

TEST REPORT

Reference No..... : WTX21X04033440W-7
FCC ID : 2AMDJ-TC50
Applicant : Tersus GNSS Inc
Address : Room 305, Building 1, No.1228 Jinhu Road, China (Shanghai) Pilot Free Trade Zone
Product Name : TD-LTE Wireless Data Terminal
Test Model. : TC50
Standards : FCC Part 15.247
Date of Receipt sample : Apr.15, 2021
Date of Test..... : Apr.15, 2021 to May.13, 2021
Date of Issue : May.13, 2021
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.

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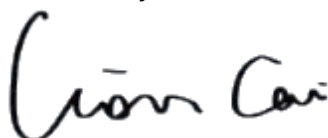
Tested by:

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Lion Cai / RF Manager



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TABLE OF CONTENTS

1. GENERAL INFORMATION.....	4
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	4
1.2 TEST STANDARDS.....	5
1.3 TEST METHODOLOGY.....	5
1.4 TEST FACILITY	5
1.5 EUT SETUP AND TEST MODE	6
1.6 MEASUREMENT UNCERTAINTY	7
1.7 TEST EQUIPMENT LIST AND DETAILS	8
2. SUMMARY OF TEST RESULTS	10
3. ANTENNA REQUIREMENT	11
3.1 STANDARD APPLICABLE.....	11
3.2 EVALUATION INFORMATION	11
4. POWER SPECTRAL DENSITY	12
4.1 STANDARD APPLICABLE.....	12
4.2 TEST SETUP BLOCK DIAGRAM	12
4.3 TEST PROCEDURE.....	12
4.4 SUMMARY OF TEST RESULTS/PLOTS	12
5. DTS BANDWIDTH.....	13
5.1 STANDARD APPLICABLE.....	13
5.2 TEST SETUP BLOCK DIAGRAM	13
5.3 TEST PROCEDURE.....	13
5.4 SUMMARY OF TEST RESULTS/PLOTS	13
6. RF OUTPUT POWER	14
6.1 STANDARD APPLICABLE.....	14
6.2 TEST SETUP BLOCK DIAGRAM	14
6.3 TEST PROCEDURE.....	14
6.4 SUMMARY OF TEST RESULTS/PLOTS	14
7. FIELD STRENGTH OF SPURIOUS EMISSIONS	15
7.1 STANDARD APPLICABLE.....	15
7.2 TEST PROCEDURE.....	15
7.3 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	17
7.4 SUMMARY OF TEST RESULTS/PLOTS	17
8. OUT OF BAND EMISSIONS.....	25
8.1 STANDARD APPLICABLE.....	25
8.2 TEST PROCEDURE.....	25
8.3 SUMMARY OF TEST RESULTS/PLOTS	26
9. CONDUCTED EMISSIONS	29
9.1 TEST PROCEDURE.....	29
9.2 BASIC TEST SETUP BLOCK DIAGRAM.....	29
9.3 TEST RECEIVER SETUP	29
9.4 SUMMARY OF TEST RESULTS/PLOTS	29
APPENDIX SUMMARY	32
APPENDIX A.....	33
APPENDIX B.....	35
APPENDIX C.....	37
APPENDIX D.....	39
APPENDIX PHOTOGRAPHS.....	41

Report version

Version No.	Date of issue	Description
Rev.00	May.13, 2021	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Tersus GNSS Inc
Address of applicant: Room 305, Building 1, No.1228 Jinhu Road, China
(Shanghai) Pilot Free Trade Zone

Manufacturer: Tersus GNSS Inc
Address of manufacturer: Room 305, Building 1, No.1228 Jinhu Road, China
(Shanghai) Pilot Free Trade Zone

General Description of EUT	
Product Name:	TD-LTE Wireless Data Terminal
Trade Name	Tersus
Model No.:	TC50
Adding Model(s):	/
Rated Voltage:	DC3.8V
Battery Capacity:	7000mAh
Power Adapter:	GQ24-090200-AX INPUT:AC100-240V, 50/60Hz, 1.0A Output:DC9V, 2.0A
Software Version:	V.SN50.2.1.26.2021041411
Hardware Version:	SD55-D3_Main board_Rev.A1
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Bluetooth Version:	V4.1 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	5.854dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	0.68dBi

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
USB Cable	1.0	Shielded	Without Ferrite
DC Cable	1.0	Unshielded	Without Ferrite

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	TianYi310-14ISK	/
Router	LINKSYS	WRT32X	/

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-1075	Communication Tester	Rohde & Schwarz	CMW500	148650	2021-03-27	2022-03-26
SEMT-1063	GSM Tester	Rohde & Schwarz	CMU200	114403	2021-03-27	2022-03-26
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2021-03-27	2022-03-26
SEMT-1079	Spectrum Analyzer	Agilent	N9020A	US47140102	2021-03-27	2022-03-26
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2021-03-27	2022-03-26
SEMT-1081	Vector Signal Generator	Agilent	N5182A	MY47070202	2021-03-27	2022-03-26
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2021-03-27	2022-03-26
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2021-03-27	2022-03-26
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2021-03-27	2022-03-26
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2021-03-27	2022-03-26
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2021-04-12	2022-04-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2021-04-12	2022-04-11
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-19	2023-03-18
SEMT-1068	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-19	2023-03-18
SEMT-1042	Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2021-04-27	2023-04-26
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2021-04-27	2022-04-26
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2021-03-27	2022-03-26
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2021-03-27	2022-03-26
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2021-03-19	2023-03-18
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	/	/
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	/	/
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	/	/
SEMT-C004	Cable	Zheng DI	2M0RFC	/	/	/
SEMT-C005	Cable	Zheng DI	1M0RFC	/	/	/
SEMT-C006	Cable	Zheng DI	1M0RFC	/	/	/

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

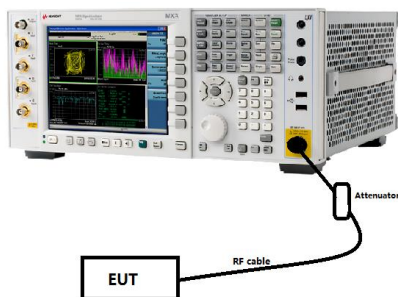
This product has a Integral antenna, fulfill the requirement of this section.

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:

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

4.4 Summary of Test Results/Plots

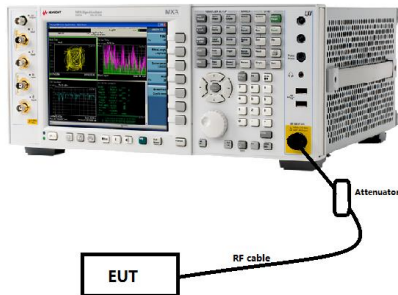
Please refer to Appendix A

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) $\geq 3 \times \text{RBW}$.
- 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

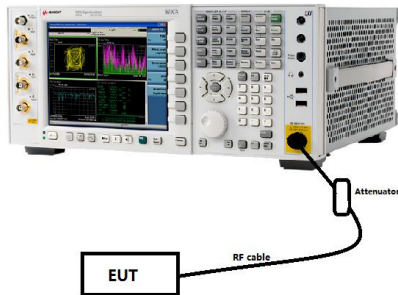
Please refer to Appendix B

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.

- Set the $RBW \geq DTS$ bandwidth.
- Set $VBW \geq 3 \times RBW$.
- Set $span \geq 3 \times RBW$.
- Sweep time = auto couple.
- Detector = peak.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- 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.

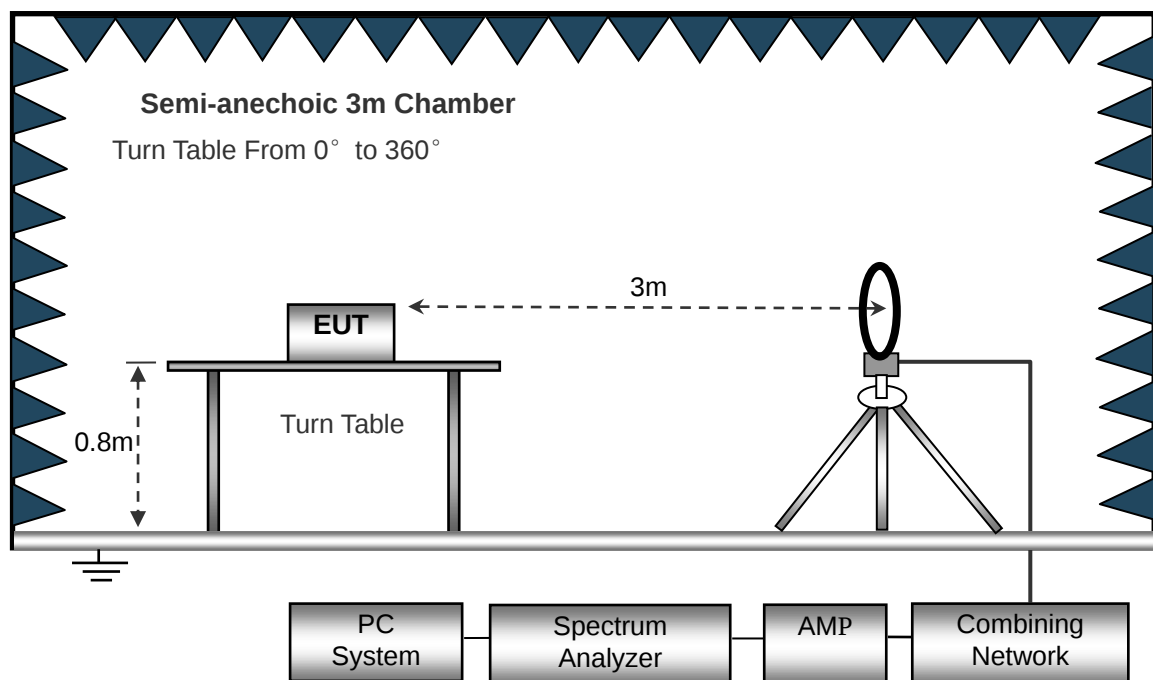
7.2 Test Procedure

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.

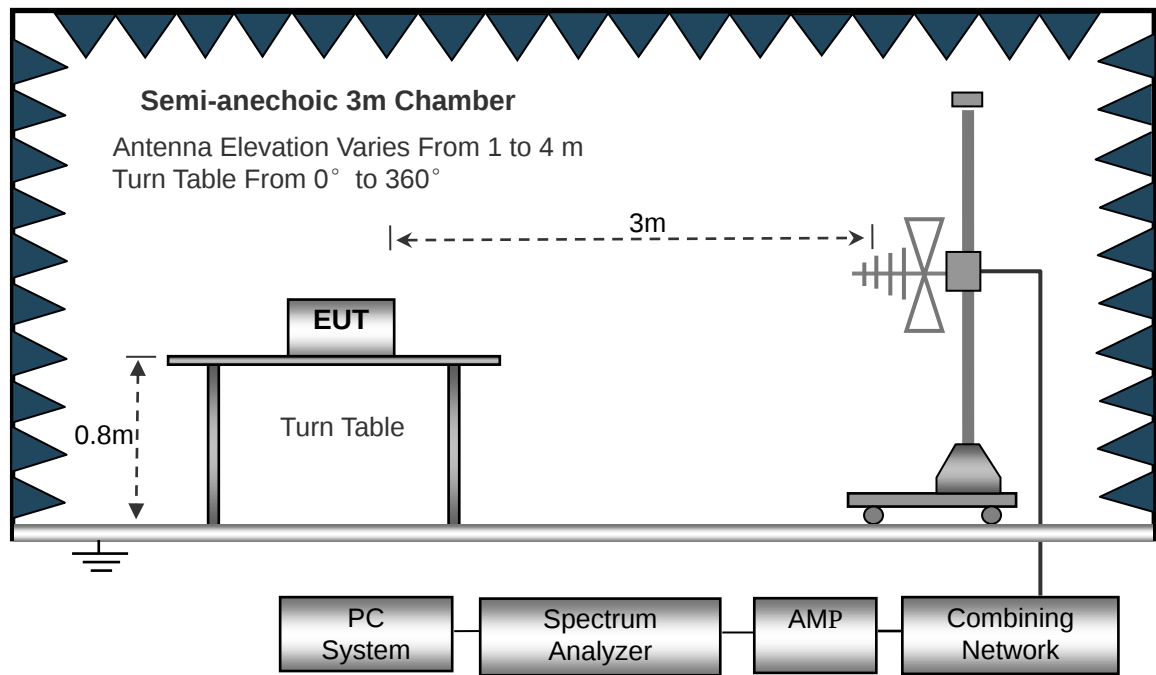
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

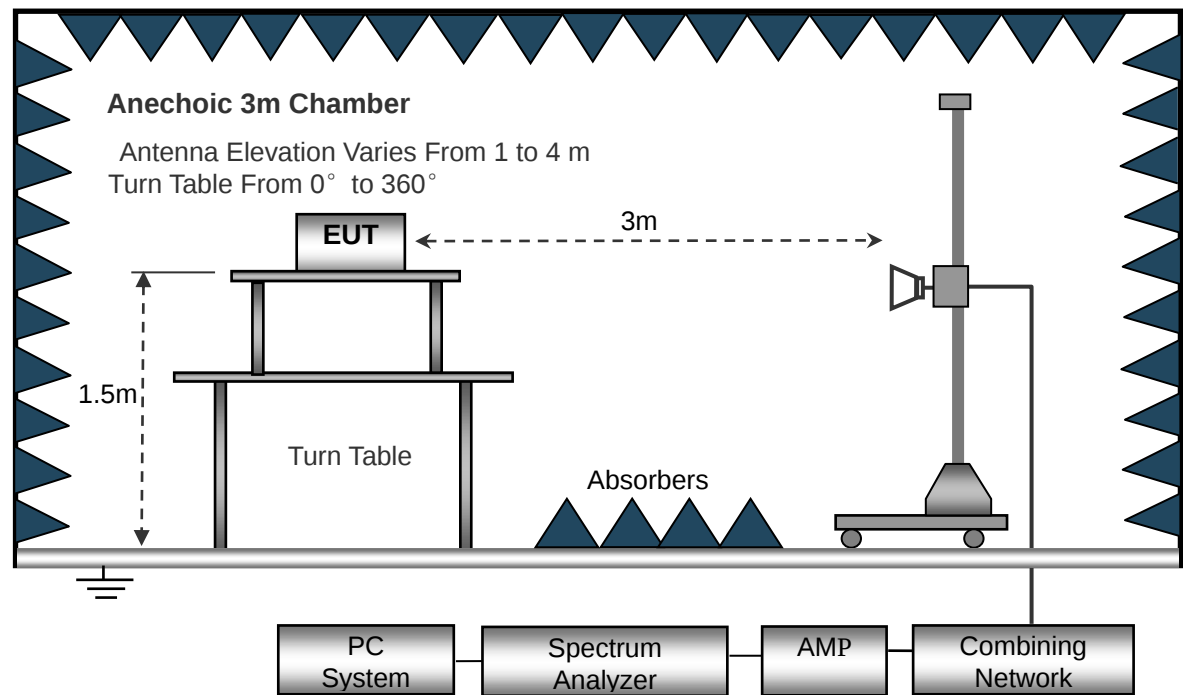
The test setup for emission measurement below 30MHz..



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:

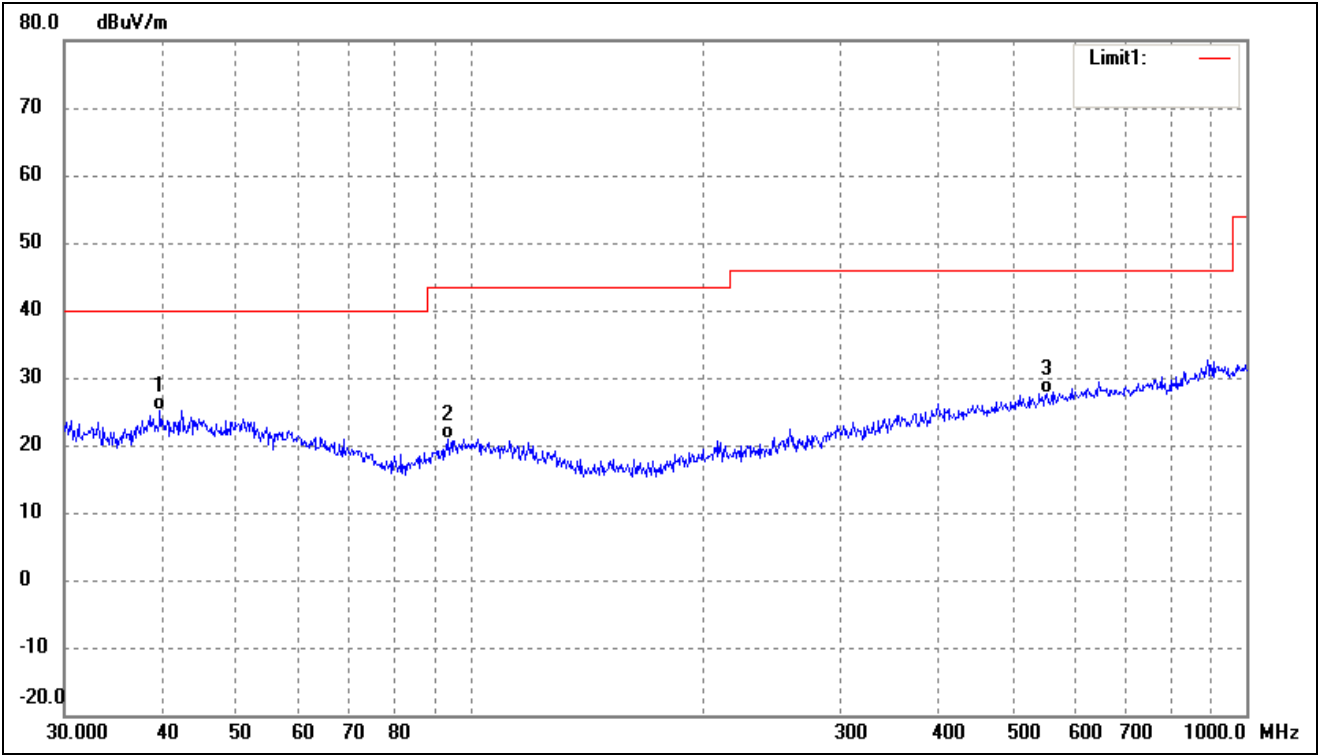
$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

7.4 Summary of Test Results/Plots

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

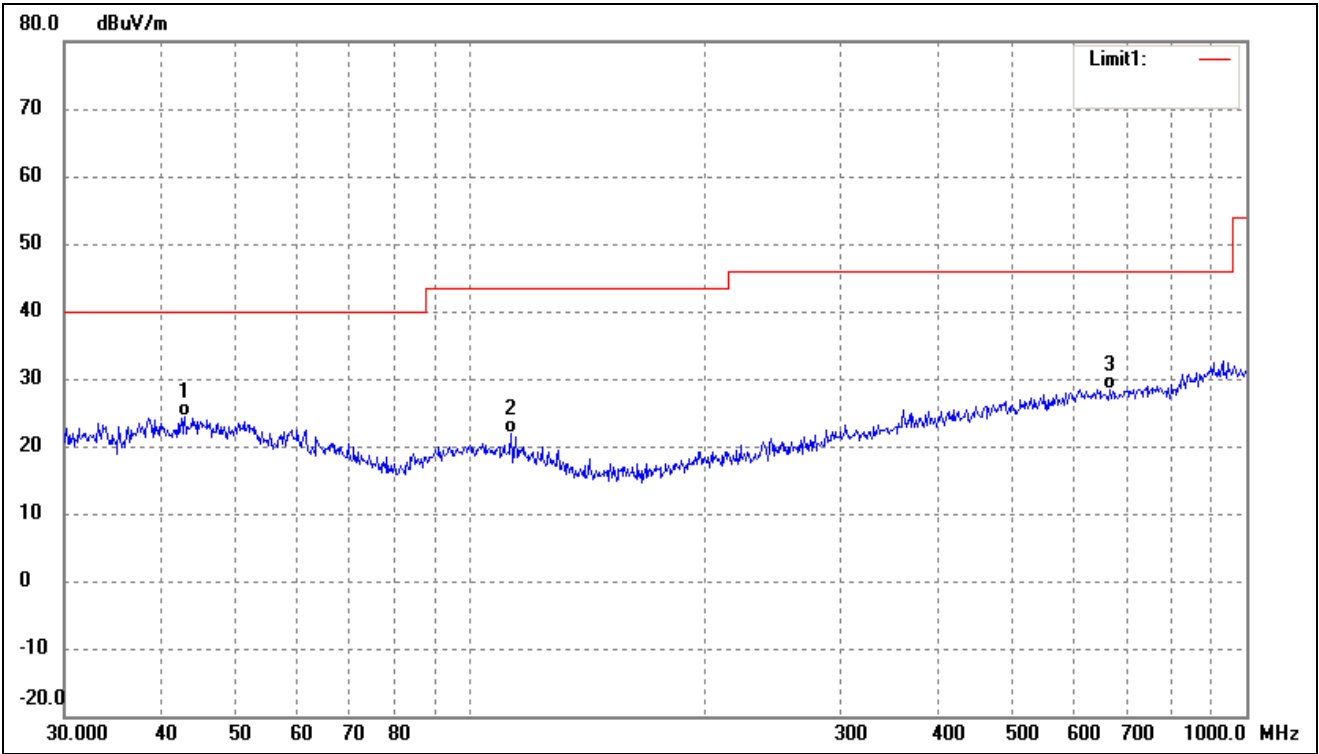
➤ Spurious Emissions Below 1GHz

Test Channel	Low	Polarity:	Horizontal
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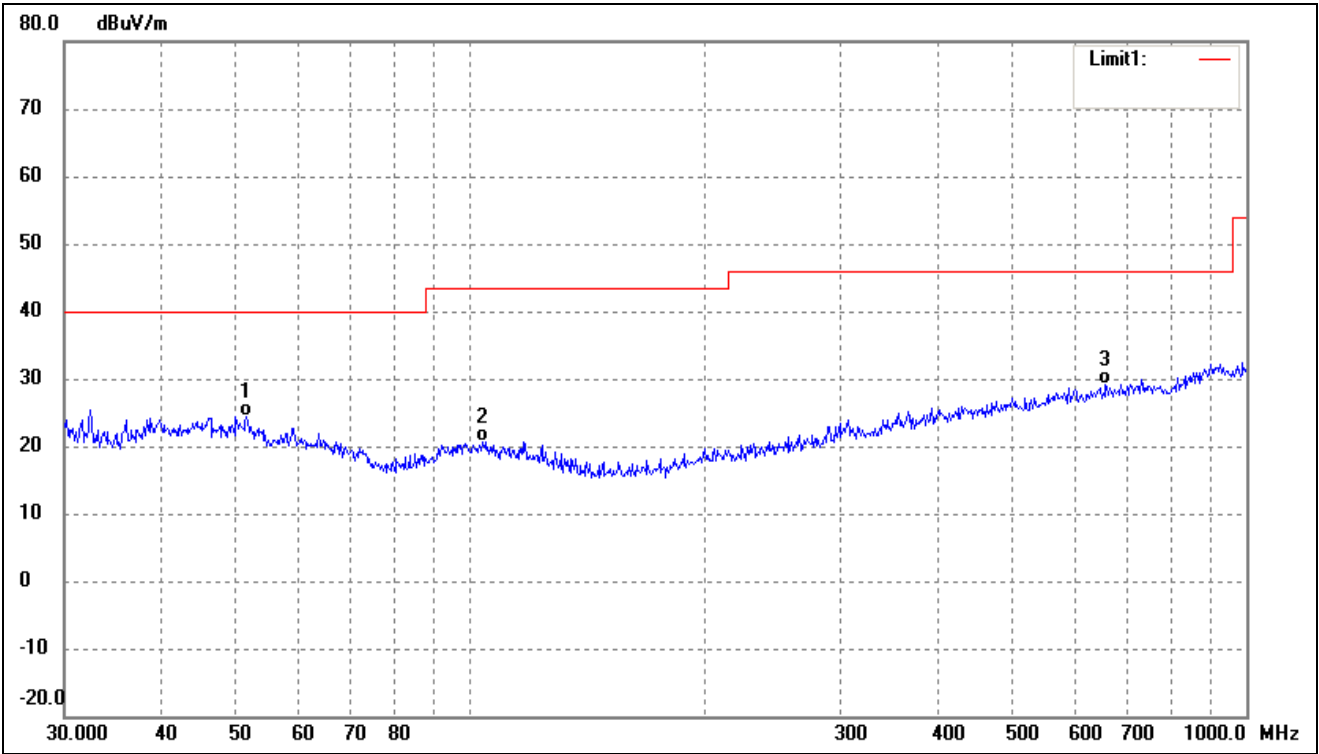
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	39.8542	37.28	-12.03	25.25	40.00	-14.75	-	-	QP
2	93.7685	35.33	-14.35	20.98	43.50	-22.52	-	-	QP
3	552.8833	31.34	-3.65	27.69	46.00	-18.31	-	-	QP

Test Channel	Low	Polarity:	Vertical
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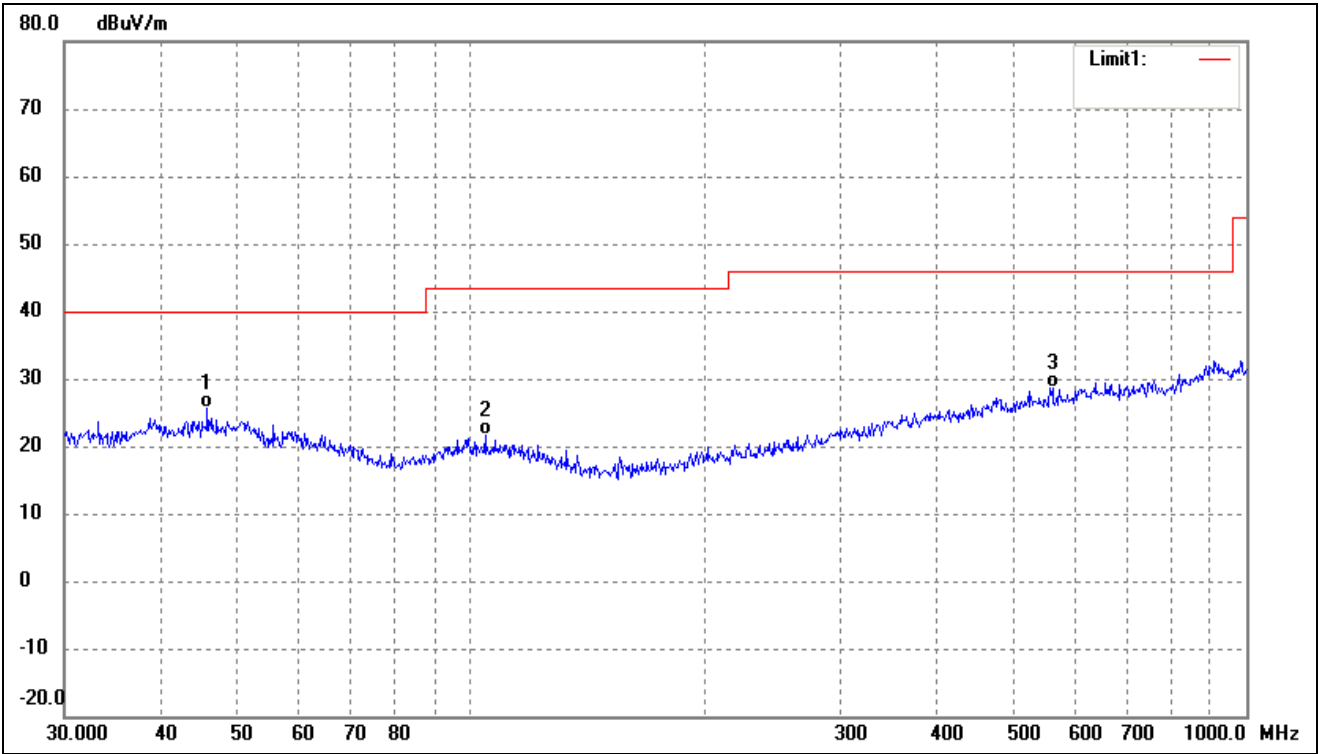
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	42.8998	36.34	-11.87	24.47	40.00	-15.53	-	-	QP
2	112.9196	35.38	-13.60	21.78	43.50	-21.72	-	-	QP
3	668.1423	30.51	-2.01	28.50	46.00	-17.50	-	-	QP

Test Channel	Middle	Polarity:	Horizontal
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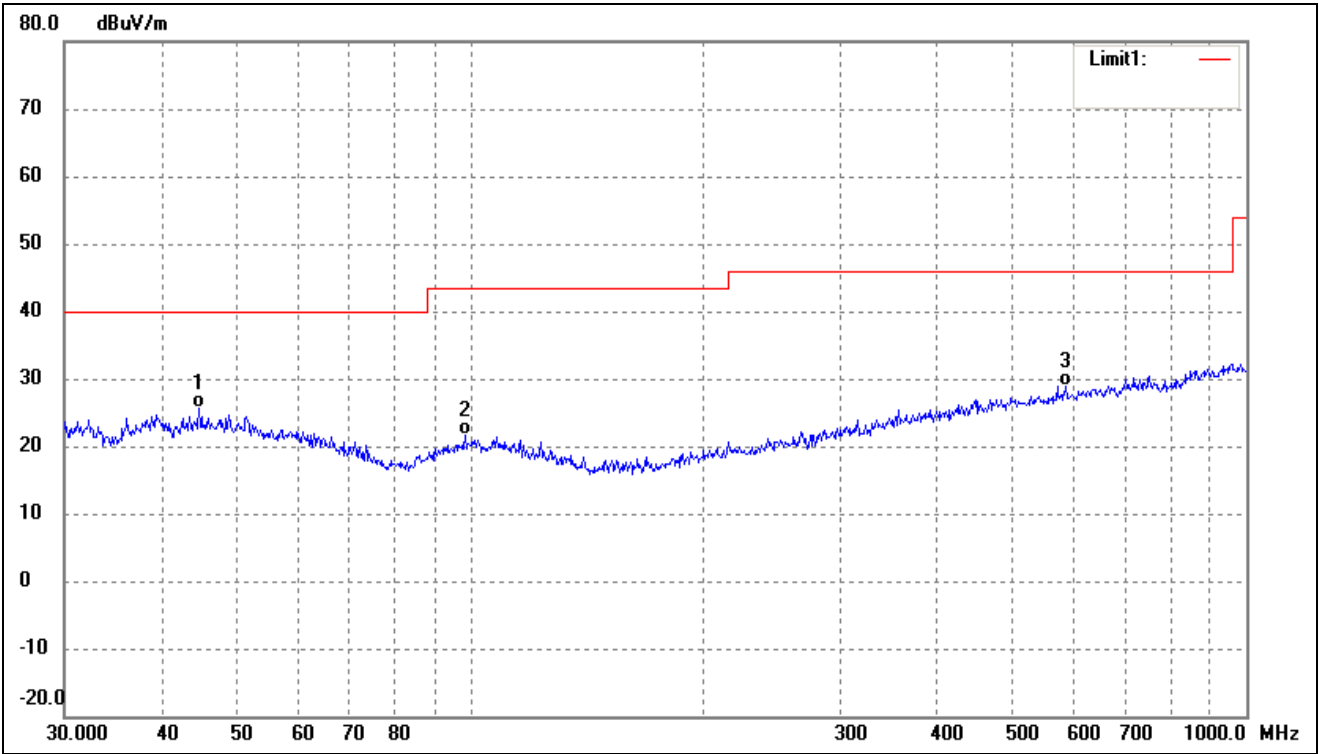
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	51.4807	36.35	-11.96	24.39	40.00	-15.61	-	-	QP
2	103.8055	33.89	-13.32	20.57	43.50	-22.93	-	-	QP
3	658.8362	31.30	-2.19	29.11	46.00	-16.89	-	-	QP

Test Channel	Middle	Polarity:	Vertical
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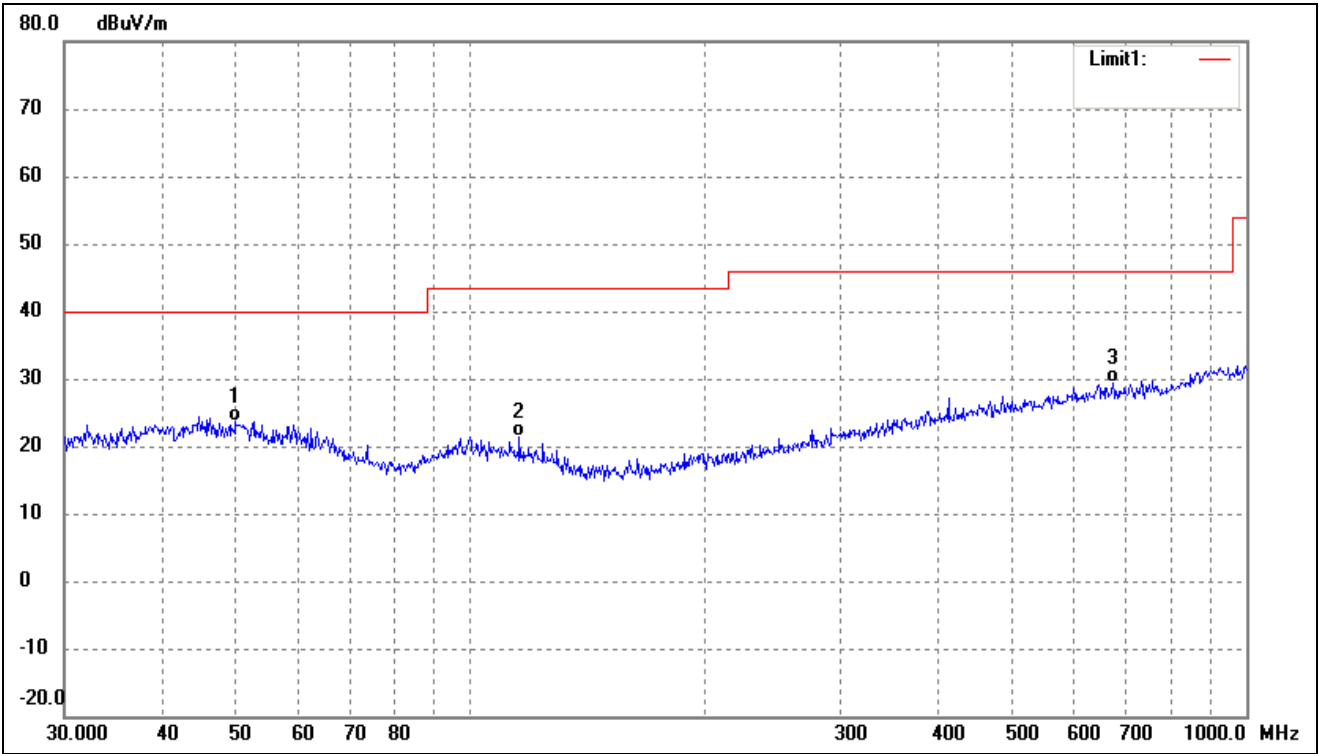
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	45.8553	37.26	-11.75	25.51	40.00	-14.49	-	-	QP
2	104.5361	34.99	-13.32	21.67	43.50	-21.83	-	-	QP
3	562.6624	31.78	-3.17	28.61	46.00	-17.39	-	-	QP

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	44.7433	37.40	-11.81	25.59	40.00	-14.41	-	-	QP
2	98.4866	35.09	-13.57	21.52	43.50	-21.98	-	-	QP
3	584.7895	31.25	-2.32	28.93	46.00	-17.07	-	-	QP

Test Channel	High	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	49.8814	35.12	-11.54	23.58	40.00	-16.42	-	-	QP
2	115.7256	35.16	-13.88	21.28	43.50	-22.22	-	-	QP
3	672.8445	31.21	-1.91	29.30	46.00	-16.70	-	-	QP

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

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2402MHz							
4804	59.68	-3.59	56.09	74	-17.91	H	PK
4804	42.64	-3.59	39.05	54	-14.95	H	AV
7206	55.57	-0.52	55.05	74	-18.95	H	PK
7206	39.09	-0.52	38.57	54	-15.43	H	AV
4804	58.48	-3.59	54.89	74	-19.11	V	PK
4804	40.46	-3.59	36.87	54	-17.13	V	AV
7206	56.38	-0.52	55.86	74	-18.14	V	PK
7206	40.83	-0.52	40.31	54	-13.69	V	AV
Middle Channel-2440MHz							
4880	60.64	-3.49	57.15	74	-16.85	H	PK
4880	40.06	-3.49	36.57	54	-17.43	H	AV
7320	59.9	-0.47	59.43	74	-14.57	H	PK
7320	39.58	-0.47	39.11	54	-14.89	H	AV
4880	61.66	-3.49	58.17	74	-15.83	V	PK
4880	39.31	-3.49	35.82	54	-18.18	V	AV
7320	58.85	-0.47	58.38	74	-15.62	V	PK
7320	39.31	-0.47	38.84	54	-15.16	V	AV
High Channel-2480MHz							
4960	59.88	-3.41	56.47	74	-17.53	H	PK
4960	41.56	-3.41	38.15	54	-15.85	H	AV
7440	60.99	-0.42	60.57	74	-13.43	H	PK
7440	38.19	-0.42	37.77	54	-16.23	H	AV
4960	59.98	-3.41	56.57	74	-17.43	V	PK
4960	39.83	-3.41	36.42	54	-17.58	V	AV
7440	60.14	-0.42	59.72	74	-14.28	V	PK
7440	40.59	-0.42	40.17	54	-13.83	V	AV

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

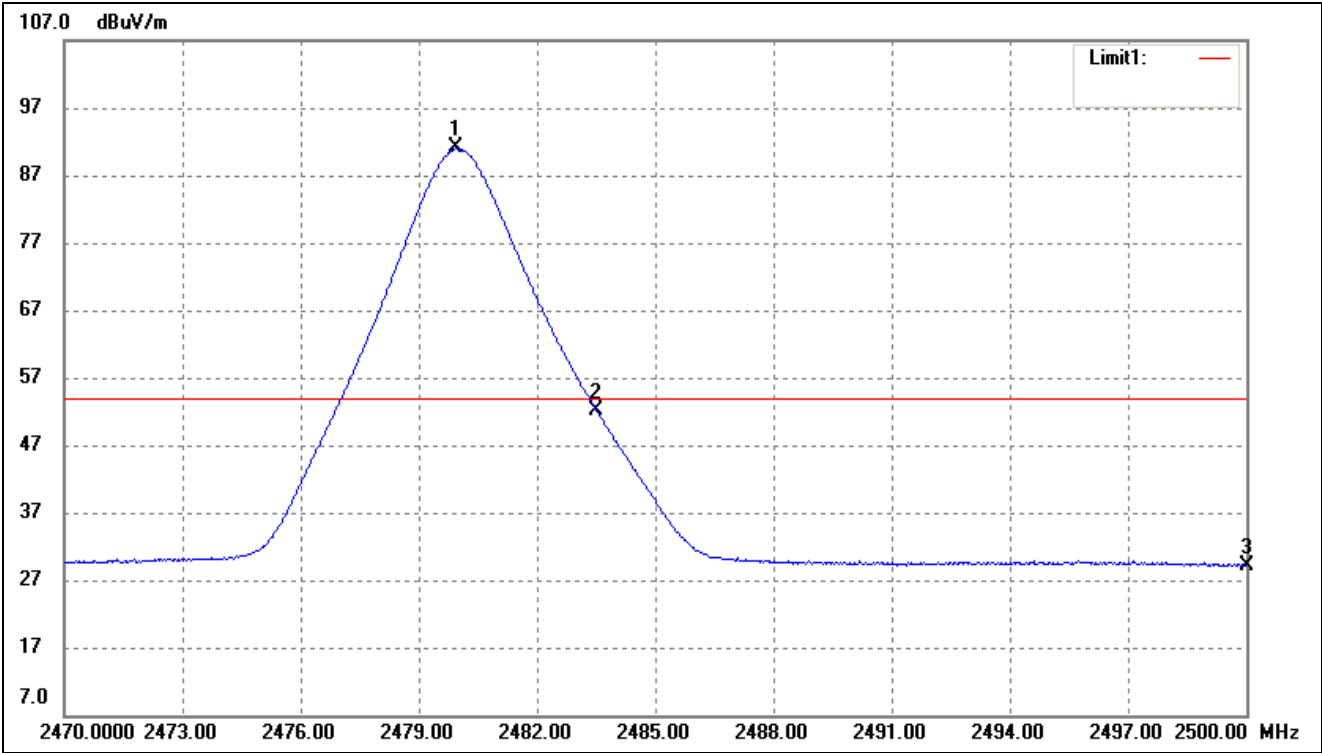
If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

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

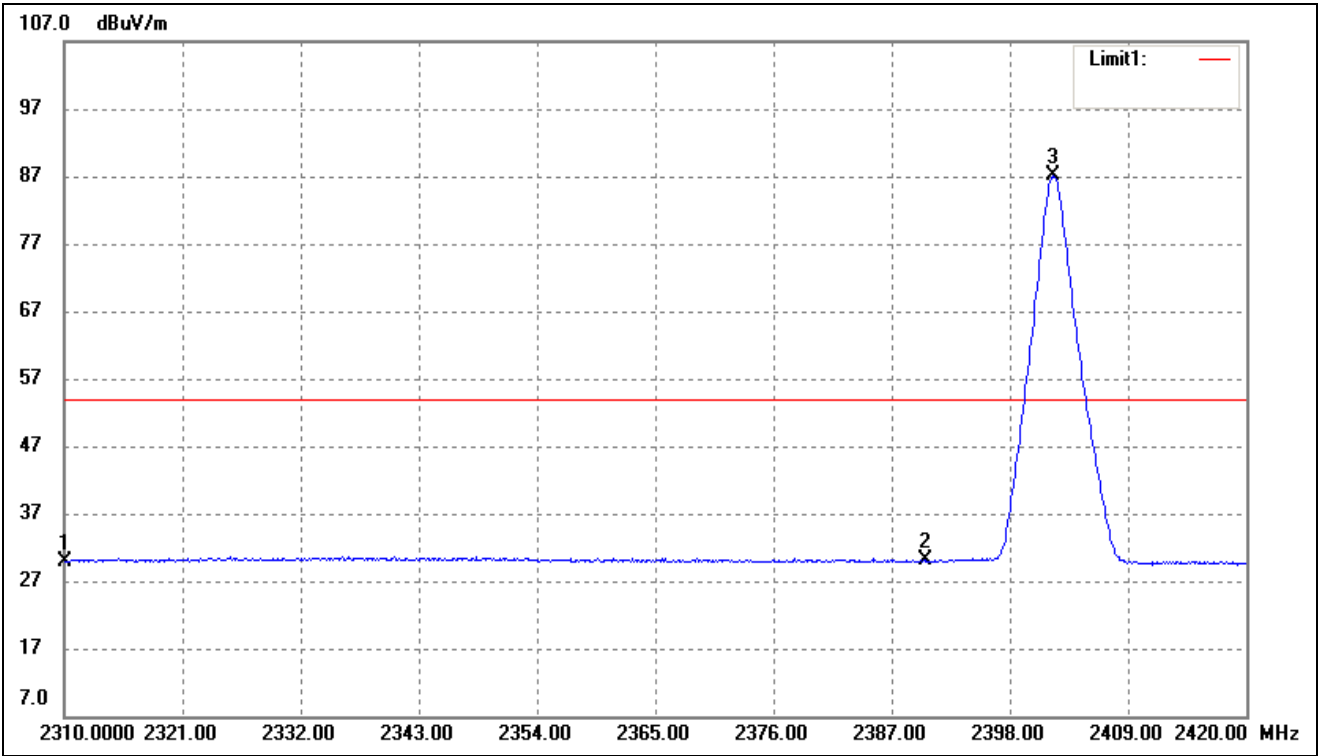
➤ Radiated test

Test Channel	Low	Polarity:	Vertical(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	2479.930	100.39	-9.32	91.07	/	/	Average Detector
	2480.230	105.49	-9.32	96.17	/	/	Peak Detector
2	2483.500	61.52	-9.31	52.21	54.00	-1.79	Average Detector
	2483.500	67.05	-9.31	57.74	74.00	-16.26	Peak Detector
3	2500.000	38.44	-9.28	29.16	54.00	-24.84	Average Detector
	2500.000	51.72	-9.28	42.44	74.00	-31.56	Peak Detector

Test Channel	High	Polarity:	Vertical(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	2310.000	39.57	-9.66	29.91	54.00	-24.09	Average Detector
	2310.000	52.88	-9.66	43.22	74.00	-30.78	Peak Detector
2	2390.000	39.66	-9.50	30.16	54.00	-23.84	Average Detector
	2390.000	53.64	-9.50	44.14	74.00	-29.86	Peak Detector
3	2402.070	96.49	-9.47	87.02	/	/	Average Detector
	2402.290	104.54	-9.47	95.07	/	/	Peak Detector

➤ Conducted test

Please refer to Appendix D

9. Conducted Emissions

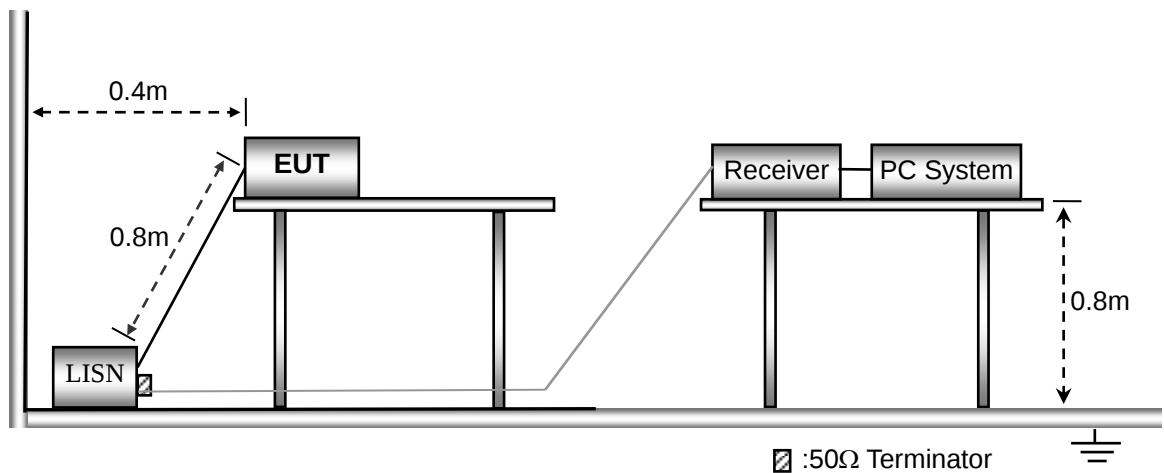
9.1 Test Procedure

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



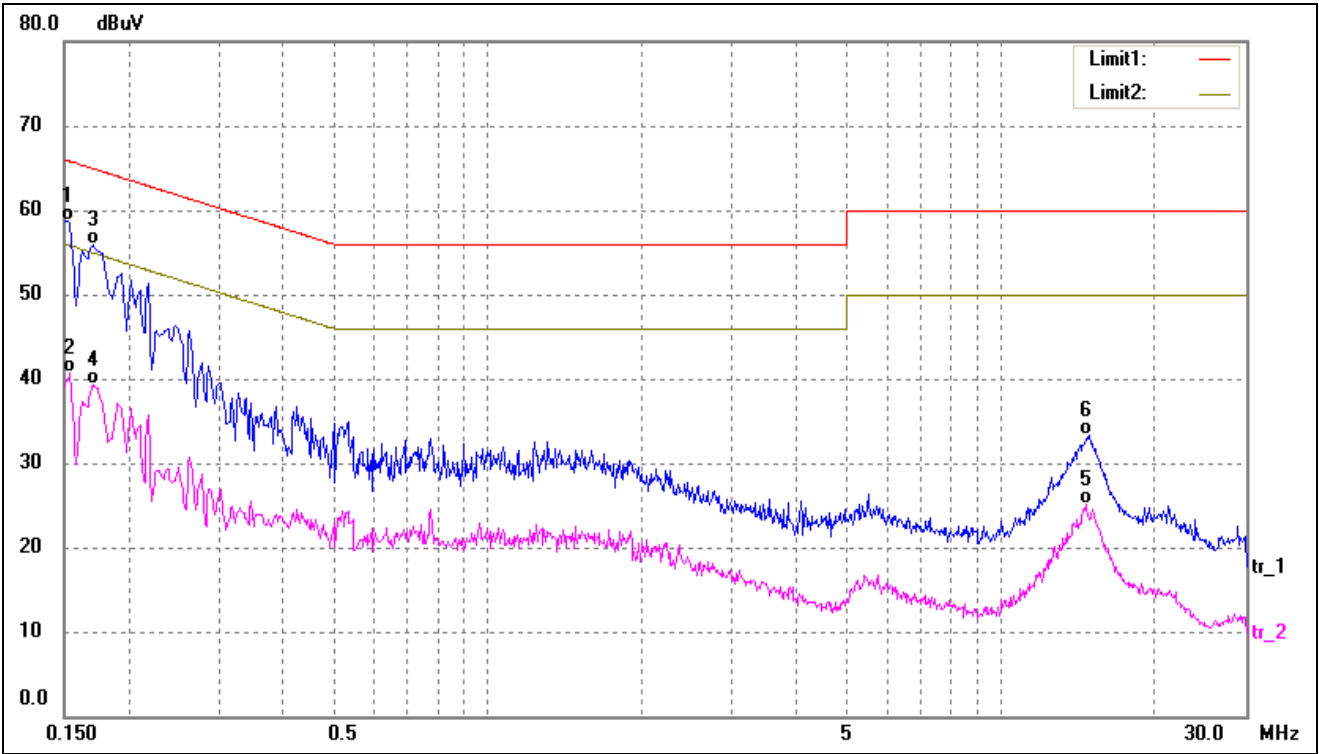
9.3 Test Receiver Setup

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

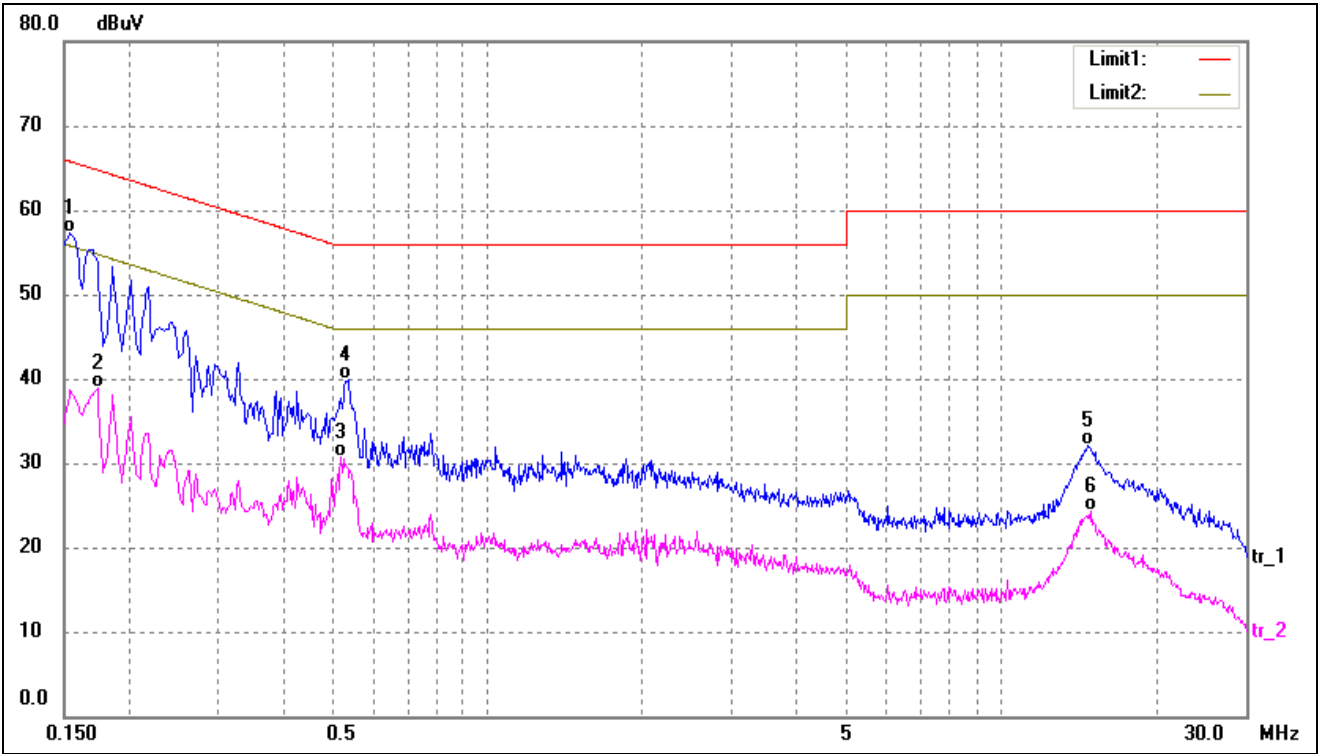
9.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1500	48.53	10.25	58.78	66.00	-7.22	QP
2	0.1540	30.36	10.25	40.61	55.78	-15.17	AVG
3	0.1700	45.60	10.25	55.85	64.96	-9.11	QP
4	0.1700	29.09	10.25	39.34	54.96	-15.62	AVG
5	14.6420	14.49	10.56	25.05	50.00	-24.95	AVG
6	14.8860	22.79	10.57	33.36	60.00	-26.64	QP

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral
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No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1*	0.1540	47.11	10.25	57.36	65.78	-8.42	QP
2	0.1740	28.60	10.25	38.85	54.77	-15.92	AVG
3	0.5180	20.43	10.22	30.65	46.00	-15.35	AVG
4	0.5380	29.73	10.21	39.94	56.00	-16.06	QP
5	14.7540	21.59	10.57	32.16	60.00	-27.84	QP
6	15.0260	13.77	10.58	24.35	50.00	-25.65	AVG

APPENDIX SUMMARY

Project No.	WTX21X04033440W	Test Engineer	Combat
Start date	2021/04/28	Finish date	2021/04/29
Temperature	23℃	Humidity	52%
RF specifications	BT-BLE		

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
GFSK(BLE)	Low	-8.76	8
	Middle	-10.99	8
	High	-9.599	8

Low	Agilent R T Ref 10 dBm Atten 20 dB Mkr1 2.4019025 GHz -8.76 dBm #Peak Log 10 dB/ Offset 1 dB M1 S2 S3 FC AA Marker 2.401902500 GHz -8.76 dBm Center 2.402 GHz #Res BW 3 kHz #VBW 10 kHz Sweep 171.5 ms (1001 pts) Span 1.5 MHz Peak Search Meas Tools ▾ Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2
Middle	Agilent R T Ref 10 dBm Atten 20 dB Mkr1 2.4399040 GHz -10.99 dBm #Peak Log 10 dB/ Offset 1 dB M1 S2 S3 FC AA Marker 2.439904000 GHz -10.99 dBm Center 2.44 GHz #Res BW 3 kHz #VBW 10 kHz Sweep 171.5 ms (1001 pts) Span 1.5 MHz Peak Search Meas Tools ▾ Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2
High	Agilent R T Ref 10 dBm Atten 20 dB Mkr1 2.4799025 GHz -9.599 dBm #Peak Log 10 dB/ Offset 1 dB M1 S2 S3 FC AA Marker 2.479902500 GHz -9.599 dBm Center 2.48 GHz #Res BW 3 kHz #VBW 10 kHz Sweep 171.5 ms (1001 pts) Span 1.5 MHz Peak Search Meas Tools ▾ Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2

APPENDIX B

Test Mode	Test Channel	6 dB Bandwidth kHz	Limit kHz
GFSK(BLE)	Low	732.467	≥ 500
	Middle	723.969	≥ 500
	High	729.521	≥ 500

Low	Agilent R T Ch Freq 2.402 GHz Trig Free Occupied Bandwidth Ref 10 dBm Atten 20 dB #Peak Log 10 dB/ Offset 1 dB Center 2.402 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts) Span 3 MHz Occupied Bandwidth 1.0591 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 4.213 kHz x dB Bandwidth 732.467 kHz Freq/Channel Center Freq 2.40200000 GHz Start Freq 2.40050000 GHz Stop Freq 2.40350000 GHz CF Step 300.000000 kHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin
Middle	Agilent R T Ch Freq 2.44 GHz Trig Free Occupied Bandwidth Center 2.440000000 GHz Ref 10 dBm Atten 20 dB #Peak Log 10 dB/ Offset 1 dB Center 2.44 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts) Span 3 MHz Occupied Bandwidth 1.0635 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 4.321 kHz x dB Bandwidth 723.969 kHz Freq/Channel Center Freq 2.44000000 GHz Start Freq 2.43850000 GHz Stop Freq 2.44150000 GHz CF Step 300.000000 kHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin
High	Agilent R T Ch Freq 2.48 GHz Trig Free Occupied Bandwidth Center 2.480000000 GHz Ref 10 dBm Atten 20 dB #Peak Log 10 dB/ Offset 1 dB Center 2.48 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts) Span 3 MHz Occupied Bandwidth 1.0562 MHz Occ BW % Pwr 99.00 % x dB -6.00 dB Transmit Freq Error 3.953 kHz x dB Bandwidth 729.521 kHz Freq/Channel Center Freq 2.48000000 GHz Start Freq 2.47850000 GHz Stop Freq 2.48150000 GHz CF Step 300.000000 kHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Scale Type Log Lin

APPENDIX C

RF Output Power			
Test Mode	Test Channel	Reading dBm	Limit dBm
GFSK(BLE)	Low	5.854	30.00
	Middle	3.713	30.00
	High	5.019	30.00

Low	Agilent Ref 10 dBm Atten 20 dB Mkr1 2.402215 GHz 5.854 dBm #Peak Log 10 dB/ Offset 1 dB M1 S2 S3 FC AA Marker 2.402215000 GHz 5.854 dBm Center 2.402 GHz #Res BW 1 MHz #VBW 3 MHz Sweep 10 ms (1001 pts) Span 5 MHz Peak Search Meas Tools ▶ Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2
Middle	Agilent Ref 10 dBm Atten 20 dB Mkr1 2.440245 GHz 3.713 dBm #Peak Log 10 dB/ Offset 1 dB M1 S2 S3 FC AA Marker 2.440245000 GHz 3.713 dBm Center 2.44 GHz #Res BW 1 MHz #VBW 3 MHz Sweep 10 ms (1001 pts) Span 5 MHz Peak Search Meas Tools ▶ Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2
High	Agilent Ref 10 dBm Atten 20 dB Mkr1 2.480185 GHz 5.019 dBm #Peak Log 10 dB/ Offset 1 dB M1 S2 S3 FC AA Marker 2.480185000 GHz 5.019 dBm Center 2.48 GHz #Res BW 1 MHz #VBW 3 MHz Sweep 10 ms (1001 pts) Span 5 MHz Peak Search Meas Tools ▶ Next Peak Next Pk Right Next Pk Left Min Search Pk-Pk Search More 1 of 2

APPENDIX D

Conducted Out of Band Emissions

Low

Agilent R T

Ref 10 dBm Atten 20 dB Mkr1 2.402250 GHz 5.11 dBm

#Peak Log 10 dB/Offst 1 dB DI -24.9 dBm

Center 2.393 GHz

Center 2.393000000 GHz

Span 25 MHz

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.402250 GHz	5.11 dBm
2	(1)	Freq	2.399975 GHz	-54.36 dBm

Center 2.393 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)

Freq/Channel

Center Freq 2.39300000 GHz

Start Freq 2.38050000 GHz

Stop Freq 2.40550000 GHz

CF Step 2.50000000 MHz Auto Man

Freq Offset 0.00000000 Hz

Signal Track On Off

Scale Type Log Lin

Agilent R T

Ref 10 dBm Atten 20 dB Mkr1 22.624 GHz -56.24 dBm

#Peak Log 10 dB/Offst 1 dB DI -24.9 dBm

M1 S2 S3 FC AA

Marker 22.623900000 GHz -56.24 dBm

Start 30 MHz Stop 26 GHz

#Res BW 100 kHz #VBW 300 kHz Sweep 2.691 s (1001 pts)

Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref Delta

Span Pair Span Center

Off

More 1 of 2

Middle

Agilent R T

Ref 10 dBm Atten 20 dB Mkr1 2.440240 GHz 3.079 dBm

#Peak Log 10 dB/Offst 1 dB DI -26.9 dBm

M1 S2 S3 FC AA

Display Line -26.92 dBm

Center 2.44 GHz

Center 2.440240 GHz

Span 12 MHz

#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)

Display

Full Screen

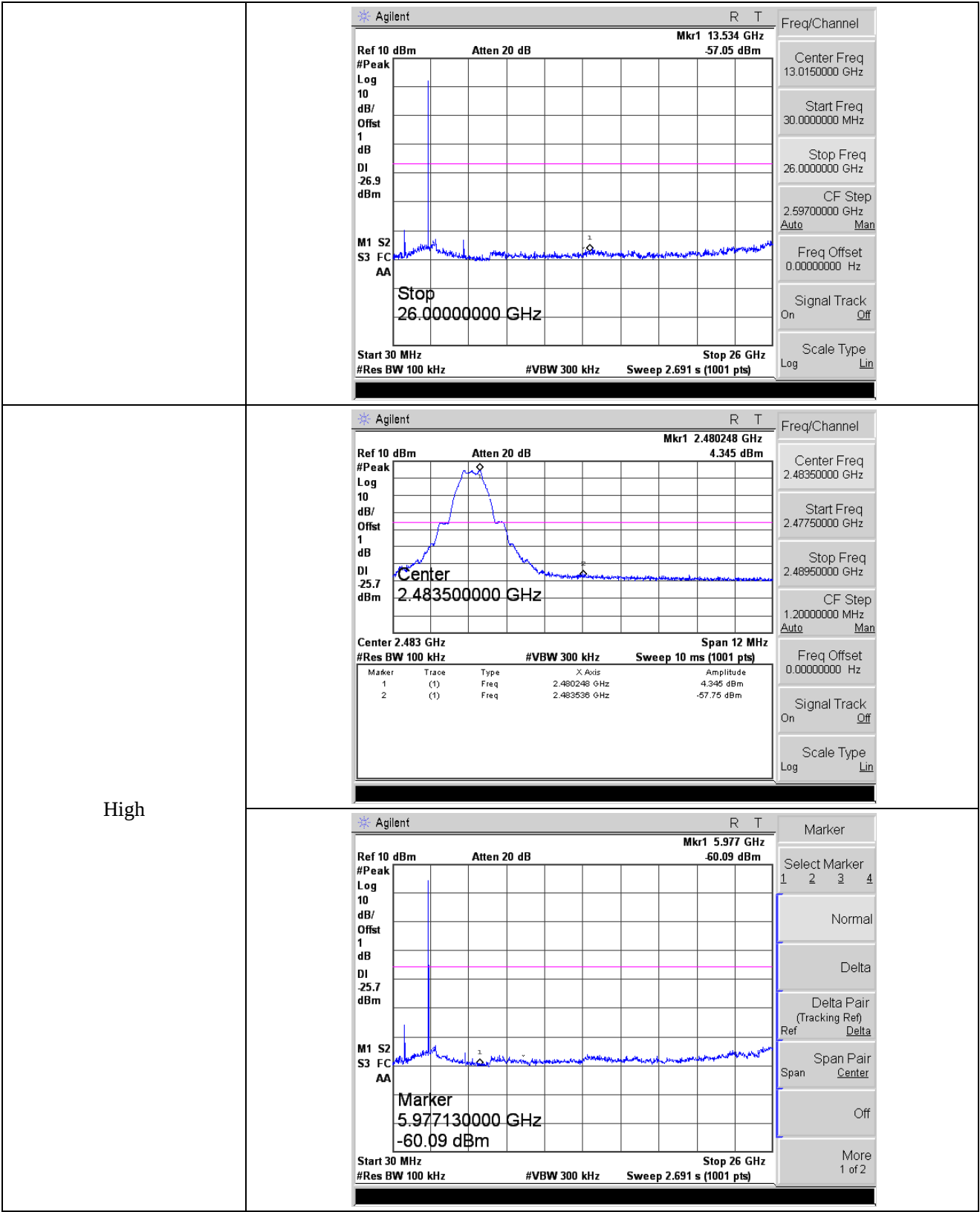
Display Line -26.92 dBm On Off

Limits

Active Fcn Position Bottom

Title

Preferences



APPENDIX PHOTOGRAPHS

Please refer to “ANNEX”

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