



FCC 47 CFR PART 15 Subpart C

TEST REPORT

For

UHF RFID ART-320 Tracer Module

Model Number: ART-320

Trade Name: ADVANTECH

Issued to

**Advantech Co., Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road,
Neihu District, Taipei 114, Taiwan, R.O.C.**

Issued by

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	March 9, 2012	Initial Issue	ALL	Jill Shiao



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1 TEST RESULT CERTIFICATION

Applicant: **Advantech Co., Ltd.**
No.1, Alley 20, Lane 26, Rueiguang Road,
Neihu District, Taipei 114, Taiwan, R.O.C.

Equipment Under Test: UHF RFID ART-320 Tracer Module

Trade Name: ADVANTECH

Model: ART-320

Date of Test: December 22, 2011 ~ March 9, 2012

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements emission limits of FCC Rules Part 15.107, 15.109, 15.207, 15.209 and 15.247.

The test results of this report relate only to the tested sample identified in this report.

Approved by:

Stan Lin
Section Manager

Reviewed by:

Jill Shiao
Section Manager



2 EUT DESCRIPTION

Product	UHF RFID ART-320 Tracer Module
Trade Name	ADVANTECH
Model Number	ART-320
Model Discrepancy	N/A
EUT Power Rating	3.3VDC from Battery
Operating Frequency Range	902-928 MHz
Output Power	29.77dBm (0.948W) (Peak)
Modulation Technique	FHSS
Number of Channels	50 Channel
Antenna Designation	Patch Antenna
Antenna Gain	6dBi

Remark:

1. The sample selected for test was production product and was provided by manufacturer.
2. This test report is intended for FCC ID: **M82-ART-320** to comply with Section 15.107 & 15.109 (FCC Part 15, Subpart B) and Section 15.207, 15.209, 14.247 (FCC Part 15, Subpart C Rules.)



3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 Part 2, 15.207, 15.209 and 14.247.

3.1. EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2. EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.107 and 15.109 under the FCC Rules Part 15 Subpart B and Section 15.207, 15.209, 14.247 under the FCC Rules Part 15 Subpart C.

3.3. GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.



3.4. FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, 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 - 5.15
¹ 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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.5. DESCRIPTION OF TEST MODES

There are two antenna ports of EUT, the one is TX, the other is RX.

ART-320 had been tested under operating condition except radiated spurious emission below 1GHz and powerline conducted emission below 30MHz, which were in transmitting mode only.

Channel Low (902MHz), Channel Mid (915MHz) and Channel High (928MHz) were chosen for the final testing.



4 INSTRUMENT CALIBRATION

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2. MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year.

Conducted Emission Test site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY48250064	12/25/2012
Spectrum Analyzer	R&S	FSEB	825829/011	12/18/2012
Power meter	Anritsu	ML2495A	1033009	08/18/2012

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY48250064	12/25/2012
Pre-Amplifier	HP	8447D	2944A06530	01/03/2012
Pre-Amplifier	HP	8449B	3008A01738	04/17/2012
EMI Test Receiver	SCHAFFNER	SCR 3501	430	01/18/2012
Loop Antenna	EMCO	6502	2356	06/11/2013
Bilog Antenna	SCHWAZBECK	VULB9160	3084	10/03/2012
Horn Antenna	EMCO	3115	9602-4659	05/19/2012
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Test S/W	LabVIEW 6.1 (Wugu Chamber EMI Test V1_4.5.3)			

Powerline Conduction Emission Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	100782	06/13/2012
LISN	R&S	ENV216	100066	08/30/2012
LISN	R&S	ENV 4200	830326/016	05/09/2012
Test S/W	CCS-3A1-CE			



4.3. MEASUREMENT UNCERTAINTY

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR 100 028-1 [2] and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 6 is based on such expansion factors.

Table 6: Maximum measurement uncertainty

Parameter	Uncertainty
RF frequency	$\pm 1 \cdot 10^{-5}$
Total RF power conducted	$\pm 1,5$ dB
RF power density, conducted	± 3 dB
Spurious emissions, conducted	± 3 dB
All emissions, radiated	± 6 dB
Humidity	± 5 %
Temperature	± 1 °C
DC and low frequency voltages	± 3 %
Powerline Conducted Emission	± 2.0518



5 FACILITIES AND ACCREDITATIONS

5.1. FACILITIES

All measurement facilities used to collect the measurement data are located at

- No.163-1, Jhongsheng Rd. Sindian City, Taipei County 23151, Taiwan.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029
- No.11, Wu-Gong 6th Rd., Wugu Industrial Park, New Taipei City 248, Taiwan (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045
- No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, Taiwan, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2. EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.




Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



5.3. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3	
USA	FCC MRA	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	<p>VCCI</p> <p>R-2882/2541/2798/725/1868 C-402/747/912 T-1930/1646</p>
Taiwan	TAF	EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803	
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	<p>SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014</p>
Canada	Industry Canada	RSS-Gen Issue 3	

Note: No part of this report may be used to claim or imply product endorsement by A2LA, TAF or other government agency.



6 SETUP OF EQUIPMENT UNDER TEST

6.1. SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

6.2. SUPPORT EQUIPMENT

For Conducted & Radiated Emission Measurement:							
No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	Notebook PC (Remote)	D400	0932RY	E2K24GBRL	DELL	RS-232 Cable: Unshielded, 3.0m	AC I/P: Unshielded, 1.8m DC O/P Unshielded, 1.8m with a Core

For Powerline Emission Measurement:							
No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	Notebook PC (Remote)	D400	0932RY	E2K24GBRL	DELL	RS-232 Cable: Unshielded, 3.0m	AC I/P: Unshielded, 1.8m DC O/P Unshielded, 1.8m with a Core
2	LCD Monitor	2407WFPb	CN-0FC255-46633-6 75-22TJS	FCC DoC	DELL	D-SUB Cable: Shielded, 1.8m with two cores	Unshielded, 1.8m
3	Printer	STYLUS C60	DR3K042012	FCC DoC	EPSON	Unshielded, 1.8m	Unshielded, 1.8m
4	USB Mouse	MO19UCA	020509291	FCC DoC	HP	Unshielded, 1.8m	N/A

Remark: Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



7 FCC PART 14.247 REQUIREMENTS

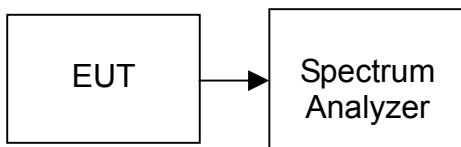
7.1. 20dB BANDWIDTH

LIMIT

For frequency hopping system, according to 15.247(a)(1), hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB Bandwidth of hopping channel, whichever is greater.

For frequency hopping system, according to 15.247(a)(1)(i), operating in the 902 – 928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10kHz, VBW = 30kHz, Span = 1MHz, Sweep = auto.
4. Mark the peak frequency and 20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

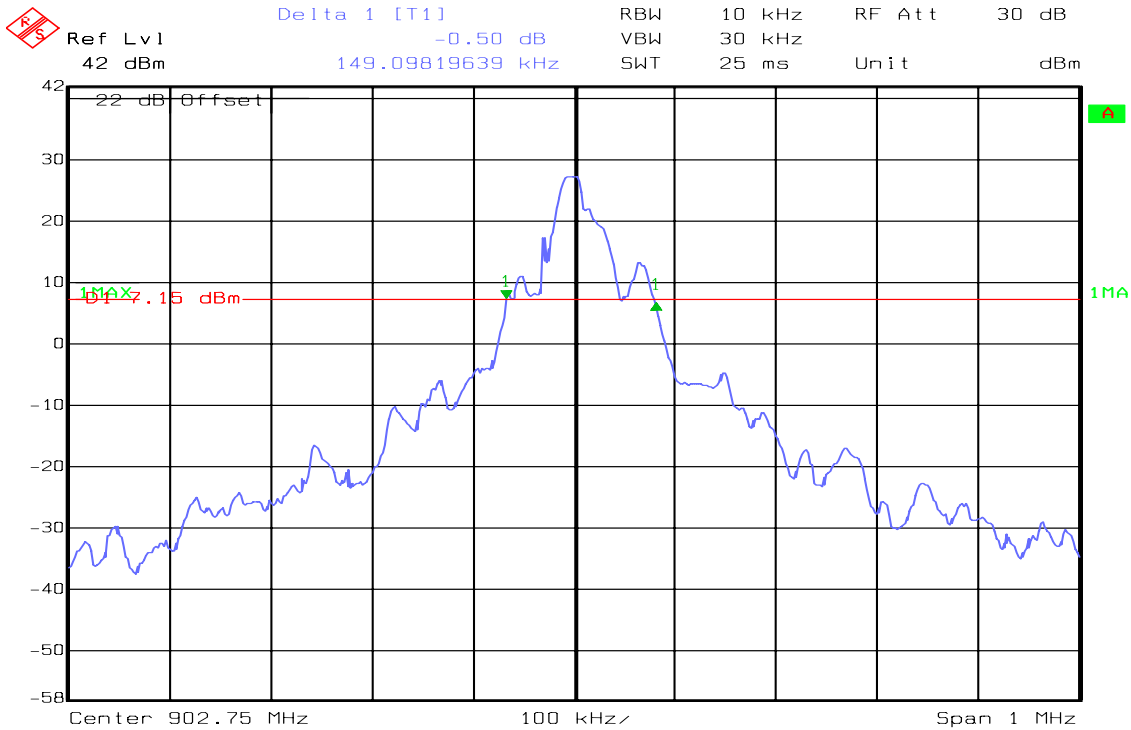
TEST RESULTS

No non-compliance noted



Test Plot

20dB Bandwidth (CH Low)



Date: 28.DEC.2011 13:02:56

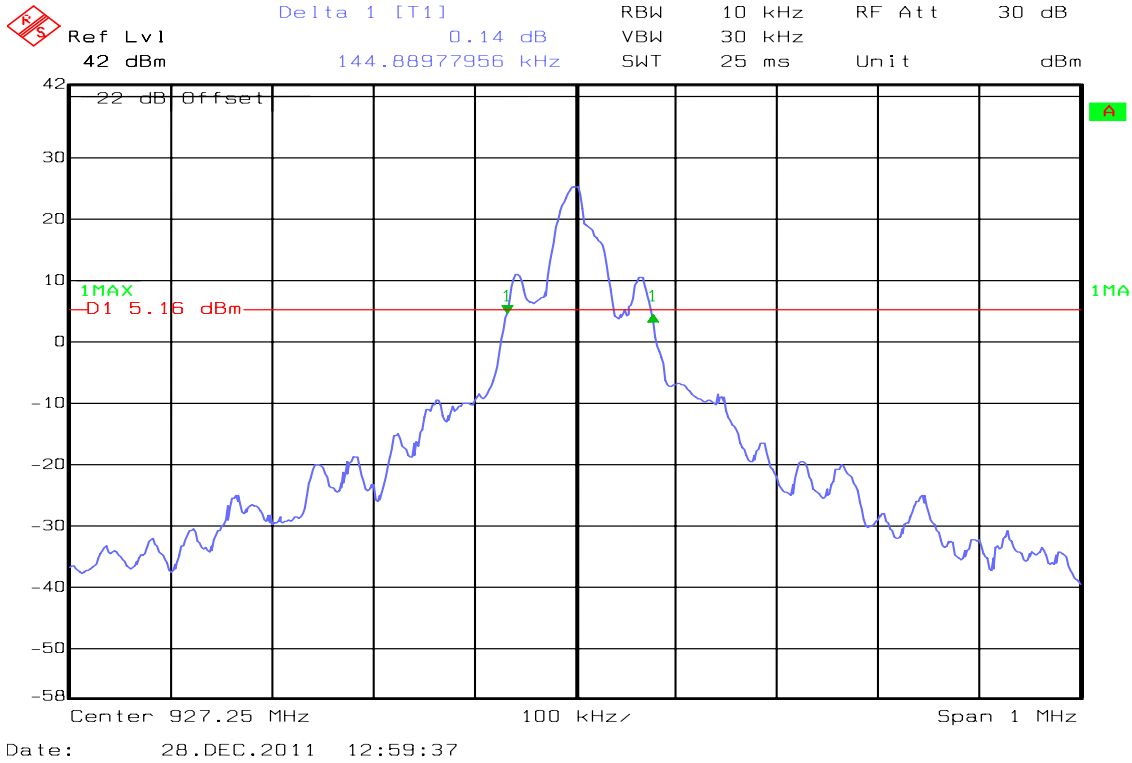
20dB Bandwidth (CH Mid)



Date: 28.DEC.2011 13:01:28



20dB Bandwidth (CH High)





7.2. PEAK OUTPUT POWER

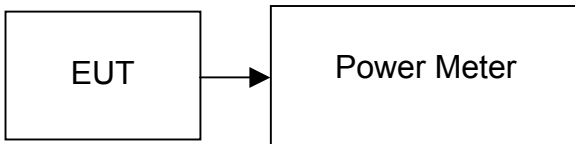
LIMIT

According to §15.247, the maximum peak output power of the intentional radiator shall not exceed the following:

According to §15.247(b)(2), For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values, as appropriated, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

TEST DATA

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Test Result
Low	902.75	29.77	0.9484	30	PASS
Mid	915.25	29.29	0.8492		PASS
High	927.25	28.31	0.6776		PASS

Note:

1. The highest antenna gain is "6dBi", the FCC limit is 30dBm.
2. Fixed Limit = 1W = 30dBm.
- 3 If antenna gain \leq 6dBi, FCC limit = (Fixed Limit) dBm.
4. If antenna gain > 6dBi, FCC limit = (Fixed Limit) dBm – (Highest antenna gain – 6dBi).

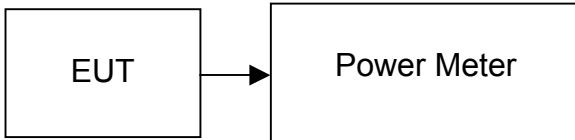


7.3. AVERGER OUTPUT POWER

LIMIT

None; for reporting purposes only.

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

TEST DATA

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	902.75	27.64	0.5808
Mid	915.25	26.92	0.4920
High	927.25	25.43	0.3491

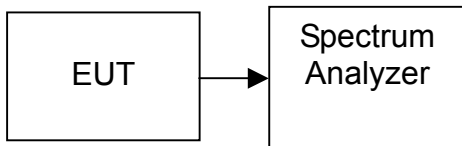


7.4. FREQUENCY SEPARATION

LIMIT

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as RBW = 30kHz, VBW = 100kHz, Span = 3MHz, Sweep = auto.
5. Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency.

TEST RESULTS

No non-compliance noted

TEST DATA

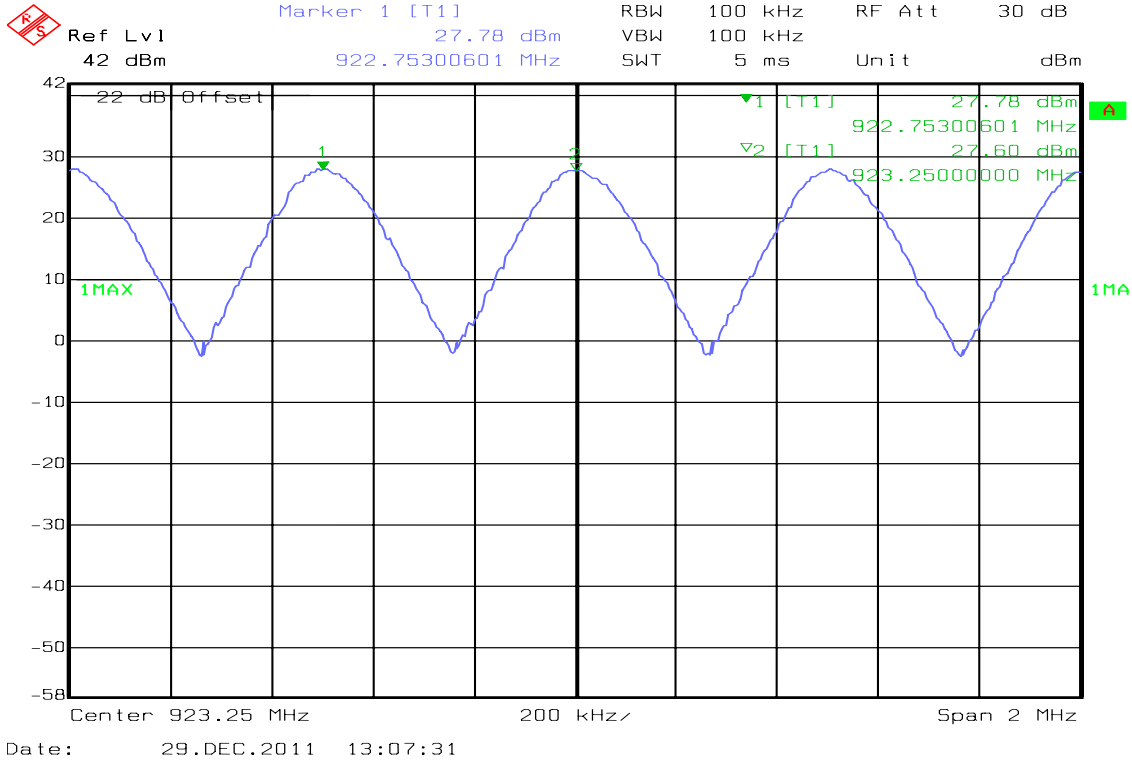
Note:

1. *Please refer to test plot.*
2. *CH Low, Mid and High have the same test result. Only CH High test result showed in the test report.*



Test Plot

Measurement of Channel Separation



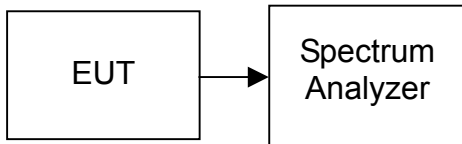


7.5. NUMBER OF HOPPING FREQUENCY

LIMIT

According to §15.247(a)(1)(i), operating in the 902 – 928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start= 899.75MHz, Stop = 929.75MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW, VBW=100kHz.
5. Max hold, view and count how many channel in the band.

TEST RESULTS

No non-compliance noted

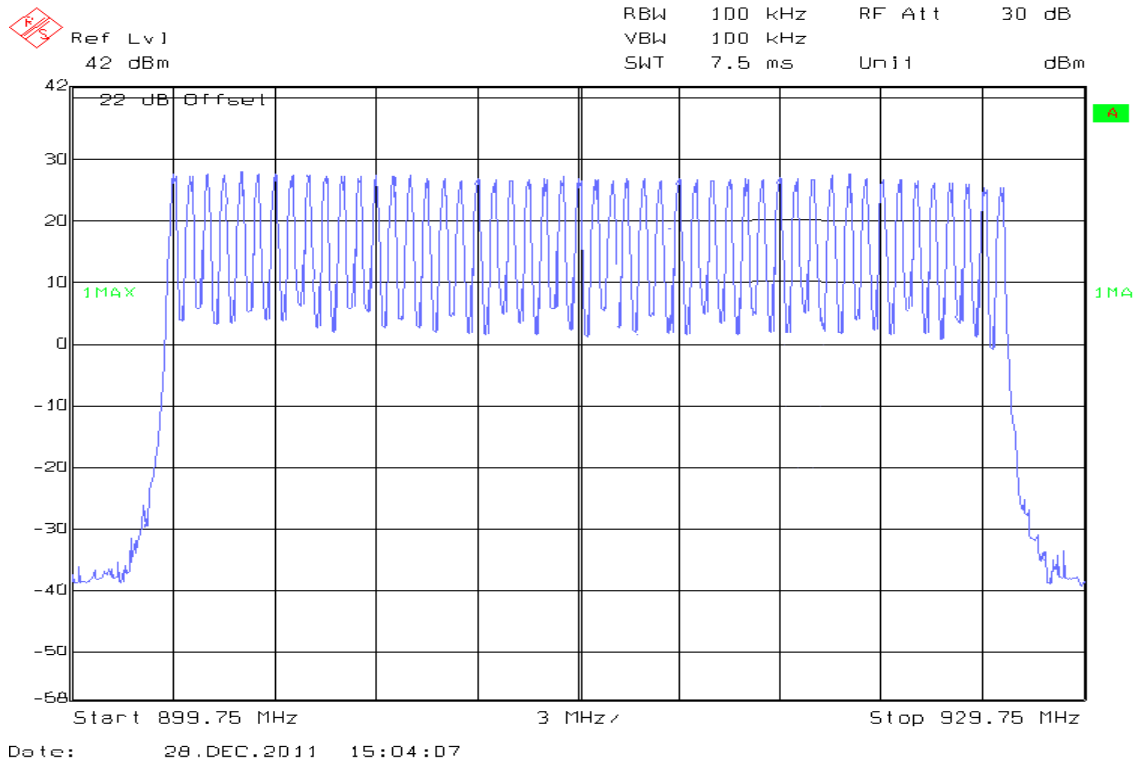
TEST DATA

Number of hopping channels = 50 channels.



Test Plot

Channel Number



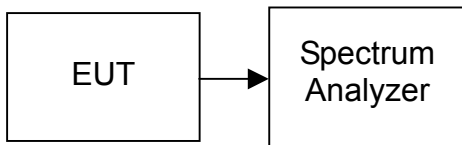


7.6. TIME OF OCCUPANCY (DWELL TIME)

LIMIT

According to §15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=10KHz, Span = 0Hz, Sweep = 10ms.
5. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

No non-compliance noted

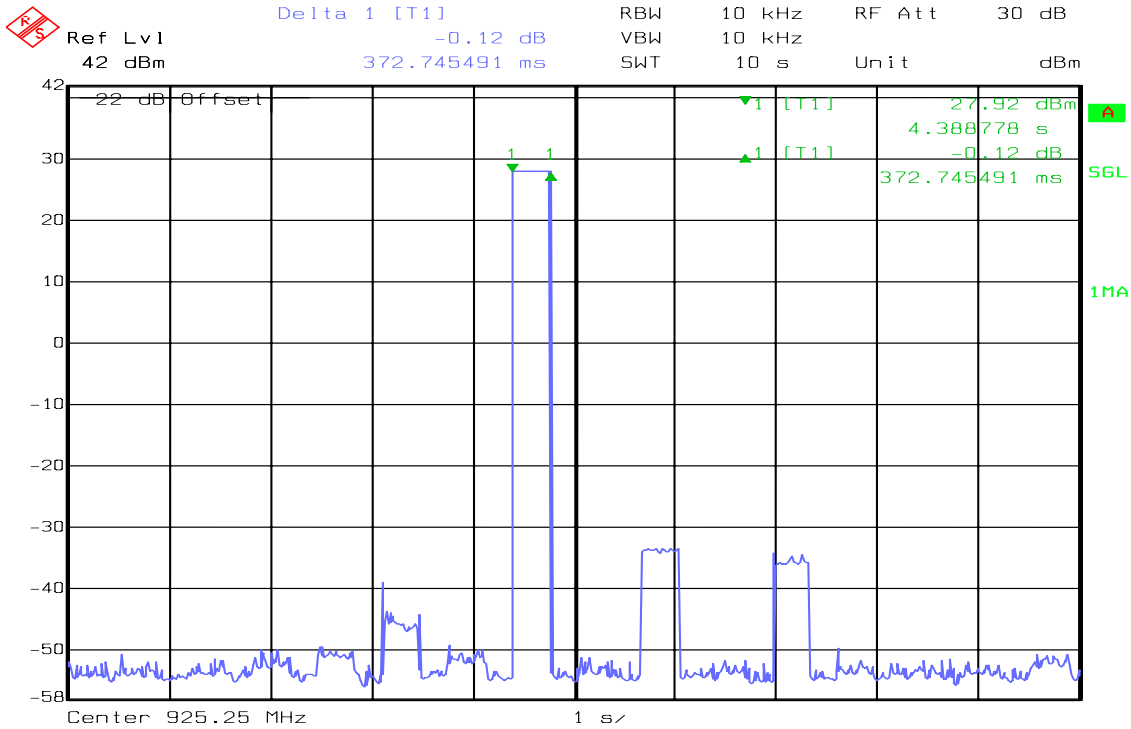
TEST DATA

Limit: 0.4sec.

CH High dwell time = 372.745 ms.



Test Plot



Date: 29.DEC.2011 11:27:30



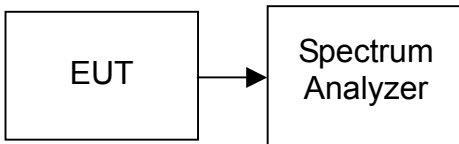
7.7. SPURIOUS EMISSION

7.6.1 CONDUCTED MEASUREMENT

LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 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)).

TEST CONFIGURATION



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

TEST RESULTS

No non-compliance noted

TEST DATA

Refer to attach spectrum analyzer data chart.



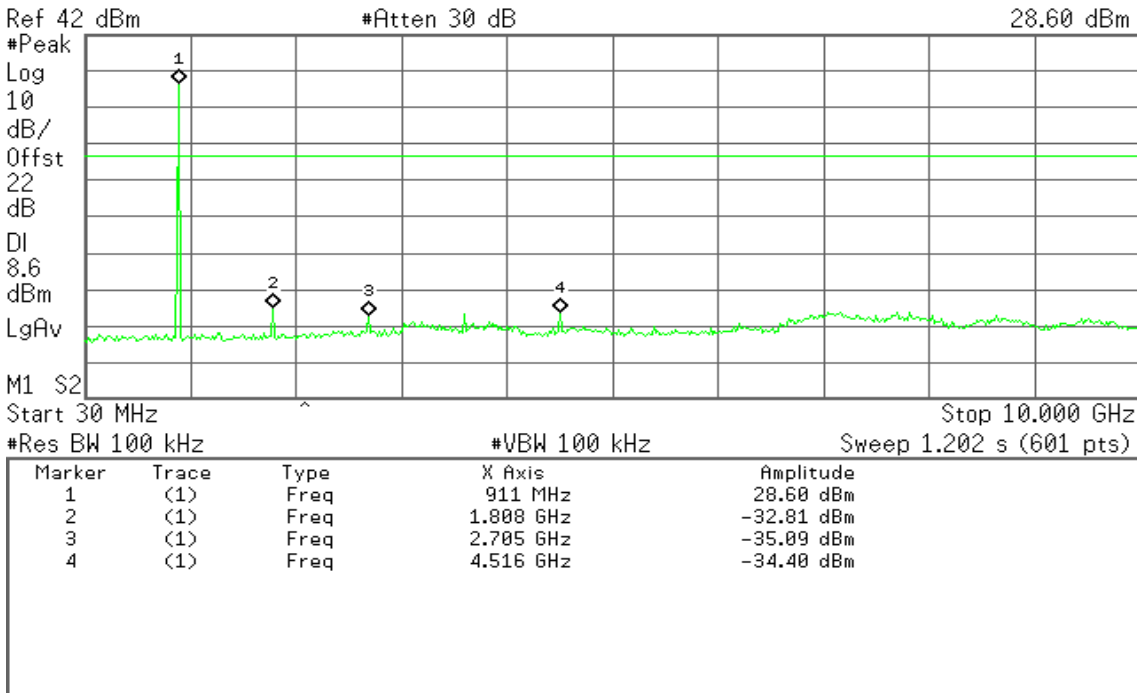
Test Plot

SPURIOUS EMISSION / CH Low

Agilent 16:22:23 Dec 28, 2011

R L

Mkr1 911 MHz
28.60 dBm

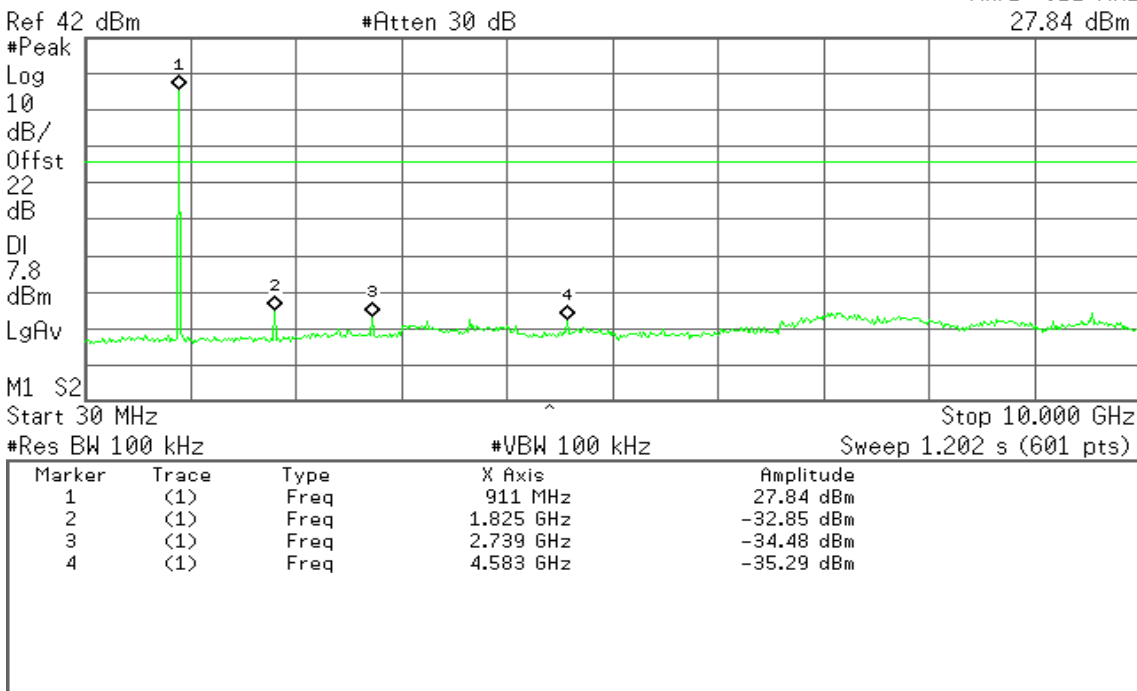


SPURIOUS EMISSION / CH Mid

Agilent 16:29:51 Dec 28, 2011

R L

Mkr1 911 MHz
27.84 dBm



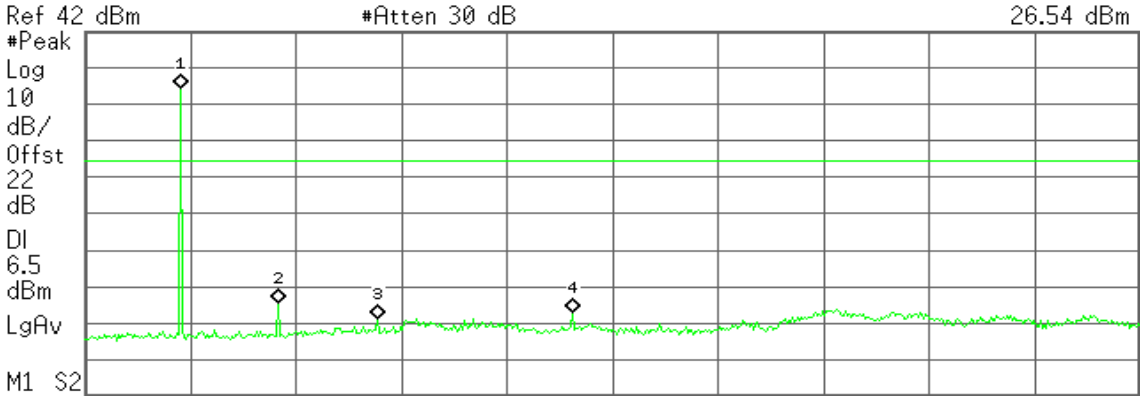


SPURIOUS EMISSION / CH High

Agilent 16:32:04 Dec 28, 2011

R L

Mkr1 927 MHz
26.54 dBm



Start 30 MHz Stop 10.000 GHz
#Res BW 100 kHz #VBW 100 kHz Sweep 1.202 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	927 MHz	26.54 dBm
2	(1)	Freq	1.858 GHz	-32.53 dBm
3	(1)	Freq	2.788 GHz	-36.74 dBm
4	(1)	Freq	4.633 GHz	-34.90 dBm



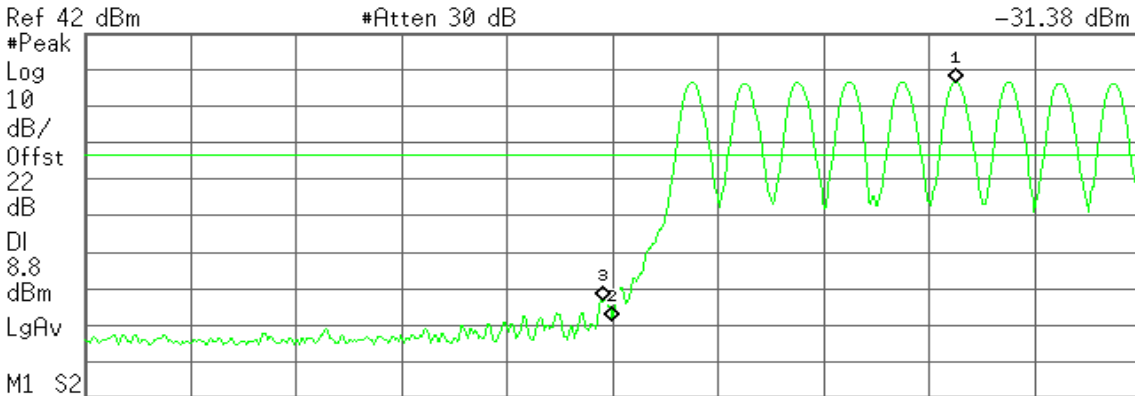
CONDUCTED-BANDEDGE / CH LOW

CH On

* Agilent 14:10:32 Mar 9, 2012

R T

Mkr3 901.900 MHz
-31.38 dBm



Start 897.000 MHz Stop 907.000 MHz
#Res BW 100 kHz #VBW 100 kHz Sweep 1.24 ms (601 pts)

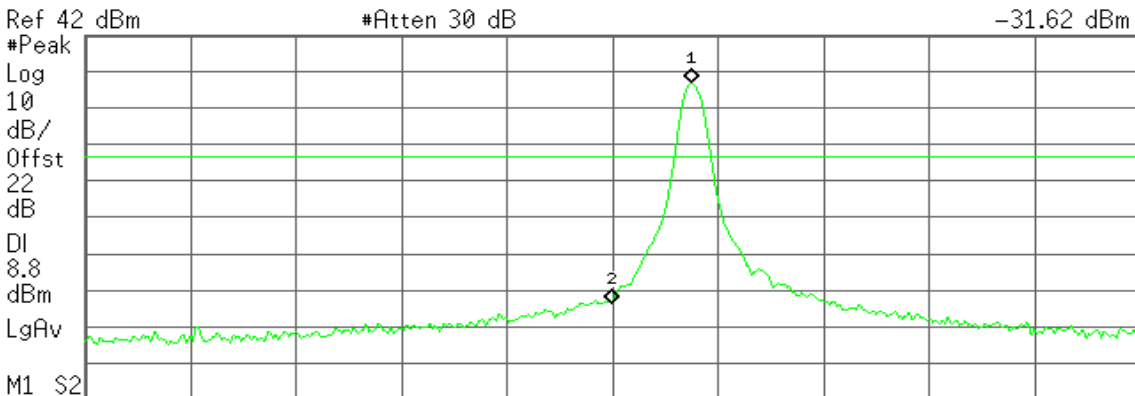
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	905.250 MHz	28.80 dBm
2	(1)	Freq	902.000 MHz	-36.63 dBm
3	(1)	Freq	901.900 MHz	-31.38 dBm

CH Off

* Agilent 14:12:58 Mar 9, 2012

R L

Mkr2 902.000 MHz
-31.62 dBm



Start 897.000 MHz Stop 907.000 MHz
#Res BW 100 kHz #VBW 100 kHz Sweep 1.24 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	902.750 MHz	28.82 dBm
2	(1)	Freq	902.000 MHz	-31.62 dBm



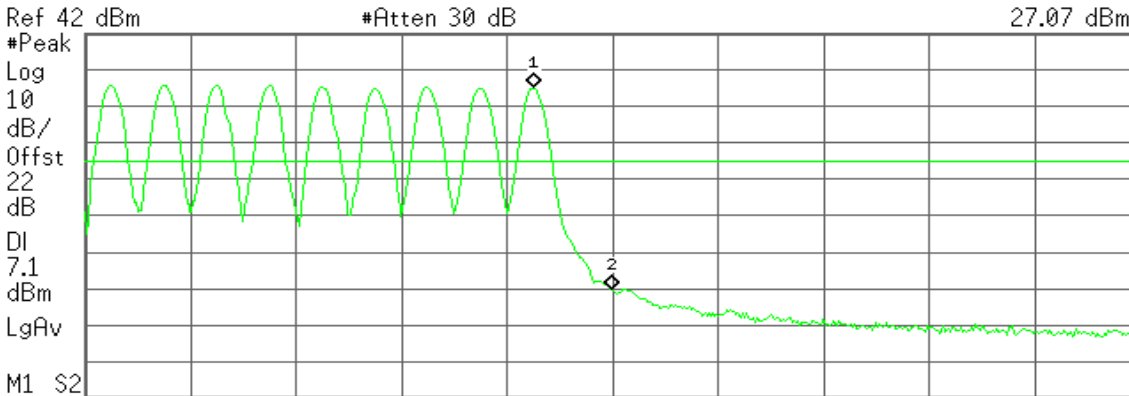
CONDUCTED-BANDEDGE / CH High

CH On

* Agilent 14:07:17 Mar 9, 2012

R T

Mkr1 927.250 MHz
27.07 dBm



Start 923.000 MHz Stop 933.000 MHz
#Res BW 100 kHz #VBW 100 kHz Sweep 1.24 ms (601 pts)

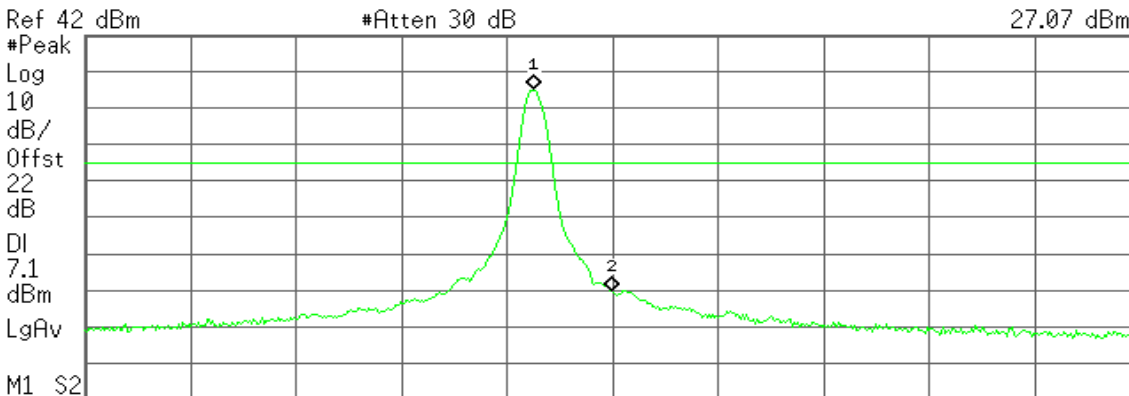
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	927.250 MHz	27.07 dBm
2	(1)	Freq	928.000 MHz	-27.99 dBm

CH Off

* Agilent 14:04:31 Mar 9, 2012

R L

Mkr1 927.250 MHz
27.07 dBm



Start 923.000 MHz Stop 933.000 MHz
#Res BW 100 kHz #VBW 100 kHz Sweep 1.24 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	927.250 MHz	27.07 dBm
2	(1)	Freq	928.000 MHz	-27.99 dBm



7.6.2 RADIATED EMISSIONS

LIMIT

1. In the section 14.247(c):

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental Field Strength (mV/m)	Field Strength of Harmonics (μ V/m)
902-928 MHz	50	500
2400 - 2483.5 MHz	50	500
5725 - 5875 MHz	50	500
24.0 - 24.25 GHz	250	2500

2. 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:

Frequency (MHz)	Field Strength (μ V/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

Remark: 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.

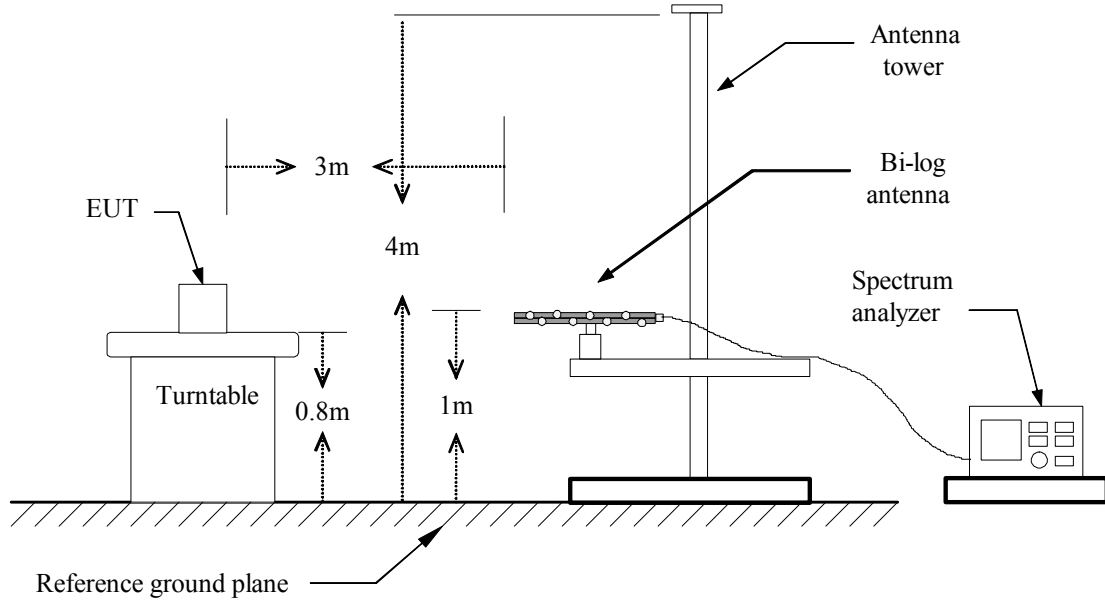
3. In the above emission table, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μ V/m at 3-meter)	Field Strength (dB μ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

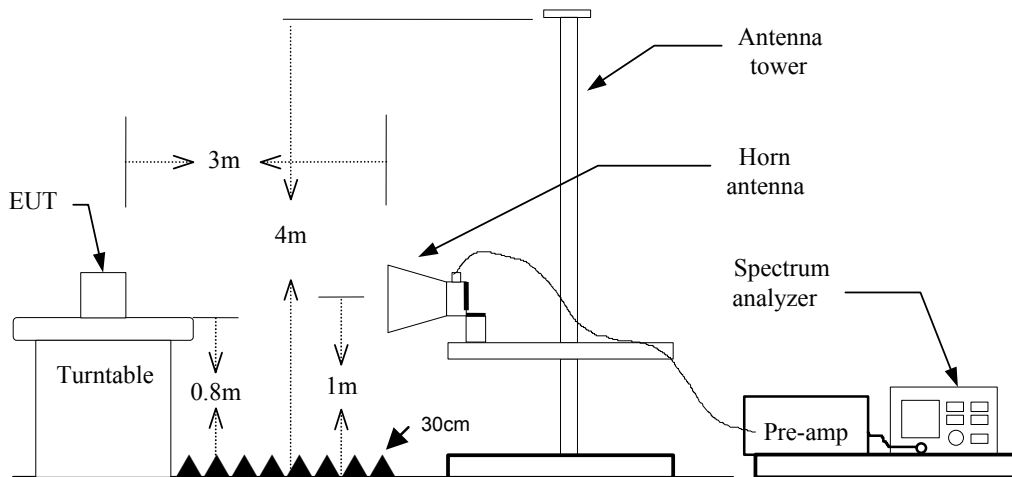


TEST CONFIGURATION

Below 1 GHz



Above 1 GHz





TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
 - For Below 30MHz**
RBW=9kHz / VBW=300kHz / Sweep=AUTO
 - For 30 ~ 1000MHz:**
RBW=120kHz / VBW=300kHz / Sweep=AUTO
 - Above 1GHz:**
PEAK: RBW=VBW=1MHz / Sweep=AUTO
AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

TEST RESULTS

No non-compliance noted.



TEST DATA

Below 1 GHz

Operation Mode: TX / CH Low **Test Date:** Dec. 25, 2011
Temperature: 22°C **Tested by:** Rick Lu
Humidity: 57% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
39.7000	V	42.60	-13.68	28.92	40.00	-11.08	QP
132.8200	V	46.24	-13.76	32.48	43.50	-11.02	QP
399.5700	V	47.34	-9.47	37.87	46.00	-8.13	QP
611.0300	V	43.17	-4.19	38.98	46.00	-7.02	QP
762.3500	V	42.77	-2.16	40.61	46.00	-5.39	QP
871.9600	V	42.75	-0.02	42.73	46.00	-3.27	QP
155.1300	H	42.45	-12.77	29.68	43.50	-13.82	QP
288.0200	H	45.15	-11.52	33.63	46.00	-12.37	QP
465.5300	H	43.64	-7.91	35.73	46.00	-10.27	QP
625.5800	H	43.37	-4.48	38.89	46.00	-7.11	QP
736.1600	H	43.08	-2.42	40.66	46.00	-5.34	QP
880.6900	H	43.31	0.08	43.39	46.00	-2.61	QP

Remark:

3. No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)
4. Measuring frequencies from 30 MHz to the 1GHz.
5. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
6. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
7. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



Compliance Certification Services Inc.

Report No: T111205103-RP1

FCC ID: M82-ART-320

Date of Issue: March 9, 2012

Operation Mode: TX / CH Mid

Test Date: Dec. 25, 2011

Temperature: 22°C

Tested by: Rick Lu

Humidity: 57% RH

Polarity: Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
132.8200	V	43.91	-13.76	30.15	43.50	-13.35	QP
256.9800	V	42.42	-12.34	30.08	46.00	-15.92	QP
384.0500	V	44.63	-9.54	35.09	46.00	-10.91	QP
613.9400	V	43.15	-4.26	38.89	46.00	-7.11	QP
729.3700	V	42.39	-2.56	39.83	46.00	-6.17	QP
852.5600	V	42.03	-0.22	41.81	46.00	-4.19	QP
140.5800	H	42.35	-12.28	30.07	43.50	-13.43	QP
288.0200	H	43.42	-11.52	31.90	46.00	-14.10	QP
421.8800	H	42.41	-8.95	33.46	46.00	-12.54	QP
581.9300	H	42.54	-4.79	37.75	46.00	-8.25	QP
753.6200	H	42.46	-2.15	40.31	46.00	-5.69	QP
864.2000	H	42.19	-0.10	42.09	46.00	-3.91	QP

Remark:

1. No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)
2. Measuring frequencies from 30 MHz to the 1GHz.
3. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



Compliance Certification Services Inc.

Report No: T111205103-RP1

FCC ID: M82-ART-320

Date of Issue: March 9, 2012

Operation Mode: TX / CH High

Test Date: Dec. 25, 2011

Temperature: 22°C

Tested by: Rick Lu

Humidity: 57% RH

Polarity: Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
132.8200	V	43.73	-13.76	29.97	43.50	-13.53	QP
350.1000	V	42.79	-9.67	33.12	46.00	-12.88	QP
384.0500	V	43.92	-9.54	34.38	46.00	-11.62	QP
455.8300	V	43.37	-8.15	35.22	46.00	-10.78	QP
577.0800	V	43.99	-5.01	38.98	46.00	-7.02	QP
764.2900	V	42.72	-2.16	40.56	46.00	-5.44	QP
147.3700	H	42.68	-12.51	30.17	43.50	-13.33	QP
288.0200	H	43.35	-11.52	31.83	46.00	-14.17	QP
408.3000	H	43.07	-9.27	33.80	46.00	-12.20	QP
612.9700	H	42.22	-4.24	37.98	46.00	-8.02	QP
729.3700	H	42.67	-2.56	40.11	46.00	-5.89	QP
881.6600	H	41.97	0.09	42.06	46.00	-3.94	QP

Remark:

1. No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)
2. Measuring frequencies from 30 MHz to the 1GHz.
3. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



Compliance Certification Services Inc.

Report No: T111205103-RP1

FCC ID: M82-ART-320

Date of Issue: March 9, 2012

Above 1 GHz

Operation Mode: Tx / CH Low

Test Date: Dec. 26, 2011

Temperature: 20°C

Tested by: Rick Lu

Humidity: 52% RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1810.00	V	59.16	53.46	-4.98	54.18	48.48	74.00	54.00	-5.52	AVG
2410.00	V	45.64	---	-1.60	44.05	---	74.00	54.00	-9.95	Peak
2710.00	V	61.00	55.02	-1.53	59.47	53.49	74.00	54.00	-0.51	AVG
3610.00	V	44.28	---	2.88	47.17	---	74.00	54.00	-6.83	Peak
4510.00	V	43.10	---	2.21	45.31	---	74.00	54.00	-8.69	Peak
5410.00	V	43.01	---	6.37	49.38	---	74.00	54.00	-4.62	Peak
7225.00	V	47.11	39.21	10.16	57.27	49.37	74.00	54.00	-4.63	AVG
1810.00	H	64.84	59.16	-6.65	58.19	52.51	74.00	54.00	-1.49	AVG
2710.00	H	60.37	56.33	-3.28	57.09	53.05	74.00	54.00	-0.95	AVG
3610.00	H	53.11	46.85	4.12	57.23	50.97	74.00	54.00	-3.03	AVG
4510.00	H	49.69	45.62	6.55	56.24	52.17	74.00	54.00	-1.83	AVG
5410.00	H	49.37	42.87	8.44	57.81	51.31	74.00	54.00	-2.69	AVG
6325.00	H	45.79	42.77	7.87	53.66	50.64	74.00	54.00	-3.36	AVG
7225.00	H	43.90	41.23	10.82	54.72	52.05	74.00	54.00	-1.95	AVG

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" no emission measured remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Compliance Certification Services Inc.

Report No: T111205103-RP1

FCC ID: M82-ART-320

Date of Issue: March 9, 2012

Operation Mode: Tx / CH Mid **Test Date:** Dec. 26, 2011
Temperature: 20°C **Tested by:** Rick Lu
Humidity: 52% RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1825.00	V	56.98	---	-4.63	52.35	---	74.00	54.00	-1.65	Peak
2740.00	V	56.38	54.56	-1.72	54.66	52.84	74.00	54.00	-1.16	AVG
3670.00	V	45.95	---	2.61	48.55	---	74.00	54.00	-5.45	Peak
4585.00	V	44.82	---	1.63	46.44	---	74.00	54.00	-7.56	Peak
5500.00	V	43.24	---	6.23	49.47	---	74.00	54.00	-4.53	Peak
6415.00	V	42.43	---	6.64	49.07	---	74.00	54.00	-4.93	Peak
7330.00	V	43.76	41.45	10.73	54.48	52.18	74.00	54.00	-1.82	AVG
1825.00	H	63.26	59.05	-6.51	56.76	52.54	74.00	54.00	-1.46	AVG
2740.00	H	55.98	---	-3.01	52.97	---	74.00	54.00	-1.03	Peak
3655.00	H	46.96	---	3.95	50.90	---	74.00	54.00	-3.10	Peak
4570.00	H	50.04	46.22	6.13	56.17	52.35	74.00	54.00	-1.65	AVG
5485.00	H	49.03	43.42	8.79	57.82	52.21	74.00	54.00	-1.79	AVG
6400.00	H	45.48	42.17	7.82	53.30	49.99	74.00	54.00	-4.01	AVG
7315.00	H	45.68	39.72	11.74	57.42	51.46	74.00	54.00	-2.54	AVG

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown "----" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" no emission measured remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Compliance Certification Services Inc.

Report No: T111205103-RP1

FCC ID: M82-ART-320

Date of Issue: March 9, 2012

Operation Mode: Tx / CH High

Test Date: Dec. 26, 2011

Temperature: 20°C

Tested by: Rick Lu

Humidity: 52% RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBUV)	AV Reading (dBUV)	Ant. / CL CF (dB)	Result		Peak Limit (dBUV/m)	AV Limit (dBUV/m)	Margin (dB)	Remark
					Peak (dBUV/m)	AV (dBUV/m)				
1390.00	V	65.10	57.12	-6.83	58.27	50.29	74.00	54.00	-3.71	AVG
1855.00	V	58.01	56.09	-3.93	54.09	52.16	74.00	54.00	-1.84	AVG
2320.00	V	55.32	54.01	-1.57	53.75	52.44	74.00	54.00	-1.56	AVG
2785.00	V	56.77	54.99	-2.01	54.76	52.98	74.00	54.00	-1.02	AVG
3250.00	V	48.81	---	-0.00	48.81	---	74.00	54.00	-5.19	Peak
3715.00	V	46.70	---	2.65	49.35	---	74.00	54.00	-4.65	Peak
4630.00	V	45.74	---	1.90	47.63	---	74.00	54.00	-6.37	Peak
5560.00	V	41.96	---	6.04	48.00	---	74.00	54.00	-6.00	Peak
7420.00	V	43.83	40.52	11.35	55.18	51.87	74.00	54.00	-2.13	AVG
1390.00	H	62.37	57.46	-7.16	55.21	50.30	74.00	54.00	-3.70	AVG
1855.00	H	65.90	58.54	-6.23	59.67	52.31	74.00	54.00	-1.69	AVG
2320.00	H	49.82	---	-6.35	43.47	---	74.00	54.00	-10.53	Peak
2785.00	H	54.58	---	-2.61	51.96	---	74.00	54.00	-2.04	Peak
3715.00	H	46.38	---	3.97	50.35	---	74.00	54.00	-3.65	Peak
4630.00	H	48.90	45.81	6.34	55.24	52.15	74.00	54.00	-1.85	AVG
5560.00	H	51.32	43.54	9.06	60.38	52.60	74.00	54.00	-1.40	AVG
6025.00	H	45.84	42.95	8.79	54.63	51.74	74.00	54.00	-2.26	AVG
6490.00	H	47.16	44.18	7.75	54.90	51.93	74.00	54.00	-2.07	AVG

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" no emission measured remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



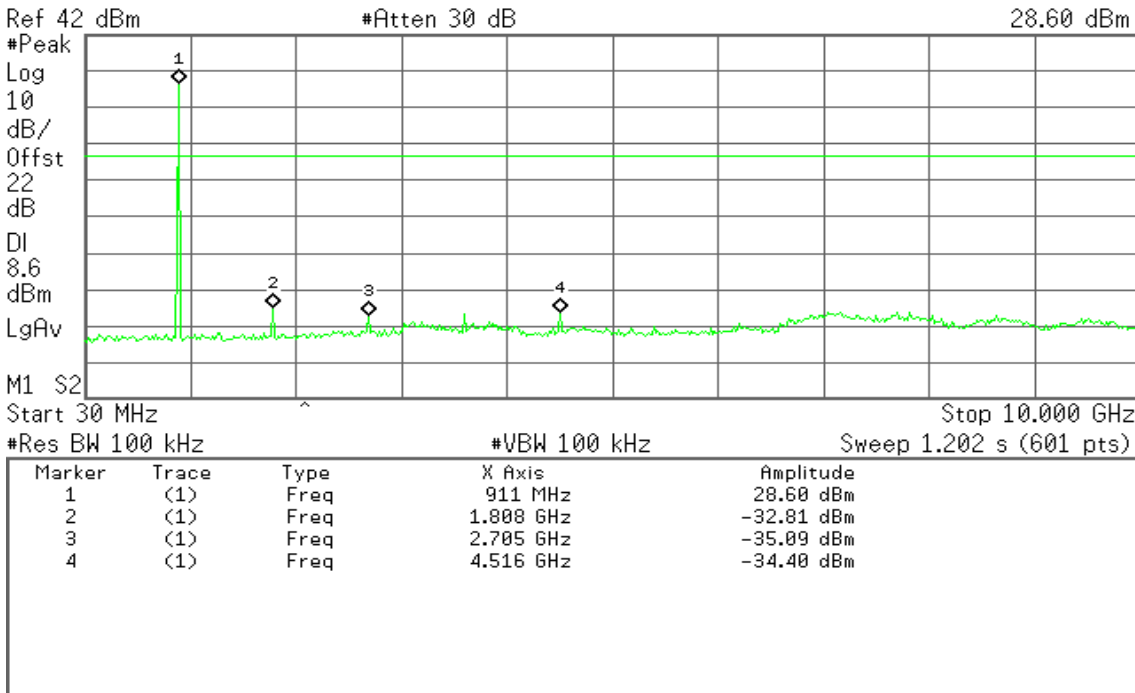
Test Plot

CH Low

* Agilent 16:22:23 Dec 28, 2011

R L

Mkr1 911 MHz
28.60 dBm

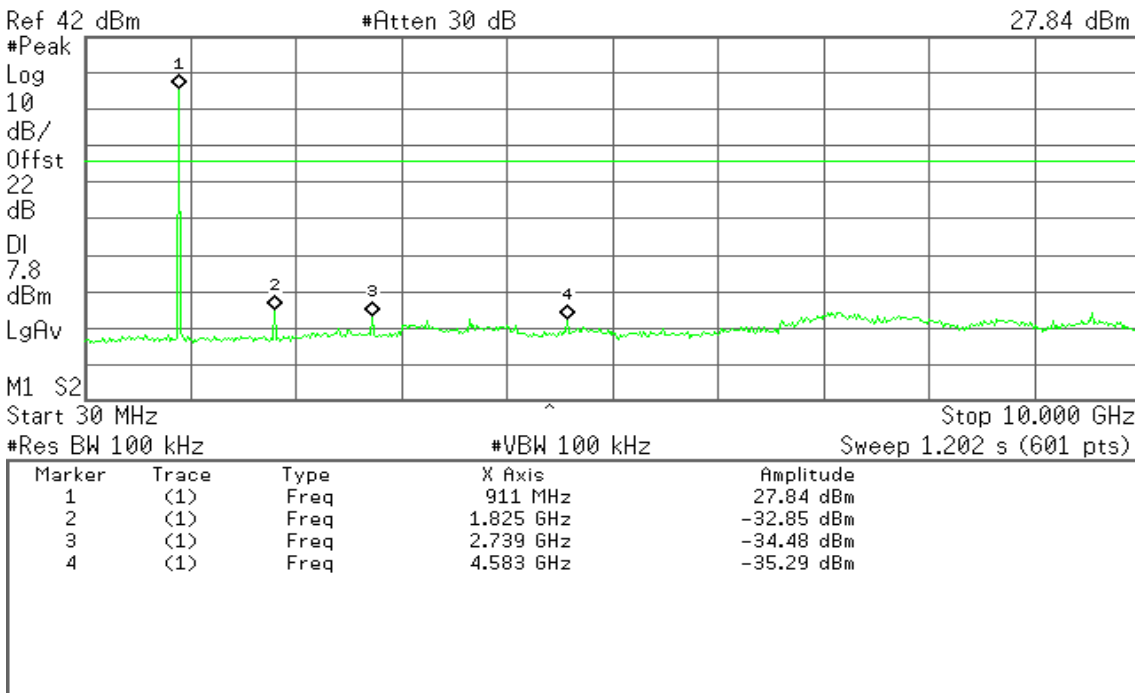


CH Mid

* Agilent 16:29:51 Dec 28, 2011

R L

Mkr1 911 MHz
27.84 dBm



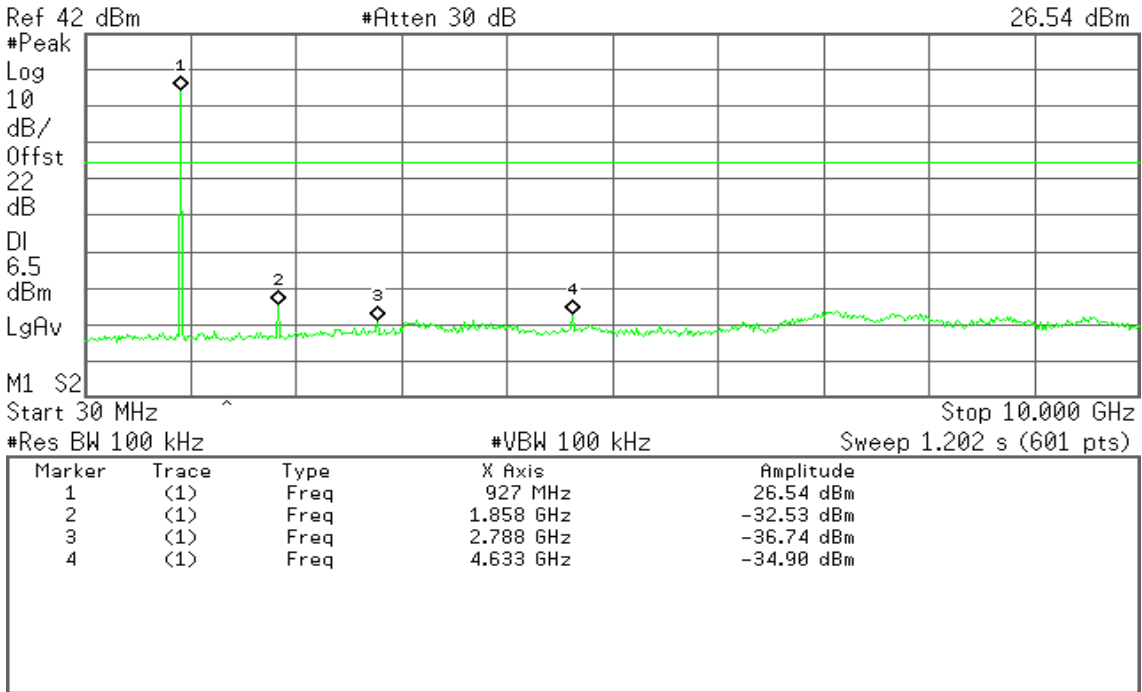


CH High

* Agilent 16:32:04 Dec 28, 2011

R L

Mkr1 927 MHz
26.54 dBm





7.8. POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

* *Decreases with the logarithm of the frequency.*

TEST CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.



TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

TEST DATA

Operation Mode: Charging

Test Date: Dec. 22, 2011

Temperature: 25°C

Tested by: Han Chaic

Humidity: 57% RH

Test

Freq. (MHz)	QP Reading	AV Reading	Corr. factor	QP Result	AV Result	QP Limit	AV Limit	QP Margin	AV Margin	Note
0.2633	23.11	11.32	9.71	32.82	21.03	61.33	51.33	-28.51	-30.30	L1
0.4125	23.51	11.32	9.71	33.22	21.03	57.60	47.60	-24.38	-26.57	L1
0.5203	25.82	14.16	9.62	35.44	23.78	56.00	46.00	-20.56	-22.22	L1
4.6930	20.89	6.01	9.82	30.71	15.83	56.00	46.00	-25.29	-30.17	L1
5.4419	23.87	9.23	9.85	33.72	19.08	60.00	50.00	-26.28	-30.92	L1
11.0608	18.87	9.08	10.20	29.07	19.28	60.00	50.00	-30.93	-30.72	L1
0.5192	25.27	12.41	9.61	34.88	22.02	56.00	46.00	-21.12	-23.98	L2
0.9322	21.46	8.91	9.61	31.07	18.52	56.00	46.00	-24.93	-27.48	L2
1.9709	15.67	1.88	9.73	25.40	11.61	56.00	46.00	-30.60	-34.39	L2
4.6929	19.57	5.18	9.82	29.39	15.00	56.00	46.00	-26.61	-31.00	L2
5.4248	22.43	7.05	9.86	32.29	16.91	60.00	50.00	-27.71	-33.09	L2
10.4784	16.89	6.11	10.26	27.15	16.37	60.00	50.00	-32.85	-33.63	L2

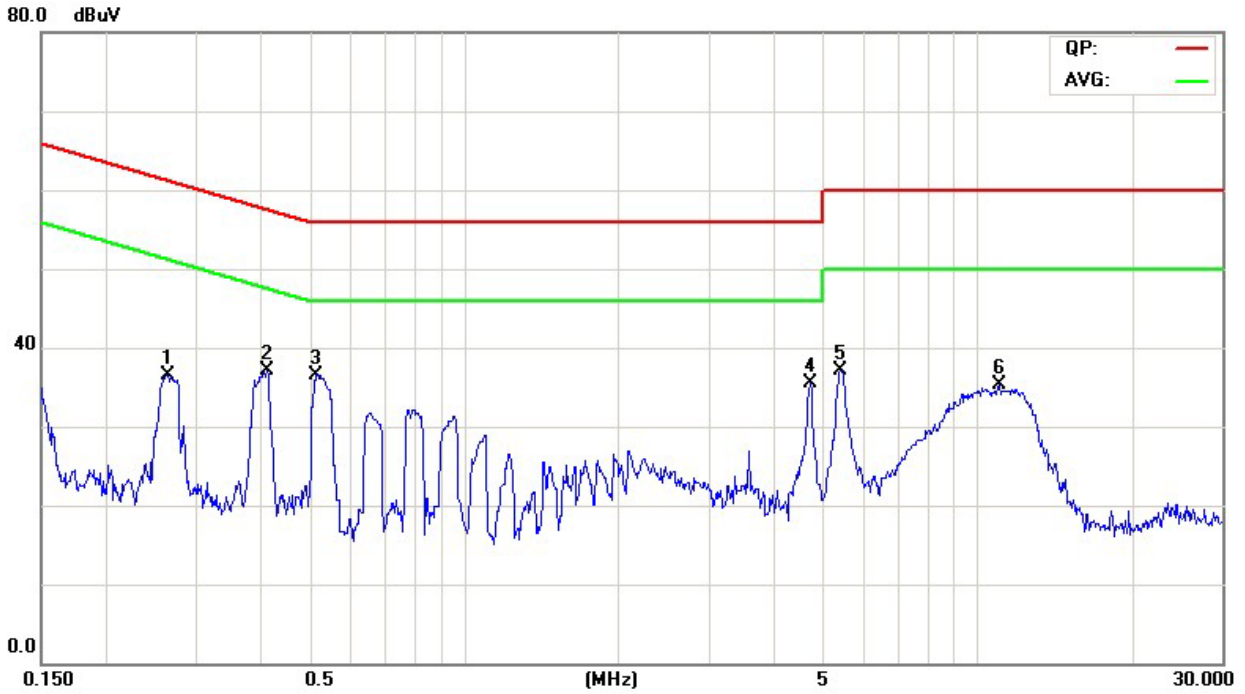
Remark:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. "---" denotes the emission level was or more than 2dB below the Average limit
4. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
5. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

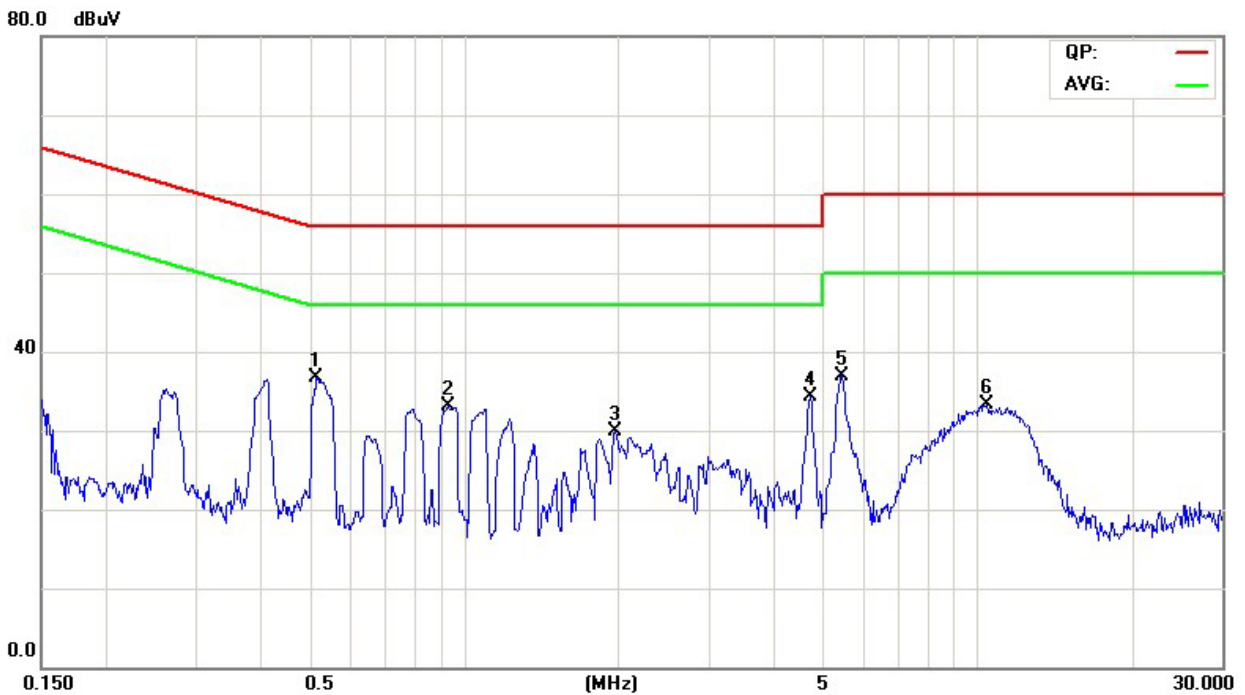


Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)





8 APPENDIX I RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

EUT Specification

EUT	UHF RFID ART-320 Tracer Module
Frequency band (Operating)	<input type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input checked="" type="checkbox"/> Others 902 ~ 928MHz
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity
Max. output power	29.77dBm (948.42mW) (Peak) 27.64dBm (580.76m) (AVG.)
Antenna gain (Max)	6.00dBi (including cable loss) (Numeric gain: 3.98)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

Remark:

1. The maximum output power is 27.64dBm (580.76mW) (with 3.98numeric antenna gain.)
2. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 0.6 mW/cm² even if the calculation indicates that the power density would be larger.

TEST RESULTS

No non-compliance noted.



Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

Maximum Permissible Exposure

EUT output power = 580.76mW

Numeric Antenna gain = 3.98

Substituting the MPE safe distance using $d = 20$ cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

→ Power density = 0.046 mW / cm²

(For mobile or fixed location transmitters, the maximum power density is 0.60 mW/cm² even if the calculation indicates that the power density would be larger.)