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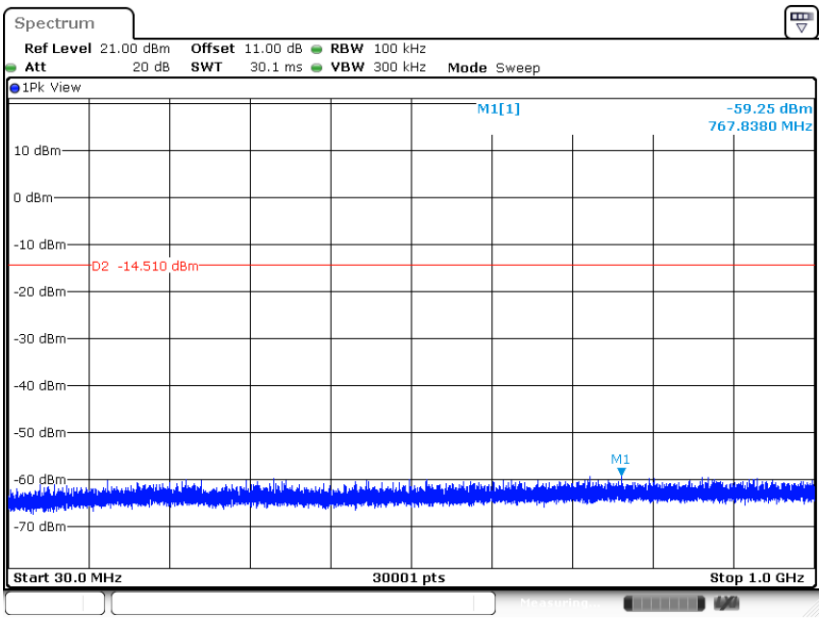

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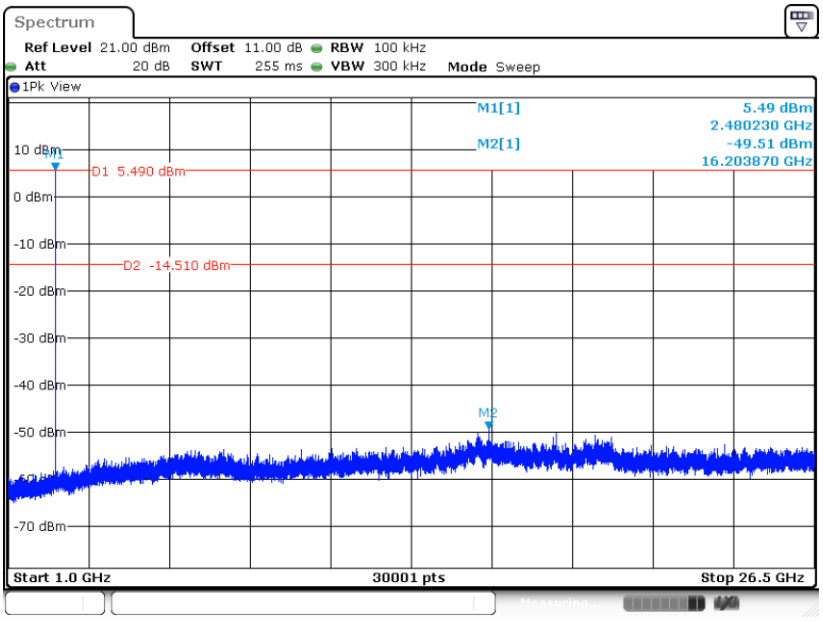

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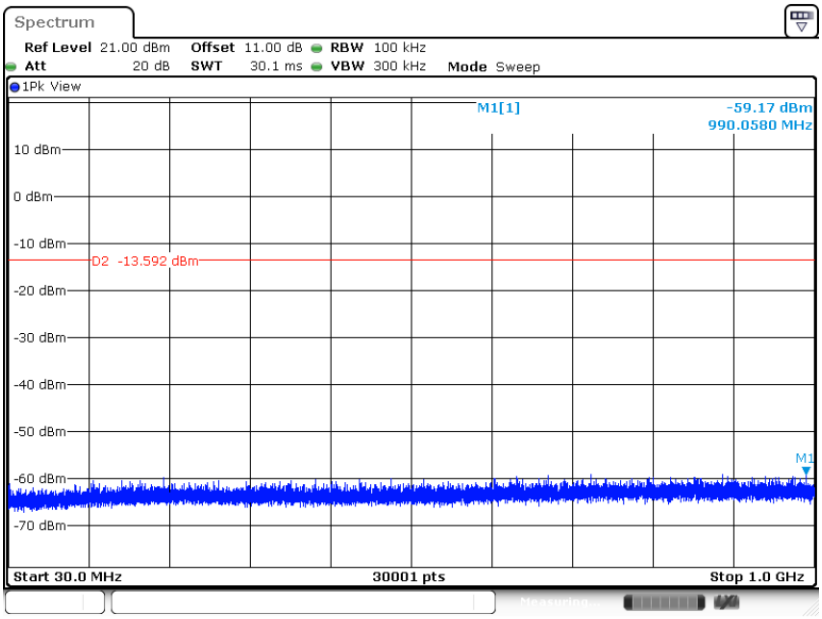

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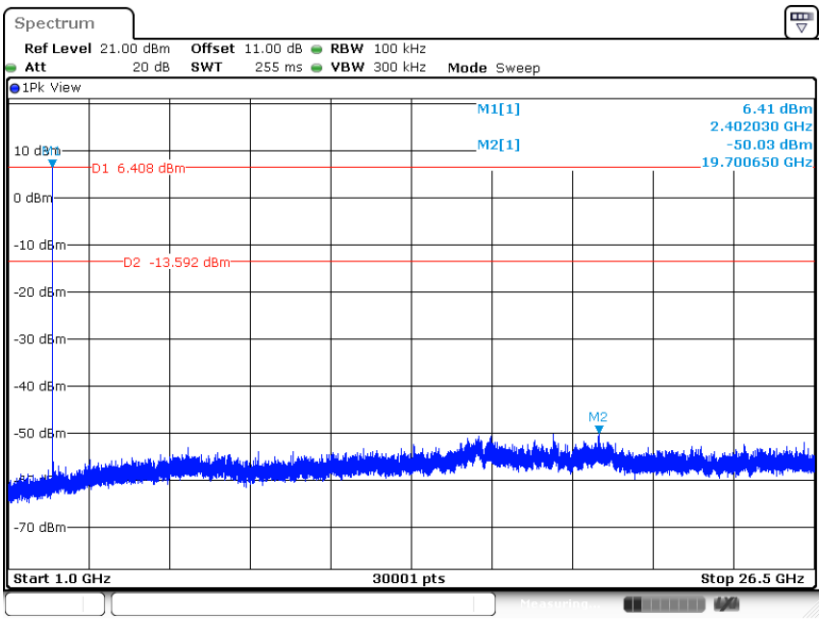

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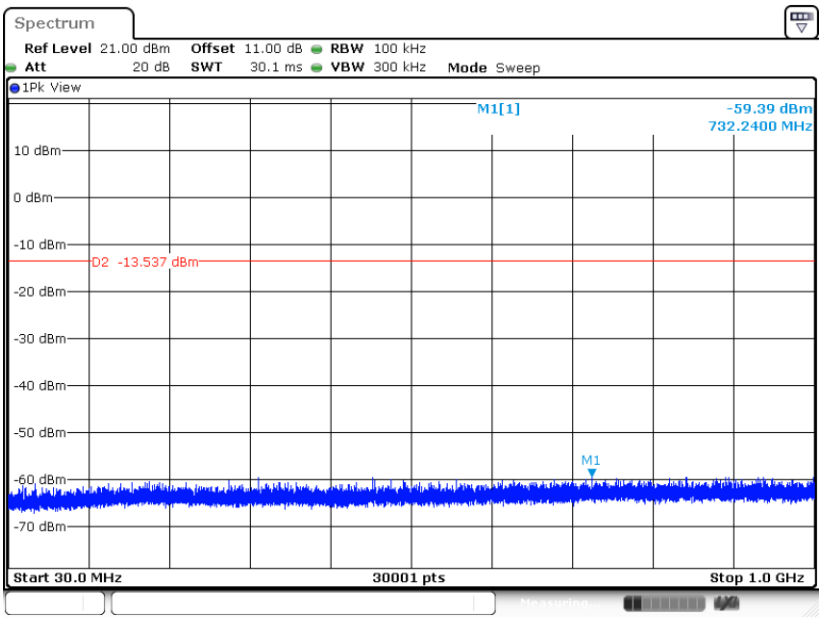

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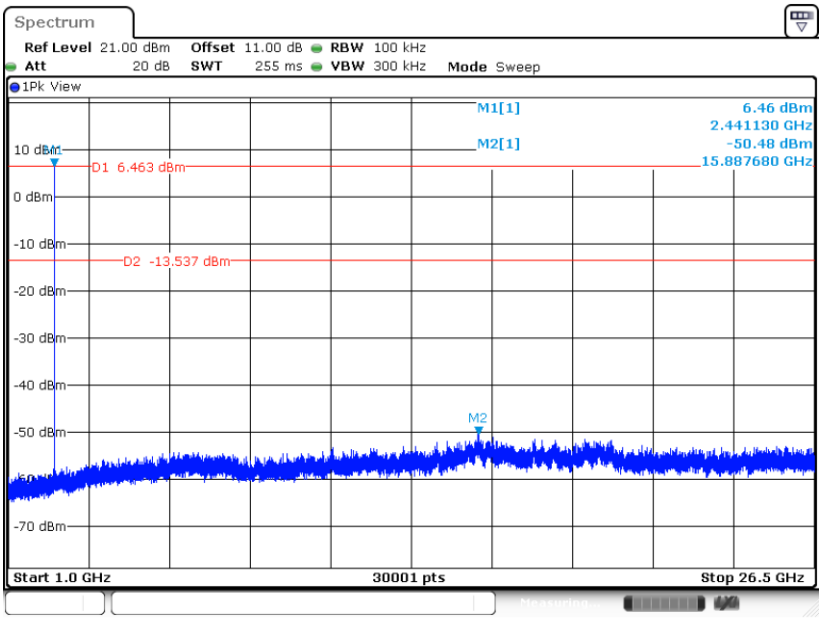

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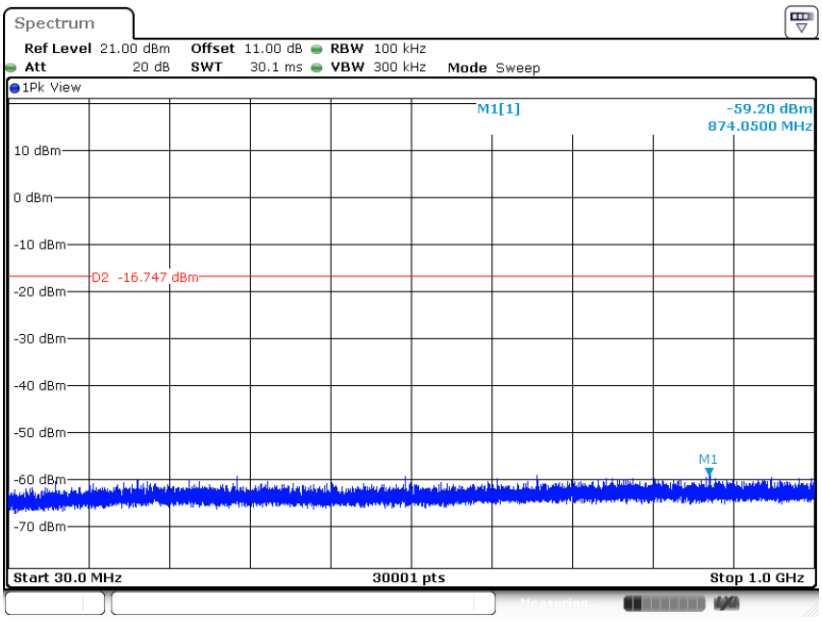

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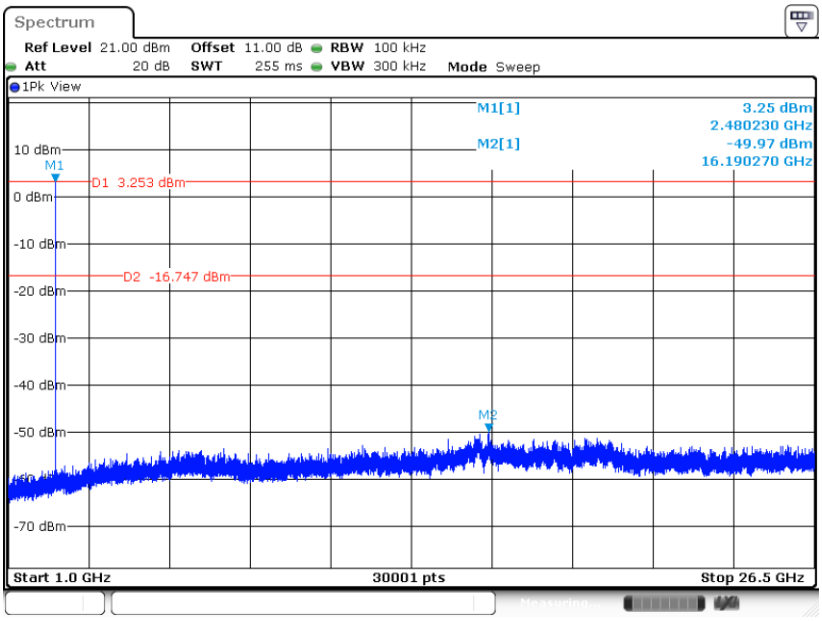

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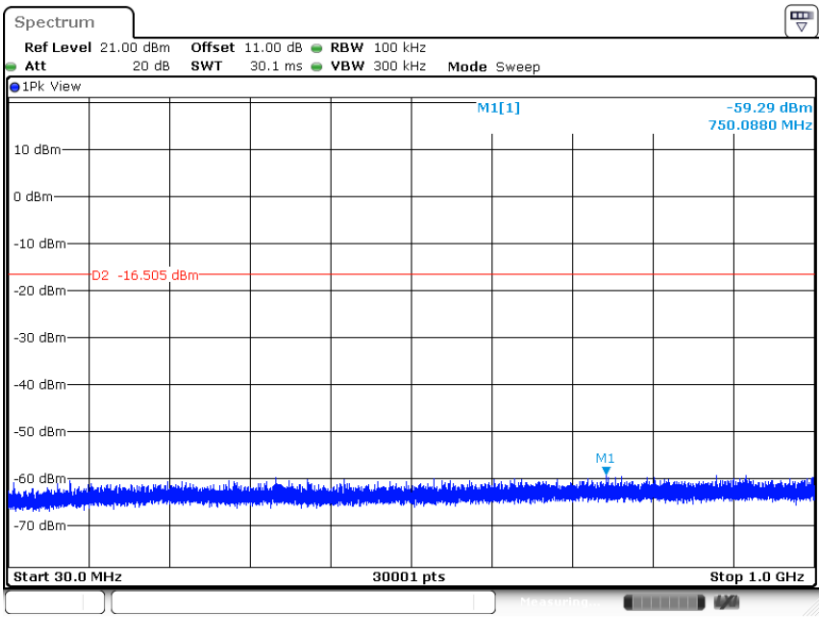

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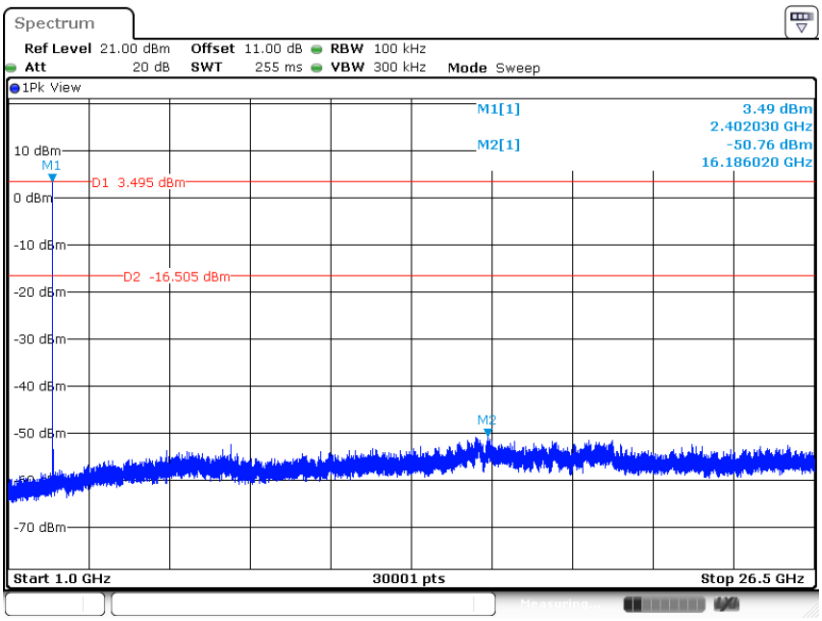

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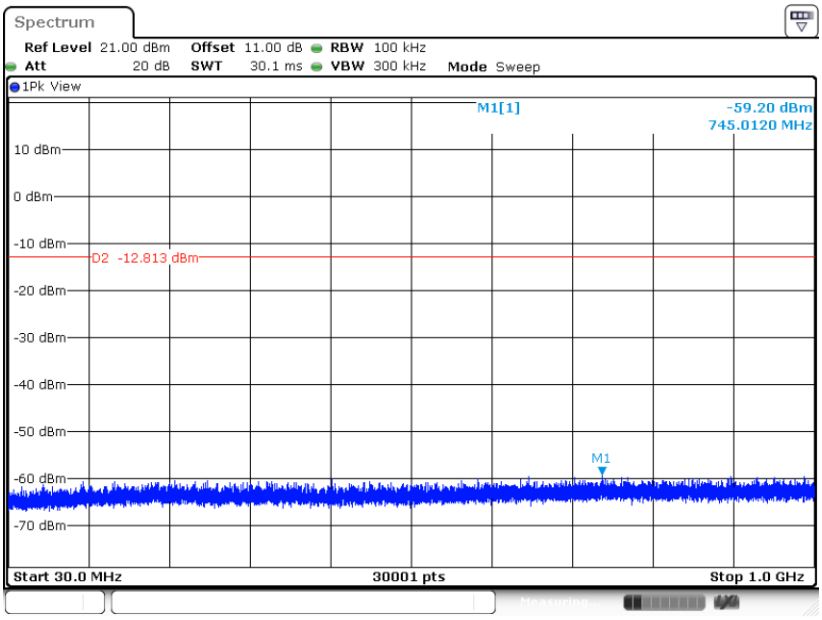

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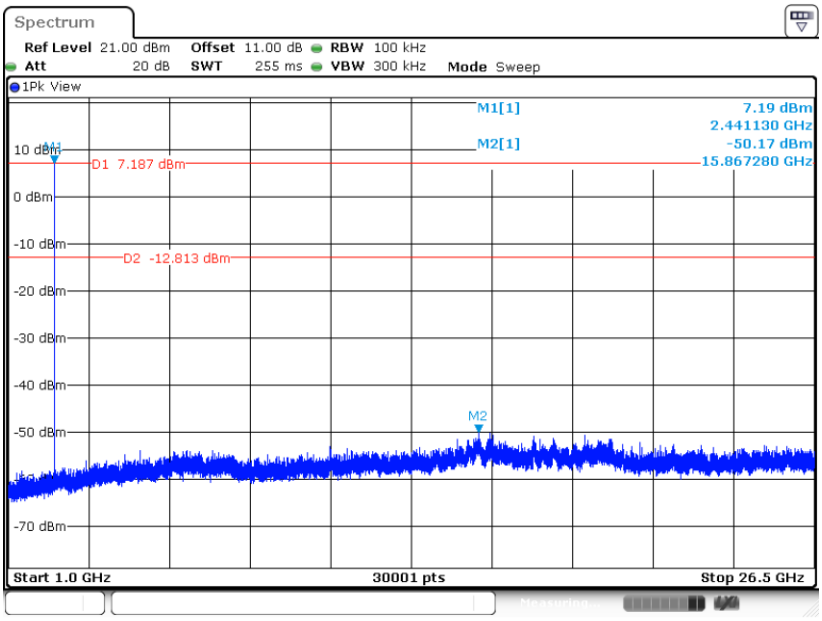

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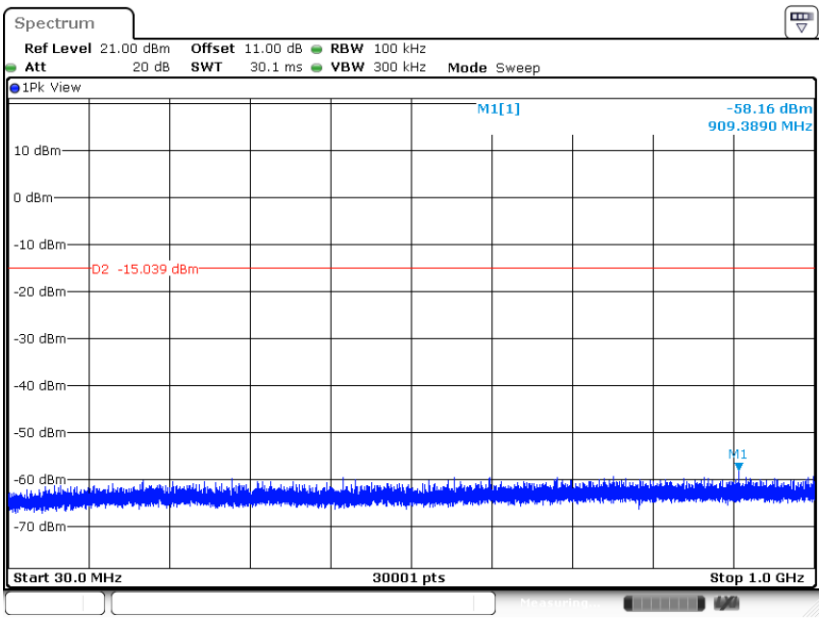

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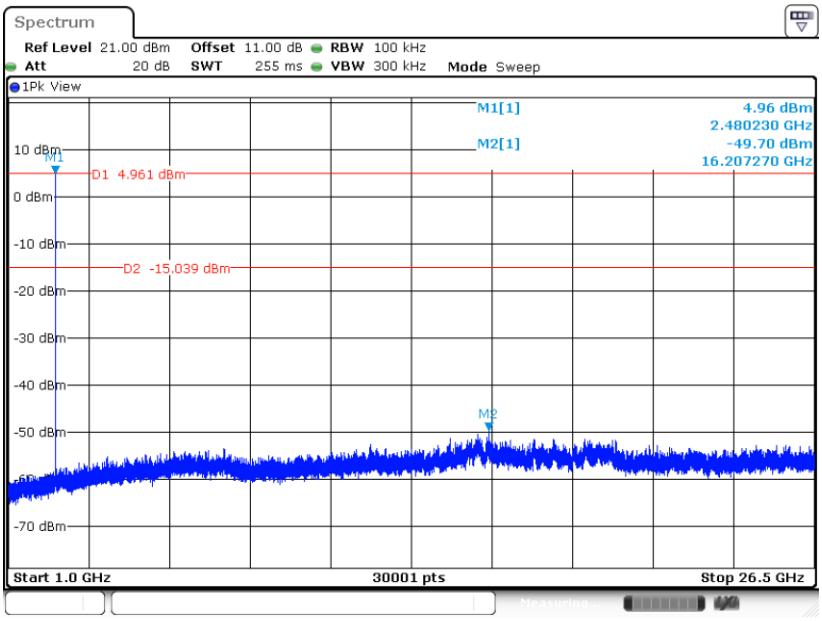

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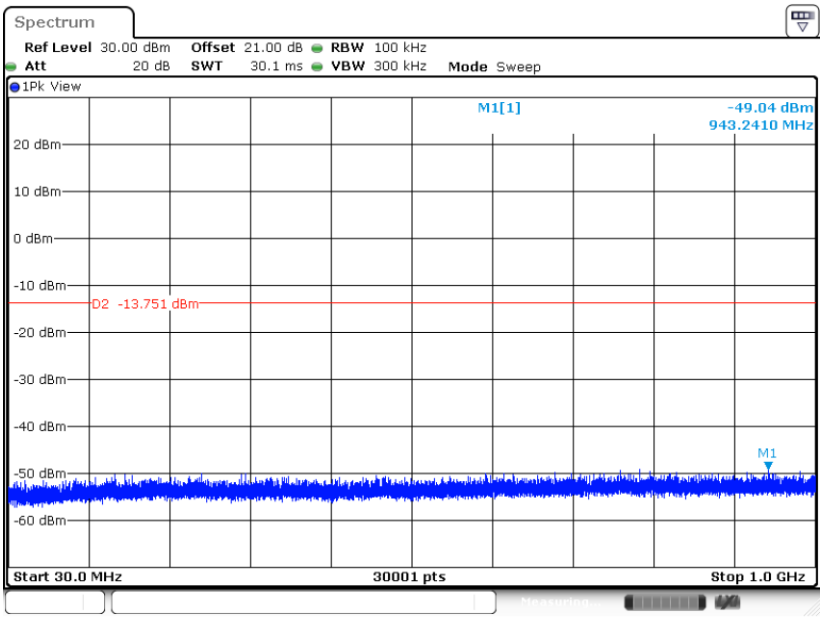

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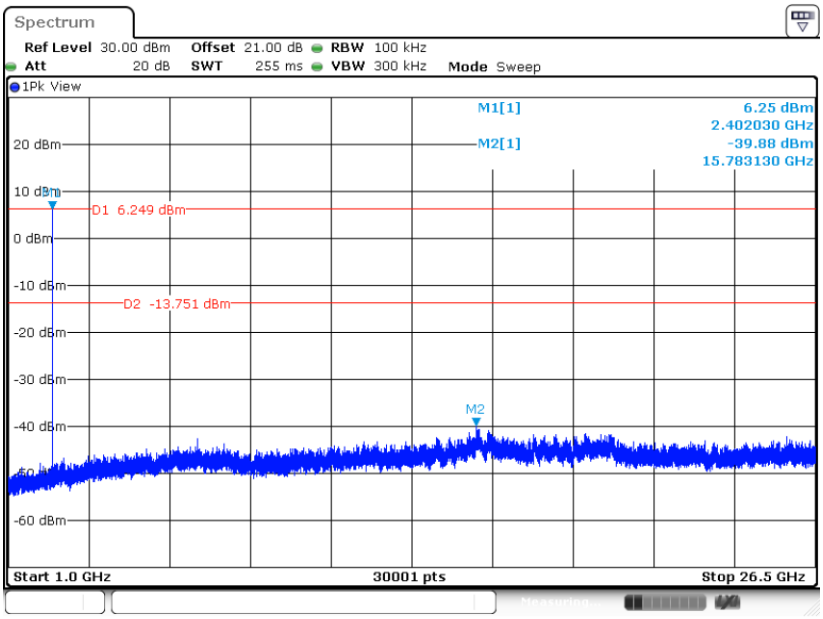

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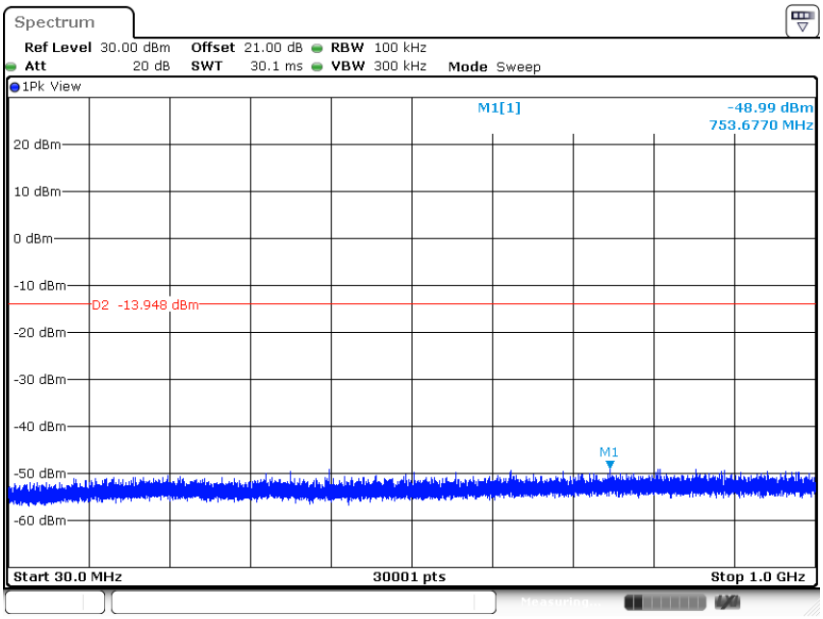

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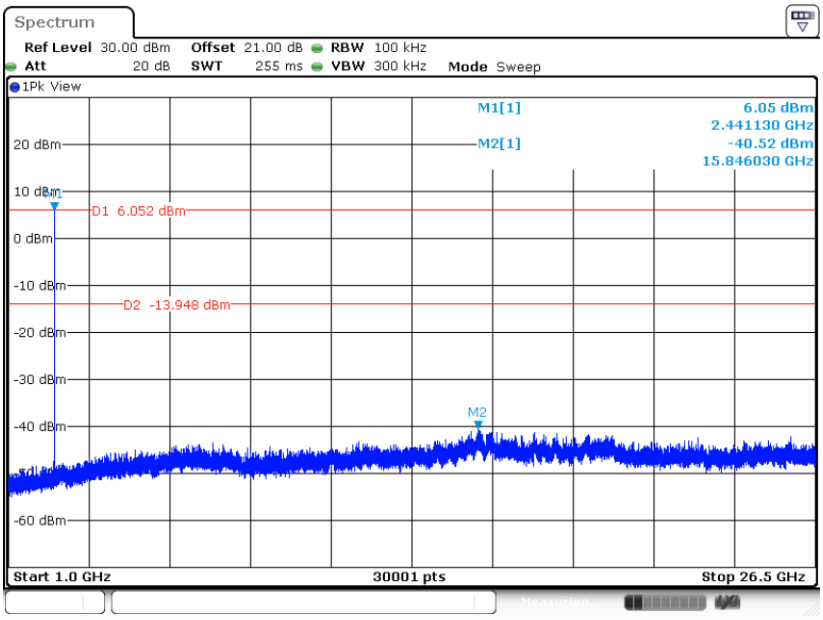

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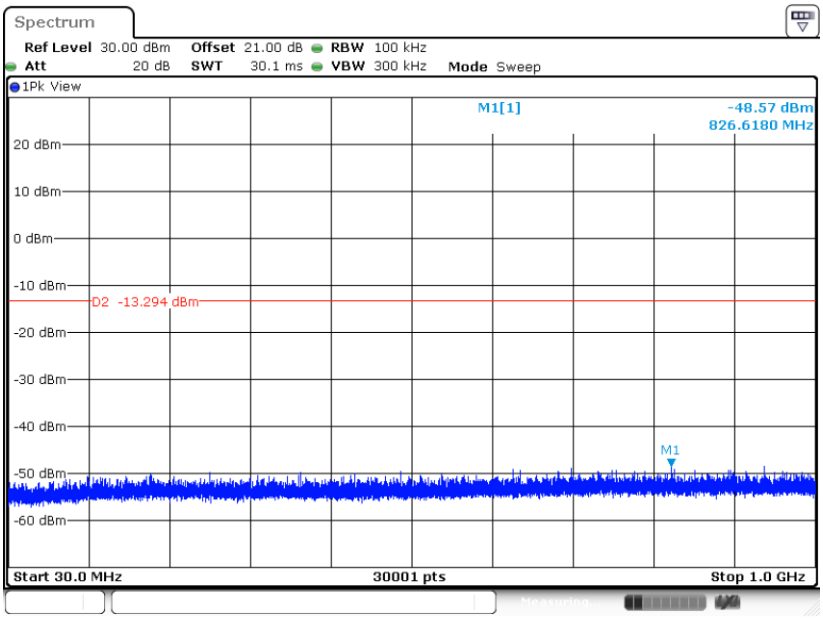

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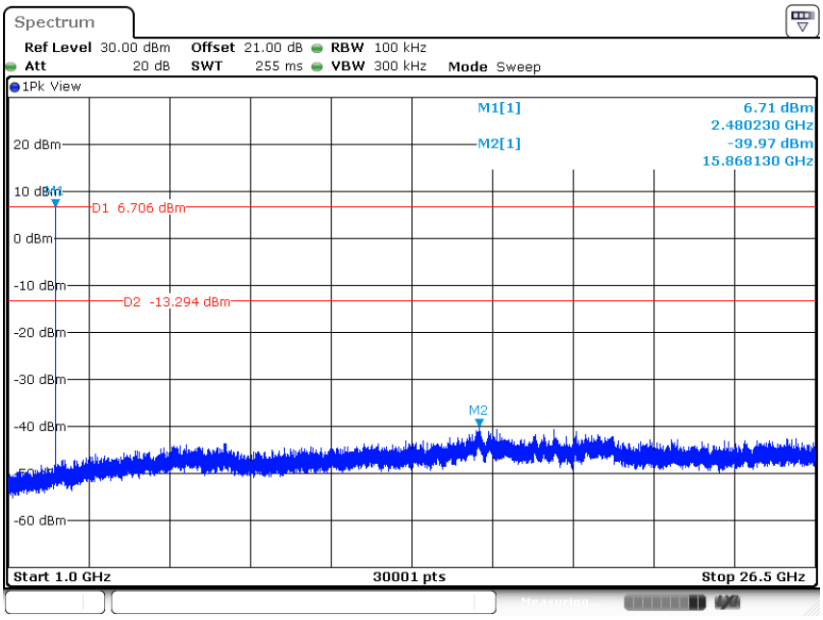

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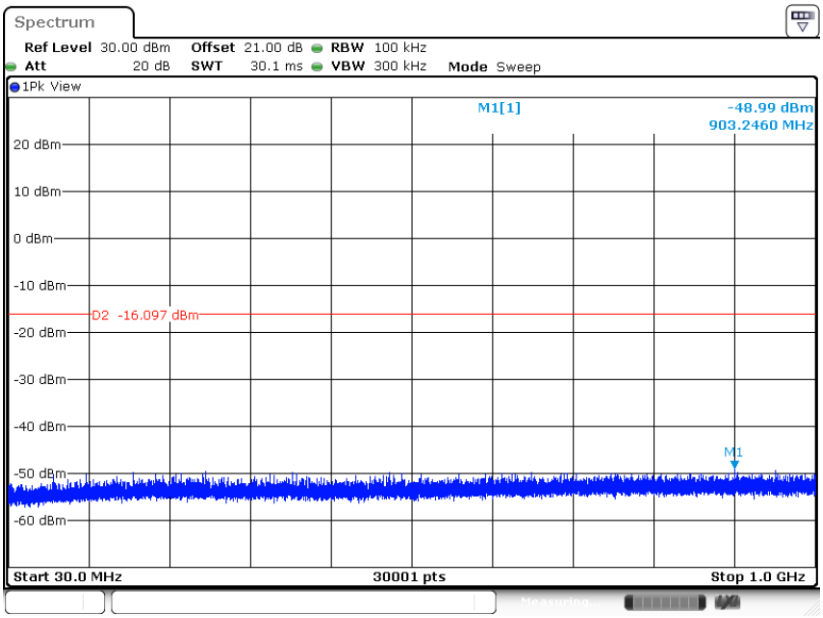

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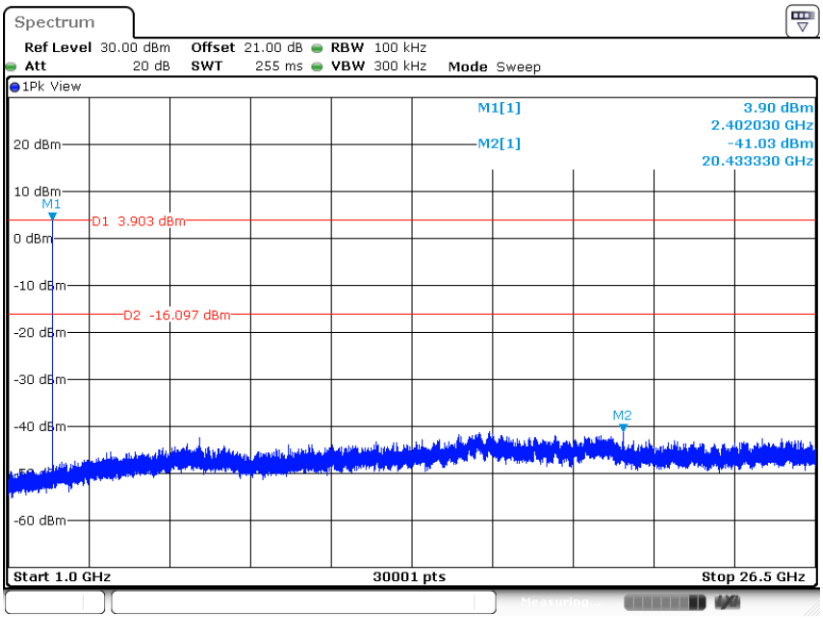

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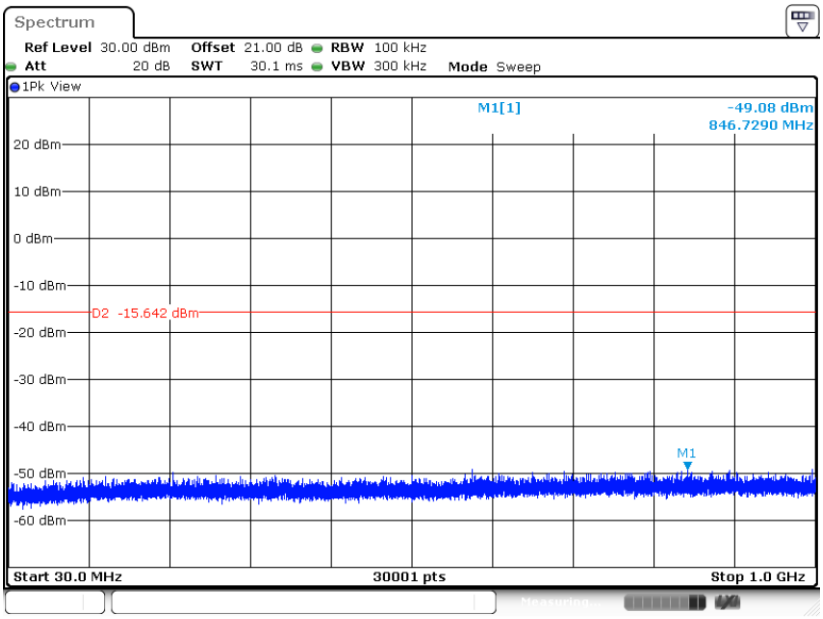

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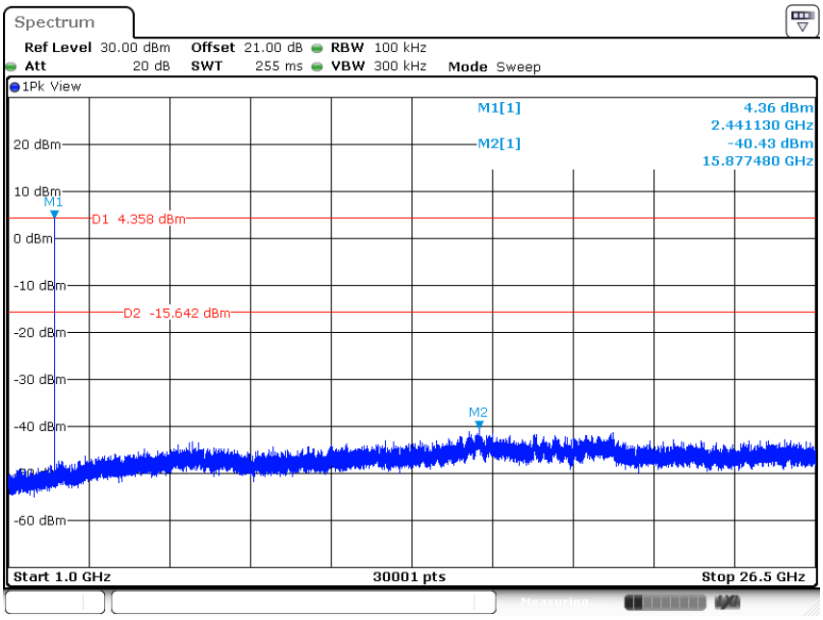

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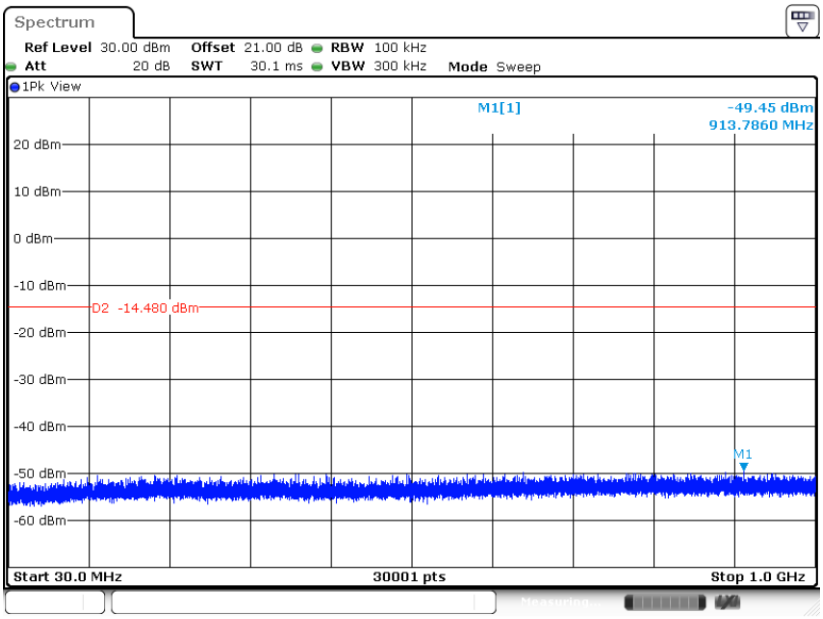

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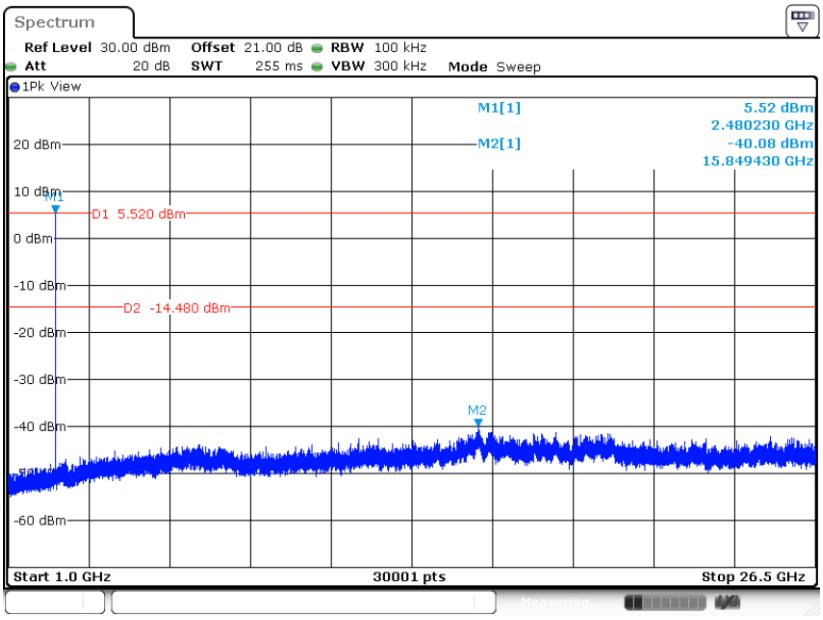

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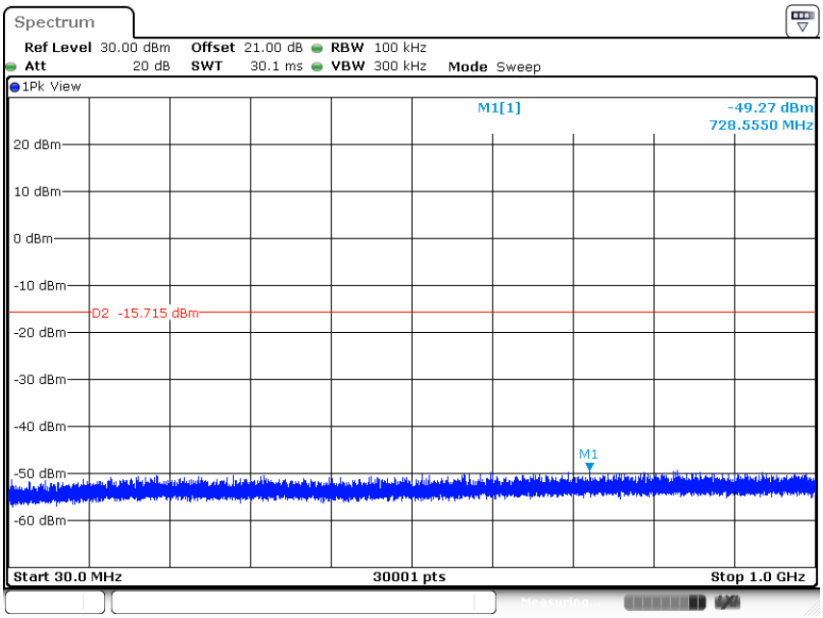

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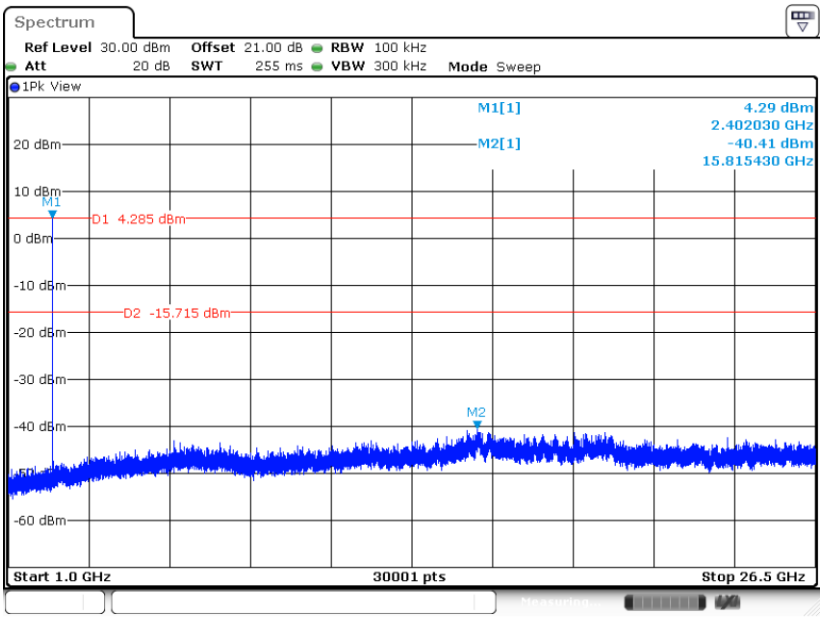

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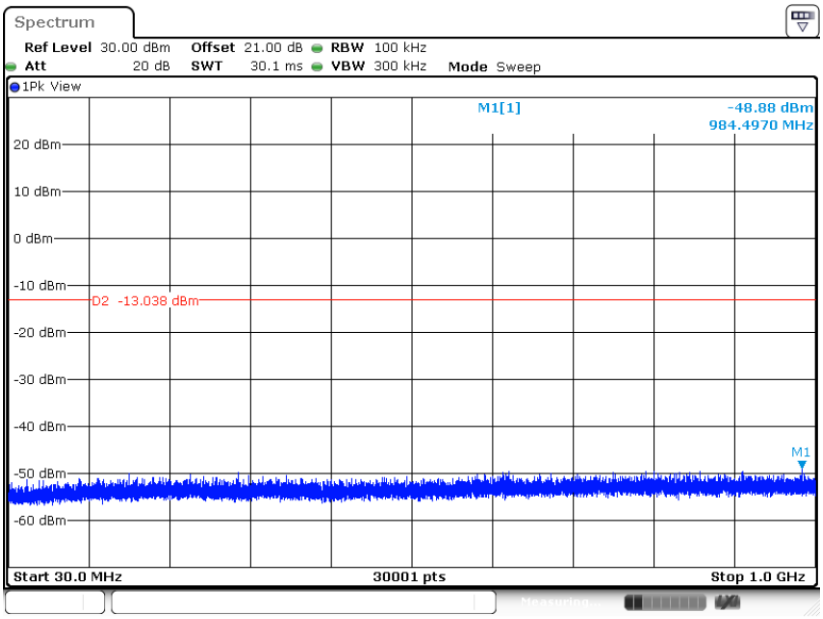

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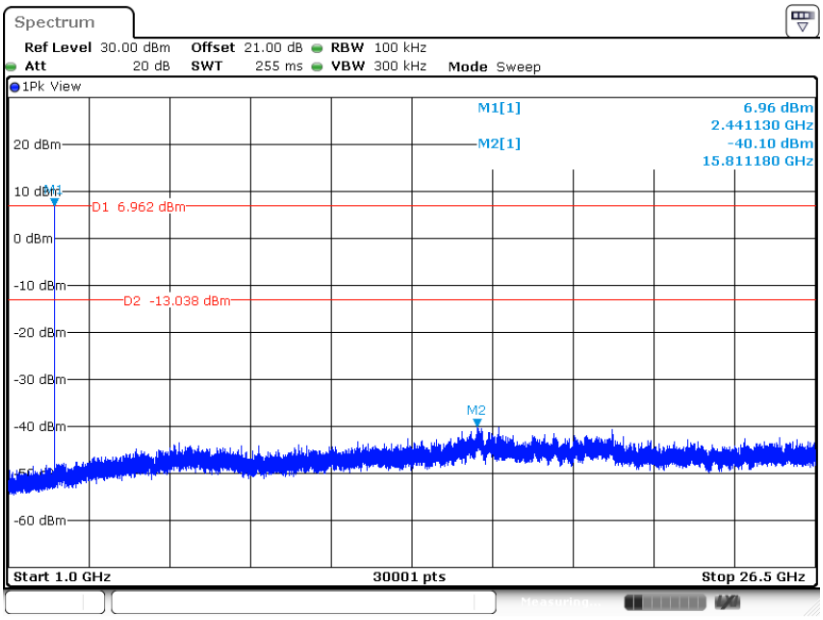

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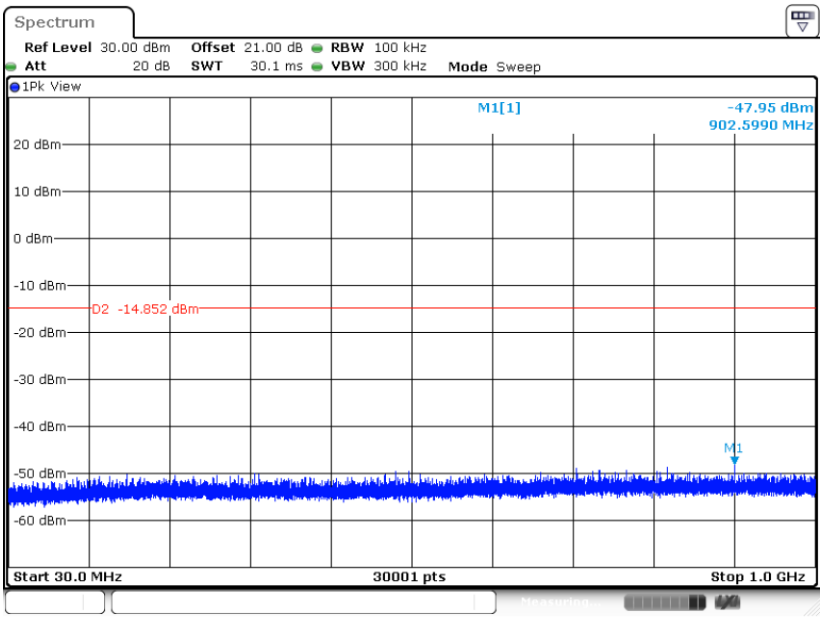

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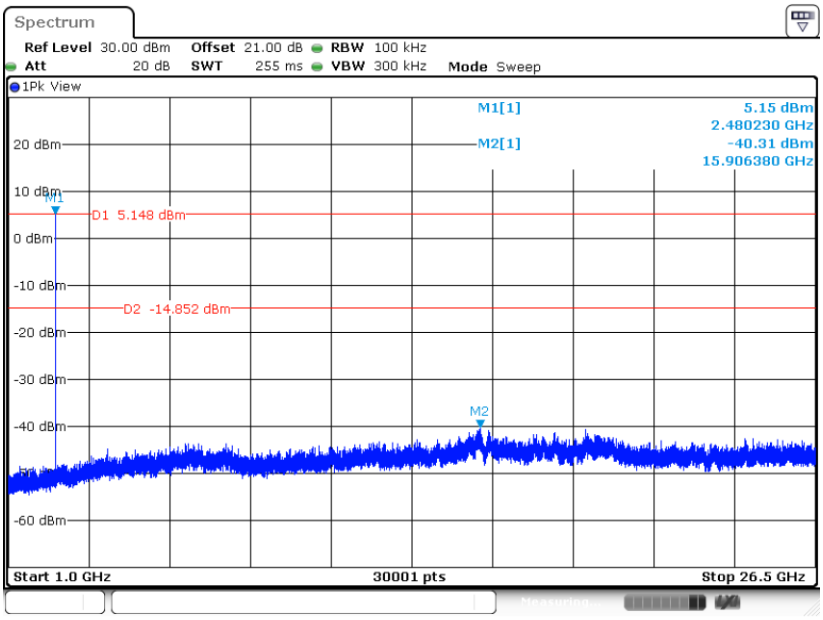

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3.8 Radiated Band Edges and Spurious Emission Measurement

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.

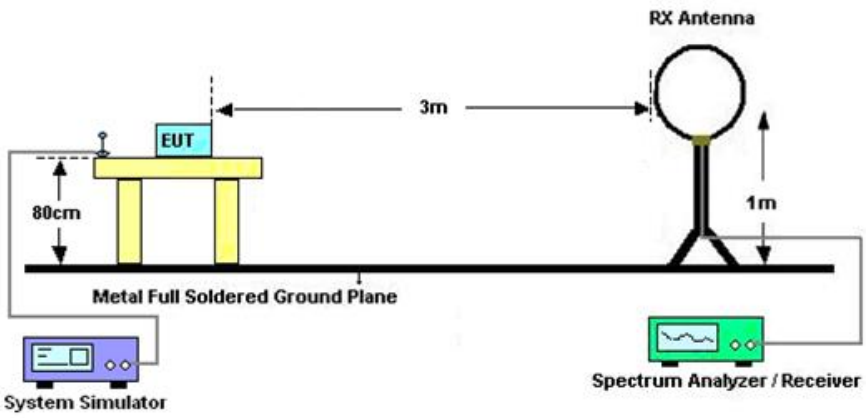
3.8.3 Test Procedures

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.

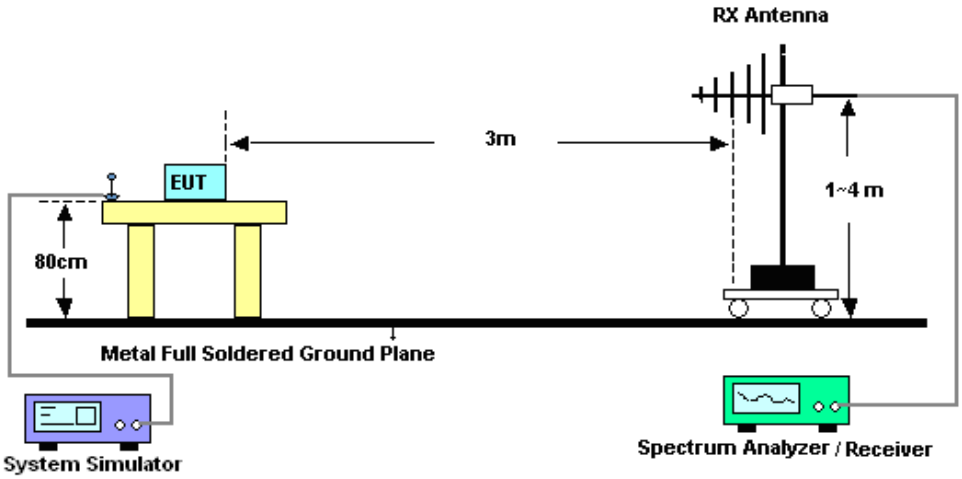
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent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

3.8.4 Test Setup

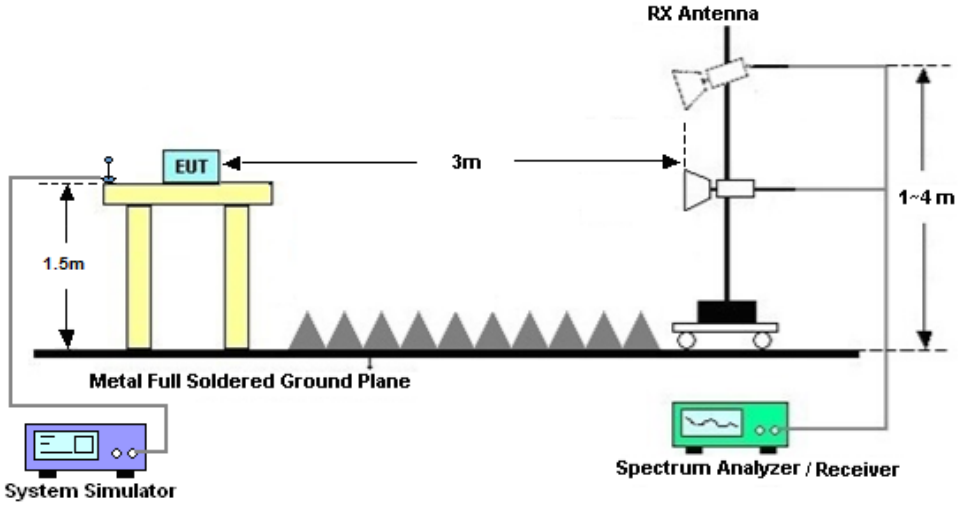
For radiated emissions below 30MHz



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.

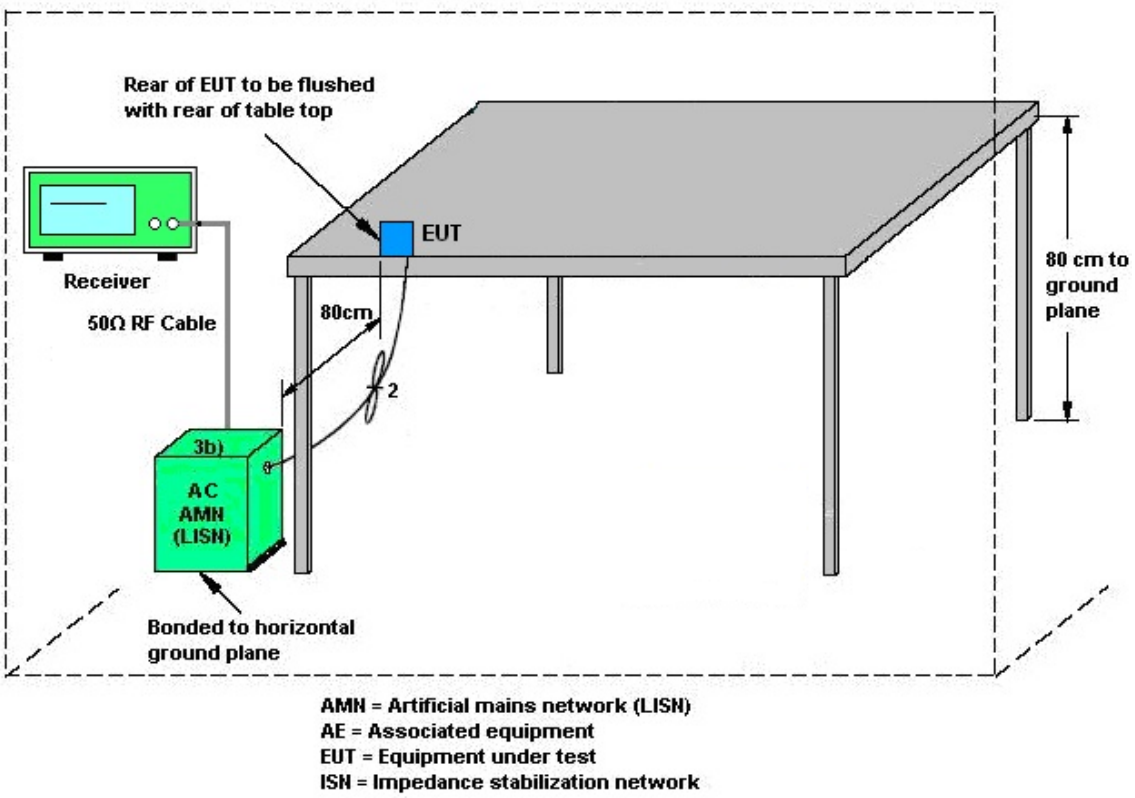
3.9.2 Measuring Instruments

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	FSV40	101078	10Hz~40GHz	Apr. 06, 2023	Jan. 16, 2024~ Mar. 08, 2024	Apr. 05, 2024	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 29, 2023	Jan. 16, 2024~ Mar. 08, 2024	Dec. 28, 2024	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Aug. 21, 2023	Jan. 16, 2024~ Mar. 08, 2024	Aug. 20, 2024	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 18, 2023	Jan. 18, 2024~ Mar. 08, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 07, 2023	Jan. 18, 2024~ Mar. 08, 2024	Jul. 06, 2024	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 28, 2022	Jan. 18, 2024~ Mar. 08, 2024	Jun. 27, 2024	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	May. 14, 2023	Jan. 18, 2024~ Mar. 08, 2024	May. 13, 2024	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1474	1GHz~18GHz	Jul. 07, 2023	Jan. 18, 2024~ Mar. 08, 2024	Jul. 06, 2024	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Jul. 08, 2023	Jan. 18, 2024~ Mar. 08, 2024	Jul. 07, 2024	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 18, 2023	Jan. 18, 2024~ Mar. 08, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 18, 2023	Jan. 18, 2024~ Mar. 08, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 07, 2023	Jan. 18, 2024~ Mar. 08, 2024	Jul. 06, 2024	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY57280136	500MHz~26.5GHz	Aug. 21, 2023	Jan. 18, 2024~ Mar. 08, 2024	Aug. 20, 2024	Radiation (03CH04-SZ)
AC Power Source	APC	AFV-S-600B	F119050019	N/A	Oct. 18, 2023	Jan. 18, 2024~ Mar. 08, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jan. 18, 2024~ Mar. 08, 2024	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jan. 18, 2024~ Mar. 08, 2024	NCR	Radiation (03CH04-SZ)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 16, 2023	Jan. 09, 2024	May 15, 2024	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 11, 2023	Jan. 09, 2024	Oct. 10, 2024	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 16, 2023	Jan. 09, 2024	May 15, 2024	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 11, 2023	Jan. 09, 2024	Oct. 10, 2024	Conduction (CO01-KS)

NCR: No Calibration Required

5 Measurement Uncertainty

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 Spurious Emission & Bandedge	±1.34 dB
Occupied Channel Bandwidth	±0.012 MHz
Conducted Power	±1.34 dB
Conducted Power Spectral Density	±1.32 dB
Frequency	±1.3 Hz

Uncertainty of AC Conducted Emission Measurement (0.15 MHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.94dB

Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.50dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.10dB

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.80dB

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.10dB

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

Appendix A. Conducted Test Results

Report Number : FR3D2611A

<Ant.0>

Test Engineer:	Chen ZhiQiang	Temperature:	21~25	°C
Test Date:	2024/1/16~2024/3/8	Relative Humidity:	51~54	%

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	0.943	0.859	1.003	0.6289	Pass
DH	1Mbps	1	39	2441	0.943	0.865	0.999	0.6289	Pass
DH	1Mbps	1	78	2480	0.943	0.859	0.999	0.6289	Pass
2DH	2Mbps	1	0	2402	1.317	1.163	0.999	0.8780	Pass
2DH	2Mbps	1	39	2441	1.274	1.163	0.994	0.8493	Pass
2DH	2Mbps	1	78	2480	1.278	1.163	0.999	0.8520	Pass
3DH	3Mbps	1	0	2402	1.304	1.169	0.994	0.8693	Pass
3DH	3Mbps	1	39	2441	1.300	1.167	1.003	0.8667	Pass
3DH	3Mbps	1	78	2480	1.270	1.155	0.999	0.8464	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 Level	Power Limit (dBm)	Test Result
DH5	0	1	7.70	Default	20.97	Pass
	39	1	8.20	Default	20.97	Pass
	78	1	**8.30**	Default	20.97	Pass
2DH5	0	1	10.30	Default	20.97	Pass
	39	1	10.70	Default	20.97	Pass
	78	1	**10.80**	Default	20.97	Pass
3DH5	0	1	10.80	Default	20.97	Pass
	39	1	11.30	Default	20.97	Pass
	78	1	**11.40**	Default	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH5	0	1	6.60	1.13
	39	1	6.80	1.13
	78	1	**6.90**	1.13
2DH5	0	1	6.90	1.13
	39	1	**7.50**	1.13
	78	1	7.40	1.13
3DH5	0	1	6.90	1.13
	39	1	**7.50**	1.13
	78	1	7.40	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

Report Number : FR3D2611A

<Ant.2>

Test Engineer:	Chen ZhiQiang	Temperature:	21~25	°C
Test Date:	2024/1/16~2024/3/8	Relative Humidity:	51~54	%

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	0.948	0.857	0.999	0.6319	Pass
DH	1Mbps	1	39	2441	0.948	0.865	1.007	0.6319	Pass
DH	1Mbps	1	78	2480	0.948	0.863	0.999	0.6319	Pass
2DH	2Mbps	1	0	2402	1.278	1.169	1.003	0.8521	Pass
2DH	2Mbps	1	39	2441	1.287	1.165	1.007	0.8580	Pass
2DH	2Mbps	1	78	2480	1.287	1.173	1.003	0.8580	Pass
3DH	3Mbps	1	0	2402	1.313	1.175	0.994	0.8753	Pass
3DH	3Mbps	1	39	2441	1.309	1.175	1.003	0.8725	Pass
3DH	3Mbps	1	78	2480	1.278	1.169	0.990	0.8520	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 Level	Power Limit (dBm)	Test Result
DH5	0	1	8.30	Default	20.97	Pass
	39	1	**8.50**	Default	20.97	Pass
	78	1	**8.50**	Default	20.97	Pass
2DH5	0	1	10.50	Default	20.97	Pass
	39	1	**10.80**	Default	20.97	Pass
	78	1	**10.80**	Default	20.97	Pass
3DH5	0	1	11.00	Default	20.97	Pass
	39	1	**11.20**	Default	20.97	Pass
	78	1	**11.20**	Default	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

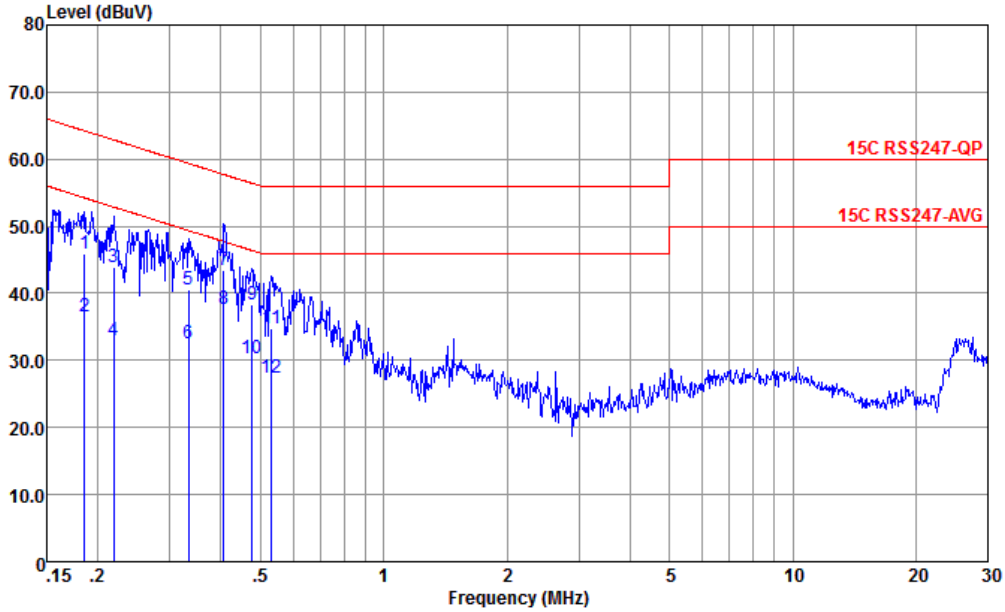
DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH5	0	1	**7.80**	1.14
	39	1	**7.80**	1.14
	78	1	7.70	1.14
2DH5	0	1	**8.30**	1.13
	39	1	**8.30**	1.13
	78	1	8.10	1.13
3DH5	0	1	**8.30**	1.11
	39	1	**8.30**	1.11
	78	1	8.00	1.11

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

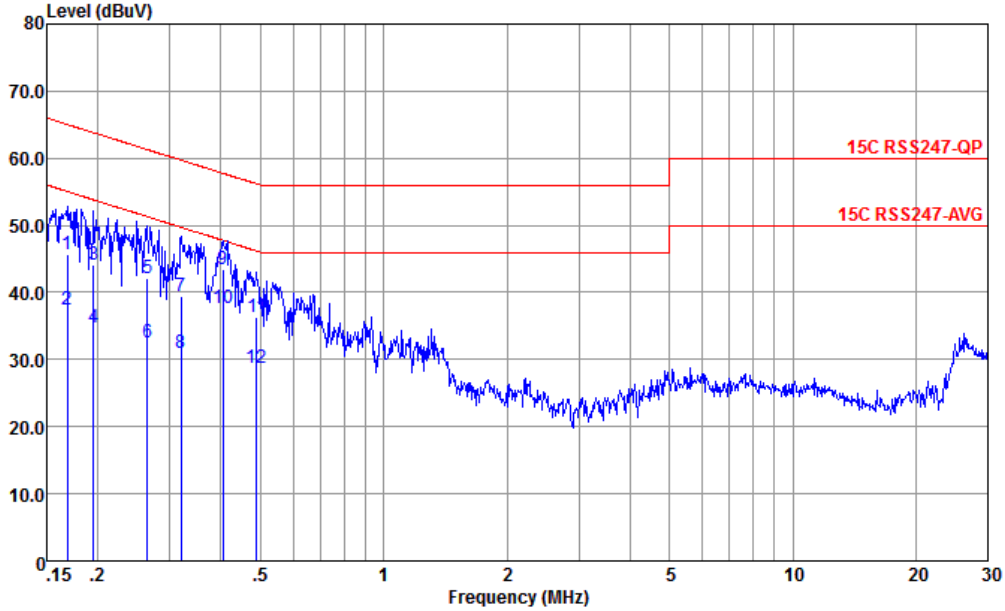
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15C RSS247-QP LISN-060105-L 2023 LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.185	45.95	-18.29	64.24	35.50	0.04	10.41	QP
2		0.185	36.65	-17.59	54.24	26.20	0.04	10.41	Average
3		0.219	43.93	-18.95	62.88	33.51	0.03	10.39	QP
4		0.219	33.03	-19.85	52.88	22.61	0.03	10.39	Average
5		0.334	40.54	-18.81	59.35	30.20	0.03	10.31	QP
6		0.334	32.64	-16.71	49.35	22.30	0.03	10.31	Average
7		0.406	43.47	-14.26	57.73	33.19	0.00	10.28	QP
8	*	0.406	37.57	-10.16	47.73	27.29	0.00	10.28	Average
9		0.476	38.41	-18.00	56.41	28.20	-0.02	10.23	QP
10		0.476	30.41	-16.00	46.41	20.20	-0.02	10.23	Average
11		0.532	34.67	-21.33	56.00	24.50	-0.04	10.21	QP
12		0.532	27.47	-18.53	46.00	17.30	-0.04	10.21	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-N 2023 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.169	45.66	-19.37	65.03	35.20	0.04	10.42	QP
2	0.169	37.36	-17.67	55.03	26.90	0.04	10.42	Average
3	0.195	44.06	-19.74	63.80	33.60	0.05	10.41	QP
4	0.195	34.66	-19.14	53.80	24.20	0.05	10.41	Average
5	0.264	42.14	-19.15	61.29	31.79	-0.01	10.36	QP
6	0.264	32.64	-18.65	51.29	22.29	-0.01	10.36	Average
7	0.320	39.48	-20.23	59.71	29.20	-0.04	10.32	QP
8	0.320	30.88	-18.83	49.71	20.60	-0.04	10.32	Average
9	0.404	43.42	-14.35	57.77	33.20	-0.06	10.28	QP
10 *	0.404	37.72	-10.05	47.77	27.50	-0.06	10.28	Average
11	0.489	36.36	-19.83	56.19	26.20	-0.07	10.23	QP
12	0.489	28.76	-17.43	46.19	18.60	-0.07	10.23	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 Test Data

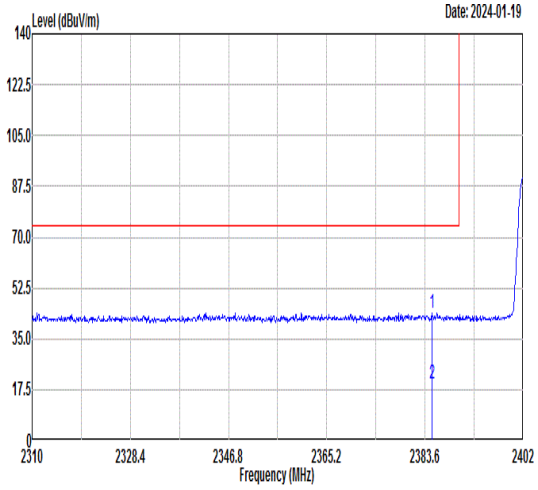
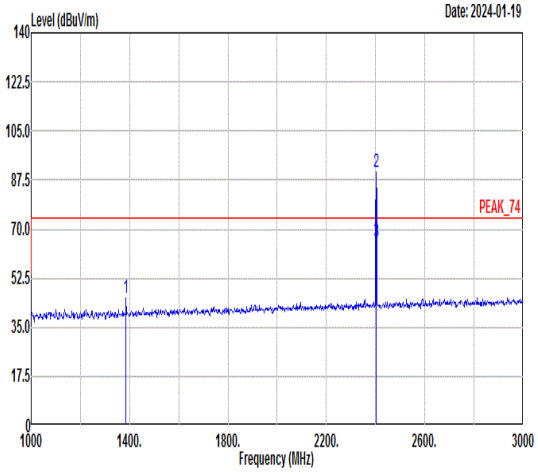
Test Engineer :	ZhangXu	Relative Humidity :	50%
		Temperature :	20-22C°

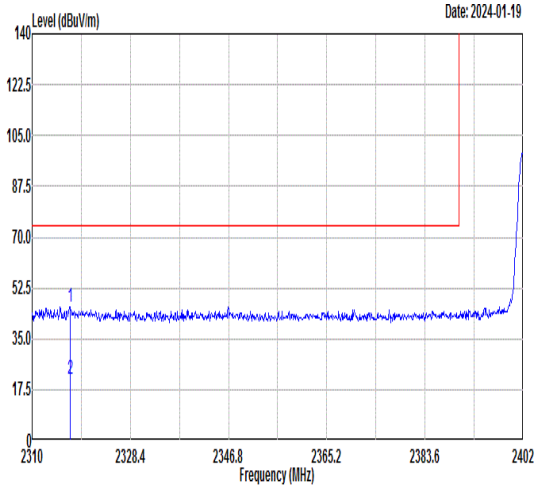
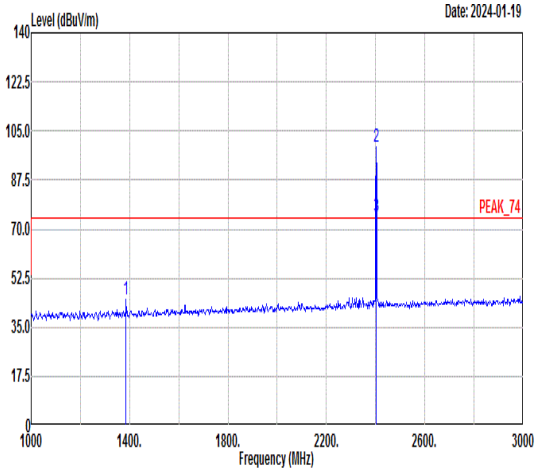
Radiated Spurious Emission Test Modes

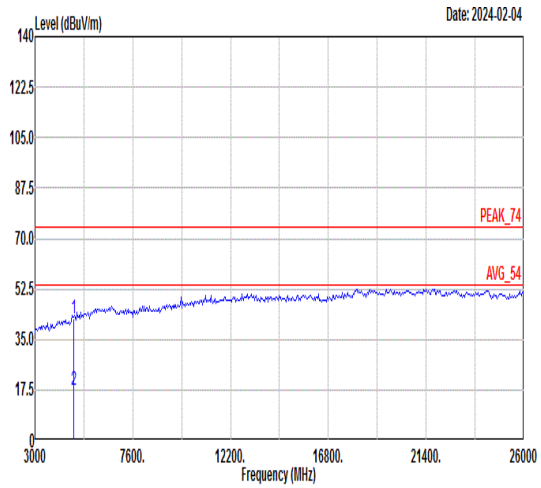
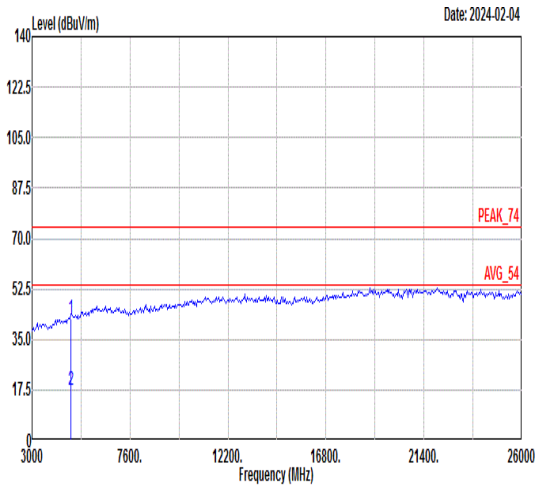
Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	Remark
Mode 1	2400-2483.5	2	Bluetooth BR_GFSK	00	2402	3DH5	-
Mode 2	2400-2483.5	2	Bluetooth BR_GFSK	39	2441	3DH5	-
Mode 3	2400-2483.5	2	Bluetooth BR_GFSK	78	2480	3DH5	-
Mode 4	2400-2483.5	2	Bluetooth BR_GFSK	78	2480	3DH5	LF
Mode 5	2400-2483.5	0	Bluetooth BR_GFSK	00	2402	3DH5	-
Mode 6	2400-2483.5	0	Bluetooth BR_GFSK	39	2441	3DH5	-
Mode 7	2400-2483.5	0	Bluetooth BR_GFSK	78	2480	3DH5	-
Mode 8	2400-2483.5	0	Bluetooth BR_GFSK	78	2480	3DH5	LF

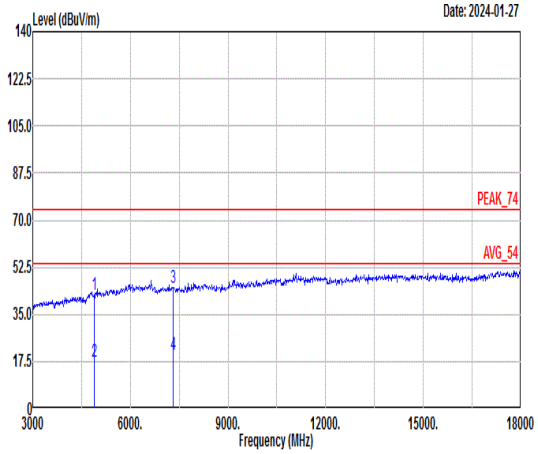
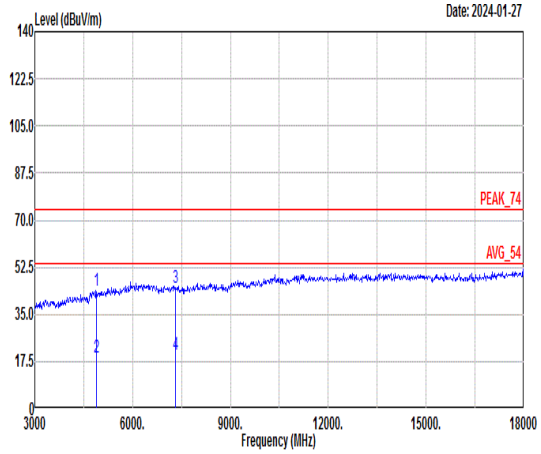
Summary of each worse mode

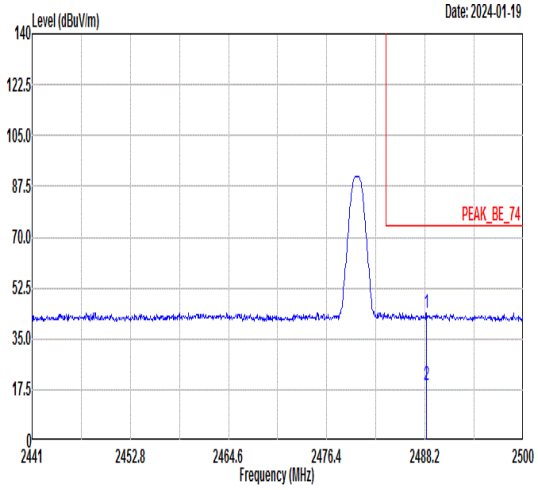
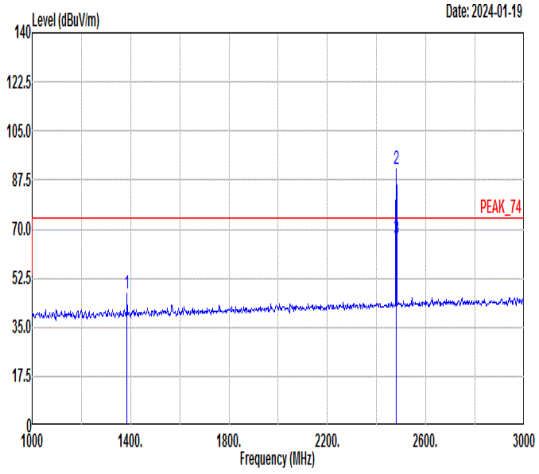
Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth BR_GFSK	00	2317.08	45.86	74.00	-28.14	V	Peak	Pass	Band Edge
	Bluetooth BR_GFSK	00	4804.00	42.19	74.00	-31.81	H	Peak	Pass	Harmonic
2	Bluetooth BR_GFSK	39	-	-	-	-	-	-	-	Band Edge
	Bluetooth BR_GFSK	39	7323.00	44.83	74.00	-29.17	H	Peak	Pass	Harmonic
3	Bluetooth BR_GFSK	78	1386.00	46.82	74.00	-27.18	H	Peak	Pass	Band Edge
	Bluetooth BR_GFSK	78	7440.00	44.14	74.00	-29.86	H	Peak	Pass	Harmonic
4	Bluetooth BR_GFSK	78	675.05	45.15	46.00	-0.85	V	Peak	Pass	LF
5	Bluetooth BR_GFSK	00	2348.27	44.62	74.00	-29.38	H	Peak	Pass	Band Edge
	Bluetooth BR_GFSK	00	4804.00	43.78	74.00	-30.22	H	Peak	Pass	Harmonic
6	Bluetooth BR_GFSK	39	-	-	-	-	-	-	-	Band Edge
	Bluetooth BR_GFSK	39	7323.00	45.05	74.00	-28.95	V	Peak	Pass	Harmonic
7	Bluetooth BR_GFSK	78	2483.95	48.83	74.00	-25.17	H	Peak	Pass	Band Edge
	Bluetooth BR_GFSK	78	7440.00	45.19	74.00	-28.81	V	Peak	Pass	Harmonic
8	Bluetooth BR_GFSK	78	675.05	45.03	46.00	-0.97	V	Peak	Pass	LF

Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	2	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 2384.89 44.09 74.00 -29.91 41.28 30.72 5.35 33.26 158 177 PEAK 2 2384.89 19.30 54.00 -34.70 16.49 30.72 5.35 33.26 158 177 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 1386.00 45.39 74.00 -28.61 46.33 29.42 4.13 34.49 158 177 PEAK 2 2402.00 90.52 ------ ------ 87.67 30.72 5.37 33.24 158 177 PEAK 3 2402.00 65.73 ------ ------ 62.88 30.72 5.37 33.24 158 177 AVERAGE

Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	2	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 2317.08 45.86 74.00 -28.14 43.18 30.74 5.30 33.36 123 269 PEAK 2 2317.08 21.07 54.00 -32.93 18.39 30.74 5.30 33.36 123 269 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 1386.00 45.12 74.00 -28.88 46.06 29.42 4.13 33.49 123 269 PEAK 2 2402.00 99.25 ------ ------ 96.40 30.72 5.37 33.24 123 269 PEAK 3 2402.00 74.46 ------ ------ 71.61 30.72 5.37 33.24 123 269 AVERAGE

Mode	1	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	2	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4804.00 42.19 74.00 -31.81 62.36 35.73 8.94 64.84 --- --- Peak 2 4804.00 17.40 54.00 -36.60 37.57 35.73 8.94 64.84 --- --- Average	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4804.00 42.16 74.00 -31.84 62.33 35.73 8.94 64.84 --- --- Peak 2 4804.00 17.37 54.00 -36.63 37.54 35.73 8.94 64.84 --- --- Average

Mode	2	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH39_2441MHz	
ANT	2	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4882.00 42.12 74.00 -31.88 62.37 35.92 8.70 64.87 --- --- Peak 2 4882.00 17.33 54.00 -36.67 37.58 35.92 8.70 64.87 --- --- Average 3 7323.00 44.83 74.00 -29.17 62.64 36.87 10.18 64.86 --- --- Peak 4 7323.00 20.04 54.00 -33.96 37.85 36.87 10.18 64.86 --- --- Average	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4882.00 43.76 74.00 -30.24 64.01 35.92 8.70 64.87 --- --- Peak 2 4882.00 18.97 54.00 -35.03 39.22 35.92 8.70 64.87 --- --- Average 3 7323.00 44.79 74.00 -29.21 62.60 36.87 10.18 64.86 --- --- Peak 4 7323.00 20.00 54.00 -34.00 37.81 36.87 10.18 64.86 --- --- Average

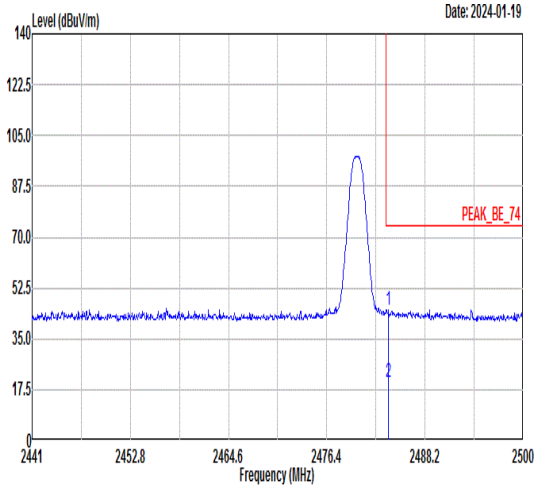
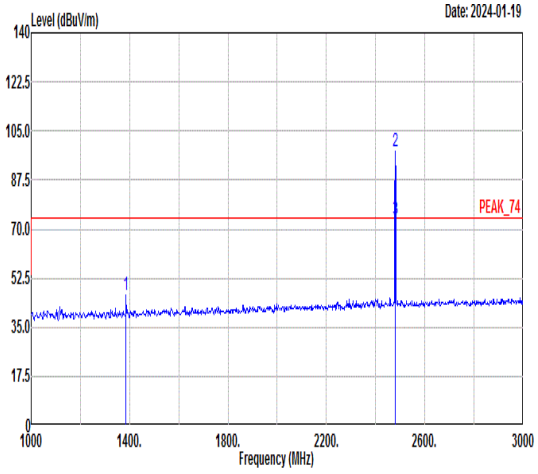
Mode	3	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	2	
Pol.	Horizontal	Fundamental
Peak		

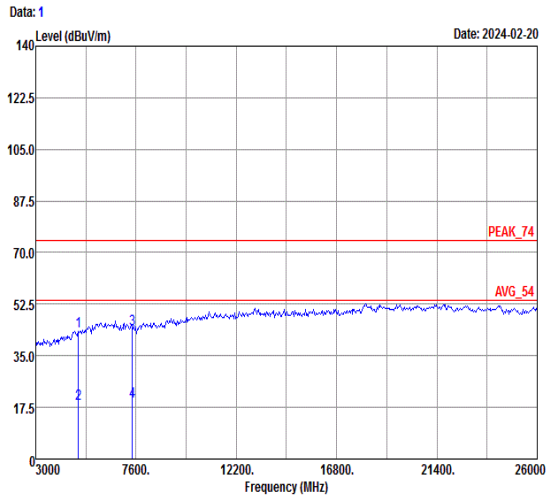
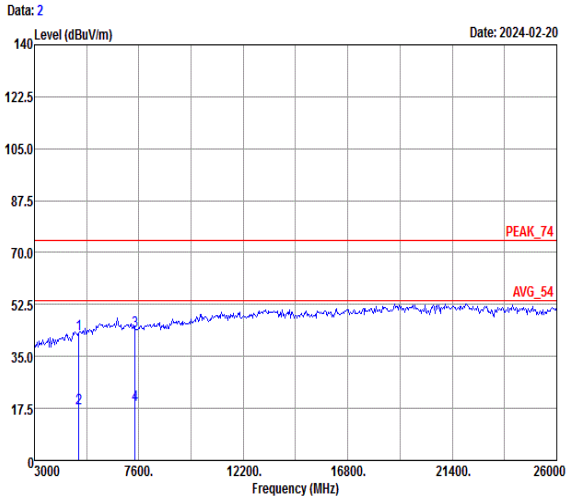
Horizontal:

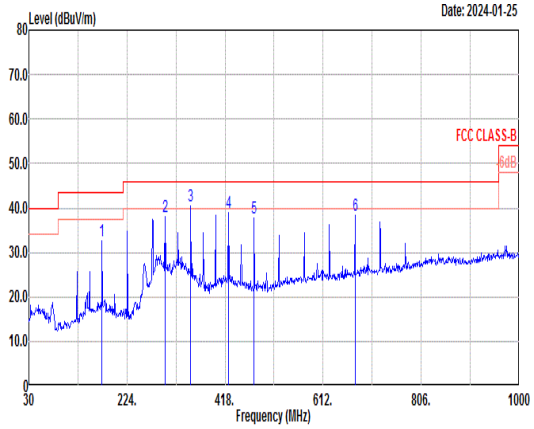
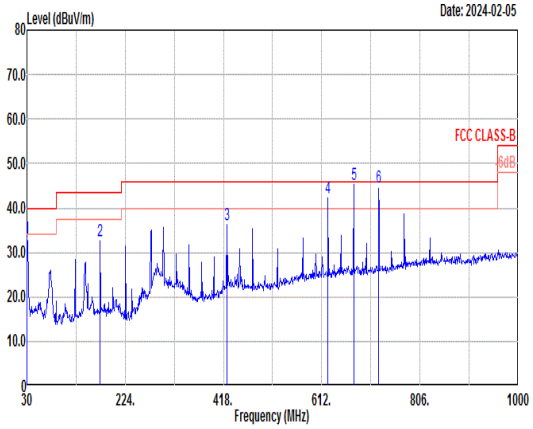
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg	
1	2488.38	44.02	74.00	-29.98	40.97	30.70	5.47	33.12	118	161	PEAK
2	2488.38	19.23	54.00	-34.77	16.18	30.70	5.47	33.12	118	161	AVERAGE

Fundamental:

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg	
1	1386.00	46.82	74.00	-27.18	47.76	29.42	4.13	34.49	118	161	PEAK
2	2480.00	91.23	------	------	88.20	30.70	5.46	33.13	118	161	PEAK
3	2480.00	66.44	------	------	63.41	30.70	5.46	33.13	118	161	AVERAGE

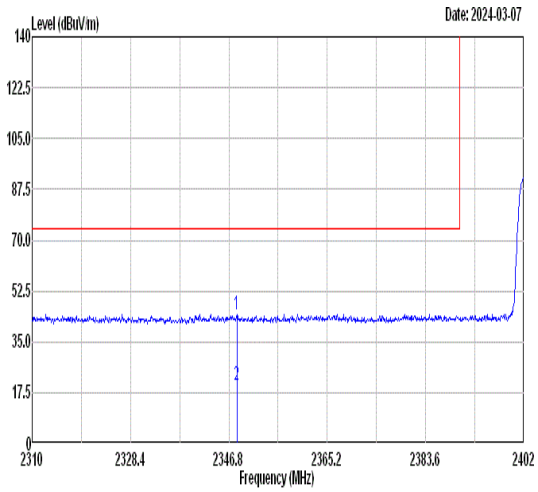
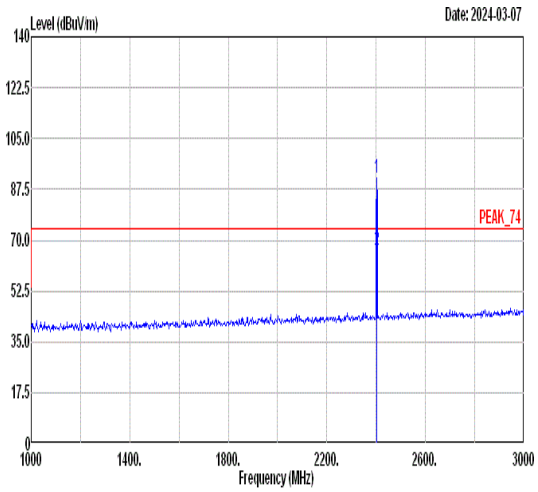
Mode	3	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	2	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 2483.83 45.10 74.00 -28.90 42.06 30.70 5.46 33.12 111 273 PEAK 2 2483.83 20.31 54.00 -33.69 17.27 30.70 5.46 33.12 111 273 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 1386.00 46.30 74.00 -27.70 47.24 29.42 4.13 34.49 111 273 PEAK 2 2480.00 98.00 ------ ------ 94.97 30.70 5.46 33.13 111 273 PEAK 3 2480.00 73.21 ------ ------ 70.18 30.70 5.46 33.13 111 273 AVERAGE

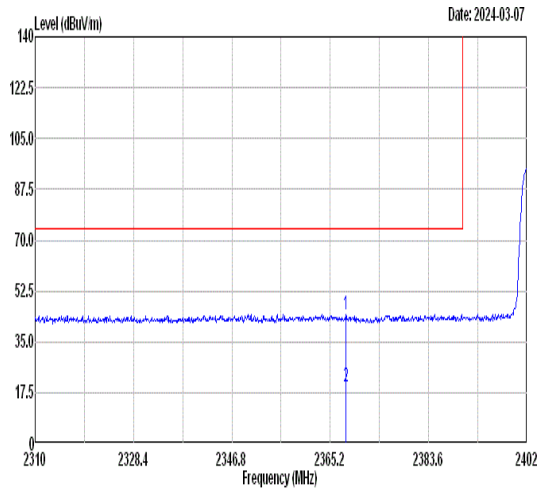
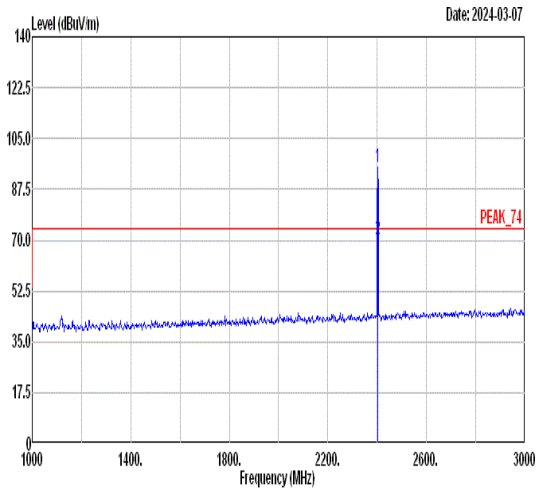
Mode	3	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	2	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Over Limit Limit Line ReadLevel Antenna Factor Cable Loss Preamp Factor A/Pos T/Pos Remark MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 4960.00 43.36 -30.64 74.00 63.75 36.10 8.41 64.90 --- --- Peak 2 4960.00 18.57 -35.43 54.00 38.96 36.10 8.41 64.90 --- --- Average 3 * 7440.00 44.14 -29.86 74.00 62.01 36.82 10.17 64.86 --- --- Peak 4 7440.00 19.36 -34.64 54.00 37.23 36.82 10.17 64.86 --- --- Average	 Freq Level Over Limit Limit Line ReadLevel Antenna Factor Cable Loss Preamp Factor A/Pos T/Pos Remark MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 4960.00 42.47 -31.53 74.00 62.86 36.10 8.41 64.90 --- --- Peak 2 4960.00 17.68 -36.32 54.00 38.07 36.10 8.41 64.90 --- --- Average 3 * 7440.00 43.70 -30.30 74.00 61.57 36.82 10.17 64.86 --- --- Peak 4 7440.00 18.91 -35.09 54.00 36.78 36.82 10.17 64.86 --- --- Average

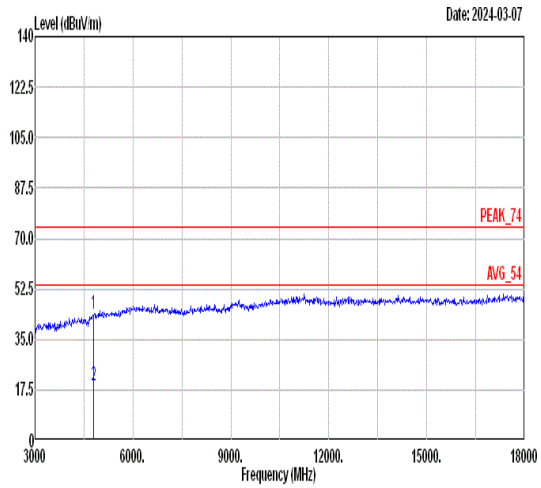
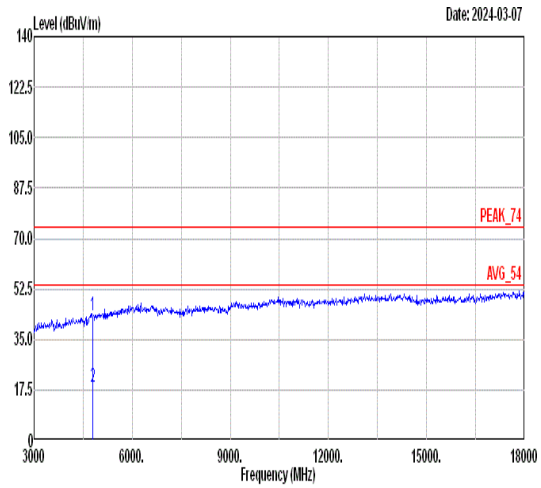
Mode	4	
	LF	
	Bluetooth BR_GFSK_CH00_2402 MHz	
ANT	2	
Pol.	Horizontal	Vertical
QP/ Peak		

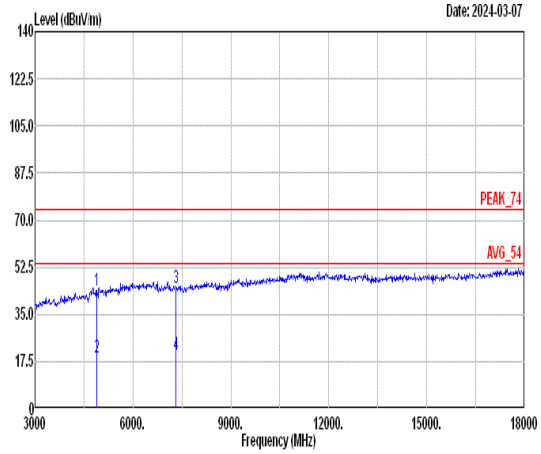
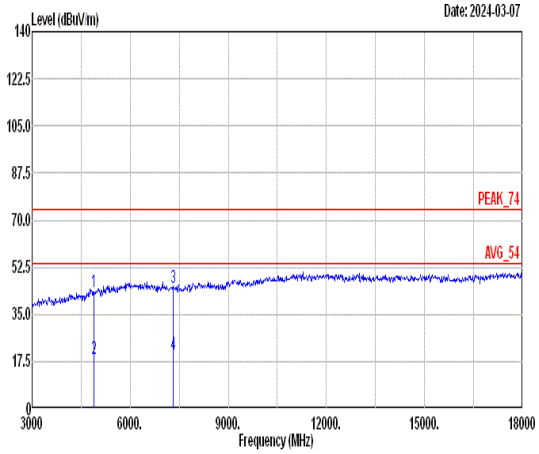
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg	
1	174.53	32.73	43.50	-10.77	47.73	15.30	1.35	31.65	---	---	Peak
2	299.66	37.89	46.00	-8.11	48.29	19.30	1.80	31.50	---	---	Peak
3	350.10	40.50	46.00	-5.50	49.42	20.50	1.98	31.40	---	---	Peak
4	424.79	38.84	46.00	-7.16	45.39	22.80	2.15	31.50	---	---	Peak
5	475.23	37.61	46.00	-8.39	43.19	23.60	2.27	31.45	---	---	Peak
6	675.05	38.43	46.00	-7.57	40.42	26.50	2.71	31.20	---	---	Peak

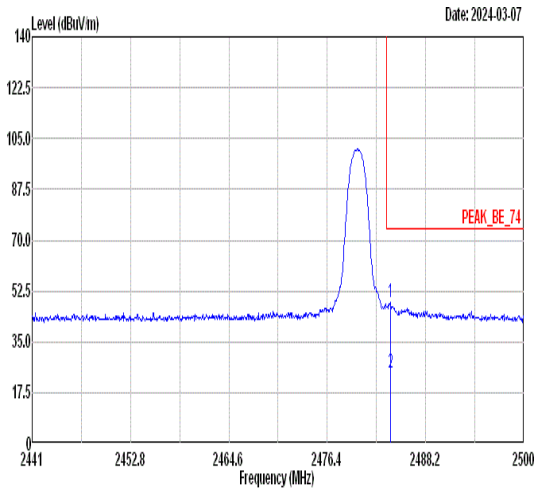
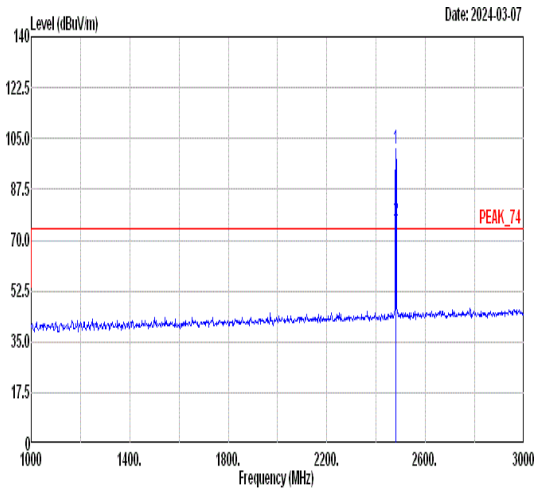
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg	
1	30.00	33.28	40.00	-6.72	39.15	25.20	0.53	31.60	---	---	Peak
2	174.53	32.64	43.50	-10.86	47.64	15.30	1.35	31.65	---	---	Peak
3	424.79	36.25	46.00	-9.75	42.80	22.80	2.15	31.50	---	---	Peak
4	624.61	42.26	46.00	-3.74	44.91	25.90	2.60	31.15	---	---	Peak
5	675.05	45.15	46.00	-0.85	47.14	26.50	2.71	31.20	---	---	Peak
6	724.52	44.58	46.00	-1.42	45.48	27.50	2.80	31.20	---	---	Peak

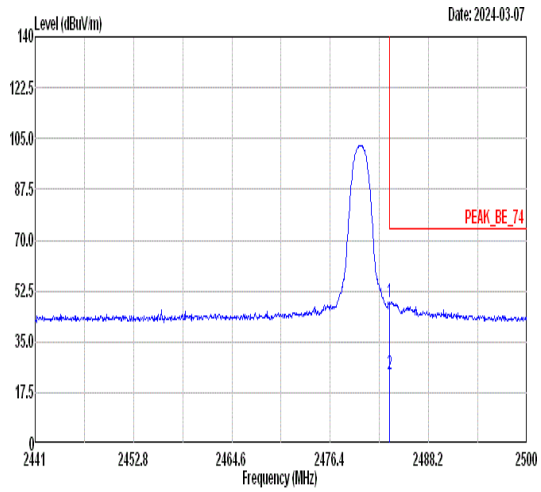
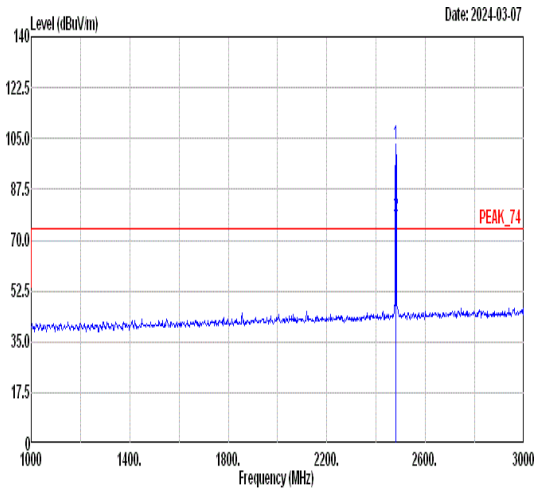
Mode	5	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	0	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin (dB) Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2348.27 44.62 74.00 -29.38 41.88 30.73 5.32 33.31 200 193 PEAK 2 2348.27 19.83 54.00 -34.17 17.09 30.73 5.32 33.31 200 193 AVERAGE	 Freq Level Limit Line Margin (dB) Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2402.00 91.43 ------ ------ 88.58 30.72 5.37 33.24 200 193 PEAK 2 2402.00 66.64 ------ ------ 63.79 30.72 5.37 33.24 200 193 AVERAGE

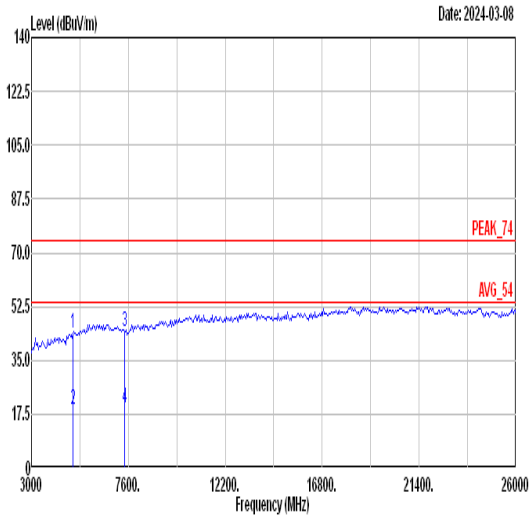
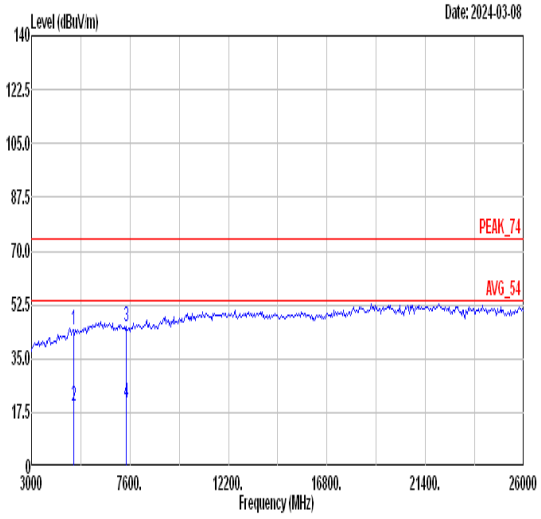
Mode	5	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	0	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin (dB) Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2368.05 44.42 74.00 -29.58 41.63 30.73 5.34 33.28 400 188 PEAK 2 2368.05 19.63 54.00 -34.37 16.84 30.73 5.34 33.28 400 188 AVERAGE	 Freq Level Limit Line Margin (dB) Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2402.00 94.92 ------ ------ 92.07 30.72 5.37 33.24 400 188 PEAK 2 2402.00 70.13 ------ ------ 67.28 30.72 5.37 33.24 400 188 AVERAGE

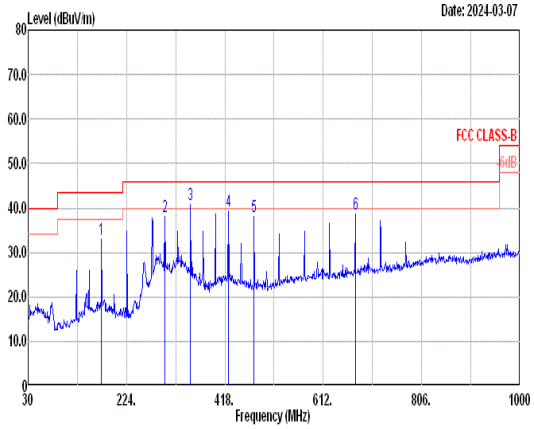
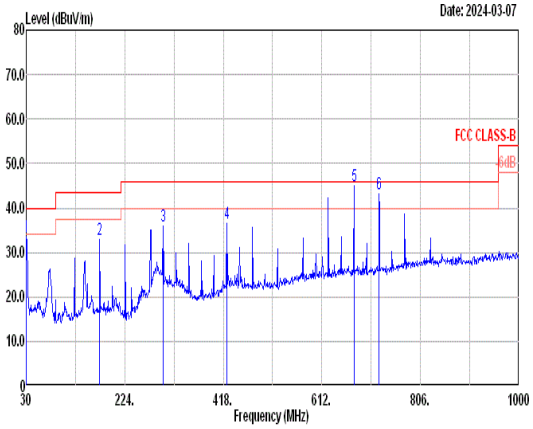
Mode	5	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	0	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4804.00 43.78 74.00 -30.22 63.95 35.73 8.94 64.84 --- --- Peak 2 4804.00 18.99 54.00 -35.01 39.16 35.73 8.94 64.84 --- --- Average	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4804.00 43.28 74.00 -30.72 63.45 35.73 8.94 64.84 --- --- Peak 2 4804.00 18.49 54.00 -35.51 38.66 35.73 8.94 64.84 --- --- Average

Mode	6	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH39_2441MHz	
ANT	0	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4882.00 43.88 74.00 -30.12 64.13 35.92 8.70 64.87 --- --- Peak 2 4882.00 19.09 54.00 -34.91 39.34 35.92 8.70 64.87 --- --- Average 3 7323.00 44.69 74.00 -29.31 62.50 36.87 10.18 64.86 --- --- Peak 4 7323.00 19.90 54.00 -34.10 37.71 36.87 10.18 64.86 --- --- Average	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4882.00 43.45 74.00 -30.55 63.70 35.92 8.70 64.87 --- --- Peak 2 4882.00 18.66 54.00 -35.34 38.91 35.92 8.70 64.87 --- --- Average 3 7323.00 45.05 74.00 -28.95 62.86 36.87 10.18 64.86 --- --- Peak 4 7323.00 20.26 54.00 -33.74 38.07 36.87 10.18 64.86 --- --- Average

Mode	7	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	0	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin (dB) Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2483.95 48.83 74.00 -25.17 45.79 30.70 5.46 33.12 306 300 PEAK 2 2483.95 24.04 54.00 -29.96 21.00 30.70 5.46 33.12 306 300 AVERAGE	 Freq Level Limit Line Margin (dB) Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2480.00 101.39 ------ ------ 98.36 30.70 5.46 33.13 306 300 PEAK 2 2480.00 76.60 ------ ------ 73.57 30.70 5.46 33.13 306 300 AVERAGE

Mode	7	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	0	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin (dB) Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2483.54 48.80 74.00 -25.20 45.76 30.70 5.46 33.12 317 360 PEAK 2 2483.54 24.01 54.00 -29.99 20.97 30.70 5.46 33.12 317 360 AVERAGE	 Freq Level Limit Line Margin (dB) Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dBuV dB/m dB dB cm deg 1 2480.00 103.09 ------ ------ 100.06 30.70 5.46 33.13 317 360 PEAK 2 2480.00 78.30 ------ ------ 75.27 30.70 5.46 33.13 317 360 AVERAGE

Mode	7	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	0	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4960.00 43.59 74.00 -30.41 63.93 36.10 8.46 64.90 --- --- Peak 2 4960.00 18.80 54.00 -35.20 39.14 36.10 8.46 64.90 --- --- Average 3 7440.00 44.42 74.00 -29.58 62.29 36.82 10.17 64.86 --- --- Peak 4 7440.00 19.63 54.00 -34.37 37.50 36.82 10.17 64.86 --- --- Average	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 4960.00 44.43 74.00 -29.57 64.77 36.10 8.46 64.90 --- --- Peak 2 4960.00 19.64 54.00 -34.36 39.98 36.10 8.46 64.90 --- --- Average 3 7440.00 45.19 74.00 -28.81 63.06 36.82 10.17 64.86 --- --- Peak 4 7440.00 20.40 54.00 -33.60 38.27 36.82 10.17 64.86 --- --- Average

Mode	8	
	LF	
	Bluetooth LF_CH78_(2480)MHz	
ANT	0	
Pol.	Horizontal	Vertical
QP/ Peak		

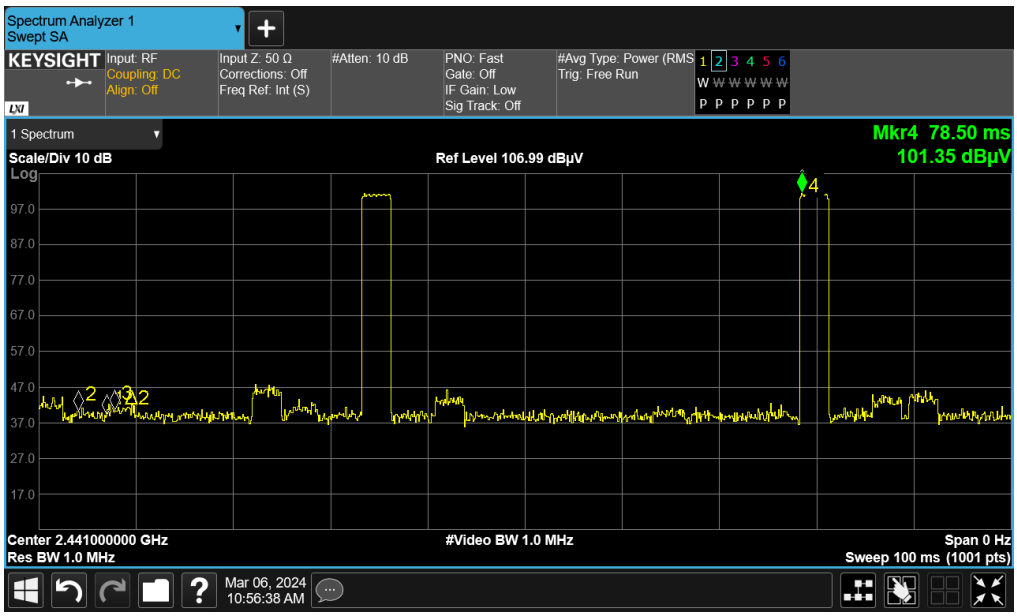
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg	
1	174.53	32.88	43.50	-10.62	47.88	15.30	1.35	31.65	---	---	Peak
2	299.66	38.04	46.00	-7.96	48.44	19.30	1.80	31.50	---	---	Peak
3	350.10	40.79	46.00	-5.21	49.71	20.50	1.98	31.40	---	---	Peak
4	424.79	39.13	46.00	-6.87	45.68	22.80	2.15	31.50	---	---	Peak
5	475.23	37.90	46.00	-8.10	43.48	23.60	2.27	31.45	---	---	Peak
6	675.05	38.72	46.00	-7.28	40.71	26.50	2.71	31.20	---	---	Peak

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg	
1	30.00	33.53	40.00	-6.47	39.40	25.20	0.53	31.60	---	---	Peak
2	174.53	32.90	43.50	-10.60	47.90	15.30	1.35	31.65	---	---	Peak
3	299.66	35.89	46.00	-10.11	46.29	19.30	1.80	31.50	---	---	Peak
4	424.79	36.50	46.00	-9.50	43.05	22.80	2.15	31.50	---	---	Peak
5	675.05	45.03	46.00	-0.97	47.02	26.50	2.71	31.20	---	---	Peak
6	724.52	43.23	46.00	-2.77	44.13	27.50	2.80	31.20	---	---	Peak

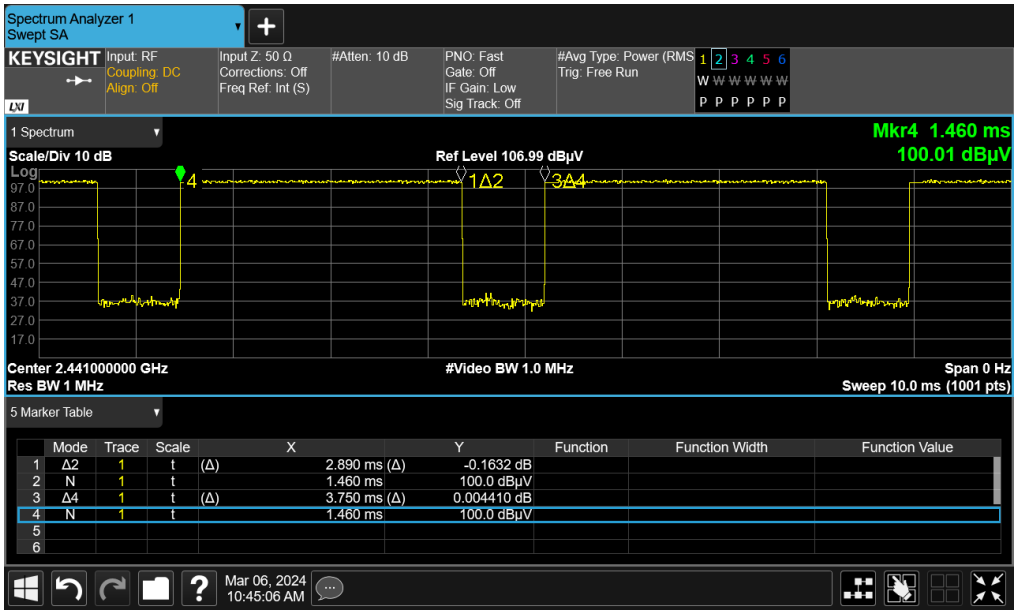
Appendix D. Duty Cycle Plots

<Ant. 0>

3DH5 on time (One Pulse) Plot on Channel 39



3DH5 on time (Count Pulses) Plot on Channel 39

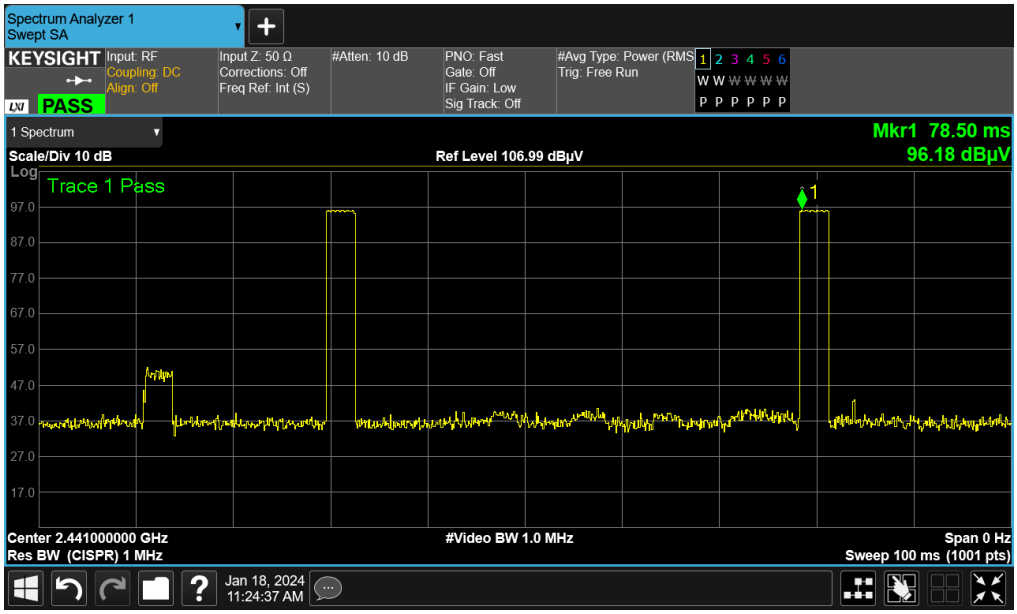


Note:

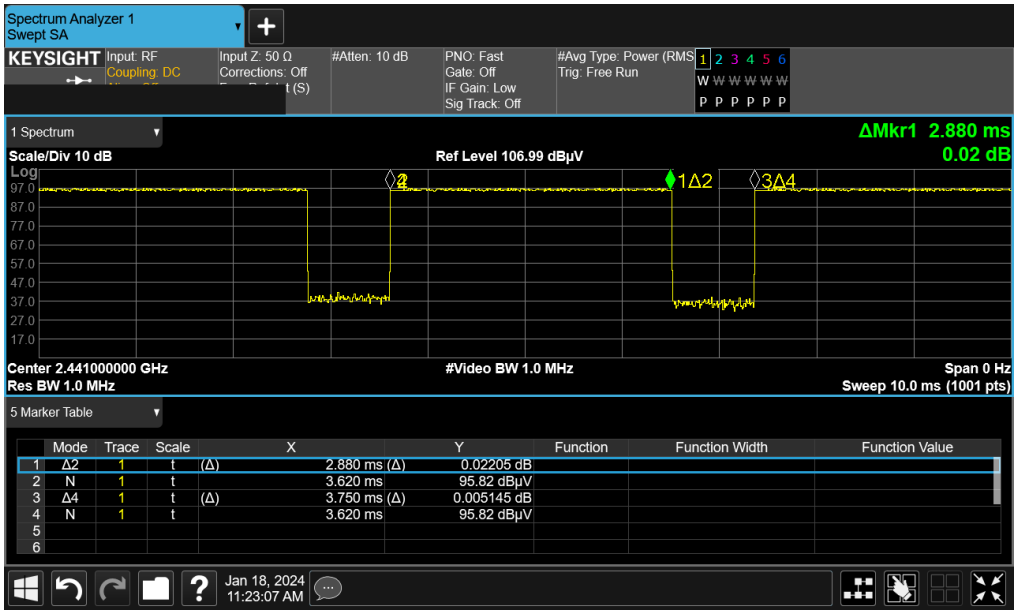
1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.78 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 dB
3. 3DH5 has the highest duty cycle worst case and is reported.

<Ant. 2>

3DH5 on time (One Pulse) Plot on Channel 39



3DH5 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. 3DH5 has the highest duty cycle worst case and is reported.