

FCC PART 15.249

TEST REPORT

For

TelergyHD BV

6 1217 AP Hilversum Netherlands

FCC ID: 2AA9TTHD601DC0003

Report Type: Original Report	Product Type: RF Remote Receiver
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *TelergyHD BV* 's product, model number: *THD-AIR1 (FCC ID: 2AA9TTHD601DC0003)* or the "EUT" in this report was a *RF Remote Receiver*, which was measured approximately: 25 mm (L) x 15 mm (W) x 10 mm (H), rated input voltage: DC 5 V from USB port.

**All measurement and test data in this report was gathered from production sample serial number: 1404004 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2014-04-18.*

Objective

This type approval report is prepared on behalf of *TelergyHD BV* in accordance with Part 2-Subpart J, and Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

FCC part 15.249 DXX of transmitter unit with FCC ID: 2AA9TTHD601DC0002 has been granted on 05/08/2014

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, 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 radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.91 dB for 30MHz-1GHz.and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication 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 December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Justification

The system was configured in a testing mode which provided by manufacturer.

Equipment Modifications

No modifications were made to the unit tested.

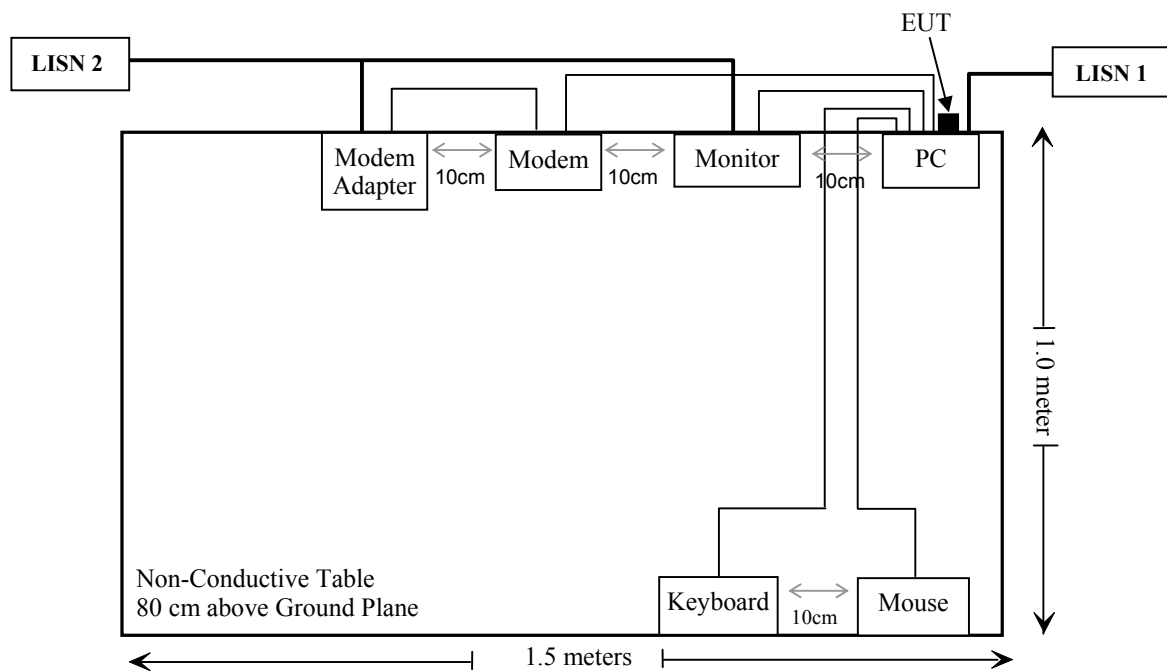
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	PC	VOSTRO 220S	127BP2X
DELL	LCD Monitor	E178WFPC	CN-OWY564-64180-7C4-2SQH
DELL	Keyboard	L100	CNORH656658907BL05DC
DELL	Mouse	MOC5UO	G1900NKD
SAST	Modem	AEM-2100	0293
HP	Laptop	COMPAQ CQ45	5CG33407QL

External I/O Cable

Cable Description	Length (m)	From/Port	To
Shielding Detachable USB Cable	1.5	Host PC	Mouse
Shielding Detachable Serial Cable	1.2	Host PC	Modem
Un-shielding Detachable DC Cable	1.0	Modem	Modem Adapter
Shielding Detachable K/B Cable	1.5	Host PC	Keyboard
Shielding Detachable VGA Cable	1.5	Host PC	LCD Monitor
Un-shielding Detachable AC Cable	2.0	Host PC	LISN
Un-shielding Detachable AC Cable	2.0	LCD Monitor	LISN

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Compliance
15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215(c)	20dB Emission Bandwidth	Compliance

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, 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.

Antenna Connector Construction

The EUT has a PCB antenna arrangement, which was permanently attached; fulfill the requirement of this section. Please refer to the internal photos.

Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

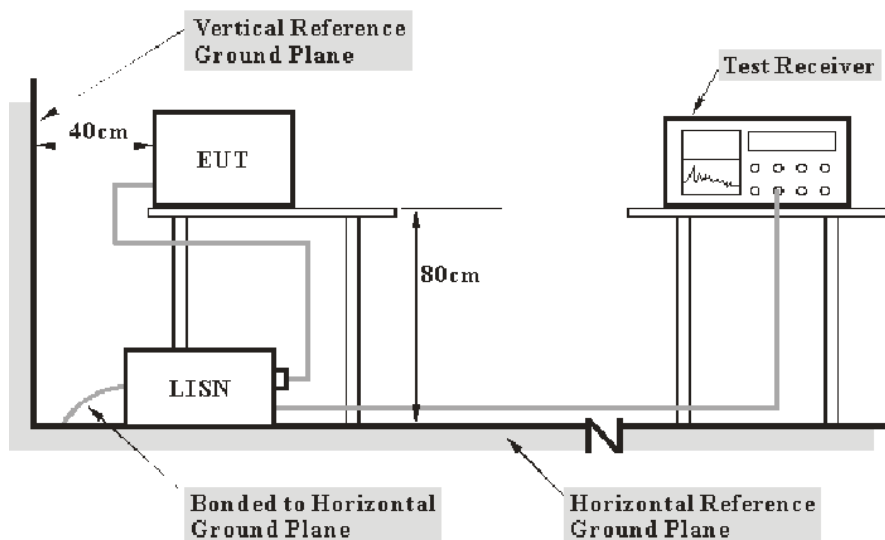
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN and receiver, LISN voltage division factor, LISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report.

Port	Expanded Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

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.

The measurement procedure of EUT setup is according with ANSI C63.4-2009. The related limit was specified in FCC Part 15.207.

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.

The host PC 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 was connected to the outlet of the LISN.

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2013-06-17	2014-06-17
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2013-05-07	2014-05-07
Rohde & Schwarz	LISN	ESH2-Z5	892107/021	2013-08-22	2014-08-22
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2013-10-15	2014-10-15
Rohde & Schwarz	CE Test software	EMC 32	V8.53	--	--

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

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

5.5 dB at 9.247310 MHz in the Line conducted mode

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cisp\text{r}}$$

In BACL., $U_{(Lm)}$ is less than $U_{cisp\text{r}}$, if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

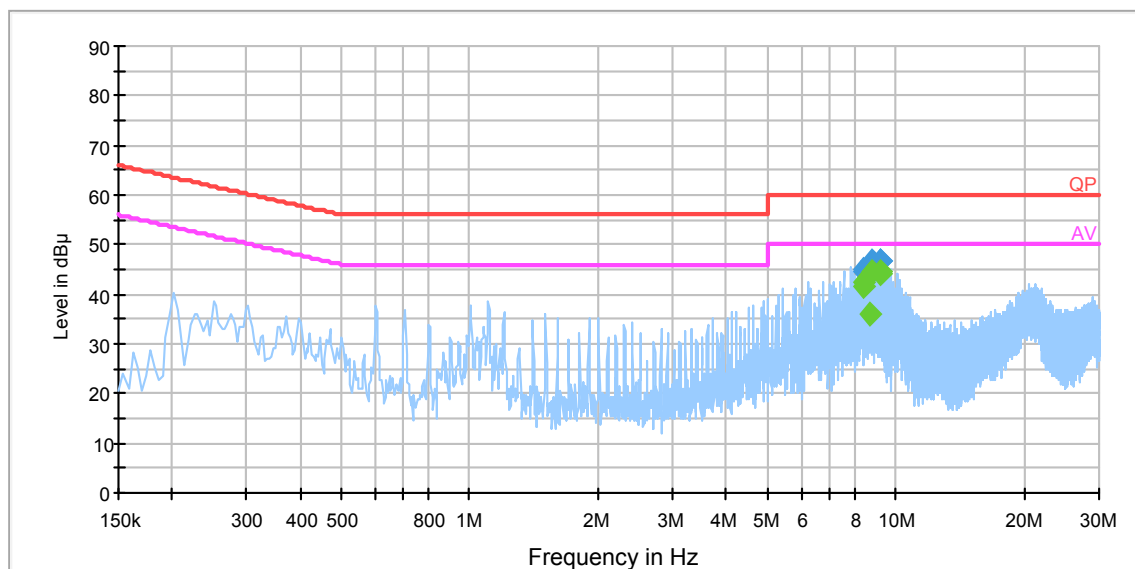
Test Data

Environmental Conditions

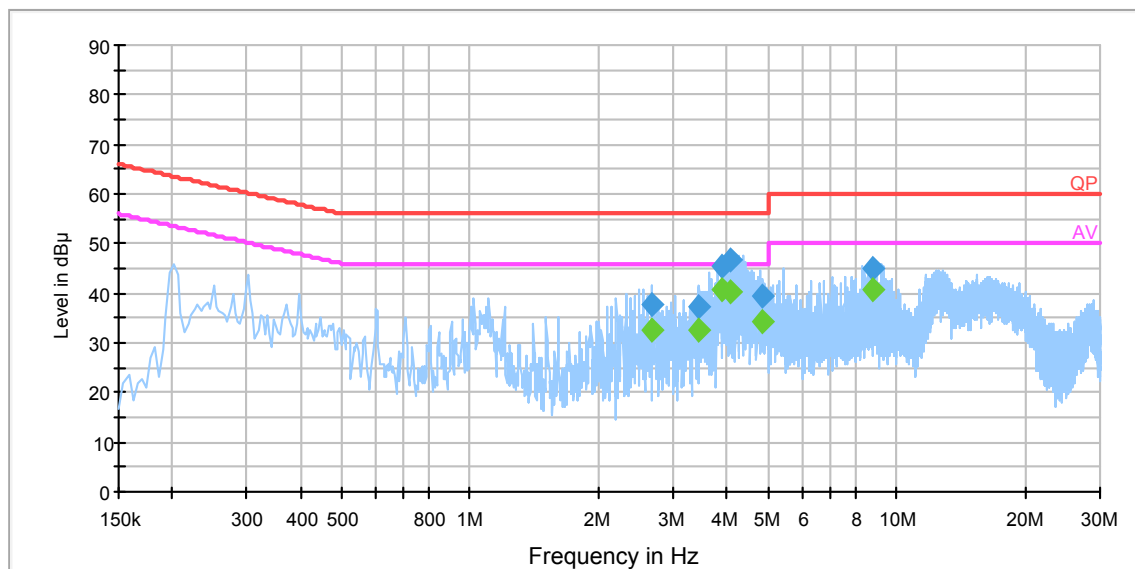
Temperature:	26 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Gardon Zhang on 2014-04-21.

EUT operation mode: Transmitting

AC 120V/60 Hz, Line**EMI Auto Test L**

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
8.439370	44.9	19.7	60.0	15.1	QP
8.439370	41.5	19.7	50.0	8.5	Ave.
8.444870	44.8	19.7	60.0	15.2	QP
8.444870	42.6	19.7	50.0	7.4	Ave.
8.737370	44.1	19.7	60.0	15.9	QP
8.737370	35.8	19.7	50.0	14.2	Ave.
8.842810	46.7	19.7	60.0	13.3	QP
8.842810	44.4	19.7	50.0	5.6	Ave.
9.244810	46.6	19.7	60.0	13.4	QP
9.244810	44.0	19.7	50.0	6.0	Ave.
9.247310	46.6	19.7	60.0	13.4	QP
9.247310	44.5	19.7	50.0	5.5	Ave.

AC 120V/60 Hz, Neutral**EMI Auto Test N**

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
2.666130	37.8	19.7	56.0	18.2	QP
2.666130	32.5	19.7	46.0	13.5	Ave.
3.418250	37.4	19.7	56.0	18.6	QP
3.418250	32.5	19.7	46.0	13.5	Ave.
3.910630	45.3	19.7	56.0	10.7	QP
3.910630	40.5	19.7	46.0	5.5	Ave.
4.084830	46.6	19.7	56.0	9.4	QP
4.084830	40.4	19.7	46.0	5.6	Ave.
4.817850	39.6	19.7	56.0	16.4	QP
4.817850	34.3	19.7	46.0	11.7	Ave.
8.841310	44.9	19.8	60.0	15.1	QP
8.841310	40.7	19.8	50.0	9.3	Ave.

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

FCC§15.205, §15.209 & §15.249 - RADIATED EMISSIONS**Applicable Standard**

As per FCC§15.249 (a), 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	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is 5.91 dB for 30MHz-1GHz, 4.92 dB for above 1GHz, and it will not be taken into consideration for the test data recorded in the report

Test Equipment Setup

The spectrum analyzer or receiver is set as:

Below 1000MHz:

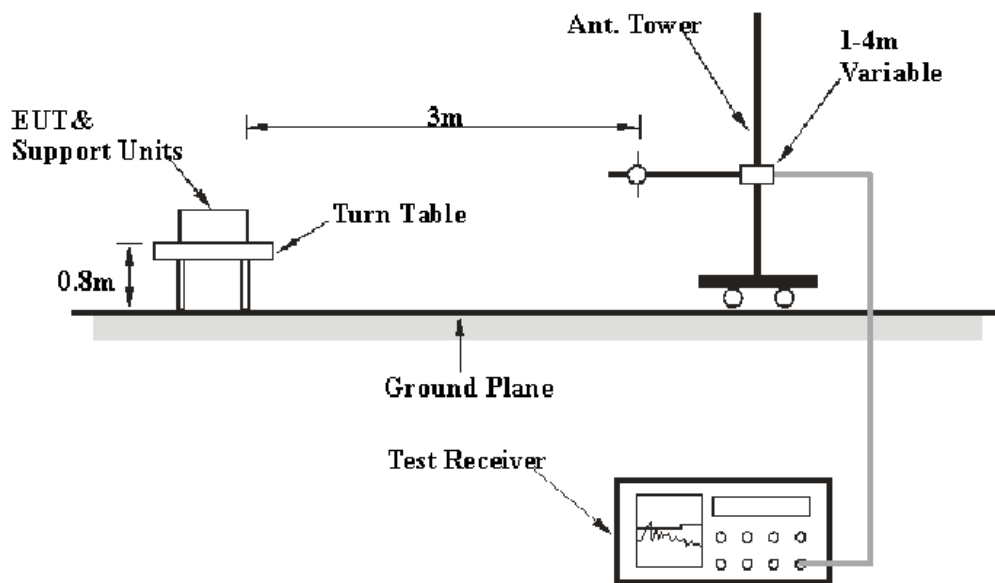
RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000MHz:

Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto

Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

EUT Setup



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

Test Procedure

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2013-09-30	2014-09-30
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-09-25	2014-09-25
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
Mini-Circuits	Pre-amplifier	ZVA-183-S+	5969001149	2014-04-03	2015-04-03
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2013-11-12	2014-11-12

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the data in the following table, the worst margin reading as below:

5.10 dB at 578.46 MHz in the Vertical polarization

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data**Environmental Conditions**

Temperature:	23 °C
Relative Humidity:	47 %
ATM Pressure:	101.0 kPa

The testing was performed by Gardon Zhang on 2014-05-09.

Test Mode: Transmitting

30 MHz to 25 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.249/15.205/15.209		
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)	Comment
Low Channel (2402 MHz)										
578.46	49.38	QP	227	1.0	V	-8.6	40.78	46	5.22	Spurious
2402.00	91.58	PK	106	2.3	H	5.48	97.06	114	16.94	Fundamental
2402.00	77.69	Ave.	106	2.3	H	5.48	83.17	94	10.83	Fundamental
2402.00	83.22	PK	109	2.0	V	5.48	88.70	114	25.30	Fundamental
2402.00	68.40	Ave.	109	2.0	V	5.48	73.88	94	20.12	Fundamental
2390.00	57.46	PK	308	1.4	V	5.48	62.94	74	11.06	Spurious
2390.00	23.71	Ave.	308	1.4	V	5.48	29.19	54	24.81	Spurious
2369.60	50.35	PK	273	2.1	H	5.48	55.83	74	18.17	Spurious
2369.60	32.06	Ave.	273	2.1	H	5.48	37.54	54	16.46	Spurious
2498.54	45.78	PK	7	1.1	H	7.21	52.99	74	21.01	Spurious
2498.54	30.68	Ave.	7	1.1	H	7.21	37.89	54	16.11	Spurious
4804.00	36.51	PK	111	2.5	H	12.44	48.95	74	25.05	Harmonic
4804.00	21.73	Ave.	111	2.5	H	12.44	34.17	54	19.83	Harmonic
7206.00	34.82	PK	95	1.6	V	17.06	51.88	74	22.12	Harmonic
7206.00	21.00	Ave.	95	1.6	V	17.06	38.06	54	15.94	Harmonic
9608.00	34.03	PK	247	1.5	H	19.28	53.31	74	20.69	Harmonic
9608.00	20.55	Ave.	247	1.5	H	19.28	39.83	54	14.17	Harmonic
Middle Channel (2436 MHz)										
578.46	49.50	QP	227	1.0	V	-8.6	40.90	46	5.10	Spurious
2436.00	89.43	PK	20	1.1	H	6.13	95.56	114	18.44	Fundamental
2436.00	76.99	Ave.	20	1.1	H	6.13	83.12	94	10.88	Fundamental
2436.00	85.96	PK	84	1.6	V	6.13	92.09	114	21.91	Fundamental
2436.00	71.01	Ave.	84	1.6	V	6.13	77.14	94	16.86	Fundamental
2340.13	37.56	PK	95	2.4	V	5.48	43.04	74	30.96	Spurious
2340.13	23.26	Ave.	95	2.4	V	5.48	28.74	54	25.26	Spurious
2372.05	40.30	PK	40	1.3	H	5.48	45.78	74	28.22	Spurious
2372.05	28.24	Ave.	40	1.3	H	5.48	33.72	54	20.28	Spurious
2500.00	43.23	PK	24	1.9	H	7.21	50.44	74	23.56	Spurious
2500.00	30.32	Ave.	24	1.9	H	7.21	37.53	54	16.47	Spurious
4872.00	36.26	PK	225	2.2	H	12.4	48.66	74	25.34	Harmonic
4872.00	21.90	Ave.	225	2.2	H	12.4	34.30	54	19.70	Harmonic
7308.00	35.83	PK	93	2.5	V	16.62	52.45	74	21.55	Harmonic
7308.00	21.50	Ave.	93	2.5	V	16.62	38.12	54	15.88	Harmonic
9744.00	34.84	PK	260	2.4	H	19.4	54.24	74	19.76	Harmonic
9744.00	20.82	Ave.	260	2.4	H	19.4	40.22	54	13.78	Harmonic

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.249/15.205/15.209		
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2479 MHz)										
578.46	49.24	QP	227	1.0	V	-8.6	40.64	46	5.36	Spurious
2479.00	87.79	PK	181	1.8	H	7.21	95.00	114	19.00	Fundamental
2479.00	73.46	Ave.	181	1.8	H	7.21	80.67	94	13.33	Fundamental
2479.00	87.78	PK	306	1.3	V	7.21	94.99	114	19.01	Fundamental
2479.00	73.25	Ave.	306	1.3	V	7.21	80.46	94	13.54	Fundamental
2374.93	36.42	PK	73	1.7	V	5.48	41.90	74	32.10	Spurious
2374.93	23.02	Ave.	73	1.7	V	5.48	28.50	54	25.50	Spurious
2388.71	36.57	PK	210	1.4	H	5.48	42.05	74	31.95	Spurious
2388.71	21.43	Ave.	210	1.4	H	5.48	26.91	54	27.09	Spurious
2483.76	54.27	PK	175	2.3	H	7.21	61.48	74	12.52	Spurious
2483.76	21.43	Ave.	175	2.3	H	7.21	28.64	54	25.36	Spurious
4958.00	36.22	PK	226	1.9	H	12.46	48.68	74	25.32	Harmonic
4958.00	23.15	Ave.	226	1.9	H	12.46	35.61	54	18.39	Harmonic
7437.00	34.72	PK	92	2.0	V	15.91	50.63	74	23.37	Harmonic
7437.00	21.00	Ave.	92	2.0	V	15.91	36.91	54	17.09	Harmonic
9916.00	34.16	PK	271	1.1	V	19.39	53.55	74	20.45	Harmonic
9916.00	19.67	Ave.	271	1.1	V	19.39	39.06	54	14.94	Harmonic

Note:

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

Margin = Limit – Corrected Amplitude

FCC§15.215(c) - 20dB EMISSION BANDWIDTH**Applicable Standard**

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that indicated 20dB bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2013-11-12	2014-11-12

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	100.0 kPa

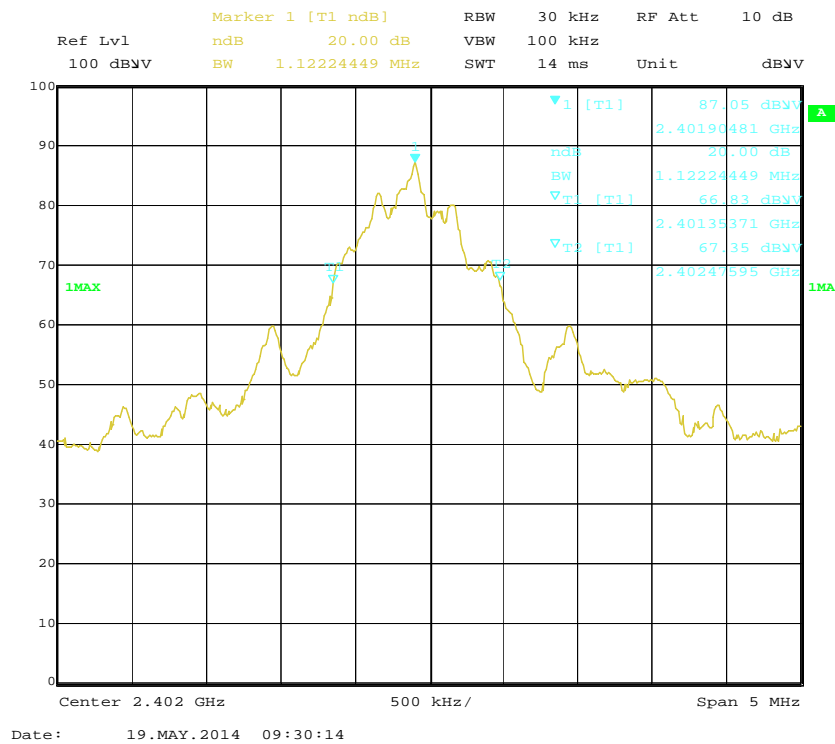
The testing was performed by Gardon Zhang on 2014-05-19.

Test Mode: Transmitting

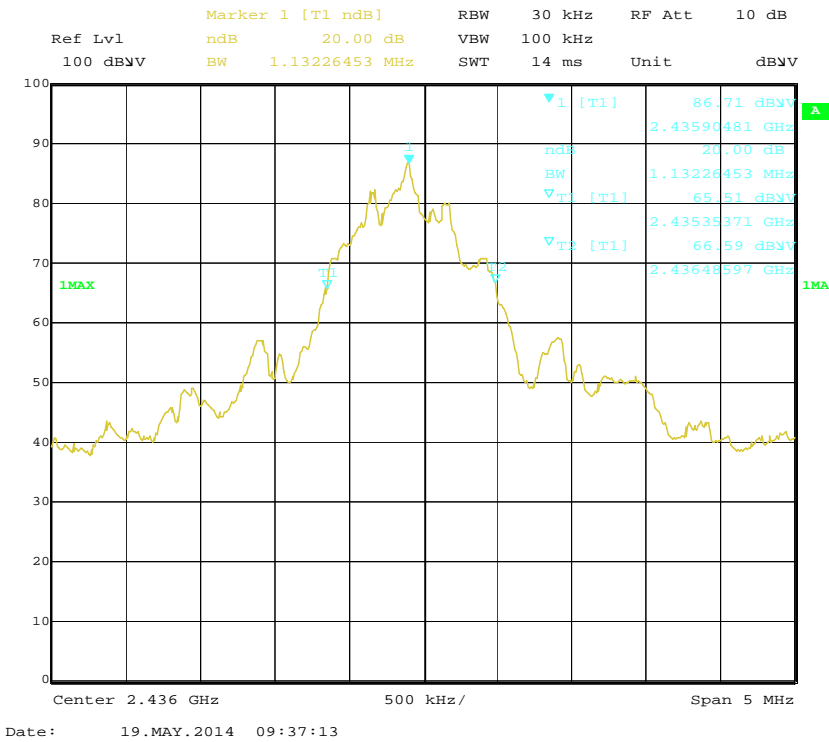
Pleas refer to the following table and plots.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	1.122
Middle	2436	1.132
High	2479	1.142

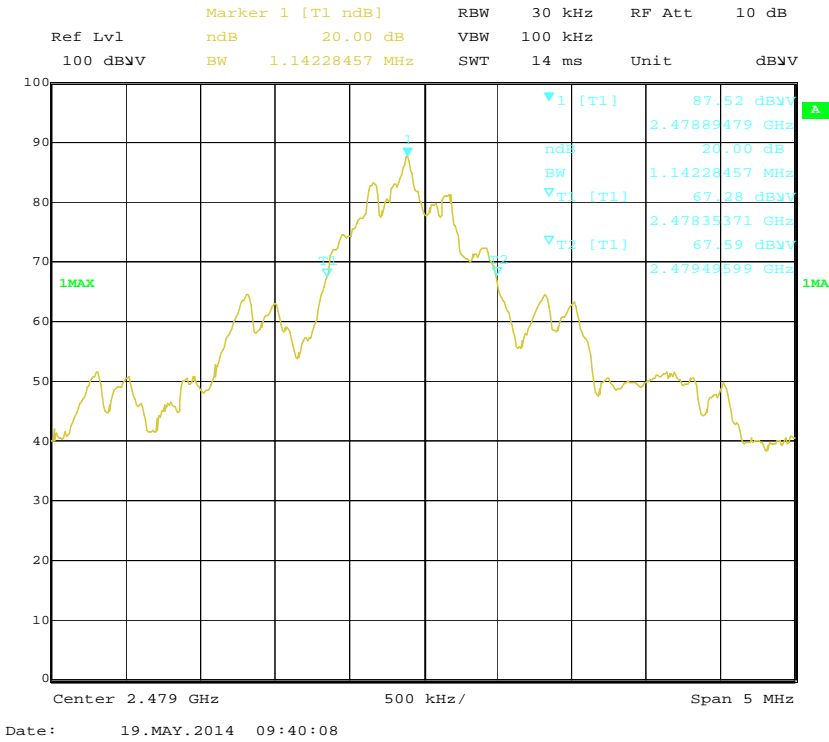
Low Channel



Middle Channel



High Channel



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