



Test report No. : 10273917H-A-R1
Page : 1 of 59
Issued date : April 21, 2014
Revised date : April 25, 2014
FCC ID : A6RBT CARD4A

RADIO TEST REPORT

Test Report No. : 10273917H-A-R1

Applicant : Yamaha Corporation
Type of Equipment : Wireless Module
Model No. : BTCARD4
FCC ID : A6RBT CARD4A
Test regulation : FCC Part 15 Subpart C: 2014
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 report is a revised version of 10273917H-A. 10273917H-A is replaced with this report.

Date of test: April 2 to 7, 2014

Representative test engineer:

H. Kukita

Hiroshi Kukita

Engineer

Consumer Technology Division

Approved by:

Takayuki Shimada

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.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10273917H-A

[illegible]

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SECTION 1: Customer information

Company Name : Yamaha Corporation
Address : 10-1 Nakazawa-cho, Naka-ku, Hamamatsu, Shizuoka 430-8650 Japan
Telephone Number : +81-53-460-2407
Facsimile Number : +81-53-460-2466
Contact Person : Atsushi Ogawa

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless Module
Model No. : BTCARD4
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC3.3V
Receipt Date of Sample : March 27, 2014
Country of Mass-production : China
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

General Specification

Clock frequency(ies) in the system : 26MHz

Radio Specification

[Bluetooth Ver 2.1 + EDR function]

Radio Type : Transceiver
Frequency of Operation : 2402-2480MHz
Modulation : FHSS
Power Supply (radio part input) : DC1.8 / 1.5V
Antenna type : Pattern Antenna
Antenna Gain : 2.0dBi

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2014, final revised on March 6, 2014 and effective April 7, 2014

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 revision on March 6, 2014 does not affect the test specification applied to the EUT.

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3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements IC: RSS-Gen 7.2.4	FCC: Section 15.207 IC: RSS-Gen 7.2.4	QP 20.3dB, 0.15000MHz, N AV 37.1dB, 0.15000MHz, N	Complied	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1) IC: RSS-210 A8.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1) IC: RSS-210 A8.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1)(iii) IC: RSS-210 A8.1 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1)(iii) IC: RSS-210 A8.1 (d)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 4.8	FCC: Section 15.247(a)(b)(1) IC: RSS-210 A8.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 4.9	FCC: Section 15.247(d) IC: RSS-210 A8.5 RSS-Gen 6 and 7.2.3	5.0dB 53.369MHz, QP, Vert. 53.372MHz, QP, Vert.	Complied	Conducted/ Radiated

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

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

The power supply voltage is stabilized by internal LDO with BTCARD regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/15.212 Antenna requirement

The antenna is not removable from the EUT as it is a pattern antenna. Therefore, the equipment complies with the antenna requirement of Section 15.203/15.212.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	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.

Test room (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

*3m/1m/0.5m = Measurement distance

Power meter (+dB)	
Below 1GHz	Above 1GHz
0.7dB	1.5dB

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (+dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.5dB	1.7dB	2.8dB	2.8dB	2.9dB	2.6dB

Conducted Emission test

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

Radiated emission test(3m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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3.5 Test Location

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

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

3.6 Data of EMI, 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
Paging

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping off) DH5, 3DH5	2402MHz 2441MHz 2480MHz
Carrier Frequency Separation, 20dB Bandwidth	Tx (Hopping on) DH5, 3DH5	2402MHz 2441MHz 2480MHz
	Paging	2442MHz
Number of Hopping Frequency	Tx (Hopping on) DH5, 3DH5 Paging	-
Dwell time	Tx (Hopping on), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	2441MHz
	Paging	2442MHz
Maximum Peak Output Power	Tx (Hopping off) DH5, 2DH5, 3DH5	2402MHz 2441MHz 2480MHz
	Paging	2442MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping on -Hopping off	2402MHz 2480MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping off	2402MHz 2441MHz 2480MHz
	Tx DH5, 3DH5 -Hopping on	-
*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. *EUT has the power settings by the software as follows; Power settings: BDR: Ext 255 / Int 50 EDR: Ext 255 / Int 105 Software: CSR Bluetest3 *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.		

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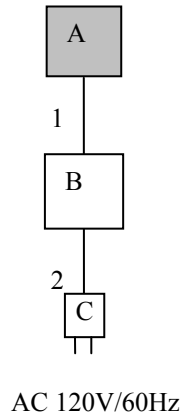
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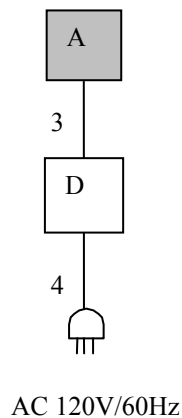
Facsimile : +81 596 24 8124

4.2 Configuration and peripherals

[Radiated spurious emission and Antenna terminal conducted tests]



[Conducted emission test]



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

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Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Wireless Module	BTCARD4	001 for RE/CE* 002 for AT*	YAMAHA	EUT
B	Jig Board	-	-	-	-
C	AC Adaptor	WQ60490	0918	YAMAHA	-
D	DC power supply	PW8-3ATP	09067054	KENWOOD TMI	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal Cable	0.12	Unshielded	Unshielded	-
2	DC Cable	1.85	Unshielded	Unshielded	-
3	DC Cable	1.0	Unshielded	Unshielded	-
4	AC Cable	1.6	Unshielded	Unshielded	-

* RE: Radiated emission,
CE: Conducted emission,
AT: Antenna Terminal Conducted Tests

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.

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

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 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm 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	: 0.15-30MHz
Test data	: APPENDIX
Test result	: Pass

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SECTION 6: Radiated Spurious Emission

Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

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

The height of the measuring antenna varied between 1 and 4m 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	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5 (IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

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

*1) Although 00-705 accepts VBW=10Hz 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 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 : 30M-25GHz
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	3MHz	30kHz	100kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	5MHz or 3MHz	100kHz or 30kHz	300kHz or 100kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30MHz	300kHz	1MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100kHz, 1MHz	300kHz, 3MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
	30MHz to 25GHz (Less or equal to 5GHz)	100kHz	300kHz				
Conducted Spurious Emission Band Edge compliance	10MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) The measurement was performed with Max Hold since the duty cycle was not 100%.
*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 low enough as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz).
*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: Data of EMI test

Conducted Emission

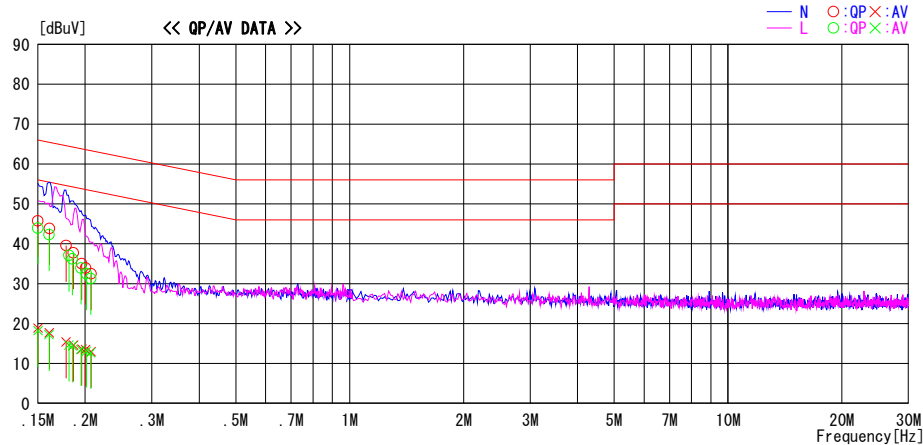
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise HQ EMC Lab. No.3 Semi Anechoic Chamber
Date : 2014/04/03

Report No. : 10273917H
Power : DC 3.3V
Temp./Humi. : 24deg. C / 34% RH
Engineer : Hiroshi Kukita

Mode / Remarks : BT Tx DH5 2480MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	32.5	5.7	13.2	45.7	18.9	66.0	56.0	20.3	37.1	N	
0.16080	30.6	4.5	13.2	43.8	17.7	65.4	55.4	21.6	37.7	N	
0.17798	26.4	2.2	13.2	39.6	15.4	64.6	54.6	25.0	39.2	N	
0.18620	24.5	1.4	13.2	37.7	14.6	64.2	54.2	26.5	39.6	N	
0.19593	21.8	0.4	13.2	35.0	13.6	63.8	53.8	28.8	40.2	N	
0.20066	20.6	0.2	13.3	33.9	13.5	63.6	53.6	29.7	40.1	N	
0.20720	19.2	-0.3	13.3	32.5	13.0	63.3	53.3	30.8	40.3	N	
0.15000	30.7	5.0	13.2	43.9	18.2	66.0	56.0	22.1	37.8	L	
0.16056	29.1	4.0	13.2	42.3	17.2	65.4	55.4	23.1	38.2	L	
0.18117	23.9	1.4	13.2	37.1	14.6	64.4	54.4	27.3	39.8	L	
0.18504	23.0	1.2	13.2	36.2	14.4	64.3	54.3	28.1	39.9	L	
0.19496	20.7	0.3	13.2	33.9	13.5	63.8	53.8	29.9	40.3	L	
0.20143	19.2	-0.2	13.3	32.5	13.1	63.6	53.6	31.1	40.5	L	
0.20692	18.0	-0.6	13.3	31.3	12.7	63.3	53.3	32.0	40.6	L	

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

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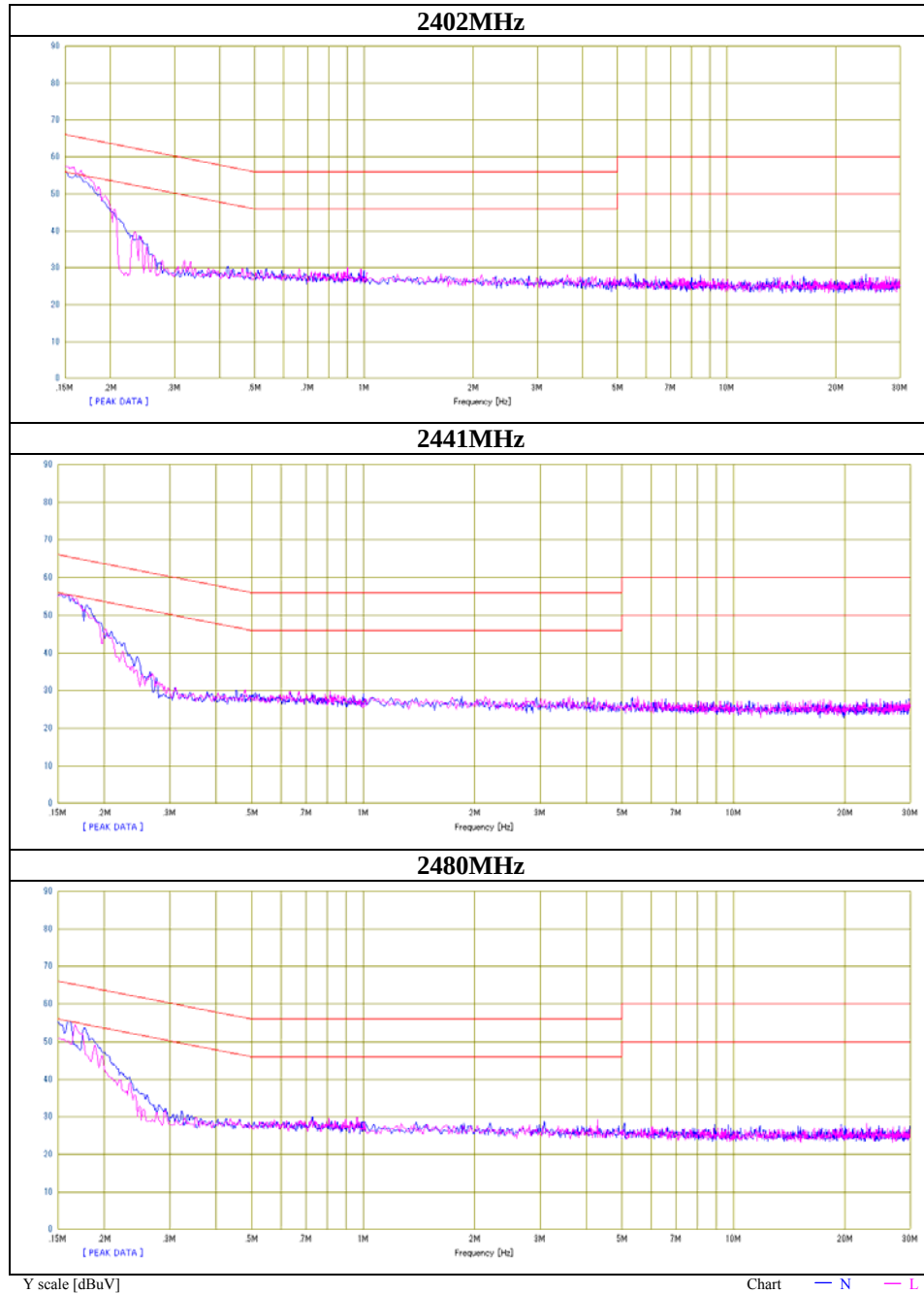
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Conducted Emission

Test place Ise HQ EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 24deg. C / 34% RH
Engineer Hiroshi Kukita
Mode Tx DH5



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Conducted Emission

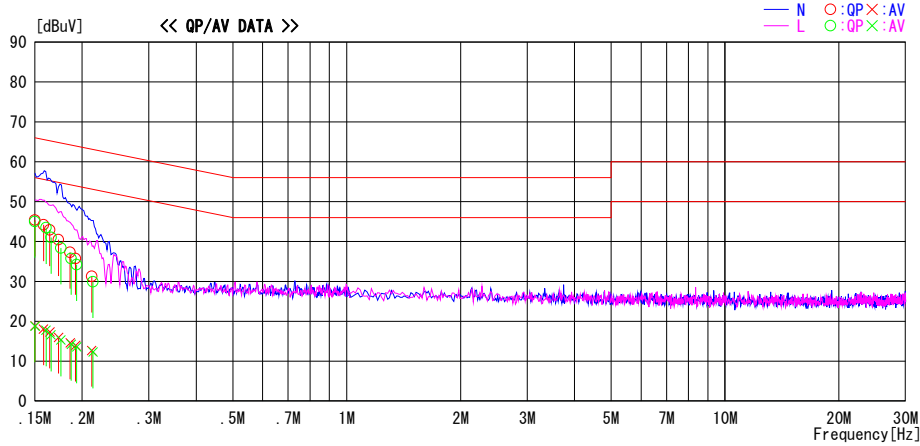
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise HQ EMC Lab. No.3 Semi Anechoic Chamber
Date : 2014/04/03

Report No. : 10273917H
Power : DC 3.3V
Temp./Humi. : 24deg. C / 34% RH
Engineer : Hiroshi Kukita

Mode / Remarks : BT Tx 3DH5 2480MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	32.2	5.7	13.2	45.4	18.9	66.0	56.0	20.6	37.1	N	
0.15000	31.8	5.6	13.2	45.0	18.8	66.0	56.0	21.0	37.2	L	
0.16056	30.3	4.6	13.2	43.5	17.8	65.4	55.4	21.9	37.6	N	
0.15803	31.0	4.9	13.2	44.2	18.1	65.6	55.6	21.4	37.5	N	
0.16416	29.7	4.1	13.2	42.9	17.3	65.3	55.3	22.4	38.0	N	
0.16553	27.8	3.4	13.2	41.0	16.6	65.2	55.2	24.2	38.6	L	
0.17326	27.3	2.8	13.2	40.5	16.0	64.8	54.8	24.3	38.8	N	
0.17578	25.2	2.1	13.2	38.4	15.3	64.7	54.7	26.3	39.4	L	
0.18708	22.5	1.0	13.2	35.7	14.2	64.2	54.2	28.5	40.0	L	
0.18594	24.1	1.4	13.2	37.3	14.6	64.2	54.2	26.9	39.6	N	
0.19338	21.0	0.4	13.2	34.2	13.6	63.9	53.9	29.7	40.3	L	
0.19215	22.5	0.8	13.2	35.7	14.0	63.9	53.9	28.2	39.9	N	
0.21194	18.0	-0.6	13.3	31.3	12.7	63.1	53.1	31.8	40.4	N	
0.21369	16.6	-1.0	13.3	29.9	12.3	63.1	53.1	33.2	40.8	L	

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

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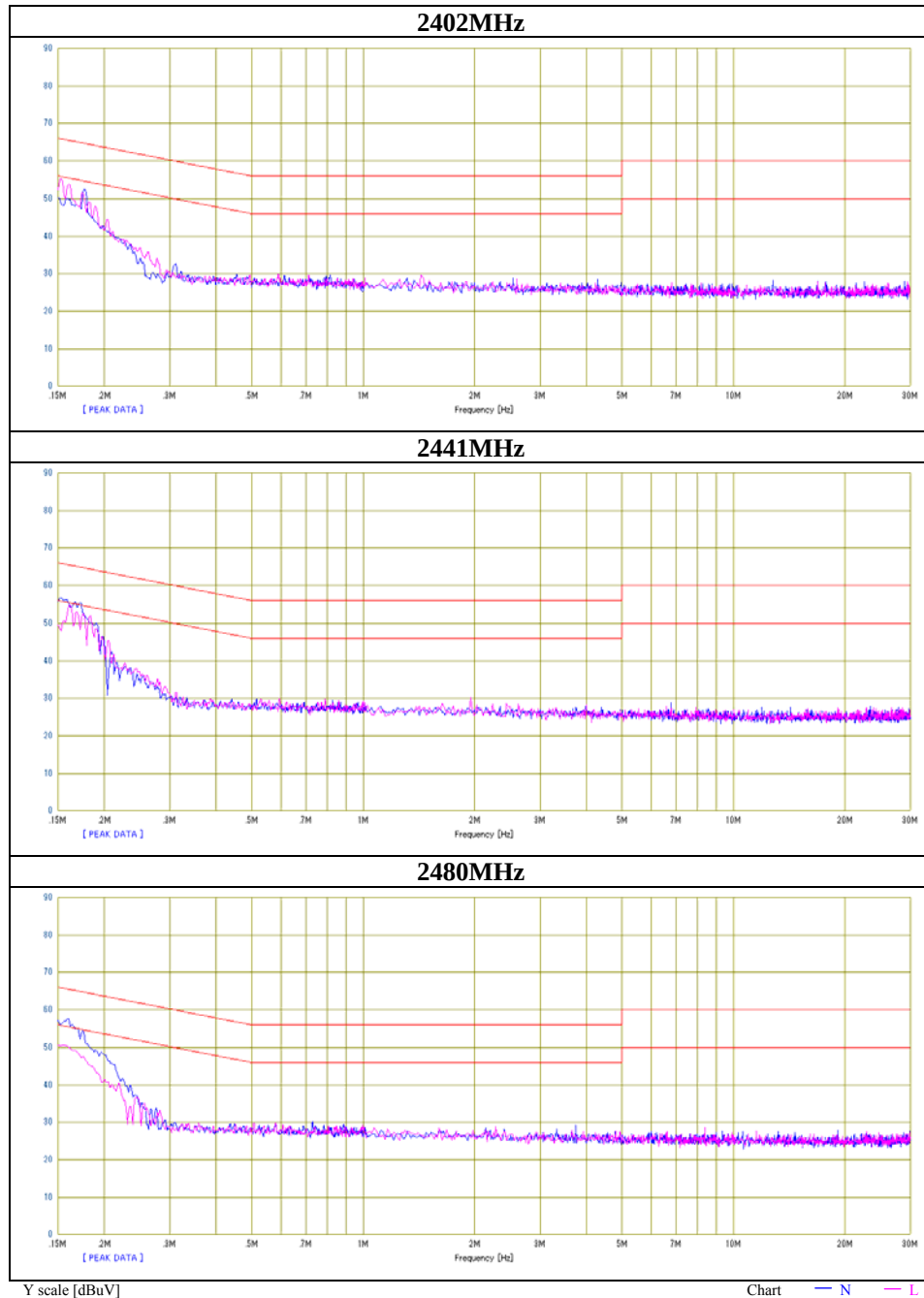
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Conducted Emission

Test place	Ise HQ EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10273917H
Date	04/03/2014
Temperature/ Humidity	24deg. C / 34% RH
Engineer	Hiroshi Kukita
Mode	Tx 3DH5



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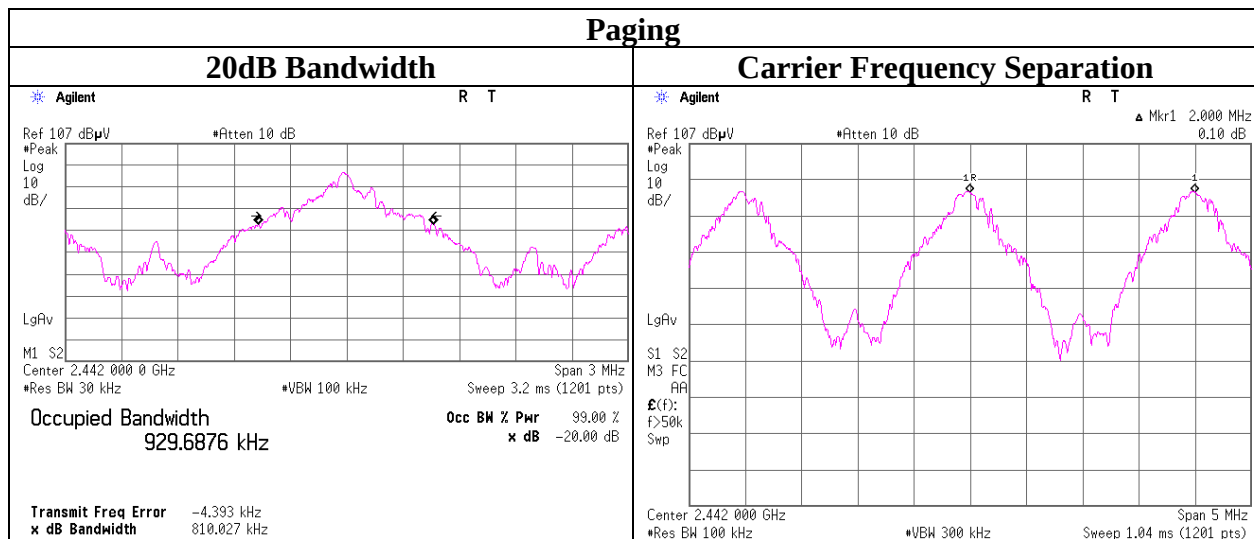
Facsimile : +81 596 24 8124

20dB Bandwidth and Carrier Frequency Separation

Test place	Ise HQ EMC Lab. No.3 Measurement Room
Report No.	10273917H
Date	04/03/2014
Temperature/ Humidity	23 deg. C / 44% RH
Engineer	Hiroshi Kukita
Mode	Tx (Hopping on) DH5/3DH5/Paging

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.930	1.000	≥ 0.620
DH5	2441.0	0.925	1.000	≥ 0.617
DH5	2480.0	0.927	1.000	≥ 0.618
3DH5	2402.0	1.273	1.000	≥ 0.849
3DH5	2441.0	1.266	1.000	≥ 0.844
3DH5	2480.0	1.261	1.000	≥ 0.841
Paging	2442.0	0.810	2.000	≥ 0.540

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.



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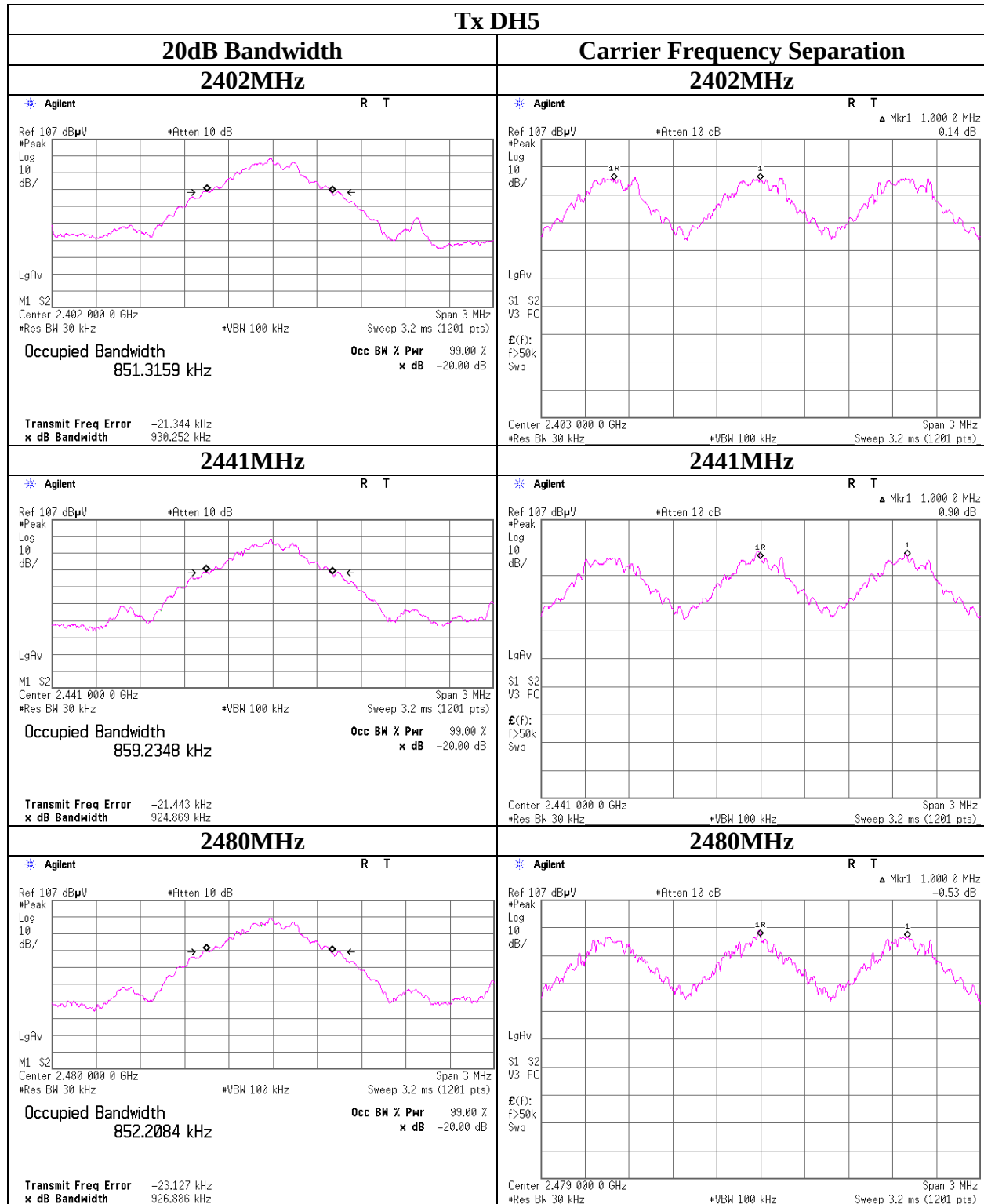
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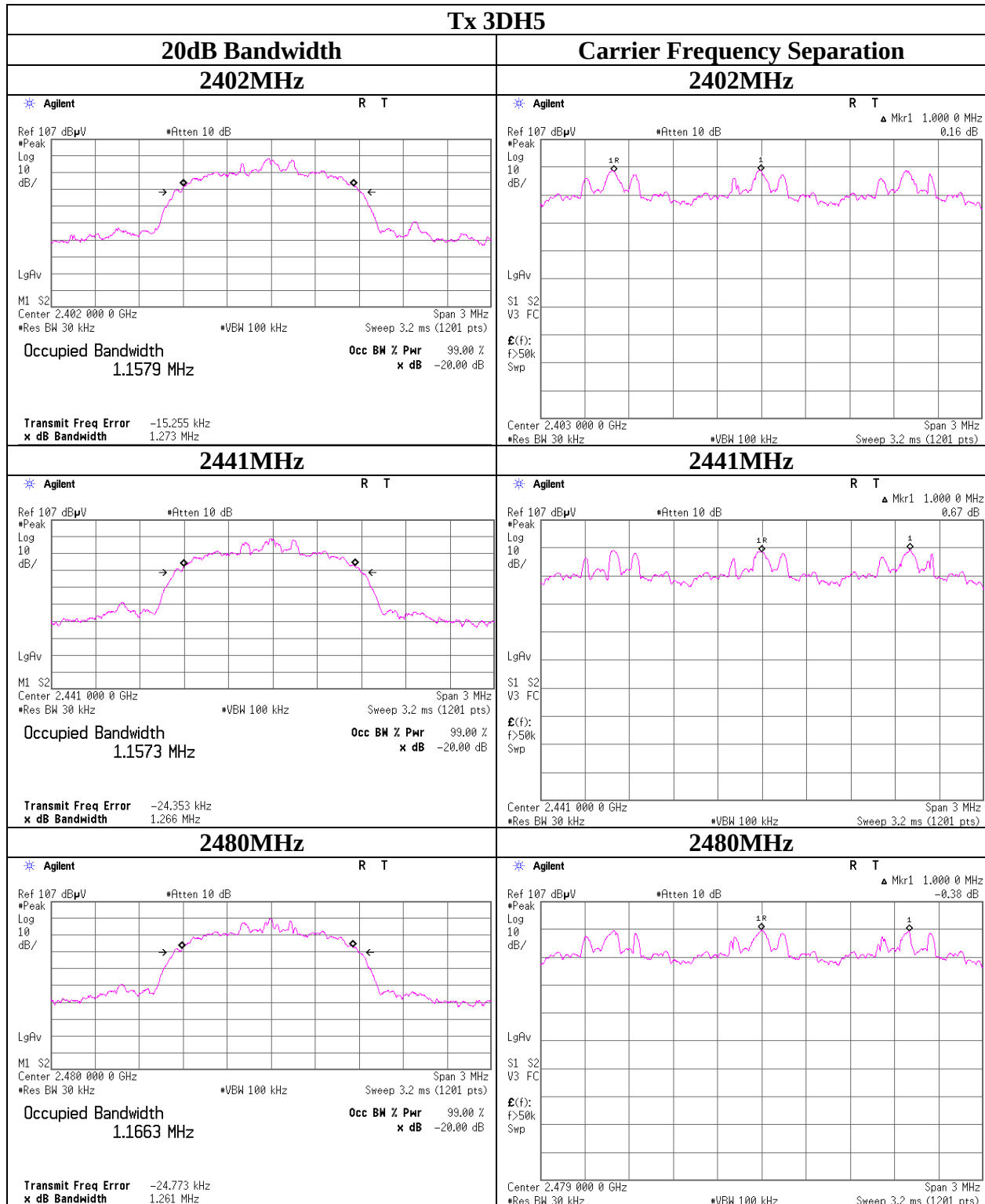
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20dB Bandwidth and Carrier Frequency Separation



20dB Bandwidth and Carrier Frequency Separation

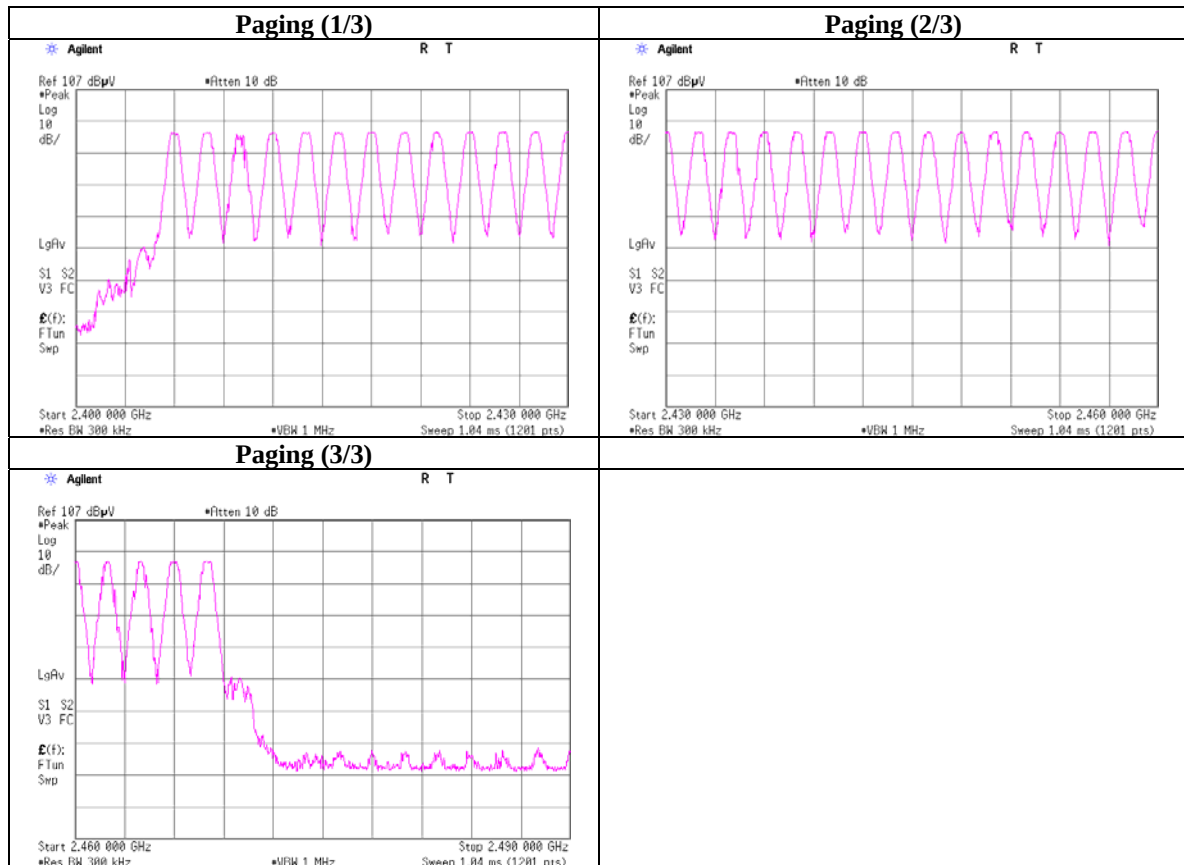


Number of Hopping Frequency

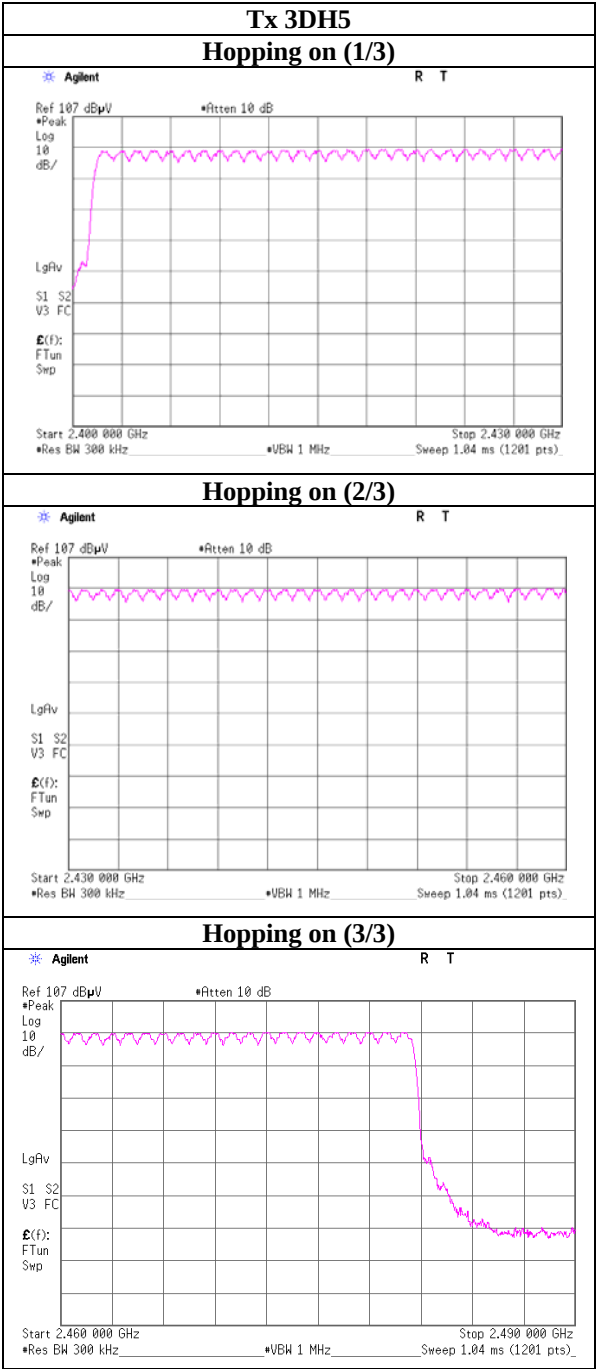
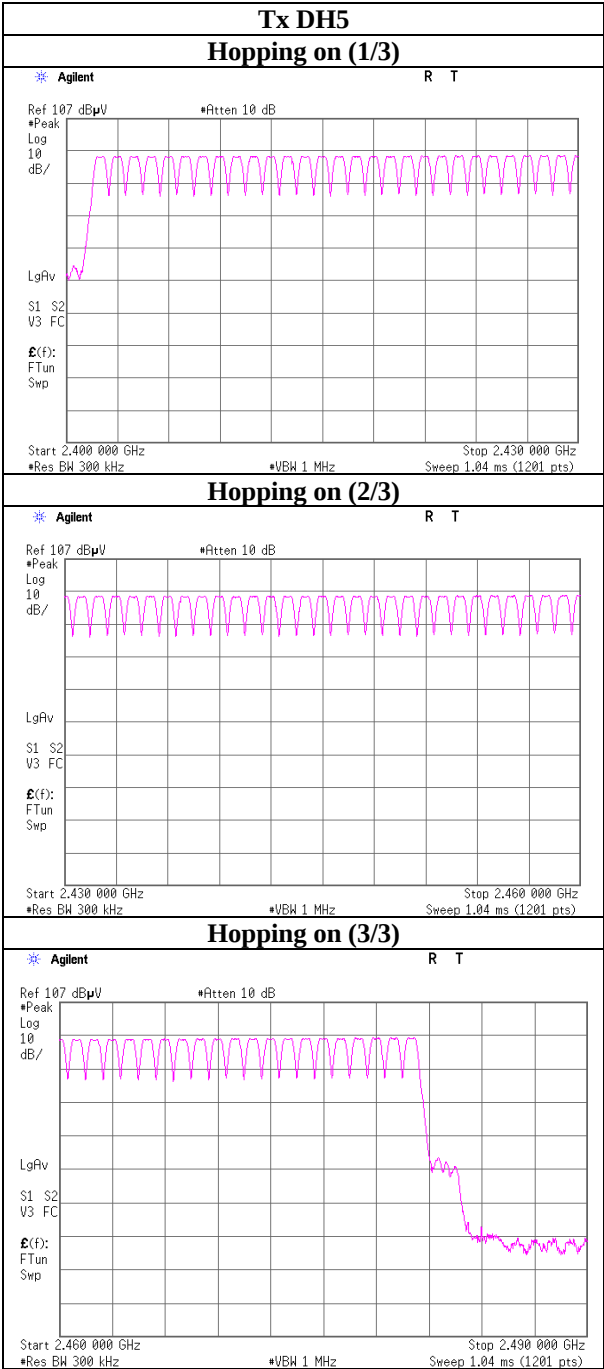
Test place	Ise HQ EMC Lab. No.3 Measurement Room
Report No.	10273917H
Date	04/03/2014
Temperature/ Humidity	23 deg. C / 44% RH
Engineer	Hiroshi Kukita
Mode	Tx (Hopping on) DH5/3DH5/Paging

Mode	Number of channel [times]	Limit [times]
DH5	79	>= 15
3DH5	79	>= 15
Paging	32	>= 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

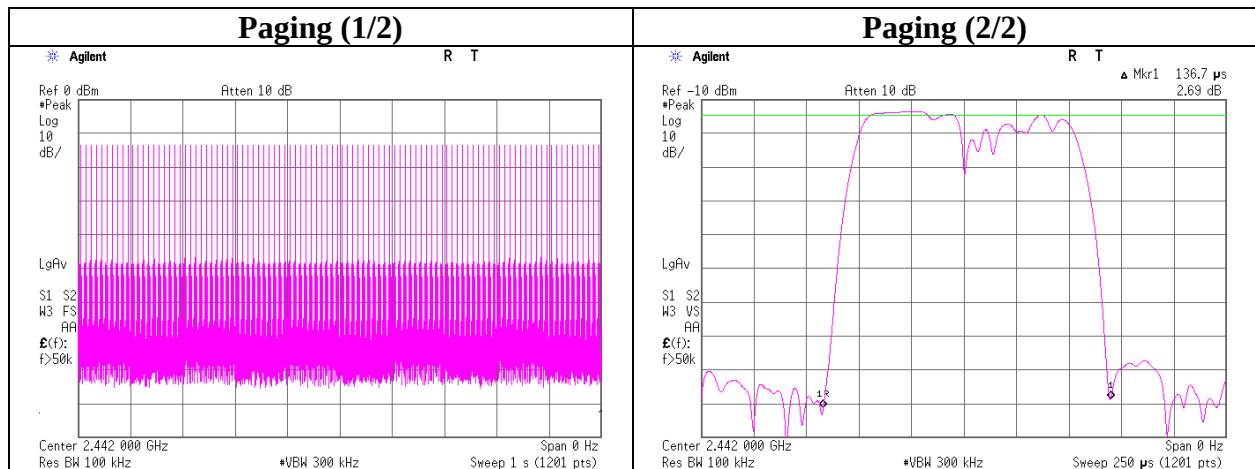
Test place	Ise HQ EMC Lab. No.3 Measurement Room	
Report No.	10273917H	
Date	04/03/2014	04/07/2014
Temperature/ Humidity	23 deg. C / 44% RH	23 deg. C / 32% RH
Engineer	Hiroshi Kukita	Hiroshi Kukita
Mode	Tx (Hopping on) DH5/3DH5/Paging	

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 time [msec]	Result [msec]	Limit [msec]
DH1	51.0 times	/	5 sec. x	31.6 sec. = 323 times	0.521	168	400
DH3	25.0 times	/	5 sec. x	31.6 sec. = 158 times	1.783	282	400
DH5	17.0 times	/	5 sec. x	31.6 sec. = 108 times	3.030	327	400
3DH1	51.0 times	/	5 sec. x	31.6 sec. = 323 times	0.539	174	400
3DH3	26.0 times	/	5 sec. x	31.6 sec. = 165 times	1.792	296	400
3DH5	17.0 times	/	5 sec. x	31.6 sec. = 108 times	3.045	329	400
Paging	100.0 times	/	1 sec. x	12.8 sec. = 1280 times	0.137	175	400

Sample Calculation

Result = Number of transmission x Length of transmission time

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 $N=79$.



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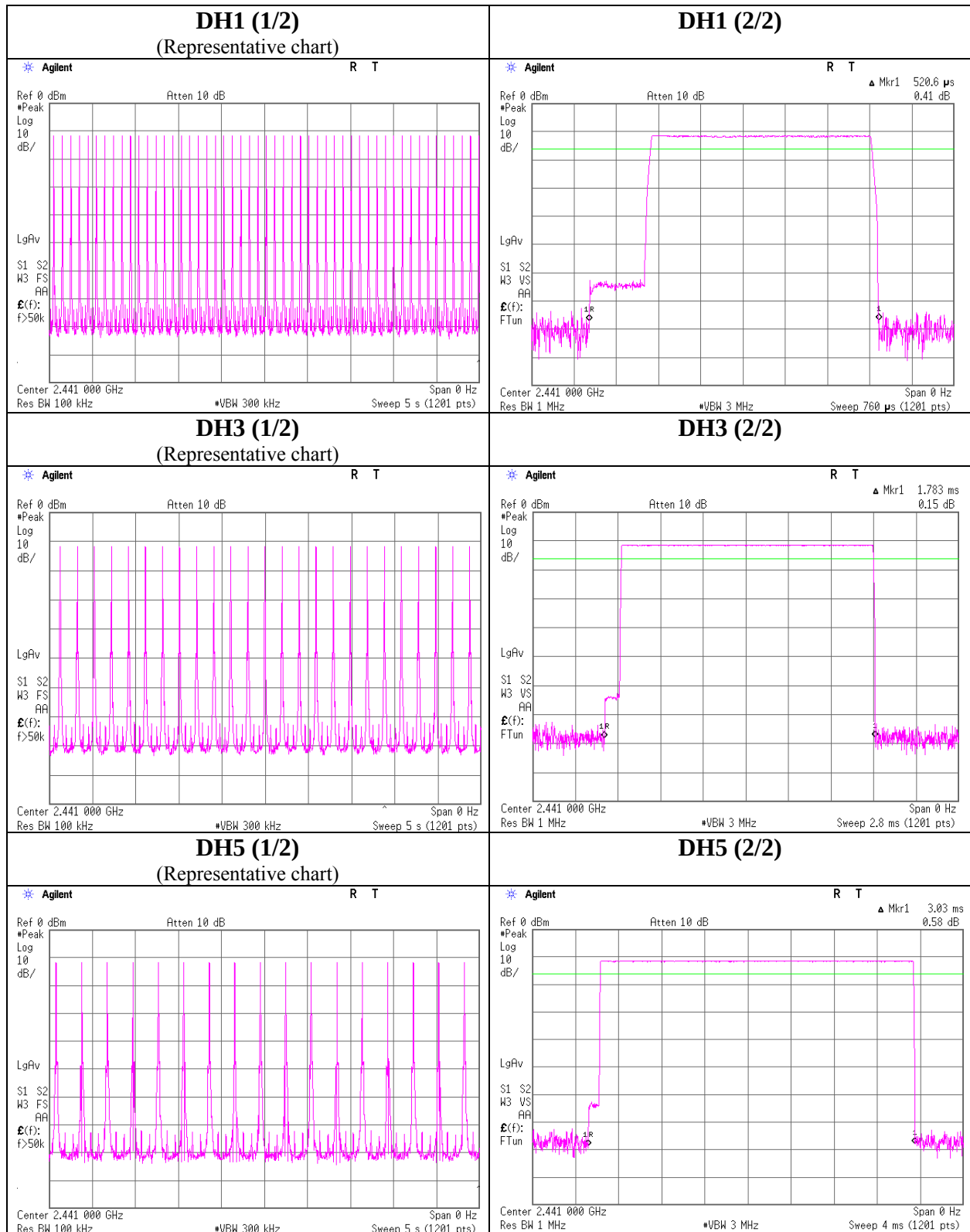
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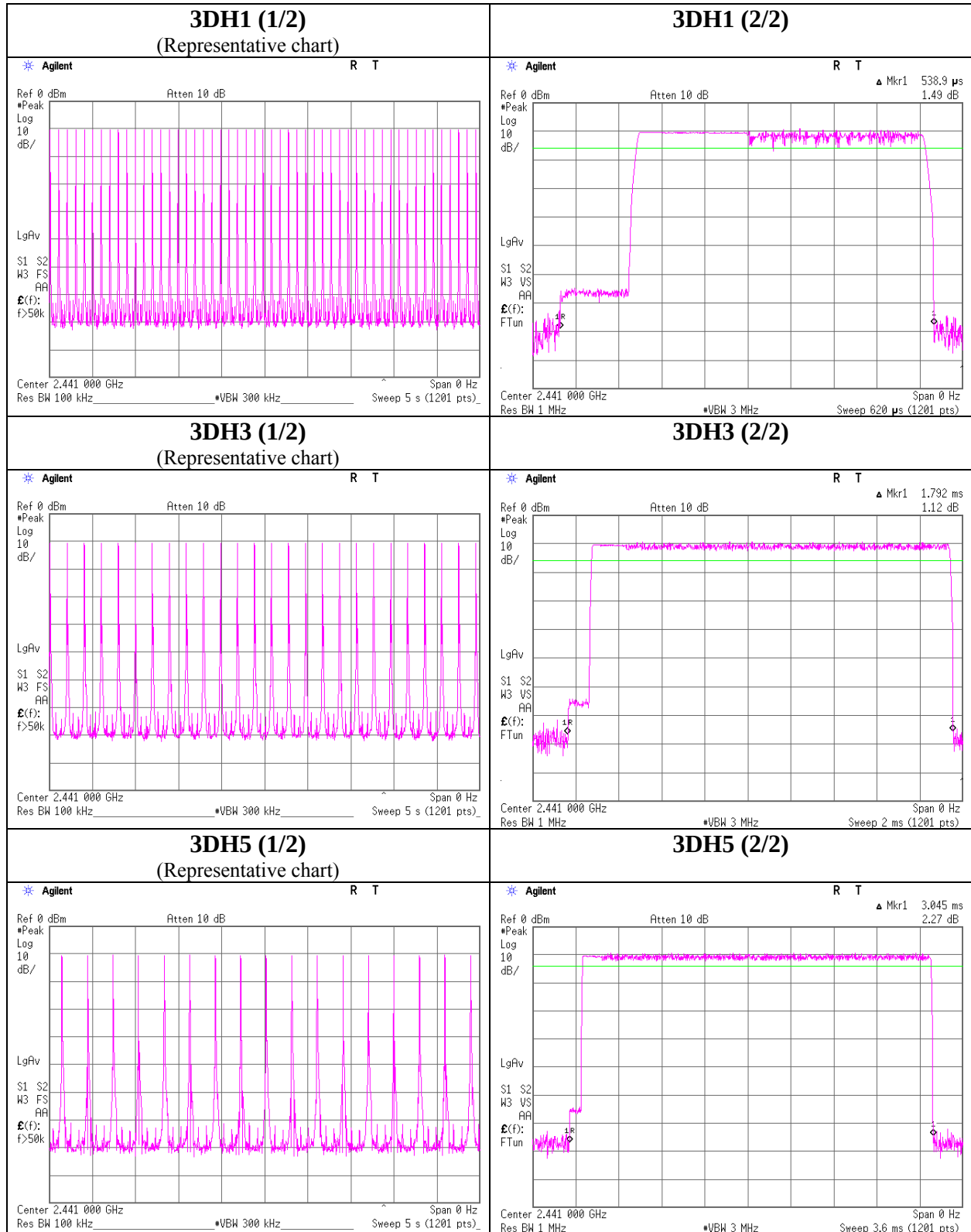
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Dwell time



Dwell time



Maximum Peak Output Power

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) DH5/2DH5/3DH5/Paging

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-11.54	1.60	10.08	0.14	1.03	20.96	125	20.82
DH5	2441.0	-11.26	1.60	10.08	0.42	1.10	20.96	125	20.54
DH5	2480.0	-10.56	1.60	10.08	1.12	1.29	20.96	125	19.84
2DH5	2402.0	-9.92	1.60	10.08	1.76	1.50	20.96	125	19.20
2DH5	2441.0	-9.08	1.60	10.08	2.60	1.82	20.96	125	18.36
2DH5	2480.0	-8.50	1.60	10.08	3.18	2.08	20.96	125	17.78
3DH5	2402.0	-9.81	1.60	10.08	1.87	1.54	20.96	125	19.09
3DH5	2441.0	-9.04	1.60	10.08	2.64	1.84	20.96	125	18.32
3DH5	2480.0	-8.34	1.60	10.08	3.34	2.16	20.96	125	17.62
Paging	2442.0	-12.70	1.60	10.08	-1.02	0.79	20.96	125	21.98

Sample Calculation:

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

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.

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Average Output Power
(Reference data for SAR testing)

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) DH5/2DH5/3DH5/Paging

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
					[dBm]	[mW]
DH5	2402.0	-12.95	1.60	10.08	-1.27	0.75
DH5	2441.0	-12.71	1.60	10.08	-1.03	0.79
DH5	2480.0	-11.97	1.60	10.08	-0.29	0.94
2DH5	2402.0	-13.47	1.60	10.08	-1.79	0.66
2DH5	2441.0	-12.72	1.60	10.08	-1.04	0.79
2DH5	2480.0	-12.17	1.60	10.08	-0.49	0.89
3DH5	2402.0	-13.59	1.60	10.08	-1.91	0.64
3DH5	2441.0	-12.89	1.60	10.08	-1.21	0.76
3DH5	2480.0	-12.16	1.60	10.08	-0.48	0.90
Paging	2442.0	-21.30	1.60	10.08	-9.62	0.11

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

Radiated Spurious Emission

Test place Ise HQ EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10273917H
Date 04/02/2014 04/03/2014
Temperature/ Humidity 23 deg. C / 35% RH 24deg. C / 34% RH
Engineer Kazuya Yoshioka Hiroshi Kukita
(1-26.5GHz) (Below 1GHz)
Mode Tx, DH5 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	54.633	QP	30.0	9.5	7.4	32.2	14.7	40.0	25.3	
Hori	63.992	QP	28.0	7.3	7.6	32.2	10.7	40.0	29.3	
Hori	85.328	QP	29.1	7.3	7.9	32.1	12.2	40.0	27.8	
Hori	96.005	QP	31.2	9.3	8.0	32.2	16.3	43.5	27.2	
Hori	147.262	QP	23.1	14.8	8.6	32.1	14.4	43.5	29.1	
Hori	160.044	QP	23.5	15.4	8.7	32.1	15.5	43.5	28.0	
Hori	213.152	QP	24.9	16.8	9.2	32.0	18.9	43.5	24.6	
Hori	1602.069	PK	51.6	26.5	2.5	35.1	45.5	73.9	28.4	
Hori	2390.000	PK	46.4	27.0	3.0	34.7	41.7	73.9	32.2	
Hori	4804.000	PK	60.8	31.8	5.3	33.9	64.0	73.9	9.9	
Hori	7206.000	PK	41.7	35.7	6.6	33.8	50.2	73.9	23.7	
Hori	9608.000	PK	43.1	38.0	7.0	34.4	53.7	73.9	20.2	
Vert	53.372	QP	49.1	9.9	7.4	32.2	34.2	40.0	5.8	
Vert	64.003	QP	41.3	7.3	7.6	32.2	24.0	40.0	16.0	
Vert	85.342	QP	43.9	7.3	7.9	32.1	27.0	40.0	13.0	
Vert	95.995	QP	46.1	9.3	8.0	32.2	31.2	43.5	12.3	
Vert	149.371	QP	34.1	14.9	8.6	32.1	25.5	43.5	18.0	
Vert	160.002	QP	36.5	15.4	8.7	32.1	28.5	43.5	15.0	
Vert	213.412	QP	32.0	16.8	9.2	32.0	26.0	43.5	17.5	
Vert	1601.970	PK	51.7	26.5	2.5	35.1	45.6	73.9	28.3	
Vert	2390.000	PK	46.2	27.0	3.0	34.7	41.5	73.9	32.4	
Vert	4804.000	PK	58.9	31.8	5.3	33.9	62.1	73.9	11.8	
Vert	7206.000	PK	41.9	35.7	6.6	33.8	50.4	73.9	23.5	
Vert	9608.000	PK	43.2	38.0	7.0	34.4	53.8	73.9	20.1	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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

Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10273917H
Date : 04/02/2014
Temperature/ Humidity : 23 deg. C / 35% RH
Engineer : Kazuya Yoshioka
(1-26.5GHz)
Mode : Tx, DH5 2402MHz

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	106.1	27.0	3.0	34.7	101.4	-	-	Carrier
Hori	2400.000	PK	68.1	27.0	3.0	34.7	63.4	81.4	18.0	
Vert	2402.000	PK	105.3	27.0	3.0	34.7	100.6	-	-	Carrier
Vert	2400.000	PK	65.6	27.0	3.0	34.7	60.9	80.6	19.7	

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	1602.069	AV	47.5	26.5	2.5	35.1	-23.5	17.9	53.9	36.0	*1)
Hori	2390.000	AV	34.5	27.0	3.0	34.7	-23.5	6.3	53.9	47.6	*2)
Hori	4804.000	AV	54.9	31.8	5.3	33.9	-23.5	34.6	53.9	19.3	
Hori	7206.000	AV	30.5	35.7	6.6	33.8	-23.5	15.5	53.9	38.4	
Hori	9608.000	AV	31.6	38.0	7.0	34.4	-23.5	18.7	53.9	35.2	
Vert	1601.970	AV	48.5	26.5	2.5	35.1	-23.5	18.9	53.9	35.0	*1)
Vert	2390.000	AV	34.2	27.0	3.0	34.7	-23.5	6.0	53.9	47.9	*2)
Vert	4804.000	AV	51.4	31.8	5.3	33.9	-23.5	31.1	53.9	22.8	
Vert	7206.000	AV	30.5	35.7	6.6	33.8	-23.5	15.5	53.9	38.4	
Vert	9608.000	AV	31.6	38.0	7.0	34.4	-23.5	18.7	53.9	35.2	

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

- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

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

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

Distance factor: 10GHz-26.5GHz $20\log(3.0\text{m}/1.0\text{m})=9.5\text{dB}$
26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*1) Emission synchronized with carrier frequency hopping

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

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Radiated Spurious Emission

Test place Ise HQ EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10273917H
Date 04/02/2014 04/03/2014
Temperature/ Humidity 23 deg. C / 35% RH 24deg. C / 34% RH
Engineer Kazuya Yoshioka Hiroshi Kukita
(1-26.5GHz) (Below 1GHz)
Mode Tx, DH5 2441MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	54.576	QP	29.7	9.5	7.4	32.2	14.4	40.0	25.6	
Hori	63.994	QP	28.9	7.3	7.6	32.2	11.6	40.0	28.4	
Hori	85.330	QP	29.6	7.3	7.9	32.1	12.7	40.0	27.3	
Hori	95.999	QP	31.8	9.3	8.0	32.2	16.9	43.5	26.6	
Hori	147.271	QP	23.8	14.8	8.6	32.1	15.1	43.5	28.4	
Hori	160.034	QP	22.7	15.4	8.7	32.1	14.7	43.5	28.8	
Hori	213.172	QP	25.4	16.8	9.2	32.0	19.4	43.5	24.1	
Hori	1626.722	PK	51.7	26.6	2.5	35.1	45.7	73.9	28.2	
Hori	4882.000	PK	58.6	32.0	5.3	33.9	62.0	73.9	11.9	
Hori	7323.000	PK	41.6	35.8	6.7	33.8	50.3	73.9	23.6	
Hori	9764.000	PK	43.2	38.3	7.1	34.5	54.1	73.9	19.8	
Vert	53.454	QP	48.2	9.8	7.4	32.2	33.2	40.0	6.8	
Vert	64.000	QP	40.7	7.3	7.6	32.2	23.4	40.0	16.6	
Vert	85.336	QP	44.4	7.3	7.9	32.1	27.5	40.0	12.5	
Vert	96.000	QP	45.5	9.3	8.0	32.2	30.6	43.5	12.9	
Vert	149.345	QP	35.5	14.9	8.6	32.1	26.9	43.5	16.6	
Vert	160.001	QP	37.2	15.4	8.7	32.1	29.2	43.5	14.3	
Vert	213.418	QP	30.6	16.8	9.2	32.0	24.6	43.5	18.9	
Vert	1626.674	PK	50.1	26.6	2.5	35.1	44.1	73.9	29.8	
Vert	4882.000	PK	58.5	32.0	5.3	33.9	61.9	73.9	12.0	
Vert	7323.000	PK	41.8	35.8	6.7	33.8	50.5	73.9	23.4	
Vert	9764.000	PK	43.3	38.3	7.1	34.5	54.2	73.9	19.7	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	1626.722	AV	48.5	26.6	2.5	35.1	-23.5	19.0	53.9	34.9	*1)
Hori	4882.000	AV	52.3	32.0	5.3	33.9	-23.5	32.2	53.9	21.7	
Hori	7323.000	AV	30.2	35.8	6.7	33.8	-23.5	15.4	53.9	38.5	
Hori	9764.000	AV	31.3	38.3	7.1	34.5	-23.5	18.7	53.9	35.2	
Vert	1626.674	AV	46.0	26.6	2.5	35.1	-23.5	16.5	53.9	37.4	*1)
Vert	4882.000	AV	52.0	32.0	5.3	33.9	-23.5	31.9	53.9	22.0	
Vert	7323.000	AV	30.2	35.8	6.7	33.8	-23.5	15.4	53.9	38.5	
Vert	9764.000	AV	31.3	38.3	7.1	34.5	-23.5	18.7	53.9	35.2	

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

- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

*1) Emission synchronized with carrier frequency hopping

UL Japan, Inc.

Ise HQ 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 HQ EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10273917H
Date : 04/02/2014 04/03/2014
Temperature/ Humidity : 23 deg. C / 35% RH 24deg. C / 34% RH
Engineer : Kazuya Yoshioka Hiroshi Kukita
(1-26.5GHz) (Below 1GHz)
Mode : Tx, 3DH5 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	54.640	QP	29.8	9.5	7.4	32.2	14.5	40.0	25.5	
Hori	63.998	QP	27.0	7.3	7.6	32.2	9.7	40.0	30.3	
Hori	85.320	QP	29.3	7.3	7.9	32.1	12.4	40.0	27.6	
Hori	96.002	QP	30.0	9.3	8.0	32.2	15.1	43.5	28.4	
Hori	147.264	QP	22.7	14.8	8.6	32.1	14.0	43.5	29.5	
Hori	160.049	QP	22.8	15.4	8.7	32.1	14.8	43.5	28.7	
Hori	213.149	QP	24.3	16.8	9.2	32.0	18.3	43.5	25.2	
Hori	1602.097	PK	52.5	26.5	2.5	35.1	46.4	73.9	27.5	
Hori	2390.000	PK	45.9	27.0	3.0	34.7	41.2	73.9	32.7	
Hori	4804.000	PK	56.3	31.8	5.3	33.9	59.5	73.9	14.4	
Hori	7206.000	PK	41.7	35.7	6.6	33.8	50.2	73.9	23.7	
Hori	9608.000	PK	43.1	38.0	7.0	34.4	53.7	73.9	20.2	
Vert	53.366	QP	49.5	9.9	7.4	32.2	34.6	40.0	5.4	
Vert	64.000	QP	40.7	7.3	7.6	32.2	23.4	40.0	16.6	
Vert	85.336	QP	43.6	7.3	7.9	32.1	26.7	40.0	13.3	
Vert	95.996	QP	46.0	9.3	8.0	32.2	31.1	43.5	12.4	
Vert	149.373	QP	34.0	14.9	8.6	32.1	25.4	43.5	18.1	
Vert	160.000	QP	37.4	15.4	8.7	32.1	29.4	43.5	14.1	
Vert	213.409	QP	30.8	16.8	9.2	32.0	24.8	43.5	18.7	
Vert	1601.695	PK	49.6	26.5	2.5	35.1	43.5	73.9	30.4	
Vert	2390.000	PK	46.1	27.0	3.0	34.7	41.4	73.9	32.5	
Vert	4804.000	PK	56.0	31.8	5.3	33.9	59.2	73.9	14.7	
Vert	7206.000	PK	41.9	35.7	6.6	33.8	50.4	73.9	23.5	
Vert	9608.000	PK	43.2	38.0	7.0	34.4	53.8	73.9	20.1	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
 26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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

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Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10273917H
Date : 04/02/2014
Temperature/ Humidity : 23 deg. C / 35% RH
Engineer : Kazuya Yoshioka
(1-26.5GHz)
Mode : Tx, 3DH5 2402MHz

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	104.2	27.0	3.0	34.7	99.5	-	-	Carrier
Hori	2400.000	PK	58.0	27.0	3.0	34.7	53.3	79.5	26.2	
Vert	2402.000	PK	102.8	27.0	3.0	34.7	98.1	-	-	Carrier
Vert	2400.000	PK	54.5	27.0	3.0	34.7	49.8	78.1	28.3	

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	1602.097	AV	48.7	26.5	2.5	35.1	-23.5	19.1	53.9	34.8	*1)
Hori	2390.000	AV	34.0	27.0	3.0	34.7	-23.5	5.8	53.9	48.1	*2)
Hori	4804.000	AV	42.6	31.8	5.3	33.9	-23.5	22.3	53.9	31.6	
Hori	7206.000	AV	30.5	35.7	6.6	33.8	-23.5	15.5	53.9	38.4	
Hori	9608.000	AV	31.6	38.0	7.0	34.4	-23.5	18.7	53.9	35.2	
Vert	1601.695	AV	45.3	26.5	2.5	35.1	-23.5	15.7	53.9	38.2	*1)
Vert	2390.000	AV	33.6	27.0	3.0	34.7	-23.5	5.4	53.9	48.5	*2)
Vert	4804.000	AV	41.7	31.8	5.3	33.9	-23.5	21.4	53.9	32.5	
Vert	7206.000	AV	30.5	35.7	6.6	33.8	-23.5	15.5	53.9	38.4	
Vert	9608.000	AV	31.6	38.0	7.0	34.4	-23.5	18.7	53.9	35.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))
- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

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

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

Distance factor:
10GHz-26.5GHz $20\log(3.0\text{m}/1.0\text{m})=9.5\text{dB}$
26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*1) Emission synchronized with carrier frequency hopping

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

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Telephone : +81 596 24 8999

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Radiated Spurious Emission

Test place	Ise HQ EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10273917H	
Date	04/02/2014	04/03/2014
Temperature/ Humidity	23 deg. C / 35% RH	24deg. C / 34% RH
Engineer	Kazuya Yoshioka (1-26.5GHz)	Hiroshi Kukita (Below 1GHz)
Mode	Tx, 3DH5 2441MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	54.643	QP	30.0	9.5	7.4	32.2	14.7	40.0	25.3	
Hori	63.999	QP	27.3	7.3	7.6	32.2	10.0	40.0	30.0	
Hori	85.322	QP	29.0	7.3	7.9	32.1	12.1	40.0	27.9	
Hori	96.001	QP	30.5	9.3	8.0	32.2	15.6	43.5	27.9	
Hori	147.252	QP	22.6	14.8	8.6	32.1	13.9	43.5	29.6	
Hori	160.042	QP	23.0	15.4	8.7	32.1	15.0	43.5	28.5	
Hori	213.144	QP	24.2	16.8	9.2	32.0	18.2	43.5	25.3	
Hori	1626.574	PK	50.4	26.6	2.5	35.1	44.4	73.9	29.5	
Hori	4882.000	PK	54.5	32.0	5.3	33.9	57.9	73.9	16.0	
Hori	7323.000	PK	41.7	35.8	6.7	33.8	50.4	73.9	23.5	
Hori	9764.000	PK	43.2	38.3	7.1	34.5	54.1	73.9	19.8	
Vert	53.369	QP	49.9	9.9	7.4	32.2	35.0	40.0	5.0	
Vert	64.001	QP	40.2	7.3	7.6	32.2	22.9	40.0	17.1	
Vert	85.330	QP	43.1	7.3	7.9	32.1	26.2	40.0	13.8	
Vert	95.999	QP	46.2	9.3	8.0	32.2	31.3	43.5	12.2	
Vert	149.370	QP	34.1	14.9	8.6	32.1	25.5	43.5	18.0	
Vert	160.001	QP	37.0	15.4	8.7	32.1	29.0	43.5	14.5	
Vert	213.422	QP	30.1	16.8	9.2	32.0	24.1	43.5	19.4	
Vert	1626.656	PK	49.3	26.6	2.5	35.1	43.3	73.9	30.6	
Vert	4882.000	PK	54.3	32.0	5.3	33.9	57.7	73.9	16.2	
Vert	7323.000	PK	41.8	35.8	6.7	33.8	50.5	73.9	23.4	
Vert	9764.000	PK	43.3	38.3	7.1	34.5	54.2	73.9	19.7	

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

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

Distance factor:	10GHz-26.5GHz	$20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$
	26.5GHz-40GHz	$20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	1626.574	AV	46.6	26.6	2.5	35.1	-23.5	17.1	53.9	36.8	*1)
Hori	4882.000	AV	39.8	32.0	5.3	33.9	-23.5	19.7	53.9	34.2	
Hori	7323.000	AV	30.2	35.8	6.7	33.8	-23.5	15.4	53.9	38.5	
Hori	9764.000	AV	31.3	38.3	7.1	34.5	-23.5	18.7	53.9	35.2	
Vert	1626.656	AV	44.1	26.6	2.5	35.1	-23.5	14.6	53.9	39.3	*1)
Vert	4882.000	AV	39.6	32.0	5.3	33.9	-23.5	19.5	53.9	34.4	
Vert	7323.000	AV	30.2	35.8	6.7	33.8	-23.5	15.4	53.9	38.5	
Vert	9764.000	AV	31.3	38.3	7.1	34.5	-23.5	18.7	53.9	35.2	

$$\text{Result} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))}$$

- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

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

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

Distance factor:	10GHz-26.5GHz	$20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$
	26.5GHz-40GHz	$20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*1) Emission synchronized with carrier frequency hopping

Radiated Spurious Emission

Test place Ise HQ EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10273917H
Date 04/02/2014 04/03/2014
Temperature/ Humidity 23 deg. C / 35% RH 24deg. C / 34% RH
Engineer Kazuya Yoshioka Hiroshi Kukita
(1-26.5GHz) (Below 1GHz)
Mode Tx, 3DH5 2480MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	54.642	QP	31.3	9.5	7.4	32.2	16.0	40.0	24.0	
Hori	63.991	QP	27.3	7.3	7.6	32.2	10.0	40.0	30.0	
Hori	85.313	QP	29.0	7.3	7.9	32.1	12.1	40.0	27.9	
Hori	96.008	QP	30.3	9.3	8.0	32.2	15.4	43.5	28.1	
Hori	147.261	QP	22.7	14.8	8.6	32.1	14.0	43.5	29.5	
Hori	160.041	QP	23.0	15.4	8.7	32.1	15.0	43.5	28.5	
Hori	213.152	QP	24.7	16.8	9.2	32.0	18.7	43.5	24.8	
Hori	1652.711	PK	51.3	26.7	2.5	35.1	45.4	73.9	28.5	
Hori	2483.500	PK	55.4	26.9	3.1	34.7	50.7	73.9	23.2	
Hori	4960.000	PK	51.7	32.2	5.3	34.0	55.2	73.9	18.7	
Hori	7440.000	PK	41.5	35.8	6.6	33.9	50.0	73.9	23.9	
Hori	9920.000	PK	42.8	38.7	7.1	34.5	54.1	73.9	19.8	
Vert	53.372	QP	49.9	9.9	7.4	32.2	35.0	40.0	5.0	
Vert	64.003	QP	39.8	7.3	7.6	32.2	22.5	40.0	17.5	
Vert	85.330	QP	43.1	7.3	7.9	32.1	26.2	40.0	13.8	
Vert	95.992	QP	45.5	9.3	8.0	32.2	30.6	43.5	12.9	
Vert	149.377	QP	34.6	14.9	8.6	32.1	26.0	43.5	17.5	
Vert	160.003	QP	36.8	15.4	8.7	32.1	28.8	43.5	14.7	
Vert	213.412	QP	30.1	16.8	9.2	32.0	24.1	43.5	19.4	
Vert	1652.769	PK	50.3	26.7	2.5	35.1	44.4	73.9	29.5	
Vert	2483.500	PK	51.8	26.9	3.1	34.7	47.1	73.9	26.8	
Vert	4960.000	PK	51.3	32.2	5.3	34.0	54.8	73.9	19.1	
Vert	7440.000	PK	41.7	35.8	6.6	33.9	50.2	73.9	23.7	
Vert	9920.000	PK	43.0	38.7	7.1	34.5	54.3	73.9	19.6	

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

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

Distance factor: 10GHz-26.5GHz $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$
26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	1652.711	AV	47.2	26.7	2.5	35.1	-23.5	17.8	53.9	36.1	*1)
Hori	2483.500	AV	41.2	26.9	3.1	34.7	-23.5	13.0	53.9	40.9	*2)
Hori	4960.000	AV	35.3	32.2	5.3	34.0	-23.5	15.3	53.9	38.6	
Hori	7440.000	AV	30.5	35.8	6.6	33.9	-23.5	15.5	53.9	38.4	
Hori	9920.000	AV	31.5	38.7	7.1	34.5	-23.5	19.3	53.9	34.6	
Vert	1652.769	AV	45.3	26.7	2.5	35.1	-23.5	15.9	53.9	38.0	*1)
Vert	2483.500	AV	39.0	26.9	3.1	34.7	-23.5	10.8	53.9	43.1	*2)
Vert	4960.000	AV	35.4	32.2	5.3	34.0	-23.5	15.4	53.9	38.5	
Vert	7440.000	AV	30.5	35.8	6.6	33.9	-23.5	15.5	53.9	38.4	
Vert	9920.000	AV	31.5	38.7	7.1	34.5	-23.5	19.3	53.9	34.6	

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

- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

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

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

Distance factor: 10GHz-26.5GHz $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$
26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

*1) Emission synchronized with carrier frequency hopping

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

UL Japan, Inc.

Ise HQ EMC Lab.

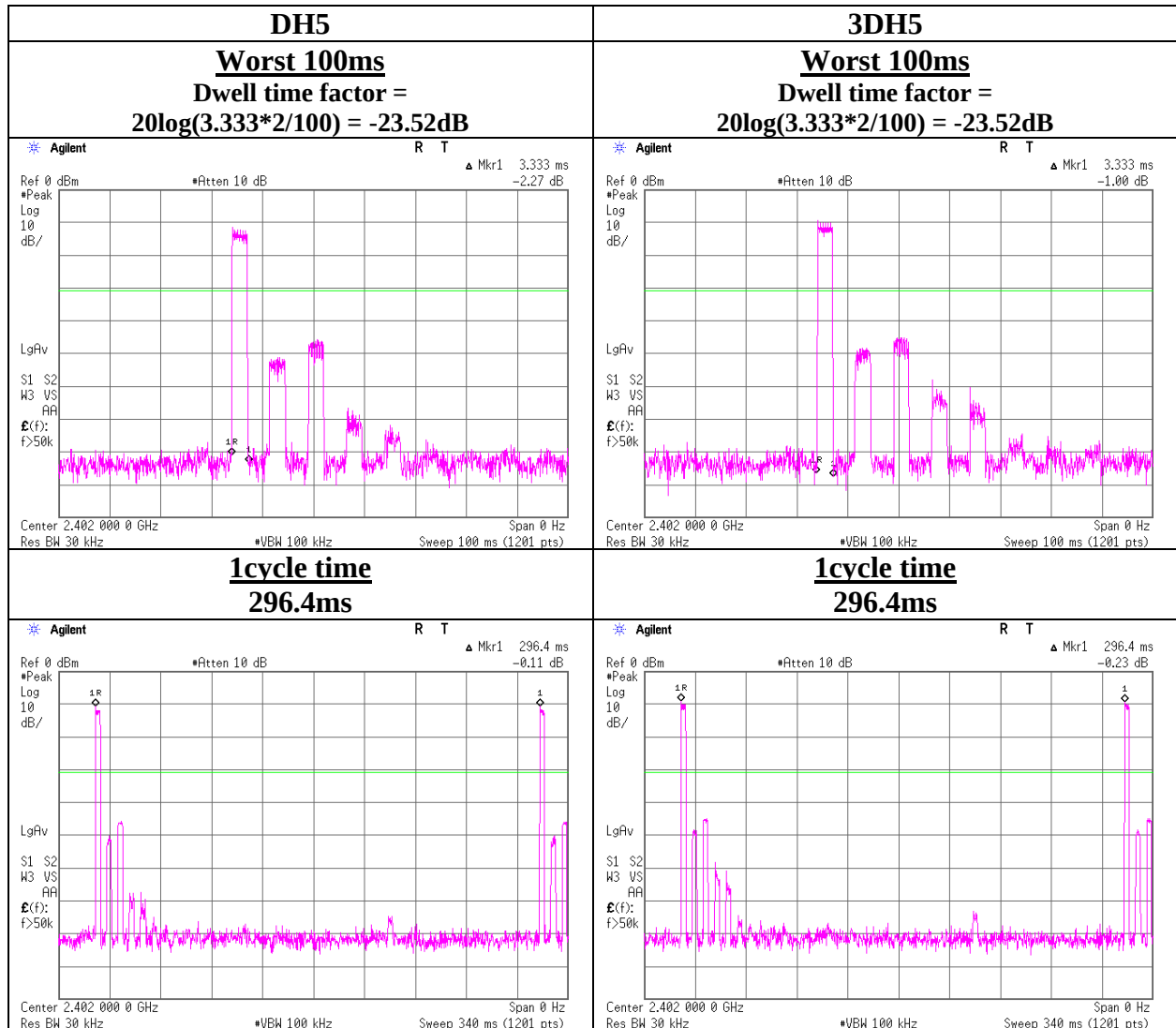
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

Dwell time factor

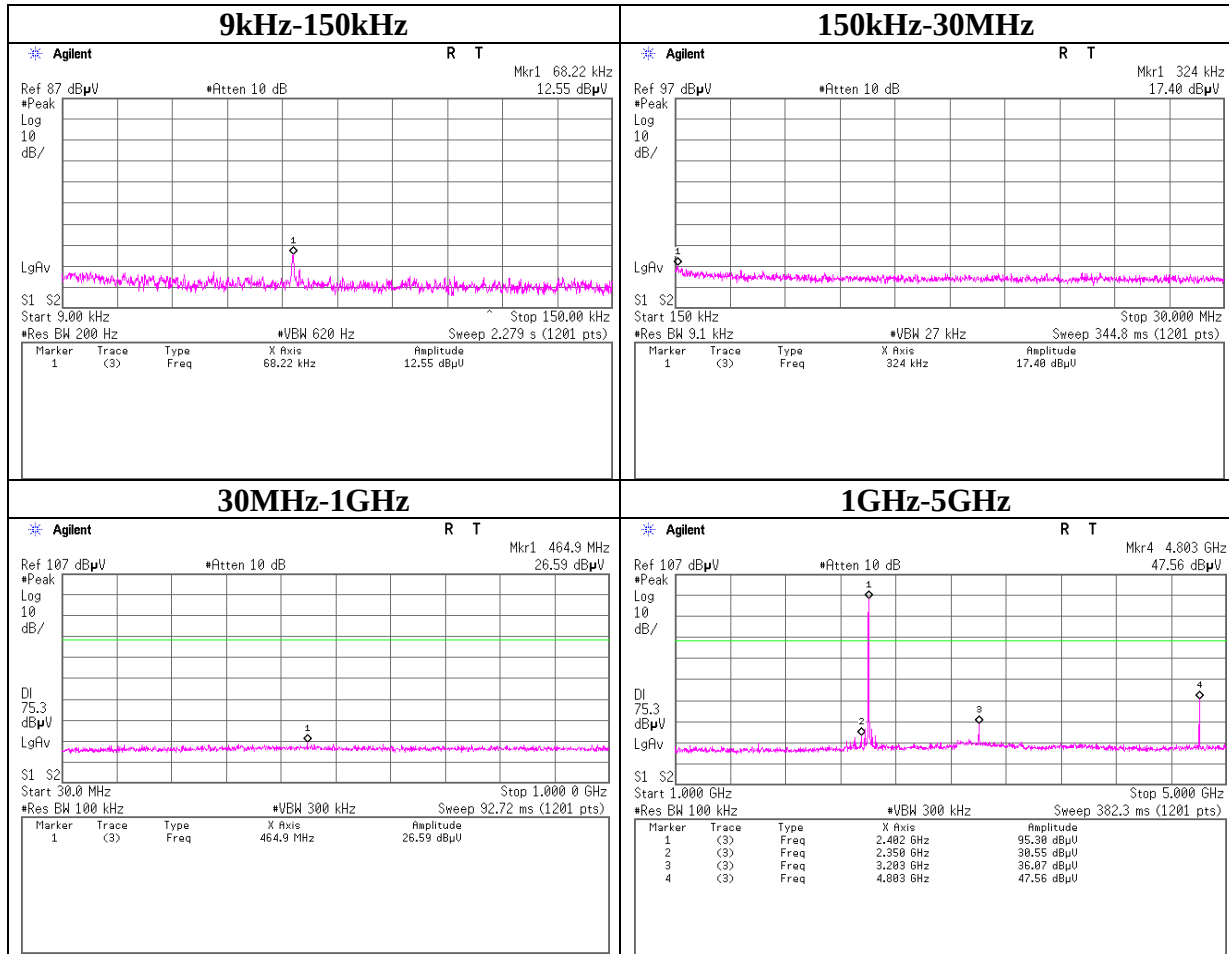
Test place	Ise HQ EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10273917H
Date	04/02/2014
Temperature/ Humidity	23 deg. C / 35% RH
Engineer	Kazuya Yoshioka
Mode	Tx (Hopping on) DH5/3DH5



Conducted Spurious Emission

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) DH5

Tx DH5 2402MHz



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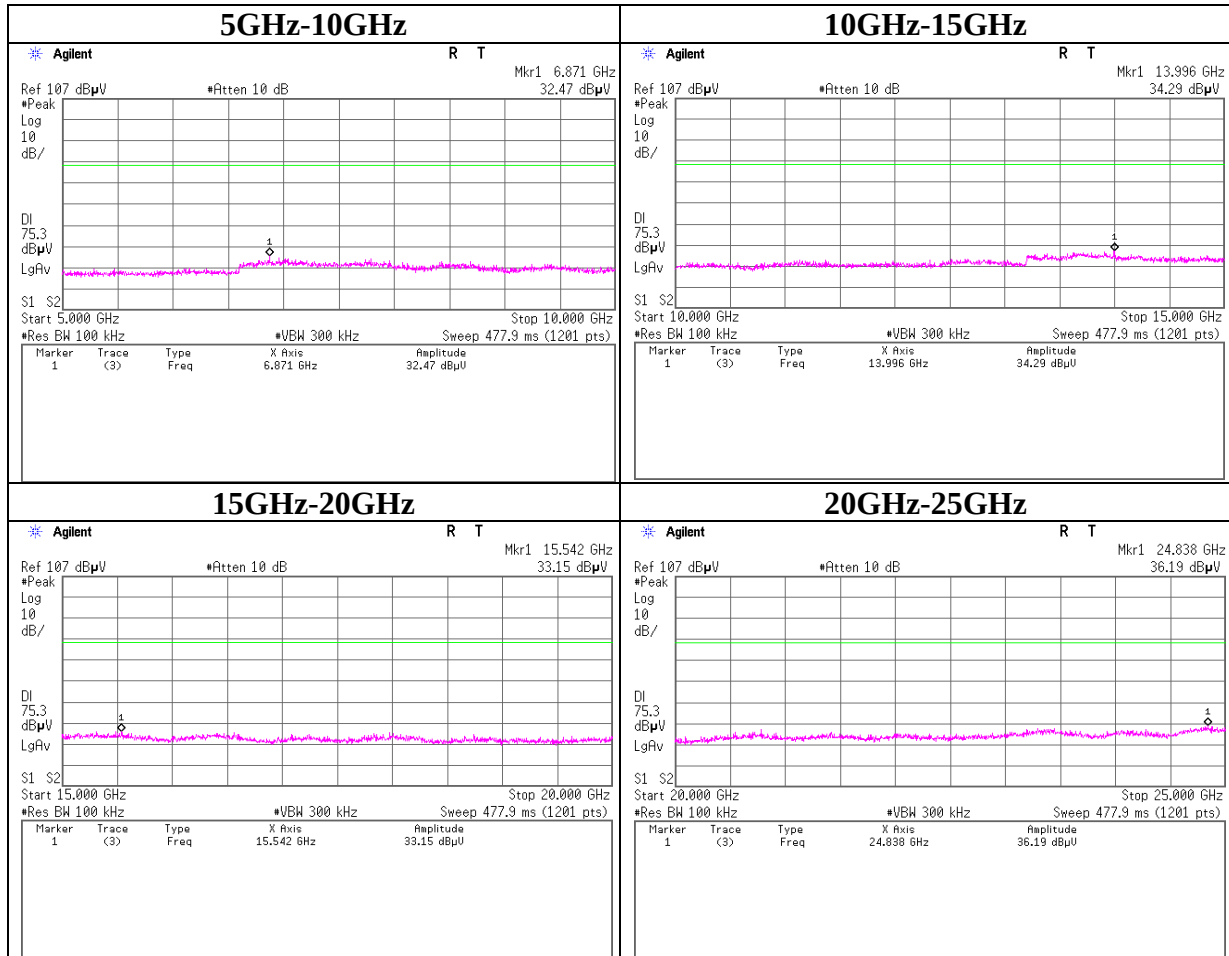
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) DH5

Tx DH5 2402MHz



UL Japan, Inc.

Ise HQ EMC Lab.

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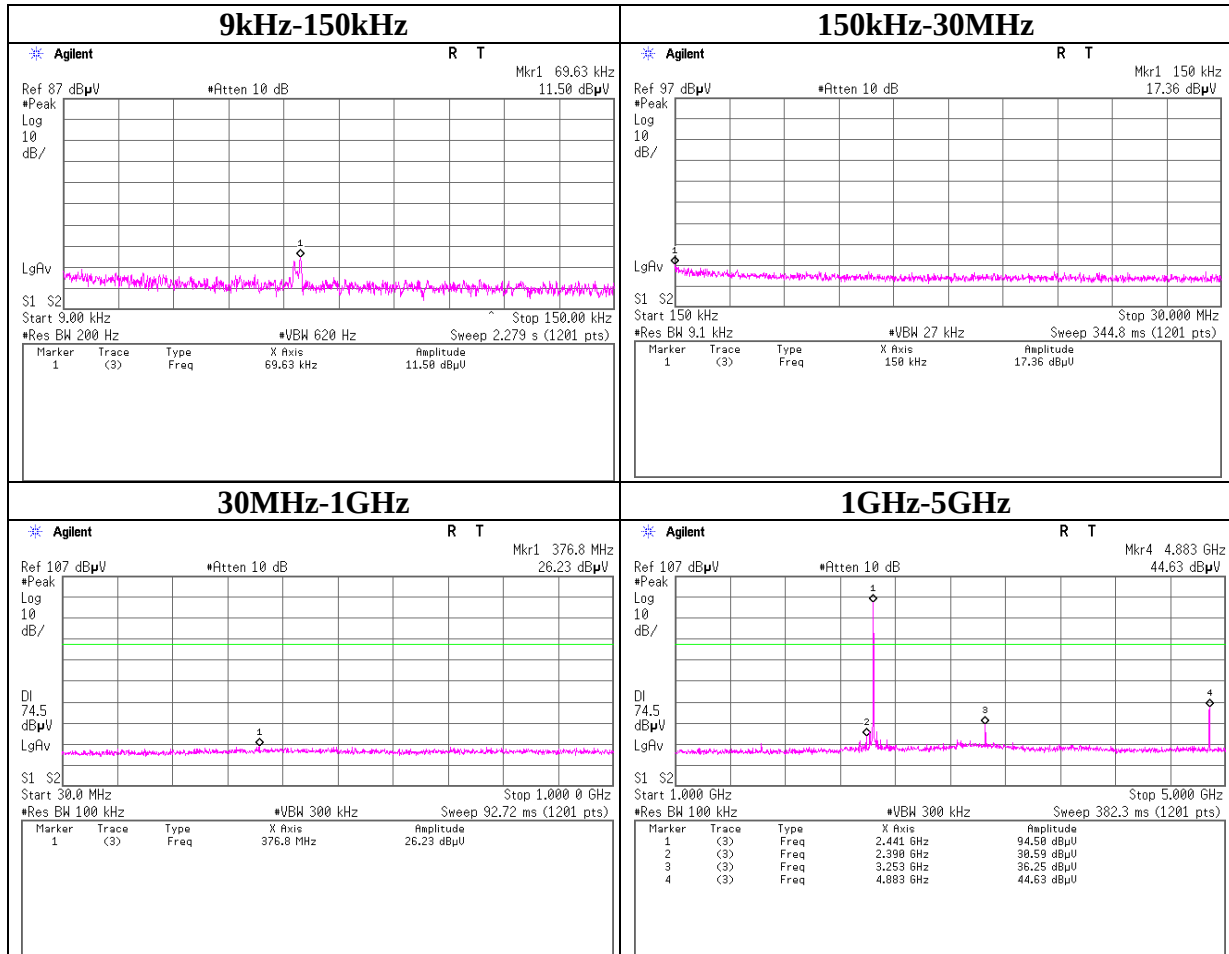
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.3 Measurement Room
Report No. : 10273917H
Date : 04/03/2014
Temperature/ Humidity : 23 deg. C / 44% RH
Engineer : Hiroshi Kukita
Mode : Tx (Hopping off) DH5

Tx DH5 2441MHz



UL Japan, Inc.

Ise HQ EMC Lab.

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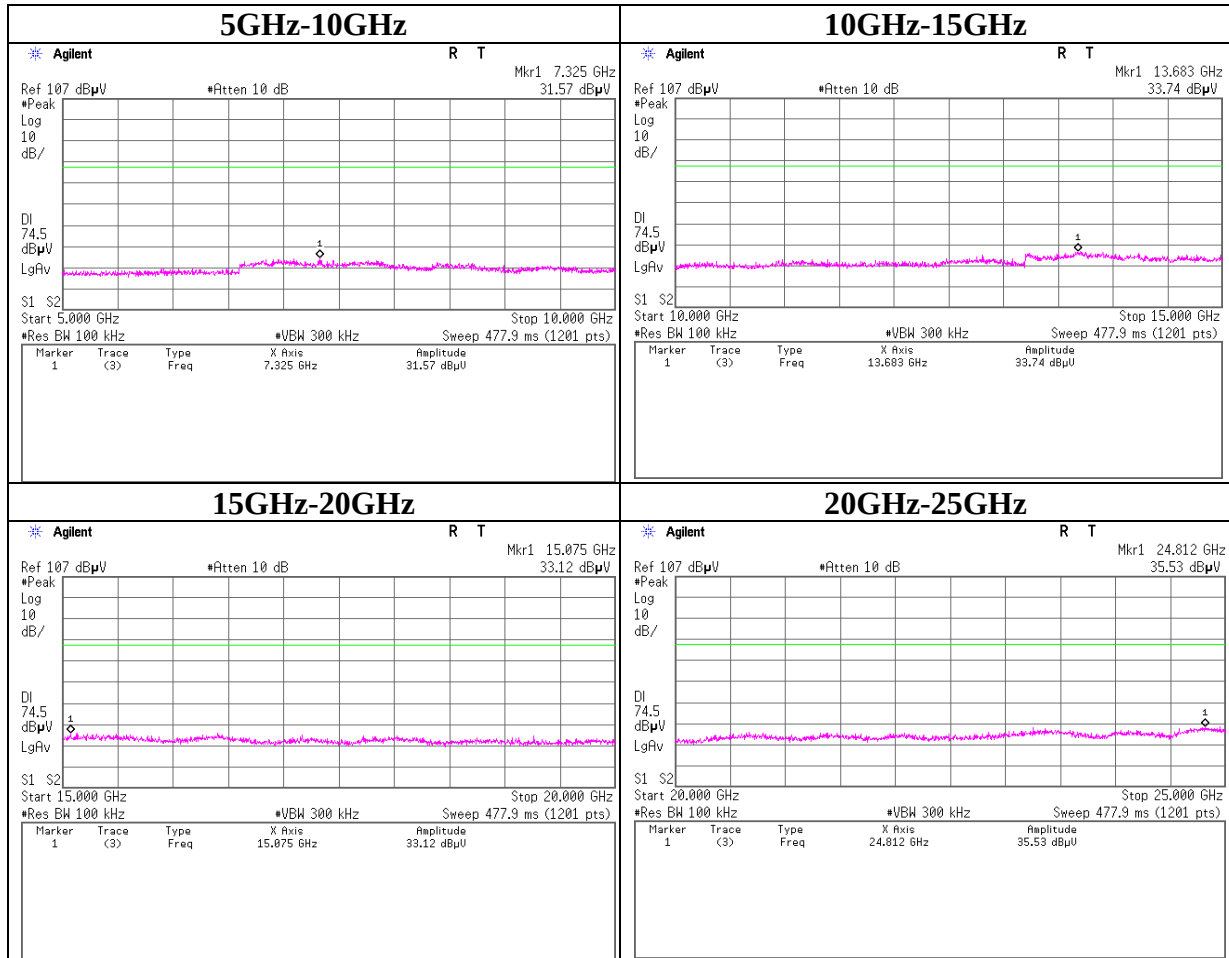
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) DH5

Tx DH5 2441MHz



UL Japan, Inc.

Ise HQ EMC Lab.

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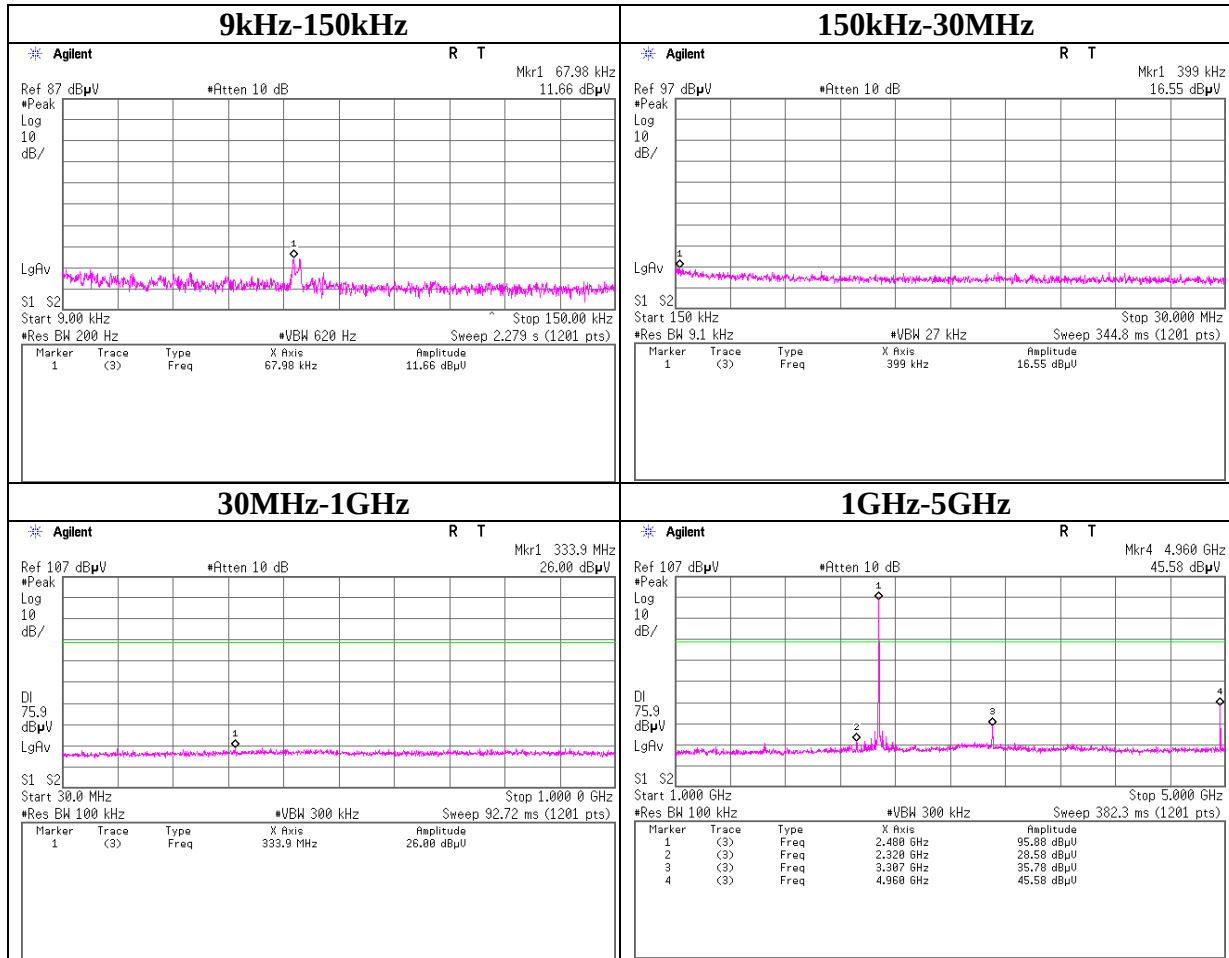
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Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) DH5

Tx DH5 2480MHz



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Ise HQ EMC Lab.

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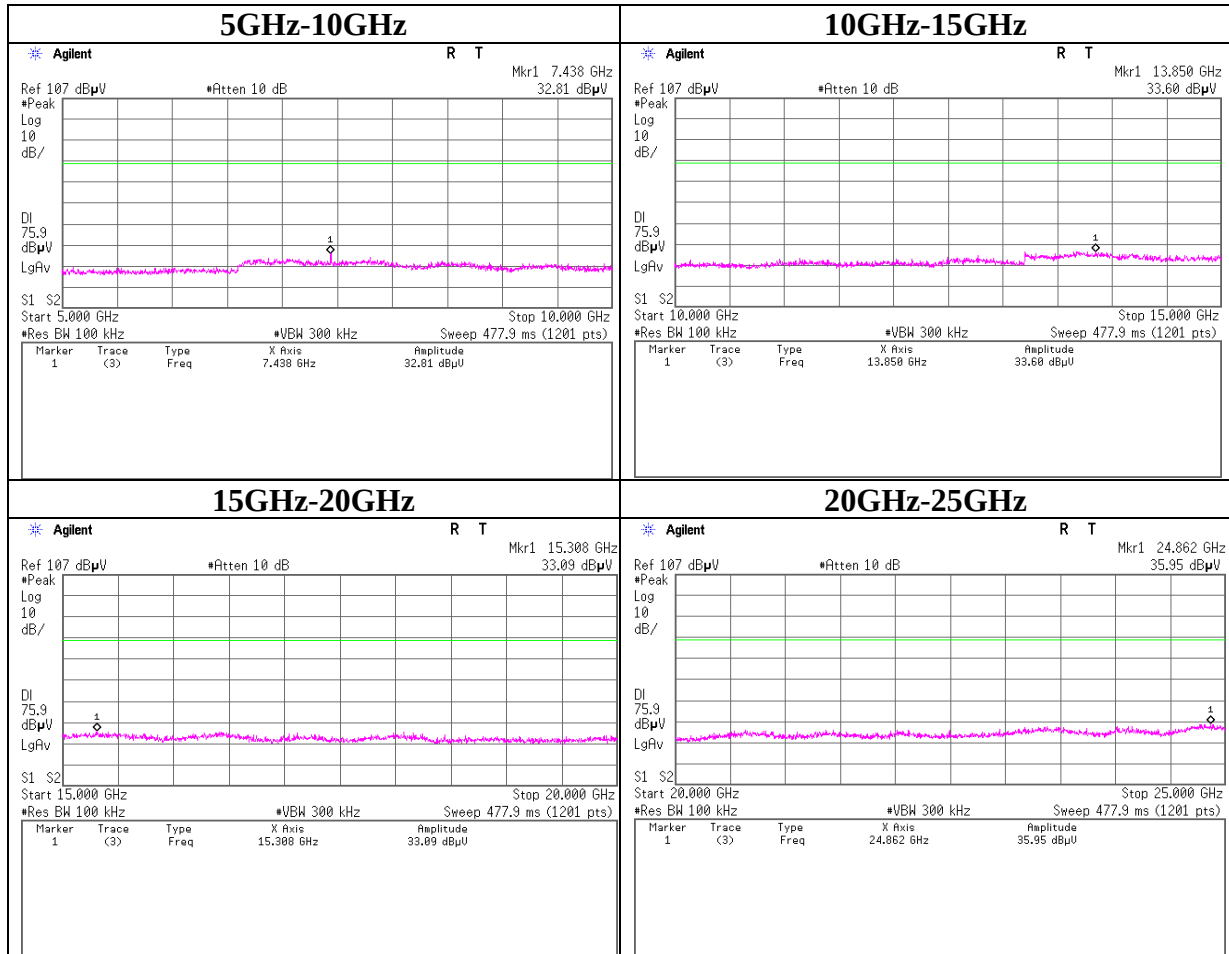
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.3 Measurement Room
Report No. : 10273917H
Date : 04/03/2014
Temperature/ Humidity : 23 deg. C / 44% RH
Engineer : Hiroshi Kukita
Mode : Tx (Hopping off) DH5

Tx DH5 2480MHz



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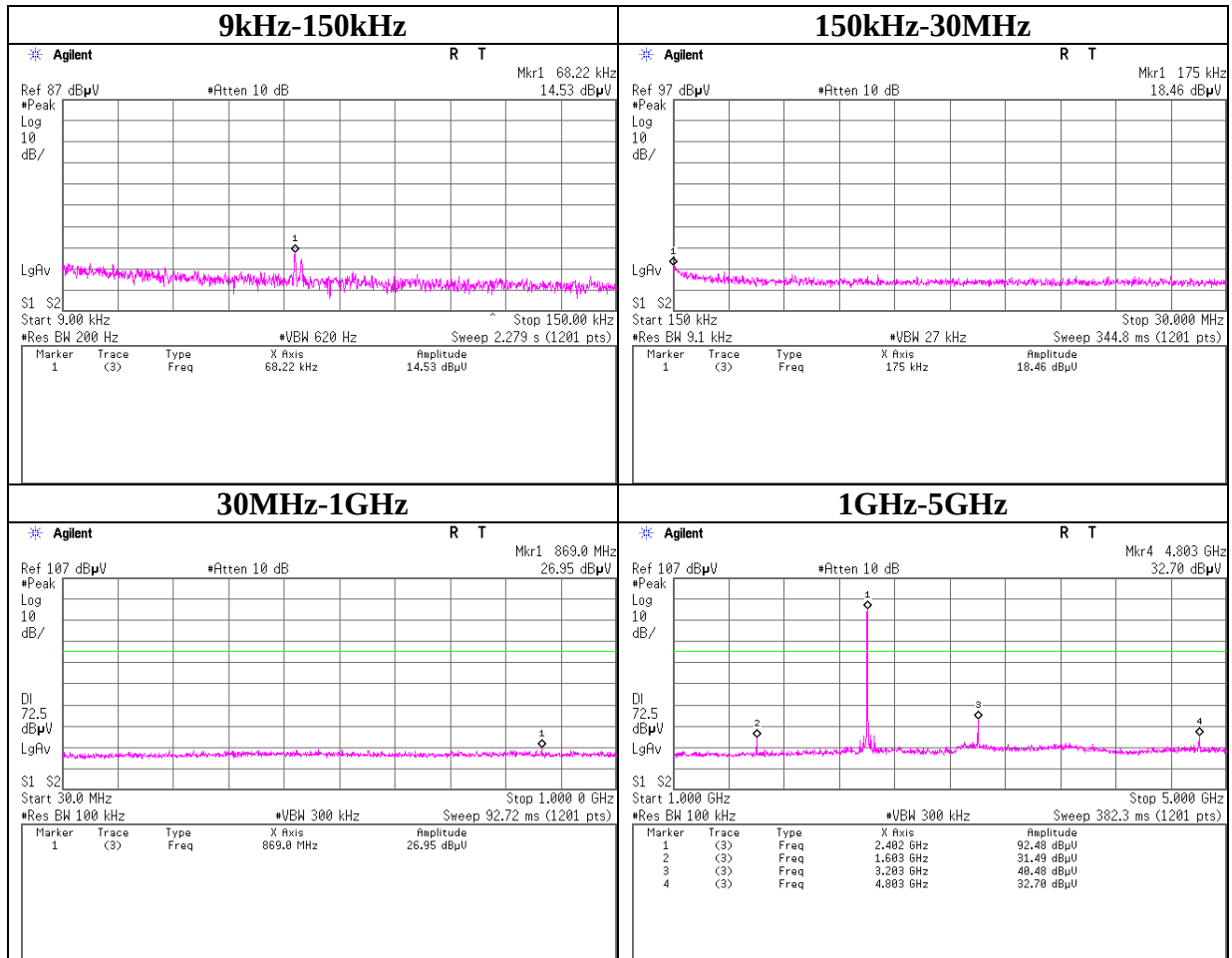
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place Ise HQ EMC Lab. No.11 Measurement Room
Report No. 10273917H
Date 04/07/2014
Temperature/ Humidity 23 deg. C / 32% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) 3DH5

Tx 3DH5 2402MHz



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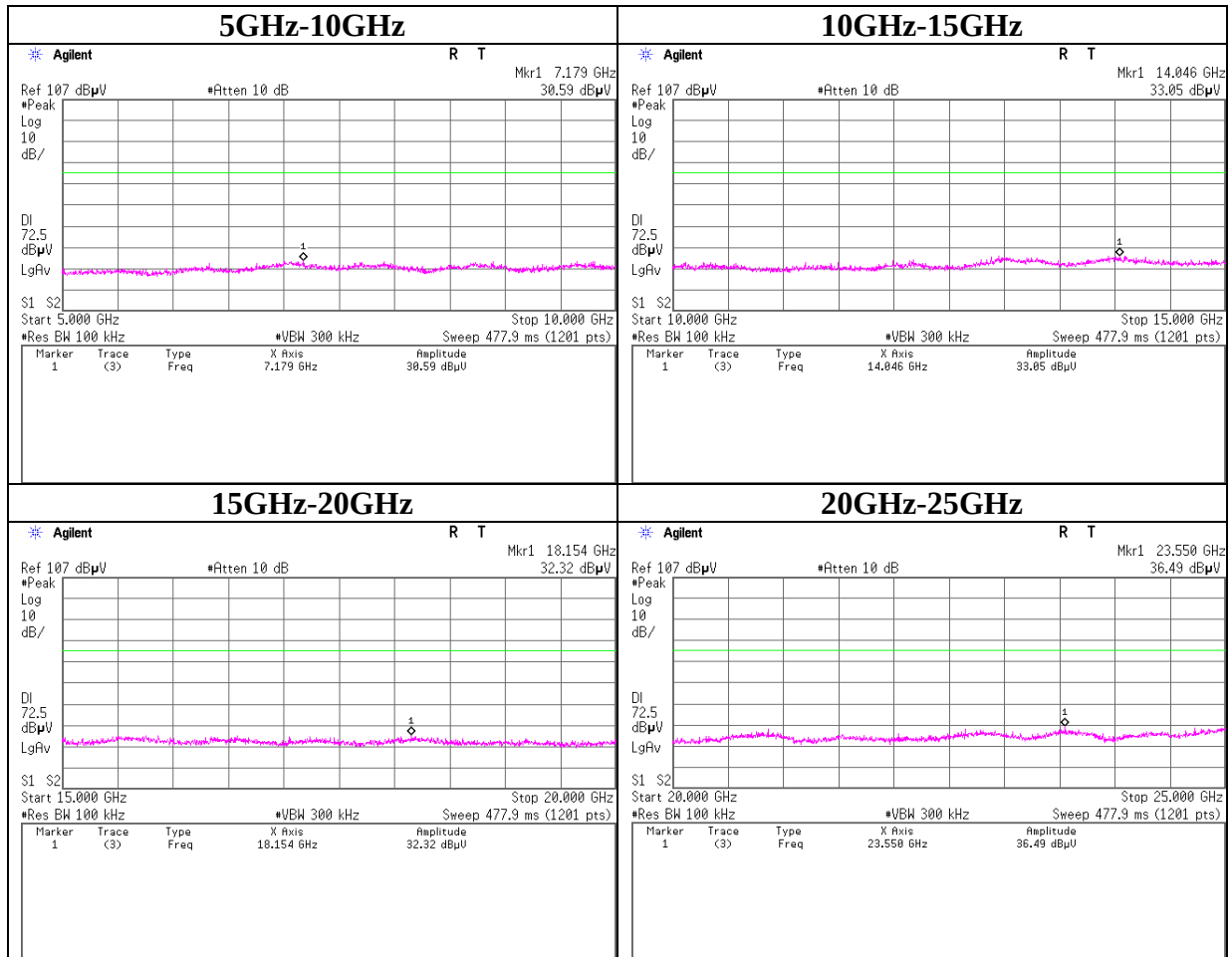
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10273917H
Date : 04/07/2014
Temperature/ Humidity : 23 deg. C / 32% RH
Engineer : Hiroshi Kukita
Mode : Tx (Hopping off) 3DH5

Tx 3DH5 2402MHz



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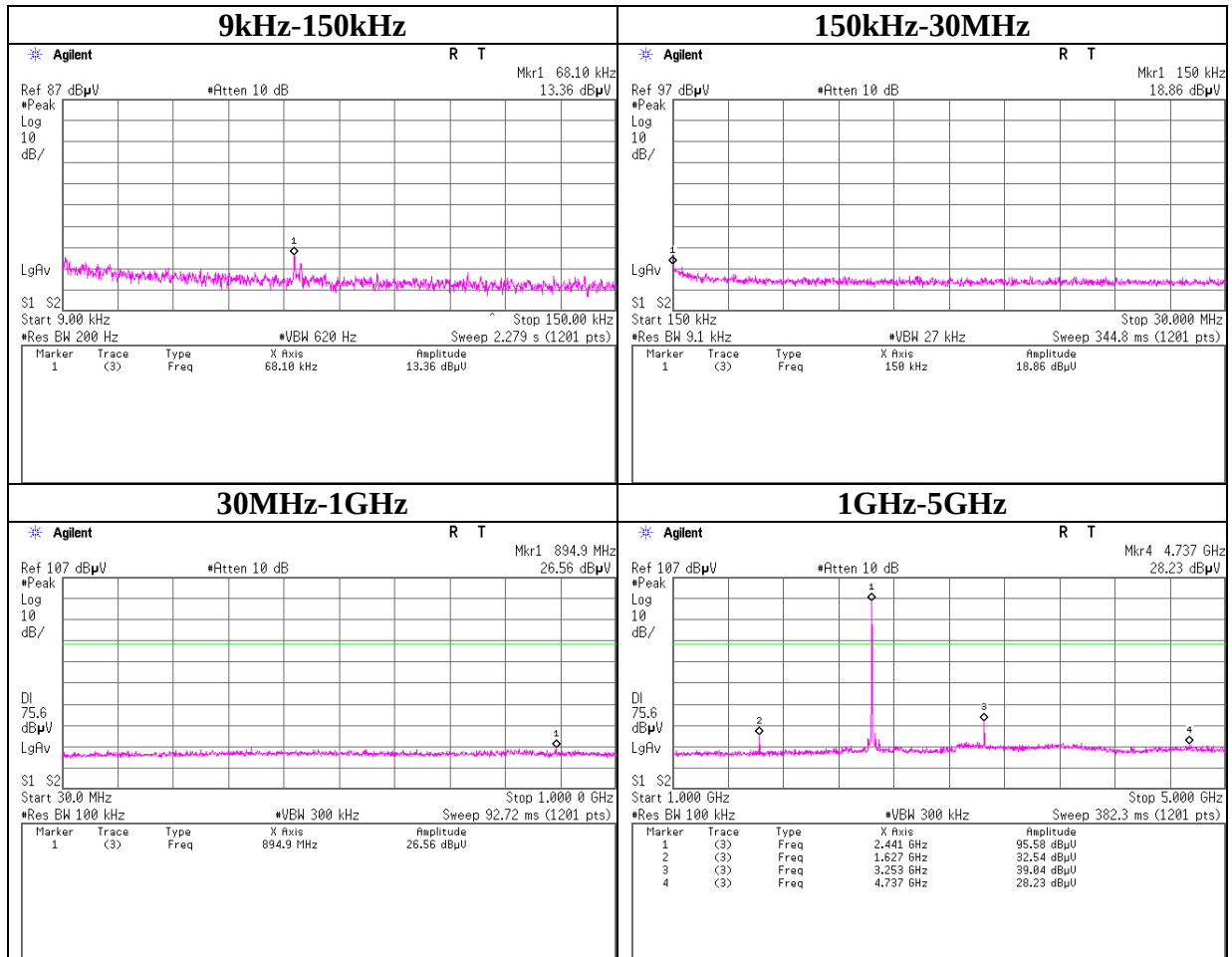
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10273917H
Date : 04/07/2014
Temperature/ Humidity : 23 deg. C / 32% RH
Engineer : Hiroshi Kukita
Mode : Tx (Hopping off) 3DH5

Tx 3DH5 2441MHz



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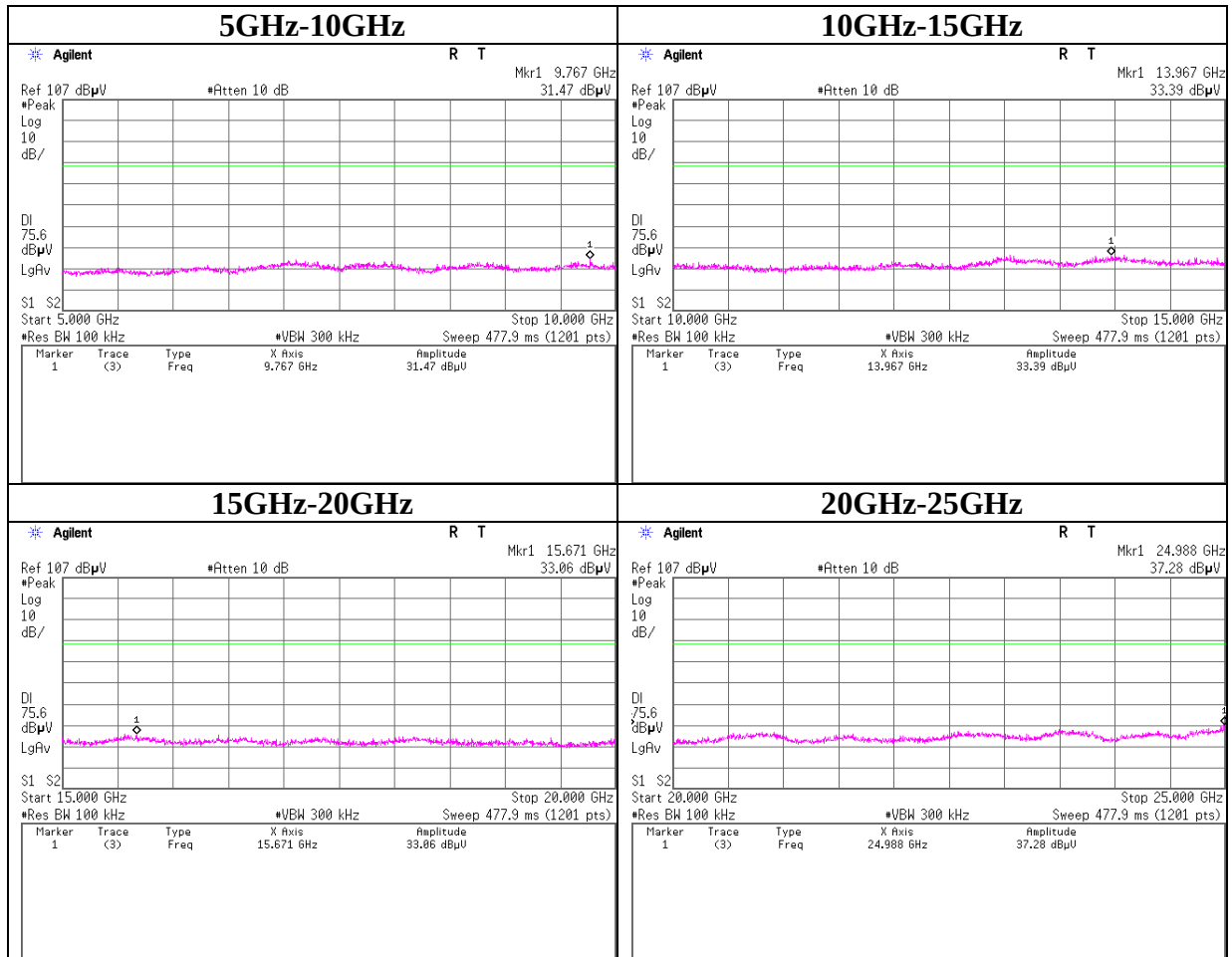
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10273917H
Date : 04/07/2014
Temperature/ Humidity : 23 deg. C / 32% RH
Engineer : Hiroshi Kukita
Mode : Tx (Hopping off) 3DH5

Tx 3DH5 2441MHz



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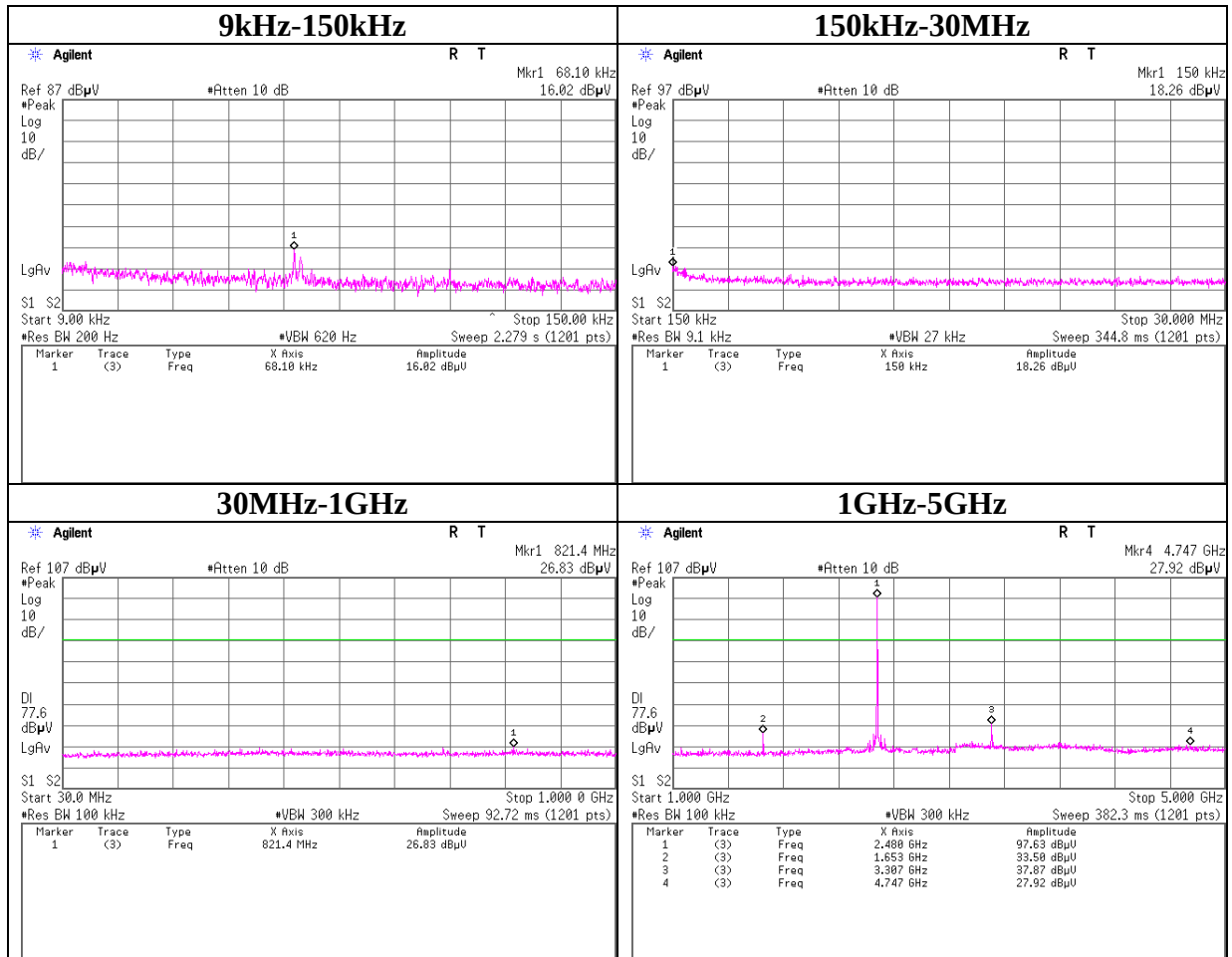
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10273917H
Date : 04/07/2014
Temperature/ Humidity : 23 deg. C / 32% RH
Engineer : Hiroshi Kukita
Mode : Tx (Hopping off) 3DH5

Tx 3DH5 2480MHz



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Ise HQ EMC Lab.

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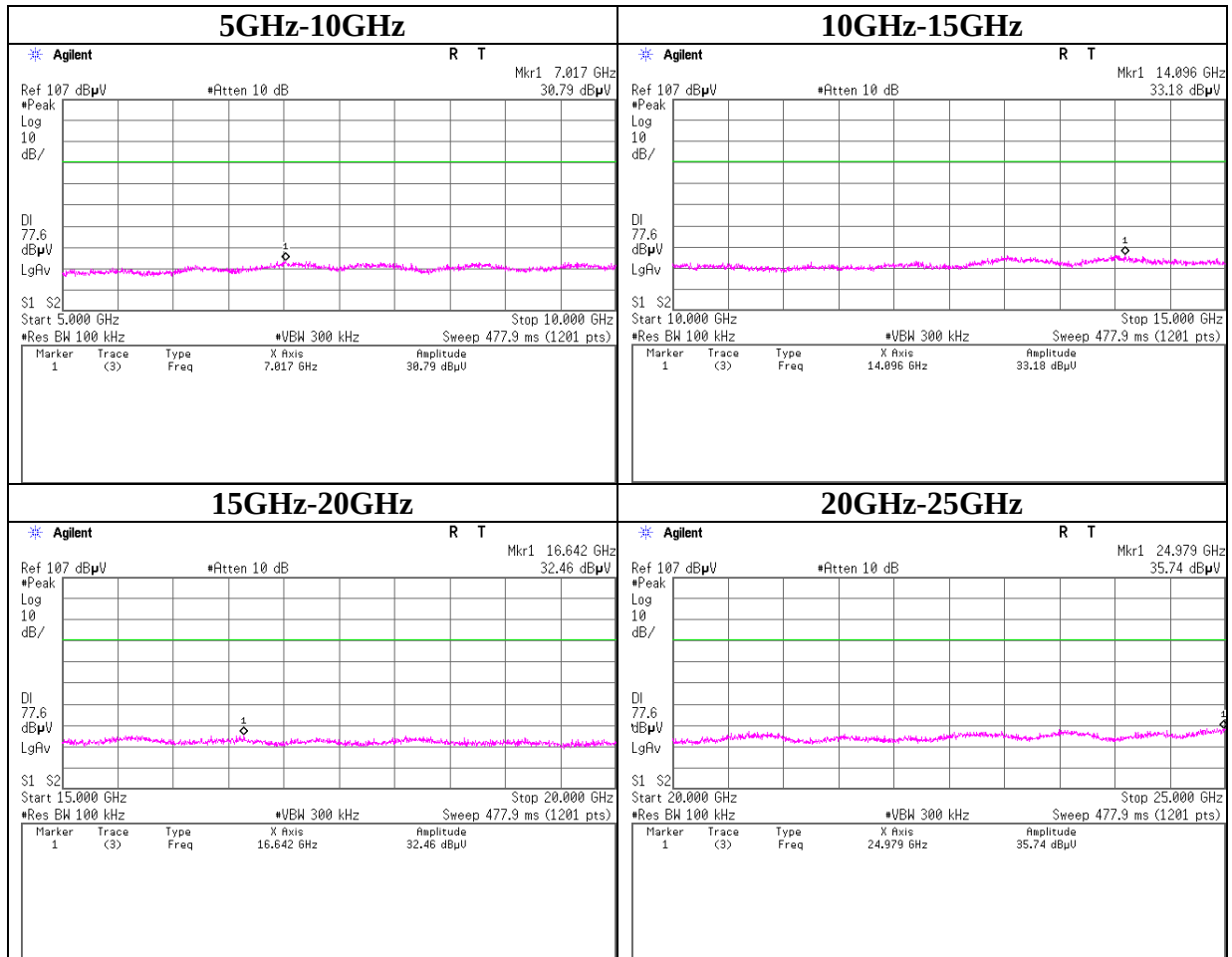
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place Ise HQ EMC Lab. No.11 Measurement Room
Report No. 10273917H
Date 04/07/2014
Temperature/ Humidity 23 deg. C / 32% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) 3DH5

Tx 3DH5 2480MHz



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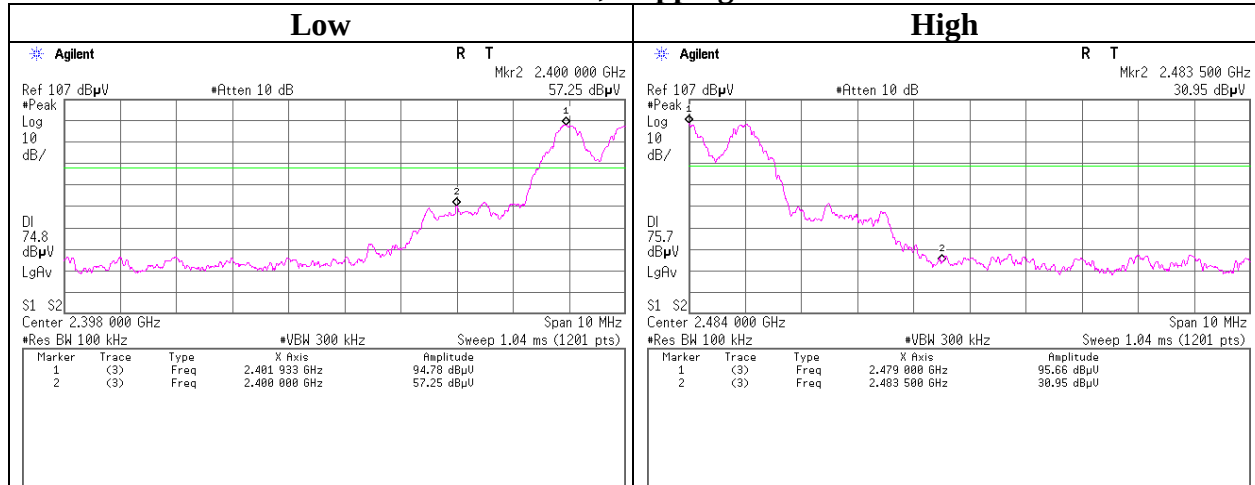
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

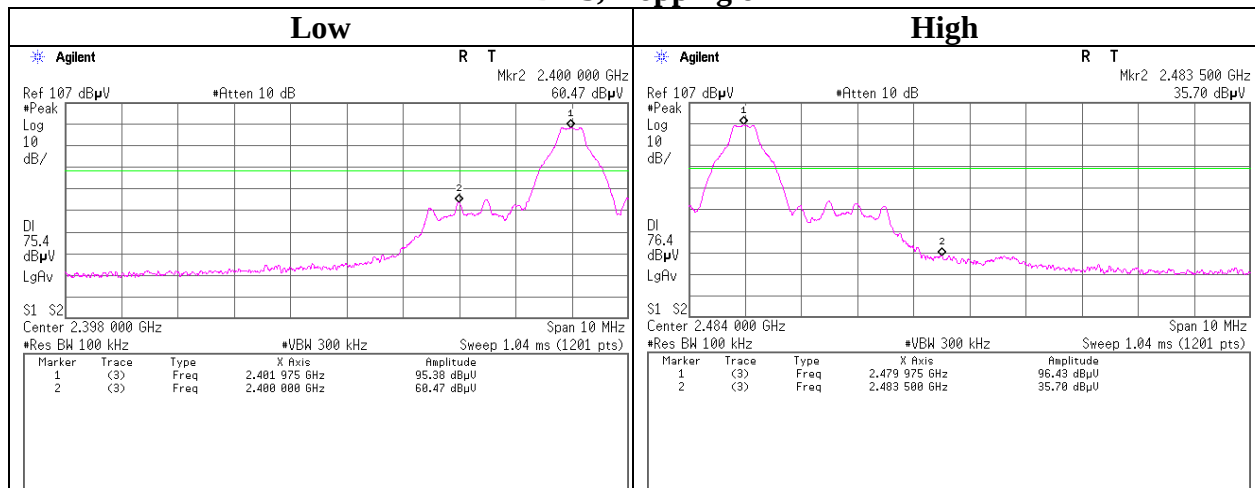
Conducted Emission Band Edge compliance

Test place : Ise HQ EMC Lab. No.3 Measurement Room
Report No. : 10273917H
Date : 04/03/2014
Temperature/ Humidity : 23 deg. C / 44% RH
Engineer : Hiroshi Kukita
Mode : Tx (Hopping on/off) DH5

Tx DH5, Hopping on



Tx DH5, Hopping off



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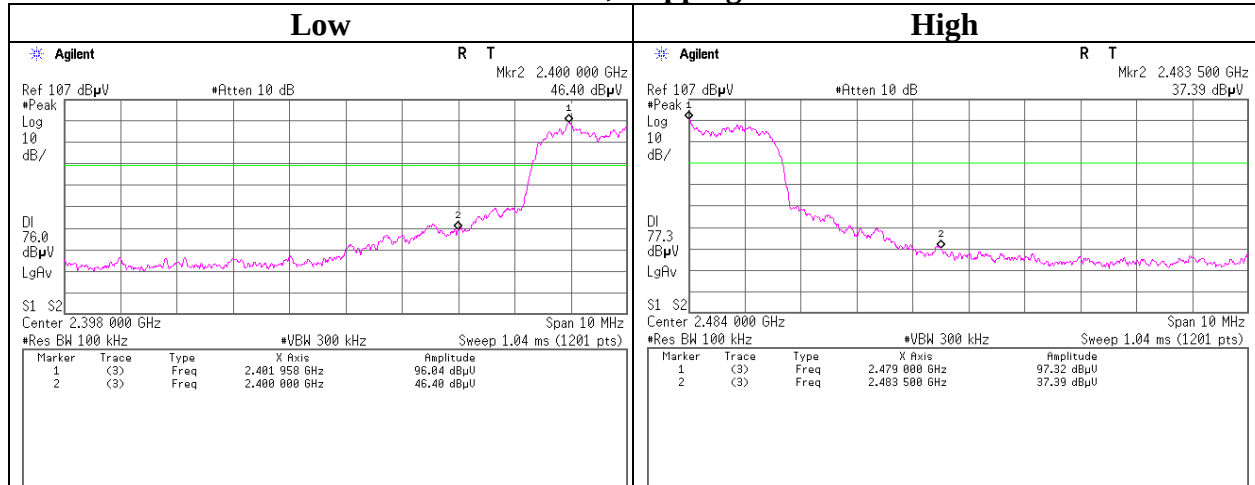
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

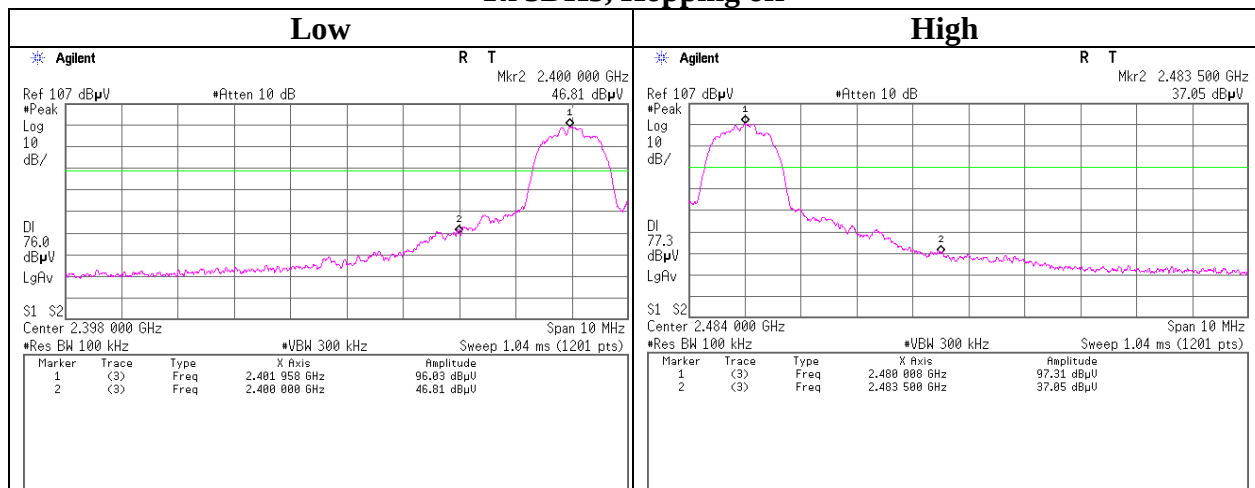
Conducted Emission Band Edge compliance

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping on/off) 3DH5

Tx 3DH5, Hopping on



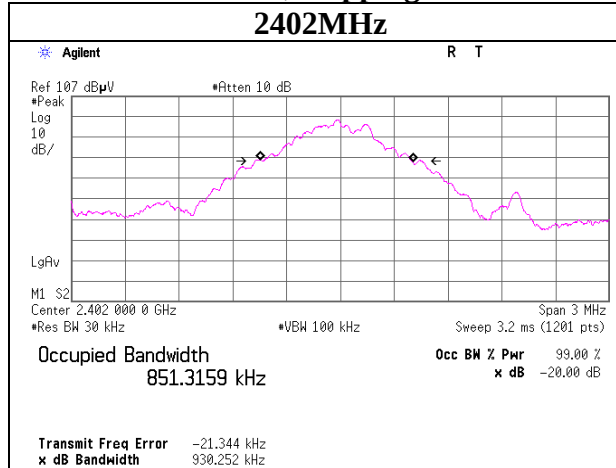
Tx 3DH5, Hopping off



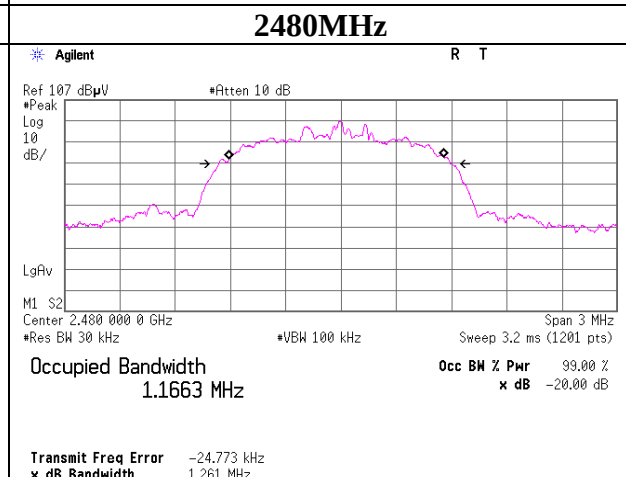
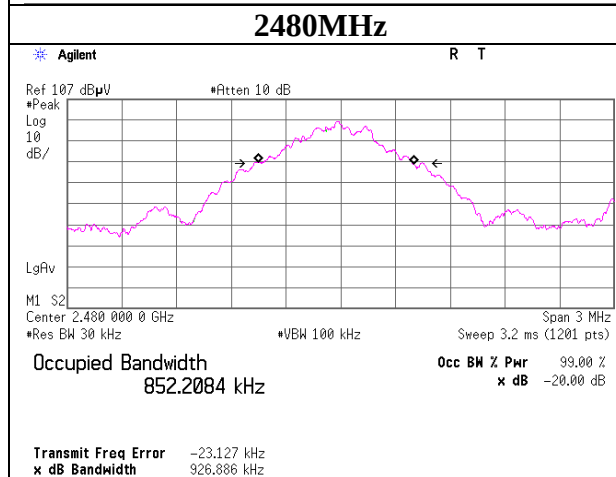
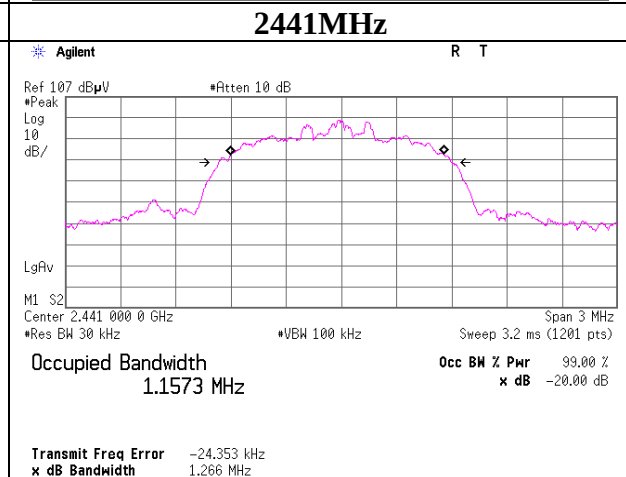
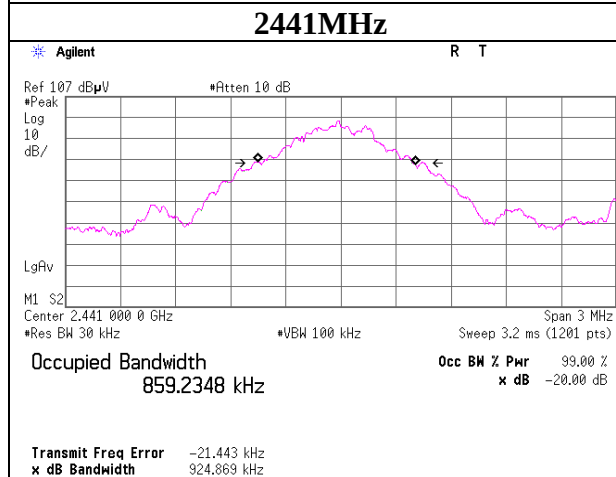
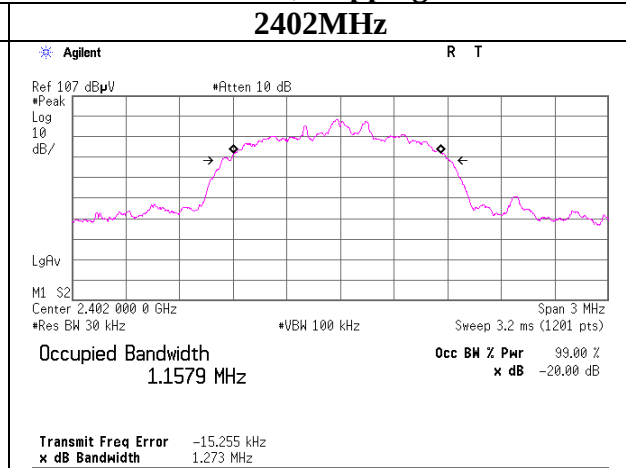
99% Occupied Bandwidth

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) DH5/3DH5

Tx DH5, Hopping off

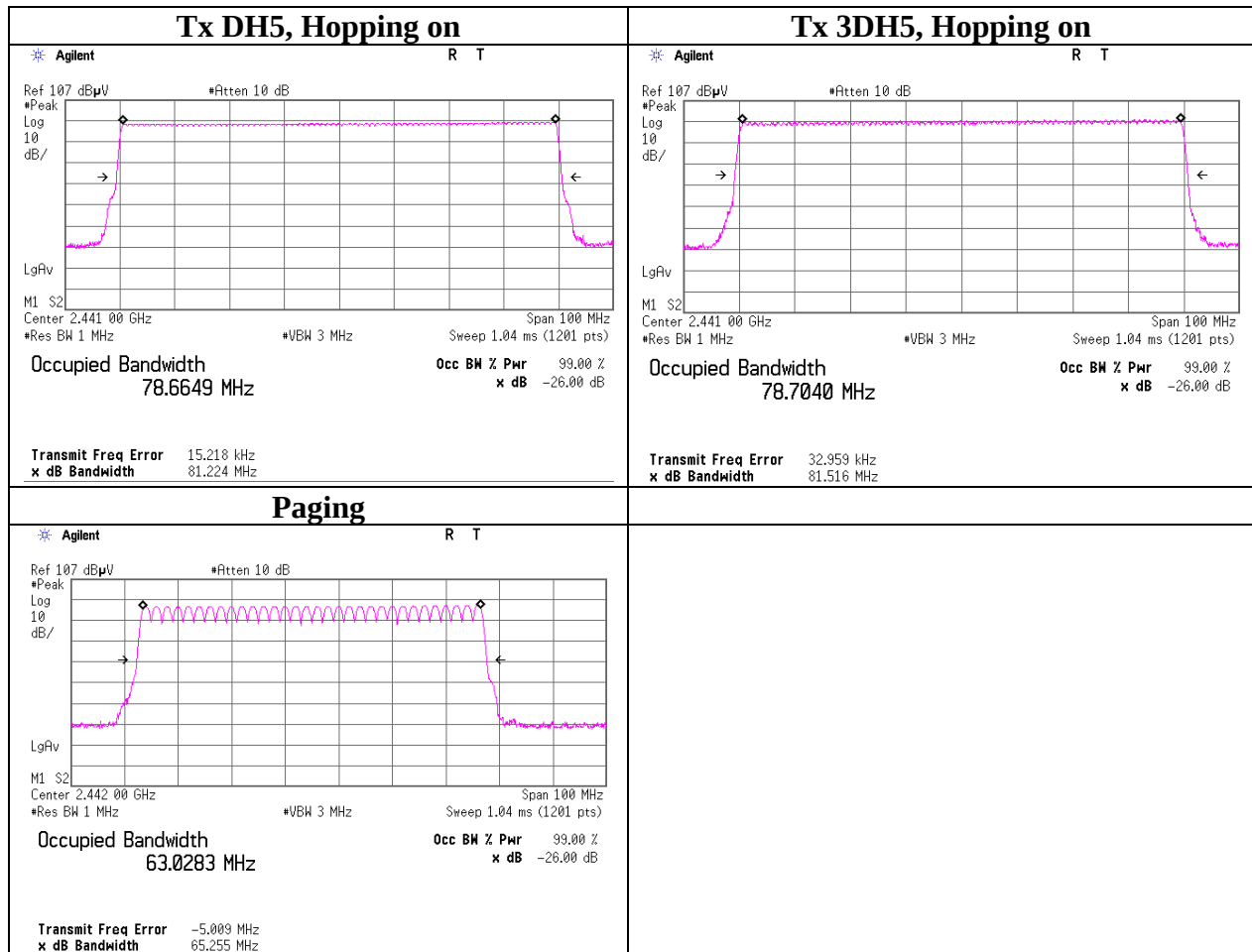


Tx 3DH5, Hopping off



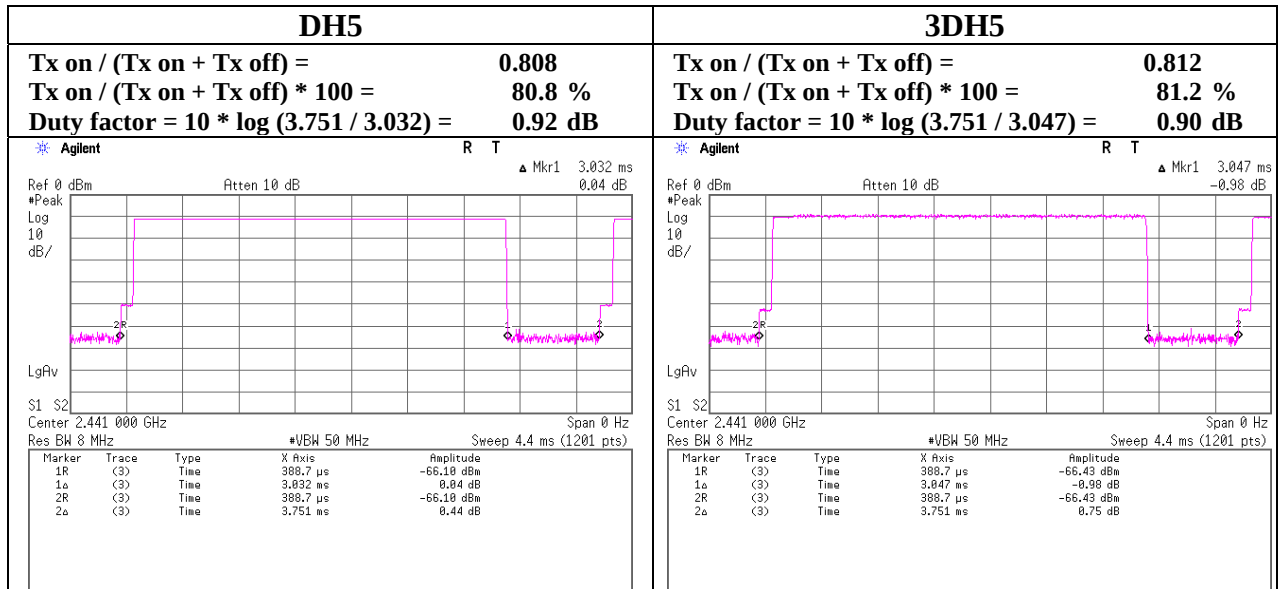
99% Occupied Bandwidth

Test place Ise HQ EMC Lab. No.3 Measurement Room
Report No. 10273917H
Date 04/03/2014
Temperature/ Humidity 23 deg. C / 44% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping on) DH5/3DH5/Paging



Burst rate confirmation

Test place Ise HQ EMC Lab. No.11 Measurement Room
Report No. 10273917H
Date 04/07/2014
Temperature/ Humidity 23 deg. C / 32% RH
Engineer Hiroshi Kukita
Mode Tx (Hopping off) DH5/3DH5



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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	RE	2014/03/05 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2014/02/21 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2013/11/27 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2013/05/17 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2013/09/01 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	AT	2014/02/20 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2014/03/13 * 12
MCC-138	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37953/2	AT	2013/10/18 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2013/10/21 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2013/10/21 * 12
MOS-12	Thermo-Hygrometer	Custom	CTH-180	1201	AT/RE/CE	2014/01/14 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2014/02/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE/CE	2013/11/08 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2014/01/27 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2014/01/20 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/suoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2013/07/23 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2013/12/17 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2013/11/25 * 12
MCC-64	Coaxial Cable	UL Japan	-	-	AT	2014/03/28 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2013/04/17 * 12

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

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

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

Test Item: CE: Conducted Emission

RE: Radiated Emission

AT: Antenna Terminal Conducted test

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