CONFORMANCE TEST REPORT
FOR
FCC 47 CFR, Part 15 Subpart C

Report No.: ET94S-05-189-01

Client:	AMIC Technology Corporation.
Product:	RFID Reader
Trade Name:	AMIC
Model No.:	A9281-A-000
FCC ID:	S8RA9281-A-000
Manufacturer/supplier:	AMIC Technology Corporation.

Date test item received:	2005/05/26
Date test campaign completed:	2005/06/29
Date of issue:	2005/06/29

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Total number of pages of this test report: 23 pages

Total number of pages of photos: External photos 1 page
Internal photos 3 pages
Setup photos 7 pages

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Manufacturer	: AMIC Technology Corporation.
Address	: No. 2, Li-Hsin 6th Road, Science-Based Industrial Park, Hsin-Chu City, 300, Taiwan, R.O.C.
EUT	: RFID Reader
Trade name	: AMIC
Model No.	: A9281-A-000
Power Source	: 3.3V DC
Regulations applied	: FCC 47 CFR, Part 15 Subpart C (2004)

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Table of Contents Page

1. GENERAL INFORMATION 4

1.1 PRODUCT DESCRIPTION 4
1.2 CHARACTERISTICS OF DEVICE: 4
1.3 TEST METHODOLOGY 4
1.4 TEST FACILITY 4

2. TEST SYSTEM AND LIMITATION 5

2.1 DEVICE FOR TESTED SYSTEM 5
2.2 RESTRICTED BANDS OF OPERATION 5
2.3 LIMITATION 6
2.4 LABELING REQUIREMENT 7
2.5 USER INFORMATION 7

3. RADIATED EMISSION MEASUREMENT 8

3.1 APPLICABLE STANDARD 8
3.2 MEASUREMENT PROCEDURE 8
3.3 TEST DATA 11
3.4 CALCULATION 14
3.5 RADIATED TEST EQUIPMENT 14
3.6 MEASURING INSTRUMENT SETUP 15

4. FREQUENCY STABILITY 16

4.1 APPLICABLE STANDARD 16
4.2 TEST EQUIPMENT 16
4.3 TEST SETUP 16

5. CONDUCTED EMISSION MEASUREMENT 19

5.1 STANDARD APPLICABLE 19
5.2 MEASUREMENT PROCEDURE 19
5.3 CONDUCTED EMISSION DATA 20
5.4 RESULT DATA CALCULATION 23
5.5 CONDUCTED MEASUREMENT EQUIPMENT 23

1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : RFID Reader
b) Model No. : A9281-A-000
c) Trade Name : AMIC
d) FCC ID : S8RA9281-A-000
e) Working Frequency : 13.56 MHz
f) Power Supply : 3.3V DC

1.2 Characteristics of Device:

The EUT is a RFID Reader. This RFID Reader is used with PDA or handheld devices equipment with Compact Flash Type - 1 or Type – 2 slot. The RFID Reader directs the RF transceiver to transmit RF signals, receives the encoded signal from the tag through the RF transceiver, decodes the tag's identification, and transmits the identification with any other data from the tag to the host computer.

1.3 Test Methodology

Both Conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4 and FCC 47 CFR Part 15.

1.4 Test Facility

The semi-anechoic chamber and conducted measurement facility used to collect the radiated and conducted data are located inside the Building at No.8, Lane 29, Wen-ming Road, Lo-shan Tsun, Kweishan Hsiang, Taoyuan, Taiwan, R.O.C.
This site has been accreditation as a FCC filing site.

2. TEST SYSTEM AND LIMITATION

2.1 Device for Tested System

Device	Manufacture	Model No.	S/N No.	Cable Description
RFID Reader*	AMIC	A9281-A-000	----	----
DC power supply	GW	GPS-3030D	----	1.8m Unshielded Line / adapter

Remark "*" means equipment under test.

2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.25
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

Remark "**" : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.3 Limitation

(1) Conducted Emission Limits :

According to §15.207 Conducted limits.

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the conducted limit is the following:

Frequency MHz	Quasi Peak dB μV	Average dB μV
0.15 - 0.5	66-56	56-46
0.5 - 5.0	56	46
5.0 - 30.0	60	50

(2) Radiated Emission Limits :

According to §15.225 Operation within the band 13.110 – 14.010 MHz.

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

According to § 15.209 Radiated emission limits, general requirements.

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100 **	3
88 – 216	150 **	3
216 – 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(3) Frequency Stability Limit

According to §15.225 Operation within the band 13.110 – 14.010 MHz.

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

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. To comply with the FCC RF exposure compliance requirement, the device and its antenna must not be co-located or operating to conjunction with any other antenna or transmitter.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.
-- Increase the separation between the equipment and receiver.
-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-- Consult the dealer or an experienced radio / TV technician for help.

3. RADIATED EMISSION MEASUREMENT

3.1 Applicable Standard

According to §15.225 Operation within the band 13.110 – 14.010 MHz.

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

According to § 15.209 Radiated emission limits, general requirements.

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100 **	3
88 – 216	150 **	3
216 – 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

3.2 Measurement Procedure

A.Preliminary Measurement For Portable Devices.

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antennna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 30 MHz respectively. Turn on EUT and make sure that it is in continuous operating function.
2. For emission measured below 30 MHz, set the EMI Test Receiver on a 10 kHz and 30 kHz resolution bandwidth respectively for each frequency measured in step 2.
3. For emission measured above 30 MHz, set the EMI Test Receiver on a 120 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

Figure 1 : Frequencies measured below 30 MHz configuration

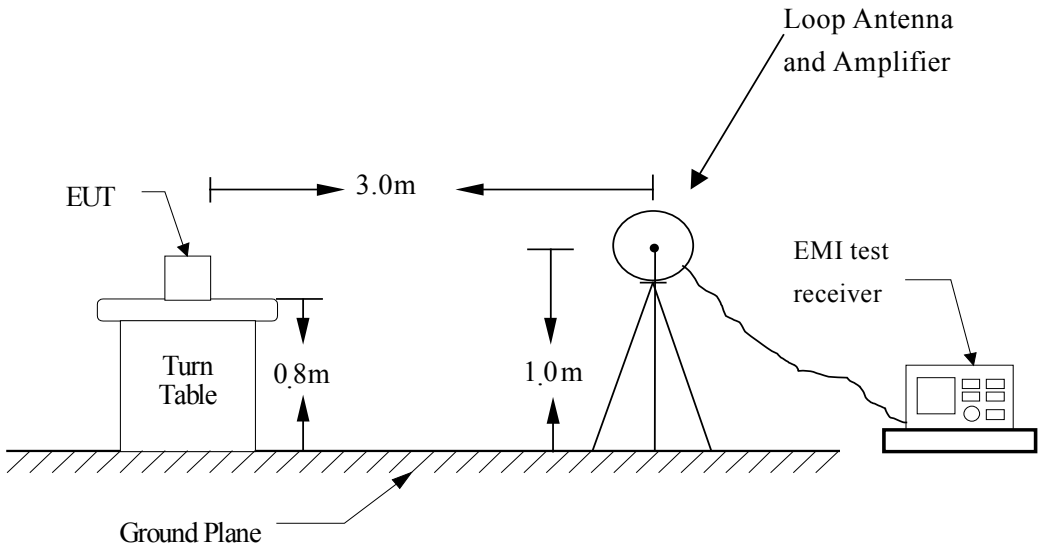
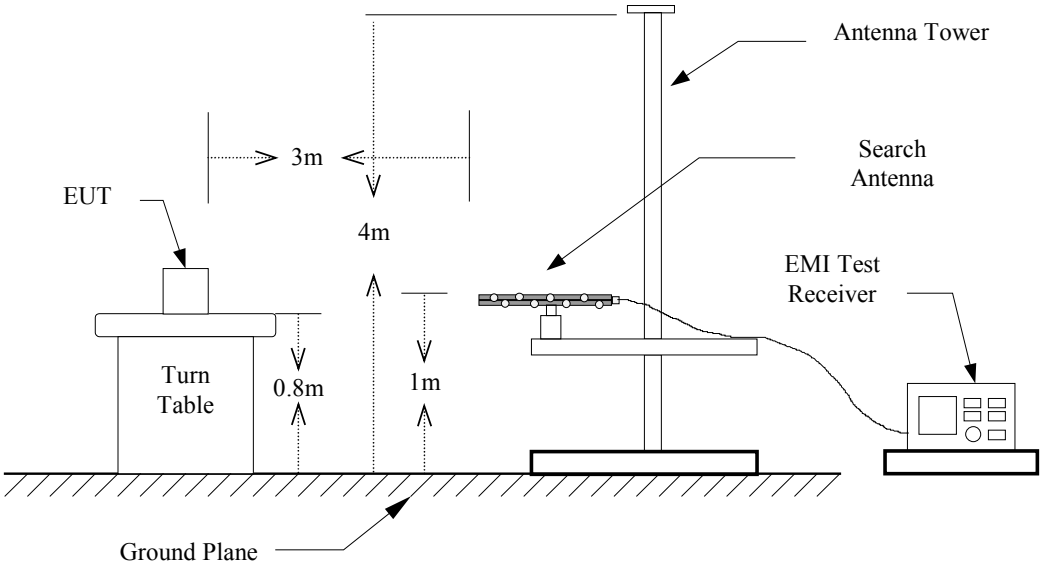


Figure 2 : Frequencies measured above 30 MHz configuration



3.3 Test Data

3.3.1 Test Frequency : Below 30 MHz
Operated mode : Continue Transmitting
Test Date : May 26, 2005 Temperature : 25 ℃ Humidity : 65 %

Frequency (MHz)	Meter Reading (dBuV) Q.P.	Corrected Factor (dB)	Resulot @3m (dBuV/m) Q.P.	Limit @3m (dBuV/m) Q.P.	Margin (dB)
13.559	39.1	0.2	39.3	124.0	-84.7
27.118	----	0.8	----	69.5	----

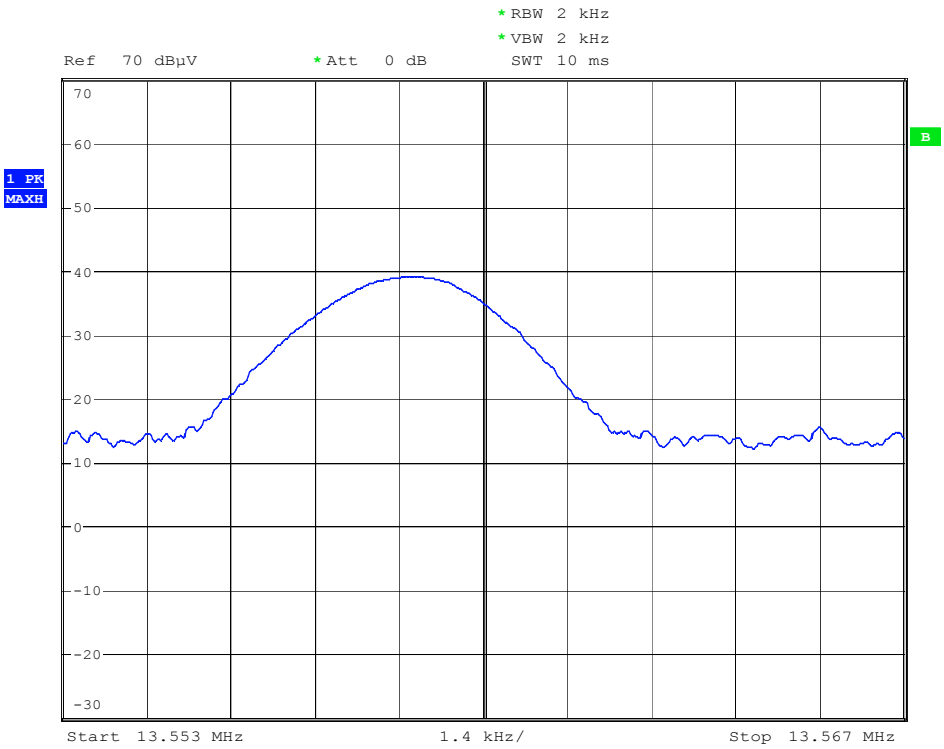
Note:

1. Place of Measurement: Measuring site of the ETC.
2. Test Result =Meter Reading + Correct Factor
3. If the result of peak value is under the limit of Quasi-Peak, the Quasi-Peak value doesn't need to be measured.

With a distant extrapolation of 40log(30m/3m) on the offset level of receiver during the test.

Limit Calculation:
Fundamental (§15.225(a)) : 20 log (15848) + 40 log (30/3) = 124.0 dBuV/m
Harmonic (§15.225(d)) : 20 log (30) + 40 log (30/3) = 69.5 dBuV/m

Occupied Bandwidth Measurement



3.3.2 Test Frequency : 30 MHz ~ 1 GHz

Operated mode : Continue Transmitting

Test Date : May 26, 2005 Temperature : 25 ℃ Humidity : 65 %

Emission Frequency (MHz)	Meter Reading (dBuV)		CORR'd Factor (dB)	Results (dBuV/m)		Limit (3m) (dBuV/m)	Margins (dB)	Table Degree (deg)		Ant. High (m)	
	HOR.	VERT.		HOR.	VERT.			HOR.	VERT.	HOR.	VERT.
41.640	***	22.4	13.2	***	35.6	40.0	-4.4	***	245	***	1.0
111.480	26.9	***	12.5	39.4	***	43.5	-4.1	125	***	1.1	***
182.290	***	22.8	14.1	***	36.9	43.5	-6.6	***	177	***	1.0
187.140	26.4	***	13.1	39.5	***	43.5	-4.0	137	***	1.1	***
261.830	30.2	***	14.6	44.8	***	46.0	-1.2	251	***	1.1	***
261.830	***	19.9	15.7	***	35.6	46.0	-10.4	***	254	***	1.1
290.930	24.7	***	16.8	41.5	***	46.0	-4.5	210	***	1.1	***
318.090	24.6	***	17.5	42.1	***	46.0	-3.9	130	***	1.1	***
371.440	***	19.3	18.8	***	38.1	46.0	-7.9	***	210	***	1.0
659.530	***	13.5	25.2	***	38.7	46.0	-7.3	***	330	***	1.1
793.390	8.5	***	27.6	36.1	***	46.0	-9.9	325	***	1.0	***
982.540	***	15.1	30.1	***	45.2	54.0	-8.8	***	48	***	1.0

Note:

1. Place of Measurement: Measuring site of the ETC.

2. Peak Result =Peak Reading + Correct Factor

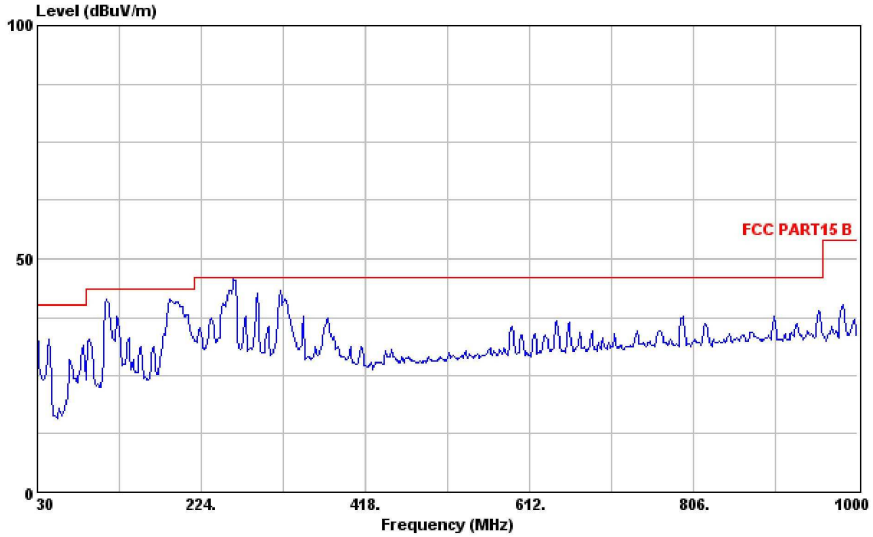
3. AVG Result = Peak Result + Duty Factor

4. If the result of peak value is under the limit of Quasi-Peak, the Quasi-Peak value doesn't need to be measured.

5. Please refer to page 13 for chart

ETC TEST LABORTARY

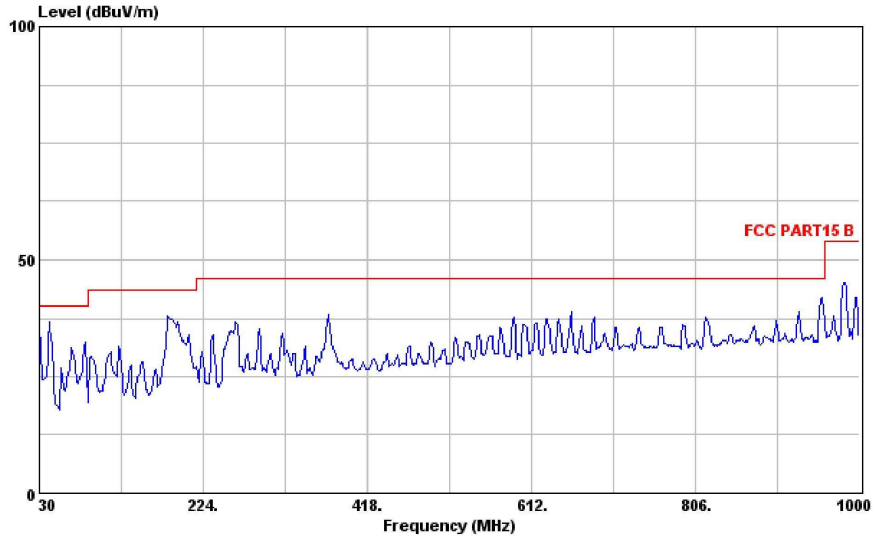
Data#: 384 File#: C:\Program Files\e3\716.EMI



Site : M00 SITE
Condition : FCC PART15 B 3m HORIZONTAL
EUT : RFID
Model : A9281-A-000
Memo : 13.56MHz

ETC TEST LABORTARY

Data#: 385 File#: C:\Program Files\e3\716.EMI



Site : M00 SITE
Condition : FCC PART15 B 3m VERTICAL
EUT : RFID
Model : A9281-A-000
Memo : 13.56MHz

3.4 Calculation

Field Strength:

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + CORR. FACTOR

where CORR. FACTOR = Antenna FACTOR + Cable FACTOR

Assume a receiver reading of 62.4 dB μ V is obtained. The Antenna Factor of 14.1 and a Cable Factor of 3.4 is added. The total of field strength is 79.9 dB μ V/m.

RESULT = 62.4 + 14.1 + 3.4 = 79.9 dB μ V/m
Level in μ V/m = Common Antilogarithm[(79.9 dB μ V/m)/20] = 9885.5 μ V/m

3.5 Radiated Test Equipment

The following instrument are used for radiated emissions measurement :

Equipment	Manufacturer	Model No.	Calibrated until
EMI Test Receiver	HP	8546A	Sep. 06, 2005
EMI Test Receiver	Rohde & Schwarz	ESCS30	Mar. 31, 2006
Amplifier	ADVANTEST	BB525C	Aug. 17, 2005
BiconiLog Antenna	Schwarzbeck	VULB 9160	Nov. 24,2005
Loop Antenna	EMCO	6512	Jul. 15, 2007
Spectrum Analyzer	Rohde & Schwarz	FSU46	Oct. 03, 2005

Note: The standards used to perform this calibration are traceable to NML/ROC, NIST/USA and NPL.

3.6 Measuring Instrument Setup

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution Bandwidth	Video Bandwidth
0.009 to 30	EMI Test Receiver	Peak	10 kHz	30 kHz
30 to 1000	EMI Test Receiver	Peak	120 kHz	300 kHz

4. FREQUENCY STABILITY

4.1 Applicable Standard

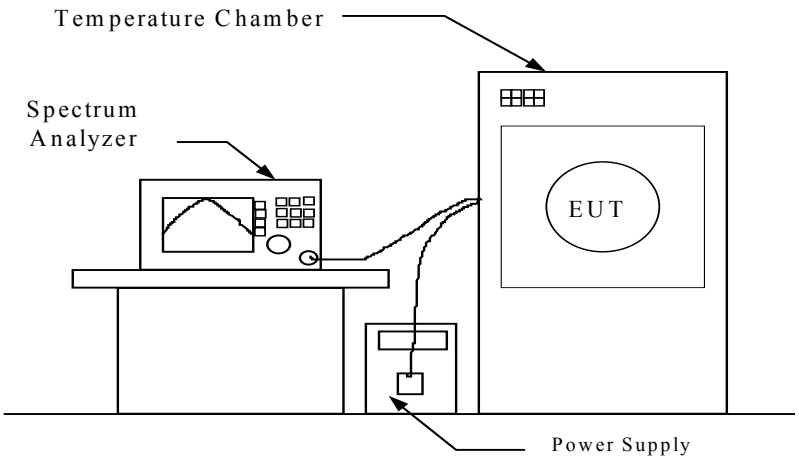
According to §15.225 Operation within the band 13.110 – 14.010 MHz.

(e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

4.2 Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Agilent	8564EC	09/16/2005
Temperature Chamber	ESPEC	SH-240	02/14/2006
DC Power Supply	GW	GPC-3030D	N/A
Digital Multi Meter	YF-FONG	YF1069	04/12/2006

4.3 Test Setup



4.4 Test Procedure

A. Frequency stability vs. temperature measurement

1. The EUT was placed into the constant temperature chamber.
2. The spectrum analyzer (a wide band antenna connected to the spectrum analyzer) was used to read the EUT operating frequency.
3. Set the constant temperature chamber temperature within the range of –20℃ to +50℃, and measured the EUT operating frequency at start-up, and two, five, and ten minutes after startup.

B. Frequency stability vs. input voltage measurement

1. The EUT was placed into the constant temperature chamber and set the temperature to 20℃.
2. The spectrum analyzer (a wide band antenna connected to the spectrum analyzer) was used to read the EUT operating frequency.
3. The EUT is powered with the DC Power Supply, supplied it with 85% and 115% voltage, and measured the EUT operating frequency.

4.4 Test Data

Operated mode : Continue Transmitting

Test Date : May 26, 2005 Temperature : 25 ℃ Humidity : 65 %

A. Frequency Stability Versus Environment Temperature (50℃~ -20℃):

Reference Frequency :							Limit : ±0.01%	
Environment Temperature (℃)	Frequency Measure with Time Elapsed							
	0 Minutes		2 Minutes		5 Minutes		10 Minutes	
	MHz	%	MHz	%	MHz	%	MHz	%
50	13.55857	-0.00096	13.55847	-0.00196	13.55847	-0.00196	13.55840	-0.00221
40	13.55867	-0.00022	13.55830	-0.00295	13.55843	-0.00199	13.55863	-0.0052
30	13.55870	0	13.55863	-0.00051	13.55840	-0.00221	13.55850	-0.00148
20	13.55870	0	13.55870	0	13.55870	0	13.55870	0
10	13.55903	0.00243	13.55907	0.00273	13.55907	0.00273	13.55910	0.00295
0	13.55917	0.00347	13.55913	0.00317	13.55913	0.00317	13.55917	0.00347
-10	13.55923	0.00391	13.55923	0.00391	13.55927	0.00420	13.55927	0.00420
-20	13.55927	0.00420	13.55930	0.00425	13.55930	0.00425	13.55930	0.00425

B. Frequency Stability Versus Input Power (±15%):
Environment Temperature : 20 ℃

Reference Frequency :							Limit : ±0.01%	
Power Supplied (Vdc)	Frequency Measure with Time Elapsed							
	0 Minutes		2 Minutes		5 Minutes		10 Minutes	
	MHz	%	MHz	%	MHz	%	MHz	%
2.805	13.55897	0.00199	13.55900	0.00221	13.55900	0.00221	13.55907	0.00273
3.795	13.55890	0.00148	13.55893	0.00170	13.55893	0.00170	13.55910	0.00295

5. CONDUCTED EMISSION MEASUREMENT

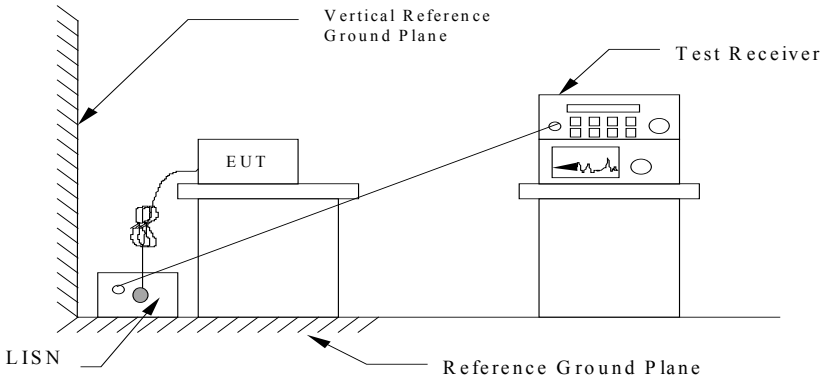
5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and § 15.207(a) respectively. Both Limits are identical specification.

5.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



5.3 Conducted Emission Data

Operation Mode: Tx mode

Test Date : Jun. 29, 2005 Temperature : 23℃ Humidity : 65%

Freq. (MHz)	Meter Reading (dBuV)				Factor (dB)	Result (dBuV)				Limit (dBuV)		Margins (dB)
	Q.P Value		AVG. Value			Q.P Value		AVG. Value		Q.P Value	AVG. Value	Q.P. or AVG.
	L1	L2	L1	L2		L1	L2	L1	L2			
0.220	***	44.6	----	----	0.2	***	44.8	----	----	62.8	52.8	-18.0
0.232	45.1	***	----	----	0.2	45.3	***	----	----	62.4	52.4	-17.1
0.465	44.4	***	----	----	0.2	44.6	***	----	----	56.6	46.6	-12.0
0.470	***	43.7	----	----	0.2	***	43.9	----	----	56.5	46.5	-12.6
0.585	***	45.0	----	----	0.2	***	45.2	----	----	56.0	46.0	-10.8
0.707	41.1	***	----	----	0.2	41.3	***	----	----	56.0	46.0	-14.7
0.808	***	44.0	----	----	0.2	***	44.2	----	----	56.0	46.0	-11.8
1.156	43.0	***	----	----	0.2	43.2	***	----	----	56.0	46.0	-12.8
1.277	***	44.7	----	----	0.2	***	44.9	----	----	56.0	46.0	-11.1
2.085	41.8	***	----	----	0.2	42.0	***	----	----	56.0	46.0	-14.0
2.402	***	41.2	----	----	0.2	***	41.4	----	----	56.0	46.0	-14.6
5.414	37.8	***	----	----	0.2	38.0	***	----	----	60.0	50.0	-22.0

Note:

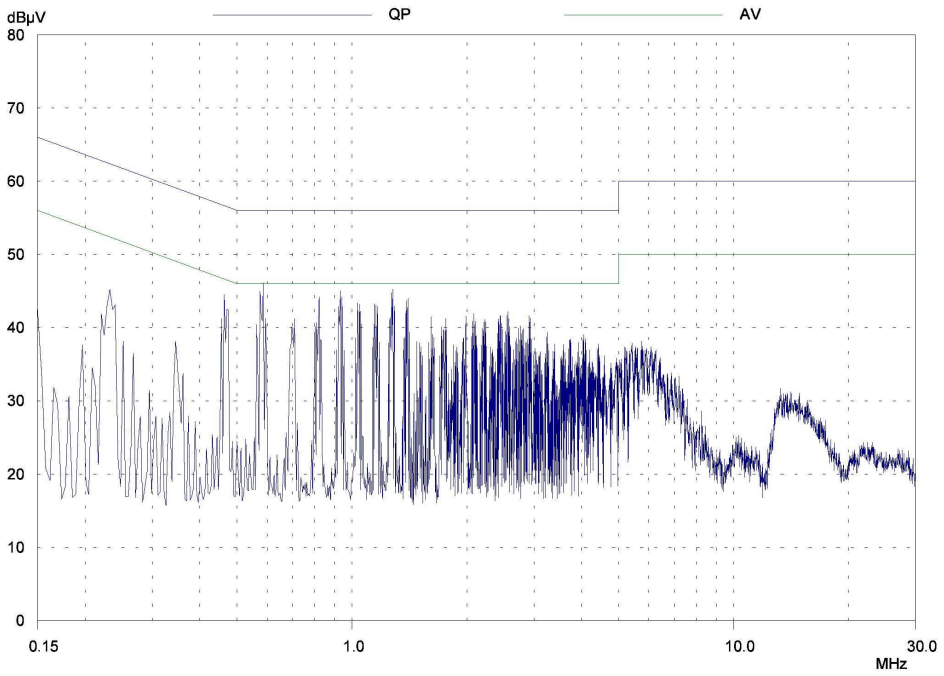
1. "***" means the value was too low to be measured.
2. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
3. "#" means the noise was too low, so record the peak value.
4. The estimated measurement uncertainty of the result measurement is ±2.5dB.
5. Please refer to page 21 to page 22 for chart.
6. The fundamental frequency is 13.56 MHz (below 30 MHz). The antenna of EUT was disabled to measure the AC line conducted emissions test result.

Conducted Emission

Peak Value

EUT:	RFID A9281-A
Manuf:	
Op Cond:	
Operator:	Jengde
Test Spec:	
Comment:	L1
Result File:	L1.dat : New Measurement

Final Measurement:	Detector:	
	Meas Time:	1sec
	Peaks:	8
	Acc Margin:	10 dB

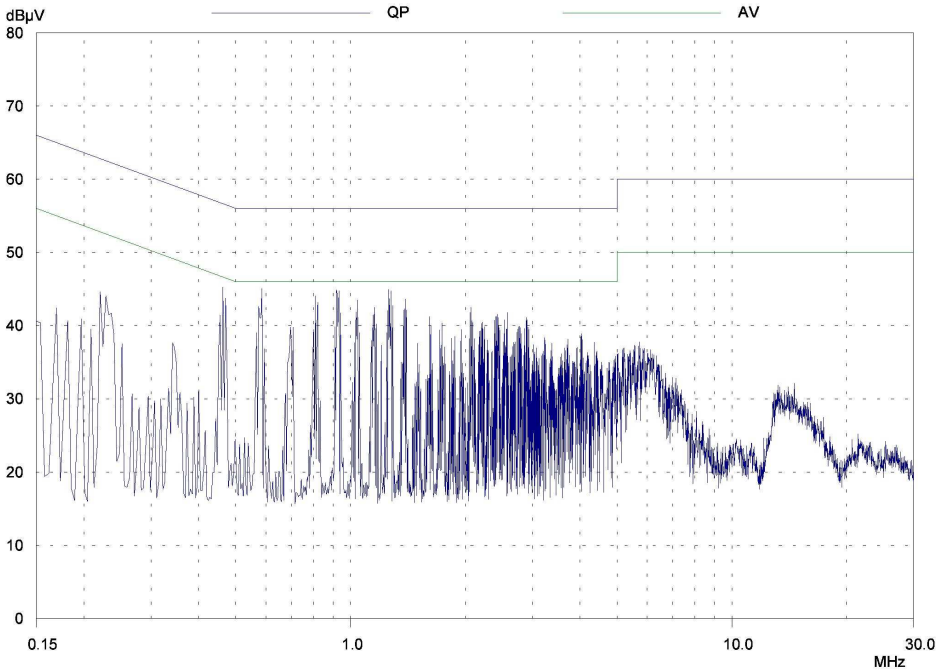


Conducted Emission

Peak Value

EUT:	RFID A9281-A
Manuf:	
Op Cond:	
Operator:	Jengde
Test Spec:	
Comment:	L2
Result File:	L2.dat : New Measurement

Final Measurement:	Detector:	
	Meas Time:	1sec
	Peaks:	8
	Acc Margin:	10 dB



5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR (Included Cable Loss)

Assume a receiver reading of 22.5 dB μ V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μ V.

RESULT = 22.5 + 0.1 = 22.6 dB μ V

Level in μ V = Common Antilogarithm[(22.6 dB μ V)/20]

= 13.48 μ V

5.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test.

Equipment	Manufacturer	Model No.	Next Cal. Due
RF Test Receiver	Rohde and Schwarz	ESCS30	03/31/2006
Line Impedance Stabilization network	EMCO	3825	11/09/2005