

TEST REPORT

Product : Chipper 2X
Trade mark : Chipper 2X
Model/Type reference : CHC2X
Serial Number : N/A
FCC ID : 2AB7XCHC2XNAA00
Ratings : 3.7V, 300mAH
Report Number : EED32H000619-1
Date : Jun. 11, 2015
Regulations : See below

Standards	Results
<input checked="" type="checkbox"/> 47 CFR FCC Part 15 Subpart C 15.225:2014	PASS

Prepared for
BBPOS Limited
RM812, 8/F., Grand City Plaza, No. 1 Sai Lau Kok Road, Tsuen Wan, N.T.,
Hong Kong

Prepared by
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Jun. 11, 2015

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(Note: N/A means not applicable)

1. GENERAL INFORMATION

Applicant: BBPOS Limited
 RM812, 8/F., Grand City Plaza, No. 1 Sai Lau Kok Road, Tsuen Wan, N.T., Hong Kong

Manufacturer: BBPOS Limited
 RM812, 8/F., Grand City Plaza, No. 1 Sai Lau Kok Road, Tsuen Wan, N.T., Hong Kong

Product: Chipper 2X

Trade mark: Chipper 2X

Model/Type reference: CHC2X

FCC ID: 2AB7XCHC2XNAA00

Report Number: EED32H000619-1

Sample Received Date: May 20, 2015

Date of Test: May 20, 2015 to Jun. 11, 2015

The above equipment was tested by Centre Testing International (Shenzhen) Corporation for compliance with the requirements set forth in the FCC Rules and the measurement procedure according to ANSI C63.10:2013.

2. TEST SUMMARY

The complete list of measurements is given below:

No.	Test Item	Rule	Result
1	AC Conducted Emissions	Part 15.207	PASS
2	Transmitter Fundamental Field Strength	Part 15.225(a)(b)(c)(d)	PASS
3	Transmitter Radiated Spurious Emissions	Part 15.209(a), 15.225(d)	PASS
4	Transmitter Band Edge Radiated Emissions	Part 15.209(a), 15.225(c)(d)	PASS
5	Transmitter 20 dB Bandwidth	Part 2.1049	PASS
6	Transmitter Frequency Stability (Temperature & Voltage Variation)	Part 15.225(e)	PASS
7	Antenna Requirements *	Part 15.203	PASS

*: According to 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. The EUT has a PCB antenna, this is permanently attached antenna and meets the requirements of this section.

3. MEASUREMENT UNCERTAINTY

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

Measurement items	Uncertainty
Conducted Emission Test	3.2 dB
Radiated Emissions / Bandedge Emission	4.5 dB
Temperature	± 1 %

4. PRODUCT INFORMATION

Items	Description
Rating	DC 5V 300mA
Product type	Intentional Transmitter
Antenna type	PCB antenna
Modulation	ASK
Operated Frequency	13.56MHz

5. TEST EQUIPMENT LIST

Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06/01/2016
Receiver	R&S	ESCI	100435	07/08/2015
Spectrum Analyzer	R&S	FSP40	100416	07/06/2015
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	617	07/13/2015
Multi device Controller	matturo	NCD/070/107 11112	---	N/A
Loop Antenna	ETS-LINDGREN	6502	00071730	08/24/2015
Microwave Preamplifier	Agilent	8449B	3008A02425	03/19/2016
Temperature & Humidity Chamber	ESPEC	EL-04KA	N/A	08/03/2015
Receiver	R&S	ESCI	100009	07/19/2015
LISN	R&S	ENV216	100098	07/19/2015

6. SUPPORT EQUIPMENT LIST

Device Type	Brand	Model	Data Cable	Remark
Notebook	HP	G3	N/A	FCC DOC
Mouse	lenovo	MO28UOL	Un-shielded 1.2M	FCC DOC

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

7. AC CONDUCTED EMISSIONS

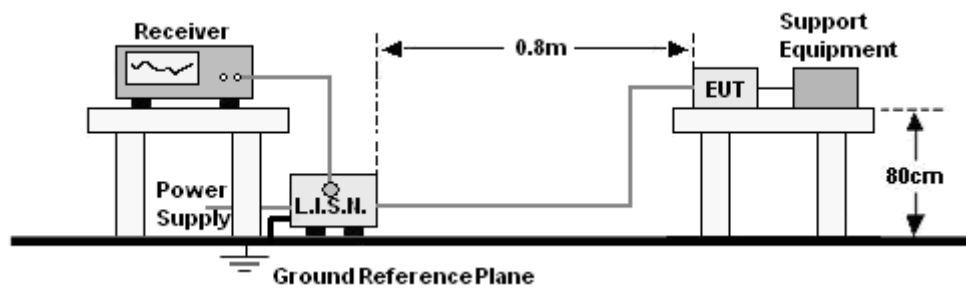
7.1 LIMITS

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

7.2 BLOCK DIAGRAM OF TEST SETUP



7.3 TEST PROCEDURE

- a. The Product was placed on a nonconductive table above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
- b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

7.4 TEST RESULT

Product : Chipper 2X

Model/Type reference : CHC2X

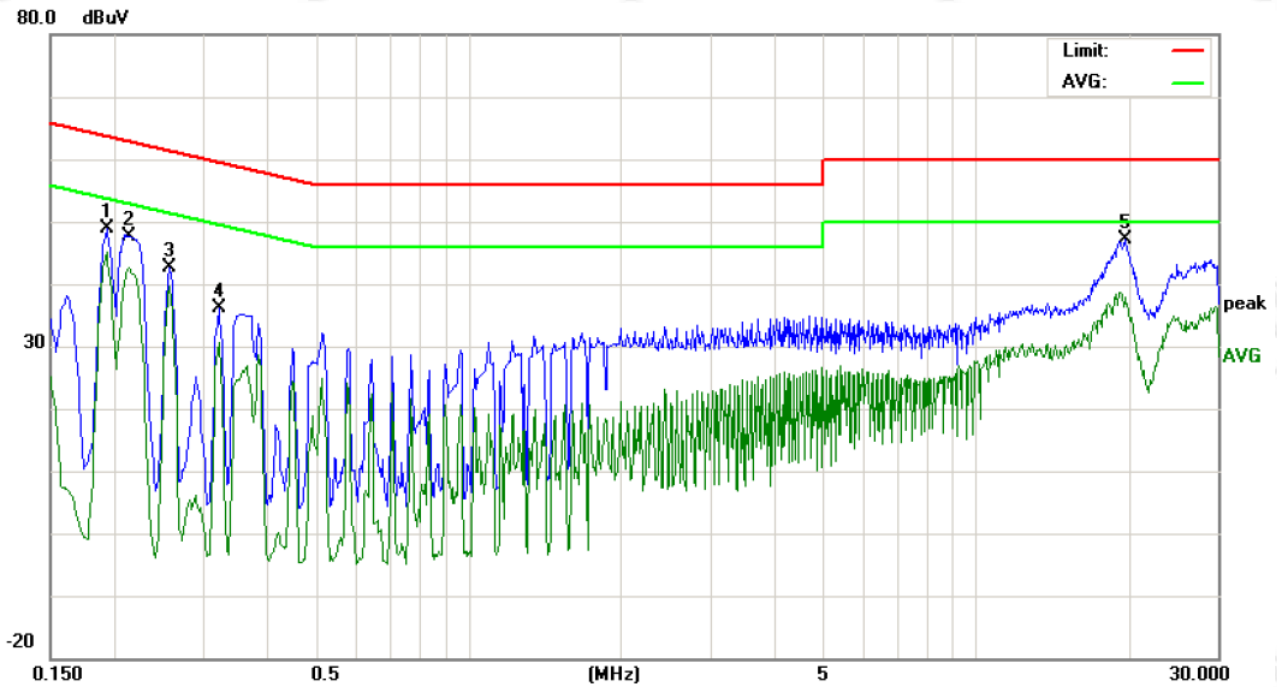
Power : AC 120V/60Hz

Temperature : 22°C

Mode : Keeping TX

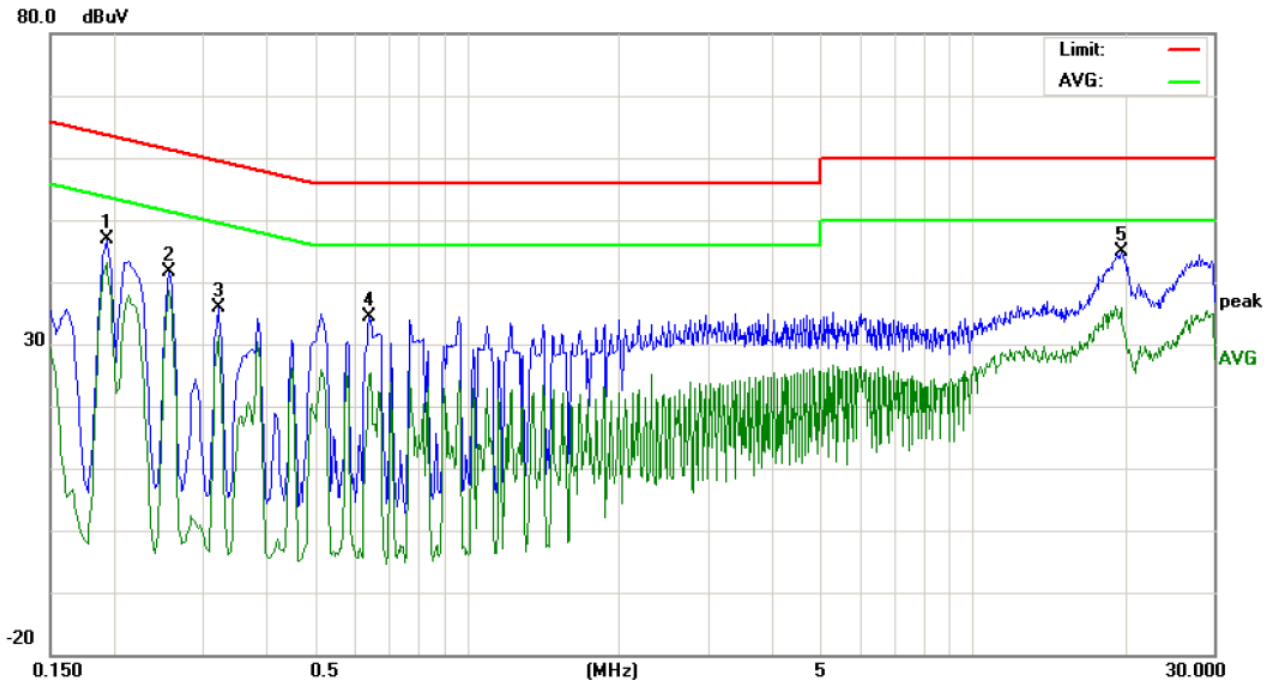
Humidity : 52%

L:



No.	Freq. MHz	Reading_Level (dBuV)			Correct Factor dB	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1940	38.97		35.14	9.90	48.87		45.04	63.86	53.86	-14.99	-8.82	P	
2	0.2162	24.53		15.15	9.90	34.43		25.05	62.96	52.96	-28.53	-27.91	P	
3	0.2580	32.74		29.82	9.90	42.64		39.72	61.49	51.49	-18.85	-11.77	P	
4	0.3220	26.27		20.76	9.90	36.17		30.66	59.65	49.65	-23.48	-18.99	P	
5	19.7099	36.66		27.49	10.37	47.03		37.86	60.00	50.00	-12.97	-12.14	P	

N:



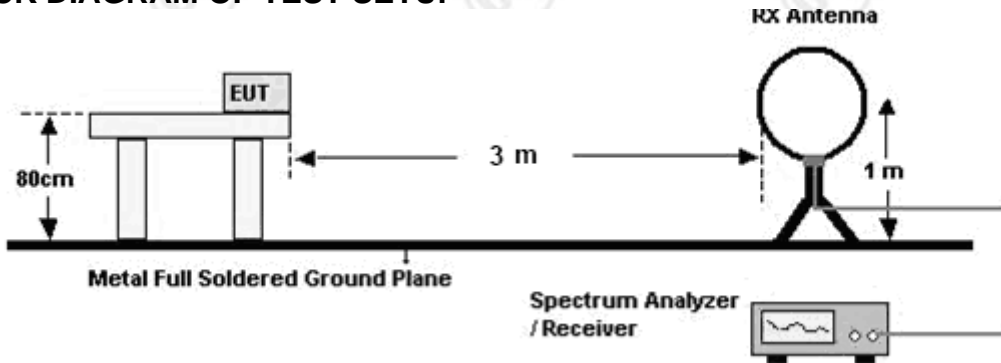
No.	Freq. MHz	Reading_Level (dBuV)			Correct Factor dB	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1940	37.01		33.23	9.90	46.91		43.13	63.86	53.86	-16.95	-10.73	P	
2	0.2580	31.72		28.84	9.90	41.62		38.74	61.49	51.49	-19.87	-12.75	P	
3	0.3220	26.09		21.52	9.90	35.99		31.42	59.65	49.65	-23.66	-18.23	P	
4	0.6419	24.57		14.99	9.90	34.47		24.89	56.00	46.00	-21.53	-21.11	P	
5	19.7099	34.60		25.60	10.37	44.97		35.97	60.00	50.00	-15.03	-14.03	P	

8. TRANSMITTER FUNDAMENTAL FIELD STRENGTH

8.1 LIMITS

The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters

8.2 BLOCK DIAGRAM OF TEST SETUP



8.3 TEST PROCEDURE

- The Product is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the Product and rotated about its vertical axis for maximum response at each azimuth about the Product. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the Product.
- For each suspected emission, the Product was arranged to its worst case and then turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test frequency analyzer system was set to Peak Detect (300Hz RBW in 9kHz to 150kHz and 10kHz RBW in 150kHz to 30MHz) Function and Specified Bandwidth with Maximum Hold Mode.

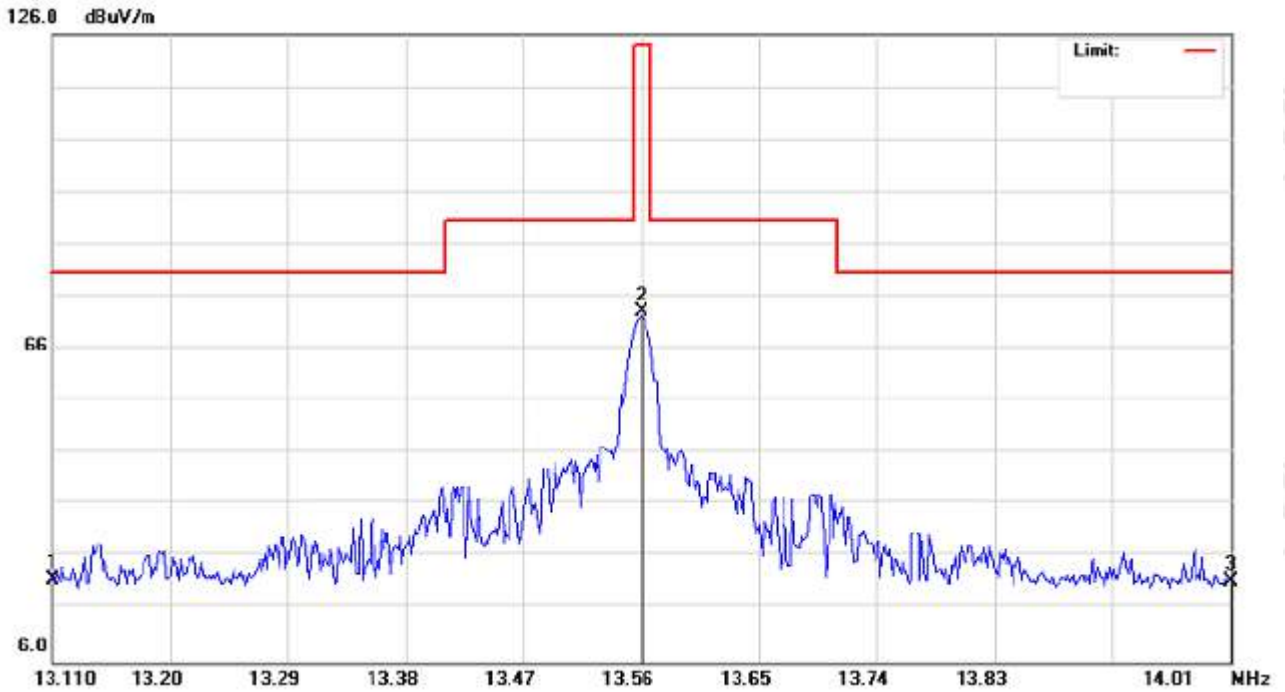
TEST RESULT

The worst data are below:

Frequency (MHz)	Antenna Polarity	PK Level (dB μ V/m)	QP Level (dB μ V/m)	Test limit_QP (dB μ V/m)	Test distance (m)	Result
13.56	90° to EUT	65.4	63.8	124	3	Pass

- Measurements were performed at 3 metres and results extrapolated to 30 metres.
- The limit is specified at a test distance of 30 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by making the measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor.

The worst test Graph is below:



9. TRANSMITTER RADIATED SPURIOUS EMISSIONS

9.1 LIMITS

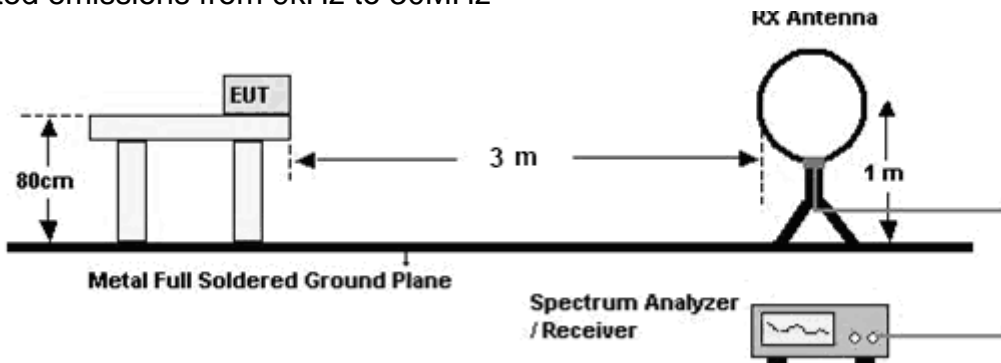
The field strength of any emissions, which appear outside of operating frequency band specified in 15.225, shall not exceed the general radiated emission limits as below.

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

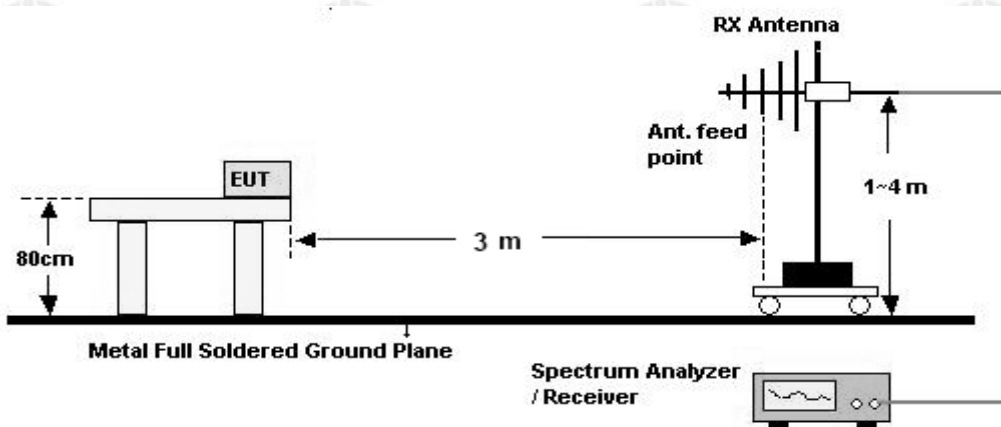
Note: the tighter limit applies at the band edges.

9.2 BLOCK DIAGRAM OF TEST SETUP

For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30 - 1000MHz



9.3 TEST PROCEDURE

A. Above 30MHz

- a. The Product was placed on the non-conductive turntable 0.8m above the ground at a chamber.
- b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 100 kHz RBW/ 300 kHz VBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP value (120 kHz RBW/ 300 kHz VBW): vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

B. Below 30MHz

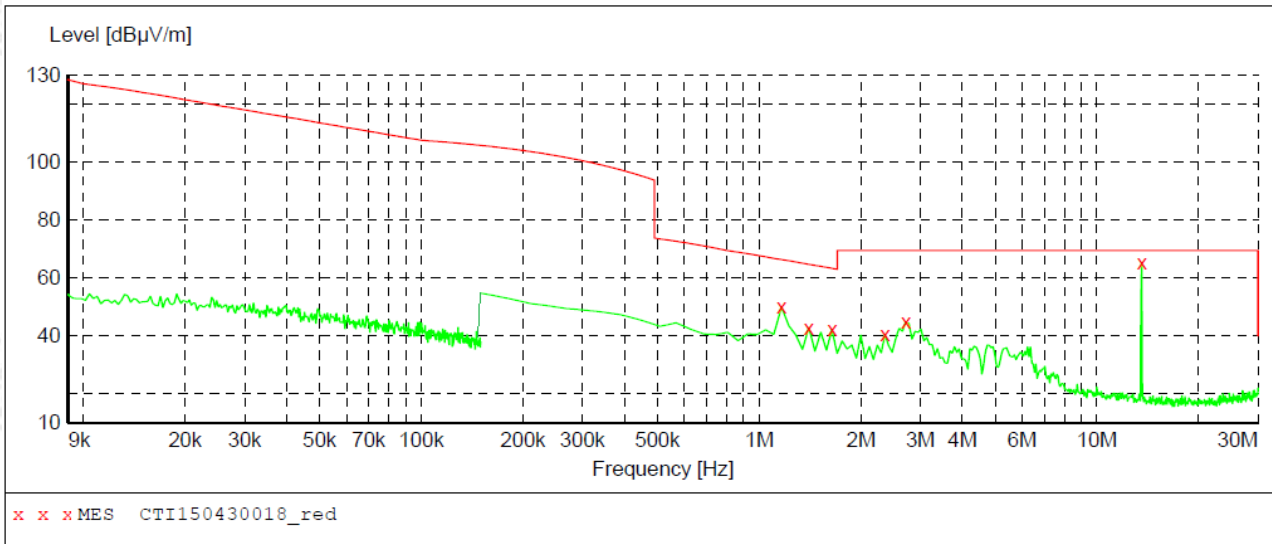
- a. The Product is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.
- b. For each suspected emission, the Product was arranged to its worst case and then turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- c. The test frequency analyzer system was set to Peak Detect (300Hz RBW in 9kHz to 150kHz and 10kHz RBW in 150kHz to 30MHz) Function and Specified Bandwidth with Maximum Hold Mode.

9.4 TEST RESULT

The worst test data are below:

Below 30MHz:

H:

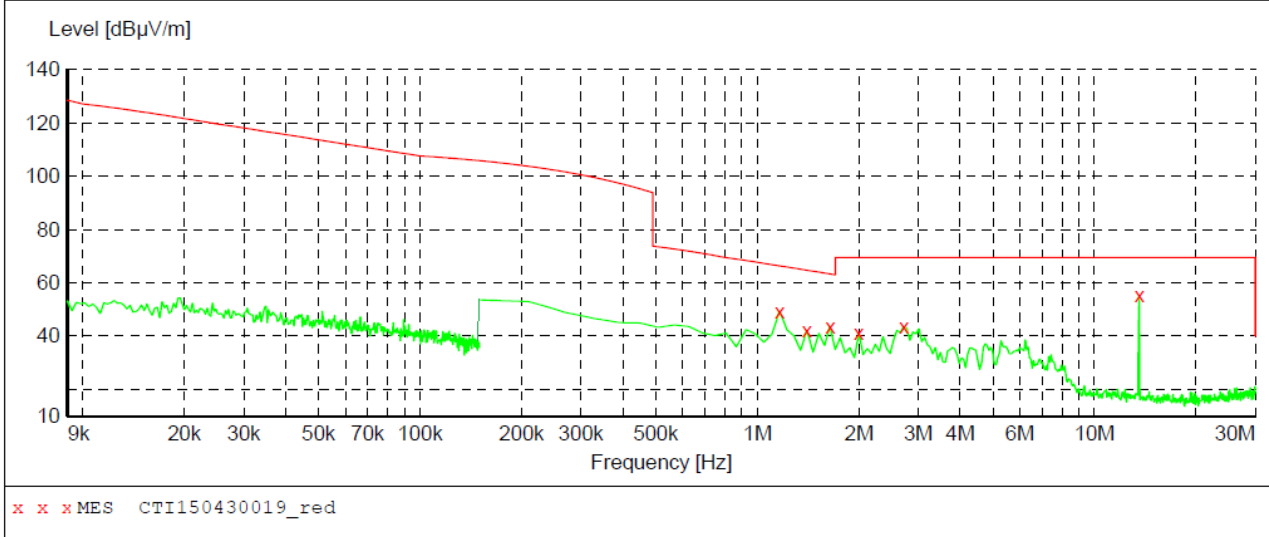


Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1.164900	49.90	11.8	66.3	16.4	QP	100.0	269.00	HORIZONTAL
1.403700	42.90	11.8	64.7	21.8	QP	100.0	70.00	HORIZONTAL
1.642500	42.10	11.8	63.3	21.2	QP	100.0	169.00	HORIZONTAL
2.358900	40.50	11.8	69.5	29.0	QP	100.0	367.00	HORIZONTAL
2.717100	44.70	11.8	69.5	24.8	QP	100.0	370.00	HORIZONTAL
*13.56000	65.40	12.4	---	--	PK	200.0	205.00	HORIZONTAL

Note:

1. The emissions below 150kHz are not reported for they are much lower than the limits.
2. *: Operated frequency
3. Measurements were performed at 3 metres and results extrapolated to 30 metres and 300 metres.
4. The limit is specified at a test distance of 30 metres and 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by making the measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor.

V:



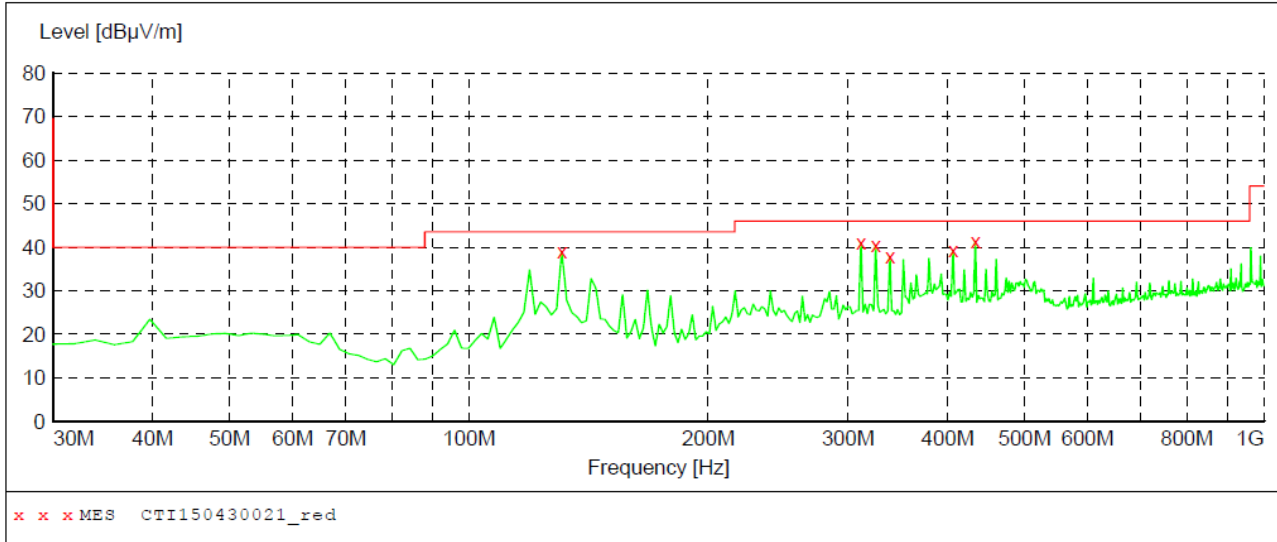
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1.164900	49.40	11.8	66.3	16.9	QP	100.0	369.00	VERTICAL
1.403700	42.20	11.8	64.7	22.5	QP	100.0	71.00	VERTICAL
1.642500	43.60	11.8	63.3	19.7	QP	100.0	369.00	VERTICAL
2.000700	41.00	11.8	69.5	28.5	QP	100.0	273.00	VERTICAL
2.717100	43.60	11.8	69.5	25.9	QP	100.0	175.00	VERTICAL
*13.56000	55.20	12.4	---	--	PK	100.0	273.00	VERTICAL

Note:

1. The emissions below 150kHz are not reported for they are much lower than the limits.
2. *: Operated frequency
3. Measurements were performed at 3 metres and results extrapolated to 30 metres and 300 metres.
4. The limit is specified at a test distance of 30 metres and 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by making the measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor.

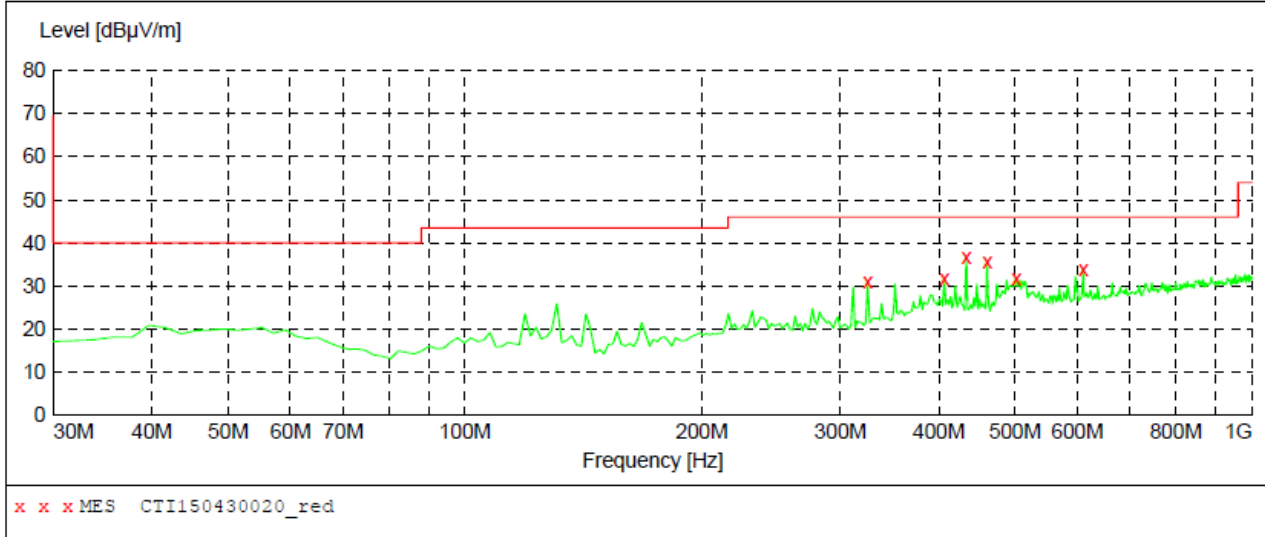
Above 30MHz:

H:



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
130.880000	38.90	11.3	43.5	4.6	QP	200.0	336.00	HORIZONTAL
311.300000	41.00	16.9	46.0	5.0	QP	100.0	313.00	HORIZONTAL
324.880000	40.50	17.5	46.0	5.5	QP	100.0	99.00	HORIZONTAL
338.460000	37.80	18.2	46.0	8.2	QP	100.0	87.00	HORIZONTAL
406.360000	39.20	19.0	46.0	6.8	QP	100.0	87.00	HORIZONTAL
433.520000	41.30	19.5	46.0	4.7	QP	100.0	111.00	HORIZONTAL

V:



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
324.880000	30.90	17.5	46.0	15.1	QP	200.0	119.00	VERTICAL
406.360000	31.80	19.0	46.0	14.2	QP	100.0	213.00	VERTICAL
433.520000	36.50	19.5	46.0	9.5	QP	100.0	225.00	VERTICAL
460.680000	35.50	20.0	46.0	10.5	QP	100.0	225.00	VERTICAL
501.420000	31.80	21.0	46.0	14.2	QP	100.0	11.00	VERTICAL
610.060000	33.90	23.2	46.0	12.1	QP	100.0	135.00	VERTICAL

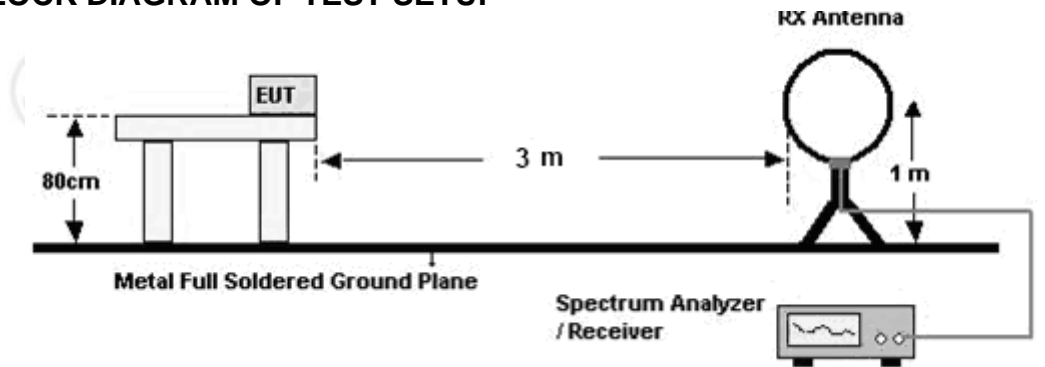
10 TRANSMITTER BAND EDGE RADIATED EMISSIONS

10.1 LIMITS

Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

10.2 BLOCK DIAGRAM OF TEST SETUP



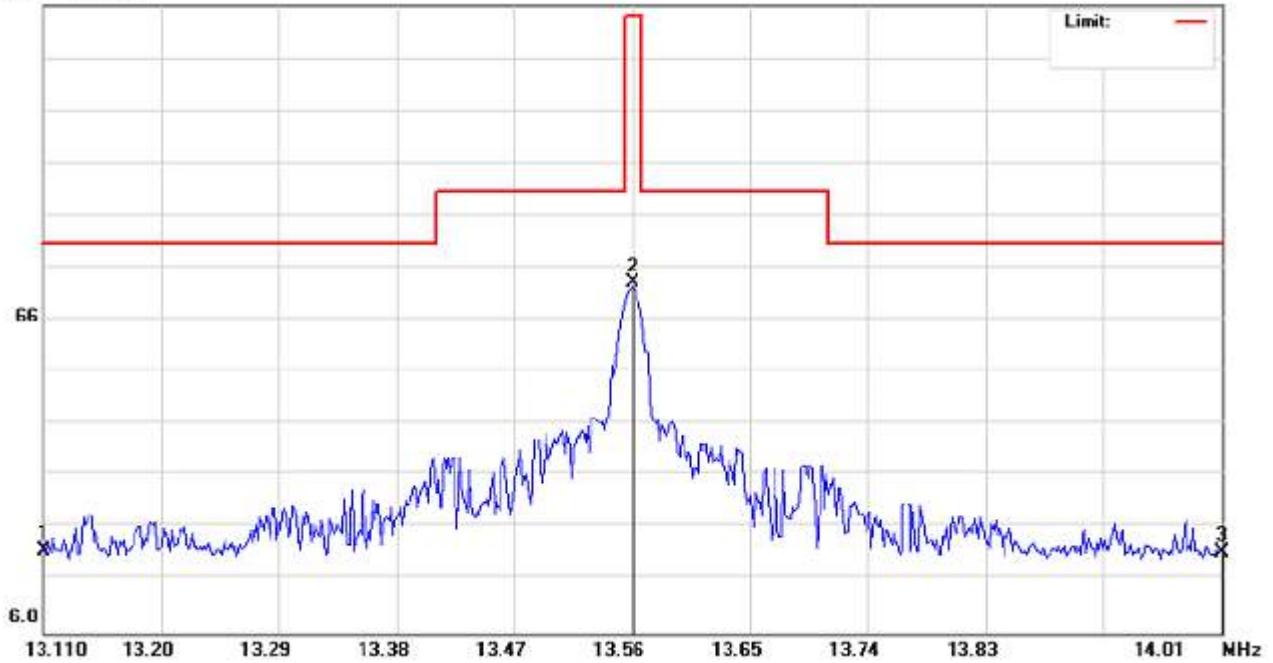
10.3 TEST PROCEDURE

- The Product is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.
- For each suspected emission, the Product was arranged to its worst case and then turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test frequency analyzer system was set to Peak Detect (300Hz RBW in 9kHz to 150kHz and 10kHz RBW in 150kHz to 30MHz) Function and Specified Bandwidth with Maximum Hold Mode.

10.4 TEST RESULT

H:

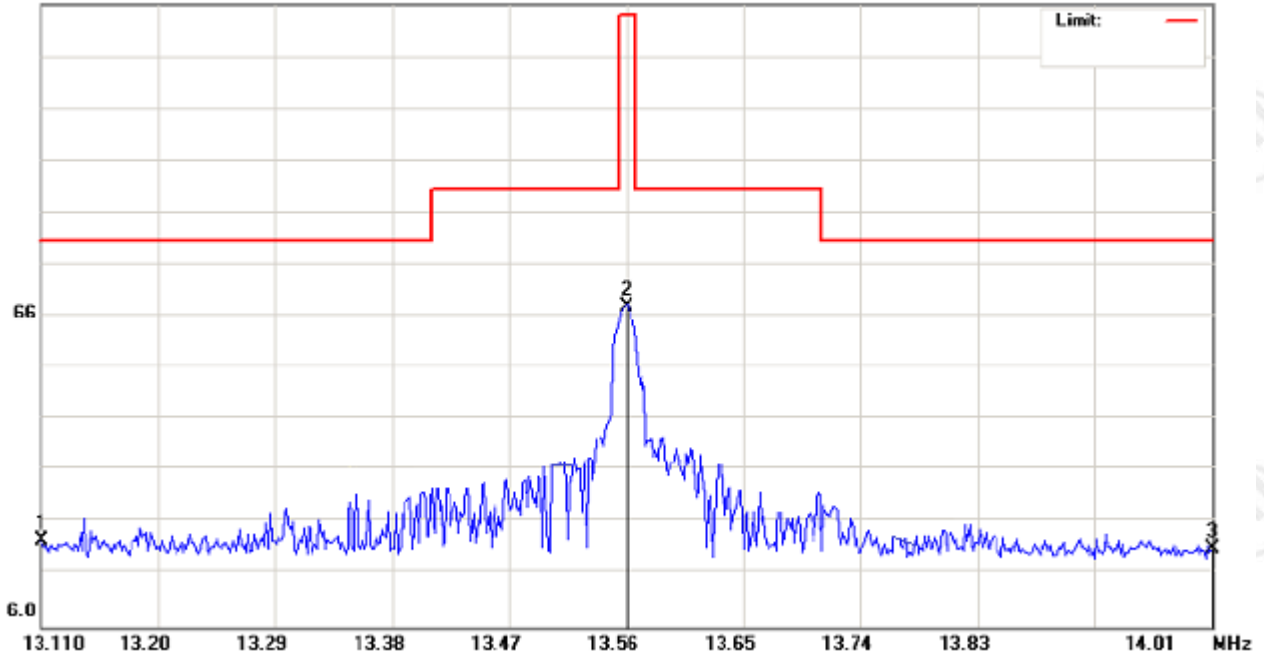
126.0 dBuV/m



Frequency (MHz)	Measurement value		Limit (dB μ V/m) @3m	Antenna (H/V)	Result (P/F)
	PK (dB μ V/m) @3m	QP (dB μ V/m) @3m			
13.11	22.87	---	69.5	H	P
14.01	21.98	---	69.5	H	P

V:

126.0 dB μ V/m



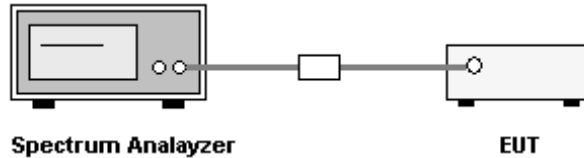
Frequency (MHz)	Measurement value		Limit	Antenna	Result
	PK (dB μ V/m) @3m	QP (dB μ V/m) @3m	QP (dB μ V/m) @3m	(H/V)	(P/F)
13.11	21.09	---	69.5	V	P
14.01	21.21	---	69.5	V	P

11. TRANSMITTER 20 DB BANDWIDTH

11.1 LIMITS

None

11.2 BLOCK DIAGRAM OF TEST SETUP

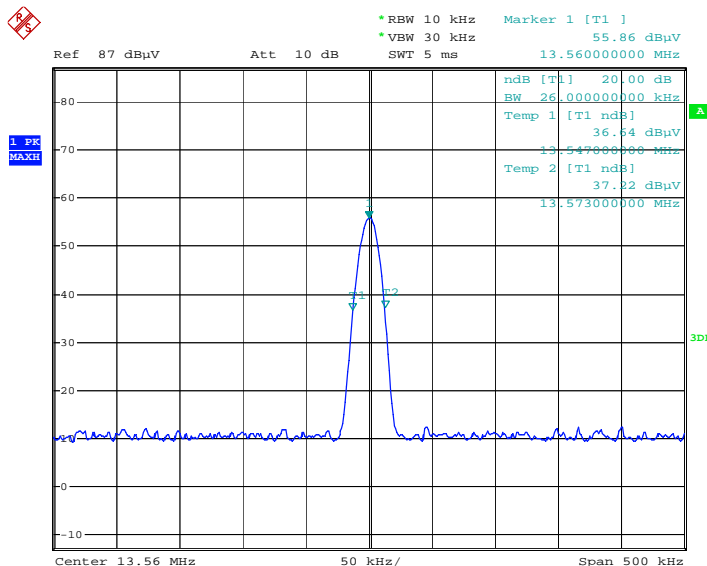


11.3 TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level.
4. The 20dB bandwidth was determined from where the channel output spectrum intersected the display line.

11.4 TEST RESULT

Frequency (MHz)	20 dB BW (kHz)
13.56	26.0



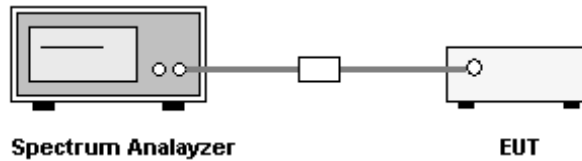
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12. TRANSMITTER FREQUENCY STABILITY

12.1 LIMITS

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

12.2 BLOCK DIAGRAM OF TEST SETUP



12.3 TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.

12.4 TEST RESULT

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	52

Maximum frequency error of the EUT with variations in ambient temperature:

Temperature (°C)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Result
-20	13.56	13.559988	-12	-0.00008850	0.01	Pass
-10	13.56	13.559979	-21	-0.00015487	0.01	Pass
0	13.56	13.56	0	0	0.01	Pass
10	13.56	13.559981	-19	-0.00014012	0.01	Pass
20	13.56	13.56	0	0	0.01	Pass
30	13.56	13.559979	-21	-0.00015487	0.01	Pass
40	13.56	13.559982	-18	-0.00013274	0.01	Pass
50	13.56	13.559927	-73	-0.00053835	0.01	Pass

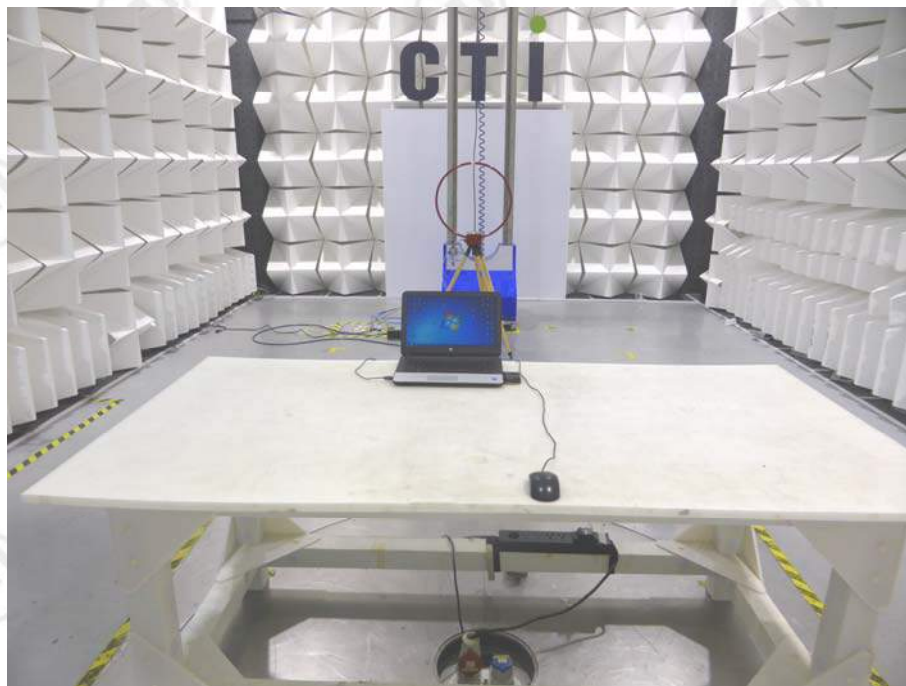
Maximum frequency error of the EUT with variations in nominal operating voltage at an ambient temperature of 20 °C (the power supply of PC is AC 120V):

Supply Voltage (V)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Result
102	13.56	13.559998	-2	-0.00001475	0.01	Pass
120	13.56	13.56	0	0	0.01	Pass
138	13.56	13.5599881	-11.9	-0.00008776	0.01	Pass

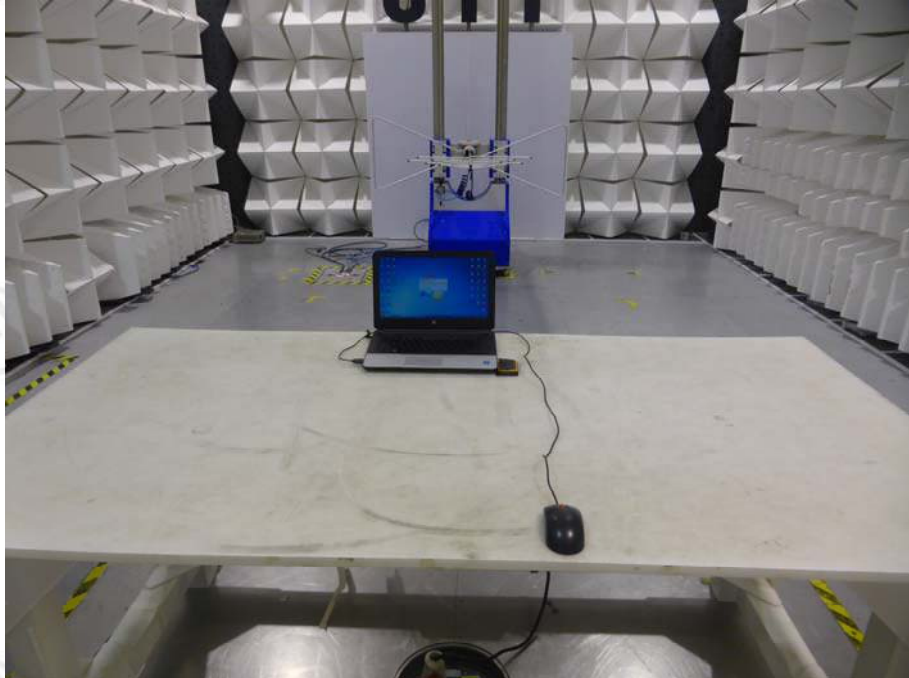
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP



TEST SETUP OF CONDUCTED EMISSION

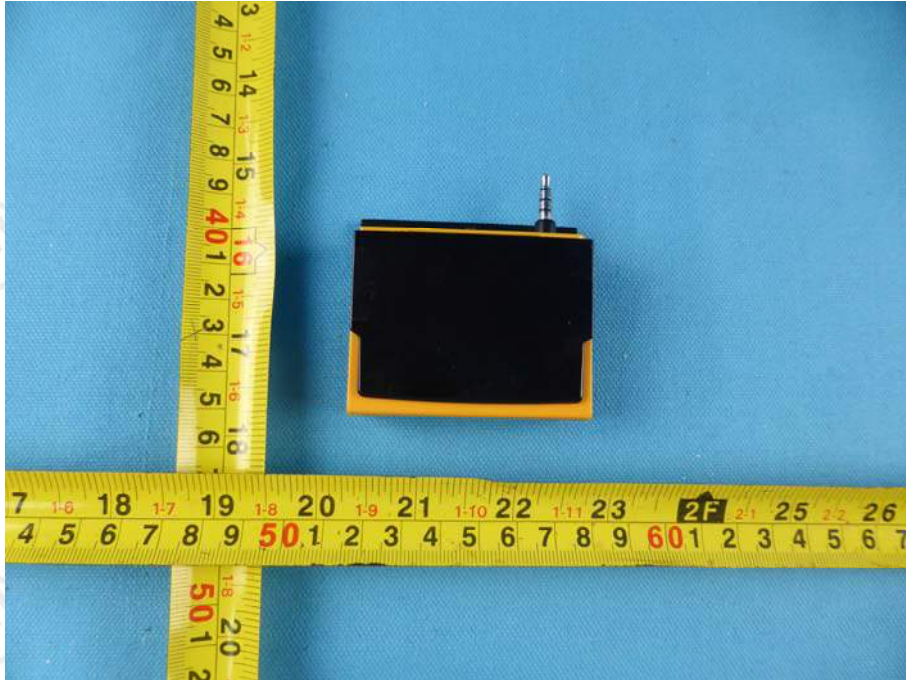


TEST SETUP OF RADIATED EMISSION (Below 30MHz)



TEST SETUP OF RADIATED EMISSION (30MHz~1GHz)

APPENDIX 2 PHOTOGRAPHS OF EUT



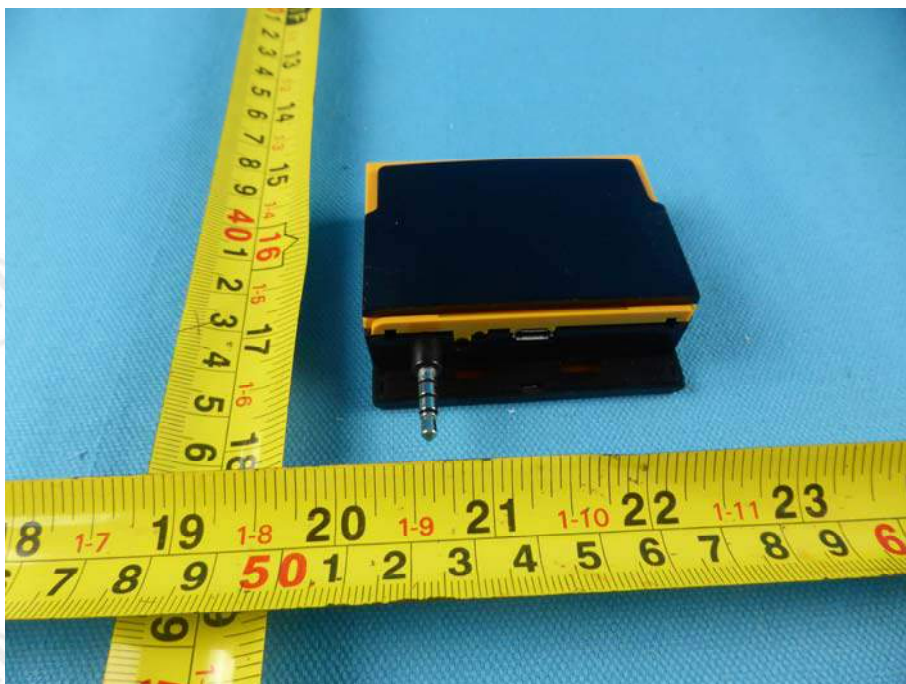
View of EUT-1



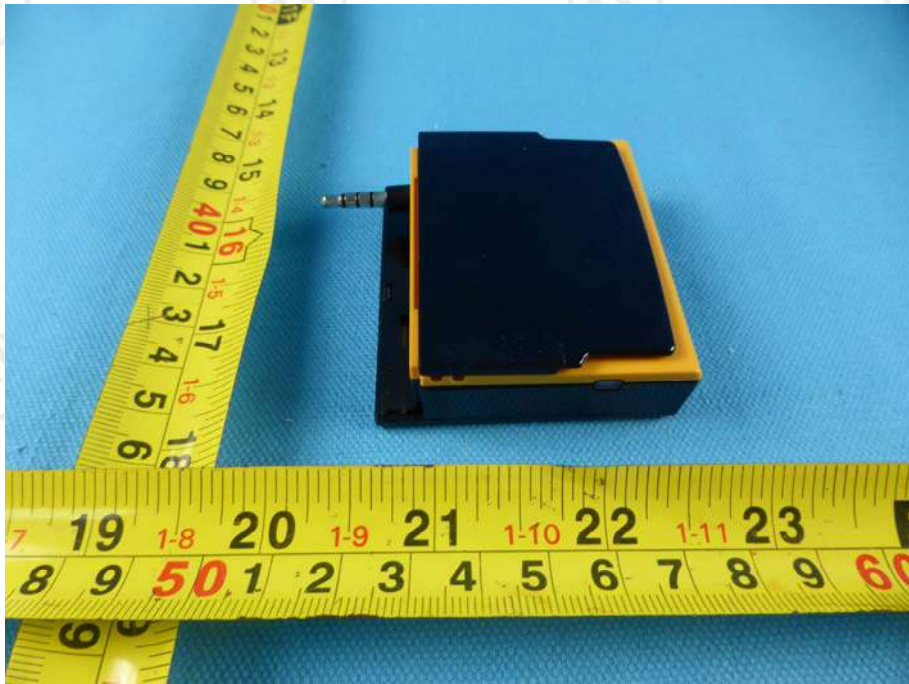
View of EUT-2



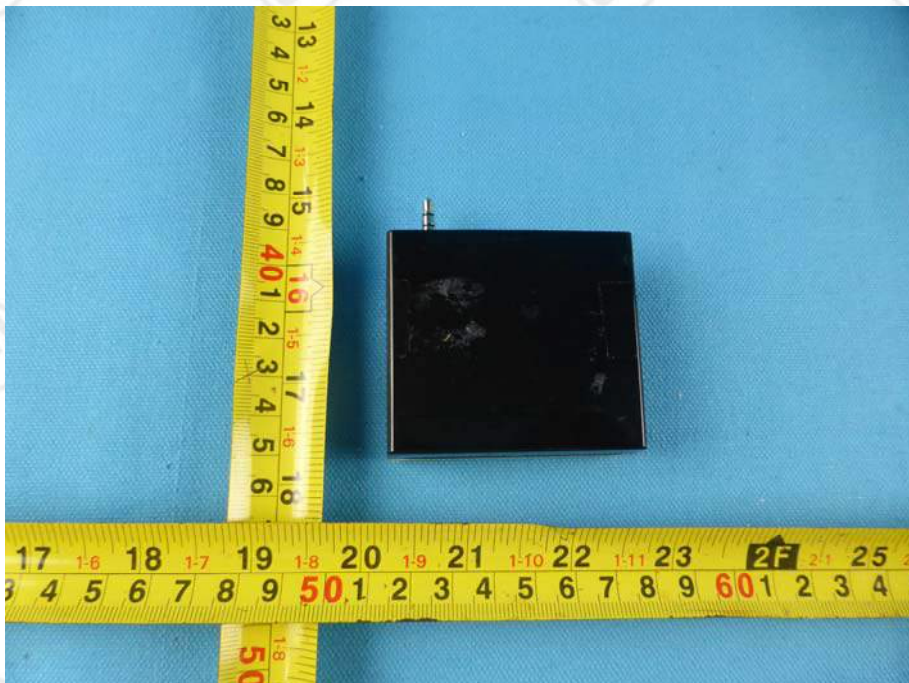
View of EUT-3



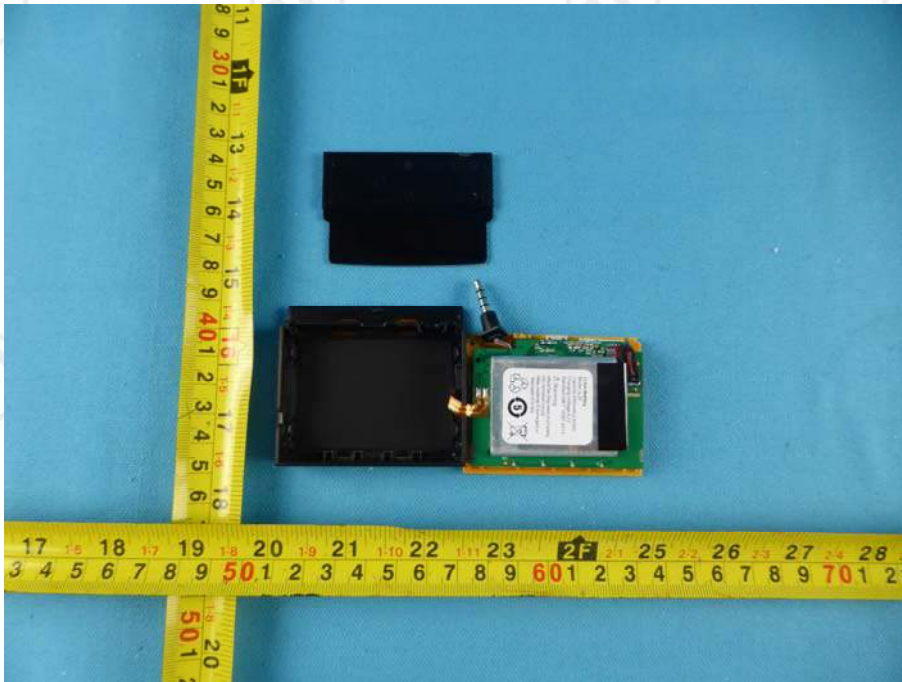
View of EUT-4



View of EUT-5



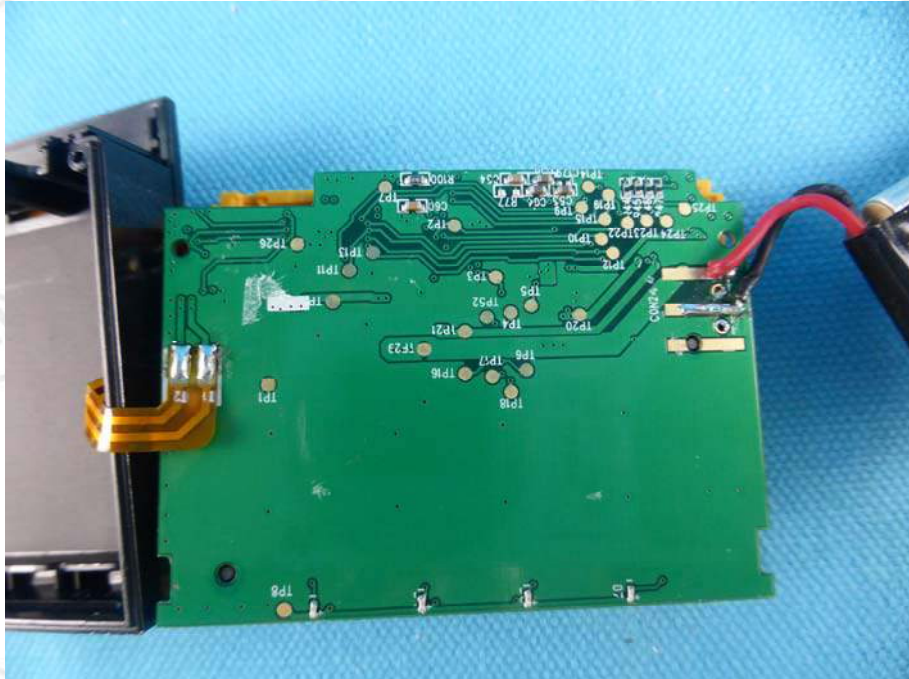
View of EUT-6



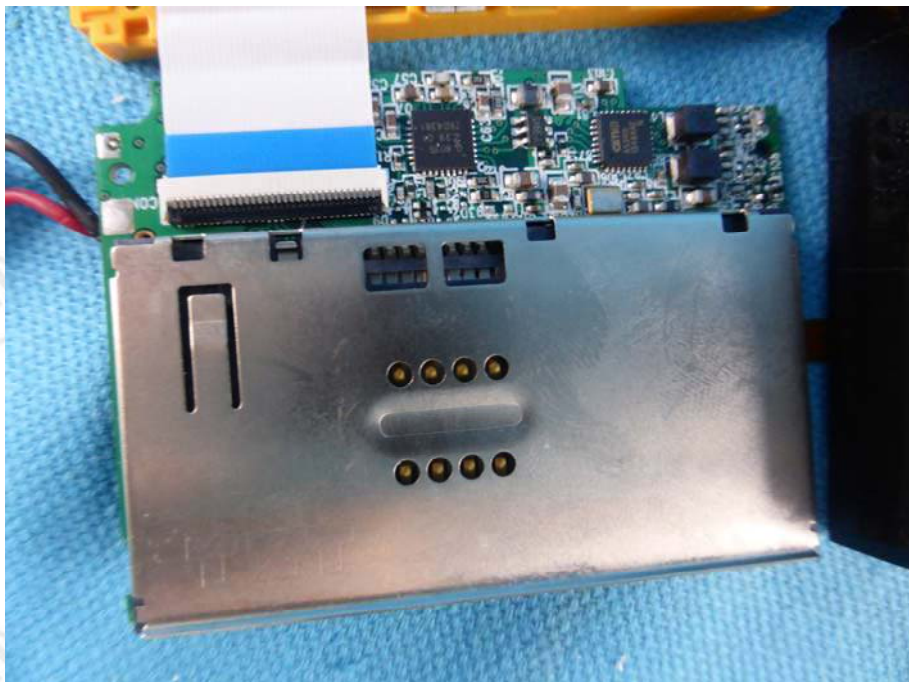
View of EUT-7



View of EUT-8



View of EUT-9



View of EUT-10



View of EUT-11



View of EUT-12



View of EUT-13

*** End of Report ***

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