

MEASUREMENT REPORT
of
RFID Module

Applicant : TSC Auto ID Technology Co., Ltd.
EUT : TSC-RFID
FCC ID : VTV2011001
Model : TSC-002B, TSC-001, TSC-002, TSC-003

Test by :

Training Research Co., Ltd.

TEL : 886-2-26935155 **FAX : 886-2-26934440**

No. 255, Nan-yang Street, Shijr, Taipei Hsien 221, Taiwan


CERTIFICATION


We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ANSI C63.4 (2003) as a reference. All tests were conducted by **Training Research Co., Ltd.**, No. 255, Nan-yang Street, Shijr, Taipei Hsien 221, Taiwan. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is **in compliance with** the technical requirements set forth in the FCC Rules Part 15 Subpart C Section 15.225.

Applicant : TSC Auto ID Technology Co., Ltd.
Applicant address : No. 35, Sec. 2, Ligong 1st Rd., Wujie Town, (Li Tse Industrial Park), I-lan County 268, Taiwan R.O.C.
Report No. : T8115110103
Test Date : November 11, 2011

Prepared by: 
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Approved by: 
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Conditions of issue :

- (1) **This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.**

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Chapter 1 General

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a RF mouse certification in accordance with Part 2 Subpart J and Part 15 Subpart C of the Commission's Rules and Regulations.

1.2 Description of EUT

FCC ID	: VTV2011001
Product Name	: TSC-RFID
Model	: TSC-002B, TSC-001, TSC-002, TSC-003
Frequency Range	: 13.553MHz ~ 13.567MHz
Operating Frequency	: 13.56MHz
Modulation Skill	: ASK
Power Type	: 4.8VDC Batteries (AAA*4)

1.3 Test method

All measurements contained in this report were performed according to the techniques described in Measurement procedure ANSI C63.4 – 2003.

Pretest was found that the emission of operating mode is worse than standby mode. So, the final test is made at the operating mode (transmitted). The EUT set in 13.56MHz continuously transmitting mode, which transmitted the maximum emission.

The test placement as the photographs showed is the worst case emission placed. (If the emission is close to the ambient, the resolution BW and view resolution will be reduced and the data will be recorded by detection of maximum hold peak mode.)

1.4 Description of Support Equipment

Batteries : Energizer (NiMH-HR03)
Model No. : NH12 1.2V
Power type : 4.8VDC (AAA*4)
Power cord : Non-shielded, 27cm length, without ferrite core

1.5 Test Procedure

All measurements contained in this report were performed mainly according to the techniques described in Measurement procedure ANSI C63.4 (2003).

1.6 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter, Anechoic Chamber (FCC Registration Number: 93906)** maintained by *Training Research Co., Ltd.* 1F, No. 255, Nan-yang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in an anechoic chamber also located at Training Research Co., Ltd. 1F, No. 255, Nan-yang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.7 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions which the EUT was considered likely to encounter in normal use were investigated.

In test, they were set in high power and continuously transmitting mode. The setting up procedure is recorded on 1.3 Test Method.

Chapter 2 Conducted Emissions Measurements

2.1 Test Condition & Setup

The EUT is 4.8VDC Batteries (AAA*4).

According to the rule of section 15.207(c). The EUT exempt to the power line conducted test.

2.2 List of Test Instruments

N/A (Not applicable)

2.3 Test Result of Conducted Emissions

N/A (Not applicable)

Chapter 3 Radiated Emission Measurements

3.1 Harmonic and Spurious Emission

3.1.1 Test Condition and Setup

Pretest:

Prior to the final test ,the EUT is placed in an anechoic chamber, and scan from 26MHz to 1GHz. The devices to determine which attitude and configuration produces the highest emission relative to the limit. This is done to ensure the radiation exactly emits form the EUT.

Final test:

Final radiation measurements is made on a **3-meter** anechoic chamber. The EUT's maximum emission of radiation is placed on a nonconductive table, which is 0.8m height, the top surface is 1.0 x 1.5 meter. All placement is according to ANSI C63.4 - 2003.

The spectrum is examined from 30MHz to 1000MHz measured by HP spectrum. The whole range antenna is used to measure frequency from 30MHz to 1GHz.

The final test is used the spectrum analyzer. Measure more than six top marked frequencies generated form pretest by computer step by step at each frequency. The EUT is three orthogonal planes and rotated 360 degrees, and antenna is raised and lowered from 1 to 4 meters to find the maximum emission levels. The antenna is used with both horizontal and vertical polarization.

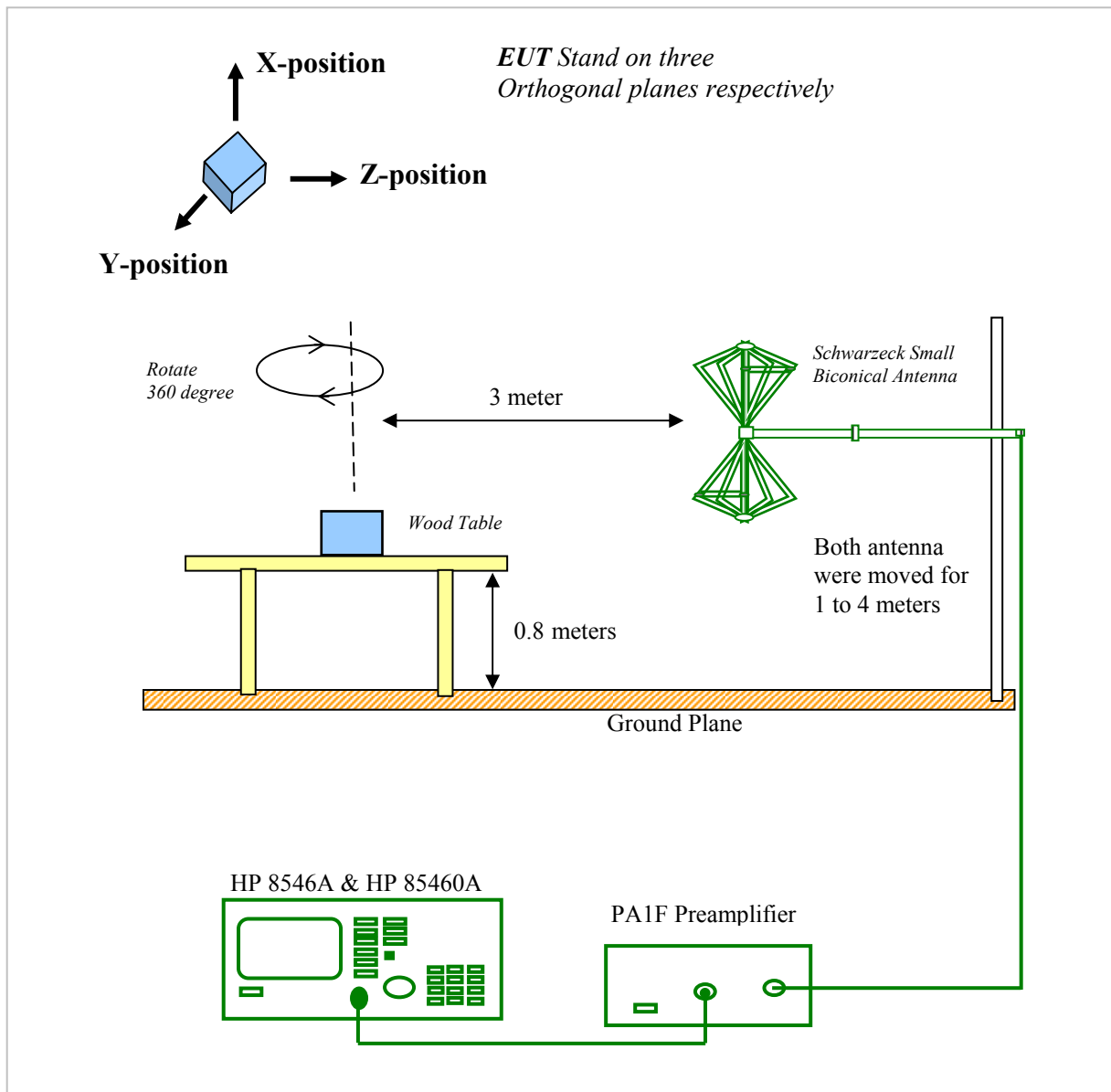
Appropriated preamplifier, which is made by TRC is used for improving sensitivity and precautions is taken to avoid overloading. The spectrum analyzer's 6dB bandwidth is set to 120 kHz, and the EUT is measured at quasi-peak mode. (30MHz to 1GHz)

If the emission is close to the frequency band of ambient, the tester will recheck the data and the corrected data will be written in the test data sheet. If the emission is just within the ambient, the data from shield room will be taken as the final data.

3.1.2 List of Test Instruments

Instrument Name	Model	Brand	Serial No.	Calibration Date
				Next time
EMI Receiver	8546A	HP	3520A00242	03/12/12
RF Filter Section	85460A	HP	3448A00217	03/12/12
Small Biconical Antenna	UBAA9114 & BBVU9135	Schwarzeck	127	03/21/12
Pre-amplifier	PA1F	TRC	1FAC	04/06/12
Coaxial Cable (Double shielded, 15 meter)	A30A30-0058-50FS-15 M	JYEBAO	SMA-01	04/06/12
Coaxial Cable (1.1 meter)	A30A30-0058-50FS-1M	JYEBAO	SMA-02	04/06/12

3.1.3 Configuration of System Under Test



3.1.4 Test Result of Harmonic and Spurious Emission

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following.

Testing room : Temperature : 25 ° C Humidity : 73 % RH

Test Result of Harmonic and Spurious Emission for Horizontal – TSC-002B (X)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
177.92	39.27	1.00	170	-3.53	35.74	43.50	-7.76
191.26	40.05	1.00	170	-3.10	36.95	43.50	-6.55
204.60	41.03	1.00	170	-2.77	38.26	43.50	-5.24
637.46	31.31	1.00	350	7.42	38.73	46.00	-7.27
867.84	28.13	1.00	178	13.76	41.89	46.00	-4.11
881.17	29.83	1.00	171	14.18	44.01	46.00	-1.99
894.95	30.34	1.00	178	14.61	44.95	46.00	-1.05
908.51	29.85	1.00	178	14.87	44.72	46.00	-1.28

Test Result of Harmonic and Spurious Emission for Vertical - TSC-002B (X)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
610.79	30.59	1.00	252	6.71	37.30	46.00	-8.70
624.12	31.50	1.00	259	7.07	38.57	46.00	-7.43
637.46	34.40	1.00	252	7.42	41.82	46.00	-4.18
650.80	33.67	1.00	252	7.78	41.45	46.00	-4.55
867.84	29.87	1.00	234	13.76	43.63	46.00	-2.37
894.95	30.01	1.00	227	14.61	44.62	46.00	-1.38
907.85	29.41	1.00	234	14.86	44.27	46.00	-1.73
935.74	27.18	1.00	234	15.18	42.36	46.00	-3.64

Note:

1. Margin = Amplitude – limit, if margin is minus means under limit.
2. Corrected Amplitude = Reading Amplitude + Correction Factors
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain) + Switching Box Loss

Testing room : Temperature : 25 ° C Humidity : 73 % RH

Test Result of Harmonic and Spurious Emission for Horizontal – TSC-002 (Z)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
150.04	41.38	1.00	175	-3.74	37.64	43.50	-5.86
176.71	44.80	1.00	175	-3.54	41.26	43.50	-2.24
191.26	43.62	1.00	189	-3.10	40.52	43.50	-2.98
204.60	41.95	1.00	189	-2.77	39.18	43.50	-4.32
285.84	42.25	1.00	202	-2.81	39.44	46.00	-6.56
652.01	31.27	1.00	294	7.82	39.09	46.00	-6.91
881.17	27.20	1.00	150	14.18	41.38	46.00	-4.62
907.85	26.76	1.00	213	14.86	41.62	46.00	-4.38

Test Result of Harmonic and Spurious Emission for Vertical - TSC-002 (Z)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
40.91	30.64	1.00	262	4.10	34.74	40.00	-5.26
150.04	36.12	1.00	214	-3.74	32.38	43.50	-11.12
624.12	32.65	1.00	156	7.07	39.72	46.00	-6.28
652.01	36.57	1.00	260	7.82	44.39	46.00	-1.61
665.35	32.00	1.00	273	8.26	40.26	46.00	-5.74
881.17	29.16	1.00	69	14.18	43.34	46.00	-2.66
907.85	29.18	1.00	69	14.86	44.04	46.00	-1.96
962.41	27.15	1.00	339	15.97	43.12	54.00	-10.88

Note:

1. Margin = Amplitude – limit, if margin is minus means under limit.
2. Corrected Amplitude = Reading Amplitude + Correction Factors
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain) + Switching Box Loss

Testing room : Temperature : 25 ° C Humidity : 73 % RH

Test Result of Harmonic and Spurious Emission for Horizontal – TSC-003 (Y)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
205.81	42.38	1.00	183	-2.76	39.62	43.50	-3.88
314.94	42.57	1.00	197	-2.68	39.89	46.00	-6.11
354.95	40.96	1.00	282	-2.19	38.77	46.00	-7.23
610.79	36.80	1.00	287	6.71	43.51	46.00	-2.49
637.46	31.54	1.00	294	7.42	38.96	46.00	-7.04
867.84	28.05	1.00	208	13.76	41.81	46.00	-4.19
894.51	28.36	1.00	180	14.60	42.96	46.00	-3.04
922.40	26.24	1.00	180	15.03	41.27	46.00	-4.73

Test Result of Harmonic and Spurious Emission for Vertical - TSC-003 (Y)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
542.89	33.49	1.00	100	4.91	38.40	46.00	-7.60
597.45	33.33	1.00	80	6.37	39.70	46.00	-6.30
610.19	38.22	1.00	66	6.70	44.92	46.00	-1.08
637.46	36.63	1.00	73	7.42	44.05	46.00	-1.95
665.35	29.92	1.00	267	8.26	38.18	46.00	-7.82
799.94	28.87	1.00	163	12.09	40.96	46.00	-5.04
867.84	29.28	1.00	48	13.76	43.04	46.00	-2.96
894.51	29.08	1.00	305	14.60	43.68	46.00	-2.32

Note:

1. Margin = Amplitude – limit, if margin is minus means under limit.
2. Corrected Amplitude = Reading Amplitude + Correction Factors
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain) + Switching Box Loss

Testing room : Temperature : 25 ° C Humidity : 73 % RH

Test Result of Harmonic and Spurious Emission for Horizontal – TSC-001 (Y)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
259.16	47.64	1.00	177	-3.48	44.16	46.00	-1.84
274.92	45.04	1.00	299	-3.18	41.86	46.00	-4.14
369.50	40.25	1.00	194	-1.76	38.49	46.00	-7.51
542.89	36.51	1.00	273	4.91	41.42	46.00	-4.58
569.56	37.35	1.00	280	5.71	43.06	46.00	-2.94
597.45	32.16	1.00	336	6.37	38.53	46.00	-7.47
867.84	27.34	1.00	213	13.76	41.10	46.00	-4.90
894.51	26.96	1.00	213	14.60	41.56	46.00	-4.44

Test Result of Harmonic and Spurious Emission for Vertical - TSC-001 (Y)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
542.89	37.68	1.00	239	4.91	42.59	46.00	-3.41
569.56	37.35	1.00	246	5.71	43.06	46.00	-2.94
650.60	32.39	1.00	260	7.78	40.17	46.00	-5.83
677.99	35.33	1.00	170	8.67	44.00	46.00	-2.00
867.84	30.22	1.00	173	13.76	43.98	46.00	-2.02
881.39	30.10	1.00	312	14.19	44.29	46.00	-1.71
894.51	30.18	1.00	312	14.60	44.78	46.00	-1.22
907.85	29.27	1.00	312	14.86	44.13	46.00	-1.87

Note:

1. Margin = Amplitude – limit, *if margin is minus means under limit.*
2. Corrected Amplitude = Reading Amplitude + Correction Factors
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain) + Switching Box Loss

3.2 Peak Power of Fundamental Frequency, Harmonic and Spurious Measurement

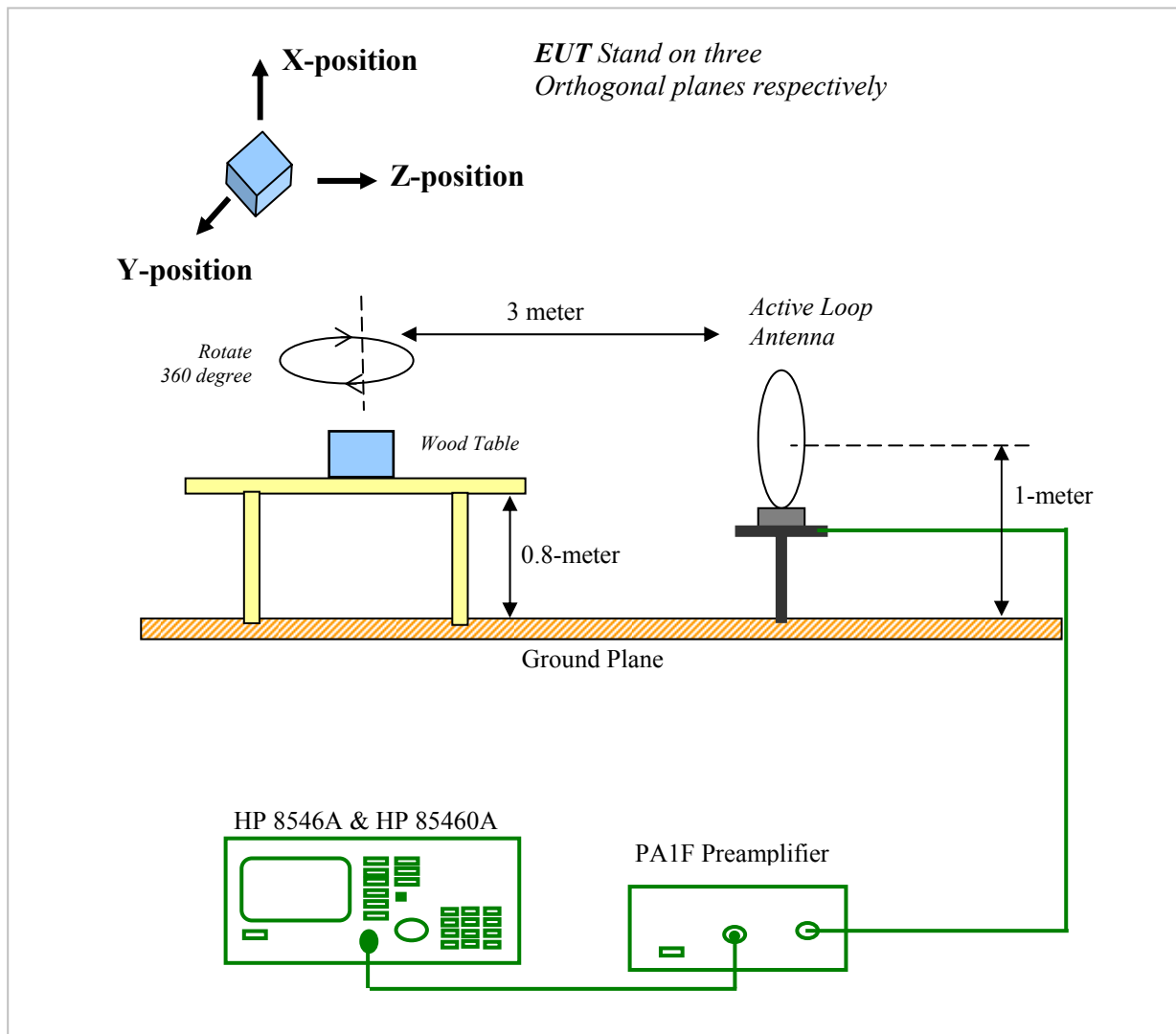
3.2.1 Test Condition and Setup

- A) The EUT was setup in the anechoic chamber
- B) Set the Loop Antenna height 1m, Vertical and rotate the antenna to find the azimuth of the highest emission and record the reading.
- C) Keep the antenna azimuth and turn the EUT 360 degree and record the highest emission.
- D) Raise the antenna to 2 meters and repeat set (B) and (C).
- E) Change the antenna Horizontal and repeat (B) to (D).
- F) Record the highest reading in test report.

3.2.2 List of Test Instruments

Instrument Name	Model	Brand	Serial No.	Calibration Date
				Next time
EMI Receiver	8546A	HP	3520A00242	03/12/12
RF Filter Section	85460A	HP	3448A00217	03/12/12
Pre-amplifier	PA1F	TRC	1FAC	04/06/12
Active Loop Antenna	FMZB 1516	SCHWARZBECK	1516132	03/28/12

3.2.3 Configuration of System Under Test

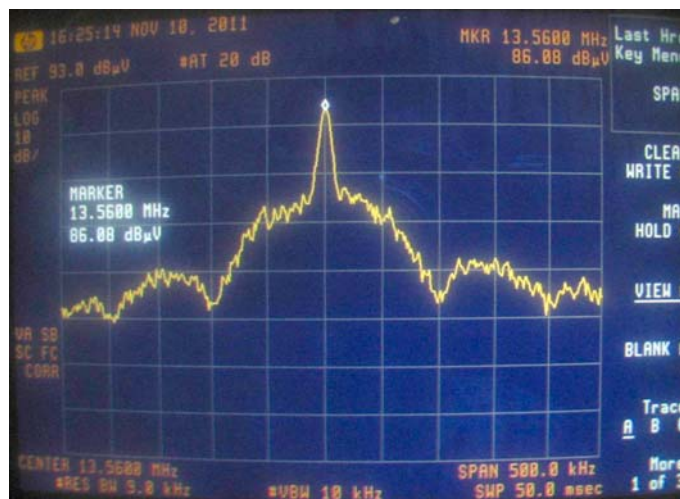


3.2.4 Test Result of Fundamental Emission

Testing room : Temperature : 25 ° C Humidity : 73 % RH

Test Result of Fundamental Emission for Horizontal – TSC-002B - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.5600	86.08	1.00	76	-12.19	73.89	124.00	-50.11

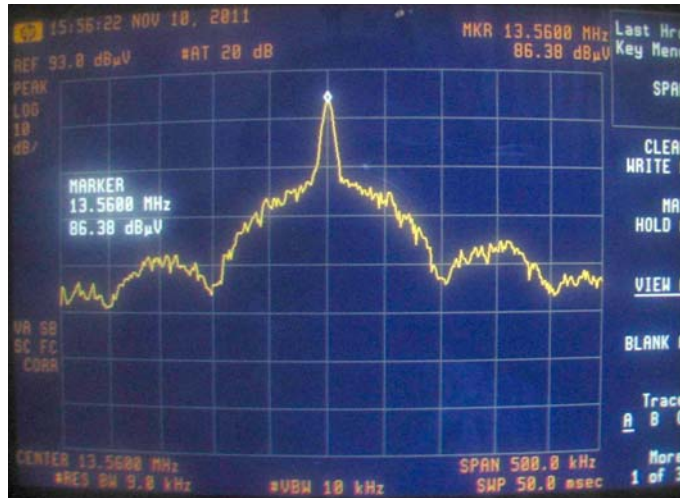


Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor
2. Corrected Amplitude (dBuV/m) = Reading Data + Correction Factor
3. The limit is 15848 (uV/m) = 84 dBuV/m @ 30 m, for main frequency < 30 MHz, the formula transfers the limit 30 m to 3 m is $L_{30}(\text{dBuV/m}) + 40 = 124 \text{ dBuV/m}$
4. Margin (dB) = Limit – Corrected Amplitude

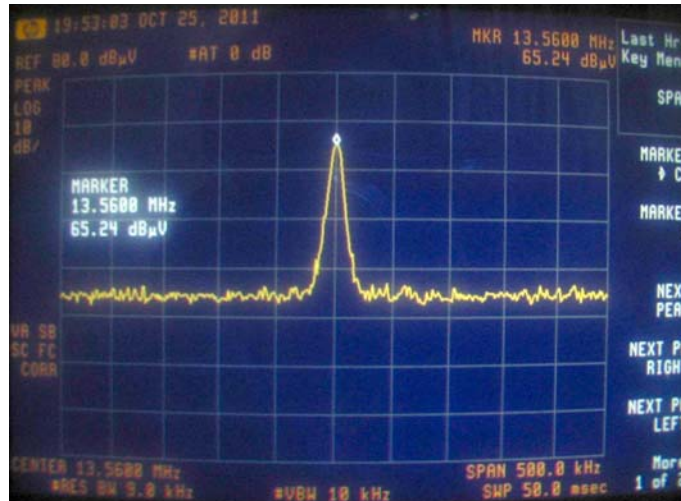
Test Result of Fundamental Emission for Vertical – TSC-002B - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
13.5600	86.38	1.00	356	-12.19	74.19	124.00	-49.81



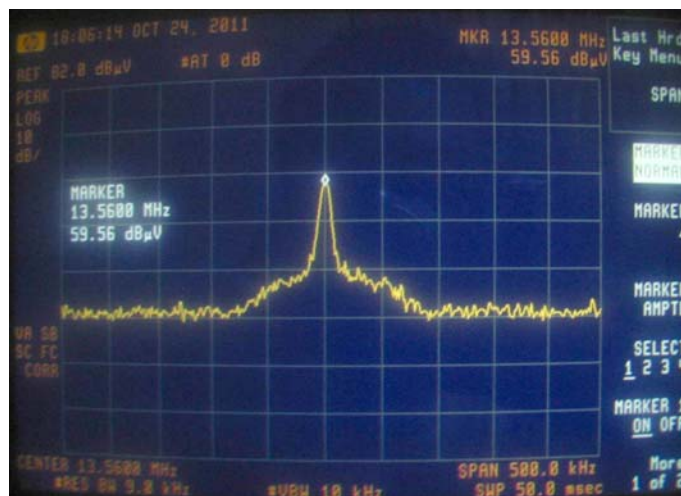
Test Result of Fundamental Emission for Horizontal – TSC-002 - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.5600	65.52	1.00	87	-12.19	53.33	124.00	-70.67



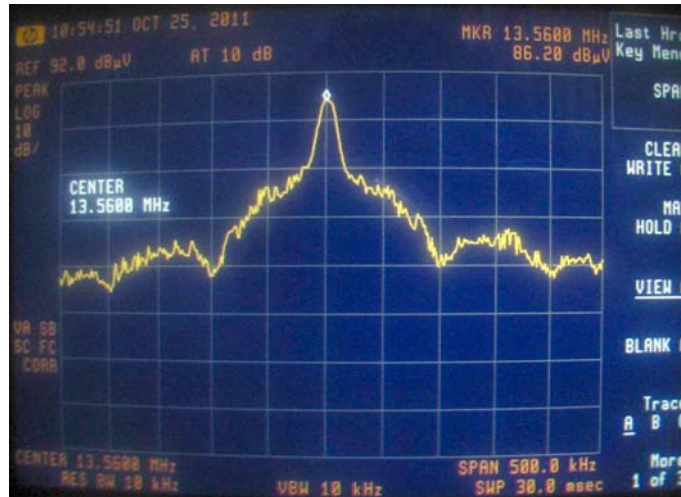
Test Result of Fundamental Emission for Vertical – TSC-002 - X

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.5600	59.56	1.00	244	-12.19	47.37	124.00	-76.63



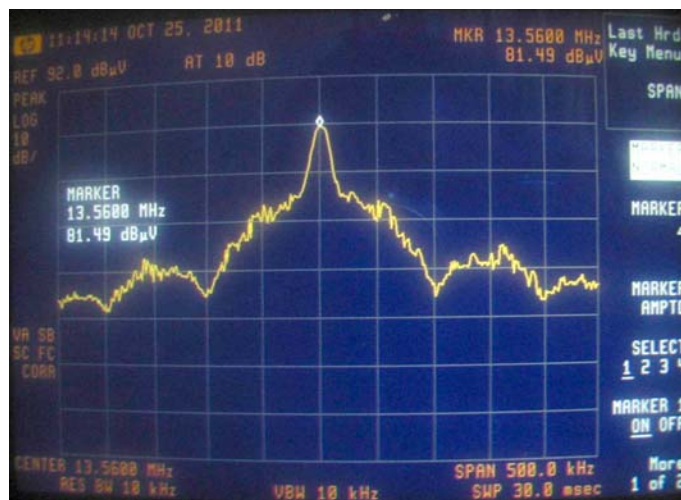
Test Result of Fundamental Emission for Horizontal – TSC-003 - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
13.5600	86.20	1.00	346	-12.19	74.01	124.00	-49.99



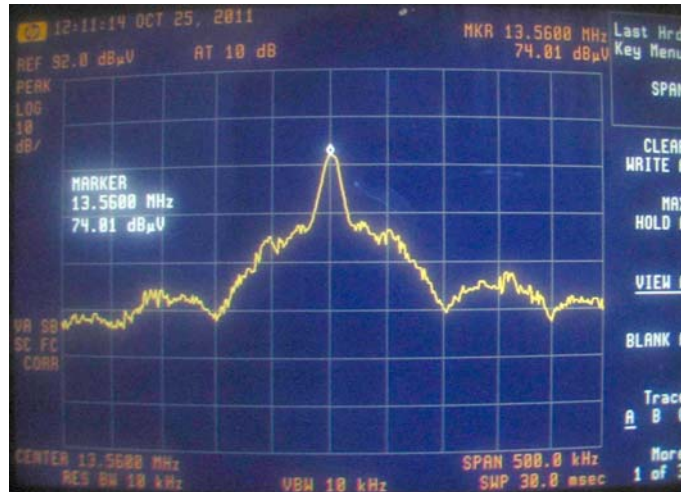
Test Result of Fundamental Emission for Vertical – TSC-003 - X

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
13.5600	81.49	1.00	233	-12.19	69.30	124.00	-54.70



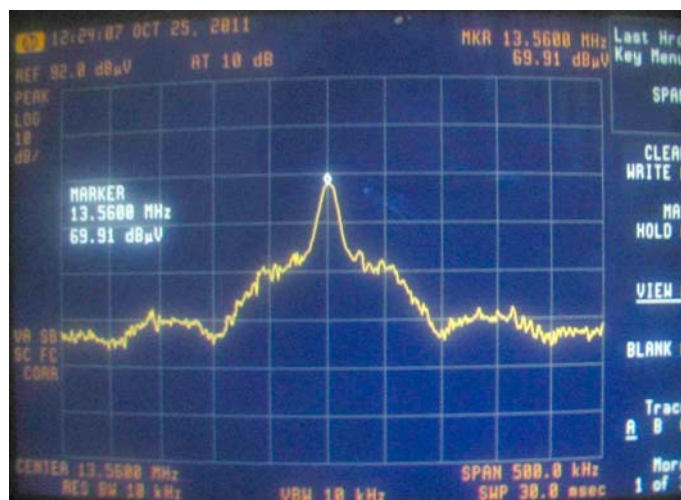
Test Result of Fundamental Emission for Horizontal – TSC-001 - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
13.5600	74.01	1.00	76	-12.19	61.82	124.00	-62.18



Test Result of Fundamental Emission for Vertical – TSC-001 - Z

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
13.5600	69.91	1.00	254	-12.19	57.72	124.00	-66.28



3.2.5 Test Result of Harmonic and Spurious Emission

Testing room : Temperature : 25 ° C Humidity : 73 % RH

Test Result of Harmonic and Spurious Emission for Horizontal - TSC-002B - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
27.1200	39.14	1.00	54	-11.20	27.94	69.54	-41.60

Test Result of Harmonic and Spurious Emission for Vertical - TSC-002B - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
27.1200	40.51	1.00	355	-11.20	29.31	69.54	-40.23

Test Result of Harmonic and Spurious Emission for Horizontal - TSC-002 - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
27.1200	41.46	1.00	233	-11.20	30.26	69.54	-39.28

Test Result of Harmonic and Spurious Emission for Vertical - TSC-002 - X

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	Degree	dB/m	dBμV/m	dBμV/m	dB
23.1580	36.49	1.00	89	-11.20	25.29	69.54	-44.25

Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor
2. Corrected Amplitude (dBμV/m) = Reading Data + Correction Factor
3. For main frequency < 30 MHz, the formula transfers the limit to 30 m to 3 m is
 $L_{30}(\text{dB}\mu\text{V/m}) + 40$
4. Margin (dB) = Limit – Corrected Amplitude

Test Result of Harmonic and Spurious Emission for Horizontal - TSC-003 - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
27.1200	50.11	1.00	359	-11.20	38.91	69.54	-30.63

Test Result of Harmonic and Spurious Emission for Vertical - TSC-003 - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
27.1200	41.42	1.00	91	-11.20	30.22	69.54	-39.32

Test Result of Harmonic and Spurious Emission for Horizontal - TSC-001 - X

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
27.1200	38.27	1.00	283	-11.20	27.07	69.54	-42.47

Test Result of Harmonic and Spurious Emission for Vertical - TSC-001 - Y

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
27.1200	35.40	1.00	322	-11.20	24.20	69.54	-45.34

Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor
2. Corrected Amplitude (dB μ V/m) = Reading Data + Correction Factor
3. For main frequency < 30 MHz, the formula transfers the limit to 30 m to 3 m is
 $L_{30}(\text{dB}\mu\text{V/m}) + 40$
4. Margin (dB) = Limit – Corrected Amplitude

3.3 Test Result of the Bandedge

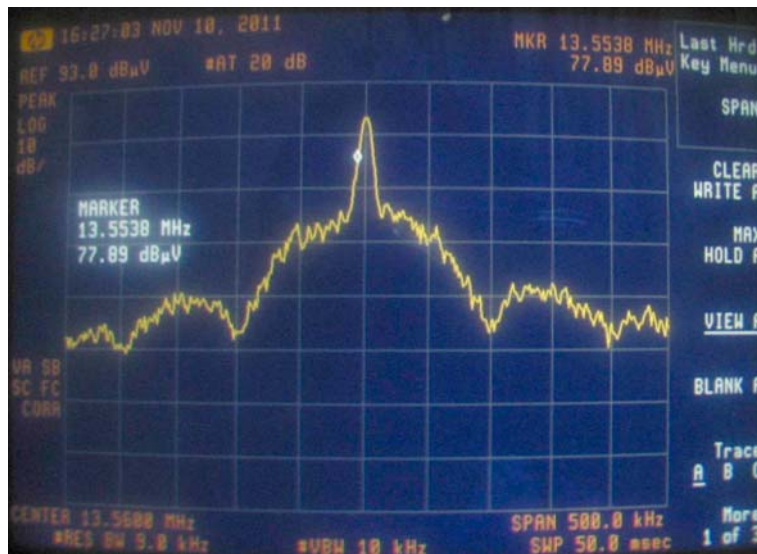
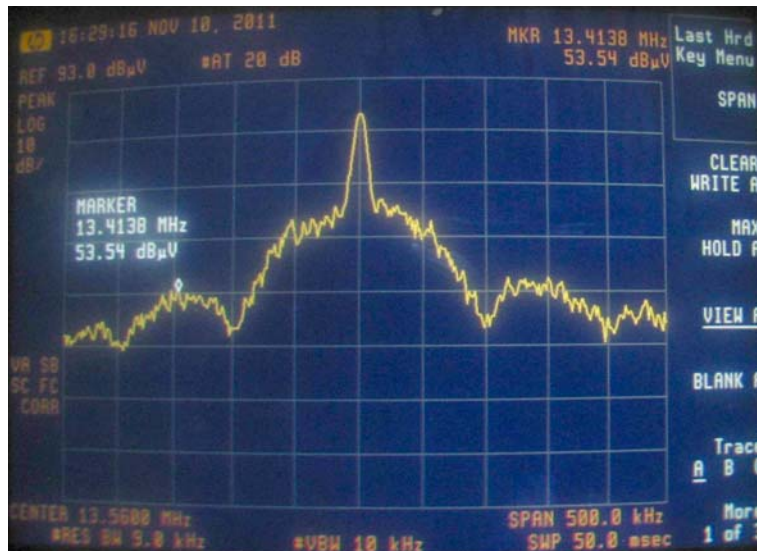
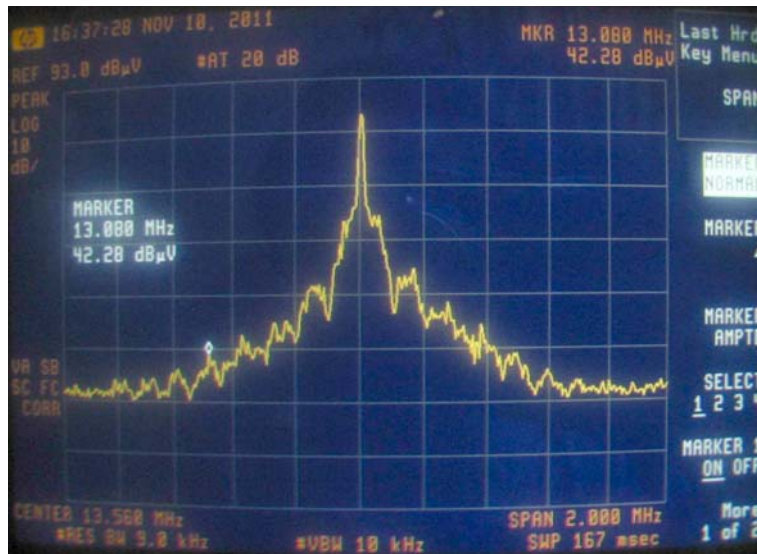
The following show our observations referring to the single channel respectively. Test Condition & Setup same as 3.2.1 to 3.2.2.

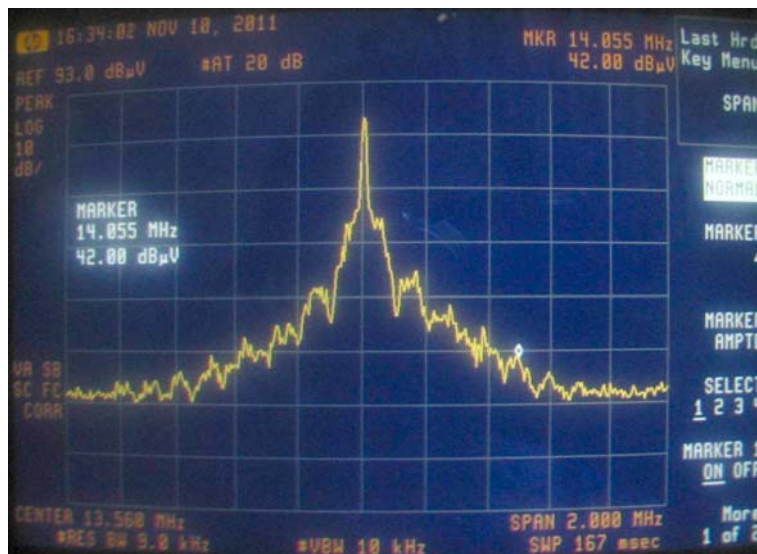
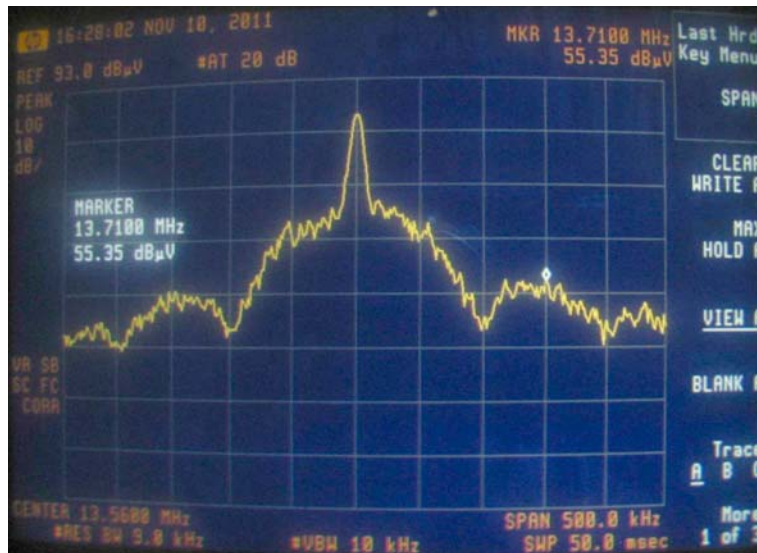
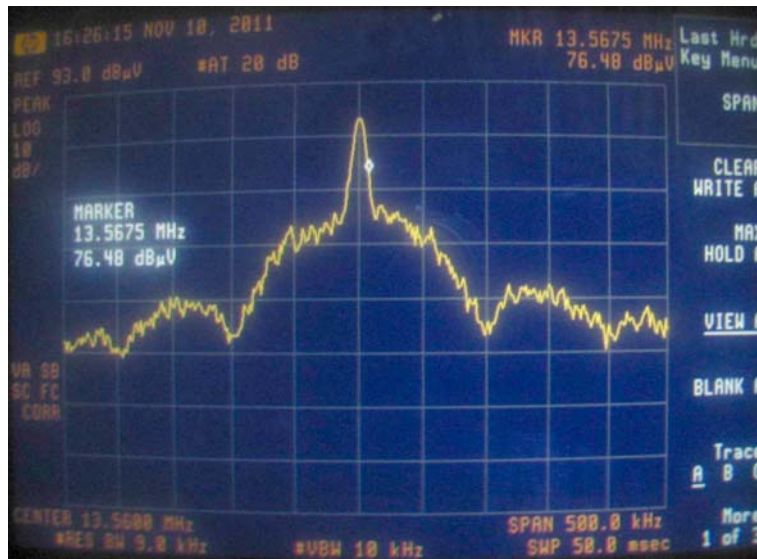
Antenna polarity: Horizontal, Frequency Band: 13.110MHz ~ 14.040MHz – TSC-002B

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.0800	42.28	1.00	76	-12.19	30.09	69.54	-39.45
13.4138	53.54	1.00	76	-12.19	41.35	69.54	-28.19
13.5538	77.89	1.00	76	-12.19	65.70	90.47	-24.77
13.5675	76.48	1.00	76	-12.19	64.29	90.47	-26.18
13.7100	55.35	1.00	76	-12.19	43.16	80.50	-37.34
14.0550	42.00	1.00	76	-12.19	29.81	80.50	-50.69

Note:

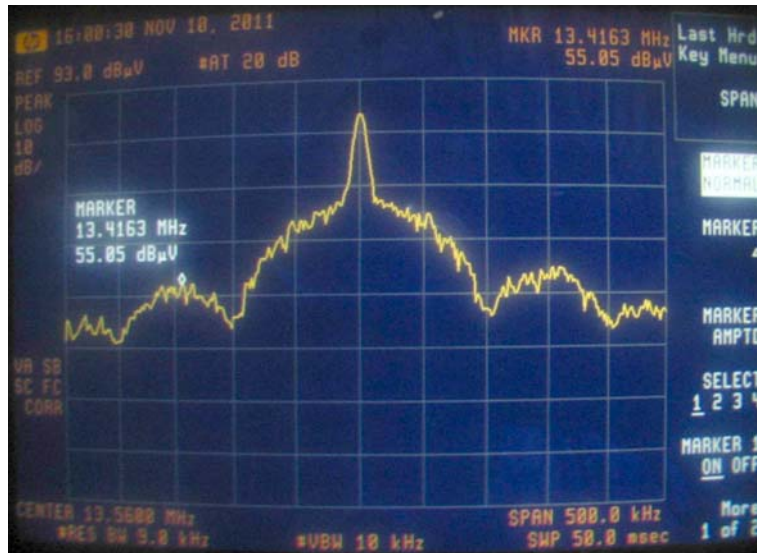
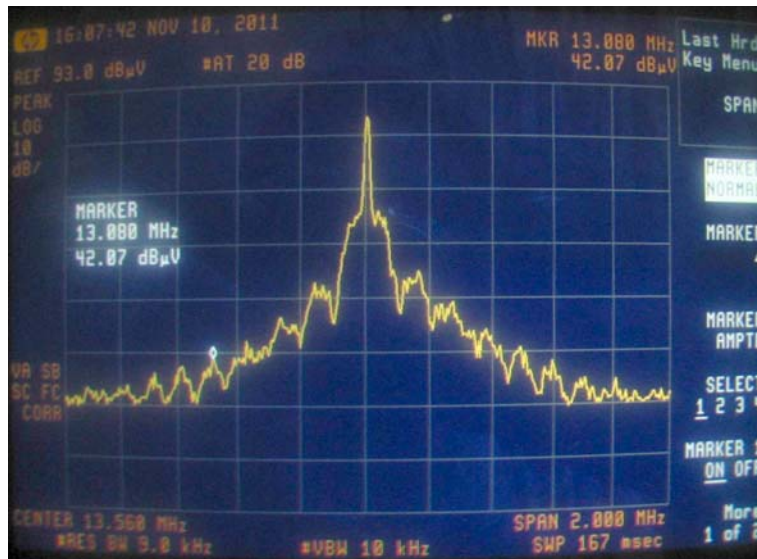
1. Correction Factor (dB/m) = Cable Loss + Antenna Factor
2. Corrected Amplitude (dBuV/m) = Reading Data + Correction Factor
3. For main frequency < 30 MHz, the formula transfers the limit to 30 m to 3 m is
 $L_{30}(\text{dBuV/m}) + 40$
4. Margin (dB) = Limit –Corrected Amplitude

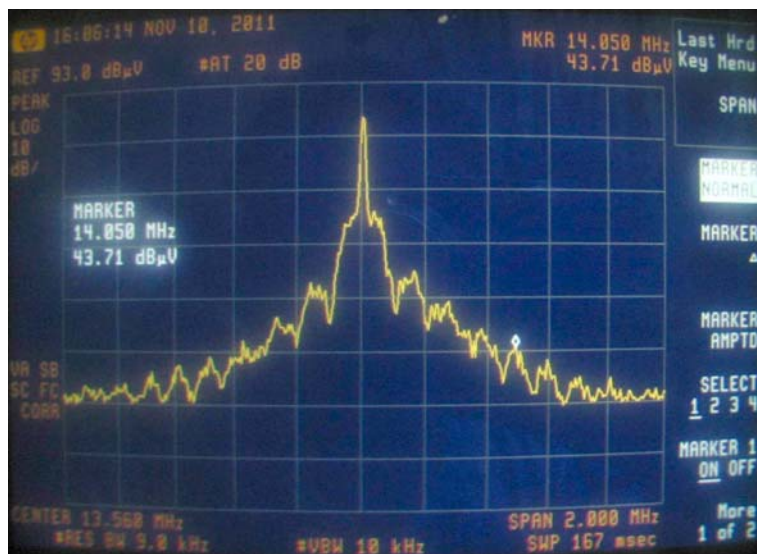




Antenna polarity: Vertical, Frequency Band: 13.110MHz ~ 14.040MHz – TSC-002B

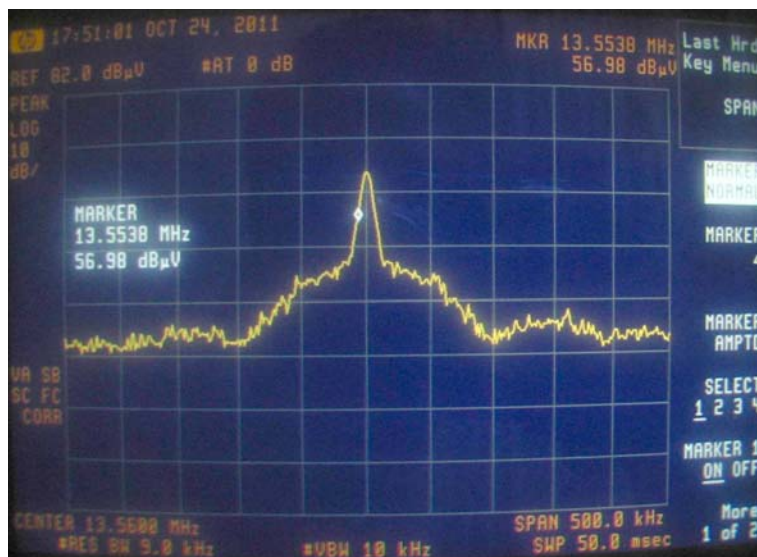
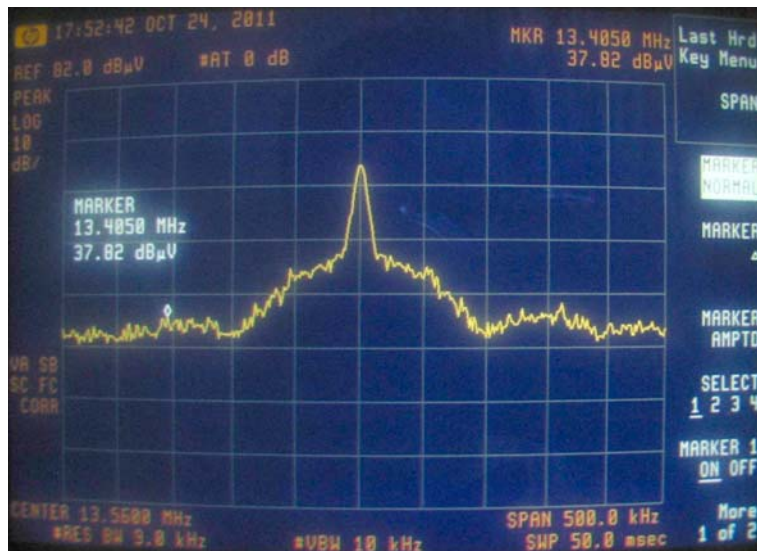
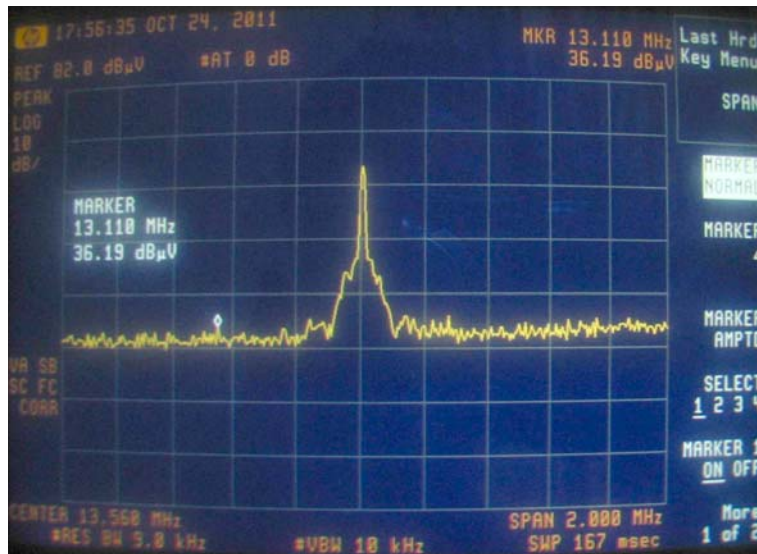
Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.0800	42.07	1.00	356	-12.19	29.88	69.54	-39.66
13.4163	55.05	1.00	356	-12.19	42.86	69.54	-26.68
13.5538	78.68	1.00	356	-12.19	66.49	90.47	-23.98
13.5675	77.51	1.00	356	-12.19	65.32	90.47	-25.15
13.7200	57.71	1.00	356	-12.19	45.52	80.50	-34.98
14.0500	43.71	1.00	356	-12.19	31.52	80.50	-48.98

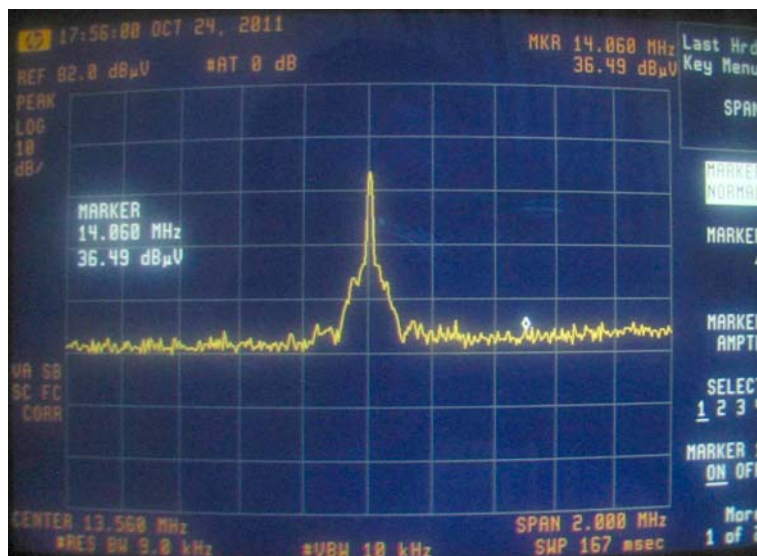
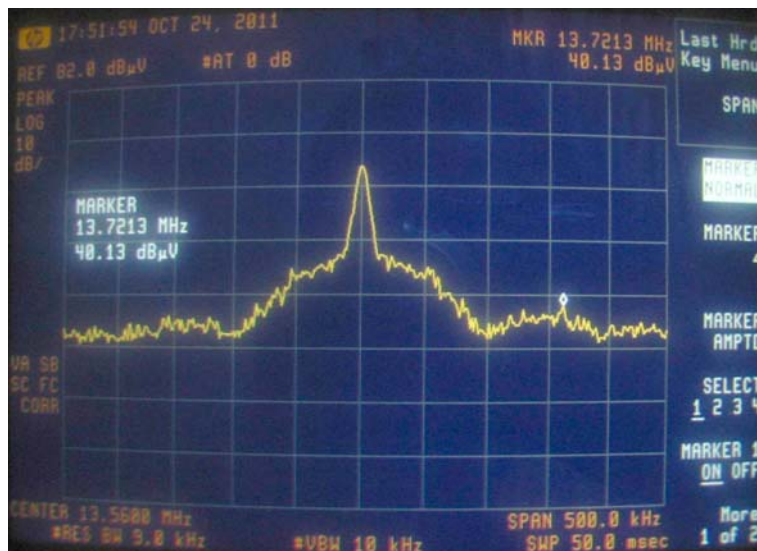
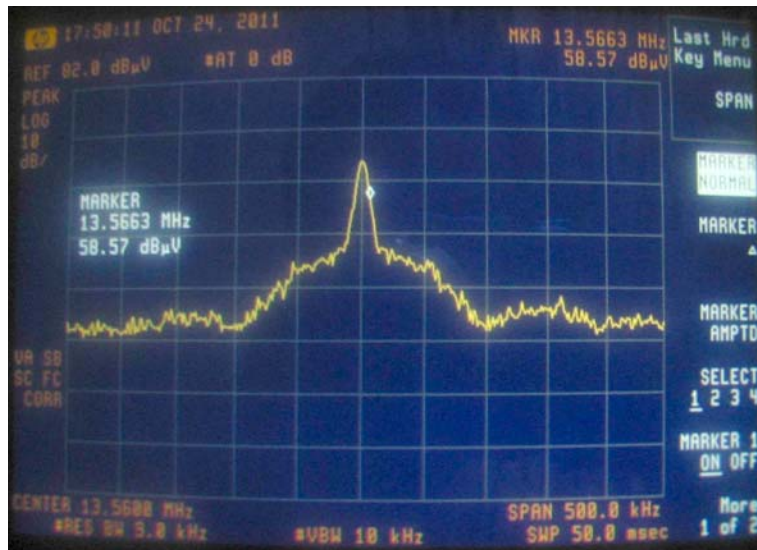




Antenna polarity: Horizontal, Frequency Band: 13.110MHz ~ 14.040MHz – TSC-002

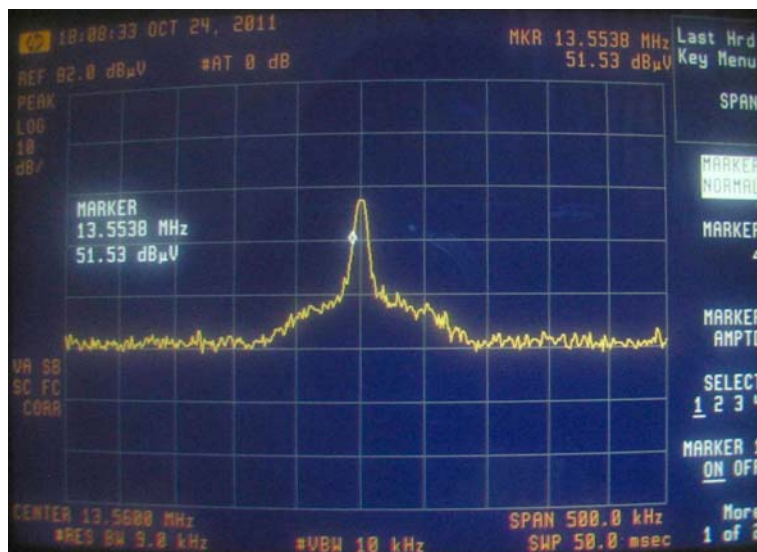
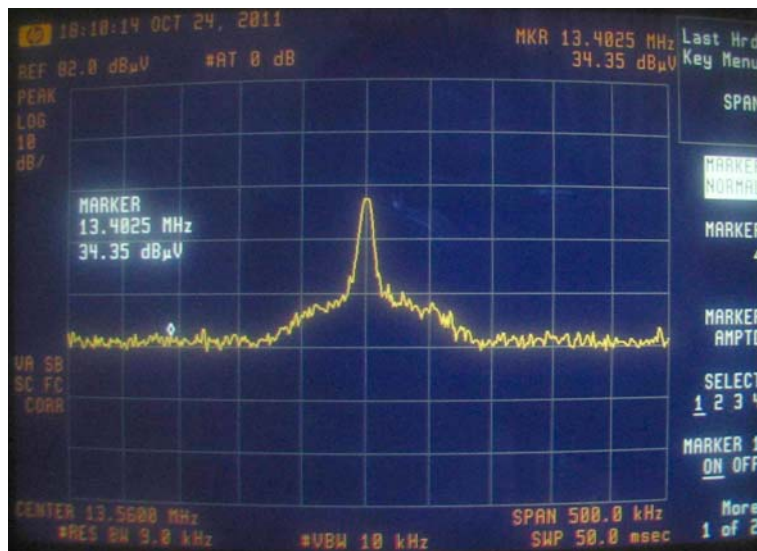
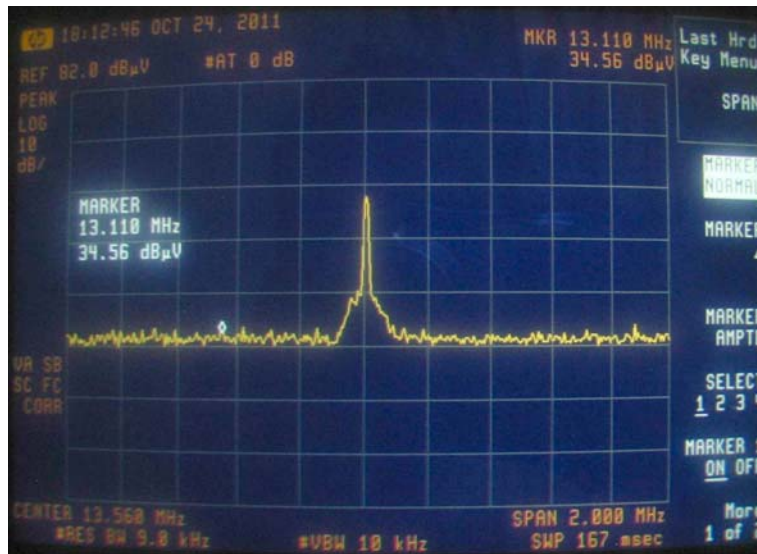
Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.1100	36.19	1.00	87	-12.19	24.00	69.54	-45.54
13.4050	37.82	1.00	87	-12.19	25.63	69.54	-43.91
13.5538	56.98	1.00	87	-12.19	44.79	90.47	-45.68
13.5663	58.57	1.00	87	-12.19	46.38	90.47	-44.09
13.7213	40.13	1.00	87	-12.19	27.94	80.50	-52.56
14.0600	36.49	1.00	87	-12.19	24.30	80.50	-56.20

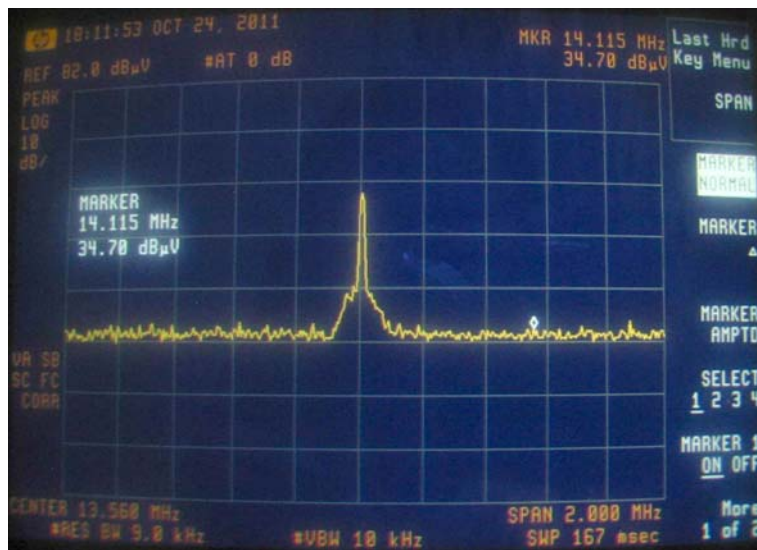
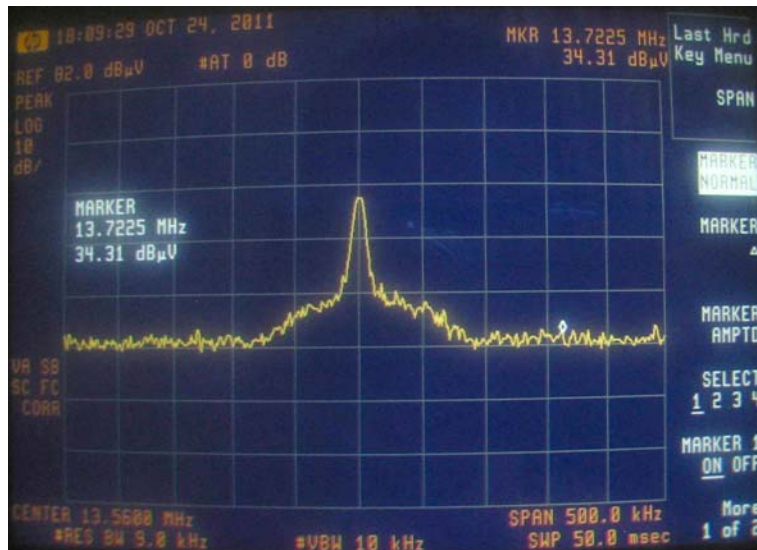
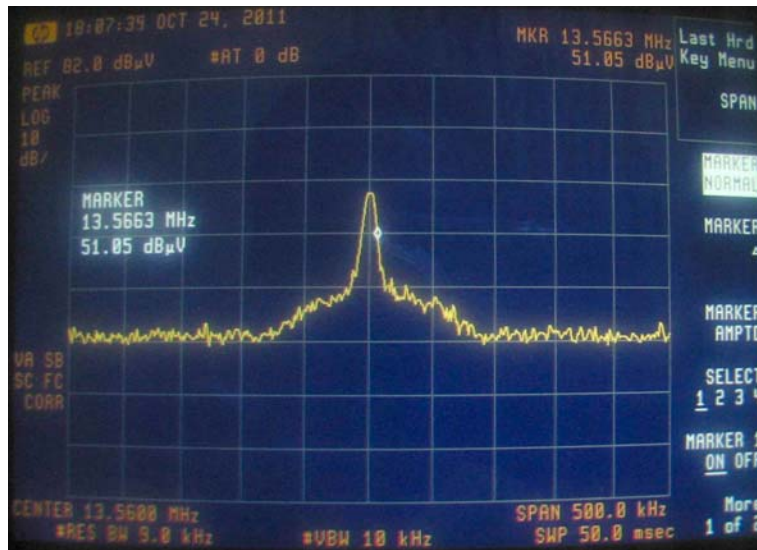




Antenna polarity: Vertical, Frequency Band: 13.110MHz ~ 14.040MHz – TSC-002

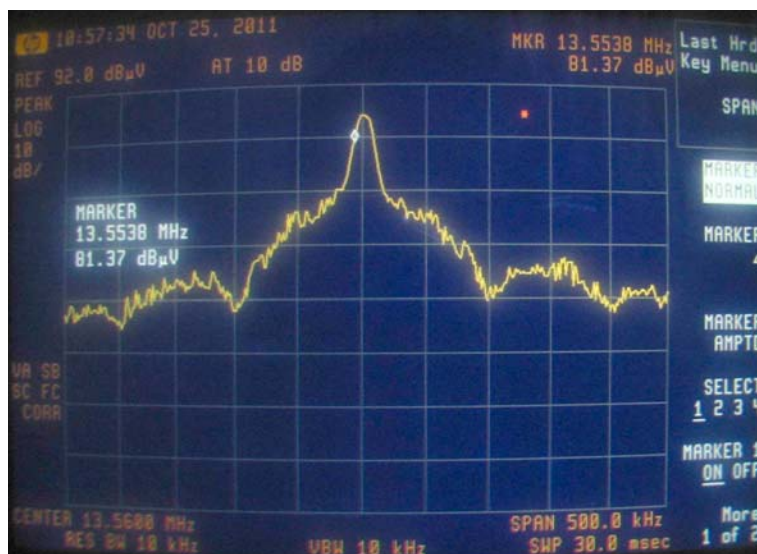
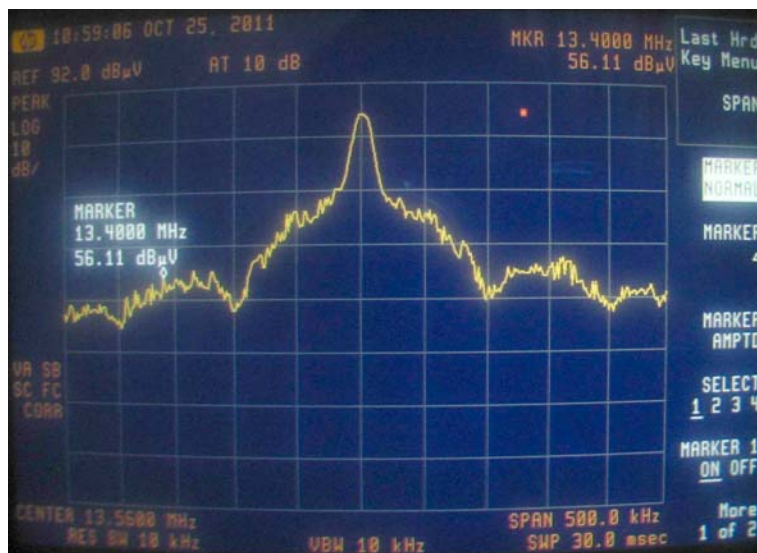
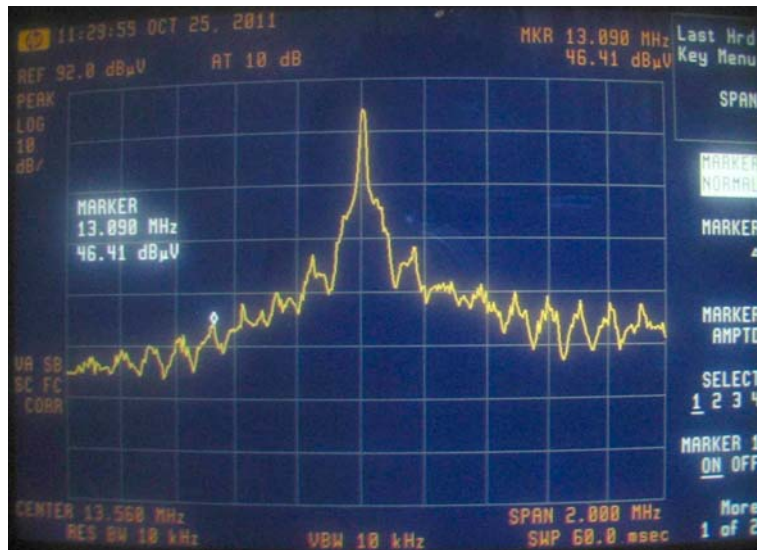
Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.1100	34.56	1.00	59	-12.19	22.37	69.54	-47.17
13.4025	34.35	1.00	59	-12.19	22.16	69.54	-47.38
13.5538	51.53	1.00	59	-12.19	39.34	90.47	-51.13
13.5663	51.05	1.00	59	-12.19	38.86	90.47	-51.61
13.7225	34.31	1.00	59	-12.19	22.12	80.50	-58.38
14.1150	34.70	1.00	59	-12.19	22.51	80.50	-57.99

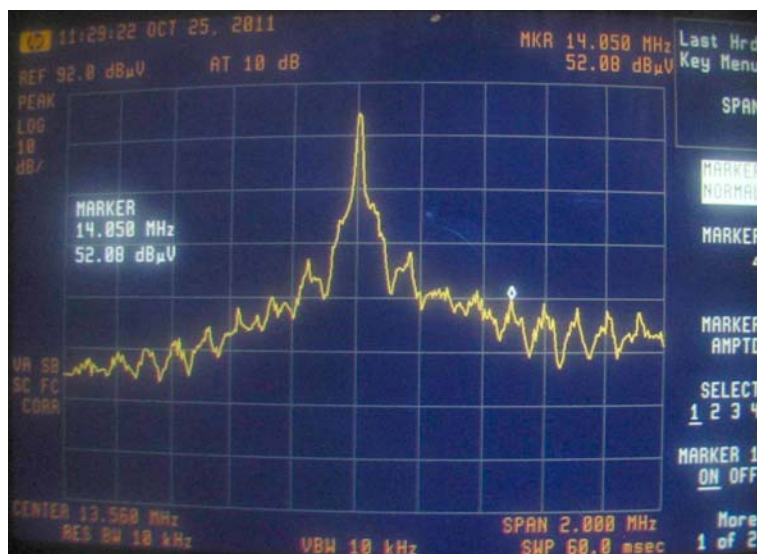
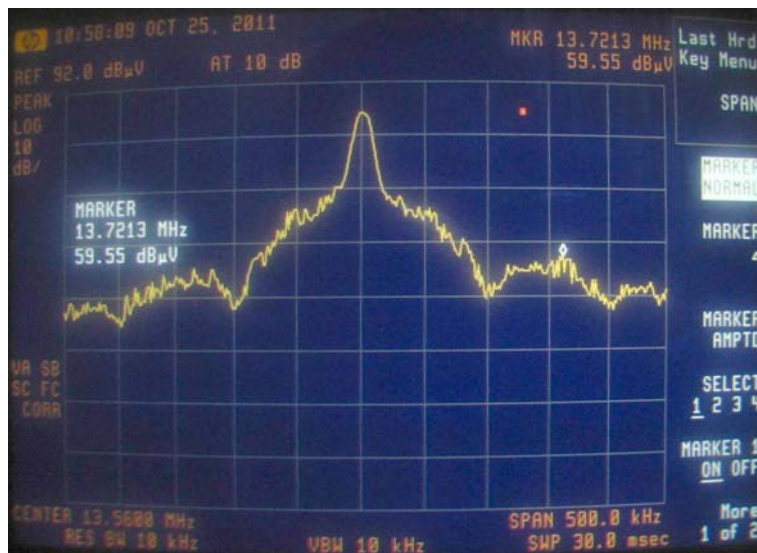
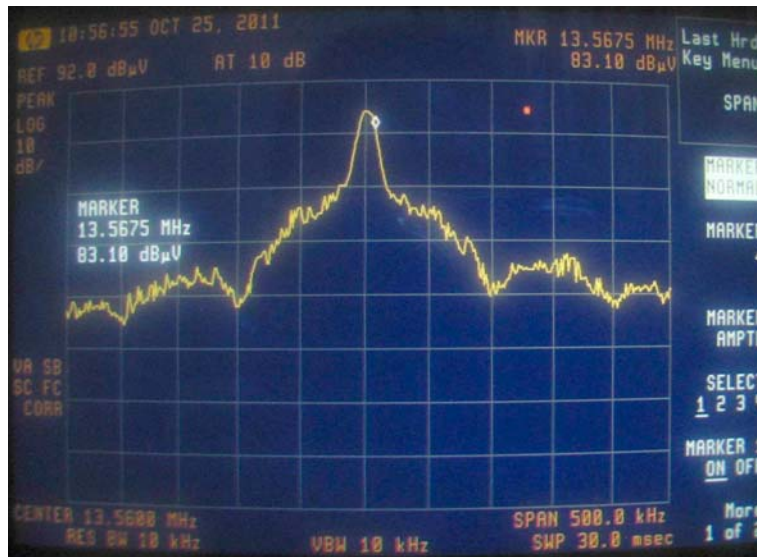




Antenna polarity: Horizontal, Frequency Band: 13.110MHz ~ 14.040MHz – TSC-003

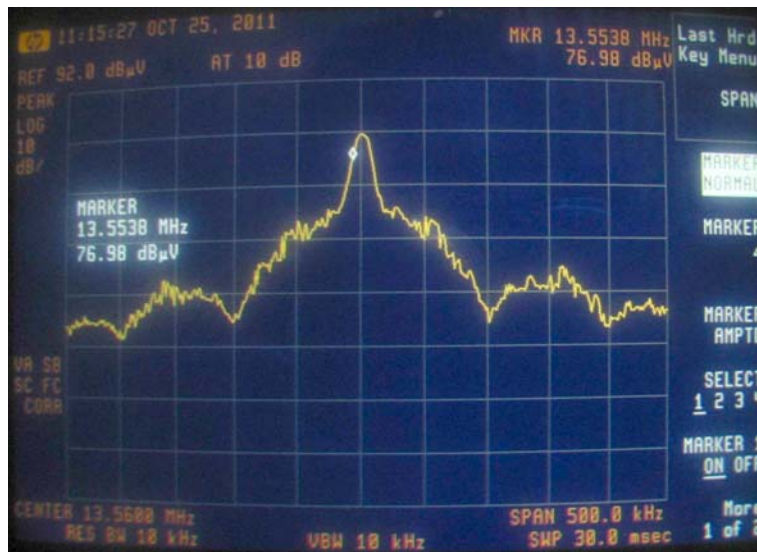
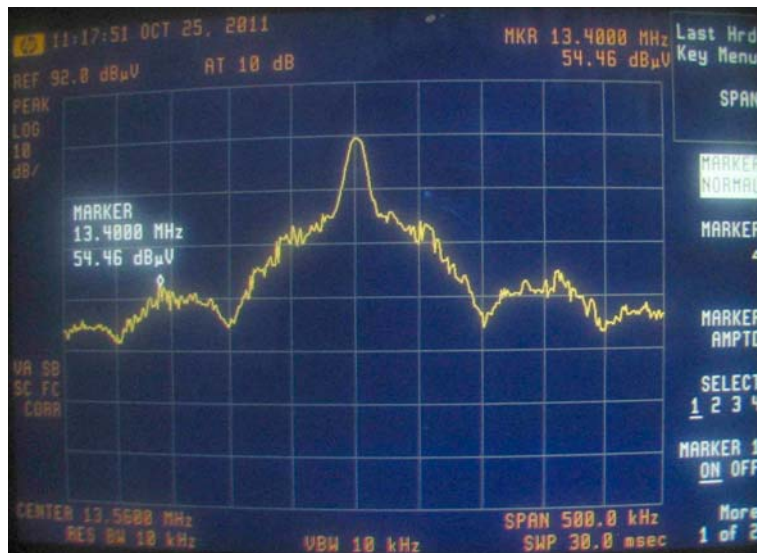
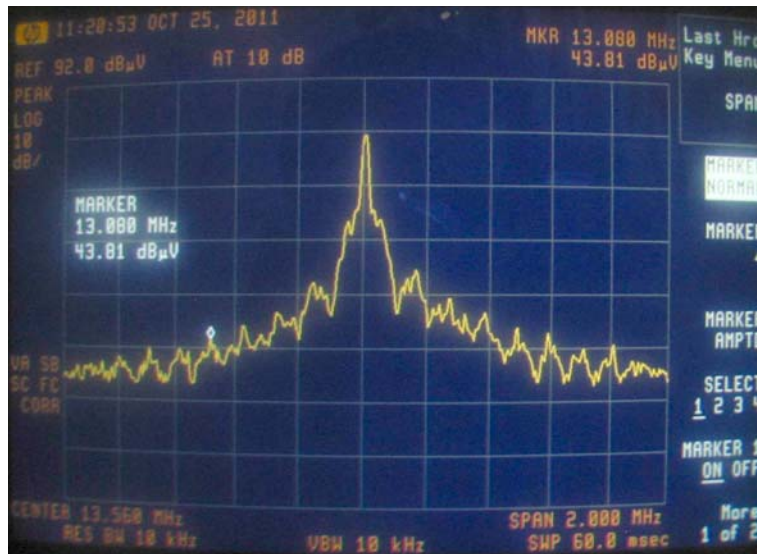
Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.0900	46.41	1.00	346	-12.19	34.22	69.54	-35.32
13.4000	56.11	1.00	346	-12.19	43.92	69.54	-25.62
13.5538	81.37	1.00	346	-12.19	69.18	90.47	-21.29
13.5675	83.10	1.00	346	-12.19	70.91	90.47	-19.56
13.7213	59.55	1.00	346	-12.19	47.36	80.50	-33.14
14.0500	52.08	1.00	346	-12.19	39.89	80.50	-40.61

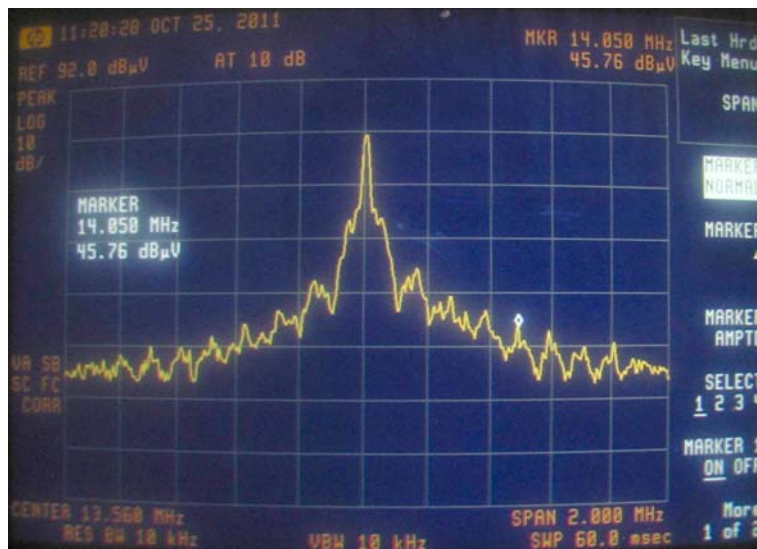
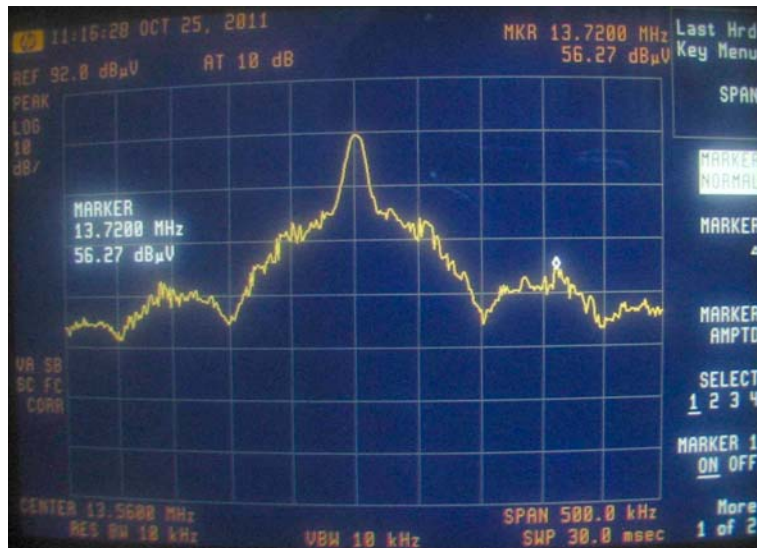
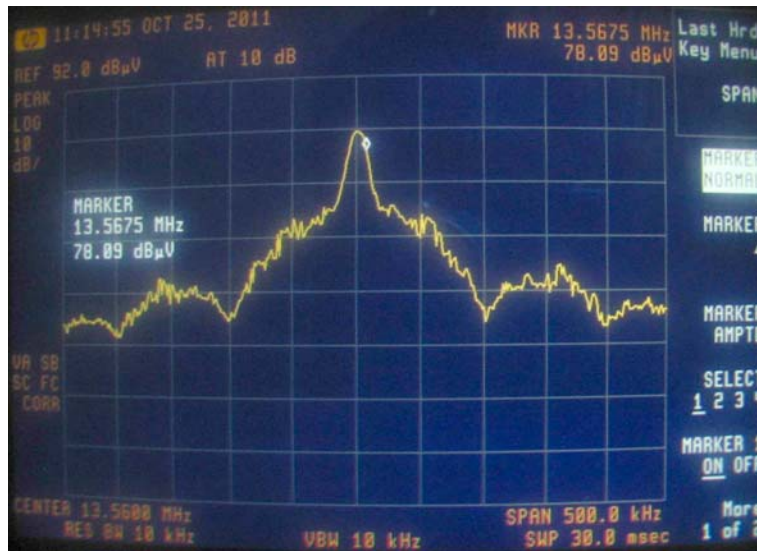




Antenna polarity: Vertical, Frequency Band: 13.110MHz ~ 14.040MHz – TSC-003

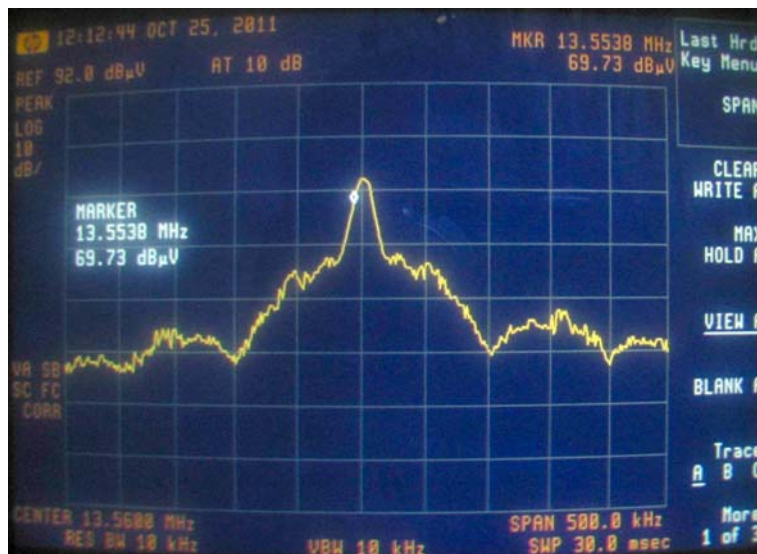
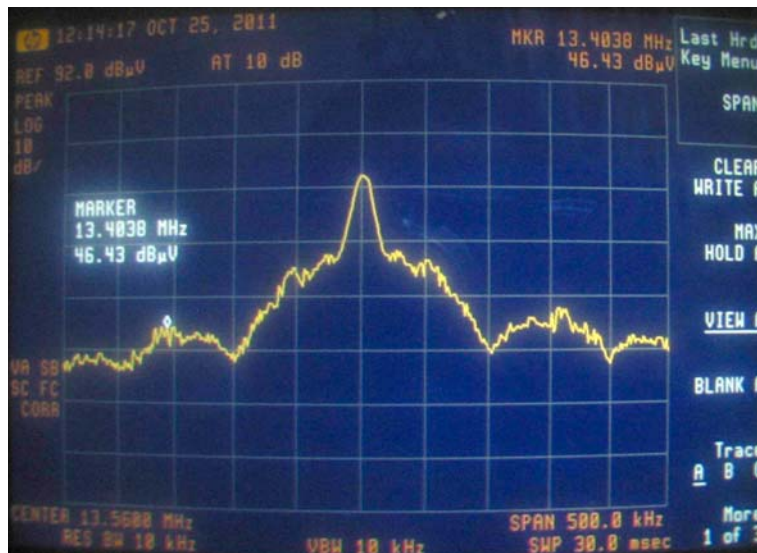
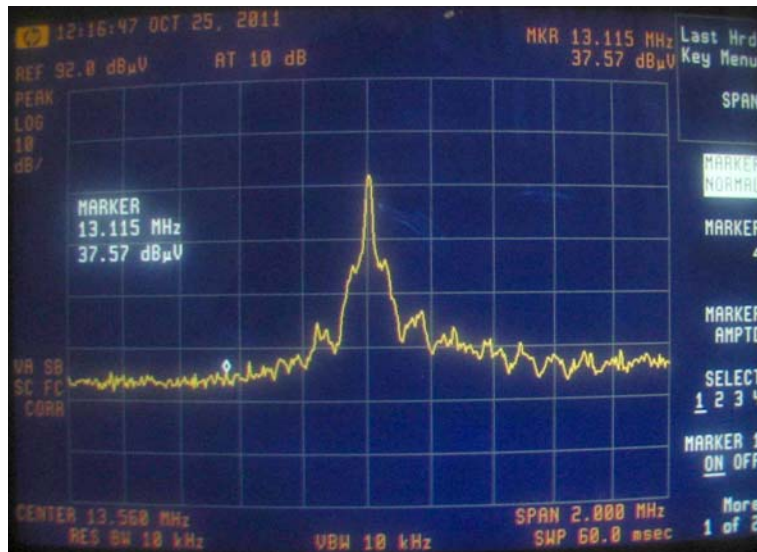
Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
13.0800	43.81	1.00	233	-12.19	31.62	69.54	-37.92
13.4000	54.46	1.00	233	-12.19	42.27	69.54	-27.27
13.5538	76.98	1.00	233	-12.19	64.79	90.47	-25.68
13.5675	78.09	1.00	233	-12.19	65.90	90.47	-24.57
13.7200	56.27	1.00	233	-12.19	44.08	80.50	-36.42
14.0500	45.76	1.00	233	-12.19	33.57	80.50	-46.93

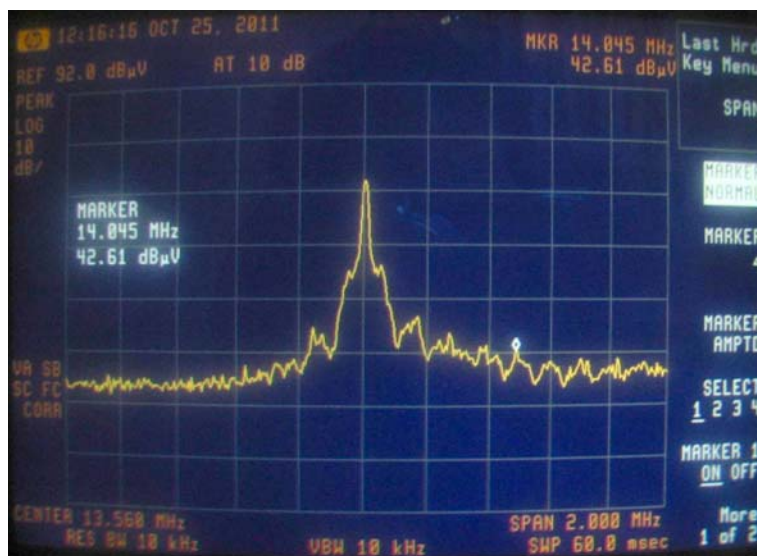
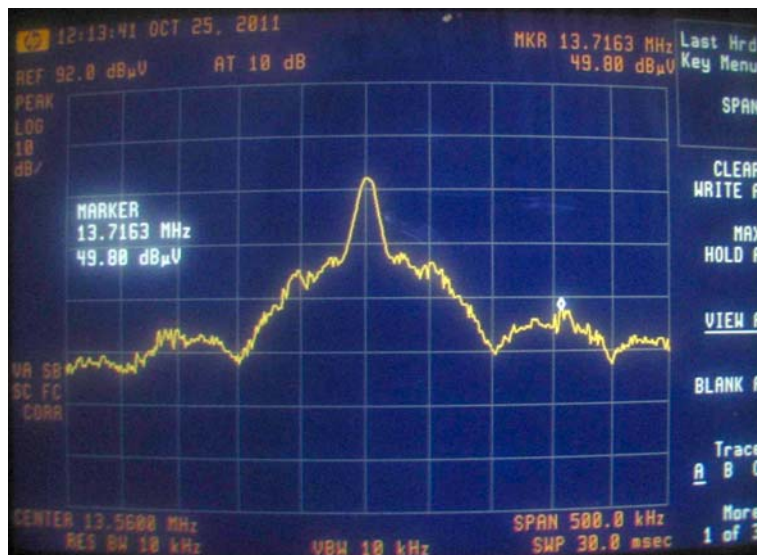
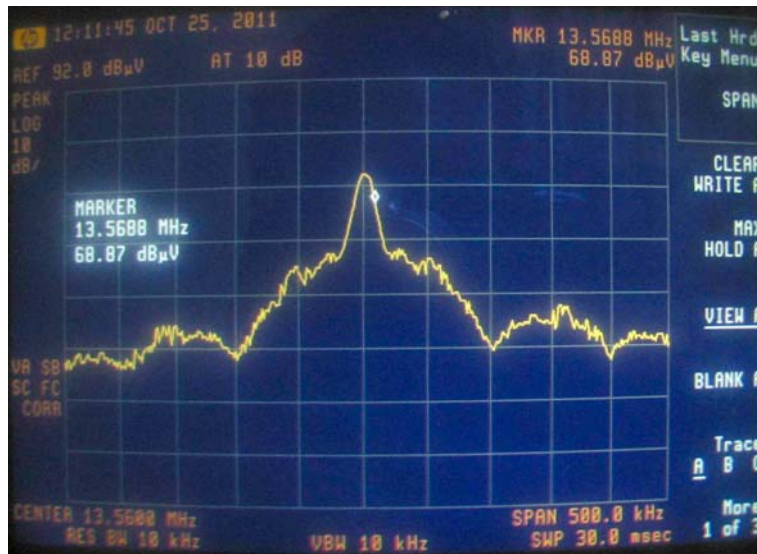




Antenna polarity: Horizontal, Frequency Band: 13.110MHz ~ 14.040MHz – TSC-001

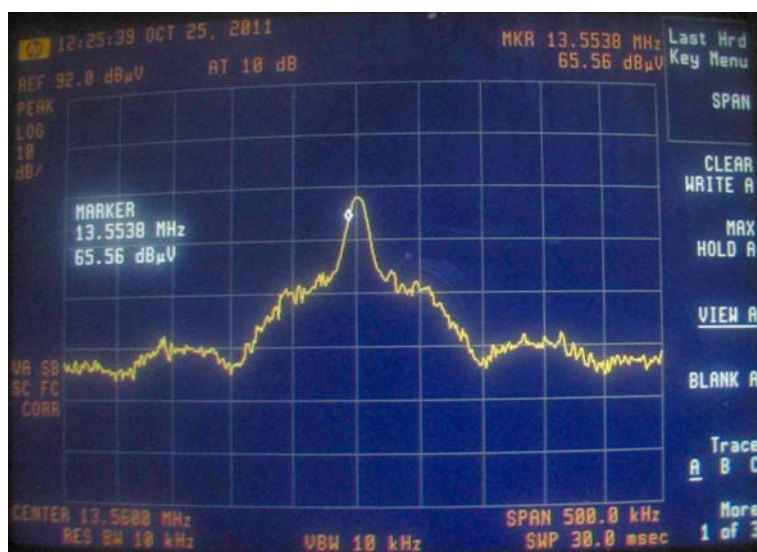
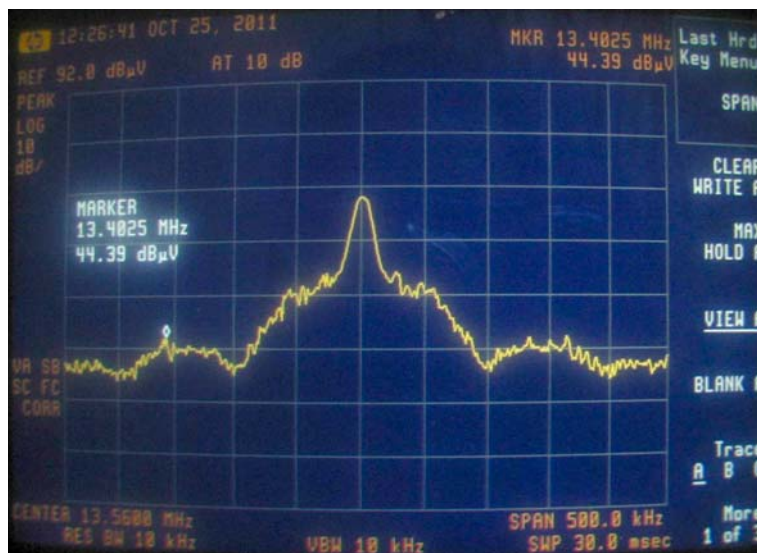
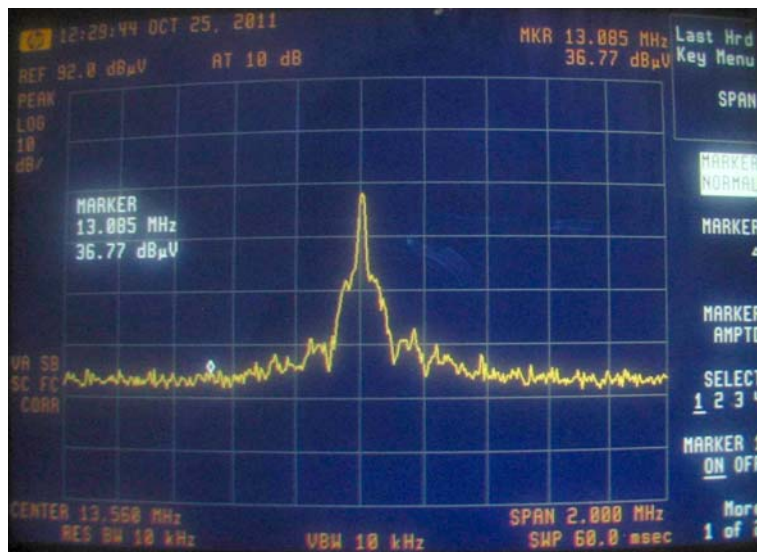
Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dB μ V	m	degree	dB/m	dB μ V/m	dB μ V/m	dB
13.1150	37.57	1.00	76	-12.19	25.38	69.54	-44.16
13.4038	46.43	1.00	76	-12.19	34.24	69.54	-35.30
13.5538	69.73	1.00	76	-12.19	57.54	90.47	-32.93
13.5688	68.87	1.00	76	-12.19	56.68	90.47	-33.79
13.7163	49.80	1.00	76	-12.19	37.61	80.50	-42.89
14.0450	42.61	1.00	76	-12.19	30.42	80.50	-50.08

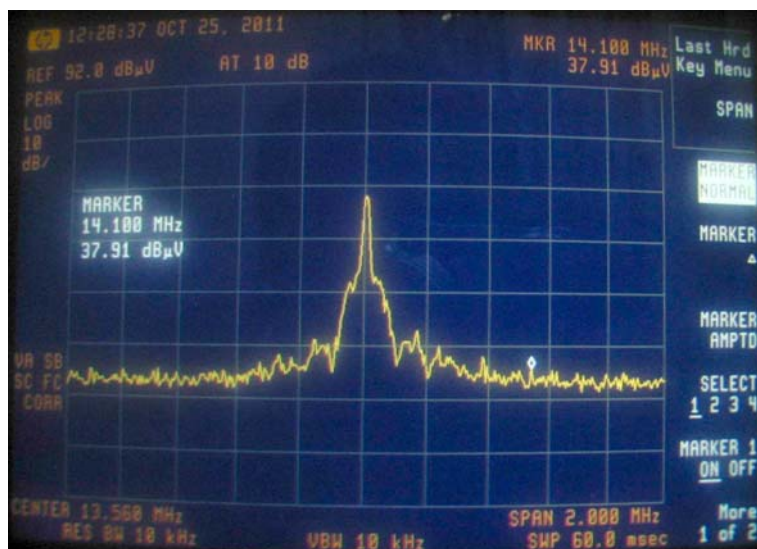
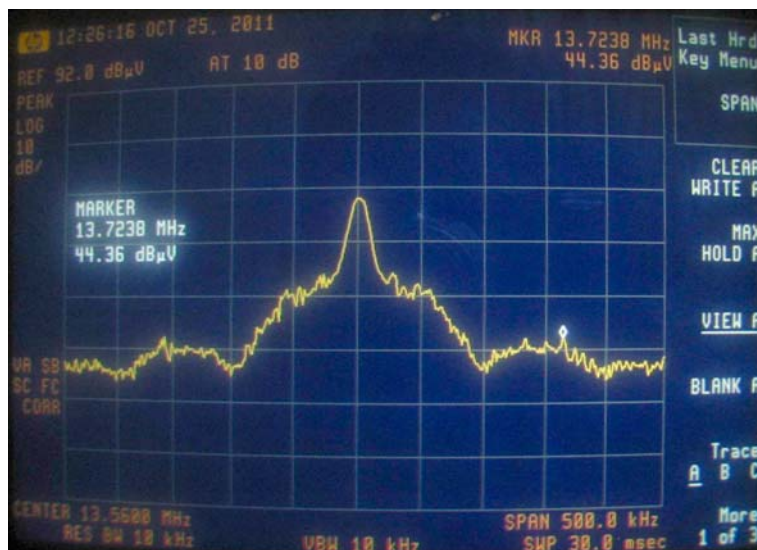
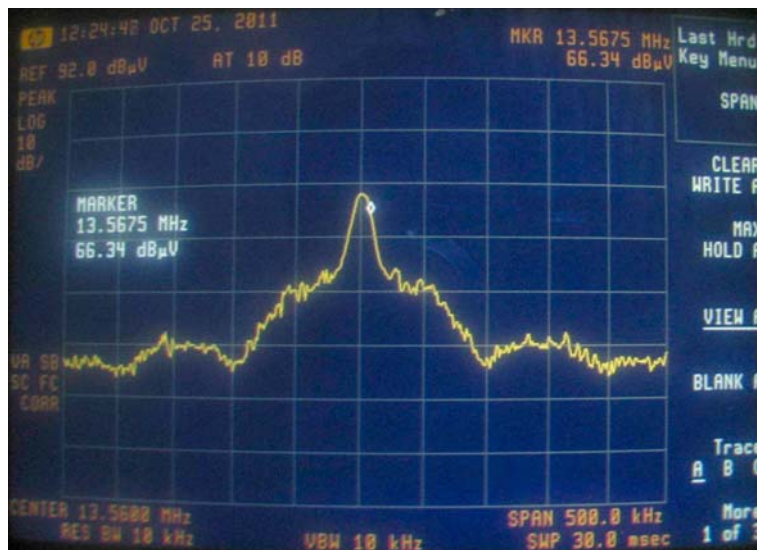




Antenna polarity: Vertical, Frequency Band: 13.110MHz ~ 14.040MHz – TSC-001

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
13.0850	36.77	1.00	254	-12.19	24.58	69.54	-44.96
13.4025	44.39	1.00	254	-12.19	32.20	69.54	-37.34
13.5538	65.56	1.00	254	-12.19	53.37	90.47	-37.10
13.5675	66.34	1.00	254	-12.19	54.15	90.47	-36.32
13.7238	44.36	1.00	254	-12.19	32.17	80.50	-48.33
14.1000	37.91	1.00	254	-12.19	25.72	80.50	-54.78





Chapter 4 Frequency Stability (Part 2.1055, 15.225 (e))

4.1 Test procedure: (Temperature)

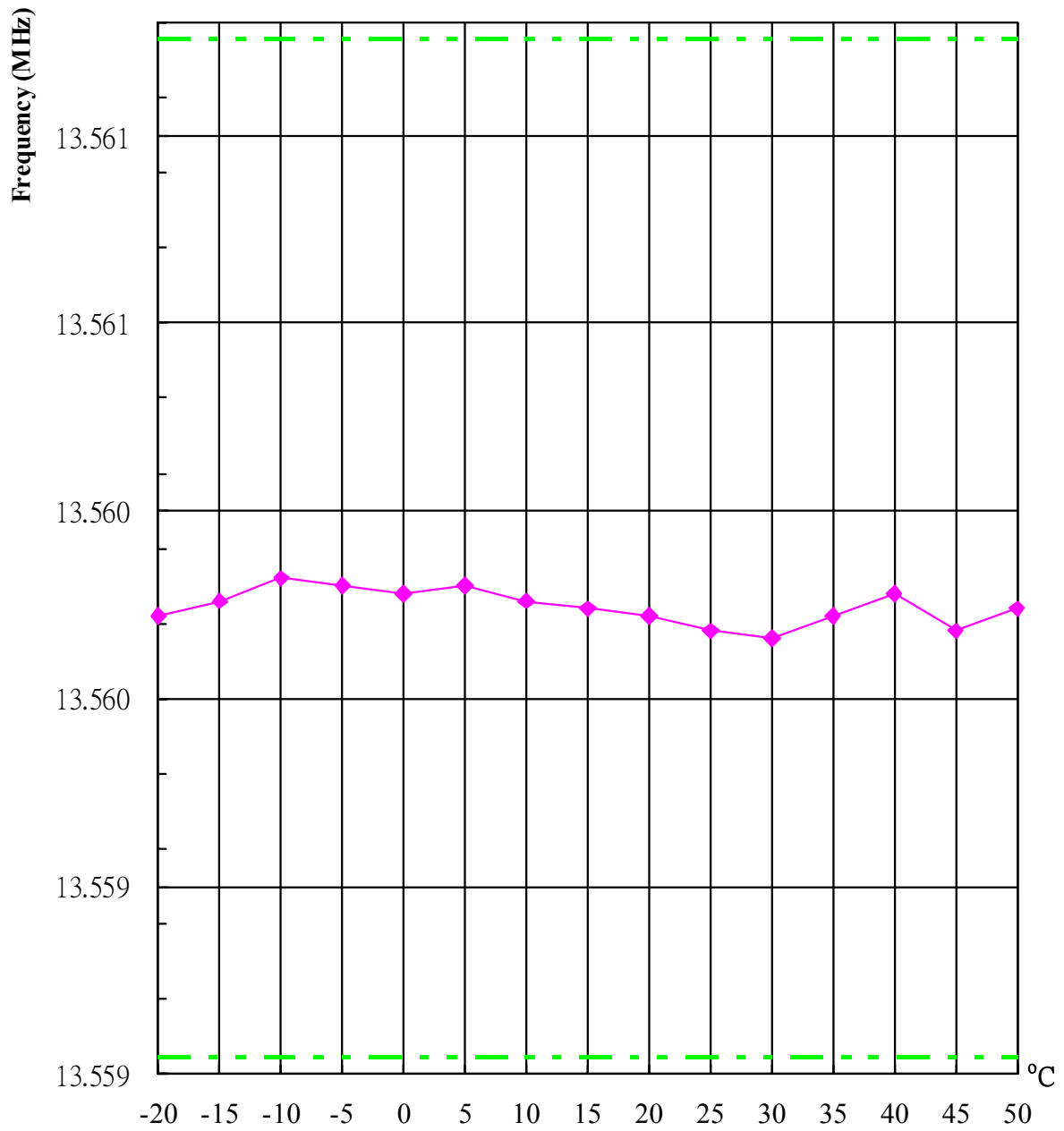
- (1) Frequency shift vs. temperature:
The nominal room temperature 20°C, and the reference frequency is 13.560000MHz.
- (2) The EUT was put in an environmental chamber and set up the temperature of this chamber from -20°C to +50°C and recorded the frequency has been shift at ± 0.01%

4.2 Test Result:

Temperature Variation Table

<i>Temperature (Centigrade)</i>	<i>Frequency (MHz)</i>	<i>Frequency Stability (± 0.01%)</i>
-20	13.559820	13.558644 ~ 13.561356
-15	13.559860	
-10	13.559920	
-5	13.559900	
0	13.559880	
5	13.559900	
10	13.559860	
15	13.559840	
20	13.559820	
25	13.559780	
30	13.559760	
35	13.559820	
40	13.559880	
45	13.559780	
50	13.559840	

Chart 4.1 Temperatuer Variation Vs. Frequency



4.3 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	MS2665C	Anritsu	6200175476	04/15/12
Digital Multimeter	GDM-8055	GW	8080365	09/20/12
Temperature & Humidity Chamber	THS-ML1	King Son	240	01/02/12

The level of confidence of 95% , the uncertainty of measurement is $\pm 12\text{Hz}$.

4.4 Test procedure:(voltage)

(1) Frequency shift vs. voltage:

Nominal power is 4.8Vdc and the reference Frequency is 13.560000MHz

(2) The EUT was powered at 85% and 115% of nominal.

4.5 Test Result:

Frequency Stability of Voltage Variation Measurement Table

<i>Supply Voltage (Volt)</i>	<i>Frequency (MHz)</i>	<i>Frequency Stability ($\pm 0.01\%$)</i>
4.08 (85%)	13.559820	13.558644
4.80 (100%)	13.559780	~
5.52 (115%)	13.559760	13.561356

Chart 4.2 Voltage Variation Vs. Frequency

