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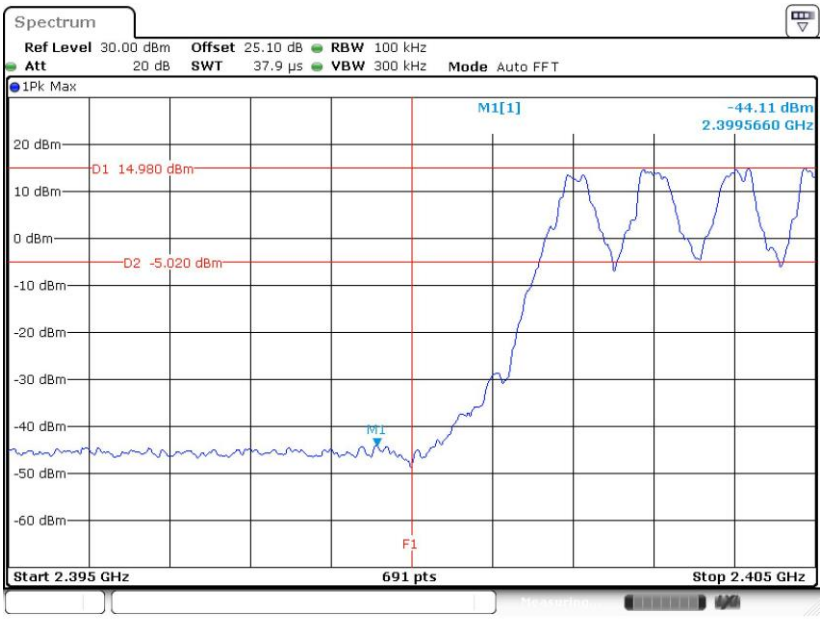
Hopping Mode Low Band Edge Plot



Date: 4.DEC.2020 01:46:58

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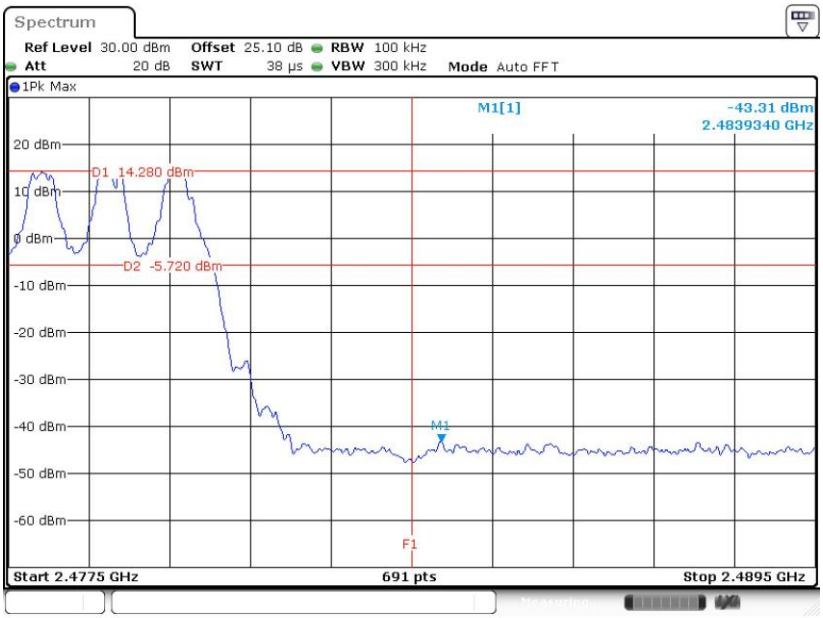

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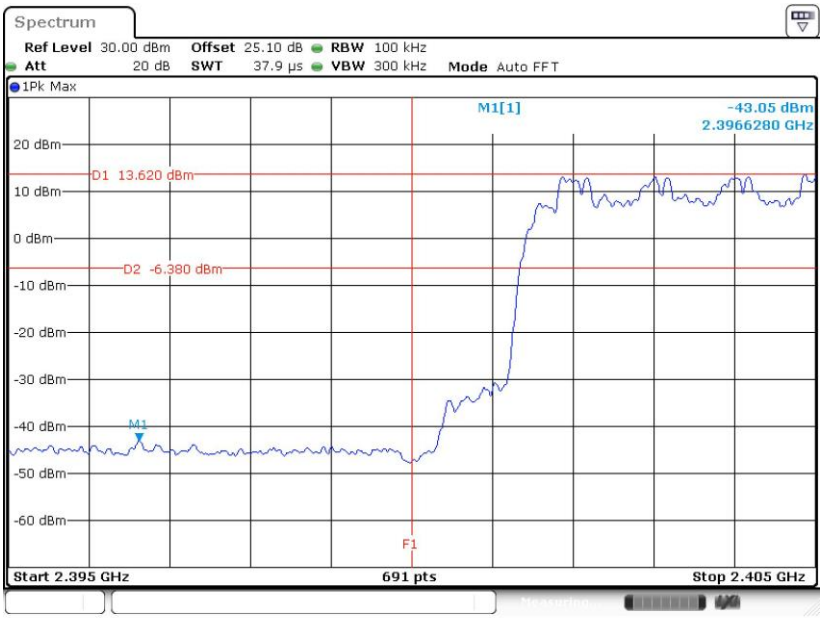

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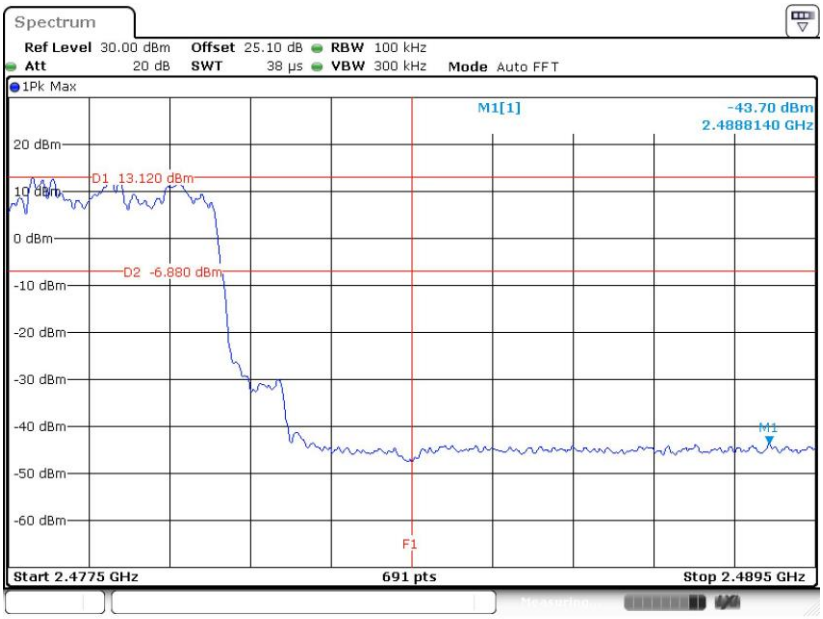

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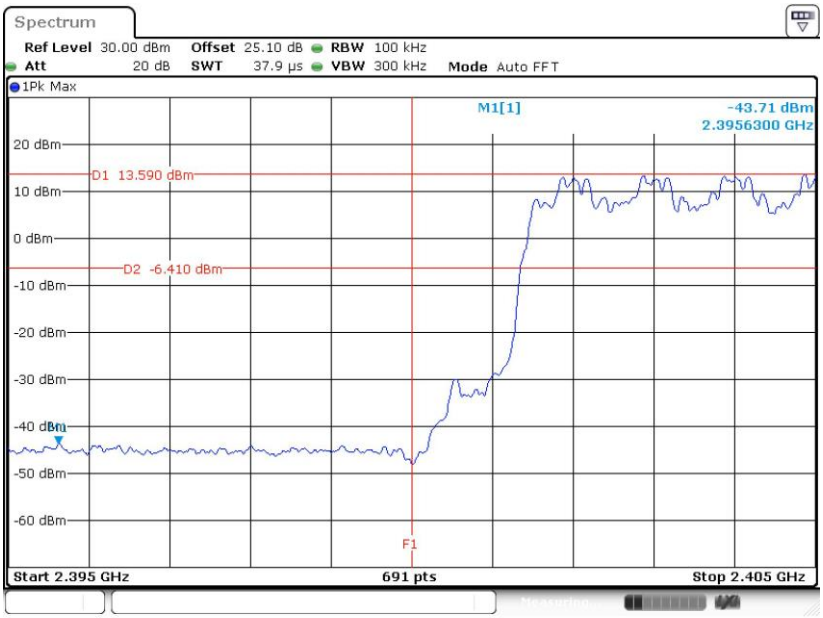

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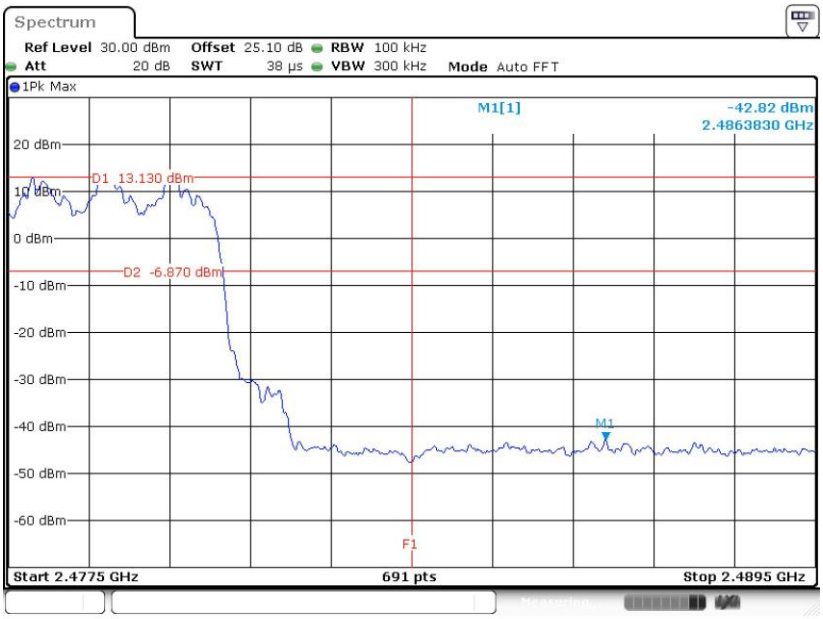

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3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

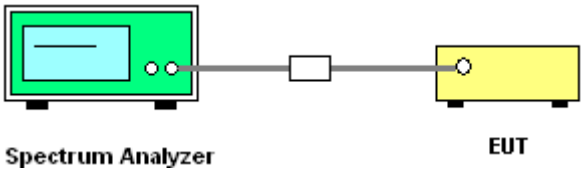
3.7.2 Measuring Instruments

See list of measuring equipment of this test report.

3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

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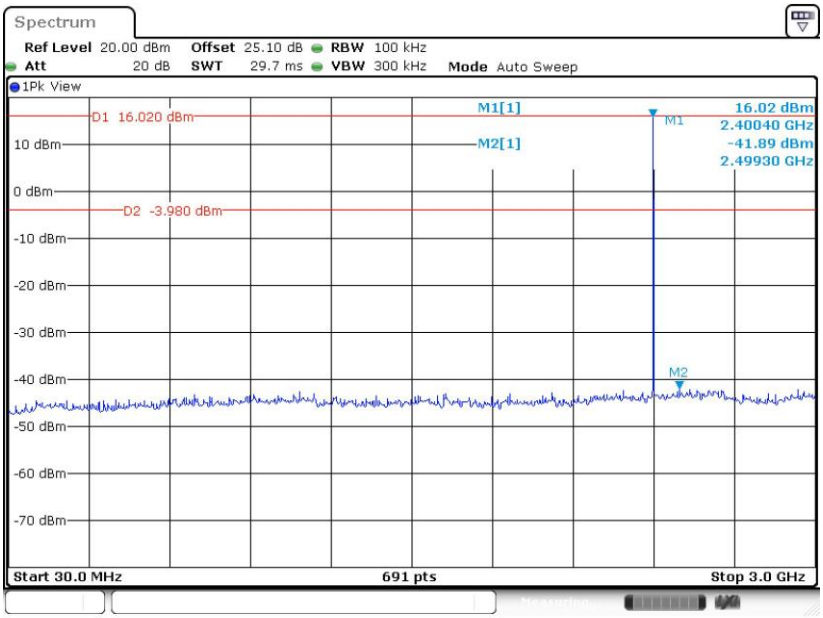
CSE Plot on Ch 00 between 30MHz ~ 3 GHz



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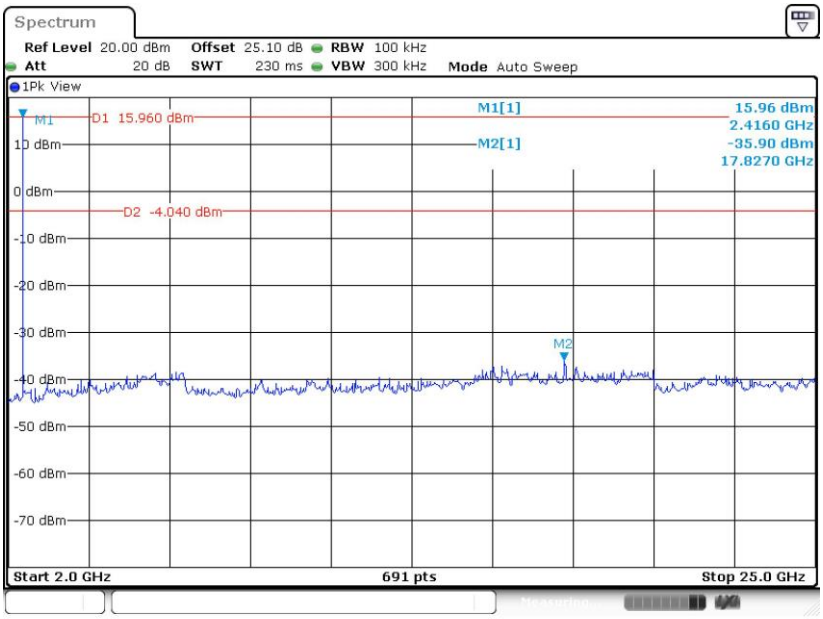
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



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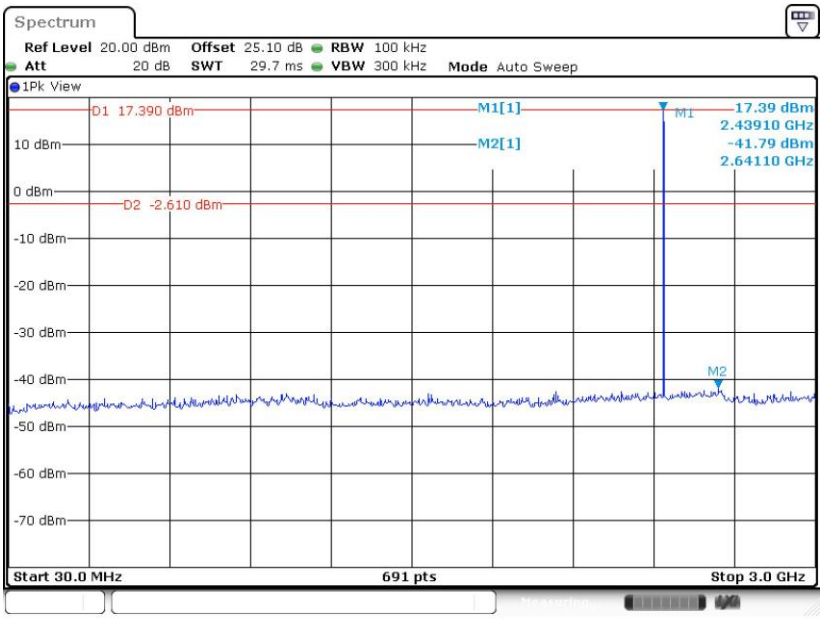
CSE Plot on Ch 39 between 30MHz ~ 3 GHz



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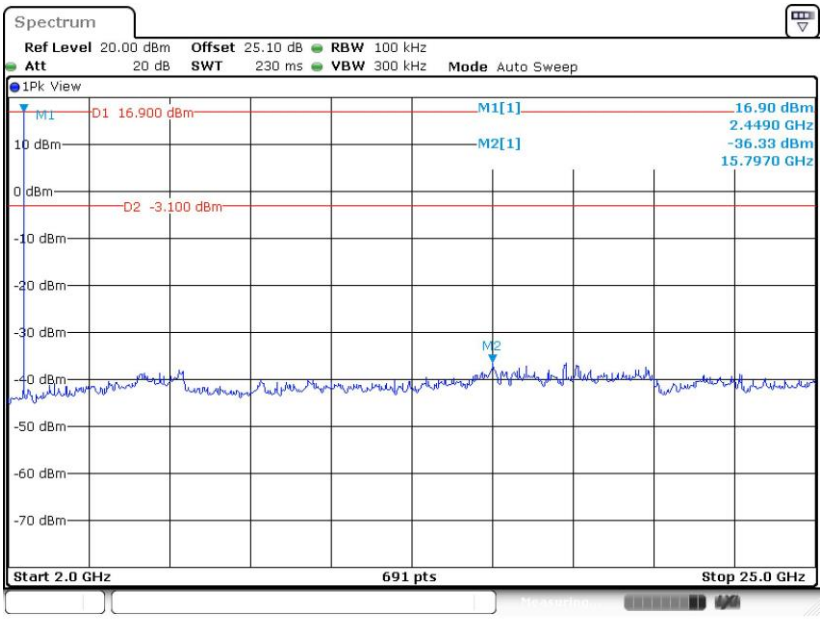
CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



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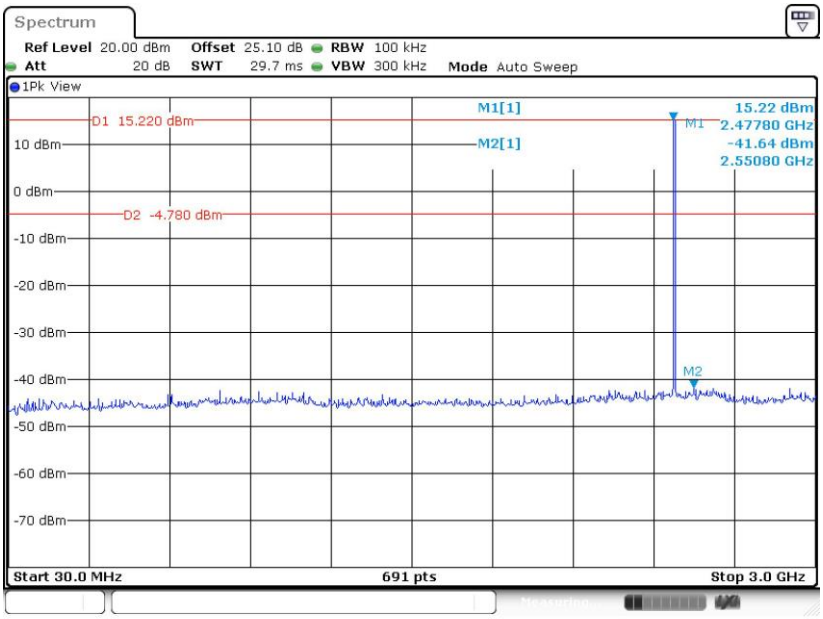
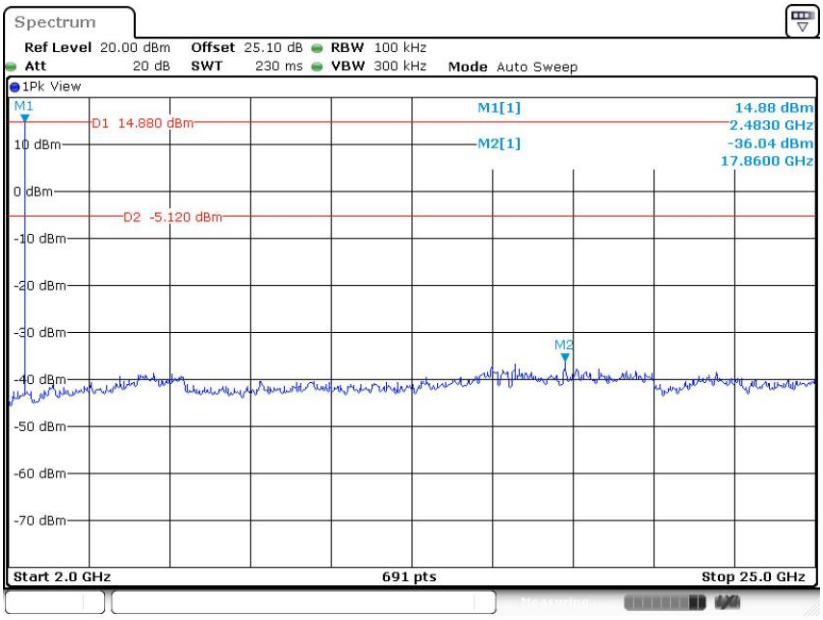
CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 3.DEC.2020 23:48:22

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



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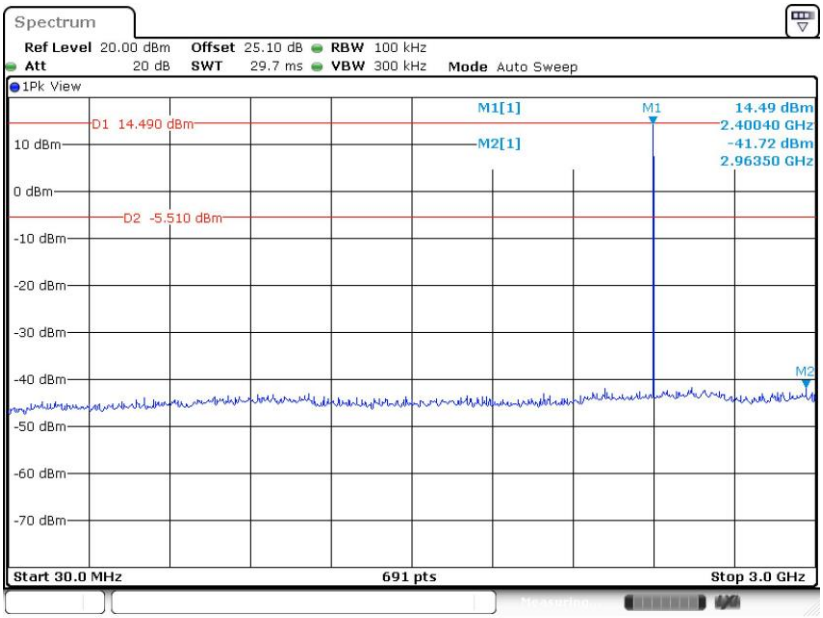

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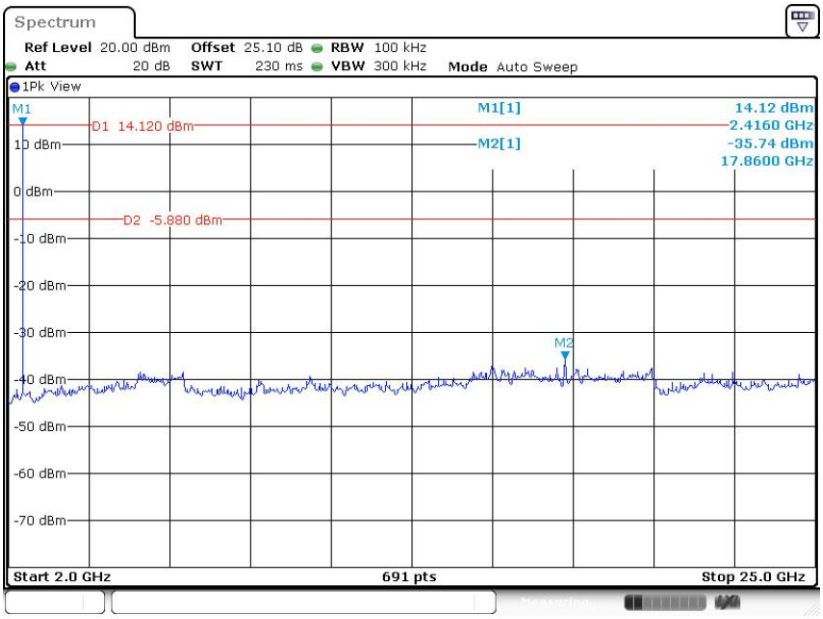

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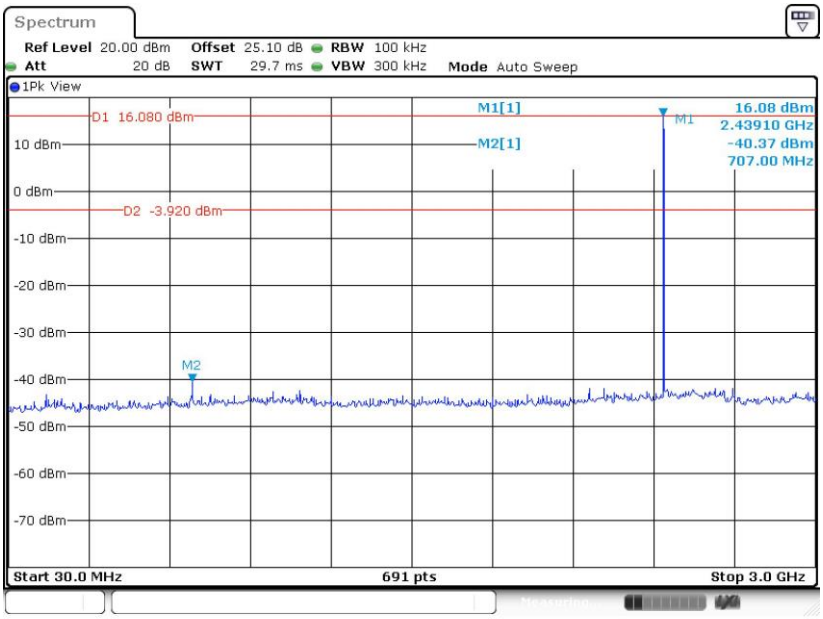

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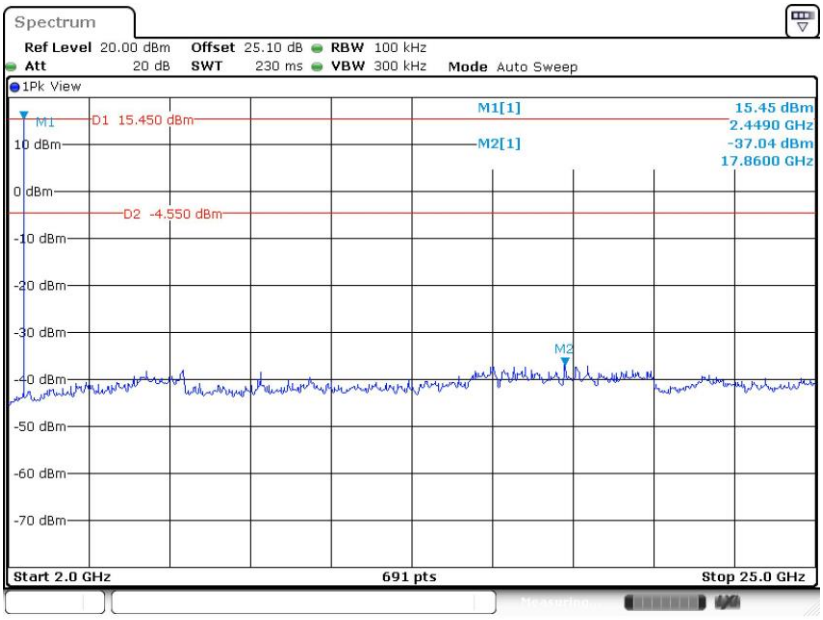

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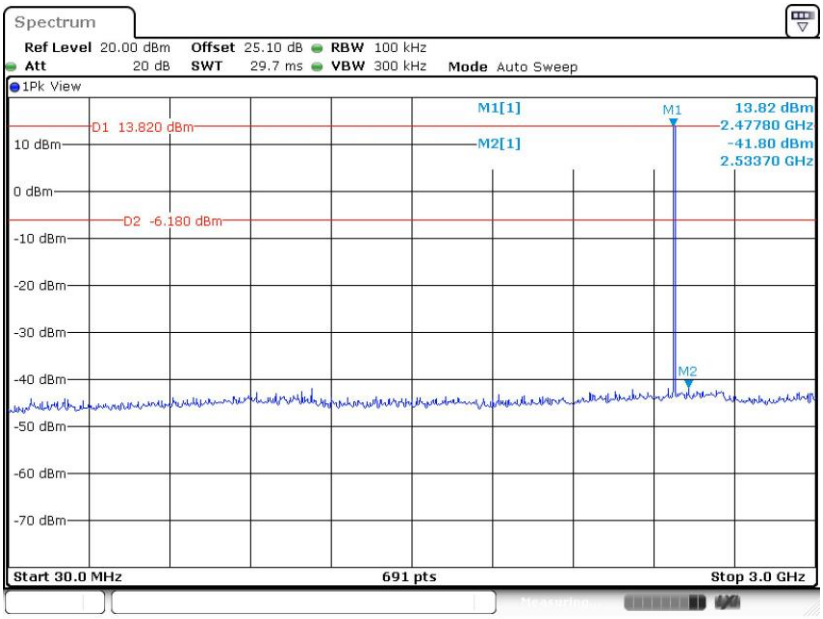

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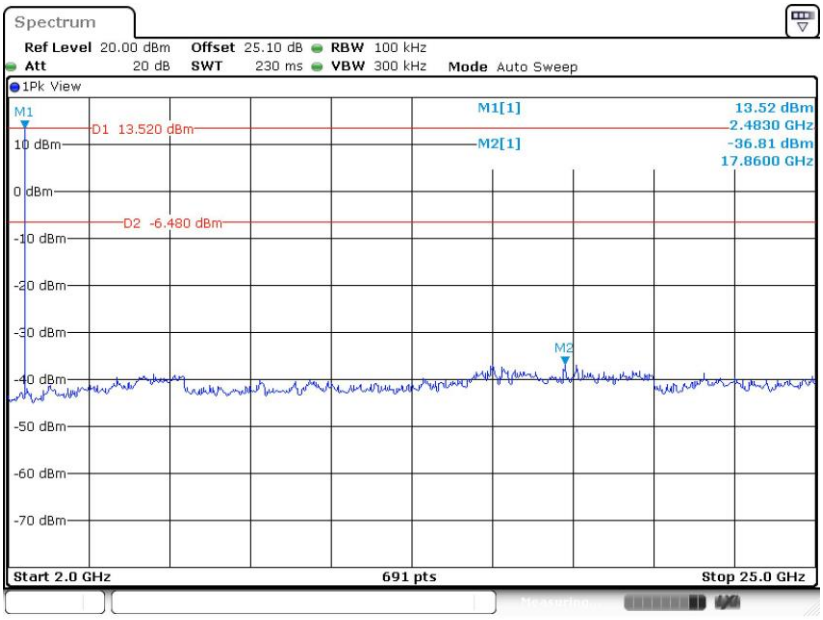

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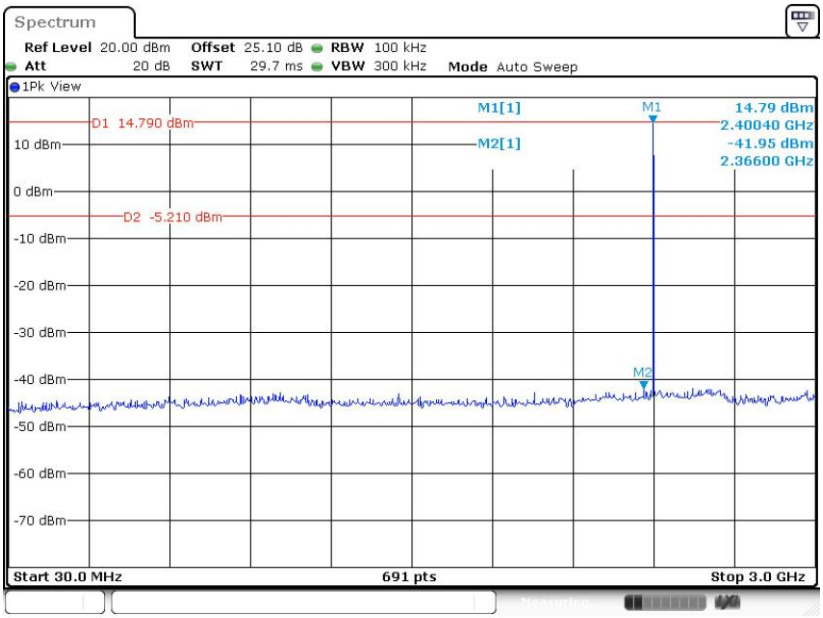
CSE Plot on Ch 00 between 30MHz ~ 3 GHz



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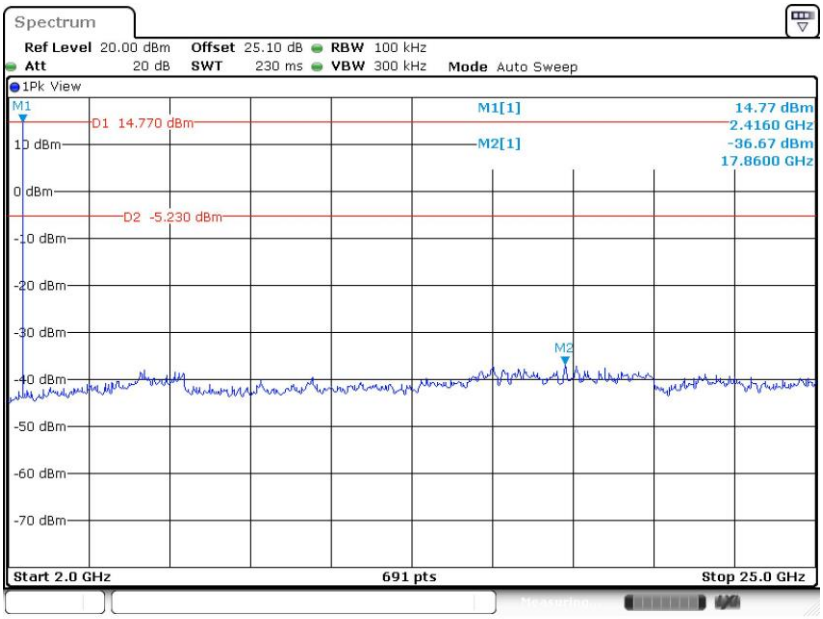
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



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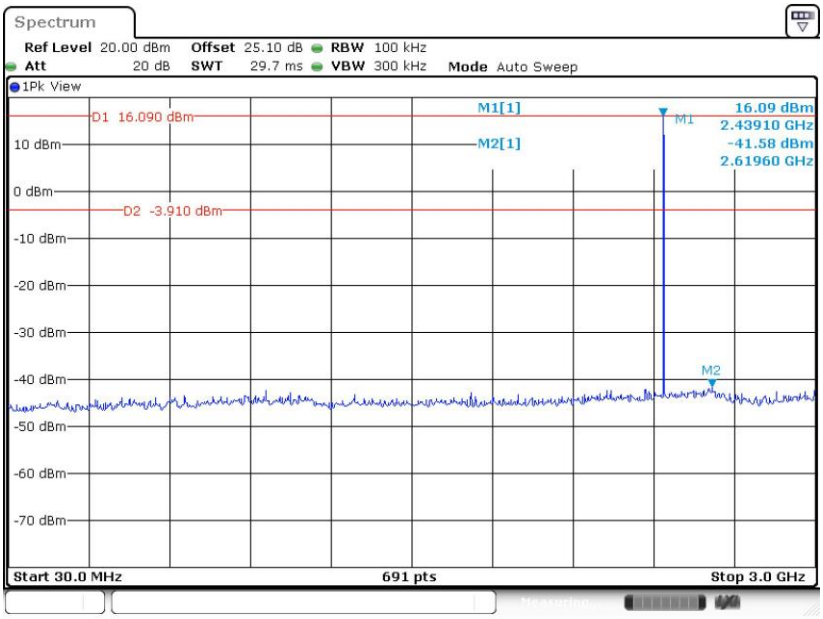

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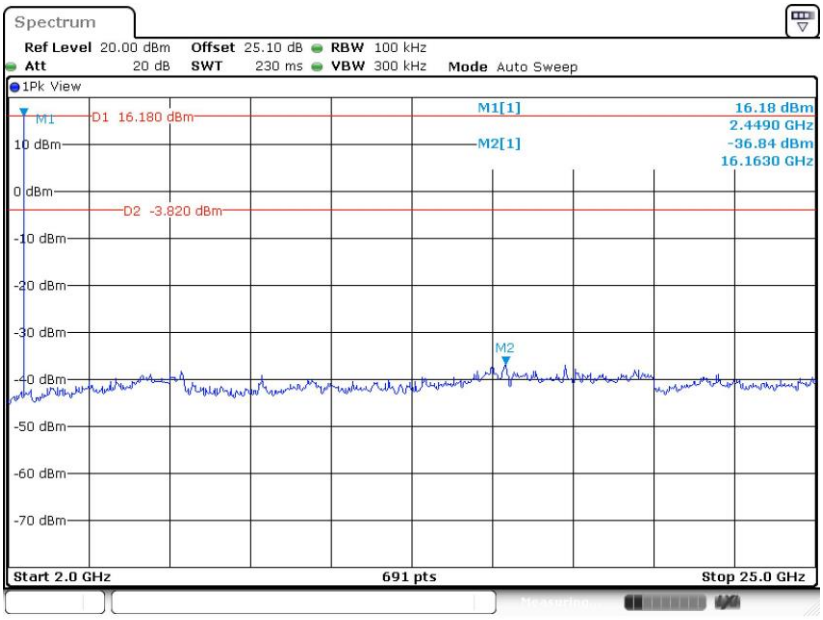

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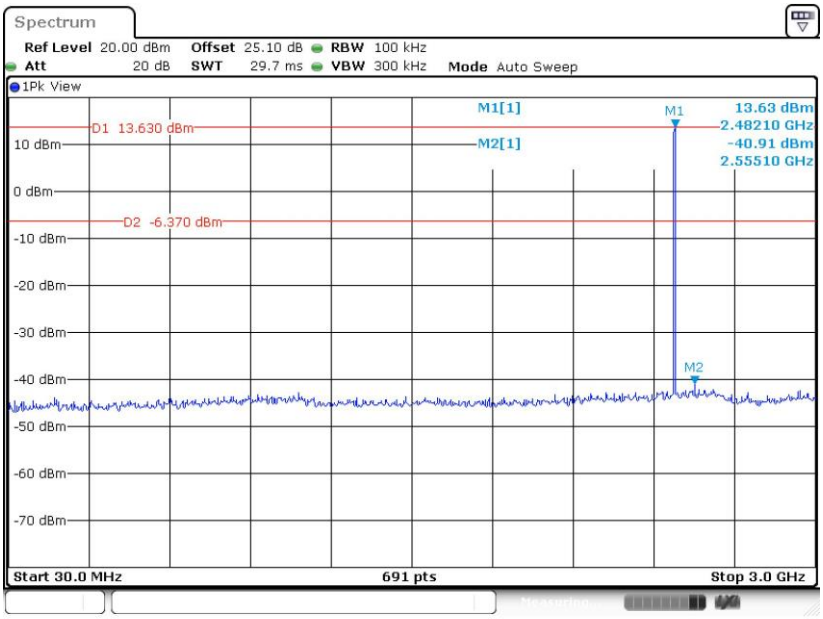

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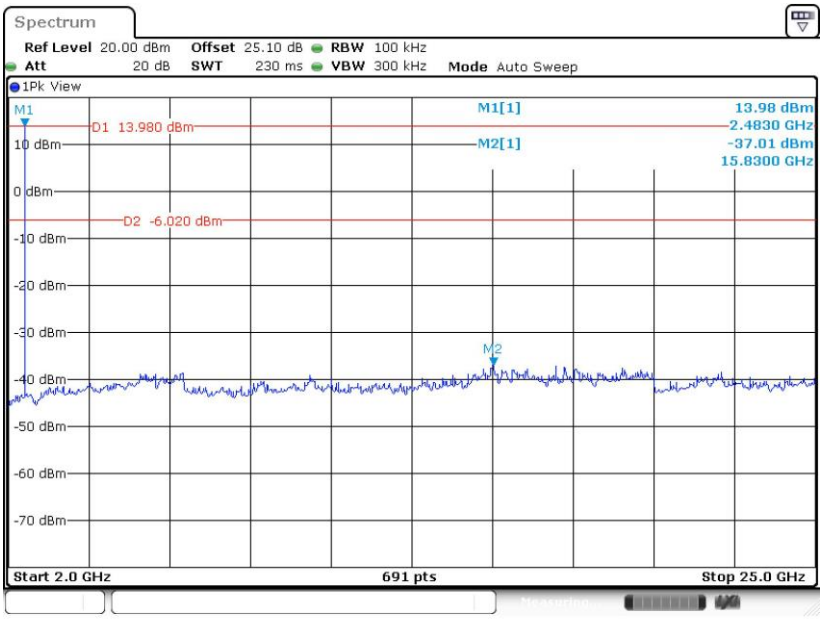

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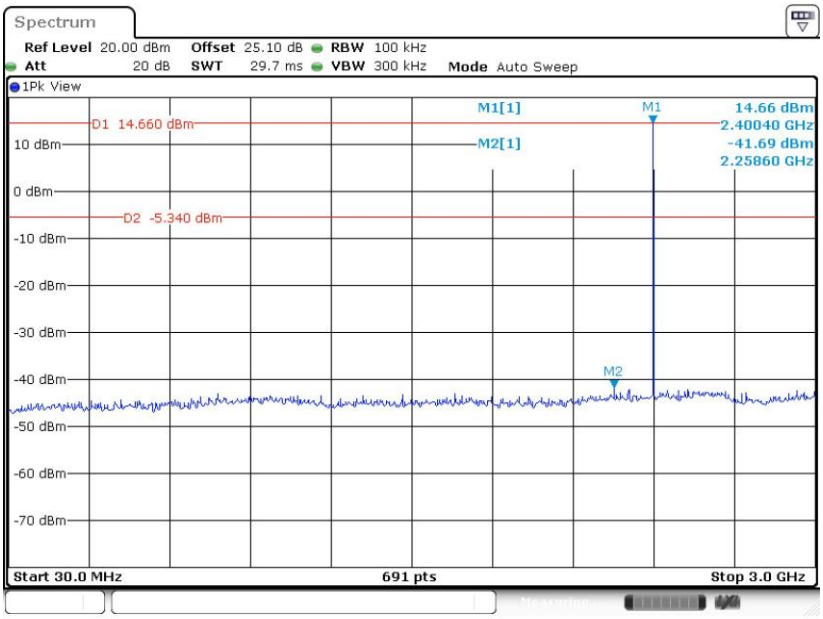

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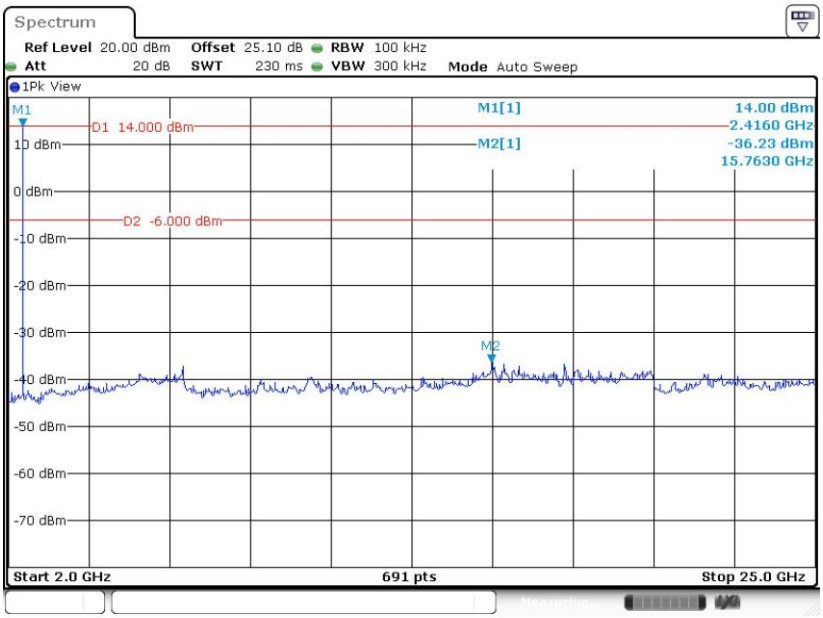

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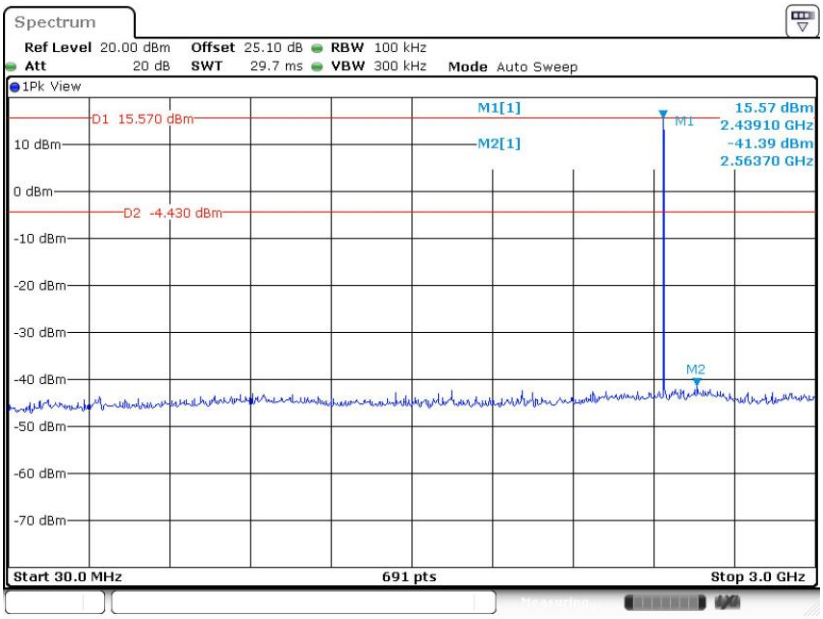

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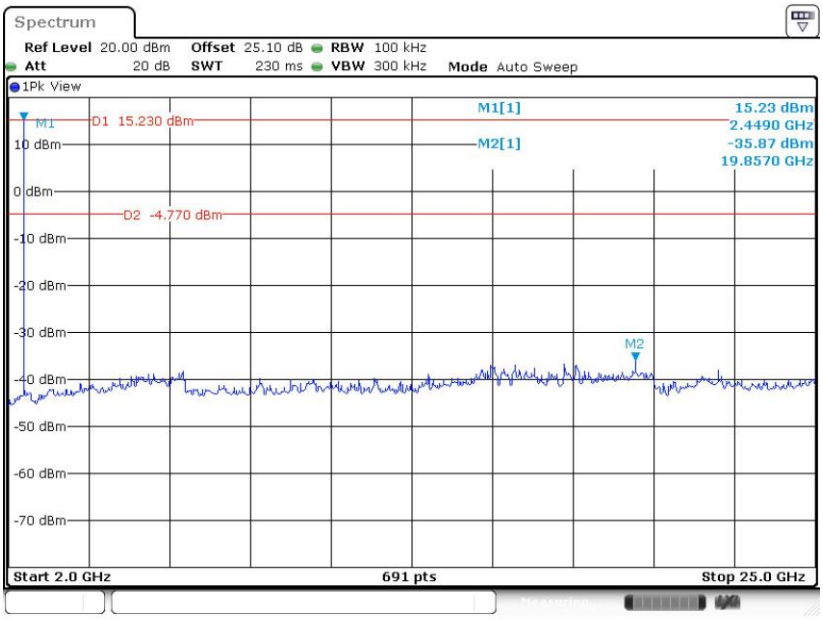

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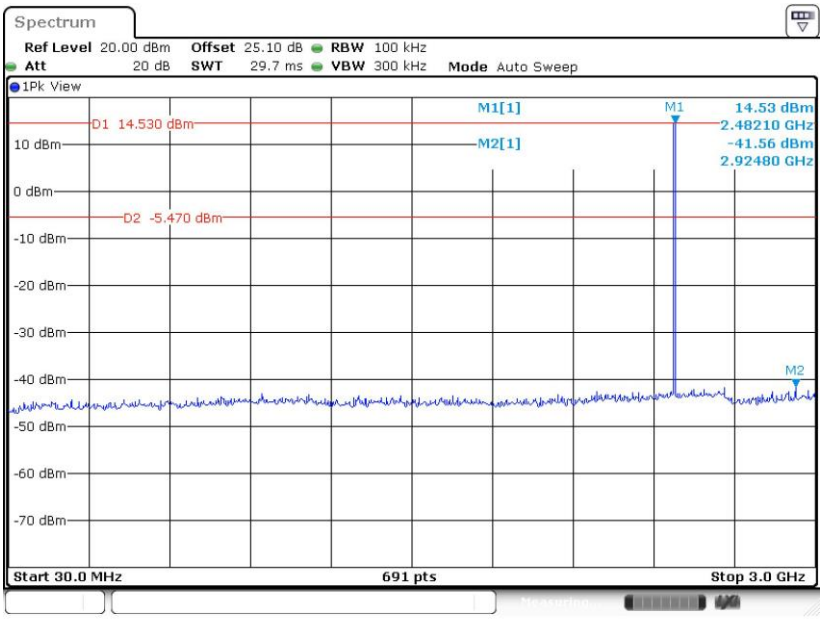

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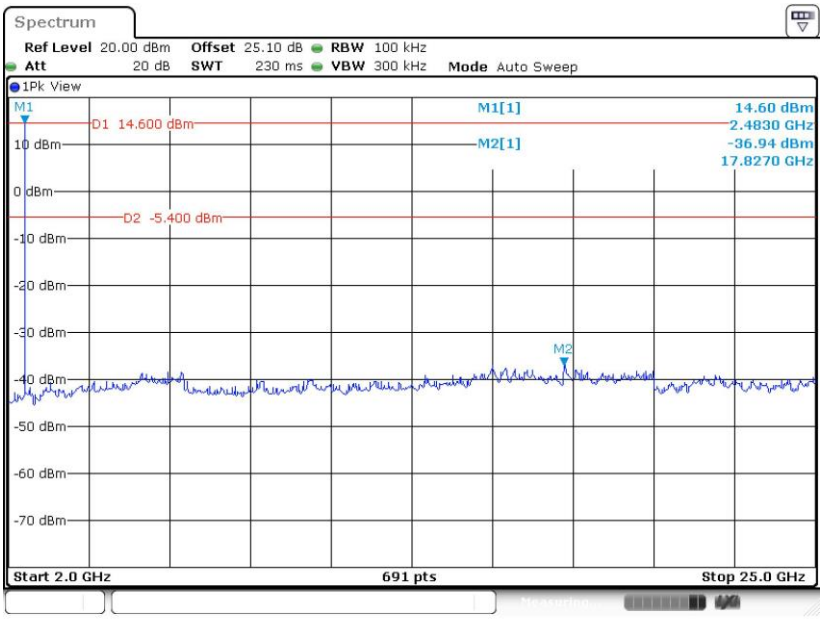

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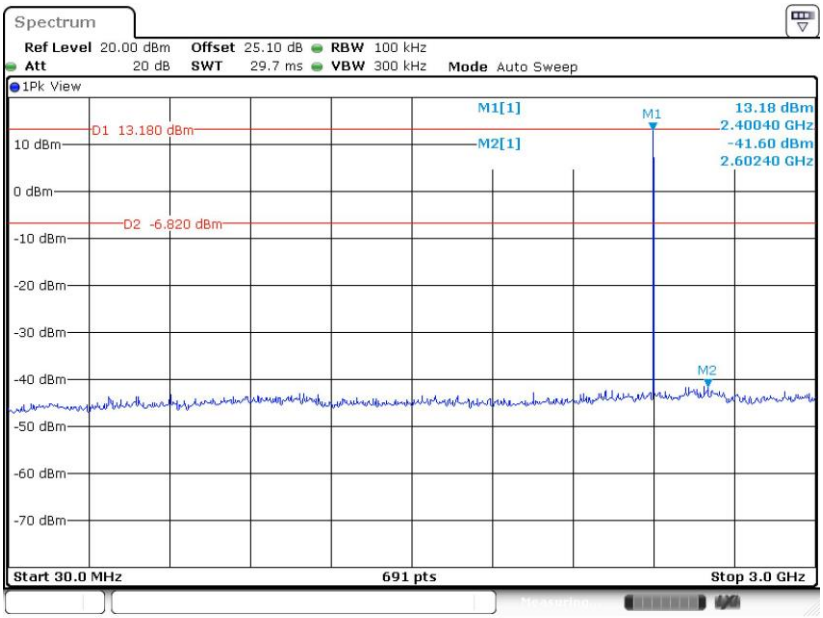
CSE Plot on Ch 00 between 30MHz ~ 3 GHz



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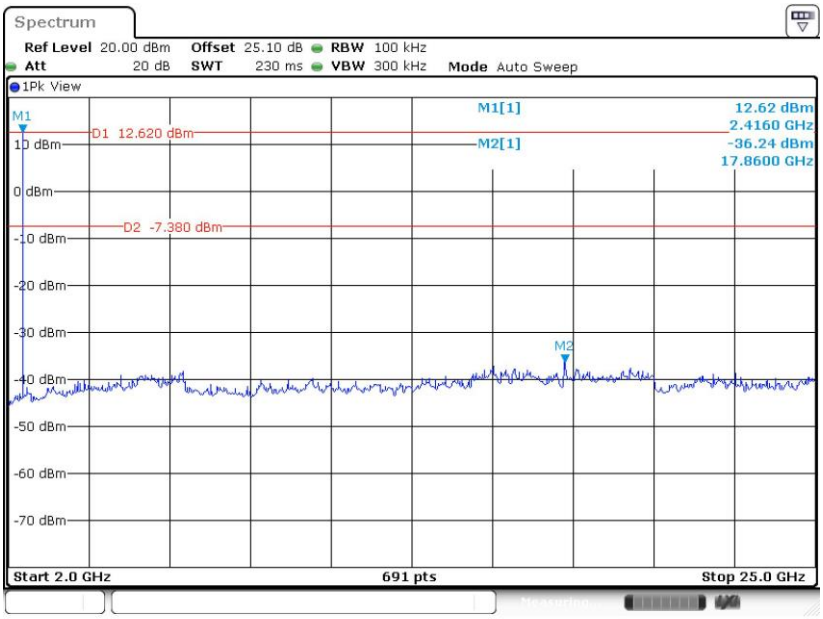

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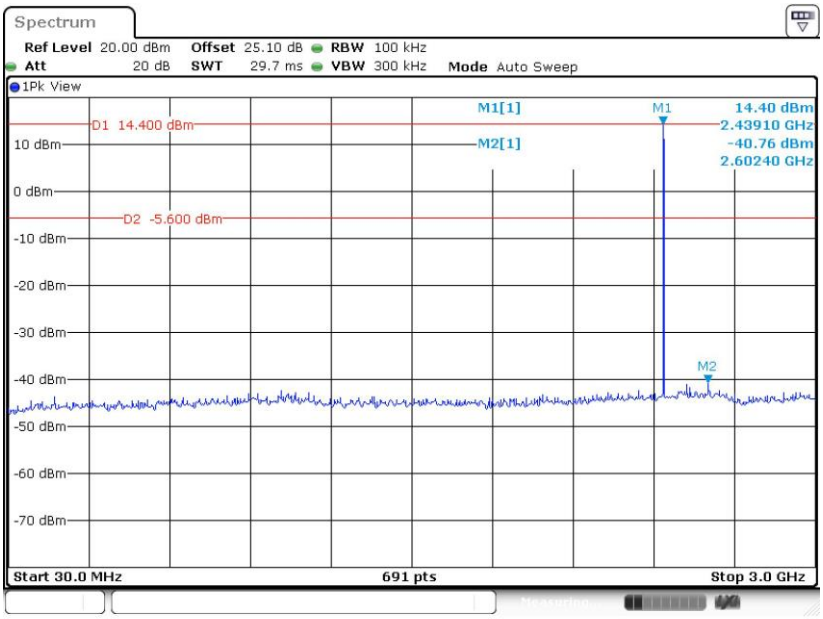

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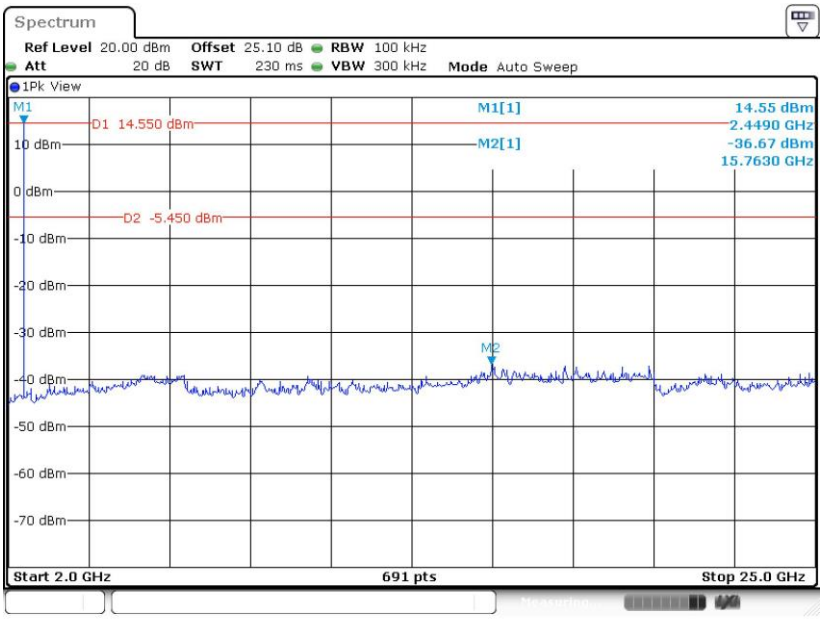

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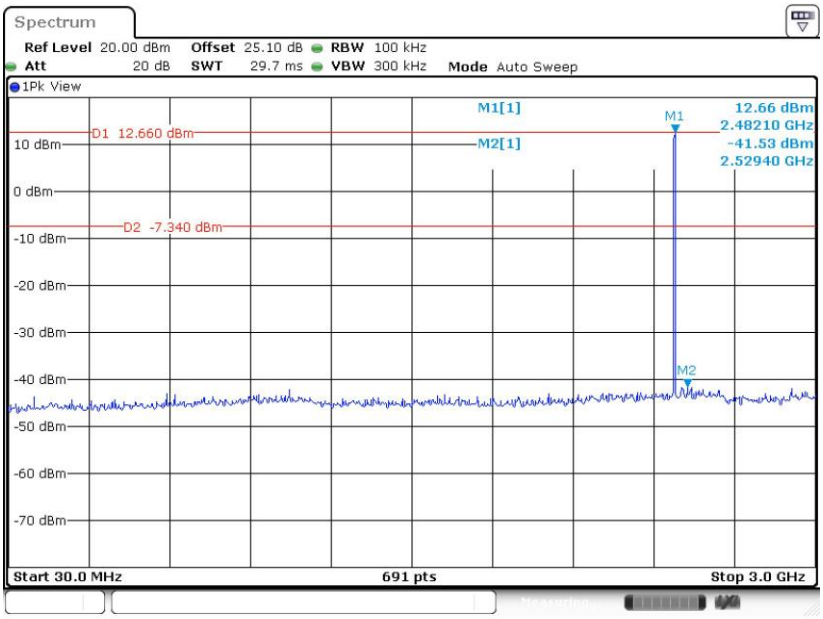
CSE Plot on Ch 78 between 30MHz ~ 3 GHz



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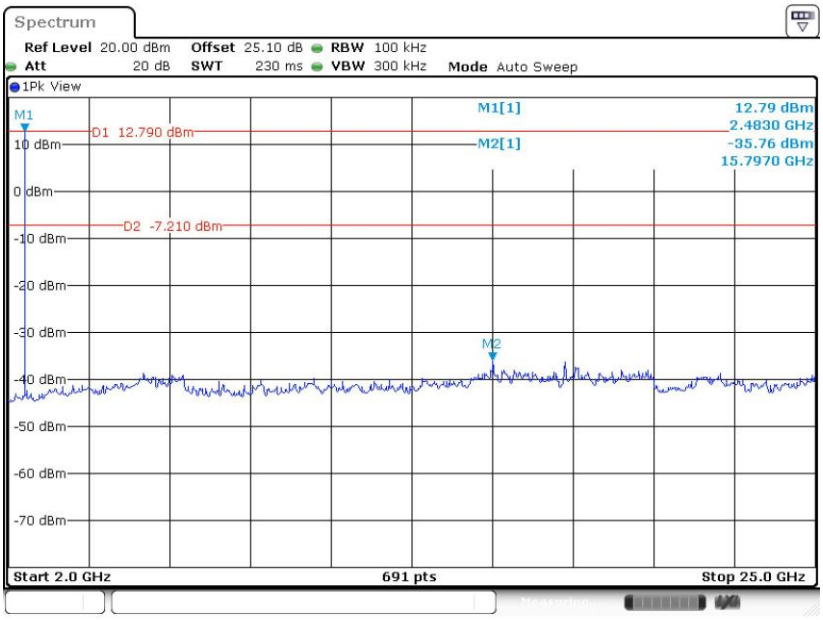

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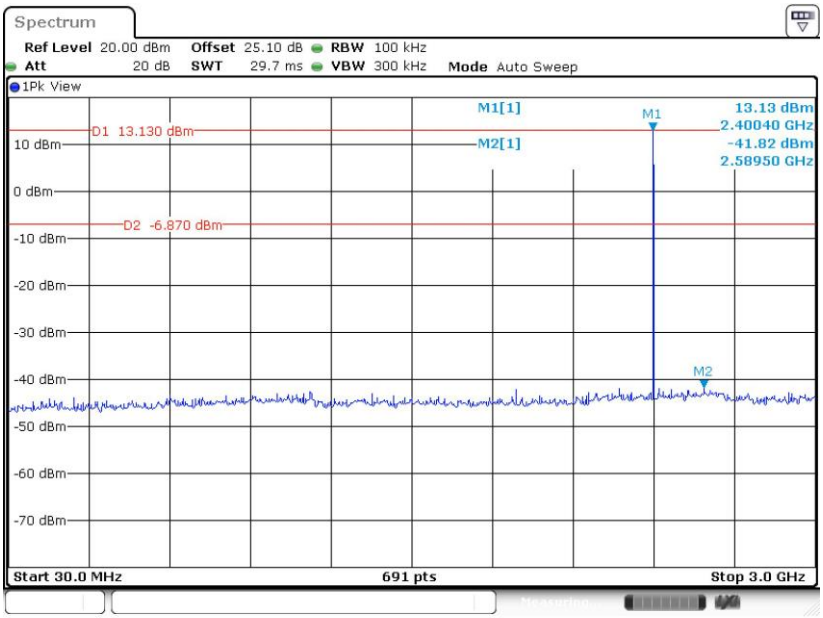

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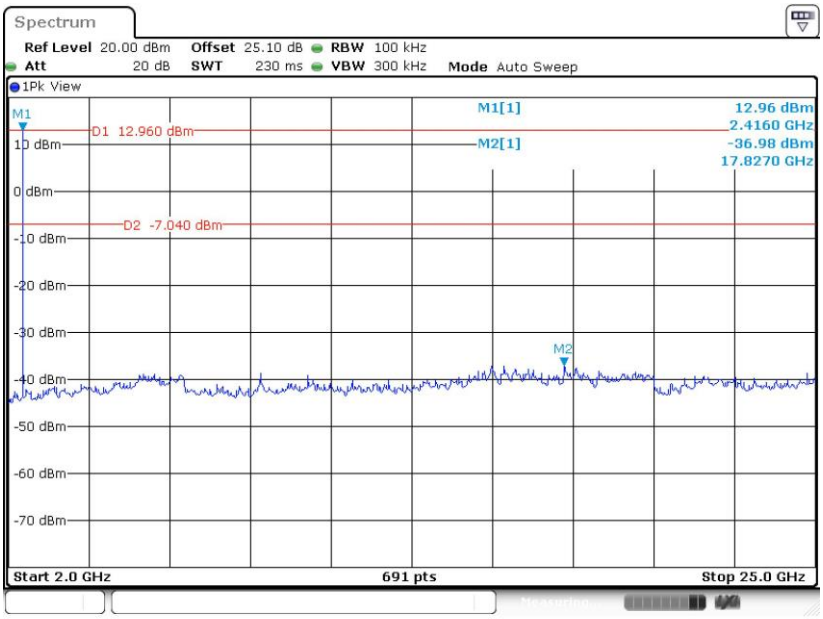
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



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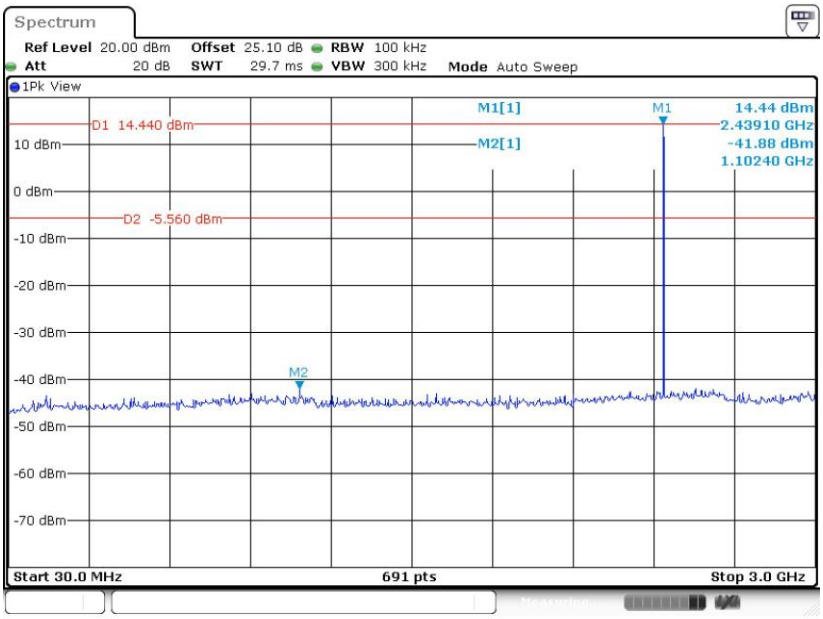

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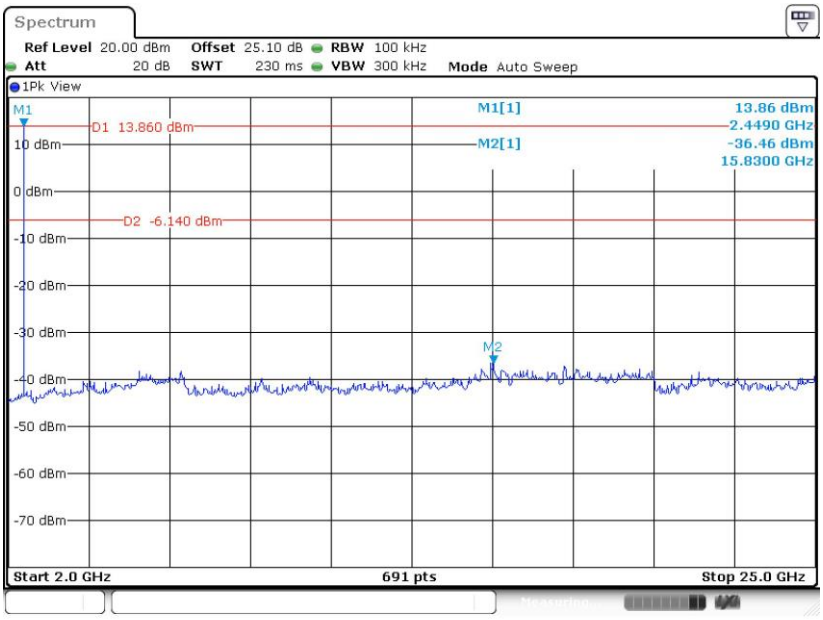
CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



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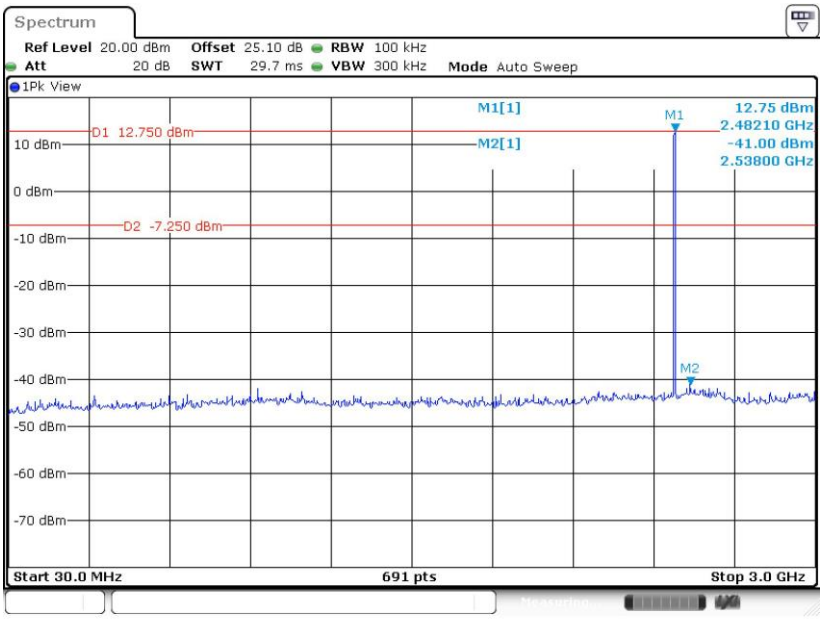

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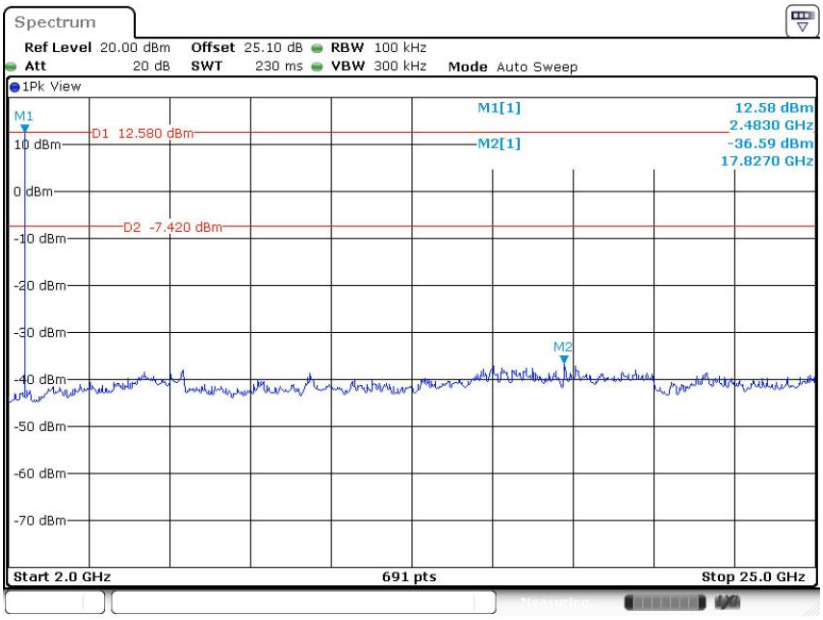
CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



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3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.8.2 Measuring Instruments

See list of measuring equipment of this test report.

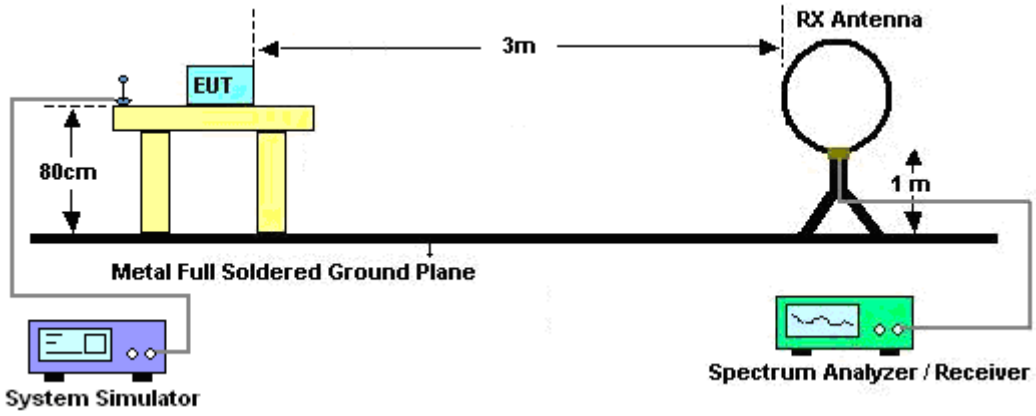
3.8.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

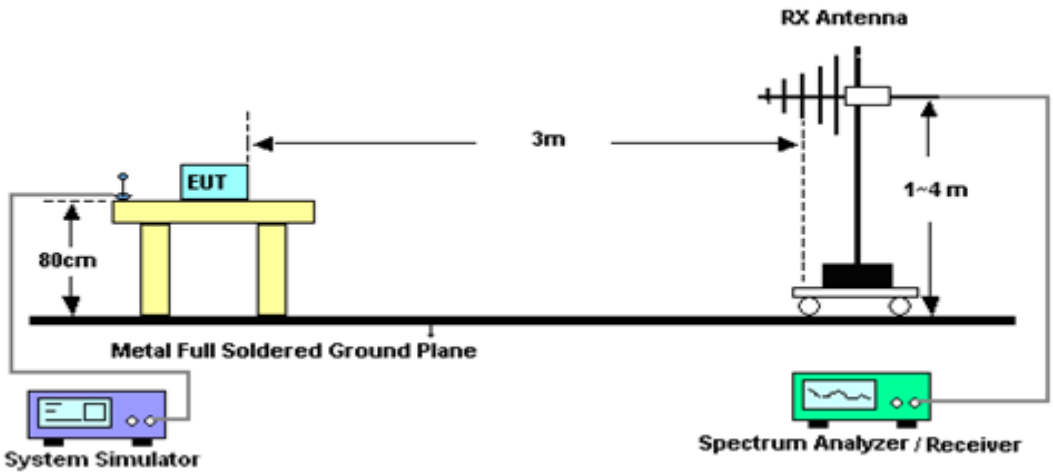
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

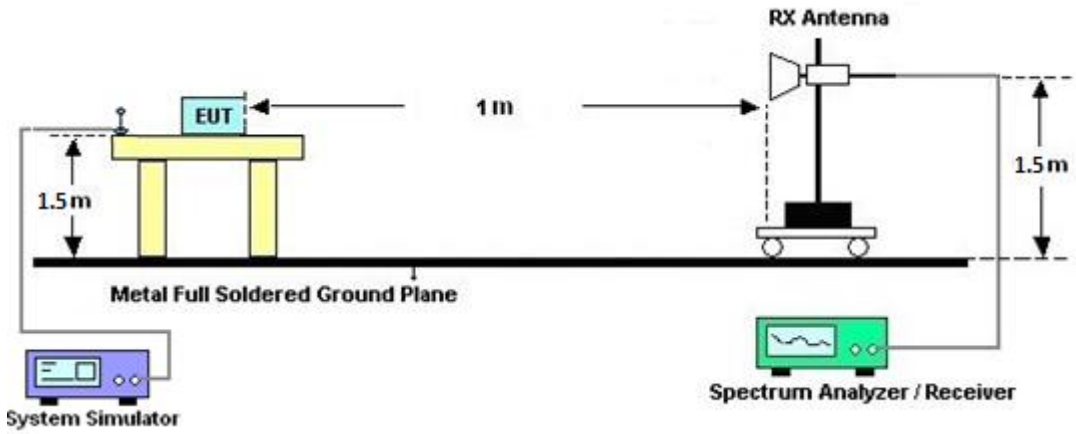
For radiated test below 30MHz



For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.8.7 Duty Cycle

Please refer to Appendix E.

3.8.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

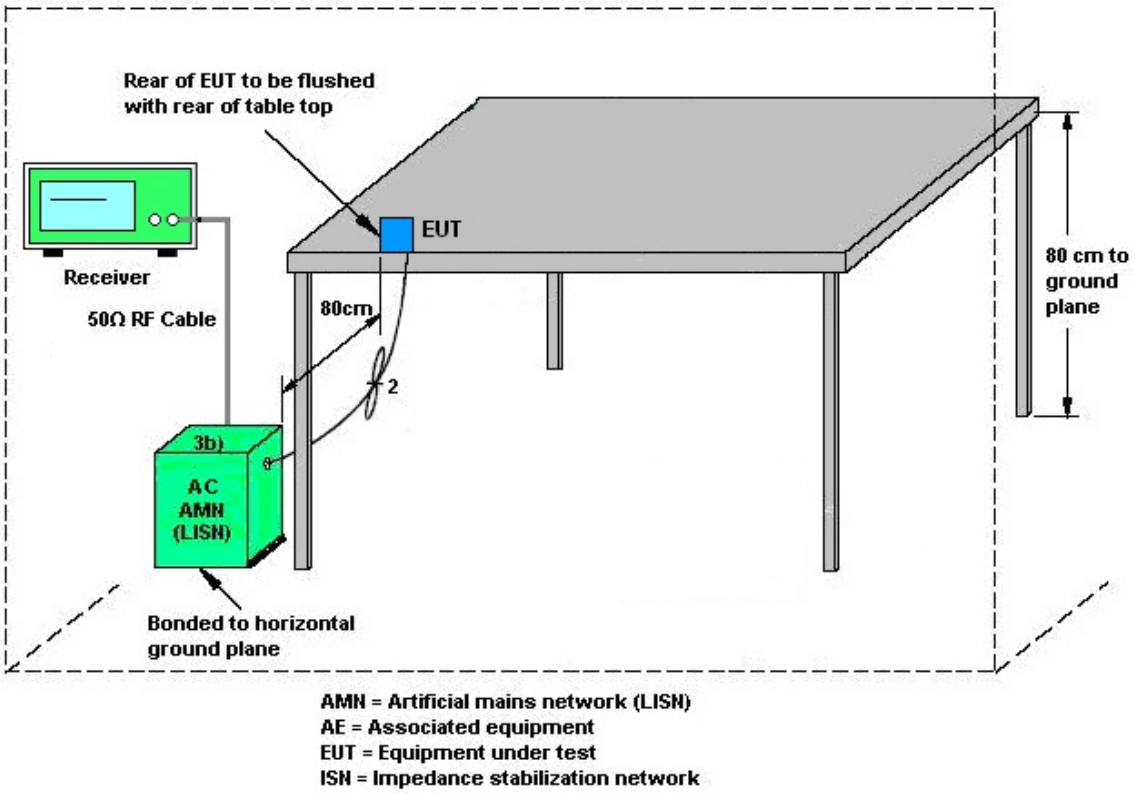
3.9.2 Measuring Instruments

See list of measuring equipment of this test report.

3.9.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.10 Antenna Requirements

3.10.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.10.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jul. 14, 2020	Nov. 16, 2020~ Dec. 10, 2020	Jul. 13, 2021	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz~18GHz	Jul. 15, 2020	Nov. 16, 2020~ Dec. 10, 2020	Jul. 14, 2021	Radiation (03CH13-HY)
Hygrometer	TECPEL	DTM-303B	TP150115	N/A	N/A	Nov. 16, 2020~ Dec. 10, 2020	N/A	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590074	1GHz~18GHz	May 19, 2020	Nov. 16, 2020~ Dec. 10, 2020	May 18, 2021	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Oct. 28, 2020	Nov. 16, 2020~ Dec. 10, 2020	Oct. 27, 2021	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 20, 2020	Nov. 16, 2020~ Dec. 10, 2020	Mar. 19, 2021	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 12, 2020	Nov. 16, 2020~ Dec. 10, 2020	Mar. 11, 2021	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz~40GHz	Mar. 12, 2020	Nov. 16, 2020~ Dec. 10, 2020	Mar. 11, 2021	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz~40GHz	Mar. 12, 2020	Nov. 16, 2020~ Dec. 10, 2020	Mar. 11, 2021	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30MHz~18GHz	Feb. 12, 2020	Nov. 16, 2020~ Dec. 10, 2020	Feb. 11, 2021	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30MHz~18GHz	Feb. 12, 2020	Nov. 16, 2020~ Dec. 10, 2020	Feb. 11, 2021	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30MHz~18GHz	Feb. 12, 2020	Nov. 16, 2020~ Dec. 10, 2020	Feb. 11, 2021	Radiation (03CH13-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Nov. 16, 2020~ Dec. 10, 2020	N/A	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Nov. 16, 2020~ Dec. 10, 2020	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 16, 2020~ Dec. 10, 2020	N/A	Radiation (03CH13-HY)
Software	AUDIX	E3 6.2009-8-24c	RK-001124	N/A	N/A	Nov. 16, 2020~ Dec. 10, 2020	N/A	Radiation (03CH13-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY53290045	20MHz~8.4GHz	Jan. 18, 2020	Nov. 16, 2020~ Dec. 10, 2020	Jan. 17, 2021	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz~40GHz	May 22, 2020	Nov. 16, 2020~ Dec. 10, 2020	May 21, 2021	Radiation (03CH13-HY)
Preamplifier	EMEC	EM18G40G	0600789	18GHz~40GHz	Jul. 31, 2020	Nov. 16, 2020~ Dec. 10, 2020	Jul. 30, 2021	Radiation (03CH13-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN5	6.75GHz High Pass Filter	Mar. 12, 2020	Nov. 16, 2020~ Dec. 10, 2020	Mar. 11, 2021	Radiation (03CH13-HY)
Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN12	1.53GHz Low Pass Filter	Sep. 15, 2020	Nov. 16, 2020~ Dec. 10, 2020	Sep. 14, 2021	Radiation (03CH13-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN2	3GHz High Pass Filter	Jul. 13, 2020	Nov. 16, 2020~ Dec. 10, 2020	Jul. 12, 2021	Radiation (03CH13-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 18, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102317	9kHz~3.6GHz	Sep. 11, 2020	Nov. 18, 2020	Sep. 10, 2021	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 20, 2019	Nov. 18, 2020	Nov. 19, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Nov. 18, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	Nov. 18, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	Nov. 18, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34893241	N/A	Mar. 02, 2020	Nov. 18, 2020	Mar. 01, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34893241	N/A	Mar. 02, 2020	Nov. 15, 2020~ Dec. 04, 2020	Mar. 01, 2021	Conducted (TH05-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Dec. 27, 2019	Nov. 15, 2020~ Dec. 04, 2020	Dec. 26, 2020	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	50MHz~18GHz	Dec. 27, 2019	Nov. 15, 2020~ Dec. 04, 2020	Dec. 26, 2020	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Jul. 22, 2020	Nov. 15, 2020~ Dec. 04, 2020	Jul. 21, 2021	Conducted (TH05-HY)
BT Base Station	Rohde & Schwarz	CBT	101136	BT 3.0	Oct. 19, 2020	Nov. 15, 2020~ Dec. 04, 2020	Oct. 19, 2021	Conducted (TH05-HY)
Switch Box & RF Cable	EM Electronics	EMSW18SE	SW200302	N/A	Mar. 17, 2020	Nov. 15, 2020~ Dec. 04, 2020	Mar. 16, 2021	Conducted (TH05-HY)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.3

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.8

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.8

Report Number : FR0N0303A

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Hank Hsu	Temperature:	21~25	°C
Test Date:	2020/11/18~2020/12/4	Relative Humidity:	51~54	%

<Ant. 5>

TEST RESULTS DATA
20dB and 99% Occupied Bandwidth and Hopping Channel Separation

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.891	0.824	1.002	0.5940	Pass
DH	1Mbps	1	39	2441	0.894	0.827	0.998	0.5960	Pass
DH	1Mbps	1	78	2480	0.891	0.824	0.998	0.5940	Pass
2DH	2Mbps	1	0	2402	1.259	1.163	1.002	0.8393	Pass
2DH	2Mbps	1	39	2441	1.285	1.166	0.994	0.8567	Pass
2DH	2Mbps	1	78	2480	1.289	1.163	1.081	0.8593	Pass
3DH	3Mbps	1	0	2402	1.233	1.149	0.846	0.8220	Pass
3DH	3Mbps	1	39	2441	1.233	1.149	0.955	0.8220	Pass
3DH	3Mbps	1	78	2480	1.233	1.149	1.124	0.8220	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Nomal	79	106.67	2.88	0.31	0.4	Pass
AFH	20	53.33	2.88	0.15	0.4	Pass

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	17.06	20.97	Pass
	39	1	**18.03**	20.97	Pass
	78	1	15.75	20.97	Pass
2DH1	0	1	17.23	20.97	Pass
	39	1	**18.20**	20.97	Pass
	78	1	15.97	20.97	Pass
3DH1	0	1	17.59	20.97	Pass
	39	1	**18.51**	20.97	Pass
	78	1	16.26	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH1	0	1	16.83	5.22
	39	1	**17.79**	5.22
	78	1	15.48	5.22
2DH1	0	1	14.87	5.12
	39	1	**15.78**	5.12
	78	1	13.61	5.12
3DH1	0	1	14.93	5.15
	39	1	**15.86**	5.15
	78	1	13.66	5.15

TEST RESULTS DATA
Number of Hopping Frequency

Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail
79	20	> 15	Pass

Report Number : FR0N0303A

<Ant. 7>

TEST RESULTS DATA
20dB and 99% Occupied Bandwidth and Hopping Channel Separation

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.891	0.821	1.002	0.5940	Pass
DH	1Mbps	1	39	2441	0.891	0.824	1.002	0.5940	Pass
DH	1Mbps	1	78	2480	0.894	0.824	0.703	0.5960	Pass
2DH	2Mbps	1	0	2402	1.285	1.166	1.002	0.8567	Pass
2DH	2Mbps	1	39	2441	1.285	1.166	1.150	0.8567	Pass
2DH	2Mbps	1	78	2480	1.285	1.166	1.033	0.8567	Pass
3DH	3Mbps	1	0	2402	1.233	1.149	0.998	0.8220	Pass
3DH	3Mbps	1	39	2441	1.233	1.146	1.002	0.8220	Pass
3DH	3Mbps	1	78	2480	1.233	1.151	0.846	0.8220	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Nomal	79	106.67	2.88	0.31	0.4	Pass
AFH	20	53.33	2.88	0.15	0.4	Pass

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	14.96	20.97	Pass
	39	1	**15.92**	20.97	Pass
	78	1	14.55	20.97	Pass
2DH1	0	1	15.28	20.97	Pass
	39	1	**16.21**	20.97	Pass
	78	1	14.86	20.97	Pass
3DH1	0	1	15.61	20.97	Pass
	39	1	**16.61**	20.97	Pass
	78	1	15.29	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH1	0	1	14.67	5.22
	39	1	**15.74**	5.22
	78	1	14.18	5.22
2DH1	0	1	12.93	5.15
	39	1	**13.97**	5.15
	78	1	12.63	5.15
3DH1	0	1	12.97	5.15
	39	1	**14.00**	5.15
	78	1	12.65	5.15

TEST RESULTS DATA
Number of Hopping Frequency

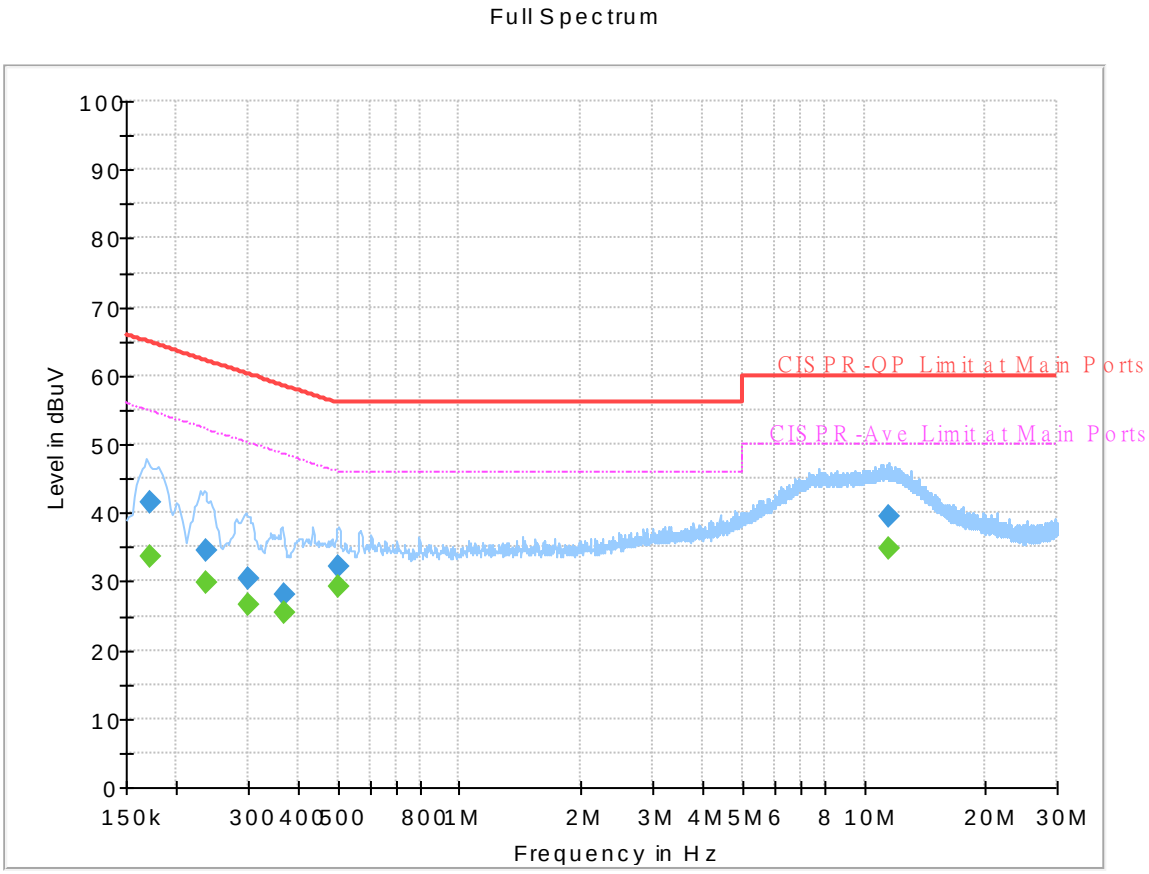
Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail
79	20	> 15	Pass

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Tom Lee	**Temperature :**	23~26℃
		Relative Humidity :	40~50%

EUT Information

Report NO :	0N0303
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

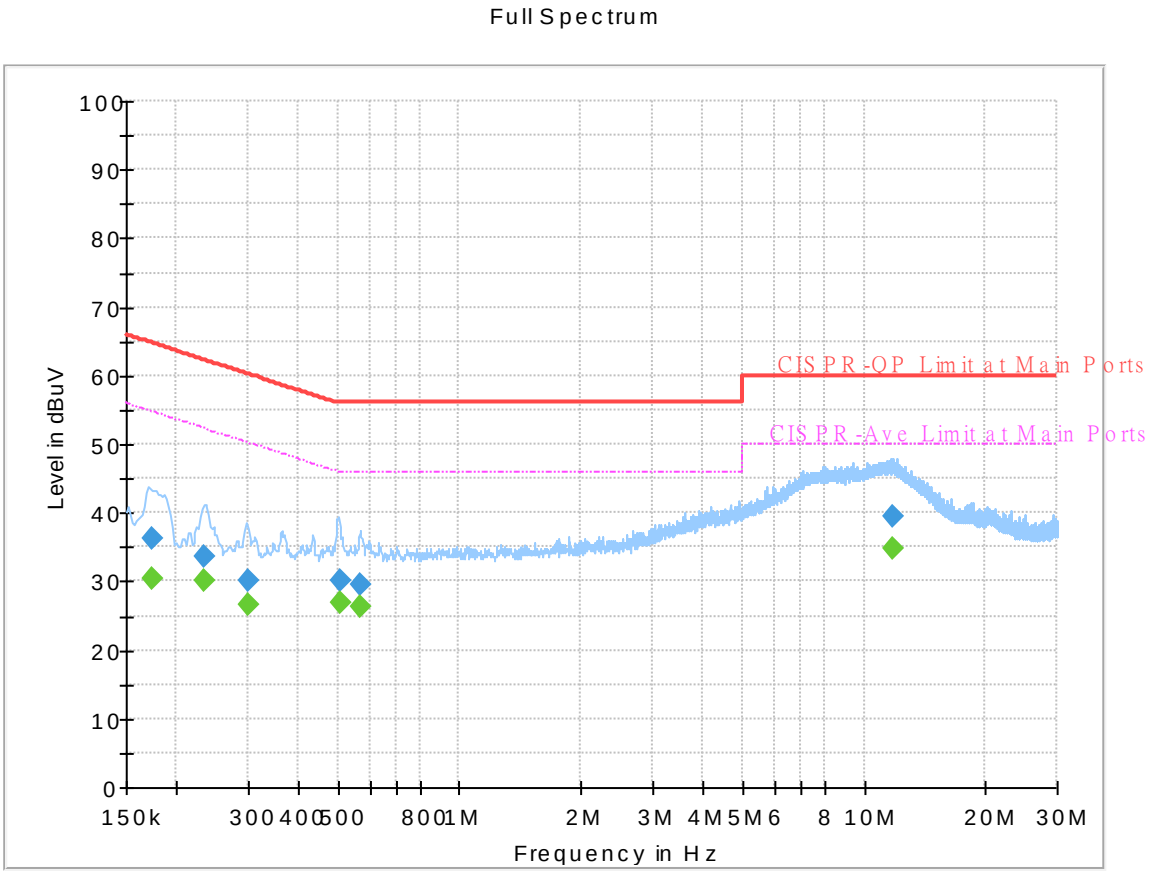


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.172500	---	33.60	54.84	21.24	L1	OFF	19.4
0.172500	41.49	---	64.84	23.35	L1	OFF	19.4
0.237750	---	29.96	52.17	22.21	L1	OFF	19.4
0.237750	34.51	---	62.17	27.66	L1	OFF	19.4
0.299940	---	26.68	50.24	23.56	L1	OFF	19.4
0.299940	30.56	---	60.24	29.68	L1	OFF	19.4
0.367440	---	25.41	48.56	23.15	L1	OFF	19.4
0.367440	28.21	---	58.56	30.35	L1	OFF	19.4
0.501450	---	29.29	46.00	16.71	L1	OFF	19.5
0.501450	32.03	---	56.00	23.97	L1	OFF	19.5
11.534100	---	34.79	50.00	15.21	L1	OFF	20.0
11.534100	39.42	---	60.00	20.58	L1	OFF	20.0

EUT Information

Report NO :	0N0303
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.174750	---	30.50	54.73	24.23	N	OFF	19.5
0.174750	36.35	---	64.73	28.38	N	OFF	19.5
0.233250	---	30.21	52.33	22.12	N	OFF	19.5
0.233250	33.49	---	62.33	28.84	N	OFF	19.5
0.299400	---	26.67	50.26	23.59	N	OFF	19.5
0.299400	30.00	---	60.26	30.26	N	OFF	19.5
0.505680	---	26.78	46.00	19.22	N	OFF	19.5
0.505680	30.13	---	56.00	25.87	N	OFF	19.5
0.571830	---	26.36	46.00	19.64	N	OFF	19.5
0.571830	29.65	---	56.00	26.35	N	OFF	19.5
11.748750	---	34.91	50.00	15.09	N	OFF	20.1
11.748750	39.51	---	60.00	20.49	N	OFF	20.1

Appendix C. Radiated Spurious Emission

Test Engineer :	Daniel Lee, Jacky Hong and Wilson Wu	Temperature :	20~25°C
		Relative Humidity :	50~60%

<Ant. 5>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2389.38	45.53	-28.47	74	41.69	27.62	4.06	27.84	115	306	P	H
		2389.38	20.71	-33.29	54	-	-	-	-	-	-	A	H
	*	2402	109.58	-	-	105.75	27.6	4.07	27.84	115	306	P	H
	*	2402	84.76	-	-	-	-	-	-	-	-	A	H
													H
		2389.17	45.05	-28.95	74	41.21	27.62	4.06	27.84	362	8	P	V
		2389.17	20.23	-33.77	54	-	-	-	-	-	-	A	V
	*	2402	105.57	-	-	101.74	27.6	4.07	27.84	362	8	P	V
	*	2402	80.75	-	-	-	-	-	-	-	-	A	V
													V
BT CH 39 2441MHz		2384.2	45.37	-28.63	74	41.53	27.63	4.05	27.84	136	308	P	H
		2384.2	20.55	-33.45	54	-	-	-	-	-	-	A	H
	*	2441	110.69	-	-	106.89	27.52	4.11	27.83	136	308	P	H
	*	2441	85.87	-	-	-	-	-	-	-	-	A	H
		2493.14	44.61	-29.39	74	40.78	27.5	4.15	27.82	136	308	P	H
		2493.14	19.79	-34.21	54	-	-	-	-	-	-	A	H
		2360.68	45.35	-28.65	74	41.49	27.68	4.03	27.85	386	0	P	V
		2360.68	20.53	-33.47	54	-	-	-	-	-	-	A	V
	*	2441	106.51	-	-	102.71	27.52	4.11	27.83	386	0	P	V
	*	2441	81.69	-	-	-	-	-	-	-	-	A	V
		2496.78	45.8	-28.2	74	41.96	27.5	4.16	27.82	386	0	P	V
		2496.78	20.98	-33.02	54	-	-	-	-	-	-	A	V

BT CH 78 2480MHz	*	2480	108.67	-	-	104.85	27.5	4.14	27.82	115	311	P	H
	*	2480	83.85	-	-	-	-	-	-	-	-	A	H
		2483.6	51.02	-22.98	74	47.19	27.5	4.15	27.82	115	311	P	H
		2483.6	26.2	-27.8	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	102.88	-	-	99.06	27.5	4.14	27.82	373	0	P	V
	*	2480	78.06	-	-	-	-	-	-	-	-	A	V
		2483.72	46.84	-27.16	74	43.01	27.5	4.15	27.82	373	0	P	V
		2483.72	22.02	-31.98	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 00 2402MHz		4804	36.58	-37.42	74	55.98	31.11	6.98	57.49	100	0	P	H
		4804	11.76	-42.24	54	-	-	-	-	-	-	A	H
													H
													H
		4804	36.59	-37.41	74	55.99	31.11	6.98	57.49	100	0	P	V
		4804	11.77	-42.23	54	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		4882	38.55	-35.45	74	57.68	31.2	6.99	57.32	100	0	P	H
		4882	13.73	-40.27	54	-	-	-	-	-	-	A	H
		7323	42.93	-31.07	74	54.96	36.75	8.32	57.1	100	0	P	H
		7323	18.11	-35.89	54	-	-	-	-	-	-	A	H
		4882	38.56	-35.44	74	57.69	31.2	6.99	57.32	100	0	P	V
		4882	13.74	-40.26	54	-	-	-	-	-	-	A	V
		7323	43.92	-30.08	74	55.95	36.75	8.32	57.1	100	0	P	V
		7323	19.1	-34.9	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	38.88	-35.12	74	57.62	31.42	7	57.16	100	0	P	H
		4960	14.06	-39.94	54	-	-	-	-	-	-	A	H
		7440	43.75	-30.25	74	55.88	36.82	8.33	57.28	100	0	P	H
		7440	18.93	-35.07	54	-	-	-	-	-	-	A	H
		4960	38.47	-35.53	74	57.21	31.42	7	57.16	100	0	P	V
		4960	13.65	-40.35	54	-	-	-	-	-	-	A	V
		7440	43.88	-30.12	74	56.01	36.82	8.33	57.28	100	0	P	V
		7440	19.06	-34.94	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		30	22.43	-17.57	40	29.58	24.59	0.48	32.22	-	-	P	H
		132.82	28.36	-15.14	43.5	41.91	17.62	1.01	32.18	-	-	P	H
		156.1	30.4	-13.1	43.5	44.65	16.86	1.11	32.22	-	-	P	H
		384.05	31.79	-14.21	46	40.54	21.26	1.69	31.7	-	-	P	H
		665.35	30.26	-15.74	46	33.69	26.24	2.19	31.86	-	-	P	H
		815.7	37.29	-8.71	46	38.94	27.79	2.46	31.9	100	0	P	H
													H
													H
													H
													H
													H
													H
		36.79	27.58	-12.42	40	38.18	21.13	0.53	32.26	-	-	P	V
		386.96	26.55	-19.45	46	35.17	21.37	1.7	31.69	-	-	P	V
		467.47	27.84	-18.16	46	34.78	23.44	1.85	32.23	-	-	P	V
		576.11	31.16	-14.84	46	35.56	25.9	2.04	32.34	-	-	P	V
		776.9	35.25	-10.75	46	36.63	28.09	2.41	31.88	-	-	P	V
		824.43	35.27	-10.73	46	36.63	28.05	2.46	31.87	100	0	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

<Ant. 7>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2343.39	44.55	-29.45	74	40.67	27.71	4.02	27.85	100	15	P	H
		2343.39	19.76	-34.24	54	-	-	-	-	-	-	A	H
	*	2402	106.02	-	-	102.19	27.6	4.07	27.84	100	15	P	H
	*	2402	81.23	-	-	-	-	-	-	-	-	A	H
													H
													H
		2329.215	44.7	-29.3	74	40.81	27.74	4	27.85	129	120	P	V
		2329.215	19.91	-34.09	54	-	-	-	-	-	-	A	V
	*	2402	106.65	-	-	102.82	27.6	4.07	27.84	129	120	P	V
	*	2402	81.86	-	-	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		2387.14	45.34	-28.66	74	41.49	27.63	4.06	27.84	116	19	P	H
		2387.14	20.55	-33.45	54	-	-	-	-	-	-	A	H
	*	2441	108.26	-	-	104.46	27.52	4.11	27.83	116	19	P	H
	*	2441	83.47	-	-	-	-	-	-	-	-	A	H
		2495.87	45.25	-28.75	74	41.41	27.5	4.16	27.82	116	19	P	H
		2495.87	20.46	-33.54	54	-	-	-	-	-	-	A	H
		2354.66	44.43	-29.57	74	40.56	27.69	4.03	27.85	121	118	P	V
		2354.66	19.64	-34.36	54	-	-	-	-	-	-	A	V
	*	2441	108.89	-	-	105.09	27.52	4.11	27.83	121	118	P	V
	*	2441	84.1	-	-	-	-	-	-	-	-	A	V
		2484.11	44.09	-29.91	74	40.26	27.5	4.15	27.82	121	118	P	V
		2484.11	19.3	-34.7	54	-	-	-	-	-	-	A	V

BT CH 78 2480MHz	*	2480	108.47	-	-	104.65	27.5	4.14	27.82	139	21	P	H
	*	2480	83.68	-	-	-	-	-	-	-	-	A	H
		2483.52	50.42	-23.58	74	46.59	27.5	4.15	27.82	139	21	P	H
		2483.52	25.63	-28.37	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	109.76	-	-	105.94	27.5	4.14	27.82	100	117	P	V
	*	2480	84.97	-	-	-	-	-	-	-	-	A	V
		2483.52	51.5	-22.5	74	47.67	27.5	4.15	27.82	100	117	P	V
		2483.52	26.71	-27.29	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 00 2402MHz		4804	37.45	-36.55	74	56.85	31.11	6.98	57.49	100	0	P	H
		4804	12.66	-41.34	54	-	-	-	-	-	-	A	H
													H
													H
		4804	37.55	-36.45	74	56.95	31.11	6.98	57.49	100	0	P	V
		4804	12.76	-41.24	54	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		4882	38.28	-35.72	74	57.41	31.2	6.99	57.32	100	0	P	H
		4882	13.49	-40.51	54	-	-	-	-	-	-	A	H
		7323	43.75	-30.25	74	55.78	36.75	8.32	57.1	100	0	P	H
		7323	18.96	-35.04	54	-	-	-	-	-	-	A	H
		4882	38.22	-35.78	74	57.35	31.2	6.99	57.32	100	0	P	V
		4882	13.43	-40.57	54	-	-	-	-	-	-	A	V
		7323	43.87	-30.13	74	55.9	36.75	8.32	57.1	100	0	P	V
		7323	19.08	-34.92	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	39.64	-34.36	74	58.38	31.42	7	57.16	100	0	P	H
		4960	14.85	-39.15	54	-	-	-	-	-	-	A	H
		7440	42.97	-31.03	74	55.1	36.82	8.33	57.28	100	0	P	H
		7440	18.18	-35.82	54	-	-	-	-	-	-	A	H
		4960	38.65	-35.35	74	57.39	31.42	7	57.16	100	0	P	V
		4960	13.86	-40.14	54	-	-	-	-	-	-	A	V
		7440	43.17	-30.83	74	55.3	36.82	8.33	57.28	100	0	P	V
		7440	18.38	-35.62	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		30.97	21.56	-18.44	40	29.1	24.21	0.48	32.23	-	-	P	H
		117.3	26.51	-16.99	43.5	40.27	17.43	0.95	32.14	-	-	P	H
		155.13	27.83	-15.67	43.5	42	16.95	1.1	32.22	-	-	P	H
		380.17	28.03	-17.97	46	36.95	21.1	1.69	31.71	-	-	P	H
		523.73	27.13	-18.87	46	33.63	24.02	1.95	32.47	-	-	P	H
		783.69	33.07	-12.93	46	34.43	28.12	2.42	31.9	100	0	P	H
													H
													H
													H
													H
													H
													H
		36.79	29.79	-10.21	40	40.39	21.13	0.53	32.26	100	0	P	V
		116.33	22.08	-21.42	43.5	35.83	17.45	0.94	32.14	-	-	P	V
		446.13	29.27	-16.73	46	36.48	23.04	1.8	32.05	-	-	P	V
		780.78	30.82	-15.18	46	32.2	28.09	2.42	31.89	-	-	P	V
		829.28	30.83	-15.17	46	31.9	28.32	2.47	31.86	-	-	P	V
		892.33	31.76	-14.24	46	32.01	28.75	2.65	31.65	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

<WPC Charging Mode>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 78 2480MHz	*	2480	106.46	-	-	102.64	27.5	4.14	27.82	107	142	P	H
	*	2480	81.67	-	-	-	-	-	-	-	-	A	H
		2484.56	55.32	-18.68	74	51.49	27.5	4.15	27.82	107	142	P	H
		2484.56	30.53	-23.47	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	105.21	-	-	101.39	27.5	4.14	27.82	375	58	P	V
	*	2480	80.42	-	-	-	-	-	-	-	-	A	V
		2483.52	46.15	-27.85	74	42.32	27.5	4.15	27.82	375	58	P	V
		2483.52	21.36	-32.64	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 78 2480MHz		4960	39.27	-34.73	74	58.01	31.42	7	57.16	100	0	P	H
		4960	14.48	-39.52	54	-	-	-	-	-	-	A	H
		7440	44.41	-29.59	74	56.54	36.82	8.33	57.28	100	0	P	H
		7440	19.62	-34.38	54	-	-	-	-	-	-	A	H
		4960	39	-35	74	57.74	31.42	7	57.16	100	0	P	V
		4960	14.21	-39.79	54	-	-	-	-	-	-	A	V
		7440	43.84	-30.16	74	55.97	36.82	8.33	57.28	100	0	P	V
		7440	19.05	-34.95	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		33.88	21.14	-18.86	40	30	22.87	0.51	32.24	-	-	P	H
		129.91	28.43	-15.07	43.5	42	17.61	0.99	32.17	-	-	P	H
		431.58	25.93	-20.07	46	33.13	22.94	1.78	31.92	-	-	P	H
		461.65	26.06	-19.94	46	33.04	23.36	1.84	32.18	-	-	P	H
		878.75	31.23	-14.77	46	31.53	28.8	2.6	31.7	-	-	P	H
		955.38	32.75	-13.25	46	30.29	30.69	2.7	30.93	100	0	P	H
													H
													H
													H
													H
													H
													H
		36.79	26.1	-13.9	40	36.7	21.13	0.53	32.26	-	-	P	V
		115.36	21.75	-21.75	43.5	35.56	17.39	0.94	32.14	-	-	P	V
		455.83	27.07	-18.93	46	34.13	23.25	1.82	32.13	-	-	P	V
		572.23	26.82	-19.18	46	31.12	26.03	2.02	32.35	-	-	P	V
		848.68	30.23	-15.77	46	30.62	28.92	2.48	31.79	-	-	P	V
		958.29	33.24	-12.76	46	30.82	30.6	2.72	30.9	100	0	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Radiated Spurious Emission Plots

Test Engineer :	Daniel Lee, Jacky Hong and Wilson Wu	**Temperature :**	20~25°C
		Relative Humidity :	50~60%

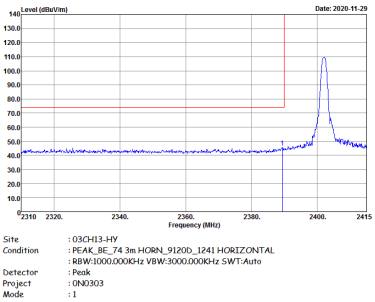
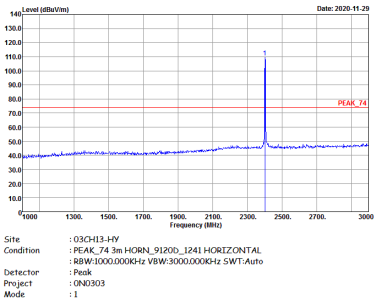
Note symbol

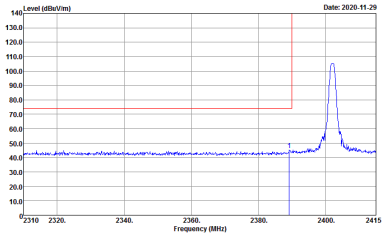
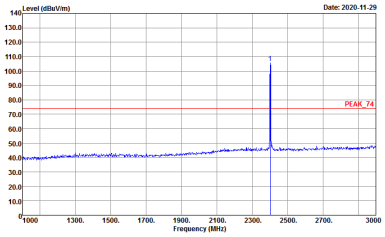
-L	**Low channel location**
-R	**High channel location**

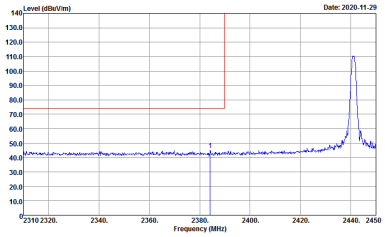
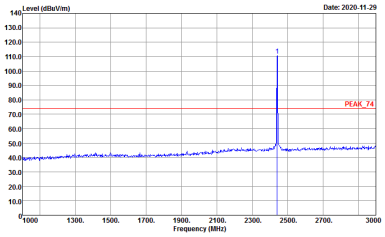
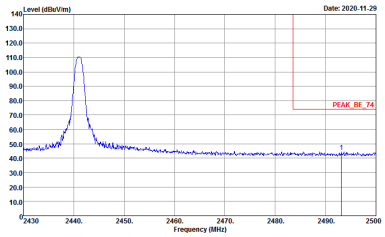
<Ant. 5>

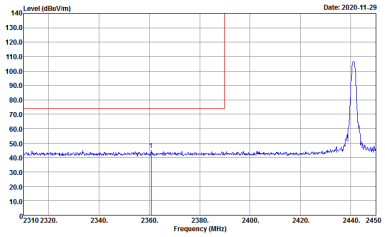
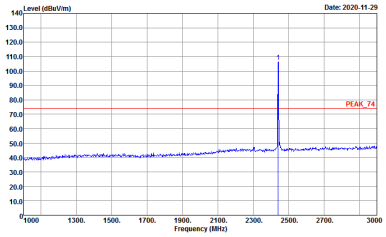
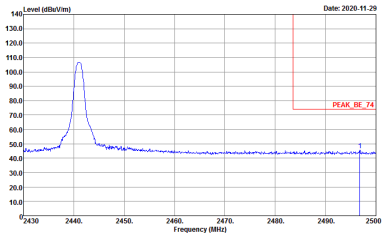
2.4GHz 2400~2483.5MHz

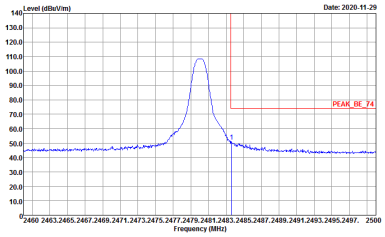
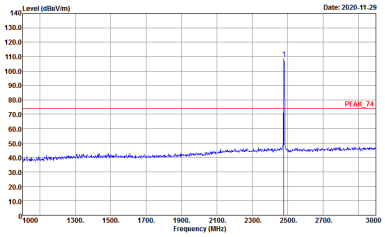
BT (Band Edge @ 3m)

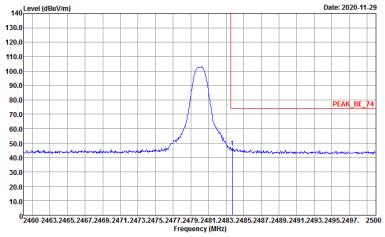
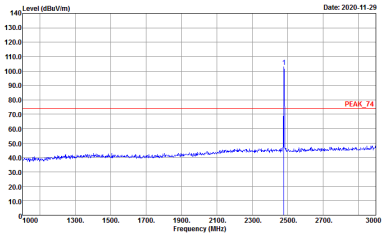
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Horizontal	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 1	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 1

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 2	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 2
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 2	Left blank

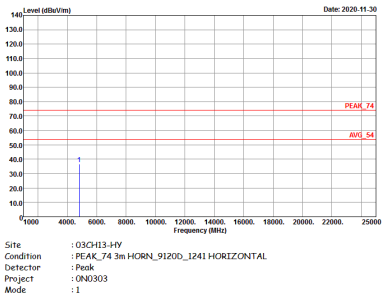
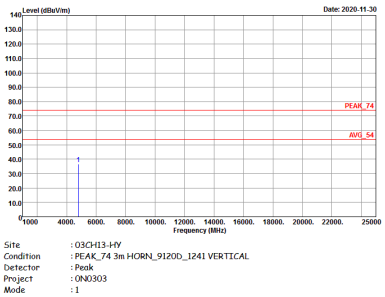
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 2	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 2
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 2	Left blank

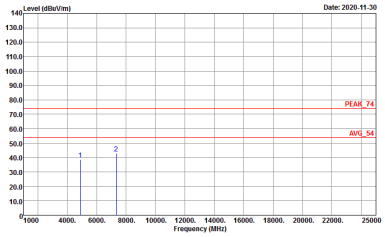
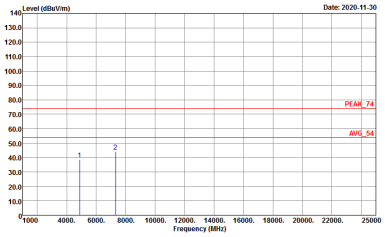
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 3	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 3

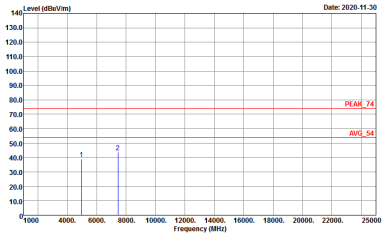
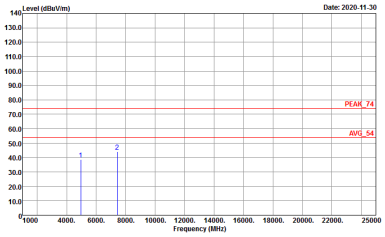
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 3	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 3

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

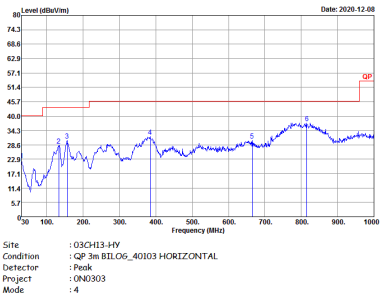
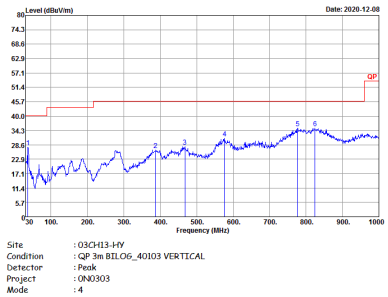
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL Detector : Peak Project : 0N0303 Mode : 2	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL Detector : Peak Project : 0N0303 Mode : 2

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL Detector : Peak Project : 0N0303 Mode : 3	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL Detector : Peak Project : 0N0303 Mode : 3

Emission below 1GHz

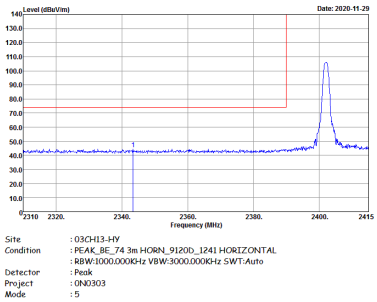
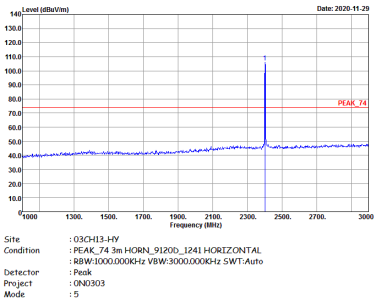
2.4GHz BT (LF)

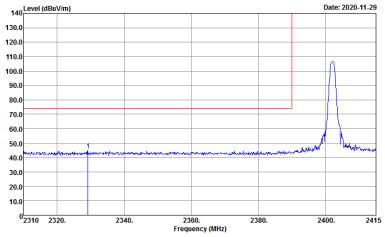
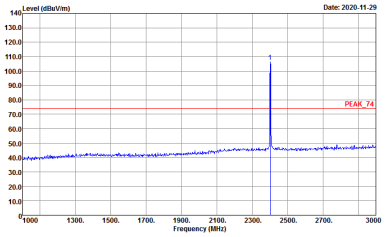
BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak		

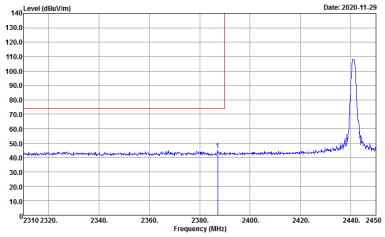
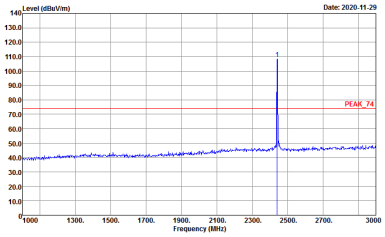
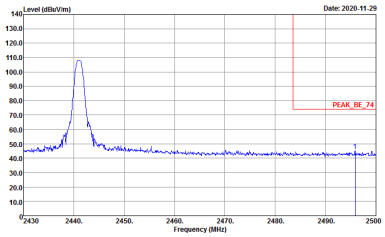
<Ant. 7>

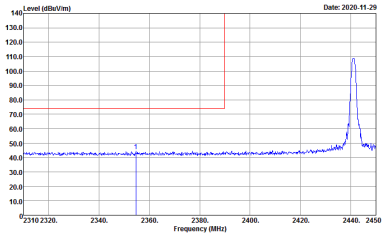
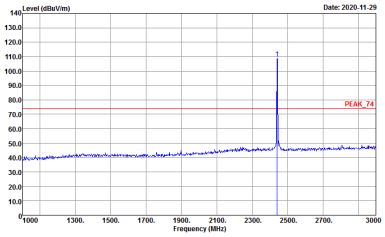
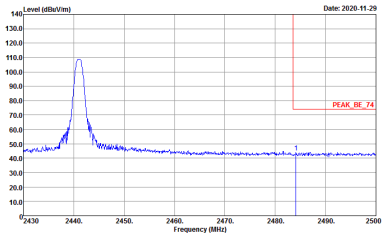
2.4GHz 2400~2483.5MHz

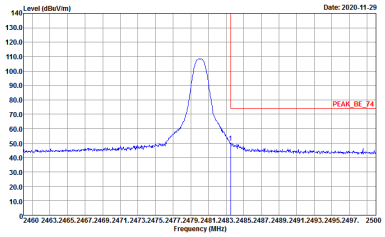
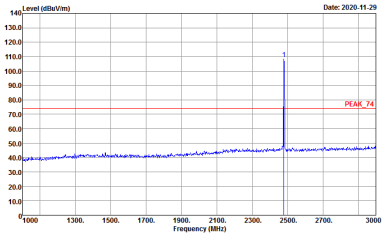
BT (Band Edge @ 3m)

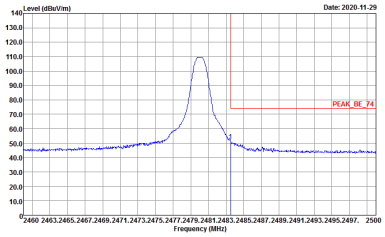
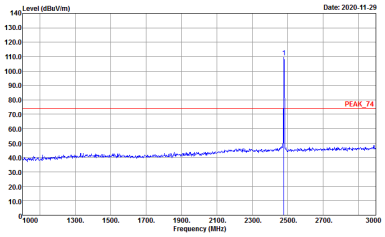
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Horizontal	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 5

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 6	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 6
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 6	Left blank

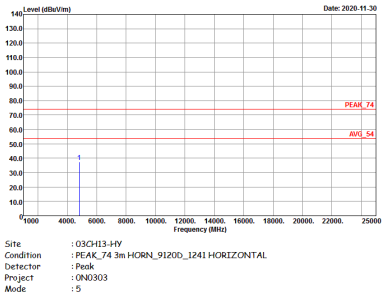
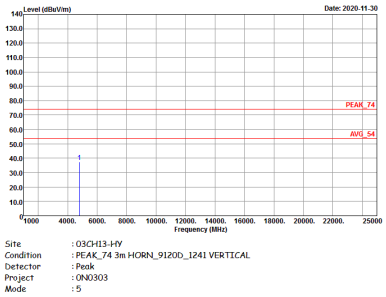
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 6	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 6
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 6	Left blank

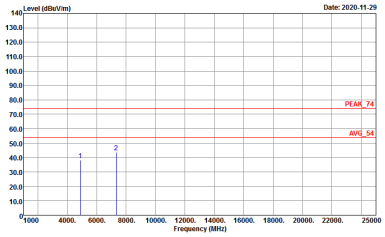
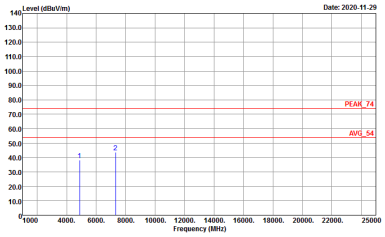
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 7	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 7

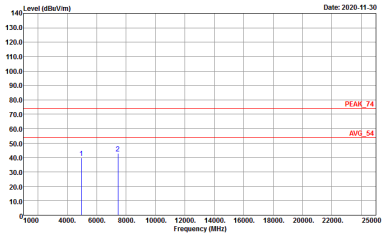
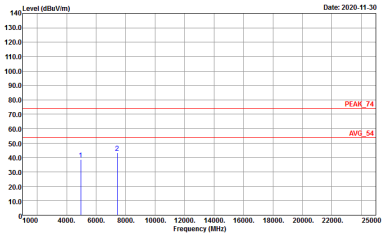
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 7	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 7

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

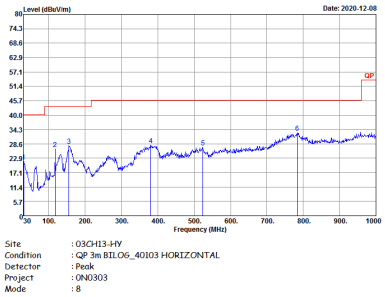
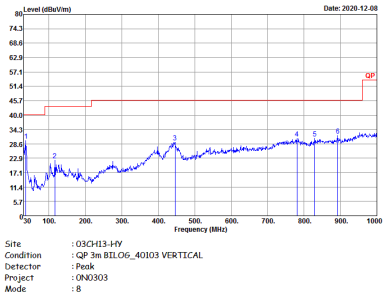
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL Detector : Peak Project : 0N0303 Mode : 5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL Detector : Peak Project : 0N0303 Mode : 5

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL Detector : Peak Project : 0N0303 Mode : 6	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL Detector : Peak Project : 0N0303 Mode : 6

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL Detector : Peak Project : 0N0303 Mode : 7	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL Detector : Peak Project : 0N0303 Mode : 7

Emission below 1GHz

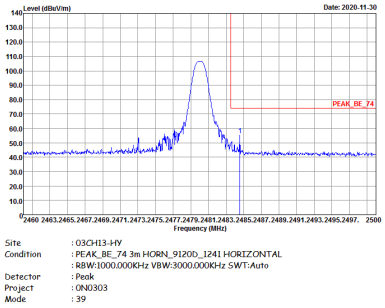
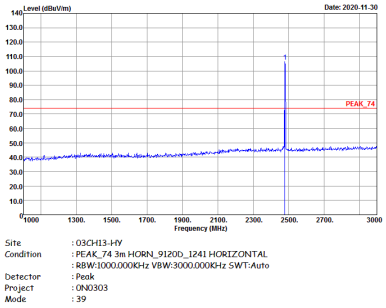
2.4GHz BT (LF)

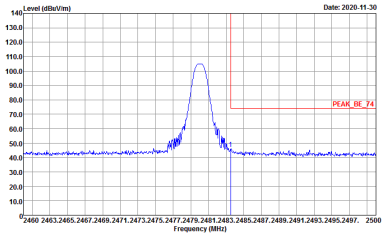
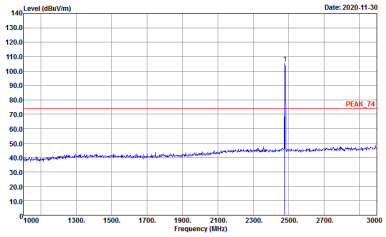
BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak		

<WPC Charging Mode>

2.4GHz 2400~2483.5MHz

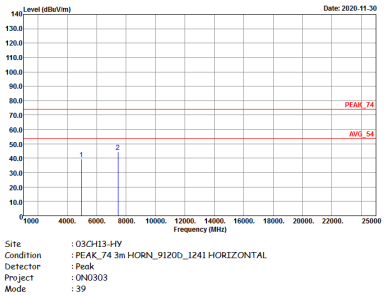
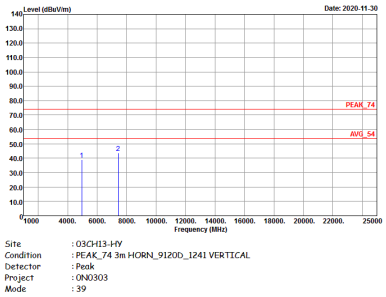
BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 39	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 0N0303 Mode : 39

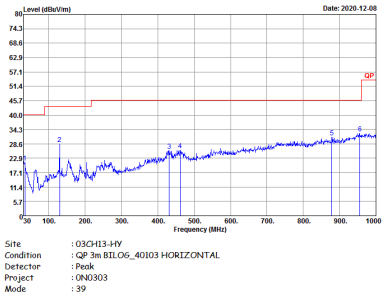
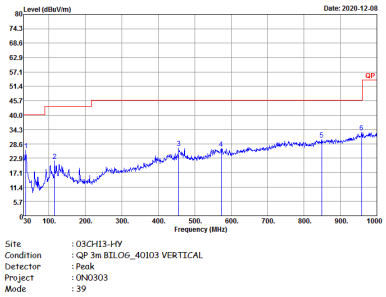
2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL Detector : Peak Project : 0N0303 Mode : 39	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL Detector : Peak Project : 0N0303 Mode : 39

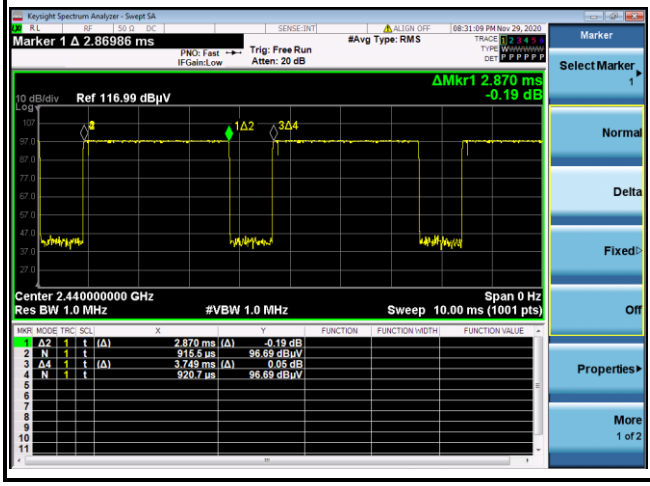
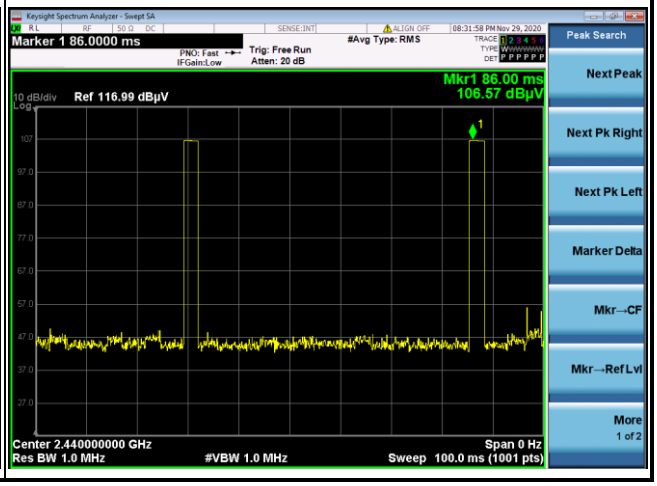
Emission below 1GHz

2.4GHz BT (LF)

BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak		

Appendix E. Duty Cycle Plots

<Ant. 5>

DH5 on time (One Pulse) Plot on Channel 39	on time (Count Pulses) Plot on Channel 39
	

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.87 / 100 = 5.74 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.82 dB
3. **DH5** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

2.87 ms x 20 channels = 57.4 ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100 ms / 57.4 ms] = 2 hops

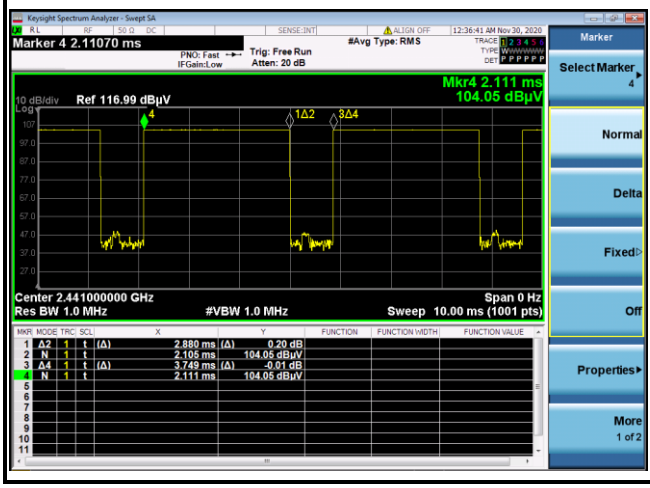
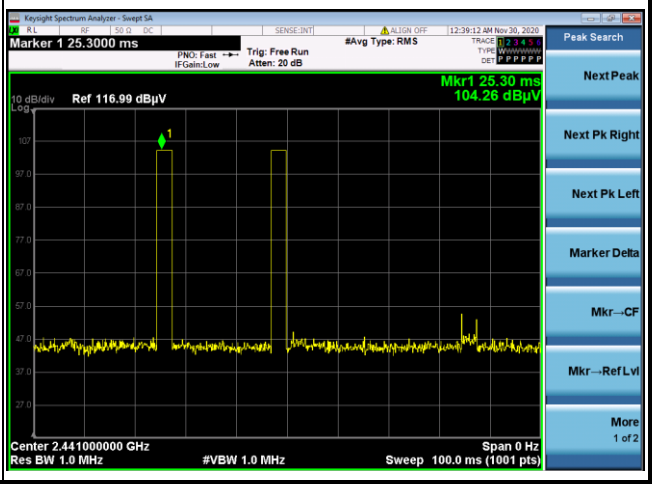
Thus, the maximum possible ON time:

2.87 ms x 2 = 5.74 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.74 ms/100 ms) = -24.82 dB

<Ant. 7>

DH5 on time (One Pulse) Plot on Channel 39	on time (Count Pulses) Plot on Channel 39
	

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.88 / 100 = 5.76 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.79 dB
3. **DH5** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

2.87 ms x 20 channels = 57.4 ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100 ms / 57.4 ms] = 2 hops

Thus, the maximum possible ON time:

2.87 ms x 2 = 5.74 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.74 ms/100 ms) = -24.82 dB