FCC Radio Test Report

Equipment	: MOD6213/MOD6212 transiver
Brand Name	: Sibeam Snap Technology Transceiver module
Model No.	: MOD6213/MOD6212
FCC ID	: UK2-MOD621X
Standard	: 47 CFR FCC Part 15.255
Applicant	: Lattice Semiconductor Corporation 111 SW 5th Avenue Suite 700 Portland, OR 97204 United States.
Manufacturer	: Lattice Semiconductor Corporation 111 SW 5th Avenue Suite 700 Portland, OR 97204 United States.

The product sample received on Aug. 16, 2016 and completely tested on Oct. 17, 2016. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013, 47 CFR FCC Part 15.255 and Millimeter Wave Test Procedures and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Cliff Chang
SPORTON INTERNATIONAL INC.

Testing Laboratory
1190

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Summary of Test Result

Standard Requirements and Conformance Test Specifications				
Report Clause	**Ref. Std. Clause**	**Description**	**Result**	**Remark**
3.1	FCC 15.207	AC Power Conducted Emissions	Complied	-
3.2	FCC 15.255(d)	Occupied Bandwidth	Complied	-
3.3	FCC 15.255(b)(1)	EIRP Power	Complied	-
3.4	FCC 15.255(d)	Peak Conducted Power	Complied	-
3.5	FCC 15.255(c)	Transmitter Spurious Emissions	Complied	-
3.6	FCC 15.255(e)	Frequency Stability	Complied	-
3.7	FCC 15.255(a),(g)	Operation Restriction and Group Installation	Complied	-

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR681603	Rev. 01	Initial issue of report	May 09, 2017

1 General Description

1.1 Information

1.1.1 The Channel Plan(s)

Operating Frequency (GHz)	60.48 GHz

1.1.2 Transmit Operating Modes

The Different Transmit Operating Modes
☐ Operating mode 1: Smart Antenna Systems - with beam forming
☐ Operating mode 2: Smart Antenna Systems - without beam forming
☒ Operating mode 3: Single Antenna Equipment

1.1.3 Antenna Information

Antenna Information	
☐ Equipment placed on the market without antennas	
☒ Integral antenna	
Integral antenna gain	2 dBi
	☐ Temporary RF connector provided
	☒ No temporary RF connector provided
☐ External antenna (dedicated antennas)	
	☐ Single power level with corresponding antenna(s)
	☐ Multiple power settings and corresponding antenna(s)

1.1.4 Power Levels

<EUT 1>

Applicable power levels	☐ Conducted ☒ EIRP		
Antenna gain	2 dBi		
Frequency (GHz)	Highest setting (P_{high}): (dBm)		
	Modulation	AV Power	Peak Power
60.48	OOK	0.40	3.51

<EUT 2>

Applicable power levels	☐ Conducted ☒ EIRP		
Antenna gain	0 dBi		
Frequency (GHz)	Highest setting (P_{high}): (dBm)		
	Modulation	AV Power	Peak Power
60.48	OOK	-3.49	0.42

1.1.5 Extreme Operating

The Extreme Operating Temperature Range that Apply to the Equipment				
☒ -25 °C to +85 °C				
☐ 0 °C to +40 °C				
☐ Other:				
EUT Power Type	From Host System			
Supply Voltage	☐ AC	State AC voltage		V
Supply Voltage	☒ DC	State DC voltage	5	V

1.1.6 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model	Radiation	I^2C Tunneling	PROX Detection	EUT
MOD6213	Broad Fire	Connect to Slave	Initiator	EUT1
MOD6212	Broad Fire	Connect to Master	Responder	EUT 2

Note: All test results were recorded in the report.

1.1.7 Equipment Use Condition

Equipment Use Condition
☐ Fixed field disturbance sensors at 61-61.5GHz
☐ Except fixed field disturbance sensors at 61-61.5GHz
☒ Except fixed field disturbance sensors

1.1.8 User Condition

Intended Operation
☒ Indoor only
☐ Outdoor only

1.2 Additional Information Provided by the Submitter

1.2.1 Modulation

Modulation	
The modulation is OOK.	
Can the transmitter operate un-modulated:	☒ Yes ☐ No

1.2.2 Duty Cycle

Duty Cycle		Duty Cycle Factor
The transmitter is intended for	100 %	0.000

1.3 Accessories

N/A

1.4 Support Equipment

For Test Site No: CO01-CB

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E6430	DoC
2	Test fixture	Lattice Semiconductor	NA	NA

For Test Site No: 03CH01-CB Test and For TH01-CB Test:

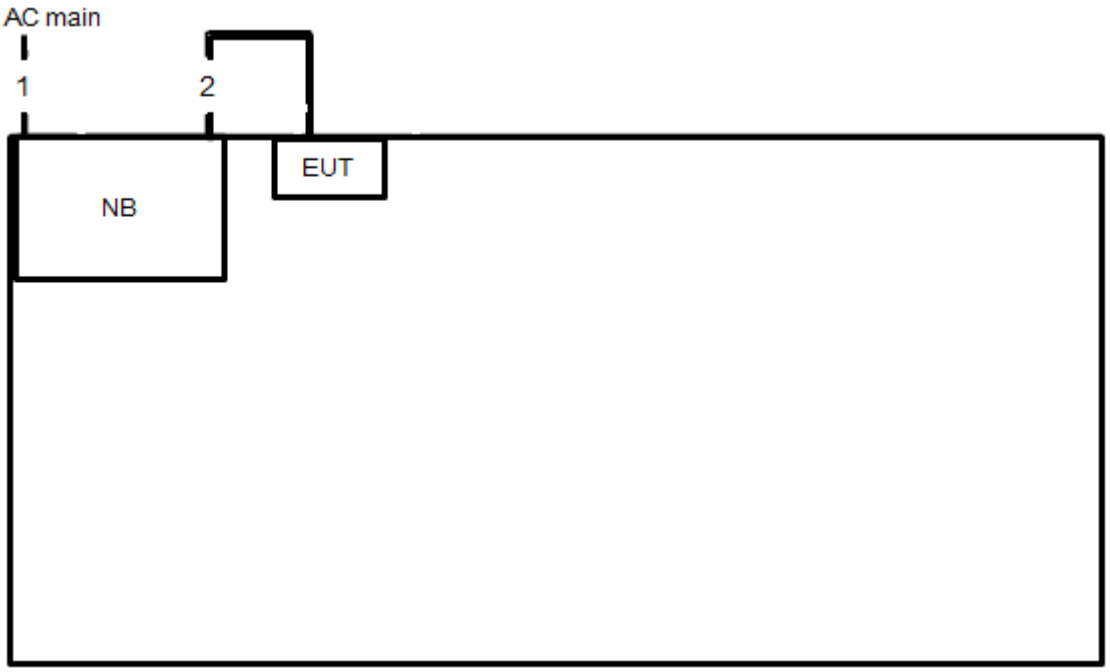
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E4300	DoC
2	Test fixture	Lattice Semiconductor	NA	NA

1.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

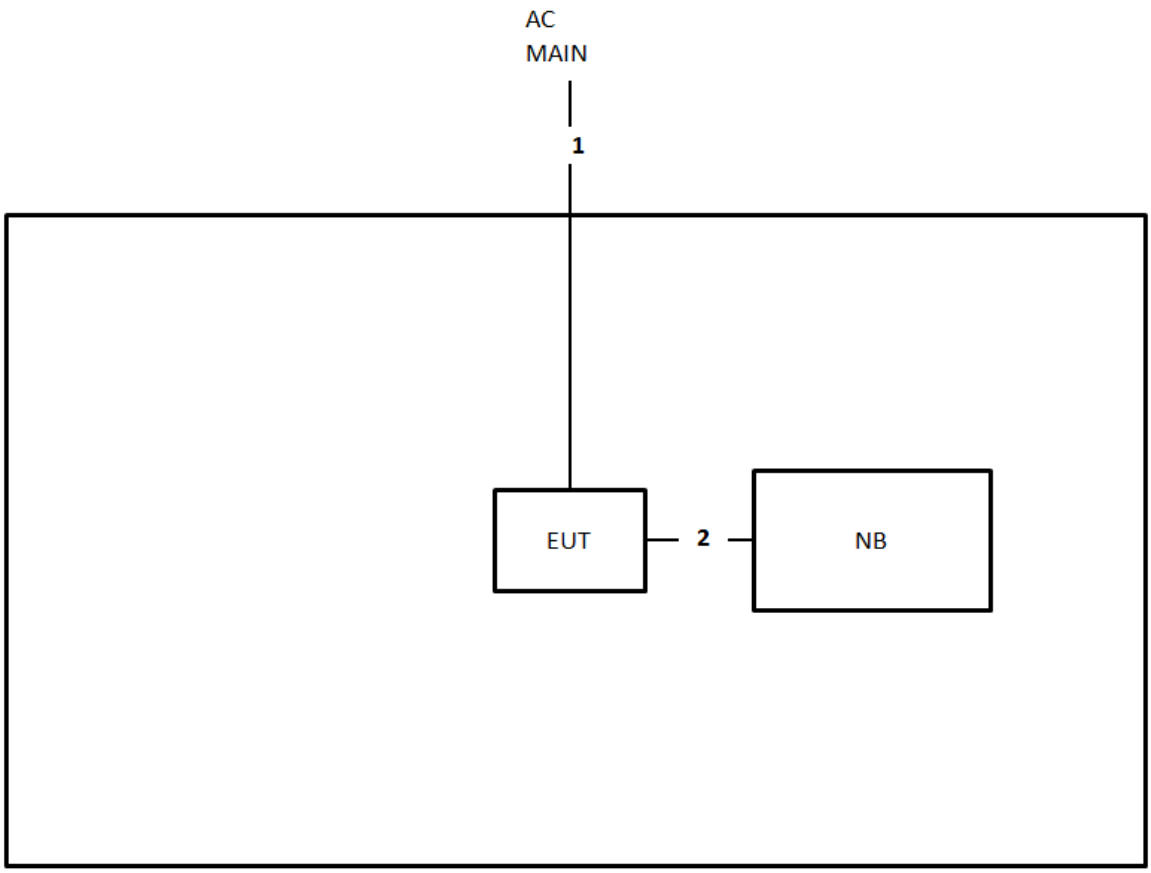
1.6 Test Setup Diagram

Test Setup Diagram - AC Power Conducted Emissions



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	Micro USB cable	Yes	1m

Test Setup Diagram - Transmitter Spurious Emissions



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	Micro USB cable	Yes	0.8m

1.7 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15.255
- ANSI C63.10-2013 Section 9. “Procedures for testing millimeter-wave systems”

1.8 Testing Location

Testing Location				
☐	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.		
		TEL : 886-3-327-3456	FAX : 886-3-327-0973	
☒	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.		
		TEL : 886-3-656-9065	FAX : 886-3-656-9085	
Test Site No.				
CO01-CB		03CH01-CB		TH01-CB

2 Test Configuration of Equipment under Test

2.1 Test Channel Frequencies

Nominal Channel Bandwidth
60.48 GHz

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)
AC Power Conducted Emissions	CTX
Occupied Bandwidth	60.48
EIRP Power	60.48
Peak Conducted Power	60.48
Transmitter Spurious Emissions (below 1 GHz)	CTX
Transmitter Spurious Emissions (1 GHz-40 GHz)	60.48
Transmitter Spurious Emissions (above 40 GHz)	60.48
Frequency Stability	Un-Modulation

2.3 Far Field Boundary Calculations

The far-field boundary is given as:

far field = (2 * L^2) / λ

where:

L = Largest Antenna Dimension, including the reflector, in meters

λ = wavelength in meters

Far Field (m)				
Frequency (GHz)	**L (m)**	**Lambda (m)**	**d(Far Field) (m)**	**d(Far Field) (cm)**
60.48	0.0022	0.0049603	0.002	0.20

3 Transmitter Test Result

3.1 AC Power Conducted Emissions

3.1.1 Limit of AC Power Conducted Emissions

AC Power Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments

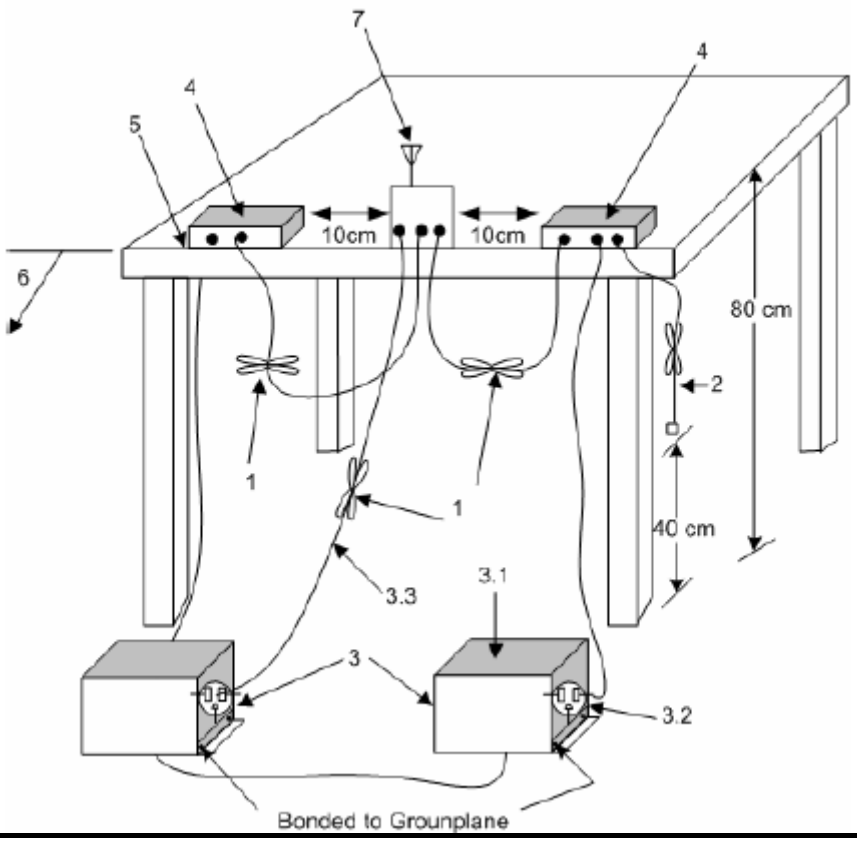
Refer a measuring instruments list in this test report.

3.1.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 6.2.

3.1.4 Test Setup

AC Power Conducted Emissions



AC Power Conducted Emissions
1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long (see ANSI C63.10, clause 6.2.3.2).
2. I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m (see ANSI C63.10, clause 6.2.2).
3. EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 ohm loads. LISN can be placed on top of, or immediately beneath, reference ground plane (see ANSI C63.10, clauses 6.2.2 and 6.2.3).
3.1. All other equipment powered from additional LISN(s).
3.2. A multiple-outlet strip can be used for multiple power cords of non-EUT equipment.
3.3. LISN at least 80 cm from nearest part of EUT chassis.
4. Non-EUT components of EUT system being tested.
5. Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop (see ANSI C63.10, clause 6.2.3.2).
6. Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane (see ANSI C63.10, clause 6.2.2 for options).
7. Antenna may be integral or detachable. If detachable, the antenna shall be attached for this test.

3.1.5 Test Result of AC Power Conducted Emissions

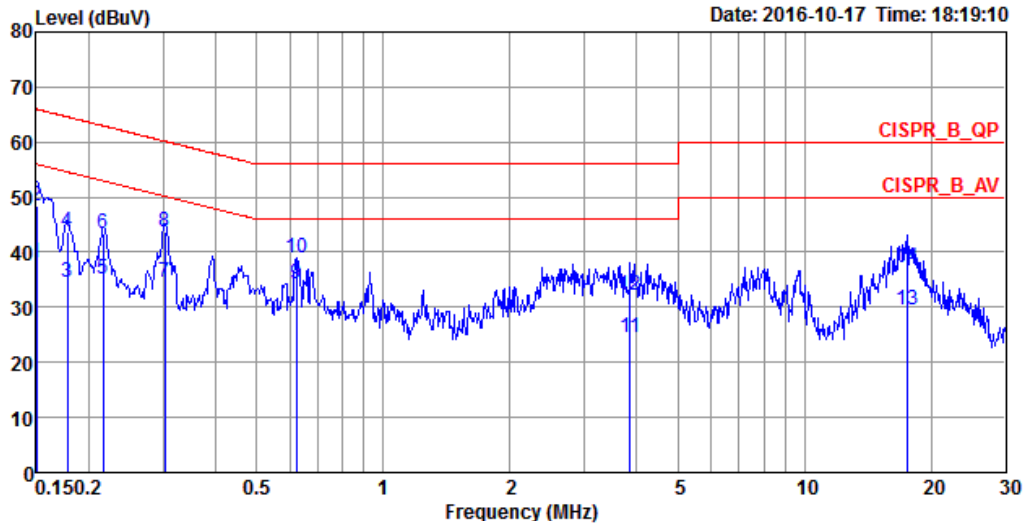
Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.2.3

NOTE 1: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes. If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing.

NOTE 2: “>20dB” means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.1.

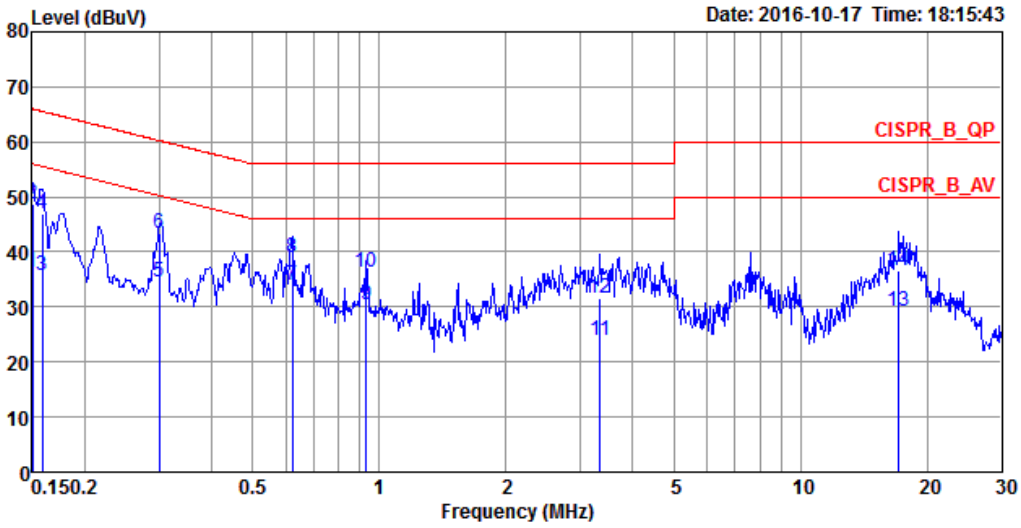
<EUT 1>

Temp	23°C	**Humidity**	60%
Test Engineer	GN Hou	**Phase**	Line
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	38.09	-17.91	56.00	27.91	10.02	0.16	LINE	Average
2	0.1500	48.30	-17.70	66.00	38.12	10.02	0.16	LINE	QP
3	0.1777	34.63	-19.96	54.59	24.53	9.92	0.18	LINE	Average
4	0.1777	43.81	-20.78	64.59	33.71	9.92	0.18	LINE	QP
5	0.2162	35.25	-17.71	52.96	25.16	9.92	0.17	LINE	Average
6	0.2162	43.38	-19.58	62.96	33.29	9.92	0.17	LINE	QP
7	0.3035	34.51	-15.64	50.15	24.51	9.92	0.08	LINE	Average
8	0.3035	43.75	-16.40	60.15	33.75	9.92	0.08	LINE	QP
9	0.6205	34.16	-11.84	46.00	23.87	9.93	0.36	LINE	Average
10	0.6205	38.85	-17.15	56.00	28.56	9.93	0.36	LINE	QP
11	3.8603	24.64	-21.36	46.00	14.56	9.99	0.09	LINE	Average
12	3.8603	32.29	-23.71	56.00	22.21	9.99	0.09	LINE	QP
13	17.4750	29.65	-20.35	50.00	19.15	10.27	0.23	LINE	Average
14	17.4750	37.30	-22.70	60.00	26.80	10.27	0.23	LINE	QP

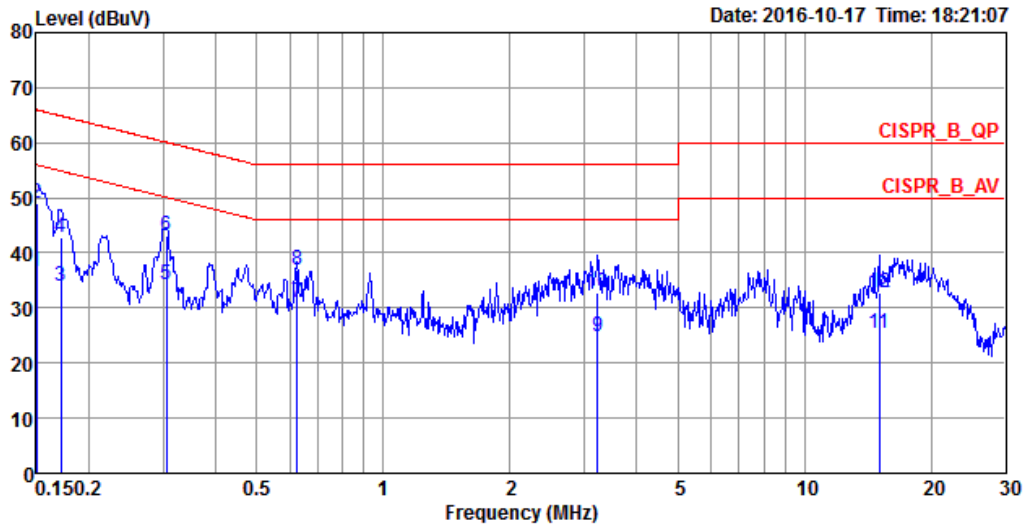
Temp	23°C	Humidity	60%
Test Engineer	GN Hou	Phase	Neutral
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	36.28	-19.72	56.00	26.10	10.02	0.16	NEUTRAL	Average
2	0.1500	48.73	-17.27	66.00	38.55	10.02	0.16	NEUTRAL	QP
3	0.1582	35.60	-19.96	55.56	25.41	10.02	0.17	NEUTRAL	Average
4	0.1582	47.06	-18.50	65.56	36.87	10.02	0.17	NEUTRAL	QP
5	0.3003	34.53	-15.71	50.24	24.52	9.92	0.09	NEUTRAL	Average
6	0.3003	43.28	-16.96	60.24	33.27	9.92	0.09	NEUTRAL	QP
7	0.6205	34.07	-11.93	46.00	23.78	9.93	0.36	NEUTRAL	Average
8	0.6205	39.02	-16.98	56.00	28.73	9.93	0.36	NEUTRAL	QP
9	0.9331	30.36	-15.64	46.00	19.74	9.94	0.68	NEUTRAL	Average
10	0.9331	36.25	-19.75	56.00	25.63	9.94	0.68	NEUTRAL	QP
11	3.3458	23.98	-22.02	46.00	13.92	9.98	0.08	NEUTRAL	Average
12	3.3458	31.56	-24.44	56.00	21.50	9.98	0.08	NEUTRAL	QP
13	17.1085	29.32	-20.68	50.00	18.83	10.26	0.23	NEUTRAL	Average
14	17.1085	36.68	-23.32	60.00	26.19	10.26	0.23	NEUTRAL	QP

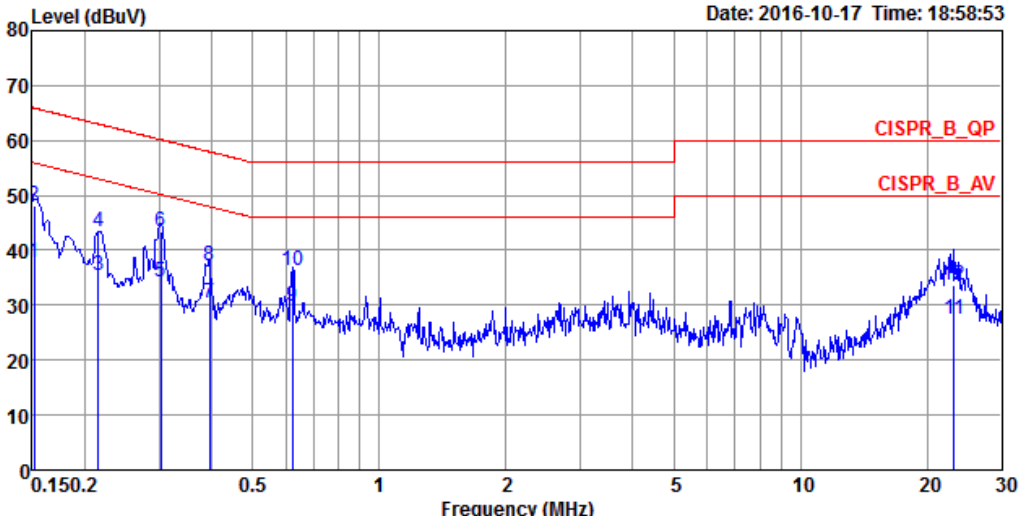
<EUT 2>

Temp	23°C	**Humidity**	60%
Test Engineer	GN Hou	**Phase**	Line
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	36.56	-19.44	56.00	26.38	10.02	0.16	LINE	Average
2	0.1500	48.87	-17.13	66.00	38.69	10.02	0.16	LINE	QP
3	0.1712	33.95	-20.95	54.90	23.76	10.02	0.17	LINE	Average
4	0.1712	42.76	-22.14	64.90	32.57	10.02	0.17	LINE	QP
5	0.3051	34.16	-15.94	50.10	24.16	9.92	0.08	LINE	Average
6	0.3051	42.99	-17.11	60.10	32.99	9.92	0.08	LINE	QP
7	0.6238	30.88	-15.12	46.00	20.58	9.93	0.37	LINE	Average
8	0.6238	36.81	-19.19	56.00	26.51	9.93	0.37	LINE	QP
9	3.2239	24.85	-21.15	46.00	14.79	9.98	0.08	LINE	Average
10	3.2239	32.70	-23.30	56.00	22.64	9.98	0.08	LINE	QP
11	15.0656	25.51	-24.49	50.00	15.06	10.23	0.22	LINE	Average
12	15.0656	32.82	-27.18	60.00	22.37	10.23	0.22	LINE	QP

Temp	23°C	Humidity	60%
Test Engineer	GN Hou	Phase	Neutral
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1516	37.92	-17.99	55.91	27.74	10.02	0.16	NEUTRAL	Average
2	0.1516	48.06	-17.85	65.91	37.88	10.02	0.16	NEUTRAL	QP
3	0.2151	35.34	-17.67	53.01	25.25	9.92	0.17	NEUTRAL	Average
4	0.2151	43.32	-19.69	63.01	33.23	9.92	0.17	NEUTRAL	QP
5	0.3035	34.35	-15.80	50.15	24.35	9.92	0.08	NEUTRAL	Average
6	0.3035	43.33	-16.82	60.15	33.33	9.92	0.08	NEUTRAL	QP
7	0.3955	30.33	-17.62	47.95	20.40	9.92	0.01	NEUTRAL	Average
8	0.3955	37.07	-20.88	57.95	27.14	9.92	0.01	NEUTRAL	QP
9	0.6205	29.88	-16.12	46.00	19.59	9.93	0.36	NEUTRAL	Average
10	0.6205	36.25	-19.75	56.00	25.96	9.93	0.36	NEUTRAL	QP
11	23.1404	27.49	-22.51	50.00	16.84	10.39	0.26	NEUTRAL	Average
12	23.1404	33.71	-26.29	60.00	23.06	10.39	0.26	NEUTRAL	QP

3.2 Occupied Bandwidth

3.2.1 Limit of Occupied Bandwidth

6dBc Bandwidth (see Note 1)	None
26dBc Bandwidth	None
99% Occupied Bandwidth (see Note 2)	None

NOTE 1: The 6dBc bandwidth is the frequency bandwidth of the signal power at the -6 dBc points when measured with a 100 kHz resolution bandwidth. These measurements shall also be performed at normal test conditions.

NOTE 2: The 99% occupied bandwidth is the frequency bandwidth of the signal power at the 99% channel power of occupied bandwidth when resolution bandwidth should be approximately 1 % to 5 % of the occupied bandwidth (OBW). These measurements shall also be performed at normal test conditions.

3.2.2 Measuring Instruments

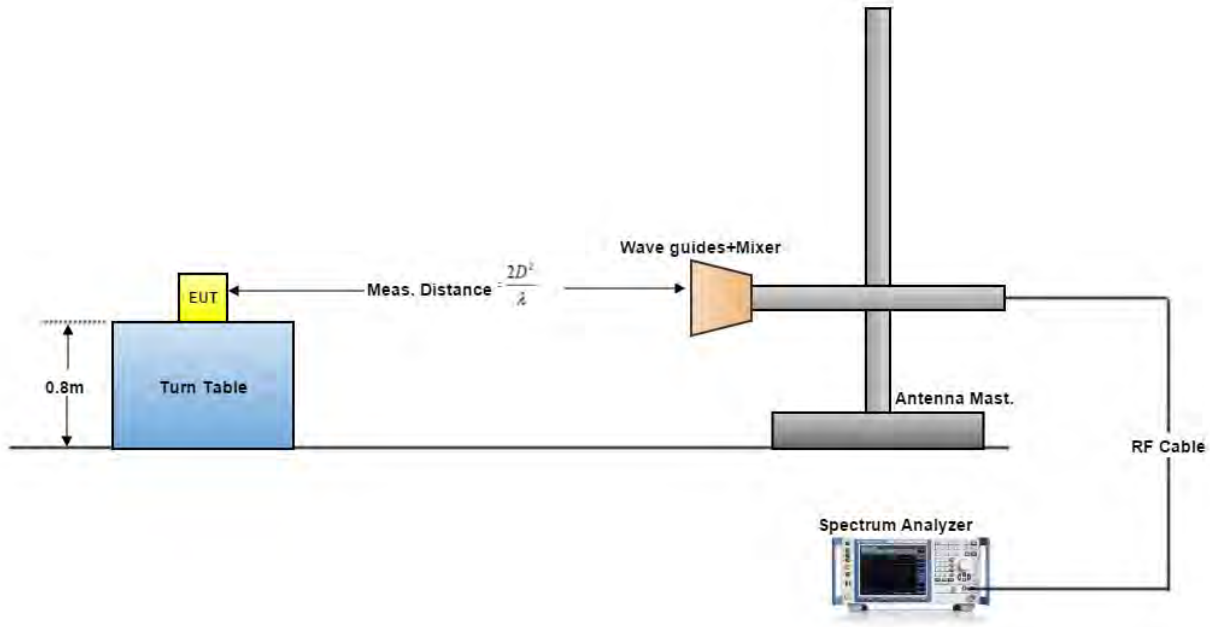
Refer a measuring instruments list in this test report.

3.2.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 6.9.2.

3.2.4 Test Setup

Occupied Channel Bandwidth



3.2.5 Test Result of Occupied Bandwidth

Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.9.2
NOTE: If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing. Refer as ANSI C63.10, clause 15, observe and record with plotted graphs or photographs the worst-case (i.e., widest) occupied bandwidth produced by these different modulation sources.	

Temp	22℃	**Humidity**	54%
Test Engineer	Paul Chen / Welson Chen		

<EUT 1>

Test Results				
Test Freq. (GHz)	**6 dBc Bandwidth (MHz)**	**Occupied Bandwidth (MHz)**	**26 dBc Bandwidth (MHz)**	**Limit (MHz)**
60.48	1.346	4670.000	8660.000	N/A

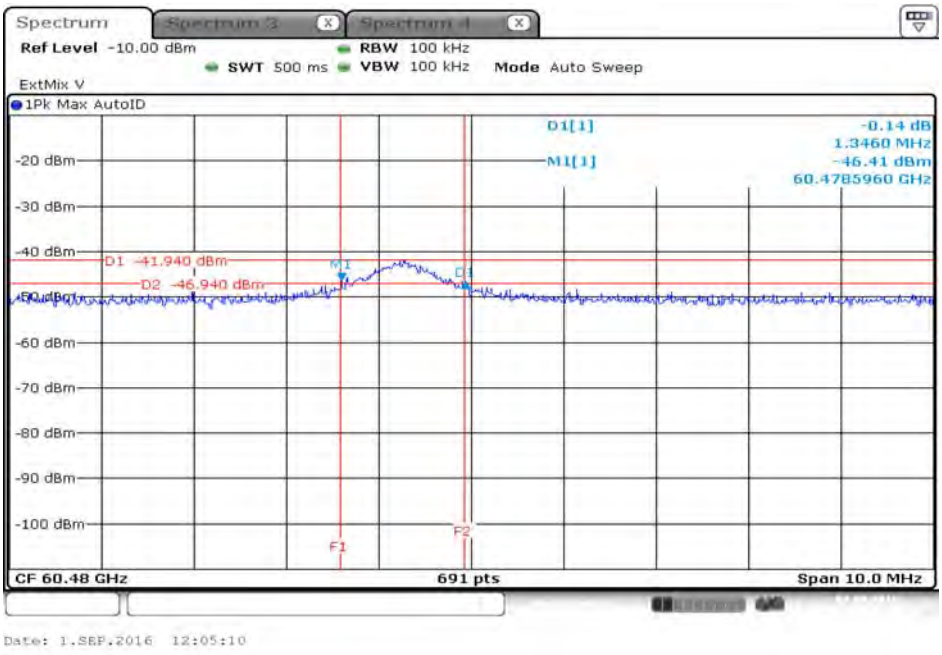
<EUT 2>

Test Results				
Test Freq. (GHz)	**6 dBc Bandwidth (MHz)**	**Occupied Bandwidth (MHz)**	**26 dBc Bandwidth (MHz)**	**Limit (MHz)**
60.48	1.360	4510.000	7520.000	N/A

3.2.5.1 Bandwidth Plots

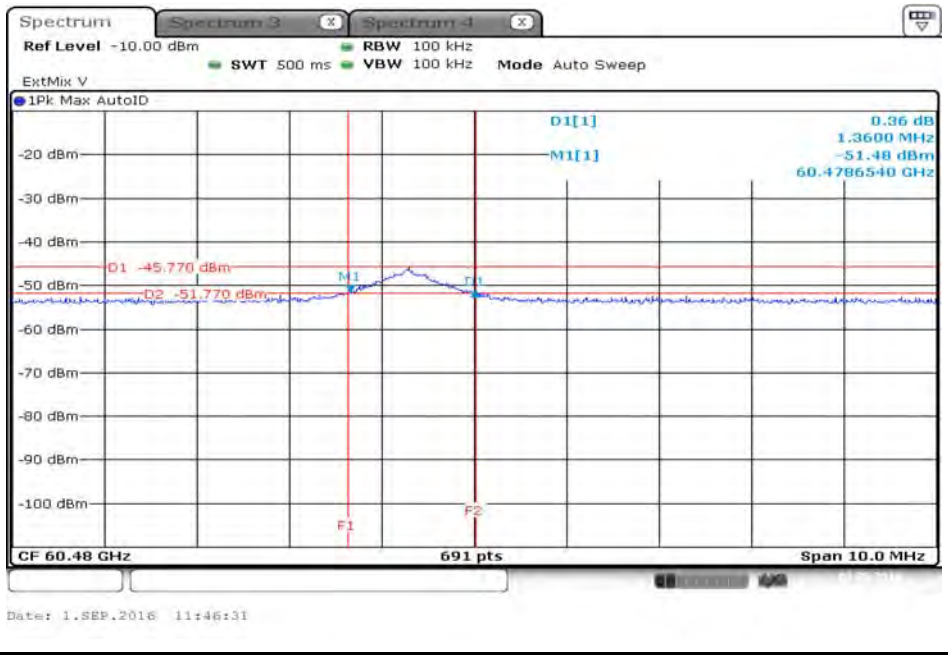
<EUT 1>

Test Frequency: 60.48 GHz
6 dBc Bandwidth



<EUT 2>

Test Frequency: 60.48 GHz
6 dBc Bandwidth



3.3 EIRP Power

3.3.1 Limit of EIRP Power

EIRP Power Limit		
Use Condition	**EIRP Average Power**	**EIRP Peak Power**
Fixed field disturbance sensors at 61-61.5GHz	10 dBm	13 dBm
Except fixed field disturbance sensors at 61-61.5GHz	N/A	10 dBm
Except fixed field disturbance sensors(indoor)	40 dBm	43 dBm
Except fixed field disturbance sensors(outdoor)	82 dBm	85 dBm

Note: For outdoor device minus 2 dB for every dB that the antenna gain is less than 51 dBi.

NOTE: For the applicable limit, see FCC 15.255 (b)

3.3.2 Measuring Instruments

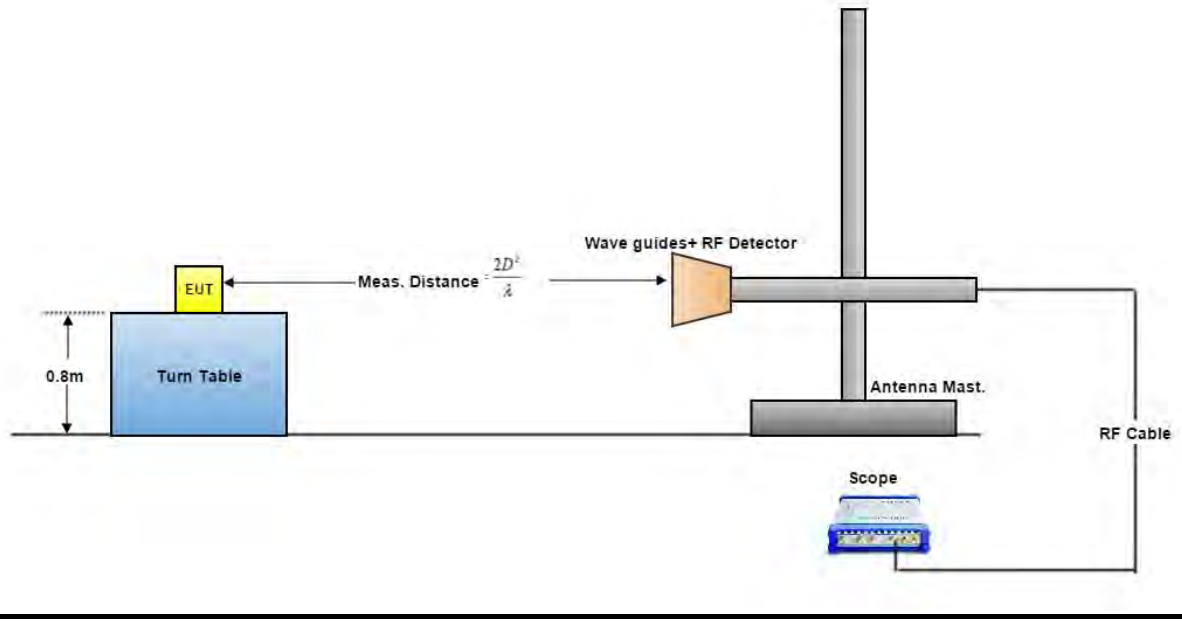
Refer a measuring instruments list in this test report.

3.3.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013 clause 9.3 & 9.5.

3.3.4 Test Setup

EIPR Power



3.3.5 Test Result of EIRP Power

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.11
NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worst case combination to be used for the conformance testing.	

3.3.5.1 Test Result of EIRP Power

Temp	22℃	**Humidity**	54%
Test Engineer	Paul Chen / Welson Chen	**Test Distance**	0.30 m
Test Date	Sep. 02, 2016~Oct. 07, 2016		

<EUT 1>

Test Results										
Test Freq. (GHz)	**DSO (mV)**		**Power Measured (dBm)**		**E_{Meas} (dBuV/m)**		**EIRP (dBm)**		**EIRP Limit (dBm)** (note 1)	
	Peak	AV	Peak	AV	Peak	AV	Peak	AV	Peak	AV
60.48	1.94	0.84	-31.12	-34.23	118.77	115.66	3.51	0.40	43	40

<EUT 2>

Test Results										
Test Freq. (GHz)	**DSO (mV)**		**Power Measured (dBm)**		**E_{Meas} (dBuV/m)**		**EIRP (dBm)**		**EIRP Limit (dBm)** (note 1)	
	Peak	AV	Peak	AV	Peak	AV	Peak	AV	Peak	AV
60.48	0.756	0.38	-34.21	-38.12	115.68	111.77	0.42	-3.49	43	40

The measured power level is converted to EIRP using the Friis equation:

For radiated emissions, calculate the field strength (E) in dBμV/meter.

$E = 126.8 – 20\log(\lambda) + P - G$

where:

E : is the field strength of the emission at the measurement distance, in dBμV/m

P : is the power measured at the output of the test antenna, in dBm

λ : is the wavelength of the emission under investigation [300/fMHz], in m

G : is the gain of the test antenna, in dBi For radiated emissions, calculate the EIRP (dBm). If the measurement was performed in the far field, calculate the EIRP.

EIRP = E-meas +20log(d-meas)-104.7

where:

EIRP : is the equivalent isotopically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dBμV/m

d-meas. : is the measurement distance, in m

NOTE 1: For the applicable limit, see FCC 15.255 (b)

3.4 Peak Conducted Power

3.4.1 Limit of Peak Conducted Power

Peak Conducted Power Limit	
6dBc Bandwidth	**Peak Conducted Power (note 1)**
> 100MHz	500mW
≤ 100MHz	500mW x (BW/100) (see note 2)
NOTE 1: For the applicable limit, see FCC 15.255(d) NOTE 2: BW= 6dB bandwidth (measured at RBW 100kHz)	

3.4.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.4.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 9.5

3.4.4 Test Result of Peak Conducted Power

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.11
NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worst case combination to be used for the conformance testing.	

3.4.4.1 Peak Conducted Power

Temp	22℃	Humidity	54%
Test Engineer	Paul Chen / Welson Chen		
Test Date	Sep. 02, 2016~Oct. 07, 2016		

<EUT 1>

Test Results						
Test Freq. (GHz)	**EIRP (dBm)**	**Max. Ant. Gain (dBi)**	**Peak Power (dBm)** (note1)	**Peak Power (mW)**	**6dBc BW (MHz)** (note2)	**Peak Power Limit (mW)** (note3)
60.48	3.51	2	1.51	1.417	1.35	6.73

<EUT 2>

Test Results						
Test Freq. (GHz)	**EIRP (dBm)**	**Max. Ant. Gain (dBi)**	**Peak Power (dBm)** (note1)	**Peak Power (mW)**	**6dBc BW (MHz)** (note2)	**Peak Power Limit (mW)** (note3)
60.48	0.42	0	0.42	1.102	1.36	6.80

NOTE 1: Because EUT used for the integral antenna without temporary RF connector provided. Therefore peak conducted power is equal to EIRP power subtract the antenna gain.

NOTE 2: For the 6dBc bandwidth, see test report clause 3.2.5.

NOTE 3: For the applicable limit, see FCC 15.255(d)

NOTE 4: For radiated emission measurements, calculate conducted transmitter output power P(cond)(dBm)

P(cond) = EIRP - G(dBi)

where:

G(dBi) is gain of EUT antenna.

3.5 Transmitter Spurious Emissions

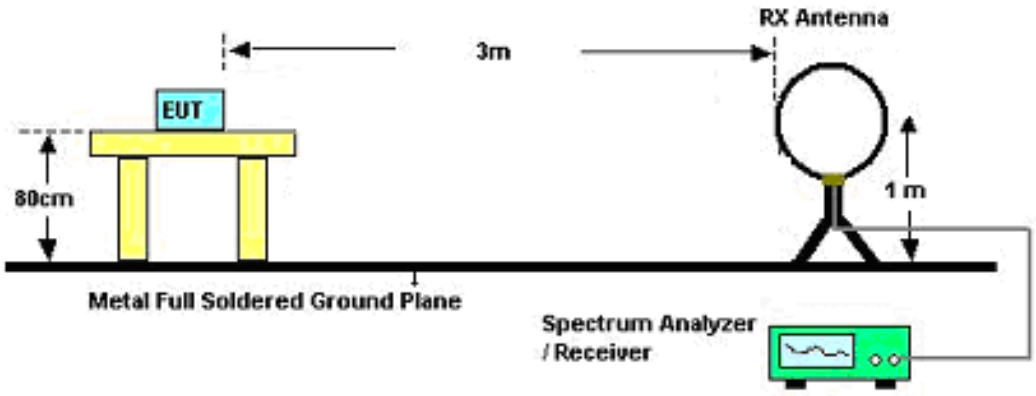
3.5.1 Limit of Transmitter Spurious Emissions

Frequency Range	Limit
Radiated emissions below 40 GHz	FCC 15.209
Radiated emissions above 40 GHz – 200GHz	90 pW/cm^2 @ 3 m (Equivalent EIRP 102 μW, -9.91dBm)
NOTE 1: For the applicable limit, see FCC 15.255(c) NOTE 2: Spurious emissions shall not exceed the level of the fundamental emission.	

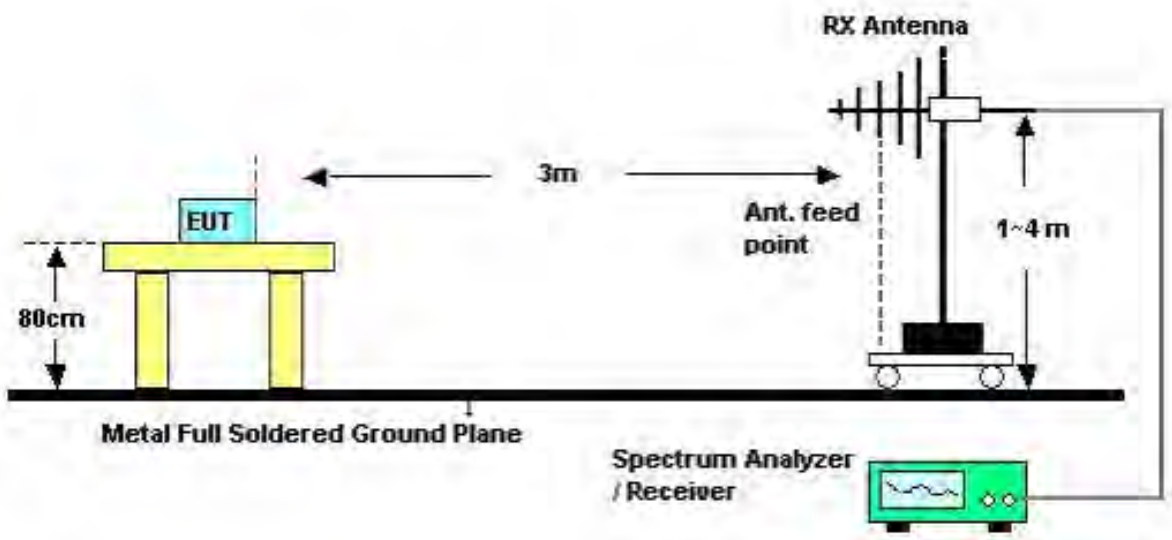
3.5.2 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 9.12

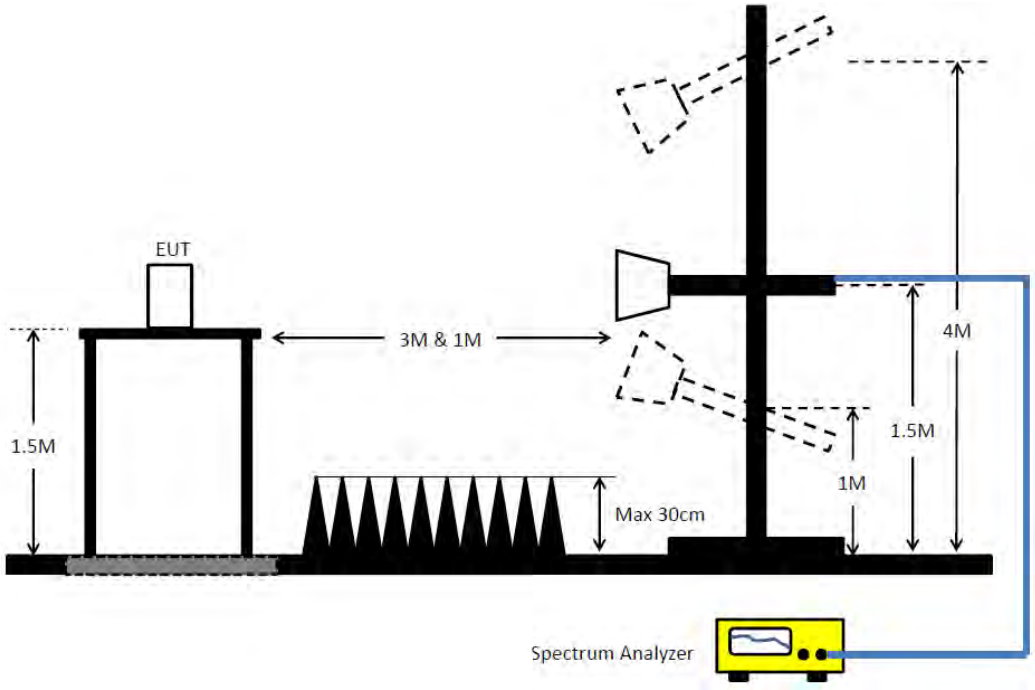
3.5.3 Test Setup

Transmitter Spurious Emissions
9kHz ~30MHz


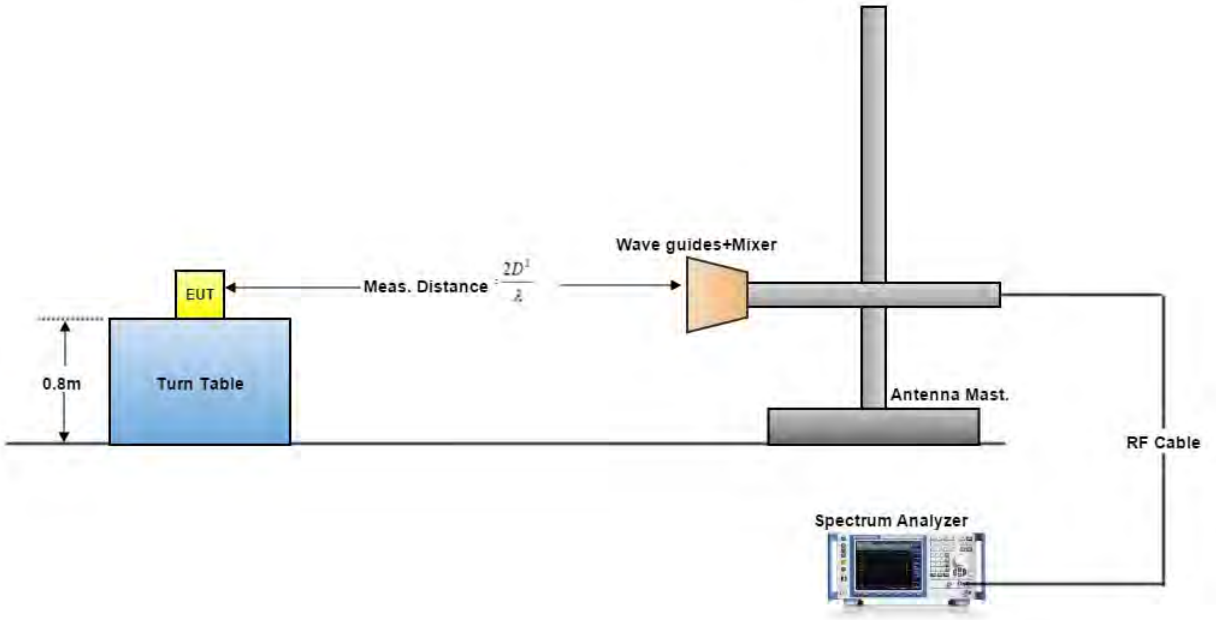
30MHz~1GHz



1GHz ~40GHz



Above 40GHz



A measuring distance of at 3 m shall be used for measurements at frequencies up to 15 GHz. For frequencies above 15 GHz, any suitable measuring distance may be used. The measurement distance is chosen up to far field distance, depending on the test system noise floor for detecting spurious emission signals. Then above 15 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from spec. distance (3 m) to measurement distance. Distance extrapolation factor = 20 log (spec. distance [3 m] / measurement distance [N m]) (dB) .The measurements described in ANSI C63.10, clause 7.8.6. If the emission cannot be detected at 1 m, reduce the RBW to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.

3.5.4 Test Result of Transmitter Spurious Emissions

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.12 、9.13
NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes.	

3.5.4.1 Test Result of Transmitter Spurious Emissions (Below 30MHz)

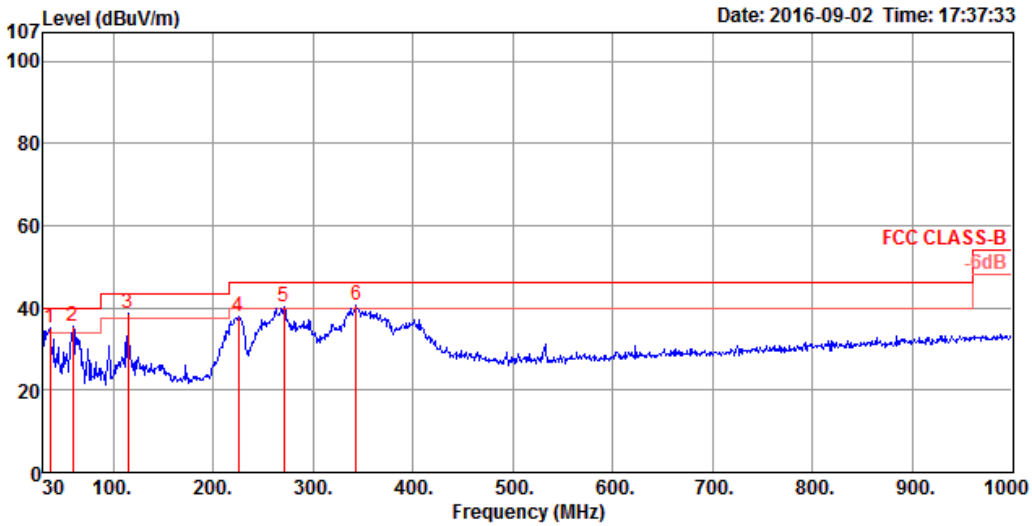
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.5.4.2 Test Result of Transmitter Spurious Emissions

<EUT 1>

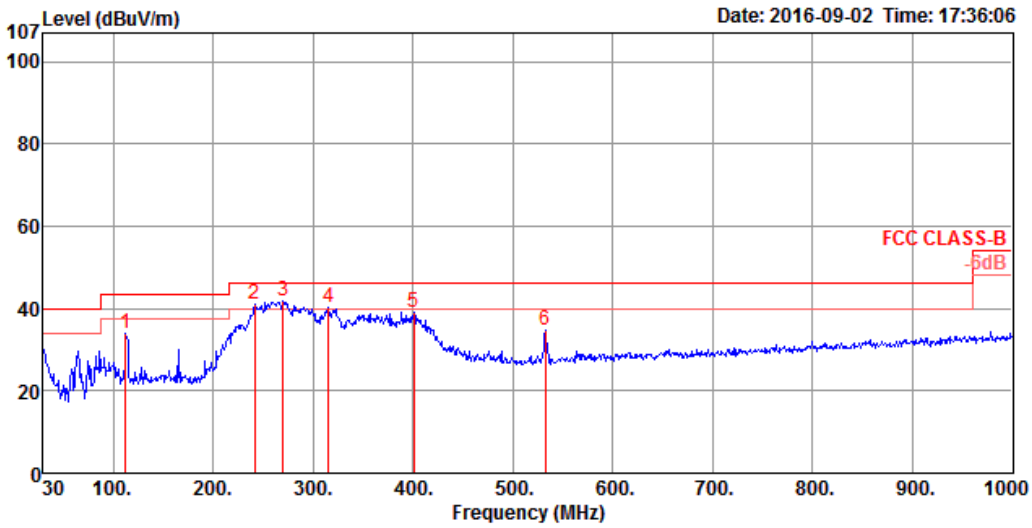
Temp	24°C	**Humidity**	54%
Test Engineer	Paul Chen / Welson Chen	**Test Distance**	3 m
Test Range	30 MHz – 1000 MHz	**Test Configuration**	CTX

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	36.79	35.20	40.00	-4.80	45.84	0.61	21.39	32.64	200	8	Peak	VERTICAL
2	59.10	35.41	40.00	-4.59	54.77	0.76	12.50	32.62	200	2	Peak	VERTICAL
3	114.39	38.74	43.50	-4.76	52.27	1.06	17.98	32.57	200	8	Peak	VERTICAL
4	224.97	37.80	46.00	-8.20	52.38	1.48	16.48	32.54	150	174	Peak	VERTICAL
5	270.56	40.43	46.00	-5.57	52.02	1.64	19.30	32.53	200	312	Peak	VERTICAL
6	343.31	40.81	46.00	-5.19	50.71	1.82	20.81	32.53	125	161	Peak	VERTICAL

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	112.45	34.01	43.50	-9.49	47.63	1.05	17.90	32.57	100	235	Peak	HORIZONTAL
2	241.46	40.90	46.00	-5.10	54.06	1.53	17.85	32.54	125	218	Peak	HORIZONTAL
3	269.59	41.66	46.00	-4.34	53.22	1.64	19.33	32.53	150	69	Peak	HORIZONTAL
4	315.18	40.19	46.00	-5.81	50.92	1.74	20.05	32.52	100	236	Peak	HORIZONTAL
5	400.54	39.05	46.00	-6.95	47.44	1.95	22.20	32.54	100	114	Peak	HORIZONTAL
6	532.46	34.67	46.00	-11.33	40.84	2.26	24.21	32.64	200	8	Peak	HORIZONTAL

Temp	24°C	Humidity	54%
Test Engineer	Paul Chen / Welson Chen	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Freq. (GHz)	60.48
Test Date	Sep. 02, 2016		

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	3034.28	43.01	74.00	-30.99	40.20	6.16	28.52	31.87	145	334	Peak	VERTICAL
2	3042.00	30.39	54.00	-23.61	27.60	6.14	28.52	31.87	145	334	Average	VERTICAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	3045.68	43.51	74.00	-30.49	40.72	6.14	28.52	31.87	145	125	Peak	HORIZONTAL
2	3051.16	30.52	54.00	-23.48	27.75	6.12	28.52	31.87	145	125	Average	HORIZONTAL

Temp	24°C	**Humidity**	54%
Test Engineer	Paul Chen / Welson Chen	**Test Distance**	1 m
Test Range	18 GHz – 40 GHz	**Test Freq. (GHz)**	60.48
Test Date	Sep. 02, 2016		

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	20206.20	50.79	83.54	-32.75	56.53	8.63	37.68	52.05	104	202	Peak	VERTICAL
2	20206.92	36.71	63.54	-26.83	42.45	8.63	37.68	52.05	104	202	Average	VERTICAL

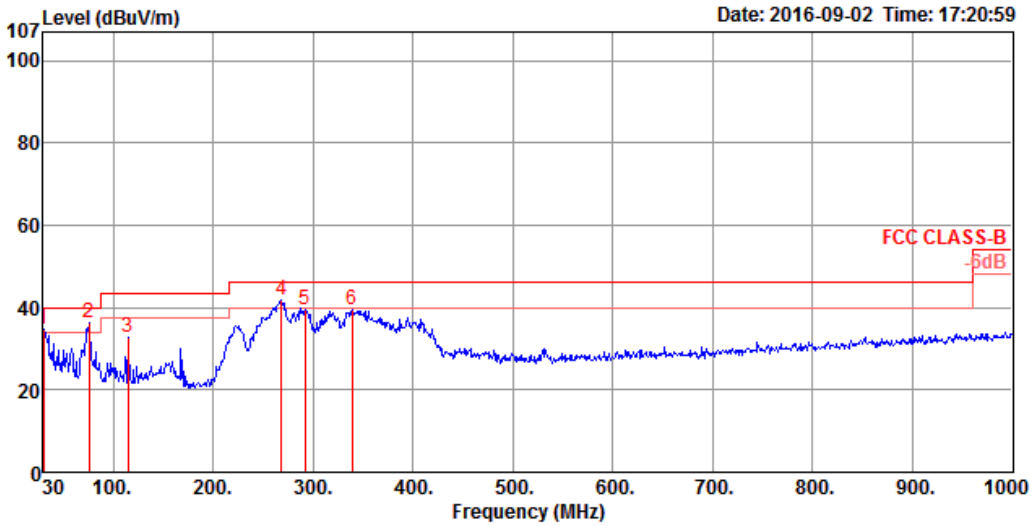
Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	20207.20	50.25	83.54	-33.29	55.99	8.63	37.68	52.05	109	233	Peak	HORIZONTAL
2	20212.40	36.64	63.54	-26.90	42.38	8.63	37.68	52.05	109	233	Average	HORIZONTAL

<EUT 2>

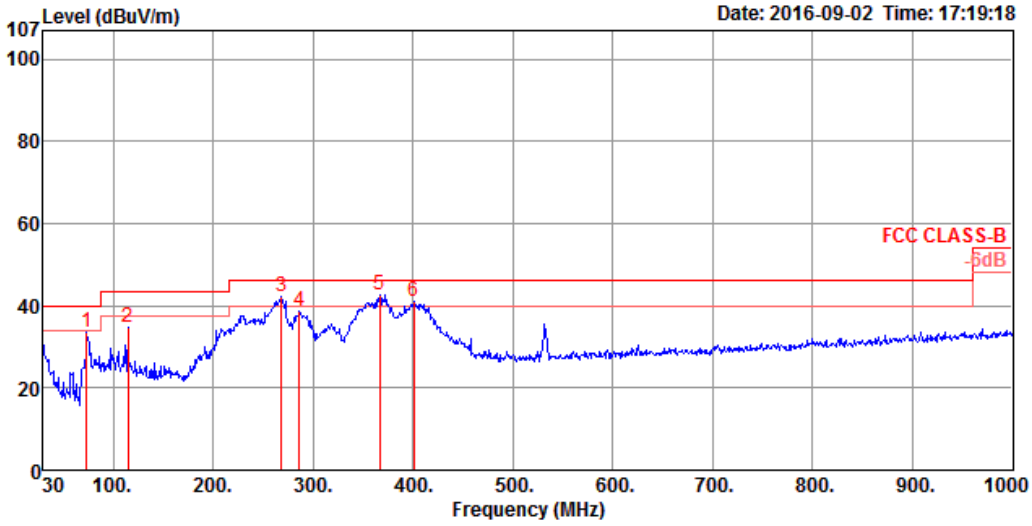
Temp	24°C	**Humidity**	54%
Test Engineer	Paul Chen / Welson Chen	**Test Distance**	3 m
Test Range	30 MHz – 1000 MHz	**Test Configuration**	CTX

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	30.00	34.74	40.00	-5.26	41.45	0.53	25.40	32.64	100	101	Peak	VERTICAL
2	75.59	36.50	40.00	-3.50	55.46	0.87	12.76	32.59	200	126	Peak	VERTICAL
3	114.39	32.77	43.50	-10.73	46.30	1.06	17.98	32.57	150	163	Peak	VERTICAL
4	268.62	41.91	46.00	-4.09	53.46	1.63	19.35	32.53	150	189	Peak	VERTICAL
5	291.90	39.65	46.00	-6.35	51.05	1.68	19.44	32.52	100	197	Peak	VERTICAL
6	339.43	39.52	46.00	-6.48	49.53	1.81	20.71	32.53	125	153	Peak	VERTICAL

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	73.65	33.63	40.00	-6.37	52.78	0.86	12.59	32.60	200	173	Peak	HORIZONTAL
2	114.39	34.76	43.50	-8.74	48.29	1.06	17.98	32.57	150	187	Peak	HORIZONTAL
3	268.62	42.08	46.00	-3.92	53.63	1.63	19.35	32.53	100	78	Peak	HORIZONTAL
4	286.08	38.82	46.00	-7.18	50.36	1.66	19.32	32.52	125	52	Peak	HORIZONTAL
5	366.59	42.67	46.00	-3.33	51.91	1.88	21.41	32.53	100	242	Peak	HORIZONTAL
6	400.54	41.08	46.00	-4.92	49.47	1.95	22.20	32.54	100	124	Peak	HORIZONTAL

Temp	24°C	Humidity	54%
Test Engineer	Paul Chen / Welson Chen	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Freq. (GHz)	60.48
Test Date	Sep. 02, 2016		

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	3000.04	40.78	54.00	-13.22	37.93	6.24	28.50	31.89	132	76	Average	VERTICAL
2	3000.06	46.69	74.00	-27.31	43.84	6.24	28.50	31.89	132	76	Peak	VERTICAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	3000.01	43.55	74.00	-30.45	40.70	6.24	28.50	31.89	100	356	Peak	HORIZONTAL
2	3000.95	34.20	54.00	-19.80	31.35	6.24	28.50	31.89	100	356	Average	HORIZONTAL

Temp	24°C	Humidity	54%
Test Engineer	Paul Chen / Welson Chen	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Freq. (GHz)	60.48
Test Date	Sep. 02, 2016		

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	21039.00	38.17	63.54	-25.37	43.36	8.79	37.63	51.61	106	136	Average	VERTICAL
2	21042.30	51.19	83.54	-32.35	56.38	8.79	37.65	51.63	106	136	Peak	VERTICAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	21038.90	50.68	63.54	-12.86	55.87	8.79	37.63	51.61	111	307	Average	HORIZONTAL
2	21044.20	37.28	63.54	-26.26	42.47	8.79	37.65	51.63	111	307	Average	HORIZONTAL

Temp	24°C	**Humidity**	54%
Test Engineer	Paul Chen / Welson Chen	**Test Date**	Sep. 02, 2016~Oct. 07, 2016
Test Range	40GHz – 200GHz		

<EUT 1>

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
60.48	23	0.30	40.62	-74.67

<EUT 2>

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
60.48	23	0.30	40.61	-73.17

3.6 Frequency Stability

3.6.1 Limit of Frequency Stability

Frequency Stability	Limit
Refer as FCC 15.255(e) and ANSI C63.10-2013, clause 9.14	within the frequency bands
Note: These measurements shall also be performed at normal and extreme test conditions.	

3.6.2 Measuring Instruments

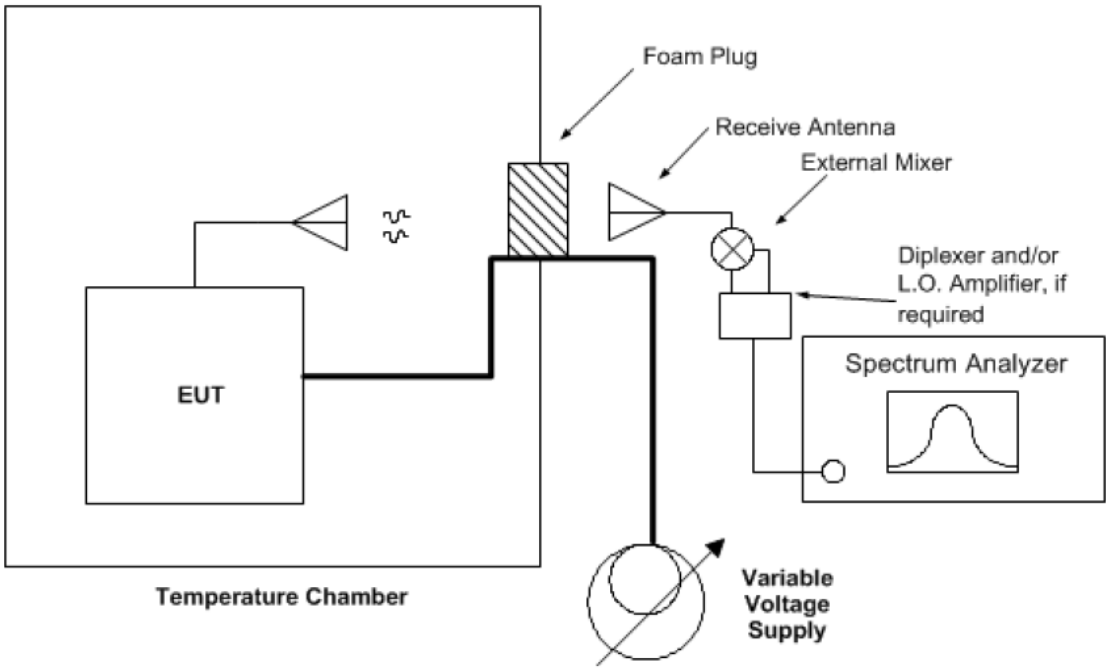
Refer a measuring instruments list in this test report.

3.6.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 9.14.

3.6.4 Test Setup

Frequency Stability



3.6.5 Test Result of Frequency Stability

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.14
NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes.	

3.6.5.1 Frequency Stability with Respect to Ambient Temperature

Frequency Stability with Respect to Ambient Temperature			
Temp	22℃	**Humidity**	54%
Test Engineer	Paul Chen / Welson Chen	**Test Date**	Sep. 02, 2016~Oct. 07, 2016

<EUT 1>

Test Results			
Test Temperature (°C)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
-25	60314.5162	1.70	Within band
-20	60314.5172	2.70	Within band
-10	60314.5159	1.40	Within band
0	60314.5147	0.20	Within band
10	60314.5176	3.10	Within band
20	60314.5145	Reference	Within band
30	60314.5147	0.20	Within band
40	60314.5176	3.10	Within band
50	60314.5131	-1.40	Within band
60	60314.5177	3.20	Within band
70	60314.5156	1.10	Within band
80	60314.5111	-3.40	Within band
85	60314.5177	3.20	Within band

NOTE:

1. For the applicable limit, see FCC 15.255(e).

2. The manufacturer's specified temperature range of -25 to +85°C.

<EUT 2>

Test Results			
Test Temperature (°C)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
-25	60479.4471	-16.30	Within band
-20	60479.4575	-5.90	Within band
-10	60479.4516	-11.80	Within band
0	60479.4745	11.10	Within band
10	60479.4747	11.30	Within band
20	60479.4634	Reference	Within band
30	60479.4758	12.40	Within band
40	60479.4814	18.00	Within band
50	60479.4877	24.30	Within band
60	60479.4856	22.20	Within band
70	60479.4527	-10.70	Within band
80	60479.4475	-15.90	Within band
85	60479.4475	-15.90	Within band

NOTE:

1. For the applicable limit, see FCC 15.255(e).

2. The manufacturer’s specified temperature range of -25 to +85°C.

3.6.5.2 Frequency Stability When Varying Supply Voltage

Frequency Stability When Varying Supply Voltage			
Temp	22℃	**Humidity**	54%
Test Engineer	Paul Chen / Welson Chen	**Test Date**	Sep. 02, 2016~Oct. 07, 2016

<EUT 1>

Test Results			
Test Voltage: (Vdc)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
4.25	60314.5179	3.40	Within band
5	60314.5145	Reference	Within band
5.75	60314.5169	2.40	Within band
NOTE: For the applicable limit, see FCC 15.255(e).			

<EUT 2>

Test Results			
Test Voltage: (Vdc)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
4.25	60479.4476	-15.80	Within band
5	60479.4634	Reference	Within band
5.75	60479.4479	-15.50	Within band
NOTE: For the applicable limit, see FCC 15.255(e).			

3.7 Operation Restriction and Group Installation

3.7.1 Limit of Operation Restriction and Group Installation

Item	Limit
Operation Restriction	Operation is not permitted for the following products: ♦ Equipment used on aircraft or satellites. (Refer as FCC 15.255 (a)) ♦ Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. (Refer as FCC 15.255 (a))
Group Installation	Operation is not permitted for the following products: ♦ External phase-locking (Refer as FCC 15.255(g))

3.7.2 Result of Operation Restriction

Manufacturer declares that EUT will not been used on aircraft or satellites. Then user manual will include a statement to caution EUT is not permitted for used on aircraft or satellites. EUT is a wireless video area network (WVAN) for the connection of consumer electronic (CE) audio and video devices.

3.7.3 Result of Group Installation

The frequency, amplitude and phase of the transmit signal are set within the EUT. There are no external phase-locking inputs or any other means of combining two or more units together to realize a beam-forming array.

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 27, 2016	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 08, 2015	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 23, 2015	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 24, 2016	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 30, 2016	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 22, 2015	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 25, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Mar. 15, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 18, 2016	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jun. 18, 2016	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 16, 2016	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
Mixer	OML	M19HW/A	U91113-1	40 ~ 60 GHz	Sep. 09, 2015*	Radiation (03CH01-CB)
Mixer	OML	M15HW/A	V91113-1	50 ~ 75 GHz	Sep. 14, 2015*	Radiation (03CH01-CB)
Mixer	OML	M12HW/A	E91113-1	60 ~ 90 GHz	Sep. 17, 2015*	Radiation (03CH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Mixer	OML	M08HW/A	F91113-1	90 ~ 140 GHz	Sep. 21, 2015*	Radiation (03CH01-CB)
*Mixer	OML	M05HW/A	G91113-1	140 ~ 220 GHz	Sep. 24, 2015*	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	HO19R	U91113-A	40 ~ 60 GHz	Sep. 09, 2015*	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	HO15R	V91113-A	50 ~ 75 GHz	Sep. 14, 2015*	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	HO12R	E91113-A	60 ~ 90 GHz	Sep. 17, 2015*	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	HO08R	F91113-A	90 ~ 140 GHz	Sep. 21, 2015*	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	HO05R	G91113-A	140 ~ 220 GHz	Sep. 24, 2015*	Radiation (03CH01-CB)
Detector	Millitech	DET-15-RPFW0	#A16473(038)	50 ~ 75 GHz	Dec. 29, 2015*	Radiation (03CH01-CB)
Pico Scope	Pico	Pico Scope 6402C	CX372/002	N/A	Jul. 06, 2016	Radiation (03CH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2016	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.
"*" Calibration Interval of instruments listed above is two years.
NCR means Non-Calibration required.

5 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 220GHz)	4.7 dB	Confidence levels of 95%
Temperature	0.7°C	Confidence levels of 95%