



FCC Part 15C Measurement and Test Report

For

Meshify Inc

706A West Ben White Blvd., Suite 210, Austin, TX 78704, United States

FCC ID: 2AQ34-TDUS-05-04

FCC Rule(s):	<u>FCC Part 15.247</u>	
Product Description:	<u>Meshify Pipe Temperature Sensor</u>	
Tested Model:	<u>TDUS-05-04</u>	
Report No.:	<u>WTX20X04015149W-2</u>	
Sample Receipt Date:	<u>Apr.01, 2020</u>	
Tested Date:	<u>Apr.01, 2020 to Apr.26, 2020</u>	
Issued Date:	<u>Apr.26, 2020</u>	
Tested By:	<u>Mike Shi / Engineer</u>	<i>Mike Shi</i>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Waltek Testing Group (Shenzhen) Co., Ltd.



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Report version

Version No.	Date of issue	Description
Rev.00	Apr.26, 2020	Original
/	/	/



1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Meshify Inc
 Address of applicant: 706A West Ben White Blvd., Suite 210, Austin, TX 78704, United States

Manufacturer: Meshify Inc
 Address of manufacturer: 706A West Ben White Blvd., Suite 210, Austin, TX 78704, United States

General Description of EUT	
Product Name:	Meshify Pipe Temperature Sensor
Brand Name:	Meshify Inc
Model No.:	TDUS-05-04
Adding Model(s):	/
Rated Voltage:	DC1.5V*2
Power Adapter:	/
Firmware Version:	01
Hardware Version:	V5.2
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	903.0-914.2MHz
RF Output Power:	8.93dBm (Conducted)
Modulation:	GFSK
Quantity of Channels:	8
Channel Separation:	1.6MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	-4.0dBi

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, Bao'an District, Shenzhen, P.R.C. (518101)

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

Use “Tera Term” and follow the instructions given by the manufacturer, you can start to test. During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. Test use the customer default power level, 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	903.0MHz
TM2	Middle	909.4MHz
TM3	High	914.2 MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	50~55 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / 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
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Power Spectral Density	Conducted	±1.8dB
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2019-04-30	2020-04-29
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2019-04-30	2020-04-29
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2019-04-30	2020-04-29
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2019-04-30	2020-04-29
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2019-04-30	2020-04-29
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	2019-04-30	2020-04-29
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2019-04-30	2020-04-29
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2019-04-30	2020-04-29
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2019-04-30	2020-04-29
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2019-04-30	2020-04-29
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2019-04-30	2020-04-29
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2019-05-05	2021-05-04
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2019-04-30	2020-04-29
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2019-04-30	2020-04-29
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2019-04-30	2020-04-29
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
§2.1091	RF Exposure	Compliant
§15.203; §15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§15.207(a)	Conducted Emission	N/A
§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. RF Exposure

3.1 Standard Applicable

According to §1.1307 and §2.1091, the mobile transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.



4. Antenna Requirement

4.1 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.

4.2 Evaluation Information

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



5. Power Spectral Density

5.1 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.

5.2 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.

5.3 Summary of Test Results/Plots

Channel	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
Low	5.90	8
Middle	6.10	8
High	6.09	8

Please refer to the following test plots:



<p>Low</p>	
<p>Middle</p>	
<p>High</p>	



6. DTS Bandwidth

6.1 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.

6.2 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:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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.

6.3 Summary of Test Results/Plots

Test Channel	6dB Bandwidth(kHz)	Result
Low	513.224	Pass
Middle	515.691	Pass
High	516.361	Pass

Please refer to the following test plots:



<p>Low</p>	<p>Agilent R T</p> <p>Ch Freq 903 MHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 21 dBm #Atten 30 dB</p> <p>#Peak Log 10 dB/ Offst 1 dB</p> <p>Center 903 MHz Span 2 MHz</p> <p>#Res BW 10 kHz #VBW 30 kHz Sweep 20.72 ms (1001 pts)</p> <p>Occupied Bandwidth 519.6541 kHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -8.801 kHz x dB Bandwidth 513.224 kHz</p> <p>Trace/View: Trace 1 2 3, Clear Write, Max Hold, Min Hold, View, Blank, More 1 of 2</p>
<p>Middle</p>	<p>Agilent R T</p> <p>Ch Freq 909.4 MHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Center 909.400000 MHz</p> <p>Ref 21 dBm #Atten 30 dB</p> <p>#Peak Log 10 dB/ Offst 1 dB</p> <p>Center 909.4 MHz Span 2 MHz</p> <p>#Res BW 10 kHz #VBW 30 kHz Sweep 20.72 ms (1001 pts)</p> <p>Occupied Bandwidth 525.5034 kHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -9.762 kHz x dB Bandwidth 515.691 kHz</p> <p>Freq/Channel: Center Freq 909.400000 MHz, Start Freq 908.400000 MHz, Stop Freq 910.400000 MHz, CF Step 200.000000 kHz, Freq Offset 0.00000000 Hz, Signal Track On, Scale Type Log</p>
<p>High</p>	<p>Agilent R T</p> <p>Ch Freq 914.2 MHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 21 dBm #Atten 30 dB</p> <p>#Peak Log 10 dB/ Offst 1 dB</p> <p>Center 914.2 MHz Span 2 MHz</p> <p>#Res BW 10 kHz #VBW 30 kHz Sweep 20.72 ms (1001 pts)</p> <p>Occupied Bandwidth 516.1417 kHz</p> <p>Occ BW % Pwr 99.00 % x dB -6.00 dB</p> <p>Transmit Freq Error -3.842 kHz x dB Bandwidth 516.361 kHz</p> <p>Trace/View: Trace 1 2 3, Clear Write, Max Hold, Min Hold, View, Blank, More 1 of 2</p>



7. RF Output Power

7.1 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.

7.2 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.

7.3 Summary of Test Results/Plots

Test Channel	Measured Value dBm	Output Power mW	Limit mW
Low	8.93	7.82	1000
Middle	8.90	7.76	1000
High	8.69	7.40	1000



<p>Low</p>	
<p>Middle</p>	
<p>High</p>	

8. Field Strength of Spurious Emissions

8.1 Standard Applicable

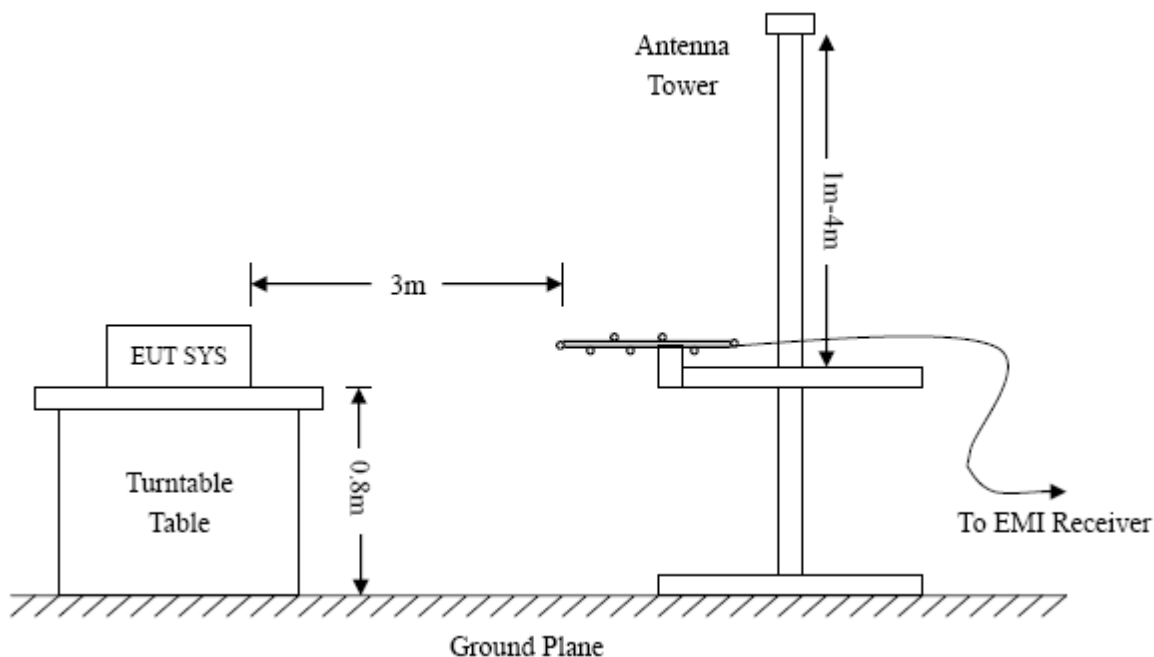
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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).

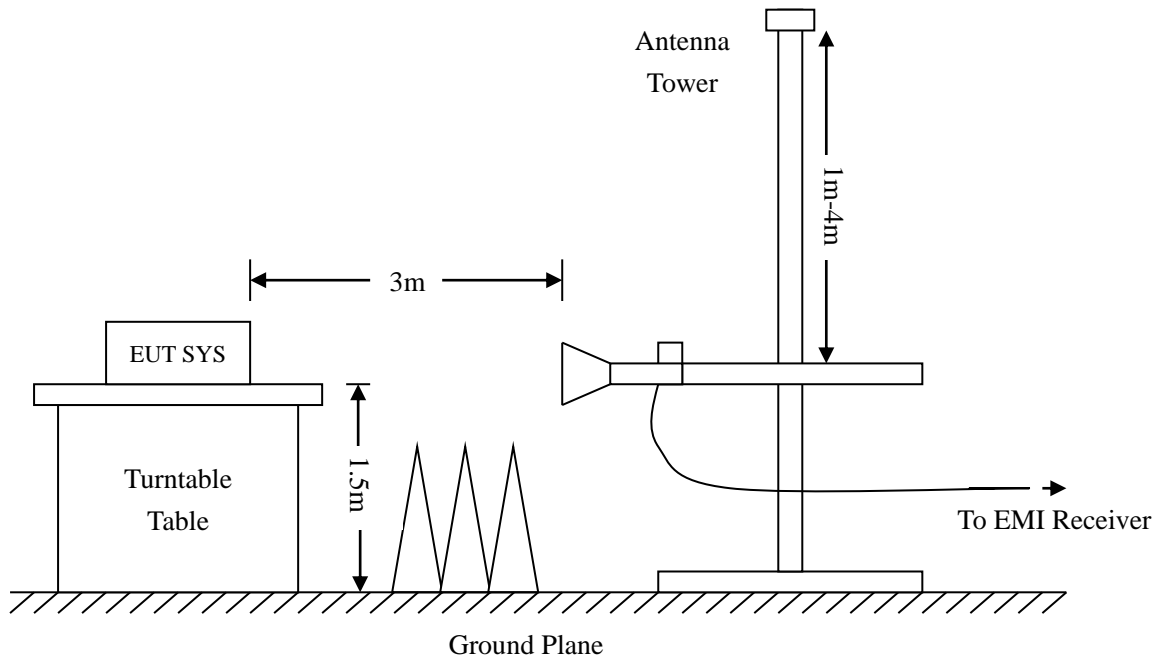
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

8.2 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.





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

8.3 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:

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

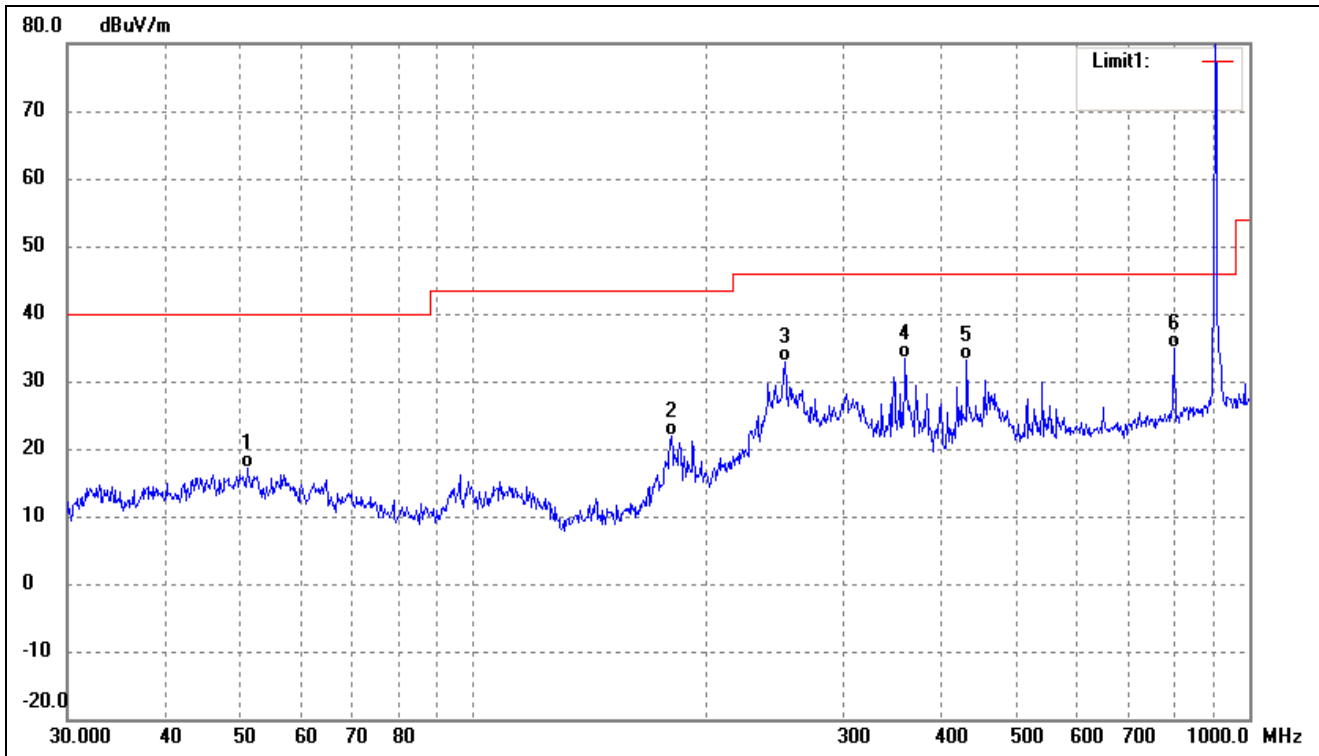
8.4 Summary of Test Results/Plots

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



➤ Spurious Emissions Below 1GHz

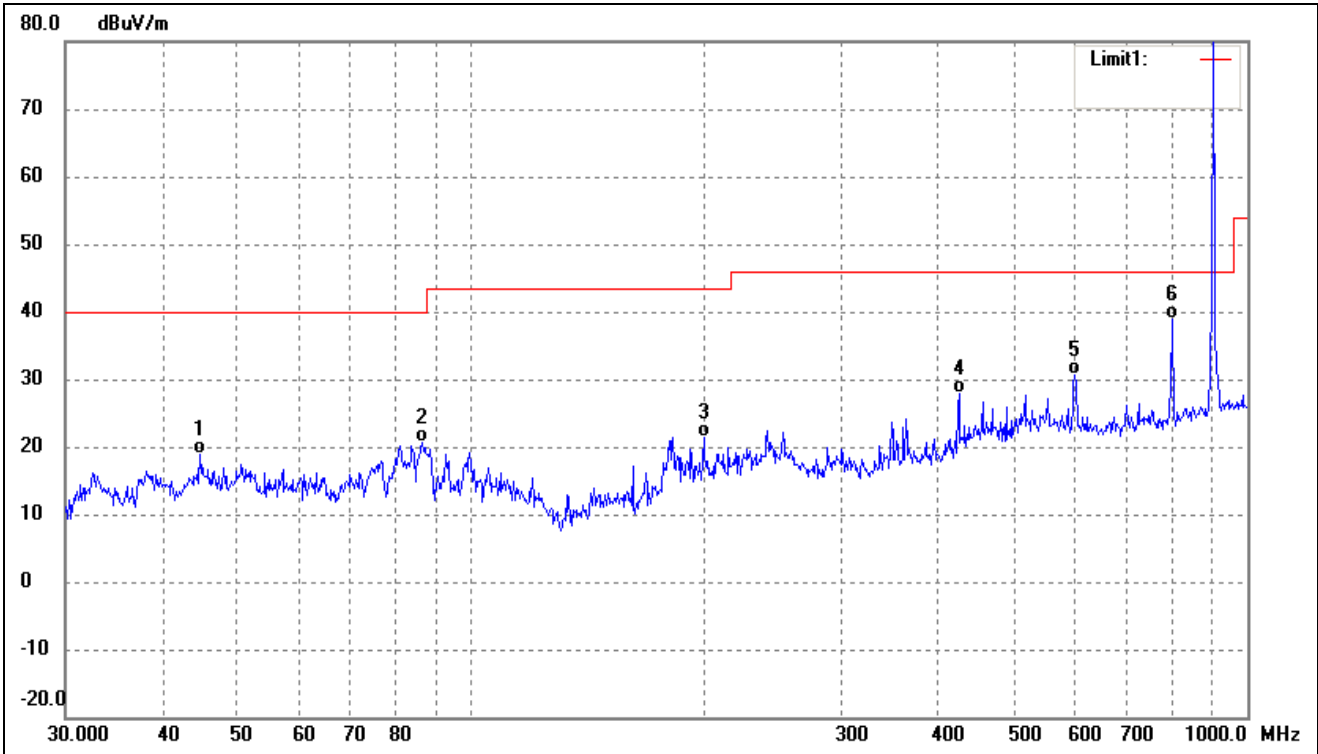
Test Channel	Low	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	51.1209	28.26	-11.25	17.01	40.00	-22.99	-	-	QP
2	180.0165	36.51	-14.60	21.91	43.50	-21.59	-	-	QP
3	252.0627	43.71	-10.95	32.76	46.00	-13.24	-	-	QP
4	360.4477	41.26	-7.86	33.40	46.00	-12.60	-	-	QP
5	432.5457	39.30	-6.19	33.11	46.00	-12.89	-	-	QP
6	798.9797	37.09	-2.23	34.86	46.00	-11.14	-	-	QP



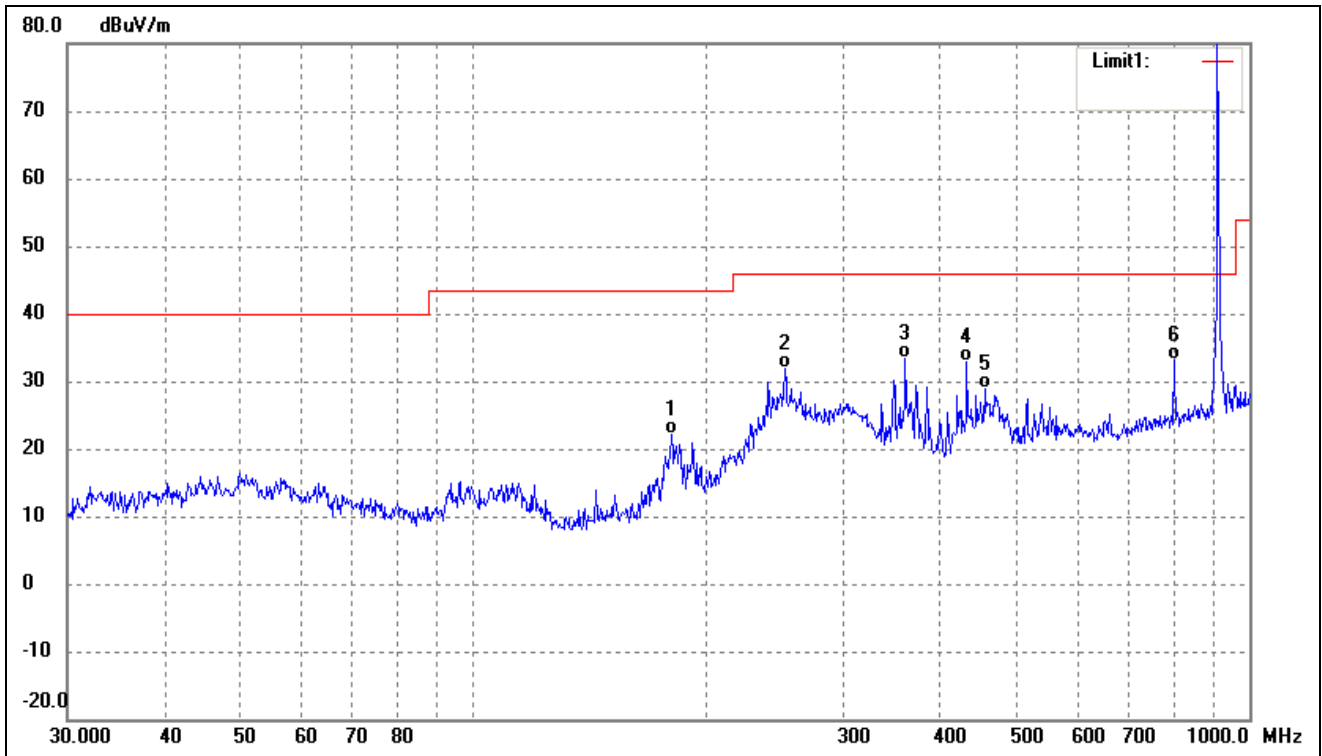
Test Channel	Low	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	44.7434	30.22	-11.40	18.82	40.00	-21.18	-	-	QP
2	86.5029	36.16	-15.59	20.57	40.00	-19.43	-	-	QP
3	199.2855	34.21	-12.75	21.46	43.50	-22.04	-	-	QP
4	425.0280	33.95	-6.19	27.76	46.00	-18.24	-	-	QP
5	599.3213	34.76	-4.03	30.73	46.00	-15.27	-	-	QP
6	801.7863	41.13	-2.18	38.95	46.00	-7.05	-	-	QP



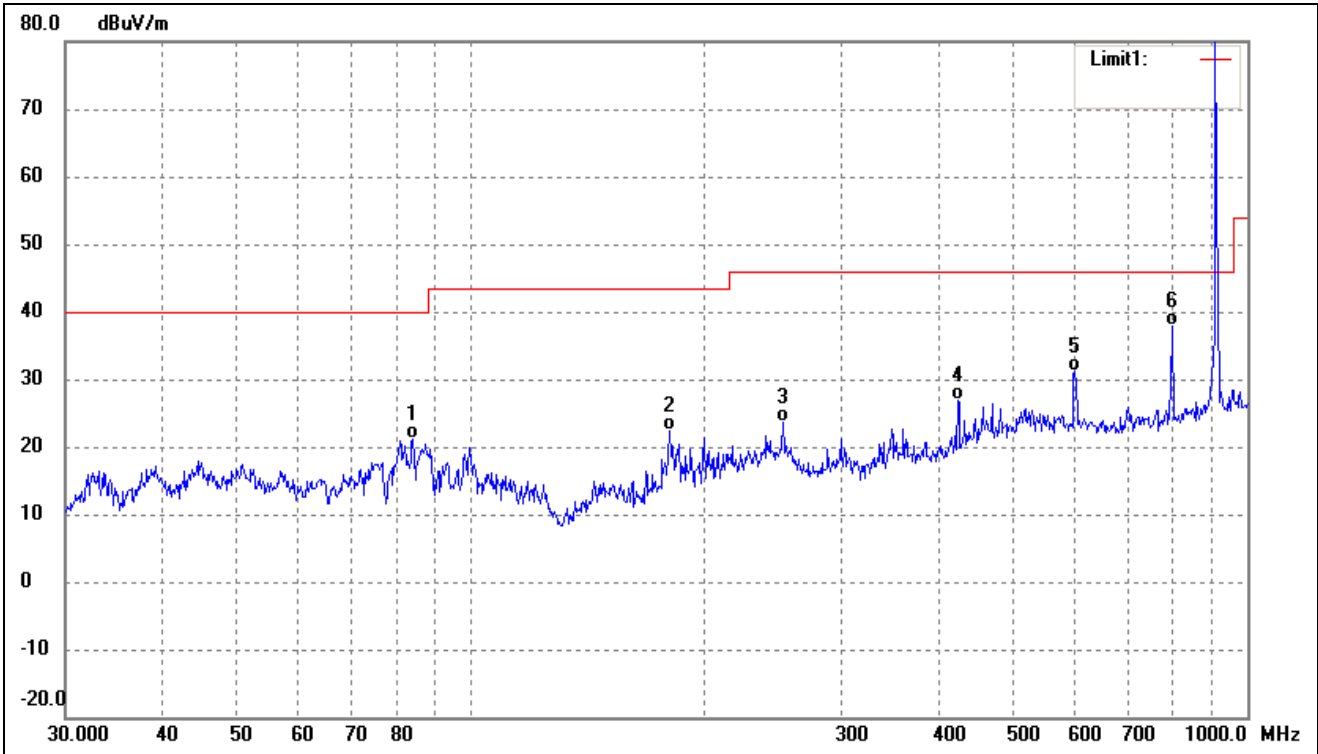
Test Channel	Middle	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	180.0165	36.77	-14.60	22.17	43.50	-21.33	-	-	QP
2	252.0627	42.91	-10.95	31.96	46.00	-14.04	-	-	QP
3	360.4477	41.15	-7.86	33.29	46.00	-12.71	-	-	QP
4	432.5457	39.04	-6.19	32.85	46.00	-13.15	-	-	QP
5	455.9058	35.47	-6.50	28.97	46.00	-17.03	-	-	QP
6	798.9797	35.30	-2.23	33.07	46.00	-12.93	-	-	QP



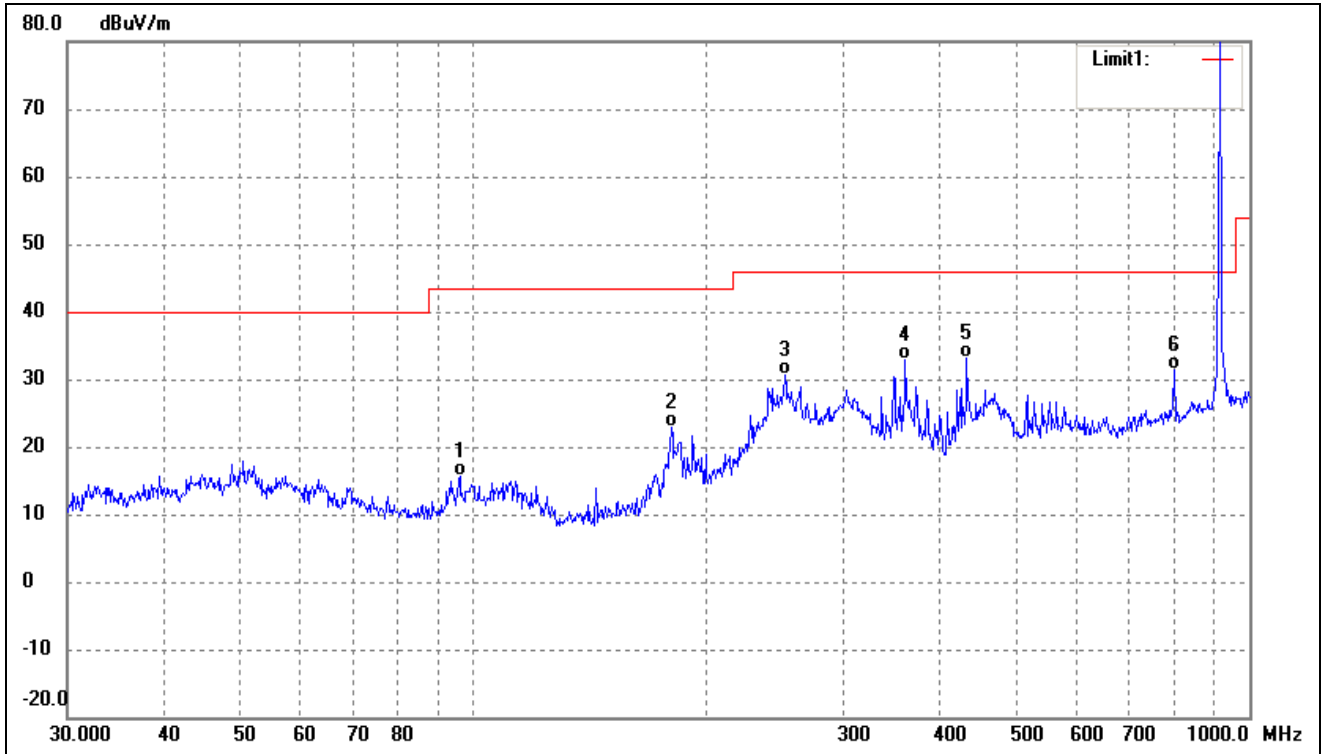
Test Channel	Middle	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	84.1100	36.75	-15.56	21.19	40.00	-18.81	-	-	QP
2	180.0165	36.88	-14.60	22.28	43.50	-21.22	-	-	QP
3	252.0627	34.57	-10.95	23.62	46.00	-22.38	-	-	QP
4	423.5403	33.20	-6.23	26.97	46.00	-19.03	-	-	QP
5	599.3213	35.07	-4.03	31.04	46.00	-14.96	-	-	QP
6	801.7863	40.03	-2.18	37.85	46.00	-8.15	-	-	QP



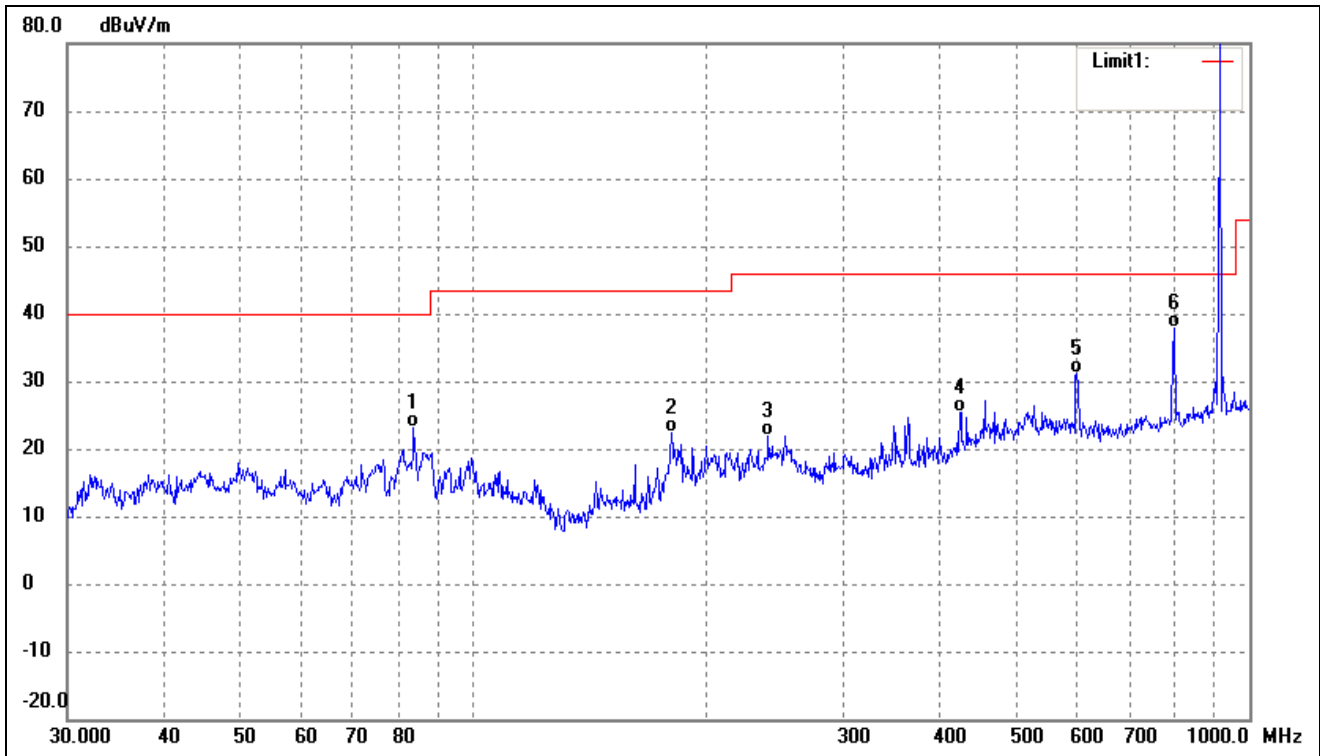
Test Channel	High	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	96.0986	29.62	-14.07	15.55	43.50	-27.95	-	-	QP
2	180.0165	37.53	-14.60	22.93	43.50	-20.57	-	-	QP
3	252.0627	41.54	-10.95	30.59	46.00	-15.41	-	-	QP
4	360.4477	40.74	-7.86	32.88	46.00	-13.12	-	-	QP
5	432.5457	39.23	-6.19	33.04	46.00	-12.96	-	-	QP
6	798.9797	33.69	-2.23	31.46	46.00	-14.54	-	-	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	83.8156	38.73	-15.56	23.17	40.00	-16.83	-	-	QP
2	180.0165	37.01	-14.60	22.41	43.50	-21.09	-	-	QP
3	239.9874	33.49	-11.53	21.96	46.00	-24.04	-	-	QP
4	423.5403	31.70	-6.23	25.47	46.00	-20.53	-	-	QP
5	599.3213	35.21	-4.03	31.18	46.00	-14.82	-	-	QP
6	801.7863	40.02	-2.18	37.84	46.00	-8.16	-	-	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 (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-903.0MHz							
1806.0	53.15	-9.39	43.76	74	-30.24	H	PK
1806.0	42.20	-9.39	32.81	54	-21.19	H	AV
2709.0	49.57	-9.02	40.55	74	-33.45	V	PK
2709.0	40.50	-9.02	31.48	54	-22.52	V	AV
Middle Channel-909.4MHz							
1818.8	51.82	-9.30	42.52	74	-31.48	H	PK
1818.8	38.50	-9.30	29.20	54	-24.80	H	AV
2728.2	52.93	-8.99	43.94	74	-30.06	V	PK
2728.2	40.59	-8.99	31.60	54	-22.40	V	AV
High Channel-914.2MHz							
1828.4	50.91	-9.18	41.73	74	-32.27	H	PK
1828.4	42.08	-9.18	32.90	54	-21.10	H	AV
2742.6	53.60	-8.97	44.63	74	-29.37	V	PK
2742.6	44.03	-8.97	35.06	54	-18.94	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.

9. Out of Band Emissions

9.1 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).

9.2 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 $\geq [3 \times \text{RBW}]$.
- 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.

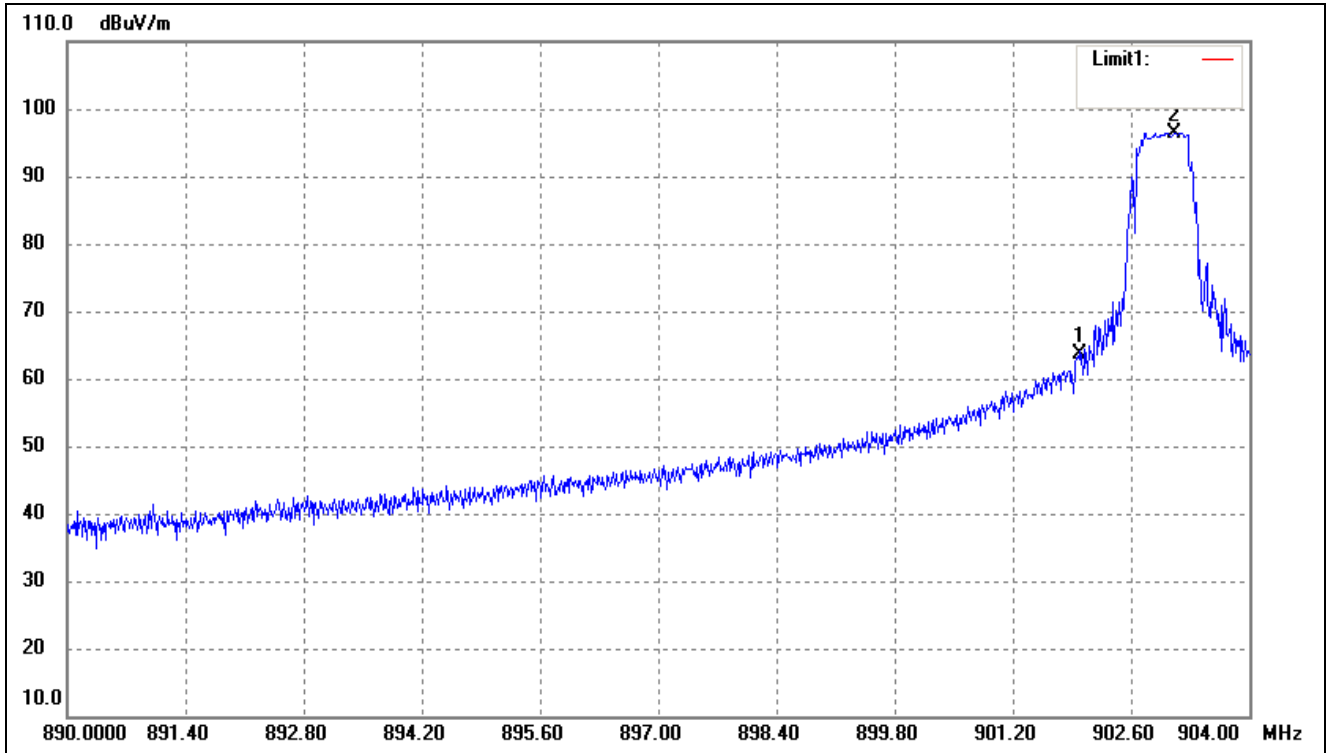
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

9.3 Summary of Test Results/Plots



➤ Radiated test

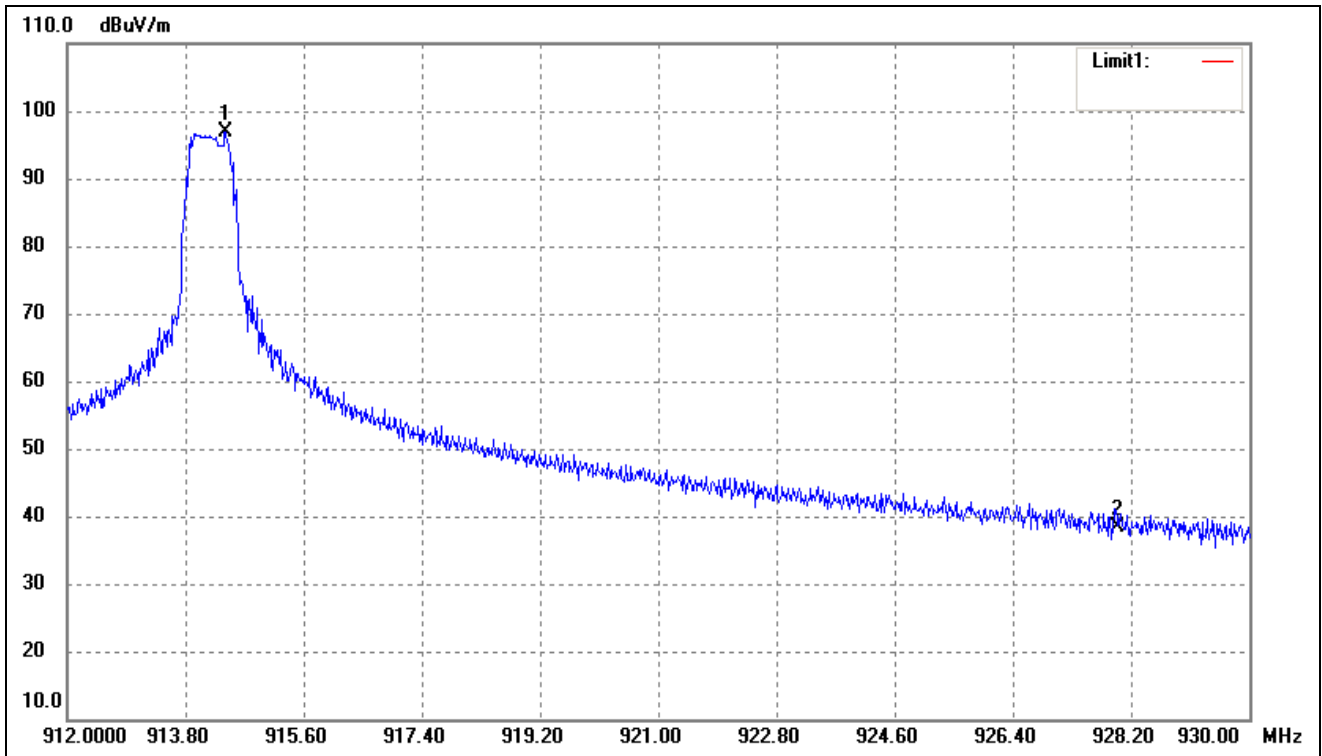
Test Channel	Low	Polarity:	Horizontal (worst case)
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	902.0000	64.11	-0.55	63.56	Delta=32.85dB		Peak Detector
2	903.1040	96.93	-0.52	96.41			Peak 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	914.4120	97.32	-0.35	96.97	Delta=58.47dB		Peak Detector
2	928.0000	38.66	-0.16	38.50			Peak Detector

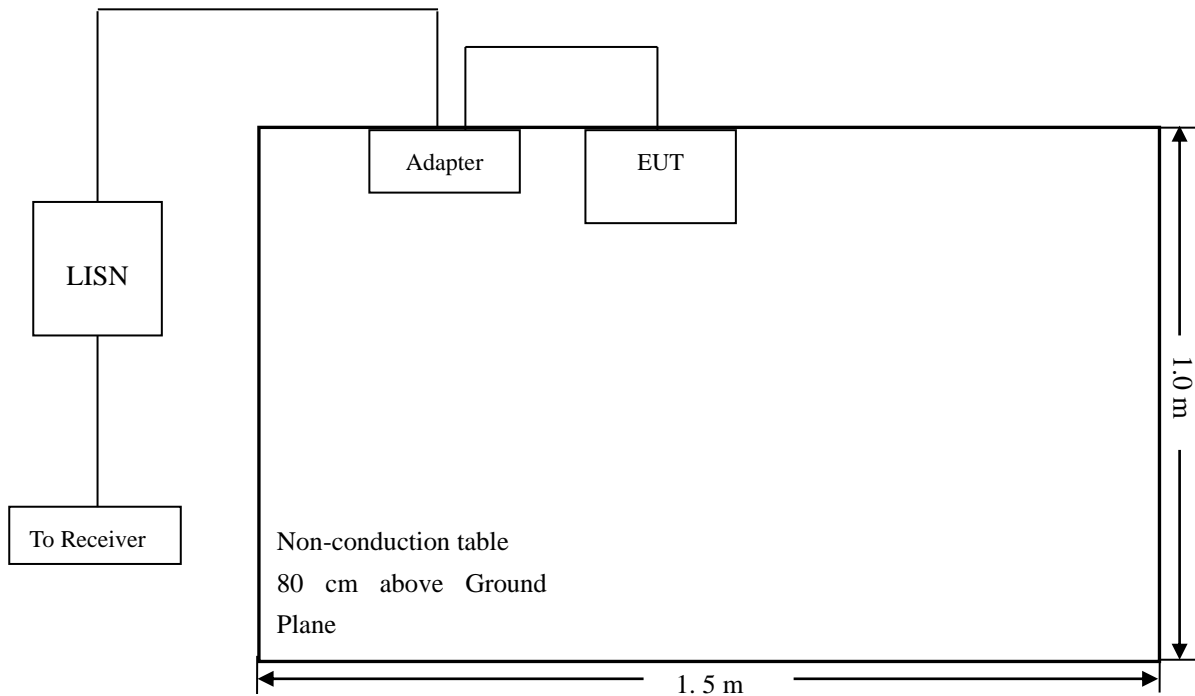
10. Conducted Emissions

10.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 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.

10.2 Basic Test Setup Block Diagram



10.3 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

10.4 Summary of Test Results/Plots

Not applicable. The EUT is powered by two DC batteries (AA batteries), so AC power line conducted test is not applicable.

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