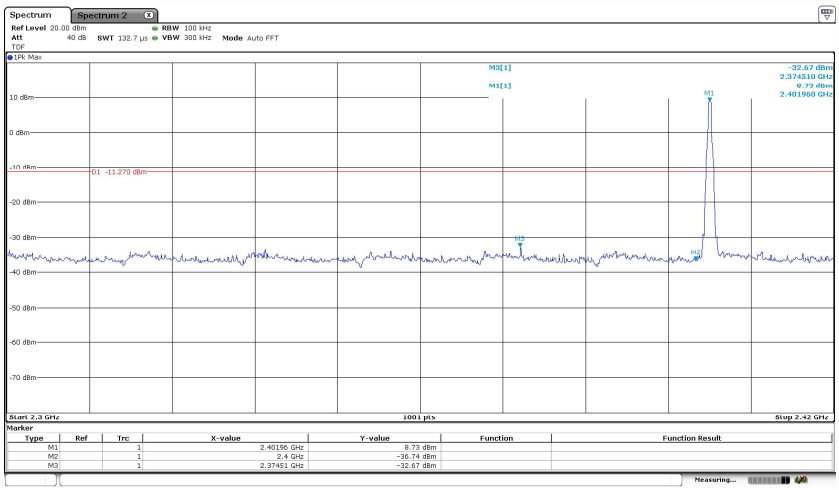
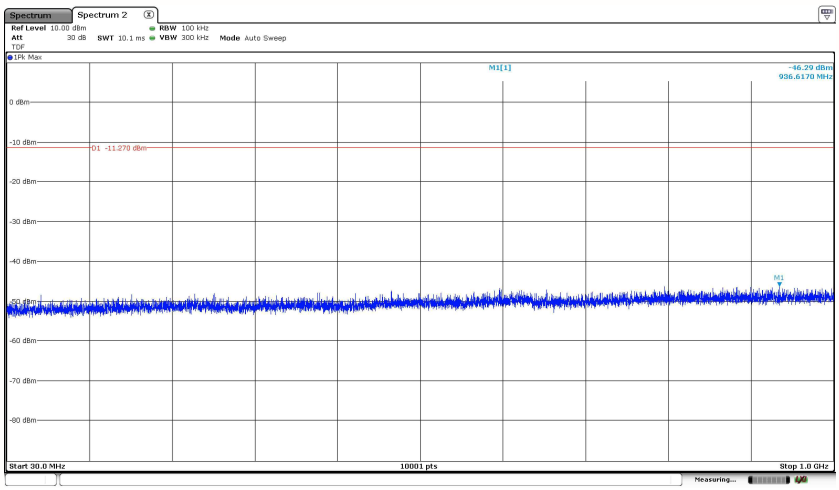
test plot as follows:

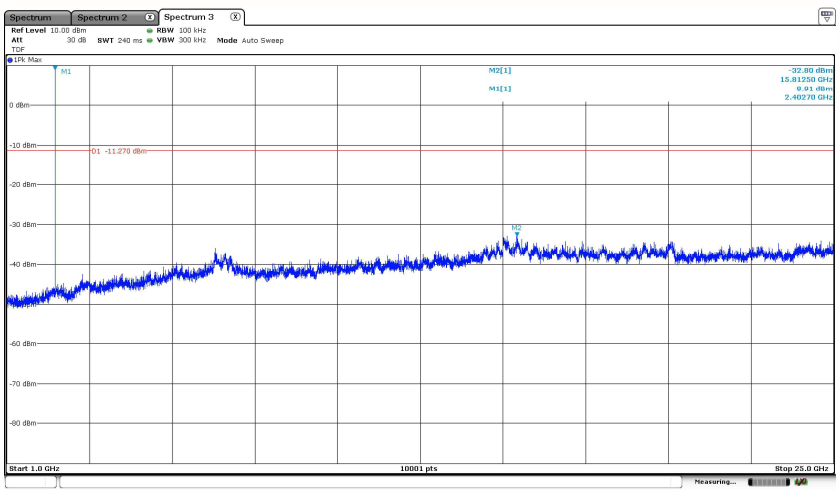
BDR	Test Channel:	Lowest



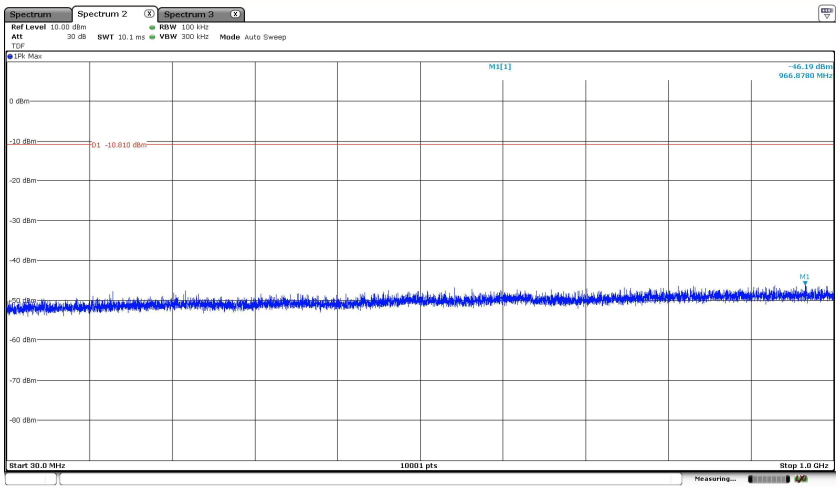
BDR	Test Channel:	Lowest



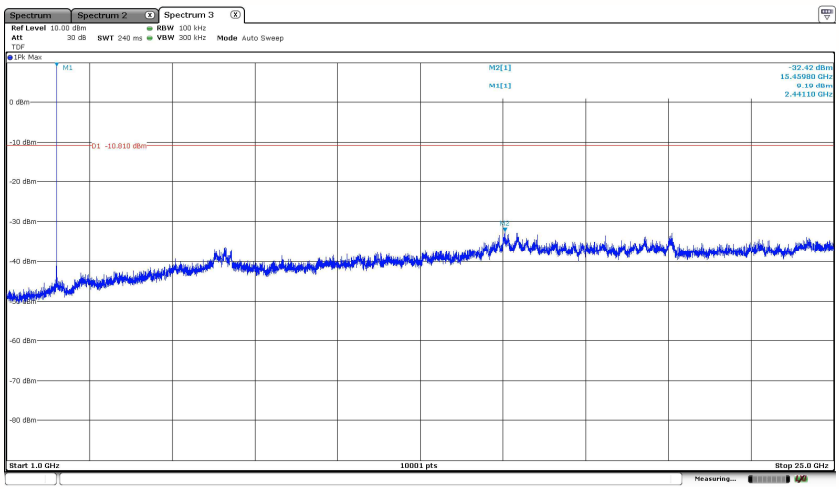
BDR	Test Channel:	Lowest



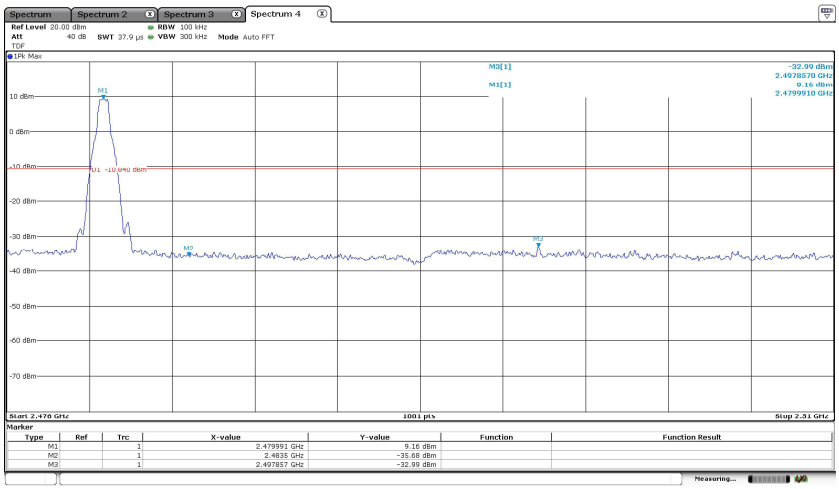
BDR	Test Channel:	Middle



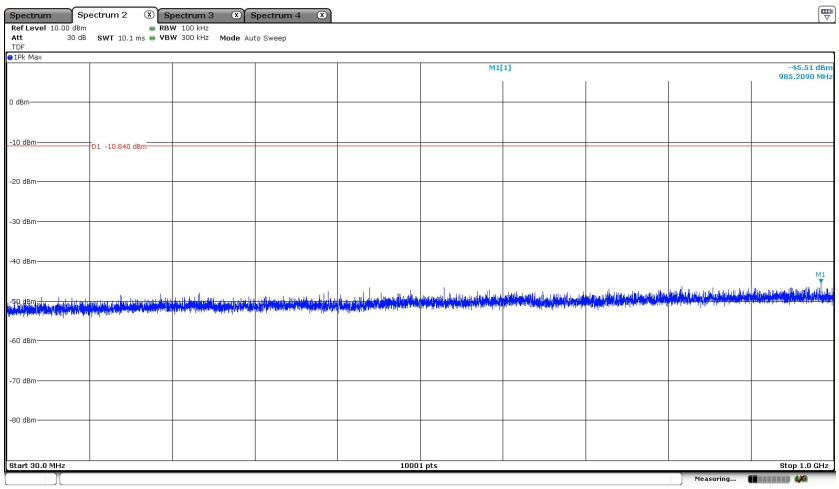
BDR	Test Channel:	Middle



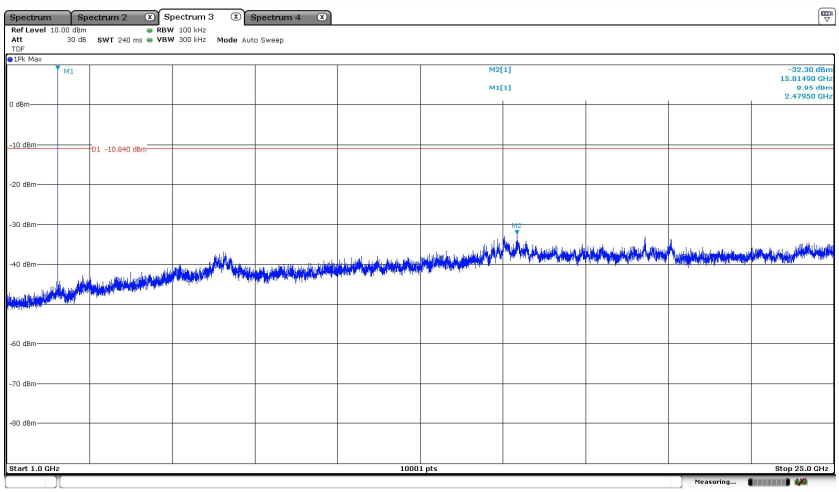
BDR	Test Channel:	Highest



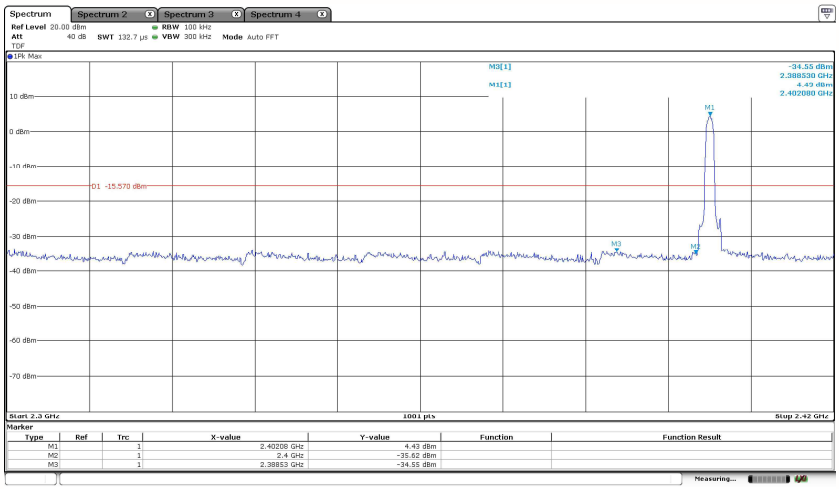
BDR	Test Channel:	Highest



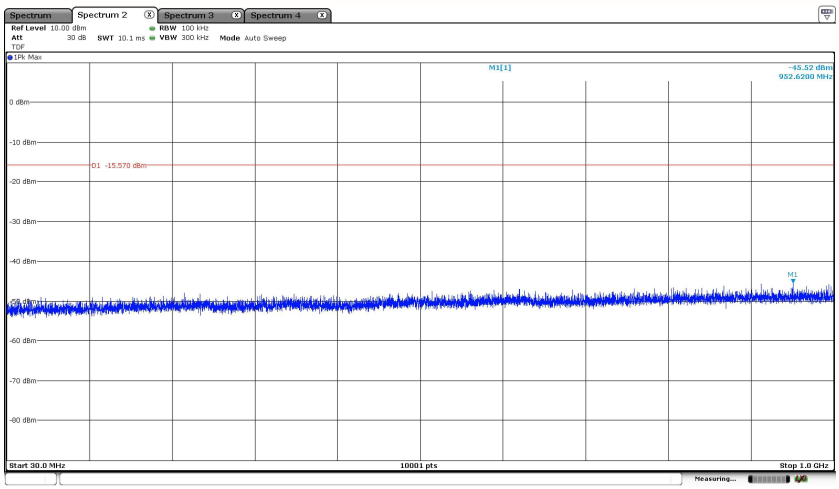
BDR	Test Channel:	Highest



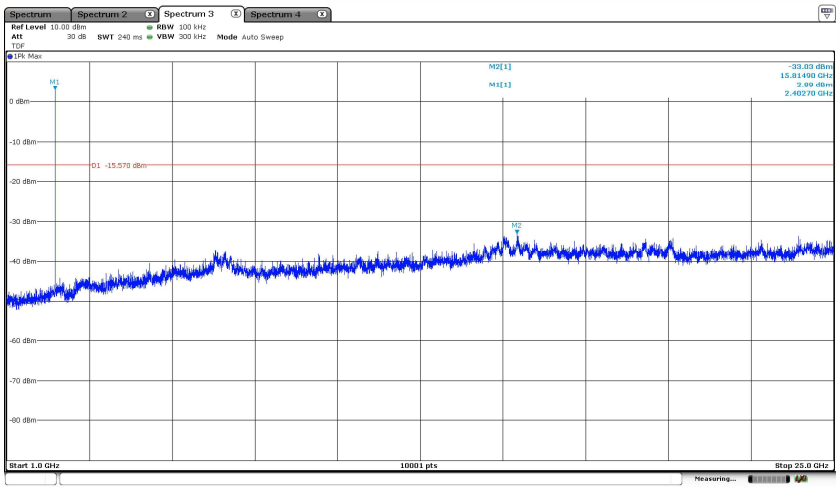
EDR(2M)	Test Channel:	Lowest



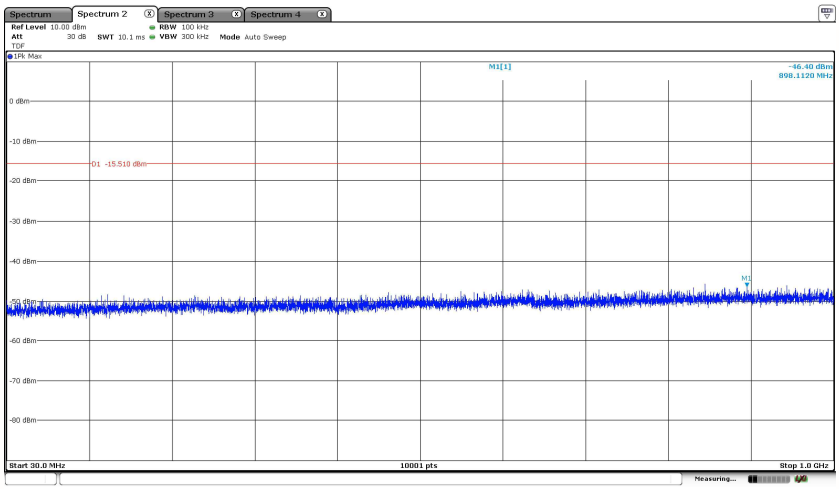
EDR(2M)	Test Channel:	Lowest



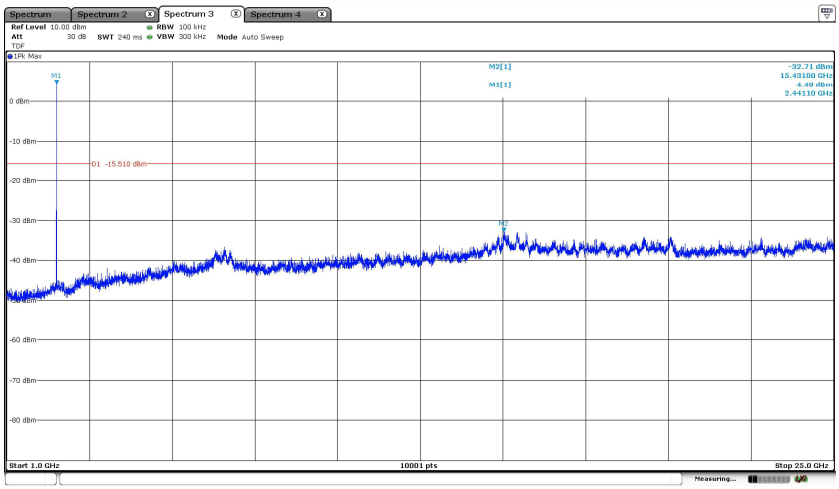
EDR(2M)	Test Channel:	Lowest



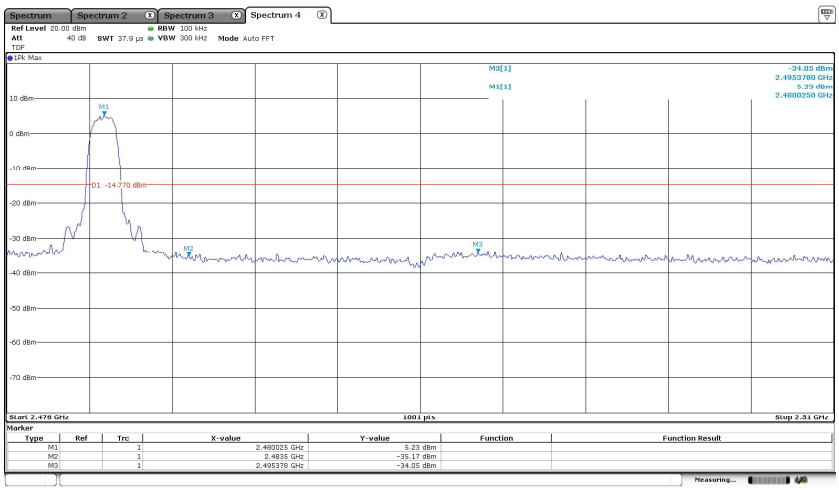
EDR(2M)	Test Channel:	Middle



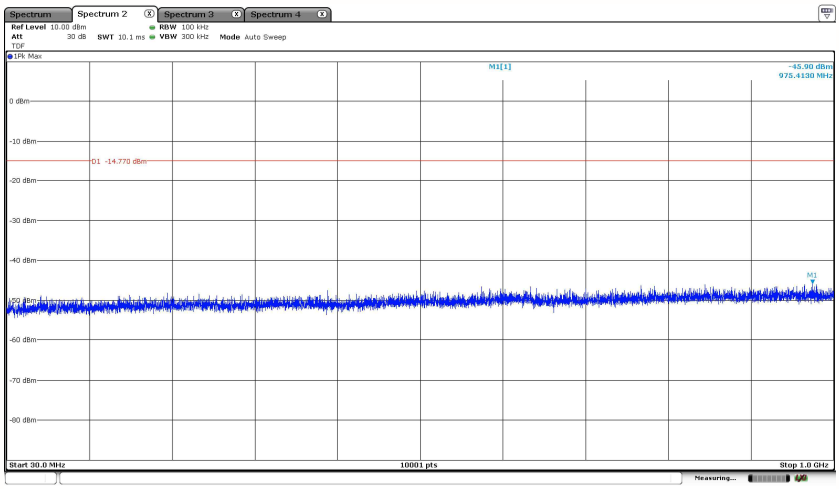
EDR(2M)	Test Channel:	Middle



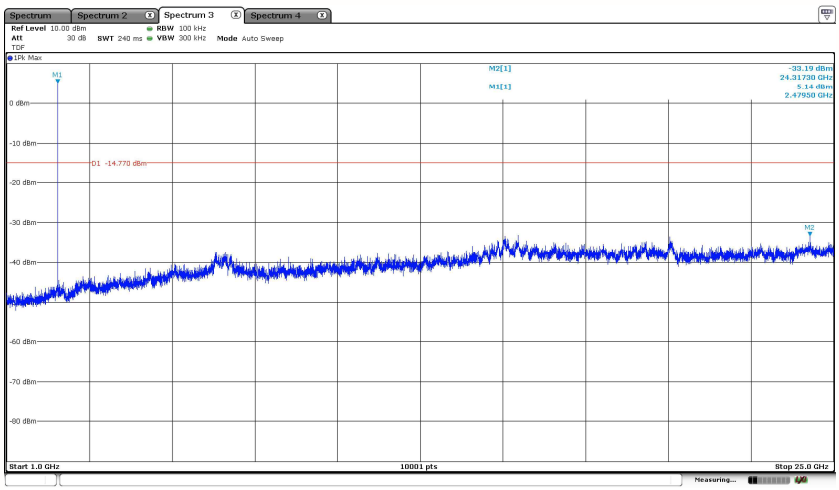
EDR(2M)	Test Channel:	Highest



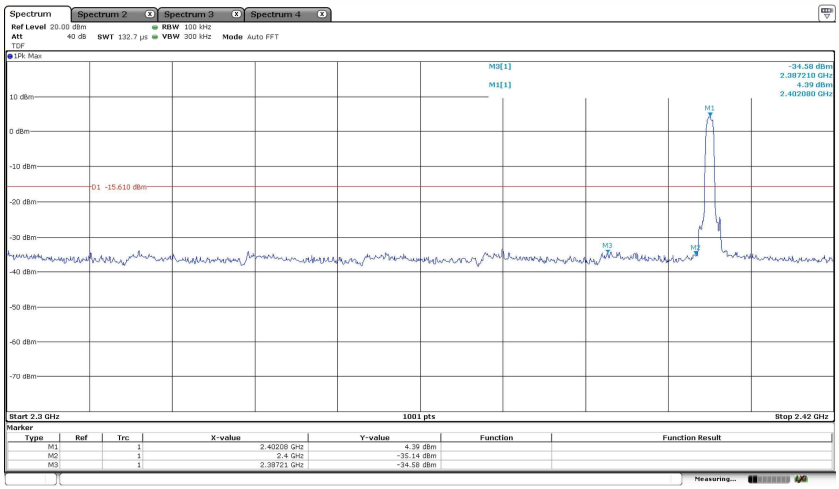
EDR(2M)	Test Channel:	Highest



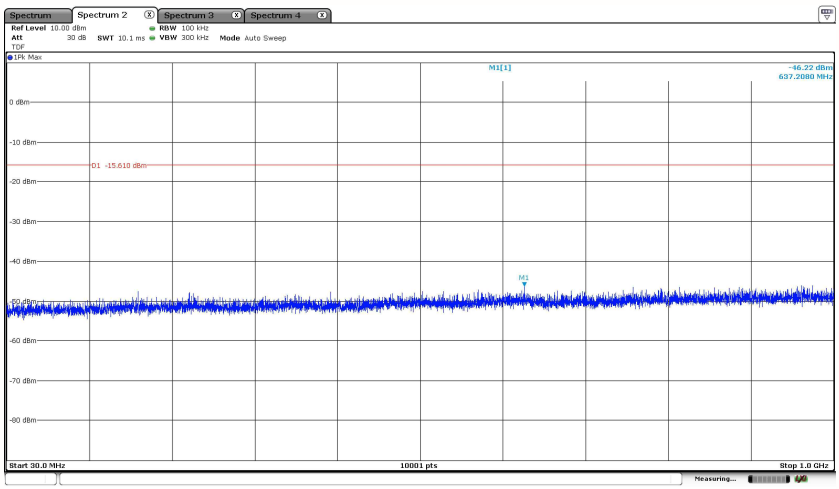
EDR(2M)	Test Channel:	Highest



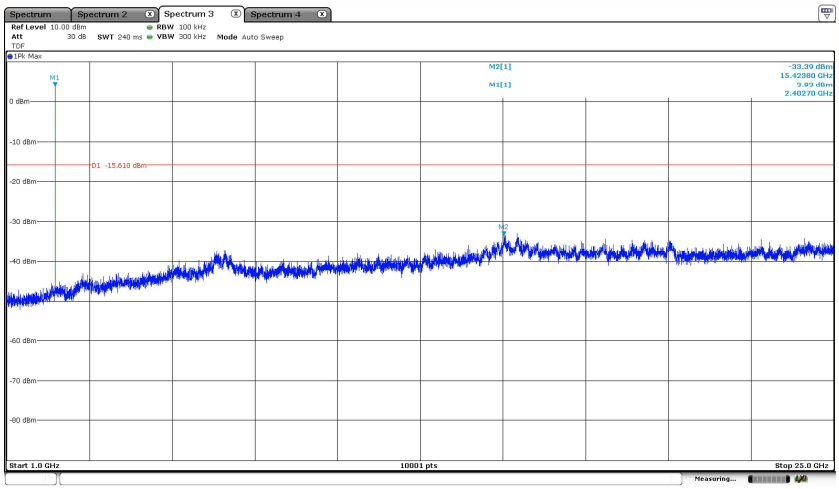
EDR(3M)	Test Channel:	Lowest



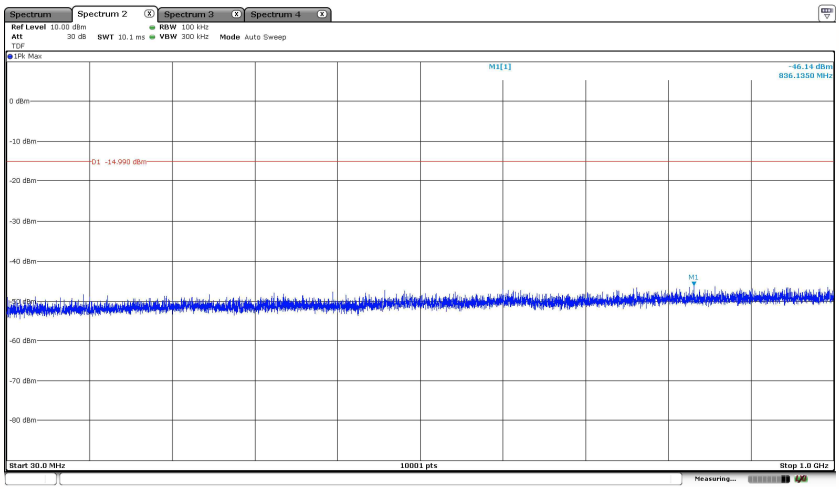
EDR(3M)	Test Channel:	Lowest



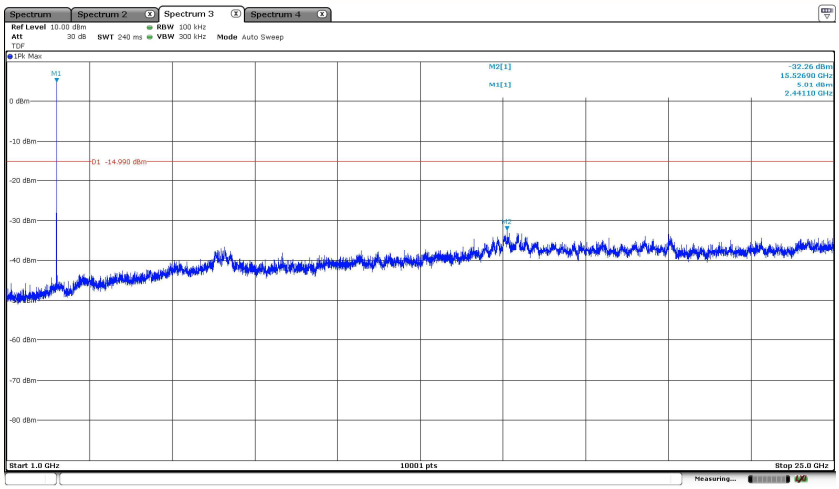
EDR(3M)	Test Channel:	Lowest



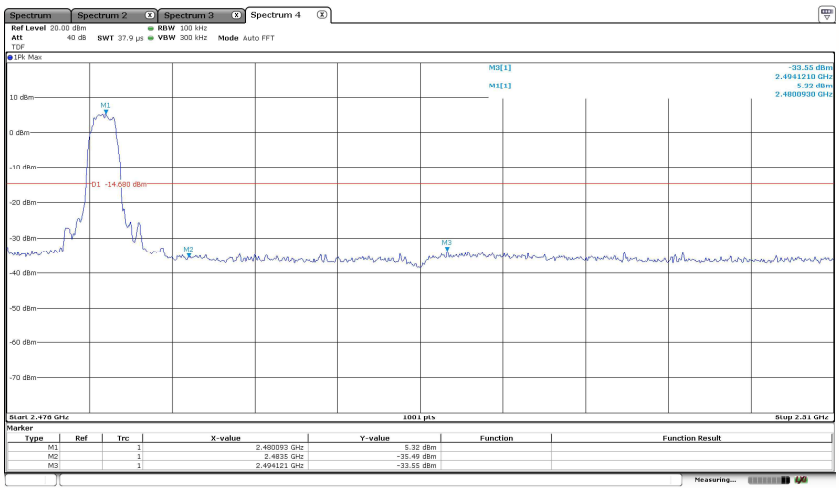
EDR(3M)	Test Channel:	Middle



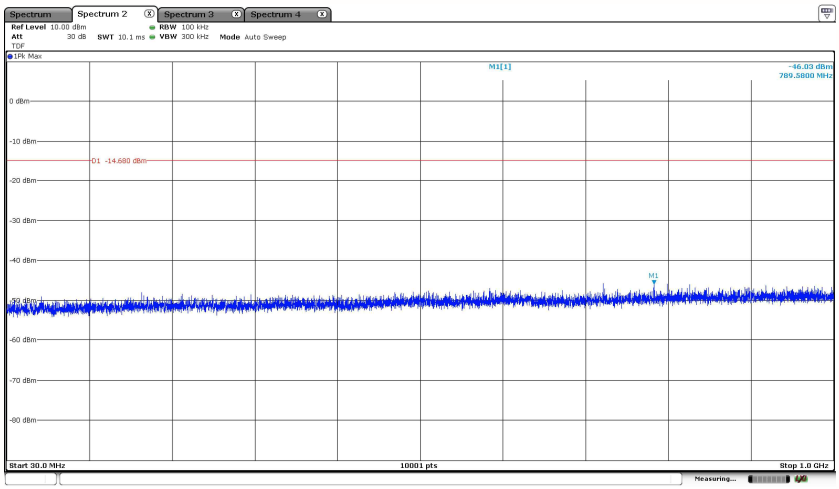
EDR(3M)	Test Channel:	Middle



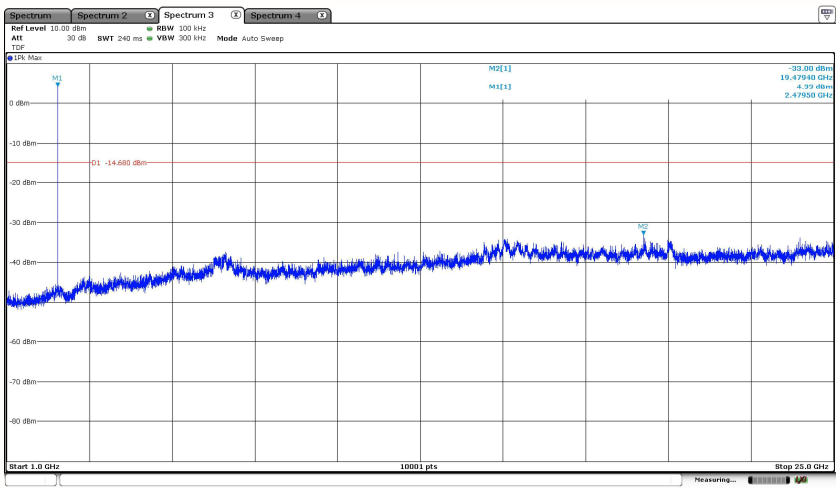
EDR(3M)	Test Channel:	Highest



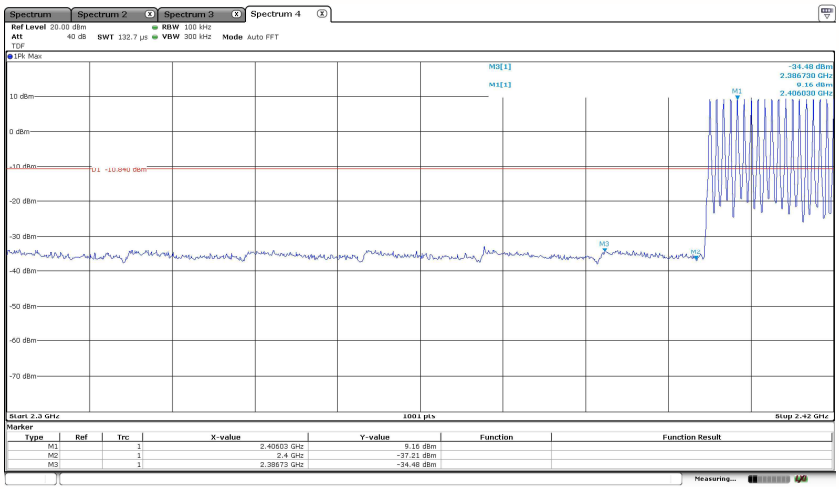
EDR(3M)	Test Channel:	Highest



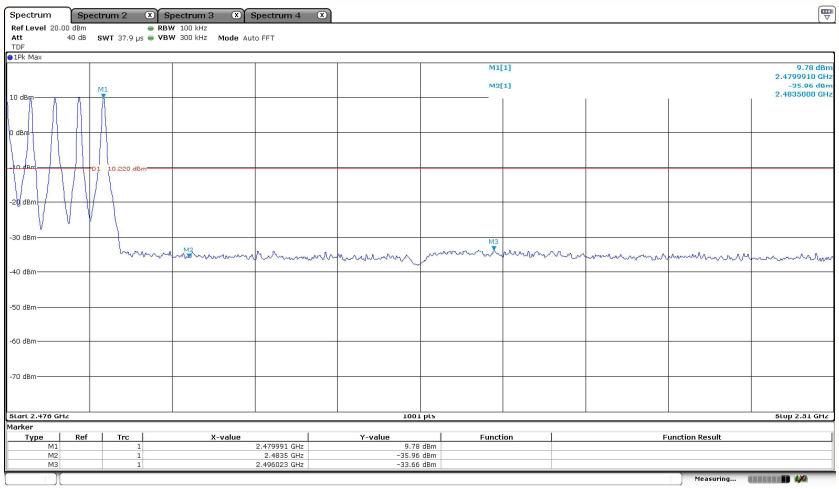
EDR(3M)	Test Channel:	Highest



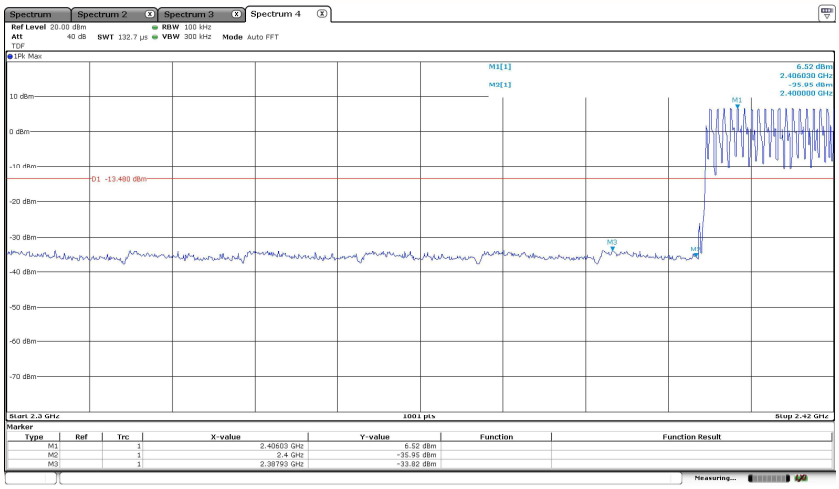
BDR	Test Mode:	Hopping



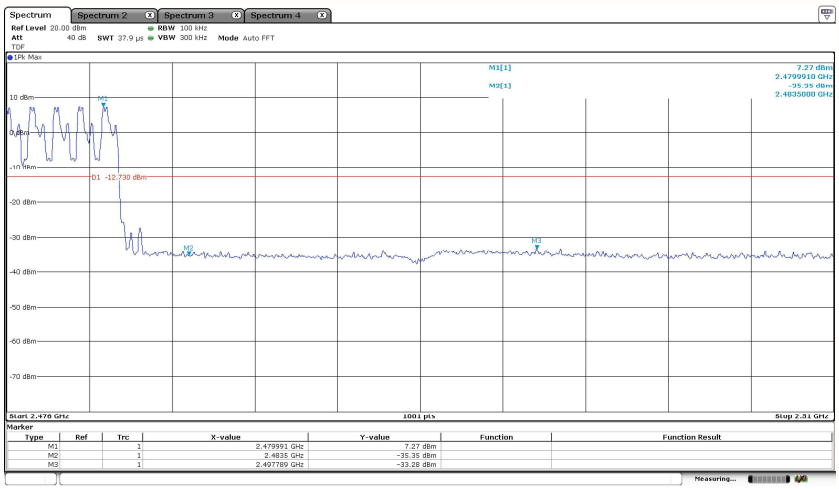
BDR	Test Mode:	Hopping



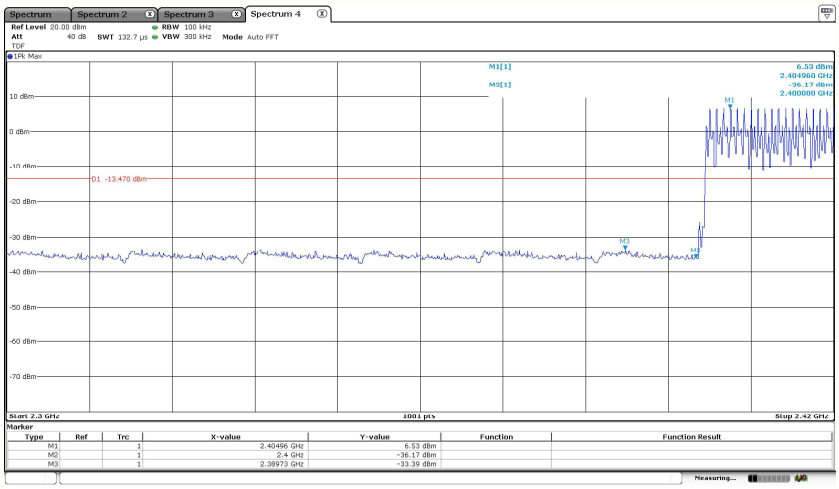
EDR(2M)	Test Mode:	Hopping



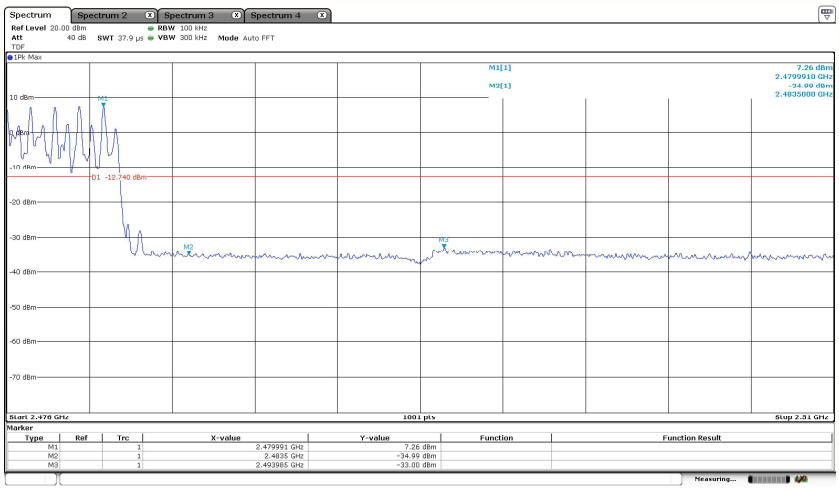
EDR(2M)	Test Mode:	Hopping



EDR(3M)	Test Mode:	Hopping



EDR(3M)	Test Mode:	Hopping



2.7 Radiated Spurious Emission and Restricted Band Edge

The measurement was performed over the frequency range of 30 MHz to 1 GHz using antenna as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120 kHz.
Procedure of Test Preliminary measurements were made at 3 meter using bi-log antennas, and Spectrum Analyzer to determine the frequency producing the max. Emission in Semi-Anechoic Chamber.
Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1000 MHz using bi-log antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.
Final measurements were made with 3-meters test distance using bi-log antenna or horn antenna. The 3 m Full Chamber have been verified in regular for its normalized site attenuation. The test equipment was placed on a table. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency of type of signal. The EUT, peripheral equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 m table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.
Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission. (The bandwidth below 1 GHz setting on the field strength meter is 120 kHz and above 1 GHz is 1 MHz)

Radiated Emissions Test, 9 kHz to 30 MHz (Magnetic Field Test):

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions at distance of 3 meters according to Section 15.31(f)(2).
2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 m non-metallic table.
3. Emissions from the EUT are maximized by adjusting the orientation of the Loop antenna and rotating the EUT on the turntable.
   Manipulating the system cables also maximizes EUT emissions if applicable.
4. To obtain the final measurement data, each frequency found during preliminary measurements was re-examined and investigated.
   The test-receiver system was set up to average, peak, and quasi-peak detector with specified bandwidth.

2.7.1 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 emission 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))
All emission from a digital device, including any network of conductors and apparatus connected thereto shall not exceed the level of field strength specified below:

FCC Part 15 Subpart C paragraph 15.247(a) Limit

Fundamental Frequency (MHz)	Field Strength of Harmonics (3 m)		
	(mV/m)	(dBuV/m)	
2 402-2 480	500	54 (Avg.)	74 (Peak)

Note : 1. RF Field Strength (dBuV) = 20log RF Voltage(uV)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector

Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dBuV/m)
0.009-0.490	300	20log 2400/F (kHz) + 80
0.490-1.705	30	20log 24000/F (kHz) + 40
1.705-30	30	20log 30 + 40
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note : 1. RF voltage (dBuV) = 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 EUT
4. This device used to install a within vehicular. The location of EUT measurements has the Y-plane(Stand).
5. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30 – 1000 MHz. As to 1 – 26.5 GHz, the final emission level got using PK and AV detector.
6. If measurement is made at 3m distance.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor Cable loss and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

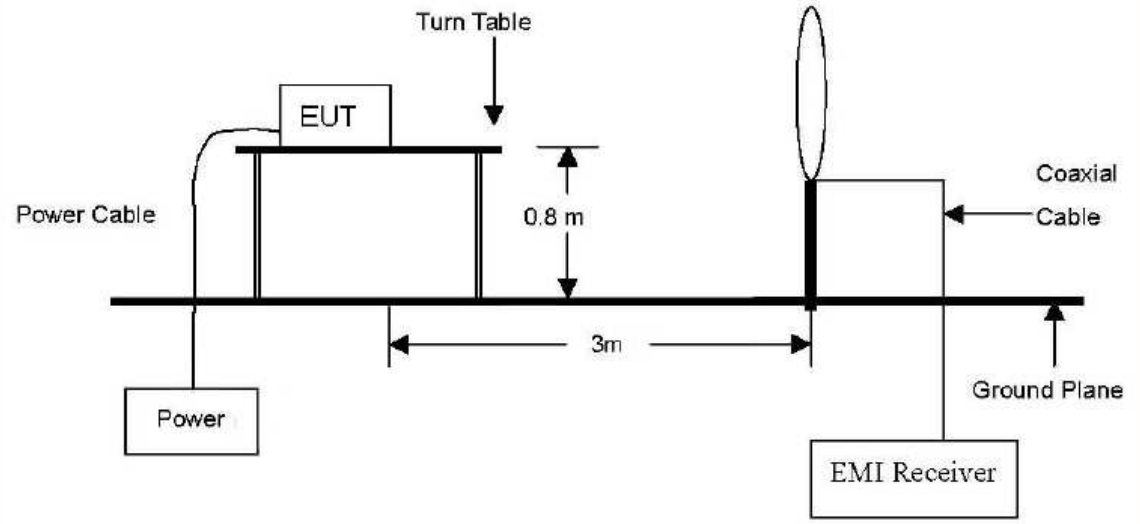
Peak = Reading + Corrected Factor

Where
Corr. Factor = Antenna Factor + Cable loss - Amplifier Gain (if any)

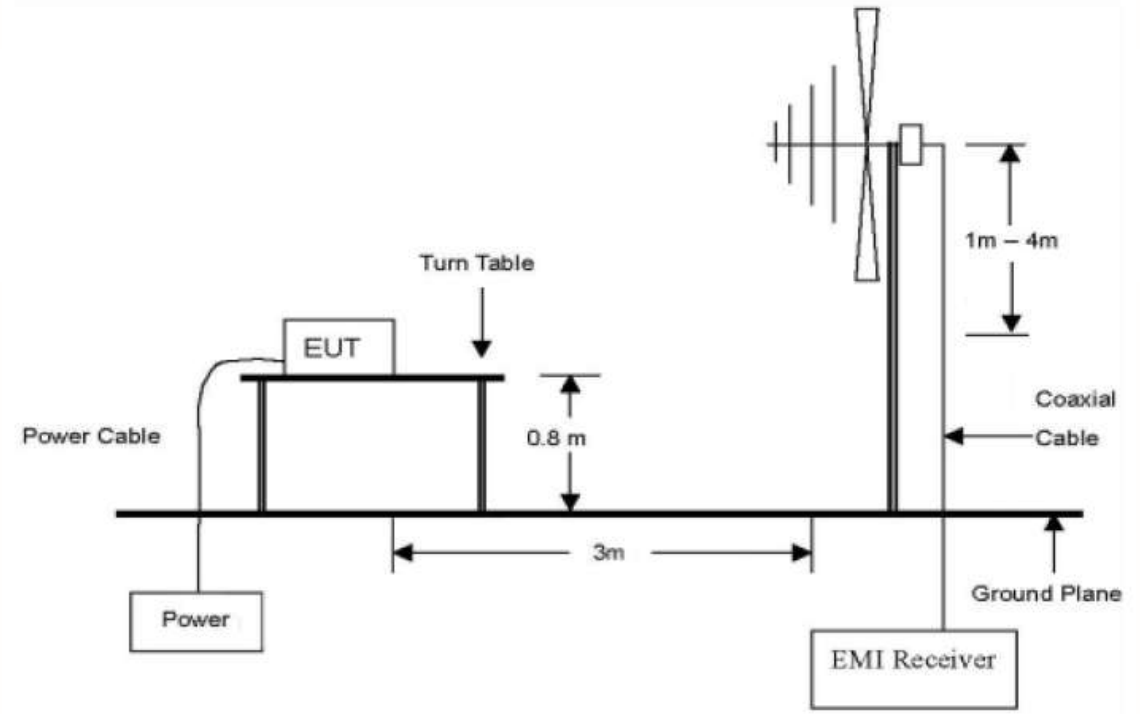
Note: Example of Field strength = 20log 2400/F + 80 = 129

2.7.2 Test Configuration

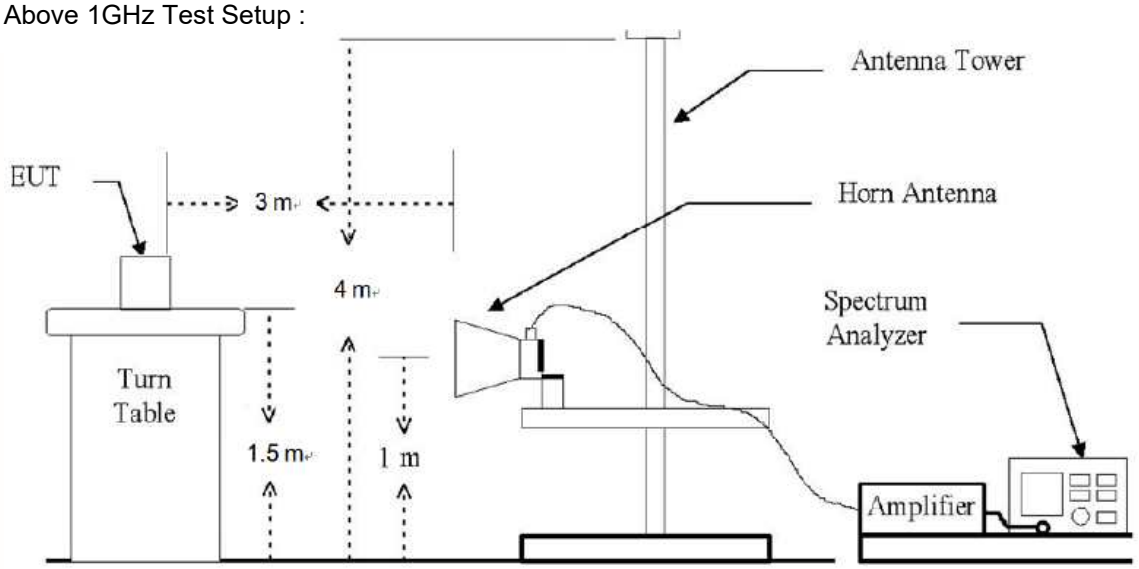
Below 30 MHz



Below 1 GHz test setup:



Above 1GHz Test Setup :



2.7.3 Test Procedure

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.
For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. (Restriced bandedge, Final detection of spurious harmonic emissions)
Duty cycle factor = 10 log (1/x). For this sample: DCF = 10log(1/1)=0 dB(Spectrum Analyzer round it up to 0 dB).
1/T minimum VBW = 1/Duty cycle. For this sample: minimum VBW = 1/1 = 1 kHz
Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.
The spectrum from 1 GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth.
The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission.
Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

2.7.4 Test Result (Restricted Band Edge Above 1 GHz)

The frequency spectrum above 1000 MHz was investigated. All reading values are peak and average values.

Bluetooth BDR

Lowest Channel(2 402 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*2 310.00	42.94	P	V	27.92	-43.16	27.70	74.00	46.30
*2 310.00	33.27	A	V	27.92	-43.16	18.03	54.00	35.97
*2 399.95	47.85	P	V	27.60	-43.05	32.40	74.00	41.60
*2 399.95	42.00	A	V	27.60	-43.05	26.55	54.00	27.45
*2 390.00	44.29	P	V	27.60	-43.02	28.87	74.00	45.13
*2 390.00	34.17	A	V	27.60	-43.02	18.75	54.00	35.25

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*4 804.05	61.45	P	V	31.20	-39.65	53.00	74.00	21.00
*4 804.05	54.48	A	V	31.20	-39.65	46.03	54.00	7.97

Middle Channel(2 441 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*4 882.05	54.53	P	V	31.26	-39.51	46.28	74.00	27.72
*4 882.05	51.83	A	V	31.26	-39.51	43.58	54.00	10.42

Highest Channel(2 480 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*2 483.50	44.60	P	V	27.47	-42.84	29.23	74.00	44.77
*2 483.50	35.62	A	V	27.47	-42.84	20.25	54.00	33.75
*2 489.76	42.29	P	V	27.44	-42.83	26.90	74.00	47.10
*2 489.76	34.06	A	V	27.44	-42.83	18.67	54.00	35.33
*2 500.00	45.12	P	V	27.40	-43.11	29.41	74.00	44.59
*2 500.00	32.82	A	V	27.40	-43.11	17.11	54.00	36.89

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*4 959.97	58.58	P	V	31.54	-39.47	50.65	74.00	23.35
*4 959.97	45.60	A	V	31.54	-39.47	37.67	54.00	16.33

Bluetooth EDR (Worst Case : EDR(2M))

Lowest Channel(2 402 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*2 310.00	41.42	P	V	27.92	-43.16	26.18	74.00	47.82
*2 310.00	33.78	A	V	27.92	-43.16	18.54	54.00	35.46
*2 376.27	48.32	P	V	27.60	-43.05	32.87	74.00	41.13
*2 376.27	39.49	A	V	27.60	-43.05	24.04	54.00	29.96
*2 390.00	45.04	P	V	27.60	-43.02	29.62	74.00	44.38
*2 390.00	34.29	A	V	27.60	-43.02	18.87	54.00	35.13

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*4 804.21	57.80	P	V	31.20	-39.65	49.35	74.00	24.65
*4 804.21	47.88	A	V	31.20	-39.65	39.43	54.00	14.57

Middle Channel(2 441 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*4 882.00	51.50	P	V	31.26	-39.51	43.25	74.00	30.75
*4 882.00	43.98	A	V	31.26	-39.51	35.73	54.00	18.27

Highest Channel(2 480 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*2 483.50	51.54	P	V	27.47	-42.84	36.17	74.00	37.83
*2 483.50	39.45	A	V	27.47	-42.84	24.08	54.00	29.92
*2 492.39	42.85	P	V	27.43	-42.82	27.46	74.00	46.54
*2 492.39	33.83	A	V	27.43	-42.82	18.44	54.00	35.56
*2 500.00	43.68	P	V	27.40	-43.11	27.97	74.00	46.03
*2 500.00	32.78	A	V	27.40	-43.11	17.07	54.00	36.93

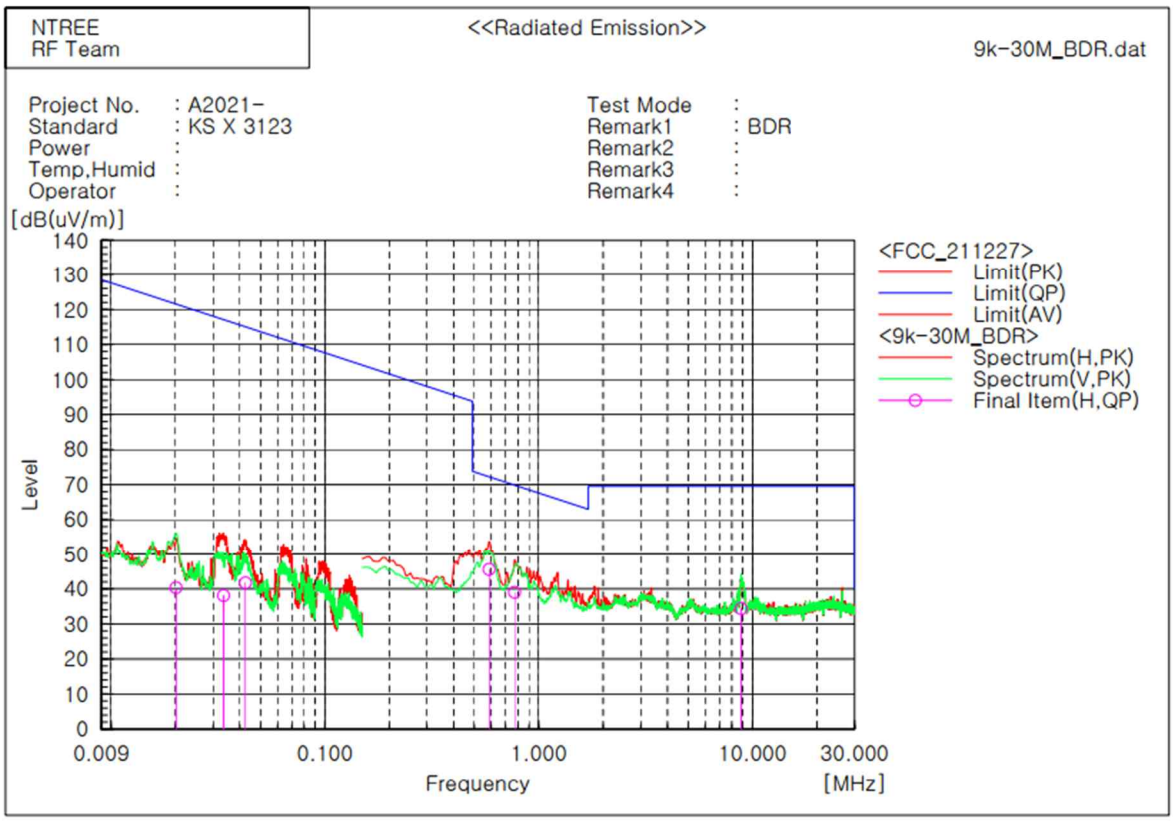
Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
*4 960.08	53.36	P	V	31.54	-39.47	45.43	74.00	28.57
*4 960.08	38.87	A	V	31.54	-39.47	30.94	54.00	23.06

Note)

1. P = Peak
2. A = Average
3. AF = Antenna Factor
4. CL = Cable Loss
5. DCF = Duty Cycle Factor
6. “*” means the restricted band.
7. Measuring frequencies from 1GHz to the 10th Harmonic of highest fundamental frequency.
8. According to §15.31(o), emissions level are not be reported lower than the limit by over 20dB.

2.7.5 Test Result (Spurious Emissions Above 9 kHz to Below 30 MHz)

Bluetooth BDR

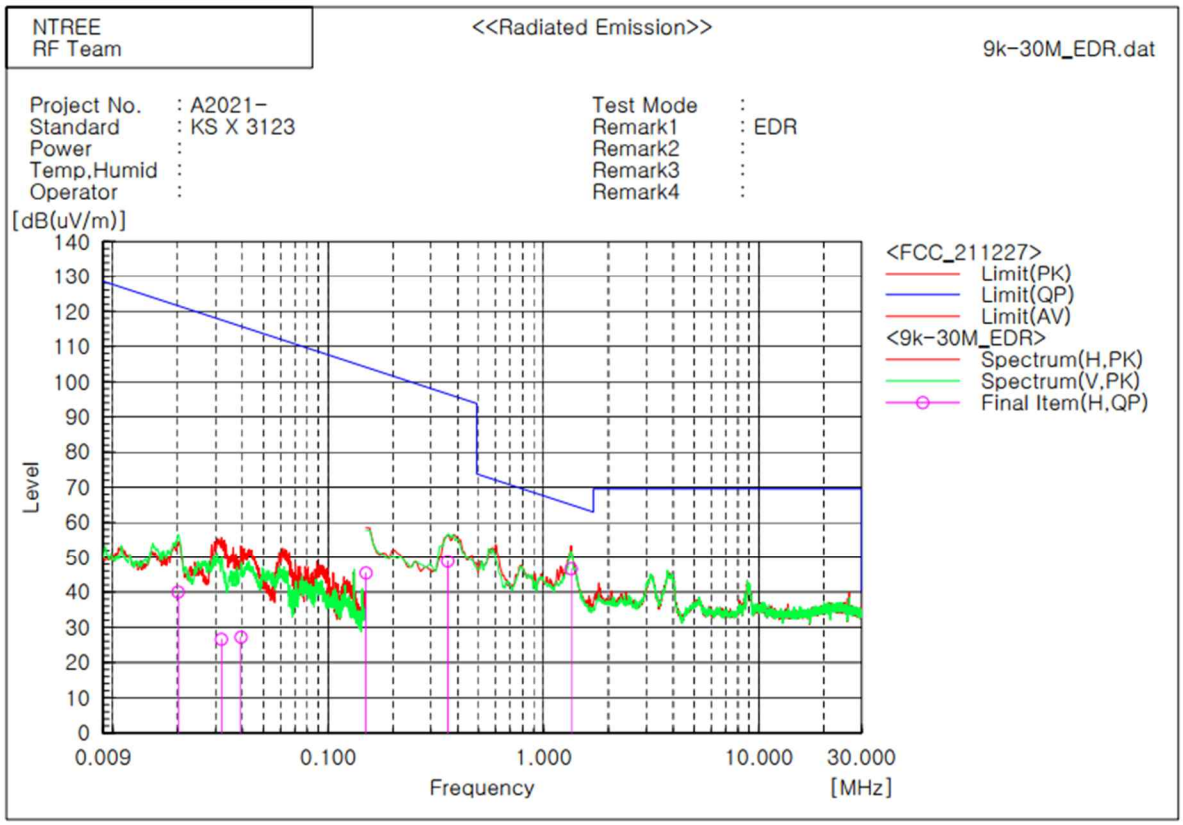


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	0.020	H	21.3	19.0	40.3	121.5	81.2	100.0	82.0	
2	8.836	H	14.3	20.1	34.4	69.5	35.1	100.0	322.0	
3	0.034	H	19.4	18.7	38.1	117.1	79.0	100.0	42.0	
4	0.043	H	23.0	18.7	41.7	115.0	73.3	100.0	315.0	
5	0.586	H	26.9	18.7	45.6	72.2	26.6	100.0	129.0	
6	0.771	H	20.3	18.8	39.1	69.9	30.8	100.0	140.0	

Note: Worst case (Highest Channel (2 480 MHz))

Bluetooth EDR(2M)



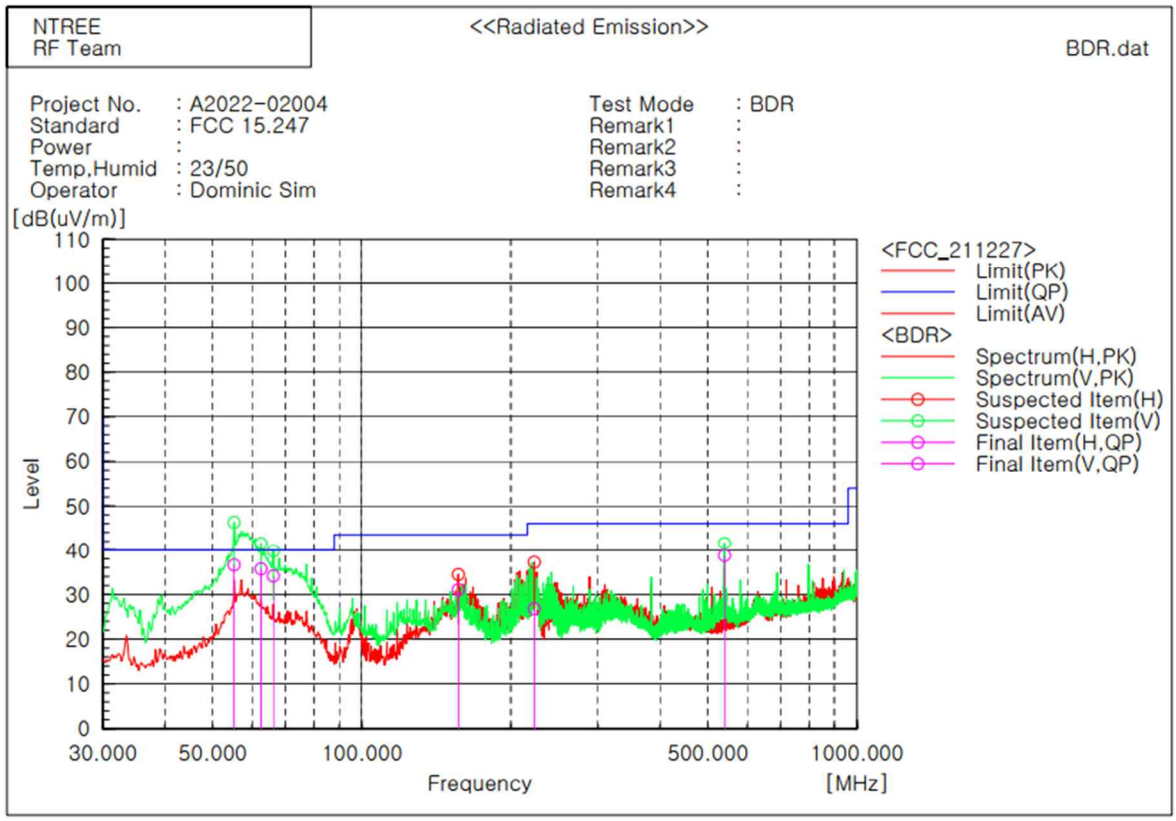
Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	0.020	H	21.0	19.0	40.0	121.5	81.5	100.0	68.0	
2	0.359	H	30.3	18.5	48.8	96.5	47.7	100.0	85.0	
3	0.032	H	7.9	18.7	26.6	117.5	90.9	100.0	35.0	
4	0.039	H	8.5	18.7	27.2	115.7	88.5	100.0	49.0	
5	1.344	H	27.5	19.1	46.6	65.0	18.4	100.0	208.0	
6	0.150	H	26.8	18.6	45.4	104.1	58.7	100.0	2.0	

Note: Worst case (Highest Channel (2 480 MHz))

2.7.6 Test Result (Spurious Emissions Above 30 MHz to Below 1 GHz)

Bluetooth BDR

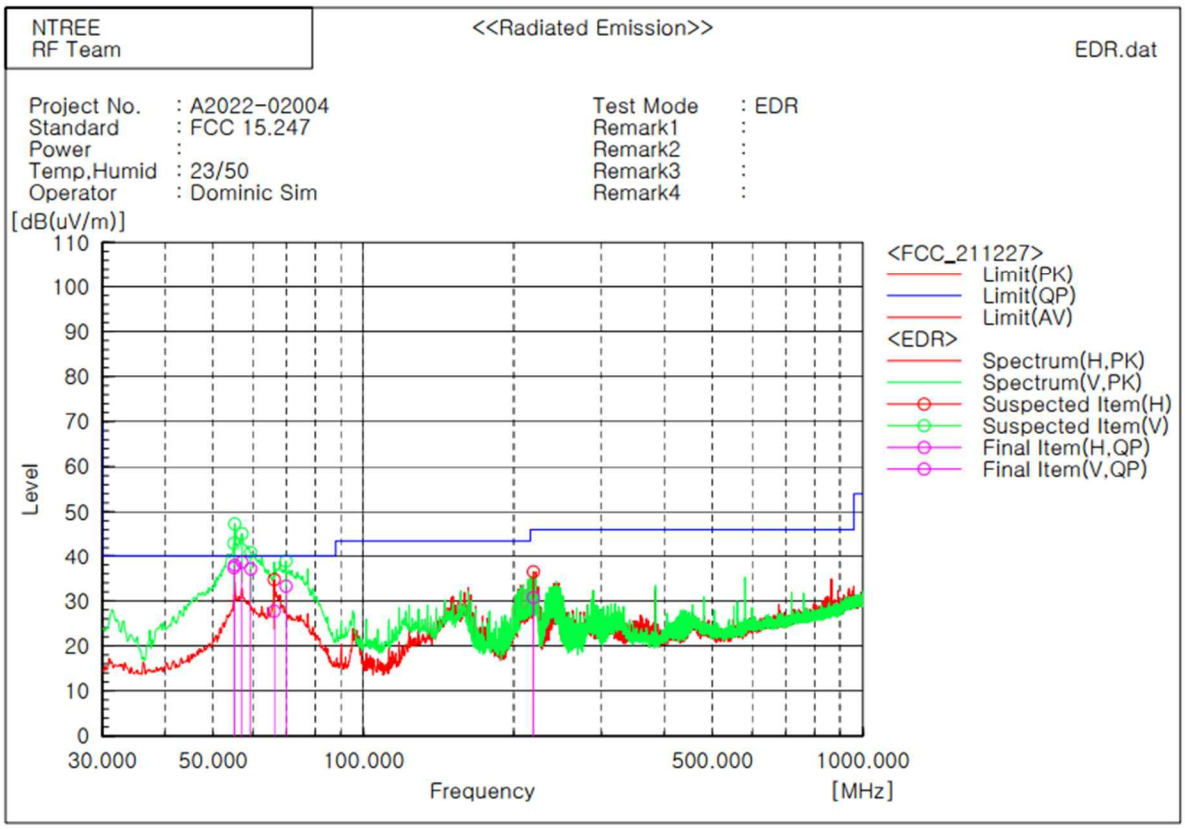


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	55.220	V	66.5	-29.9	36.6	40.0	3.4	100.0	222.0	
2	62.592	V	65.8	-30.1	35.7	40.0	4.3	100.0	107.0	
3	66.278	V	64.6	-30.5	34.1	40.0	5.9	100.0	330.0	
4	540.026	V	59.8	-21.1	38.7	46.0	7.3	100.0	56.0	
5	156.682	H	59.7	-28.6	31.1	43.5	12.4	200.0	121.0	
6	223.030	H	58.4	-31.6	26.8	46.0	19.2	100.0	297.0	

Note: Worst case (Lowest Channel (2 480 MHz))

Bluetooth EDR(2M)



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	55.026	V	67.3	-29.9	37.4	40.0	2.6	100.0	236.0	
2	55.220	V	67.8	-29.9	37.9	40.0	2.1	100.0	356.0	
3	57.160	V	68.4	-29.8	38.6	40.0	1.4	100.0	85.0	
4	59.488	V	66.9	-29.8	37.1	40.0	2.9	100.0	150.0	
5	66.278	H	58.2	-30.5	27.7	40.0	12.3	200.0	315.0	
6	69.964	V	64.5	-31.3	33.2	40.0	6.8	100.0	330.0	
7	218.956	H	62.4	-31.6	30.8	46.0	15.2	100.0	297.0	

Note: Worst case (Lowest Channel (2 480 MHz))

2.8 AC Power Line Conducted Emission

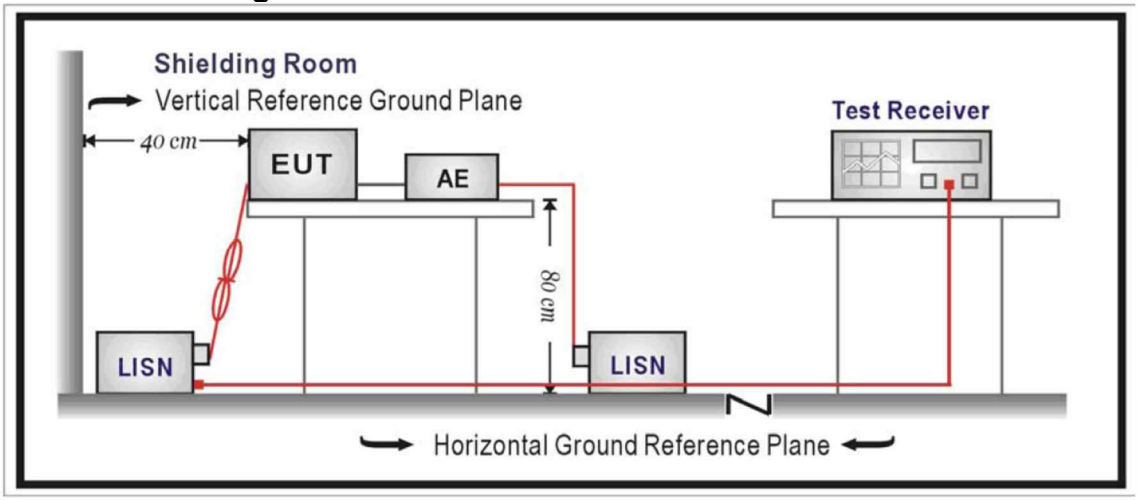
2.8.1 Limit

Test Specification: According to FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency (MHz)	Limit (dBuV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56 *	56 to 46 *
0.5 to 5	56	46
5 to 30	60	50

Note : * Decrease with the logarithm of the frequency

2.8.2 Test Configuration



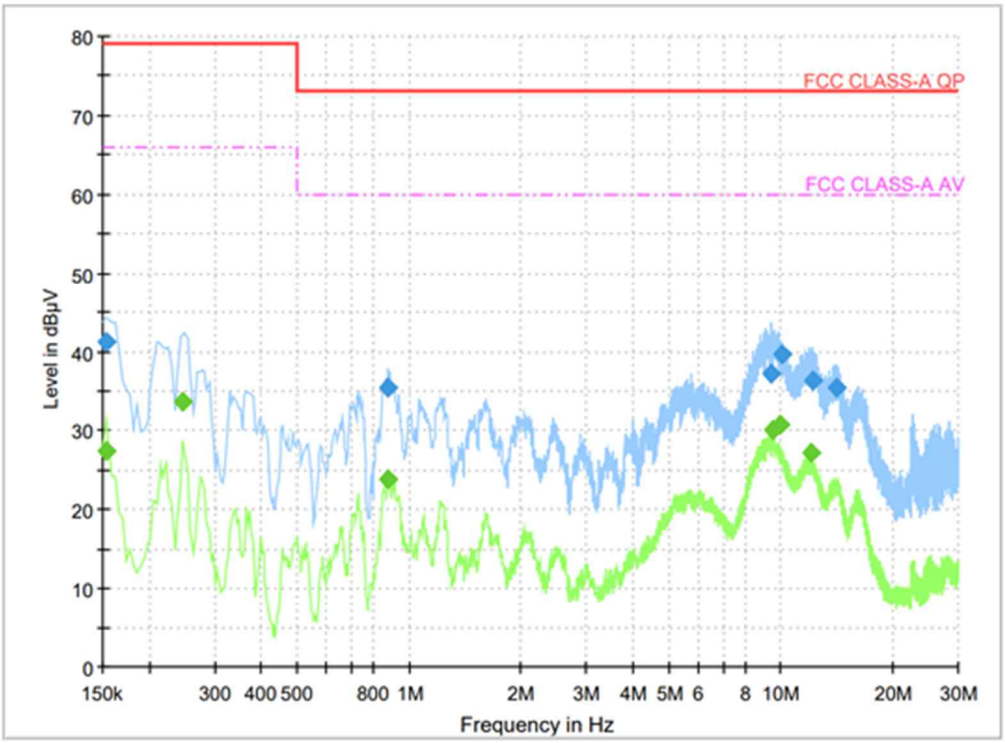
2.8.3 Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/50 uH coupling impedance with 50ohm termination. (Please refers 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 of the interface cables must be changed on conducted measurement.

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

2.8.4 Test Result

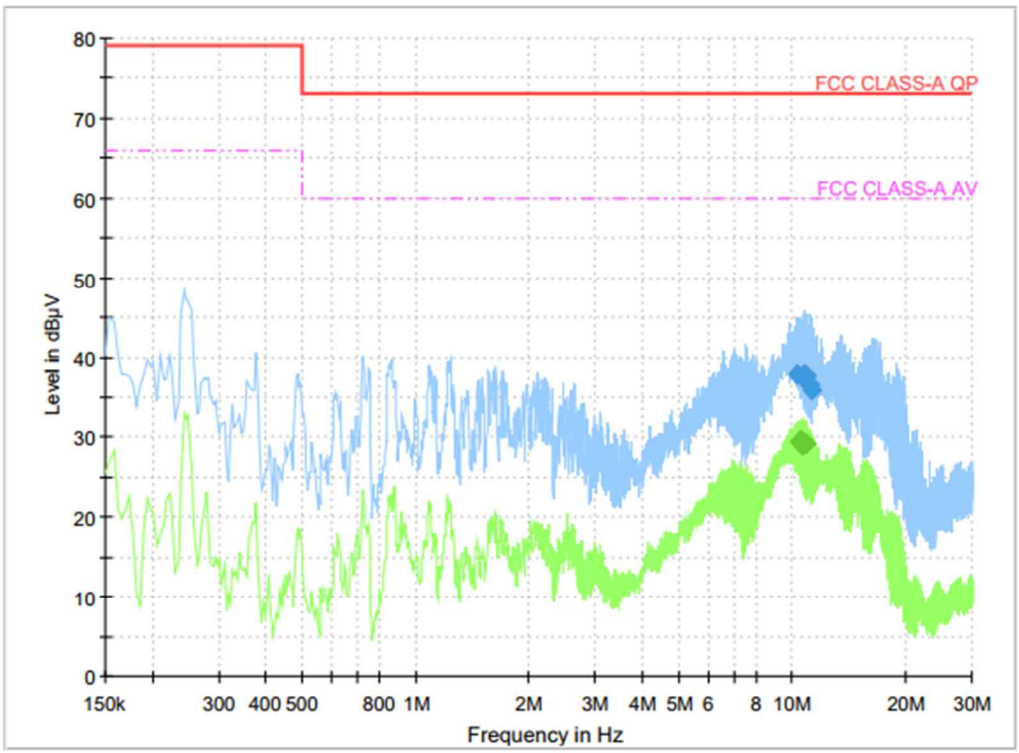
Line : Hot



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154000	---	27.47	66.00	38.53	1000.0	9.000	L1	9.8
0.154000	41.27	---	79.00	37.73	1000.0	9.000	L1	9.8
0.246000	---	33.66	66.00	32.34	1000.0	9.000	L1	9.6
0.882000	---	23.77	60.00	36.23	1000.0	9.000	L1	9.8
0.882000	35.39	---	73.00	37.61	1000.0	9.000	L1	9.8
9.434000	37.19	---	73.00	35.81	1000.0	9.000	L1	9.9
9.530000	---	29.98	60.00	30.02	1000.0	9.000	L1	9.9
10.004000	---	30.78	60.00	29.22	1000.0	9.000	L1	9.9
10.096000	39.74	---	73.00	33.26	1000.0	9.000	L1	9.9
12.120000	---	27.12	60.00	32.88	1000.0	9.000	L1	10.0
12.144000	36.28	---	73.00	36.72	1000.0	9.000	L1	10.0
14.068000	35.52	---	73.00	37.48	1000.0	9.000	L1	10.0

Line : Neutral



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
10.280000	37.89	---	73.00	35.11	1000.0	9.000	N	9.9
10.476000	---	29.46	60.00	30.54	1000.0	9.000	N	9.9
10.528000	---	29.58	60.00	30.42	1000.0	9.000	N	9.9
10.604000	---	29.01	60.00	30.99	1000.0	9.000	N	9.9
10.648000	---	29.52	60.00	30.48	1000.0	9.000	N	9.9
10.792000	---	29.11	60.00	30.89	1000.0	9.000	N	9.9
10.808000	37.22	---	73.00	35.78	1000.0	9.000	N	9.9
10.836000	37.92	---	73.00	35.08	1000.0	9.000	N	9.9
10.892000	37.61	---	73.00	35.39	1000.0	9.000	N	9.9
10.892000	---	29.12	60.00	30.88	1000.0	9.000	N	9.9
11.200000	36.51	---	73.00	36.49	1000.0	9.000	N	9.9
11.308000	35.82	---	73.00	37.18	1000.0	9.000	N	9.9

2.9 Antenna Requirement

2.9.1 Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

2.9.2 Applicable Construction

2.9.3 Test Result

Pass