

RF TEST REPORT



Report No.: 18070891-FCC-R

Supersede Report No.: N/A

Applicant	Horizon Hobby, LLC	
Product Name	Receiver	
Main Model	EFLR310013	
Serial Model	N/A	
Test Standard	FCC Part 15.249; ANSI C63.10: 2013	
Test Date	August 10 to September 11, 2018	
Issue Date	October 12, 2018	
Test Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Equipment complied with the specification	<input checked="" type="checkbox"/>	
Equipment did not comply with the specification	<input type="checkbox"/>	
		
Aaron Liang Test Engineer	David Huang Checked By	
This test report may be reproduced in full only 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

South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108

Phone: +86 0755 2601 4629801 Email: China@siemic.com.cn

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

Test Report No.	18070891-FCC-R
Page	3 of 34

This page has been left blank intentionally.

CONTENTS

1. REPORT REVISION HISTORY.....	5
2. CUSTOMER INFORMATION	5
3. TEST SITE INFORMATION.....	5
4. EQUIPMENT UNDER TEST (EUT) INFORMATION	7
5. TEST SUMMARY	8
6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS	9
6.1 ANTENNA REQUIREMENT	9
6.2 AC LINE CONDUCTED EMISSIONS.....	10
6.3 RADIATED SPURIOUS EMISSIONS.....	12
6.4 FIELD STRENGTH MEASUREMENT	20
6.5 20DB BANDWIDTH TESTING	22
6.6 BAND EDGE.....	26
ANNEX A. TEST INSTRUMENT.....	30
ANNEX B. TEST SETUP AND SUPPORTING EQUIPMENT.....	31
ANNEX C. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST/ DECLARATION OF SIMILARITY.....	34

1. Report Revision History

Report No.	Report Version	Description	Issue Date
18070891-FCC-R	NONE	Original	September 17, 2018
18070891-FCC-R	V1	Updated the test data from “ August 10 to September 16, 2018” to “ August 10 to September 11, 2018”	October 12, 2018

2. Customer information

Applicant Name	Horizon Hobby, LLC
Applicant Add	4105 Fieldstone Road, Champaign IL, USA 61822
Manufacturer	Horizon Hobby, LLC
Manufacturer Add	4105 Fieldstone Road, Champaign IL, USA 61822

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	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch Laboratories
Lab Address	No. 34, Chenwulu Section, Guantai Rd., Houjie Town, Dongguan City, Guangdong 523942, China
FCC Test Site No.	749762



Test Report No.	18070891-FCC-R
Page	6 of 34

IC Test Site No.	5936A-1
Test Software	ADT_Radiated_V7.6.15.9.2

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

4. Equipment under Test (EUT) Information

Description of EUT:	Receiver
Main Model:	EFLR310013
Serial Model:	N/A
Date EUT received:	August 10, 2018
Test Date(s):	August 10 to September 11, 2018
Antenna Gain:	Antenna 0: 2dBi Antenna 1: 2dBi
Antenna Type:	Internal/external antenna
Power:	63.79dBuV/m
Type of Modulation:	FHSS
RF Operating Frequency (ies):	2404MHz-2476MHz
Number of Channels:	23CH
Input Power:	5V
Port:	Please refer to the user' s manual
Trade Name :	E-flite
FCC ID:	BRWAPRNTCSV1

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
§15.207(a)	AC Line Conducted Emissions	N/A
§15.205, §15.209, §15.249(a), §15.249(d)	Radiated Fundamental / Radiated Spurious Emissions	Compliance
§15.249(a)	Field Strength Measurement	Compliance
§15.249©	20 dB Bandwidth	Compliance
§15.249(d)	Band Edge	Compliance

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	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

Standard Requirement:

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.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction


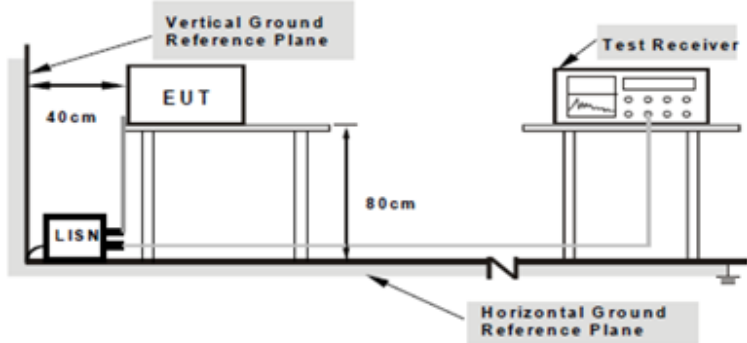
The EUT has 2 antennas:

A permanently attached internal/external antenna for antenna 0/antenna 1, the gain is 2dBi for antenna 0, the gain is 2dBi for antenna 1.

Test Result: Pass

6.2 AC Line Conducted Emissions

Temperature	-----
Relative Humidity	-----
Atmospheric Pressure	-----
Test date :	-----
Tested By :	-----

Spec	Item	Requirement	Applicable														
§15.207	a)	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 border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBµV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <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> </tbody> </table>		Frequency ranges (MHz)	Limit (dBµV)		QP	Average	0.15 ~ 0.5	66 – 56	56 – 46	0.5 ~ 5	56	46	5 ~ 30	60	50
		Frequency ranges (MHz)			Limit (dBµV)												
				QP	Average												
0.15 ~ 0.5	66 – 56	56 – 46															
0.5 ~ 5	56	46															
5 ~ 30	60	50															
Test Setup	 <p style="text-align: center;"> 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. </p>																
Procedure	<ol style="list-style-type: none"> 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. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. 																

Test Report No.	18070891-FCC-R
Page	11 of 34

	<p>4. All other supporting equipment were powered separately from another main supply.</p> <p>5. The EUT was switched on and allowed to warm up to its normal operating condition.</p> <p>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.</p> <p>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.</p> <p>8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).</p>
Remark	The EUT is powered by battery.
Result	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A

Test Data Yes N/A

Test Plot Yes (See below) N/A

6.3 Radiated Spurious Emissions

Temperature	25°C
Relative Humidity	58%
Atmospheric Pressure	1016mbar
Test date :	August 16, 2018
Tested By :	Aaron Liang

Requirement(s):

Spec	Requirement	Applicable																															
§15.209, §15.205, §15.249(a) & §15.249(d)	<p>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.</p> <p>The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:</p> <table border="1"> <thead> <tr> <th>Fundamental frequency</th> <th>Field strength of fundamental (millivolts/meter)</th> <th>Field strength of harmonics (microvolts/meter)</th> </tr> </thead> <tbody> <tr> <td>902– 928 MHz</td> <td>50</td> <td>500</td> </tr> <tr> <td>2400– 2483.5 MHz</td> <td>50</td> <td>500</td> </tr> <tr> <td>5725– 5875 MHz</td> <td>50</td> <td>500</td> </tr> <tr> <td>24.0– 24.25 GHz</td> <td>250</td> <td>2500</td> </tr> </tbody> </table> <p>(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.</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (µV/m)</th> </tr> </thead> <tbody> <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> </tbody> </table>	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	Frequency range (MHz)	Field Strength (µV/m)	0.009~0.490	2400/F(KHz)	0.490~1.705	24000/F(KHz)	1.705~30.0	30	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	<input checked="" type="checkbox"/>
	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																														
	Frequency range (MHz)	Field Strength (µV/m)																															
	0.009~0.490	2400/F(KHz)																															
	0.490~1.705	24000/F(KHz)																															
	1.705~30.0	30																															
30 – 88	100																																
88 – 216	150																																
216 960	200																																
Above 960	500																																

<p>Test Setup</p>	
<p>Procedure</p>	<ul style="list-style-type: none"> - Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function - For emission frequencies measured below 1GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1GHZ, a pre-scan also be performed with a meter measuring distance before final test. - For emission frequencies measured below and above 1GHz, set the spectrum analyzer on a 100kHz and 1MHz resolution bandwidth respectively for each frequency measured in step 2. - The search antenna is to be raised and lowered over a range from 1 to 4m in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, the change the orientation of EUT on the test table over a range from 0 to 360°. With a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer.

Test Report No.	18070891-FCC-R
Page	14 of 34

	<p>Vary the antenna position again and record the highest value as a final reading.</p> <ul style="list-style-type: none"> - Repeat step 4 until all frequencies need to be measured was complete. - Repeat step5 with search antenna in vertical polarized orientations.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Test Result (worst case):

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:

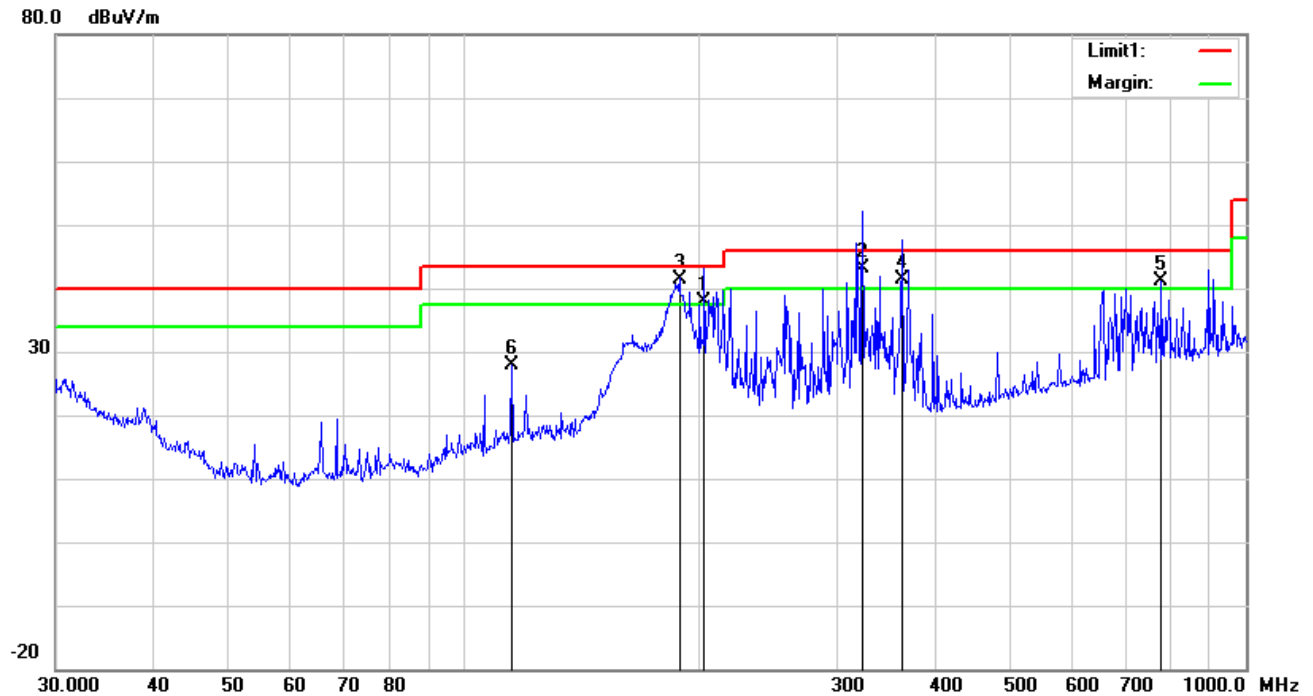
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);

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

Test Mode:	Normal Working Mode(worst case)
-------------------	--

30MHz -1GHz

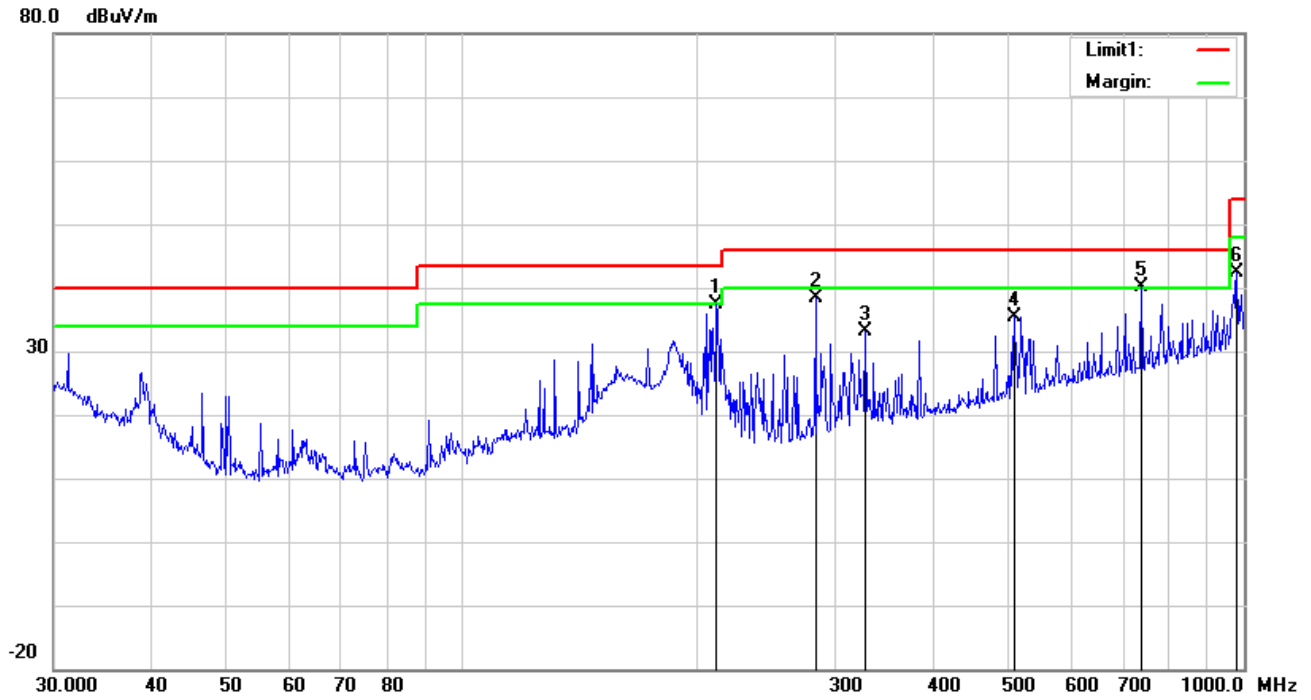


Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	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	202.8104	46.57	12.06	22.37	1.55	37.81	43.50	-5.69	100	213
2	H	323.3204	49.37	14.09	22.22	1.91	43.15	46.00	-2.85	100	205
3	H	188.4125	50.83	11.46	22.30	1.51	41.50	43.50	-2.00	100	336
4	H	362.9845	46.63	14.92	22.11	2.03	41.47	46.00	-4.53	100	235
5	H	779.6068	38.17	21.16	21.19	2.92	41.06	46.00	-4.94	100	29
6	H	114.9169	36.00	13.01	22.35	1.17	27.83	43.50	-15.67	100	185

30MHz -1GHz



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	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	211.5265	46.31	11.94	22.36	1.58	37.47	43.50	-6.03	100	336
2	V	282.9852	46.18	12.85	22.29	1.76	38.50	46.00	-7.50	100	186
3	V	327.8873	39.17	14.19	22.21	1.93	33.08	46.00	-12.92	100	40
4	V	508.2582	37.02	17.82	21.79	2.43	35.48	46.00	-10.52	100	298
5	V	739.6605	37.87	20.68	21.28	2.80	40.07	46.00	-5.93	100	304
6	V	979.1804	36.77	22.90	20.73	3.35	42.29	54.00	-11.71	100	173

Above 1GHz

Test Mode:	Normal Working Mode
-------------------	----------------------------

2404MHz

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4808	46.92	AV	V	33.39	7.22	48.46	39.07	54	-14.93
4808	43.56	AV	H	33.39	7.22	48.46	35.71	54	-18.29
4808	57.46	PK	V	33.39	7.22	48.46	49.61	74	-24.39
4808	66.73	PK	H	33.39	7.22	48.46	58.88	74	-15.12
10437	30.72	AV	V	39.02	12.94	46.78	35.9	54	-18.1
10437	28.87	AV	H	39.02	12.94	46.78	34.05	54	-19.95
10437	46.74	PK	V	39.02	12.94	46.78	51.92	74	-22.08
10437	40.15	PK	H	39.02	12.94	46.78	45.33	74	-28.67

2440 MHz

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4880	44.64	AV	V	33.62	7.53	48.36	37.43	54	-16.57
4880	45.79	AV	H	33.62	7.53	48.36	38.58	54	-15.42
4880	59.15	PK	V	33.62	7.53	48.36	51.94	74	-22.06
4880	63.6	PK	H	33.62	7.53	48.36	56.39	74	-17.61
7109	30.03	AV	V	39.92	13.03	46.57	36.41	54	-17.59
7109	21.45	AV	H	39.92	13.03	46.57	27.83	54	-26.17
7109	39.11	PK	V	39.92	13.03	46.57	45.49	74	-28.51
7109	44.13	PK	H	39.92	13.03	46.57	50.51	74	-23.49

2476 MHz

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4952	44.25	AV	V	33.89	7.86	48.31	37.69	54	-16.31
4952	44.66	AV	H	33.89	7.86	48.31	38.1	54	-15.9
4952	68.58	PK	V	33.89	7.86	48.31	62.02	74	-11.98
4952	67.41	PK	H	33.89	7.86	48.31	60.85	74	-13.15
17924	18.52	AV	V	42.63	18.53	45.29	34.39	54	-19.61
17924	14.96	AV	H	42.63	18.53	45.29	30.83	54	-23.17
17924	35.9	PK	V	42.63	18.53	45.29	51.77	74	-22.23
17924	40.61	PK	H	42.63	18.53	45.29	56.48	74	-17.52

Note:

1, The testing has been conformed to $10 \times 2476 \text{ MHz} = 24,760 \text{ MHz}$

2, All other emissions more than 30 dB below the limit

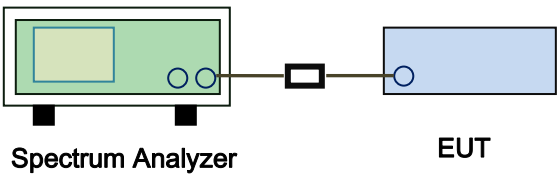
3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

4, The radiated spurious test above 18GHz is subcontracted to Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch Laboratories and found 30dB below the limit at least.

6.4 Field Strength Measurement

Temperature	25°C
Relative Humidity	58%
Atmospheric Pressure	1016mbar
Test date :	August 16, 2018
Tested By :	Aaron Liang

Requirement(s):

Spec	Requirement	Applicable															
§15.249(a)	<table border="1"> <thead> <tr> <th>Fundamental frequency</th> <th>Field strength of fundamental (millivolts/meter)</th> <th>Field strength of harmonics (microvolts/meter)</th> </tr> </thead> <tbody> <tr> <td>902–928 MHz</td> <td>50</td> <td>500</td> </tr> <tr> <td>2400–2483.5 MHz</td> <td>50</td> <td>500</td> </tr> <tr> <td>5725–5875 MHz</td> <td>50</td> <td>500</td> </tr> <tr> <td>24.0–24.25 GHz</td> <td>250</td> <td>2500</td> </tr> </tbody> </table>	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	<input checked="" type="checkbox"/>
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															
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>																
Test Procedure	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.																
Remark																	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail																

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test Mode:	Normal Working Mode
-------------------	----------------------------

Field Strength Measurement

Antenna 0&1:

2404MHz

P/L	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measurement (dBuV/m)	Limit (dB/m)	Over (dB)	Detector
H	2404	80.99	-18.1	62.89	114	-51.11	peak
H	2404	74.45	-18.1	56.35	94	-37.65	AVG
V	2404	81.89	-18.1	63.79	114	-50.21	peak
V	2404	77.21	-18.1	59.11	94	-34.89	AVG

2440MHz

P/L	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measurement (dBuV/m)	Limit (dB/m)	Over (dB)	Detector
H	2440	80.54	-18.05	62.49	114	-51.51	peak
H	2440	73.27	-18.05	55.22	94	-38.78	AVG
V	2440	79.22	-18.05	61.17	114	-52.83	peak
V	2440	72.87	-18.05	54.82	94	-39.18	AVG

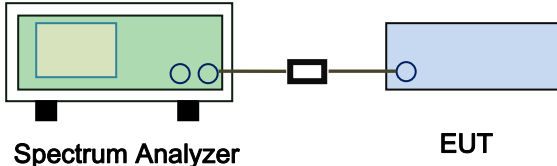
2476MHz

P/L	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measurement (dBuV/m)	Limit (dB/m)	Over (dB)	Detector
H	2476	80.08	-18.03	62.05	114	-51.95	peak
H	2476	74.81	-18.03	56.78	94	-37.22	AVG
V	2476	76.85	-18.03	58.82	114	-55.18	peak
V	2476	72.38	-18.03	54.35	94	-39.65	AVG

6.5 20dB Bandwidth Testing

Temperature	26°C
Relative Humidity	55%
Atmospheric Pressure	1020mbar
Test date :	September 11, 2018
Tested By :	Aaron Liang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.215(c)	a)	Radiated Emissions Measurement Uncertainty All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz (3m & 10m) & 1GHz above (3m) is +5.6/-4.5dB.	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<ul style="list-style-type: none"> - -Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. 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. - Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth. - Repeat above procedures until all frequencies measured were complete. 		

Test Report No.	18070891-FCC-R
Page	23 of 34

Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data Yes N/A
 Test Plot Yes (See below) N/A

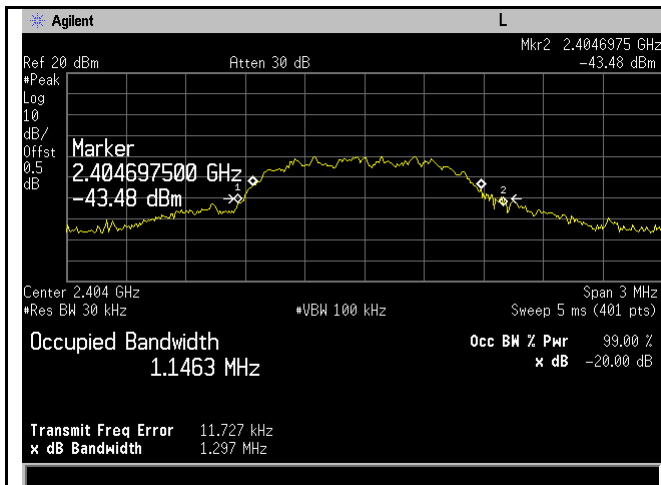
20dB Bandwidth measurement result

Antenna 0:

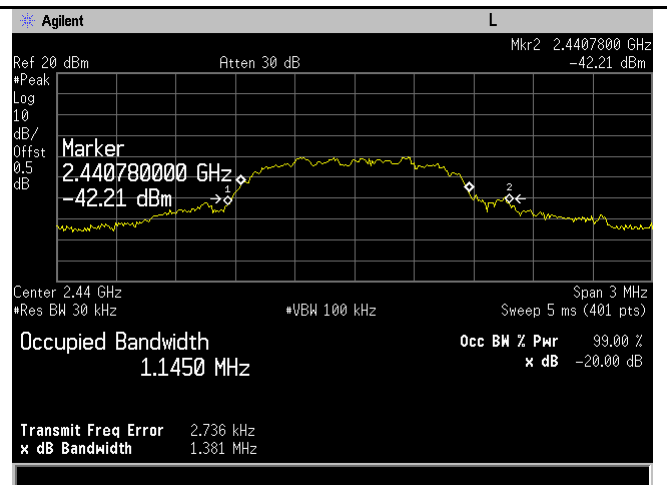
CH	Fundamental Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low	2404	1.297	Pass
Middle	2440	1.381	Pass
High	2476	1.256	Pass

Test Plots

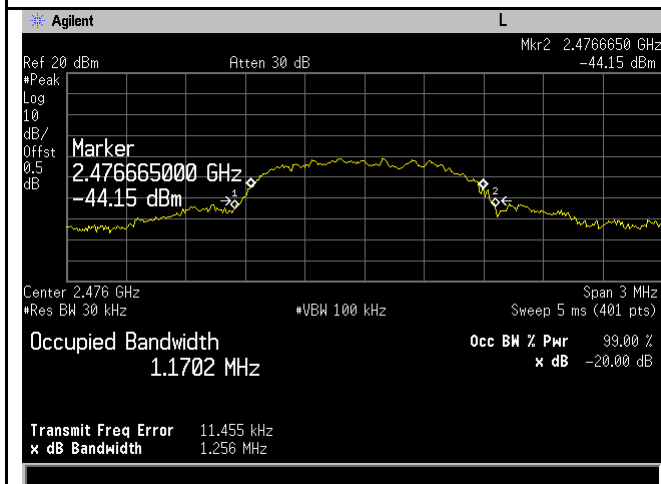
20dB Bandwidth measurement result



20dB Bandwidth – Low CH 2404



20dB Bandwidth - Middle CH 2440



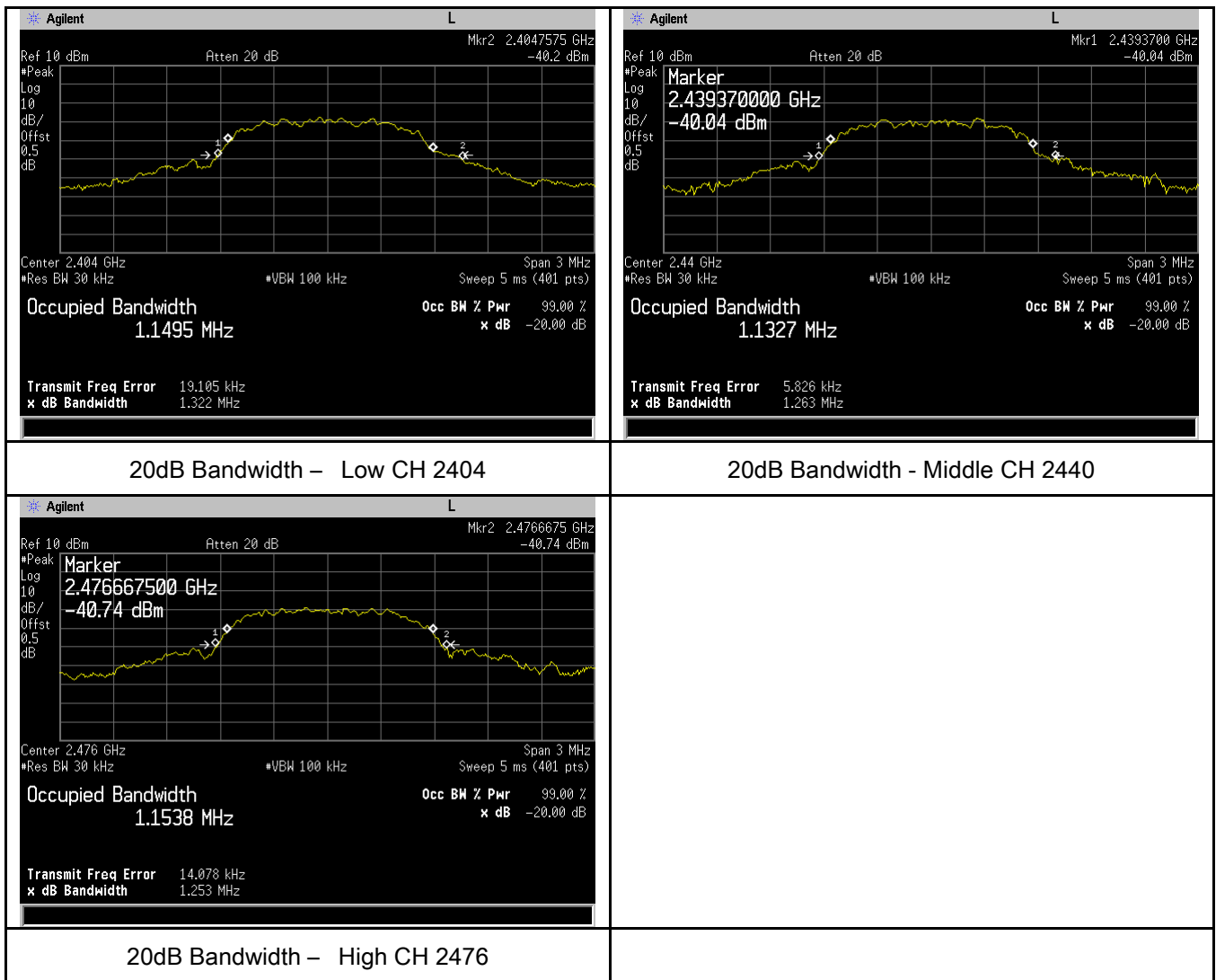
20dB Bandwidth – High CH 2476

Antenna 1:

CH	Fundamental Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low	2404	1.322	Pass
Middle	2440	1.263	Pass
High	2476	1.253	Pass

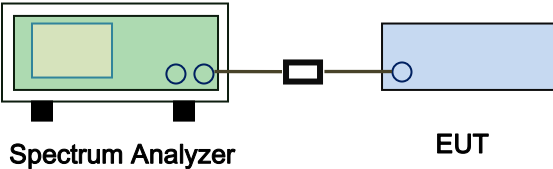
Test Plots

20dB Bandwidth measurement result



6.6 Band Edge

Temperature	25°C
Relative Humidity	58%
Atmospheric Pressure	1016mbar
Test date :	August 16, 2018
Tested By :	Aaron Liang

Spec	Item	Requirement	Applicable
§15.249(d)	a)	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.	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<ul style="list-style-type: none"> - Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - 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. - Set both RBW and VBW of spectrum analyzer to 1MHz. - 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. - Repeat above procedures until all measured frequencies were complete. 		
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

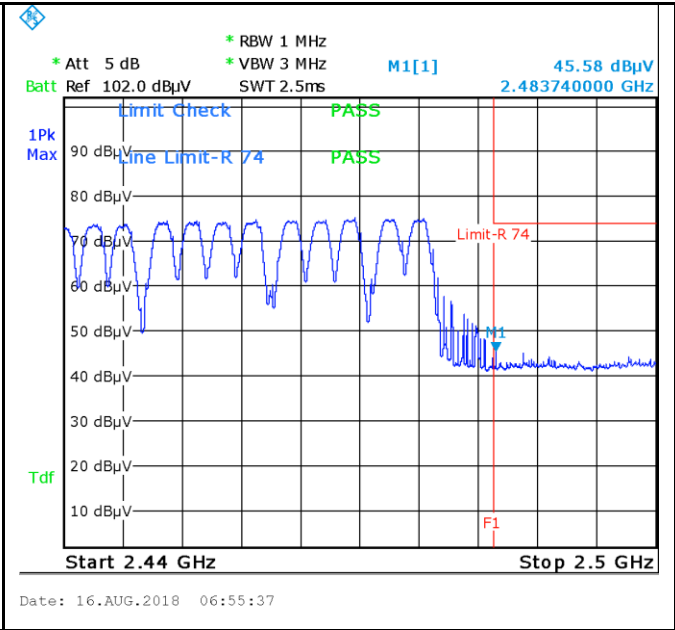
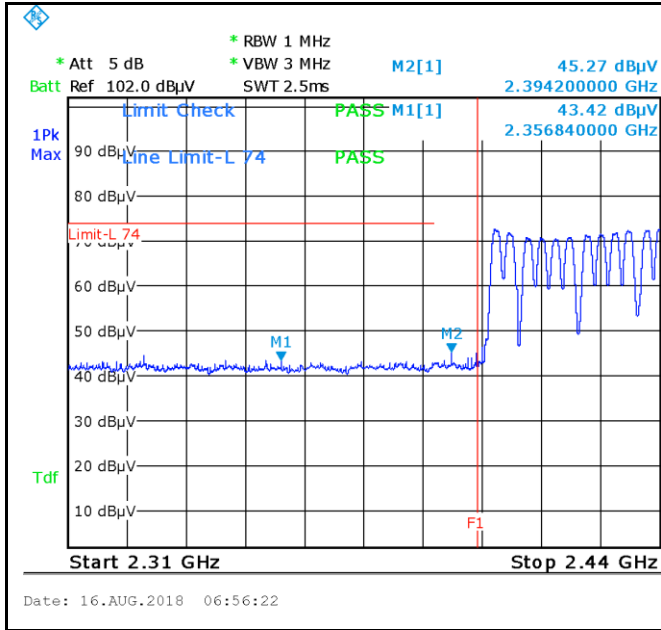
Test Report No.	18070891-FCC-R
Page	27 of 34

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test Plots

Band Edge measurement result (worst case)



GFSK-Hopping Left Side-PK
 Note: F1 is frequency 2400MHz

GFSK-Hopping Right Side-PK
 Note: F1 is frequency 2483.5MHz

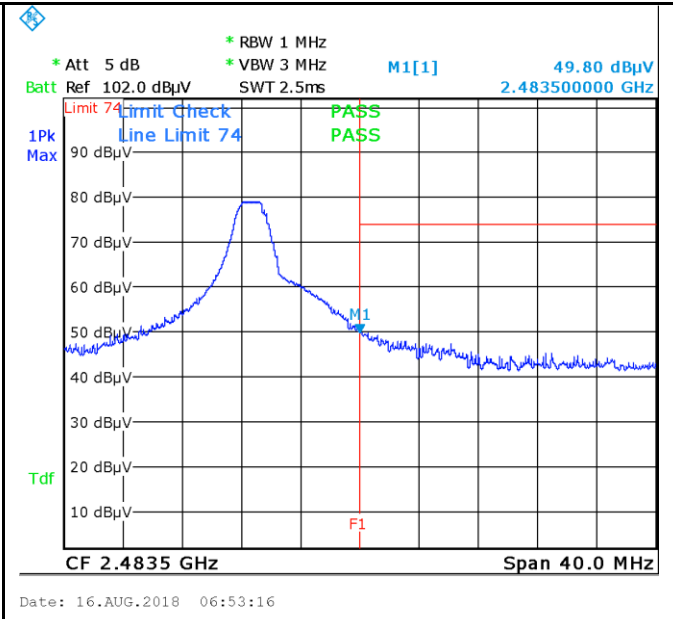
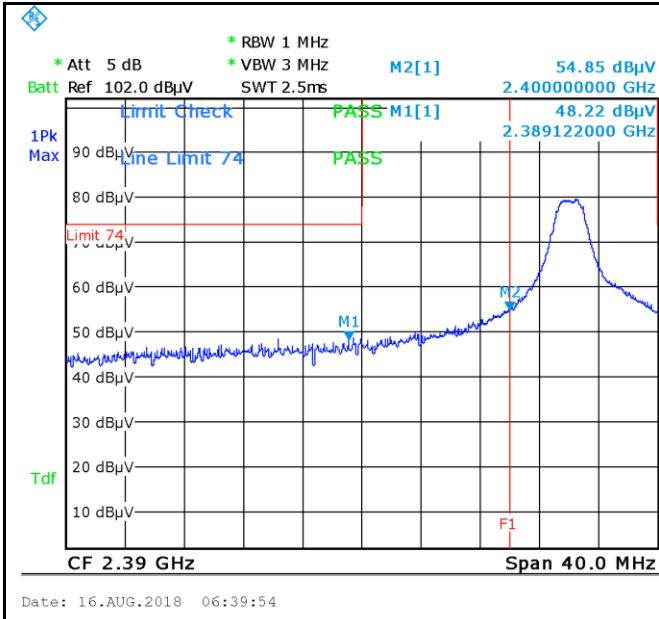
Note: (no need if PK value less than the AV limit)

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

GFSK-Hopping Left Side-AV

GFSK-Hopping Right Side-AV

Note: Both Horizontal and vertical polarities were investigated.

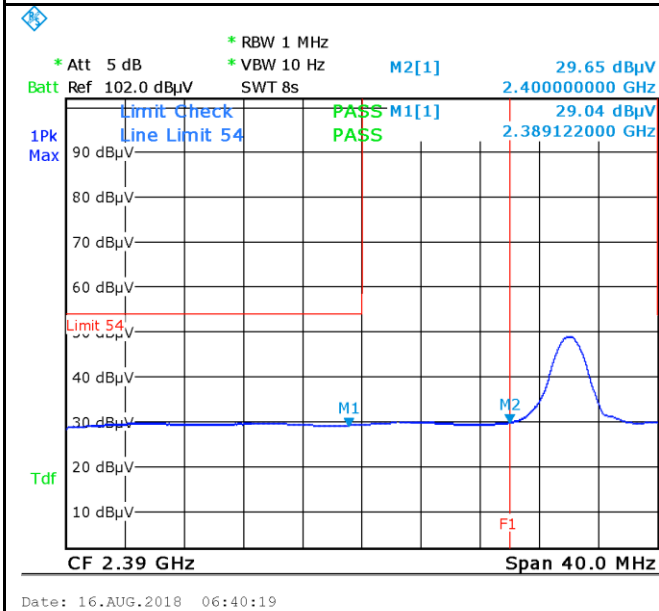


GFSK-Left Side-PK

Note: F1 is frequency 2400MHz

GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



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

GFSK-Left Side-AV

GFSK-Right Side-AV

Note: Both Horizontal and vertical polarities were investigated.

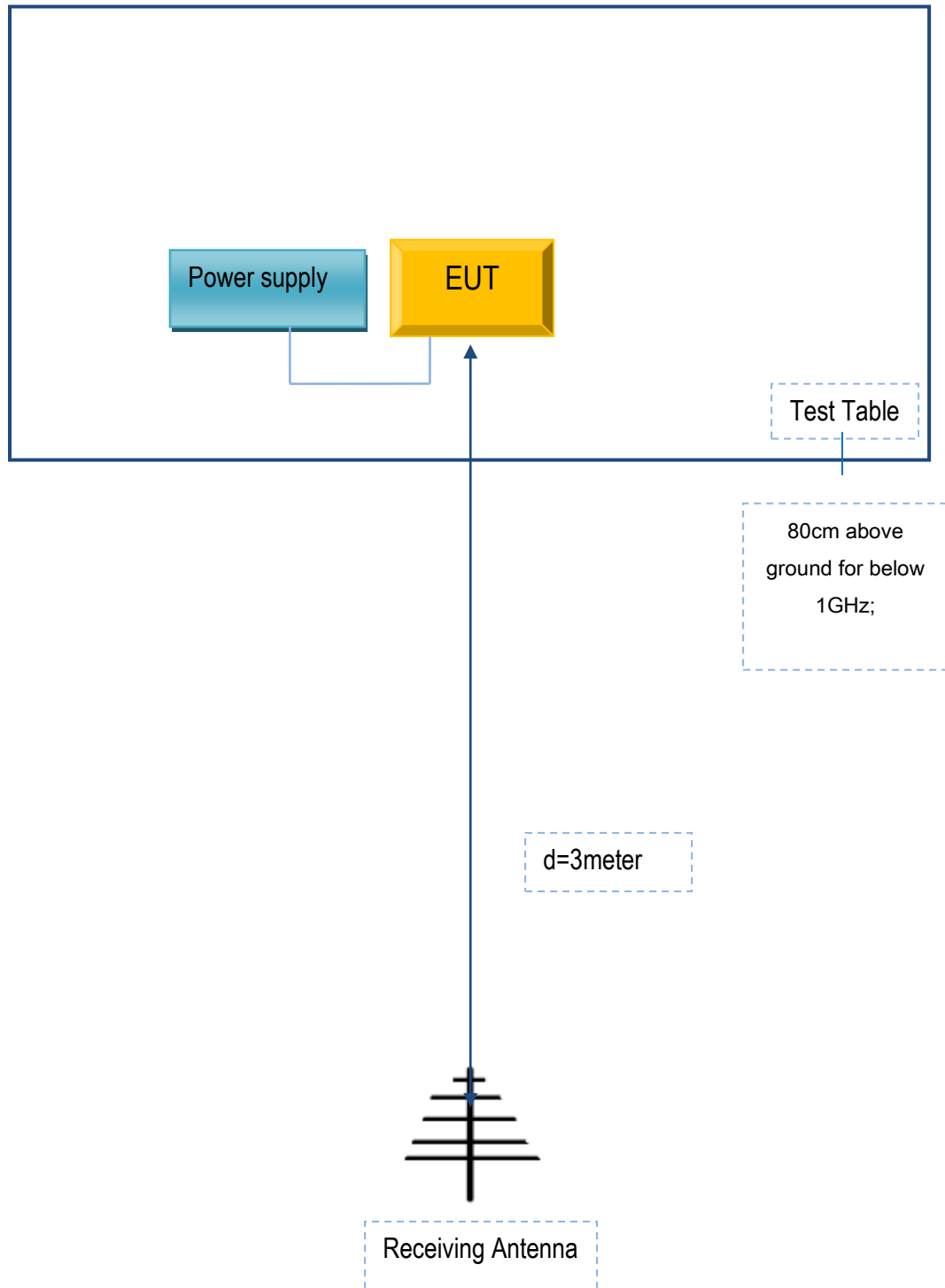
Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/15/2017	09/14/2018	<input type="checkbox"/>
Line Impedance	LI-125A	191106	09/23/2017	09/22/2018	<input type="checkbox"/>
Line Impedance	LI-125A	191107	09/23/2017	09/22/2018	<input type="checkbox"/>
ISN	ISN T800	34373	09/23/2017	09/22/2018	<input type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	<input type="checkbox"/>
Transient Limiter	LIT-153	531118	08/29/2018	08/28/2019	<input type="checkbox"/>
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	08/29/2018	08/28/2019	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Radiated Emissions					
EMI test receiver	ESL6	100262	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/17/2017	11/16/2018	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
Active Antenna (9kHz-30MHz)	AL-130	121031	10/12/2017	10/11/2018	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/22/2018	03/21/2019	<input checked="" type="checkbox"/>
Active Antenna (9kHz-30MHz)	AL-130	121031	10/12/2017	10/11/2018	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/19/2017	09/18/2018	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/23/2017	09/22/2018	<input checked="" type="checkbox"/>

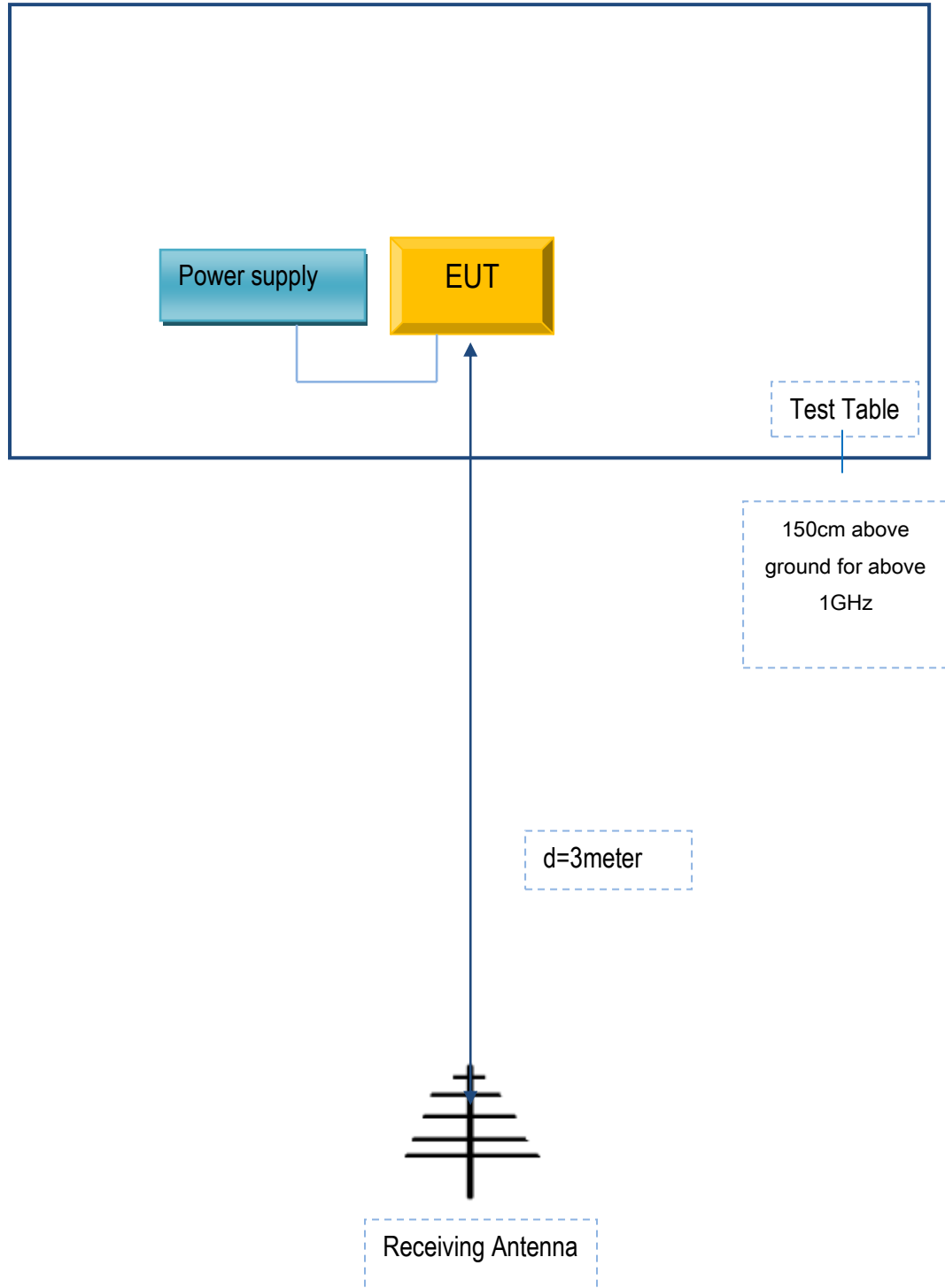
Annex B. TEST SETUP AND SUPPORTING EQUIPMENT

Annex B.i. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions



Block Configuration Diagram for Radiated Emissions



Annex B. ii. SUPPORTING EQUIPMENT DESCRIPTION

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

Manufacturer	Equipment Description	Model	Serial No.
N/A	Power supply	N/A	N/A

Test Report No.	18070891-FCC-R
Page	34 of 34

**Annex C. User Manual / Block Diagram / Schematics / Partlist/
DECLARATION OF SIMILARITY**

Please see attachment