



RADIO TEST REPORT

Test Report No. : 10191682A-D

Applicant : CASIO COMPUTER CO., LTD.
Type of Equipment : Electronic Cash Register
Model No. : V-R7100-C
FCC ID : BBQVR7100
Test regulation : FCC Part 15 Subpart C: 2013
[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.

Date of test: December 27, 2013 to January 29, 2014

Representative test engineer:

Shinya Watanabe
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service



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.: 101916821A-D

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CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of E.U.T. during testing	9
SECTION 5: Conducted Emission.....	11
SECTION 6: Radiated Spurious Emission	12
SECTION 7: Antenna Terminal Conducted Tests.....	13
APPENDIX 1: Data of EMI test.....	14
Conducted Emission	14
20dB Bandwidth and Carrier Frequency Separation.....	18
Number of Hopping Frequency	21
Dwell time	23
Maximum Peak Output Power	26
Radiated Spurious Emission	28
Conducted Spurious Emission	36
Conducted Emission Band Edge compliance	48
99%Occupied Bandwidth	50
APPENDIX 2: Test instruments	52
APPENDIX 3: Photographs of test setup	54
Conducted Emission	54
Radiated Spurious Emission	55
Worst Case Position (Horizontal: Y-axis/ Vertical:Y-axis).....	56

SECTION 1: Customer information

Company Name : CASIO COMPUTER CO., LTD.
Address : 2-1, Sakaecho 3-chome, Hamura-shi, Tokyo 205-8555 Japan

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

2.1 Identification of E.U.T.

Type of Equipment : Electronic Cash Register
Model No. : V-R7100-C
Serial No. : Refer to Section 4, Clause 4.2
Rating : AC120V (AC Adapter output: DC24V)
Receipt Date of Sample : December 24, 2013
Country of Mass-production : Indonesia
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

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2.2 Product Description

Radio Specification

[Bluetooth (Ver. 2.0)]

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS: GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna Type	FPC Antenna
Antenna connector type	Internal Antenna
Antenna Gain	4.09dBi (2.4GHz Main)
Power Supply (radio part input)	DC3.7V

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

Equipment Type	Transceiver	
Frequency of Operation	2412-2462MHz	5180-5320MHz 5500-5700MHz * 5745-5825MHz
Type of Modulation	DSSS, OFDM	OFDM
Antenna Type	FPC Antenna	
Antenna connector type	Internal Antenna	
Antenna Gain	4.09dBi (2.4GHz Main)	4.25 dBi (W52/53 Aux), 4.18 dBi (W56 Aux), 4.62 dBi (W58 Aux)

*5600MHz-5640MHz is not used in Canada.

[WLAN (IEEE802.11n-40)]

Equipment Type	Transceiver	
Frequency of Operation	2422-2452MHz	5190-5310MHz 5510-5670MHz * 5755-5795MHz
Type of Modulation	OFDM	OFDM
Antenna Type	FPC Antenna	
Antenna connector type	Internal Antenna	
Antenna Gain	4.09dBi (2.4GHz Main)	4.25 dBi (W52/53 Aux), 4.18 dBi (W56 Aux), 4.62 dBi (W58 Aux)

*5590MHz-5630MHz is not used in Canada.

Model difference

Model	WLAN Bluetooth	iButton	Power cord (enclosed)
V-R7100-C*	X	-	X
V-R7100-AUS	X	-	-

*Tested model

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013

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 C63.4:2003 7. AC powerline conducted emission measurements IC: RSS-Gen 7.2.4	FCC: Section 15.207 IC: RSS-Gen 7.2.4	QP 18.8dB, 0.17476MHz, L AV 19.8dB, 0.42722MHz, N	Complied	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-210 A8.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-210 A8.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-210 A8.1 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(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: Section15.247(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: Section15.247(d) IC: RSS-210 A8.5 RSS-Gen 6 and 7.2.3	1.6dB 768.007MHz, QP, Hori.	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)

This EUT provides stable voltage(DC3.7V) 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 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	2.4 x 3.4m	-

* 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

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
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	2402MHz 2441MHz 2480MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping on -Hopping off	2402MHz 2480MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping on -Hopping off	2402MHz 2441MHz 2480MHz
*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) *We removed 2DH mode (2 Mb/s EDR: pi/4DQPSK) except 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: Power Level 5 - Software: WLAN:18xx_test.sh, BT: bdt 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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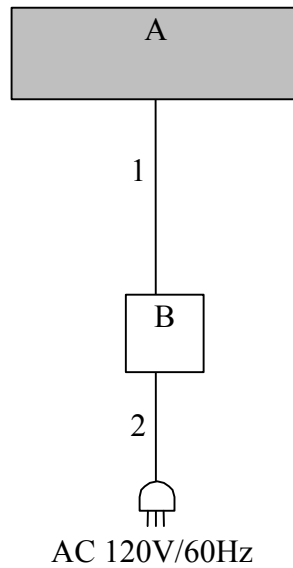
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4.2 Configuration and peripherals



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Electronic Cash Register	V-R7100-C	CS-43 *1) CS-19 *2)	CASIO COMPUTER CO., LTD.	EUT
B	AC Adaptor	EKF2400250X1BA	-	Mass Power Electronic Limited	-

*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	1.8	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, 1.0m 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, 1.0m by 1.5m, 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 and Y 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-26.5GHz

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	3MHz	30kHz	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	Max Hold	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

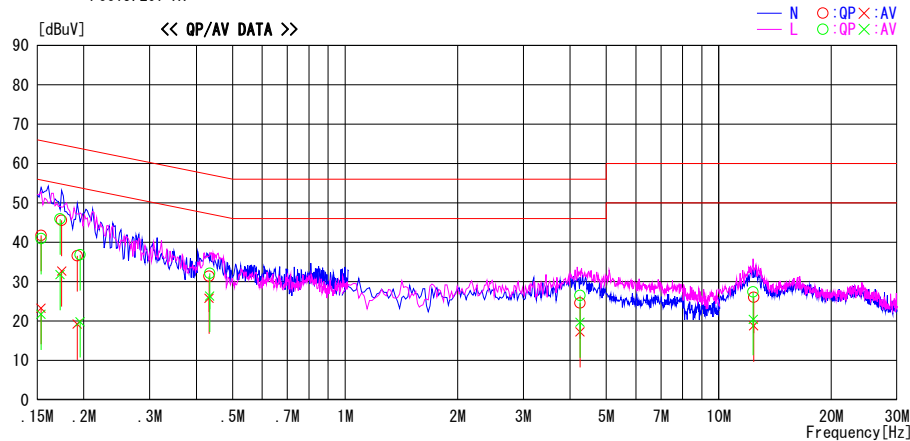
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/01/18

Report No. : 10191682H

Temp./Humi. : 21deg. C / 35% RH
Engineer : Yuta Moriya

Mode / Remarks : Tx_DH5_2402MHz

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]		
0.15349	28.5	10.0	13.2	41.7	23.2	65.8	55.8	24.1	32.6	N	
0.17441	32.4	19.5	13.2	45.6	32.7	64.7	54.7	19.1	22.0	N	
0.19184	23.4	6.0	13.2	36.6	19.2	64.0	54.0	27.4	34.8	N	
0.43245	18.1	12.5	13.3	31.4	25.8	57.2	47.2	25.8	21.4	N	
4.25174	10.6	3.3	14.0	24.6	17.3	56.0	46.0	31.4	28.7	N	
12.40099	11.1	3.8	14.9	26.0	18.7	60.0	50.0	34.0	31.3	N	
0.15349	27.7	8.5	13.2	40.9	21.7	65.8	55.8	24.9	34.1	L	
0.17267	32.7	18.6	13.2	45.9	31.8	64.8	54.8	18.9	23.0	L	
0.19533	23.6	6.6	13.2	36.8	19.8	63.8	53.8	27.0	34.0	L	
0.43419	18.8	13.0	13.3	32.1	26.3	57.2	47.2	25.1	20.9	L	
4.25174	12.5	5.7	14.0	26.5	19.7	56.0	46.0	29.5	26.3	L	
12.36081	12.6	5.6	14.8	27.4	20.4	60.0	50.0	32.6	29.6	L	

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

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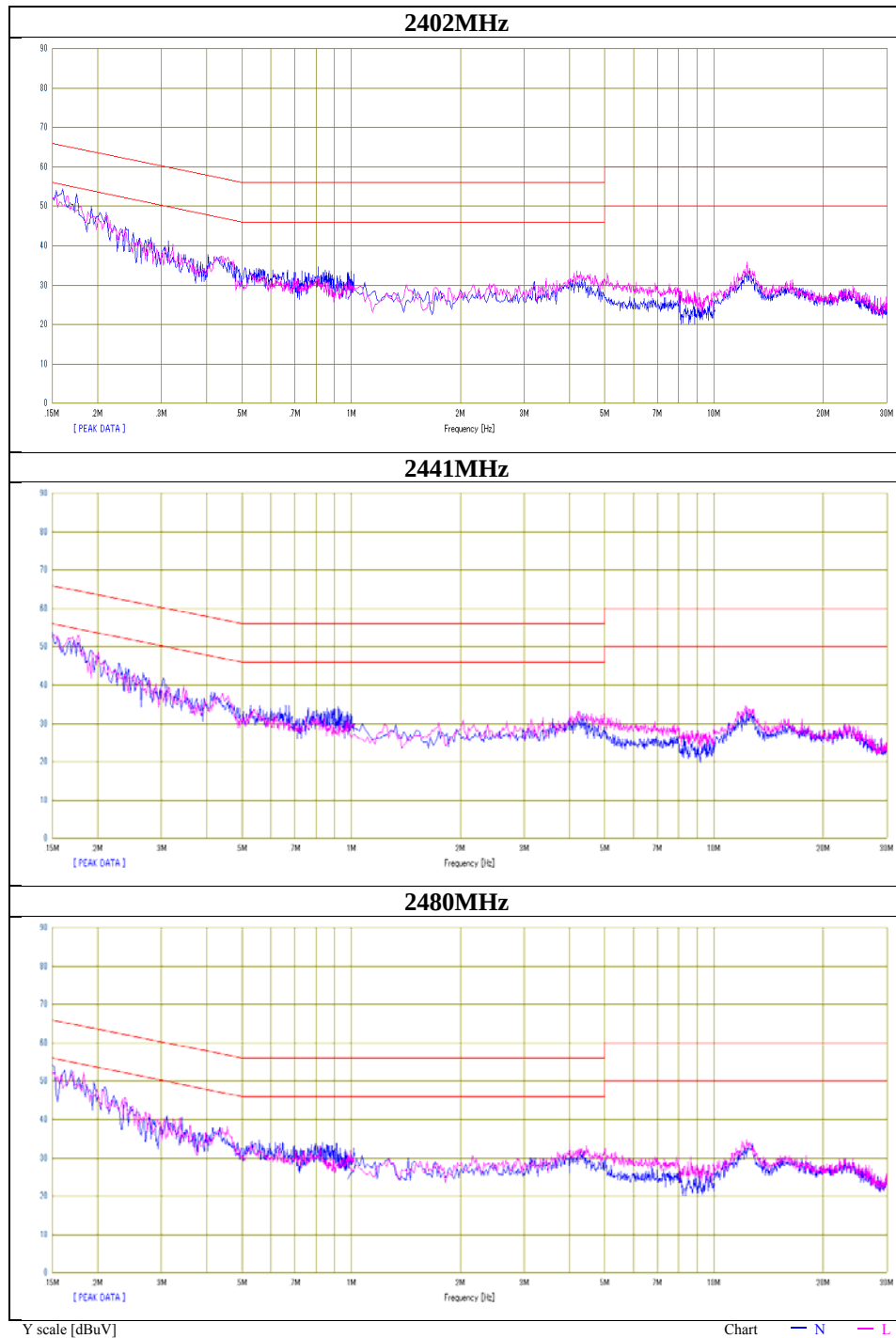
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Conducted Emission

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10191682A
Date	01/18/2014
Temperature/ Humidity	21 deg. C / 35% RH
Engineer	Yuta Moriya
Mode	Tx DH5



Conducted Emission

DATA OF CONDUCTED EMISSION TEST

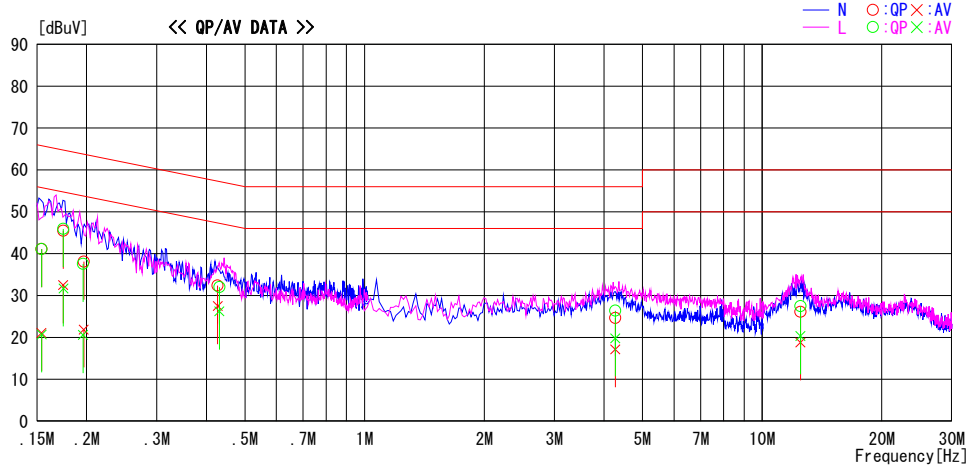
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/01/18

Report No. : 10191682H

Temp./Humi. : 21deg. C / 35% RH
Engineer : Yuta Moriya

Mode / Remarks : Tx_3DH5_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]		
0.15389	27.9	7.9	13.2	41.1	21.1	65.8	55.8	24.7	34.7	N	
0.17452	32.3	19.3	13.2	45.5	32.5	64.7	54.7	19.2	22.2	N	
0.19657	24.9	8.7	13.2	38.1	21.9	63.8	53.8	25.7	31.9	N	
0.42722	19.1	14.2	13.3	32.4	27.5	57.3	47.3	24.9	19.8	N	
4.26992	10.6	3.2	14.0	24.6	17.2	56.0	46.0	31.4	28.8	N	
12.48135	11.2	3.9	14.9	26.1	18.8	60.0	50.0	33.9	31.2	N	
0.15400	27.9	7.5	13.2	41.1	20.7	65.8	55.8	24.7	35.1	L	
0.17476	32.7	18.5	13.2	45.9	31.7	64.7	54.7	18.8	23.0	L	
0.19567	24.4	7.4	13.2	37.6	20.6	63.8	53.8	26.2	33.2	L	
0.43120	18.7	12.9	13.3	32.0	26.2	57.2	47.2	25.2	21.0	L	
4.26992	12.4	5.8	14.0	26.4	19.8	56.0	46.0	29.6	26.2	L	
12.48135	12.6	5.4	14.9	27.5	20.3	60.0	50.0	32.5	29.7	L	

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

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Head Office EMC Lab.

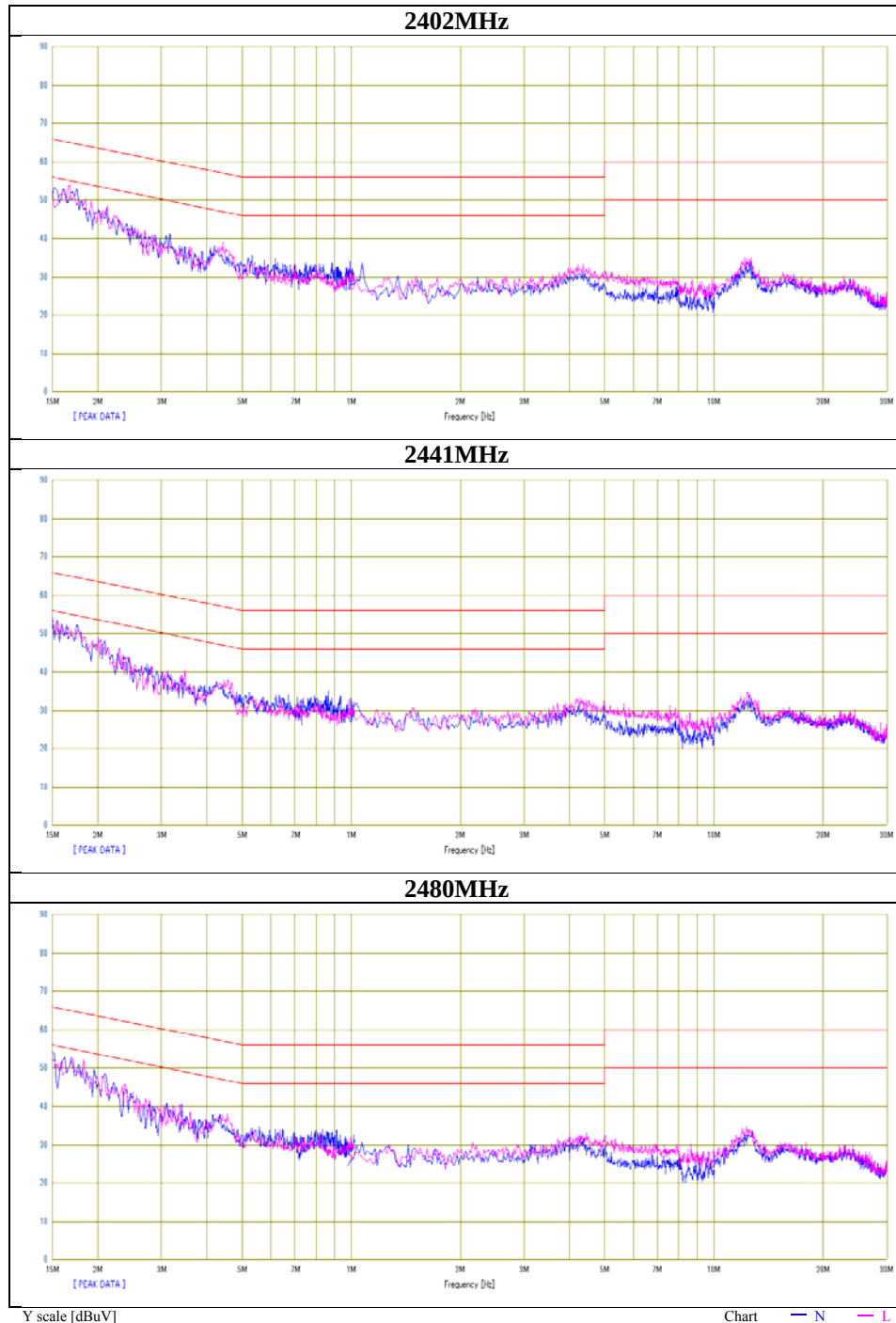
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Report No.	10191682A
Date	01/18/2014
Temperature/ Humidity	21 deg. C / 35% RH
Engineer	Yuta Moriya
Mode	Tx 3DH5



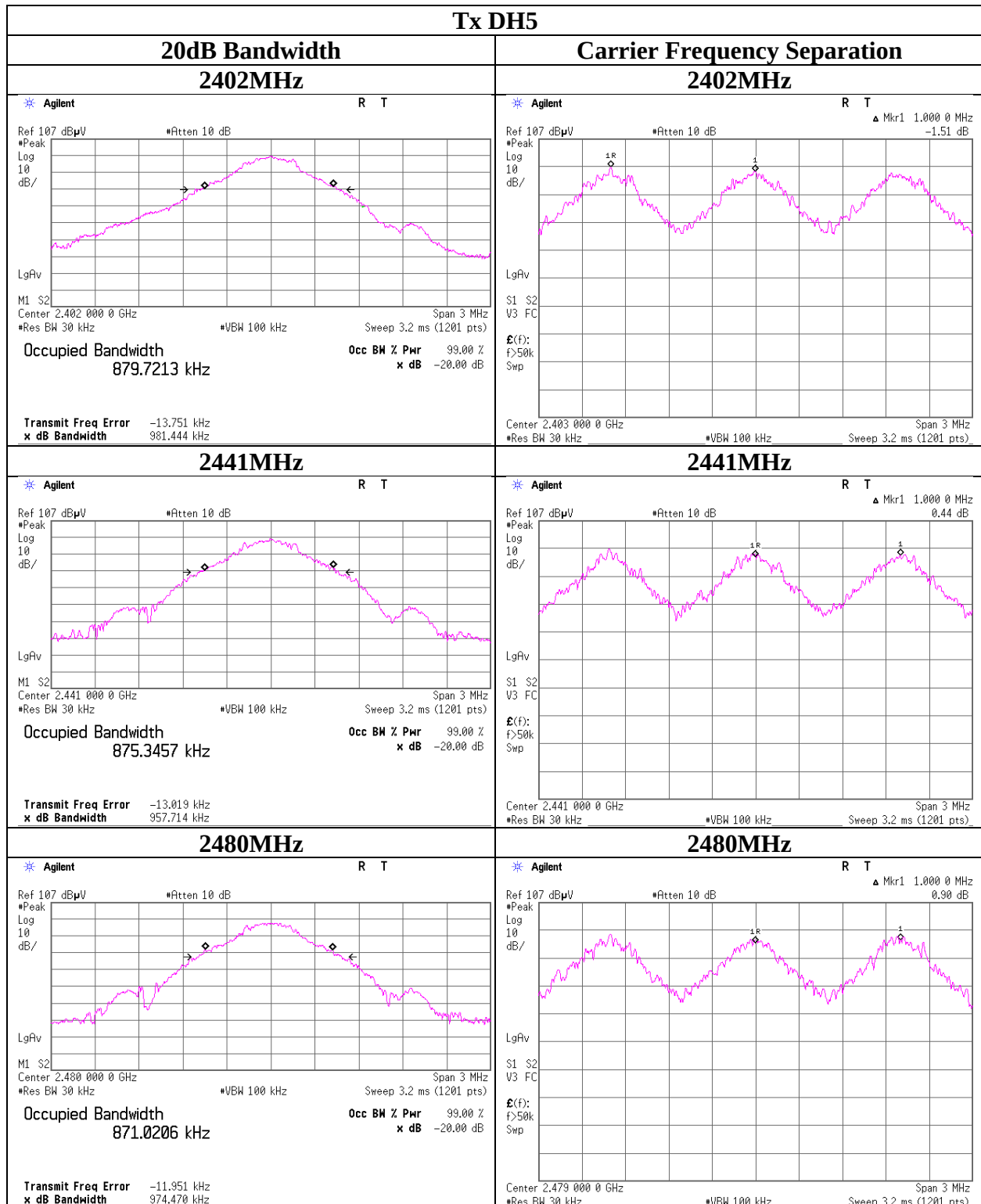
20dB Bandwidth and Carrier Frequency Separation

Test place Head Office EMC Lab. No.3 Measurement Room
Report No. 10191682A
Date 01/07/2014 (DH5) , 01/08/2014 (3DH5)
Temperature/ Humidity 24 deg. C / 43% RH , 22 deg. C / 45% RH
Engineer Shinya Watanabe
Mode Tx (Hopping on) DH5/3DH5

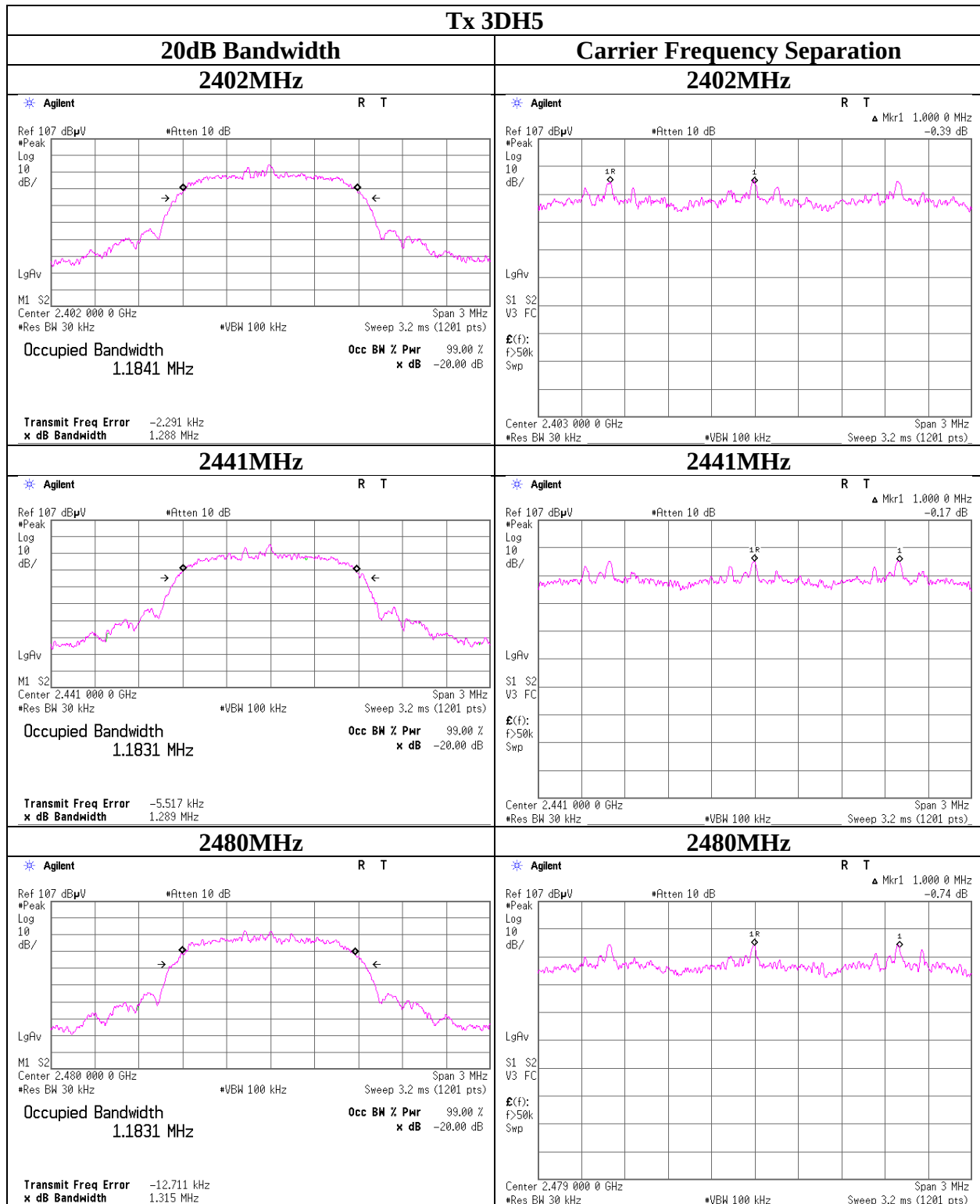
Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.981	1.000	≥ 0.654
DH5	2441.0	0.958	1.000	≥ 0.639
DH5	2480.0	0.974	1.000	≥ 0.649
3DH5	2402.0	1.288	1.000	≥ 0.859
3DH5	2441.0	1.289	1.000	≥ 0.859
3DH5	2480.0	1.315	1.000	≥ 0.877

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

20dB Bandwidth and Carrier Frequency Separation



20dB Bandwidth and Carrier Frequency Separation



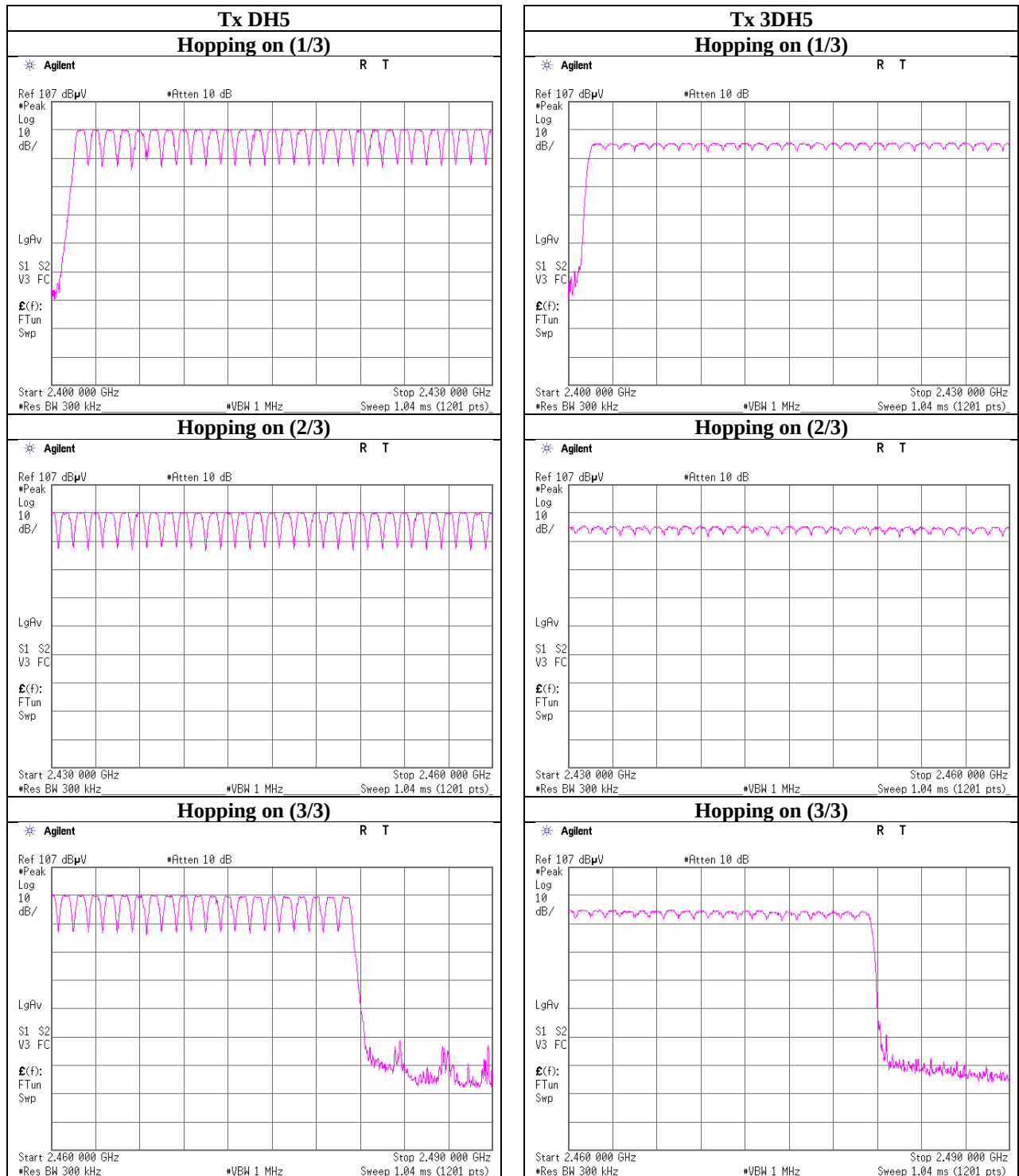
Number of Hopping Frequency

Test place Head Office EMC Lab. No.3 Measurement Room
Report No. 10191682A
Date 01/07/2014 (DH5) , 01/08/2014 (3DH5)
Temperature/ Humidity 24 deg. C / 43% RH , 22 deg. C / 45% RH
Engineer Shinya Watanabe
Mode Tx (Hopping on) DH5/3DH5

Mode	Number of channel [times]	Limit [times]
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 Head Office EMC Lab. No.3 Measurement Room
Report No. 10191682A
Date 01/07/2014 (DH5) , 01/08/2014 (3DH5)
Temperature/ Humidity 24 deg. C / 43% RH , 22 deg. C / 45% RH
Engineer Shinya Watanabe
Mode Tx (Hopping on) DH5/3DH5

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	48.2 times /	5 sec. x	31.6 sec. =	305 times	0.424	129	400
DH3	25.0 times /	5 sec. x	31.6 sec. =	158 times	1.686	266	400
DH5	17.4 times /	5 sec. x	31.6 sec. =	110 times	2.930	322	400
3DH1	49.0 times /	5 sec. x	31.6 sec. =	310 times	0.439	136	400
3DH3	24.0 times /	5 sec. x	31.6 sec. =	152 times	1.680	255	400
3DH5	17.6 times /	5 sec. x	31.6 sec. =	112 times	2.947	330	400

Sample Calculation

Result = Number of transmission x Length of transmission time

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	47	47	49	50	48	48.2
DH3	25	24	26	25	25	25
DH5	18	15	15	20	19	17.4
3DH1	48	50	50	50	47	49
3DH3	22	22	24	27	25	24
3DH5	20	17	16	16	19	17.6

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

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

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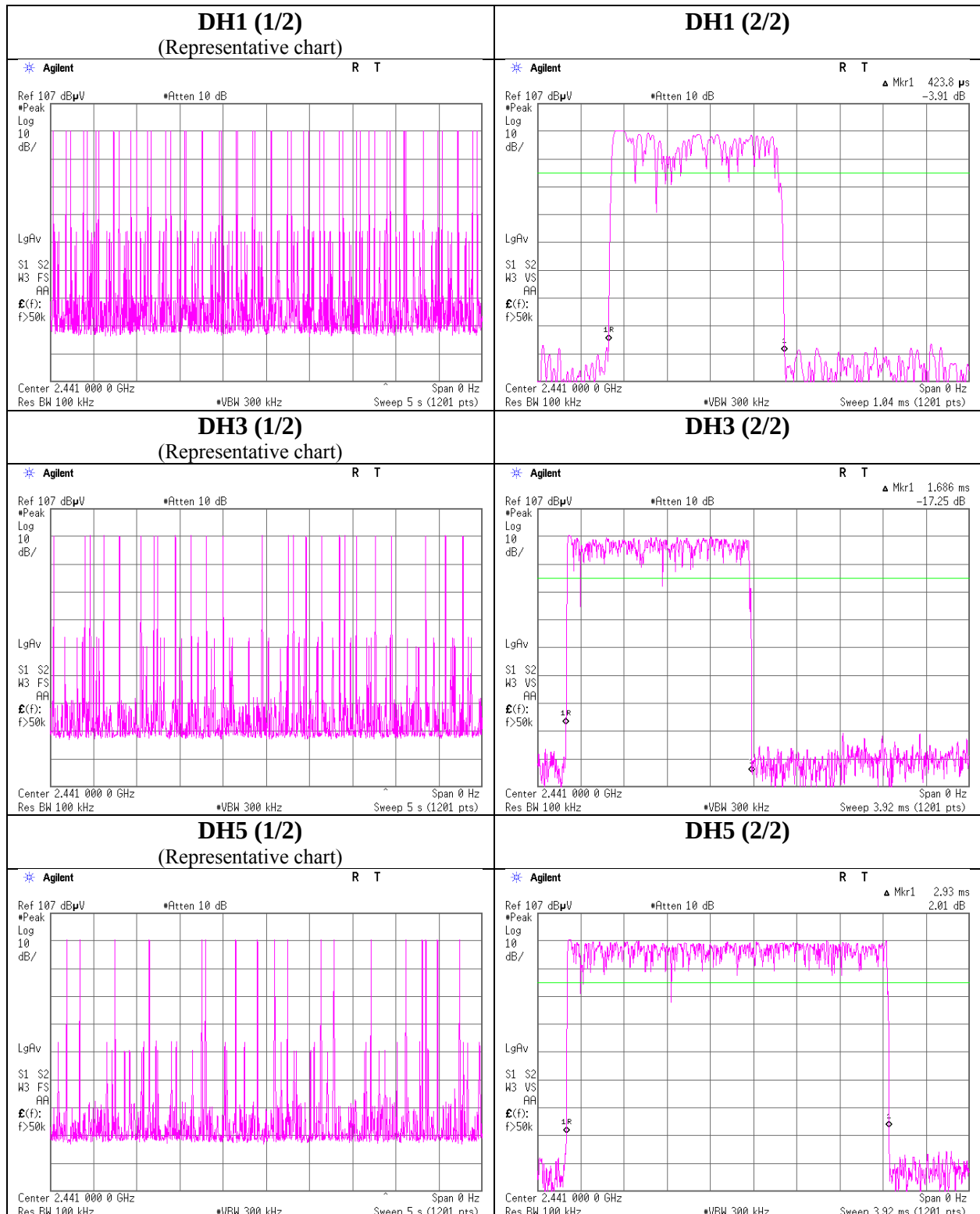
Head Office EMC Lab.

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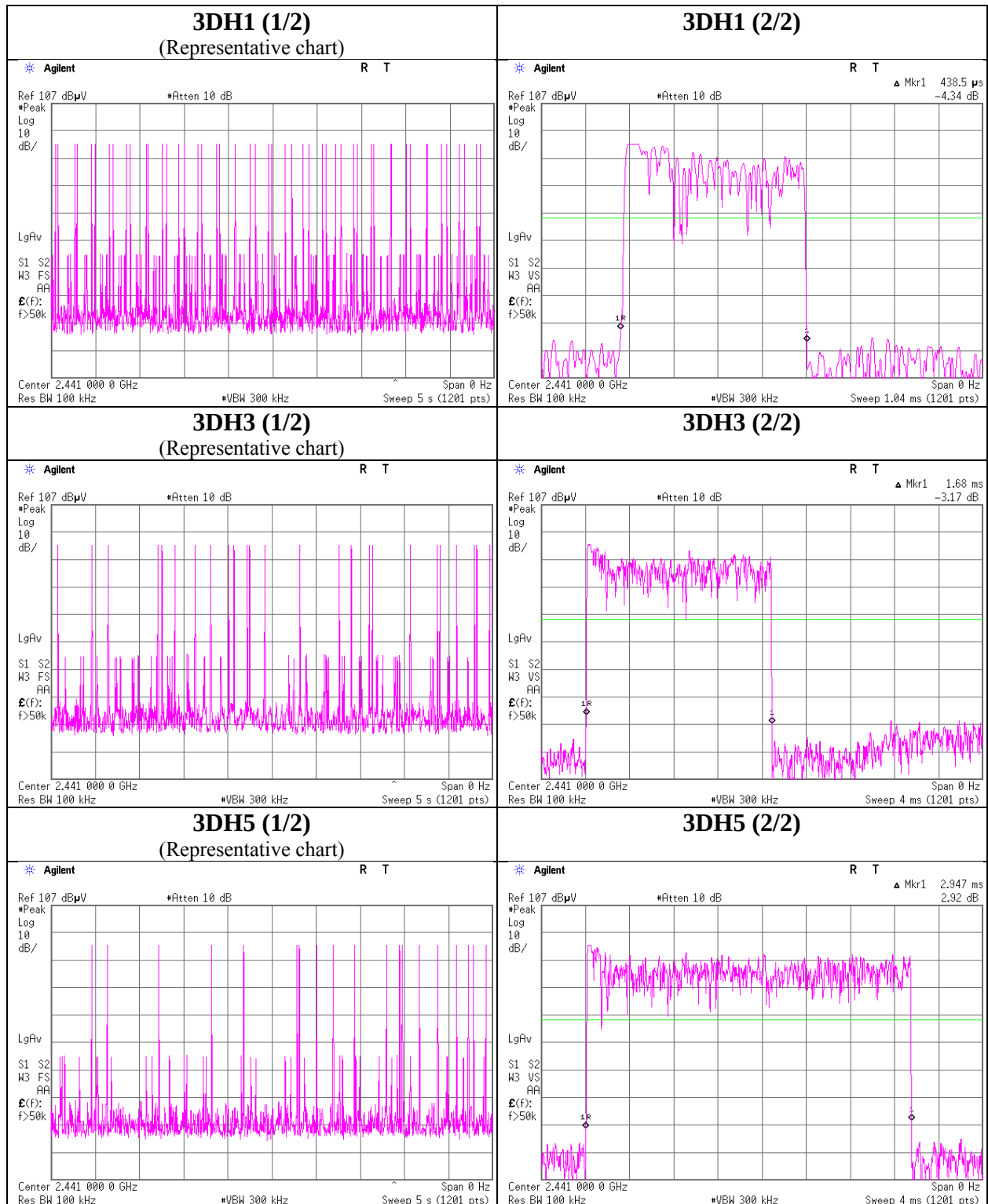
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Dwell time



Dwell time



Maximum Peak Output Power

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 10191682A
Date 12/27/2013 01/29/2014
Temperature/ Humidity 20 deg. C / 47% RH 20 deg. C / 39% RH
Engineer Keisuke Kawamura Tomohisa Nakagawa
Mode Tx (Hopping off) DH5/2DH5/3DH5

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-10.05	1.77	10.07	1.79	1.51	20.96	125	19.17
DH5	2441.0	-9.15	1.79	10.07	2.71	1.87	20.96	125	18.25
DH5	2480.0	-9.04	1.79	10.07	2.82	1.91	20.96	125	18.14
2DH5	2402.0	-12.86	1.77	10.07	-1.02	0.79	20.96	125	21.98
2DH5	2441.0	-11.84	1.79	10.07	0.02	1.00	20.96	125	20.94
2DH5	2480.0	-11.61	1.79	10.07	0.25	1.06	20.96	125	20.71
3DH5	2402.0	-11.85	1.77	10.07	-0.01	1.00	20.96	125	20.97
3DH5	2441.0	-11.80	1.79	10.07	0.06	1.01	20.96	125	20.90
3DH5	2480.0	-11.57	1.79	10.07	0.29	1.07	20.96	125	20.67

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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Head Office EMC Lab.

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Average Output Power
(Reference data for SAR testing)

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 10191682A
Date 12/27/2013 01/29/2014
Temperature/ Humidity 20 deg. C / 47% RH 20 deg. C / 39% RH
Engineer Keisuke Kawamura Tomohisa Nakagawa
Mode Tx (Hopping off) DH5/2DH5/3DH5

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
					[dBm]	[mW]
DH5	2402.0	-11.49	1.77	10.07	0.35	1.08
DH5	2441.0	-10.44	1.79	10.07	1.42	1.39
DH5	2480.0	-10.32	1.79	10.07	1.54	1.43
2DH5	2402.0	-18.86	1.77	10.07	-7.02	0.20
2DH5	2441.0	-15.78	1.79	10.07	-3.92	0.41
2DH5	2480.0	-15.51	1.79	10.07	-3.65	0.43
3DH5	2402.0	-18.57	1.77	10.07	-6.73	0.21
3DH5	2441.0	-15.52	1.79	10.07	-3.66	0.43
3DH5	2480.0	-15.28	1.79	10.07	-3.42	0.45

Sample Calculation:

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 and No.3 Semi Anechoic Chamber
Report No. 10191682A
Date 01/07/2014 01/10/2014
Temperature/ Humidity 26 deg. C / 30% RH 22 deg. C / 32% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(Above 1GHz) (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	42.133	QP	30.4	13.7	7.2	32.2	19.1	40.0	20.9	
Hori	102.351	QP	44.3	10.5	8.1	32.1	30.8	43.5	12.7	
Hori	120.000	QP	40.8	12.8	8.3	32.1	29.8	43.5	13.7	
Hori	307.206	QP	44.4	14.4	9.9	32.0	36.7	46.0	9.3	
Hori	384.005	QP	40.3	17.0	10.4	32.0	35.7	46.0	10.3	
Hori	768.007	QP	41.9	21.5	12.6	31.7	44.3	46.0	1.7	
Hori	998.420	QP	36.5	24.5	13.7	30.5	44.2	53.9	9.7	
Hori	2390.000	PK	50.6	26.8	3.0	35.7	44.7	73.9	29.2	
Hori	4804.000	PK	43.8	30.6	5.4	34.9	44.9	73.9	29.0	
Hori	7206.000	PK	41.7	35.5	6.5	34.9	48.8	73.9	25.1	
Hori	9608.000	PK	41.5	38.2	7.2	35.4	51.5	73.9	22.4	
Hori	2390.000	AV	34.4	26.8	3.0	35.7	28.5	53.9	25.5	
Hori	4804.000	AV	32.7	30.6	5.4	34.9	33.8	53.9	20.1	
Hori	7206.000	AV	31.1	35.5	6.5	34.9	38.2	53.9	15.7	
Hori	9608.000	AV	30.7	38.2	7.2	35.4	40.7	53.9	13.2	
Vert	42.111	QP	37.3	13.7	7.2	32.2	26.0	40.0	14.0	
Vert	102.303	QP	40.5	10.5	8.1	32.1	27.0	43.5	16.5	
Vert	171.200	QP	38.4	15.8	8.8	32.1	30.9	43.5	12.6	
Vert	307.206	QP	43.3	14.4	9.9	32.0	35.6	46.0	10.4	
Vert	768.007	QP	37.1	21.5	12.6	31.7	39.5	46.0	6.5	
Vert	921.619	QP	35.6	22.8	13.4	30.9	40.9	46.0	5.1	
Vert	998.415	QP	33.0	24.5	13.7	30.5	40.7	53.9	13.2	
Vert	2390.000	PK	48.3	26.8	3.0	35.7	42.4	73.9	31.5	
Vert	4804.000	PK	42.8	30.6	5.4	34.9	43.9	73.9	30.0	
Vert	7206.000	PK	41.1	35.5	6.5	34.9	48.2	73.9	25.7	
Vert	9608.000	PK	40.8	38.2	7.2	35.4	50.8	73.9	23.1	
Vert	2390.000	AV	33.5	26.8	3.0	35.7	27.6	53.9	26.3	
Vert	4804.000	AV	32.0	30.6	5.4	34.9	33.1	53.9	20.8	
Vert	7206.000	AV	31.1	35.5	6.5	34.9	38.2	53.9	15.8	
Vert	9608.000	AV	30.8	38.2	7.2	35.4	40.8	53.9	13.1	

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

Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10191682A
Date : 01/07/2014
Temperature/ Humidity : 26 deg. C / 30% RH
Engineer : Keisuke Kawamura
20dBc
Mode : Tx, DH5 2402MHz

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2402.000	PK	99.4	26.8	3.0	35.7	93.5	-	-	Carrier
Hori	2400.000	PK	46.3	26.8	3.0	35.7	40.4	73.5	33.1	
Vert	2402.000	PK	96.5	26.8	3.0	35.7	90.6	-	-	Carrier
Vert	2400.000	PK	42.6	26.8	3.0	35.7	36.7	70.6	33.9	

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

UL Japan, Inc.

Head Office EMC Lab.

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 and No.3 Semi Anechoic Chamber
Report No. 10191682A
Date 01/07/2014 01/10/2014
Temperature/ Humidity 26 deg. C / 30% RH 22 deg. C / 32% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(Above 1GHz) (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	42.111	QP	30.4	13.7	7.2	32.2	19.1	40.0	20.9	
Hori	102.285	QP	44.2	10.5	8.1	32.1	30.7	43.5	12.8	
Hori	120.000	QP	40.7	12.8	8.3	32.1	29.7	43.5	13.8	
Hori	307.206	QP	44.5	14.4	9.9	32.0	36.8	46.0	9.2	
Hori	384.010	QP	41.3	17.0	10.4	32.0	36.7	46.0	9.3	
Hori	768.007	QP	40.7	21.5	12.6	31.7	43.1	46.0	2.9	
Hori	998.420	QP	37.1	24.5	13.7	30.5	44.8	53.9	9.1	
Hori	4882.000	PK	46.3	30.9	5.4	34.9	47.7	73.9	26.2	
Hori	7323.000	PK	41.7	35.7	6.6	34.9	49.1	73.9	24.8	
Hori	9764.000	PK	41.5	38.4	7.3	35.4	51.8	73.9	22.1	
Hori	4882.000	AV	35.2	30.9	5.4	34.9	36.6	53.9	17.3	
Hori	7323.000	AV	31.1	35.7	6.6	34.9	38.5	53.9	15.4	
Hori	9764.000	AV	30.7	38.4	7.3	35.4	41.0	53.9	12.9	
Vert	42.120	QP	37.5	13.7	7.2	32.2	26.2	40.0	13.8	
Vert	102.307	QP	40.6	10.5	8.1	32.1	27.1	43.5	16.4	
Vert	171.996	QP	38.5	15.8	8.8	32.1	31.0	43.5	12.5	
Vert	307.200	QP	43.6	14.4	9.9	32.0	35.9	46.0	10.1	
Vert	768.019	QP	37.0	21.5	12.6	31.7	39.4	46.0	6.6	
Vert	921.625	QP	35.0	22.8	13.4	30.9	40.3	46.0	5.7	
Vert	998.415	QP	33.0	24.5	13.7	30.5	40.7	53.9	13.2	
Vert	4882.000	PK	45.2	30.9	5.4	34.9	46.6	73.9	27.3	
Vert	7323.000	PK	41.1	35.7	6.6	34.9	48.5	73.9	25.4	
Vert	9764.000	PK	40.8	38.4	7.3	35.4	51.1	73.9	22.8	
Vert	4882.000	AV	34.9	30.9	5.4	34.9	36.3	53.9	17.6	
Vert	7323.000	AV	31.1	35.7	6.6	34.9	38.5	53.9	15.5	
Vert	9764.000	AV	30.8	38.4	7.3	35.4	41.1	53.9	12.8	

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

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 and No.3 Semi Anechoic Chamber
Report No. 10191682A
Date 01/07/2014 01/10/2014
Temperature/ Humidity 26 deg. C / 30% RH 22 deg. C / 32% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(Above 1GHz) (Below 1GHz)
Mode Tx, DH5 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	42.111	QP	29.2	13.7	7.2	32.2	17.9	40.0	22.1	
Hori	102.274	QP	43.4	10.5	8.1	32.1	29.9	43.5	13.6	
Hori	120.000	QP	41.0	12.8	8.3	32.1	30.0	43.5	13.5	
Hori	307.206	QP	44.2	14.4	9.9	32.0	36.5	46.0	9.5	
Hori	384.015	QP	40.0	17.0	10.4	32.0	35.4	46.0	10.6	
Hori	768.008	QP	41.3	21.5	12.6	31.7	43.7	46.0	2.3	
Hori	844.817	QP	37.2	22.1	13.0	31.3	41.0	46.0	5.0	
Hori	998.420	QP	36.7	24.5	13.7	30.5	44.4	53.9	9.5	
Hori	2483.500	PK	52.3	26.7	3.1	35.7	46.4	73.9	27.5	
Hori	4960.000	PK	46.4	31.1	5.4	34.9	48.0	73.9	25.9	
Hori	7440.000	PK	41.7	35.9	6.6	34.9	49.3	73.9	24.6	
Hori	9920.000	PK	41.5	38.7	7.3	35.4	52.1	73.9	21.8	
Hori	2483.500	AV	38.1	26.7	3.1	35.7	32.2	53.9	21.7	
Hori	4960.000	AV	36.1	31.1	5.4	34.9	37.7	53.9	16.2	
Hori	7440.000	AV	31.1	35.9	6.6	34.9	38.7	53.9	15.2	
Hori	9920.000	AV	30.7	38.7	7.3	35.4	41.3	53.9	12.6	
Vert	42.120	QP	37.3	13.7	7.2	32.2	26.0	40.0	14.0	
Vert	102.295	QP	40.0	10.5	8.1	32.1	26.5	43.5	17.0	
Vert	172.476	QP	38.3	15.9	8.8	32.1	30.9	43.5	12.6	
Vert	307.201	QP	44.3	14.4	9.9	32.0	36.6	46.0	9.4	
Vert	768.019	QP	37.2	21.5	12.6	31.7	39.6	46.0	6.4	
Vert	921.621	QP	36.4	22.8	13.4	30.9	41.7	46.0	4.3	
Vert	998.415	QP	35.3	24.5	13.7	30.5	43.0	53.9	10.9	
Vert	2483.500	PK	53.5	26.7	3.1	35.7	47.6	73.9	26.3	
Vert	4960.000	PK	45.3	31.1	5.4	34.9	46.9	73.9	27.1	
Vert	7440.000	PK	41.1	35.9	6.6	34.9	48.7	73.9	25.2	
Vert	9920.000	PK	40.8	38.7	7.3	35.4	51.4	73.9	22.5	
Vert	2483.500	AV	35.9	26.7	3.1	35.7	30.0	53.9	23.9	
Vert	4960.000	AV	34.4	31.1	5.4	34.9	36.0	53.9	17.9	
Vert	7440.000	AV	31.1	35.9	6.6	34.9	38.7	53.9	15.3	
Vert	9920.000	AV	30.8	38.7	7.3	35.4	41.4	53.9	12.5	

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

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 and No.3 Semi Anechoic Chamber
Report No. 10191682A
Date 01/07/2014 01/10/2014
Temperature/ Humidity 26 deg. C / 30% RH 22 deg. C / 32% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(Above 1GHz) (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	42.133	QP	30.6	13.7	7.2	32.2	19.3	40.0	20.7	
Hori	102.294	QP	44.3	10.5	8.1	32.1	30.8	43.5	12.7	
Hori	120.000	QP	40.9	12.8	8.3	32.1	29.9	43.5	13.6	
Hori	307.203	QP	44.9	14.4	9.9	32.0	37.2	46.0	8.8	
Hori	384.016	QP	40.4	17.0	10.4	32.0	35.8	46.0	10.2	
Hori	768.007	QP	42.0	21.5	12.6	31.7	44.4	46.0	1.6	
Hori	998.428	QP	37.4	24.5	13.7	30.5	45.1	53.9	8.8	
Hori	2390.000	PK	47.8	26.8	3.0	35.7	41.9	73.9	32.0	
Hori	4804.000	PK	53.5	30.6	5.4	34.9	54.6	73.9	19.3	
Hori	7206.000	PK	41.7	35.5	6.5	34.9	48.8	73.9	25.1	
Hori	9608.000	PK	41.5	38.2	7.2	35.4	51.5	73.9	22.4	
Hori	12010.000	PK	45.9	38.9	-1.6	34.4	48.8	73.9	25.1	
Hori	2390.000	AV	34.4	26.8	3.0	35.7	28.5	53.9	25.5	
Hori	4804.000	AV	48.1	30.6	5.4	34.9	49.2	53.9	4.7	
Hori	7206.000	AV	31.1	35.5	6.5	34.9	38.2	53.9	15.7	
Hori	9608.000	AV	30.7	38.2	7.2	35.4	40.7	53.9	13.2	
Hori	12010.000	AV	35.0	38.9	-1.6	34.4	37.9	53.9	16.0	
Vert	42.112	QP	37.9	13.7	7.2	32.2	26.6	40.0	13.4	
Vert	102.301	QP	40.5	10.5	8.1	32.1	27.0	43.5	16.5	
Vert	172.480	QP	38.3	15.9	8.8	32.1	30.9	43.5	12.6	
Vert	307.206	QP	44.1	14.4	9.9	32.0	36.4	46.0	9.6	
Vert	768.007	QP	37.6	21.5	12.6	31.7	40.0	46.0	6.0	
Vert	921.619	QP	36.6	22.8	13.4	30.9	41.9	46.0	4.1	
Vert	998.428	QP	32.7	24.5	13.7	30.5	40.4	53.9	13.5	
Vert	2390.000	PK	45.5	26.8	3.0	35.7	39.6	73.9	34.3	
Vert	4804.000	PK	51.5	30.6	5.4	34.9	52.6	73.9	21.3	
Vert	7206.000	PK	41.1	35.5	6.5	34.9	48.2	73.9	25.7	
Vert	9608.000	PK	40.8	38.2	7.2	35.4	50.8	73.9	23.1	
Vert	12010.000	PK	43.3	38.9	-1.6	34.4	46.2	73.9	27.7	
Vert	2390.000	AV	32.7	26.8	3.0	35.7	26.8	53.9	27.1	
Vert	4804.000	AV	45.6	30.6	5.4	34.9	46.7	53.9	7.2	
Vert	7206.000	AV	31.1	35.5	6.5	34.9	38.2	53.9	15.8	
Vert	9608.000	AV	30.8	38.2	7.2	35.4	40.8	53.9	13.1	
Vert	12010.000	AV	33.5	38.9	-1.6	34.4	36.4	53.9	17.5	

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

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10191682A
Date 01/07/2014
Temperature/ Humidity 26 deg. C / 30% RH
Engineer Keisuke Kawamura
20dBc
Mode Tx, 3DH5 2402MHz

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2402.000	PK	104.6	26.8	3.0	35.7	98.7	-	-	Carrier
Hori	2400.000	PK	60.9	26.8	3.0	35.7	55.0	78.7	23.7	
Vert	2402.000	PK	101.5	26.8	3.0	35.7	95.6	-	-	Carrier
Vert	2400.000	PK	57.4	26.8	3.0	35.7	51.5	75.6	24.1	

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

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 and No.3 Semi Anechoic Chamber
Report No. 10191682A
Date 01/07/2014 01/10/2014
Temperature/ Humidity 26 deg. C / 30% RH 22 deg. C / 32% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(Above 1GHz) (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	42.096	QP	31.1	13.7	7.2	32.2	19.8	40.0	20.2	
Hori	102.285	QP	42.5	10.5	8.1	32.1	29.0	43.5	14.5	
Hori	120.000	QP	40.9	12.8	8.3	32.1	29.9	43.5	13.6	
Hori	307.208	QP	45.0	14.4	9.9	32.0	37.3	46.0	8.7	
Hori	384.008	QP	40.2	17.0	10.4	32.0	35.6	46.0	10.4	
Hori	768.005	QP	40.0	21.5	12.6	31.7	42.4	46.0	3.6	
Hori	844.817	QP	37.8	22.1	13.0	31.3	41.6	46.0	4.4	
Hori	998.420	QP	37.7	24.5	13.7	30.5	45.4	53.9	8.5	
Hori	4882.000	PK	53.9	30.9	5.4	34.9	55.3	73.9	18.6	
Hori	7323.000	PK	41.7	35.7	6.6	34.9	49.1	73.9	24.8	
Hori	9764.000	PK	41.5	38.4	7.3	35.4	51.8	73.9	22.1	
Hori	12205.000	PK	44.1	38.9	-1.6	34.2	47.2	73.9	26.7	
Hori	4882.000	AV	48.9	30.9	5.4	34.9	50.3	53.9	3.6	
Hori	7323.000	AV	31.1	35.7	6.6	34.9	38.5	53.9	15.4	
Hori	9764.000	AV	30.7	38.4	7.3	35.4	41.0	53.9	12.9	
Hori	12205.000	AV	33.2	38.9	-1.6	34.2	36.3	53.9	17.6	
Vert	42.091	QP	37.5	13.7	7.2	32.2	26.2	40.0	13.8	
Vert	102.307	QP	40.3	10.5	8.1	32.1	26.8	43.5	16.7	
Vert	171.956	QP	37.6	15.8	8.8	32.1	30.1	43.5	13.4	
Vert	307.196	QP	43.1	14.4	9.9	32.0	35.4	46.0	10.6	
Vert	768.019	QP	36.2	21.5	12.6	31.7	38.6	46.0	7.4	
Vert	921.625	QP	36.0	22.8	13.4	30.9	41.3	46.0	4.7	
Vert	998.415	QP	34.6	24.5	13.7	30.5	42.3	53.9	11.6	
Vert	4882.000	PK	52.8	30.9	5.4	34.9	54.2	73.9	19.7	
Vert	7323.000	PK	41.1	35.7	6.6	34.9	48.5	73.9	25.4	
Vert	9764.000	PK	40.8	38.4	7.3	35.4	51.1	73.9	22.8	
Vert	12205.000	PK	44.4	38.9	-1.6	34.2	47.5	73.9	26.4	
Vert	4882.000	AV	47.0	30.9	5.4	34.9	48.4	53.9	5.5	
Vert	7323.000	AV	31.1	35.7	6.6	34.9	38.5	53.9	15.5	
Vert	9764.000	AV	30.8	38.4	7.3	35.4	41.1	53.9	12.8	
Vert	12205.000	AV	32.5	38.9	-1.6	34.2	35.6	53.9	18.3	

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

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 and No.3 Semi Anechoic Chamber
Report No. 10191682A
Date 01/07/2014 01/10/2014
Temperature/ Humidity 26 deg. C / 30% RH 22 deg. C / 32% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(Above 1GHz) (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	42.111	QP	28.8	13.7	7.2	32.2	17.5	40.0	22.5	
Hori	102.256	QP	42.8	10.5	8.1	32.1	29.3	43.5	14.2	
Hori	120.000	QP	41.4	12.8	8.3	32.1	30.4	43.5	13.1	
Hori	307.206	QP	44.6	14.4	9.9	32.0	36.9	46.0	9.1	
Hori	384.007	QP	38.5	17.0	10.4	32.0	33.9	46.0	12.1	
Hori	768.014	QP	38.1	21.5	12.6	31.7	40.5	46.0	5.5	
Hori	844.817	QP	36.7	22.1	13.0	31.3	40.5	46.0	5.5	
Hori	998.420	QP	38.0	24.5	13.7	30.5	45.7	53.9	8.2	
Hori	2483.500	PK	54.5	26.7	3.1	35.7	48.6	73.9	25.3	
Hori	4960.000	PK	49.8	31.1	5.4	34.9	51.4	73.9	22.5	
Hori	7440.000	PK	41.7	35.9	6.6	34.9	49.3	73.9	24.6	
Hori	9920.000	PK	41.5	38.7	7.3	35.4	52.1	73.9	21.8	
Hori	12400.000	PK	46.6	38.9	-1.4	34.1	50.0	73.9	23.9	
Hori	2483.500	AV	39.7	26.7	3.1	35.7	33.8	53.9	20.1	
Hori	4960.000	AV	43.2	31.1	5.4	34.9	44.8	53.9	9.1	
Hori	7440.000	AV	31.1	35.9	6.6	34.9	38.7	53.9	15.2	
Hori	9920.000	AV	30.7	38.7	7.3	35.4	41.3	53.9	12.6	
Hori	12400.000	AV	35.5	38.9	-1.4	34.1	38.9	53.9	15.0	
Vert	42.114	QP	37.1	13.7	7.2	32.2	25.8	40.0	14.2	
Vert	102.295	QP	39.7	10.5	8.1	32.1	26.2	43.5	17.3	
Vert	172.147	QP	37.6	15.8	8.8	32.1	30.1	43.5	13.4	
Vert	307.201	QP	42.8	14.4	9.9	32.0	35.1	46.0	10.9	
Vert	768.020	QP	35.2	21.5	12.6	31.7	37.6	46.0	8.4	
Vert	921.618	QP	36.2	22.8	13.4	30.9	41.5	46.0	4.5	
Vert	998.418	QP	34.3	24.5	13.7	30.5	42.0	53.9	11.9	
Vert	2483.500	PK	51.1	26.7	3.1	35.7	45.2	73.9	28.8	
Vert	4960.000	PK	49.4	31.1	5.4	34.9	51.0	73.9	22.9	
Vert	7440.000	PK	41.1	35.9	6.6	34.9	48.7	73.9	25.2	
Vert	9920.000	PK	40.8	38.7	7.3	35.4	51.4	73.9	22.5	
Vert	12400.000	PK	41.2	38.9	-1.4	34.1	44.6	73.9	29.3	
Vert	2483.500	AV	38.9	26.7	3.1	35.7	33.0	53.9	21.0	
Vert	4960.000	AV	42.1	31.1	5.4	34.9	43.7	53.9	10.3	
Vert	7440.000	AV	31.1	35.9	6.6	34.9	38.7	53.9	15.3	
Vert	9920.000	AV	30.8	38.7	7.3	35.4	41.4	53.9	12.5	
Vert	12400.000	AV	30.9	38.9	-1.4	34.1	34.3	53.9	19.6	

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

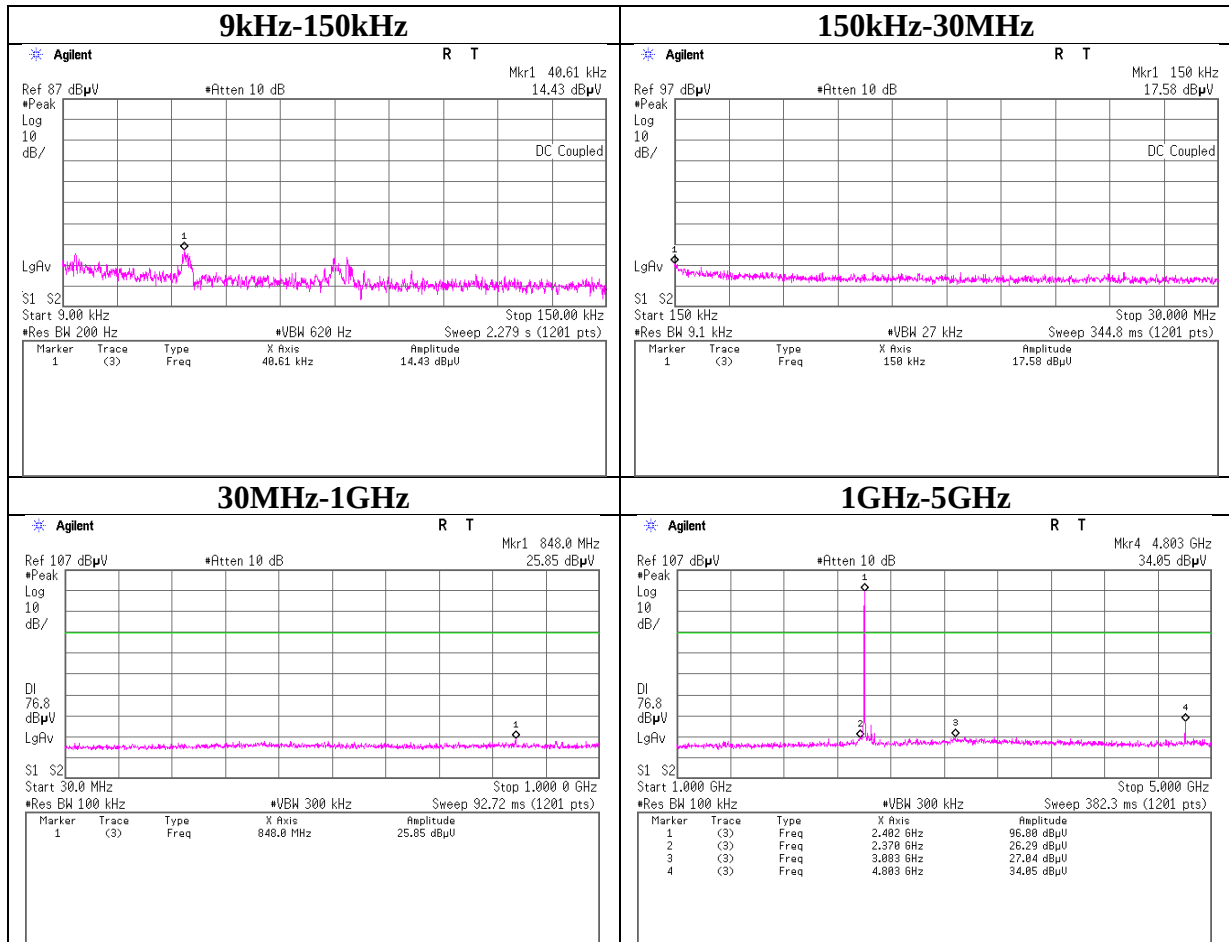
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

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

Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/07/2014
Temperature/ Humidity : 24 deg. C / 43% RH
Engineer : Shinya Watanabe
Mode : Tx DH5

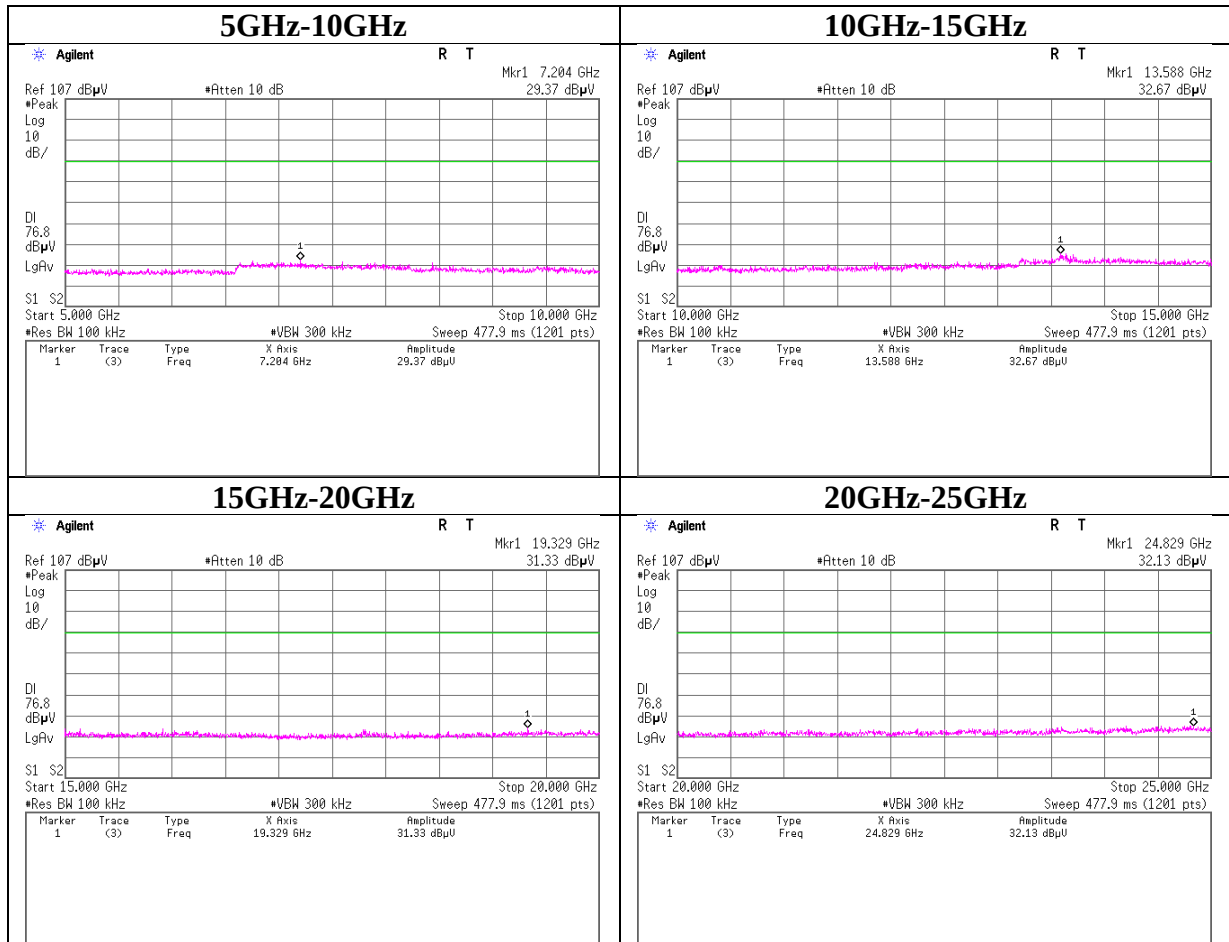
Tx DH5 2402MHz



Conducted Spurious Emission

Test place Head Office EMC Lab. No.3 Measurement Room
Report No. 10191682A
Date 01/07/2014
Temperature/ Humidity 24 deg. C / 43% RH
Engineer Shinya Watanabe
Mode Tx DH5

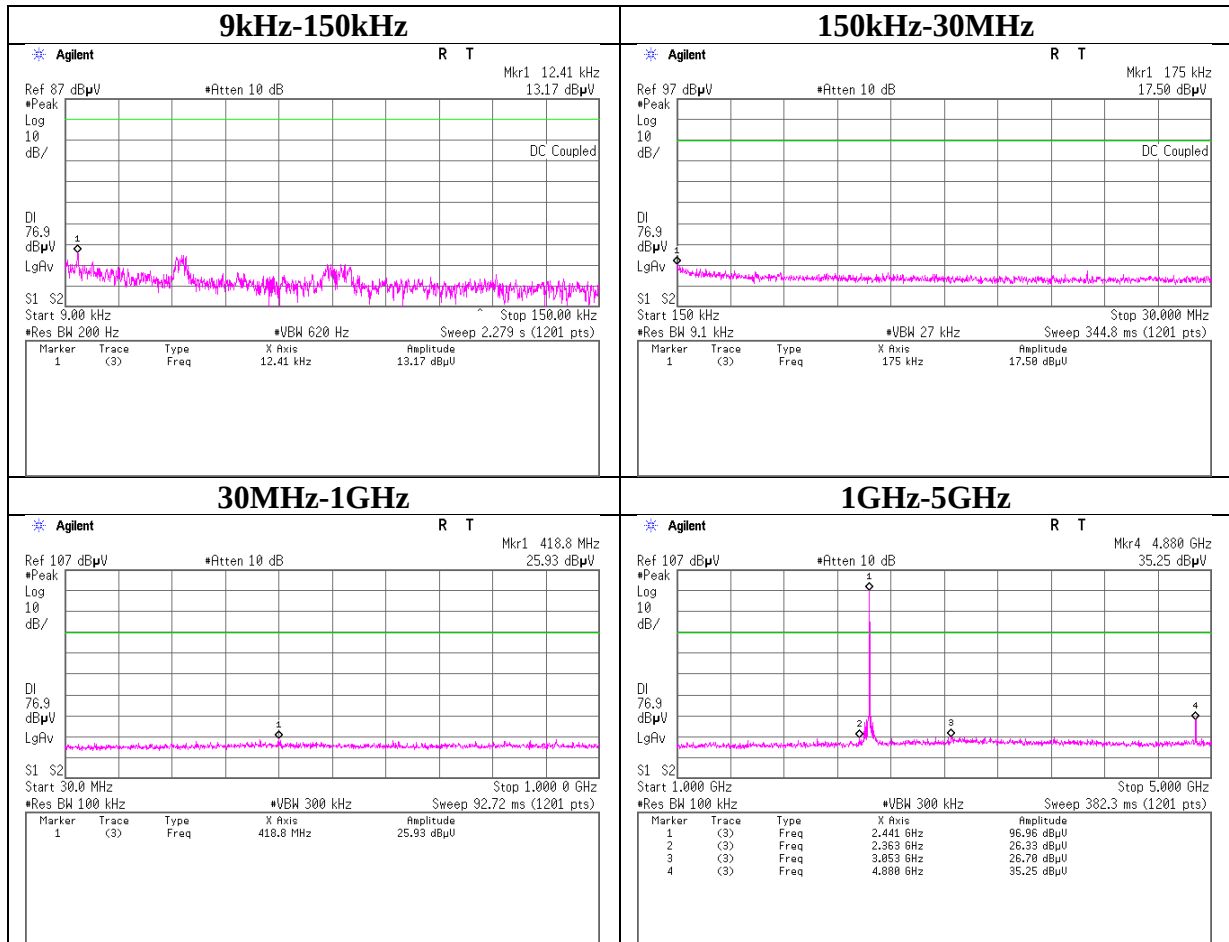
Tx DH5 2402MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/07/2014
Temperature/ Humidity : 24 deg. C / 43% RH
Engineer : Shinya Watanabe
Mode : Tx DH5

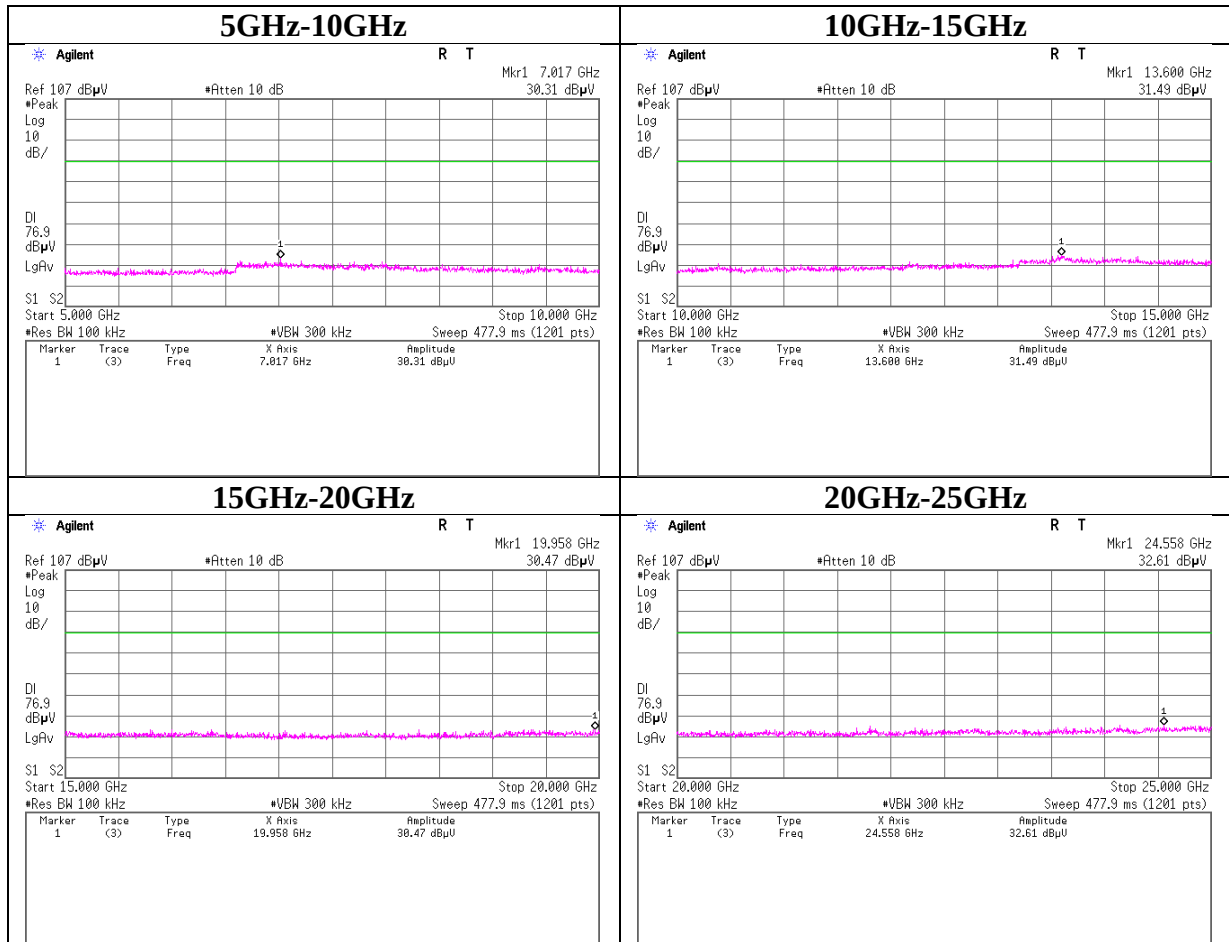
Tx DH5 2441MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/07/2014
Temperature/ Humidity : 24 deg. C / 43% RH
Engineer : Shinya Watanabe
Mode : Tx DH5

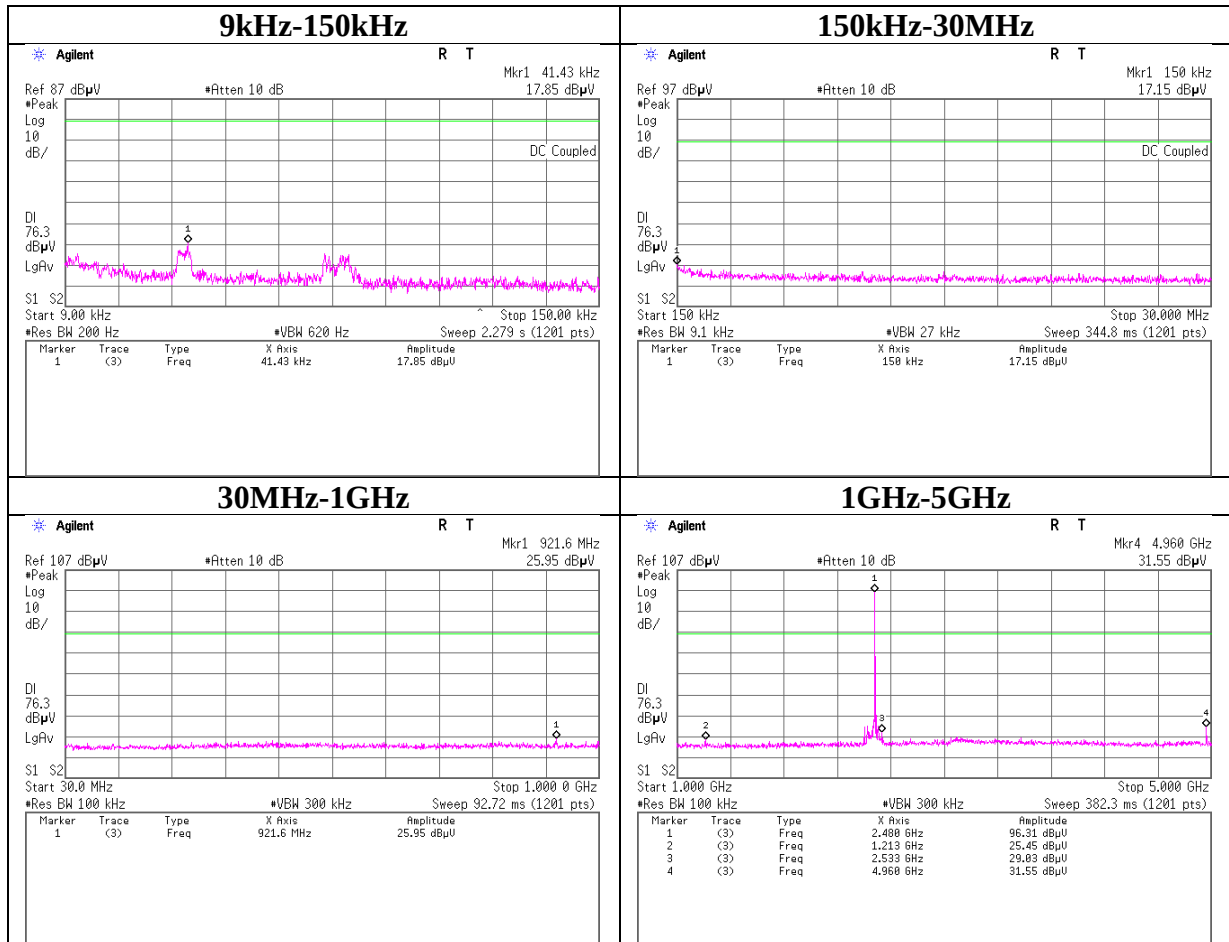
Tx DH5 2441MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/07/2014
Temperature/ Humidity : 24 deg. C / 43% RH
Engineer : Shinya Watanabe
Mode : Tx DH5

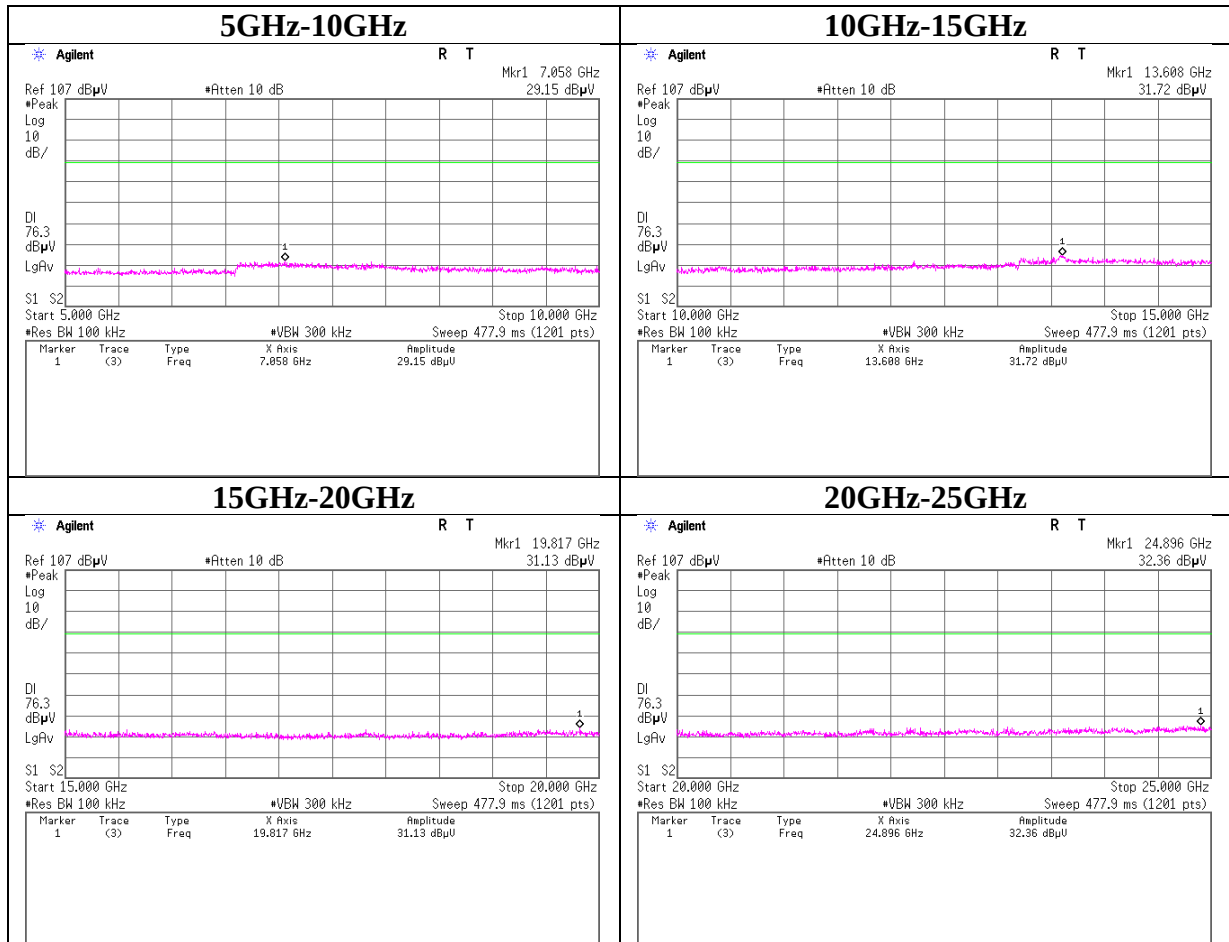
Tx DH5 2480MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/07/2014
Temperature/ Humidity : 24 deg. C / 43% RH
Engineer : Shinya Watanabe
Mode : Tx DH5

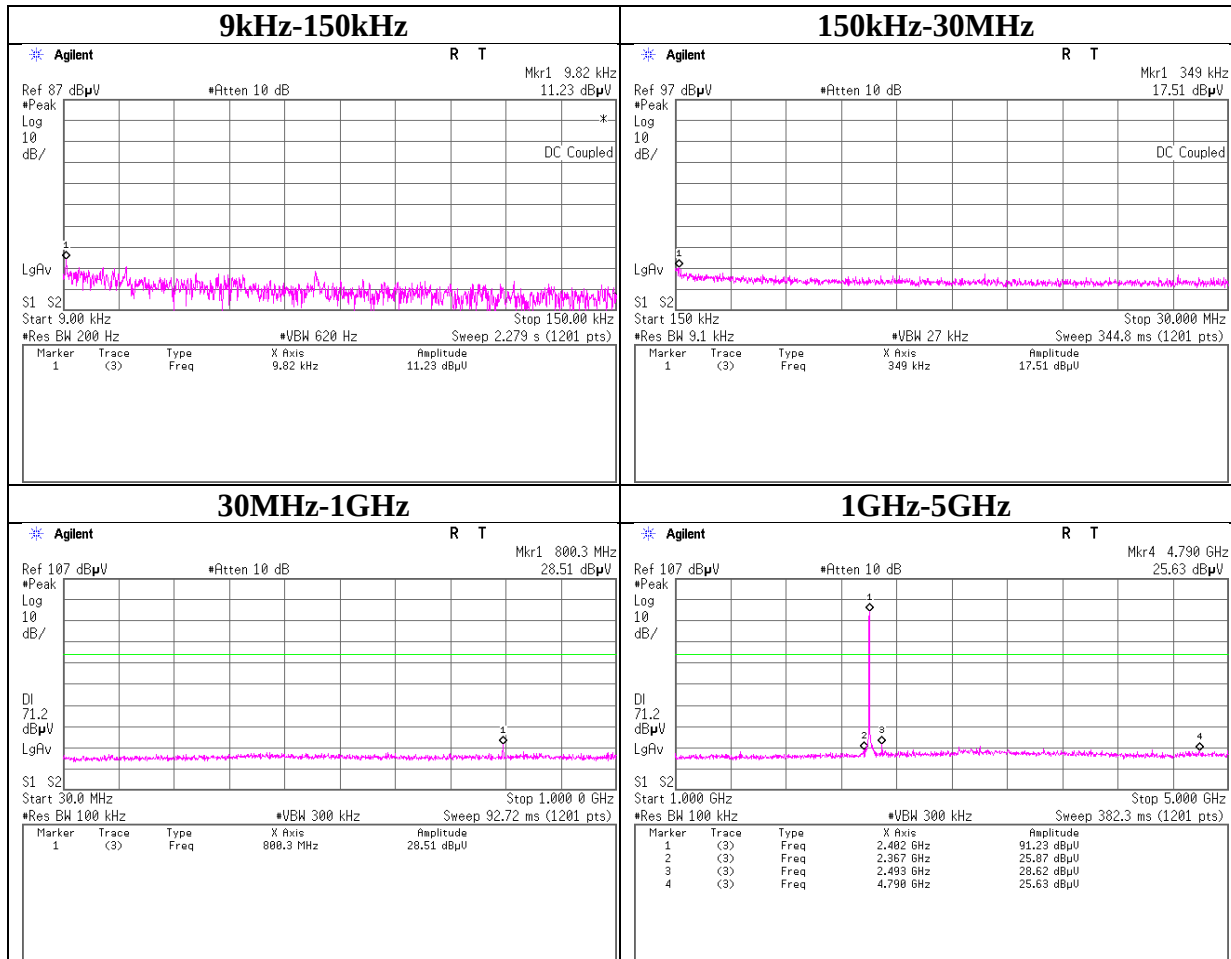
Tx DH5 2480MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/08/2014
Temperature/ Humidity : 22 deg. C / 45% RH
Engineer : Shinya Watanabe
Mode : Tx 3DH5

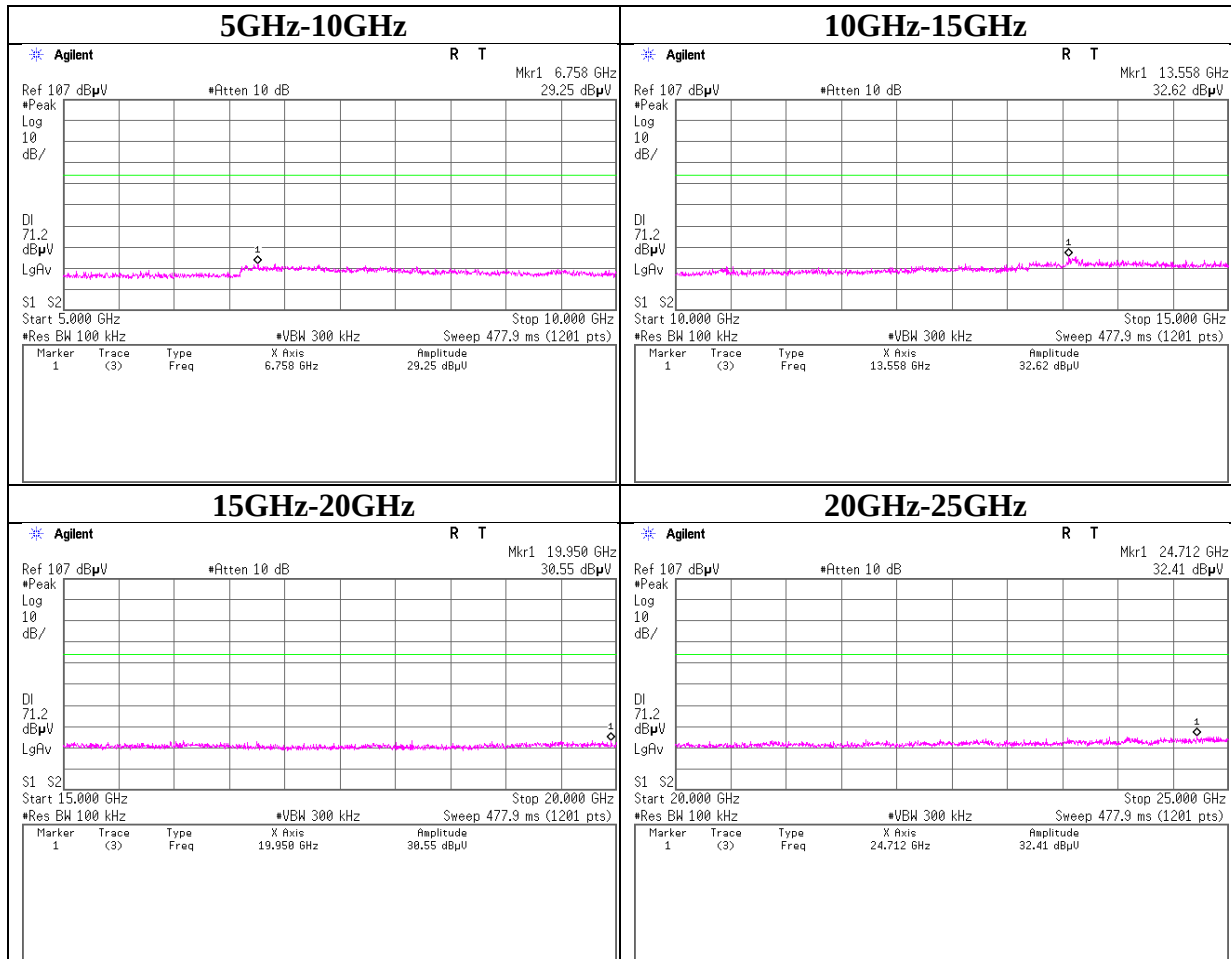
Tx 3DH5 2402MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/08/2014
Temperature/ Humidity : 22 deg. C / 45% RH
Engineer : Shinya Watanabe
Mode : Tx 3DH5

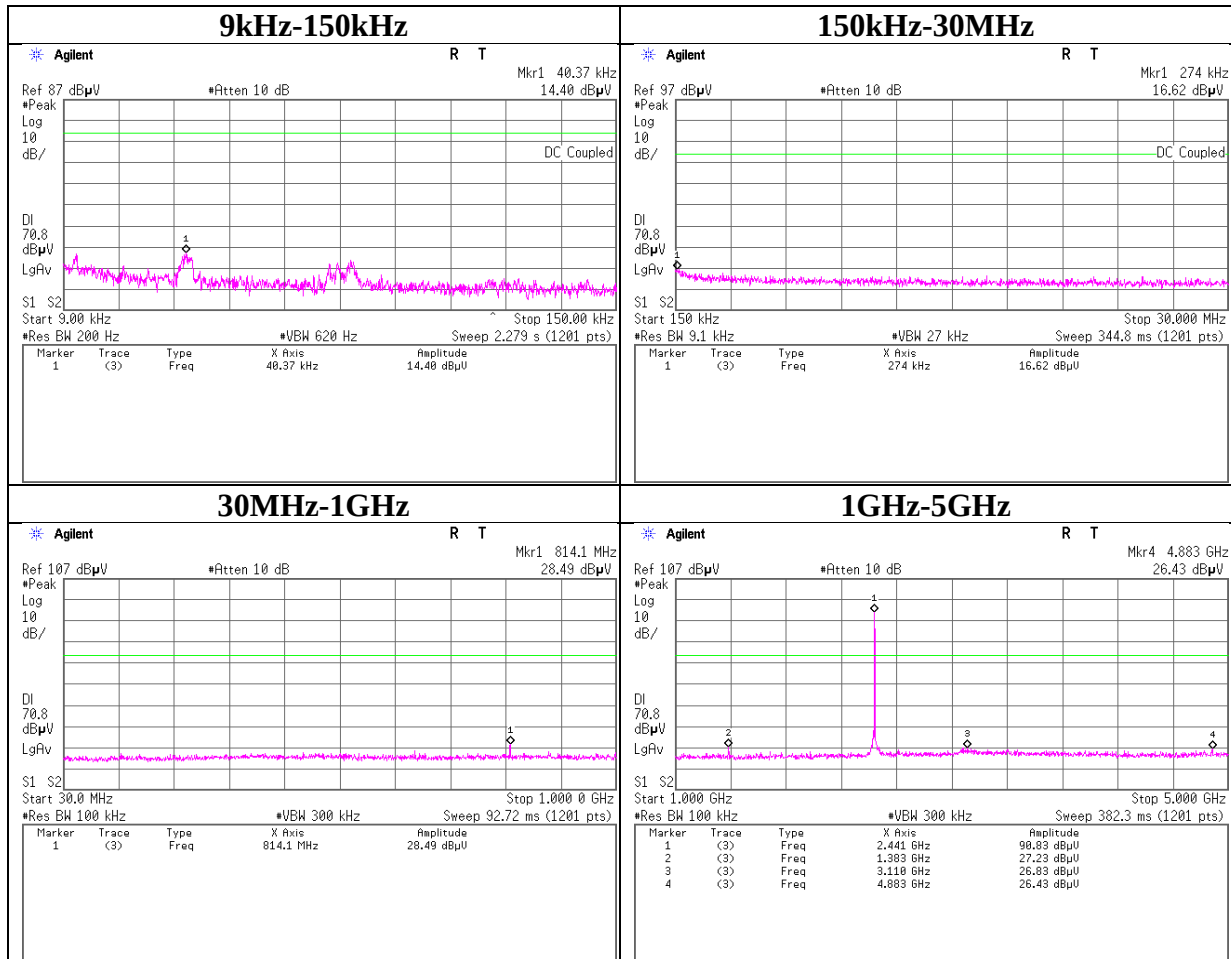
Tx 3DH5 2402MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/08/2014
Temperature/ Humidity : 22 deg. C / 45% RH
Engineer : Shinya Watanabe
Mode : Tx 3DH5

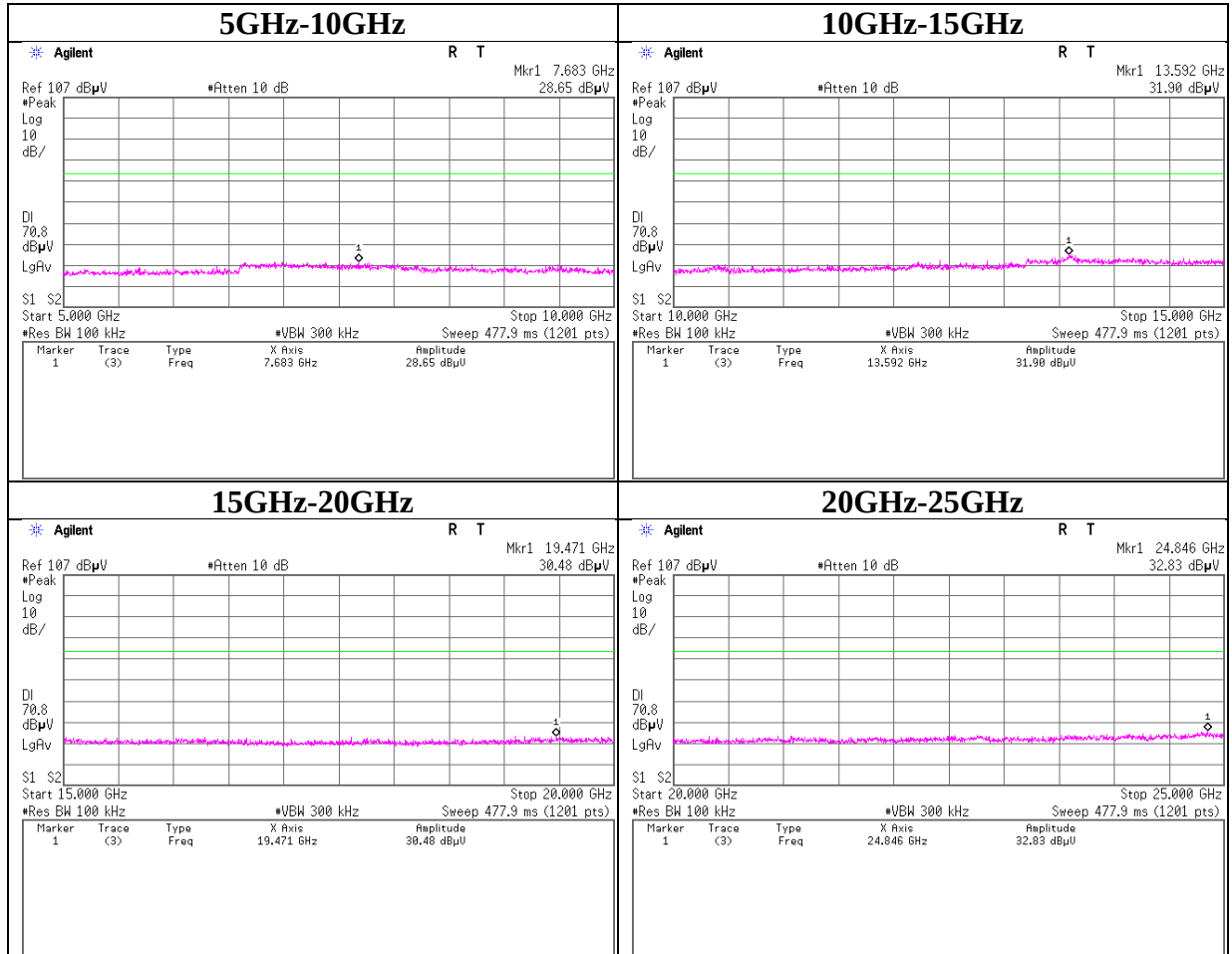
Tx 3DH5 2441MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/08/2014
Temperature/ Humidity : 22 deg. C / 45% RH
Engineer : Shinya Watanabe
Mode : Tx 3DH5

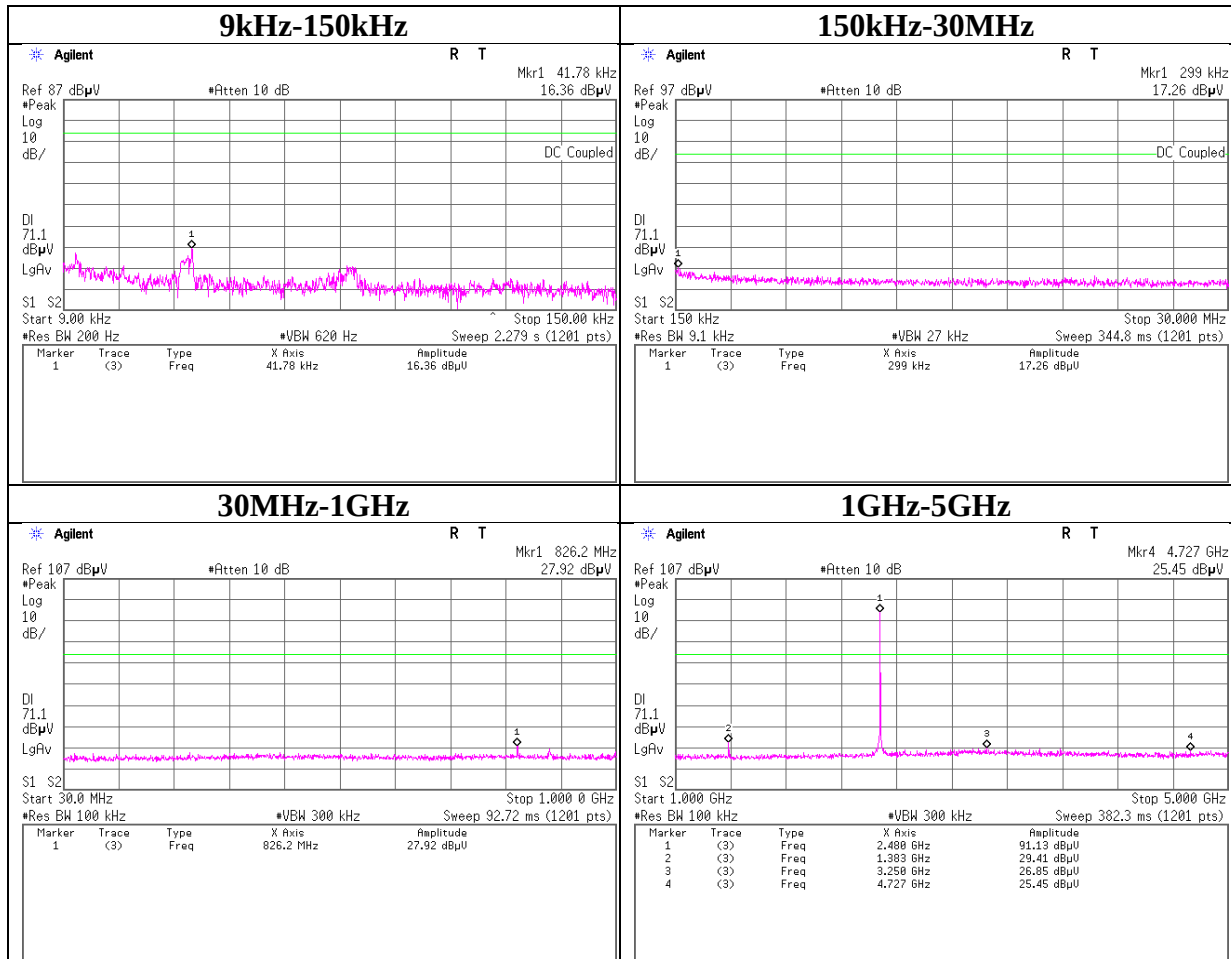
Tx 3DH5 2441MHz



Conducted Spurious Emission

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/08/2014
Temperature/ Humidity : 22 deg. C / 45% RH
Engineer : Shinya Watanabe
Mode : Tx 3DH5

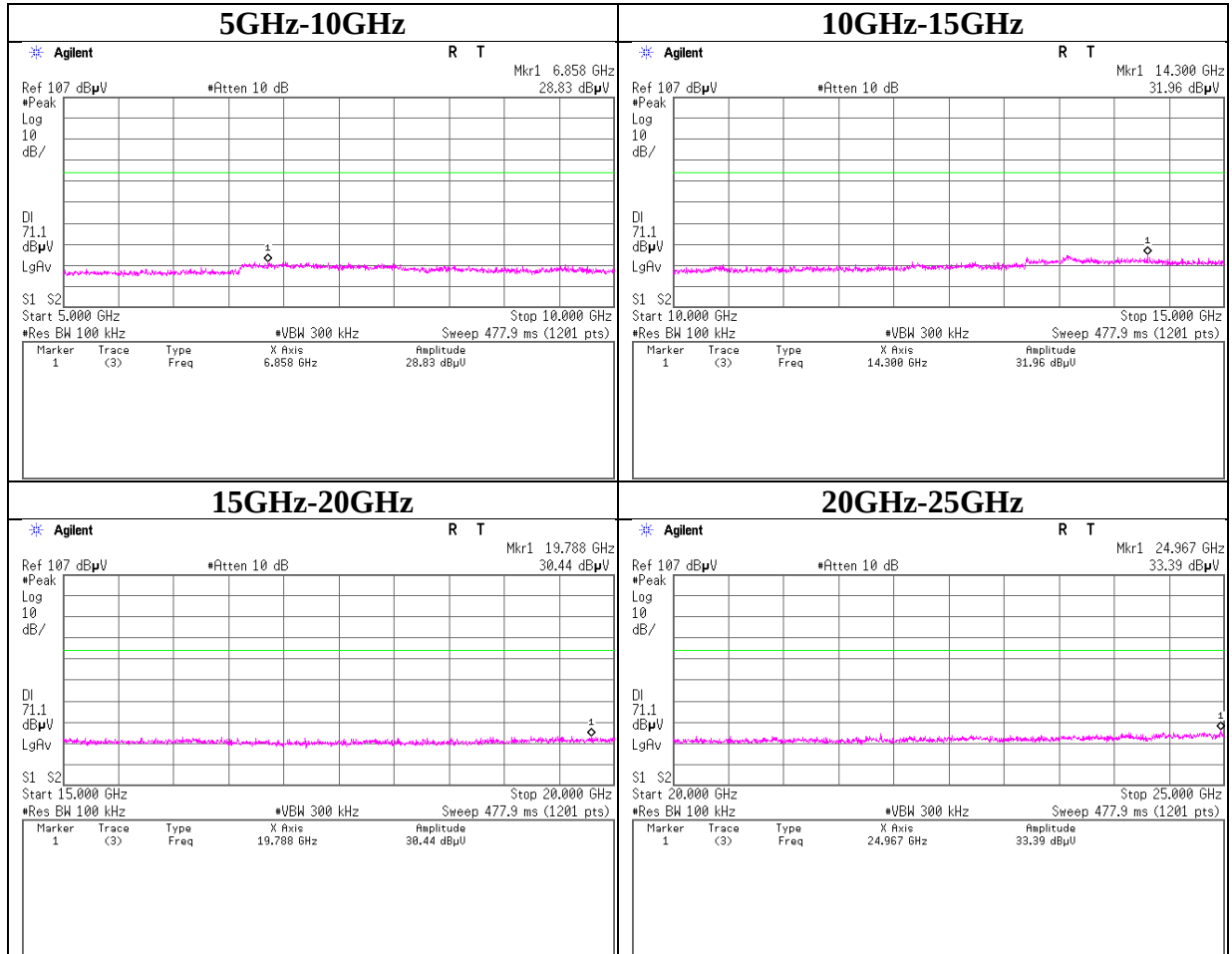
Tx 3DH5 2480MHz



Conducted Spurious Emission

Test place Head Office EMC Lab. No.3 Measurement Room
Report No. 10191682A
Date 01/08/2014
Temperature/ Humidity 22 deg. C / 45% RH
Engineer Shinya Watanabe
Mode Tx 3DH5

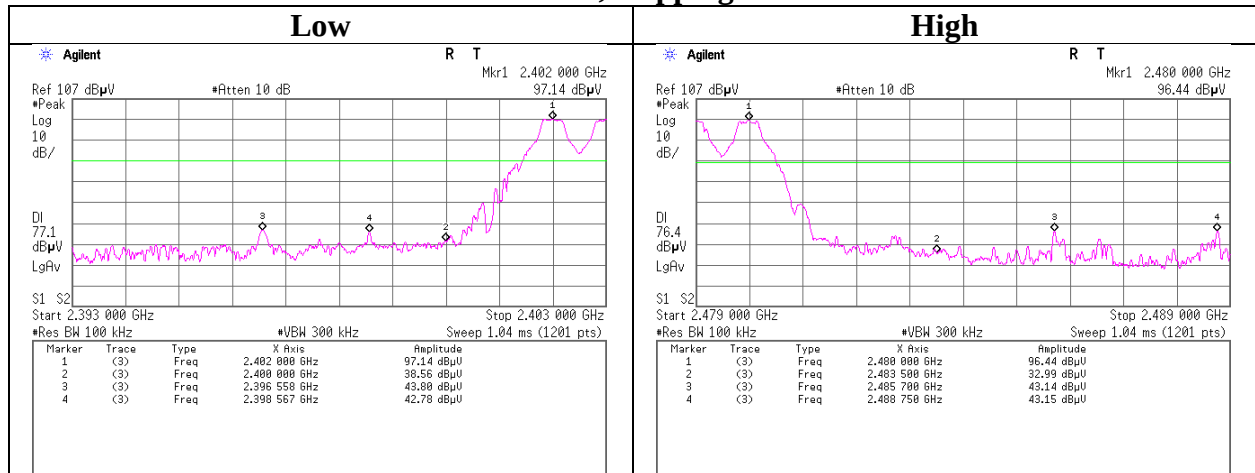
Tx 3DH5 2480MHz



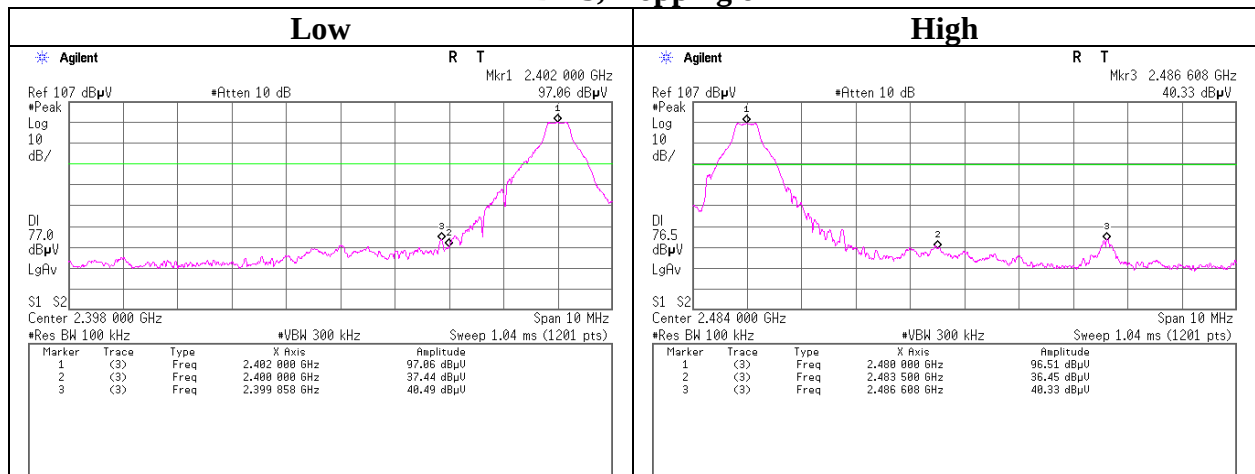
Conducted Emission Band Edge compliance

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/07/2014
Temperature/ Humidity : 24 deg. C / 43% RH
Engineer : Shinya Watanabe
Mode : Tx (Hopping on/off) DH5

Tx DH5, Hopping on



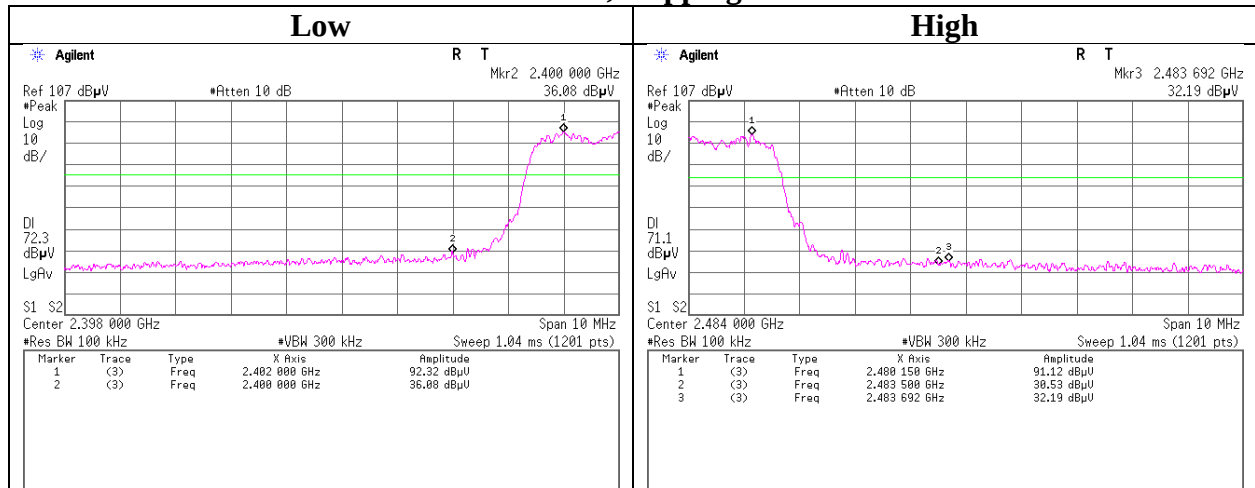
Tx DH5, Hopping off



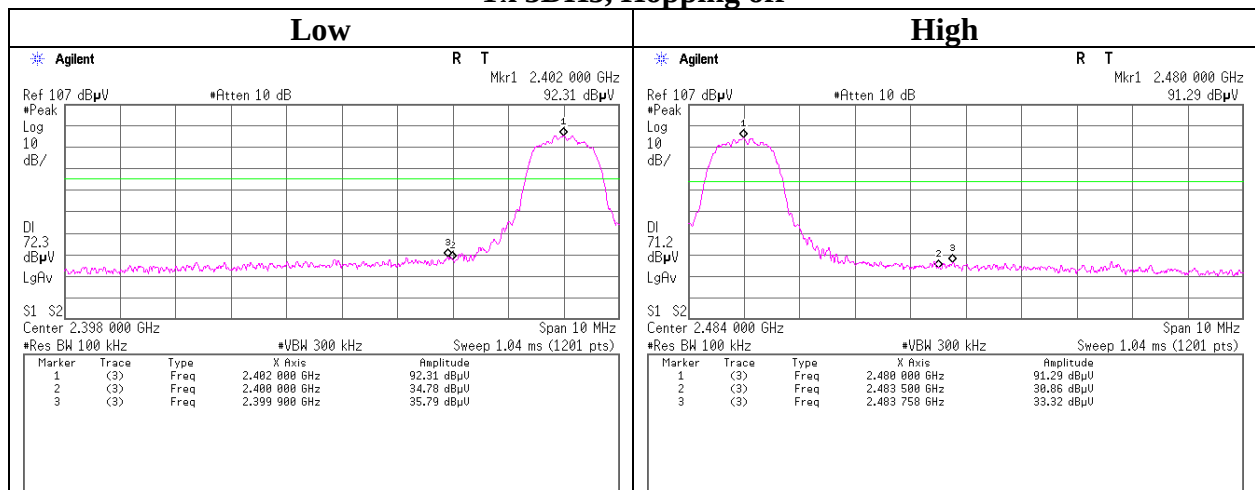
Conducted Emission Band Edge compliance

Test place Head Office EMC Lab. No.3 Measurement Room
Report No. 10191682A
Date 01/08/2014
Temperature/ Humidity 22 deg. C / 45% RH
Engineer Shinya Watanabe
Mode Tx (Hopping on/off) 3DH5

Tx 3DH5, Hopping on



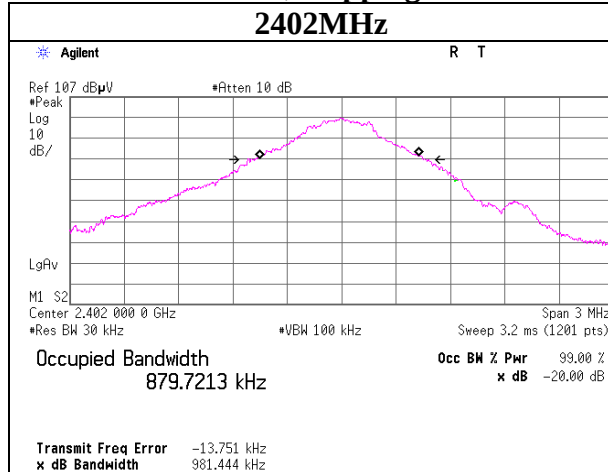
Tx 3DH5, Hopping off



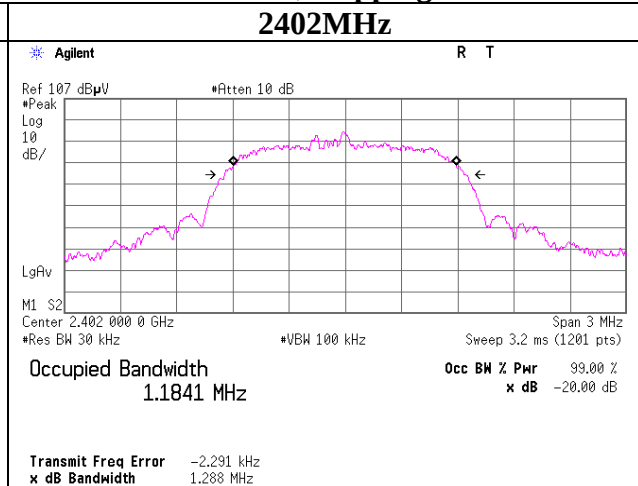
99% Occupied Bandwidth

Test place : Head Office EMC Lab. No.3 Measurement Room
Report No. : 10191682A
Date : 01/07/2014 (DH5) , 01/08/2014 (3DH5)
Temperature/ Humidity : 24 deg. C / 43% RH , 22 deg. C / 45% RH
Engineer : Shinya Watanabe
Mode : Tx (Hopping off) DH5/3DH5

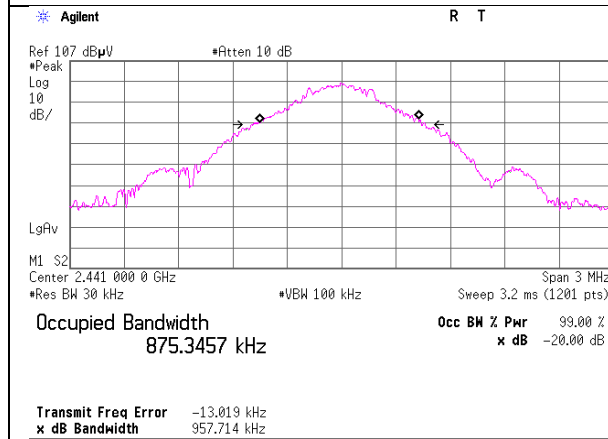
Tx DH5, Hopping off



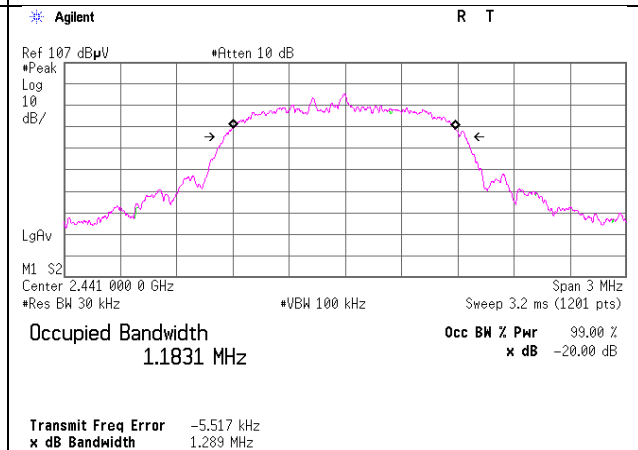
Tx 3DH5, Hopping off



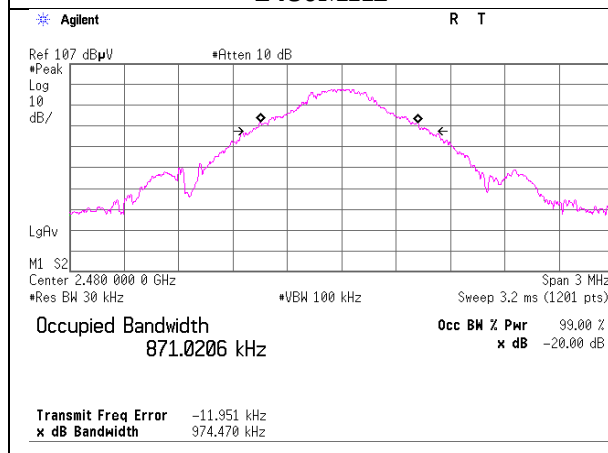
2441MHz



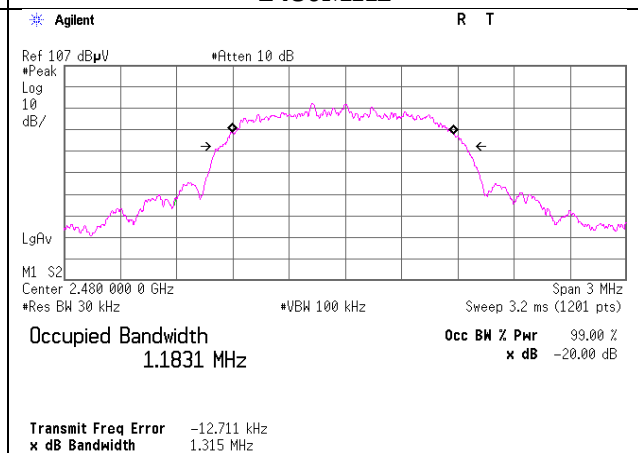
2441MHz



2480MHz

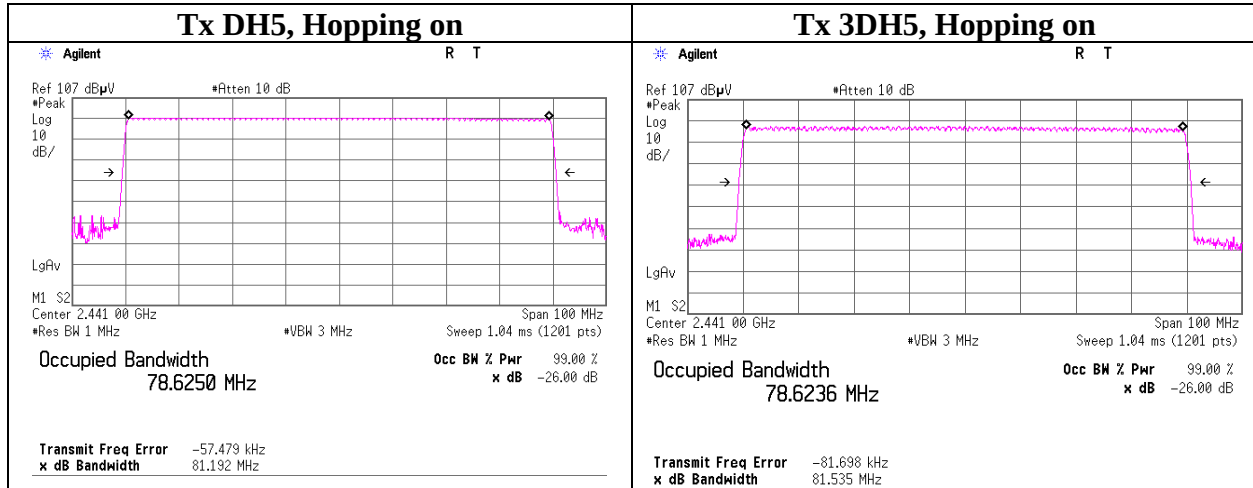


2480MHz



99% Occupied Bandwidth

Test place	Head Office EMC Lab. No.3 Measurement Room
Report No.	10191682A
Date	01/07/2014 (DH5) , 01/08/2014 (3DH5)
Temperature/ Humidity	24 deg. C / 43% RH , 22 deg. C / 45% RH
Engineer	Shinya Watanabe
Mode	Tx (Hopping on) DH5/3DH5



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	2013/02/26 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2013/11/15 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2013/02/15 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2013/01/10 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2013/02/15 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2013/11/27 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2013/09/01 * 12
MOS-12	Thermo-Hygrometer	Custom	CTH-180	-	AT	2014/01/14 * 12
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	AT	2013/11/11 * 12
MAT-20	Attenuator(10dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2013/01/09 * 12
MCC-138	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37953/2	AT	2013/10/18 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2013/06/12 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2013/06/12 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2013/02/28 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2013/02/26 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2013/02/22 * 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	2013/03/12 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	CE	2013/08/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	CE	2013/02/26 * 12
MJM-21	Measure	KOMELON	KMC-36	-	CE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	CE	2013/06/07 * 12
MLS-03	LISN(AMN)	Schwarzbeck	NSLK8127	8127384	CE(EUT)	2013/03/18 * 12
MTA-30	Terminator	TME	CT-01	-	CE	2013/01/10 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	- /01068(Switcher)	CE	2013/09/12 * 12
MAT-64	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2013/01/09 * 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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