



RADIO TEST REPORT

Test Report No. : 11017362H-B-R1

Applicant : CASIO COMPUTER CO., LTD.
Type of Equipment : Handheld Printer Terminal
Model No. : IT-9000-MC25E-C
FCC ID : BBQIT9000C
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)
7. This report is a revised version of 11017362H-B. 11017362H-B is replaced with this report.

Date of test: November 25 to December 8, 2015

Representative test engineer:

Hironobu Ohnishi

Engineer

Consumer Technology Division

Approved by:

Takahiro Hatakeda

Leader

Consumer Technology Division



NVLAP LAB CODE: 200572-0

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SECTION 1: Customer information

Company Name	:	CASIO COMPUTER CO., LTD.
Address	:	2951-5, Ishikawa-Machi, Hachioji-shi Tokyo 192-8556, Japan
Telephone Number	:	+81-42-639-5188
Facsimile Number	:	+81-42-639-5046
Contact Person	:	KATSUMASA MOTOKI

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

2.1 Identification of E.U.T.

Type of Equipment	:	Handheld Printer Terminal
Model No.	:	IT-9000-MC25E-C
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	Li-ion battery DC7.4V 2000mAh/15Wh, M/N:HA-G20BAT
Receipt Date of Sample	:	October 17, 2015
Country of Mass-production	:	Japan
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: IT-9000-MC25E-C (referred to as the EUT in this report) is Handheld Printer Terminal.

Model No.: IT-9000-MC25E-C has a variant model: IT-9000-C25E-C.
The difference of them is that only IT-9000-MC25E-C has a magnetic card reader.
Except for it they are completely identical in electronic characteristics.
Therefore the test was performed with IT-9000-MC25E-C as a representative.

Radio Specification

WLAN (IEEE802.11b/g/n-20)

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Type of Modulation	DSSS, OFDM
Antenna Gain	2.34dBi

BT

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS
Antenna Gain	2.34dBi

RFID

Equipment Type	Transceiver
Frequency of Operation	13.56MHz
Type of Modulation	ASK

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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

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	QP 22.2 dB, 0.23593 MHz, L AV 19.8 dB, 0.23593 MHz, L	Complied	-
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	9.6 dB 9920.000 MHz, AV, Vert.	Complied	Conducted/ Radiated (above 30 MHz) *1)

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

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

* 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 (DC 3.3 V / 1.8 V) constantly to RF Part 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 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	

Frequency range	Conducted emission using AMN(LISN) (+dB)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	2.9 dB

Test distance	Radiated emission (+dB) 9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 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

Conducted Emission test

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

Radiated emission test

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

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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.

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

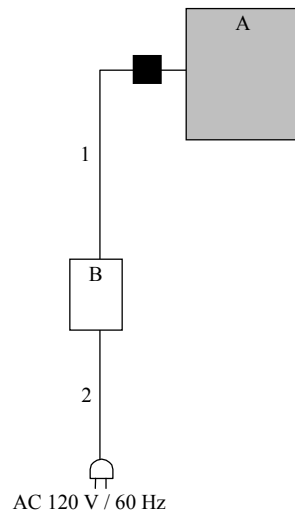
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Conducted Emission, 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 the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: 15 Software: WL127X_BTTOOL *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



■: Standard Ferrite Core

* 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	Handheld Printer Terminal	IT-9000-MC25E-C	11CGM L75B00007IAAA1 *1) 11CGM L75B00016IAA1 *2)	CASIO COMPUTER CO., LTD.	EUT
B	AC Adapter	AD-S42120C	0915C	CASIO COMPUTER CO., LTD.	-

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.5	Unshielded	Unshielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-

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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 0.8m above the conducting ground plane.

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

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 AV
Measurement range	: 0.15 MHz - 30 MHz
Test data	: APPENDIX
Test result	: Pass

SECTION 6: Radiated Spurious Emission

Test Procedure

[For 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.

[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	3 m (below 10 GHz), 1 m*2) (above 10 GHz)		3 m (below 10 GHz), 1 m*2) (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: $20 \times \log(3.0 \text{ m} / 1.0 \text{ m}) = 9.5 \text{ dB}$

- The carrier level and noise levels were confirmed at each position of X, Y, and Z axes of EUT and EUT on the cradle 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 - 26.5 GHz
Test data	: APPENDIX
Test result	: Pass

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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
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: 160MHz 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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

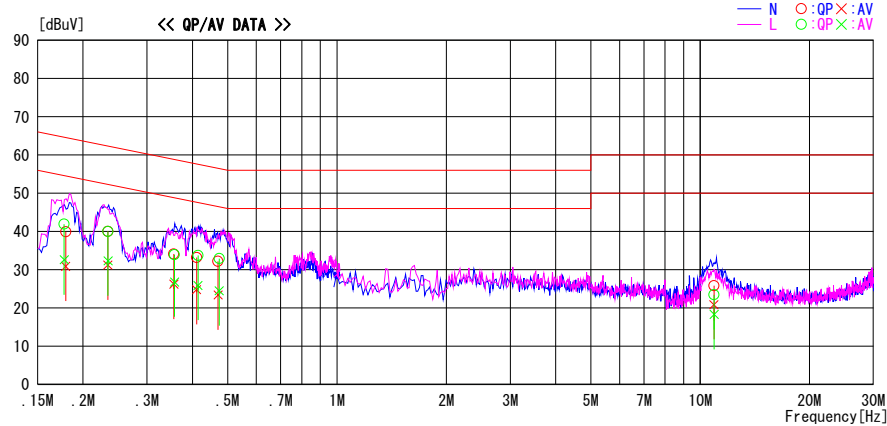
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/12/08

Report No. : 11017362H

Temp./Humi. : 20deg. C / 31% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx DH5 2402MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.17917	26.7	17.7	13.2	39.9	30.9	64.5	54.5	24.6	23.6	N	
0.23394	26.7	17.9	13.3	40.0	31.2	62.3	52.3	22.3	21.1	N	
0.35556	20.8	12.9	13.3	34.1	26.2	58.8	48.8	24.7	22.6	N	
0.41075	19.9	11.5	13.3	33.2	24.8	57.6	47.6	24.4	22.8	N	
0.47069	18.9	10.1	13.3	32.2	23.4	56.5	46.5	24.3	23.1	N	
10.90459	11.3	6.4	14.5	25.8	20.9	60.0	50.0	34.2	29.1	N	
0.17753	28.7	19.4	13.2	41.9	32.6	64.6	54.6	22.7	22.0	L	
0.23426	26.7	19.0	13.3	40.0	32.3	62.3	52.3	22.3	20.0	L	
0.35726	20.6	13.5	13.3	33.9	26.8	58.8	48.8	24.9	22.0	L	
0.41440	20.4	12.6	13.3	33.7	25.9	57.6	47.6	23.9	21.7	L	
0.47415	19.6	11.2	13.3	32.9	24.5	56.4	46.4	23.5	21.9	L	
10.92032	9.0	3.8	14.5	23.5	18.3	60.0	50.0	36.5	31.7	L	

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

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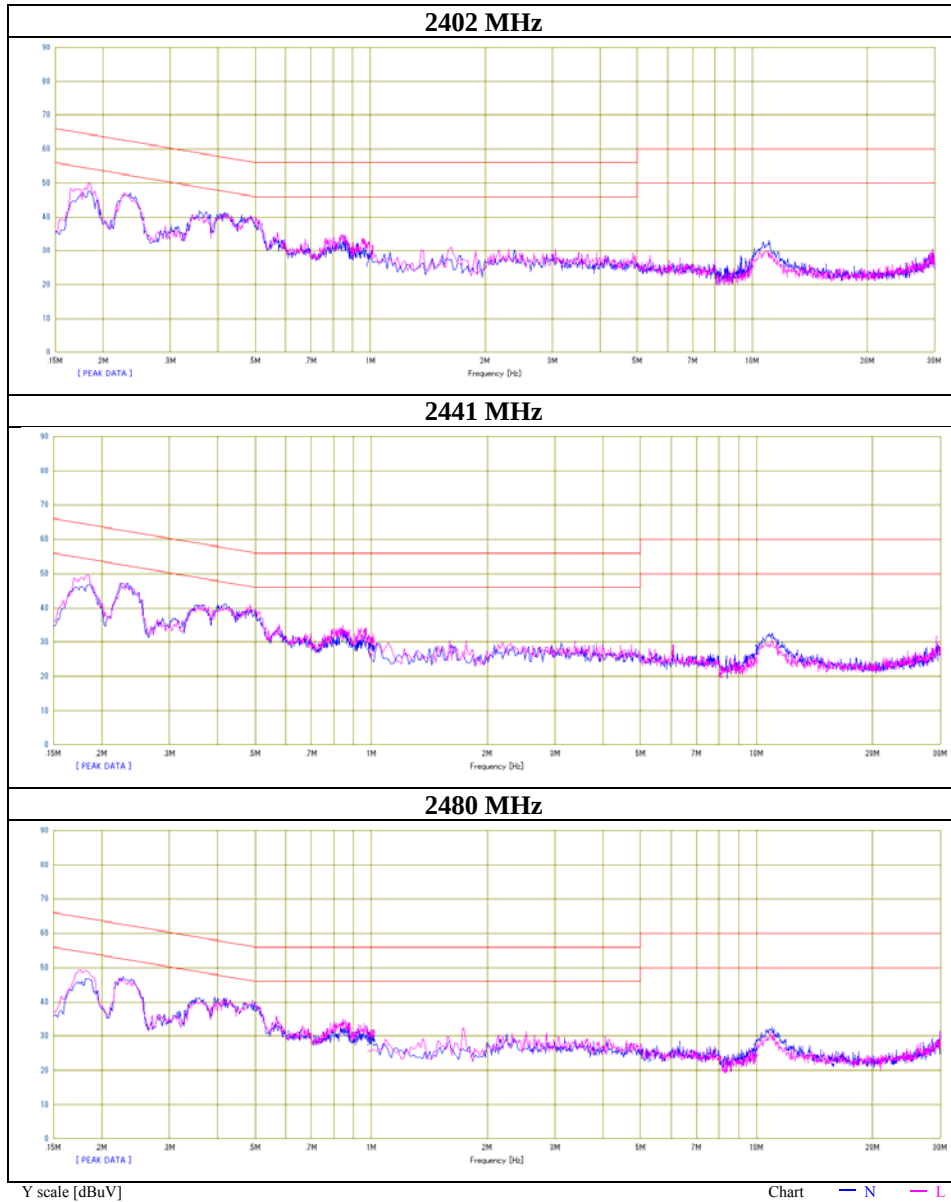
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Conducted Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11017362H
Date	December 8, 2015
Temperature / Humidity	20 deg. C / 31 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5



Conducted Emission

DATA OF CONDUCTED EMISSION TEST

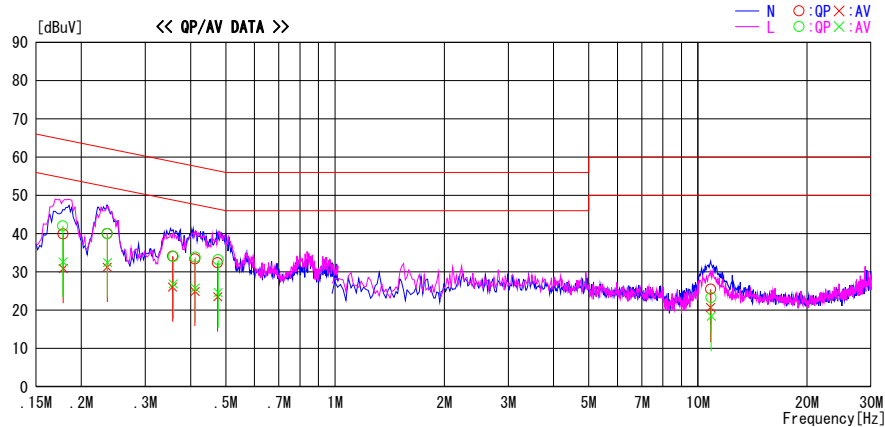
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/12/08

Report No. : 11017362H

Temp./Humi. : 20deg. C / 31% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 3DH5 2402MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.17817	26.7	17.7	13.2	39.9	30.9	64.6	54.6	24.7	23.7	N
0.23553	26.7	17.9	13.3	40.0	31.2	62.3	52.3	22.3	21.1	N
0.35665	20.8	12.8	13.3	34.1	26.1	58.8	48.8	24.7	22.7	N
0.41114	20.1	11.6	13.3	33.4	24.9	57.6	47.6	24.2	22.7	N
0.47480	19.1	10.2	13.3	32.4	23.5	56.4	46.4	24.0	22.9	N
10.83300	11.0	6.2	14.5	25.5	20.7	60.0	50.0	34.5	29.3	N
0.17783	28.8	19.4	13.2	42.0	32.6	64.6	54.6	22.6	22.0	L
0.23593	26.7	19.1	13.3	40.0	32.4	62.2	52.2	22.2	19.8	L
0.35841	20.7	13.6	13.3	34.0	26.9	58.8	48.8	24.8	21.9	L
0.41174	20.5	12.5	13.3	33.8	25.8	57.6	47.6	23.8	21.8	L
0.47630	19.9	11.3	13.3	33.2	24.6	56.4	46.4	23.2	21.8	L
10.86836	8.8	3.9	14.5	23.3	18.4	60.0	50.0	36.7	31.6	L

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

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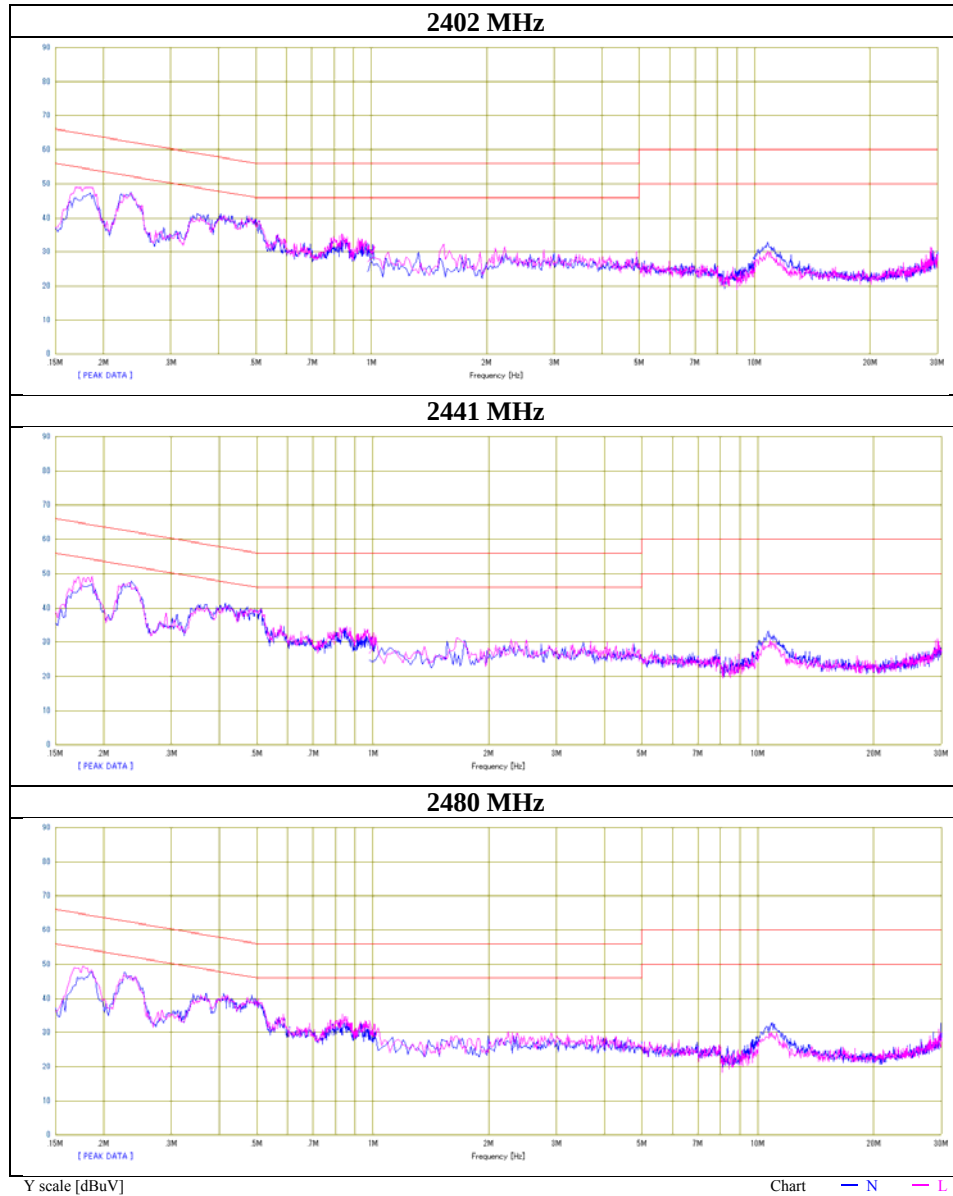
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Conducted Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11017362H
Date	December 8, 2015
Temperature / Humidity	20 deg. C / 31 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5



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20dB Bandwidth and Carrier Frequency Separation

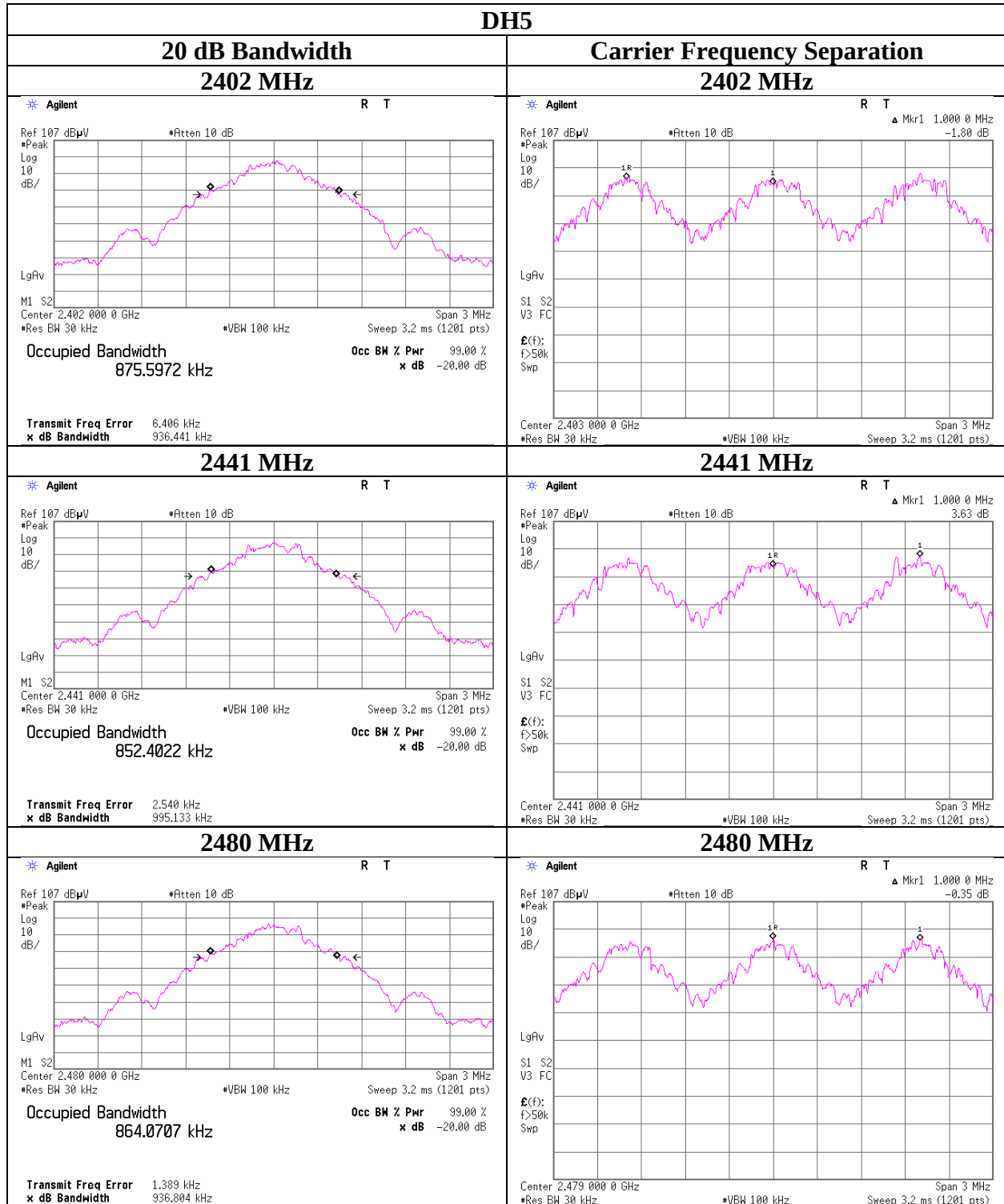
Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11017362H
Date : November 25, 2015
Temperature / Humidity : 23 deg. C / 36 % RH
Engineer : Hironobu Ohnishi
Mode : Tx

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.936	1.000	≥ 0.624
DH5	2441.0	0.995	1.000	≥ 0.663
DH5	2480.0	0.937	1.000	≥ 0.625
3DH5	2402.0	1.303	1.000	≥ 0.869
3DH5	2441.0	1.302	1.000	≥ 0.868
3DH5	2480.0	1.305	1.000	≥ 0.870

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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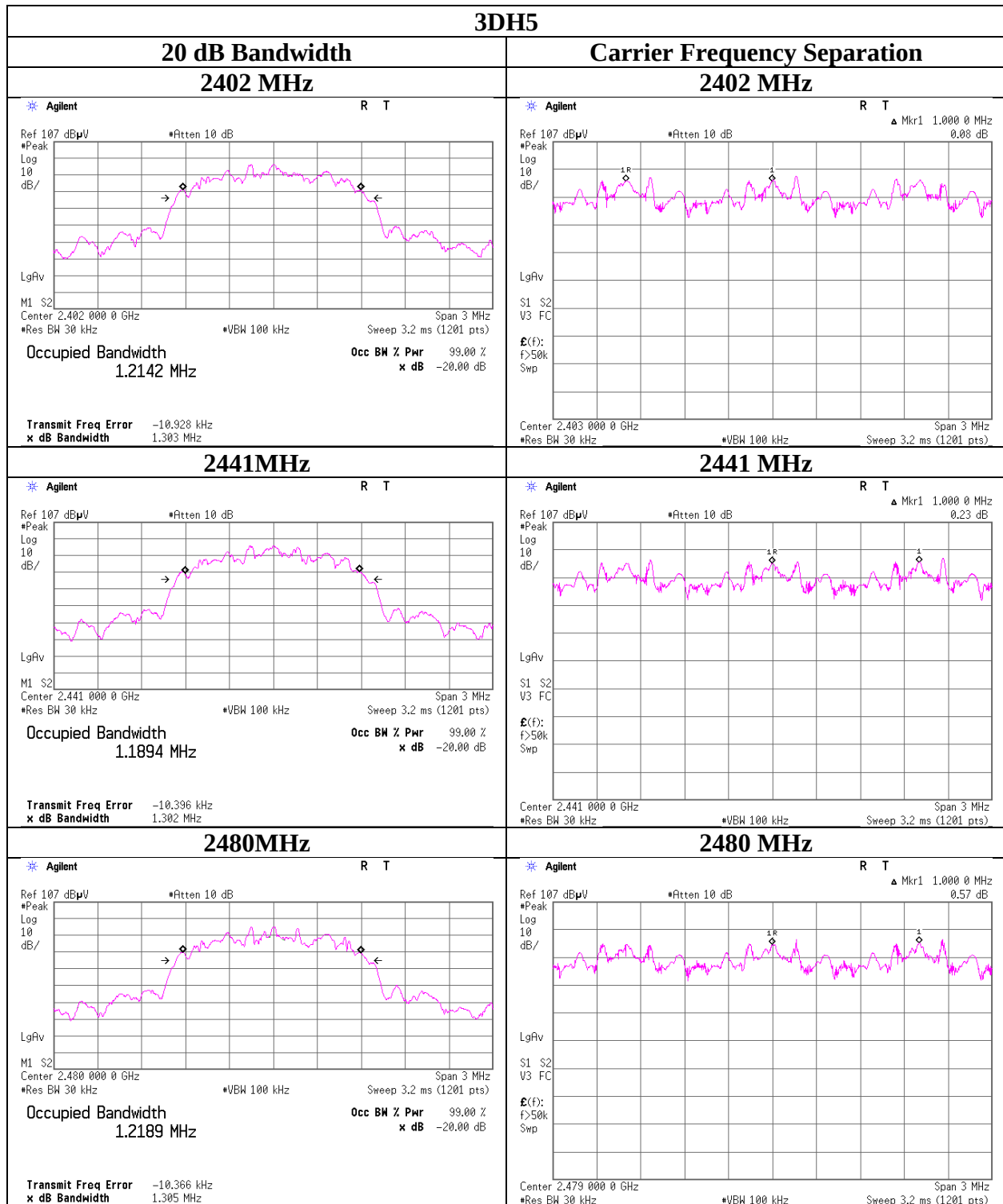
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20dB Bandwidth and Carrier Frequency Separation



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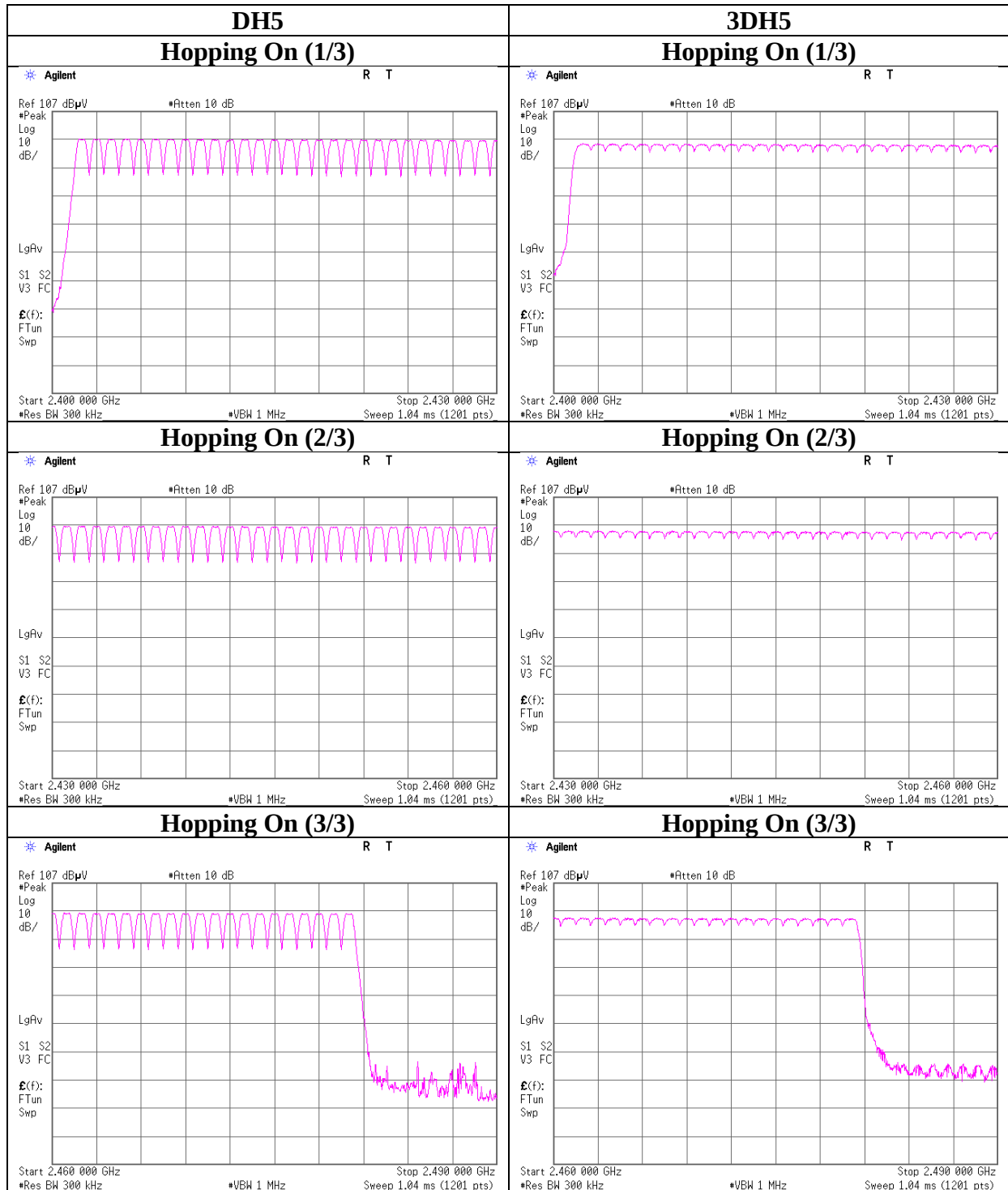
Number of Hopping Frequency

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11017362H
Date November 25, 2015
Temperature / Humidity 23 deg. C / 36 % RH
Engineer Hironobu Ohnishi
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



Dwell time

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
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	49.0 times / 5 sec. x 31.6 sec. = 310 times	0.3996	124	400
DH3	24.6 times / 5 sec. x 31.6 sec. = 156 times	1.656	258	400
DH5	18.0 times / 5 sec. x 31.6 sec. = 114 times	2.904	331	400
3DH1	49.0 times / 5 sec. x 31.6 sec. = 310 times	0.4275	133	400
3DH3	25.8 times / 5 sec. x 31.6 sec. = 164 times	1.679	275	400
3DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.930	316	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

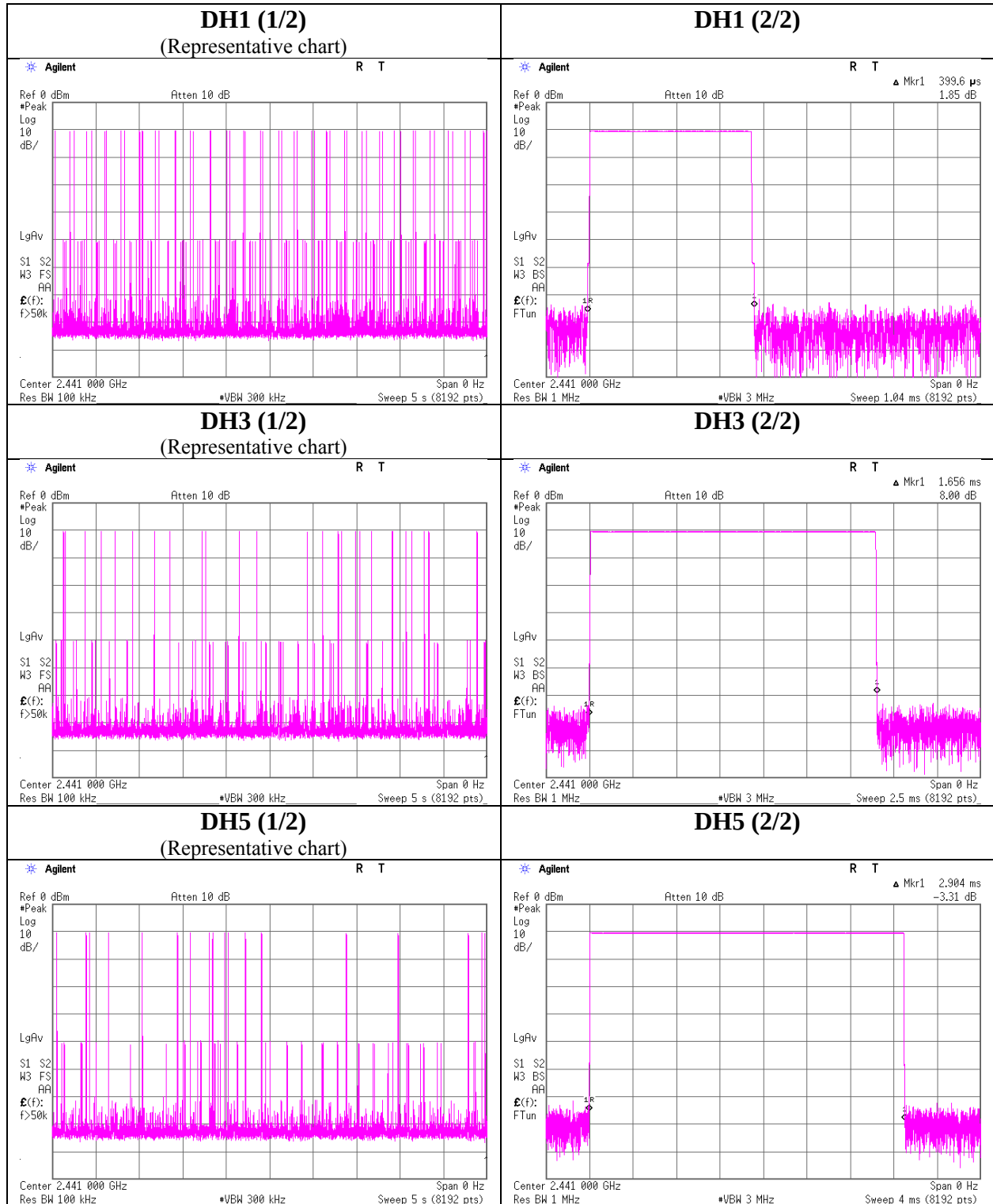
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	48	47	49	51	49.0
DH3	25	24	24	23	27	24.6
DH5	18	15	20	19	18	18.0
3DH1	48	50	49	49	49	49.0
3DH3	22	27	24	28	28	25.8
3DH5	19	14	22	13	17	17.0

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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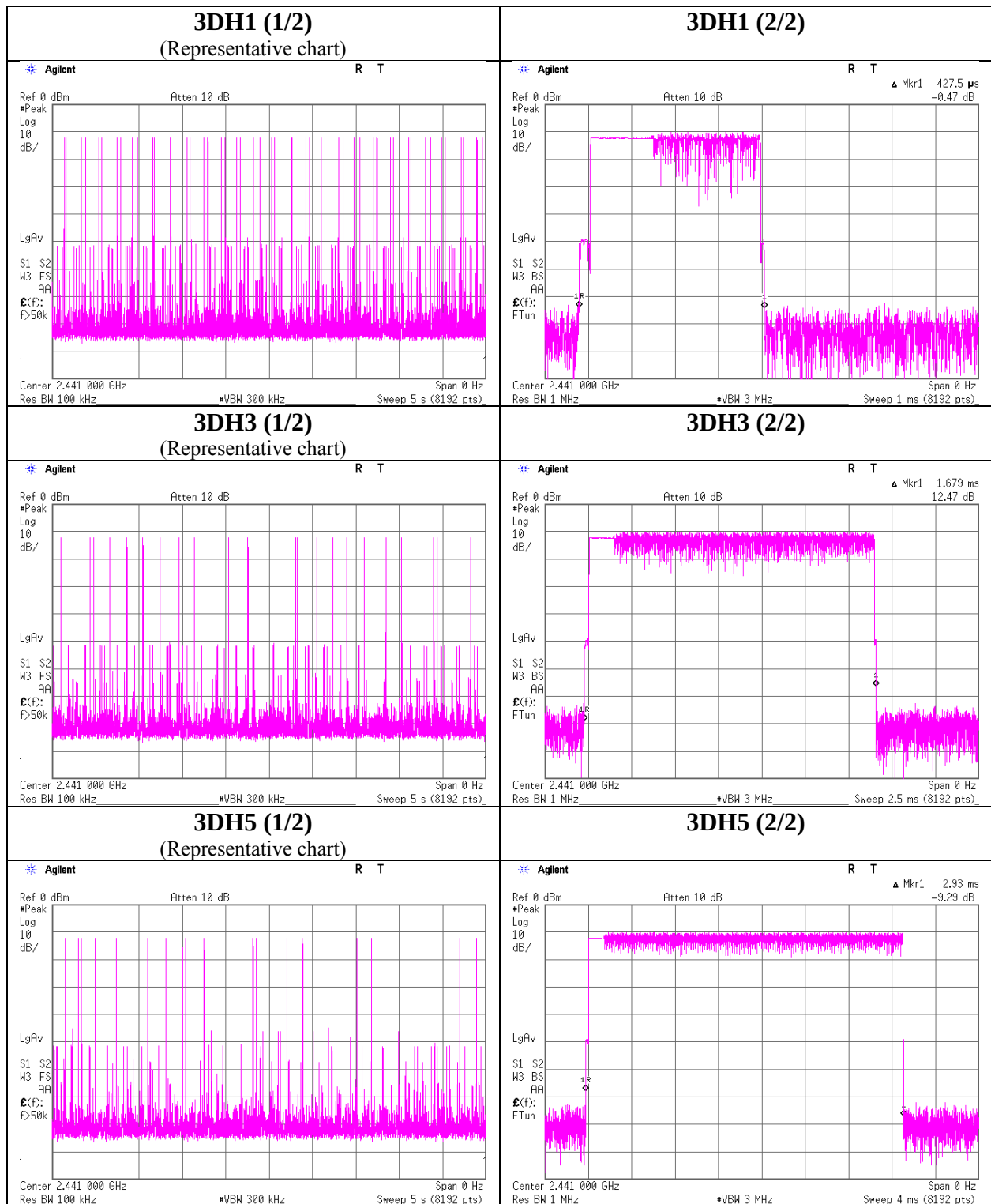
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Dwell time



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Maximum Peak Output Power

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
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	-9.78	0.67	9.53	0.42	1.10	20.96	125	20.54
DH5	2441.0	-10.37	0.67	9.54	-0.16	0.96	20.96	125	21.12
DH5	2480.0	-10.89	0.67	9.54	-0.68	0.86	20.96	125	21.64
2DH5	2402.0	-9.31	0.67	9.53	0.89	1.23	20.96	125	20.07
2DH5	2441.0	-9.88	0.67	9.54	0.33	1.08	20.96	125	20.63
2DH5	2480.0	-10.36	0.67	9.54	-0.15	0.97	20.96	125	21.11
3DH5	2402.0	-8.96	0.67	9.53	1.24	1.33	20.96	125	19.72
3DH5	2441.0	-9.46	0.67	9.54	0.75	1.19	20.96	125	20.21
3DH5	2480.0	-10.05	0.67	9.54	0.16	1.04	20.96	125	20.80

Sample Calculation:

Result = Reading + Cable Loss (including the cable 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.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-11.26	0.67	9.53	-1.06	0.78	1.11	0.05	1.01
DH5	2441.0	-11.91	0.67	9.54	-1.70	0.68	1.11	-0.59	0.87
DH5	2480.0	-12.46	0.67	9.54	-2.25	0.60	1.11	-1.14	0.77
2DH5	2402.0	-13.15	0.67	9.53	-2.95	0.51	1.07	-1.88	0.65
2DH5	2441.0	-13.81	0.67	9.54	-3.60	0.44	1.07	-2.53	0.56
2DH5	2480.0	-14.36	0.67	9.54	-4.15	0.38	1.07	-3.08	0.49
3DH5	2402.0	-13.13	0.67	9.53	-2.93	0.51	1.06	-1.87	0.65
3DH5	2441.0	-13.79	0.67	9.54	-3.58	0.44	1.06	-2.52	0.56
3DH5	2480.0	-14.32	0.67	9.54	-4.11	0.39	1.06	-3.05	0.50

Sample Calculation:

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

Result (Burst power) = Frame power + Duty factor

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

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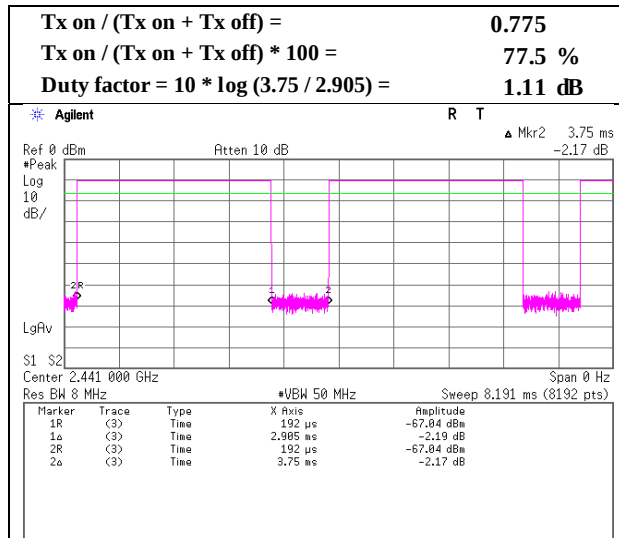
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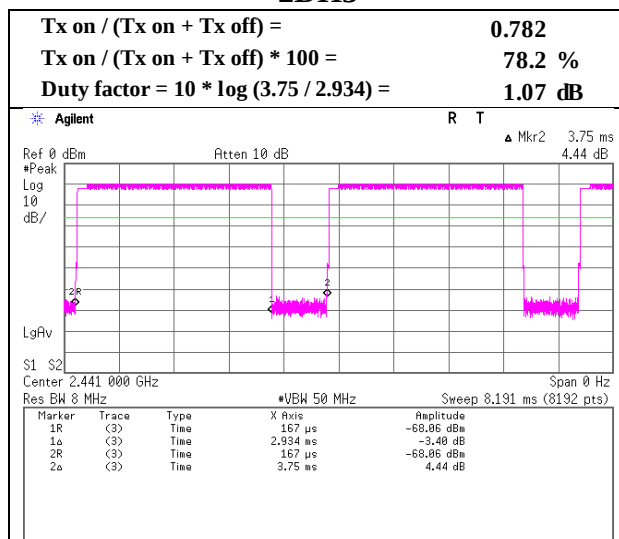
Burst Rate Confirmation

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx, Hopping Off

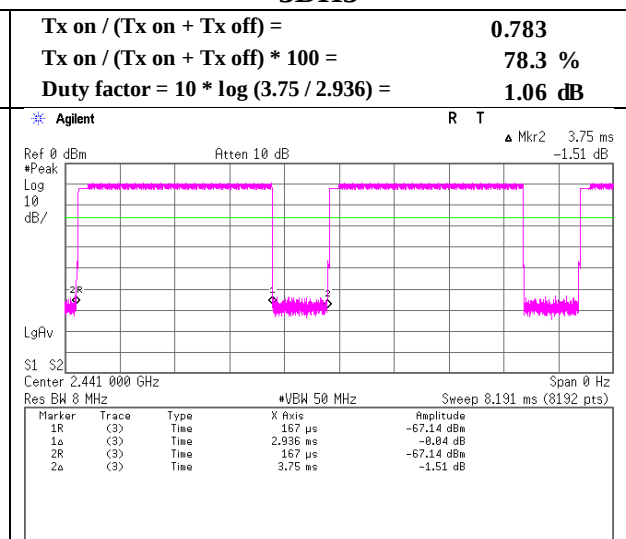
DH5



2DH5



3DH5



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Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11017362H
Date : December 1, 2015
Temperature / Humidity : 23 deg. C / 42 % RH
Engineer : Tsubasa Takayama
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	97.950	QP	36.3	9.4	8.0	32.2	21.5	43.5	22.0	
Hori	129.900	QP	32.4	13.3	8.4	32.2	21.9	43.5	21.6	
Hori	286.050	QP	30.0	18.9	9.7	32.0	26.6	46.0	19.4	
Hori	520.000	QP	32.0	18.3	11.3	32.1	29.5	46.0	16.5	
Hori	769.003	QP	29.3	21.5	12.7	31.7	31.8	46.0	14.2	
Hori	915.000	QP	28.1	22.5	13.3	30.9	33.0	46.0	13.0	
Hori	2390.000	PK	43.4	26.9	3.3	32.0	41.6	73.9	32.3	
Hori	2400.000	PK	-	-	-	-	-	-	-	See 20dBc Data Sheet
Hori	4804.000	PK	42.3	31.8	4.7	31.3	47.5	73.9	26.4	
Hori	7206.000	PK	40.2	36.0	6.7	32.0	50.9	73.9	23.0	Floor noise
Hori	9608.000	PK	39.8	38.2	7.5	32.4	53.1	73.9	20.8	Floor noise
Hori	2390.000	AV	30.2	26.9	3.3	32.0	28.4	53.9	25.5	
Hori	4804.000	AV	32.0	31.8	5.5	31.3	38.0	53.9	15.9	
Hori	7206.000	AV	29.5	36.0	6.7	32.0	40.2	53.9	13.7	Floor noise
Hori	9608.000	AV	30.2	38.2	7.5	32.4	43.5	53.9	10.5	Floor noise
Vert	37.200	QP	37.2	14.9	7.1	32.3	26.9	40.0	13.1	
Vert	96.150	QP	37.6	9.1	8.0	32.2	22.5	43.5	21.0	
Vert	124.050	QP	36.8	12.8	8.3	32.2	25.7	43.5	17.8	
Vert	499.192	QP	31.8	17.9	11.3	32.1	28.9	46.0	17.1	
Vert	520.000	QP	32.0	18.3	11.3	32.1	29.5	46.0	16.5	
Vert	546.000	QP	32.8	18.6	11.4	32.1	30.7	46.0	15.3	
Vert	2390.000	PK	44.5	26.9	3.3	32.0	42.7	73.9	31.2	
Vert	2400.000	PK	-	-	-	-	-	-	-	See 20dBc Data Sheet
Vert	4804.000	PK	41.7	31.8	5.5	31.3	47.7	73.9	26.2	
Vert	7206.000	PK	41.9	36.0	6.7	32.0	52.6	73.9	21.3	Floor noise
Vert	9608.000	PK	39.8	38.2	7.5	32.4	53.1	73.9	20.8	Floor noise
Vert	2390.000	AV	30.6	26.9	3.3	32.0	28.8	53.9	25.1	
Vert	4804.000	AV	32.3	31.8	5.5	31.3	38.3	53.9	15.6	
Vert	7206.000	AV	30.3	36.0	6.7	32.0	41.0	53.9	12.9	Floor noise
Vert	9608.000	AV	30.2	38.2	7.5	32.4	43.5	53.9	10.4	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

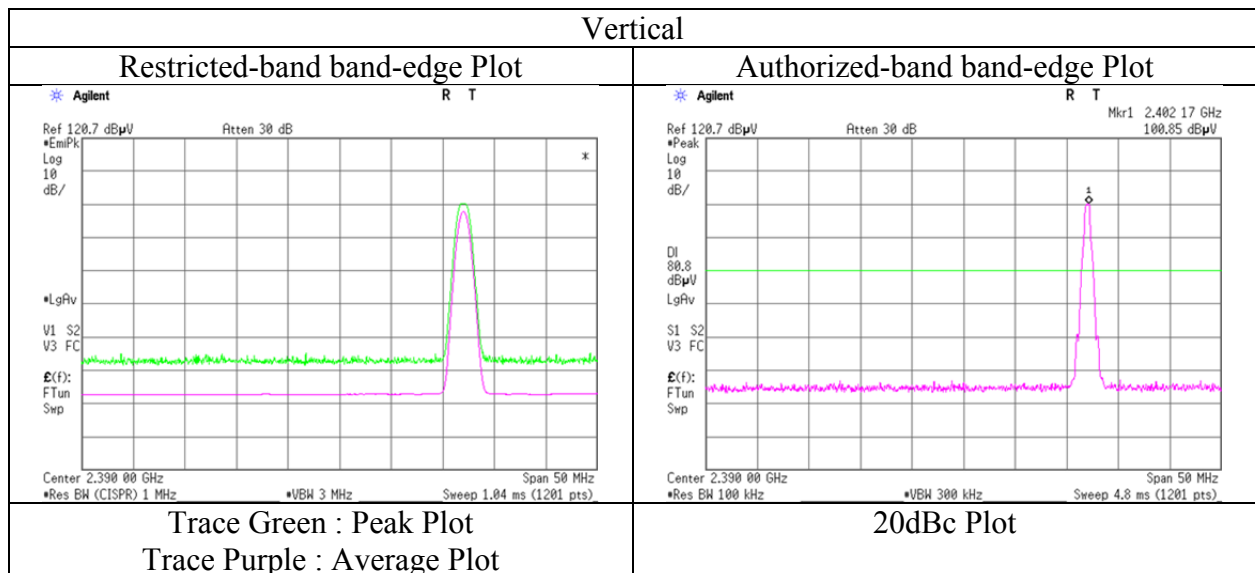
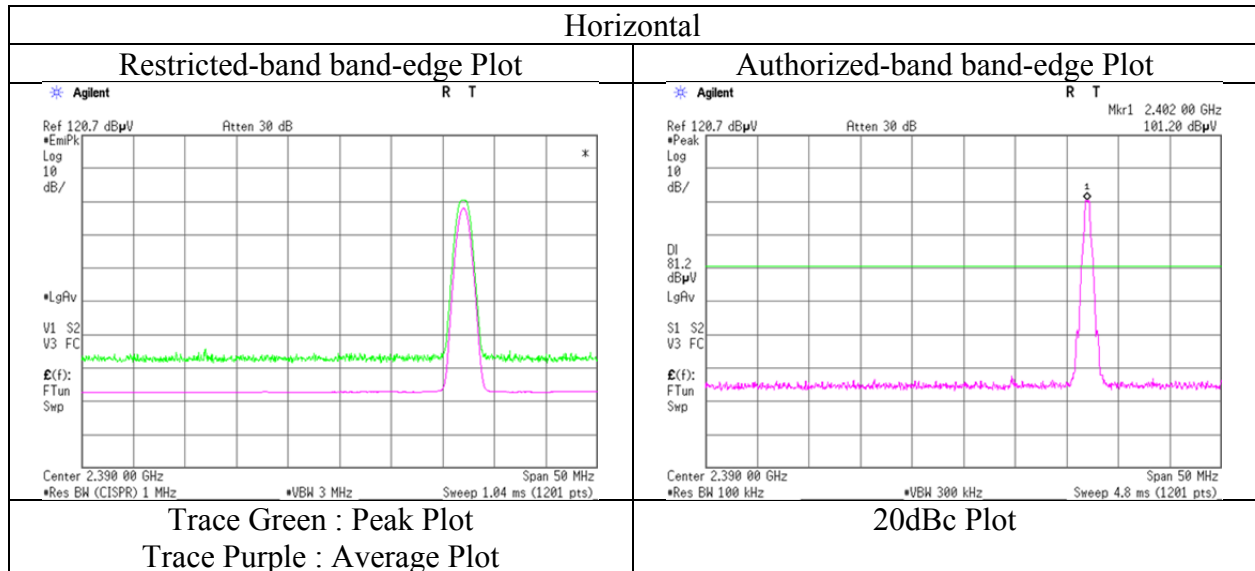
20dBc Data Sheet

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	101.2	26.9	3.3	32.0	99.4	-	-	Carrier
Hori	2400.000	PK	46.4	26.9	3.3	32.0	44.6	79.4	34.8	
Vert	2402.000	PK	100.9	26.9	3.3	32.0	99.1	-	-	Carrier
Vert	2400.000	PK	45.1	26.9	3.3	32.0	43.3	79.1	35.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11017362H
Date	December 1, 2015
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Tsubasa Takayama
Mode	Tx, Hopping Off, DH5 2402 MHz



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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11017362H
Date : December 1, 2015
Temperature / Humidity : 23 deg. C / 42 % RH
Engineer : Tsubasa Takayama
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	97.950	QP	36.3	9.4	8.0	32.2	21.5	43.5	22.0	
Hori	129.900	QP	32.6	13.3	8.4	32.2	22.1	43.5	21.4	
Hori	286.050	QP	30.2	18.9	9.7	32.0	26.8	46.0	19.2	
Hori	520.000	QP	32.0	18.3	11.3	32.1	29.5	46.0	16.5	
Hori	769.003	QP	29.2	21.5	12.7	31.7	31.7	46.0	14.3	
Hori	915.000	QP	28.0	22.5	13.3	30.9	32.9	46.0	13.1	
Hori	4882.000	PK	43.3	31.9	5.5	31.3	49.4	73.9	24.5	
Hori	7323.000	PK	41.2	36.0	6.8	32.0	52.0	73.9	21.9	Floor noise
Hori	9764.000	PK	40.0	38.2	7.5	32.5	53.2	73.9	20.7	Floor noise
Hori	4882.000	AV	32.8	31.9	5.5	31.3	38.9	53.9	15.0	
Hori	7323.000	AV	30.3	36.0	6.8	32.0	41.1	53.9	12.8	Floor noise
Hori	9764.000	AV	30.2	38.2	7.5	32.5	43.4	53.9	10.5	Floor noise
Vert	37.200	QP	37.0	14.9	7.1	32.3	26.7	40.0	13.3	
Vert	96.150	QP	37.2	9.1	8.0	32.2	22.1	43.5	21.4	
Vert	124.050	QP	36.8	12.8	8.3	32.2	25.7	43.5	17.8	
Vert	499.192	QP	31.8	17.9	11.3	32.1	28.9	46.0	17.1	
Vert	520.000	QP	32.1	18.3	11.3	32.1	29.6	46.0	16.4	
Vert	546.000	QP	32.8	18.6	11.4	32.1	30.7	46.0	15.3	
Vert	4882.000	PK	43.1	31.9	5.5	31.3	49.2	73.9	24.7	
Vert	7323.000	PK	41.4	36.0	6.8	32.0	52.2	73.9	21.7	Floor noise
Vert	9764.000	PK	40.7	38.2	7.5	32.5	53.9	73.9	20.0	Floor noise
Vert	4882.000	AV	32.7	31.9	5.5	31.3	38.8	53.9	15.1	
Vert	7323.000	AV	31.3	36.0	6.8	32.0	42.1	53.9	11.8	Floor noise
Vert	9764.000	AV	31.0	38.2	7.5	32.5	44.2	53.9	9.7	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11017362H
Date : December 1, 2015
Temperature / Humidity : 23 deg. C / 42 % RH
Engineer : Tsubasa Takayama
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	97.950	QP	36.7	9.4	8.0	32.2	21.9	43.5	21.6	
Hori	129.900	QP	32.6	13.3	8.4	32.2	22.1	43.5	21.4	
Hori	286.050	QP	30.2	18.9	9.7	32.0	26.8	46.0	19.2	
Hori	520.000	QP	32.3	18.3	11.3	32.1	29.8	46.0	16.2	
Hori	769.003	QP	29.7	21.5	12.7	31.7	32.2	46.0	13.8	
Hori	915.000	QP	28.3	22.5	13.3	30.9	33.2	46.0	12.8	
Hori	2483.500	PK	44.7	26.9	3.3	32.0	42.9	73.9	31.0	
Hori	4960.000	PK	42.3	32.1	5.4	31.2	48.6	73.9	25.3	
Hori	7440.000	PK	41.2	36.0	6.7	32.1	51.8	73.9	22.1	Floor noise
Hori	9920.000	PK	41.1	38.2	7.6	32.5	54.4	73.9	19.5	Floor noise
Hori	2483.500	AV	31.4	26.9	3.3	32.0	29.6	53.9	24.3	
Hori	4960.000	AV	31.9	32.1	5.4	31.2	38.2	53.9	15.7	
Hori	7440.000	AV	30.4	36.0	6.7	32.1	41.0	53.9	12.9	Floor noise
Hori	9920.000	AV	30.5	38.2	7.6	32.5	43.8	53.9	10.1	Floor noise
Vert	37.200	QP	37.3	14.9	7.1	32.3	27.0	40.0	13.0	
Vert	96.150	QP	37.0	9.1	8.0	32.2	21.9	43.5	21.6	
Vert	124.050	QP	36.8	12.8	8.3	32.2	25.7	43.5	17.8	
Vert	499.192	QP	32.5	17.9	11.3	32.1	29.6	46.0	16.4	
Vert	520.000	QP	32.0	18.3	11.3	32.1	29.5	46.0	16.5	
Vert	546.000	QP	32.7	18.6	11.4	32.1	30.6	46.0	15.4	
Vert	2483.500	PK	43.3	26.9	3.3	32.0	41.5	73.9	32.4	
Vert	4960.000	PK	43.3	32.1	5.4	31.2	49.6	73.9	24.3	
Vert	7440.000	PK	41.1	36.0	6.7	32.1	51.7	73.9	22.2	Floor noise
Vert	9920.000	PK	41.0	38.2	7.6	32.5	54.3	73.9	19.6	Floor noise
Vert	2483.500	AV	31.2	26.9	3.3	32.0	29.4	53.9	24.5	
Vert	4960.000	AV	32.7	32.1	5.4	31.2	39.0	53.9	14.9	
Vert	7440.000	AV	31.2	36.0	6.7	32.1	41.8	53.9	12.1	Floor noise
Vert	9920.000	AV	30.9	38.2	7.6	32.5	44.2	53.9	9.7	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

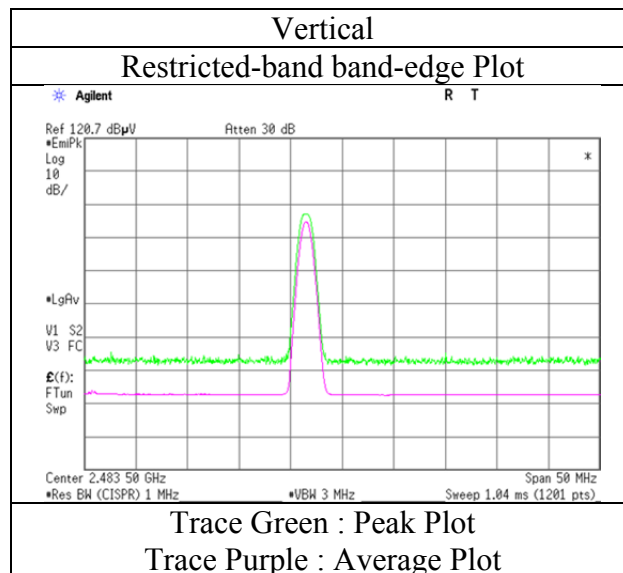
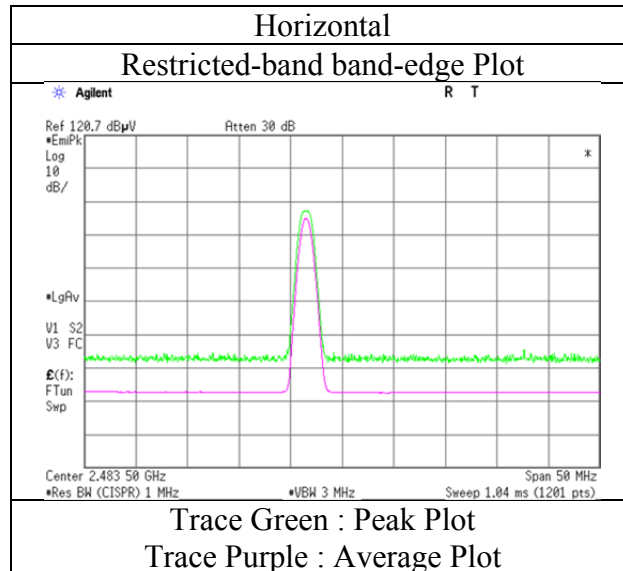
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11017362H
Date	December 1, 2015
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Tsubasa Takayama
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.3 Semi Anechoic Chamber
Report No. : 11017362H
Date : December 1, 2015
Temperature / Humidity : 23 deg. C / 42 % RH
Engineer : Tsubasa Takayama
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	98.065	QP	36.0	9.4	8.0	32.2	21.2	43.5	22.3	
Hori	130.352	QP	32.8	13.4	8.4	32.2	22.4	43.5	21.1	
Hori	286.041	QP	32.0	18.9	9.7	32.0	28.6	46.0	17.4	
Hori	520.000	QP	32.0	18.3	11.3	32.1	29.5	46.0	16.5	
Hori	769.003	QP	29.6	21.5	12.7	31.7	32.1	46.0	13.9	
Hori	915.000	QP	28.9	22.5	13.3	30.9	33.8	46.0	12.2	
Hori	2386.595	PK	63.8	26.9	3.3	32.0	62.0	73.9	11.9	
Hori	2390.000	PK	51.2	26.9	3.3	32.0	49.4	73.9	24.5	
Hori	2400.000	PK	-	-	-	-	-	-	-	- See 20dBc Data Sheet
Hori	4804.000	PK	43.4	31.8	5.5	31.3	49.4	73.9	24.5	
Hori	7206.000	PK	41.0	36.0	6.7	32.0	51.7	73.9	22.2	Floor noise
Hori	9608.000	PK	40.4	38.2	7.5	32.4	53.7	73.9	20.2	Floor noise
Hori	2386.595	AV	31.6	26.9	3.3	32.0	29.8	53.9	24.1	
Hori	2390.000	AV	31.9	26.9	3.3	32.0	30.1	53.9	23.8	
Hori	4804.000	AV	31.9	31.8	5.5	31.3	37.9	53.9	16.0	
Hori	7206.000	AV	30.1	36.0	6.7	32.0	40.8	53.9	13.1	Floor noise
Hori	9608.000	AV	30.2	38.2	7.5	32.4	43.5	53.9	10.5	Floor noise
Vert	37.532	QP	38.2	14.8	7.1	32.3	27.8	40.0	12.2	
Vert	96.398	QP	38.0	9.2	8.0	32.2	23.0	43.5	20.5	
Vert	124.272	QP	37.8	12.8	8.3	32.2	26.7	43.5	16.8	
Vert	499.192	QP	34.0	17.9	11.3	32.1	31.1	46.0	14.9	
Vert	520.000	QP	32.8	18.3	11.3	32.1	30.3	46.0	15.7	
Vert	546.000	QP	31.3	18.6	11.4	32.1	29.2	46.0	16.8	
Vert	2386.460	PK	63.6	26.9	3.3	32.0	61.8	73.9	12.1	
Vert	2390.000	PK	51.5	26.9	3.3	32.0	49.7	73.9	24.2	
Vert	2400.000	PK	-	-	-	-	-	-	-	- See 20dBc Data Sheet
Vert	4804.000	PK	42.9	31.8	5.5	31.3	48.9	73.9	25.0	
Vert	7206.000	PK	42.1	36.0	6.7	32.0	52.8	73.9	21.1	Floor noise
Vert	9608.000	PK	40.1	38.2	7.5	32.4	53.4	73.9	20.5	Floor noise
Vert	2386.460	AV	32.4	26.9	3.3	32.0	30.6	53.9	23.3	
Vert	2390.000	AV	31.9	26.9	3.3	32.0	30.1	53.9	23.8	
Vert	4804.000	AV	32.8	31.8	5.5	31.3	38.8	53.9	15.1	
Vert	7206.000	AV	31.0	36.0	6.7	32.0	41.7	53.9	12.2	Floor noise
Vert	9608.000	AV	30.2	38.2	7.5	32.4	43.5	53.9	10.4	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5dB

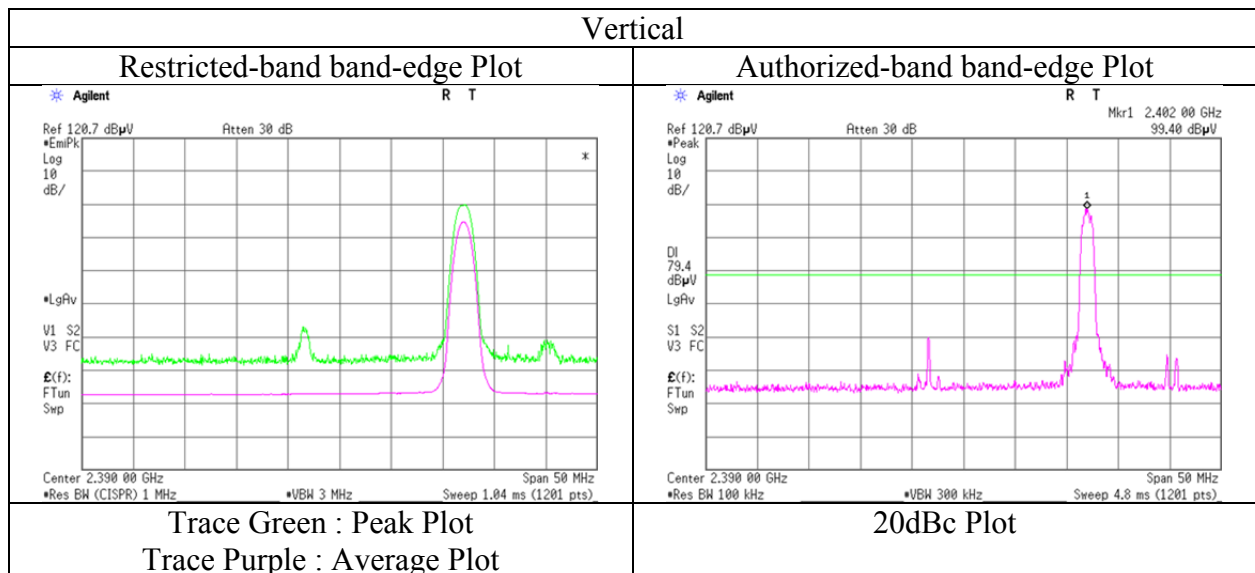
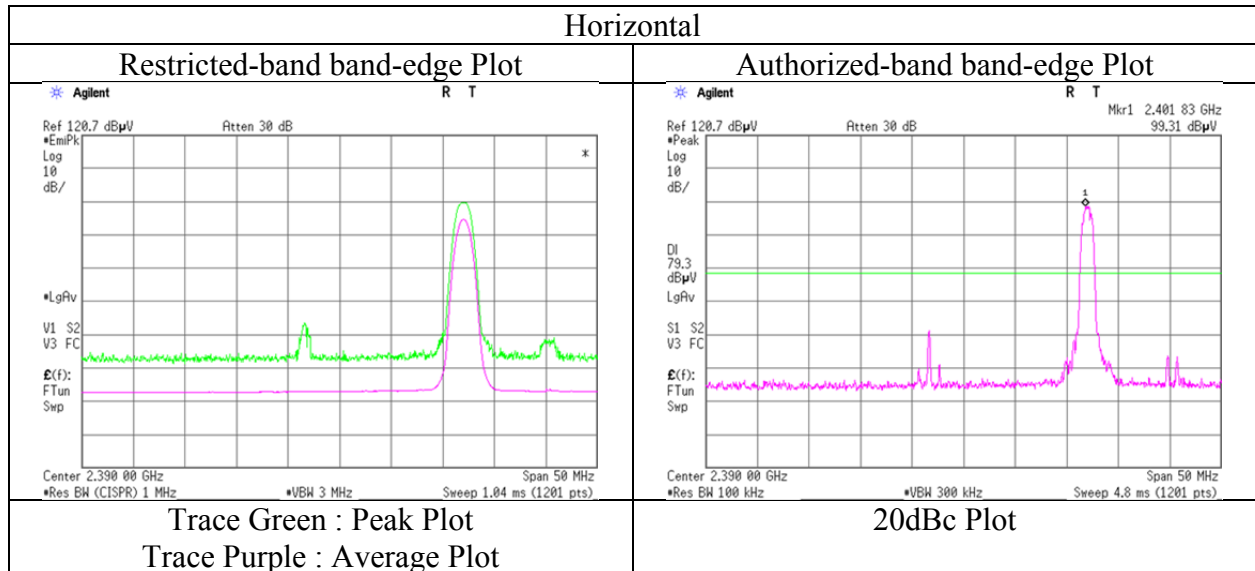
20dBc Data Sheet

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	99.3	26.9	3.3	32.0	97.5	-	-	Carrier
Hori	2400.000	PK	53.4	26.9	3.3	32.0	51.6	77.5	25.9	
Vert	2402.000	PK	99.4	26.9	3.3	32.0	97.6	-	-	Carrier
Vert	2400.000	PK	53.2	26.9	3.3	32.0	51.4	77.6	26.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11017362H
Date	December 1, 2015
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Tsubasa Takayama
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

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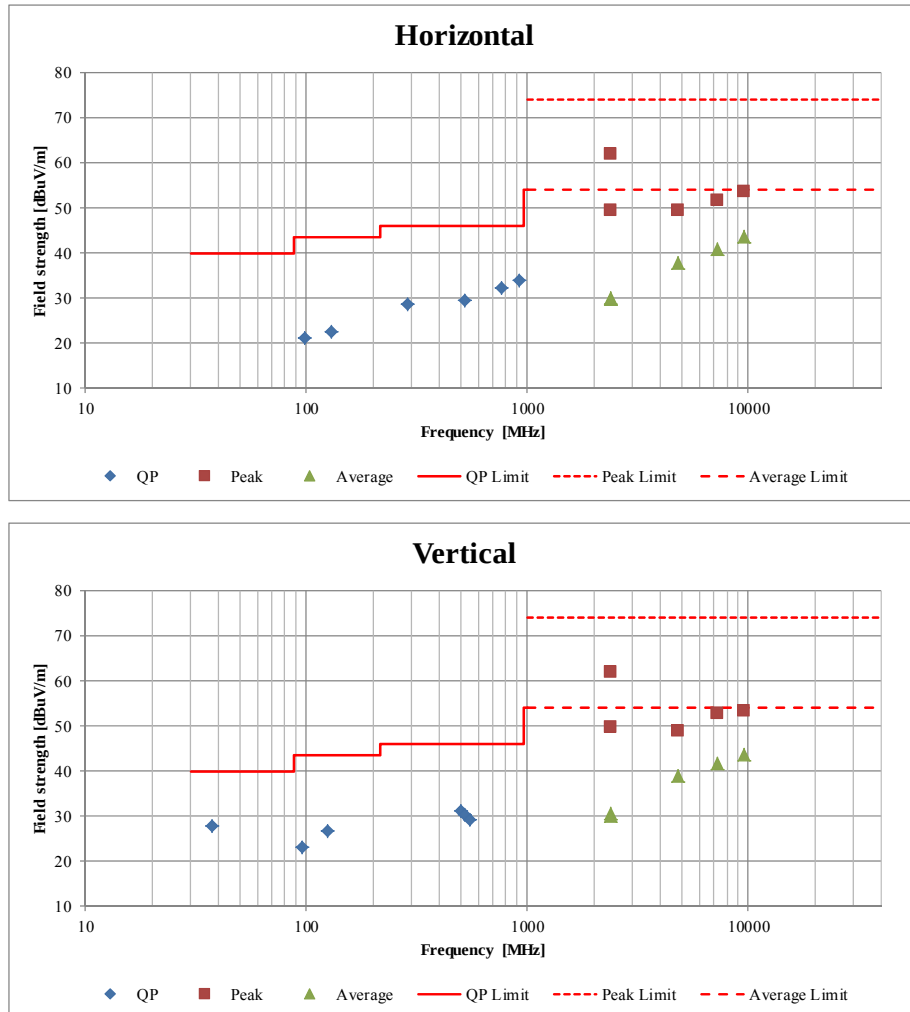
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11017362H
Date : December 1, 2015
Temperature / Humidity : 23 deg. C / 42 % RH
Engineer : Tsubasa Takayama
Mode : Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11017362H
Date : December 1, 2015
Temperature / Humidity : 23 deg. C / 42 % RH
Engineer : Tsubasa Takayama
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	97.940	QP	36.3	9.4	8.0	32.2	21.5	43.5	22.0	
Hori	129.923	QP	32.5	13.3	8.4	32.2	22.0	43.5	21.5	
Hori	286.041	QP	31.0	18.9	9.7	32.0	27.6	46.0	18.4	
Hori	520.000	QP	32.0	18.3	11.3	32.1	29.5	46.0	16.5	
Hori	769.003	QP	29.6	21.5	12.7	31.7	32.1	46.0	13.9	
Hori	915.000	QP	28.6	22.5	13.3	30.9	33.5	46.0	12.5	
Hori	2344.985	PK	61.9	26.8	3.2	32.1	59.8	73.9	14.1	
Hori	4882.000	PK	43.5	31.9	5.5	31.3	49.6	73.9	24.3	
Hori	7323.000	PK	41.1	36.0	6.8	32.0	51.9	73.9	22.0	Floor noise
Hori	9764.000	PK	40.2	38.2	7.5	32.5	53.4	73.9	20.5	Floor noise
Hori	2344.985	AV	31.8	26.8	3.2	32.1	29.7	53.9	24.2	
Hori	4882.000	AV	32.0	31.9	5.5	31.3	38.1	53.9	15.8	
Hori	7323.000	AV	30.3	36.0	6.8	32.0	41.1	53.9	12.8	Floor noise
Hori	9764.000	AV	30.2	38.2	7.5	32.5	43.4	53.9	10.5	Floor noise
Vert	37.800	QP	37.8	14.7	7.2	32.3	27.4	40.0	12.6	
Vert	96.370	QP	37.0	9.2	8.0	32.2	22.0	43.5	21.5	
Vert	124.061	QP	36.4	12.8	8.3	32.2	25.3	43.5	18.2	
Vert	499.192	QP	33.0	17.9	11.3	32.1	30.1	46.0	15.9	
Vert	520.000	QP	32.4	18.3	11.3	32.1	29.9	46.0	16.1	
Vert	546.000	QP	31.3	18.6	11.4	32.1	29.2	46.0	16.8	
Vert	2345.042	PK	62.2	26.8	3.2	32.1	60.1	73.9	13.8	
Vert	4882.000	PK	43.4	31.9	5.5	31.3	49.5	73.9	24.4	
Vert	7323.000	PK	41.3	36.0	6.8	32.0	52.1	73.9	21.8	Floor noise
Vert	9764.000	PK	40.5	38.2	7.5	32.5	53.7	73.9	20.2	Floor noise
Vert	2345.042	AV	31.4	26.8	3.2	32.1	29.3	53.9	24.6	
Vert	4882.000	AV	32.5	31.9	5.5	31.3	38.6	53.9	15.3	
Vert	7323.000	AV	31.2	36.0	6.8	32.0	42.0	53.9	11.9	Floor noise
Vert	9764.000	AV	31.0	38.2	7.5	32.5	44.2	53.9	9.7	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5dB

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11017362H
Date : December 1, 2015
Temperature / Humidity : 23 deg. C / 42 % RH
Engineer : Tsubasa Takayama
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	97.950	QP	36.0	9.4	8.0	32.2	21.2	43.5	22.3	
Hori	129.900	QP	32.4	13.3	8.4	32.2	21.9	43.5	21.6	
Hori	286.050	QP	31.0	18.9	9.7	32.0	27.6	46.0	18.4	
Hori	520.000	QP	32.1	18.3	11.3	32.1	29.6	46.0	16.4	
Hori	769.003	QP	29.6	21.5	12.7	31.7	32.1	46.0	13.9	
Hori	915.000	QP	28.3	22.5	13.3	30.9	33.2	46.0	12.8	
Hori	2483.500	PK	49.7	26.9	3.3	32.0	47.9	73.9	26.0	
Hori	4960.000	PK	43.2	32.1	5.4	31.2	49.5	73.9	24.4	
Hori	7440.000	PK	41.2	36.0	6.7	32.1	51.8	73.9	22.1	Floor noise
Hori	9920.000	PK	41.4	38.2	7.6	32.5	54.7	73.9	19.2	Floor noise
Hori	2483.500	AV	31.6	26.9	3.3	32.0	29.8	53.9	24.1	
Hori	4960.000	AV	32.0	32.1	5.4	31.2	38.3	53.9	15.6	
Hori	7440.000	AV	30.2	36.0	6.7	32.1	40.8	53.9	13.1	Floor noise
Hori	9920.000	AV	30.4	38.2	7.6	32.5	43.7	53.9	10.2	Floor noise
Vert	37.200	QP	37.8	14.9	7.1	32.3	27.5	40.0	12.5	
Vert	96.150	QP	37.3	9.1	8.0	32.2	22.2	43.5	21.3	
Vert	124.050	QP	36.8	12.8	8.3	32.2	25.7	43.5	17.8	
Vert	499.192	QP	32.8	17.9	11.3	32.1	29.9	46.0	16.1	
Vert	520.000	QP	32.4	18.3	11.3	32.1	29.9	46.0	16.1	
Vert	546.000	QP	31.1	18.6	11.4	32.1	29.0	46.0	17.0	
Vert	2471.140	PK	56.3	26.9	3.3	32.0	54.5	73.9	19.4	
Vert	2483.500	PK	47.7	26.9	3.3	32.0	45.9	73.9	28.0	
Vert	4960.000	PK	43.5	32.1	5.4	31.2	49.8	73.9	24.1	
Vert	7440.000	PK	41.5	36.0	6.7	32.1	52.1	73.9	21.8	Floor noise
Vert	9920.000	PK	41.2	38.2	7.6	32.5	54.5	73.9	19.4	Floor noise
Vert	2471.140	AV	32.1	26.9	3.3	32.0	30.3	53.9	23.6	
Vert	2483.500	AV	33.2	26.9	3.3	32.0	31.4	53.9	22.5	
Vert	4960.000	AV	32.2	32.1	5.4	31.2	38.5	53.9	15.4	
Vert	7440.000	AV	31.1	36.0	6.7	32.1	41.7	53.9	12.2	Floor noise
Vert	9920.000	AV	31.0	38.2	7.6	32.5	44.3	53.9	9.6	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

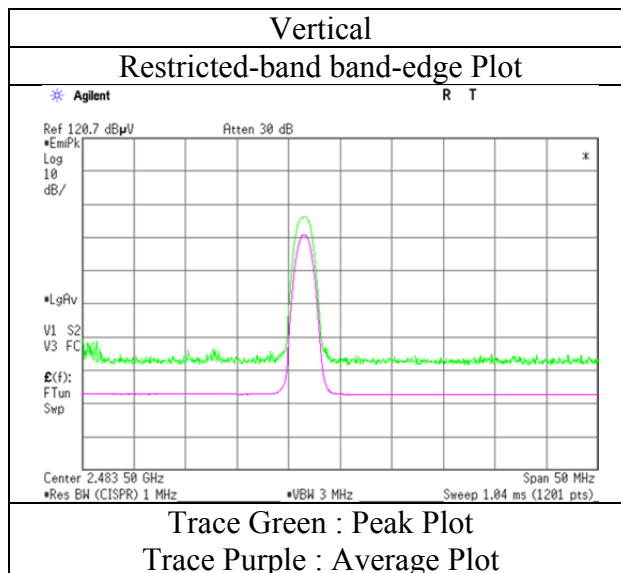
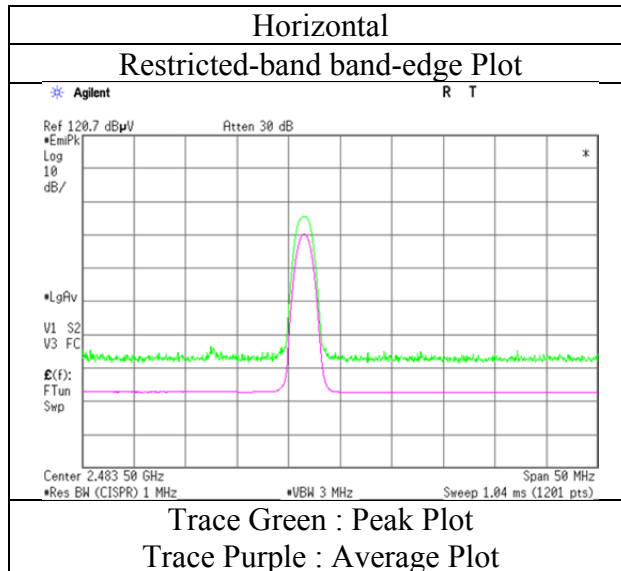
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11017362H
Date	December 1, 2015
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Tsubasa Takayama
Mode	Tx, Hopping Off, 3DH5 2480 MHz

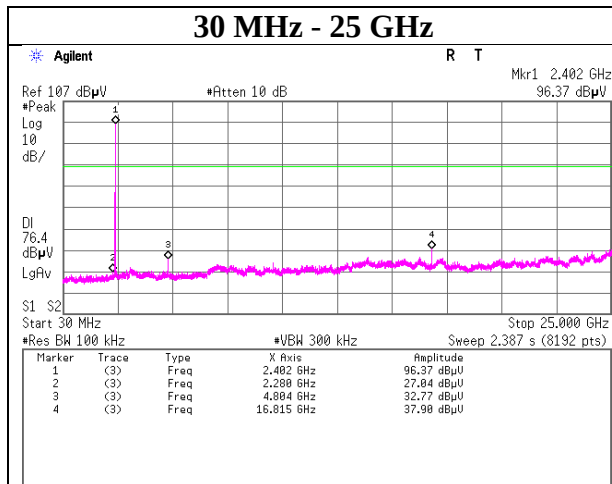
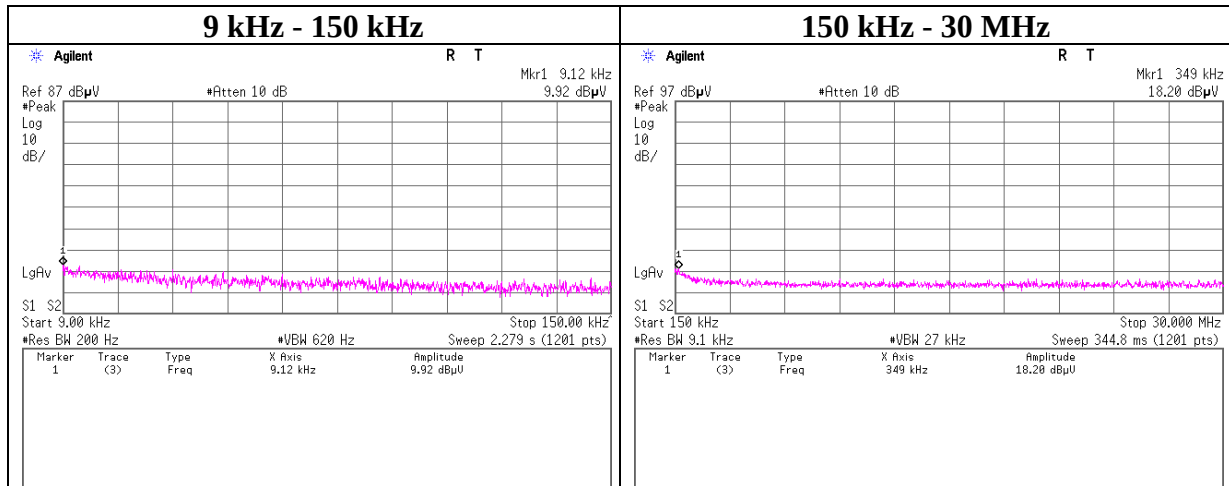


* Final result of restricted band edge was shown in tabular data.

Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx, Hopping Off, DH5

2402 MHz



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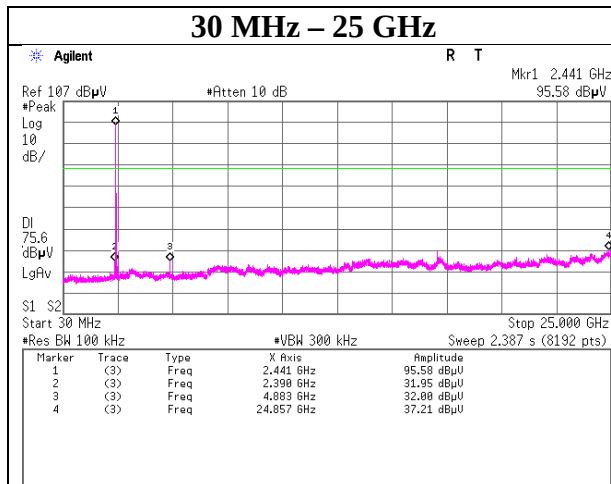
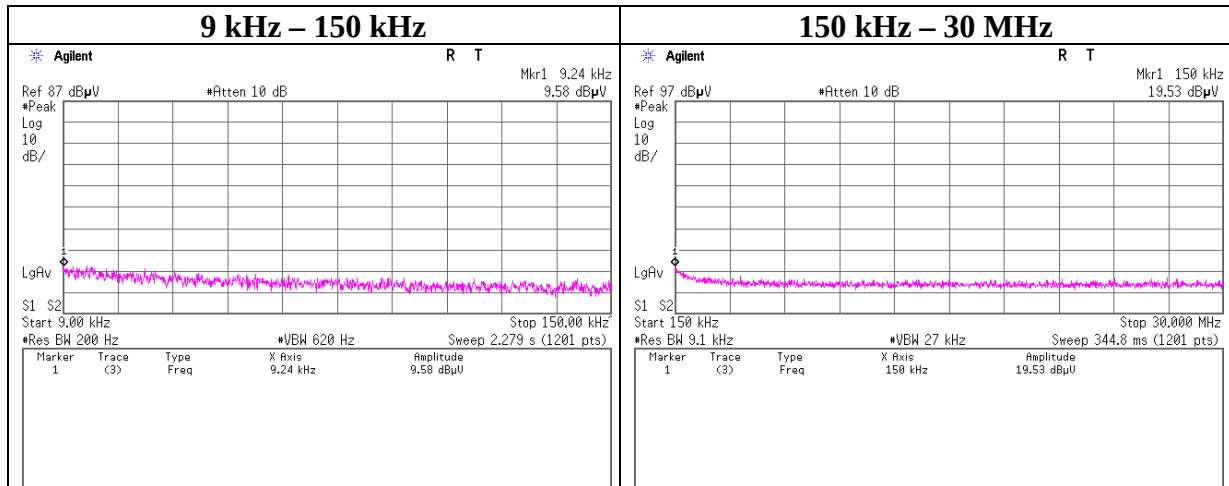
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx, Hopping Off, DH5

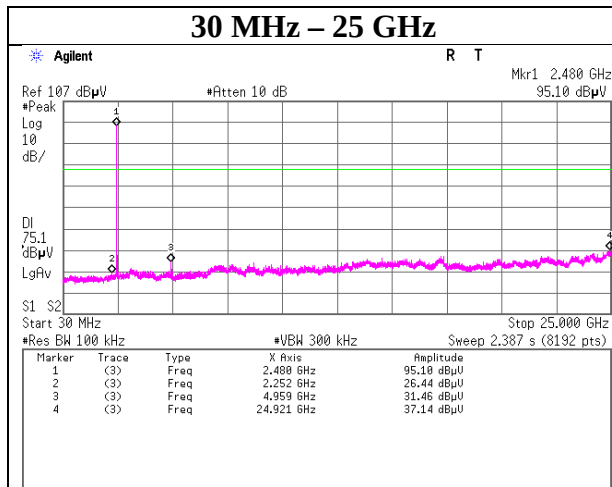
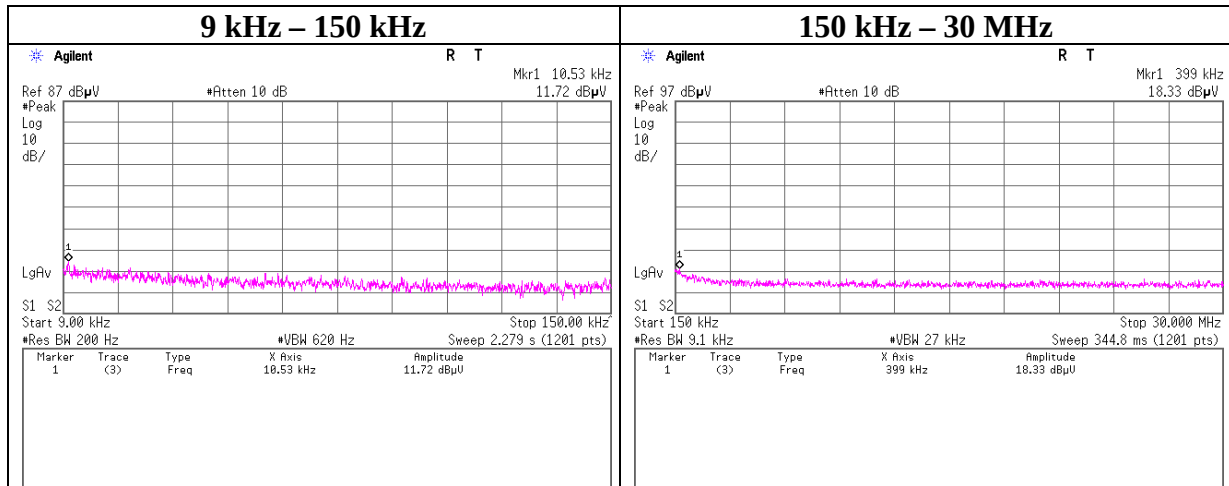
2441 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx, Hopping Off, DH5

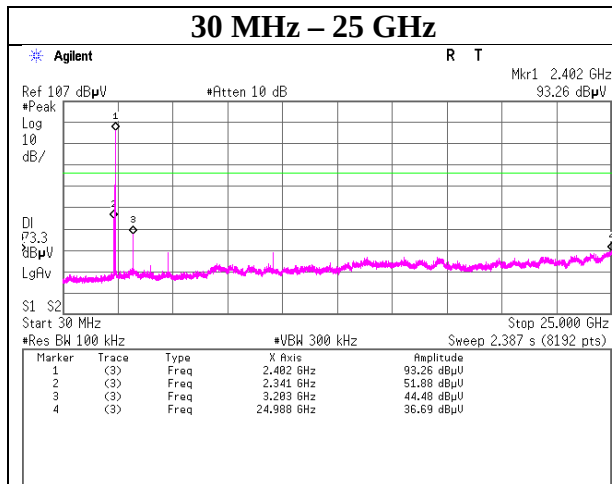
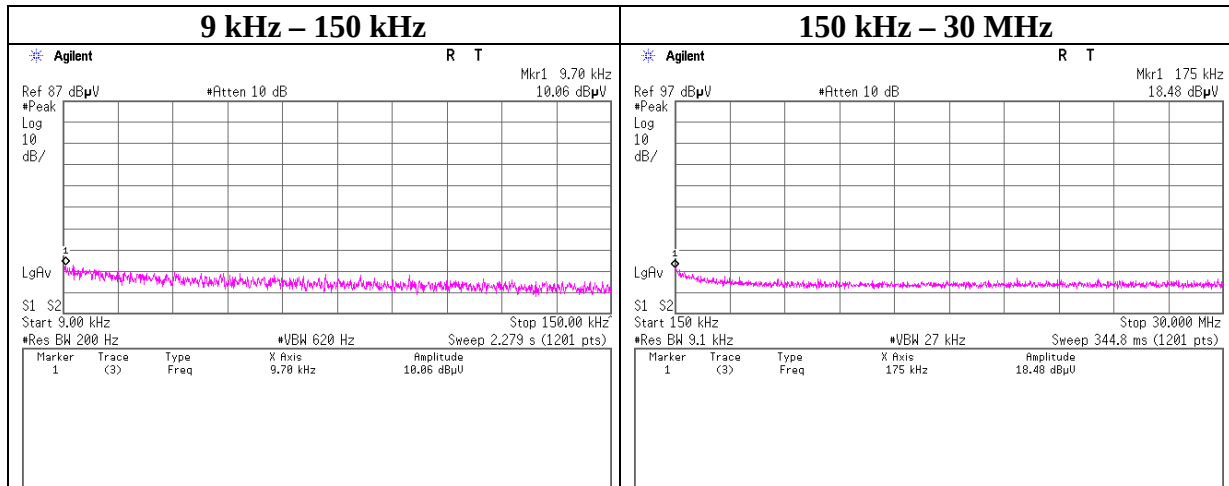
2480 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx, Hopping Off, 3DH5

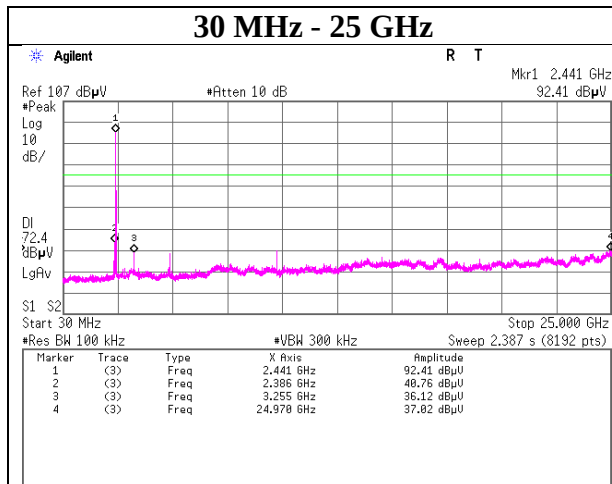
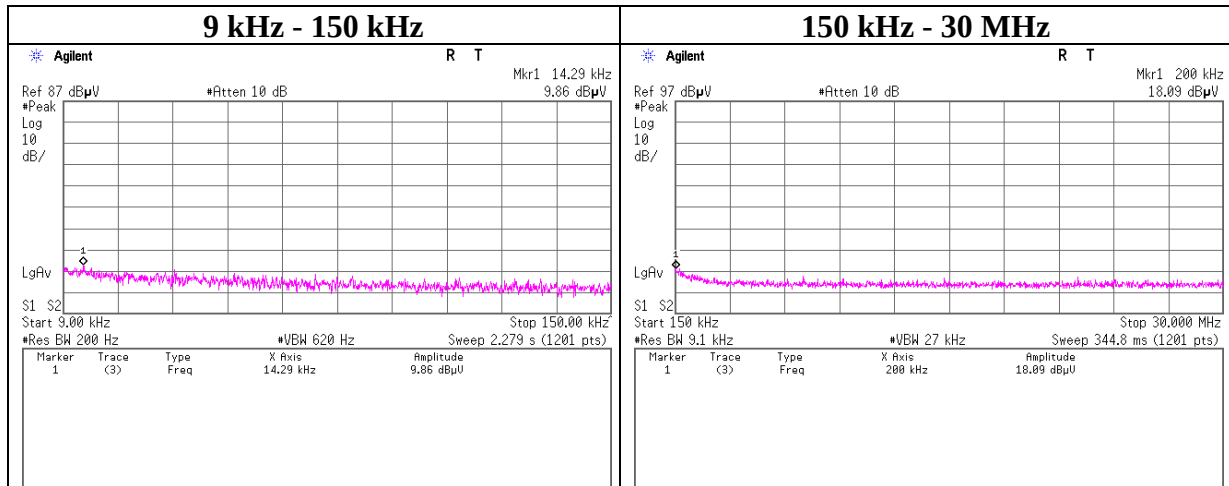
2402 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx, Hopping Off, 3DH5

2441 MHz



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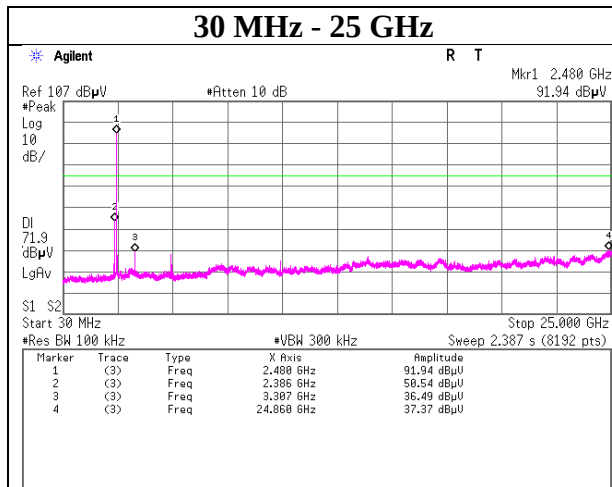
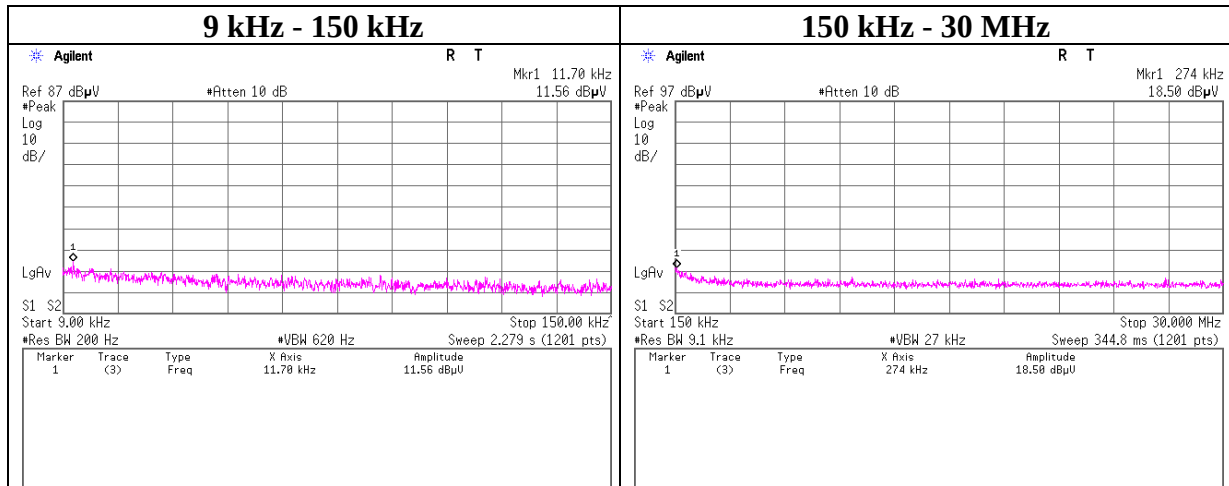
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx, Hopping Off, 3DH5

2480 MHz



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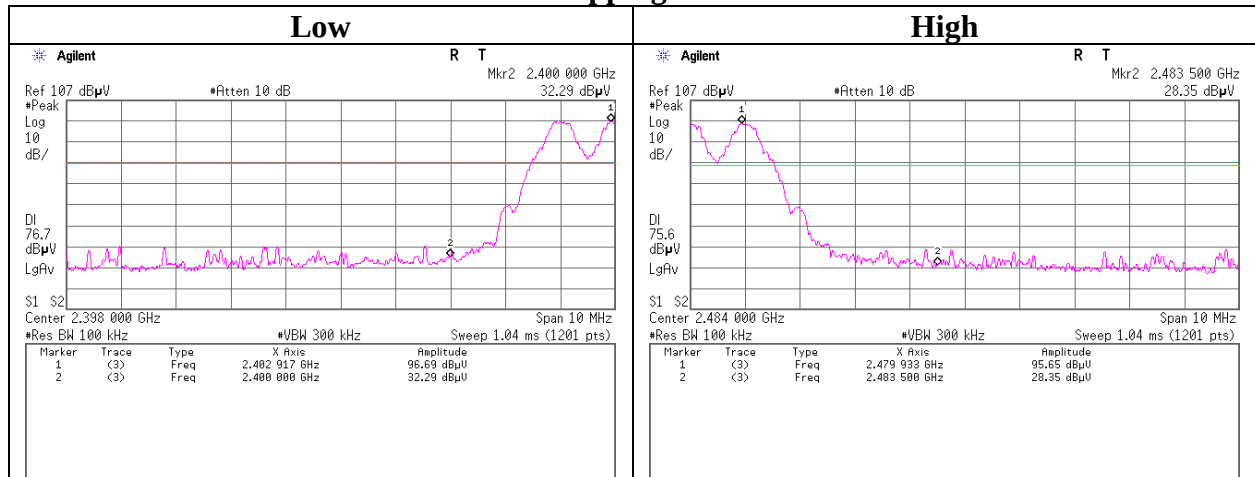
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

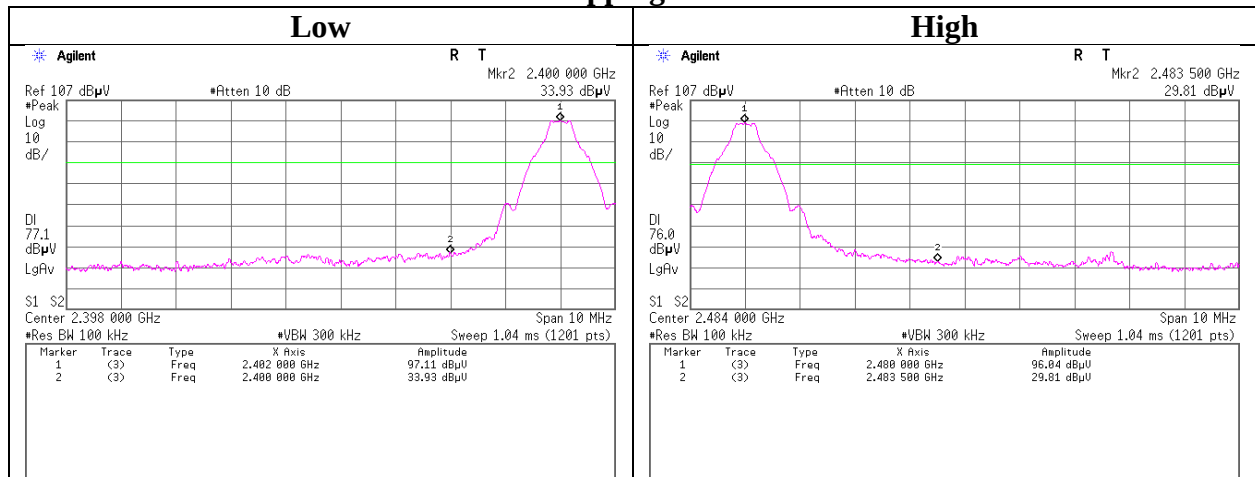
Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx DH5

Hopping On



Hopping Off



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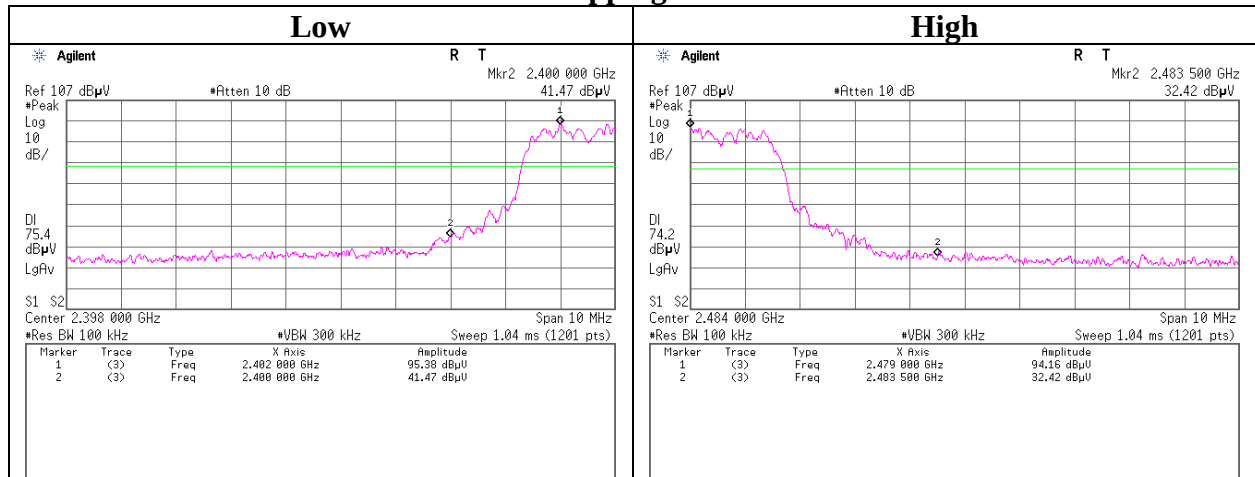
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

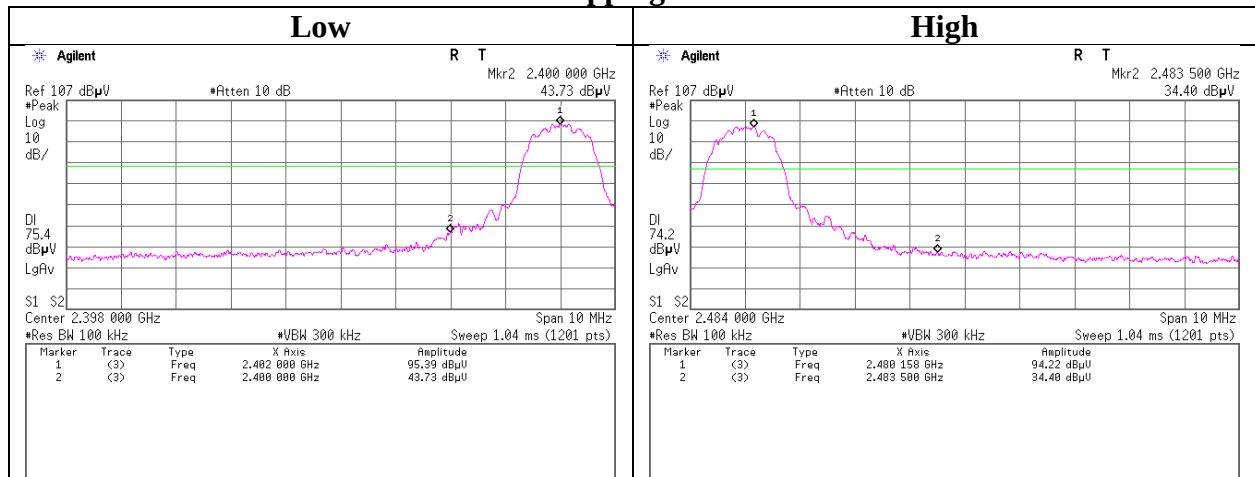
Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx 3DH5

Hopping On



Hopping Off



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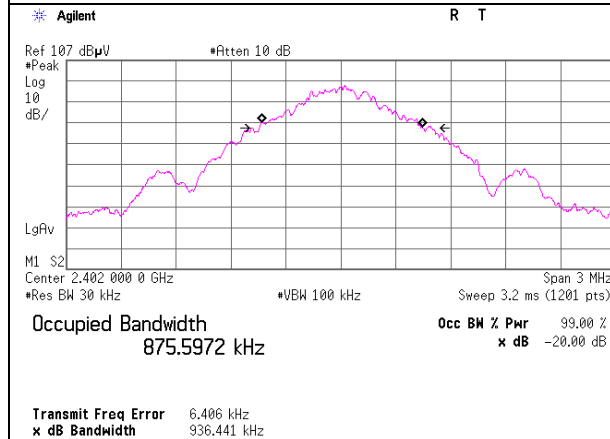
Facsimile : +81 596 24 8124

99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
Mode	Tx Hopping Off

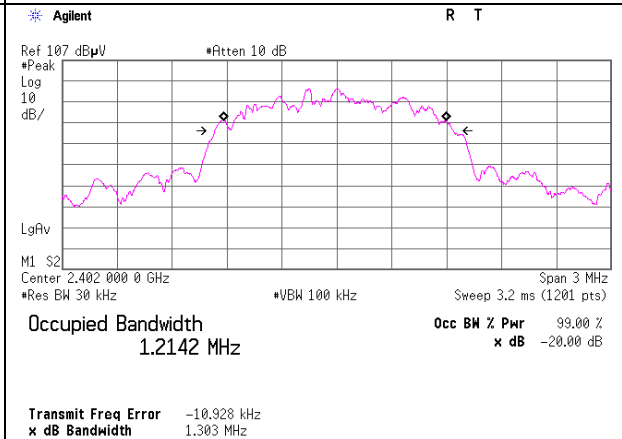
Hopping Off, DH5

2402 MHz

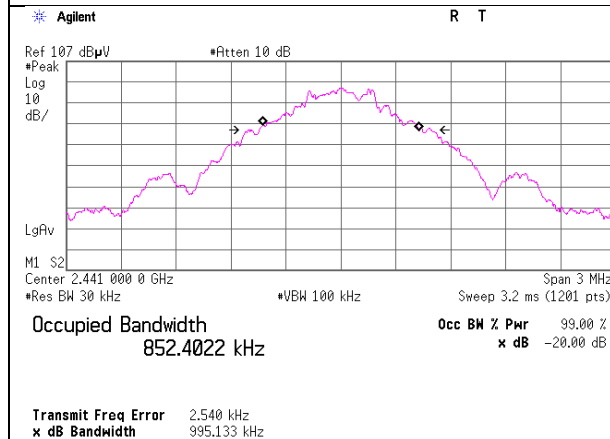


Hopping Off, 3DH5

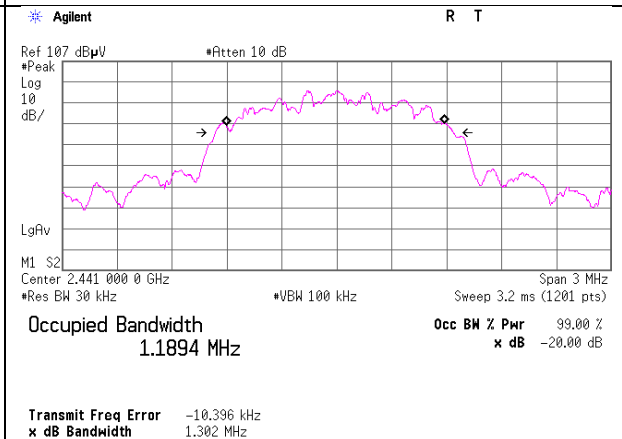
2402 MHz



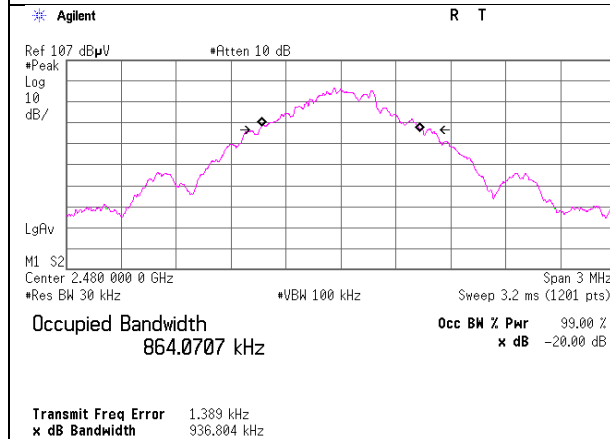
2441 MHz



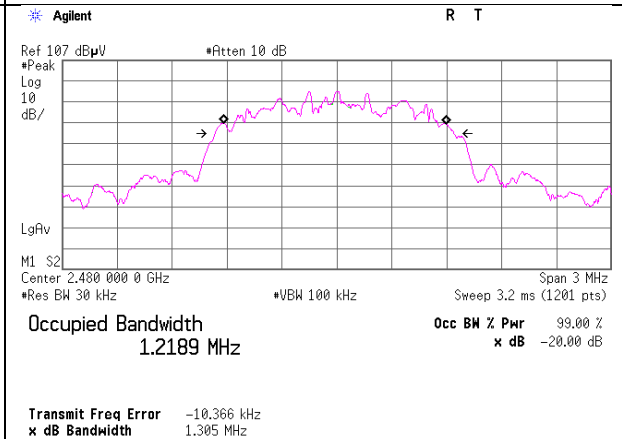
2441 MHz



2480 MHz



2480 MHz



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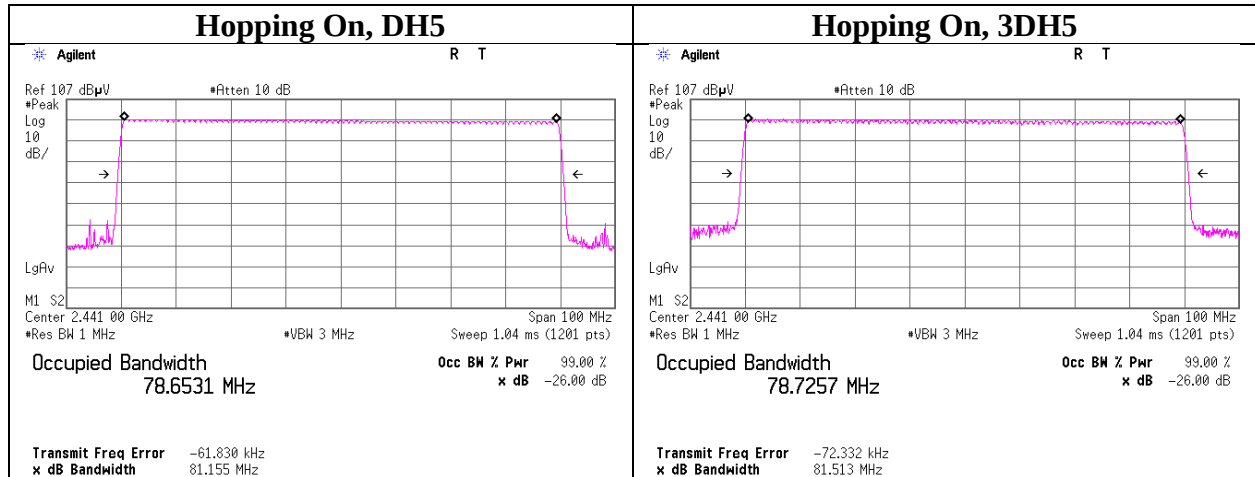
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99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11017362H
Date	November 25, 2015
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Hironobu Ohnishi
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)
MOS-24	Thermo-Hygrometer	Custom	CTH-201	0005	AT	2015/01/13 * 12
MMM-12	DIGITAL HiTESTER	Hioki	3805	060500120	AT	2015/02/05 * 12
MOTS-MATM	Antenna Terminal Measurement Software	UL Japan	-	-	AT	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT	2015/05/18 * 12
MAT-90	Attenuator	Weinschel Associates	WA56-10	56100306	AT	2015/06/01 * 12
MPSE-22	Power sensor	Agilent	N1923A	MY54070003	AT	2015/04/01 * 12
MPM-16	Power Meter	Agilent	8990B	MY51000271	AT	2015/04/01 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	CE	2015/09/19 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	CE	2015/01/13 * 12
MJM-25	Measure	KOMELON	KMC-36	-	CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	CE/RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	CE	2015/06/08 * 12
MLS-26	LISN(AMN)	Schwarzbeck	NSLK8127	8127-732	CE	2015/07/17 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2 W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	-/01068(Switcher)	CE	2015/09/29 * 12
MAT-64	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2015/01/29 * 12
MMM-03	Digital Tester	Fluke	FLUKE 26-3	78030621	CE	2015/08/19 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2015/01/13 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2015/11/11 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2015/09/02 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2015/10/11 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2015/07/13 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2015/04/08 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2015/01/16 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2015/05/18 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2015/05/21 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2015/03/19 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2015/05/19 * 12

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

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

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

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

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