



# FCC PART 15B, CLASS B

## MEASUREMENT AND TEST REPORT

For

**Shenzhen Tena Electronic Co., Ltd.**

9 Floor IER Building, South Area, Hi-Tech Industrial Park, Shenzhen, Guangdong, China

**FCC ID: SGRB35100001**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Android TV Box
<b>Test Engineer:</b> <u>Sula Huang</u> 	
<b>Report Number:</b> <u>RSZ131014002-00A</u>	
<b>Report Date:</b> <u>2013-11-13</u>	
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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 *Shenzhen Tena Electronic CO., Ltd.*'s product, model number: *B351* (*FCC ID: SGRB35100001*) or the "EUT" in this report was a *Android TV Box*, which was measured approximately: 14.5 cm (L) x 9.8 cm (W) x 1.8 cm (H), rated input voltage: DC 5V from adapter. The highest operating frequency is 1.6 GHz.

Adapter information: AC ADAPTOR

Model: YHSAFC0502000W1EU

Input: 100-240V~50/60Hz, 0.32A Max

Output: DC 5V, 2000mA

*Note: the product Android TV Box, model BX09\_V2.1, BX09\_V3.0, B351\_V1.1, B351\_V2.0, B351\_3.0, B351\_V3.1, B321\_V1.0 and B321\_V1.1 are electrically identical with the model B351 that was selected to test, the difference among them is just the model number due to market purpose which was explained in the attached product similarity declaration letter provided and guaranteed by applicant.*

*\*All measurement and test data in this report was gathered from production sample serial number: 1310008 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2013-10-14.*

### Objective

This report is prepared on behalf of *Shenzhen Tena Electronic CO., Ltd.* in accordance with Part 2-Subpart J, Part 15- Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine the compliance of EUT with FCC Part 15B, Class B.

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

FCC Part 15.247 DTS submission with FCC ID: SGRB35100001.

### 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 C63.4-2003.

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**

### **Description of Test Configuration**

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

The EUT was tested together with the below additional components and configuration, such case produced the worst emission level that was selected to test and recorded in this report.

Test mode 1: Play video&audio file (HDMI)  
Test mode 2: Play video&audio file (AV)

After the preliminary scan, the following test mode was found to produce the highest emission level.

Test mode 1: Play video&audio file (HDMI)

### **EUT Exercise Software**

No Exercise Software was used

**Equipment Modifications**

No Modification was made to the EUT

**Support Equipment List and Details**

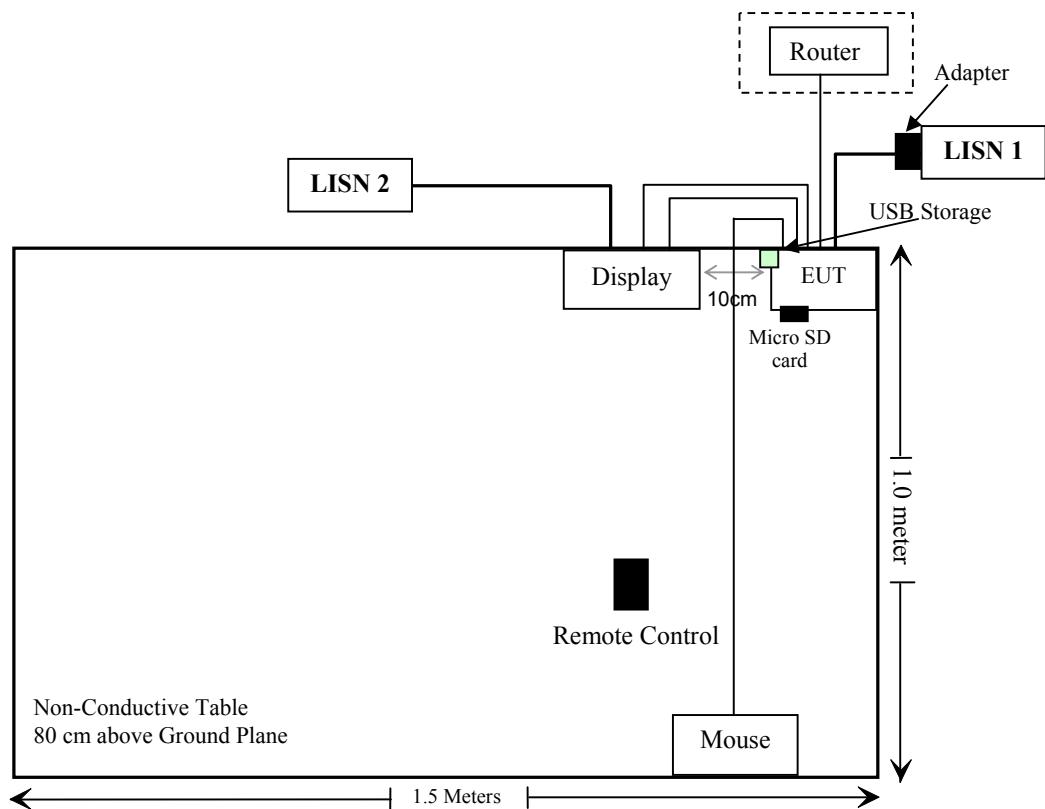
Manufacturer	Description	Model	Serial Number
SAMSUNG	LCD TV Monitor	225MS	CR22HVIP401073M
Kingston	USB Storage	2GB	N/A
SAGEMCOM	Modem/Router	F@st 3804	LK11153DP530005
Kingston	Micro SD card	4GB	/
DELL	Mouse	MOC5UO	G1B0096D

**External I/O Cable**

Cable Description	Length (m)	From/Port	To
Unshielded Detachable Mouse Cable	1.5	Mouse Port/Host	Mouse
Shielded Detachable HDMI Cable with core	0.9	EUT	LCD TV Monitor
Unshielded Detachable AV Cables	1.5	EUT	LCD TV Monitor
Unshielded Detachable RJ45 Cable	10.0	EUT	Router
Unshielded DC Power Cable	1.6	EUT	Adapter

**Block Diagram of Test Setup**

For Conducted Emissions:



## **SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Results
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Emissions	Compliance

## FCC §15.107 – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

According to FCC §15.107

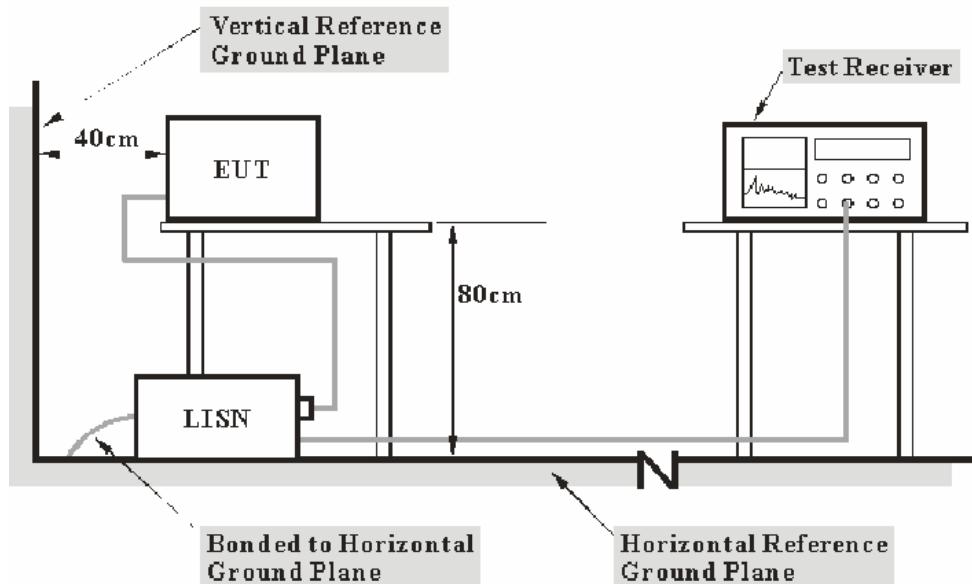
### Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between AMN/ISN and receiver, AMN/ISN voltage division factor, AMN/ISN 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	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 C63.4-2003. The related limit was specified in FCC Part 15.107 Class B.

The spacing between the peripherals was 10 cm.

The adapter was connected to an AC 120V/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 emissions, the adapter was connected to the first LISN, the LCD monitor was connected to 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.

### 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	1 <sup>st</sup> LISN	ENV216	3560.6650.12-101613-Yb	2013-05-07	2014-05-07
Rohde & Schwarz	2 <sup>nd</sup> LISN	ESH2-Z5	892107/021	2013-08-22	2014-08-22
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2013-08-09	2014-08-09
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/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

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

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB 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, with the worst margin reading of:

**9.0 dB at 3.574000 MHz in the Line conducted mode**

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

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

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

## Test Data

### Environmental Conditions

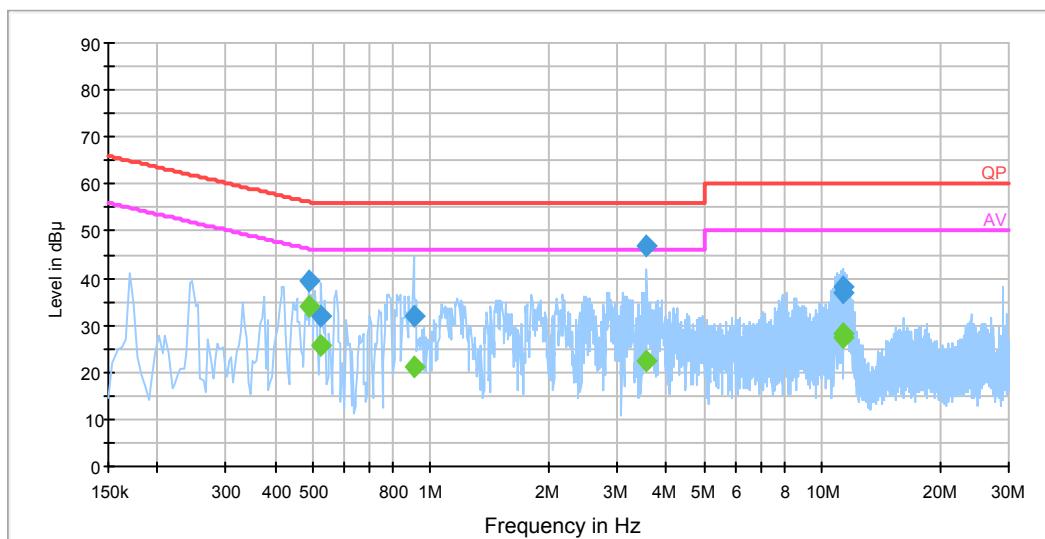
<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Sula Huang on 2013-11-06.*

*Test Mode: Play video&audio file (HDMI) - (worst case)*

**AC 120V/60 Hz, Line**

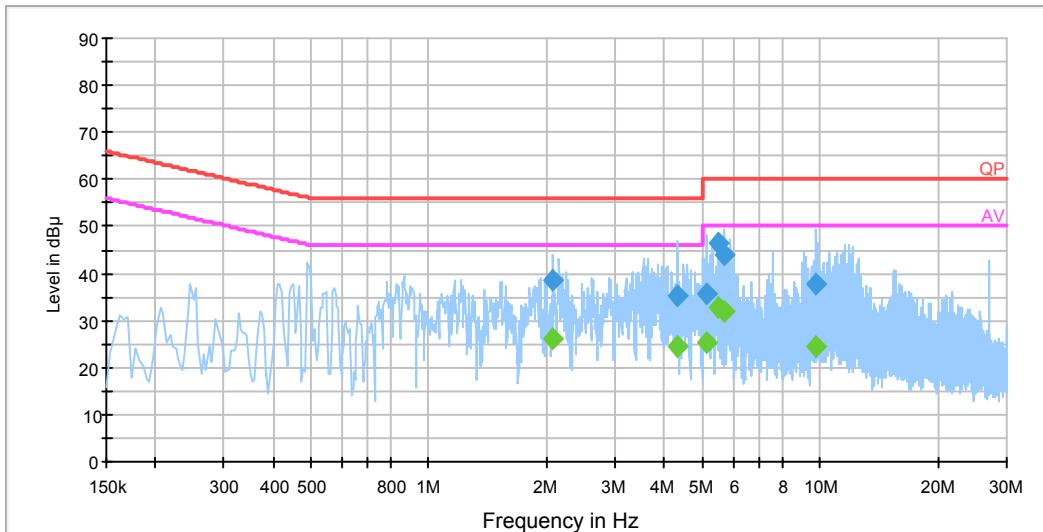
EMI Auto Test L



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V)	Correction Factor (dB)	Limit (dB $\mu$ V)	Margin (dB)	Detector (PK/ QP/Ave.)
0.486000	39.5	19.5	56.2	16.7	QP
0.526000	32.1	19.5	56.0	23.9	QP
0.906000	31.9	19.5	56.0	24.1	QP
3.574000	47.0	19.6	56.0	9.0	QP
11.346000	38.1	19.8	60.0	21.9	QP
11.382000	36.8	19.8	60.0	23.2	QP
0.486000	33.9	19.5	46.2	12.3	Ave.
0.526000	25.5	19.5	46.0	20.5	Ave.
0.906000	21.3	19.5	46.0	24.7	Ave.
3.574000	22.3	19.6	46.0	23.7	Ave.
11.346000	28.1	19.8	50.0	21.9	Ave.
11.382000	27.4	19.8	50.0	22.6	Ave.

**AC 120V/60 Hz, Neutral**

EMI Auto Test N



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V)	Correction Factor (dB)	Limit (dB $\mu$ V)	Margin (dB)	Detector (PK/ QP/Ave.)
2.082000	38.7	19.6	56.0	17.3	QP
4.306000	35.3	19.7	56.0	20.7	QP
5.146000	35.5	19.7	60.0	24.5	QP
5.474000	46.6	19.7	60.0	13.4	QP
5.702000	44.1	19.7	60.0	15.9	QP
9.766000	37.9	19.8	60.0	22.1	QP
2.082000	26.0	19.6	46.0	20.0	Ave.
4.306000	24.4	19.7	46.0	21.6	Ave.
5.146000	25.4	19.7	50.0	24.6	Ave.
5.474000	33.0	19.7	50.0	17.0	Ave.
5.702000	32.0	19.7	50.0	18.0	Ave.
9.766000	24.5	19.8	50.0	25.5	Ave.

**Note:**

- 1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation  
The corrected factor has been input into the transducer of the test software.
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

## FCC §15.109 - RADIATED EMISSIONS

### Applicable Standard

According to FCC §15.109

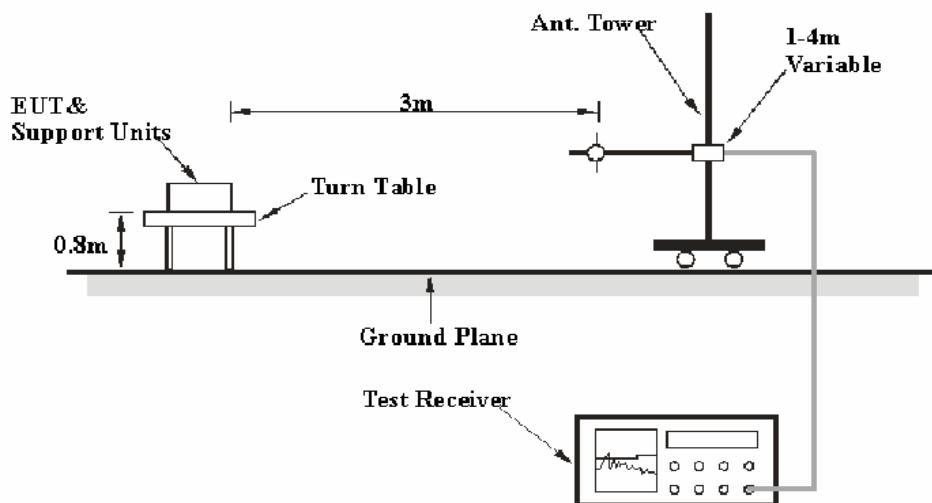
### Measurement Uncertainty

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 shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report

Frequency	Polarity	Measurement uncertainty
30MHz~200MHz	Horizontal	4.62 dB (k=2, 95% level of confidence)
	Vertical	4.54 dB (k=2, 95% level of confidence)
200MHz~1GHz	Horizontal	4.84 dB (k=2, 95% level of confidence)
	Vertical	5.91 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	Horizontal / Vertical	4.68 dB (k=2, 95% level of confidence)
Above 6 GHz	Horizontal / Vertical	4.92 dB (k=2, 95% level of confidence)

### EUT Setup



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 Part 15.109 Class B 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.

The adapter was connected to an AC 120V/60 Hz power source

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 6000 MHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

### Test Procedure

During the radiated emissions, adapter, LCD monitor were connected to the AC floor outlet.

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

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1 GHz, Peak and average detection mode above 1 GHz.

### 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	2013-09-17	2014-09-17
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2013-04-03	2014-04-03
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23
R&S	Auto test Software	EMC32	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 Amplitude & Margin Calculation

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

$$\text{Correction Factor} = \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

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 Results Summary

According to the recorded data in following table, with the worst margin reading of:

**0.4 dB at 371.256500 MHz in the Horizontal polarization**

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

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

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

## Test Data

### Environmental Conditions

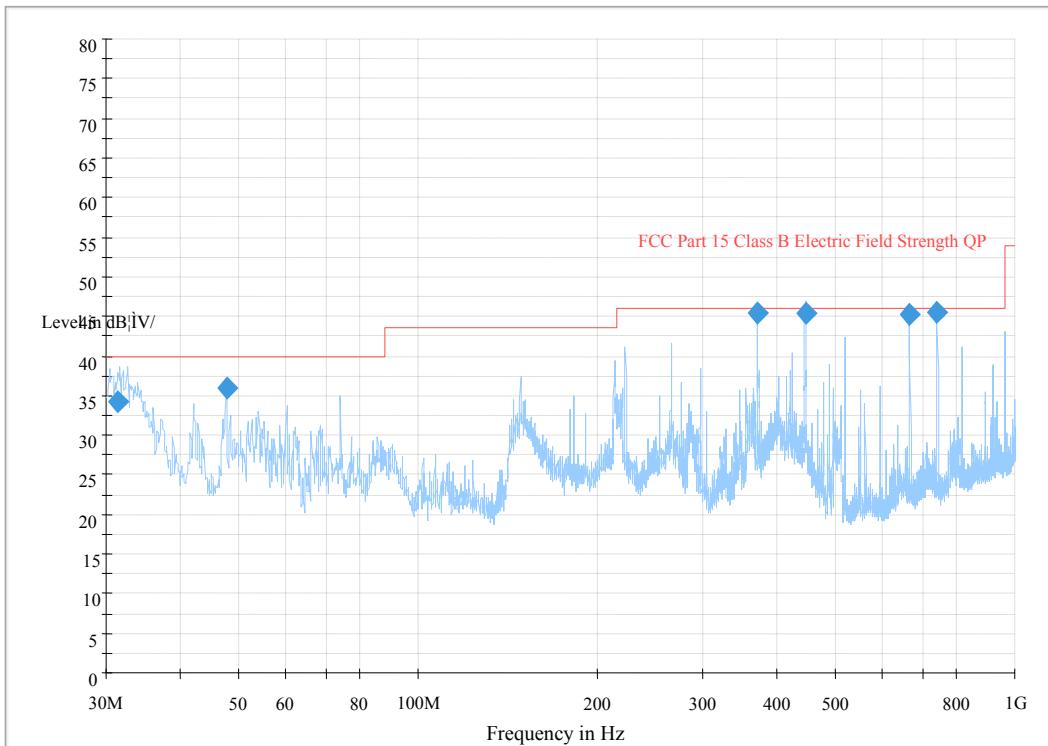
Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

*The testing was performed by Sula Huang on 2013-11-06.*

Test Mode: Play video&audio file (HDMI)-(worst case)

**1) 30 MHz ~ 1 GHz:**

Auto Test(FCC part 15 Class B)



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Ant. Polarity (H/V)	Turntable Position (degree)	Correction Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
31.447000	34.2	102.0	V	253.0	-7.1	40.0	5.8
47.784900	36.0	102.0	V	94.0	-18.1	40.0	4.0
371.256500	45.6	103.0	H	244.0	-10.2	46.0	0.4
445.496150	45.3	102.0	H	21.0	-8.5	46.0	0.7
668.290900	45.2	100.0	V	35.0	-4.4	46.0	0.8
742.516200	45.4	100.0	V	85.0	-3.2	46.0	0.6

## 1) Above 1 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dB $\mu$ V/m)	FCC Part 15.109	
	Reading (dB $\mu$ V)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dB $\mu$ V/m)	Margin (dB)
1142.28	52.07	PK	0	1.1	H	0.58	52.65	74	21.35
1142.28	39.66	Ave.	0	1.1	H	0.58	40.24	54	13.76
1142.28	52.54	PK	0	1.1	V	0.58	53.12	74	20.88
1142.28	39.22	Ave.	0	1.1	V	0.58	39.80	54	14.20
1480.96	57.12	PK	145	1.1	H	1.15	58.27	74	15.73
1480.96	41.41	Ave.	145	1.1	H	1.15	42.56	54	11.44
1480.96	57.77	PK	0	1.1	V	1.15	58.92	74	15.08
1480.96	41.65	Ave.	0	1.1	V	1.15	42.80	54	11.20
1853.71	50.38	PK	90	1.1	H	2.63	53.01	74	20.99
1853.71	38.60	Ave.	90	1.1	H	2.63	41.23	54	12.77
1853.71	50.85	PK	0	1.1	V	2.63	53.48	74	20.52
1853.71	40.08	Ave.	0	1.1	V	2.63	42.71	54	11.29
2599.20	47.40	PK	182	1.2	H	7.40	54.80	74	19.20
2599.20	37.2	Ave.	182	1.2	H	7.40	44.60	54	9.40
2599.20	47.89	PK	186	1.2	V	7.40	55.29	74	18.71
2599.20	35.63	Ave.	186	1.2	V	7.40	43.03	54	10.97
3561.12	46.3	PK	360	1.2	H	9.00	55.30	74	18.70
3561.12	33.45	Ave.	360	1.2	H	9.00	42.45	54	11.55

Note:

- 1) Corrected Amplitude = Corrected Factor + Reading
- 2) Corrected Factor=Antenna factor (RX) + Cable loss – Amplifier factor
- 3) Margin = Limit - Corrected Amplitude

## PRODUCT SIMILARITY DECLARATION LETTER



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2013-11-12

### Product Similarity Declaration

To Whom It May Concern,

We, Shenzhen Tena Electronic CO.,Ltd., hereby declare that our Android TV Box, Model Number: BX09\_V2.1, BX09\_V3.0, B351\_V1.1, B351\_V2.0, B351\_3.0, B351\_V3.1, B321\_V1.0, B321\_V1.1 are electrically identical with B351 that was certified by BACL.

There are named differently due to market purpose.

Please contact me if you have any question.

Signature:

Jerome Pan  
Manager

A handwritten signature in black ink that reads "Jerome Pan".

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