

TEST REPORT

Reference No..... : WTX20X11083933W-2
FCC ID : 2AGA6-OZSBAR
Applicant : Shenzhen AngSi Technology Co., Ltd.
Address..... : 6/F, Block B, Ding Xin Science Park, Hong Lang North No.2 Road, Bao An District, ShenZhen PRC
Product Name : OontZ Angle 3 Pro Soundbar
Test Model. : OontZ Angle 3 Pro Soundbar
Standards : FCC Part 15.247
Date of Receipt sample : Nov.10, 2020
Date of Test..... : Nov.10, 2020 to Dec.07, 2020
Date of Issue : Dec.08, 2020
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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Report version

Version No.	Date of issue	Description
Rev.00	Dec.08, 2020	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shenzhen AngSi Technology Co., Ltd.
Address of applicant: 6/F, Block B, Ding Xin Science Park, Hong Lang North No.2 Road, Bao An District, ShenZhen PRC

Manufacturer: Shenzhen AngSi Technology Co., Ltd.
Address of manufacturer: 6/F, Block B, Ding Xin Science Park, Hong Lang North No.2 Road, Bao An District, ShenZhen PRC

General Description of EUT	
Product Name:	OontZ Angle 3 Pro Soundbar
Trade Name	OontZ
Model No.:	OontZ Angle 3 Pro Soundbar
Adding Model(s):	/
Rated Voltage:	DC 15V
Power Adapter:	Model No: GQ24-150150-AU Input: AC100-240V, 50/60Hz, 1.0A, Max Output: DC15V, 1.5A
Software Version:	V0.1
Hardware Version:	HS2043-01A1
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Bluetooth Version:	V5.0 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	-0.26dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	3.91dBi

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

558074 D01 15.247 Meas Guidance v05r02: Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under section 15.247 of the Fcc rules.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Test Facility

Address of the test laboratory

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Low	2402MHz
TM2	Middle	2440MHz
TM3	High	2480MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	45~55 %
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
DC Cable	1.53	Unshielded	Without Ferrite

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
AUX IN Cable	0.80	Unshielded	Without Ferrite
USB Cable	1.20	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Mobile phone	HUAWEI	VOG-AL00	/
Notebook	Lenovo	E445	EB12648265

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-26GHz $\pm 3.92\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2020-04-28	2021-04-27
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2020-04-28	2021-04-27
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2020-04-28	2021-04-27
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2020-04-28	2021-04-27
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2020-04-28	2021-04-27
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2019-05-05	2021-05-04
SEMT-1042	Horn Antenna	ETS	3117	00086197	2019-05-05	2021-05-04
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2019-05-05	2021-05-04
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2019-05-05	2021-05-04
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2020-04-28	2021-04-27
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2020-04-28	2021-04-27
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2020-04-28	2021-04-27
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2020-04-28	2021-04-27
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2020-04-28	2021-04-27
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2020-04-28	2021-04-27
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2019-05-05	2021-05-04
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2020-04-28	2021-04-27
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2020-04-28	2021-04-27
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2020-04-28	2021-04-27
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2020-03-17	2021-03-16
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2020-03-17	2021-03-16
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2020-03-17	2021-03-16
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2020-03-17	2021-03-16
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2020-03-17	2021-03-16
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2020-03-17	2021-03-16

Software List			
Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A1

*Remark: indicates software version used in the compliance certification testing

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§15.203; §15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§15.207(a)	Conducted Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.247(a)(2)	DTS Bandwidth	Compliant
§15.247(b)(3)	RF Output Power	Compliant
§15.209(a)	Radiated Emission	Compliant
§15.247(d)	Band Edge (Out of Band Emissions)	Compliant

N/A: Not applicable

3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section.

3.2 Evaluation Information

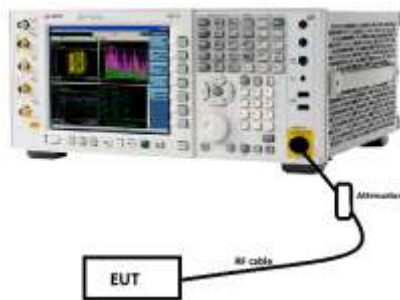
This product has an Integral antenna, fulfill the requirement of this section.

4. Power Spectral Density

4.1 Standard Applicable

According to 15.247(a)(1)(iii), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.2 Test Setup Block Diagram



4.3 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.10.2, the test method of power spectral density as below:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

4.4 Summary of Test Results/Plots

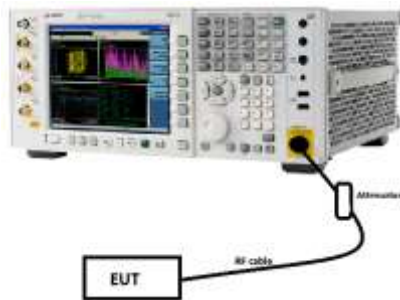
Please refer to Appendix A

5. DTS Bandwidth

5.1 Standard Applicable

According to 15.247(a)(2), systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2 Test Setup Block Diagram



5.3 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.2 and ANSI C63.10-2013 Subclause 11.8.1, the test method of DTS Bandwidth as below:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.4 Summary of Test Results/Plots

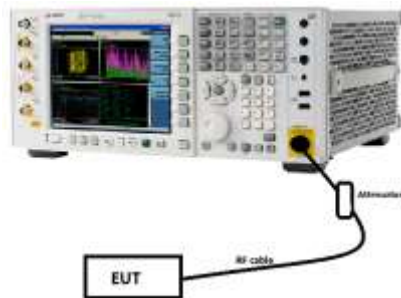
Please refer to Appendix B

6. RF Output Power

6.1 Standard Applicable

According to 15.247(b)(3), for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

6.2 Test Setup Block Diagram



6.3 Test Procedure

According to the KDB-558074 D01 v05r02 Subclause 8.3.1.1 and ANSI C63.10-2013 Subclause 11.9.1.1, this procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the $RBW \geq DTS$ bandwidth.
- b) Set $VBW \geq 3 \times RBW$.
- c) Set $span \geq 3 \times RBW$
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

6.4 Summary of Test Results/Plots

Please refer to Appendix C

7. Field Strength of Spurious Emissions

7.1 Standard Applicable

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

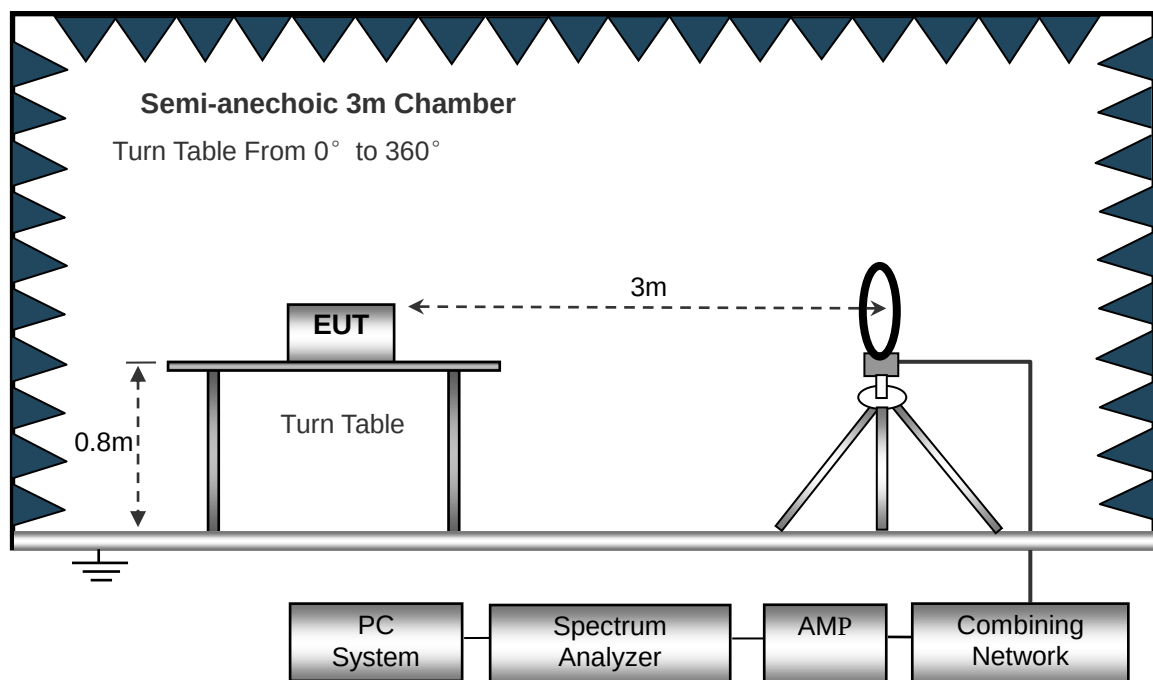
7.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

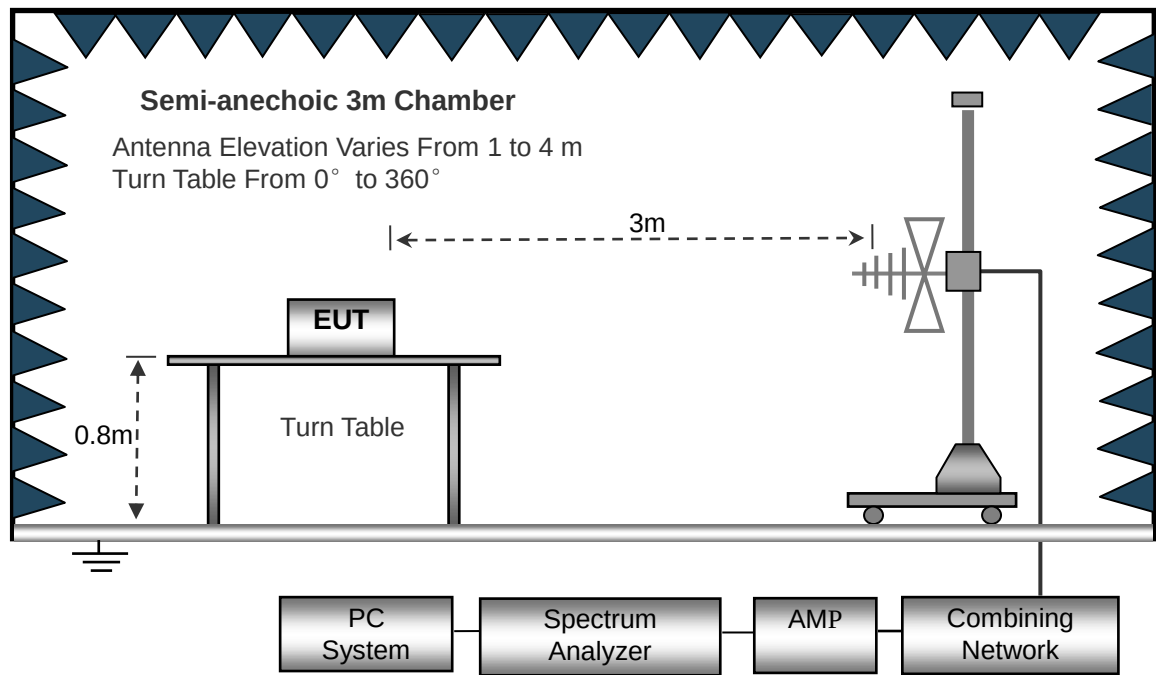
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

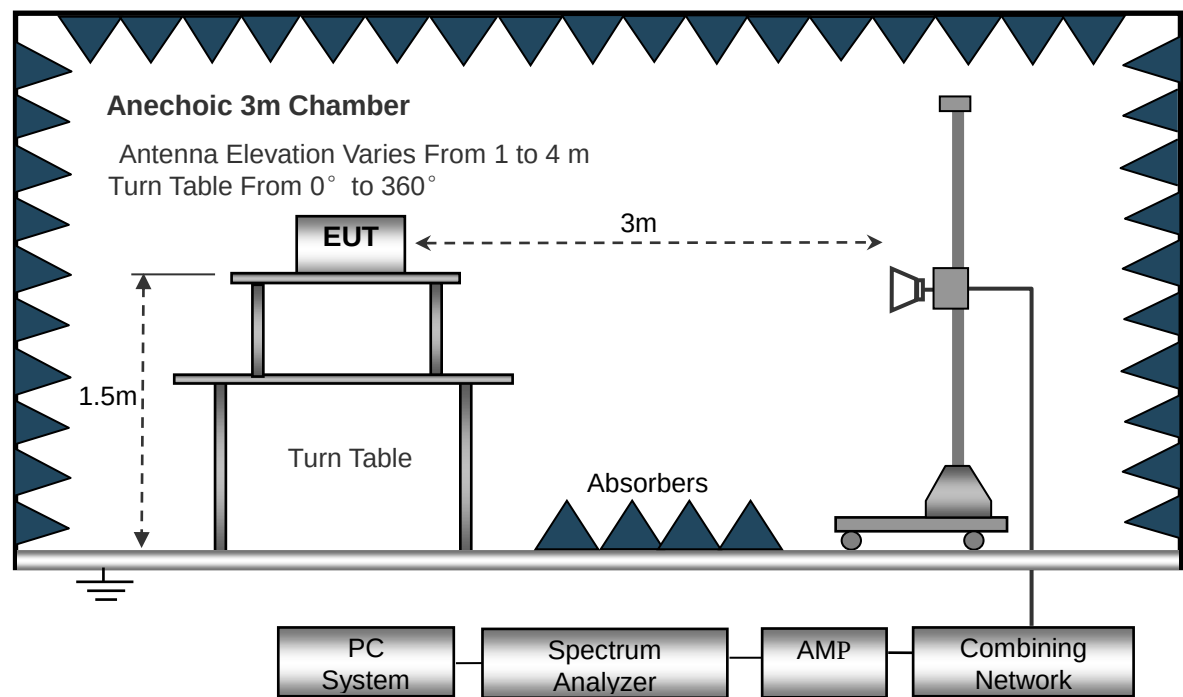
The test setup for emission measurement below 30MHz..



The test setup for emission measurement from 30 MHz to 1 GHz..



The test setup for emission measurement above 1 GHz..



Frequency :9kHz-30MHz
RBW=10KHz,
VBW =30KHz
Sweep time= Auto
Trace = max hold
Detector function = peak

Frequency :30MHz-1GHz
RBW=120KHz,
VBW=300KHz
Sweep time= Auto
Trace = max hold
Detector function = peak, QP

Frequency :Above 1GHz
RBW=1MHz,
VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto
Trace = max hold
Detector function = peak, AV

7.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

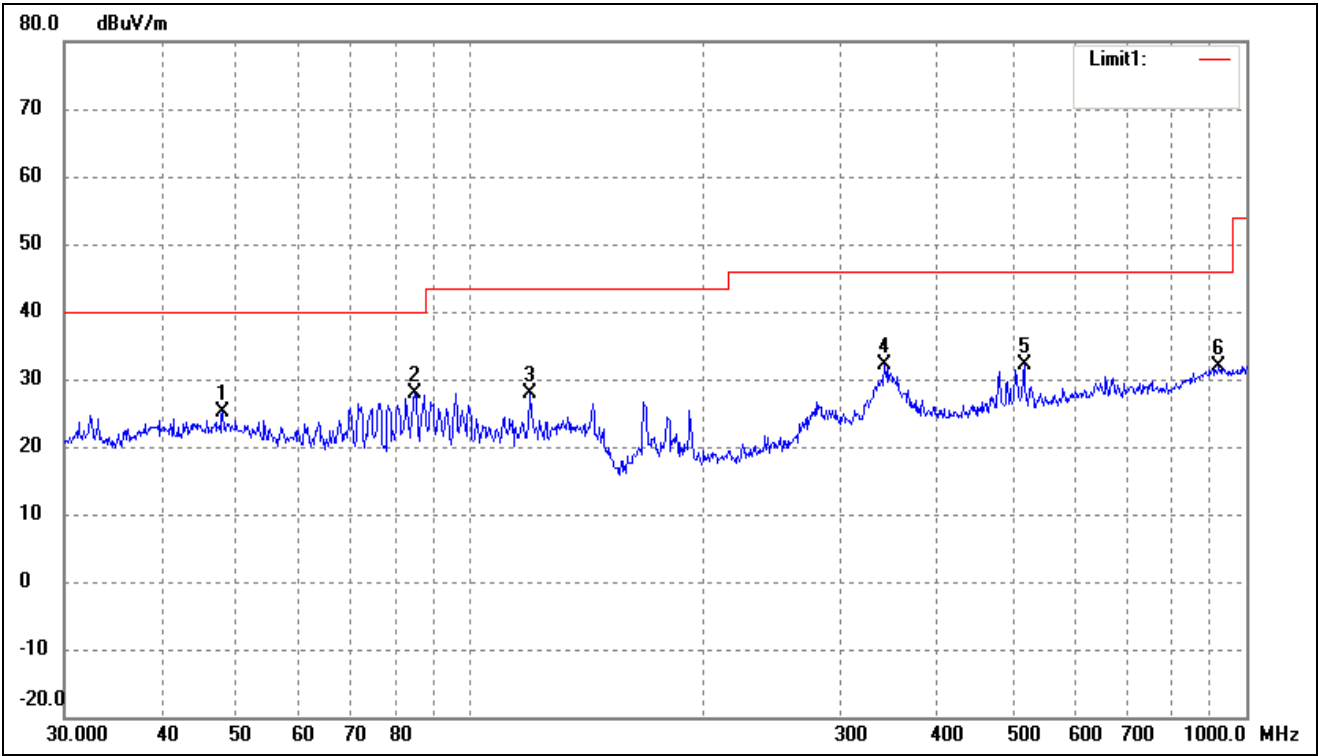
$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

7.4 Summary of Test Results/Plots

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

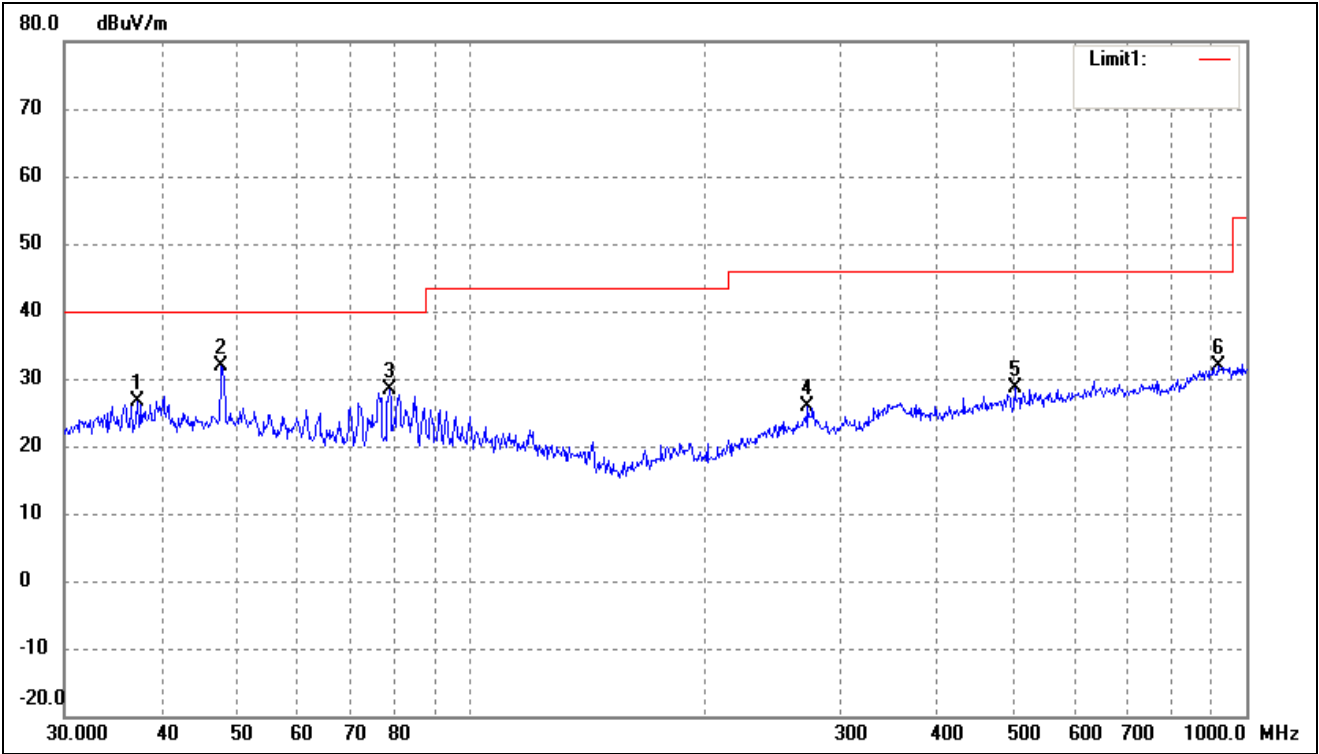
- Spurious Emissions Below 1GHz
- 1M(Chip~ATS2835)

Test Channel	Low	Polarity:	Horizontal
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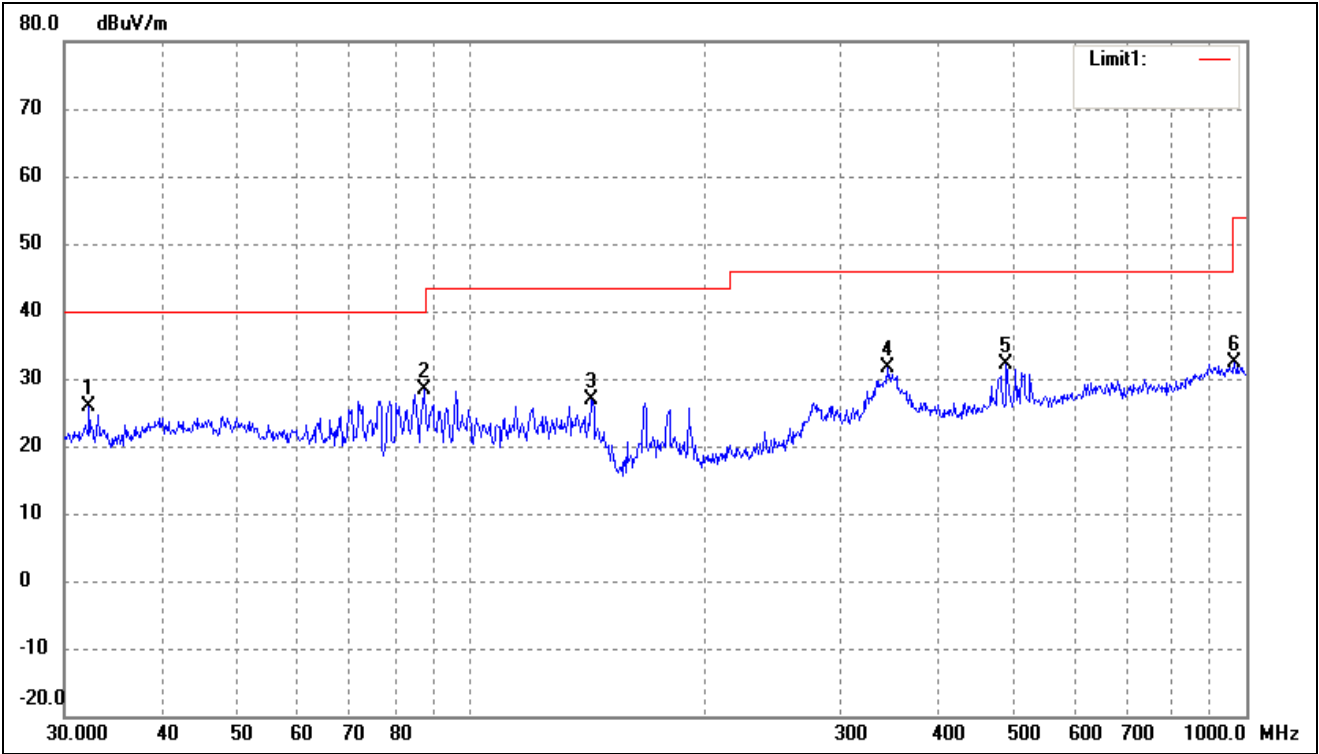
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	47.9940	36.86	-11.63	25.23	40.00	-14.77	-	-	peak
2	84.7019	44.08	-16.08	28.00	40.00	-12.00	-	-	peak
3	119.4361	42.05	-14.24	27.81	43.50	-15.69	-	-	peak
4	341.9786	39.96	-7.92	32.04	46.00	-13.96	-	-	peak
5	517.2480	36.38	-4.14	32.24	46.00	-13.76	-	-	peak
6	922.5157	30.06	1.83	31.89	46.00	-14.11	-	-	peak

Test Channel	Low	Polarity:	Vertical
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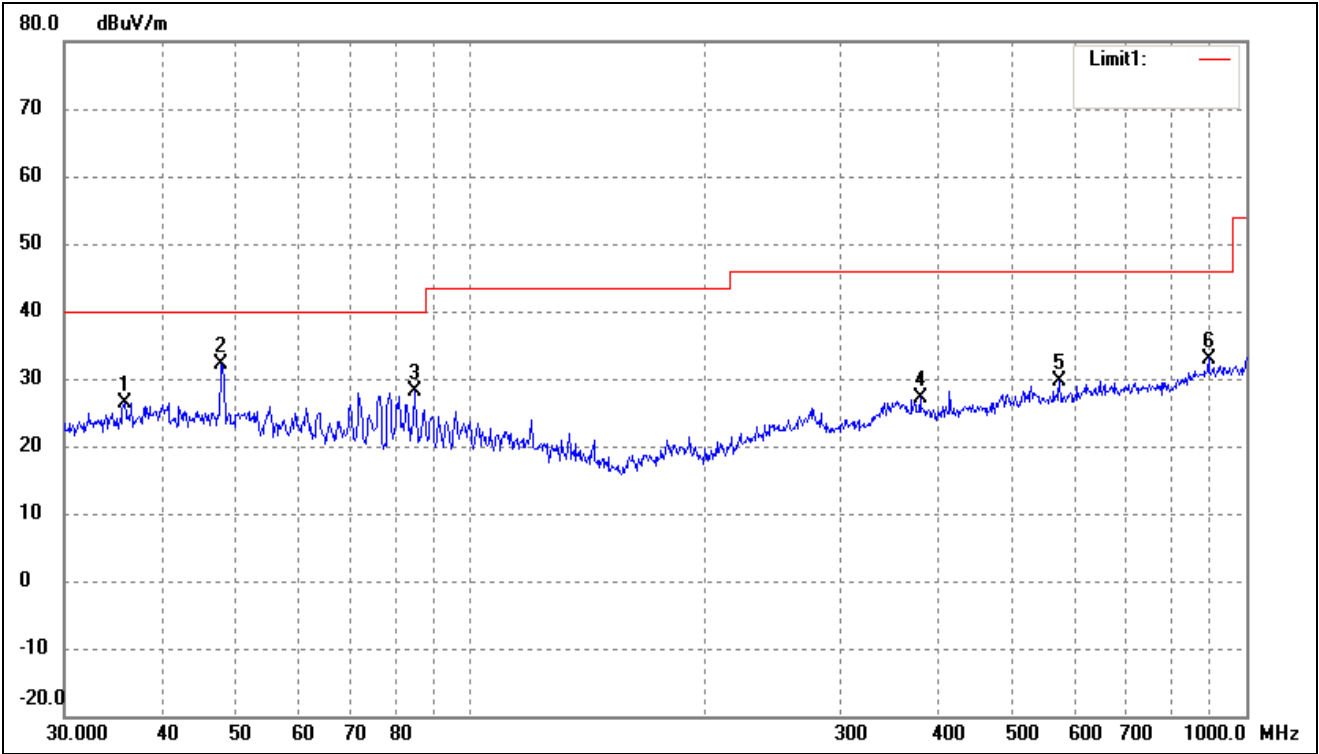
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	37.2855	39.59	-13.01	26.58	40.00	-13.42	-	-	peak
2	47.8260	43.47	-11.64	31.83	40.00	-8.17	-	-	peak
3	78.6888	45.06	-16.60	28.46	40.00	-11.54	-	-	peak
4	272.2776	36.75	-10.77	25.98	46.00	-20.02	-	-	peak
5	502.9395	32.68	-4.07	28.61	46.00	-17.39	-	-	peak
6	919.2866	30.06	1.78	31.84	46.00	-14.16	-	-	peak

Test Channel	Middle	Polarity:	Horizontal
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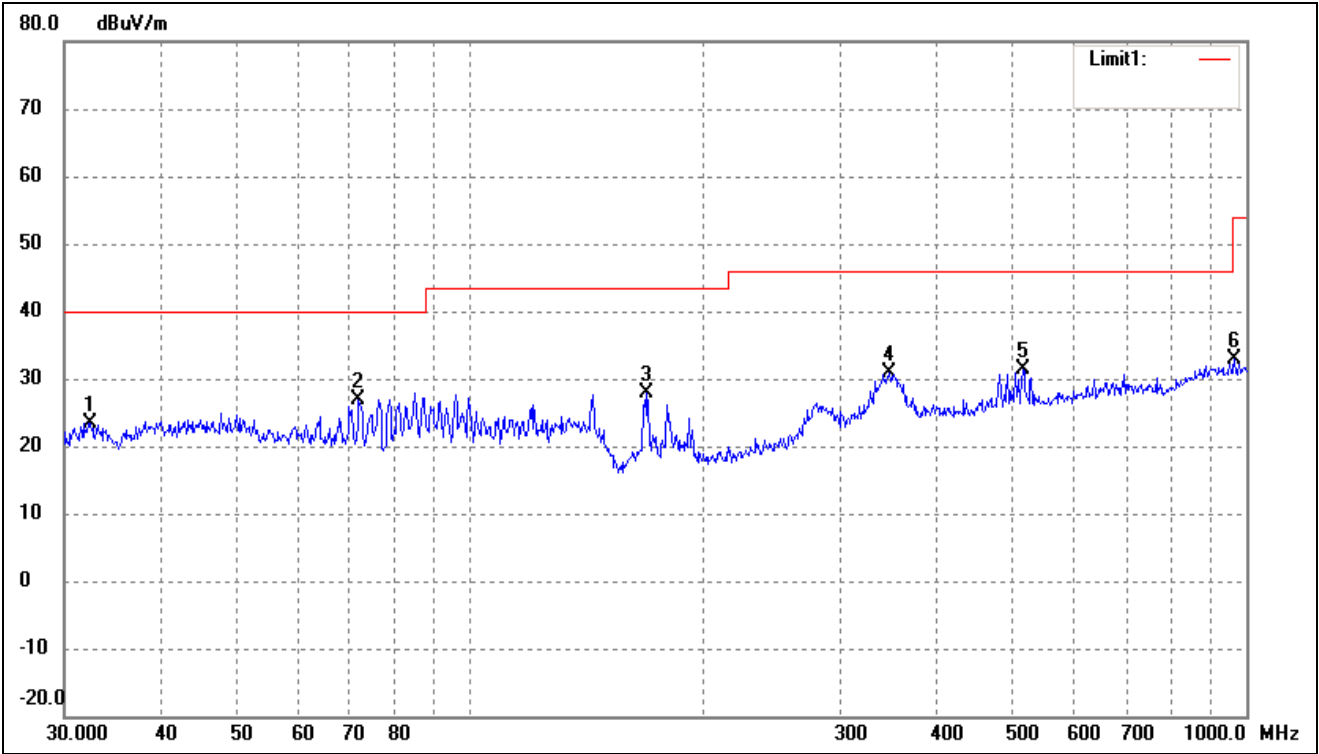
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	32.2925	39.99	-14.03	25.96	40.00	-14.04	-	-	peak
2	87.4177	43.83	-15.51	28.32	40.00	-11.68	-	-	peak
3	143.3261	42.75	-15.98	26.77	43.50	-16.73	-	-	peak
4	344.3855	39.31	-7.77	31.54	46.00	-14.46	-	-	peak
5	490.7447	36.35	-4.33	32.02	46.00	-13.98	-	-	peak
6	965.5421	30.99	1.43	32.42	54.00	-21.58	-	-	peak

Test Channel	Middle	Polarity:	Vertical
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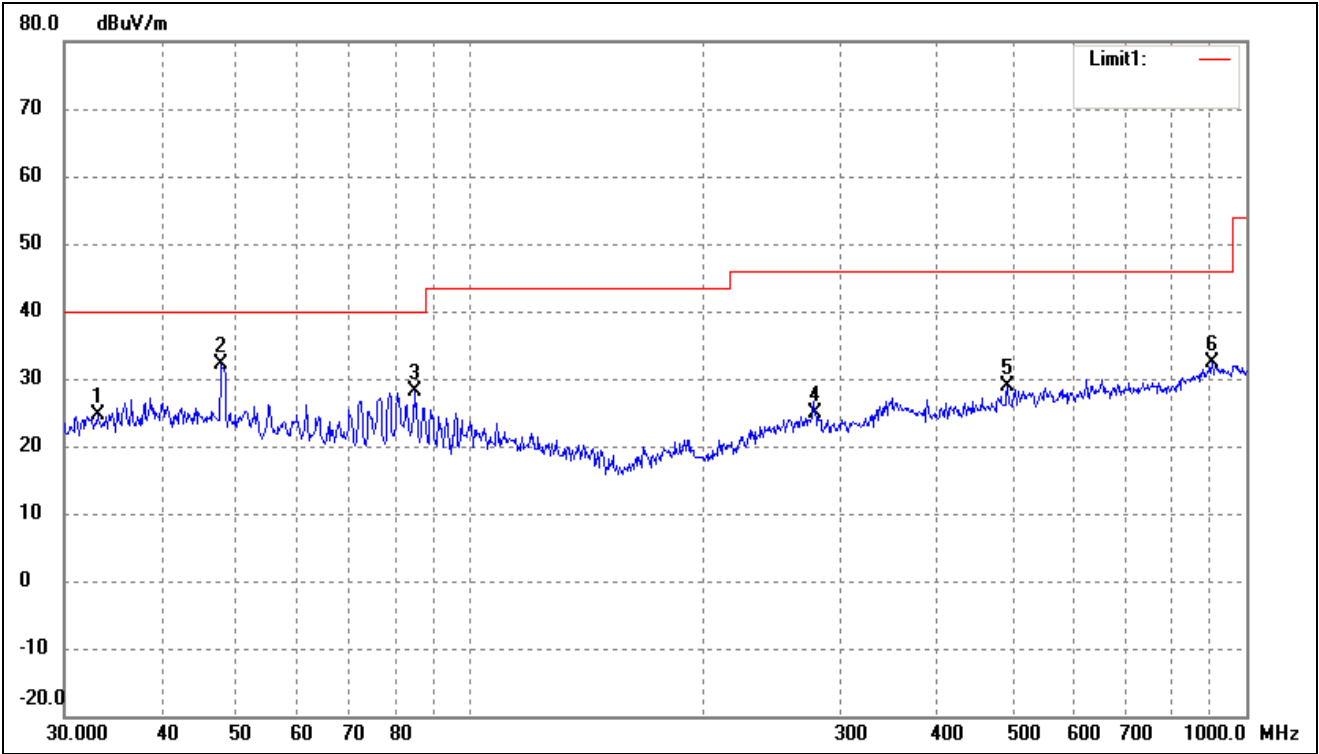
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	35.8746	39.89	-13.54	26.35	40.00	-13.65	-	-	peak
2	47.8260	43.68	-11.64	32.04	40.00	-7.96	-	-	peak
3	84.7019	44.14	-16.08	28.06	40.00	-11.94	-	-	peak
4	379.9141	34.20	-7.04	27.16	46.00	-18.84	-	-	peak
5	574.6258	32.27	-2.58	29.69	46.00	-16.31	-	-	peak
6	893.8567	31.70	1.30	33.00	46.00	-13.00	-	-	peak

Test Channel	High	Polarity:	Horizontal
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No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	32.4059	37.44	-14.02	23.42	40.00	-16.58	-	-	peak
2	71.8320	42.04	-15.15	26.89	40.00	-13.11	-	-	peak
3	169.0054	42.99	-15.08	27.91	43.50	-15.59	-	-	peak
4	346.8092	38.42	-7.63	30.79	46.00	-15.21	-	-	peak
5	515.4374	35.39	-4.12	31.27	46.00	-14.73	-	-	peak
6	965.5421	31.35	1.43	32.78	54.00	-21.22	-	-	peak

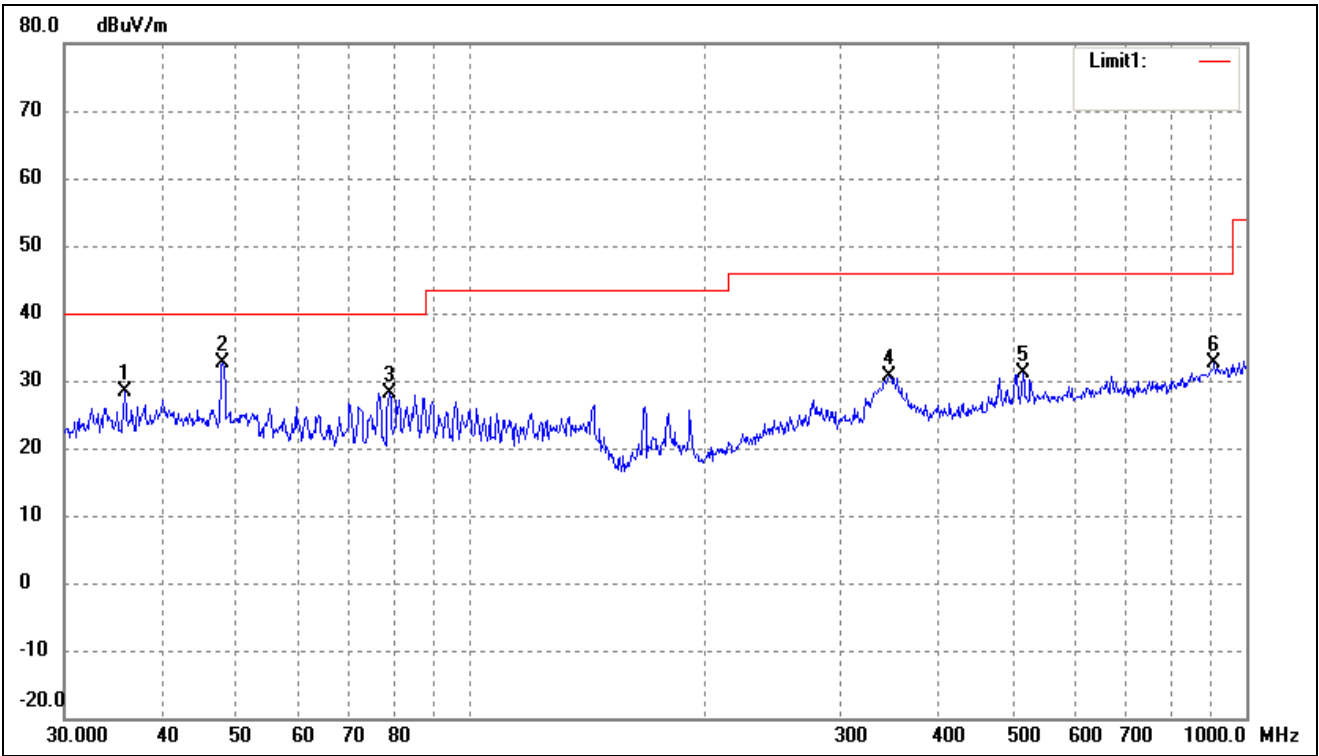
Test Channel	High	Polarity:	Vertical
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No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	33.0950	38.64	-13.98	24.66	40.00	-15.34	-	-	peak
2	47.8260	43.74	-11.64	32.10	40.00	-7.90	-	-	peak
3	84.7019	44.28	-16.08	28.20	40.00	-11.80	-	-	peak
4	278.0668	35.33	-10.53	24.80	46.00	-21.20	-	-	peak
5	492.4685	33.26	-4.29	28.97	46.00	-17.03	-	-	peak
6	903.3094	30.81	1.60	32.41	46.00	-13.59	-	-	peak

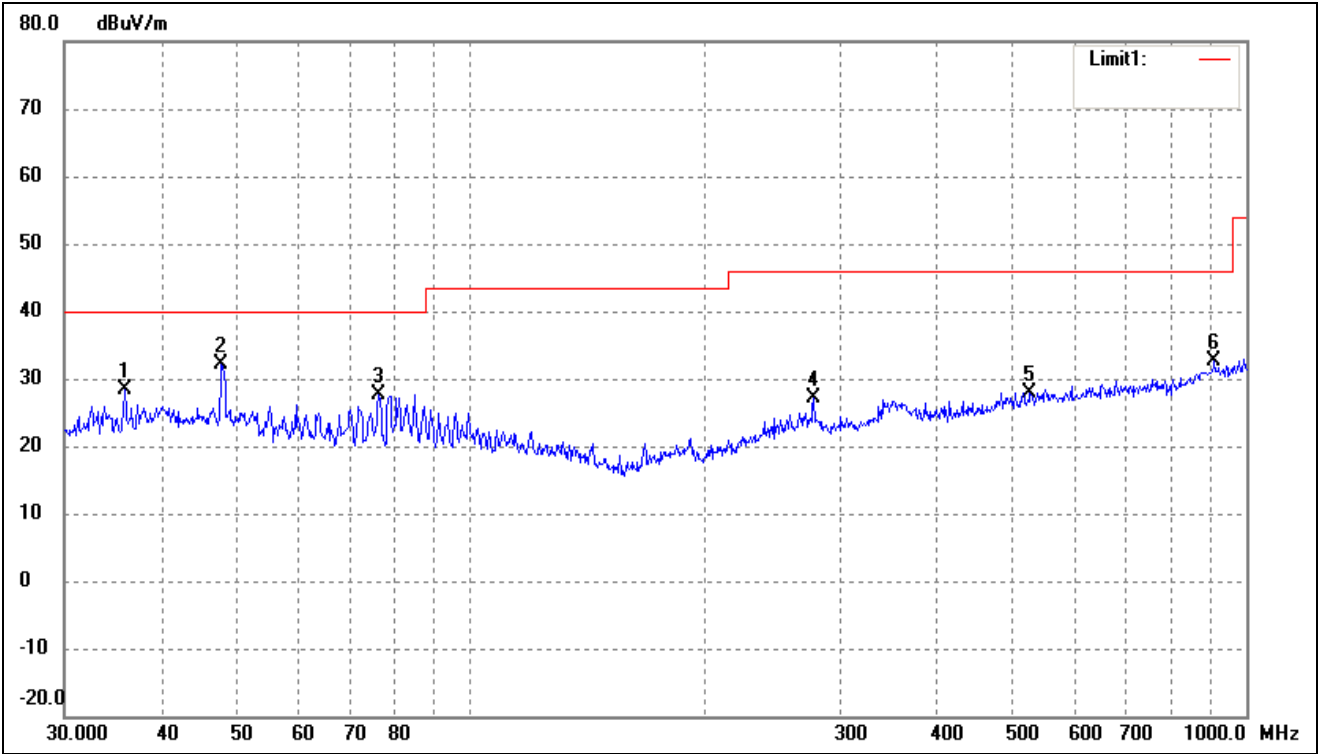
➤ 2M(Chip~ATS2835)

Test Channel	Low	Polarity:	Horizontal
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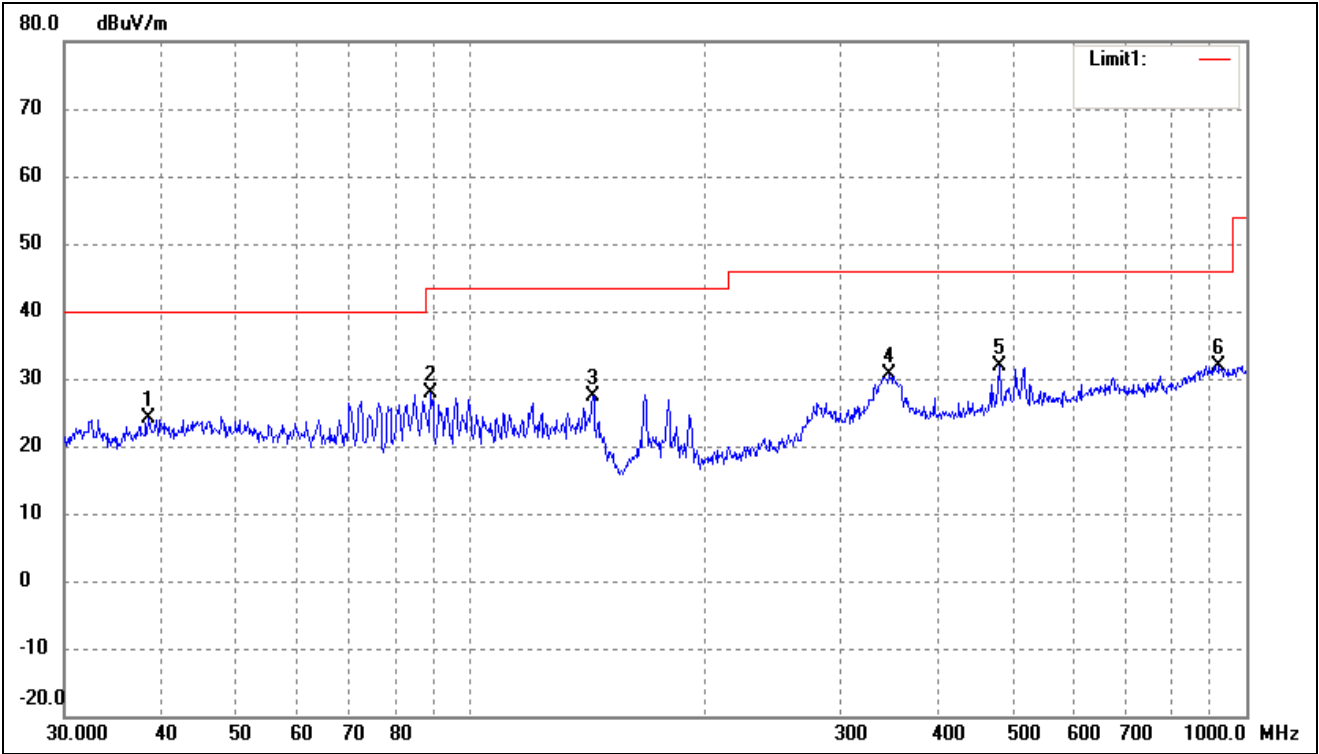
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	35.8746	41.98	-13.54	28.44	40.00	-11.56	-	-	peak
2	47.9940	44.25	-11.63	32.62	40.00	-7.38	-	-	peak
3	78.6888	44.80	-16.60	28.20	40.00	-11.80	-	-	peak
4	346.8092	38.38	-7.63	30.75	46.00	-15.25	-	-	peak
5	515.4374	35.35	-4.12	31.23	46.00	-14.77	-	-	peak
6	909.6667	31.02	1.67	32.69	46.00	-13.31	-	-	peak

Test Channel	Low	Polarity:	Vertical
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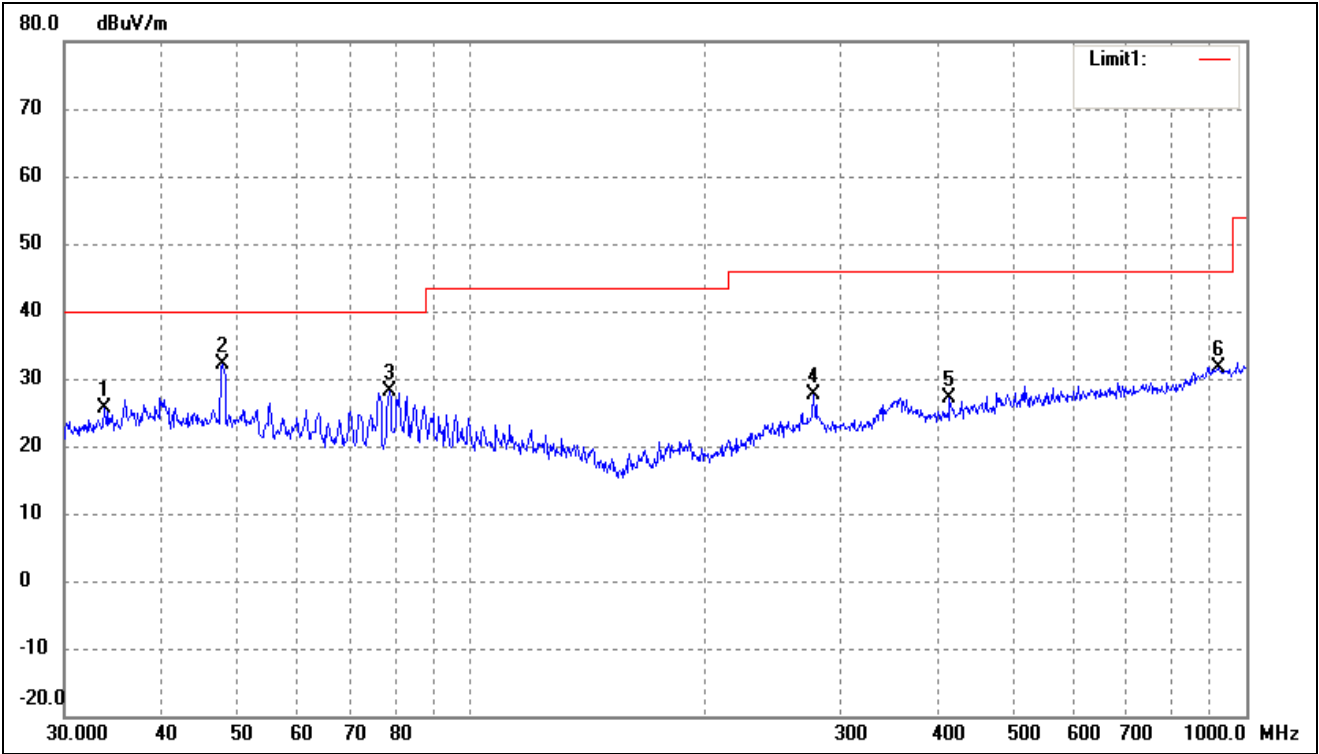
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	35.8746	41.98	-13.54	28.44	40.00	-11.56	-	-	peak
2	47.8260	43.83	-11.64	32.19	40.00	-7.81	-	-	peak
3	76.2442	43.76	-16.23	27.53	40.00	-12.47	-	-	peak
4	277.0935	37.81	-10.61	27.20	46.00	-18.80	-	-	peak
5	526.3967	32.13	-4.15	27.98	46.00	-18.02	-	-	peak
6	909.6667	31.02	1.67	32.69	46.00	-13.31	-	-	peak

Test Channel	Middle	Polarity:	Horizontal
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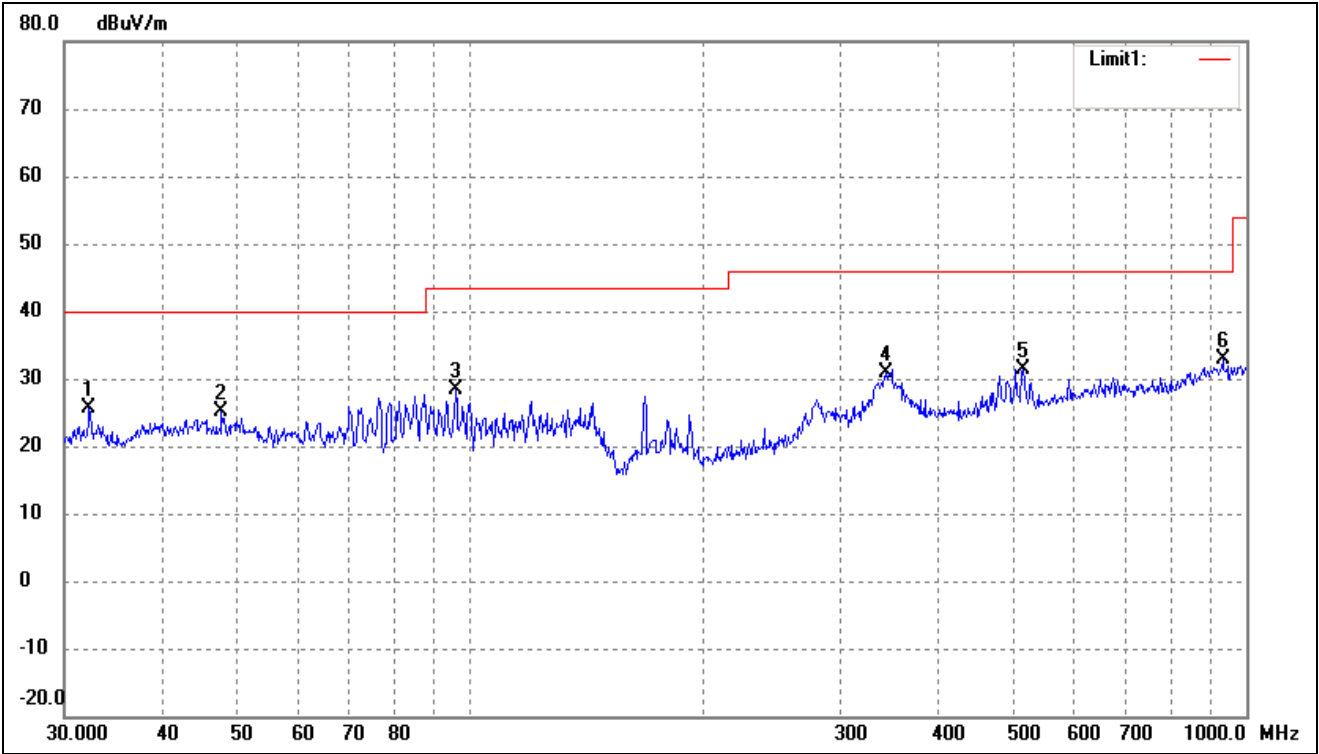
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	38.4809	36.64	-12.56	24.08	40.00	-15.92	-	-	peak
2	88.9639	43.14	-15.18	27.96	43.50	-15.54	-	-	peak
3	143.8295	43.43	-15.94	27.49	43.50	-16.01	-	-	peak
4	346.8092	38.20	-7.63	30.57	46.00	-15.43	-	-	peak
5	480.5276	36.61	-4.64	31.97	46.00	-14.03	-	-	peak
6	922.5157	30.15	1.83	31.98	46.00	-14.02	-	-	peak

Test Channel	Middle	Polarity:	Vertical
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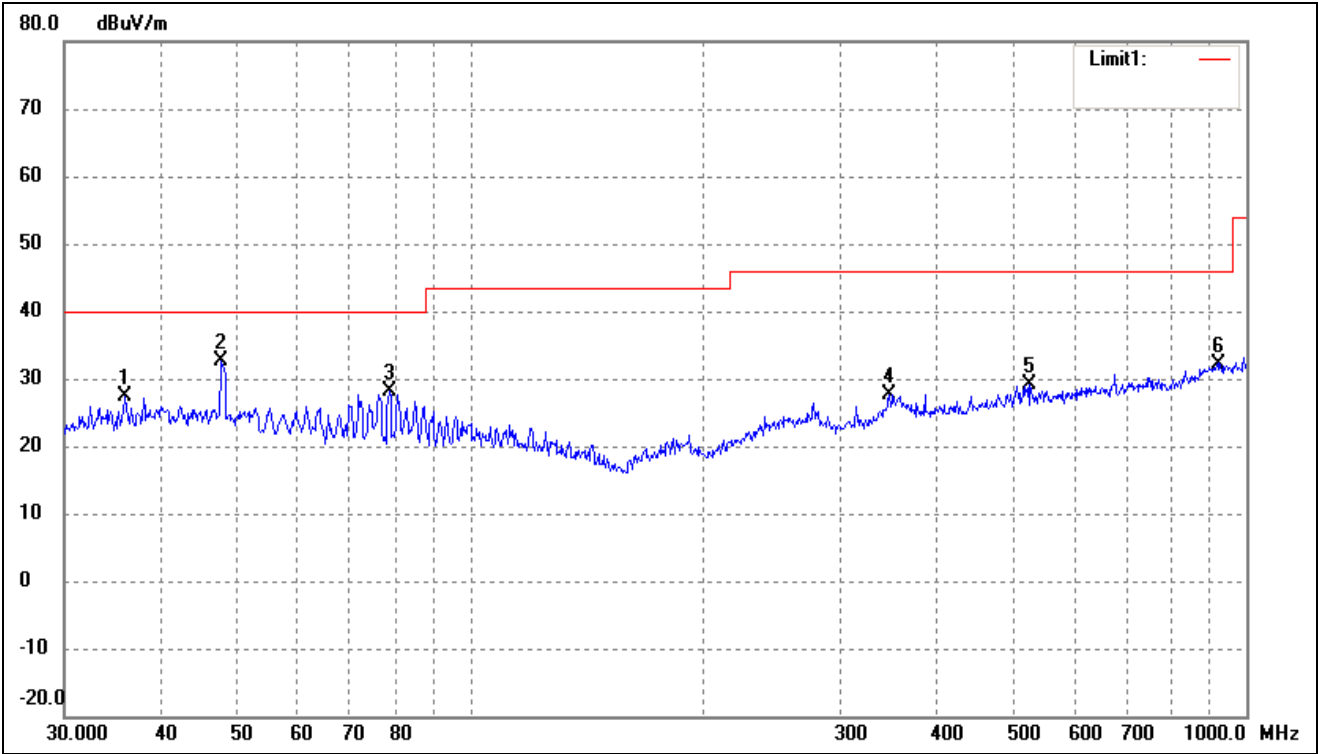
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	33.7986	39.51	-13.94	25.57	40.00	-14.43	-	-	peak
2	47.9940	43.64	-11.63	32.01	40.00	-7.99	-	-	peak
3	78.6888	44.63	-16.60	28.03	40.00	-11.97	-	-	peak
4	277.0935	38.13	-10.61	27.52	46.00	-18.48	-	-	peak
5	414.7223	33.35	-6.12	27.23	46.00	-18.77	-	-	peak
6	922.5157	29.91	1.83	31.74	46.00	-14.26	-	-	peak

Test Channel	High	Polarity:	Horizontal
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No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	32.2925	39.59	-14.03	25.56	40.00	-14.44	-	-	peak
2	47.8260	36.66	-11.64	25.02	40.00	-14.98	-	-	peak
3	95.7622	42.42	-14.03	28.39	43.50	-15.11	-	-	peak
4	343.1800	38.69	-7.84	30.85	46.00	-15.15	-	-	peak
5	515.4374	35.40	-4.12	31.28	46.00	-14.72	-	-	peak
6	932.2715	31.09	1.71	32.80	46.00	-13.20	-	-	peak

Test Channel	High	Polarity:	Vertical
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No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	35.8746	40.82	-13.54	27.28	40.00	-12.72	-	-	peak
2	47.8260	44.32	-11.64	32.68	40.00	-7.32	-	-	peak
3	78.6888	44.85	-16.60	28.25	40.00	-11.75	-	-	peak
4	346.8091	35.35	-7.63	27.72	46.00	-18.28	-	-	peak
5	526.3967	33.26	-4.15	29.11	46.00	-16.89	-	-	peak
6	922.5157	30.42	1.83	32.25	46.00	-13.75	-	-	peak

Remark: ‘-’Means’ the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

➤ Spurious Emissions Above 1GHz

1M(Chip~ATS2835)

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2402MHz							
4804.000	50.95	-4.52	46.43	74.00	-27.57	H	PK
7206.000	50.53	-2.20	48.33	74.00	-25.67	H	PK
4804.000	51.19	-4.52	46.67	74.00	-27.33	V	PK
7206.000	50.09	-2.20	47.89	74.00	-26.11	V	PK
Middle Channel-2440MHz							
4880.000	51.21	-4.47	46.74	74.00	-27.26	H	PK
7320.000	49.81	-2.17	47.64	74.00	-26.36	H	PK
4880.000	53.66	-4.47	49.19	74.00	-24.81	V	PK
7320.000	48.97	-2.17	46.80	74.00	-27.20	V	PK
High Channel-2480MHz							
4958.678	54.30	-4.41	49.89	74.00	-24.11	H	PK
7440.000	49.84	-2.14	47.70	74.00	-26.30	H	PK
4958.678	56.05	-4.41	51.64	74.00	-22.36	V	PK
7440.000	50.44	-2.14	48.30	74.00	-25.70	V	PK

2M(Chip~ATS2835)

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2402MHz							
4804.000	50.79	-4.52	46.27	74.00	-27.73	H	PK
7206.000	50.35	-2.20	48.15	74.00	-25.85	H	PK
4804.000	51.11	-4.52	46.59	74.00	-27.41	V	PK
7206.000	50.93	-2.20	48.73	74.00	-25.27	V	PK
Middle Channel-2440MHz							
4880.000	51.52	-4.47	47.05	74.00	-26.95	H	PK
7320.000	48.98	-2.17	46.81	74.00	-27.19	H	PK
4880.000	53.06	-4.47	48.59	74.00	-25.41	V	PK
7320.000	48.86	-2.17	46.69	74.00	-27.31	V	PK
High Channel-2480MHz							
4960.000	51.34	-4.41	46.93	74.00	-27.07	H	PK
7440.000	50.12	-2.14	47.98	74.00	-26.02	H	PK
4958.678	55.57	-4.41	51.16	74.00	-22.84	V	PK
7440.000	49.57	-2.14	47.43	74.00	-26.57	V	PK

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

8. Out of Band Emissions

8.1 Standard Applicable

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

8.2 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.11, the Emissions in nonrestricted frequency bands test method as follows:

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW $\geq [3 \times \text{RBW}]$.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

According to the KDB 558074 D01 v05r02 Subclause 8.5 and ANSI C63.10-2013 Subclause 11.12, the Emissions in restricted frequency bands test method as follows:

A. Radiated emission measurements:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement

KDB publication number: 913591 may be used for the radiated bandedge measurements.

B. Antenna-port conducted measurements

Peak emission levels are measured by setting the instrument as follows:

- a) RBW = as specified in Table 9.
- b) $VBW \geq [3 \times RBW]$.
- c) Detector = peak.
- d) Sweep time = auto.
- e) Trace mode = max hold.
- f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be lengthened for low-duty-cycle applications.)

RBW as a function of frequency

Frequency	RBW
9kHz to 150kHz	200Hz to 300Hz
0.15MHz to 30MHz	9kHz to 10kHz
30MHz to 1000MHz	100kHz to 120kHz
>1000MHz	1MHz

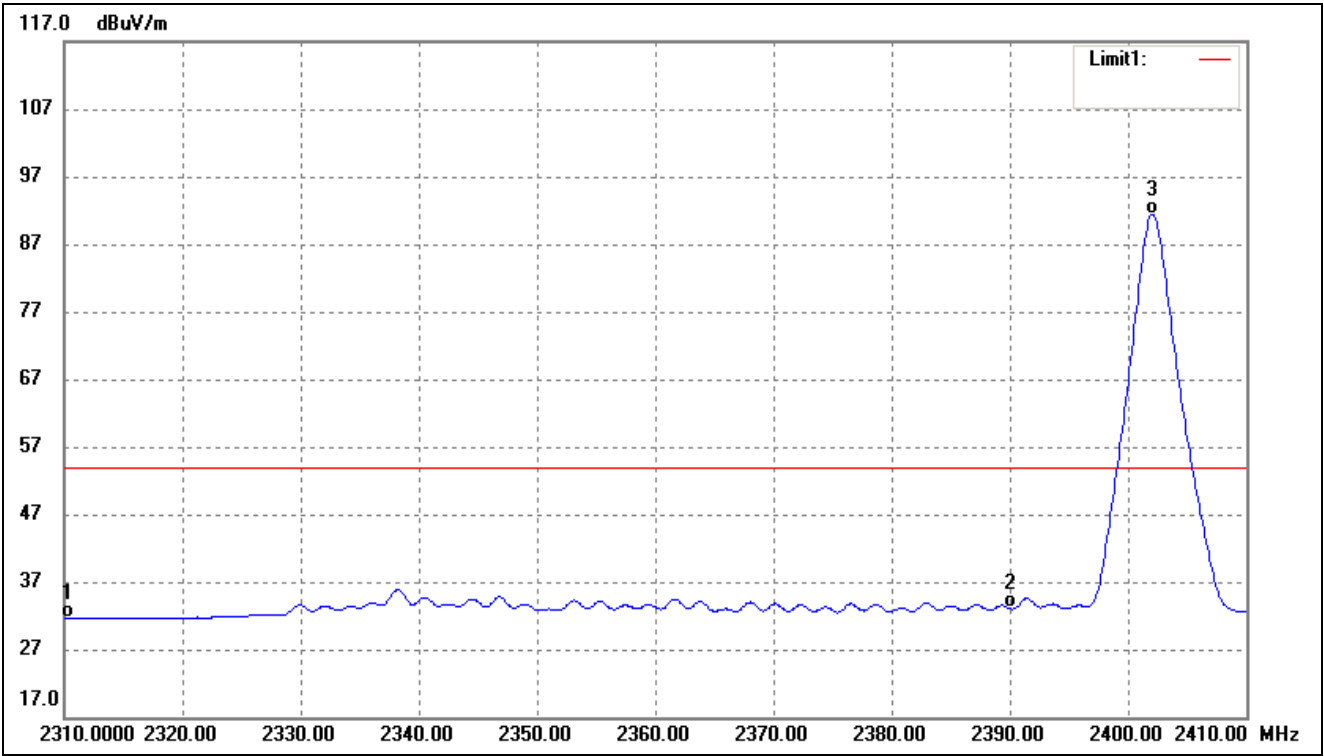
If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

8.3 Summary of Test Results/Plots

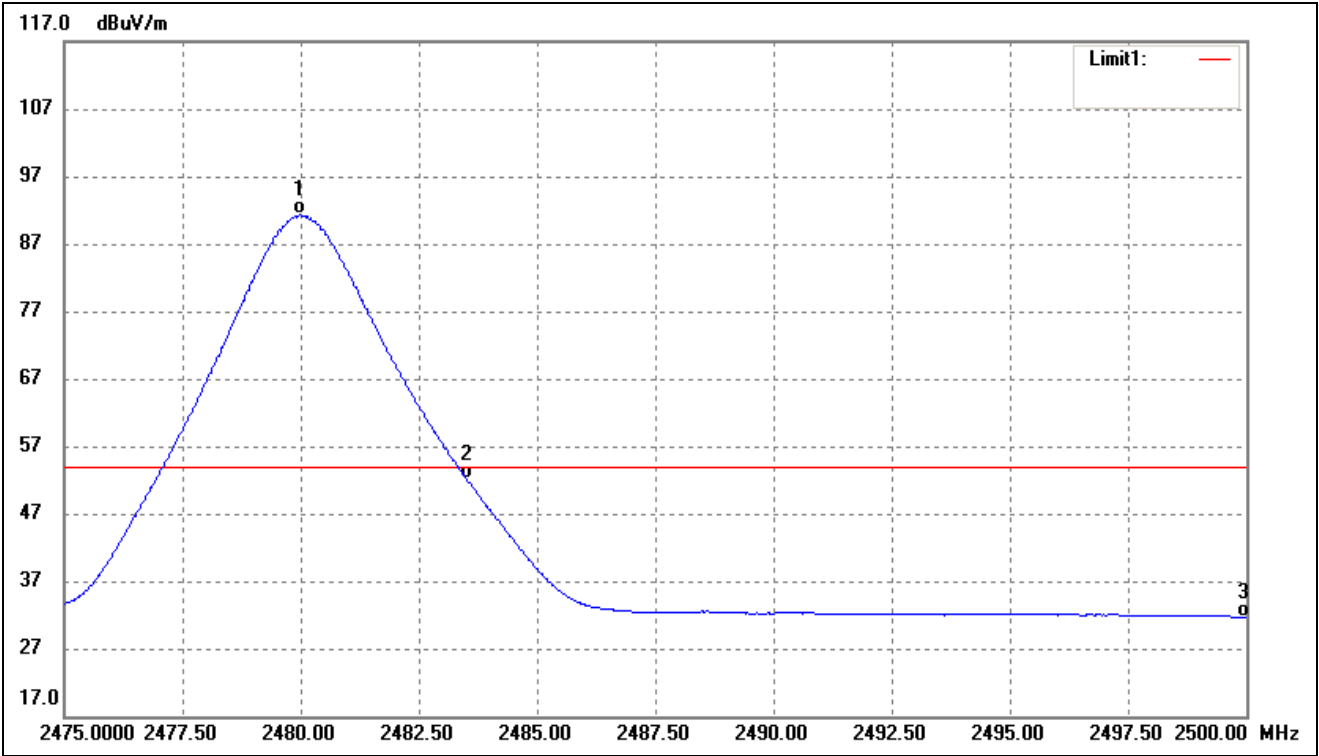
- Radiated test
- 1M(Chip~ATS2835)

Test Channel	Low	Polarity:	Horizontal (worst case)
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.24	-9.66	31.58	54.00	-22.42	Average Detector
	2310.000	52.88	-9.66	43.22	74.00	-30.78	Peak Detector
2	2390.000	42.57	-9.50	33.07	54.00	-20.93	Average Detector
	2390.000	55.91	-9.50	46.41	74.00	-27.59	Peak Detector
3	2402.000	100.92	-9.47	91.45	/	/	Average Detector
	2402.200	104.47	-9.47	95.00	/	/	Peak Detector

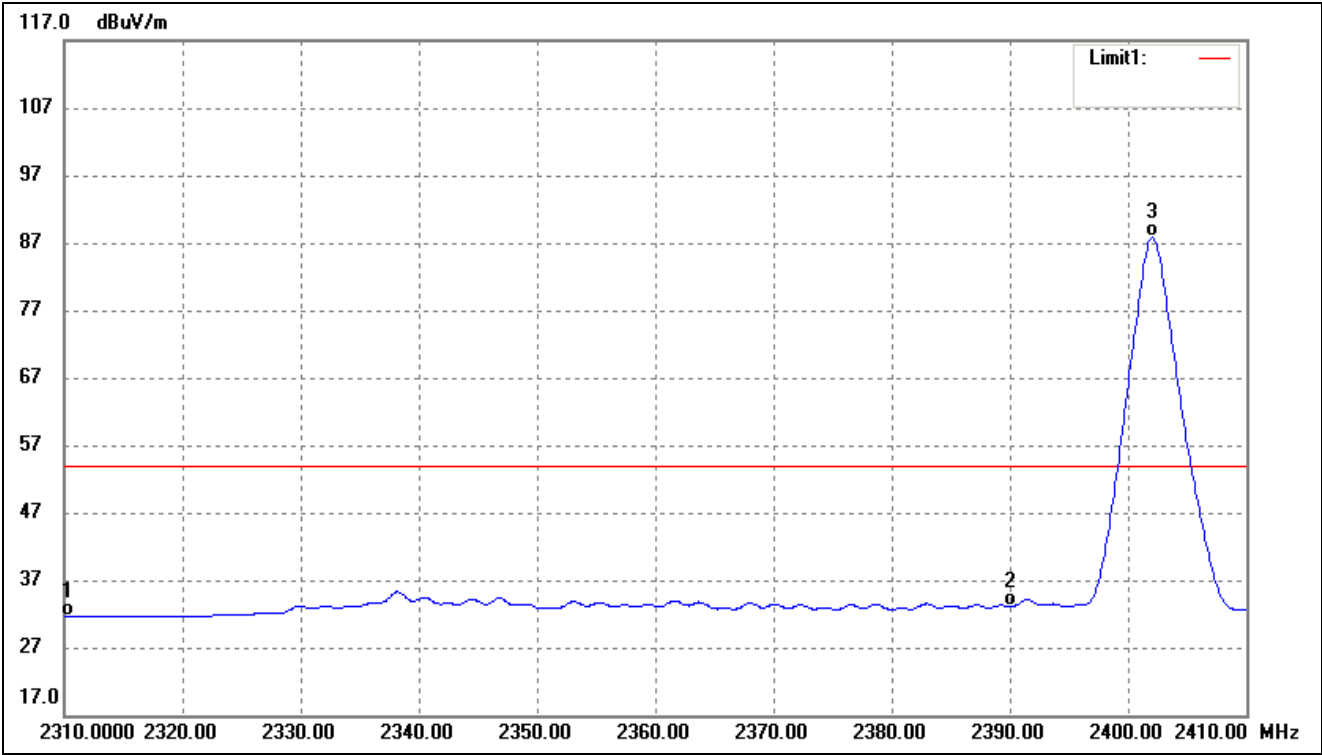
Test Channel	High	Polarity:	Horizontal (worst case)
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.975	100.60	-9.32	91.28	/	/	Average Detector
	2480.125	104.13	-9.32	94.81	/	/	Peak Detector
2	2483.500	61.52	-9.31	52.21	54.00	-1.79	Average Detector
	2483.500	66.71	-9.31	57.40	74.00	-16.60	Peak Detector
3	2500.000	40.96	-9.28	31.68	54.00	-22.32	Average Detector
	2500.000	53.03	-9.28	43.75	74.00	-30.25	Peak Detector

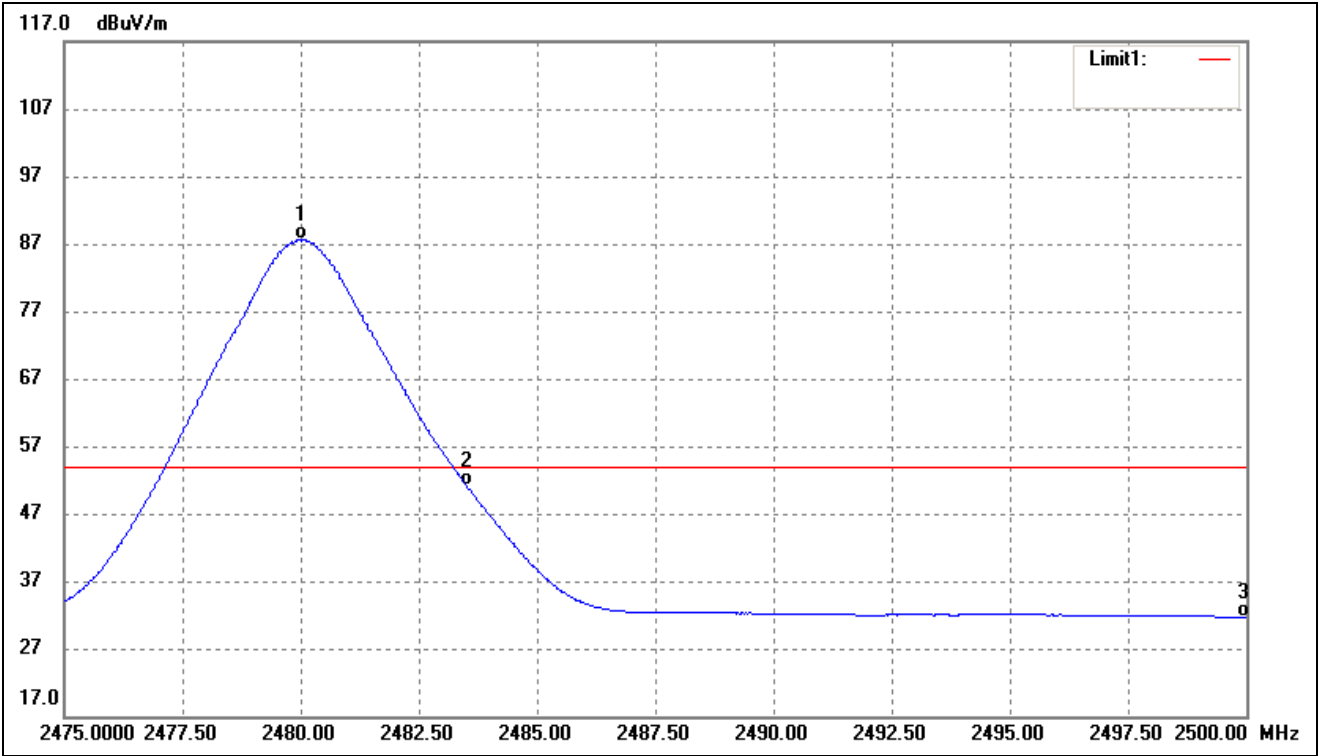
➤ 2M(Chip~ATS2835)

Test Channel	Low	Polarity:	Horizontal (worst case)
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.28	-9.66	31.62	54.00	-22.38	Average Detector
	2310.000	53.03	-9.66	43.37	74.00	-30.63	Peak Detector
2	2390.000	42.61	-9.50	33.11	54.00	-20.89	Average Detector
	2390.000	54.48	-9.50	44.98	74.00	-29.02	Peak Detector
3	2402.100	97.35	-9.47	87.88	/	/	Average Detector
	2402.500	104.42	-9.47	94.95	/	/	Peak Detector

Test Channel	High	Polarity:	Horizontal (worst case)
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	97.03	-9.32	87.71	/	/	Average Detector
	2480.500	103.94	-9.32	94.62	/	/	Peak Detector
2	2483.500	60.56	-9.31	51.25	54.00	-2.75	Average Detector
	2483.500	69.52	-9.31	60.21	74.00	-13.79	Peak Detector
3	2500.000	40.94	-9.28	31.66	54.00	-22.34	Average Detector
	2500.000	53.59	-9.28	44.31	74.00	-29.69	Peak Detector

➤ Conducted test

Please refer to Appendix D

9. Conducted Emissions

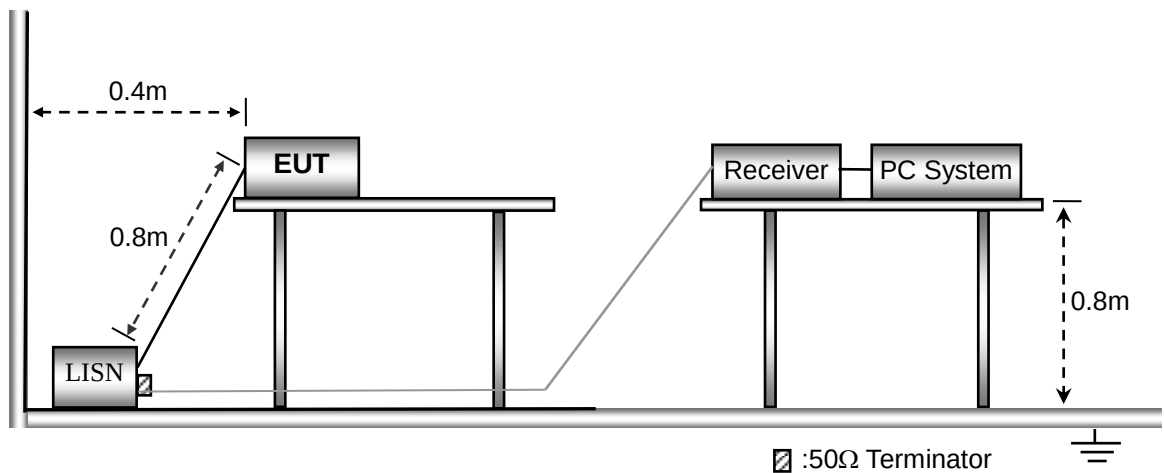
9.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

9.2 Basic Test Setup Block Diagram



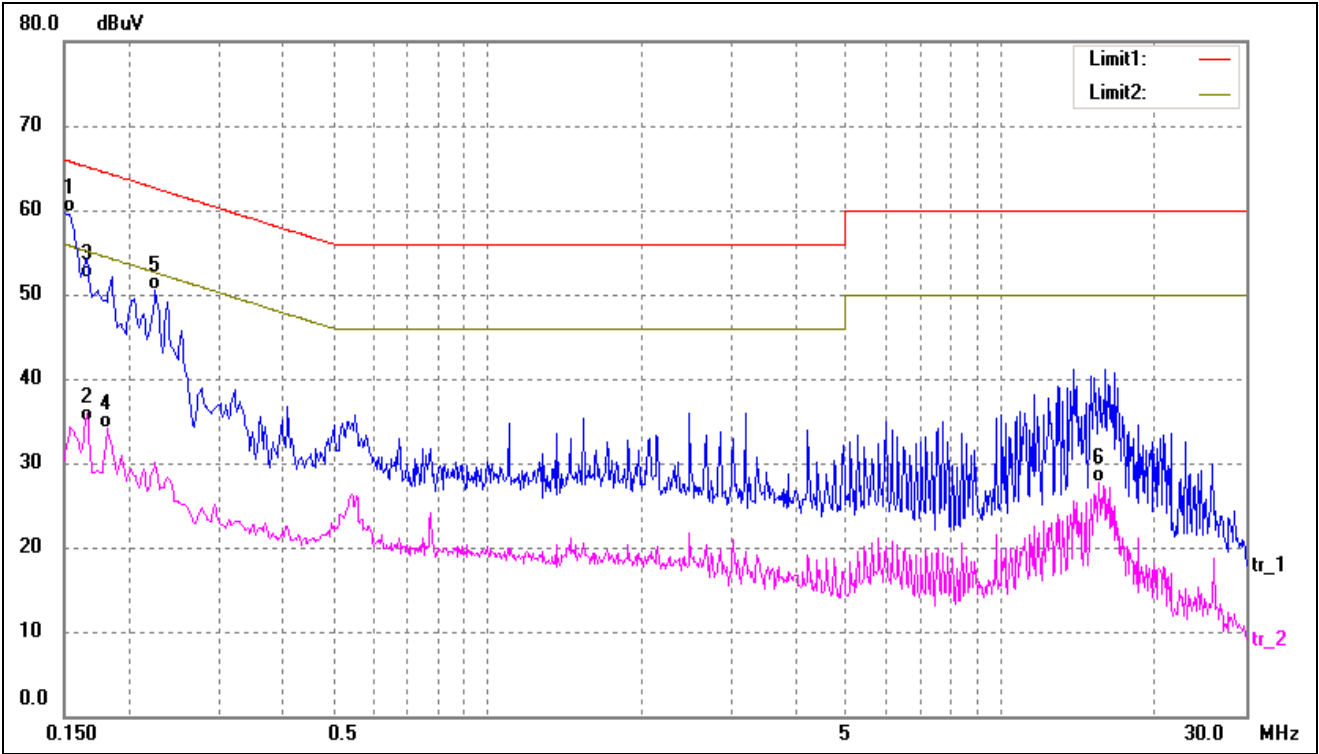
9.3 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency	150 kHz
Stop Frequency	30 MHz
Sweep Speed	Auto
IF Bandwidth.....	10 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Quasi-Peak Adapter Mode	Normal

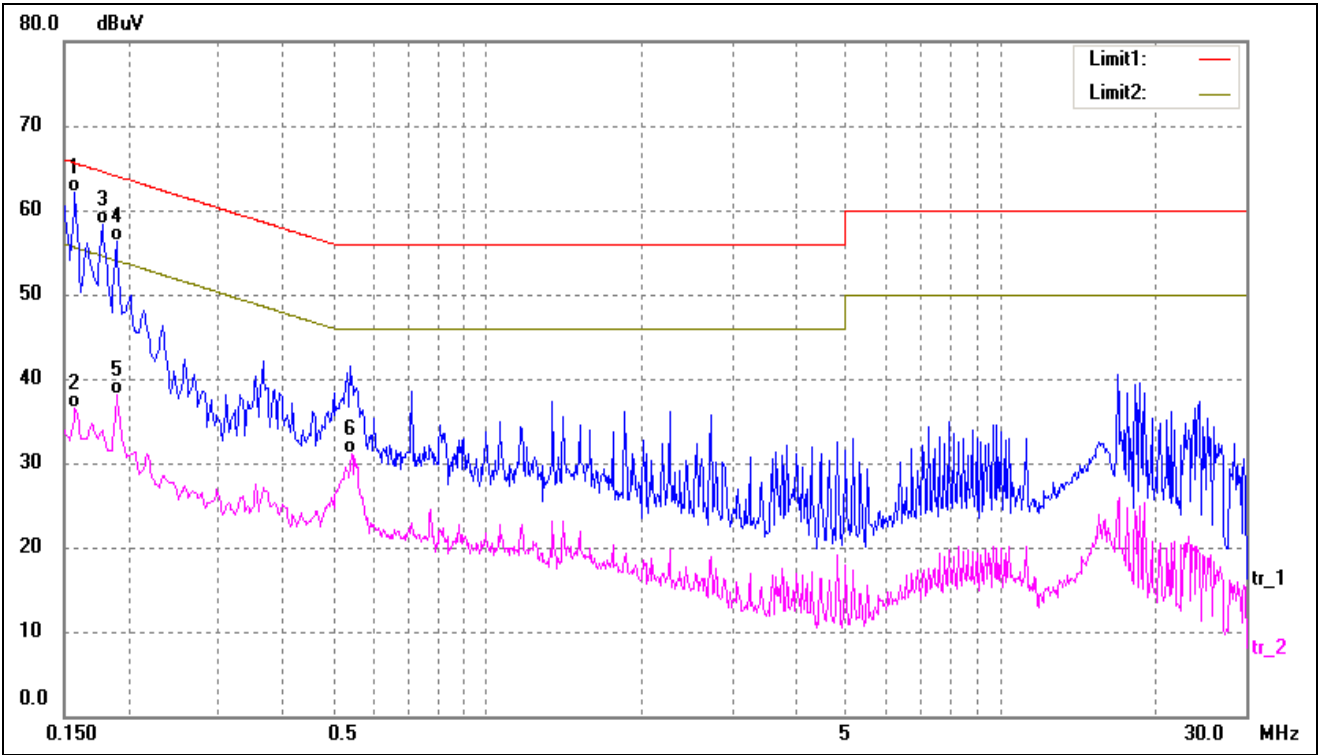
9.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1500	49.38	10.25	59.63	65.99	-6.36	QP
2	0.1650	24.57	10.25	34.82	55.20	-20.38	AVG
3	0.1677	41.68	10.25	51.93	65.07	-13.14	QP
4	0.1819	23.76	10.26	34.02	54.39	-20.37	AVG
5	0.2260	40.27	10.26	50.53	62.59	-12.06	QP
6	15.5140	17.20	10.58	27.78	50.00	-22.22	AVG

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1580	51.82	10.25	62.07	65.56	-3.49	QP
2	0.1580	26.33	10.25	36.58	55.56	-18.98	AVG
3	0.1780	48.13	10.26	58.39	64.57	-6.18	QP
4	0.1900	46.12	10.26	56.38	64.03	-7.65	QP
5	0.1900	27.78	10.26	38.04	54.03	-15.99	AVG
6	0.5460	20.87	10.21	31.08	46.00	-14.92	AVG

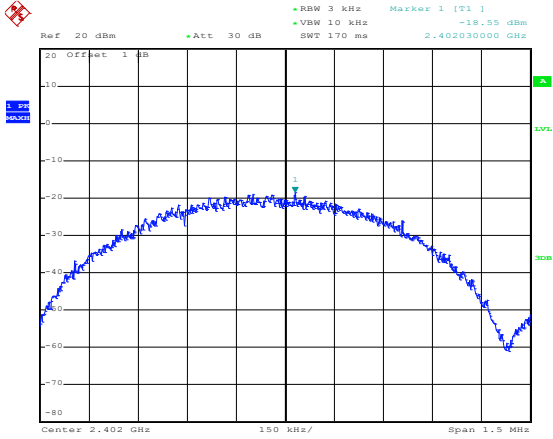
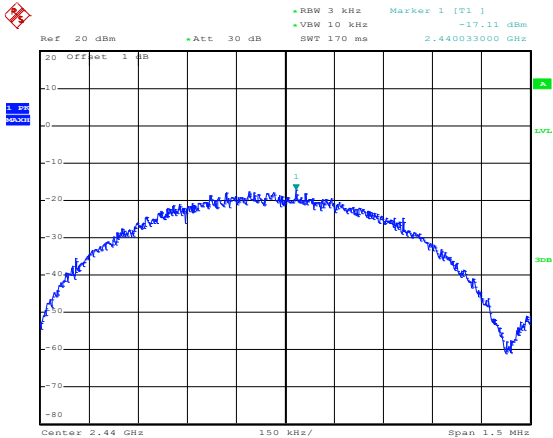
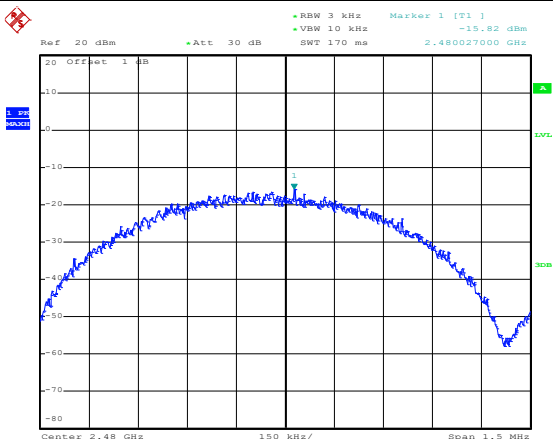
APPENDIX SUMMARY

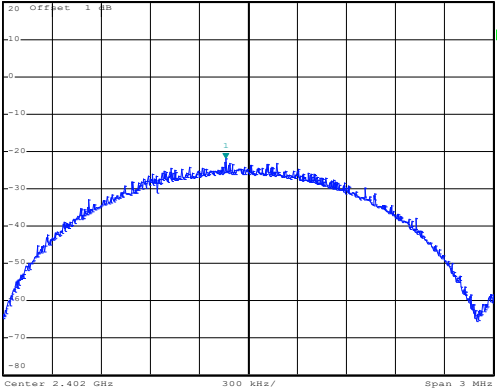
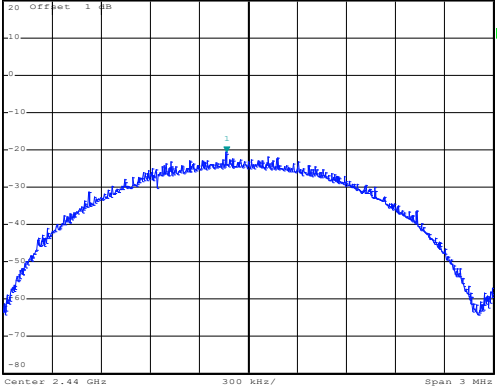
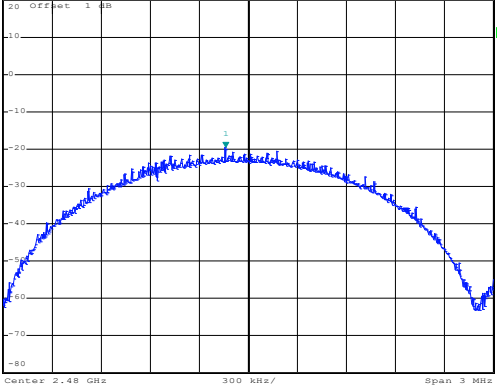
Project No.	WTX20X11083933W	Test Engineer	Moon
Start date	2020/11/20	Finish date	2020/11/20
Temperature	24.9℃	Humidity	55%

APPENDIX	Description of Test Item	Result
A	Power Spectral Density	Compliant
B	DTS Bandwidth	Compliant
C	RF Output Power	Compliant
D	Conducted Out of Band Emissions	Compliant

APPENDIX A

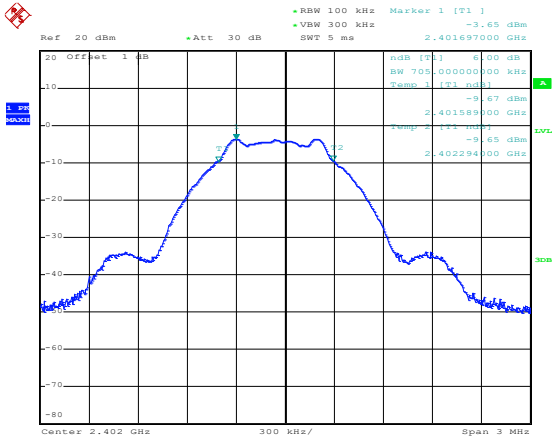
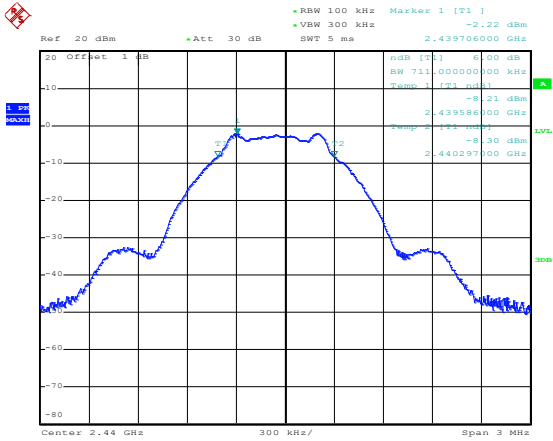
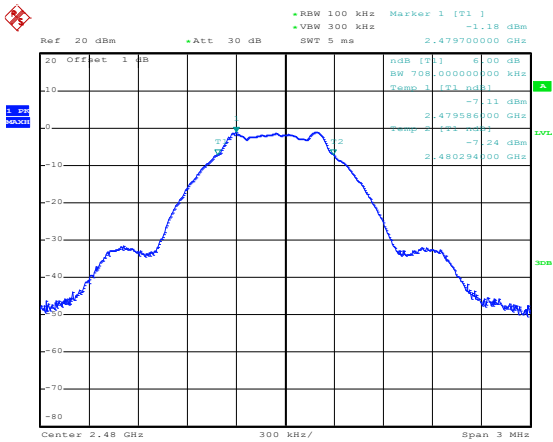
Power Spectral Density			
Test Mode	Test Channel	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
1MGFSK(BLE)	Low	-18.55	8
	Middle	-17.11	8
	High	-15.82	8
2MGFSK(BLE)	Low	-21.79	8
	Middle	-20.45	8
	High	-19.41	8

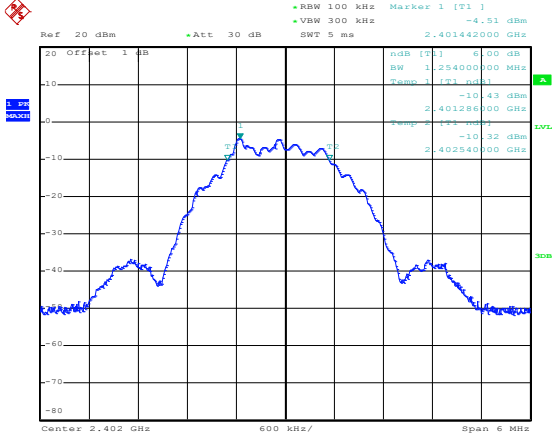
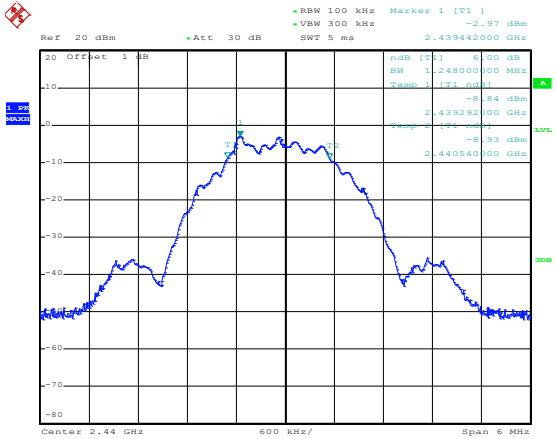
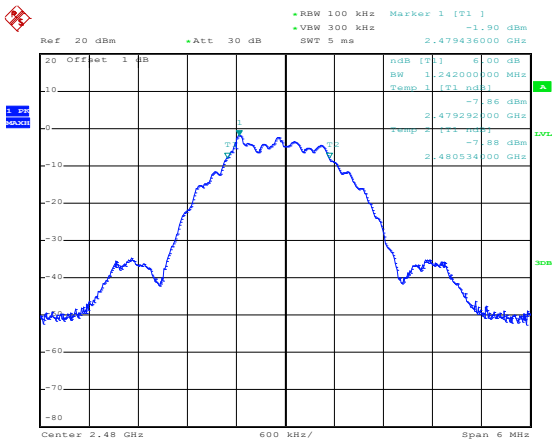
1MLow	 Ref: 20 dBm Att: 30 dB RBW: 3 kHz VBW: 10 kHz SWT: 170 ms Marker 1 [T1]: -18.55 dBm 2.402030000 GHz Center: 2.402 GHz Span: 1.5 MHz Date: 20.NOV.2020 08:43:51
1MMiddle	 Ref: 20 dBm Att: 30 dB RBW: 3 kHz VBW: 10 kHz SWT: 170 ms Marker 1 [T1]: -17.11 dBm 2.440030000 GHz Center: 2.44 GHz Span: 1.5 MHz Date: 20.NOV.2020 08:44:12
1MHigh	 Ref: 20 dBm Att: 30 dB RBW: 3 kHz VBW: 10 kHz SWT: 170 ms Marker 1 [T1]: -15.82 dBm 2.480037000 GHz Center: 2.48 GHz Span: 1.5 MHz Date: 20.NOV.2020 08:44:43

2MLow	 Date: 20.NOV.2020 08:56:24
2MMiddle	 Date: 20.NOV.2020 08:56:37
2MHigh	 Date: 20.NOV.2020 08:56:52

APPENDIX B

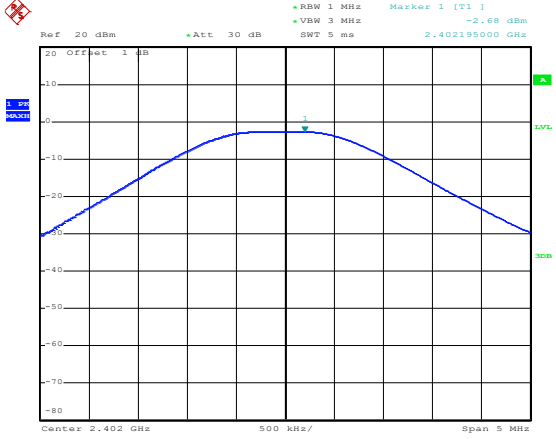
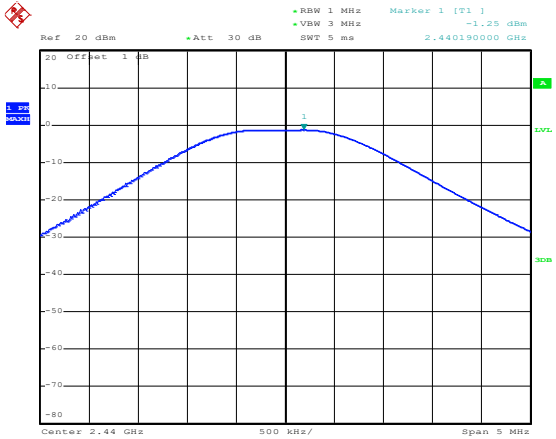
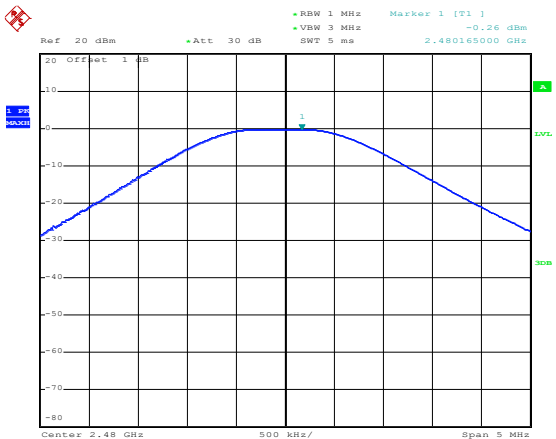
Test Mode	Test Channel	6 dB Bandwidth kHz	Limit kHz
1MGFSK(BLE)	Low	705	≥500
	Middle	711	≥500
	High	708	≥500
2MGFSK(BLE)	Low	1254	≥500
	Middle	1248	≥500
	High	1242	≥500

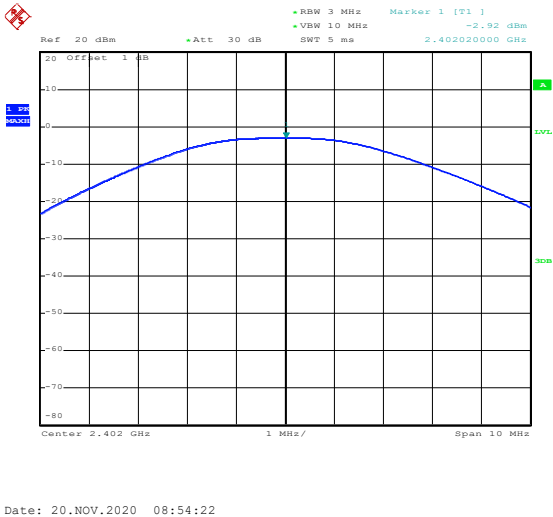
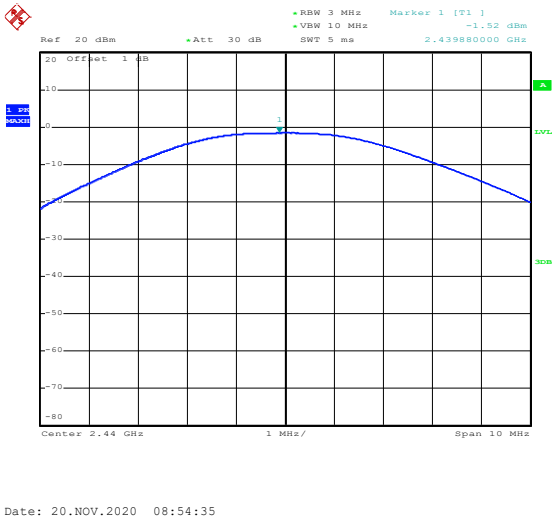
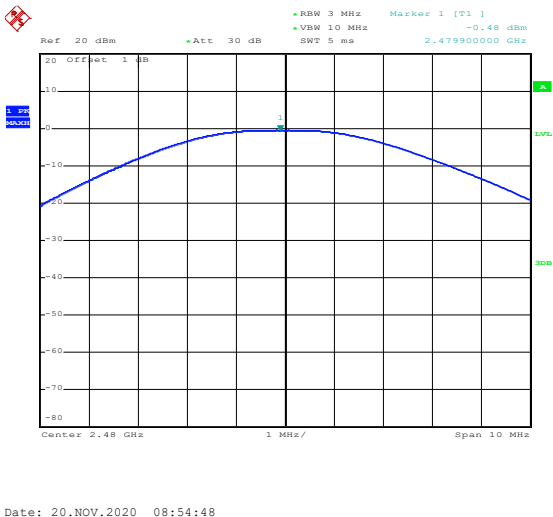
1MLow	 Ref 20 dBm Att 30 dB RBW 100 kHz VBW 300 kHz SWT 5 ms Marker 1 [T1] -3.65 dBm 2.401697000 GHz ndB [T1] 6.00 dB BW 705.00000000 kHz Temp 1 [T1] -3.67 dBm 2.401697000 GHz -9.65 dBm 2.402294000 GHz Center 2.402 GHz 300 kHz/ Span 3 MHz Date: 20.NOV.2020 08:49:34
1MMiddle	 Ref 20 dBm Att 30 dB RBW 100 kHz VBW 300 kHz SWT 5 ms Marker 1 [T1] -2.22 dBm 2.439706000 GHz ndB [T1] 6.00 dB BW 711.00000000 kHz Temp 1 [T1] -2.21 dBm 2.439586000 GHz -8.30 dBm 2.440297000 GHz Center 2.44 GHz 300 kHz/ Span 3 MHz Date: 20.NOV.2020 08:49:58
1MHigh	 Ref 20 dBm Att 30 dB RBW 100 kHz VBW 300 kHz SWT 5 ms Marker 1 [T1] -1.18 dBm 2.479700000 GHz ndB [T1] 6.00 dB BW 708.00000000 kHz Temp 1 [T1] -1.13 dBm 2.479586000 GHz -7.24 dBm 2.480294000 GHz Center 2.48 GHz 300 kHz/ Span 3 MHz Date: 20.NOV.2020 08:50:17

2MLow	 Ref: 20 dBm Att: 30 dB RBW: 100 kHz VBW: 300 kHz SWT: 5 ms Marker 1 [T1] -4.53 dBm 2.401442000 GHz ndB [T1] 6.00 dB BW 1.254000000 MHz Temp 1 [T1] ndB ndB [T2] -10.43 dBm 2.401286000 GHz Temp 2 [T2] ndB ndB [T3] -10.32 dBm 2.402540000 GHz Center 2.402 GHz 600 kHz/ Span 6 MHz Date: 20.NOV.2020 08:59:41
2MMiddle	 Ref: 20 dBm Att: 30 dB RBW: 100 kHz VBW: 300 kHz SWT: 5 ms Marker 1 [T1] -2.97 dBm 2.439442000 GHz ndB [T1] 6.00 dB BW 1.248000000 MHz Temp 1 [T1] ndB ndB [T2] -8.84 dBm 2.439292000 GHz Temp 2 [T2] ndB ndB [T3] -8.93 dBm 2.440540000 GHz Center 2.44 GHz 600 kHz/ Span 6 MHz Date: 20.NOV.2020 09:00:04
2MHigh	 Ref: 20 dBm Att: 30 dB RBW: 100 kHz VBW: 300 kHz SWT: 5 ms Marker 1 [T1] -1.90 dBm 2.479436000 GHz ndB [T1] 6.00 dB BW 1.242000000 MHz Temp 1 [T1] ndB ndB [T2] -7.86 dBm 2.479292000 GHz Temp 2 [T2] ndB ndB [T3] -7.88 dBm 2.480534000 GHz Center 2.48 GHz 600 kHz/ Span 6 MHz Date: 20.NOV.2020 09:00:25

APPENDIX C

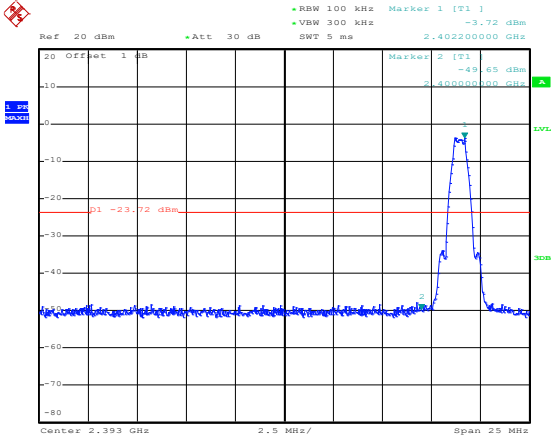
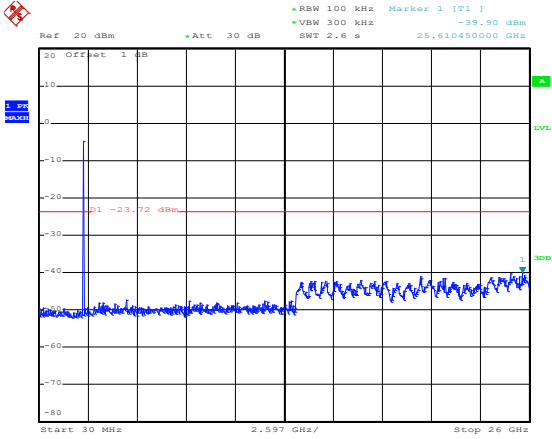
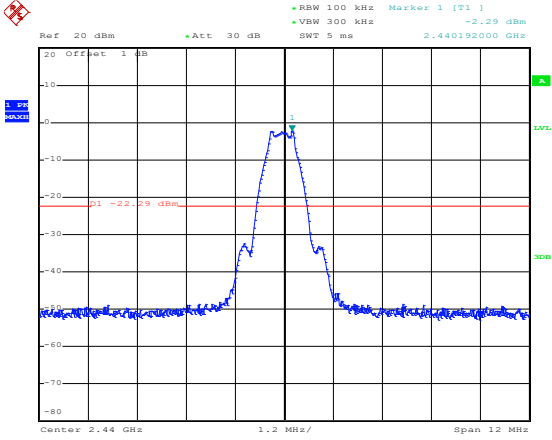
RF Output Power			
Test Mode	Test Channel	Reading dBm	Limit dBm
1MGFSK(BLE)	Low	-2.68	30.00
	Middle	-1.25	30.00
	High	-0.26	30.00
2MGFSK(BLE)	Low	-2.92	30.00
	Middle	-1.52	30.00
	High	-0.48	30.00

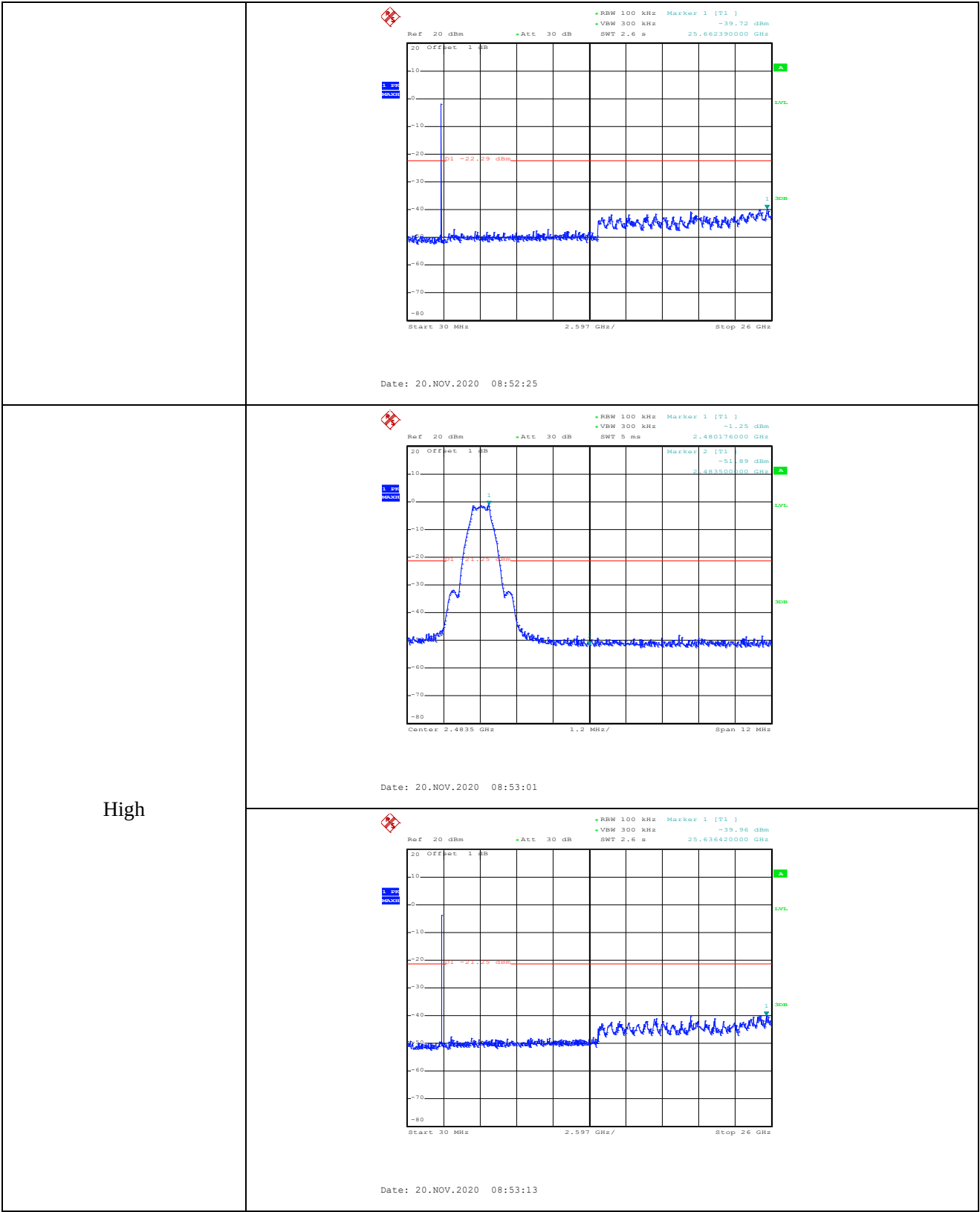
1MLow	 Ref: 20 dBm Att: 30 dB RBW 1 MHz VBW 3 MHz SWT 5 ms Marker 1 [T1] -2.68 dBm 2.402195000 GHz Center 2.402 GHz 500 kHz/ Span 5 MHz Date: 20.NOV.2020 08:41:09
1MMiddle	 Ref: 20 dBm Att: 30 dB RBW 1 MHz VBW 3 MHz SWT 5 ms Marker 1 [T1] -1.25 dBm 2.440190000 GHz Center 2.44 GHz 500 kHz/ Span 5 MHz Date: 20.NOV.2020 08:41:51
1MHigh	 Ref: 20 dBm Att: 30 dB RBW 1 MHz VBW 3 MHz SWT 5 ms Marker 1 [T1] -0.26 dBm 2.480165000 GHz Center 2.48 GHz 500 kHz/ Span 5 MHz Date: 20.NOV.2020 08:42:08

2MLow	 Ref: 20 dBm Att: 30 dB RBW 3 MHz VBW 10 MHz SWT 5 ms Marker 1 [T1] -2.92 dBm 2.402020000 GHz Center 2.402 GHz 1 MHz/ Span 10 MHz Date: 20.NOV.2020 08:54:22
2MMiddle	 Ref: 20 dBm Att: 30 dB RBW 3 MHz VBW 10 MHz SWT 5 ms Marker 1 [T1] -1.52 dBm 2.439880000 GHz Center 2.44 GHz 1 MHz/ Span 10 MHz Date: 20.NOV.2020 08:54:35
2MHigh	 Ref: 20 dBm Att: 30 dB RBW 3 MHz VBW 10 MHz SWT 5 ms Marker 1 [T1] -0.48 dBm 2.479900000 GHz Center 2.48 GHz 1 MHz/ Span 10 MHz Date: 20.NOV.2020 08:54:48

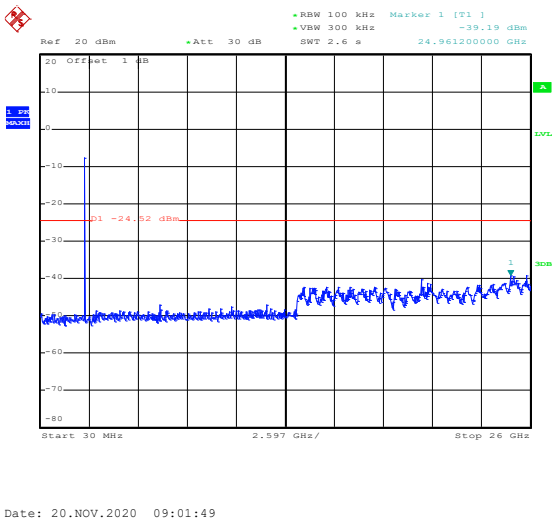
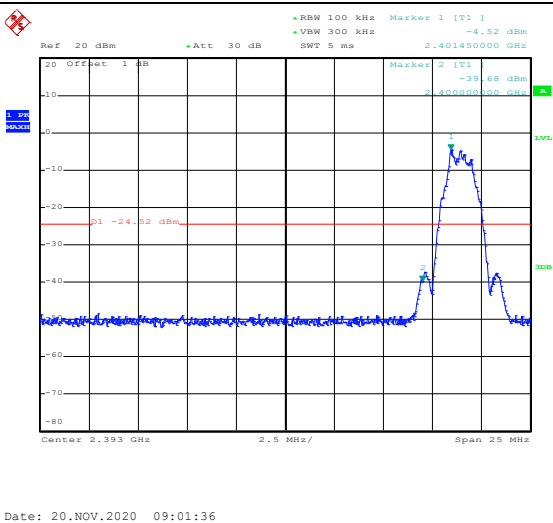
APPENDIX D

Conducted Out of Band Emissions

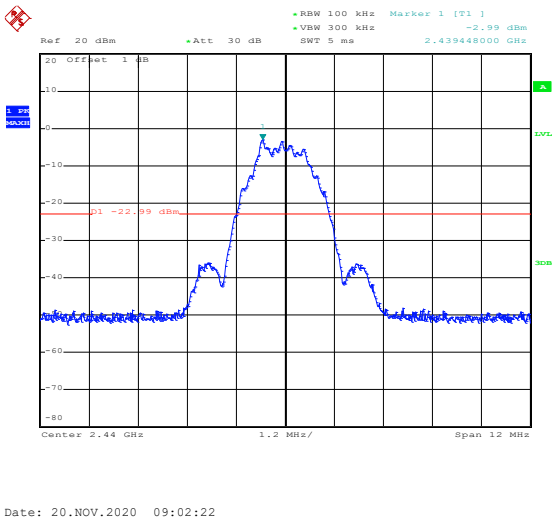
Low	 Date: 20.NOV.2020 08:51:36
	 Date: 20.NOV.2020 08:51:48
Middle	 Date: 20.NOV.2020 08:52:13

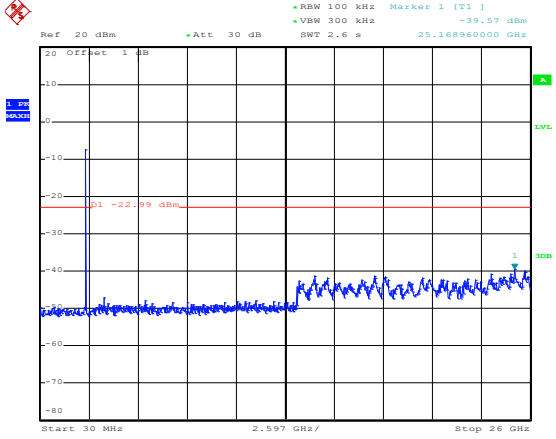
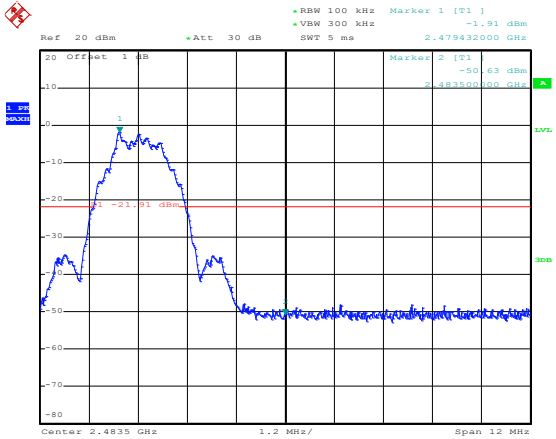
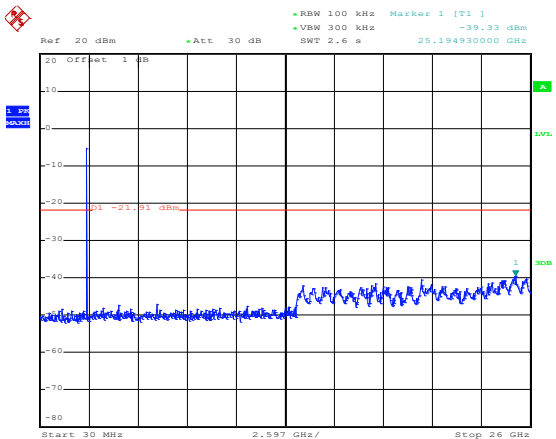


Low



Middle



	 Ref: 20 dBm •Att: 30 dB •RBW 100 kHz •VBW 300 kHz Marker 1 [T1] -39.57 dBm SWT 2.6 s 25.16896000 GHz Start 30 MHz 2.597 GHz/ Stop 26 GHz Date: 20.NOV.2020 09:02:34
High	 Ref: 20 dBm •Att: 30 dB •RBW 100 kHz •VBW 300 kHz Marker 1 [T1] -1.91 dBm Marker 2 [T2] -50.63 dBm SWT 5 ms 2.479432000 GHz Center 2.4835 GHz 1.2 MHz/ Span 12 MHz Date: 20.NOV.2020 09:03:09
	 Ref: 20 dBm •Att: 30 dB •RBW 100 kHz •VBW 300 kHz Marker 1 [T1] -39.33 dBm SWT 2.6 s 25.194930000 GHz Start 30 MHz 2.597 GHz/ Stop 26 GHz Date: 20.NOV.2020 09:03:23

APPENDIX PHOTOGRAPHS

Please refer to “ANNEX”

******* END OF REPORT *******