



RADIO TEST REPORT

Test Report No. : 32CE0308-HO-01-A-R1

Applicant : Panasonic System Networks Co., Ltd.
Type of Equipment : SIP Phone
Model No. : KX-UT248
FCC ID : ACJ96NKX-UT248
Test regulation : FCC Part 15 Subpart C: 2011
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 32CE0308-HO-01-A. 32CE0308-HO-01-A is replaced with this report.

Date of test: November 3 to 8, 2011

Representative test engineer:

T. Shimada

Takumi Shimada
Engineer of WiSE Japan,
UL Verification Service

Approved by:

T. Hatakeda

Takahiro Hatakeda
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UL Verification Service



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13-EM-F0429

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SECTION 1: Customer information

Company Name : Panasonic System Networks Co., Ltd.
Address : 4-1-62, Minoshima, Hakata-ku, Fukuoka, 812-8531, Japan
Telephone Number : +81-92-477-1405
Facsimile Number : +81-92-477-1487
Contact Person : Michihito Miyazaki

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

2.1 Identification of E.U.T.

Type of Equipment : SIP Phone
Model No. : KX-UT248
Serial No. : Refer to Section 4, Clause 4.2
Rating : AC 100 - 240V, 50/60Hz
Receipt Date of Sample : November 2, 2011
Country of Mass-production : Vietnam
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 : CPU: 288MHz

Radio Specification

[Bluetooth (Ver. 2.0)]

Radio Type : Transceiver
Frequency of Operation : 2400-2483.5MHz
Modulation : FHSS
Power Supply (radio part input) : DC 3.3V
Antenna type : Wired-monopole-Antenna
Antenna Gain : 1dBi

*Remarks:

AC Adapter for SIP Phone (KX-UT series)

Model Number	Plug shape	Main shipment destination	Applicable standard
PQLV206	A2 plug	100V series general area, The United States, Canada and Mexico	FCC
PQLV206CE	C2 plug	200V series general area, Europe (except The United Kingdom), Russian Federation and Ukraine	EN/CISPR
PQLV206E	BF plug	The United Kingdom, Hong Kong, Malaysia, Singapore and Saudi Arabia	EN/CISPR
PQLV206AL	S plug	Oceania	CISPR

The difference of AC Adapter is the plug shape only, and electrical circuit is the same.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2011, final revised on July 8, 2011 and effective August 8, 2011

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 10.2dB, 0.18934MHz, L AV 15.9dB, 0.56261MHz, L	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		2.2dB 57.362MHz, 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)

This EUT provides stable voltage (DC3.3V) 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.

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
Receiver Spurious Emission	IC: RSS-Gen 4.10	IC: RSS-Gen 6	2.3dB 57.360MHz, QP, Vertical	Complied	Radiated

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	3.6dB
No.3	3.6dB
No.4	3.6dB

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	4.2dB	5.0dB	5.1dB	5.6dB	5.9dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	5.7dB	5.8dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	5.7dB	5.8dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	5.7dB	5.8dB	5.1dB	4.2dB

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

Power meter (+dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

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	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

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	4.75 x 5.4 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 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 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.

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

4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping off) DH5	2402MHz 2441MHz 2480MHz
Carrier Frequency Separation	Tx (Hopping on) DH5 Inquiry	2402MHz 2441MHz 2480MHz
20dB Bandwidth	Tx (Hopping off) DH5 Inquiry	2402MHz 2441MHz 2480MHz
Number of Hopping Frequency	Tx (Hopping on) DH5 Inquiry	-
Dwell time	Tx (Hopping on), -DH1, DH3, DH5 -Inquiry	-
Maximum Peak Output Power	Tx (Hopping off) DH5 Inquiry	2402MHz 2441MHz 2480MHz
Band Edge Compliance (Conducted)	Tx DH5 -Hopping on -Hopping off	2402MHz 2480MHz
99% Occupied Bandwidth	Tx DH5 -Hopping on -Hopping off	2402MHz 2441MHz 2480MHz
Spurious Emissions (Receiver) (Conducted/Radiated)	Rx	2441MHz

*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)

*EUT has the power settings by the software as follows;

Power settings: BDR: 49

Software Version: Special version for Compliance test

*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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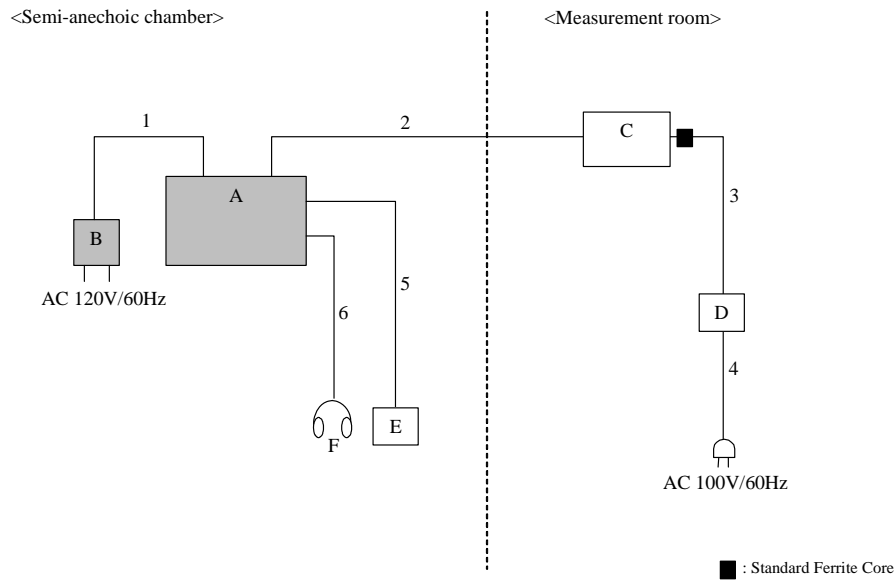
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4.2 Configuration and peripherals



* 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	SIP Phone	KX-UT248	1GAVA000034 *1) 1JACA000217 *2)	Panasonic System Networks Co., Ltd.	EUT
B	AC Adapter	PQLV206	1041R	Panasonic System Networks Co., Ltd.	EUT
C	Laptop PC	7661-CB9	L3-Y3936	Lenovo	-
D	AC Adapter	92P1160	11S92P1160Z1ZBGH79K 94N	Lenovo	-
E	Terminator(1k Ohm)	-	-	-	-
F	Earphone microphone	DR-EX62VP	-	SONY	-

*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	2.9	Unshielded	Unshielded	-
2	LAN Cable	2.0 *1) , 15.0 *2)	Unshielded	Unshielded	-
3	DC Cable	1.8	Unshielded	Unshielded	-
4	AC Cable	0.9	Unshielded	Unshielded	-
5	Audio Cable	1.5	Unshielded	Unshielded	-
6	Earphone microphone Cable	1.2	Unshielded	Unshielded	-

*1) Used for Antenna Terminal conducted test and Conducted Emission test

*2) Used for Radiated Emission test

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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 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	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	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) or RBW: 1MHz VBW: 270Hz *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) Used for the band edge of the carrier and the harmonics that can be measured. The VBW is based on the inverse of the duty cycle (see Appendix). 270Hz was used for DH5.

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

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

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

Measurement range : 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	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	5MHz	100kHz	300kHz	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 *1)	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	20MHz	300kHz	1MHz	Auto	Peak	Max Hold	Spectrum Analyzer

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

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

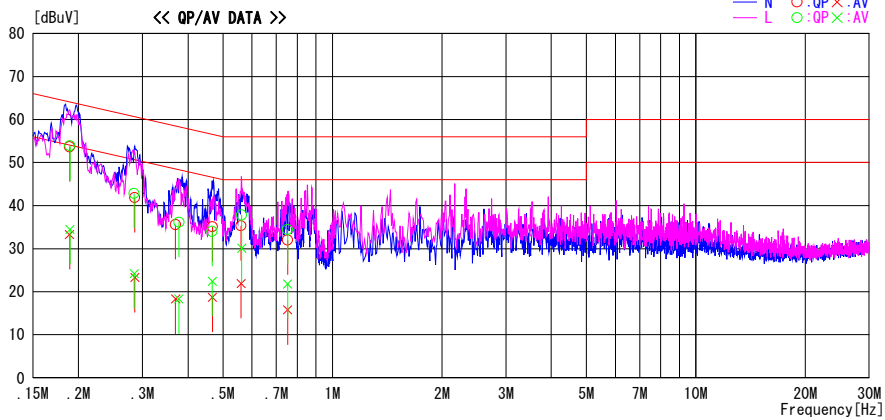
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber
Date : 2011/11/08

Report No. : 32CE0308-HO-01
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47%RH
Engineer : Keisuke Kawamura

Mode / Remarks : BT Tx DH5 2441MHz

LIMIT : FCC15.207 QP
FCC15.207 AV

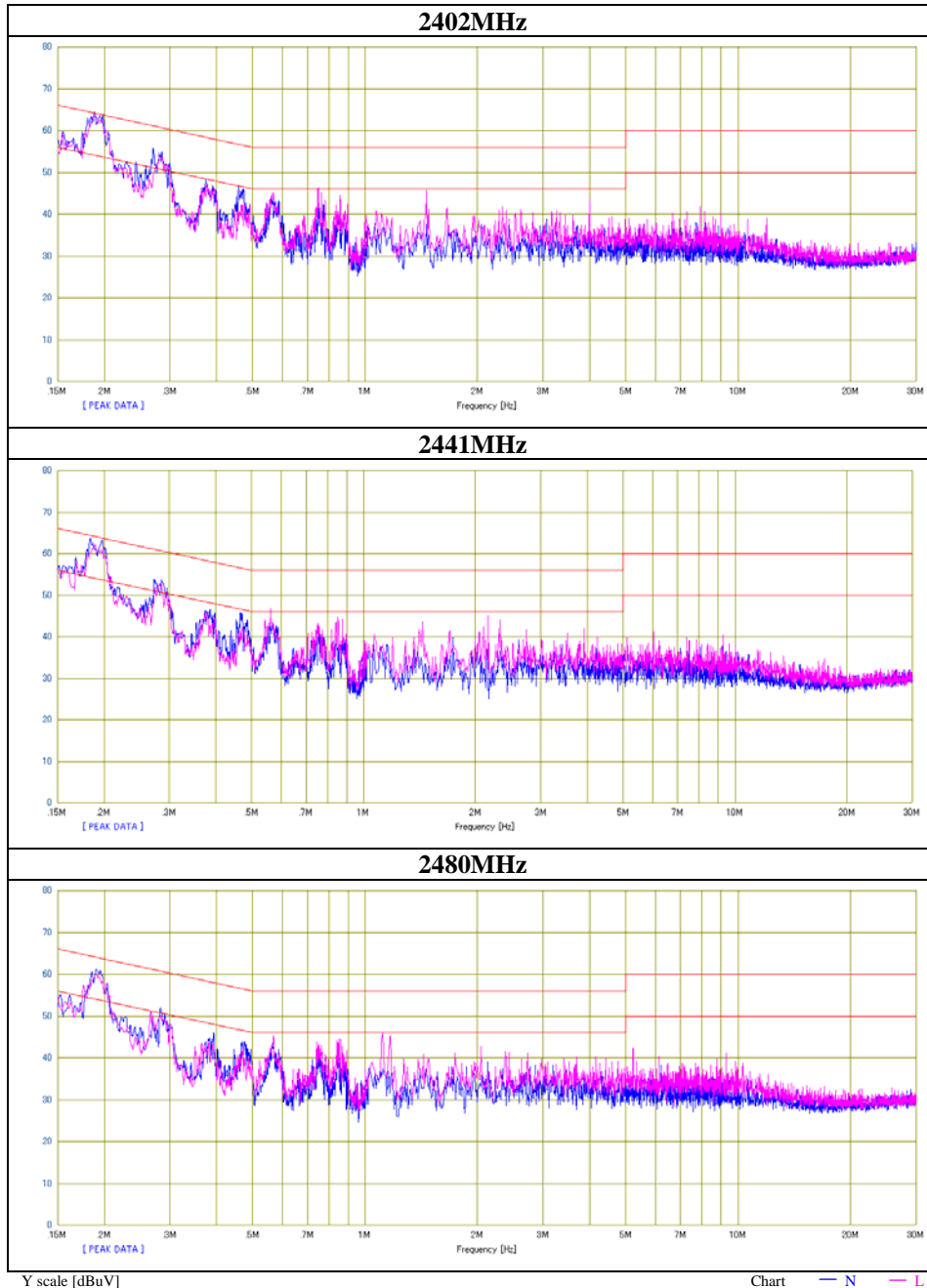


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.18904	40.4	20.0	13.3	53.7	33.3	64.1	54.1	10.4	20.8	N	
0.28572	28.6	10.0	13.3	41.9	23.3	60.6	50.6	18.7	27.3	N	
0.37008	22.3	5.0	13.3	35.6	18.3	58.5	48.5	22.9	30.2	N	
0.46701	21.8	5.4	13.3	35.1	18.7	56.6	46.6	21.5	27.9	N	
0.56047	21.9	8.5	13.4	35.3	21.9	56.0	46.0	20.7	24.1	N	
0.75205	18.6	2.4	13.4	32.0	15.8	56.0	46.0	24.0	30.2	N	
0.18934	40.6	21.2	13.3	53.9	34.5	64.1	54.1	10.2	19.6	L	
0.28452	29.5	10.9	13.3	42.8	24.2	60.7	50.7	17.9	26.5	L	
0.37794	22.8	5.0	13.3	36.1	18.3	58.3	48.3	22.2	30.0	L	
0.46661	20.7	9.1	13.3	34.0	22.4	56.6	46.6	22.6	24.2	L	
0.56261	24.4	16.7	13.4	37.8	30.1	56.0	46.0	18.2	15.9	L	
0.75205	21.0	8.4	13.4	34.4	21.8	56.0	46.0	21.6	24.2	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.

Conducted Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32CE0308-HO-01
Date : 11/08/2011
Temperature/ Humidity : 23 deg. C / 47% RH
Engineer : Keisuke Kawamura
Mode : Tx DH5



Conducted Emission

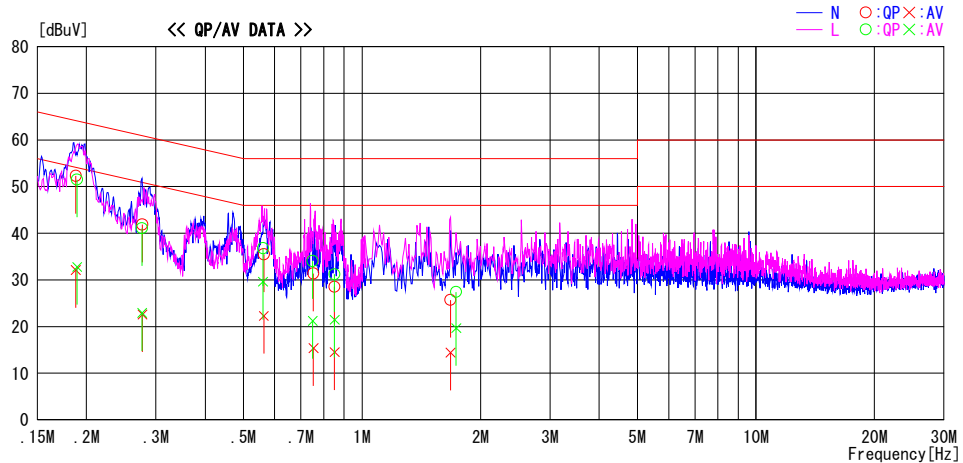
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
 Date : 2011/11/08

Report No. : 32CE0308-HO-01
 Power : AC 120V / 60Hz
 Temp./Humi. : 23deg. C / 47%RH
 Engineer : Keisuke Kawamura

Mode / Remarks : BT Rx 2441MHz

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]		
0.18762	39.0	18.8	13.3	52.3	32.1	64.1	54.1	11.8	22.0	N	
0.27702	28.6	9.3	13.3	41.9	22.6	60.9	50.9	19.0	28.3	N	
0.56313	22.1	8.9	13.4	35.5	22.3	56.0	46.0	20.5	23.7	N	
0.75299	18.0	2.0	13.4	31.4	15.4	56.0	46.0	24.6	30.6	N	
0.85208	15.1	1.1	13.4	28.5	14.5	56.0	46.0	27.5	31.5	N	
1.67839	12.2	0.9	13.5	25.7	14.4	56.0	46.0	30.3	31.6	N	
0.18913	38.2	19.5	13.3	51.5	32.8	64.1	54.1	12.6	21.3	L	
0.27636	27.8	9.6	13.3	41.1	22.9	60.9	50.9	19.8	28.0	L	
0.56073	23.4	16.2	13.4	36.8	29.6	56.0	46.0	19.2	16.4	L	
0.74986	20.6	7.8	13.4	34.0	21.2	56.0	46.0	22.0	24.8	L	
0.85208	17.8	8.1	13.4	31.2	21.5	56.0	46.0	24.8	24.5	L	
1.73439	13.9	6.2	13.5	27.4	19.7	56.0	46.0	28.6	26.3	L	

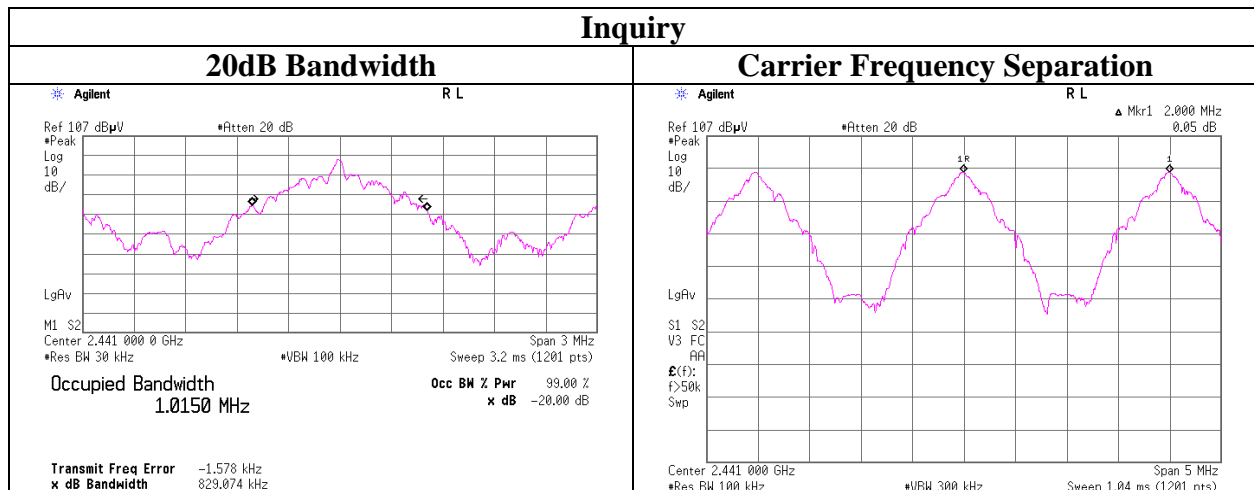
CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C.F (LISN LOSS+ATT LOSS +CABLE LOSS)
 Except for the above table : adequate margin data below the limits.

20dB Bandwidth and Carrier Frequency Separation

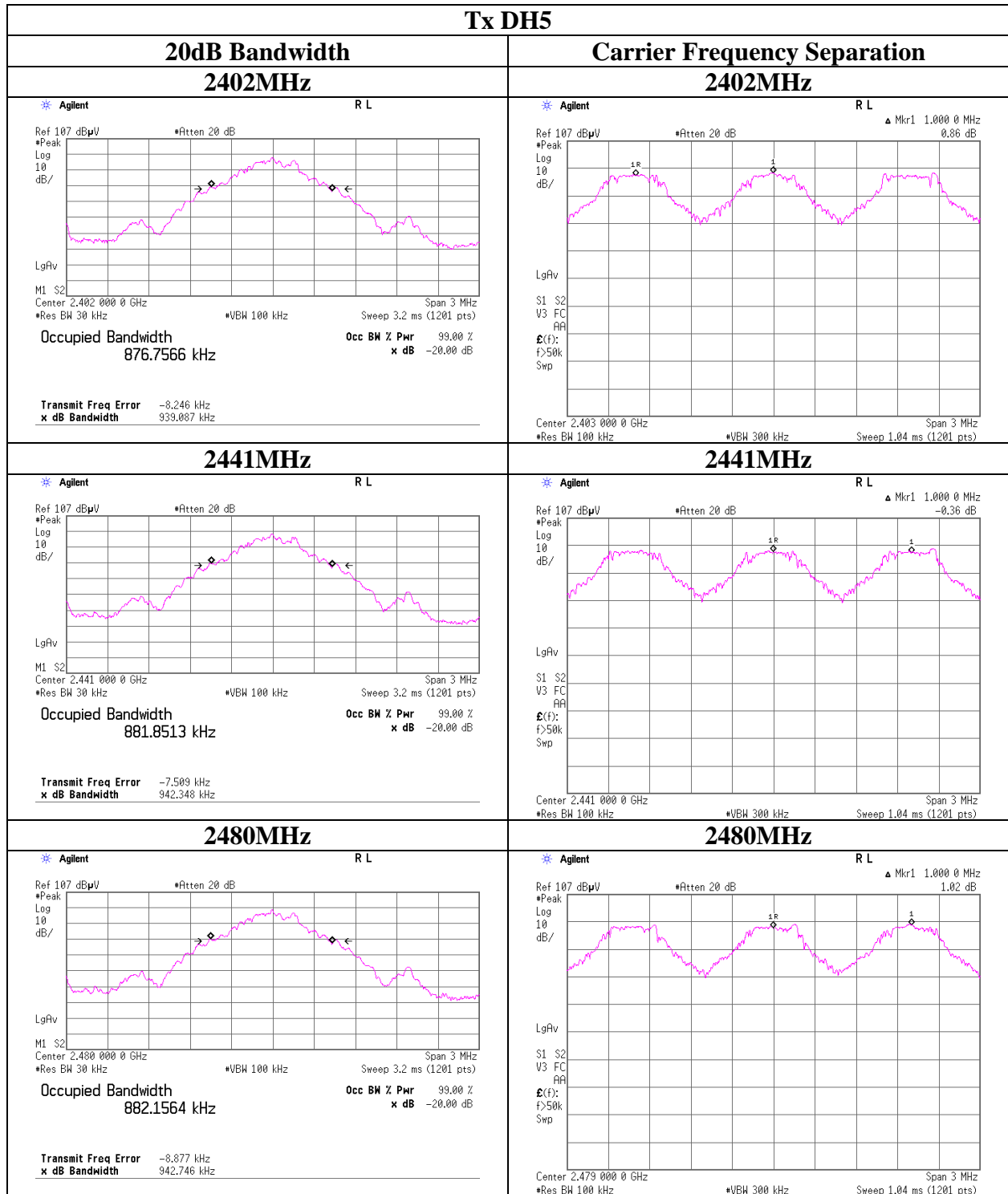
Test place	Head Office EMC Lab. No.6 Shielded Room		
Report No.	32CE0308-HO-01		
Date	11/03/2011	11/04/2011	11/08/2011
Temperature/ Humidity	21 deg. C / 68% RH	25 deg. C / 58% RH	23 deg. C / 48% RH
Engineer	Takumi Shimada	Takayuki Shimada	Takumi Shimada
Mode	Tx (Hopping on) DH5/Inquiry		

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.939	1.000	≥ 0.626
DH5	2441.0	0.942	1.000	≥ 0.628
DH5	2480.0	0.943	1.000	≥ 0.628
Inquiry	2441.0	0.829	2.000	≥ 0.553

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



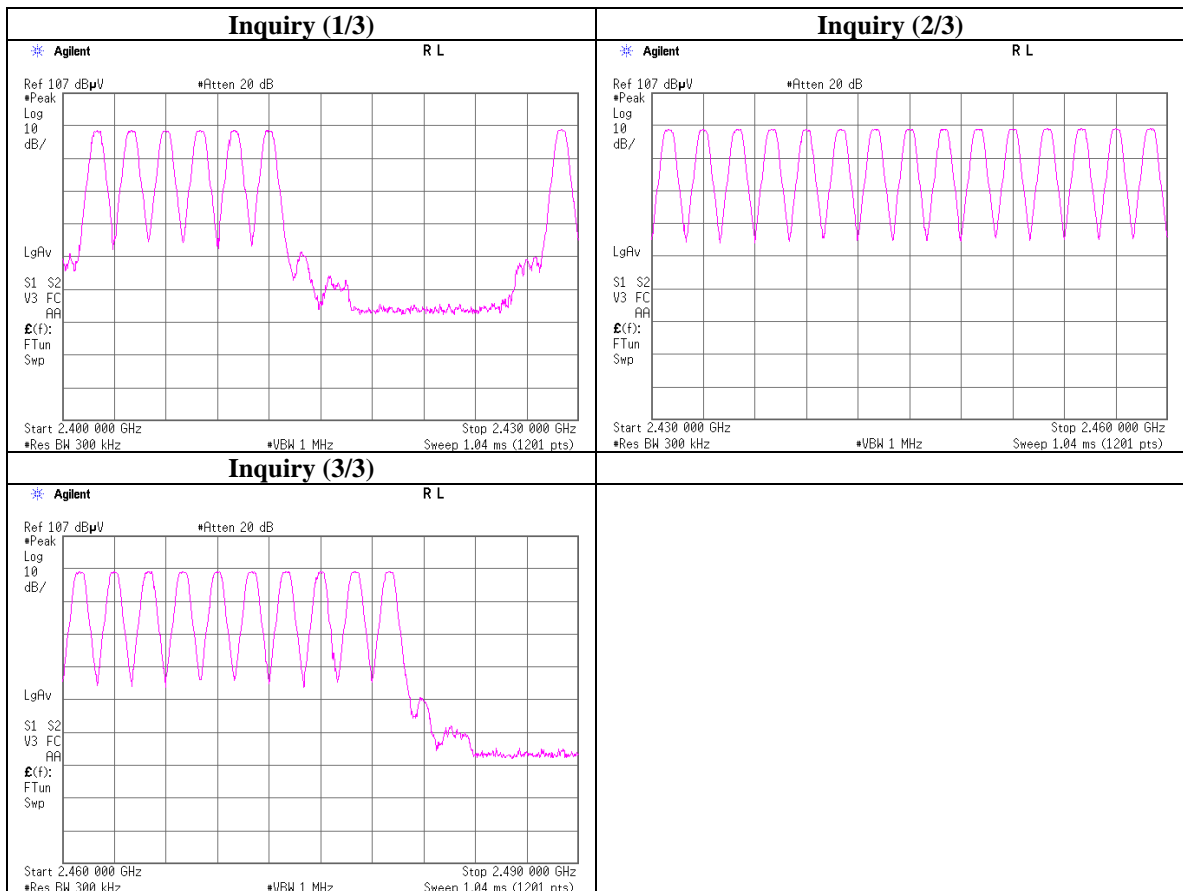
20dB Bandwidth and Carrier Frequency Separation



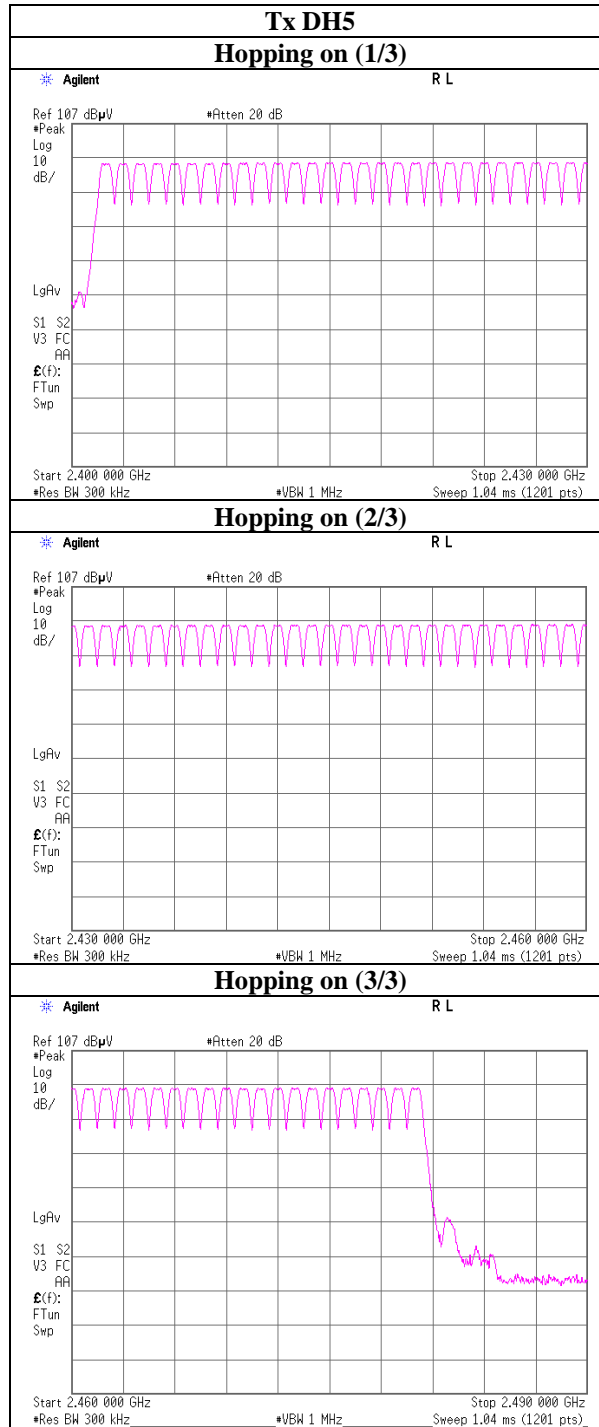
Number of Hopping Frequency

Test place	Head Office EMC Lab. No.6 Shielded Room		
Report No.	32CE0308-HO-01		
Date	11/03/2011	11/04/2011	11/08/2011
Temperature/ Humidity	21 deg. C / 68% RH	25 deg. C / 58% RH	23 deg. C / 48% RH
Engineer	Takumi Shimada	Takayuki Shimada	Takumi Shimada
Mode	Tx (Hopping on) DH5/Inquiry		

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



Number of Hopping Frequency



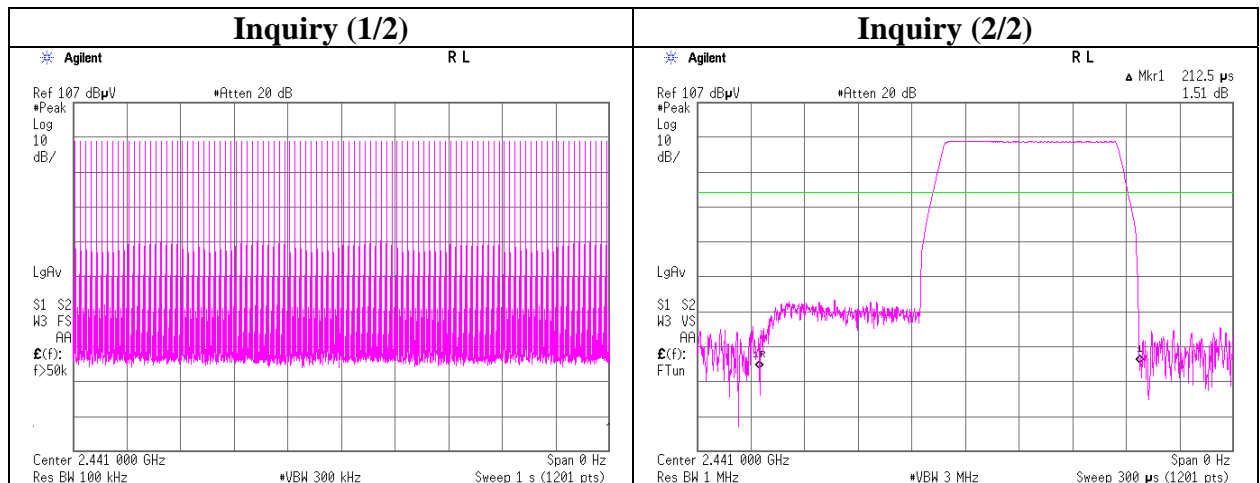
Dwell time

Test place	Head Office EMC Lab. No.6 Shielded Room
Report No.	32CE0308-HO-01
Date	11/03/2011
Temperature/ Humidity	21 deg. C / 68% RH
Engineer	Takumi Shimada
Mode	Tx (Hopping on) DH5/Inquiry

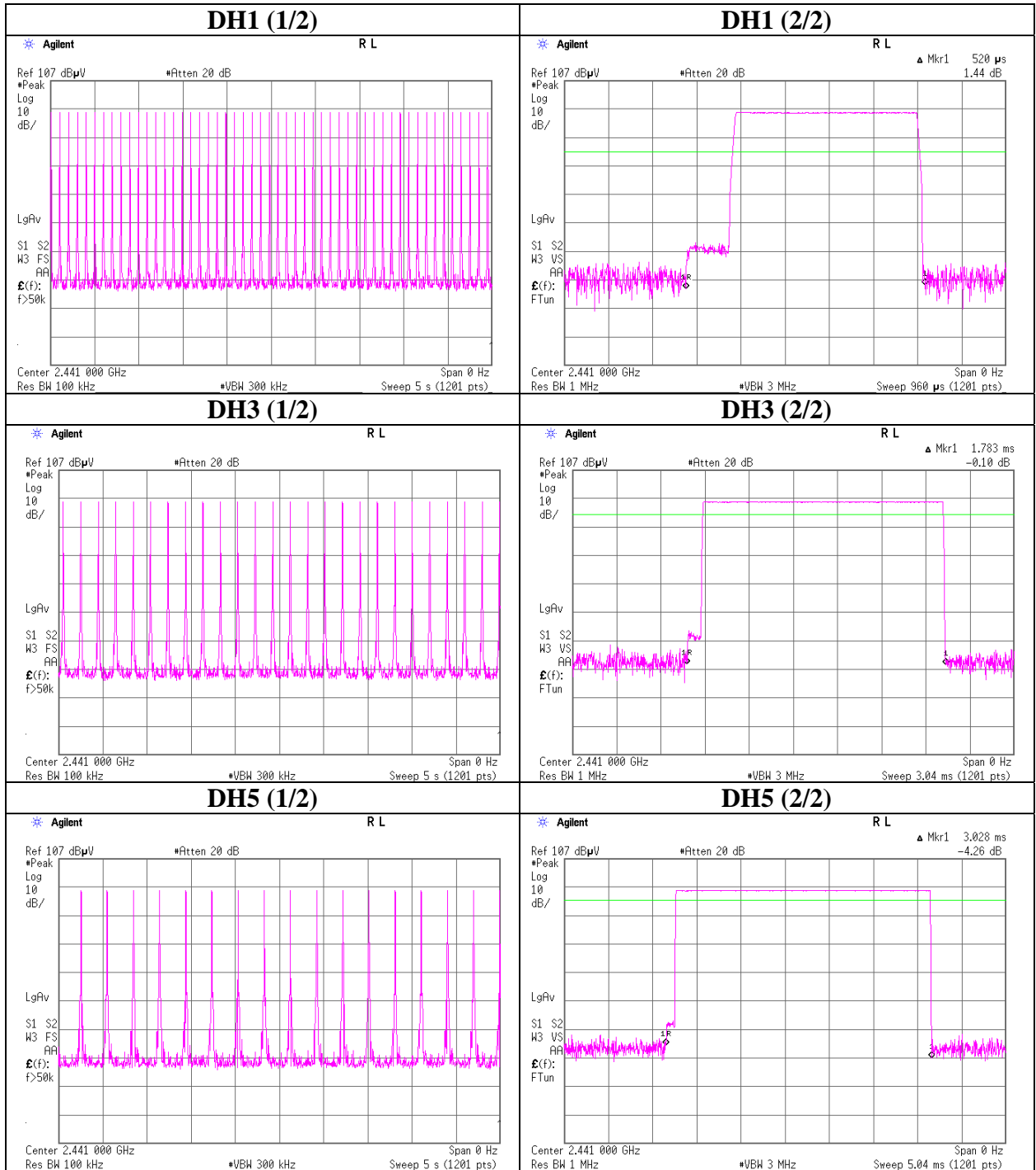
Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8(32 Hopping x 0.4)second period	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.520	168	400
DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.783	294	400
DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	3.028	327	400
Inquiry	100.0 times / 1 sec. x 12.8 sec. = 1280 times	0.213	272	400

Sample Calculation

Result = Number of transmission x Length of transmission time



Dwell time



Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32CE0308-HO-01
Date : 11/04/2011
Temperature/ Humidity : 21 deg. C / 58% RH
Engineer : Takumi Shimada
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	41.839	QP	33.3	14.2	7.2	32.2	22.5	40.0	17.5	
Hori	57.366	QP	43.4	8.7	7.4	32.2	27.3	40.0	12.7	
Hori	325.021	QP	39.3	16.6	9.9	32.1	33.7	46.0	12.3	
Hori	375.024	QP	36.7	17.3	10.2	32.1	32.1	46.0	13.9	
Hori	775.051	QP	31.2	23.0	12.5	31.9	34.8	46.0	11.2	
Hori	800.048	QP	30.1	23.3	12.7	31.8	34.3	46.0	11.7	
Hori	2390.000	PK	42.9	28.1	2.5	32.2	41.3	73.9	32.6	
Hori	2400.000	PK	59.2	28.1	2.5	32.2	57.6	-	-	See 20dBc Data Sheet
Hori	3203.000	PK	41.6	28.7	2.9	31.9	41.3	73.9	32.7	
Hori	4804.000	PK	45.3	31.2	5.3	31.4	50.4	73.9	23.5	
Hori	7206.000	PK	42.5	35.6	6.1	32.4	51.8	73.9	22.1	
Hori	9608.000	PK	42.3	38.3	7.1	33.2	54.5	73.9	19.5	
Hori	24020.000	PK	47.6	38.8	-0.9	31.6	53.9	73.9	20.0	
Hori	2390.000	AV	31.8	28.1	2.5	32.2	30.2	53.9	23.7	
Hori	2400.000	AV	52.0	28.1	2.5	32.2	50.4	-	-	See 20dBc Data Sheet
Hori	3203.000	AV	29.9	28.7	2.9	31.9	29.6	53.9	24.3	
Hori	4804.000	AV	36.0	31.2	5.3	31.4	41.1	53.9	12.8	
Hori	7206.000	AV	30.4	35.6	6.1	32.4	39.7	53.9	14.2	
Hori	9608.000	AV	30.7	38.3	7.1	33.2	42.9	53.9	11.0	
Hori	24020.000	AV	34.8	38.8	-0.9	31.6	41.1	53.9	12.9	
Vert	41.793	QP	46.2	14.2	7.2	32.2	35.4	40.0	4.6	
Vert	57.362	QP	53.9	8.7	7.4	32.2	37.8	40.0	2.2	
Vert	325.022	QP	35.5	16.6	9.9	32.1	29.9	46.0	16.1	
Vert	375.027	QP	33.5	17.3	10.2	32.1	28.9	46.0	17.1	
Vert	775.052	QP	27.7	23.0	12.5	31.9	31.3	46.0	14.7	
Vert	800.051	QP	27.4	23.3	12.7	31.8	31.6	46.0	14.4	
Vert	2390.000	PK	42.8	28.1	2.5	32.2	41.2	73.9	32.7	
Vert	2400.000	PK	59.1	28.1	2.5	32.2	57.5	-	-	See 20dBc Data Sheet
Vert	3203.000	PK	42.0	28.7	2.9	31.9	41.7	73.9	32.2	
Vert	4804.000	PK	45.9	31.2	5.3	31.4	51.0	73.9	22.9	
Vert	7206.000	PK	43.1	35.6	6.1	32.4	52.4	73.9	21.5	
Vert	9608.000	PK	42.6	38.3	7.1	33.2	54.8	73.9	19.2	
Vert	24020.000	PK	47.5	38.8	-0.9	31.6	53.8	73.9	20.1	
Vert	2390.000	AV	31.9	28.1	2.5	32.2	30.3	53.9	23.6	
Vert	2400.000	AV	51.4	28.1	2.5	32.2	49.8	-	-	See 20dBc Data Sheet
Vert	3203.000	AV	29.8	28.7	2.9	31.9	29.5	53.9	24.4	
Vert	4804.000	AV	39.3	31.2	5.3	31.4	44.4	53.9	9.5	
Vert	7206.000	AV	30.9	35.6	6.1	32.4	40.2	53.9	13.7	
Vert	9608.000	AV	30.8	38.3	7.1	33.2	43.0	53.9	10.9	
Vert	24020.000	AV	34.7	38.8	-0.9	31.6	41.0	53.9	12.9	

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).

*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

*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.

Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32CE0308-HO-01
Date : 11/04/2011
Temperature/ Humidity : 21 deg. C / 58% RH
Engineer : Takumi Shimada
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	97.6	28.1	2.5	32.2	96.0	-	-	Carrier
Hori	2400.000	PK	55.5	28.1	2.5	32.2	53.9	76.0	22.1	
Vert	2402.000	PK	96.7	28.1	2.5	32.2	95.1	-	-	Carrier
Vert	2400.000	PK	55.0	28.1	2.5	32.2	53.4	75.1	21.7	

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

Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32CE0308-HO-01
Date : 11/04/2011
Temperature/ Humidity : 21 deg. C / 58% RH
Engineer : Takumi Shimada
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	41.839	QP	33.1	14.2	7.2	32.2	22.3	40.0	17.7	
Hori	57.376	QP	43.3	8.7	7.4	32.2	27.2	40.0	12.8	
Hori	325.022	QP	39.0	16.6	9.9	32.1	33.4	46.0	12.6	
Hori	375.021	QP	36.3	17.3	10.2	32.1	31.7	46.0	14.3	
Hori	775.048	QP	31.4	23.0	12.5	31.9	35.0	46.0	11.0	
Hori	800.049	QP	30.3	23.3	12.7	31.8	34.5	46.0	11.5	
Hori	3257.000	PK	42.2	28.8	3.0	31.9	42.1	73.9	31.8	
Hori	4882.000	PK	44.2	31.4	5.3	31.4	49.5	73.9	24.4	
Hori	7323.000	PK	42.3	35.7	6.2	32.5	51.7	73.9	22.2	
Hori	9764.000	PK	42.9	38.5	7.3	33.2	55.5	73.9	18.4	
Hori	24410.000	PK	46.5	38.6	-0.9	31.6	52.6	73.9	21.3	
Hori	3257.000	AV	29.9	28.8	3.0	31.9	29.8	53.9	24.1	
Hori	4882.000	AV	35.4	31.4	5.3	31.4	40.7	53.9	13.2	
Hori	7323.000	AV	30.6	35.7	6.2	32.5	40.0	53.9	13.9	
Hori	9764.000	AV	30.5	38.5	7.3	33.2	43.1	53.9	10.8	
Hori	24410.000	AV	33.9	38.6	-0.9	31.6	40.0	53.9	13.9	
Vert	41.691	QP	46.6	14.2	7.2	32.2	35.8	40.0	4.2	
Vert	57.374	QP	53.6	8.7	7.4	32.2	37.5	40.0	2.5	
Vert	325.020	QP	35.2	16.6	9.9	32.1	29.6	46.0	16.4	
Vert	375.024	QP	33.6	17.3	10.2	32.1	29.0	46.0	17.0	
Vert	775.054	QP	27.4	23.0	12.5	31.9	31.0	46.0	15.0	
Vert	800.052	QP	27.5	23.3	12.7	31.8	31.7	46.0	14.3	
Vert	3257.000	PK	41.8	28.8	3.0	31.9	41.7	73.9	32.2	
Vert	4882.000	PK	47.4	31.4	5.3	31.4	52.7	73.9	21.2	
Vert	7323.000	PK	42.6	35.7	6.2	32.5	52.0	73.9	21.9	
Vert	9764.000	PK	42.4	38.5	7.3	33.2	55.0	73.9	18.9	
Vert	24410.000	PK	46.5	38.6	-0.9	31.6	52.6	73.9	21.3	
Vert	3257.000	AV	30.0	28.8	3.0	31.9	29.9	53.9	24.0	
Vert	4882.000	AV	41.9	31.4	5.3	31.4	47.2	53.9	6.7	
Vert	7323.000	AV	30.7	35.7	6.2	32.5	40.1	53.9	13.8	
Vert	9764.000	AV	30.6	38.5	7.3	33.2	43.2	53.9	10.7	
Vert	24410.000	AV	33.9	38.6	-0.9	31.6	40.0	53.9	13.9	

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).

*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

*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.

Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32CE0308-HO-01
Date : 11/04/2011
Temperature/ Humidity : 21 deg. C / 58% RH
Engineer : Takumi Shimada
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	41.842	QP	33.3	14.2	7.2	32.2	22.5	40.0	17.5	
Hori	57.369	QP	43.7	8.7	7.4	32.2	27.6	40.0	12.4	
Hori	325.020	QP	38.4	16.6	9.9	32.1	32.8	46.0	13.2	
Hori	375.022	QP	35.7	17.3	10.2	32.1	31.1	46.0	14.9	
Hori	775.046	QP	31.2	23.0	12.5	31.9	34.8	46.0	11.2	
Hori	800.049	QP	30.5	23.3	12.7	31.8	34.7	46.0	11.3	
Hori	2483.500	PK	56.5	28.5	2.6	32.2	55.4	73.9	18.5	
Hori	3100.000	PK	44.0	28.7	2.9	31.9	43.7	73.9	30.2	
Hori	4960.000	PK	44.4	31.6	5.3	31.4	49.9	73.9	24.0	
Hori	7440.000	PK	44.2	35.8	6.2	32.5	53.7	73.9	20.2	
Hori	9920.000	PK	44.4	38.6	7.4	33.3	57.1	73.9	16.8	
Hori	24800.000	PK	48.0	38.5	-0.9	31.5	54.1	73.9	19.8	
Hori	2483.500	AV	45.7	28.5	2.6	32.2	44.6	53.9	9.3	
Hori	3100.000	AV	31.9	28.7	2.9	31.9	31.6	53.9	22.3	
Hori	4960.000	AV	36.3	31.6	5.3	31.4	41.8	53.9	12.1	
Hori	7440.000	AV	32.3	35.8	6.2	32.5	41.8	53.9	12.1	
Hori	9920.000	AV	32.2	38.6	7.4	33.3	44.9	53.9	9.0	
Hori	24800.000	AV	35.6	38.5	-0.9	31.5	41.7	53.9	12.2	
Vert	41.696	QP	46.7	14.2	7.2	32.2	35.9	40.0	4.1	
Vert	57.372	QP	53.8	8.7	7.4	32.2	37.7	40.0	2.3	
Vert	325.025	QP	37.4	16.6	9.9	32.1	31.8	46.0	14.2	
Vert	375.026	QP	36.0	17.3	10.2	32.1	31.4	46.0	14.6	
Vert	775.055	QP	27.5	23.0	12.5	31.9	31.1	46.0	14.9	
Vert	800.049	QP	27.6	23.3	12.7	31.8	31.8	46.0	14.2	
Vert	2483.500	PK	53.1	28.5	2.6	32.2	52.0	73.9	21.9	
Vert	3100.000	PK	44.2	28.7	2.9	31.9	43.9	73.9	30.0	
Vert	4960.000	PK	47.4	31.6	5.3	31.4	52.9	73.9	21.0	
Vert	7440.000	PK	44.3	35.8	6.2	32.5	53.8	73.9	20.1	
Vert	9920.000	PK	44.0	38.6	7.4	33.3	56.7	73.9	17.2	
Vert	24800.000	PK	48.1	38.5	-0.9	31.5	54.2	73.9	19.7	
Vert	2483.500	AV	42.6	28.5	2.6	32.2	41.5	53.9	12.4	
Vert	3100.000	AV	31.9	28.7	2.9	31.9	31.6	53.9	22.3	
Vert	4960.000	AV	41.7	31.6	5.3	31.4	47.2	53.9	6.7	
Vert	7440.000	AV	32.3	35.8	6.2	32.5	41.8	53.9	12.1	
Vert	9920.000	AV	32.2	38.6	7.4	33.3	44.9	53.9	9.0	
Vert	24800.000	AV	35.6	38.5	-0.9	31.5	41.7	53.9	12.2	

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).

*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

*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.

Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32CE0308-HO-01
Date : 11/07/2011
Temperature/ Humidity : 21 deg. C / 58% RH
Engineer : Takayuki Shimada
Mode : Rx, 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	41.952	QP	33.5	14.1	7.2	32.2	22.6	40.0	17.4	
Hori	57.368	QP	43.6	8.7	7.4	32.2	27.5	40.0	12.5	
Hori	325.021	QP	39.2	16.6	9.9	32.1	33.6	46.0	12.4	
Hori	375.023	QP	36.8	17.3	10.2	32.1	32.2	46.0	13.8	
Hori	775.049	QP	31.0	23.0	12.5	31.9	34.6	46.0	11.4	
Hori	800.043	QP	30.5	23.3	12.7	31.8	34.7	46.0	11.3	
Hori	2441.000	PK	44.8	28.3	2.5	32.2	43.4	73.9	30.5	
Hori	2441.000	AV	37.1	28.3	2.5	32.2	35.7	53.9	18.2	
Vert	41.790	QP	46.1	14.2	7.2	32.2	35.3	40.0	4.7	
Vert	57.360	QP	53.8	8.7	7.4	32.2	37.7	40.0	2.3	
Vert	325.021	QP	35.8	16.6	9.9	32.1	30.2	46.0	15.8	
Vert	375.026	QP	33.4	17.3	10.2	32.1	28.8	46.0	17.2	
Vert	775.054	QP	27.4	23.0	12.5	31.9	31.0	46.0	15.0	
Vert	800.055	QP	27.5	23.3	12.7	31.8	31.7	46.0	14.3	
Vert	2441.000	PK	45.3	28.3	2.5	32.2	43.9	73.9	30.0	
Vert	2441.000	AV	37.5	28.3	2.5	32.2	36.1	53.9	17.8	

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).

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

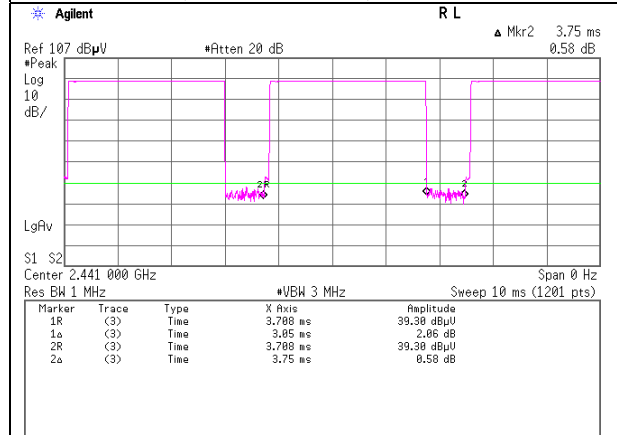
Distance factor: 10GHz-26.5GHz $20\log(3.0m/1.0m)=9.5dB$
26.5GHz-40GHz $20\log(3.0m/0.5m)=15.6dB$

*For the band edge of the carrier and the harmonics that emission was found, the test was performed with VBW of the average detector set at 270Hz. For other average detectors, VBW was set at 10Hz.

VBW (AV) Calculation

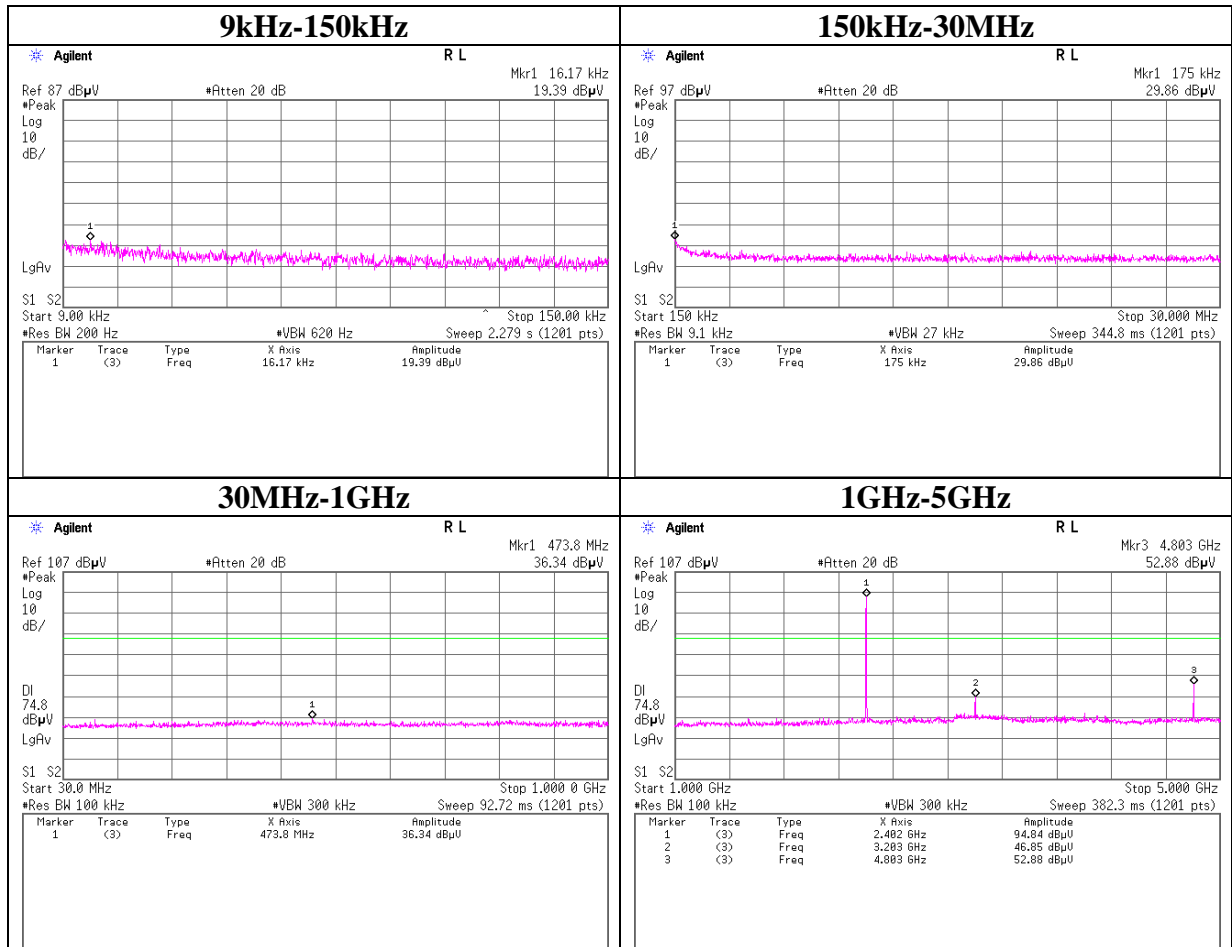
Tx DH5

VBW: $1/x = 266\text{Hz} < 270\text{Hz}$
x: (Tx on+Tx off) = 3.75ms



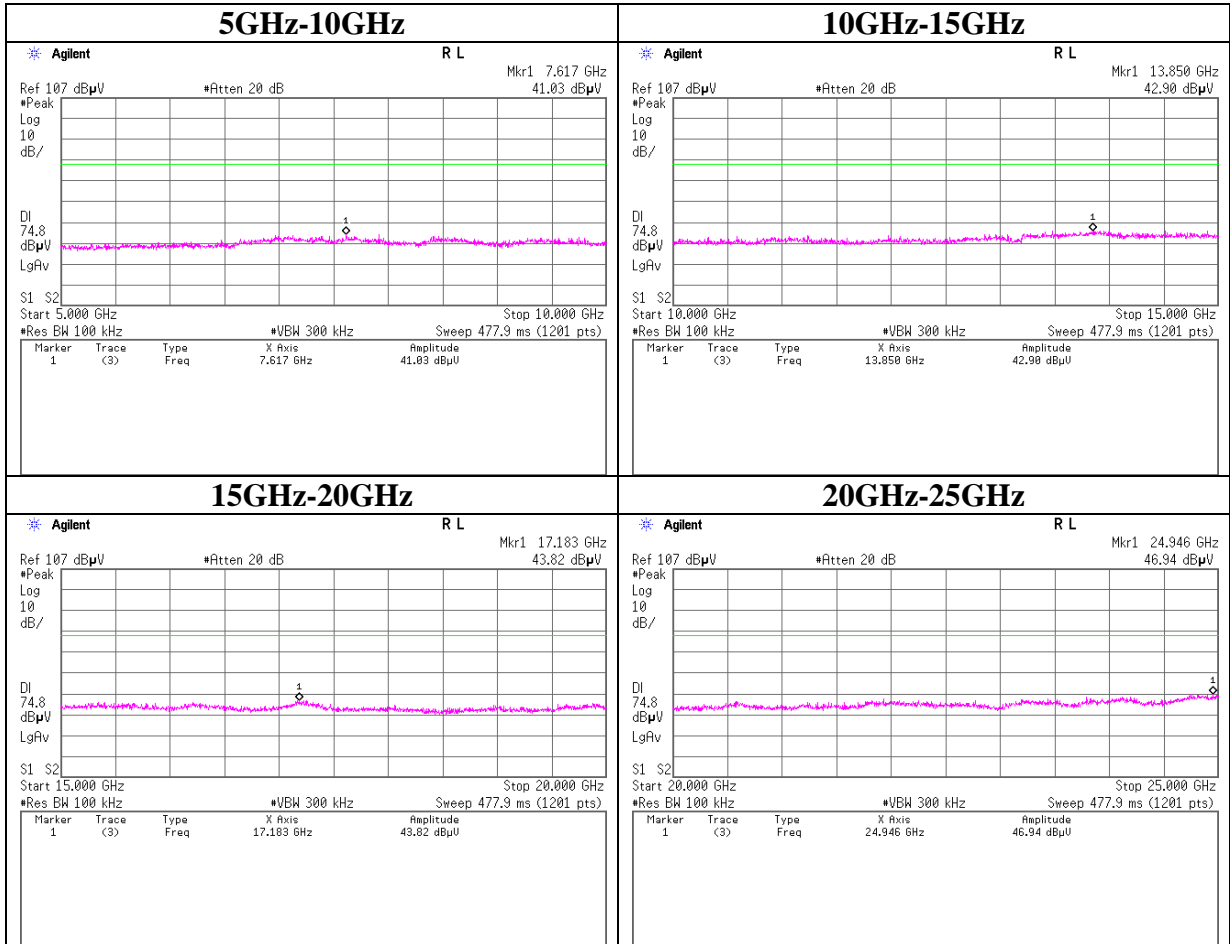
Conducted Spurious Emission

Tx DH5 2402MHz



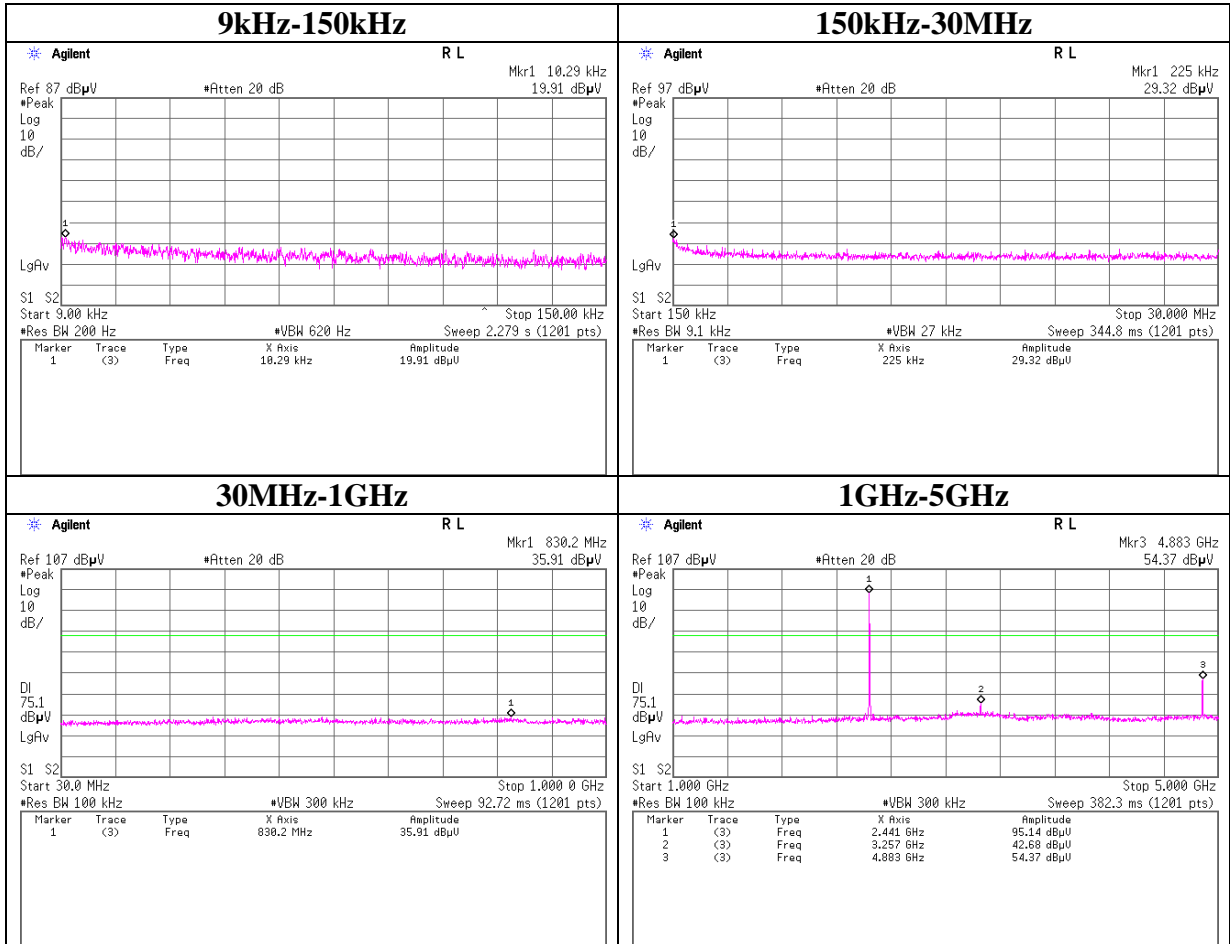
Conducted Spurious Emission

Tx DH5 2402MHz



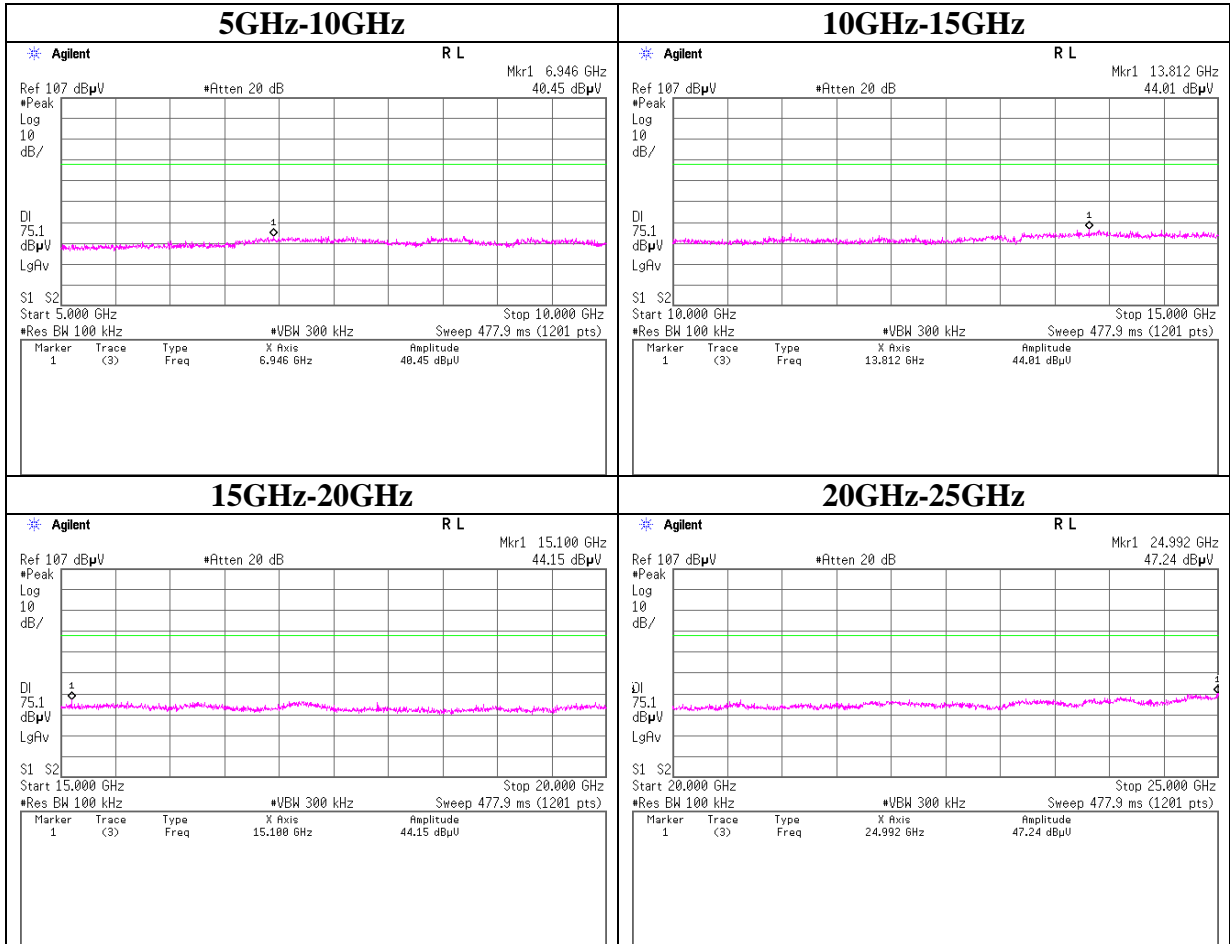
Conducted Spurious Emission

Tx DH5 2441MHz



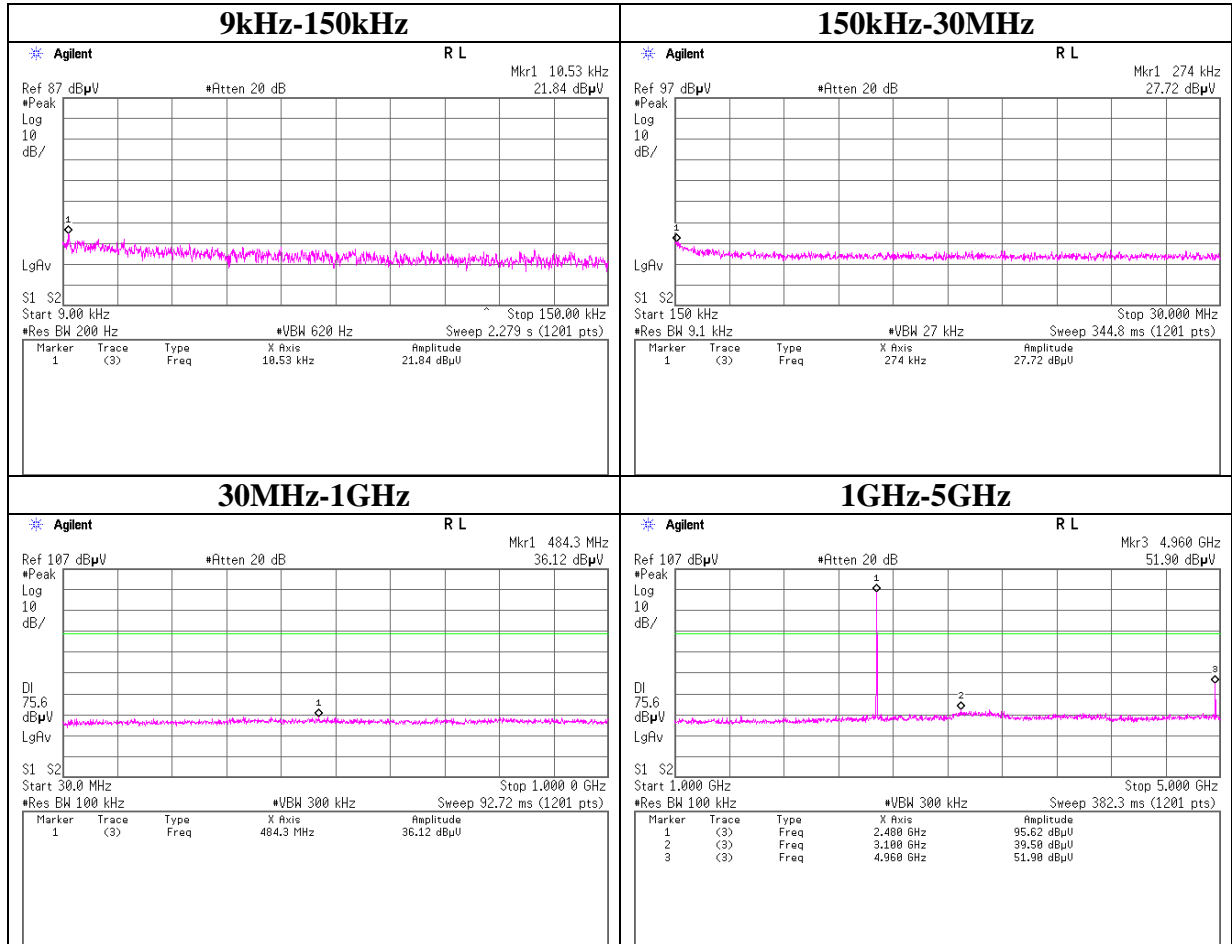
Conducted Spurious Emission

Tx DH5 2441MHz



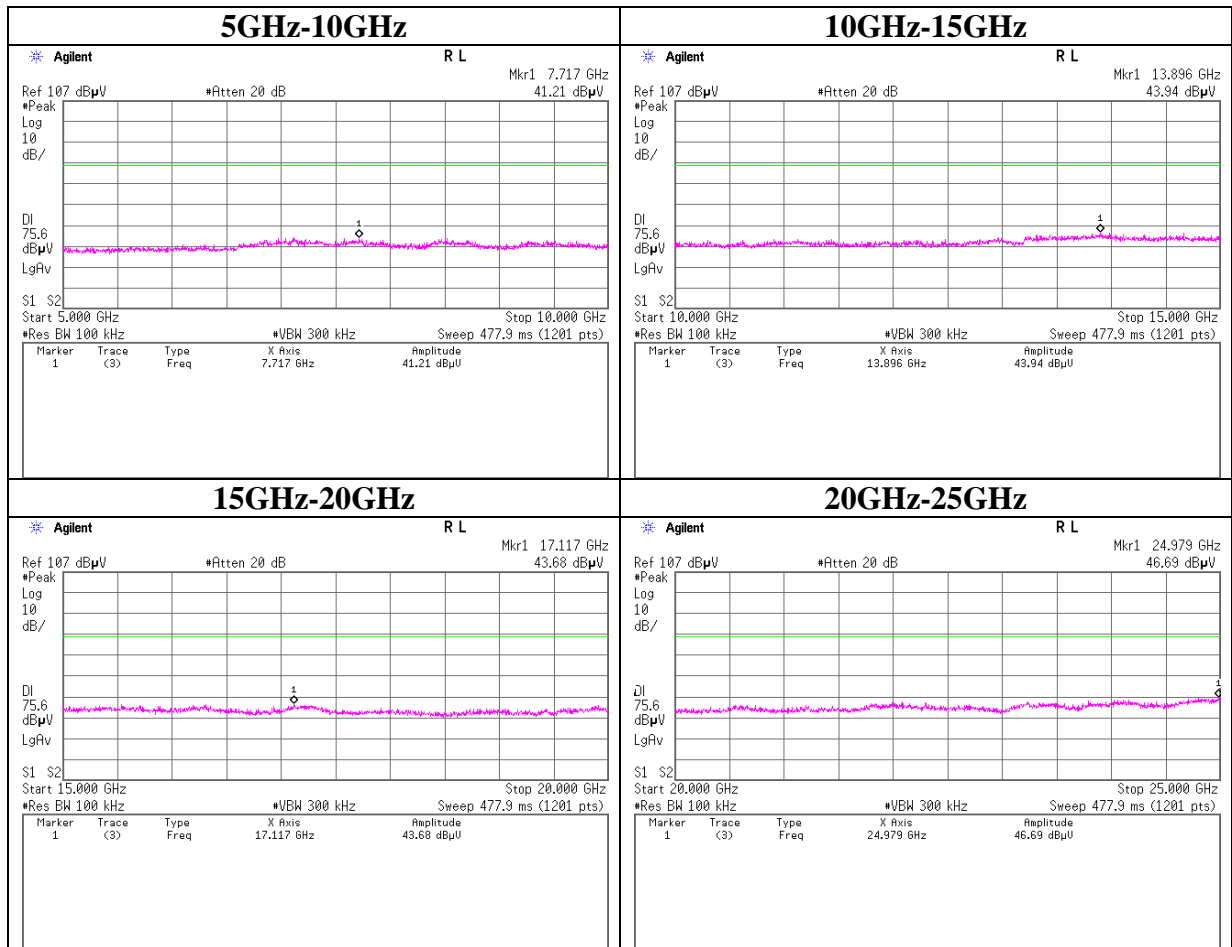
Conducted Spurious Emission

Tx DH5 2480MHz



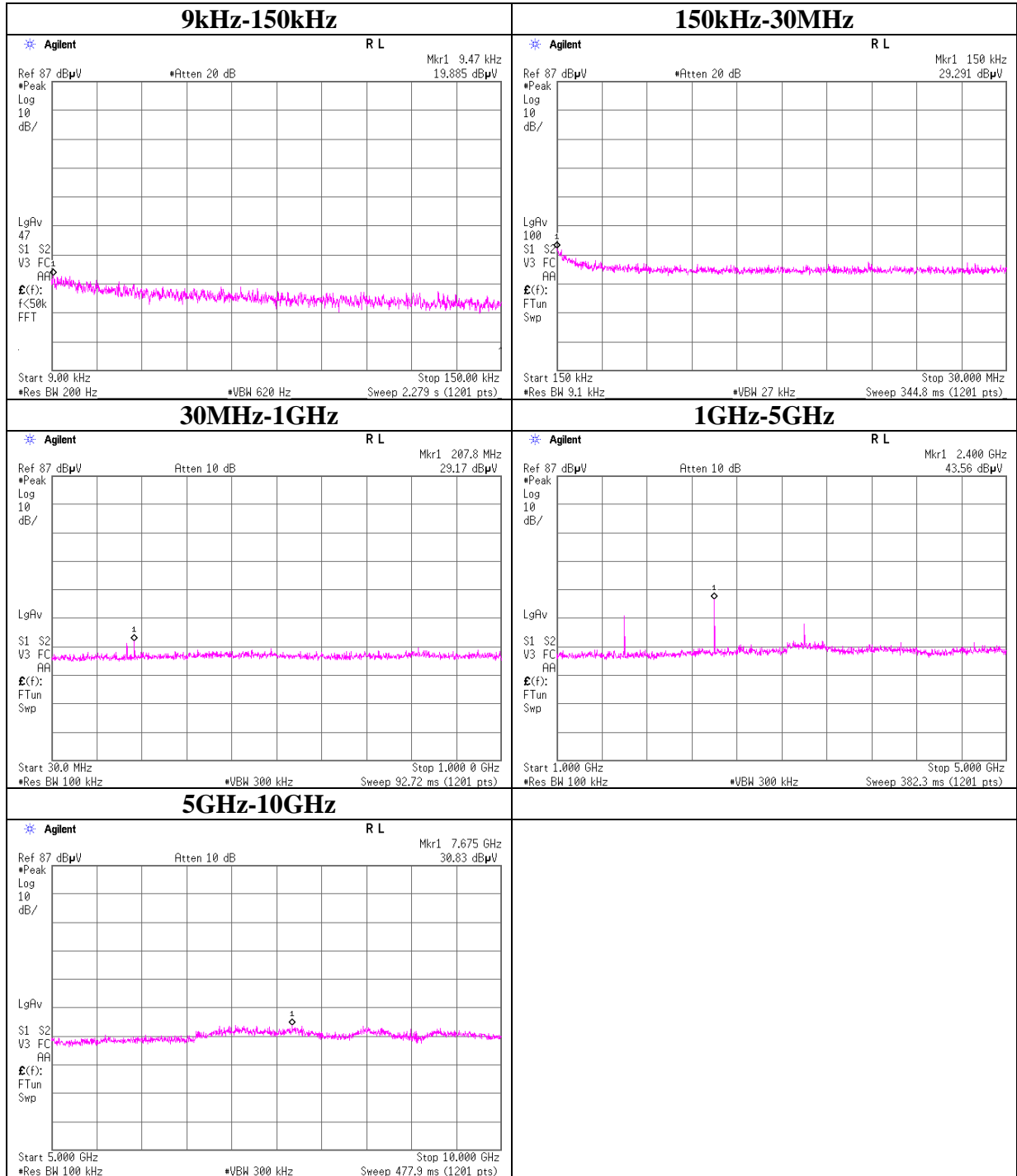
Conducted Spurious Emission

Tx DH5 2480MHz



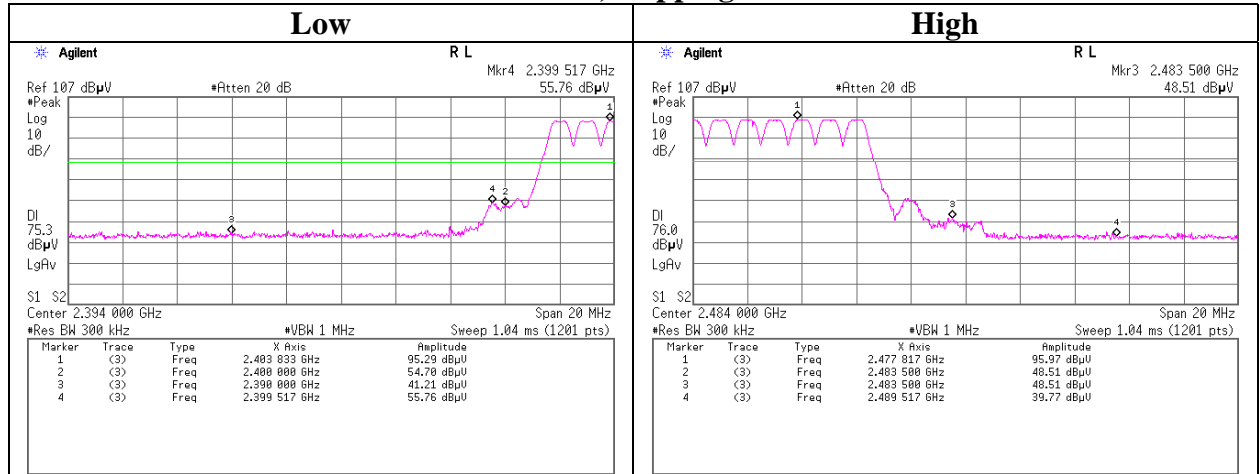
Conducted Spurious Emission

Rx 2441MHz

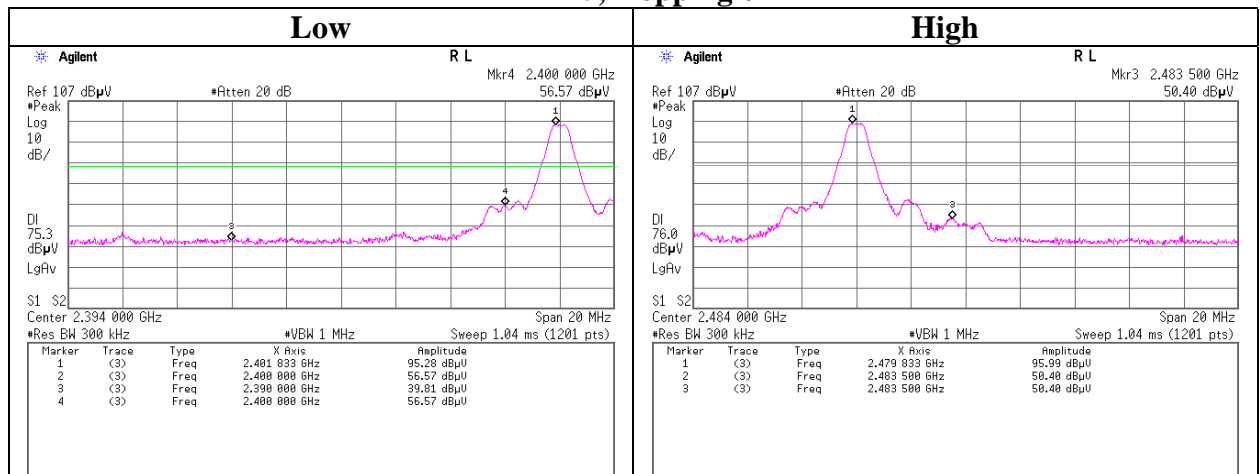


Conducted Emission Band Edge compliance

Tx DH5, Hopping on

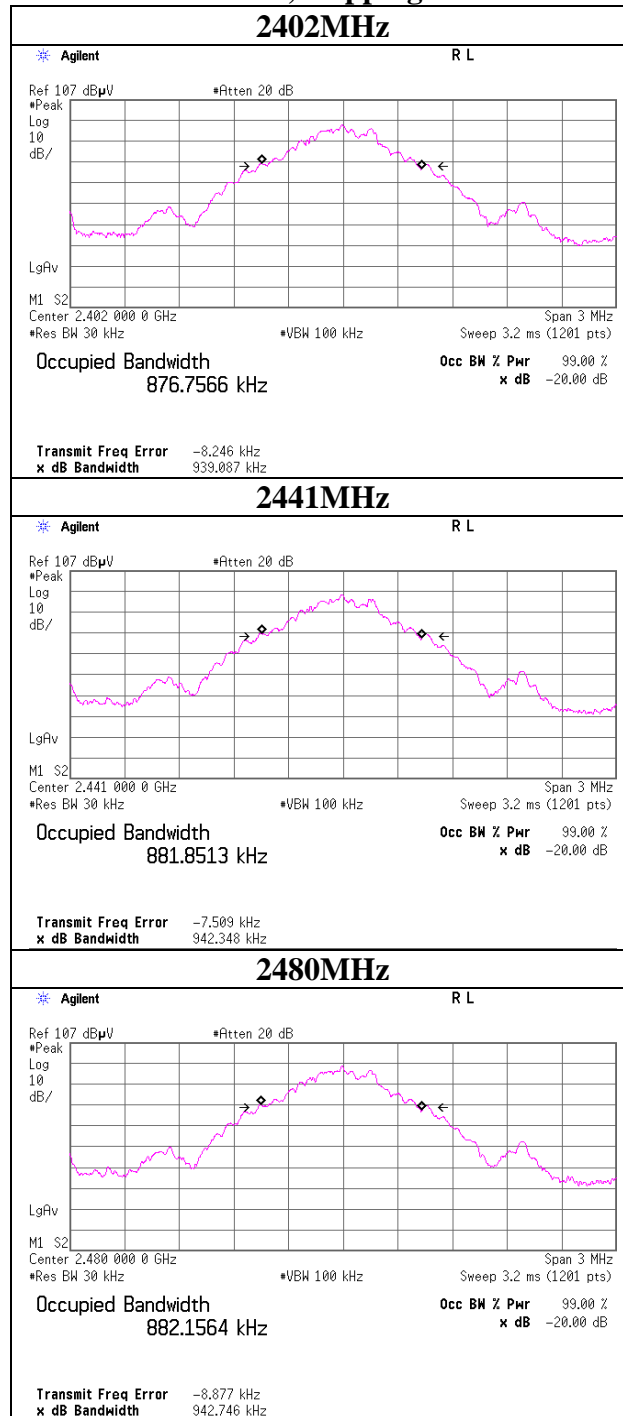


Tx DH5, Hopping off

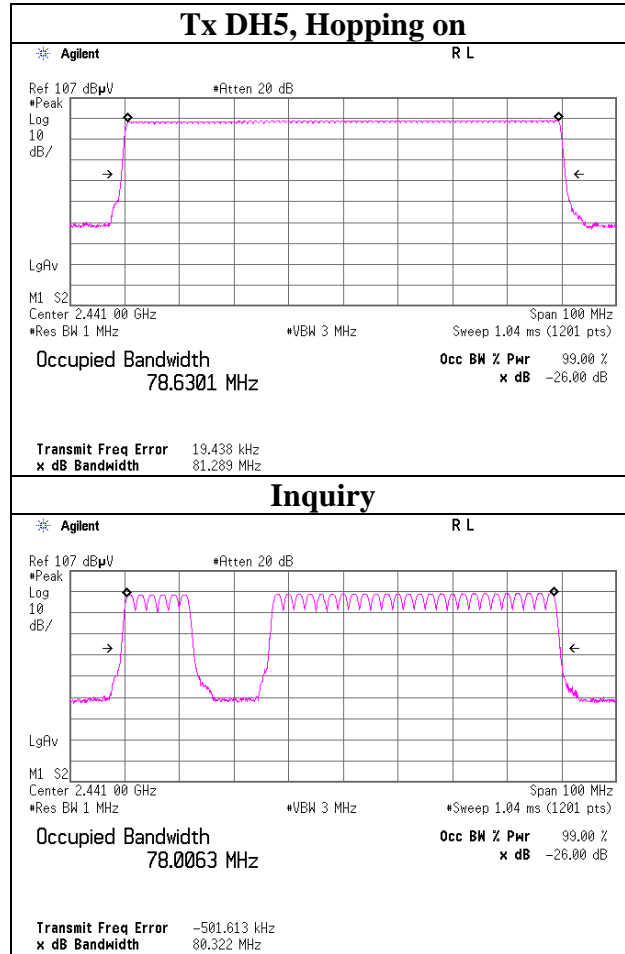


99% Occupied Bandwidth

Tx DH5, Hopping off



99% Occupied Bandwidth



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2011/09/13 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2011/09/13 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT/RE	2010/11/30 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2011/04/22 * 12
MAT-24	Attenuator(10dB)(above 1GHz)	Agilent	8493C	71389	AT	2011/06/23 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2011/02/23 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE/CE	2011/02/23 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE/CE	2011/10/19 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/08/17 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/08/17 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2011/03/25 * 12
MAT-51	Attenuator(6dB)	Weinschel	2	AS3557	RE	2011/01/14 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-56	Microwave Cable	Suhner	SUCOFLEX104	270875/4(1m) / 284655(5m)	RE	2011/03/02 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2011/03/10 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2011/06/17 * 12
MCC-79	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278923/4	RE	2010/12/02 * 12
MHF-20	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCC	607	RE	2011/09/08 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2011/05/16 * 12
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	CE	2010/11/18 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2011/02/20 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(AE)	2011/02/22 * 12
MTA-28	Terminator	TME	CT-01	-	CE	2011/11/01 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2011/02/22 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/suciform141-PE(1m)/RFM-E121(Switcher)	-/04178	CE	2011/07/04 * 12

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

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

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

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

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