



RADIO TEST REPORT

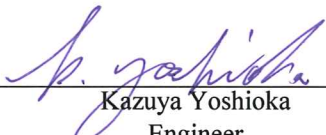
Test Report No. : 11081928H-A

Applicant : DENSO CORPORATION
Type of Equipment : Control Box
Model No. : DNNS087
FCC ID : HYQDNNS087
Test regulation : FCC Part 15 Subpart C: 2015
(Bluetooth part)
Test Result : Complied

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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 must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

Date of test: February 12 and 13, 2016

Representative test engineer:


Kazuya Yoshioka
Engineer
Consumer Technology Division

Approved by:


Takayuki Shimada
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11081928H-A

[illegible]

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of E.U.T. during testing.....	9
SECTION 5: Radiated Spurious Emission	11
SECTION 6: Antenna Terminal Conducted Tests.....	12
APPENDIX 1: Test data	13
20dB Bandwidth and Carrier Frequency Separation.....	13
Number of Hopping Frequency	16
Dwell time.....	18
Maximum Peak Output Power	21
Average Output Power	22
Radiated Spurious Emission	24
Conducted Spurious Emission	35
Conducted Emission Band Edge compliance	41
99%Occupied Bandwidth	43
APPENDIX 2: Test instruments	45
APPENDIX 3: Photographs of test setup	46
Radiated Spurious Emission	46

SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone Number	:	+81-566-26-5919
Facsimile Number	:	+81-566-25-4920
Contact Person	:	Isamu Suzuki

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

2.1 Identification of E.U.T.

Type of Equipment	:	Control Box
Model No.	:	DNNS087
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	February 11, 2016
Country of Mass-production	:	United States of America
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: DNNS087 (referred to as the EUT in this report) is a Control Box.

General Specification

Clock frequency(ies) in the system : 533 MHz
32.768 kHz, 37.4 MHz (Crystal)

Operating Temperature : -30 deg. C - +70 deg. C

Radio Specification

Radio Type : Transceiver

Power Supply (inner) : DC 3.3 V (VDD)
DC 1.8 V (VIO)

	IEEE802.11b	IEEE802.11g/n (20 M band)	IEEE802.11a/n/ac (20 M band)	IEEE802.11n/ac (40 M band)	IEEE802.11ac (80 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5720 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5710 MHz 5755 MHz - 5795 MHz	5210 MHz 5290 MHz 5530 MHz - 5690 MHz 5775 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM(IEEE802.11ac only))		
Channel spacing	5MHz		20MHz	40MHz	80MHz
Antenna type	ASSEMBLY WiFi Antenna				
Antenna Connector type	MHF PLUG				
Antenna Gain	-3.2 dBi				

	GPS	Bluetooth Ver.4.1 with EDR function *1)
Frequency of operation	1575.42 MHz	2402 MHz - 2480 MHz
Type of modulation	BPSK	BT: FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK) LE: GFSK
Channel spacing	-	BT: 1 MHz LE: 2 MHz
Antenna type	ANTENNA ASSY, GPS	ASSEMBLY WiFi Antenna
Antenna Connector type	FAKRA	MHF PLUG
Antenna Gain	26.5 dBi	-3.2 dBi

*1) This test report applies to Bluetooth Ver.4.1 with EDR function (2402 MHz - 2480 MHz).

*Wireless LAN and Bluetooth do not transmit simultaneously.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015
 *Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
 Section 15.207 Conducted limits
 Section 15.247 Operation within the bands 902-928MHz,
 2400-2483.5MHz, and 5725-5850MHz

* The EUT complies with FCC Part 15 Subpart B: 2015, final revised on November 23, 2015

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	N/A	N/A *1)	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (1)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	6.6 dB 207.920 MHz, QP, Vert.	Complied	Conducted/ Radiated (above 30 MHz) *2)

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 is not the device that is designed to be connected to the public utility (AC) power line.

*2) Radiated test was selected over 30 MHz based on section 15.247(d).

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

FCC 15.31 (e)

The EUT provides stable voltage (DC 1.8 V / DC 3.3.V) 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 vehicle. 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 Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	-	Conducted

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

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
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Antenna terminal test Uncertainty (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz - 3 GHz	3 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+dB)		(10 m*)(+dB)	
	30 – 300 MHz	300 – 1000MHz	30 – 300 MHz	300 – 1000MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	4.5 dB	5.9 dB	4.8 dB	5.1 dB

Radiated emission				
(3 m*)(+dB)		(1 m*)(+dB)	(0.5 m*)(+dB)	(10 m*)(+dB)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.1 dB	5.3 dB	5.1 dB	5.1 dB	5.3 dB

*Measurement distance

Radiated emission test

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

3.5 Test Location

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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	N/A	-	-
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 m 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.

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

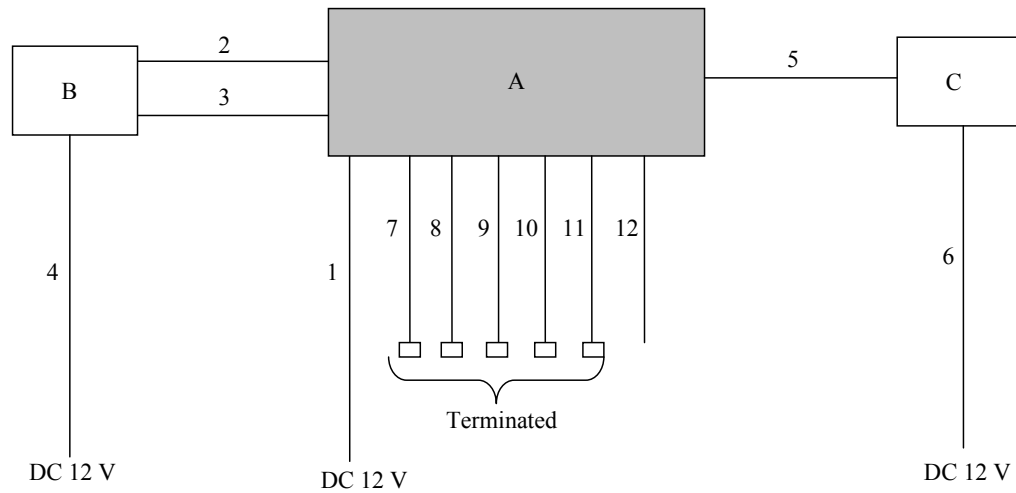
4.1 Operating Mode(s)

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: 0dBm Software: Bluetool Ver 1.8.7.3 *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.		

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Control Box	DNNS087	002 *1) 001 *2)	DENSO CORPORATION	EUT
B	Jig	-	-	-	-
C	Display	703748	AUO-1507019	SPECTRUM DIGITAL INCORPORATED	-

*1) Used for Antenna Terminal conducted tests

*2) Used for Conducted Emission and Radiated Spurious Emission tests

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	MOST Cable (Red)	2.0	Shielded	Shielded	-
3	MOST Cable (Green)	2.0	Shielded	Shielded	-
4	DC Cable	2.0	Unshielded	Unshielded	-
5	LVDS Cable	2.0	Shielded	Shielded	-
6	DC Cable	2.0	Unshielded	Unshielded	-
7	GPS Cable	2.0	Shielded	Shielded	-
8	Camera Cable	2.0	Unshielded	Unshielded	-
9	USB Cable	2.0	Shielded	Shielded	-
10	USB Cable	2.0	Shielded	Shielded	-
11	USB Cable	2.0	Shielded	Shielded	-
12	HDMI Cable	2.0	Shielded	Shielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For 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.

[For 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.

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.

Test Antennas are used as below;

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

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	4.4 m *2) (below 10 GHz), 1 m*3) (above 10 GHz)		4.4 m *2) (below 10 GHz), 1 m*3) (above 10 GHz)

*1) Although DA 00-705 accepts VBW = 10 Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.

*2) Distance Factor: $20 \times \log(4.4 \text{ m} / 3.0 \text{ m}) = 3.3 \text{ dB}$

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

The test was made on EUT at the normal use position.

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

Measurement range : 30 M - 26.5 GHz
Test data : APPENDIX
Test result : Pass

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SECTION 6: 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
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

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

*2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

*3) Reference data

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

20dB Bandwidth and Carrier Frequency Separation

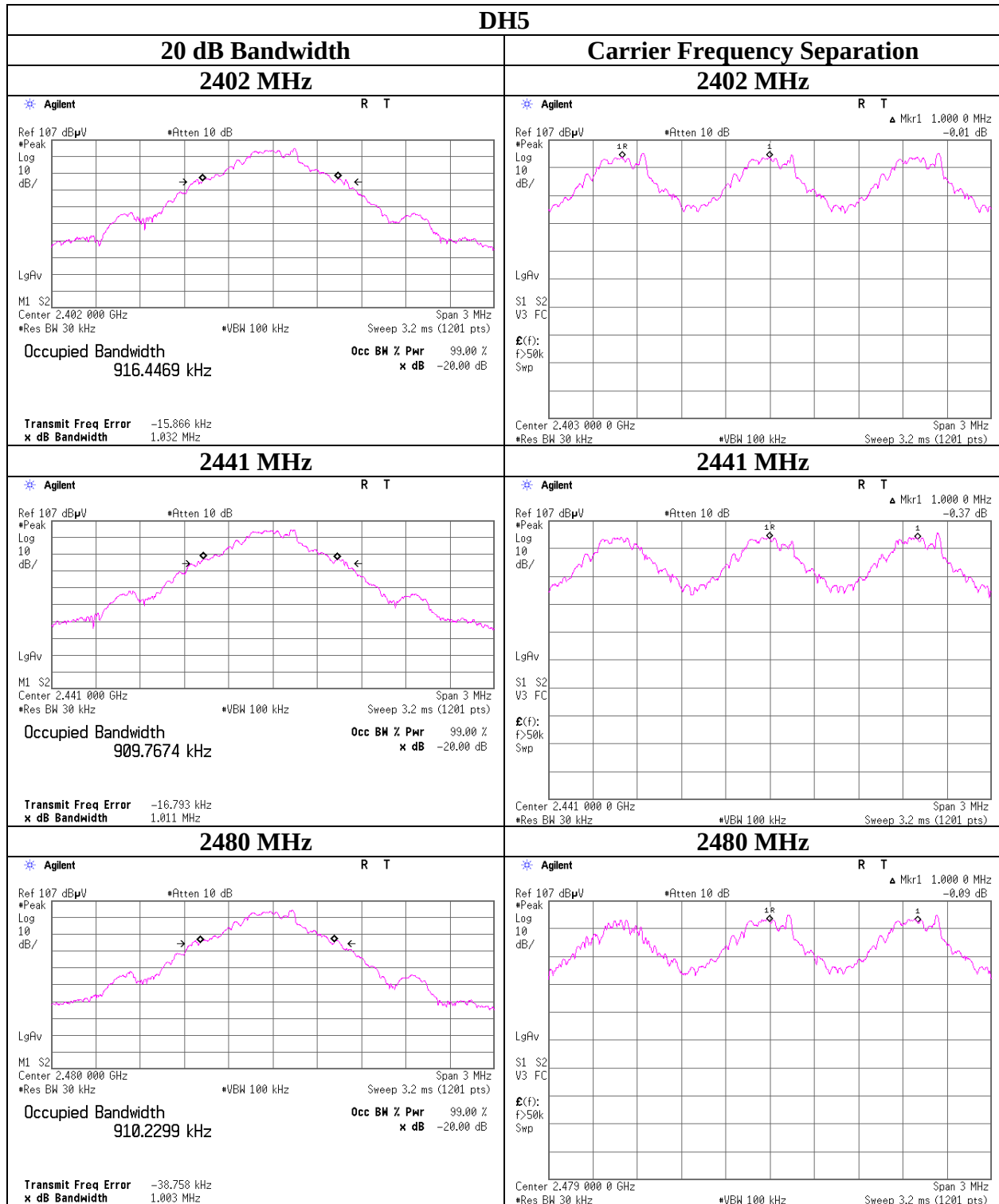
Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11081928H
Date February 13, 2016
Temperature / Humidity 23 deg. C / 37 % RH
Engineer Kazuya Yoshioka
Mode Tx, Hopping Off/On, DH5/3DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.032	1.000	≥ 0.688
DH5	2441.0	1.011	1.000	≥ 0.674
DH5	2480.0	1.003	1.000	≥ 0.669
3DH5	2402.0	1.339	1.000	≥ 0.893
3DH5	2441.0	1.316	1.000	≥ 0.877
3DH5	2480.0	1.321	1.000	≥ 0.881

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



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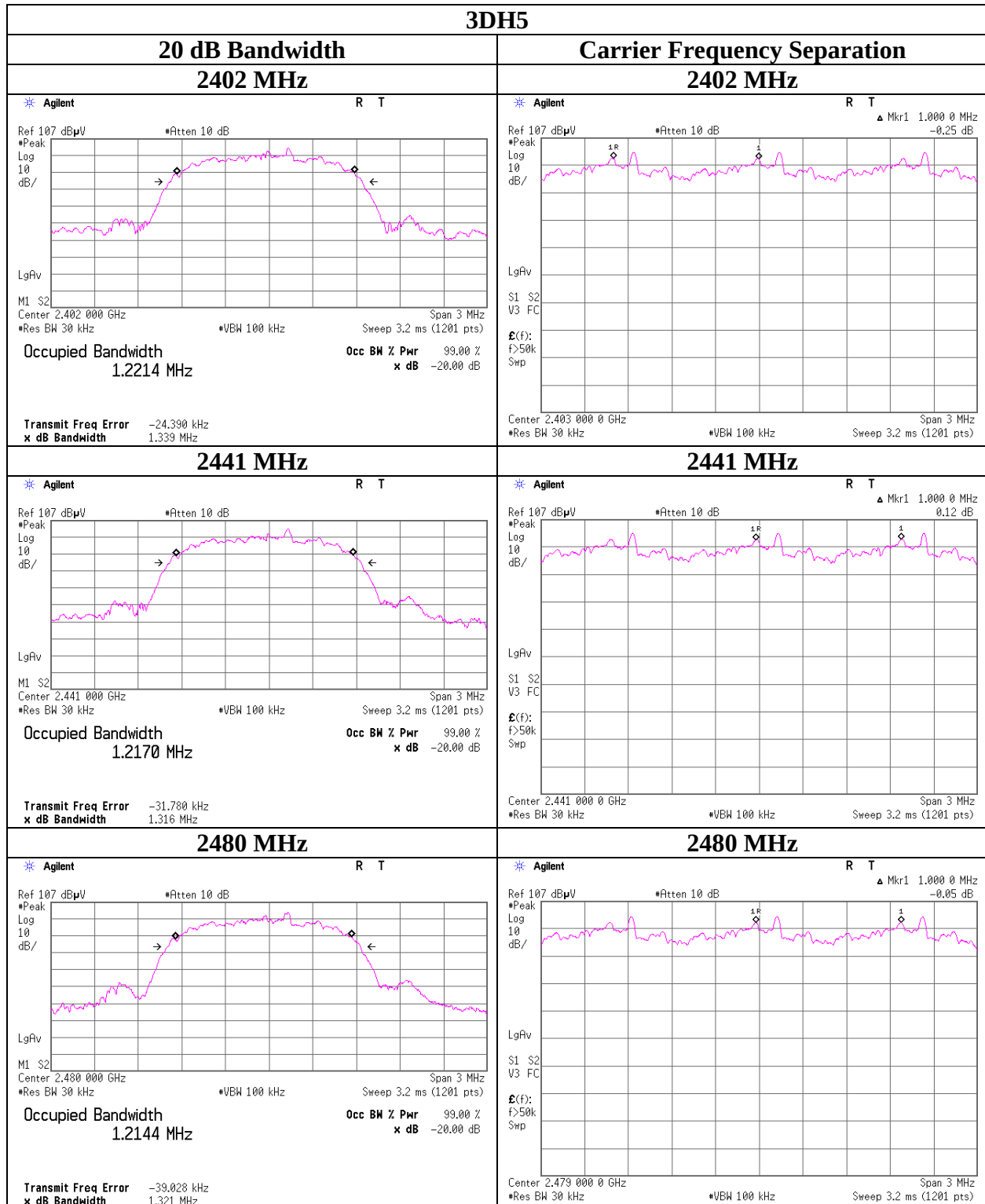
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20dB Bandwidth and Carrier Frequency Separation



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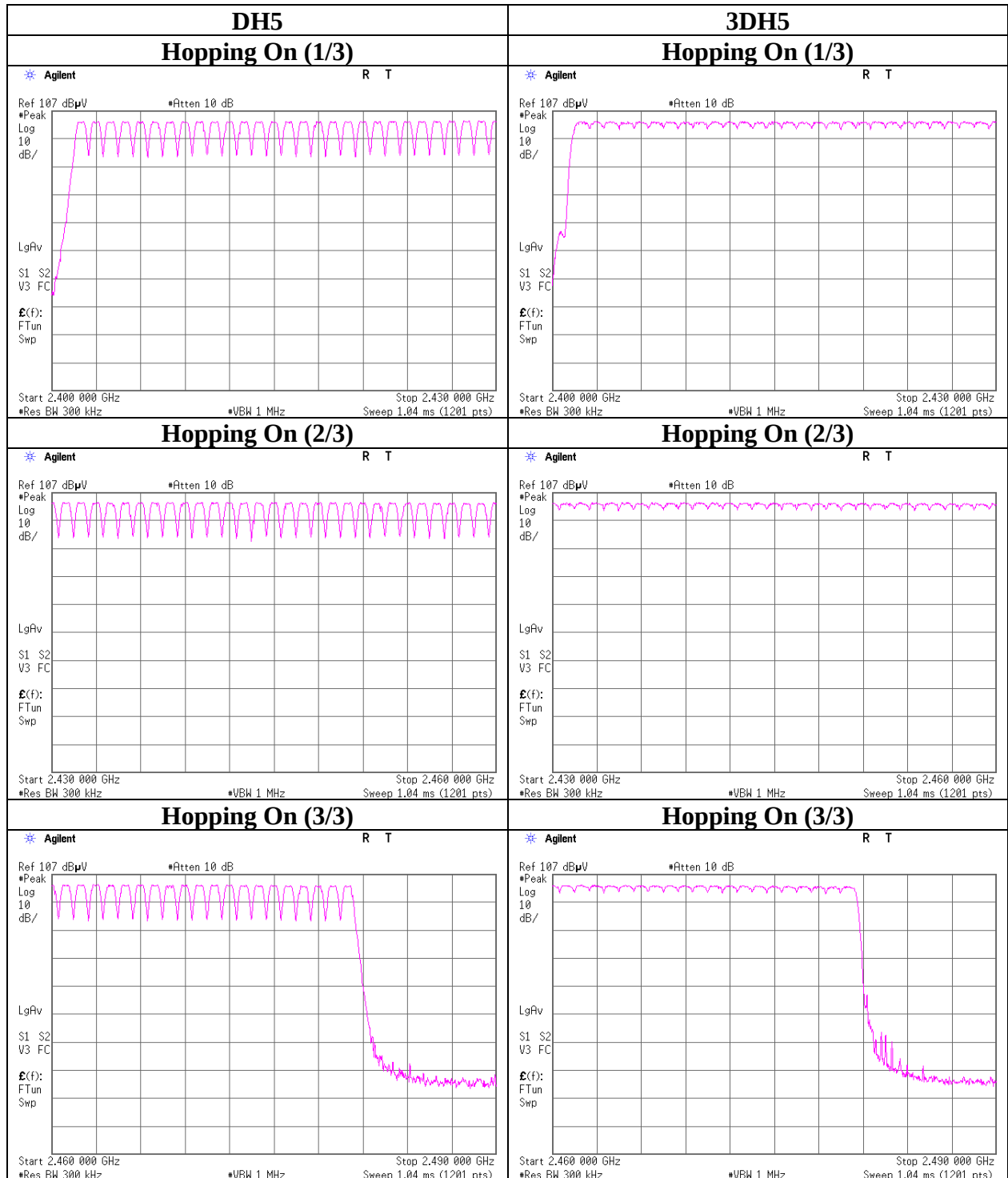
Number of Hopping Frequency

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11081928H
Date February 13, 2016
Temperature / Humidity 23 deg. C / 37 % RH
Engineer Kazuya Yoshioka
Mode Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.

Number of Hopping Frequency



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Dwell time

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11081928H
Date February 13, 2016
Temperature / Humidity 23 deg. C / 37 % RH
Engineer Kazuya Yoshioka
Mode Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period			Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	50.8 times /	5 sec. x	31.6 sec. = 322 times	0.421	136	400
DH3	26.8 times /	5 sec. x	31.6 sec. = 170 times	1.681	286	400
DH5	18.8 times /	5 sec. x	31.6 sec. = 119 times	2.932	349	400
3DH1	51.0 times /	5 sec. x	31.6 sec. = 323 times	0.427	138	400
3DH3	25.8 times /	5 sec. x	31.6 sec. = 164 times	1.679	275	400
3DH5	18.6 times /	5 sec. x	31.6 sec. = 118 times	2.936	346	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

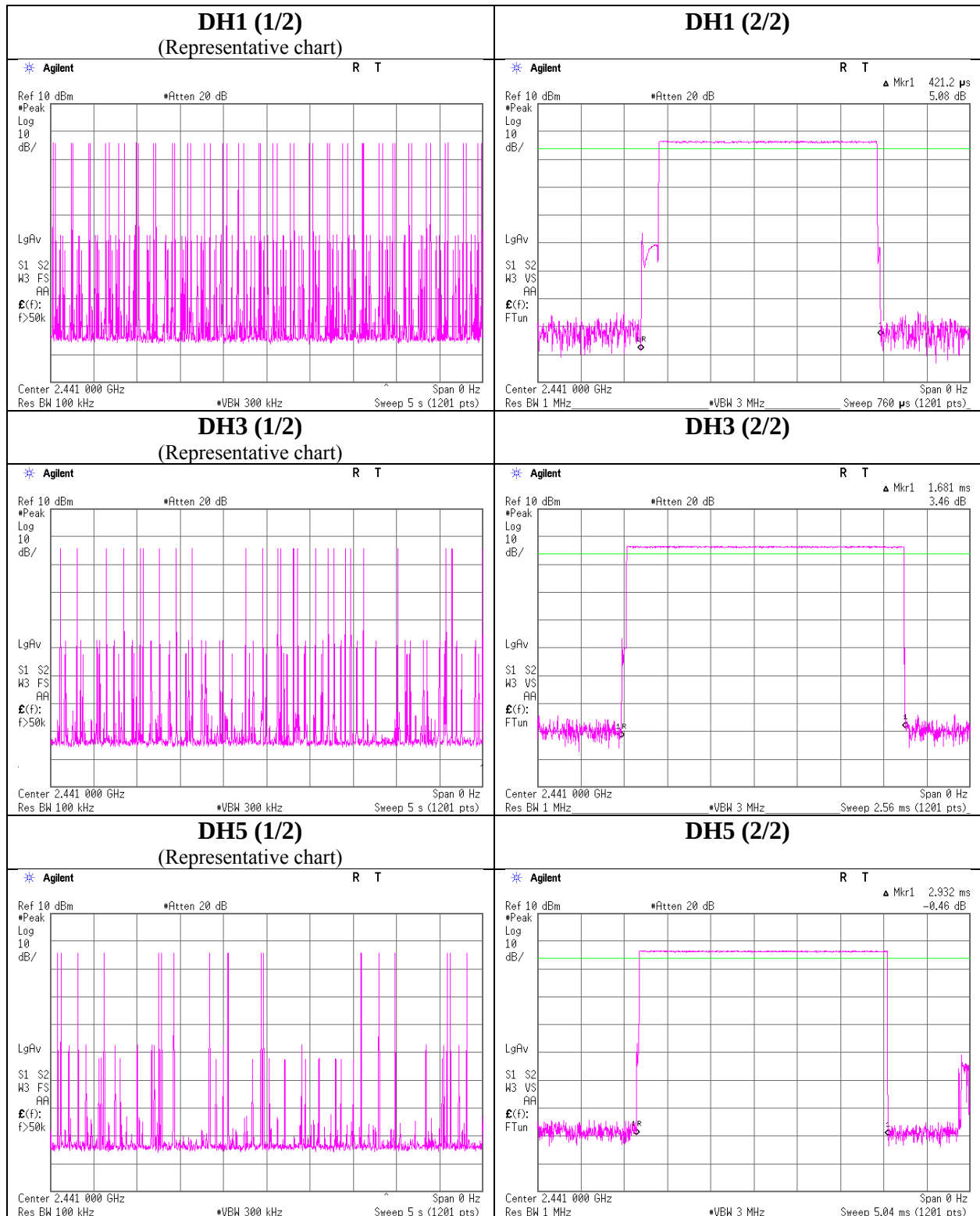
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	52	52	49	51	50	50.8
DH3	25	27	27	27	28	26.8
DH5	19	19	18	19	19	18.8
3DH1	50	52	51	52	50	51.0
3DH3	26	28	26	24	25	25.8
3DH5	19	18	18	20	18	18.6

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in $N \times 0.4s$, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than $0.4s$ regardless of packet size. This is confirmed in the test report for $N = 79$.

Dwell time



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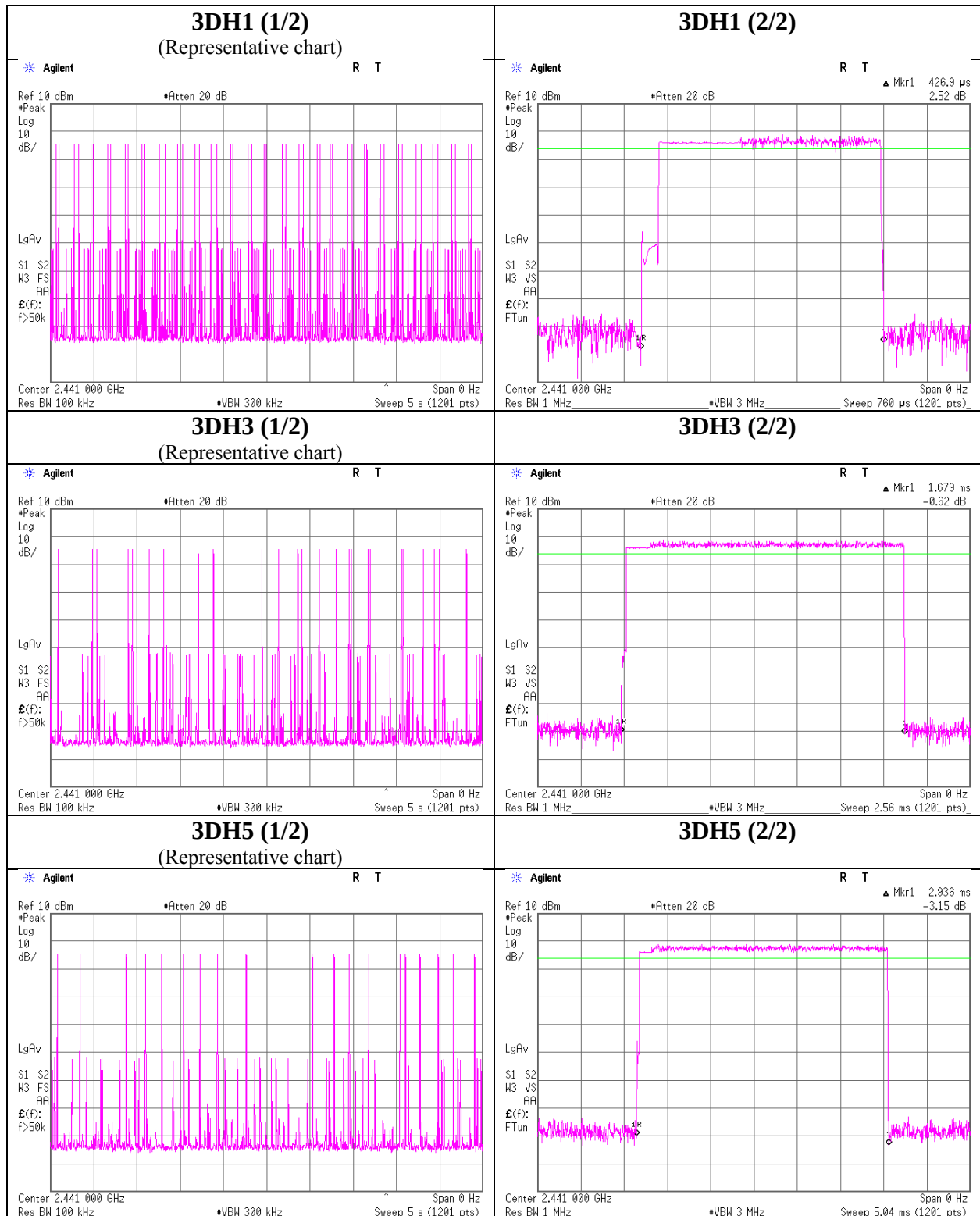
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Dwell time



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Maximum Peak Output Power

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11081928H
Date	February 13, 2016
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-4.42	3.42	0.00	-1.00	0.79	20.96	125	21.96
DH5	2441.0	-4.05	3.50	0.00	-0.55	0.88	20.96	125	21.51
DH5	2480.0	-4.47	3.52	0.00	-0.95	0.80	20.96	125	21.91
2DH5	2402.0	-1.75	3.42	0.00	1.67	1.47	20.96	125	19.29
2DH5	2441.0	-1.55	3.50	0.00	1.95	1.57	20.96	125	19.01
2DH5	2480.0	-2.08	3.52	0.00	1.44	1.39	20.96	125	19.52
3DH5	2402.0	-1.61	3.42	0.00	1.81	1.52	20.96	125	19.15
3DH5	2441.0	-1.37	3.50	0.00	2.13	1.63	20.96	125	18.83
3DH5	2480.0	-1.88	3.52	0.00	1.64	1.46	20.96	125	19.32

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.

As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

Average Output Power
(Reference data)

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11081928H
Date	February 13, 2016
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Frame power)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
DH5	2402.0	-5.58	3.42	0.00	-2.16	0.61
DH5	2441.0	-5.25	3.50	0.00	-1.75	0.67
DH5	2480.0	-5.74	3.52	0.00	-2.22	0.60
2DH5	2402.0	-5.61	3.42	0.00	-2.19	0.60
2DH5	2441.0	-5.44	3.50	0.00	-1.94	0.64
2DH5	2480.0	-6.02	3.52	0.00	-2.50	0.56
3DH5	2402.0	-5.60	3.42	0.00	-2.18	0.61
3DH5	2441.0	-5.43	3.50	0.00	-1.93	0.64
3DH5	2480.0	-6.00	3.52	0.00	-2.48	0.56

Sample Calculation:

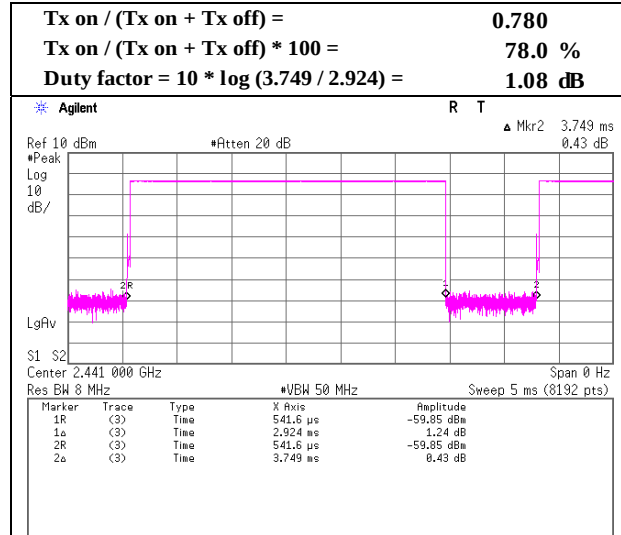
Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

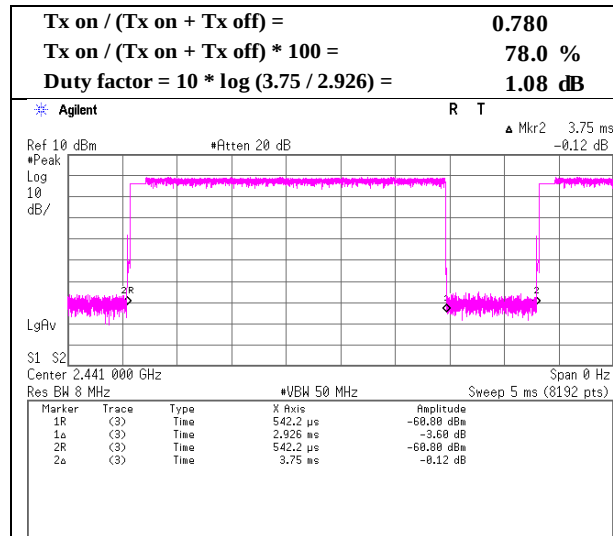
Burst Rate Confirmation

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11081928H
Date	February 13, 2016
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off

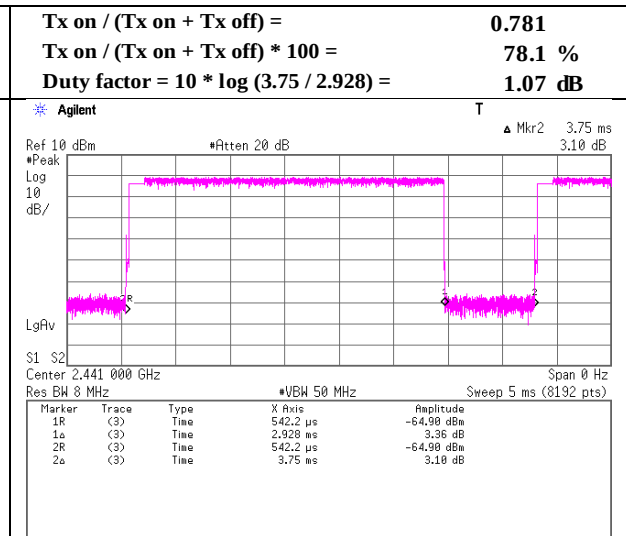
DH5



2DH5



3DH5



Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11081928H
Date : February 12, 2016 February 12, 2016
Temperature / Humidity : 23 deg. C / 39 % RH 23 deg. C / 30 % RH
Engineer : Kazuya Yoshioka Shinichi Miyazono
(1 GHz - 26.5 GHz) (30 MHz - 1000 MHz)
Mode : Tx, Hopping Off, DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	61.444	QP	35.9	7.3	7.6	32.0	18.8	40.0	21.2	
Hori	207.913	QP	41.2	16.6	9.2	31.8	35.2	43.5	8.3	
Hori	540.685	QP	36.7	19.9	11.4	32.0	36.0	46.0	10.0	
Hori	589.836	QP	38.2	20.4	11.7	32.1	38.2	46.0	7.8	
Hori	762.489	QP	32.7	22.8	12.6	31.8	36.3	46.0	9.7	
Hori	900.911	QP	30.6	24.2	13.3	31.2	36.9	46.0	9.1	
Hori	2390.000	PK	40.3	27.9	6.6	32.1	42.7	73.9	31.2	
Hori	4804.000	PK	39.3	32.8	9.0	31.3	49.8	73.9	24.1	Floor noise
Hori	7206.000	PK	40.0	36.8	10.2	32.6	54.4	73.9	19.5	Floor noise
Hori	9608.000	PK	40.9	38.1	10.9	32.6	57.3	73.9	16.6	Floor noise
Hori	2390.000	AV	27.3	27.9	6.6	32.1	29.7	53.9	24.2	
Hori	4804.000	AV	25.6	32.8	9.0	31.3	36.1	53.9	17.8	Floor noise
Hori	7206.000	AV	27.0	36.8	10.2	32.6	41.4	53.9	12.5	Floor noise
Hori	9608.000	AV	27.3	38.1	10.9	32.6	43.7	53.9	10.2	Floor noise
Vert	49.781	QP	44.8	10.7	7.4	32.1	30.8	40.0	9.2	
Vert	207.911	QP	42.7	16.6	9.2	31.8	36.7	43.5	6.8	
Vert	589.836	QP	39.1	20.4	11.7	32.1	39.1	46.0	6.9	
Vert	699.693	QP	34.8	22.4	12.3	32.2	37.3	46.0	8.7	
Vert	762.190	QP	31.6	22.8	12.6	31.8	35.2	46.0	10.8	
Vert	900.817	QP	33.4	24.2	13.3	31.2	39.7	46.0	6.3	
Vert	2390.000	PK	41.0	27.9	6.6	32.1	43.4	73.9	30.5	
Vert	4804.000	PK	39.1	32.8	9.0	31.3	49.6	73.9	24.3	Floor noise
Vert	7206.000	PK	40.2	36.8	10.2	32.6	54.6	73.9	19.3	Floor noise
Vert	9608.000	PK	41.0	38.1	10.9	32.6	57.4	73.9	16.5	Floor noise
Vert	2390.000	AV	28.7	27.9	6.6	32.1	31.1	53.9	22.8	
Vert	4804.000	AV	25.6	32.8	9.0	31.3	36.1	53.9	17.8	Floor noise
Vert	7206.000	AV	27.0	36.8	10.2	32.6	41.4	53.9	12.5	Floor noise
Vert	9608.000	AV	27.3	38.1	10.9	32.6	43.7	53.9	10.2	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).

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.3 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	88.2	28.0	6.6	32.1	90.7	-	-	Carrier
Hori	2400.000	PK	32.0	28.0	6.6	32.1	34.5	70.7	36.2	
Vert	2402.000	PK	89.8	28.0	6.6	32.1	92.3	-	-	Carrier
Vert	2400.000	PK	33.1	28.0	6.6	32.1	35.6	72.3	36.7	

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

Distance factor: 1GHz-10GHz 20log (4.4 m / 3.0 m) = 3.3 dB
10GHz-26.5GHz 20log (1.0m / 3.0m) = -9.5dB

***These results have sufficient margin without taking account Dwell time factor.**

UL Japan, Inc.

Ise EMC Lab.

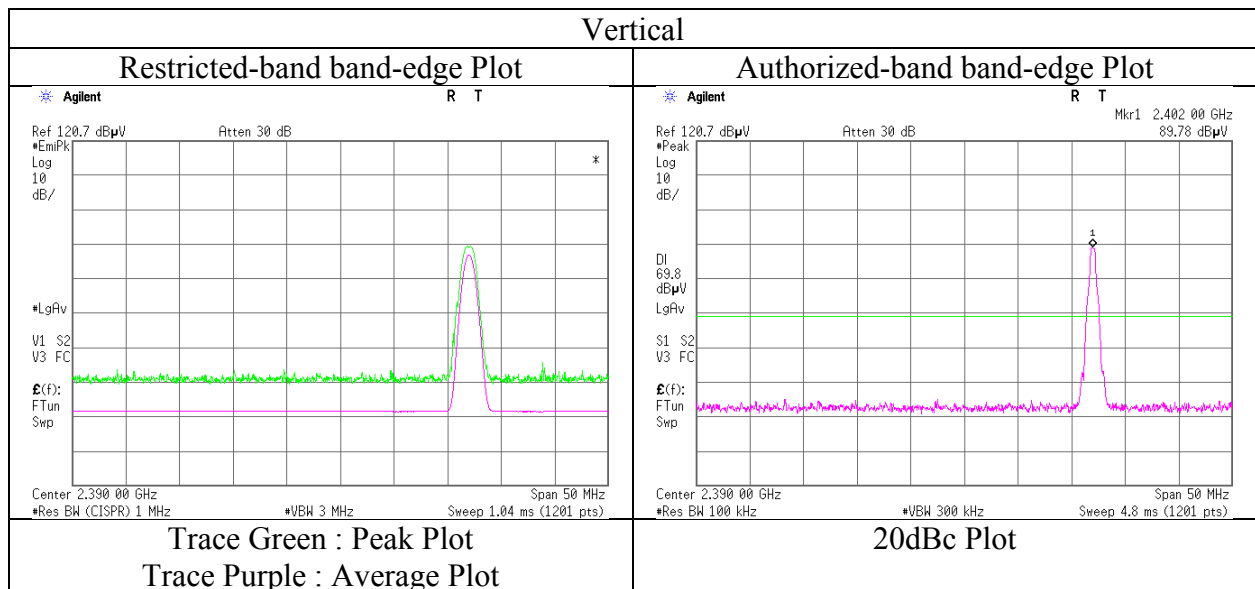
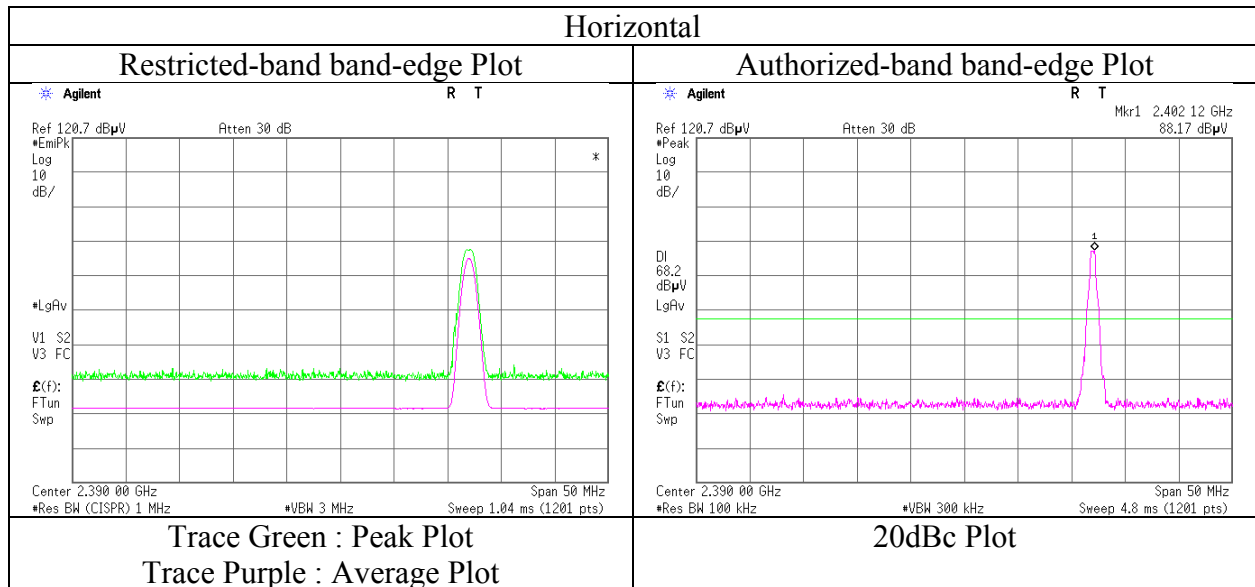
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11081928H
Date	February 12, 2016
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off, DH5 2402 MHz



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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11081928H
Date : February 12, 2016 February 12, 2016
Temperature / Humidity : 23 deg. C / 39 % RH 23 deg. C / 30 % RH
Engineer : Kazuya Yoshioka Shinichi Miyazono
(1 GHz - 26.5 GHz) (30 MHz - 1000 MHz)
Mode : Tx, Hopping Off, DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	61.450	QP	36.0	7.3	7.6	32.0	18.9	40.0	21.1	
Hori	207.913	QP	41.3	16.6	9.2	31.8	35.3	43.5	8.2	
Hori	540.679	QP	36.8	19.9	11.4	32.0	36.1	46.0	9.9	
Hori	589.844	QP	38.1	20.4	11.7	32.1	38.1	46.0	7.9	
Hori	737.287	QP	31.3	22.7	12.5	32.0	34.5	46.0	11.5	
Hori	884.749	QP	31.5	24.0	13.2	31.2	37.5	46.0	8.5	
Hori	4882.000	PK	39.0	33.1	9.1	31.3	49.9	73.9	24.0	Floor noise
Hori	7323.000	PK	40.7	36.8	10.2	32.6	55.1	73.9	18.8	Floor noise
Hori	9764.000	PK	41.4	38.2	11.0	32.7	57.9	73.9	16.0	Floor noise
Hori	4882.000	AV	27.1	33.1	9.1	31.3	38.0	53.9	15.9	Floor noise
Hori	7323.000	AV	28.7	36.8	10.2	32.6	43.1	53.9	10.8	Floor noise
Hori	9764.000	AV	29.0	38.2	11.0	32.7	45.5	53.9	8.4	Floor noise
Vert	49.801	QP	44.9	10.7	7.4	32.1	30.9	40.0	9.1	
Vert	207.915	QP	42.8	16.6	9.2	31.8	36.8	43.5	6.7	
Vert	589.841	QP	39.3	20.4	11.7	32.1	39.3	46.0	6.7	
Vert	726.456	QP	30.6	22.6	12.4	32.0	33.6	46.0	12.4	
Vert	762.113	QP	31.5	22.8	12.6	31.8	35.1	46.0	10.9	
Vert	884.751	QP	28.1	24.0	13.2	31.2	34.1	46.0	11.9	
Vert	4882.000	PK	39.6	33.1	9.1	31.3	50.5	73.9	23.4	Floor noise
Vert	7323.000	PK	40.9	36.8	10.2	32.6	55.3	73.9	18.6	Floor noise
Vert	9764.000	PK	41.6	38.2	11.0	32.7	58.1	73.9	15.8	Floor noise
Vert	4882.000	AV	27.1	33.1	9.1	31.3	38.0	53.9	15.9	Floor noise
Vert	7323.000	AV	28.7	36.8	10.2	32.6	43.1	53.9	10.8	Floor noise
Vert	9764.000	AV	29.0	38.2	11.0	32.7	45.5	53.9	8.4	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).

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz $20\log(4.4\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11081928H
Date : February 12, 2016 February 12, 2016
Temperature / Humidity : 23 deg. C / 39 % RH 23 deg. C / 30 % RH
Engineer : Kazuya Yoshioka Shinichi Miyazono
(1 GHz - 26.5 GHz) (30 MHz - 1000 MHz)
Mode : Tx, Hopping Off, DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	61.422	QP	35.9	7.3	7.6	32.0	18.8	40.0	21.2	
Hori	207.907	QP	41.1	16.6	9.2	31.8	35.1	43.5	8.4	
Hori	540.679	QP	36.5	19.9	11.4	32.0	35.8	46.0	10.2	
Hori	589.841	QP	38.3	20.4	11.7	32.1	38.3	46.0	7.7	
Hori	737.291	QP	31.6	22.7	12.5	32.0	34.8	46.0	11.2	
Hori	884.751	QP	31.6	24.0	13.2	31.2	37.6	46.0	8.4	
Hori	2483.500	PK	41.2	28.1	6.7	32.1	43.9	73.9	30.0	
Hori	4960.000	PK	38.5	33.4	9.1	31.2	49.8	73.9	24.1	Floor noise
Hori	7440.000	PK	41.5	36.8	10.2	32.7	55.8	73.9	18.1	Floor noise
Hori	9920.000	PK	40.0	38.3	11.0	32.8	56.5	73.9	17.4	Floor noise
Hori	2483.500	AV	27.8	28.1	6.7	32.1	30.5	53.9	23.4	
Hori	4960.000	AV	25.4	33.4	9.1	31.2	36.7	53.9	17.2	Floor noise
Hori	7440.000	AV	27.5	36.8	10.2	32.7	41.8	53.9	12.1	Floor noise
Hori	9920.000	AV	27.0	38.3	11.0	32.8	43.5	53.9	10.4	Floor noise
Vert	49.811	QP	44.9	10.7	7.4	32.1	30.9	40.0	9.1	
Vert	207.902	QP	42.8	16.6	9.2	31.8	36.8	43.5	6.7	
Vert	589.885	QP	39.2	20.4	11.7	32.1	39.2	46.0	6.8	
Vert	726.452	QP	30.7	22.6	12.4	32.0	33.7	46.0	12.3	
Vert	762.190	QP	31.5	22.8	12.6	31.8	35.1	46.0	10.9	
Vert	884.749	QP	29.0	24.0	13.2	31.2	35.0	46.0	11.0	
Vert	2483.500	PK	39.9	28.1	6.7	32.1	42.6	73.9	31.3	
Vert	4960.000	PK	38.8	33.4	9.1	31.2	50.1	73.9	23.8	Floor noise
Vert	7440.000	PK	41.7	36.8	10.2	32.7	56.0	73.9	17.9	Floor noise
Vert	9920.000	PK	40.3	38.3	11.0	32.8	56.8	73.9	17.1	Floor noise
Vert	2483.500	AV	28.9	28.1	6.7	32.1	31.6	53.9	22.3	
Vert	4960.000	AV	25.4	33.4	9.1	31.2	36.7	53.9	17.2	Floor noise
Vert	7440.000	AV	27.5	36.8	10.2	32.7	41.8	53.9	12.1	Floor noise
Vert	9920.000	AV	27.0	38.3	11.0	32.8	43.5	53.9	10.4	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).

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.3 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

UL Japan, Inc.

Ise EMC Lab.

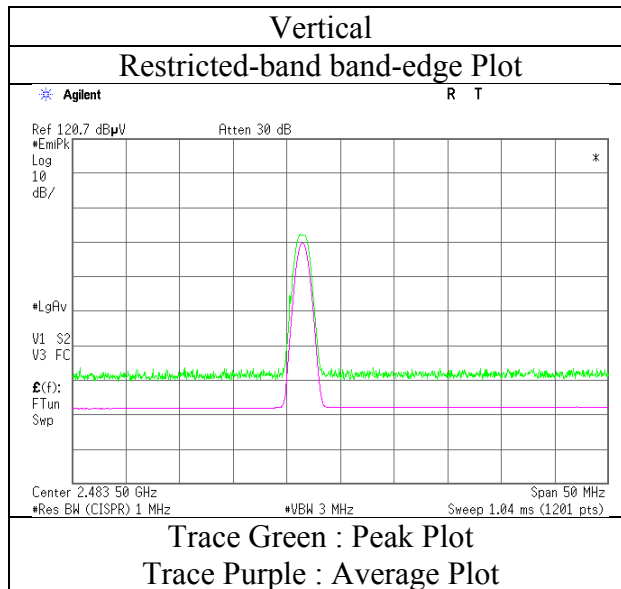
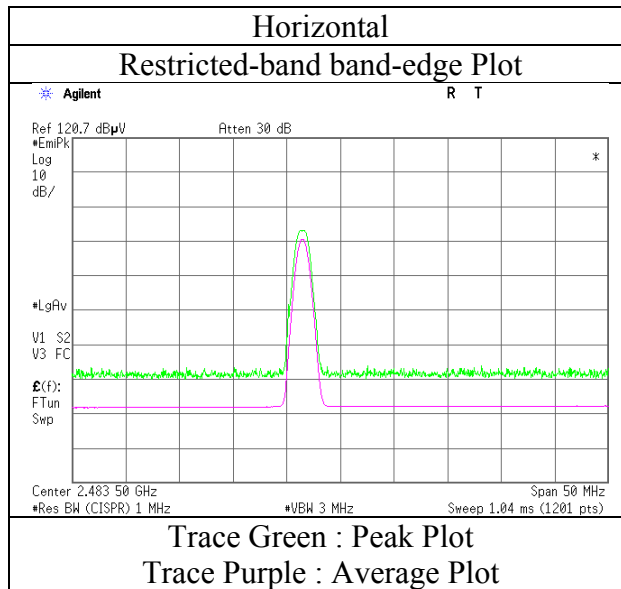
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11081928H
Date	February 12, 2016
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11081928H
Date : February 12, 2016 February 12, 2016
Temperature / Humidity : 23 deg. C / 39 % RH 23 deg. C / 30 % RH
Engineer : Kazuya Yoshioka Shinichi Miyazono
(1 GHz - 26.5 GHz) (30 MHz - 1000 MHz)
Mode : Tx, Hopping Off, 3DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	61.439	QP	36.0	7.3	7.6	32.0	18.9	40.0	21.1	
Hori	207.923	QP	41.0	16.6	9.2	31.8	35.0	43.5	8.5	
Hori	540.694	QP	36.6	19.9	11.4	32.0	35.9	46.0	10.1	
Hori	589.839	QP	38.3	20.4	11.7	32.1	38.3	46.0	7.7	
Hori	737.295	QP	31.6	22.7	12.5	32.0	34.8	46.0	11.2	
Hori	884.738	QP	31.5	24.0	13.2	31.2	37.5	46.0	8.5	
Hori	2390.000	PK	40.4	27.9	6.6	32.1	42.8	73.9	31.1	
Hori	4804.000	PK	40.0	32.8	9.0	31.3	50.5	73.9	23.4	Floor noise
Hori	7206.000	PK	40.2	36.8	10.2	32.6	54.6	73.9	19.3	Floor noise
Hori	9608.000	PK	40.4	38.1	10.9	32.6	56.8	73.9	17.1	Floor noise
Hori	2390.000	AV	27.3	27.9	6.6	32.1	29.7	53.9	24.2	
Hori	4804.000	AV	25.6	32.8	9.0	31.3	36.1	53.9	17.8	Floor noise
Hori	7206.000	AV	27.0	36.8	10.2	32.6	41.4	53.9	12.5	Floor noise
Hori	9608.000	AV	27.3	38.1	10.9	32.6	43.7	53.9	10.2	Floor noise
Vert	49.782	QP	44.9	10.7	7.4	32.1	30.9	40.0	9.1	
Vert	207.920	QP	42.9	16.6	9.2	31.8	36.9	43.5	6.6	
Vert	589.844	QP	39.3	20.4	11.7	32.1	39.3	46.0	6.7	
Vert	726.445	QP	30.7	22.6	12.4	32.0	33.7	46.0	12.3	
Vert	762.188	QP	31.7	22.8	12.6	31.8	35.3	46.0	10.7	
Vert	884.799	QP	29.0	24.0	13.2	31.2	35.0	46.0	11.0	
Vert	2390.000	PK	40.4	27.9	6.6	32.1	42.8	73.9	31.1	
Vert	4804.000	PK	40.3	32.8	9.0	31.3	50.8	73.9	23.1	Floor noise
Vert	7206.000	PK	40.5	36.8	10.2	32.6	54.9	73.9	19.0	Floor noise
Vert	9608.000	PK	40.0	38.1	10.9	32.6	56.4	73.9	17.5	Floor noise
Vert	2390.000	AV	28.7	27.9	6.6	32.1	31.1	53.9	22.8	
Vert	4804.000	AV	25.6	32.8	9.0	31.3	36.1	53.9	17.8	Floor noise
Vert	7206.000	AV	27.0	36.8	10.2	32.6	41.4	53.9	12.5	Floor noise
Vert	9608.000	AV	27.3	38.1	10.9	32.6	43.7	53.9	10.2	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).

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.3 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	88.8	28.0	6.6	32.1	91.3	-	-	Carrier
Hori	2400.000	PK	32.5	28.0	6.6	32.1	35.0	71.3	36.3	
Vert	2402.000	PK	90.4	28.0	6.6	32.1	92.9	-	-	Carrier
Vert	2400.000	PK	32.7	28.0	6.6	32.1	35.2	72.9	37.7	

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

Distance factor: 1GHz-10GHz 20log (4.4 m / 3.0 m) = 3.3 dB
 10GHz-26.5GHz 20log(1.0m / 3.0m)= -9.5dB

***These results have sufficient margin without taking account Dwell time factor.**

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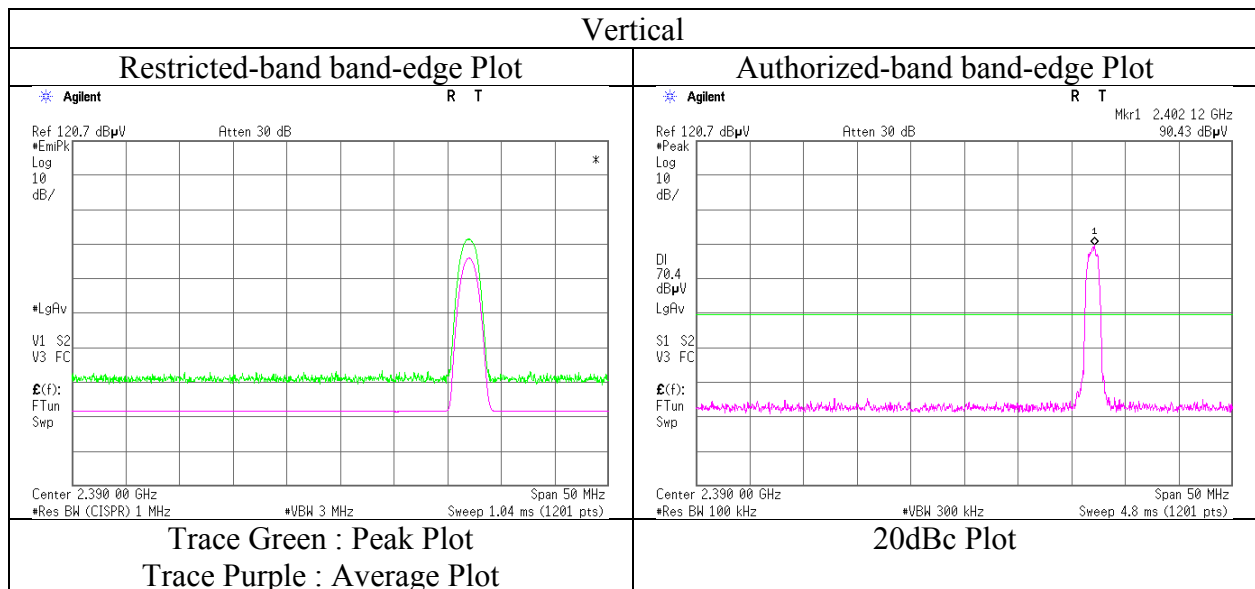
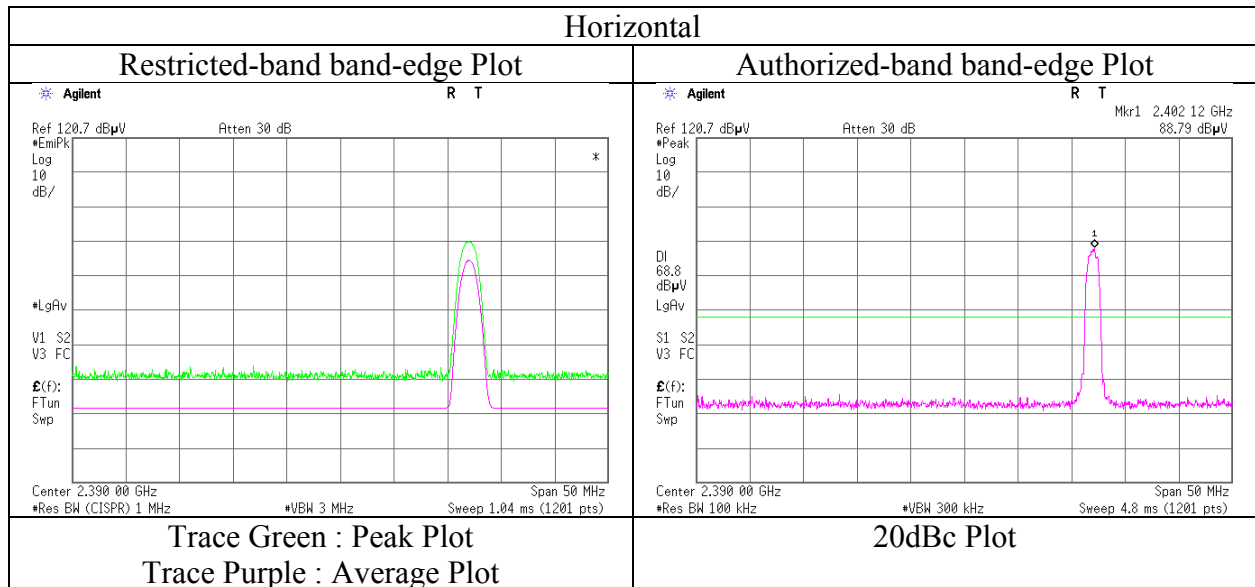
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11081928H
Date	February 12, 2016
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11081928H
Date : February 12, 2016 February 12, 2016
Temperature / Humidity : 23 deg. C / 39 % RH 23 deg. C / 30 % RH
Engineer : Kazuya Yoshioka Shinichi Miyazono
(1 GHz - 26.5 GHz) (30 MHz - 1000 MHz)
Mode : Tx, Hopping Off, 3DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	61.449	QP	36.0	7.3	7.6	32.0	18.9	40.0	21.1	
Hori	207.915	QP	41.5	16.6	9.2	31.8	35.5	43.5	8.0	
Hori	540.669	QP	36.5	19.9	11.4	32.0	35.8	46.0	10.2	
Hori	589.840	QP	38.1	20.4	11.7	32.1	38.1	46.0	7.9	
Hori	737.299	QP	31.7	22.7	12.5	32.0	34.9	46.0	11.1	
Hori	884.761	QP	31.5	24.0	13.2	31.2	37.5	46.0	8.5	
Hori	4882.000	PK	38.6	33.1	9.1	31.3	49.5	73.9	24.4	Floor noise
Hori	7323.000	PK	39.1	36.8	10.2	32.6	53.5	73.9	20.4	Floor noise
Hori	9764.000	PK	40.6	38.2	11.0	32.7	57.1	73.9	16.8	Floor noise
Hori	4882.000	AV	27.1	33.1	9.1	31.3	38.0	53.9	15.9	Floor noise
Hori	7323.000	AV	28.7	36.8	10.2	32.6	43.1	53.9	10.8	Floor noise
Hori	9764.000	AV	29.0	38.2	11.0	32.7	45.5	53.9	8.4	Floor noise
Vert	49.695	QP	44.9	10.8	7.4	32.1	31.0	40.0	9.0	
Vert	207.915	QP	42.8	16.6	9.2	31.8	36.8	43.5	6.7	
Vert	589.841	QP	39.2	20.4	11.7	32.1	39.2	46.0	6.8	
Vert	726.477	QP	30.8	22.6	12.4	32.0	33.8	46.0	12.2	
Vert	762.186	QP	31.5	22.8	12.6	31.8	35.1	46.0	10.9	
Vert	884.773	QP	28.9	24.0	13.2	31.2	34.9	46.0	11.1	
Vert	4882.000	PK	38.9	33.1	9.1	31.3	49.8	73.9	24.1	Floor noise
Vert	7323.000	PK	39.1	36.8	10.2	32.6	53.5	73.9	20.4	Floor noise
Vert	9764.000	PK	40.8	38.2	11.0	32.7	57.3	73.9	16.6	Floor noise
Vert	4882.000	AV	27.1	33.1	9.1	31.3	38.0	53.9	15.9	Floor noise
Vert	7323.000	AV	28.7	36.8	10.2	32.6	43.1	53.9	10.8	Floor noise
Vert	9764.000	AV	29.0	38.2	11.0	32.7	45.5	53.9	8.4	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).

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz $20\log(4.4\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$

10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11081928H
Date	February 12, 2016 February 12, 2016
Temperature / Humidity	23 deg. C / 39 % RH 23 deg. C / 30 % RH
Engineer	Kazuya Yoshioka Shinichi Miyazono
	(1 GHz - 26.5 GHz) (30 MHz - 1000 MHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	61.451	QP	36.0	7.3	7.6	32.0	18.9	40.0	21.1	
Hori	207.915	QP	41.1	16.6	9.2	31.8	35.1	43.5	8.4	
Hori	540.691	QP	36.5	19.9	11.4	32.0	35.8	46.0	10.2	
Hori	589.833	QP	38.2	20.4	11.7	32.1	38.2	46.0	7.8	
Hori	737.291	QP	31.7	22.7	12.5	32.0	34.9	46.0	11.1	
Hori	884.749	QP	31.5	24.0	13.2	31.2	37.5	46.0	8.5	
Hori	2483.500	PK	41.1	28.1	6.7	32.1	43.8	73.9	30.1	
Hori	4960.000	PK	38.3	33.4	9.1	31.2	49.6	73.9	24.3	Floor noise
Hori	7440.000	PK	40.4	36.8	10.2	32.7	54.7	73.9	19.2	Floor noise
Hori	9920.000	PK	39.6	38.3	11.0	32.8	56.1	73.9	17.8	Floor noise
Hori	2483.500	AV	27.7	28.1	6.7	32.1	30.4	53.9	23.5	
Hori	4960.000	AV	25.5	33.4	9.1	31.2	36.8	53.9	17.1	Floor noise
Hori	7440.000	AV	27.4	36.8	10.2	32.7	41.7	53.9	12.2	Floor noise
Hori	9920.000	AV	27.0	38.3	11.0	32.8	43.5	53.9	10.4	Floor noise
Vert	49.677	QP	44.9	10.8	7.4	32.1	31.0	40.0	9.0	
Vert	207.916	QP	42.8	16.6	9.2	31.8	36.8	43.5	6.7	
Vert	589.839	QP	39.2	20.4	11.7	32.1	39.2	46.0	6.8	
Vert	726.440	QP	30.6	22.6	12.4	32.0	33.6	46.0	12.4	
Vert	762.211	QP	31.7	22.8	12.6	31.8	35.3	46.0	10.7	
Vert	884.749	QP	28.6	24.0	13.2	31.2	34.6	46.0	11.4	
Vert	2483.500	PK	40.4	28.1	6.7	32.1	43.1	73.9	30.8	
Vert	4960.000	PK	38.7	33.4	9.1	31.2	50.0	73.9	23.9	Floor noise
Vert	7440.000	PK	40.7	36.8	10.2	32.7	55.0	73.9	18.9	Floor noise
Vert	9920.000	PK	39.8	38.3	11.0	32.8	56.3	73.9	17.6	Floor noise
Vert	2483.500	AV	29.0	28.1	6.7	32.1	31.7	53.9	22.2	
Vert	4960.000	AV	25.5	33.4	9.1	31.2	36.8	53.9	17.1	Floor noise
Vert	7440.000	AV	27.4	36.8	10.2	32.7	41.7	53.9	12.2	Floor noise
Vert	9920.000	AV	27.0	38.3	11.0	32.8	43.5	53.9	10.4	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).

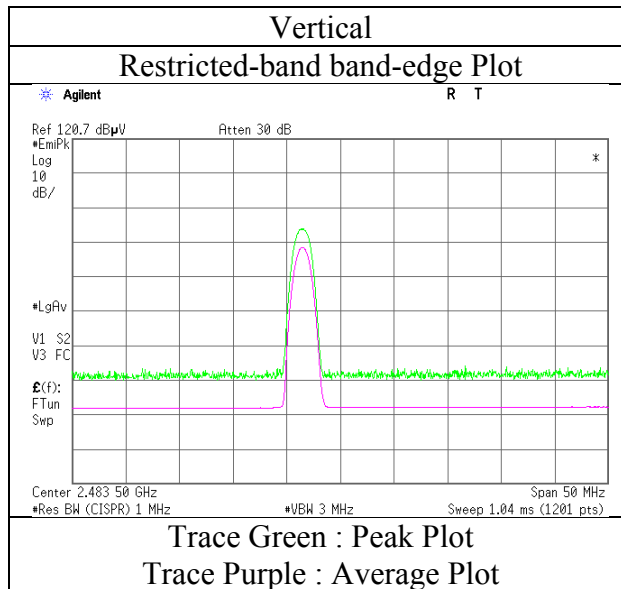
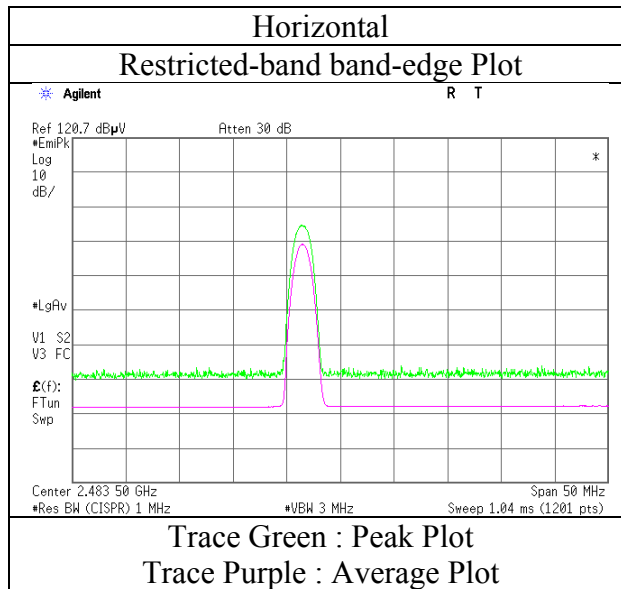
*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz 20log (4.4 m / 3.0 m) = 3.3 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission (Reference Plot for band-edge)

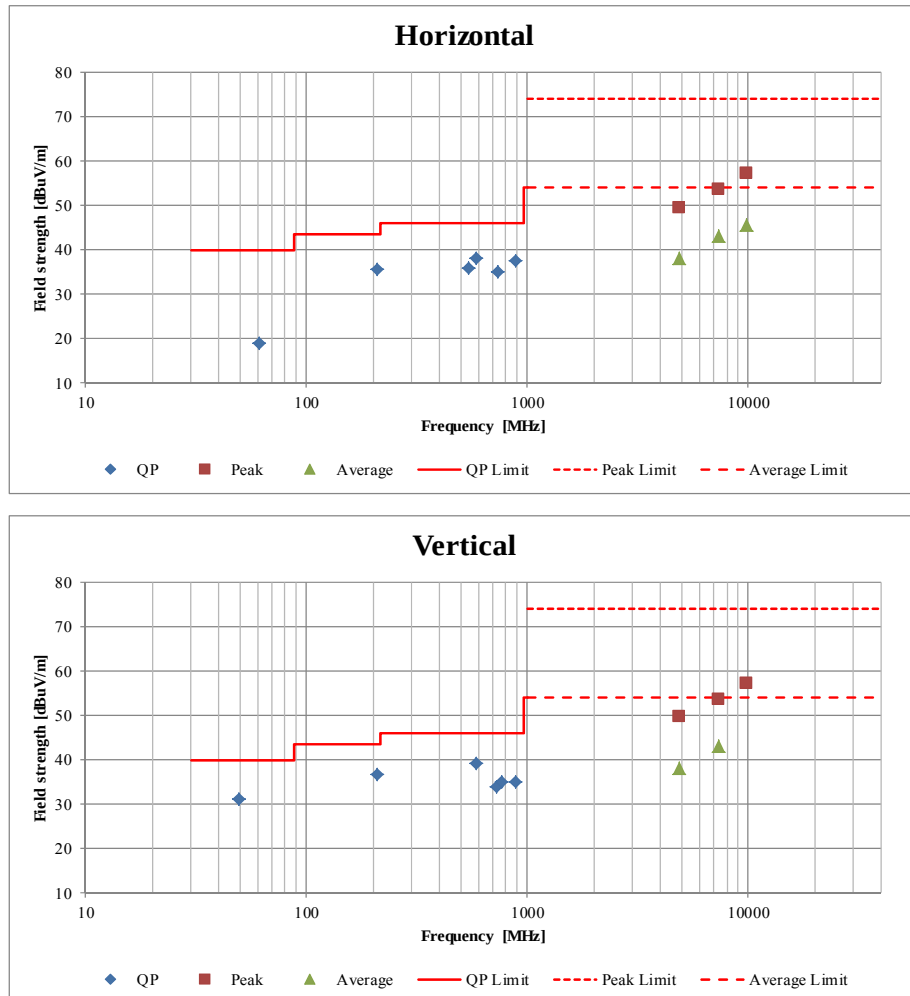
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11081928H
Date	February 12, 2016
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Kazuya Yoshioka
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission **(Plot data, Worst case)**

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber		
Report No.	11081928H		
Date	February 12, 2016	February 12, 2016	
Temperature / Humidity	23 deg. C / 39 % RH	23 deg. C / 30 % RH	
Engineer	Kazuya Yoshioka	Shinichi Miyazono	
	(1 GHz - 26.5 GHz)	(30 MHz - 1000 MHz)	
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

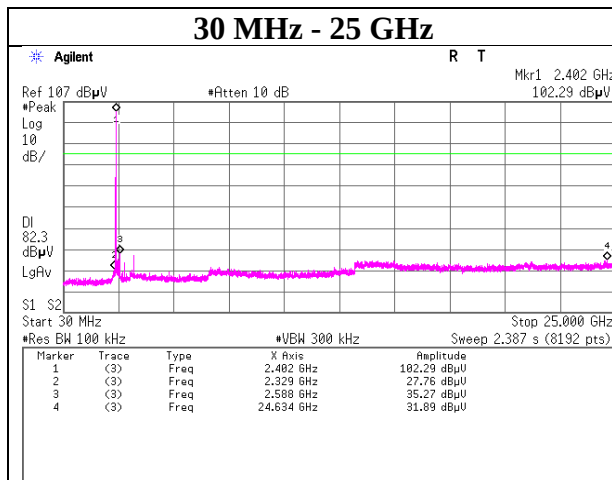
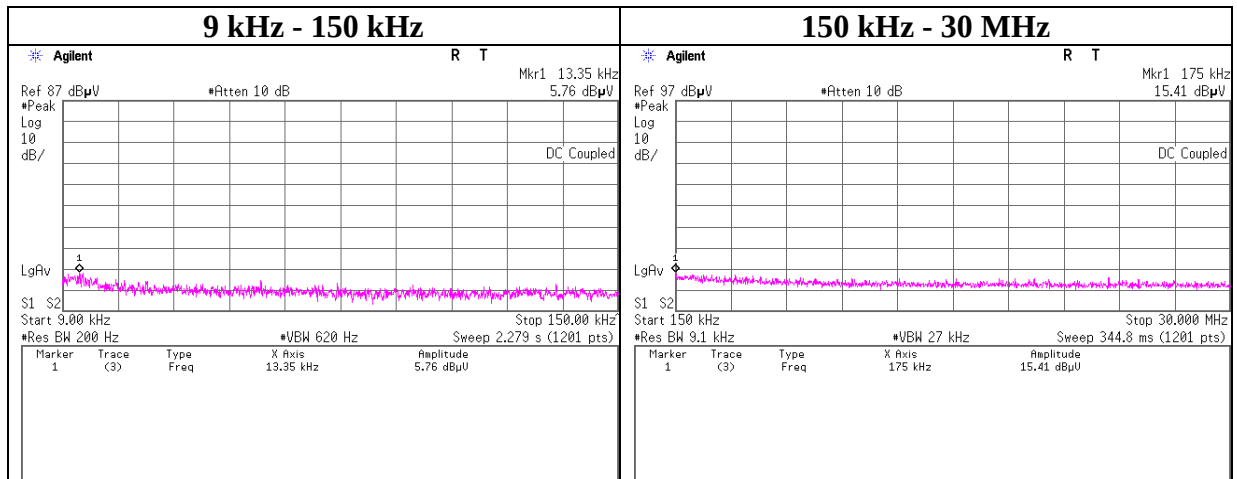


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11081928H
Date : February 13, 2016
Temperature / Humidity : 23 deg. C / 37 % RH
Engineer : Kazuya Yoshioka
Mode : Tx, Hopping Off, DH5

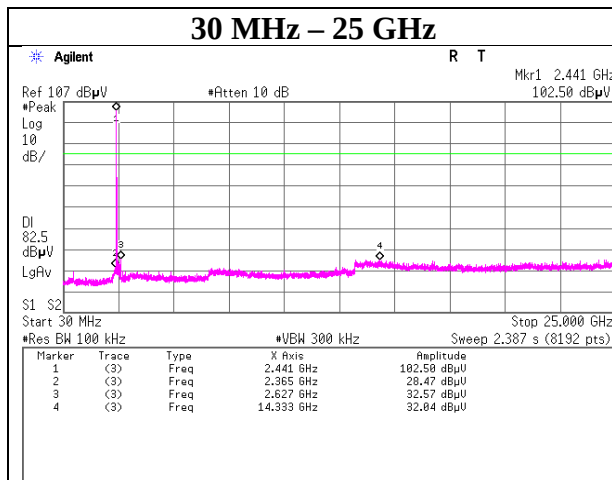
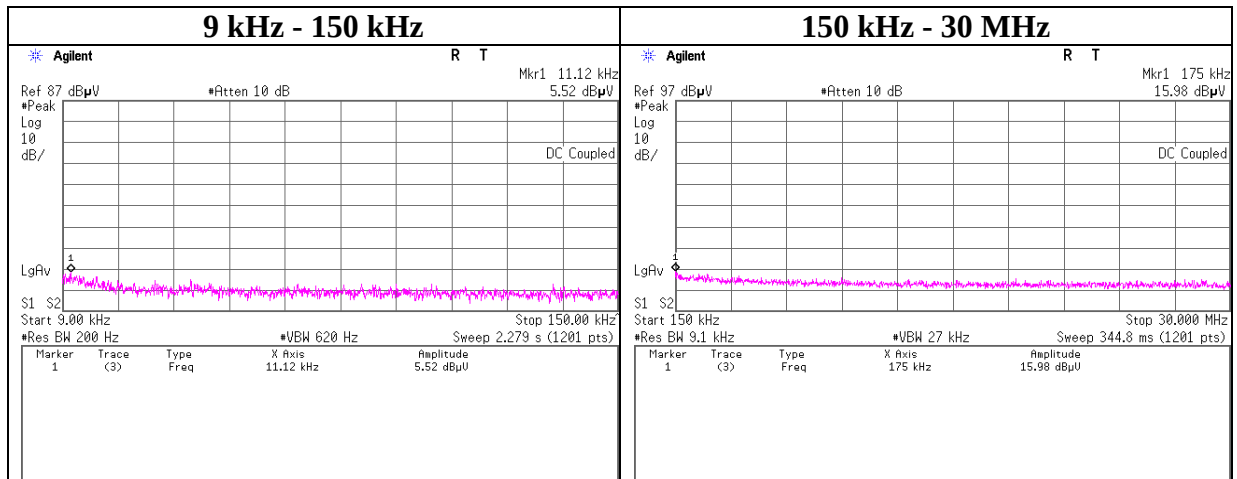
2402 MHz



Conducted Spurious Emission

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11081928H
Date : February 13, 2016
Temperature / Humidity : 23 deg. C / 37 % RH
Engineer : Kazuya Yoshioka
Mode : Tx, Hopping Off, DH5

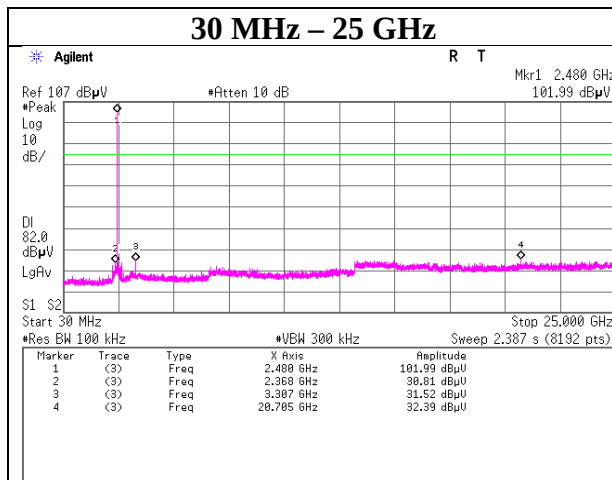
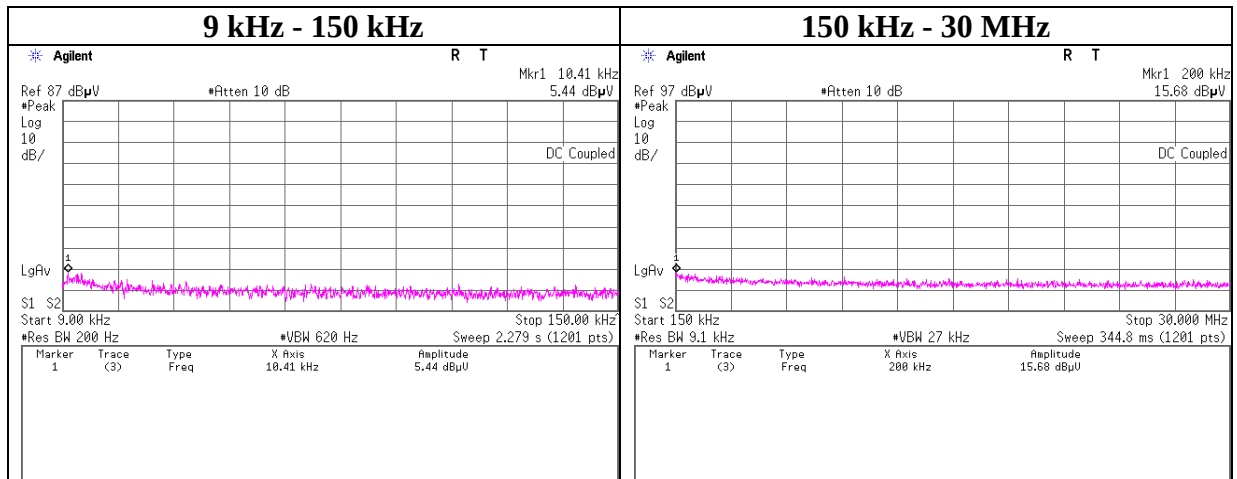
2441 MHz



Conducted Spurious Emission

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11081928H
Date : February 13, 2016
Temperature / Humidity : 23 deg. C / 37 % RH
Engineer : Kazuya Yoshioka
Mode : Tx, Hopping Off, DH5

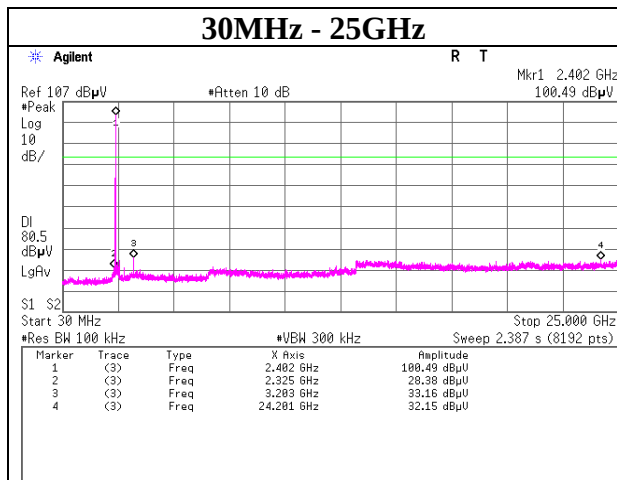
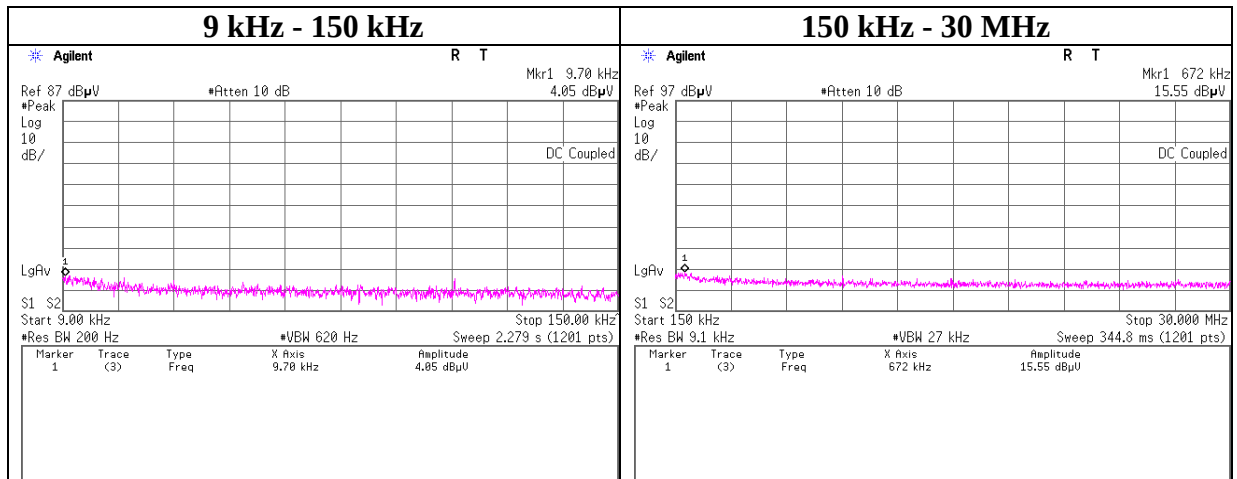
2480 MHz



Conducted Spurious Emission

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11081928H
Date : February 13, 2016
Temperature / Humidity : 23 deg. C / 37 % RH
Engineer : Kazuya Yoshioka
Mode : Tx, Hopping Off, 3DH5

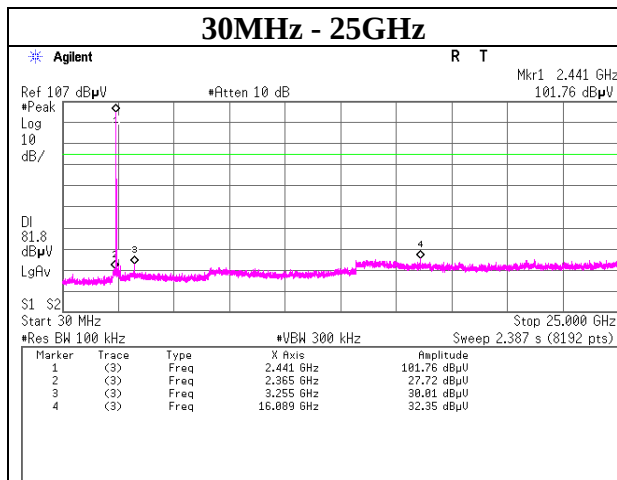
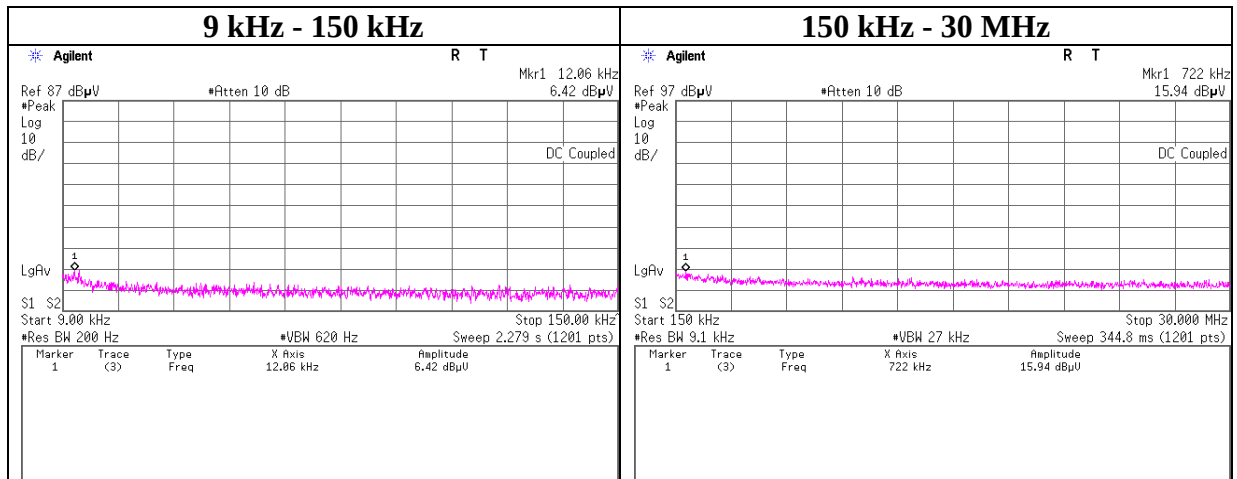
2402 MHz



Conducted Spurious Emission

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11081928H
Date : February 13, 2016
Temperature / Humidity : 23 deg. C / 37 % RH
Engineer : Kazuya Yoshioka
Mode : Tx, Hopping Off, 3DH5

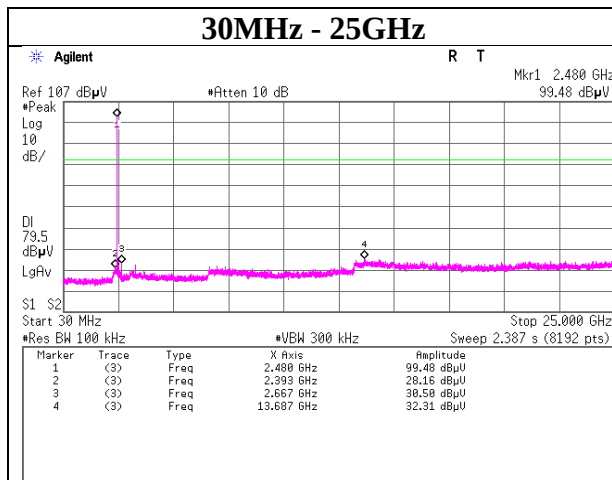
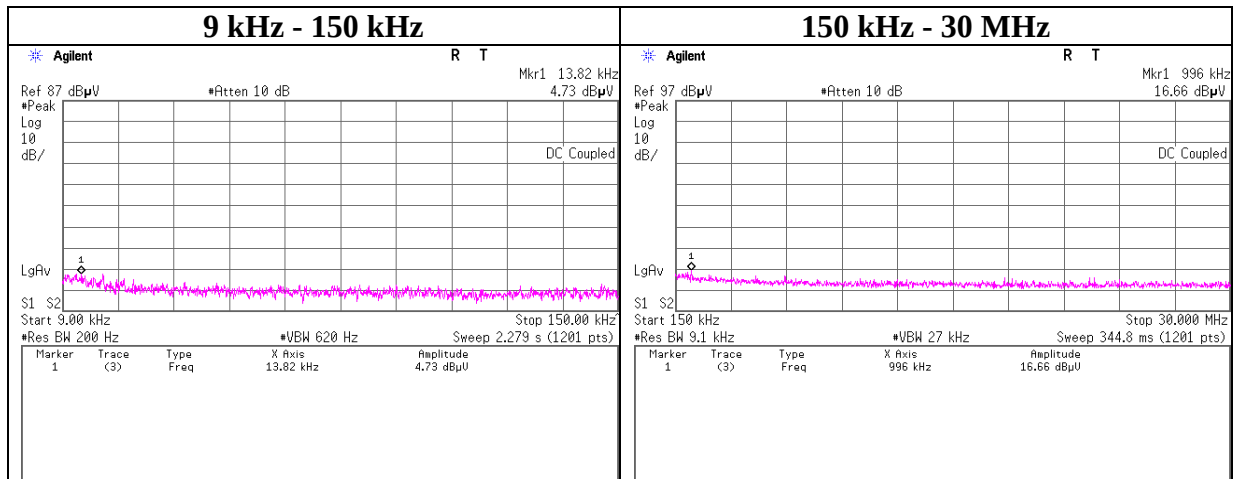
2441 MHz



Conducted Spurious Emission

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11081928H
Date February 13, 2016
Temperature / Humidity 23 deg. C / 37 % RH
Engineer Kazuya Yoshioka
Mode Tx, Hopping Off, 3DH5

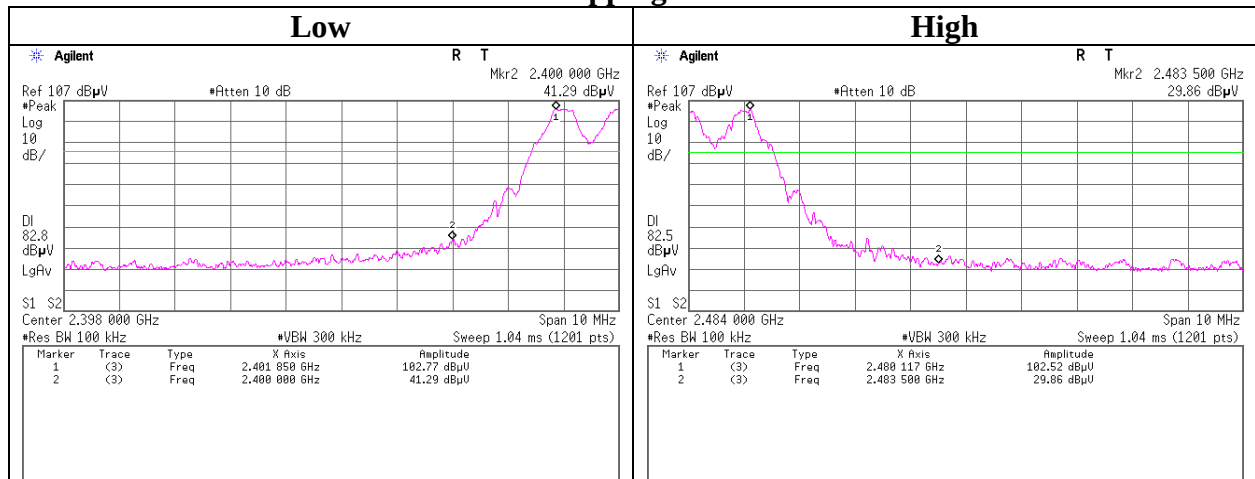
2480 MHz



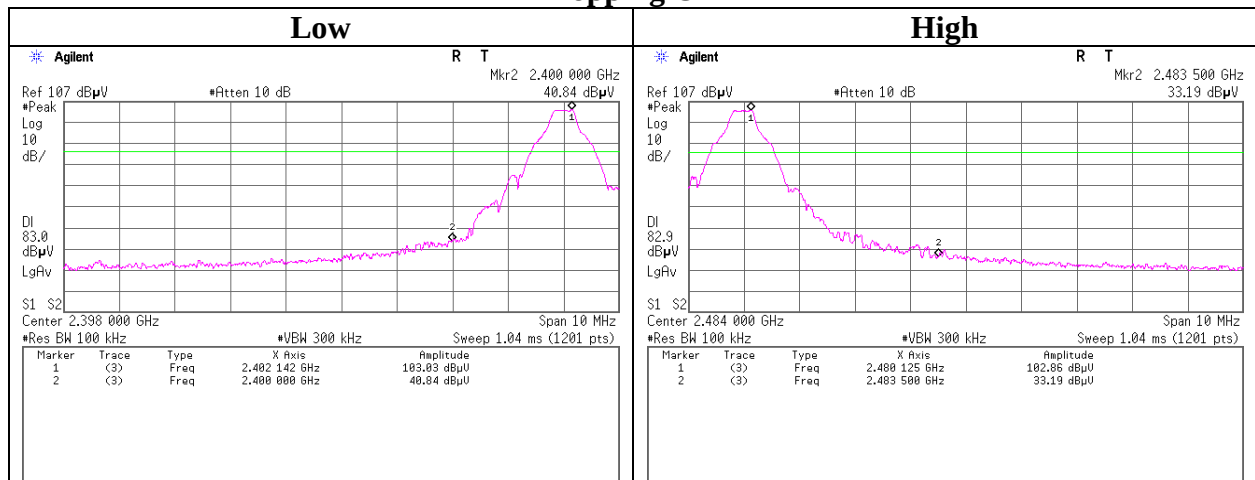
Conducted Emission Band Edge compliance

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11081928H
Date : February 13, 2016
Temperature / Humidity : 23 deg. C / 37 % RH
Engineer : Kazuya Yoshioka
Mode : Tx DH5

Hopping On



Hopping Off



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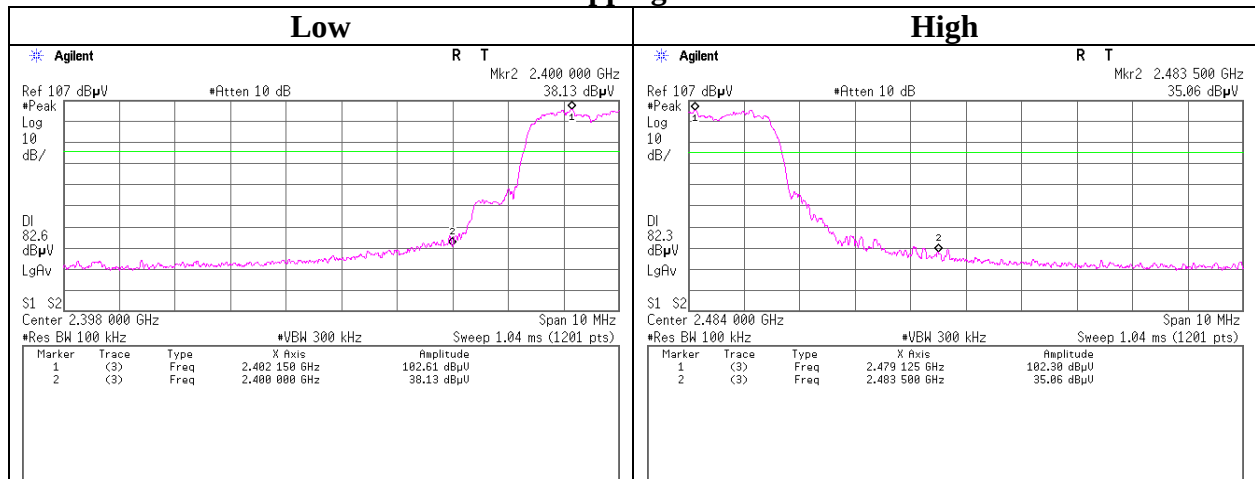
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

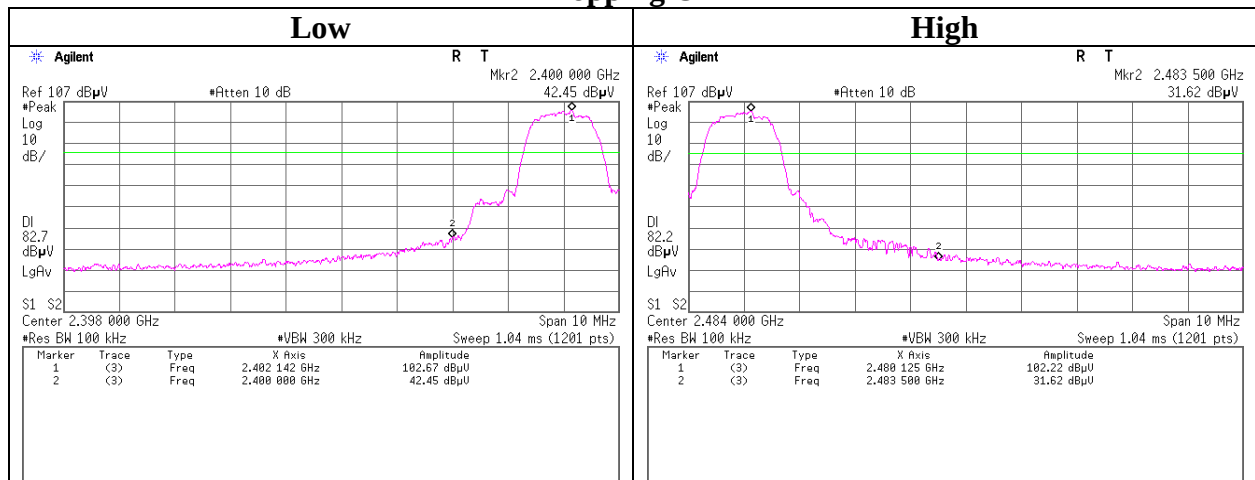
Conducted Emission Band Edge compliance

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11081928H
Date : February 13, 2016
Temperature / Humidity : 23 deg. C / 37 % RH
Engineer : Kazuya Yoshioka
Mode : Tx 3DH5

Hopping On



Hopping Off



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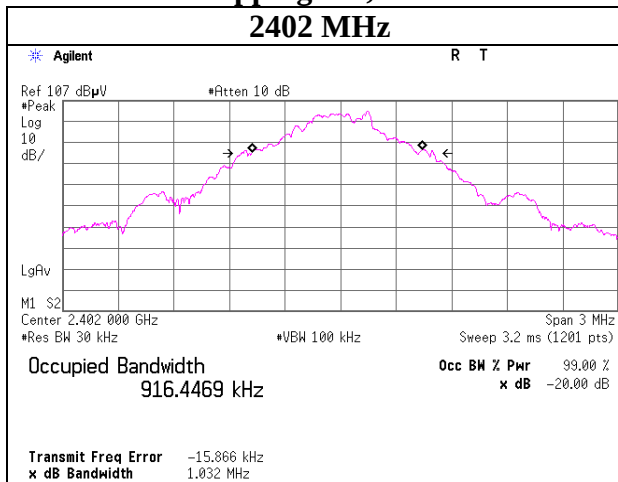
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

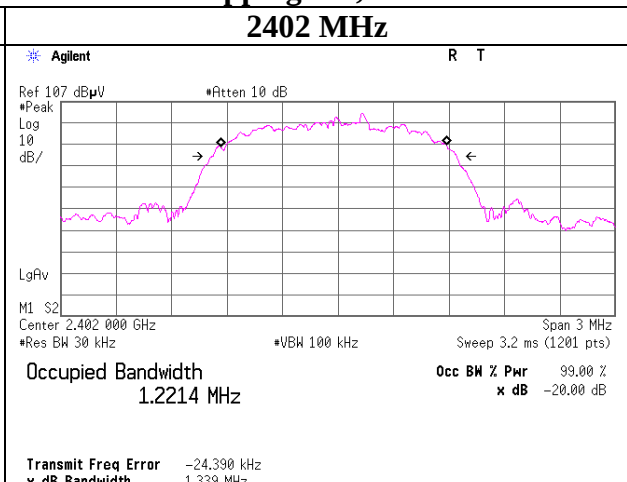
99%Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11081928H
Date	February 13, 2016
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka
Mode	Tx Hopping Off

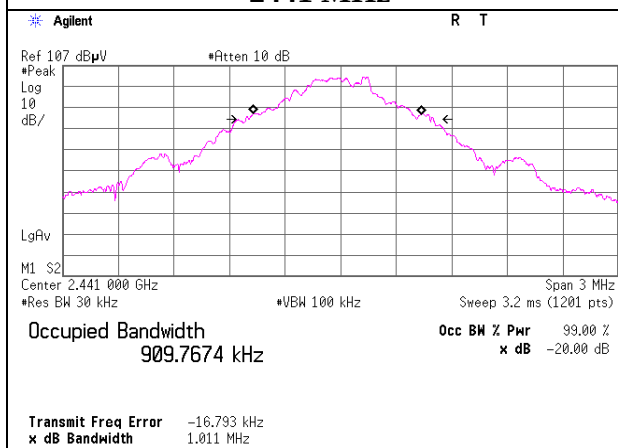
Hopping Off, DH5



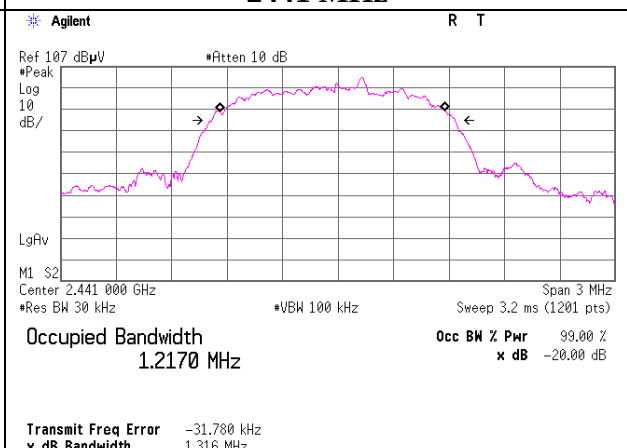
Hopping Off, 3DH5



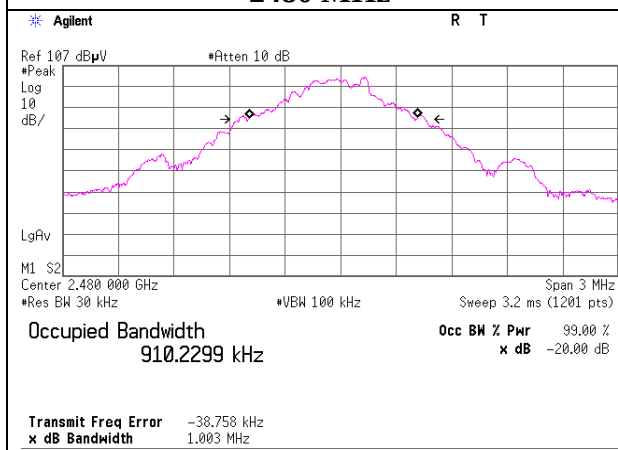
2441 MHz



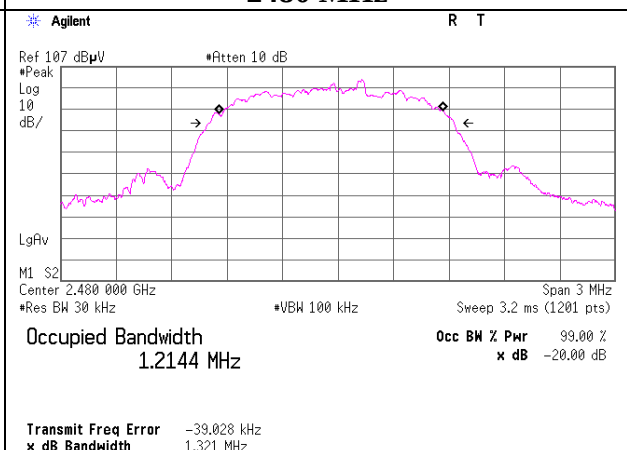
2441 MHz



2480 MHz



2480 MHz



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Ise EMC Lab.

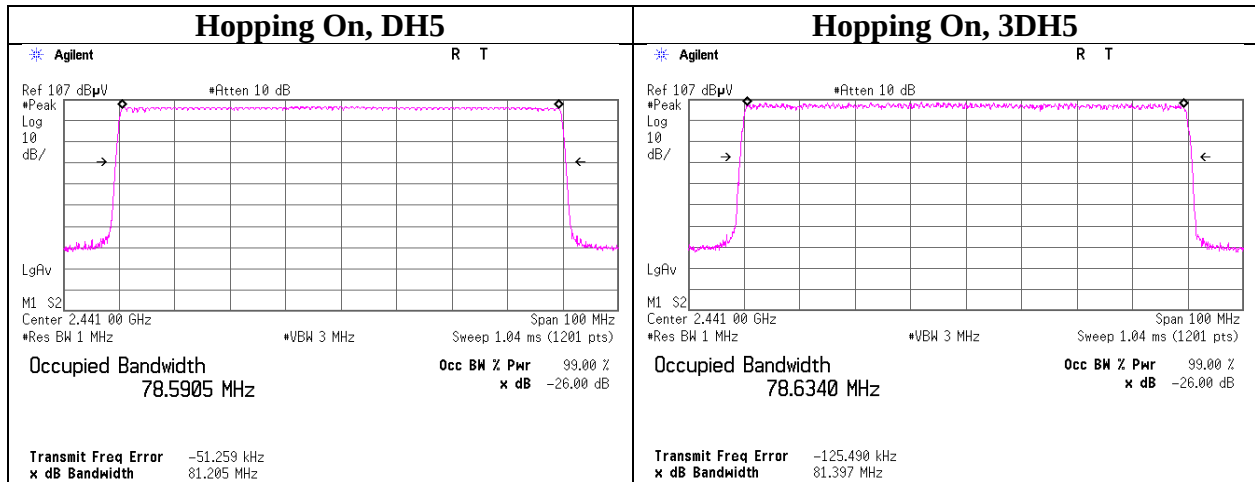
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11081928H
Date	February 13, 2016
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka
Mode	Tx Hopping On



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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2015/06/02 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2015/08/10 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2015/06/22 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2015/06/06 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2015/09/17 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2015/11/28 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2015/11/02 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2015/11/03 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2015/06/19 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2015/11/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2015/03/09 * 12
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	AT	2015/10/07 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2015/04/02 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2015/10/08 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2015/10/08 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2016/01/21 * 12
MMM-12	DIGITAL HiTESTER	Hioki	3805	060500120	AT	2015/02/05 * 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 test
AT: Antenna Terminal Conducted test**

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