FCC RADIO TEST REPORT

FCC ID	:	2ALBB-J1
Equipment	:	Audio Adapter HD
Brand Name	:	Essential
Model Name	:	J1
Applicant	:	Essential Products Inc. 380 Portage Ave., Palo Alto, CA 94306,USA
Standard	:	47 CFR FCC Part 15.255

The product was received on Jul. 23, 2018, and testing was started from Aug. 20, 2018 and completed on Sep. 13, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, 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, Millimeter Wave Test Procedures and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

Approved by: Cliff Chang

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FR820628	01	Initial issue of report	Sep. 13, 2018

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	FCC 15.207	AC Power Conducted Emissions	PASS	-
3.2	FCC 15.255(e)	Occupied Bandwidth	PASS	-
3.3	FCC 15.255(c)	EIRP Power	PASS	-
3.4	FCC 15.255(c)	Peak Conducted Power	PASS	-
3.5	FCC 15.255(d)	Transmitter Spurious Emissions	PASS	-
3.6	FCC 15.255(f)	Frequency Stability	PASS	-
3.7	FCC 15.255(a),(h)	Operation Restriction and Group Installation	PASS	-

Reviewed by: Sam Chen

Report Producer: Wendy Pan

1 General Description

1.1 Information

1.1.1 The Channel Plan(s)

Frequency Range	57-71 GHz
Operating Frequency (GHz)	60.48 GHz

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	SiBeam	SB6213CZU	Integral	N/A	2

1.1.3 Power Levels

Worst Power Levels for MRP			
Applicable power levels	☐ Conducted ☒ EIRP		
Antenna gain	2 dBi		
Frequency (GHz)	Highest setting (P_{high}): (dBm)		
	Modulation	AV Power	Peak Power
60.48	BPSK	-15.30	-3.72

1.1.4 Extreme Operating

The Extreme Operating Temperature Range that Apply to the Equipment			
☒ -10 °C to +55 °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 1.7	V

1.1.5 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

1.1.6 User Condition

Intended Operation
☒ Indoor
☒ Outdoor (except outdoor fixed Point to Point)
☐ Outdoor fixed Point to Point

1.2 Additional Information Provided by the Submitter

1.2.1 Modulation

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

1.2.2 Duty Cycle

Duty Cycle		Duty Cycle Factor
The transmitter is intended for	100 %	0.00

1.3 Accessories

N/A

1.4 Support Equipment

For Transmitter Spurious Emissions test:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E4300	N/A
2	Sarmt Phone	Essential	A11	2ALBB-A11
3	Fixture	NA	NA	NA

For Conducted Emissions test:

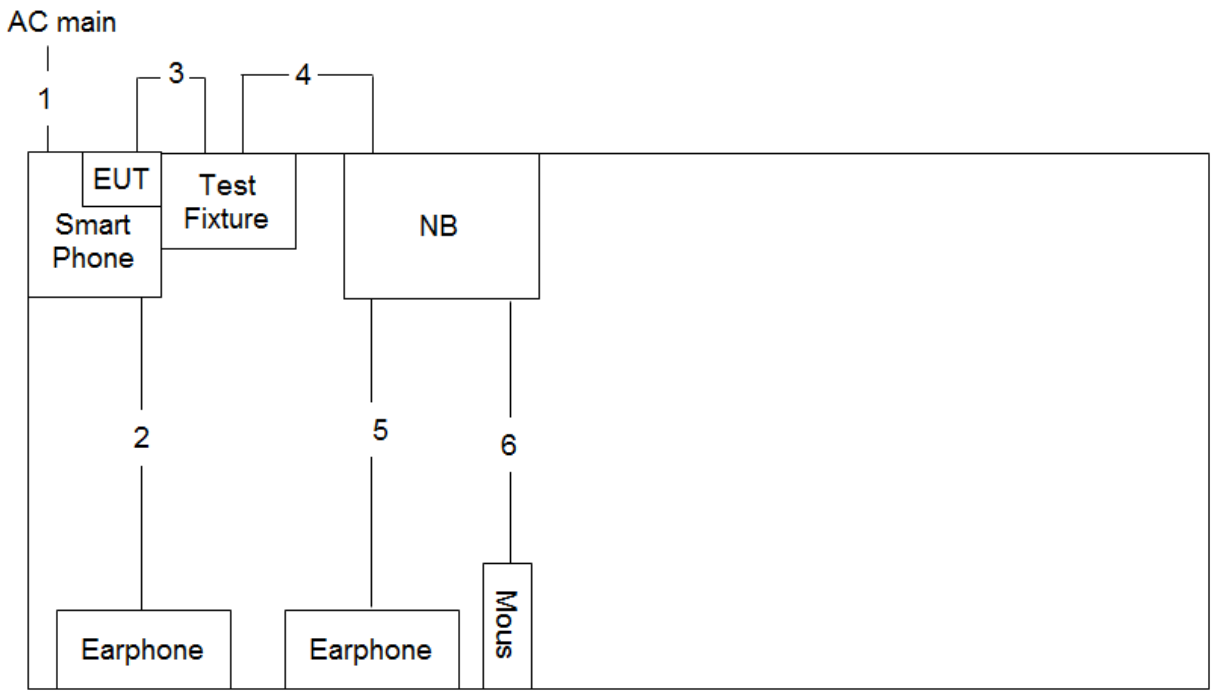
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E6430	NA
2	Test fixture	NA	NA	NA
3	Earphone	SHYARO CHI	MIC-04	NA
4	Mouse	HP	FM100	NA
5	Earphone	e-Power	S90W	N/A
6	Smart Phone	Essential	A11	2ALBB-A11

1.5 EUT Operation during Test

During the test, executed the test program to control the EUT continuously transmit RF signal.

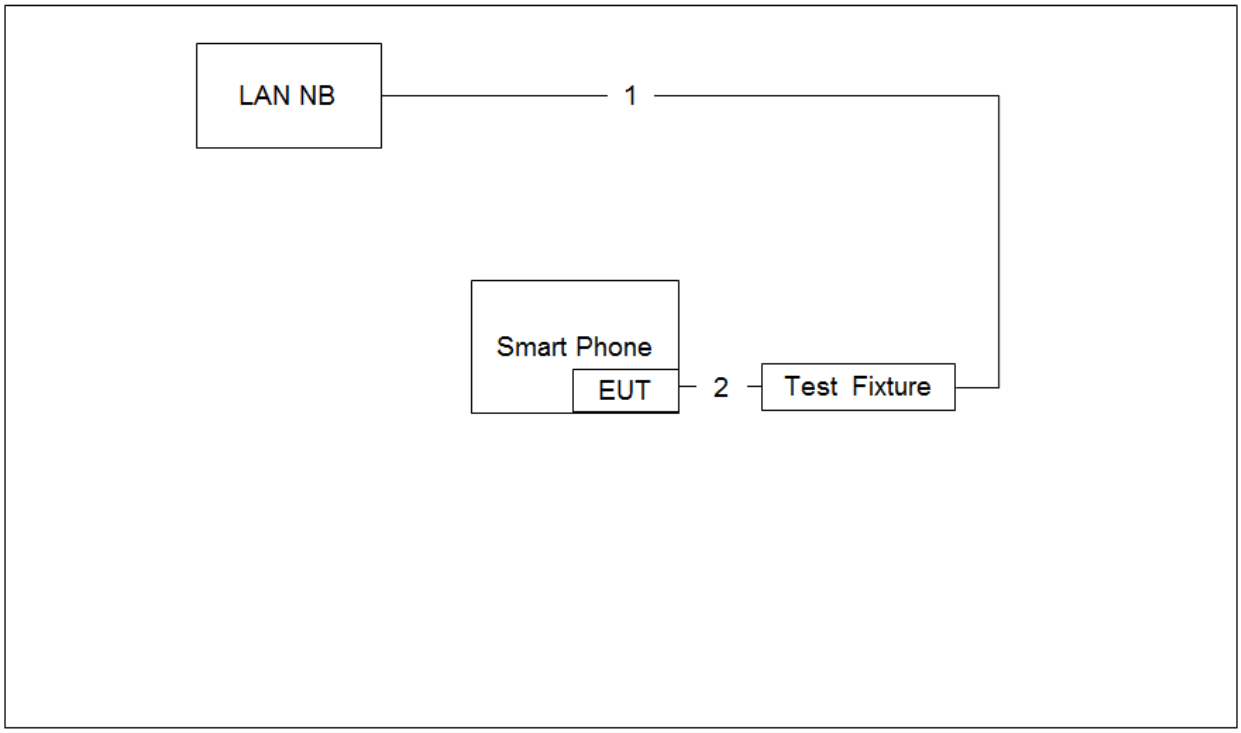
1.6 Test Setup Diagram

Test Setup Diagram - AC Power Conducted Emissions



Item	Connection	Shield	Length
1	Power cable	Yes	1m
2	Audio cable	No	1m
3	Bus cable	No	0.1m
4	USB cable	Yes	1m
5	Audio cable	No	1.8m
6	USB cable	Yes	1.8m

Test Setup Diagram - Transmitter Spurious Emissions



Item	Connection	Shield	Length
1	Micro USB cable	No	1 m
2	Console cable	No	0.05 m

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, Huaya 1st Rd., Guishan Dist., Taoyuan City, 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.			
CO02-CB		03CH01-CB	TH01-CB

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

2 Test Configuration of Equipment under Test

2.1 Test Channel Frequencies

Test Channel Frequencies (GHz)	60.48

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

The following test modes were performed for all tests:

For Transmitter Spurious Emissions (below 1 GHz) test:

The EUT was performed at X axis, Y axis and Z axis position for Transmitter Spurious Emissions (above 1 GHz) test, and the worst case was found at X axis. So the measurement will follow this same test configuration.

Mode 1. EUT in X axis

For Transmitter Spurious Emissions (above 1 GHz) test:

The EUT was performed at X axis, Y axis and Z axis position for Transmitter Spurious Emissions (above 1 GHz) test, and the worst case was found at X axis. So the measurement will follow this same test configuration.

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	0.008	0.0049603	0.026	2.58

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

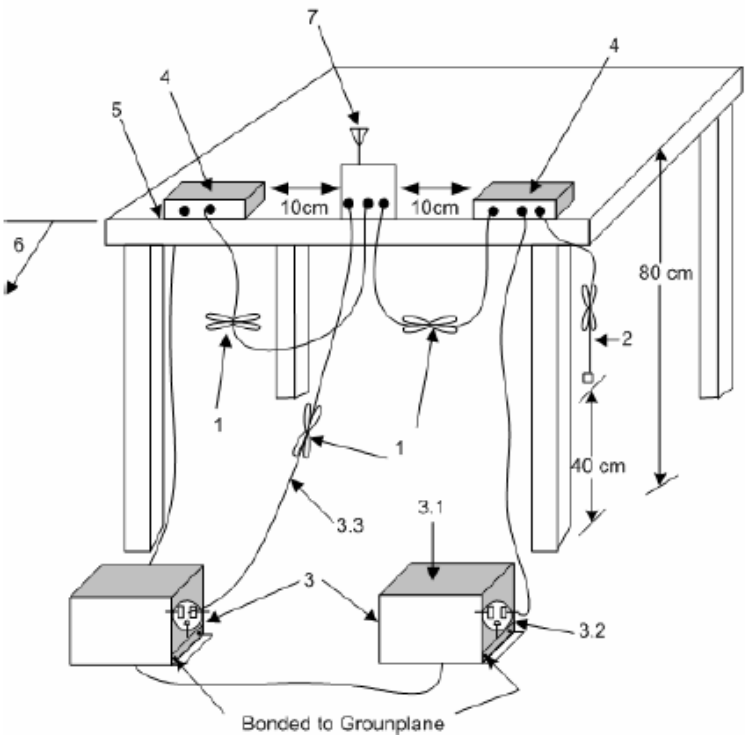
Refer a measuring instruments list in this test report.

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



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.

2—The 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.

3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.

3.1—All other equipment powered from additional LISN(s).

3.2—A multiple-outlet strip may 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.

6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

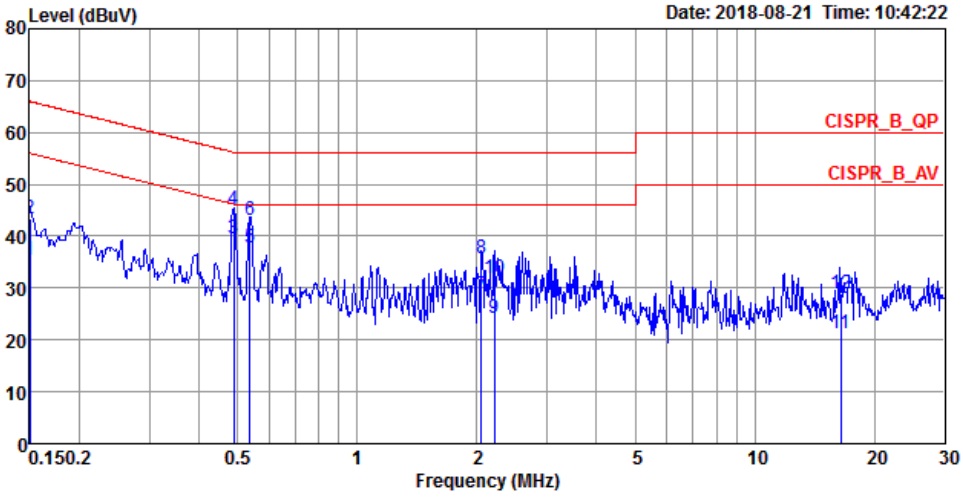
3.1.5 Test Result of AC Power Conducted Emissions

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.

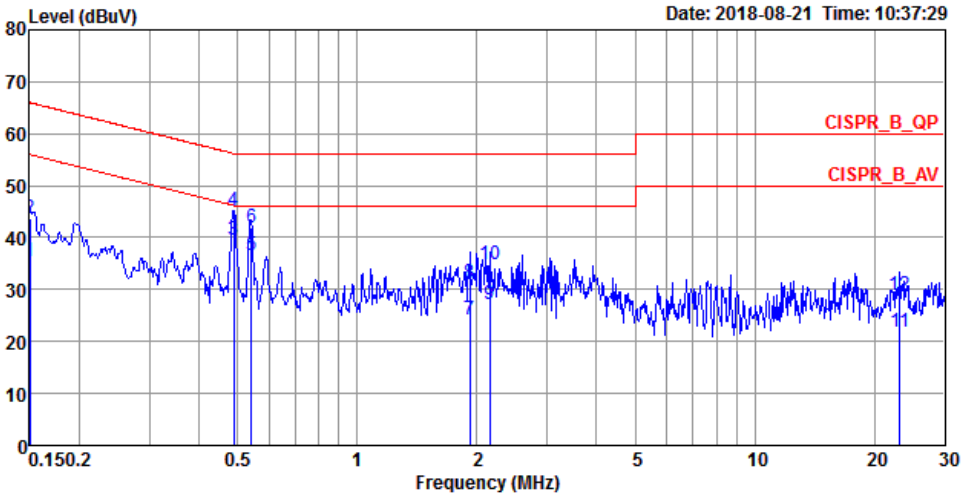
NOTE 2: “>20dB” means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.1.

Temp	24°C	Humidity	63%
Test Engineer	GN Hou	Phase	Line
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	35.52	-20.48	56.00	25.35	10.16	0.01	Average	LINE
2	0.1500	43.48	-22.52	66.00	33.31	10.16	0.01	QP	LINE
3	0.4889	39.60	-6.59	46.19	29.41	10.16	0.03	Average	LINE
4	0.4889	45.04	-11.15	56.19	34.85	10.16	0.03	QP	LINE
5	0.5378	37.80	-8.20	46.00	27.61	10.16	0.03	Average	LINE
6	0.5378	43.21	-12.79	56.00	33.02	10.16	0.03	QP	LINE
7	2.0549	28.63	-17.37	46.00	18.39	10.19	0.05	Average	LINE
8	2.0549	35.62	-20.38	56.00	25.38	10.19	0.05	QP	LINE
9	2.2132	24.24	-21.76	46.00	14.00	10.19	0.05	Average	LINE
10	2.2132	31.74	-24.26	56.00	21.50	10.19	0.05	QP	LINE
11	16.4370	21.32	-28.68	50.00	10.83	10.38	0.11	Average	LINE
12	16.4370	28.98	-31.02	60.00	18.49	10.38	0.11	QP	LINE

Temp	24°C	Humidity	63%
Test Engineer	GN Hou	Phase	Neutral
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	35.29	-20.71	56.00	25.11	10.17	0.01	Average	NEUTRAL
2	0.1500	43.73	-22.27	66.00	33.55	10.17	0.01	QP	NEUTRAL
3	0.4889	39.59	-6.60	46.19	29.39	10.17	0.03	Average	NEUTRAL
4	0.4889	45.06	-11.13	56.19	34.86	10.17	0.03	QP	NEUTRAL
5	0.5407	36.59	-9.41	46.00	26.39	10.17	0.03	Average	NEUTRAL
6	0.5407	42.03	-13.97	56.00	31.83	10.17	0.03	QP	NEUTRAL
7	1.9182	24.27	-21.73	46.00	14.02	10.20	0.05	Average	NEUTRAL
8	1.9182	31.35	-24.65	56.00	21.10	10.20	0.05	QP	NEUTRAL
9	2.1553	27.18	-18.82	46.00	16.93	10.20	0.05	Average	NEUTRAL
10	2.1553	34.93	-21.07	56.00	24.68	10.20	0.05	QP	NEUTRAL
11	23.1404	21.88	-28.12	50.00	11.27	10.44	0.17	Average	NEUTRAL
12	23.1404	28.86	-31.14	60.00	18.25	10.44	0.17	QP	NEUTRAL

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

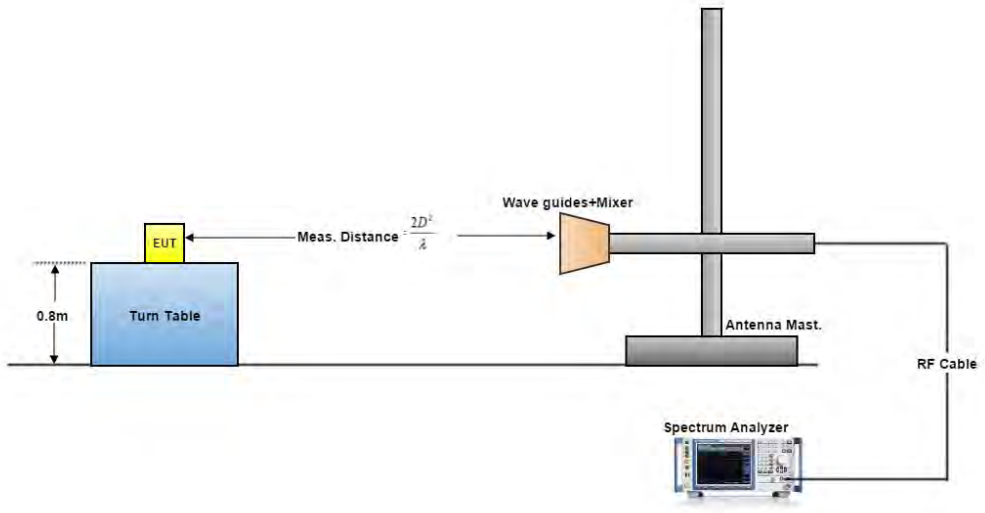
Refer a measuring instruments list in this test report.

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

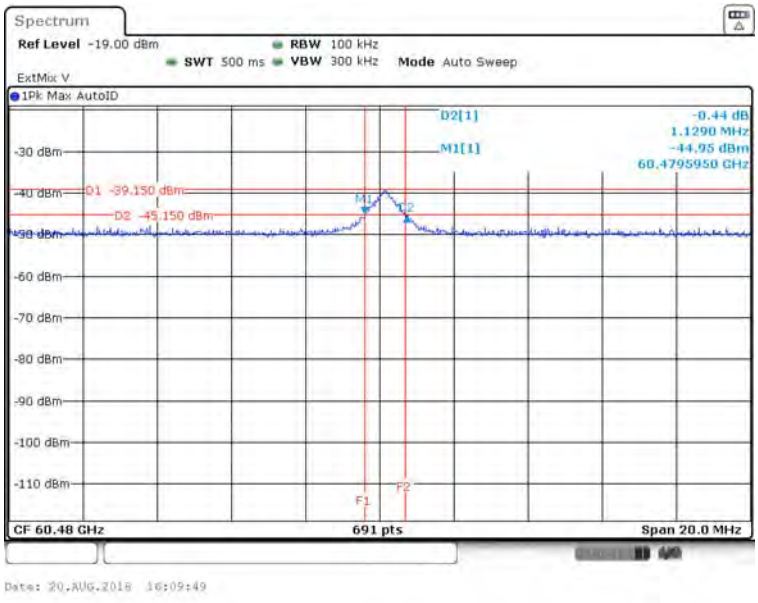
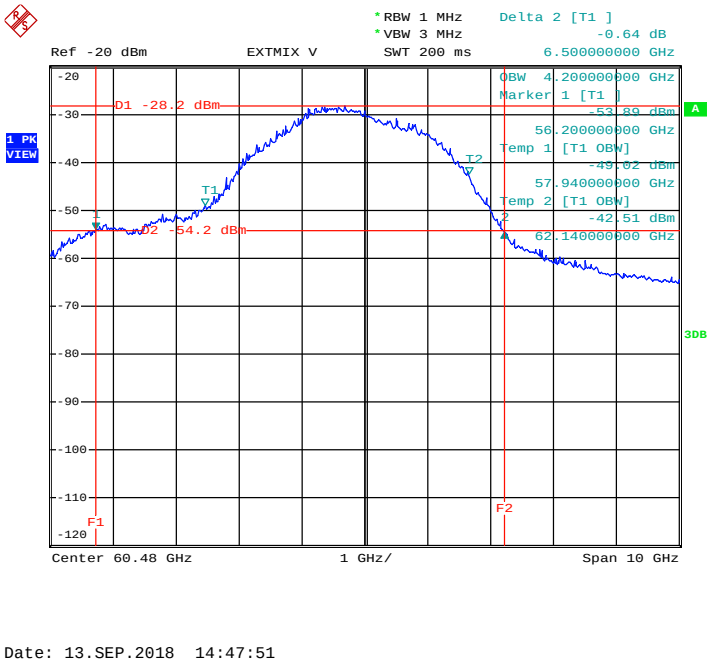
Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.9.2
NOTE: If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating 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	Eason Chen, Lucas Huang		

Test Results

Test Freq. (GHz)	6 dBc Bandwidth (MHz)	Occupied Bandwidth (MHz)	26 dBc Bandwidth (MHz)	Limit (MHz)
60.48	1.129	4200.00	6500.00	N/A

3.2.5.1 Bandwidth Plots

Test Frequency: 60.48 GHz
6 dBc Bandwidth

Occupied Bandwidth&26 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 within the frequency band 61-61.5GHz	40 dBm	43 dBm
Fixed field disturbance sensors at outside of the band 61-61.5GHz	10 dBm	13 dBm
Except fixed field disturbance sensors at 61-61.5GHz	N/A	10 dBm
Except outdoor fixed Point to Point	40 dBm	43 dBm
Outdoor fixed Point to Point	82 dBm	85 dBm

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

3.3.2 Measuring Instruments

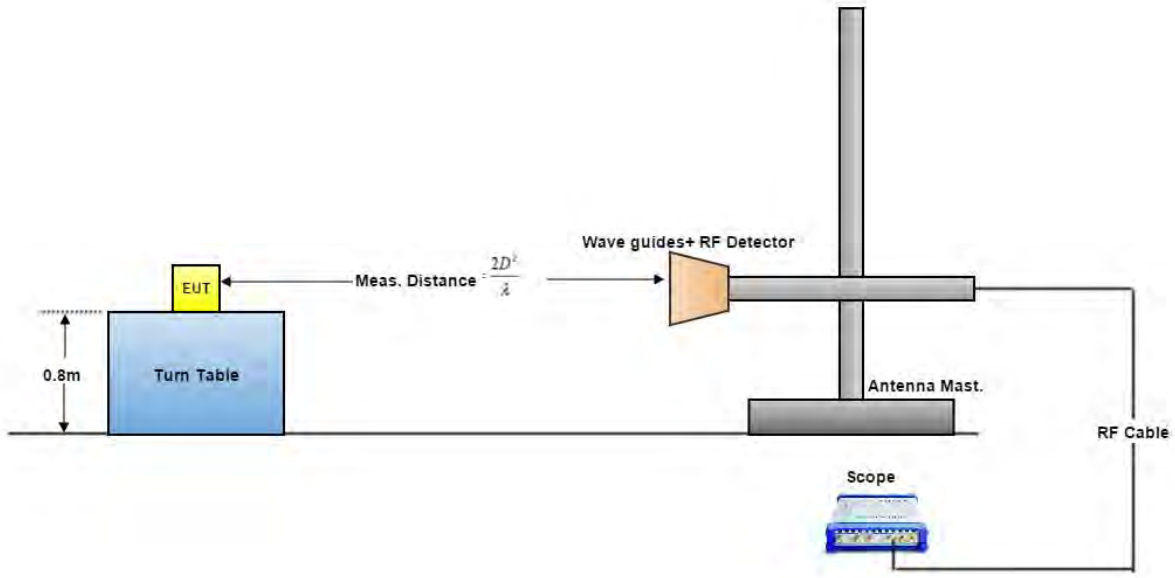
Refer a measuring instruments list in this test report.

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	Eason Chen, Lucas Huang			Test Distance	0.50						
Test Date	Aug. 20, 2018 ~ Aug. 21, 2018										
Test Results											
Test Freq. (GHz)	Rx Gain (dBi)	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	23.6	0.30	0.26	-42.19	-53.77	107.10	95.52	-3.72	-15.30	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 (c)

NOTE 2: The comparison method which replaces EUT with a signal generator is used to find the correct conversion factor between “DSO(mV)” & “Power Measured(dBm)”.

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(c) 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	Eason Chen, Lucas Huang		
Test Date	Aug. 20, 2018 ~ Aug. 21, 2018		

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	-3.72	2	-5.72	0.268	1.13	5.65

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(c)

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

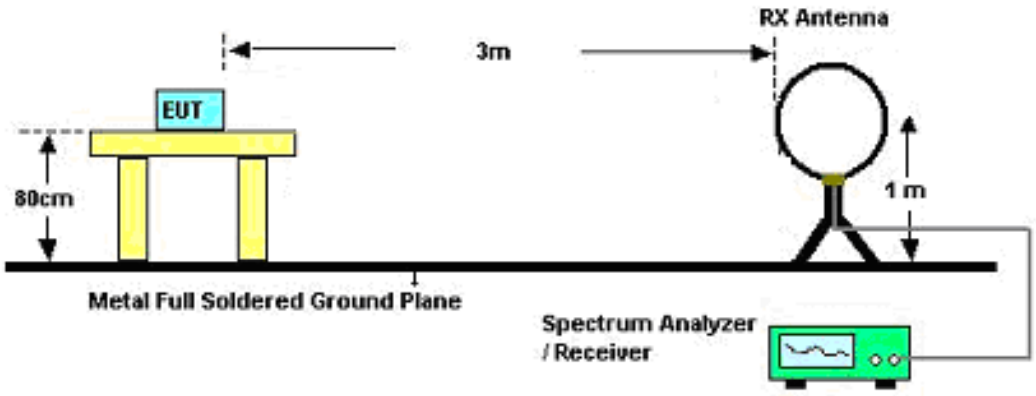
3.5.1 Limit of Transmitter Spurious Emissions

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(d) NOTE 2: Spurious emissions shall not exceed the level of the fundamental emission.	

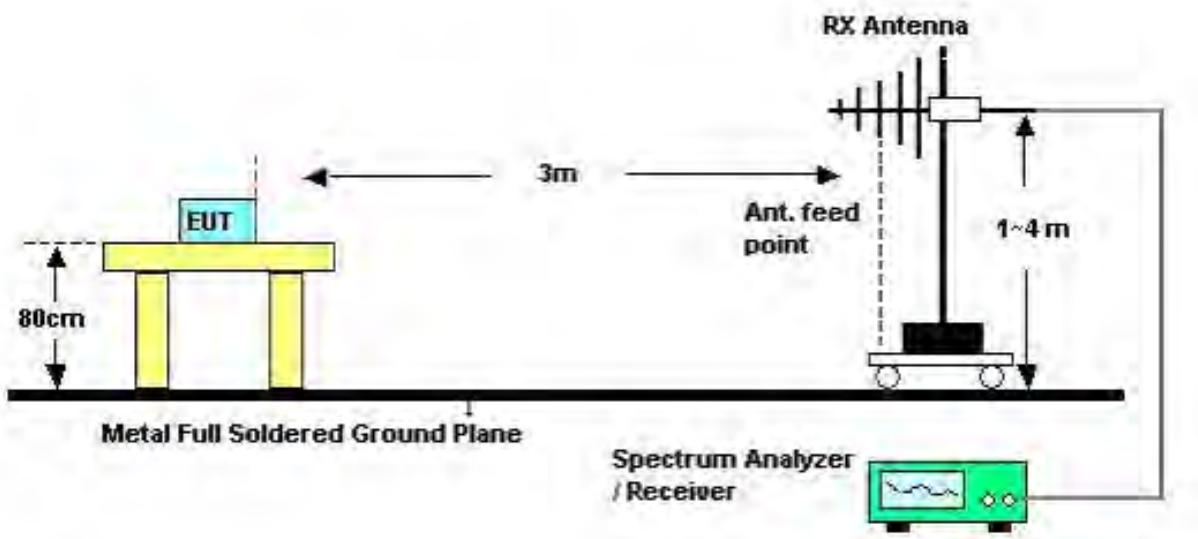
3.5.2 Test Procedures

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

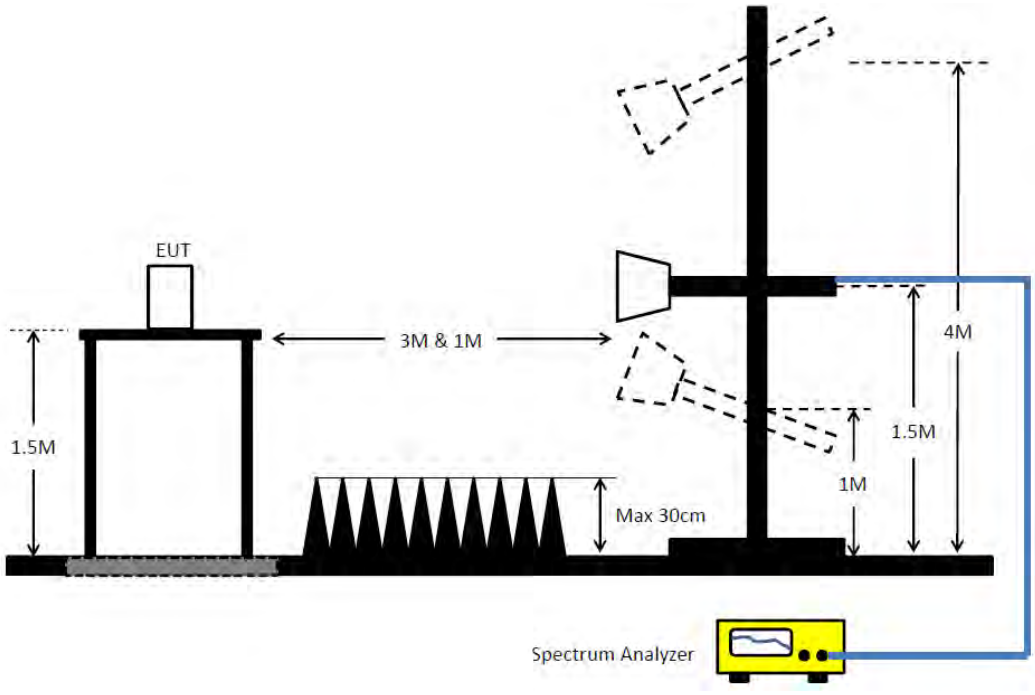
3.5.3 Test Setup

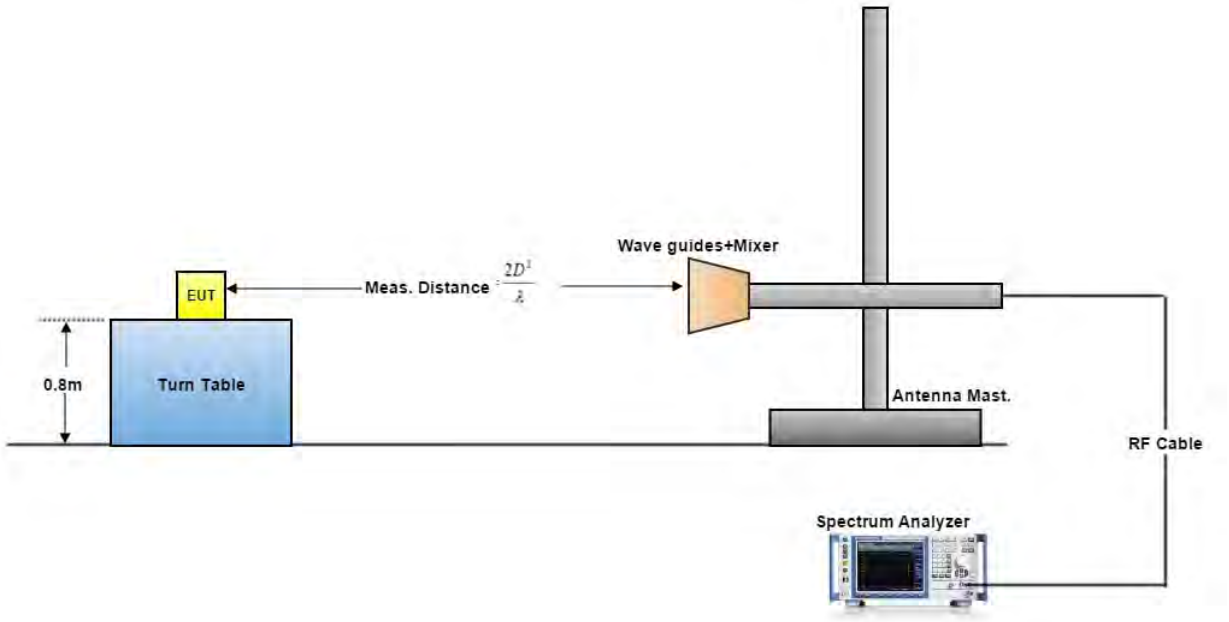
Transmitter Spurious Emissions
9kHz ~30MHz


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)

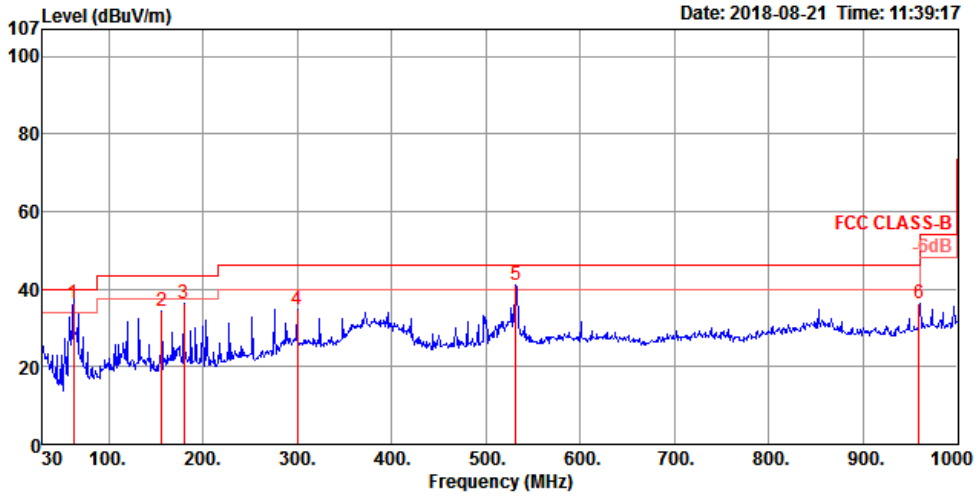
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

3.5.4.2 Test Result of Transmitter Spurious Emissions

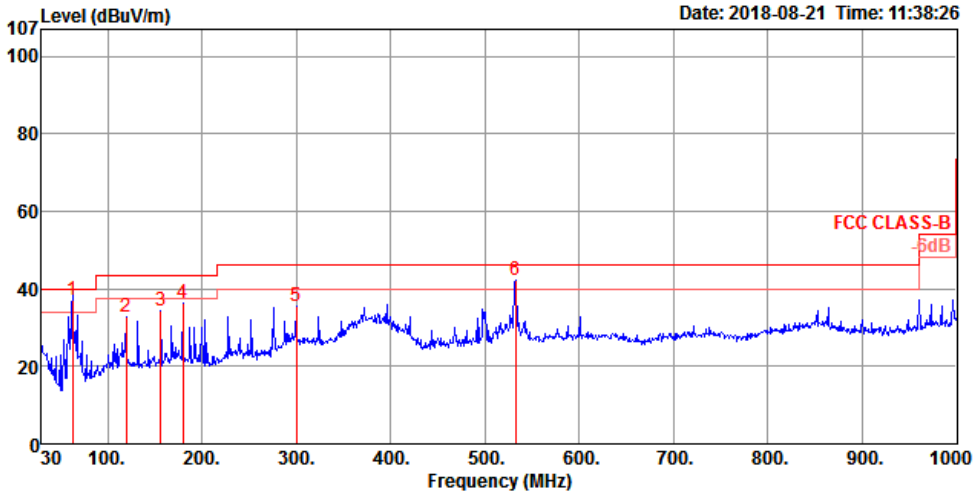
Temp	22°C	**Humidity**	54%
Test Engineer	Eason Chen, Lucas Huang	**Test Distance**	3 m
Test Range	30 MHz – 1000 MHz	**Test Configuration**	CTX

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	62.98	36.35	40.00	-3.65	55.49	0.99	12.27	32.40	370	268	QP	VERTICAL
2	156.10	34.26	43.50	-9.24	48.85	1.53	16.21	32.33	100	0	Peak	VERTICAL
3	179.38	36.28	43.50	-7.22	51.56	1.65	15.38	32.31	100	0	Peak	VERTICAL
4	299.66	34.93	46.00	-11.07	46.43	2.10	18.66	32.26	100	0	Peak	VERTICAL
5	531.49	41.06	46.00	-4.94	46.79	2.83	23.80	32.36	100	0	Peak	VERTICAL
6	959.23	36.33	46.00	-9.67	37.01	3.83	26.63	31.14	100	0	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	62.98	36.97	40.00	-3.03	56.11	0.99	12.27	32.40	315	85	QP	HORIZONTAL
2	119.24	32.92	43.50	-10.58	45.56	1.36	18.35	32.35	400	0	Peak	HORIZONTAL
3	156.10	34.45	43.50	-9.05	49.04	1.53	16.21	32.33	400	0	Peak	HORIZONTAL
4	179.38	36.26	43.50	-7.24	51.54	1.65	15.38	32.31	400	0	Peak	HORIZONTAL
5	299.66	35.34	46.00	-10.66	46.84	2.10	18.66	32.26	400	0	Peak	HORIZONTAL
6	532.46	42.09	46.00	-3.91	47.82	2.83	23.80	32.36	400	0	Peak	HORIZONTAL

Temp	22°C	**Humidity**	54%
Test Engineer	Eason Chen, Lucas Huang	**Test Distance**	3 m
Test Range	1 GHz – 18 GHz	**Test Freq. (GHz)**	60.48
Test Date	Aug. 20, 2018 ~ Aug. 21, 2018		

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	2458.82	29.80	54.00	-24.20	30.91	5.22	27.96	34.29	250	84	Average	VERTICAL
2	2459.93	38.21	74.00	-35.79	39.32	5.22	27.96	34.29	250	84	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	2462.54	30.60	54.00	-23.40	31.71	5.23	27.95	34.29	169	204	Average	HORIZONTAL
2	2462.61	43.12	74.00	-30.88	44.23	5.23	27.95	34.29	169	204	Peak	HORIZONTAL

Temp	22°C	Humidity	54%
Test Engineer	Eason Chen, Lucas Huang	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Freq. (GHz)	60.48
Test Date	Aug. 20, 2018 ~ Aug. 21, 2018		

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	37477.60	56.83	63.54	-6.71	44.49	18.83	43.45	49.94	150	360	Average	VERTICAL
2	37481.25	58.94	83.54	-24.60	46.48	18.86	43.50	49.90	150	360	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	37444.85	56.76	83.54	-26.78	44.53	18.80	43.41	49.98	150	0	Peak	HORIZONTAL
2	37456.40	56.76	63.54	-6.78	44.42	18.83	43.45	49.94	150	0	Average	HORIZONTAL

Temp	22°C	**Humidity**	54%
Test Engineer	Eason Chen, Lucas Huang	**Test Date**	Aug. 20, 2018 ~ Aug. 21, 2018
Test Range	40GHz – 200GHz		

Test Frequency (GHz)	**Rx Antenna Gain (dBi)**	**Measurement Distance (m)**	**Read Worse Frequency (GHz)**	**Read Level (dBm)**
60.48	23.6	0.50	40.12	-81.22
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-46.33	3	0.0206	90	PASS

Note:
EIRP = Prx – Grx + Free Space Path Loss = Prx – Grx + 20Log(4πd/ λ)2
Which
Prx = Read Level.
Grx = Rx Antenna Gain.
A distance factor is offset and the formula is 20LOG(D1/D2)
Which
D1 = Specification Distance
D2 = Measurement Distance

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

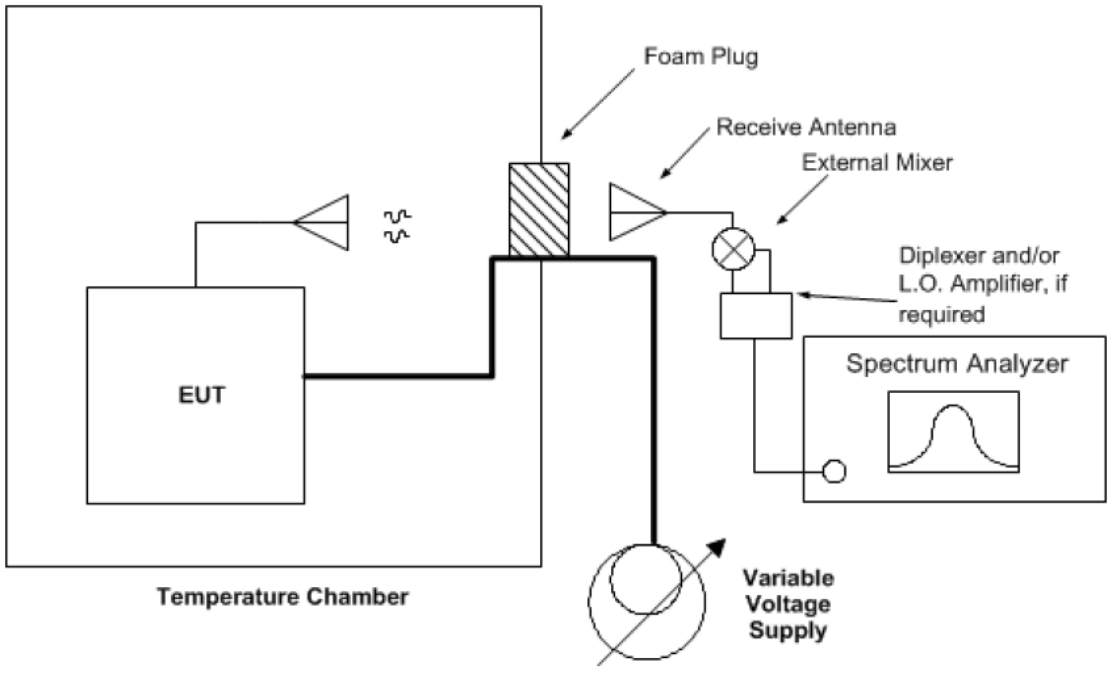
Refer a measuring instruments list in this test report.

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	22°C	**Humidity**	54%
Test Engineer	Eason Chen, Lucas Huang	**Test Date**	Aug. 20, 2018 ~ Aug. 21, 2018

Test Results			
Test Temperature (°C)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
-10	60480.0089	8.90	within band
0	60480.0072	7.20	within band
10	60480.0061	6.10	within band
20	60480.0000	Reference	within band
30	60480.0013	1.30	within band
40	60480.0029	2.90	within band
50	60480.0057	5.70	within band
55	60480.0066	6.60	within band
NOTE: The manufacturer's specified temperature range of -10 to 55°C.			

3.6.5.2 Frequency Stability When Varying Supply Voltage

Frequency Stability When Varying Supply Voltage			
Temp	22°C	**Humidity**	54%
Test Engineer	Eason Chen, Lucas Huang	**Test Date**	Aug. 20, 2018 ~ Aug. 21, 2018

Test Results			
Test Voltage: (Vdc)	**Measured Frequency (MHz)**	**Delta Frequency (kHz)**	**Limit (±kHz)**
1.45	60480.0023	2.30	within band
1.70	60480.0000	Reference	within band
1.96	60480.0019	1.90	within band

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.

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 24, 2017	Nov. 23, 2018	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 13, 2017	Nov. 12, 2018	Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	Jan. 17, 2018	Jan. 16, 2019	Conduction (CO02-CB)
COND Cable	Woken	Cable	2	0.15MHz ~ 30MHz	Nov. 10, 2017	Nov. 09, 2018	Conduction (CO02-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO02-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 30, 2017	Aug. 29, 2018	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 20, 2017	Nov. 19, 2018	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 23, 2017	Nov. 22, 2018	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100354	9kHz ~ 2.75GHz	Dec. 08, 2017	Dec. 07, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
Mixer	OML	M19HW/A	U91113-1	40 ~ 60 GHz	Sep. 08, 2017*	Sep. 07, 2019*	Radiation (03CH01-CB)
Mixer	OML	M15HW/A	V91113-1	50 ~ 75 GHz	Sep. 13, 2017*	Sep. 12, 2019*	Radiation (03CH01-CB)
Mixer	OML	M12HW/A	E91113-1	60 ~ 90 GHz	Sep. 16, 2017*	Sep. 15, 2019*	Radiation (03CH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Mixer	OML	M08HW/A	F91113-1	90 ~ 140 GHz	Sep. 20, 2017*	Sep. 19, 2019*	Radiation (03CH01-CB)
Mixer	OML	M05HW/A	G91113-1	140 ~ 220 GHz	Sep. 23, 2017*	Sep. 22, 2019*	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M15RH	V91113-A	50 ~ 75 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M05RH	G91113-A	140 ~ 220 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Pico Scope	Pico	Pico Scope 6402C	CX372/002	N/A	Jul. 13, 2018	Jul. 12, 2019	Radiation (03CH01-CB)
Detector	Millitech	DET-15-RPFW 0	#A18185(074)	50 ~ 75 GHz	Jan. 29, 2018*	Jan. 29, 2020*	Radiation (03CH01-CB)
Temp. and Humidity Chamber	Gaint Force	GTH-408-40-C P-AR	MAA1410-011	-40~100 degree	Sep. 15, 2017	Sep. 14, 2018	Conducted (TH01-CB)

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

"*" Calibration Interval of instruments listed above is two years.

N.C.R. 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%