



RADIO TEST REPORT

Test Report No.: 32DE0304-SH-02-A

Applicant : **SMK Corporation**
Type of Equipment : **Remote control**
Model No. : **NSG-MR5U**
FCC ID : **GT3FC013**
Test regulation : **FCC Part15 Subpart C: 2012**
Test result : **Complied**

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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: March 5 to 6, 2012

Tested by: *S. Takano*
Shinichi Takano
Engineer of WiSE Japan,
UL Verification Service

Approved by : *G. Ishiwata*
Go Ishiwata
Manager of WiSE Japan,
UL Verification Service

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13-EM-F0429

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SECTION 1: Customer information

Company Name : SMK Corporation
Address : 5-5, Togoshi 6-chome, Shinagawa-ku, Tokyo 142-8511 JAPAN
Telephone Number : +81-3-3785-1111
Facsimile Number : +81-3-3785-1878
Contact Person : Mitsuhiro Goto

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

2.1 Identification of E.U.T.

Type of Equipment : Remote control
Brand name : SONY
Model No. : NSG-MR5U
Serial No. : Refer to 4.2 in this report.
Rating : DC3V
Country of Mass-production : China, Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.
Receipt Date of Sample : March 5, 2012

2.2 Product description

Model: NSG-MR5U (referred to as the EUT in this report) is a Remote control.

Clock Frequency: 24MHz, 500kHz

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth & channel spacing : 1MHz
Type of modulation : FHSS
Antenna type : Metal (Inverted F)
Antenna gain with cable loss : -2.17dBi (max)
Antenna connector type : None
Operation temperature range : -10 to +50 deg.C.

FCC 15.31 (e)

The equipment provides the Bluetooth transmitter with stable power supply (DC1.6V and DC3.3V). Therefore, the equipment complies with the requirement.

FCC 15.203

The equipment and its antenna comply with this requirement since this antenna is built in the equipment and it cannot be replaced by end users.

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SECTION 3: Test specification, procedures & results**3.1 Test specification**

Test specification : FCC Part 15 Subpart C: 2012, final revised on February 1, 2012
 Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
 Section 15.207 Conducted limits
 Section 15.209 Radiated emission limits, general requirements
 Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,
 and 5725-5850MHz

The EUT complies with FCC Part 15 Subpart B. Refer to the test report: 32DE0304-SH-02-C.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results	
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A *1)	-	N/A	
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A	*See data.	Complied	
20dB bandwidth	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A		-	
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)(iii)	Conducted	N/A		Complied	
Dwell time	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)(iii)	Conducted	N/A		Complied	
Maximum peak output power	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (b)(1)	Conducted	N/A		Complied	
Band edge compliance & Spurious emission	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (d) 15.209	Conducted/ Radiated	N/A		12.8dB Freq.: 9920.00MHz Polarization: Horizontal Detection: Peak Mode: Tx 2480MHz	Complied
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422 *1) The test is not applicable since the EUT has no AC mains.							

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 4.6.1	RSS-Gen 4.6.1	Conducted	-	-

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

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

3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Item	Frequency range	No.1 SAC ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.9 dB	5.1 dB	5.0 dB
	300MHz-1GHz	5.0 dB	5.2 dB	5.0 dB
	1GHz-15GHz	4.8 dB	4.8 dB	4.9 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.6 dB	5.6 dB	5.6 dB
	18GHz-40GHz	4.8 dB	4.3 dB	4.4 dB

*1: SAC=Semi-Anechoic Chamber

*2: SR= Shielded Room is applied besides radiated emission

Radiated emission test

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

Antenna port conducted test

Power measurement uncertainty above 1GHz for this test was: (±) 1.5dB

Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (±) 1.7dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 3.0dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.9dB

Bandwidth measurement uncertainty for this test was: (±) 5.4%

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3.5 Test location

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JAB Accreditation No. : RTL02610

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
<input type="checkbox"/> No.1 Semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input checked="" type="checkbox"/> No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.3 Semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
<input type="checkbox"/> No.4 Full-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input type="checkbox"/> No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input checked="" type="checkbox"/> No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-

3.6 Test setup, Data of EMI & Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating mode

Test item	Operating mode	Tested frequency
Carrier frequency separation	Transmitting Hopping ON (DH5) Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5) Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5) Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 -DH1, -DH3, -DH5	-
Maximum peak output power	Transmitting (Hopping OFF), Payload: PRBS9 -DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted)	Transmitting (DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz
(Radiated)	Transmitting (DH5), Payload: PRBS9	Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5), Payload: PRBS9 -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 (except Dwell time test).

*Remarks: Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not affect 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.

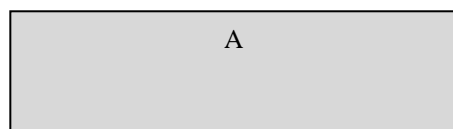
Power settings: Fixed

Software: LYRA RF Control Application v0.1.1.0

*The EUT has no Inquiry mode.

Justification: The system was configured in typical fashion (as customer would normally use it) for testing.

4.2 Configuration of tested system



* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Remote control	NSG-MR5U	*1)	SMK	EUT

*1) 000190F0733C: Radiated emissions, 000190F06F59: Other tests

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SECTION 5: Carrier frequency separation

Test procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

Refer to APPENDIX

SECTION 6: 20dB bandwidth & Occupied bandwidth (99%)

Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

Refer to APPENDIX

SECTION 7: Number of hopping frequency

Test procedure

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

Refer to APPENDIX

SECTION 8: Dwell time

Test procedure

The Dwell time was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

Refer to APPENDIX

SECTION 9: Maximum peak output power

Test procedure

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.

Summary of the test results: Pass

Refer to APPENDIX

SECTION 10: Spurious emissions (Antenna port conducted)

Test procedure

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.

In any 100kHz bandwidth outside the frequency 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.

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=10kHz)

Summary of the test results: Pass

Refer to APPENDIX

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SECTION 11: Radiated emission

11.1 Operating environment

The test was carried out in No.2 Semi-Anechoic Chamber.

Temperature : See test data (APPENDIX)

Humidity : See test data (APPENDIX)

11.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in APPENDIX.

11.3 Test conditions

Frequency range : 30MHz to 25GHz

Test distance : 3m (below 15GHz) / 1m (above 15GHz)

EUT position : Table top

11.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m (below 15GHz) / 1m (above 15GHz) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection of the test receiver.

Frequency	30-1000MHz	1-25GHz		20dBc
Detection type	Quasi-Peak	Peak	* Average	Peak
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz	RBW: 100kHz VBW: 300kHz

* When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

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

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Worst position:

	Below 1GHz	1G-2.8GHz	2.8G-13GHz	13G-18GHz	18G-25GHz
Horizontal	X	X	Y	Y	Y
Vertical	X	Z	X	X	X

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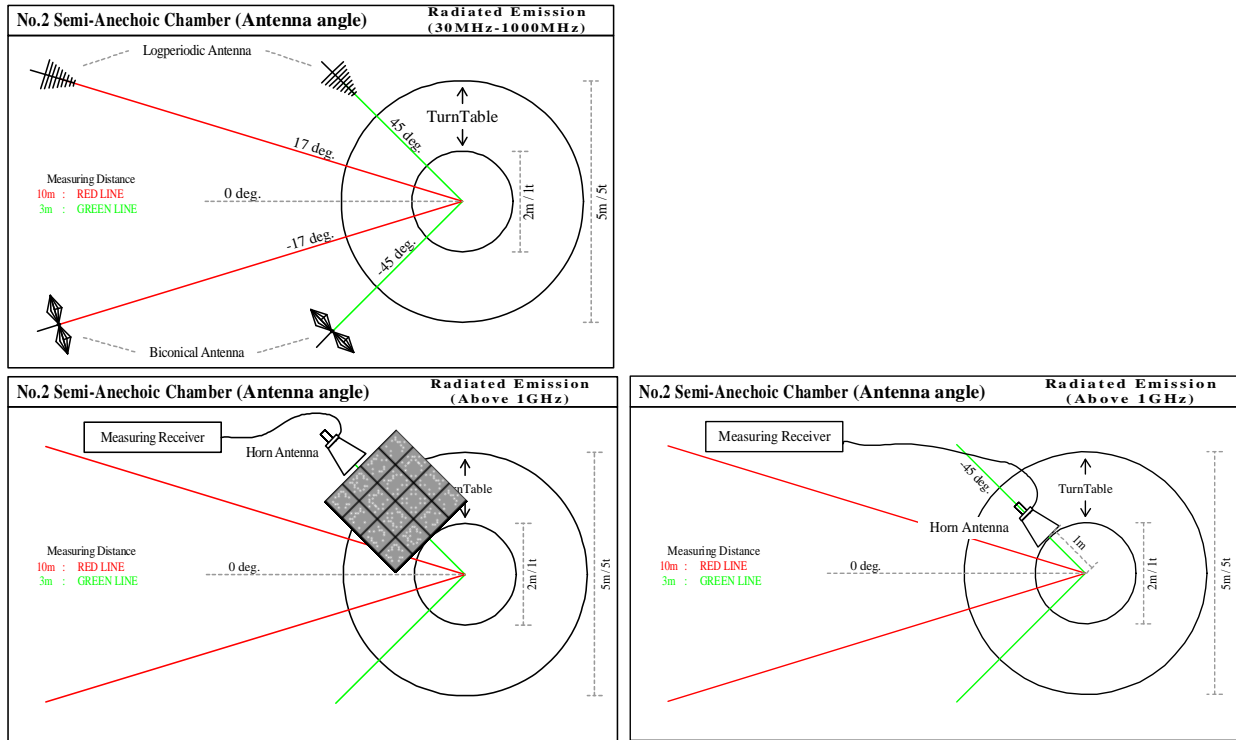
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Figure 1. Antenna angle



11.5 Band edge

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

11.6 Results

Summary of the test results : Pass *No noise was detected above the 5th order harmonics.

Refer to APPENDIX

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APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission

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APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date March 5, 2012
 Temperature / Humidity 23 deg.C , 39 %RH
 Engineer Shinichi Takano
 Mode Tx, Bluetooth, BDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	1.036	1.000	≥ 0.691
DH5	2441.0	1.027	1.003	≥ 0.684
DH5	2480.0	1.018	1.000	≥ 0.679

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

No limit applies to 20dB Bandwidth.

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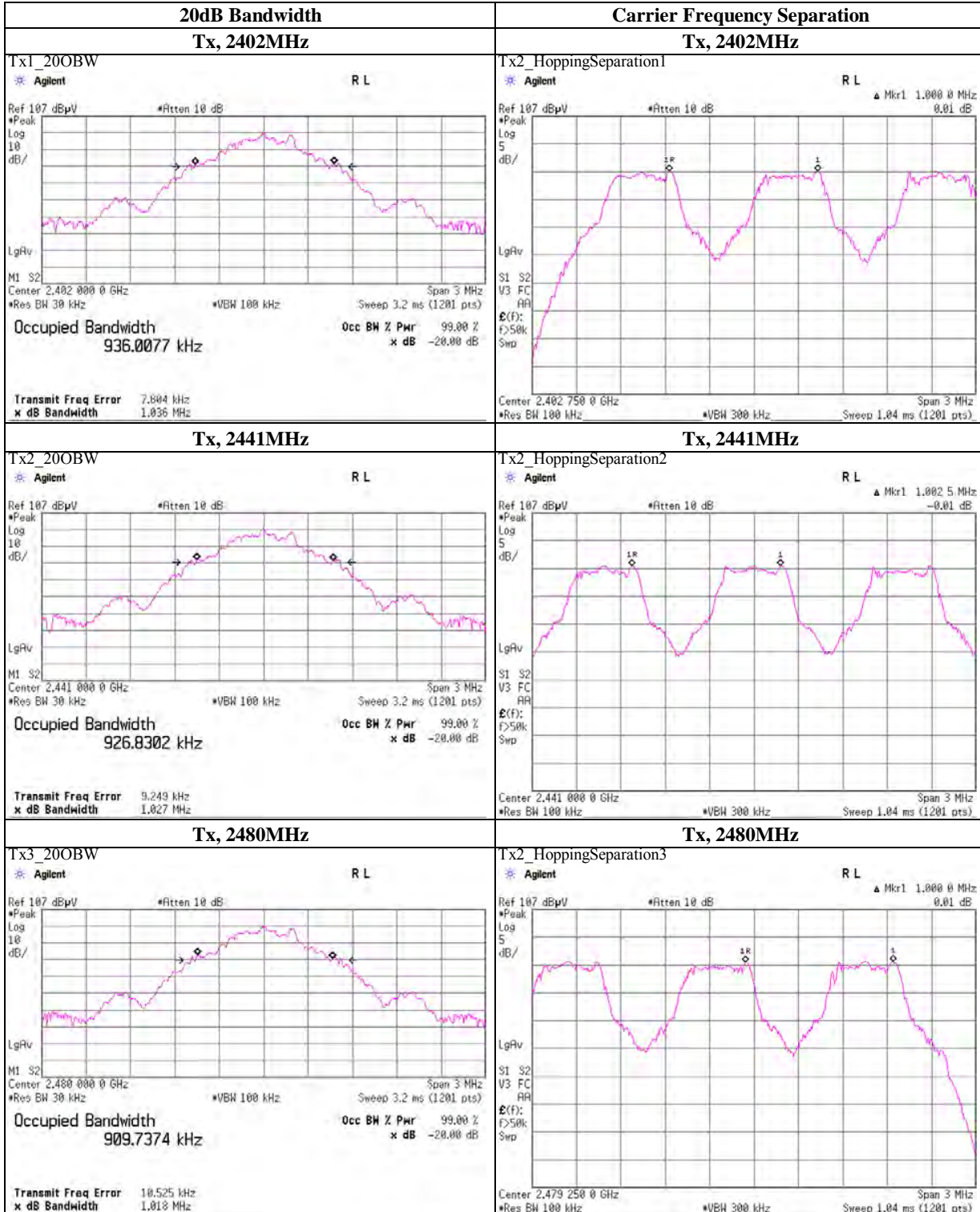
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9



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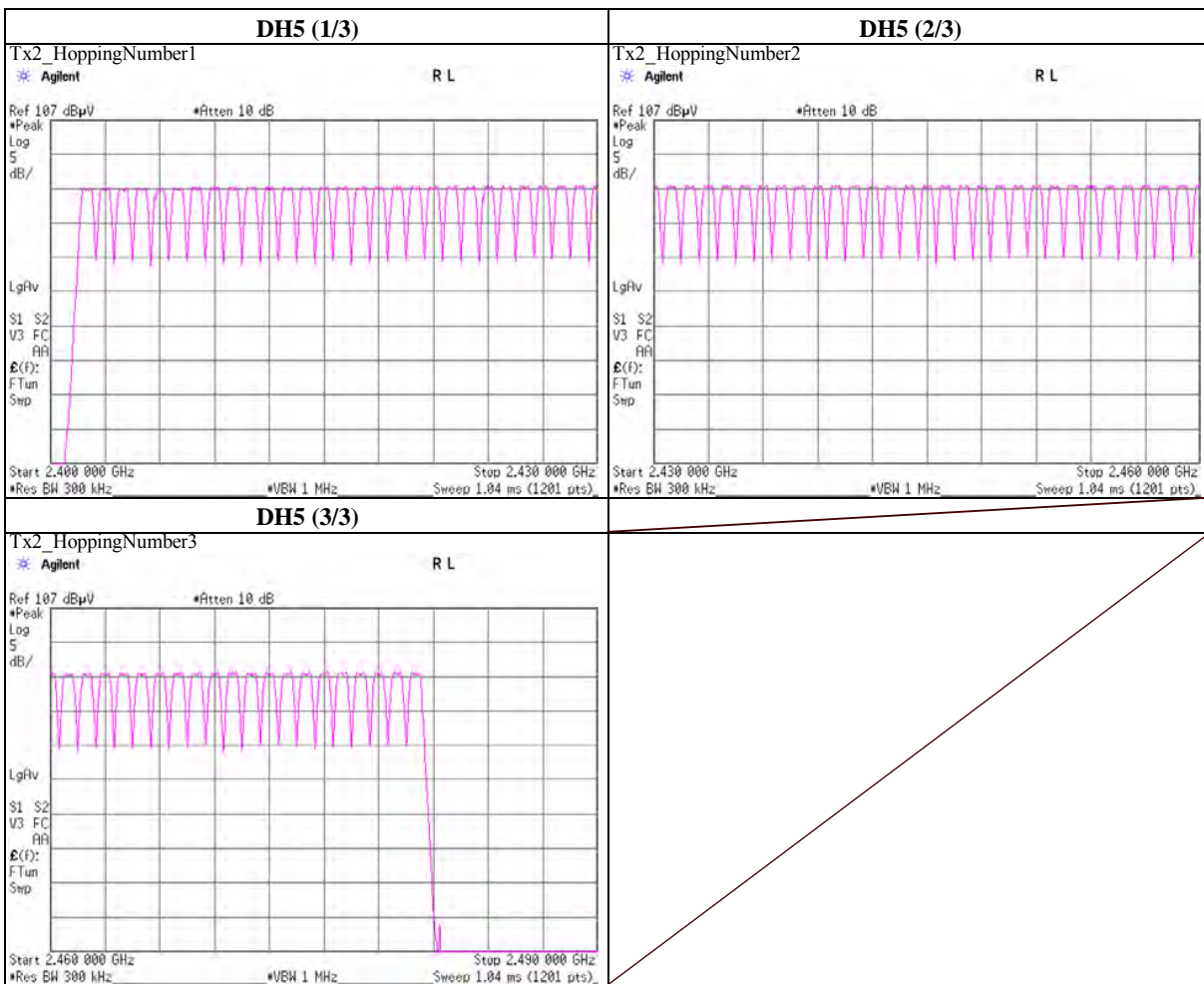
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 5, 2012	
Temperature / Humidity	23 deg.C , 39 %RH	
Engineer	Shinichi Takano	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Number of Channel [times]	Limit [times]
DH5	79	>= 15



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Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date March 6, 2012
 Temperature / Humidity 23 deg.C , 44 %RH
 Engineer Shinichi Takano
 Mode Tx, Bluetooth, BDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second period	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	50.4 / 5.0 sec. x 31.6 sec. = 319 times	0.434	138	400
DH3	27.0 / 5.0 sec. x 31.6 sec. = 171 times	1.689	289	400
DH5	18.6 / 5.0 sec. x 31.6 sec. = 118 times	2.937	347	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	51	51	49	51	50	50.4
DH3	25	27	29	26	28	27.0
DH5	19	21	18	19	16	18.6

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

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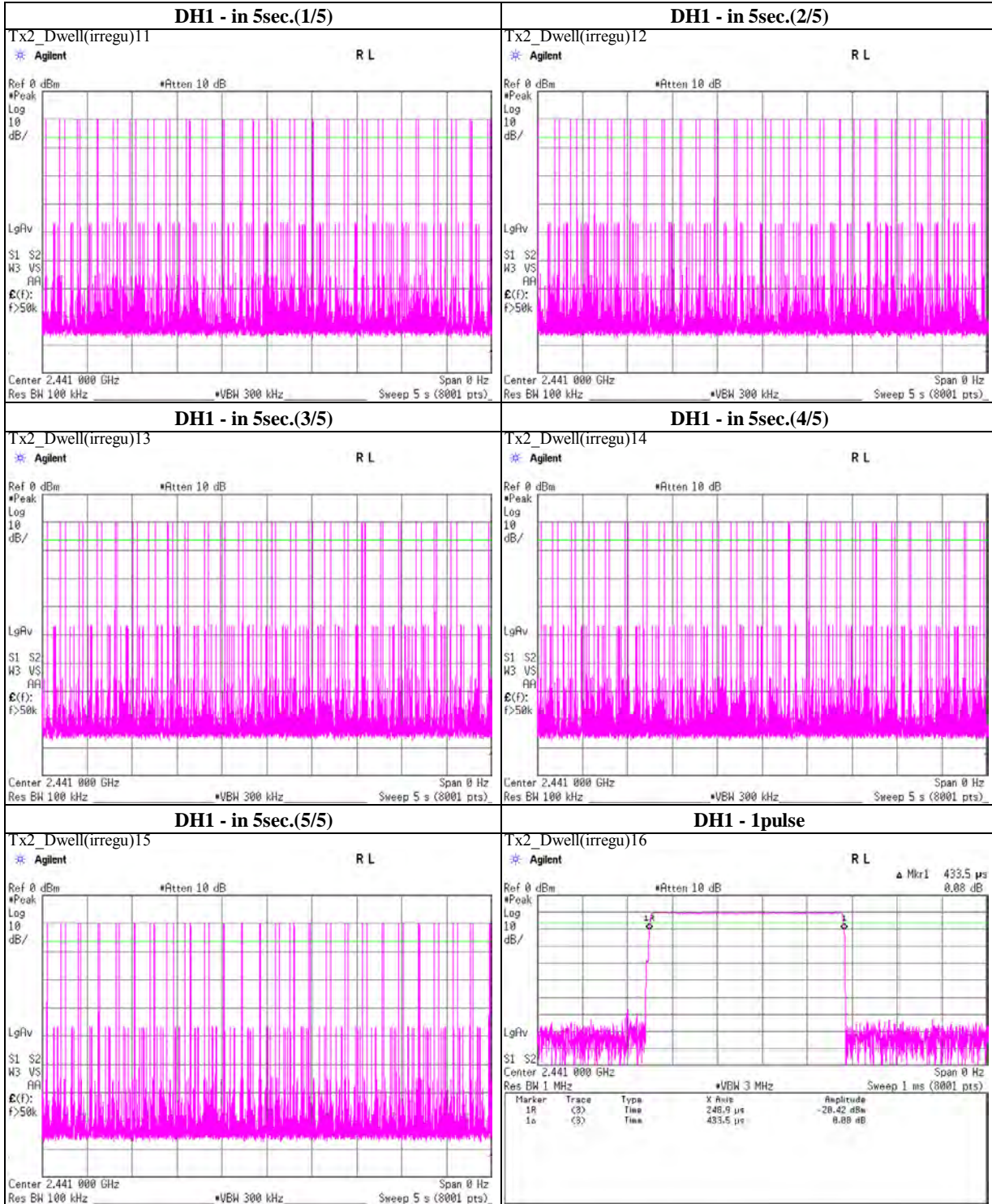
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Dwell time

Tx, Bluetooth, BDR, PRBS9



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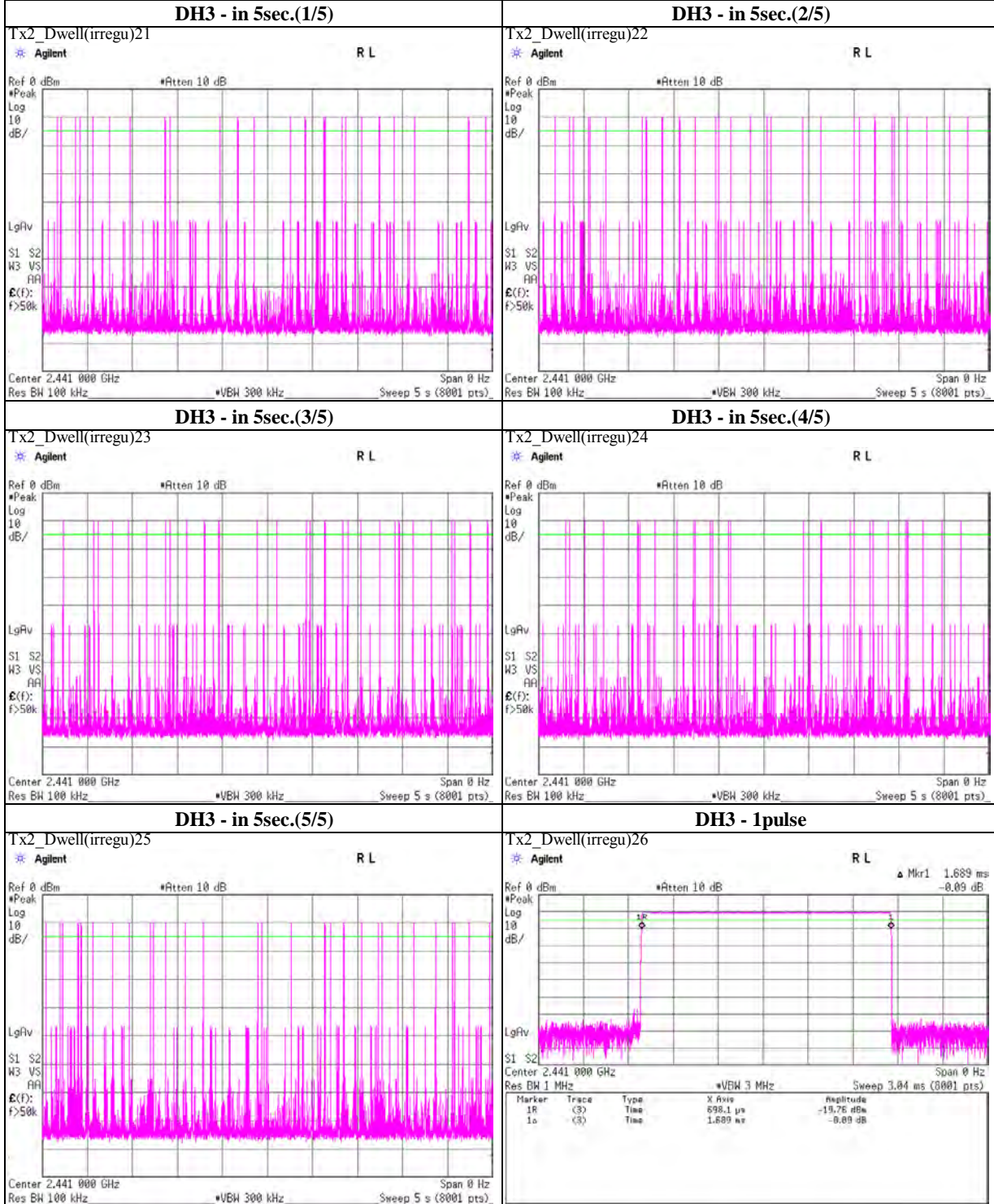
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Dwell time

Tx, Bluetooth, BDR, PRBS9



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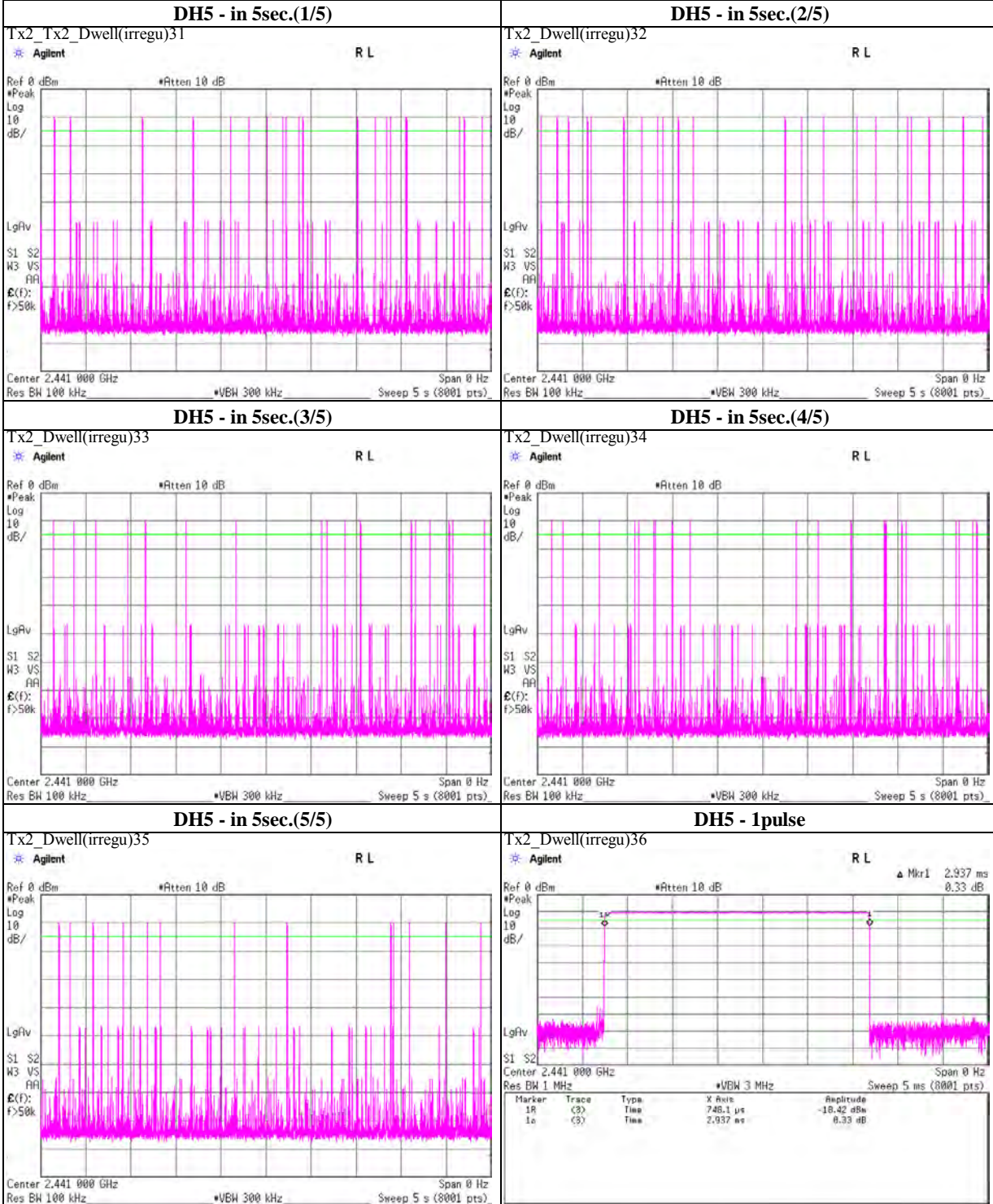
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Dwell time

Tx, Bluetooth, BDR, PRBS9



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Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date March 5, 2012
 Temperature / Humidity 23 deg.C , 39 %RH
 Engineer Shinichi Takano
 Mode Tx, Bluetooth

(* P/M: Power Meter with power sensor)

	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-9.67	0.78	9.68	0.79	1.20	20.97	125	20.18
DH5	2441.0	-9.37	0.79	9.68	1.10	1.29	20.97	125	19.87
DH5	2480.0	-9.31	0.80	9.68	1.17	1.31	20.97	125	19.80

Sample Calculation:

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.2 Semi Anechoic Chamber
Date	March 5, 2012	March 6, 2012
Temperature / Humidity	19 deg.C , 45 %RH	23 deg.C , 49 %RH
Engineer	Akio Hayashi	Wataru Kojima
Mode	Tx, 2402 MHz	
	Tx, Bluetooth, BDR, PRBS9	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	171.601	QP	23	15.6	8.9	31.8	15.7	43.5	27.8	200	61	
Hori.	229.258	QP	21.6	17.3	9.6	31.8	16.7	46	29.3	150	343	
Hori.	360.003	QP	32.5	15.5	7.3	31.7	23.6	46	22.4	100	124	
Hori.	408.003	QP	29.8	16.5	7.6	31.7	22.2	46	23.8	100	289	
Hori.	2257	PK	43.5	26.8	23.9	38	56.2	73.9	17.7	100	0	Not Detected
Hori.	2307	PK	43.9	27	23.9	37.9	56.9	73.9	17	100	0	Not Detected
Hori.	2353	PK	43.5	27.1	23.9	37.9	56.6	73.9	17.3	100	0	Not Detected
Hori.	2390	PK	43.2	27.2	24	37.8	56.6	73.9	17.3	100	161	
Hori.	2450	PK	42.6	27.4	24	37.7	56.3	73.9	17.6	100	0	Not Detected
Hori.	2497	PK	43.9	27.6	24	37.6	57.9	73.9	16	100	0	Not Detected
Hori.	2547	PK	43.6	27.7	24.1	37.6	57.8	73.9	16.1	100	0	Not Detected
Hori.	4804	PK	46.2	31.2	5.8	36.6	46.6	73.9	27.3	121	163	
Hori.	7206	PK	54.2	36.5	7.3	38.4	59.6	73.9	14.3	157	33	
Hori.	9608	PK	48.1	38.3	8.5	37.1	57.8	73.9	16.1	101	303	
Hori.	12010	PK	44.9	39.3	9.9	37.9	56.2	73.9	17.7	102	59	
Vert.	620.615	QP	21.1	19.5	8.7	31.7	17.6	46	28.4	100	208	
Vert.	917.384	QP	20.7	22.2	10.1	30.8	22.2	46	23.8	100	352	
Vert.	2257	PK	44.2	26.8	23.9	38	56.9	73.9	17	100	0	Not Detected
Vert.	2307	PK	43.6	27	23.9	37.9	56.6	73.9	17.3	100	0	Not Detected
Vert.	2353	PK	43	27.1	23.9	37.9	56.1	73.9	17.8	100	0	Not Detected
Vert.	2390	PK	43.4	27.2	24	37.8	56.8	73.9	17.1	100	27	
Vert.	2450	PK	43	27.4	24	37.7	56.7	73.9	17.2	100	0	Not Detected
Vert.	2497	PK	43.2	27.6	24	37.6	57.2	73.9	16.7	100	0	Not Detected
Vert.	2547	PK	43.1	27.7	24.1	37.6	57.3	73.9	16.6	100	0	Not Detected
Vert.	4804	PK	47	31.2	5.8	36.6	47.4	73.9	26.5	113	97	
Vert.	7206	PK	54.2	36.5	7.3	38.4	59.6	73.9	14.3	113	86	
Vert.	9608	PK	46.3	38.3	8.5	37.1	56	73.9	17.9	117	292	
Vert.	12010	PK	43.8	39.3	9.9	37.9	55.1	73.9	18.8	100	65	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2257	AV	33.2	26.8	23.9	38	-24.6	21.3	53.9	32.6	100	0	Not Detected
Hori.	2307	AV	33.1	27	23.9	37.9	-24.6	21.5	53.9	32.4	100	0	Not Detected
Hori.	2353	AV	33	27.1	23.9	37.9	-24.6	21.5	53.9	32.4	100	0	Not Detected
Hori.	2390	AV	32.5	27.2	24	37.8	-24.6	21.3	53.9	32.6	100	161	
Hori.	2450	AV	32.9	27.4	24	37.7	-24.6	22	53.9	31.9	100	0	Not Detected
Hori.	2497	AV	32.9	27.6	24	37.6	-24.6	22.3	53.9	31.6	100	0	Not Detected
Hori.	2547	AV	32.3	27.7	24.1	37.6	-24.6	21.9	53.9	32	100	0	Not Detected
Hori.	4804	AV	38.3	31.2	5.8	36.6	-24.6	14.1	53.9	39.8	121	163	
Hori.	7206	AV	47.4	36.5	7.3	38.4	-24.6	28.2	53.9	25.7	157	33	
Hori.	9608	AV	38.5	38.3	8.5	37.1	-24.6	23.6	53.9	30.3	101	303	
Hori.	12010	AV	33.6	39.3	9.9	37.9	-24.6	20.3	53.9	33.6	102	59	
Vert.	2257	AV	33.1	26.8	23.9	38	-24.6	21.2	53.9	32.7	100	0	Not Detected
Vert.	2307	AV	33.2	27	23.9	37.9	-24.6	21.6	53.9	32.3	100	0	Not Detected
Vert.	2353	AV	33.1	27.1	23.9	37.9	-24.6	21.6	53.9	32.3	100	0	Not Detected
Vert.	2390	AV	32.5	27.2	24	37.8	-24.6	21.3	53.9	32.6	100	27	
Vert.	2450	AV	32.9	27.4	24	37.7	-24.6	22	53.9	31.9	100	0	Not Detected
Vert.	2497	AV	32.9	27.6	24	37.6	-24.6	22.3	53.9	31.6	100	0	Not Detected
Vert.	2547	AV	32.8	27.7	24.1	37.6	-24.6	22.4	53.9	31.5	100	0	Not Detected
Vert.	4804	AV	38.4	31.2	5.8	36.6	-24.6	14.2	53.9	39.7	113	97	
Vert.	7206	AV	47.6	36.5	7.3	38.4	-24.6	28.4	53.9	25.5	113	86	
Vert.	9608	AV	36.7	38.3	8.5	37.1	-24.6	21.8	53.9	32.1	117	292	
Vert.	12010	AV	33.2	39.3	9.9	37.9	-24.6	19.9	53.9	34	100	65	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

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

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

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	PK	83.2	27.3	24	37.8	96.7	-	-	Carrier
Hori.	2400	PK	40.5	27.3	24	37.8	54.0	76.7	22.7	
Vert.	2402	PK	82.6	27.3	24	37.8	96.1	-	-	Carrier
Vert.	2400	PK	39.3	27.3	24	37.8	52.8	76.1	23.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 13GHz)) - Gain(Amplifier)

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.2 Semi Anechoic Chamber
 Date March 5, 2012 March 6, 2012
 Temperature / Humidity 19 deg.C , 45 %RH 23 deg.C , 49 %RH
 Engineer Akio Hayashi Wataru Kojima
 Mode Tx, 2441 MHz
 Tx, Bluetooth, BDR, PRBS9

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	175.547	QP	21.7	15.7	8.9	31.8	14.5	43.5	29	300	212	
Hori.	336.01	QP	28.9	15	7.2	31.7	19.4	46	26.6	100	115	
Hori.	360.002	QP	32.6	15.5	7.3	31.7	23.7	46	22.3	100	140	
Hori.	408.002	QP	29.7	16.5	7.6	31.7	22.1	46	23.9	100	100	
Hori.	904.194	QP	20.9	22.1	10	30.9	22.1	46	23.9	150	26	
Hori.	2297	PK	43.3	26.9	23.9	38	56.1	73.9	17.8	100	0	Not Detected
Hori.	2347	PK	43	27.1	23.9	37.9	56.1	73.9	17.8	100	0	Not Detected
Hori.	2393	PK	43.5	27.2	24	37.8	56.9	73.9	17	100	0	Not Detected
Hori.	2490	PK	43	27.5	24	37.6	56.9	73.9	17	100	0	Not Detected
Hori.	2537	PK	43.3	27.7	24.1	37.6	57.5	73.9	16.4	100	0	Not Detected
Hori.	2587	PK	43.2	27.8	24.1	37.7	57.4	73.9	16.5	100	0	Not Detected
Hori.	4882	PK	44.9	31.4	5.8	36.6	45.5	73.9	28.4	121	191	
Hori.	7323	PK	51.2	36.7	7.5	38.4	57	73.9	16.9	152	42	
Hori.	9764	PK	49.4	38.7	8.5	37.1	59.5	73.9	14.4	105	295	
Hori.	12205	PK	41.4	39.4	9.8	38	52.6	73.9	21.3	100	0	Not Detected
Vert.	626.942	QP	21.4	19.5	8.7	31.7	17.9	46	28.1	100	222	
Vert.	2297	PK	43.5	26.9	23.9	38	56.3	73.9	17.6	100	0	Not Detected
Vert.	2347	PK	42.8	27.1	23.9	37.9	55.9	73.9	18	100	0	Not Detected
Vert.	2393	PK	43.4	27.2	24	37.8	56.8	73.9	17.1	100	0	Not Detected
Vert.	2490	PK	43.5	27.5	24	37.6	57.4	73.9	16.5	100	0	Not Detected
Vert.	2537	PK	43	27.7	24.1	37.6	57.2	73.9	16.7	100	0	Not Detected
Vert.	2587	PK	43.1	27.8	24.1	37.7	57.3	73.9	16.6	100	0	Not Detected
Vert.	4882	PK	44.4	31.4	5.8	36.6	45	73.9	28.9	100	293	
Vert.	7323	PK	51.6	36.7	7.5	38.4	57.4	73.9	16.5	100	86	
Vert.	9764	PK	47.8	38.7	8.5	37.1	57.9	73.9	16	147	302	
Vert.	12205	PK	43.7	39.4	9.8	38	54.9	73.9	19	159	0	Not Detected

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2297	AV	33.1	26.9	23.9	38	-24.6	21.3	53.9	32.6	100	0	Not Detected
Hori.	2347	AV	33.1	27.1	23.9	37.9	-24.6	21.6	53.9	32.3	100	0	Not Detected
Hori.	2393	AV	33.1	27.2	24	37.8	-24.6	21.9	53.9	32	100	0	Not Detected
Hori.	2490	AV	32.8	27.5	24	37.6	-24.6	22.1	53.9	31.8	100	0	Not Detected
Hori.	2537	AV	32.8	27.7	24.1	37.6	-24.6	22.4	53.9	31.5	100	0	Not Detected
Hori.	2587	AV	32.9	27.8	24.1	37.7	-24.6	22.5	53.9	31.4	100	0	Not Detected
Hori.	4882	AV	35.6	31.4	5.8	36.6	-24.6	11.6	53.9	42.3	121	191	
Hori.	7323	AV	44.5	36.7	7.5	38.4	-24.6	25.7	53.9	28.2	152	42	
Hori.	9764	AV	39.9	38.7	8.5	37.1	-24.6	25.4	53.9	28.5	105	295	
Hori.	12205	AV	30.8	39.4	9.8	38	-24.6	17.4	53.9	36.5	100	0	Not Detected
Vert.	2297	AV	33.2	26.9	23.9	38	-24.6	21.4	53.9	32.5	100	0	Not Detected
Vert.	2347	AV	33.1	27.1	23.9	37.9	-24.6	21.6	53.9	32.3	100	0	Not Detected
Vert.	2393	AV	33	27.2	24	37.8	-24.6	21.8	53.9	32.1	100	0	Not Detected
Vert.	2490	AV	32.6	27.5	24	37.6	-24.6	21.9	53.9	32	100	0	Not Detected
Vert.	2537	AV	32.9	27.7	24.1	37.6	-24.6	22.5	53.9	31.4	100	0	Not Detected
Vert.	2587	AV	32.9	27.8	24.1	37.7	-24.6	22.5	53.9	31.4	100	0	Not Detected
Vert.	4882	AV	33.7	31.4	5.8	36.6	-24.6	9.7	53.9	44.2	100	293	
Vert.	7323	AV	45.1	36.7	7.5	38.4	-24.6	26.3	53.9	27.6	100	86	
Vert.	9764	AV	38.6	38.7	8.5	37.1	-24.6	24.1	53.9	29.8	147	302	
Vert.	12205	AV	32.5	39.4	9.8	38	-24.6	19.1	53.9	34.8	159	0	Not Detected

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

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

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.2 Semi Anechoic Chamber
 Date March 5, 2012 March 6, 2012
 Temperature / Humidity 19 deg.C , 45 %RH 23 deg.C , 49 %RH
 Engineer Akio Hayashi Wataru Kojima
 Mode Tx, 2480 MHz
 Tx, Bluetooth, BDR, PRBS9

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	169.062	QP	21.8	15.5	8.9	31.8	14.4	43.5	29.1	300	10	
Hori.	181.186	QP	23.7	15.9	8.9	31.8	16.7	43.5	26.8	153	63	
Hori.	359.999	QP	32.1	15.5	7.3	31.7	23.2	46	22.8	100	96	
Hori.	408.007	QP	28.4	16.5	7.6	31.7	20.8	46	25.2	100	121	
Hori.	904.899	QP	20.8	22.1	10	30.9	22	46	24	150	166	
Hori.	2337	PK	44	27.1	23.9	37.9	57.1	73.9	16.8	100	0	Not Detected
Hori.	2383	PK	44.6	27.2	24	37.8	58	73.9	15.9	100	0	Not Detected
Hori.	2433	PK	44	27.4	24	37.7	57.7	73.9	16.2	100	0	Not Detected
Hori.	2483.5	PK	44	27.5	24	37.6	57.9	73.9	16	100	260	
Hori.	2527	PK	44.2	27.6	24.1	37.6	58.3	73.9	15.6	100	0	Not Detected
Hori.	2577	PK	42.8	27.7	24.1	37.7	56.9	73.9	17	100	0	Not Detected
Hori.	2623	PK	43.9	27.8	24.1	37.7	58.1	73.9	15.8	100	0	Not Detected
Hori.	4960	PK	46.4	31.6	5.8	36.5	47.3	73.9	26.6	100	271	
Hori.	7440	PK	49	37	7.5	38.4	55.1	73.9	18.8	100	54	
Hori.	9920	PK	50.9	39	8.4	37.2	61.1	73.9	12.8	100	291	
Hori.	12400	PK	42.5	39.5	9.7	38	53.7	73.9	20.2	100	127	
Vert.	629.847	QP	21.2	19.5	8.7	31.7	17.7	46	28.3	100	132	
Vert.	2337	PK	42.6	27.1	23.9	37.9	55.7	73.9	18.2	100	0	Not Detected
Vert.	2383	PK	44.1	27.2	24	37.8	57.5	73.9	16.4	100	0	Not Detected
Vert.	2433	PK	44	27.4	24	37.7	57.7	73.9	16.2	100	0	Not Detected
Vert.	2483.5	PK	43.8	27.5	24	37.6	57.7	73.9	16.2	132	138	
Vert.	2527	PK	43.4	27.6	24.1	37.6	57.5	73.9	16.4	100	0	Not Detected
Vert.	2577	PK	44.1	27.7	24.1	37.7	58.2	73.9	15.7	100	0	Not Detected
Vert.	2623	PK	42.9	27.8	24.1	37.7	57.1	73.9	16.8	100	0	Not Detected
Vert.	4960	PK	47.1	31.6	5.8	36.5	48	73.9	25.9	100	279	
Vert.	7440	PK	52.5	37	7.5	38.4	58.6	73.9	15.3	145	190	
Vert.	9920	PK	50.4	39	8.4	37.2	60.6	73.9	13.3	152	303	
Vert.	12400	PK	43	39.5	9.7	38	54.2	73.9	19.7	135	326	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2337	AV	33.1	27.1	23.9	37.9	-24.6	21.6	53.9	32.3	100	0	Not Detected
Hori.	2383	AV	33.1	27.2	24	37.8	-24.6	21.9	53.9	32	100	0	Not Detected
Hori.	2433	AV	33	27.4	24	37.7	-24.6	22.1	53.9	31.8	100	0	Not Detected
Hori.	2483.5	AV	32.5	27.5	24	37.6	-24.6	21.8	53.9	32.1	100	260	
Hori.	2527	AV	32.9	27.6	24.1	37.6	-24.6	22.4	53.9	31.5	100	0	Not Detected
Hori.	2577	AV	32.8	27.7	24.1	37.7	-24.6	22.3	53.9	31.6	100	0	Not Detected
Hori.	2623	AV	32.9	27.8	24.1	37.7	-24.6	22.5	53.9	31.4	100	0	Not Detected
Hori.	4960	AV	37.5	31.6	5.8	36.5	-24.6	13.8	53.9	40.1	100	271	
Hori.	7440	AV	41.4	37	7.5	38.4	-24.6	22.9	53.9	31	100	54	
Hori.	9920	AV	41.8	39	8.4	37.2	-24.6	27.4	53.9	26.5	100	291	
Hori.	12400	AV	31.8	39.5	9.7	38	-24.6	18.4	53.9	35.5	100	127	
Vert.	2337	AV	33.1	27.1	23.9	37.9	-24.6	21.6	53.9	32.3	100	0	Not Detected
Vert.	2383	AV	33.1	27.2	24	37.8	-24.6	21.9	53.9	32	100	0	Not Detected
Vert.	2433	AV	33.1	27.4	24	37.7	-24.6	22.2	53.9	31.7	100	0	Not Detected
Vert.	2483.5	AV	32.5	27.5	24	37.6	-24.6	21.8	53.9	32.1	132	138	
Vert.	2527	AV	32.9	27.6	24.1	37.6	-24.6	22.4	53.9	31.5	100	0	Not Detected
Vert.	2577	AV	32.9	27.7	24.1	37.7	-24.6	22.4	53.9	31.5	100	0	Not Detected
Vert.	2623	AV	32.8	27.8	24.1	37.7	-24.6	22.4	53.9	31.5	100	0	Not Detected
Vert.	4960	AV	39.3	31.6	5.8	36.5	-24.6	15.6	53.9	38.3	100	279	
Vert.	7440	AV	45.2	37	7.5	38.4	-24.6	26.7	53.9	27.2	145	190	
Vert.	9920	AV	41.6	39	8.4	37.2	-24.6	27.2	53.9	26.7	152	303	
Vert.	12400	AV	31.8	39.5	9.7	38	-24.6	18.4	53.9	35.5	135	326	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

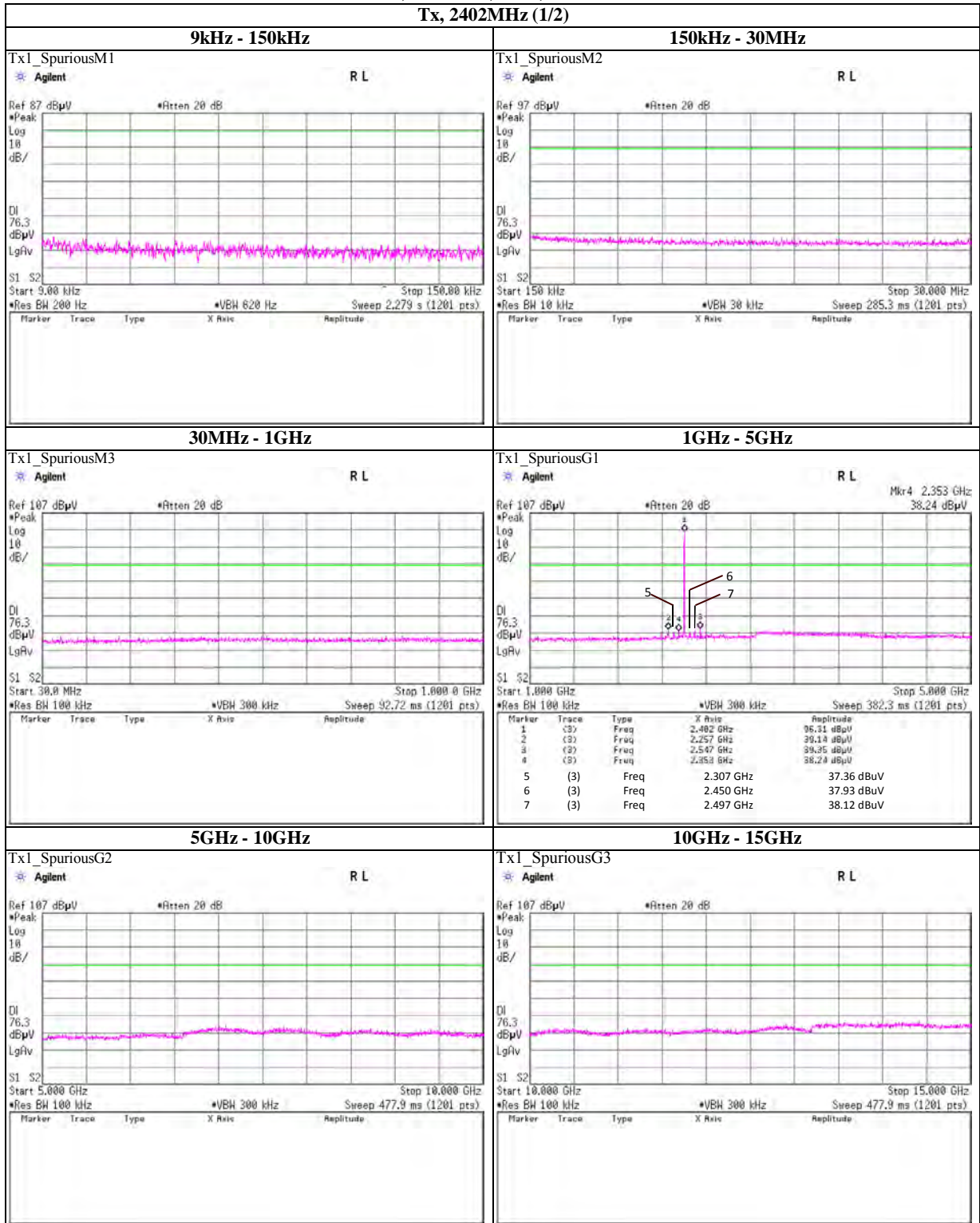
*The 10th harmonic was not seen so the result was its base noise level.

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (1/2)



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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (2/2)

15GHz - 20GHz		20GHz - 25GHz																			
<p>Tx1_SpuriousG4</p> <p>Agilent R L</p> <p>Ref 107 dBµV *Atten 20 dB</p> <p>*Peak</p> <p>Log</p> <p>10</p> <p>dB/</p> <p>DI</p> <p>76.3</p> <p>dBµV</p> <p>LgFv</p> <p>S1 S2</p> <p>Start 15.000 GHz Stop 20.000 GHz</p> <p>*Res BW 100 kHz *VBW 300 kHz Sweep 477.9 ms (1201 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Marker	Trace	Type	X Axis	Amplitude						<p>Tx1_SpuriousG5</p> <p>Agilent R L</p> <p>Ref 107 dBµV *Atten 20 dB</p> <p>*Peak</p> <p>Log</p> <p>10</p> <p>dB/</p> <p>DI</p> <p>76.3</p> <p>dBµV</p> <p>LgFv</p> <p>S1 S2</p> <p>Start 20.000 GHz Stop 25.000 GHz</p> <p>*Res BW 100 kHz *VBW 300 kHz Sweep 477.9 ms (1201 pts)</p> <table border="1"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Marker	Trace	Type	X Axis	Amplitude					
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Marker	Trace	Type	X Axis	Amplitude																	
Tx1_SpuriousG6	Tx1_SpuriousG7																				
Tx1_SpuriousG8																					

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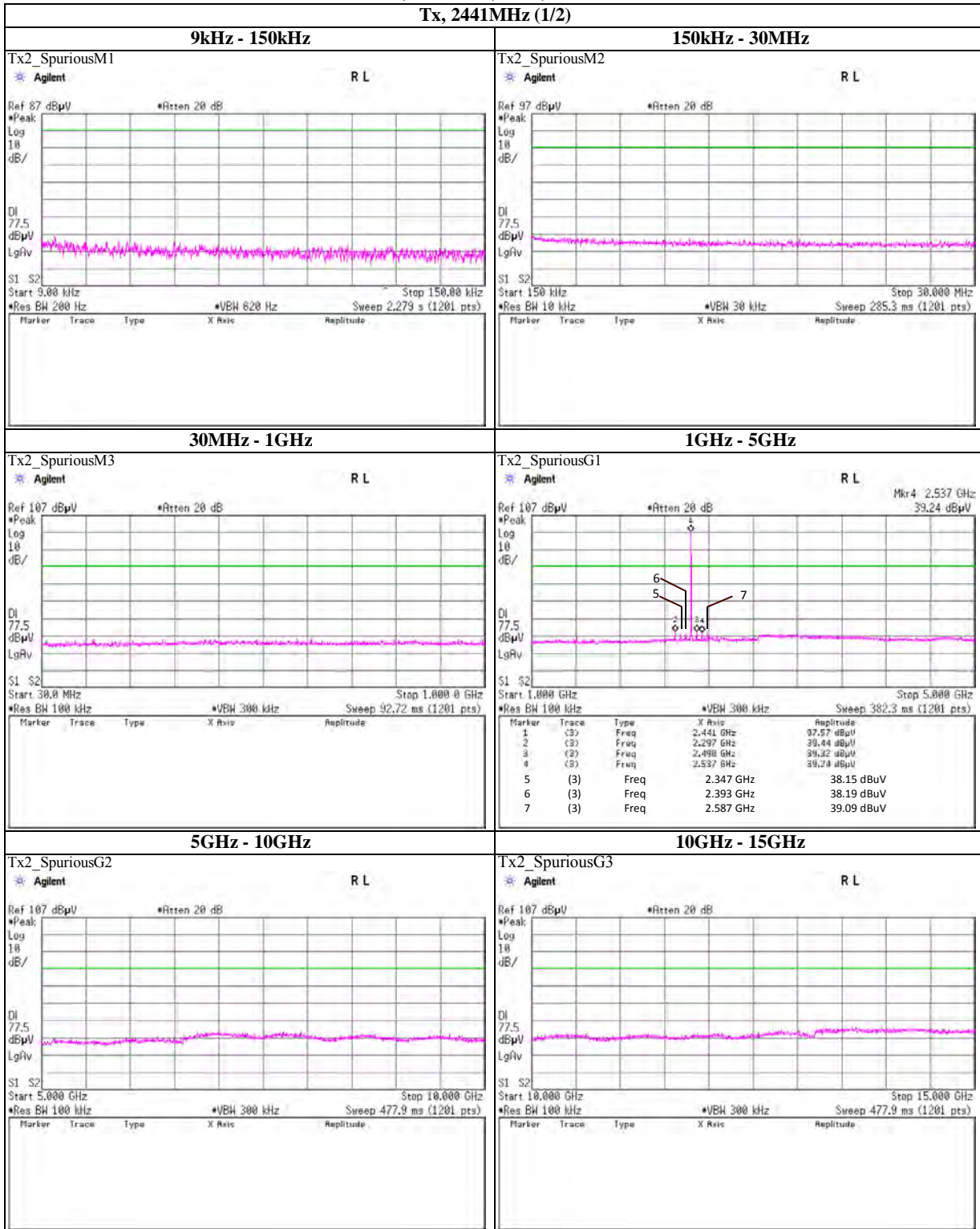
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (1/2)



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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (2/2)



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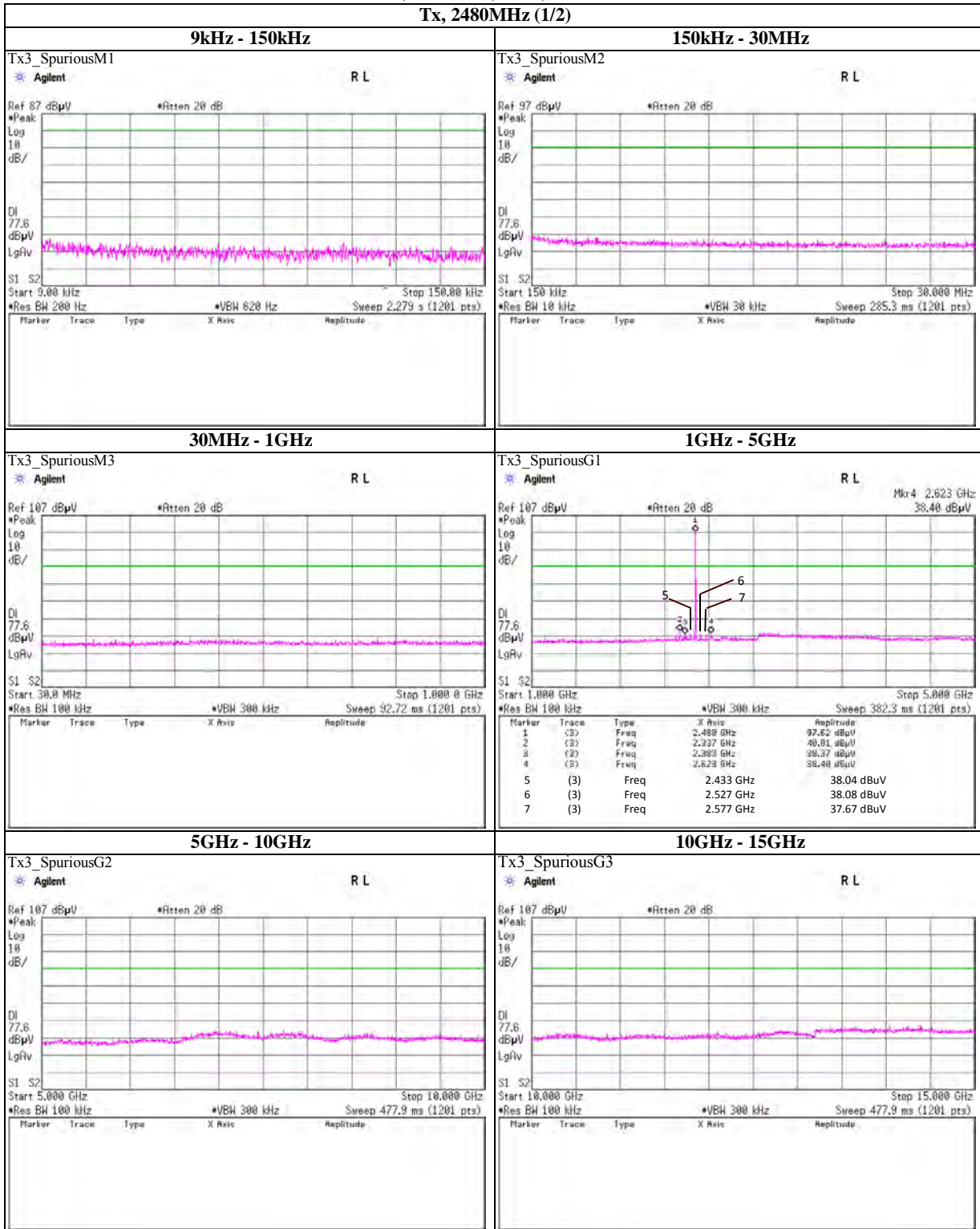
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Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (1/2)



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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (2/2)



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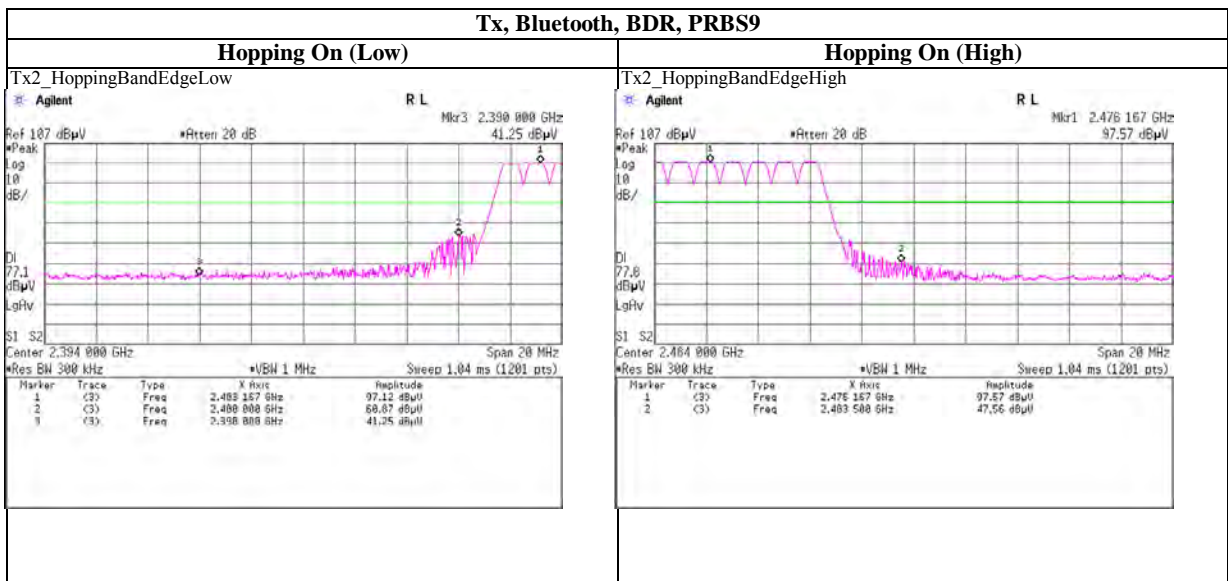
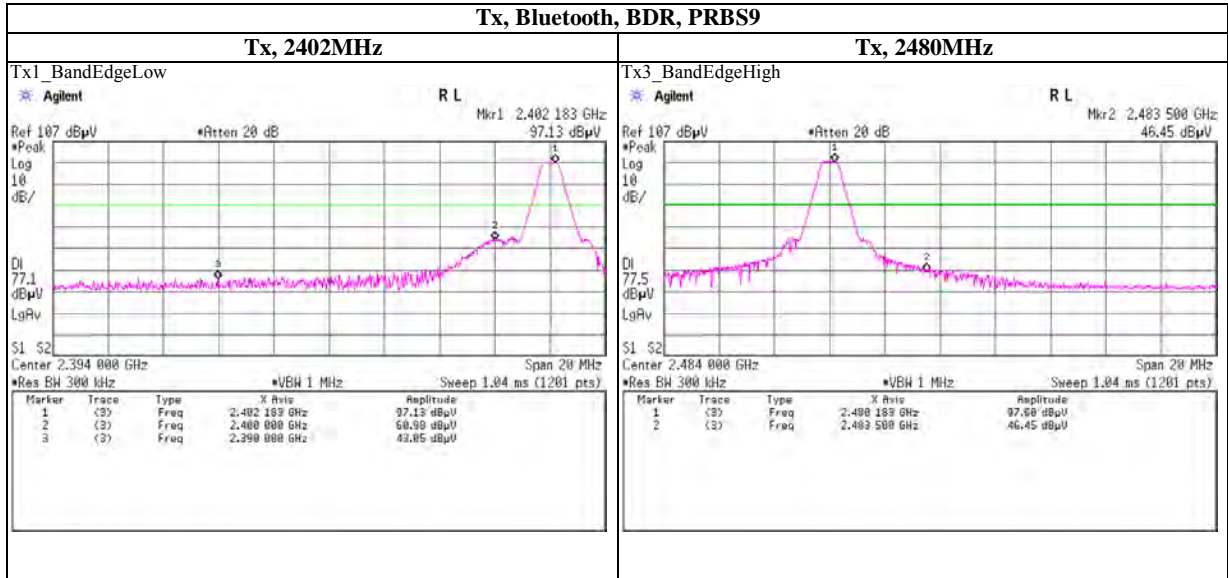
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Spurious emission (Conducted)

Band Edge compliance



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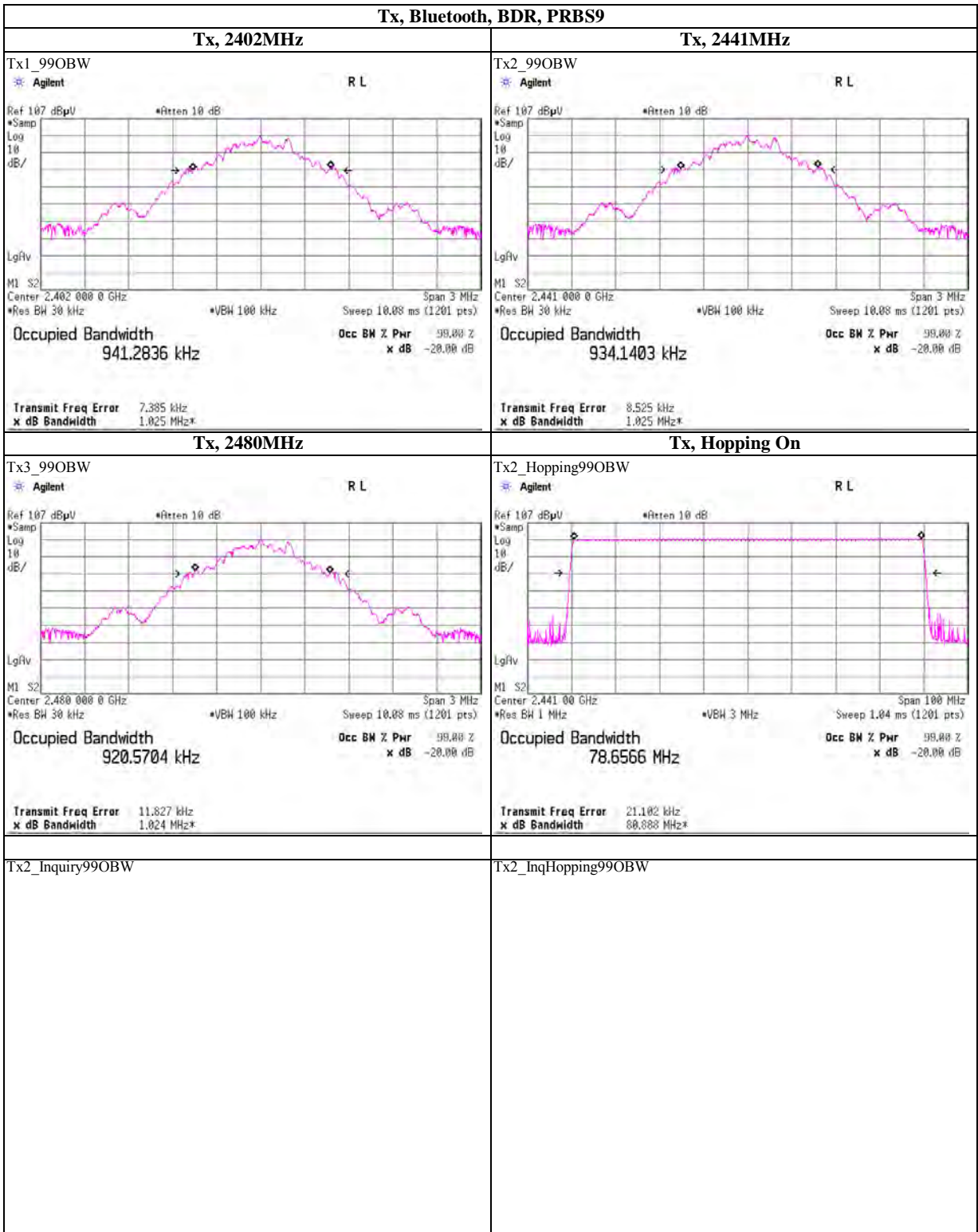
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99% Occupied Bandwidth



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APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT, RE	2011/03/07 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2011/03/23 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2011/11/09 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2011/04/12 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2011/04/12 * 12
SOS-08	Humidity Indicator	A&D	AD-5681	4060109	AT	2011/03/02 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2011/03/23 * 12
SCC-G02	Coaxial Cable	Suhner	SUCOFLEX 104A	46498/4A	RE	2011/04/28 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2011/05/27 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2011/08/28 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2012/02/06 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
SAT20-01	Attenuator(above 1GHz)	Agilent	8493C-020	74889	RE	2011/12/27 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2011/12/27 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2011/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2011/03/16 * 12
SCC-G17	Coaxial Cable	Suhner	SUCOFLEX 104A	46291/4A	RE	2011/03/16 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2012/02/10 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
SAT3-02	Attenuator	JFW	50HF-003N	-	RE	2012/02/10 * 12
SBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1908	RE	2011/11/23 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2011/04/28 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2011/04/28 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2011/11/16 * 12
STR-02	Test Receiver	Rohde & Schwarz	ESCI	100575	RE	2011/08/04 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2011/09/25 * 12

The expiration date of the calibration is the end of the expired month .
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

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

Test Item :

- RE: Radiated emission ,
- AT: Antenna terminal conducted tests