



RADIO TEST REPORT

Applicant : Partner Tech Corp.

Address : 10FL, 233-2, Baoqiao Road, Xindian,
New Taipei City, Taiwan

Equipment : Mobile POS Terminal

Model No. : PAT-120,PAT-12XYYYYY ("X" could be 1-9, -,
A-Z or blank for marketing purpose; "Y" could be
0-9, -, A-Z or blank for marketing purpose)

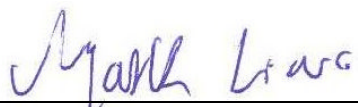
Trade Name : PARTNER

FCC ID : NDPPAT-120

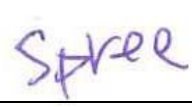
I HEREBY CERTIFY THAT :

The sample was received on Nov. 23, 2017 and the testing was carried out on Nov. 30, 2017 at CerpPASS Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of CerpPASS Technology Corp., the test report shall not be reproduced except in full.

Approved by:


Mark Liao / Assistant Manager

Tested by:


Spree Yei / Engineer

Laboratory Accreditation:

☒ CerpPASS Technology Corporation Test Laboratory





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**History of this test report**

Report No.	Issue Date	Description
TEFO1710127	Dec. 13, 2017	Original



1. Summary of Test Procedure and Test Results

1.1. Applicable Standards

ANSI C63.4:2014

ANSI C63.10:2013

FCC Rules and Regulations Part 15 Subpart C §15.225

FCC Rule	Description of Test	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.209 15.225	Radiated Emission	Pass
15.225	20dB Bandwidth BW	Pass
15.225(e)	Frequency Stability	Pass



2. Test Configuration of Equipment under Test

2.1. Feature of Equipment under Test

Frequency Range	BT: 2402~2480MHz RFID: 13.56MHz 2.4G: 2412-2462MHz
Modulation Type	OFDM, DSSS, GFSK, $\pi/4$ -DQPSK, 8DPSK, ASK
Data Rate	WLAN: 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0 – MCS7, HT20 Bluetooth: GFSK: 1Mbps $\pi/4$ -DQPSK: 2Mbps 8DPSK: 3Mbps BLE: GFSK: 1Mbps
Antenna Type/gain	WLAN: PIFA Antenna / 1.39 dBi BT: PIFA Antenna / 1.39 dBi BLE: PIFA Antenna / 1.39 dBi RFID: Loop Antenna / 1.0 dBi

2.2. The Difference of Model No.

Model No.	Difference
PAT-120	Marketing Purpose
PAT-12XXXXXX ("X" could be 1-9, -, A-Z or blank for marketing purpose; "Y" could be 0-9, -, A-Z or blank for marketing purpose)	

2.3. Carrier Frequency of Channels

Channel	Frequency(MHz)
*1	13.56

Note: Channel remarked "*" is selected to perform test.



2.4. Test Mode and Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- b. The complete test system included EUT for RF test.
- c. An executive program,"wl command" under WIN 7 was executed to transmit and receive data.
- d. The test mode of RF test as follow:

Test Mode	Operating Description
1	RFID (ASK)

2.5. Description of Test System

The EUT was tested alone. No support devices are needed for testing.



2.6. General Information of Test

☒ Test Site	Cerpass Technology Corporation Test Laboratory Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582	
	FCC	TW1079, TW1061, TW1439
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4663 for Conducted emission test R-4399, R-4218 for Radiated emission test G-10812, G-10813 for radiated disturbance above 1GHz
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 9kHz to 1000 MHz	
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.	



3. Test Equipment and Ancillaries Used for Tests

Instrument	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
EMI Receiver	R&S	ESCI3	100443	2017/03/07	2018/03/06
LISN	Schwarzbeck	NSLK 8127	8127-568	2017/02/15	2018/02/14
Pulse Limiter	R&S	ESH3-Z2	101934	2017/02/14	2018/02/13
Bilog Antenna	Schwarzbeck	VULB9168	369	2017/03/15	2018/03/14
Active Loop Antenna	EMCO	6507	40855	2017/05/15	2018/05/14
Horn Antenna	EMCO	3115	31589	2017/02/18	2018/02/17
Horn Antenna	EMCO	3116	31970	2017/03/29	2018/03/28
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200207	2017/03/17	2018/03/16
Preamplifier	EM	EM330	60660	2017/02/25	2018/02/24
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2017/09/20	2018/09/19
Preamplifier	Agilent	8449B	3008A01954	2017/02/09	2018/02/08
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2017/11/10	2018/11/09
MXG MW Analog Signal Generator	KEYSIGHT	N5183A	MY50142931	2017/03/17	2018/03/16
Spectrum Analyzer	R&S	FSP40	100219	2017/07/01	2018/06/30
Bluetooth Tester	R&S	CBT	101133	2017/03/10	2018/03/09
Attenuator	KEYSIGHT	8491B	MY39250703	2017/03/07	2018/03/06
Rotary Attenuator	Agilent	8495B	MY42146680	2017/03/13	2018/03/12
Temp & Humi chamber	T-MACHINE	TMJ-9712	T-12-040111	2017/09/04	2018/09/03
Series Power Meter	Anritsu	ML2495A	1224005	2017/03/01	2018/02/28
Power Sensor	Anritsu	MA2411B	1207295	2017/03/01	2018/02/28
Cable	HUBER SUHNER	SUCOFLEX 102	28422/2	2017/02/25	2018/02/24
Cable	HUBER SUHNER	SUCOFLEX 102	28418/2	2017/02/25	2018/02/24
Software	Farad	Ez-EMC	ver.ct3a1	N/A	N/A
Software	AUDIX	E3	V8.2014-8-6	N/A	N/A
Software	Keysight	N7607B Signal Studio	v2.0.0.1	N/A	N/A
Software	Keysight	Inservice MonitorUtility	N/A	N/A	N/A



4. Antenna Requirements

4.1. 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.

And according to FCC 47 CFR Section 15.249, 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.

4.2. Antenna Construction and Directional Gain

Antenna Type	Loop Antenna
Antenna Gain	1.0 dBi



5. Test of AC Power Line Conducted Emission

5.1. Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz, according to the methods defined in ANSI C63.4-2014. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

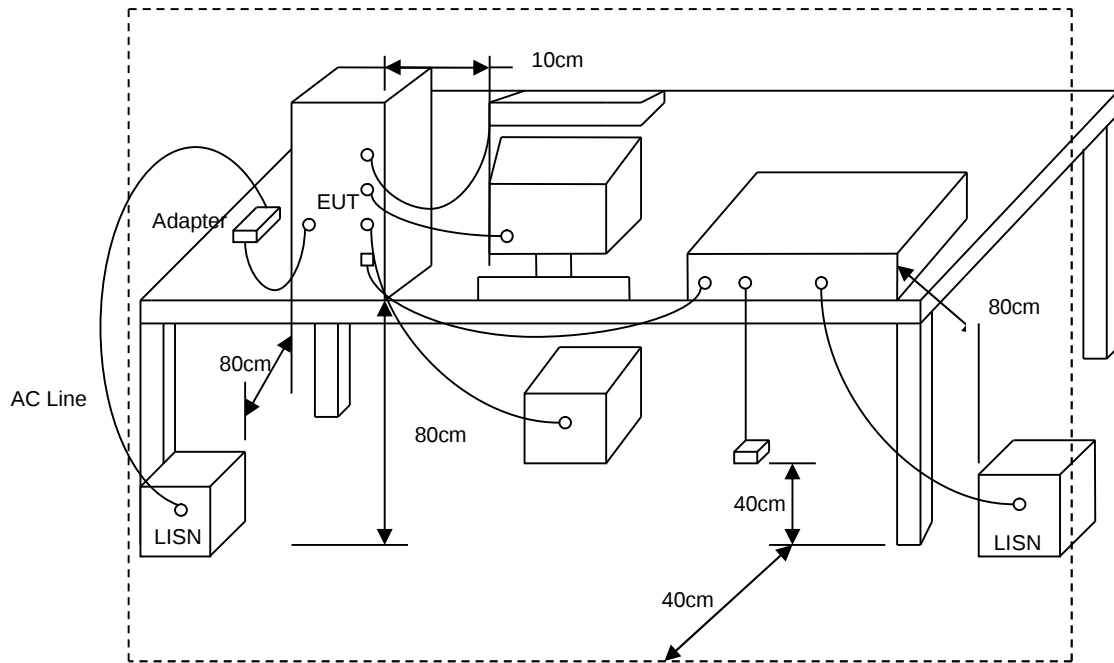
*Decreases with the logarithm of the frequency.

5.2. Test Procedures

- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



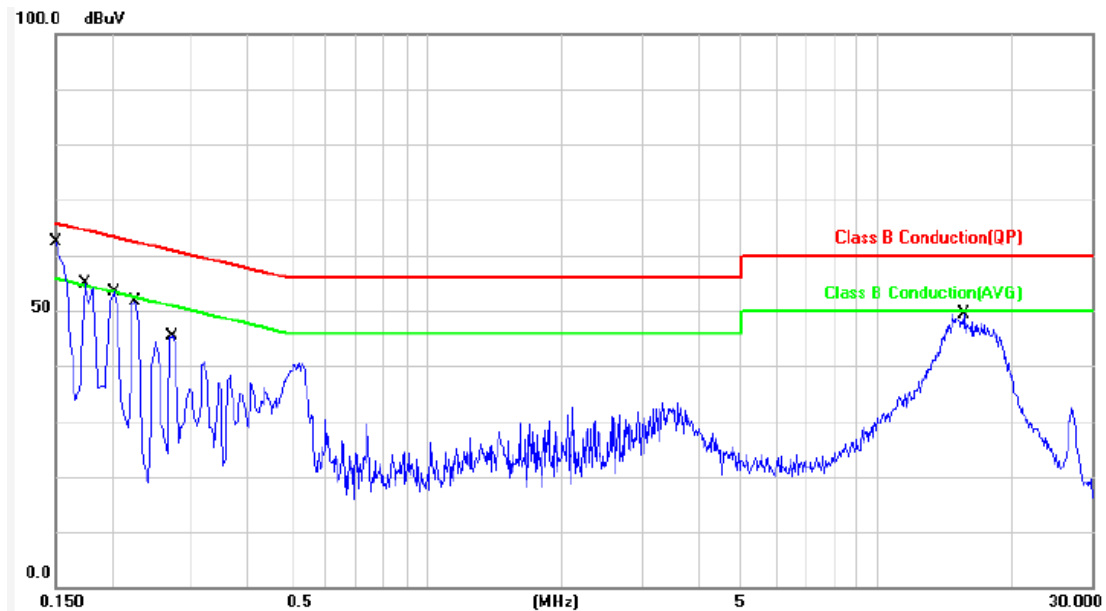
5.3. Typical Test Setup





5.4. Test Result and Data

Power	: AC 120V	Pol/Phase	: LINE
Test Mode	: Mode 1	Temperature	: 20 °C
Test date	: Nov. 29, 2017	Humidity	: 40 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1500	9.91	45.48	55.39	65.99	-10.60	QP	P
2	0.1500	9.91	23.37	33.28	55.99	-22.71	AVG	P
3	0.1740	9.91	40.97	50.88	64.76	-13.88	QP	P
4	0.1740	9.91	20.71	30.62	54.76	-24.14	AVG	P
5	0.2020	9.91	36.86	46.77	63.52	-16.75	QP	P
6	0.2020	9.91	17.63	27.54	53.52	-25.98	AVG	P
7	0.2260	9.91	34.85	44.76	62.59	-17.83	QP	P
8	0.2260	9.91	13.93	23.84	52.59	-28.75	AVG	P
9	0.2740	9.91	29.34	39.25	60.99	-21.74	QP	P
10	0.2740	9.91	10.36	20.27	50.99	-30.72	AVG	P
11	15.6620	10.36	32.33	42.69	60.00	-17.31	QP	P
12	15.6620	10.36	20.55	30.91	50.00	-19.09	AVG	P

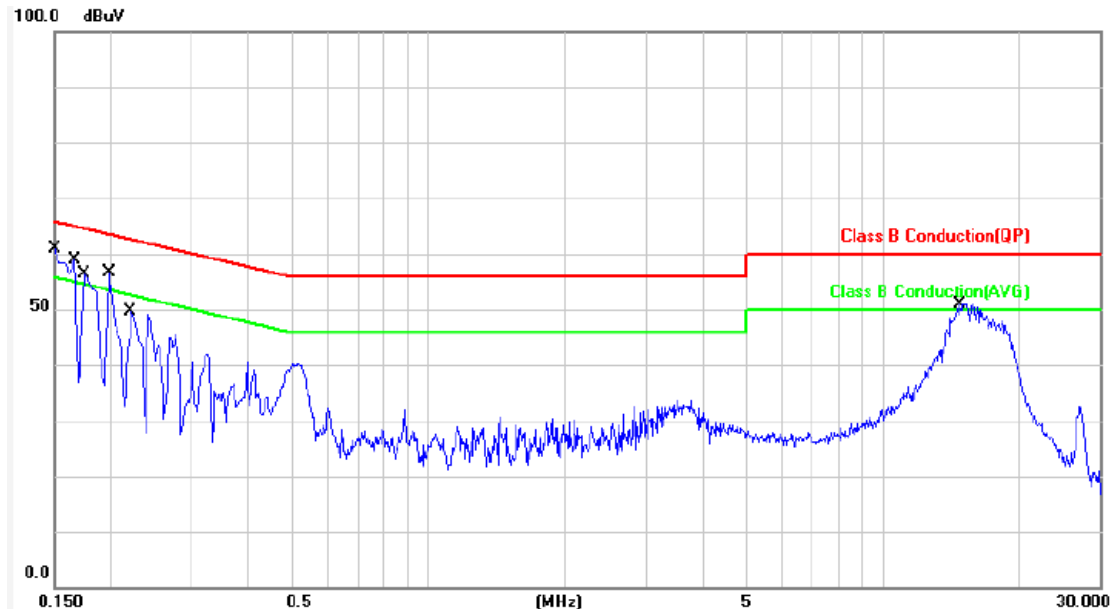
Note: Level = Reading + Factor

Margin = Level – Limit

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss+ Attenuator



Power	: AC 120V	Pol/Phase	: NEUTRAL
Test Mode	: Mode 1	Temperature	: 20 °C
Test date	: Nov. 29, 2017	Humidity	: 40 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1500	9.91	44.84	54.75	65.99	-11.24	QP	P
2	0.1500	9.91	23.14	33.05	55.99	-22.94	AVG	P
3	0.1660	9.91	41.56	51.47	65.15	-13.68	QP	P
4	0.1660	9.91	20.96	30.87	55.15	-24.28	AVG	P
5	0.1740	9.91	40.49	50.40	64.76	-14.36	QP	P
6	0.1740	9.91	20.25	30.16	54.76	-24.60	AVG	P
7	0.1980	9.91	37.47	47.38	63.69	-16.31	QP	P
8	0.1980	9.91	18.42	28.33	53.69	-25.36	AVG	P
9	0.2220	9.91	35.22	45.13	62.74	-17.61	QP	P
10	0.2220	9.91	15.28	25.19	52.74	-27.55	AVG	P
11	14.7820	10.34	34.24	44.58	60.00	-15.42	QP	P
12	14.7820	10.34	22.77	33.11	50.00	-16.89	AVG	P

Note: Level = Reading + Factor

Margin = Level – Limit

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss+ Attenuator



6. Test of Radiated Emission

6.1. Test Limit

- (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.

The field strength Measure at 3 meters use Equation

$$FS_{\max} = FS_{\text{limit}} + 40 \log[d_{\text{limit}}/d_{\text{measure}}]$$

where

FS_{limit} is the calculation of field strength at the limit distance, expressed in dB μ V/m

$FS_{\max}$ is the measured field strength, expressed in dB μ V/m

d_{measure} is the distance of the measurement point from the EUT

d_{limit} is the reference distance or the distance of the $\lambda/2\pi$ point

The field strength Measure at 3 meters =>

15,848 μ V/m at 30 meters. = 84 dB μ V/m at 30 meters.

84 dB μ V/m + 40log(30 meter /3 meter) = 84 dB μ V/m + 40 = 124 dB μ V/m at 3 meters.

- (b) 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.

Frequency (MHz)	Distance	Limit (μ V/ m)
0.09 ~ 0.490	300m	2400/F(kHz)
0.490 ~ 1.705	30m	24000/ F(kHz)
1.705 ~ 30	30m	30
30 ~ 88	3m	100
88 ~ 216	3m	150
216 ~ 960	3m	200
Above 960	3m	500

15.215 Additional provisions to the general radiated emission limitations.:

- (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.



6.2. Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h. "Cone of radiation" has been considered to be 3dB beamwidth of the measurement antenna.

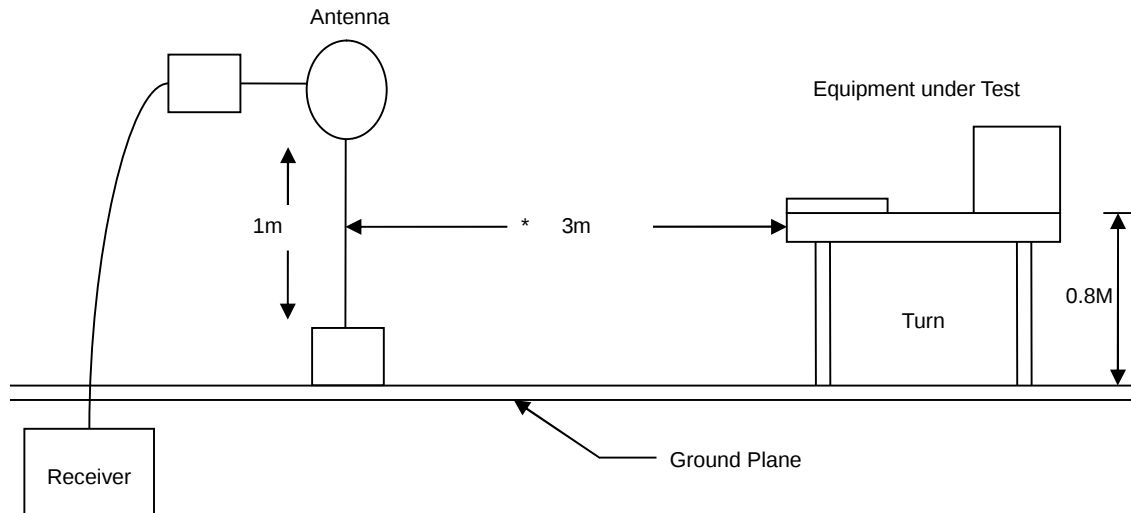
NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 300Hz or CISPS 200Hz(QP detector) at frequency Below 150 kHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 10KHz or CISPS 9KHz(QP detector) at frequency 150 kHz to 30 MHz.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

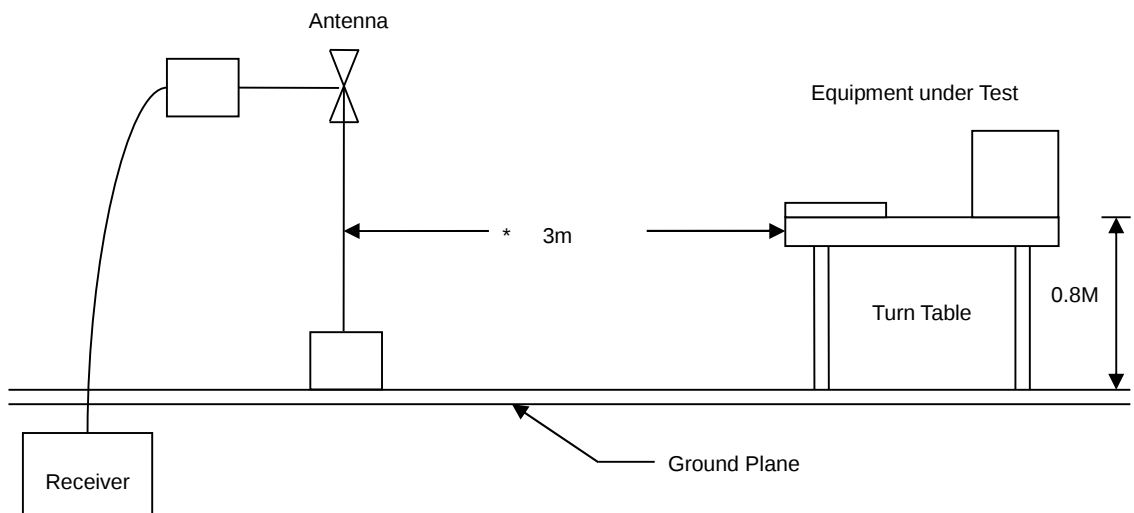


6.3. Typical Test Setup Layout of Radiated Emission

Below 30MHz test setup



Below 1GHz Test Setup



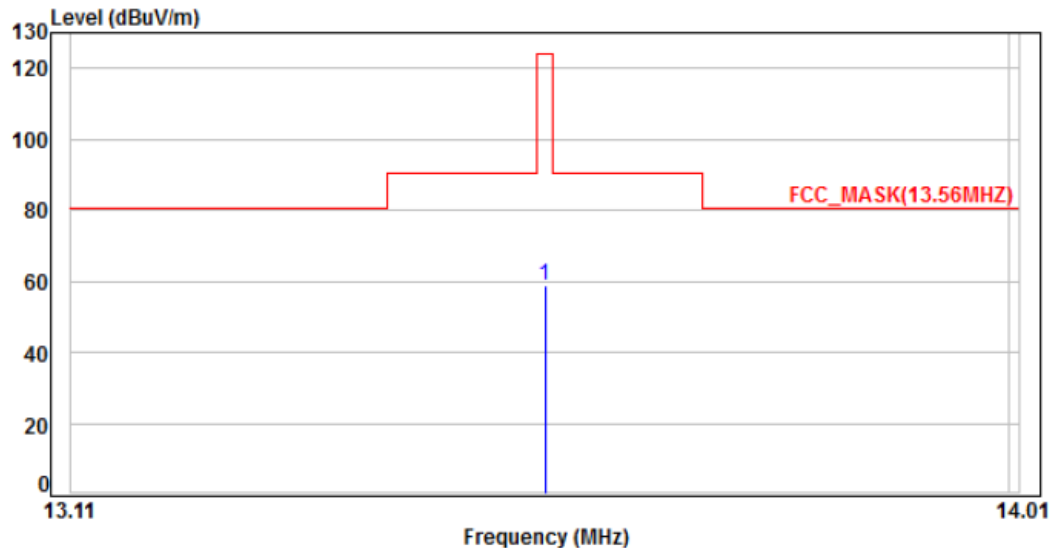
1.5M



6.4. Test Result and Data

6.4.1. Test Result of Fundamental Emission

Power	: AC 120V	Loop	: Open
Test Mode	: Mode 1	Temperature	: 21°C
Test date	: Nov. 23, 2017	Humidity	: 59%



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	13.56	17.07	41.78	58.85	124.00	-65.15	Peak	100	25	P

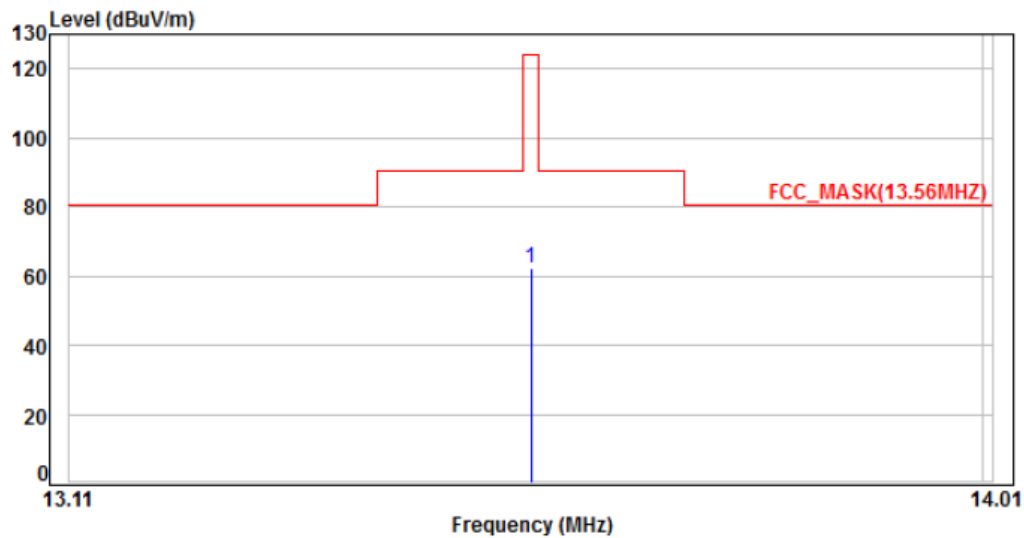
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Loop	: Close
Test Mode	: Mode 1	Temperature	: 21°C
Test date	: Nov. 23, 2017	Humidity	: 59%



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	13.56	17.07	45.23	62.30	124.00	-61.70	Peak	100	302	P

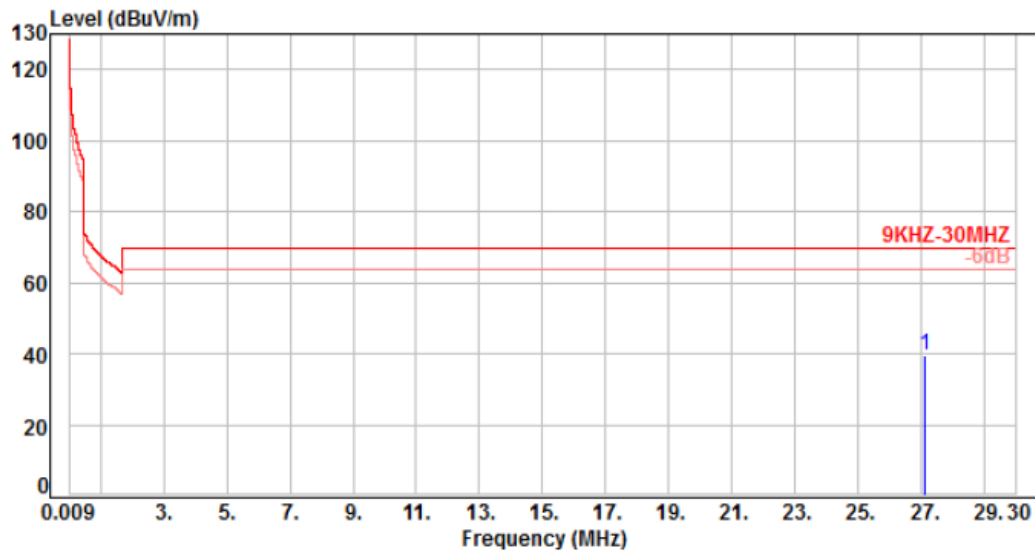
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

**6.4.2. Test Result of Unwanted Spurious emission (9KHz ~ 30MHz)**

Power	: AC 120V	Loop	: Open
Test Mode	: Mode 1	Temperature	: 21°C
Test date	: Nov. 23, 2017	Humidity	: 59%



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	27.12	16.84	22.76	39.60	69.54	-29.94	Peak	100	65	P

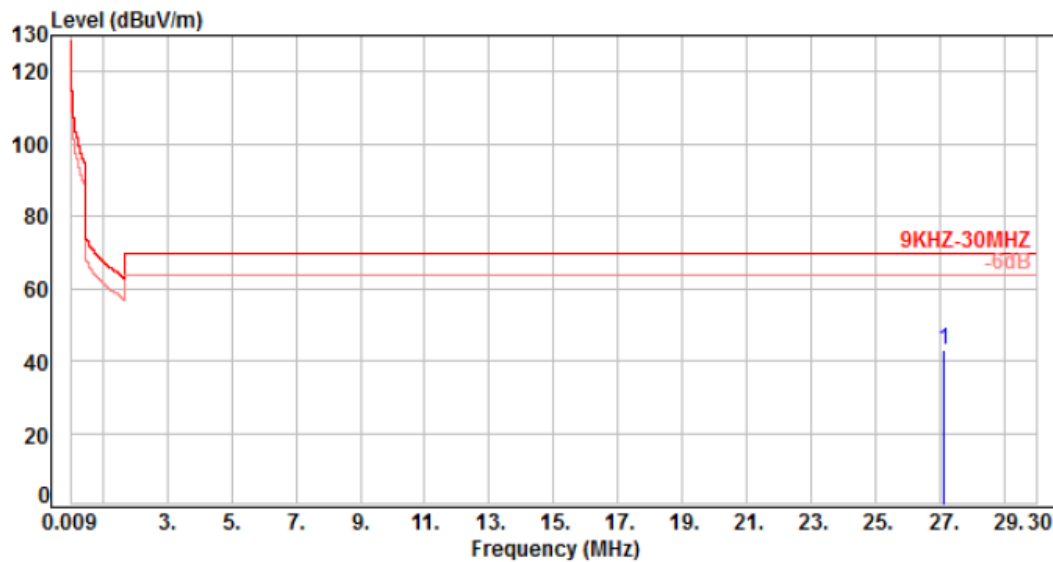
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Loop	: Close
Test Mode	: Mode 1	Temperature	: 21°C
Test date	: Nov. 23, 2017	Humidity	: 59%



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	27.12	16.84	26.33	43.17	69.54	-26.37	Peak	100	214	P

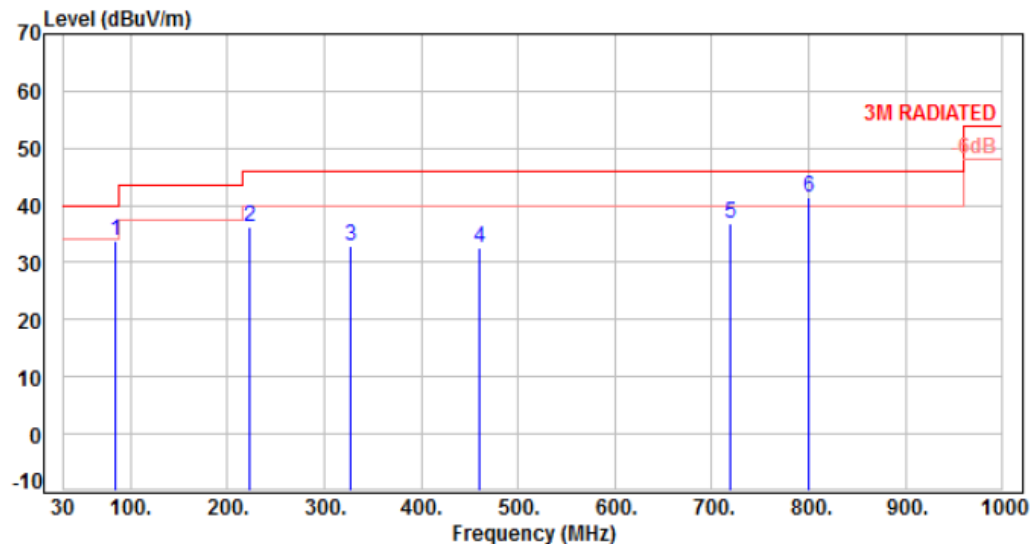
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

**6.4.3. Test Result of Unwanted Spurious emission (30GHz ~ 1GHz)**

Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 21°C
Test date	: Nov. 23, 2017	Humidity	: 59%



No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	84.32	-14.91	48.62	33.71	40.00	-6.29	QP	103	124	P
2	223.03	-11.84	48.17	36.33	46.00	-9.67	Peak	400	0	P
3	327.79	-8.07	40.83	32.76	46.00	-13.24	Peak	400	0	P
4	460.68	-4.59	37.15	32.56	46.00	-13.44	Peak	400	0	P
5	719.67	0.23	36.62	36.85	46.00	-9.15	Peak	400	0	P
6	800.18	1.48	39.97	41.45	46.00	-4.55	Peak	400	0	P

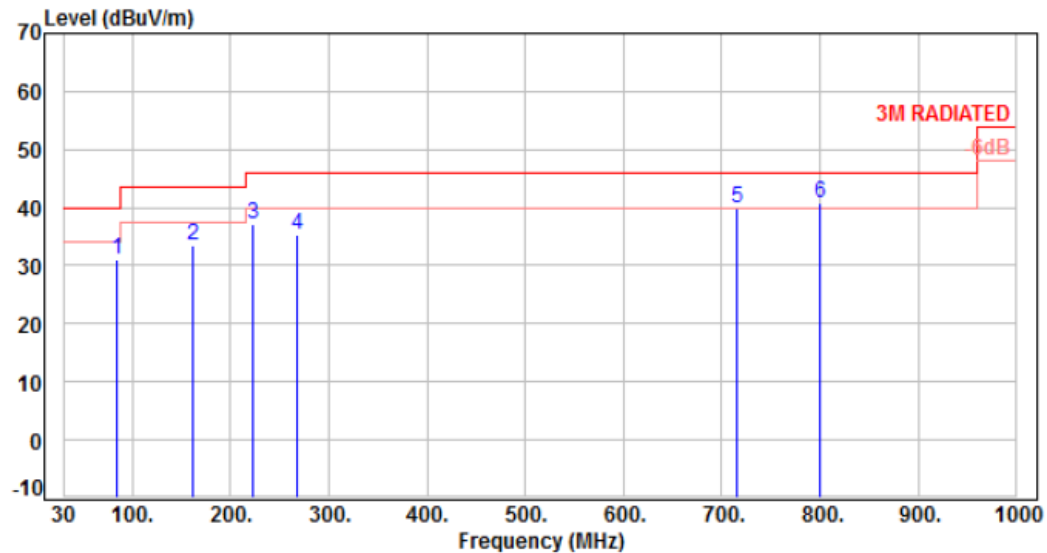
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 21°C
Test date	: Nov. 23, 2017	Humidity	: 59%



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	84.32	-14.91	46.12	31.21	40.00	-8.79	Peak	100	0	P
2	161.92	-9.88	43.51	33.63	43.50	-9.87	Peak	100	0	P
3	223.03	-11.84	48.88	37.04	46.00	-8.96	Peak	100	0	P
4	267.65	-9.89	45.17	35.28	46.00	-10.72	Peak	100	0	P
5	714.82	0.14	39.74	39.88	46.00	-6.12	Peak	100	0	P
6	800.18	1.48	39.29	40.77	46.00	-5.23	Peak	100	0	P

Note: Level=Reading+Factor

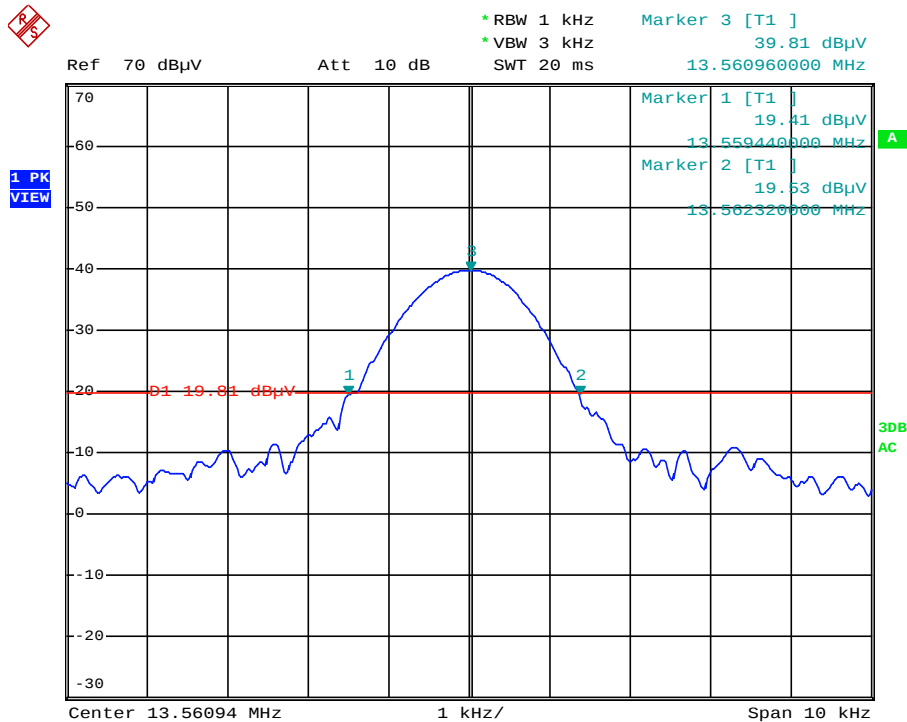
Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



6.5. 20dB Bandwidth BW

Frequency (MHz)	20dB Bandwidth (KHz)	Frequency range MHz (20dB Down) fL > 13.553 MHz	Frequency range MHz (20dB Down) fH < 13.567 MHz
13.560	2.888	13.55944	13.562328



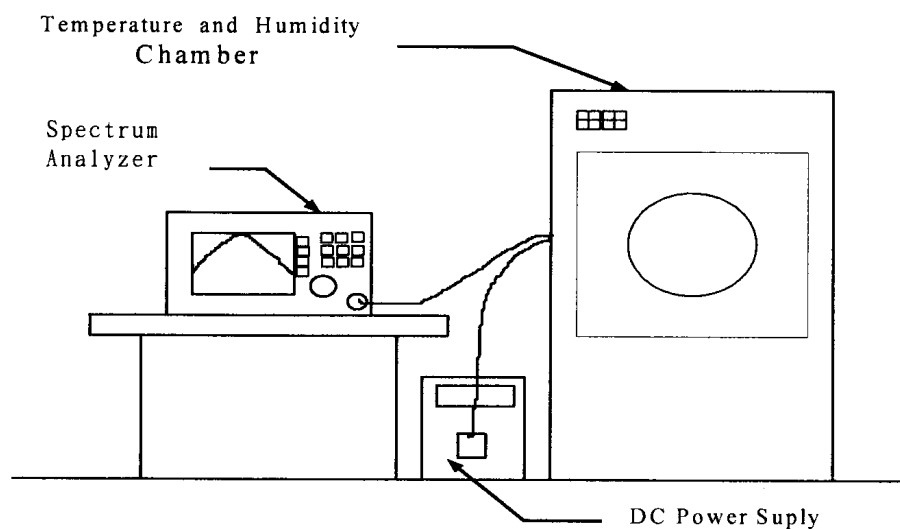


7. Frequency Stability

7.1. Test Procedure

1. The EUT was placed inside the Temperature and Humidity chamber.
2. The transmitter output was connected to spectrum analyzer.
3. Turn the EUT on and couple its output to a spectrum analyzer.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
6. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
7. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

7.2. Test Setup Layout





7.3. Test Result and Data

Operating frequency:13.56MHz							
Temp (°C)	Power supply(V)	2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	93.5	13.5608	0.006237	13.5610	0.007099	13.5610	0.073721
	110	13.5608	0.006195	13.5608	0.005605	13.5608	0.056047
	126.5	13.5610	0.007290	13.5609	0.006821	13.5608	0.057574
40	93.5	13.5611	0.007991	13.5608	0.005860	13.5610	0.072758
	110	13.5609	0.006270	13.5609	0.006869	13.5610	0.070300
	126.5	13.5608	0.006240	13.5609	0.006661	13.5609	0.064245
30	93.5	13.5611	0.007919	13.5611	0.007764	13.5610	0.076339
	110	13.5609	0.006671	13.5608	0.005634	13.5611	0.077811
	126.5	13.5609	0.006479	13.5609	0.006887	13.5610	0.070230
20	93.5	13.5609	0.006345	13.5611	0.007796	13.5608	0.056303
	110	13.5608	0.005605	13.5608	0.005605	13.5607	0.054572
	126.5	13.5610	0.007275	13.5612	0.008816	13.5608	0.056257
10	93.5	13.5610	0.007135	13.5611	0.007812	13.5610	0.072294
	110	13.5608	0.005898	13.5608	0.006207	13.5609	0.065179
	126.5	13.5610	0.007303	13.5608	0.005717	13.5609	0.068473
0	93.5	13.5609	0.006428	13.5608	0.005727	13.5609	0.066163
	110	13.5608	0.006111	13.5611	0.007756	13.5610	0.076787
	126.5	13.5609	0.006326	13.5610	0.007631	13.5609	0.063477
-10	93.5	13.5609	0.006932	13.5609	0.006294	13.5608	0.060685
	110	13.5609	0.006406	13.5608	0.005766	13.5609	0.068450
	126.5	13.5610	0.007050	13.5608	0.006028	13.5608	0.058123
-20	93.5	13.5609	0.006563	13.5609	0.006636	13.5609	0.069117
	110	13.5608	0.005834	13.5609	0.006673	13.5609	0.068777
	126.5	13.5609	0.006792	13.5609	0.006322	13.5609	0.066614
-30	93.5	13.5609	0.006390	13.5609	0.006651	13.5608	0.056870
	110	13.5608	0.005605	13.5608	0.006047	13.5608	0.060472
	126.5	13.5610	0.007652	13.5608	0.005684	13.5610	0.074869