



RADIO TEST REPORT

Test Report No. : 13063556M-C-R2

Applicant : PIONEER CORPORATION
Type of Equipment : RDS AV RECEIVER
Model No. : DMH-WC6600NEX
FCC ID : AJDK112
Test regulation : FCC Part 15 Subpart E: 2019
*Wireless LAN NII part
Test items : Radiated emission tests
Test Result : Complied (Refer to SECTION 3.2)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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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)
7. The all test items in this test report are conducted by UL Japan, Inc. Kashima EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13063556M-C-R1. 13063556M-C-R1 is replaced with this report.

Date of test: September 27 to October 24, 2019

Representative test engineer:

Hiromitsu Tanabe
Engineer
Consumer Technology Division

Approved by:

Tomoyuki Yamashita
Leader
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CERTIFICATE 1266.01

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

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REVISION HISTORY

Original Test Report No.: 13063556M-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13063556M-C	January 16, 2020	-	-
1	13063556M-C-R1	February 4, 2020	P.1	Add *Wireless LAN NII part to the Test regulation
1	13063556M-C-R1	February 4, 2020	P.5	Remove from Clock frequency (ies) in the system: "Bluetooth Wi-Fi module: 32.768 kHz"
1	13063556M-C-R1	February 4, 2020	P.6	Modify the Frequency of Operation for WLAN (IEEE802.11.a/n/ac) from 5725 MHz-5825 MHz to 5745 MHz (IEEE 802.11a/n-20) 5755 MHz (IEEE 802.11n-40/ac-40) 5775 MHz (IEEE 802.11ac-80)
1	13063556M-C-R1	February 4, 2020	P.6	Modify the Type of Modulation for WLAN (IEEE802.11.b/g/n) from external to DSSS
1	13063556M-C-R1	February 4, 2020	P.6	Delete the Frequency Band and Transmit Power or Power Range from the Radio Specification
1	13063556M-C-R1	February 4, 2020	P.7	Modify the reference test report number from 13063555S-C to 13063555S-C-R1
2	13063556M-C-R2	February 14, 2020	P.6	Modify the Antenna Gain for Bluetooth from -9.4 dBi to -14.5 dBi
2	13063556M-C-R2	February 14, 2020	P.6	Modify the Antenna Gain for WLAN (IEEE802.11.b/g/n) from -11.9 dBi to -11.2 dBi
2	13063556M-C-R2	February 14, 2020	P.6	Modify the Antenna Gain for WLAN (IEEE802.11.a/n/ac) from -11.1 dBi to -13.2 dBi
2	13063556M-C-R2	February 14, 2020	P.6	Modify the Emission Designation (ITU Code) for WLAN (IEEE802.11.b) from D1D to G1D
2	13063556M-C-R2	February 14, 2020	P.7	Modify the reference test report number from 13063555S-C-R1 to 13063555S-C-R2
2	13063556M-C-R2	February 14, 2020	P.12	Modify the Shielded condition for GPS Antenna from Unshielded to Shielded

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Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
Fac.	Factor		
FCC	Federal Communications Commission		
FHSS	Frequency Hopping Spread Spectrum		
FM	Frequency Modulation		
Freq.	Frequency		
FSK	Frequency Shift Keying		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		
ILAC	International Laboratory Accreditation Conference		
ISED	Innovation, Science and Economic Development Canada		
ISO	International Organization for Standardization		
JAB	Japan Accreditation Board		
LAN	Local Area Network		
LIMS	Laboratory Information Management System		

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CONTENTS	PAGE
SECTION 1: Customer information.....	5
SECTION 2: Equipment under test (E.U.T.).....	5
SECTION 3: Test specification, procedures & results.....	7
SECTION 4: Operation of E.U.T. during testing.....	10
SECTION 5: Radiated Spurious Emission and Band Edge Compliance	13
APPENDIX 1: Test data	17
Radiated Spurious Emission	19
APPENDIX 2: Test instruments	30
APPENDIX 3: Photographs of test setup	31
Radiated Spurious Emission	31
Worst Case Position	33

SECTION 1: Customer information

Company Name	:	PIONEER CORPORATION
Address	:	25-1, Yamada, Kawagoe-shi, Saitama, 350-8555, Japan
Telephone Number	:	+81-49-228-7681
Facsimile Number	:	+81-49-228-6172
Contact Person	:	Shigeru Yoshida

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	:	RDS AV RECEIVER
Model No.	:	DMH-WC6600NEX
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 14.4 V (DC 10.8 V to 15.1 V)
Receipt Date of Sample (Information from test lab.)	:	September 27, 2019
Country of Mass-production	:	Thailand
Condition of EUT	:	Production 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: DMH-WC6600NEX (referred to as the EUT in this report) is an RDS AV RECEIVER.

The clock frequencies used in the EUT

DC-DC CONVERTER	:	1008 kHz/700.5 kHz, 365.8 kHz/413.9 kHz
FM/AM TUNER	:	55.467 MHz (VCO : 5.9904 GHz/6.2208 GHz)
MAIN PROCESSOR	:	24 MHz
SYSTEM MICRO COMPUTER	:	12.5 MHz
LCD BACK LIGHT	:	515.7 kHz/476.6 kHz
LINE AMPLIFIER	:	515.7 kHz/476.6 kHz
CHIPS	:	26 MHz, 32.768 kHz, 10 MHz
HDMI RECEIVER	:	27 MHz
VIDEO DECODER	:	32 MHz
WVR UNIT	:	55.467 MHz

Radio Specification

Equipment Radio Type : RF Receiver& RF Transmitter
Antenna Type : Monopole Type PCB Antenna
Operating Temperature Range : -10 degree C to +60 degree C

Items	Bluetooth (Version 4.2)	WLAN (IEEE802.11.b/g/n)	WLAN (IEEE802.11.a/n/ac)	GNSS
Frequency of Operation	2402 MHz-2480 MHz	2412 MHz-2462 MHz	5745 MHz (IEEE 802.11a/n-20) 5755 MHz (IEEE 802.11n-40/ac-40) 5775 MHz (IEEE 802.11ac-80)	GPS:1575.42 MHz GLONASS:1598.025 MHz-1605.375 MHz Galileo:1575.42 MHz
Antenna Gain	-14.5 dBi	-11.2 dBi	-13.2 dBi	2.0 dBi (Elevation Angle:90°) -6.0 dBi (Elevation Angle:10°)
Type of Modulation	GFSK, $\pi/4$ -DQPSK, 8DPSK	DSSS	(a, n): OFDM / BPSK, QPSK,16QAM, 64QAM (ac): OFDM / BPSK, QPSK, 16QAM, 64QAM, 256QAM	CDMA/FDMA/CDMA
Emission Designation (ITU Code)	(BDR): F1D, (EDR): G1D, (LE): F1D,	(IEEE802.11.b): G1D (IEEE802.11.g/n): D1D	D1D	-
Bandwidth	1 MHz	20 MHz	(a):20 MHz, (n):20 MHz,40 MHz, (ac):40 MHz,80 MHz	GPS:+-1.023 MHz GLONASS:+-0.511 MHz Galileo:+-12.276 MHz
Channel Spacing	BDR, EDR: 1 MHz, LE:2 MHz	5 MHz	20 MHz	GPS:- GLONASS:0.5625 MHz Galileo:-

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

*The customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

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	-	N/A	- *1)
	ISED: RSS-Gen 8.8	ISED: 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 *2)
	ISED: -	ISED: -			
Maximum Conducted Output Power	FCC: KDB Publication Number 789033	FCC: 15.407 (a) (1) (2) (3)		N/A	Conducted *2)
	ISED: -	ISED: RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1			
	FCC: KDB Publication Number 789033	FCC : 15.407 (a) (1) (2) (3)			
Maximum Power Spectral Density	ISED: -	ISED: 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	3.2 dB 417.791 MHz, QP, Hori.	Complied# a)	Conducted (30 MHz) *2) Radiated (30 MHz) *3)
	ISED: -	ISED: 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	N/A	Conducted *2)
	ISED: -	ISED: RSS-247 6.2.4.1			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					
*1) The test is not applicable since the EUT does not have AC power ports.					
*2) For other than the Radiated spurious emission test, refer to test report No.13063555S-C-R2.					
*3) Radiated test was selected over 30 MHz based on section FCC 15.407 (b) and KDB 789033 D02 G.3.b).					
a) Refer to APPENDIX 1 (data of Radiated Spurious Emission)					
Symbols:					
Complied		The data of this test item has enough margin, more than the measurement uncertainty.			
Complied#		The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.			

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)

The EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

Conducted emission

Frequency range	Required Uncertainty (+/-)	Uncertainty (+/-)
0.15 MHz to 30 MHz	3.4 dB	3.3 dB

Radiated emission

Measurement distance	Frequency range	Required Uncertainty (+/-)	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	Not Defined	2.9 dB
	30 MHz to 200 MHz	6.3 dB	6.1 dB
	200 MHz to 1000 MHz		6.2 dB
	1 GHz to 6 GHz	5.2 dB	5.0 dB
	6 GHz to 18 GHz	5.5 dB	5.4 dB
	18 GHz to 40 GHz	Not Defined	5.5 dB
1 m	1 GHz to 18 GHz	Not Defined	5.4 dB
	18 GHz to 40 GHz		5.6 dB

Antenna Terminal test

Test Item	Required Uncertainty (+/-)	Uncertainty (+/-)
26 dB Emission Bandwidth / 6 dB Emission Bandwidth / 99 % Occupied Bandwidth	Not Defined	1.6 %
Maximum Conducted Output Power / Average Output Power (SPM-06)	0.75 dB	0.73 dB
Burst Rate	Not Defined	0.256 %
Maximum Power Spectral Density	4 dB	2.2 dB
Conducted Spurious Emission (9 kHz to 30 MHz)	4 dB	2.2 dB

3.5 Test Location

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JAB Accreditation No.:RTL02610 / FCC Test Firm Registration Number: 910230 / ISED Lab Company Number: 4659A

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Open site	6.0 x 5.5 x 2.5	20 x 40	10 m
No.5 Open site	8.6 x 7.1 x 2.4	18 x 23	10 m
No.1 Shielded room	5.4 x 4.5 x 2.3	-	-
No.5 Shielded Room	4.2 x 3.1 x 2.5	-	-
No.6 Semi-anechoic Chamber	8.5 x 5.5 x 5.2	-	3 m
No.10 Semi-anechoic Chamber	18.4 x 9.9 x 7.7	-	10 m
No.11 Semi-anechoic Chamber	9.0 x 6.5 x 5.2	-	3 m
No.1 Measurement room	5.0 x 3.7 x 2.6	-	-
No.2 Measurement room	4.3 x 4.4 x 2.7	-	-
No.3 Measurement room	4.5 x 5.3 x 2.7	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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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 and also was judged the necessity of 802.11ac mode by the pre-test.

Mode	Remarks*
IEEE 802.11a (11a)	9 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 5 (SGI OFF), PN9
IEEE 802.11n 40 MHz BW (11n-40)	MCS 2 (SGI OFF), PN9
IEEE 802.11ac 40 MHz BW (11ac-40)	MCS 1 (SGI OFF), PN9
IEEE 802.11ac 80 MHz BW (11ac-80)	MCS 2 (SGI OFF), PN9
*The worst condition was determined based on the test result of Maximum Conducted Output Power.	
*Power of the EUT was set by the software as follows; Power settings : 11a:11 dBm 11n-20: 11 dBm 11n-40: 10 dBm 11ac-40: 9 dBm 11ac-80: 8 dBm Software : SoC: 0.0601400 SYS: 7.13 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operation mode(s)

Test Item	Operating Mode	Tested Frequency			
		Lower Band	Middle Band	Additional Band	Upper Band
Radiated Spurious Emission	Tx 11a	-	-	-	5745 MHz
	Tx 11n-20	-	-	-	5755 MHz
	Tx 11n-40	-	-	-	5755 MHz
	Tx 11ac-40	-	-	-	5775 MHz
	Tx 11ac-80	-	-	-	5775 MHz

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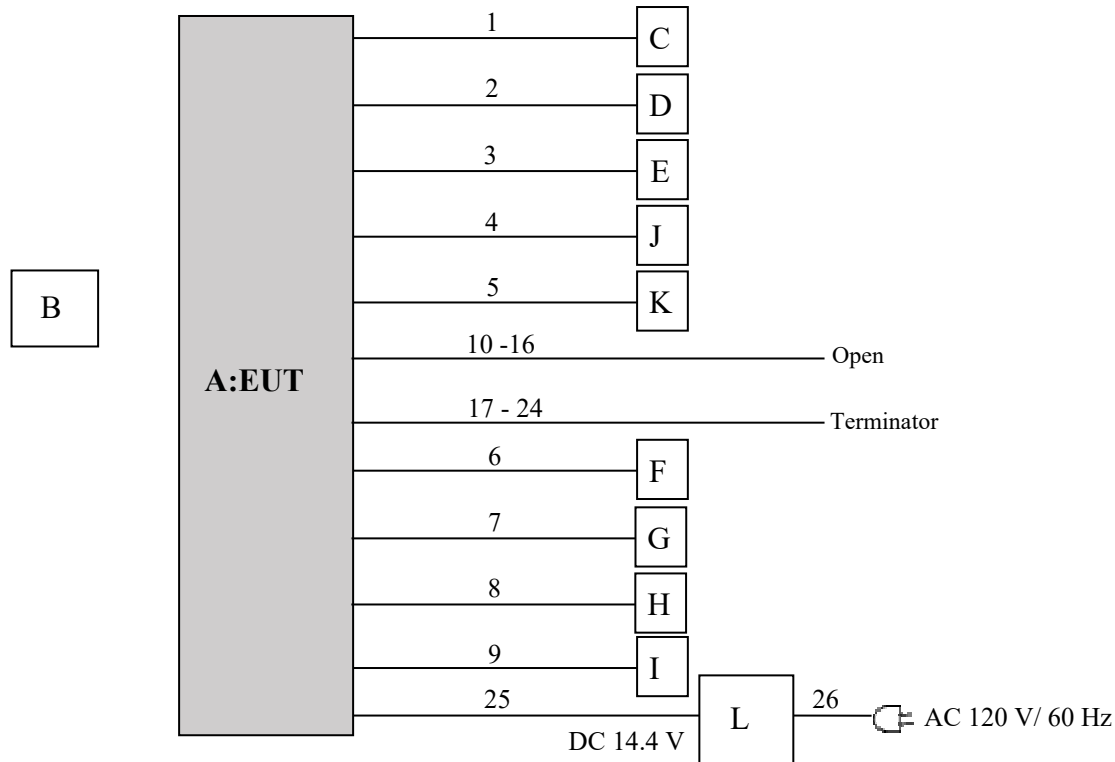
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4.2 Configuration and peripherals



* 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	Remark
A	RDS AV RECEIVER	DMH-WC6600NEX	SGTM000008UC	PIONEER CORPORATION	EUT
B	REMOTE CONTROLLER	CXE5116	-	PIONEER CORPORATION	-
C	GPS Antenna	GPA-MG248	-	mitsumi	-
D	USB Memory	-	-	TOSHIBA	-
E	Mic	-	-	-	-
F	Speaker	KFC-RS101	-	KENWOOD	-
G	Speaker	KFC-RS101	-	KENWOOD	-
H	Speaker	KFC-RS101	-	KENWOOD	-
I	Speaker	KFC-RS101	-	KENWOOD	-
J	Smart phone	SO-01C	-	Sony Ericsson	-
K	Vehicle Tuner	SXV200	45V80ACL	SiriusXM	-
L	DC Power Supply	GSV3000	1708192899	DIAMOND ANTENNA	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	GPS Antenna	3.5	Shielded	Shielded	-
2	USB	1.5	Shielded	Shielded	Type C
3	Mic	3.0	Unshielded	Unshielded	-
4	HDMI	0.7 + 2.0	Shielded	Shielded	-
5	Vehicle Tuner	0.65	Shielded	Shielded	-
6	Speaker	0.1 + 0.8	Unshielded	Unshielded	-
7	Speaker	0.1 + 0.8	Unshielded	Unshielded	-
8	Speaker	0.1 + 0.8	Unshielded	Unshielded	-
9	Speaker	0.1 + 0.8	Unshielded	Unshielded	-
10	MUTE	0.15 + 1.15	Unshielded	Unshielded	-
11	Steering Wheel Control	1.0	Unshielded	Unshielded	-
12	REVERSE-GERA SIGNAL INPUT	0.1 + 1.0	Unshielded	Unshielded	-
13	SYSTEM REMOTE CONTROL	0.15 + 1.0	Unshielded	Unshielded	-
14	PARKING BRAKE	2.0	Unshielded	Unshielded	-
15	CARSPEED SIGNAL INPUT	0.1 + 1.0	Unshielded	Unshielded	-
16	iDATA	1.6	Unshielded	Unshielded	-
17	FM Antenna	0.2	Unshielded	Unshielded	-
18	AUX IN	0.15 + 2.0	Unshielded	Unshielded	-
19	Front OUTPUT	0.1 + 1.0	Unshielded	Unshielded	-
20	Rear OUTPUT	0.1 + 1.0	Unshielded	Unshielded	-
21	SUBWOOFER OUTPUT	0.2 + 1.5	Unshielded	Unshielded	-
22	REAR MONITOR OUTPUT	0.2 + 1.5	Unshielded	Unshielded	-
23	SECOND CAMERA INPUT	0.2 + 1.5	Unshielded	Unshielded	-
24	REAR VIEW CAMERA IN	0.2 + 1.5	Unshielded	Unshielded	-
25	DC	0.4 + 1.6	Unshielded	Unshielded	-
26	AC	1.7	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< Below 1GHz >

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 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 urethane 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 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

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. *) in the Section 15.407 (b) (1) (2) (3).

For W58 Bandedge

-27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge in the section 15.407(b)(4)(i).

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:

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

Test Antennas are used as below;

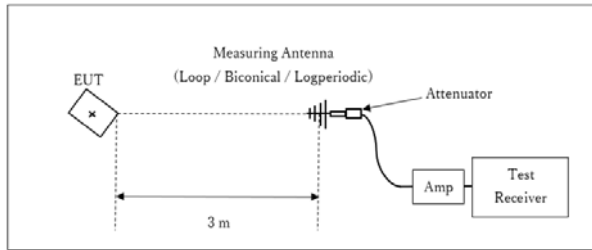
Frequency	30 MHz to 1000 MHz	Above 1 GHz
Antenna Type	Hybrid	Horn

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: 1/T (T: burst length, refer to APPENDIX) Detector: Peak Trace: ≥ 100 traces

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

Figure 2: Test Setup

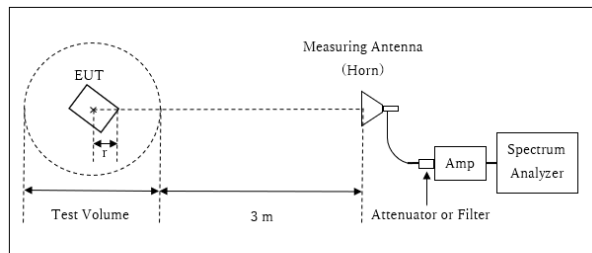
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

No.10 Semi-Anechoic Chamber

Distance Factor: $20 \times \log (4.4 \text{ m} / 3.0 \text{ m}) = 3.33 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 4.4 \text{ m}$

Test Volume : 3.0 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

r = 0.1 m

No.11 Semi-Anechoic Chamber

Distance Factor: $20 \times \log (3.9 \text{ m} / 3.0 \text{ m}) = 2.28 \text{ dB}$

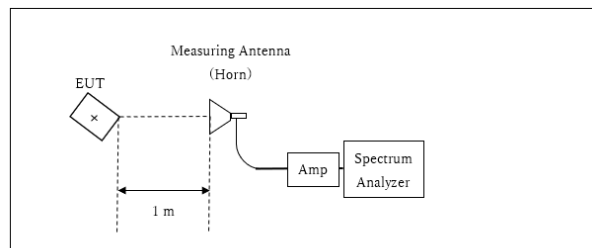
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.9 \text{ m}$

Test Volume : 2.0 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

r = 0.1 m

10 GHz - 26.5 GHz

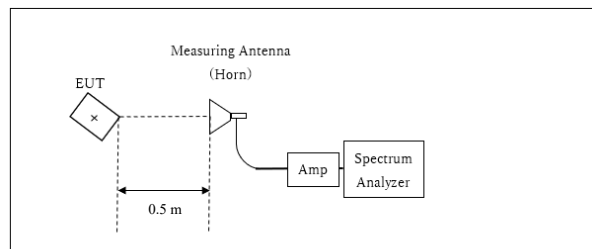


x : Center of turn table

Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

*Test Distance: 1 m

26.5 GHz - 40 GHz



x : Center of turn table

Distance Factor: $20 \times \log (0.5 \text{ m} / 3.0 \text{ m}) = -15.56 \text{ dB}$

*Test Distance: 0.5 m

- The carrier level and noise levels were confirmed at angle of 0 deg. to 30 deg. based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.
The test results and limit are rounded off to one decimal place, so some differences might be observed.

WLAN mode

Frequency Test Antenna	Below 1 GHz	1 GHz - 6.4 GHz	6.4 GHz - 10 GHz	10 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz
Horizontal	0 deg.	0 deg.	30 deg.	30 deg.	0 deg.	0 deg.
Vertical	0 deg.	30 deg.	30 deg.	30 deg.	0 deg.	0 deg.

WLAN + Bluetooth mode

Frequency Test Antenna	Below 1 GHz	1 GHz - 6.4 GHz	6.4 GHz - 10 GHz	10 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz
Horizontal	0 deg.	0 deg.	0 deg.	0 deg.	0 deg.	0 deg.
Vertical	0 deg.	30 deg.	30 deg.	30 deg.	30 deg.	30 deg.

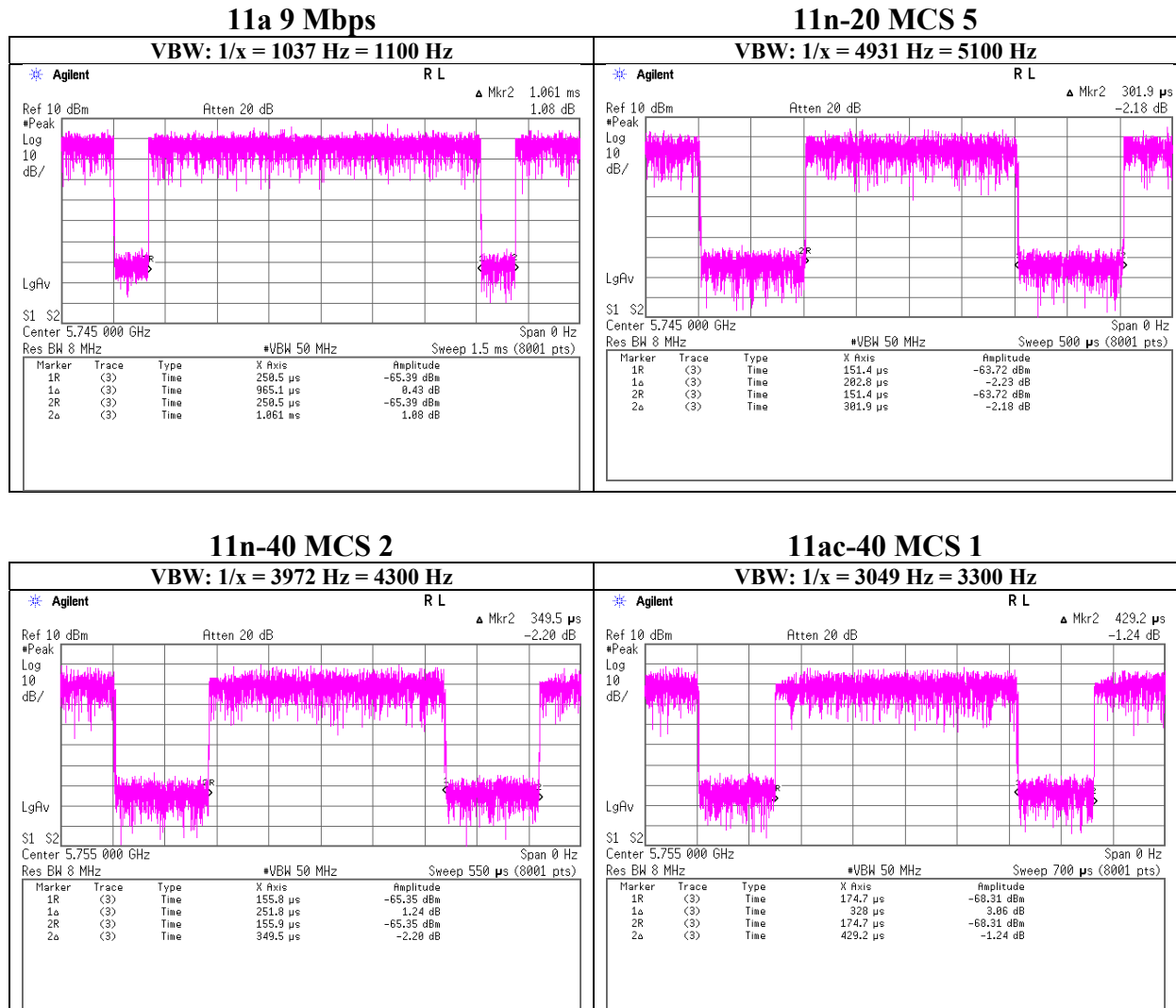
The test results and limit are rounded off to one decimal place, so some differences might be observed.

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

APPENDIX 1: Test data

Burst rate confirmation

Report No. 13063556M-C-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date September 27, 2019
Temperature / Humidity 26 deg. C / 45 % RH
Engineer Makoto Hosaka
Mode Tx



UL Japan, Inc.

Kashima EMC Lab.

1614, Mushiata, Katori-shi, Chiba-ken, 289-0341 Japan

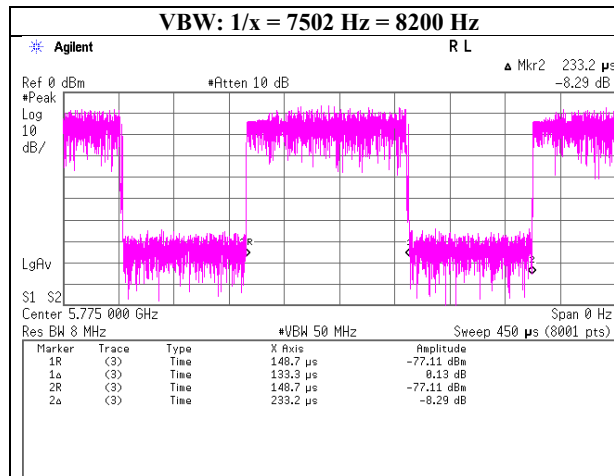
Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

Burst rate confirmation

Report No. 13063556M-C-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date September 27, 2019
Temperature / Humidity 26 deg. C / 45 % RH
Engineer Makoto Hosaka
Mode Tx

11ac-80 MCS 2



Radiated Spurious Emission

Report No. 13063556M-C-R2
Test place Kashima EMC Lab.
Semi Anechoic Chamber No.11
Date October 20, 2019 No.10 October 24, 2019 No.11 October 18, 2019 No.11 October 18, 2019
Temperature / Humidity 20 deg. C / 58 % RH 20 deg. C / 58 % RH 22 deg. C / 48 % RH 22 deg. C / 48 % RH
Engineer Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe
(1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11a 5745 MHz

(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.	2799.009	PK	51.00	28.81	13.95	43.82	2.28	52.22	73.90	21.6	140	205	
Hori.	11490.000	PK	48.50	38.76	8.35	42.76	-9.54	43.31	73.9	30.5	135	220	
Hori.	17235.000	PK	49.80	41.26	10.77	44.67	-9.54	47.62	73.9	26.2	150	0	Floor noise
Hori.	2799.009	AV	39.20	28.81	13.95	43.82	2.28	40.42	53.9	13.4	140	205	VBW:10Hz
Hori.	11490.000	AV	40.00	38.76	8.35	42.76	-9.54	34.81	53.9	19.0	135	220	VBW:1.1kHz
Hori.	17235.000	AV	40.10	41.26	10.77	44.67	-9.54	37.92	53.9	15.9	150	0	Floor noise
Vert.	2799.009	PK	53.70	28.81	13.95	43.82	2.28	54.92	73.9	18.9	100	189	
Vert.	11490.000	PK	49.10	38.76	8.35	42.76	-9.54	43.91	73.9	29.9	140	160	
Vert.	17235.000	PK	50.30	41.26	10.77	44.67	-9.54	48.12	73.9	25.7	150	0	Floor noise
Vert.	2799.009	AV	44.80	28.81	13.95	43.82	2.28	46.02	53.9	7.8	100	189	VBW:10Hz
Vert.	11490.000	AV	42.00	38.76	8.35	42.76	-9.54	36.81	53.9	17.0	140	160	VBW:1.1kHz
Vert.	17235.000	AV	40.10	41.26	10.77	44.67	-9.54	37.92	53.9	15.9	150	0	Floor noise

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 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.	5650.000	PK	51.10	33.62	15.68	45.55	2.28	57.13	-38.07	-27.00	11.0	138	207	
Hori.	5700.000	PK	51.80	33.68	15.71	45.54	2.28	57.93	-37.27	10.00	47.2	138	207	
Hori.	5720.000	PK	54.50	33.76	15.72	45.53	2.28	60.73	-34.47	15.60	50.0	138	207	
Hori.	5725.000	PK	56.40	33.78	15.72	45.53	2.28	62.65	-32.55	27.00	59.5	138	207	
Hori.	5850.000	PK	51.90	34.29	15.78	45.46	2.28	58.79	-36.41	27.00	63.4	138	207	
Hori.	5855.000	PK	51.60	34.33	15.78	45.46	2.28	58.53	-36.67	15.60	52.2	138	207	
Hori.	5875.000	PK	52.00	34.47	15.80	45.45	2.28	59.10	-36.10	10.00	46.1	138	207	
Hori.	5925.000	PK	51.70	34.75	15.83	45.40	2.28	59.16	-36.04	-27.00	9.0	138	207	
Vert.	5650.000	PK	51.70	33.62	15.68	45.55	2.28	57.73	-37.47	-27.00	10.4	151	175	
Vert.	5700.000	PK	52.10	33.68	15.71	45.54	2.28	58.23	-36.97	10.00	46.9	151	175	
Vert.	5720.000	PK	55.30	33.76	15.72	45.53	2.28	61.53	-33.67	15.60	49.2	151	175	
Vert.	5725.000	PK	57.00	33.78	15.72	45.53	2.28	63.25	-31.95	27.00	58.9	151	175	
Vert.	5850.000	PK	52.50	34.29	15.78	45.46	2.28	59.39	-35.81	27.00	62.8	151	175	
Vert.	5855.000	PK	52.30	34.33	15.78	45.46	2.28	59.23	-35.97	15.60	51.5	151	175	
Vert.	5875.000	PK	51.50	34.47	15.80	45.45	2.28	58.60	-36.60	10.00	46.6	151	175	
Vert.	5925.000	PK	52.00	34.75	15.83	45.40	2.28	59.46	-35.74	-27.00	8.7	151	175	

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 dB

UL Japan, Inc.

Kashima EMC Lab.

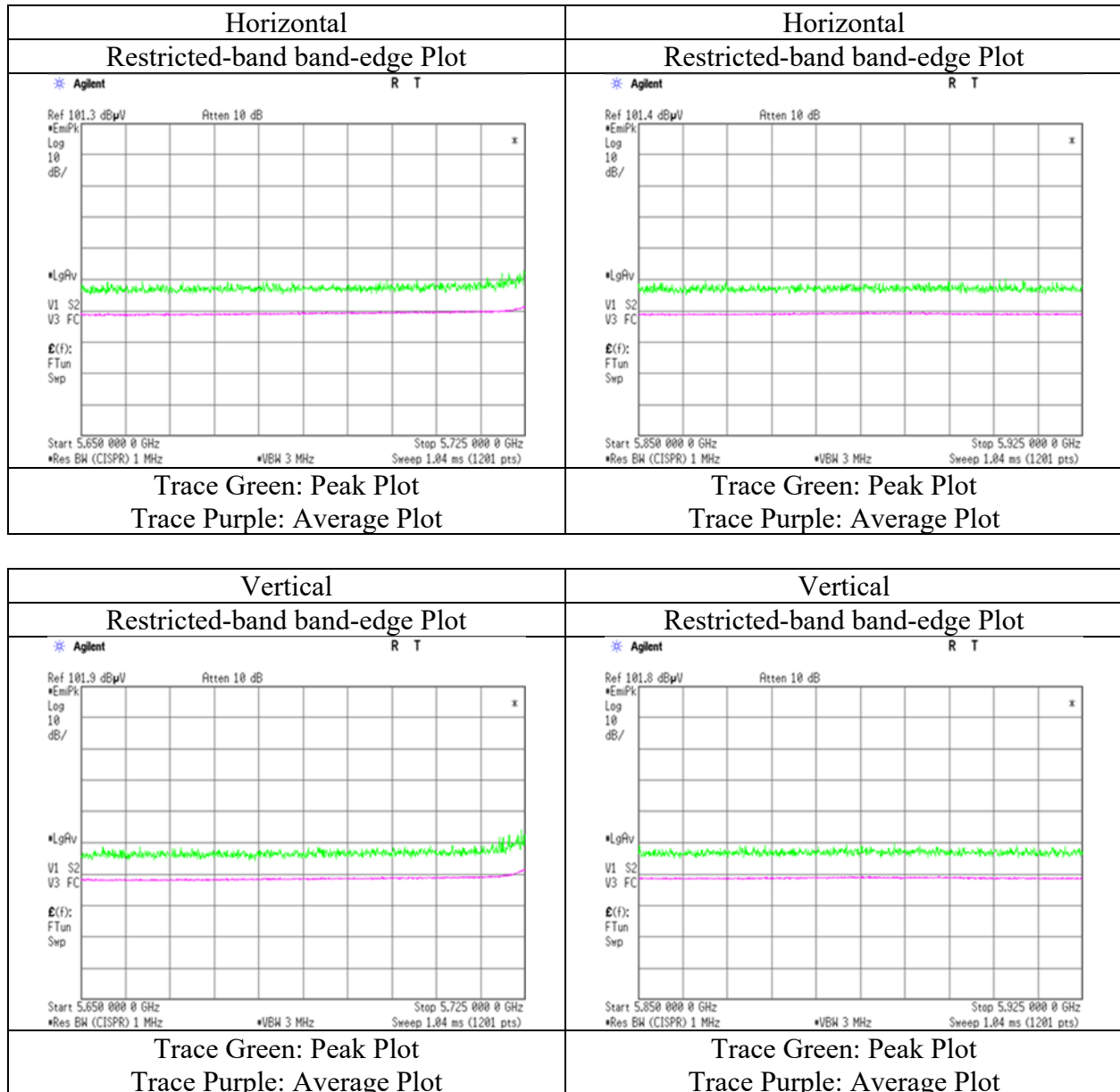
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

Radiated Spurious Emission

Report No.	13063556M-C-R2
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	October 20, 2019
Temperature / Humidity	20 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz - 10 GHz)
Mode	Tx 11a 5745 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
 Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No. 13063556M-C-R2
Test place Kashima EMC Lab.
Semi Anechoic Chamber No.10 No.11 No.10 No.11 No.11
Date October 17, 2019 October 20, 2019 October 24, 2019 October 18, 2019 October 18, 2019
Temperature / Humidity 23 deg. C / 57% RH 20 deg. C / 58 % RH 20 deg. C / 58 % RH 22 deg. C / 48 % RH 22 deg. C / 48 % RH
Engineer Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe
(30 MHz - 1000 MHz) (1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
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.	229.267	QP	55.77	10.00	8.10	31.51	0.00	42.36	46.02	3.6	148	59	
Hori.	405.502	QP	45.39	15.60	9.51	31.44	0.00	39.06	46.0	6.9	100	200	
Hori.	417.791	QP	48.60	15.99	9.59	31.43	0.00	42.75	46.0	3.2	100	151	
Hori.	430.078	QP	43.83	16.52	9.68	31.43	0.00	38.60	46.0	7.4	100	25	
Hori.	2799.009	PK	50.90	28.81	13.95	43.82	2.28	52.12	73.9	21.7	141	210	
Hori.	11490.000	PK	48.30	38.76	8.35	42.76	-9.54	43.11	73.9	30.7	133	220	
Hori.	17235.000	PK	50.20	41.26	10.77	44.67	-9.54	48.02	73.9	25.8	150	0	Floor noise
Hori.	2799.009	AV	39.60	28.81	13.95	43.82	2.28	40.82	53.9	13.0	141	210	VBW:10Hz
Hori.	11490.000	AV	41.30	38.76	8.35	42.76	-9.54	36.11	53.9	17.7	133	220	VBW:5.1kHz
Hori.	17235.000	AV	41.10	41.26	10.77	44.67	-9.54	38.92	53.9	14.9	150	0	Floor noise
Vert.	52.902	QP	40.95	13.75	6.26	31.78	0.00	29.18	40.0	10.8	100	98	
Vert.	180.000	QP	44.80	11.97	7.67	31.56	0.00	32.88	43.5	10.6	100	125	
Vert.	229.294	QP	47.27	10.00	8.10	31.51	0.00	33.86	46.0	12.1	100	317	
Vert.	417.791	QP	43.05	15.99	9.59	31.43	0.00	37.20	46.0	8.8	148	164	
Vert.	2799.009	PK	53.20	28.81	13.95	43.82	2.28	54.42	73.9	19.4	100	184	
Vert.	11490.000	PK	49.60	38.76	8.35	42.76	-9.54	44.41	73.9	29.4	140	160	
Vert.	17235.000	PK	50.00	41.26	10.77	44.67	-9.54	47.82	73.9	26.0	150	0	Floor noise
Vert.	2799.009	AV	44.20	28.81	13.95	43.82	2.28	45.42	53.9	8.4	100	184	VBW:10Hz
Vert.	11490.000	AV	42.50	38.76	8.35	42.76	-9.54	37.31	53.9	16.5	140	160	VBW:5.1kHz
Vert.	17235.000	AV	40.90	41.26	10.77	44.67	-9.54	38.72	53.9	15.1	150	0	Floor noise

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 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.	5650.000	PK	51.00	33.62	15.68	45.55	2.28	57.03	-38.17	-27.00	11.1	146	205	
Hori.	5700.000	PK	52.10	33.68	15.71	45.54	2.28	58.23	-36.97	10.00	46.9	146	205	
Hori.	5720.000	PK	54.40	33.76	15.72	45.53	2.28	60.63	-34.57	15.60	50.1	146	205	
Hori.	5725.000	PK	56.10	33.78	15.72	45.53	2.28	62.35	-32.85	27.00	59.8	146	205	
Hori.	5850.000	PK	51.50	34.29	15.78	45.46	2.28	58.39	-36.81	27.00	63.8	146	205	
Hori.	5855.000	PK	51.50	34.33	15.78	45.46	2.28	58.43	-36.77	15.60	52.3	146	205	
Hori.	5875.000	PK	51.20	34.47	15.80	45.45	2.28	58.30	-36.90	10.00	46.9	146	205	
Hori.	5925.000	PK	51.60	34.75	15.83	45.40	2.28	59.06	-36.14	-27.00	9.1	146	205	
Vert.	5650.000	PK	51.00	33.62	15.68	45.55	2.28	57.03	-38.17	-27.00	11.1	150	175	
Vert.	5700.000	PK	52.30	33.68	15.71	45.54	2.28	58.43	-36.77	10.00	46.7	150	175	
Vert.	5720.000	PK	54.40	33.76	15.72	45.53	2.28	60.63	-34.57	15.60	50.1	150	175	
Vert.	5725.000	PK	56.10	33.78	15.72	45.53	2.28	62.35	-32.85	27.00	59.8	150	175	
Vert.	5850.000	PK	52.00	34.29	15.78	45.46	2.28	58.89	-36.31	27.00	63.3	150	175	
Vert.	5855.000	PK	52.40	34.33	15.78	45.46	2.28	59.33	-35.87	15.60	51.4	150	175	
Vert.	5875.000	PK	51.50	34.47	15.80	45.45	2.28	58.60	-36.60	10.00	46.6	150	175	
Vert.	5925.000	PK	52.10	34.75	15.83	45.40	2.28	59.56	-35.64	-27.00	8.6	150	175	

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 dB

UL Japan, Inc.

Kashima EMC Lab.

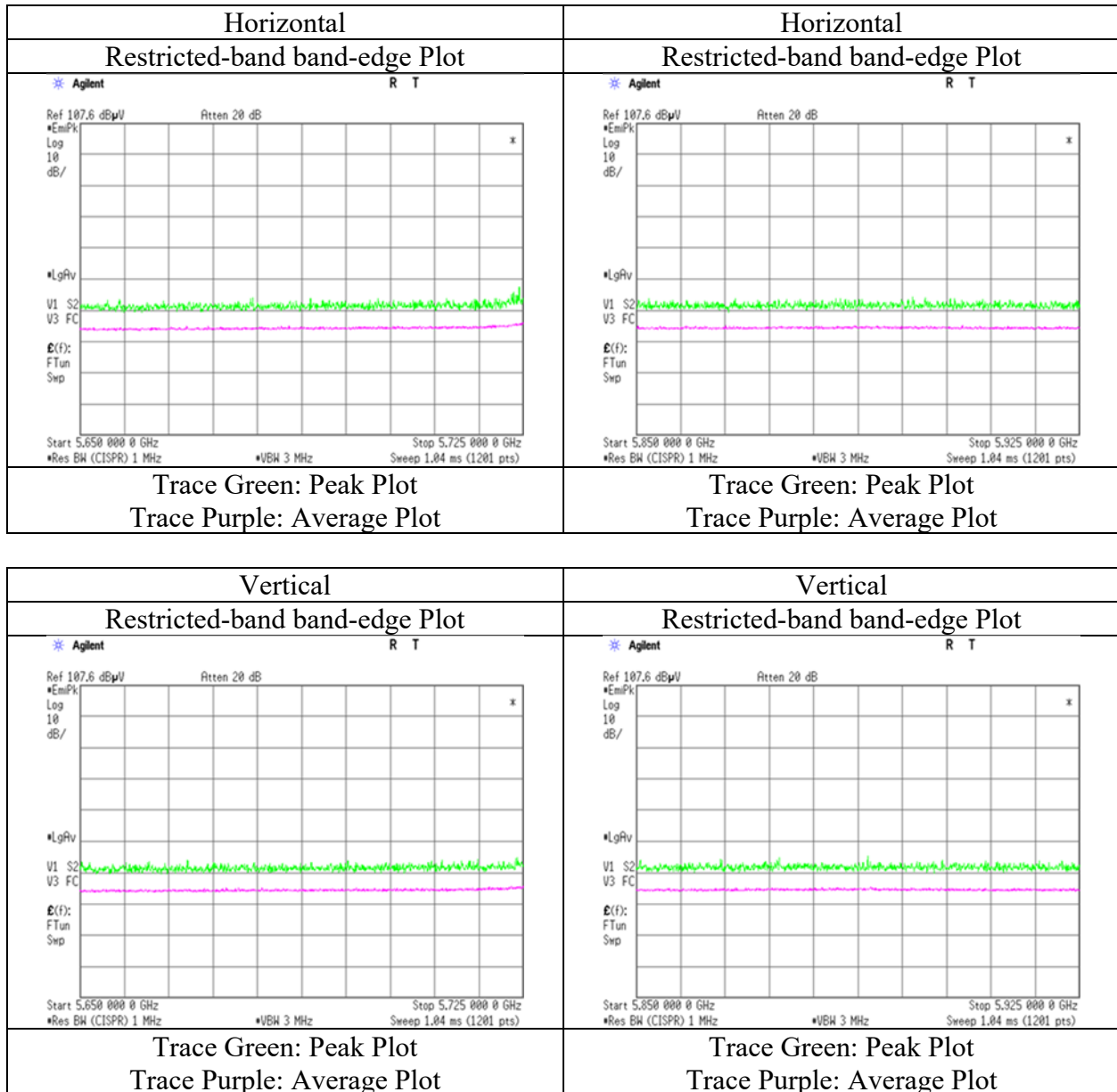
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

Radiated Spurious Emission

Report No.	13063556M-C-R2
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	October 20, 2019
Temperature / Humidity	20 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 5745 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

UL Japan, Inc.

Kashima EMC Lab.

1614, Mushiata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

Radiated Spurious Emission

Report No.	13063556M-C-R2			
Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.10	No.11	No.11
Date	October 20, 2019	October 24, 2019	October 18, 2019	October 18, 2019
Temperature / Humidity	20 deg. C / 58 % RH	20 deg. C / 58 % RH	22 deg. C / 48 % RH	22 deg. C / 48 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)	(26.5 GHz - 40 GHz)
Mode	Tx 11n-40 5755 MHz			

(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.	2799.009	PK	51.10	28.81	13.95	43.82	2.28	52.32	73.9	21.5	141	204	
Hori.	11510.000	PK	48.40	38.75	8.35	42.81	-9.54	43.15	73.9	30.7	135	220	
Hori.	17265.000	PK	50.60	41.30	10.79	44.65	-9.54	48.50	73.9	25.4	150	0	Floor noise
Hori.	2799.009	AV	39.20	28.81	13.95	43.82	2.28	40.42	53.9	13.4	141	204	VBW:10Hz
Hori.	11510.000	AV	40.50	38.75	8.35	42.81	-9.54	35.25	53.9	18.6	135	220	VBW:4.3kHz
Hori.	17265.000	AV	41.10	41.30	10.79	44.65	-9.54	39.00	53.9	14.9	150	0	Floor noise
Vert.	2799.009	PK	53.80	28.81	13.95	43.82	2.28	55.02	73.9	18.8	100	196	
Vert.	11510.000	PK	49.10	38.75	8.35	42.81	-9.54	43.85	73.9	30.0	138	159	
Vert.	17265.000	PK	49.60	41.30	10.79	44.65	-9.54	47.50	73.9	26.4	150	0	Floor noise
Vert.	2799.009	AV	44.60	28.81	13.95	43.82	2.28	45.82	53.9	8.0	100	196	VBW:10Hz
Vert.	11510.000	AV	43.00	38.75	8.35	42.81	-9.54	37.75	53.9	16.1	138	159	VBW:4.3kHz
Vert.	17265.000	AV	41.20	41.30	10.79	44.65	-9.54	39.10	53.9	14.8	150	0	Floor noise

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 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.	5650.000	PK	51.90	33.62	15.68	45.55	2.28	57.93	-37.27	-27.00	10.2	148	203	
Hori.	5700.000	PK	51.60	33.68	15.71	45.54	2.28	57.73	-37.47	10.00	47.4	148	203	
Hori.	5720.000	PK	53.60	33.76	15.72	45.53	2.28	59.83	-35.37	15.60	50.9	148	203	
Hori.	5725.000	PK	54.90	33.78	15.72	45.53	2.28	61.15	-34.05	27.00	61.0	148	203	
Hori.	5850.000	PK	51.30	34.29	15.78	45.46	2.28	58.19	-37.01	27.00	64.0	148	203	
Hori.	5855.000	PK	51.40	34.33	15.78	45.46	2.28	58.33	-36.87	15.60	52.4	148	203	
Hori.	5875.000	PK	51.80	34.47	15.80	45.45	2.28	58.90	-36.30	10.00	46.3	148	203	
Hori.	5925.000	PK	51.60	34.75	15.83	45.40	2.28	59.06	-36.14	-27.00	9.1	148	203	
Vert.	5650.000	PK	51.60	33.62	15.68	45.55	2.28	57.63	-37.57	-27.00	10.5	158	179	
Vert.	5700.000	PK	51.60	33.68	15.71	45.54	2.28	57.73	-37.47	10.00	47.4	158	179	
Vert.	5720.000	PK	53.80	33.76	15.72	45.53	2.28	60.03	-35.17	15.60	50.7	158	179	
Vert.	5725.000	PK	55.00	33.78	15.72	45.53	2.28	61.25	-33.95	27.00	60.9	158	179	
Vert.	5850.000	PK	52.10	34.29	15.78	45.46	2.28	58.99	-36.21	27.00	63.2	158	179	
Vert.	5855.000	PK	51.50	34.33	15.78	45.46	2.28	58.43	-36.77	15.60	52.3	158	179	
Vert.	5875.000	PK	51.70	34.47	15.80	45.45	2.28	58.80	-36.40	10.00	46.4	158	179	
Vert.	5925.000	PK	51.70	34.75	15.83	45.40	2.28	59.16	-36.04	-27.00	9.0	158	179	

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 dB

UL Japan, Inc.

Kashima EMC Lab.

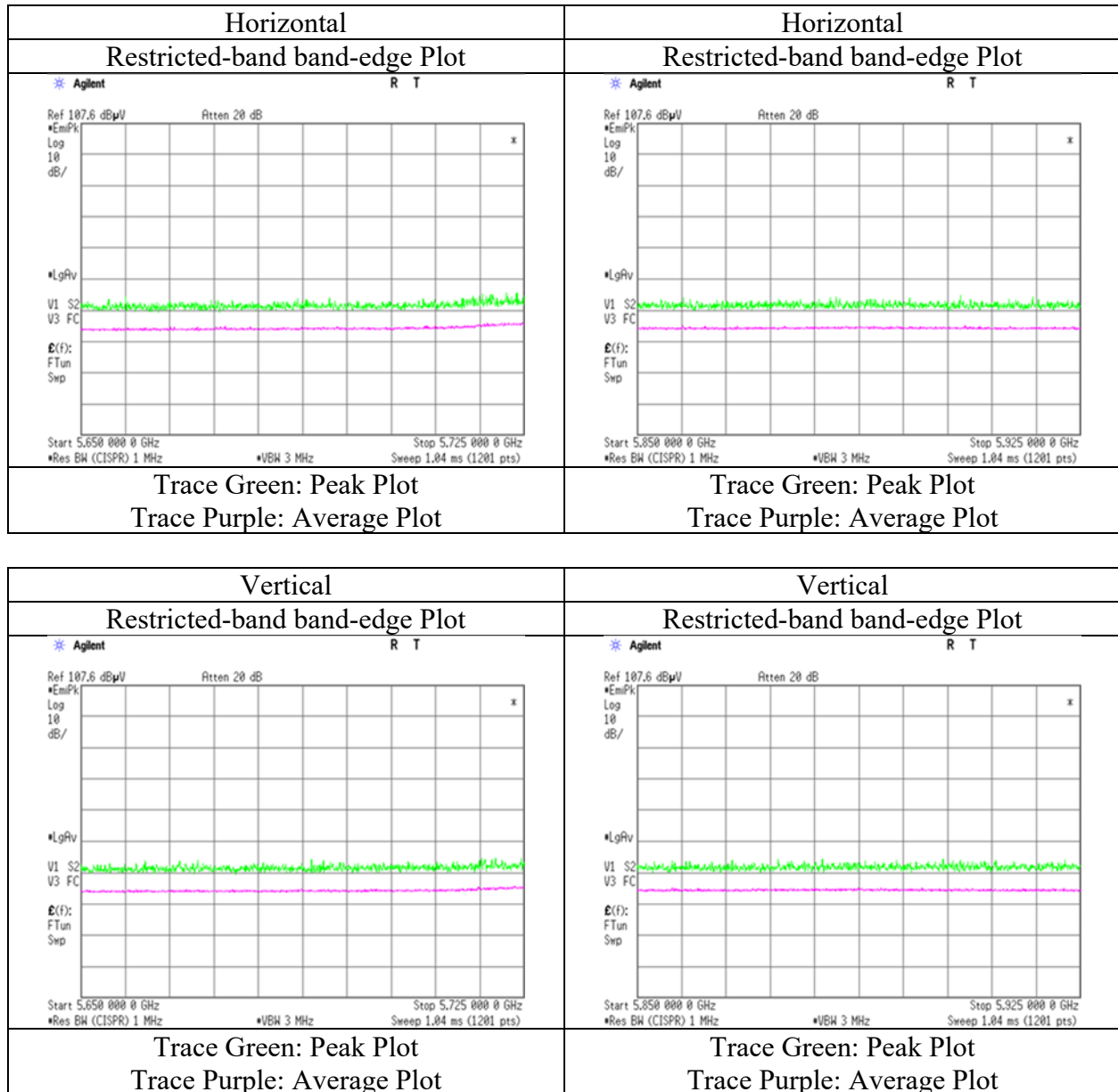
1614, Mushiata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

Radiated Spurious Emission

Report No.	13063556M-C-R2
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	October 20, 2019
Temperature / Humidity	20 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz - 10 GHz)
Mode	Tx 11n-40 5755 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No. 13063556M-C-R2
Test place Kashima EMC Lab.
Semi Anechoic Chamber No.11
Date October 20, 2019 No.10 October 24, 2019 No.11 October 18, 2019 No.11 October 18, 2019
Temperature / Humidity 20 deg. C / 58 % RH 20 deg. C / 58 % RH 22 deg. C / 48 % RH 22 deg. C / 48 % RH
Engineer Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe
(1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11ac-40 5755 MHz

(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.	2799.009	PK	50.80	28.81	13.95	43.82	2.28	52.02	73.90	21.8	147	206	
Hori.	11510.000	PK	49.10	38.75	8.35	42.81	-9.54	43.85	73.9	30.0	131	221	
Hori.	17265.000	PK	49.90	41.30	10.79	44.65	-9.54	47.80	73.9	26.1	150	0	Floor noise
Hori.	2799.009	AV	39.00	28.81	13.95	43.82	2.28	40.22	53.9	13.6	147	206	VBW:10Hz
Hori.	11510.000	AV	40.60	38.75	8.35	42.81	-9.54	35.35	53.9	18.5	131	221	VBW:3.3kHz
Hori.	17265.000	AV	40.60	41.30	10.79	44.65	-9.54	38.50	53.9	15.4	150	0	Floor noise
Vert.	2799.009	PK	53.00	28.81	13.95	43.82	2.28	54.22	73.9	19.6	100	195	
Vert.	11510.000	PK	48.90	38.75	8.35	42.81	-9.54	43.65	73.9	30.2	138	160	
Vert.	17265.000	PK	49.90	41.30	10.79	44.65	-9.54	47.80	73.9	26.1	150	0	Floor noise
Vert.	2799.009	AV	44.80	28.81	13.95	43.82	2.28	46.02	53.9	7.8	100	195	VBW:10Hz
Vert.	11510.000	AV	42.60	38.75	8.35	42.81	-9.54	37.35	53.9	16.5	138	160	VBW:3.3kHz
Vert.	17265.000	AV	40.60	41.30	10.79	44.65	-9.54	38.50	53.9	15.4	150	0	Floor noise

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 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.	5650.000	PK	51.50	33.62	15.68	45.55	2.28	57.53	-37.67	-27.00	10.6	150	205	
Hori.	5700.000	PK	51.70	33.68	15.71	45.54	2.28	57.83	-37.37	10.00	47.3	150	205	
Hori.	5720.000	PK	54.00	33.76	15.72	45.53	2.28	60.23	-34.97	15.60	50.5	150	205	
Hori.	5725.000	PK	54.60	33.78	15.72	45.53	2.28	60.85	-34.35	27.00	61.3	150	205	
Hori.	5850.000	PK	51.60	34.29	15.78	45.46	2.28	58.49	-36.71	27.00	63.7	150	205	
Hori.	5855.000	PK	51.30	34.33	15.78	45.46	2.28	58.23	-36.97	15.60	52.5	150	205	
Hori.	5875.000	PK	51.90	34.47	15.80	45.45	2.28	59.00	-36.20	10.00	46.2	150	205	
Hori.	5925.000	PK	51.50	34.75	15.83	45.40	2.28	58.96	-36.24	-27.00	9.2	150	205	
Vert.	5650.000	PK	51.40	33.62	15.68	45.55	2.28	57.43	-37.77	-27.00	10.7	152	176	
Vert.	5700.000	PK	51.70	33.68	15.71	45.54	2.28	57.83	-37.37	10.00	47.3	152	176	
Vert.	5720.000	PK	52.50	33.76	15.72	45.53	2.28	58.73	-36.47	15.60	52.0	152	176	
Vert.	5725.000	PK	53.00	33.78	15.72	45.53	2.28	59.25	-35.95	27.00	62.9	152	176	
Vert.	5850.000	PK	52.10	34.29	15.78	45.46	2.28	58.99	-36.21	27.00	63.2	152	176	
Vert.	5855.000	PK	52.00	34.33	15.78	45.46	2.28	58.93	-36.27	15.60	51.8	152	176	
Vert.	5875.000	PK	51.70	34.47	15.80	45.45	2.28	58.80	-36.40	10.00	46.4	152	176	
Vert.	5925.000	PK	51.90	34.75	15.83	45.40	2.28	59.36	-35.84	-27.00	8.8	152	176	

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 dB

UL Japan, Inc.

Kashima EMC Lab.

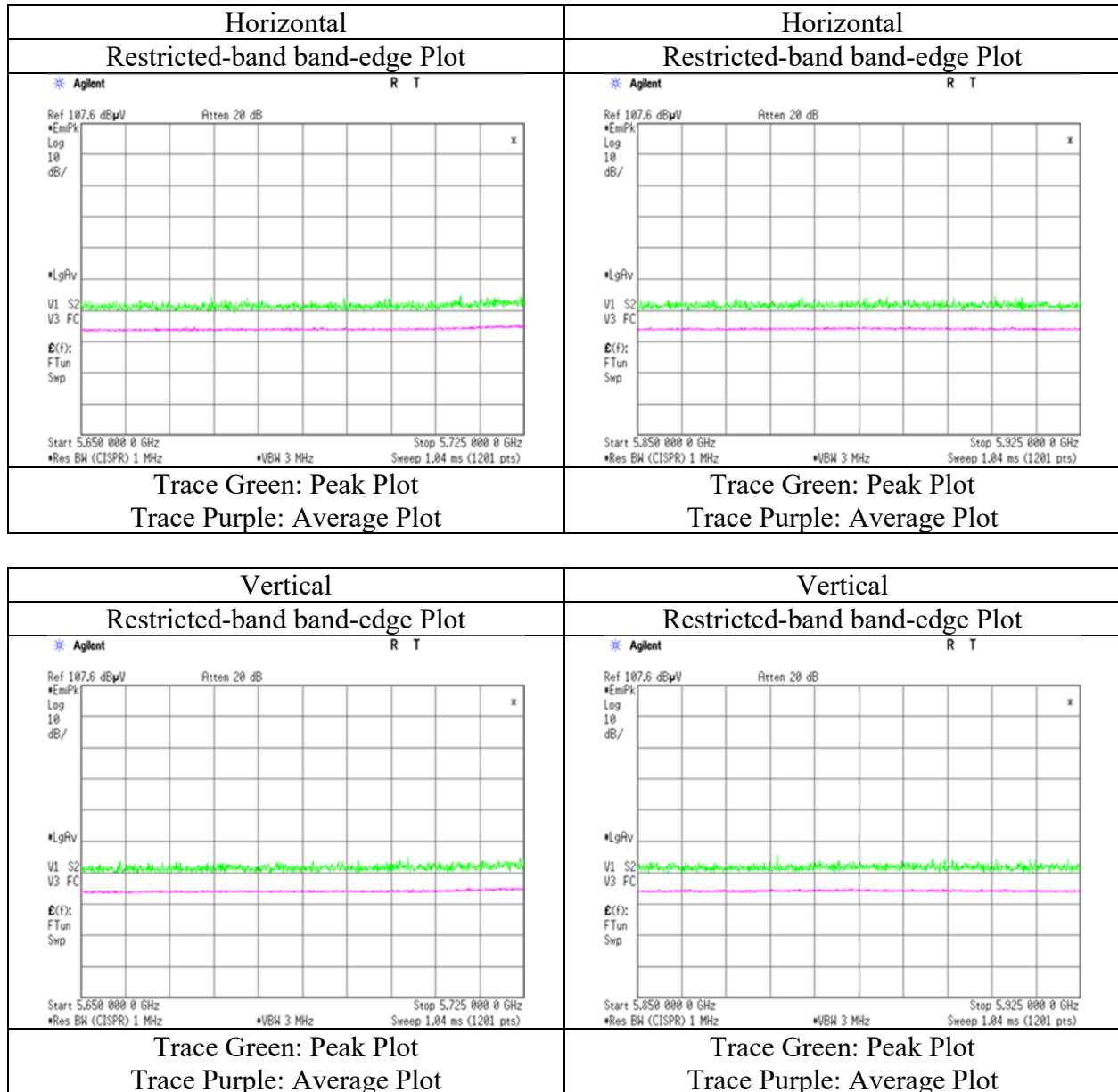
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

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Radiated Spurious Emission

Report No.	13063556M-C-R2
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	October 20, 2019
Temperature / Humidity	20 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz - 10 GHz)
Mode	Tx 11ac-40 5755 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

UL Japan, Inc.

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Radiated Spurious Emission

Report No. 13063556M-C-R2
Test place Kashima EMC Lab.
Semi Anechoic Chamber No.11
Date October 20, 2019 No.10 October 24, 2019 No.11 October 18, 2019 No.11 October 18, 2019
Temperature / Humidity 20 deg. C / 58 % RH 20 deg. C / 58 % RH 22 deg. C / 48 % RH 22 deg. C / 48 % RH
Engineer Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe Hiromitsu Tanabe
(1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11ac-80 5775 MHz

(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.	2799.009	PK	50.80	28.81	13.95	43.82	2.28	52.02	73.90	21.8	143	206	
Hori.	11550.000	PK	48.80	38.77	8.36	42.91	-9.54	43.48	73.9	30.4	151	220	
Hori.	17325.000	PK	49.60	41.41	10.85	44.62	-9.54	47.70	73.9	26.2	150	0	Floor noise
Hori.	2799.009	AV	39.60	28.81	13.95	43.82	2.28	40.82	53.9	13.0	143	206	VBW:10Hz
Hori.	11550.000	AV	41.20	38.77	8.36	42.91	-9.54	35.88	53.9	18.0	151	220	VBW:8.2kHz
Hori.	17325.000	AV	41.40	41.41	10.85	44.62	-9.54	39.50	53.9	14.4	150	0	Floor noise
Vert.	2799.009	PK	53.60	28.81	13.95	43.82	2.28	54.82	73.9	19.0	100	196	
Vert.	11550.000	PK	49.30	38.77	8.36	42.91	-9.54	43.98	73.9	29.9	148	160	
Vert.	17325.000	PK	49.50	41.41	10.85	44.62	-9.54	47.60	73.9	26.3	150	0	Floor noise
Vert.	2799.009	AV	44.80	28.81	13.95	43.82	2.28	46.02	53.9	7.8	100	196	VBW:10Hz
Vert.	11550.000	AV	43.30	38.77	8.36	42.91	-9.54	37.98	53.9	15.9	148	160	VBW:8.2kHz
Vert.	17325.000	AV	41.50	41.41	10.85	44.62	-9.54	39.60	53.9	14.3	150	0	Floor noise

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 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.	5650.000	PK	51.30	33.62	15.68	45.55	2.28	57.33	-37.87	-27.00	10.8	144	205	
Hori.	5700.000	PK	51.80	33.68	15.71	45.54	2.28	57.93	-37.27	10.00	47.2	144	205	
Hori.	5720.000	PK	52.60	33.76	15.72	45.53	2.28	58.83	-36.37	15.60	51.9	144	205	
Hori.	5725.000	PK	53.90	33.78	15.72	45.53	2.28	60.15	-35.05	27.00	62.0	144	205	
Hori.	5850.000	PK	51.50	34.29	15.78	45.46	2.28	58.39	-36.81	27.00	63.8	144	205	
Hori.	5855.000	PK	51.70	34.33	15.78	45.46	2.28	58.63	-36.57	15.60	52.1	144	205	
Hori.	5875.000	PK	51.60	34.47	15.80	45.45	2.28	58.70	-36.50	10.00	46.5	144	205	
Hori.	5925.000	PK	51.50	34.75	15.83	45.40	2.28	58.96	-36.24	-27.00	9.2	144	205	
Vert.	5650.000	PK	51.00	33.62	15.68	45.55	2.28	57.03	-38.17	-27.00	11.1	186	178	
Vert.	5700.000	PK	51.30	33.68	15.71	45.54	2.28	57.43	-37.77	10.00	47.7	186	178	
Vert.	5720.000	PK	51.80	33.76	15.72	45.53	2.28	58.03	-37.17	15.60	52.7	186	178	
Vert.	5725.000	PK	53.10	33.78	15.72	45.53	2.28	59.35	-35.85	27.00	62.8	186	178	
Vert.	5850.000	PK	51.60	34.29	15.78	45.46	2.28	58.49	-36.71	27.00	63.7	186	178	
Vert.	5855.000	PK	51.50	34.33	15.78	45.46	2.28	58.43	-36.77	15.60	52.3	186	178	
Vert.	5875.000	PK	51.40	34.47	15.80	45.45	2.28	58.50	-36.70	10.00	46.7	186	178	
Vert.	5925.000	PK	51.70	34.75	15.83	45.40	2.28	59.16	-36.04	-27.00	9.0	186	178	

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 - 10 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

26.5 GHz - 40 GHz : 20log (0.5 m / 3.0 m) = -15.56 dB

UL Japan, Inc.

Kashima EMC Lab.

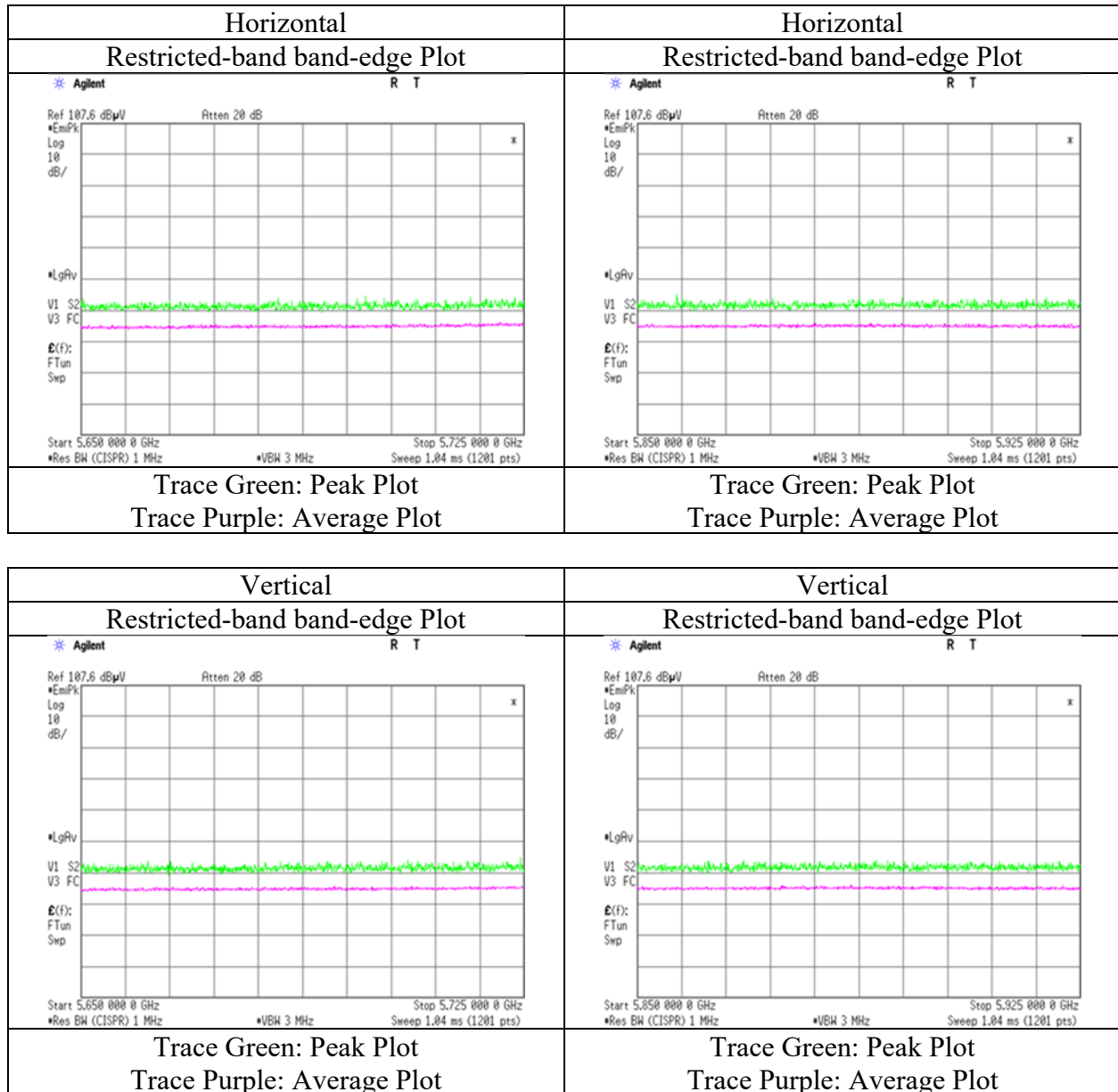
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

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Radiated Spurious Emission

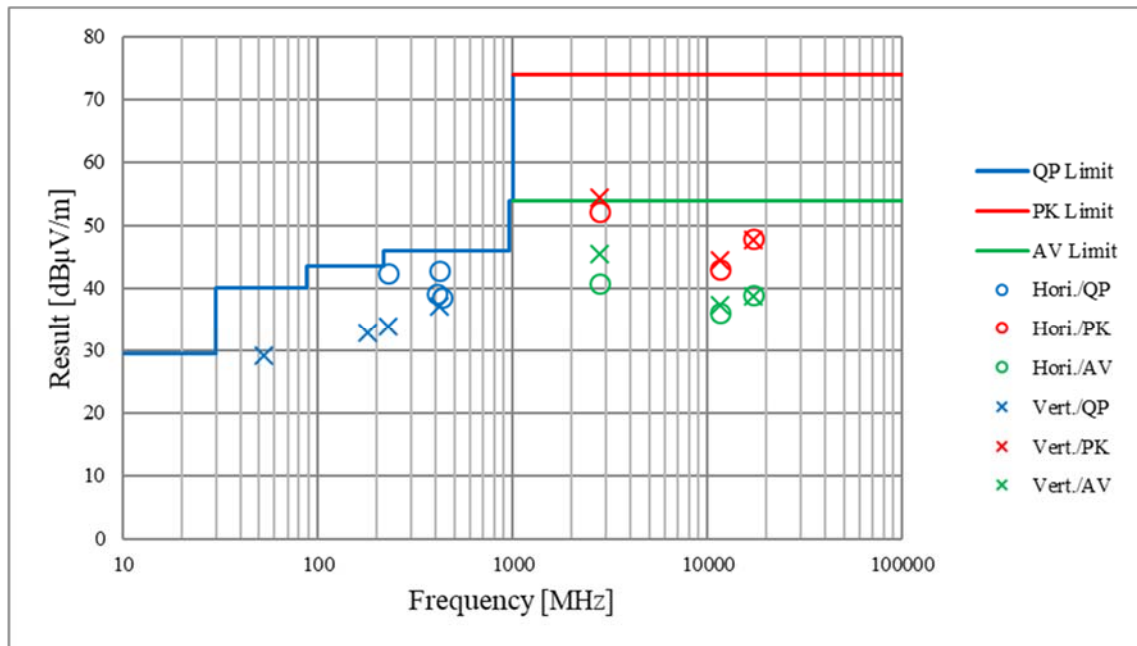
Report No.	13063556M-C-R2
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	October 20, 2019
Temperature / Humidity	20 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz - 10 GHz)
Mode	Tx 11ac-80 5775 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
 Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13063556M-C-R2				
Test place	Kashima EMC Lab.				
Semi Anechoic Chamber	No.10	No.11	No.10	No.11	No.11
Date	October 17, 2019	October 20, 2019	October 24, 2019	October 18, 2019	October 18, 2019
Temperature / Humidity	23 deg. C / 57% RH	20 deg. C / 58 % RH	20 deg. C / 58 % RH	22 deg. C / 48 % RH	22 deg. C / 48 % RH
Engineer	Hiromitsu Tanabe (30 MHz - 1000 MHz)	Hiromitsu Tanabe (1 GHz - 10 GHz)	Hiromitsu Tanabe (10 GHz - 18 GHz)	Hiromitsu Tanabe (18 GHz - 26.5 GHz)	Hiromitsu Tanabe (26.5 GHz - 40 GHz)
Mode	Tx 11n-20 5745 MHz				



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

APPENDIX 2: Test instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	143121	LOGBICON	Schwarzbeck	VULB 9168	343	2019/04/03	2020/04/30	12
RE	178806	5dB Fixed Atten.	PASTERNAK	PE7047-5	none	2019/04/03	2020/04/30	12
RE	143165	10 Site RE 3m System	UL Japan Inc.	none	none	2019/08/04	2020/08/31	12
RE	183880	Pre-Amplifier	UL Japan Inc.	ZKL-2	1	2019/04/08	2020/04/30	12
RE	144199	Test Receiver	AGILENT	N9038A	MY53290016	2019/07/17	2020/07/31	12
RE(GHz)	143455	Double Ridged Wave Guide	ETS-Lindgren	3115	00204569	2019/02/04	2020/02/29	12
RE(GHz)	143456	Double Ridged Wave Guide	ETS-Lindgren	3115	00204573	2019/02/04	2020/02/29	12
RE(GHz)	143140	Micro Wave Cable	Junkosha	MWX221	1407S222	2018/11/15	2019/11/30	12
RE(GHz)	143111	Micro Wave Cable	Junkosha	MWX221	MRA-12-14-148	2019/05/23	2020/05/31	12
RE(GHz)	142940	Pre-Amplifier	Micro Wave Factory	MPR-1G26.5-35	161399	2019/06/09	2020/06/30	12
RE(GHz)	143023	10dB Fixed Atten.	Weinschel- API Technologies Corp	54A-10	56251	2019/05/23	2020/05/31	12
RE(GHz)	143443	HPF	MICRO-TRONICS	HPM50112-02	006	2019/05/23	2020/05/31	12
RE(GHz)	143643	Spectrum Analyzer	AGILENT	E4448A	MY52490024	2019/06/01	2020/06/30	12
RE(GHz)	143438	Double Ridged Horn	ETS-Lindgren	3160-09	0016603	2019/06/08	2020/06/30	12
RE(GHz)	142937	Pre-Amplifier	TOYO	HAP18-26W	00000035	2019/06/12	2020/06/30	12
RE(GHz)	143113	Micro Wave Cable	Suhner	SUCOFLEX104	MY588/4	2019/07/12	2020/07/31	12
RE(GHz)	146356	Horn Antenna	ETS LINDGREN	3116	46543	2019/02/17	2020/02/29	12
RE(GHz)	144880	Pre Amplifier	TSJ	MLA-1840B02-35	-	2019/03/01	2020/03/31	12
RE(GHz)	171928	Microwave Cable	Huber+Suhner	SF102/SKm/SKm/1000mm	801389	2019/07/16	2020/07/31	12
RE(GHz)	142992	Micro Wave Cable	Suhner	SUCOFLEX102	MY010/2A	2019/07/16	2020/07/31	12
EMI	178804	EMI Software	TSJ	TEPTO-DV3 (RE,CE,ME,PE)	-	-	-	-
EMI	143654	Ruler	TAJIMA	L19-55	-	-	-	-
EMI	143542	Temperature & Humidity Indicator	HIOKI	3641/9680-50	090999 895/090905 406	2019/06/21	2020/06/30	12
EMI	143133	Barometer	Sunoh	SBR-151	001439	2018/11/25	2021/11/30	36
EMI	144216	Digital Multimeter	Fluke Corporation	115	994460954	2019/10/27	2020/10/31	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: RE: Radiated Emission

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