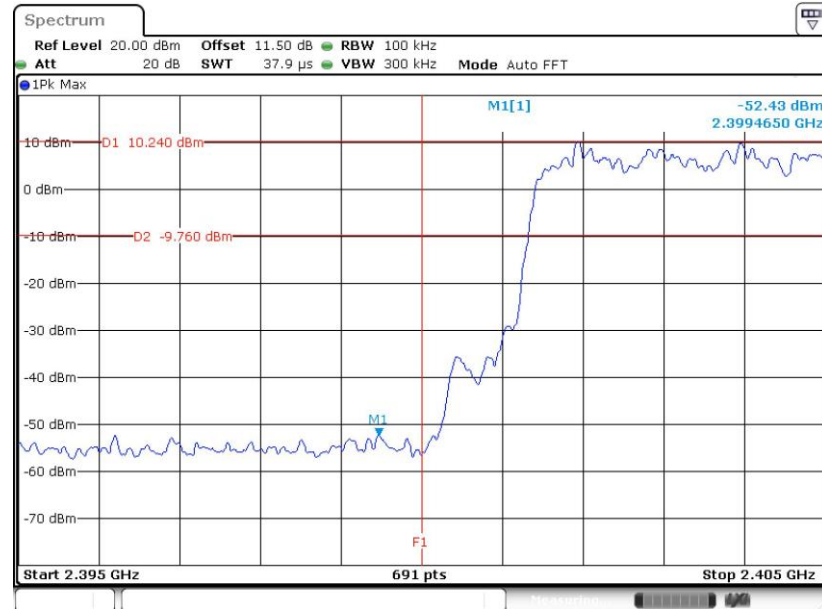


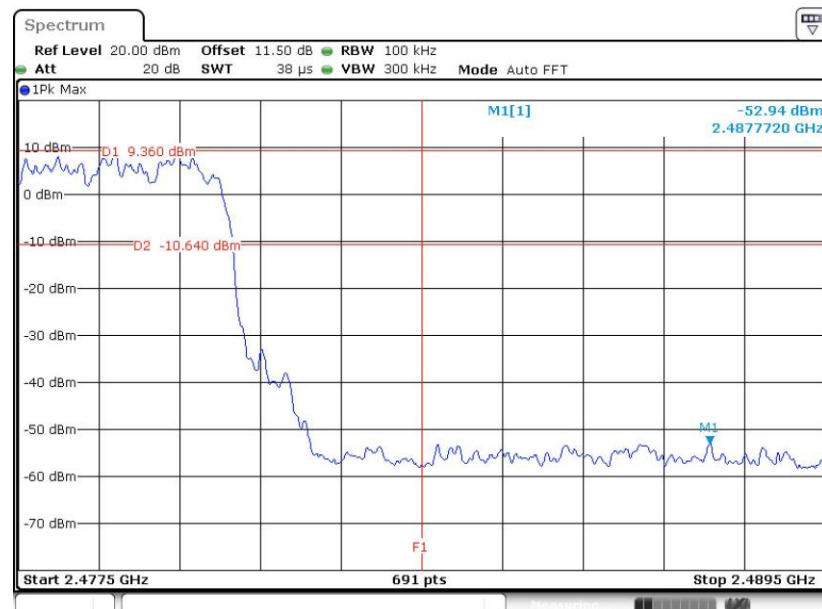
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Hopping Mode Low Band Edge Plot



Date: 1.JUN.2022 20:58:04

Hopping Mode High Band Edge Plot



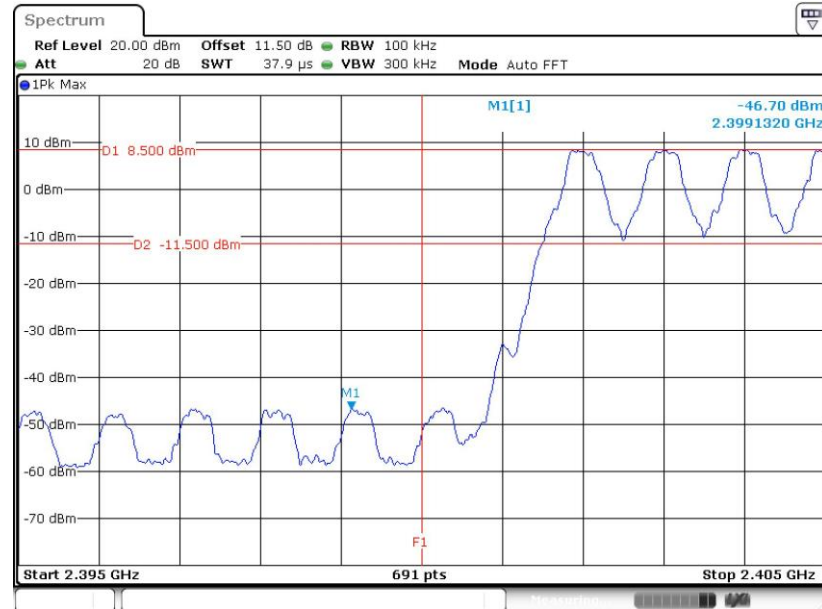
Date: 1.JUN.2022 20:57:19



For Ant 2:

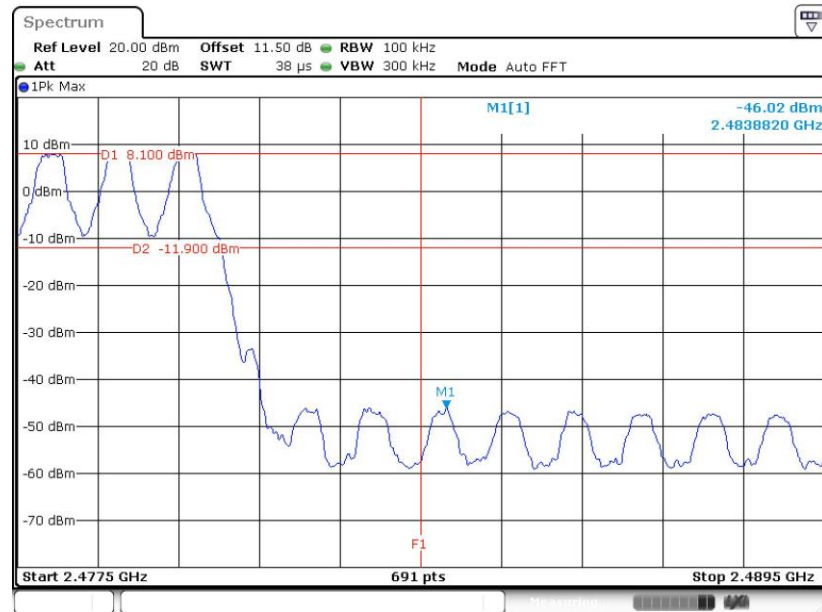
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Hopping Mode Low Band Edge Plot



Date: 1.JUN.2022 22:51:32

Hopping Mode High Band Edge Plot

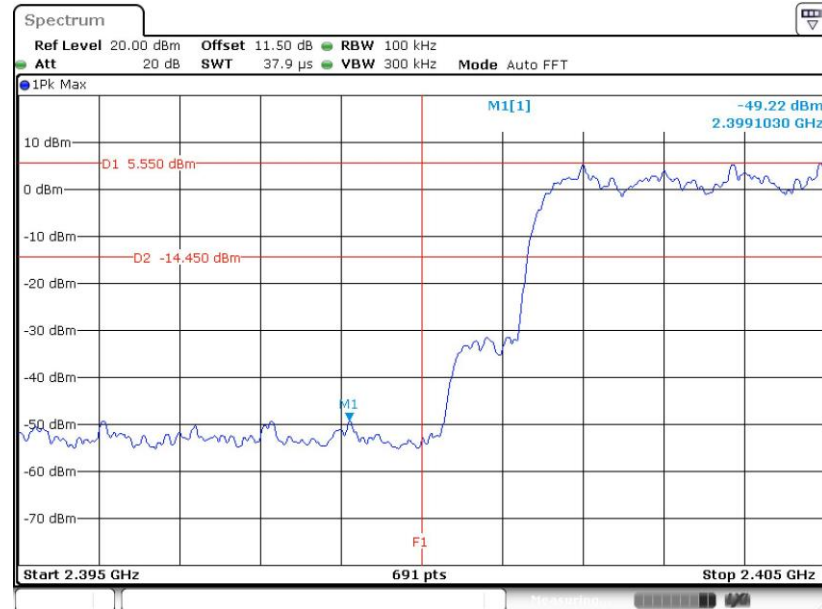


Date: 1.JUN.2022 22:52:12



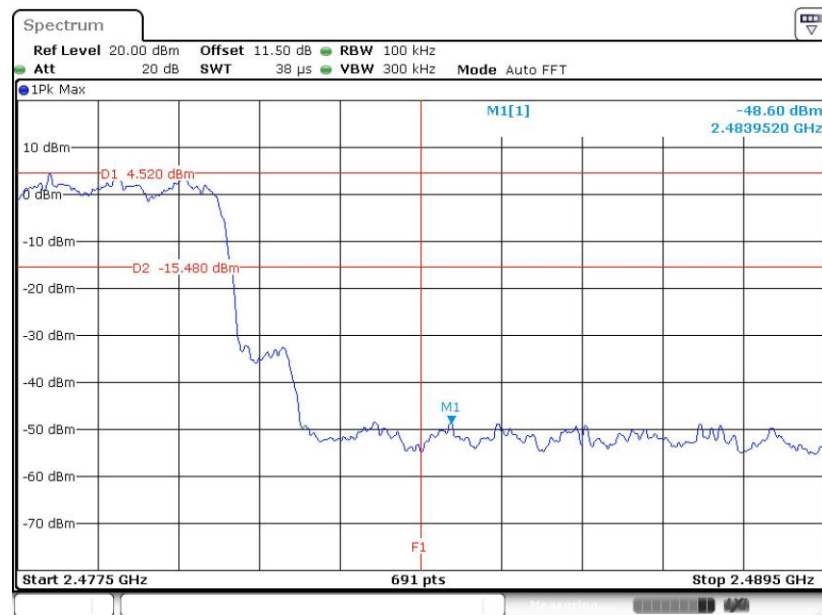
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Hopping Mode Low Band Edge Plot



Date: 1 JUN 2022 22:58:11

Hopping Mode High Band Edge Plot

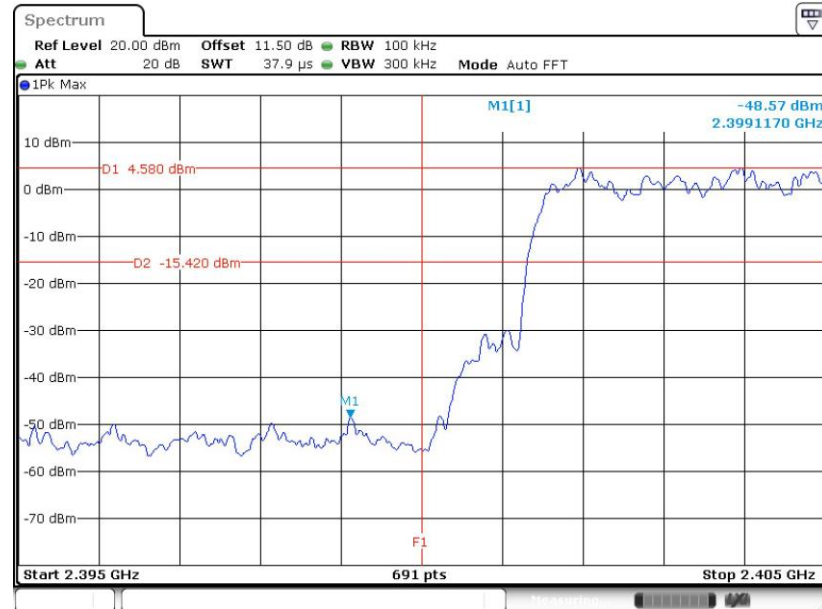


Date: 1 JUN 2022 22:59:56



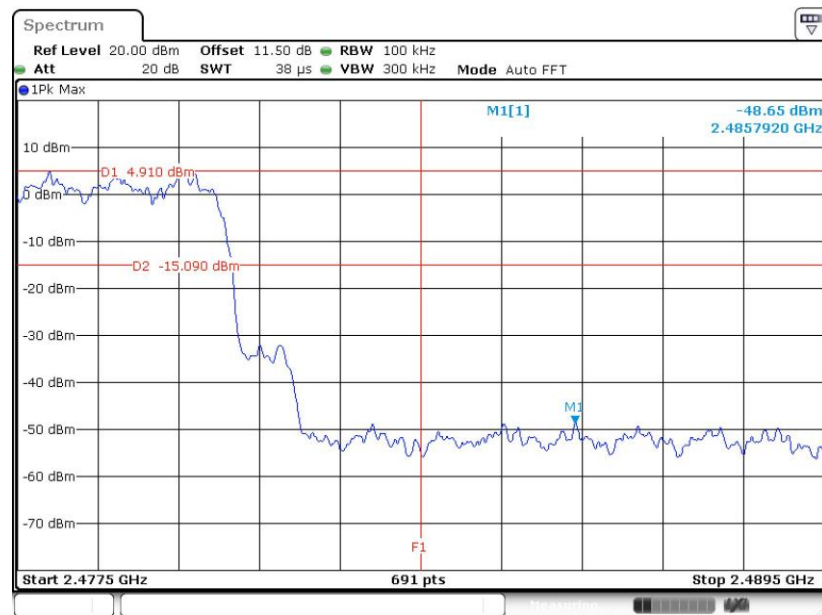
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Hopping Mode Low Band Edge Plot



Date: 1 JUN 2022 23:12:22

Hopping Mode High Band Edge Plot



Date: 1 JUN 2022 23:08:07

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.

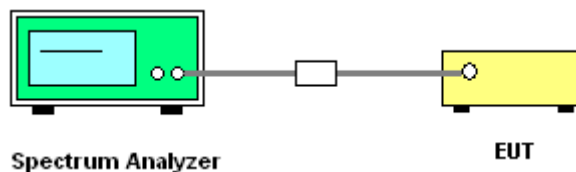
3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 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



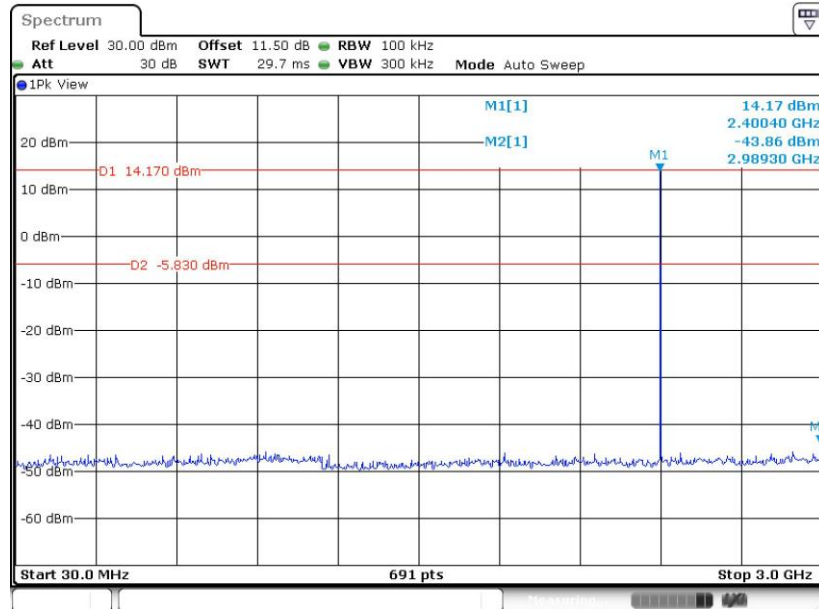


3.7.5 Test Result of Conducted Spurious Emission

For Ant 1:

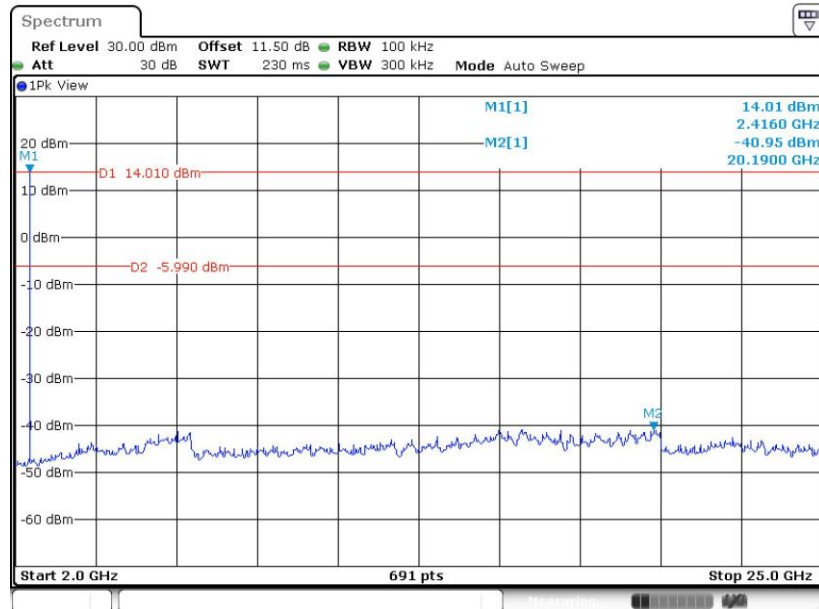
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CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 19:49:01

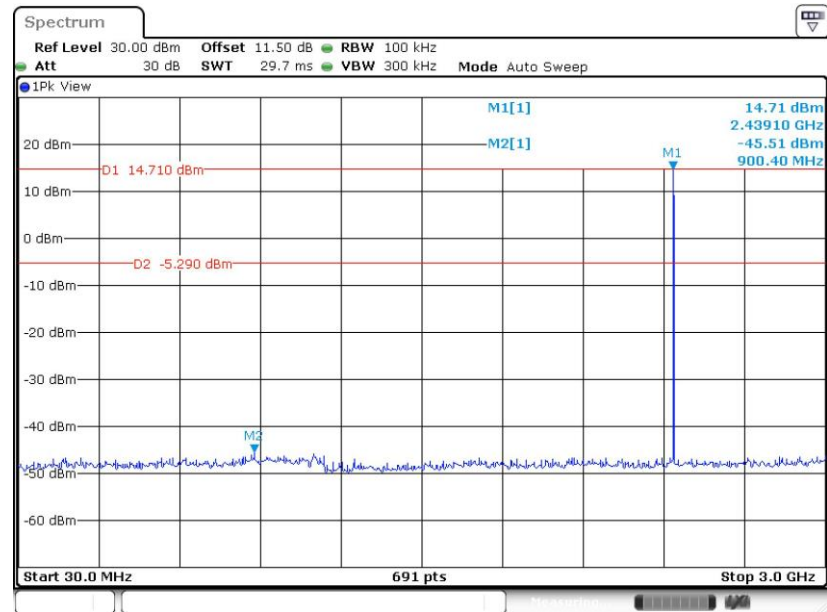
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 1.JUN.2022 19:49:30

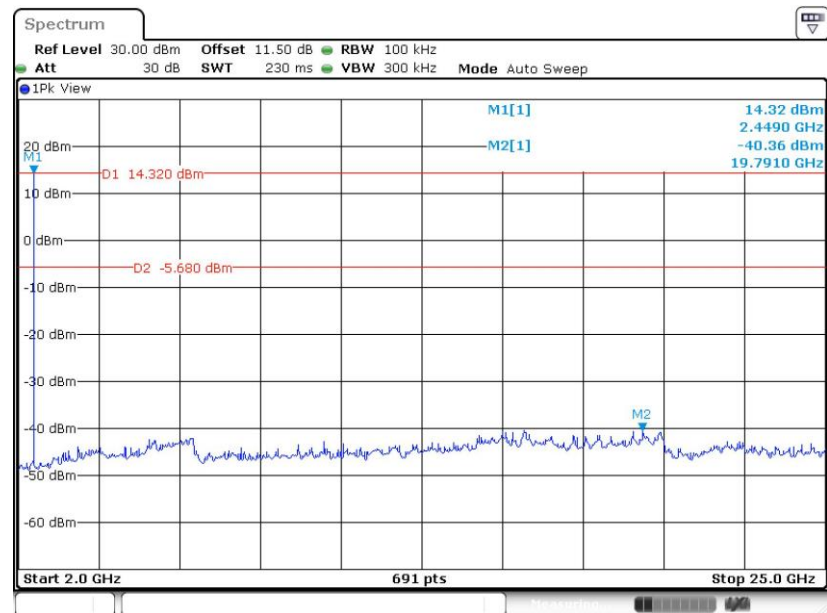


CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 19:55:33

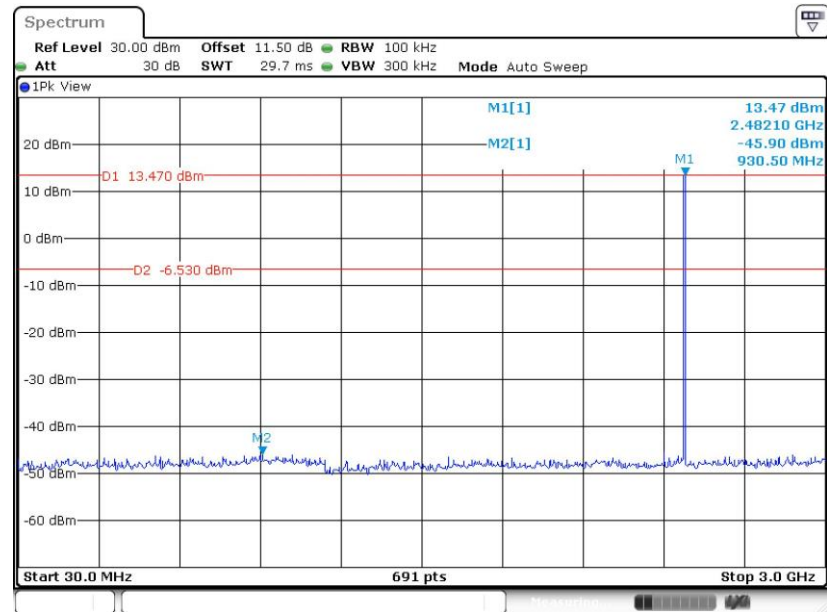
CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 1.JUN.2022 19:56:04

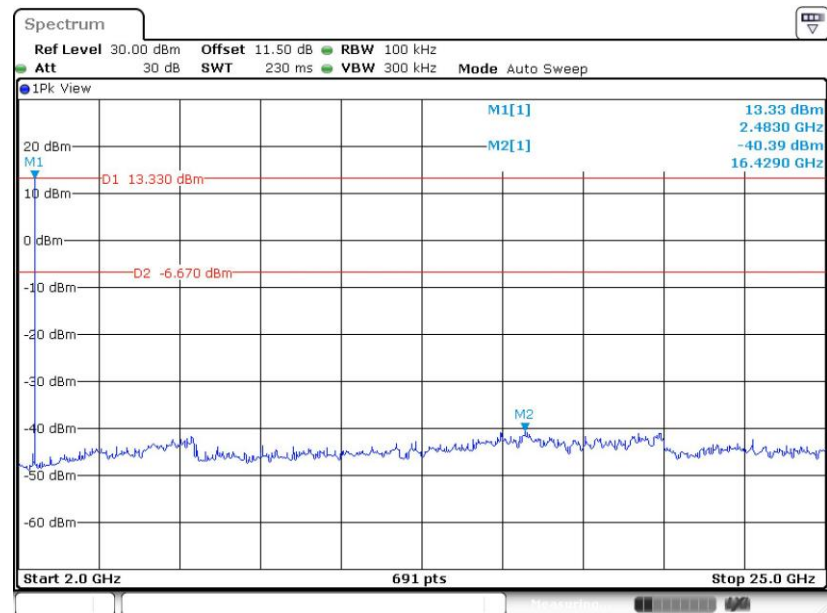


CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 20:03:06

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

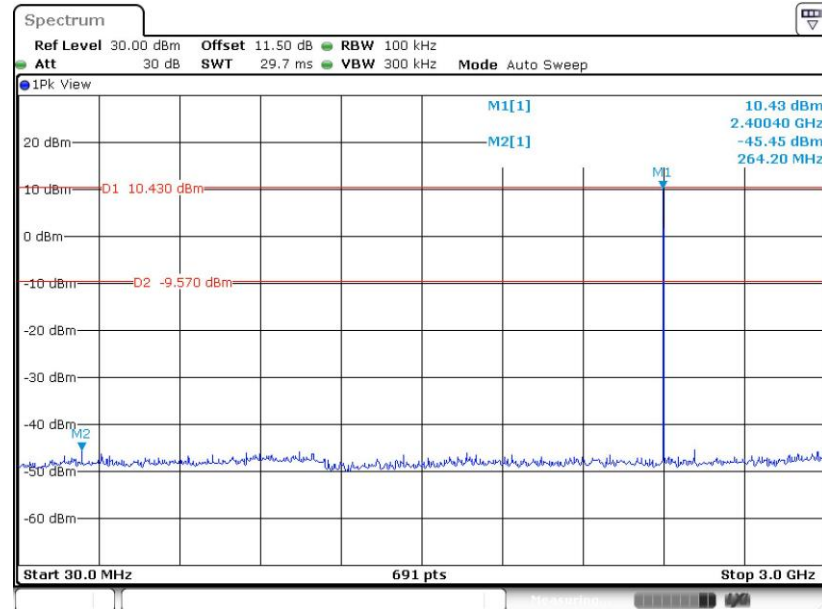


Date: 1.JUN.2022 20:03:35



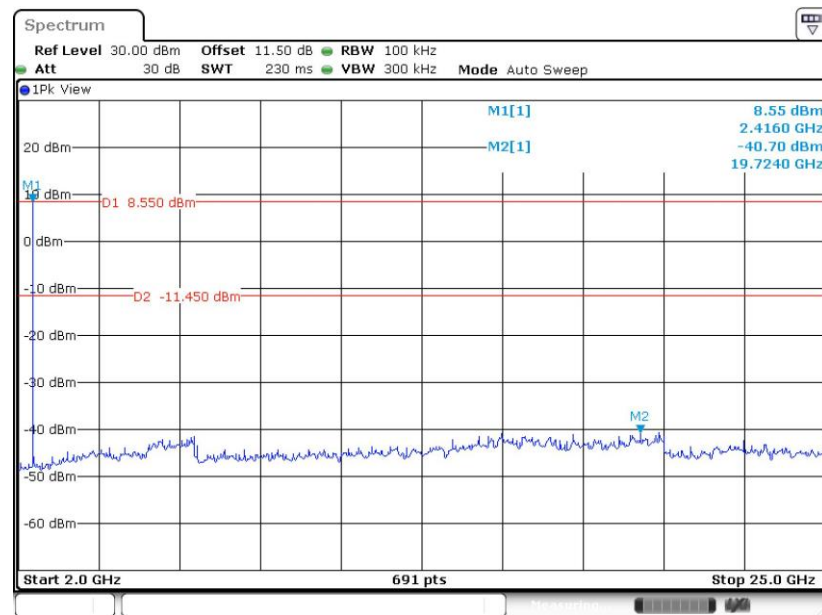
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CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 20:08:14

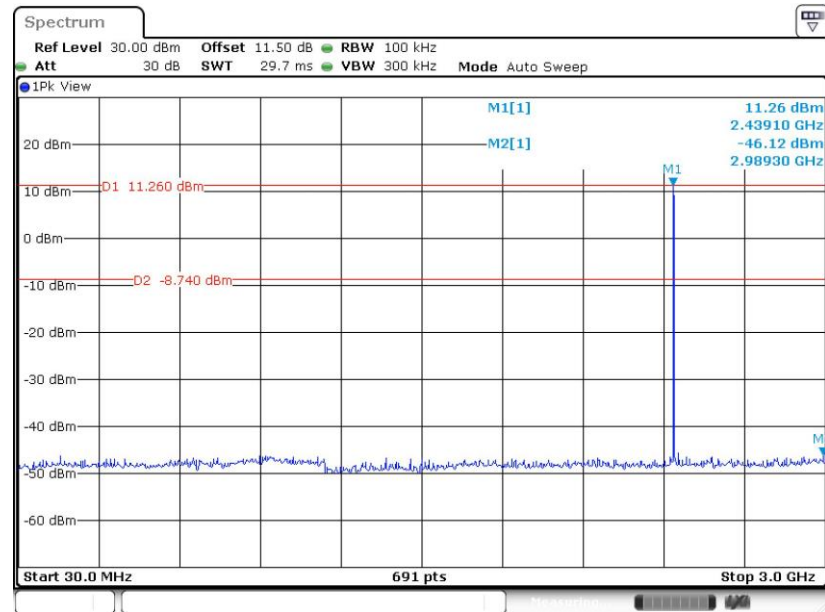
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 1.JUN.2022 20:08:45

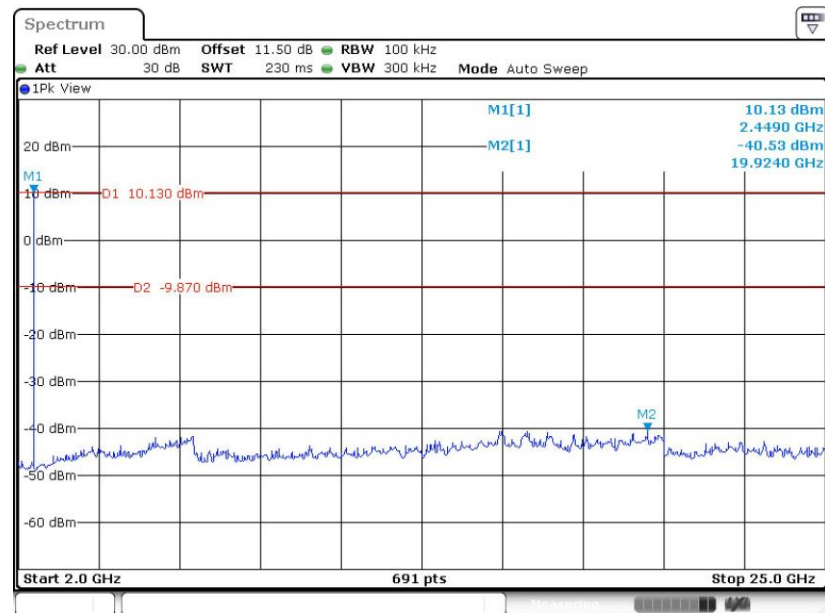


CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Date: 1 JUN 2022 20:13:53

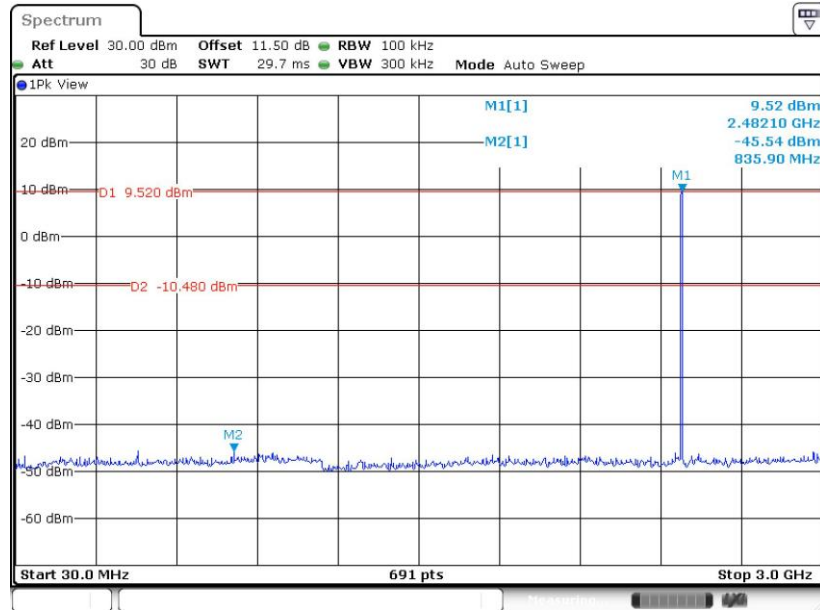
CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 1 JUN 2022 20:14:22

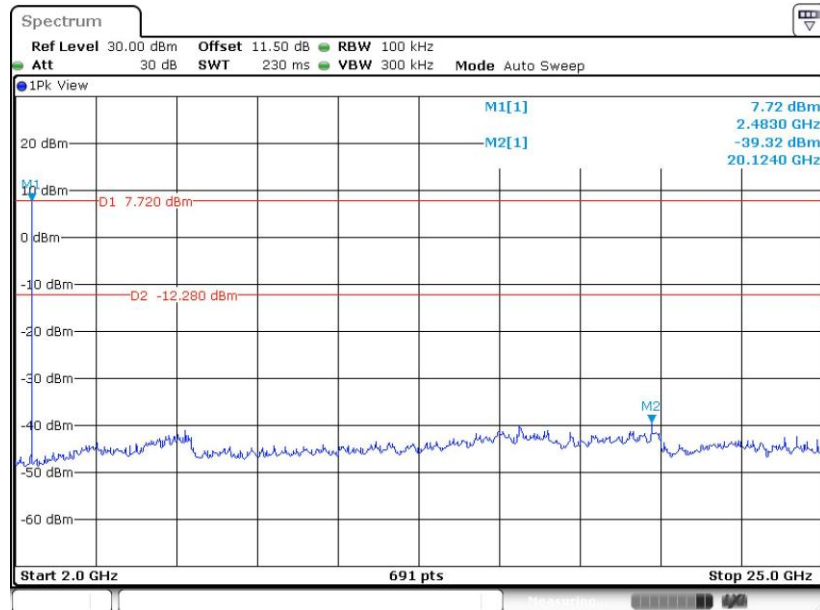


CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 20:21:54

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

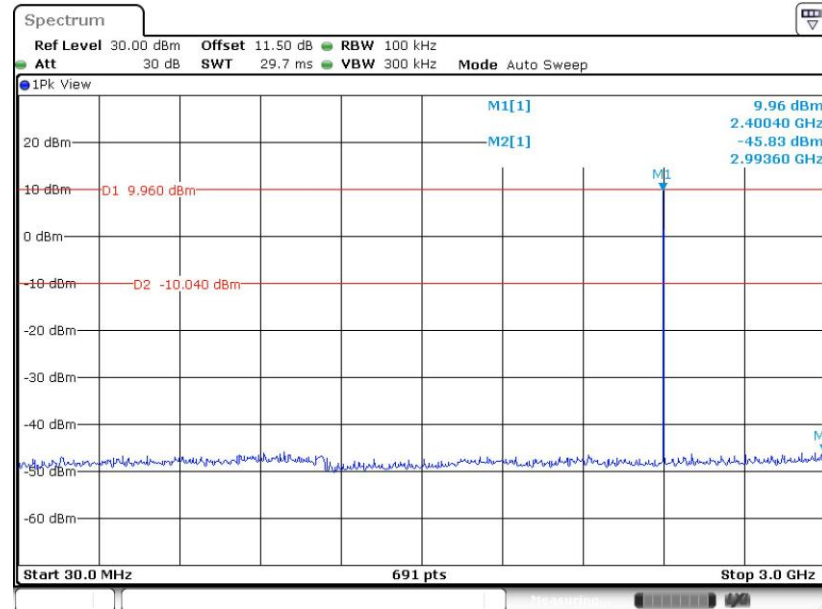


Date: 1.JUN.2022 20:22:29



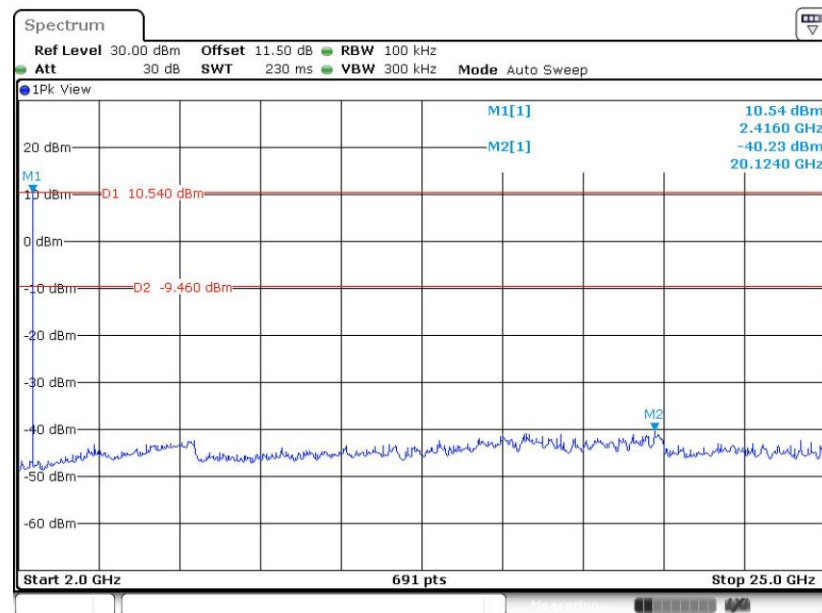
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CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 20:28:23

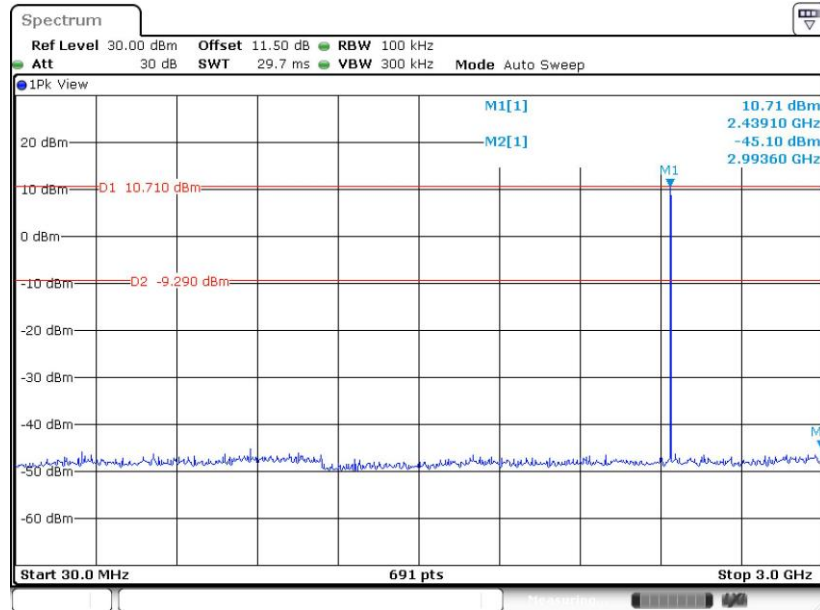
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 1.JUN.2022 20:29:02

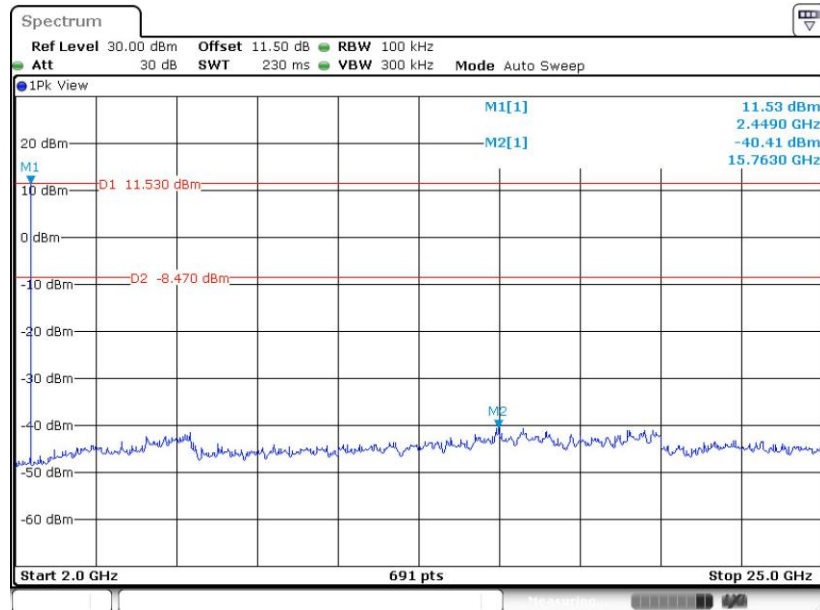


CSE Plot on Ch 39 between 30MHz ~ 3 GHz



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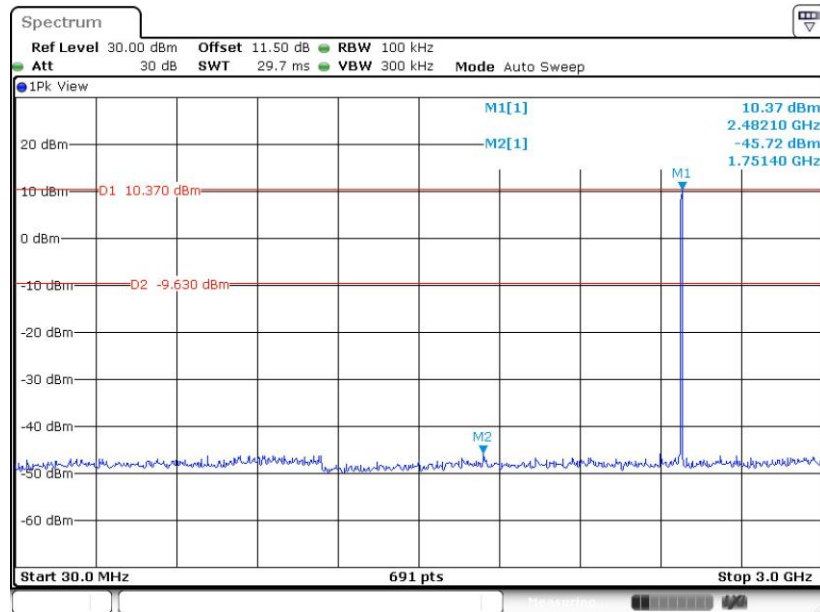
CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 1.JUN.2022 20:34:45

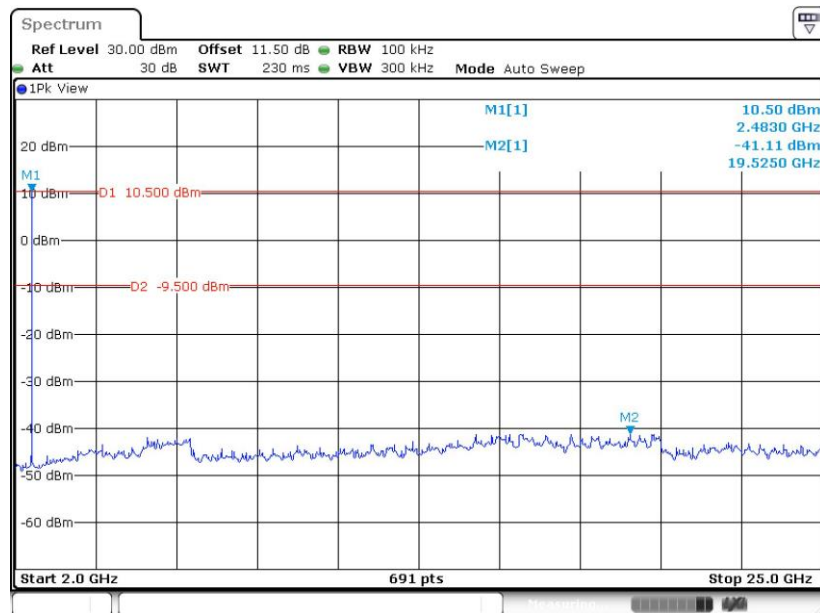


CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 1 JUN 2022 20:46:42

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



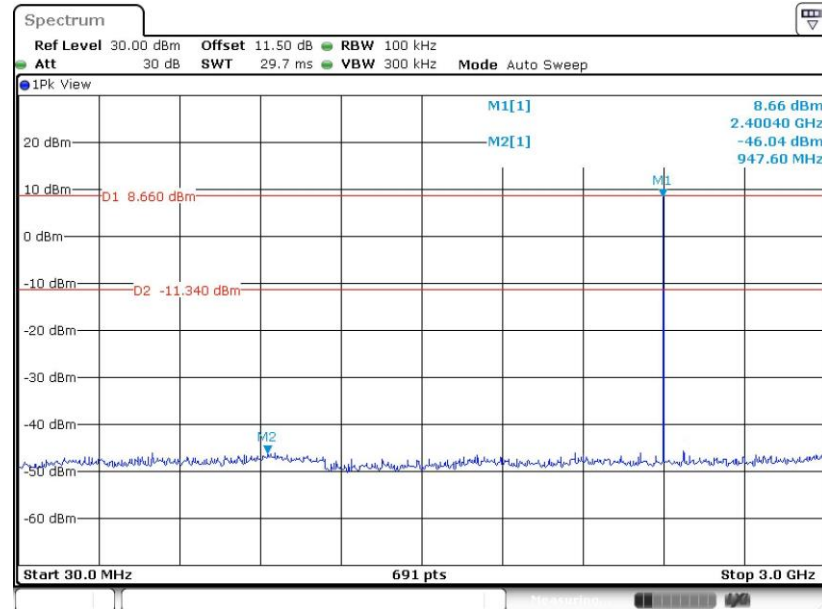
Date: 1 JUN 2022 20:47:10



For Ant 2:

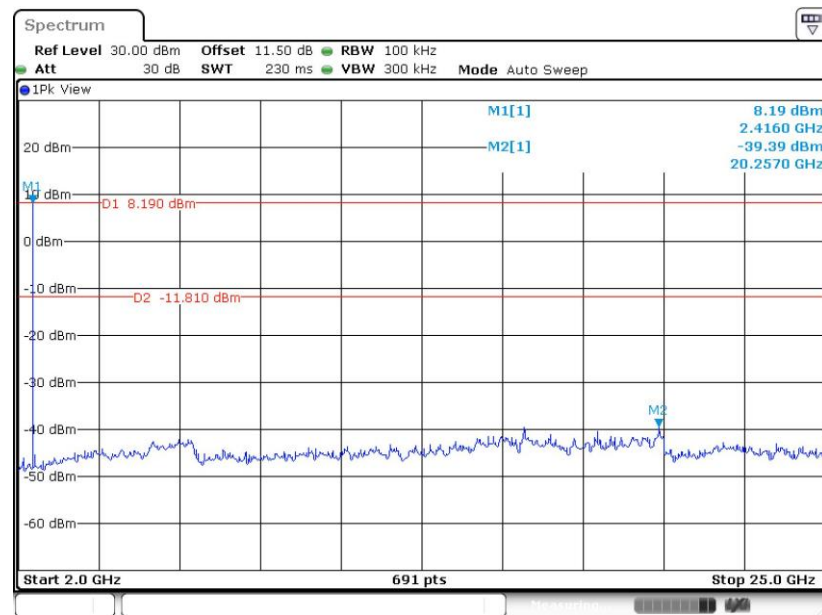
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CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 21:28:47

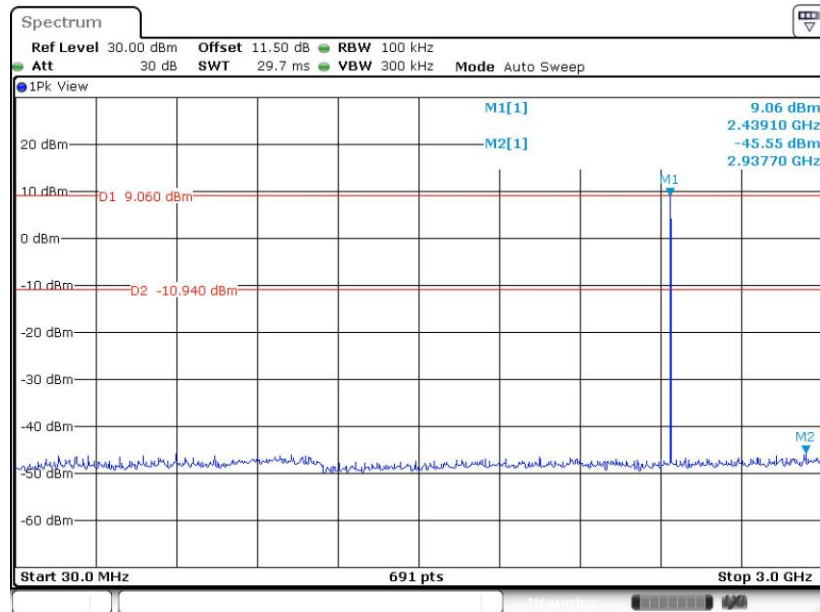
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



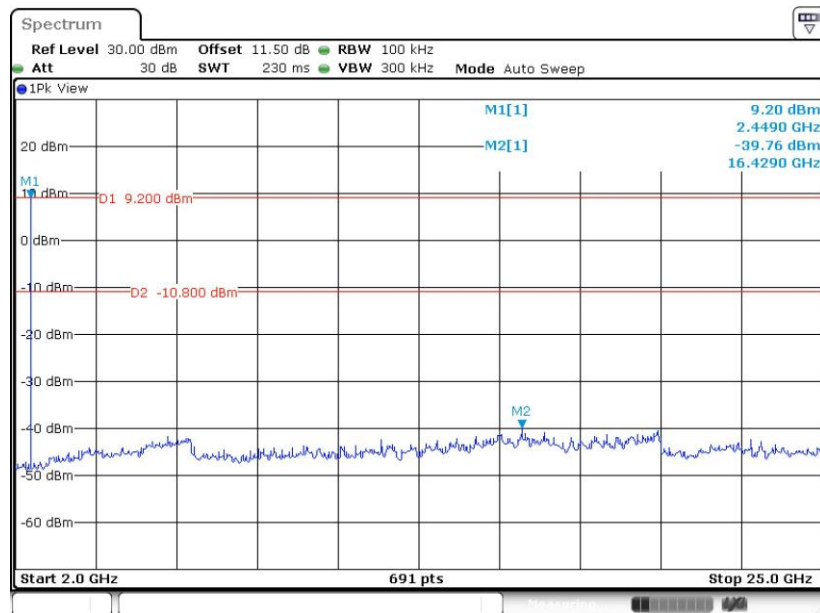
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CSE Plot on Ch 39 between 30MHz ~ 3 GHz

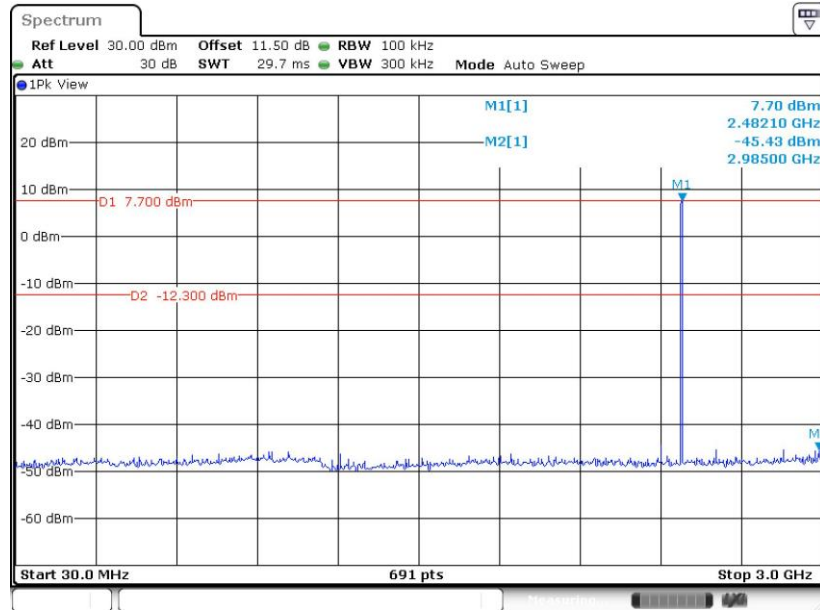


CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



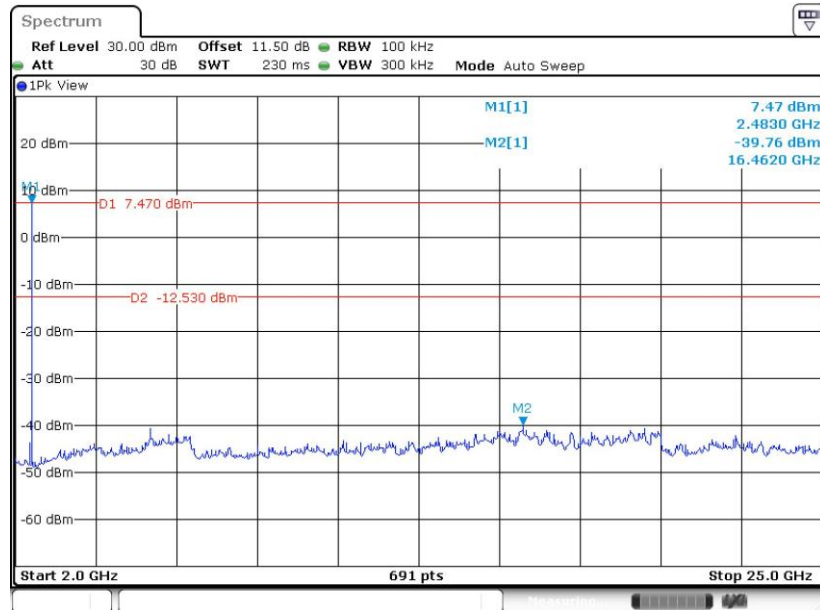


CSE Plot on Ch 78 between 30MHz ~ 3 GHz



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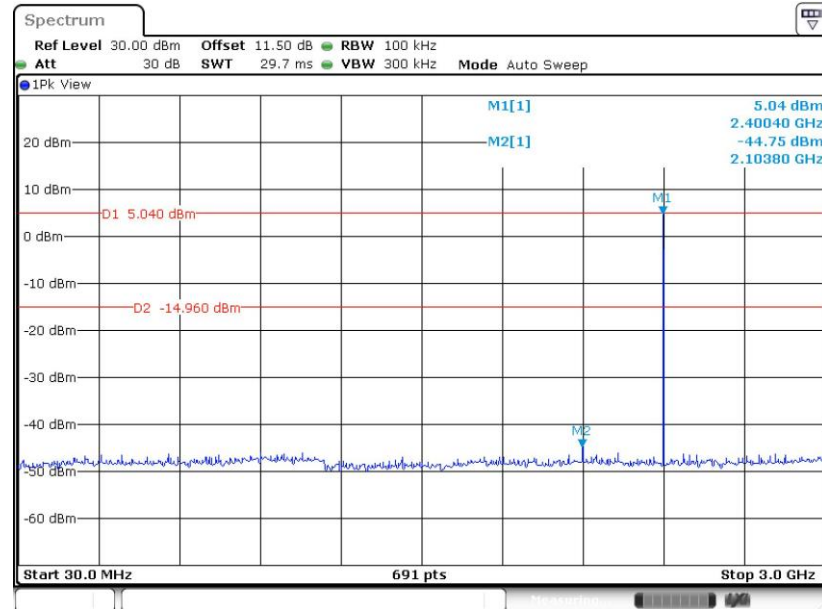
CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



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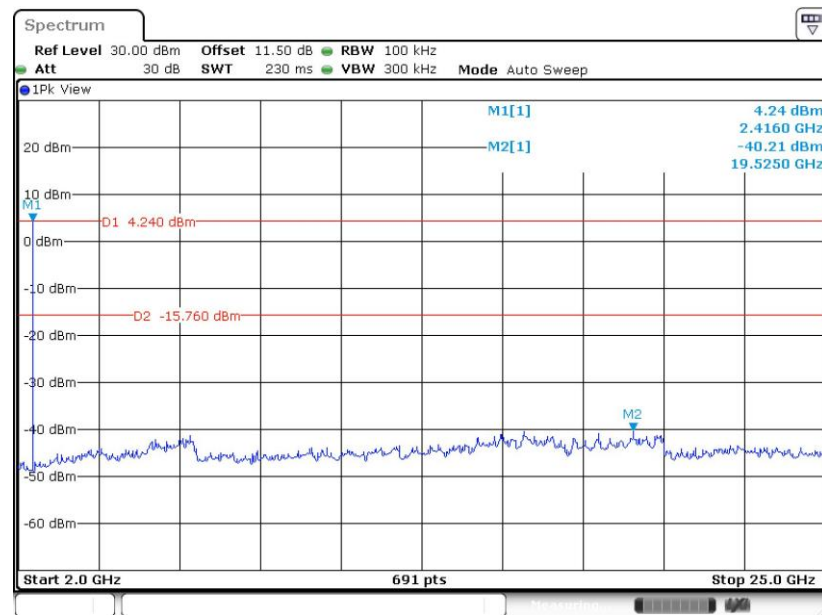
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CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 21:46:01

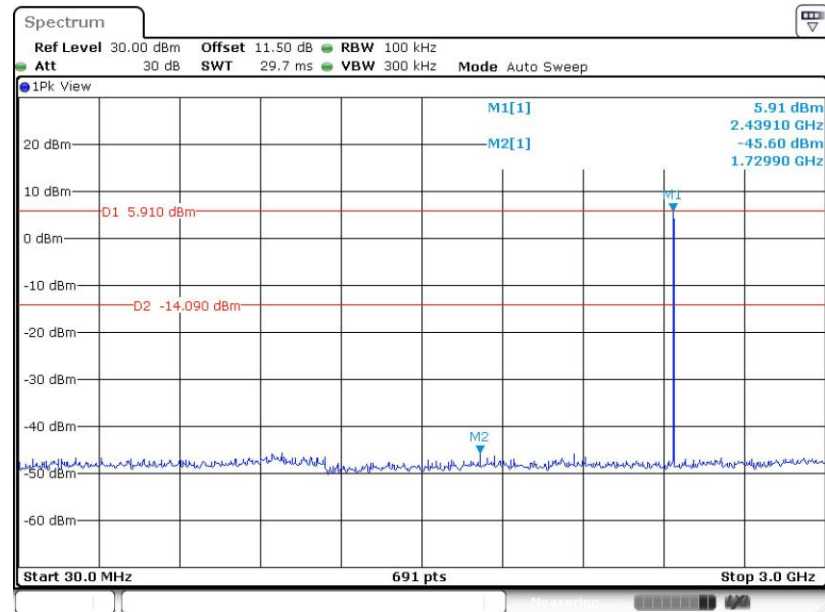
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 1.JUN.2022 21:46:32

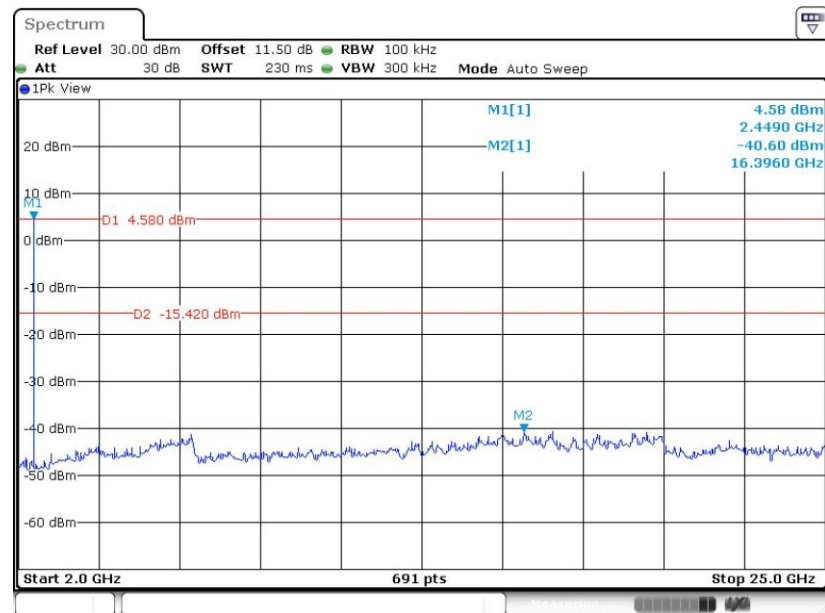


CSE Plot on Ch 39 between 30MHz ~ 3 GHz



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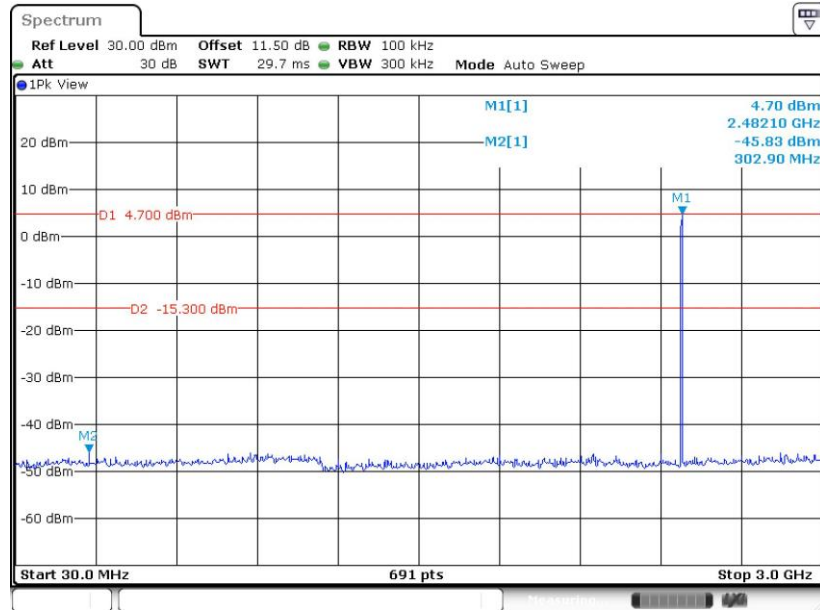
CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



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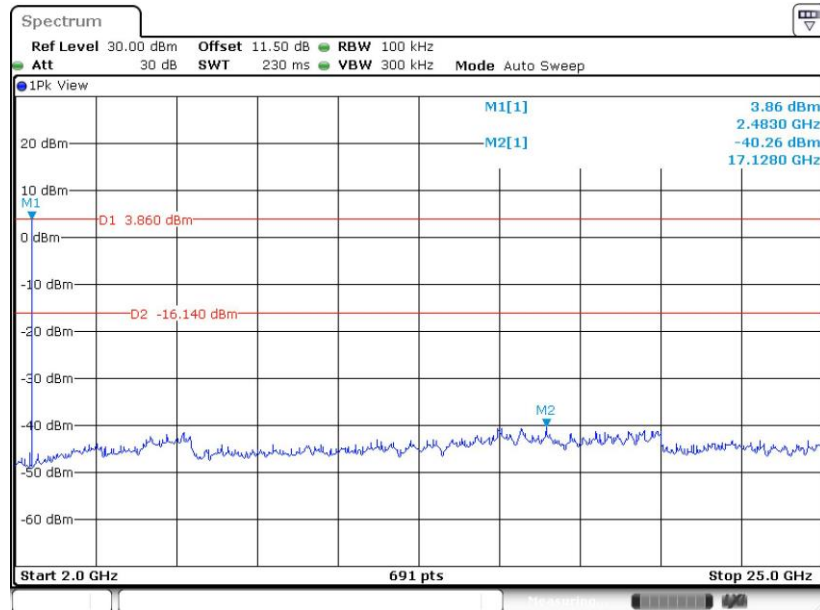


CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 21:58:19

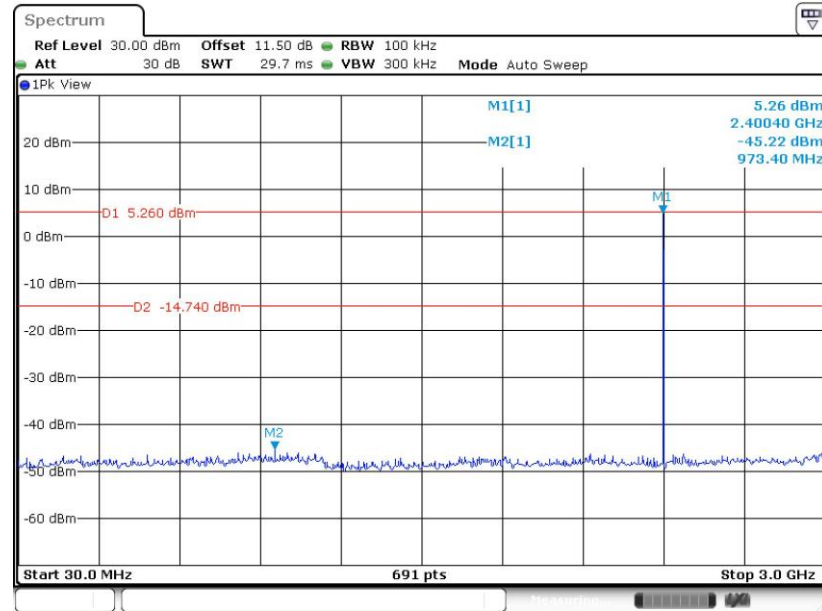
CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 1.JUN.2022 21:58:50

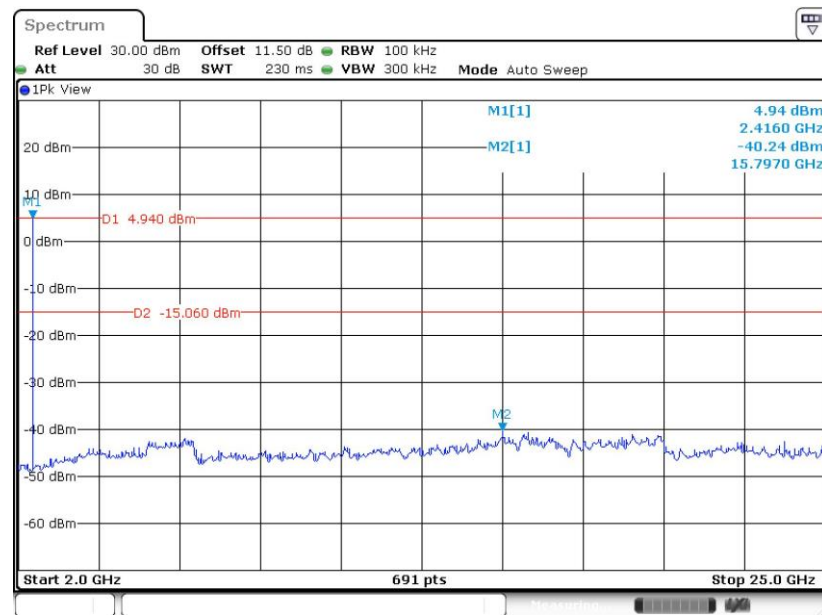
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CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 1.JUN.2022 22:24:44

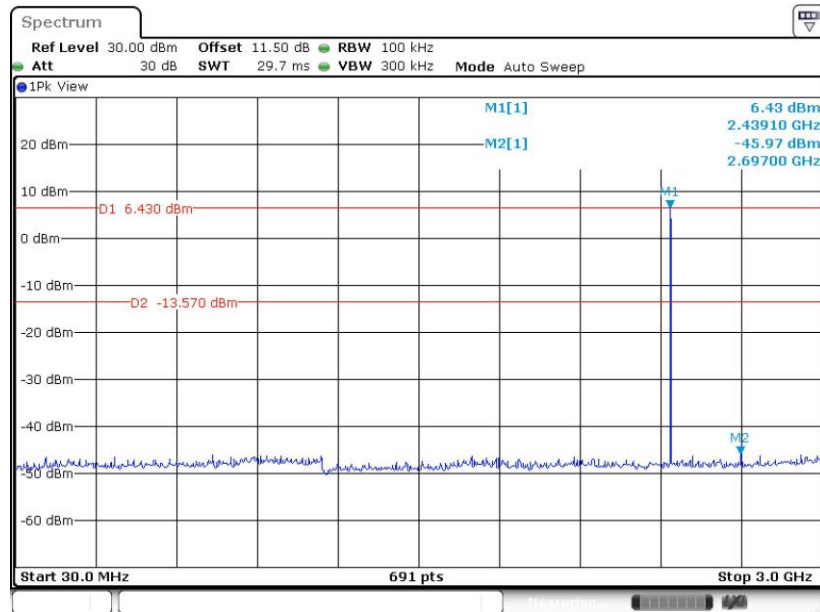
CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



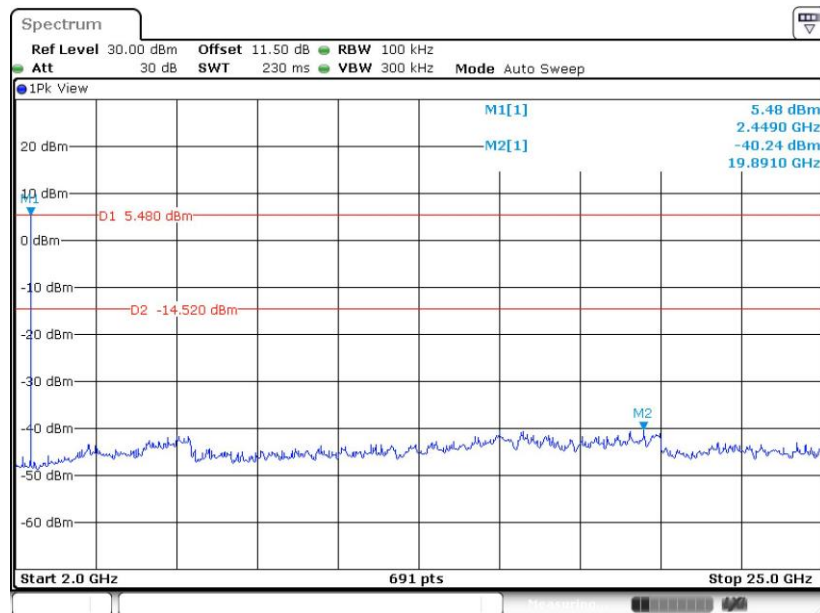
Date: 1.JUN.2022 22:25:35



CSE Plot on Ch 39 between 30MHz ~ 3 GHz

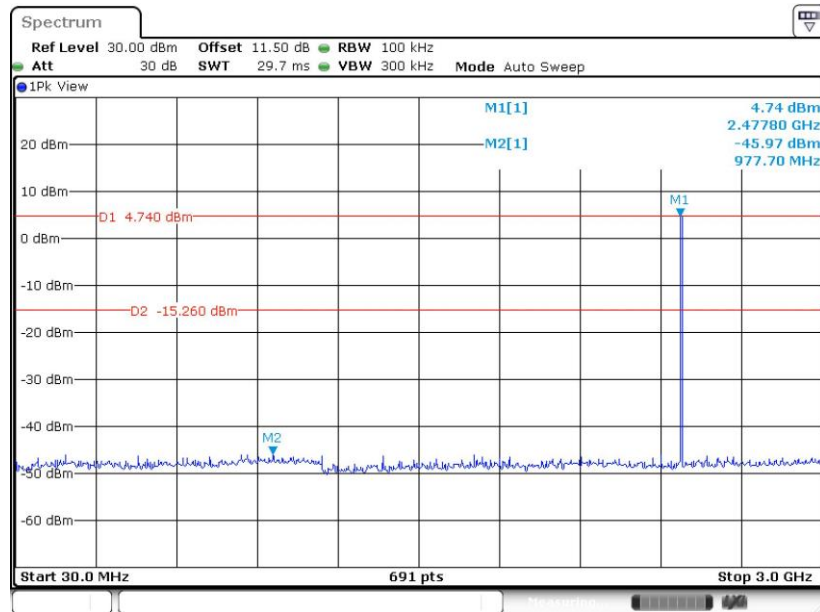


CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

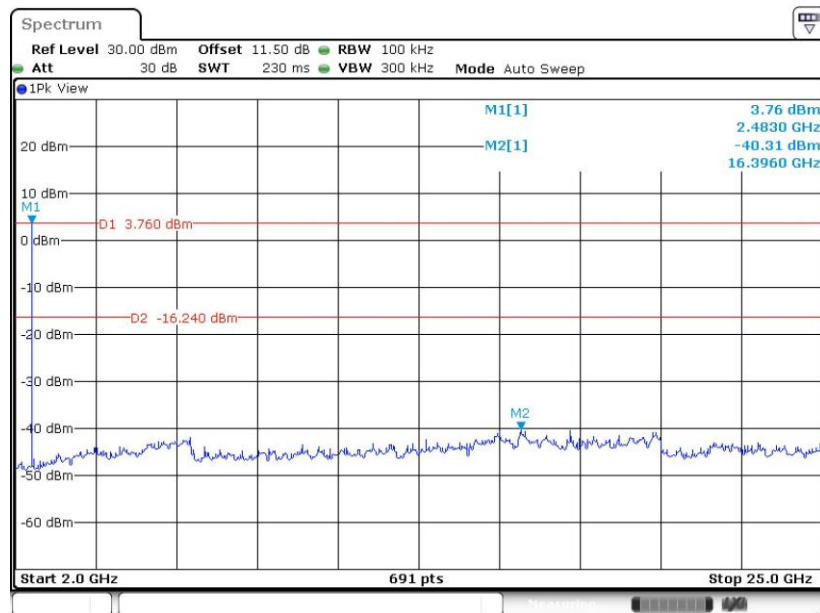




CSE Plot on Ch 78 between 30MHz ~ 3 GHz



CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



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

The measuring equipment is listed in the section 4 of this test report.

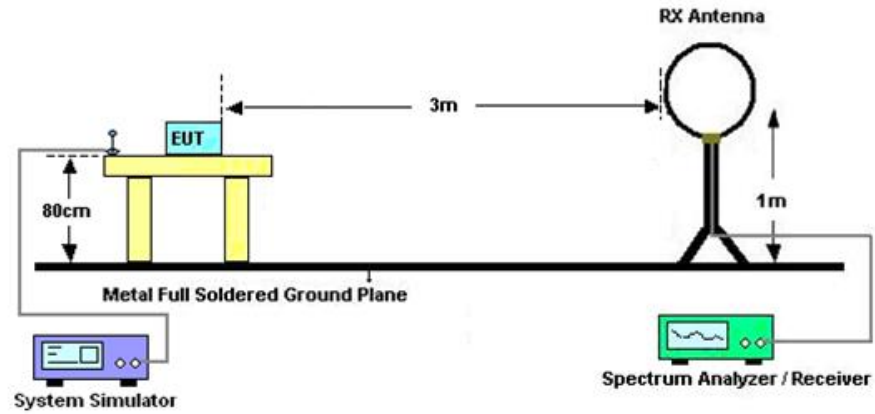
3.8.3 Test Procedures

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 $f > 1$ GHz ; VBW $\geq$ 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 = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
Average Emission Level = Peak Emission Level + $20 * \log(\text{Duty cycle})$
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 peak 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.

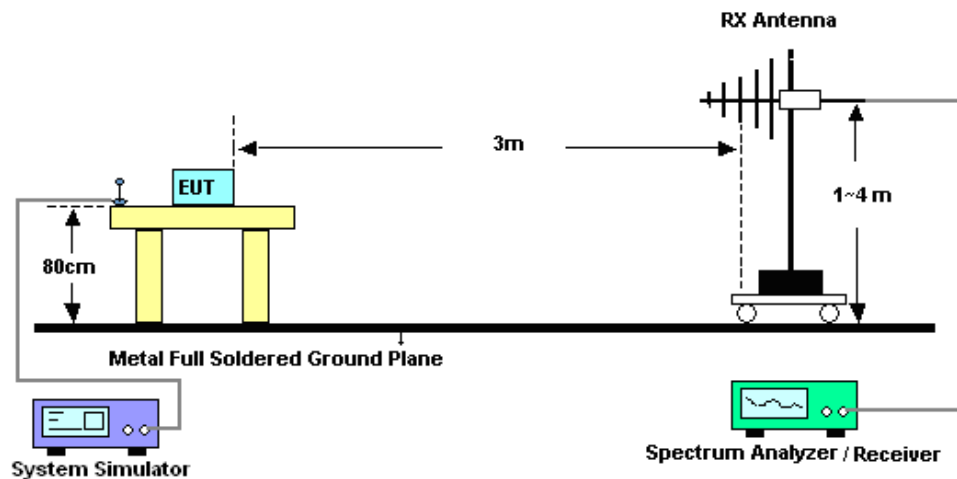
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from $20 \log(\text{dwell time}/100\text{ms})$. This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals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

3.8.4 Test Setup

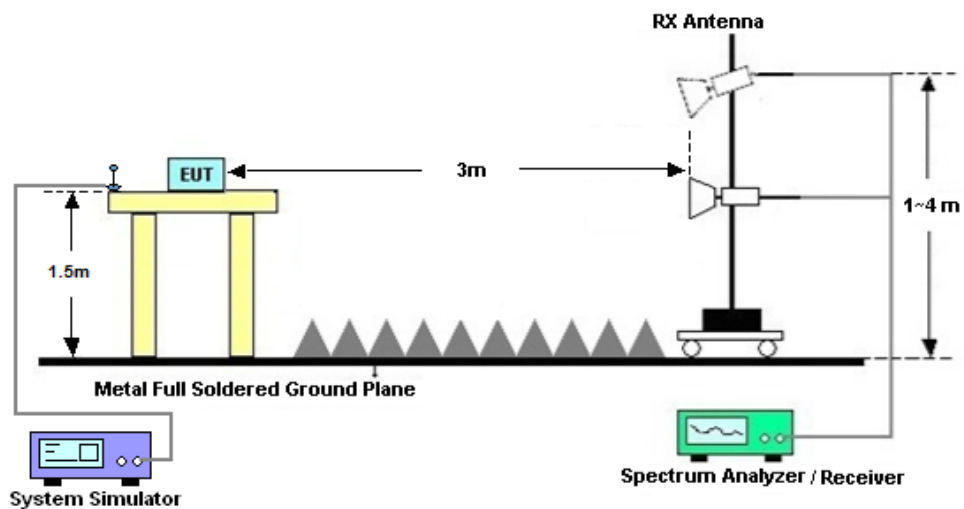
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions 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 semi-Anechoic chamber, and the result came out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.8.7 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C.

3.8.8 Duty cycle correction factor for average measurement

Please refer to Appendix 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.

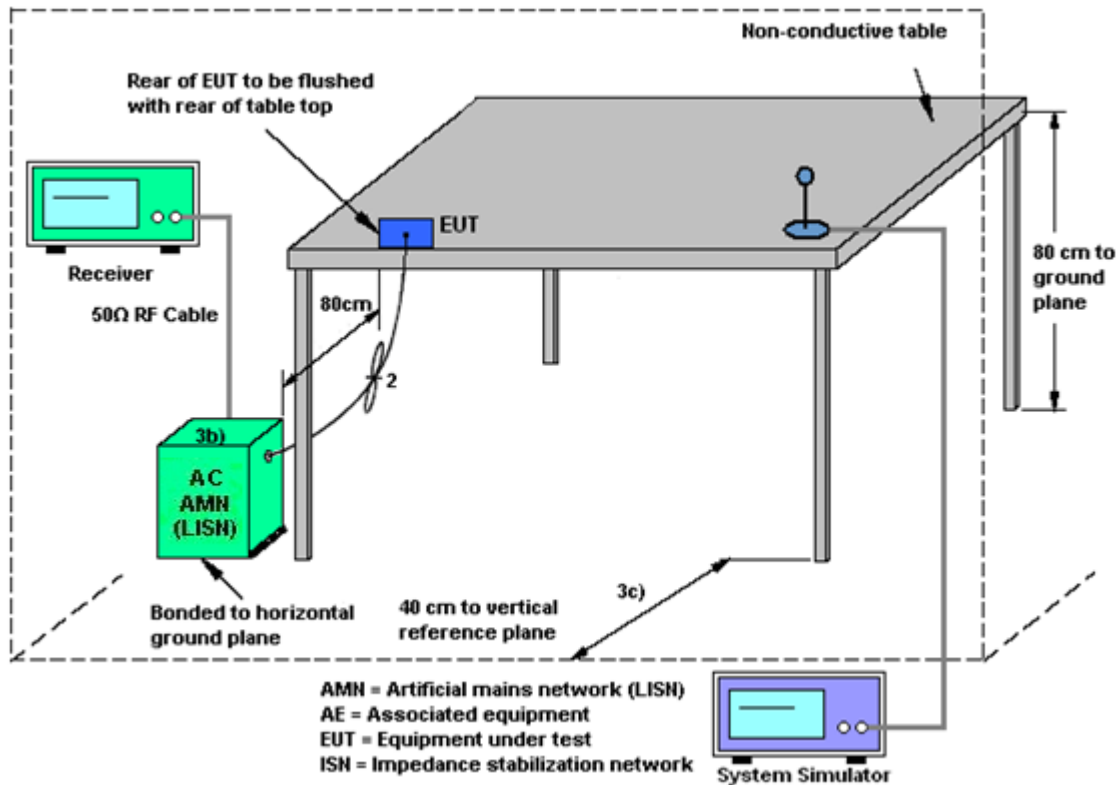
3.9.2 Measuring Instruments

The measuring equipment is listed in the section 4 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	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP30	101400	9KHz~30GHz	Dec. 28, 2021	May 27, 2022~ Jun. 20, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	May 27, 2022~ Jun. 20, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	May 27, 2022~ Jun. 20, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 22, 2021	Jun. 01, 2022~ Jun. 15, 2022	Oct. 21, 2022	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 13	10Hz~44GHz	Jul. 20, 2021	Jun. 01, 2022~ Jun. 15, 2022	Jul. 19, 2022	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 22, 2020	Jun. 01, 2022~ Jun. 15, 2022	Jun. 21, 2022	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Oct. 22, 2021	Jun. 01, 2022~ Jun. 15, 2022	Oct. 21, 2022	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-147 4	1GHz~18GHz	Jul. 15, 2021	Jun. 01, 2022~ Jun. 15, 2022	Jul. 14, 2022	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Jul. 25, 2021	Jun. 01, 2022~ Jun. 15, 2022	Jul. 24, 2022	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz~3000MHz	Oct. 22, 2021	Jun. 01, 2022~ Jun. 15, 2022	Oct. 21, 2022	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P-R	1943528	1GHz~18GHz	Oct. 22, 2021	Jun. 01, 2022~ Jun. 15, 2022	Oct. 21, 2022	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 20, 2021	Jun. 01, 2022~ Jun. 15, 2022	Jul. 19, 2022	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY532701 56	500MHz~26.5G Hz	Oct. 22, 2021	Jun. 01, 2022~ Jun. 15, 2022	Oct. 21, 2022	Radiation (03CH04-SZ)
AC Power Source	Chroma	61601	N/A	N/A	NCR	Jun. 01, 2022~ Jun. 15, 2022	NCR	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jun. 01, 2022~ Jun. 15, 2022	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jun. 01, 2022~ Jun. 15, 2022	NCR	Radiation (03CH04-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Sep. 01, 2021	Jun. 09, 2022~ Jun. 13, 2022	Aug. 31, 2022	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sep. 01, 2021	Jun. 09, 2022~ Jun. 13, 2022	Aug. 31, 2022	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 29, 2021	Jun. 09, 2022~ Jun. 13, 2022	Oct. 28, 2022	Conduction (CO01-SZ)

NCR:No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage $K=2$ to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.2dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

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

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1dB
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----- THE END -----



Appendix A. Conducted Test Results

Appendix A. Test Result of Conducted Test Items for Ant.1

Test Engineer:	Chen Hong	Temperature:	24~26	°C
Test Date:	2022/5/27~2022/6/20	Relative Humidity:	50~53	%

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	0.937	0.839	0.999	0.6247	Pass
DH	1Mbps	1	39	2441	0.937	0.839	0.999	0.6247	Pass
DH	1Mbps	1	78	2480	0.940	0.842	1.003	0.6267	Pass
2DH	2Mbps	1	0	2402	1.311	1.172	1.003	0.8740	Pass
2DH	2Mbps	1	39	2441	1.311	1.172	0.999	0.8740	Pass
2DH	2Mbps	1	78	2480	1.316	1.172	1.003	0.8770	Pass
3DH	3Mbps	1	0	2402	1.298	1.175	1.003	0.8653	Pass
3DH	3Mbps	1	39	2441	1.298	1.178	1.003	0.8653	Pass
3DH	3Mbps	1	78	2480	1.294	1.175	1.003	0.8625	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	2.89	0.31	0.4	Pass
AFH	20	53.33	2.89	0.15	0.4	Pass

TEST RESULTS DATA**Peak Power Table**

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH5	0	1	10.60	20.97	Pass
	39	1	11.40	20.97	Pass
	78	1	10.20	20.97	Pass
2DH5	0	1	10.20	20.97	Pass
	39	1	10.90	20.97	Pass
	78	1	9.70	20.97	Pass
3DH5	0	1	10.30	20.97	Pass
	39	1	11.00	20.97	Pass
	78	1	9.80	20.97	Pass

TEST RESULTS DATA**Average Power Table****(Reporting Only)**

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH5	0	1	10.20	1.15
	39	1	11.00	1.15
	78	1	9.70	1.15
2DH5	0	1	7.80	1.13
	39	1	8.70	1.13
	78	1	7.20	1.13
3DH5	0	1	7.80	1.15
	39	1	8.70	1.15
	78	1	7.20	1.15

TEST RESULTS DATA**Number of Hopping Frequency**

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

Test Result of Conducted Test Items for Ant.2

Test Engineer:	Chen Hong	Temperature:	24~26	°C
Test Date:	2022/5/27~2022/6/20	Relative Humidity:	50~53	%

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	0.941	0.839	0.999	0.6271	Pass
DH	1Mbps	1	39	2441	0.941	0.836	1.003	0.6271	Pass
DH	1Mbps	1	78	2480	0.941	0.836	1.003	0.6271	Pass
2DH	2Mbps	1	0	2402	1.316	1.181	1.003	0.8770	Pass
2DH	2Mbps	1	39	2441	1.316	1.178	1.003	0.8770	Pass
2DH	2Mbps	1	78	2480	1.311	1.175	0.999	0.8740	Pass
3DH	3Mbps	1	0	2402	1.316	1.181	1.003	0.8770	Pass
3DH	3Mbps	1	39	2441	1.316	1.175	0.999	0.8770	Pass
3DH	3Mbps	1	78	2480	1.316	1.175	0.999	0.8770	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	2.90	0.31	0.4	Pass
AFH	20	53.33	2.90	0.15	0.4	Pass

TEST RESULTS DATA**Peak Power Table**

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH5	0	1	10.60	20.97	Pass
	39	1	11.40	20.97	Pass
	78	1	10.00	20.97	Pass
2DH5	0	1	10.40	20.97	Pass
	39	1	11.10	20.97	Pass
	78	1	9.90	20.97	Pass
3DH5	0	1	10.50	20.97	Pass
	39	1	11.20	20.97	Pass
	78	1	10.00	20.97	Pass

TEST RESULTS DATA**Average Power Table****(Reporting Only)**

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH5	0	1	10.20	1.15
	39	1	11.00	1.15
	78	1	9.60	1.15
2DH5	0	1	8.30	1.11
	39	1	8.80	1.11
	78	1	7.50	1.11
3DH5	0	1	8.30	1.13
	39	1	8.80	1.13
	78	1	7.50	1.13

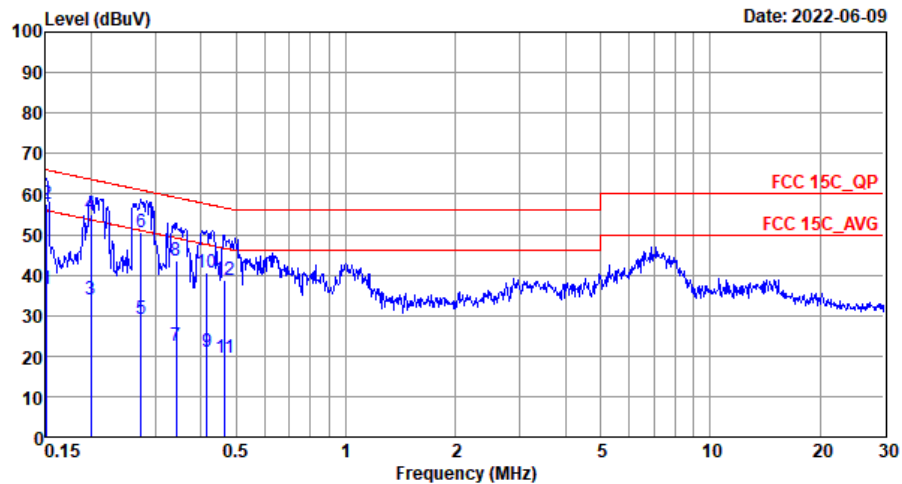
TEST RESULTS DATA**Number of Hopping Frequency**

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 :	Lily Qiu	Temperature :	22~25°C
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		

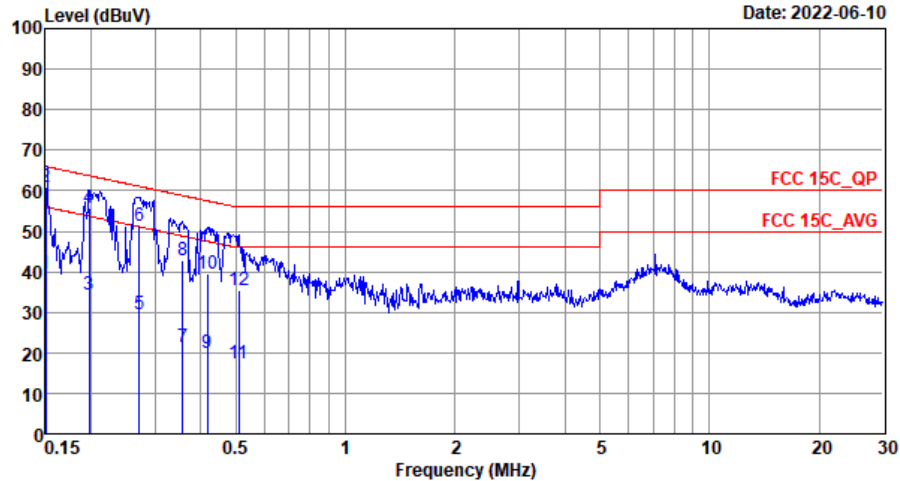


Site : CO01-SZ
Condition: FCC 15C_QP LISN_20210901_L LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	36.65	-19.31	55.96	15.60	10.20	10.85	Average
2 *	0.15	57.65	-8.31	65.96	36.60	10.20	10.85	QP
3	0.20	33.95	-19.67	53.62	13.60	10.20	10.15	Average
4	0.20	55.15	-8.47	63.62	34.80	10.20	10.15	QP
5	0.27	29.01	-21.97	50.98	8.10	10.17	10.74	Average
6	0.27	50.41	-10.57	60.98	29.50	10.17	10.74	QP
7	0.34	22.45	-26.68	49.13	1.20	10.09	11.16	Average
8	0.34	43.65	-15.48	59.13	22.40	10.09	11.16	QP
9	0.41	21.01	-26.54	47.55	-0.60	10.10	11.51	Average
10	0.41	40.51	-17.04	57.55	18.90	10.10	11.51	QP
11	0.47	19.45	-27.13	46.58	-2.40	10.11	11.74	Average
12	0.47	38.65	-17.93	56.58	16.80	10.11	11.74	QP



Test Engineer :	Lily Qiu	Temperature :	22~25°C
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : C001-SZ
Condition: FCC 15C_QP LISN_20210901_N NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.15	39.66	-16.34	56.00	18.50	10.31	10.85	Average
2 *	0.15	60.96	-5.04	66.00	39.80	10.31	10.85	QP
3	0.20	34.35	-19.36	53.71	13.90	10.28	10.17	Average
4	0.20	55.85	-7.86	63.71	35.40	10.28	10.17	QP
5	0.27	29.36	-21.71	51.07	8.40	10.23	10.73	Average
6	0.27	51.26	-9.81	61.07	30.30	10.23	10.73	QP
7	0.36	21.31	-27.47	48.78	-0.10	10.17	11.24	Average
8	0.36	42.91	-15.87	58.78	21.50	10.17	11.24	QP
9	0.42	19.92	-27.59	47.51	-1.80	10.19	11.53	Average
10	0.42	39.62	-17.89	57.51	17.90	10.19	11.53	QP
11	0.51	17.40	-28.60	46.00	-4.60	10.20	11.80	Average
12	0.51	35.40	-20.60	56.00	13.40	10.20	11.80	QP

Note:

- Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
- Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)



Appendix C. Radiated Spurious Emission

For Ant 1

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	Line (dBμV/m)	Level (dBμV)	Factor (dB/m)	Loss (dB)	Factor (dB)	Pos (cm)	Pos (deg)	Avg. (P/A)	(H/V)
BT CH00 2402MHz		2370.585	40.25	-33.75	74	41.77	27	5.34	33.86	151	332	P	H
		2370.585	15.46	-38.54	54	-	-	-	-	-	-	A	H
		2402	94.49	-	-	95.93	27.02	5.37	33.83	151	332	P	H
		2402	69.7	-	-	-	-	-	-	-	-	A	H
		2343.705	39.79	-34.21	74	41.38	26.98	5.31	33.88	371	251	P	V
		2343.705	15	-39	54	-	-	-	-			A	V
		2402	92.07	-	-	93.51	27.02	5.37	33.83	371	251	P	V
		2402	67.28	-	-	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		2362.78	40.29	-33.71	74	41.84	26.99	5.34	33.88	165	331	P	H
		2362.78	15.5	-38.5	54	-	-	-	-	-	-	A	H
		2441	97.24	-	-	98.53	27.06	5.41	33.76	165	331	P	H
		2441	72.45	-	-	-	-	-	-	-	-	A	H
		2487.19	40.33	-33.67	74	41.5	27.09	5.46	33.72	165	331	P	H
		2487.19	15.54	-38.46	54	-	-	-	-	-	-	A	H
		2343.46	39.94	-34.06	74	41.53	26.98	5.31	33.88	366	251	P	V
		2343.46	15.15	-38.85	54	-	-	-	-	-	-	A	V
		2441	93.37	-	-	94.66	27.06	5.41	33.76	366	251	P	V
		2441	68.58	-	-	-	-	-	-	-	-	A	V
		2483.83	40.86	-33.14	74	42.03	27.09	5.46	33.72	366	251	P	V
		2483.83	16.07	-37.93	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		2480	95.6	-	-	96.77	27.09	5.46	33.72	163	332	P	H
		2480	70.81	-	-	-	-	-	-	-	-	A	H
		2486.12	40.59	-33.41	74	41.76	27.09	5.46	33.72	163	332	P	H
		2486.12	15.8	-38.2	54	-	-	-	-	-	-	A	H
		2480	92.03	-	-	93.2	27.09	5.46	33.72	400	255	P	V
		2480	67.24	-	-	-	-	-	-	-	-	A	V
		2487.76	41.03	-32.97	74	42.19	27.1	5.46	33.72	400	255	P	V
		2487.76	16.24	-37.76	54	-	-	-	-	-	-	A	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 (dB μ V/m)	Margin (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	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	43.88	-30.12	74	53.16	31.19	8.88	49.35	-	-	P	H
		4804	19.09	-34.91	54	-	-	-	-	-	-	A	H
		4804	42.82	-31.18	74	52.1	31.19	8.88	49.35	-	-	P	V
		4804	18.03	-35.97	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	42.31	-31.69	74	51.25	31.41	8.65	49	-	-	P	H
		4882	17.52	-36.48	54	-	-	-	-	-	-	A	H
		7323	45.18	-28.82	74	50.34	36.49	10.18	51.83	-	-	P	H
		7323	20.39	-33.61	54	-	-	-	-	-	-	A	H
		4882	44.79	-29.21	74	53.73	31.41	8.65	49	-	-	P	V
		4882	20	-34	54	-	-	-	-	-	-	A	V
		7323	45.5	-28.5	74	50.66	36.49	10.18	51.83	-	-	P	V
		7323	20.71	-33.29	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	43.38	-30.62	74	51.85	31.69	8.41	48.57			P	H
		4960	18.59	-35.41	54	-	-	-	-	-	-	A	H
		7440	44.94	-29.06	74	50.01	36.71	10.17	51.95	184	278	P	H
		7440	20.15	-33.85	54	-	-	-	-	-	-	A	H
		4960	42.8	-31.2	74	51.27	31.69	8.41	48.57	146	215	P	V
		4960	18.01	-35.99	54	-	-	-	-	-	-	A	V
		7440	44.54	-29.46	74	49.61	36.71	10.17	51.95			P	V
		7440	19.75	-34.25	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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					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	24.22	-15.78	40	30.23	25.86	0.53	32.4	-	-	P	H
		159.01	18.96	-24.54	43.5	33.14	16.71	1.29	32.18	-	-	P	H
		276.38	32.31	-13.69	46	42.99	19.34	1.73	31.75	-	-	P	H
		370.47	27.42	-18.58	46	35.76	21.21	2.03	31.58	-	-	P	H
		611.03	28.21	-17.79	46	29.94	26.41	2.58	30.72	-	-	P	H
		940.83	32.87	-13.13	46	30.32	30.83	3.22	31.5	-	-	P	H
		30	24.75	-15.25	40	30.76	25.86	0.53	32.4	-	-	P	V
		54.25	24.47	-15.53	40	42.68	13.46	0.73	32.4	-	-	P	V
		159.01	19.74	-23.76	43.5	33.92	16.71	1.29	32.18	-	-	P	V
		281.23	26.18	-19.82	46	36.72	19.46	1.74	31.74	-	-	P	V
		616.85	29.54	-16.46	46	31.27	26.42	2.59	30.74	-	-	P	V
		951.5	32.12	-13.88	46	29.26	31.13	3.23	31.5	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



For Ant 2

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	Avg. (P/A)	(H/V)
BT CH00 2402MHz		2314.935	39.99	-34.01	74	41.63	26.95	5.31	33.9	142	329	P	H
		2314.935	15.2	-38.8	54	-	-	-	-	-	-	A	H
		2402	95.5	-	-	96.94	27.02	5.37	33.83	142	329	P	H
		2402	70.71	-	-	-	-	-	-	-	-	A	H
		2387.385	39.85	-34.15	74	41.32	27.02	5.37	33.86	379	249	P	V
		2387.385	15.06	-38.94	54	-	-	-	-	-	-	A	V
		2402	91.8	-	-	93.24	27.02	5.37	33.83	379	249	P	V
		2402	67.01	-	-	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		2381.96	39.54	-34.46	74	41.06	27	5.34	33.86	138	283	P	H
		2381.96	14.75	-39.25	54	-	-	-	-	-	-	A	H
		2441	96.14	-	-	97.43	27.06	5.41	33.76	138	283	P	H
		2441	71.35	-	-	-	-	-	-	-	-	A	H
		2486.42	39.41	-34.59	74	40.58	27.09	5.46	33.72	138	283	P	H
		2486.42	14.62	-39.38	54	-	-	-	-	-	-	A	H
		2381.12	39.9	-34.1	74	41.42	27	5.34	33.86	362	260	P	V
		2381.12	15.11	-38.89	54	-	-	-	-	-	-	A	V
		2441	93.51	-	-	94.8	27.06	5.41	33.76	362	260	P	V
		2441	68.72	-	-	-	-	-	-	-	-	A	V
		2486.35	40.08	-33.92	74	41.25	27.09	5.46	33.72	362	260	P	V
		2486.35	15.29	-38.71	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		2480	96	-	-	97.17	27.09	5.46	33.72	133	324	P	H
		2480	71.21	-	-	-	-	-	-	-	-	A	H
		2484.2	40.63	-33.37	74	41.8	27.09	5.46	33.72	133	324	P	H
		2484.2	15.84	-38.16	54	-	-	-	-	-	-	A	H
		2480	92.17	-	-	93.34	27.09	5.46	33.72	396	248	P	V
		2480	67.38	-	-	-	-	-	-	-	-	A	V
		2484.44	39.77	-34.23	74	40.94	27.09	5.46	33.72	396	248	P	V
		2484.44	14.98	-39.02	54	-	-	-	-	-	-	A	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)	Margin (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	42.08	-31.92	74	51.36	31.19	8.88	49.35	-	-	P	H
		4804	17.29	-36.71	54	-	-	-	-	-	-	A	H
		4804	43.42	-30.58	74	52.7	31.19	8.88	49.35	-	-	P	V
		4804	18.63	-35.37	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	43.41	-30.59	74	52.35	31.41	8.65	49	-	-	P	H
		4882	18.62	-35.38	54	-	-	-	-	-	-	A	H
		7323	44.96	-29.04	74	50.12	36.49	10.18	51.83	-	-	P	H
		7323	20.17	-33.83	54	-	-	-	-	-	-	A	H
		4882	42.59	-31.41	74	51.53	31.41	8.65	49	-	-	P	V
		4882	17.8	-36.2	54	-	-	-	-	-	-	A	V
		7323	45	-29	74	50.16	36.49	10.18	51.83	-	-	P	V
		7323	20.21	-33.79	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	43.48	-30.52	74	51.95	31.69	8.41	48.57	-	-	P	H
		4960	18.69	-35.31	54	-	-	-	-	-	-	A	H
		7440	45.68	-28.32	74	50.75	36.71	10.17	51.95	-	-	P	H
		7440	20.89	-33.11	54	-	-	-	-	-	-	A	H
		4960	44.44	-29.56	74	52.91	31.69	8.41	48.57	-	-	P	V
		4960	19.65	-34.35	54	-	-	-	-	-	-	A	V
		7440	44.25	-29.75	74	49.32	36.71	10.17	51.95	-	-	P	V
		7440	19.46	-34.54	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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					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	24.69	-15.31	40	30.7	25.86	0.53	32.4	-	-	P	H
		159.01	19.43	-24.07	43.5	33.61	16.71	1.29	32.18	-	-	P	H
		276.38	31.68	-14.32	46	42.36	19.34	1.73	31.75	-	-	P	H
		370.47	26.42	-19.58	46	34.76	21.21	2.03	31.58	-	-	P	H
		575.14	28.59	-17.41	46	30.7	26.17	2.51	30.79	-	-	P	H
		948.59	31.57	-14.43	46	28.73	31.11	3.23	31.5	-	-	P	H
		30	24.48	-15.52	40	30.49	25.86	0.53	32.4	-	-	P	V
		54.25	25.21	-14.79	40	43.42	13.46	0.73	32.4	-	-	P	V
		159.01	19.85	-23.65	43.5	34.03	16.71	1.29	32.18	-	-	P	V
		281.23	26.55	-19.45	46	37.09	19.46	1.74	31.74	-	-	P	V
		513.06	25.48	-20.52	46	29.58	24.65	2.36	31.11	-	-	P	V
		951.5	32.14	-13.86	46	29.28	31.13	3.23	31.5	-	-	P	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 Margin line.
P/A	Peak or Average
H/V	Horizontal or Vertical

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

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					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. Margin (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. Margin (dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

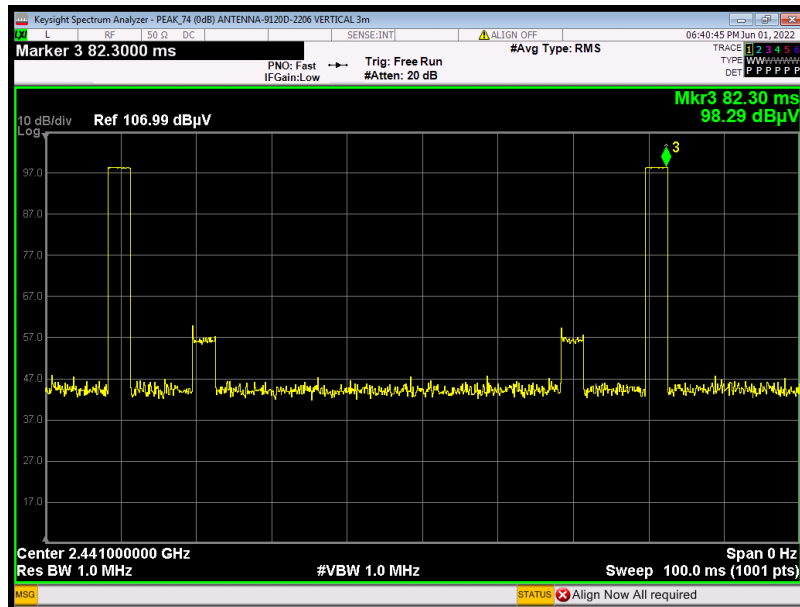
1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
2. Margin (dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

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

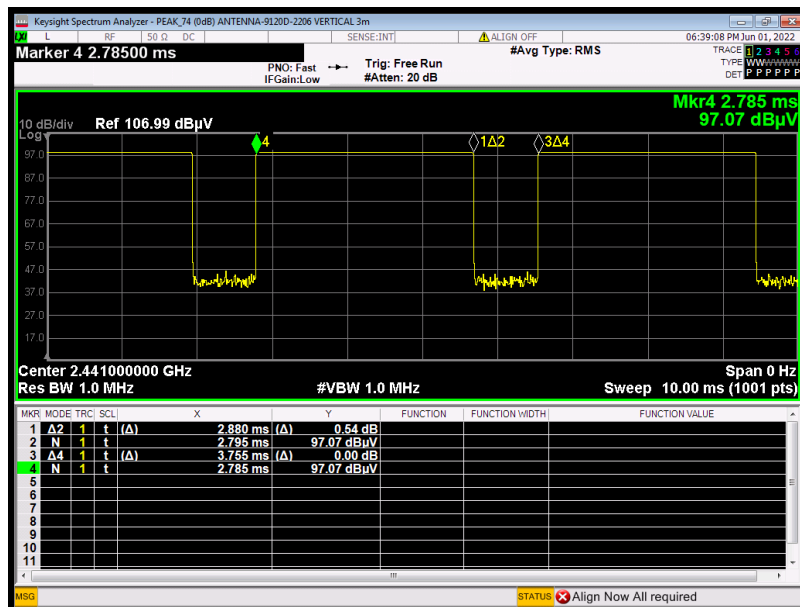
Appendix D. Duty Cycle Plots

For Ant.1

DH5 on time (One Pulse) Plot on Channel 39



DH5 on time (Count Pulses) Plot on Channel 39

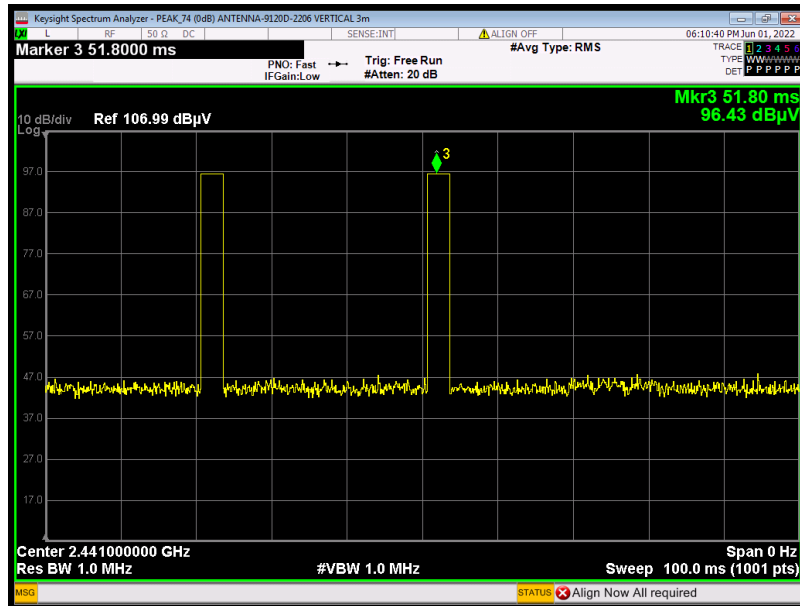


Note:

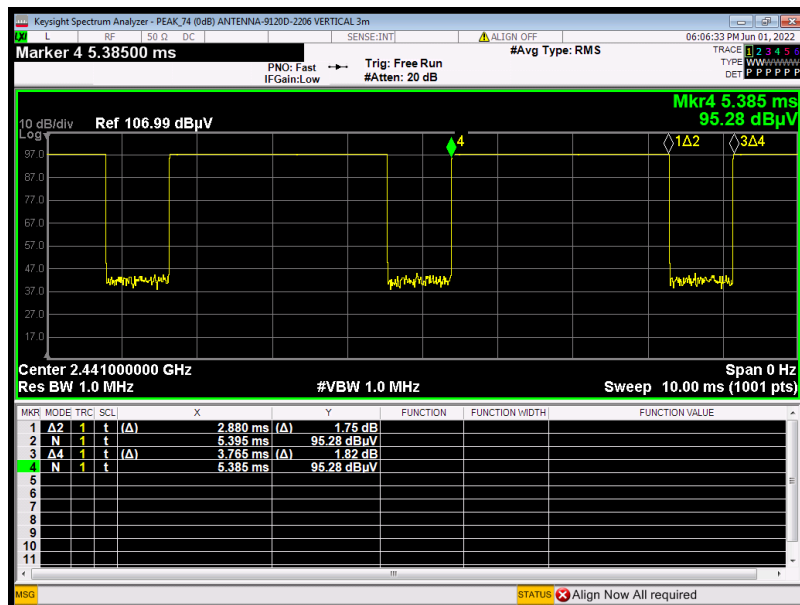
1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.

For Ant.2:

DH5 on time (One Pulse) Plot on Channel 39



DH5 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 = $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.