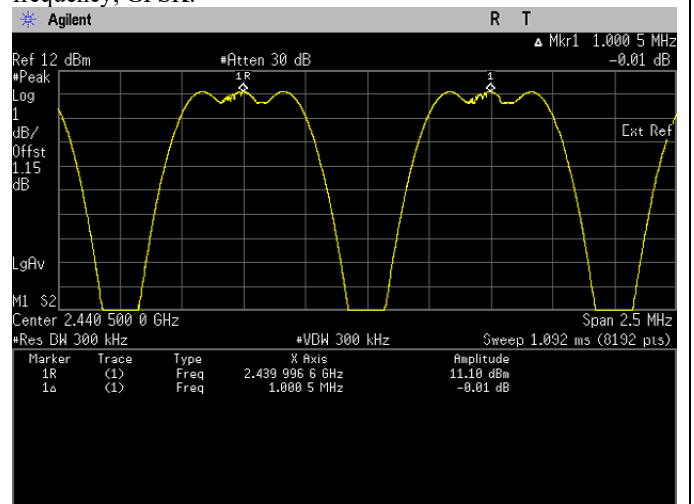
6.6.3. Test Result

Test Conditions		Test Frequency (GHz)	Results			
Modulation	Voltage(V)		Test Data Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Min Limit = 2/3 of 20dB Bandwidth (kHz)	Status
GFSK	7.50	2.4020	0.997	1.002	668.000	Pass
		2.4410	1.001	1.004	669.333	Pass
		2.4800	1.008	1.001	667.333	Pass
Pi/4DQPSK	7.50	2.4020	0.998	1.277	851.157	Pass
		2.4410	0.999	1.277	851.075	Pass
		2.4800	1.001	1.279	852.913	Pass
8DPSK	7.50	2.4020	1.002	1.270	846.818	Pass
		2.4410	1.003	1.270	846.696	Pass
		2.4800	0.997	1.270	846.583	Pass

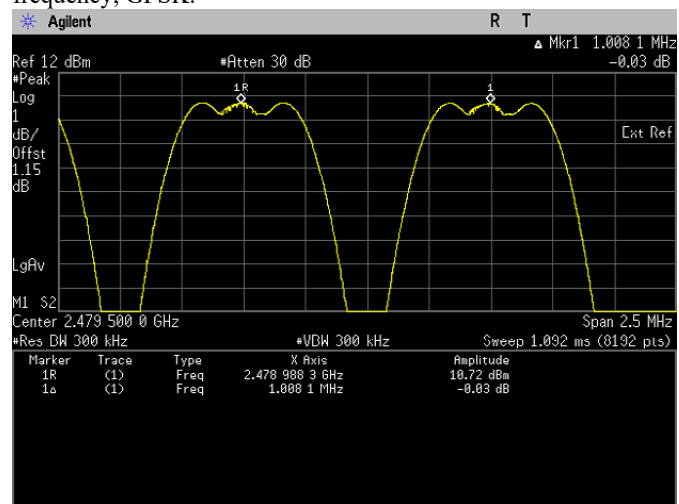
The Conducted RF Output Power test with result at low frequency, GFSK.



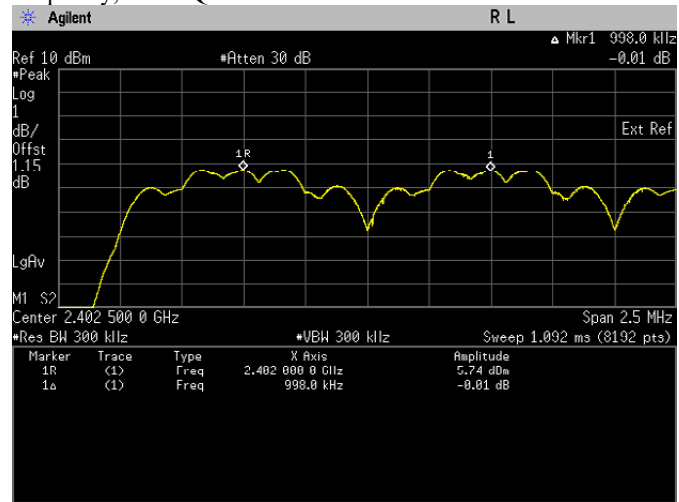
The Conducted RF Output Power test with result at mid frequency, GFSK.



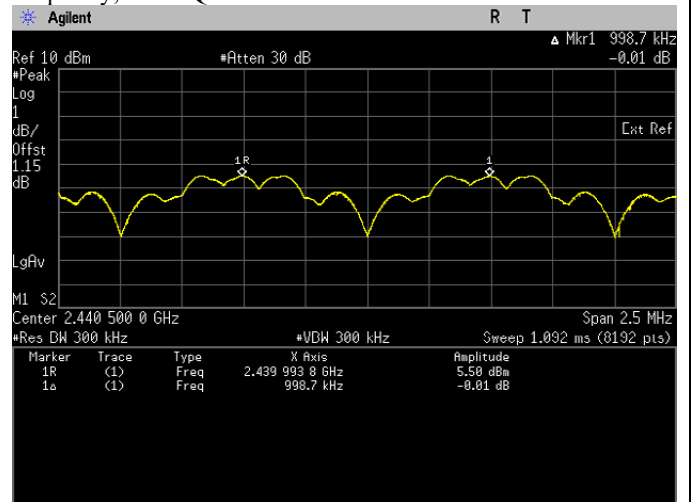
The Conducted RF Output Power test with result at high frequency, GFSK.



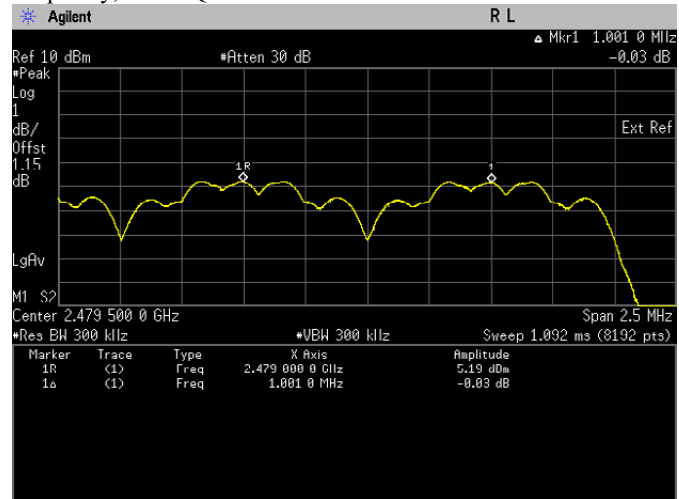
The Conducted RF Output Power test with result at low frequency, Pi/4 DQPSK.



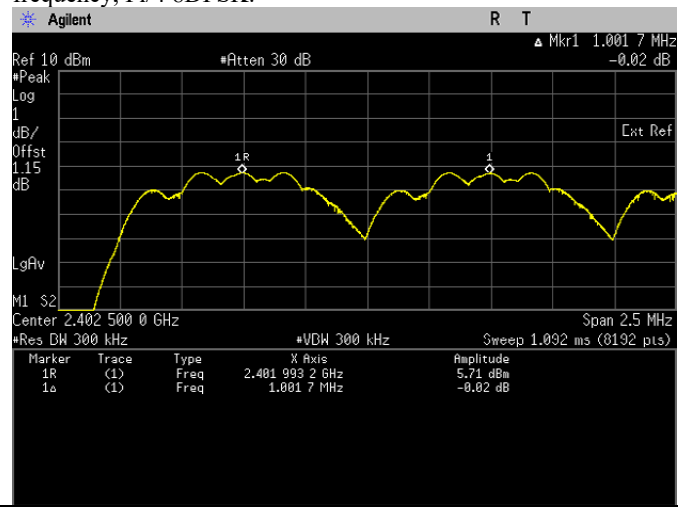
The Conducted RF Output Power test with result at mid frequency, Pi/4 DQPSK.



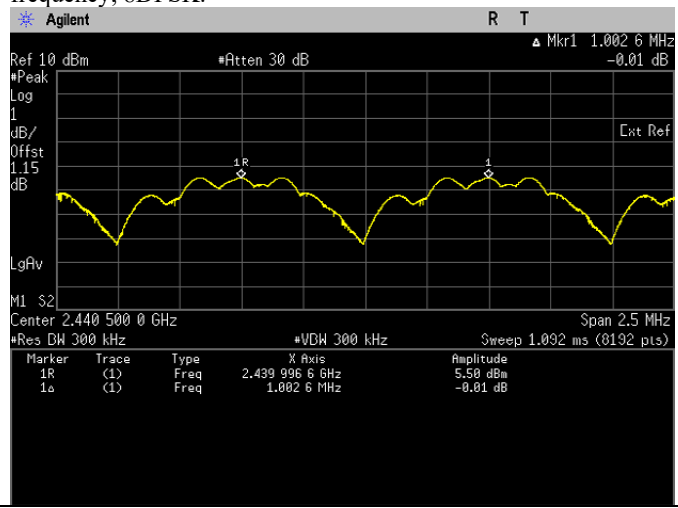
The Conducted RF Output Power test with result at high frequency, Pi/4 DQPSK.



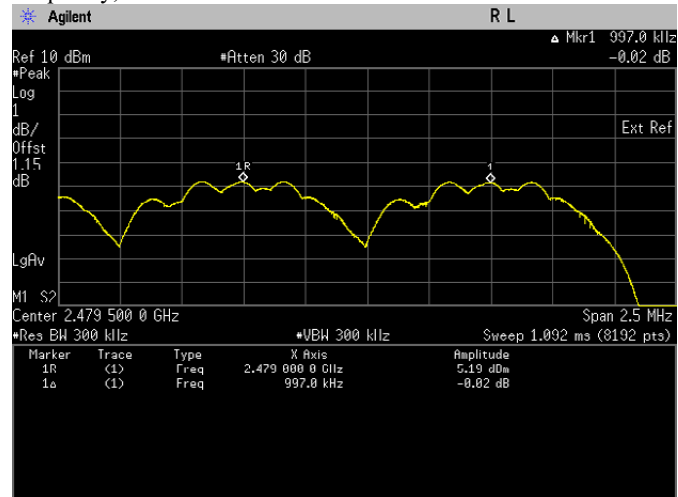
The Conducted RF Output Power test with result at low frequency, Pi/4 8DPSK.



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

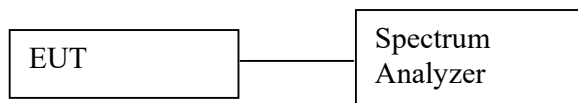


The Conducted RF Output Power test with result at high frequency, Pi/4 8DPSK.



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:

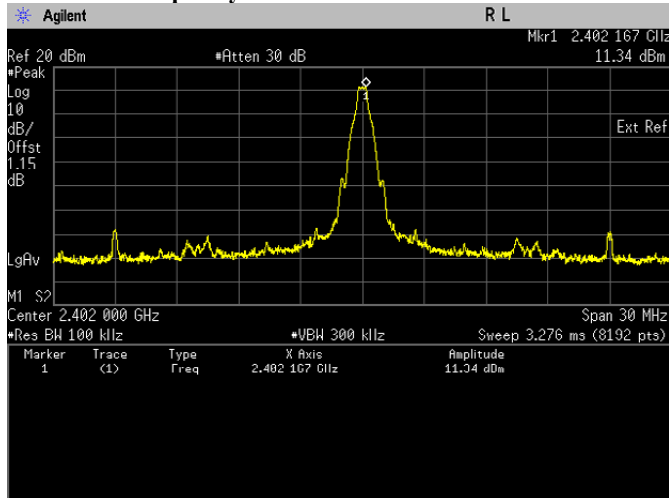
Normal Condition (25 ° C)
Shall be at least 20 dB below for peak power.

6.7.3. Test Data:

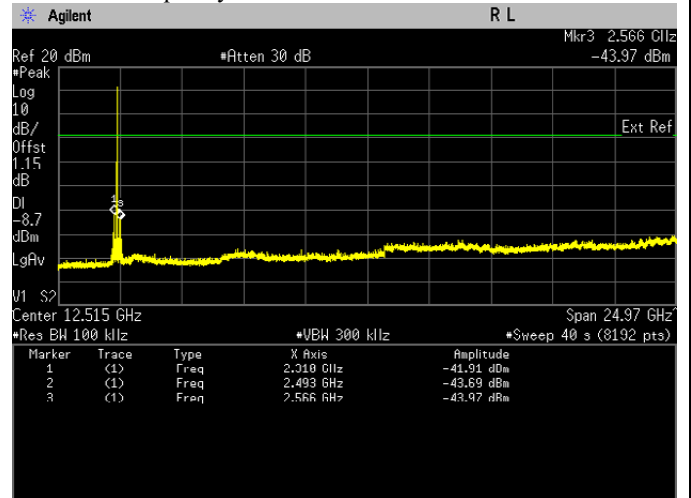
Test Conditions			Results		
Modulation	Voltage(V)	Test Frequency (GHz)	Spurs (MHz)	Level (dBm)	Status
GFSK	7.50	2.4020	2310.000	-41.914	Pass
		2.4410	2347.000	-41.824	Pass
		2.4800	2383.000	-42.061	Pass
Pi/4 DQPSK	7.50	2.4020	24912.000	-50.442	Pass
		2.4410	2341.000	-50.485	Pass
		2.4800	24811.000	-50.635	Pass
8DPSK	7.50	2.4020	24902.000	-50.545	Pass
		2.4410	24899.000	-50.086	Pass
		2.4800	24884.000	-50.204	Pass

GFSK Modulation:

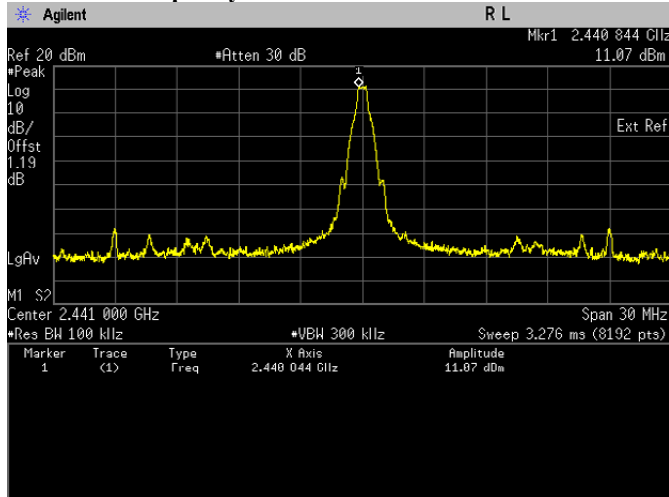
- The high emission level within the assigned band at low carrier frequency.



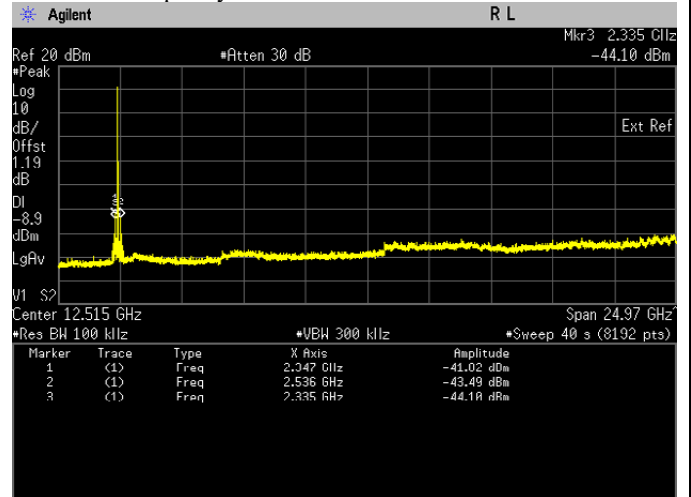
- Spurious emission measurement in 30MHz – 25GHz at low carrier frequency.



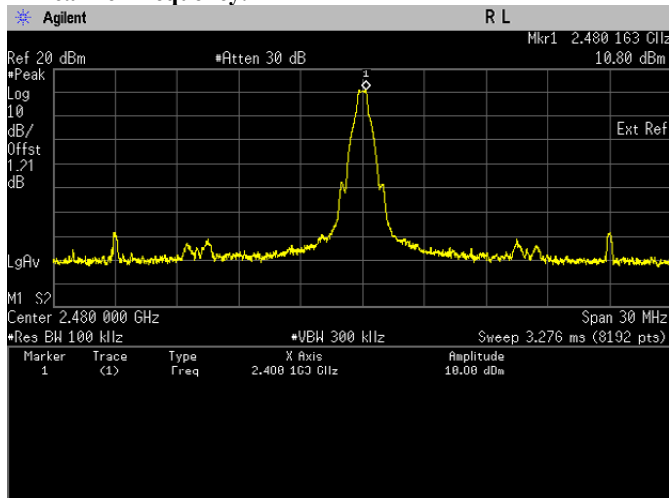
- The high emission level within the assigned band at mid carrier frequency.



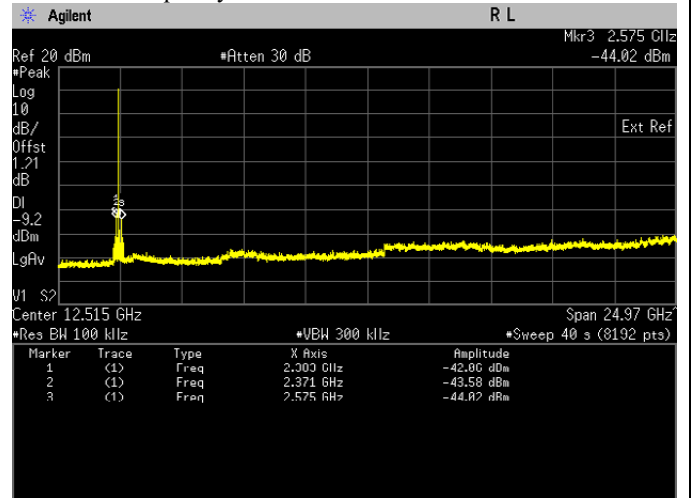
- Spurious emission measurement in 30MHz – 25GHz at mid carrier frequency.



- The high emission level within the assigned band at high carrier frequency.

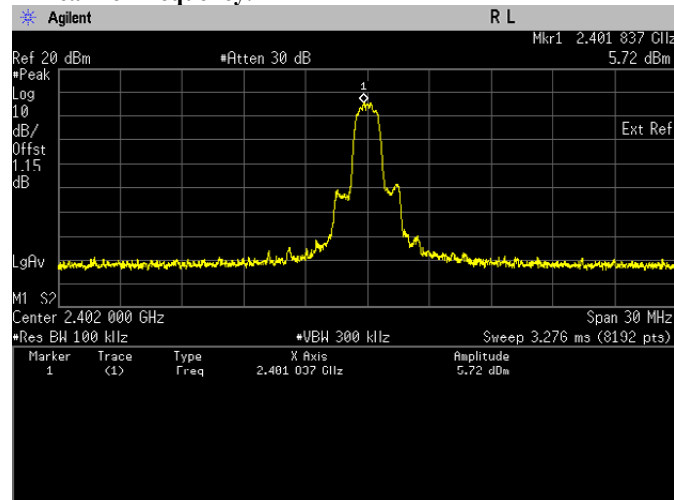


- Spurious emission measurement in 30MHz – 25GHz at high carrier frequency.

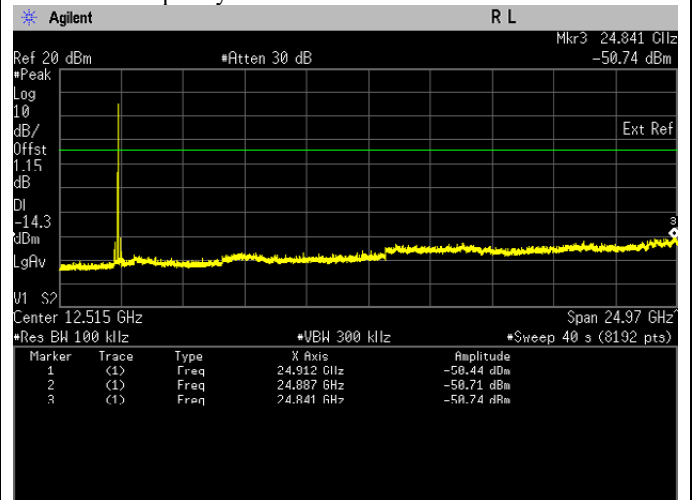


Pi/4 DQPSK Modulation:

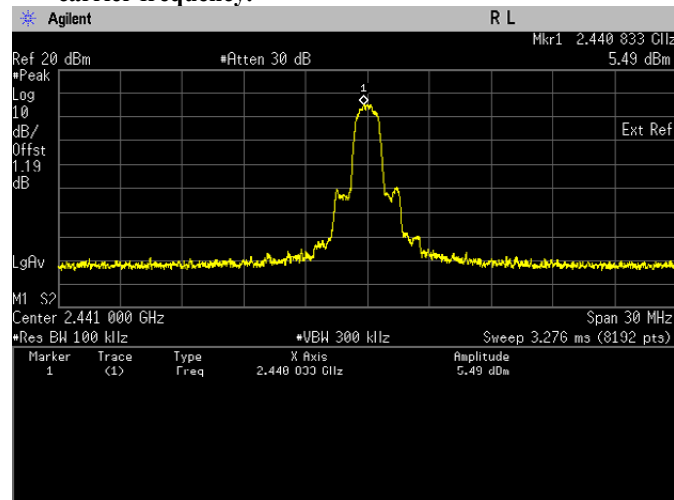
i. The high emission level within the assigned band at low carrier frequency.



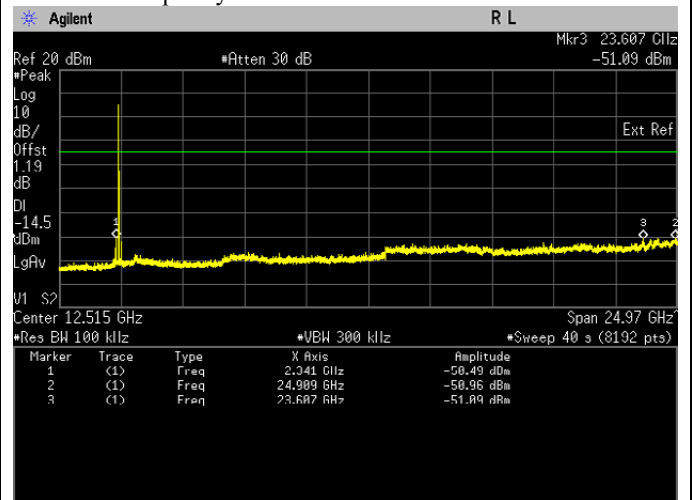
ii. Spurious emission measurement in 30MHz – 25GHz at low carrier frequency.



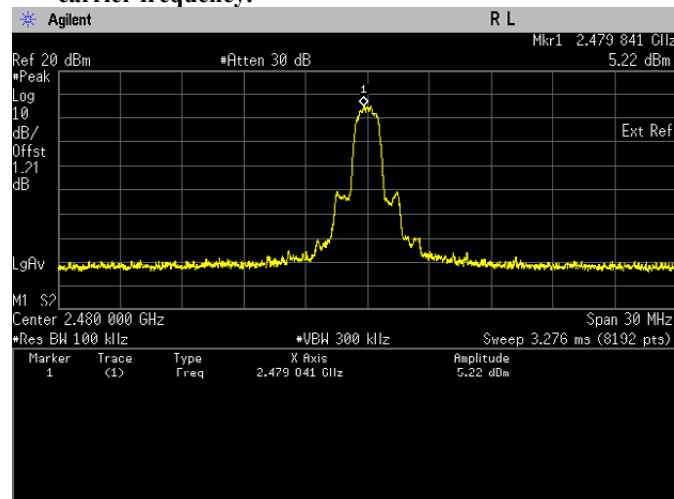
iii. The high emission level within the assigned band at mid carrier frequency.



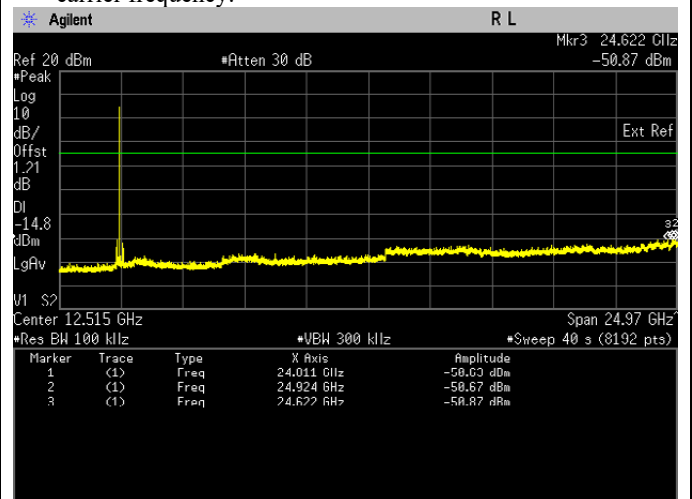
iv. Spurious emission measurement in 30MHz – 25GHz at mid carrier frequency.



v. The high emission level within the assigned band at high carrier frequency.

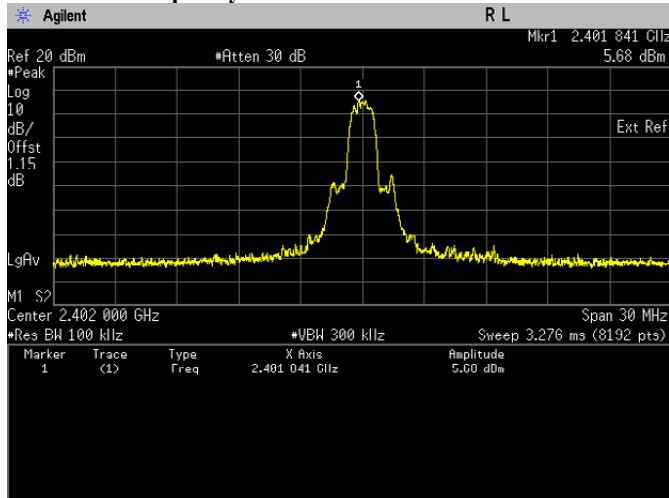


vi. Spurious emission measurement in 30MHz – 25GHz at high carrier frequency.

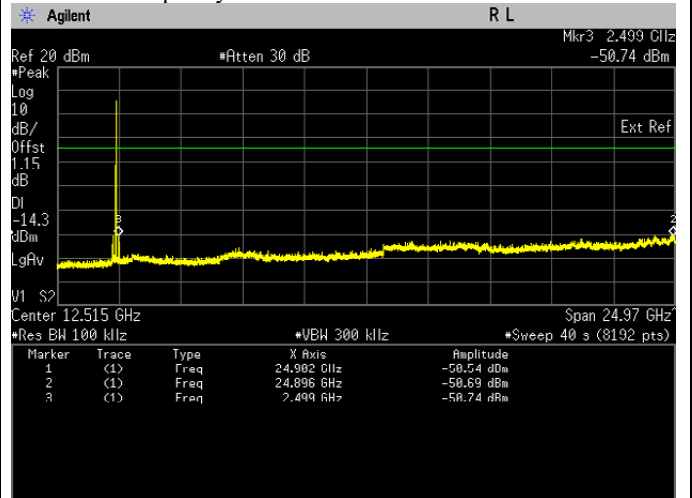


8DPSK Modulation:

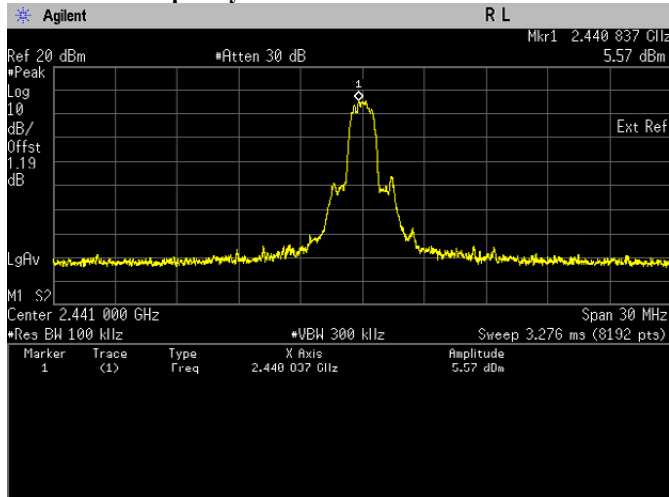
i. The high emission level within the assigned band at low carrier frequency.



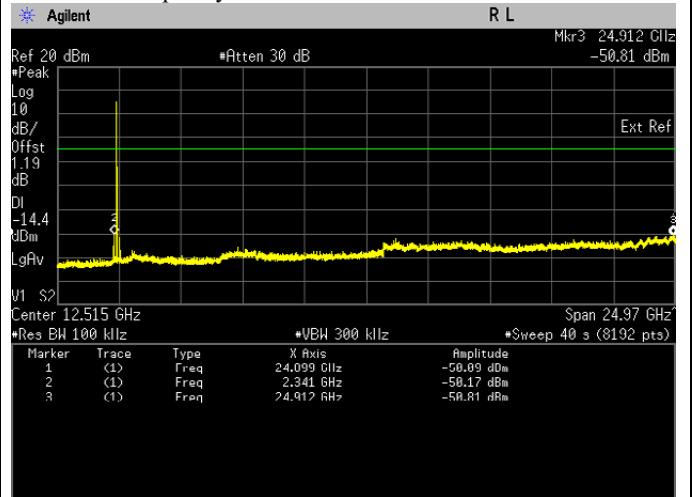
ii. Spurious emission measurement in 30MHz – 25GHz at low carrier frequency.



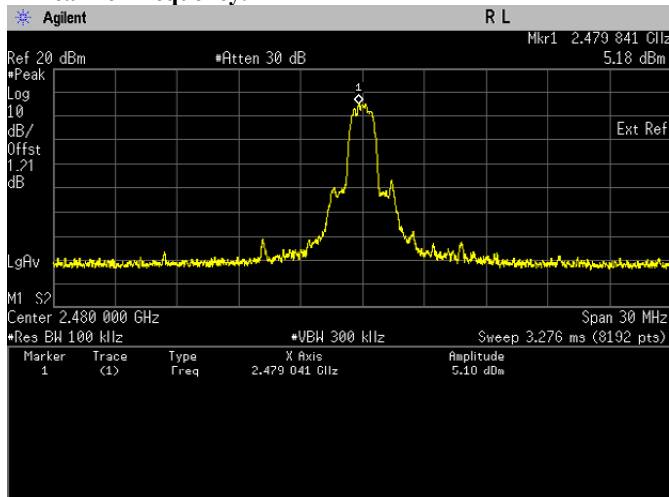
iii. The high emission level within the assigned band at mid carrier frequency.



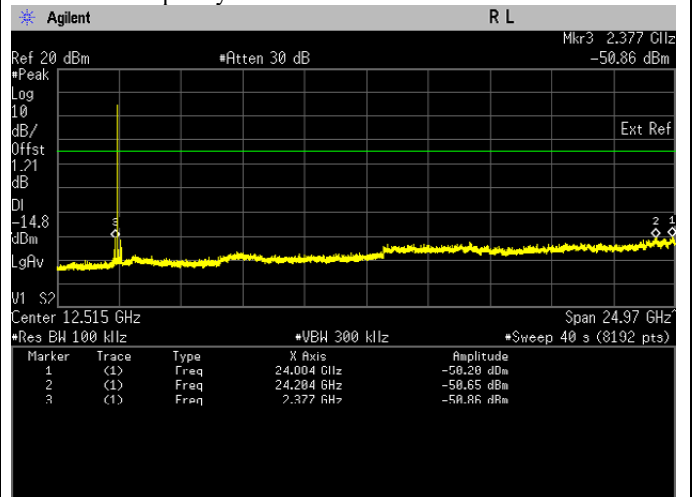
iv. Spurious emission measurement in 30MHz – 25GHz at mid carrier frequency.



v. The high emission level within the assigned band at high carrier frequency.

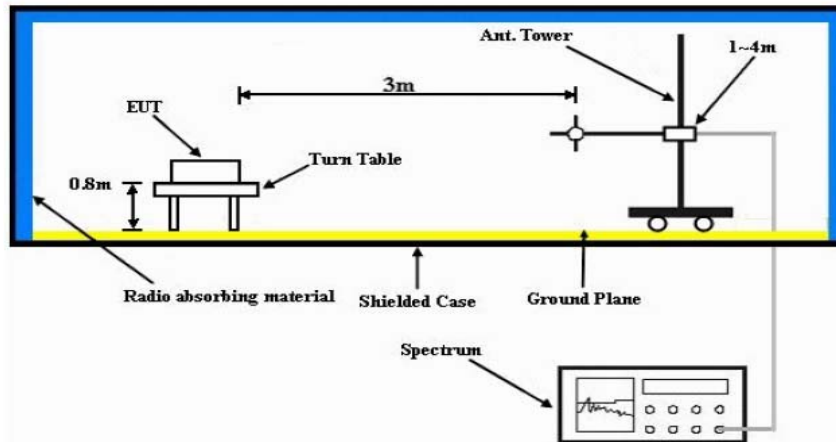


vi. Spurious emission measurement in 30MHz – 25GHz at high carrier frequency.



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.

6.8.3. Test Data:

Test: Bluetooth SAC Restricted Band Edge
Model Number: H25UCF9PW6AN S/N: 657TYB0771 EMC SR ID#: 26860-EMC-00075
Battery: PMNN4813A Accessory: AN000411A01
Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-2013
Worst Case Plane: Z-Plane (GFSK)

Restricted Band Edge (Low Channel) tabular data

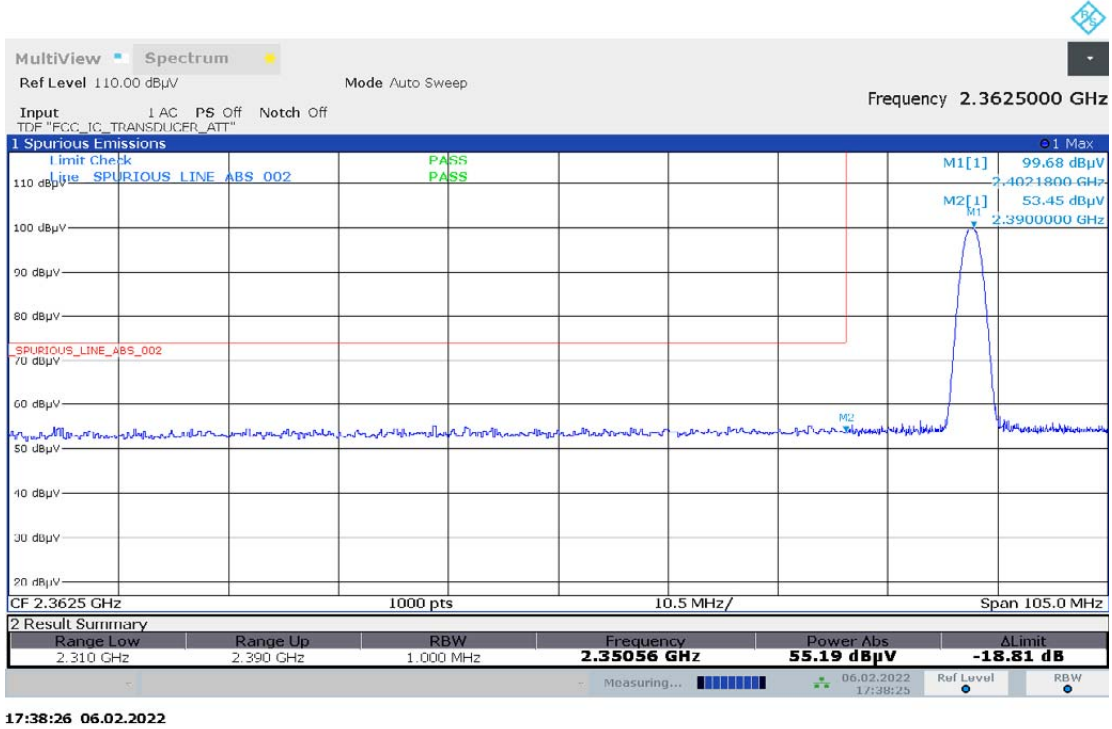
Vertical Radiated Emission Result										
Spur Freq (MHz)	Spur level QPK (dBµV/m)	Spur level PK (dBµV/m)	Spur level AV (dBµV/m)	Limit QPK (dBµV/m)	Limit PK (dBµV/m)	Limit AV (dBµV/m)	Margin QPK (dBµV/m)	Margin PK (dBµV/m)	Margin AV (dBµV/m)	Carrier PK Power (dBµV/m)
2390.0000	-	53.4487	43.6186	-	74.0000	54.0000	-	-20.5513	-10.3814	-
Horizontal Radiated Emission Result										
2390.0000	-	54.2567	44.0557	-	74.0000	54.0000	-	-19.7433	-9.9443	-

Remarks: Pass Result	Marginal Result	Fail Result
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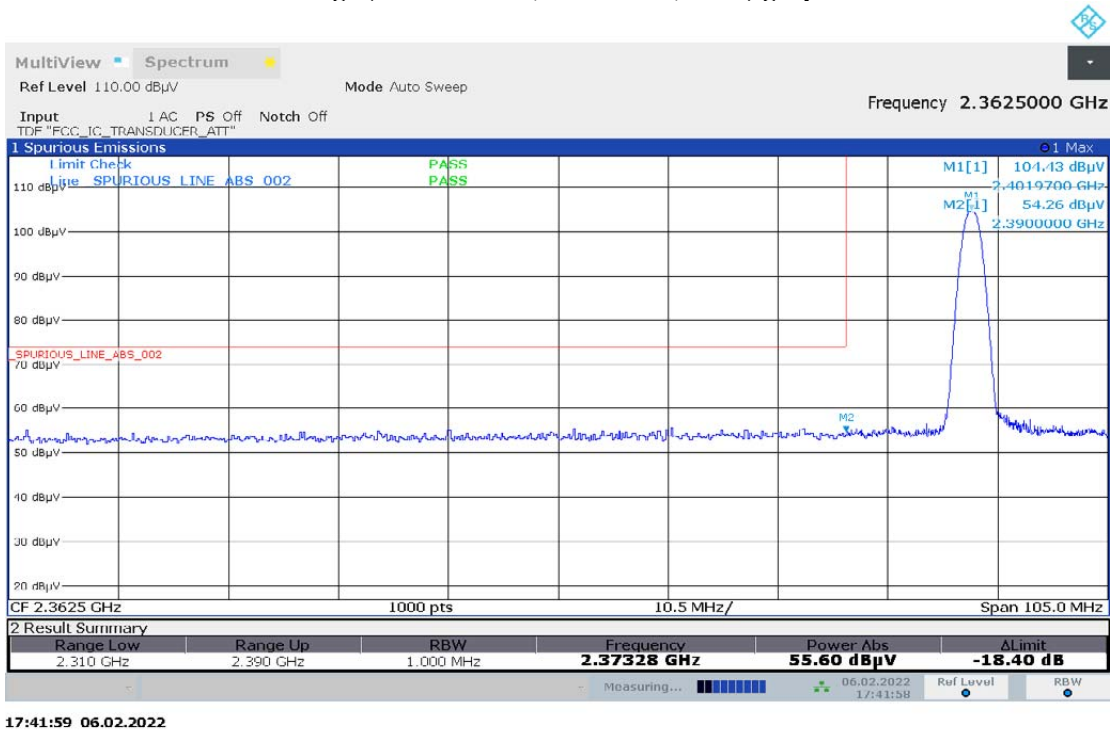
Temperature (degC): 23.6
 Test Performed by: Qawiman&Nazrin
 System MU: 5.84dB

Humidity (%): 69.3
 Test Date: Mon, 7 Feb, 2022

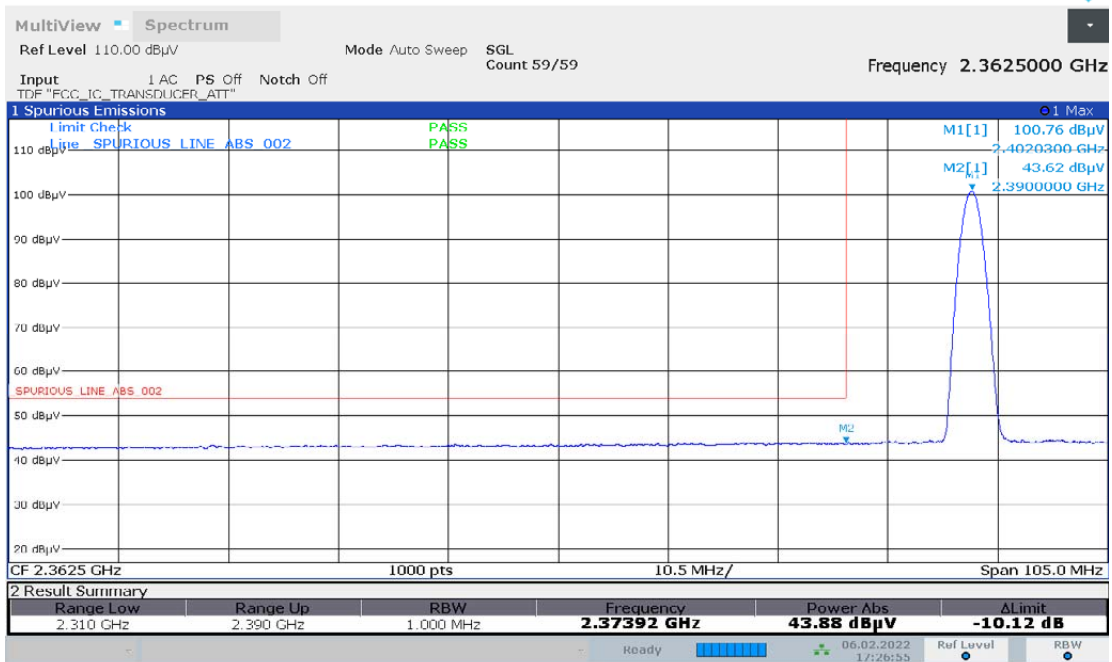
Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



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

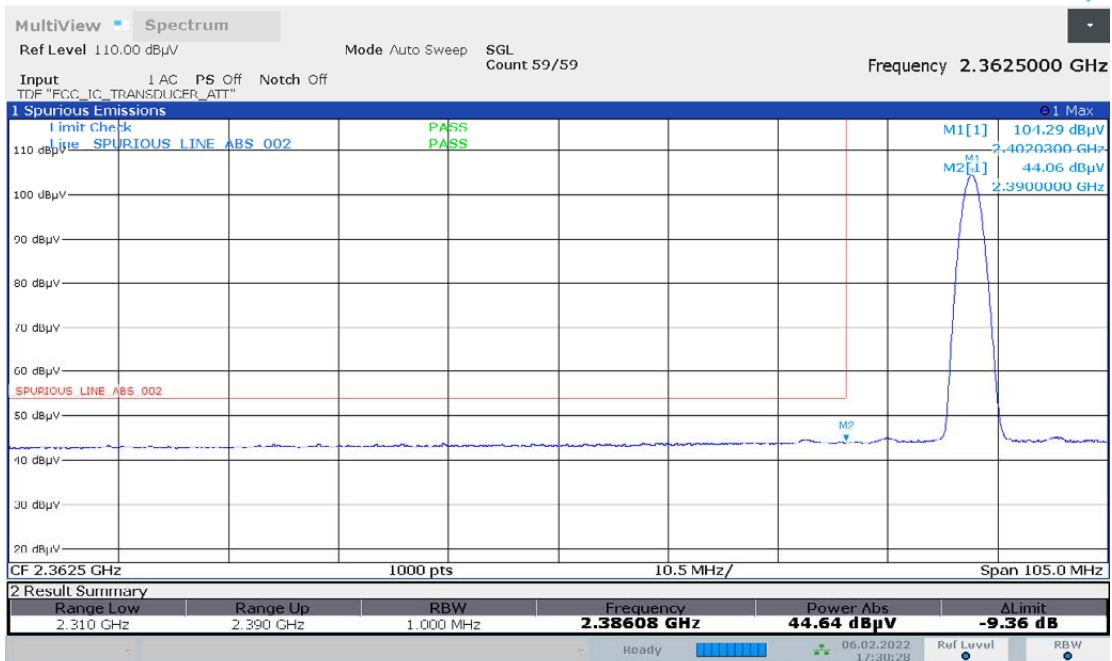


Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot



17:26:55 06.02.2022

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



17:30:28 06.02.2022

Test: Bluetooth SAC Restricted Band Edge

Model Number: H25UCF9PW6AN **S/N:** 657TYB0771 **EMC SR ID#:** 26860-EMC-00075
Battery: PMNN4813A **Accessory:** AN000411A01
Test Channel: High **Test Frequency:** 2480.0000 MHz **Test Standard:** ANSI C63.10-2013
Worst Case Plane: Z-Plane (GFSK)

Restricted Band Edge (High Channel) tabular data

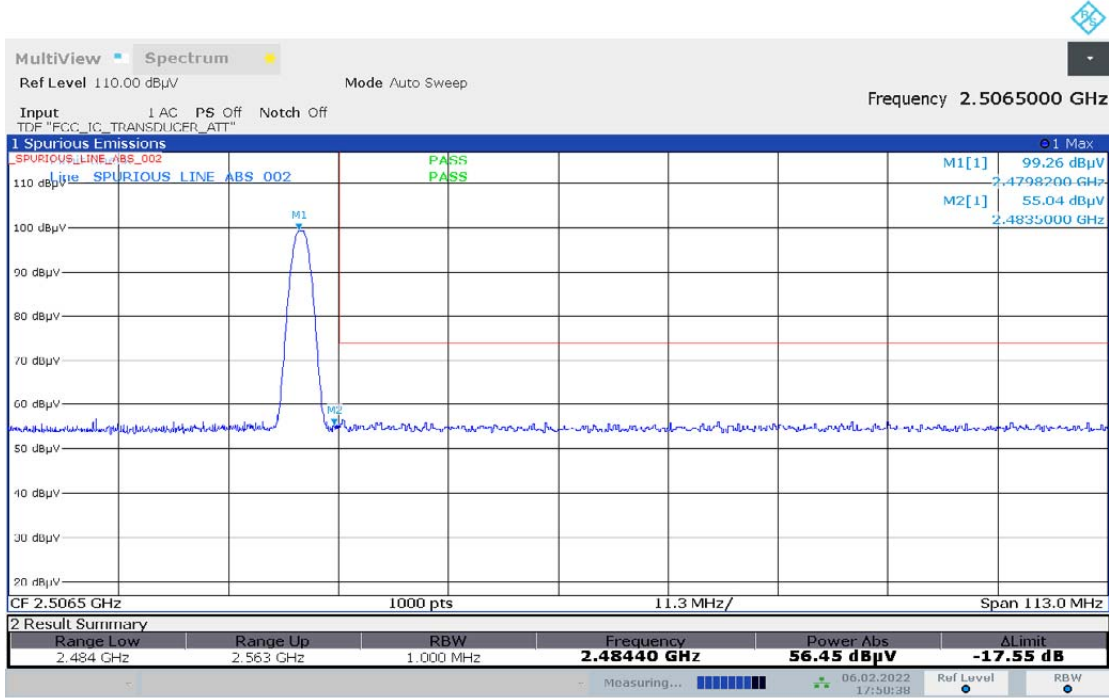
Vertical Radiated Emission Result										
Spur Freq (MHz)	Spur level QPK (dBµV/m)	Spur level PK (dBµV/m)	Spur level AV (dBµV/m)	Limit QPK (dBµV/m)	Limit PK (dBµV/m)	Limit AV (dBµV/m)	Margin QPK (dBµV/m)	Margin PK (dBµV/m)	Margin AV (dBµV/m)	Carrier PK Power (dBµV/m)
2483.5000	-	55.0428	44.4727	-	74.0000	54.0000	-	-18.9572	-9.5273	-
Horizontal Radiated Emission Result										
2483.5000	-	54.2362	44.7347	-	74.0000	54.0000	-	-19.7638	-9.2653	-

Remarks: Pass Result	Marginal Result	Fail Result
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Temperature (degC): 23.6
Test Performed by: Qawiman&Nazrin
System MU: 5.84dB

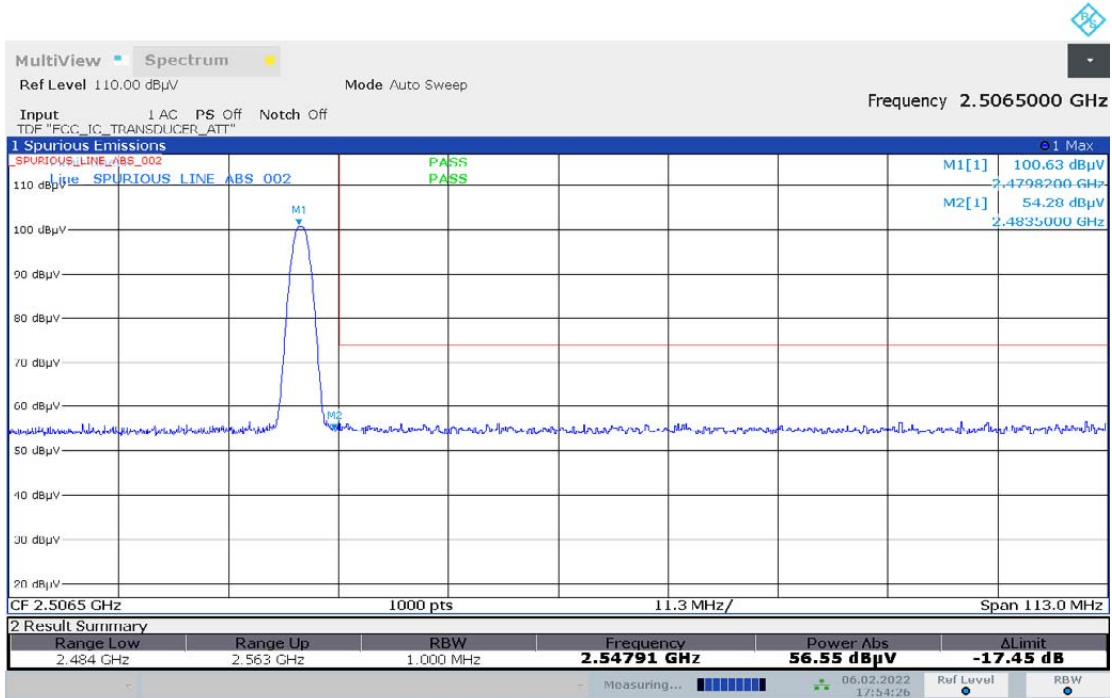
Humidity (%): 69.3
Test Date: Mon, 7 Feb, 2022

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



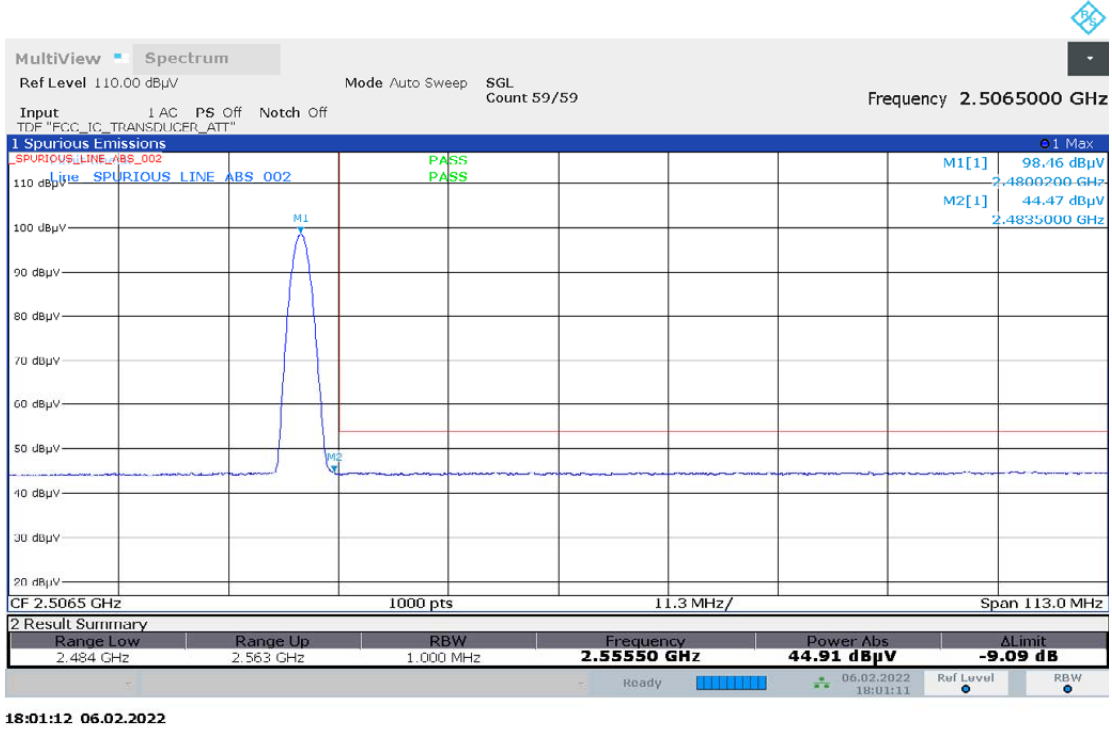
17:50:38 06.02.2022

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

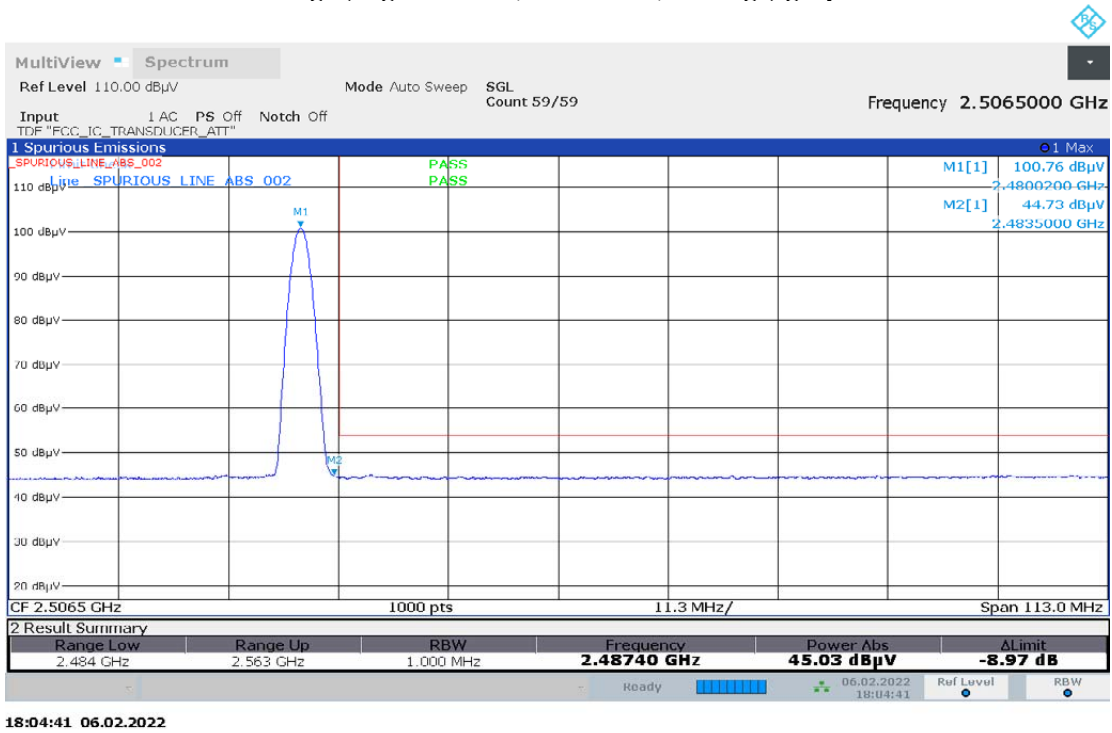


17:54:26 06.02.2022

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



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



Test: Bluetooth SAC Restricted Band Edge
Model Number: H25UCF9PW6AN S/N: 657TYB0771 EMC SR ID#: 26860-EMC-00075
Battery: PMNN4813A Accessory: AN000411A01
Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-2013
Worst Case Plane: Z-Plane (DQPSK)

Restricted Band Edge (Low Channel) tabular data

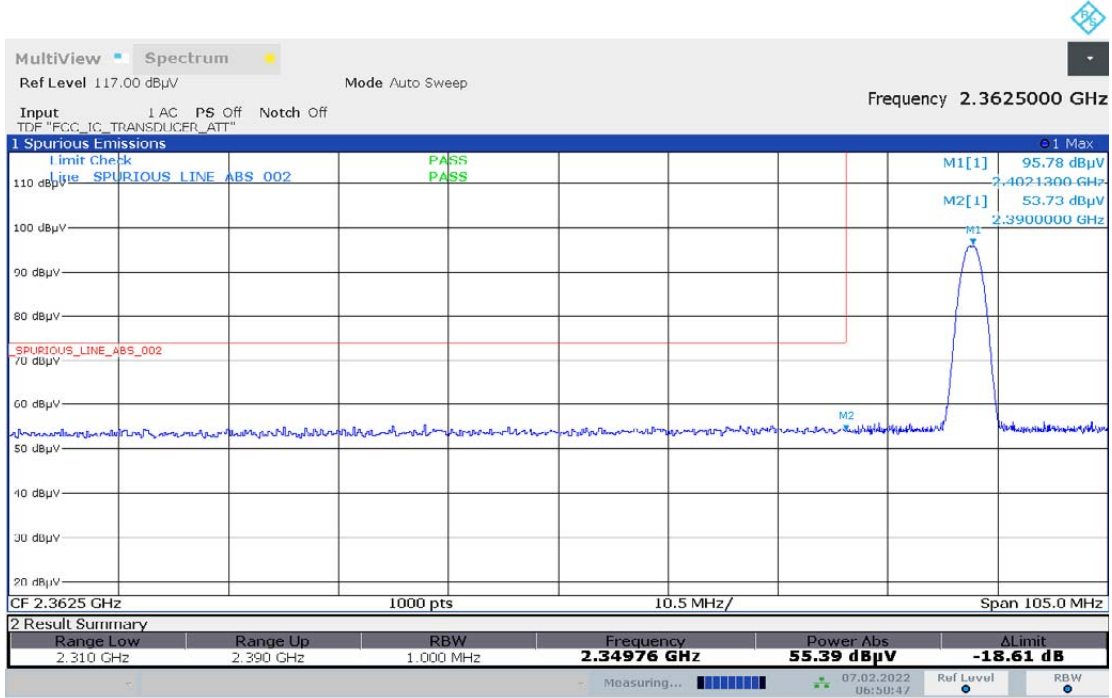
Vertical Radiated Emission Result										
Spur Freq (MHz)	Spur level QPK (dBµV/m)	Spur level PK (dBµV/m)	Spur level AV (dBµV/m)	Limit QPK (dBµV/m)	Limit PK (dBµV/m)	Limit AV (dBµV/m)	Margin QPK (dBµV/m)	Margin PK (dBµV/m)	Margin AV (dBµV/m)	Carrier PK Power (dBµV/m)
2390.0000	-	53.7315	43.9198	-	74.0000	54.0000	-	-20.2685	-10.0802	-
Horizontal Radiated Emission Result										
2390.0000	-	53.7076	43.8000	-	74.0000	54.0000	-	-20.2924	-10.2000	-

Remarks: Pass Result	Marginal Result	Fail Result
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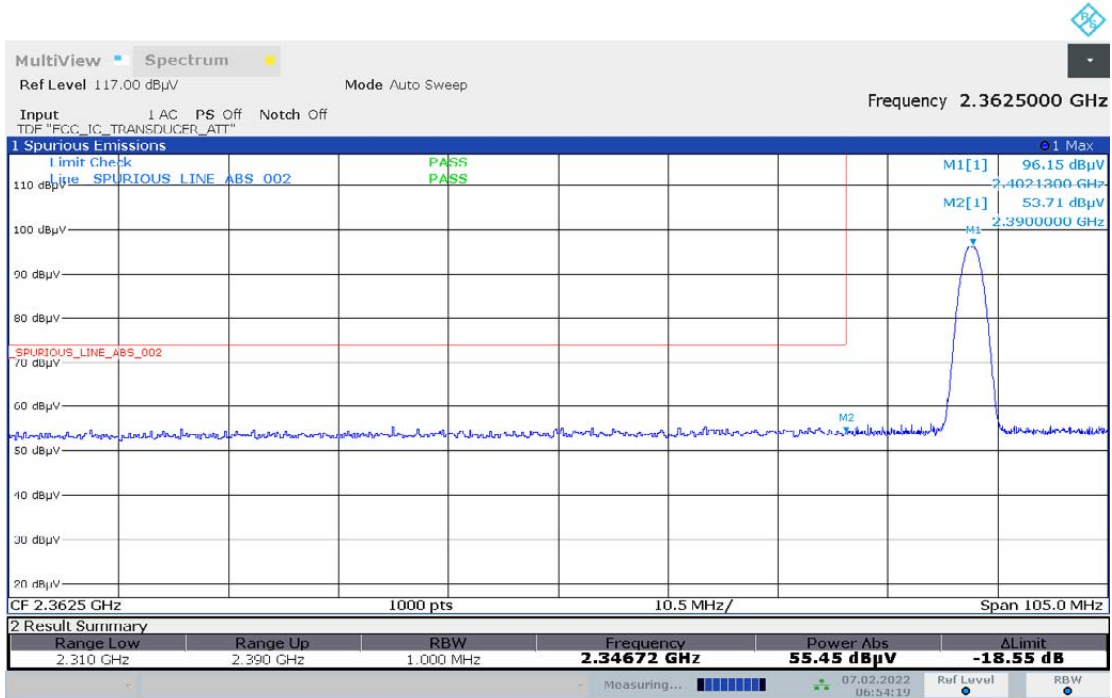
Temperature (degC): 23.6
Test Performed by: Qawiman&Nazrin
System MU: 5.84dB

Humidity (%): 69.3
Test Date: Mon, 7 Feb, 2022

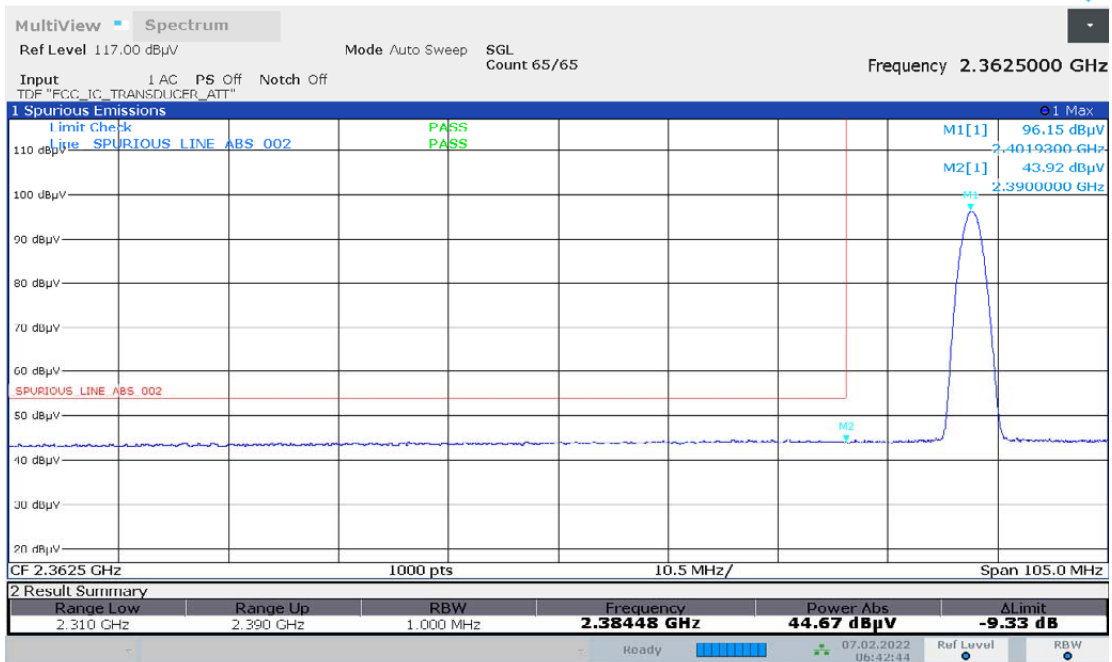
Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



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

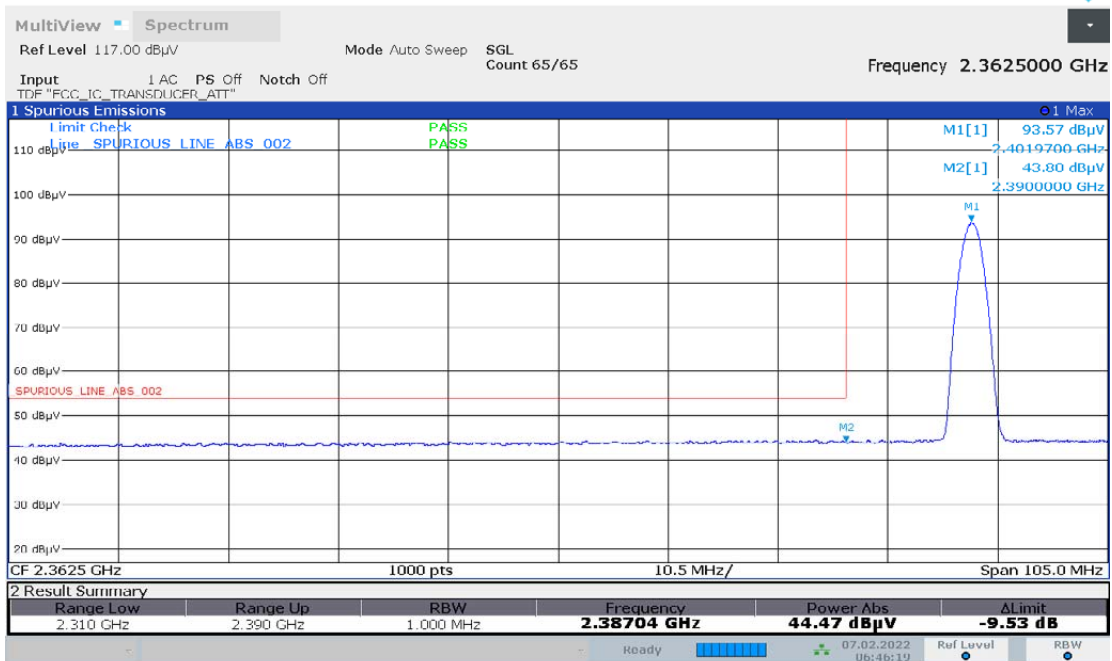


Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot



06:42:44 07.02.2022

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



06:46:19 07.02.2022

Test: Bluetooth SAC Restricted Band Edge

Model Number: H25UCF9PW6AN S/N: 657TYB0771 EMC SR ID#: 26860-EMC-00075

Battery: PMNN4813A Accessory: AN000411A01

Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013

Worst Case Plane: Z-Plane (DQPSK)

Restricted Band Edge (High Channel) tabular data

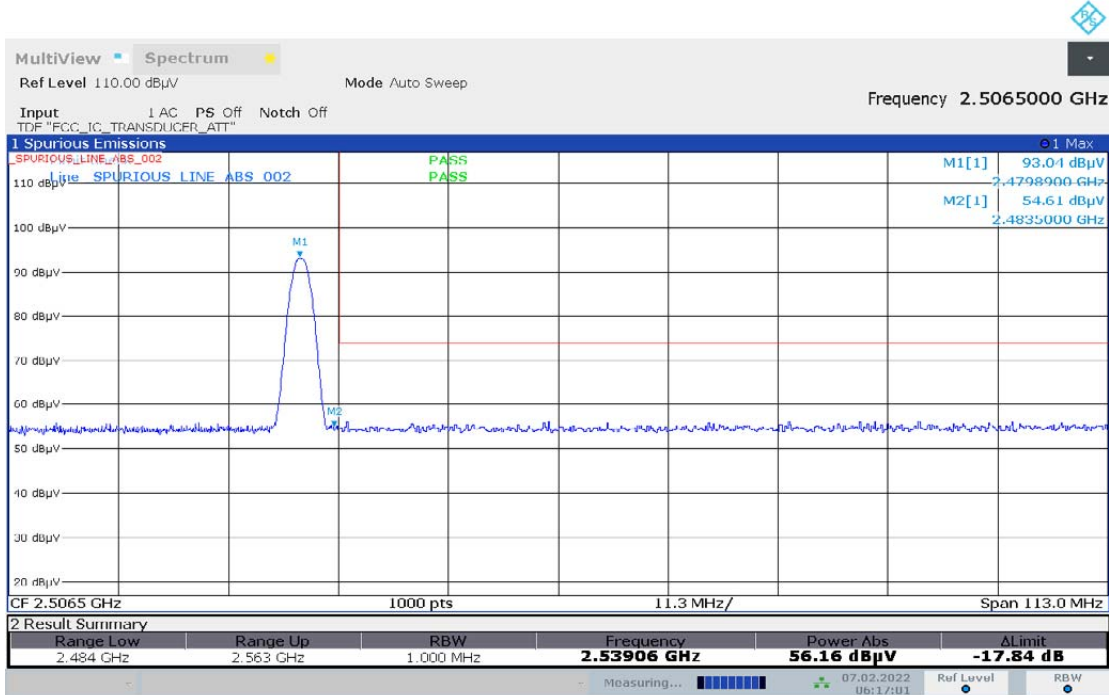
Vertical Radiated Emission Result										
Spur Freq (MHz)	Spur level QPK (dBµV/m)	Spur level PK (dBµV/m)	Spur level AV (dBµV/m)	Limit QPK (dBµV/m)	Limit PK (dBµV/m)	Limit AV (dBµV/m)	Margin QPK (dBµV/m)	Margin PK (dBµV/m)	Margin AV (dBµV/m)	Carrier PK Power (dBµV/m)
2483.5000	-	54.6115	44.7448	-	74.0000	54.0000	-	-19.3885	-9.2552	-
Horizontal Radiated Emission Result										
2483.5000	-	53.9085	44.8387	-	74.0000	54.0000	-	-20.0915	-9.1613	-

Remarks: Pass Result	Marginal Result	Fail Result
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Temperature (degC): 23.6
Test Performed by: Qawiman&Nazrin
System MU: 5.84dB

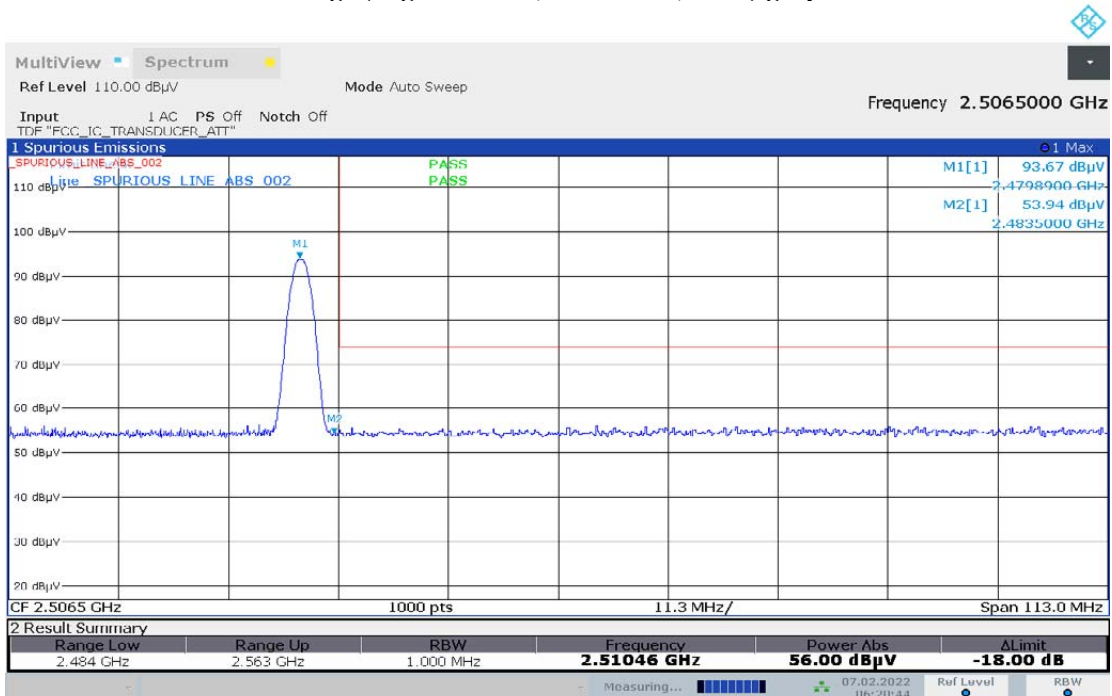
Humidity (%): 69.3
Test Date: Mon, 7 Feb, 2022

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



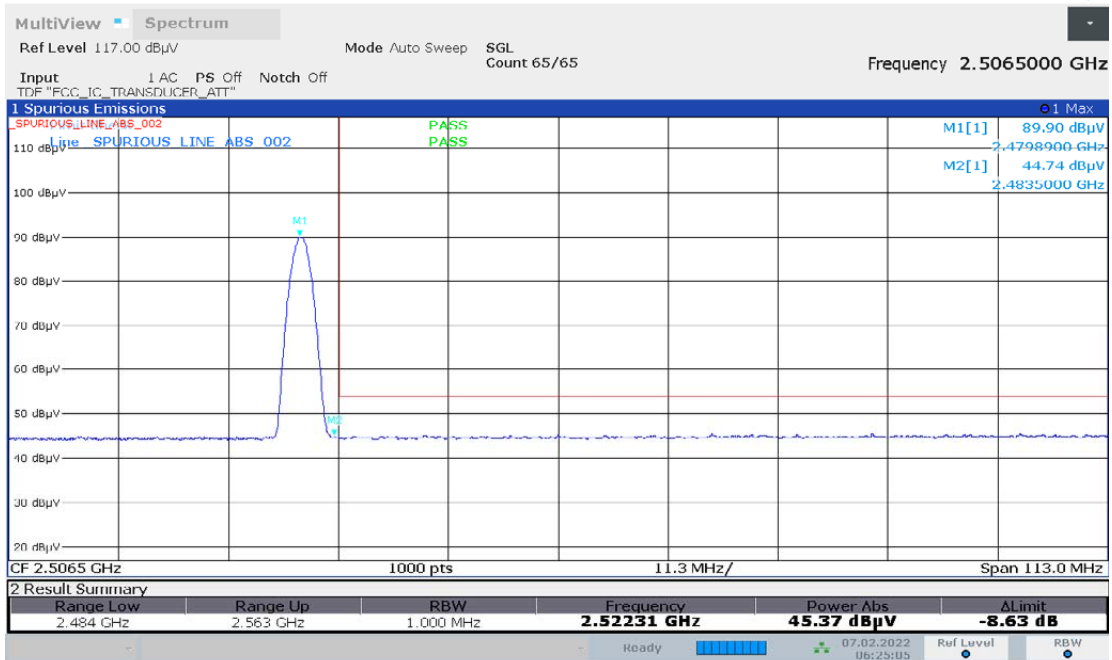
06:17:02 07.02.2022

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



06:20:45 07.02.2022

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



06:25:05 07.02.2022

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

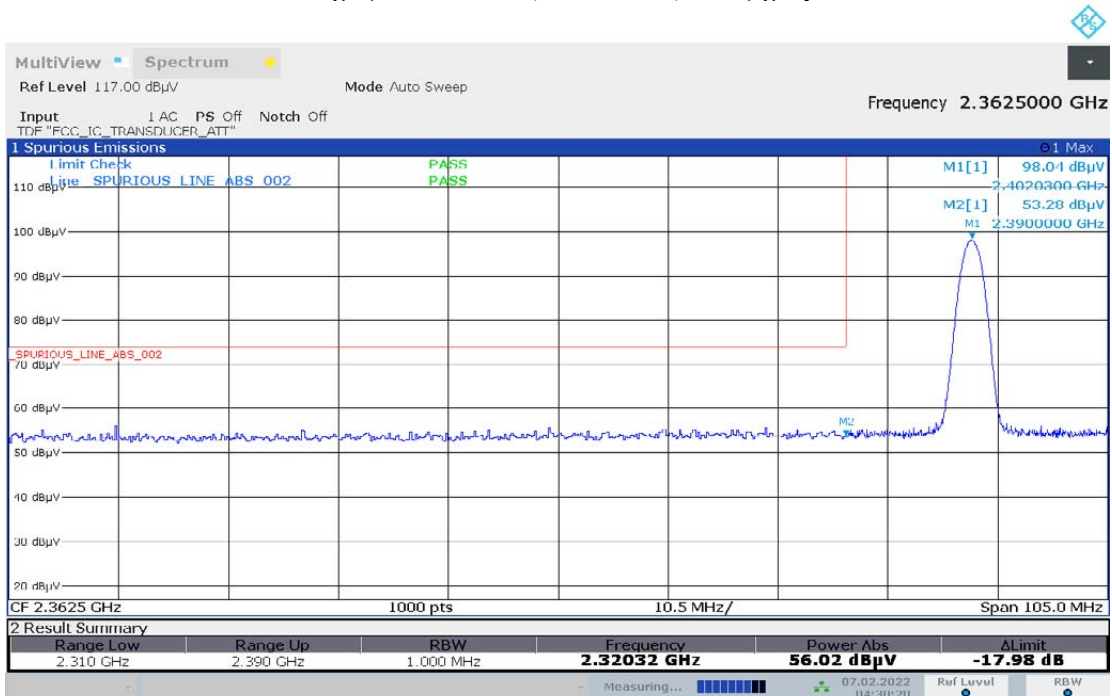


06:28:43 07.02.2022

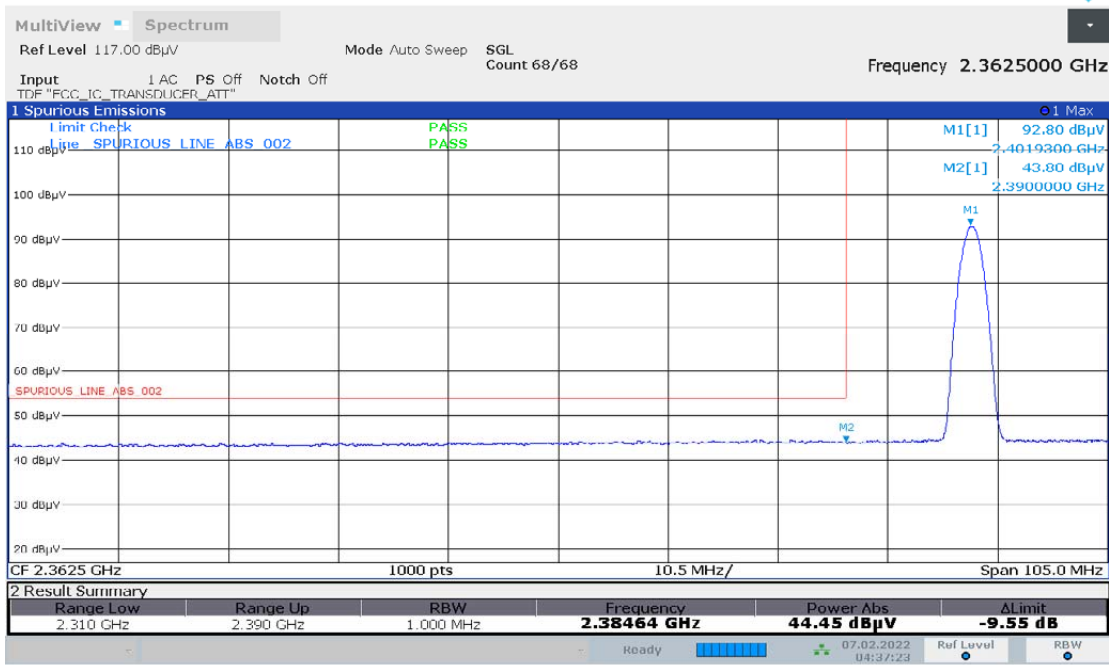
Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



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

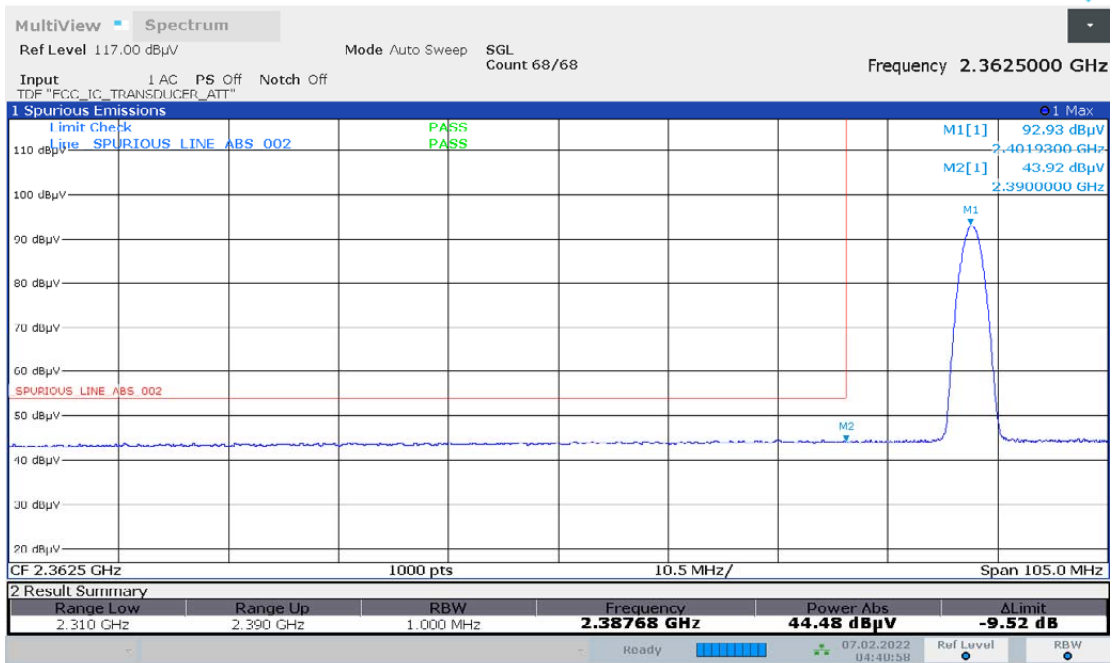


Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot



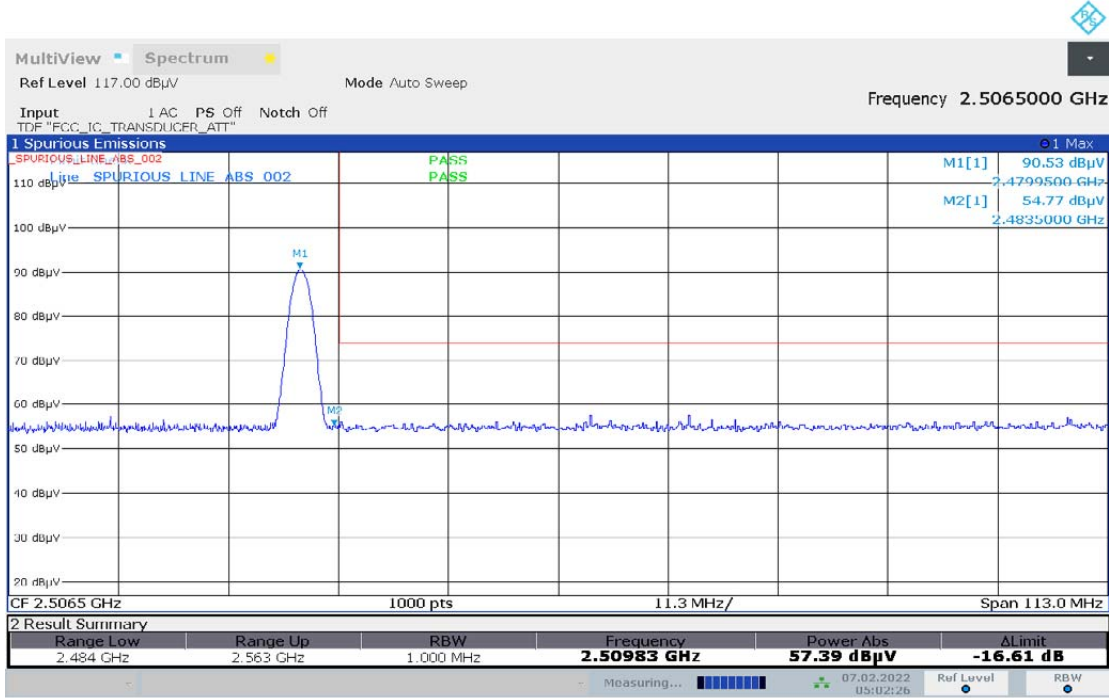
04:37:23 07.02.2022

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

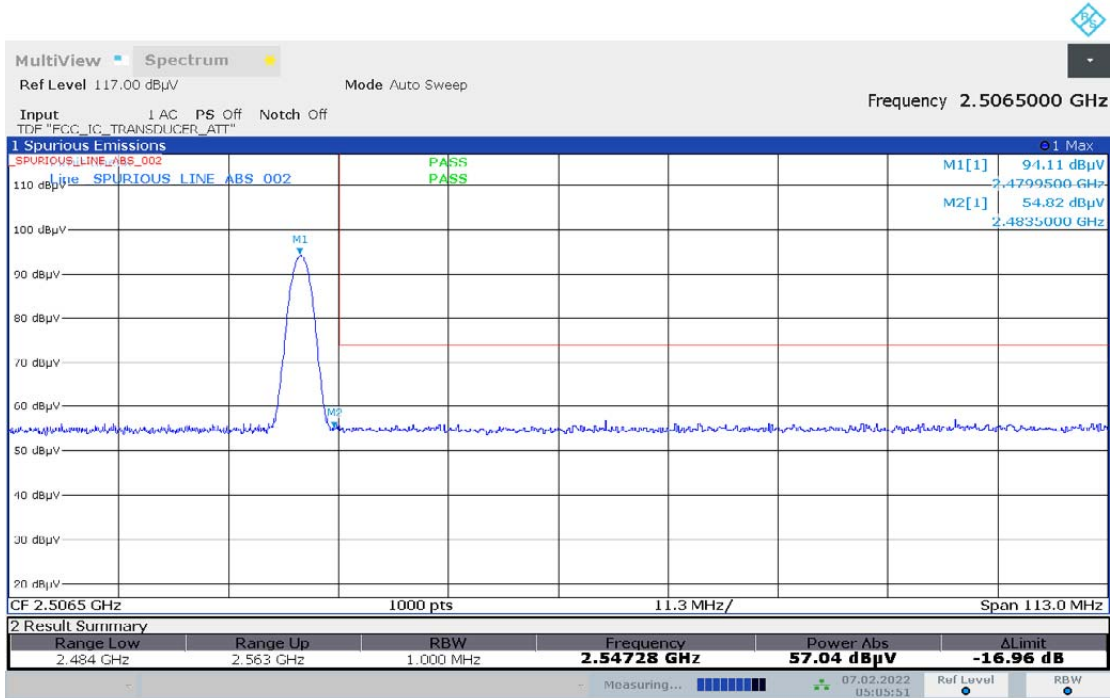


04:40:58 07.02.2022

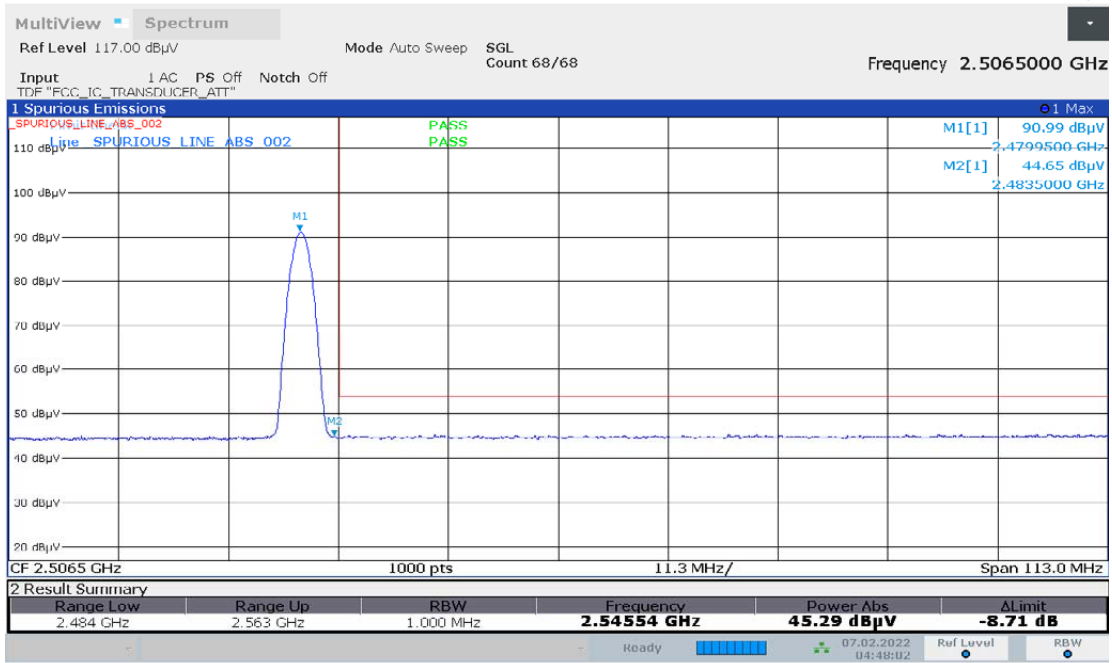
Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



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

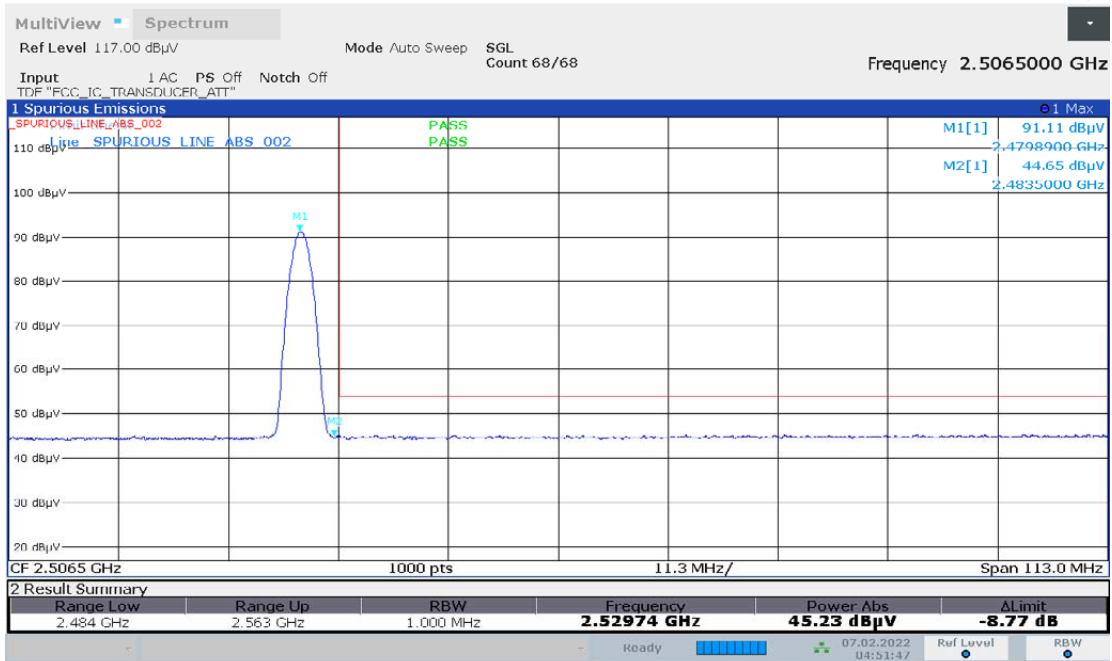


Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot



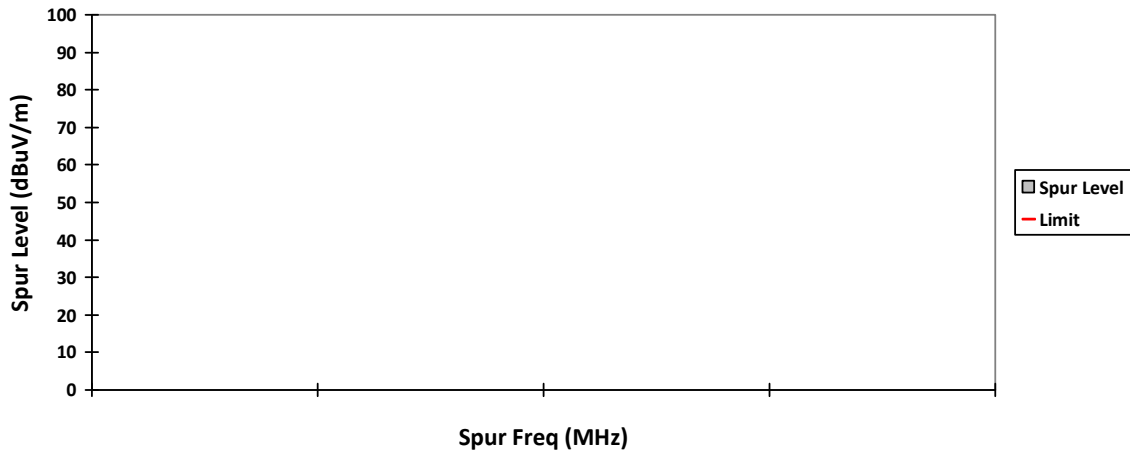
04:48:02 07.02.2022

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

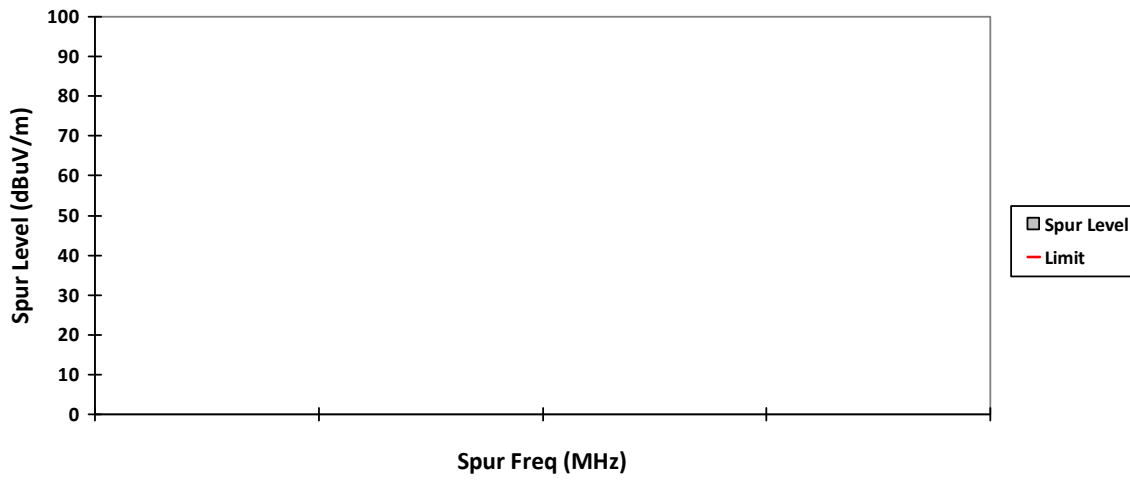


04:51:47 07.02.2022

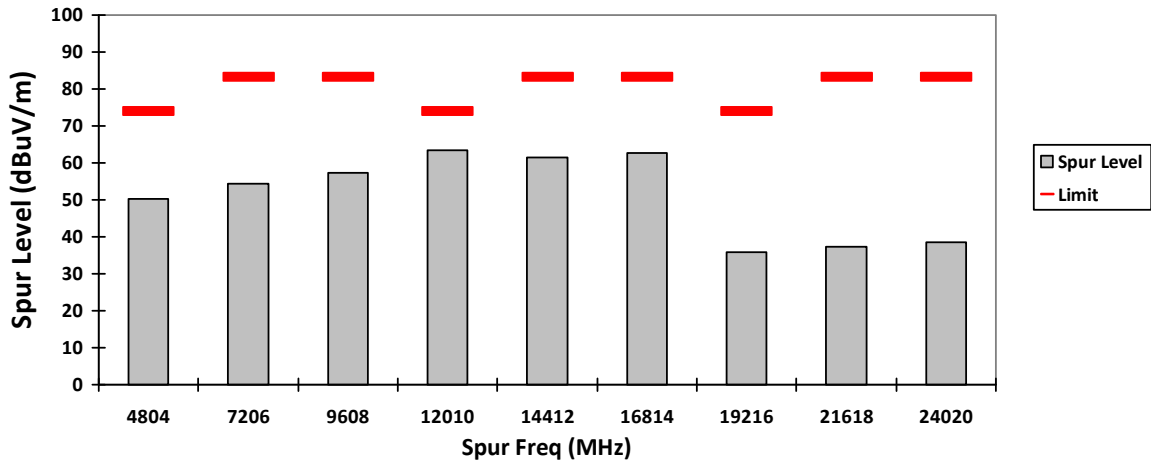
VERTICAL, QPK



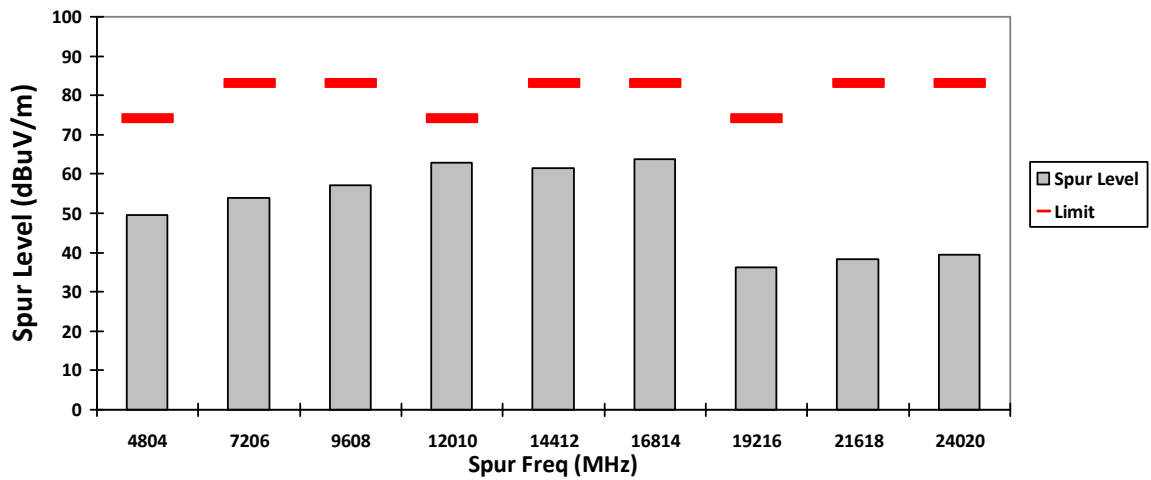
HORIZONTAL, QPK



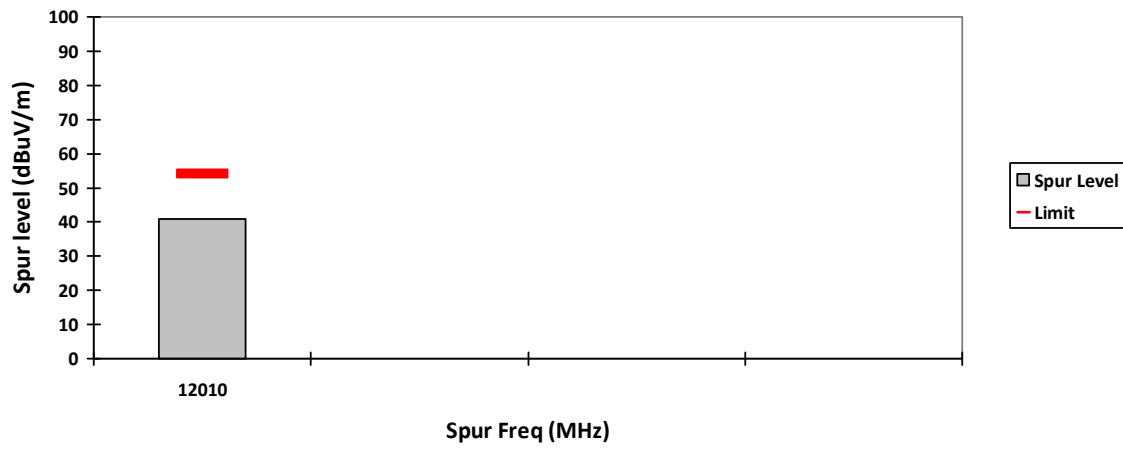
VERTICAL, PK



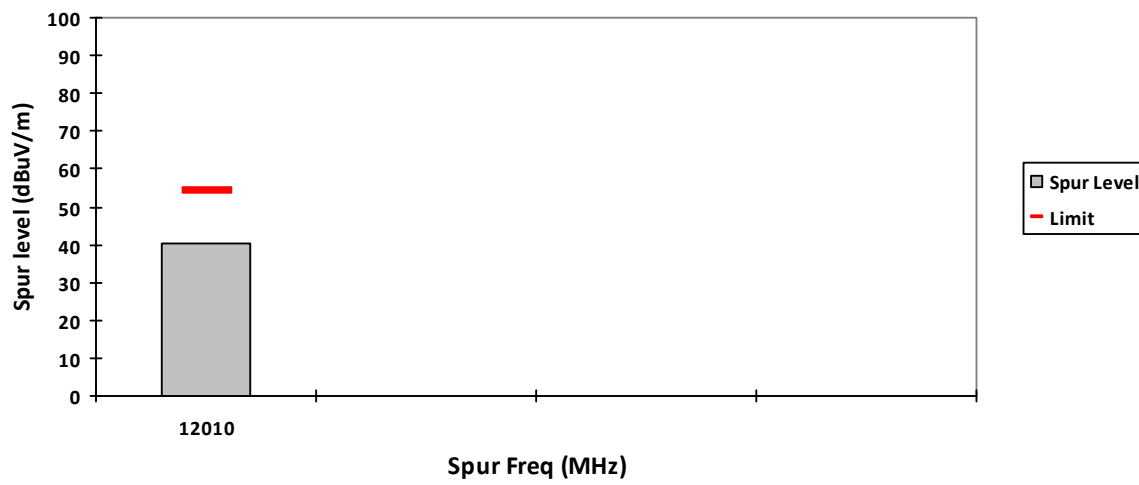
HORIZONTAL, PK



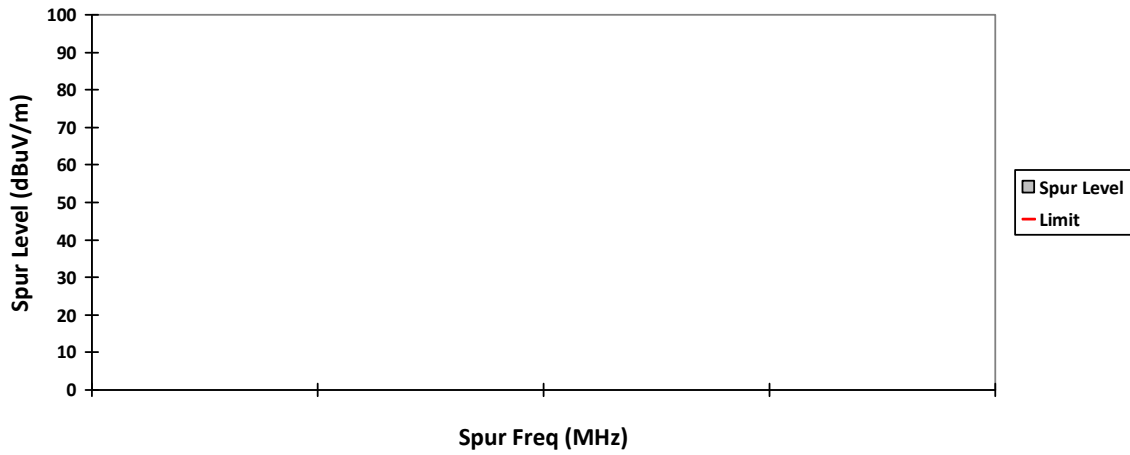
VERTICAL, AV



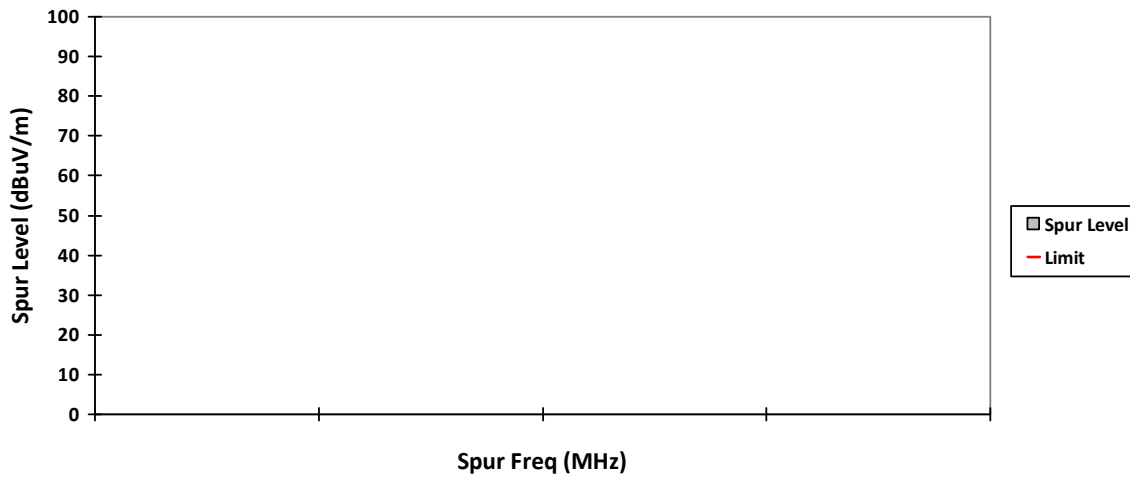
HORIZONTAL, AV



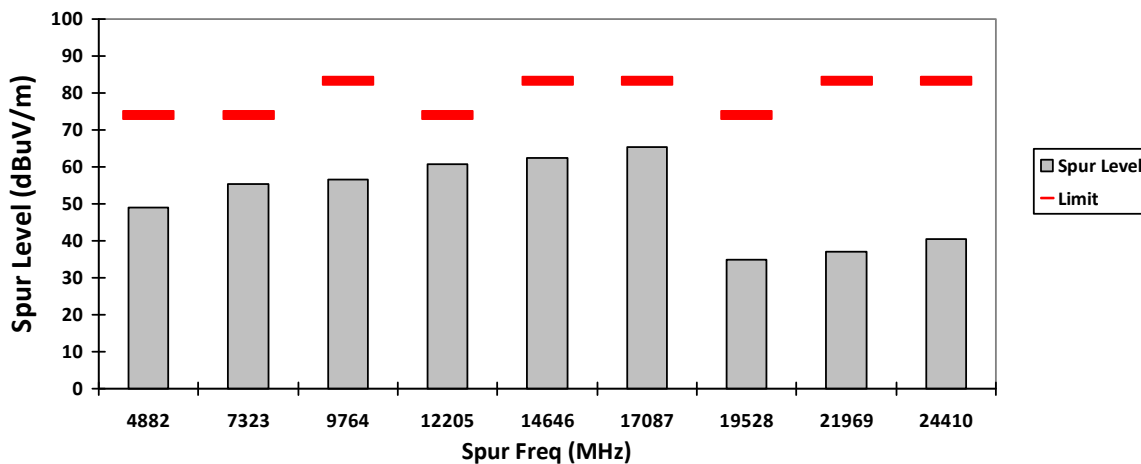
VERTICAL, QPK



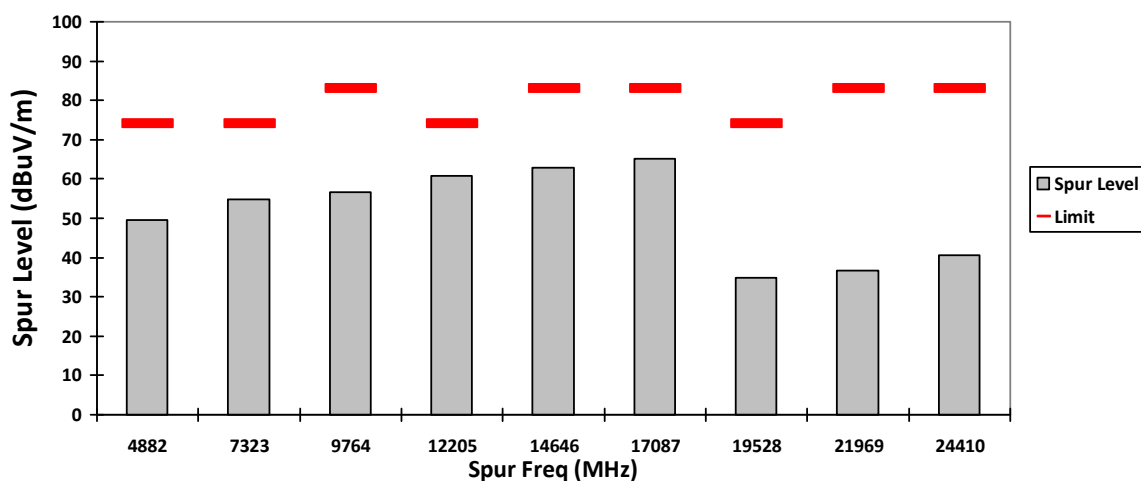
HORIZONTAL, QPK



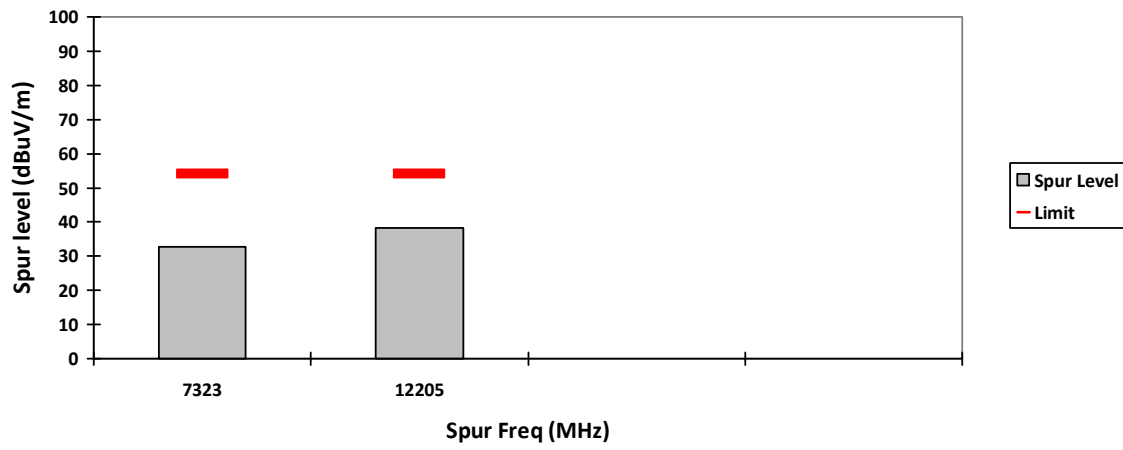
VERTICAL, PK



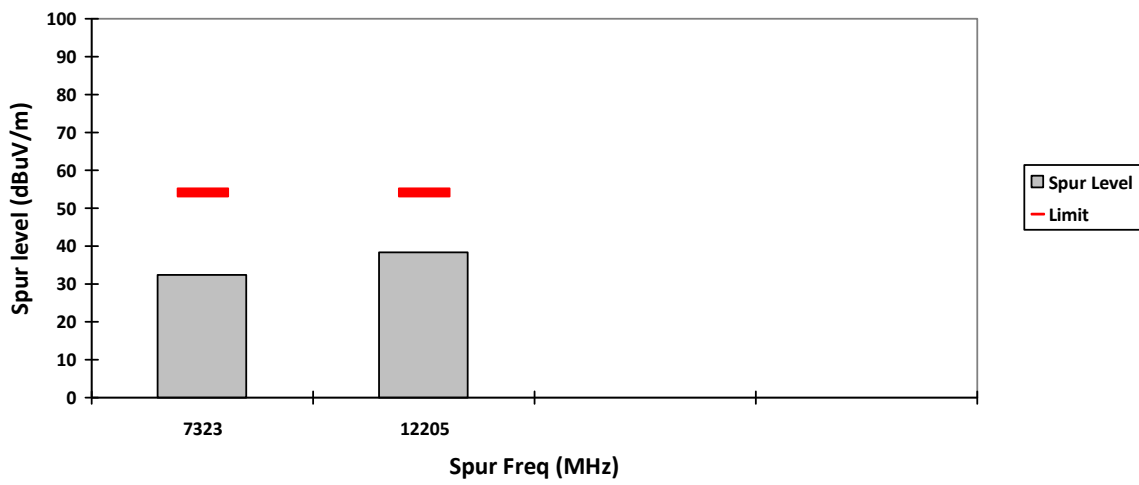
HORIZONTAL, PK



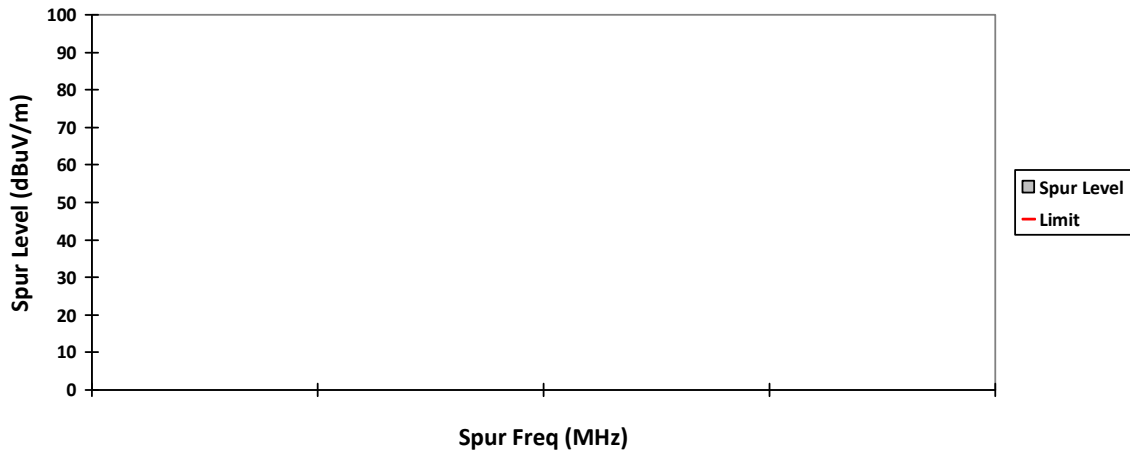
VERTICAL, AV



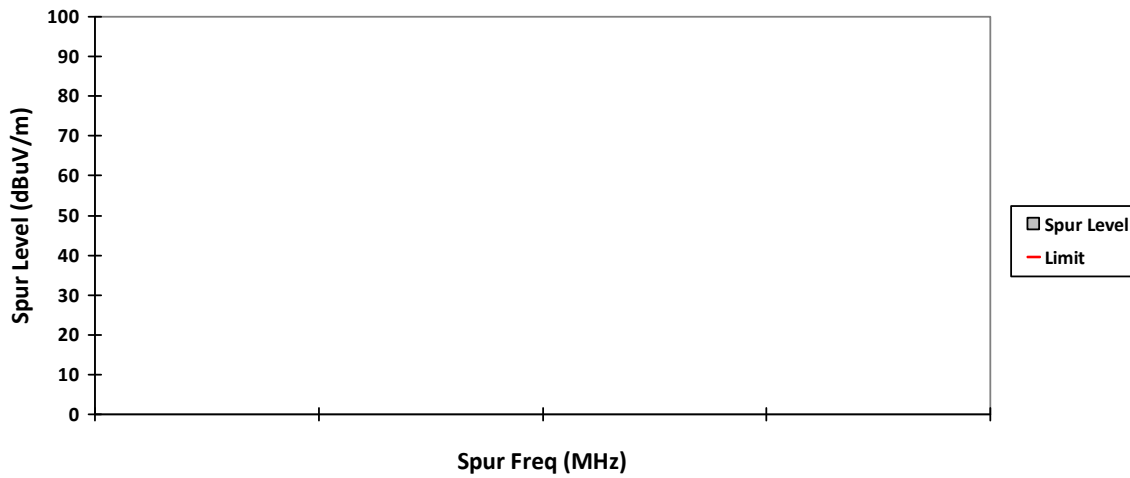
HORIZONTAL, AV



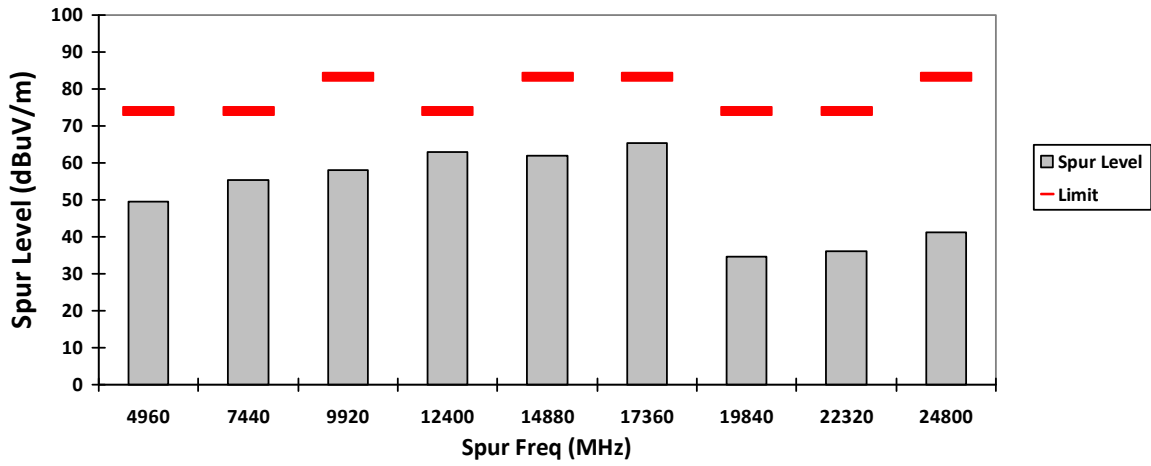
VERTICAL, QPK



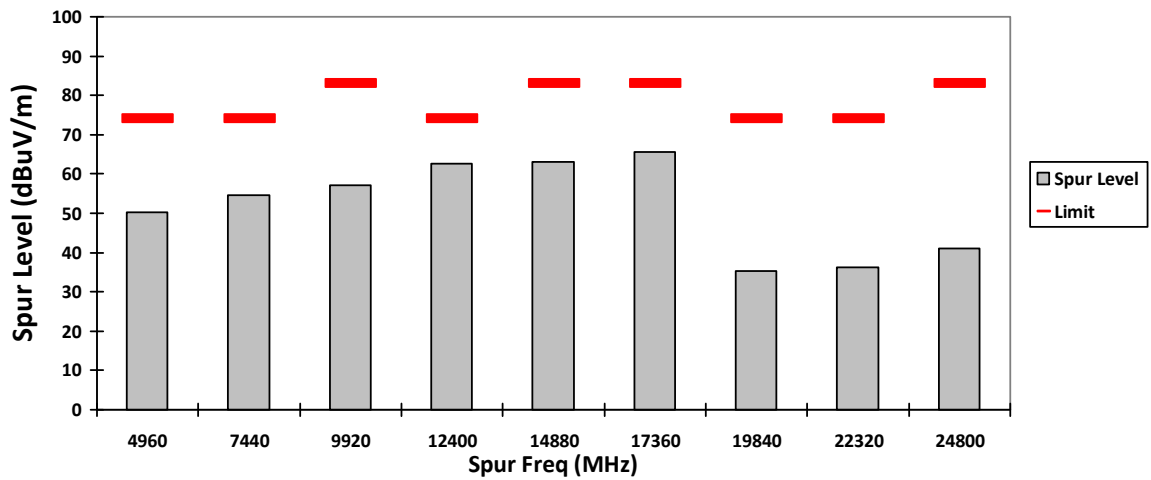
HORIZONTAL, QPK



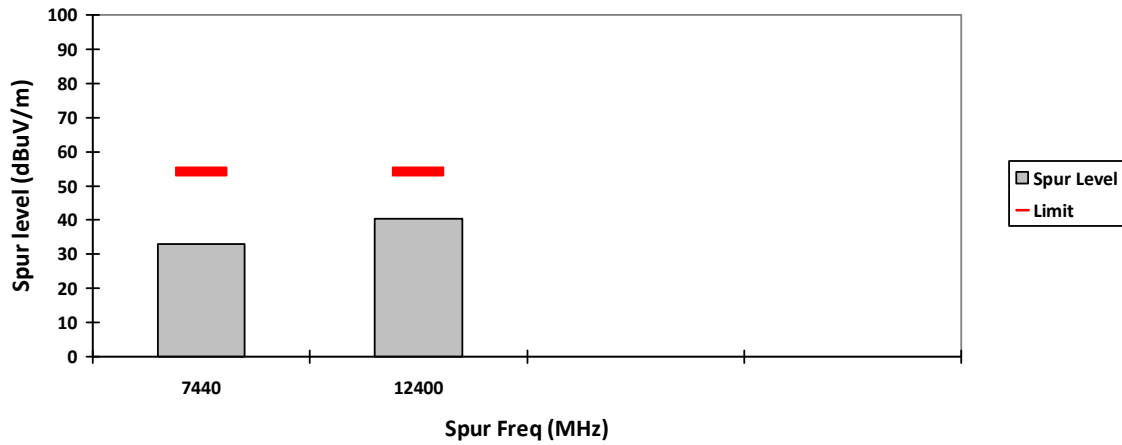
VERTICAL, PK



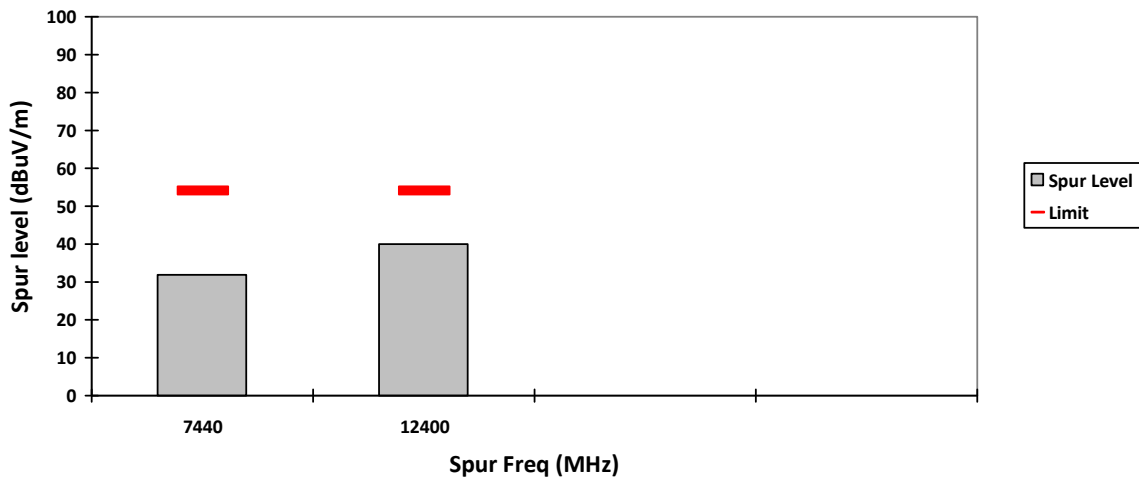
HORIZONTAL, PK



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 = $20\log_{10}(7.5\text{ms} / 100\text{ms}) = -22.5 \text{ dB}$

Test: **Bluetooth SAC Transmitter Radiated Emission**
 Model#: **H25UCF9PW6AN** S/N: **657TYB0771** EMC SR ID#: **26860-EMC-00075**
 Battery: **PMNN4813A** Accessory: **AN000411A01**
 Test Channel: **Low** Test Frequency: **2402.0000 MHz** Test Standard: **ANSI C63.10-2013**
 Worst Case Plane: **Z-Plane (DQPSK)**

Radiated Emission (Low Channel) tabular data

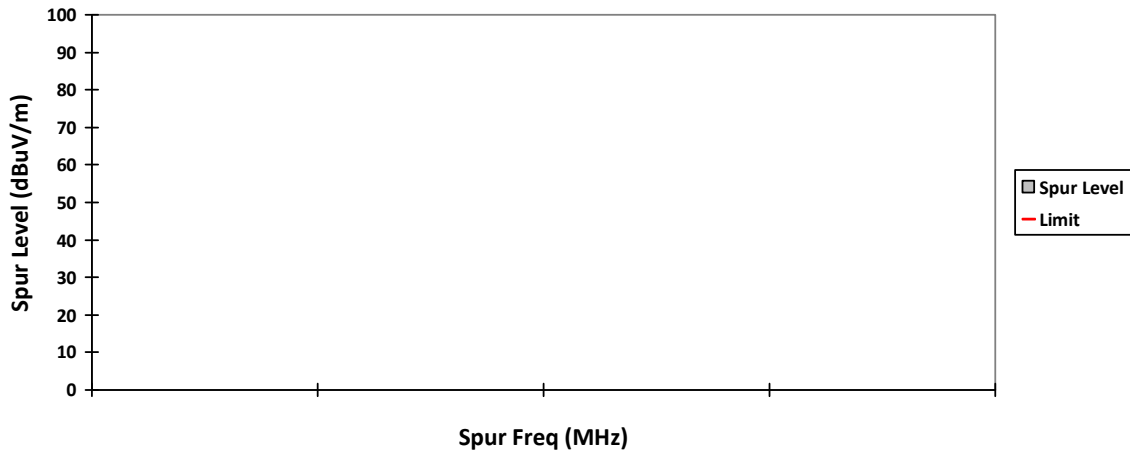
Vertical Radiated Emission Result										
Spur Freq (MHz)	Spur level QPK (dBµV/m)	Spur level PK (dBµV/m)	Spur level AV (dBµV/m)	Limit QPK (dBµV/m)	Limit PK (dBµV/m)	Limit AV (dBµV/m)	Margin QPK (dBµV/m)	Margin PK (dBµV/m)	Margin AV (dBµV/m)	Carrier PK Power (dBµV/m)
4804	-	49.2284**	-	-	74.0	-	-	24.7716	-	-
7206	-	54.1485**	-	-	83.0546	-	-	28.9061	-	103.0546
9608	-	57.9396**	-	-	83.0546	-	-	25.1150	-	103.0546
12010	-	62.6168**	40.1168**	-	74.0	54.0	-	11.3832	13.8832	-
14412	-	61.3239**	-	-	83.0546	-	-	21.7307	-	103.0546
16814	-	63.3352**	-	-	83.0546	-	-	19.7194	-	103.0546
19216	-	35.1377**	-	-	74.0	-	-	38.8623	-	-
21618	-	37.7438**	-	-	83.0546	-	-	45.3108	-	103.0546
24020	-	39.7634**	-	-	83.0546	-	-	43.2912	-	103.0546
Horizontal 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)
4804	-	49.4794**	-	-	74.0	-	-	24.5206	-	-
7206	-	54.6467**	-	-	83.0546	-	-	28.4079	-	103.0546
9608	-	56.6588**	-	-	83.0546	-	-	26.3958	-	103.0546
12010	-	63.0234**	40.5234**	-	74.0	54.0	-	10.9766	13.4766	-
14412	-	62.6208**	-	-	83.0546	-	-	20.4338	-	103.0546
16814	-	62.8690**	-	-	83.0546	-	-	20.1856	-	103.0546
19216	-	36.2316**	-	-	74.0	-	-	37.7684	-	-
21618	-	37.3953**	-	-	83.0546	-	-	45.6593	-	103.0546
24020	-	38.0428**	-	-	83.0546	-	-	45.0118	-	103.0546

Remarks: Pass Result	Marginal Result	Fail Result
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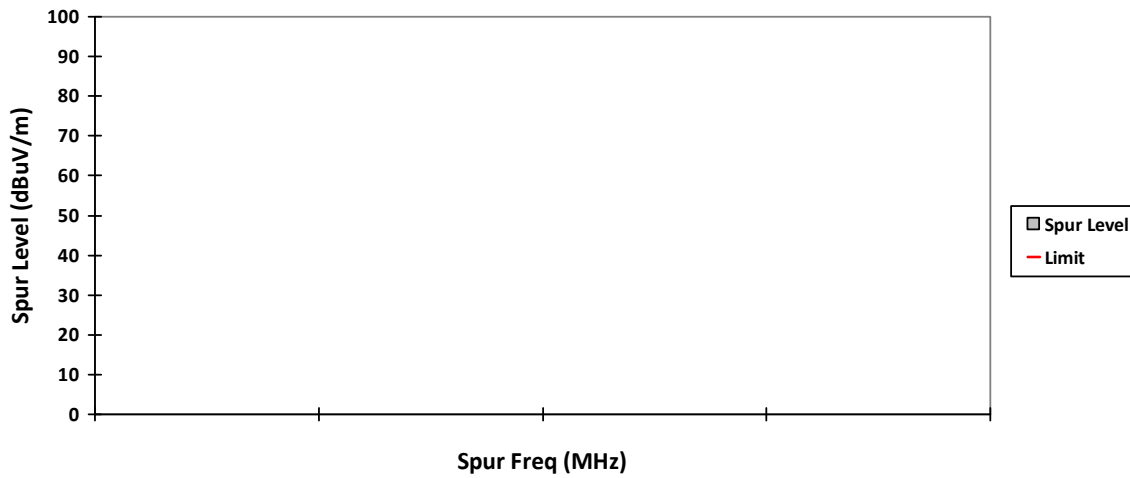
Temperature (degC): **23.6** Humidity (%): **69.3**
 Test Performed by: **Nazrin&Azil** Test Date: **Thu, 10 Feb, 2022** System MU:
5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)

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.**

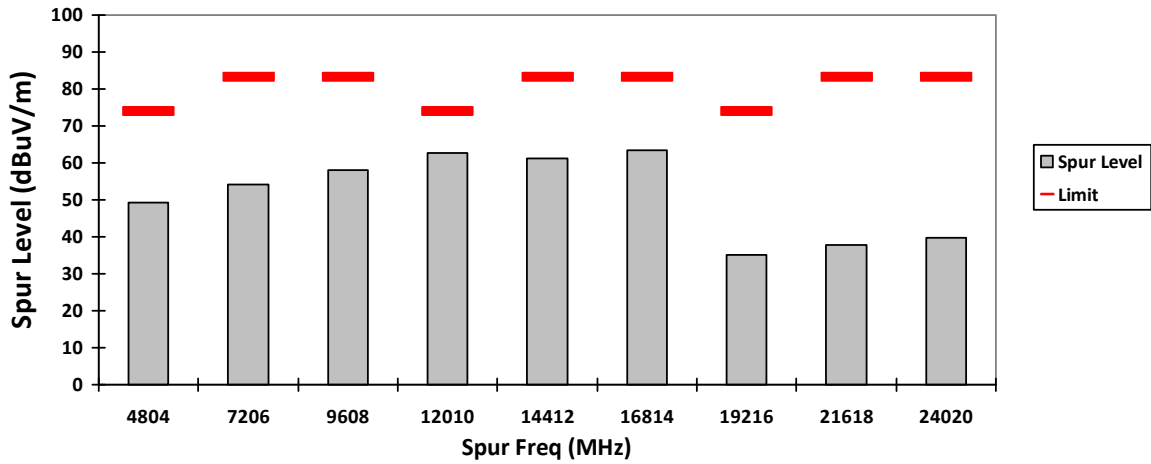
VERTICAL, QPK



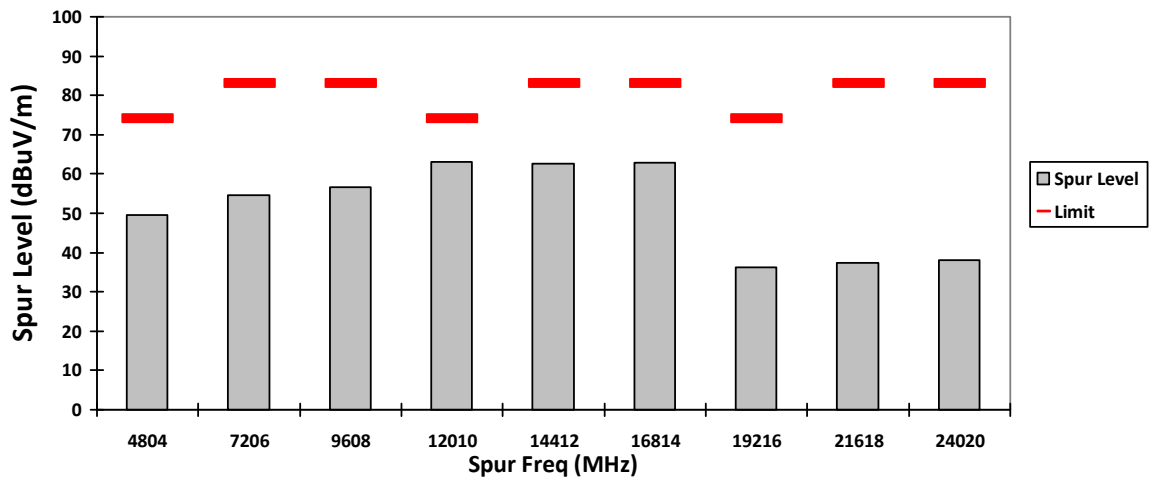
HORIZONTAL, QPK



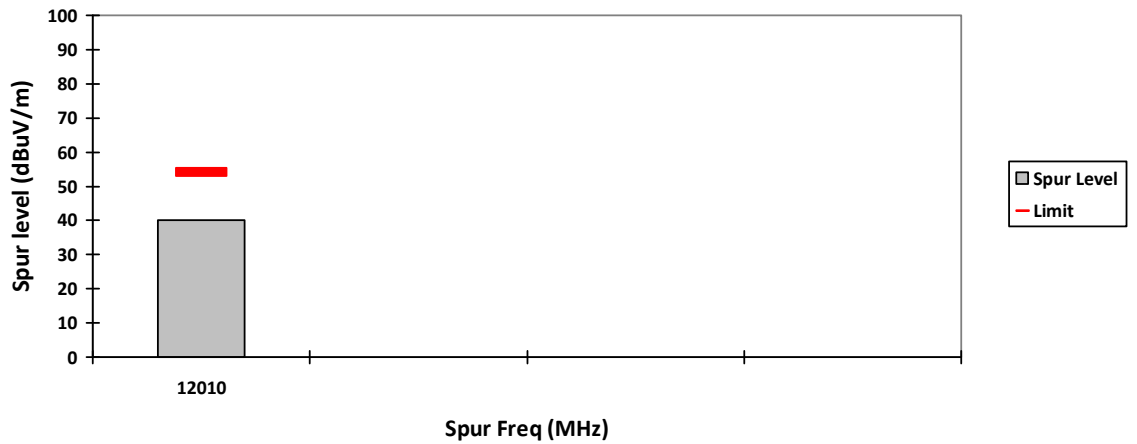
VERTICAL, PK



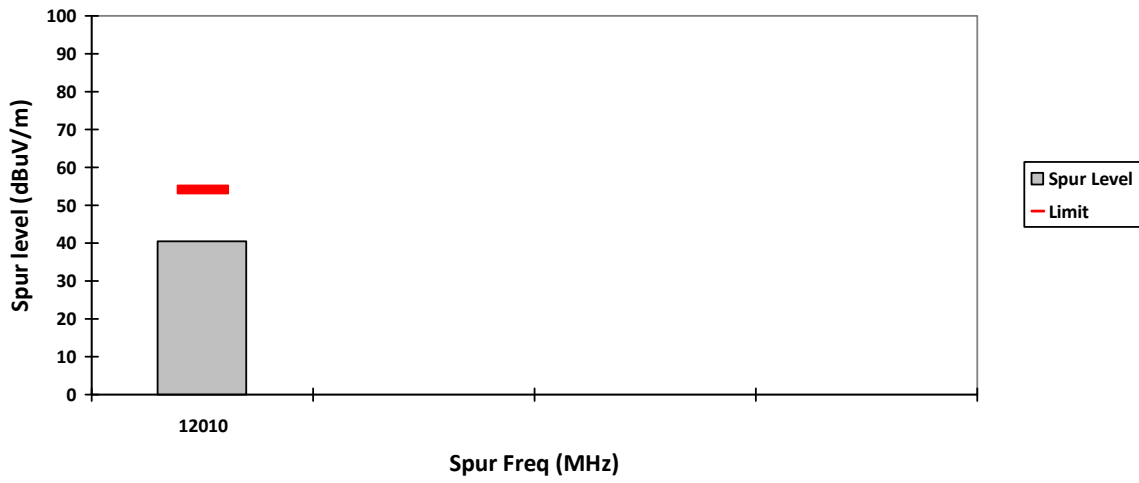
HORIZONTAL, PK



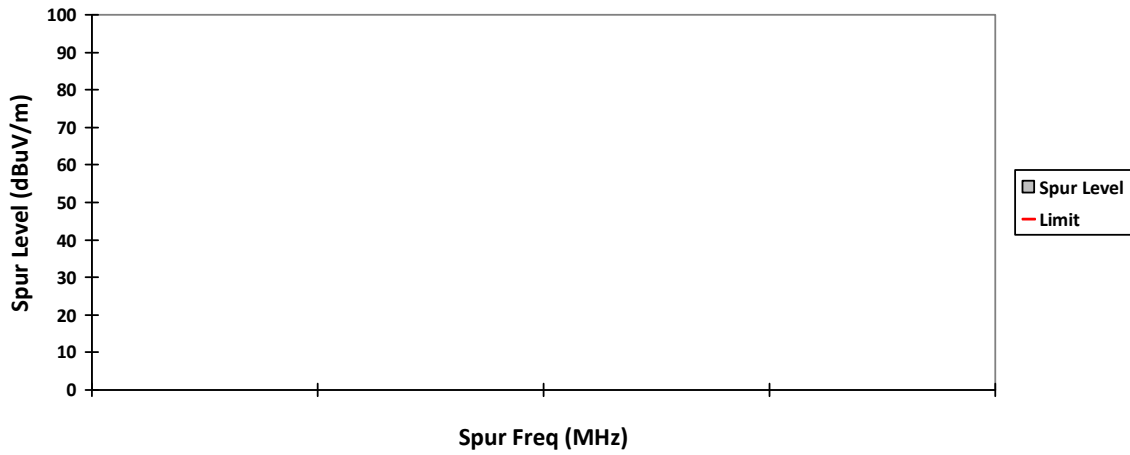
VERTICAL, AV



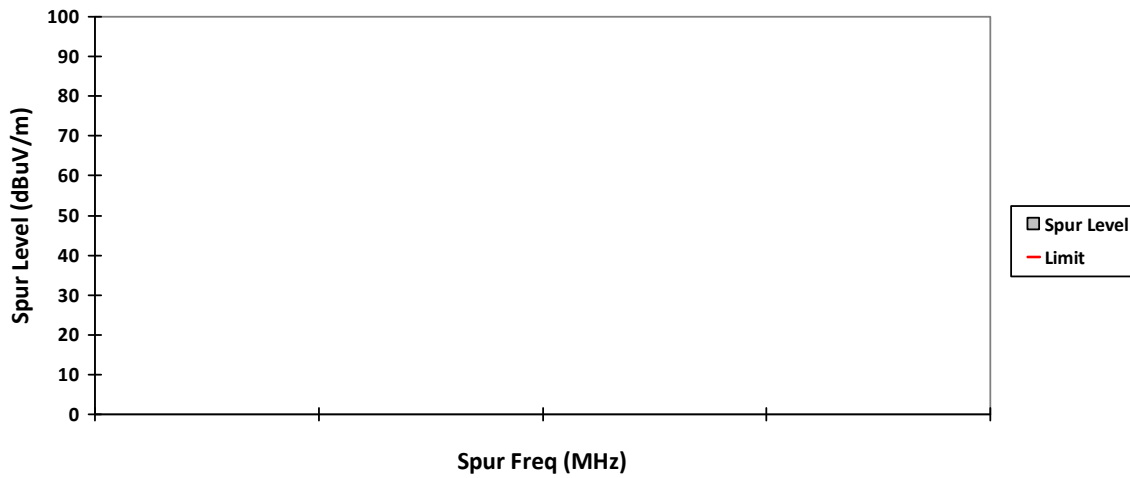
HORIZONTAL, AV



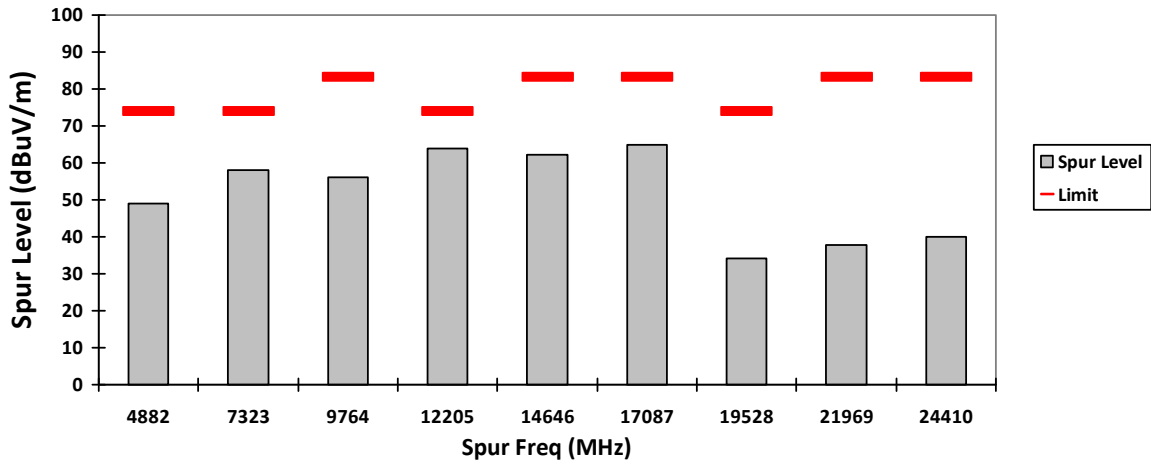
VERTICAL, QPK



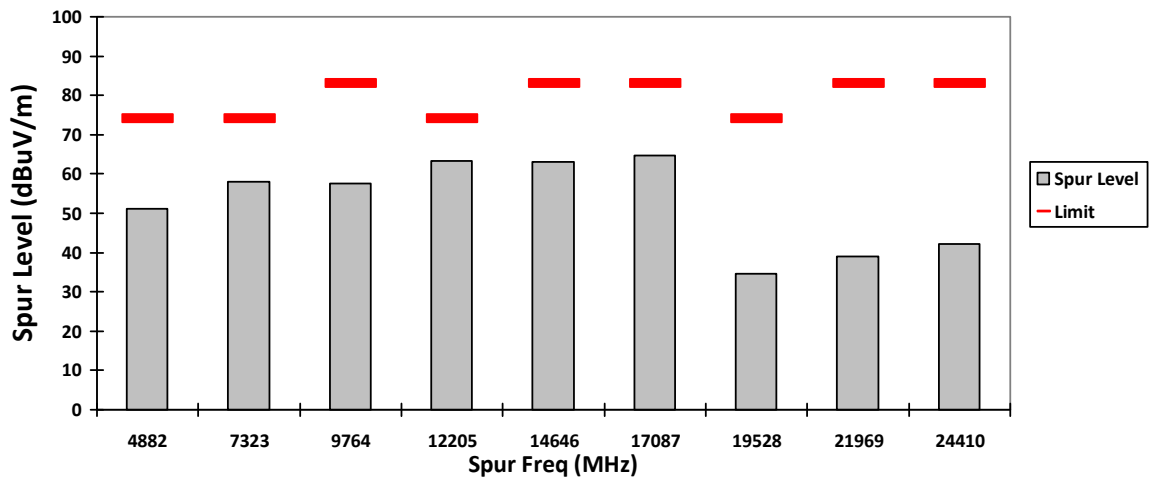
HORIZONTAL, QPK



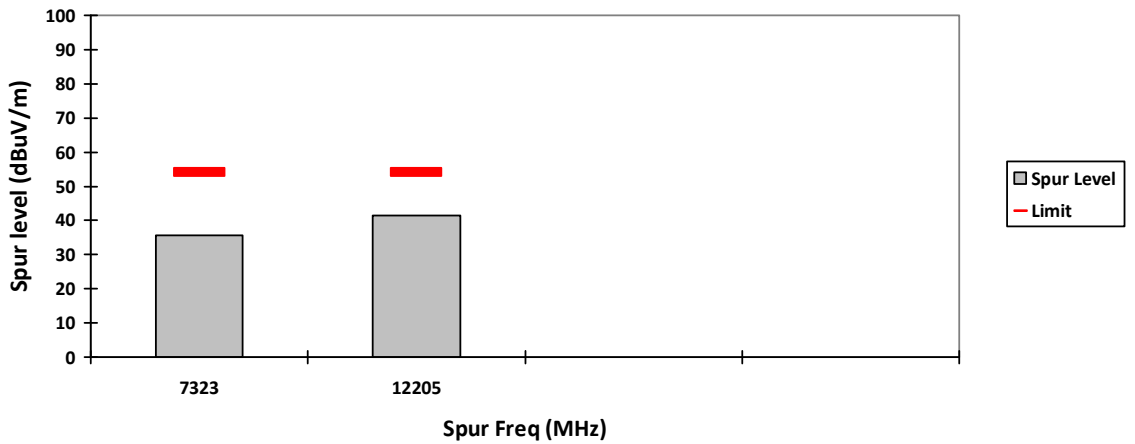
VERTICAL, PK



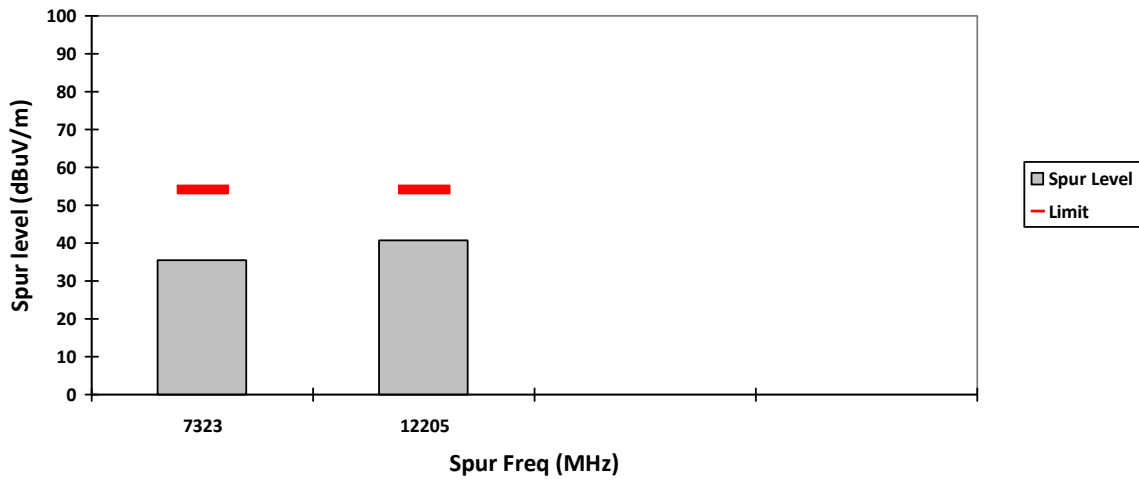
HORIZONTAL, PK



VERTICAL, AV



HORIZONTAL, AV



Test: Bluetooth SAC Transmitter Radiated Emission
Model#: H25UCF9PW6AN S/N: 657TYB0771 EMC SR ID#: 26860-EMC-00075
Battery: PMNN4813A Accessory: AN000411A01
Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013
Worst Case Plane: Z-Plane (DQPSK)

Radiated Emission (High Channel) tabular data

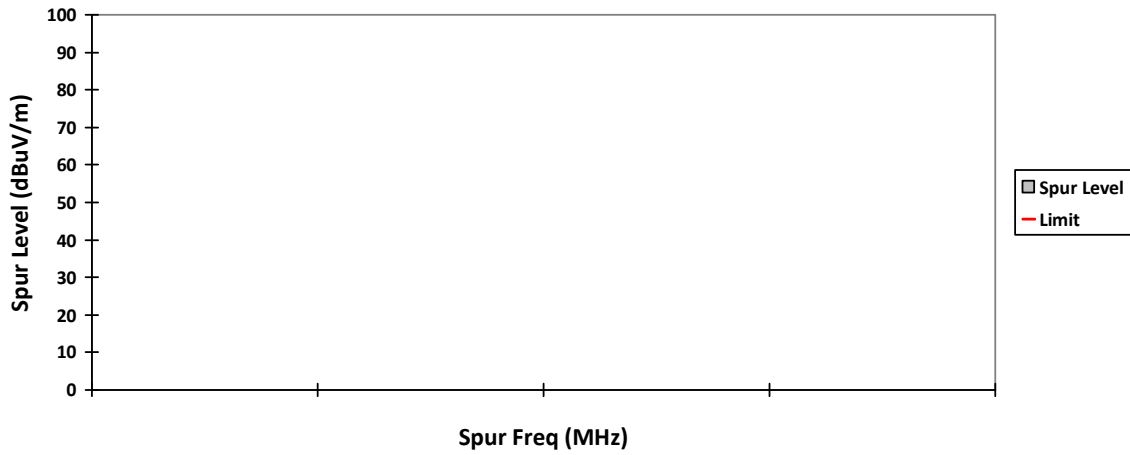
Vertical Radiated Emission Result										
Spur Freq (MHz)	Spur level QPK (dBµV/m)	Spur level PK (dBµV/m)	Spur level AV (dBµV/m)	Limit QPK (dBµV/m)	Limit PK (dBµV/m)	Limit AV (dBµV/m)	Margin QPK (dBµV/m)	Margin PK (dBµV/m)	Margin AV (dBµV/m)	Carrier PK Power (dBµV/m)
4960	-	50.1438**	-	-	74.0	-	-	23.8562	-	-
7440	-	57.0437**	34.5437**	-	74.0	54.0	-	16.9563	19.4563	-
9920	-	58.6854**	-	-	83.0546	-	-	24.3692	-	103.0546
12400	-	62.5630**	40.0630**	-	74.0	54.0	-	11.4370	13.9370	-
14880	-	61.7135**	-	-	83.0546	-	-	21.3411	-	103.0546
17360	-	65.2862**	-	-	83.0546	-	-	17.7684	-	103.0546
19840	-	34.2970**	-	-	74.0	-	-	39.7030	-	-
22320	-	37.4805**	-	-	74.0	-	-	36.5195	-	-
24800	-	40.9009**	-	-	83.0546	-	-	42.1537	-	103.0546
Horizontal 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)
4960	-	50.4136**	-	-	74.0	-	-	23.5864	-	-
7440	-	57.2784**	34.7784**	-	74.0	54.0	-	16.7216	19.2216	-
9920	-	57.6118**	-	-	83.0546	-	-	25.4428	-	103.0546
12400	-	63.0846**	40.5846**	-	74.0	54.0	-	10.9154	13.4154	-
14880	-	61.8704**	-	-	83.0546	-	-	21.1842	-	103.0546
17360	-	66.0479**	-	-	83.0546	-	-	17.0067	-	103.0546
19840	-	34.2991**	-	-	74.0	-	-	39.7009	-	-
22320	-	37.4417**	-	-	74.0	-	-	36.5583	-	-
24800	-	40.5457**	-	-	83.0546	-	-	42.5089	-	103.0546

Remarks: Pass Result	Marginal Result	Fail Result
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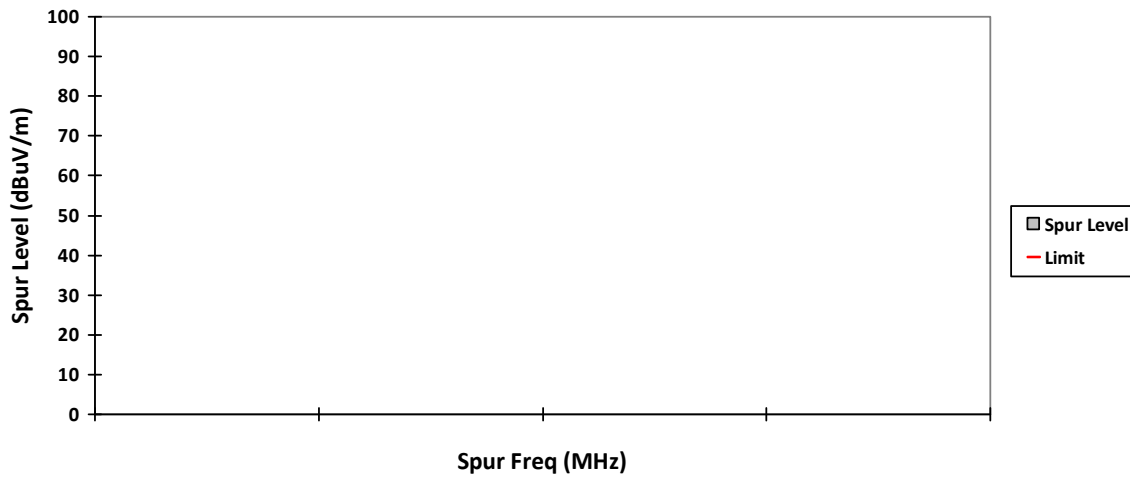
Temperature (degC): 23.6 Humidity (%): 69.3
Test Performed by: Nazrin&Azil Test Date: Thu, 10 Feb, 2022 System MU:
5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)

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.**

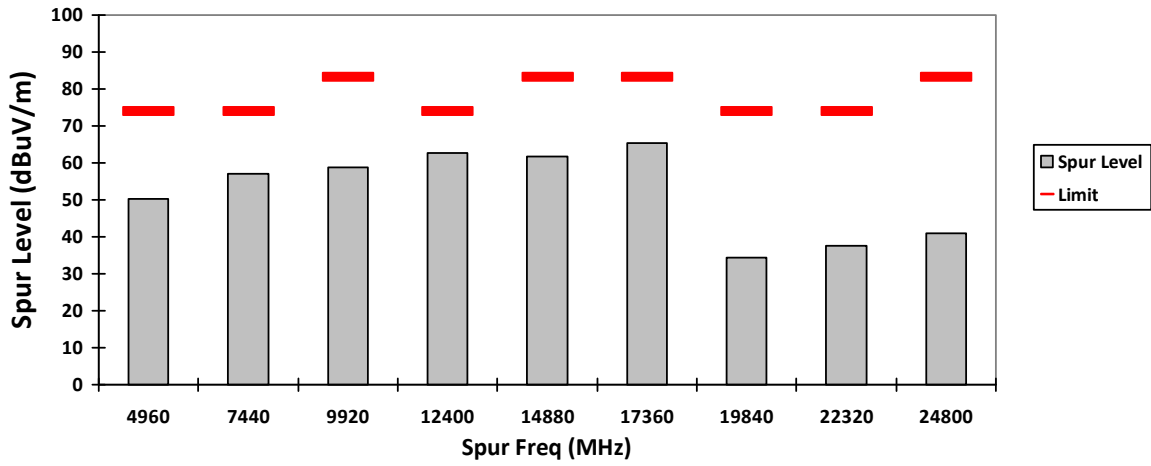
VERTICAL, QPK



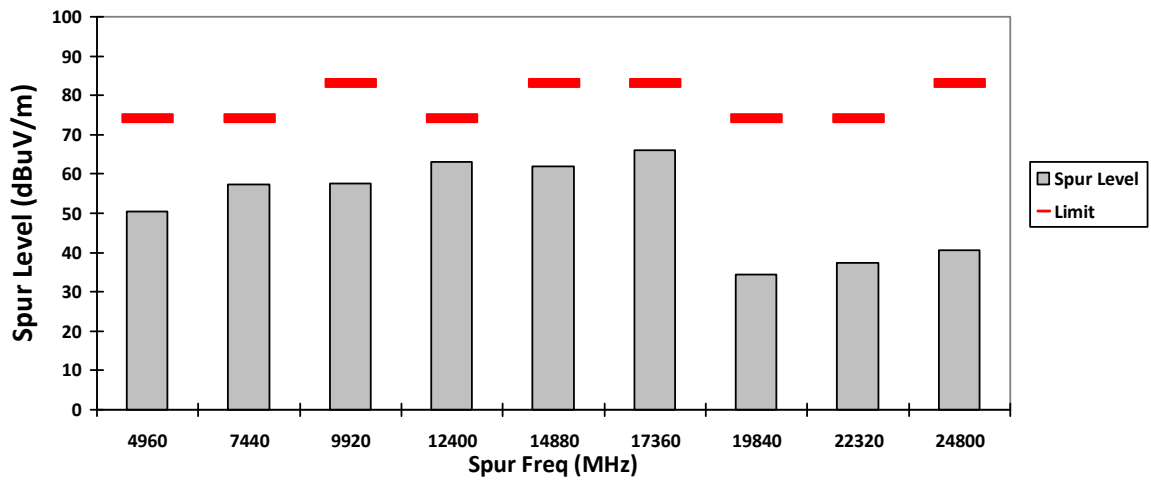
HORIZONTAL, QPK



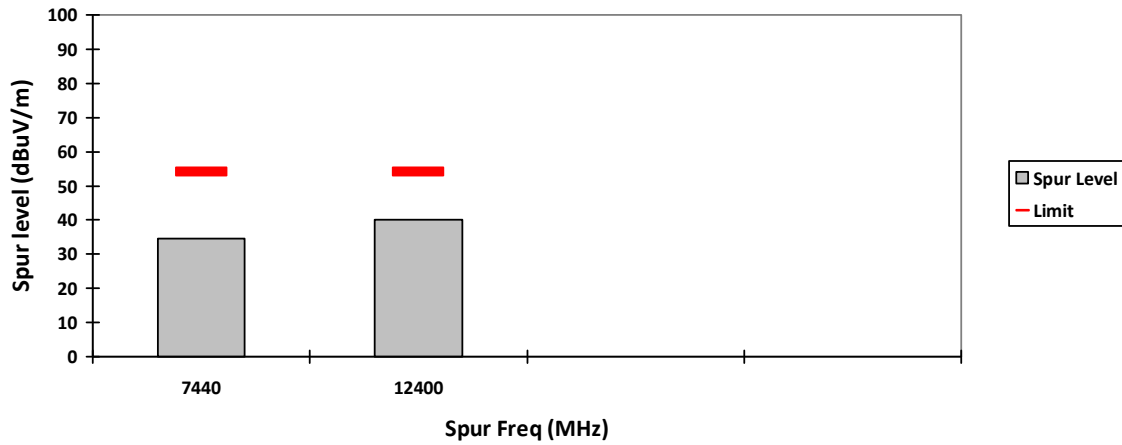
VERTICAL, PK



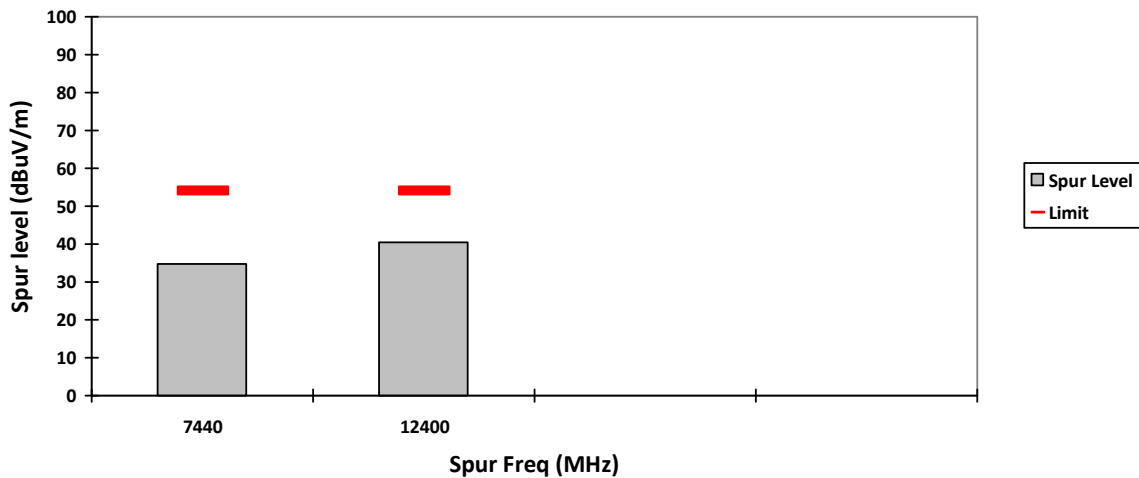
HORIZONTAL, PK



VERTICAL, AV



HORIZONTAL, AV



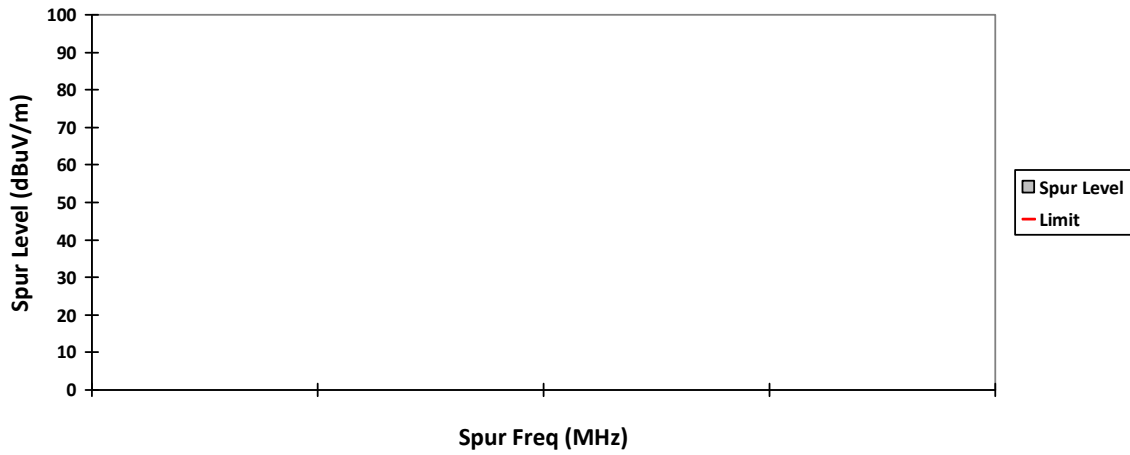
NOTE:

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

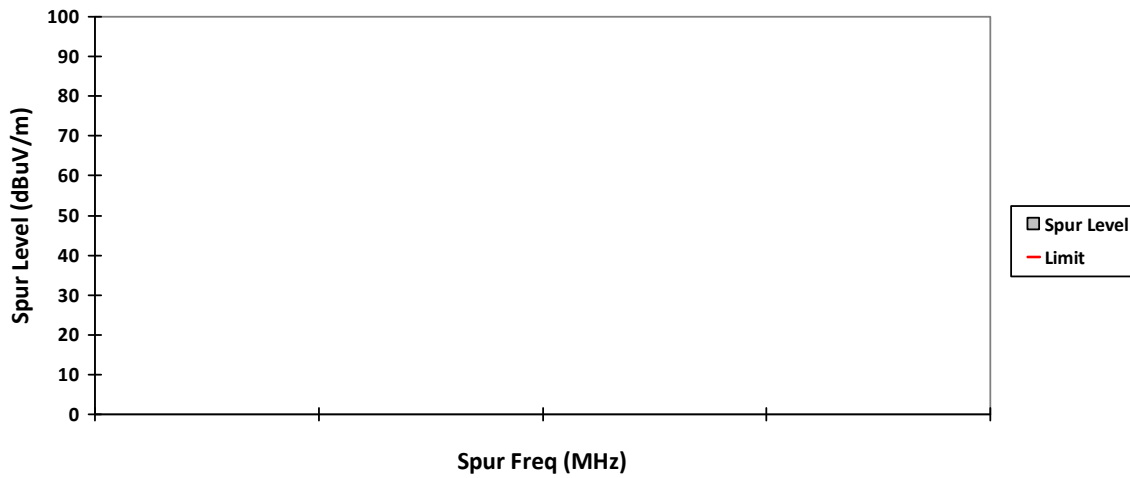
Based on the Bluetooth Specification Version 2.1+EDR, and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

- 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 = $20\log_{10}(7.5\text{ms} / 100\text{ms}) = -22.5 \text{ dB}$

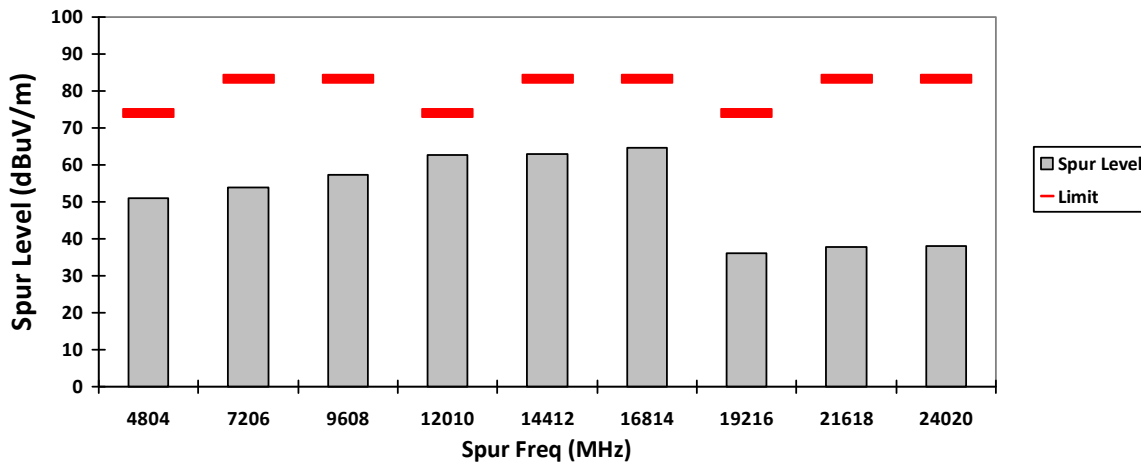
VERTICAL, QPK



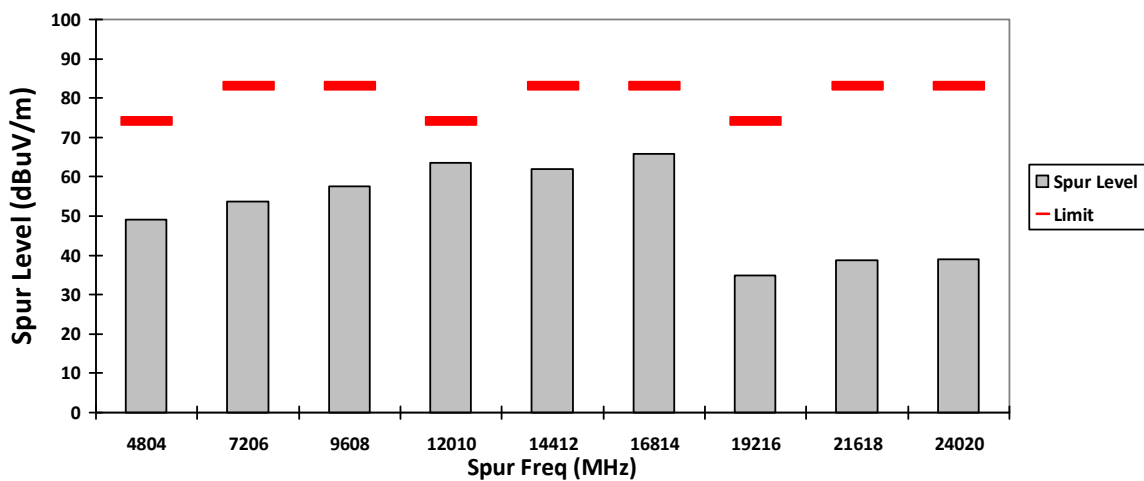
HORIZONTAL, QPK



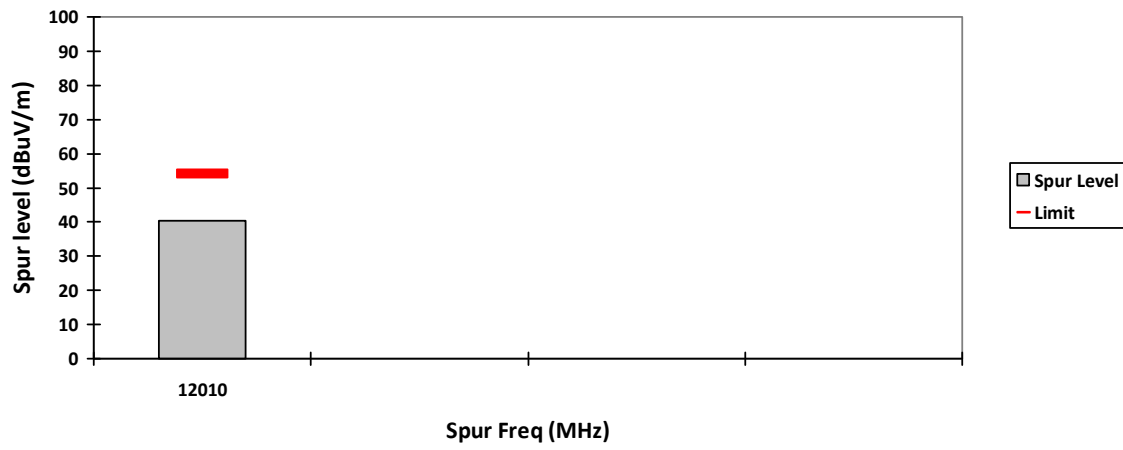
VERTICAL, PK



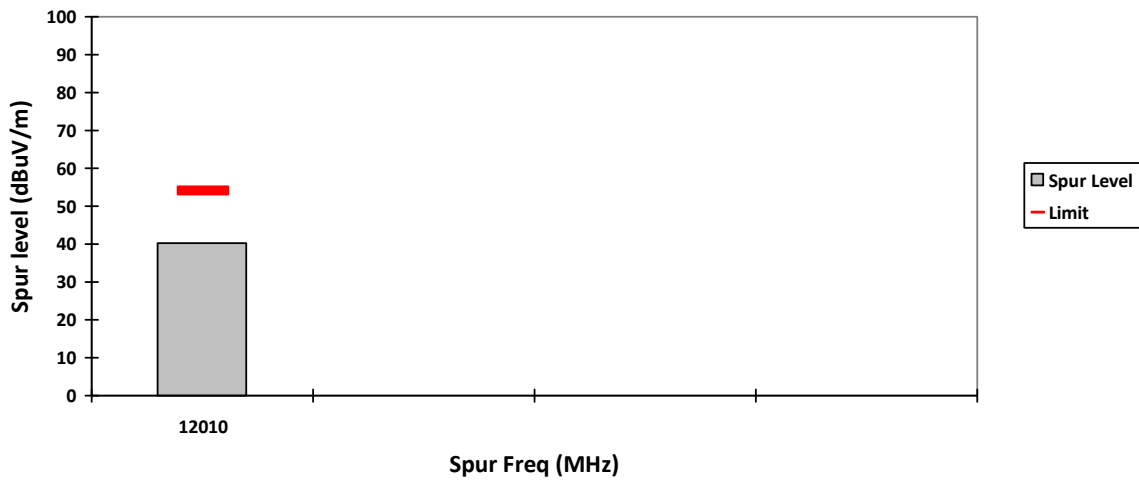
HORIZONTAL, PK



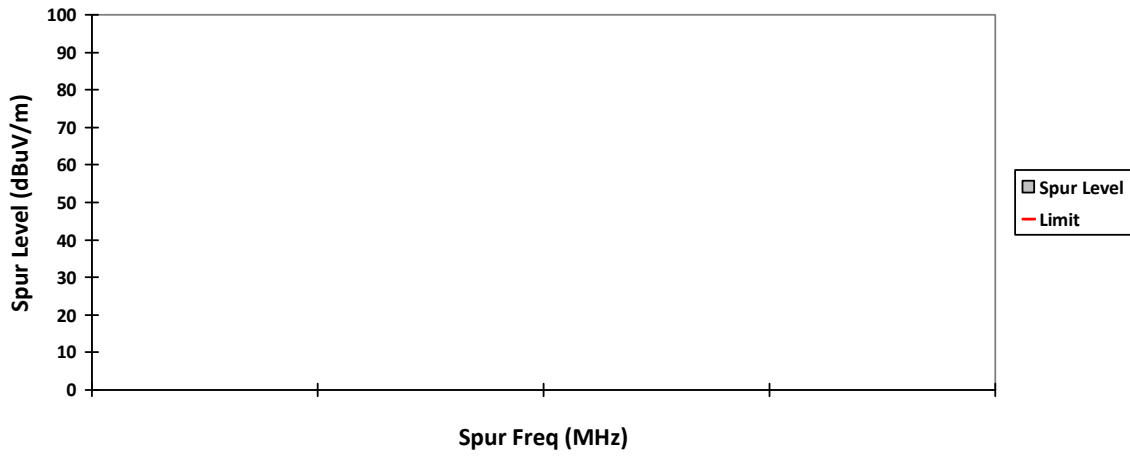
VERTICAL, AV



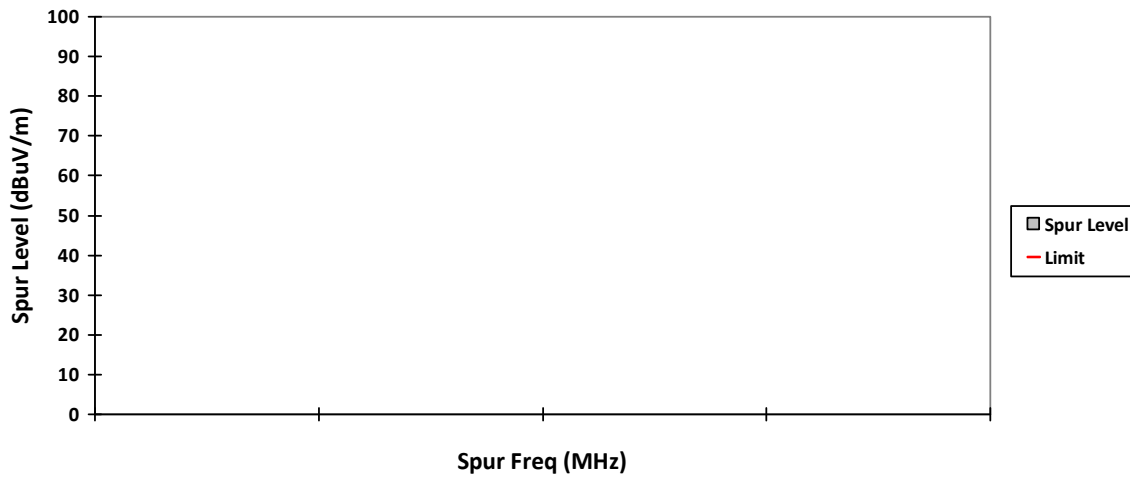
HORIZONTAL, AV



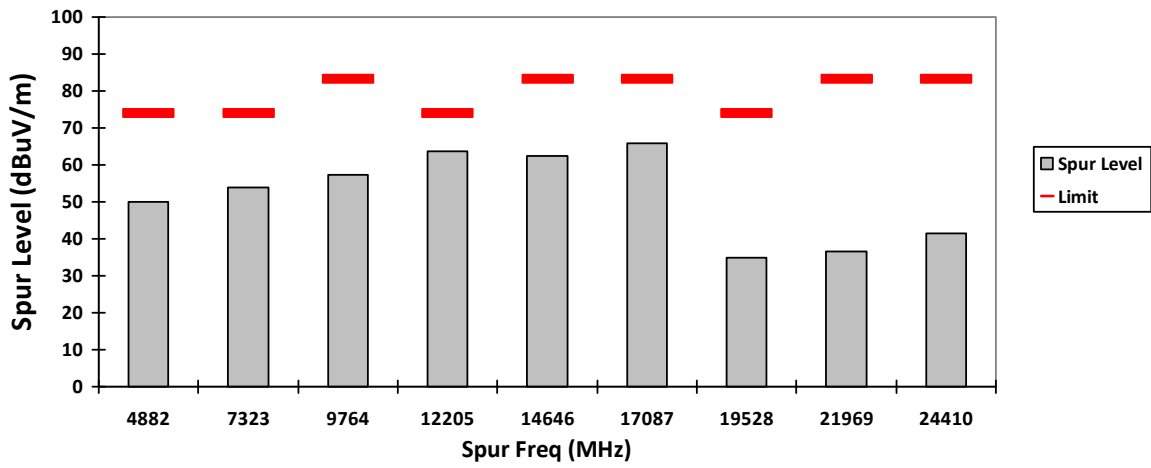
VERTICAL, QPK



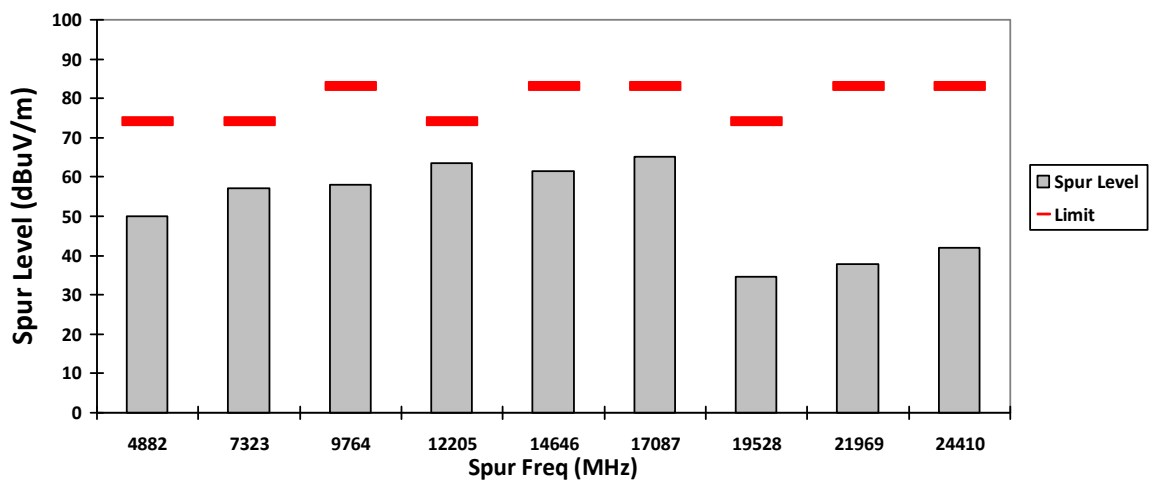
HORIZONTAL, QPK



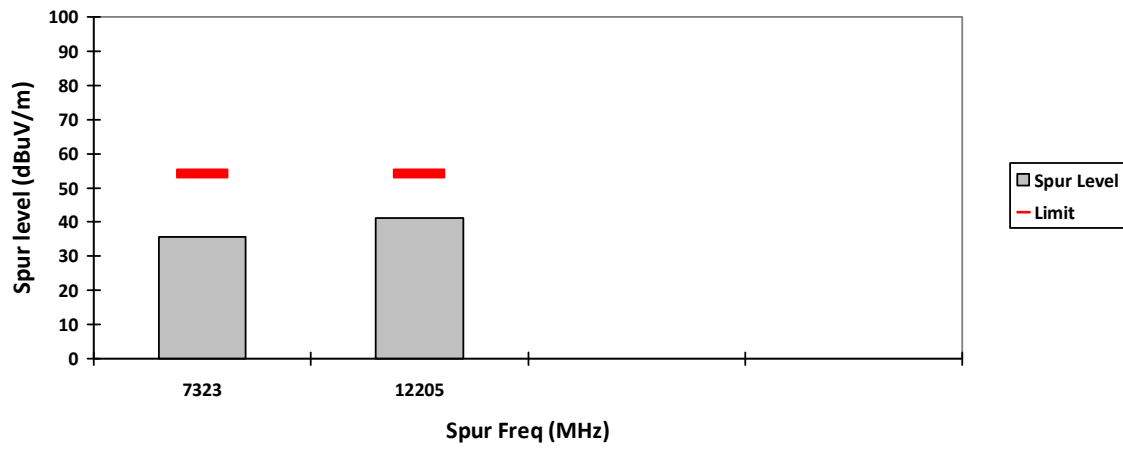
VERTICAL, PK



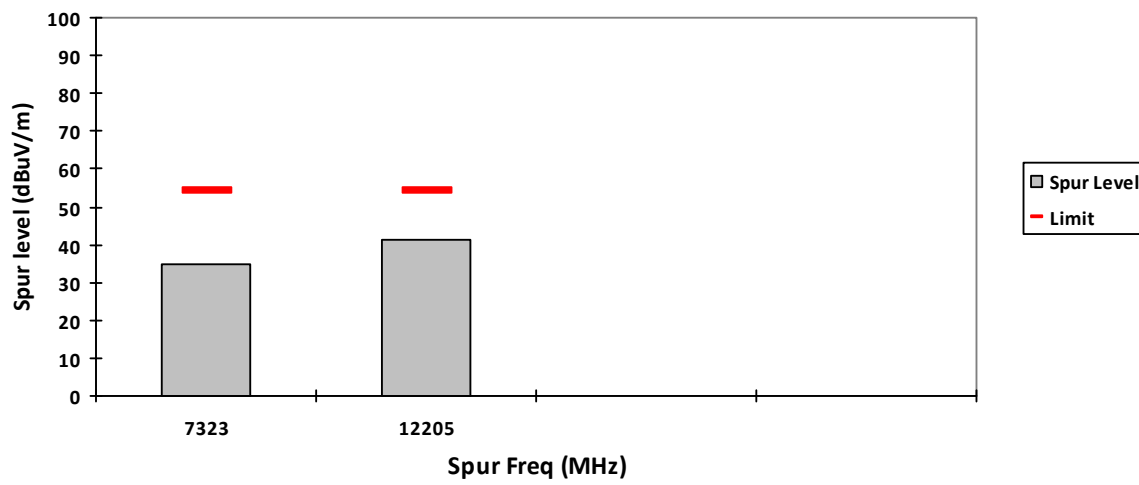
HORIZONTAL, PK



VERTICAL, AV



HORIZONTAL, AV



Test: Bluetooth SAC Transmitter Radiated Emission
Model#: H25UCF9PW6AN **S/N: 657TYB0771** **EMC SR ID#: 26860-EMC-00075**
Battery: PMNN4813A **Accessory: AN000411A01**
Test Channel: High **Test Frequency: 2480.0000 MHz** **Test Standard: ANSI C63.10-2013**
Worst Case Plane: Z-Plane (8DPSK)

Radiated Emission (High Channel) tabular data

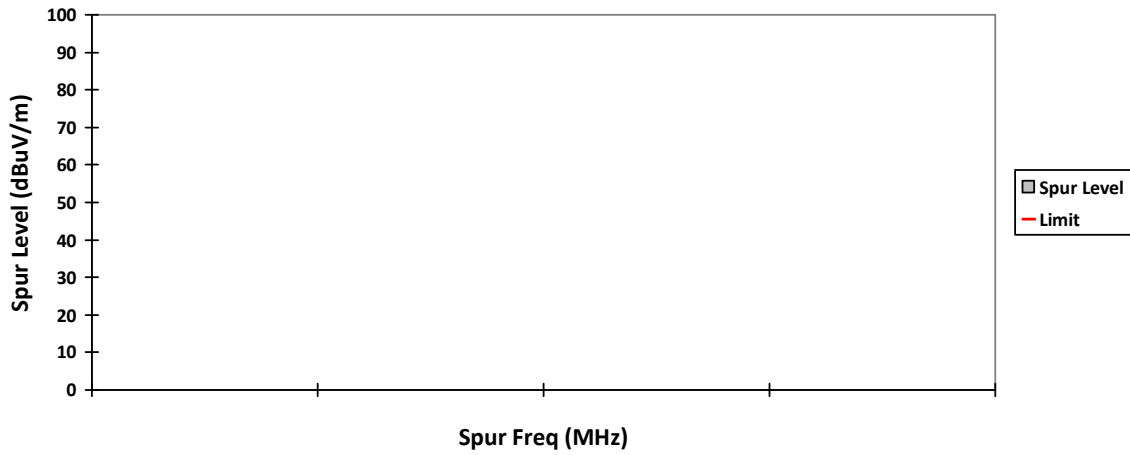
Vertical Radiated Emission Result										
Spur Freq (MHz)	Spur level QPK (dBμV/m)	Spur level PK (dBμV/m)	Spur level AV (dBμV/m)	Limit QPK (dBμV/m)	Limit PK (dBμV/m)	Limit AV (dBμV/m)	Margin QPK (dBμV/m)	Margin PK (dBμV/m)	Margin AV (dBμV/m)	Carrier PK Power (dBμV/m)
4960	-	49.6403**	-	-	74.0	-	-	24.3597	-	-
7440	-	57.6808**	35.1808**	-	74.0	54.0	-	16.3192	18.8192	-
9920	-	57.0833**	-	-	83.0546	-	-	25.9713	-	103.0546
12400	-	63.1864**	40.6864**	-	74.0	54.0	-	10.8136	13.3136	-
14880	-	62.2965**	-	-	83.0546	-	-	20.7581	-	103.0546
17360	-	64.5708**	-	-	83.0546	-	-	18.4838	-	103.0546
19840	-	35.9233**	-	-	74.0	-	-	38.0767	-	-
22320	-	36.1139**	-	-	74.0	-	-	37.8861	-	-
24800	-	42.3461**	-	-	83.0546	-	-	40.7085	-	103.0546
Horizontal 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)
4960	-	49.0051**	-	-	74.0	-	-	24.9949	-	-
7440	-	57.8372**	35.3372**	-	74.0	54.0	-	16.1628	18.6628	-
9920	-	56.8084**	-	-	83.0546	-	-	26.2462	-	103.0546
12400	-	63.3803**	40.8803**	-	74.0	54.0	-	10.6197	13.1197	-
14880	-	61.8970**	-	-	83.0546	-	-	21.1576	-	103.0546
17360	-	64.5713**	-	-	83.0546	-	-	18.4833	-	103.0546
19840	-	35.7574**	-	-	74.0	-	-	38.2426	-	-
22320	-	37.0473**	-	-	74.0	-	-	36.9527	-	-
24800	-	41.3098**	-	-	83.0546	-	-	41.7448	-	103.0546

Remarks: Pass Result	Marginal Result	Fail Result
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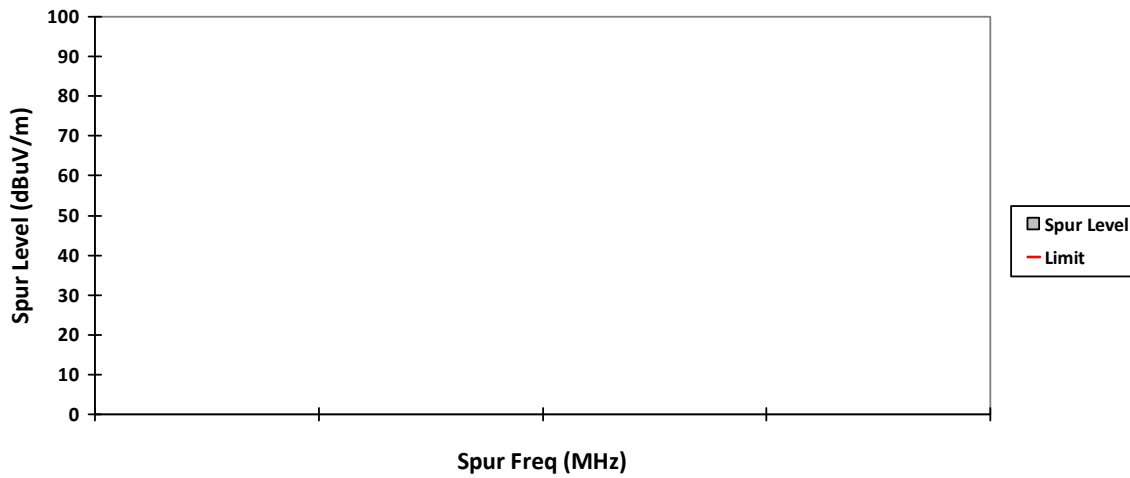
Temperature (degC): 23.6 **Humidity (%): 69.3**
Test Performed by: Nazrin&Azil **Test Date: Thu, 10 Feb, 2022**
System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)

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.**

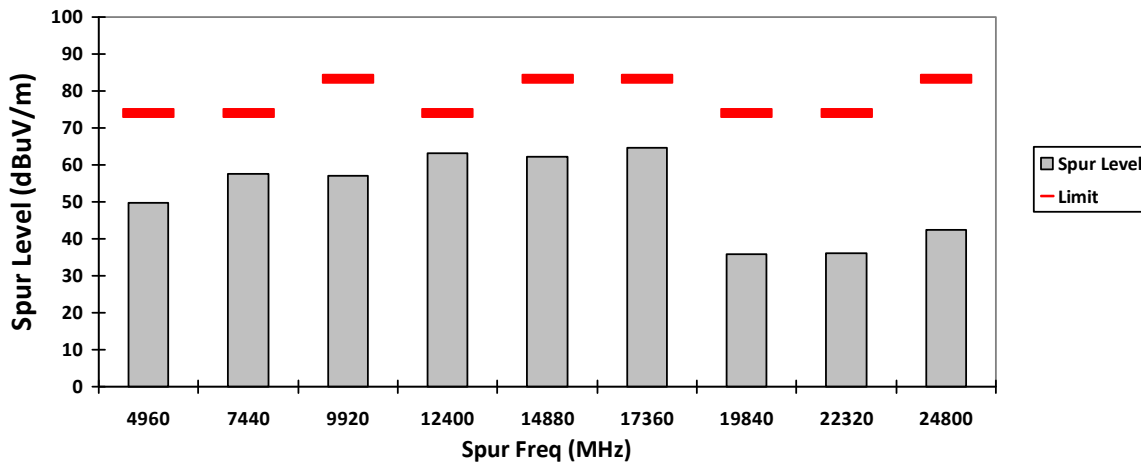
VERTICAL, QPK



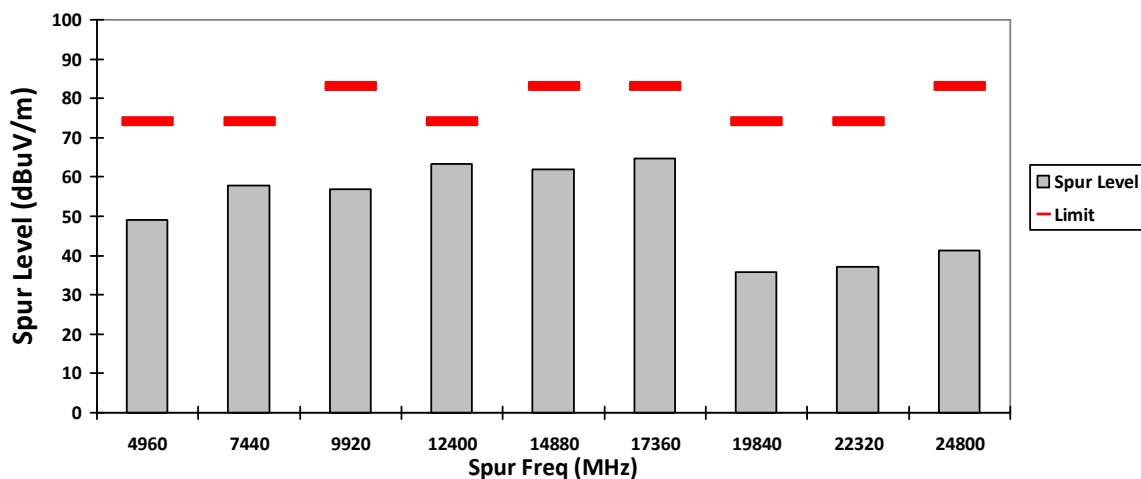
HORIZONTAL, QPK



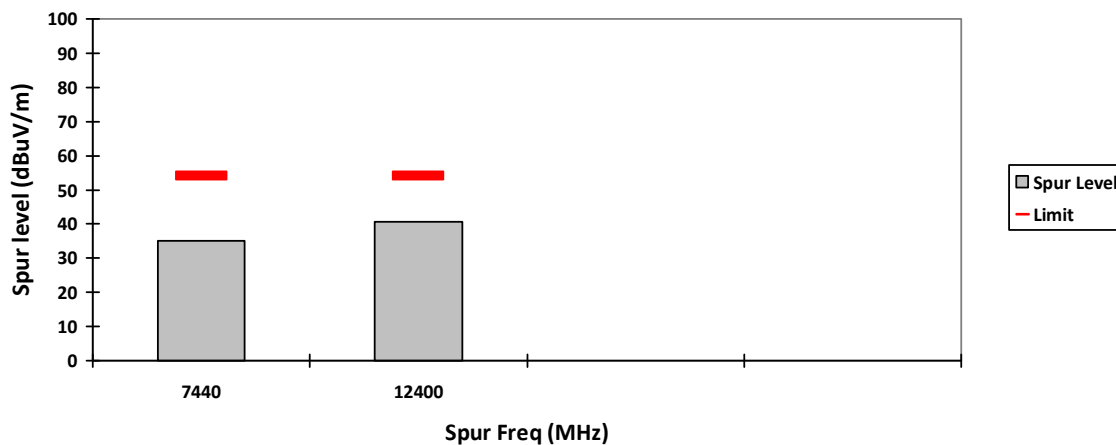
VERTICAL, PK



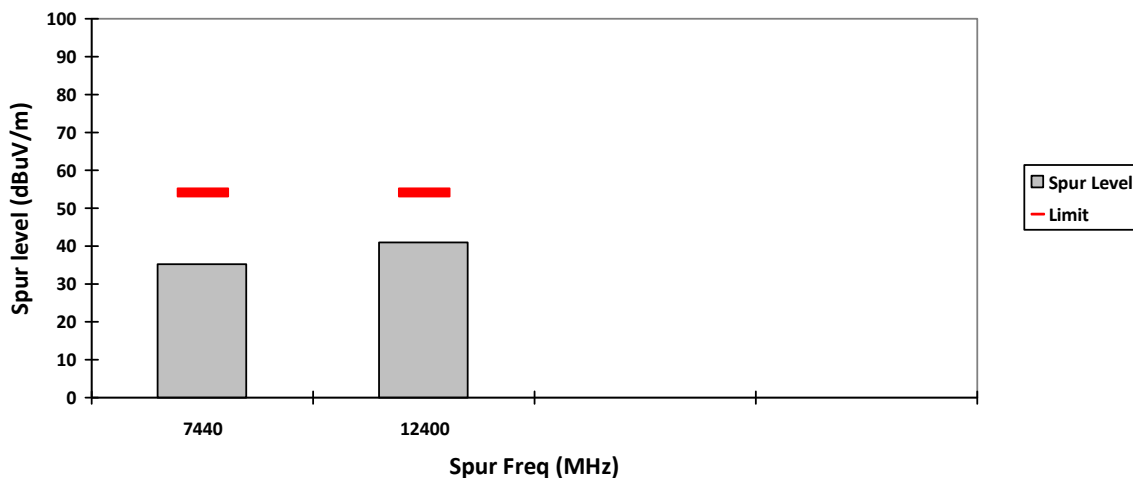
HORIZONTAL, PK



VERTICAL, AV



HORIZONTAL, AV



NOTE:

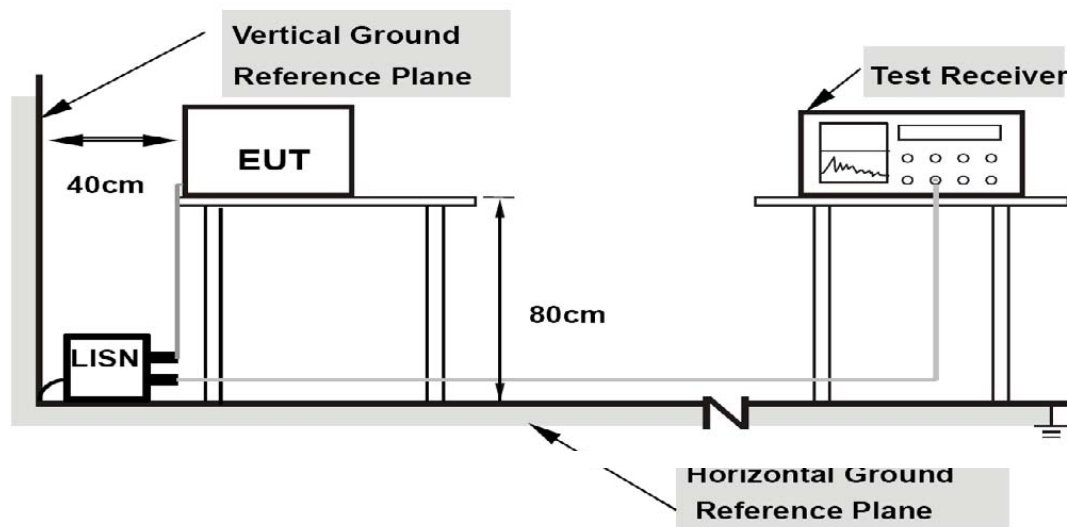
Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b,c)

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 = $20\log_{10}(7.5\text{ms} / 100\text{ms}) = -22.5 \text{ dB}$

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

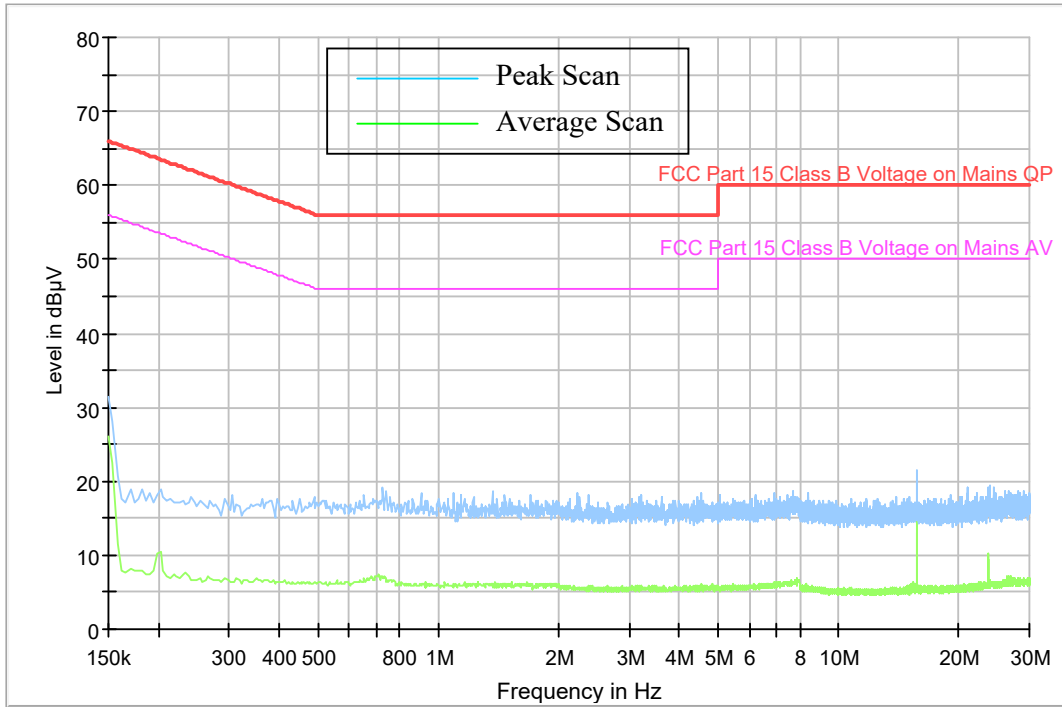
Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies.		
NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

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

6.9.3. Test Result

1) Ambient

Full Spectrum

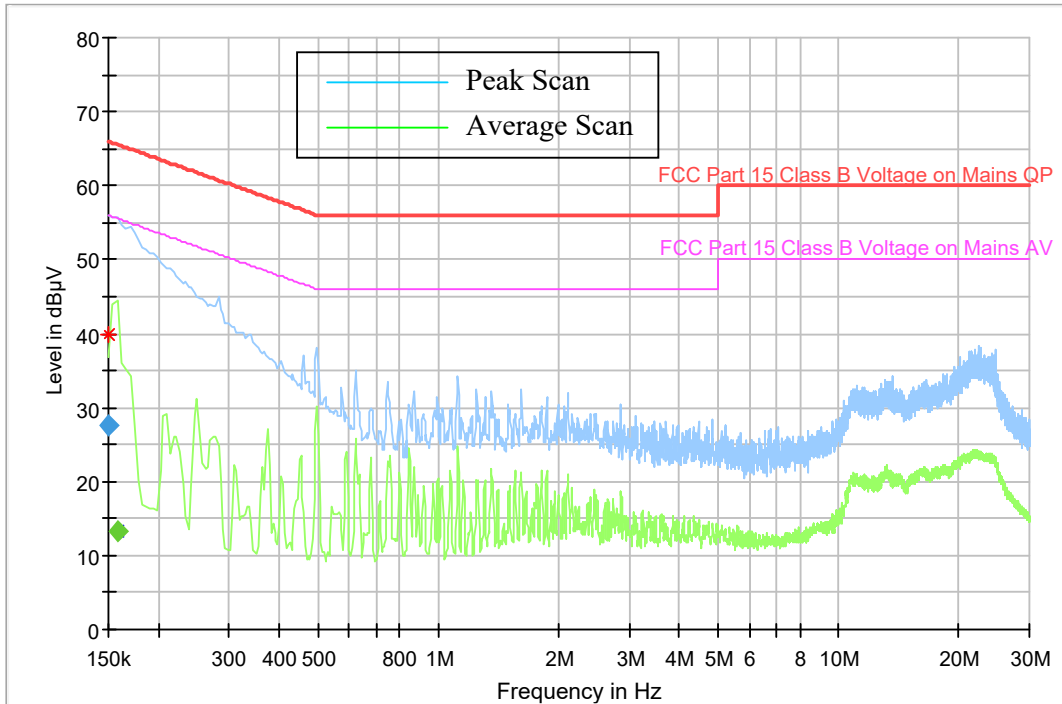


120VAC , 60Hz

MUC

1) Charger + Radio in BT Tx (8DPSK)

Full Spectrum



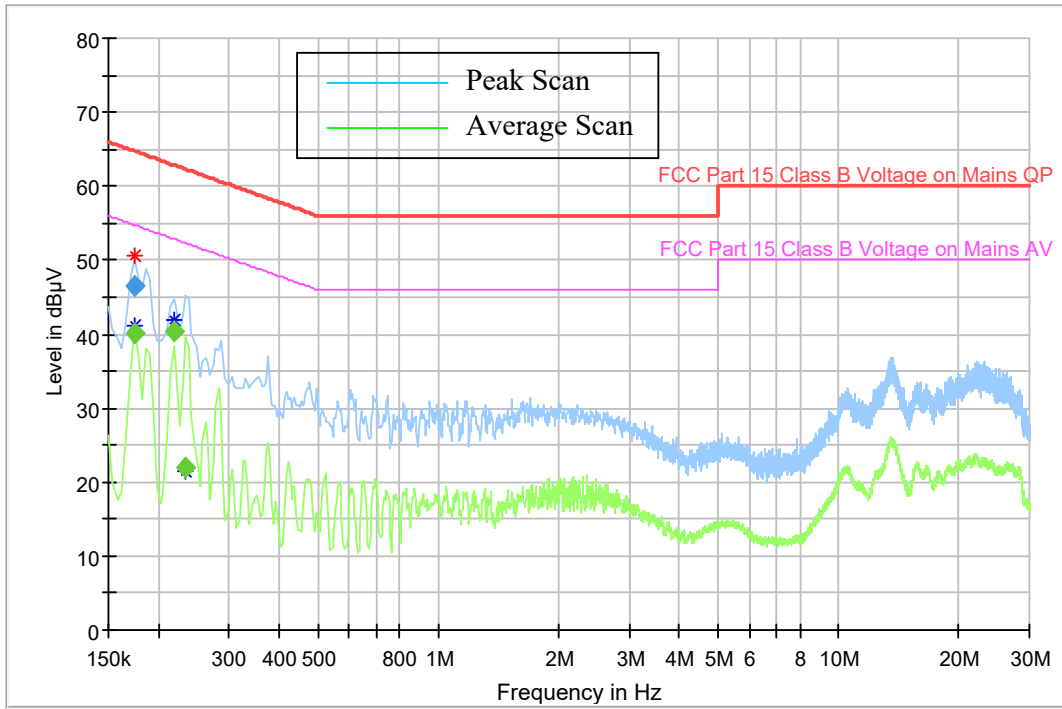
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.150000	27.70	---	66.00	38.30	1000.0	9.000	L1	ON	10.4	PASSS
0.158000	---	13.20	55.57	42.37	1000.0	9.000	N	ON	10.6	PASS

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

2) Charger + Radio in BT Tx (GFSK)

Full Spectrum



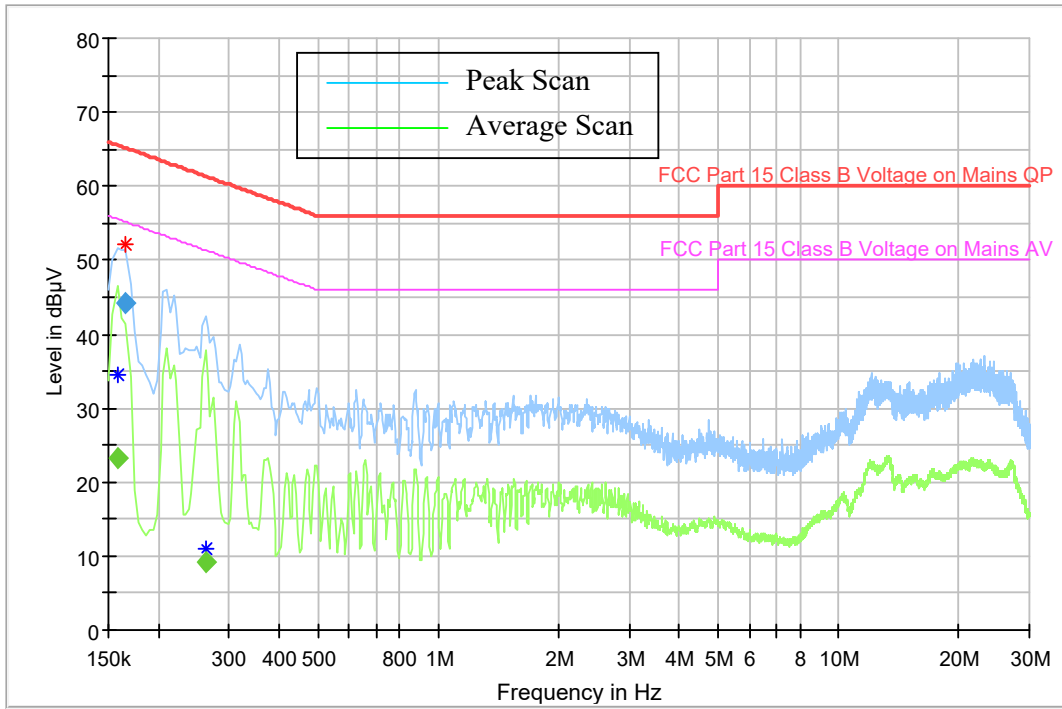
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.174000	---	40.01	54.77	14.76	1000.0	9.000	N	ON	10.7	PASS
0.174000	46.50	---	64.77	18.26	1000.0	9.000	N	ON	10.7	PASS
0.218000	---	40.51	52.90	12.38	1000.0	9.000	N	ON	10.4	PASS
0.234000	---	21.93	52.31	30.37	1000.0	9.000	N	ON	10.3	PASS

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

3) Charger + Radio in BT Tx (DQPSK)

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
0.158000	---	23.34	55.57	32.23	1000.0	9.000	L1	ON	10.6	PASS
0.166000	44.15	---	65.16	21.01	1000.0	9.000	N	ON	10.7	PASS
0.262000	---	9.17	51.37	42.20	1000.0	9.000	N	ON	10.3	PASS

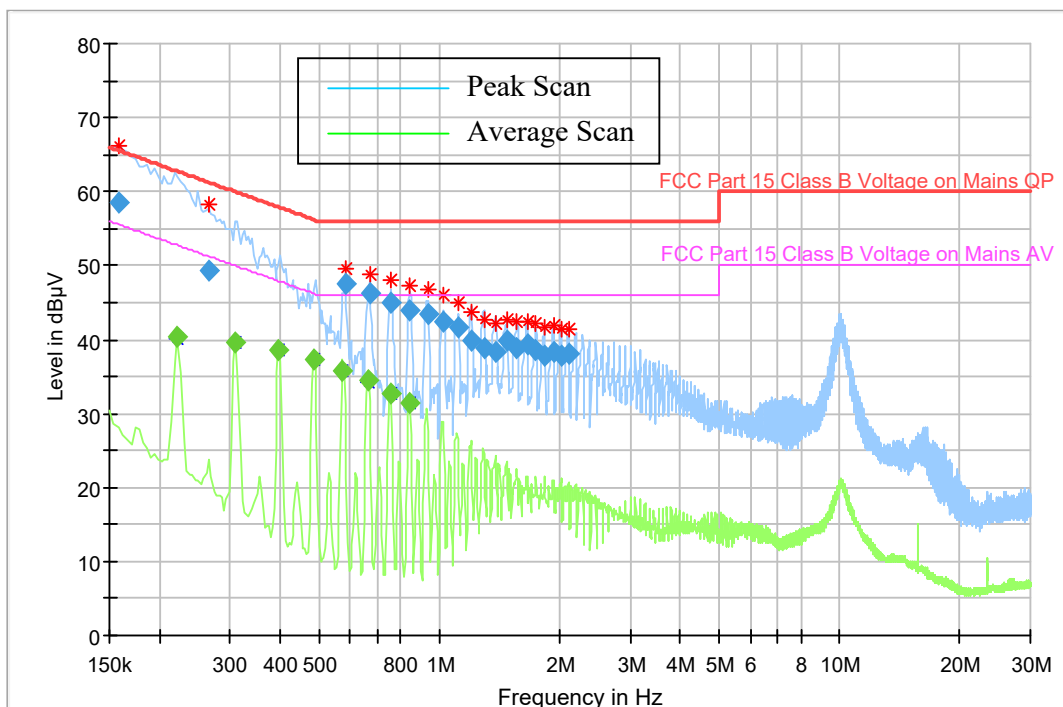
* Expanded Uncertainty (U) = +/- 3.48dB

120VAC, 60Hz

SUC

4) Charger + Radio in BT Tx (8DPSK)

Full Spectrum



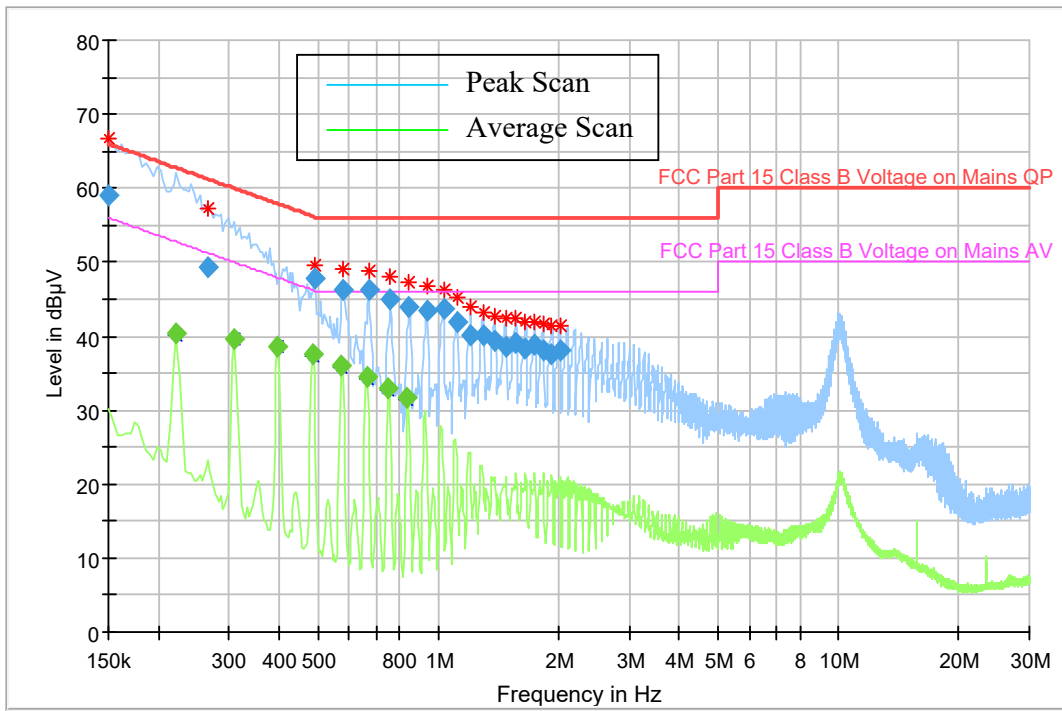
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.158000	58.49	---	65.57	7.08	1000.0	9.000	L1	ON	10.6	PASS
0.222000	---	40.41	52.74	12.33	1000.0	9.000	N	ON	10.4	PASS
0.266000	49.27	---	61.24	11.97	1000.0	9.000	N	ON	10.3	PASS
0.310000	---	39.74	49.97	10.23	1000.0	9.000	N	ON	10.4	PASS
0.398000	---	38.62	47.90	9.27	1000.0	9.000	N	ON	10.4	PASS
0.486000	---	37.44	46.24	8.80	1000.0	9.000	N	ON	10.5	PASS
0.574000	---	35.91	46.00	10.09	1000.0	9.000	N	ON	10.5	PASS
0.582000	47.55	---	56.00	8.45	1000.0	9.000	N	ON	10.5	PASS
0.662000	---	34.40	46.00	11.60	1000.0	9.000	N	ON	10.4	PASS
0.670000	46.16	---	56.00	9.84	1000.0	9.000	N	ON	10.4	PASS
0.754000	---	32.80	46.00	13.20	1000.0	9.000	N	ON	10.4	PASS
0.758000	44.98	---	56.00	11.02	1000.0	9.000	N	ON	10.4	PASS
0.842000	---	31.54	46.00	14.46	1000.0	9.000	N	ON	10.3	PASS
0.846000	44.07	---	56.00	11.93	1000.0	9.000	N	ON	10.3	PASS
0.938000	43.47	---	56.00	12.53	1000.0	9.000	N	ON	10.3	PASS
1.026000	42.36	---	56.00	13.64	1000.0	9.000	N	ON	10.3	PASS
1.118000	41.59	---	56.00	14.41	1000.0	9.000	N	ON	10.3	PASS
1.202000	39.88	---	56.00	16.12	1000.0	9.000	N	ON	10.3	PASS
1.294000	38.94	---	56.00	17.06	1000.0	9.000	L1	ON	10.3	PASS
1.382000	38.45	---	56.00	17.55	1000.0	9.000	L1	ON	10.3	PASS
1.478000	39.76	---	56.00	16.24	1000.0	9.000	L1	ON	10.3	PASS
1.566000	38.79	---	56.00	17.21	1000.0	9.000	L1	ON	10.3	PASS
1.658000	39.47	---	56.00	16.53	1000.0	9.000	L1	ON	10.3	PASS
1.746000	38.50	---	56.00	17.50	1000.0	9.000	L1	ON	10.3	PASS
1.834000	37.84	---	56.00	18.16	1000.0	9.000	L1	ON	10.3	PASS
1.926000	38.35	---	56.00	17.65	1000.0	9.000	L1	ON	10.3	PASS
2.014000	37.74	---	56.00	18.26	1000.0	9.000	L1	ON	10.2	PASS
2.106000	38.19	---	56.00	17.81	1000.0	9.000	L1	ON	10.2	PASS

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

5) Charger + Radio in BT Tx (GFSK)

Full Spectrum



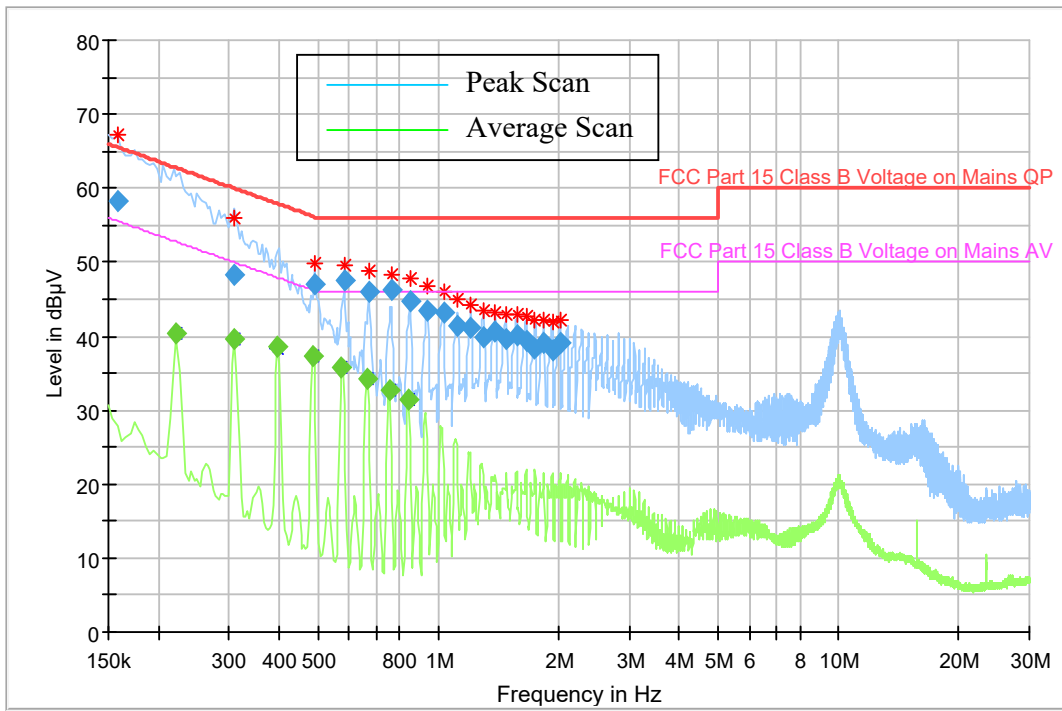
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.150000	58.98	---	66.00	7.02	1000.0	9.000	N	ON	10.4	PASS
0.222000	---	40.34	52.74	12.41	1000.0	9.000	N	ON	10.4	PASS
0.266000	49.30	---	61.24	11.94	1000.0	9.000	L1	ON	10.3	PASS
0.310000	---	39.73	49.97	10.24	1000.0	9.000	N	ON	10.4	PASS
0.398000	---	38.66	47.90	9.23	1000.0	9.000	N	ON	10.4	PASS
0.486000	---	37.47	46.24	8.76	1000.0	9.000	N	ON	10.5	PASS
0.494000	47.87	---	56.10	8.23	1000.0	9.000	N	ON	10.5	PASS
0.574000	---	35.96	46.00	10.04	1000.0	9.000	N	ON	10.5	PASS
0.578000	46.23	---	56.00	9.77	1000.0	9.000	N	ON	10.5	PASS
0.662000	---	34.44	46.00	11.56	1000.0	9.000	N	ON	10.4	PASS
0.670000	46.31	---	56.00	9.69	1000.0	9.000	N	ON	10.4	PASS
0.750000	---	32.95	46.00	13.05	1000.0	9.000	N	ON	10.4	PASS
0.758000	45.00	---	56.00	11.00	1000.0	9.000	N	ON	10.4	PASS
0.838000	---	31.63	46.00	14.37	1000.0	9.000	N	ON	10.3	PASS
0.846000	44.09	---	56.00	11.91	1000.0	9.000	N	ON	10.3	PASS
0.938000	43.54	---	56.00	12.46	1000.0	9.000	N	ON	10.3	PASS
1.030000	43.79	---	56.00	12.21	1000.0	9.000	N	ON	10.3	PASS
1.118000	41.88	---	56.00	14.12	1000.0	9.000	N	ON	10.3	PASS
1.206000	40.24	---	56.00	15.76	1000.0	9.000	N	ON	10.3	PASS
1.298000	40.21	---	56.00	15.79	1000.0	9.000	L1	ON	10.3	PASS
1.386000	39.30	---	56.00	16.70	1000.0	9.000	L1	ON	10.3	PASS
1.474000	38.65	---	56.00	17.35	1000.0	9.000	L1	ON	10.3	PASS
1.566000	39.05	---	56.00	16.95	1000.0	9.000	L1	ON	10.3	PASS
1.654000	38.24	---	56.00	17.76	1000.0	9.000	L1	ON	10.3	PASS
1.746000	38.86	---	56.00	17.14	1000.0	9.000	L1	ON	10.3	PASS
1.834000	37.96	---	56.00	18.04	1000.0	9.000	L1	ON	10.3	PASS
1.922000	37.51	---	56.00	18.49	1000.0	9.000	L1	ON	10.3	PASS
2.014000	37.97	---	56.00	18.03	1000.0	9.000	L1	ON	10.2	PASS

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

6) Charger + Radio in BT Tx (DQPSK)

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
0.158000	58.37	---	65.57	7.20	1000.0	9.000	L1	ON	10.6	PASS
0.222000	---	40.40	52.74	12.34	1000.0	9.000	N	ON	10.4	PASS
0.310000	---	39.71	49.97	10.26	1000.0	9.000	N	ON	10.4	PASS
0.310000	48.31	---	59.97	11.66	1000.0	9.000	N	ON	10.4	PASS
0.398000	---	38.50	47.90	9.39	1000.0	9.000	N	ON	10.4	PASS
0.486000	---	37.31	46.24	8.92	1000.0	9.000	N	ON	10.5	PASS
0.490000	47.09	---	56.17	9.08	1000.0	9.000	N	ON	10.5	PASS
0.574000	---	35.78	46.00	10.22	1000.0	9.000	N	ON	10.5	PASS
0.582000	47.52	---	56.00	8.48	1000.0	9.000	N	ON	10.5	PASS
0.662000	---	34.28	46.00	11.72	1000.0	9.000	N	ON	10.4	PASS
0.670000	46.03	---	56.00	9.97	1000.0	9.000	N	ON	10.4	PASS
0.754000	---	32.72	46.00	13.28	1000.0	9.000	N	ON	10.4	PASS
0.762000	46.26	---	56.00	9.74	1000.0	9.000	N	ON	10.4	PASS
0.842000	---	31.49	46.00	14.51	1000.0	9.000	N	ON	10.3	PASS
0.850000	44.68	---	56.00	11.32	1000.0	9.000	N	ON	10.3	PASS
0.938000	43.35	---	56.00	12.65	1000.0	9.000	N	ON	10.3	PASS
1.030000	43.13	---	56.00	12.87	1000.0	9.000	N	ON	10.3	PASS
1.118000	41.37	---	56.00	14.63	1000.0	9.000	N	ON	10.3	PASS
1.210000	41.23	---	56.00	14.77	1000.0	9.000	N	ON	10.3	PASS
1.298000	39.89	---	56.00	16.11	1000.0	9.000	L1	ON	10.3	PASS
1.390000	40.59	---	56.00	15.41	1000.0	9.000	L1	ON	10.3	PASS
1.478000	39.62	---	56.00	16.38	1000.0	9.000	L1	ON	10.3	PASS
1.570000	40.21	---	56.00	15.79	1000.0	9.000	L1	ON	10.3	PASS
1.658000	39.24	---	56.00	16.76	1000.0	9.000	L1	ON	10.3	PASS
1.746000	38.41	---	56.00	17.59	1000.0	9.000	L1	ON	10.3	PASS
1.838000	39.08	---	56.00	16.92	1000.0	9.000	L1	ON	10.3	PASS
1.926000	38.18	---	56.00	17.82	1000.0	9.000	L1	ON	10.3	PASS
2.018000	39.11	---	56.00	16.89	1000.0	9.000	L1	ON	10.2	PASS

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

END OF TEST REPORT