

# FCC PART 15.247 TEST REPORT

For

# **Avantronics Limited**

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FCC ID: WJ5-AS6P

Report Type: Product Type: Original Report Bluetooth Stereo Headset Allen Dious Test Engineer: Allen Qiao **Report Number:** R2DG140430001-00B **Report Date:** 2014-05-14 Sola Hugof Sula Huang Reviewed By: RF Engineer **Test Laboratory:** Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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# **GENERAL INFORMATION**

## **Product Description for Equipment under Test (EUT)**

The *Avantronics Limited*'s product, model number: *BTHS-AS6P* (*FCC ID: WJ5-AS6P*) (the "EUT") in this report was a *Bluetooth Stereo Headset*, which was measured approximately: 8.5 cm (L) x 7.2 cm (W) x 2.55 cm (H), rated input voltage: DC 3.7V rechargeable Li-ion battery.

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All measurement and test data in this report was gathered from production sample serial number: 140430001 (Assigned by BACL, Dongguan). The EUT was received on 2014-04-30.

## **Objective**

This report is prepared on behalf of *Avantronics Limited* in accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

## **Related Submittal(s)/Grant(s)**

FCC Part15C DSS submissions with FCC ID: WJ5-AS6P for Bluetooth BDR, EDR mode.

### **Test Methodology**

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

#### **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

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# **SYSTEM TEST CONFIGURATION**

## **Description of Test Configuration**

The system was configured for testing in an engineering mode, which was provided by manufacturer. The engineering mode was configured the system transmitting with maximum power.

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For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404		
•••			•••
•••			•••
		38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

## **EUT Exercise Software**

The software "Bluetooth 2.5.0" was used.

## **Equipment Modifications**

No modification was made to the EUT.

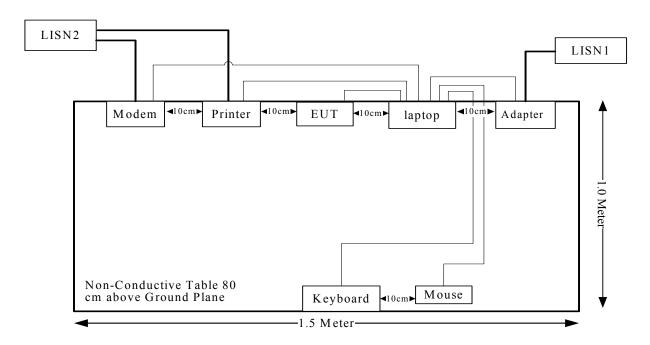
# **Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017
HP	Printer	C3941A	JPTVOB2337
DELL	Keyboard	L100	CNORH656658907BL05DC
HP	Mouse	UV-69a	32617-001
SAST	Modem	AEM-2100	0293

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Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	То
Serial Cable	Yes	No	1.5	Serial Port of Laptop	Modem
Parallel Cable	Yes	No	1.5	Parallel Port of Laptop	Printer
USB Cable	No	No	0.6	USB port of Laptop	EUT
USB Cable	Yes	No	1.6	USB port of Laptop	Mouse
USB Cable	Yes	No	1.8	USB port of Laptop	Keyboard

# **Block Diagram of Test Setup**



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# **SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093	RF EXPOSURE	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

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# FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE

## **Applicable Standard**

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

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According to KDB447498 D01 General RF Exposure Guidance v05r02:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq$  50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance,

mm)]  $\cdot [\sqrt{f(GHz)}] \le 3.0$  for 1-g SAR and  $\le 7.5$  for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $\leq 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

#### **Measurement Result**

The maximum conducted output power= 3.08 dBm (2.03mW) at 2480 MHz [(max. power of channel, mW)/(min. test separation distance, mm)]  $\cdot [\sqrt{f(GHz)}]$  = 2.03/5\*( $\sqrt{2}$ .48) = 0.639 < 3.0

So the stand-alone SAR evaluation is not necessary.

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# FCC §15.203 - ANTENNA REQUIREMENT

## **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

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- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

#### **Antenna Connector Construction**

The EUT has one integral antenna arrangement, which was permanently attached and the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

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#### **Measurement Uncertainty**

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

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If  $U_{\text{lab}}$  is less than or equal to  $U_{\text{cispr}}$  of Table 1, then:

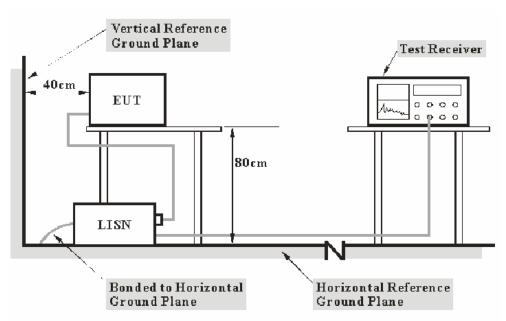
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit. If  $U_{\text{lab}}$  is greater than  $U_{\text{cispr}}$  of Table 1, then:
- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} U_{cispr})$ , exceeds the disturbance limit;
- non compliance is deemed to occur if any measured disturbance level, increased by  $(U_{\text{lab}} U_{\text{cispr}})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz).

Table 1 – Values of  $U_{\text{cisp}}$ 

Measurement	$U_{ m cispr}$
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

## **EUT Setup**



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

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The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 Class B limits.

The spacing between the peripherals was 10 cm.

The adapter of laptop was connected to a 120 VAC/60 Hz power source

## **EMI Test Receiver Setup**

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W	
150 kHz – 30 MHz	9 kHz	

#### **Test Procedure**

During the conducted emission test, the adapter of laptop was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

## **Corrected Amplitude & Margin Calculation**

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$
  
$$C_f = A_C + VDF$$

Herein,

V<sub>C</sub>(cord. Reading): corrected voltage amplitude

 $V_R$ : reading voltage amplitude  $A_c$ : attenuation caused by cable loss VDF: voltage division factor of AMN

C<sub>f</sub>: Correction Factor

The "Margin" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

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## **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2013-11-20	2014-11-19
R&S	Two-line V-network	ENV216	3560.6550.12	2014-01-22	2015-01-21
R&S	L.I.S.N	ESH3-Z5	100113	N/A	N/A
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

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## **Test Results Summary**

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

10.10 dB at 0.317235 MHz in the Line conducted mode

#### **Test Data**

#### **Environmental Conditions**

Temperature:	23.4 °C
Relative Humidity:	66 %
ATM Pressure:	100.8 kPa

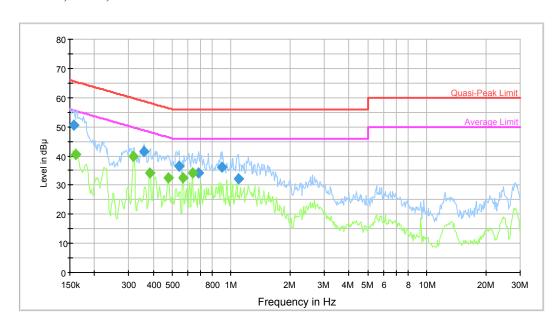
The testing was performed by Allen Qiao on 2014-05-08.

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<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test mode: Charging&Transmitting

# AC120 V, 60 Hz, Line:

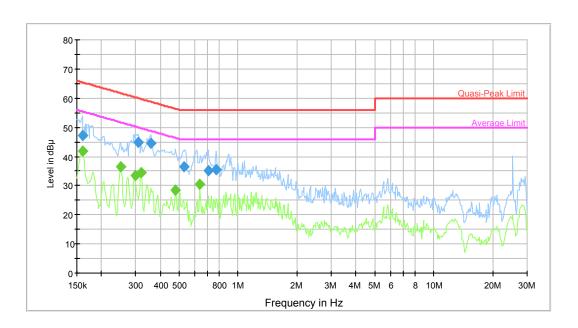


Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.157346	50.6	9.000	L1	10.1	15.0	65.6	Compliance
0.360371	41.5	9.000	L1	10.7	17.2	58.7	Compliance
0.541050	36.4	9.000	L1	10.4	19.6	56.0	Compliance
0.681699	34.2	9.000	L1	10.6	21.8	56.0	Compliance
0.900972	36.3	9.000	L1	10.5	19.7	56.0	Compliance
1.090848	32.2	9.000	L1	10.4	23.8	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.161152	40.4	9.000	L1	10.2	15.0	55.4	Compliance
0.317235	39.7	9.000	L1	10.7	10.1	49.8	Compliance
0.384091	34.2	9.000	L1	10.6	14.0	48.2	Compliance
0.480097	32.6	9.000	L1	10.4	13.8	46.3	Compliance
0.567545	32.6	9.000	L1	10.4	13.4	46.0	Compliance
0.634524	34.3	9.000	L1	10.6	11.7	46.0	Compliance

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# AC120 V, 60 Hz, Neutral:



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Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.159873	47.1	9.000	N	10.4	18.4	65.5	Compliance
0.309742	44.8	9.000	N	11.1	15.2	60.0	Compliance
0.360371	44.4	9.000	N	11.0	14.3	58.7	Compliance
0.528270	36.5	9.000	N	10.4	19.5	56.0	Compliance
0.703777	35.1	9.000	N	10.6	20.9	56.0	Compliance
0.774393	35.3	9.000	N	10.6	20.7	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.159873	41.7	9.000	N	10.4	13.7	55.5	Compliance
0.251783	36.5	9.000	N	11.2	15.2	51.7	Compliance
0.297644	33.6	9.000	N	11.2	16.7	50.3	Compliance
0.319773	34.4	9.000	N	11.1	15.4	49.7	Compliance
0.480097	28.5	9.000	N	10.5	17.8	46.3	Compliance
0.639600	30.5	9.000	N	10.6	15.5	46.0	Compliance

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# FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

## **Applicable Standard**

FCC §15.247 (d); §15.209; §15.205;

## **Measurement Uncertainty**

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

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If  $U_{\text{lab}}$  is less than or equal to  $U_{\text{cispr}}$  of Table 2, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit. If  $U_{\text{lab}}$  is greater than  $U_{\text{cispr}}$  of Table 1, then:
- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} U_{cispr})$ , exceeds the disturbance limit;
- non compliance is deemed to occur if any measured disturbance level, increased by  $(U_{\text{lab}} U_{\text{cispr}})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:

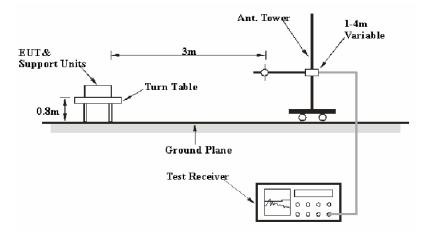
30M~200MHz: 5.0 dB 200M~1GHz: 6.2 dB 1G~6GHz: 4.45 dB 6G~18GHz: 5.23 dB

Table 2 – Values of  $U_{\text{cispr}}$ 

Measurement	$U_{ m cispr}$
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

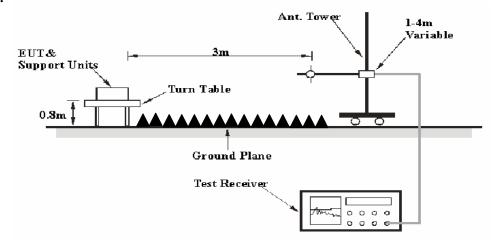
#### **EUT Setup**

#### **Below 1GHz:**



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#### **Above 1GHz:**



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## **EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Abovo 1 CHz	1MHz	3 MHz	/	PK
Above 1 GHz	1MHz	10 Hz	/	Ave.

#### **Test Procedure**

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and average detection modes for frequencies above 1 GHz.

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## **Corrected Amplitude & Margin Calculation**

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

## **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2014-05-06	2015-05-05
Sunol Sciences	Antenna	JB3	A060611-1	2011-09-06	2014-09-05
HP	Amplifier	8447E	2434A02181	2013-09-06	2014-09-05
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-07	2015-05-06
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-05
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2014-02-19	2015-02-18
R&S	Spectrum Analyzer	FSP 38	100478	2013-06-16	2014-06-15
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2013-06-16	2014-06-15
Quinstar	Amplifier	QLW- 18405536-JO	15964001001	2013-09-06	2014-09-05

<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### **Test Results Summary**

According to the recorded data in following table, the EUT complied with the <u>FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247</u>, with the worst margin reading of:

#### 7.29 dB at 4880 MHz in the Horizontal polarization

#### **Test Data**

#### **Environmental Conditions**

Temperature:	23.7 °C
Relative Humidity:	64 %
ATM Pressure:	100.8 kPa

<sup>\*</sup> The testing was performed by Allen Qiao on 2014-05-08.

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Mode: Transmitting

Frequency	e: Transmi Re	eceiver	Rx A	ntenna	Cable	Amplifier	Corrected	FCC 1	5.247
	Reading	Detector	Polar	Factor	loss	Gain	Amplitude	Limit	Margin
(MHz)	(dBµV)	(PK/QP/AV)	(H/V)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
	(2.			ow Chann	. ,	MHz	. ,	, ,	( )
2402	99.11	PK	Н	25.65	4.42	27.32	101.86	N/A	N/A
2402	72.61	AV	Н	25.65	4.42	27.32	75.36	N/A	N/A
2402	97.14	PK	V	25.65	4.42	27.32	99.89	N/A	N/A
2402	70.21	AV	V	25.65	4.42	27.32	72.96	N/A	N/A
2390	38.71	PK	Н	25.61	4.39	27.32	41.39	74.00	32.61
2390	24.27	AV	Н	25.61	4.39	27.32	26.95	54.00	27.05
4804	47.65	PK	Н	30.59	5.98	27.41	56.81	74.00	17.19
4804	34.45	AV	Н	30.59	5.98	27.41	43.61	54.00	10.39
7206	41.17	PK	Н	34.09	7.45	25.91	56.80	74.00	17.20
7206	28.11	AV	Н	34.09	7.45	25.91	43.74	54.00	10.26
2587	46.74	PK	Н	26.13	4.63	27.41	50.09	74.00	23.91
2587	27.19	AV	Н	26.13	4.63	27.41	30.54	54.00	23.46
6987	38.71	PK	Н	33.57	7.33	26.27	53.34	74.00	20.66
6987	25.47	AV	V	33.57	7.33	26.27	40.10	54.00	13.90
				ddle Chan			I	1	
2440	101.32	PK	Н	25.74	4.40	27.34	104.12	N/A	N/A
2440	75.62	AV	Н	25.74	4.40	27.34	78.42	N/A	N/A
2440	98.74	PK	V	25.74	4.40	27.34	101.54	N/A	N/A
2440	71.25	AV	V	25.74	4.40	27.34	74.05	N/A	N/A
4880	48.99	PK	Н	30.79	6.08	27.42	58.44	74.00	15.56
4880	37.26	AV	Н	30.79	6.08	27.42	46.71	54.00	7.29
7320	40.30	PK	Н	34.37	7.51	25.88	56.30	74.00	17.70
7320	27.97	AV	Н	34.37	7.51	25.88	43.97	54.00	10.03
2550	46.99	PK	Н	26.03	4.64	27.40	50.26	74.00	23.74
2550	28.51	AV	Н	26.03	4.64	27.40	31.78	54.00	22.22
6962	41.25	PK	Н	33.50	7.30	26.32	55.73	74.00	18.27
6962	25.36	AV	Н	33.50	7.30	26.32	39.84	54.00	14.16
1198	42.96	PK	Н	22.81	2.79	26.81	41.75	74.00	32.25
1198	36.21	AV	Н	22.81	2.79	26.81	35.00	54.00	19.00
2490	102.06	DIZ		igh Chann			105.02	NT/A	NT/A
2480 2480	102.96	PK	H H	25.85	4.48	27.36	105.93	N/A	N/A
2480	76.36 99.57	AV	V	25.85	4.48	27.36	79.33	N/A	N/A
2480	73.14	PK AV	V	25.85 25.85	4.48 4.48	27.36 27.36	102.54 76.11	N/A N/A	N/A N/A
2480	57.12	PK	H	25.86	4.48	27.36	60.11	74.00	13.89
2483.5	37.12	AV	Н	25.86	4.49	27.36	40.72	54.00	13.89
4960	50.01	PK		31.00	5.90	27.43	59.48	74.00	14.52
4960	37.08	AV	H	31.00	5.90	27.43	46.55	54.00	7.45
7440	38.69	PK	Н	34.66	7.58	25.97	54.96	74.00	19.04
7440	24.88	AV	H	34.66	7.58	25.97	41.15	54.00	12.85
2582	47.10	PK	H	26.11	4.63	27.41	50.43	74.00	23.57
2582	23.82	AV	H	26.11	4.63	27.41	27.15	54.00	26.85
6962	36.47	PK	Н	33.50	7.30	26.32	50.95	74.00	23.05
6962	21.04	AV	Н	33.50	7.30	26.32	35.52	54.00	18.48

 $<sup>*</sup>Within\ measurement\ uncertainty!$ 

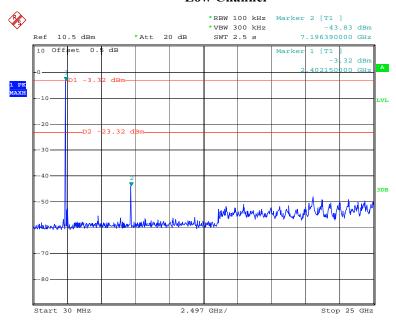
Note: For below 1GHz, all spurious emissions are 20 dB below the limit or are on the system noise floor level.

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## **Conducted Spurious Emissions at Antenna Port**

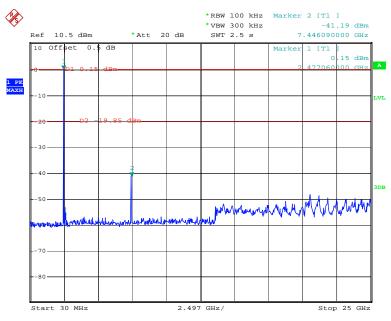
Report No.: R2DG140430001-00B

## **Low Channel**



Date: 8.MAY.2014 10:18:18

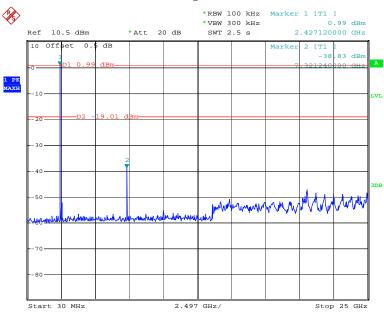
#### Middle Channel



Date: 8.MAY.2014 10:19:11

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Date: 8.MAY.2014 10:16:57

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# FCC $\S15.247(a)$ (2) – 6 dB EMISSION BANDWIDTH

## **Applicable Standard**

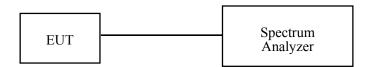
Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Report No.: R2DG140430001-00B

#### **Test Procedure**

According to KDB 558074 D01 DTS Meas Guidance v03r01clause8.1 Option 1:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times RBW$ .
- c) Detector = Peak.
- d) Trace mode =  $\max$  hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



#### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-07	2015-05-06

<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### **Test Data**

#### **Environmental Conditions**

Temperature:	25.1 °C
Relative Humidity:	64 %
ATM Pressure:	100.6 kPa

<sup>\*</sup> The testing was performed by Allen Qiao on 2014-05-08.

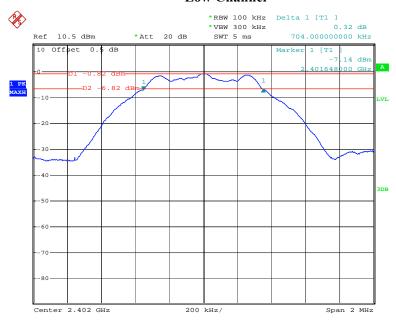
Test Result: Pass.

Please refer to the following tables and plots.

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Channel	Frequency	6 dB Bandwidth	Limit
	(MHz)	(MHz)	(kHz)
Low	2402	0.704	≥500
Middle	2440	0.700	≥500
High	2480	0.704	≥500

## **Low Channel**

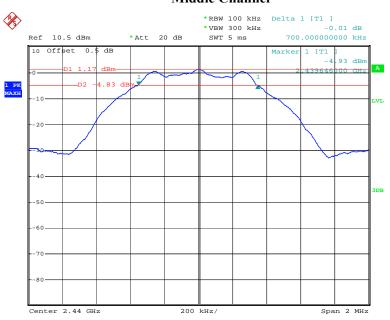


Date: 8.MAY.2014 09:59:46

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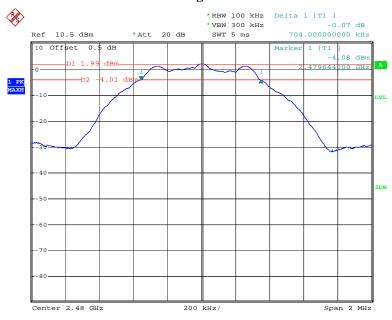
## Middle Channel

Report No.: R2DG140430001-00B



Date: 8.MAY.2014 09:58:41

## **High Channel**



Date: 8.MAY.2014 10:02:11

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# FCC §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

#### **Applicable Standard**

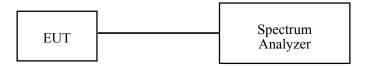
According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Report No.: R2DG140430001-00B

#### **Test Procedure**

According to KDB 558074 D01 DTS Meas Guidance v03r01clause9.1.1:

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq 3 \times RBW$ .
- c) Set span  $\geq 3 \times RBW$
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
  h) Use peak marker function to determine the peak amplitude level.



### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-07	2015-05-06

<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### **Test Data**

#### **Environmental Conditions**

Temperature:	25.1 °C
Relative Humidity:	64 %
ATM Pressure:	100.6 kPa

<sup>\*</sup> The testing was performed by Allen Qiao on 2014-05-08.

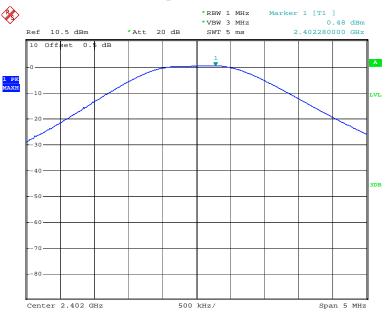
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Test Mode: Transmitting

Channel	Frequency	Max Peak Conducted Output Power	Limit	Result
	(MHz)	(dBm)	(dBm)	
Low	2402	0.48	30	PASS
Middle	2440	2.21	30	PASS
High	2480	3.08	30	PASS

Please refer to the following plots

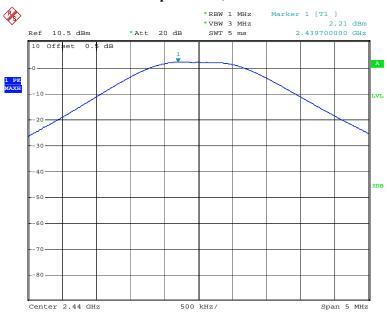
# **RF Output Power, Low Channel**



Date: 8.MAY.2014 09:49:44

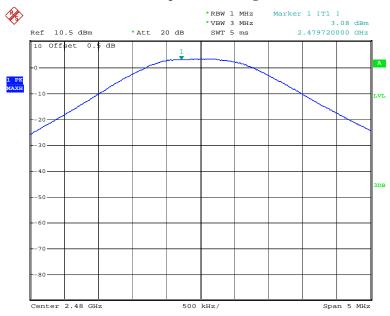
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## **RF Output Power, Middle Channel**



Date: 8.MAY.2014 09:56:09

## **RF Output Power, High Channel**



Date: 8.MAY.2014 09:48:50

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# FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Report No.: R2DG140430001-00B

#### **Applicable Standard**

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

#### **Test Procedure**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- 3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 5. Repeat above procedures until all measured frequencies were complete.

## **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-07	2015-05-06

<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### **Test Data**

#### **Environmental Conditions**

Temperature:	25.1 °C
Relative Humidity:	64 %
ATM Pressure:	100.6 kPa

<sup>\*</sup> The testing was performed by Allen Qiao on 2014-05-08.

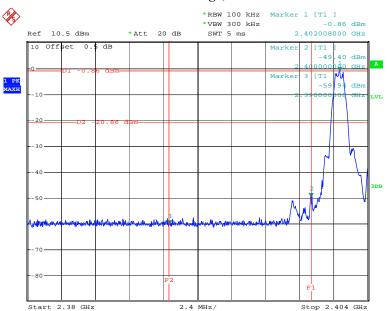
**Test Result:** Compliance

Please refer to following plots.

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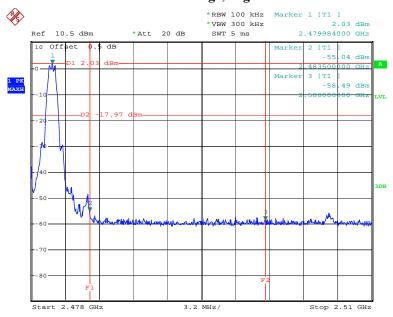
## Band Edge, Left Side

Report No.: R2DG140430001-00B



Date: 8.MAY.2014 10:10:36

## Band Edge, Right Side



Date: 8.MAY.2014 10:05:08

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# FCC §15.247(e) - POWER SPECTRAL DENSITY

#### **Applicable Standard**

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Report No.: R2DG140430001-00B

#### **Test Procedure**

According to KDB 558074 D01 DTS Meas Guidance v03r01clause10.2:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to:  $3 \text{ kHz} \le \text{RBW} \le 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times RBW$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

## **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-07	2015-05-06

<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### **Test Data**

#### **Environmental Conditions**

Temperature:	25.1 °C
Relative Humidity:	64 %
ATM Pressure:	100.6 kPa

<sup>\*</sup> The testing was performed by Allen Qiao on 2014-05-08.

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Test Mode: Transmitting

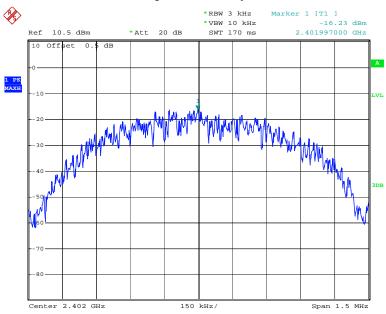
Test Result: Pass

Channel	Frequency MHz	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low	2402	-16.23	≪8	PASS
Middle	2440	-14.08	≤8	PASS
High	2480	-13.25	€8	PASS

Report No.: R2DG140430001-00B

Please refer to the following plots

## **Power Spectral Density, Low Channel**

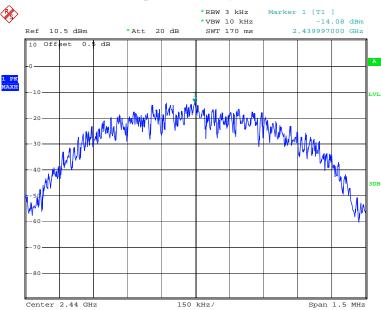


Date: 8.MAY.2014 10:26:55

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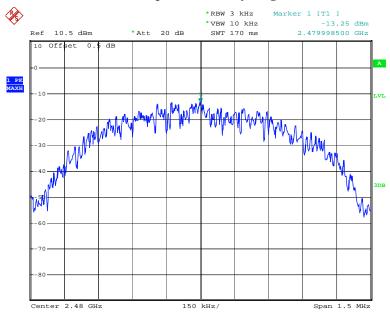
# **Power Spectral Density, Middle Channel**

Report No.: R2DG140430001-00B



Date: 8.MAY.2014 10:26:17

## **Power Spectral Density, High Channel**



Date: 8.MAY.2014 10:25:55

\*\*\*\*\* END OF REPORT \*\*\*\*\*

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