



RADIO TEST REPORT

Test Report No. : 12475916H-D-R1

Applicant : RICOH COMPANY, LTD.
Type of Equipment : Digital Camera
Model No. : R02070
FCC ID : BBP-R02070
Test regulation : FCC Part 15 Subpart E: 2019
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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12475916H-D. 12475916H-D is replaced with this report.

Date of test: October 13, 2018 to February 25, 2019

Representative test engineer:

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 There is no testing item of "Non-accreditation".

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SECTION 1: Customer information

Company Name : RICOH COMPANY, LTD.
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Telephone Number : +81-46-249-8146
Facsimile Number : +81-3-6673-4430
Contact Person : Naohito Yazaki

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., FCC ID on the cover and other 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 : Digital Camera
Model No. : R02070
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.6 V (Battery)
Receipt Date of Sample : October 2, 2018
Country of Mass-production : Indonesia
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: R02070 (referred to as the EUT in this report) is a Digital Camera.

Operating Temperature: -10 deg. C to +40 deg. C

Radio Specification

WLAN (2.4 GHz band)

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Radio type	Transceiver			
Frequency of operation	2412 MHz - 2462 MHz			2422 MHz - 2452 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5 MHz			
Antenna type	Chip Antenna			
Antenna Gain	+0.6 dBi			

WLAN (5 GHz band) *1)

Type of radio	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11ac (20 M band)	IEEE802.11n (40 M band)	IEEE802.11ac (40 M band)	IEEE802.11ac (80 M band)
Radio type	Transceiver					
Frequency of operation	5180 MHz - 5240 MHz			5190 MHz - 5230 MHz		5210 MHz
Type of modulation	OFDM (64QAM, 16QAM, QPSK)		OFDM (256QAM, 64QAM, 16QAM, QPSK)	OFDM (64QAM, 16QAM, QPSK)	OFDM (256QAM, 64QAM, 16QAM, QPSK)	
Channel spacing	20 MHz			40 MHz		80 MHz
Antenna type	Chip Antenna					
Antenna Gain	+1.8 dBi					

Bluetooth

Type of radio	Bluetooth Ver.4.2
Radio type	Transceiver
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK): BDR/EDR GFSK: BLE
Channel spacing	1 MHz: BDR/EDR 2 MHz: BLE
Antenna type	Chip Antenna
Antenna Gain	+0.6 dBi

NFC

Type of radio	NFC
Radio type	Transceiver
Frequency of operation	13.56 MHz
Type of modulation	ASK
Channel spacing	-
Antenna type	Pattern Antenna
Antenna Gain	-

*1) This test report applies to Wireless LAN (5GHz Band).

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E
FCC Part 15 final revised on June 4, 2019 and effective July 5, 2019 except 15.258

Title : FCC 47CFR Part15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

* The revision on June 4, 2019, does not affect the test specification applied to the EUT.

** 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	QP 8.2 dB, 0.19944 MHz, L AV 11.4 dB, 0.50459 MHz, L	Complied a)	-
	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 *1)
	IC: -	IC: -			
Maximum Conducted Output Power	FCC: KDB Publication Number 789033	FCC: 15.407 (a) (1) (2) (3)		Complied b)	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)		Complied c)	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	0.3 dB 5150.000 MHz, AV, Vert.	Complied# d) / e)	Conducted (< 30 MHz)/ Radiated (> 30 MHz) *2)
	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	N/A	Conducted *1)
	IC: -	IC: RSS-247 6.2.4.1			
<p>Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) This test was not applicable since the EUT was only support of U-NII-1 band. *2) Radiated test was selected over 30 MHz based on section FCC 15.407 (b) and KDB 789033 D02 G.3.b).</p> <p>a) Refer to APPENDIX 1 (data of Conducted Emission) b) Refer to APPENDIX 1 (data of Maximum Conducted Output Power) c) Refer to APPENDIX 1 (data of Maximum Power Spectral Density) d) Refer to APPENDIX 1 (data of Radiated Spurious Emission) e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)</p> <p>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.</p>					

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

FCC Part 15.31 (e)

This EUT provides stable voltage constantly to RF Module through the regulator regardless of input voltage. Therefore, this 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

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Band Width	RSS-Gen 6.7	IC: -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 99 % Occupied Bandwidth)					
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.				

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

3.4 Uncertainty

EMI

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 $k=2$.
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Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.8 dB
	0.15 MHz to 30 MHz	3.4 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)	
3 m	9 kHz to 30 MHz	3.3 dB	
10 m		3.2 dB	
3 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	5.0 dB
	200 MHz to 1000 MHz	(Horizontal)	5.2 dB
		(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	4.9 dB
	200 MHz to 1000 MHz	(Horizontal)	5.0 dB
		(Vertical)	5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB	
	6 GHz to 18 GHz	5.3 dB	
1 m	10 GHz to 26.5 GHz	5.8 dB	
	26.5 GHz to 40 GHz	5.8 dB	
10 m	1 GHz to 18 GHz	5.2 dB	

Antenna Terminal test

Test Item	Uncertainty (+/-)
26 dB Emission Bandwidth / 6 dB Emission Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Conducted Output Power / Average Output Power	1.3 dB
Burst Rate	0.10 %
Maximum Power Spectral Density	2.7 dB
Spurious Emission (Conducted)	1.9 dB

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3.5 Test Location

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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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)	18 Mbps, PN9
IEEE 802.11n 20MHz BW (11n-20)	MCS 0, PN9
IEEE 802.11ac 20MHz BW (11ac-20)	MCS 7, PN9
IEEE 802.11n 40MHz BW (11n-40)	MCS 7, PN9
IEEE 802.11ac 40MHz BW (11ac-40)	MCS 6, PN9
IEEE 802.11ac 80MHz BW (11ac-80)	MCS 5, PN9
*The worst antenna and 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: 15 dBm 11n-20 / 40: 15 dBm 11ac-20: 14 dBm 11ac-40: 13 dBm 11ac-80: 12 dBm Software: Certification FW 001 *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)

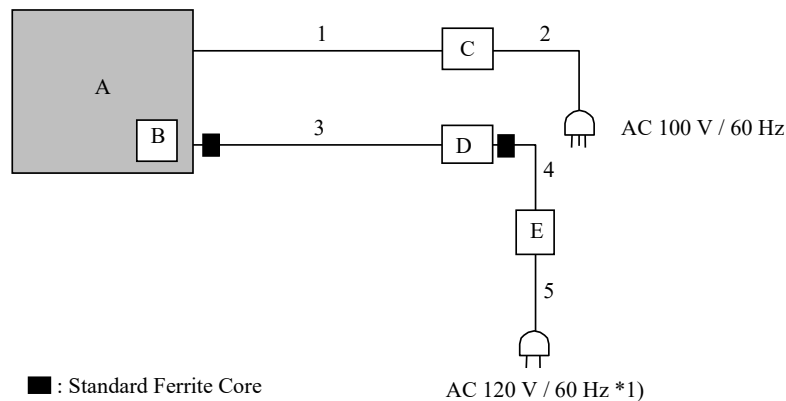
Test Item	Operating Mode	Tested Frequency
Conducted emission Radiated Spurious Emission (Below 1GHz) Conducted Spurious Emission	11n-40 Tx *1)	5190 MHz
99 % Occupied Bandwidth, Maximum Conducted Output Power, Maximum Power Spectral Density	11a Tx,	5180 MHz
	11n-20 Tx,	5220 MHz
	11ac-20 Tx	5240 MHz
	11n-40 Tx,	5190 MHz
Radiated Spurious Emission (Above 1 GHz)	11ac-40 Tx	5230 MHz
	11ac-80 Tx	5210 MHz
	11a Tx	5180 MHz
	11n-20 Tx *2)	5220 MHz
	11n-40 Tx *2)	5190 MHz
		5230 MHz
	11ac-40 Tx	5190 MHz
	11ac-80 Tx	5210 MHz

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.

*2) Since 11n-20 and 11ac-20, 11n-40 and 11ac-40, have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest output power.

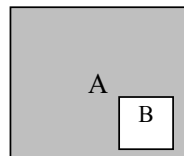
4.2 Configuration and peripherals

Conducted Emission and Radiated Emission test



*1) Conducted emission was performed on this port.

Antenna Terminal Conducted test



* 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	Digital Camera	R02070	1004 used for CE* and RE* 1009 used for AT*	RICOH COMPANY, LTD.	EUT
B	LI-ION Battery Pack	DB-110	20170328WAB	RICOH COMPANY, LTD.	-
C	Monitor	M237WS-PM	107KC8020445	LG	-
D	Laptop PC	CF-N8HWC DPS	9LKSA04258	Panasonic	-
E	AC Adapter	CF-AA6372B	6372BM409X14190B	Panasonic	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	HDMI Cable	1.0	Shielded	Shielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-
3	USB Cable	1.0	Shielded	Shielded	*1)
4	DC cable	1.0	Unshielded	Unshielded	-
5	AC cable	1.0	Unshielded	Unshielded	-

*1) This Cable was accessory of the EUT. This is only used to the EUT.

* CE: Conducted Emission

* RE: Radiated Emission

* AT: Antenna Terminal Conducted test

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SECTION 5: Conducted Emission

Test Procedure and conditions

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 rear of tabletop was located 40cm 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 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

1) For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

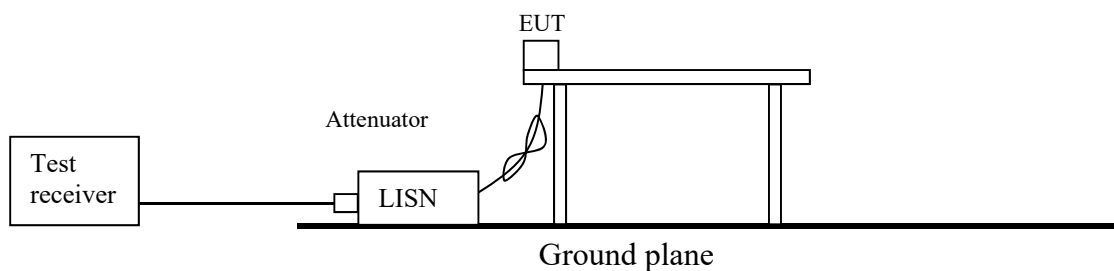
The EUT was connected to a LISN (AMN).

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

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< Below 1GHz >

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 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 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).

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;

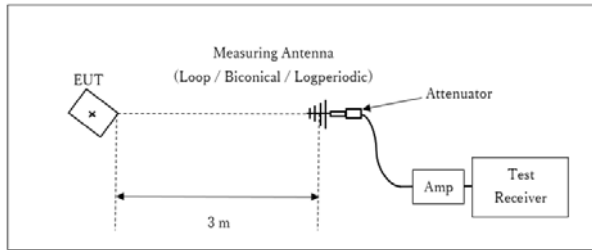
Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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 AD *1) RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: ≥ 100 traces If duty cycle was less than 98%, a duty factor was added to the results.

*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

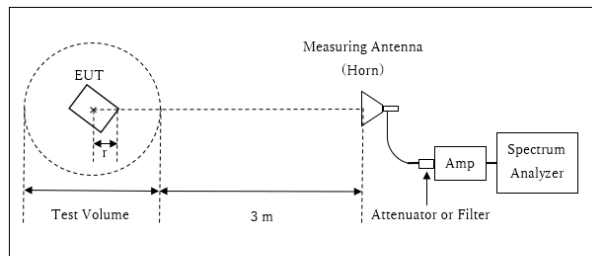
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



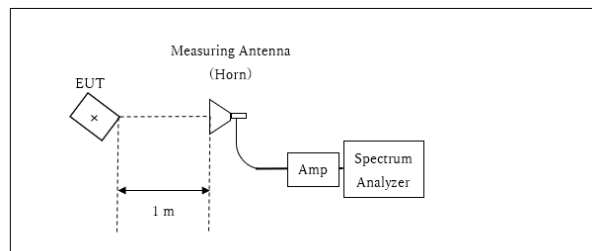
r : Radius of an outer periphery of EUT
 × : Center of turn table

Distance Factor: $20 \times \log(4.0 \text{ m} / 3.0 \text{ m}) = 2.5 \text{ dB}$
 * Test Distance: $(3 + \text{Test Volume} / 2) - r = 4.0 \text{ m}$

Test Volume : 2.0 m
 (Test Volume has been calibrated based on CISPR 16-1-4.)
 r = 0.0 m

* The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.

10 GHz - 40 GHz



× : Center of turn table

Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$
 * Test Distance: 1 m

- 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.

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
26 dB Bandwidth	Enough to capture the emission	Close to 1 % of EBW	> RBW	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 % to 5 % of OBW	≥ 3 RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Conducted Output Power	-	-	-	Auto	Average	-	Power Meter (Sensor: 80 MHz BW) (Method PM)
Maximum Power Spectral Density	Encompass the entire EBW	1 MHz	≥ 3 RBW	Auto	RMS Power Averaging (200 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*2)	9 kHz – 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz – 30 MHz	9.1 kHz	27 kHz				

* 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".

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

*2) 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 low enough as shown in the chart. (9 kHz-150 kHz: RBW = 200 Hz, 150 kHz-30 MHz: RBW = 9.1 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

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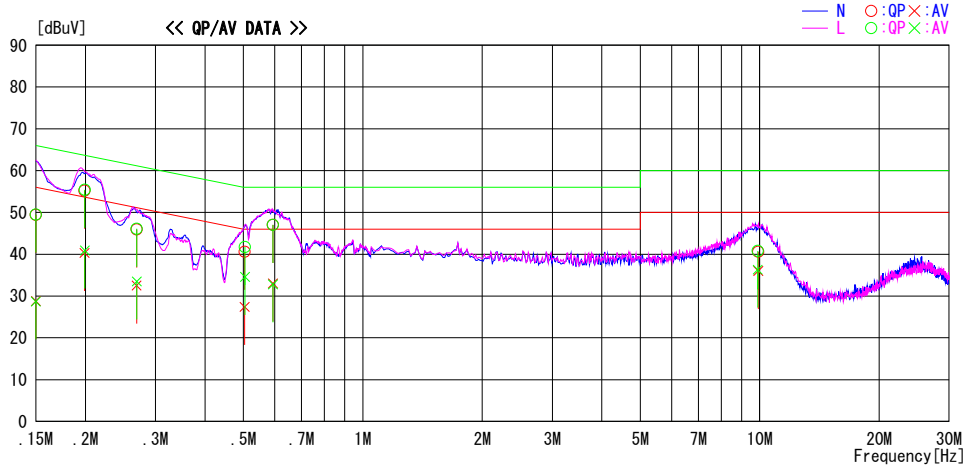
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APPENDIX 1: Test data

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab. No.4 Shielded Room
Date November 18, 2018
Temperature / Humidity 21 deg. C / 41 % RH
Engineer Yuta Moriya
Mode Tx 11n-40 5190 MHz

LIMIT : FCC15. 207 QP
FCC15. 207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15005	35.9	15.3	13.5	49.4	28.8	66.0	56.0	16.6	27.2	N
0.19892	41.7	26.8	13.5	55.2	40.3	63.7	53.7	8.5	13.4	N
0.26923	32.4	19.0	13.5	45.9	32.5	61.1	51.1	15.2	18.6	N
0.50381	27.1	13.9	13.5	40.6	27.4	56.0	46.0	15.4	18.6	N
0.59386	33.4	19.4	13.6	47.0	33.0	56.0	46.0	9.0	13.0	N
9.91221	26.4	21.8	14.2	40.6	36.0	60.0	50.0	19.4	14.0	N
0.15001	36.0	15.2	13.5	49.5	28.7	66.0	56.0	16.5	27.3	L
0.19944	41.9	27.4	13.5	55.4	40.9	63.6	53.6	8.2	12.7	L
0.26943	32.6	20.0	13.5	46.1	33.5	61.1	51.1	15.0	17.6	L
0.50459	28.2	21.1	13.5	41.7	34.6	56.0	46.0	14.3	11.4	L
0.59383	33.4	19.2	13.6	47.0	32.8	56.0	46.0	9.0	13.2	L
9.88430	26.6	22.1	14.2	40.8	36.3	60.0	50.0	19.2	13.7	L

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

99 % Occupied Bandwidth

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date October 24, 2018
Temperature / Humidity 24 deg. C / 56 % RH
Engineer Takafumi Noguchi
Mode Tx

11a

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 1	5180	-	17231.7
	5220	-	17194.1
	5240	-	17195.6

11n-20

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 1	5180	-	18246.5
	5220	-	18222.5
	5240	-	18200.0

11ac-20

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 1	5180	-	18023.6
	5220	-	17973.3
	5240	-	17976.1

99 % Occupied Bandwidth

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date October 24, 2018
Temperature / Humidity 24 deg. C / 56 % RH
Engineer Takafumi Noguchi
Mode Tx

11n-40

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 1	5190	-	36322.5
	5230	-	36511.6

11ac-40

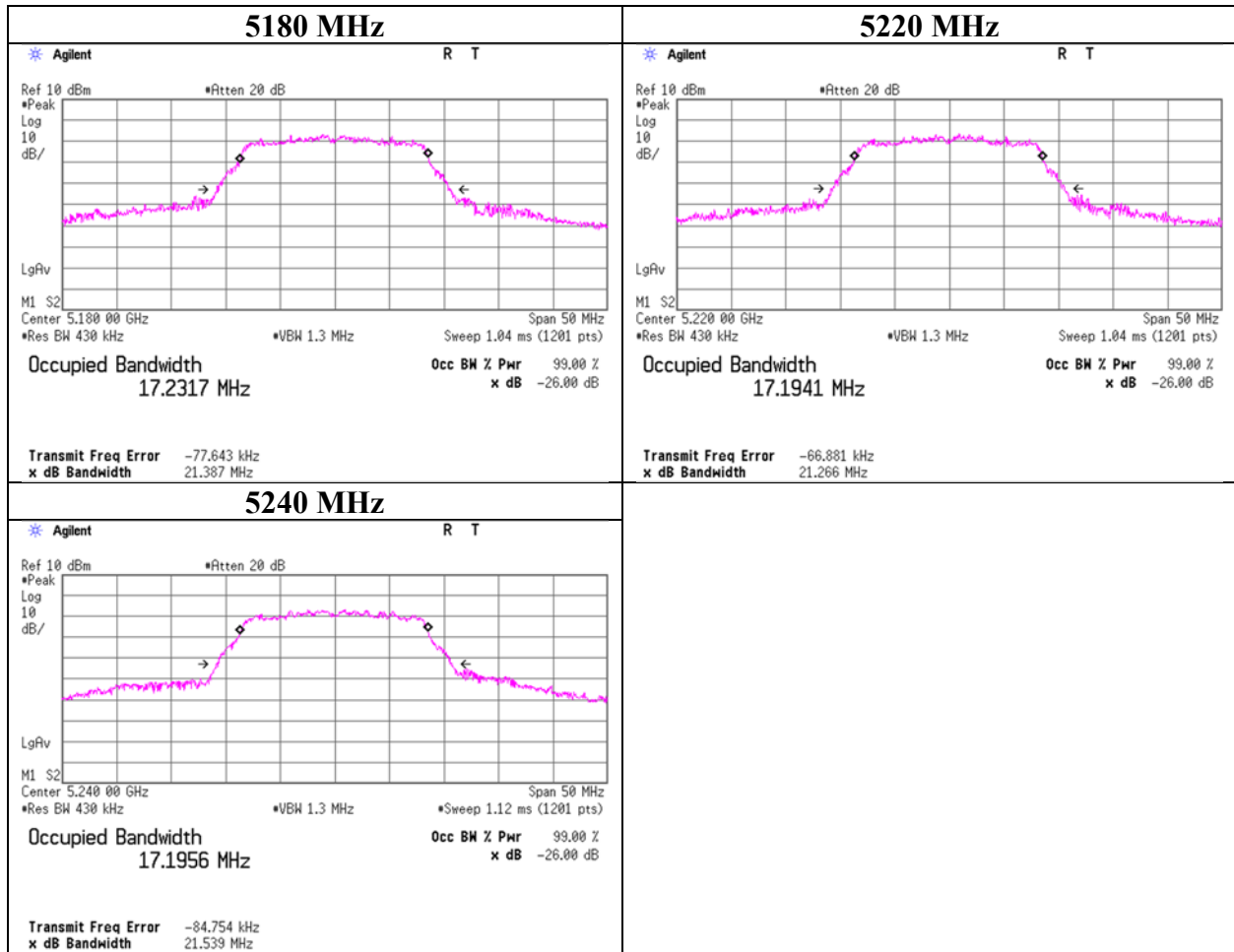
Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 1	5190	-	36408.5
	5230	-	36416.4

11ac-80

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 1	5210	-	75863.8

99 % Occupied Bandwidth

11a



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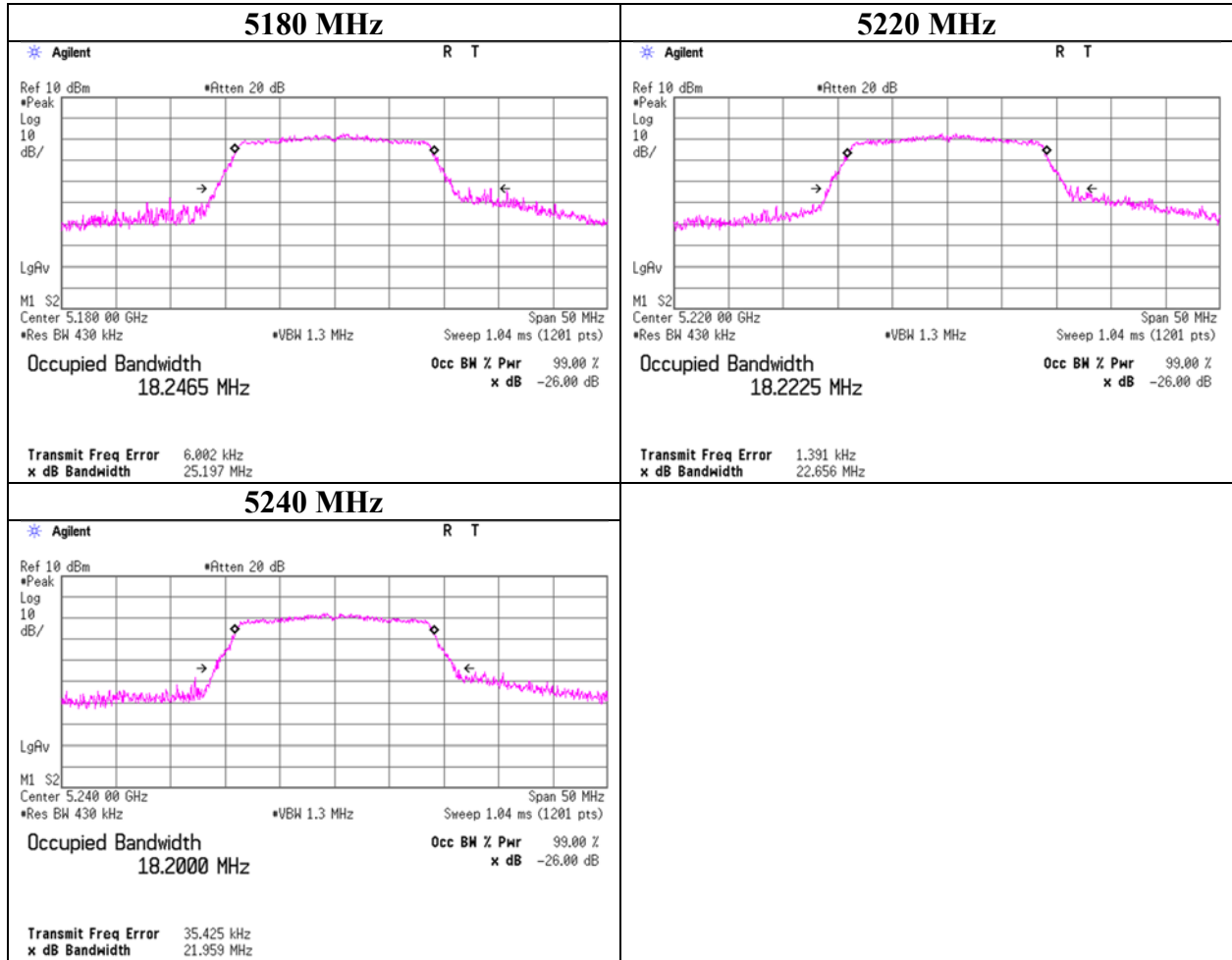
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

99 % Occupied Bandwidth

11n-20



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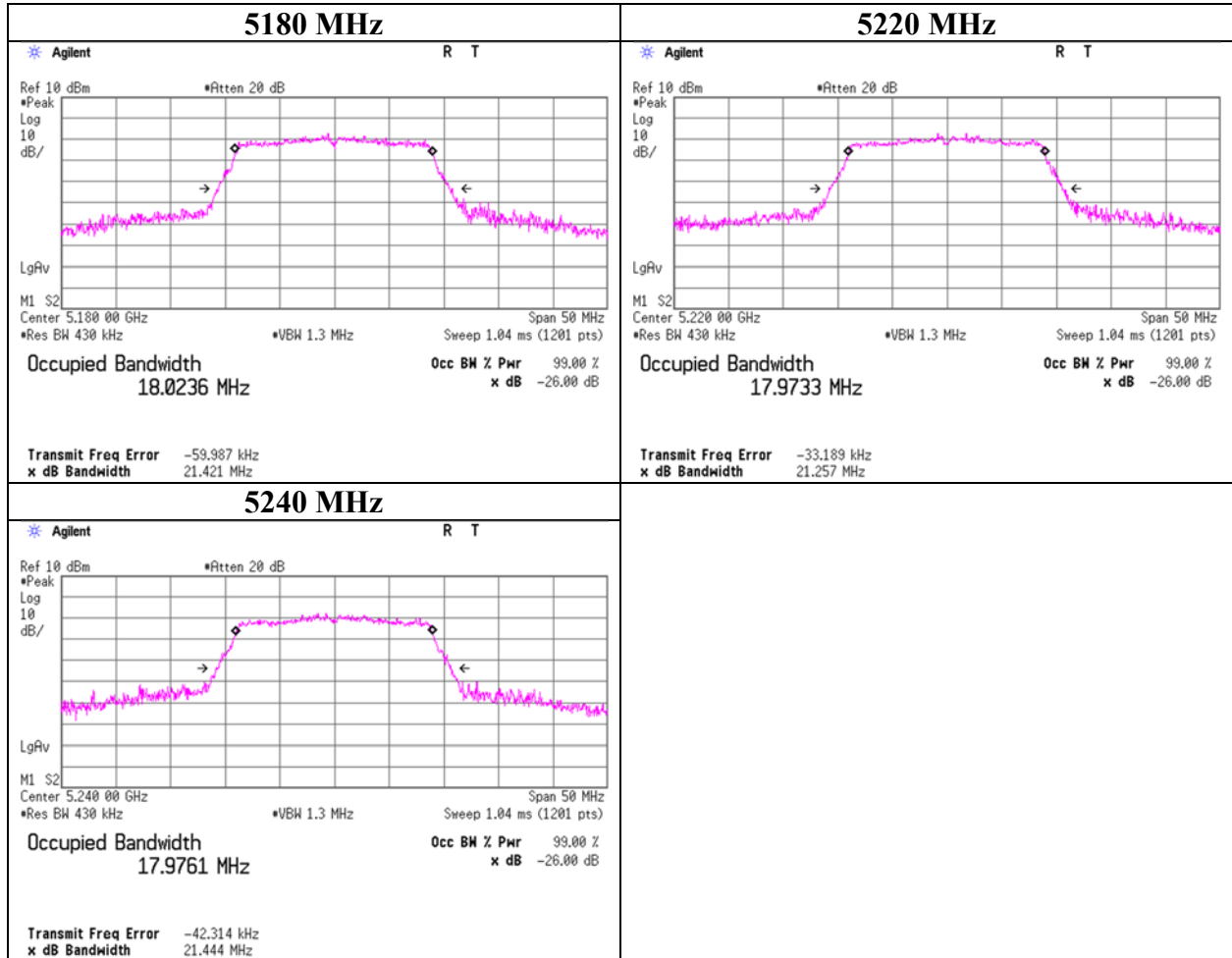
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99 % Occupied Bandwidth

11ac-20



UL Japan, Inc.

Ise EMC Lab.

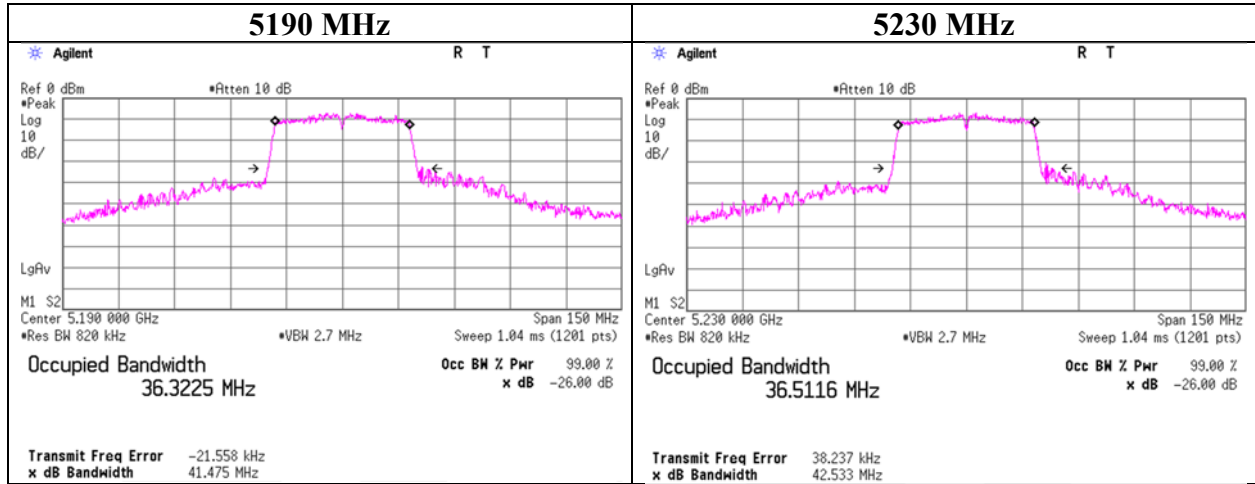
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99 % Occupied Bandwidth

11n-40



UL Japan, Inc.

Ise EMC Lab.

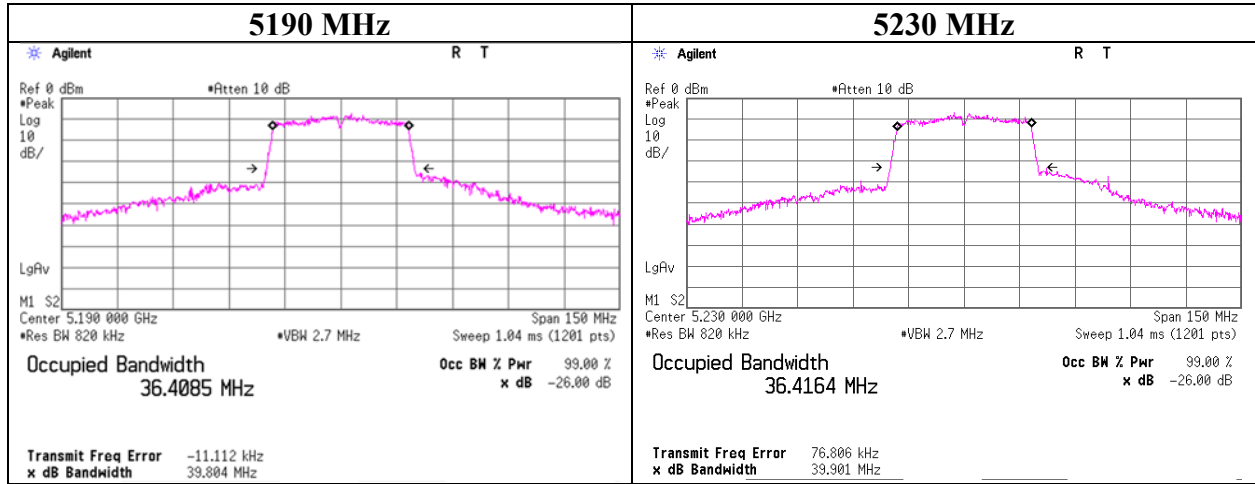
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99 % Occupied Bandwidth

11ac-40



UL Japan, Inc.

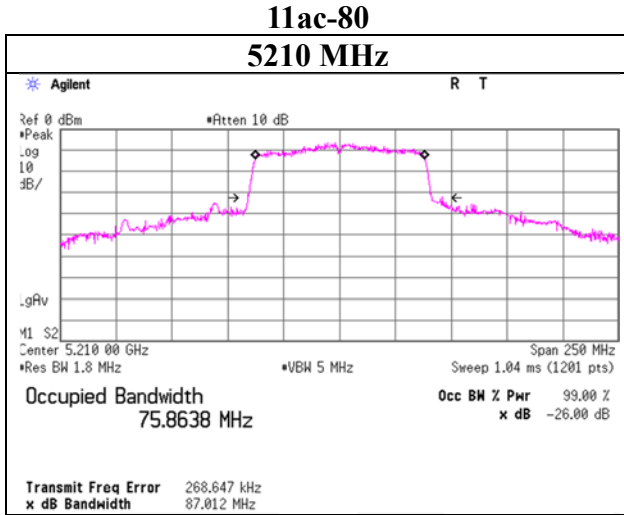
Ise EMC Lab.

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99 % Occupied Bandwidth



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Ise EMC Lab.

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Maximum Conducted Output Power

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11a

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]		
5180	3.10	1.88	10.10	0.80	1.8	-	17.232	15.88	38.73	23.97	8.09	17.68	58.61	29.97	12.29
5220	3.11	1.89	10.10	0.80	1.8	-	17.194	15.90	38.90	23.97	8.07	17.70	58.88	29.97	12.27
5240	3.13	1.89	10.10	0.80	1.8	-	17.196	15.92	39.08	23.97	8.05	17.72	59.16	29.97	12.25

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

5220MHz

Rate [MBPS]	Freq. [MHz]	P/M Reading [dBm]	Remarks
6	5220	9.92	
9	5220	9.99	
12	5220	10.10	
18	5220	10.15	*
24	5220	9.99	
36	5220	9.90	
48	5220	10.14	
54	5220	10.03	

*: Worst Rate

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

*Difference between worst rate check data and formal test result is due to the different test condition.

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Maximum Conducted Output Power

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11n-20

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]	[mW]	Limit [dBm]	Margin [dB]	Result [dBm]	[mW]	Limit [dBm]	Margin [dB]
5180	3.19	1.88	10.10	0.31	1.8	-	18.247	15.48	35.32	23.97	8.49	17.28	53.46	29.97	12.69
5220	3.15	1.89	10.10	0.31	1.8	-	18.223	15.45	35.08	23.97	8.52	17.25	53.09	29.97	12.72
5240	3.16	1.89	10.10	0.31	1.8	-	18.200	15.46	35.16	23.97	8.51	17.26	53.21	29.97	12.71

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

5220MHz

Rate [MCS]	Freq. [MHz]	P/M Reading [dBm]	Remarks
0	5220	9.91	*
1	5220	9.56	
2	5220	9.63	
3	5220	9.75	
4	5220	9.78	
5	5220	9.70	
6	5220	9.86	
7	5220	9.89	

*: Worst Rate

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

*Difference between worst rate check data and formal test result is due to the different test condition.

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Ise EMC Lab.

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Maximum Conducted Output Power

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-20

11ac-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]	[mW]	Limit [dBm]	Margin [dB]	Result [dBm]	[mW]	Limit [dBm]	Margin [dB]
5180	1.04	1.88	10.10	1.98	1.8	-	18.024	15.00	31.62	23.97	8.97	16.80	47.86	29.97	13.17
5220	1.05	1.89	10.10	1.98	1.8	-	17.973	15.02	31.77	23.97	8.95	16.82	48.08	29.97	13.15
5240	1.09	1.89	10.10	1.98	1.8	-	17.976	15.06	32.06	23.97	8.91	16.86	48.53	29.97	13.11

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

5220MHz

Rate [MBPS]	Freq. [MHz]	P/M Reading [dBm]	Remarks
0	5220	8.62	
1	5220	8.56	
2	5220	8.69	
3	5220	8.77	
4	5220	8.54	
5	5220	8.78	
6	5220	8.75	
7	5220	8.80	*
8	5220	8.77	

*: Worst Rate

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

*Difference between worst rate check data and formal test result is due to the different test condition.

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

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Maximum Conducted Output Power

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11n-40

11n-40

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]	[mW]	Limit [dBm]	[dB]	Result [dBm]	[mW]	Limit [dBm]	[dB]
5190	0.97	1.88	10.10	2.98	1.8	-	36.323	15.93	39.17	23.97	8.04	17.73	59.29	29.97	12.24
5230	0.95	1.89	10.10	2.98	1.8	-	36.512	15.92	39.08	23.97	8.05	17.72	59.16	29.97	12.25

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

5230MHz

Rate [MBPS]	Freq. [MHz]	P/M Reading [dBm]	Remarks
0	5230	9.07	
1	5230	9.22	
2	5230	9.26	
3	5230	9.24	
4	5230	9.19	
5	5230	9.27	
6	5230	9.30	
7	5230	9.36	*

*: Worst Rate

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

*Difference between worst rate check data and formal test result is due to the different test condition.

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Ise EMC Lab.

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Maximum Conducted Output Power

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-40

11ac-40

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]		
5190	-1.10	1.88	10.10	2.78	1.8	-	36.409	13.66	23.23	23.97	10.31	15.46	35.16	29.97	14.51
5230	-1.12	1.89	10.10	2.78	1.8	-	36.416	13.65	23.17	23.97	10.32	15.45	35.08	29.97	14.52

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

5230MHz

Rate [MBPS]	Freq. [MHz]	P/M Reading [dBm]	Remarks
0	5230	8.15	
1	5230	8.27	
2	5230	8.31	
3	5230	8.38	
4	5230	8.40	
5	5230	8.30	
6	5230	8.52	*
7	5230	8.22	
8	5230	8.47	
9	5230	8.44	

*: Worst Rate

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

*Difference between worst rate check data and formal test result is due to the different test condition.

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

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Maximum Conducted Output Power

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-80

11ac-80

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 [mW]
5210	-3.00	1.89	10.10	3.52	1.8	-	75.864	12.51	17.82	23.97	11.46	14.31	26.98	29.97	15.66

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

5210MHz

Rate [MBPS]	Freq. [MHz]	P/M Reading [dBm]	Remarks
0	5210	8.17	
1	5210	8.21	
2	5210	8.24	
3	5210	8.18	
4	5210	8.21	
5	5210	8.60	*
6	5210	8.24	
7	5210	8.31	
8	5210	8.33	
9	5210	8.40	

*: Worst Rate

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

*Difference between worst rate check data and formal test result is due to the different test condition.

Average Output Power
(Reference data for RF Exposure)

Report No. 12475916H
Test place Ise EMC Lab. No.4 Measurement Room
Date January 17, 2019
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Junki Nagatomi
Mode Tx 11a

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5180	3.75	1.73	10.10	15.58	36.14	0.28	15.86	38.55
5220	3.72	1.73	10.10	15.55	35.89	0.28	15.83	38.28
5240	3.74	1.73	10.10	15.57	36.06	0.28	15.85	38.46

Sample Calculation:

Result (Timed average) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

Result (Burst power average) = Time average + Duty factor

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Average Output Power
(Reference data for RF Exposure)

Report No. 12475916H
Test place Ise EMC Lab. No.4 Measurement Room
Date January 17, 2019
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Junki Nagatomi
Mode Tx 11n-20

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5180	3.35	1.73	10.10	15.18	32.96	0.30	15.48	35.32
5220	3.32	1.73	10.10	15.15	32.73	0.30	15.45	35.08
5240	3.30	1.73	10.10	15.13	32.58	0.30	15.43	34.91

Sample Calculation:

Result (Timed average) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

Result (Burst power average) = Time average + Duty factor

Average Output Power
(Reference data for RF Exposure)

Report No. 12475916H
Test place Ise EMC Lab. No.4 Measurement Room
Date January 17, 2019
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Junki Nagatomi
Mode Tx 11ac-20

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5180	2.43	1.73	10.10	14.26	26.67	0.31	14.57	28.64
5220	2.41	1.73	10.10	14.24	26.55	0.31	14.55	28.51
5240	2.44	1.73	10.10	14.27	26.73	0.31	14.58	28.71

Sample Calculation:

Result (Timed average) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

Result (Burst power average) = Time average + Duty factor

Average Output Power
(Reference data for RF Exposure)

Report No. 12475916H
Test place Ise EMC Lab. No.4 Measurement Room
Date January 17, 2019
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Junki Nagatomi
Mode Tx 11n-40

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5190	2.75	1.73	10.10	14.58	28.71	0.59	15.17	32.89
5230	2.74	1.73	10.10	14.57	28.64	0.59	15.16	32.81

Sample Calculation:

Result (Timed average) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

Result (Burst power average) = Time average + Duty factor

Average Output Power
(Reference data for RF Exposure)

Report No. 12475916H
Test place Ise EMC Lab. No.4 Measurement Room
Date January 17, 2019
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Junki Nagatomi
Mode Tx 11ac-40

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5190	1.17	1.73	10.10	13.00	19.95	0.58	13.58	22.80
5230	1.16	1.73	10.10	12.99	19.91	0.58	13.57	22.75

Sample Calculation:

Result (Timed average) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

Result (Burst power average) = Time average + Duty factor

Average Output Power
(Reference data for RF Exposure)

Report No. 12475916H
Test place Ise EMC Lab. No.4 Measurement Room
Date January 17, 2019
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Junki Nagatomi
Mode Tx 11ac-80

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5210	-0.75	1.73	10.10	11.08	12.82	1.11	12.19	16.56

Sample Calculation:

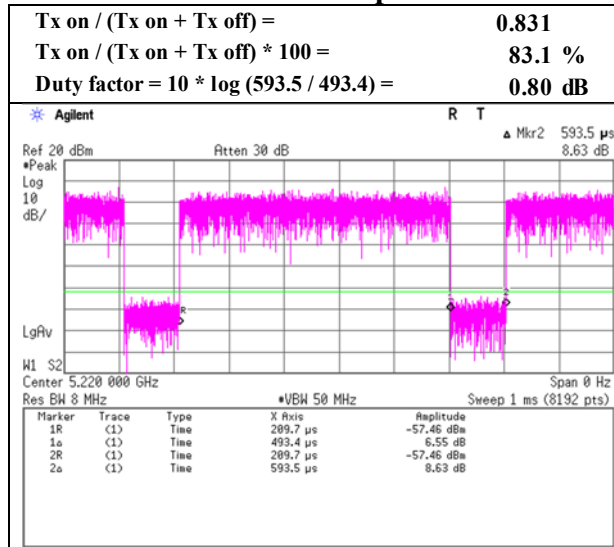
Result (Timed average) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

Result (Burst power average) = Time average + Duty factor

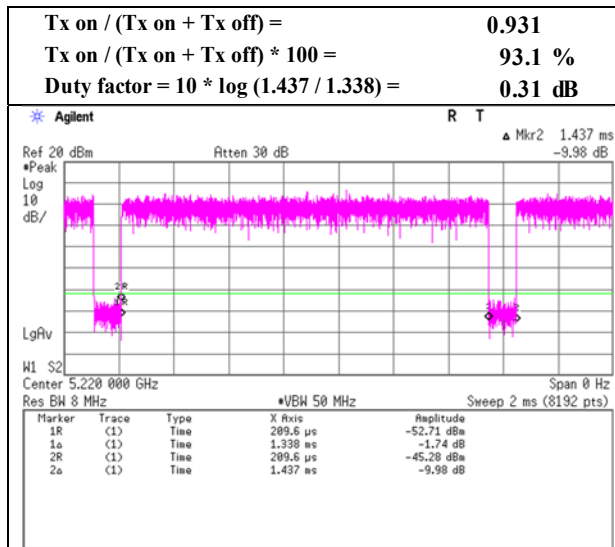
Burst rate confirmation

Report No. 12475916H
 Test place Ise EMC Lab. No.4 Measurement Room
 Date October 13, 2018
 Temperature / Humidity 22 deg. C / 40 % RH
 Engineer Akihiko Maeda
 Mode Tx

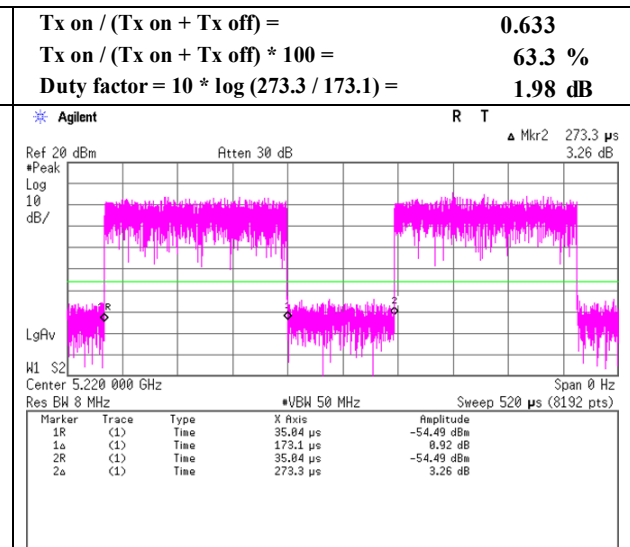
11a 18 Mbps



11n-20 MCS 0



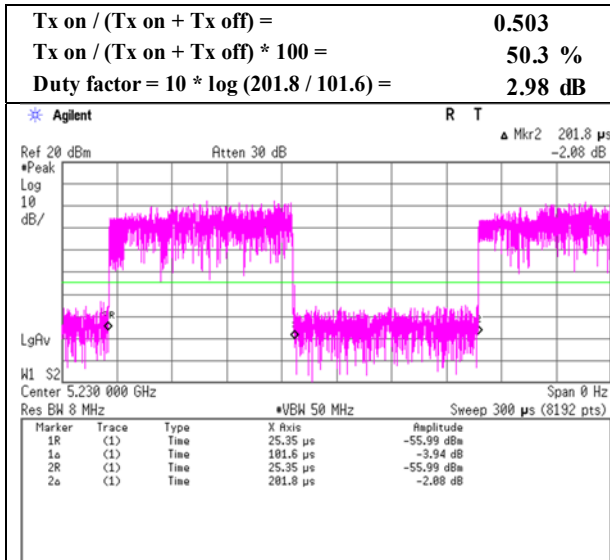
11ac-20 MCS 7



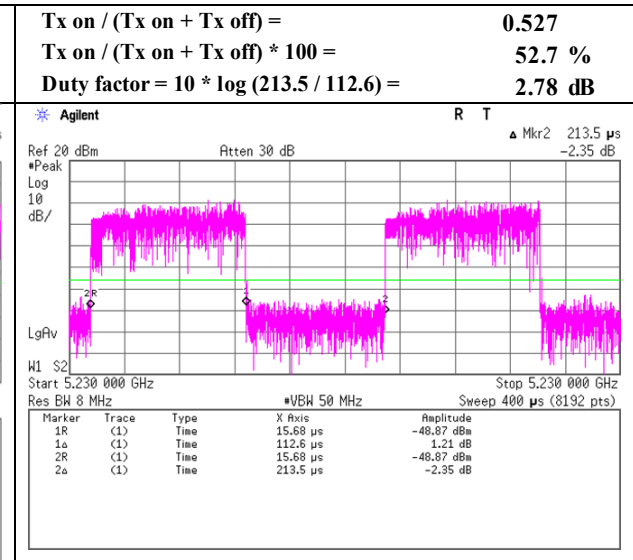
Burst rate confirmation

Report No. 12475916H
 Test place Ise EMC Lab. No.4 Measurement Room
 Date October 13, 2018
 Temperature / Humidity 22 deg. C / 40 % RH
 Engineer Akihiko Maeda
 Mode Tx

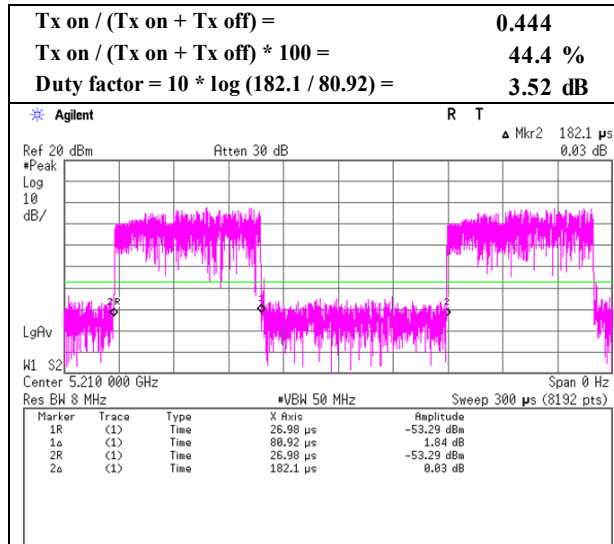
11n-40 MCS 7



11ac-40 MCS 6



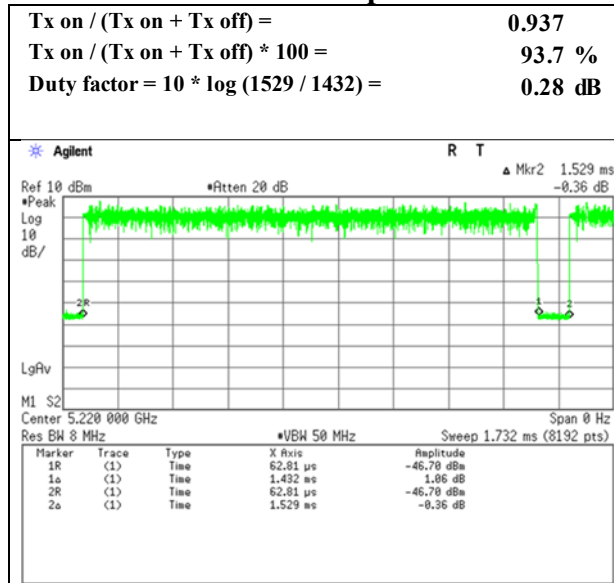
11ac-80 MCS 5



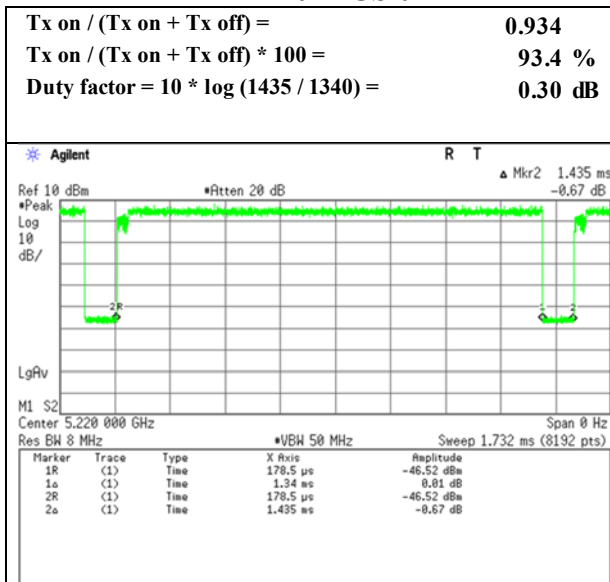
Burst rate confirmation

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date October 24, 2018
Temperature / Humidity 24 deg. C / 56 % RH
Engineer Takafumi Noguchi
Mode Tx

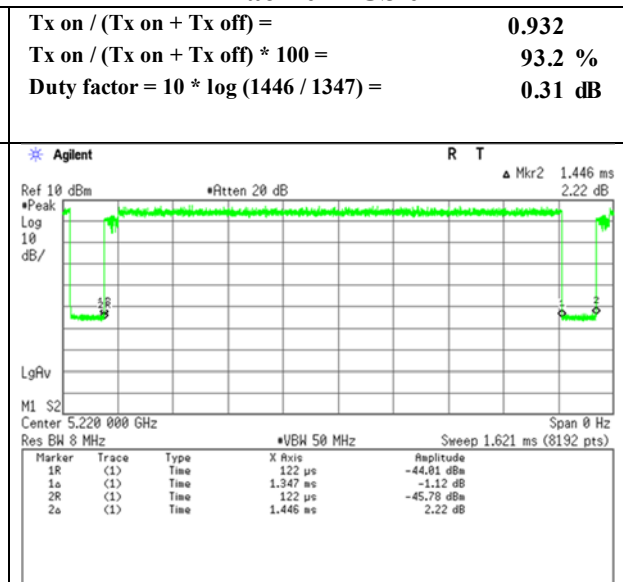
11a 6 Mbps



11n-20 MCS 0



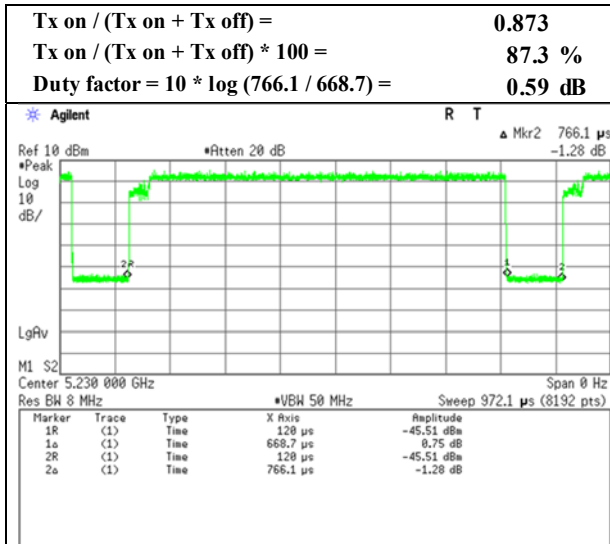
11ac-20 MCS 0



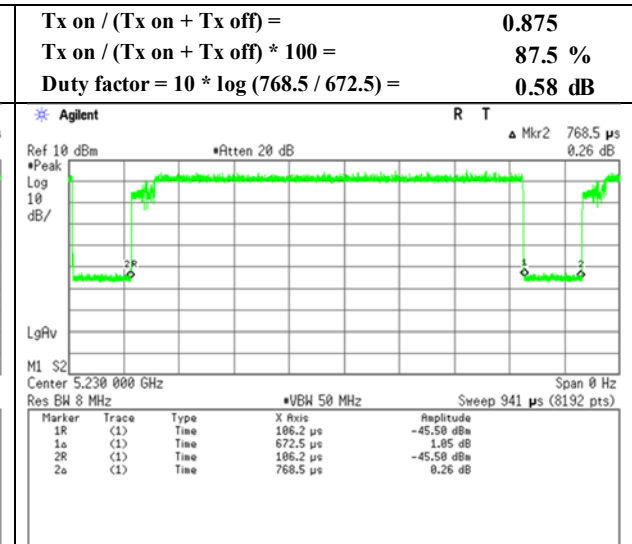
Burst rate confirmation

Report No. 12475916H
 Test place Ise EMC Lab. No.4 Measurement Room
 Date October 13, 2018
 Temperature / Humidity 22 deg. C / 40 % RH
 Engineer Akihiko Maeda
 Mode Tx

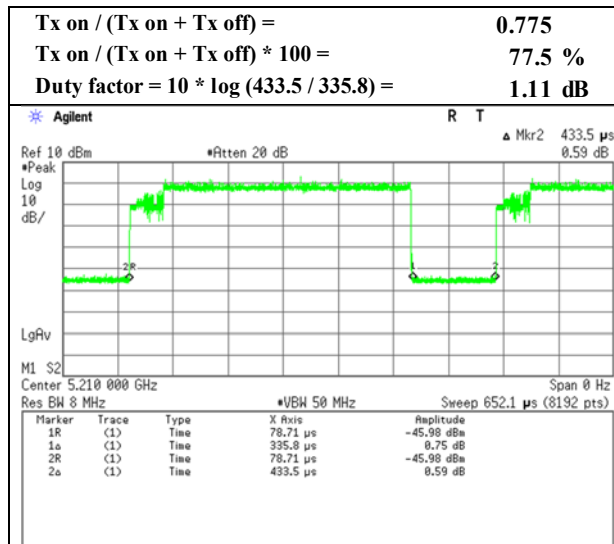
11n-40 MCS 0



11ac-40 MCS 0



11ac-80 MCS 0



Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
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]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result	Limit	Margin	Result	Limit	Margin
						[dBm /MHz]	[dBm /MHz]	[dB]	[dBm /MHz]	[dBm /MHz]	[dB]
5180	-6.78	1.88	10.10	0.80	1.8	6.00	11.00	5.00	7.80	17.00	9.20
5220	-6.82	1.89	10.10	0.80	1.8	5.97	11.00	5.03	7.77	17.00	9.23
5240	-6.52	1.89	10.10	0.80	1.8	6.27	11.00	4.73	8.07	17.00	8.93

Sample Calculation:

PSD: Power Spectral Density

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

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

Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
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]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5180	-6.92	1.88	10.10	0.31	1.8	5.37	11.00	5.63	7.17	17.00	9.83
5220	-7.20	1.89	10.10	0.31	1.8	5.10	11.00	5.90	6.90	17.00	10.10
5240	-7.18	1.89	10.10	0.31	1.8	5.12	11.00	5.88	6.92	17.00	10.08

Sample Calculation:

PSD: Power Spectral Density

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

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

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Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-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]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5180	-9.52	1.88	10.10	1.98	1.8	4.44	11.00	6.56	6.24	17.00	10.76
5220	-9.39	1.89	10.10	1.98	1.8	4.58	11.00	6.42	6.38	17.00	10.62
5240	-9.63	1.89	10.10	1.98	1.8	4.35	11.00	6.66	6.15	17.00	10.86

Sample Calculation:

PSD: Power Spectral Density

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

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

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Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11n-40

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]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5190	-12.75	1.88	10.10	2.98	1.8	2.21	11.00	8.79	4.01	17.00	12.99
5230	-13.09	1.89	10.10	2.98	1.8	1.88	11.00	9.12	3.68	17.00	13.32

Sample Calculation:

PSD: Power Spectral Density

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

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

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Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-40

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]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
5190	-14.22	1.88	10.10	2.78	1.8	0.54	11.00	10.46	2.34	17.00	14.66
5230	-14.03	1.89	10.10	2.78	1.8	0.74	11.00	10.26	2.54	17.00	14.46

Sample Calculation:

PSD: Power Spectral Density

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

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

Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-80

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]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]
						5210	-18.68	1.89	10.10	3.52	1.8

Sample Calculation:

PSD: Power Spectral Density

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

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

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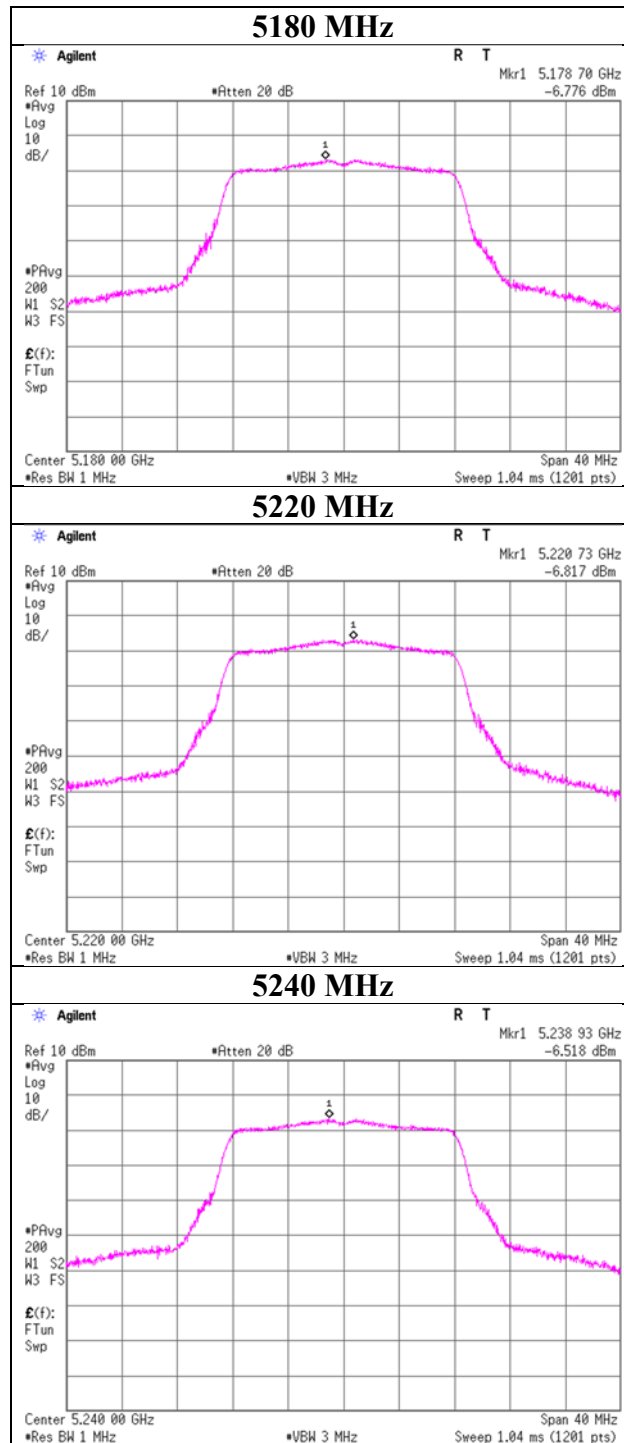
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Facsimile : +81 596 24 8124

Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11a

11a



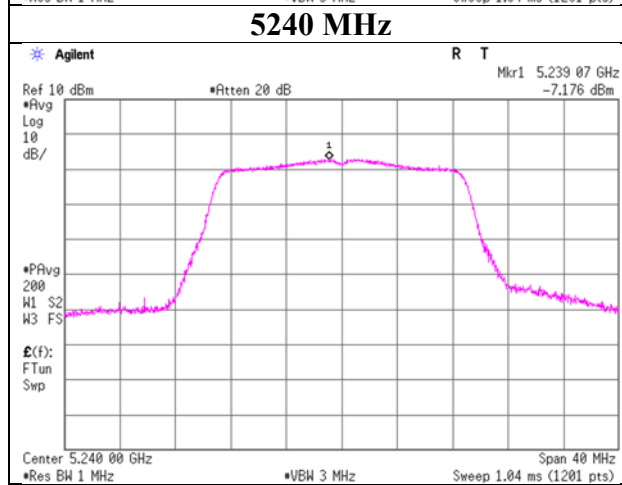
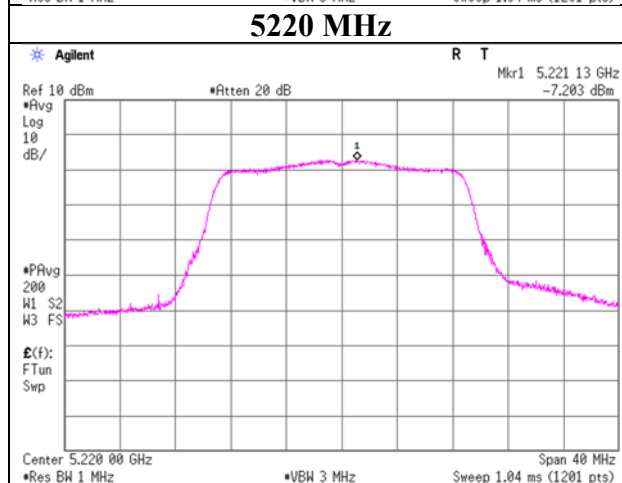
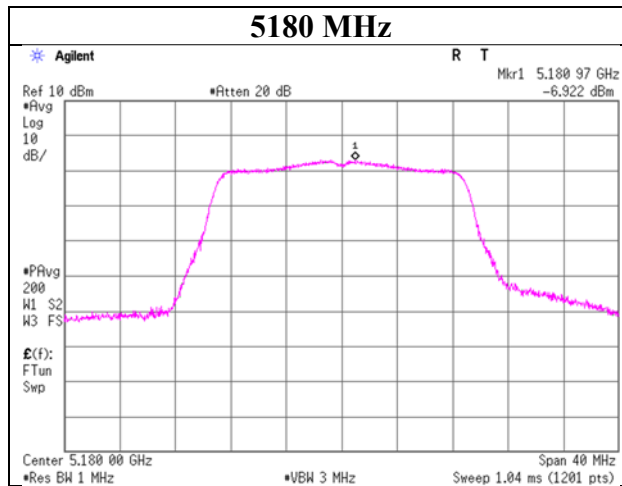
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Maximum Power Spectral Density

Report No.	12475916H
Test place	Ise EMC Lab. No.8 Measurement Room
Date	January 21, 2019
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Tomoki Matsui
Mode	Tx 11n-20

11n-20



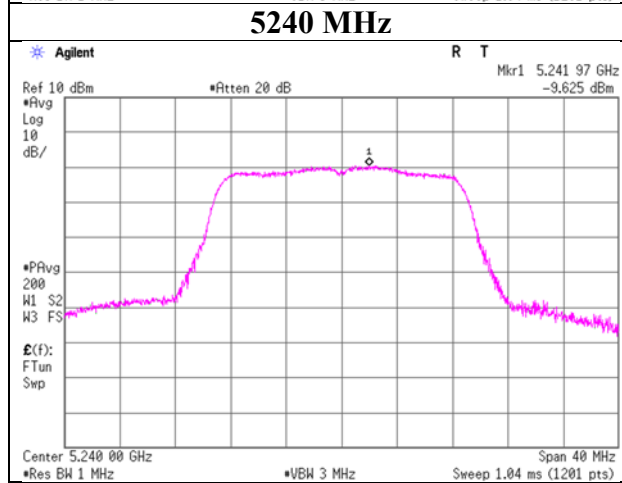
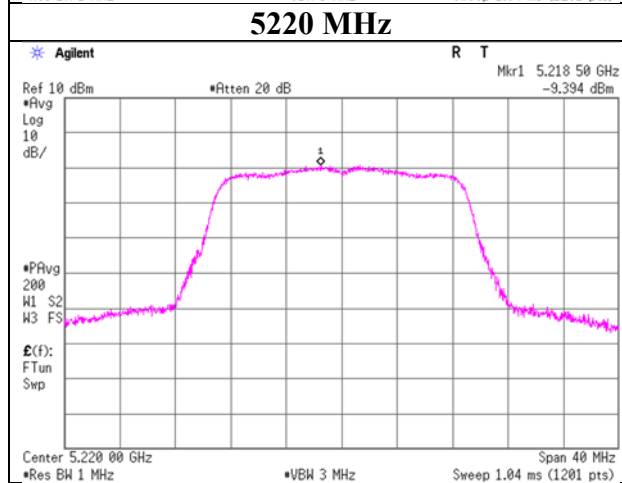
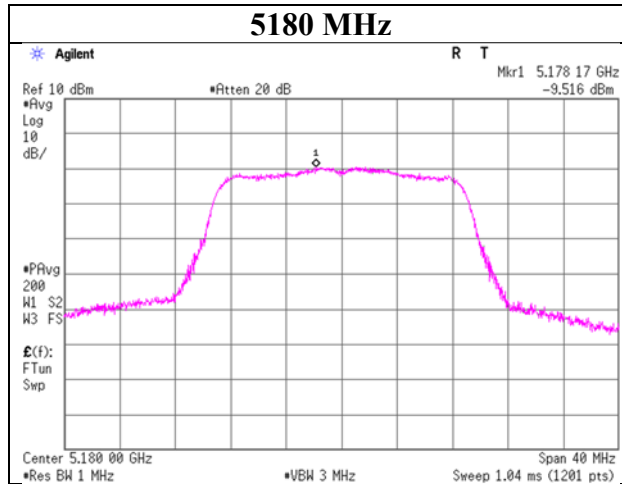
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Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-20

11ac-20



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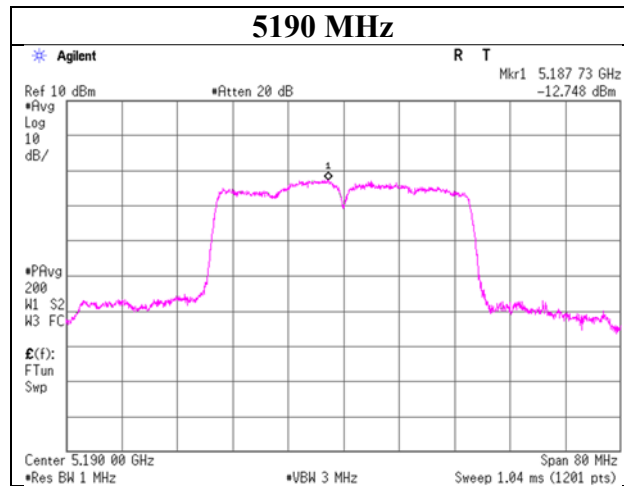
Telephone : +81 596 24 8999

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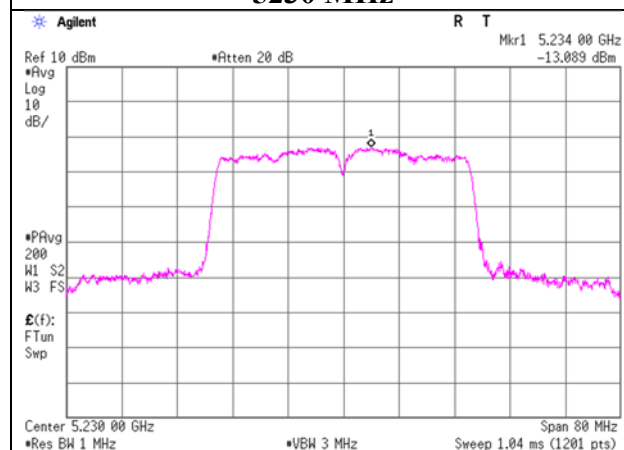
Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11n-40

11n-40



5230 MHz



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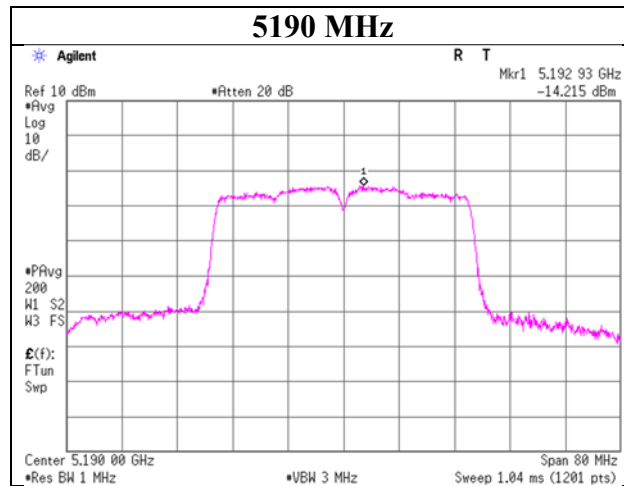
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

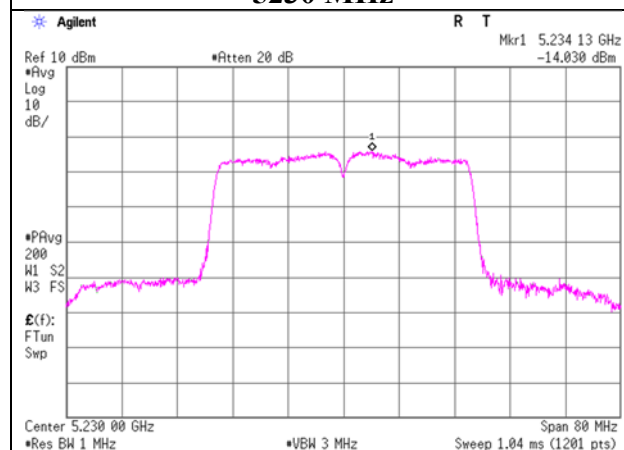
Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-40

11ac-40



5230 MHz



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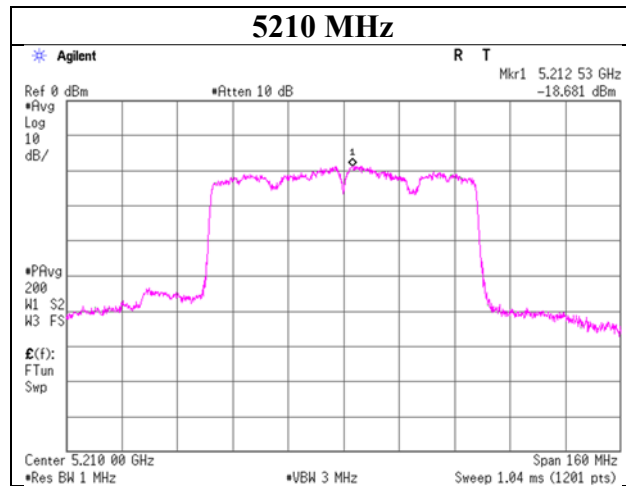
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Maximum Power Spectral Density

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date January 21, 2019
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tomoki Matsui
Mode Tx 11ac-80

11ac-80



Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date February 25, 2019
Temperature / Humidity 21 deg. C / 34 % RH
Engineer Yuta Moriya
(1 GHz - 40 GHz)
Mode Tx 11a 5180 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	5150.000	PK	59.6	32.1	6.4	30.7	-	67.4	73.9	6.5	
Hori	10360.000	PK	42.9	38.9	-1.6	32.4	-	47.8	68.2	20.4	Floor noise
Hori	15540.000	PK	43.5	37.7	-0.3	32.0	-	48.9	73.9	25.0	Floor noise
Hori	5150.000	AV	43.1	32.1	6.4	30.7	0.8	51.7	53.9	2.2	*1)
Hori	15540.000	AV	35.7	37.7	-0.3	32.0	-	41.1	53.9	12.8	Floor noise
Vert	5150.000	PK	58.0	32.1	6.4	30.7	-	65.8	73.9	8.1	
Vert	10360.000	PK	43.0	38.9	-1.6	32.4	-	47.9	68.2	20.3	Floor noise
Vert	15540.000	PK	44.4	37.7	-0.3	32.0	-	49.8	73.9	24.1	Floor noise
Vert	5150.000	AV	45.0	32.1	6.4	30.7	0.8	53.6	53.9	0.3	*1),*2)
Vert	15540.000	AV	35.6	37.7	-0.3	32.0	-	41.0	53.9	12.9	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

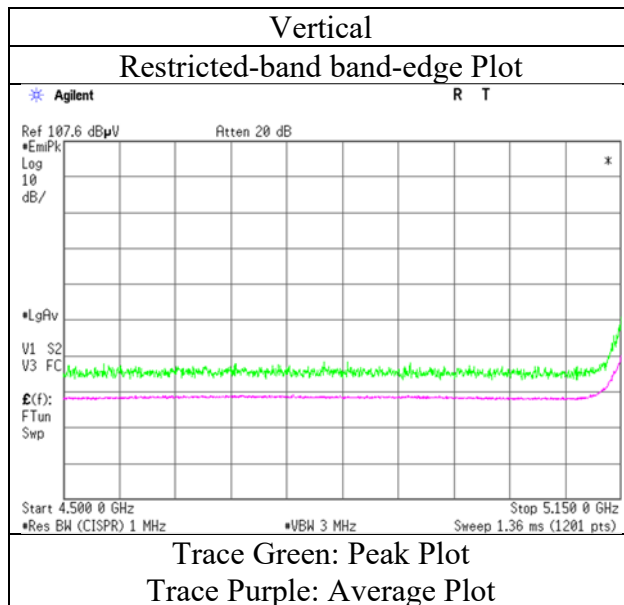
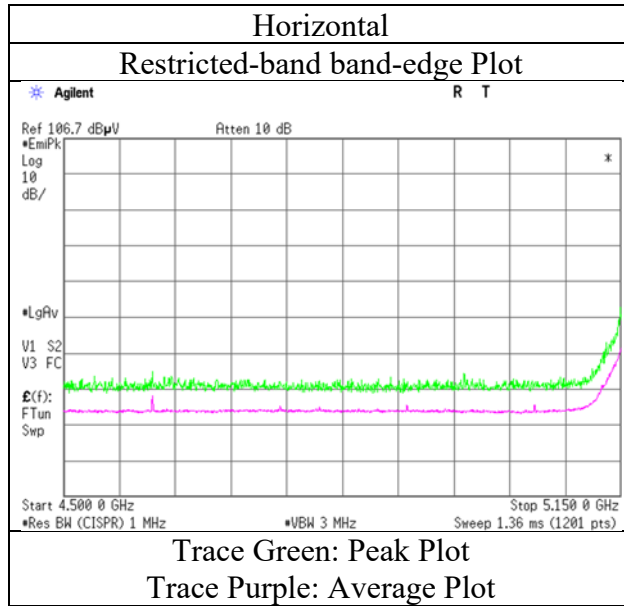
Distance factor: 1 GHz - 10 GHz $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

*2) Integration method

Radiated Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	February 25, 2019
Temperature / Humidity	21 deg. C / 34 % RH
Engineer	Yuta Moriya
	(1 GHz - 10 GHz)
Mode	Tx 11a 5180 MHz



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

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date February 25, 2019
Temperature / Humidity 21 deg. C / 34 % RH
Engineer Yuta Moriya
(1 GHz - 40 GHz)
Mode Tx 11a 5220 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	10440.000	PK	42.3	39.1	-1.6	32.4	-	47.4	68.2	20.8	Floor noise
Hori	15660.000	PK	43.8	37.5	-0.3	32.0	-	49.0	73.9	24.9	Floor noise
Hori	15660.000	AV	35.4	37.5	-0.3	32.0	-	40.6	53.9	13.3	Floor noise
Vert	10440.000	PK	42.3	39.1	-1.6	32.4	-	47.4	68.2	20.8	Floor noise
Vert	15660.000	PK	42.9	37.5	-0.3	32.0	-	48.1	73.9	25.8	Floor noise
Vert	15660.000	AV	35.3	37.5	-0.3	32.0	-	40.5	53.9	13.4	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date February 25, 2019
Temperature / Humidity 21 deg. C / 34 % RH
Engineer Yuta Moriya
(1 GHz - 40 GHz)
Mode Tx 11a 5240 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	10480.000	PK	42.2	39.1	-1.6	32.5	-	47.2	68.2	21.0	Floor noise
Hori	15720.000	PK	43.9	37.5	-0.3	32.0	-	49.1	73.9	24.8	Floor noise
Hori	15720.000	AV	35.4	37.5	-0.3	32.0	-	40.6	53.9	13.3	Floor noise
Vert	10480.000	PK	42.6	39.1	-1.6	32.5	-	47.6	68.2	20.6	Floor noise
Vert	15720.000	PK	43.5	37.5	-0.3	32.0	-	48.7	73.9	25.2	Floor noise
Vert	15720.000	AV	35.4	37.5	-0.3	32.0	-	40.6	53.9	13.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date February 25, 2019
Temperature / Humidity 21 deg. C / 34 % RH
Engineer Yuta Moriya
(1 GHz - 10 GHz)
Mode Tx 11n-20 5180 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	5150.000	PK	58.0	32.1	6.4	30.7	-	65.8	73.9	8.1	
Hori	5150.000	AV	44.1	32.1	6.4	30.7	0.3	52.2	53.9	1.7	*1)
Vert	5150.000	PK	59.4	32.1	6.4	30.7	-	67.2	73.9	6.7	
Vert	5150.000	AV	45.3	32.1	6.4	30.7	0.3	53.4	53.9	0.5	*1)

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

UL Japan, Inc.

Ise EMC Lab.

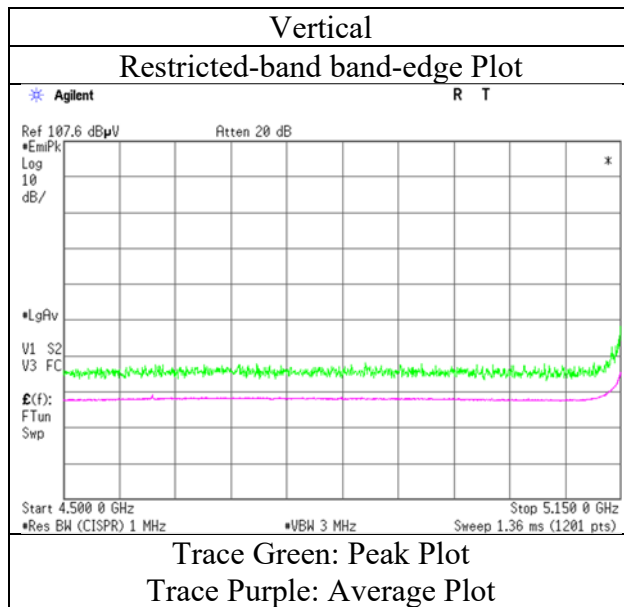
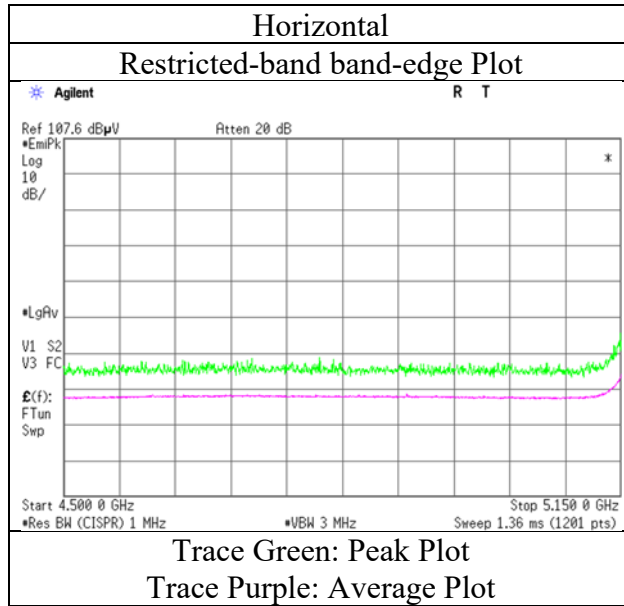
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

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Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date February 25, 2019
Temperature / Humidity 21 deg. C / 34 % RH
Engineer Yuta Moriya
(1 GHz - 10 GHz)
Mode Tx 11n-20 5180 MHz



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

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 13, 2018 October 14, 2018
Temperature / Humidity 22 deg. C / 40 % RH 22 deg. C / 64 % RH
Engineer Akihiko Maeda Takumi Shimada
(Below 1 GHz) (1 GHz - 40 GHz)
Mode Tx 11n-40 5190 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	148.501	QP	39.0	15.0	8.7	32.2	-	30.5	43.5	13.0	
Hori	297.004	QP	39.9	13.5	9.9	32.1	-	31.2	46.0	14.8	
Hori	445.500	QP	38.0	16.7	10.9	32.1	-	33.5	46.0	12.5	
Hori	594.005	QP	38.5	19.1	11.8	32.1	-	37.3	46.0	8.7	
Hori	742.500	QP	43.0	20.2	12.5	31.9	-	43.8	46.0	2.2	
Hori	891.004	QP	32.2	22.1	13.2	31.1	-	36.4	46.0	9.6	
Hori	5150.000	PK	58.1	32.1	6.4	31.3	-	65.3	73.9	8.6	
Hori	10380.000	PK	42.6	39.0	-1.9	32.9	-	46.8	68.2	21.4	Floor noise
Hori	15570.000	PK	44.1	37.6	-0.5	32.4	-	48.8	73.9	25.1	Floor noise
Hori	5150.000	AV	43.0	32.1	6.4	31.3	3.0	53.2	53.9	0.7	*1),*2)
Hori	15570.000	AV	35.8	37.6	-0.5	32.4	-	40.5	53.9	13.4	Floor noise
Vert	148.501	QP	39.7	15.0	8.7	32.2	-	31.2	43.5	12.3	
Vert	297.004	QP	40.0	13.5	9.9	32.1	-	31.3	46.0	14.7	
Vert	445.500	QP	37.4	16.7	10.9	32.1	-	32.9	46.0	13.1	
Vert	594.005	QP	39.0	19.1	11.8	32.1	-	37.8	46.0	8.2	
Vert	742.500	QP	42.6	20.2	12.5	31.9	-	43.4	46.0	2.6	
Vert	891.004	QP	35.0	22.1	13.2	31.1	-	39.2	46.0	6.8	
Vert	5150.000	PK	57.6	32.1	6.4	31.3	-	64.8	73.9	9.1	
Vert	10380.000	PK	42.1	39.0	-1.9	32.9	-	46.3	68.2	21.9	Floor noise
Vert	15570.000	PK	43.5	37.6	-0.5	32.4	-	48.2	73.9	25.7	Floor noise
Vert	5150.000	AV	43.1	32.1	6.4	31.3	3.0	53.3	53.9	0.6	*1),*2)
Vert	15570.000	AV	35.9	37.6	-0.5	32.4	-	40.6	53.9	13.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

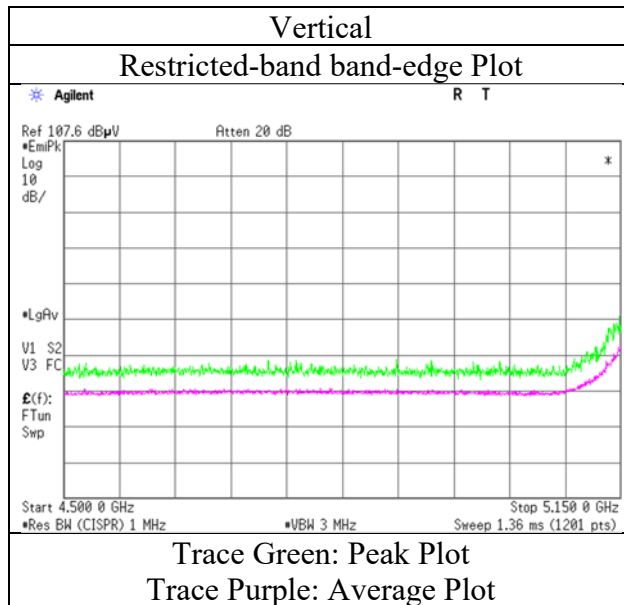
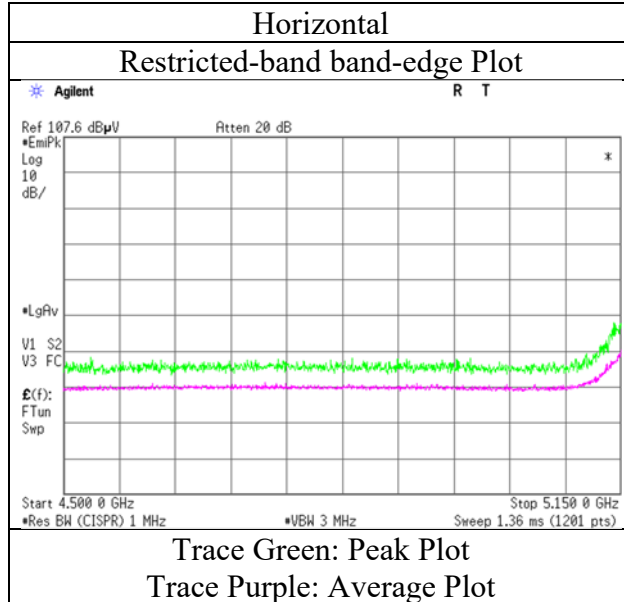
Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

*1) Not Out of Band emission(Leakage Power)

*2) Integration method

Radiated Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	October 14, 2018
Temperature / Humidity	22 deg. C / 64 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-40 5190 MHz



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

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 14, 2018
Temperature / Humidity 22 deg. C / 64 % RH
Engineer Takumi Shimada
(1 GHz - 40 GHz)
Mode Tx 11n-40 5230 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	10460.000	PK	42.1	39.1	-1.8	33.0	-	46.4	68.2	21.8	Floor noise
Hori	15690.000	PK	43.3	37.5	-0.5	32.4	-	47.9	73.9	26.0	Floor noise
Hori	15690.000	AV	35.6	37.5	-0.5	32.4	-	40.2	53.9	13.7	Floor noise
Vert	10460.000	PK	42.8	39.1	-1.8	33.0	-	47.1	68.2	21.1	Floor noise
Vert	15690.000	PK	43.2	37.5	-0.5	32.4	-	47.8	73.9	26.1	Floor noise
Vert	15690.000	AV	35.4	37.5	-0.5	32.4	-	40.0	53.9	13.9	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 14, 2018
Temperature / Humidity 22 deg. C / 64 % RH
Engineer Takumi Shimada
(1 GHz - 40 GHz)
Mode Tx 11ac-40 5190 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	5150.000	PK	57.5	32.1	6.4	31.3	-	64.7	73.9	9.2	
Hori	5150.000	AV	41.0	32.1	6.4	31.3	2.8	51.0	53.9	2.9	*1),*2)
Vert	5150.000	PK	59.4	32.1	6.4	31.3	-	66.6	73.9	7.3	
Vert	5150.000	AV	42.9	32.1	6.4	31.3	2.8	52.9	53.9	1.0	*1),*2)

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

*2) Integration method

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 14, 2018
Temperature / Humidity 22 deg. C / 64 % RH
Engineer Takumi Shimada
(1 GHz - 40 GHz)
Mode Tx 11ac-80 5210 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	5150.000	PK	51.9	32.1	6.4	31.3	-	59.1	73.9	14.8	
Hori	10420.000	PK	42.1	39.0	-1.9	32.9	-	46.3	68.2	21.9	Floor noise
Hori	15630.000	PK	43.3	37.5	-0.5	32.4	-	47.9	73.9	26.0	Floor noise
Hori	5150.000	AV	39.0	32.1	6.4	31.3	3.5	49.7	53.9	4.2	*1)
Hori	15630.000	AV	35.4	37.5	-0.5	32.4	-	40.0	53.9	13.9	Floor noise
Vert	5150.000	PK	52.9	32.1	6.4	31.3	-	60.1	73.9	13.8	
Vert	10420.000	PK	42.8	39.0	-1.9	32.9	-	47.0	68.2	21.2	Floor noise
Vert	15630.000	PK	43.1	37.5	-0.5	32.4	-	47.7	73.9	26.2	Floor noise
Vert	5150.000	AV	35.0	32.1	6.4	31.3	3.5	45.7	53.9	8.2	*1)
Vert	15630.000	AV	35.5	37.5	-0.5	32.4	-	40.1	53.9	13.8	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

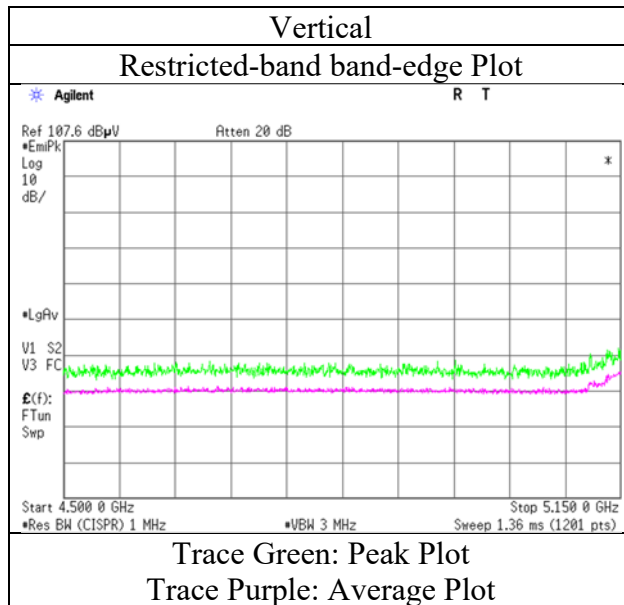
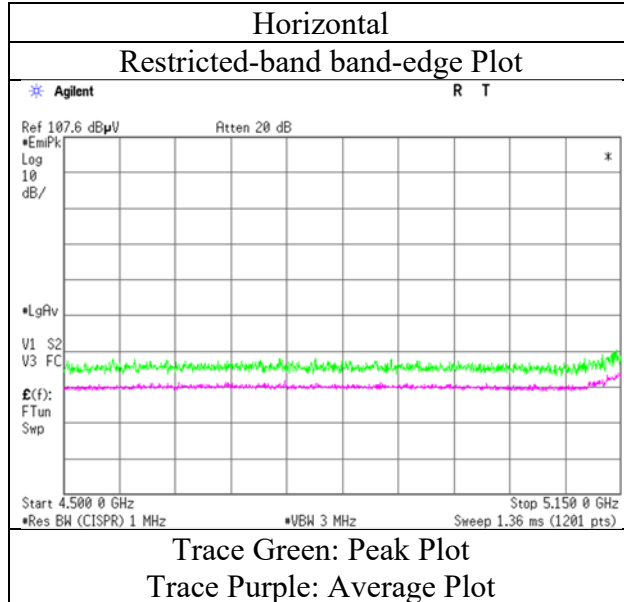
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission

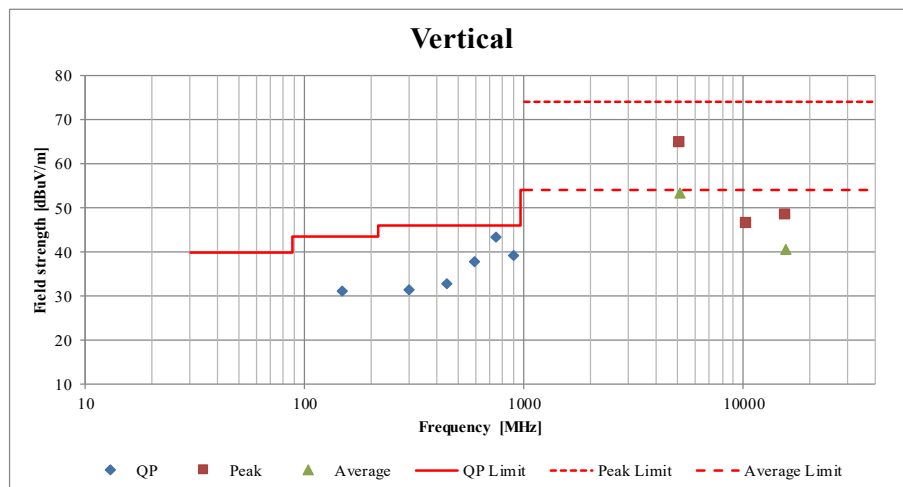
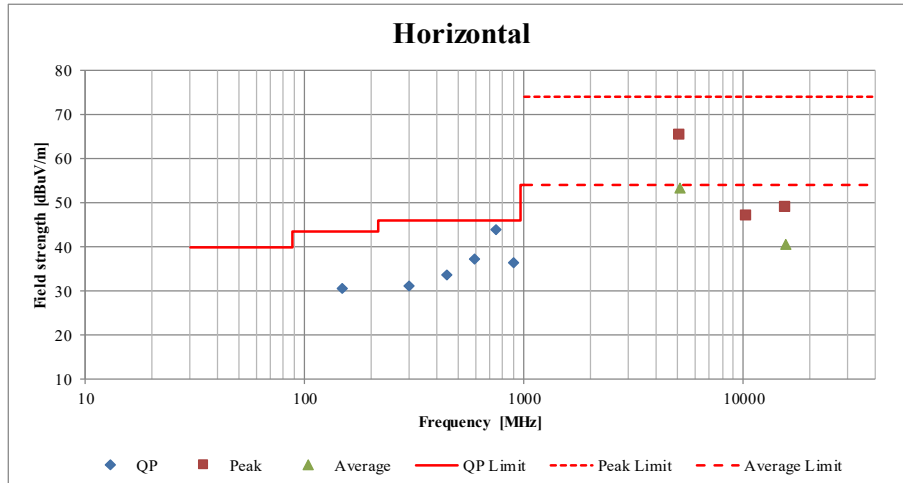
Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	October 14, 2018
Temperature / Humidity	22 deg. C / 64 % RH
Engineer	Takumi Shimada
Mode	Tx 11ac-80 5210 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

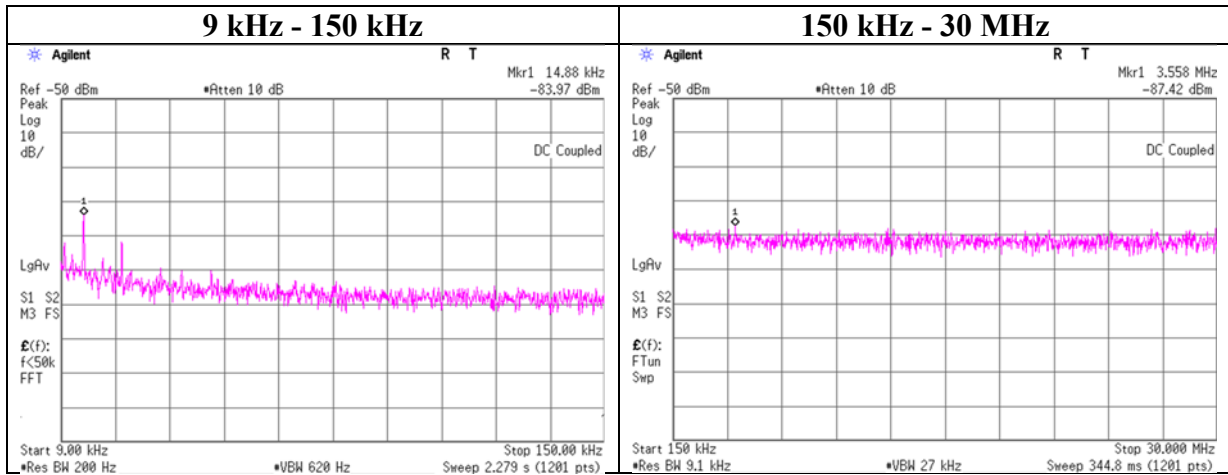
Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 13, 2018	October 14, 2018
Temperature / Humidity	22 deg. C / 40 % RH	22 deg. C / 64 % RH
Engineer	Akihiko Maeda (Below 1 GHz)	Takumi Shimada (1 GHz - 40 GHz)
Mode	Tx 11n-40 5190 MHz	



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

Conducted Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab. No.8 Measurement Room
Date October 25, 2018
Temperature / Humidity 26 deg. C / 34 % RH
Engineer Takafumi Noguchi
Mode Tx 11n-40 5190 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
14.88	-84.0	0.40	9.8	2.0	1	-71.7	300	6.0	-10.5	44.1	54.6	
3558.00	-87.4	0.44	9.8	2.0	1	-75.1	30	6.0	6.1	29.5	23.4	

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

$$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$$

N: Number of output

*2.0 dBi was applied to the test result based on KDB 789033 since antenna gain was less than 2.0 dBi.

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APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE,CE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE,CE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	1/29/2019	01/31/2020	12
RE,CE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	1/30/2018	01/31/2019	12
RE,CE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE,CE	142011	AC4 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/28/2018	06/30/2020	24
RE,CE	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	1/11/2019	01/31/2020	12
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/6/2018	12/31/2019	12
CE	141217	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM141/421-010/sucoform141-P	-/04178	6/13/2018	06/30/2019	12
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	7/24/2018	07/31/2019	12
CE	141358	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	7/25/2018	07/31/2019	12
CE	141935		TME	CT-01BP				
AT	141557	DIGITAL HiTESTER	HIOKI	3805	70900530	1/29/2019	01/31/2020	12
AT	141567	Thermo-Hygrometer	CUSTOM	CTH-201	0008	1/11/2019	01/31/2020	12
AT	141842	Power sensor	AGILENT	N1923A	MY54070003	8/21/2018	08/31/2019	12
AT	141334	Attenuator(10dB)	Suhner	6810.19.A	-	12/6/2018	12/31/2019	12
AT	141414	Microwave Cable	Junkosha	MWX221	1207S407	8/21/2018	08/31/2019	12
AT	141855	Spectrum Analyzer	AGILENT	E4440A	MY46187750	11/9/2018	11/30/2019	12
AT	141812	Power Meter	AGILENT	8990B	MY51000271	8/21/2018	08/31/2019	12
RE/AT	141899	Spectrum Analyzer	AGILENT	E4448A	MY46180655	8/10/2018	08/31/2019	12
RE	142011	AC4 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/28/2018	06/30/2020	24
RE/AT	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	1/29/2019	01/31/2020	12
RE/AT	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
AT	141226	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S304	3/12/2018	03/31/2019	12
RE	141267	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	6/1/2018	06/30/2019	12
AT	141269	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	3/12/2018	03/31/2019	12
AT	141812	Power Meter	AGILENT	8990B	MY51000271	8/21/2018	08/31/2019	12
AT	141835	Power sensor	AGILENT	N1923A	MY54070004	8/21/2018	08/31/2019	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	1/30/2018	01/31/2019	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	6/1/2018	06/30/2019	12
RE	141397	Coaxial Cable	UL Japan	-	-	6/13/2018	06/30/2019	12
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/3/2018	10/31/2019	12
RE/AT	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	1/11/2019	01/31/2020	12
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	6/8/2018	06/30/2019	12
RE	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/4/2018	10/31/2019	12
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	6/14/2018	06/30/2019	12
RE	141517	Horn Antenna 26.5-40GHz	ETS LINDGREN	Oct-60	152399	6/8/2018	06/30/2019	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	6/8/2018	06/30/2019	12
RE	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	11/8/2018	11/30/2019	12
RE	141227	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S305	3/12/2018	03/31/2019	12
RE	141588	Pre Amplifier	MITEQ, Inc	AMF-6F-2600400-33-8P / AMF-4F-2600	1871355 / 1871328	9/21/2018	09/30/2019	12
RE	141294	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCC	603	1/10/2019	01/31/2020	12

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*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

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