Test Report

Product Name	TSC-RFID
Model No.	TSC-RF013
FCC ID	VTV2009001

Applicant	TSC Auto ID Technology Co., Ltd.
Address	No. 35, Sec. 2, Ligong 1st Rd., Wujie Town (Li Tse Industrial Park), I-lan County 268, Taiwan R.O.C.

Date of Receipt	Oct. 27, 2009
Issued Date	Dec. 04, 2009
Report No.	09B028R-RFUSP25V01
Report Version	V1.0

Test Report Certification

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Product Name	TSC-RFID
Applicant	TSC Auto ID Technology Co., Ltd.
Address	No. 35, Sec. 2, Ligong 1st Rd., Wujie Town (Li Tse Industrial Park), I-lan County 268, Taiwan R.O.C.
Manufacturer	TSC Auto ID Technology Co., Ltd.
Model No.	TSC-RF013
FCC ID.	VTV2009001
EUT Test Voltage	AC 120V/60Hz
EUT Rated Voltage	DC 5V
Trade Name	TSC
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2007 ANSI C63.4: 2003
Test Result	Complied

NVLAP Lab Code: 200533-0

Test results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : Jinn Chen
(Adm. Specialist / Jinn Chen)

Tested By : Johnson Liao
(Engineer / Johnson Liao)

Approved By :
(Manager /Vincent Lin)

Testing Laboratory
0914

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	TSC-RFID
Trade Name	TSC
Model No.	TSC-RF013
FCC ID	VTV2009001
Frequency Range	13.56MHz
Channel Control	N/A
Antenna Type	Loop

Frequency of Each Channel:

Channel	Frequency
Channel 1:	13.56 MHz

Note:

1. This device is a TSC-RFID with a built-in 13.56MHz transceiver.
2. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.225 for spread spectrum devices.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

1.2. Operational Description

EUT is a TSC-RFID with a built-in 13.56MHz transmitter with ASK modulation. The signal will be transmitted through 13.56 MHz ASK RF signal from the Connector antenna.

Test Mode	Mode 1: Flexible Print Circuit Antenna Mode 2: Print Antenna 6 Circle Mode 3: Print Antenna 4 Circle Mode 4: Internal Antenna

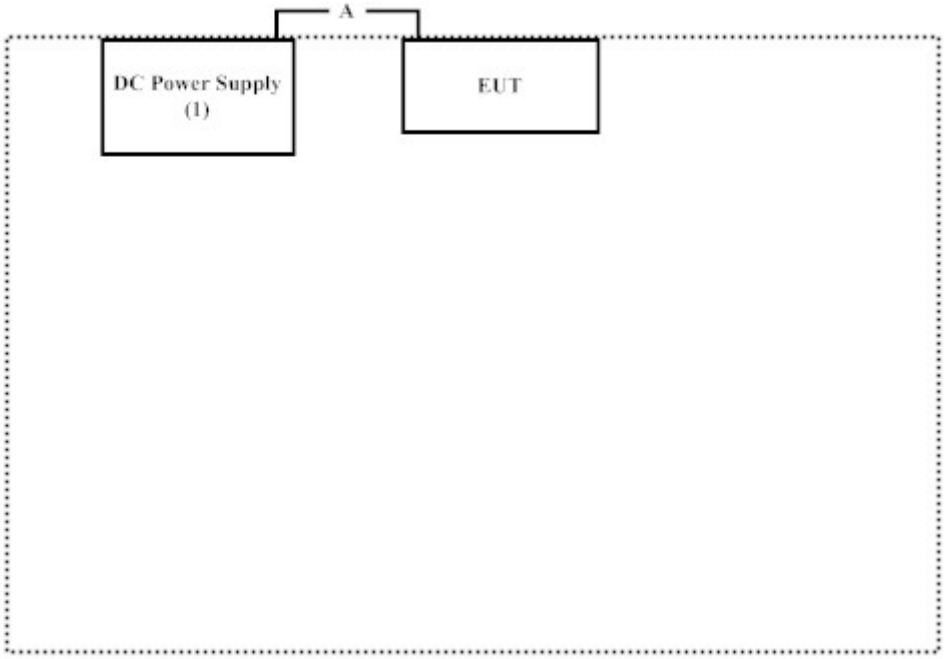
1.3. Tested System Datails

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
(1)	DC Power Supply	Agilent	E3646A	MY48888217	Non-shielded, 1.8m

Signal Cable Type		Signal cable Description
A.	Power Line Cable	Non-shielded, 1.2m

1.4. Configuration of tested System



1.5. EUT Exercise Software

(1) Setup the EUT as shown in Section 1.4

(2) Execute RF ID Software on the EUT.

(3) Configure the test mode, the test channel, and the data rate.

(4) Press “OK” to start the continuous transmitter.

(5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation
Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

Testing Laboratory
0914

2. Conducted Emission

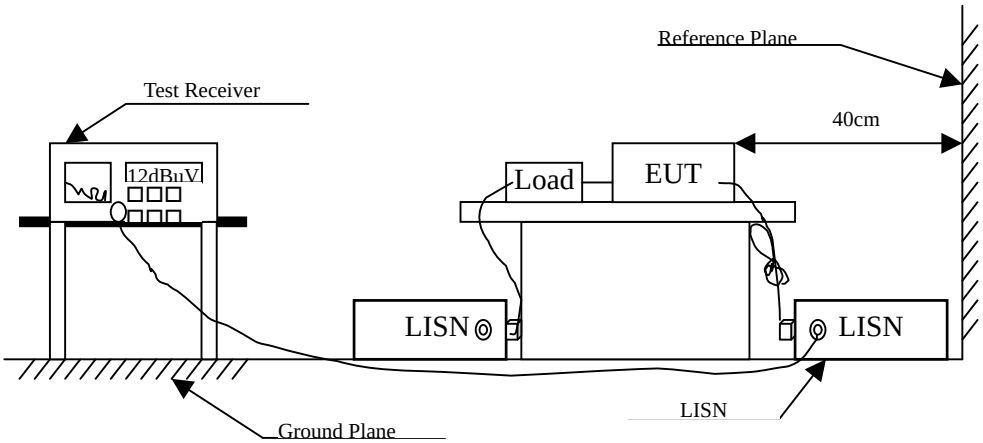
2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2009	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2009	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2009	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2009	
5	No.1 Shielded Room			N/A	

Note: All equipments are calibrated every one year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56(注)	56-46(注)
0.50-5.0	56	46
5.0 - 30	60	50

2.4. 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 50 ohm /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. (Please refers to the block diagram of the test setup and photographs.)
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 ANSI C63.4: 2003 on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : TSC-RFID
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 1: Flexible Print Circuit Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.318	9.790	4.390	14.180	-47.020	61.200
0.951	9.800	4.910	14.710	-41.290	56.000
4.994	9.830	32.330	42.160	-13.840	56.000
11.974	9.965	19.260	29.225	-30.775	60.000
23.951	10.130	36.340	46.470	-13.530	60.000
29.939	10.130	24.360	34.490	-25.510	60.000
Average					
0.318	9.790	0.980	10.770	-40.430	51.200
0.951	9.800	0.850	10.650	-35.350	46.000
4.994	9.830	22.560	32.390	-13.610	46.000
11.974	9.965	14.360	24.325	-25.675	50.000
23.951	10.130	33.440	43.570	-6.430	50.000
29.939	10.130	21.830	31.960	-18.040	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 1: Flexible Print Circuit Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
1.755	9.800	3.980	13.780	-42.220	56.000
4.974	9.830	30.920	40.750	-15.250	56.000
11.974	10.005	19.600	29.605	-30.395	60.000
17.962	10.210	15.320	25.530	-34.470	60.000
23.951	10.280	32.570	42.850	-17.150	60.000
29.939	10.340	21.820	32.160	-27.840	60.000
Average					
1.755	9.800	0.740	10.540	-35.460	46.000
4.974	9.830	24.360	34.190	-11.810	46.000
11.974	10.005	14.480	24.485	-25.515	50.000
17.962	10.210	12.500	22.710	-27.290	50.000
23.951	10.280	26.230	36.510	-13.490	50.000
29.939	10.340	18.330	28.670	-21.330	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 2: Print Antenna 6 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
1.162	9.800	1.390	11.190	-44.810	56.000
3.392	9.820	2.080	11.900	-44.100	56.000
4.974	9.830	32.920	42.750	-13.250	56.000
11.978	9.965	17.900	27.865	-32.135	60.000
23.951	10.130	36.260	46.390	-13.610	60.000
29.939	10.130	24.460	34.590	-25.410	60.000
Average					
1.162	9.800	0.320	10.120	-35.880	46.000
3.392	9.820	0.440	10.260	-35.740	46.000
4.974	9.830	25.450	35.280	-10.720	46.000
11.978	9.965	13.130	23.095	-26.905	50.000
23.951	10.130	33.310	43.440	-6.560	50.000
29.939	10.130	21.880	32.010	-17.990	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 2: Print Antenna 6 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
3.377	9.810	4.580	14.390	-41.610	56.000
4.986	9.830	30.840	40.670	-15.330	56.000
5.986	9.850	12.200	22.050	-37.950	60.000
11.974	10.005	19.640	29.645	-30.355	60.000
23.951	10.280	32.660	42.940	-17.060	60.000
29.939	10.340	21.620	31.960	-28.040	60.000
Average					
3.377	9.810	0.740	10.550	-35.450	46.000
4.986	9.830	27.890	37.720	-8.280	46.000
5.986	9.850	11.350	21.200	-28.800	50.000
11.974	10.005	10.190	20.195	-29.805	50.000
23.951	10.280	23.290	33.570	-16.430	50.000
29.939	10.340	19.290	29.630	-20.370	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 3: Print Antenna 4 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.447	9.790	1.490	11.280	-46.234	57.514
2.896	9.810	2.320	12.130	-43.870	56.000
4.978	9.830	32.680	42.510	-13.490	56.000
11.974	9.965	18.760	28.725	-31.275	60.000
23.951	10.130	36.220	46.350	-13.650	60.000
29.939	10.130	24.280	34.410	-25.590	60.000
Average					
0.447	9.790	0.510	10.300	-37.214	47.514
2.896	9.810	1.040	10.850	-35.150	46.000
4.978	9.830	28.770	38.600	-7.400	46.000
11.974	9.965	6.590	16.555	-33.445	50.000
23.951	10.130	32.020	42.150	-7.850	50.000
29.939	10.130	22.640	32.770	-17.230	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 3: Print Antenna 4 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.689	9.790	2.480	12.270	-43.730	56.000
4.982	9.830	30.700	40.530	-15.470	56.000
11.974	10.005	19.520	29.525	-30.475	60.000
17.939	10.208	4.060	14.268	-45.732	60.000
23.951	10.280	32.620	42.900	-17.100	60.000
29.189	10.330	13.320	23.650	-36.350	60.000
Average					
0.689	9.790	3.020	12.810	-33.190	46.000
4.982	9.830	21.640	31.470	-14.530	46.000
11.974	10.005	17.640	27.645	-22.355	50.000
17.939	10.208	0.410	10.618	-39.382	50.000
23.951	10.280	19.770	30.050	-19.950	50.000
29.189	10.330	12.250	22.580	-27.420	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 4: Internal Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.787	9.800	1.960	11.760	-44.240	56.000
2.127	9.810	3.820	13.630	-42.370	56.000
4.986	9.830	30.820	40.650	-15.350	56.000
11.974	9.965	19.640	29.605	-30.395	60.000
23.951	10.130	32.580	42.710	-17.290	60.000
28.443	10.130	14.770	24.900	-35.100	60.000
Average					
0.787	9.800	0.920	10.720	-35.280	46.000
2.127	9.810	1.910	11.720	-34.280	46.000
4.986	9.830	28.080	37.910	-8.090	46.000
11.974	9.965	19.320	29.285	-20.715	50.000
23.951	10.130	32.420	42.550	-7.450	50.000
28.443	10.130	13.640	23.770	-26.230	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 4: Internal Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.650	9.790	4.490	14.280	-41.720	56.000
4.970	9.830	30.940	40.770	-15.230	56.000
5.990	9.850	11.780	21.630	-38.370	60.000
11.974	10.005	19.640	29.645	-30.355	60.000
23.951	10.280	32.640	42.920	-17.080	60.000
27.138	10.310	6.370	16.680	-43.320	60.000
Average					
0.650	9.790	1.590	11.380	-34.620	46.000
4.970	9.830	27.390	37.220	-8.780	46.000
5.990	9.850	10.950	20.800	-29.200	50.000
11.974	10.005	10.190	20.195	-29.805	50.000
23.951	10.280	21.140	31.420	-18.580	50.000
27.138	10.310	1.730	12.040	-37.960	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Radiated Emission

3.1. Test Equipment

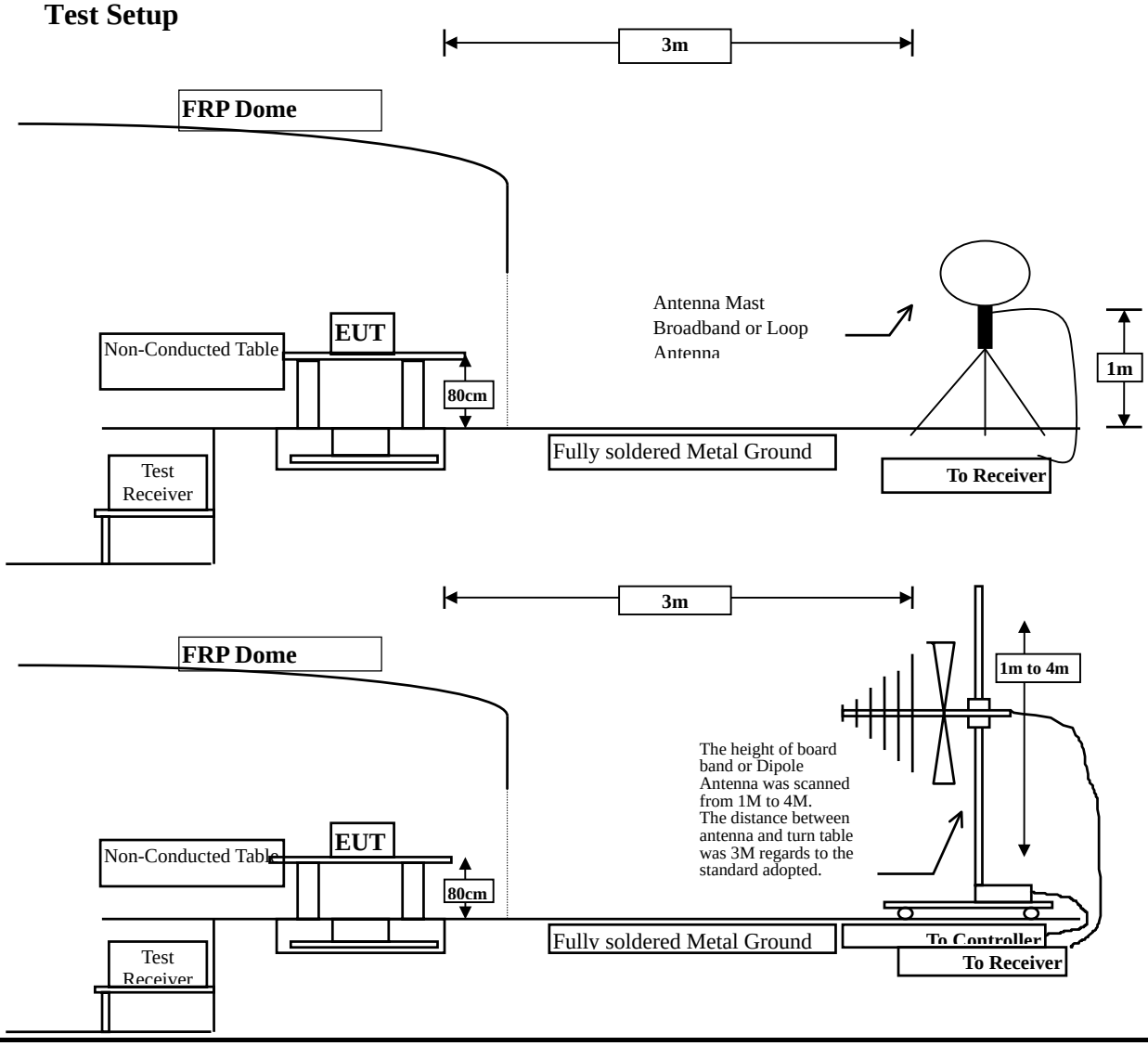
The following test equipment are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3	X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2009
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
	X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2009
	X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2009
	X	Horn Antenna	ETS	3115 / 0005-6160	July, 2009
	X	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2009
	X	Loop Antenna	SCHAFFNER	HLA 6120/26739	July, 2009

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

3.2. Test Setup



3.3. Limits

➢ Fundamental electric field strength Limit

FCC Part 15 Subpart C Paragraph 15.225 Limits				
Fundamental Frequency MHz	Field strength of fundamental			
	uV/m	Distance (meter)	dBuV/m	Distance (meter)
13.553 – 13.567	15848	30	103.08	10
13.410 – 13.553 and 13.567 – 13.710	334	30	79.55	10
13.110 – 13.410 and 13.710 – 14.010	106	30	59.58	10
Outside of the 13.110 – 14.010	See 15.209 Limits			

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

➢ Spurious electric field strength Limit

FCC Part 15 Subpart C Paragraph 15.209 Limits			
Frequency MHz	uV/m	dBuV/m	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	See Remark[1]	300
0.490-1.705	24000/F(kHz)	See Remark[1]	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4. Test Procedure

Fundamental electric field strength:
The EUT and its simulators are placed on a turn table which is 1 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum electric field strength.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna which is 1 meter above ground. All X-axis, Y-axis and Z-axis polarization of the antenna are set on measurement.

Spurious electric field strength:
The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4 on radiated measurement.
On any frequency the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz.

3.5. Uncertainty

± 2.6 dB below 30MHz
± 3.8 dB above 30MHz

3.6. Test Result of Radiated Emission

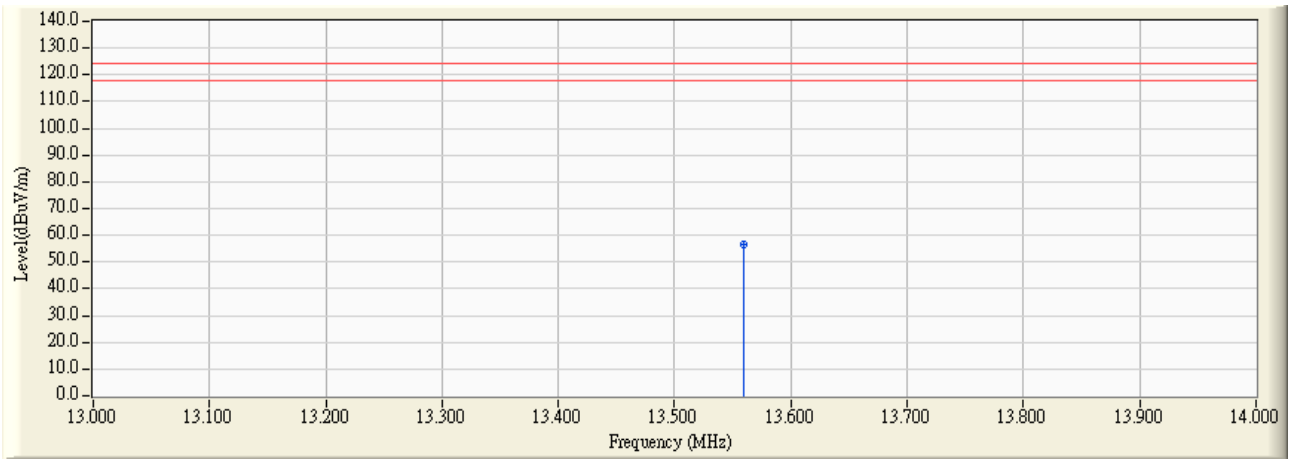
Product : TSC-RFID
Test Item : Fundamental Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Flexible Print Circuit Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
X-LINE					
Quasi-Peak					
13.560	20.486	36.030	56.516	-67.484	124.000
Y-LINE					
Quasi-Peak					
13.560	20.486	35.560	56.046	-67.954	124.000
Z-LINE					
Quasi-Peak					
13.560	20.486	34.040	54.526	-69.474	124.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

FUNDAMENTAL : ANT1-X



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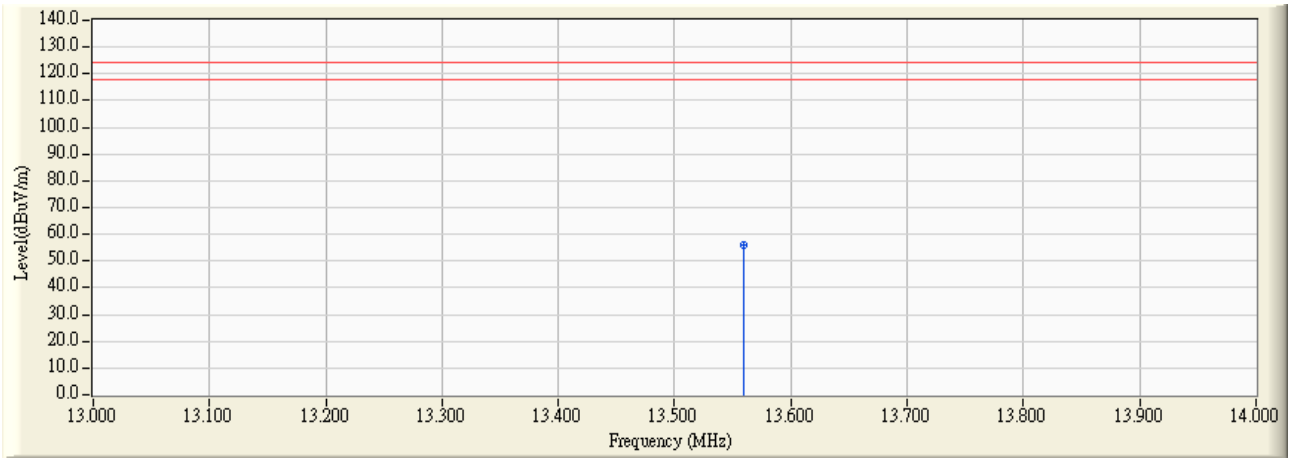
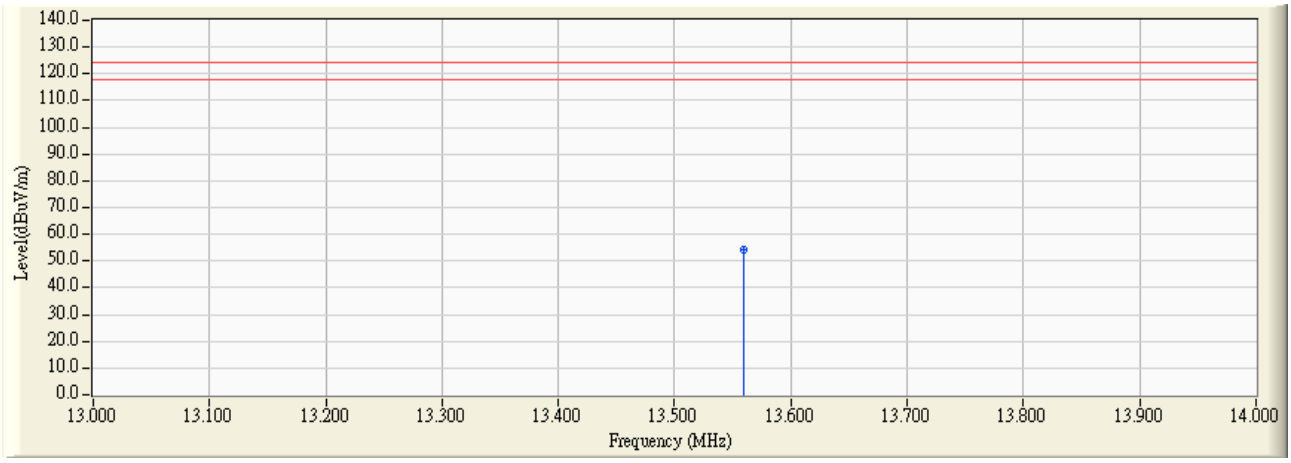


FUNDAMENTAL : ANT1-Z



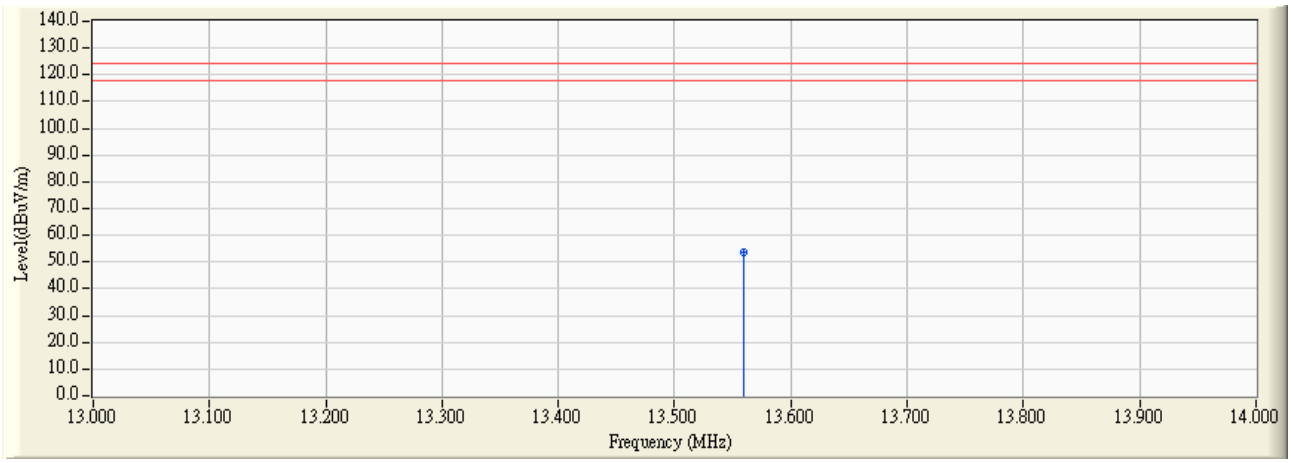
Product : TSC-RFID
Test Item : Fundamental Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 2: Print Antenna 6 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
X-LINE					
Quasi-Peak					
13.560	20.486	33.170	53.656	-70.344	124.000
Y-LINE					
Quasi-Peak					
13.560	20.486	33.610	54.096	-69.904	124.000
Z-LINE					
Quasi-Peak					
13.560	20.486	29.980	50.466	-73.534	124.000

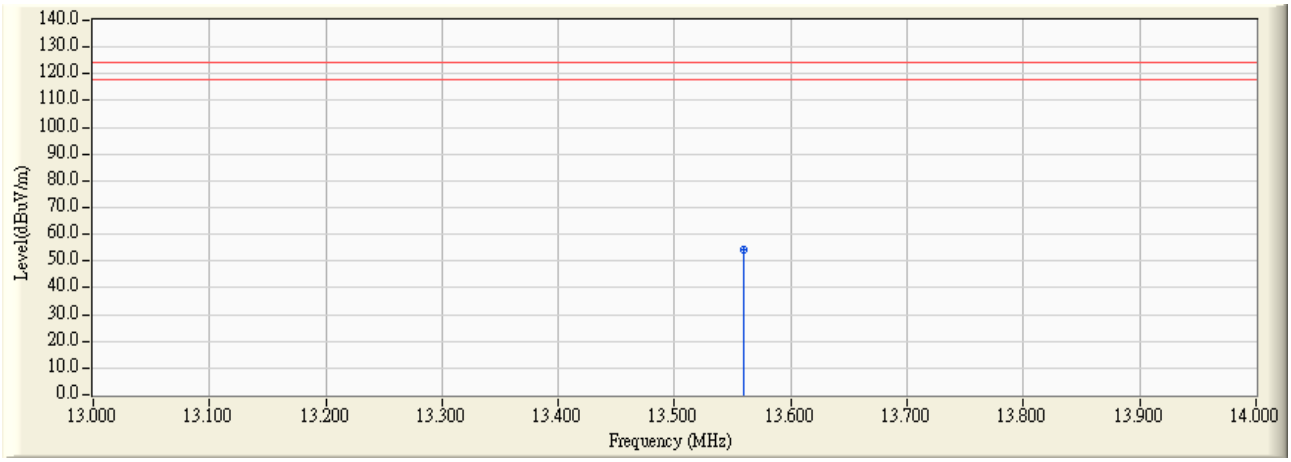
Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

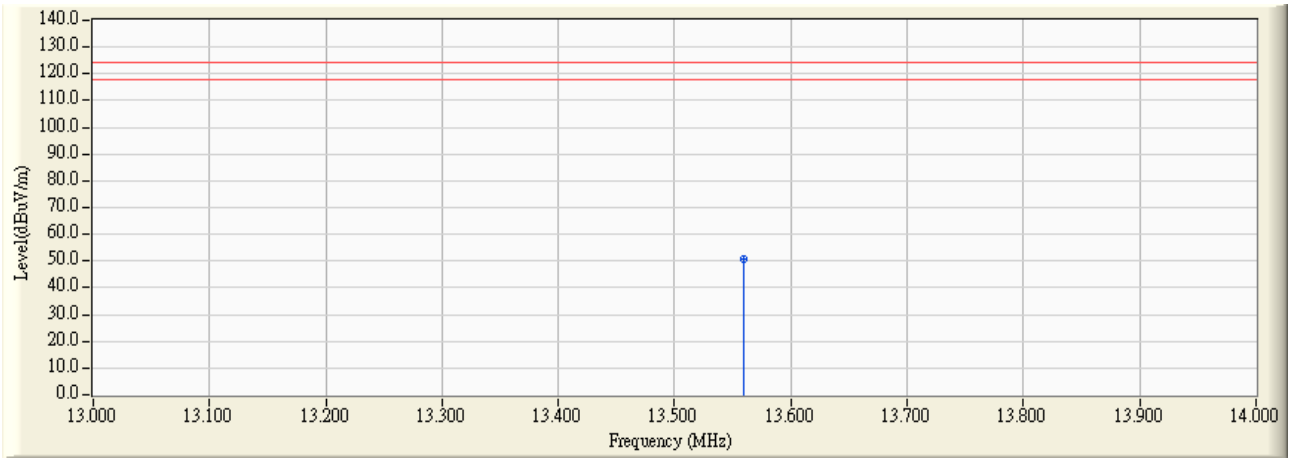
FUNDAMENTAL : ANT2-X



FUNDAMENTAL : ANT2-Y



FUNDAMENTAL : ANT2-Z



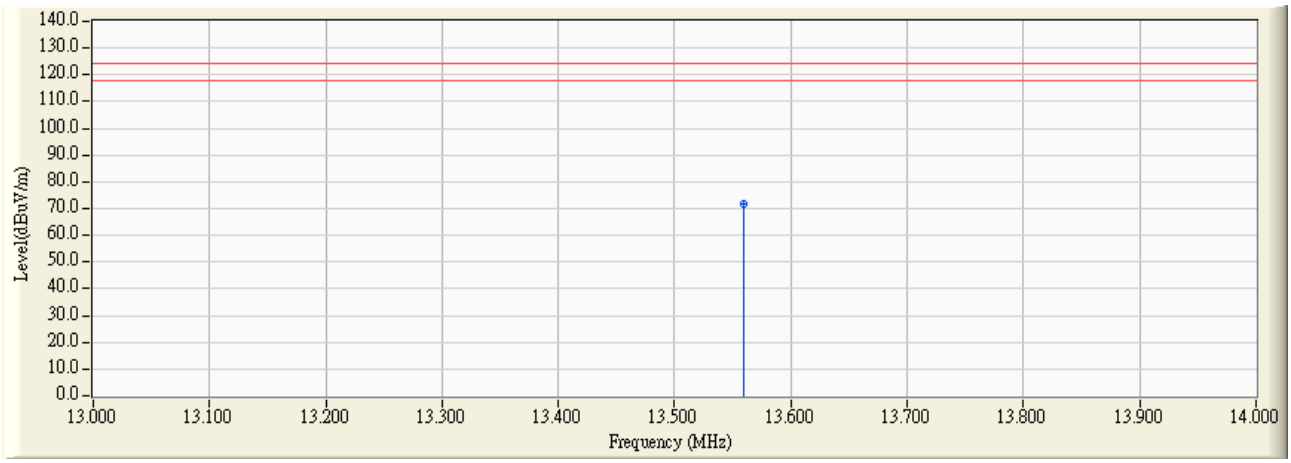
Product : TSC-RFID
Test Item : Fundamental Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 3: Print Antenna 4 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
X-LINE					
Quasi-Peak					
13.560	20.486	51.040	71.526	-52.474	124.000
Y-LINE					
Quasi-Peak					
13.560	20.486	50.800	71.286	-52.714	124.000
Z-LINE					
Quasi-Peak					
13.560	20.486	43.690	64.176	-59.824	124.000

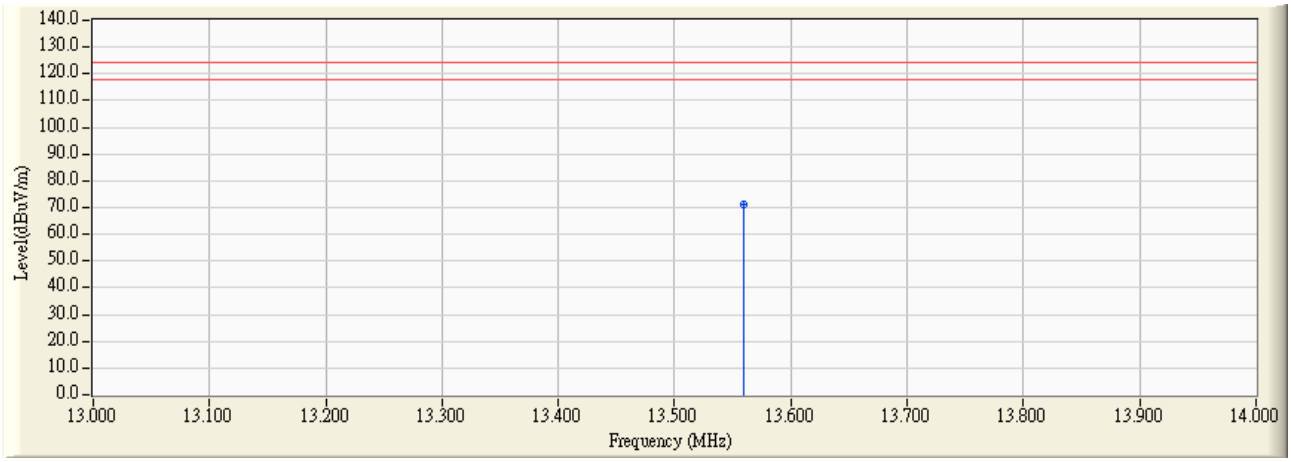
Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

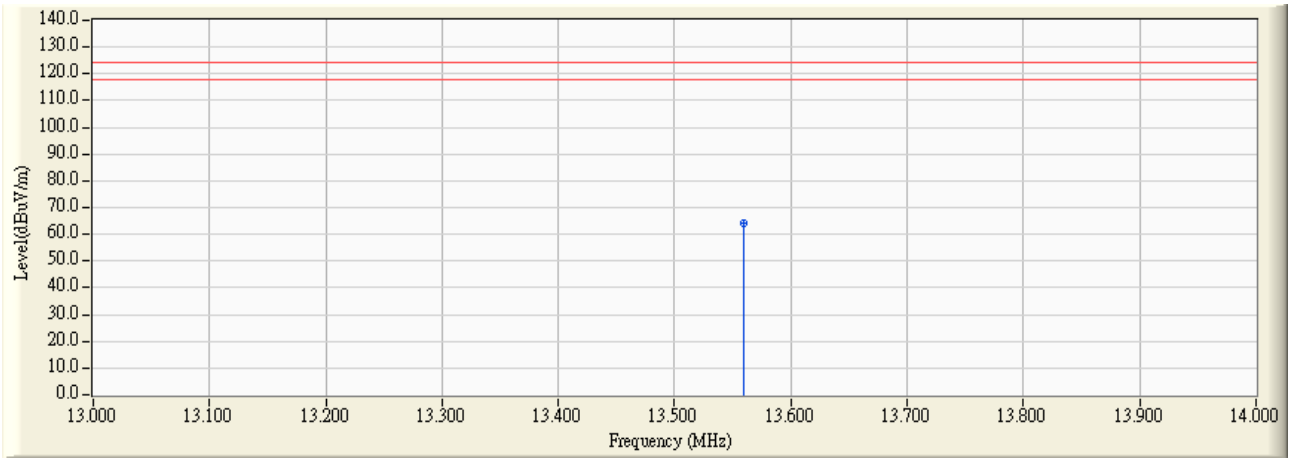
FUNDAMENTAL : ANT3-X



FUNDAMENTAL : ANT3-Y



FUNDAMENTAL : ANT3-Z



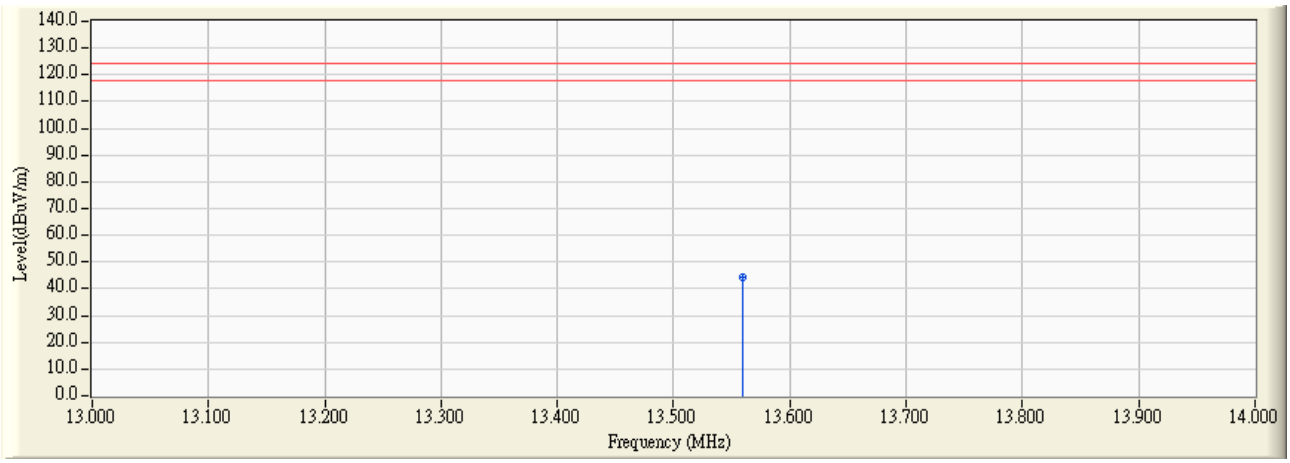
Product : TSC-RFID
Test Item : Fundamental Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 4: Internal Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
X-LINE					
Quasi-Peak					
13.560	20.486	23.560	44.046	-79.954	124.000
Y-LINE					
Quasi-Peak					
13.560	20.486	21.590	42.076	-81.924	124.000
Z-LINE					
Quasi-Peak					
13.560	20.486	10.920	31.406	-92.594	124.000

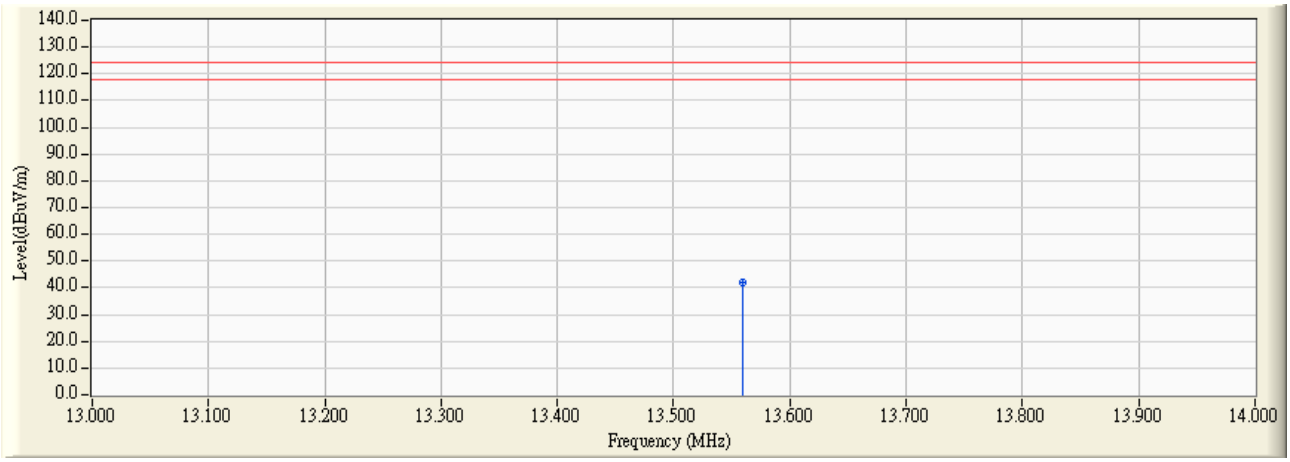
Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

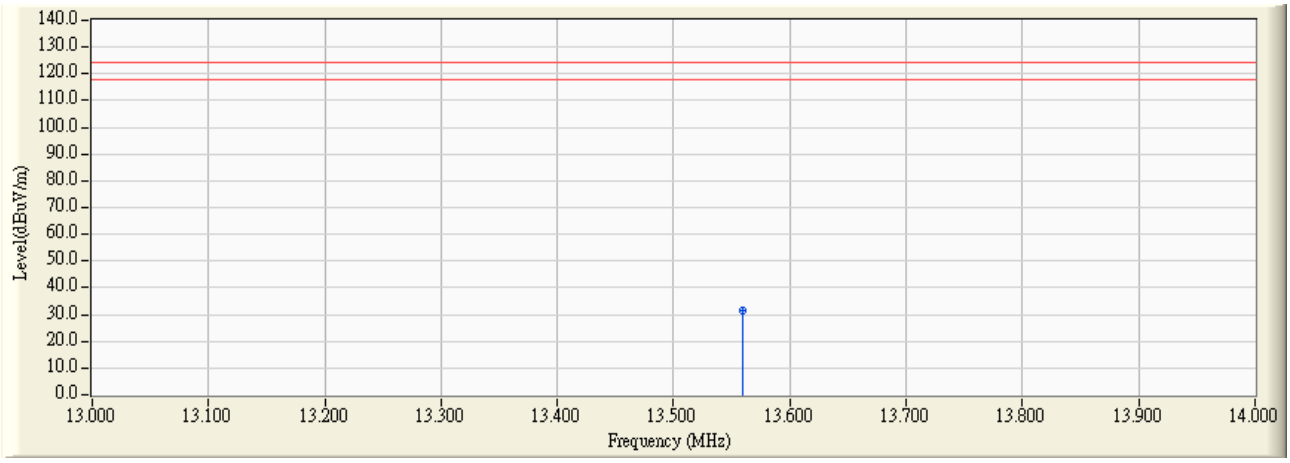
FUNDAMENTAL : ANT4-X



FUNDAMENTAL : ANT4-Y



FUNDAMENTAL : ANT4-Z



Product : TSC-RFID
Test Item : General Radiated Emission Data (below 30MHz)
Test Site : No.3 OATS
Test Mode : Mode 1: Flexible Print Circuit Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
27.120	20.470	15.220	35.690	-33.850	69.540

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : TSC-RFID
Test Item : General Radiated Emission Data (below 30MHz)
Test Site : No.3 OATS
Test Mode : Mode 2: Print Antenna 6 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
27.120	20.470	12.260	32.730	-36.810	69.540

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : TSC-RFID
Test Item : General Radiated Emission Data (below 30MHz)
Test Site : No.3 OATS
Test Mode : Mode 3: Print Antenna 4 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
27.120	20.470	16.660	37.130	-32.410	69.540

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : TSC-RFID
Test Item : General Radiated Emission Data (below 30MHz)
Test Site : No.3 OATS
Test Mode : Mode 4: Internal Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
27.120	20.470	16.660	37.130	-32.410	69.540

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : TSC-RFID
Test Item : General Radiated Emission Data (above 30MHz)
Test Site : No.3 OATS
Test Mode : Mode 1: Flexible Print Circuit Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
QP Detector					
136.914	-12.986	49.258	36.273	-7.227	43.500
203.006	-11.645	52.128	40.483	-3.017	43.500
271.042	-8.015	42.556	34.541	-11.459	46.000
298.257	-7.774	41.428	33.654	-12.346	46.000
397.395	-1.397	34.679	33.282	-12.718	46.000
679.259	3.593	28.531	32.124	-13.876	46.000
Vertical					
QP Detector					
99.980	-5.191	42.754	37.564	-5.936	43.500
133.026	-8.122	43.504	35.382	-8.118	43.500
185.511	-4.428	40.466	36.038	-7.462	43.500
203.006	-2.404	38.846	36.442	-7.058	43.500
397.395	-2.179	38.485	36.306	-9.694	46.000
735.631	1.895	32.924	34.819	-11.181	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : General Radiated Emission Data (above 30MHz)
Test Site : No.3 OATS
Test Mode : Mode 2: Print Antenna 6 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
QP Detector					
203.006	-11.645	43.195	31.550	-11.950	43.500
271.042	-8.015	40.232	32.217	-13.783	46.000
298.257	-7.774	42.686	34.912	-11.088	46.000
638.437	4.180	29.114	33.294	-12.706	46.000
679.259	3.593	31.725	35.318	-10.682	46.000
875.591	4.380	29.309	33.689	-12.311	46.000
Vertical					
QP Detector					
35.832	-6.885	43.842	36.957	-3.043	40.000
99.980	-5.191	42.109	36.919	-6.581	43.500
133.026	-8.122	45.056	36.934	-6.566	43.500
203.006	-2.404	38.410	36.006	-7.494	43.500
232.164	-2.918	36.638	33.720	-12.280	46.000
389.619	-2.726	37.418	34.692	-11.308	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : General Radiated Emission Data (above 30MHz)
Test Site : No.3 OATS
Test Mode : Mode 3: Print Antenna 4 Circle

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
QP Detector					
107.756	-7.641	45.339	37.698	-5.802	43.500
298.257	-7.774	42.247	34.473	-11.527	46.000
496.533	-0.360	31.796	31.436	-14.564	46.000
611.222	4.250	27.153	31.403	-14.597	46.000
735.631	3.645	27.529	31.174	-14.826	46.000
875.591	4.380	26.911	31.291	-14.709	46.000
Vertical					
QP Detector					
94.148	-7.185	40.263	33.078	-10.422	43.500
136.914	-7.602	42.719	35.118	-8.382	43.500
203.006	-2.404	38.927	36.523	-6.977	43.500
216.613	-2.648	37.721	35.073	-10.927	46.000
377.956	-3.543	36.145	32.602	-13.398	46.000
599.559	0.934	30.237	31.170	-14.830	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : TSC-RFID
Test Item : General Radiated Emission Data (above 30MHz)
Test Site : No.3 OATS
Test Mode : Mode 4: Internal Antenna

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
QP Detector					
94.148	-8.515	41.744	33.229	-10.271	43.500
107.756	-7.641	45.107	37.466	-6.034	43.500
298.257	-7.774	42.878	35.104	-10.896	46.000
311.864	-6.969	40.146	33.177	-12.823	46.000
723.968	3.500	28.349	31.849	-14.151	46.000
875.591	4.380	26.486	30.866	-15.134	46.000
Vertical					
QP Detector					
203.006	-2.404	38.719	36.315	-7.185	43.500
216.613	-2.648	37.345	34.697	-11.303	46.000
376.012	-3.684	38.668	34.984	-11.016	46.000
442.104	-1.730	33.720	31.990	-14.010	46.000
611.222	1.074	29.679	30.753	-15.247	46.000
875.591	4.802	27.833	32.635	-13.365	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

4. Band Edge

4.1. Test Equipment

The following test equipments are used during the band edge tests:

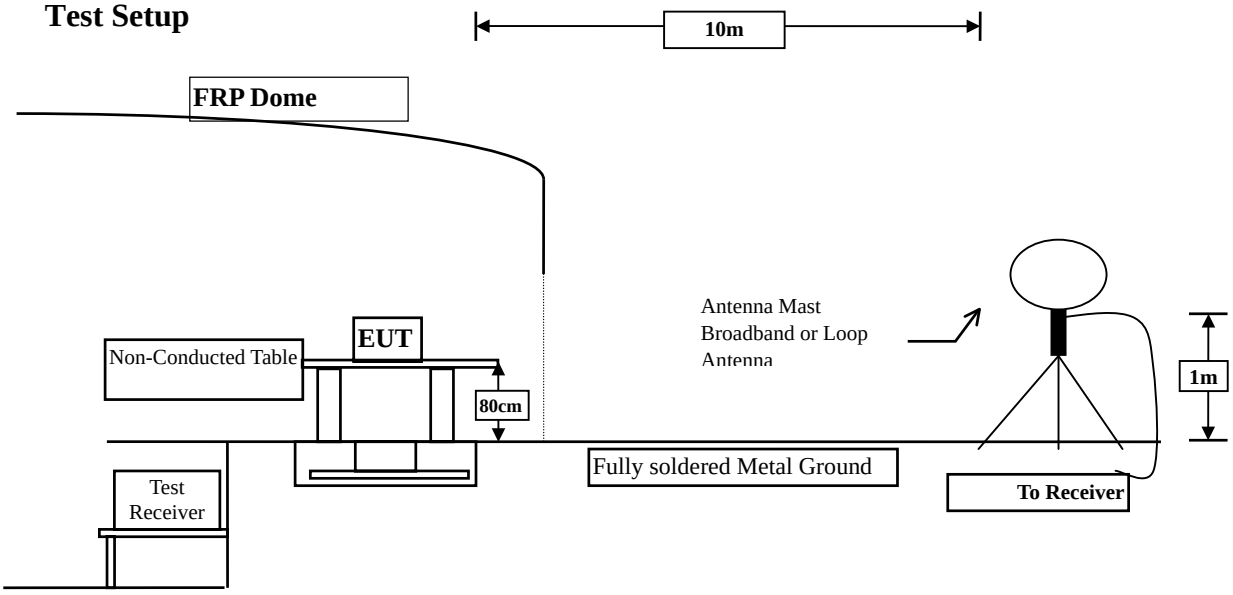
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2009
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2009
X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2009
X	Horn Antenna	ETS	3115 / 0005-6160	July, 2009
X	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2009
X	Loop Antenna	R & S	HFH2-Z2/833799/004	July, 2009

Test Site: Site 3

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

4.2. Test Setup



4.3. Limits

In any 9 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 50 dB below that in the 9 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

4.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4 on radiated measurement.
The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz.

4.5. Uncertainty

Radiated is ± 2.6 dB

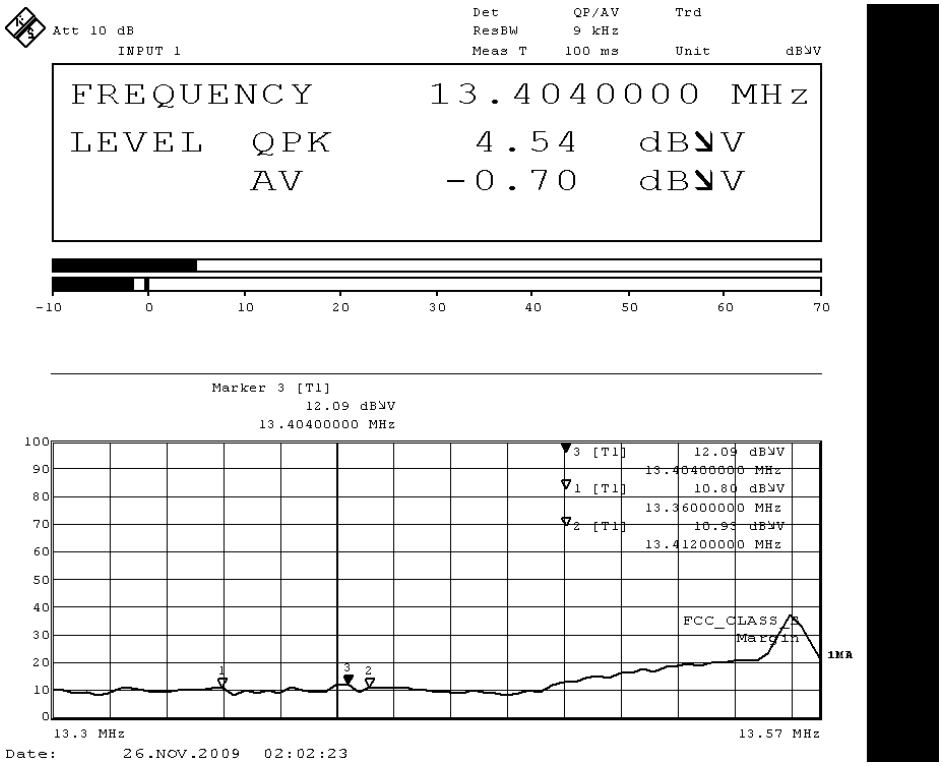
4.6. Test Result of Band Edge

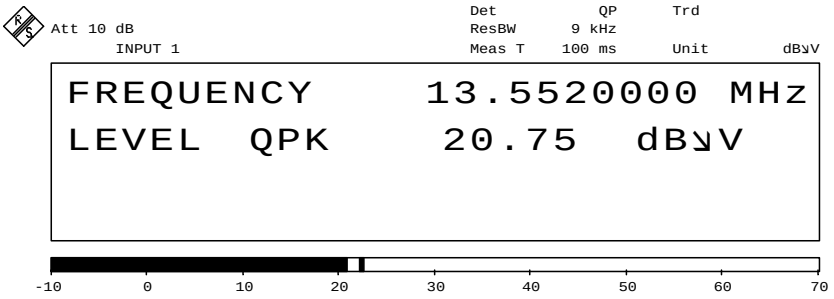
Product : TSC-RFID
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Flexible Print Circuit Antenna

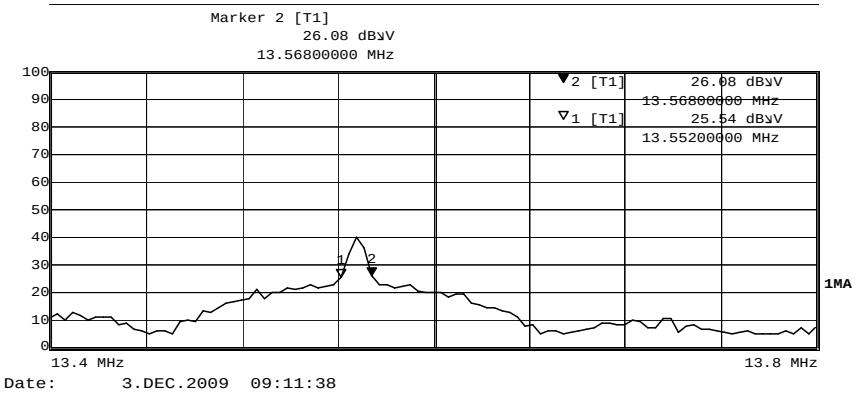
RF Radiated Measurement :

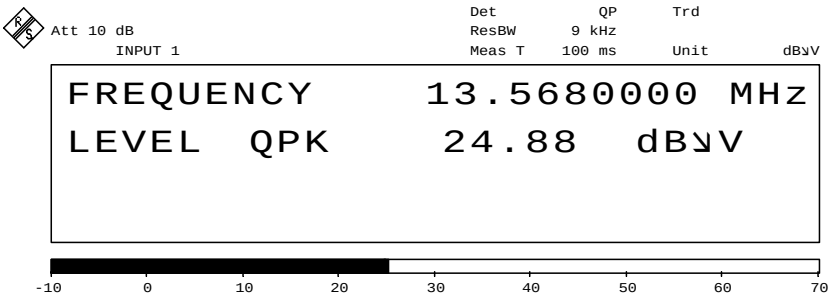
Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	QP Limit (dBuV/m)	Result
1 (Quasi-Peak)	13.404	20.480	4.540	25.020	69.540	Pass
2 (Quasi-Peak)	13.552	20.485	20.750	41.235	69.540	Pass
3 (Quasi-Peak)	13.568	20.487	24.880	45.367	69.540	Pass

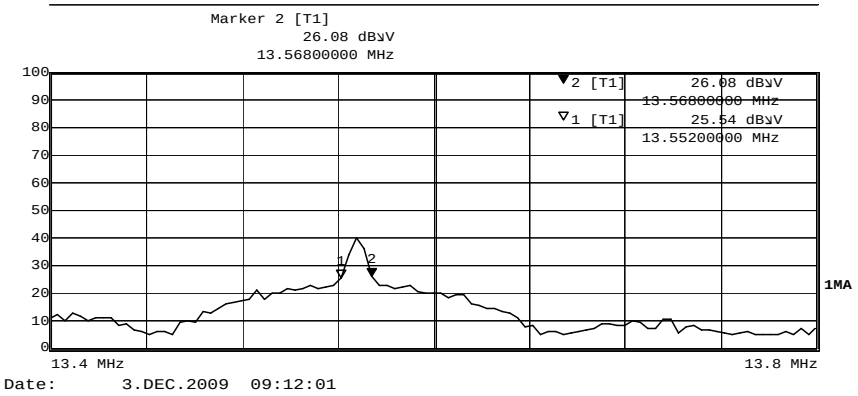
Figure Channel 1: (Band Edge Data see mark 4)




Att 10 dB
INPUT 1
Det QP Trd
ResBW 9 kHz
Meas T 100 ms Unit dBµV
FREQUENCY 13.5520000 MHz
LEVEL QPK 20.75 dBµV
-10 0 10 20 30 40 50 60 70


Marker 2 [T1]
26.08 dBµV
13.56800000 MHz
2 [T1] 26.08 dBµV
13.56800000 MHz
1 [T1] 25.54 dBµV
13.55200000 MHz
1MA
13.4 MHz
13.8 MHz
Date: 3.DEC.2009 09:11:38


Att 10 dB
INPUT 1
Det QP Trd
ResBW 9 kHz
Meas T 100 ms Unit dBµV
FREQUENCY 13.5680000 MHz
LEVEL QPK 24.88 dBµV
-10 0 10 20 30 40 50 60 70

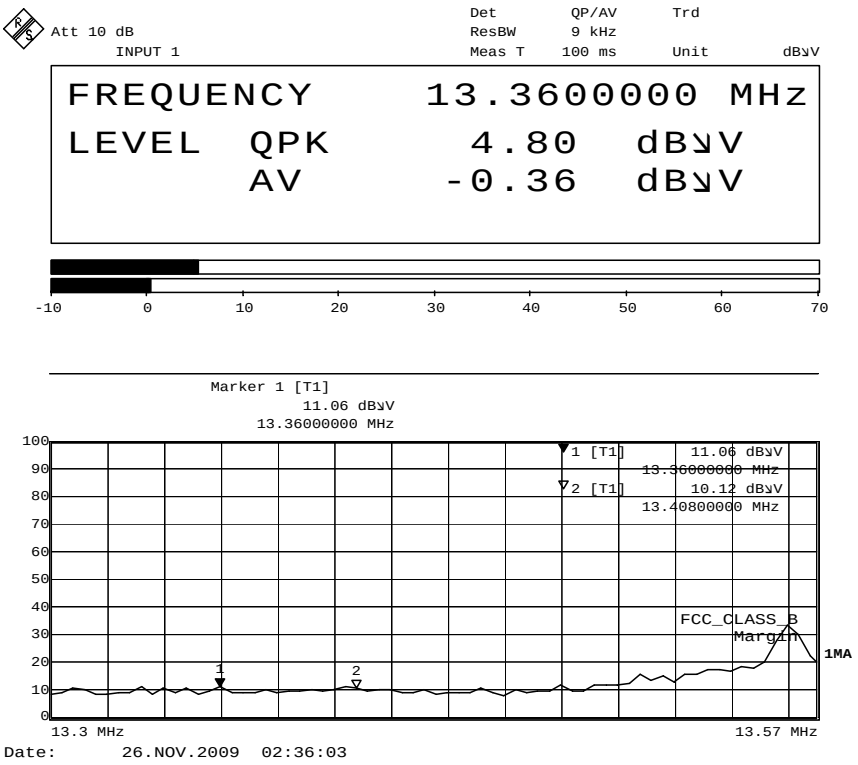

Marker 2 [T1]
26.08 dBµV
13.56800000 MHz
2 [T1] 26.08 dBµV
13.56800000 MHz
1 [T1] 25.54 dBµV
13.55200000 MHz
1MA
13.4 MHz
13.8 MHz
Date: 3.DEC.2009 09:12:01

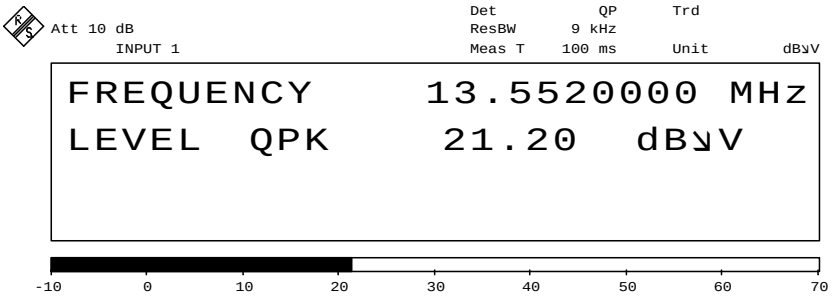
Product : TSC-RFID
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 2: Print Antenna 6 Circle

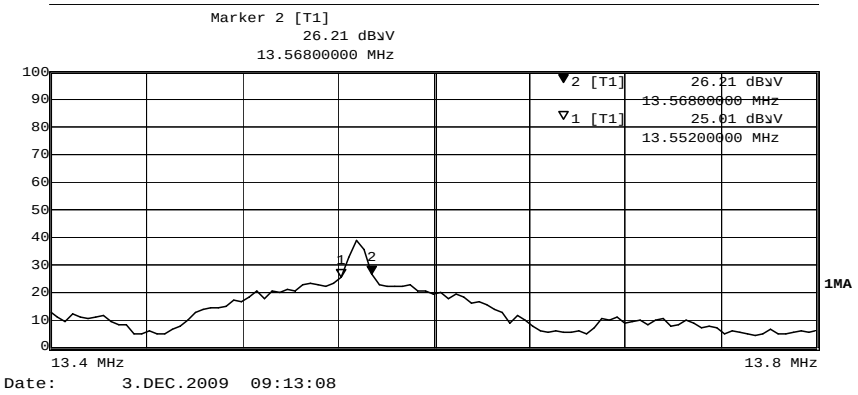
RF Radiated Measurement :

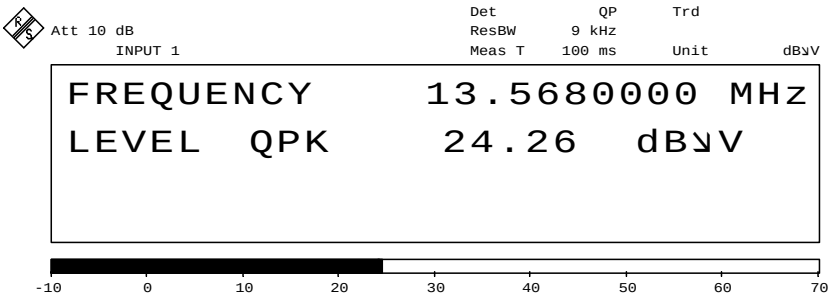
Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	QP Limit (dBuV/m)	Result
1 (Quasi-Peak)	13.360	20.473	4.800	25.273	69.540	Pass
2 (Quasi-Peak)	13.552	20.485	21.200	41.685	69.540	Pass
3 (Quasi-Peak)	13.568	20.487	24.260	44.747	69.540	Pass

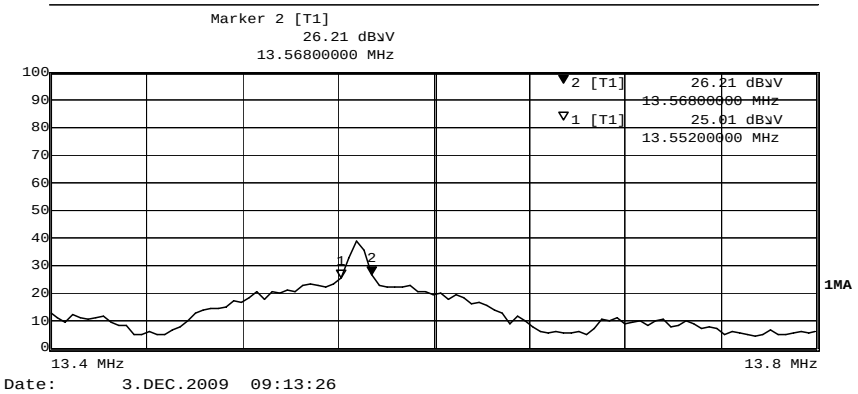
Figure Channel 1: (Band Edge Data see mark 4)




Att 10 dB
INPUT 1
Det QP Trd
ResBW 9 kHz
Meas T 100 ms Unit dBµV
FREQUENCY 13.5520000 MHz
LEVEL QPK 21.20 dBµV
-10 0 10 20 30 40 50 60 70


Marker 2 [T1]
26.21 dBµV
13.56800000 MHz
2 [T1] 26.21 dBµV
13.56800000 MHz
1 [T1] 25.01 dBµV
13.55200000 MHz
1MA
13.4 MHz
13.8 MHz
Date: 3.DEC.2009 09:13:08


Att 10 dB
INPUT 1
Det QP Trd
ResBW 9 kHz
Meas T 100 ms Unit dBµV
FREQUENCY 13.5680000 MHz
LEVEL QPK 24.26 dBµV
-10 0 10 20 30 40 50 60 70

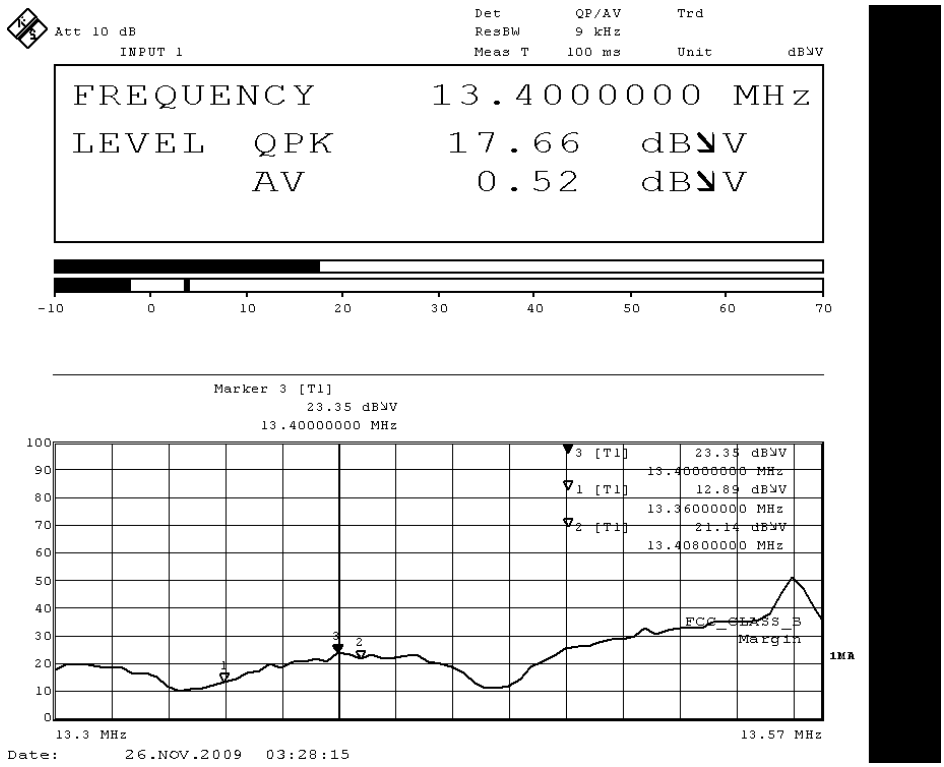

Marker 2 [T1]
26.21 dBµV
13.56800000 MHz
2 [T1] 26.21 dBµV
13.56800000 MHz
1 [T1] 25.01 dBµV
13.55200000 MHz
1MA
13.4 MHz
13.8 MHz
Date: 3.DEC.2009 09:13:26

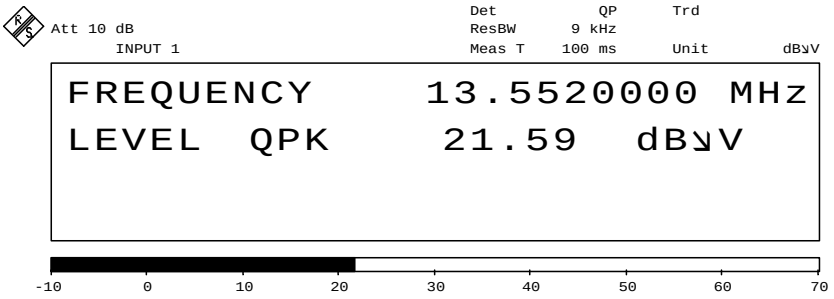
Product : TSC-RFID
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 3: Print Antenna 4 Circle

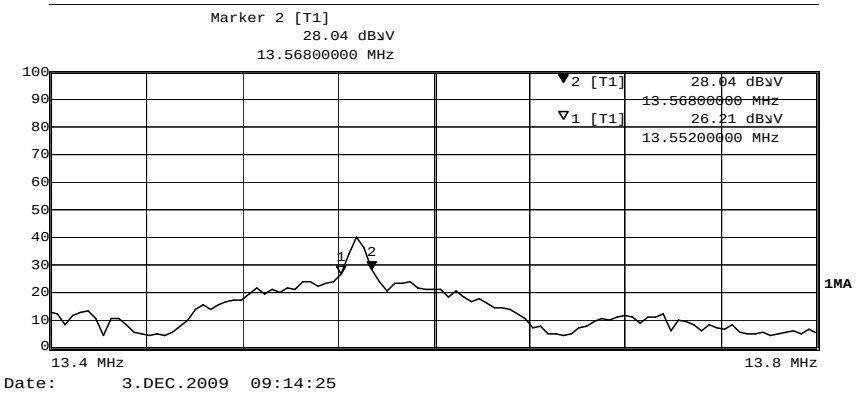
RF Radiated Measurement :

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	QP Limit (dBuV/m)	Result
1 (Quasi-Peak)	13.400	20.480	17.660	38.140	69.540	Pass
2 (Quasi-Peak)	13.552	20.485	21.590	42.075	69.540	Pass
3 (Quasi-Peak)	13.568	20.487	24.400	44.887	69.540	Pass

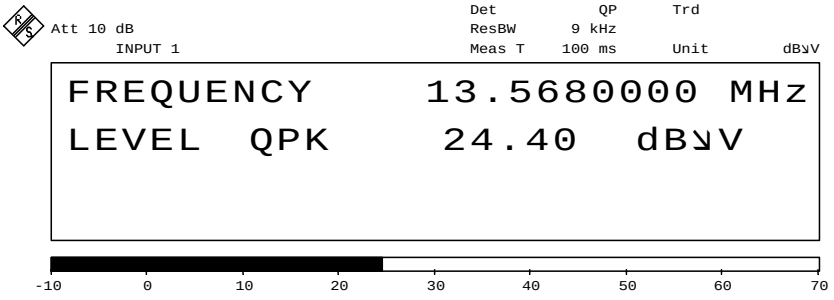
Figure Channel 1: (Band Edge Data see mark 4)

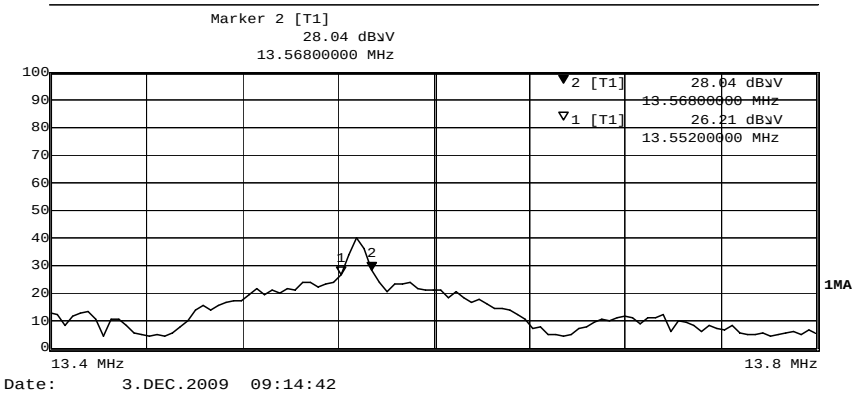






Date: 3.DEC.2009 09:14:25





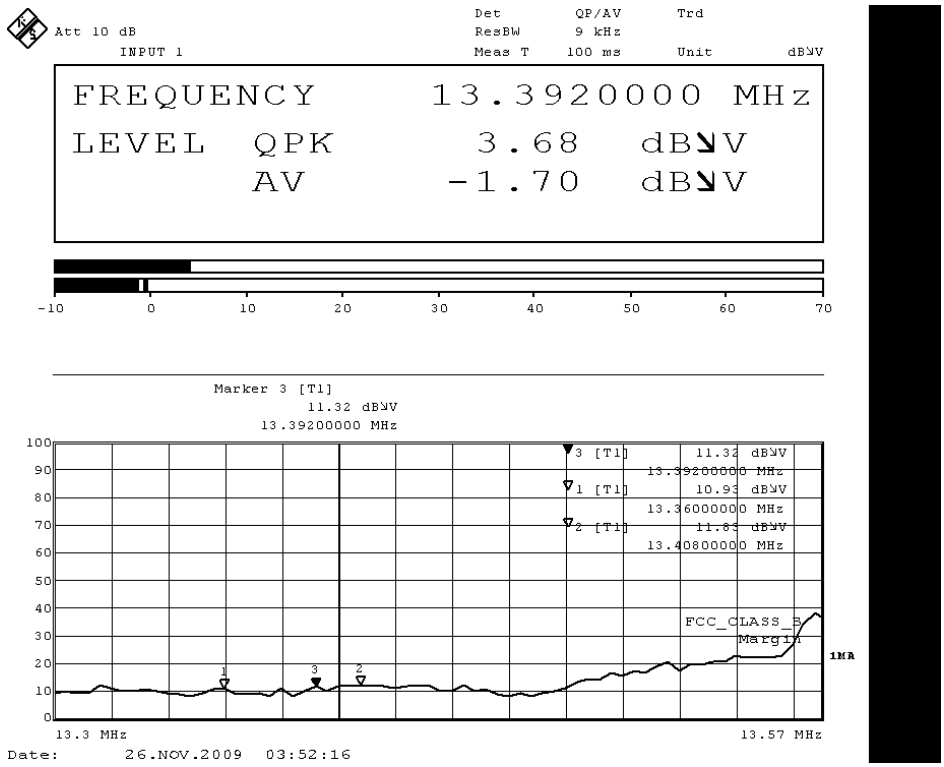
Date: 3.DEC.2009 09:14:42

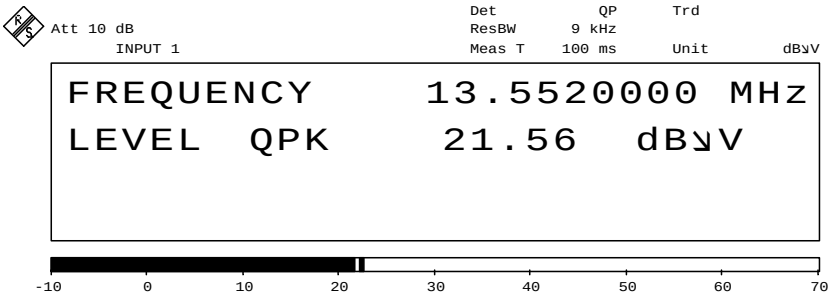
Product : TSC-RFID
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 4: Internal Antenna

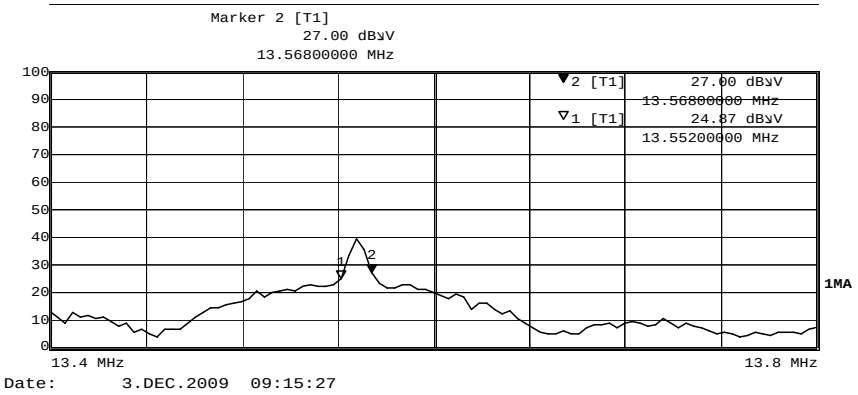
RF Radiated Measurement :

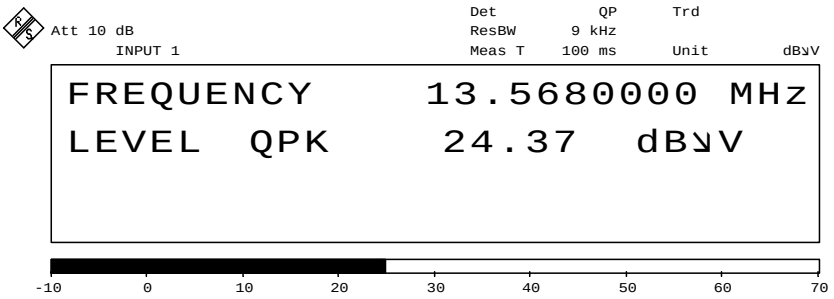
Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	QP Limit (dBuV/m)	Result
1 (Quasi-Peak)	13.392	20.480	3.680	24.160	69.540	Pass
2 (Quasi-Peak)	13.552	20.485	21.560	42.045	69.540	Pass
3 (Quasi-Peak)	13.568	20.487	24.370	44.857	69.540	Pass

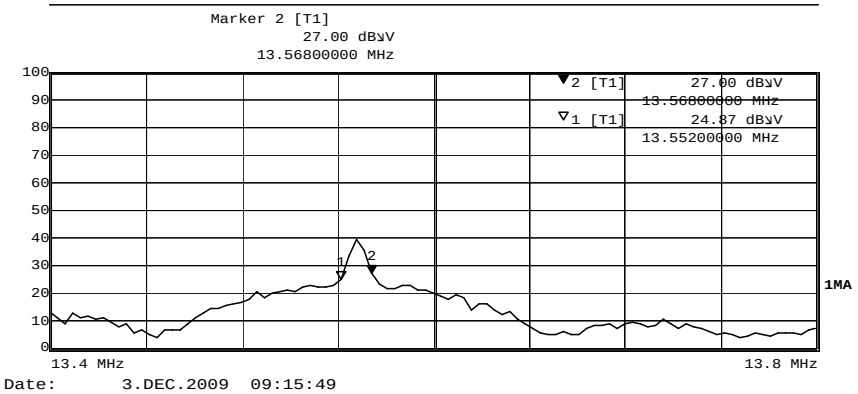
Figure Channel 1: (Band Edge Data see mark 4)




Att 10 dB
INPUT 1
Det QP Trd
ResBW 9 kHz
Meas T 100 ms Unit dBµV
FREQUENCY 13.5520000 MHz
LEVEL QPK 21.56 dBµV
-10 0 10 20 30 40 50 60 70


Marker 2 [T1]
27.00 dBµV
13.56800000 MHz
2 [T1] 27.00 dBµV
13.56800000 MHz
1 [T1] 24.87 dBµV
13.55200000 MHz
1MA
13.4 MHz
13.8 MHz
Date: 3.DEC.2009 09:15:27


Att 10 dB
INPUT 1
Det QP Trd
ResBW 9 kHz
Meas T 100 ms Unit dBµV
FREQUENCY 13.5680000 MHz
LEVEL QPK 24.37 dBµV
-10 0 10 20 30 40 50 60 70


Marker 2 [T1]
27.00 dBµV
13.56800000 MHz
2 [T1] 27.00 dBµV
13.56800000 MHz
1 [T1] 24.87 dBµV
13.55200000 MHz
1MA
13.4 MHz
13.8 MHz
Date: 3.DEC.2009 09:15:49

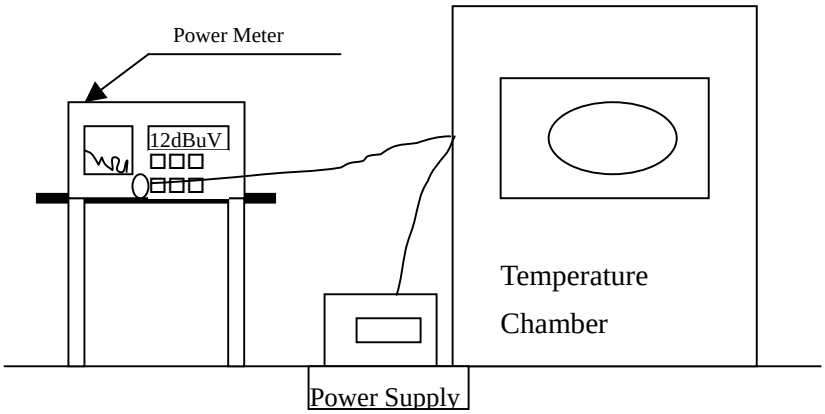
5. Frequency Tolerance

5.1. Test Equipment

Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Remark
Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009	
Temperature Chamber	WIT GROUP	TH-1S-B / WIT-02121901	June, 2009	

Note: All equipments are calibrated every one year.

5.2. Test Setup



5.3. Limits

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency.

5.4. Test Procedure

The over 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.

5.5. Uncertainty

± 150 Hz

5.6. Test Result of Frequency Stability

Product : TSC-RFID
Test Item : Frequency Tolerance
Test Site : Temperature Chamber
Test Mode : Mode 1: Flexible Print Circuit Antenna

Test Conditions						Ref. Freq. (MHz)	Measure Level (MHz)	Limits (MHz)			Magin (MHz)	Result
T_{nom}	20	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{nom}	20	℃	V_{hight}	DC 5.75	V	13.55895	13.55894	13.55759	~	13.56031	0.00001	PASS
T_{nom}	20	℃	V_{low}	DC 4.25	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS
T_{max}	50	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{max}	40	℃	V_{nom}	DC 5	V	13.55895	13.55894	13.55759	~	13.56031	0.00001	PASS
T_{min}	30	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{min}	10	℃	V_{nom}	DC 5	V	13.55895	13.55897	13.55759	~	13.56031	-0.00002	PASS
T_{min}	0	℃	V_{nom}	DC 5	V	13.55895	13.55896	13.55759	~	13.56031	-0.00001	PASS
T_{min}	-10	℃	V_{nom}	DC 5	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS
T_{min}	-20	℃	V_{nom}	DC 5	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS

Note: Limit= Ref. Freq. * (±) 0.01% = 13.4244~13.6956MHz

Product : TSC-RFID
Test Item : Frequency Tolerance
Test Site : Temperature Chamber
Test Mode : Mode 2: Print Antenna 6 Circle

Test Conditions						Ref. Freq. (MHz)	Measure Level (MHz)	Limits (MHz)			Magin (MHz)	Result
T_{nom}	20	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{nom}	20	℃	V_{hight}	DC 5.75	V	13.55895	13.55894	13.55759	~	13.56031	0.00001	PASS
T_{nom}	20	℃	V_{low}	DC 4.25	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS
T_{max}	50	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{max}	40	℃	V_{nom}	DC 5	V	13.55895	13.55894	13.55759	~	13.56031	0.00001	PASS
T_{min}	30	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{min}	10	℃	V_{nom}	DC 5	V	13.55895	13.55897	13.55759	~	13.56031	-0.00002	PASS
T_{min}	0	℃	V_{nom}	DC 5	V	13.55895	13.55896	13.55759	~	13.56031	-0.00001	PASS
T_{min}	-10	℃	V_{nom}	DC 5	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS
T_{min}	-20	℃	V_{nom}	DC 5	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS

Note: Limit= Ref. Freq. * (±) 0.01% = 13.4244~13.6956MHz

Product : TSC-RFID
Test Item : Frequency Tolerance
Test Site : Temperature Chamber
Test Mode : Mode 3: Print Antenna 4 Circle

Test Conditions						Ref. Freq. (MHz)	Measure Level (MHz)	Limits (MHz)			Magin (MHz)	Result
T_{nom}	20	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{nom}	20	℃	V_{hight}	DC 5.75	V	13.55895	13.55894	13.55759	~	13.56031	0.00001	PASS
T_{nom}	20	℃	V_{low}	DC 4.25	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS
T_{max}	50	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{max}	40	℃	V_{nom}	DC 5	V	13.55895	13.55894	13.55759	~	13.56031	0.00001	PASS
T_{min}	30	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{min}	10	℃	V_{nom}	DC 5	V	13.55895	13.55897	13.55759	~	13.56031	-0.00002	PASS
T_{min}	0	℃	V_{nom}	DC 5	V	13.55895	13.55896	13.55759	~	13.56031	-0.00001	PASS
T_{min}	-10	℃	V_{nom}	DC 5	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS
T_{min}	-20	℃	V_{nom}	DC 5	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS

Note: Limit= Ref. Freq. * (±) 0.01% = 13.4244~13.6956MHz

Product : TSC-RFID
Test Item : Frequency Tolerance
Test Site : Temperature Chamber
Test Mode : Mode 4: Internal Antenna

Test Conditions						Ref. Freq. (MHz)	Measure Level (MHz)	Limits (MHz)			Magin (MHz)	Result
T_{nom}	20	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{nom}	20	℃	V_{hight}	DC 5.75	V	13.55895	13.55894	13.55759	~	13.56031	0.00001	PASS
T_{nom}	20	℃	V_{low}	DC 4.25	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS
T_{max}	50	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{max}	40	℃	V_{nom}	DC 5	V	13.55895	13.55894	13.55759	~	13.56031	0.00001	PASS
T_{min}	30	℃	V_{nom}	DC 5	V	13.55895	13.55895	13.55759	~	13.56031	0.00000	PASS
T_{min}	10	℃	V_{nom}	DC 5	V	13.55895	13.55897	13.55759	~	13.56031	-0.00002	PASS
T_{min}	0	℃	V_{nom}	DC 5	V	13.55895	13.55896	13.55759	~	13.56031	-0.00001	PASS
T_{min}	-10	℃	V_{nom}	DC 5	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS
T_{min}	-20	℃	V_{nom}	DC 5	V	13.55895	13.55893	13.55759	~	13.56031	0.00002	PASS

Note: Limit= Ref. Freq. * (±) 0.01% = 13.4244~13.6956MHz

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 1: EUT Test Setup Photographs

Front View of Conducted Test - Mode 1

Back View of Conducted Test - Mode 1

Front View of Conducted Test - Mode 2

Back View of Conducted Test - Mode 2

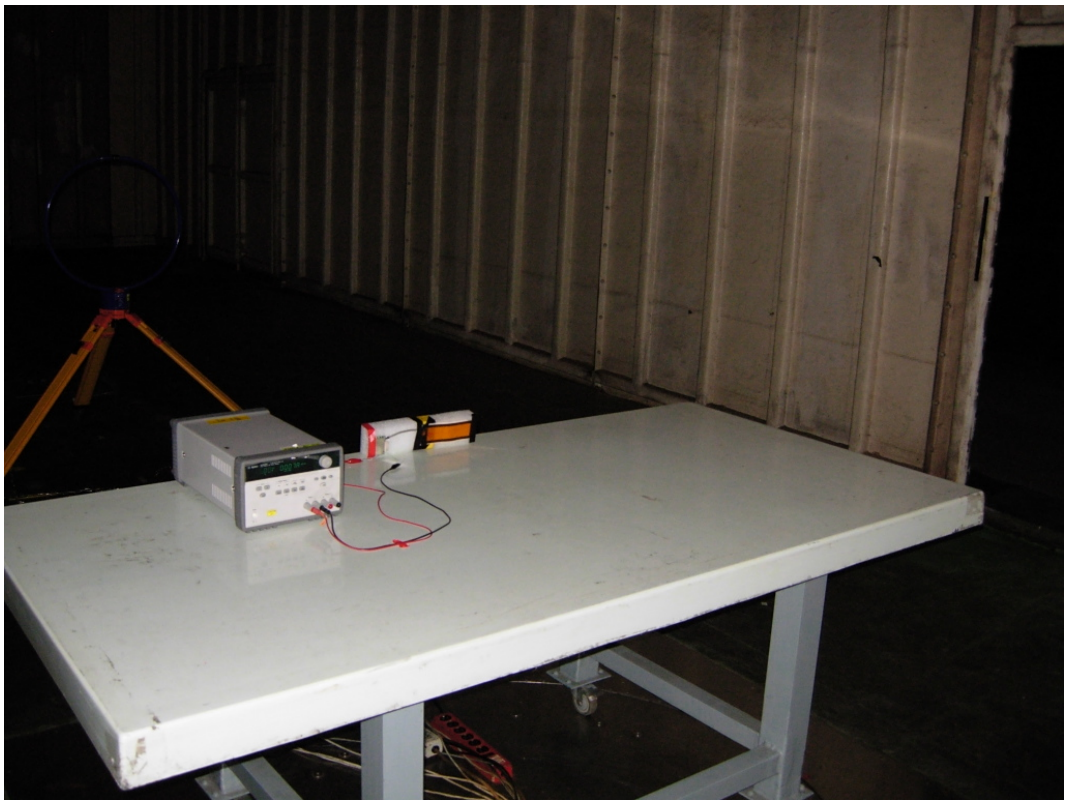
Front View of Conducted Test - Mode 3

Back View of Conducted Test - Mode 3

Front View of Conducted Test - Mode 4

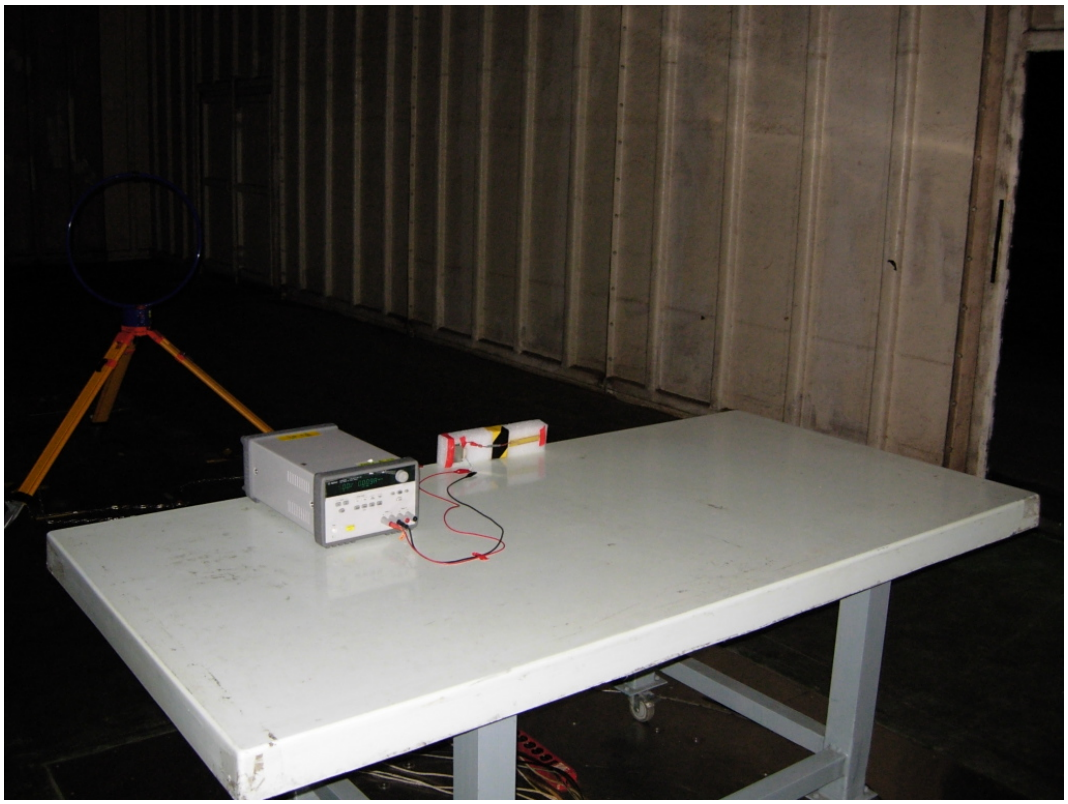
Back View of Conducted Test - Mode 4

Front View of Radiated Test (below 30MHz) - Loop - Mode 1



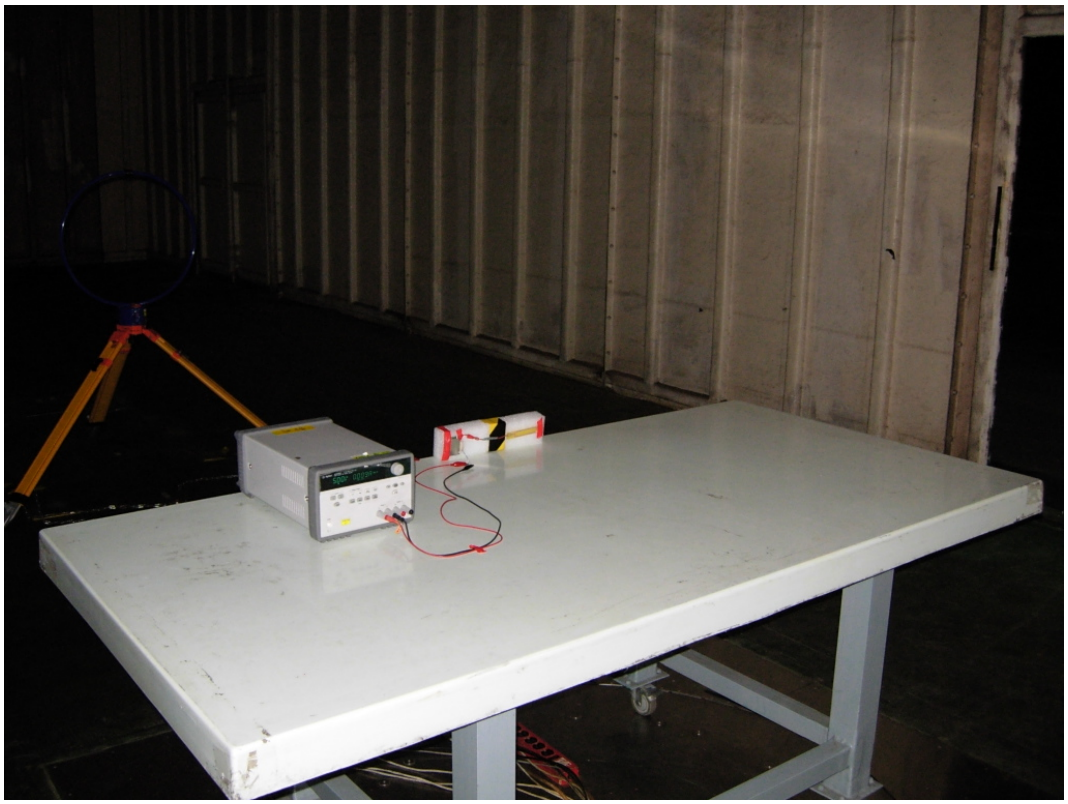
Back View of Radiated Test (below 30MHz) - Loop - Mode 1

Front View of Radiated Test (below 30MHz) - Loop - Mode 2



Back View of Radiated Test (below 30MHz) - Loop - Mode 2

Front View of Radiated Test (below 30MHz) - Loop - Mode 3



Back View of Radiated Test (below 30MHz) - Loop - Mode 3