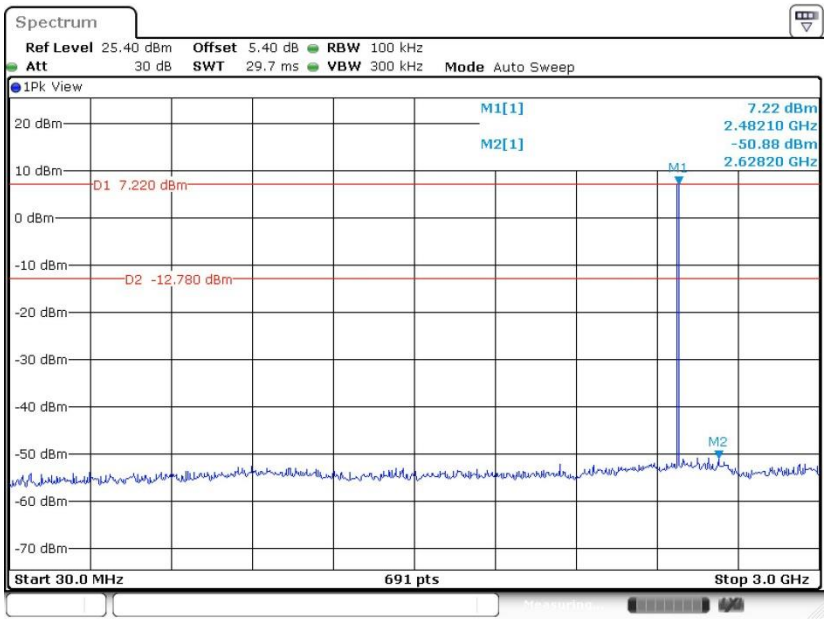
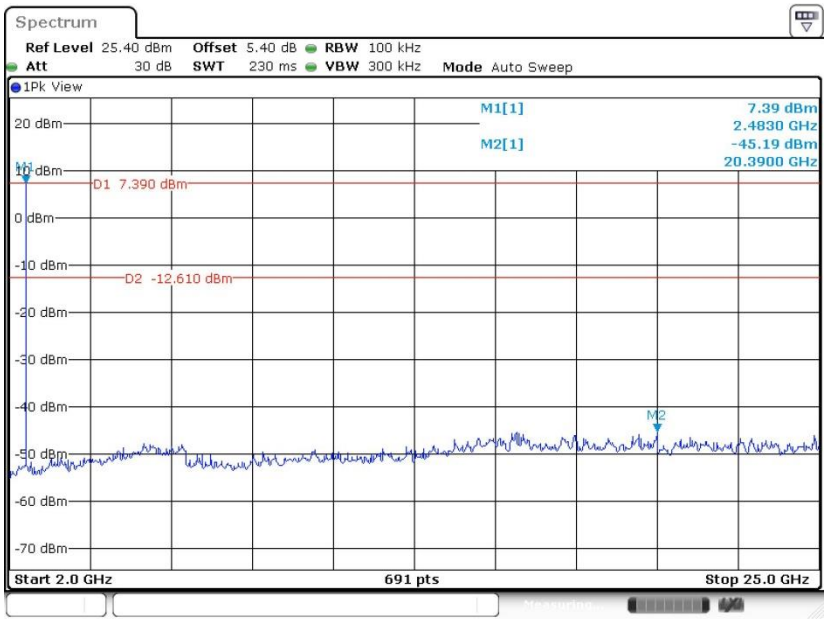
CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 4.NOV.2022 07:02:20

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

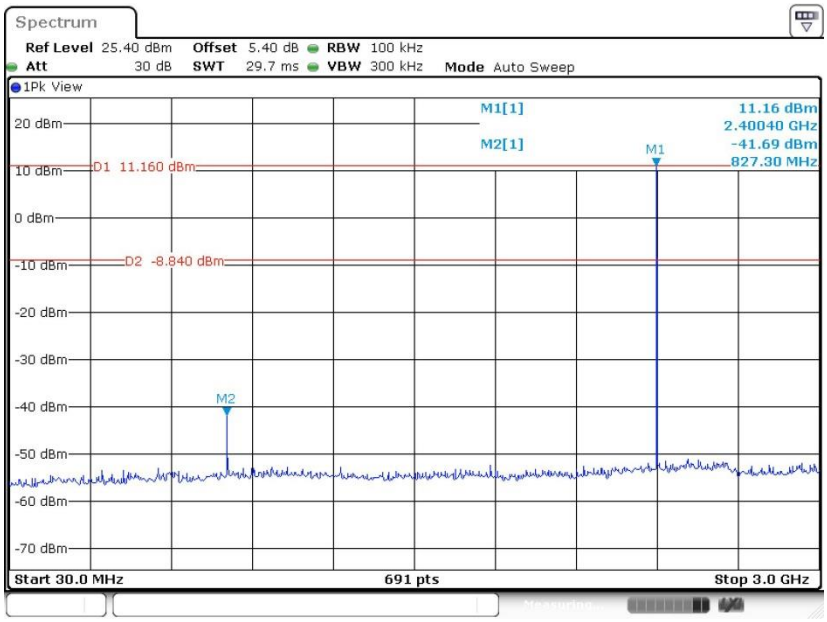


Date: 4.NOV.2022 07:02:47

Beamforming < Ant.2>

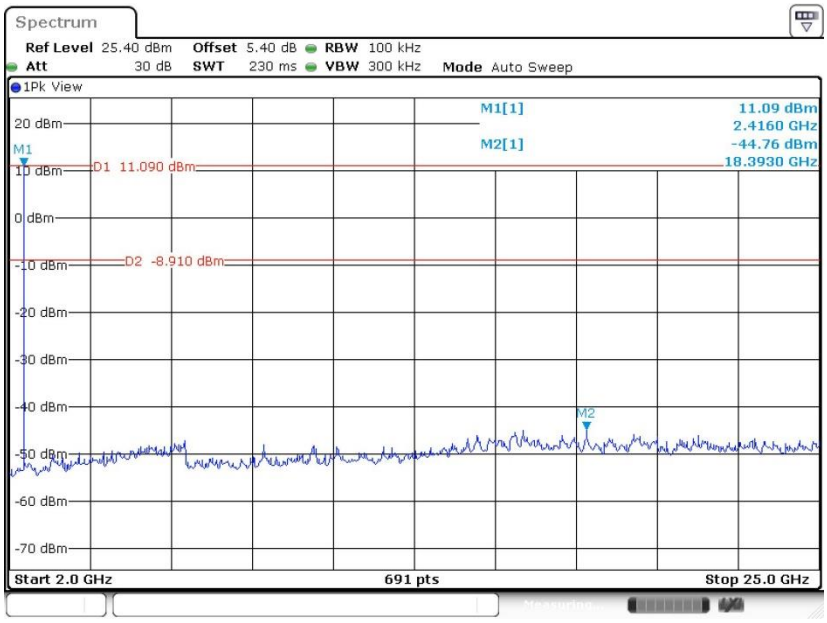
<1Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



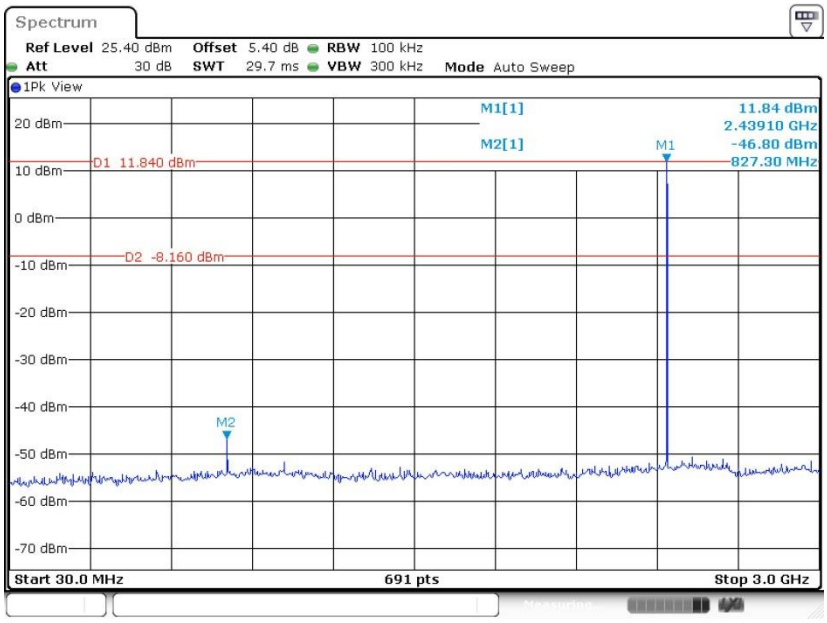
Date: 4.NOV.2022 05:36:40

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



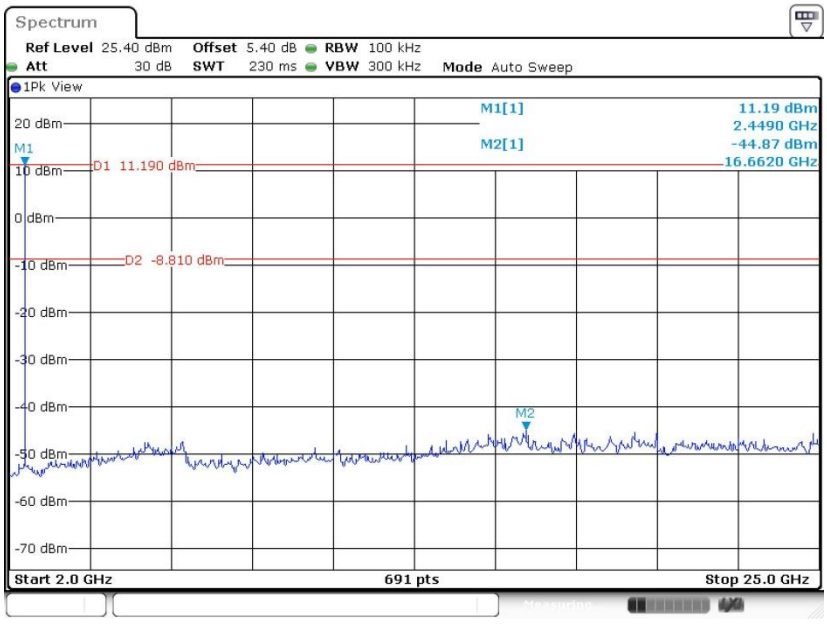
Date: 4.NOV.2022 05:37:09

CSE Plot on Ch 39 between 30MHz ~ 3 GHz



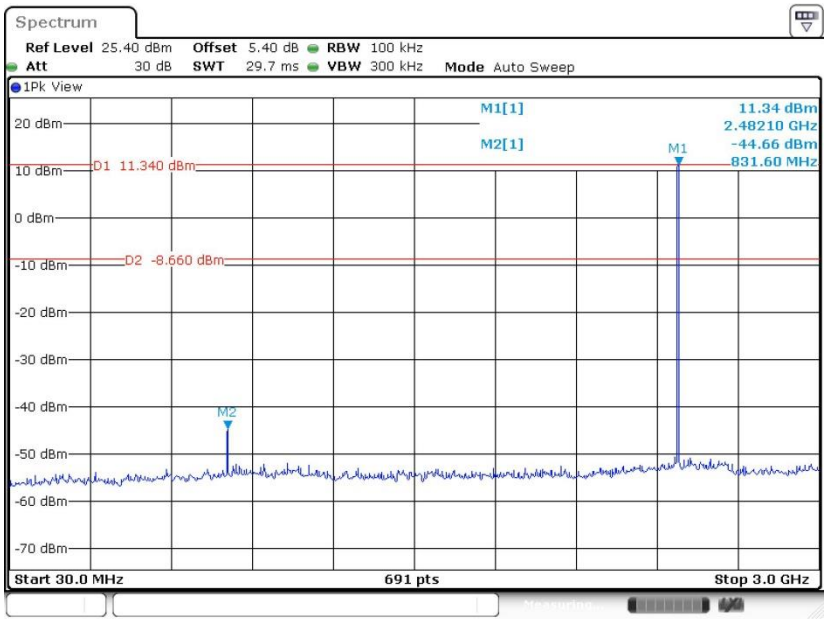
Date: 4.NOV.2022 05:48:49

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



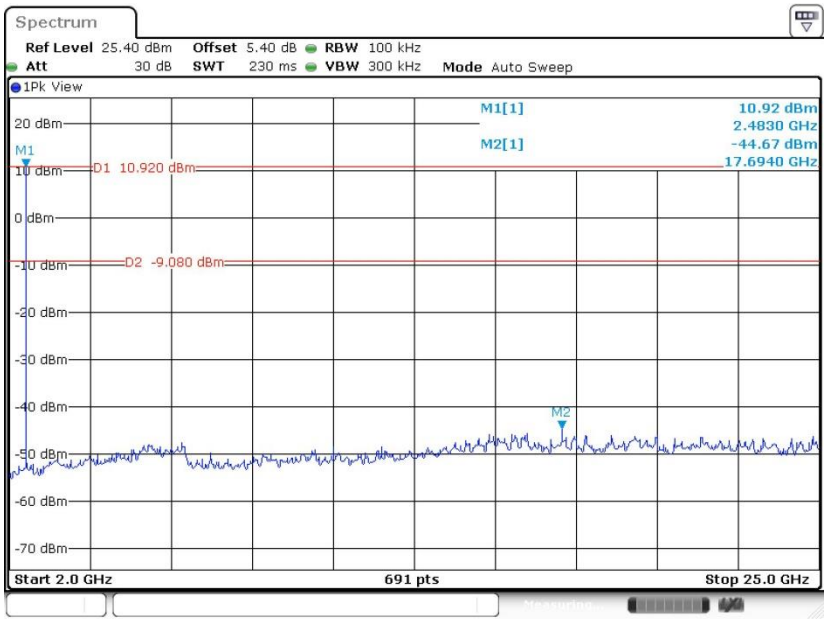
Date: 4.NOV.2022 05:49:17

CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 4.NOV.2022 05:54:53

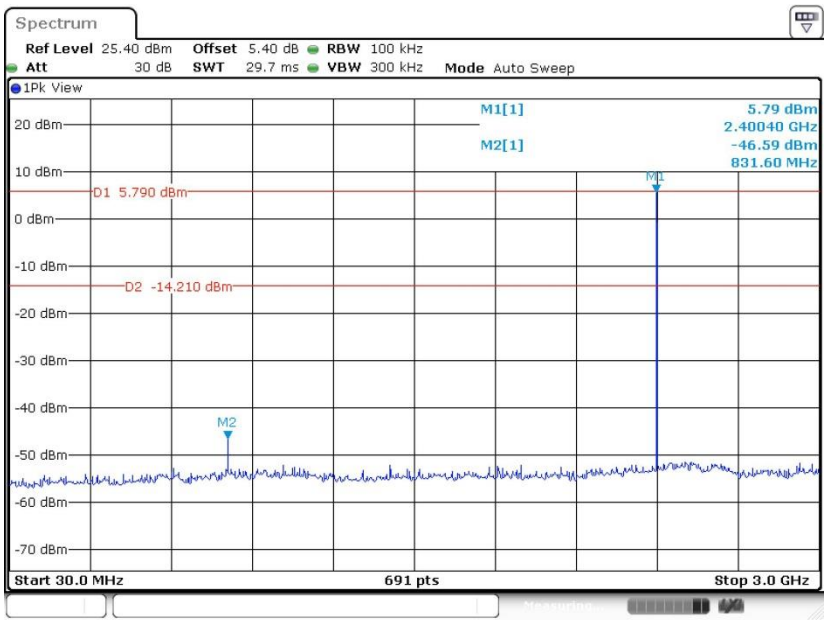
CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 4.NOV.2022 05:55:21

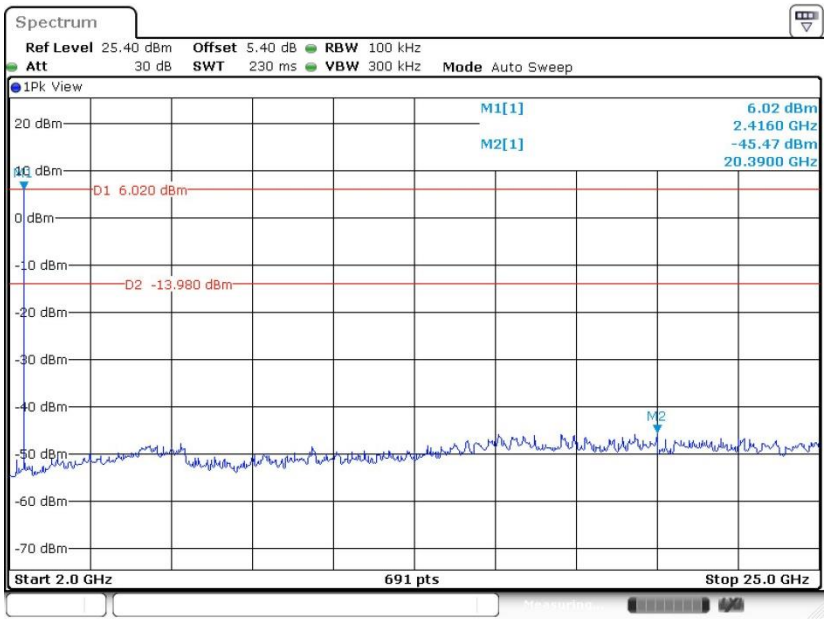
<2Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 4.NOV.2022 06:07:44

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



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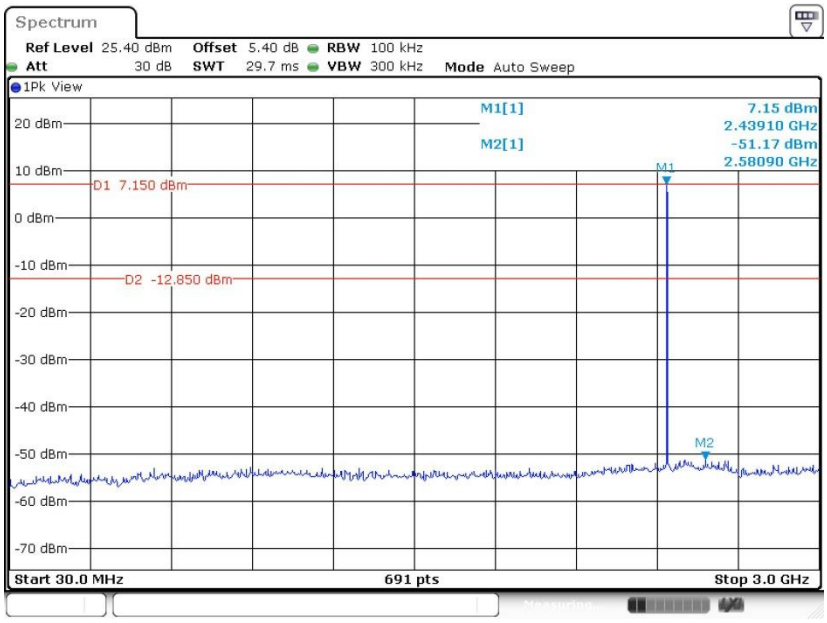
CSE Plot on Ch 39 between 30MHz ~ 3 GHz



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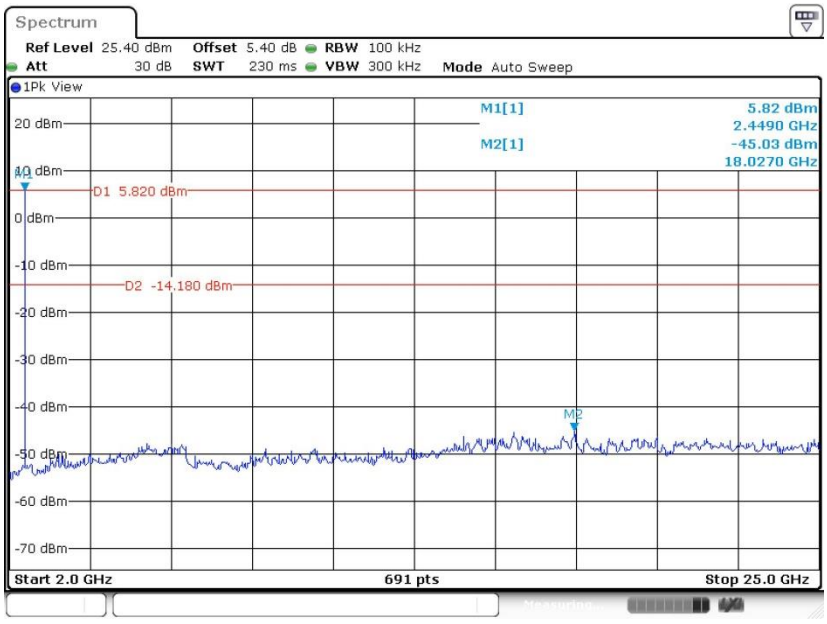
CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



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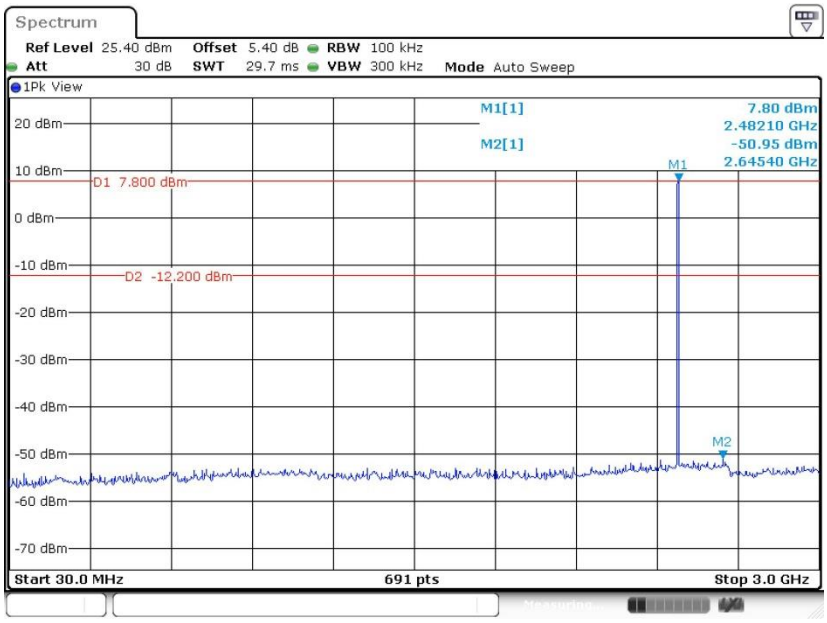
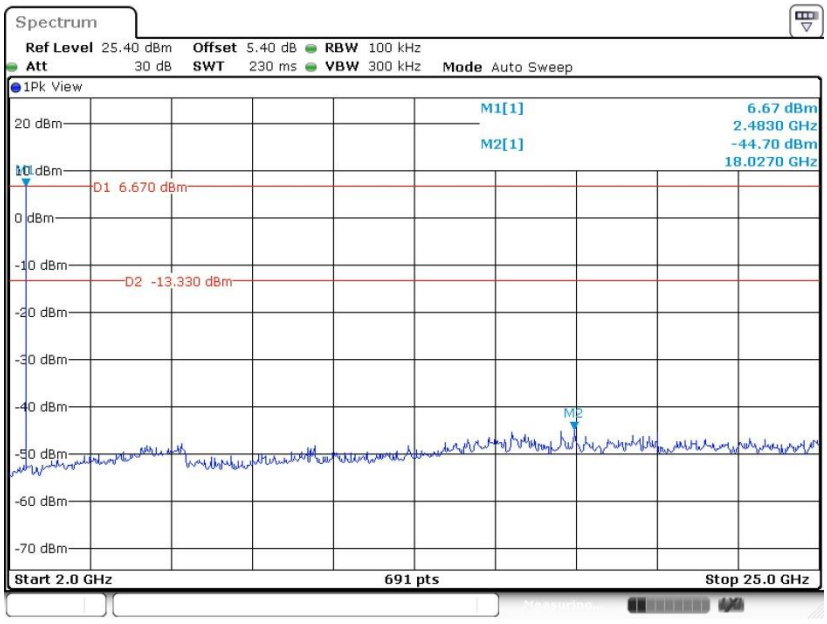
CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 4.NOV.2022 06:00:24

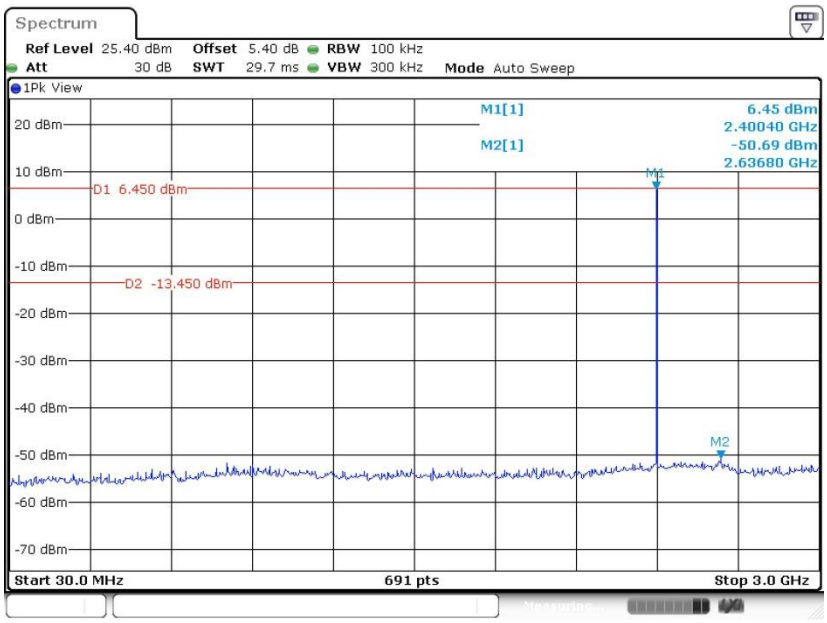
CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 4.NOV.2022 06:01:03

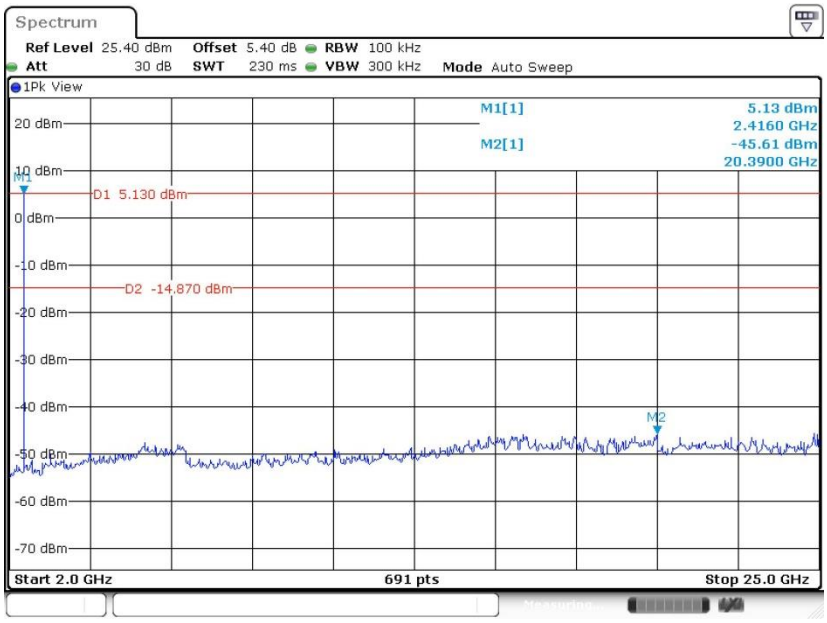
<3Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



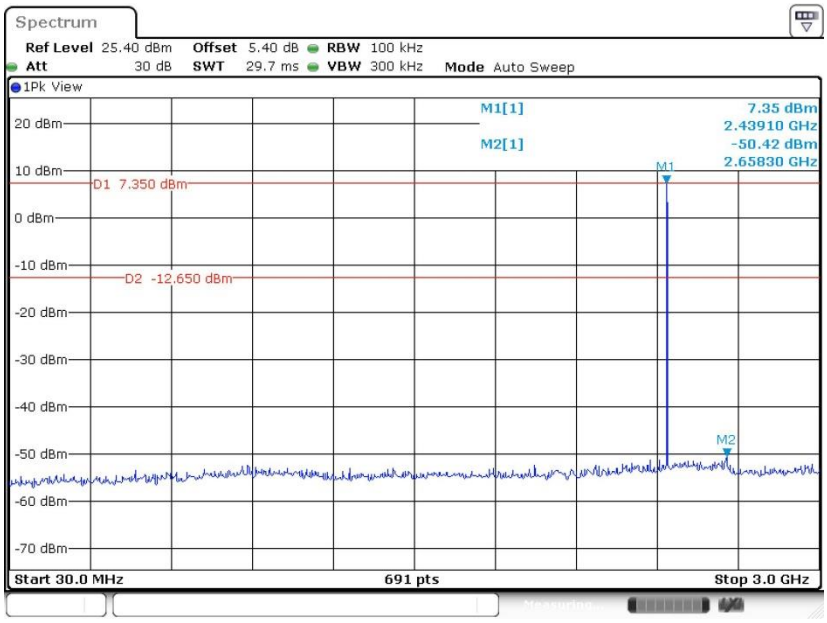
Date: 4.NOV.2022 06:24:45

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



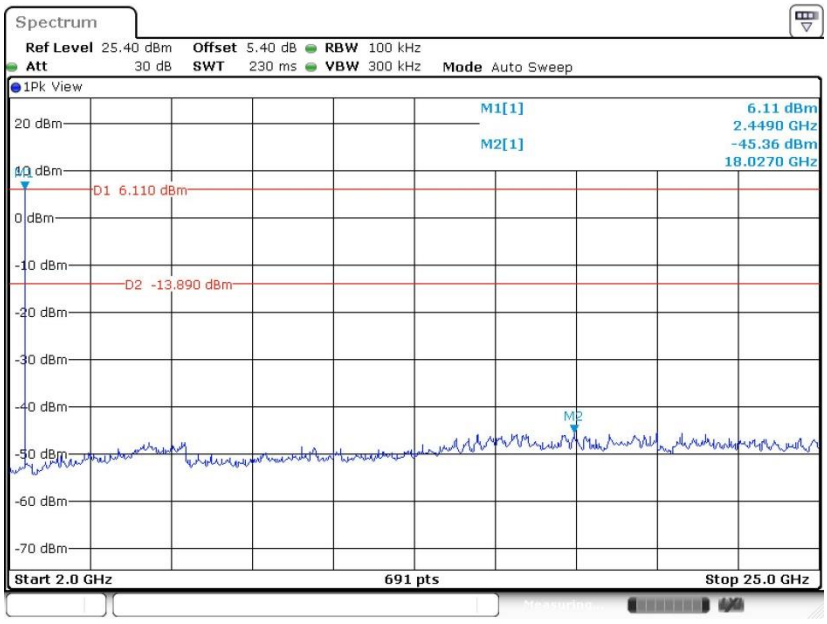
Date: 4.NOV.2022 06:25:12

CSE Plot on Ch 39 between 30MHz ~ 3 GHz



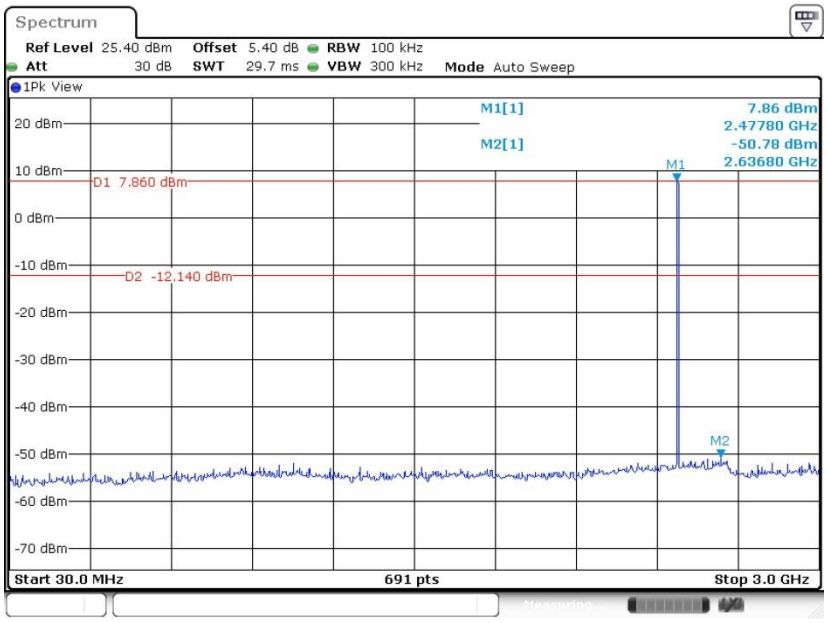
Date: 4.NOV.2022 06:28:19

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



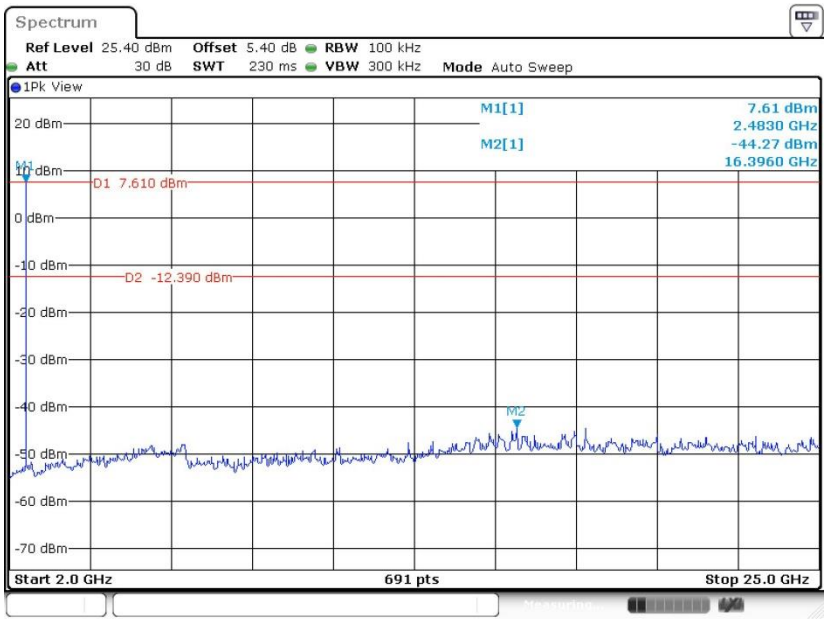
Date: 4.NOV.2022 06:30:21

CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 4.NOV.2022 06:55:56

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 4.NOV.2022 06:56:22

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.

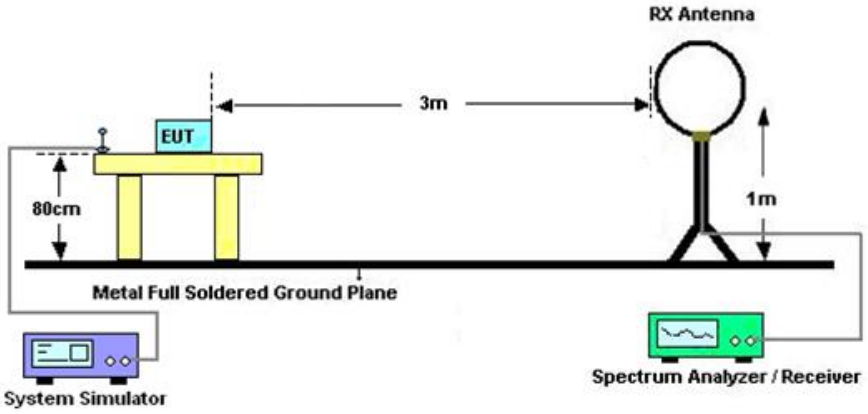
3.8.3 Test Procedures

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>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 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.

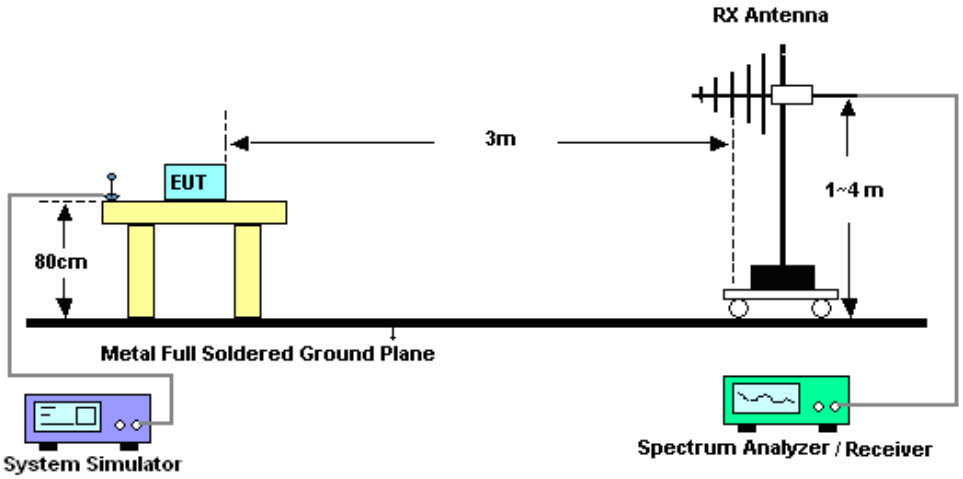
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.76dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

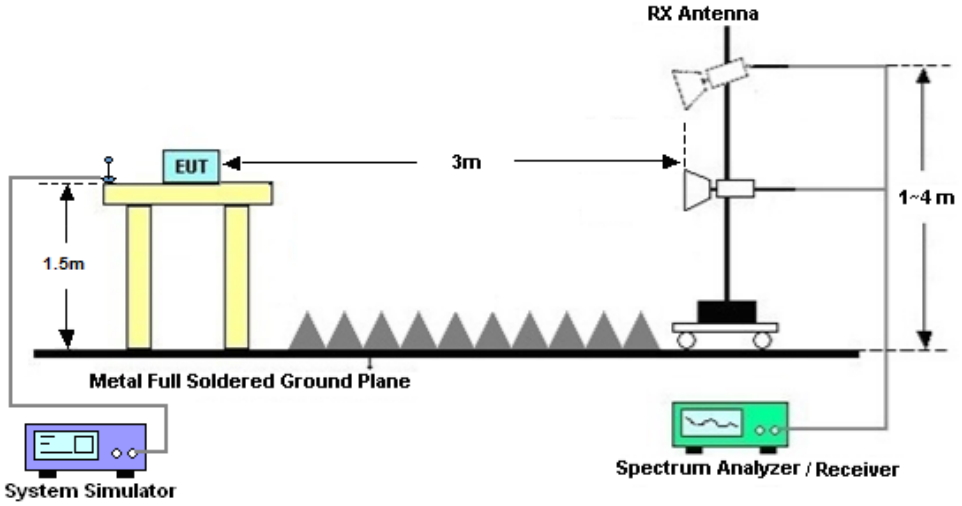
For radiated emissions below 30MHz



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.

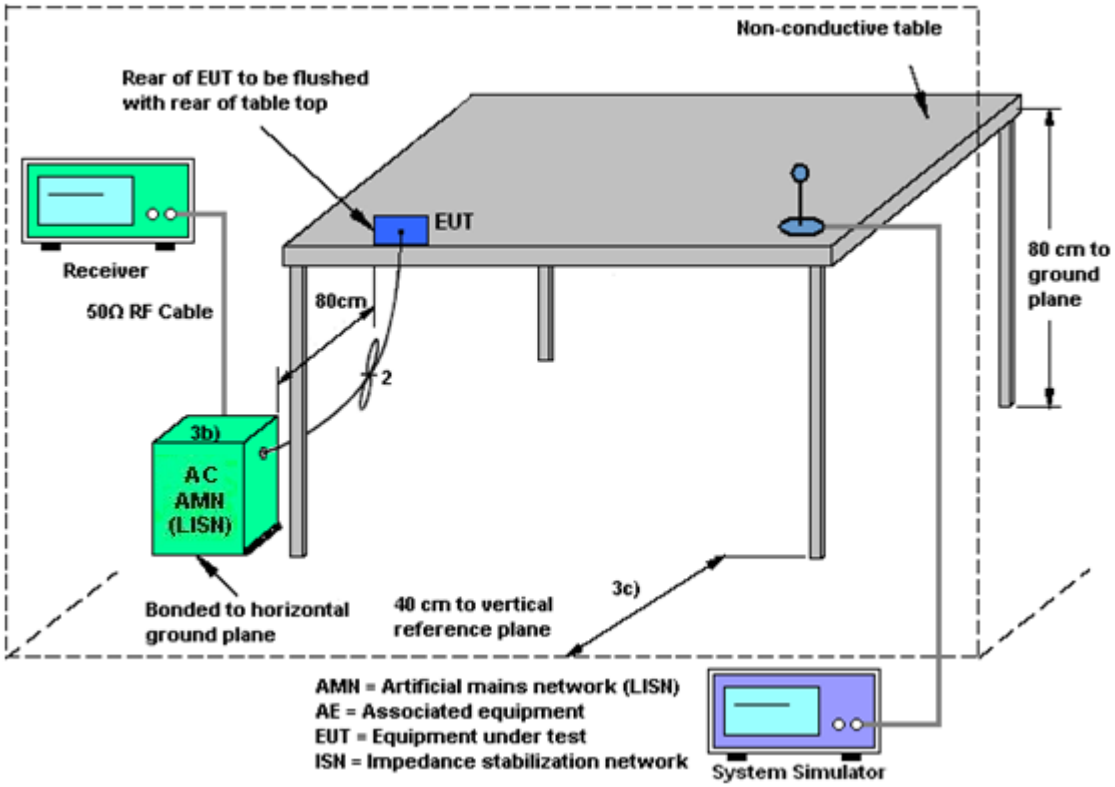
3.9.2 Measuring Instruments

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.

TXBF modes

FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

For CDD transmissions, directional gain is calculated as

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k / 20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

The EUT supports beamforming for Bluetooth BR/EDR modes.

The directional gain calculation is following F)2)e)ii) of KDB 662911 D01 v02r01..

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain “DG” is calculated as following table.

	Ant 1 (dBi)	Ant 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
BT BF	-2.60	1.10	2.46	2.46	0.00	0.00

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 12, 2022	Oct. 18, 2022~ Nov. 04, 2022	Oct. 11, 2023	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2022	Oct. 18, 2022~ Nov. 04, 2022	Jan. 04, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2022	Oct. 18, 2022~ Nov. 04, 2022	Jan. 04, 2023	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 13, 2022	Oct. 30, 2022	Oct. 12, 2023	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Mar. 24, 2022	Oct. 30, 2022	Mar. 23, 2023	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 08, 2021	Oct. 30, 2022	Nov. 07, 2022	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Oct. 30, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	Oct. 30, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
high gain Amplifier	EM	EM01G18GA	060839	1Ghz-18Ghz	Oct. 12, 2022	Oct. 30, 2022	Oct. 11, 2023	Radiation (03CH05-KS)
Amplifier	EM	EM01G18GA	060833	1Ghz-18Ghz	Jan. 05, 2022	Oct. 30, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Oct. 30, 2022	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Oct. 30, 2022	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Oct. 30, 2022	NCR	Radiation (03CH05-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 13, 2022	Oct. 30, 2022	Oct. 12, 2023	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY60242126	10Hz-44GHz	Oct. 13, 2022	Oct. 30, 2022	Oct. 12, 2023	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Oct. 30, 2022	Oct. 15, 2023	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz-1GHz	May 24, 2022	Oct. 30, 2022	May 23, 2023	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218642	1GHz~18GHz	Apr. 18, 2022	Oct. 30, 2022	Apr. 17, 2023	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 05, 2022	Oct. 30, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	380827	9KHz ~1GHZ	Jul. 11, 2022	Oct. 30, 2022	Jul. 10, 2023	Radiation (03CH06-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	Oct. 30, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2082395	1Ghz-18Ghz	Jan. 05, 2022	Oct. 30, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270319	500MHz~26.5GHz	Oct. 12, 2022	Oct. 30, 2022	Oct. 12, 2023	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Oct. 30, 2022	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Oct. 30, 2022	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Oct. 30, 2022	NCR	Radiation (03CH06-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 24, 2022	Oct. 22, 2022	May 23, 2023	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2022	Oct. 22, 2022	Oct. 12, 2023	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 24, 2022	Oct. 22, 2022	May 23, 2023	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2022	Oct. 22, 2022	Oct. 11, 2023	Conduction (CO01-KS)

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 Measurement

Test Item	Uncertainty
Conducted Power	±0.46 dB
Conducted Emissions	±0.48 dB
Occupied Channel Bandwidth	±0.10 %
Conducted Power Spectral Density	±0.40 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.78dB

03CH05-KS

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB

03CH06-KS

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

---------- THE END ----------

Appendix A. Conducted Test Results

Report Number : FR292001A

Test Engineer:	Albert shi	Temperature:	20~26	°C
Test Date:	2022/10/28-2022/11/04	Relative Humidity:	40~51	%

Bluetooth-Ant. 1

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 (KHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.947	0.854	998.600	0.6310	Pass
DH	1Mbps	1	39	2441	0.949	0.851	1002.900	0.6329	Pass
DH	1Mbps	1	78	2480	0.947	0.854	1002.890	0.6310	Pass
2DH	2Mbps	1	0	2402	1.303	1.169	1237.300	0.8683	Pass
2DH	2Mbps	1	39	2441	1.303	1.172	1037.600	0.8683	Pass
2DH	2Mbps	1	78	2480	1.303	1.169	1028.900	0.8683	Pass
3DH	3Mbps	1	0	2402	1.203	1.152	1107.090	0.8017	Pass
3DH	3Mbps	1	39	2441	1.268	1.100	1002.900	0.8451	Pass
3DH	3Mbps	1	78	2480	1.268	1.155	981.200	0.8451	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec) (MHz)	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
DH1	0	1	**16.24**	20.97	Pass
	39	1	16.01	20.97	Pass
	78	1	16.12	20.97	Pass

2DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
2DH1	0	1	**16.24**	20.97	Pass
	39	1	15.88	20.97	Pass
	78	1	15.91	20.97	Pass

3DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
3DH1	0	1	**16.71**	20.97	Pass
	39	1	16.27	20.97	Pass
	78	1	16.42	20.97	Pass

TEST RESULTS DATA
Number of Hopping Frequency

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

Bluetooth-Ant. 1

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 (KHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.944	0.854	998.600	0.6291	Pass
DH	1Mbps	1	39	2441	0.947	0.851	998.600	0.6310	Pass
DH	1Mbps	1	78	2480	0.947	0.851	998.550	0.6310	Pass
2DH	2Mbps	1	0	2402	1.185	1.172	1041.970	0.7901	Pass
2DH	2Mbps	1	39	2441	1.276	1.172	1141.800	0.8509	Pass
2DH	2Mbps	1	78	2480	1.303	1.149	963.800	0.8683	Pass
3DH	3Mbps	1	0	2402	1.211	1.140	1311.140	0.8075	Pass
3DH	3Mbps	1	39	2441	1.268	1.155	1002.900	0.8451	Pass
3DH	3Mbps	1	78	2480	1.268	1.146	1024.600	0.8451	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec) (MHz)	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
DH1	0	1	**16.12**	20.97	Pass
	39	1	15.61	20.97	Pass
	78	1	14.77	20.97	Pass

2DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
2DH1	0	1	**15.48**	20.97	Pass
	39	1	15.23	20.97	Pass
	78	1	14.39	20.97	Pass

3DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
3DH1	0	1	**16.13**	20.97	Pass
	39	1	15.97	20.97	Pass
	78	1	15.17	20.97	Pass

TEST RESULTS DATA
Number of Hopping Frequency

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

Bluetooth-Beamforming Ant. 1+2

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	14.85	20.97	Pass
	39	1	**14.97**	20.97	Pass
	78	1	14.64	20.97	Pass

2DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
2DH1	0	1	12.94	20.97	Pass
	39	1	**13.50**	20.97	Pass
	78	1	13.33	20.97	Pass

3DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
3DH1	0	1	13.45	20.97	Pass
	39	1	**14.00**	20.97	Pass
	78	1	13.76	20.97	Pass

Bluetooth-Beamforming Ant. 1

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	0.952	0.854	994.200	0.6348	Pass
DH	1Mbps	1	39	2441	0.949	0.860	1002.900	0.6329	Pass
DH	1Mbps	1	78	2480	0.949	0.860	994.200	0.6329	Pass
2DH	2Mbps	1	0	2402	1.303	1.169	1150.500	0.8683	Pass
2DH	2Mbps	1	39	2441	1.307	1.172	907.400	0.8712	Pass
2DH	2Mbps	1	78	2480	1.303	1.169	1115.800	0.8683	Pass
3DH	3Mbps	1	0	2402	1.268	1.152	911.700	0.8451	Pass
3DH	3Mbps	1	39	2441	1.263	1.152	1159.200	0.8423	Pass
3DH	3Mbps	1	78	2480	1.263	1.152	924.700	0.8423	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec) (MHz)	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
DH1	0	1	**11.95**	20.97	Pass
	39	1	11.85	20.97	Pass
	78	1	11.39	20.97	Pass

2DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
2DH1	0	1	10.41	20.97	Pass
	39	1	**10.88**	20.97	Pass
	78	1	10.13	20.97	Pass

3DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
3DH1	0	1	10.88	20.97	Pass
	39	1	**11.35**	20.97	Pass
	78	1	10.57	20.97	Pass

TEST RESULTS DATA
Number of Hopping Frequency

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

Bluetooth-Beamforming Ant. 2

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 (KHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.949	0.851	998.600	0.6348	Pass
DH	1Mbps	1	39	2441	0.949	0.854	1319.800	0.6329	Pass
DH	1Mbps	1	78	2480	0.947	0.851	998.600	0.6329	Pass
2DH	2Mbps	1	0	2402	1.303	1.169	937.800	0.8683	Pass
2DH	2Mbps	1	39	2441	1.303	1.169	1215.600	0.8712	Pass
2DH	2Mbps	1	78	2480	1.298	1.169	1128.800	0.8683	Pass
3DH	3Mbps	1	0	2402	1.263	1.152	1011.600	0.8451	Pass
3DH	3Mbps	1	39	2441	1.263	1.152	1028.900	0.8423	Pass
3DH	3Mbps	1	78	2480	1.263	1.155	1163.500	0.8423	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec) (MHz)	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
DH1	0	1	11.72	20.97	Pass
	39	1	**12.07**	20.97	Pass
	78	1	11.85	20.97	Pass

2DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
2DH1	0	1	9.39	20.97	Pass
	39	1	10.05	20.97	Pass
	78	1	**10.51**	20.97	Pass

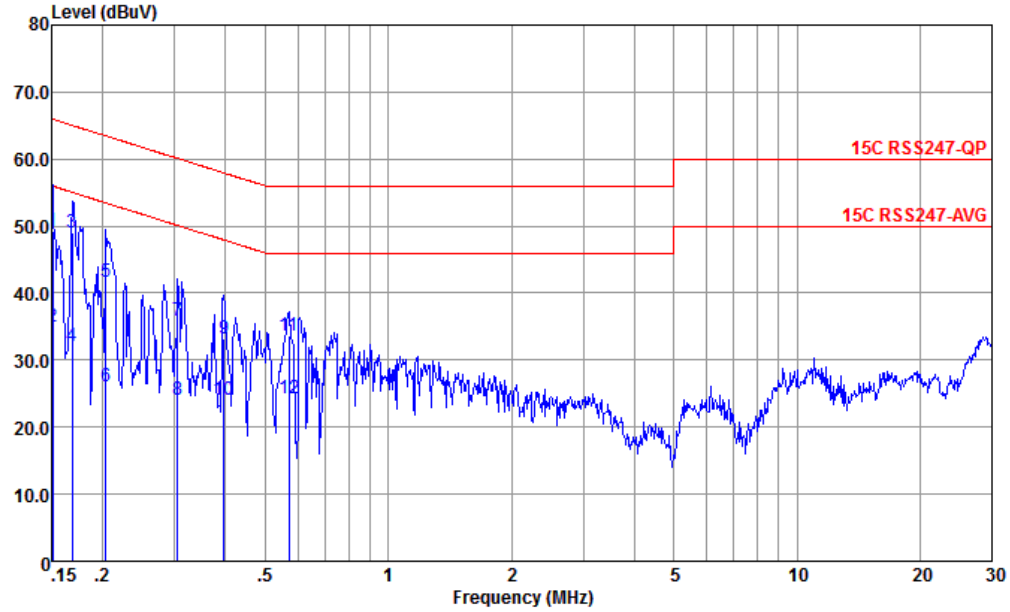
3DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
3DH1	0	1	9.94	20.97	Pass
	39	1	10.59	20.97	Pass
	78	1	**10.92**	20.97	Pass

TEST RESULTS DATA
Number of Hopping Frequency

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

Appendix B. AC Conducted Emission Test Results

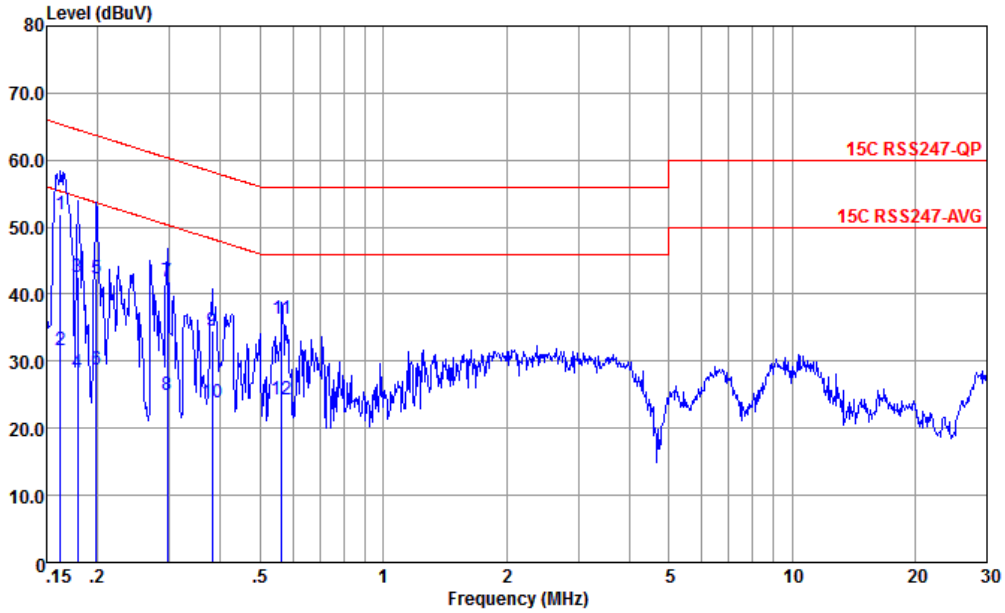
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15C RSS247-QP LISN-060105-LINE LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.151	49.30	-16.66	65.96	38.80	0.07	10.43	QP
2		0.151	35.00	-20.96	55.96	24.50	0.07	10.43	Average
3	*	0.169	48.98	-16.05	65.03	38.50	0.05	10.43	QP
4		0.169	32.08	-22.95	55.03	21.60	0.05	10.43	Average
5		0.204	41.64	-21.81	63.45	31.20	0.02	10.42	QP
6		0.204	26.04	-27.41	53.45	15.60	0.02	10.42	Average
7		0.305	35.90	-24.20	60.10	25.49	0.06	10.35	QP
8		0.305	24.00	-26.10	50.10	13.59	0.06	10.35	Average
9		0.396	33.11	-24.84	57.95	22.80	0.01	10.30	QP
10		0.396	24.11	-23.84	47.95	13.80	0.01	10.30	Average
11		0.570	33.64	-22.36	56.00	23.50	-0.05	10.19	QP
12		0.570	24.34	-21.66	46.00	14.20	-0.05	10.19	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15C RSS247-QP LISN-060105-NEUTRAL NEUTRAL

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	*	0.162	51.96	-13.38	65.34	41.49	0.04	10.43	QP
2		0.162	31.66	-23.68	55.34	21.19	0.04	10.43	Average
3		0.179	42.67	-21.88	64.55	32.21	0.04	10.42	QP
4		0.179	28.37	-26.18	54.55	17.91	0.04	10.42	Average
5		0.199	42.27	-21.40	63.67	31.80	0.05	10.42	QP
6		0.199	28.67	-25.00	53.67	18.20	0.05	10.42	Average
7		0.296	41.81	-18.56	60.37	31.51	-0.05	10.35	QP
8		0.296	24.91	-25.46	50.37	14.61	-0.05	10.35	Average
9		0.381	34.44	-23.81	58.25	24.19	-0.06	10.31	QP
10		0.381	23.84	-24.41	48.25	13.59	-0.06	10.31	Average
11		0.564	36.31	-19.69	56.00	26.20	-0.08	10.19	QP
12		0.564	24.21	-21.79	46.00	14.10	-0.08	10.19	Average

Note:

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

Appendix C. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

BT—ANT 15 (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		2380.33	48.14	-25.86	74	45.28	32.31	7.1	36.55	106	36	P	H
	*	2380.33	23.38	-30.62	54	-	-	-	-	-	-	A	H
		2402	106.29	-	-	103.27	32.4	7.13	36.51	106	36	P	H
		2402	81.53	-	-	-	-	-	-	-	-	A	H
		2322.87	48.68	-25.32	74	46.28	32.04	7.01	36.65	115	11	P	V
	*	2322.87	23.92	-30.08	54	-	-	-	-	-	-	A	V
		2402	111.14	-	-	108.12	32.4	7.13	36.51	115	11	P	V
		2402	86.38	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz	*	2480	104.70	-	-	102.13	32.34	7.25	37.02	115	129	P	H
		2480	79.94	-	-	-	-	-	-	-	-	A	H
		2483.5	58.19	-15.81	74	55.62	32.34	7.25	37.02	115	129	P	H
		2483.5	33.43	-20.57	54	-	-	-	-	-	-	A	H
	*	2480	107.58	-	-	105.01	32.34	7.25	37.02	100	213	P	V
		2480	82.82	-	-	-	-	-	-	-	-	A	V
		2483.56	58.51	-15.49	74	55.94	32.34	7.25	37.02	100	213	P	V
		2483.56	33.75	-20.25	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—ANT 15 (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		4800	38.27	-35.73	74	59.32	34	10.2	65.25	300	0	P	H
		4800	38.82	-35.18	74	59.87	34	10.2	65.25	100	0	P	V
BT CH 39 2441MHz		4875	39.53	-34.47	74	60.52	34	10.29	65.28	300	0	P	H
		7320	41.84	-32.16	74	60.08	35.77	12.72	66.73	300	0	P	H
		4875	39.54	-34.46	74	60.53	34	10.29	65.28	100	0	P	V
		7320	41.12	-32.88	74	59.36	35.77	12.72	66.73	100	0	P	V
BT CH 78 2480MHz		4965	40.47	-33.53	74	61.38	34	10.41	65.32	300	0	P	H
		7440	42.84	-31.16	74	61.4	35.79	12.79	67.14	300	0	P	H
		4965	40.22	-33.78	74	61.13	34	10.41	65.32	100	0	P	V
		7440	41.55	-32.45	74	60.11	35.79	12.79	67.14	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BT—ANT 18 (Band Edge @ 3m)

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 CH00 2402MHz		2386.7	53.21	-20.79	74	47.18	32.3	6.61	32.88	357	12	P	H
	*	2386.7	28.45	-25.55	54	-	-	-	-	-	-	A	H
		2402	106.28	-	-	100.21	32.3	6.61	32.84	357	12	P	H
		2402	81.52	-	-	-	-	-	-	-	-	A	H
		2334.83	53.02	-20.98	74	47.35	32.1	6.53	32.96	264	292	P	V
	*	2334.83	28.26	-25.74	54	-	-	-	-	-	-	A	V
		2402	109.56	-	-	103.49	32.3	6.61	32.84	264	292	P	V
		2402	84.80	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz	*	2480	104.98	-	-	98.46	32.43	6.73	32.64	299	17	P	H
		2480	80.22	-	-	-	-	-	-	-	-	A	H
		2484.4	54.86	-19.14	74	48.34	32.43	6.73	32.64	299	17	P	H
		2484.4	30.10	-23.90	54	-	-	-	-	-	-	A	H
	*	2480	109.95	-	-	103.43	32.43	6.73	32.64	225	311	P	V
		2480	85.19	-	-	-	-	-	-	-	-	A	V
		2483.86	56.02	-17.98	74	49.5	32.43	6.73	32.64	225	311	P	V
		2483.86	31.26	-22.74	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—ANT 18 (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		4800	39.95	-34.05	74	58.02	34.3	9.45	61.82	300	0	P	H
		4800	39.61	-34.39	74	57.68	34.3	9.45	61.82	100	0	P	V
BT CH 39 2441MHz		4875	39.47	-34.53	74	57.58	34.14	9.52	61.77	300	0	P	H
		7320	41.57	-32.43	74	56.24	35.7	11.69	62.06	300	0	P	H
		4875	39	-35	74	57.11	34.14	9.52	61.77	100	0	P	V
		7320	41.91	-32.09	74	56.58	35.7	11.69	62.06	100	0	P	V
BT CH 78 2480MHz		4965	39.88	-34.12	74	57.88	34.1	9.61	61.71	300	0	P	H
		7440	41.8	-32.2	74	56.39	35.7	11.78	62.07	300	0	P	H
		4965	39.59	-34.41	74	57.59	34.1	9.61	61.71	100	0	P	V
		7440	40.84	-33.16	74	55.43	35.7	11.78	62.07	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BT - BF 15+18 (Band Edge @ 3m)

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 CH00 2402MHz		2387.22	53.53	-20.47	74	47.5	32.3	6.61	32.88	100	89	P	H
	*	2387.22	28.77	-25.23	54	-	-	-	-	-	-	A	H
		2402	107.66	-	-	101.59	32.3	6.61	32.84	100	89	P	H
		2402	82.90	-	-	-	-	-	-	-	-	A	H
		2372.01	53.10	-20.90	74	47.17	32.23	6.58	32.88	336	124	P	V
	*	2372.01	28.34	-25.66	54	-	-	-	-	-	-	A	V
		2402	104.83	-	-	98.76	32.3	6.61	32.84	336	124	P	V
		2402	80.07	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz	*	2480	107.33	-	-	100.81	32.43	6.73	32.64	127	274	P	H
		2480	82.57	-	-	-	-	-	-	-	-	A	H
		2483.5	61.54	-12.46	74	55.02	32.43	6.73	32.64	127	274	P	H
		2483.5	36.78	-17.22	54	-	-	-	-	-	-	A	H
	*	2480	104.94	-	-	98.42	32.43	6.73	32.64	290	106	P	V
		2480	80.18	-	-	-	-	-	-	-	-	A	V
		2483.56	63.46	-10.54	74	56.94	32.43	6.73	32.64	290	106	P	V
		2483.56	38.70	-15.30	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 - BF 15+18 (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		4800	41.26	-32.74	74	59.33	34.3	9.45	61.82	300	0	P	H
		4800	39.37	-34.63	74	57.44	34.3	9.45	61.82	100	0	P	V
BT CH 39 2441MHz		4875	39.74	-34.26	74	57.85	34.14	9.52	61.77	300	0	P	H
		7320	42.12	-31.88	74	56.79	35.7	11.69	62.06	300	0	P	H
		4875	39.31	-34.69	74	57.42	34.14	9.52	61.77	100	0	P	V
		7320	44.28	-29.72	74	58.95	35.7	11.69	62.06	100	0	P	V
BT CH 78 2480MHz		4965	40.13	-33.87	74	58.13	34.1	9.61	61.71	300	0	P	H
		7440	41.58	-32.42	74	56.17	35.7	11.78	62.07	300	0	P	H
		4965	39.68	-34.32	74	57.68	34.1	9.61	61.71	100	0	P	V
		7440	43.01	-30.99	74	57.6	35.7	11.78	62.07	100	0	P	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	21.62	-18.38	40	27.96	25.1	0.76	32.2	-	-	P	H
		167.74	29.68	-13.82	43.5	44.04	15.86	1.88	32.1	-	-	P	H
		324.88	21.13	-24.87	46	30.89	19.74	2.65	32.15	-	-	P	H
		500.45	23.18	-22.82	46	28.44	24	3.14	32.4	-	-	P	H
		665.35	26.84	-19.16	46	28.68	26.56	3.8	32.2	-	-	P	H
		775.93	29.6	-16.4	46	29.55	28.2	4.15	32.3	-	-	P	H
		30	21.93	-18.07	40	28.27	25.1	0.76	32.2	-	-	P	V
		93.05	19.87	-23.63	43.5	35.56	15.19	1.36	32.24	-	-	P	V
		153.19	28.29	-15.21	43.5	41.66	16.92	1.81	32.1	-	-	P	V
		214.3	20.7	-22.8	43.5	35.5	15.24	2.09	32.13	-	-	P	V
		326.82	20.94	-25.06	46	30.63	19.8	2.66	32.15	-	-	P	V
		471.35	22.75	-23.25	46	28.41	23.48	3.14	32.28	-	-	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 **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)

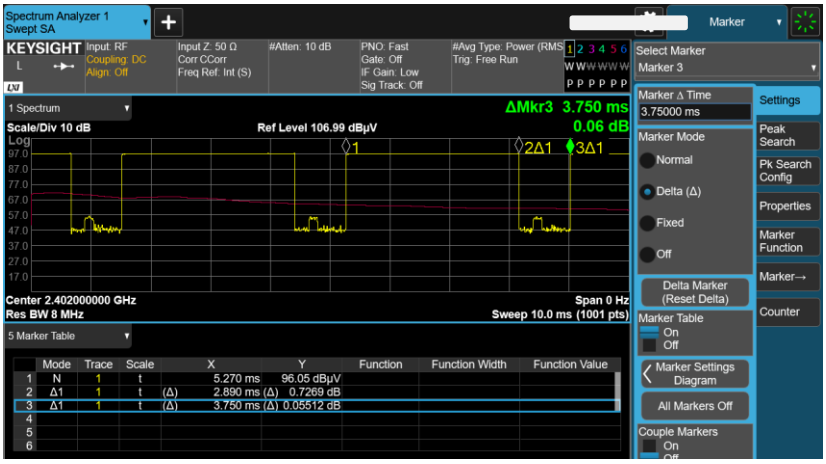
= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

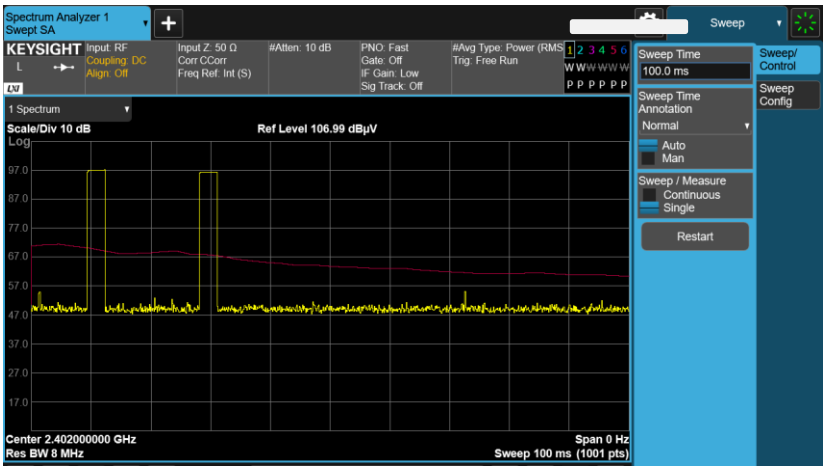
Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Duty Cycle Plots

DH5 on time (One Pulse) Plot on Channel 00



DH5 on time (Count Pulses) Plot on Channel 00



Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.78 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 dB
3. DH5 has the highest duty cycle worst case and is reported.