



RADIO TEST REPORT

Test Report No. : 11003205S-A

Applicant : SMK Corporation
Type of Equipment : WLAN Complete Module
Model No. : VRL4149-0601F
FCC ID : GT3FC016
Test regulation : FCC Part 15 Subpart E: 2015
W58 (5745 MHz - 5825 MHz Band) only
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

Date of test: January 5 to 14, 2016

Representative test engineer:

H. Morikawa

Hiroyuki Morikawa
Engineer
Consumer Technology Division

Approved by:

T. Imamura

Toyokazu Imamura
Leader
Consumer Technology Division



JAB
Testing
RTL02610

- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
 There is no testing item of "Non-accreditation".

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing.....	7
SECTION 5: Conducted Emission.....	9
SECTION 6: Radiated Spurious Emission and Band Edge Compliance.....	10
SECTION 7: Antenna Terminal Conducted Tests.....	12
APPENDIX 1: Test data	13
Conducted Emission	13
99 % Occupied Bandwidth.....	17
6 dB Bandwidth	20
Maximum Conducted Output Power	23
Maximum Power Spectral Density	27
Radiated Spurious Emission	31
Conducted Spurious Emission	43
APPENDIX 2: Test instruments	44
APPENDIX 3: Photographs of test setup	45
Conducted Emission	45
Radiated Spurious Emission	46
Pre-check of the worst position.....	47

SECTION 1: Customer information

Company Name : SMK Corporation
Address : 5-6, Togoshi 6-chome, Shinagawa-ku, Tokyo 142-8511, Japan
Telephone Number : +81-3-3785-1111
Facsimile Number : +81-3-3785-1878
Contact Person : Mitsuhiro Goto

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : WLAN Complete Module
Model No. : VRL4149-0601F
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 1.8 V (DC 1.71 V to 1.89 V)
DC 3.3 V (DC 3.0 V to 3.6 V)
Receipt Date of Sample : January 5, 2016
Country of Mass-production : Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab.

2.2 Product Description

Model: VRL4149-0601F (referred to as the EUT in this report) is a WLAN Complete Module.

General Specification

Clock frequency(ies) in the system : 38.4 MHz

Radio Specification

Equipment type : Transceiver
Frequency of operation : 2412 MHz to 2462 MHz, 5180 MHz to 5320 MHz,
5500 MHz to 5700 MHz, 5745 MHz to 5825 MHz
Radio part clock frequency : 38.4 MHz
Channel spacing : 5 MHz (for 2412 MHz to 2462 MHz), 20 MHz (for 5180 MHz to 5825 MHz)
Type of modulation : DSSS, OFDM
Antenna type : Printed wire
Antenna connector type : None
Antenna gain (maximum) : +1.47 dBi (for 2412 MHz to 2462 MHz), -0.5 dBi (for 5180 MHz to 5260MHz),
+1.15 dBi (for 5260 MHz to 5320 MHz), -0.2dBi (for above 5500 MHz)
ITU code : G1D, D1D
Operating Voltage (Radio part) : DC 1.8 V (DC 1.71 V to 1.89 V)
DC 3.3 V (DC 3.0 V to 3.6 V)
Operation temperature range : -20 deg.C to +70 deg.C

Refer to 32FE0117-SH-02-A (FCC part 15 subpart C report), 32FE0117-SH-02-B (FCC part 15 subpart E report) and 32FE0117-SH-02-C (FCC part 15 DFS report).

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E: 2015, final revised on November 23, 2015
Title : FCC 47CFR Part15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

*Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013	FCC: 15.407 (b) (6) / 15.207	21.6 dB, 0.50376 MHz, QP, N DC 1.8 V Line Tx 11a 5745 MHz	Complied	-
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
26 dB Emission Bandwidth	FCC: KDB Publication Number 789033	FCC: 15.407 (a) (1) (2) (3)	See data	N/A	Conducted
	IC: -	IC: -			
Maximum Conducted Output Power	FCC: KDB Publication Number 789033	FCC: 15.407 (a) (1) (2) (3)	See data	Complied	Conducted
	IC: -	IC: RSS-247 6.2.1 (1) 6.2.2 (1) 6.2.3 (1) 6.2.4 (1)			
Maximum Power Spectral Density	FCC: KDB Publication Number 789033	FCC : 15.407 (a) (1) (2) (3)	See data	Complied	Conducted
	IC: -	IC: RSS-247 6.2.1 (1) 6.2.2 (1) 6.2.3 (1) 6.2.4 (1)			
Spurious Emission Restricted Band Edge	FCC: ANSI C63.10-2013 KDB Publication Number 789033	FCC: 15.407 (b), 15.205 and 15.209	5.7 dB 7713.3 MHz, AV, Horizontal Tx 11n-20 5785 MHz	Complied	Conducted (< 30 MHz) / Radiated (> 30 MHz) *1)
	IC: -	IC: RSS-247 6.2.1 (2) 6.2.2 (2) 6.2.3 (2) 6.2.4 (2)			
6 dB Emission Bandwidth	FCC: ANSI C63.10-2013	FCC: 15.407 (e)	See data	Complied	Conducted
	IC: -	IC: RSS-247 6.2.4 (1)			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) Radiated test was selected over 30 MHz based on section FCC 15.407 (b) and KDB 789033 D02 G.3.b).

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred. (ANSI C63.10:2013 is Non-accreditation)

FCC 15.31 (e) / 212

The stable voltage (DC 1.8 V and DC 3.3 V) is constantly provided to RF Module from the host device. Therefore, this EUT complies with the requirement.

FCC Part 15.203 / 212

It is impossible for end users to replace the antenna, because it is soldered on the circuit board. Therefore the equipment complies with the requirement.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Band Width	RSS-Gen 6.6	IC: -	N/A	N/A	Conducted

Other than above, no addition, exclusion nor deviation has been made from the standard.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.
Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)		
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	3.6 dB	3.4 dB	3.4 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.7 dB	3.5 dB	3.5 dB
	30 MHz-300 MHz	4.9 dB	4.9 dB	4.7 dB
	300 MHz-1 GHz	5.0 dB	5.0 dB	4.8 dB
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB
	18 GHz-40 GHz	4.5 dB	4.3 dB	4.3 dB

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Bandwidth Measurement	0.66 %

Conducted emission test

The data listed in this test report has enough margin, more than the site margin.

Radiated emission test

The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401

JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

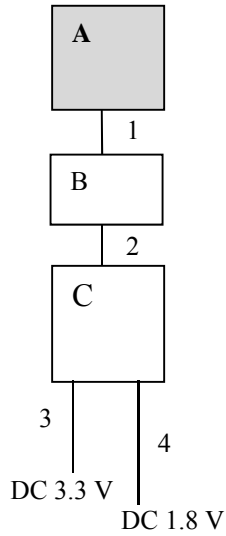
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals -” of TCB Council Workshop October 2009.

Mode	Remarks*
Transmitting (Tx), IEEE 802.11a (11a)	6 Mbps, PN9
Transmitting (Tx), IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 0, PN9
*Transmitting duty was 100 % on all tests. *The worst antenna condition was determined based on the test result of Maximum Conducted Output Power.	
Power settings:	11a : 17, 11n-20 : 16
Software:	MetisApp.exe, Version 1.0.0.0

*The details of Operation mode(s)

Test Item	Operating Mode	Tested Frequency
Conducted emission Radiated Spurious Emission (Below 1 GHz) Conducted Spurious Emission	Tx, 11a Tx, 11n-20	5745 MHz
99 % Occupied Bandwidth, Maximum Conducted Output Power, Maximum Power Spectral Density 6 dB Bandwidth Radiated Spurious Emission (Above 1 GHz)	Tx, 11a Tx, 11n-20	5745 MHz 5785 MHz 5825 MHz

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	WLAN Complete Module	VRL4149-0601F	C0000012	SMK Corporation	EUT
B	Jig A	-	-	SMK Corporation	-
C	Jig B	-	-	SMK Corporation	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal	0.025	Unshielded	Unshielded	-
2	Signal	0.025	Unshielded	Unshielded	-
3	DC	3.0	Unshielded	Unshielded	-
4	DC	2.0	Unshielded	Unshielded	-

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN / (AMN) to the input power source.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a shielded room. The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector : QP and CISPR Average
Measurement range : 0.15 MHz-30 MHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< Below 1GHz >

EUT was placed on a polystyrene platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

< Above 1GHz >

EUT was placed on a polystyrene platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

< Below 1GHz >

The result also satisfied with the general limits specified in section 15.209 (a).

< Above 1GHz >

Inside of restricted bands (Section 15.205):

Apply to limit in the Section 15.209 (a).

Outside of the restricted bands:

Apply to limit 68.2 dBuV/m, 3 m (-27 dBm e.i.r.p. *) or

78.2 dBuV/m, 3 m (-17 dBm e.i.r.p. *) in the Section 15.407 (b).

Restricted band edge:

Apply to limit in the Section 15.209 (a).

Since this limit is severer than the limit of the inside of restricted bands.

*Electric field strength to e.i.r.p. conversion:

$$E = \frac{1000000\sqrt{30P}}{3} \text{ (uV/m)} \quad ; P \text{ is the e.i.r.p. (Watts)}$$

Test Antennas are used as below;

Frequency	30 MHz to 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

Frequency	Below 1 GHz	Above 1 GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	Peak	Average
IF Bandwidth	BW: 120 kHz	RBW: 1 MHz VBW: 3 MHz	Method VB *1) RBW: 1 MHz VBW: 10 Hz (duty > 98 %)
Test Distance	3 m	4.49 m *2) (below 13 GHz), 1 m *3) (above 13 GHz),	

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v01r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

*2) Distance Factor: $20 \times \log(4.49 \text{ m}/3.0 \text{ m}) = 3.5 \text{ dB}$

*3) Distance Factor: $20 \times \log(1.0 \text{ m}/3.0 \text{ m}) = -9.5 \text{ dB}$

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Worst case:

Antenna polarization	Carrier (Band edge)	Spurious			
		Below 1 GHz	Above 1 GHz		
			1 GHz - 6.4 GHz	6.4 GHz - 26.5 GHz	26.5 GHz - 40 GHz
Horizontal	Z	Y	Z	Y	X
Vertical	Y	Y	Y	Y	X

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30 MHz-40 GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used and Test method
99 % Occupied Bandwidth*1)	Enough width to display emission skirts	1 % to 5 % of OBW	≥ 3 RBW	Auto	Sample	Max Hold	Spectrum Analyzer
6 dB Bandwidth	Enough to capture the emission	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Conducted Output Power	-	-	-	Auto	Average	-	Power Meter (Sensor: 160 MHz BW (Method PM-G))
Maximum Power Spectral Density	Encompass the entire EBW	100 kHz *2)	≥ 3 RBW	Auto	RMS Power Averaging (100 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*3)	9 kHz – 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz – 30 MHz	10 kHz	30 kHz				

* The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v01r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

*1) Peak hold was applied as Worst-case measurement.

*2) FCC standard says that RBW is set to be 500 kHz for 5.725 GHz-5.850 GHz, but it is not possible with spectrum analyzer, so $10\log(500\text{ kHz}/100\text{ kHz})$ was added to the test result.

*3) In the frequency range below 30 MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9 kHz-150 kHz: RBW = 200 Hz, 150 kHz-30 MHz: RBW = 10 kHz)

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX

Test result : Pass

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

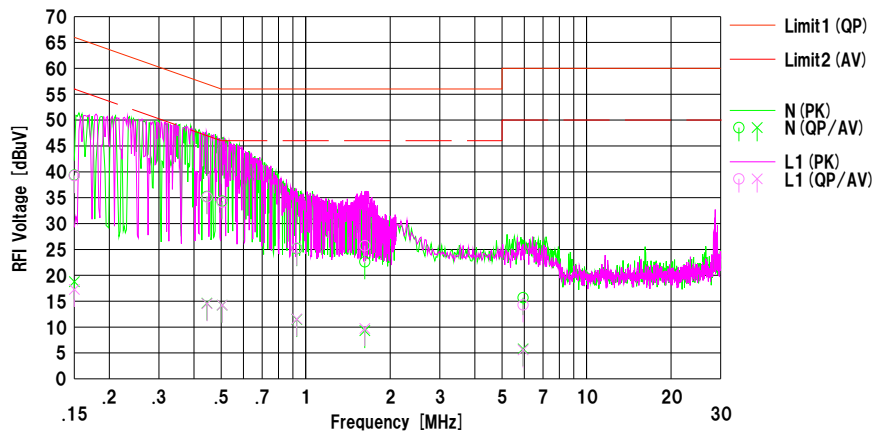
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2016/01/11

Mode : Tx 11a 5745MHz
Order No. : 11003205S

Remarks : DC power supply input: AC 120 V / 60 Hz, DC 1.8 V line.
Temp./Humi. : 24 deg.C / 29 %RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]	<QP> [dB]	<AV> [dB]		
1	0.15000	27.00	8.40	12.37	39.37	18.77	66.00	56.00	26.6	37.2	N	
2	0.44493	22.80	2.20	12.43	35.23	14.63	56.97	46.97	21.7	32.3	N	
3	0.50376	21.90	1.80	12.44	34.34	14.24	56.00	46.00	21.6	31.7	N	
4	0.92939	12.70	-1.00	12.47	25.17	11.47	56.00	46.00	30.8	34.5	N	
5	1.62312	10.10	-3.20	12.52	22.62	9.32	56.00	46.00	33.3	36.6	N	
6	5.94216	2.90	-7.00	12.79	15.69	5.79	60.00	50.00	44.3	44.2	N	
7	0.15000	26.90	4.90	12.37	39.27	17.27	66.00	56.00	26.7	38.7	L1	
8	0.44499	22.70	2.10	12.43	35.13	14.53	56.96	46.96	21.8	32.4	L1	
9	0.50429	21.70	1.80	12.44	34.14	14.24	56.00	46.00	21.8	31.7	L1	
10	0.92895	12.80	-0.90	12.47	25.27	11.57	56.00	46.00	30.7	34.4	L1	
11	1.62252	13.20	-2.80	12.52	25.72	9.72	56.00	46.00	30.2	36.2	L1	
12	5.94228	1.50	-7.20	12.79	14.29	5.59	60.00	50.00	45.7	44.4	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-03

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

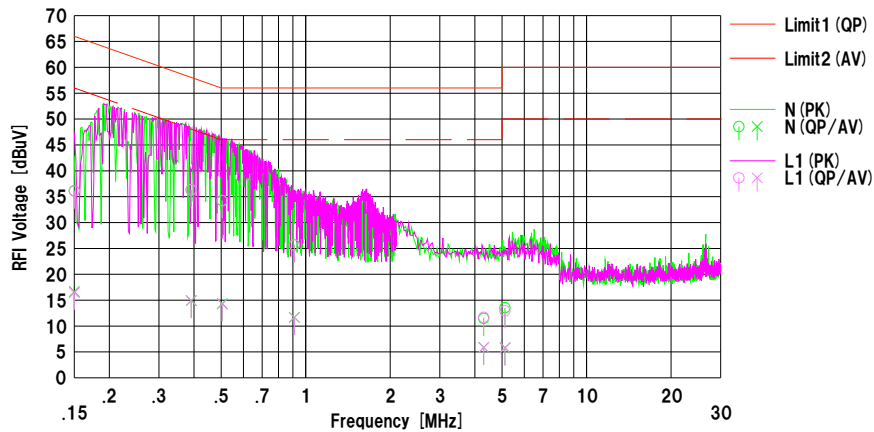
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2016/01/11

Mode : Tx 11a 5745 MHz
Order No. : 11003205S

Remarks : DC power supply input: AC 120 V / 60 Hz, DC 3.3 V line. Temp./Humi. : 24 deg.C / 29 %RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	23.80	4.30	12.37	36.17	16.67	66.00	56.00	29.8	39.3	N	
2	0.39115	23.90	2.50	12.43	36.33	14.93	58.04	48.04	21.7	33.1	N	
3	0.50417	21.80	1.90	12.44	34.24	14.34	56.00	46.00	21.7	31.6	N	
4	0.91119	13.20	-0.80	12.47	25.67	11.67	56.00	46.00	30.3	34.3	N	
5	4.30331	-1.20	-6.80	12.69	11.49	5.89	56.00	46.00	44.5	40.1	N	
6	5.12453	0.80	-7.00	12.75	13.55	5.75	60.00	50.00	46.4	44.2	N	
7	0.15000	23.70	4.10	12.37	36.07	16.47	66.00	56.00	29.9	39.5	L1	
8	0.39102	23.90	2.50	12.43	36.33	14.93	58.04	48.04	21.7	33.1	L1	
9	0.50418	21.80	1.90	12.44	34.24	14.24	56.00	46.00	21.7	31.7	L1	
10	0.91097	13.20	-0.80	12.47	25.67	11.67	56.00	46.00	30.3	34.3	L1	
11	4.30304	-1.00	-6.80	12.69	11.69	5.89	56.00	46.00	44.3	40.1	L1	
12	5.12437	0.20	-6.90	12.75	12.95	5.85	60.00	50.00	47.0	44.1	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-03

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

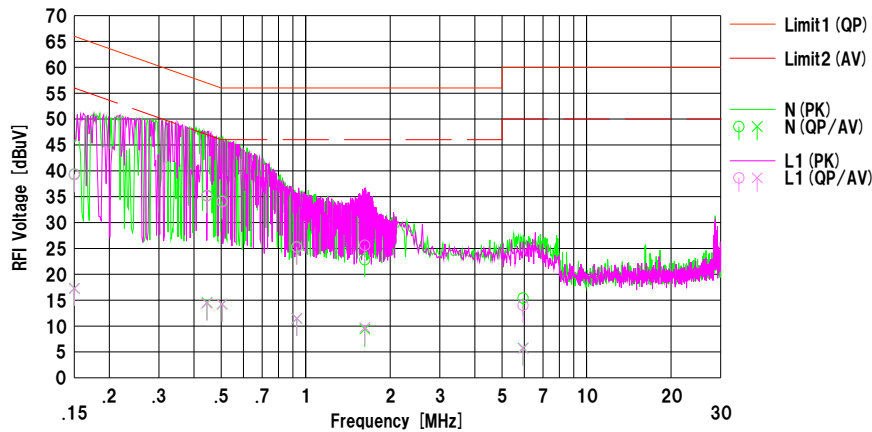
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
 Date : 2016/01/11

Company : SMK Corporation
 Kind of EUT : WLAN Complete Module
 Model No. : VRL4149-0601F
 Serial No. : C0000012
 Remarks : DC power supply input: AC 120 V / 60 Hz, DC 1.8 V line.

Mode : Tx 11n 5745 MHz
 Order No. : 11003205S
 Power : DC 3.3 V/DC 1.8 V
 Temp./Humi. : 24 deg.C / 29 %RH

Limit1 : FCC 15C (15.207) QP
 Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		[dB]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]		
1	0.15000	27.00	4.90	12.37	39.37	17.27	66.00	56.00	26.6	38.7	N	
2	0.44508	22.80	2.10	12.43	35.23	14.53	56.97	46.97	21.7	32.4	N	
3	0.50391	21.80	1.80	12.44	34.24	14.24	56.00	46.00	21.7	31.7	N	
4	0.92901	12.80	-1.00	12.47	25.27	11.47	56.00	46.00	30.7	34.5	N	
5	1.62289	10.30	-3.10	12.52	22.82	9.42	56.00	46.00	33.1	36.5	N	
6	5.94243	2.60	-7.00	12.79	15.39	5.79	60.00	50.00	44.6	44.2	N	
7	0.15000	26.90	4.90	12.37	39.27	17.27	66.00	56.00	26.7	38.7	L1	
8	0.44497	22.70	2.00	12.43	35.13	14.43	56.97	46.97	21.8	32.5	L1	
9	0.50414	21.80	1.80	12.44	34.04	14.24	56.00	46.00	21.9	31.7	L1	
10	0.92895	12.80	-1.00	12.47	25.27	11.47	56.00	46.00	30.7	34.5	L1	
11	1.62296	13.10	-2.80	12.52	25.62	9.72	56.00	46.00	30.3	36.2	L1	
12	5.94211	1.20	-7.10	12.79	13.99	5.69	60.00	50.00	46.0	44.3	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
 LISN:SLS-03

Conducted Emission

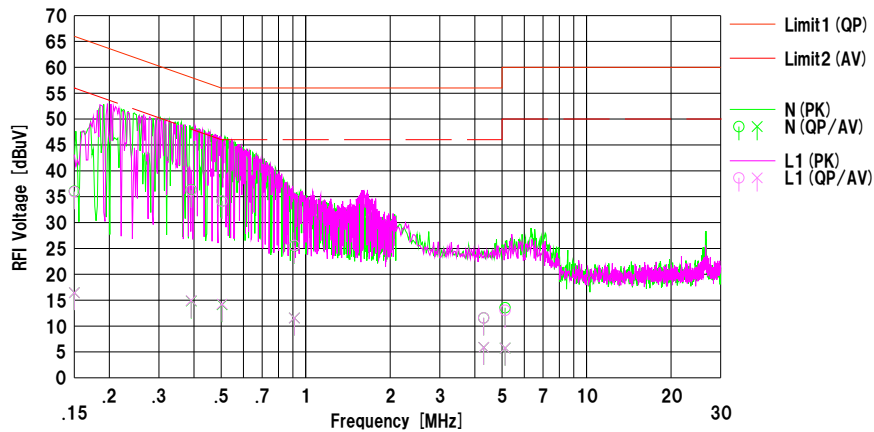
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2016/01/11

Company : SMK Corporation	Mode : Tx 11n 5745 MHz
Kind of EUT : WLAN Complete Module	Order No. : 11003205S
Model No. : VRL4149-0601F	Power : DC 3.3 V/DC 1.8 V
Serial No. : C0000012	Temp./Humi. : 24 deg.C / 29 %RH
Remarks : DC power supply input: AC 120 V / 60 Hz, DC 3.3 V line.	

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		[dB]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]		
1	0.15000	23.70	4.10	12.37	36.07	16.47	66.00	56.00	29.9	39.5	N	
2	0.39129	23.90	2.40	12.43	36.33	14.83	58.04	48.04	21.7	33.2	N	
3	0.50365	21.70	1.70	12.44	34.14	14.14	56.00	46.00	21.8	31.8	N	
4	0.91115	13.00	-0.90	12.47	25.47	11.57	56.00	46.00	30.5	34.4	N	
5	4.30304	-1.10	-6.80	12.69	11.59	5.89	56.00	46.00	44.4	40.1	N	
6	5.12516	0.80	-7.00	12.75	13.55	5.75	60.00	50.00	46.4	44.2	N	
7	0.15000	23.60	4.10	12.37	35.97	16.47	66.00	56.00	30.0	39.5	L1	
8	0.39091	23.80	2.50	12.43	36.23	14.93	58.04	48.04	21.8	33.1	L1	
9	0.50397	21.70	1.80	12.44	34.14	14.24	56.00	46.00	21.8	31.7	L1	
10	0.91092	13.10	-0.90	12.47	25.57	11.57	56.00	46.00	30.4	34.4	L1	
11	4.30306	-1.10	-6.80	12.69	11.59	5.89	56.00	46.00	44.4	40.1	L1	
12	5.12538	0.30	-7.00	12.75	13.05	5.75	60.00	50.00	46.9	44.2	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-03

99 % Occupied Bandwidth

Test place Shonan EMC Lab. No.6 Shielded Room
Report No. 11003205S-A
Date January 14, 2016
Temperature / Humidity 24deg. C / 32 % RH
Engineer Shinichi Takano
Mode Tx

11a

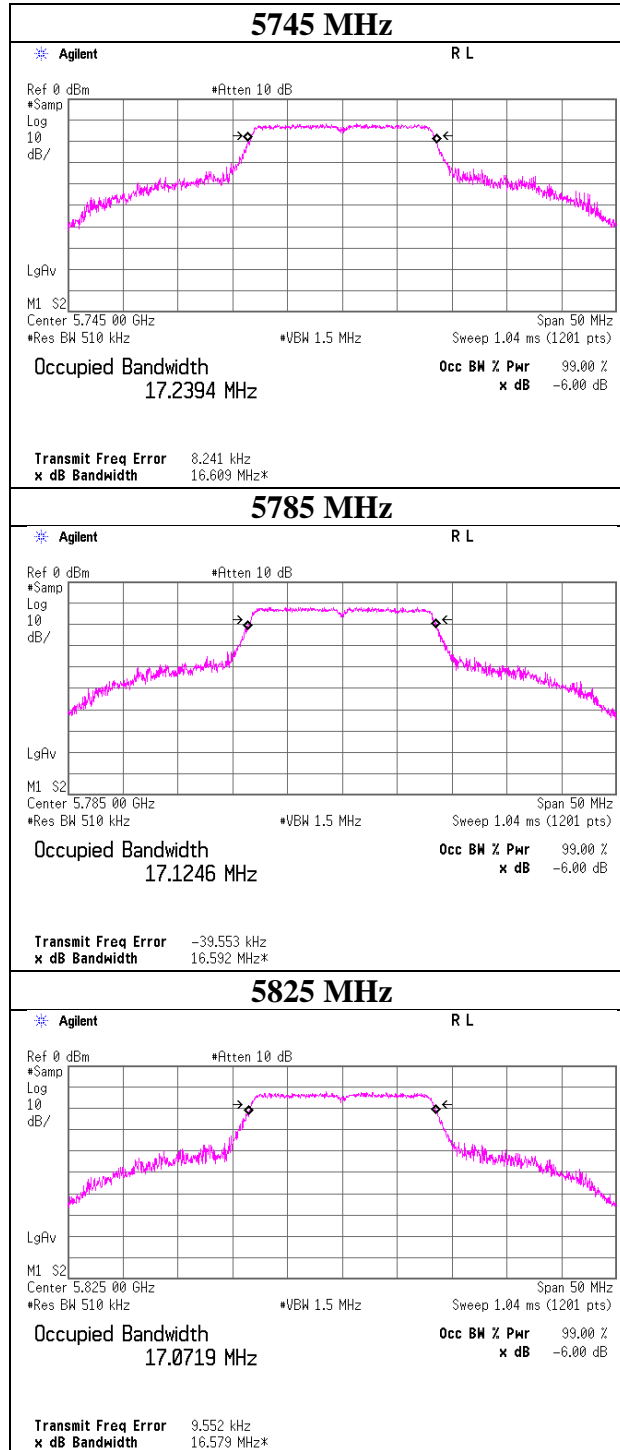
Tested Frequency [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
5745	17.239	-
5785	17.125	-
5825	17.072	-

11n-20

Tested Frequency [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
5745	18.160	-
5785	18.118	-
5825	18.041	-

99 % Occupied Bandwidth

11a



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

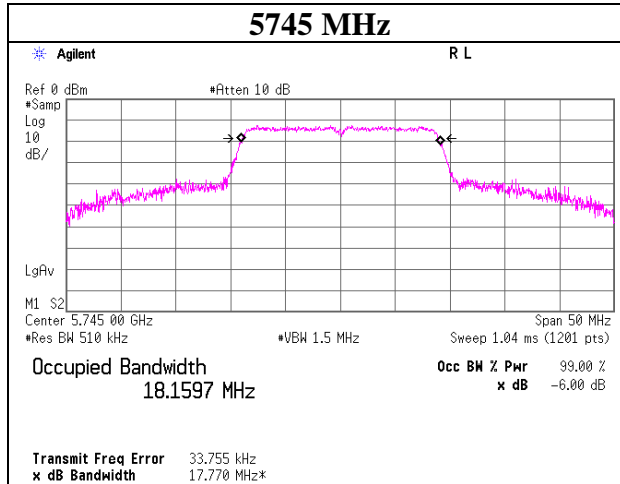
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

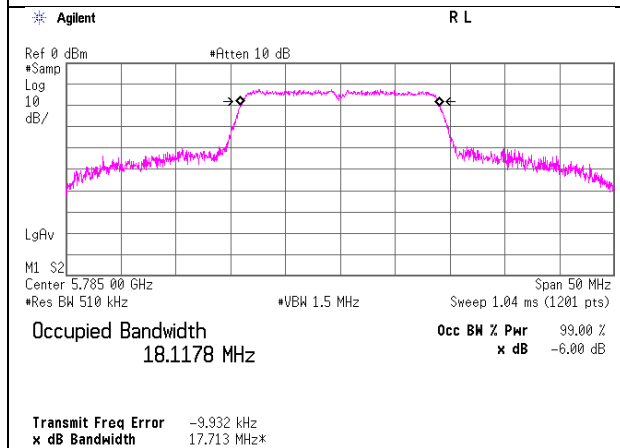
99 % Occupied Bandwidth

11n-20

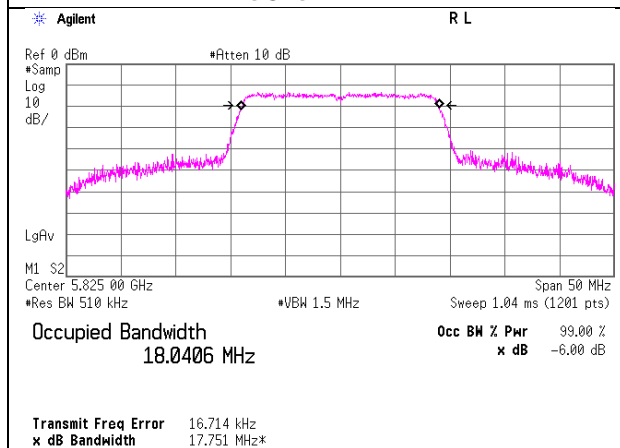
5745 MHz



5785 MHz



5825 MHz



6 dB Bandwidth

Test place Shonan EMC Lab. No.6 Shielded Room
Report No. 11003205S-A
Date January 14, 2016
Temperature / Humidity 24deg. C / 32 % RH
Engineer Shinichi Takano
Mode Tx

11a

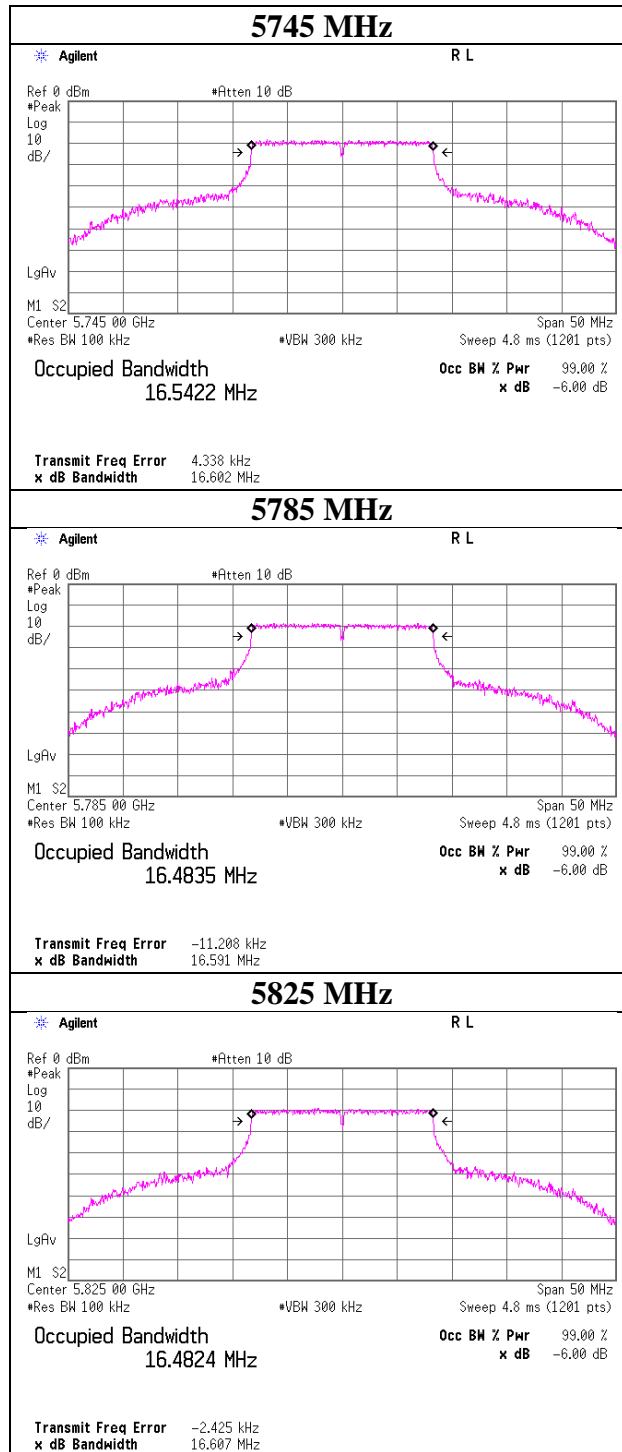
Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [kHz]
5745	16.602	> 500
5785	16.591	> 500
5825	16.607	> 500

11n-20

Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [kHz]
5745	17.805	> 500
5785	17.797	> 500
5825	17.808	> 500

6 dB Bandwidth

11a



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

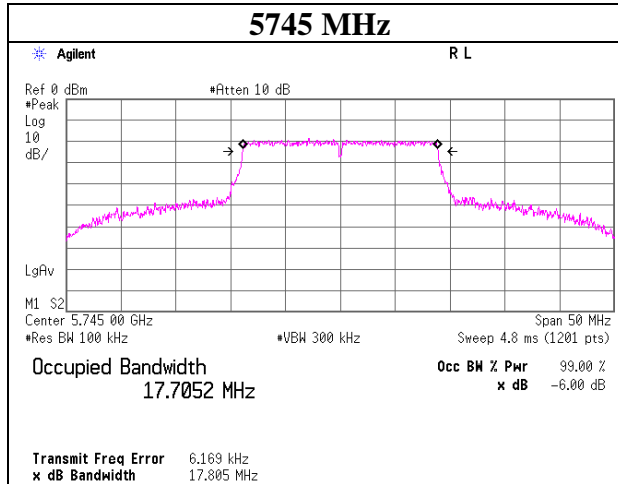
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

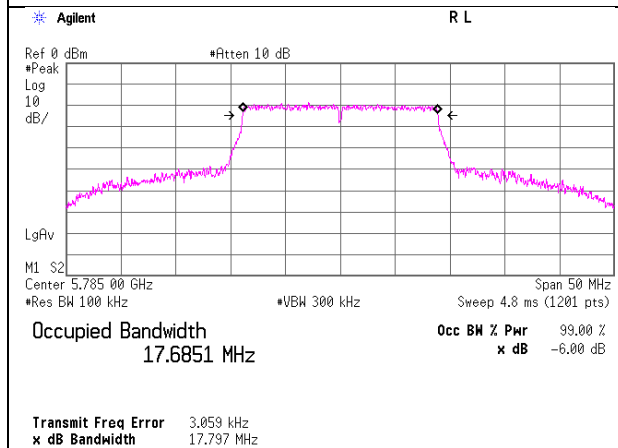
6 dB Bandwidth

11n-20

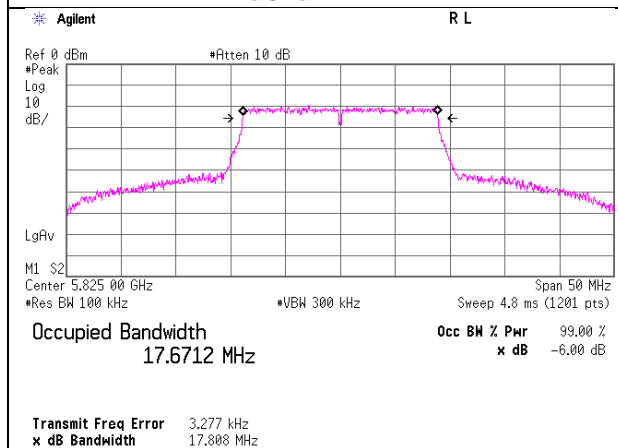
5745 MHz



5785 MHz



5825 MHz



Maximum Conducted Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
 Report No. : 11003205S-A
 Date : January 12, 2016
 Temperature / Humidity : 20 deg. C / 50 % RH
 Engineer : Hiroyuki Morikawa
 Mode : Tx 11a

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted Power			e.i.r.p.				
								Result [dBm]	Limit [dBm]	Margin [dB]	Result [dBm]	Limit [dBm]	Margin [dB]	Result [mW]	Limit [dBm]
5745	-3.14	3.39	10.18	0.00	-0.2	-	-	10.43	11.05	30.00	19.57	10.23	10.55	36.00	25.77
5785	-3.44	3.42	10.19	0.00	-0.2	-	-	10.17	10.40	30.00	19.83	9.97	9.93	36.00	26.03
5825	-3.52	3.45	10.20	0.00	-0.2	-	-	10.13	10.30	30.00	19.87	9.93	9.83	36.00	26.07

Sample Calculation:

Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

e.i.r.p. Result = Conducted Power Result + Antenna Gain

Conducted Power Limit (5250 MHz-5350 MHz, 5470 MHz-5725 MHz) = 250 mW or (11 + 10logB) dBm, whichever is lower

The conducted power limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725-5850MHz for IC)

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Maximum Conducted Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
 Report No. : 11003205S-A
 Date : January 12, 2016
 Temperature / Humidity : 20 deg. C / 50 % RH
 Engineer : Hiroyuki Morikawa
 Mode : Tx 11n-20

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted Power			e.i.r.p.				
								Result [dBm]	Limit [dBm]	Margin [dB]	Result [dBm]	Limit [dBm]	Margin [dB]	Result [mW]	Limit [dBm]
5745	-3.81	3.35	10.17	0.00	-0.2	-	-	9.71	9.36	30.00	20.29	9.51	8.94	36.00	26.49
5785	-4.18	3.37	10.18	0.00	-0.2	-	-	9.37	8.64	30.00	20.63	9.17	8.25	36.00	26.83
5825	-4.50	3.38	10.18	0.00	-0.2	-	-	9.06	8.05	30.00	20.94	8.86	7.69	36.00	27.14

Sample Calculation:

Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

e.i.r.p. Result = Conducted Power Result + Antenna Gain

Conducted Power Limit (5250 MHz-5350 MHz, 5470 MHz-5725 MHz) = 250 mW or (11 + 10logB) dBm, whichever is lower

The conducted power limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725-5850MHz for IC)

Maximum Conducted Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11003205S-A
Date : January 12, 2016
Temperature / Humidity : 20 deg. C / 50 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

5785 MHz

Mode	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11a	6	-3.44	0.00	-3.44	*
	9	-3.47	0.00	-3.47	
	12	-3.54	0.00	-3.54	
	18	-3.52	0.00	-3.52	
	24	-3.58	0.00	-3.58	
	36	-3.55	0.00	-3.55	
	48	-3.50	0.00	-3.50	
	54	-3.48	0.00	-3.48	

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

All comparison were carried out on same frequency and measurement factors.

5785 MHz

Mode	MCS Number	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n	0	-4.18	0.00	-4.18	*
	1	-4.29	0.00	-4.29	
	2	-4.32	0.00	-4.32	
	3	-4.32	0.00	-4.32	
	4	-4.33	0.00	-4.33	
	5	-4.31	0.00	-4.31	
	6	-4.28	0.00	-4.28	
	7	-4.28	0.00	-4.28	

* Worst rate

Sample Calculation:

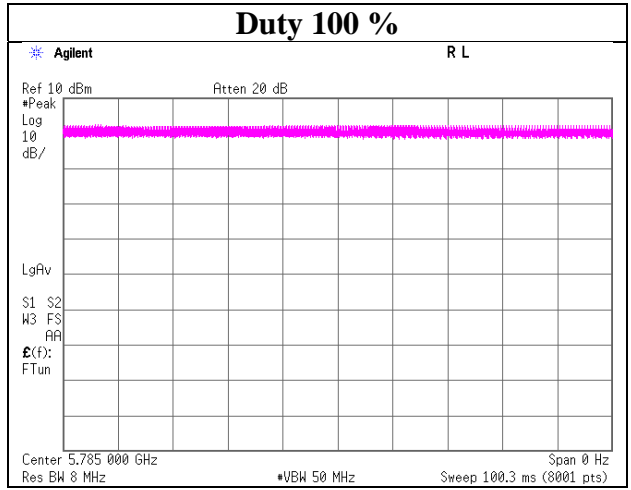
$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

All comparison were carried out on same frequency and measurement factors.

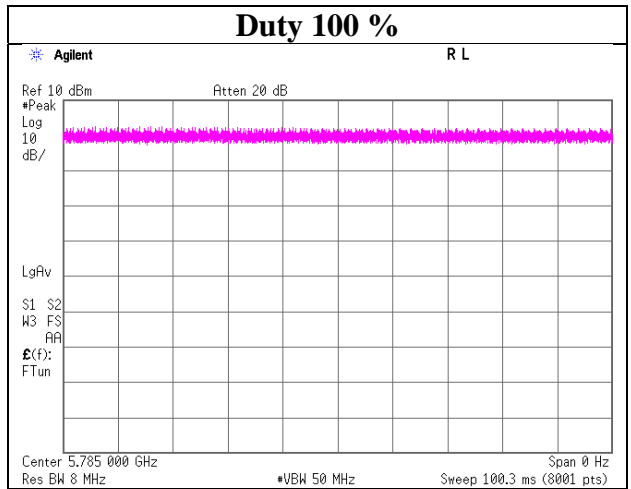
Burst rate confirmation

Test place Shonan EMC Lab. No.6 Shielded Room
Report No. 11003205S-A
Date January 14, 2016
Temperature / Humidity 24deg. C / 32 % RH
Engineer Shinichi Takano
Mode Tx

11a



11n-20



Maximum Power Spectral Density

Test place : Shonan EMC Lab. No.6 Shielded Room
Report No. : 11003205S-A
Date : January 14, 2016
Temperature / Humidity : 24deg. C / 32 % RH
Engineer : Shinichi Takano
Mode : Tx 11a

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted)			PSD (e.i.r.p.)		
							Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5745	-24.13	3.39	10.18	0.00	-0.2	6.99	-3.57	30.00	33.57	-3.77	36.00	39.77
5785	-24.16	3.42	10.19	0.00	-0.2	6.99	-3.56	30.00	33.56	-3.76	36.00	39.76
5825	-24.72	3.45	10.20	0.00	-0.2	6.99	-4.08	30.00	34.08	-4.28	36.00	40.28

Sample Calculation:

PSD: Power Spectral Density

The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.

RBW Correction Factor = $10 * \log(\text{Specified bandwidth} / \text{Measured bandwidth})$

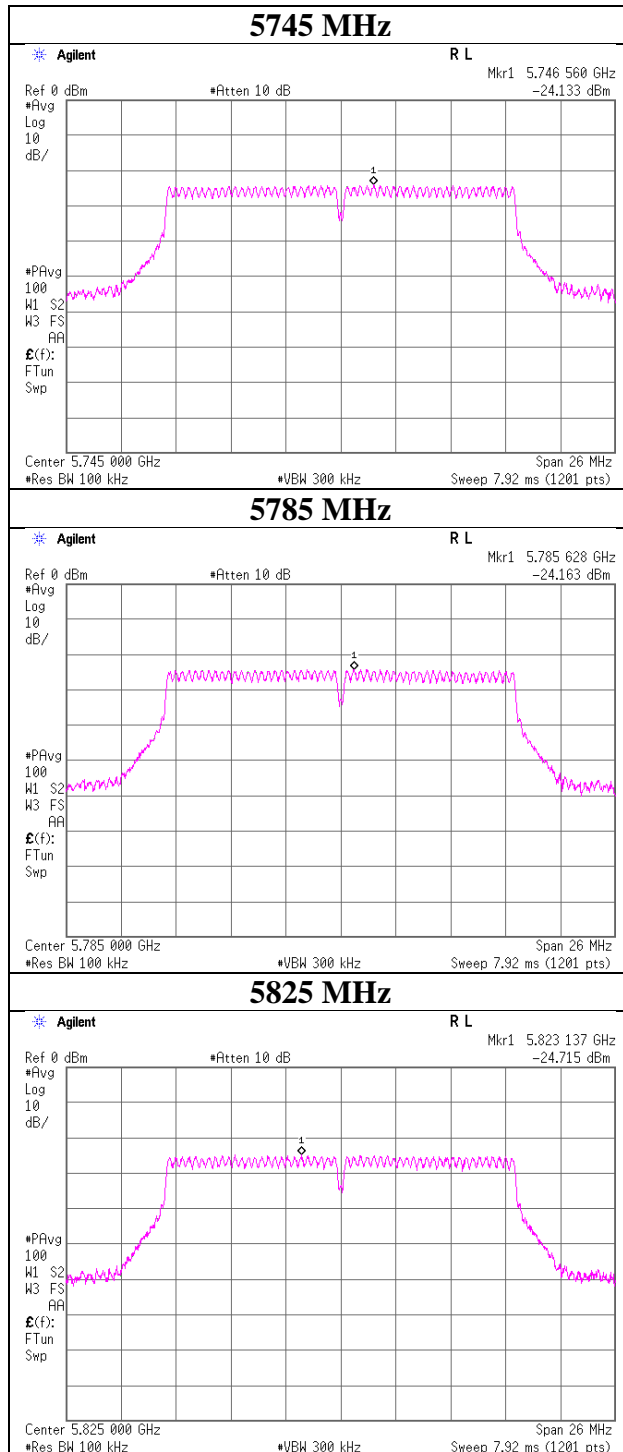
PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor

PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for IC)

Maximum Power Spectral Density

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11003205S-A
Date	January 14, 2016
Temperature / Humidity	24deg. C / 32 % RH
Engineer	Shinichi Takano
Mode	Tx 11a



Maximum Power Spectral Density

Test place : Shonan EMC Lab. No.6 Shielded Room
Report No. : 11003205S-A
Date : January 14, 2016
Temperature / Humidity : 24deg. C / 32 % RH
Engineer : Shinichi Takano
Mode : Tx 11n-20

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted)			PSD (e.i.r.p.)		
							Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5745	-24.82	3.35	10.17	0.00	-0.2	6.99	-4.31	30.00	34.31	-4.51	36.00	40.51
5785	-25.18	3.37	10.18	0.00	-0.2	6.99	-4.64	30.00	34.64	-4.84	36.00	40.84
5825	-25.81	3.38	10.18	0.00	-0.2	6.99	-5.26	30.00	35.26	-5.46	36.00	41.46

Sample Calculation:

PSD: Power Spectral Density

The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.

RBW Correction Factor = $10 * \log(\text{Specified bandwidth} / \text{Measured bandwidth})$

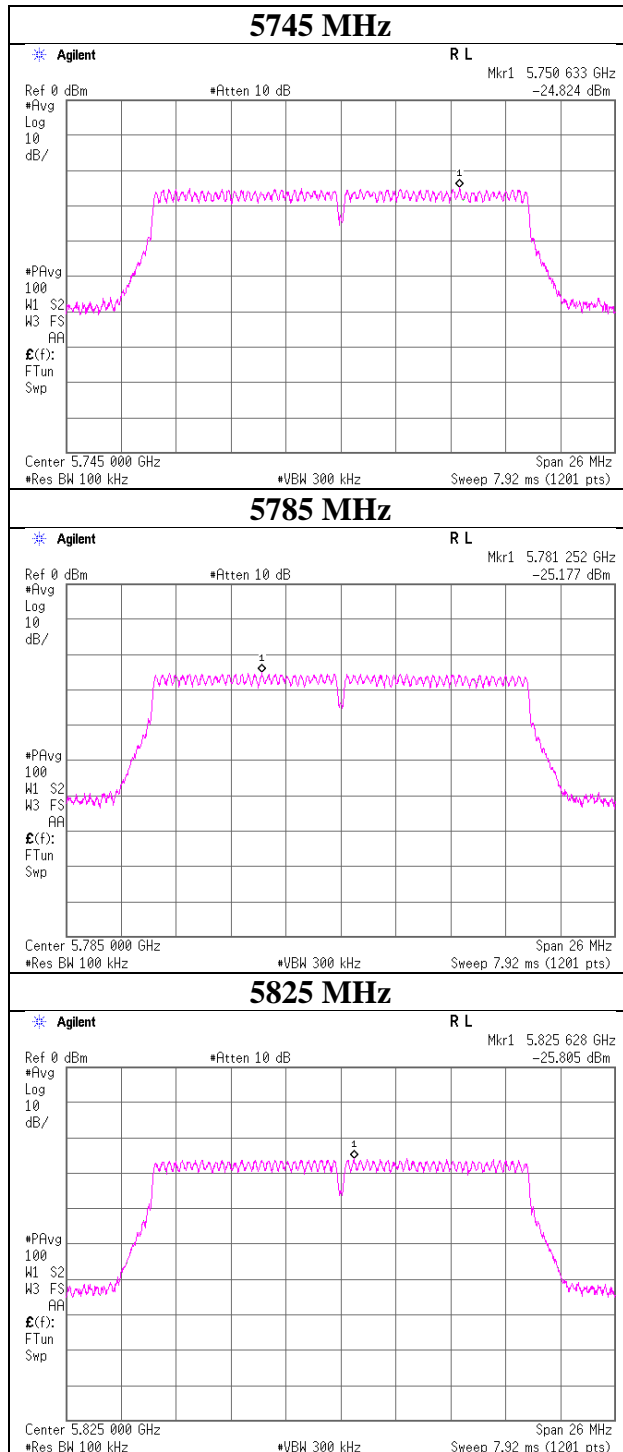
PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor

PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for IC)

Maximum Power Spectral Density

Test place : Shonan EMC Lab. No.6 Shielded Room
Report No. : 11003205S-A
Date : January 14, 2016
Temperature / Humidity : 24deg. C / 32 % RH
Engineer : Shinichi Takano
Mode : Tx 11n-20



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11003205S-A
Date : January 5, 2016 January 6, 2016 January 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH 23 deg. C / 32 % RH 18 deg. C / 24 % RH
Engineer : Wataru Kojima Shinichi Takano Wataru Kojima
Mode : Tx 11a 5745 MHz

(below 1GHz and above 1GHz Inside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	200.3	QP	23.1	16.3	8.1	32.0	0.0	15.5	43.5	28.0	150.0	155.0	
Hori.	320.0	QP	24.6	14.3	8.8	31.9	0.0	15.8	46.0	30.2	150.0	174.0	
Hori.	534.0	QP	20.9	17.9	9.7	31.9	0.0	16.6	46.0	29.4	150.0	157.0	
Hori.	596.7	QP	20.9	18.9	9.9	31.9	0.0	17.8	46.0	28.2	100.0	359.0	
Hori.	640.0	QP	25.3	19.5	10.1	31.9	0.0	23.0	46.0	23.0	150.0	357.0	
Hori.	919.5	QP	20.2	22.4	11.0	30.8	0.0	22.8	46.0	23.2	150.0	278.0	
Hori.	7660.0	PK	46.9	37.2	7.1	40.5	3.5	54.2	73.9	19.7	183.0	352.0	
Hori.	11490.0	PK	44.7	40.0	8.5	38.8	3.5	57.9	73.9	16.0	100.0	0.0	
Hori.	17235.0	PK	44.1	42.0	10.7	39.3	-9.5	48.0	73.9	25.9	100.0	0.0	
Hori.	7660.0	AV	38.0	37.2	7.1	40.5	3.5	45.3	53.9	8.6	183.0	352.0	
Hori.	11490.0	AV	34.4	40.0	8.5	38.8	3.5	47.6	53.9	6.3	100.0	0.0	
Hori.	17235.0	AV	35.3	42.0	10.7	39.3	-9.5	39.2	53.9	14.7	100.0	0.0	
Vert.	203.4	QP	21.1	16.3	8.1	32.0	0.0	13.5	43.5	30.0	100.0	2.0	
Vert.	320.0	QP	23.8	14.3	8.8	31.9	0.0	15.0	46.0	31.0	100.0	32.0	
Vert.	640.0	QP	22.8	19.5	10.1	31.9	0.0	20.5	46.0	25.5	100.0	323.0	
Vert.	794.3	QP	20.8	20.9	10.6	31.5	0.0	20.8	46.0	25.2	100.0	38.0	
Vert.	915.2	QP	20.4	22.4	11.0	30.8	0.0	23.0	46.0	23.0	100.0	359.0	
Vert.	7660.0	PK	46.1	37.2	7.1	40.5	3.5	53.4	73.9	20.5	112.0	285.0	
Vert.	11490.0	PK	43.9	40.0	8.5	38.8	3.5	57.1	73.9	16.8	100.0	0.0	
Vert.	17235.0	PK	43.3	42.0	10.7	39.3	-9.5	47.2	73.9	26.7	100.0	0.0	
Vert.	7660.0	AV	37.3	37.2	7.1	40.5	3.5	44.6	53.9	9.3	112.0	285.0	
Vert.	11490.0	AV	34.3	40.0	8.5	38.8	3.5	47.5	53.9	6.4	100.0	0.0	
Vert.	17235.0	AV	35.3	42.0	10.7	39.3	-9.5	39.2	53.9	14.7	100.0	0.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (4.49 m / 3.0 m) = 3.5 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5715.0	PK	45.1	32.6	15.8	38.8	3.5	58.2	-37.0	-27.0	10.0	161.0	183.0	
Hori.	5725.0	PK	50.3	32.6	15.8	38.8	3.5	63.4	-31.8	-17.0	14.8	161.0	183.0	
Vert.	5715.0	PK	45.3	32.6	15.8	38.8	3.5	58.4	-36.8	-27.0	9.8	117.0	346.0	
Vert.	5725.0	PK	51.7	32.6	15.8	38.8	3.5	64.8	-30.4	-17.0	13.4	117.0	346.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Result(EIRP[dBm])=10*LOG (({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m] }) ^ 2) / 30 * 10^3

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (4.49 m / 3.0 m) = 3.5 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Shonan EMC Lab.

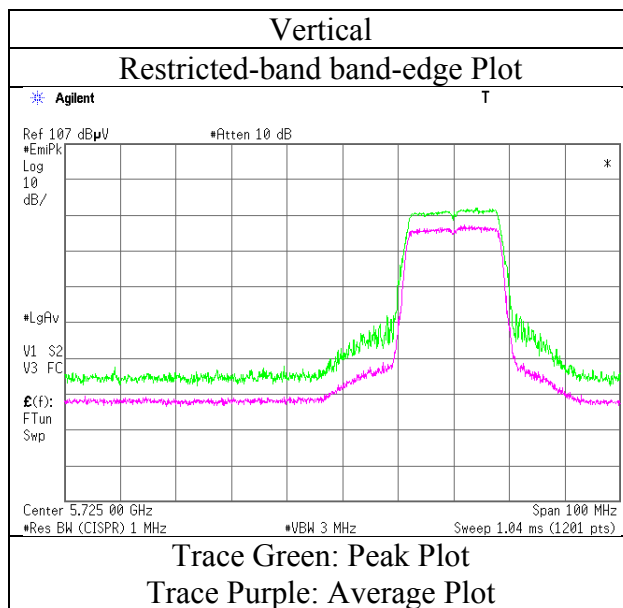
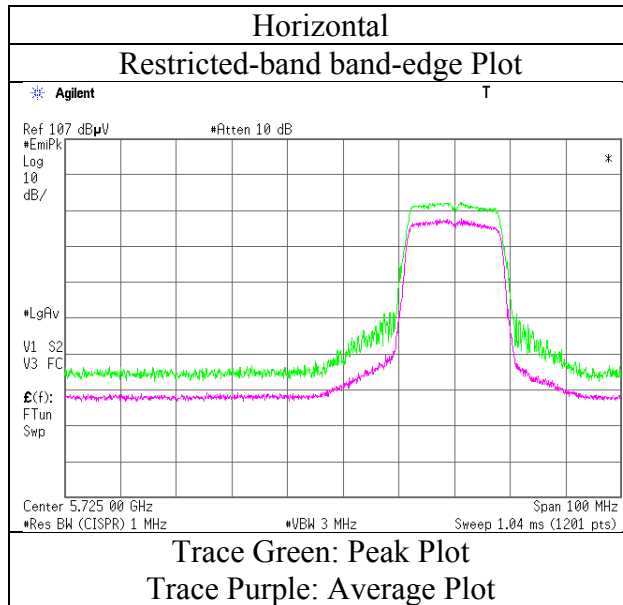
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11003205S-A
Date	January 5, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Wataru Kojima
Mode	Tx 11a 5745 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11003205S-A
Date : January 5, 2016 January 6, 2016 January 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH 23 deg. C / 32 % RH 18 deg. C / 24 % RH
Engineer : Wataru Kojima Shinichi Takano Wataru Kojima
Mode : Tx 11a 5825 MHz

(below 1GHz and above 1GHz Inside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	7766.7	PK	47.7	37.4	7.1	40.5	3.5	55.2	73.9	18.7	156.0	290.0	
Hori.	11650.0	PK	43.3	39.9	8.5	39.0	3.5	56.2	73.9	17.7	150.0	0.0	
Hori.	17355.0	PK	44.1	42.4	10.7	39.2	-9.5	48.5	73.9	25.4	100.0	0.0	
Hori.	7766.7	AV	40.3	37.4	7.1	40.5	3.5	47.8	53.9	6.1	156.0	290.0	
Hori.	11650.0	AV	33.8	39.9	8.5	39.0	3.5	46.7	53.9	7.2	150.0	0.0	
Hori.	17355.0	AV	35.2	42.4	10.7	39.2	-9.5	39.6	53.9	14.3	100.0	0.0	
Vert.	7766.7	PK	48.8	37.4	7.1	40.5	3.5	56.3	73.9	17.6	155.0	230.0	
Vert.	11650.0	PK	43.2	39.9	8.5	39.0	3.5	56.1	73.9	17.8	150.0	0.0	
Vert.	17355.0	PK	43.1	42.4	10.7	39.2	-9.5	47.5	73.9	26.4	100.0	0.0	
Vert.	7766.7	AV	39.4	37.4	7.1	40.5	3.5	46.9	53.9	7.0	155.0	230.0	
Vert.	11650.0	AV	33.5	39.9	8.5	39.0	3.5	46.4	53.9	7.5	150.0	0.0	
Vert.	17355.0	AV	35.3	42.4	10.7	39.2	-9.5	39.7	53.9	14.2	100.0	0.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (4.49 m / 3.0 m) = 3.5 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5850.0	PK	45.3	32.9	15.8	38.8	3.5	58.7	-36.5	-17.0	19.5	148.0	198.0	
Hori.	5860.0	PK	44.1	32.9	15.8	38.8	3.5	57.5	-37.7	-27.0	10.7	148.0	198.0	
Vert.	5850.0	PK	44.7	32.9	15.8	38.8	3.5	58.1	-37.1	-17.0	20.1	177.0	144.0	
Vert.	5860.0	PK	44.2	32.9	15.8	38.8	3.5	57.6	-37.6	-27.0	10.6	177.0	144.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Result(EIRP[dBm])=10*LOG (({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m] } ^ 2) / 30) * 10 ^ 3

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (4.49 m / 3.0 m) = 3.5 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Shonan EMC Lab.

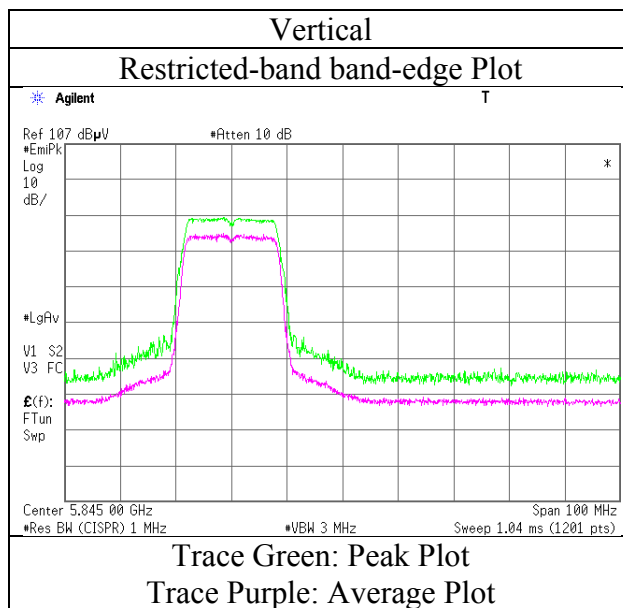
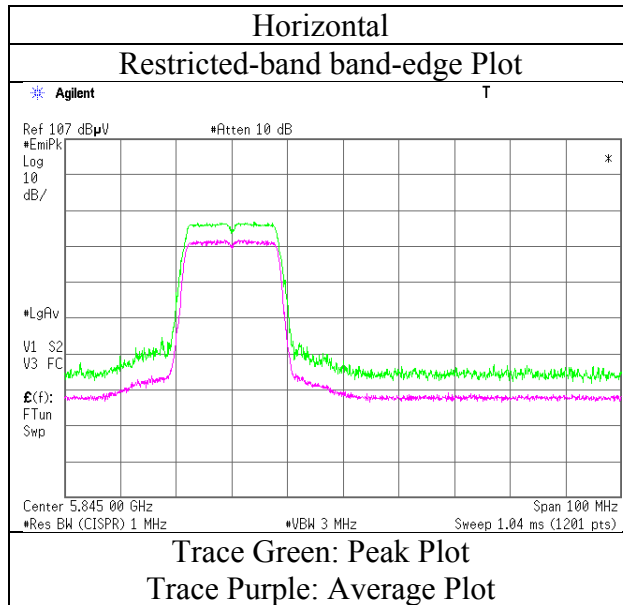
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

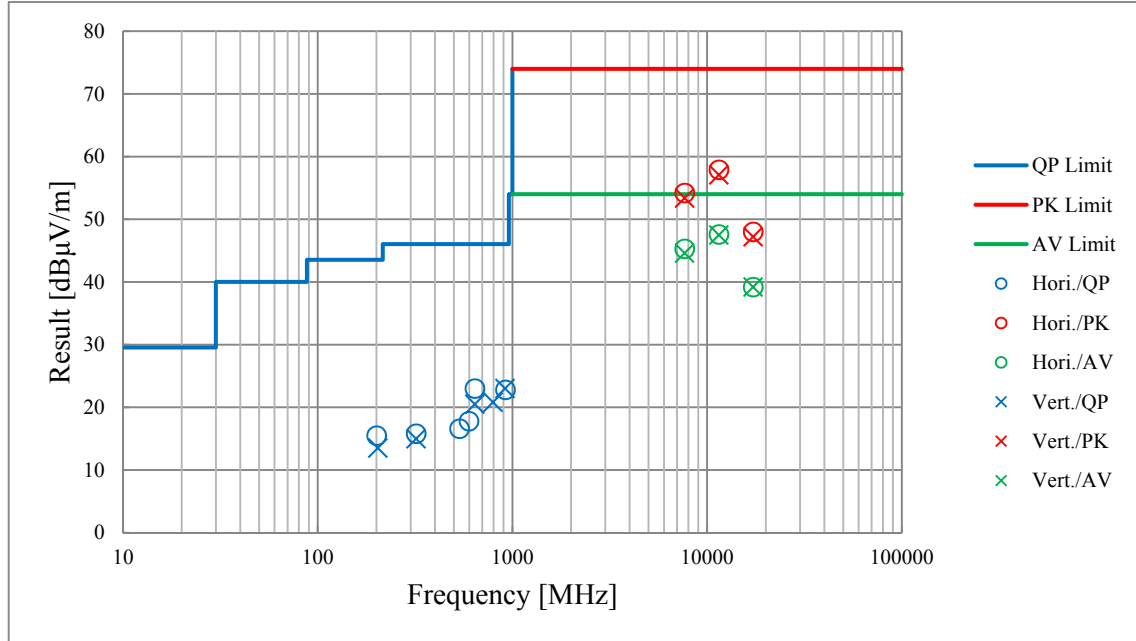
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11003205S-A
Date	January 5, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Wataru Kojima
Mode	Tx 11a 5825 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission (Plot data, Worst case)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11003205S-A		
Date	January 5, 2016	January 6, 2016	January 8, 2016
Temperature / Humidity	21 deg. C / 38 % RH	23 deg. C / 32 % RH	18 deg. C / 24 % RH
Engineer	Wataru Kojima	Shinichi Takano	Wataru Kojima
	January 5, 2016	January 6, 2016	January 8, 2016
Mode	Tx 11a 5745 MHz		



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11003205S-A
Date : January 5, 2016 January 6, 2016 January 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH 23 deg. C / 32 % RH 18 deg. C / 24 % RH
Engineer : Wataru Kojima Shinichi Takano Wataru Kojima
Mode : Tx 11n-20 5745 MHz

(below 1GHz and above 1GHz Inside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	200.0	QP	22.5	16.2	8.1	32.0	0.0	14.8	43.5	28.7	150.0	113.0	
Hori.	320.0	QP	23.2	14.3	8.8	31.9	0.0	14.4	46.0	31.6	150.0	181.0	
Hori.	640.0	QP	23.2	19.5	10.1	31.9	0.0	20.9	46.0	25.1	150.0	359.0	
Hori.	769.2	QP	21.6	20.7	10.6	31.6	0.0	21.3	46.0	24.7	150.0	214.0	
Hori.	937.5	QP	21.0	22.6	11.1	30.6	0.0	24.1	46.0	21.9	150.0	28.0	
Hori.	7660.0	PK	46.8	37.2	7.1	40.5	3.5	54.1	73.9	19.8	146.0	22.0	
Hori.	11490.0	PK	43.7	40.0	8.5	38.8	3.5	56.9	73.9	17.0	100.0	0.0	
Hori.	17235.0	PK	44.1	42.0	10.7	39.3	-9.5	48.0	73.9	25.9	100.0	0.0	
Hori.	7660.0	AV	39.1	37.2	7.1	40.5	3.5	46.4	53.9	7.5	146.0	22.0	
Hori.	11490.0	AV	34.5	40.0	8.5	38.8	3.5	47.7	53.9	6.2	100.0	0.0	
Hori.	17235.0	AV	35.1	42.0	10.7	39.3	-9.5	39.0	53.9	14.9	100.0	0.0	
Vert.	60.0	QP	22.0	7.3	6.7	32.1	0.0	3.9	40.0	36.1	100.0	44.0	
Vert.	320.0	QP	23.2	14.3	8.8	31.9	0.0	14.4	46.0	31.6	100.0	91.0	
Vert.	640.0	QP	23.6	19.5	10.1	31.9	0.0	21.3	46.0	24.7	100.0	221.0	
Vert.	654.9	QP	21.6	19.7	10.1	31.9	0.0	19.5	46.0	26.5	100.0	359.0	
Vert.	666.5	QP	21.8	19.8	10.2	31.9	0.0	19.9	46.0	26.1	100.0	126.0	
Vert.	883.5	QP	21.1	22.1	10.9	31.0	0.0	23.1	46.0	22.9	100.0	357.0	
Vert.	889.1	QP	21.2	22.2	10.9	31.0	0.0	23.3	46.0	22.7	100.0	357.0	
Vert.	7660.0	PK	46.1	37.2	7.1	40.5	3.5	53.4	73.9	20.5	149.0	242.0	
Vert.	11490.0	PK	43.5	40.0	8.5	38.8	3.5	56.7	73.9	17.2	100.0	0.0	
Vert.	17235.0	PK	43.2	42.0	10.7	39.3	-9.5	47.1	73.9	26.8	100.0	0.0	
Vert.	7660.0	AV	37.1	37.2	7.1	40.5	3.5	44.4	53.9	9.5	149.0	242.0	
Vert.	11490.0	AV	34.6	40.0	8.5	38.8	3.5	47.8	53.9	6.1	100.0	0.0	
Vert.	17235.0	AV	35.1	42.0	10.7	39.3	-9.5	39.0	53.9	14.9	100.0	0.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (4.49 m / 3.0 m) = 3.5 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5715.0	PK	44.8	32.6	15.8	38.8	3.5	57.9	-37.3	-27.0	10.3	131.0	213.0	
Hori.	5725.0	PK	54.1	32.6	15.8	38.8	3.5	67.2	-28.0	-17.0	11.0	131.0	213.0	
Vert.	5715.0	PK	44.4	32.6	15.8	38.8	3.5	57.5	-37.7	-27.0	10.7	126.0	189.0	
Vert.	5725.0	PK	55.0	32.6	15.8	38.8	3.5	68.1	-27.1	-17.0	10.1	126.0	189.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Result(EIRP[dBm])=10*LOG (({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m]) ^ 2 } / 30) *10^3)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (4.49 m / 3.0 m) = 3.5 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Shonan EMC Lab.

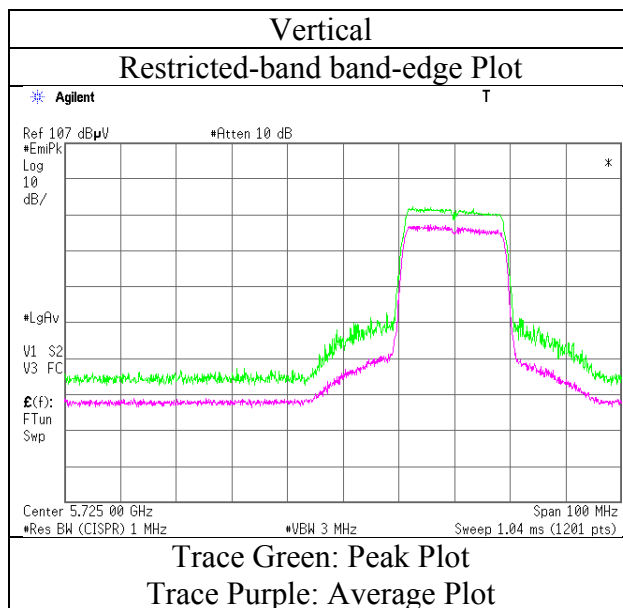
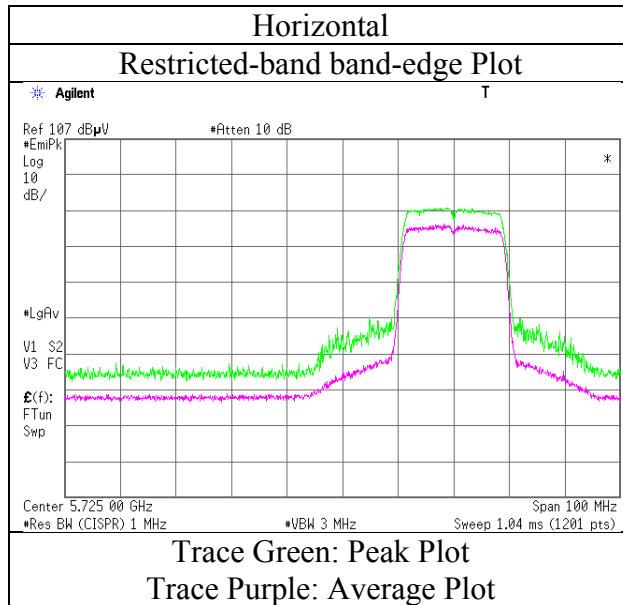
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11003205S-A
Date	January 5, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Wataru Kojima
Mode	Tx 11n-20 5745 MHz



* Final result of restricted band edge was shown in tabular data.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11003205S-A
Date : January 5, 2016 January 6, 2016 January 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH 23 deg. C / 32 % RH 18 deg. C / 24 % RH
Engineer : Wataru Kojima Shinichi Takano Wataru Kojima
Mode : Tx 11n-20 5785 MHz

(below 1GHz and above 1GHz Inside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	7713.3	PK	49.0	37.3	7.1	40.5	3.5	56.4	73.9	17.5	171.0	290.0	
Hori.	11570.0	PK	42.9	39.9	8.5	38.9	3.5	55.9	73.9	18.0	100.0	0.0	
Hori.	17355.0	PK	44.2	42.4	10.7	39.2	-9.5	48.6	73.9	25.3	100.0	0.0	
Hori.	7713.3	AV	40.8	37.3	7.1	40.5	3.5	48.2	53.9	5.7	171.0	290.0	
Hori.	11570.0	AV	34.0	39.9	8.5	38.9	3.5	47.0	53.9	6.9	100.0	0.0	
Hori.	17355.0	AV	35.1	42.4	10.7	39.2	-9.5	39.5	53.9	14.4	100.0	0.0	
Vert.	7713.3	PK	46.4	37.3	7.1	40.5	3.5	53.8	73.9	20.1	146.0	292.0	
Vert.	11570.0	PK	42.8	39.9	8.5	38.9	3.5	55.8	73.9	18.1	100.0	0.0	
Vert.	17355.0	PK	43.3	42.4	10.7	39.2	-9.5	47.7	73.9	26.2	100.0	0.0	
Vert.	7713.3	AV	39.2	37.3	7.1	40.5	3.5	46.6	53.9	7.3	146.0	292.0	
Vert.	11570.0	AV	33.7	39.9	8.5	38.9	3.5	46.7	53.9	7.2	100.0	0.0	
Vert.	17355.0	AV	35.1	42.4	10.7	39.2	-9.5	39.5	53.9	14.4	100.0	0.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : $20\log(4.49\text{ m} / 3.0\text{ m}) = 3.5\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11003205S-A
Date : January 5, 2016 January 6, 2016 January 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH 23 deg. C / 32 % RH 18 deg. C / 24 % RH
Engineer : Wataru Kojima Shinichi Takano Wataru Kojima
Mode : Tx 11n-20 5825 MHz

(below 1GHz and above 1GHz Inside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	7766.7	PK	48.6	37.4	7.1	40.5	3.5	56.1	73.9	17.8	154.0	283.0	
Hori.	11650.0	PK	43.6	39.9	8.5	39.0	3.5	56.5	73.9	17.4	100.0	0.0	
Hori.	17475.0	PK	43.7	42.8	10.7	39.1	-9.5	48.6	73.9	25.3	100.0	0.0	
Hori.	7766.7	AV	40.3	37.4	7.1	40.5	3.5	47.8	53.9	6.1	154.0	283.0	
Hori.	11650.0	AV	33.8	39.9	8.5	39.0	3.5	46.7	53.9	7.2	100.0	0.0	
Hori.	17475.0	AV	35.2	42.8	10.7	39.1	-9.5	40.1	53.9	13.8	100.0	0.0	
Vert.	7766.7	PK	48.5	37.4	7.1	40.5	3.5	56.0	73.9	17.9	132.0	227.0	
Vert.	11650.0	PK	42.6	39.9	8.5	39.0	3.5	55.5	73.9	18.4	100.0	0.0	
Vert.	17475.0	PK	43.8	42.8	10.7	39.1	-9.5	48.7	73.9	25.2	100.0	0.0	
Vert.	7766.7	AV	39.3	37.4	7.1	40.5	3.5	46.8	53.9	7.1	132.0	227.0	
Vert.	11650.0	AV	33.5	39.9	8.5	39.0	3.5	46.4	53.9	7.5	100.0	0.0	
Vert.	17475.0	AV	35.3	42.8	10.7	39.1	-9.5	40.2	53.9	13.7	100.0	0.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (4.49 m / 3.0 m) = 3.5 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Vert.	5850.0	PK	46.5	32.9	15.8	38.8	3.5	59.9	-35.3	-17.0	18.3	131.0	322.0	
Vert.	5860.0	PK	44.9	32.9	15.8	38.8	3.5	58.3	-36.9	-27.0	9.9	131.0	322.0	
Hori.	5850.0	PK	45.6	32.9	15.8	38.8	3.5	59.0	-36.2	-17.0	19.2	189.0	154.0	
Hori.	5860.0	PK	43.5	32.9	15.8	38.8	3.5	56.9	-38.3	-27.0	11.3	189.0	154.0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Result(EIRP[dBm])=10*LOG (({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m] } ^ 2) / 30) * 10 ^ 3)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (4.49 m / 3.0 m) = 3.5 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Shonan EMC Lab.

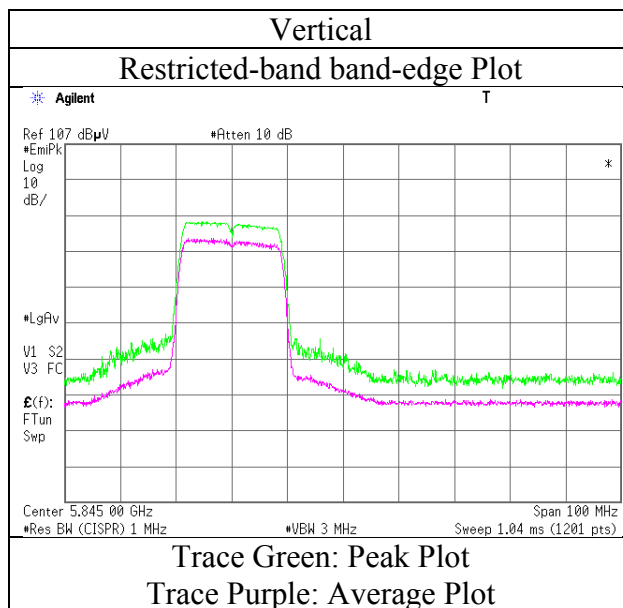
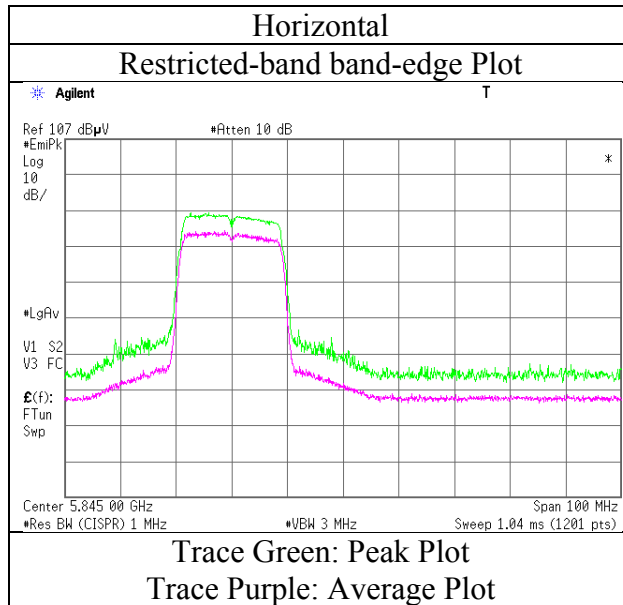
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

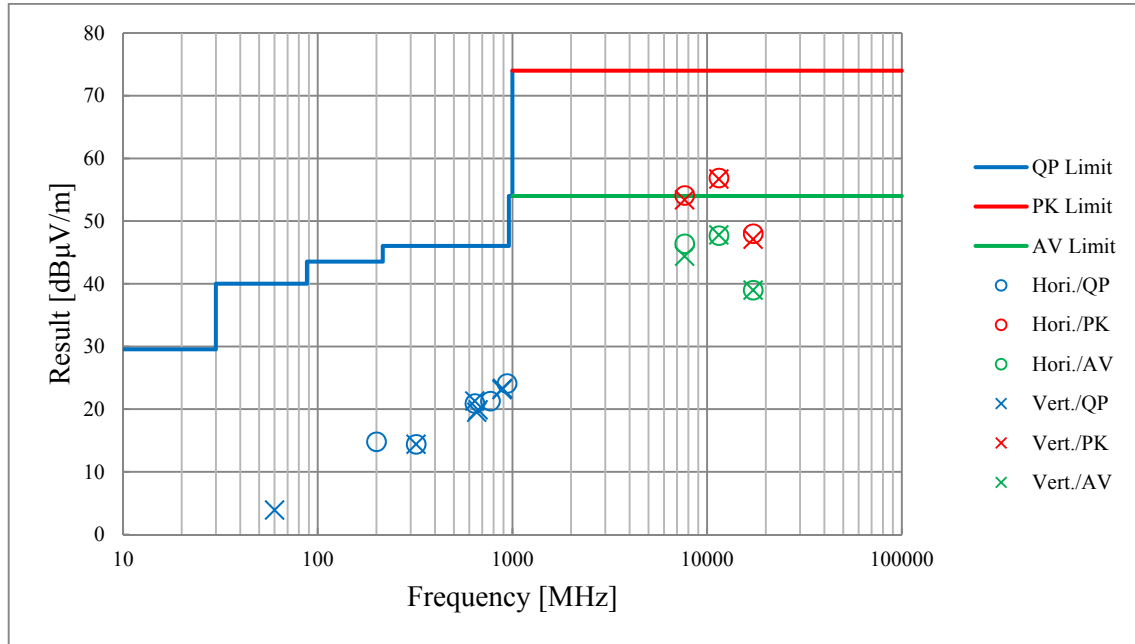
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11003205S-A
Date	January 5, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Wataru Kojima
Mode	Tx 11n-20 5825 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission (Plot data, Worst case)

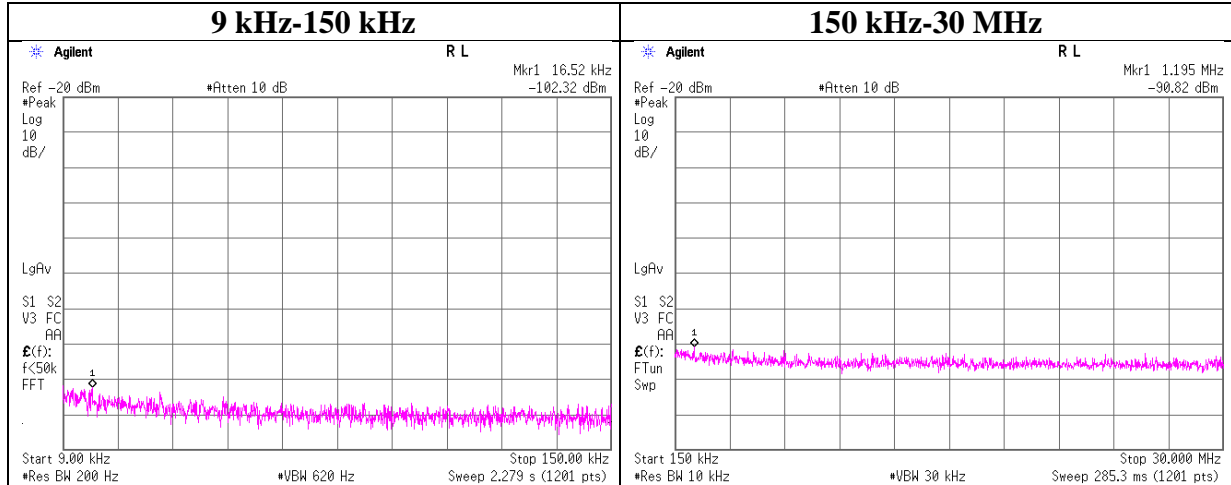
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11003205S-A		
Date	January 5, 2016	January 6, 2016	January 8, 2016
Temperature / Humidity	21 deg. C / 38 % RH	23 deg. C / 32 % RH	18 deg. C / 24 % RH
Engineer	Wataru Kojima	Shinichi Takano	Wataru Kojima
Mode	Tx 11n-20 5745 MHz		



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11003205S-A
Date	January 14, 2016
Temperature / Humidity	24deg. C / 32 % RH
Engineer	Shinichi Takano
Mode	Tx 11a 5745 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
16.52	-102.3	0.03	9.9	-0.2	1	-92.6	300	6.0	-31.3	43.2	74.5	
1195.00	-90.8	0.15	9.9	-0.2	1	-80.9	30	6.0	0.3	26.0	25.7	

$$E = \text{EIRP} - 20 \cdot \log(D) + \text{Ground bounce} + 104.8 \text{ [dBuV/m]}$$

$$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain} + 10 \cdot \log(N)$$

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2015/04/02 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2015/04/02 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	AT	2015/11/04 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2015/03/11 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2015/11/18 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2015/03/23 * 12
SOS-10	Humidity Indicator	A&D	AD-5681	4064561	AT	2015/10/22 * 12
STS-06	Digital Hitester	Hioki	3805-50	080997830	AT	2015/03/10 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2015/05/27 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-018	RE	2015/06/08 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2015/05/19 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2015/08/11 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2015/10/22 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2015/03/26 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
SAEC-03(SVSW R)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSW R)	3	RE	2015/08/28 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE, CE,RFI,MF)	-	RE,CE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2015/11/18 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2015/11/04 * 12
SFL-03	Highpass Filter	MICRO-TRONICS	HPM50112	028	RE	2015/11/16 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2015/03/17 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2015/03/23 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2015/03/11 * 12
SHA-06	Horn Antenna	ETS LINDGREN	3160-10	LM3459	RE	2015/03/17 * 12
SAF-10	Pre Amplifier	TOYO Corporation	HAP26-40W	00000010	RE	2015/03/23 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2015/03/11 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2015/07/16 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2015/10/11 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2015/10/11 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2015/08/31 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner /Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2015/04/17 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2015/02/18 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2015/03/24 * 12
SCC-B12/B13/SRSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-270(RF Selector)	CE	2015/04/17 * 12
SLS-03	LISN	Rohde & Schwarz	ENV216	100513	CE	2015/02/25 * 12
SLS-04	LISN	Rohde & Schwarz	ENV216	100514	CE	2015/02/25 * 12
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2015/02/18 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2015/12/07 * 12
STM-03	Terminator	TME	CT-01 BP	-	CE	2015/12/18 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	CE	2015/09/04 * 12
SJM-09	Measure	PROMART	SEN1935	-	CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	CE	2015/03/10 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: CE: Conducted Emission
RE: Radiated Emission
AT: Antenna Terminal Conducted test

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401