

RF TEST REPORT

Report No.: UNI-14120501

Product Name: FM transmitter

FCC ID: 2ADKF3AED16-A16

Model No. : AD-A16

Applicant: SHENZHEN AIERDI ELECTRONICS CO., LTD

Applicant Address: 3/F, Building A, Ruida Science and Technology Park, Zhongxing Road, Bantian, Shenzhen, China.

Issued by: Shenzhen United Testing Technology Co.,Ltd

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Test Report

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Manufacturer..... : SHENZHEN AIERDI ELECTRONICS CO., LTD

Manufacturer Address..... : 3/F, Building A, Ruida Science and Technology Park,
Zhongxing Road, Bantian, Shenzhen, China.

Test Standards : 47 CFR Part 15 Subpart C: Radio Frequency Devices
ANSI C63.10:2009: American National Standard for
Testing Unlicensed Wireless Devices

Test Result : PASS

Tested by : Michael Su 2014.12.05
Michael Su, Test Engineer

Reviewed by..... : Mike Yong 2014.12.05
Mike Yong, Senior EGINEER

Approved by..... : Hoffer Lau 2014.12.05
Hoffer Lau, Manager

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Change History		
Issue	Date	Reason for change
1.0	Dec 05,2014	First edition

1. GENERAL INFORMATION

1.1 EUT Description

EUT Type : FM transmitter
Frequency Range..... : 88.1MHz – 107.9MHz
Channel Separation..... : 100KHz
Modulation Type : FM
Antenna Type : PCB Antenna
Antenna Gain : 1 dBi

Note 1: The EUT is a FM transmitter, it operating at 88.1MHz – 107.9MHz.

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 3: Apply Audio Signal 2.5kHz tone, 400mVrms 100% modulated into Audio of the FM transmitter box.

1.2 Support Equipment

Equipment type	Manufacturer	Model	FCC ID/Doc
Notebook	Lenovo	G480	FCC DOC approved

1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C 2012	Radio Frequency Devices
2	ANSI C63.10 2009	American National Standard for Testing Unlicensed Wireless Devices

Test detailed items/section required by FCC rules and results are as below:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207	Conducted Emission	Compliant
§15.239(c) §15.209	Radiated Emission Test	Compliant
§15.239(b) §15.35	Field Strength of Radiated Emissions	Compliant
§15.239(a)	Occupied Bandwidth	Compliant

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2009.

1.4 Facilities and Accreditations

1.4.1 Facilities

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 572331**

Shenzhen TCT Testing Technology Co., Ltd., Shenzhen EMC Laboratory: Shenzhen Tongce Testing Lab The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

Registration Number: 572331

● **Industry Canada (IC)**

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

Registration Number IC: 10668A-1

1.4.2 Test Location

All tests were performed at:

Shenzhen Tongce Testing Lab

1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China

1.4.3 Test Environment Conditions

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

Temperature (°C):	15°C - 35°C
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa

1.4.4 Test Instruments list

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2014.07.02	2015.07.01
Spectrum Analyzer	R&S	FSEM	848597/001	2014.07.03	2015.07.02

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
Pre-amplifier	Teseq	LAN6900	--	2014.07.03	2015.07.02
Pre-amplifier	Agilent	8447D	83153007374	2014.07.03	2015.07.02
Pre-amplifier	Agilent	8449B	3008A01738	2014.07.03	2015.07.02
Loop antenna	A.R.A	PLA-1030/ B	1029	2014.07.03	2015.07.02
Ultra Broadband ANT	R&S	HL562	100157	2014.07.03	2015.07.02
Horn Antenna	ETS LINDGREN	3117	--	2014.07.03	2015.07.02
Horn Antenna	ETS LINDGREN	3160	--	2014.07.03	2015.07.02
EMI Test Receiver	R&S	ESCS30	10039	2014.07.02	2015.07.01
LISN	AFJ	LS16C	16010222119	2014.07.02	2015.07.01
Coaxial Cable	TCT	N/A	N/A	2014.07.02	2015.07.01
Coaxial Cable	TCT	N/A	N/A	2014.07.02	2015.07.01

2. 47 CFR PART 15C REQUIREMENTS

2.1 Antenna requirement

2.1.1 Applicable Standard

According to FCC 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.

2.1.2 Antenna Information

Antenna Category: Integral antenna

Antenna General Information:

No.	EUT Model	Ant. Cat.	Ant. Type	Gain(dBi)
1	FM transmitter	Internal antenna	PCB	1

2.1.3 Result: comply

The EUT has a permanently antenna. which complies with the Part 15.203. Please refer to the EUT internal photos.

2.2 Field Strength of Radiated Emissions

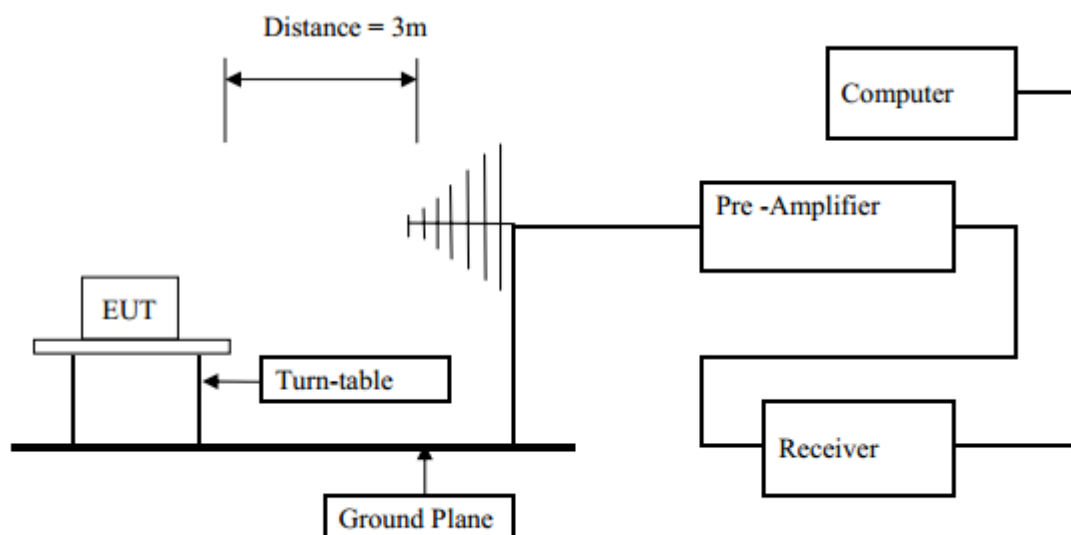
2.2.1 Requirement

As per FCC Part 15.239

(b) The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

2.2.2 Test Description

Test Setup:



The radiated emission tests were performed in the 3-meter chamber A test site, using the setup accordance with the ANSI C63.10:2009. The specification used was the FCC Part Subpart C limits.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

2.2.3 Test Result of Fundamental Emission

Antenna polarization: Horizontal

Frequency (MHz)	Detector	Read Level (dBμV)	Correction Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)
	PK/ AV					
Low channel 88.1MHz						
88.1	PK	36.72	11.90	48.62	68.00	-19.38
88.1	AV	20.39	11.90	32.29	48.00	-15.71
Middle channel 98.0MHz						
98.0	PK	31.17	17.40	48.57	68.00	-19.43
98.0	AV	18.65	17.40	36.05	48.00	-11.95
High channel 107.9MHz						
107.9	PK	32.37	16.80	49.17	68.00	-18.83
107.9	AV	19.37	16.80	36.17	48.00	-11.83

Antenna polarization: Vertical

Frequency (MHz)	Detector	Read Level (dBμV)	Correction Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)
	PK/ AV					
Low channel 88.1MHz						
88.1	PK	29.76	15.50	45.26	68.00	-22.74
88.1	AV	16.34	15.50	31.84	48.00	-16.16
Middle channel 98.0MHz						
98.0	PK	22.85	17.40	40.25	68.00	-27.75
98.0	AV	13.26	17.40	30.66	48.00	-17.34
High channel 107.9MHz						
107.9	PK	27.45	16.80	44.25	68.00	-23.75
107.9	AV	15.21	16.80	32.01	48.00	-15.99

2.3 Occupied Bandwidth

2.3.1 Requirement

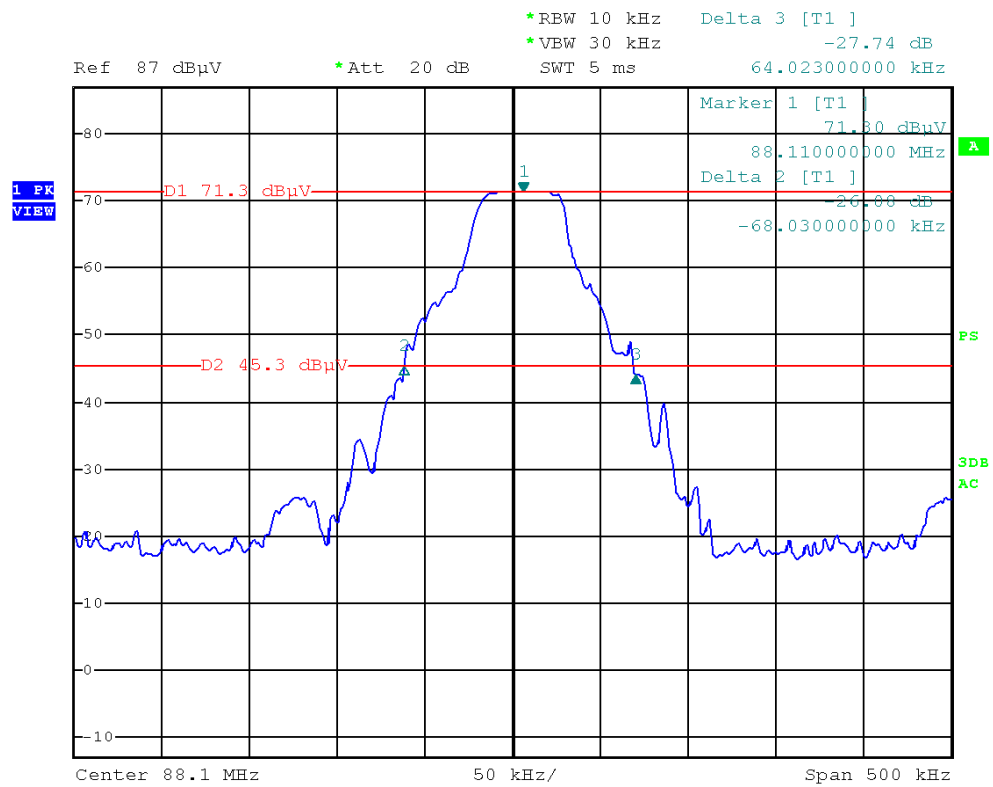
Per 15.239 (a) Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

2.3.2 Test Procedure

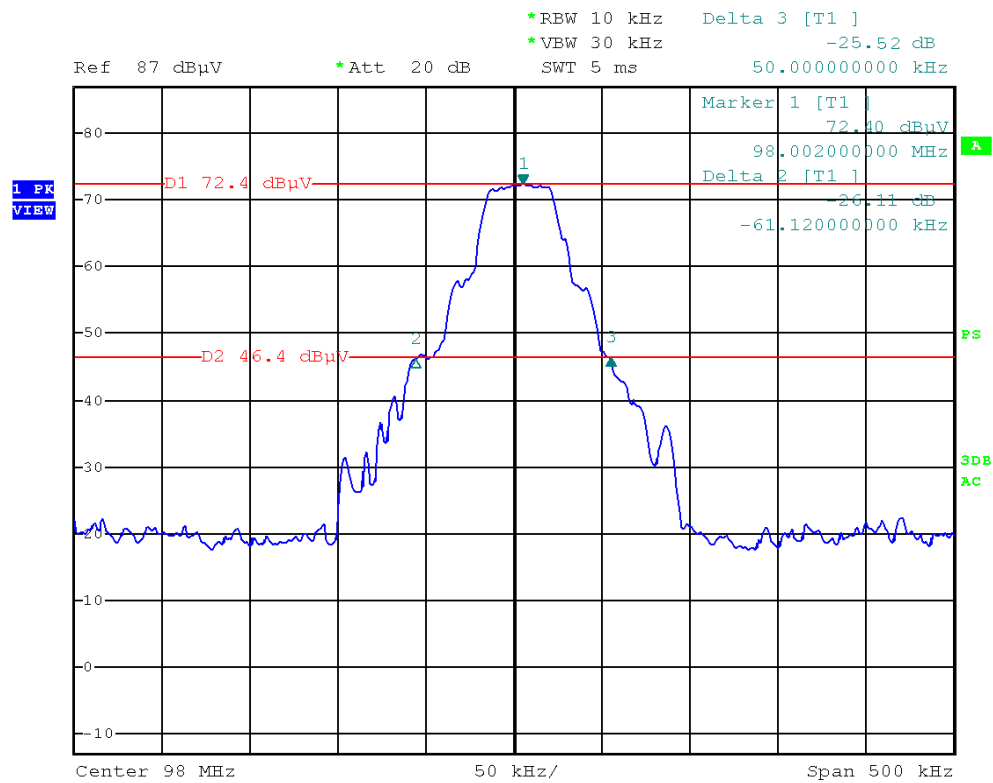
- 1). The EUT was placed on the top of the turntable 0.8 meter above ground.
- 2). The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 3). Power on the EUT and all the supporting units.
- 4). The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 5). For each suspected emission, the antenna tower was scanned (from 1 m to 4 m) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading of both horizontal and vertical polarization.
- 6). Set EMI test receiver with Max hold. Mark peak

2.3.3 Emissions within Band Edges Test Result

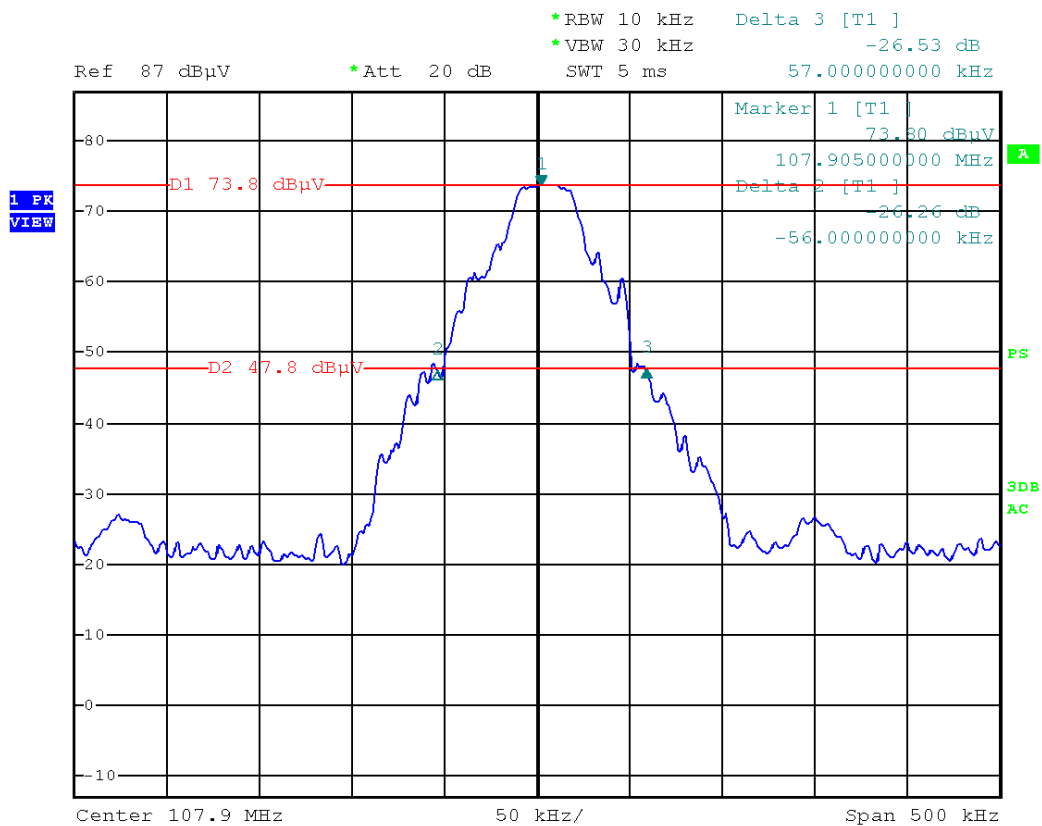
Low Channel: 88.1MHz



Middle Channel: 98MHz



High Channel: 107.9MHz



2.4 Conducted Emission

2.4.1 Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

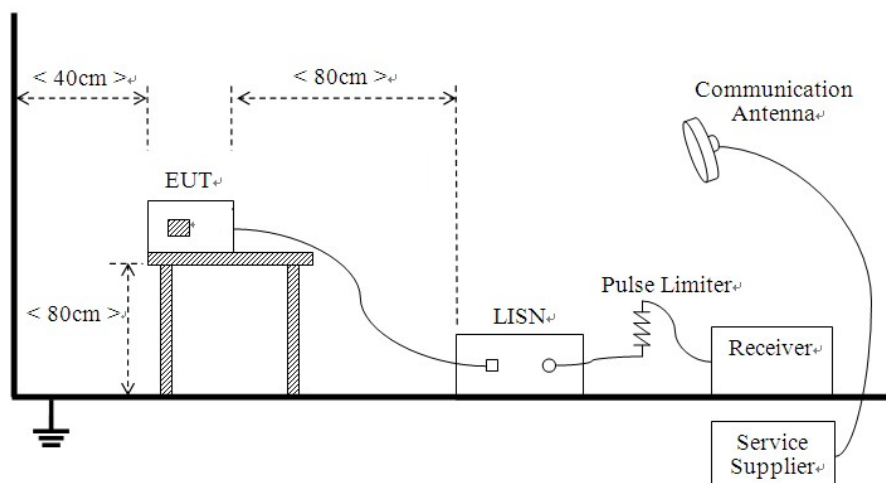
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

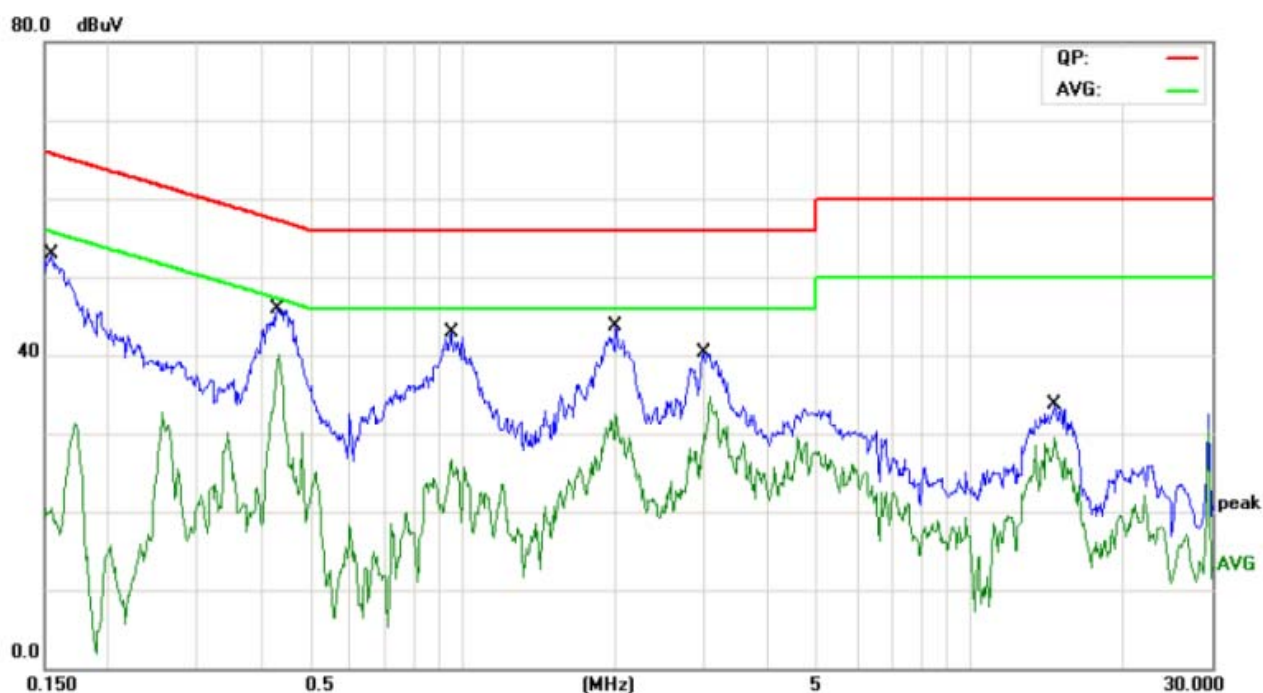
2.4.2 Test Description

A. Test Setup:



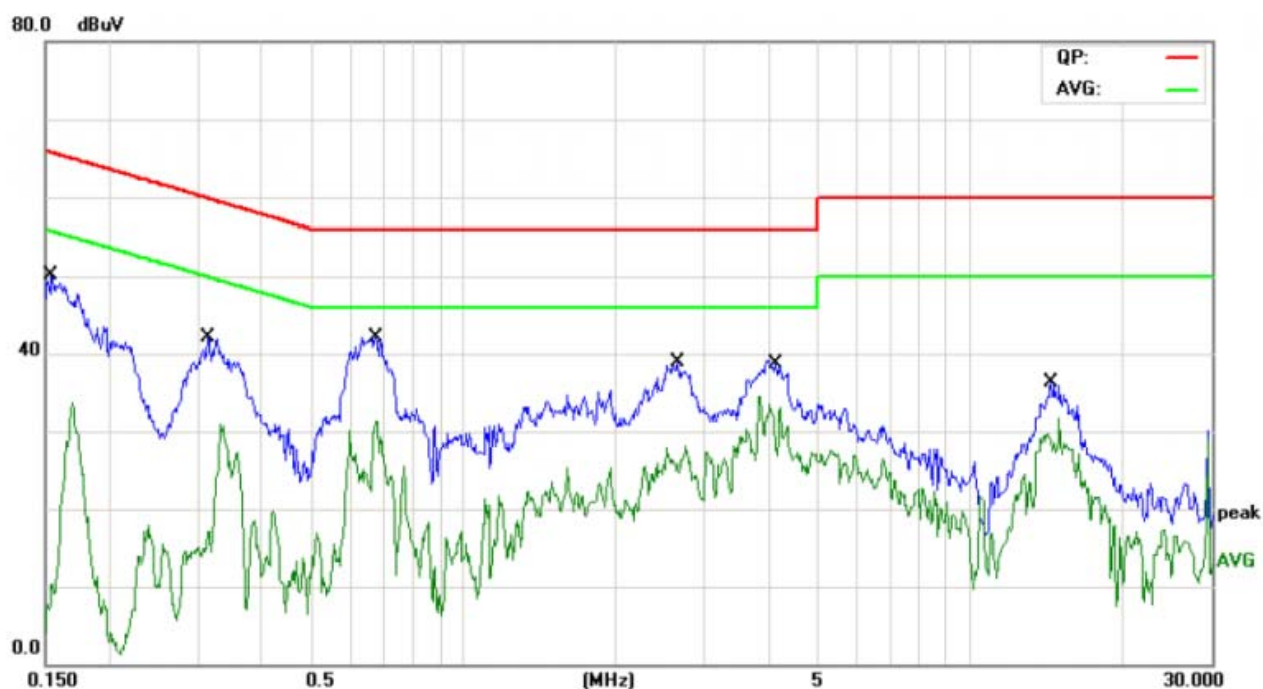
The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10:2009:2009

2.4.3 Test Result



Conducted Disturbance at Mains Terminals					
L Test Data					
QP			AV		
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)
0.1547	65.74	52.99	0.1547	55.74	19.11
0.9475	56.00	42.91	0.9475	46.00	26.31
14.7460	60.00	33.60	14.7460	50.00	27.53
L Test Curve					

(Plot A: L Phase)



Conducted Disturbance at Mains Terminals					
N Test Data					
QP			AV		
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)
0.1539	65.78	50.13	0.1539	55.78	8.78
2.6499	56.00	38.92	2.6499	46.00	26.11
14.4725	60.00	36.22	14.4725	50.00	28.75
N Test Curve					

(Plot B: N Phase)

Test Result: PASS

2.5 Radiated Emission

2.5.1 Requirement

As per FCC Part 15.239(c) The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section 15.209..

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	$20\log(2400/F(\text{KHz}))+80$	300
0.490 - 1.705	$24000/F(\text{kHz})$	$20\log(24000/F(\text{KHz}))+40$	30
1.705 - 30.0	30	$20\log(30)+40$	30
30 - 88	100	40.0	3
88 - 216	150	43.5	3
216 - 960	200	46.0	3
Above 960	500	54.0	3

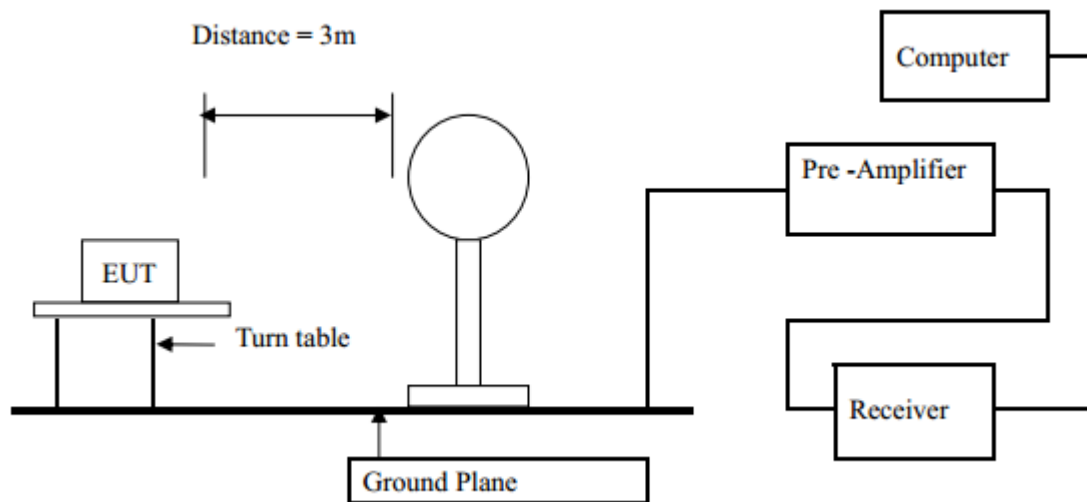
Note:

The radiated emission tests were performed in the 10-meter chamber test site, using the setup accordance with the ANSI C63.10:2009. The specification used was the FCC Part Subpart C limits.

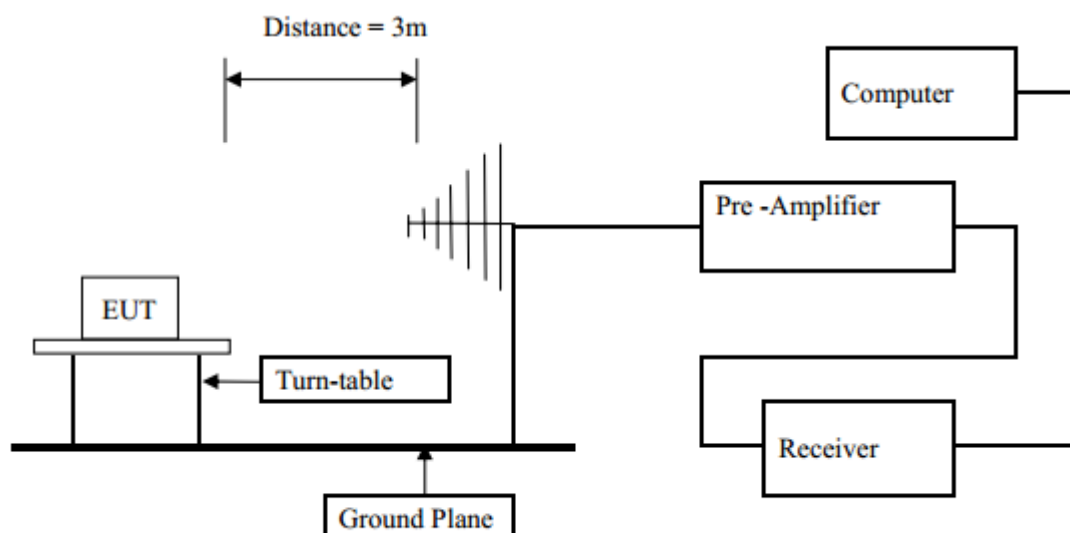
2.5.2 Test Description

Test Setup:

- (1) For radiated emissions from 9kHz to 30MHz



(2) For radiated emissions from 30MHz to 1GHz



5.3 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

- 1). Configure the EUT according to ANSI C63.10:2009
- 2). The EUT was placed on the top of the turntable 0.8 meter above ground.
- 3). The receiving antenna was placed 3 meters far away from the turntable.
- 4). The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 5). For Spurious Emissions test, The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to

find the maximum reading.

- 6). For Field Strength of Fundamental Emissions test, Positioned the loop antenna with its plane vertical at the specified distance of 3 meters between its center and the EUT. The center of the loop antenna is set with 1m above the grounded plane. Then rotated about its vertical axis for finding out the maximum emission level of the EUT.

2.5.3 Test Result

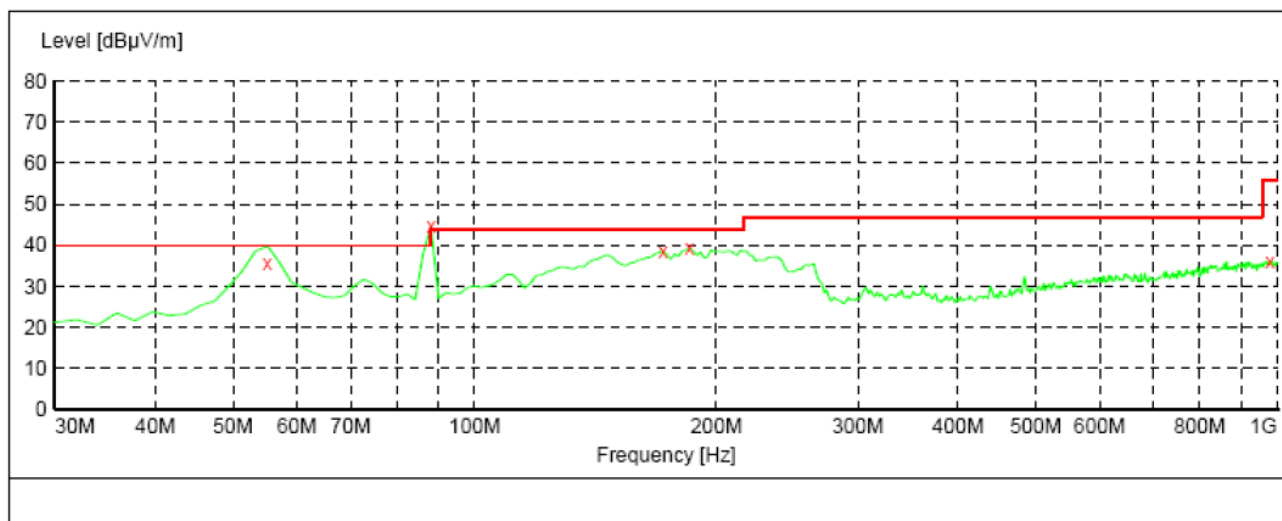
According to ANSI C63.10:2009 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

For 9 kHz to 30 MHz

The test has been performed, and the Radiated Emission level is too low to the limit.

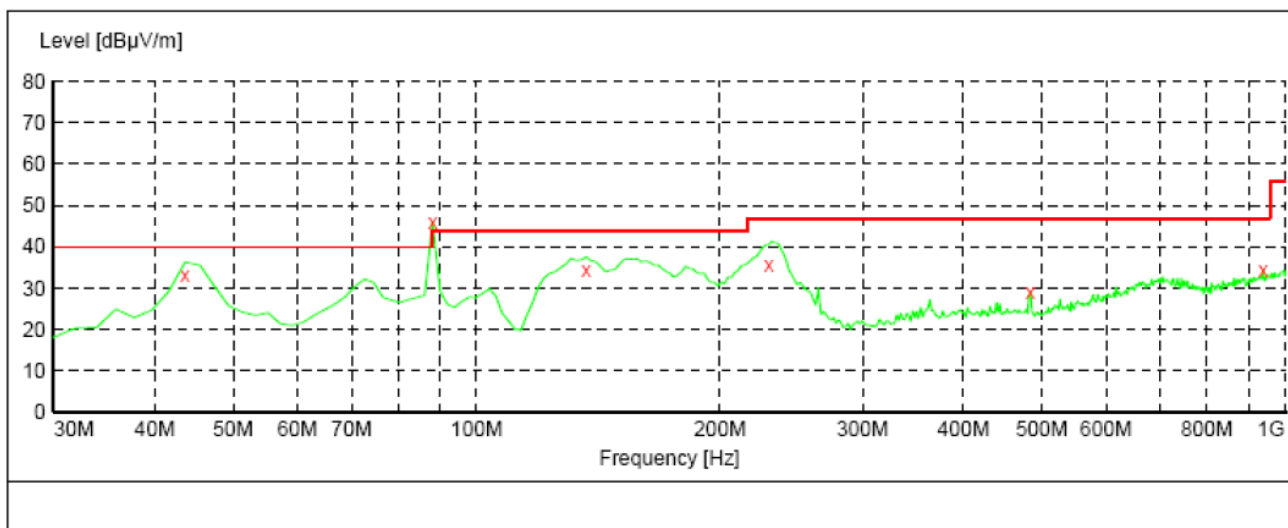
For 30MHz to 1000 MHz



(Plot A: Low channel_88.1MHz_30MHz to 1GHz, Antenna Vertical)

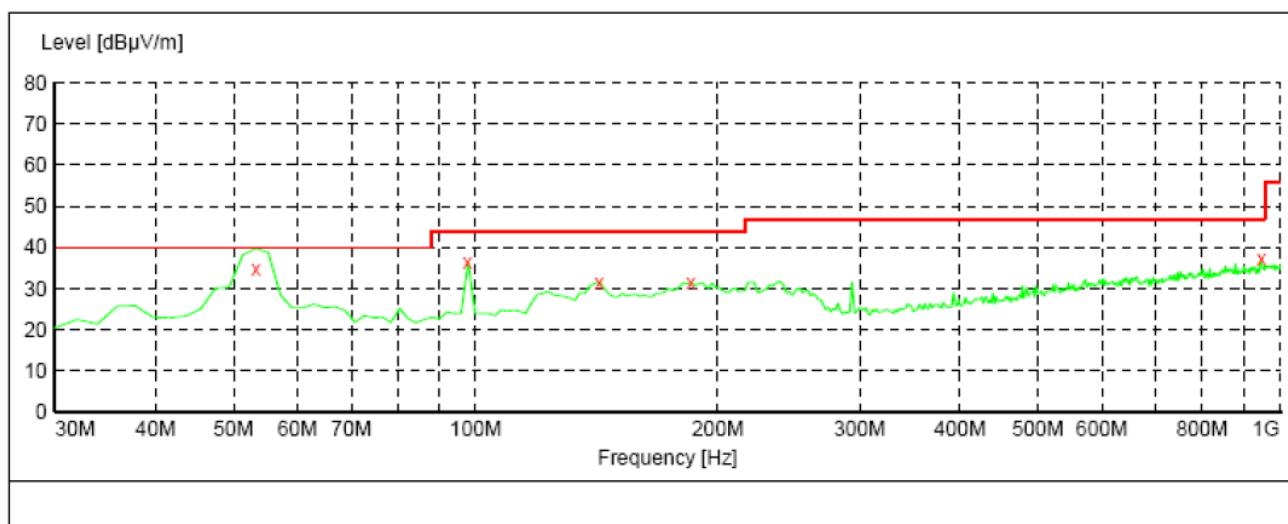
ANTENNA POLARITY & TEST DISTANCE: Vertical AT 3 M (Low_88.1MHz)				
No.	Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit Line (dBuV/m)	Over Limit (dB)
1	55.22	35.76	40.0	-4.24
2	88.10	/	/	/
3	171.62	38.75	43.5	-4.75

4	185.20	39.64	43.5	-3.86
5	978.66	36.29	54.0	-17.71



(Plot B: Low channel_88.1MHz_30MHz to 1GHz, Antenna Horizontal)

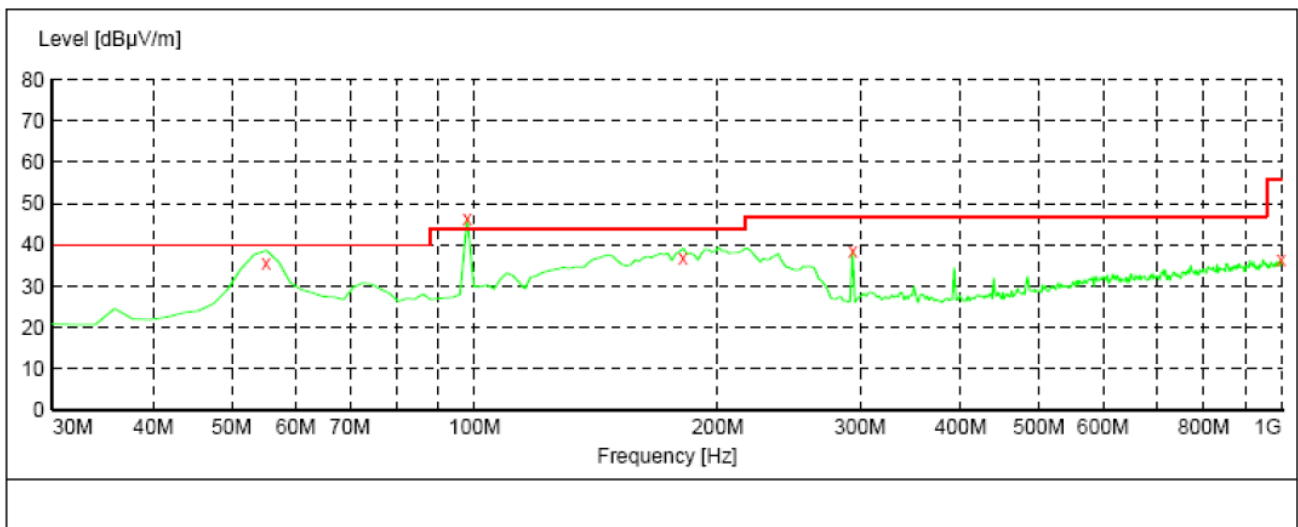
ANTENNA POLARITY & TEST DISTANCE: Horizontal AT 3 M (Low_88.1MHz)				
No.	Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit Line (dBuV/m)	Over Limit (dB)
1	43.58	33.27	40.0	-6.73
2	88.10	/	/	/
3	136.70	34.07	43.5	-9.43
4	229.82	35.41	46.0	-10.59
5	483.96	28.97	46.0	-17.03



(Plot C: Middle channel_98.0MHz_30MHz to 1GHz, Antenna Vertical)

ANTENNA POLARITY & TEST DISTANCE: Vertical AT 3 M (Middle_98.0MHz)

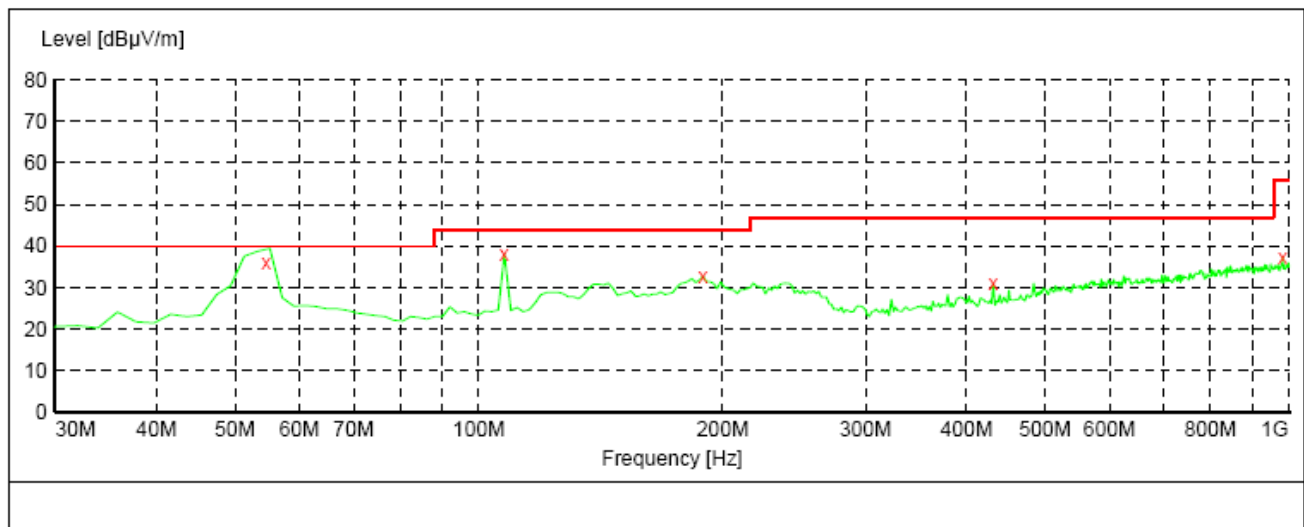
No.	Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit Line (dBuV/m)	Over Limit (dB)
1	53.28	34.81	40.0	-5.19
2	98.00	/	/	/
3	142.52	36.54	40.0	-3.46
4	185.20	31.73	40.0	-8.27
5	947.62	37.21	46.0	-8.79



(Plot D: Middle channel_98.0MHz_30MHz to 1GHz, Antenna Horizontal)

ANTENNA POLARITY & TEST DISTANCE: Horizontal AT 3 M (Middle_98.0MHz)

No.	Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit Line (dBuV/m)	Over Limit (dB)
1	55.22	35.71	40.0	-4.29
2	98.00	/	/	/
3	181.32	36.68	43.5	-6.82
4	293.84	38.49	46.0	-7.51
5	998.06	36.52	54.0	-17.48



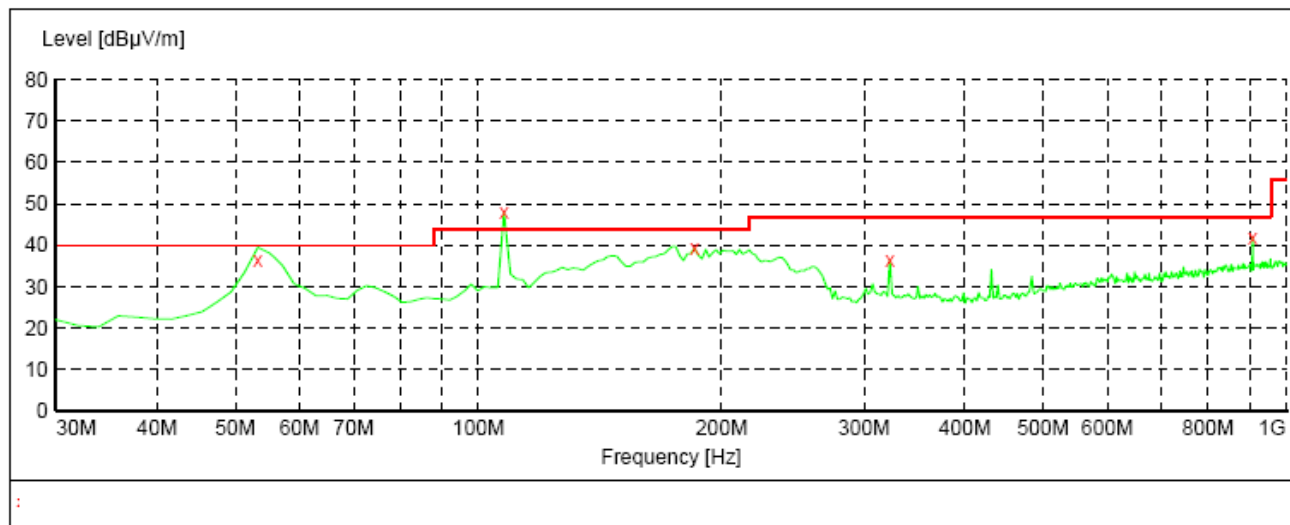
(Plot E: Middle channel_107.9MHz_30MHz to 1GHz, Antenna Vertical)

ANTENNA POLARITY & TEST DISTANCE: Vertical AT 3 M (High_107.9MHz Below1GHz)

No.	Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit Line (dBμV/m)	Over Limit (dB)
1	55.22	35.37	40.0	-4.63
2	107.90	/	/	/
3	189.08	32.68	43.5	-10.82
4	431.58	31.00	46.0	-15.00
5	982.54	37.28	54.0	-16.72

ANTENNA POLARITY & TEST DISTANCE: Vertical AT 3 M (High_107.9MHz Above 1GHz)

No.	Frequency (MHz)	PK/AV (dB μ V/m)		Limit Line (dBμV/m)	Over Limit (dB)
1	1010.21	47.24	PK	74.00	-26.76
2	1010.21	30.36	AV	54.00	-23.64



(Plot F: Middle channel_107.9MHz_30MHz to 1GHz, Antenna Horizontal)

ANTENNA POLARITY & TEST DISTANCE: Horizontal AT 3 M (High_107.9MHz Below1GHz)

No.	Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit Line (dBuV/m)	Over Limit (dB)
1	53.28	36.50	40.0	-3.50
2	107.90	/	/	/
3	185.20	39.27	43.5	-4.23
4	322.94	36.51	46.0	-9.49
5	908.82	41.89	46.0	-4.11

ANTENNA POLARITY & TEST DISTANCE: Horizontal AT 3 M (High_107.9MHz Above 1GHz)

No.	Frequency (MHz)	PK/AV (dB μ V/m)		Limit Line (dBuV/m)	Over Limit (dB)
1	1016.24	47.83	PK	74.00	-26.17
2	1016.24	30.55	AV	54.00	-23.45

**** END OF REPORT ****