FCC Test Report

Product Name	Humly Room Display One
Model No.	HUM1001
FCC ID.	2APYB-HUM1001

Applicant	Certus Eiger Ltd.
Address	814, Houston Center, Mody Road, TST East Kowloon, Hong Kong

Date of Receipt	Oct. 08, 2019
Issued Date	Nov. 13, 2019
Report No.	19A0116R-RFUSP01V00
Report Version	V1.0

Testing Laboratory
3023

The test results relate only to the samples tested.
The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
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The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.

Test Report

Issued Date: Nov. 13, 2019
Report No.: 19A0116R-RFUSP01V00

Product Name	Humly Room Display One
Applicant	Certus Eiger Ltd.
Address	814, Houston Center, Mody Road, TST East Kowloon, Hong Kong
Manufacturer	Certus Eiger Ltd.
Model No.	HUM1001
FCC ID.	2APYB-HUM1001
EUT Rated Voltage	AC 100-240V, 50/60Hz
EUT Test Voltage	AC 110 V / 50 Hz
Trade Name	Humly
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Rita Huang

(Senior Adm. Specialist / Rita Huang)

Tested By : Yun Che Chen

(Engineer / Yunche Chen)

Approved By :

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Humly Room Display One
Trade Name	Humly
Model No.	HUM1001
FCC ID.	2APYB-HUM1001
Frequency Range	2402-2480MHz
Channel Number	79
Type of Modulation	FHSS: GFSK(1Mbps) /π/4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna Type	PIFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ANJIE	AJDQ1J-B0027 (Main), AJDQ1J-W0020 (Aux)	PIFA Antenna	2.17dBi for 2.4GHz

Note: The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz	Channel 76:	2478 MHz
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz	Channel 77:	2479 MHz
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz	Channel 78:	2480 MHz
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		

Note:

1. The EUT is a Humly Room Display One with built-in WLAN (802.11a/b/g/n/ac) and Bluetooth (5.0 and V3.0+HS, V2.1+EDR) transceiver, this report for Bluetooth (V3.0+HS, V2.1+EDR).
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report
5. Bluetooth operation was evaluated at both 1Mb/s and 3Mb/s data rates. 2Mb/s data rate was found, through pre-testing, to produce emissions similar to those for 3Mb/s.
6. The consider Co-Location based on KDB 996369 D02 Question 1 and KDB 996369 D04 for Radiated Spurious Emission.

Test Mode	Mode 1: Transmit - 1Mbps (GFSK) Mode 2: Transmit - 3Mbps (8DPSK) Mode 3: Transmit - 1Mbps (GFSK)+NFC Mode 4: Transmit - 3Mbps (8DPSK)+NFC

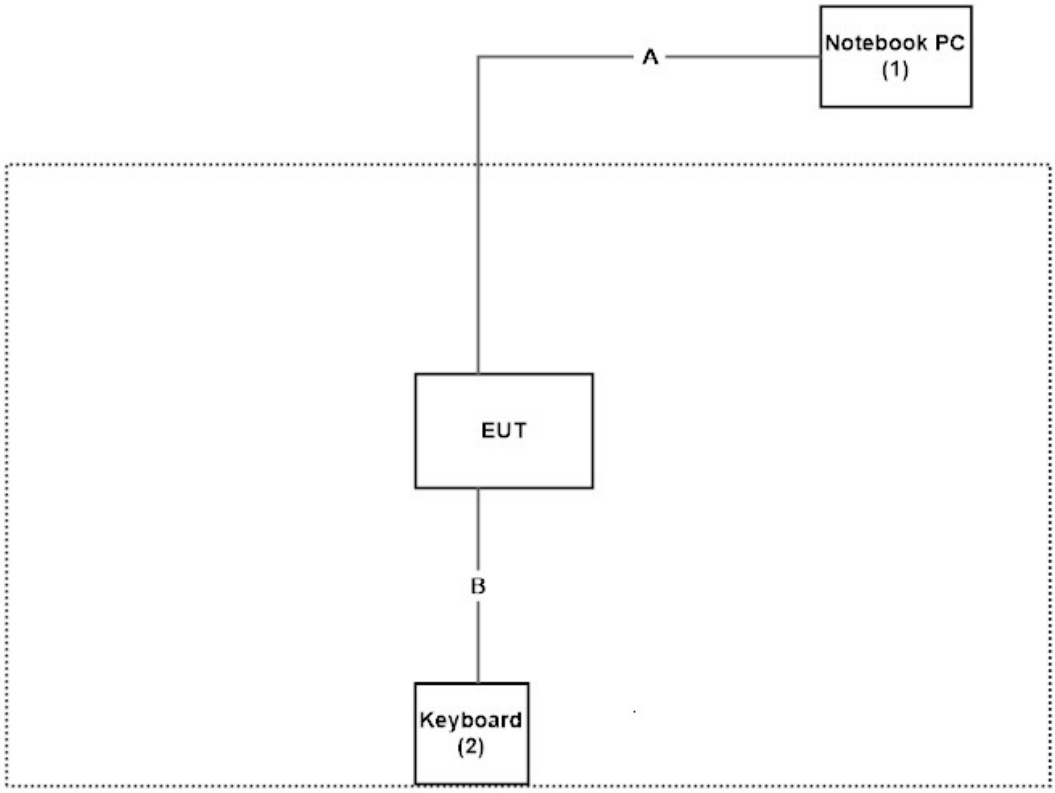
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	Latitude E5440	B6TYTZ1	Non-Shielded, 0.8m
2	Keyboard	Dell	SK-8175	MY-0W217F-71619-092-0497-A01	N/A

Signal Cable Type		Signal cable Description
A	LAN Cable	Non-Shielded, 2.0m
B	Keyboard Cable	Shielded, 1.8m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software “Cmd” on the EUT.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

USA : FCC Registration Number: TW3023

Canada : IC Registration Number: 4075A

Site Description: Accredited by TAF
Accredited Number: 3023

Test Laboratory: DEKRA Testing and Certification Co., Ltd
Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
Phone number: 886-2-8601-3788
Fax number: 886-2-8601-3789
Email address: info.tw@dekra.com
Website: http://www.dekra.com.tw

1.7. List of Test Equipment

Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2019/02/26	2020/02/25
X	Spectrum Analyzer	Agilent	N9010A	MY53470892	2019/09/25	2020/09/24
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2019/07/30	2020/07/29
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2019/07/30	2020/07/29
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2019/07/30	2020/07/29
X	EMI Test Receiver	R&S	ESCS 30	100369	2018/11/19	2019/11/18
X	LISN	R&S	ENV216	101105	2019/04/10	2020/04/09
X	LISN	R&S	ESH3-Z5	836679/014	2019/04/10	2020/04/09
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2019/06/20	2020/06/19

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version :DEKRA Conduction Test SystemV9.0.5.

For Radiated measurements /Site3/CB8

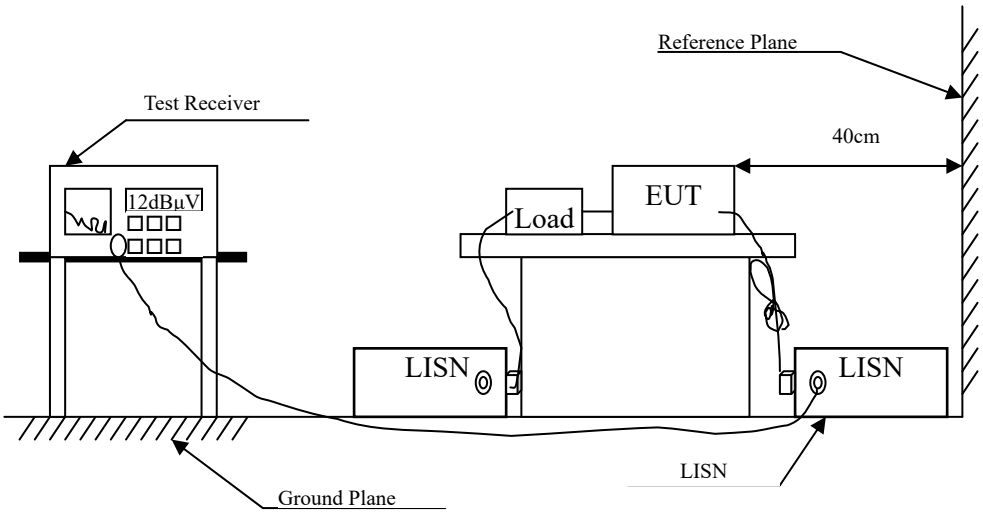
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/11	2020/03/10
X	Loop Antenna	Teseq	HLA6121	37133	2019/10/15	2021/10/14
X	Bilog Antenna	Schaffner Chase	CBL6112B	2794	2019/06/23	2020/06/22
X	Coaxial Cable	DEKRA	L1907-001C	280280.F141.1000D	2019/07/10	2020/07/09
X	Amplifier	EMCI	EMC001330	980254	2019/08/22	2020/08/21
X	Horn Antenna	ETS-LINDGREN	3117	00228113	2019/05/02	2020/05/01
X	Coaxial Cable	DEKRA	L1907-002C	280280.F141.1000D	2019/07/10	2020/07/09
X	Amplifier	EMCI	EMC05820SE	980362	2019/06/26	2020/06/25
X	Amplifier	EMCI	EMC051845SE	SN980632	2019/08/08	2020/08/07
	Horn Antenna	Com-Power	AH-1840	101101	2019/10/31	2020/10/30
	Amplifier + Cable	EMCI	EMC184045SE	980369	2019/04/16	2020/04/15
	Bilog Antenna	Schaffner Chase	CBL6112B	2916	2019/06/23	2020/06/22
	Coaxial Cable	DEKRA	L1907-003C	00100A1B3A120M	2019/07/10	2020/07/09
	Amplifier	EMCI	EMC001330	980255	2019/06/28	2020/06/27
X	Filter	MICRO-TRONICS	BRM50702	G270	2019/08/08	2020/08/07
	Filter	MICRO-TRONICS	BRM50716	G196	2019/08/08	2020/08/07

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version :QuieTek EMI System V2.1.134.

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBμV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

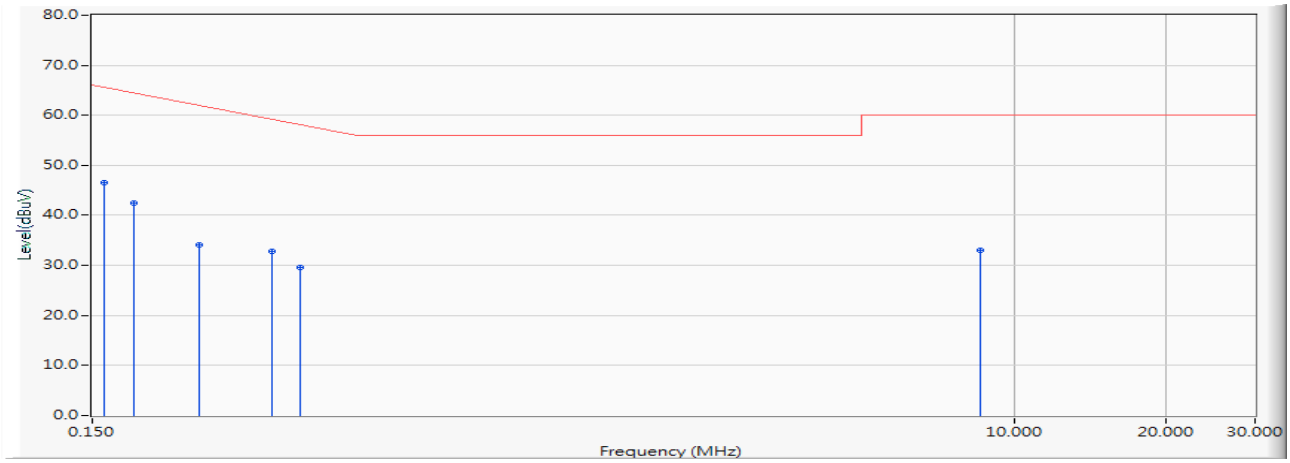
2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : Humly Room Display One
Test Item : Conducted Emission Test
Test date : 2019/11/02
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Line 1



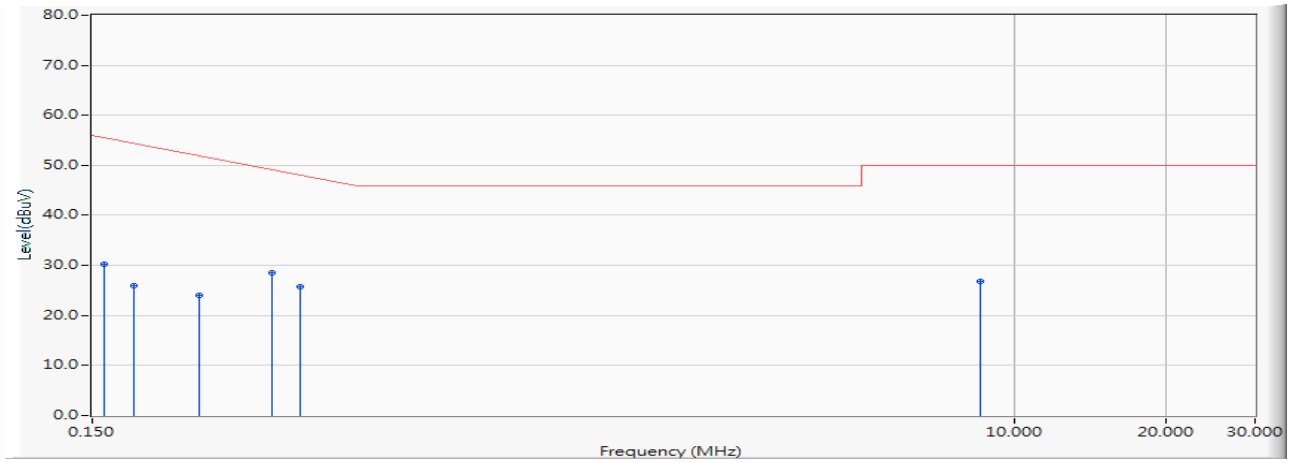
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.158	9.668	36.790	46.458	-19.313	65.771	QUASIPEAK
2		0.181	9.669	32.710	42.379	-22.735	65.114	QUASIPEAK
3		0.244	9.673	24.470	34.143	-29.171	63.314	QUASIPEAK
4		0.341	9.678	23.170	32.848	-27.695	60.543	QUASIPEAK
5		0.388	9.681	19.900	29.581	-29.619	59.200	QUASIPEAK
6		8.552	9.984	22.980	32.964	-27.036	60.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Conducted Emission Test
Test date : 2019/11/02
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Line 1



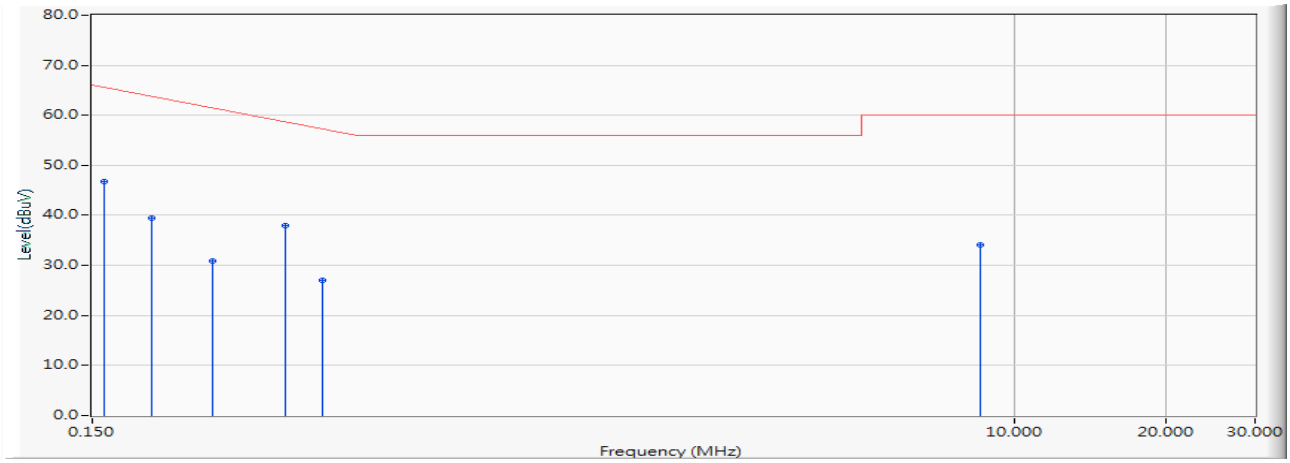
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.158	9.668	20.530	30.198	-25.573	55.771	AVERAGE
2		0.181	9.669	16.210	25.879	-29.235	55.114	AVERAGE
3		0.244	9.673	14.280	23.953	-29.361	53.314	AVERAGE
4	*	0.341	9.678	18.790	28.468	-22.075	50.543	AVERAGE
5		0.388	9.681	16.070	25.751	-23.449	49.200	AVERAGE
6		8.552	9.984	16.860	26.844	-23.156	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Conducted Emission Test
Test date : 2019/11/02
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Line 2



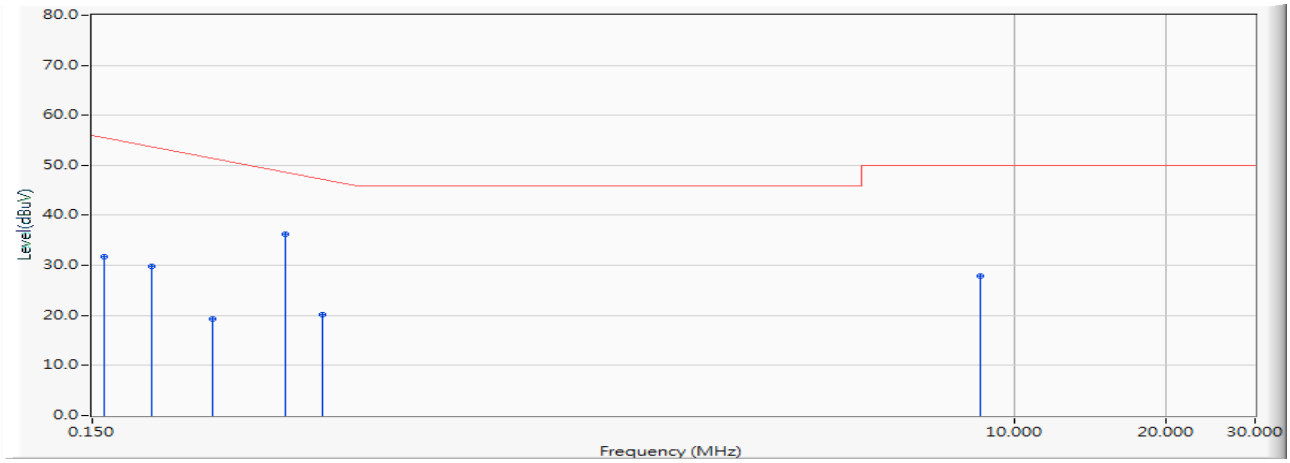
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.158	9.708	37.150	46.858	-18.913	65.771	QUASIPEAK
2		0.197	9.700	29.770	39.470	-25.187	64.657	QUASIPEAK
3		0.259	9.704	21.200	30.904	-31.982	62.886	QUASIPEAK
4		0.361	9.709	28.330	38.039	-21.932	59.971	QUASIPEAK
5		0.427	9.713	17.340	27.053	-31.033	58.086	QUASIPEAK
6		8.588	10.045	23.990	34.035	-25.965	60.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Conducted Emission Test
Test date : 2019/11/02
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Line 2



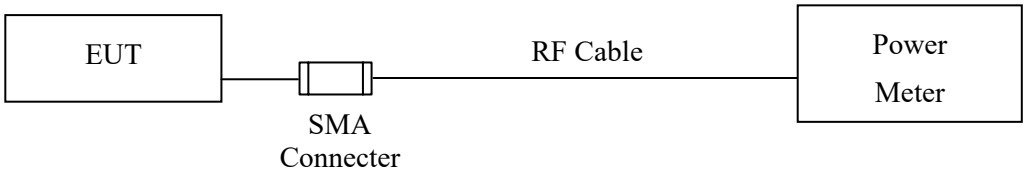
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.158	9.708	21.980	31.688	-24.083	55.771	AVERAGE
2		0.197	9.700	20.160	29.860	-24.797	54.657	AVERAGE
3		0.259	9.704	9.700	19.404	-33.482	52.886	AVERAGE
4	*	0.361	9.709	26.440	36.149	-13.822	49.971	AVERAGE
5		0.427	9.713	10.400	20.113	-27.973	48.086	AVERAGE
6		8.588	10.045	17.890	27.935	-22.065	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

3.4. Uncertainty

± 1.19 dB

3.5. Test Result of Peak Power Output

Product : Humly Room Display One
Test Item : Peak Power Output
Test date : 2019/11/01
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit	Result
Channel 00	2402.00	1.28	1 Watt= 30 dBm	Pass
Channel 39	2441.00	1.16	1 Watt= 30 dBm	Pass
Channel 78	2480.00	0.41	1 Watt= 30 dBm	Pass

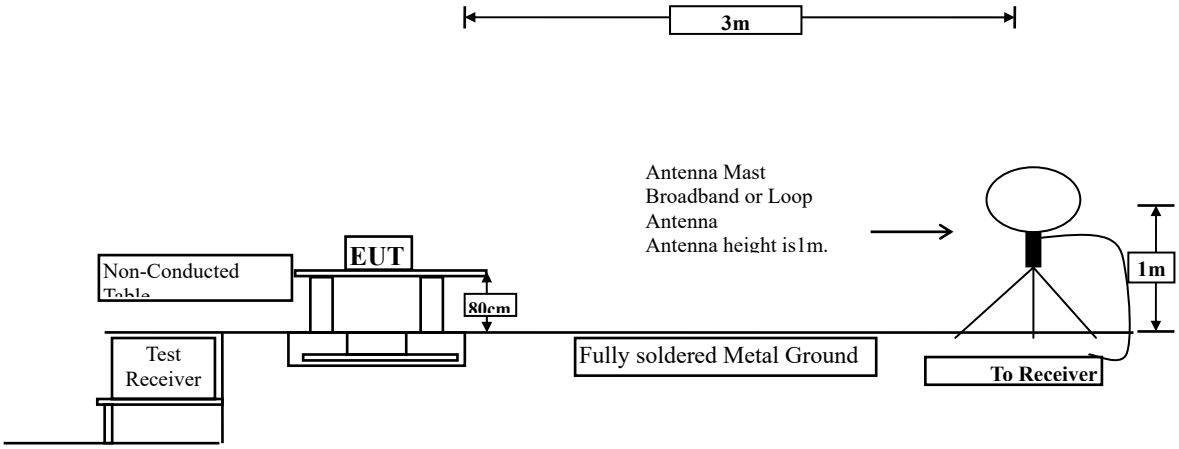
Product : Humly Room Display One
Test Item : Peak Power Output
Test date : 2019/11/01
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit	Result
Channel 00	2402.00	4.00	1 Watt= 30 dBm	Pass
Channel 39	2441.00	3.86	1 Watt= 30 dBm	Pass
Channel 78	2480.00	3.10	1 Watt= 30 dBm	Pass

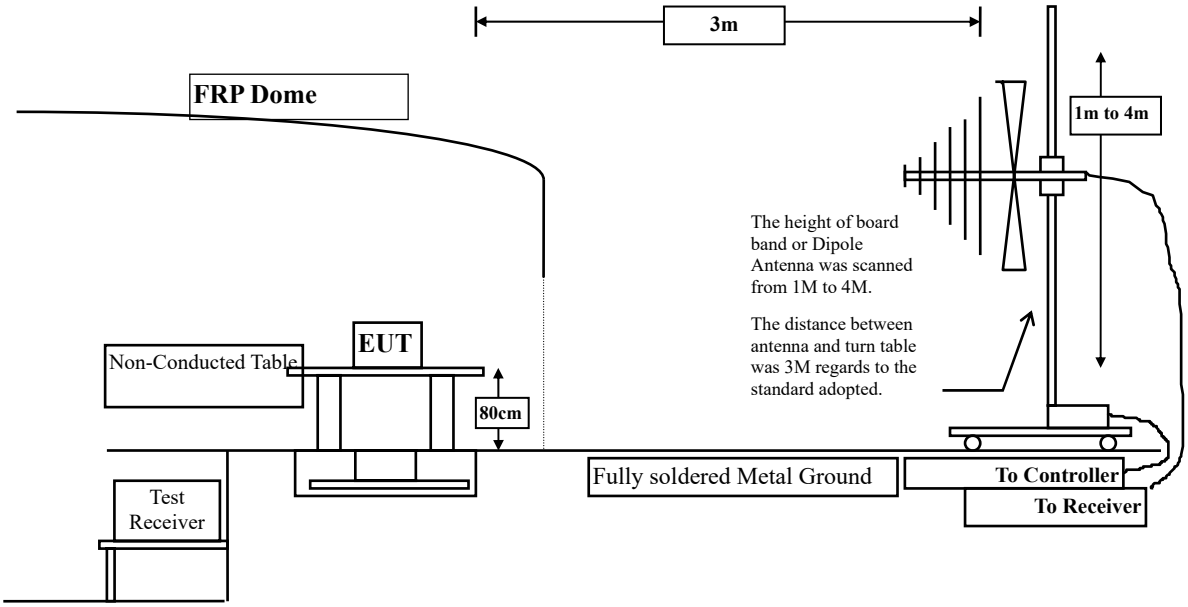
4. Radiated Emission

4.1. Test Setup

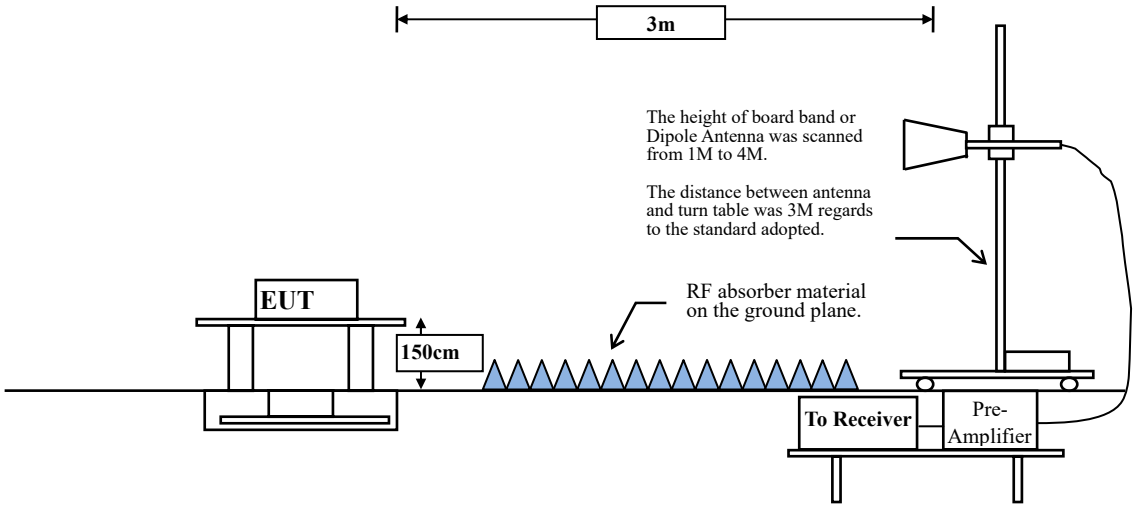
Under 30MHz



Below 1GHz



Above 1GHz



4.2. Limits

➢ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: 1. RF Voltage (dBμV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

4.4. Uncertainty

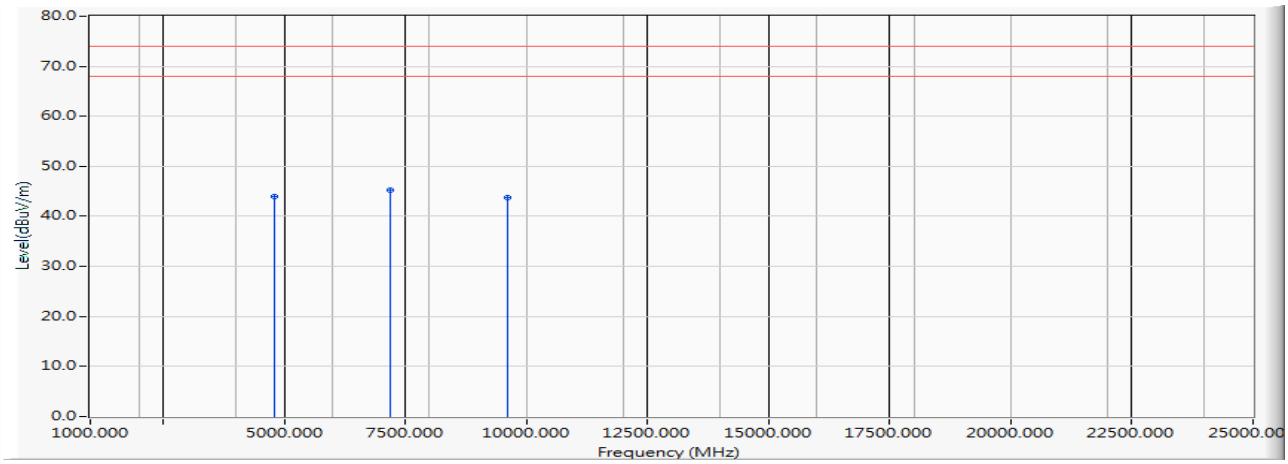
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC(2402MHz)

Horizontal



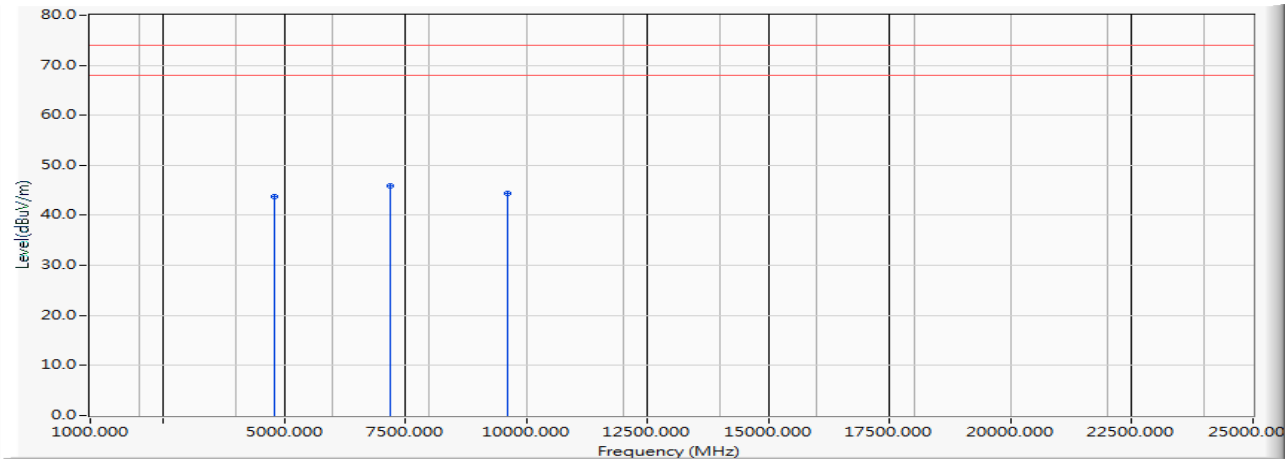
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	-12.148	56.070	43.922	-30.078	74.000	PEAK
2	*	7206.000	-13.147	58.380	45.233	-28.767	74.000	PEAK
3		9608.000	-13.430	57.160	43.730	-30.270	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC(2402MHz)

Vertical



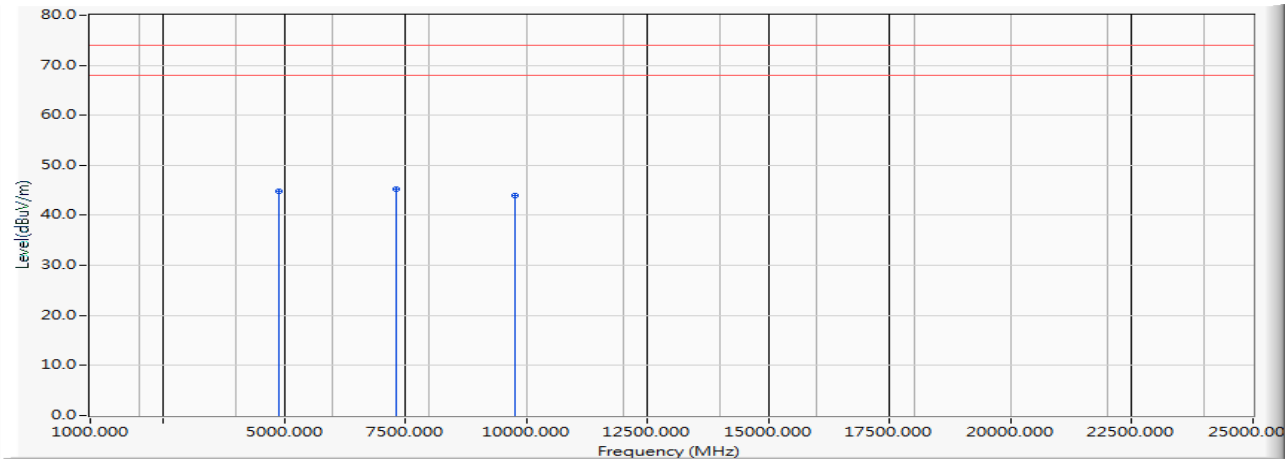
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	-12.148	55.900	43.752	-30.248	74.000	PEAK
2	*	7206.000	-13.147	59.020	45.873	-28.127	74.000	PEAK
3		9608.000	-13.430	57.760	44.330	-29.670	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC(2441MHz)

Horizontal



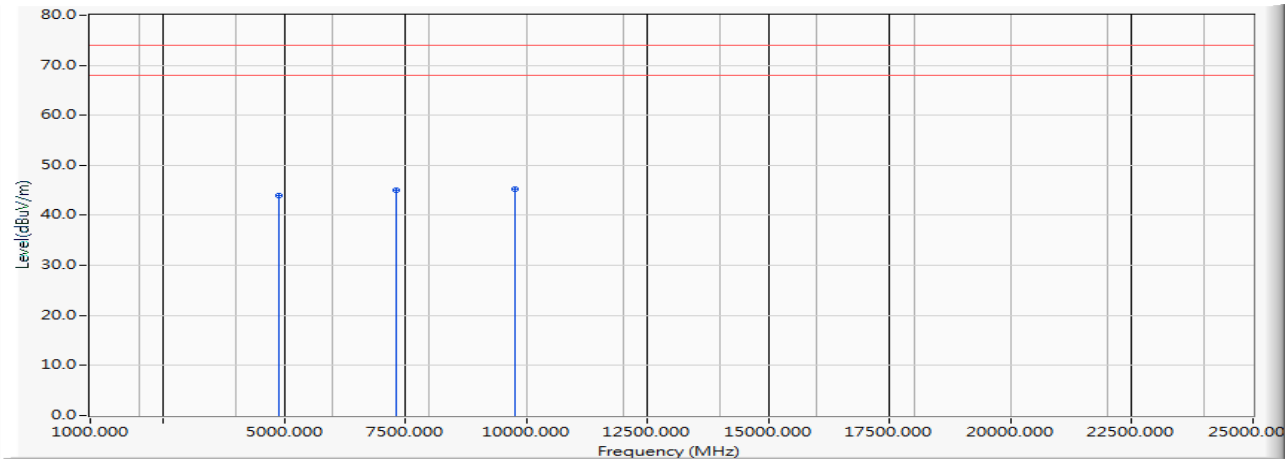
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4882.000	-11.589	56.370	44.781	-29.219	74.000	PEAK
2	*	7323.000	-13.572	58.790	45.218	-28.782	74.000	PEAK
3		9764.000	-12.529	56.470	43.941	-30.059	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC(2441MHz)

Vertical



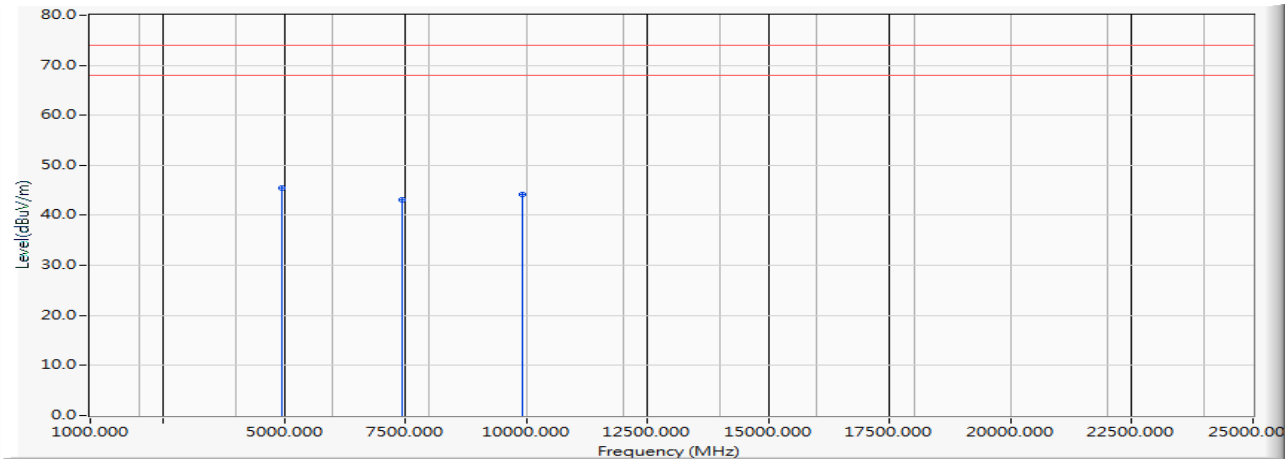
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4882.000	-11.589	55.600	44.011	-29.989	74.000	PEAK
2		7323.000	-13.572	58.570	44.998	-29.002	74.000	PEAK
3	*	9764.000	-12.529	57.680	45.151	-28.849	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC(2480MHz)

Horizontal



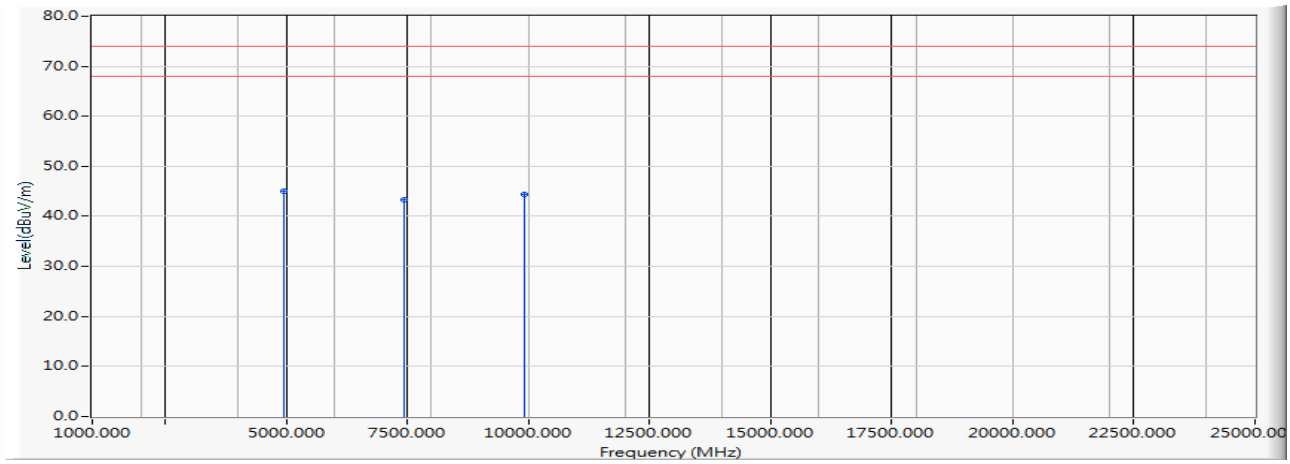
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-10.882	56.250	45.368	-28.632	74.000	PEAK
2		7440.000	-14.622	57.780	43.158	-30.842	74.000	PEAK
3		9920.000	-14.231	58.380	44.149	-29.851	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC(2480MHz)

Vertical



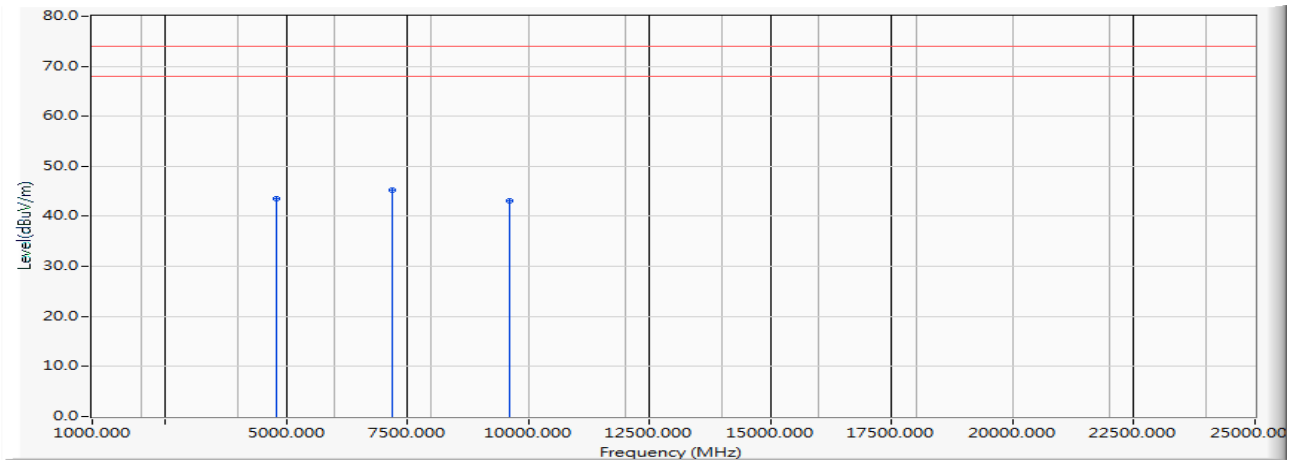
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-10.882	55.870	44.988	-29.012	74.000	PEAK
2		7440.000	-14.622	57.850	43.228	-30.772	74.000	PEAK
3		9920.000	-14.231	58.730	44.499	-29.501	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC(2402MHz)

Horizontal



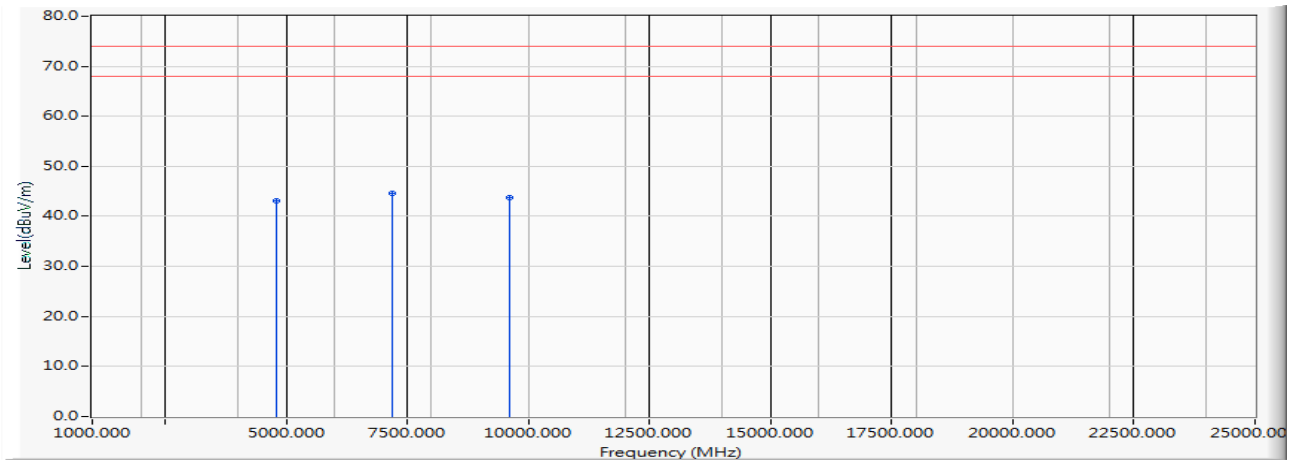
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	-12.148	55.600	43.452	-30.548	74.000	PEAK
2	*	7206.000	-13.147	58.440	45.293	-28.707	74.000	PEAK
3		9608.000	-13.430	56.520	43.090	-30.910	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC(2402MHz)

Vertical



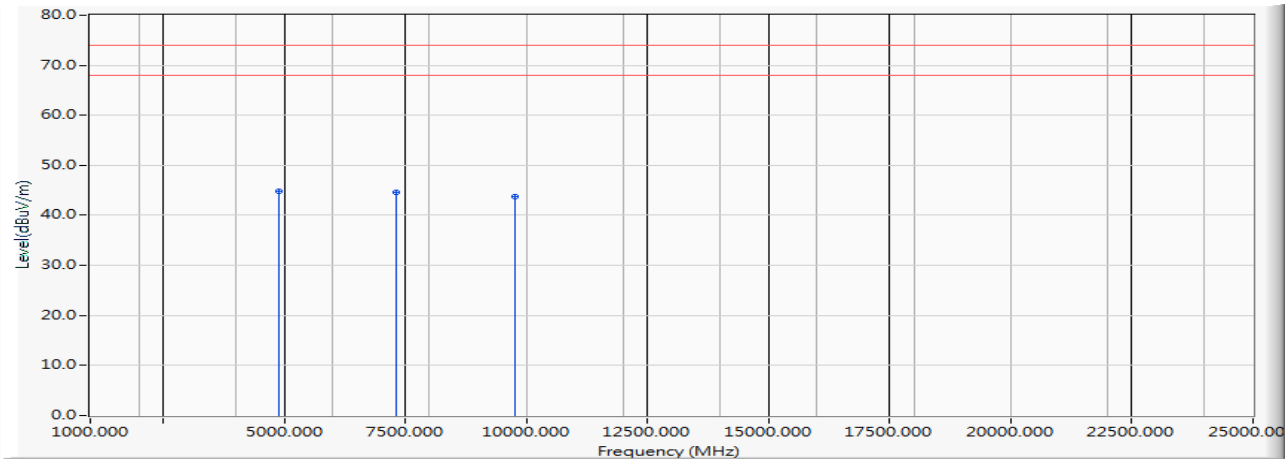
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	-12.148	55.250	43.102	-30.898	74.000	PEAK
2	*	7206.000	-13.147	57.740	44.593	-29.407	74.000	PEAK
3		9608.000	-13.430	57.270	43.840	-30.160	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product	:	Humly Room Display One
Test Item	:	Harmonic Radiated Emission
Test date	:	2019/11/04
Test Mode	:	Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2441MHz)

Horizontal



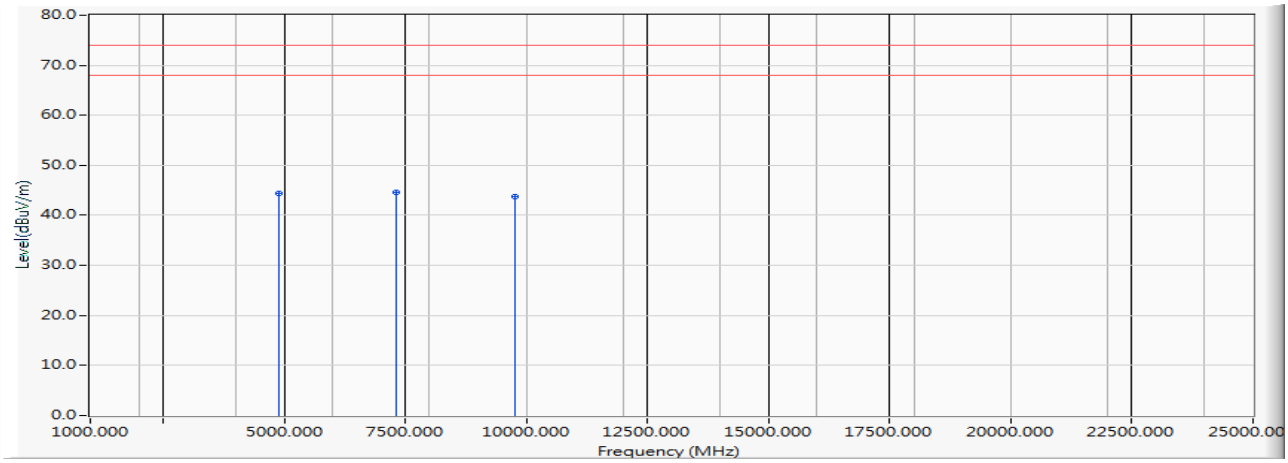
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4882.000	-11.589	56.430	44.841	-29.159	74.000	PEAK
2		7323.000	-13.572	58.150	44.578	-29.422	74.000	PEAK
3		9764.000	-12.529	56.210	43.681	-30.319	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product	:	Humly Room Display One
Test Item	:	Harmonic Radiated Emission
Test date	:	2019/11/04
Test Mode	:	Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2441MHz)

Vertical



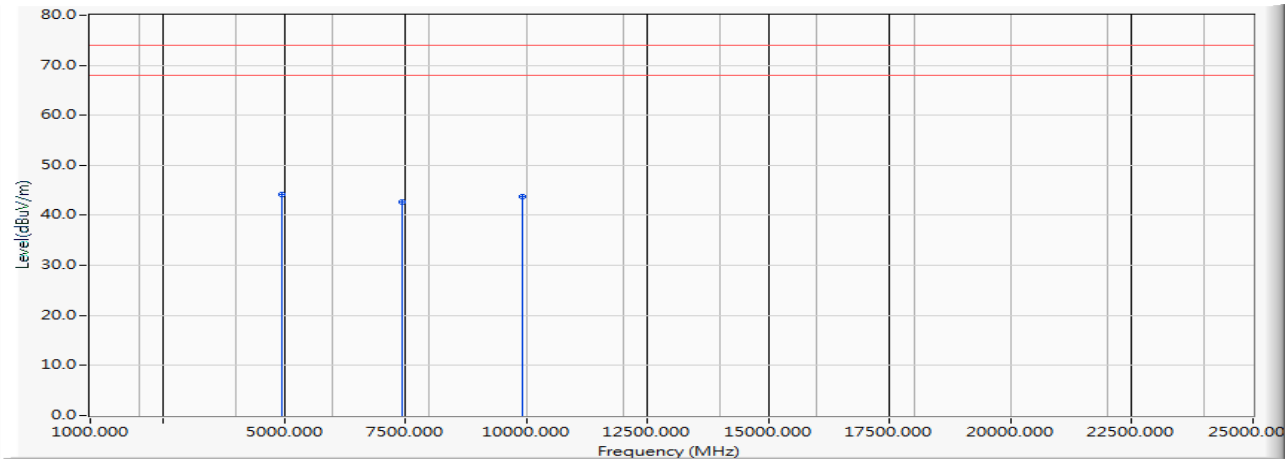
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4882.000	-11.589	55.940	44.351	-29.649	74.000	PEAK
2	*	7323.000	-13.572	58.100	44.528	-29.472	74.000	PEAK
3		9764.000	-12.529	56.270	43.741	-30.259	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2480MHz)

Horizontal



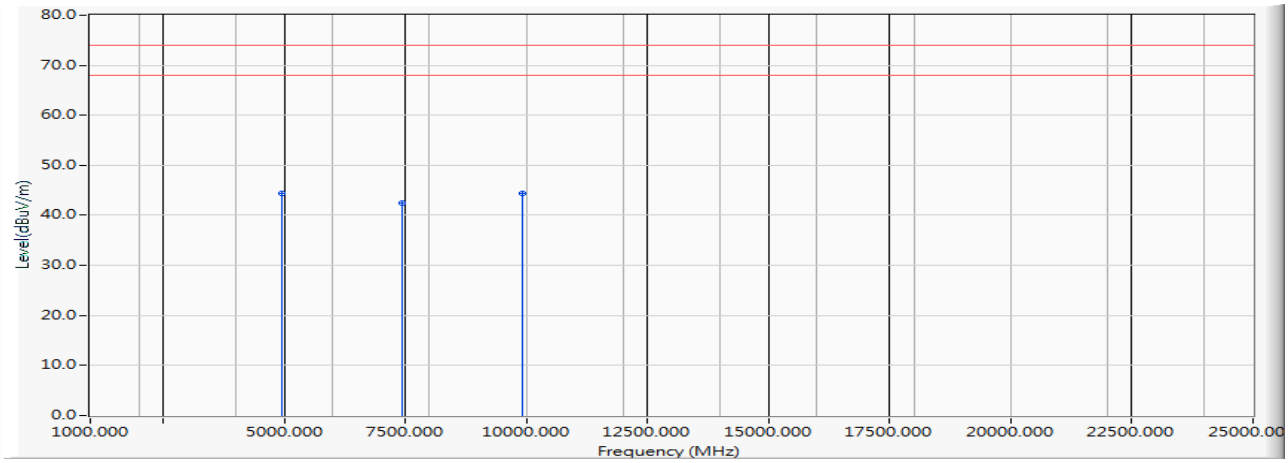
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-10.882	54.970	44.088	-29.912	74.000	PEAK
2		7440.000	-14.622	57.220	42.598	-31.402	74.000	PEAK
3		9920.000	-14.231	57.990	43.759	-30.241	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : Harmonic Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2480MHz)

Vertical



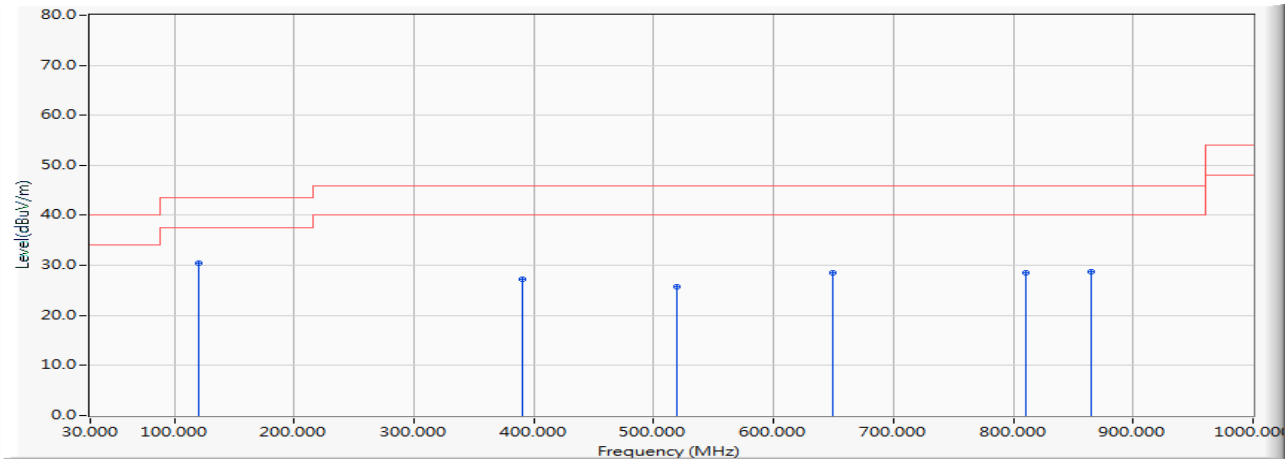
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	-10.882	55.220	44.338	-29.662	74.000	PEAK
2		7440.000	-14.622	57.130	42.508	-31.492	74.000	PEAK
3	*	9920.000	-14.231	58.590	44.359	-29.641	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : General Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC (2441MHz)

Horizontal



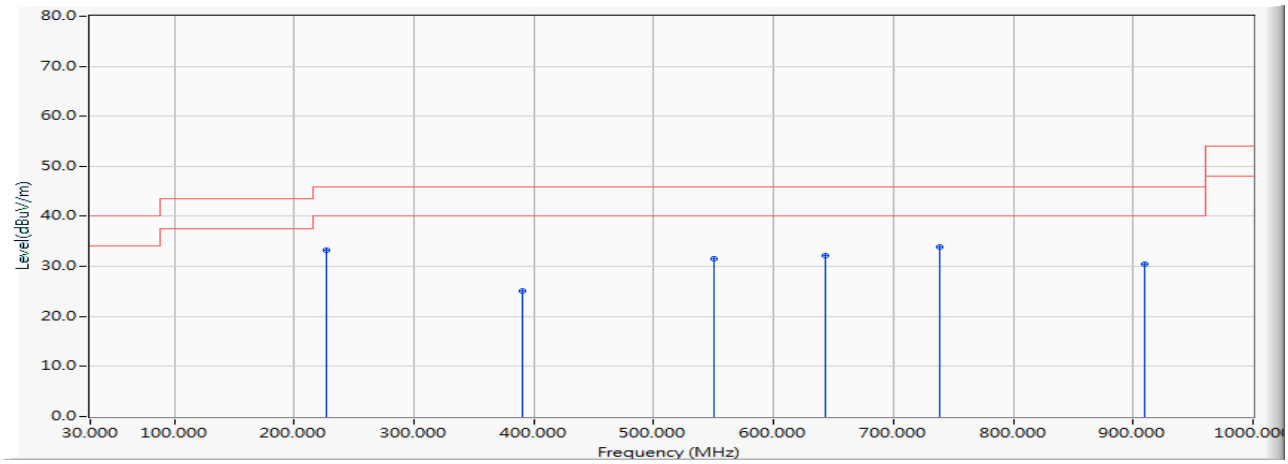
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	119.971	-16.904	47.459	30.556	-12.944	43.500	QUASIPEAK
2		389.884	-12.845	40.073	27.228	-18.772	46.000	QUASIPEAK
3		519.217	-11.232	36.871	25.640	-20.360	46.000	QUASIPEAK
4		649.957	-9.372	37.852	28.481	-17.519	46.000	QUASIPEAK
5		810.217	-8.944	37.467	28.523	-17.477	46.000	QUASIPEAK
6		865.043	-8.419	37.212	28.793	-17.207	46.000	QUASIPEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : General Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC (2441MHz)

Vertical



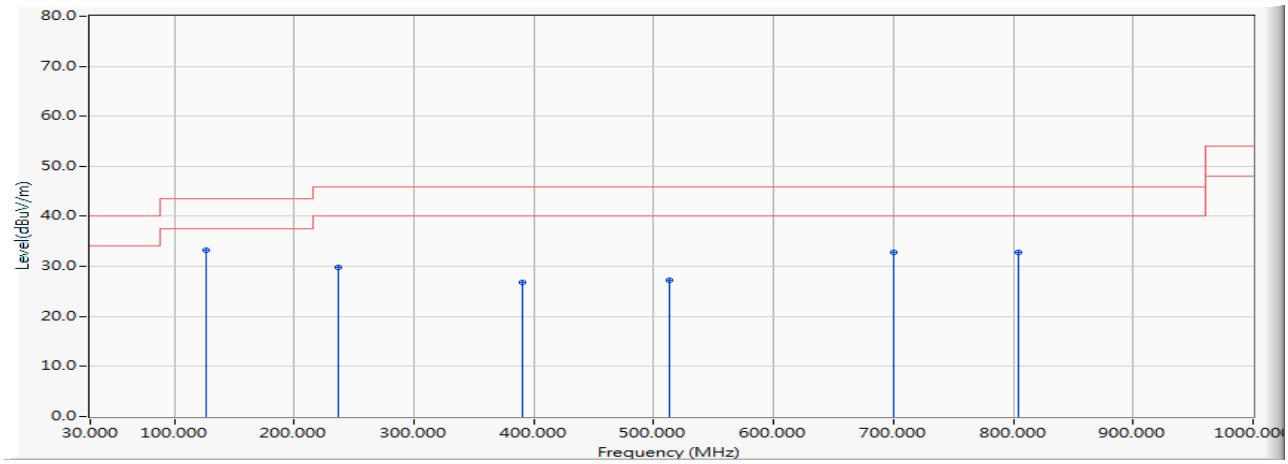
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		226.812	-17.741	50.953	33.211	-12.789	46.000	QUASIPEAK
2		389.884	-12.845	38.027	25.182	-20.818	46.000	QUASIPEAK
3		550.145	-10.963	42.498	31.534	-14.466	46.000	QUASIPEAK
4		642.928	-8.985	41.175	32.191	-13.809	46.000	QUASIPEAK
5	*	738.522	-5.757	39.661	33.903	-12.097	46.000	QUASIPEAK
6		910.029	-10.072	40.477	30.405	-15.595	46.000	QUASIPEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : General Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2441MHz)

Horizontal



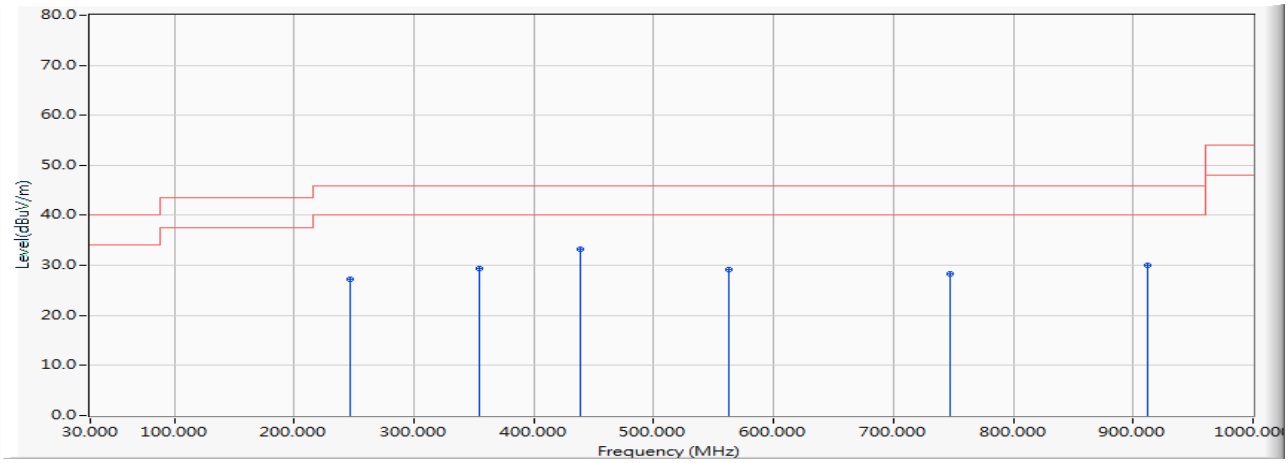
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	127.000	-16.313	49.479	33.166	-10.334	43.500	QUASIPEAK
2		236.652	-18.238	48.059	29.821	-16.179	46.000	QUASIPEAK
3		389.884	-12.845	39.564	26.719	-19.281	46.000	QUASIPEAK
4		513.594	-11.113	38.434	27.321	-18.679	46.000	QUASIPEAK
5		700.565	-9.152	41.869	32.717	-13.283	46.000	QUASIPEAK
6		804.594	-8.951	41.755	32.804	-13.196	46.000	QUASIPEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Humly Room Display One
Test Item : General Radiated Emission
Test date : 2019/11/04
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2441MHz)

Vertical



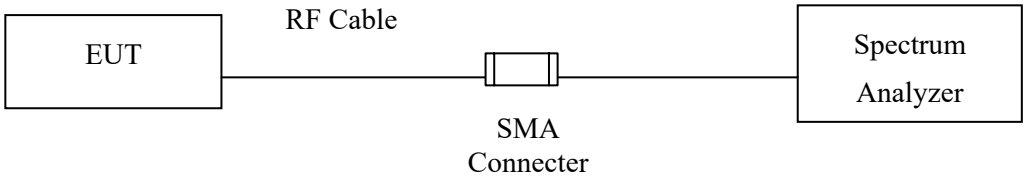
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		246.493	-18.154	45.469	27.315	-18.685	46.000	QUASIPEAK
2		354.739	-13.025	42.308	29.283	-16.717	46.000	QUASIPEAK
3	*	439.087	-9.871	43.086	33.215	-12.785	46.000	QUASIPEAK
4		562.797	-10.108	39.324	29.216	-16.784	46.000	QUASIPEAK
5		746.957	-6.271	34.603	28.333	-17.667	46.000	QUASIPEAK
6		911.435	-10.107	40.119	30.012	-15.988	46.000	QUASIPEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

5.4. Uncertainty

± 1.20dB

5.5. Test Result of RF Antenna Conducted Test

Product	:	Humly Room Display One
Test Item	:	RF Antenna Conducted Test
Test date	:	2019/11/04
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)

Figure Channel 00:

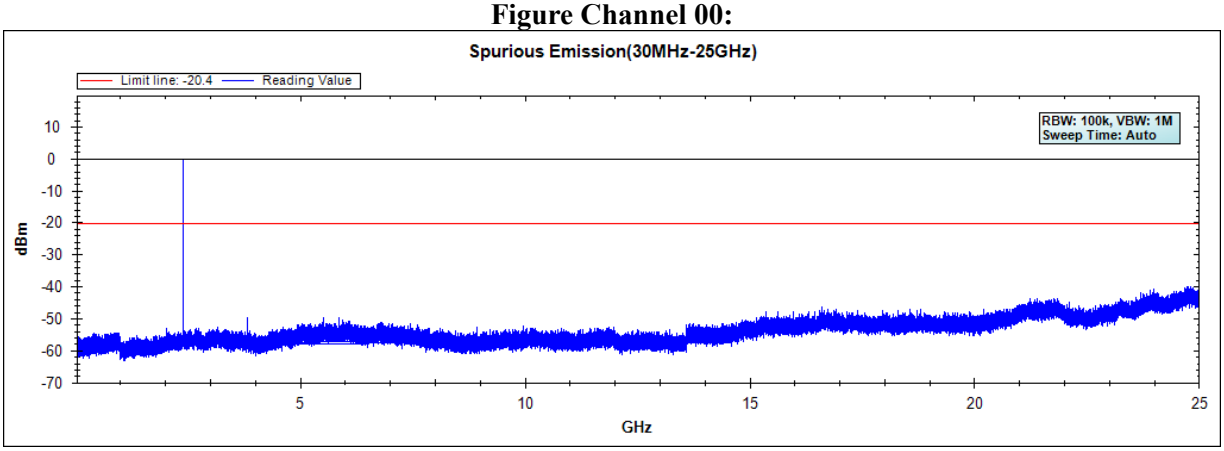


Figure Channel 39:

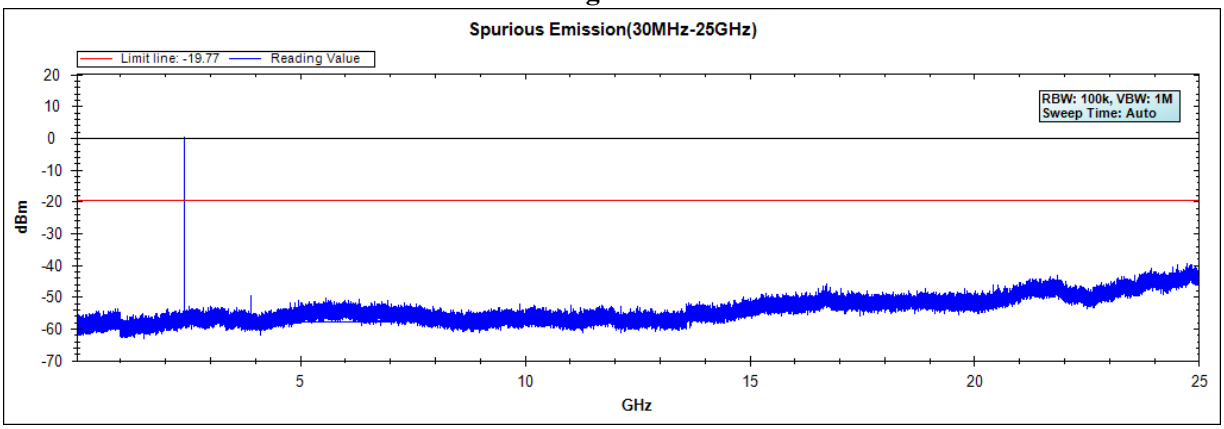
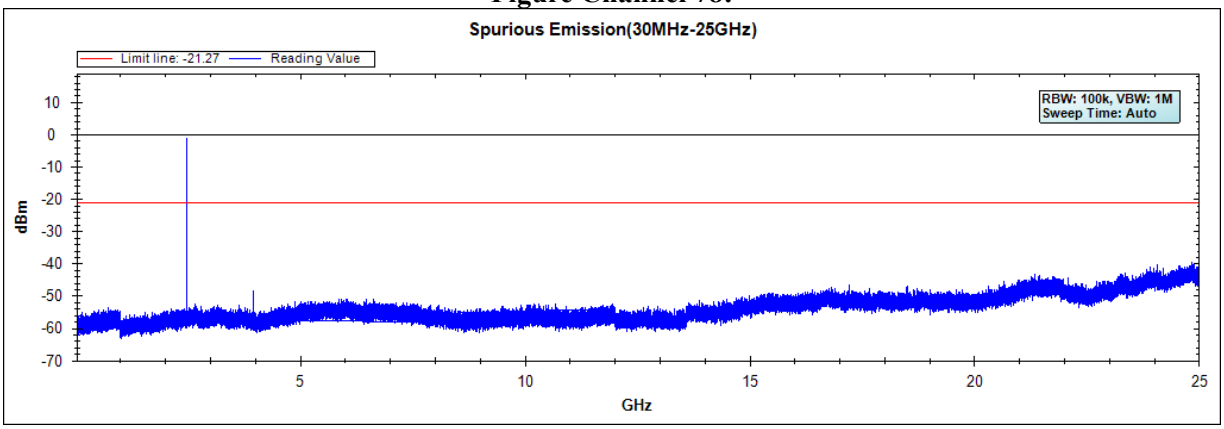


Figure Channel 78:



Note: The above test pattern is synthesized by multiple of the frequency range.

Product	:	Humly Room Display One
Test Item	:	RF Antenna Conducted Test
Test date	:	2019/11/04
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)

Figure Channel 00:

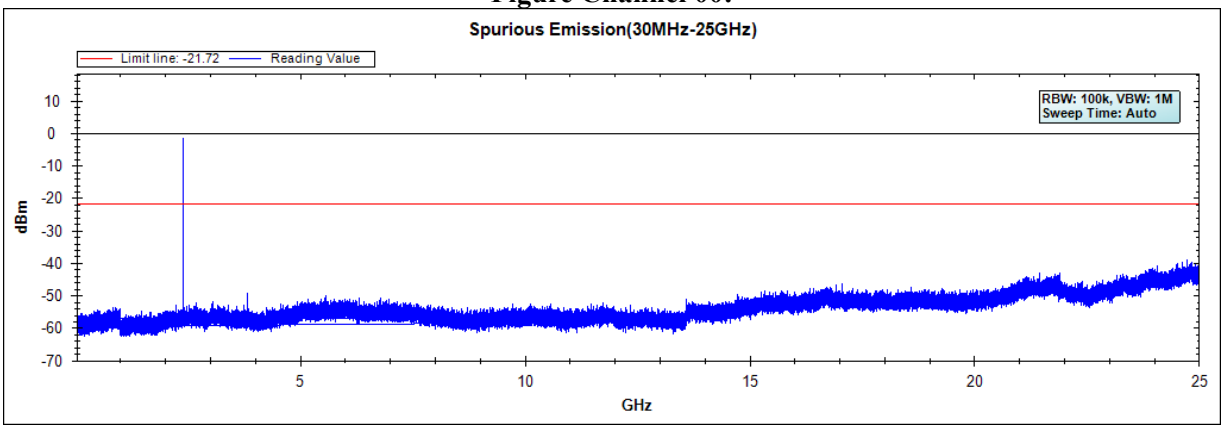


Figure Channel 39:

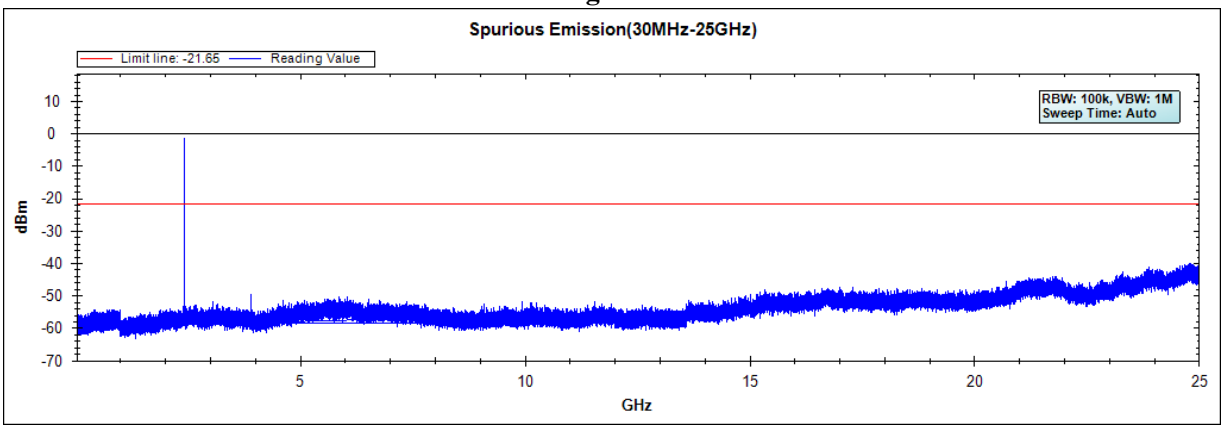
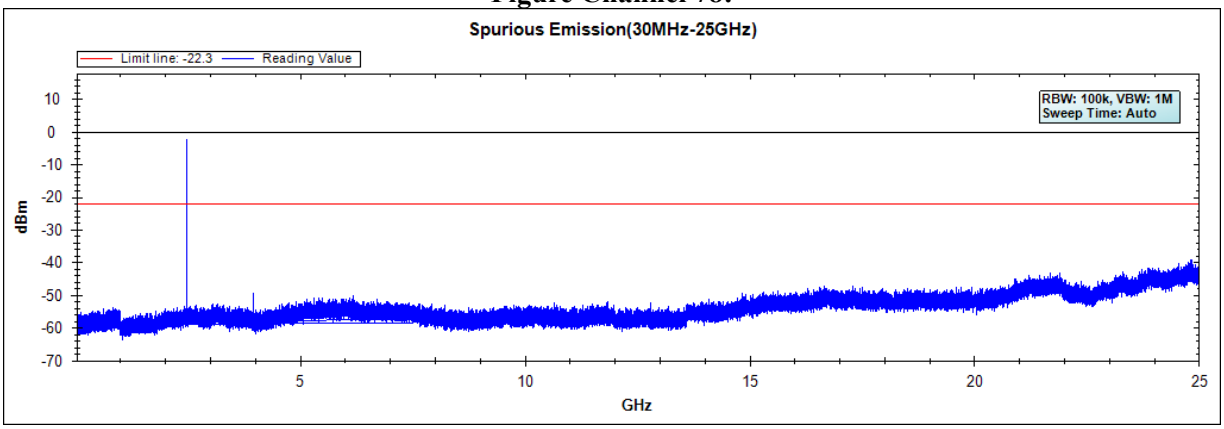


Figure Channel 78:



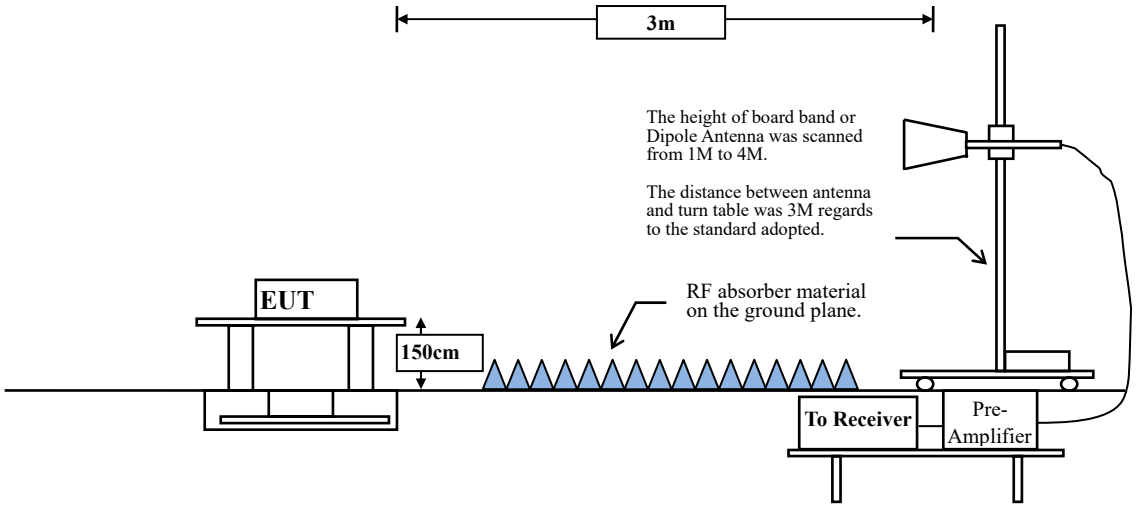
Note: The above test pattern is synthesized by multiple of the frequency range.

6. Band Edge

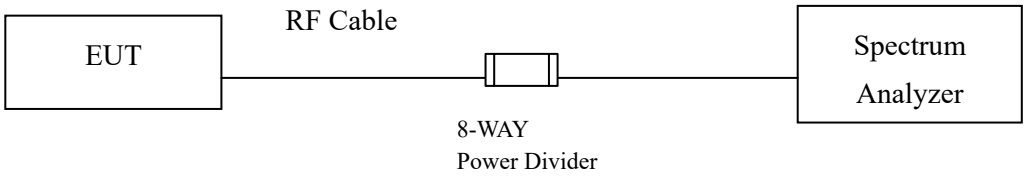
6.1. Test Setup

RF Radiated Measurement:

Above 1GHz



RF Conducted Measurement



6.2. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.3. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

6.4. Uncertainty

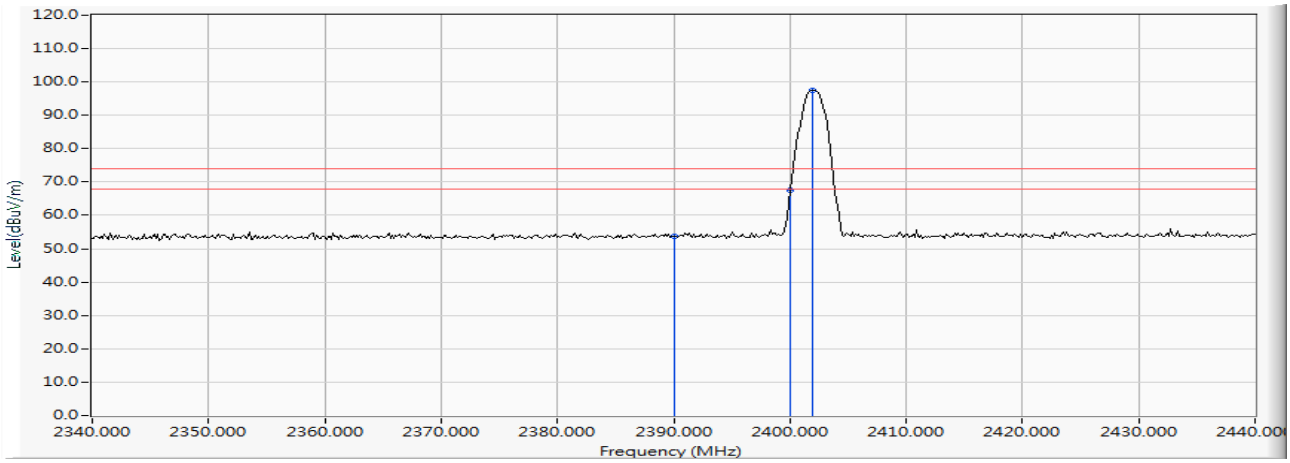
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

6.5. Test Result of Band Edge

Product : Humly Room Display One
Test Item : Band Edge
Test date : 2019/10/30
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC (2402MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	12.899	40.671	53.570	-20.430	74.000	PEAK
2		2400.000	12.961	54.487	67.448	--	--	PEAK
3	*	2401.884	12.974	84.408	97.382	--	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.

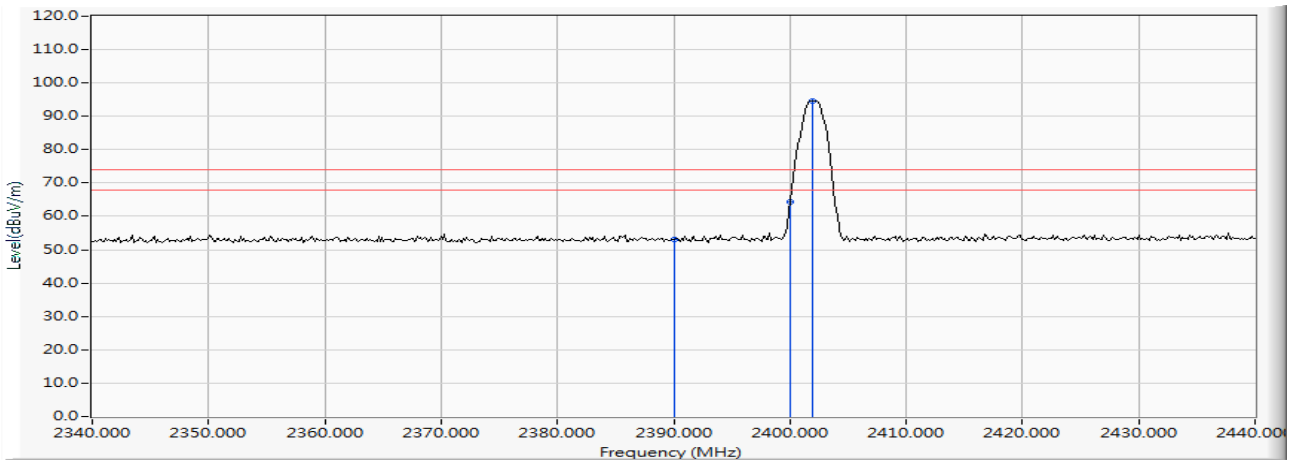
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Measurement (dBμV/m)	Margin (dB)	Limit (dBuV/m)
00 (Average)	2390.000	53.570	-30.755	22.815	-31.185	54.000
00 (Average)	2400.000	67.448	-30.755	36.693	--	--
00 (Average)	2401.884	97.382	-30.755	66.627	--	--

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Humly Room Display One
Test Item : Band Edge
Test date : 2019/10/30
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC (2402MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	12.899	40.259	53.158	-20.842	74.000	PEAK
2		2400.000	12.961	51.507	64.468	--	--	PEAK
3	*	2401.884	12.974	81.701	94.675	--	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.

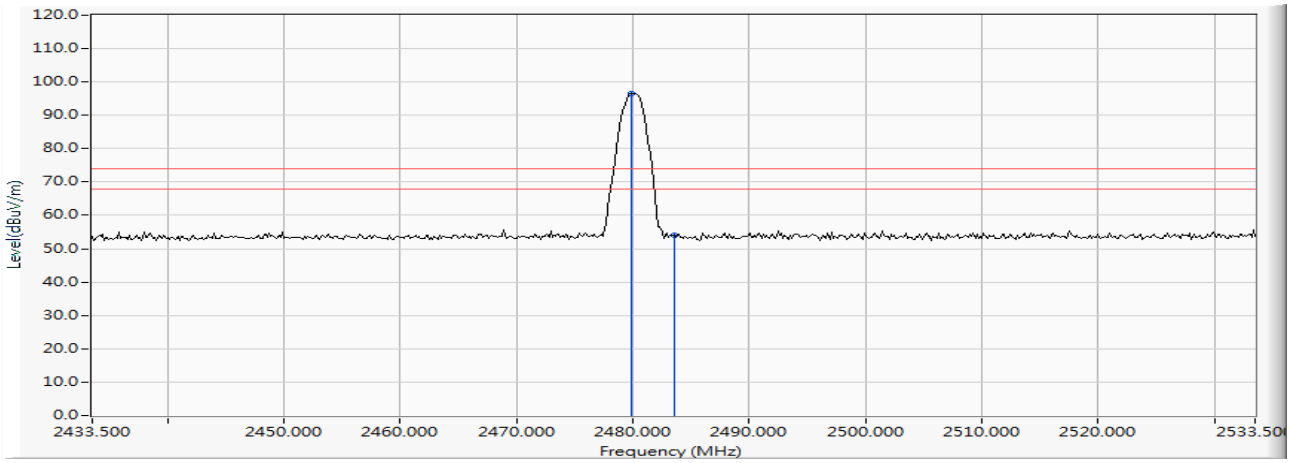
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Measurement (dBμV/m)	Margin (dB)	Limit (dBuV/m)
00 (Average)	2390.000	53.158	-30.755	22.403	-31.597	54.000
00 (Average)	2400.000	64.468	-30.755	33.713	--	--
00 (Average)	2401.884	94.675	-30.755	63.920	--	--

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Humly Room Display One
Test Item : Band Edge
Test date : 2019/10/30
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC (2480MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.877	13.369	83.085	96.454	--	--	PEAK
2		2483.500	13.375	40.562	53.936	-20.064	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.

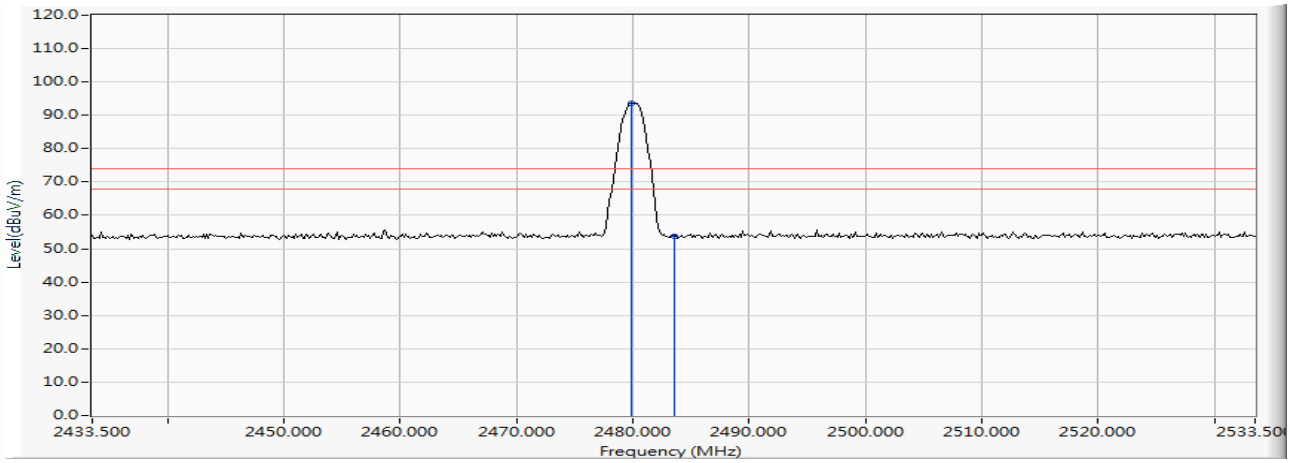
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Measurement (dBµV/m)	Margin (dB)	Limit (dBuV/m)
78 (Average)	2479.877	96.454	-30.755	65.699	--	--
78 (Average)	2483.500	53.936	-30.755	23.181	-30.819	54.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Humly Room Display One
Test Item : Band Edge
Test date : 2019/10/30
Test Mode : Mode 3: Transmit - 1Mbps (GFSK)+NFC (2480MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.877	13.369	80.260	93.629	--	--	PEAK
2		2483.500	13.375	40.442	53.816	-20.184	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.

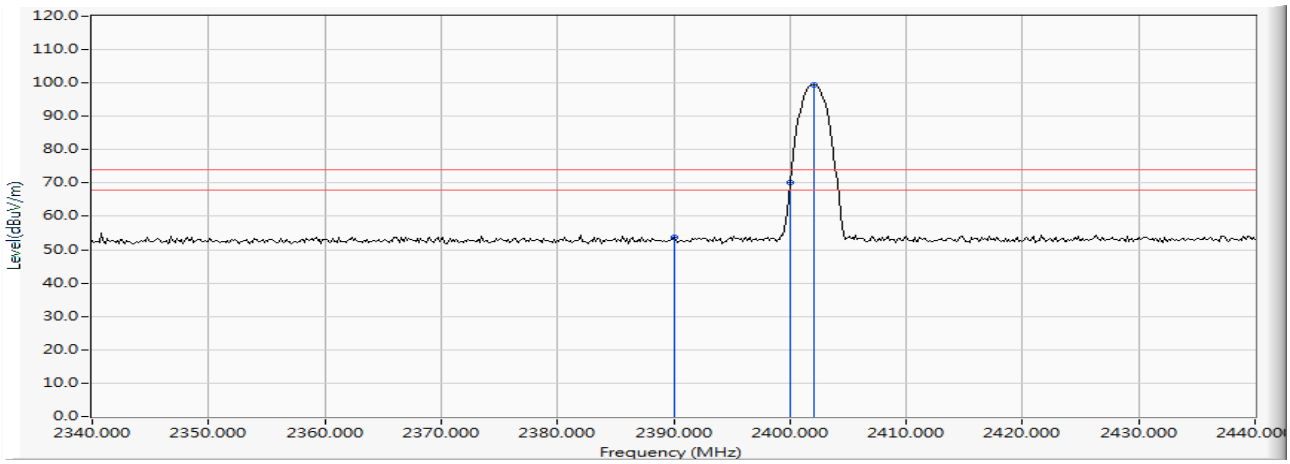
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Measurement (dBμV/m)	Margin (dB)	Limit (dBuV/m)
78 (Average)	2479.877	93.629	-30.755	62.874	--	--
78 (Average)	2483.500	53.816	-30.755	23.061	-30.939	54.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Humly Room Display One
Test Item : Band Edge
Test date : 2019/10/30
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2402MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	12.899	40.808	53.707	-20.293	74.000	PEAK
2		2400.000	12.961	57.041	70.002	--	--	PEAK
3	*	2402.029	12.975	86.581	99.556	--	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.

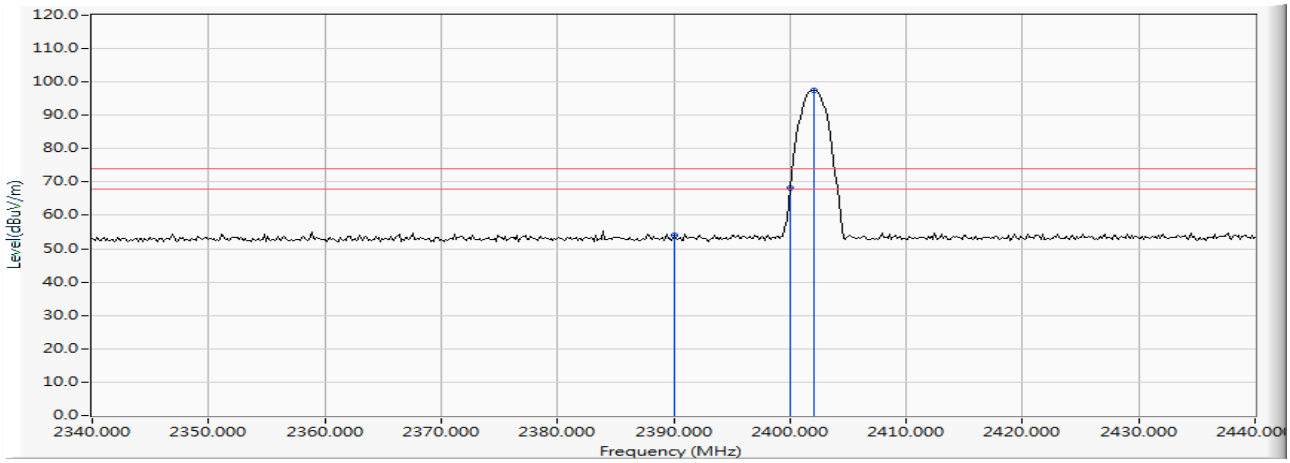
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Measurement (dBµV/m)	Margin (dB)	Limit (dBuV/m)
00 (Average)	2390.000	53.707	-30.755	22.952	-31.048	54.000
00 (Average)	2400.000	70.002	-30.755	39.247	--	--
00 (Average)	2402.029	99.556	-30.755	68.801	--	--

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Humly Room Display One
Test Item : Band Edge
Test date : 2019/10/30
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2402MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	12.899	41.247	54.146	-19.854	74.000	PEAK
2		2400.000	12.961	55.314	68.275	--	--	PEAK
3	*	2402.029	12.975	84.492	97.467	--	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.

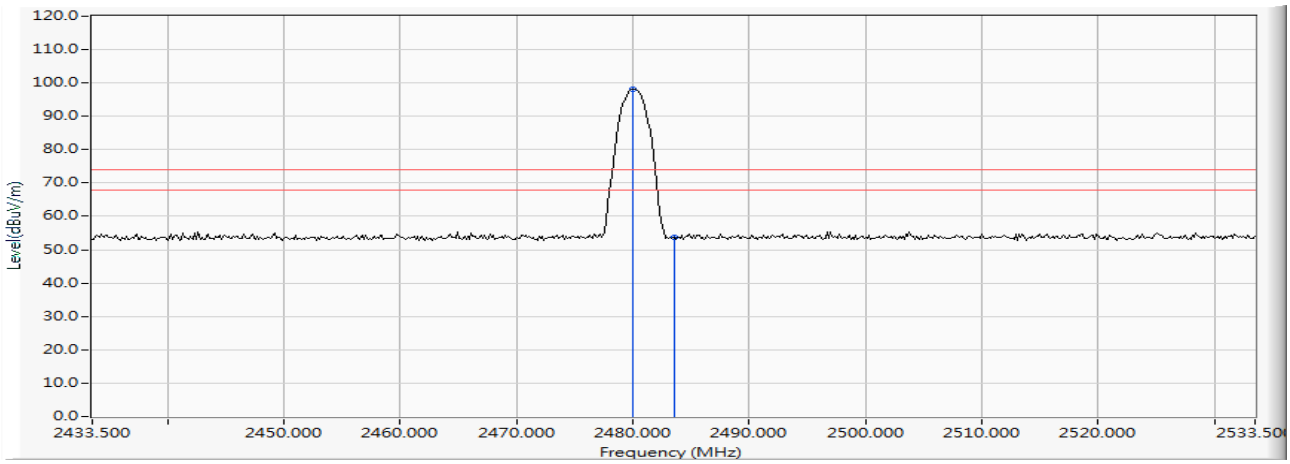
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Measurement (dBµV/m)	Margin (dB)	Limit (dBuV/m)
00 (Average)	2390.000	54.146	-30.755	23.391	-30.609	54.000
00 (Average)	2400.000	68.275	-30.755	37.520	--	--
00 (Average)	2402.029	97.467	-30.755	66.712	--	--

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Humly Room Display One
Test Item : Band Edge
Test date : 2019/10/30
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2480MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	13.369	84.792	98.161	--	--	PEAK
2		2483.500	13.375	40.436	53.810	-20.190	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.

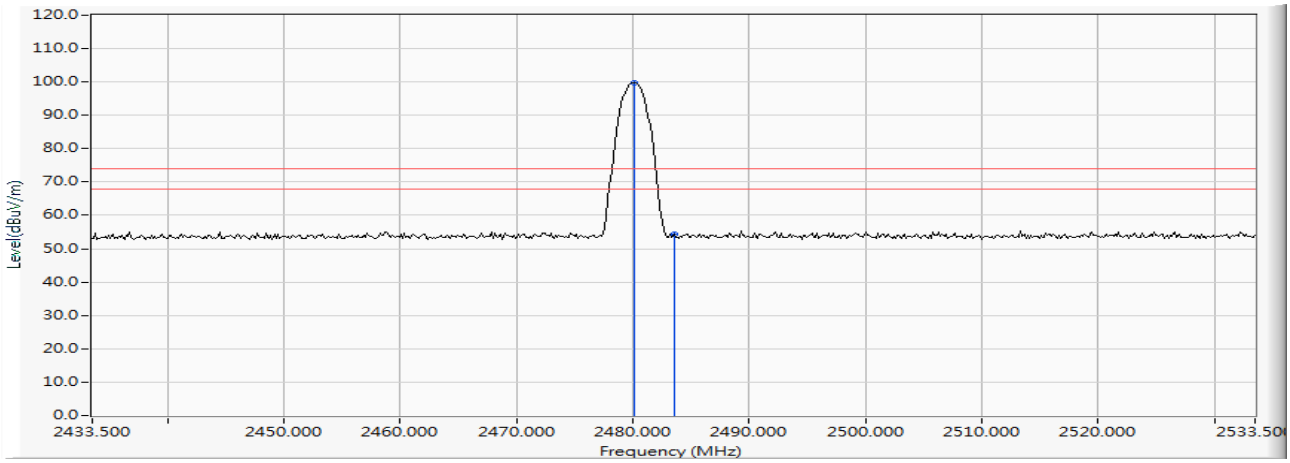
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Measurement (dBµV/m)	Margin (dB)	Limit (dBuV/m)
78 (Average)	2480.022	98.161	-30.755	67.406	--	--
78 (Average)	2483.500	53.810	-30.755	23.055	-30.945	54.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Humly Room Display One
Test Item : Band Edge
Test date : 2019/10/30
Test Mode : Mode 4: Transmit - 3Mbps (8DPSK)+NFC (2480MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.167	13.369	86.391	99.760	--	--	PEAK
2		2483.500	13.375	41.035	54.409	-19.591	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.

Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Measurement (dBµV/m)	Margin (dB)	Limit (dBuV/m)
78 (Average)	2480.167	99.760	-30.755	69.005	--	--
78 (Average)	2483.500	54.409	-30.755	23.654	-30.346	54.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Humly Room Display One
Test Item : Band Edge
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(Hopping off)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00:

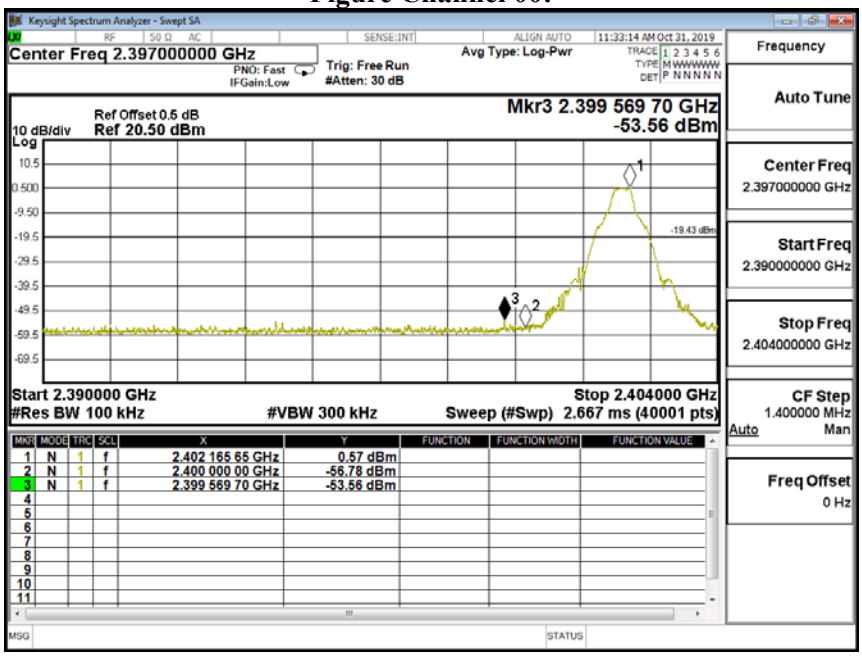
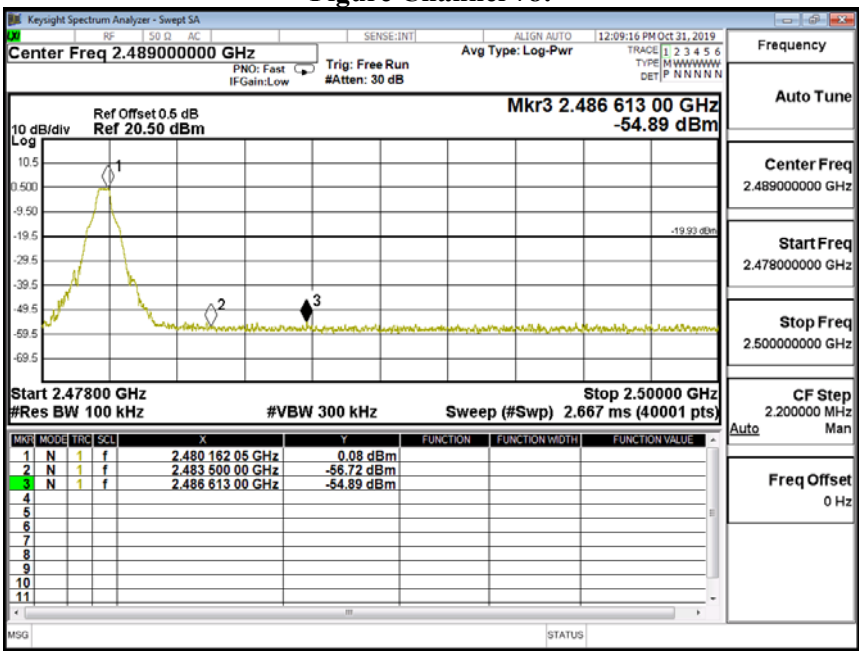


Figure Channel 78:



Product : Humly Room Display One
Test Item : Band Edge
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Hopping off)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00:

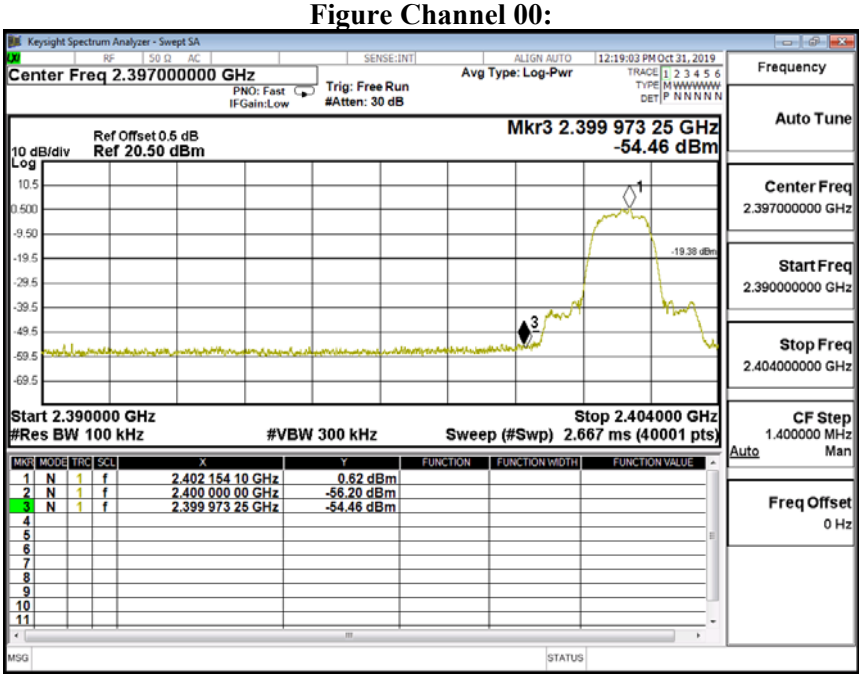
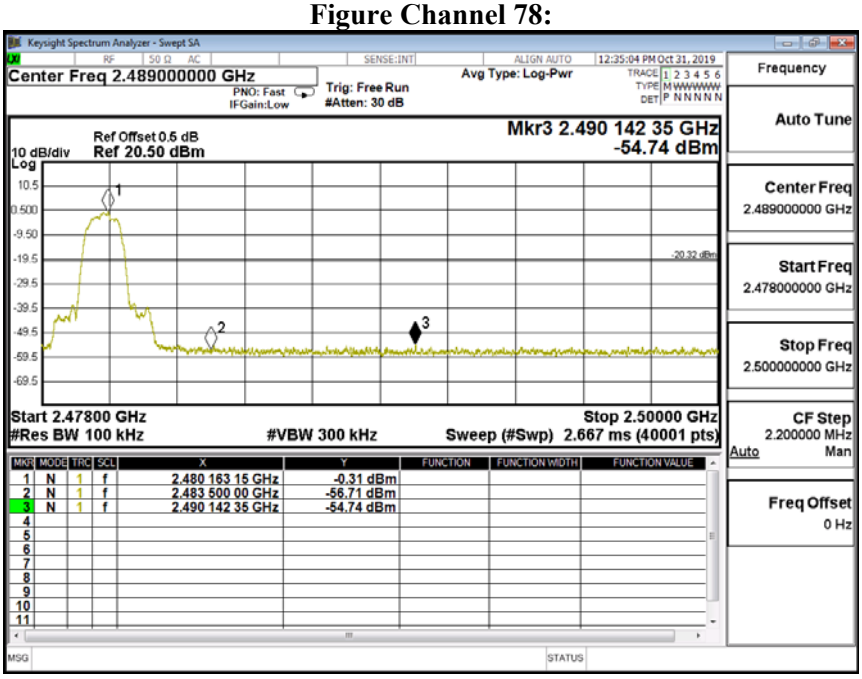


Figure Channel 78:



Product : Humly Room Display One
Test Item : Band Edge
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(Hopping on)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00 Hopping:

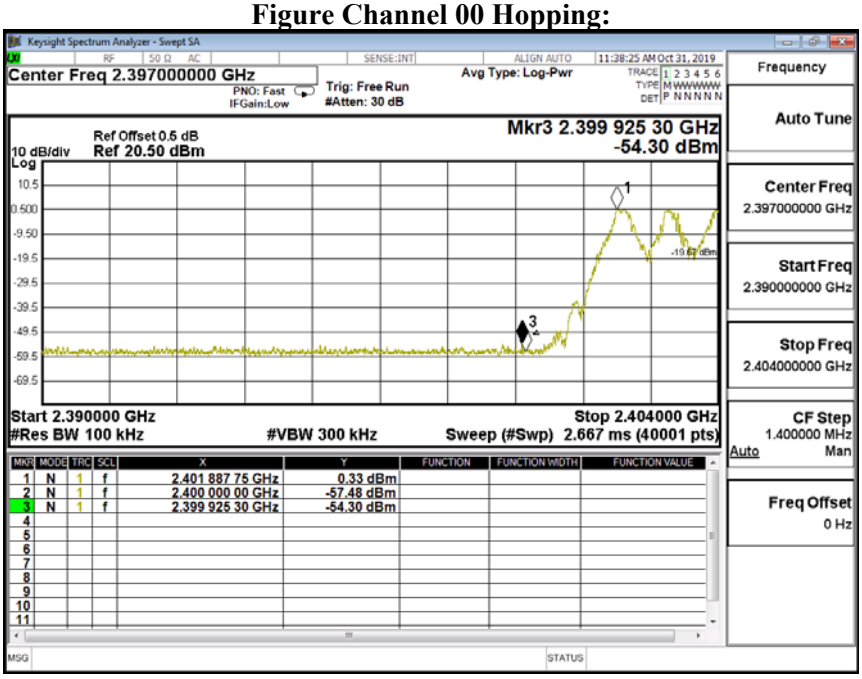
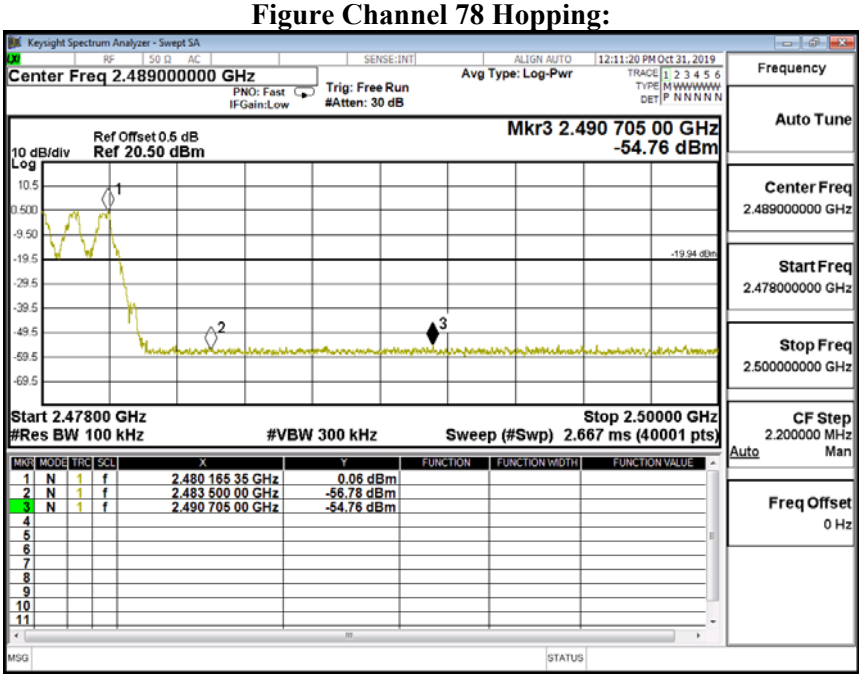


Figure Channel 78 Hopping:



Product : Humly Room Display One
Test Item : Band Edge
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Hopping on)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00 Hopping:

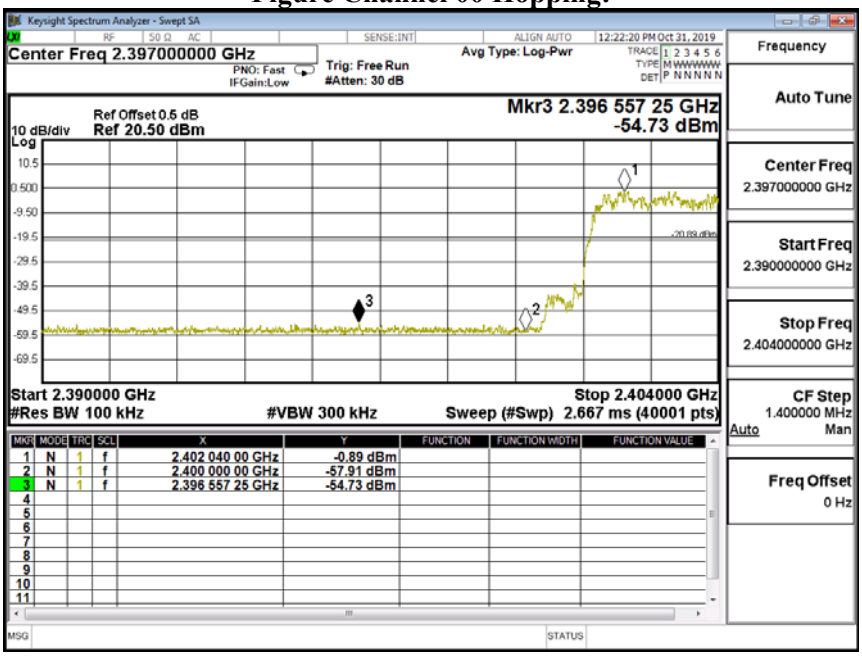
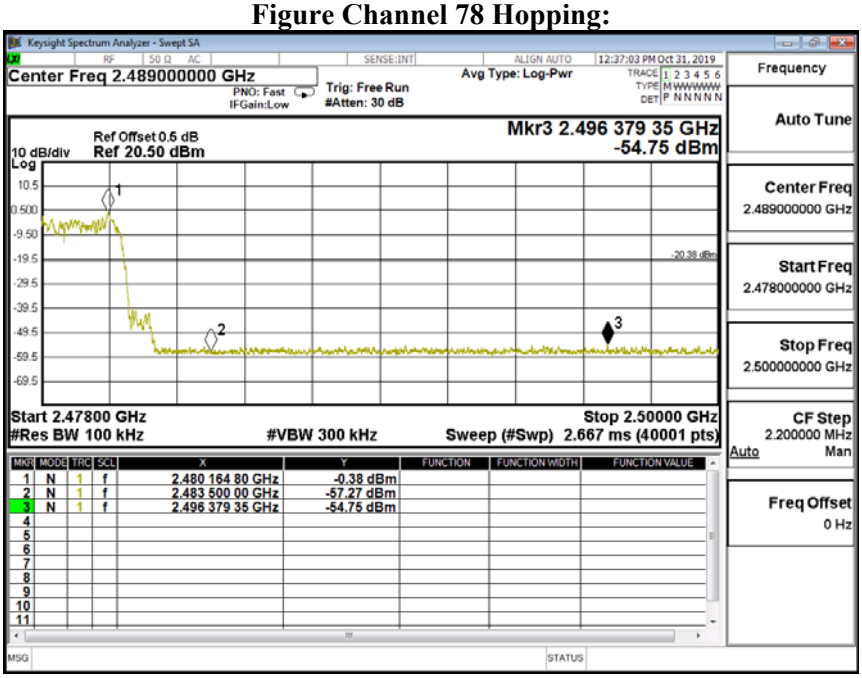
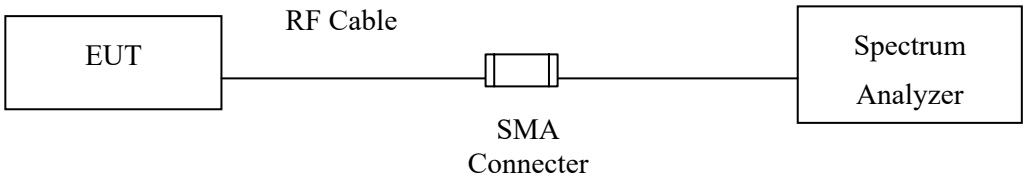


Figure Channel 78 Hopping:



7. Channel Number

7.1. Test Setup



7.2. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

7.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

7.4. Uncertainty

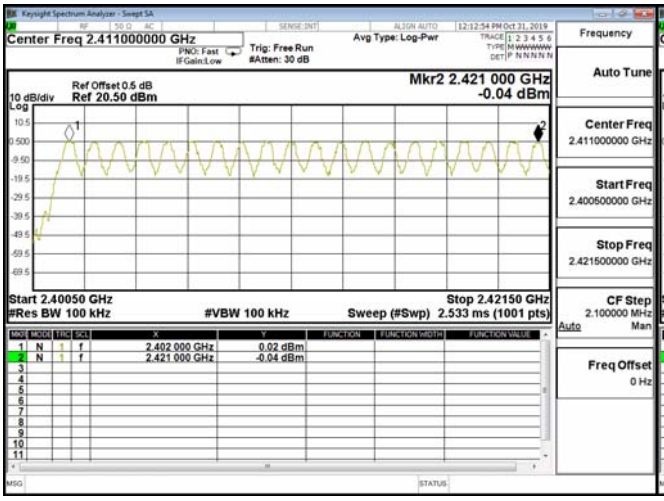
N/A

7.5. Test Result of Channel Number

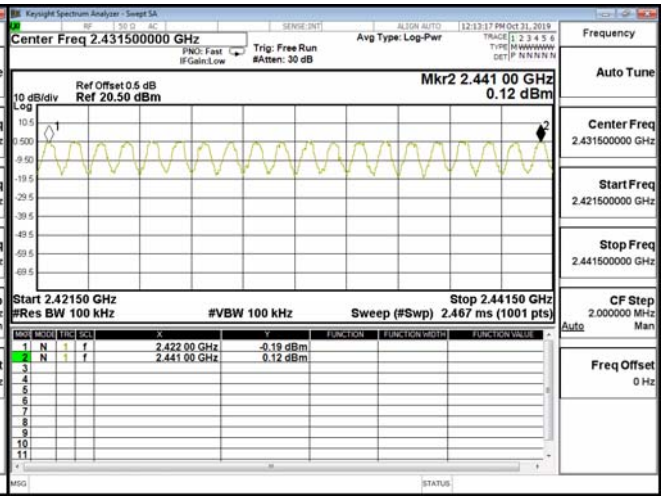
Product : Humly Room Display One
Test Item : Channel Number
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

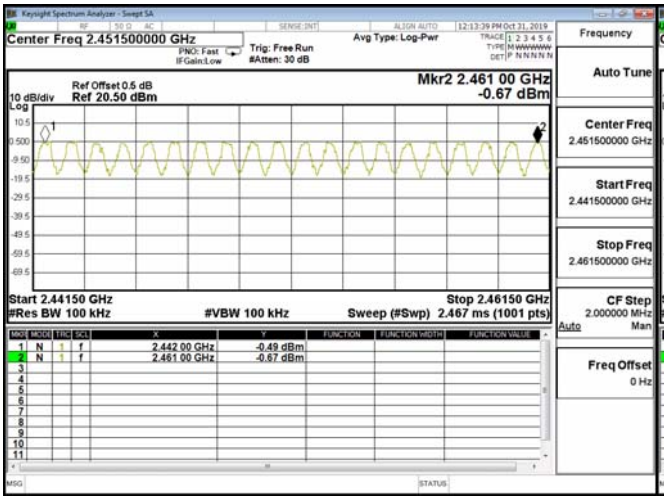
2402-2421MHz



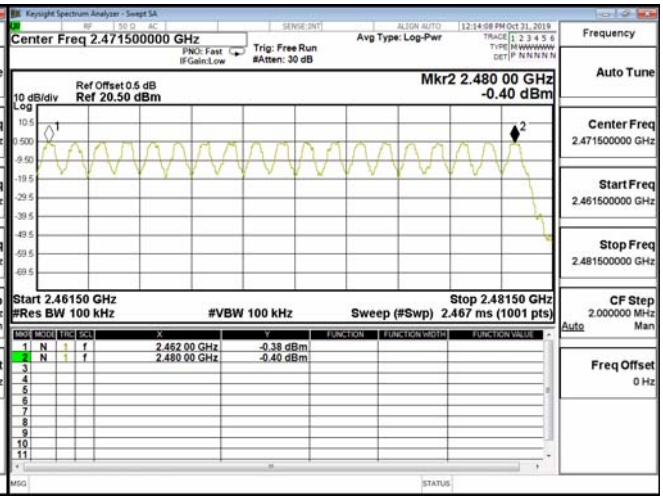
2422-2441MHz



2442-2461MHz



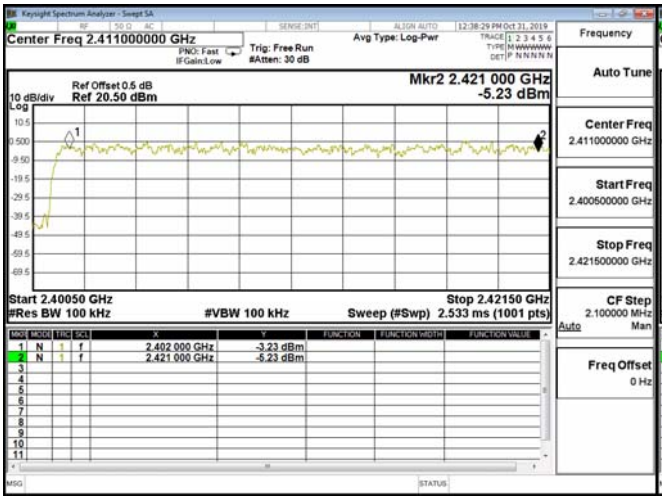
2462-2480MHz



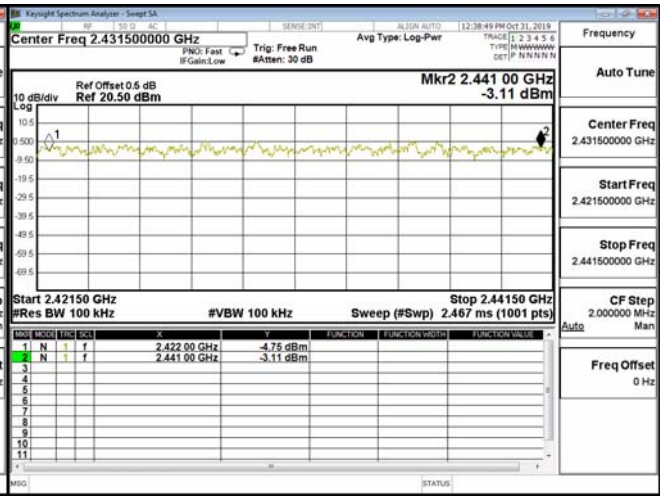
Product : Humly Room Display One
Test Item : Channel Number
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

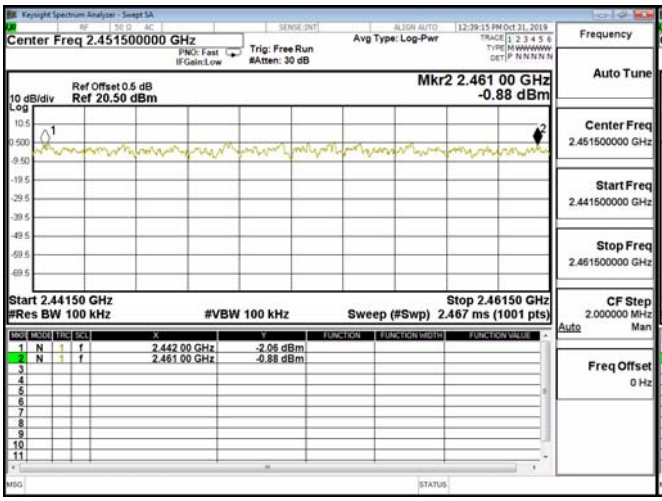
2402-2421MHz



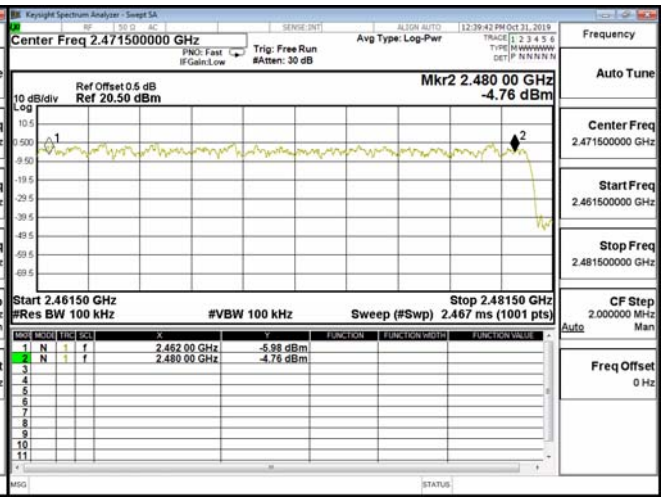
2422-2441MHz



2442-2461MHz

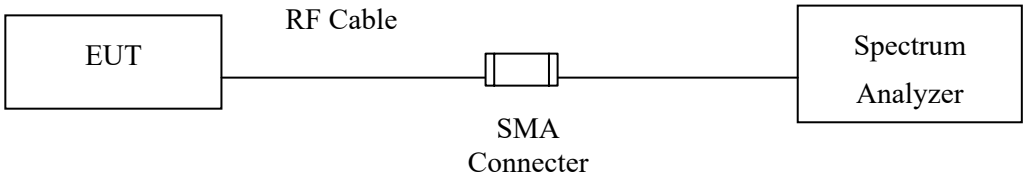


2462-2480MHz



8. Channel Separation

8.1. Test Setup



8.2. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

8.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

8.4. Uncertainty

± 283Hz

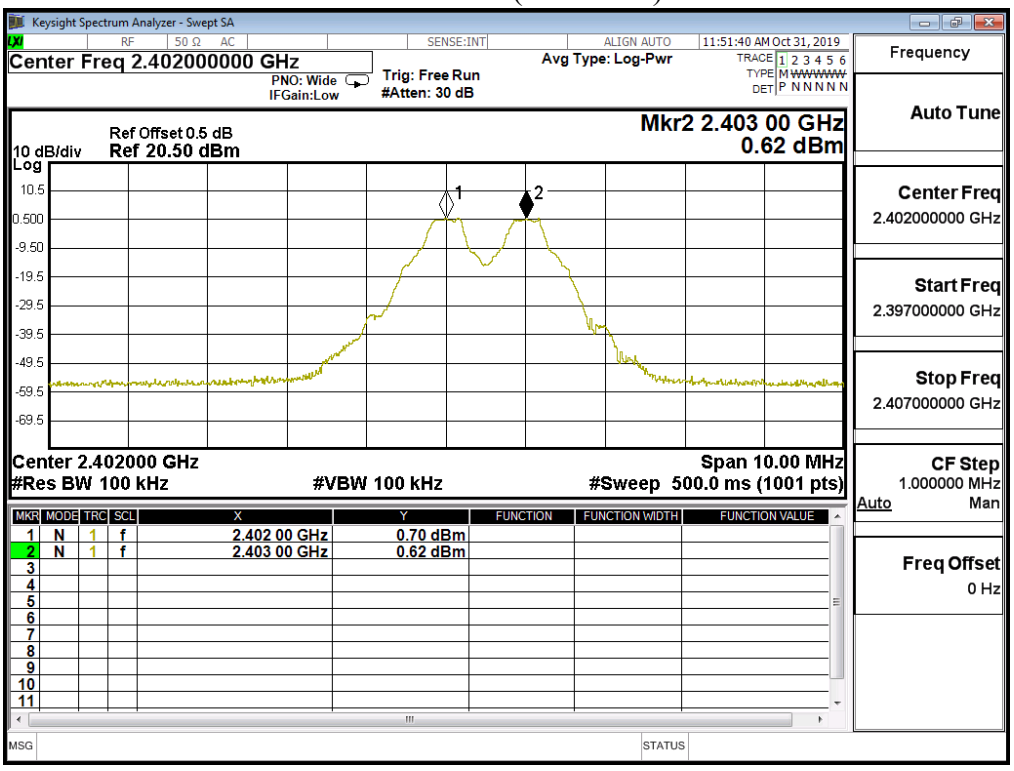
8.5. Test Result of Channel Separation

Product : Humly Room Display One
Test Item : Channel Separation
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

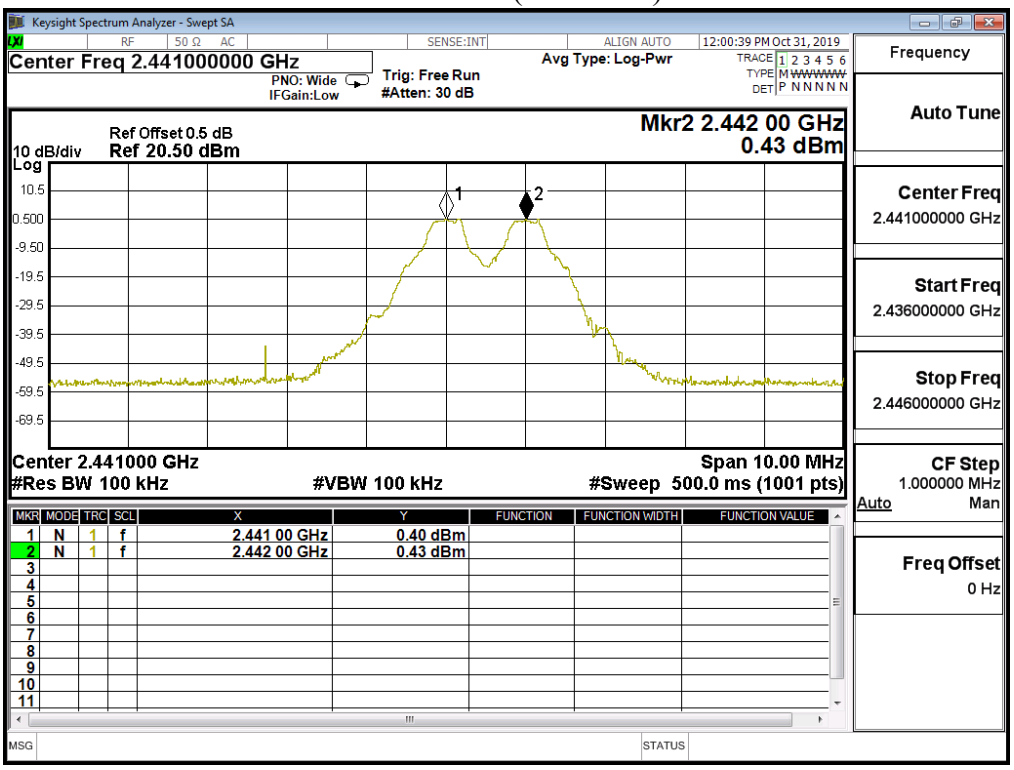
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	688.0	Pass
39	2441	1000	>25 kHz	688.0	Pass
78	2480	1000	>25 kHz	690.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

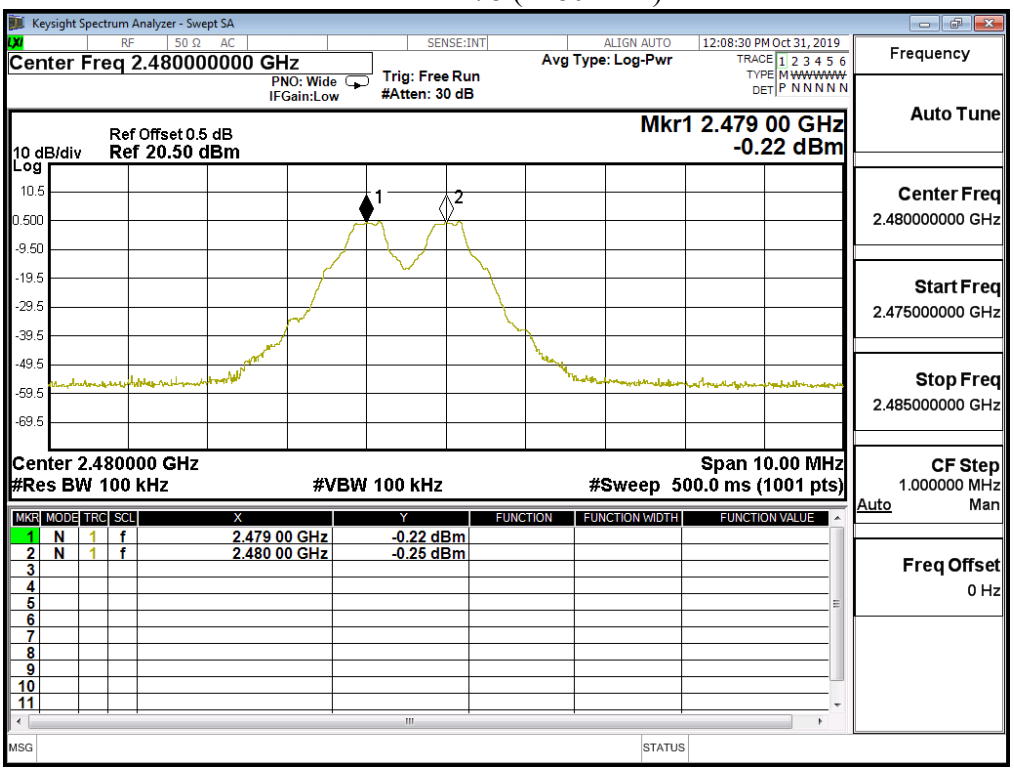
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)

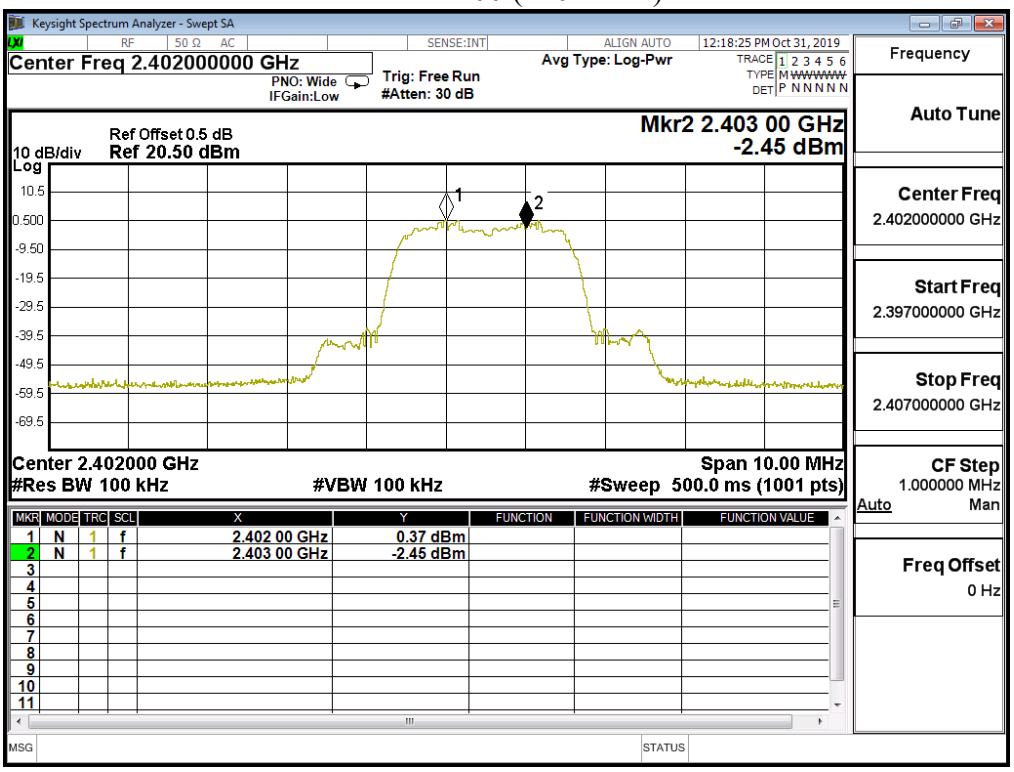


Product : Humly Room Display One
Test Item : Channel Separation
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

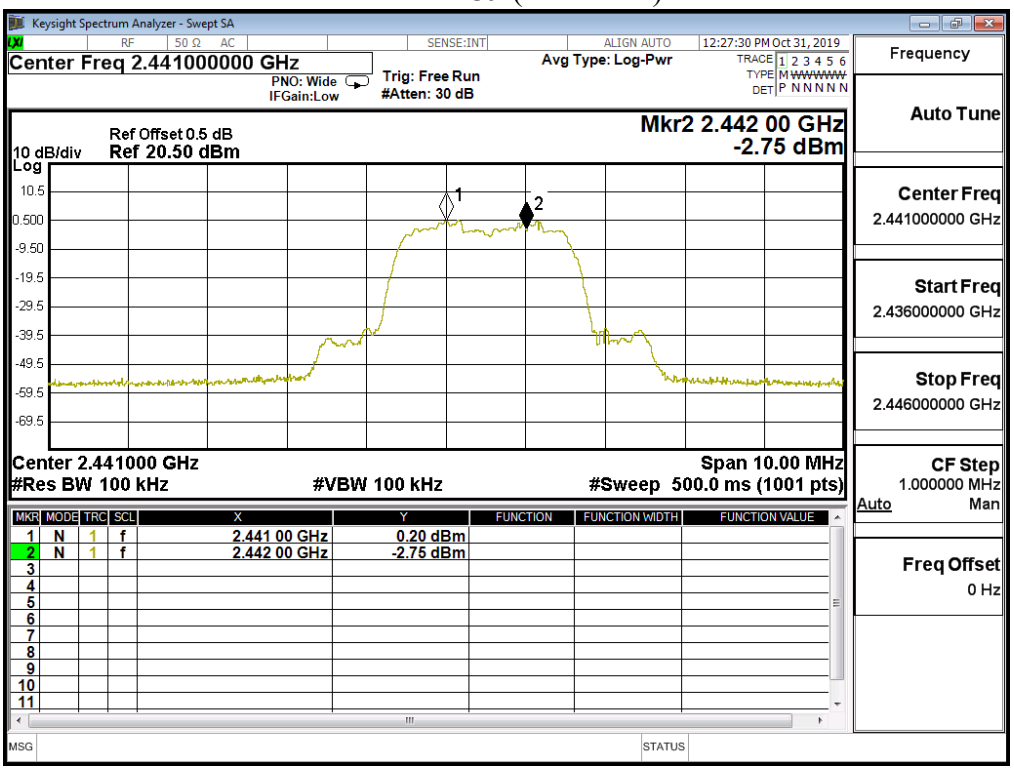
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	882.0	Pass
39	2441	1000	>25 kHz	882.0	Pass
78	2480	1000	>25 kHz	880.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

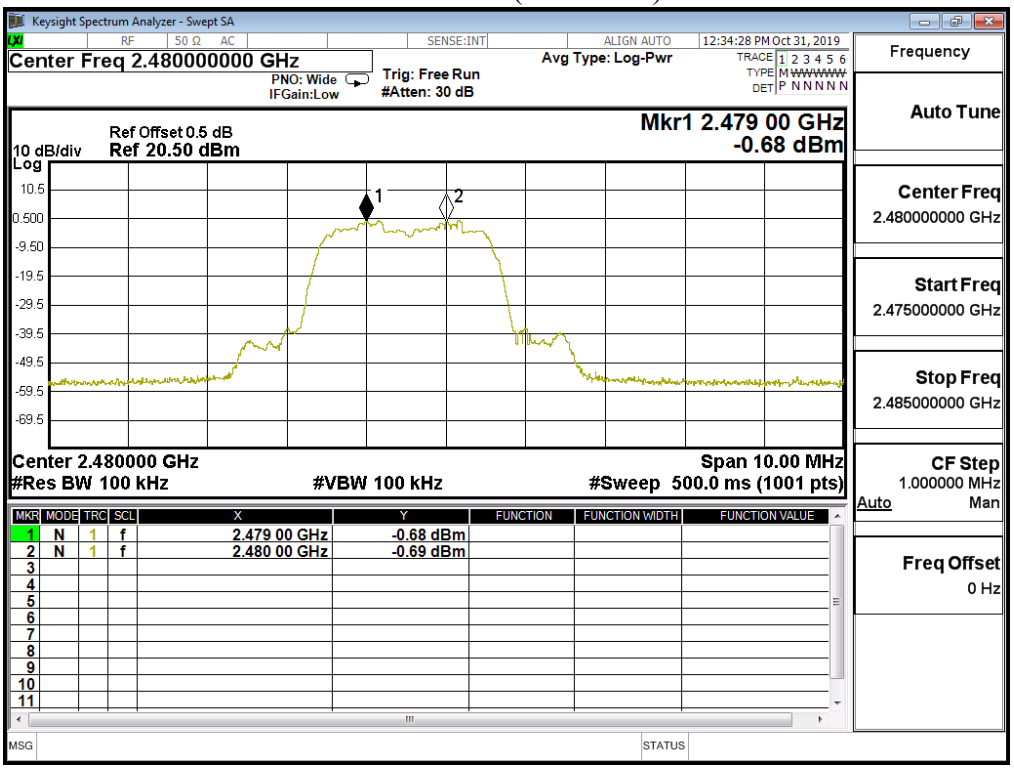
Channel 00 (2402MHz)



Channel 39 (2441MHz)

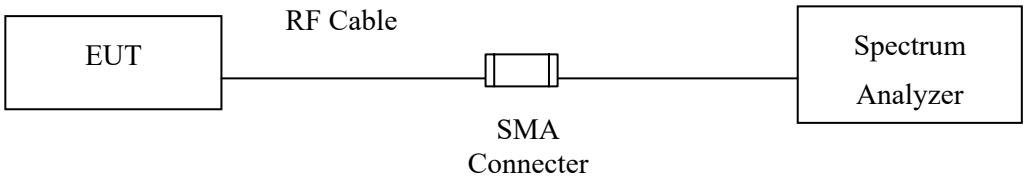


Channel 78 (2480MHz)



9. Dwell Time

9.1. Test Setup



9.2. Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

9.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

9.4. Uncertainty

± 25msec

9.5. Test Result of Dwell Time

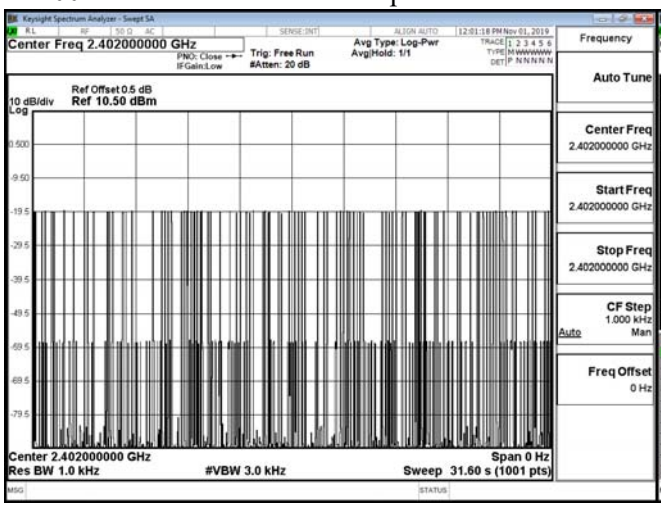
Product : Humly Room Display One
Test Item : Dwell Time
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
2402	2.890	94	31600	271.660	400	Pass
2441	2.890	85	31600	245.650	400	Pass
2480	2.890	89	31600	257.210	400	Pass

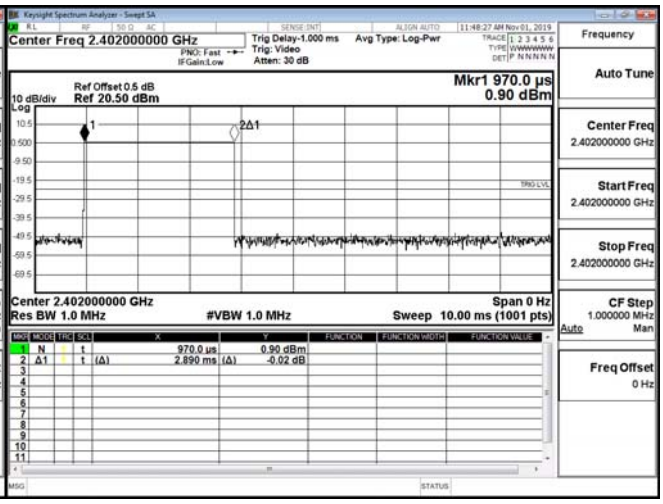
Dwell time = Time slot length*Hopping of number

Sweep time= 79 CHannel * 0.4

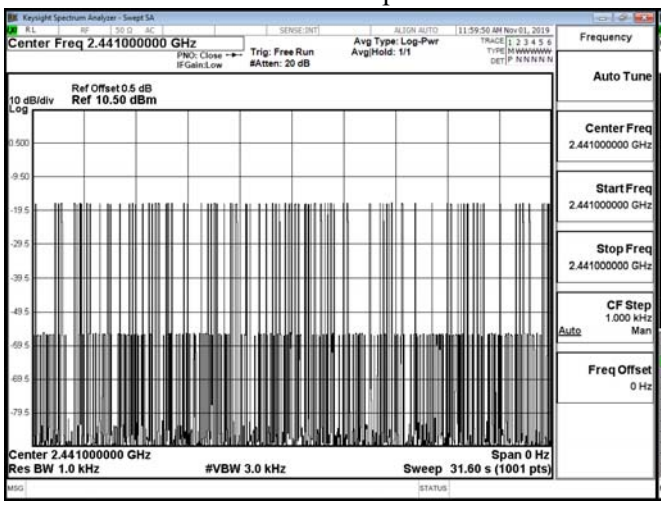
CH 00 Time Interval between hops



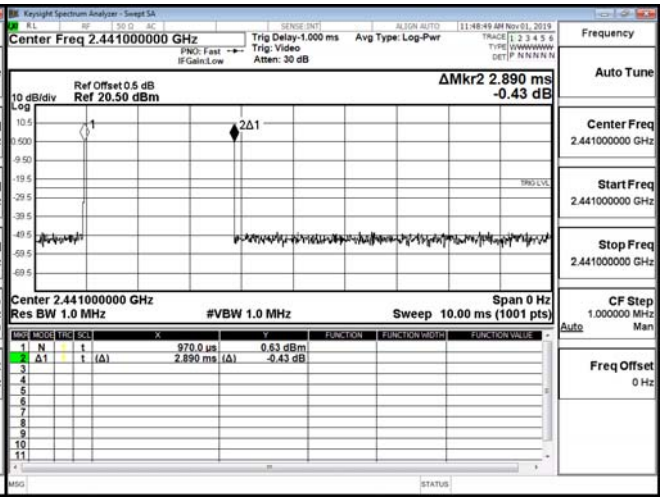
CH 00 Transmission Time



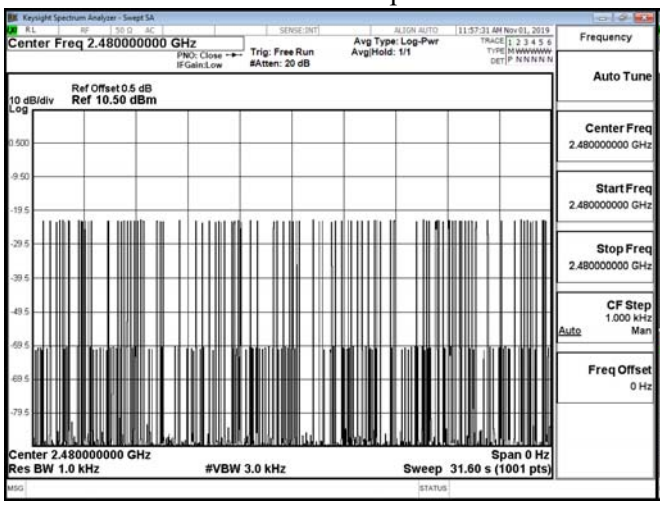
CH39 Time Interval between hops



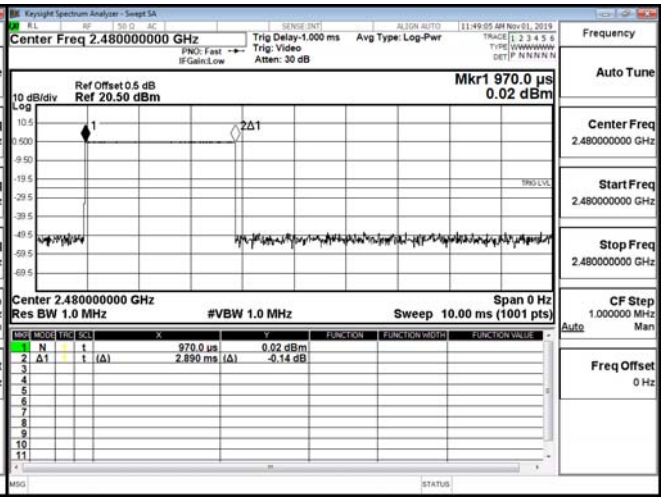
CH 39Transmission Time



CH 78 Time Interval between hops



CH 78 Transmission Time



Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

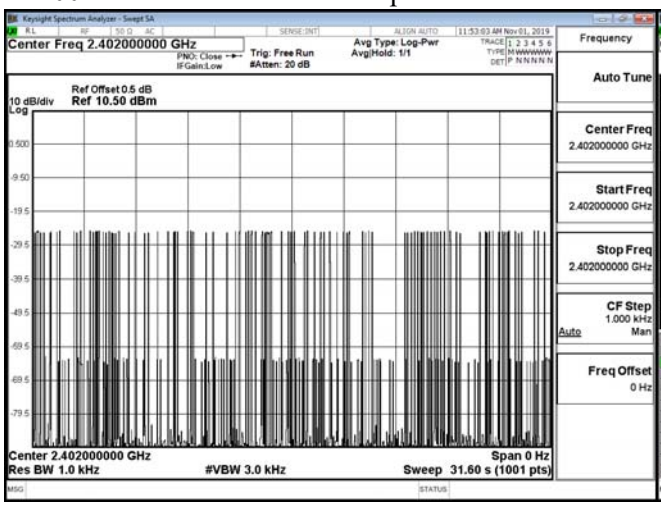
Product : Humly Room Display One
Test Item : Dwell Time
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
2402	2.890	91	31600	262.990	400	Pass
2441	2.890	89	31600	257.210	400	Pass
2480	2.890	86	31600	248.540	400	Pass

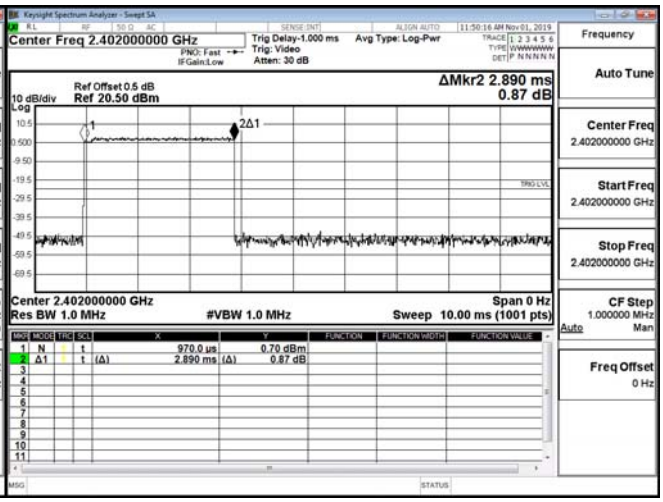
Dwell time = Time slot length*Hopping of number

Sweep time= 79 CHannel * 0.4

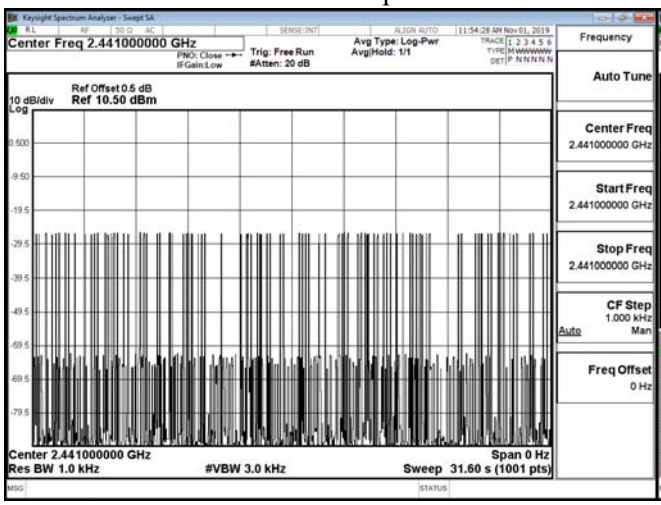
CH 00 Time Interval between hops



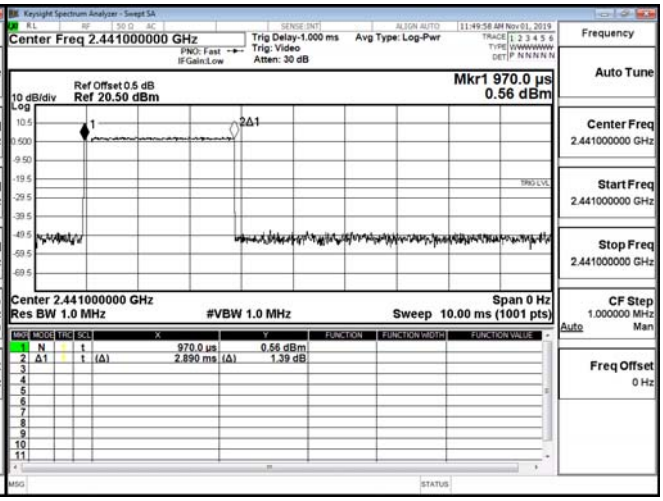
CH 00 Transmission Time



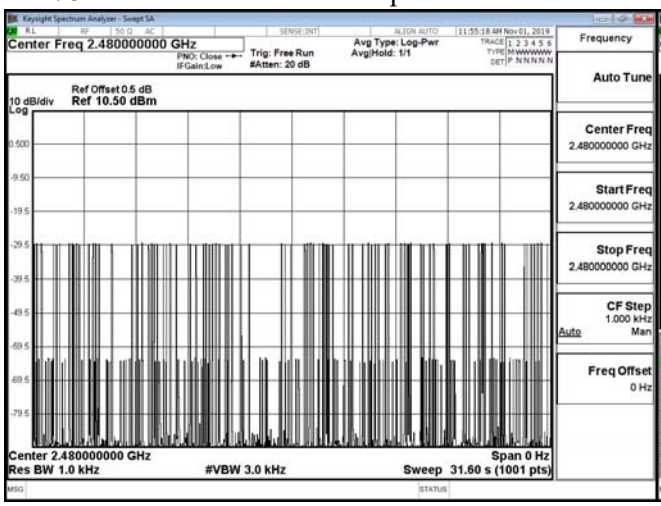
CH39 Time Interval between hops



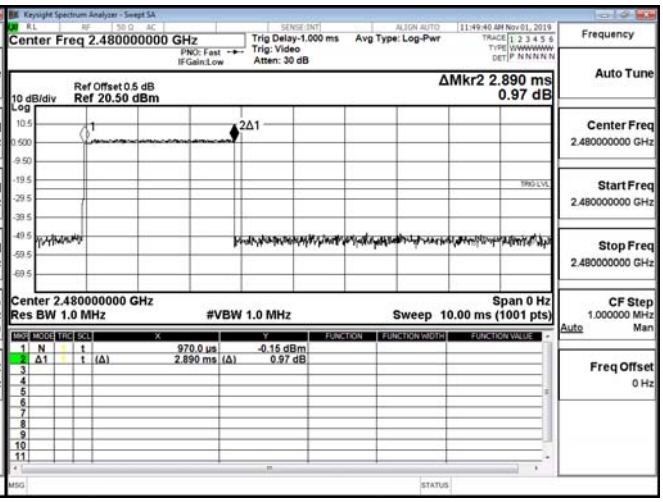
CH 39Transmission Time



CH 78 Time Interval between hops



CH 78 Transmission Time

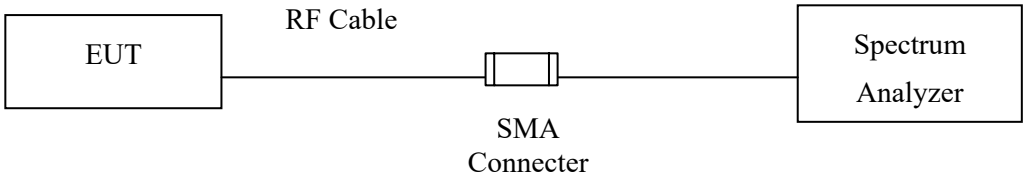


Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

10. Occupied Bandwidth

10.1. Test Setup



10.2. Limits

N/A

10.3. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

10.4. Uncertainty

± 283Hz

10.5. Test Result of Occupied Bandwidth

Product : Humly Room Display One
Test Item : Occupied Bandwidth Data
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1032	--	NA
39	2441	1032	--	NA
78	2480	1035	--	NA

Figure Channel 00:

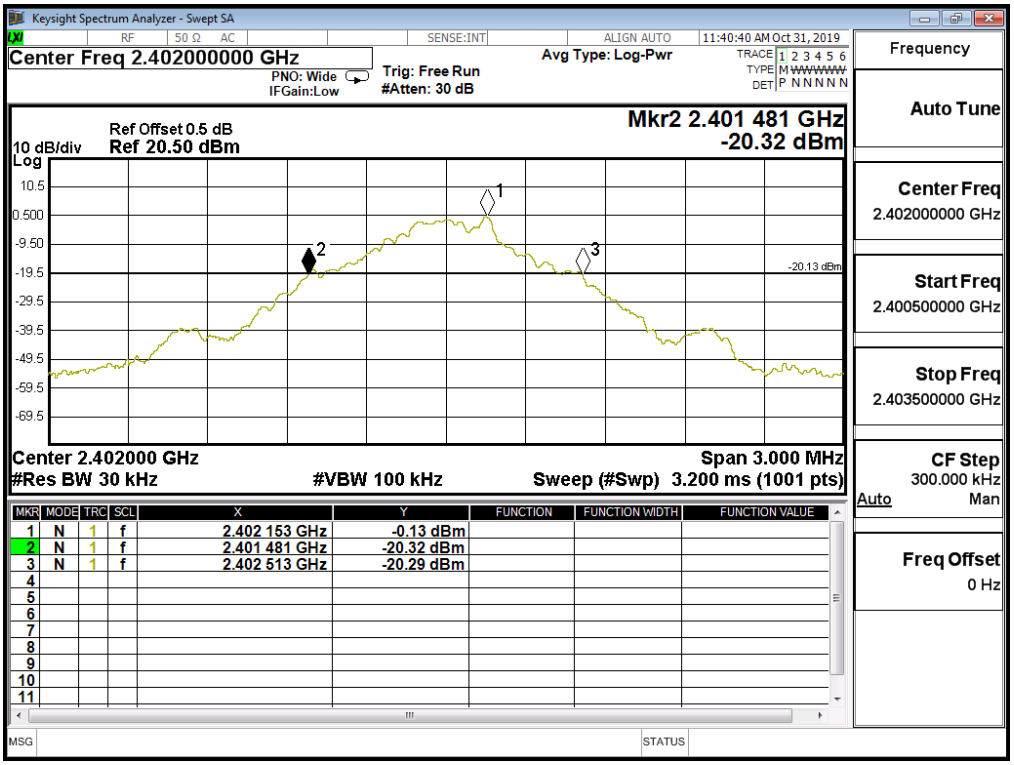


Figure Channel 39:

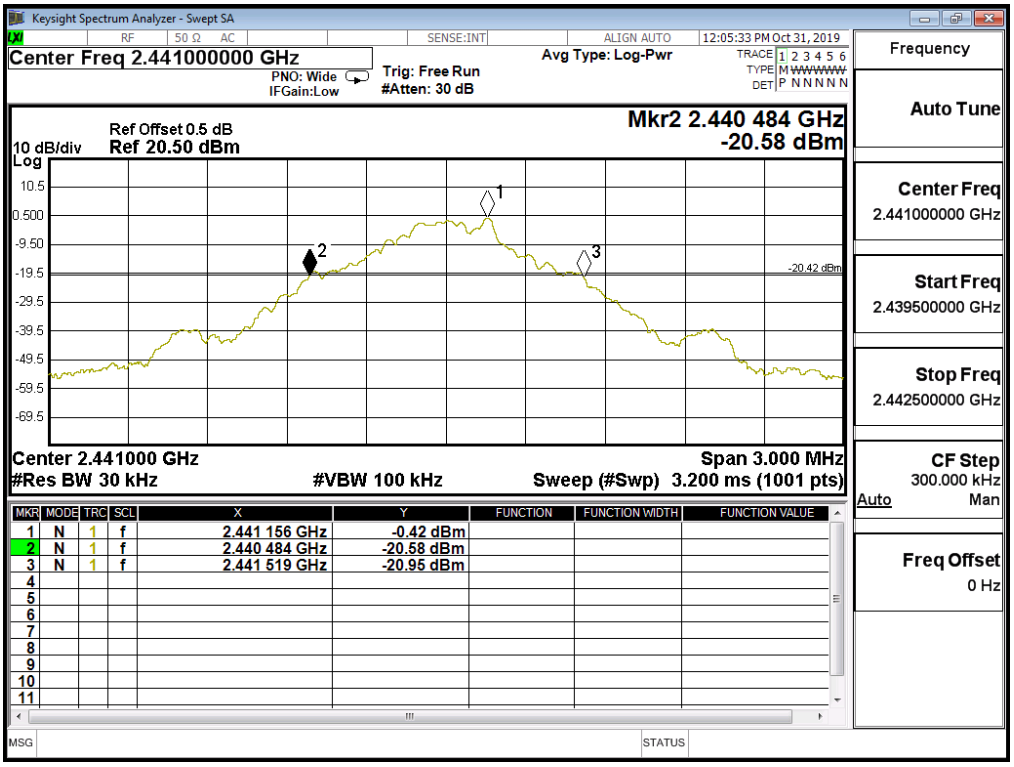
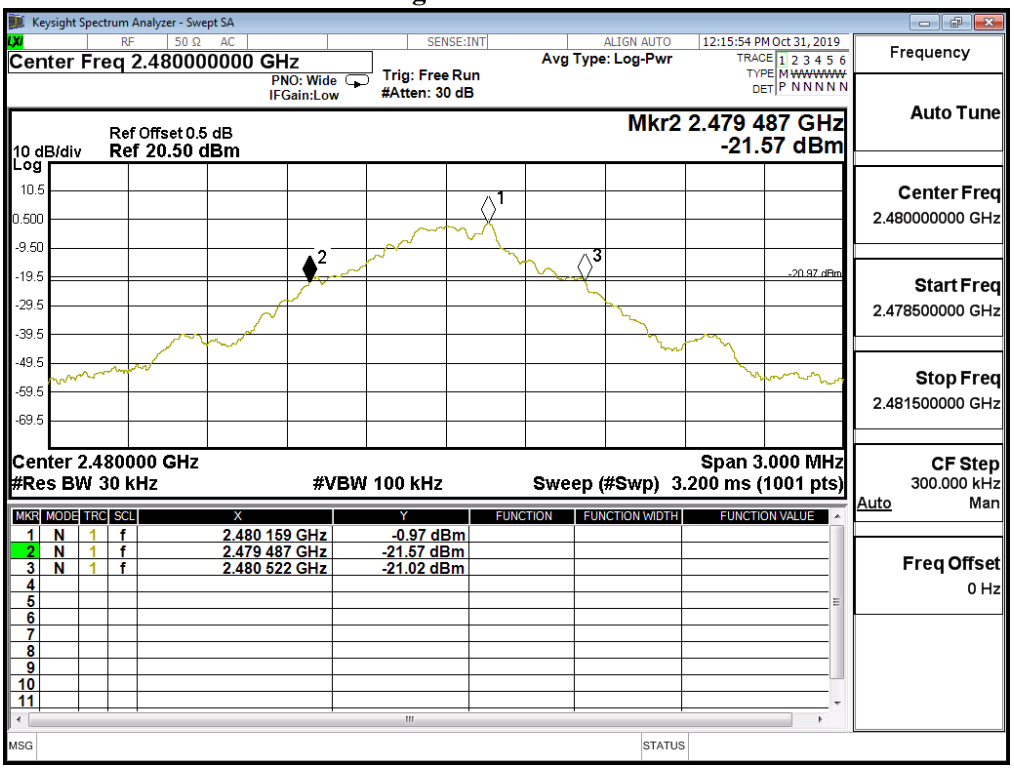


Figure Channel 78:



Product : Humly Room Display One
Test Item : Occupied Bandwidth Data
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1323	--	NA
39	2441	1323	--	NA
78	2480	1320	--	NA

Figure Channel 00:

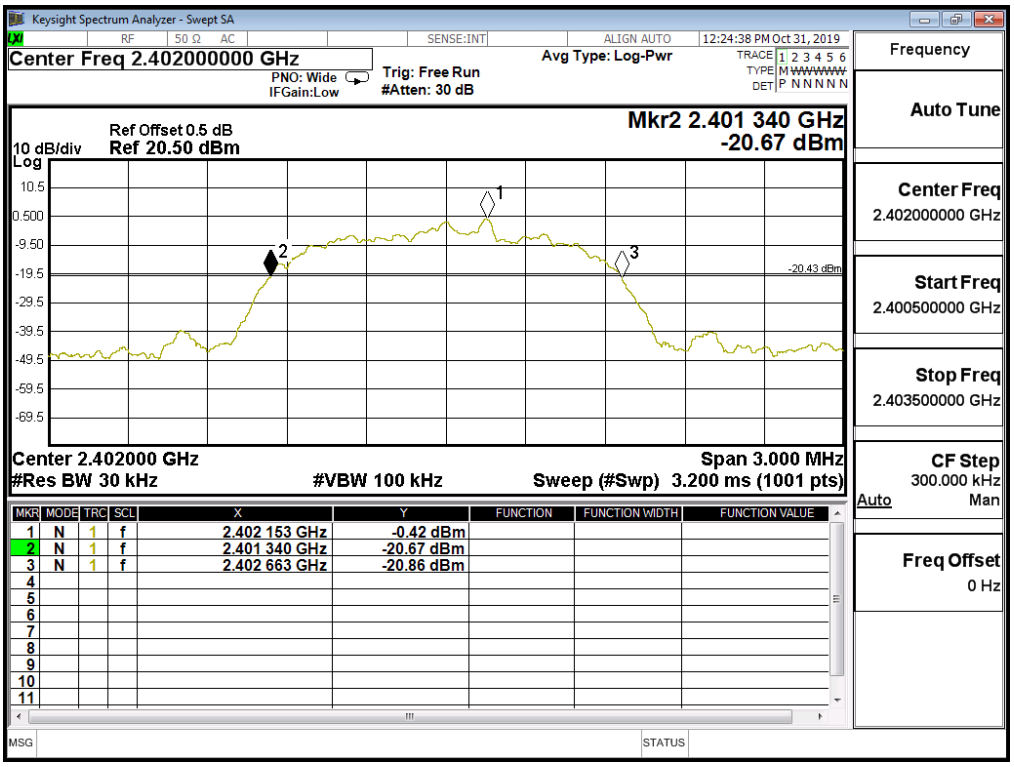


Figure Channel 39:

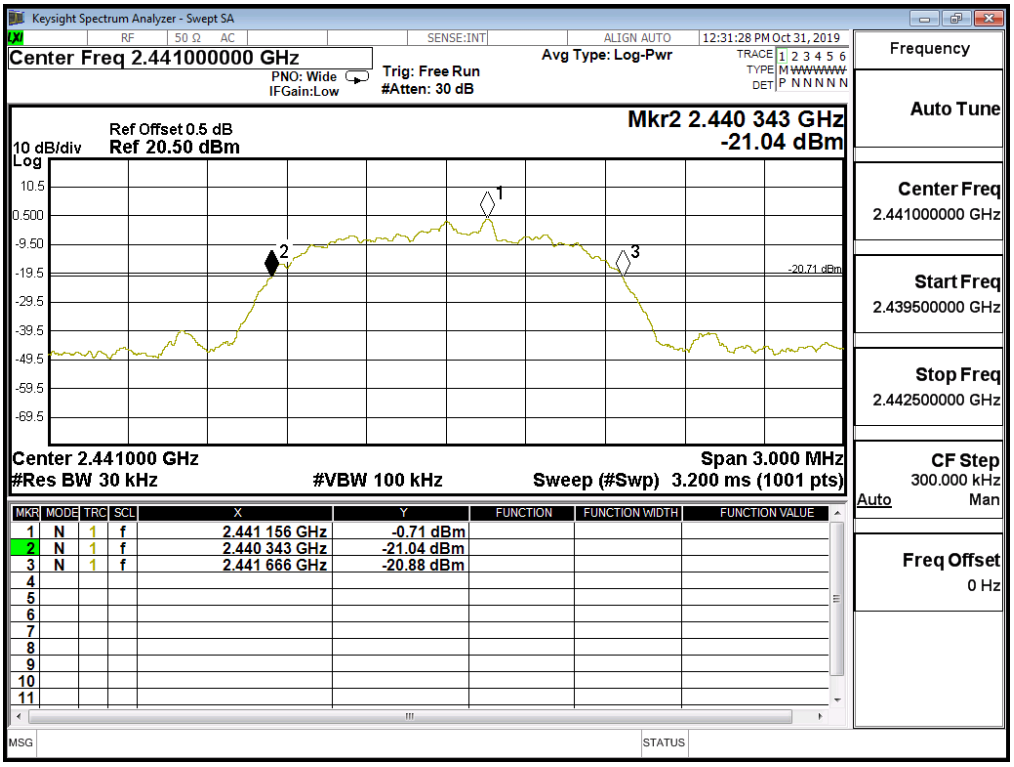
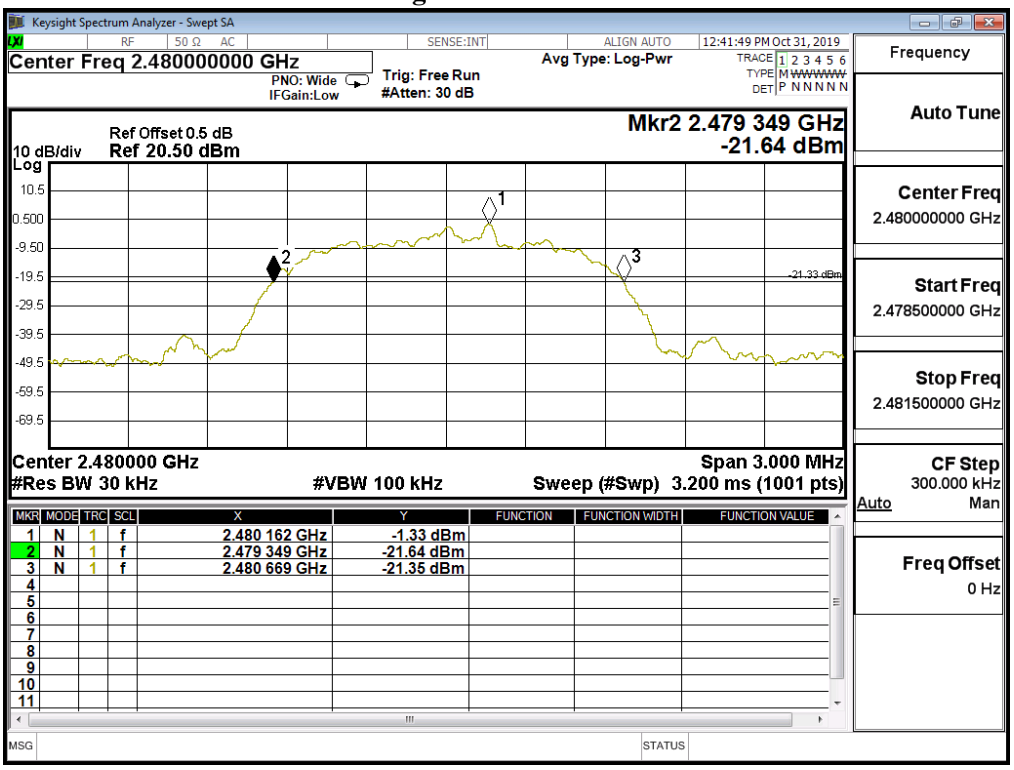
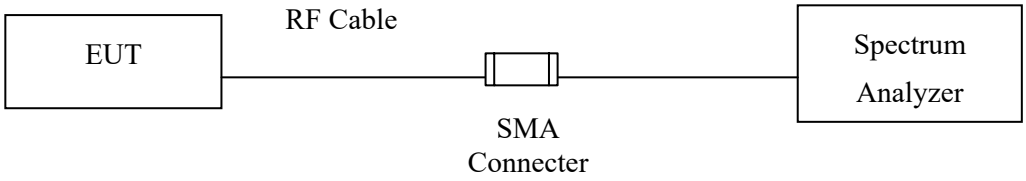


Figure Channel 78:



11. Duty Cycle

11.1. Test Setup

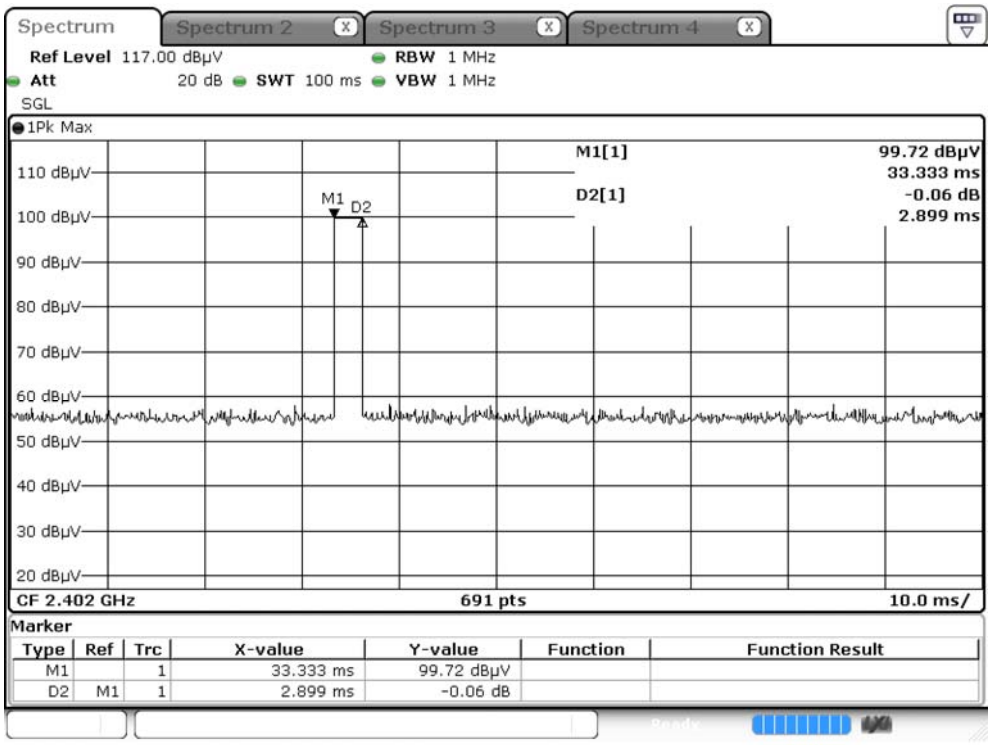


11.2. Uncertainty

± 25msec

11.3. Test Result of Duty Cycle

Product : Humly Room Display One
Test Item : Duty Cycle
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)



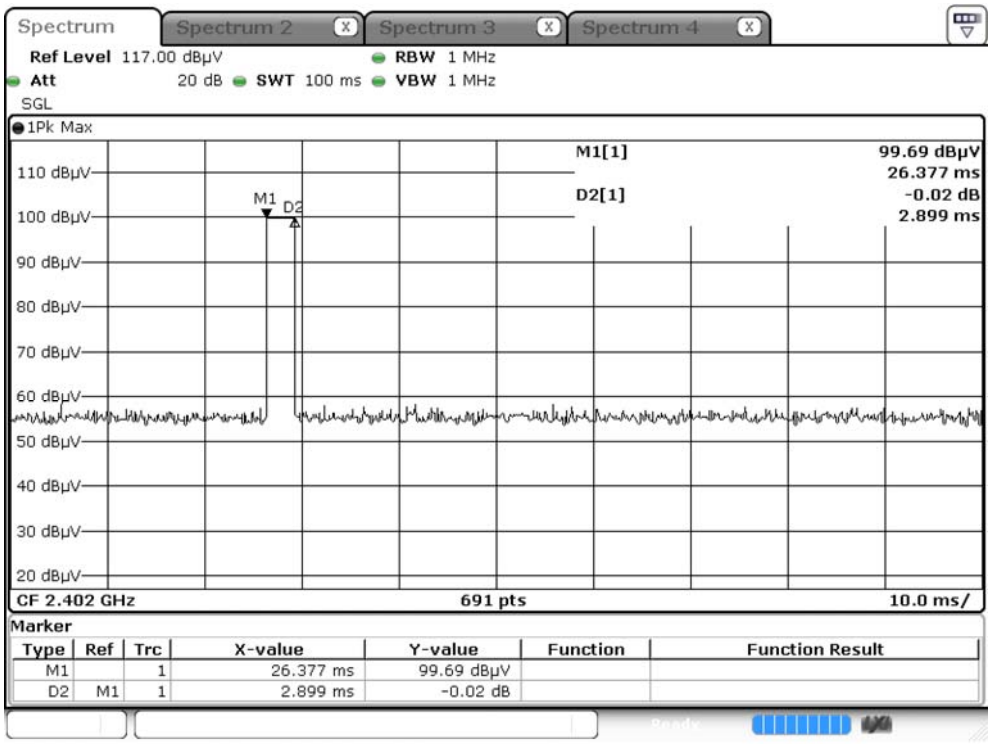
Time on of 100ms= 2.899ms

Duty Cycle=2.899ms / 100ms= 0.02899

Duty Cycle correction factor= 20 LOG 0.02899= -30.755 dB

Duty Cycle correction factor	-30.755	**dB**

Product : Humly Room Display One
Test Item : Duty Cycle
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)



Time on of 100ms= 2.899ms

Duty Cycle=2.899ms / 100ms= 0.02899

Duty Cycle correction factor= 20 LOG 0.02899= -30.755 dB

Duty Cycle correction factor	-30.755	**dB**

12. EMI Reduction Method During Compliance Testing

No modification was made during testing.