RF TEST REPORT

Report No.: 17070669-FCC-R4

Supersede Report No.: N/A

Applicant	HUMAX Co., Ltd.
Product Name	Cable Set-top box
Main Model No.	1008R-HDD-XXX(XXX=A~Z)
Serial Model No.	1008C-STB-XXX(XXX=A~Z)
Test Standard	FCC Part 15.247: 2017, ANSI C63.10: 2013
Test Date	August 12, 2017 to January 09, 2018
Issue Date	January 08, 2018
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Aaron Liang	David Huang	
Aarron Liang Test Engineer	David Huang Checked By	

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Test result presented in this test report is applicable to the tested sample only

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
17070669-FCC-R4	NONE	Original	January 08, 2018

2. Customer information

Applicant Name	HUMAX Co., Ltd.
Applicant Add	HUMAX BLDG., 2, Yeongmun-ro, Cheoin-gu Yongin-si, Gyeonggi-do South Korea 17040
Manufacturer	HUMAX Co., Ltd.
Manufacturer Add	HUMAX BLDG., 2, Yeongmun-ro, Cheoin-gu Yongin-si, Gyeonggi-do South Korea 17040

3. Test site information

Test Lab A:

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	535293
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

Test Lab B:

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	694825
IC Test Site No.	4842B-1
Test Software	EZ_EMC(ver.Icp-03A1)

Note: We just perform Radiated Spurious Emission above 18GHz in the test Lab. B.

4. Equipment under Test (EUT) Information

Description of EUT:	Cable Set-top box
Main Model:	1008R-HDD-XXX(XXX=A~Z)
Serial Model:	1008C-STB-XXX(XXX=A~Z)
Date EUT received:	August 11, 2017
Test Date(s):	August 12, 2017 to January 09, 2018
Equipment Category：	DTS
Antenna Gain:	WIFI(2.4G): Antenna (Green): 1.9 dBi Antenna (Gray): 2.8 dBi Antenna (Black): 1.7 dBi WIFI(5150-5250MHz): Antenna (Green): 3.9 dBi Antenna (Gray): 3.8 dBi Antenna (Black): 2.5 dBi WIFI(5250-5350MHz): Antenna (Green): 3.8 dBi Antenna (Gray): 3.9 dBi Antenna (Black): 3.8 dBi WIFI(5470-5725MHz): Antenna (Green): 3.6 dBi Antenna (Gray): 3.9 dBi Antenna (Black): 3.7 dBi WIFI(5725-5850MHz): Antenna (Green): 3.8 dBi Antenna (Gray): 3.8 dBi Antenna (Black): 2.7 dBi RF4CE: Antenna 0: 2.35 dBi Antenna 1: 2.28 dBi
Antenna Type:	Dipole antenna RF4CE: PCB antenna
Type of Modulation:	802.11b: DSSS 802.11g/n20/n40/a/ac20/ac40/ac80: OFDM RF4CE: O-QPSK

RF Operating Frequency (ies):	WIFI: 802.11b/g: 2412-2462 MHz(TX/RX) WIFI: 802.11n(20M): 2412-2462 MHz; 5180-5240 MHz; 5260-5320 MHz; 5500-5700 MHz; 5745-5825 MHz； (TX/RX) WIFI: 802.11n(40M): 2422-2452 MHz; 5190-5230 MHz; 5270-5310 MHz; 5510-5710 MHz; 5755-5795 MHz；(TX/RX) 802.11a: 5180-5240 MHz; 5260-5320 MHz; 5500-5700 MHz; 5745-5825 MHz； (TX/RX) 802.11ac 20: 5180-5240 MHz; 5260-5320 MHz; 5500-5700 MHz; 5745-5825 MHz； (TX/RX) 802.11ac 40: 5190-5230 MHz; 5270-5310 MHz; 5510-5710 MHz; 5755-5795 MHz；(TX/RX) 802.11ac 80: 5210 MHz; 5290 MHz; 5530-5690 MHz; 5775 MHz；(TX/RX) RF4CE: 2405-2480 MHz
Max. Output Power:	Conducted output power: 3.012 dBm; E.I.R.P.: 5.362 dBm.
Number of Channels:	WIFI :802.11b/g: 11CH WIFI :802.11a: 24CH WIFI :802.11n20: 11CH(2.4GHz); 24CH(5GHz) WIFI :802.11n40: 7CH(2.4GHz); 12CH(5GHz) WIFI :802.11ac20: 24CH WIFI :802.11ac40: 12CH WIFI :802.11ac80: 6CH RF4CE:16CH
Port:	Please refer to the user manual
Trade Name :	LGI
Input Power:	Adapter Model: ADP-30LR A Input: 100-240V~0.5A, 50/60Hz Output: 12V DC, 2.5A
FCC ID:	O6ZEOS-1008C

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247 (a)(2)	DTS (6 dB) CHANNEL BANDWIDTH	Compliance
§15.247(b)(3)	Conducted Maximum Output Power	Compliance
§15.247(e)	Power Spectral Density	Compliance
§15.247(d)	Band-Edge & Unwanted Emissions into Restricted Frequency Bands	Compliance
§15.207 (a),	AC Power Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

Measurement Uncertainty

Emissions		
Test Item	**Description**	**Uncertainty**
Band-Edge & Unwanted Emissions into Restricted Frequency Bands and Radiated Emissions & Unwanted Emissions into Restricted Frequency Bands	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

6. Measurements, Examination And Derived Results

6.1 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:

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.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has three attached Dipole antennas for 2.4GHz WIFI /5GHz WIFI and two attached PCB antennas for RF4CE.

MIMO mode:
FCC KDB 662911 D01 Mutiple Transmitter Output V02r01
For CDD transmissions, directional gain is calculateed as
Dirctional Gain= GANT+ Array Gain, where Array Gain is as follows.
For power spectral desity(PSD) measurements on all devices.
Array Gain=10 log(NANT/NSS=1)
For power measurements on IEEE802.11 devices,
Array Gain=0 dB (i.e, no array gain) for NANT<=4.
The EUT support CDD mode, for Power and PSD, the directional gain is following F)2)f)i)
The directional gain "DG" is calculated as following table.

Mode	Antenna (Green) (dBi)	Antenna (Gray) (dBi)	Antenna (Black) (dBi)	DG For Power (dBi)	DG For PSD (dBi)	Power Limit Reduction	PSD Limit Reduction
2.4GHz	1.9	2.8	1.7	2.8	6.92	0	0.92
5G(5150-5250)	3.9	3.8	2.5	3.9	8.19	0	2.19
5G(5250-5350)	3.8	3.9	3.8	3.8	8.6	0	2.6
5G (5470-5725)	3.6	3.9	3.7	3.9	8.51	0	2.51
5G (5725-5850)	3.8	3.8	2.7	3.8	8.22	0	2.22

Power Limit Reduction= DG(Power)-6dBi,(min=0)

PSD Limit Reduction= DG(Power)-6dBi,(min=0)

DG: Directional Gain

SISO:

WIFI:

Mode	Antenna (Green) (dBi)	Antenna (Gray) (dBi)	Antenna (Black) (dBi)	Power Limit Reduction	PSD Limit Reduction
2.4GHz (802.11b; 802.11g)	1.9	2.8	1.7	0	0
5G(5150-5250) (802.11a)	3.9	3.8	2.5	0	0
5G(5250-5350) (802.11a)	3.8	3.9	3.8	0	0
5G (5470-5725) (802.11a)	3.6	3.9	3.7	0	0
5G (5725-5850) (802.11a)	3.8	3.8	2.7	0	0

Zigbee:

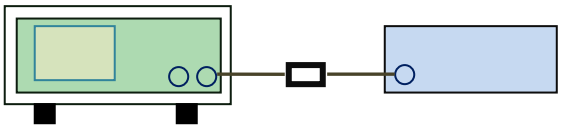
Mode	Antenna 0 (dBi)	Antenna 1 (dBi)	Power Limit Reduction	PSD Limit Reduction
2.4GHz (Zigbee)	1.9	2.8	0	0

The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 DTS (6 dB) Channel Bandwidth

Temperature	25℃
Relative Humidity	55%
Atmospheric Pressure	1017mbar
Test date :	December 23, 2017
Tested By :	Aarron Liang

Spec	Item	Requirement	Applicable
§ 15.247(a)(2)	a)	6dB BW≥ 500kHz;	☑
RSS Gen(4.6.1)	b)	99% BW: For FCC reference only; required by IC.	☑
Test Setup			
Test Procedure	558074 D01 DTS MEAS Guidance v04, 8.1 DTS bandwidth 6dB Emission bandwidth measurement procedure - Set RBW = 100 kHz. - Set the video bandwidth (VBW) ≥ 3 RBW. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. 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.		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

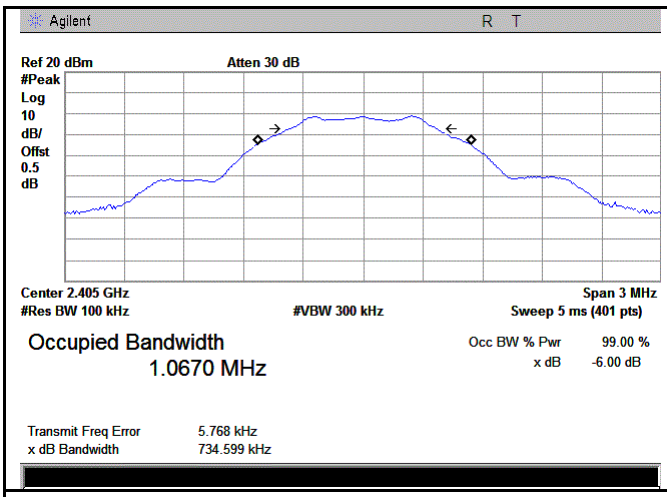
6dB Bandwidth measurement result

Test Data

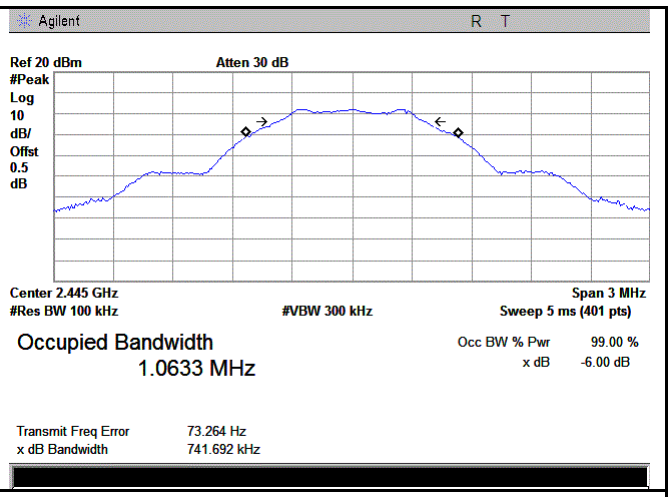
CH	Frequency (MHz)	6dB Bandwidth (kHz)		99% Occupied Bandwidth (MHz)	
		Ant. 0	Ant. 1	Ant. 0	Ant. 1
Low	2405	734.599	743.233	1.0670	1.0723
Mid	2445	741.692	735.896	1.0633	1.0711
High	2480	739.482	744.073	1.0617	1.0699

Test Plots

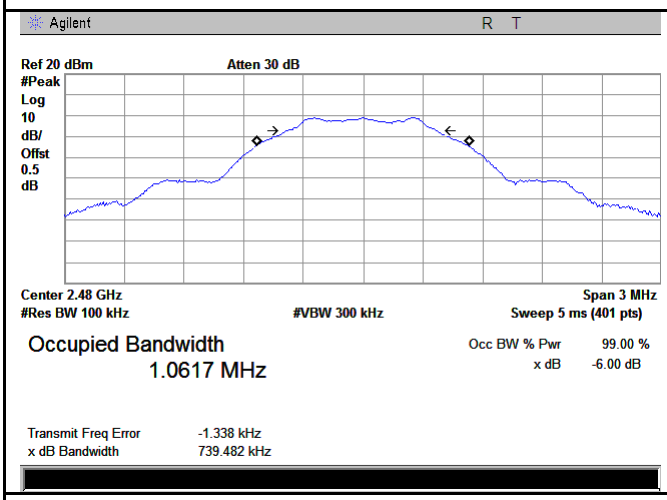
Ant .0:



6dB Bandwidth - Low CH 2405

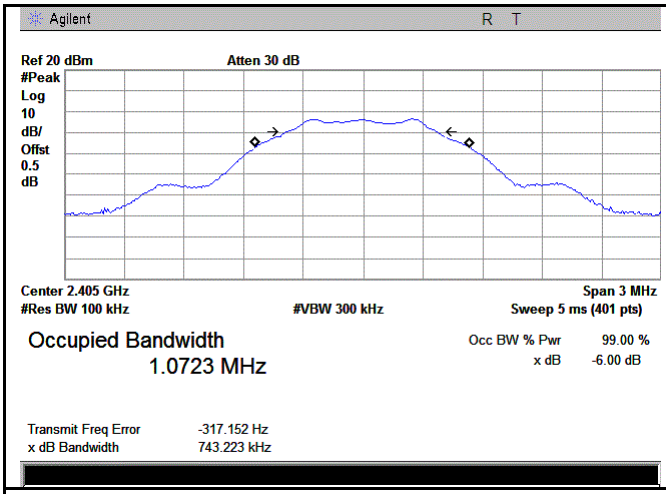


6dB Bandwidth - Mid CH 2445

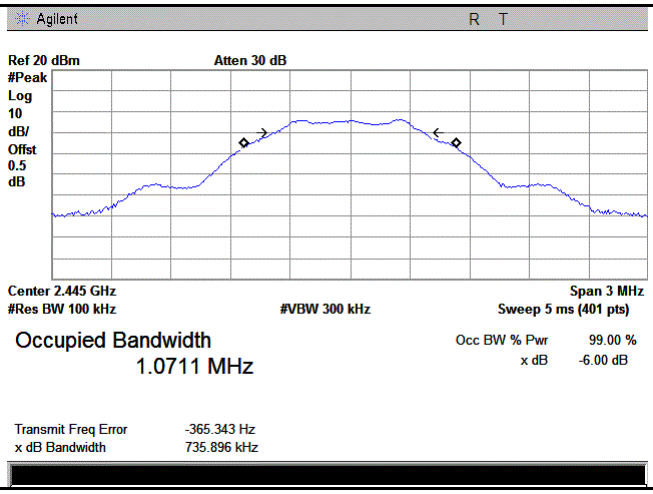


6dB Bandwidth - High CH 2480

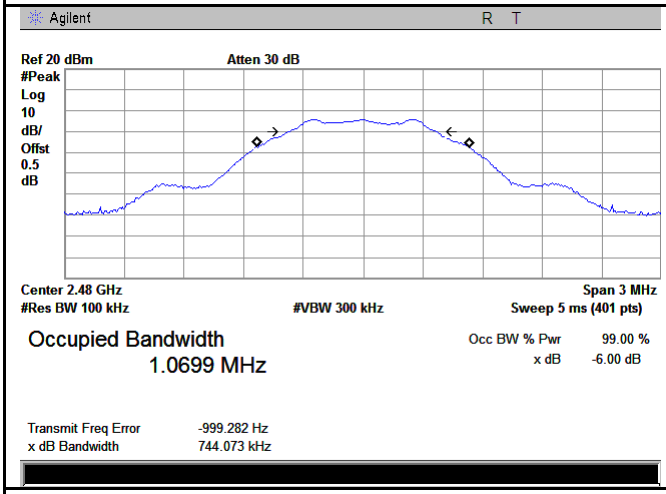
Ant .1:



6dB Bandwidth - Low CH 2405



6dB Bandwidth - Mid CH 2445

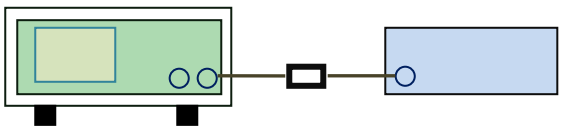


6dB Bandwidth - High CH 2480

6.3 Maximum Output Power

Temperature	25℃
Relative Humidity	55%
Atmospheric Pressure	1017mbar
Test date :	December 23, 2017
Tested By :	Aarron Liang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b)(3),RSS210(A8.4)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt	☐
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	☐
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤ 0.25 Watt	☐
	f)	DTS in 902-928MHz, 2400-2483.5MHz: ≤ 1 Watt	☑
Test Setup	 Spectrum Analyzer EUT		
Test Procedure	558074 D01 DTS MEAS Guidance v04, 9.1.2 Integrated band power method Maximum output power measurement procedure a) Set the RBW ≥ DTS bandwidth. b) Set VBW ≥ 3 × RBW. c) Set span ≥ 3 x 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.		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

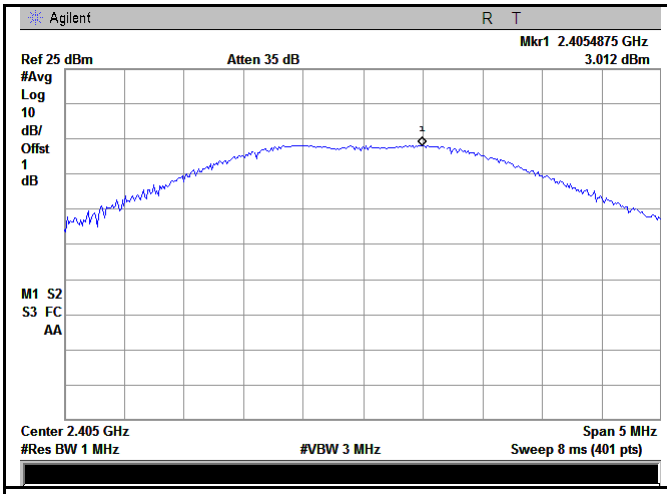
Output Power measurement result

Test Data

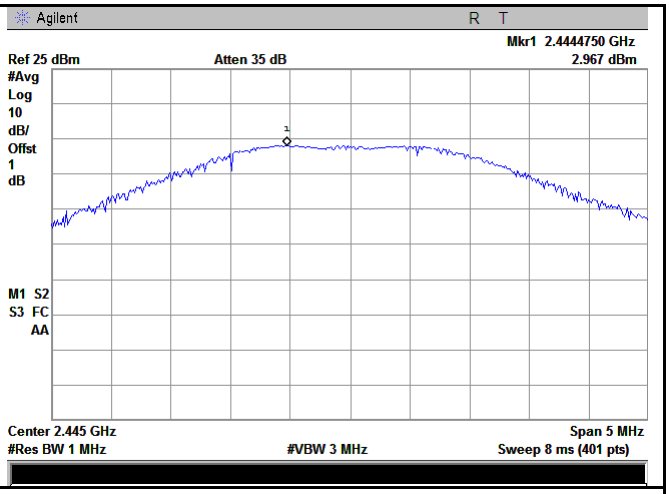
Type	CH	Frequency (MHz)	Conducted Power (dBm)		Conducted Power Limit (dBm)	Ant. Gain		E.I.R.P (The SUBTEL certification's requirement for Chile)		E.I.R.P Limit (dBm)	Result
			Ant. 0	Ant. 1		Ant.0	Ant.1	Ant.0	Ant.1		
Output power	Low	2402	3.012	1.417	30	2.35	2.28	5.362	3.697	21.8	Pass
	Mid	2440	2.967	1.580	30	2.35	2.28	5.317	3.86	21.8	Pass
	High	2480	2.908	1.764	30	2.35	2.28	5.258	4.044	21.8	Pass

Test Plots

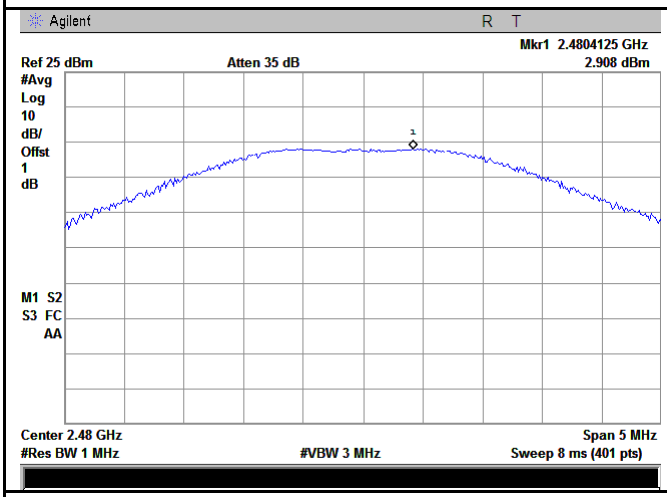
Ant.0



PK Output power - Low CH 2405

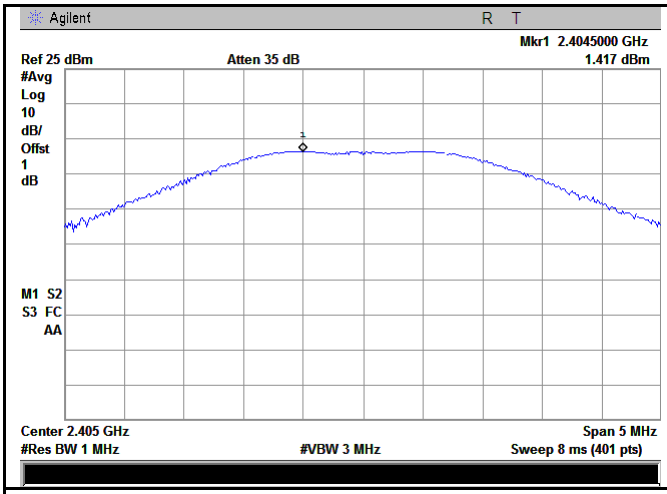


PK Output power - Mid CH 2445

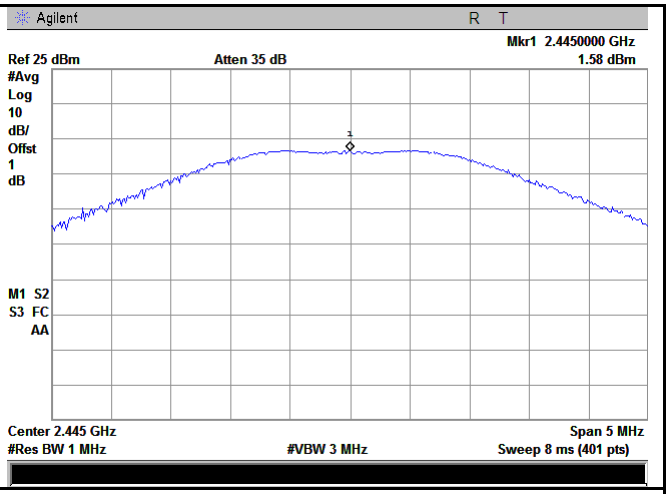


PK Output power - High CH 2480

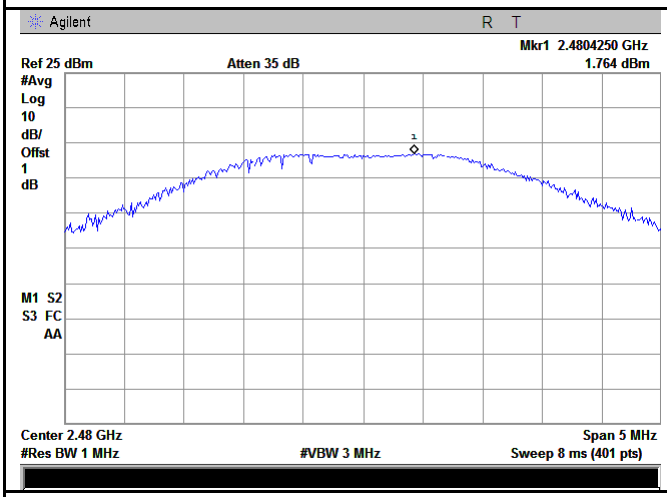
Ant .1:



PK Output power - Low CH 2402



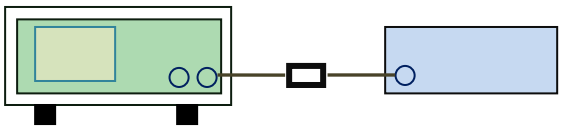
PK Output power - Mid CH 2440



PK Output power - High CH 2480

6.4 Power Spectral Density

Temperature	25℃
Relative Humidity	55%
Atmospheric Pressure	1017mbar
Test date :	December 23, 2017
Tested By :	Aarron Liang

Spec	Item	Requirement	Applicable
§15.247(e)	a)	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.	☑
Test Setup			
Test Procedure	558074 D01 DTS MEAS Guidance v04, 10.2 power spectral density method power spectral density measurement procedure - 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 kHz ≤ RBW ≤ 100 kHz. - d) Set the VBW ≥ 3 × 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.		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Power Spectral Density measurement result

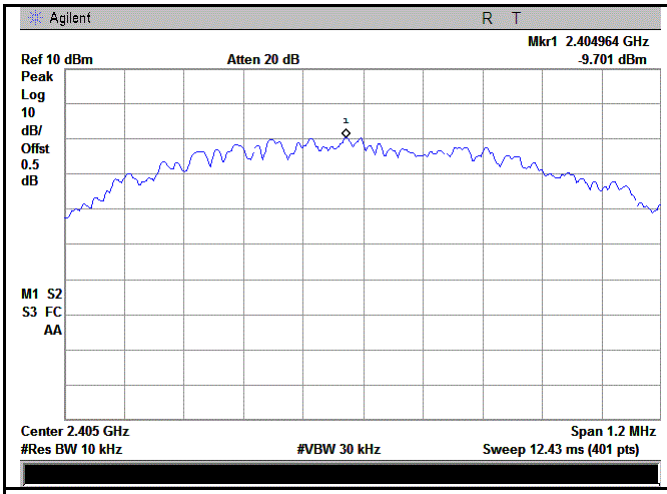
Test Data

Type	CH	Freq (MHz)	Reading(dBm)		Factor (dB)	Result (dBm)		Limit (dBm)	Result
			Ant.0	Ant.1		Ant.0	Ant.1		
PSD	Low	2402	-9.701	-12.2	-5.23	-14.931	-17.43	8	Pass
	Mid	2440	-6.376	-12.52	-5.23	-11.606	-17.75	8	Pass
	High	2480	-9.499	-12.74	-5.23	-14.729	-17.97	8	Pass

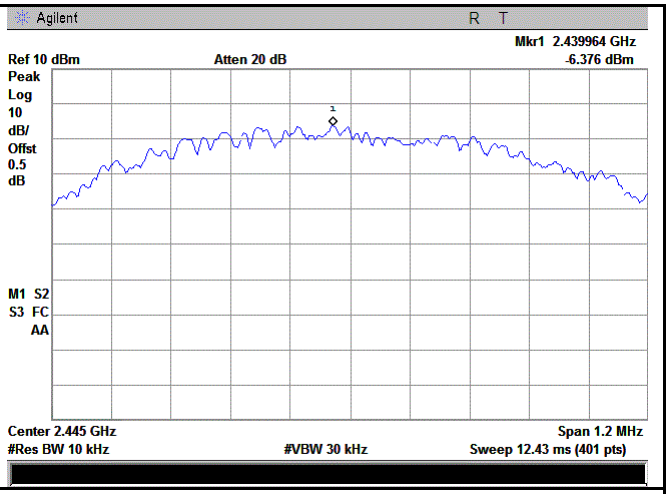
Note: factor=10log(3/10)=-5.23

Test Plots

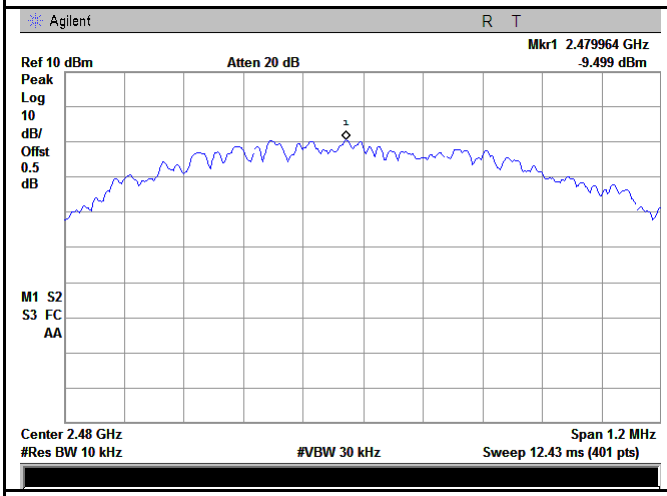
Ant.0:



PSD - Low CH 2405

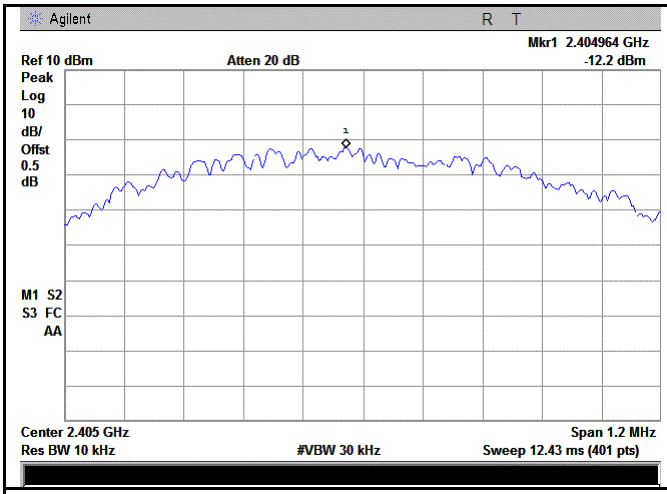


PSD - Mid CH 2445

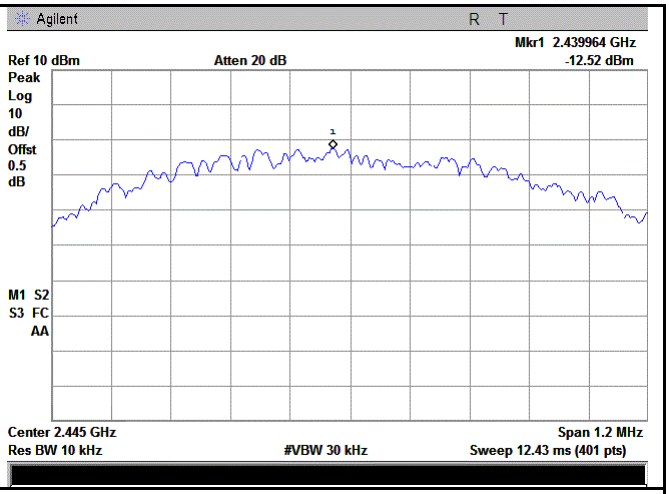


PSD - High CH 2480

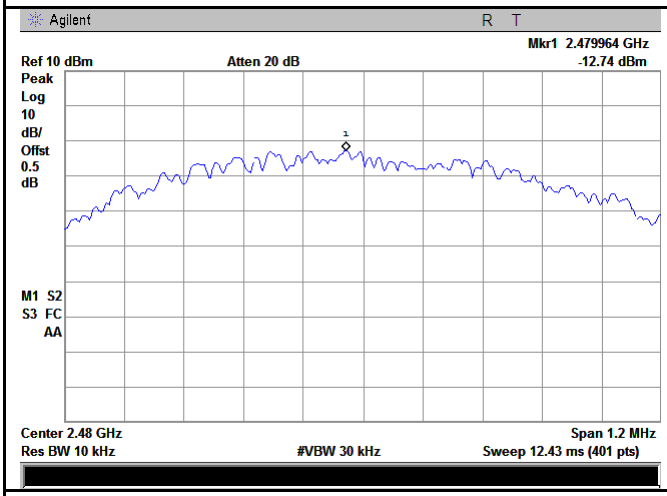
Ant .1:



PSD - Low CH 2405



PSD - Mid CH 2445

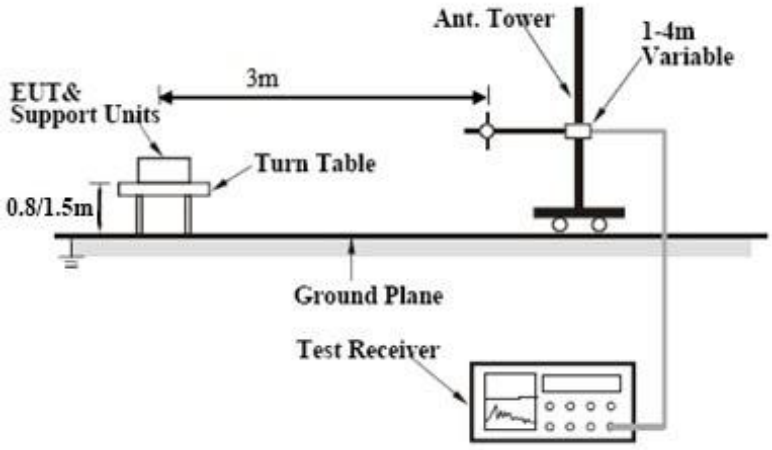


PSD - High CH 2480

6.5 Band-Edge & Unwanted Emissions into Restricted Frequency Bands

Temperature	25℃
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	January 12, 2018
Tested By :	Aarron Liang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(d)	a)	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 Setup			
Test Procedure	Radiated Method Only - 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. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.		

	- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz. - 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.
Remark	
Result	☑ Pass ☐ Fail

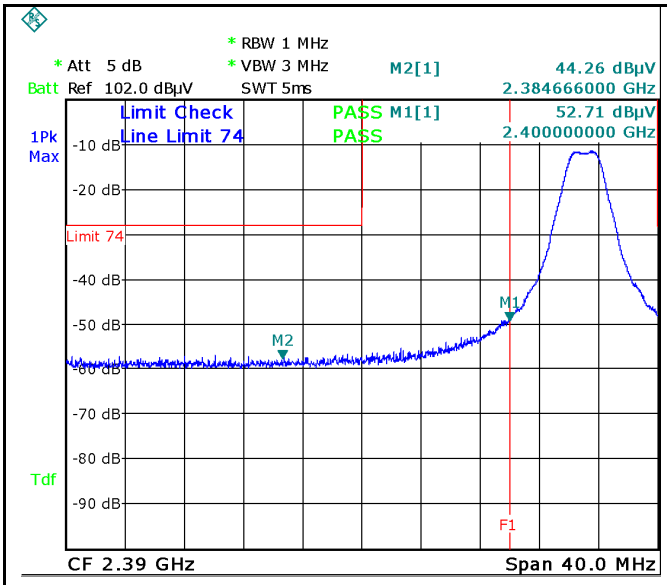
Test Data ☐ Yes ☑ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Plots

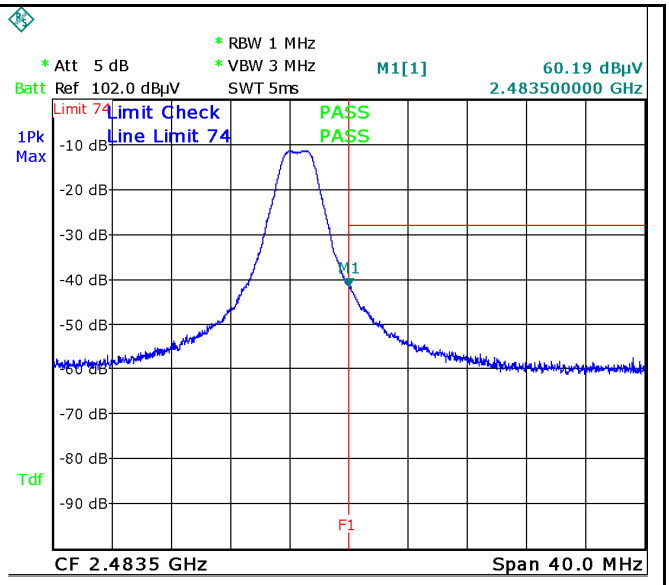
Band Edge measurement result

Ant.0



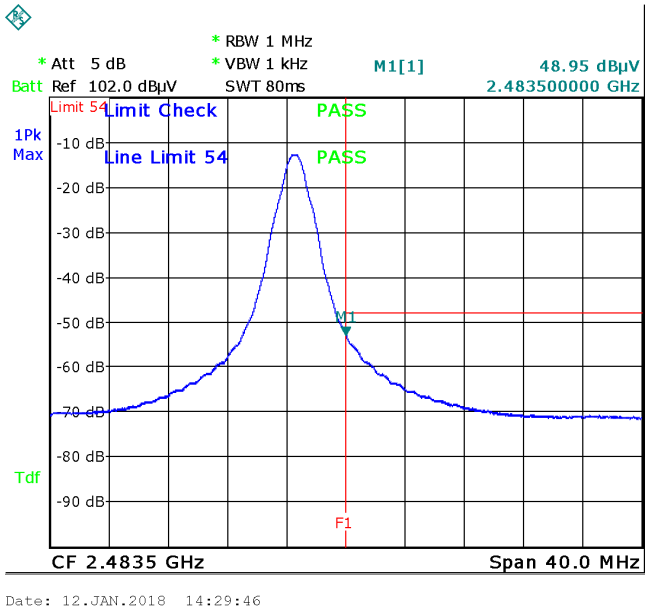
Band Edge, Left Side (Peak)

Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz



Band Edge, Right Side (Peak)

Note: F1 is frequency 2483.5MHz



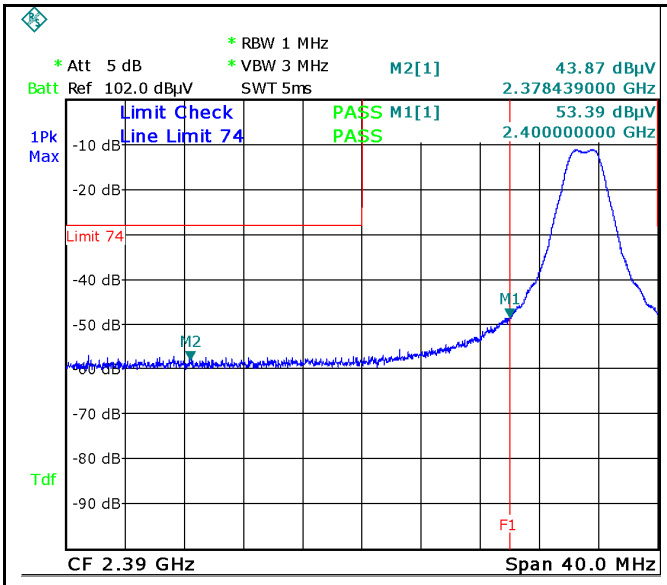
Band Edge, Left Side-AV

Note: (no need if PK value less than the AV limit)

Band Edge, Right Side-AV

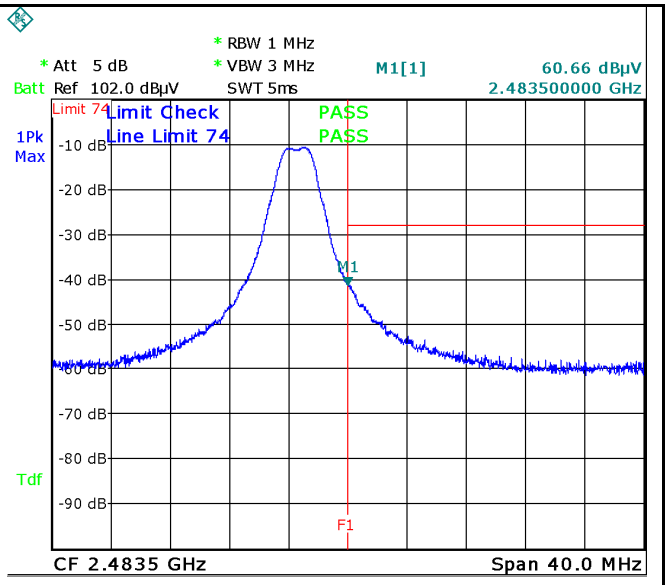
Note: Both Horizontal and vertical polarities were investigated.

Ant.1



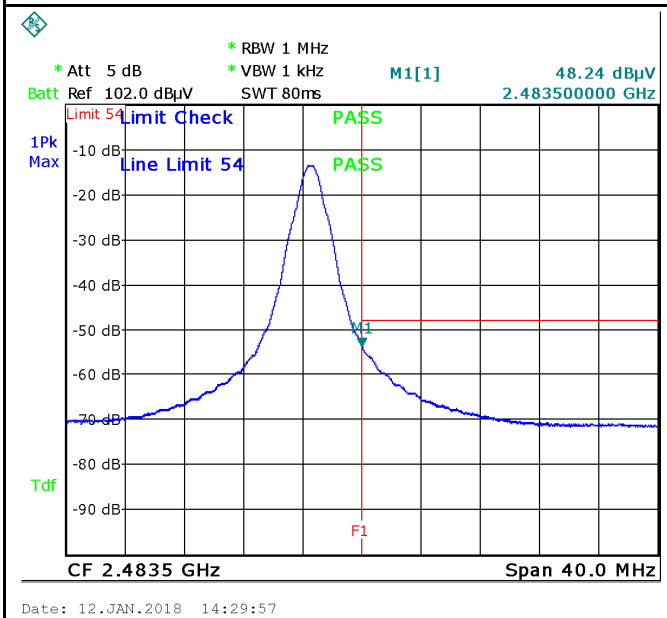
Band Edge, Left Side (Peak)

Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz



Band Edge, Right Side (Peak)

Note: F1 is frequency 2483.5MHz



Band Edge, Left Side-AV

Note: (no need if PK value less than the AV limit)

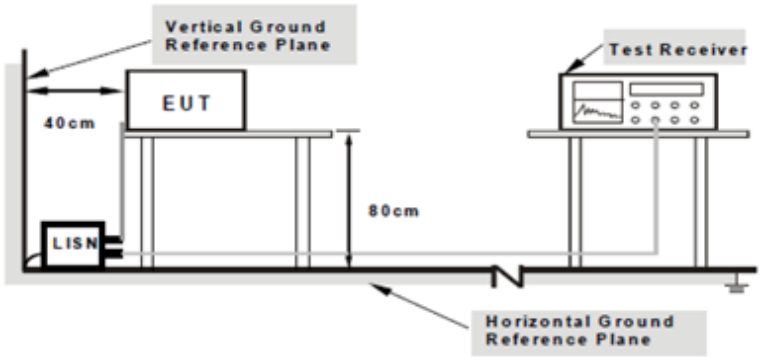
Band Edge, Right Side-AV

Note: Both Horizontal and vertical polarities were investigated.

6.6 AC Power Line Conducted Emissions

Temperature	25℃
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	January 12, 2018
Tested By :	Aarron Liang

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.207, RSS210 (A8.1)</td><td>a)</td><td>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu] H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<tr><td>0.15 ~ 0.5</td><td>66 – 56</td><td>56 – 46</td></tr>
<tr><td>0.5 ~ 5</td><td>56</td><td>46</td></tr>
<tr><td>5 ~ 30</td><td>60</td><td>50</td></tr>
</table></td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 

Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</td></tr>
<tr><td>Procedure</td><td colspan="3">1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss</td></tr>
</table>

	coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver. 7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

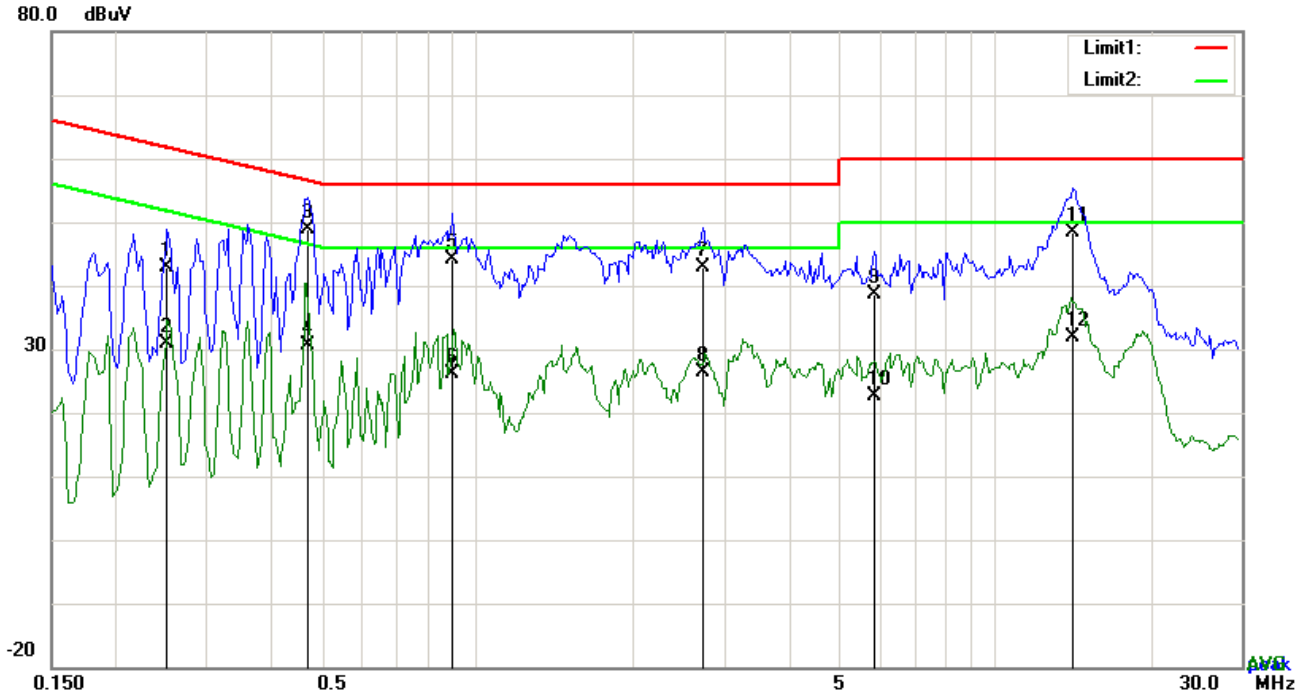
Test Plot ☑ Yes (See below) ☐ N/A

Test Model 1:	RF4CE(Ant.0)

Test Model 2:	RF4CE(Ant.1)

Note: we have tested all the modes, but we only show the worst case(RF4CE(Ant.1)

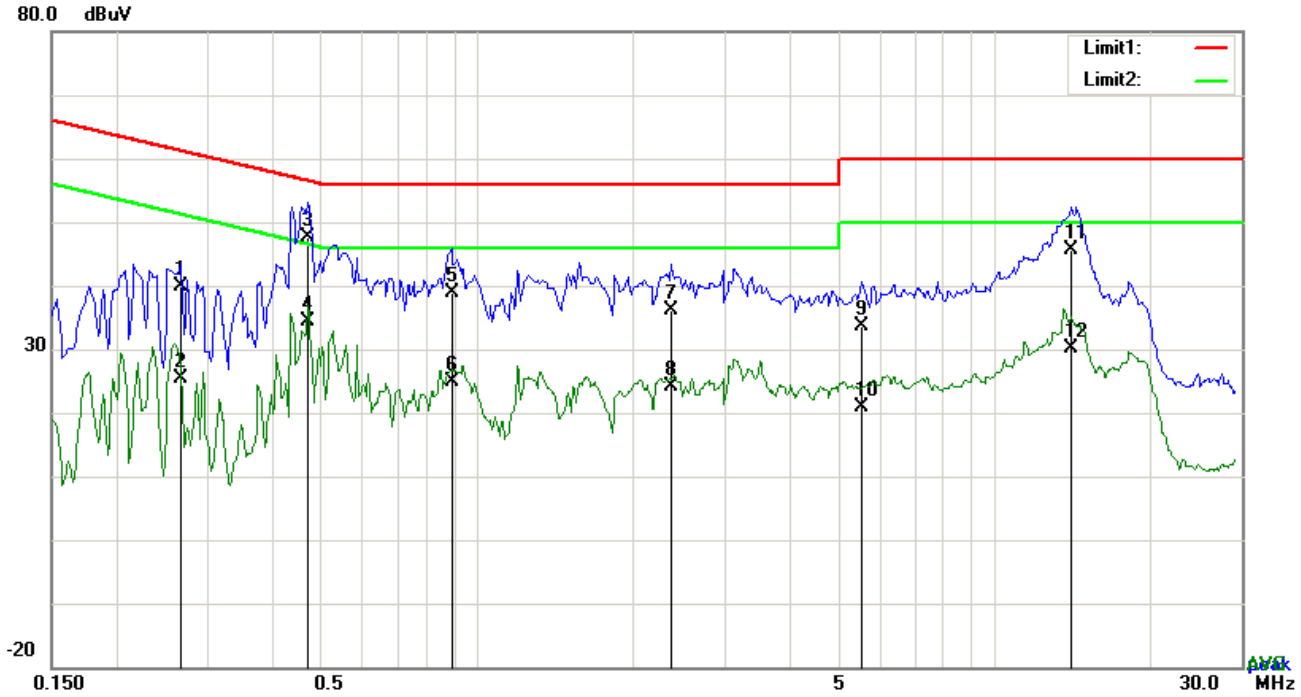
Test Model 2:	RF4CE(Ant.1)



Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L	0.2514	32.81	QP	10.03	42.84	61.71	-18.87
2	L	0.2514	20.75	AVG	10.03	30.78	51.71	-20.93
3	L	0.4698	38.73	QP	10.03	48.76	56.52	-7.76
4	L	0.4698	20.67	AVG	10.03	30.70	46.52	-15.82
5	L	0.8949	34.05	QP	10.03	44.08	56.00	-11.92
6	L	0.8949	16.18	AVG	10.03	26.21	46.00	-19.79
7	L	2.7240	32.88	QP	10.05	42.93	56.00	-13.07
8	L	2.7240	16.30	AVG	10.05	26.35	46.00	-19.65
9	L	5.8509	28.42	QP	10.09	38.51	60.00	-21.49
10	L	5.8509	12.58	AVG	10.09	22.67	50.00	-27.33
11	L	14.2047	38.23	QP	10.21	48.44	60.00	-11.56
12	L	14.2047	21.77	AVG	10.21	31.98	50.00	-18.02

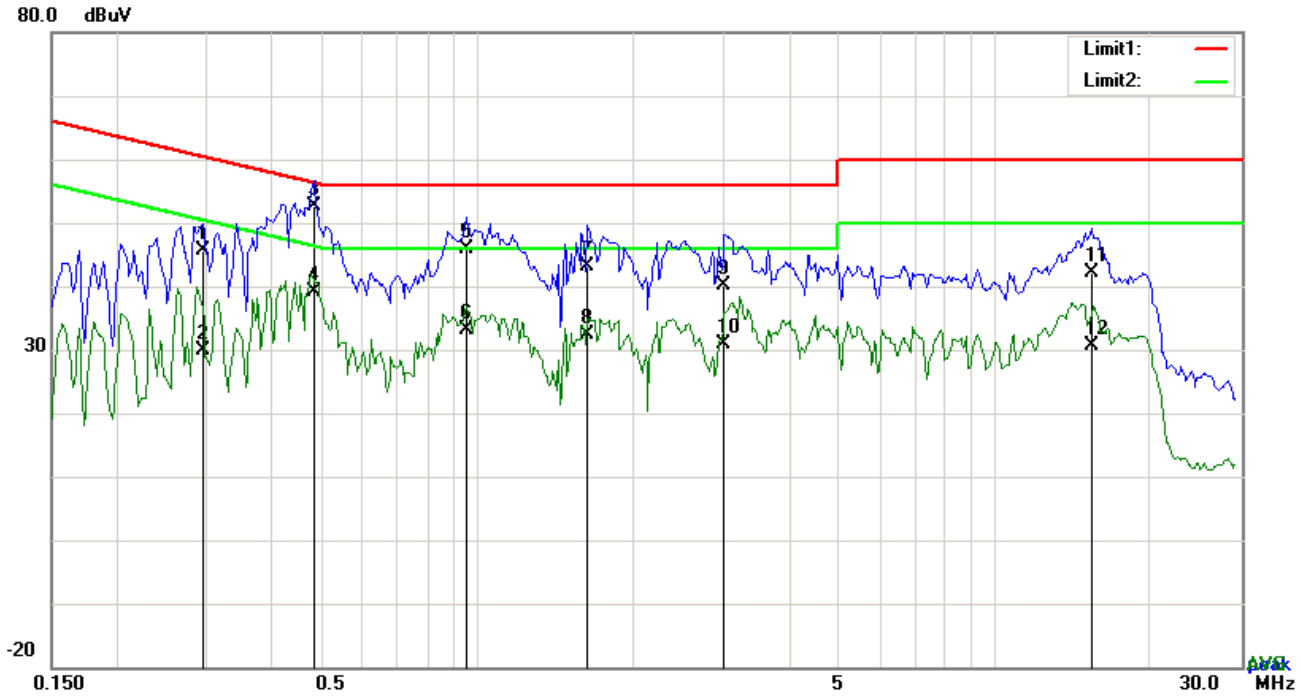


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.2670	29.74	QP	10.02	39.76	61.21	-21.45
2	N	0.2670	15.39	AVG	10.02	25.41	51.21	-25.80
3	N	0.4698	37.62	QP	10.02	47.64	56.52	-8.88
4	N	0.4698	24.46	AVG	10.02	34.48	46.52	-12.04
5	N	0.8910	28.96	QP	10.03	38.99	56.00	-17.01
6	N	0.8910	14.82	AVG	10.03	24.85	46.00	-21.15
7	N	2.3652	26.14	QP	10.04	36.18	56.00	-19.82
8	N	2.3652	14.09	AVG	10.04	24.13	46.00	-21.87
9	N	5.5311	23.64	QP	10.08	33.72	60.00	-26.28
10	N	5.5311	10.90	AVG	10.08	20.98	50.00	-29.02
11	N	14.0487	35.40	QP	10.19	45.59	60.00	-14.41
12	N	14.0487	19.82	AVG	10.19	30.01	50.00	-19.99

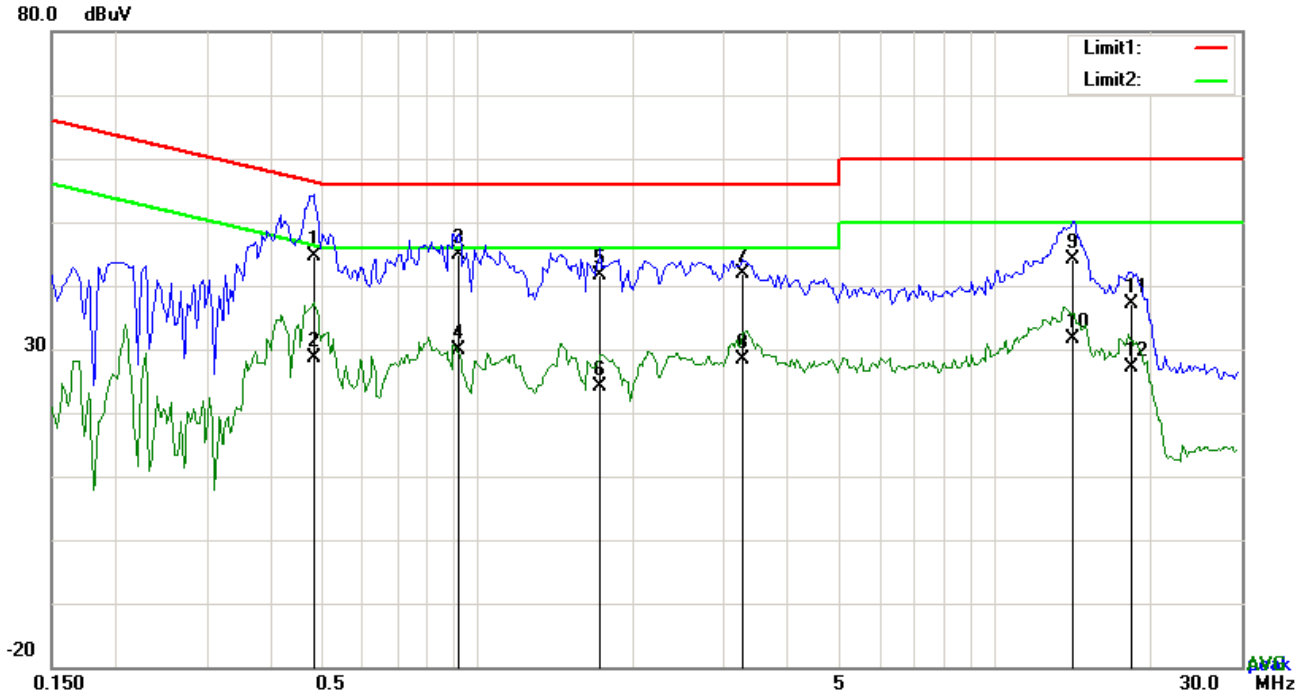
Test Model 2:	RF4CE(Ant.1)



Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	L	0.2943	35.55	QP	10.03	45.58	60.40	-14.82
2	L	0.2943	19.96	AVG	10.03	29.99	50.40	-20.41
3	L	0.4815	42.70	QP	10.03	52.73	56.31	-3.58
4	L	0.4815	29.03	AVG	10.03	39.06	46.31	-7.25
5	L	0.9495	35.89	QP	10.03	45.92	56.00	-10.08
6	L	0.9495	22.99	AVG	10.03	33.02	46.00	-12.98
7	L	1.6281	33.21	QP	10.04	43.25	56.00	-12.75
8	L	1.6281	22.27	AVG	10.04	32.31	46.00	-13.69
9	L	3.0078	30.16	QP	10.06	40.22	56.00	-15.78
10	L	3.0078	20.89	AVG	10.06	30.95	46.00	-15.05
11	L	15.4683	31.93	QP	10.23	42.16	60.00	-17.84
12	L	15.4683	20.52	AVG	10.23	30.75	50.00	-19.25



Test Data

Phase Neutral Plot at 240Vac, 60Hz

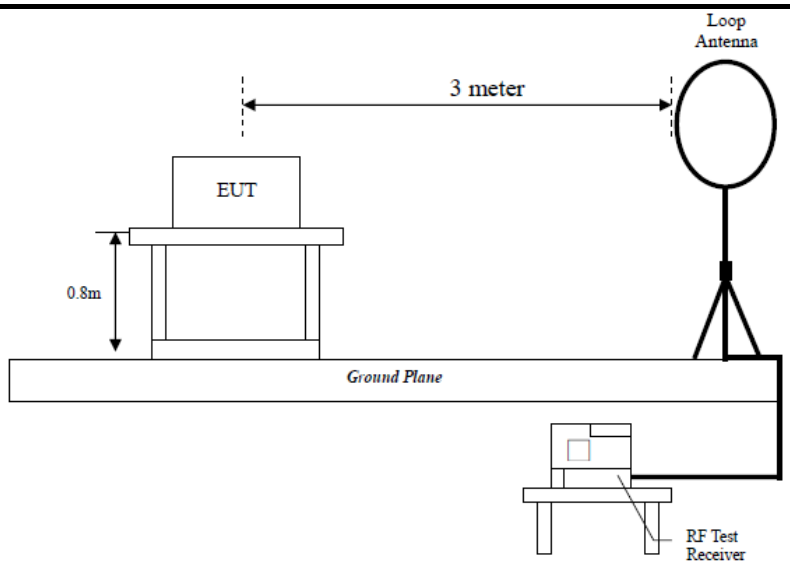
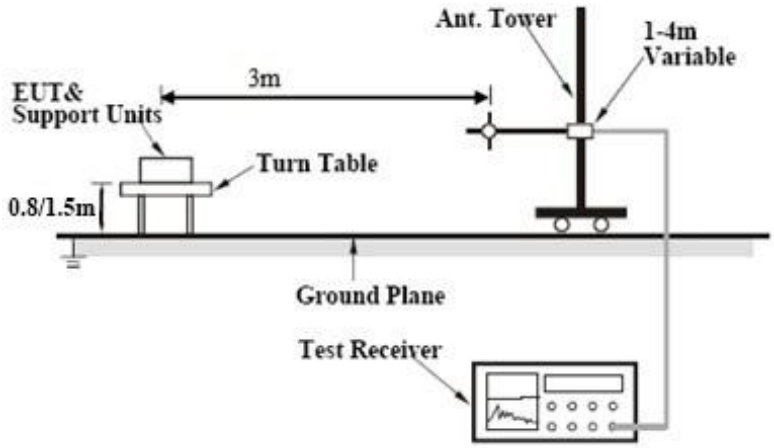
No.	P/L	Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	N	0.4815	34.54	QP	10.02	44.56	56.31	-11.75
2	N	0.4815	18.68	AVG	10.02	28.70	46.31	-17.61
3	N	0.9222	34.91	QP	10.03	44.94	56.00	-11.06
4	N	0.9222	19.79	AVG	10.03	29.82	46.00	-16.18
5	N	1.7334	31.51	QP	10.04	41.55	56.00	-14.45
6	N	1.7334	13.97	AVG	10.04	24.01	46.00	-21.99
7	N	3.2574	31.74	QP	10.05	41.79	56.00	-14.21
8	N	3.2574	18.35	AVG	10.05	28.40	46.00	-17.60
9	N	14.2086	33.91	QP	10.19	44.10	60.00	-15.90
10	N	14.2086	21.50	AVG	10.19	31.69	50.00	-18.31
11	N	18.3699	26.81	QP	10.24	37.05	60.00	-22.95
12	N	18.3699	16.84	AVG	10.24	27.08	50.00	-22.92

6.7 Radiated Emissions & Restricted Band

Temperature	25℃
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	January 12, 2018
Tested By :	Aarron Liang

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td rowspan="3">47CFR§15.247(d), RSS210 (A8.5)</td><td>a)</td><td>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (μV/m)</th></tr>
<tr><td>0.009~0.490</td><td>2400/F(KHz)</td></tr>
<tr><td>0.490~1.705</td><td>24000/F(KHz)</td></tr>
<tr><td>1.705~30.0</td><td>30</td></tr>
<tr><td>30 – 88</td><td>100</td></tr>
<tr><td>88 – 216</td><td>150</td></tr>
<tr><td>216 960</td><td>200</td></tr>
<tr><td>Above 960</td><td>500</td></tr>
</table></td><td>☑</td></tr>
<tr><td>b)</td><td>For non-restricted band, 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 or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required
☒ 20 dB down ☐ 30 dB down</td><td>☑</td></tr>
<tr><td>c)</td><td>or restricted band, emission must also comply with the radiated emission limits specified in 15.209</td><td>☑</td></tr>
</table>

Test Setup	 
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.

	The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz. 5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Model 1:	RF4CE(Ant.0)

Test Model 2:	RF4CE(Ant.1)

Note: we have tested all the modes, but we only show the worst case(RF4CE(Ant.1)

Test Result:

Test Mode:	Transmitting Mode

Frequency range: 9KHz - 30MHz

Freq. (MHz)	Detection value	Factor (dB/m)	Reading (dBuV/m)	Result (dBuV/m)	Limit@3m (dBuV/m)	Margin (dB)
--	--	--	--	--	--	>20
--	--	--	--	--	--	>20

Note:

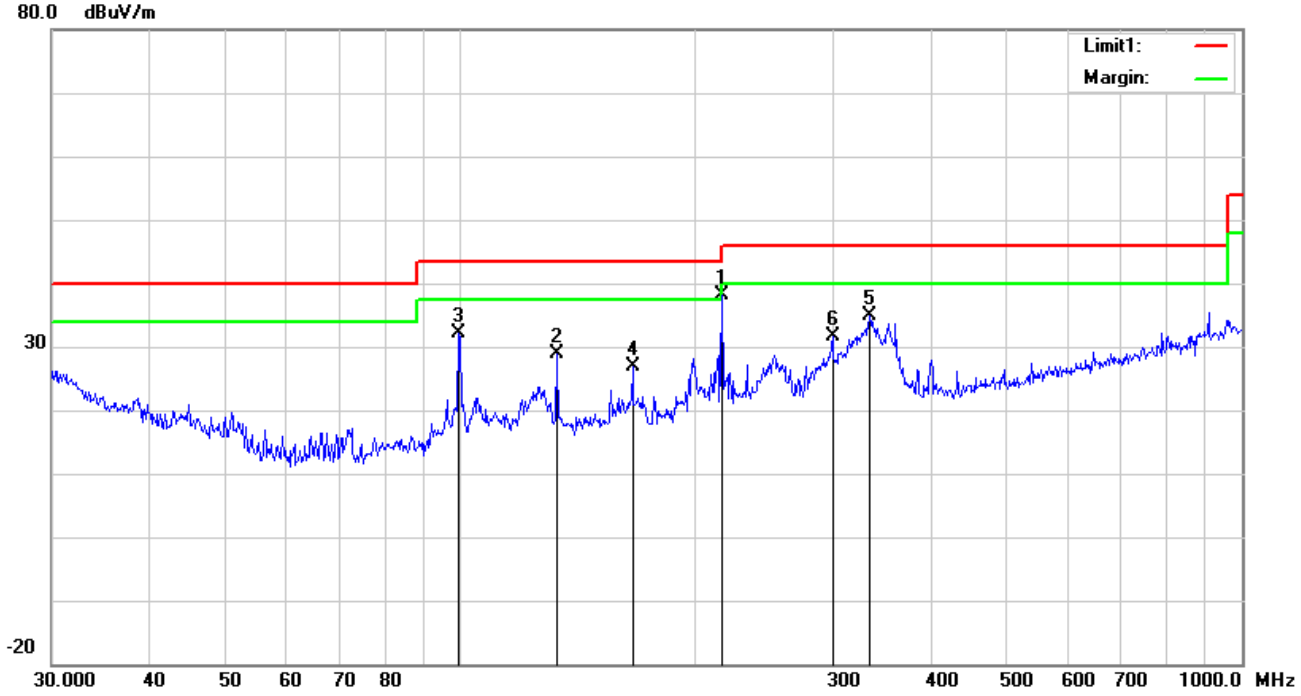
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

Test Model 2:	RF4CE(Ant.1)

(Below 1GHz)

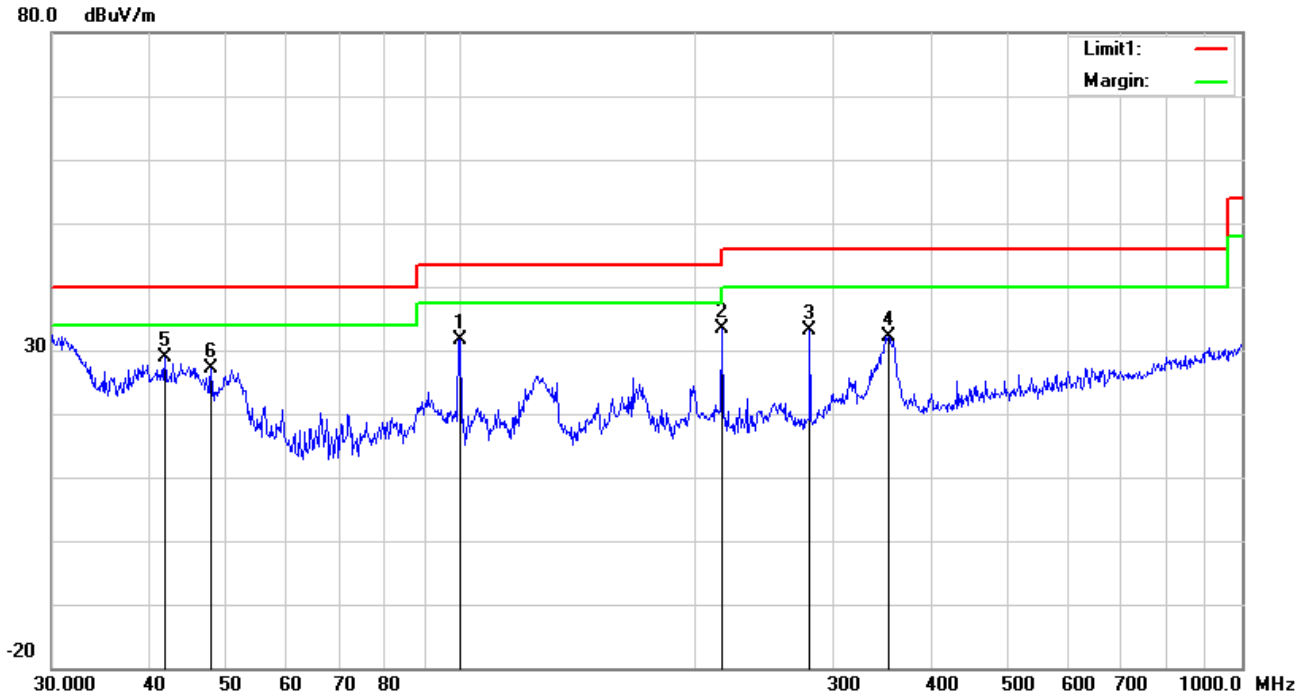


Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )
1	H	216.0240	46.90	peak	11.88	22.35	1.59	38.02	46.00	-7.98	100	188
2	H	132.6850	36.93	peak	13.08	22.39	1.22	28.84	43.50	-14.66	100	47
3	H	99.5281	43.01	peak	10.29	22.32	1.11	32.09	43.50	-11.41	200	124
4	H	166.0680	35.63	peak	12.11	22.26	1.37	26.85	43.50	-16.65	100	124
5	H	333.6867	40.93	peak	14.31	22.20	1.96	35.00	46.00	-11.00	100	342
6	H	299.3158	38.48	peak	13.57	22.29	1.79	31.55	46.00	-14.45	100	290

(Below 1GHz)



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	V	99.8777	42.57	peak	10.37	22.32	1.12	31.74	43.50	-11.76	100	212
2	V	216.0240	42.38	peak	11.88	22.35	1.59	33.50	46.00	-12.50	100	360
3	V	280.0238	41.05	peak	12.72	22.29	1.75	33.23	46.00	-12.77	100	101
4	V	352.9434	37.64	peak	14.71	22.14	2.04	32.25	46.00	-13.75	100	133
5	V	41.8596	37.73	peak	12.67	22.28	0.78	28.90	40.00	-11.10	100	348
6	V	47.9940	39.46	peak	9.28	22.34	0.78	27.18	40.00	-12.82	200	179

Above 1GHz

Test Mode:	Transmitting Mode

Low Channel (2405 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4810	48.76	AV	V	33.25	8.01	47.58	42.44	54	-11.56
4810	46.52	AV	H	33.25	8.01	47.58	40.2	54	-13.8
4810	60.86	PK	V	33.25	8.01	47.58	54.54	74	-19.46
4810	58.49	PK	H	33.25	8.01	47.58	52.17	74	-21.83
2988.4	54.33	AV	V	29.47	5.69	47.47	42.02	54	-11.98
2988.4	52.73	AV	H	29.47	5.69	47.47	40.42	54	-13.58
2988.4	70.09	PK	V	29.47	5.69	47.47	57.78	74	-16.22
2988.4	69.67	PK	H	29.47	5.69	47.47	57.36	74	-16.64

Middle Channel (2445 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4880	49.95	AV	V	34.02	6.66	47.64	42.99	54	-11.01
4880	45.59	AV	H	34.02	6.66	47.64	38.63	54	-15.37
4880	60.9	PK	V	34.02	6.66	47.64	53.94	74	-20.06
4880	58.16	PK	H	34.02	6.66	47.64	51.2	74	-22.8
3620	53.2	AV	V	30.73	6.36	48.11	42.18	54	-11.82
3620	51.58	AV	H	30.73	6.36	48.11	40.56	54	-13.44
3620	66.56	PK	V	30.73	6.36	48.11	55.54	74	-18.46
3620	68.26	PK	H	30.73	6.36	48.11	57.24	74	-16.76

High Channel (2480 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	49.56	AV	V	33.41	8.11	47.95	43.13	54	-10.87
4960	46.82	AV	H	33.41	8.11	47.95	40.39	54	-13.61
4960	61.18	PK	V	33.41	8.11	47.95	54.75	74	-19.25
4960	57.57	PK	H	33.41	8.11	47.95	51.14	74	-22.86
15012	28.77	AV	V	42.92	15.32	46.65	40.36	54	-13.64
15012	29.51	AV	H	42.92	15.32	46.65	41.1	54	-12.9
15012	43.95	PK	V	42.92	15.32	46.65	55.54	74	-18.46
15012	46.49	PK	H	42.92	15.32	46.65	58.08	74	-15.92

Note:

*1, The testing has been conformed to 10*2480MHz=24,800MHz*
2, All other emissions more than 30 dB below the limit
3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.
4, The radiated spurious test above 18GHz is subcontracted to SIEMIC (Nanjing-China) Laboratories. and found 30dB below the limit at least.

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/15/2017	09/14/2018	☑
Line Impedance	LI-125A	191106	09/23/2017	09/22/2018	☑
Line Impedance	LI-125A	191107	09/23/2017	09/22/2018	☑
ISN	ISN T800	34373	09/23/2017	09/22/2018	☐
Transient Limiter	LIT-153	531118	08/30/2017	08/29/2018	☐
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/15/2017	09/14/2018	☑
Power Splitter	1#	1#	08/30/2017	08/29/2018	☑
DC Power Supply	E3640A	MY40004013	09/15/2017	09/14/2018	☑
Radiated Emissions					
EMI test receiver	ESL6	100262	09/15/2017	09/14/2018	☑
Positioning Controller	UC3000	MF780208282	11/17/2017	11/16/2018	☑
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/30/2017	08/29/2018	☑
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/23/2017	03/22/2018	☑
Horn Antenna	BBHA9170	3145226D1	09/27/2017	09/26/2018	☑
Active Antenna (9kHz-30MHz)	AL-130	121031	10/12/2017	10/11/2018	☑
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/19/2017	09/18/2018	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	☑
Universal Radio Communication Tester	CMU200	121393	09/23/2017	09/22/2018	☑

Annex B. EUT And Test Setup Photographs

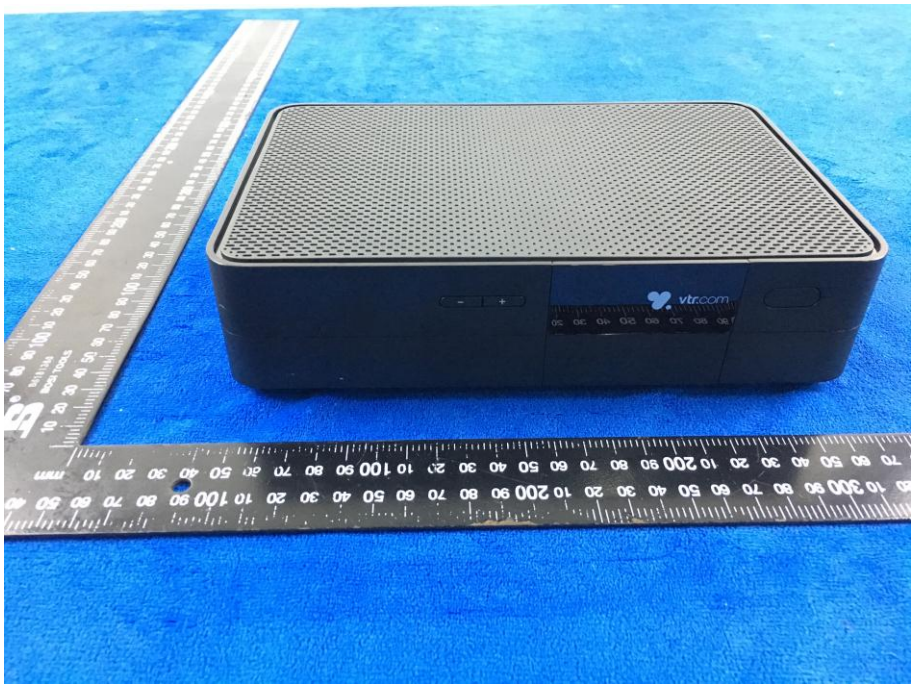
Annex B.i. Photograph EUT External Photo

Adapter - Front View

EUT - Front View

EUT - Rear View

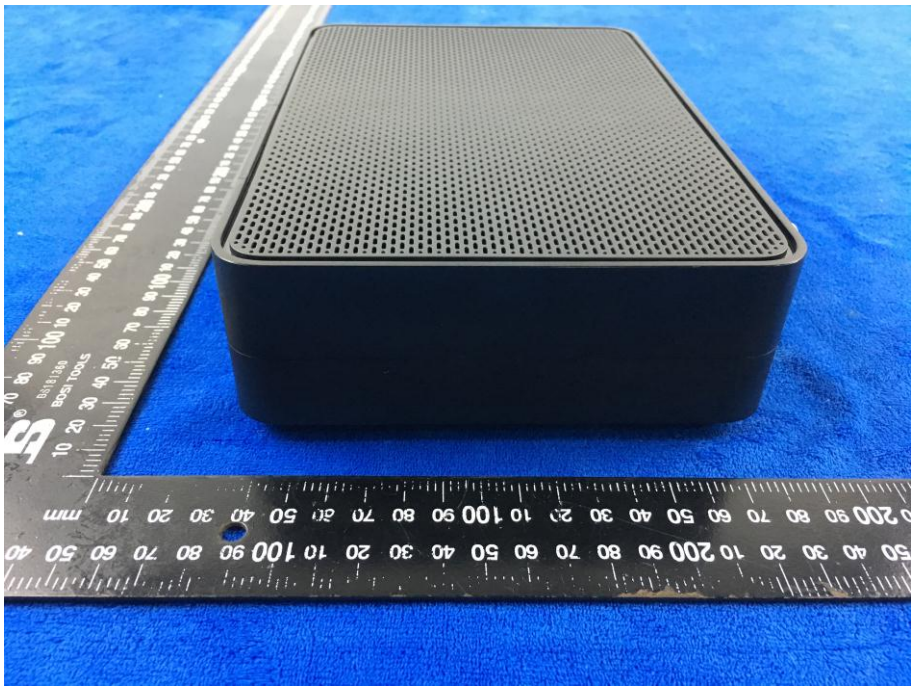
EUT - Top View



EUT - Bottom View

EUT - Left View

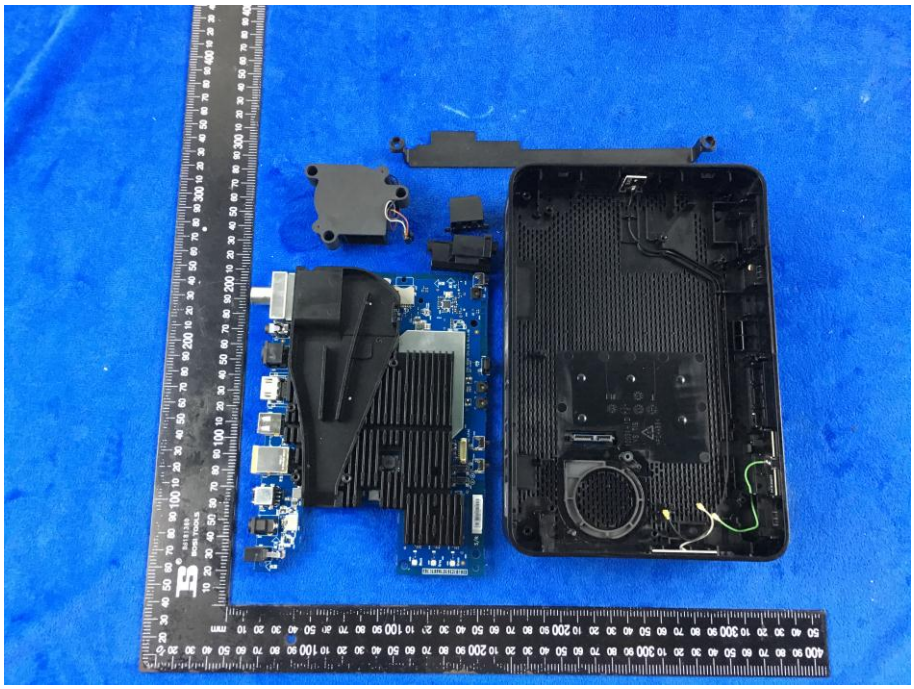
EUT - Right View



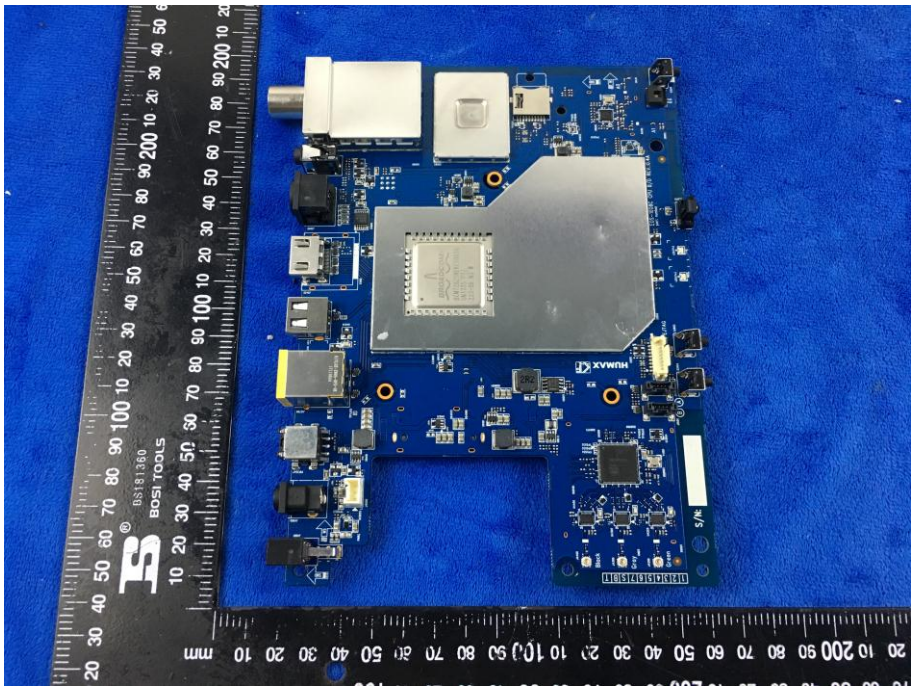
Annex B.ii. Photograph: EUT Internal Photo

Cover Off - Top View 1

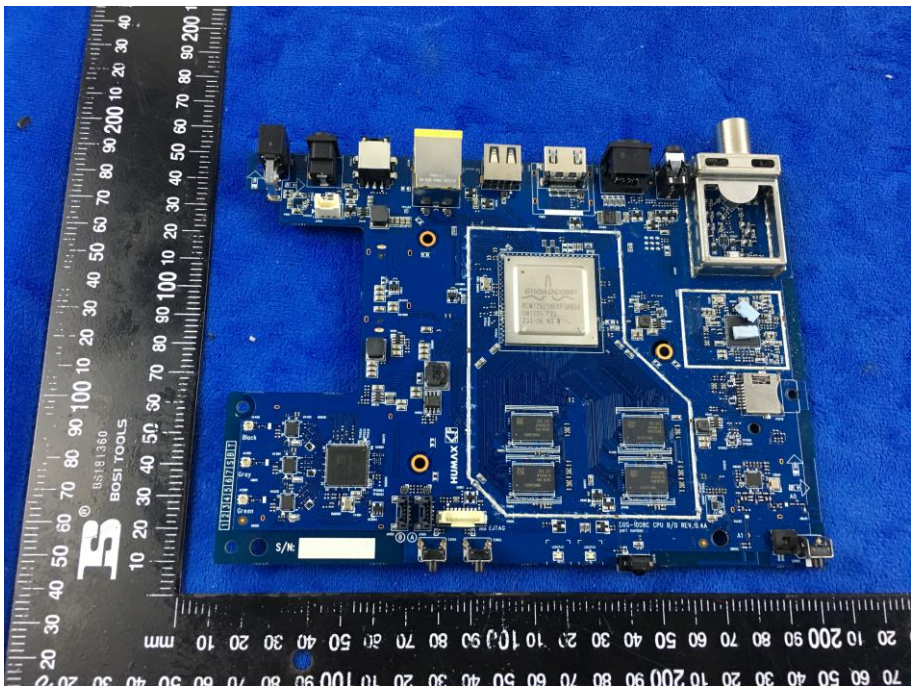
Cover Off - Top View 2



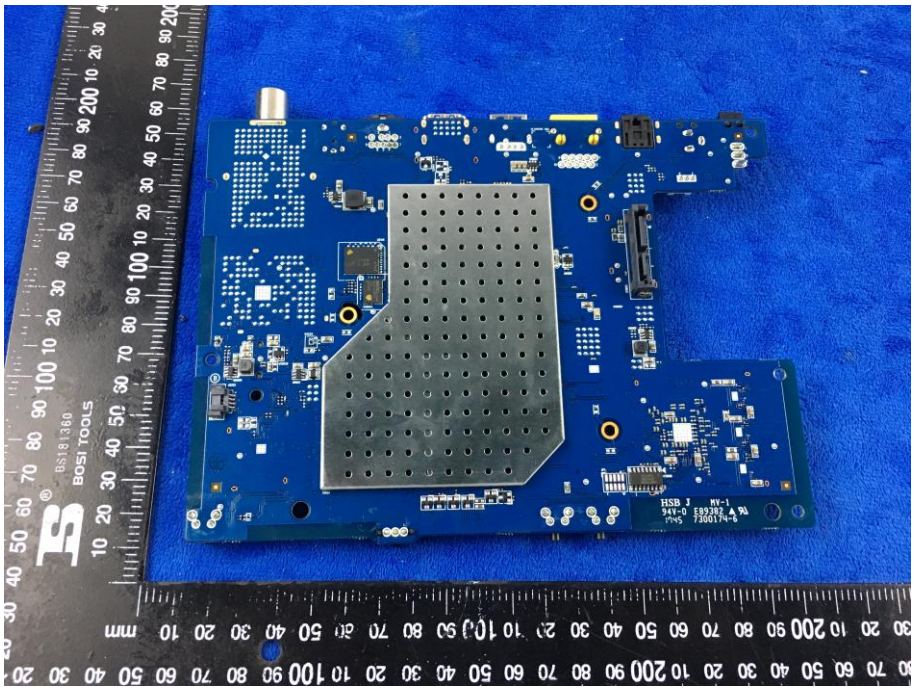
Mainboard with Shielding - Top View



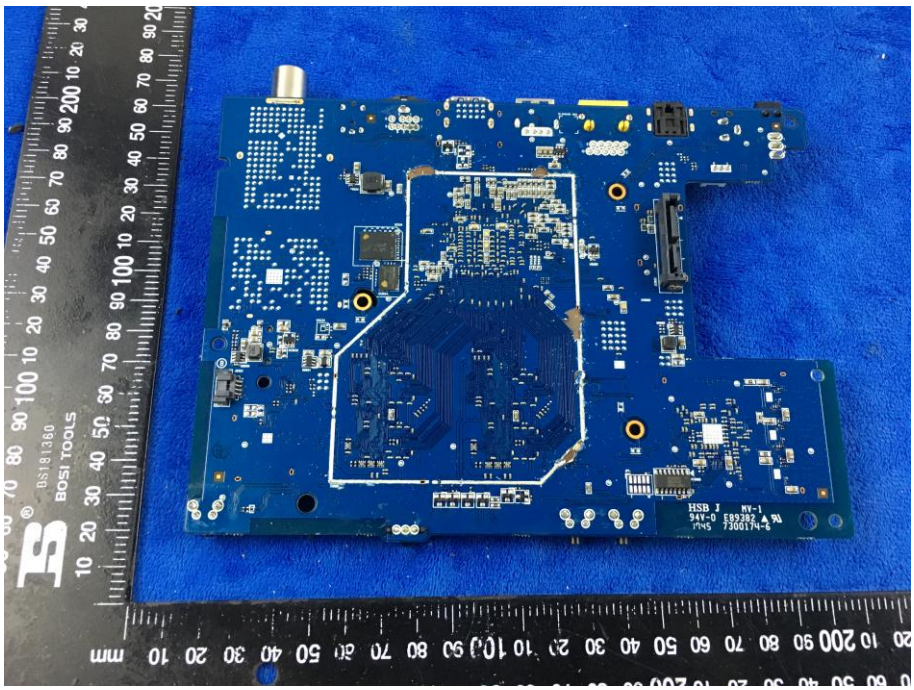
Mainboard without Shielding - Top View



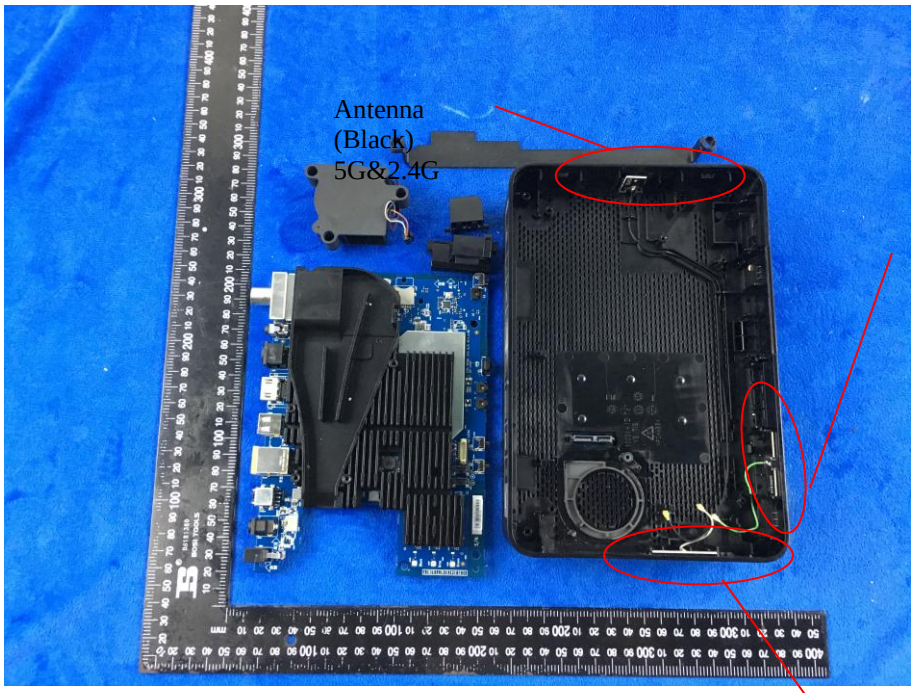
Mainboard with Shielding - Bottom View



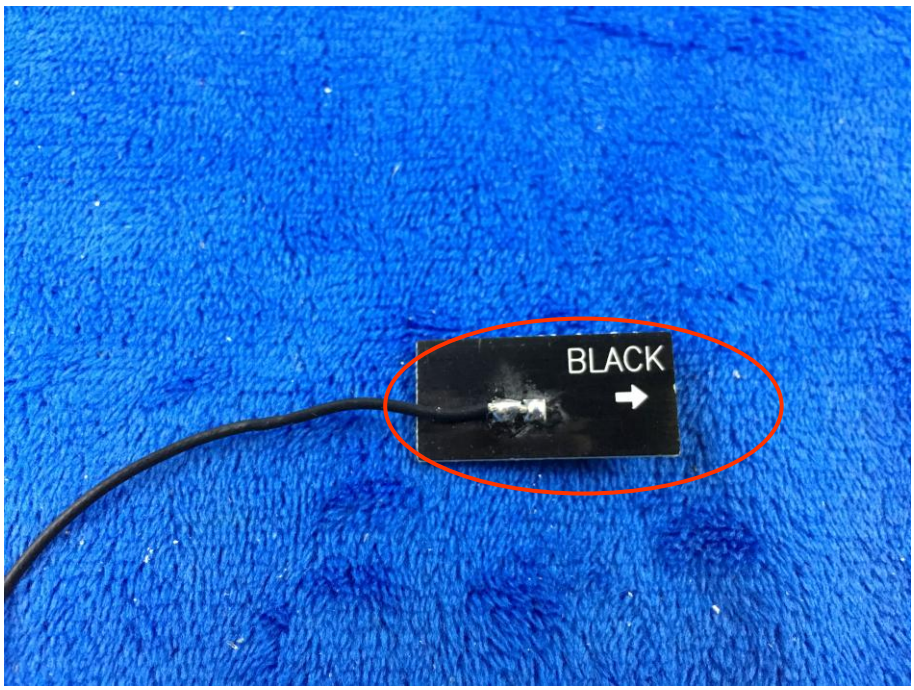
Mainboard without Shielding - Bottom View



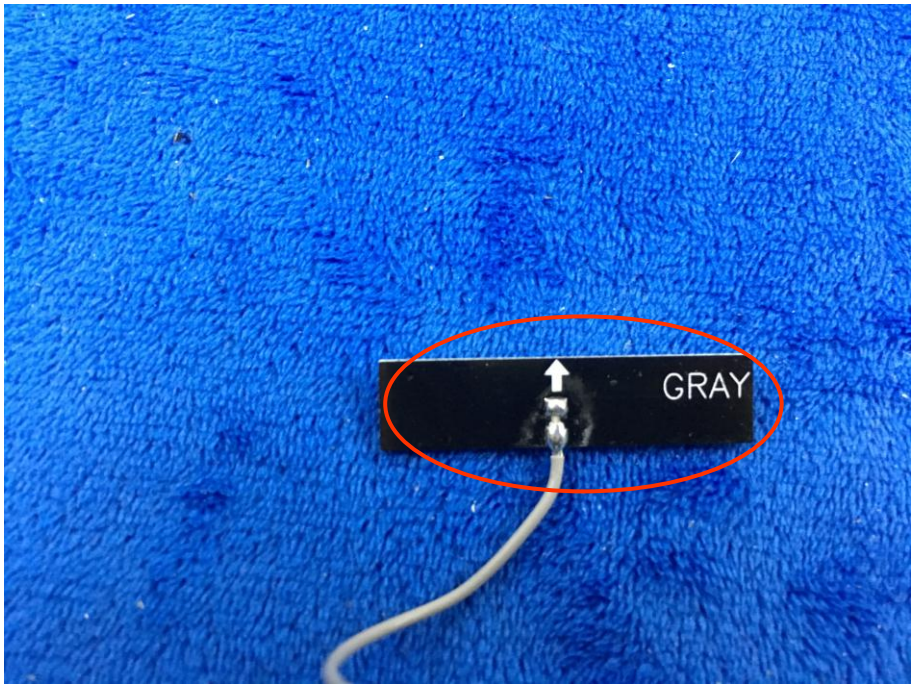
2.4G&5G Antenna View



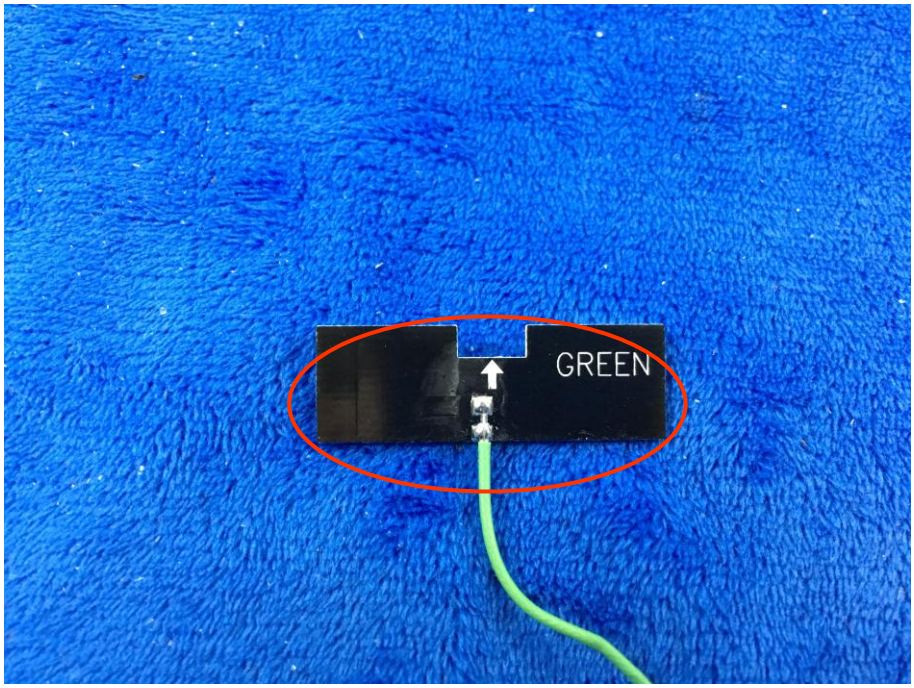
Ant. (black)



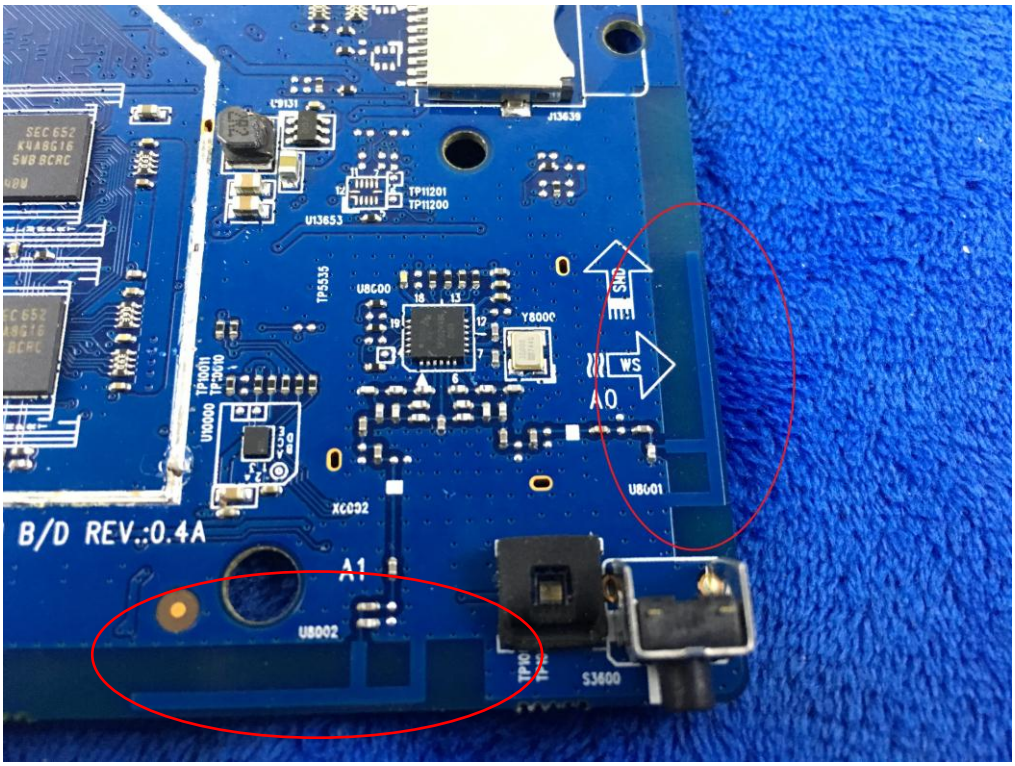
Ant. (gray)



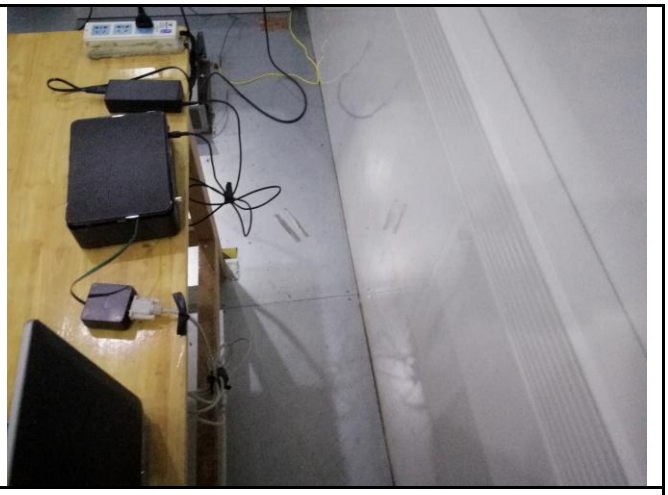
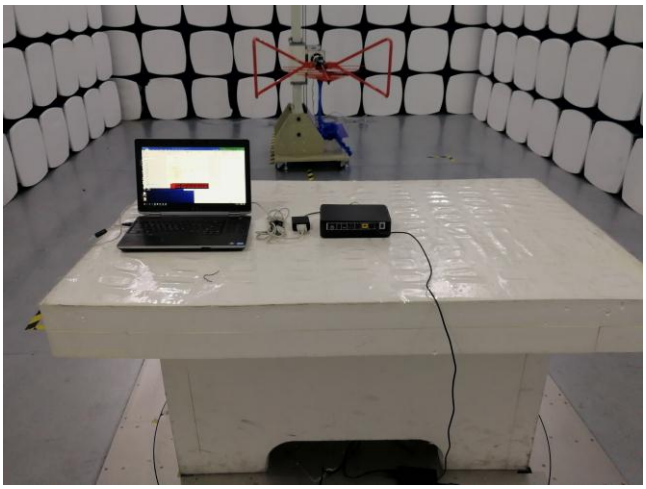
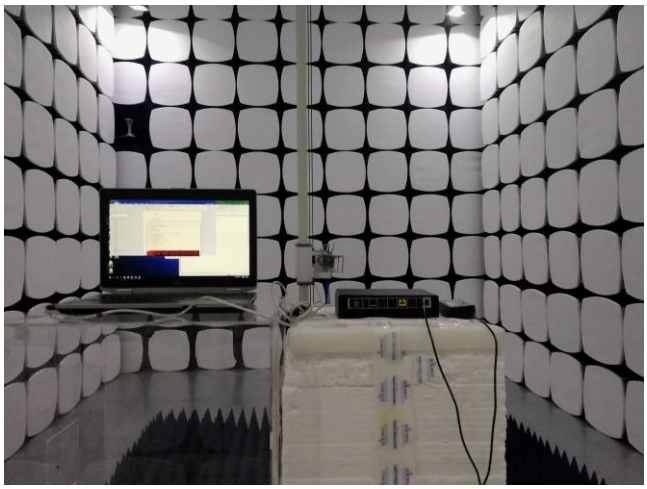
Ant. (green)



Zigbee (RF4CE)



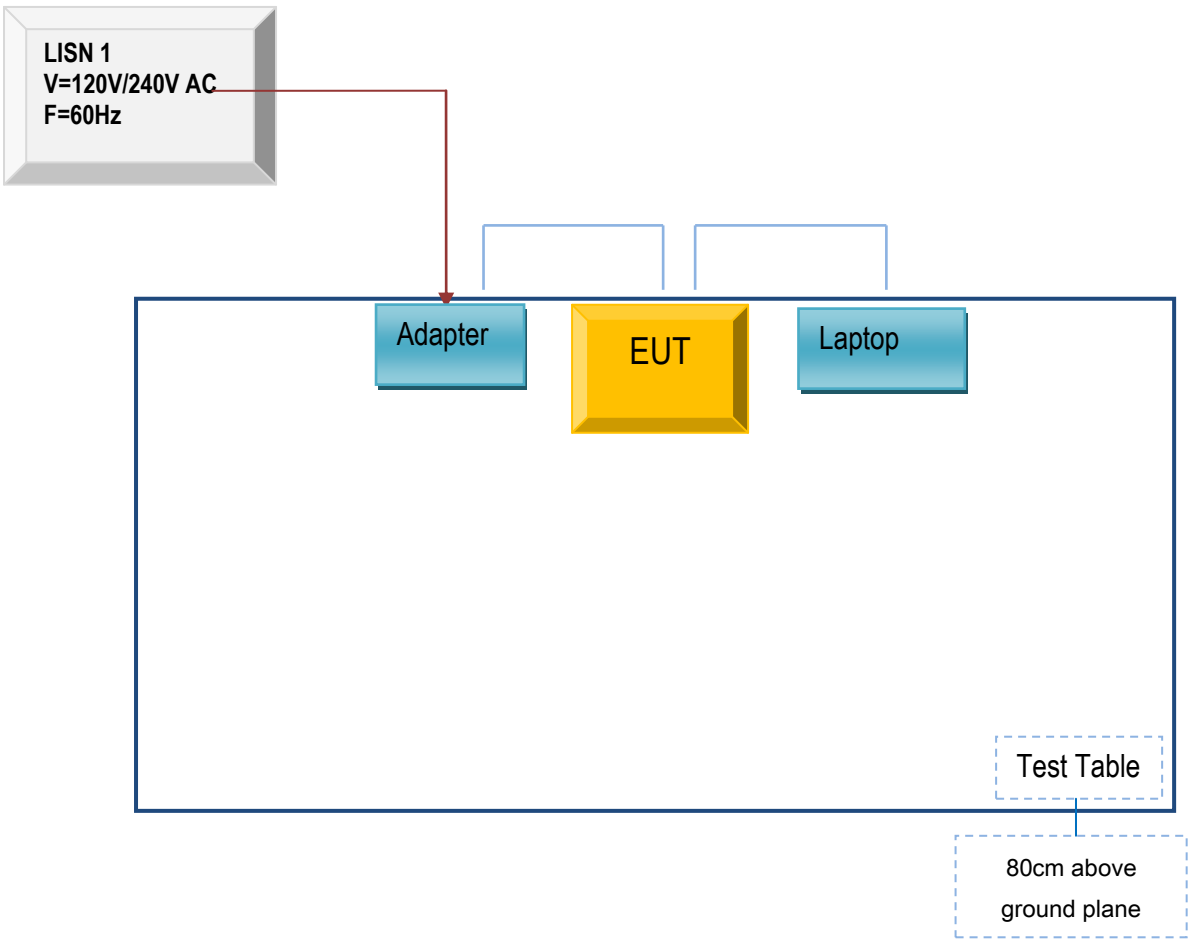
Annex B.iii. Photograph: Test Setup Photo

	
Conducted Emissions Test Setup Front View	Conducted Emissions Test Setup Side View
	
Radiated Spurious Emissions Test Setup Below 1GHz	Radiated Spurious Emissions Test Setup Above 1GHz

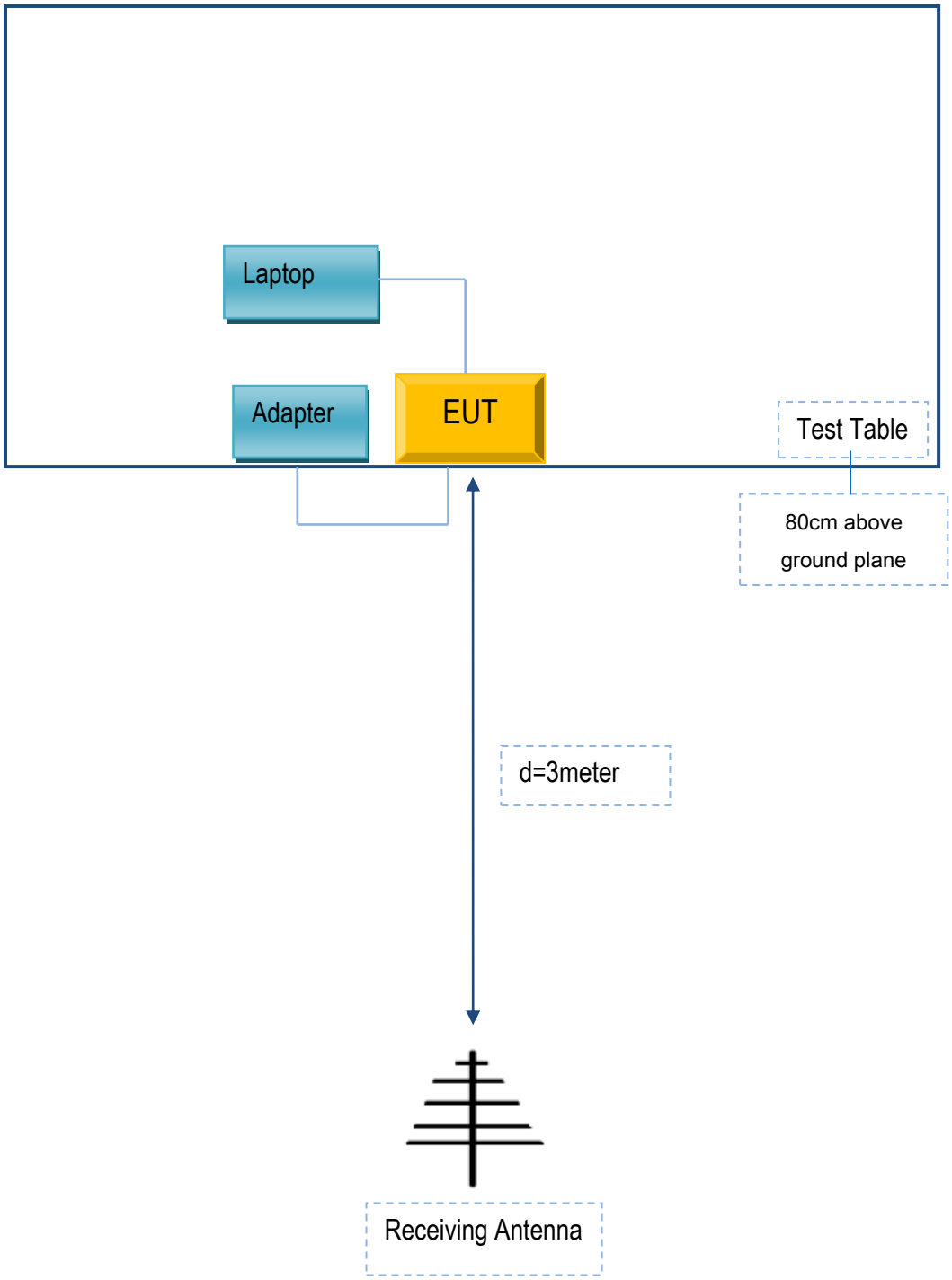
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

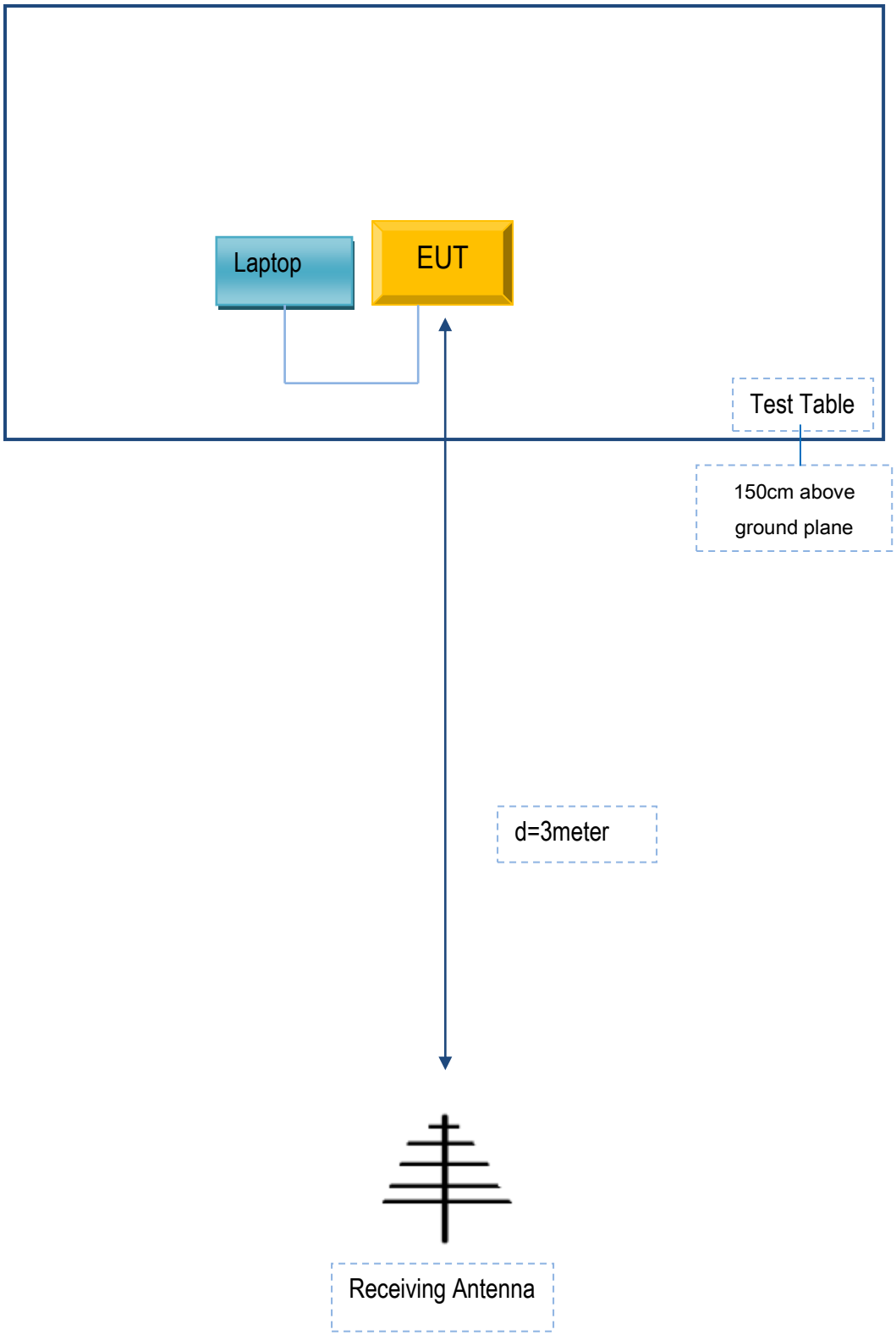
Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions （Below 1GHz）.



Block Configuration Diagram for Radiated Emissions （Above 1GHz）.



Annex C. il. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
DELTA ELECTRONICS, INC.	Adapter	ADP-30LR A	N/A
DELL	Laptop	E6530	N/A

Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

Annex E. DECLARATION OF SIMILARITY

Humax Co., Ltd.

To: SIEMIC ,775 Montague Expressway, Milpitas, CA 95035,USA

Declaration Letter

Dear Sir,

For our business issue and marketing requirement, we would like to list 2 model numbers on the **FCC&CE** certificates and reports, as following:

Model No.: 1008R-HDD-XXX(XXX=A~Z) , 1008C-STB-XXX(XXX=A~Z)

FCC ID: O6ZEOS-1008C

We declare that, all the model PCB, Antenna and Appearance shape, accessories are the same. The difference of these is listed as below:

Main Model No	Serial Model No	Difference
1008R-HDD-XXX(XXX=A~Z)	1008C-STB-XXX(XXX=A~Z)	1008R-HDD-XXX(XXX=A~Z) has internal 3.5 " HDD, 1008C-STB-XXX(XXX=A~Z) without HDD.

Printed name/ title: Inseok Seo / Senior Engineer

Address: HUMAX BLDG., 2, Yeongmun-ro, Cheoin-gu Yongin-si, Gyeonggi-do South Korea 17040