

TEST REPORT

REGULATIONS : FCC Part15 C §15.247
RSS-247 Issue 1

Applicant	Testing Laboratory
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Equipment Type	Communication module
Trademark	Murata
Model(s)	Type1LD
Serial No.	2 (WLAN Antenna Port Conductive testing) 10 (WLAN Radiated testing) 11 (BT LE Antenna Port Conductive and Radiated testing)
FCC ID	VPYLB1LD
IC CN and UPN	772C-LB1LD
Test Result	Complied
Report Number	17040026JMA-001
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Approved by



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Tested by



Tomochika Yonemura
[Engineer]



Responsible Party of Test Item (Product)

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TABLE OF CONTENTS

	Page
SECTION 1. GENERAL INFORMATION	3
SECTION 2. SUMMARY OF TEST RESULTS	4
SECTION 3. EQUIPMENT UNDER TEST	5
SECTION 4. SUPPORT EQUIPMENT	6
SECTION 5. USED CABLE(S)	7
SECTION 6. TEST CONFIGURATION	8
SECTION 7. OPERATING CONDITION	9
SECTION 8. UNCERTAINTY	10
SECTION 9. TEST DATA	11
9.1 6 dB Bandwidth and 99 % Occupied Bandwidth	11
9.2 Maximum Peak Output Power	12
9.3 Radiated Spurious Emissions and Band Edge of Restrict Band	15
9.4 Band Edge of Authorized Frequency Band	28
9.5 Spurious RF Conducted Emissions	31
9.6 Power Density	32
9.7 AC Conducted Emissions	33
9.8 Receiver Spurious Emissions	38
SECTION 10. LIST AND DIAGRAM OF MEASURING INSTRUMENTS	40
ANNEX	45
A. HARD COPY OF SPECTRUM PLOTS	46
B. PHOTOGRAPHS OF EMISSION SET-UP	81
C. PHOTOGRAPHS OF EUT Axis	85

SECTION 1. GENERAL INFORMATION

Test Performed

EUT Received	March 30, 2017	
Date of Test	From April 4, 2017 to April 14, 2017	
Standard Applied	FCC	IC
	FCC Part15 C §15.247	RSS-247 Issue 1
Test methods	ANSI C63.10-2013	RSS-Gen Issue 4 ANSI C63.10-2013
Deviation from Standard(s)	None	

Qualifications of Testing Laboratory

Accreditation	Scope	Lab. Code	Remarks
VLAC	EMC Testing	VLAC-008-3	JAPAN
BSMI	EMC Testing	SL2-IN-E-6009	TAIWAN
Filing			
VCCI	EMC Testing	A-0127	JAPAN
FCC	EMC Testing	Designation Number : JP0009	USA
IC	EMC Testing	2042S-1, 2042S-2, 2042S-3	Canada
CB-Scheme	EMC Testing	TL223	IECEE
SAUDI ARABIA	EMC Testing	N/A	

Abbreviations

EUT	Equipment Under Test	DoC	Declaration of Conformity
AMN	Artificial Mains Network	ISN	Impedance Stabilization Network
LISN	Line Impedance Stabilization Network	Q-P	Quasi-peak
AMP	Amplifier	AVG	Average
ATT	Attenuator	PK	Peak
ANT	Antenna	Cal	Calibration
BBA	Broadband Antenna	N/A	Not applicable or Not available
DIP	Dipole Antenna	LCD	Liquid-Crystal Display
AE	Associated Equipment	HDMI	High-Definition Multimedia Interface
AFH	Adaptive Hopping Frequency		

Revision Summary

Revised Date	Section	Description of Changes
April 20, 2017	-	First issue.
May 2, 2017	3, 9, 10	Page 5: Section 3.4: Error correction. Page 11: Section 9.1: Carried out remeasurement, changed the results. Page 15: Section 9.3: Error correction. Page 16, 19, 22, 25: Described the method of calculating the limit value. Page 49: Annex A.1: Carried out remeasurement, changed the plots.
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SECTION 2. SUMMARY OF TEST RESULTS

Test Item	Specification	Results	Detail
6 dB Bandwidth and 99 % Occupied Bandwidth	FCC Part15C §15.247 (a) (1) RSS-247 5.1 (1) RSS-Gen 6.6	PASS	Section 9.1
Maximum Peak Output Power	FCC Part15C §15.247 (b) (1) RSS-247 5.4 (2)	PASS	Section 9.2
Radiated Spurious Emissions and Restrict Band edge	FCC Part15C §15.209, §15.205 RSS-247 5.5 RSS-Gen 8.9	PASS	Section 9.3
Band Edge of Authorized Frequency Band	FCC Part15C §15.247 (d) RSS-247 5.5	PASS	Section 9.4
Spurious RF Conducted Emissions	FCC Part15C §15.247 (d) RSS-247 5.5	PASS	Section 9.5
Power Density	FCC Part15C §15.247 (e) RSS-247 5.2	PASS	Section 9.6
AC Conducted Emissions	FCC Part15C §15.207 RSS-Gen 7.2.2	PASS	Section 9.7
Receiver Spurious Emissions	RSS-Gen 7.1	PASS	Section 9.8

Limitation on Results

The test result of this report is effective equipment under test itself and under the test configuration described on the report.

This test report does not assure that whether the test result taken in other testing laboratory is compatible or reproducible to the test result on this report or not.

SECTION 3. EQUIPMENT UNDER TEST

The equipment under test (EUT) consisted of the following apparatus.

3.1 System Configuration

Symbol	Item	Model No.	Serial No.	Manufacturer
A	Communication module	Type1LD	2 (WLAN Antenna Port Conductive testing) 10 (WLAN Radiated testing) 11 (BT LE Antenna Port Conductive and Radiated testing)	Murata Manufacturing Co., Ltd.
Rated Power		DC 3.2 ~ 4.8 V		
Supplied Power		DC 3.3 V		
Condition of Equipment		Prototype		
Type		Communication module		
Suppression Devices		No Modifications by the laboratory were made to the device		

3.2 Port(s)/Connector(s)

Port Name	Connector Type	Connector Pin	Remarks
-	-	-	-

3.3 Highest Frequency Generated / Used

Operating Frequency	Board Name	Remarks
37.4 MHz	Generated	-

3.4 Over View of EUT

Access method	WLAN 802.11b/g/n20		
Rated Output Power	11b	17 dBm (Antenna terminal conducted average power)	
	11g	17 dBm (Antenna terminal conducted average power)	
	11n20	17 dBm (Antenna terminal conducted average power)	
Frequency Range of Operating	2412 – 2462 MHz		
Number of Channels	11 ch, 5 MHz step		
Modulation Method	DSSS, OFDM		

Access method	Bluetooth Version 4.1		
Rated Output Power	BT	9 dBm (Antenna terminal conducted average power)	
	LE	7 dBm (Antenna terminal conducted average power)	
Frequency Range of Operating	2402 – 2480 MHz		
Number of Channels	BT	79 ch, 1 MHz step	
	LE	40 ch, 2 MHz step	
Modulation Method	BT	FHSS (GFSK, π /4DQPSK, 8DPSK)	
	LE	GFSK	

Antenna Type and Gain	Integrated Printed Antenna, 0 dBi See Note 1
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Note:

- The EUT comply with the requirement of FCC Part15C §15.203, because
 - The antenna was built in the EUT and permanently attached.
 - There were no other antennas.

SECTION 4. SUPPORT EQUIPMENT

The EUT was supported by the following equipment during the test.

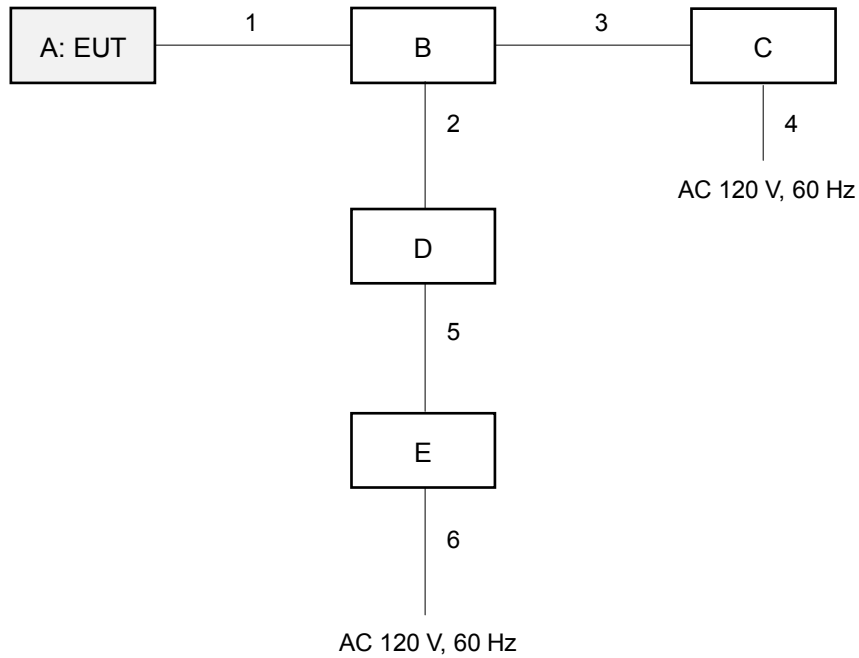
Symbol	Item	Model No.	Serial No.	Manufacturer	Remarks	FCC ID
B	Jig board	-	-	Murata	-	-
C	DC Power Supply	PAN60-3A	ND001658	KIKUSUI	-	N/A
D	Notebook Computer	X61s	7666-77J	Lenovo	-	N/A
E	AC Adaptor	92P1213	11S92P1213Z1ZDDZ92	Lenovo	-	-
Supplied Power:						
B	DC 3.3 V					
C, E	AC 120 V, 60 Hz					

SECTION 5. USED CABLE(S)

The following cable(s) was used for the test.

No.	Name	Length (m)	Shield	Metal Connector	Ferrite Core
1	FLEXIBLE PRINTED CIRCUITS CABLE	0.20	No	No	-
2	USB CABEL	2.00	Shielded	Shielded	-
3	DC CABLE	0.70	No	No	-
4	AC CABLE	1.80	No	No	-
5	DC CABLE	0.80	No	No	-
6	AC CABLE	1.80	Shielded	Shielded	-

SECTION 6. TEST CONFIGURATION



The symbols and numbers assigned to the equipment and cables on this diagram correspond to the ones in Sections 3 to 5.

SECTION 7. OPERATING CONDITION

The test was carried out under the following mode.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

7.1 Test Channel

In accordance with Section 15.31 (m), all test items was conducted in the following three channels:

Operating mode	Test Channel	Frequency [MHz]
WLAN 802.11b/g/n20	Low	2412
	Middle	2437
	High	2462
Bluetooth LE	Low	2402
	Middle	2440
	High	2480

7.2 Test modes

Test Item	Operating modes
6dB Bandwidth and 99 % Occupied Bandwidth	For 802.11b/g/n20 2412MHz, 2437MHz, 2462MHz For Bluetooth Low Energy 2402MHz, 2440MHz, 2480MHz
Maximum Peak Output Power	For 802.11b/g/n20 2412MHz, 2437MHz, 2462MHz For Bluetooth Low Energy 2402MHz, 2440MHz, 2480MHz
Radiated Spurious Emissions and Restrict Band edge	For 802.11b/g/n20 2412MHz, 2437MHz, 2462MHz For Bluetooth Low Energy 2402MHz, 2440MHz, 2480MHz
Band Edge of Authorized Frequency Band	For 802.11b/g/n20 2412MHz, 2437MHz, 2462MHz For Bluetooth Low Energy 2402MHz, 2440MHz, 2480MHz
Spurious RF Conducted Emissions	For 802.11b/g/n20 2412MHz, 2437MHz, 2462MHz For Bluetooth Low Energy 2402MHz, 2440MHz, 2480MHz
Power Density	For 802.11b/g/n20 2412MHz, 2437MHz, 2462MHz For Bluetooth Low Energy 2402MHz, 2440MHz, 2480MHz
AC Conducted Emissions	For 802.11g *1 2412MHz, 2437MHz, 2462MHz For Bluetooth Low Energy 2402MHz, 2440MHz, 2480MHz
Receiver Spurious Emissions	WLAN Receiving, Bluetooth LE Receiving

Note: The Test modes were configured in typical fashion as a customer would normally use it.

*1 : Highest output power, the mode was tested as a representative,

SECTION 8. UNCERTAINTY

The following uncertainty represents the expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Traceability to national standard in SI units is ensured with these values.

Compliance with the limits in this standard are determined without in consideration of the measurement uncertainty of the measurement instrumentation.

8.1 Emission tests

Test items	$U_{lab} [k = 2]$	U_{cispr}
Radiated Spurious Emissions at 3m		
30 MHz – 1000 MHz	+/- 3.96 dB	6.3 dB
Above 1 GHz	+/- 4.91 dB	5.2 dB
AC Conducted Emissions		
150 kHz – 30 MHz	+/- 2.80 dB	3.4 dB

The above expanded instrumentation uncertainty, U_{lab} , is estimated in accordance with CISPR 16-4-2:2011.

8.2 RF Conducted tests

Test Items	$U_{lab} [k = 2]$
Bandwidth	+/- 1.42 %
Maximum Output Power	+/- 1.96 dB
Conducted Emissions	+/- 1.82 dB

SECTION 9. TEST DATA

9.1 6 dB Bandwidth and 99 % Occupied Bandwidth

Regulations	FCC Part15C §15.247 (a) (1) RSS-247 5.1 (1) RSS-Gen 6.6
Test Method/Guide	ANSI C63.10-2013 clause 6.9.2

Test Procedure

1. The EUT and test instrument were set up as shown on section 10.1.
2. Adjust the test instrument for the following setting:

RBW	:	1 to 5 % of the 6 dB bandwidth
VBW	:	approximately 3 times RBW
Span	:	approximately 3 times the 6 dB bandwidth
Detector	:	Peak
Sweep Time	:	Auto
Trace mode	:	Max Hold
3. Allow trace to fully stabilize.
4. Use "Occupied Bandwidth Measurement" function to measure the 6 dB bandwidth.

Location	Matsuda Laboratory No.1 Test Site
Test date	April 4, 2017 and May 1, 2017
Temperature	22.0 [degree C]
Humidity variation	55.0 [%RH]
Test Engineer	Tomochika Yonemura

Mode	Frequency [MHz]	6 dB Bandwidth [MHz]	99 % Bandwidth [MHz]
WLAN 802.11b	2412	9.326	13.971
	2437	9.322	13.963
	2462	9.325	13.959
WLAN 802.11g	2412	16.089	17.476
	2437	16.042	17.472
	2462	16.225	17.484
WLAN 802.11n20	2412	17.455	18.473
	2437	17.236	18.519
	2462	17.550	18.502
Bluetooth Low Energy	2402	0.703	1.083
	2440	0.703	1.084
	2480	0.695	1.084

Spectrum Plots

See ANNEX A.1.

9.2 Maximum Peak Output Power

Regulations	FCC Part15C §15.247 (b) (1) RSS-247 5.4 (2)
Test Method/Guide	ANSI C63.10-2013 clause 7.8.5

Test Procedure

1. The EUT and test instrument were set up as shown on section 10.1.
2. Adjust the test instrument for the following setting:

RBW : $\geq$ the 6 dB bandwidth
VBW : $\geq$ RBW
Span : approximately 5 times the 6 dB bandwidth
Detector : Peak
Sweep Time : Auto
Trace mode : Max Hold

Note: The value of the "6 dB bandwidth", from the result of section 9.1.

3. Allow trace to fully stabilize.
4. Use the peak search function to measure the peak of the emission.
5. Measurement data correction;

Measured Value [dBm] = Reading [dBm] + Factor [dB]

*Factor = Cable Loss [dB] + Attenuator [dB]

Margin [dB] = Limit [dBm] - Measured Value [dBm]

Rate check

Operating Modes	Rate [Mbps]	Reading [dBm]	Remark
WLAN 802.11b @2412MHz	1	-0.83	Highest 11b
	2	-0.92	
	5.5	-1.01	
	11	-1.11	
WLAN 802.11g @2412MHz	6	4.85	Highest 11g
	9	4.79	
	12	4.83	
	18	4.75	
	24	4.51	
	36	3.57	
	48	2.24	
WLAN 802.11n20 @2412MHz	54	1.88	
	mcs0	4.63	Highest 11n20
	mcs1	4.41	
	mcs2	4.18	
	mcs3	3.89	
	mcs4	3.91	
	mcs5	2.97	
	mcs6	1.58	
	mcs7	0.94	

Location	Matsuda Laboratory No.1 Test Site
Test date	April 4, 2017
Temperature	22.0 [degree C]
Humidity variation	55.0 [%]
Test Engineer	Tomochika Yonemura

Operating modes	Freq. [MHz]	Reading [dBm]	Factor [dB]	Measured Value [dBm]	Limit		Margin [dB]
					[mW]	[dBm]	
WLAN 802.11b	2412	-0.830	21.020	20.190	1000	30	9.810
	2437	-1.030	21.020	19.990			10.010
	2462	-1.110	21.020	19.910			10.090
WLAN 802.11g	2412	4.850	21.020	25.870			4.130
	2437	4.650	21.020	25.670			4.330
	2462	4.580	21.020	25.600			4.400
WLAN 802.11n20	2412	4.630	21.020	25.650			4.350
	2437	4.480	21.020	25.500			4.500
	2462	4.290	21.020	25.310			4.690
Bluetooth Low Energy	2402	-12.946	21.020	8.074			21.926
	2440	-13.005	21.020	8.015			21.985
	2480	-13.173	21.020	7.847			22.153

Average Output Power(for Reference data)

Operating modes	Freq. [MHz]	Reading [dBm]	Factor [dB]	Duty Factor [dB]	Measured Value [dBm]
WLAN 802.11b	2412	-3.41	21.020	0.010	17.62
	2437	-3.94	21.020	0.010	17.09
	2462	-4.08	21.020	0.010	16.95
WLAN 802.11g	2412	-3.79	21.020	0.063	17.29
	2437	-3.95	21.020	0.063	17.13
	2462	-4.02	21.020	0.063	17.06
WLAN 802.11n20	2412	-3.93	21.020	0.068	17.16
	2437	-3.98	21.020	0.068	17.11
	2462	-4.12	21.020	0.068	16.97
Bluetooth Low Energy	2402	-14.55	21.020	1.803	8.27
	2440	-14.55	21.020	1.803	8.27
	2480	-14.55	21.020	1.803	8.27

Measured Value [dBm] = Reading [dBm] + Factor [dB]+Duty Factor[dB]

*Factor = Cable Loss [dB] + Attenuator [dB]

Burst Rate

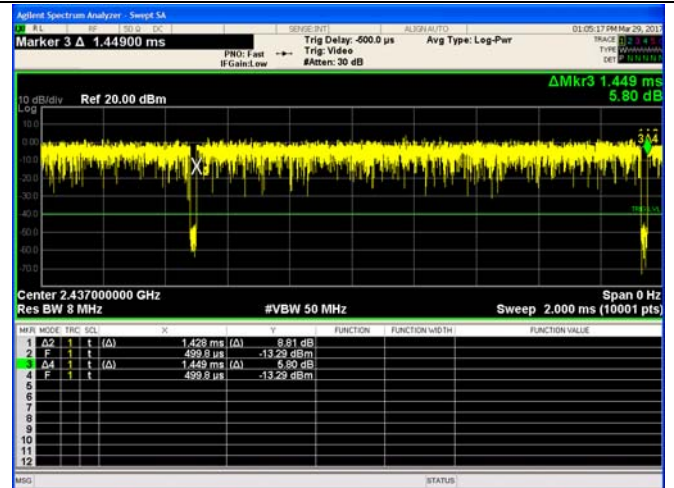
WLAN 802.11b

On time: 8.607 ms
1 Cycle: 8.627 ms



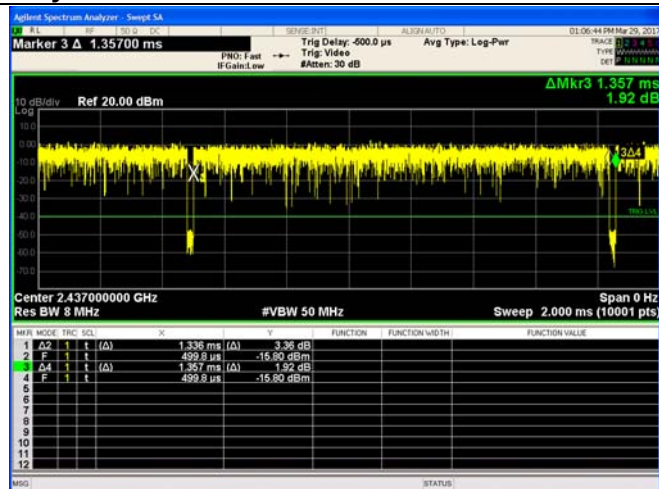
WLAN 802.11g

On time: 1.428 ms
1 Cycle: 1.449 ms



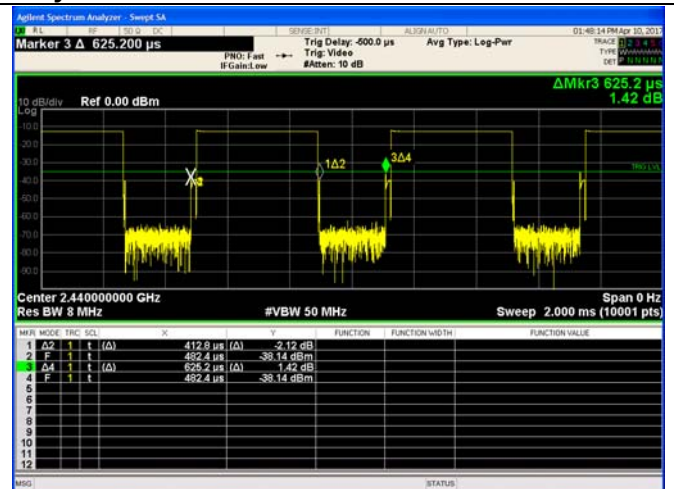
WLAN 802.11n20

On time: 1.336 ms
1 Cycle: 1.357 ms



Bluetooth Low Energy

On time: 0.413 ms
1 Cycle: 0.625 ms



9.3 Radiated Spurious Emissions and Band Edge of Restrict Band

Regulations	FCC Part15C §15.209, §15.205 RSS-247 5.5 RSS-Gen 8.9
Test Method/Guide	ANSI C63.10-2013 clause 6.5 and 6.6

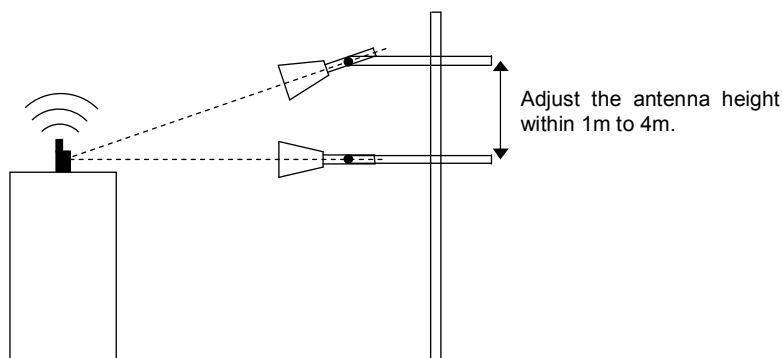
Test Procedure

1. The EUT and test instrument were set up as shown on section 10.2.
2. The measurement antenna was placed at a distance of 3 m from the EUT.
4. The turntable azimuth (EUT direction, 0 – 360 degree) and antenna height (1 – 4 m) are adjusted the position so that maximum field strength is obtained for each frequency spectrum to be measured.

The equipment and cables are arranged or manipulated within the range of the test standard in the above condition. At least six highest spectrums are measured by the test receiver (below 1 GHz) and spectrum analyzer (above 1 GHz).

For measurements above 1GHz, the emission signal shall be kept within the illumination area of the 3 dB beamwidth of the antenna so that the maximum emission from the EUT is measured.

And the antenna angle toward the source of the emission.



5. Adjust the test instrument for the following setting:

Frequency	Instruments	Detector	RBW	VBW	Remarks
30 – 1000 MHz	CISPR Receiver	QP	120 kHz	N/A	-
Above 1000 MHz	Spectrum Analyzer	Peak	1 MHz	1 MHz	for Peak
				10 Hz	for Average

6. Measurement data correction;

$$\text{Emission Level [dBuV/m]} = \text{Reading [dBuV]} + \text{Factor [dB/m]}$$

$$\text{Margin [dB]} = \text{Limit [dBuV/m]} - \text{Emission Level [dBuV/m]}$$

$$\begin{aligned} * \text{Factor} &= \text{Antenna Factor} + \text{Amplifier gain} + \text{Cable loss} + \text{Attenuator (+ Filter)} \\ &+ \text{Distance Conversion Factor} \end{aligned}$$

* For other than Standard distance:

$$\text{Distance Conversion Factor} = 20 \log (\text{Measurement distance} / \text{Standard distance})$$

Note: Did not carried out the fainal measurement about frequency range of 9 kHz to 30 MHz, because result of pre-check in shield room, spurious emissions was not detected.

Test Result

Operating mode	WLAN 802.11b, 2412 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver	Hor	Ver	Hor	Ver
1	296.480	QuasiPeak	36.07	36.07	-3.0	0.0	33.1	33.1	46		12.9	12.9
2	960.230	QuasiPeak	29.61	29.41	5.7	0.0	35.3	35.1	54		18.7	18.9
3	2390.000	Peak	40.49	40.16	3.8	0.0	44.2	43.9	74		29.7	30.1
4	2390.000	Average	31.48	31.43	3.8	0.0	35.2	35.2	54		18.7	18.8
5	4824.000	Peak	38.48	39.29	9.6	0.0	48.1	48.9	74		25.9	25.1
6	4824.000	Average	30.95	30.88	9.6	0.0	40.5	40.5	54		13.4	13.5
7	7236.000	Peak	45.34	40.01	15.0	0.0	60.3	55.0	74		13.7	19.0
8	7236.000	Average	28.65	28.54	15.0	0.0	43.6	43.5	54		10.4	10.5
9	9648.000	Peak	35.49	38.01	17.3	0.0	52.8	55.3	74		21.2	18.7
10	9648.000	Average	27.51	27.56	17.3	0.0	44.8	44.9	54		9.2	9.1
11	12060.000	Peak	35.06	36.20	21.7	0.0	56.8	57.9	74		17.2	16.0
12	12060.000	Average	26.46	26.45	21.7	0.0	48.2	48.2	54		5.8	5.8

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver	Hor	Ver	Hor	Ver
1*	2412.000	Peak	84.66	81.22	3.8	0.0	88.5	85.0	-	-	-	-
2*	2400.000	Peak	34.23	32.33	3.8	0.0	38.1	36.2	68.5	65.0	30.4	28.9

Note.

* : Band Edge of Restrict Band

- : Measurement limit

The limit value is -20dBc from the detected the carrier power.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	WLAN 802.11b, 2437 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.530	QuasiPeak	38.36	38.36	-3.0	0.0	35.4	35.4	46	10.6	10.6
2	960.260	QuasiPeak	32.04	31.84	5.7	0.0	37.7	37.5	54	16.2	16.4
3	4874.000	Peak	39.64	40.45	9.6	0.0	49.2	50.0	74	24.8	23.9
4	4874.000	Average	32.64	32.57	9.6	0.0	42.2	42.2	54	11.8	11.8
5	7311.000	Peak	53.00	47.67	15.0	0.0	68.0	62.6	74	6.0	11.4
6	7311.000	Average	29.44	29.33	15.0	0.0	44.4	44.3	54	9.6	9.7
7	9748.000	Peak	39.18	41.70	17.3	0.0	56.5	59.0	74	17.5	15.0
8	9748.000	Average	28.91	28.96	17.3	0.0	46.2	46.3	54	7.8	7.7
9	12185.000	Peak	36.69	37.83	21.7	0.0	58.4	59.6	74	15.6	14.4
10	12185.000	Average	26.62	26.61	21.7	0.0	48.4	48.3	54	5.6	5.6

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	WLAN 802.11b, 2462 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.510	QuasiPeak	37.97	37.97	-3.0	0.0	35.0	35.0	46	11.0	11.0
2	960.230	QuasiPeak	31.33	31.13	5.7	0.0	37.0	36.8	54	17.0	17.2
3	2483.500	Peak	41.62	41.29	3.8	0.0	45.4	45.0	74	28.6	28.9
4	2483.500	Average	33.44	33.39	3.8	0.0	37.2	37.1	54	16.8	16.8
5	4924.000	Peak	39.30	40.11	9.6	0.0	48.9	49.7	74	25.1	24.3
6	4924.000	Average	32.17	32.10	9.6	0.0	41.8	41.7	54	12.2	12.3
7	7386.000	Peak	50.77	45.44	15.0	0.0	65.7	60.4	74	8.3	13.6
8	7386.000	Average	29.25	29.14	15.0	0.0	44.2	44.1	54	9.8	9.9
9	9848.000	Peak	38.11	40.63	17.3	0.0	55.4	57.9	74	18.6	16.0
10	9848.000	Average	28.52	28.57	17.3	0.0	45.8	45.9	54	8.1	8.1
11	12310.000	Peak	36.21	37.35	21.7	0.0	57.9	59.1	74	16.0	14.9
12	12310.000	Average	26.58	26.57	21.7	0.0	48.3	48.3	54	5.7	5.7

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	WLAN 802.11g, 2412 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver	Hor	Ver	Hor	Ver
1	296.470	QuasiPeak	36.12	36.12	-3.0	0.0	33.1	33.1	46		12.9	12.9
2	960.200	QuasiPeak	29.70	29.50	5.7	0.0	35.4	35.2	54		18.6	18.8
3	2390.000	Peak	40.55	40.22	3.8	0.0	44.3	44.0	74		29.7	30.0
4	2390.000	Average	31.59	31.53	3.8	0.0	35.3	35.3	54		18.6	18.7
5	4824.000	Peak	38.53	39.34	9.6	0.0	48.1	48.9	74		25.9	25.1
6	4824.000	Average	31.01	30.94	9.6	0.0	40.6	40.5	54		13.4	13.5
7	7236.000	Peak	45.63	40.30	15.0	0.0	60.6	55.3	74		13.4	18.7
8	7236.000	Average	28.68	28.57	15.0	0.0	43.6	43.5	54		10.3	10.5
9	9648.000	Peak	35.63	38.15	17.3	0.0	52.9	55.5	74		21.0	18.5
10	9648.000	Average	27.56	27.61	17.3	0.0	44.9	44.9	54		9.1	9.1
11	12060.000	Peak	35.12	36.26	21.7	0.0	56.9	58.0	74		17.1	16.0
12	12060.000	Average	26.46	26.45	21.7	0.0	48.2	48.2	54		5.8	5.8

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver	Hor	Ver	Hor	Ver
1*	2412.000	Peak	81.34	79.43	3.8	0.0	85.2	83.3	-	-	-	-
2*	2400.000	Peak	33.82	33.12	3.8	0.0	37.6	36.9	65.2	63.3	27.5	26.3

Note.

* : Band Edge of Restrict Band

- : Measurement limit

The limit value is -20dBc from the detected the carrier power.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	WLAN 802.11g, 2437 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.480	QuasiPeak	36.05	36.05	-3.0	0.0	33.1	33.1	46	12.9	12.9
2	960.220	QuasiPeak	29.58	29.38	5.7	0.0	35.3	35.1	54	18.7	18.9
3	4874.000	Peak	38.47	39.28	9.6	0.0	48.1	48.9	74	25.9	25.1
4	4874.000	Average	30.92	30.85	9.6	0.0	40.5	40.4	54	13.5	13.5
5	7311.000	Peak	45.23	39.90	15.0	0.0	60.2	54.9	74	13.8	19.1
6	7311.000	Average	28.64	28.53	15.0	0.0	43.6	43.5	54	10.4	10.5
7	9748.000	Peak	39.43	37.95	17.3	0.0	56.7	55.3	74	17.2	18.7
8	9748.000	Average	27.49	27.54	17.3	0.0	44.8	44.9	54	9.2	9.1
9	12185.000	Peak	35.04	36.18	21.7	0.0	56.8	57.9	74	17.2	16.1
10	12185.000	Average	26.45	26.44	21.7	0.0	48.2	48.2	54	5.8	5.8

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	WLAN 802.11g, 2462 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.510	QuasiPeak	38.22	38.22	-3.0	0.0	35.2	35.2	46	10.8	10.8
2	960.240	QuasiPeak	31.79	31.59	5.7	0.0	37.5	37.3	54	16.5	16.7
3	2483.500	Peak	41.91	41.58	3.8	0.0	45.7	45.3	74	28.3	28.6
4	2483.500	Average	33.96	33.90	3.8	0.0	37.7	37.7	54	16.3	16.3
5	4924.000	Peak	39.52	40.33	9.6	0.0	49.1	49.9	74	24.9	24.1
6	4924.000	Average	32.47	32.40	9.6	0.0	42.1	42.0	54	11.9	12.0
7	7386.000	Peak	42.20	42.87	15.0	0.0	57.2	57.8	74	16.8	16.2
8	7386.000	Average	27.18	29.27	15.0	0.0	42.1	44.2	54	11.8	9.8
9	9848.000	Peak	38.80	41.32	17.3	0.0	56.1	58.6	74	17.9	15.3
10	9848.000	Average	26.77	27.10	17.3	0.0	44.1	44.4	54	9.9	9.6
11	12310.000	Peak	36.52	37.66	21.7	0.0	58.3	59.4	74	15.7	14.6
12	12310.000	Average	26.60	26.59	21.7	0.0	48.3	48.3	54	5.6	5.7

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	WLAN 802.11n20, 2412 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver	Hor	Ver	Hor	Ver
1	296.520	QuasiPeak	38.31	38.31	-3.0	0.0	35.3	35.3	46		10.7	10.7
2	960.230	QuasiPeak	31.95	31.75	5.7	0.0	37.6	37.4	54		16.3	16.5
3	2390.000	Peak	42.02	41.69	3.8	0.0	45.8	45.4	74		28.2	28.5
4	2390.000	Average	34.15	34.09	3.8	0.0	37.9	37.8	54		16.1	16.1
5	4824.000	Peak	39.60	40.41	9.6	0.0	49.2	50.0	74		24.8	24.0
6	4824.000	Average	32.58	32.51	9.6	0.0	42.2	42.1	54		11.8	11.9
7	7236.000	Peak	42.72	37.39	15.0	0.0	57.7	52.3	74		16.3	21.6
8	7236.000	Average	29.42	29.31	15.0	0.0	44.4	44.3	54		9.6	9.7
9	9648.000	Peak	39.04	41.56	17.3	0.0	56.4	58.9	74		17.6	15.1
10	9648.000	Average	27.22	27.11	17.3	0.0	44.5	44.4	54		9.4	9.6
11	12060.000	Peak	36.63	37.77	21.7	0.0	58.4	59.5	74		15.6	14.5
12	12060.000	Average	26.61	26.60	21.7	0.0	48.3	48.3	54		5.6	5.6

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver	Hor	Ver	Hor	Ver
1*	2412.000	Peak	81.01	78.82	3.8	0.0	84.8	82.6	-	-	-	-
2*	2400.000	Peak	33.99	33.36	3.8	0.0	37.8	37.2	64.8	62.6	27.0	25.5

Note.

* : Band Edge of Restrict Band

- : Measurement limit

The limit value is -20dBc from the detected the carrier power.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	WLAN 802.11n20, 2437 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.530	QuasiPeak	40.24	40.24	-3.0	0.0	37.3	37.3	46	8.8	8.8
2	960.210	QuasiPeak	33.73	33.53	5.7	0.0	39.4	39.2	54	14.6	14.8
3	4874.000	Peak	40.45	41.26	9.6	0.0	50.0	50.8	74	23.9	23.1
4	4874.000	Average	33.84	33.77	9.6	0.0	43.4	43.4	54	10.6	10.6
5	7311.000	Peak	45.17	39.84	15.0	0.0	60.1	54.8	74	13.9	19.2
6	7311.000	Average	28.03	27.92	15.0	0.0	43.0	42.9	54	11.0	11.1
7	9748.000	Peak	41.74	44.26	17.3	0.0	59.1	61.6	74	14.9	12.4
8	9748.000	Average	27.90	29.04	17.3	0.0	45.2	46.4	54	8.8	7.6
9	12185.000	Peak	37.82	38.96	21.7	0.0	59.6	60.7	74	14.4	13.3
10	12185.000	Average	26.73	26.72	21.7	0.0	48.5	48.5	54	5.5	5.5

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	WLAN 802.11n20, 2462 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.520	QuasiPeak	40.16	40.16	-3.0	0.0	37.2	37.2	46	8.8	8.8
2	960.220	QuasiPeak	33.58	33.38	5.7	0.0	39.3	39.1	54	14.7	14.9
3	2483.500	Peak	43.09	42.76	3.8	0.0	46.8	46.5	74	27.1	27.5
4	2483.500	Average	36.01	35.95	3.8	0.0	39.8	39.7	54	14.2	14.3
5	4924.000	Peak	40.38	41.19	9.6	0.0	50.0	50.8	74	24.0	23.2
6	4924.000	Average	33.74	33.67	9.6	0.0	43.3	43.3	54	10.7	10.7
7	7386.000	Peak	41.97	39.64	15.0	0.0	56.9	54.6	74	17.1	19.4
8	7386.000	Average	29.11	29.20	15.0	0.0	44.1	44.2	54	9.9	9.8
9	9848.000	Peak	41.52	44.04	17.3	0.0	58.8	61.4	74	15.1	12.6
10	9848.000	Average	27.82	26.87	17.3	0.0	45.1	44.2	54	8.8	9.8
11	12310.000	Peak	37.72	38.86	21.7	0.0	59.5	60.6	74	14.5	13.4
12	12310.000	Average	26.72	26.71	21.7	0.0	48.5	48.4	54	5.5	5.5

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	Bluetooth Low Energy, 2402 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver	Hor	Ver	Hor	Ver
1	296.540	QuasiPeak	35.74	35.74	-3.0	0.0	32.8	32.8	46		13.3	13.3
2	960.250	QuasiPeak	29.02	28.82	5.7	0.0	34.7	34.5	54		19.3	19.5
3	2390.000	Peak	40.11	39.78	3.8	0.0	43.9	43.5	74		30.1	30.4
4	2390.000	Average	30.80	30.75	3.8	0.0	34.6	34.5	54		19.4	19.5
5	4804.000	Peak	38.20	39.01	9.6	0.0	47.8	48.6	74		26.2	25.4
6	4804.000	Average	30.55	30.48	9.6	0.0	40.1	40.1	54		13.8	13.9
7	7206.000	Peak	40.60	35.27	15.0	0.0	55.6	50.2	74		18.4	23.8
8	7206.000	Average	28.49	28.38	15.0	0.0	43.4	43.3	54		10.5	10.6
9	9608.000	Peak	34.58	37.10	17.3	0.0	51.9	54.4	74		22.1	19.6
10	9608.000	Average	27.18	27.23	17.3	0.0	44.5	44.5	54		9.5	9.4
11	12010.000	Peak	34.66	35.80	21.7	0.0	56.4	57.5	74		17.6	16.4
12	12010.000	Average	26.42	26.41	21.7	0.0	48.2	48.1	54		5.8	5.8

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver	Hor	Ver	Hor	Ver
1*	2402.000	Peak	76.62	74.12	3.8	0.0	80.4	77.9	-	-	-	-
2*	2400.000	Peak	33.22	32.81	3.8	0.0	37.0	36.6	60.4	57.9	23.4	21.3

Note.

* : Band Edge of Restrict Band

- : Measurement limit

The limit value is -20dBc from the detected the carrier power.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	Bluetooth Low Energy, 2440 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.520	QuasiPeak	37.65	37.65	-3.0	0.0	34.7	34.7	46	11.3	11.3
2	960.210	QuasiPeak	30.76	30.56	5.7	0.0	36.5	36.3	54	17.5	17.7
3	4880.000	Peak	39.03	39.84	9.6	0.0	48.6	49.4	74	25.4	24.6
4	4880.000	Average	31.79	31.72	9.6	0.0	41.4	41.3	54	12.6	12.7
5	7320.000	Peak	38.00	37.67	15.0	0.0	53.0	52.6	74	21.0	21.4
6	7320.000	Average	29.09	28.98	15.0	0.0	44.0	43.9	54	9.9	10.0
7	9760.000	Peak	37.22	39.74	17.3	0.0	54.5	57.1	74	19.4	16.9
8	9760.000	Average	28.20	28.25	17.3	0.0	45.5	45.6	54	8.5	8.4
9	12200.000	Peak	35.83	36.97	21.7	0.0	57.6	58.7	74	16.4	15.3
10	12200.000	Average	26.54	26.53	21.7	0.0	48.3	48.3	54	5.7	5.7

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	Bluetooth Low Energy, 2480 MHz, EUT axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20.0	22.0	22.0 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.490	QuasiPeak	39.63	39.63	-3.0	0.0	36.7	36.7	46	9.4	9.4
2	960.190	QuasiPeak	32.63	32.43	5.7	0.0	38.3	38.1	54	15.7	15.9
3	2483.500	Peak	42.47	42.14	3.8	0.0	46.2	45.9	74	27.8	28.1
4	2483.500	Average	34.91	34.86	3.8	0.0	38.7	38.6	54	15.3	15.4
5	4960.000	Peak	39.92	40.73	9.6	0.0	49.5	50.3	74	24.5	23.7
6	4960.000	Average	33.11	33.04	9.6	0.0	42.7	42.6	54	11.3	11.4
7	7440.000	Peak	41.58	40.25	15.0	0.0	56.5	55.2	74	17.4	18.8
8	7440.000	Average	29.73	29.62	15.0	0.0	44.7	44.6	54	9.3	9.4
9	9920.000	Peak	40.06	42.58	17.3	0.0	57.4	59.9	74	16.6	14.1
10	9920.000	Average	28.29	28.34	17.3	0.0	45.6	45.7	54	8.4	8.3
11	12400.000	Peak	37.08	38.22	21.7	0.0	58.8	60.0	74	15.2	14.0
12	12400.000	Average	26.67	26.66	21.7	0.0	48.4	48.4	54	5.6	5.6

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

9.4 Band Edge of Authorized Frequency Band

Regulations	FCC Part15C §15.247 (d) RSS-247 5.5
Test Method/Guide	ANSI C63.10-2013 clause 6.10.4

Test Procedure

1. The EUT and test instrument were set up as shown on section 10.1.
2. Adjust the measurement instrument for the following setting:

RBW	:	100 kHz
VBW	:	300 kHz
Span	:	20 MHz
Detector	:	Peak
Sweep Time	:	Auto
Trace mode	:	Max Hold
3. Allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within in-band emission.
5. Use the marker function to ensure that the band edge level of the authorized frequency band was attenuated by at least the minimum requirements specified.
6. Band Edge Measurement data correction;
 $\text{Limit [dBm]} = \text{Peak level within in-band emission [dBm]} + \text{Factor [dB]} - 20 \text{ [dB]}$
 $\text{Margin [dB]} = \text{Limit [dBm]} - (\text{Band edge Level [dBm]} + \text{Factor [dB]})$

Test Result

Location	Matsuda Laboratory No.1 Test Site
Test date	April 5, 2017
Temperature	22 [degree C]
Humidity variation	45 [%RH]
Test Engineer	Tomochika Yonemura

Operating mode	WLAN 802.11b			
Freq. [MHz]	Peak level within in-band emission [dBm]	Limit [dBm]	Band edge level [dBm]	Margin [dB]
2390	9.734	-10.266	-51.756	41.490
2400	9.734	-10.266	-39.532	29.266
2483.5	9.467	-10.533	-51.574	41.041
2500	9.467	-10.533	-55.230	44.697

Operating mode	WLAN 802.11g			
Freq. [MHz]	Peak level within in-band emission [dBm]	Limit [dBm]	Band edge level [dBm]	Margin [dB]
2390	6.861	-13.139	-43.604	30.465
2400	6.861	-13.139	-24.992	11.853
2483.5	6.435	-13.565	-39.255	25.690
2500	6.435	-13.565	-53.073	39.508

Operating mode	WLAN 802.11n20			
Freq. [MHz]	Peak level within in-band emission [dBm]	Limit [dBm]	Band edge level [dBm]	Margin [dB]
2390	7.142	-12.858	-40.314	27.456
2400	7.142	-12.858	-24.270	11.412
2483.5	6.615	-13.385	-40.578	27.193
2500	6.615	-13.385	-51.087	37.702

Operating mode	Bluetooth Low Energy			
Freq. [MHz]	Peak level within in-band emission [dBm]	Limit [dBm]	Band edge level [dBm]	Margin [dB]
2390	8.361	-11.639	-62.369	50.730
2400	8.361	-11.639	-48.934	37.295
2483.5	8.014	-11.986	-53.331	41.345
2500	8.014	-11.986	-61.567	49.581

Spectrum Plots
See ANNEX A.6

9.5 Spurious RF Conducted Emissions

Regulations	FCC Part15C §15.247 (d) RSS-247 5.5
Test Method/Guide	ANSI C63.10-2013 clause 7.8.8

Test Procedure

1. The EUT and test instrument were set up as shown on section 10.1.
2. Adjust the measurement instrument for the following setting:

RBW	:	100 kHz
VBW	:	300 kHz
Span	:	Set span to encompass the spectrum to be examined
Detector	:	Peak
Sweep Time	:	Auto
Correction Factor	:	Input Cable loss and Attenuator
Trace mode	:	Max Hold, Allow trace to fully stabilize.
3. Use the marker function to ensure that the amplitude of all unwanted emissions outside of the authorized frequency band is attenuated by at least the minimum requirements specified.

Spectrum Plots

See ANNEX A.7

Location	Matsuda Laboratory No.1 Test Site
Test date	April 6, 2017
Temperature	22 [degree C]
Humidity variation	45 [%]
Test Engineer	Tomochika Yonemura

9.6 Power Density

Regulations	FCC Part15C §15.247 (e) RSS-247 5.2 (2)
Test Method/Guide	ANSI C63.10-2013 clause 7.8.5

Test Procedure

1. The EUT and test instrument were set up as shown on section 10.1.
2. Adjust the test instrument for the following setting:

RBW	:	3 kHz
VBW	:	9 kHz
Span	:	1.5 times the 6 dB bandwidth
Detector	:	Peak
Sweep Time	:	Auto
Trace mode	:	Max Hold

Note: The value of the "6 dB bandwidth", from the result of section 9.1.

3. Allow trace to fully stabilize.
4. Use the peak search function to measure the peak of the emission.
5. Measurement data correction;

Measured Value [dBm] = Reading [dBm] + Factor [dB]

*Factor = Cable Loss [dB] + Attenuator [dB]

Margin [dB] = Limit [dBm] - Measured Value [dBm]

Location	Matsuda Laboratory No.1 Test Site
Test date	April 4, 2017
Temperature	22.0 [degree C]
Humidity variation	55.0 [%]
Test Engineer	Tomochika Yonemura

Operating modes	Freq. [MHz]	Reading [dBm]	Factor [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
WLAN 802.11b	2412	-24.773	21.020	-3.753	8.000	11.753
	2437	-25.608	21.020	-4.588	8.000	12.588
	2462	-25.311	21.020	-4.291	8.000	12.291
WLAN 802.11g	2412	-28.478	21.020	-7.458	8.000	15.458
	2437	-29.262	21.020	-8.242	8.000	16.242
	2462	-28.837	21.020	-7.817	8.000	15.817
WLAN 802.11n20	2412	-27.653	21.020	-6.633	8.000	14.633
	2437	-28.760	21.020	-7.740	8.000	15.740
	2462	-29.304	21.020	-8.284	8.000	16.284
Bluetooth Low Energy	2402	-26.229	21.020	-5.209	8.000	13.209
	2440	-26.356	21.020	-5.336	8.000	13.336
	2480	-26.708	21.020	-5.688	8.000	13.688

9.7 AC Conducted Emissions

Regulations	FCC Part15C §15.207 RSS-Gen 7.2.2
Test Method/Guide	ANSI C63.10-2013 clause 6.2

Test Procedure

1. The EUT and test instrument were set up as shown on section 10.3.
2. The spectrum analyzer is controlled by the computer program to sweep the frequency range to be measured, then spectrum chart is plotted out to find the worst emission.

At least six highest spectrum are measured in quasi-peak and average (if necessary) using the CISPR Receiver.

3. Adjust the test instrument for the following setting:

Frequency	Instruments	Detector	RBW	VBW
0.15 – 30 MHz	CISPR Receiver	QP	9 kHz	N/A
		AVG		

6. Measurement data correction;

Emission Level [dBuV] = Reading [dBuV] + Factor [dB]

Margin [dB] = Limit [dBuV] – Emission Level [dBuV]

* Factor = LISN Factor + Cable loss + Attenuator

Test Result

Test date	April 14, 2017
Location	Matsuda Laboratory No.2 Test Site
Temperature	22 [degree C]
Humidity variation	55 [%]
Test Engineer	Tomochika Yonemura

Operating mode			WLAN 802.11g, 2412 MHz								
No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Emission Level [dBuV]		Limit [dBuV]	Margin [dB]	
			L1	L2	L1	L2	L1	L2		L1	L2
1	0.25	QuasiPeak	30.85	32.53	10.40	10.40	41.25	42.93	62.40	21.15	19.47
2	0.27	Average	24.78	27.26	10.40	10.40	35.18	37.66	52.40	17.22	14.74
3	0.42	QuasiPeak	21.51	25.67	10.50	10.50	32.01	36.17	58.90	26.89	22.73
4	0.38	Average	16.23	19.33	10.50	10.50	26.73	29.83	48.90	22.17	19.07
5	0.66	QuasiPeak	9.16	11.32	10.50	10.50	19.66	21.82	56.00	36.34	34.18
6	0.69	Average	7.70	7.71	10.50	10.50	18.20	18.21	46.00	27.80	27.79
7	14.99	QuasiPeak	25.94	25.16	11.30	11.30	37.24	36.46	60.00	22.76	23.54
8	15.88	Average	10.23	10.09	11.30	11.30	21.53	21.39	50.00	28.47	28.61
9	18.00	QuasiPeak	23.59	23.25	11.30	11.30	34.89	34.55	60.00	25.11	25.45
10	16.07	Average	10.56	10.27	11.30	11.30	21.86	21.57	50.00	28.14	28.43
11	17.70	QuasiPeak	27.86	26.50	11.30	11.30	39.16	37.80	60.00	20.84	22.20
12	18.72	Average	11.74	11.42	11.30	11.30	23.04	22.72	50.00	26.96	27.28

Operating mode			WLAN 802.11g, 2437 MHz								
No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Emission Level [dBuV]		Limit [dBuV]	Margin [dB]	
			L1	L2	L1	L2	L1	L2		L1	L2
1	0.26	QuasiPeak	33.31	36.43	10.40	10.40	43.71	46.83	62.40	18.69	15.57
2	0.29	Average	26.76	30.54	10.40	10.40	37.16	40.94	52.40	15.24	11.46
3	0.45	QuasiPeak	23.23	28.75	10.50	10.50	33.73	39.25	58.90	25.17	19.65
4	0.41	Average	17.53	21.66	10.50	10.50	28.03	32.16	48.90	20.87	16.74
5	0.71	QuasiPeak	9.89	12.68	10.50	10.50	20.39	23.18	56.00	35.61	32.82
6	0.74	Average	8.32	8.64	10.50	10.50	18.82	19.14	46.00	27.18	26.86
7	16.04	QuasiPeak	28.02	28.17	11.30	11.30	39.32	39.47	60.00	20.68	20.53
8	16.99	Average	11.05	11.30	11.30	11.30	22.35	22.60	50.00	27.65	27.40
9	19.26	QuasiPeak	25.47	26.04	11.30	11.30	36.77	37.34	60.00	23.23	22.66
10	17.19	Average	11.40	11.50	11.30	11.30	22.70	22.80	50.00	27.30	27.20
11	18.93	QuasiPeak	30.09	29.68	11.30	11.30	41.39	40.98	60.00	18.61	19.02
12	20.03	Average	12.68	12.79	11.30	11.30	23.98	24.09	50.00	26.02	25.91

Operating mode			WLAN 802.11g, 2462 MHz								
No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Emission Level [dBuV]		Limit [dBuV]	Margin [dB]	
			L1	L2	L1	L2	L1	L2		L1	L2
1	0.26	QuasiPeak	32.39	34.80	10.40	10.40	42.79	45.20	62.40	19.61	17.20
2	0.28	Average	26.01	29.17	10.40	10.40	36.41	39.57	52.40	15.99	12.83
3	0.44	QuasiPeak	22.59	27.47	10.50	10.50	33.09	37.97	58.90	25.81	20.93
4	0.40	Average	17.04	20.69	10.50	10.50	27.54	31.19	48.90	21.36	17.71
5	0.69	QuasiPeak	9.62	12.11	10.50	10.50	20.12	22.61	56.00	35.88	33.39
6	0.72	Average	8.09	8.25	10.50	10.50	18.59	18.75	46.00	27.41	27.25
7	15.74	QuasiPeak	27.24	26.92	11.30	11.30	38.54	38.22	60.00	21.46	21.78
8	16.68	Average	10.75	10.80	11.30	11.30	22.05	22.10	50.00	27.95	27.90
9	18.90	QuasiPeak	24.77	24.88	11.30	11.30	36.07	36.18	60.00	23.93	23.82
10	16.87	Average	11.08	10.99	11.30	11.30	22.38	22.29	50.00	27.62	27.71
11	18.58	QuasiPeak	29.25	28.36	11.30	11.30	40.55	39.66	60.00	19.45	20.34
12	19.65	Average	12.33	12.22	11.30	11.30	23.63	23.52	50.00	26.37	26.48

Operating mode			Bluetooth Low Energy, 2402MHz								
No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Emission Level [dBuV]		Limit [dBuV]	Margin [dB]	
			L1	L2	L1	L2	L1	L2		L1	L2
1	0.23	QuasiPeak	35.47	38.38	10.40	10.40	45.87	48.78	62.40	16.53	13.62
2	0.25	Average	28.49	32.17	10.40	10.40	38.89	42.57	52.40	13.51	9.83
3	0.40	QuasiPeak	24.74	30.29	10.50	10.50	35.24	40.79	58.90	23.66	18.11
4	0.36	Average	18.66	22.82	10.50	10.50	29.16	33.32	48.90	19.74	15.58
5	0.62	QuasiPeak	10.53	13.36	10.50	10.50	21.03	23.86	56.00	34.97	32.14
6	0.65	Average	8.86	9.10	10.50	10.50	19.36	19.60	46.00	26.64	26.40
7	14.09	QuasiPeak	29.83	29.68	11.30	11.30	41.13	40.98	60.00	18.87	19.02
8	14.93	Average	11.77	11.91	11.30	11.30	23.07	23.21	50.00	26.93	26.79
9	16.92	QuasiPeak	27.13	27.44	11.30	11.30	38.43	38.74	60.00	21.57	21.26
10	15.10	Average	12.14	12.12	11.30	11.30	23.44	23.42	50.00	26.56	26.58
11	16.63	QuasiPeak	32.04	31.27	11.30	11.30	43.34	42.57	60.00	16.66	17.43
12	17.59	Average	13.51	13.47	11.30	11.30	24.81	24.77	50.00	25.19	25.23

Operating mode			Bluetooth Low Energy, 2440MHz								
No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Emission Level [dBuV]		Limit [dBuV]	Margin [dB]	
			L1	L2	L1	L2	L1	L2		L1	L2
1	0.21	QuasiPeak	34.41	35.70	10.40	10.40	44.81	46.10	62.40	17.59	16.30
2	0.23	Average	27.64	29.92	10.40	10.40	38.04	40.32	52.40	14.36	12.08
3	0.37	QuasiPeak	24.00	28.17	10.50	10.50	34.50	38.67	58.90	24.40	20.23
4	0.33	Average	18.10	21.22	10.50	10.50	28.60	31.72	48.90	20.30	17.18
5	0.57	QuasiPeak	10.22	12.42	10.50	10.50	20.72	22.92	56.00	35.28	33.08
6	0.60	Average	8.59	8.47	10.50	10.50	19.09	18.97	46.00	26.91	27.03
7	12.96	QuasiPeak	28.94	27.61	11.30	11.30	40.24	38.91	60.00	19.76	21.09
8	13.74	Average	11.42	11.07	11.30	11.30	22.72	22.37	50.00	27.28	27.63
9	15.57	QuasiPeak	26.31	25.52	11.30	11.30	37.61	36.82	60.00	22.39	23.18
10	13.90	Average	11.78	11.27	11.30	11.30	23.08	22.57	50.00	26.92	27.43
11	15.30	QuasiPeak	31.08	29.09	11.30	11.30	42.38	40.39	60.00	17.62	19.61
12	16.18	Average	13.10	12.53	11.30	11.30	24.40	23.83	50.00	25.60	26.17

Operating mode			Bluetooth Low Energy, 2480MHz								
No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Emission Level [dBuV]		Limit [dBuV]	Margin [dB]	
			L1	L2	L1	L2	L1	L2		L1	L2
1	0.21	QuasiPeak	33.35	34.93	10.40	10.40	43.75	45.33	62.40	18.65	17.07
2	0.23	Average	26.78	29.28	10.40	10.40	37.18	39.68	52.40	15.22	12.72
3	0.36	QuasiPeak	23.25	27.56	10.50	10.50	33.75	38.06	58.90	25.15	20.84
4	0.32	Average	17.54	20.76	10.50	10.50	28.04	31.26	48.90	20.86	17.64
5	0.56	QuasiPeak	9.90	12.16	10.50	10.50	20.40	22.66	56.00	35.60	33.34
6	0.58	Average	8.33	8.28	10.50	10.50	18.83	18.78	46.00	27.17	27.22
7	12.68	QuasiPeak	28.04	27.01	11.30	11.30	39.34	38.31	60.00	20.66	21.69
8	13.44	Average	11.06	10.83	11.30	11.30	22.36	22.13	50.00	27.64	27.87
9	15.23	QuasiPeak	25.50	24.97	11.30	11.30	36.80	36.27	60.00	23.20	23.73
10	13.59	Average	11.41	11.03	11.30	11.30	22.71	22.33	50.00	27.29	27.67
11	14.97	QuasiPeak	30.12	28.46	11.30	11.30	41.42	39.76	60.00	18.58	20.24
12	15.83	Average	12.70	12.26	11.30	11.30	24.00	23.56	50.00	26.00	26.44

9.8 Receiver Spurious Emissions

Regulations	RSS-Gen 7.1
Test Method/Guide	ANSI C63.10-2013 clause 6.5 and 6.6

Test Procedure

See section 9.6

Test Result

Operating mode	WLAN Receiving mode, EUT Axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20	22	22 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.440	QuasiPeak	36.02	35.25	-3.0	0.0	33.0	32.3	46	13.0	13.7
2	960.300	QuasiPeak	30.04	29.21	5.7	0.0	35.7	34.9	54	18.2	19.1
3	2437.000	Peak	39.50	38.36	3.8	0.0	43.3	42.1	74	30.7	31.9
4	2437.000	Average	32.11	31.37	3.8	0.0	35.9	35.1	54	18.1	18.9
5	4874.000	Peak	37.23	37.18	9.6	0.0	46.8	46.8	74	27.2	27.2
6	4874.000	Average	30.63	29.91	9.6	0.0	40.2	39.5	54	13.8	14.5
7	7311.000	Peak	40.16	34.40	15.0	0.0	55.1	49.4	74	18.9	24.6
8	7311.000	Average	27.66	26.97	15.0	0.0	42.6	41.9	54	11.4	12.1
9	9748.000	Peak	36.70	38.24	17.3	0.0	54.0	55.6	74	20.0	18.4
10	9748.000	Average	25.59	24.95	17.3	0.0	42.9	42.3	54	11.1	11.7
11	12185.000	Peak	34.44	34.75	21.7	0.0	56.2	56.5	74	17.8	17.5
12	12185.000	Average	25.02	24.48	21.7	0.0	46.8	46.2	54	7.2	7.8

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

Operating mode	Bluetooth Low Energy Receiving mode, EUT Axis: X		
Location	Matsuda Laboratory No.2 Test Site	Matsuda Laboratory No.1 Test Site	
Frequency	30 - 1000 MHz,	1 - 18 GHz,	18 - 25 GHz
Test date	April 12, 2017	April 13, 2017	April 14, 2017
Temperature	20	22	22 [degree C]
Humidity variation	50	55	55 [%]
Test Engineer	Tomochika Yonemura		

No.	Freq. [MHz]	Detector	Reading [dBuV]		Factor [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
			Hor	Ver	Loss, Gain	Dist. Factor	Hor	Ver		Hor	Ver
1	296.450	QuasiPeak	37.83	35.96	-3.0	0.0	34.9	33.0	46	11.2	13.0
2	960.280	QuasiPeak	31.55	29.80	5.7	0.0	37.2	35.5	54	16.7	18.5
3	2440.000	Peak	41.48	39.13	3.8	0.0	45.2	42.9	74	28.7	31.1
4	2440.000	Average	33.72	32.00	3.8	0.0	37.5	35.8	54	16.5	18.2
5	4880.000	Peak	39.10	37.93	9.6	0.0	48.7	47.5	74	25.3	26.5
6	4880.000	Average	32.17	30.51	9.6	0.0	41.8	40.1	54	12.2	13.9
7	7320.000	Peak	42.17	35.09	15.0	0.0	57.1	50.0	74	16.9	23.9
8	7320.000	Average	29.05	27.51	15.0	0.0	44.0	42.5	54	10.0	11.5
9	9760.000	Peak	38.54	39.01	17.3	0.0	55.9	56.3	74	18.1	17.7
10	9760.000	Average	26.87	25.45	17.3	0.0	44.2	42.8	54	9.8	11.2
11	12200.000	Peak	36.17	35.45	21.7	0.0	57.9	57.2	74	16.1	16.8
12	12200.000	Average	26.28	24.97	21.7	0.0	48.0	46.7	54	6.0	7.3

Note.

Any Spurious emissions higher than the frequency reported in the table above were not detected during the measurement.

SECTION 10. LIST AND DIAGRAM OF MEASURING INSTRUMENTS

Test instruments are calibrated according to Quality Manual and Calibration Rules of Intertek Japan K.K.

All measurements equipment used for the measurement is calibrated based on standard.

Each measurement result is traceable to national or international standards.

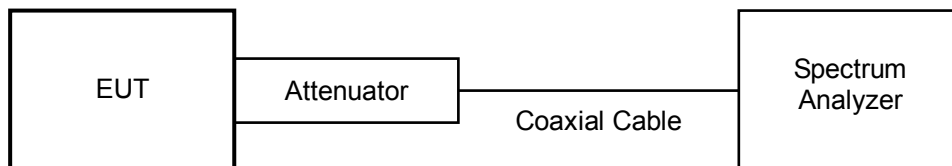
Antenna used in the measurement is calibrated according to ANSI C63.5:2006.

10.1 RF Conducted

Measurement Instruments

Instrument	Model No.	Serial No.	Manufacturer	Cal. Interval	Effective period
Spectrum Analyzer	N9030A	MY52350520	Agilent	1 Y	Mar. 31, 2018
20 dB Attenuator	8493C	78585	Agilent	1 Y	Mar. 31, 2018
Coaxial Cable	SUCOFLEX 104PE	94703/4PE	SUHNER	1 Y	Mar. 31, 2018

Measurement Equipment Configuration



10.2 Radiated Emission

Measurement Instruments

Instrument	Model No.	Serial No.	Manufacturer	Cal. Interval	Effective period
30 – 1000 MHz					
Broad Band Antenna	VULB9168	111	Schwarzbeck	1 Y	Sep. 30, 2017
Amplifier	8447F	2805A02505	Hewlett Packard	1 Y	Jan. 31, 2018
Attenuator	6806.17.AC	-	HUBER+SUHNER	1 Y	Jan. 31, 2018
Coaxial Cable (R1)	EM0NSA3	MTD02325	Fujiura	1 Y	Jan. 31, 2018
Coaxial Cable (R2)	SUCOFLEX 106	12718/6	HUBER+SUHNRT	1 Y	Jan. 31, 2018
Site Attenuation	-	-	-	1 Y	Apr. 30, 2017
Test Receiver	ESS (Firmware Version 1.07)	842886/010	Rohde & Schwarz	1 Y	Feb. 28, 2018
Above 1000 MHz					
Double Ridged Antenna	3115	2568	EMCO	1 Y	Jan. 31, 2018
Horn Antenna with Preamplifier	MLA-18265-B03-30	1694440	TSJ	1 Y	Sep. 30, 2017
Amplifier	TPA0118-30	950186	TOYO Corporation	1 Y	Apr. 30, 2017
6dB Attenuator	6806.17.B	E00AT6GA	SUNNER	1 Y	Apr. 30, 2017
Coaxial Cable (R3)	SUCOFLEX 104(6.0m)	64611/4PE	SUNNER	1 Y	Apr. 30, 2017
Coaxial Cable (R4)	SUCOFLEX 104(1.0m)	64587/4PE	SUNNER	1 Y	Apr. 30, 2017
Coaxial Cable (R5)	5B-048-98-98-6000	120315	Candox	1 Y	Sep. 30, 2017
SVSWR				1 Y	Sep. 30, 2017
Spectrum Analyzer	N9030A	MY52350520	Agilent	1 Y	Mar. 31, 2018
Common					
Testing Software	emiT (Version 3,0,0,0)			N/A	N/A

Measurement Instruments Configurations

Diagram of the measurement instruments (30-1000 MHz)

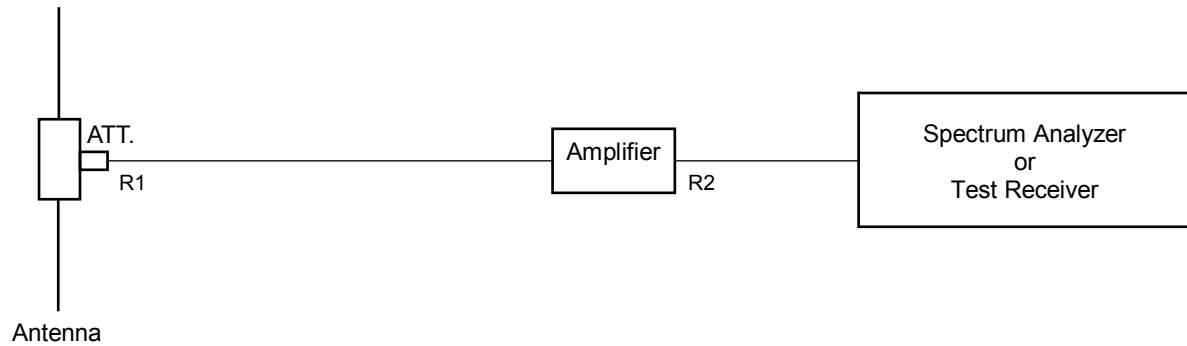


Diagram of the measurement instruments (2000 - 3000 MHz)

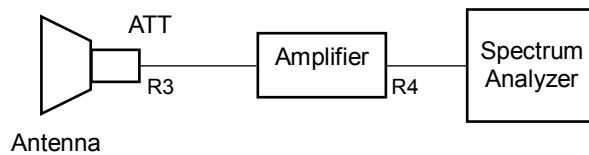


Diagram of the measurement instruments (1000- 2000 and 3000 – 18000 MHz)

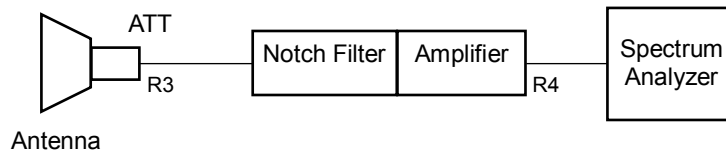
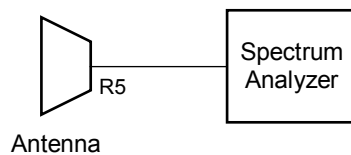
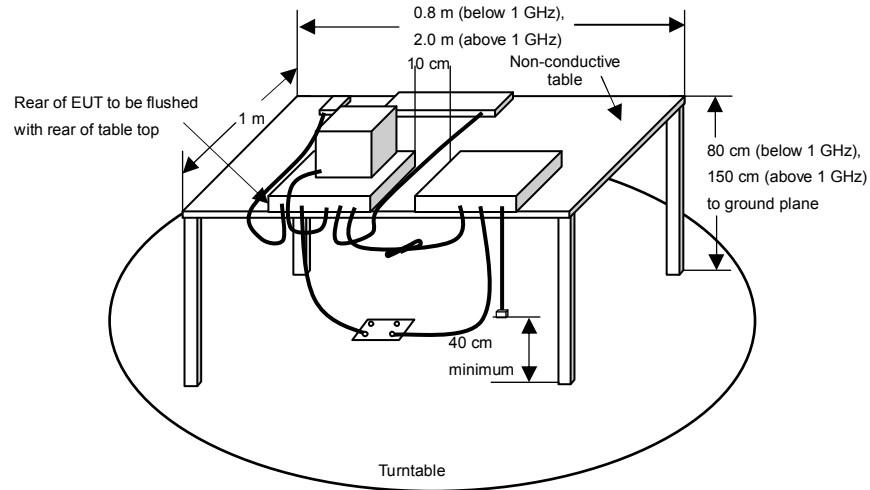


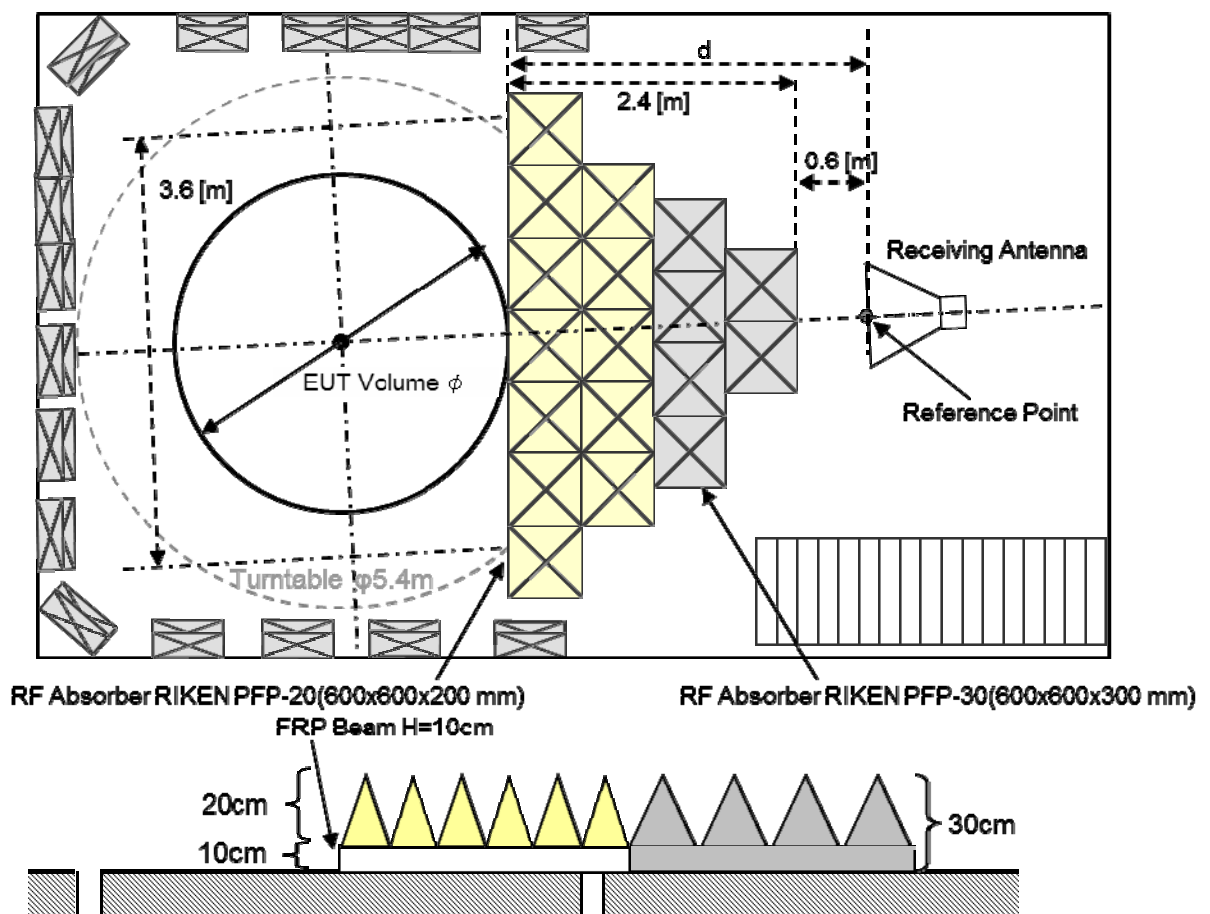
Diagram of the measurement instruments (18000 - 25000 MHz)



EUT set-up as per standard



Absorber placement and Receive Antenna location in Radiated disturbance above 1 GHz

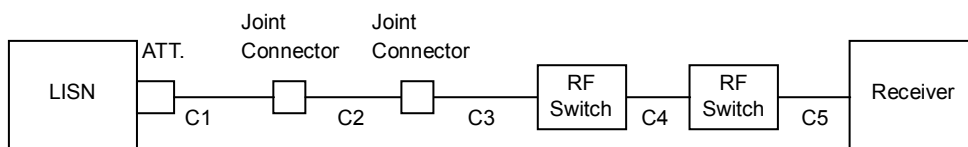


10.3 AC Line Conducted Emission

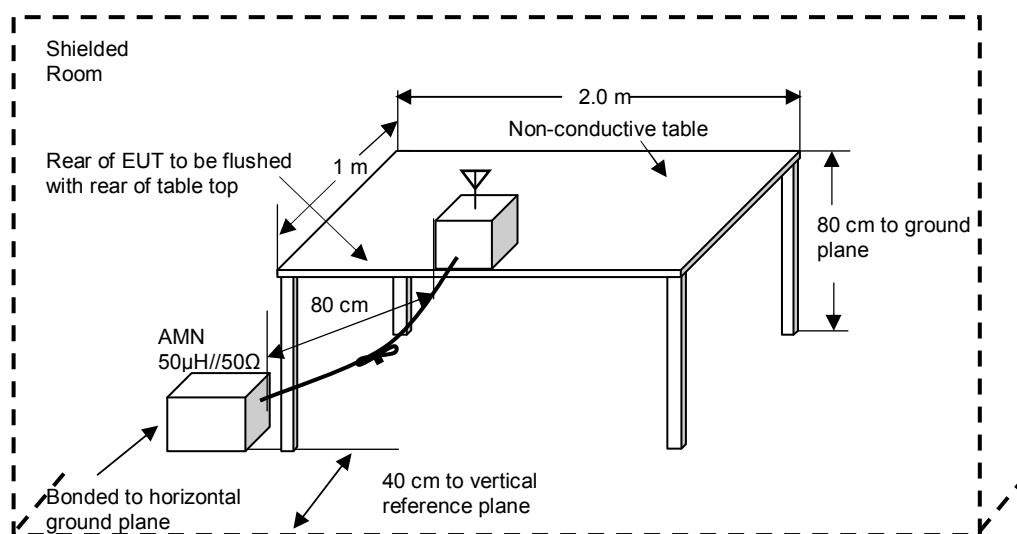
Measurement Instrument

Instrument	Model No.	Serial No.	Manufacturer	Cal. Interval	Effective period
LISN(EUT)	ESH2-Z5	842966/001	Rohde & Schwarz	1 Y	Aug. 31, 2017
LISN(Peripheral)	KNW-407	8-1395-2	Kyoritsu	1 Y	Jun. 30, 2017
10dB LISN Pad	CFA-01	E03AT10D	TAMAGAWA	1 Y	Aug. 31, 2017
10dB LISN Pad	6801.01.A	E00AT10D	HUBER+SUHNER	1 Y	Jun. 30, 2017
50Ω Termination	65BNC-50-0-2/133NE	E02TRM50A	SUHNER	1 Y	Jun. 30, 2017
Coaxial Cable (C1)	3D-2W(7.8m)	MTS02CSR-1	Intertek	1 Y	Jan. 31, 2018
Coaxial Cable (C2)	RG-5A/U(12.0m)	MTS02CSR-2	Intertek	1 Y	Jan. 31, 2018
Coaxial Cable (C3)	RG214HF(1.5m)	MTS02CSR-3	SUHNER	1 Y	Jan. 31, 2018
Coaxial Cable (C4)	RG214HF(1.5m)	MTS02CSR-4	SUHNER	1 Y	Jan. 31, 2018
Coaxial Cable (C5)	RG214HF(1.5m)	MTS02CSR-5	SUHNER	1 Y	Jan. 31, 2018
RF Switch	MP59B	M28542	Anritsu	1 Y	Feb. 28, 2018
RF Switch	ACX-150-1	E02301501	Intertek	1 Y	Feb. 28, 2018
Test Receiver	ESS (Firmware Version 1.21)	842123/010	Rohde & Schwarz	1 Y	Feb. 28, 2018
Testing Software	emiT (Version 3,0,0,0)	-	-	-	-

Measurement Instruments Configurations



Test setup as per standard



* Reference Ground plane : greater than 2 x 2m