

FCC CERTIFICATION TEST REPORT

For
FCC ID: 2AD9E-MM100

Report Reference No. : 15FBS12032 51

FCC 2.948 No : 923232

Date of issue : 2016-02-17

Testing Laboratory : ATT Product Service Co., Ltd.

Address : No. 3, ChangLianShan Industrial Park, ChangAn Town,
DongGuan City, GuangDong, China.

Applicant's name : JL Audio INC

Address : 10369 N Commerce Parkway Miramar, FL 33025 USA

Manufacturer : JL Audio INC

Test specification:

Test item description : Marine Audio Controller

Trade Mark : --

Model/Type reference : MM100s

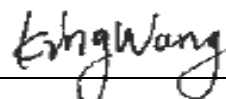
Ratings : I/P: 12Vdc full battery is used to supply power

Tested by

A handwritten signature in black ink, appearing to read 'Lake Hu', written over a horizontal line.

(Lake Hu /Engineer)

Approved by

A handwritten signature in black ink, appearing to read 'King Wang', written over a horizontal line.

(King Wang/EMC Manger)

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TEST REPORT DECLARE

Applicant	:	JL Audio INC
Address	:	10369 N Commerce Parkway Miramar, FL 33025 USA
Equipment under Test	:	Marine Audio Controller
Model No	:	MM100s
FCC ID	:	2AD9E-MM100
Manufacturer	:	JL Audio INC
Address	:	10369 N Commerce Parkway Miramar, FL 33025 USA

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C: 2013

Test procedure used: ANSI C63.4: 2014, KDB558074 D01 DTS Meas Guidance V03r02.

We Declare:

The equipment described above is tested by ATT Product Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and ATT Product Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	15FBS12032 51		
Date of Test:	2015/12/14-2016/02/16	Date of Report:	2016/02/17

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of ATT Product Service Co., Ltd.

1. Summary of test results

The EUT have been tested according to the applicable standards as referenced below.		
Description of Test Item	Standard	Results
6dB Bandwidth	FCC Part 15: 15.247	PASS
Maximum Output Power	FCC Part 15: 15.247	PASS
Power Spectral Density	FCC Part 15: 15.247	PASS
Conducted Spurious Emissions	FCC Part 15: 15.247	PASS
Radiated Spurious Emissions	FCC Part 15.205 / 15.209	PASS
Antenna requirement	FCC Part 15: 15.203	PASS
Conducted Emission	FCC Part 15.207	N/A

Remark : all test are according to ANSI C63.10-2013 and ANSI C63.4-2014

2. General test information

2.1. Description of EUT

EUT* Name	:	Marine Audio Controller
Model Number	:	MM100s
EUT function description	:	Please reference user manual of this device
Power supply	:	12Vdc full battery is used to supply power
Radio Technology	:	Bluetooth V4.0
Operation frequency	:	2402-2480MHz
Modulation	:	GFSK
Antenna Type	:	Integral antenna, maximum PK gain:2dBi
Date of Receipt	:	2015/12/14
Sample Type	:	Single production

Note1: EUT is the ab.of equipment under test.

Channle information							
CH	Frequency	CH	Frequency	CH	Frequency	CH	Frequency
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

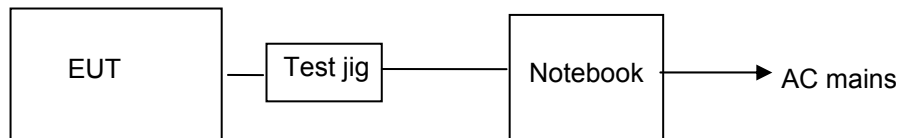
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Output.
/	/	/	/

2.3. Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	EMC Compliance	SN
Notebook	acer	Aspire E1-472G	FCC DoC	/
Battery Charge	Ao Neng	6-DZM-10	FCC VoC	/

2.4. Block diagram of EUT configuration for test



EUT was connected to control to a special test jig provided by manufacturer which has a Micro USB connector to connect to Notebook, and the Notebook will run a special test software to control EUT work in Continuous TX mode (>98% duty cycle), and select test channel, wireless mode and data rate.

Tested mode, channel, and data rate information			
Mode	data rate (Mbps) (see Note)	Channel	Frequency (MHz)
GFSK	2	Low :CH0	2402
	2	Middle: CH19	2440
	2	High: CH39	2480
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.			

2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa

2.6.Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.44dB
Uncertainty for Radiation Emission test (9KHz-30MHz)	3.21dB
Uncertainty for Radiation Emission test (30MHz-200MHz)	3.42 dB (Polarize: V)
	3.52 dB (Polarize: H)
Uncertainty for Radiation Emission test (200MHz-1GHz)	3.52 dB (Polarize: V)
	3.54 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	4.20 dB (Polarize: V)
	4.20 dB (Polarize: H)
Uncertainty for radio frequency	1×10-9
Uncertainty for conducted RF Power	0.65dB

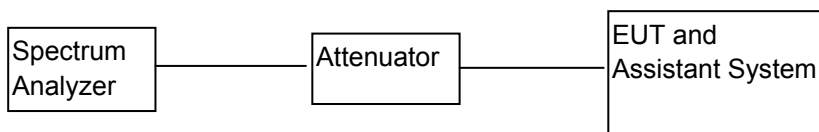
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. 6dB Bandwidth and 99% Bandwidth

3.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.2 6	2016/12/19	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/12/19	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2016/12/19	1 Year

3.2. Block diagram of test setup



3.3. Limits

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 KHz

3.4. Test Procedure

- (1) Configure EUT and assistant system according clause 2.4 and 3.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

RBW:	100KHz
VBW:	300KHz
Detector Mode:	Peak
Sweep time:	auto
Trace mode:	Max hold

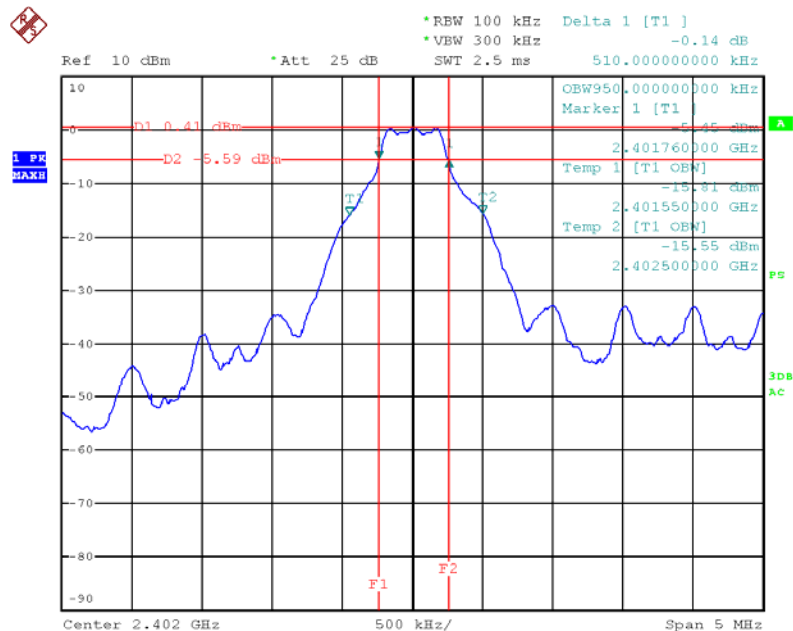
- (5) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.5. Test Result

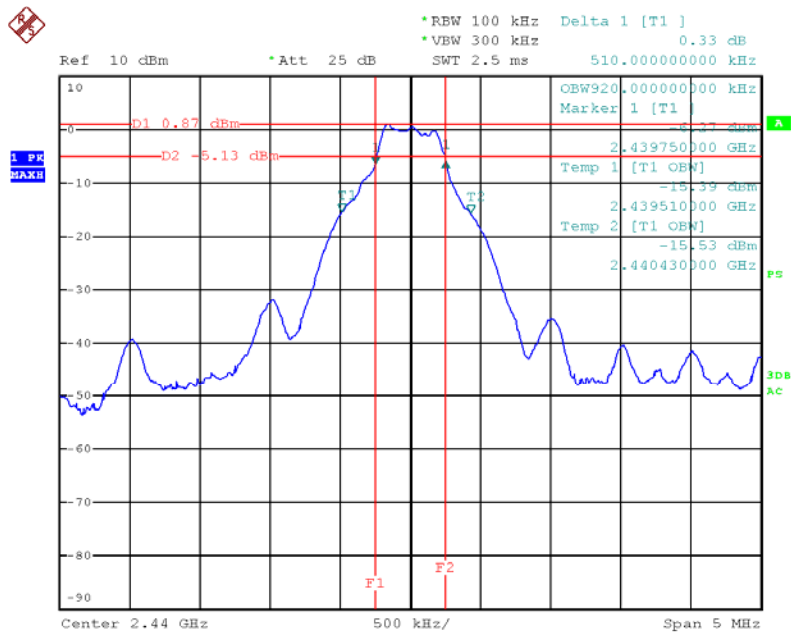
EUT: Marine Audio Controller M/N: MM100s			
EUT Set Mode	CH or Frequency	6 dB bandwidth	99% dB bandwidth
		Result (MHz)	Result (MHz)
GFSK	CH0	0.510	0.950
	CH19	0.510	0.920
	CH39	0.510	0.950
Limit: >500KHz			Conclusion: PASS

3.6. Original test data

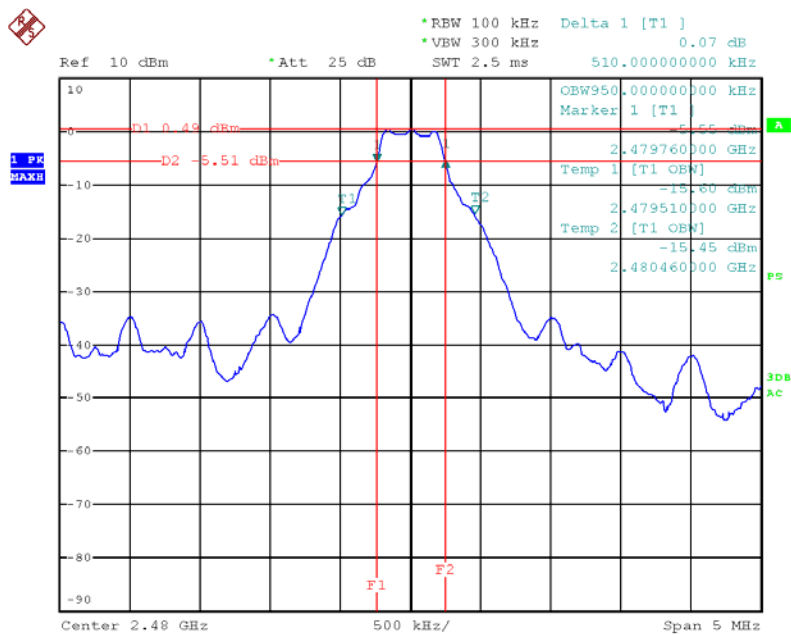
6 dB bandwidth



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4. Maximum Output Power

4.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/12/19	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/12/19	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2016/12/19	1 Year

4.2. Test equipment

Same with 3.1

4.3. Block diagram of test setup

Same with 3.2

4.4. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.5. Test Procedure

- (1) Configure EUT and assistant system according clause 2.4 and 3.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

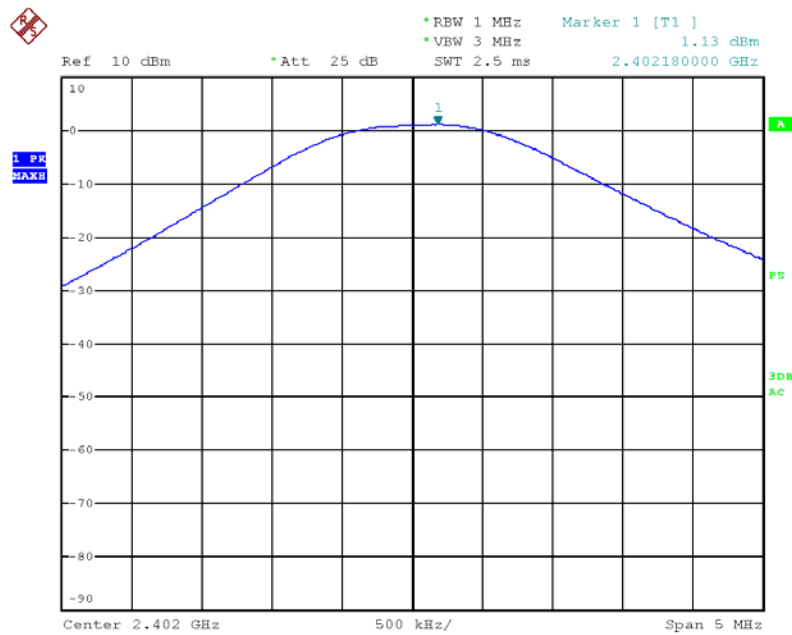
RBW:	1MHz
VBW:	3MHz
Span	>1.5x 6dB bandwidth
Detector Mode:	PEAK
Sweep time:	auto
Trace mode	Max hold

- (5) Allow the trace to stabilize, Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges measure out the Average and PK output power.

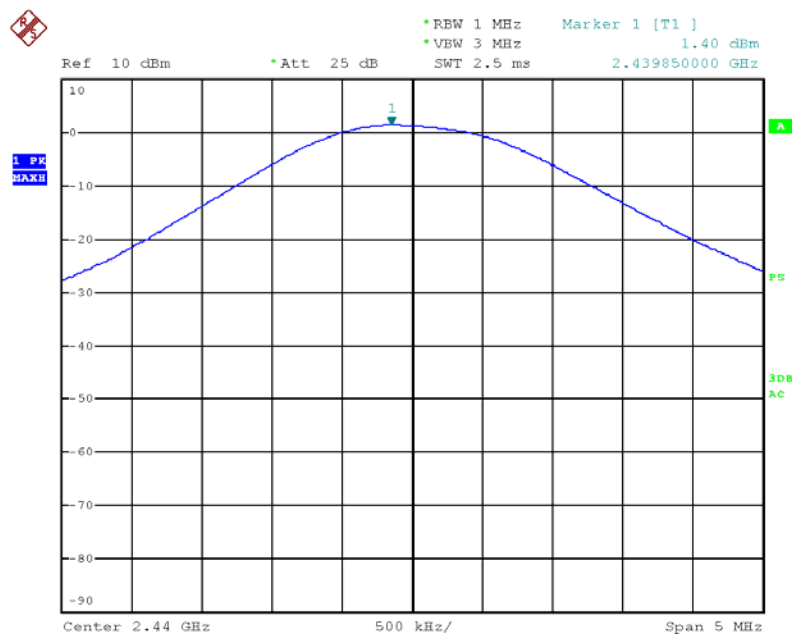
4.6. Test Result

EUT: Marine Audio Controller M/N: MM100s			
EUT Set Mode	Data Rate (Mbps)	CH	Result(dBm)
			Peak
GFSK	2	CH0	1.13
		CH19	1.40
		CH39	1.02
Limit: 30dBm		Conclusion: PASS	

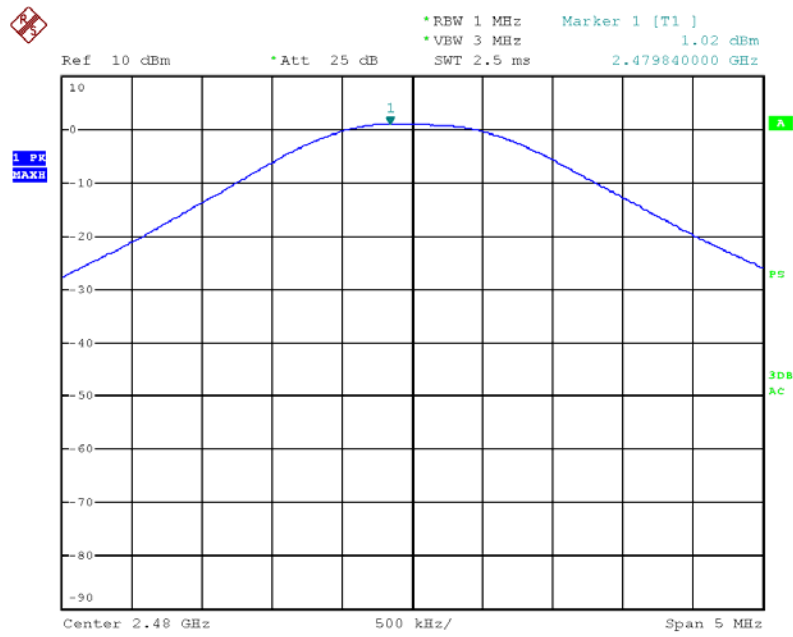
4.7.Original test data



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5. Power Spectral Density

5.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/12/19	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/12/19	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2016/12/19	1 Year

5.2. Test equipment

Same with 3.1

5.3. Block diagram of test setup

Same with 3.2

5.4. Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

5.5. Test Procedure

- (1) Configure EUT and assistant system according clause 2.4 and 5.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

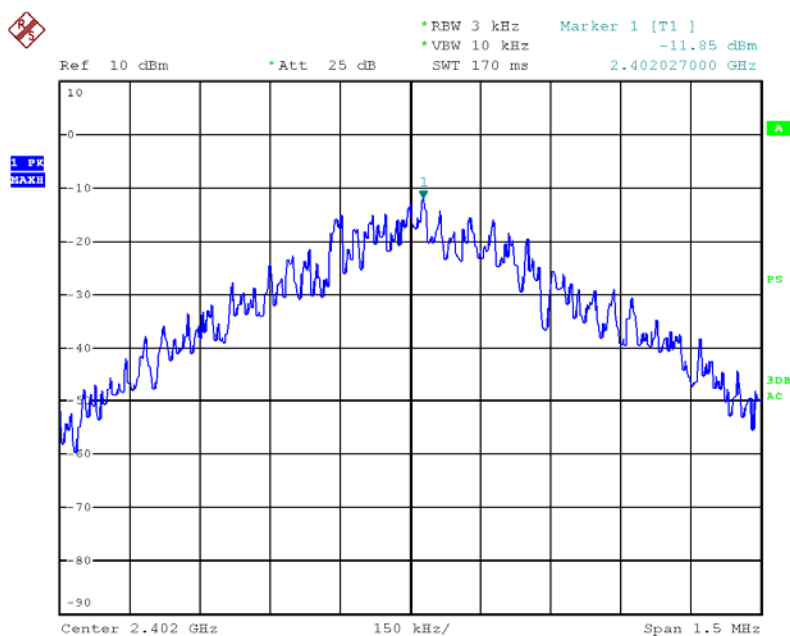
Center frequency	Channel center frequency
RBW:	3 kHz
VBW:	10kHz
Span	1.5times the DTS bandwidth
Detector Mode:	PEAK
Sweep time:	auto
Trace mode	Max hold

- (5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
- (6) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

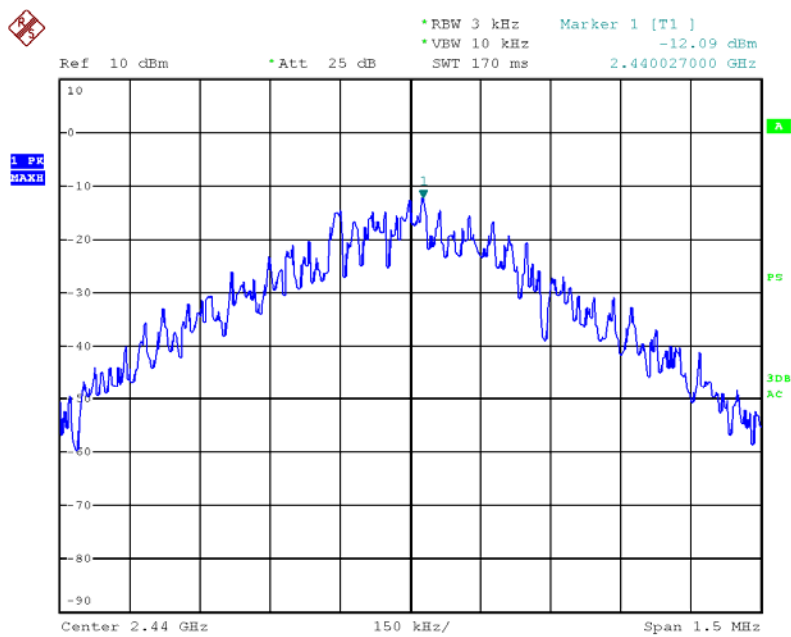
5.6. Test Result

EUT: Marine Audio Controller M/N: MM100s		
EUT Set Mode	CH or Frequency	Result
GFSK	CH0	-11.85 dBm/3KHz
	CH19	-12.09 dBm/3KHz
	CH39	-11.93 dBm/3KHz
Limit: <8dBm/3KHz		Conclusion: PASS

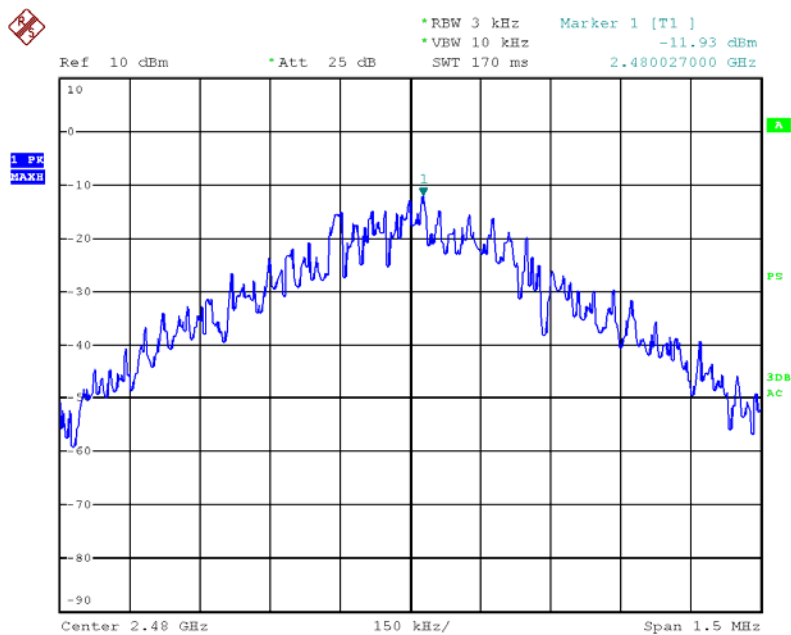
5.7. Original test data



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Date: 26.DEC.2015 10:25:40

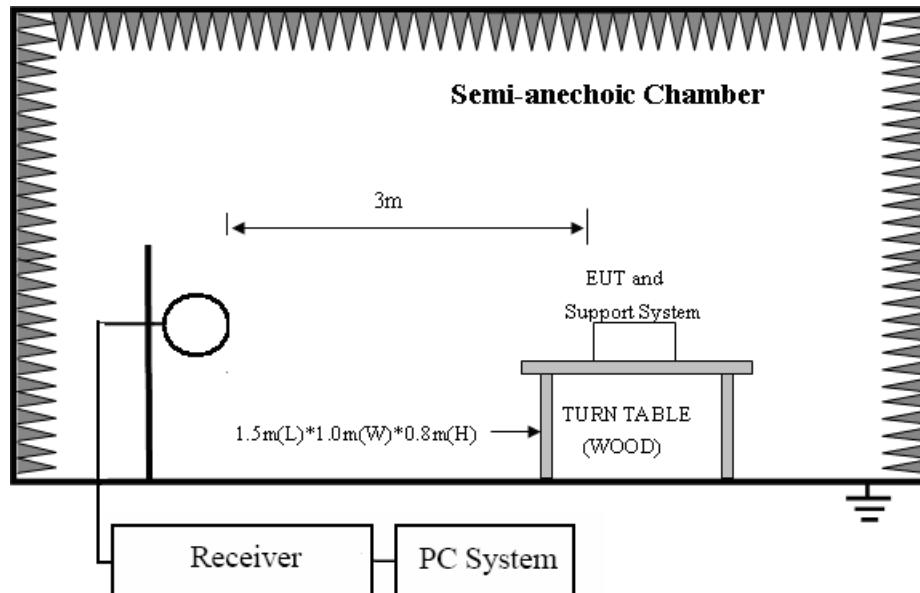
6 . Spurious Emission

6.1. Test equipment

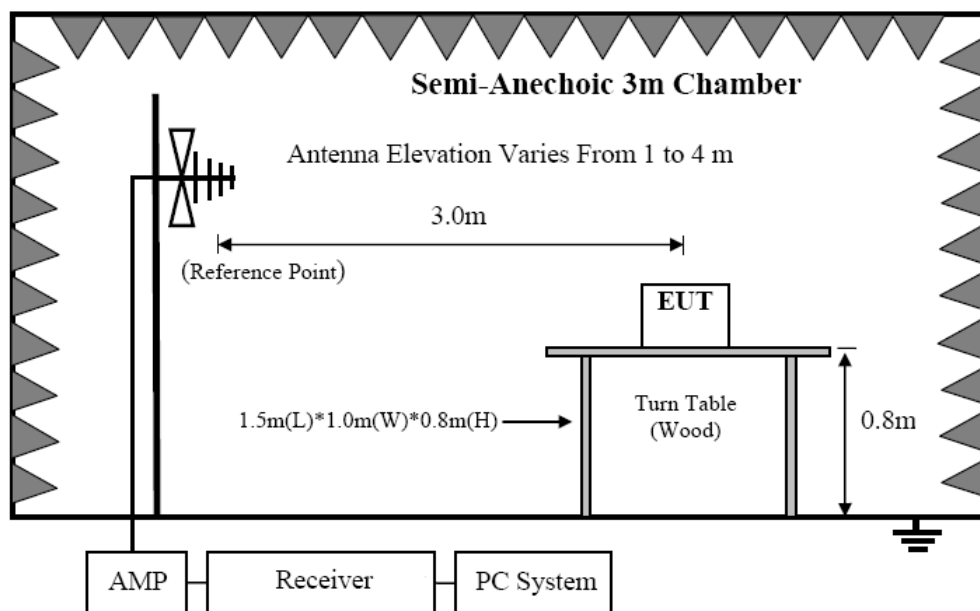
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	EMI Test Receiver	R&S	ESU8	100316	2016/12/19	1 Year
2	Spectrum analyzer	R&S	FSU	1166.1660.2 6	2016/12/19	1 Year
3	Loop antenna	TESEQ	HLA6120	20129	2016/12/19	1 Year
4	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2016/12/19	1 Year
5	Double Ridged Horn Antenna	R&S	HF907	100276	2016/12/19	1 Year
6	Horn Antenna	EMCO	3116	00060095	2016/12/19	1 Year
7	Pre-amplifier	A.H.	PAM-1840VH	562	2016/12/19	1 Year
8	Pre-amplifier	R&S	AFS33-18002 650-30-8P-44	SEL0080	2016/12/19	1 Year
9	RF Cable	R&S	R01	10403	2016/12/19	1 Year
10	RF Cable	R&S	R02	10512	2016/12/19	1 Year

6.2. Block diagram of test setup

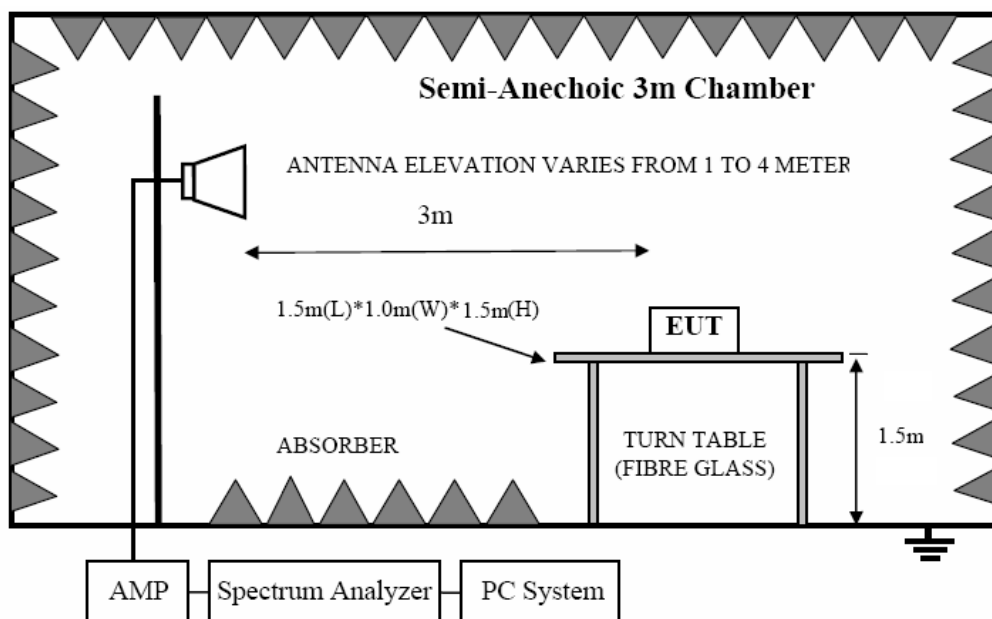
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for 30MHz-1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

6.3. Limit

8.3.1 FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

8.3.2 FCC 15.209 Limit.

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(KHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(KHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer then that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3m}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30m}(\text{dB}\mu\text{V}/\text{m}) + 40\text{Log}(30\text{m}/3\text{m})$$

8.3.3 Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 30dB below the fundamental emissions, or comply with 15.209 limits.

6.4. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.4 and 7.2
- (3) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used
9KHz-30MHz	Active Loop antenna
30MHz-1GHz	Trilog Broadband Antenna
1GHz-18GHz	Double Ridged Horn Antenna(1GHz-18GHz)
18GHz-40GHz	Horn Antenna(18GHz-40GHz)

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (4) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9KHz to 25GHz:
 - (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m(Except loop antenna, it's fixed 1m above ground.)
 - (b) Change work frequency or channel of device if practicable.
 - (c) Change modulation type of device if practicable.
 - (d) new battery is used during testing.
 - (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18GHz to 25GHz, so below final test was performed with frequency range from 9KHz to 18GHz.

- (f) the EUT were test at X, Y, Z axis , only list the worst result(x axis) in the report.
- (5) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.
- (6) The emissions from 9KHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz, for emissions from 9KHz-90KHz, 110KHz-490KHz and above 1GHz were measured based on average detector, for emissions above 1GHz, peak emissions also be measured and need comply with Peak limit.
- (7) The emissions from 9KHz to 1GHz, QP or average values were measured with EMI receiver with below RBW

Frequency band	RBW
9KHz-150KHz	200Hz
150KHz-30MHz	9KHz
30MHz-1GHz	120KHz

- (8) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz Peak detector for Peak measure ;RMS detector for AV value.

6.5. Test result

PASS. (See below detailed test result)

All the emissions except fundamental emission from 9KHz to 25GHz were comply with 15.209 limit.

Note1: According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

Note2: For below test data, when the limit tabular marked “f” means this frequency point is the fundamental emission and no need comply with this limit.

Test Result

Test Site : DDT 3m Chamber
EUT : Marine Audio Controller **Model Number** : MM100s
Power Supply : 12Vdc full battery is used to supply power **Test Mode** : TX
Condition : Temp:24.5'C,Humi:55%, **Antenna/Distance** : VULB 9163 /3m
 Press:100.1kPa
Memo : TX MODE

Frequency	Receiver		Rx Antenna		Cable Loss	Amplifier Gain	Result Level	FCC 15.247 & 15.209	
(MHz)	Reading (dBμV)	(PK/QP/AV)	Polar (H/V)	Factor (dB)	(dB)	(dB)	(dBμV/m)	Limit (dBμV)	Margin (dB)
Low Channel (2402)									
4804	41.01	PK	H	32.3	5.91	31.78	47.44	74	-26.56
4804	28.15	AV	H	32.3	5.91	31.78	34.58	54	-19.42
4804	46.47	PK	V	32.3	5.91	31.78	52.9	74	-21.1
4804	32.9	AV	V	32.3	5.91	31.78	39.33	54	-14.67
7206	34.31	PK	H	36.3	6.34	30.97	45.98	74	-28.02
7206	23.34	AV	H	36.3	6.34	30.97	35.01	54	-18.99
7206	34.72	PK	V	36.3	6.34	30.97	46.39	74	-27.61
7206	23.17	AV	V	36.3	6.34	30.97	34.84	54	-19.16
9608	31.63	PK	H	37.9	8.01	30.86	46.68	74	-27.32
9608	20.2	AV	H	37.9	8.01	30.86	35.25	54	-18.75
9608	31.53	PK	V	37.9	8.01	30.86	46.58	74	-27.42
9608	19.96	AV	V	37.9	8.01	30.86	35.01	54	-18.99
195.84	48.34	QP	H	14.2	2.74	27.6	37.68	43.5	-5.82
233.05	45.82	QP	V	14.2	2.74	27.6	35.16	46	-10.84
Middle Channel (2440)									
4880	41.76	PK	H	32.9	6.34	31.78	49.22	74	-24.78
4880	29.67	AV	H	32.9	6.34	31.78	37.13	54	-16.87
4880	47.63	PK	V	32.9	6.34	31.78	55.09	74	-18.91
4880	33.95	AV	V	32.9	6.34	31.78	41.41	54	-12.59
7320	33.8	PK	H	37.1	6.72	30.97	46.65	74	-27.35
7320	23.05	AV	H	37.1	6.72	30.97	35.9	54	-18.1
7320	33.85	PK	V	37.1	6.72	30.97	46.7	74	-27.3
7320	22.65	AV	V	37.1	6.72	30.97	35.5	54	-18.5
9760	31.81	PK	H	38.6	8.43	30.86	47.98	74	-26.02
9760	19.25	AV	H	38.6	8.43	30.86	35.42	54	-18.58
9760	31.67	PK	V	38.6	8.43	30.86	47.84	74	-26.16
9760	18.19	AV	V	38.6	8.43	30.86	34.36	54	-19.64
168.32	47.04	QP	H	14.2	2.74	27.6	36.38	43.5	-7.12
228.97	46.11	QP	V	14.2	2.74	27.6	35.45	46	-10.55

High Channel (2480)									
4960	39.64	PK	H	33.1	6.39	31.78	47.35	74	-26.65
4960	26.8	AV	H	33.1	6.39	31.78	34.51	54	-19.49
4960	45.66	PK	V	33.1	6.39	31.78	53.37	74	-20.63
4960	30.99	AV	V	33.1	6.39	31.78	38.7	54	-15.3
7440	31.92	PK	H	37.2	6.77	30.97	44.92	74	-29.08
7440	21.32	AV	H	37.2	6.77	30.97	34.32	54	-19.68
7440	32.12	PK	V	37.2	6.77	30.97	45.12	74	-28.88
7440	21.17	AV	V	37.2	6.77	30.97	34.17	54	-19.83
9920	30.26	PK	H	38.7	8.48	30.86	46.58	74	-27.42
9920	18.96	AV	H	38.7	8.48	30.86	35.28	54	-18.72
9920	29.52	PK	V	38.7	8.48	30.86	45.84	74	-28.16
9920	18.77	AV	V	38.7	8.48	30.86	35.09	54	-18.91
187.63	47.85	QP	H	14.2	2.74	27.6	37.19	43.5	-6.31
230.71	45.13	QP	V	14.2	2.74	27.6	34.47	46	-11.53

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss-Amp Gain

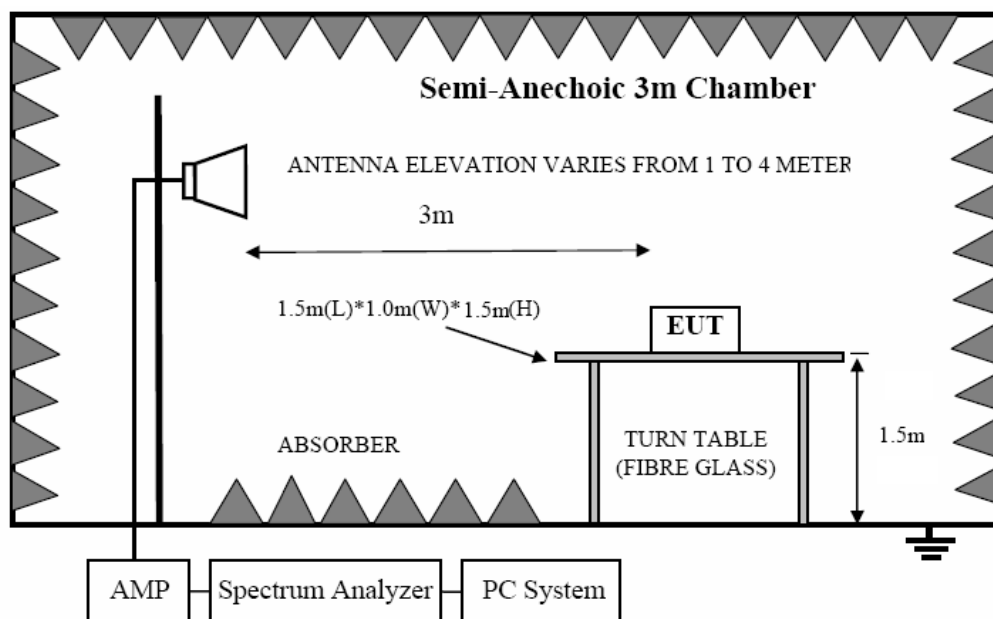
2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit

7. Band Edge

7.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	EMI Test Receiver	R&S	ESU8	100316	2016/12/19	1 Year
2	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/12/19	1 Year
3	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2016/12/19	1 Year
4	Double Ridged Horn Antenna	R&S	HF907	100276	2016/12/19	1 Year
5	Pre-amplifier	A.H.	PAM0-0118	360	2016/12/19	1 Year
6	RF Cable	R&S	R01	10403	2016/12/19	1 Year
7	RF Cable	R&S	R02	10512	2016/12/19	1 Year

7.2. Block diagram of test setup



7.3. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 30dB below the fundamental emissions, or comply with 15.209 limits.

7.4. Test Procedure

Same with clause 8.4 except change investigated frequency range from 2100MHz to 2450MHz and 2450MHz to 2500MHz.

Remark: All restriction band have been tested, and only the worse case is shown in report.

7.5. Test result

Freque ncy	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	FCC 15.247	
(MHz)	Reading (dBμV)	PK/QP/ AV	Polar (H/V)	Factor (dB)	(dB)	(dB)	(dBμV/m)	Limit (dBμV/m)	Margi n (dB)
Lowest Channel									
2390	23.3	PK	H	27.8	3.57	0	54.67	74	-19.33
2390	10.17	AV	H	27.8	3.57	0	41.54	54	-12.46
2390	23.28	PK	V	27.8	3.57	0	54.65	74	-19.35
2390	9.85	AV	V	27.8	3.57	0	41.22	54	-12.78
2400	28.66	PK	H	28	3.57	0	60.23	74	-13.77
2400	14.19	AV	H	28	3.57	0	45.76	54	-8.24
2400	29.81	PK	V	28	3.57	0	61.38	74	-12.62
2400	14.06	AV	V	28	3.57	0	45.63	54	-8.37
Highest Channel									
2483.5	22.93	PK	H	28.7	3.72	0	55.35	74	-18.65
2483.5	9.69	AV	H	28.7	3.72	0	42.11	54	-11.89
2483.5	23.89	PK	V	28.7	3.72	0	56.31	74	-17.69
2483.5	9.67	AV	V	28.7	3.72	0	42.09	54	-11.91

Note: 1. Result Level = Read Level + Antenna Factor + Cable Loss- Amplifier Gain

2. After test and evaluation hopping off mode and hopping on mode, will record worst case (hopping off mode) in this report.

8 . Conducted Spurious Emissions

8.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/12/19	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/12/19	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2016/12/19	1 Year

8.2. Limit

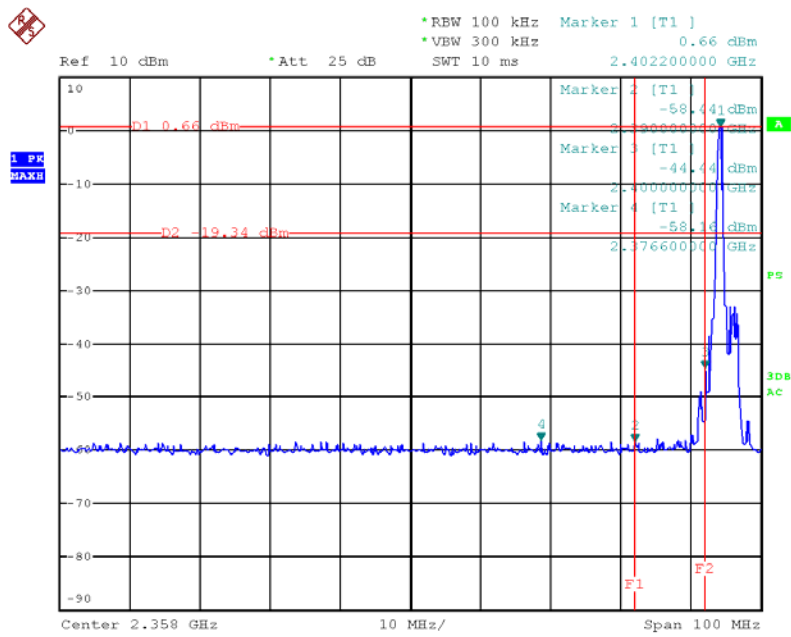
In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

8.3. Test Procedure

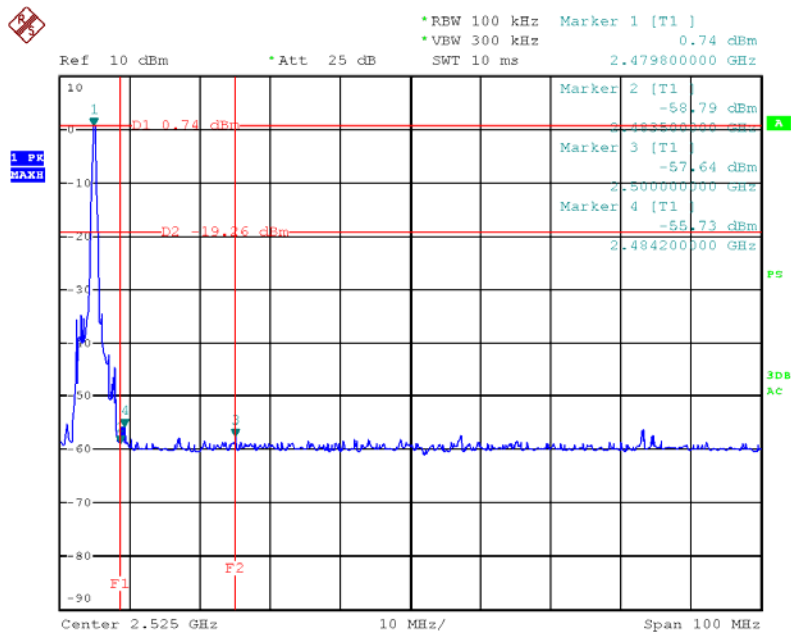
The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions detected.

8.4. Test result

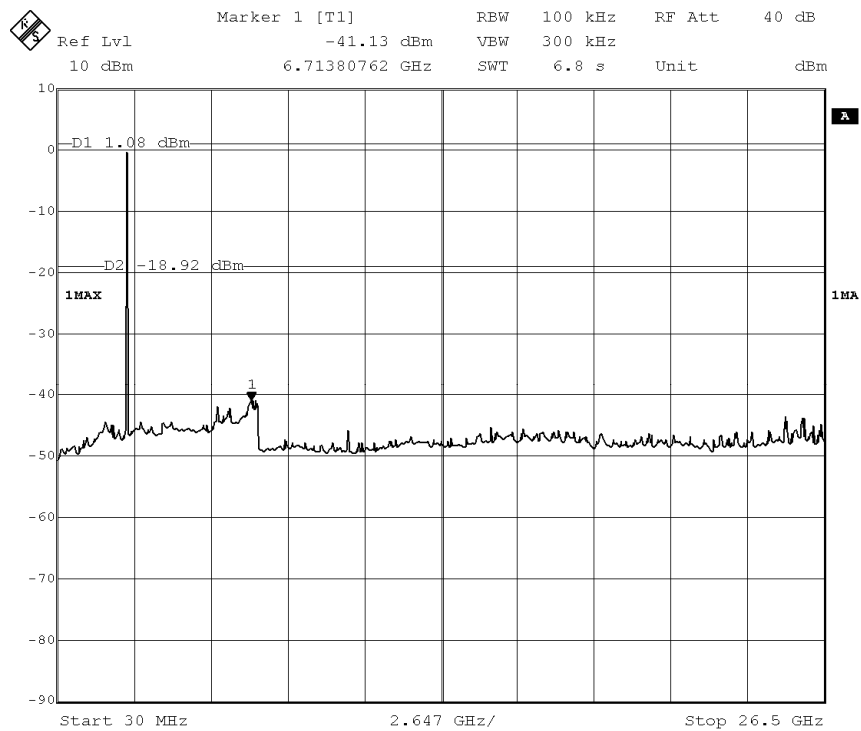
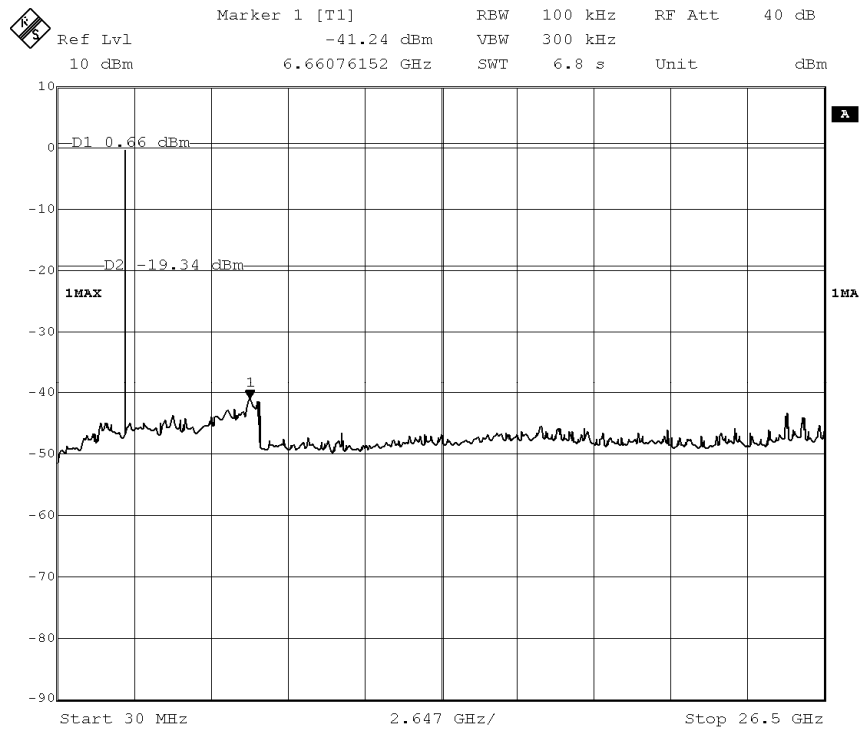
PASS (See below detailed test result.)

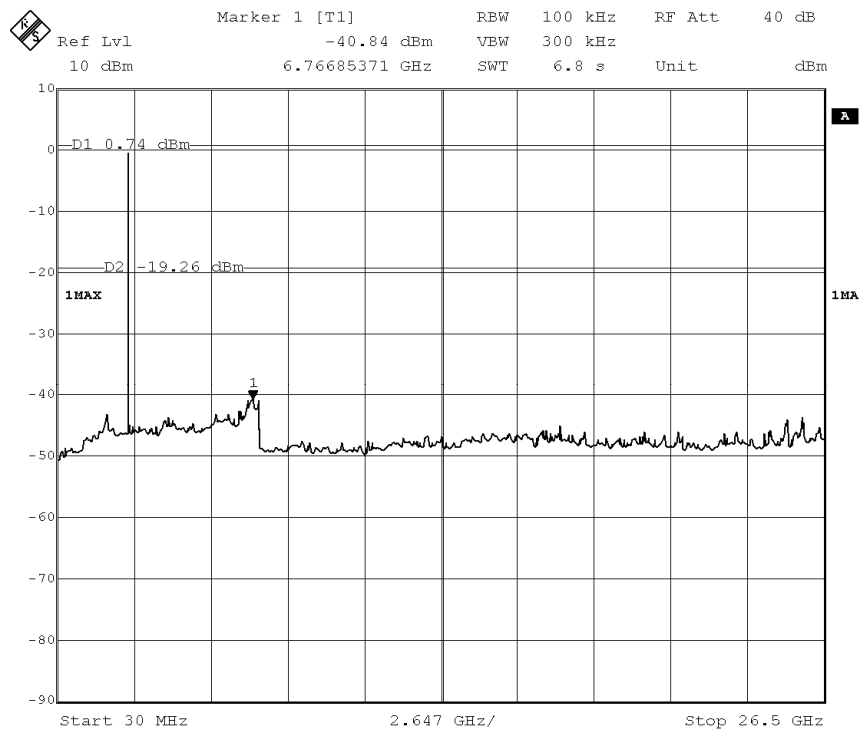


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9. Antenna Requirements

9.1. Limit

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2. Result

The antennas used for this product are dipole antenna and other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi. The EUT has an internal antenna, the directional gain of antenna is 2dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

END OF REPORT