



RADIO TEST REPORT

For

Product Name: Auto Data Server

Brand Name: iEi

Model No.: AVL-3000

FCC ID: RFHAVL3000

Test Report Number:

C130923R01-RPR

Issued for

IEI Integration Corp.

No.29,Zhongxing Rd., Xizhi Dist., New Taipei City 22161, Taiwan(R.O.C.)

Issued by

Compliance Certification Services Inc.

Kun shan Laboratory

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Development Zone, Kunshan City, Jiangsu, China

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TESTING CERT #2541.01

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1 TEST RESULT CERTIFICATION

Product Name:	Auto Data Server
Trade Name:	iEi
Model Name.:	AVL-3000
Series Model:	N/A
Applicant Discrepancy:	Initial
Device Category:	Mobile Device
Date of Test:	December 5, 2013 and April 16, 2014
Applicant:	IEI Integration Corp. No.29,Zhongxing Rd., Xizhi Dist., New Taipei City 22161, Taiwan(R.O.C.)
Manufacturer:	IEI Integration Corp. No.29,Zhongxing Rd., Xizhi Dist., New Taipei City 22161, Taiwan(R.O.C.)
Application Type:	Certification

APPLICABLE STANDARDS

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

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 C63.4:2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

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

Approved by:

Jeff Fang

Tested by:

Blent Wang

Jeff.Fang
RF Manager
Compliance Certification Services Inc.

Blent.Wang
Test Engineer
Compliance Certification Services Inc.



2 EUT DESCRIPTION

Product Name:	Auto Data Server
Trade Name:	iEi
Model Name.:	AVL-3000
Model Discrepancy:	N/A
Power Rating :	Power supply: INPUT: DC9-36V
Frequency Range :	902-928MHz
Transmit Power :	24.78dBm(0.301W)
Modulation :	ASK
Spreading technique :	FHSS
Number of Channels :	50 Channels
Antenna Gain :	8.5dBi
Antenna Specification :	Patch Antenna

Remark:

1. This submittal(s) (test report) is intended for **FCC ID: RFHAVL3000** to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



3 TEST METHODOLOGY

The test methodology used is based on the requirements of 47 CFR part 15, sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209 and 15.247.

The test methods, which have been used, are based on ANSI C63.10:2009.

During pretests no significant differences were observed in test results while varying supply voltage from 85% to 115%.

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 EXERCISE EUT

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 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

Testing was performed at the lowest operating frequency (902.75), at the operating frequency in the middle of the specified frequency band (915.25 MHz) and at the highest operating frequency (927.25 MHz).

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 30 MHz 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 MODIFICATION

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Test Channel	Antenna
Conducted output power	Low/Mid/High	1
20dB bandwidth	Low/High	1
Hopping channel separation	Mid	1
Number of hopping frequency	Low/High	1
Time of occupancy	Mid	1
Conducted spurious emission	Low/Mid/High	1
Band Edge conducted Emissions	Low/High	1
Radiated Emissions Below 1GHz	Low/Mid/High	1
Radiated Emissions Above 1GHz	Low/Mid/High	1
AC Power Conducted Emissions	-	-

Remark: For radiated test cases below 1GHz, the worst mode data rate channel 1 was reported only, because this data rate has the highest RF output power at preliminary tests.



3.5 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
0.0900 - 0.1100	16.420 - 16.423	399.9 - 410.0	4.50 - 5.15
0.4950 - 0.505 ⁽¹⁾	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960.0 - 1240	7.25 - 7.75
4.1250 - 4.1280	25.50 - 25.67	1300 - 1427	8.025 - 8.500
4.17725 - 4.17775	37.50 - 38.25	1435.0 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73.0 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.2150 - 6.2180	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108.00 - 121.94	1718.8 - 1722.2	13.25 - 13.40
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.50
8.2910 - 8.2940	149.90 - 150.05	2310 - 2390	15.35 - 16.20
8.3620 - 8.3660	156.52475 - 156.52525	2483.5 - 2500.0	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.1700	3260 - 3267	23.6 - 24.0
12.2900 - 12.2930	167.72 - 173.20	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345 - 3358	36.43 - 36.5 ⁽²⁾
12.57675 - 12.57725	322.0 - 335.4	3600 - 4400	
13.3600 - 13.4100			

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.



4 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, facilities and accreditations

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at CCS China Kunshan Lab at 10#Weiye Rd, Innovation Park Eco. & Tec. Development Zone Kunshan city JiangSu, (215300), CHINA.

The sites are constructed in conformance with the requirements of 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 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by American Association for Laboratory Accreditation Program for the specific scope accreditation under Lab Code: 200581-0 to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC5743 for 10m chamber 10m, IC5743 for 10m chamber 3m.



5.4 TABLE OF ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF
USA	A2LA

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Japan	VCCI
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site,
<http://www.ccsrf.com>



5.5 LIST OF MEASURING EQUIPMENT

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	2014-4-16
DETECTOR NEGATIVE	Agilent	8473B	MY42240176	2014-5-12
OSCILLOSCOPE	Agilent	DSO6104A	MY44002585	2015-3-16
Power Sensor	Agilent	E9327A	US40441788	2015-3-17
Power Meter	Agilent	E4416A	QB41292714	2015-3-17
Power SPLITTER	Mini-Circuits	ZN2PD-9G	SF078500430	N.C.R
DC Power Supply	AGILENT	E3632A	MY50340053	N.C.R
Temp. / Humidity Chamber	TERCHY	MHK-120AK	X30109	2015-1-22
Test Software	EZ-EMC			

977 Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	2014-4-16
EMI Test Receiver	R&S	ESPI3	101378	2015-1-22
Pre-Amplifier	MINI	ZFL-1000VH2	070306	2015-1-22
Pre-Amplifier	Miteq	NSP400-NF	N/A	N.C.R
Bilog Antenna	Sunol	JB1	A110204-1	2015-3-7
Horn-antenna	SCHWARZBECK	BBHA9120D	D:267	2015-3-6
Turn Table	CT	CT123	4165	N.C.R
Antenna Tower	CT	CTERG23	3256	N.C.R
Test Software	EZ-EMC			

Conducted Emission				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI TEST RECEIVER	R&S	ESCI	100781	2015-3-16
V (V-LISN)	Schwarzbeck	NNLK 8129	8129-143	2014-8-19
LISN (EUT)	FCC	FCC-LISN-50/250-50-2-02	SN:05012	2015-3-16
10dB Attenuation	SCHAFFNER	CFL9206	1710	N.C.R
Test Software	EZ-EMC			

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



5.6 SETUP CONFIGURATION

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

5.7 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID
1.	N/A	N/A	N/A	N/A	N/A

Remark:

- 1.All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2.Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



6 FCC PART 15.247 REQUIREMENTS

6.1 Conducted Output Power

Requirements:

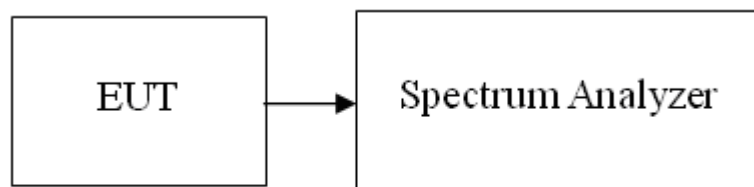
FCC 15.247(b)(2).

The maximum peak output power of the intentional radiator shall not exceed the following:

According to §15.247(b)(2), For systems using frequency hopping in the 902-928 MHz band, the maximum peak output power is 1W (+30dBm) for systems employing at least 50 hopping channels.

According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, 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 spectrum analyzer. Set the RBW = 1MHz , VBW = 1MHz, Detector = Peak, Trace mode = max hold, Sweep = auto couple. Record the max reading, Limit=30-(8.5-6)=27.5dBm.

Repeat the above procedure until the measurements for all frequencies are completed.



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Test Results

No non-compliance noted

Test RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	902.75	24.78	0.301	27.5	PASS
Mid	915.25	24.57	0.286		PASS
High	927.25	23.34	0.216		PASS

Test Data

Ch low



* RBW 1 MHz

Marker 1 [T1]

* VBW 1 MHz

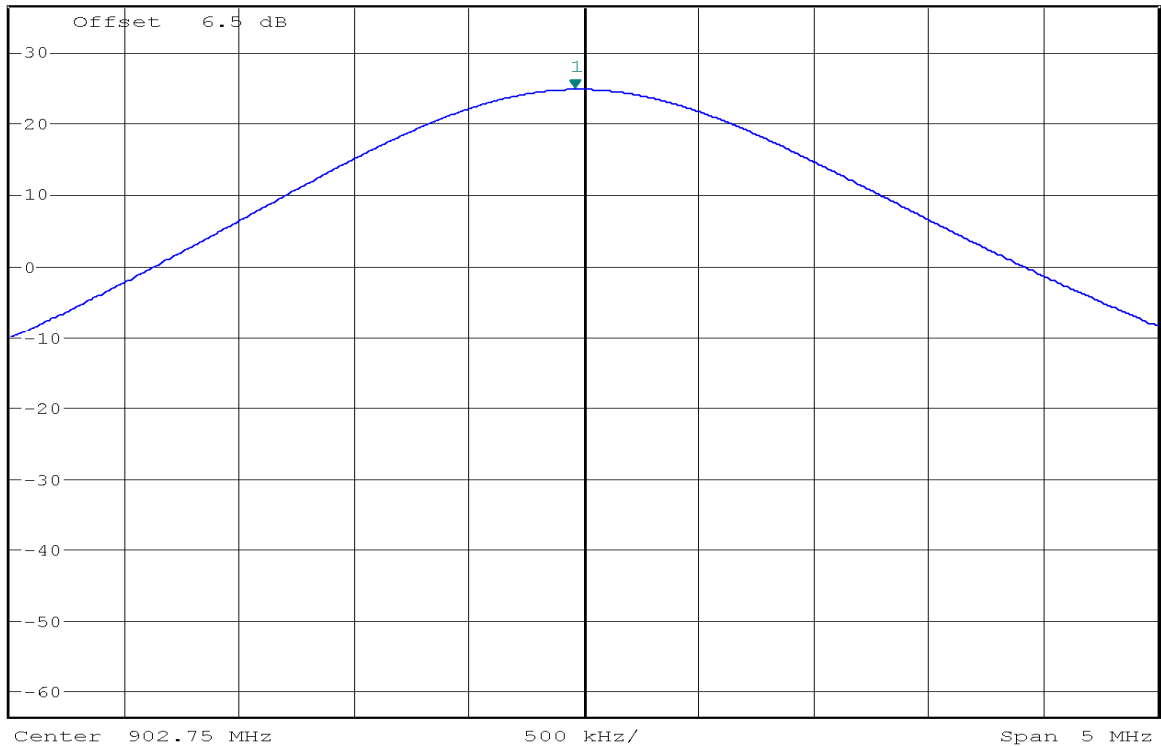
24.78 dBm

SWT 2.5 ms

902.709935897 MHz

Ref 36.5 dBm

Att 55 dB





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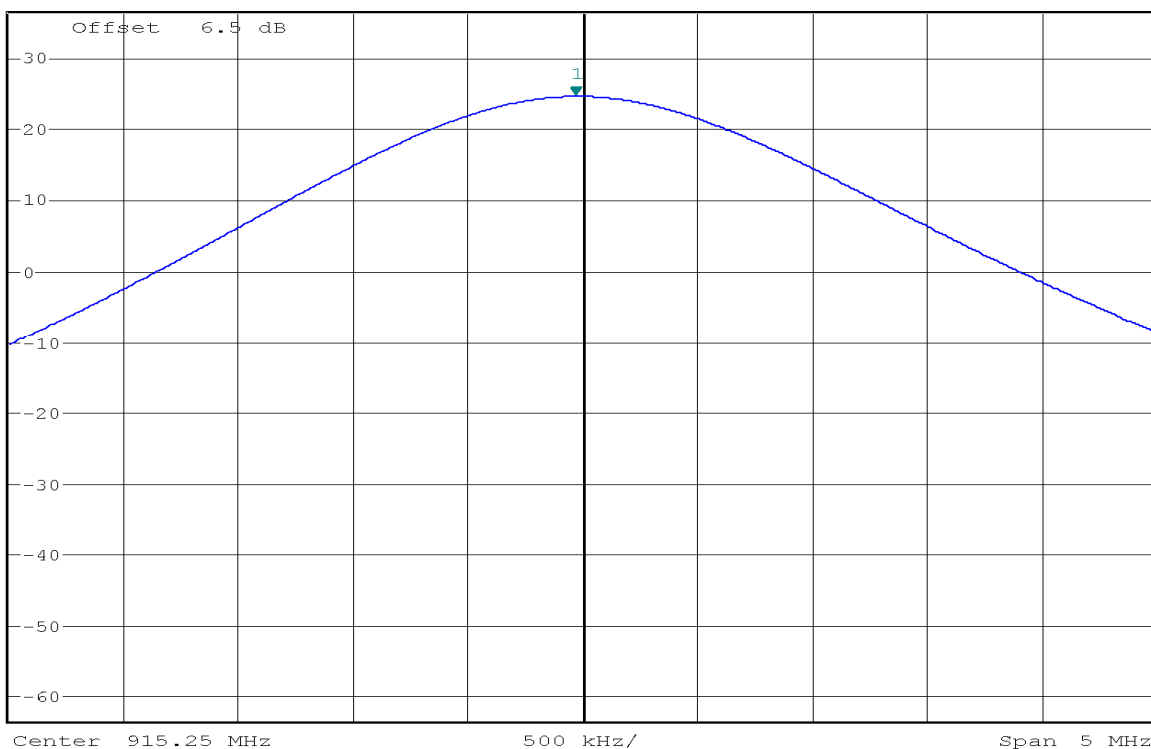
CH Mid



Ref 36.5 dBm Att 55 dB SWT 2.5 ms

* RBW 1 MHz * VBW 1 MHz

Marker 1 [T1] 24.57 dBm 915.217948718 MHz



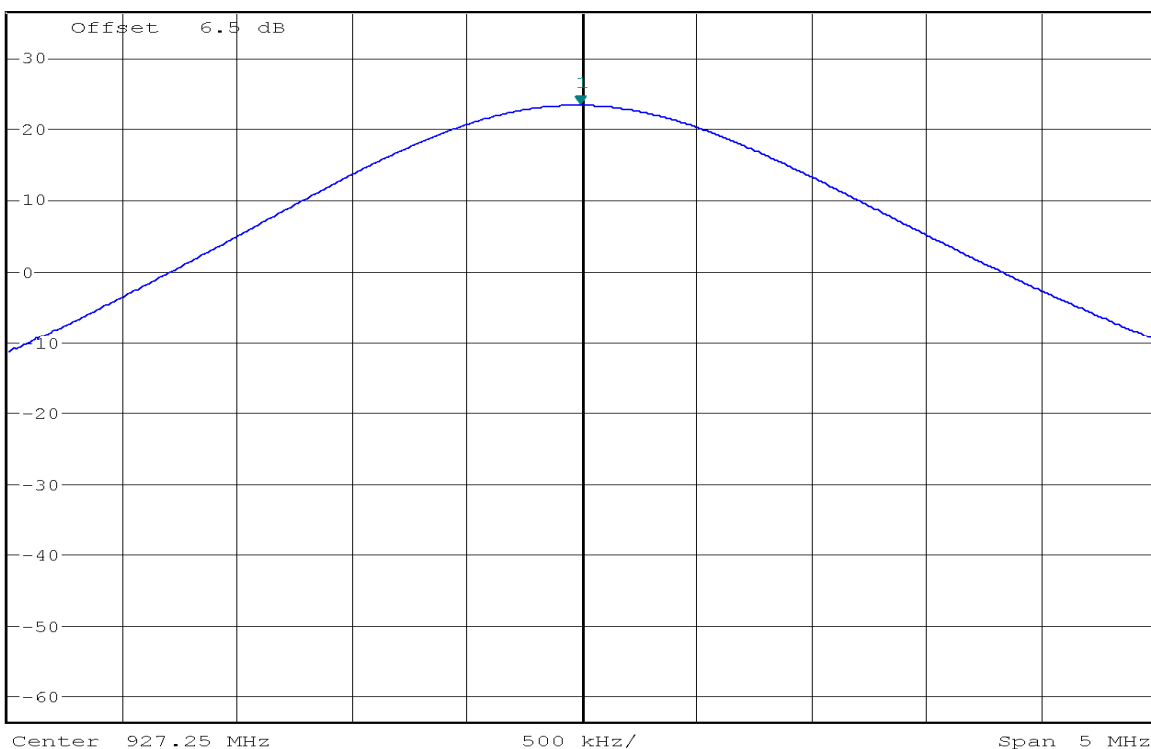
CH High



Ref 36.5 dBm Att 55 dB SWT 2.5 ms

* RBW 1 MHz * VBW 1 MHz

Marker 1 [T1] 23.34 dBm 927.241987179 MHz





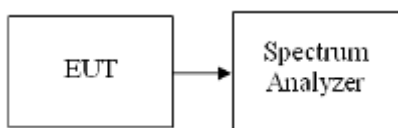
6.2 20dB Bandwidth

Requirements:

FCC 15.247(a)(1)(i).

According to §15.247(a)(1), 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 have at least have 50 hopping channels 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 the spectrum analyzer as RBW = 10kHz, VBW = 30kHz, Span = 200kHz, Sweep = auto.
4. Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

Test Results of Bandwidth

No non-compliance noted

Channel	Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)
Low	902.75	30.77	<500
Mid	915.25	31.41	<500
High	927.25	31.41	<500



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Test Plot

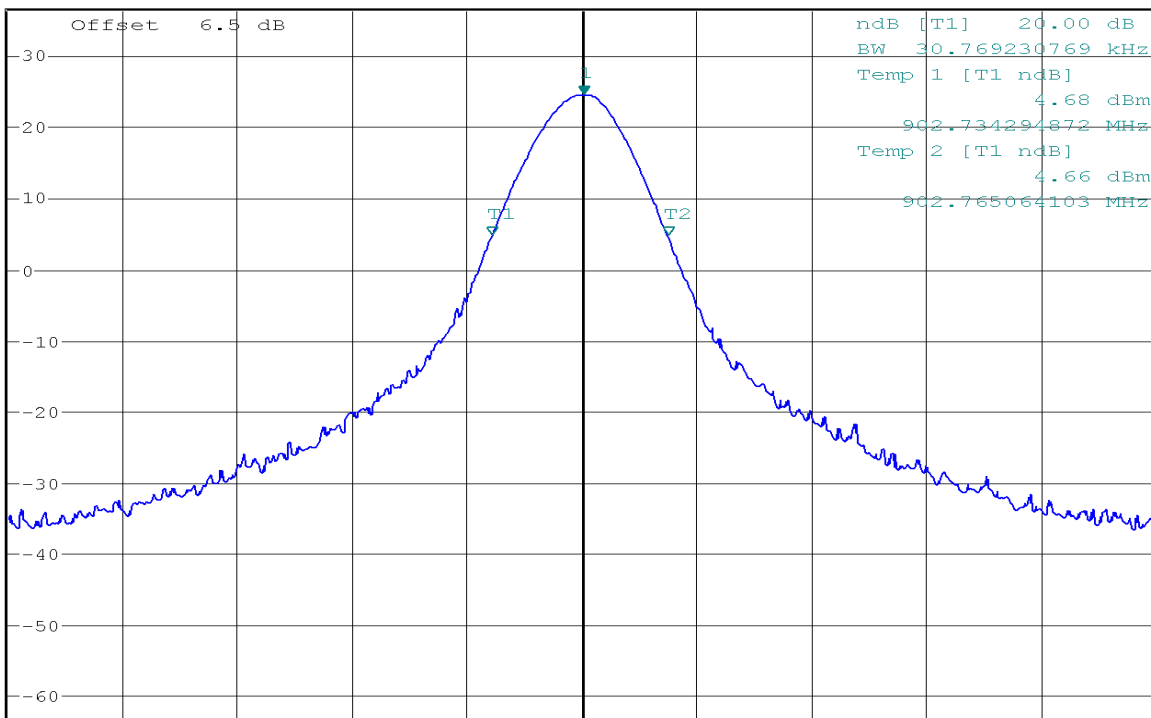
Channel Low



Ref 36.5 dBm Att 55 dB SWT 10 ms

* RBW 10 kHz
* VBW 30 kHz

Marker 1 [T1]
24.52 dBm
902.750320513 MHz



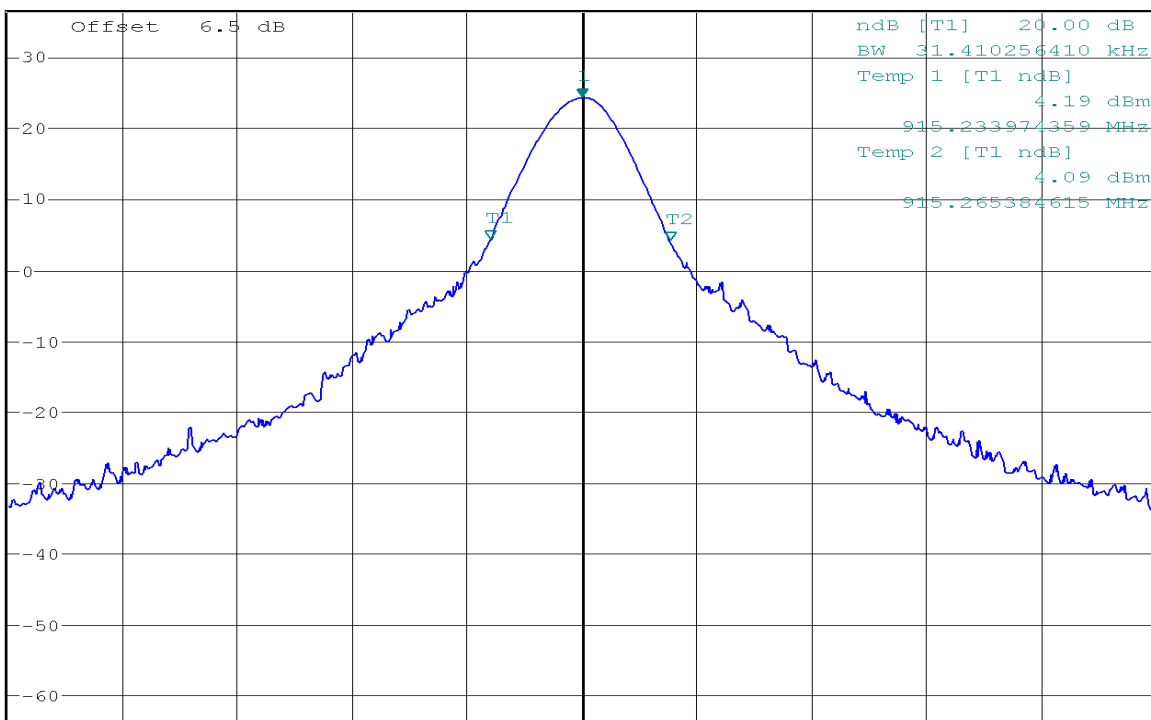
Channel Mid



Ref 36.5 dBm Att 55 dB SWT 10 ms

* RBW 10 kHz
* VBW 30 kHz

Marker 1 [T1]
24.24 dBm
915.250000000 MHz

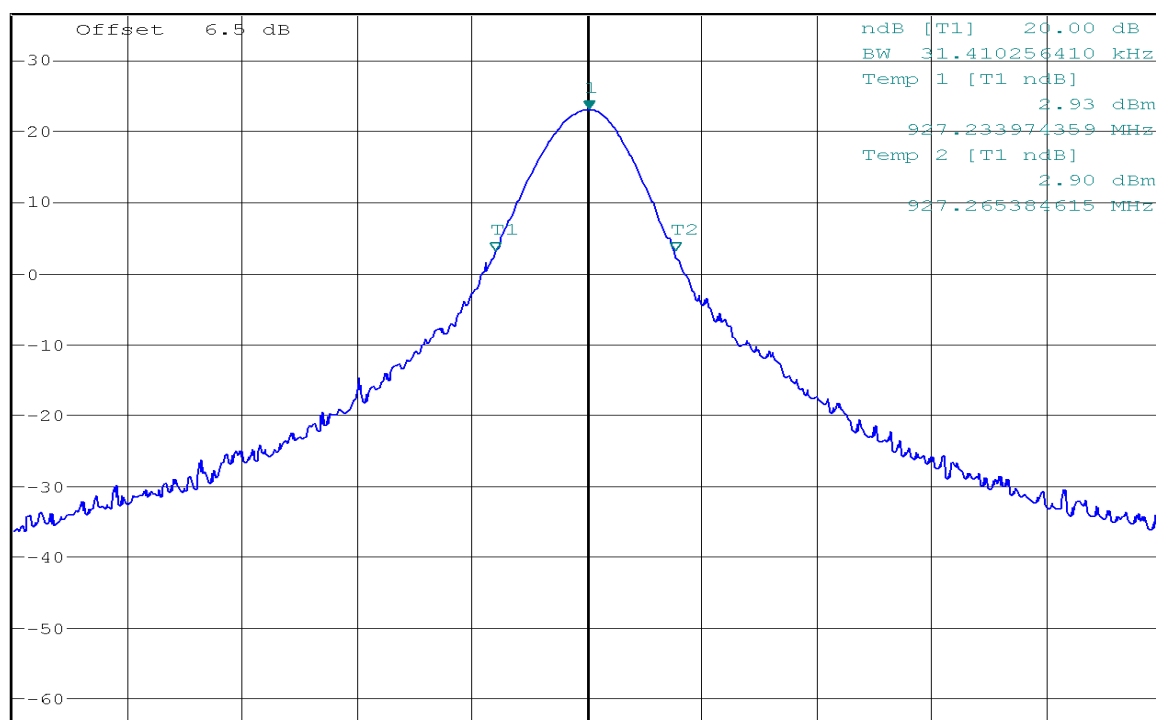




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22.98 dBm

927.250320513 MHz



Span 200 kHz



6.3 HOPPING CHANNEL SEPARATION

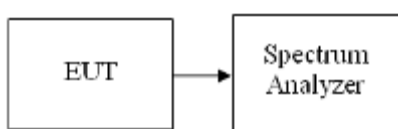
Requirements:

FCC 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 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.

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 = 100kHz, VBW = 100kHz, Span = 1MHz, Sweep = auto.
5. Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

TEST RESULTS

No non-compliance noted

Frequency	Separation	20dB bandwidth	Result
(MHz)	(kHz)	Limits (kHz)	
914.75~915.25	500	31.41	Pass



Channel Separation Plot



Ref 36.5 dBm

Att 55 dB

* RBW 100 kHz

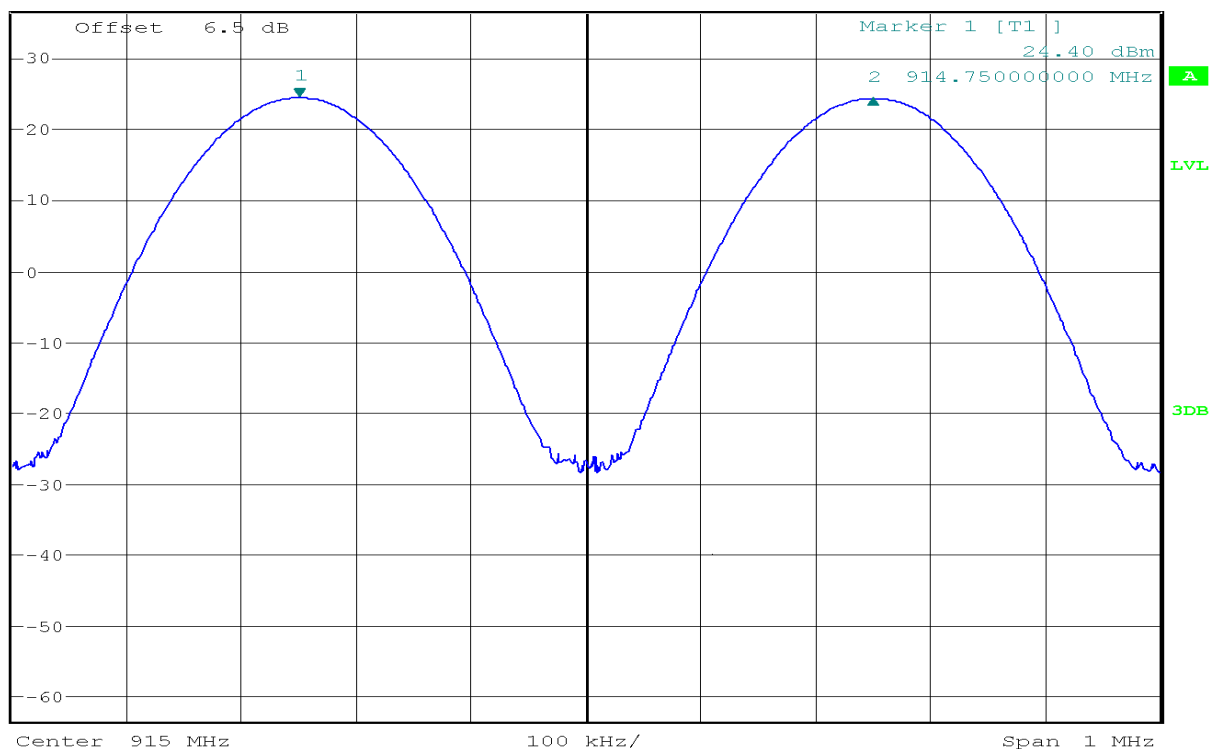
* VBW 100 kHz

SWT 2.5 ms

Delta 2 [T1]

-0.12 dB

500.000000000 kHz

1 PK
MATCH



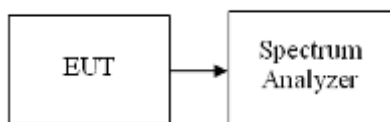
6.4 NUMBER OF HOPPING FREQUENCY

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 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 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall therefore have at least 50 hopping channels.

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=902MHz, Stop = 928MHz, 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

Result (No. of CH)	Limit (No. of CH)	Result
50	≥ 50 for 1W power limit	PASS

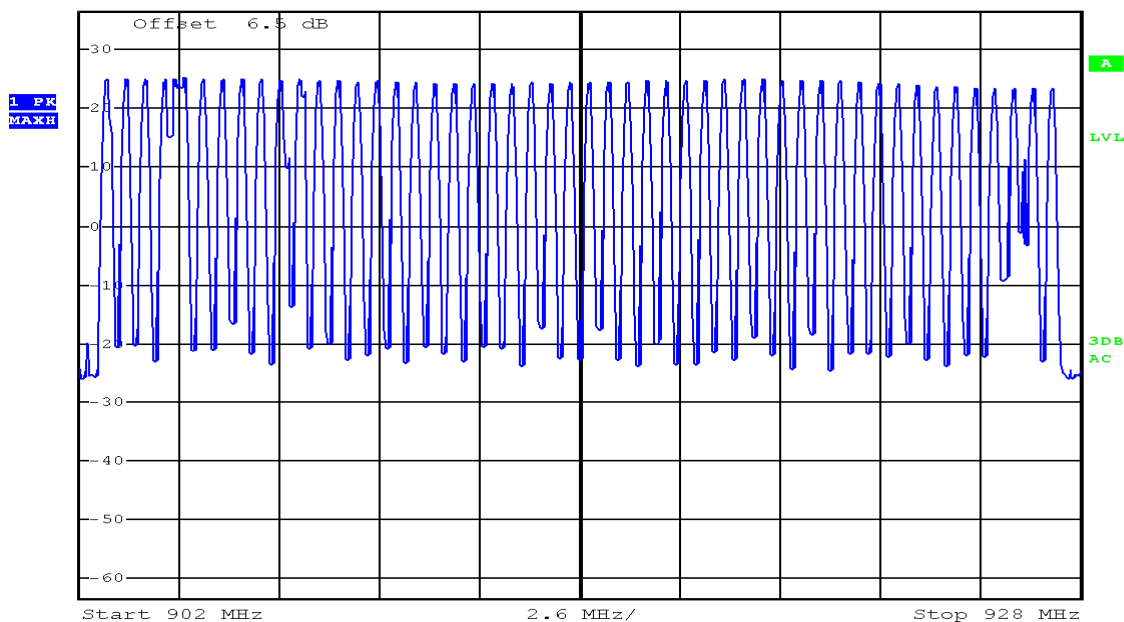


Test Plot:

Channel Number 902MHz~928 MHz



Ref 36.5 dBm Att 60 dB
*RBW 100 kHz
*VBW 100 kHz
SWT 5 ms



Date: 28.NOV.2013 09:25:37

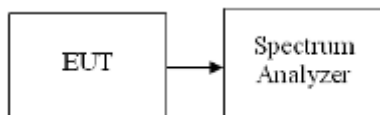


6.5 TIME OF OCCUPANCY (DWELL TIME)

LIMIT

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 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 center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = 520ms.
5. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

No non-compliance noted

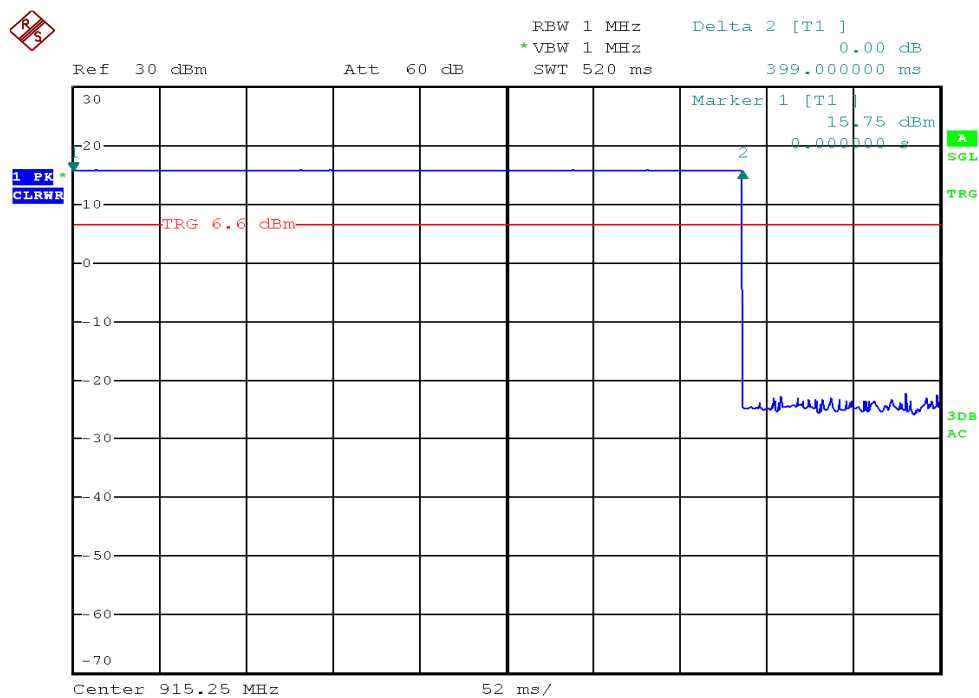


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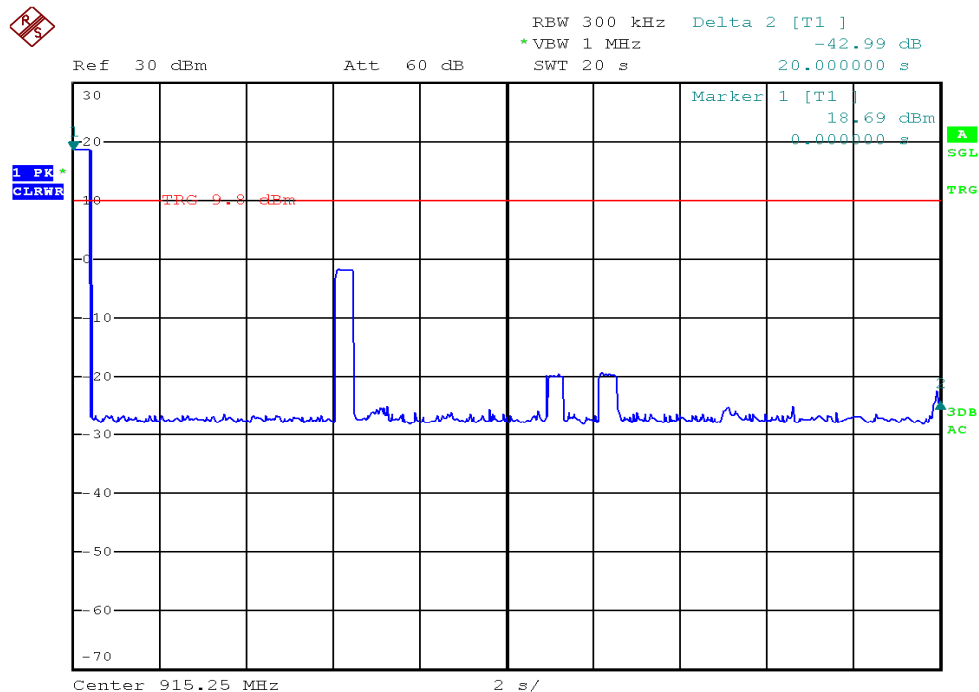
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Date: 29.NOV.2013 06:52:28

Plot showing Dwell time of a hop as measured on a spectrum analyzer.



Date: 29.NOV.2013 06:54:31

Plot showing average time of occupancy in a 20 second period as measured on a spectrum analyzer.
Note: Not measured in 1 MHz resolution bandwidth to avoid hops from next channel being registered.
Instead a RBW of 500 kHz is used with a sharp Channel filter.

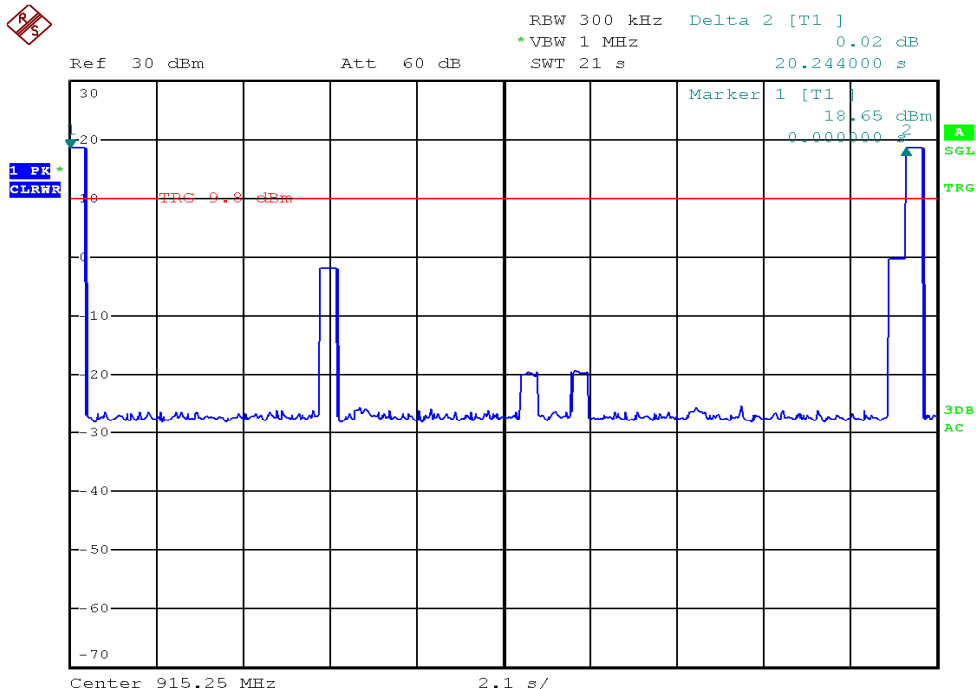


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Date: 29.NOV.2013 06:56:07

Plot showing period time of a hop cycle on 1 channel as measured on a spectrum analyzer.

Note: Not measured in 1 MHz resolution bandwidth to avoid hops from next channel being registered. Instead a RBW of 500 kHz is used with a sharp Channel filter.

Limit: The 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall therefore have an average time of occupancy not greater than 0.4 seconds within a 20 second period.

Result: **Pass**

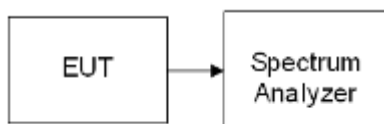


6.6 Conducted Spurious Emission

LIMIT

In any 100kHz bandwidth outside the frequency band, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

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.

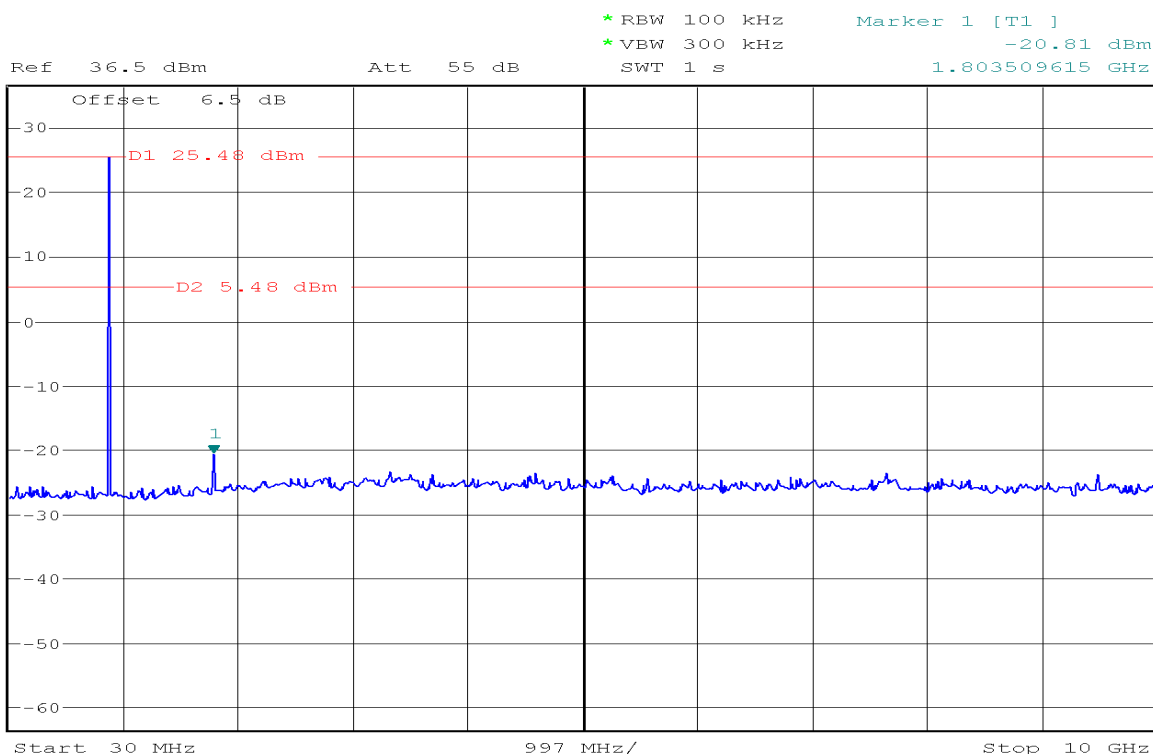
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz.

Measurements are made over the 30MHz to 10GHz range with the transmitter set to the lowest, middle, and highest channels.

TEST RESULTS

No non-compliance noted

30MHz - 10GHz, 902.75 MHz





Compliance Certification Services Inc.

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30MHz - 10GHz, 915.25 MHz



* RBW 100 kHz
* VBW 300 kHz
SWT 1 s

Marker 1 [T1]

-23.34 dBm

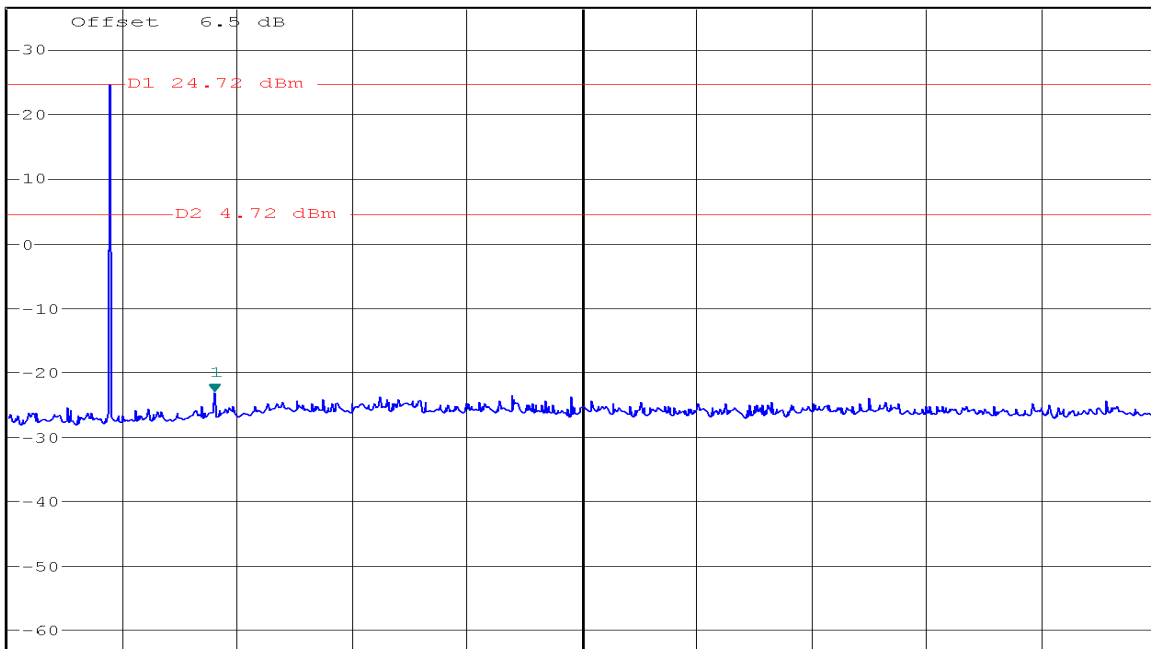
1.819487179 GHz

Ref 36.5 dBm

Att 55 dB

Offset 6.5 dB

1 PK
MATCH



Start 30 MHz

997 MHz/

Stop 10 GHz

30MHz - 10GHz, 927.25 MHz



* RBW 100 kHz
* VBW 300 kHz
SWT 1 s

Marker 1 [T1]

-24.18 dBm

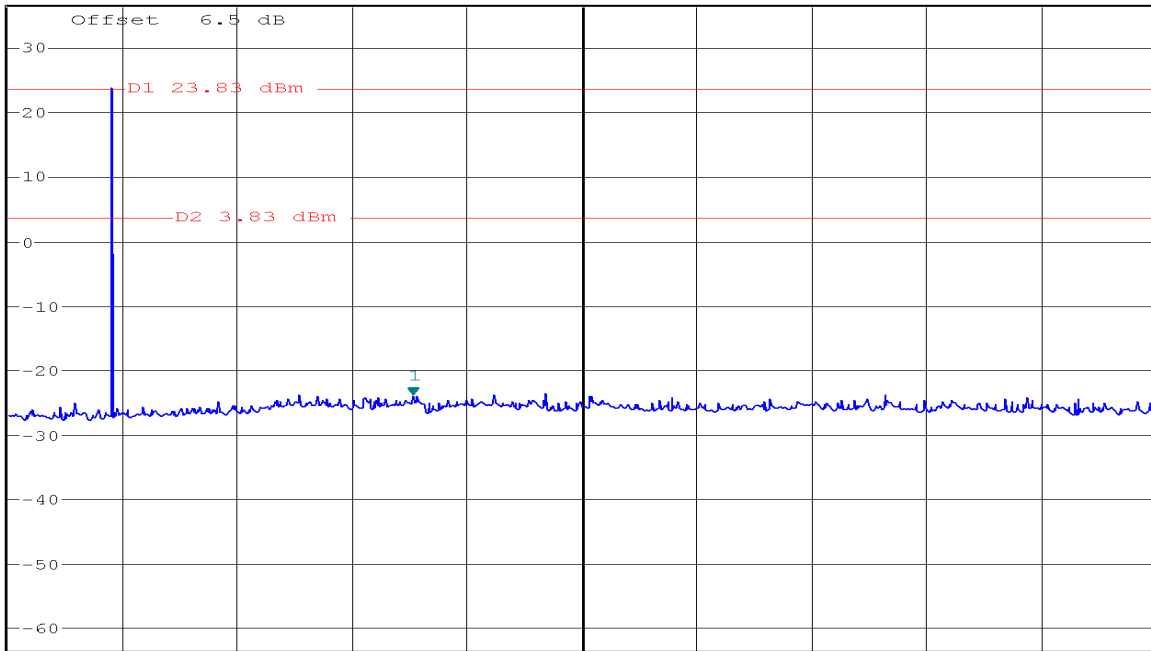
3.545064103 GHz

Ref 36.5 dBm

Att 55 dB

Offset 6.5 dB

1 PK
MATCH



Start 30 MHz

997 MHz/

Stop 10 GHz

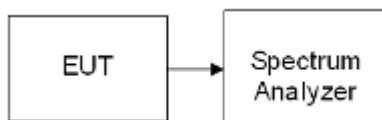


6.7 Band Edge Conducted Emissions

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, provided the transmitter demonstrates compliance with the peak conducted power limits.

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.

Set spectrum analyzer Start=900MHz, Stop = 903MHz, Sweep = auto and Start=927MHz, Stop = 930MHz, Sweep = auto.

TEST RESULTS

No non-compliance noted



RESTRICTED BANDEDGE (Low Channel)

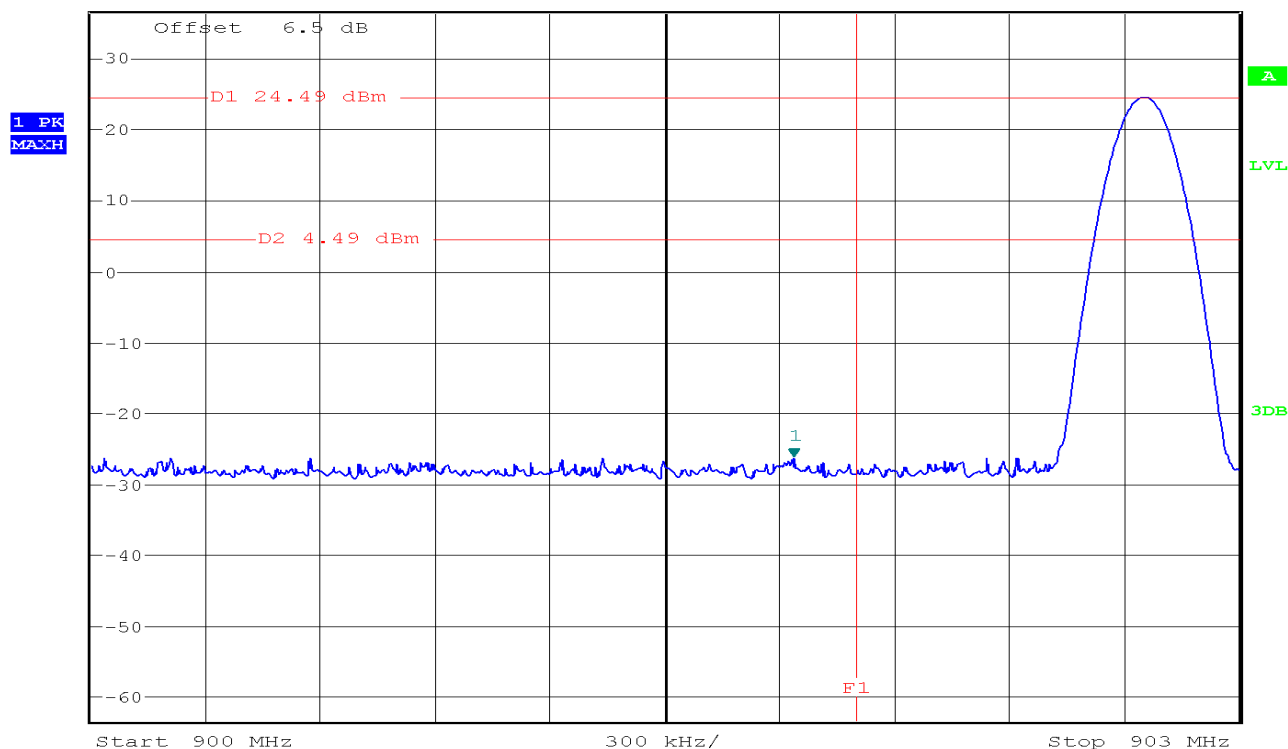


Ref 36.5 dBm Att 55 dB SWT 2.5 ms

* RBW 100 kHz * VBW 100 kHz

Marker 1 [T1] -26.44 dBm

901.836538462 MHz



Remark: F1 shows the band edge frequency of 902 MHz.

RESTRICTED BANDEDGE (High Channel)

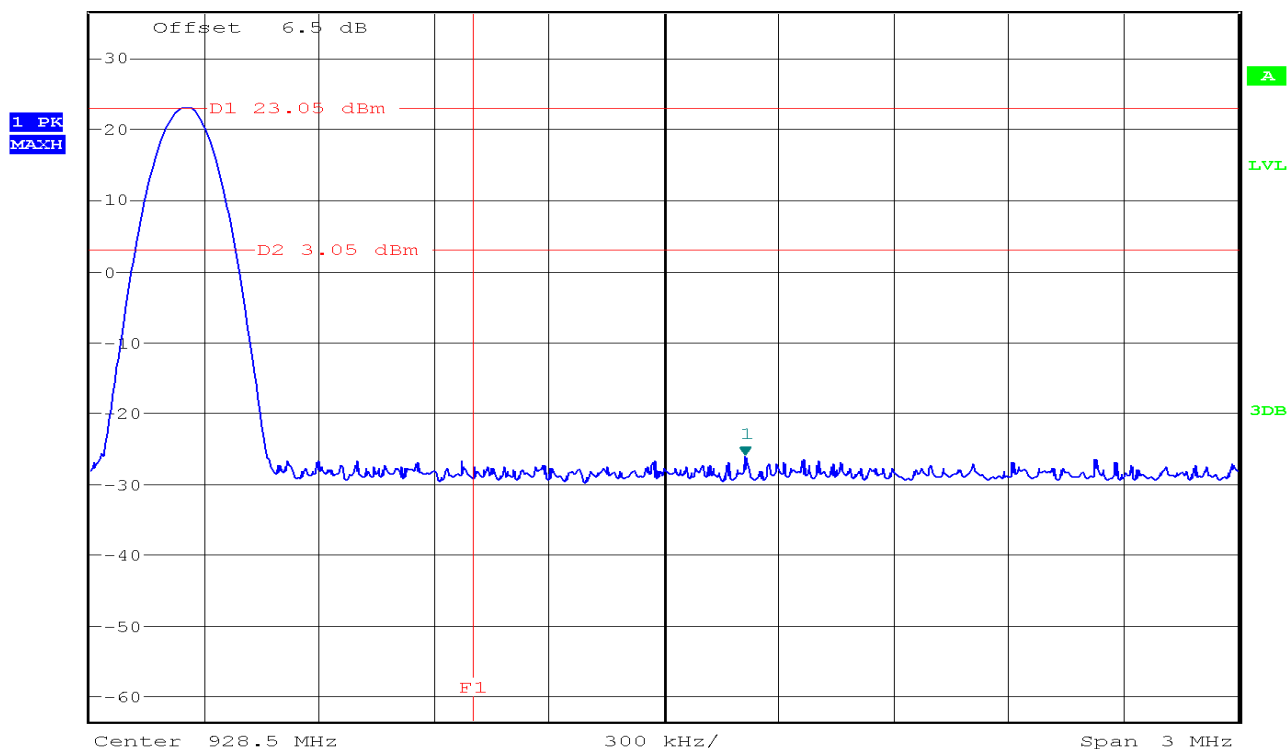


Ref 36.5 dBm Att 55 dB SWT 2.5 ms

* RBW 100 kHz * VBW 100 kHz

Marker 1 [T1] -26.22 dBm

928.711538462 MHz



Remark: F1 shows the band edge frequency of 928 MHz.



6.8 Radiated Spurious Emission Measurement

LIMIT

1. 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 (mV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

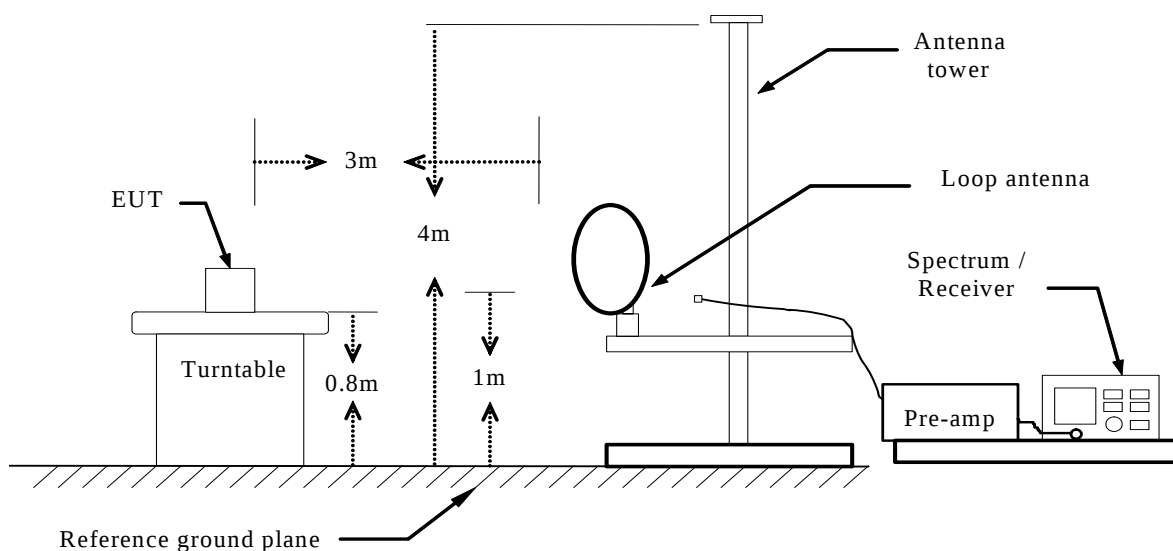
Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

Frequency (Hz)	Field Strength ($\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

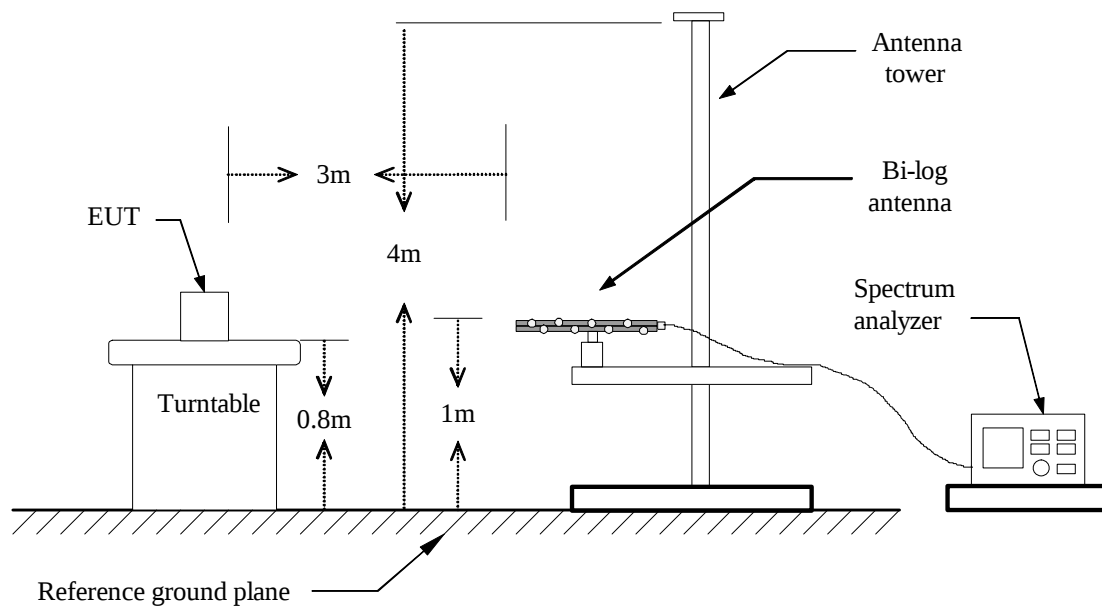
Test Configuration

Below 30MHz

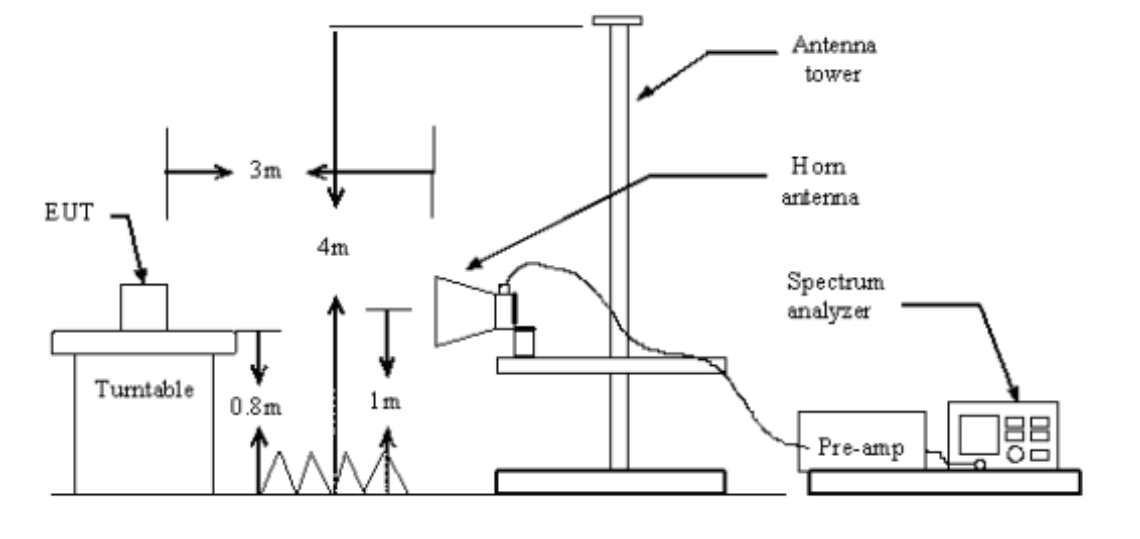




Below 1 GHz



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:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.



TEST RESULT OF RADIATED EMISSION

9KHz-30MHz

The low frequency, which started from 9 KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

30MHz-1GHz

Test Date: April 16, 2014

Polarity:

Ver. / Hor.

Test Frequency: 902.75MHz

Tested by:

Blent.Wang

Temperature: 25°C

Test Results:

Pass

Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	30.0000	7.69	22.71	30.40	40.00	-9.60	100	61	peak
2	179.2308	17.50	13.23	30.73	43.50	-12.77	100	3	peak
3	204.1026	20.14	13.28	33.42	43.50	-10.08	100	63	peak
4	323.7981	17.01	15.25	32.26	46.00	-13.74	100	1	peak
5	829.0064	10.12	24.72	34.84	46.00	-11.16	100	50	peak
6	939.3750	11.44	24.27	35.71	46.00	-10.29	100	41	peak

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	30.0000	8.69	22.71	31.40	40.00	-8.60	100	240	peak
2	131.0417	14.82	15.71	30.53	43.50	-12.97	100	240	peak
3	179.2308	21.77	13.23	35.00	43.50	-8.50	100	267	peak
4	348.6699	15.45	16.47	31.92	46.00	-14.08	100	262	peak
5	687.5481	9.45	22.00	31.45	46.00	-14.55	100	258	peak
6	978.2372	10.00	27.14	37.14	54.00	-16.86	100	75	peak

Test Date: April 16, 2014

Polarity:

Ver. / Hor.

Test Frequency: 915.25MHz

Tested by:

Blent.Wang

Temperature: 25°C

Test Results:

Pass

Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	143.4900	22.71	14.76	37.47	43.50	-6.03	152	360	peak
2	203.6300	25.94	13.29	39.23	43.50	-4.27	200	122	peak
3	288.0200	27.41	15.11	42.52	46.00	-3.48	100	76	peak
4	335.5500	26.93	15.63	42.56	46.00	-3.44	100	139	peak
5	485.9000	20.01	19.23	39.24	46.00	-6.76	200	111	peak
6	596.4800	18.49	20.52	39.01	46.00	-6.99	100	222	peak

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	179.3800	18.93	12.23	31.16	43.50	-12.34	100	112	peak
2	203.6300	24.03	13.29	37.32	43.50	-6.18	100	85	peak
3	252.1300	24.07	14.13	38.20	46.00	-7.80	100	195	peak
4	275.4100	23.02	15.21	38.23	46.00	-7.77	100	181	peak
5	299.6600	25.78	14.72	40.50	46.00	-5.50	100	181	peak
6	348.1600	20.40	16.43	36.83	46.00	-9.17	100	197	peak



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FCC ID: RFHAVL3000

Date of Issue :April 16, 2014

Test Date: April 16, 2014

Polarity: Ver. / Hor.

Test Frequency: 927.25MHz

Tested by: Blent.Wang

Temperature: 25°C

Test Results: Pass

Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	179.3800	24.50	12.23	36.73	43.50	-6.77	100	110	peak
2	299.6600	25.71	14.72	40.43	46.00	-5.57	100	112	peak
3	323.9100	24.96	15.26	40.22	46.00	-5.78	100	90	peak
4	348.1600	22.47	16.43	38.90	46.00	-7.10	100	136	peak
5	562.5300	12.22	20.91	33.13	46.00	-12.87	200	198	peak
6	935.9800	10.13	24.30	34.43	46.00	-11.57	300	61	peak

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	156.1000	22.88	13.48	36.36	43.50	-7.14	100	165	peak
2	179.3800	24.90	12.23	37.13	43.50	-6.37	100	119	peak
3	203.6300	25.37	13.29	38.66	43.50	-4.84	100	83	peak
4	275.4100	23.49	15.21	38.70	46.00	-7.30	100	172	peak
5	299.6600	25.70	14.72	40.42	46.00	-5.58	100	183	peak
6	371.4400	16.53	17.45	33.98	46.00	-12.02	100	121	peak

Notes:

1. Radiated emissions measured in frequency range from 30MHz to 1000MHz were made with an instrument using Peak detector mode.
2. 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.
3. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



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Above 1 GHz

Test Date: April 16, 2014

Polarity: Ver. / Hor.

Test Frequency: 902.75MHz

Tested by: Blent.Wang

Temperature: 25°C

Test Results: Pass

Frequency (MHz)	Ant. Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1875.000	V	53.19	-15.67	37.52	74.00	-36.48	PEAK
2711.539	V	66.28	-12.71	53.57	74.00	-20.43	PEAK
1802.885	H	54.86	-16.02	38.84	74.00	-35.16	PEAK
2711.539	H	60.62	-12.71	47.91	74.00	-26.09	PEAK

Test Date: April 16, 2014

Polarity: Ver. / Hor.

Test Frequency: 915.25MHz

Tested by: Blent.Wang

Temperature: 25°C

Test Results: Pass

Frequency (MHz)	Ant. Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1831.731	V	56.75	-15.88	40.87	74.00	-33.13	PEAK
2745.192	V	64.54	-12.71	51.83	74.00	-22.17	PEAK
1831.731	H	62.58	-15.88	46.70	74.00	-27.30	PEAK
2745.192	H	61.53	-12.71	48.82	74.00	-25.18	PEAK

Test Date: April 16, 2014

Polarity: Ver. / Hor.

Test Frequency: 927.25MHz

Tested by: Blent.Wang

Temperature: 25°C

Test Results: Pass

Frequency (MHz)	Ant. Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1855.769	V	60.04	-15.76	44.28	74.00	-29.72	PEAK
2783.654	V	61.74	-12.72	49.02	74.00	-24.98	PEAK
1855.769	H	65.27	-15.76	49.51	74.00	-24.49	PEAK
2783.654	H	57.26	-12.72	44.54	74.00	-29.46	PEAK



Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.
 - b. AV Setting 1GHz to 10th harmonics of fundamental, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.



6.9 POWERLINE CONDUCTED EMISSIONS

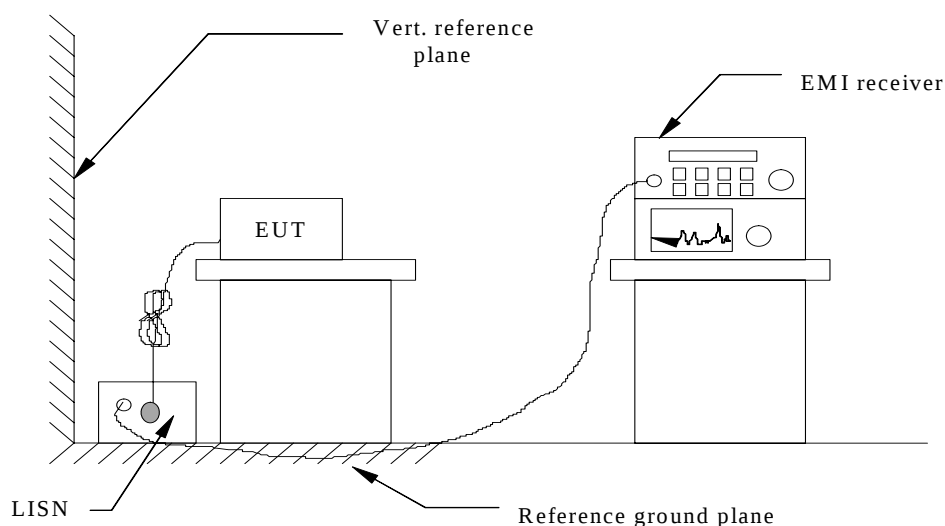
LIMIT

For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

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.



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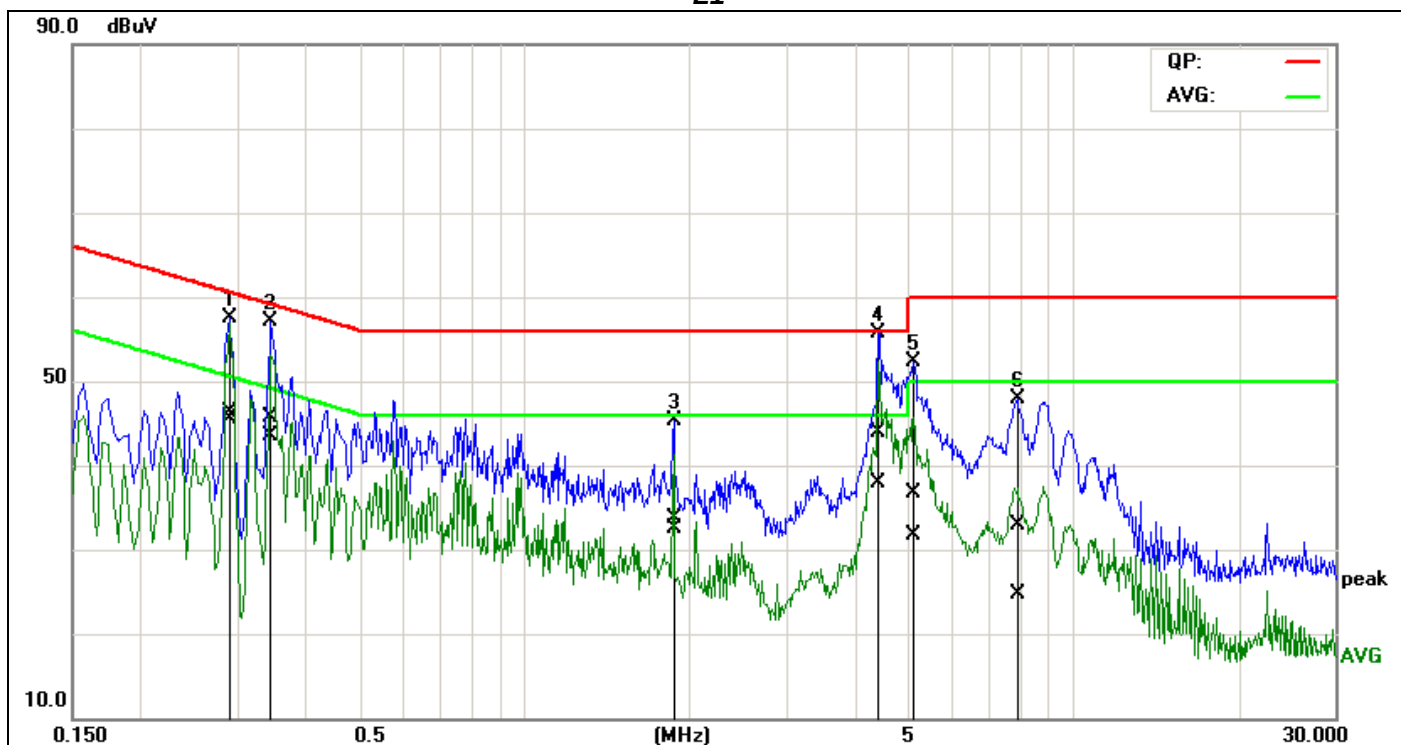
FCC ID: RFHAVL3000

Date of Issue :April 16, 2014

Test Data

Model: AVL-3000	Humidity: 51% RH
Temperature: 23°C	Test Results: Pass
Tested by: Blent.Wang	

L1



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1*	0.2880	26.67	25.84	19.67	46.34	45.51	60.58	50.58	-14.24	-5.07	Pass
2	0.3465	25.91	23.79	19.71	45.62	43.50	59.05	49.05	-13.43	-5.55	Pass
3	1.8692	13.83	12.60	19.92	33.75	32.52	56.00	46.00	-22.25	-13.48	Pass
4	4.4522	23.62	17.72	20.23	43.85	37.95	56.00	46.00	-12.15	-8.05	Pass
5	5.0994	16.35	11.45	20.31	36.66	31.76	60.00	50.00	-23.34	-18.24	Pass
6	7.8953	12.27	4.19	20.57	32.84	24.76	60.00	50.00	-27.16	-25.24	Pass



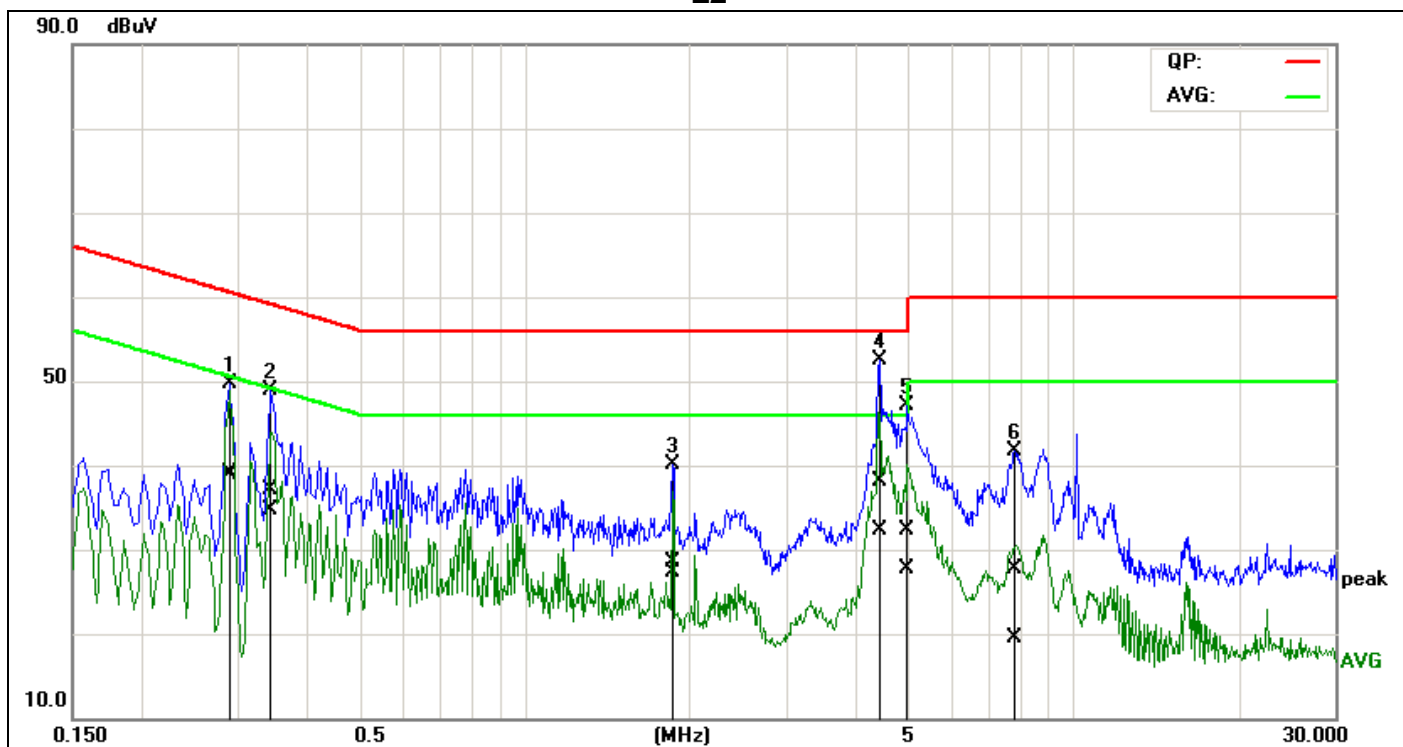
Compliance Certification Services Inc.

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FCC ID: RFHAVL3000

Date of Issue :April 16, 2014

L2



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1*	0.2886	19.30	19.50	19.67	38.97	39.17	60.56	50.56	-21.59	-11.39	Pass
2	0.3469	17.31	15.07	19.71	37.02	34.78	59.04	49.04	-22.02	-14.26	Pass
3	1.8653	8.50	7.36	19.92	28.42	27.28	56.00	46.00	-27.58	-18.72	Pass
4	4.4524	17.78	12.14	20.23	38.01	32.37	56.00	46.00	-17.99	-13.63	Pass
5	5.0061	11.93	7.41	20.30	32.23	27.71	60.00	50.00	-27.77	-22.29	Pass
6	7.8593	7.20	-1.10	20.57	27.77	19.47	60.00	50.00	-32.23	-30.53	Pass

Remark:

- 1.The measuring frequencies range between 0.15 MHz and 30 MHz.
- 2.The emissions measured in the frequency range between 0.15 MHz and 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, and no re-check was made.
- 4.The IF bandwidth of SPA between 0.15MHz and 30MHz was 10KHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz.

END OF REPORT