FCC Radio Test Report

Equipment	: Metrolinq Outdoor 60GHz PTP + 5 GHz
Brand Name	: IgniteNet
Model No.	: ML-60-35, ML-60-35-1
FCC ID	: HED-ML6035
Standard	: 47 CFR FCC Part 15.255
Applicant	: Accton Technology Corporation No. 1, Creation Rd. III, Science-based Industrial Park Hsin Chu 30077, Taiwan R.O.C
Manufacturer	: Joy Technology (ShenZhen) Corporation HengKeng Ind., Shangpai, Shangwu,Aiqun Rd., Shiyan Town,Shenzhen 518108 China

The product sample received on Nov. 30, 2015 and completely tested on Dec. 18, 2015. 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.

Sam Chen
SPORTON INTERNATIONAL INC.

TAF
Testing Laboratory
1190

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Summary of Test Result

Standard Requirements and Conformance Test Specifications				
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3.1	FCC 15.207	AC Power Conducted Emissions	Complied	-
3.2	FCC 15.255(e)	Occupied Bandwidth	Complied	-
3.3	FCC 15.255(b)(1)	EIRP Power	Complied	-
3.4	FCC 15.255(e)	Peak Conducted Power	Complied	-
3.5	FCC 15.255(c)	Transmitter Spurious Emissions	Complied	-
3.6	FCC 15.255(f)	Frequency Stability	Complied	-
3.7	FCC 15.255(a),(h)	Operation Restriction and Group Installation	Complied	-

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR5N2614AA	Rev. 01	Initial issue of report	Dec. 29, 2015

1 General Description

1.1 Information

1.1.1 The Channel Plan(s)

RF General Information	
Frequency Range	57-64 GHz
The Channel Plan(s)	Channel 1: 58.32 GHz Channel 2: 60.48 GHz Channel 3: 62.64 GHz

1.1.2 Table of Modulation

MCS index	Modulation	N_{CBPS}	Repetition	Code rate	Data rate (Mbps)
1	π/2-BPSK	1	2	1/2	385
2	π/2-BPSK	1	1	1/2	770
3	π/2-BPSK	1	1	5/8	962.5
4	π/2-BPSK	1	1	3/4	1155
5	π/2-BPSK	1	1	13/16	1251.25
6	π/2-QPSK	2	1	1/2	1540
7	π/2-QPSK	2	1	5/8	1925
8	π/2-QPSK	2	1	3/4	2310
9	π/2-QPSK	2	1	13/16	2502.5
10	π/2-16QAM	4	1	1/2	3080
11	π/2-16QAM	4	1	5/8	3850
12	π/2-16QAM	4	1	3/4	4620

1.1.3 Antenna Information

Ant.	Brand	P/N	Antenna Type	Connector	Antenna Gain (dBi)	Cable Loss (dB)	True Gain (dBi)	Remark
1	IgniteNet	FS5-19N-120	Sector Ant. (PATCH ARRAY)	Type-N	19	1	18	External (5GHz use)

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)		Remark
					Band 1	Band 4	
2	Accton	123400001084A	Dish Ant.	N/A	12.33	15.35	Internal (5G&60G use)

1.1.4 EUT Operational Condition

EUT Power Type	From PoE

1.1.5 Table for Multiple Listing

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

The difference is the type of the antenna equipped.

Model Name	5GHz	60GHz	Remark
ML-60-35	Internal / Dish Ant.	Internal / Dish Ant.	Outdoor use
ML-60-35-1	External / Sector Ant.	Internal / Dish Ant.	

Note: Both models were tested and recorded in the report for 5GHz. But for 60GHz, only the model: ML-60-35 was tested and recorded in the report.

1.1.6 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

1.1.7 User Condition

Intended Operation
☐ Indoor only
☒ Outdoor only

1.1.8 Duty Cycle

Duty Cycle			Duty Cycle Factor
The transmitter is intended for	**Low Channel**	100%	0.00
	Middle Channel	100%	0.00
	High Channel	100%	0.00

1.2 Accessories

N/A

1.3 Support Equipment

For AC Power Conducted Emissions Test:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB*3	DELL	E6430	DoC
2	PoE*2	ITE	NU24-F240100-I2	N/A
3	60G+5G WLAN AP (Device)	Accton	OAP920920	N/A
4	Flash disk3.0	Transcend	639205 7755	DoC
5	Voltage and current device	HUA	85C1-50V	N/A

For Transmitter Spurious Emissions (below 1 GHz) Test:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB*3	DELL	E4300	DoC
2	PoE*2	ITE	NU24-F240100-I2	N/A
3	60G+5G WLAN AP (Device)	Accton	OAP920920	N/A
4	Flash disk3.0	Silicon Power	B06	DoC
5	Voltage and current device	HUA	85C1-50V	N/A

For Other Test Items:

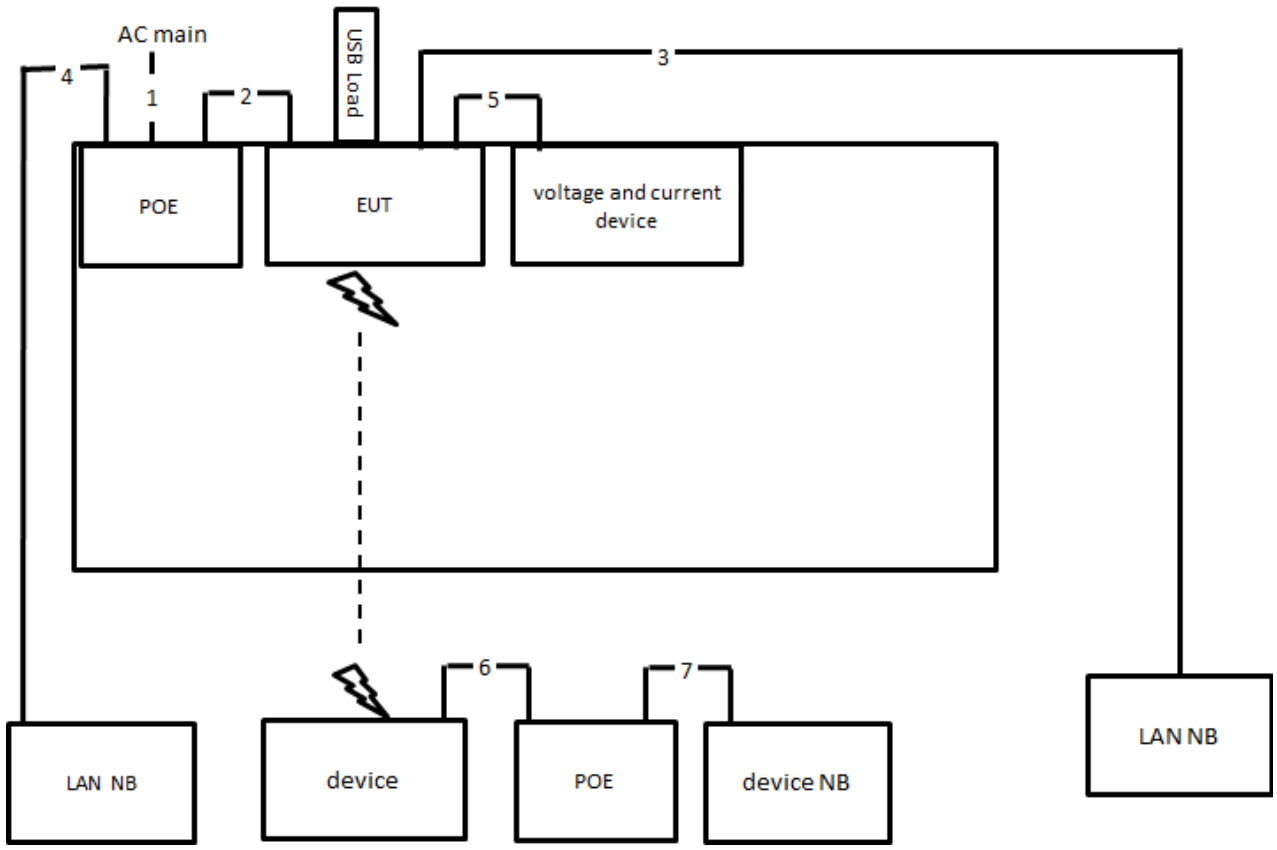
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E4300	DoC
2	PoE	ITE	NU24-F240100-I2	NA

1.4 EUT Operation during Test

During the test, “DOS” under WIN 7 was executed the test program to control the EUT continuously transmit RF signal.

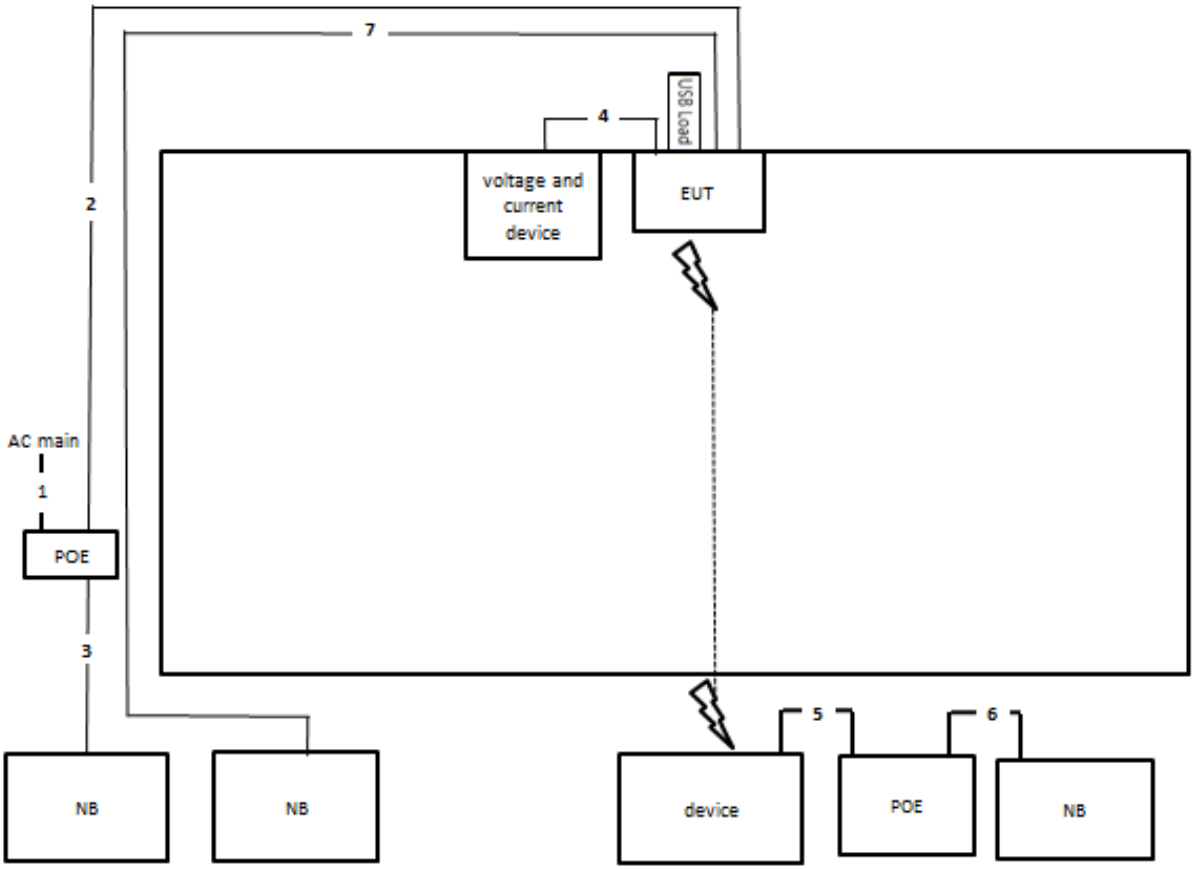
1.5 Test Setup Diagram

Test Setup Diagram - AC Power Conducted Emissions



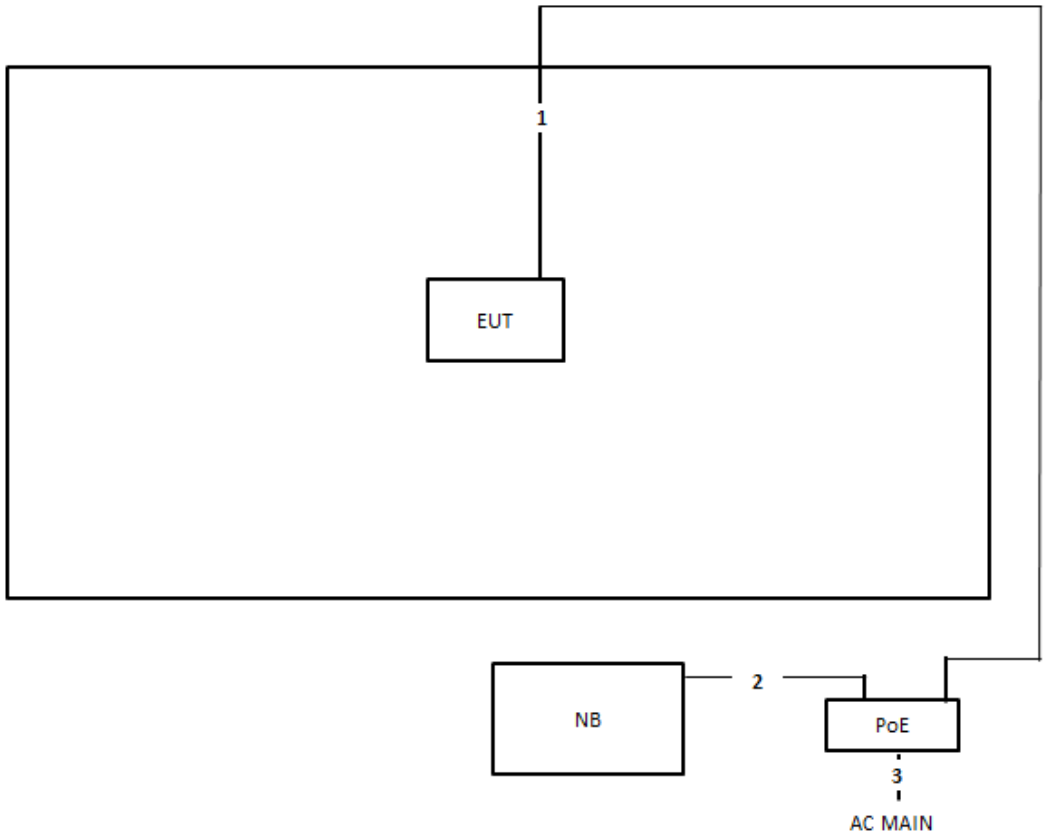
Item	Connection	Shield	Length(m)
1	Power cable	No	1m
2	RJ-45 cable	No	1.5m
3	RJ-45 cable	No	10m
4	RJ-45 cable	No	10m
5	Console cable	No	0.4m
6	RJ-45 cable	No	1.5m
7	RJ-45 cable	No	1.5m

Test Setup Diagram - Transmitter Spurious Emissions below 1 GHz



Item	Connection	Shielded	Length(m)
1	Power cable	No	1m
2	RJ-45 cable	No	10m
3	RJ-45 cable	No	1.5m
4	Console cable	No	0.4m
5	RJ-45 cable	No	1.5m
6	RJ-45 cable	No	1.5m
7	RJ-45 cable	No	10m

Test Setup Diagram - Transmitter Spurious Emissions above 1 GHz



Item	Connection	Shielded	Length(m)
1	RJ-45 cable	No	10m
2	RJ-45 cable	No	0.5m
3	Power cable	No	0.3m

1.6 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”

1.7 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

Test Channel Frequencies Configuration	
Low Channel (GHz)	58.32
Middle Channel (GHz)	60.48
High Channel (GHz)	62.64

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)
AC Power Conducted Emissions	Normal Link
Occupied Bandwidth	58.32, 60.48, 62.64
EIRP Power	58.32, 60.48, 62.64
Peak Conducted Power	58.32, 60.48, 62.64
Transmitter Spurious Emissions (below 1 GHz)	Normal Link
Transmitter Spurious Emissions (1 GHz-40 GHz)	58.32, 60.48, 62.64
Transmitter Spurious Emissions (above 40 GHz)	58.32, 60.48, 62.64
Frequency Stability	Un-Modulation

Note1:

The power of EUT is supplied by PoE. But the PoE is for measurement only, and it would not be marketed.

Equipment	Brand Name	Model Name
PoE	ITE	NU24-F240100-I2

Note2: The USB port can not be used by end user.

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)**
58.32	0.35	0.0051440	47.628	4762.80
60.48	0.35	0.0049603	49.392	4939.20
62.64	0.35	0.0047893	51.156	5115.60

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

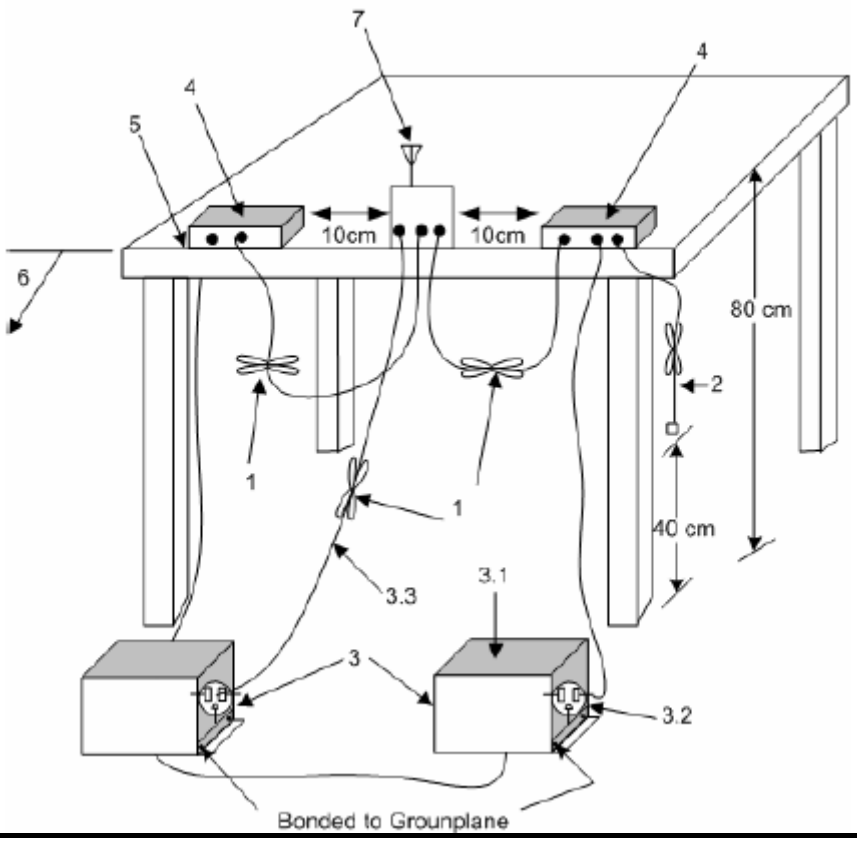
Refer a measuring instruments list in this test report.

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.

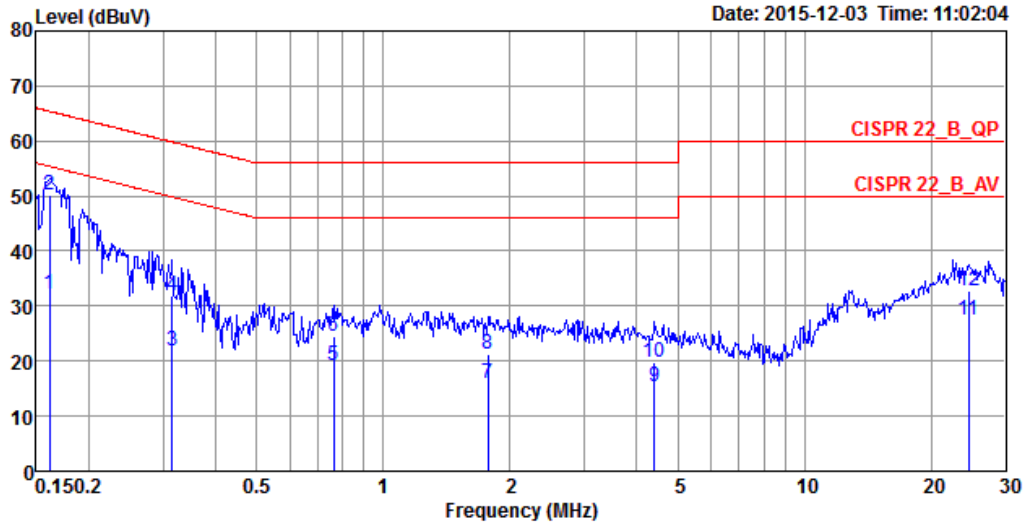
3.1.5 Test Result of AC Power Conducted Emissions

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.

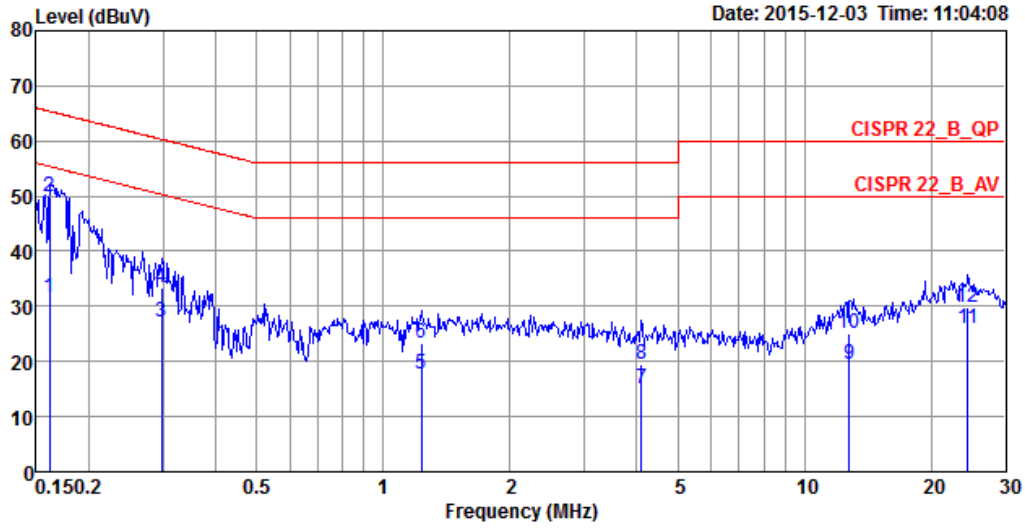
NOTE 2: “>20dB” means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.1.

Temp	25°C	**Humidity**	58%
Test Engineer	Parody Lin	**Phase**	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1616	32.03	-23.35	55.38	22.08	9.93	0.02	LINE	Average
2	0.1616	50.15	-15.23	65.38	40.20	9.93	0.02	LINE	QP
3	0.3149	21.99	-27.85	49.84	12.02	9.93	0.04	LINE	Average
4	0.3149	31.85	-27.99	59.84	21.88	9.93	0.04	LINE	QP
5	0.7630	19.32	-26.68	46.00	9.34	9.95	0.03	LINE	Average
6	0.7630	24.45	-31.55	56.00	14.47	9.95	0.03	LINE	QP
7	1.7716	16.03	-29.97	46.00	5.99	9.98	0.06	LINE	Average
8	1.7716	21.39	-34.61	56.00	11.35	9.98	0.06	LINE	QP
9	4.4071	15.35	-30.65	46.00	5.23	10.04	0.08	LINE	Average
10	4.4071	19.77	-36.23	56.00	9.65	10.04	0.08	LINE	QP
11	24.5291	27.56	-22.44	50.00	16.73	10.56	0.27	LINE	Average
12	24.5291	32.85	-27.15	60.00	22.02	10.56	0.27	LINE	QP

Temp	25°C	Humidity	58%
Test Engineer	Parody Lin	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1616	31.49	-23.89	55.38	21.69	9.78	0.02	NEUTRAL	Average
2	0.1616	49.74	-15.64	65.38	39.94	9.78	0.02	NEUTRAL	QP
3	0.2971	27.14	-23.18	50.32	17.31	9.79	0.04	NEUTRAL	Average
4	0.2971	33.44	-26.88	60.32	23.61	9.79	0.04	NEUTRAL	QP
5	1.2291	17.76	-28.24	46.00	7.89	9.82	0.05	NEUTRAL	Average
6	1.2291	23.38	-32.62	56.00	13.51	9.82	0.05	NEUTRAL	QP
7	4.0920	15.13	-30.87	46.00	5.19	9.87	0.07	NEUTRAL	Average
8	4.0920	19.45	-36.55	56.00	9.51	9.87	0.07	NEUTRAL	QP
9	12.7837	19.48	-30.52	50.00	9.16	10.07	0.25	NEUTRAL	Average
10	12.7837	25.01	-34.99	60.00	14.69	10.07	0.25	NEUTRAL	QP
11	24.3995	25.86	-24.14	50.00	15.32	10.27	0.27	NEUTRAL	Average
12	24.3995	29.87	-30.13	60.00	19.33	10.27	0.27	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

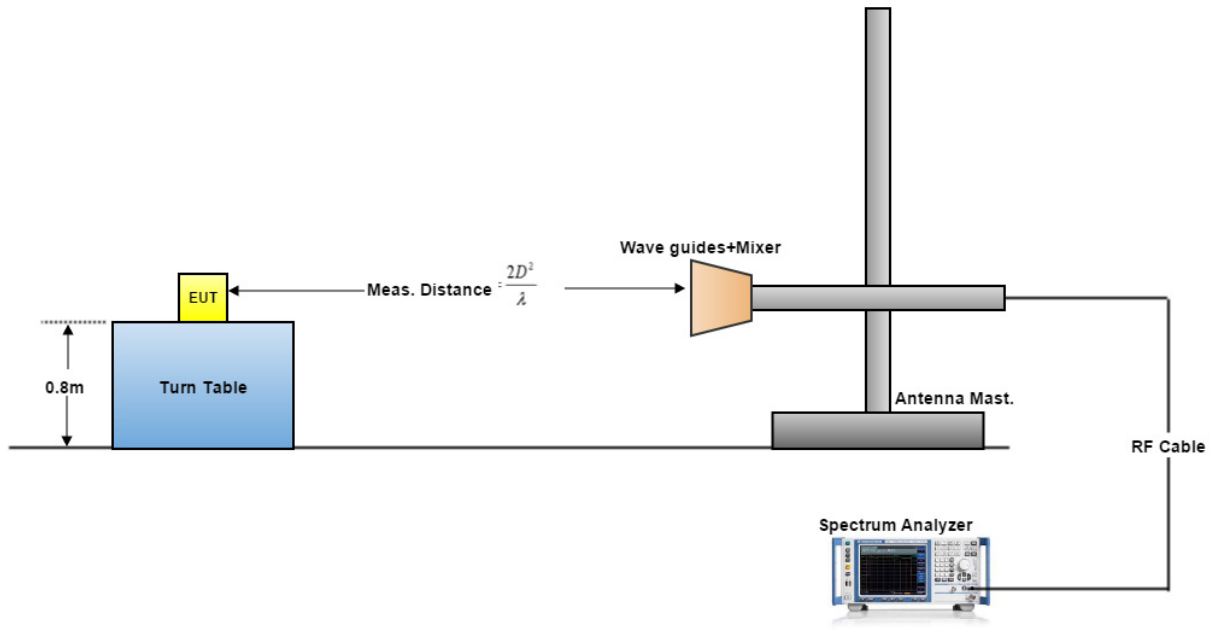
Refer a measuring instruments list in this test report.

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	24℃	**Humidity**	60%
Test Engineer	Gary Chu		

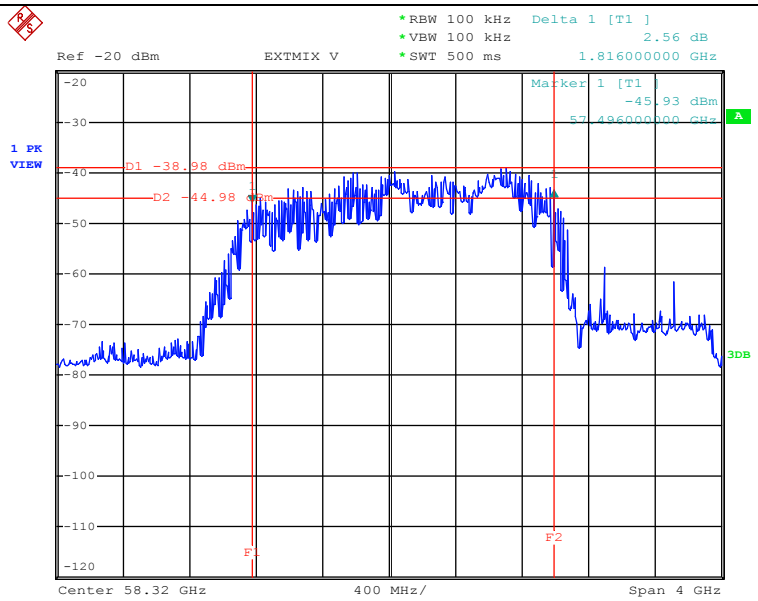
Test Results

Test Freq. (GHz)	6 dBc Bandwidth (MHz)	Occupied Bandwidth (MHz)	26 dBc Bandwidth (MHz)	Limit (MHz)
58.32	1816.00	1960.00	2992.00	N/A
60.48	1824.00	1944.00	2184.00	N/A
62.64	1768.00	1952.00	3216.00	N/A

3.2.5.1 Bandwidth Plots

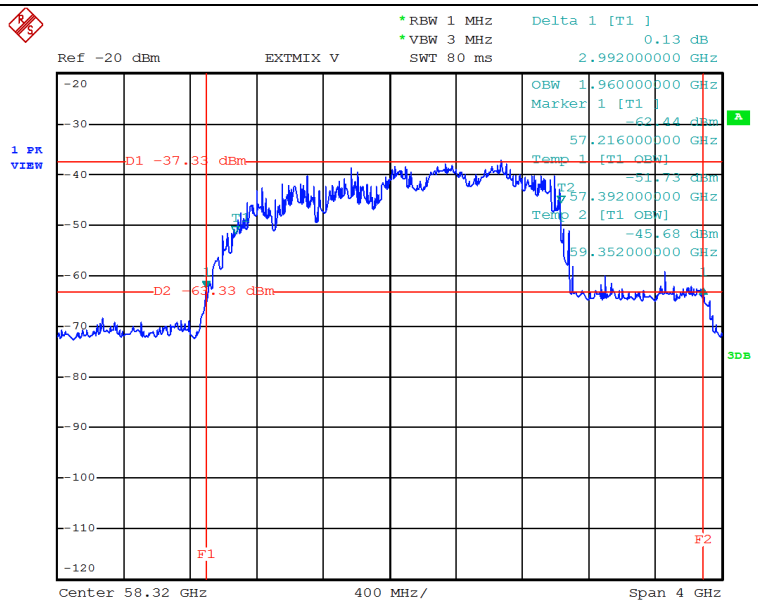
Test Frequency: 58.32 GHz

6 dBc Bandwidth



Date: 17.DEC.2015 14:32:01

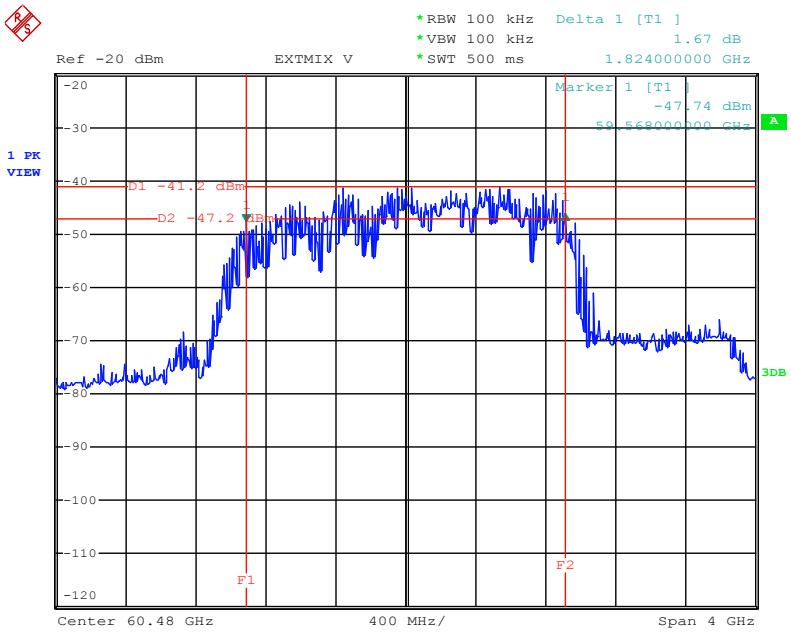
Occupied Bandwidth&26 dBc Bandwidth



Date: 17.DEC.2015 16:36:40

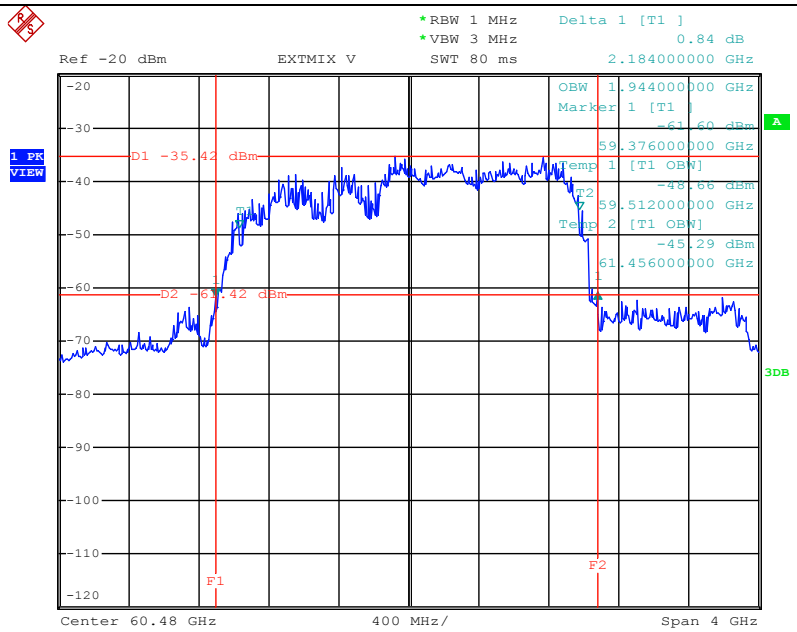
Test Frequency: 60.48 GHz

6 dBc Bandwidth



Date: 17.DEC.2015 15:10:38

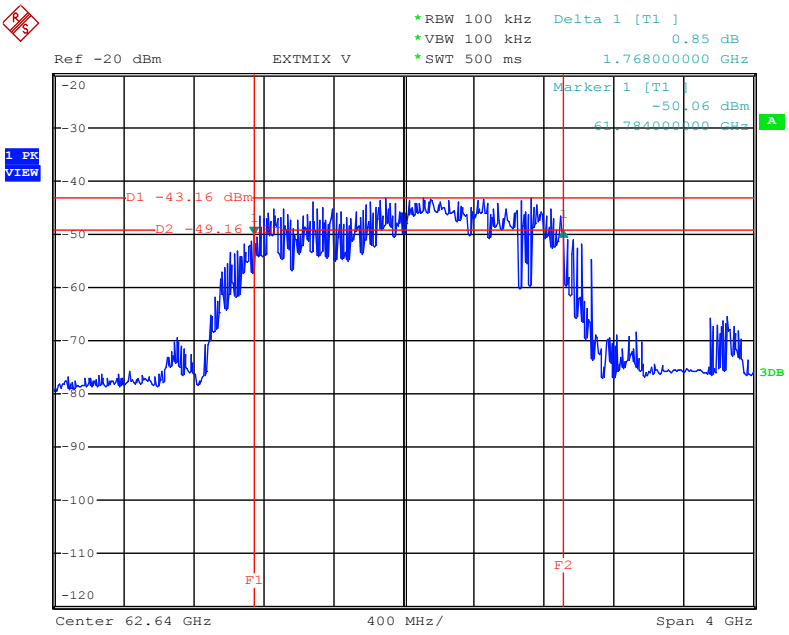
Occupied Bandwidth&26 dBc Bandwidth



Date: 17.DEC.2015 15:34:36

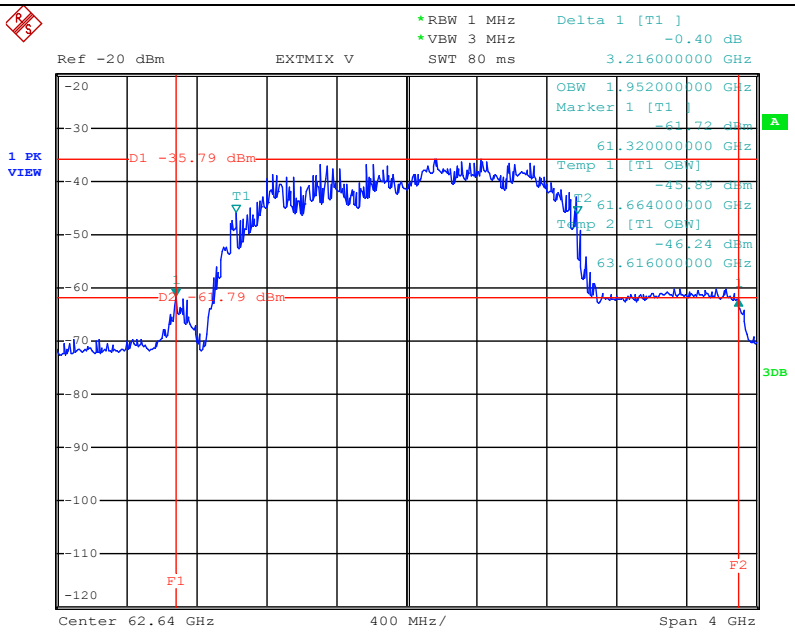
Test Frequency: 62.64 GHz

6 dBc Bandwidth



Date: 17.DEC.2015 16:19:26

Occupied Bandwidth&26 dBc Bandwidth



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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	10.08 dBm	13.09 dBm
Except fixed field disturbance sensors at 61-61.5GHz	N/A	10.08 dBm
Except fixed field disturbance sensors(indoor)	40.08 dBm	43.08 dBm
Except fixed field disturbance sensors(outdoor)	82 dBm	85 dBm
NOTE: For the applicable limit, see FCC 15.255 (b)		

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

3.3.2 Measuring Instruments

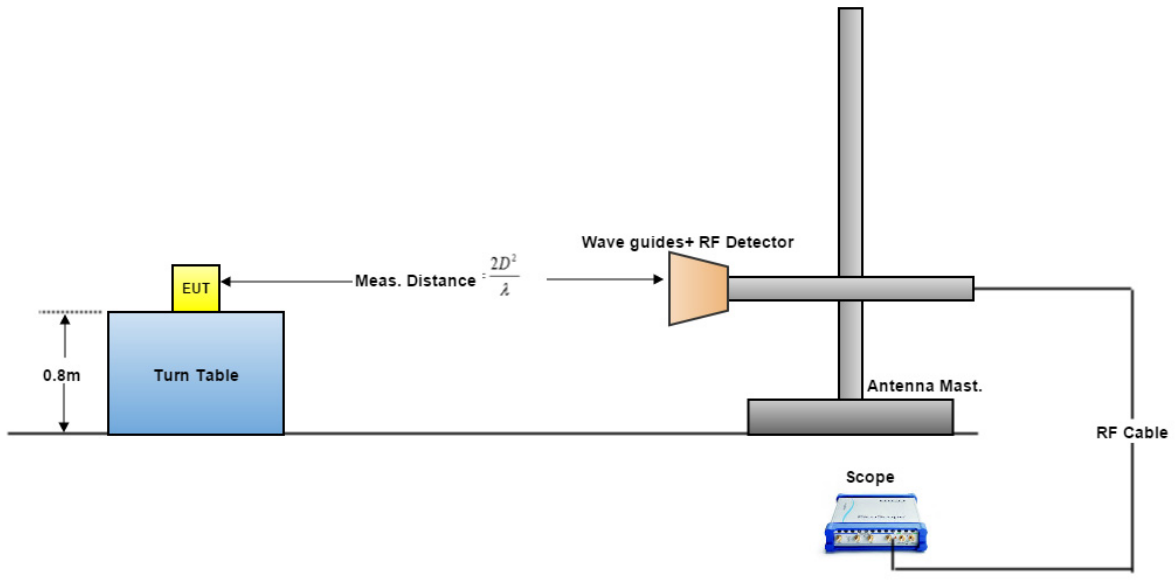
Refer a measuring instruments list in this test report.

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	24℃	Humidity	60%
Test Engineer	Gary Chu	Test Distance	58.32 GHz/60.48 GHz: 50m 62.64 GHz: 55m
Test Date	Dec. 18, 2015		

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
58.32	130	24	-24.49	-33.57	125.08	116.00	54.36	45.28	85	82
60.48	197	41	-21.65	-30.86	128.24	119.03	57.52	48.31	85	82
62.64	130	21	-24.58	-33.91	125.61	116.28	55.72	46.39	85	82

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(e)	
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	24℃	Humidity	60%
Test Engineer	Gary Chu		
Test Date	Dec. 18, 2015		

Test Results

Test Freq. (GHz)	EIRP (dBm)	Max. Ant. Gain	Peak Power (dBm) (note1)	Peak Power (mW)	6dBc BW (MHz) (note2)	Peak Power Limit (mW) (note3)
58.32	54.36	42	12.36	17.232	1816.00	9080.00
60.48	57.52	42	15.52	35.639	1824.00	9120.00
62.64	55.72	42	13.72	23.561	1768.00	8840.00

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(e)

NOTE 5: 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. NOTE 3: publicly-accessible coordination channel, whose purpose is to coordinate operation between diverse transmitters with a view towards reducing the probability of interference throughout the 57-64 GHz band, are permitted in the 57-57.05 GHz band. The development of standards for this channel shall be performed pursuant to authorizations issued under part 5 of this chapter.	

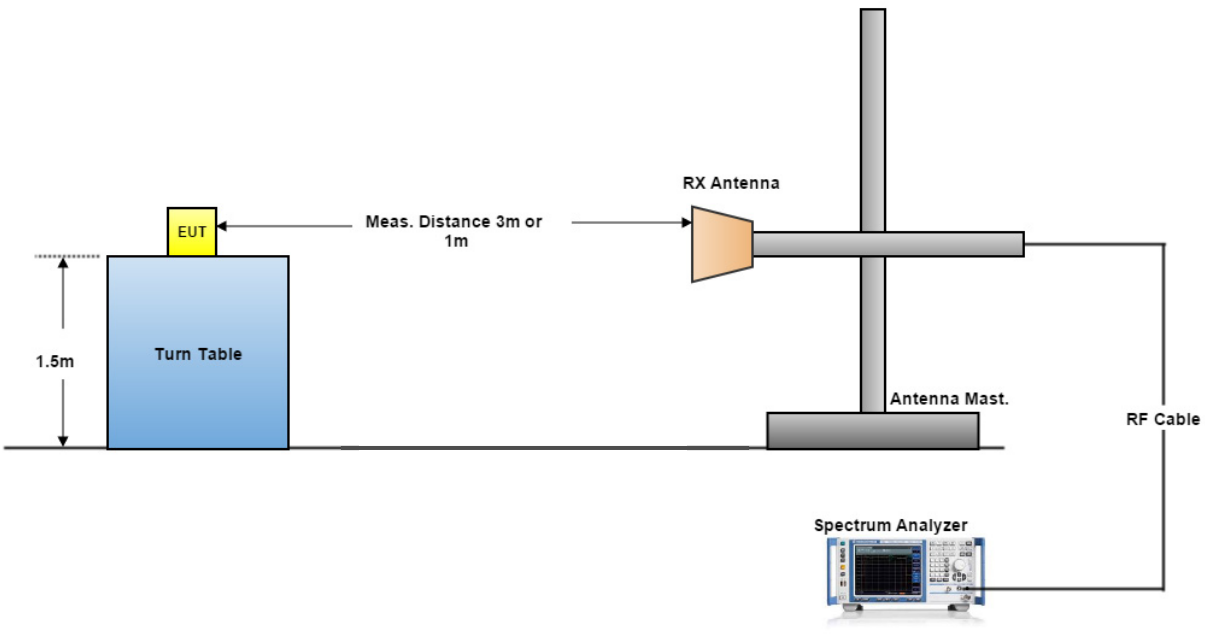
3.5.2 Test Procedures

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

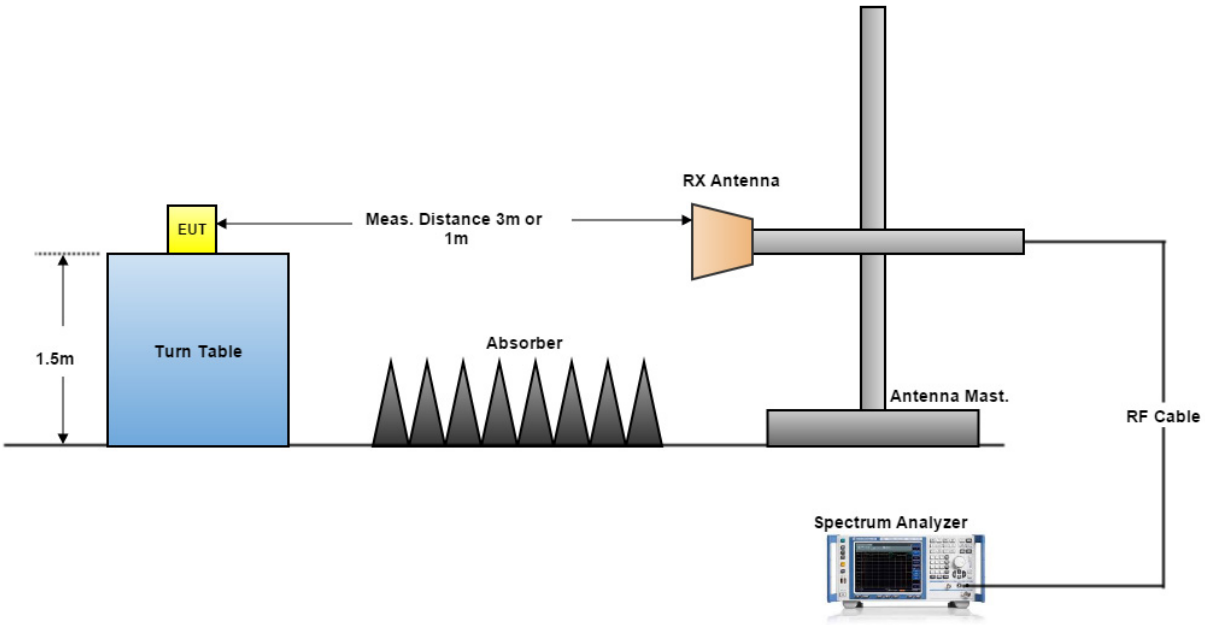
3.5.3 Test Setup

Transmitter Spurious Emissions

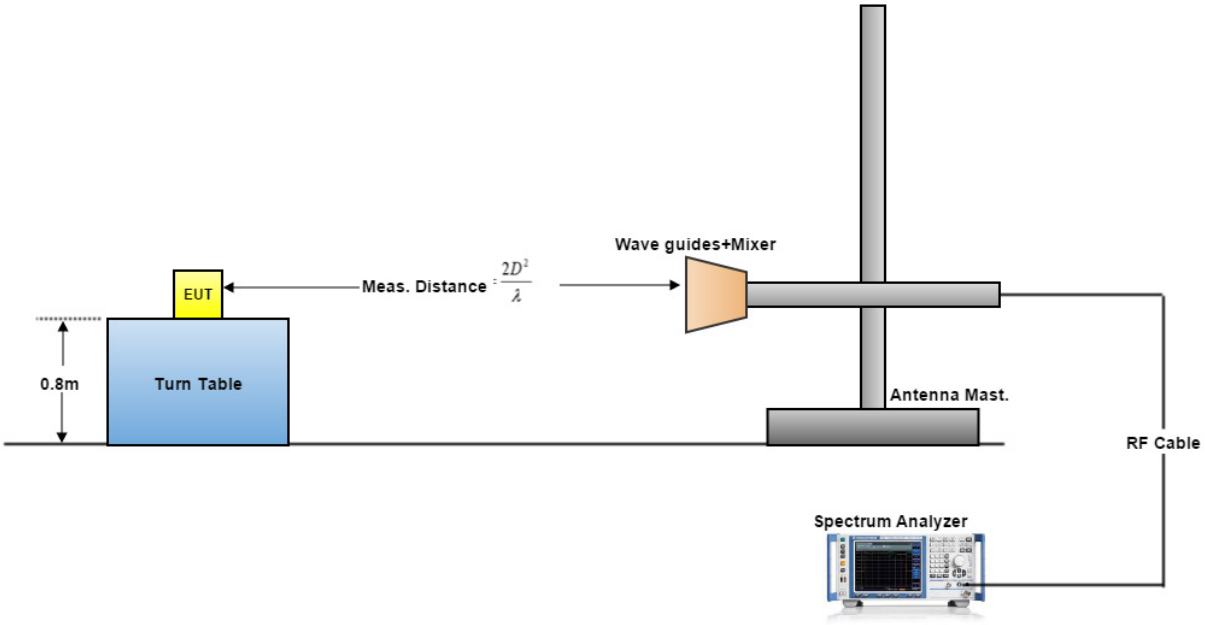
30MHz~1GHz



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.

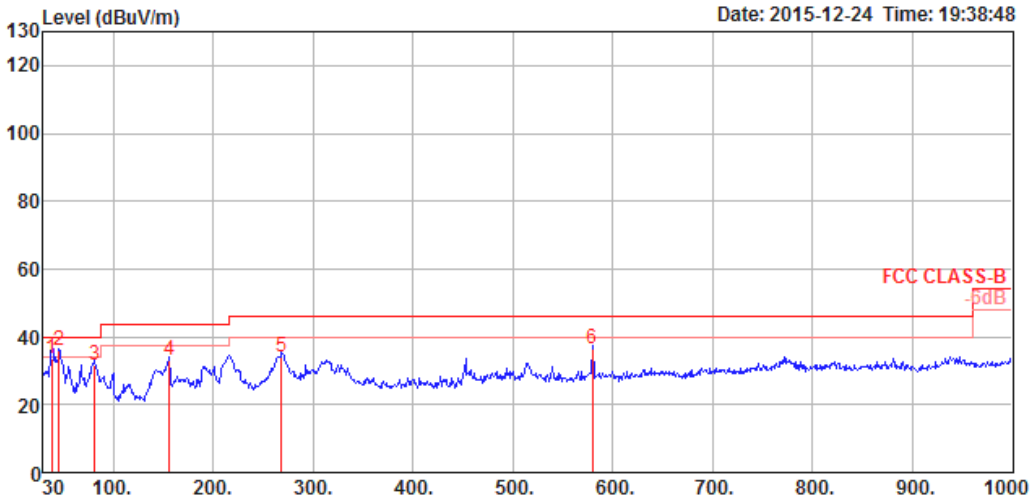
3.5.4 Test Result of Transmitter Spurious Emissions

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

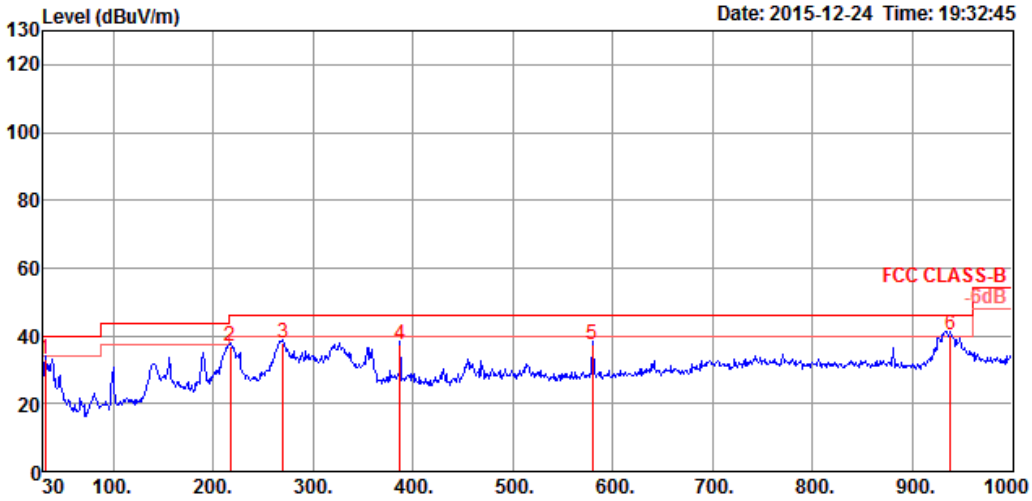
Temp	25°C	**Humidity**	61%
Test Engineer	Paul Chen/ Peter Wu	**Test Distance**	3 m
Test Range	30 MHz – 1000 MHz	**Test Configuration**	Normal Link

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	38.73	33.51	40.00	-6.49	50.57	0.54	14.81	32.41	100	179	QP	VERTICAL
2	45.52	35.77	40.00	-4.23	56.50	0.60	11.08	32.41	125	211	QP	VERTICAL
3	81.41	31.46	40.00	-8.54	55.20	0.79	7.87	32.40	150	173	QP	VERTICAL
4	156.10	33.21	43.50	-10.29	53.50	1.07	10.99	32.35	100	173	QP	VERTICAL
5	268.62	34.04	46.00	-11.96	51.20	1.39	13.74	32.29	300	63	QP	VERTICAL
6	579.99	36.24	46.00	-9.76	47.50	2.09	19.05	32.40	400	259	QP	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	31.94	33.17	40.00	-6.83	46.20	0.50	18.87	32.40	100	212	QP	HORIZONTAL
2	217.21	36.87	46.00	-9.13	57.31	1.26	10.62	32.32	200	45	QP	HORIZONTAL
3	269.59	38.02	46.00	-7.98	55.19	1.40	13.72	32.29	200	75	QP	HORIZONTAL
4	386.96	37.31	46.00	-8.69	51.60	1.70	16.33	32.32	300	358	QP	HORIZONTAL
5	579.99	37.24	46.00	-8.76	48.50	2.09	19.05	32.40	300	281	QP	HORIZONTAL
6	937.92	40.31	46.00	-5.69	47.20	2.65	21.84	31.38	100	50	QP	HORIZONTAL

Temp	24°C	**Humidity**	60%
Test Engineer	Gary Chu	**Test Distance**	3 m
Test Range	1 GHz – 18 GHz	**Test Configuration**	Normal Link
Test Freq.	Channel 1: 58.32 GHz	**Test Date**	Dec. 01, 2015

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	1145.51	51.67	74.00	-22.33	60.47	2.47	24.27	35.54	354	143	Peak	VERTICAL
2	1150.00	39.35	54.00	-14.65	48.11	2.47	24.29	35.52	354	143	Average	VERTICAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	1173.40	45.21	74.00	-28.79	53.80	2.49	24.39	35.47	6	163	Peak	HORIZONTAL
2	1173.40	41.79	54.00	-12.21	50.38	2.49	24.39	35.47	6	163	Average	HORIZONTAL

Temp	24°C	Humidity	60%
Test Engineer	Gary Chu	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Configuration	Normal Link
Test Freq.	Channel 2: 60.48 GHz	Test Date	Dec. 01, 2015

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	1147.07	51.59	74.00	-22.41	60.38	2.47	24.27	35.53	2	149	Peak	VERTICAL
2	1149.96	39.25	54.00	-14.75	48.01	2.47	24.29	35.52	2	149	Average	VERTICAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	1167.27	45.52	74.00	-28.48	54.15	2.49	24.37	35.49	359	136	Peak	HORIZONTAL
2	1173.36	41.62	54.00	-12.38	50.21	2.49	24.39	35.47	359	136	Average	HORIZONTAL

Temp	24°C	Humidity	60%
Test Engineer	Gary Chu	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Configuration	Normal Link
Test Freq.	Channel 3: 62.64 GHz	Test Date	Dec. 01, 2015

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	1173.36	41.53	54.00	-12.47	50.12	2.49	24.39	35.47	355	143	Average	HORIZONTAL
2	1175.60	45.57	74.00	-28.43	54.14	2.50	24.40	35.47	355	143	Peak	HORIZONTAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	1147.40	49.52	74.00	-24.48	58.29	2.47	24.29	35.53	355	149	Peak	VERTICAL
2	1150.28	39.20	54.00	-14.80	47.96	2.47	24.29	35.52	355	149	Average	VERTICAL

Temp	24°C	**Humidity**	60%
Test Engineer	Gary Chu	**Test Distance**	1 m
Test Range	18 GHz – 40 GHz	**Test Configuration**	Normal Link
Test Freq.	Channel 1: 58.32 GHz	**Test Date**	Dec. 01, 2015

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	18560.64	49.78	83.54	-33.76	55.70	8.50	37.89	52.31	307	165	Peak	VERTICAL
2	18564.84	36.39	63.54	-27.15	42.32	8.51	37.87	52.31	307	165	Average	VERTICAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	18556.64	36.68	63.54	-26.86	42.60	8.50	37.89	52.31	359	165	Average	HORIZONTAL
2	18560.68	49.50	83.54	-34.04	55.42	8.50	37.89	52.31	359	165	Peak	HORIZONTAL

Temp	24°C	**Humidity**	60%
Test Engineer	Gary Chu	**Test Distance**	1 m
Test Range	18 GHz – 40 GHz	**Test Configuration**	Normal Link
Test Freq.	Channel 2: 60.48 GHz	**Test Date**	Dec. 01, 2015

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	21154.96	38.68	63.54	-24.86	43.84	8.81	37.75	51.72	297	165	Average	VERTICAL
2	21158.64	51.88	83.54	-31.66	57.04	8.81	37.75	51.72	297	165	Peak	VERTICAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	21153.80	51.56	83.54	-31.98	56.72	8.81	37.75	51.72	72	165	Peak	HORIZONTAL
2	21155.44	38.78	63.54	-24.76	43.94	8.81	37.75	51.72	72	165	Average	HORIZONTAL

Temp	24°C	Humidity	60%
Test Engineer	Gary Chu	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Configuration	Normal Link
Test Freq.	Channel 3: 62.64 GHz	Test Date	Dec. 01, 2015

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	20680.08	37.22	63.54	-26.32	42.66	8.72	37.73	51.89	18	165	Average	VERTICAL
2	20696.04	50.92	83.54	-32.62	56.34	8.73	37.72	51.87	18	165	Peak	VERTICAL

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	20682.24	37.18	63.54	-26.36	42.62	8.72	37.73	51.89	322	165	Average	HORIZONTAL
2	20695.96	50.55	83.54	-32.99	55.97	8.73	37.72	51.87	322	165	Peak	HORIZONTAL

Temp	24°C	Humidity	60%
Test Engineer	Gary Chu	Test Date	Dec. 18, 2015
Test Range	40GHz – 200GHz		

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
58.32	23	3	41.16	-84.42
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/m^2)**	**Limit (pW/cm^2)**	**Test Result**
-33.15	3	4.2847	90.00	Complied

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
60.48	23	3	41.16	-84.05
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/m^2)**	**Limit (pW/cm^2)**	**Test Result**
-32.78	3	4.6657	90.00	Complied

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
62.64	23	3	41.16	-84.16
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/m^2)**	**Limit (pW/cm^2)**	**Test Result**
-32.89	3	4.5490	90.00	Complied

3.6 Frequency Stability

3.6.1 Limit of Frequency Stability

Frequency Stability	Limit
Refer as FCC 15.255(f) 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

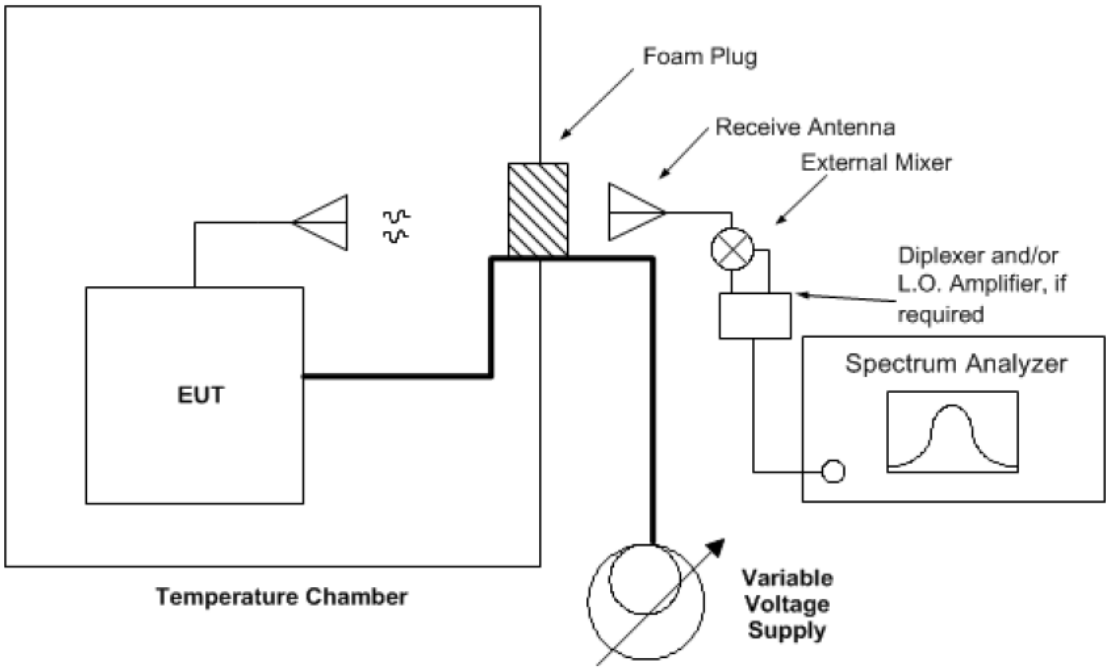
Refer a measuring instruments list in this test report.

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	24℃	**Humidity**	60%
Test Engineer	Gary Chu	**Test Date**	Dec. 18, 2015
Test Results			
Test Temperature (°C)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
-40	60511.5000	17252.500	Within band
-30	60511.0000	16752.500	Within band
-20	60511.4000	17152.500	Within band
-10	60511.5000	17252.500	Within band
0	60476.0000	-18247.500	Within band
10	60476.9500	-17297.500	Within band
20	60494.2475	Reference	Within band
30	60490.0000	-4247.500	Within band
40	60497.2500	3002.500	Within band
50	60511.0000	16752.500	Within band
60	60511.5000	17252.500	Within band
70	60512.2500	22250.000	Within band
NOTE: 1. For the applicable limit, see FCC 15.255(f). 2. The manufacturer's specified temperature range of -40 to 70°C.			

3.6.5.2 Frequency Stability When Varying Supply Voltage

Frequency Stability When Varying Supply Voltage			
Temp	24℃	**Humidity**	60%
Test Engineer	Gary Chu	**Test Date**	Dec. 18, 2015
Test Results			
Test Voltage: (Vdc)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
20.4	60495.3000	1052.500	Within band
24	60494.2475	Reference	Within band
27.6	60495.7000	1452.500	Within band
NOTE: For the applicable limit, see FCC 15.255(f).			

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 (h))

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.

3.8 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100355	9kHz ~ 2.75GHz	Apr. 22, 2015	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 16, 2015	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 13, 2015	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 25, 2015	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 12, 2015*	Radiation (03CH01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	37880	20MHz ~ 2GHz	Sep. 03, 2015	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. 21, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Feb. 24, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 2015	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Feb.10, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
EMI Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8.4GHz	Jan. 21, 2015	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)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
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)
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)
Pico Scope	Pico	Pico Scope 6402C	CX372/002	N/A	Jul. 06, 2015	Radiation (03CH01-CB)
RF Detector	millitech	DET-15-RPFW0	38	50 ~ 75 GHz	Oct. 31, 2015*	Radiation (03CH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 02, 2015	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

* Calibration Interval of instruments listed above is two year.

N.C.R. means Non-Calibration required.

4 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%