

FCC Part 15C Measurement and Test Report

For

Net Profit Global Company Limited

RM 1421-22 14/F BLK A HI-TECH IND CTR, TSUEN WAN, N.T,

HONG KONG

FCC ID: 2AOW9SP1R

FCC Rule(s):	<u>FCC Part 15.247</u>
Product Description:	<u>Amazon Music Box with Voice Remote Controller</u>
Tested Model:	<u>SP1</u>
Report No.:	<u>STR18078391I</u>
Sample Receipt Date:	<u>2018-07-31</u>
Tested Date:	<u>2018-08-01 to 2018-09-12</u>
Issued Date:	<u>2018-09-12</u>
Tested By:	<u>Long Tang / Engineer</u> <i>Long Tang</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 Shenzhen SEM Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Net Profit Global Company Limited
Address of applicant: RM 1421-22 14/F BLK A HI-TECH IND CTR, TSUEN WAN,
N.T, HONG KONG

Manufacturer: MEI HUA ELECTRONICS (HUIZHOU) LIMITED
Address of manufacturer: No.1, GongYe 5nd Road, HuiZhou Industry Transfer Ind.
park, LongMen Village, HuiZhou City, Guangdong Province,
P.R.China.

General Description of EUT	
Product Name:	Amazon Music Box with Voice Remote Controller
Brand Name:	iHaper / dpnao
Model No.:	SP1
Adding Model(s):	dp-012
Rated Voltage:	Battery: DC 3.7V
Battery Capacity:	500mAh
Power Adapter:	/
<i>Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model SP1, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Bluetooth Version:	V4.0 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	0.35dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PCB Antenna
Antenna Gain:	0dBi
Lowest Internal Frequency of EUT:	24MHz

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 DTS Meas Guidance v04: GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247

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 DTS Meas Guidance v04

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

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology 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	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	2018-05-22	2019-05-21
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2018-05-22	2019-05-21
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2018-05-22	2019-05-21
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2018-05-22	2019-05-21
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2018-05-22	2019-05-21
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2020-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2020-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2020-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2020-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2018-05-22	2019-05-21
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2018-05-22	2019-05-21
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2018-05-22	2019-05-21
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2018-05-22	2019-05-21
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2018-05-22	2019-05-21
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2018-05-22	2019-05-21
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2018-03-19	2021-03-18
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2018-05-22	2019-05-21
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2018-05-22	2019-05-21
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2018-05-22	2019-05-21
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2018-03-19	2019-03-18
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2018-03-19	2019-03-18
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2018-03-19	2019-03-18
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2018-03-19	2019-03-18
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	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	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB 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 § 2.1093, the portable 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 a PCB 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

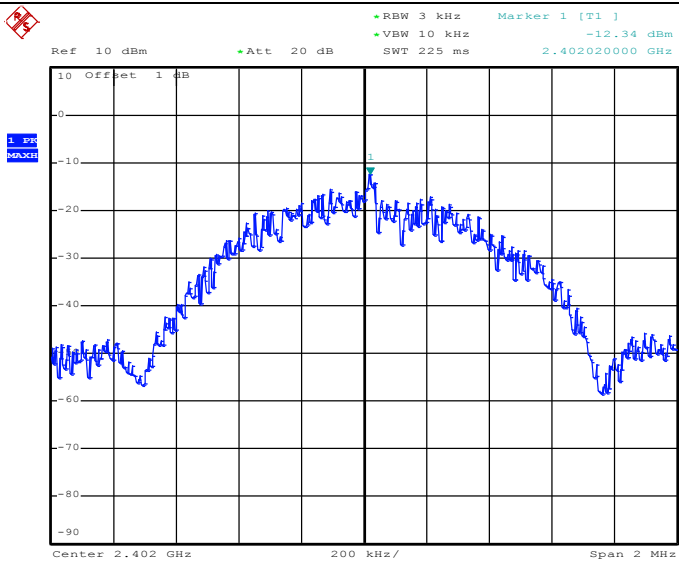
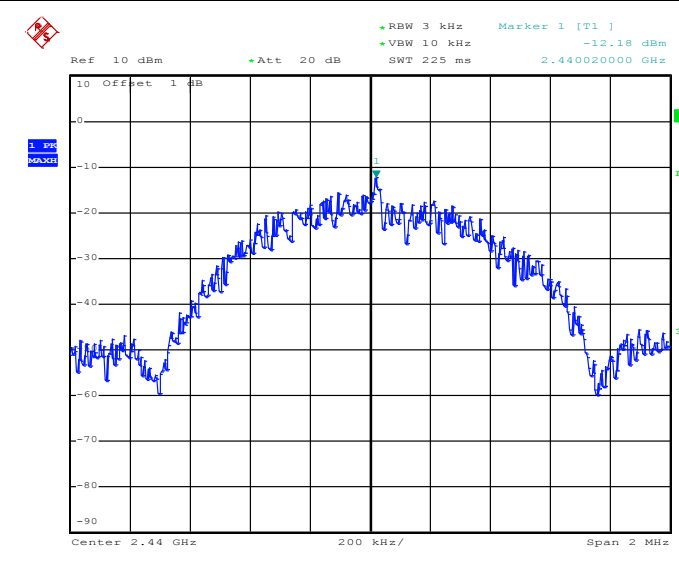
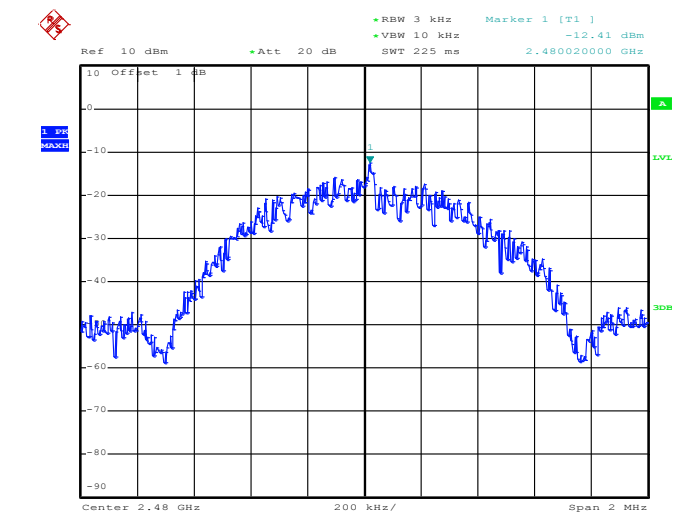
According to the KDB 558074, the test method of power spectral density as below:

- 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

Test Mode	Test Channel	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
GFSK(BLE)	Low	-12.34	8
	Middle	-12.18	8
	High	-12.41	8

Please refer to the following test plots:

<p>Low</p>	 <p> Ref 10 dBm Att 20 dB RBW 3 kHz Marker 1 [T1] -12.34 dBm VBW 10 kHz SWT 225 ms 2.40202000 GHz 10 Offset 1 dB 1. EPS MAX32 LVL 3dB Center 2.402 GHz 200 kHz/ Span 2 MHz </p>
<p>Middle</p>	 <p> Ref 10 dBm Att 20 dB RBW 3 kHz Marker 1 [T1] -12.18 dBm VBW 10 kHz SWT 225 ms 2.44002000 GHz 10 Offset 1 dB 1. EPS MAX32 LVL 3dB Center 2.44 GHz 200 kHz/ Span 2 MHz </p>
<p>High</p>	 <p> Ref 10 dBm Att 20 dB RBW 3 kHz Marker 1 [T1] -12.41 dBm VBW 10 kHz SWT 225 ms 2.48002000 GHz 10 Offset 1 dB 1. EPS MAX32 LVL 3dB Center 2.48 GHz 200 kHz/ Span 2 MHz </p>

6. 6dB 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.

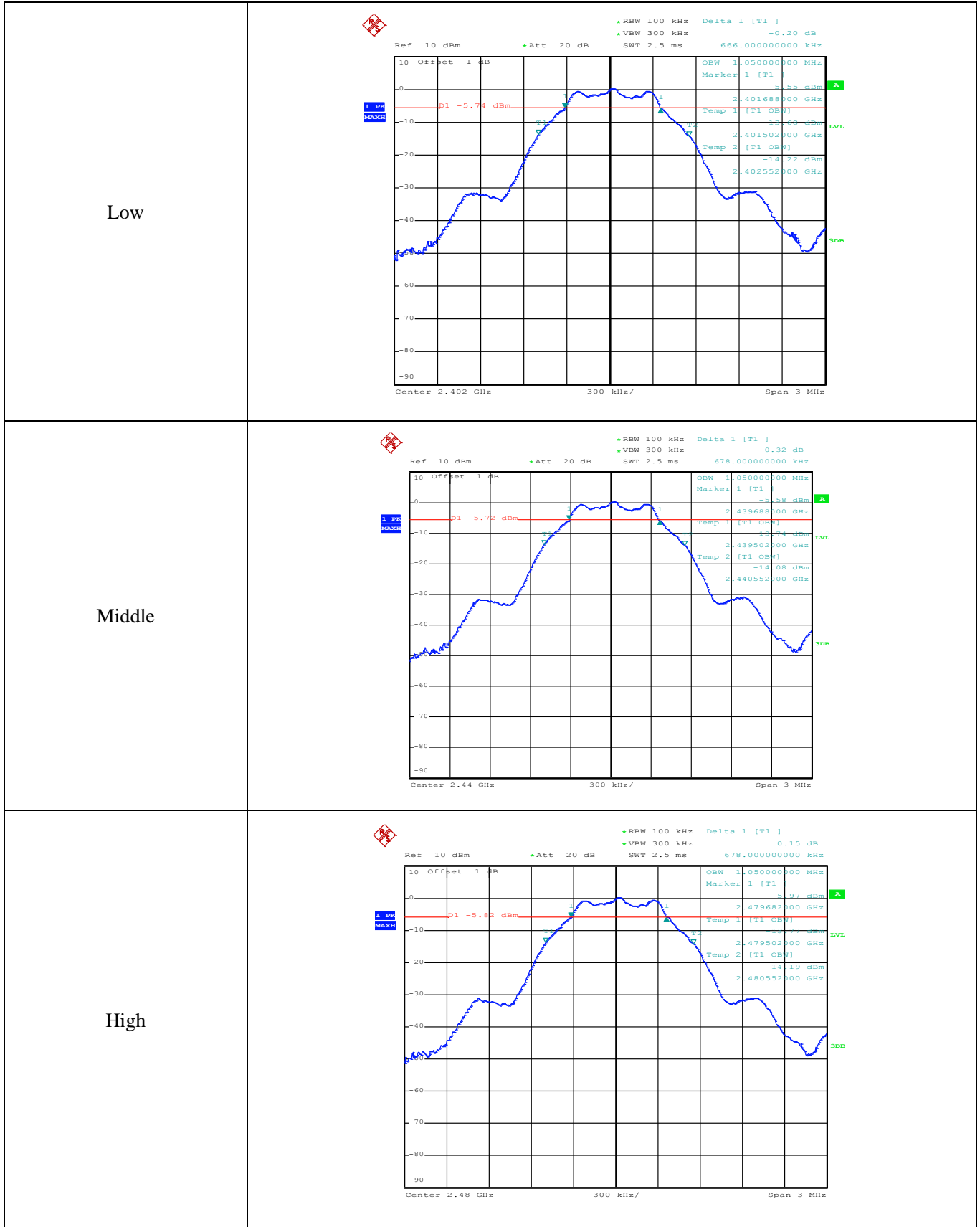
6.2 Test Procedure

- 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 Mode	Test Channel	6 dB Bandwidth kHz	Limit kHz
GFSK(BLE)	Low	666.000	≥ 500
	Middle	678.000	≥ 500
	High	678.000	≥ 500

Please refer to the following test plots:



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.

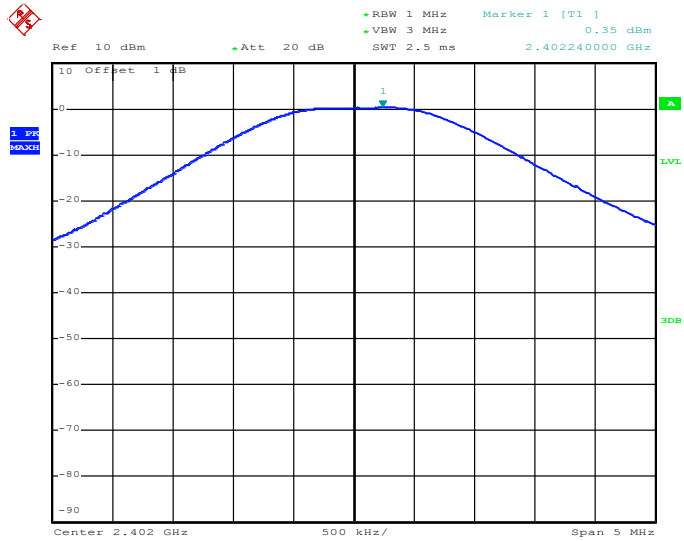
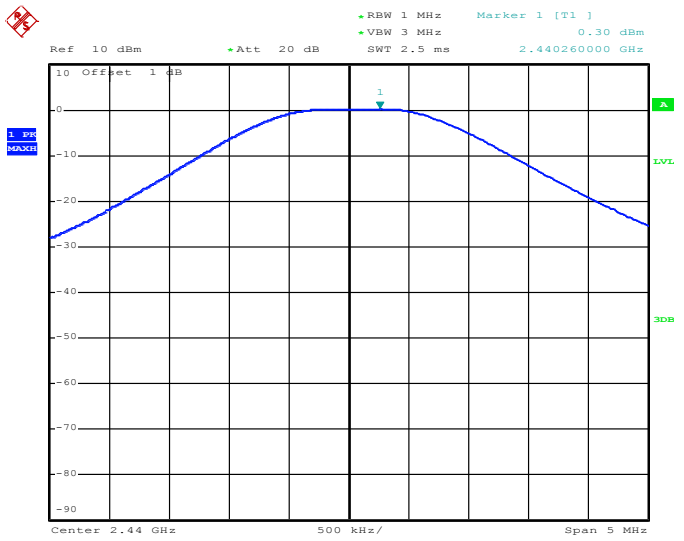
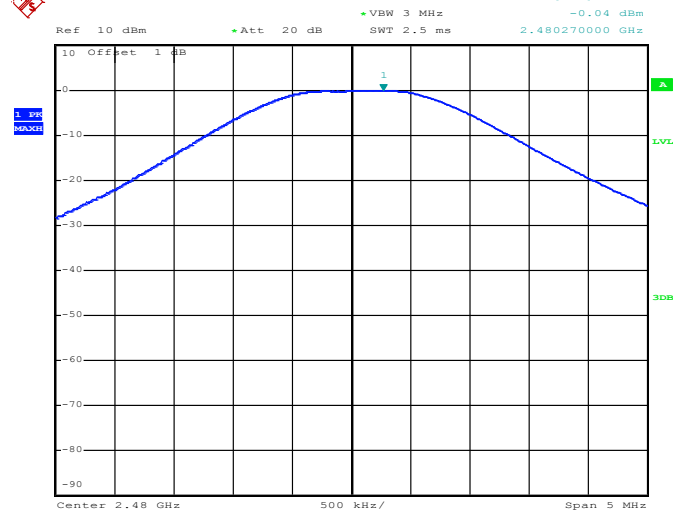
7.2 Test Procedure

According to section KDB-558074 D01 v04 section 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 Mode	Test Channel	Reading dBm	Output Power mW	Limit mW
GFSK(BLE)	Low	0.35	1.08	1000
	Middle	0.30	1.07	1000
	High	-0.04	0.99	1000

<p>Low</p>	 <p>Ref 10 dBm Att 20 dB RBW 1 MHz VBW 3 MHz SWT 2.5 ms Marker 1 [T1] 0.35 dBm 2.402240000 GHz</p> <p>Center 2.402 GHz 500 kHz/ Span 5 MHz</p>
<p>Middle</p>	 <p>Ref 10 dBm Att 20 dB RBW 1 MHz VBW 3 MHz SWT 2.5 ms Marker 1 [T1] 0.30 dBm 2.440260000 GHz</p> <p>Center 2.44 GHz 500 kHz/ Span 5 MHz</p>
<p>High</p>	 <p>Ref 10 dBm Att 20 dB RBW 1 MHz VBW 3 MHz SWT 2.5 ms Marker 1 [T1] -0.04 dBm 2.480270000 GHz</p> <p>Center 2.48 GHz 500 kHz/ Span 5 MHz</p>

8. Field Strength of Spurious Emissions

8.1 Standard Applicable

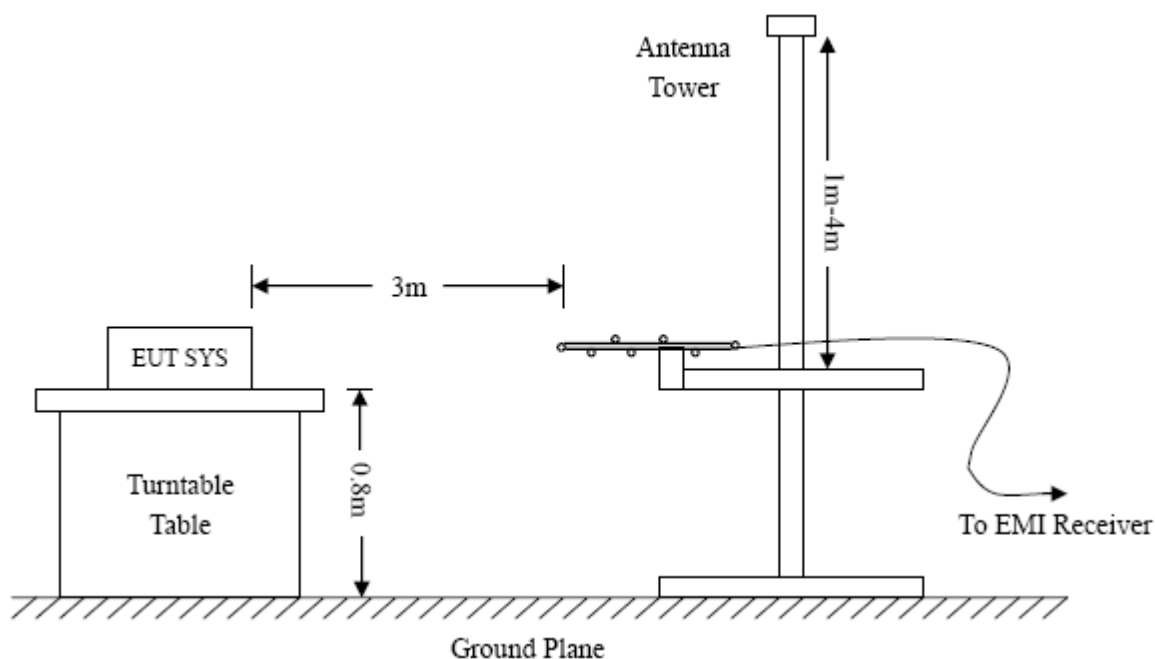
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within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

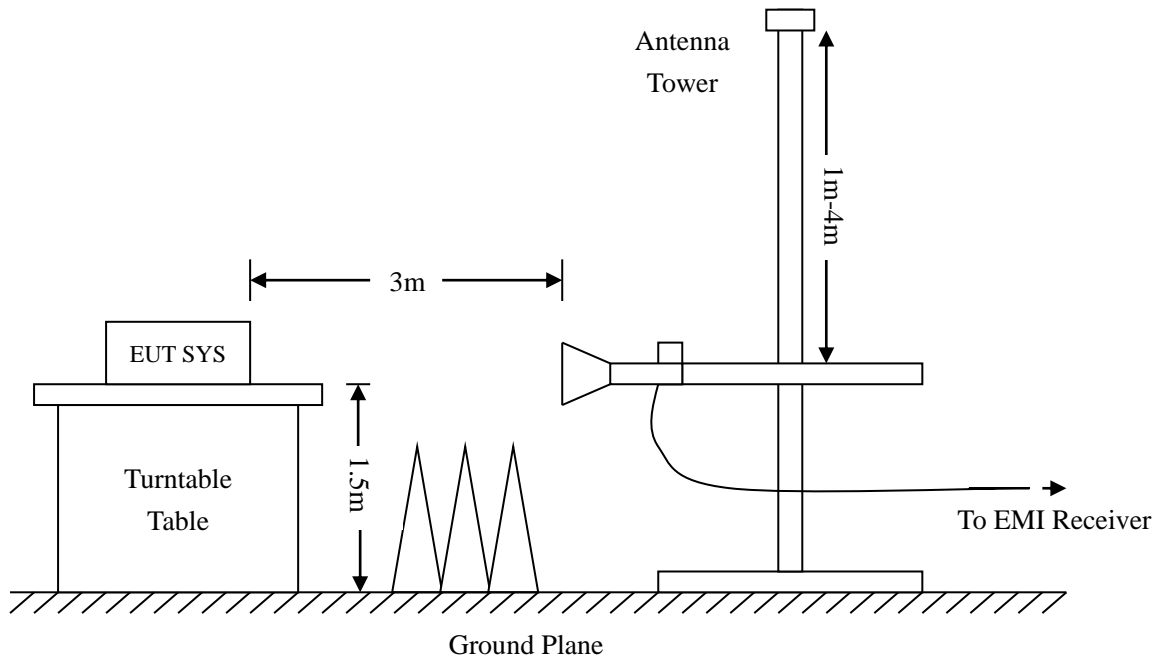
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

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 $-6\text{dB}\mu\text{V}$ means the emission is $6\text{dB}\mu\text{V}$ 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.

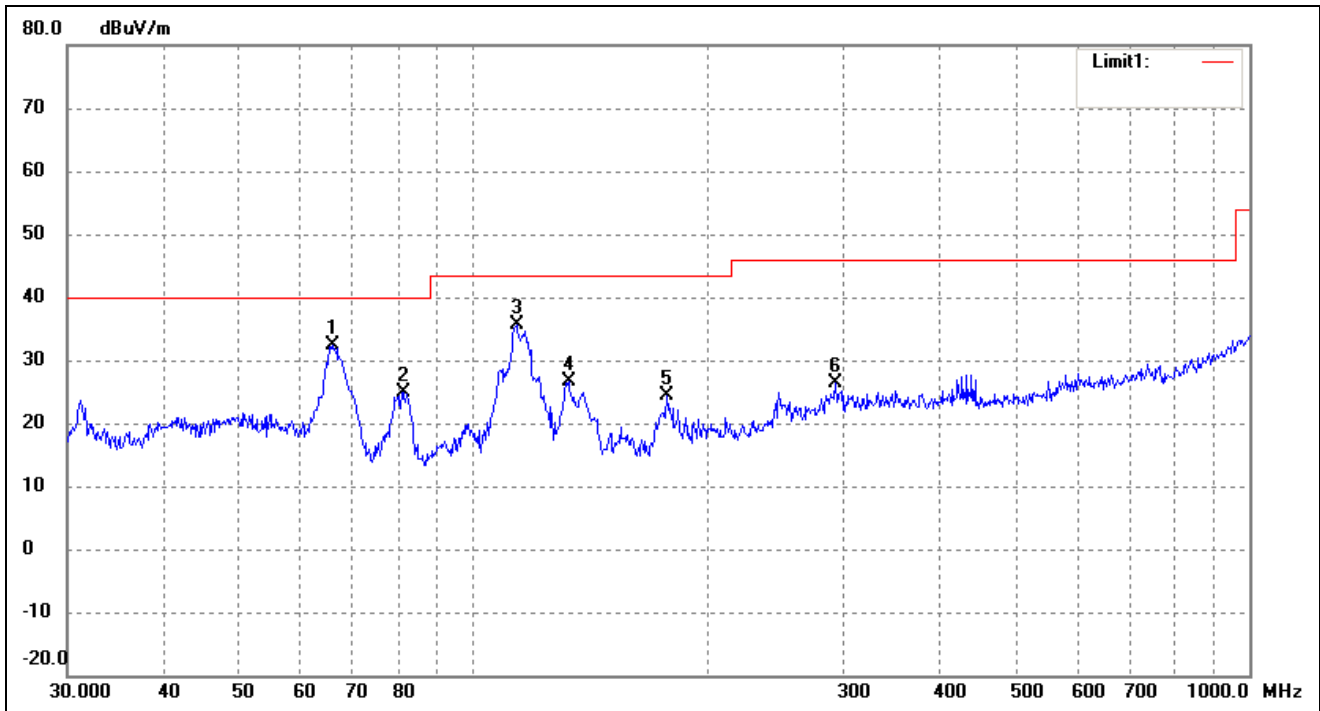
➤ Spurious Emissions Below 1GHz

Test Channel	Low	Polarity:	Horizontal
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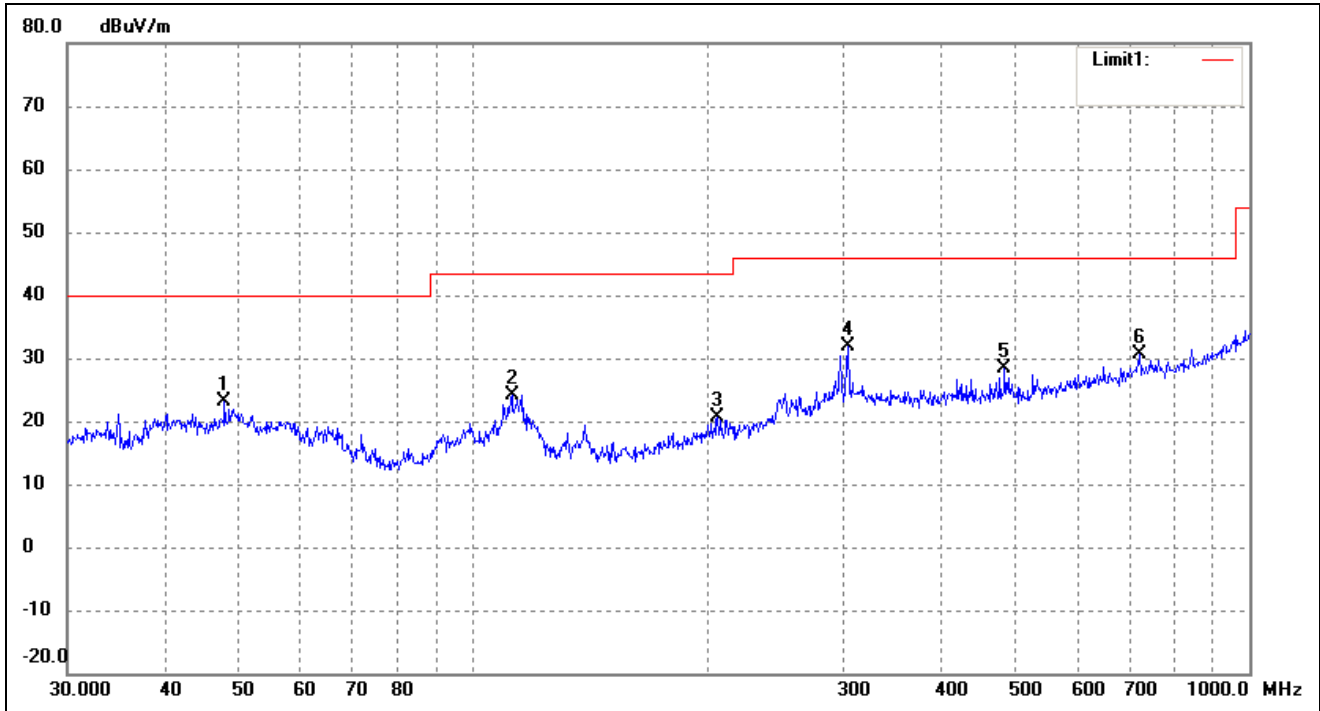
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	48.1626	34.72	-12.78	21.94	40.00	-18.06	340	100	peak
2	112.1305	37.04	-14.29	22.75	43.50	-20.75	97	100	peak
3	211.5265	34.62	-12.06	22.56	43.50	-20.94	328	100	peak
4	300.3672	35.62	-7.44	28.18	46.00	-17.82	118	100	peak
5	489.0269	34.83	-5.98	28.85	46.00	-17.15	256	100	peak
6	763.3757	33.06	-1.67	31.39	46.00	-14.61	185	100	peak

Test Channel	Low	Polarity:	Vertical
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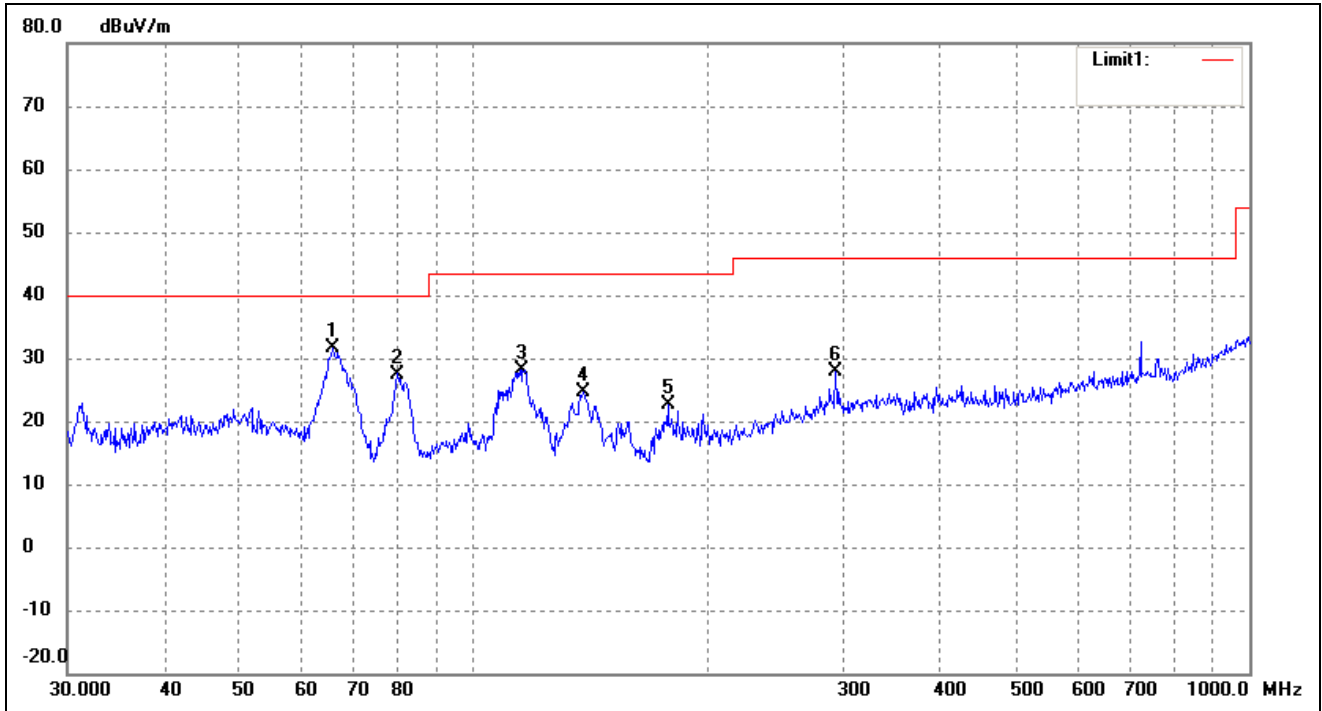
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	65.8031	47.82	-15.54	32.28	40.00	-7.72	329	100	peak
2	81.2117	43.63	-18.67	24.96	40.00	-15.04	95	100	peak
3	113.7143	50.17	-14.56	35.61	43.50	-7.89	137	100	peak
4	132.6850	43.65	-17.06	26.59	43.50	-16.91	100	100	peak
5	177.5092	38.84	-14.55	24.29	43.50	-19.21	316	100	peak
6	293.0842	33.98	-7.69	26.29	46.00	-19.71	229	100	peak

Test Channel	Middle	Polarity:	Horizontal
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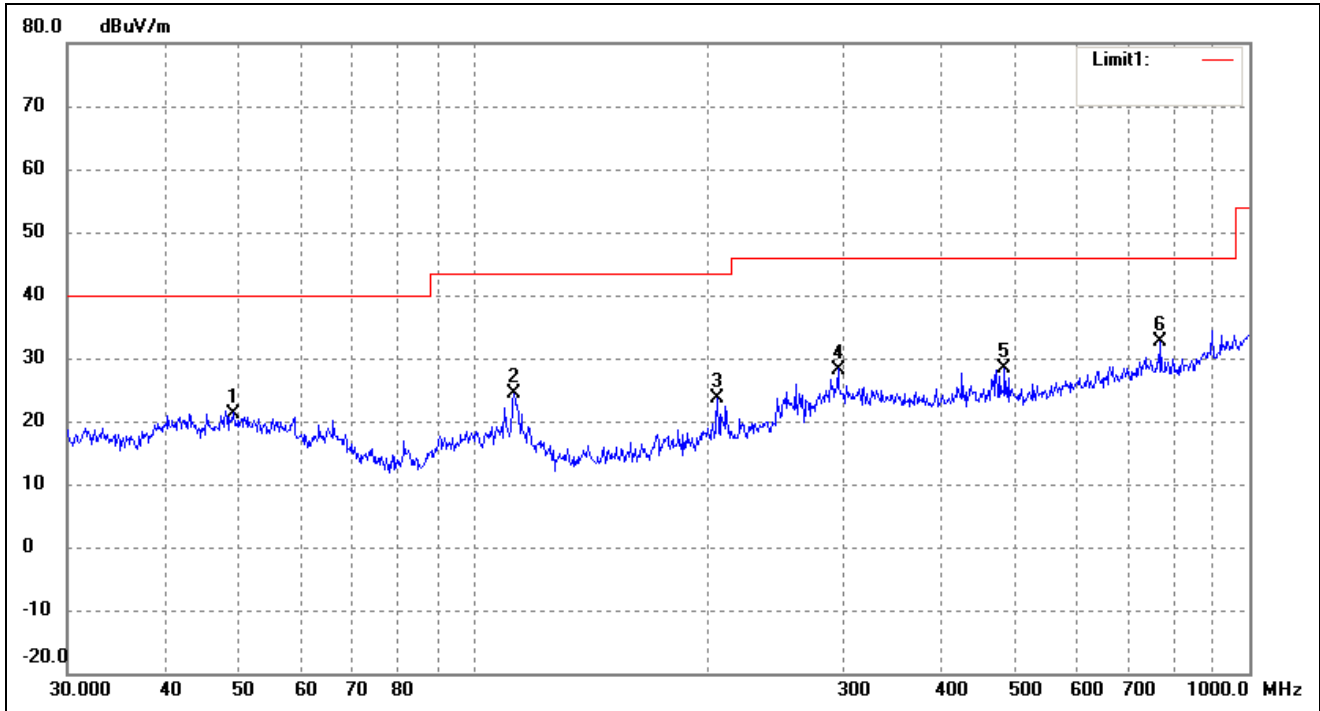
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	47.8260	35.81	-12.79	23.02	40.00	-16.98	73	100	peak
2	112.1305	38.43	-14.29	24.14	43.50	-19.36	214	100	peak
3	206.3976	32.82	-12.25	20.57	43.50	-22.93	82	100	peak
4	303.5437	39.23	-7.35	31.88	46.00	-14.12	139	100	peak
5	483.9094	34.34	-6.08	28.26	46.00	-17.74	153	100	peak
6	721.7259	32.97	-2.31	30.66	46.00	-15.34	233	100	peak

Test Channel	Middle	Polarity:	Vertical
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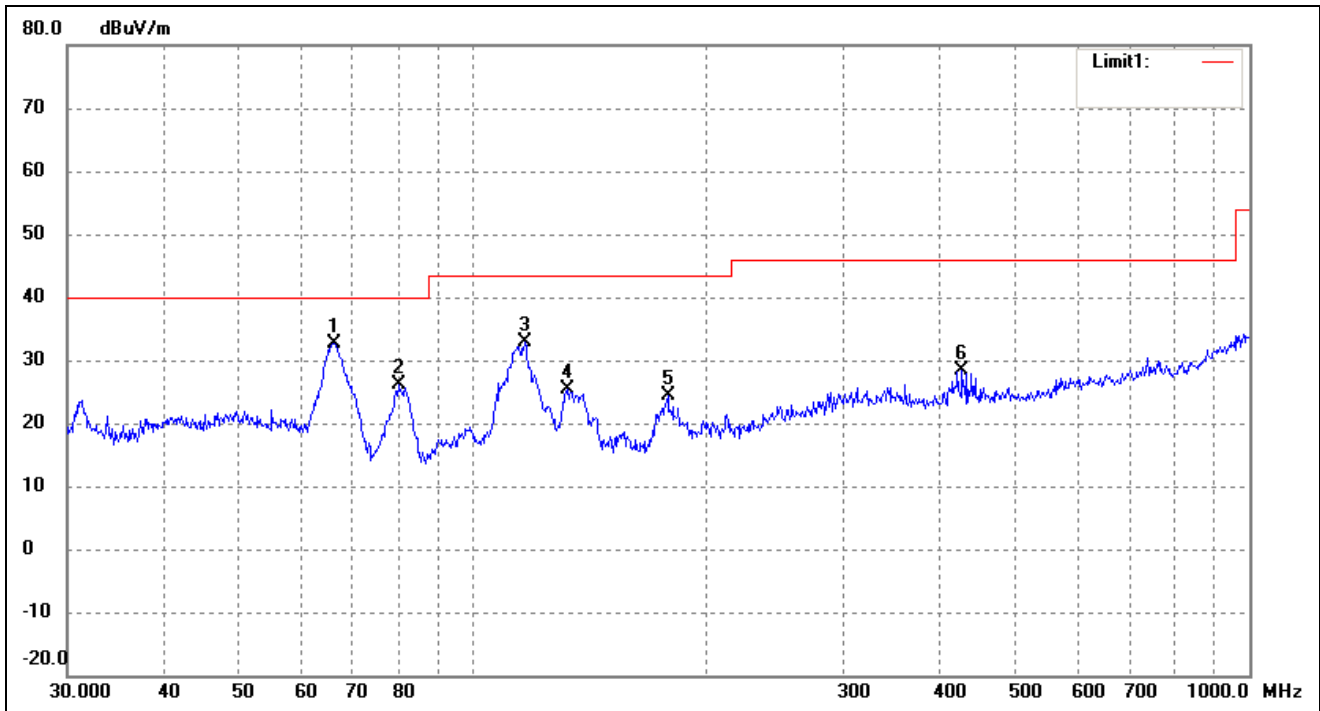
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	65.8031	47.08	-15.54	31.54	40.00	-8.46	229	100	peak
2	79.8003	46.29	-18.79	27.50	40.00	-12.50	198	100	peak
3	115.7256	43.01	-14.89	28.12	43.50	-15.38	100	100	peak
4	138.8735	41.63	-16.99	24.64	43.50	-18.86	133	100	peak
5	178.1327	36.99	-14.48	22.51	43.50	-20.99	89	100	peak
6	293.0842	35.59	-7.69	27.90	46.00	-18.10	262	100	peak

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	49.1865	34.04	-12.86	21.18	40.00	-18.82	144	100	peak
2	112.9196	38.72	-14.42	24.30	43.50	-19.20	163	100	peak
3	206.3976	35.84	-12.25	23.59	43.50	-19.91	56	100	peak
4	295.1469	35.76	-7.51	28.25	46.00	-17.75	105	100	peak
5	483.9094	34.38	-6.08	28.30	46.00	-17.70	224	100	peak
6	768.7481	34.41	-1.85	32.56	46.00	-13.44	277	100	peak

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	66.2662	48.47	-15.73	32.74	40.00	-7.26	63	100	peak
2	80.0806	44.96	-18.79	26.17	40.00	-13.83	98	100	peak
3	116.5401	47.79	-15.00	32.79	43.50	-10.71	109	100	peak
4	132.2206	42.44	-17.03	25.41	43.50	-18.09	111	100	peak
5	178.1327	38.97	-14.48	24.49	43.50	-19.01	336	100	peak
6	426.5210	34.61	-6.25	28.36	46.00	-17.64	337	100	peak

➤ Spurious Emissions Below 1GHz

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2402MHz							
4804	58.63	-3.59	55.04	74	-18.96	H	PK
4804	40.27	-3.59	36.68	54	-17.32	H	AV
7206	60.27	-0.52	59.75	74	-14.25	H	PK
7206	38.25	-0.52	37.73	54	-16.27	H	AV
4804	61.56	-3.59	57.97	74	-16.03	V	PK
4804	39.87	-3.59	36.28	54	-17.72	V	AV
7206	60.74	-0.52	60.22	74	-13.78	V	PK
7206	41.7	-0.52	41.18	54	-12.82	V	AV
Middle Channel-2440MHz							
4880	58.66	-3.49	55.17	74	-18.83	H	PK
4880	39.98	-3.49	36.49	54	-17.51	H	AV
7320	61	-0.47	60.53	74	-13.47	H	PK
7320	38.95	-0.47	38.48	54	-15.52	H	AV
4880	62	-3.49	58.51	74	-15.49	V	PK
4880	39.39	-3.49	35.9	54	-18.1	V	AV
7320	61.89	-0.47	61.42	74	-12.58	V	PK
7320	38.87	-0.47	38.4	54	-15.6	V	AV
High Channel-2480MHz							
4960	60.14	-3.41	56.73	74	-17.27	H	PK
4960	40.75	-3.41	37.34	54	-16.66	H	AV
7440	61.62	-0.42	61.2	74	-12.8	H	PK
7440	40.99	-0.42	40.57	54	-13.43	H	AV
4960	60.48	-3.41	57.07	74	-16.93	V	PK
4960	39.85	-3.41	36.44	54	-17.56	V	AV
7440	58.42	-0.42	58	74	-16	V	PK
7440	38.57	-0.42	38.15	54	-15.85	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 v04, the band-edge radiated test method as follows:

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.

According to the KDB 558074 D01 v04, the conducted spurious emissions test method as follows:

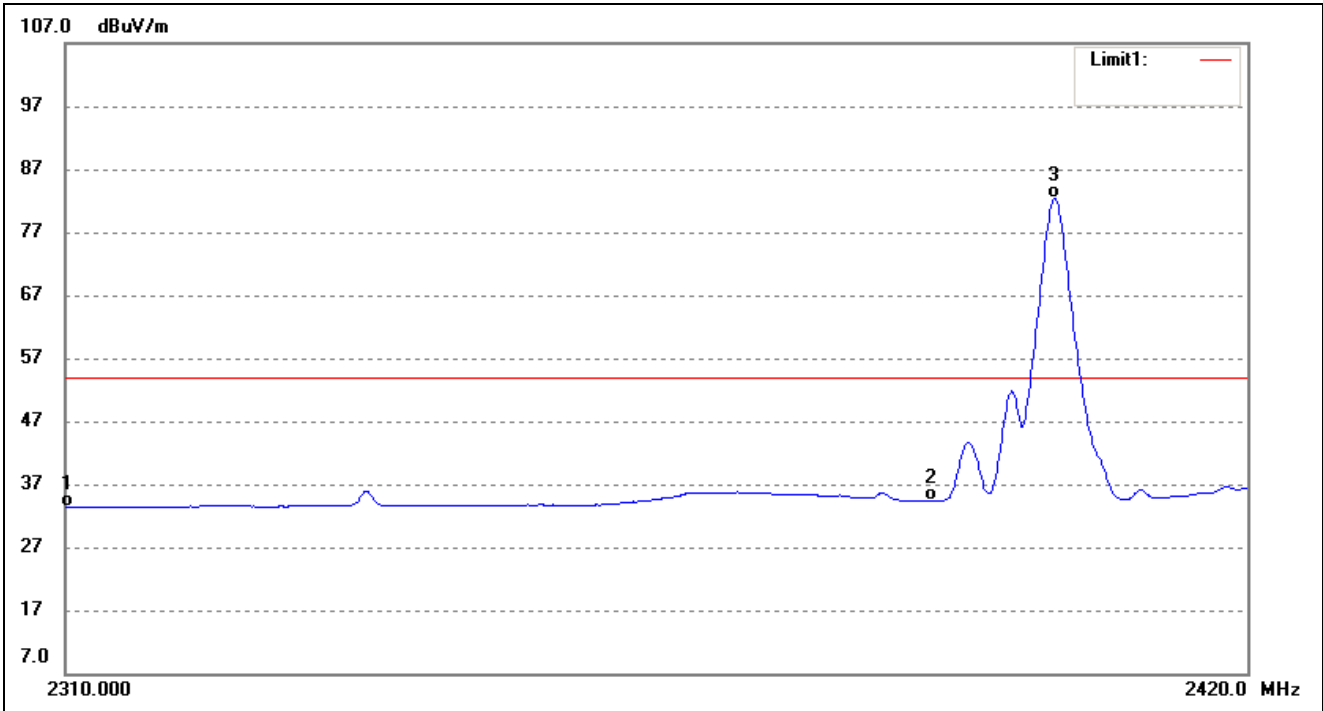
1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW \geq 300 kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

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

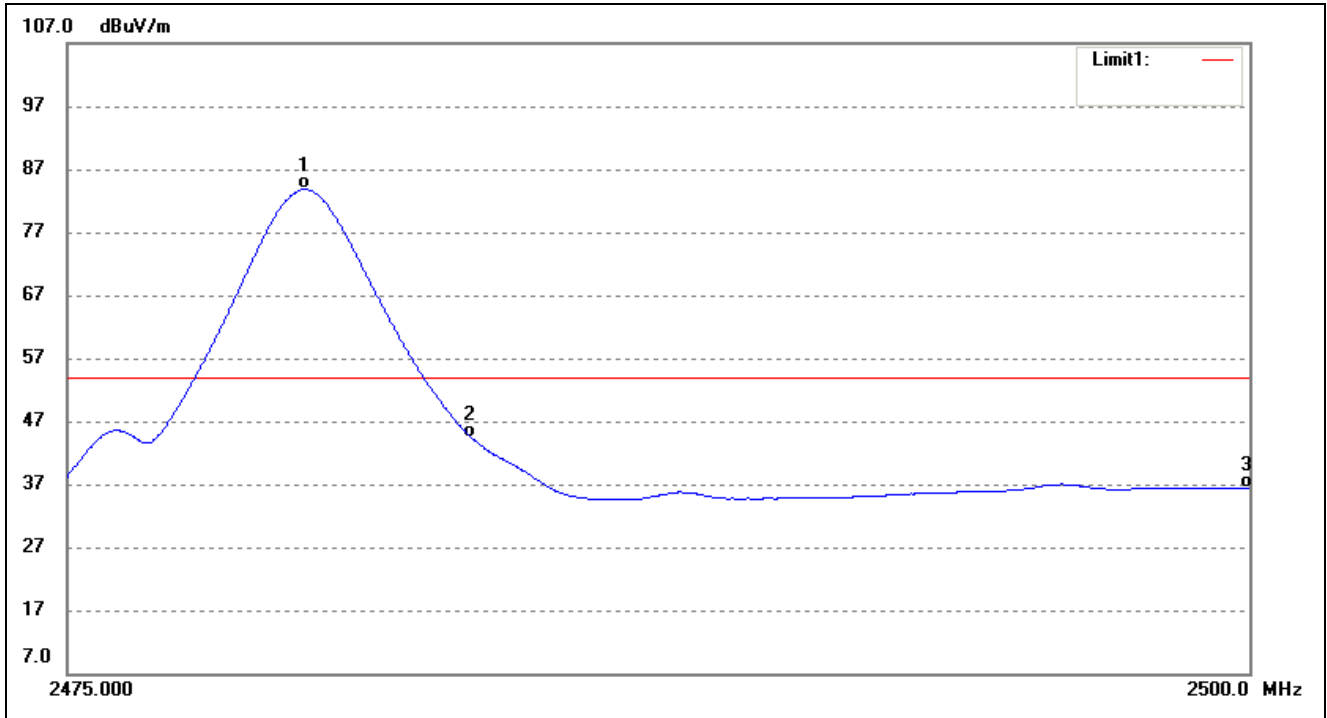
➤ Radiated test

Test Channel	Low	Polarity:	Horizontal (worst case)
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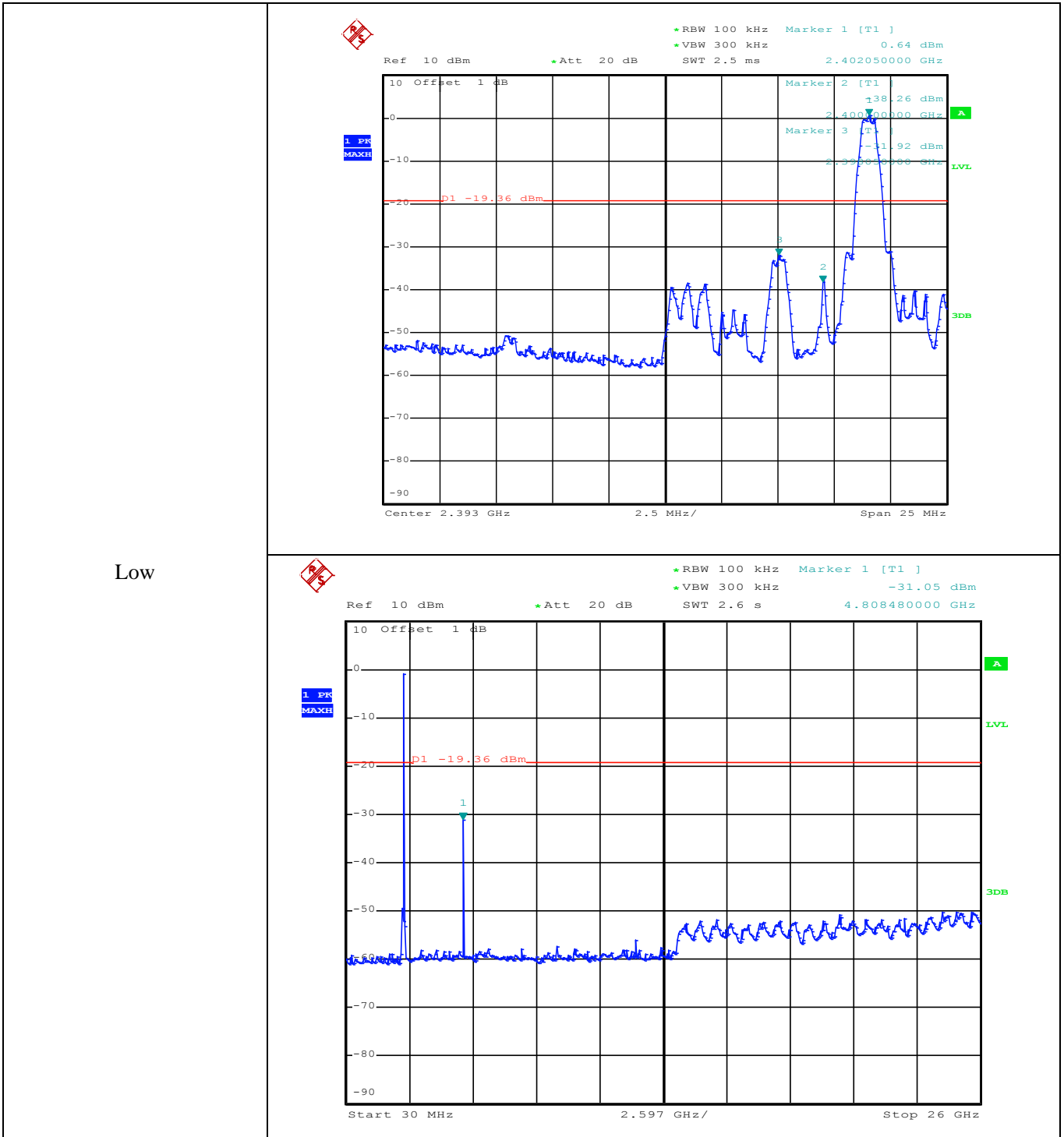
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	41.12	-7.78	33.34	54.00	-20.66	Average Detector
	2310.000	52.67	-7.78	44.89	74.00	-29.11	Peak Detector
2	2390.000	41.68	-7.32	34.36	54.00	-19.64	Average Detector
	2390.000	55.16	-7.32	47.84	74.00	-26.16	Peak Detector
3	2401.719	89.69	-7.25	82.44	/	/	Average Detector
	2401.719	99.88	-7.25	92.63	/	/	Peak Detector

Test Channel	High	Polarity:	Horizontal (worst case)
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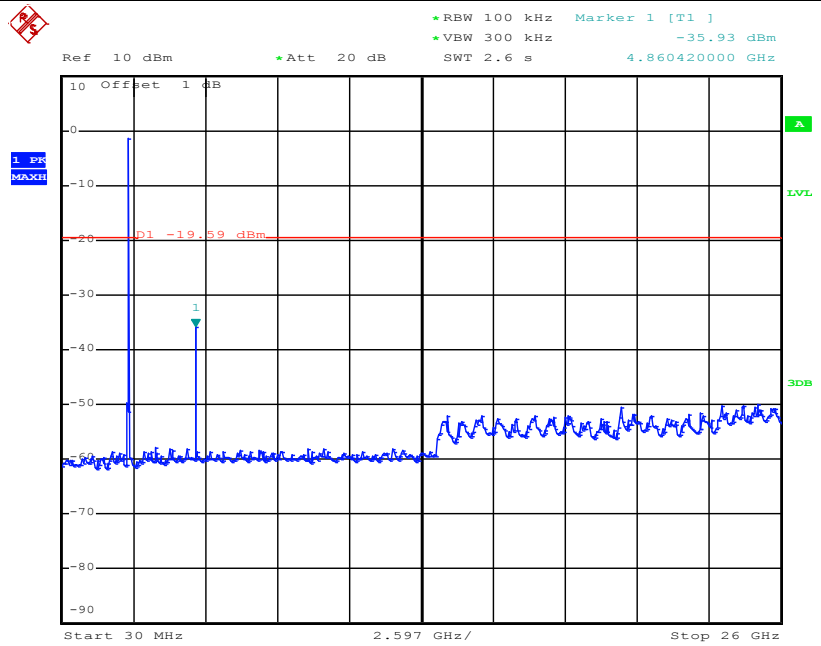
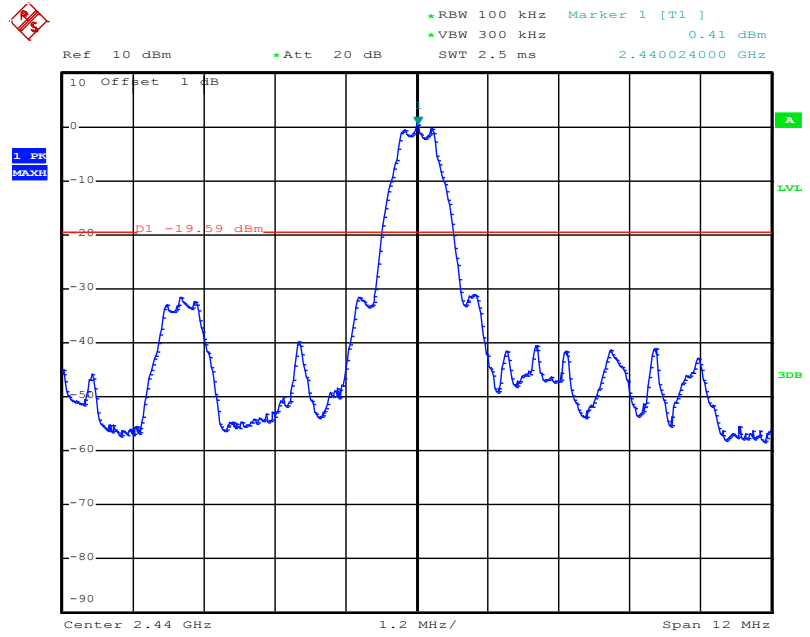


No.	Frequenc y (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.005	90.60	-6.79	83.81	/	/	Average Detector
	2480.154	100.69	-6.78	93.91	/	/	Peak Detector
2	2483.500	51.16	-6.77	44.39	54.00	-9.61	Average Detector
	2483.500	62.93	-6.77	56.16	74.00	-17.84	Peak Detector
3	2500.000	43.06	-6.67	36.39	54.00	-17.61	Average Detector
	2500.000	58.01	-6.67	51.34	74.00	-22.66	Peak Detector

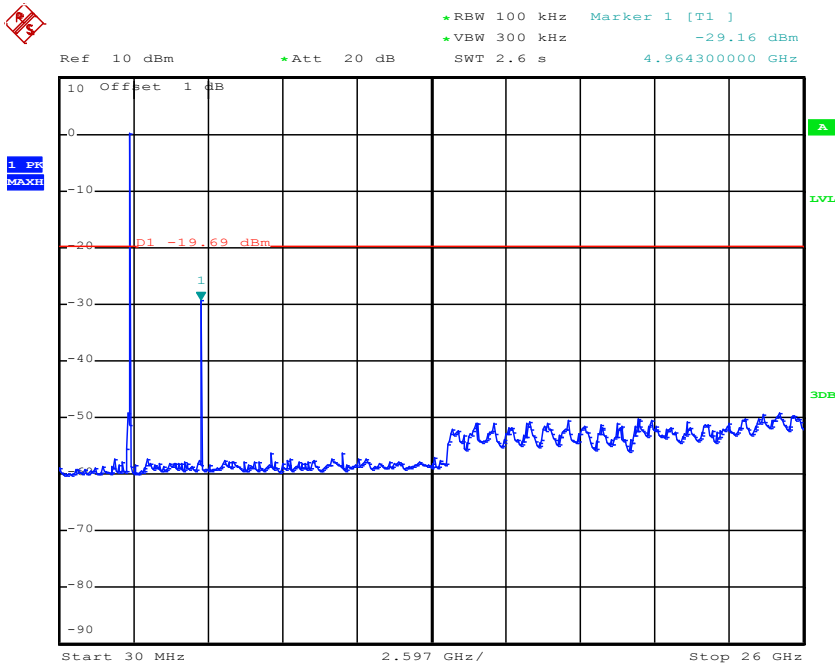
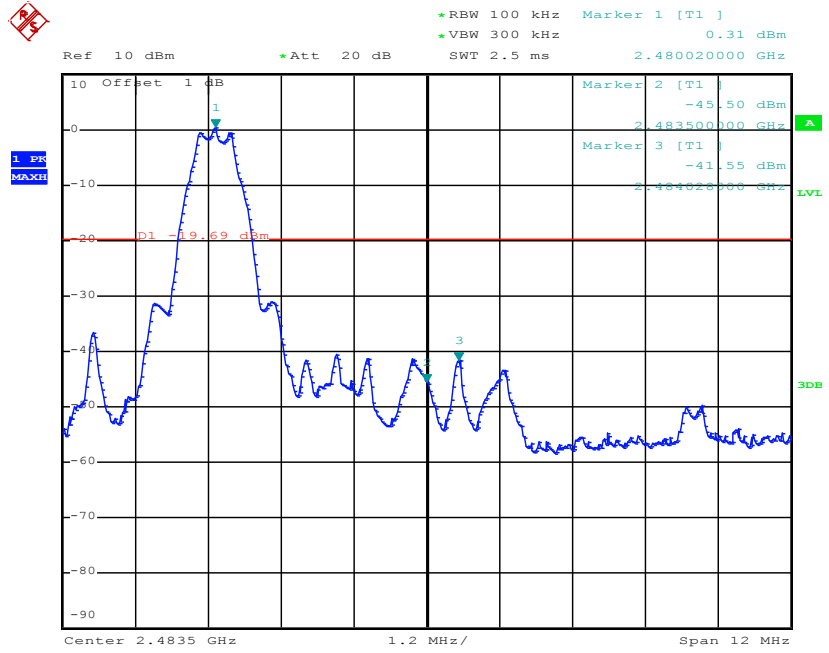
➤ Conducted test



Middle



High



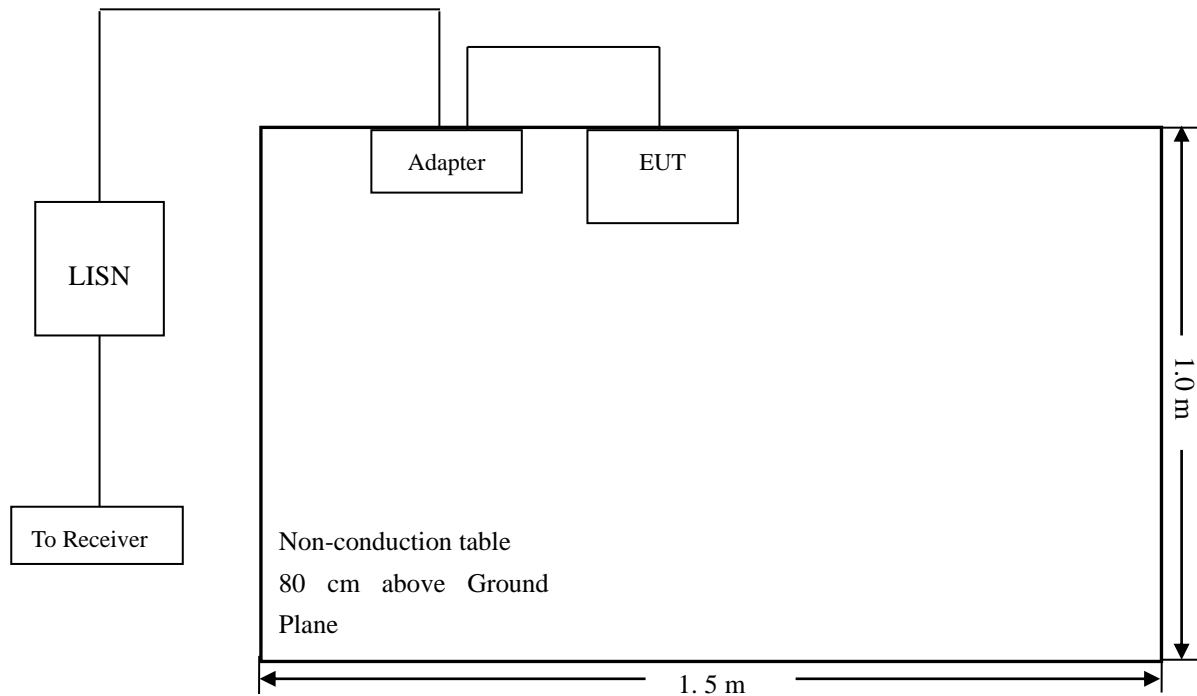
10. Conducted Emissions

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



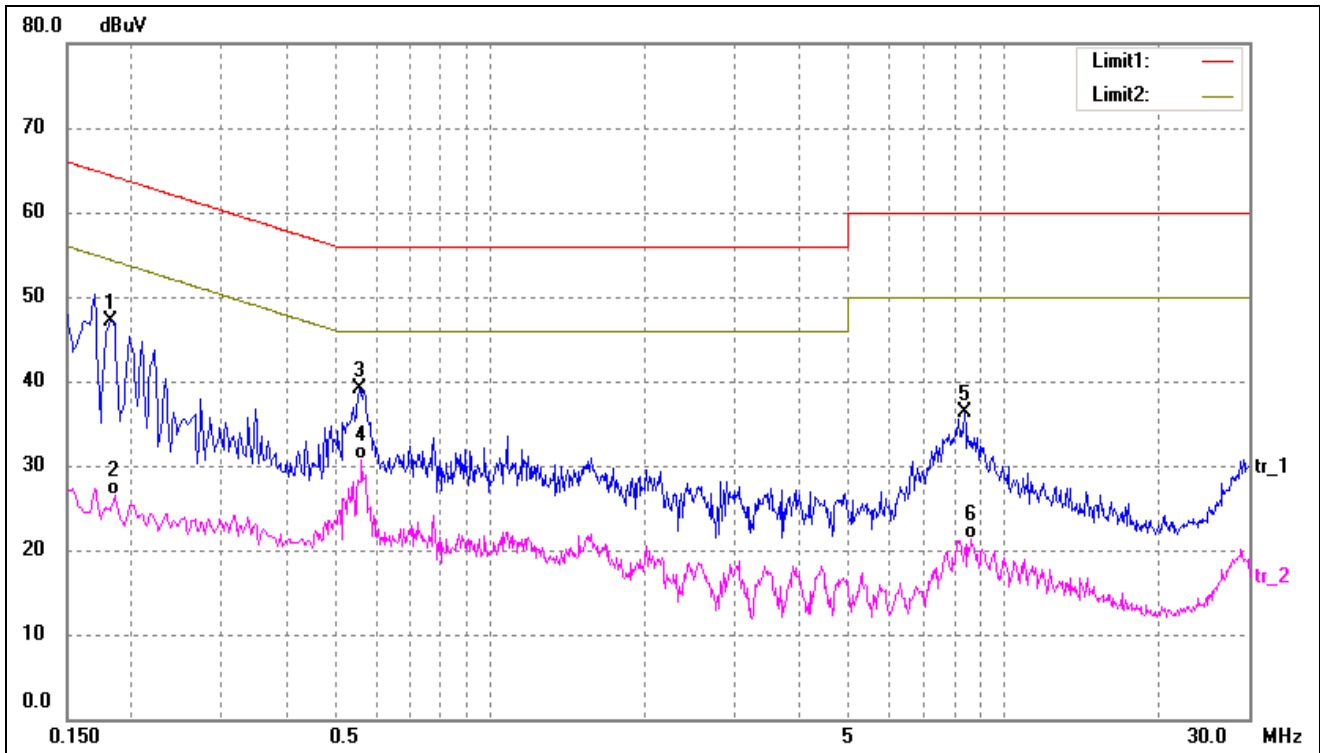
10.3 Test Receiver Setup

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

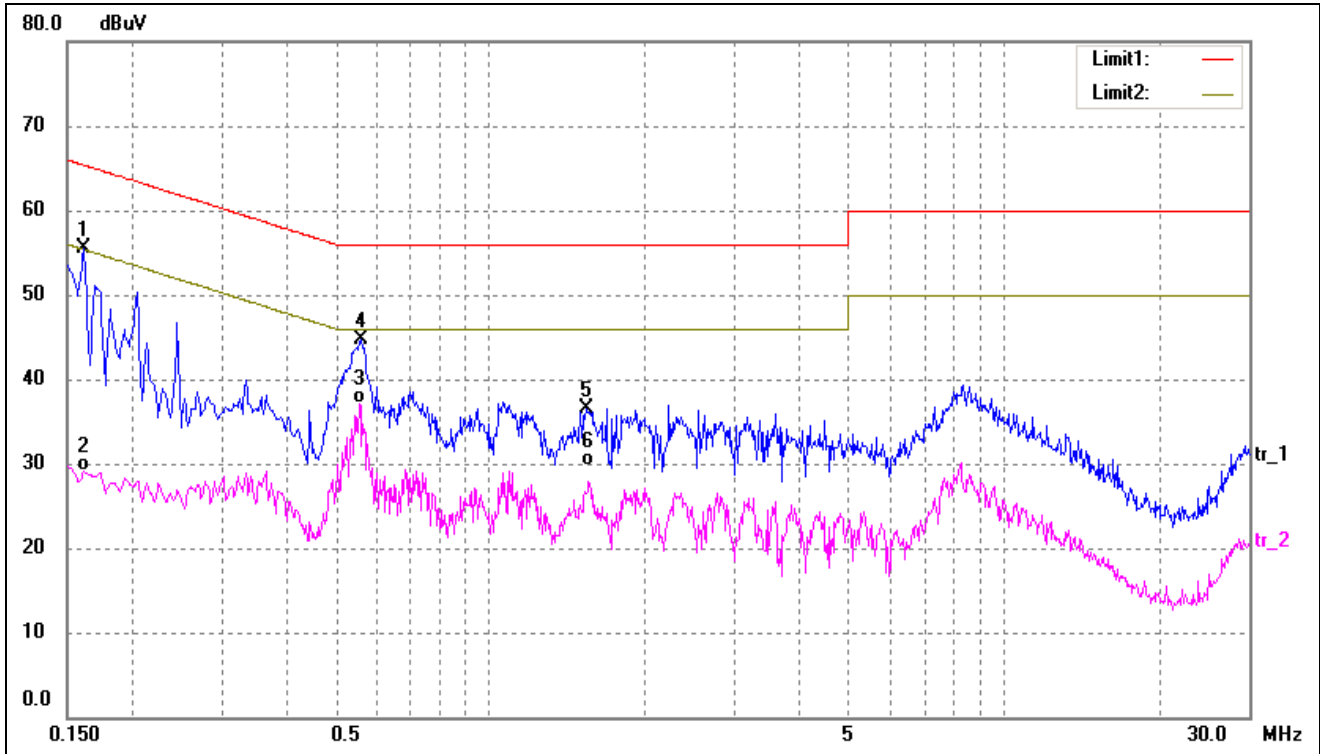
10.4 Summary of Test Results/Plots

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	0.1819	37.06	10.11	47.17	64.39	-17.22	peak
2	0.1860	16.32	10.11	26.43	54.21	-27.78	AVG
3	0.5580	28.74	10.32	39.06	56.00	-16.94	peak
4*	0.5620	20.41	10.32	30.73	46.00	-15.27	AVG
5	8.3940	25.40	10.90	36.30	60.00	-23.70	peak
6	8.6540	10.32	10.91	21.23	50.00	-28.77	AVG

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	0.1620	55.53	0.00	55.53	65.36	-9.83	peak
2	0.1620	29.02	0.00	29.02	55.36	-26.34	AVG
3*	0.5580	37.05	0.00	37.05	46.00	-8.95	AVG
4	0.5620	44.65	0.00	44.65	56.00	-11.35	peak
5	1.5420	36.60	0.00	36.60	56.00	-19.40	peak
6	1.5420	29.75	0.00	29.75	46.00	-16.25	AVG

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