



CE Radio Test Report

Equipment : RouterBOARD wAP G-60ad
Brand Name : RouterBOARD
Model No. : RBwAPG-60ad
Standard : EN 302 567 V1.2.1(2012-01)
Frequency Range : 57 GHz – 66 GHz
Applicant : Mikrotiks SIA
Pernavas 46, Riga, LV-1009 Latvia
Manufacturer : Mikrotiks SIA
Pernavas 46, Riga, LV-1009 Latvia

The product sample received on Jun. 29, 2017 and completely tested on Jul. 26, 2017. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in EN 302 567 V1.2.1(2012-01) 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.

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PHOTOGRAPHS OF EUT V01	

SUMMARY OF TEST RESULT

Harmonized Standard Requirements and Conformance Test Specifications				
Report Clause	Ref. Std. Clause	Description	Result	Remark
3.1	3.1	6dBc Bandwidth	Complied	-
3.2	4.2.1	Spectral Power Density	Complied	-
3.3	4.2.2	RF Output Power	Complied	-
3.4	4.2.3	Transmitter Unwanted Emissions	Complied	-
4.1	4.2.4	Receiver Unwanted Emissions	Complied	-

REVISION HISTORY

[illegible]

1 General Description

1.1 Information

1.1.1 The Channel Plan(s)

The Channel Plan(s)
Channel 1: 58.32 GHz
Channel 2: 60.48 GHz
Channel 3: 62.64 GHz

1.1.2 Transmit Operating Modes

The Different Transmit Operating Modes
<input checked="" type="checkbox"/> Operating mode 1: Smart Antenna Systems - with beam forming
<input type="checkbox"/> Operating mode 2: Smart Antenna Systems - without beam forming
<input type="checkbox"/> Operating mode 3: Single Antenna Equipment

1.1.3 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)		
					58.32 GHz	60.48 GHz	62.64 GHz
1	Mikrotik	60G-phased-array	Integral phased-array	Soldered	12.13	13.48	10.56

1.1.4 Medium Access Protocol Implemented

Medium Access Protocol implemented	
Medium Access Protocol Implemented	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Medium Access Protocol	<input checked="" type="checkbox"/> IEEE 802.15.3c
	<input type="checkbox"/> IEEE 802.11
	<input type="checkbox"/> Other
A medium access protocol has been implemented by the equipment. With mechanism designed to facilitate spectrum sharing with other devices in a wireless network.	

1.1.5 User Condition

Intended Operation
<input checked="" type="checkbox"/> Indoor only
<input type="checkbox"/> Indoor & Outdoor

1.1.6 Power Type

Power Type			
EUT Power Type	From Power Adapter or PoE		
Supply Voltage	<input checked="" type="checkbox"/> AC	State AC voltage	230 V
Supply Voltage	<input type="checkbox"/> DC	State DC voltage	V

1.2 Additional Information Provided by the Submitter

1.2.1 Modulation

IEEE 802.11ad Modulation Scheme

MCS Index	Modulation	Code rate	Data rate (Mbit/s)
0	π /-2BPSK	1/2	27.5
1	π /-2BPSK	1/2	385
2	π /-2BPSK	1/2	770
3	π /-2BPSK	5/8	962.5
4	π /-2BPSK	3/4	1155
5	π /-2BPSK	13/16	1251.25
6	π /-2QPSK	1/2	1540
7	π /-2QPSK	5/8	1925
8	π /-2QPSK	3/4	2310
9	π /-2QPSK	13/16	2502.5
10	π /2-16QAM	1/2	3080
11	π /2-16QAM	5/8	3850
12	π /2-16QAM	3/4	4620
The Channel Bandwidth is 2.16GHz			
Can the transmitter operate un-modulated:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

1.2.2 Duty Cycle

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

1.3 Accessories

Accessories				
No.	Equipment Name	Brand Name	Model Name	Rating
1	Adapter	MLF	MLF-A00122400380FE0141	Input: 100-240V ~ 50/60Hz, 0.4Amax Output: 24V, 0.38A
2	PoE	MikroTik	RBGPOE	Input: 9-48V

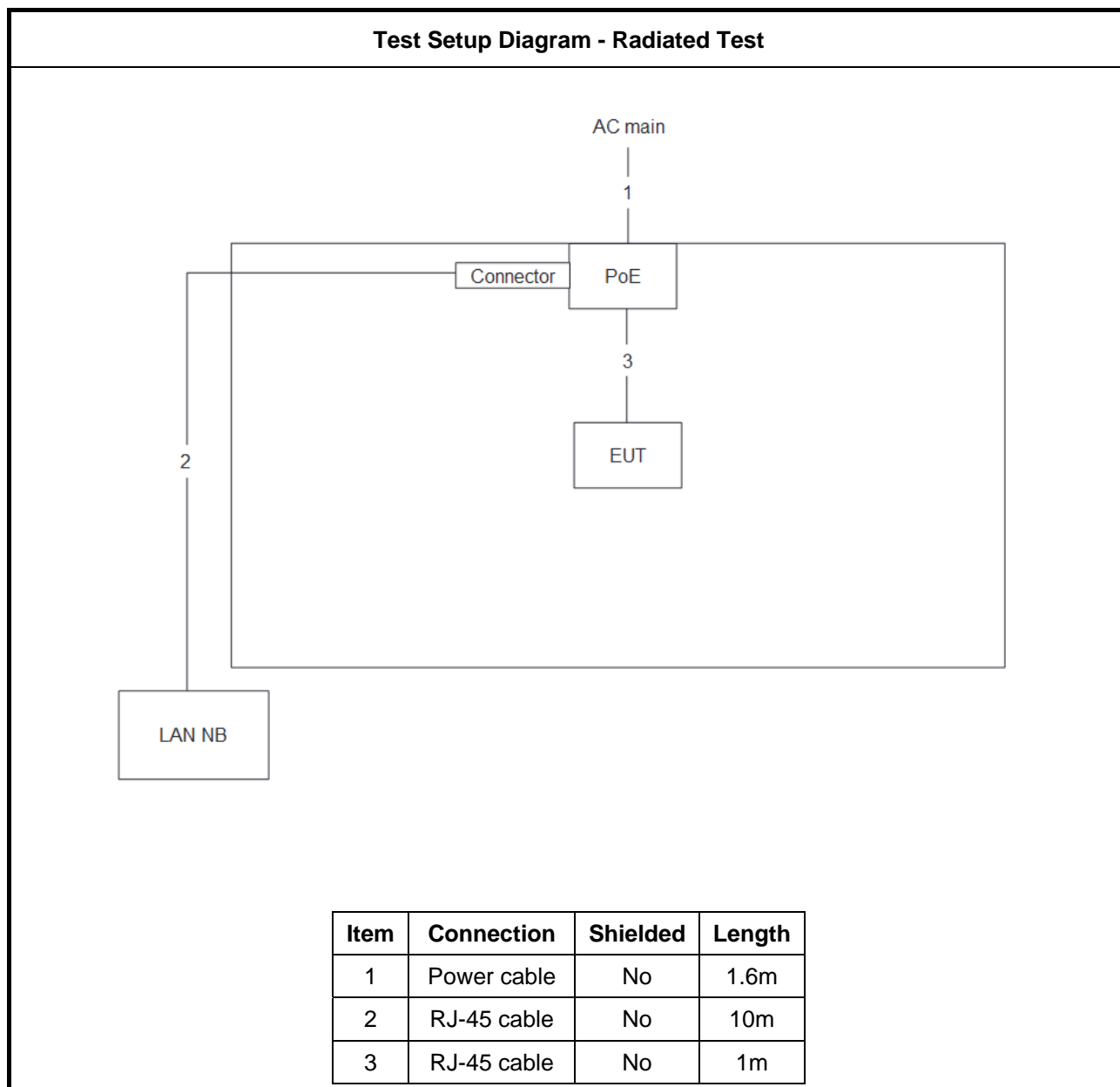
1.4 Support Equipment

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	lenovo	80J2	DoC

1.5 EUT Setups

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

1.6 Test Setup Diagram



1.7 Testing Applied Standards

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

- ♦ EN 302 567 V1.2.1(2012-01)

1.8 Testing Location

Testing Location		
<input type="checkbox"/>	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
<input checked="" type="checkbox"/>	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 Condition		Test Site No.
Radiated Emission		05CH01-CB

2 Test Configuration of Equipment under Test

2.1 Test Channel Frequencies

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

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)		
	Low Channel	Middle Channel	High Channel
6dBc Bandwidth	58.32	60.48	62.64
Spectral Power Density	58.32	60.48	62.64
RF Output Power	58.32	60.48	62.64
Transmitter Unwanted Emissions	58.32	60.48	62.64
Receiver Unwanted Emissions	58.32	60.48	62.64

Note: The EUT was performed at Y axis and Z axis position for Radiated emission test, and the worst case was found at Y axis. So the measurement will follow this same test configuration.

3 Transmitter Test Result

3.1 6dBc Bandwidth

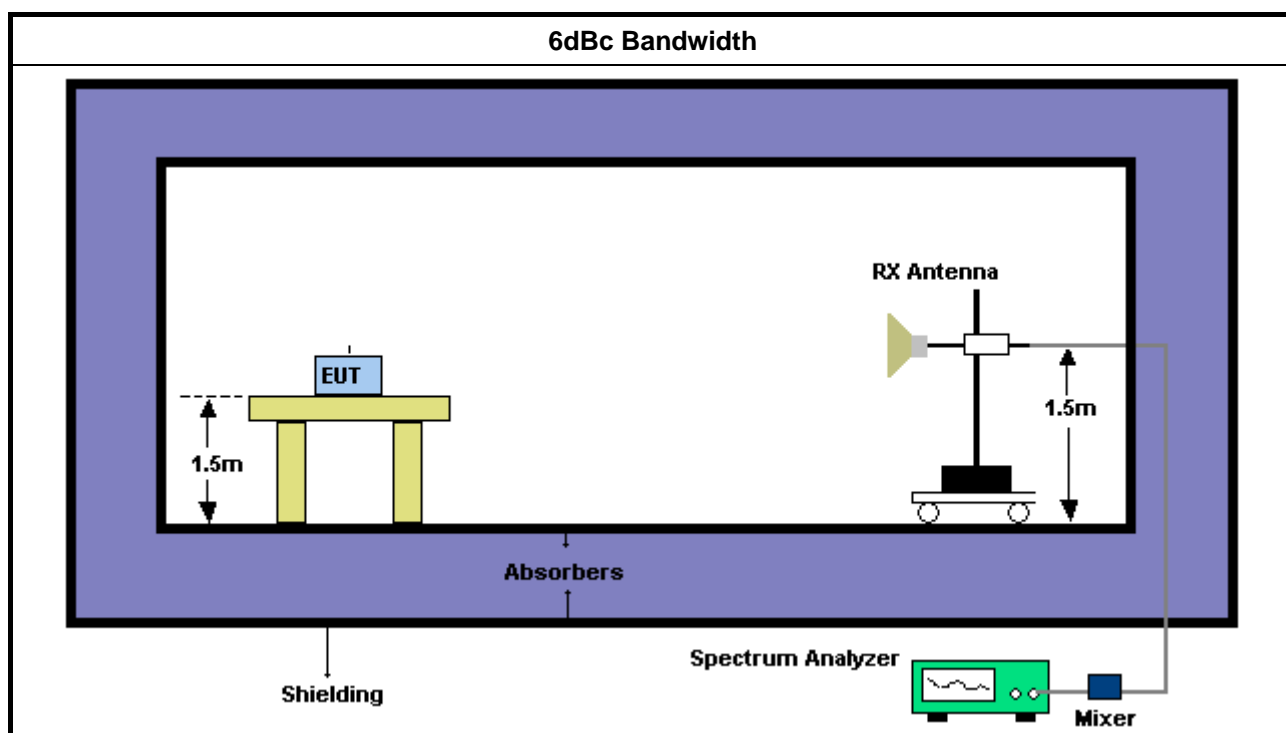
3.1.1 Limit of 6dBc Bandwidth

Item	Limit
6dBc Bandwidth (see Note)	None
NOTE: The 6dBc bandwidth is the frequency bandwidth of the signal power at the -6 dBc points when measured with a 1000 kHz resolution bandwidth. These measurements shall also be performed at normal test conditions. According to EN 302 567 V1.2.1(2012-01) Section 3.1, occupied bandwidth is defined as frequency bandwidth of the signal power at the -6 dBc points	

3.1.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.1.3 Test Setup



3.1.4 Test Result of 6dBc Bandwidth

Test Conditions	see EN 302 567, clause 5.3.2
Test Setup	see EN 302 567, Annex C1.2

Temp	22℃	Humidity	54%
Test Engineer	Ekko Hsieh	Test Date	Jul. 15, 2017 ~ Jul. 26, 2017
Test Distance	1 m		
Test Results			
Test Freq. (GHz)	6dBc Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
58.32	1121.6	N/A	N/A
60.48	1772.6	N/A	N/A
62.64	1259	N/A	N/A
Note: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.			

3.2 Spectral Power Density

3.2.1 Limit of EIRP Spectral Power Density

Power Density Limit	
Use Condition	EIRP Average Power Density
Indoor and Outdoor	13 dBm / MHz

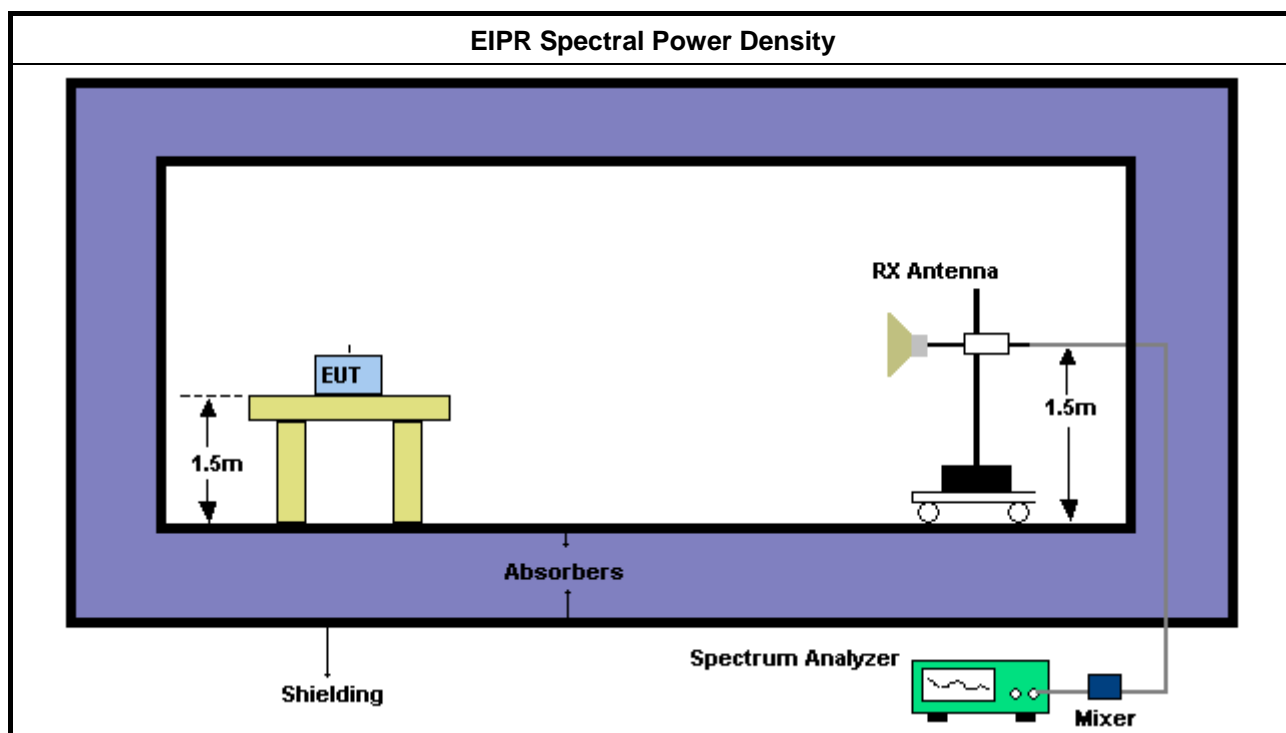
3.2.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.2.3 Test Procedures

Method of measurement: Refer as EN 302 567, clause 5.3.3.

3.2.4 Test Setup



3.2.5 Test Result of EIRP Spectral Power Density

Test Conditions	see EN 302 567, clause 5.3.2
Test Setup	see EN 302 567, Annex C1.2
NOTE: If the equipment supports different modulations and/or 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.	

Temp	22℃	Humidity	54%
Test Engineer	Ekko Hsieh	Test Date	Jul. 15, 2017 ~ Jul. 26, 2017
Test Distance	0.17 m		
Test Results			
Test Freq. (GHz)	PD (dBm/MHz)	PD Limit (dBm/MHz)	Margin (dB)
58.32	5.21	13	-7.79
60.48	-2.58	13	-15.58
62.64	-2.59	13	-15.59
The measured power level is converted to EIRP using the Friis equation: $EIRP = P_T * G_T = (P_R / G_R) * (4 * \pi * D / \lambda)^2$ P_R = measured channel power G_R = 23.6 dBi, The gain of the receive measurement antenna D = The measurement distance λ = The wavelength. Note: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.			

3.3 RF Output Power

3.3.1 Limit of RF Output Power

EIRP RF Output Power Limit	
Use Condition	EIRP Average RF Output Power
Indoor and Outdoor	40 dBm

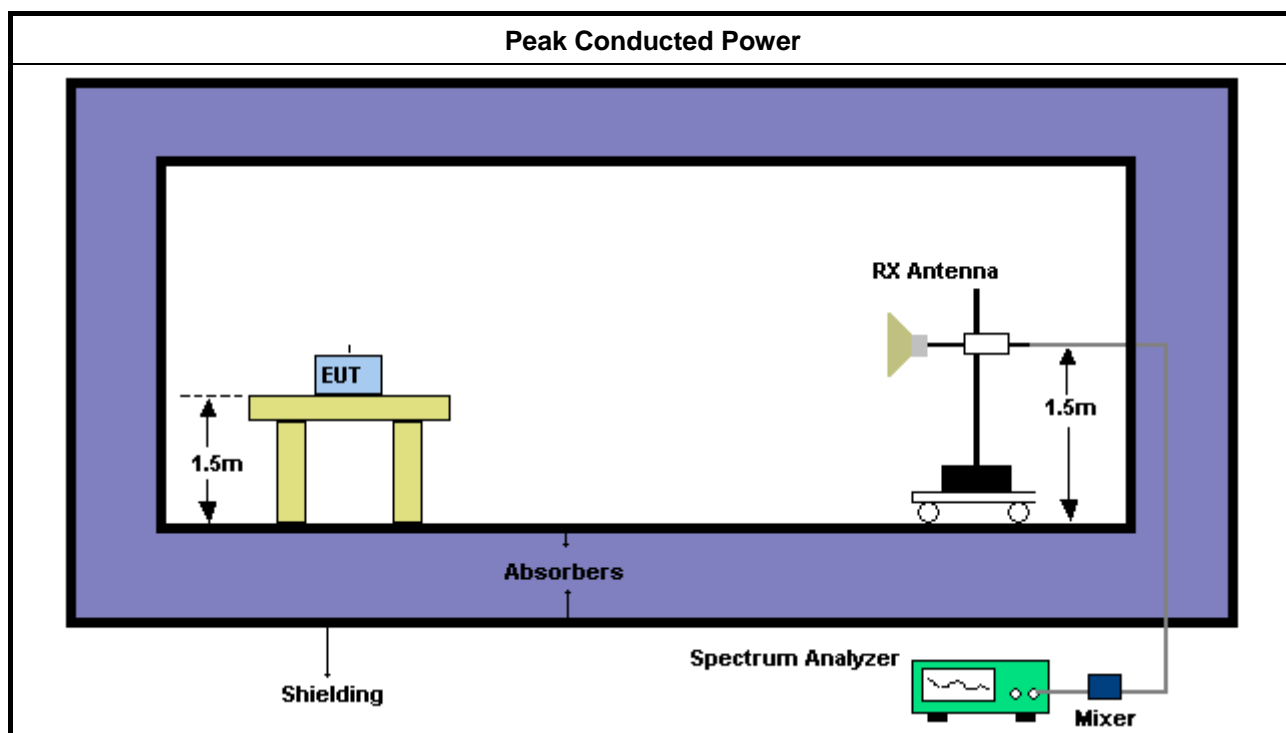
3.3.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.3.3 Test Procedures

Method of measurement: Refer as EN 302 567, clause 5.3.4.

3.3.4 Test Setup



3.3.5 Test Result of EIRP RF Output Power

Test Conditions	see EN 302 567, clause 5.3.2
Test Setup	see EN 302 567, Annex C1.2
NOTE: If the equipment supports different modulations and/or 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.	

Temp	22℃	Humidity	54%
Test Engineer	Ekko Hsieh	Test Date	Jul. 15, 2017 ~ Jul. 26, 2017
Test Distance	0.17 m		
Test Results			
Test Freq. (GHz)	Power (dBm)	Power Limit (dBm)	Margin (dB)
58.32	29.23	40	-10.77
60.48	30.58	40	-9.42
62.64	27.66	40	-12.34
The measured power level is converted to EIRP using the Friis equation: $EIRP = P_T * G_T = (P_R / G_R) * (4 * \pi * D / \lambda)^2$ P_R = measured channel power G_R = 23.6 dBi, The gain of the receive measurement antenna D = The measurement distance λ = The wavelength. Note: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.			

3.4 Transmitter Unwanted Emissions

3.4.1 Limit of Transmitter Unwanted Emissions

Frequency Range	Emission Limit	Measurement Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87.5 MHz	-36 dBm	100 kHz
87.5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 132 GHz	-30 dBm	1 MHz

NOTE: The boundary where the spurious domain begins as given by ITU-R Recommendation SM.1539-1 [6] is considered to be the offset from the nominal centre frequency of the transmission by $\pm 250\%$ of the relevant occupied bandwidth (OBW) for $OBW \leq 500$ MHz and $\pm (500 \text{ MHz} + 1,5 \times OBW)$ for $OBW > 500$ MHz.

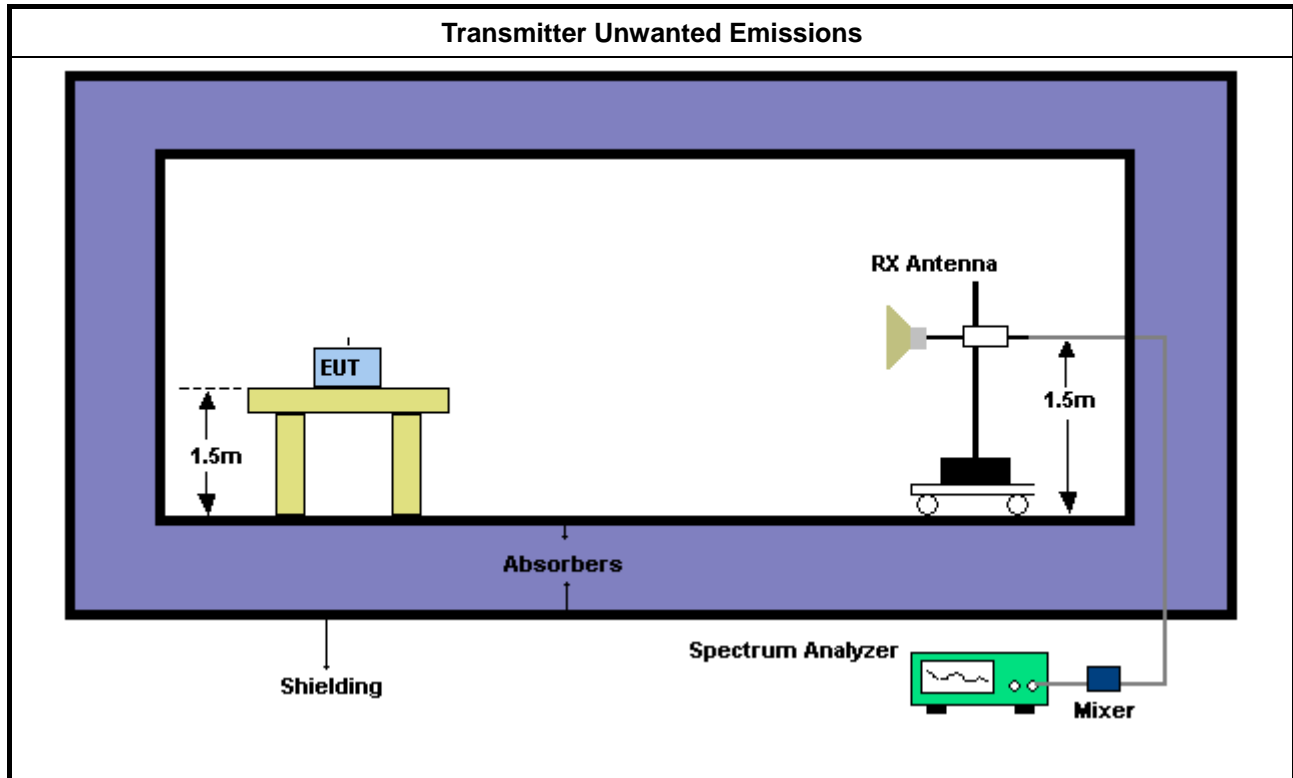
3.4.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.4.3 Test Procedures

Method of measurement: Refer as Refer as EN 302 567, clause 5.3.5.

3.4.4 Test Setup



3.4.5 Test Result of Transmitter Unwanted Emissions

Test Conditions	see EN 302 567, clause 5.3.2
Test Setup	see EN 302 567, Annex C1.2
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.	

3.4.5.1 Test Result of Transmitter Unwanted Emissions

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	30 MHz – 1000 MHz	Test Configuration	58.32 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	100.810	-72.17	-18.17	-54.00	-70.91	-1.26	VERTICAL
2 @	270.560	-72.31	-36.31	-36.00	-69.88	-2.43	VERTICAL
3 @	377.260	-69.95	-33.95	-36.00	-69.92	-0.02	VERTICAL
4 @	617.820	-65.80	-11.80	-54.00	-69.79	3.99	VERTICAL
5 @	731.310	-63.90	-9.90	-54.00	-69.26	5.35	VERTICAL
6 @	870.020	-61.81	-25.81	-36.00	-68.82	7.02	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	123.120	-73.49	-37.49	-36.00	-70.84	-2.65	HORIZONTAL
2 @	353.010	-72.38	-36.38	-36.00	-69.69	-2.69	HORIZONTAL
3 @	632.370	-67.98	-13.98	-54.00	-69.96	1.97	HORIZONTAL
4 @	753.620	-65.50	-11.50	-54.00	-69.02	3.52	HORIZONTAL
5 @	828.310	-64.36	-10.36	-54.00	-69.03	4.67	HORIZONTAL
6 @	950.530	-61.97	-25.97	-36.00	-68.76	6.79	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	30 MHz – 1000 MHz	Test Configuration	60.48 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	97.900	-71.94	-17.94	-54.00	-70.60	-1.34	VERTICAL
2 @	263.770	-72.51	-36.51	-36.00	-70.01	-2.49	VERTICAL
3 @	392.780	-69.52	-33.52	-36.00	-69.93	0.41	VERTICAL
4 @	675.050	-64.98	-10.98	-54.00	-69.49	4.51	VERTICAL
5 @	917.550	-60.88	-24.88	-36.00	-68.45	7.56	VERTICAL
6 @	978.660	-59.95	-23.95	-36.00	-69.03	9.08	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	127.000	-73.55	-37.55	-36.00	-70.87	-2.68	HORIZONTAL
2	319.060	-73.75	-37.75	-36.00	-70.43	-3.31	HORIZONTAL
3 @	405.390	-71.32	-35.32	-36.00	-69.68	-1.64	HORIZONTAL
4 @	600.360	-67.71	-13.71	-54.00	-69.25	1.54	HORIZONTAL
5 @	822.490	-64.23	-10.23	-54.00	-68.78	4.54	HORIZONTAL
6 @	914.640	-62.32	-26.32	-36.00	-68.65	6.33	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	30 MHz – 1000 MHz	Test Configuration	62.64 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	151.250	-74.47	-38.47	-36.00	-70.34	-4.13	VERTICAL
2 @	338.460	-70.44	-34.44	-36.00	-69.33	-1.12	VERTICAL
3 @	485.900	-67.32	-13.32	-54.00	-69.62	2.30	VERTICAL
4 @	654.680	-65.42	-11.42	-54.00	-69.74	4.32	VERTICAL
5 @	788.540	-63.12	-9.12	-54.00	-69.63	6.51	VERTICAL
6 @	987.390	-59.59	-23.59	-36.00	-68.89	9.30	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	125.060	-73.32	-37.32	-36.00	-70.94	-2.38	HORIZONTAL
2 @	383.080	-71.48	-35.48	-36.00	-69.35	-2.13	HORIZONTAL
3 @	537.310	-67.85	-13.85	-54.00	-69.30	1.46	HORIZONTAL
4 @	687.660	-66.38	-12.38	-54.00	-69.10	2.72	HORIZONTAL
5 @	859.350	-63.92	-9.92	-54.00	-69.23	5.31	HORIZONTAL
6 @	958.290	-62.15	-26.15	-36.00	-69.04	6.89	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.



Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Configuration	58.32 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2666.000	-67.31	-37.31	-30.00	-57.75	-9.56	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2683.000	-65.40	-35.40	-30.00	-55.97	-9.43	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Configuration	60.48 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2683.000	-66.38	-36.38	-30.00	-56.87	-9.51	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2666.000	-66.04	-36.04	-30.00	-56.57	-9.46	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Configuration	62.64 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2632.000	-66.50	-36.50	-30.00	-56.83	-9.67	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2683.000	-66.23	-36.23	-30.00	-56.80	-9.43	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Configuration	58.32 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	33004.000	-54.07	-24.07	-30.00	-64.41	10.34	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32696.000	-55.13	-25.13	-30.00	-65.69	10.55	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Configuration	60.48 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32762.000	-54.19	-24.19	-30.00	-64.78	10.60	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32740.000	-54.51	-24.51	-30.00	-65.03	10.52	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.



Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Configuration	62.64 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32740.000	-54.59	-24.59	-30.00	-65.21	10.62	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32740.000	-54.01	-24.01	-30.00	-64.53	10.52	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.

Temp	22°C	Humidity	54%			
Test Engineer	Ekko Hsieh	Test Distance	0.5 m			
Test Range	40 GHz – 132 GHz	Test Configuration	58.32 GHz			
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017					
Test Results						
Frequency (GHz)	Test Distance (m)	Rx Power (dBm)	Rx Ant. Gain (dBi)	EIRP Power (dBm)	Limit (dBm)	Margin (dB)
56.56	0.5	-73.65	23.6	-35.78	-30	-5.78
The measured power level is converted to EIRP using the Friis equation: $EIRP = P_T * G_T = (P_R / G_R) * (4 * \pi * D / \lambda)^2$ P_R = measured channel power G_R = 23.6 dBi, The gain of the receive measurement antenna D = The measurement distance λ = The wavelength. Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance. Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss. Level= Read Level + Factor.						

Temp	22°C	Humidity	54%			
Test Engineer	Ekko Hsieh	Test Distance	0.5 m			
Test Range	40 GHz – 132 GHz	Test Configuration	60.48 GHz			
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017					
Test Results						
Frequency (GHz)	Test Distance (m)	Rx Power (dBm)	Rx Ant. Gain (dBi)	EIRP Power (dBm)	Limit (dBm)	Margin (dB)
56.88	0.5	-71.78	23.6	-33.86	-30	-3.86
The measured power level is converted to EIRP using the Friis equation: $EIRP = P_T * G_T = (P_R / G_R) * (4 * \pi * D / \lambda)^2$ P_R = measured channel power G_R = 23.6 dBi, The gain of the receive measurement antenna D = The measurement distance λ = The wavelength. Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance. Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss. Level= Read Level + Factor.						

Temp	22°C	Humidity	54%			
Test Engineer	Ekko Hsieh	Test Distance	0.5 m			
Test Range	40 GHz – 132 GHz	Test Configuration	62.64 GHz			
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017					
Test Results						
Frequency (GHz)	Test Distance (m)	Rx Power (dBm)	Rx Ant. Gain (dBi)	EIRP Power (dBm)	Limit (dBm)	Margin (dB)
40.82	0.5	-73.02	23.6	-37.98	-30	-7.98
The measured power level is converted to EIRP using the Friis equation: $EIRP = P_T * G_T = (P_R / G_R) * (4 * \pi * D / \lambda)^2$ P_R = measured channel power G_R = 23.6 dBi, The gain of the receive measurement antenna D = The measurement distance λ = The wavelength. Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance. Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss. Level= Read Level + Factor.						

4 Receiver Test Result

4.1 Receiver Unwanted Emissions

4.1.1 Limit of Receiver Unwanted Emissions

Frequency Range	Limit
30 MHz - 1 GHz	38 dBuV/m at 3m (-57dBm eirp)
1 GHz - 132 GHz	48 dBuV/m at 3m (-47dBm eirp)

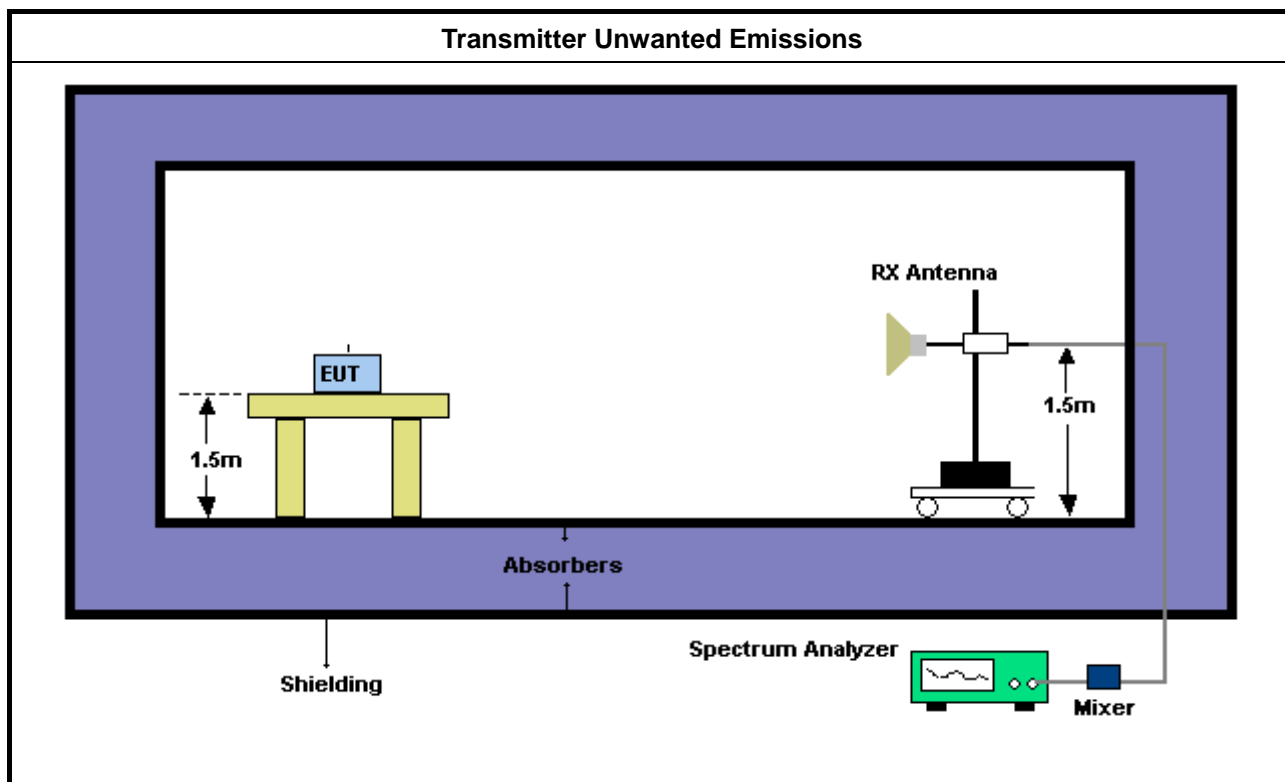
4.1.2 Measuring Instruments

Refer a measuring instruments list in this test report.

4.1.3 Test Procedures

Method of measurement: Refer as Refer as EN 302 567, clause 5.3.6.

4.1.4 Test Setup



4.1.5 Test Result of Receiver Unwanted Emissions

Test Conditions:	Standby Mode, the EUT doesn't have a receive only mode
Test Setup:	see EN 302 567, Annex C1.2
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.	

4.1.5.1 Test Result of Receiver Unwanted Emissions

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	30 MHz – 1000 MHz	Test Configuration	58.32 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	99.840	-72.28	-15.28	-57.00	-71.10	-1.18	VERTICAL
2 @	224.970	-72.96	-15.96	-57.00	-69.72	-3.25	VERTICAL
3 @	370.470	-70.37	-13.37	-57.00	-70.15	-0.22	VERTICAL
4 @	509.180	-67.43	-10.43	-57.00	-70.12	2.68	VERTICAL
5 @	664.380	-65.04	-8.04	-57.00	-69.45	4.41	VERTICAL
6 @	773.990	-63.15	-6.15	-57.00	-69.36	6.21	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	125.060	-73.40	-16.40	-57.00	-71.02	-2.38	HORIZONTAL
2 @	380.170	-71.46	-14.46	-57.00	-69.27	-2.18	HORIZONTAL
3 @	464.560	-70.01	-13.01	-57.00	-70.29	0.28	HORIZONTAL
4 @	624.610	-67.84	-10.84	-57.00	-69.71	1.87	HORIZONTAL
5 @	806.970	-65.06	-8.06	-57.00	-69.29	4.22	HORIZONTAL
6 @	879.720	-63.37	-6.37	-57.00	-69.10	5.74	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.
Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	30 MHz – 1000 MHz	Test Configuration	60.48 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	197.810	-73.92	-16.92	-57.00	-70.01	-3.92	VERTICAL
2 @	365.620	-70.15	-13.15	-57.00	-69.80	-0.35	VERTICAL
3 @	538.280	-66.67	-9.67	-57.00	-69.72	3.04	VERTICAL
4 @	613.940	-65.51	-8.51	-57.00	-69.46	3.95	VERTICAL
5 @	849.650	-66.89	-9.89	-57.00	-73.83	6.94	VERTICAL
6 @	907.850	-64.74	-7.74	-57.00	-72.06	7.32	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	278.320	-75.00	-18.00	-57.00	-70.55	-4.46	HORIZONTAL
2 @	368.530	-71.97	-14.97	-57.00	-69.57	-2.40	HORIZONTAL
3 @	522.760	-67.94	-10.94	-57.00	-69.38	1.44	HORIZONTAL
4 @	634.310	-67.45	-10.45	-57.00	-69.45	2.00	HORIZONTAL
5 @	743.920	-65.15	-8.15	-57.00	-68.55	3.40	HORIZONTAL
6 @	847.710	-63.72	-6.72	-57.00	-68.79	5.07	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	30 MHz – 1000 MHz	Test Configuration	62.64 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	96.930	-72.11	-15.11	-57.00	-70.69	-1.42	VERTICAL
2 @	263.770	-72.69	-15.69	-57.00	-70.20	-2.49	VERTICAL
3 @	445.160	-68.46	-11.46	-57.00	-69.96	1.50	VERTICAL
4 @	522.760	-67.01	-10.01	-57.00	-69.86	2.86	VERTICAL
5 @	719.670	-64.06	-7.06	-57.00	-69.18	5.12	VERTICAL
6 @	785.630	-65.52	-8.52	-57.00	-71.97	6.45	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	123.120	-73.28	-16.28	-57.00	-70.63	-2.65	HORIZONTAL
2 @	277.350	-74.58	-17.58	-57.00	-70.09	-4.49	HORIZONTAL
3 @	353.010	-72.32	-15.32	-57.00	-69.63	-2.69	HORIZONTAL
4 @	542.160	-68.30	-11.30	-57.00	-69.76	1.46	HORIZONTAL
5 @	676.020	-66.87	-9.87	-57.00	-69.43	2.56	HORIZONTAL
6 @	731.310	-65.78	-8.78	-57.00	-69.03	3.25	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Configuration	58.32 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2717.000	-66.80	-19.80	-47.00	-57.40	-9.40	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2683.000	-66.46	-19.46	-47.00	-57.03	-9.43	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Configuration	60.48 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2802.000	-66.63	-19.63	-47.00	-57.55	-9.08	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2666.000	-67.19	-20.19	-47.00	-57.73	-9.46	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.



Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	3 m
Test Range	1 GHz – 18 GHz	Test Configuration	62.64 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2700.000	-66.49	-19.49	-47.00	-57.03	-9.46	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	2700.000	-66.42	-19.42	-47.00	-57.03	-9.39	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Configuration	58.32 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32982.000	-53.86	-6.86	-47.00	-64.22	10.36	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32784.000	-54.76	-7.76	-47.00	-65.24	10.48	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Configuration	60.48 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32740.000	-54.28	-7.28	-47.00	-64.90	10.62	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32762.000	-54.81	-7.81	-47.00	-65.31	10.50	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.

Temp	22°C	Humidity	54%
Test Engineer	Ekko Hsieh	Test Distance	1 m
Test Range	18 GHz – 40 GHz	Test Configuration	62.64 GHz
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017		

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32740.000	-54.24	-7.24	-47.00	-64.86	10.62	VERTICAL

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1 @	32718.000	-54.73	-7.73	-47.00	-65.27	10.54	HORIZONTAL

Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.

Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.

Level= Read Level + Factor.

Temp	22°C	Humidity	54%			
Test Engineer	Ekko Hsieh	Test Distance	0.5 m			
Test Range	40 GHz – 132 GHz	Test Configuration	58.32 GHz			
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017					
Test Results						
Frequency (GHz)	Test Distance (m)	Rx Power (dBm)	Rx Ant. Gain (dBi)	EIRP Power (dBm)	Limit (dBm)	Margin (dB)
40.31	0.5	-85.23	23.6	-50.30	-47	-3.30
The measured power level is converted to EIRP using the Friis equation: $EIRP = P_T * G_T = (P_R / G_R) * (4 * \pi * D / \lambda)^2$ P_R = measured channel power G_R = 23.6 dBi, The gain of the receive measurement antenna D = The measurement distance λ = The wavelength. Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance. Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss. Level= Read Level + Factor.						

Temp	22°C	Humidity	54%			
Test Engineer	Ekko Hsieh	Test Distance	0.5 m			
Test Range	40 GHz – 132 GHz	Test Configuration	60.48 GHz			
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017					
Test Results						
Frequency (GHz)	Test Distance (m)	Rx Power (dBm)	Rx Ant. Gain (dBi)	EIRP Power (dBm)	Limit (dBm)	Margin (dB)
40.85	0.5	-86.56	23.6	-51.51	-47	-4.51
The measured power level is converted to EIRP using the Friis equation:						
$EIRP = P_T * G_T = (P_R / G_R) * (4 * \pi * D / \lambda)^2$						
P_R = measured channel power						
G_R = 23.6 dBi, The gain of the receive measurement antenna						
D = The measurement distance						
λ = The wavelength.						
Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.						
Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.						
Level= Read Level + Factor.						

Temp	22°C	Humidity	54%			
Test Engineer	Ekko Hsieh	Test Distance	0.5 m			
Test Range	40 GHz – 132 GHz	Test Configuration	62.64 GHz			
Test Date	Jul. 15, 2017 ~ Jul. 26, 2017					
Test Results						
Frequency (GHz)	Test Distance (m)	Rx Power (dBm)	Rx Ant. Gain (dBi)	EIRP Power (dBm)	Limit (dBm)	Margin (dB)
40.78	0.5	-85.33	23.6	-50.30	-47	-3.30
The measured power level is converted to EIRP using the Friis equation:						
$EIRP = P_T * G_T = (P_R / G_R) * (4 * \pi * D / \lambda)^2$						
P_R = measured channel power						
G_R = 23.6 dBi, The gain of the receive measurement antenna						
D = The measurement distance						
λ = The wavelength.						
Note 1: DUT - Receive Antenna Distance = Test Distance, all test was conducted at far-field distance.						
Note 2: Factor: Transmit Antenna Gain + Signal Generator Level - SA reading - Transmit Cable Loss.						
Level= Read Level + Factor.						

5 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV40	101024	9kHz ~ 40GHz	Aug. 29, 2016	Radiation (05CH01-CB)
Pre-Amplifier	WIRELESS	FPA-6592G	060027	0.1MHz~1.4GHz	Apr. 25, 2017	Radiation (05CH01-CB)
Pre-Amplifier	EMCI	EMC012645SE	980338	1GHz ~ 26.5GHz	Sep. 20, 2016	Radiation (05CH01-CB)
Bilog Antenna	Schaffner	CBL6112B & N-6-06	2894 & AT-N0608	30MHz ~ 1GHz	Feb. 07, 2017	Radiation (05CH01-CB)
Horn Antenna	COM-POWER	AH-118	071028	1GHz ~ 18GHz	Jun. 14, 2017	Radiation (05CH01CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 05, 2017	Radiation (05CH01CB)
CABLE	Marvelous	N/A	CAB-03	30MHz ~ 1GHz	Oct. 24, 2016	Radiation (05CH01-CB)
CABLE	Woken	N/A	High Cable-25+26	1GHz ~ 26.5GHz	Oct. 24, 2016	Radiation (05CH01-CB)
Test Software	Audix	E3	5.04.1019f	N/A	N/A	Radiation (05CH01-CB)
Mixer	OML	M19HW/A	U91113-1	40 ~ 60 GHz	Sep. 09, 2015*	Radiation (05CH01-CB)
Mixer	OML	M15HW/A	V91113-1	50 ~ 75 GHz	Sep. 14, 2015*	Radiation (05CH01-CB)
Mixer	OML	M12HW/A	E91113-1	60 ~ 90 GHz	Sep. 17, 2015*	Radiation (05CH01-CB)
Mixer	OML	M08HW/A	F91113-1	90 ~ 140 GHz	Sep. 21, 2015*	Radiation (05CH01-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	Sep. 09, 2015*	Radiation (05CH01-CB)
Standard Horn Antenna	Custom Microwave	M15RH	V91113-A	50 ~ 75 GHz	Sep. 14, 2015*	Radiation (05CH01-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	Sep. 17, 2015*	Radiation (05CH01-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	Sep. 21, 2015*	Radiation (05CH01-CB)

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

“**” Calibration Interval of instruments listed above is two years.

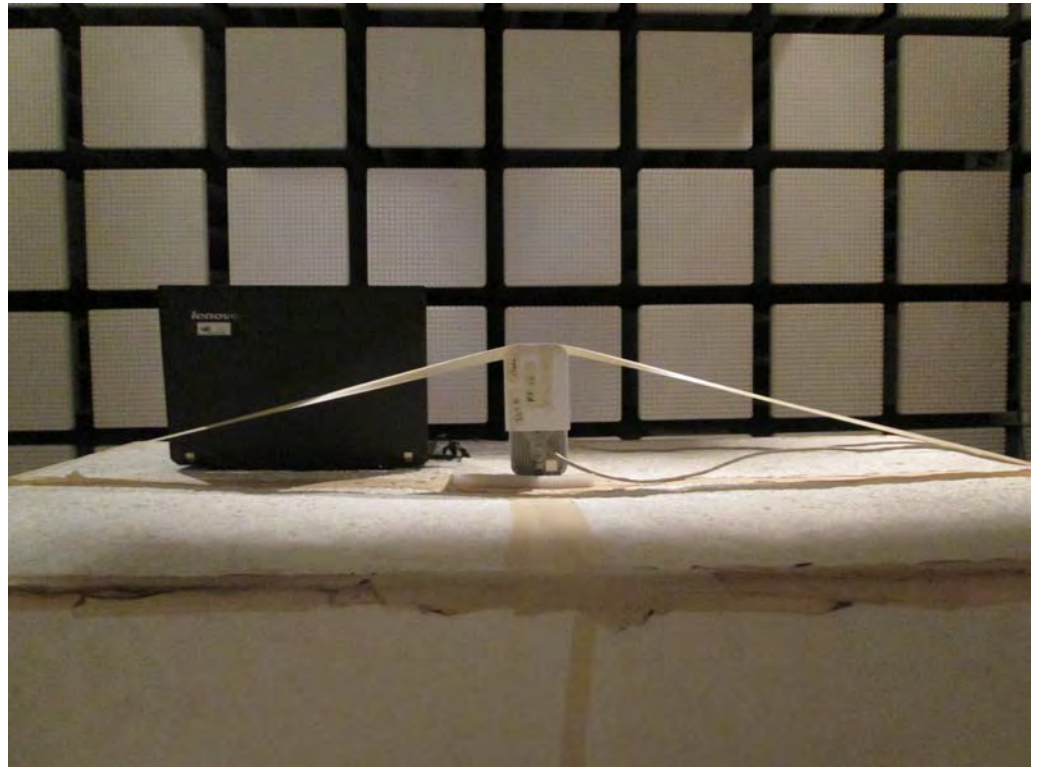
6 Measurement Uncertainty

Test Items	Uncertainty	Remark
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%

Appendix A. Test Photos

1. Photographs of Test Configuration

FRONT VIEW



REAR VIEW

