



FCC PART 15.Subpart C
EMI MEASUREMENT AND TEST REPORT
For

Shenzhen yetong technology co.,ltd
3/F, Bldg. 16, Longsheng Industrial Zone, Dalang Street, Longhua New Area,
Shenzhen, Guangdong, China

FCC ID: 2ACECYET-MF2

2014-05-13

This Report Concerns: Original Report		Equipment Type: RFID READER	
Test Engineer:	Simon		
Report No.:	TMC20140521EY01		
Receive EUT	2014-05-10 /		
Date/Test Date:	2014-05-10 ~ 2014-05-13		
Reviewed By:	 Michal Ling		
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1. GENERAL INFORMATION

1.1. Report information

1.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that WST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that WST in any way guarantees the later performance of the product/equipment.

1.1.2. The sample/s mentioned in this report is/are supplied by Applicant, WST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through WST, unless the applicant has authorized WST in writing to do so.

Test Facility -

The test site used to collect the radiated data is located on the address of

Shenzhen WST Testing Technology Co., Ltd.

(FCC Registered Test Site Number: 939433) on

1F, No.9 Building, TKG Science & Technology Park, Shenzhen, China

The Test Site is constructed and calibrated to meet the FCC requirements.

1.2. Measurement Uncertainty

Available upon request.

2. PRODUCT DESCRIPTION

2.1. EUT Description

Description : RFID READER

Applicant : Shenzhen yetong technology co.,ltd

Model Number : YET-MF2,YET-MF3,YET-U1,YET-U6,YET-U8,YET-689,YET-680,YET-2621E,YET-618,YET-619

Trade : RFGATE

The series products, model name:

YET-MF2,YET-MF3,YET-U1,YET-U6,YET-U8,YET-689,YET-680,YET-2621E,YET-618,YET-619 have the same circuit diagram,PCB layout, software, RF Module, Features and functionality. The differences are the model name, so, we select YET-MF2 to test.

Additional Information

Frequency : 13.56MHz

Power Supply : DC5V

Modulation : ASK

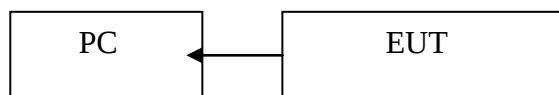
Type

Transmitter : 0dBi

Antenna Gain

Channel Number 1

2.2. Block Diagram of EUT Configuration



2.3. Support Equipment List

Manufacturer	Description	Model	Serial Number
ThinkPad	notebook PC	Y410P-ISE	CN-0TC670-70821-560-F4Q6

2.4. Test Conditions

Temperature: 23~25℃

Relative Humidity: 55~63 %

3. TEST RESULTS SUMMARY

FCC 15 Subpart C, Paragraph 15.231

Test Standards	Test Items	Test Results
§15.207	Conducted test	Pass
§15.205/15.209/15.225	Radiated Emission	Pass
§15.225 (e)	Frequency Stability	Pass
§15.203	ANTENNA REQUIREMENT	Pass
§15.215	20dB Bandwidth	Pass

Remark: “N/A” means “Not applicable.”

Modifications

No modification was made.

4. TEST EQUIPMENT USED

EQUIPMENT	MANUFACTURER	MODEL #	SERIAL NO.	DATE OF CAL.	CAL. INTERVAL
Cable	Resenberger	N/A	NO.1	Mar 10, 2014	1 Year
Cable	SCHWARZBECK	N/A	NO.2	Mar 10, 2014	1 Year
Cable	SCHWARZBECK	N/A	NO.3	Mar 10, 2014	1 Year
LISN	Rohde & Schwarz	ESH3-Z5	100305	Mar 10, 2014	1 Year
50Ω Coaxial Switch	ANRITSU CORP	MP59B	6200283933	Mar 10, 2014	1 Year
EMI Test Receiver	Rohde & Schwarz	ESP13	100180	Oct.11,2013	1 Year
Spectrum Analyzer	Rohde & Schwarz	FSP40	100273	Sep.10,2013	1 Year
3m Semi-Anechoic Chamber	Albatross Projects	9m×6m×6m	N/A	Feb.20,2014	1 Year
Loop Antenna	SCHWARZBECK	FMZB1516	113	Jan.30,2014	1 Year
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	9161-4079	Sep.22,2013	1 Year
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-564	Sep.22,2013	1 Year
Ultra Broadband Antenna	Rohde & Schwarz	HL-562	100110	June.15,2013	1 Year
AMN	Rohde & Schwarz	ESH3-Z5	100196	Oct.11,2013	1 Year
AMN	Rohde & Schwarz	ESH3-Z5	100197	Oct.11,2013	1 Year
EMI Test Receiver	Rohde & Schwarz	ESCS30	100003	Feb.20,2014	1 Year
Coaxial Cable with N-connectors	SCHWARZBECK	AK9515H	95549	Sep.22,2013	1 Year
Passive Loop Antenna	ETS	6512	00029604	June.15,2013	1 Year
Temperature & Humidity Chamber	ESPEC	EL-10KA	09107726	Oct.11,2013	1 Year
DC POWER SUPPLY	GOOD WILL	GPS-2020DD	100003	Oct.11,2013	1 Year

5. CONDUCTED POWER LINE TEST

5.1. Test Equipment

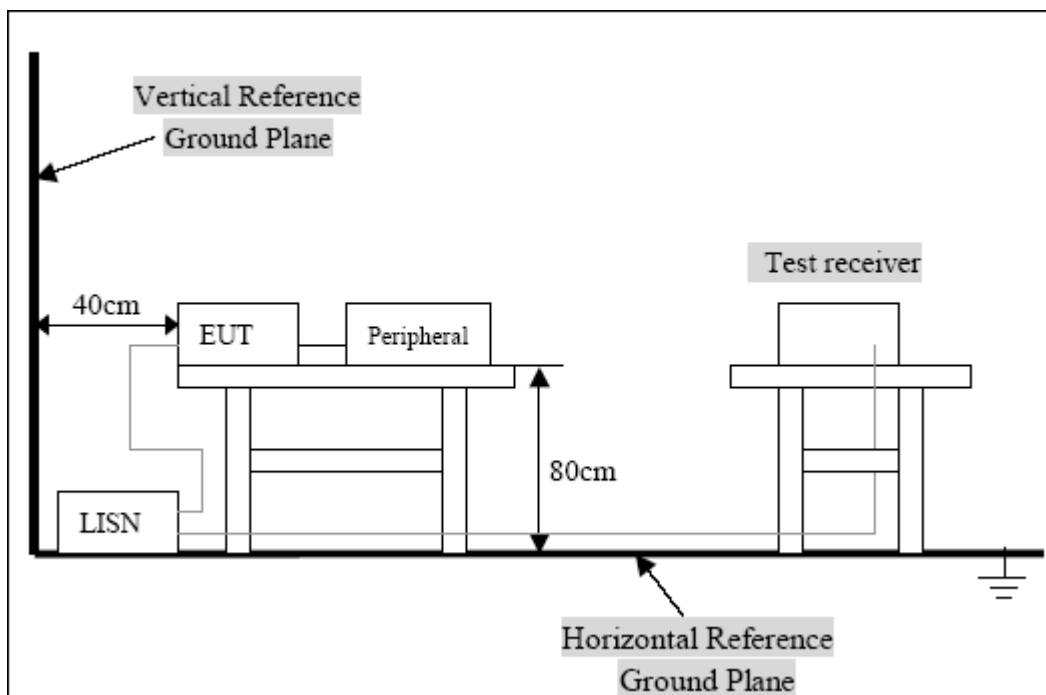
Please refer to section 4 this report.

5.2. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uh coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling impedance with 50ohm termination.

Both sides of A.C. Line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ASIN C63.4:2003 on conducted measurement. Conducted emissions were measured over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9KHz.

5.3. Test Setup



For the actual test configuration, Please refer to the related items-Photos of testing

5.4. Configuring of the EUT

The EUT was configured according to ASIN C63.4:2003. Enable the signal transmitted from the external antenna from EUT to receiver. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

Note:

Below 1GHz, the channel low, middle, high were pre-tested, The channel low, worst case one, was chosen for conducted and radiated emission test.

Above 1GHz, the channel low, middle, high were tested individually.

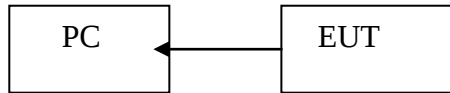
5.5. EUT Operating Condition

Operating condition is according to ANSI C63.4-2003.

Setup the EUT and simulators as shown on follow.

Enable RF signal and confirm EUT active.

Modulate output capacity of EUT up to specification.



5.6. Conducted Power line Emission Limits

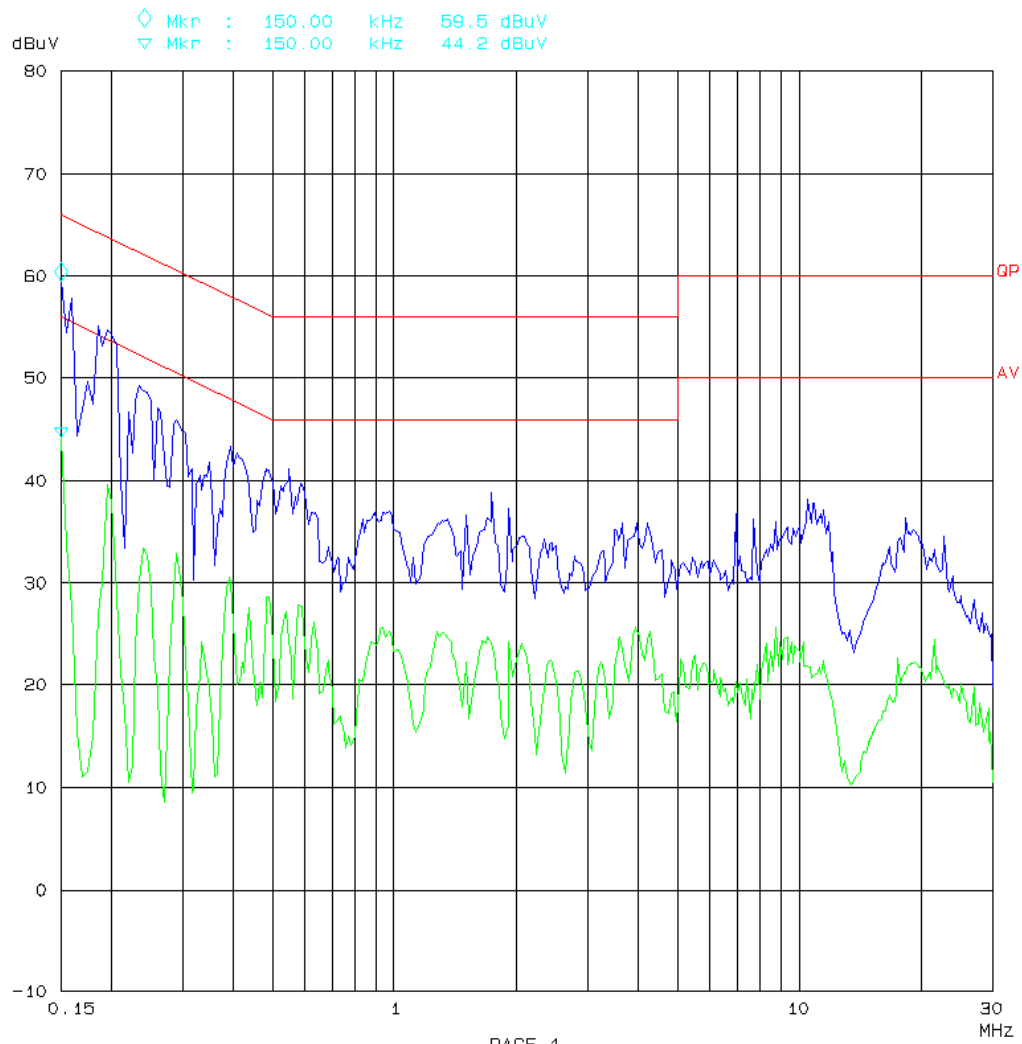
FCC Part 15 Paragraph 15.207 (dBuv)		
Frequency Range (MHZ)	Class A QP/AV	Class B QP/AV
0.15-0.5	79/66	65-56/56-46
0.5-5.0	73/60	56/46
5.0-30	73/60	60/50

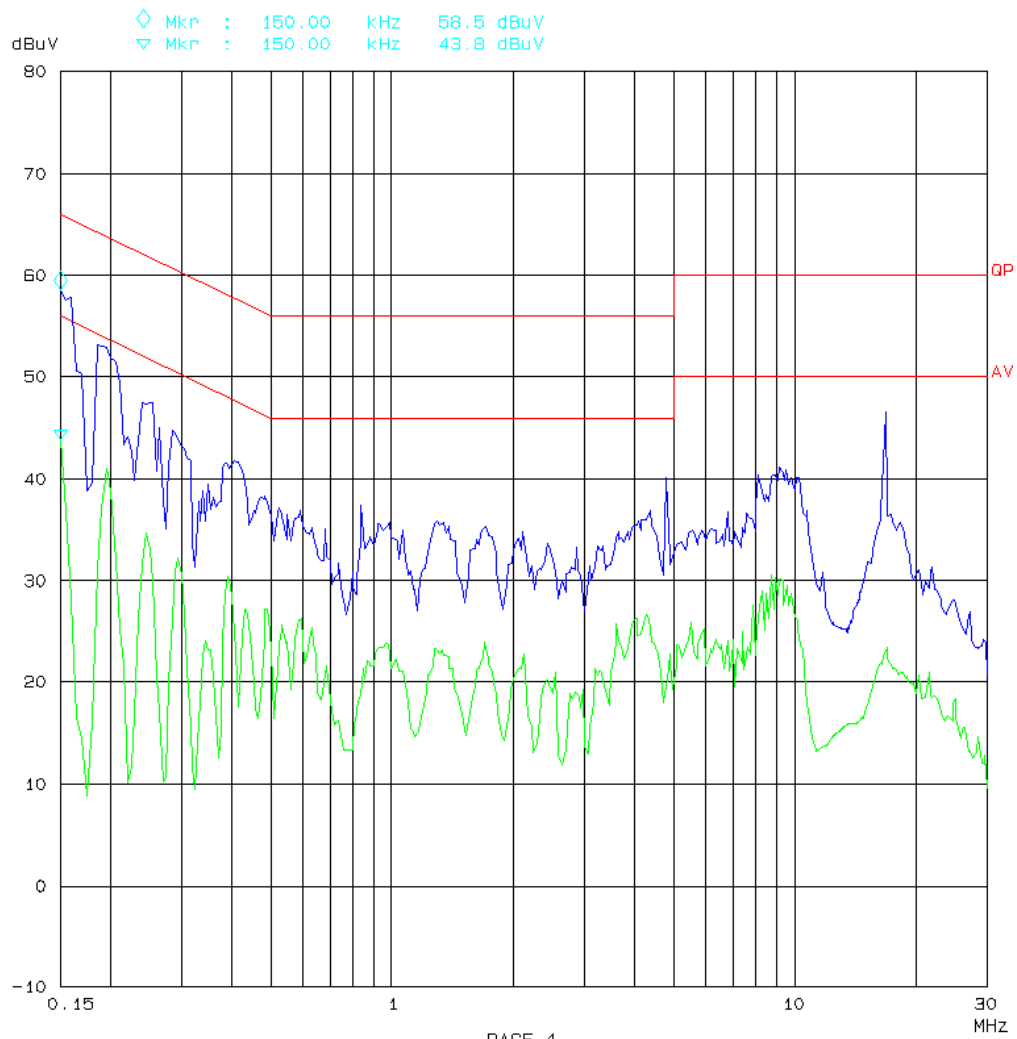
Note: In the above table, the tighter limit applies at the band edges.

5.7. Conducted Power Line Test Result

Test Mode: operating

LINE CONDUCTED EMISSIONS				FCC PART 15.207	
Frequency (MHz)	Amplitude (dBμV)	Detector QP/AV	Conductor Hot/Neutral	Limit (dBμV)	Margin (dB)
0.150	59.50	QP	Neutral	66.00	6.50
0.150	58.50	QP	Hot	66.00	7.50
0.150	44.20	AV	Neutral	56.00	11.80
0.150	43.80	AV	Hot	56.00	12.20
16.745	46.50	QP	Hot	60.00	13.50
0.290	46.00	QP	Neutral	60.50	14.50
0.550	41.20	QP	Neutral	56.00	14.80
0.405	41.90	QP	Hot	57.80	15.90
1.740	38.80	QP	Neutral	56.00	17.20
0.290	32.80	AV	Neutral	50.50	17.70
0.840	37.40	QP	Hot	56.00	18.60
4.355	36.90	QP	Hot	56.00	19.10
0.400	28.50	AV	Hot	47.80	19.30
8.075	40.40	QP	Hot	60.00	19.60
4.345	26.30	AV	Hot	46.00	19.70
10.780	37.80	QP	Neutral	60.00	22.20
1.760	23.00	AV	Neutral	46.00	23.00
6.970	36.70	QP	Neutral	60.00	23.30
0.555	22.60	AV	Neutral	46.00	23.40
8.075	26.50	AV	Hot	50.00	23.50
0.850	21.50	AV	Hot	46.00	24.50
16.595	22.60	AV	Hot	50.00	27.40
10.680	20.70	AV	Neutral	50.00	29.30
6.970	20.30	AV	Neutral	50.00	29.70



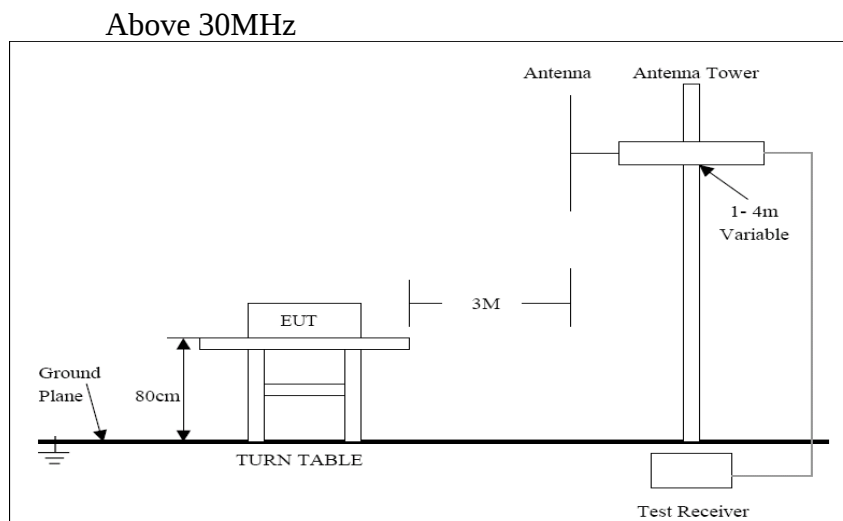
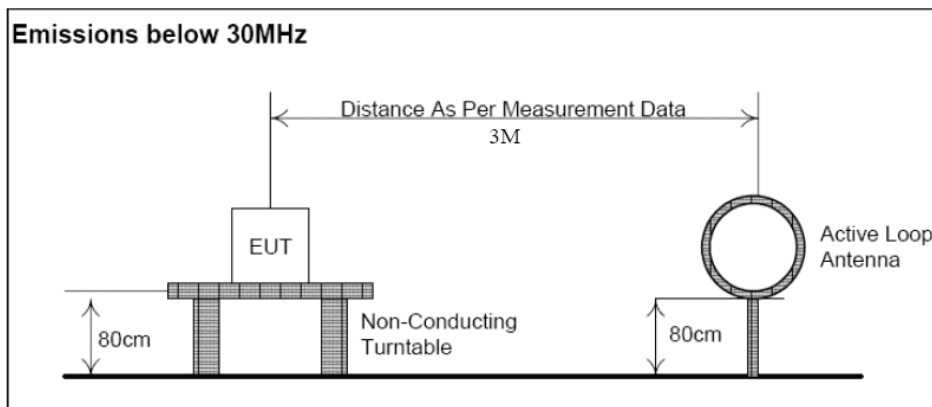


6. RADIATION EMISSIONS

6.1. Test Procedure

The emission tests were performed in the 3-meter chamber test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part Subpart C limits. through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit.

6.2. Radiated Test Setup



Setup below 3mMHz, refer to 7.3; For the accrual test configuration, please refer to the related items-photos of Testing.

6.3. Radiated Emission Limit

According to §15.225, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) 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.
- (d) 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.

The 30m limit was converted to 3m Limit using square factor(x) as it was found by measurements as follows;

$$3 \text{ m Limit(dBuV/m)} = 20\log(X) + 40\log(30/3) = 20\log(15848) + 40\log(30/3) = 124\text{dBuV/m}$$

6.4. Radiated Emission Test Result

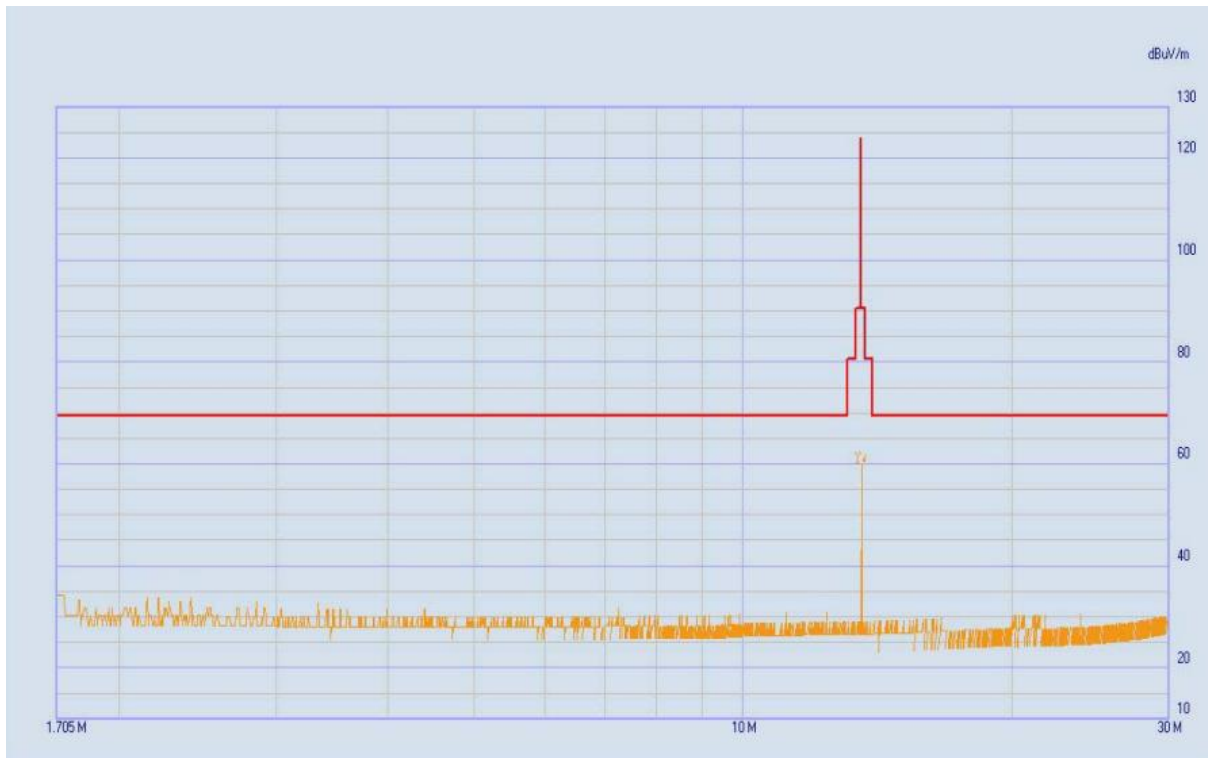
Temperature: 25°C

Humidity: 56%RH

Test Result: PASS

For below 9kHz-30MHz Spurious

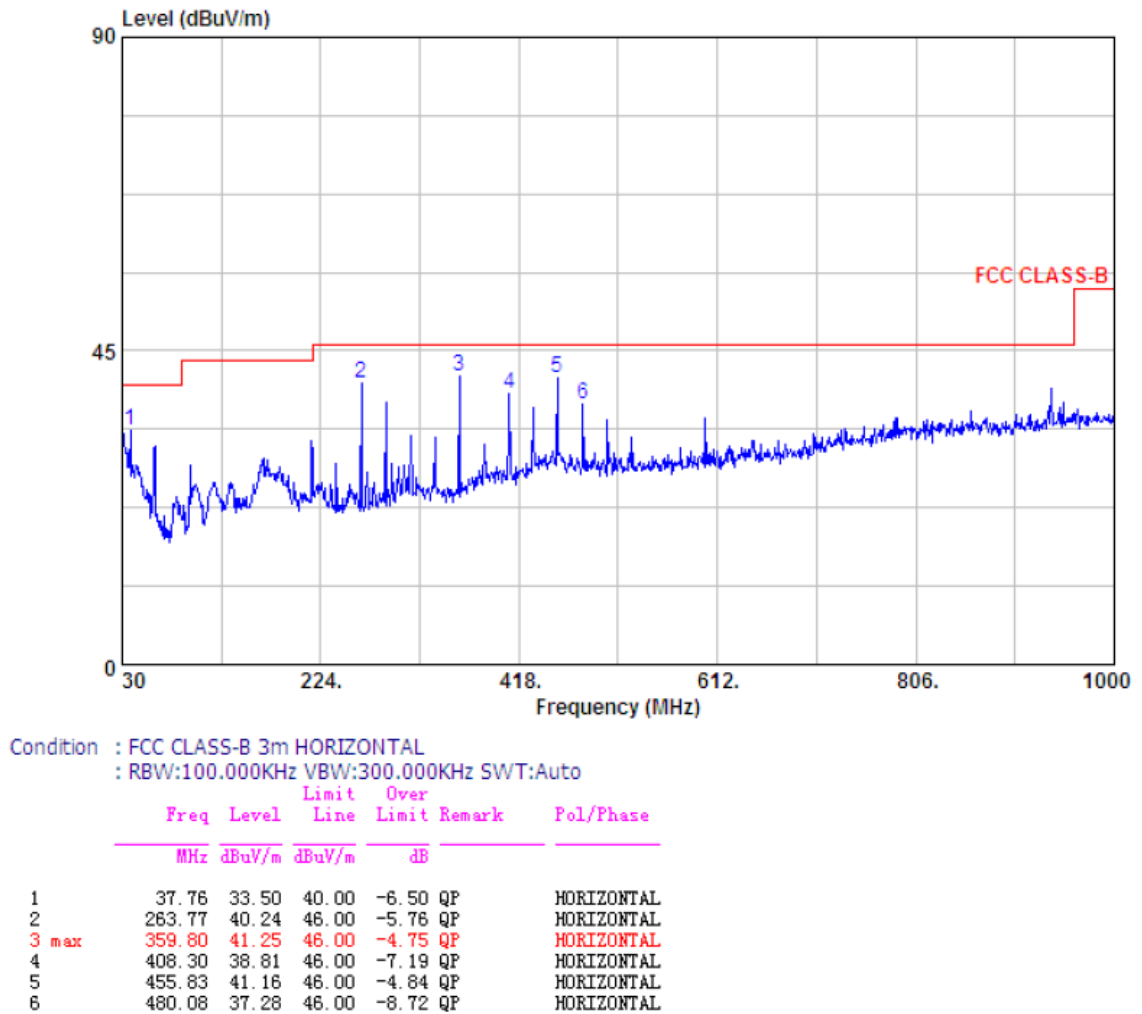
Frequency (MHz)	Antenna Polarization	Emission Level (QP)(dBuV/m)	FCC 15 Subpart C Limit (QP) (dBuV/m)
1.708	-	28.6	69.5
13.49	-	24.7	90.5
13.64	-	24.3	90.5
13.43	-	24.6	90.5
13.70	-	24.3	90.5
13.56	-	60.3	124.0
27.12	-	24.3	69.5

**Note:**

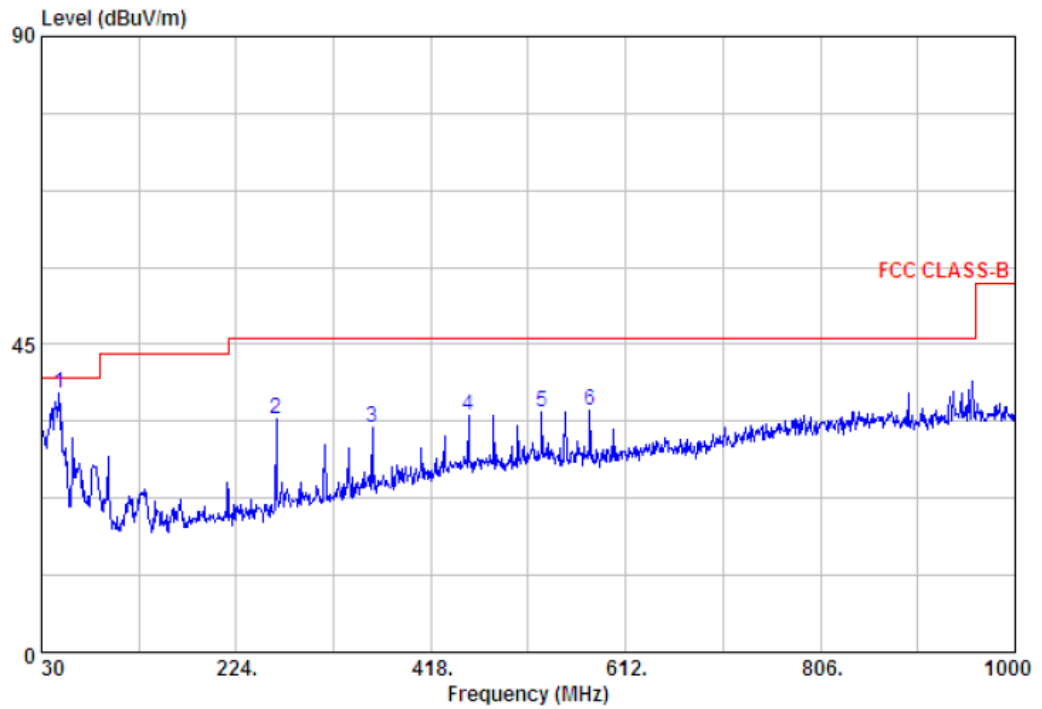
-----means the emission is too low, more than 20dB from the limit.

For 30M-1000MHz Spurious

Horizontal



Vertical



Condition : FCC CLASS-B 3m VERTICAL
 : RBW:100.000KHz VBW:300.000KHz SWT:Auto

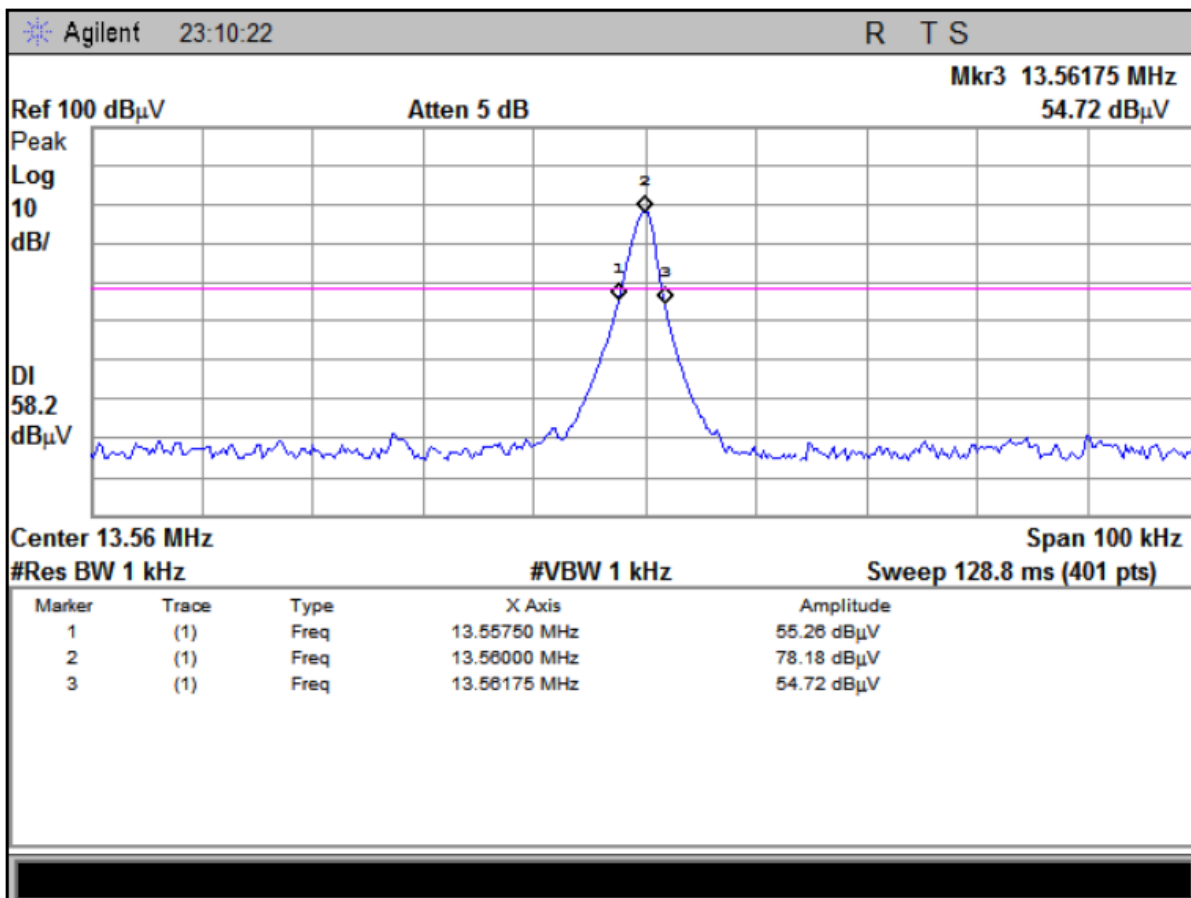
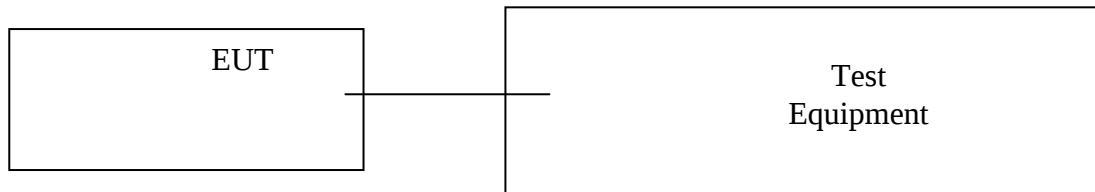
	Freq	Level	Limit	Over		
	MHz	dBuV/m	dBuV/m	dB	Remark	Pol/Phase
1 max	47.46	37.79	40.00	-2.21	QP	VERTICAL
2	263.77	34.18	46.00	-11.82	QP	VERTICAL
3	359.80	32.73	46.00	-13.27	QP	VERTICAL
4	455.83	34.65	46.00	-11.35	QP	VERTICAL
5	528.58	35.13	46.00	-10.87	QP	VERTICAL
6	576.11	35.25	46.00	-10.75	QP	VERTICAL

7. 20DB BANDWIDTH

Test result:

Centre Frequency	Measurement		limit		Verdi
13.56MHz	20 dB Bandwidth(KHz)	Frequency Range(MHz)	20 dB Bandwidth(KHz)	Frequency Range(MHz)	
	4.25	13.55750-13.56175	14	13.553-13.567	Pass

Test setup:



8. FREQUENCY STABILITY

8.1. Test Equipment

Please refer to Section 4 this report.

8.2. FCC 15.225 FREQUENCY STABILITY Limit

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.

8.3. Test Result

Reference Frequency:13.56MHz, Limit: 100 ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	PPM Error
50	5	13.559822	-13.1268
40	5	13.559820	-13.2743
30	5	13.559818	-13.4218
20	5	13.559802	-14.6018
10	5	13.559791	-15.413
0	5	13.559772	-16.8142
-10	5	13.559743	-18.9528
-20	5	13.559720	-20.649

Frequency Stability Versus Input Voltage

Reference Frequency: 13.56 MHz, Limit: 100 ppm		
Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	PPM Error
4.25	13.559795	-15.118
5.75	13.559803	-14.528

9. ANTENNA REQUIREMENT

9.1. STANDARD APPLICABLE

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.

9.2. ANTENNA CONNECTED CONSTRUCTION

According to § 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The antenna was PCB antenna and a unique, fulfill the requirement of this section.

9.3. Result

Compliance