



Test report No. : 10407942S-A
Page : 1 of 57
Issued date : September 12, 2014
FCC ID : ACJ932AT1501

RADIO TEST REPORT

Test Report No.: 10407942S-A

Applicant : Panasonic Corporation
Type of Equipment : Car Audio
Model No. : AT1501
FCC ID : ACJ932AT1501
Test regulation : FCC Part15 Subpart C: 2014
Test result : Complied

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Date of test: March 1, 2013 to August 25, 2014

Tested by:

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Panasonic Corporation
Brand Name : Panasonic
Address : 4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa 224-8520 Japan
Telephone Number : +81-50-3689-6973
Facsimile Number : +81-45-931-0806
Contact Person : Ichiro Furuya

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

2.1 Identification of E.U.T.

Type of Equipment : Car Audio
Model No. : AT1501
Serial No. : No.0001 (CV-VS05F2AJ)
Rating : System : DC12.0V (Car battery), Bluetooth Block : DC5V
Receipt Date of Sample : February 26, 2013 and August 8, 2014
Country of Mass-production : 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.

2.2 Product description

Model: AT1501 (referred to as the EUT in this report) is a Car Audio.

Clock frequency(ies) in the system : 26MHz, 32.768kHz

Radio specification

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth / Channel spacing : 79MHz & 1MHz
Type of modulation : FHSS (GFSK, $\pi/4$ -DQPSK, 8DPSK)
Antenna type : Dipole
Antenna connector type : U.FL
Antenna gain with cable loss : -2.85dBi
ITU code : F1D, G1D
Operation temperature range : -30 to +85 deg. C.

FCC 15.31 (e)

The stable voltage (DC3.3V and DC1.8V) is provided constantly to RF part via regulator. Therefore, the EUT complies with the requirement.

FCC 15.203

The equipment and its antenna comply with the requirement since the 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: 2014, final revised on May 1, 2014 and effective June 2, 2014
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

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)	-	-
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	14.8 dB Freq.: 7440.000MHz Detection: Peak Polarization: Vertical Mode: Tx 2480MHz, DH5	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	-	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	4.8 dB	5.0 dB	4.8 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB
	1GHz-15GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.7 dB	5.6 dB	5.6 dB
	18GHz-40GHz	5.2 dB	4.3 dB	4.3 dB

*1: SAC=Semi-Anechoic Chamber

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

The data listed in this test report has enough margin, more than the 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: (±) 1.6dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 1.4dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 2.8dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.5dB

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

	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
☒ No.1 semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.2 semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.3 semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☒ No.3 shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☒ No.5 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.6 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test setup, Data of test & 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 / 3-DH5) / Inquiry, Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5 -Inquiry	-
Maximum peak output power	Transmitting Hopping OFF, Payload: PRBS9 - DH5, - 2-DH5, - 3-DH5	2402MHz, 2441MHz, 2480MHz
Spurious emission (Conducted)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz Spurious emission: 2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Radiated)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping OFF	
99% occupied bandwidth	Transmitting (DH5 / 3-DH5), Payload: PRBS9 / Inquiry -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.
The carrier separation may be less than 20 dB bandwidth, therefore 125mW power limit was applied to it.

We removed 2-DH mode (2 Mb/s EDR: pi/4DQPSK) except power measurement by using 3-DH mode (3 Mb/s EDR: 8DPSK) as a representative.

EUT has the power settings by the software as follows;

Power settings	Fixed
Software	HCI Tester Ver 3.0.0.12

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

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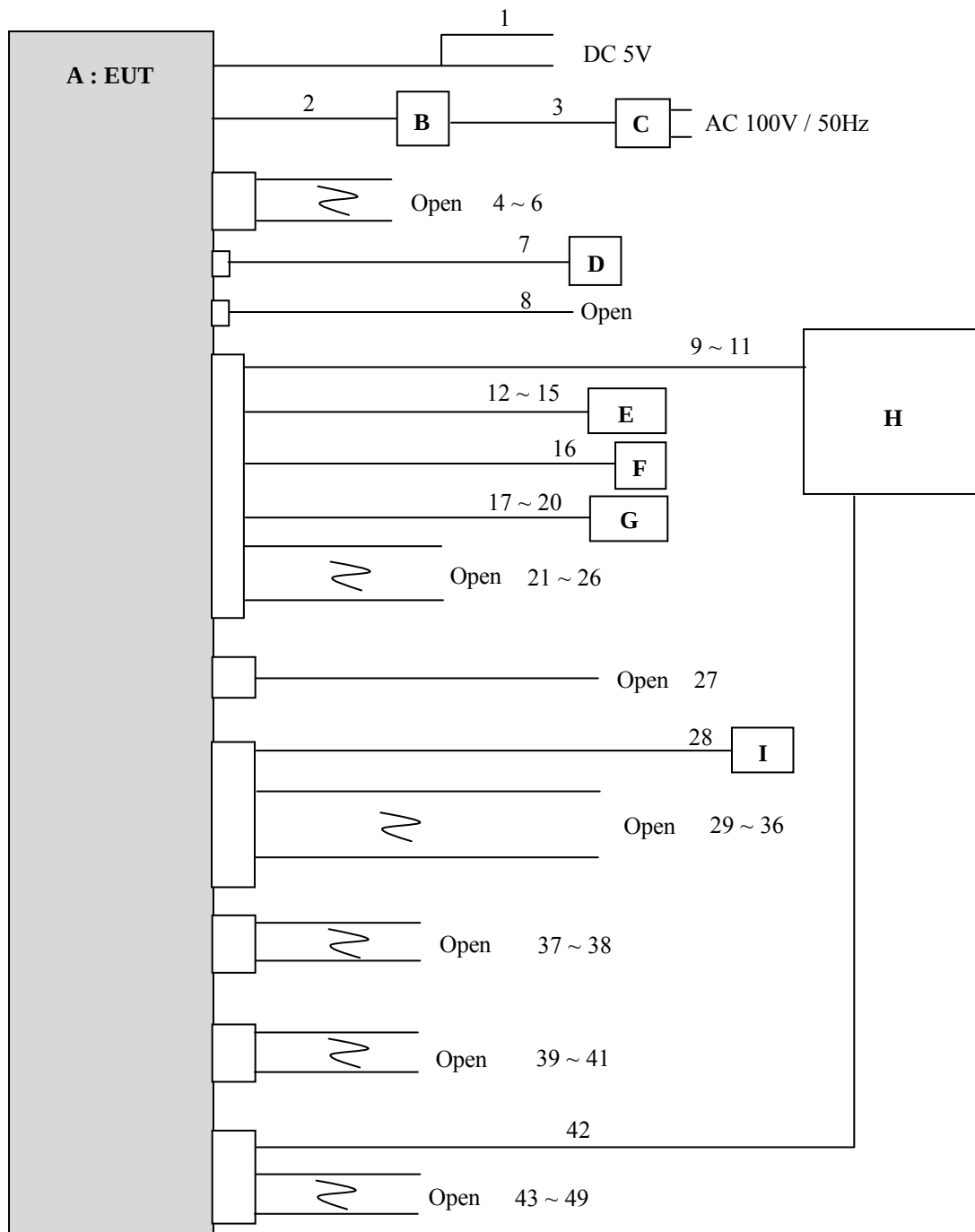
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4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

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Description of EUT and Auxiliary equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio	AT1501	No.0001(CV-VS05F2AJ)	Panasonic	EUT
B	Test Jig	PCA-A-036702	48554	Panasonic	-
C	AC Adapter	GF18-US0530T	-	GO FORWARD ENTERPRISE CORP	-
D	GPS Antenna	-	07330028	Panasonic	-
E	AUX	86190-12020	-	Panasonic	-
F	Mic	-	No.100	Panasonic	-
G	Remote Controller	1-36-I-i	No.56	Panasonic	-
H	JIG Terminal Box	-	-	Panasonic	-
I	Rear Camera	GP-KD3302RS	7XS00016	Panasonic	-

List of cables used

No.	Item	Length(m)	Shield (Cable)	Shield (Connector)	Remarks
1	DC	2.3	Unshielded	Unshielded	-
2	Signal	0.5	Shielded	Shielded	-
3	DC	1.6	Unshielded	Unshielded	-
4	Signal (3pin Connector)	0.25	Shielded	Shielded	-
5	Signal (3pin Connector)	0.25	Shielded	Shielded	-
6	Signal (3pin Connector)	0.25	Unshielded	Unshielded	-
7	GPS	3.5	Shielded	Shielded	-
8	USB	2.0	Shielded	Shielded	-
9	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
10	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
11	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
12	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
13	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
14	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
15	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
16	Signal (28pin Connector)	4.4	Unshielded	Unshielded	-
17	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
18	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
19	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
20	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
21	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
22	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
23	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
24	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
25	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
26	Signal (28pin Connector)	2.0	Unshielded	Unshielded	-
27	Signal (12pin Connector)	6.2	Unshielded	Unshielded	-
28	Signal (24pin Connector)	2.2	Unshielded	Unshielded	-
29	Signal (24pin Connector)	2.0	Unshielded	Unshielded	-
30	Signal (24pin Connector)	2.0	Unshielded	Unshielded	-

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List of cables used

No.	Item	Length(m)	Shield (Cable)	Shield (Connector)	Remarks
31	Signal (24pin Connector)	2.0	Unshielded	Unshielded	-
32	Signal (24pin Connector)	2.0	Unshielded	Unshielded	-
33	Signal (24pin Connector)	2.0	Unshielded	Unshielded	-
34	Signal (24pin Connector)	2.0	Unshielded	Unshielded	-
35	Signal (24pin Connector)	2.0	Unshielded	Unshielded	-
36	Signal (24pin Connector)	2.0	Unshielded	Unshielded	-
37	Signal (8pin Connector)	1.0	Unshielded	Unshielded	-
38	Signal (8pin Connector)	1.0	Unshielded	Unshielded	-
39	Signal (6pin Connector)	1.7	Unshielded	Unshielded	-
40	Signal (6pin Connector)	1.7	Unshielded	Unshielded	-
41	Signal (6pin Connector)	1.7	Unshielded	Unshielded	-
42	Signal (10pin Connector)	1.7	Unshielded	Unshielded	-
43	Signal (10pin Connector)	1.7	Unshielded	Unshielded	-
44	Signal (10pin Connector)	1.7	Unshielded	Unshielded	-
45	Signal (10pin Connector)	1.7	Unshielded	Unshielded	-
46	Signal (10pin Connector)	1.7	Unshielded	Unshielded	-
47	Signal (10pin Connector)	1.7	Unshielded	Unshielded	-
48	Signal (10pin Connector)	1.7	Unshielded	Unshielded	-
49	Signal (10pin Connector)	1.7	Unshielded	Unshielded	-

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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 1.

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 1.

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 1.

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 1.

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 1.

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SECTION 10: Radiated emission

10.1 Operating environment

Test room : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

10.2 Test configuration

EUT was placed on a platform of nominal size, 1.0m by 2.0m (30MHz-1GHz) or 1.0m by 1.5m (1-25GHz), raised 0.8m (30MHz-15GHz) or 1.0m (15-25GHz) above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.

Photographs of the set up are shown in APPENDIX 3.

10.3 Test conditions

Frequency range : 30MHz - 25GHz
EUT position : Table top

10.4 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.

Frequency	30 - 1000MHz	1 - 25GHz	20dBc
Detection Type	Quasi-Peak	Peak	* Average
IF Bandwidth	120kHz	RBW:1MHz	RBW:1MHz
		VBW:3MHz	VBW:10Hz
			Peak
			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 angle of 0 to 29 deg. based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Test item	Carrier *1)	Spurious emission (Below 1GHz)	Spurious emission (Above 1GHz)
Horizontal		0 deg.	0 deg.	0 deg.
Vertical		0 deg.	0 deg.	0 deg.

*1) with spurious emissions near carrier frequency

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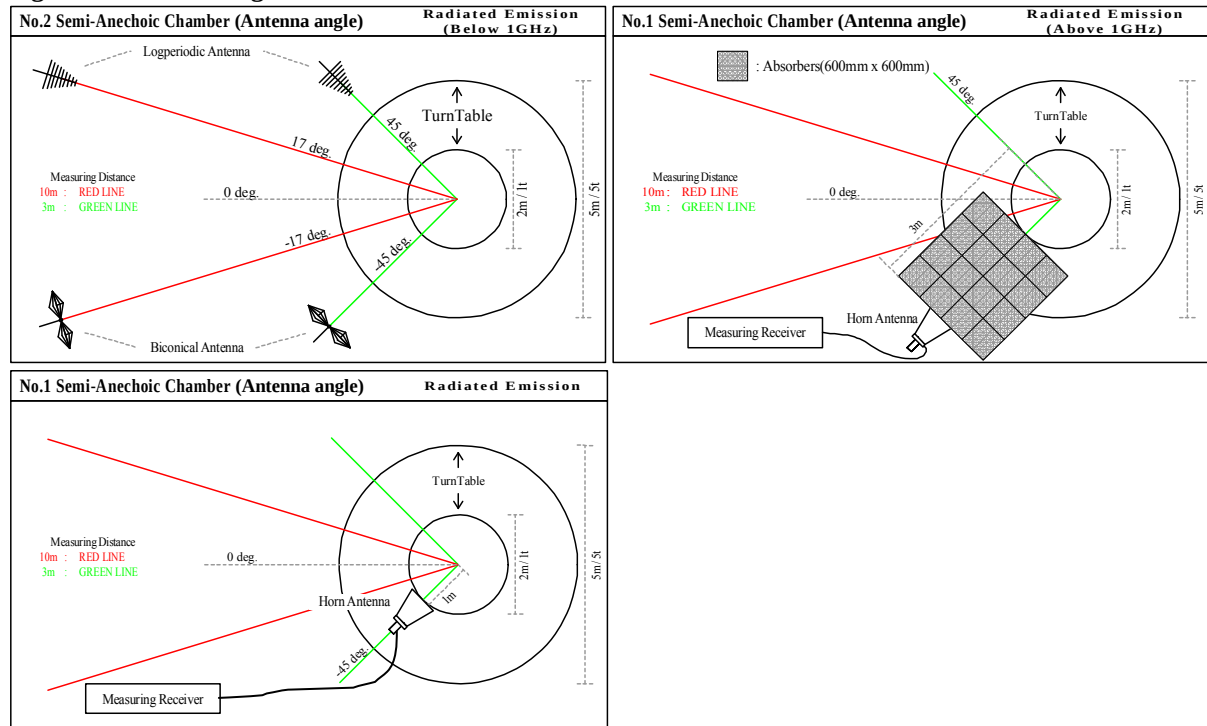
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Figure 1. Antenna angle



10.5 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.

10.6 Results

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

Refer to APPENDIX 1.

SECTION 11: Spurious emissions (Antenna port conducted)

Test procedure

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port. 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 1

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Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

20dB bandwidth and Carrier frequency separation
Number of hopping frequency
Dwell time
Maximum peak output power
Radiated emission
Spurious emission (Antenna port conducted)
Occupied bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission

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APPENDIX 1: Data of Radio tests

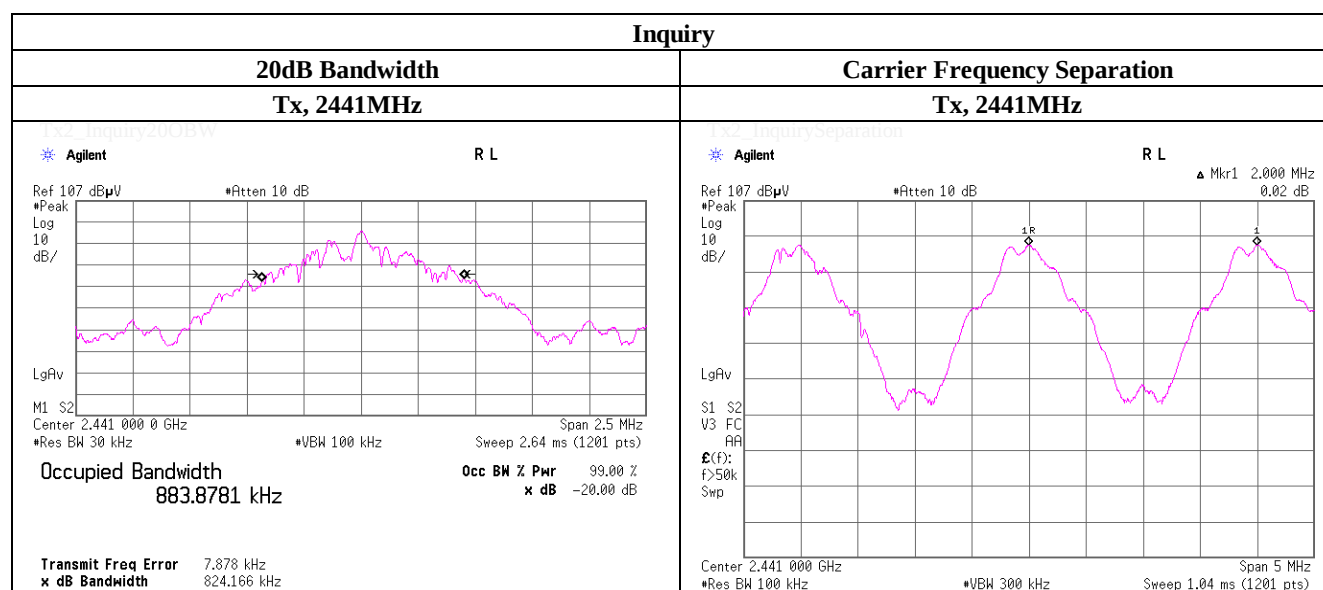
20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	March 1, 2013	
Temperature / Humidity	22 deg.C , 31 %RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.956	1.000	>= 0.637
DH5	2441.0	0.947	1.000	>= 0.631
DH5	2480.0	0.951	1.000	>= 0.634
Inquiry	2441.0	0.824	2.000	>= 0.549

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

No limit applies to 20dB Bandwidth.



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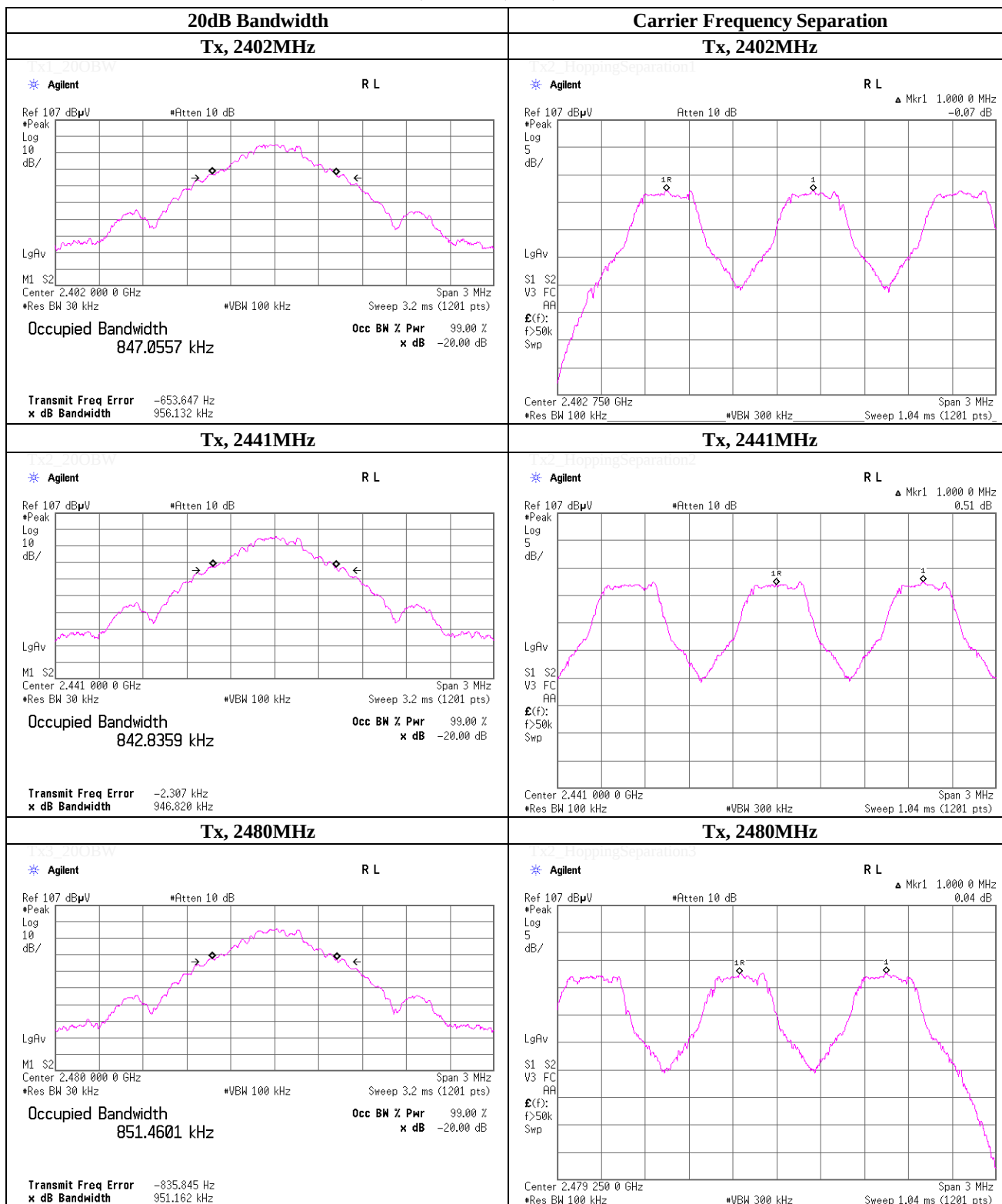
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9



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20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date March 1, 2013
Temperature / Humidity 22 deg.C , 31 %RH
Engineer Tatsuya Arai
Mode Tx, Bluetooth, EDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.318	1.000	>= 0.879
3-DH5	2441.0	1.331	1.000	>= 0.888
3-DH5	2480.0	1.317	1.000	>= 0.878

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

No limit applies to 20dB Bandwidth.

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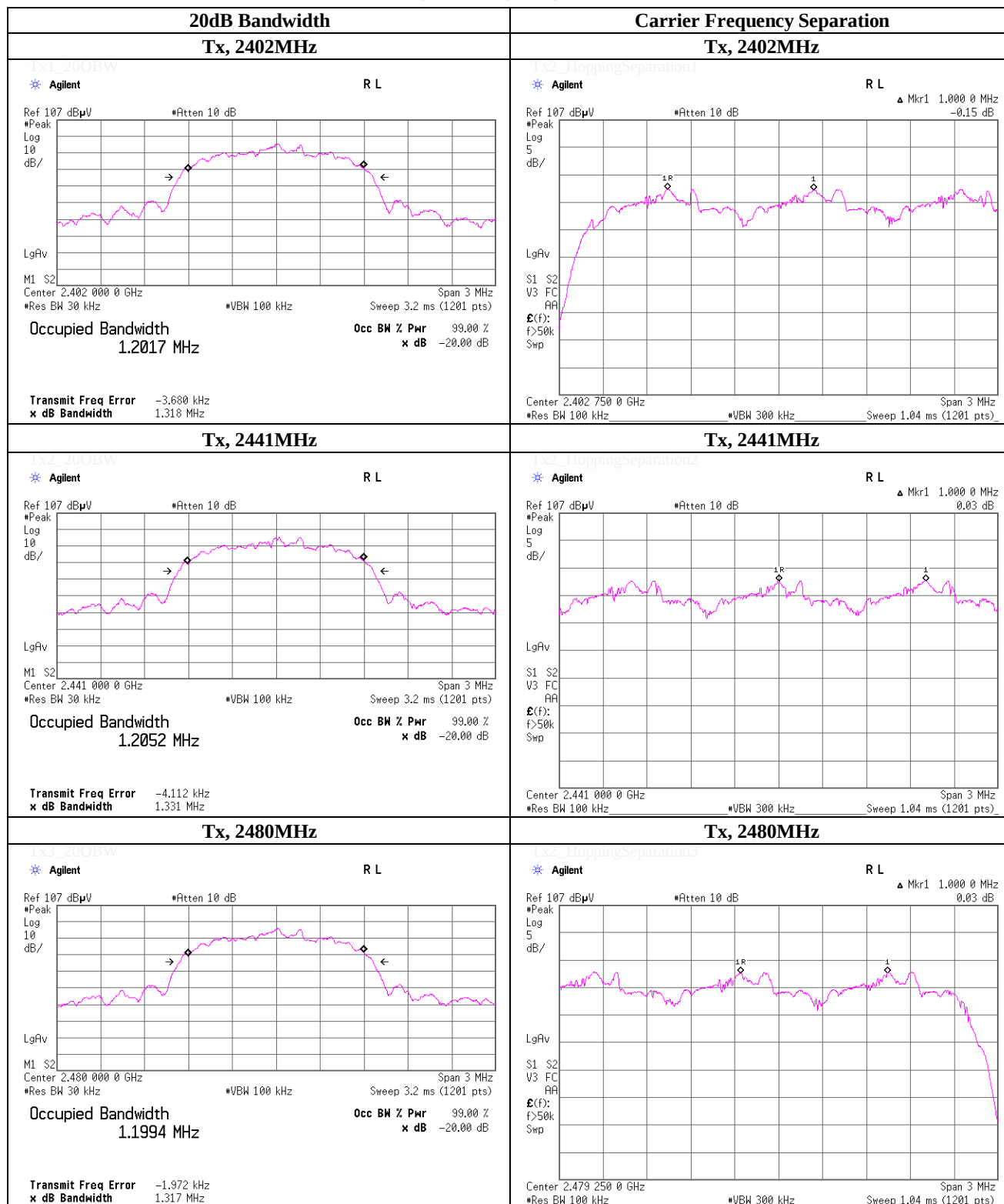
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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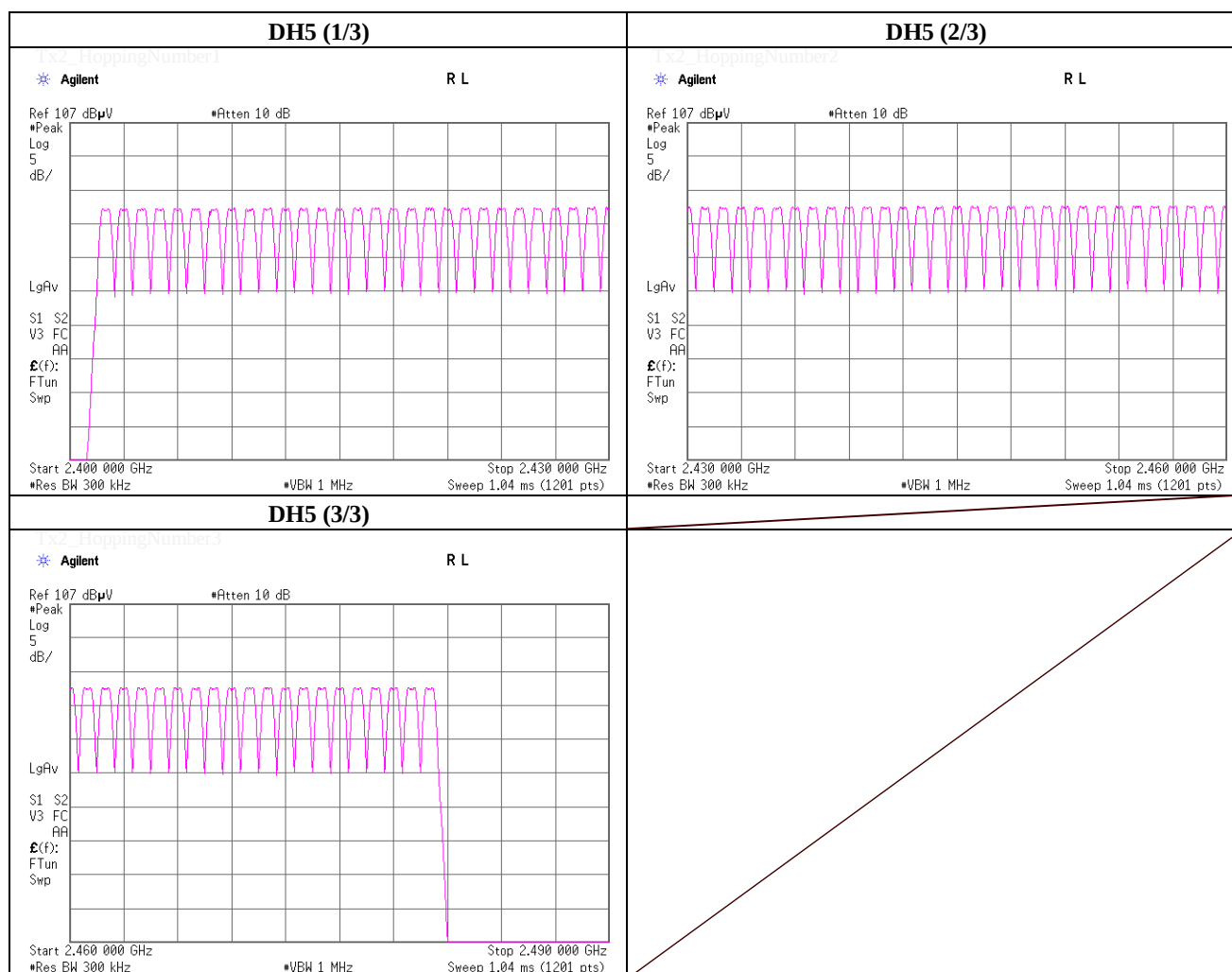
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	March 1, 2013	
Temperature / Humidity	22 deg.C , 31 %RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Number of Channel [times]	Limit [times]
DH5	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.



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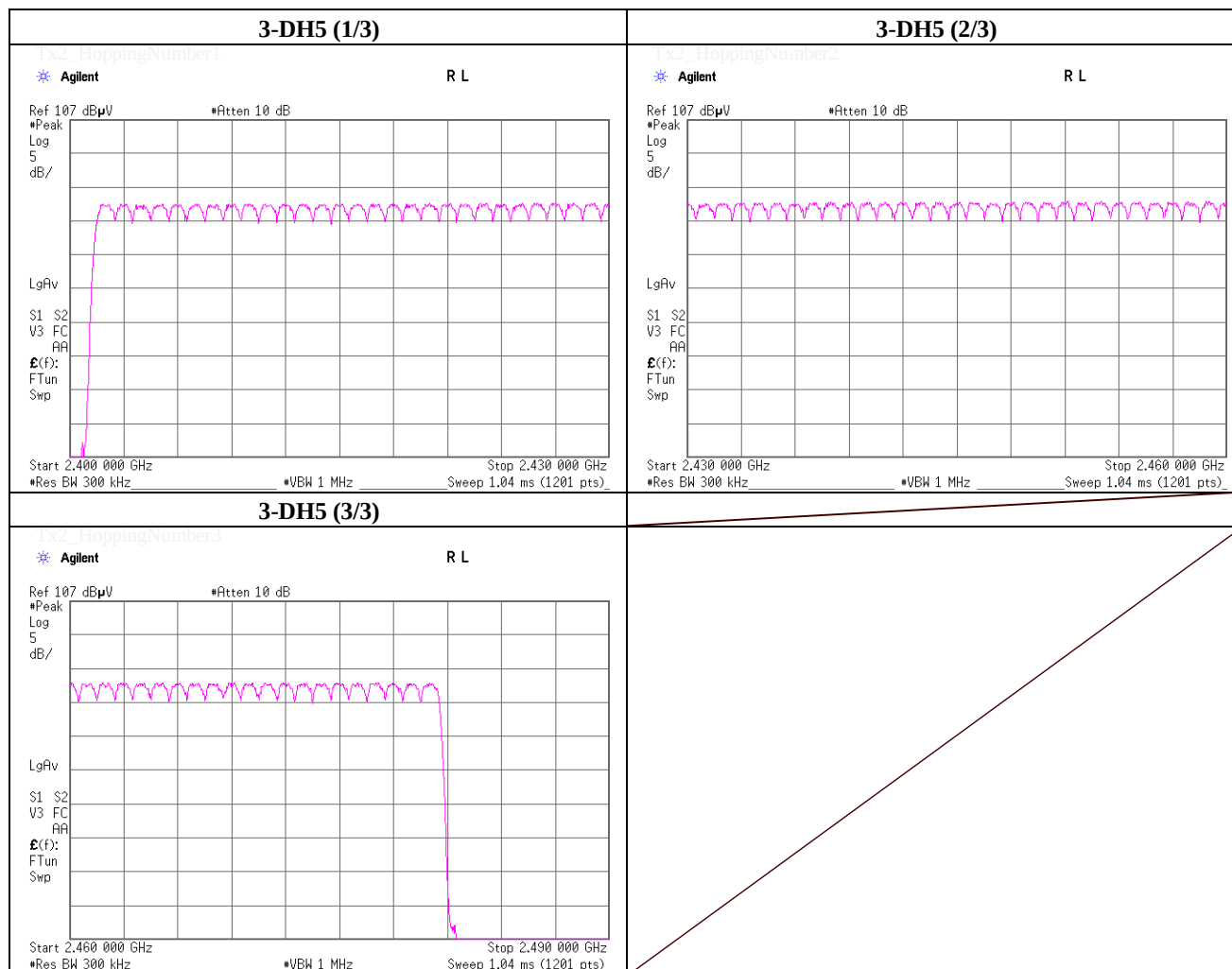
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 1, 2013	
Temperature / Humidity	22 deg.C , 31 %RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth, EDR, PRBS9	

Mode	Number of Channel [times]	Limit [times]
3-DH5	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.



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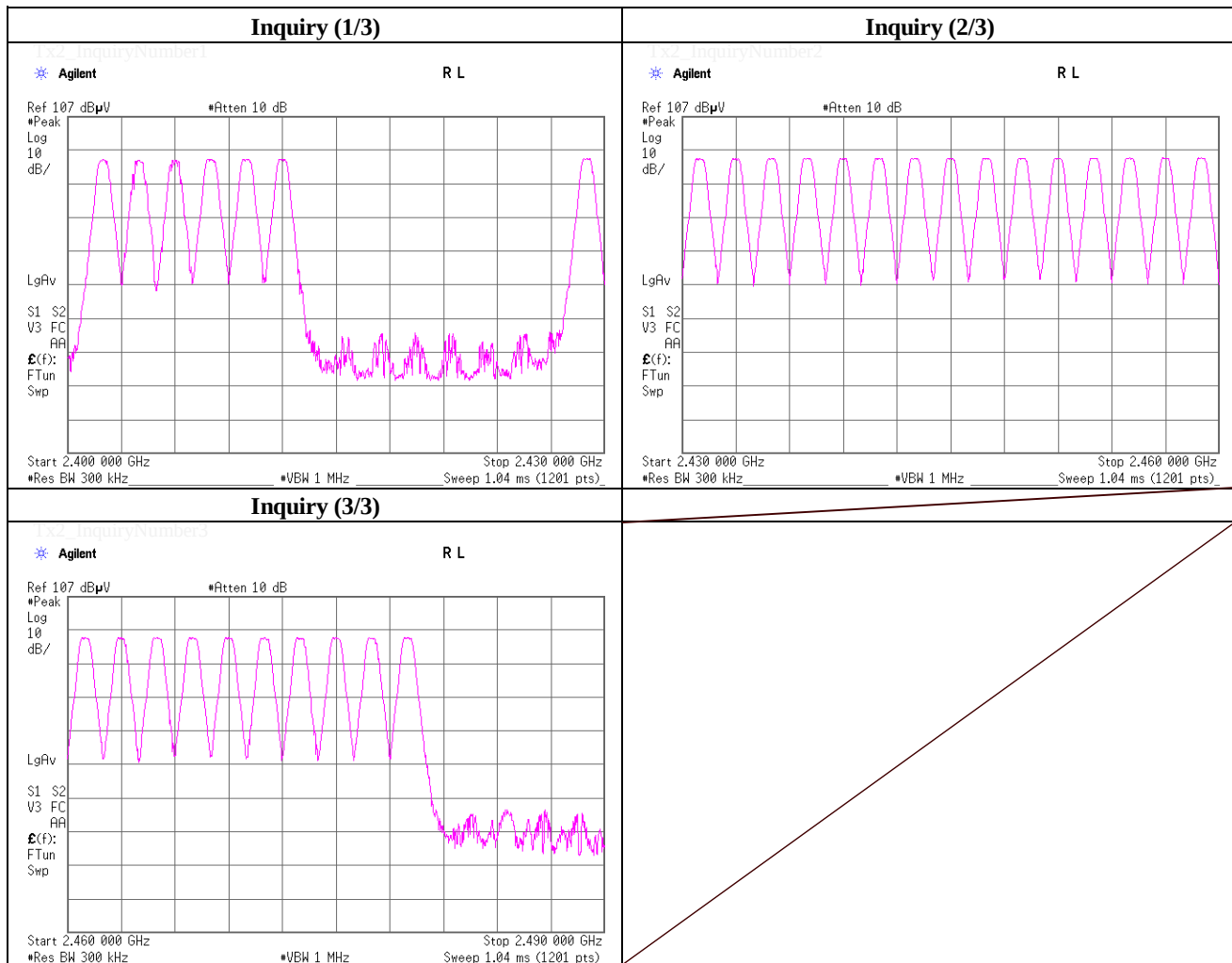
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Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	March 1, 2013	
Temperature / Humidity	22 deg.C , 31 %RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth, Inquiry	

Mode	Number of Channel [times]	Limit [times]
Inquiry	32	>= 15



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Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	March 1, 2013	
Temperature / Humidity	22 deg.C , 31 %RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth, BDR, PRBS9	

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	49.8	/ 5.0 sec.	x 31.6 sec. =	315 times	0.387	122
DH3	25.4	/ 5.0 sec.	x 31.6 sec. =	161 times	1.643	265
DH5	19.0	/ 5.0 sec.	x 31.6 sec. =	121 times	2.891	350
Inquiry	100.0	/ 1.0 sec.	x 12.8 sec. =	1280 times	0.093	119

Sample Calculation

Result = Number of transmission x Length of transmission time

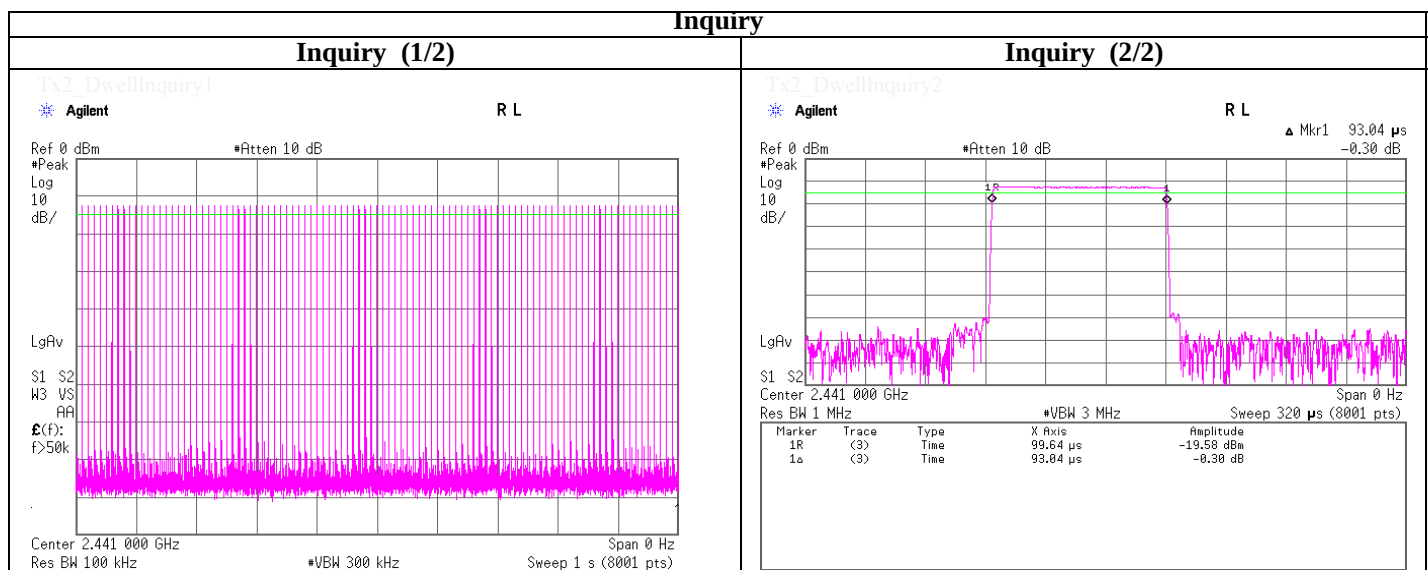
*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	49	50	51	50	49.8
DH3	27	27	25	26	22	25.4
DH5	18	15	18	21	23	19.0
Inquiry	100	-	-	-	-	100.0

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

* This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in $N \times 0.4s$, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless of packet size (DH1, DH3 or DH5). This is confirmed in the test report for $N=79$.



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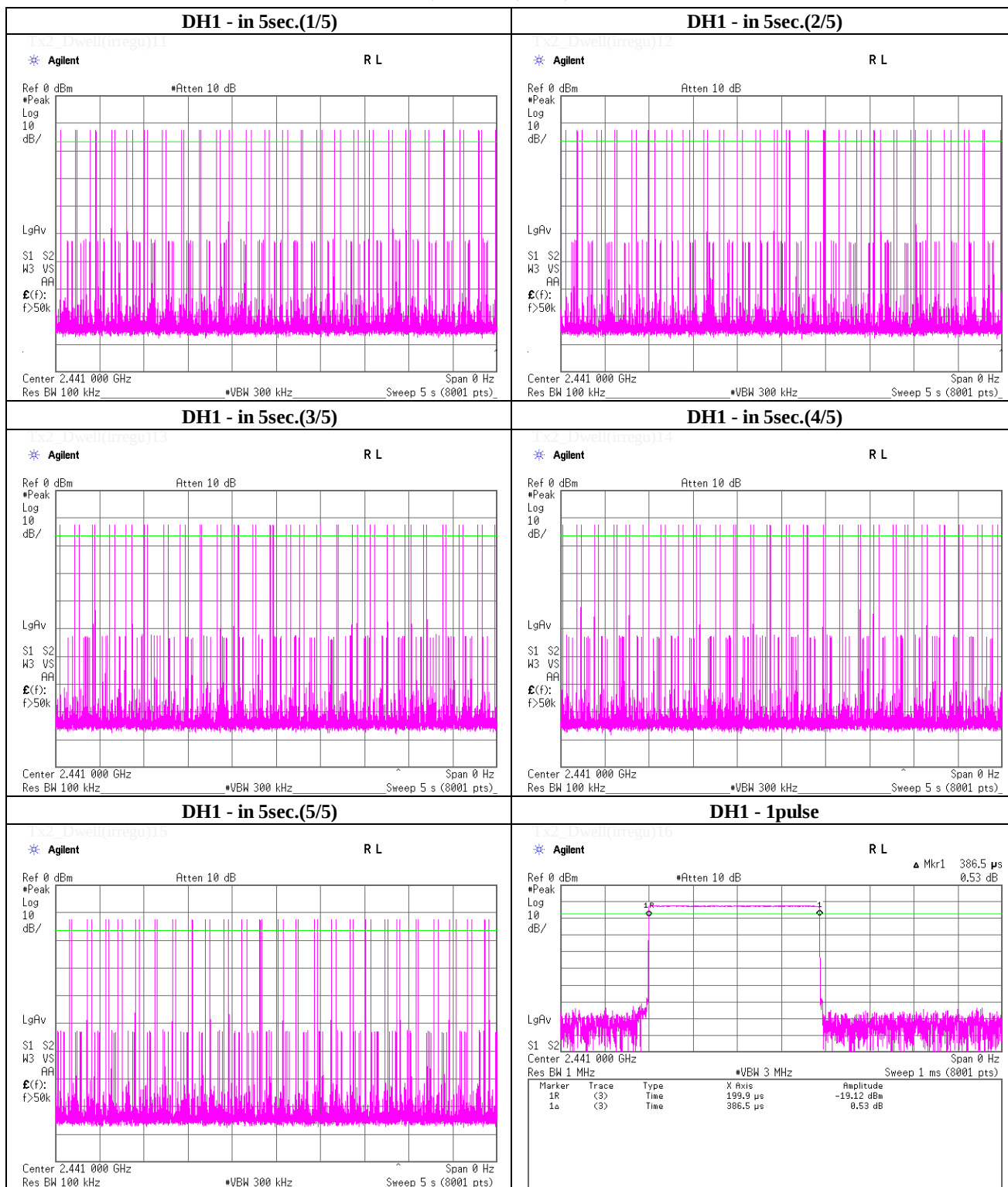
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Dwell time

Tx, Bluetooth, BDR, PRBS9



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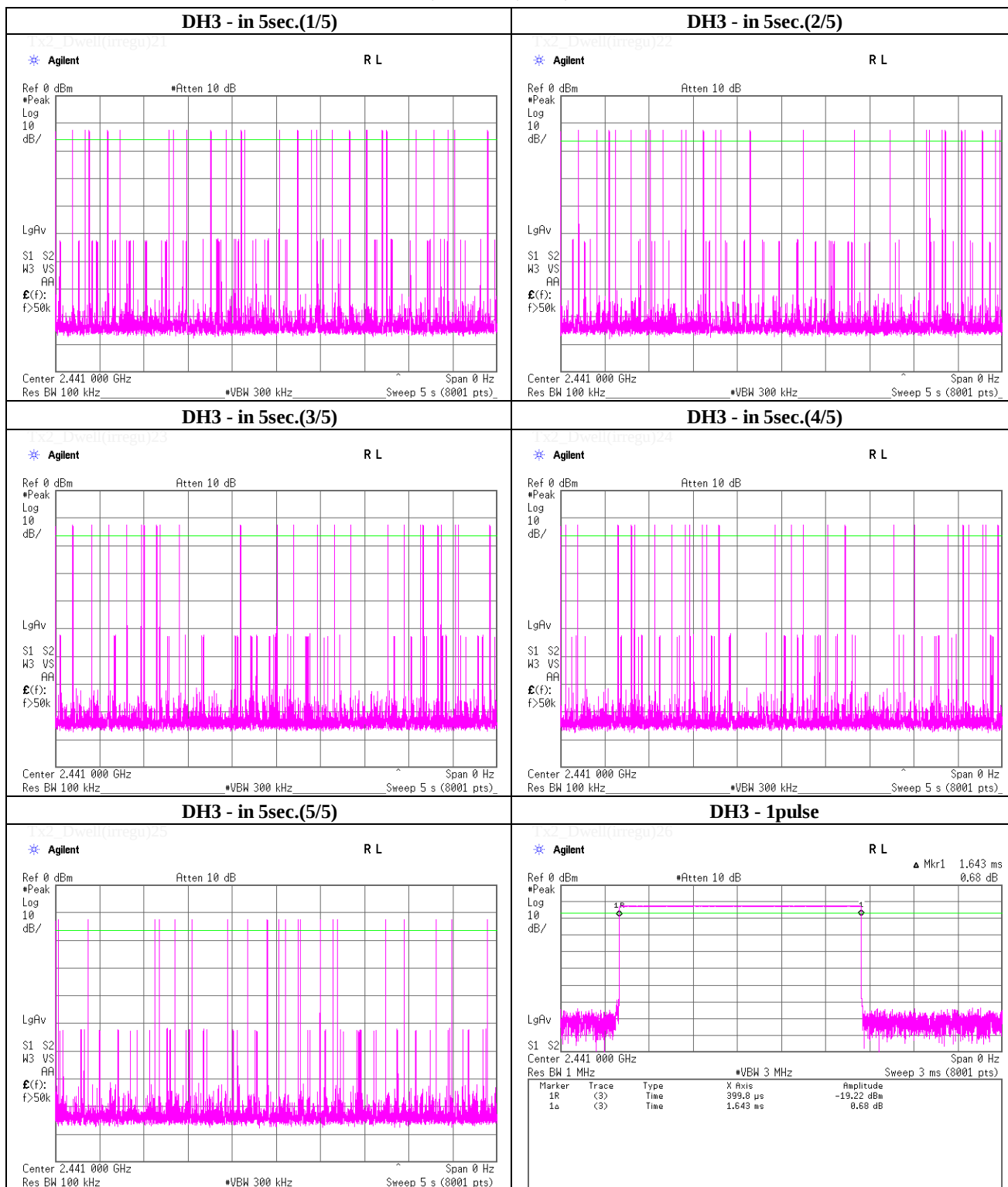
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Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, PRBS9



UL Japan, Inc.

Shonan EMC Lab.

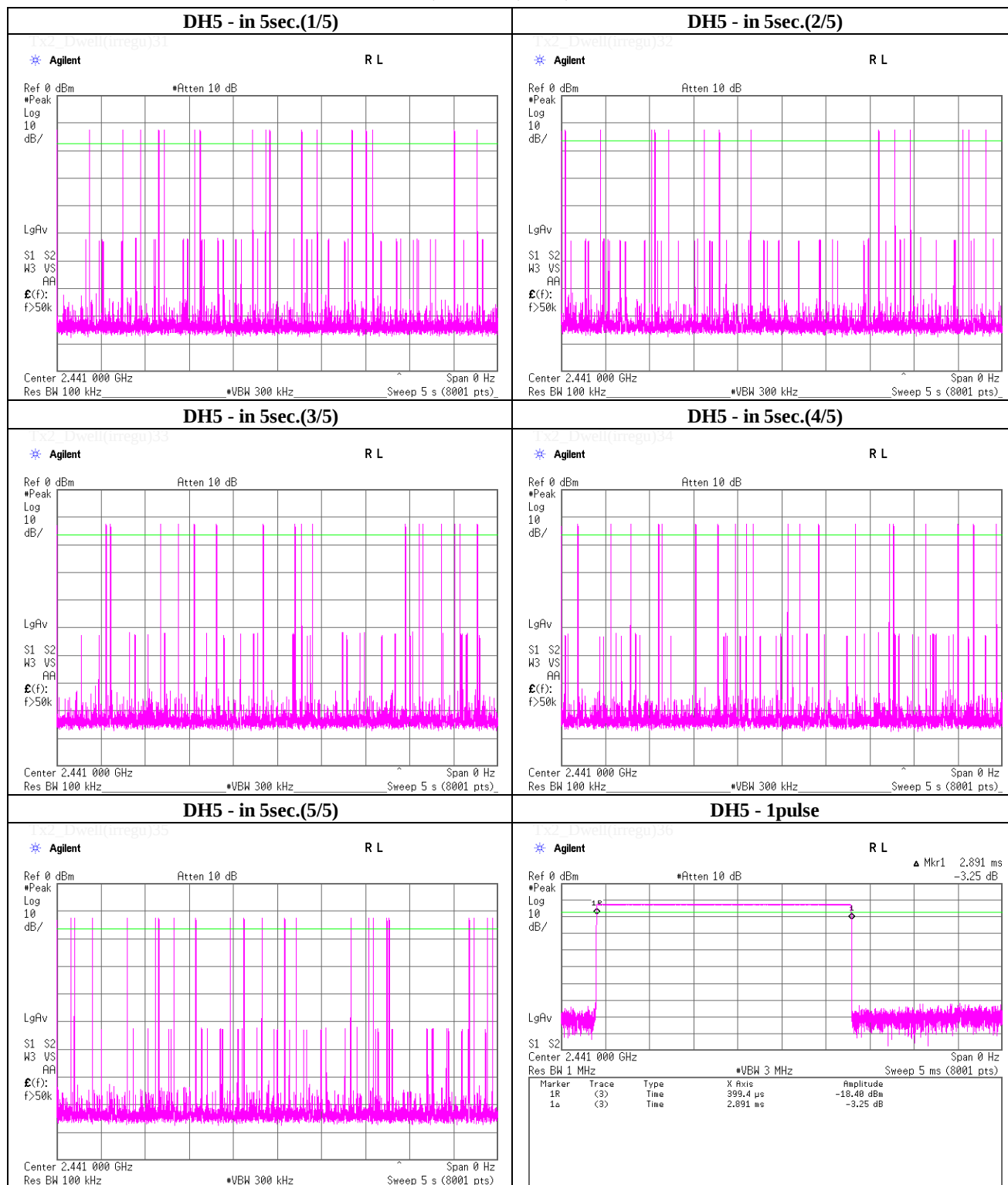
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Dwell time

Tx, Bluetooth, BDR, PRBS9



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Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date March 1, 2013
 Temperature / Humidity 22 deg.C , 31 %RH
 Engineer Tatsuya Arai
 Mode Tx, Bluetooth, EDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second			Length of transmission time [msec]	Result [msec]	Limit [msec]
3-DH1	50.0	/ 5.0 sec.	x 31.6 sec. = 316 times	0.388	122	400
3-DH3	25.2	/ 5.0 sec.	x 31.6 sec. = 160 times	1.636	262	400
3-DH5	19.2	/ 5.0 sec.	x 31.6 sec. = 122 times	2.884	352	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	
3-DH1	50	50	50	50	50	50.0
3-DH3	27	26	26	23	24	25.2
3-DH5	17	22	18	20	19	19.2

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 (3-DH1, 3-DH3 or 3-DH5). This is confirmed in the test report for $N=79$.

UL Japan, Inc.

Shonan EMC Lab.

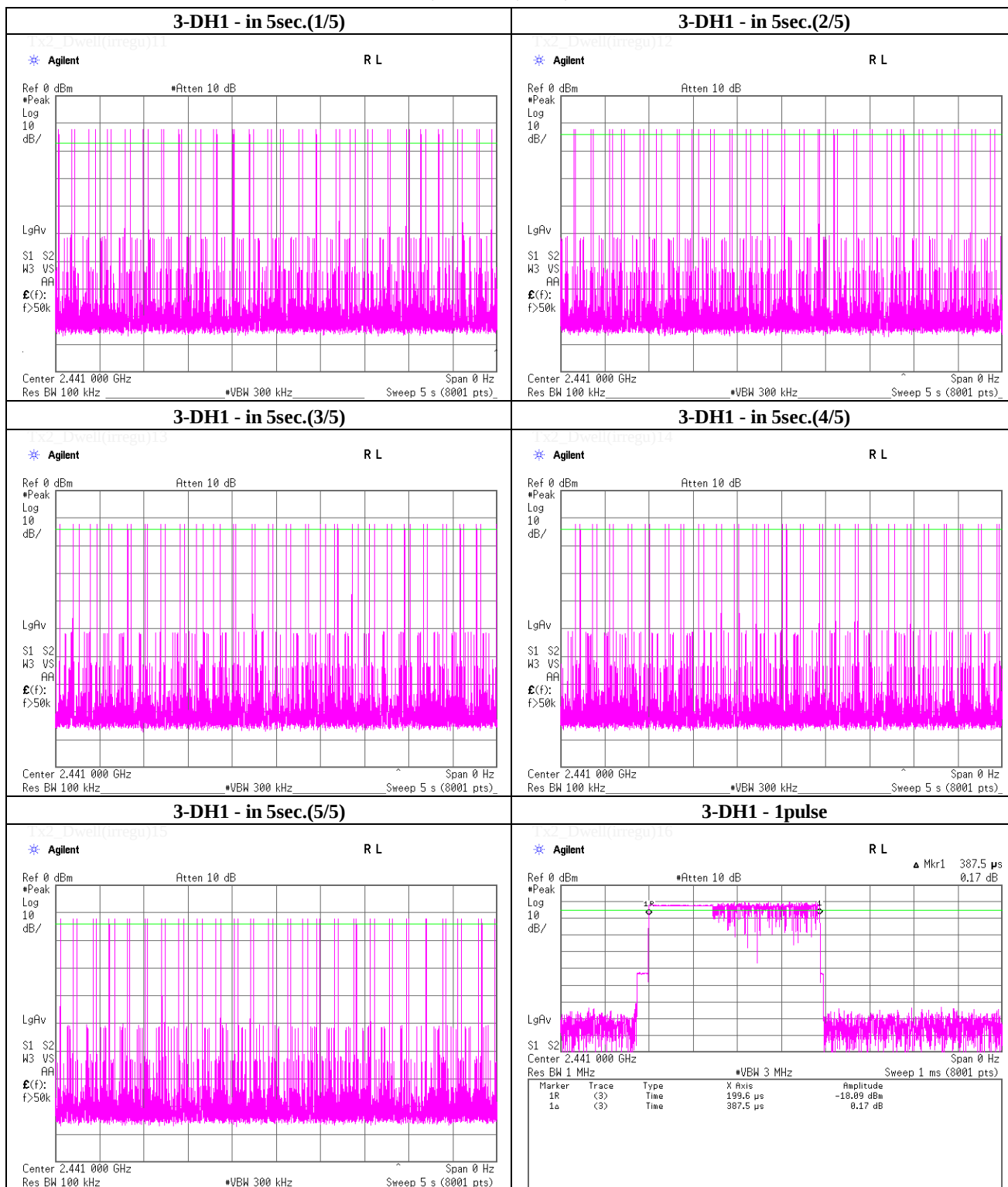
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Dwell time

Tx, Bluetooth, EDR, PRBS9



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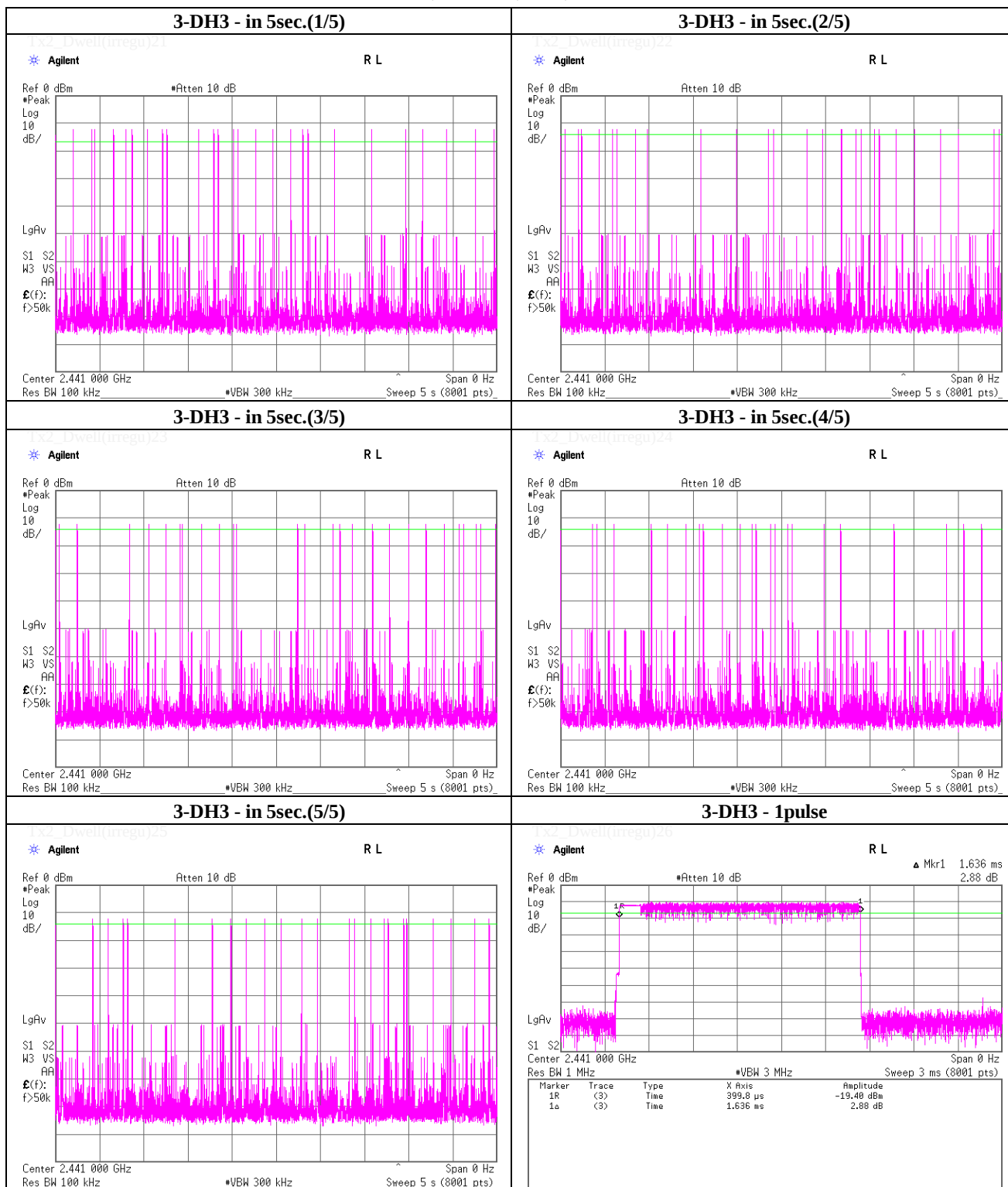
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Dwell time

Tx, Bluetooth, EDR, PRBS9



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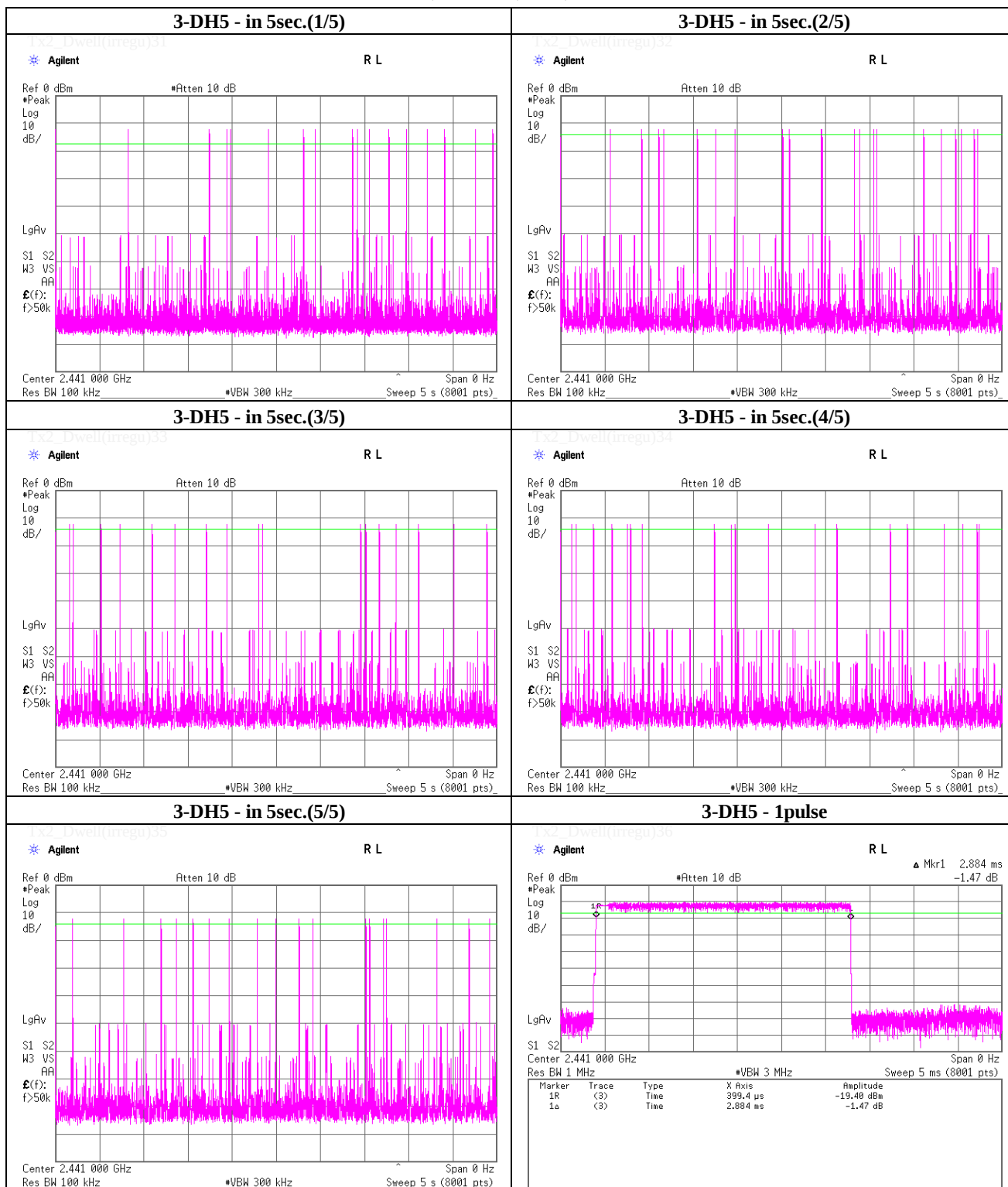
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Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, PRBS9



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Maximum Peak Conducted Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
 Date March 1, 2013
 Temperature / Humidity 22 deg.C , 31 %RH
 Engineer Tatsuya Arai
 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	-12.27	1.48	10.00	-0.79	0.83	20.97	125	21.76
DH5	2441.0	-12.05	1.49	10.00	-0.56	0.88	20.97	125	21.53
DH5	2480.0	-11.94	1.50	10.00	-0.44	0.90	20.97	125	21.41
2-DH5	2402.0	-10.15	1.48	10.00	1.33	1.36	20.97	125	19.64
2-DH5	2441.0	-9.98	1.49	10.00	1.51	1.42	20.97	125	19.46
2-DH5	2480.0	-9.89	1.50	10.00	1.61	1.45	20.97	125	19.36
3-DH5	2402.0	-9.78	1.48	10.00	1.70	1.48	20.97	125	19.27
3-DH5	2441.0	-9.61	1.49	10.00	1.88	1.54	20.97	125	19.09
3-DH5	2480.0	-9.52	1.50	10.00	1.98	1.58	20.97	125	18.99

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

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Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	August 21, 2014	August 25, 2014
Temperature / Humidity	23 deg.C, 68 %RH	24 deg.C, 55 %RH
Engineer	Shinichi Takano	Makoto Hosaka
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.	182.005	QP	32.7	16.1	8.6	31.8	25.6	43.5	17.9	181	227	
Hori.	442.007	QP	25.5	16.7	7.4	31.7	17.9	46.0	28.1	169	172	
Hori.	2390.000	PK	45.6	28.1	14.6	40.9	47.4	73.9	26.5	100	321	
Hori.	4804.000	PK	46.0	32.2	7.0	41.7	43.5	73.9	30.4	100	240	
Hori.	7206.000	PK	50.6	37.1	8.4	41.5	54.6	73.9	19.3	100	15	
Hori.	9608.000	PK	46.4	39.1	9.3	40.4	54.4	73.9	19.5	100	15	
Hori.	12010.000	PK	45.0	40.3	10.3	39.7	55.9	73.9	18.0	100	0	
Hori.	2390.000	AV	34.4	28.1	14.6	40.9	36.2	53.9	17.7	100	321	
Vert.	78.008	QP	39.1	6.4	7.9	31.9	21.5	40.0	18.5	100	145	
Vert.	130.001	QP	28.8	13.7	8.1	31.8	18.8	43.5	24.7	100	110	
Vert.	2390.000	PK	46.0	28.1	14.6	40.9	47.8	73.9	26.1	100	277	
Vert.	4804.000	PK	47.0	32.2	7.0	41.7	44.5	73.9	29.4	100	154	
Vert.	7206.000	PK	51.1	37.1	8.4	41.5	55.1	73.9	18.8	100	96	
Vert.	9608.000	PK	46.4	39.1	9.3	40.4	54.4	73.9	19.5	119	95	
Vert.	12010.000	PK	44.4	40.3	10.3	39.7	55.3	73.9	18.6	100	0	
Vert.	2390.000	AV	33.7	28.1	14.6	40.9	35.5	53.9	18.4	100	277	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4804.000	AV	35.1	32.2	7.0	41.7	-24.8	7.9	53.9	46.1	
Hori.	7206.000	AV	40.7	37.1	8.4	41.5	-24.8	20.0	53.9	33.9	
Hori.	9608.000	AV	35.6	39.1	9.3	40.4	-24.8	18.9	53.9	35.0	
Hori.	12010.000	AV	33.3	40.3	10.3	39.7	-24.8	19.5	53.9	34.4	
Vert.	4804.000	AV	35.8	32.2	7.0	41.7	-24.8	8.6	53.9	45.3	
Vert.	7206.000	AV	42.8	37.1	8.4	41.5	-24.8	22.1	53.9	31.9	
Vert.	9608.000	AV	35.2	39.1	9.3	40.4	-24.8	18.5	53.9	35.4	
Vert.	12010.000	AV	33.4	40.3	10.3	39.7	-24.8	19.6	53.9	34.4	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell(time)factor

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.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	89.0	28.1	14.6	40.9	90.8	-	-	
Hori.	2400.000	PK	37.7	28.1	14.6	40.9	39.5	70.8	31.3	
Vert.	2402.000	PK	87.3	28.1	14.6	40.9	89.1	-	-	
Vert.	2400.000	PK	37.8	28.1	14.6	40.9	39.6	69.1	29.5	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

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Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	August 21, 2014	August 25, 2014
Temperature / Humidity	23 deg.C, 68 %RH	24 deg.C, 55 %RH
Engineer	Shinichi Takano	Makoto Hosaka
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.	181.997	QP	32.8	16.1	8.6	31.8	25.7	43.5	17.8	183	229	
Hori.	441.957	QP	25.2	16.7	7.4	31.7	17.6	46.0	28.4	166	173	
Hori.	4882.000	PK	46.7	32.6	7.0	41.6	44.7	73.9	29.2	100	246	
Hori.	7323.000	PK	49.9	37.3	8.3	41.5	54.0	73.9	19.9	104	15	
Hori.	9764.000	PK	45.2	39.0	9.5	40.4	53.3	73.9	20.6	100	104	
Hori.	12205.000	PK	45.4	40.4	10.4	39.7	56.5	73.9	17.4	100	0	
Vert.	77.816	QP	39.1	6.4	7.9	31.9	21.5	40.0	18.5	100	153	
Vert.	129.908	QP	29.0	13.7	8.1	31.8	19.0	43.5	24.5	100	112	
Vert.	4882.000	PK	47.3	32.6	7.0	41.6	45.3	73.9	28.6	115	165	
Vert.	7323.000	PK	52.0	37.3	8.3	41.5	56.1	73.9	17.8	100	165	
Vert.	9764.000	PK	46.4	39.0	9.5	40.4	54.5	73.9	19.4	125	96	
Vert.	12205.000	PK	44.4	40.4	10.4	39.7	55.5	73.9	18.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	36.7	32.6	7.0	41.6	-24.8	10.0	53.9	44.0	
Hori.	7323.000	AV	40.3	37.3	8.3	41.5	-24.8	19.7	53.9	34.3	
Hori.	9764.000	AV	34.2	39.0	9.5	40.4	-24.8	17.6	53.9	36.4	
Hori.	12205.000	AV	32.6	40.4	10.4	39.7	-24.8	19.0	53.9	34.9	
Vert.	4882.000	AV	37.5	32.6	7.0	41.6	-24.8	10.8	53.9	43.2	
Vert.	7323.000	AV	43.7	37.3	8.3	41.5	-24.8	23.1	53.9	30.9	
Vert.	9764.000	AV	35.0	39.0	9.5	40.4	-24.8	18.4	53.9	35.5	
Vert.	12205.000	AV	32.6	40.4	10.4	39.7	-24.8	19.0	53.9	34.9	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell(time)factor

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

Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	August 21, 2014	August 25, 2014
Temperature / Humidity	23 deg.C, 68 %RH	24 deg.C, 55 %RH
Engineer	Shinichi Takano	Makoto Hosaka
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.	182.011	QP	32.5	16.1	8.6	31.8	25.4	43.5	18.1	188	233	
Hori.	441.985	QP	25.3	16.7	7.4	31.7	17.7	46.0	28.3	166	177	
Hori.	2483.500	PK	44.9	28.4	14.7	40.9	47.1	73.9	26.8	100	32	
Hori.	4960.000	PK	49.9	33.0	7.1	41.5	48.5	73.9	25.4	100	252	
Hori.	7440.000	PK	50.2	37.4	8.4	41.4	54.6	73.9	19.3	100	358	
Hori.	9920.000	PK	46.2	38.9	9.6	40.4	54.3	73.9	19.6	100	246	
Hori.	12400.000	PK	45.6	40.4	10.5	39.7	56.8	73.9	17.1	100	0	
Hori.	2483.500	AV	34.0	28.4	14.7	40.9	36.2	53.9	17.7	100	32	
Vert.	77.760	QP	39.0	6.4	7.9	31.9	21.4	40.0	18.6	100	140	
Vert.	129.900	QP	29.0	13.7	8.1	31.8	19.0	43.5	24.5	100	109	
Vert.	2483.500	PK	45.7	28.4	14.7	40.9	47.9	73.9	26.0	240	288	
Vert.	4960.000	PK	50.2	33.0	7.1	41.5	48.8	73.9	25.1	131	162	
Vert.	7440.000	PK	54.7	37.4	8.4	41.4	59.1	73.9	14.8	100	0	
Vert.	9920.000	PK	46.9	38.9	9.6	40.4	55.0	73.9	18.9	112	275	
Vert.	12400.000	PK	45.5	40.4	10.5	39.7	56.7	73.9	17.2	100	0	
Vert.	2483.500	AV	33.9	28.4	14.7	40.9	36.1	53.9	17.8	240	288	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	AV	40.2	33.0	7.1	41.5	-24.8	14.1	53.9	39.8	
Hori.	7440.000	AV	40.3	37.4	8.4	41.4	-24.8	20.0	53.9	33.9	
Hori.	9920.000	AV	34.5	38.9	9.6	40.4	-24.8	17.9	53.9	36.0	
Hori.	12400.000	AV	33.1	40.4	10.5	39.7	-24.8	19.6	53.9	34.4	
Vert.	4960.000	AV	42.1	33.0	7.1	41.5	-24.8	16.0	53.9	38.0	
Vert.	7440.000	AV	47.1	37.4	8.4	41.4	-24.8	26.8	53.9	27.2	
Vert.	9920.000	AV	35.7	38.9	9.6	40.4	-24.8	19.1	53.9	34.9	
Vert.	12400.000	AV	33.2	40.4	10.5	39.7	-24.8	19.7	53.9	34.3	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell(time)factor

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

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Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	August 21, 2014	August 25, 2014
Temperature / Humidity	23 deg.C, 68 %RH	24 deg.C, 55 %RH
Engineer	Shinichi Takano	Makoto Hosaka
Mode	Tx, 2402 MHz	
	Tx, Bluetooth, EDR, 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.	182.011	QP	32.8	16.1	8.6	31.8	25.7	43.5	17.8	180	220	
Hori.	442.062	QP	25.3	16.7	7.4	31.7	17.7	46.0	28.3	165	162	
Hori.	2362.214	PK	48.1	28.0	14.5	40.9	49.7	73.9	24.2	100	0	
Hori.	2385.287	PK	48.3	28.1	14.6	40.9	50.1	73.9	23.8	100	0	
Hori.	2390.000	PK	45.6	28.1	14.6	40.9	47.4	73.9	26.5	100	323	
Hori.	4804.000	PK	47.3	32.2	7.0	41.7	44.8	73.9	29.1	100	111	
Hori.	7206.000	PK	48.8	37.1	8.4	41.5	52.8	73.9	21.1	100	16	
Hori.	9608.000	PK	49.5	39.1	9.3	40.4	57.5	73.9	16.4	104	14	
Hori.	12010.000	PK	45.7	40.3	10.3	39.7	56.6	73.9	17.3	100	0	
Hori.	2362.214	AV	35.2	28.0	14.5	40.9	36.8	53.9	17.1	100	0	
Hori.	2385.287	AV	35.5	28.1	14.6	40.9	37.3	53.9	16.6	100	0	
Hori.	2390.000	AV	34.1	28.1	14.6	40.9	35.9	53.9	18.0	100	323	
Vert.	77.650	QP	39.0	6.4	7.9	31.9	21.4	40.0	18.6	100	144	
Vert.	129.910	QP	28.9	13.7	8.1	31.8	18.9	43.5	24.6	100	121	
Vert.	2362.235	PK	47.6	28.0	14.5	40.9	49.2	73.9	24.7	100	0	
Vert.	2385.268	PK	48.3	28.1	14.6	40.9	50.1	73.9	23.8	100	0	
Vert.	2390.000	PK	45.7	28.1	14.6	40.9	47.5	73.9	26.4	100	284	
Vert.	4804.000	PK	47.6	32.2	7.0	41.7	45.1	73.9	28.8	100	150	
Vert.	7206.000	PK	50.3	37.1	8.4	41.5	54.3	73.9	19.6	100	97	
Vert.	9608.000	PK	49.3	39.1	9.3	40.4	57.3	73.9	16.6	173	275	
Vert.	12010.000	PK	45.0	40.3	10.3	39.7	55.9	73.9	18.0	100	0	
Vert.	2362.235	AV	35.0	28.0	14.5	40.9	36.6	53.9	17.3	100	0	
Vert.	2385.268	AV	35.3	28.1	14.6	40.9	37.1	53.9	16.8	100	0	
Vert.	2390.000	AV	34.0	28.1	14.6	40.9	35.8	53.9	18.1	100	284	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4804.000	AV	36.9	32.2	7.0	41.7	-24.8	9.6	53.9	44.3	
Hori.	7206.000	AV	38.8	37.1	8.4	41.5	-24.8	18.0	53.9	35.9	
Hori.	9608.000	AV	38.2	39.1	9.3	40.4	-24.8	21.4	53.9	32.5	
Hori.	12010.000	AV	33.3	40.3	10.3	39.7	-24.8	19.4	53.9	34.5	
Vert.	4804.000	AV	36.8	32.2	7.0	41.7	-24.8	9.5	53.9	44.4	
Vert.	7206.000	AV	40.0	37.1	8.4	41.5	-24.8	19.2	53.9	34.7	
Vert.	9608.000	AV	37.2	39.1	9.3	40.4	-24.8	20.4	53.9	33.5	
Vert.	12010.000	AV	33.2	40.3	10.3	39.7	-24.8	19.3	53.9	34.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell(time)factor

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.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	87.2	28.1	14.6	40.9	89.0	-	-	
Hori.	2400.000	PK	38.4	28.1	14.6	40.9	40.2	69.0	28.8	
Vert.	2402.000	PK	85.1	28.1	14.6	40.9	86.9	-	-	
Vert.	2400.000	PK	37.6	28.1	14.6	40.9	39.4	66.9	27.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	August 21, 2014	August 25, 2014
Temperature / Humidity	23 deg.C, 68 %RH	24 deg.C, 55 %RH
Engineer	Shinichi Takano	Makoto Hosaka
Mode	Tx, 2441 MHz	
	Tx, Bluetooth, EDR, 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.	182.015	QP	33.0	16.1	8.6	31.8	25.9	43.5	17.6	183	229	
Hori.	441.946	QP	25.6	16.7	7.4	31.7	18.0	46.0	28.0	166	173	
Hori.	4882.000	PK	50.1	32.6	7.0	41.6	48.1	73.9	25.8	100	245	
Hori.	7323.000	PK	49.6	37.3	8.3	41.5	53.7	73.9	20.2	105	15	
Hori.	9764.000	PK	48.0	39.0	9.5	40.4	56.1	73.9	17.8	100	317	
Hori.	12205.000	PK	45.1	40.4	10.4	39.7	56.2	73.9	17.7	100	0	
Vert.	78.058	QP	39.0	6.4	7.9	31.9	21.4	40.0	18.6	100	147	
Vert.	129.889	QP	28.9	13.7	8.1	31.8	18.9	43.5	24.6	100	112	
Vert.	4882.000	PK	50.1	32.6	7.0	41.6	48.1	73.9	25.8	100	171	
Vert.	7323.000	PK	51.5	37.3	8.3	41.5	55.6	73.9	18.3	100	165	
Vert.	9764.000	PK	48.1	39.0	9.5	40.4	56.2	73.9	17.7	100	100	
Vert.	12205.000	PK	44.1	40.4	10.4	39.7	55.2	73.9	18.7	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	39.7	32.6	7.0	41.6	-24.8	12.9	53.9	41.0	
Hori.	7323.000	AV	38.8	37.3	8.3	41.5	-24.8	18.1	53.9	35.8	
Hori.	9764.000	AV	36.1	39.0	9.5	40.4	-24.8	19.4	53.9	34.5	
Hori.	12205.000	AV	32.7	40.4	10.4	39.7	-24.8	19.0	53.9	34.9	
Vert.	4882.000	AV	40.8	32.6	7.0	41.6	-24.8	14.0	53.9	39.9	
Vert.	7323.000	AV	41.8	37.3	8.3	41.5	-24.8	21.1	53.9	32.8	
Vert.	9764.000	AV	36.3	39.0	9.5	40.4	-24.8	19.6	53.9	34.3	
Vert.	12205.000	AV	32.7	40.4	10.4	39.7	-24.8	19.0	53.9	34.9	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell(time)factor

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

Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	August 21, 2014	August 25, 2014
Temperature / Humidity	23 deg.C, 68 %RH	24 deg.C, 55 %RH
Engineer	Shinichi Takano	Makoto Hosaka
Mode	Tx, 2480 MHz	
	Tx, Bluetooth, EDR, 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.	182.023	QP	32.8	16.1	8.6	31.8	25.7	43.5	17.8	187	230	
Hori.	441.640	QP	25.4	16.7	7.3	31.7	17.7	46.0	28.3	169	169	
Hori.	2483.500	PK	46.9	28.4	14.7	40.9	49.1	73.9	24.8	100	278	
Hori.	2493.367	PK	47.8	28.5	14.7	40.9	50.1	73.9	23.8	100	0	
Hori.	2520.010	PK	47.1	28.5	14.7	40.9	49.4	73.9	24.5	100	339	
Hori.	4960.000	PK	52.7	33.0	7.1	41.5	51.3	73.9	22.6	100	251	
Hori.	7440.000	PK	49.1	37.4	8.4	41.4	53.5	73.9	20.4	100	15	
Hori.	9920.000	PK	47.6	38.9	9.6	40.4	55.7	73.9	18.2	100	15	
Hori.	12400.000	PK	45.3	40.4	10.5	39.7	56.5	73.9	17.4	100	0	
Hori.	2483.500	AV	33.8	28.4	14.7	40.9	36.0	53.9	17.9	100	278	
Hori.	2493.367	AV	34.1	28.5	14.7	40.9	36.4	53.9	17.5	100	0	
Hori.	2520.010	AV	35.4	28.5	14.7	40.9	37.7	53.9	16.2	100	339	
Vert.	77.515	QP	39.0	6.4	7.9	31.9	21.4	40.0	18.6	100	148	
Vert.	129.936	QP	29.0	13.7	8.1	31.8	19.0	43.5	24.5	100	111	
Vert.	2483.500	PK	46.7	28.4	14.7	40.9	48.9	73.9	25.0	243	288	
Vert.	2493.367	PK	48.3	28.5	14.7	40.9	50.6	73.9	23.3	100	0	
Vert.	2519.978	PK	46.6	28.5	14.7	40.9	48.9	73.9	25.0	195	281	
Vert.	4960.000	PK	52.7	33.0	7.1	41.5	51.3	73.9	22.6	100	167	
Vert.	7440.000	PK	54.2	37.4	8.4	41.4	58.6	73.9	15.3	100	99	
Vert.	9920.000	PK	48.7	38.9	9.6	40.4	56.8	73.9	17.1	100	275	
Vert.	12400.000	PK	45.5	40.4	10.5	39.7	56.7	73.9	17.2	100	0	
Vert.	2483.500	AV	33.8	28.4	14.7	40.9	36.0	53.9	17.9	243	288	
Vert.	2493.367	AV	34.4	28.5	14.7	40.9	36.7	53.9	17.2	100	0	
Vert.	2519.978	AV	35.0	28.5	14.7	40.9	37.3	53.9	16.6	195	281	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

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

Dwell time factor relaxation

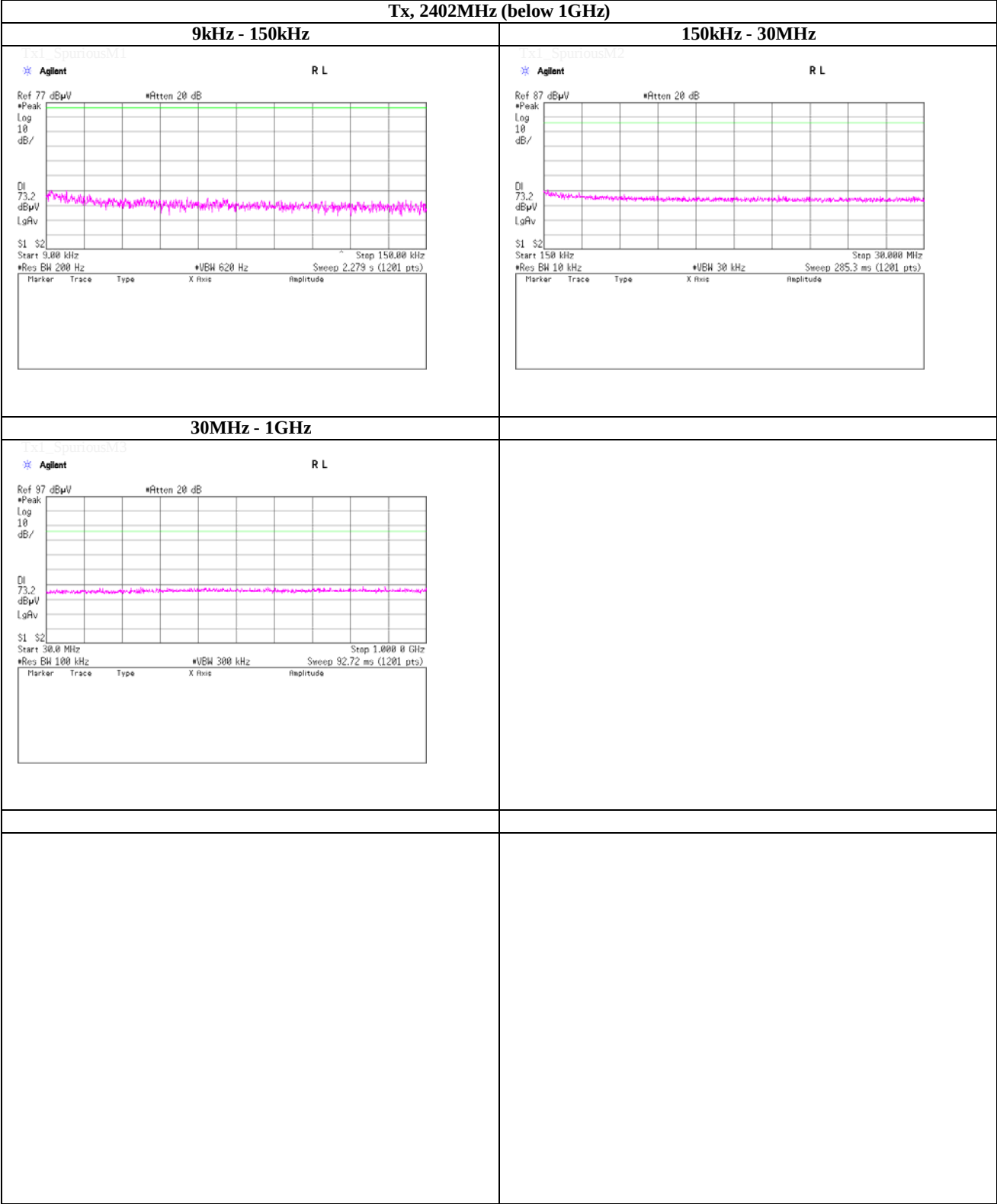
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	AV	43.9	33.0	7.1	41.5	-24.8	17.7	53.9	36.2	
Hori.	7440.000	AV	39.6	37.4	8.4	41.4	-24.8	19.2	53.9	34.7	
Hori.	9920.000	AV	36.1	38.9	9.6	40.4	-24.8	19.4	53.9	34.5	
Hori.	12400.000	AV	33.2	40.4	10.5	39.7	-24.8	19.6	53.9	34.3	
Vert.	4960.000	AV	44.2	33.0	7.1	41.5	-24.8	18.0	53.9	35.9	
Vert.	7440.000	AV	44.7	37.4	8.4	41.4	-24.8	24.3	53.9	29.6	
Vert.	9920.000	AV	37.7	38.9	9.6	40.4	-24.8	21.0	53.9	32.9	
Vert.	12400.000	AV	33.2	40.4	10.5	39.7	-24.8	19.6	53.9	34.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell(time)factor

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

Spurious emission (Conducted)

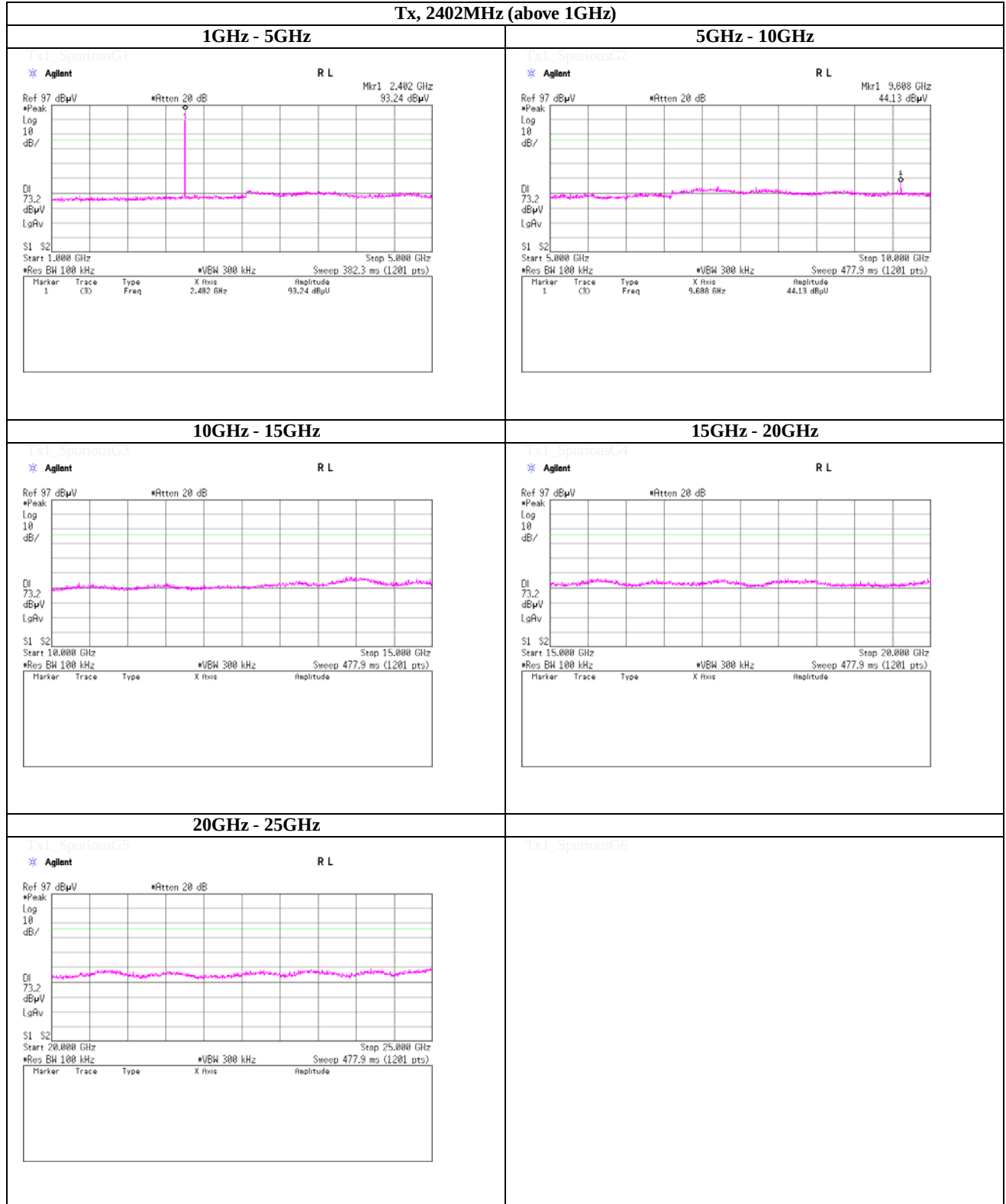
Tx, Bluetooth, BDR, PRBS9
Tx, 2402MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (above 1GHz)



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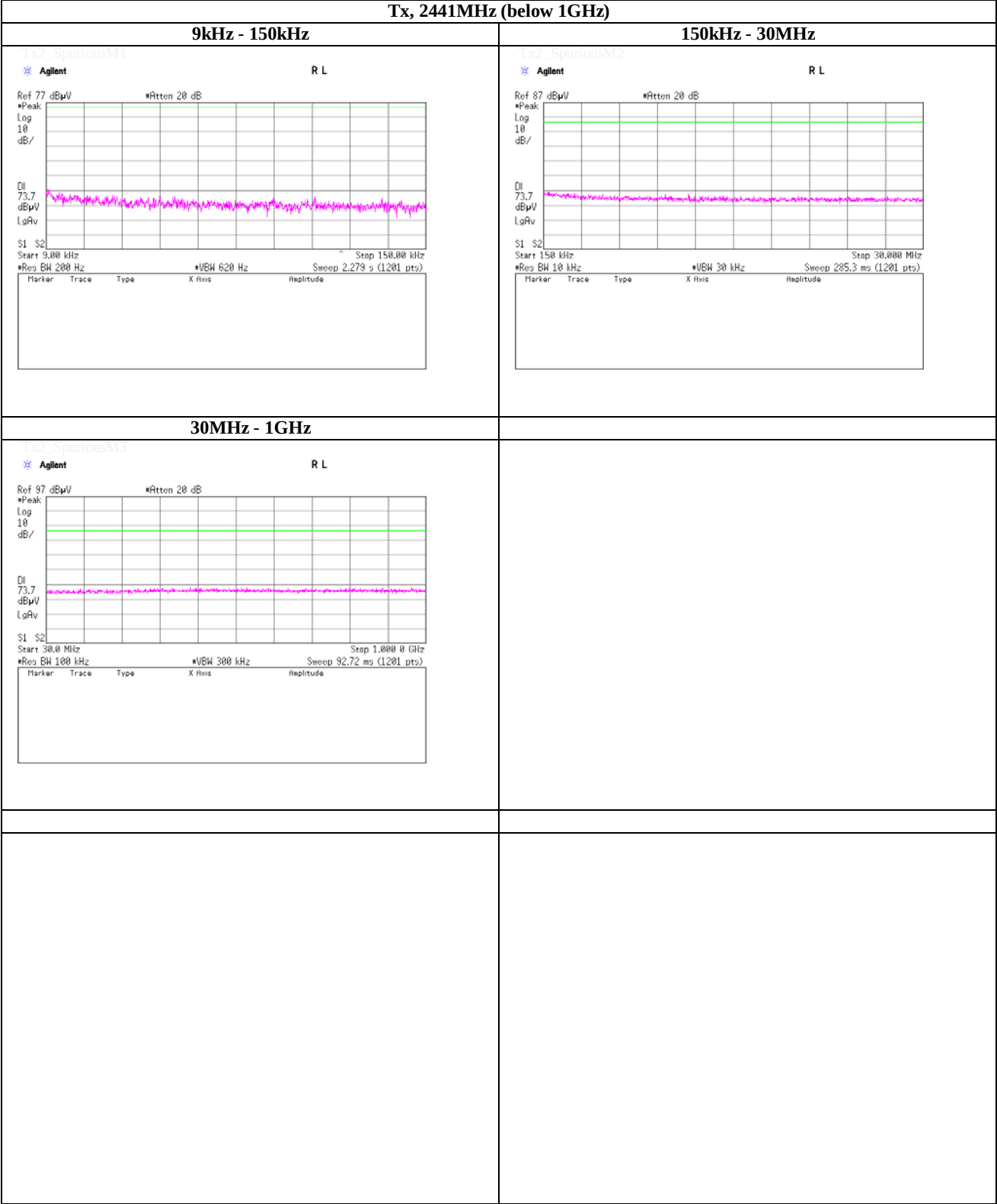
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

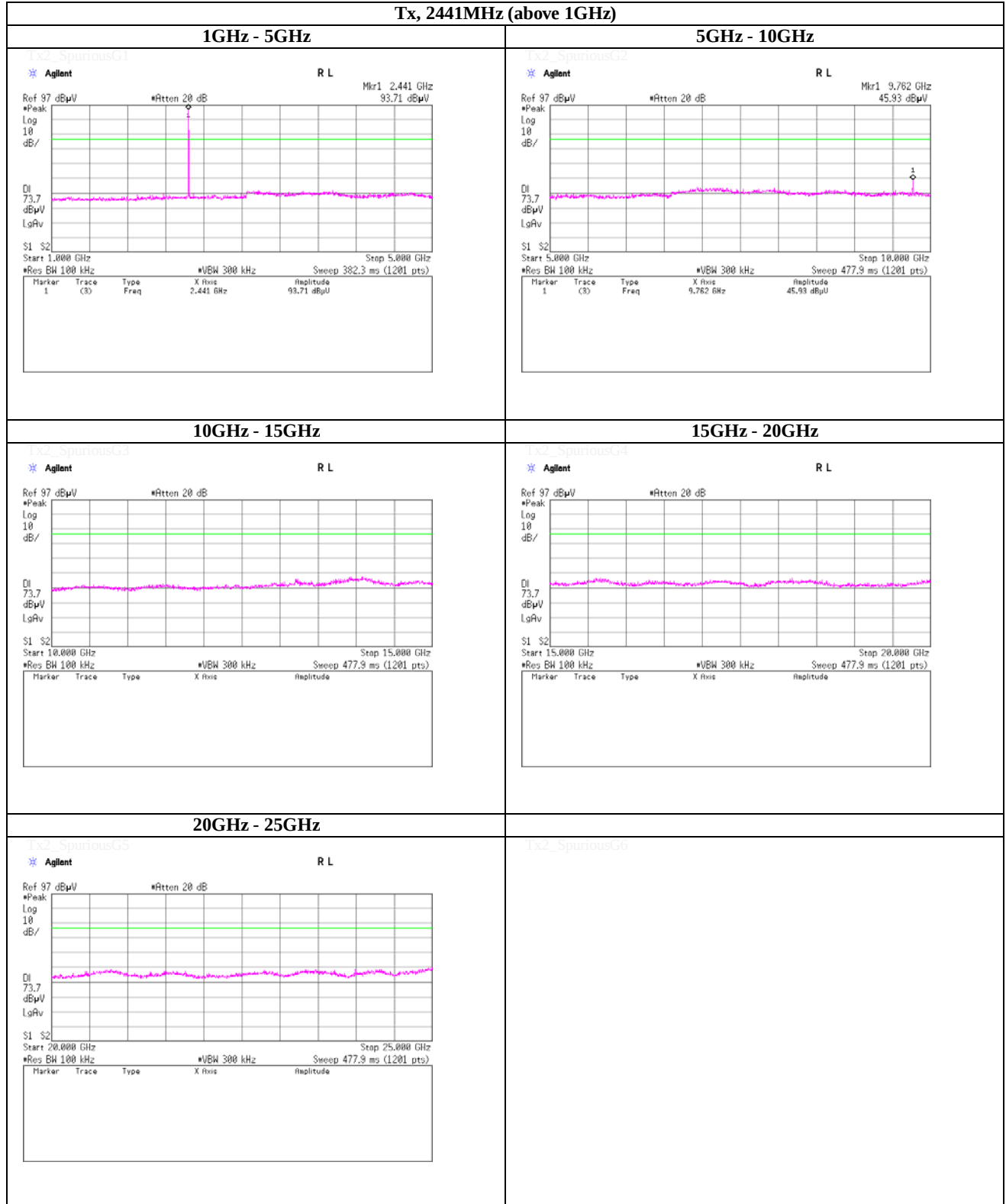
Tx, 2441MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (above 1GHz)



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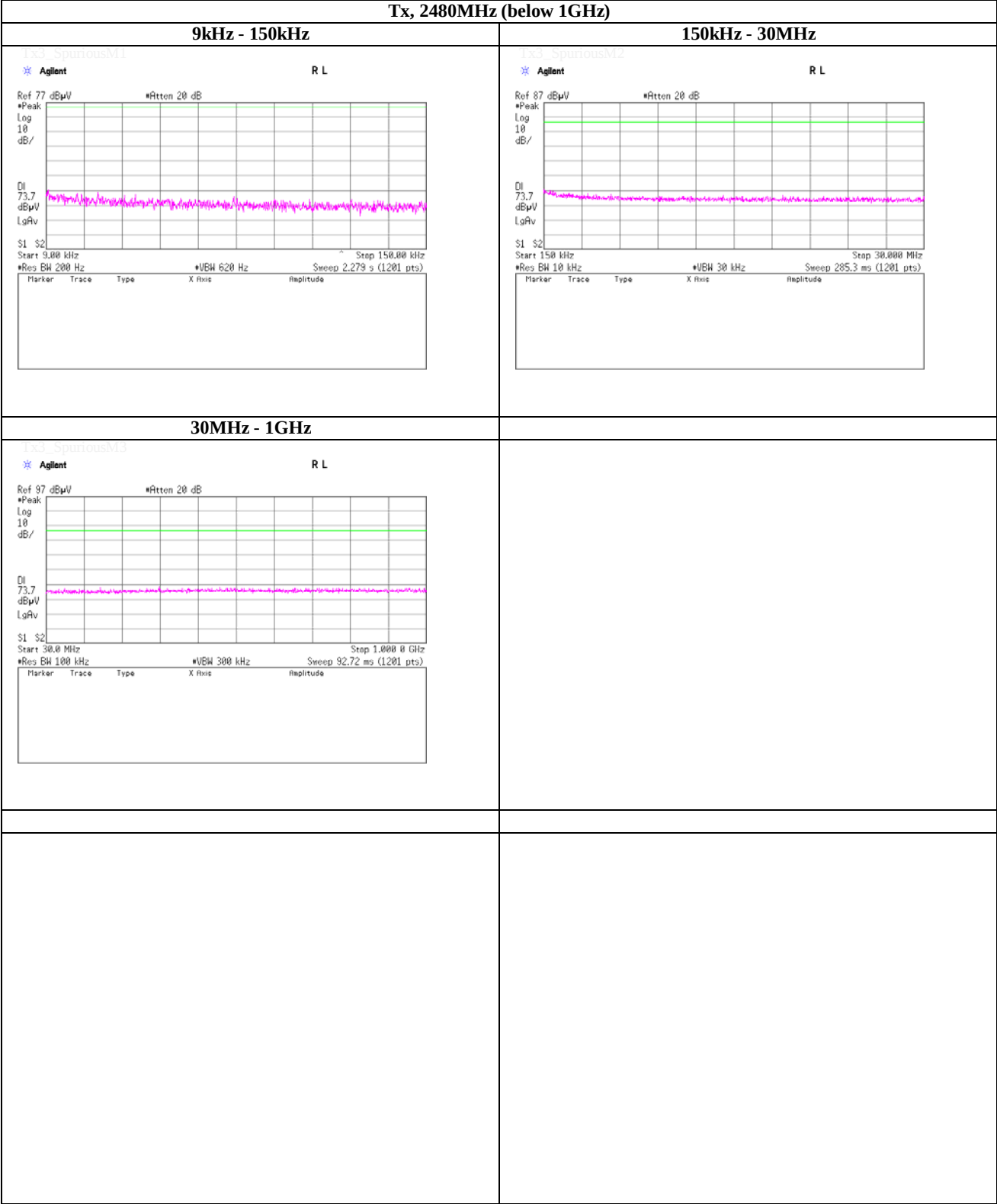
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Spurious emission (Conducted)

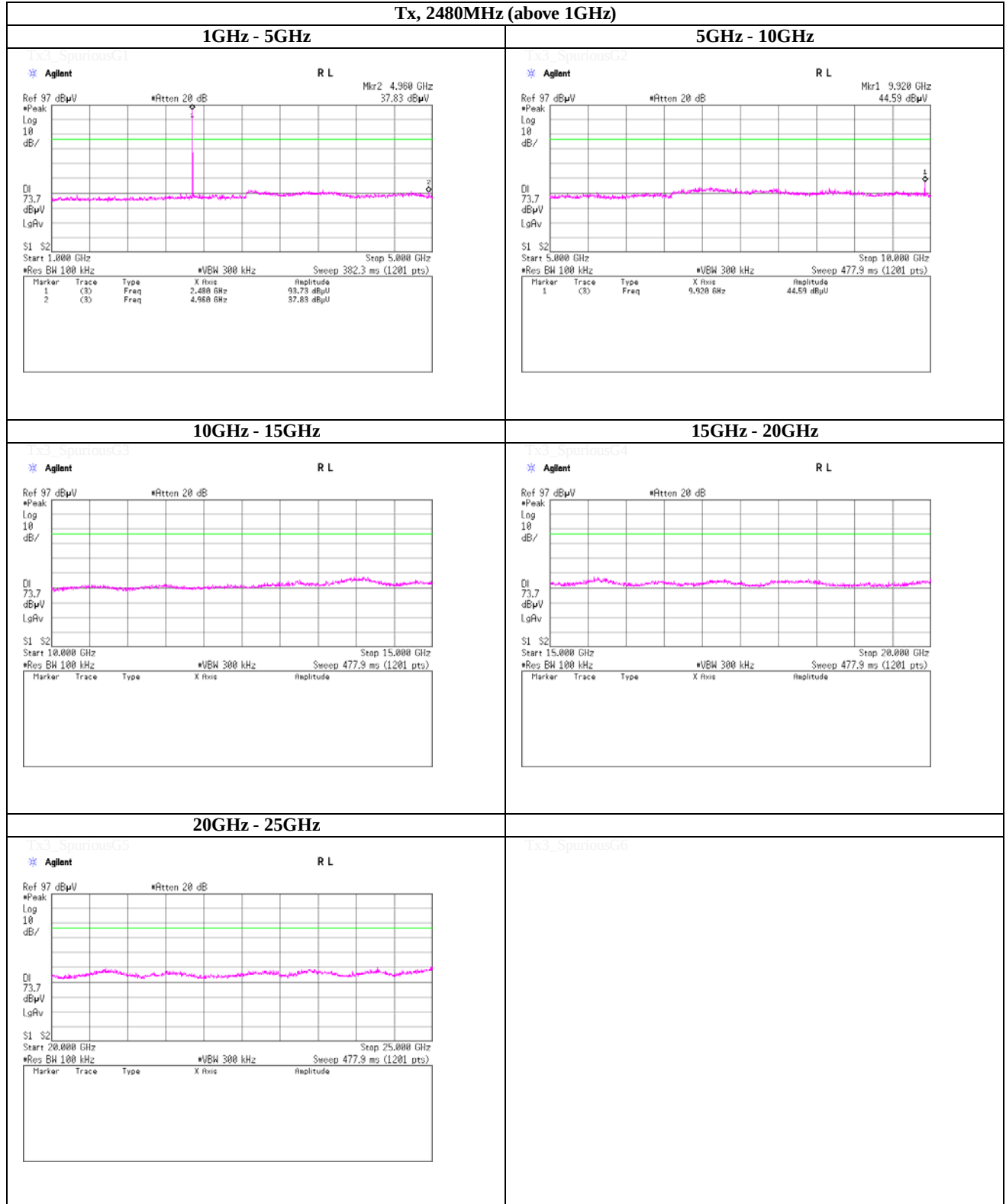
Tx, Bluetooth, BDR, PRBS9
Tx, 2480MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (above 1GHz)



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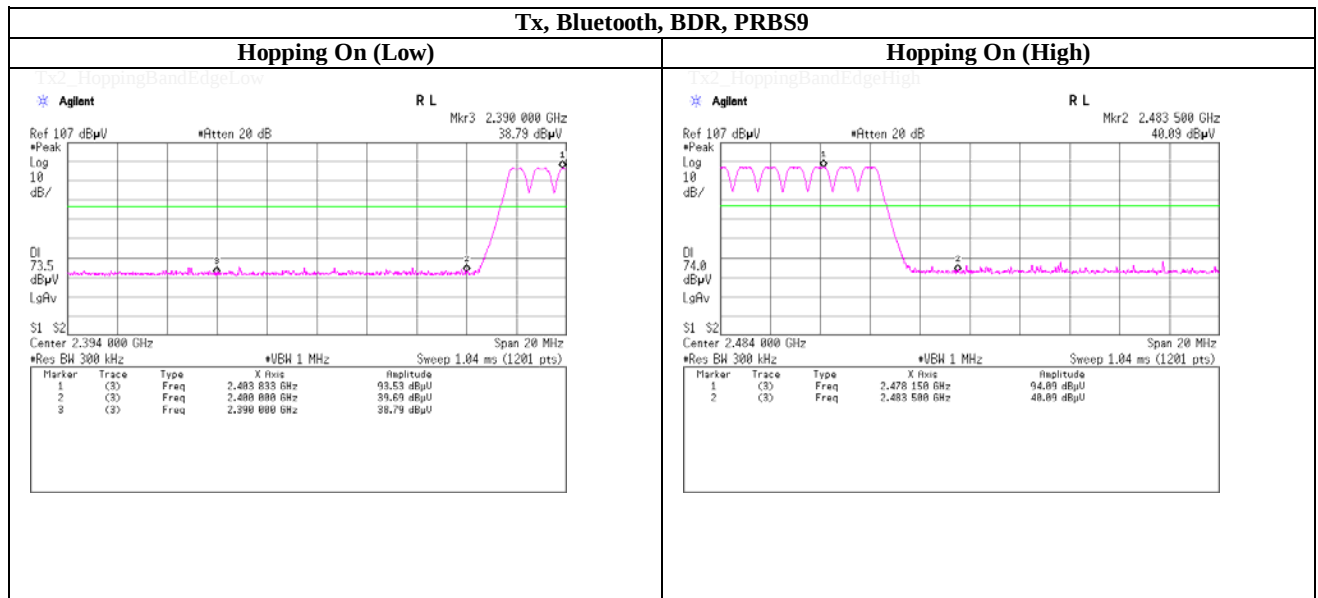
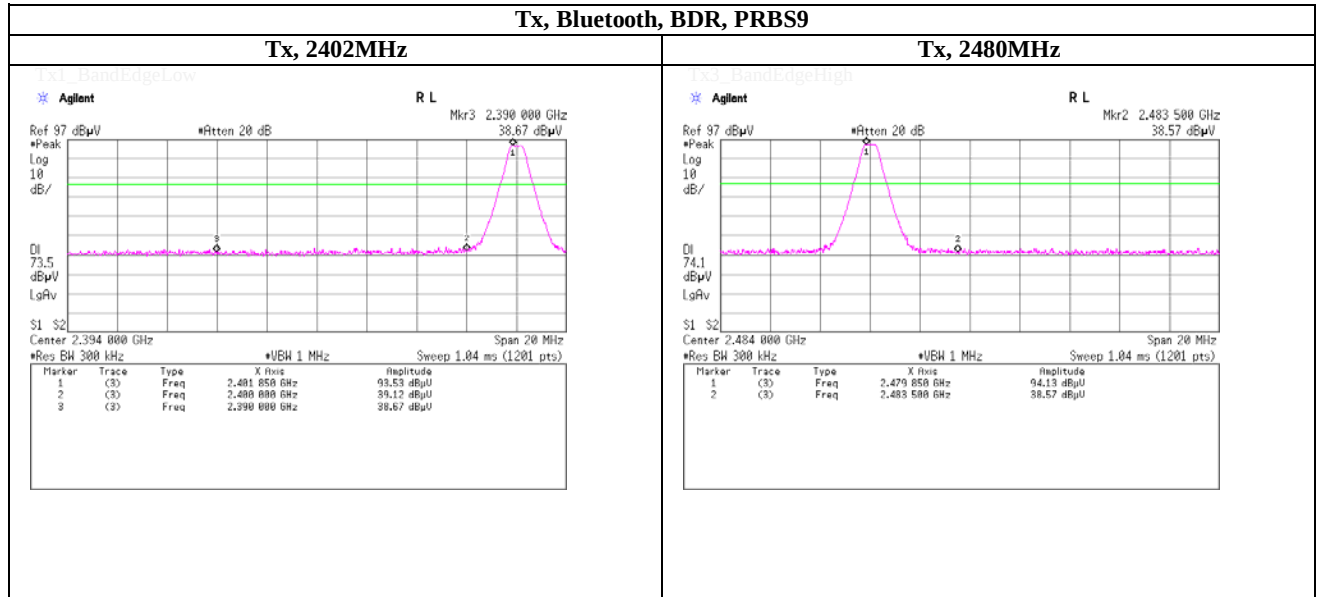
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Spurious emission (Conducted)

Band Edge compliance



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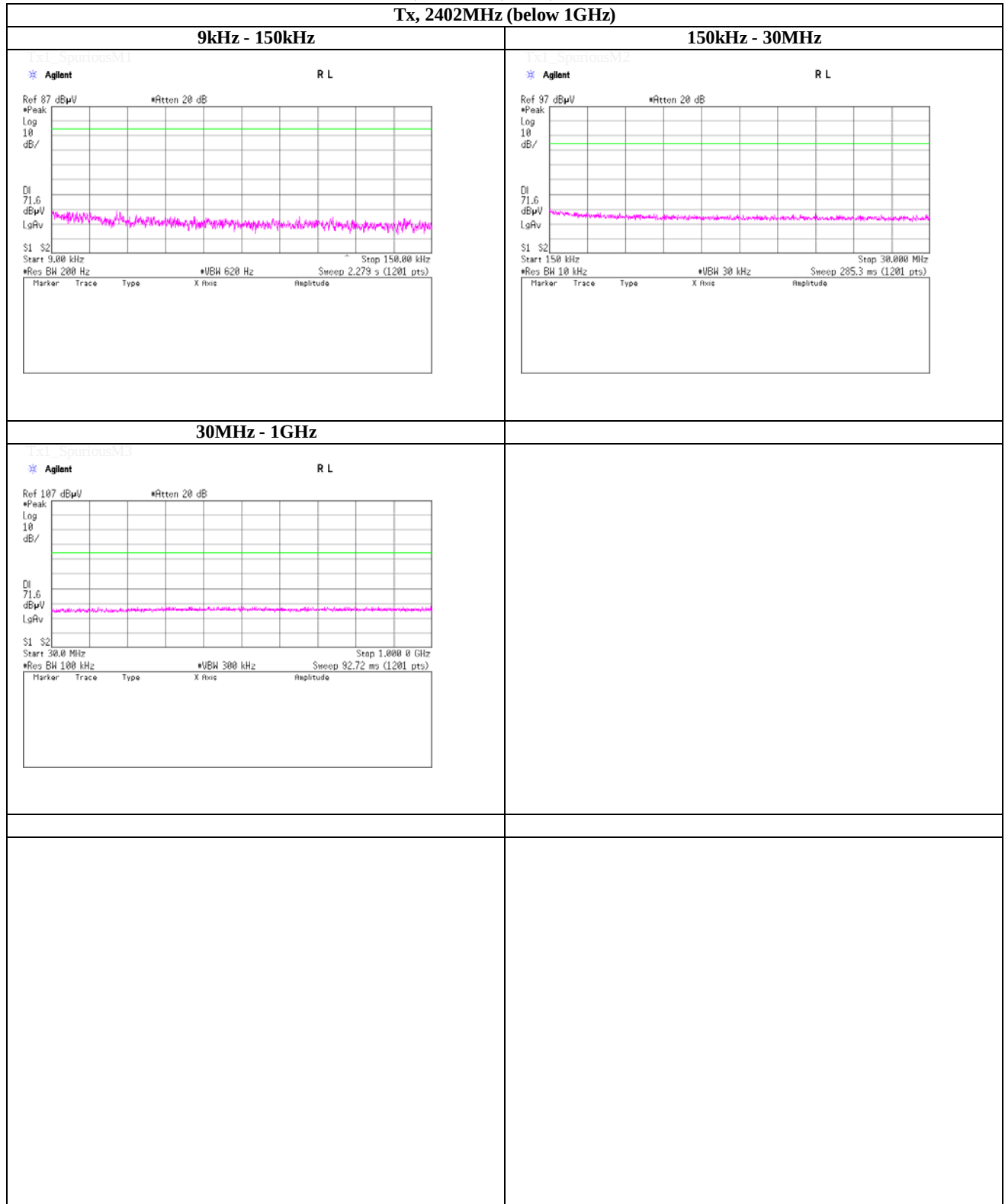
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Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 1GHz)



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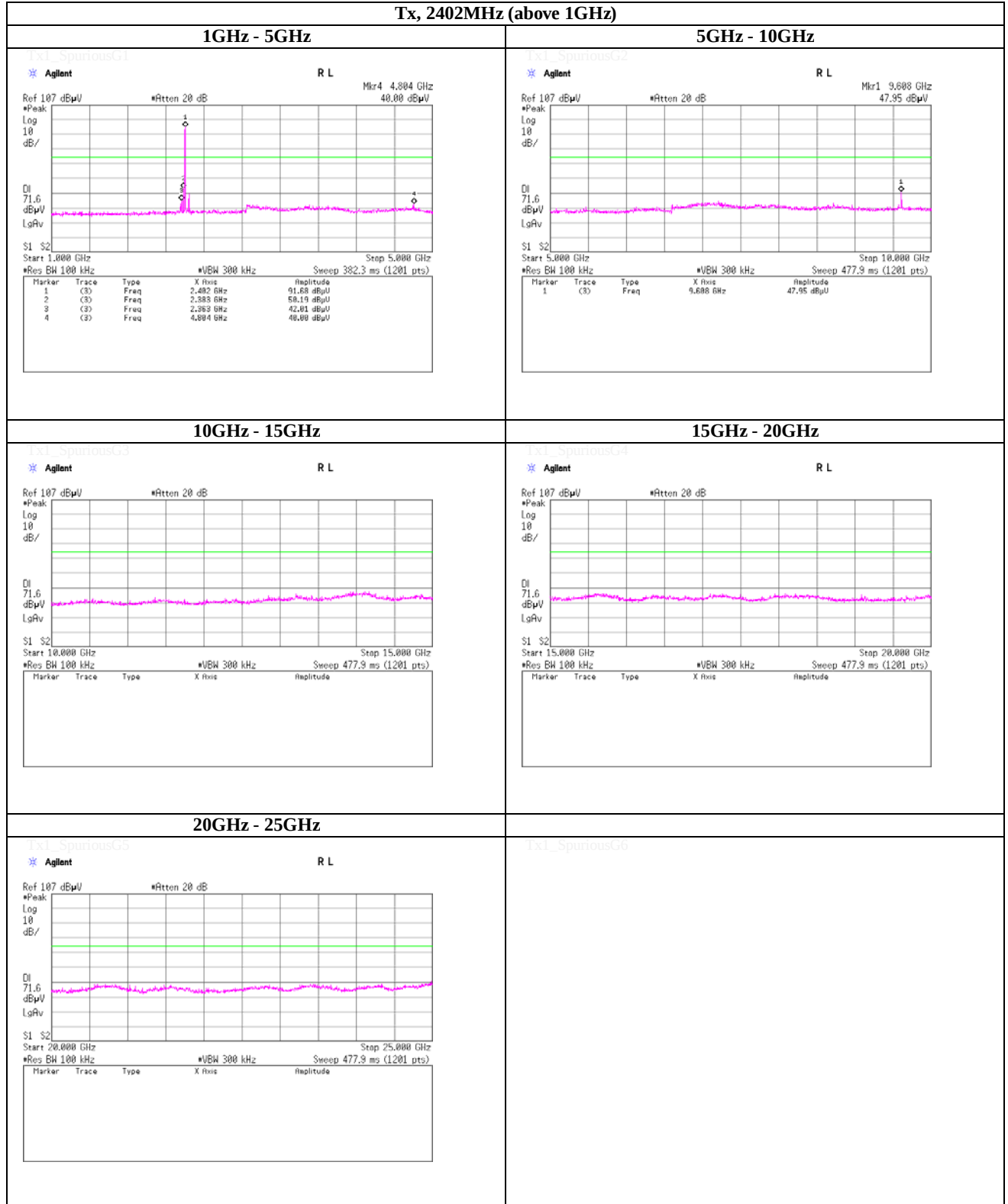
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Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (above 1GHz)



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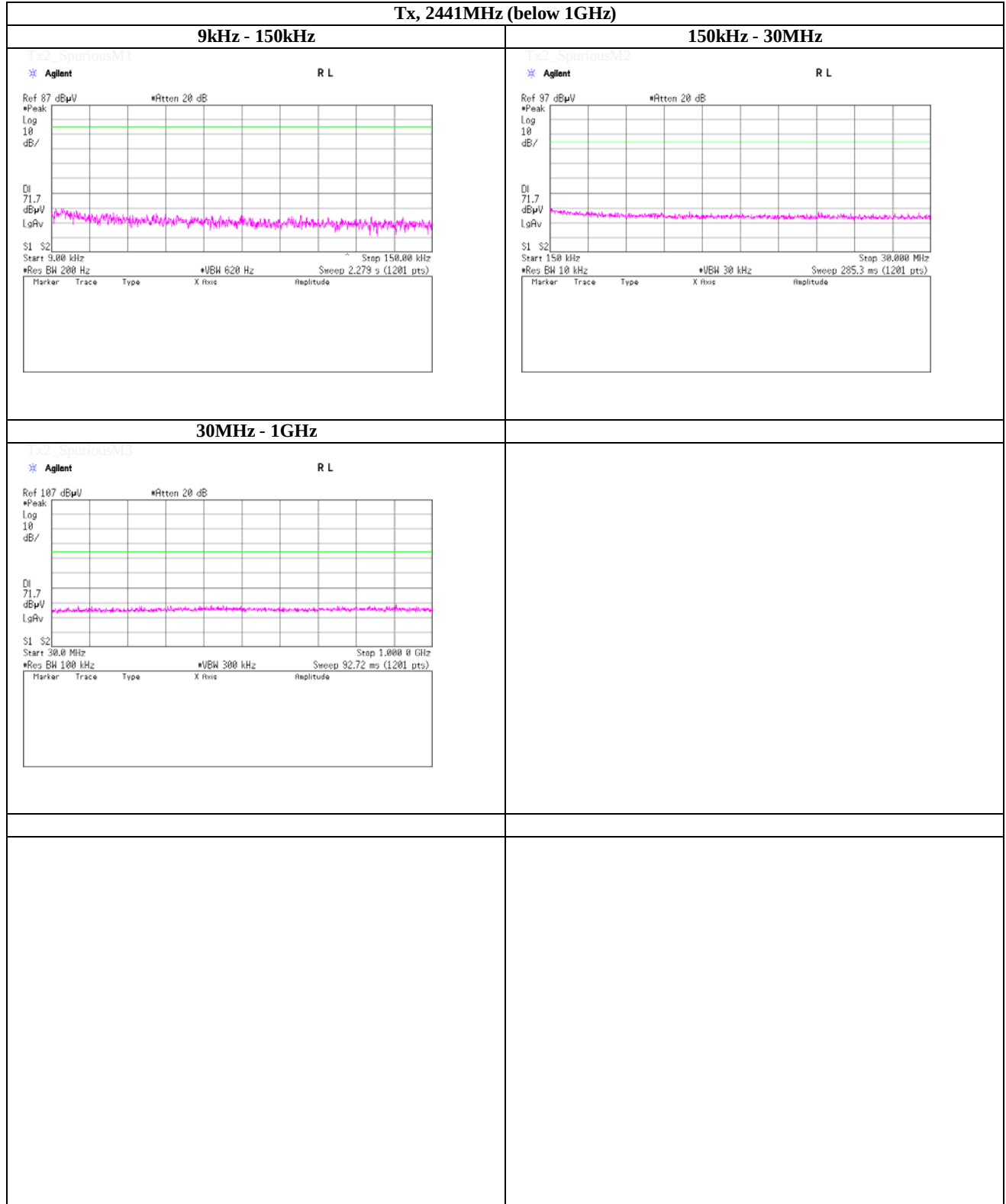
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Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (below 1GHz)



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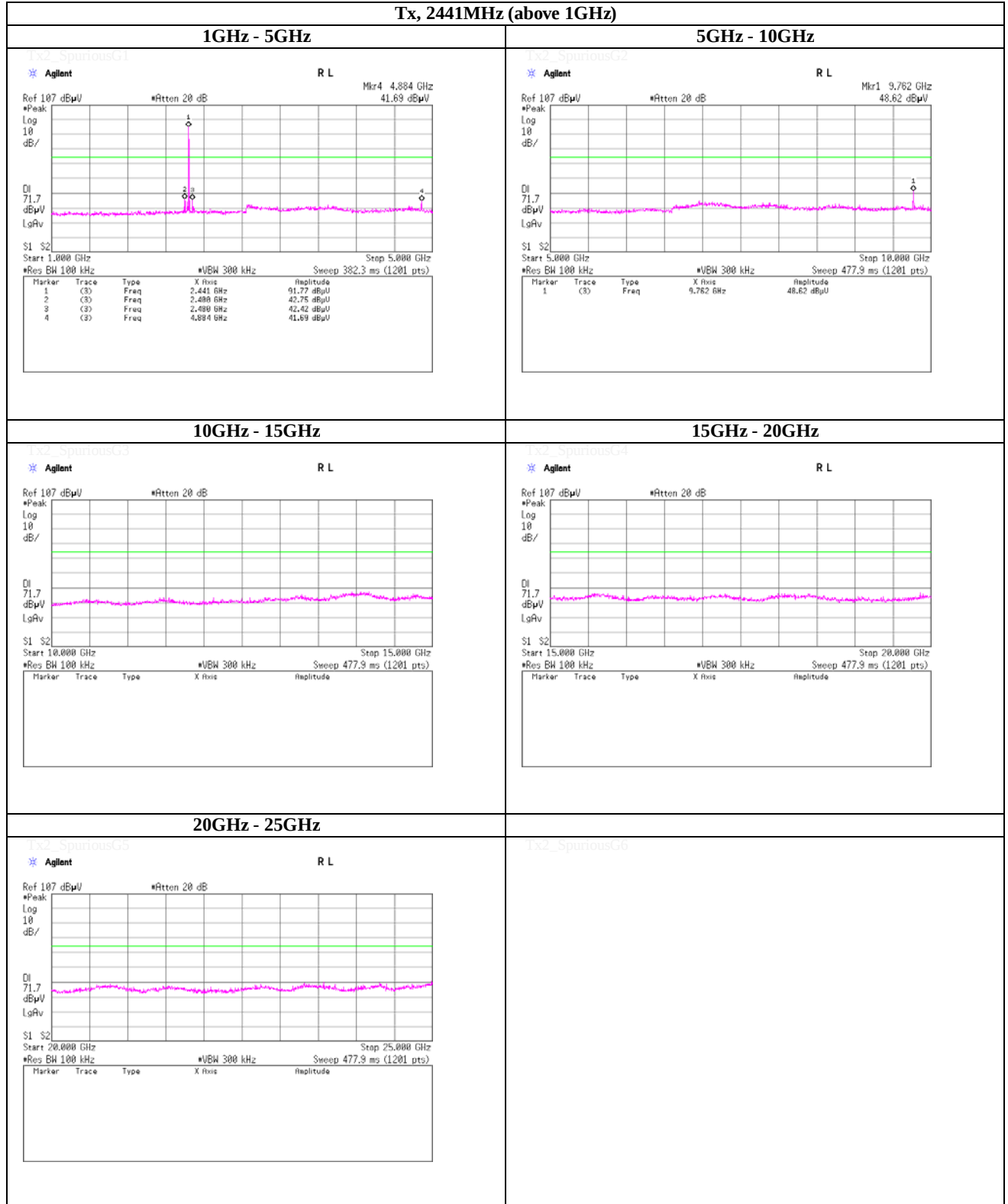
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Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (above 1GHz)



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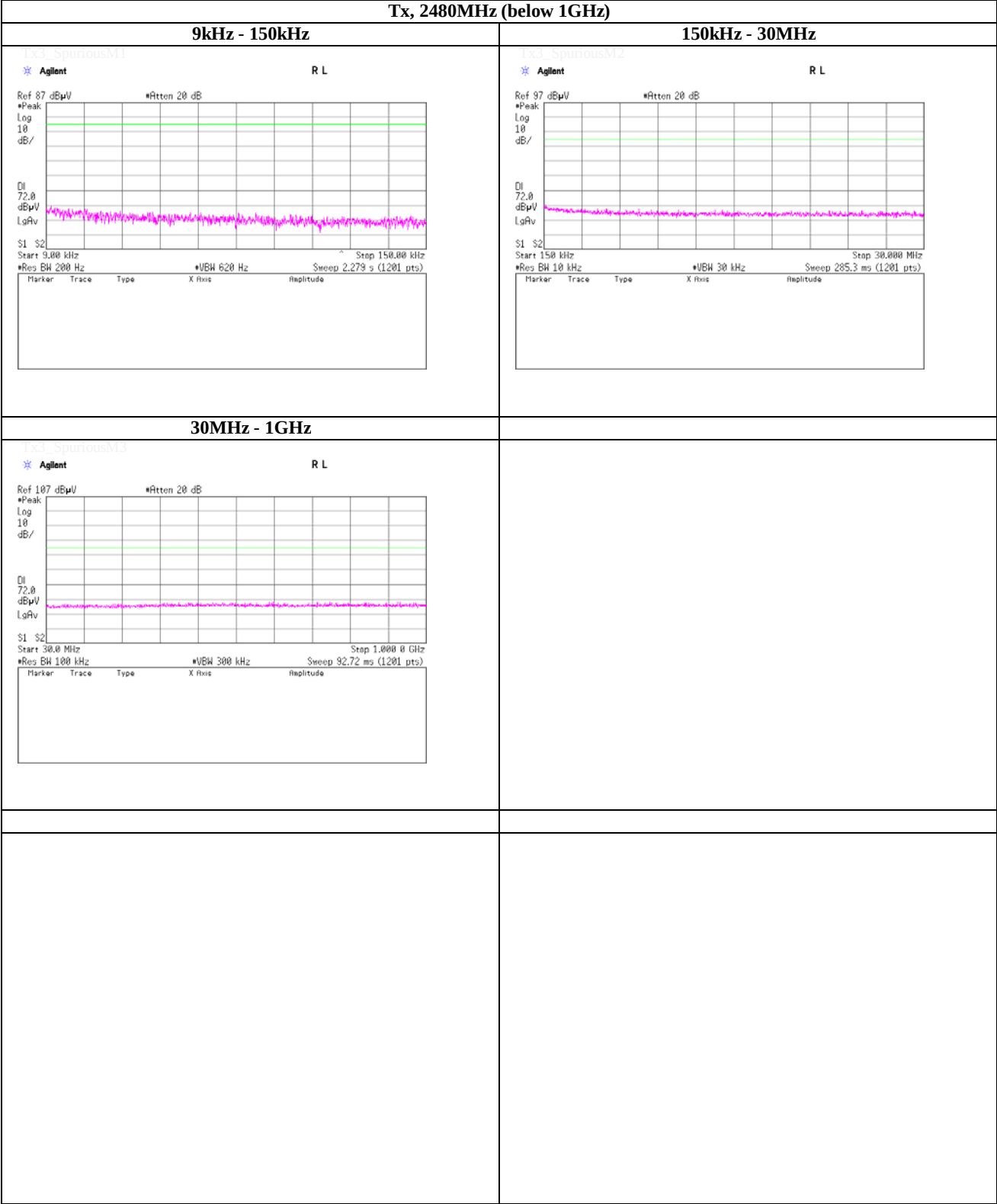
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Facsimile : +81 463 50 6401

Spurious emission (Conducted)

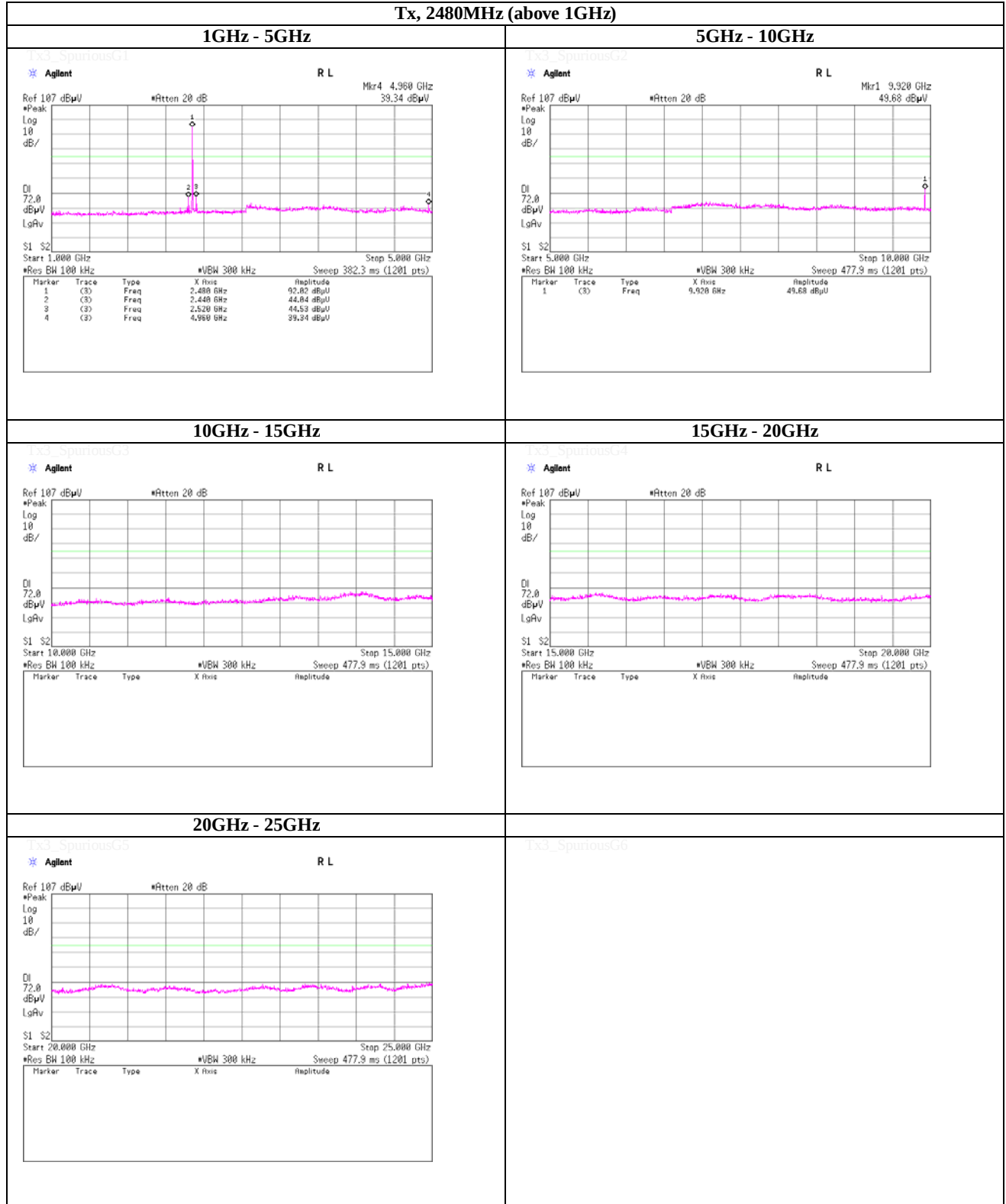
Tx, Bluetooth, EDR, PRBS9
Tx, 2480MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (above 1GHz)



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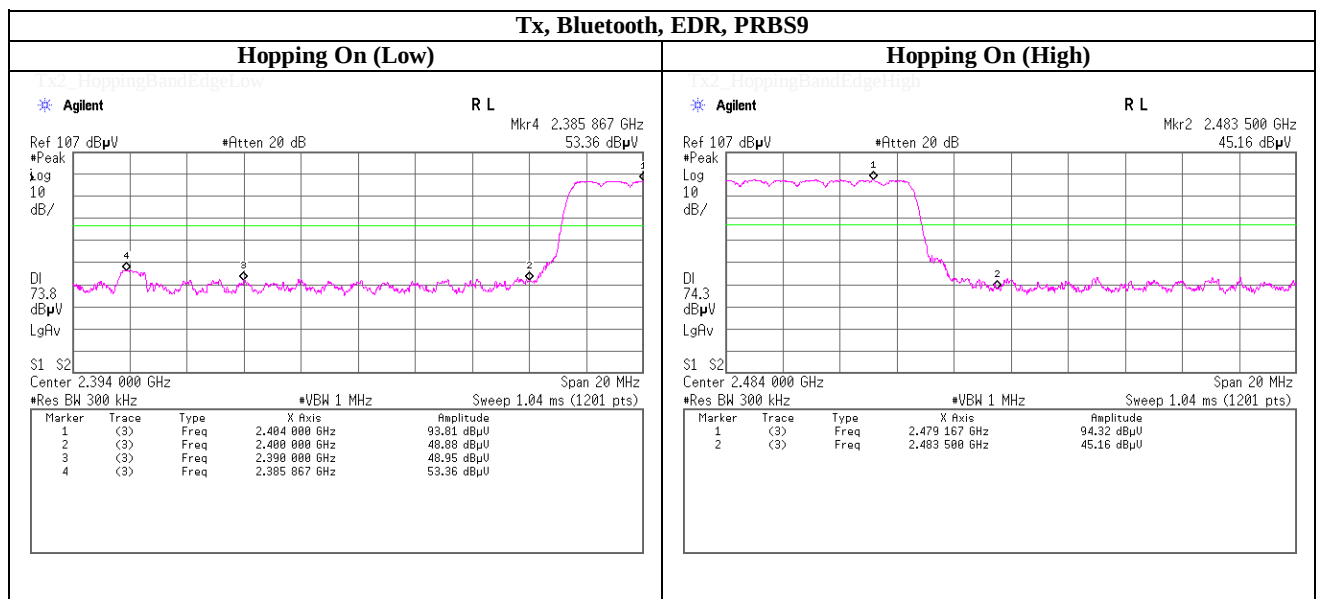
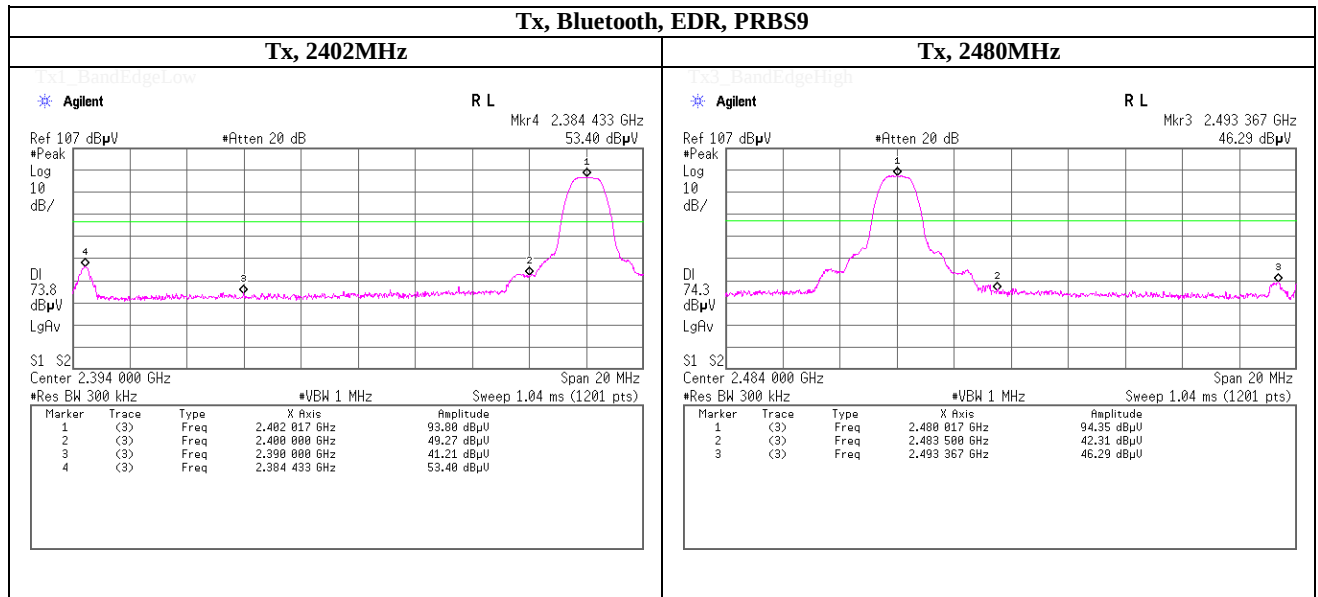
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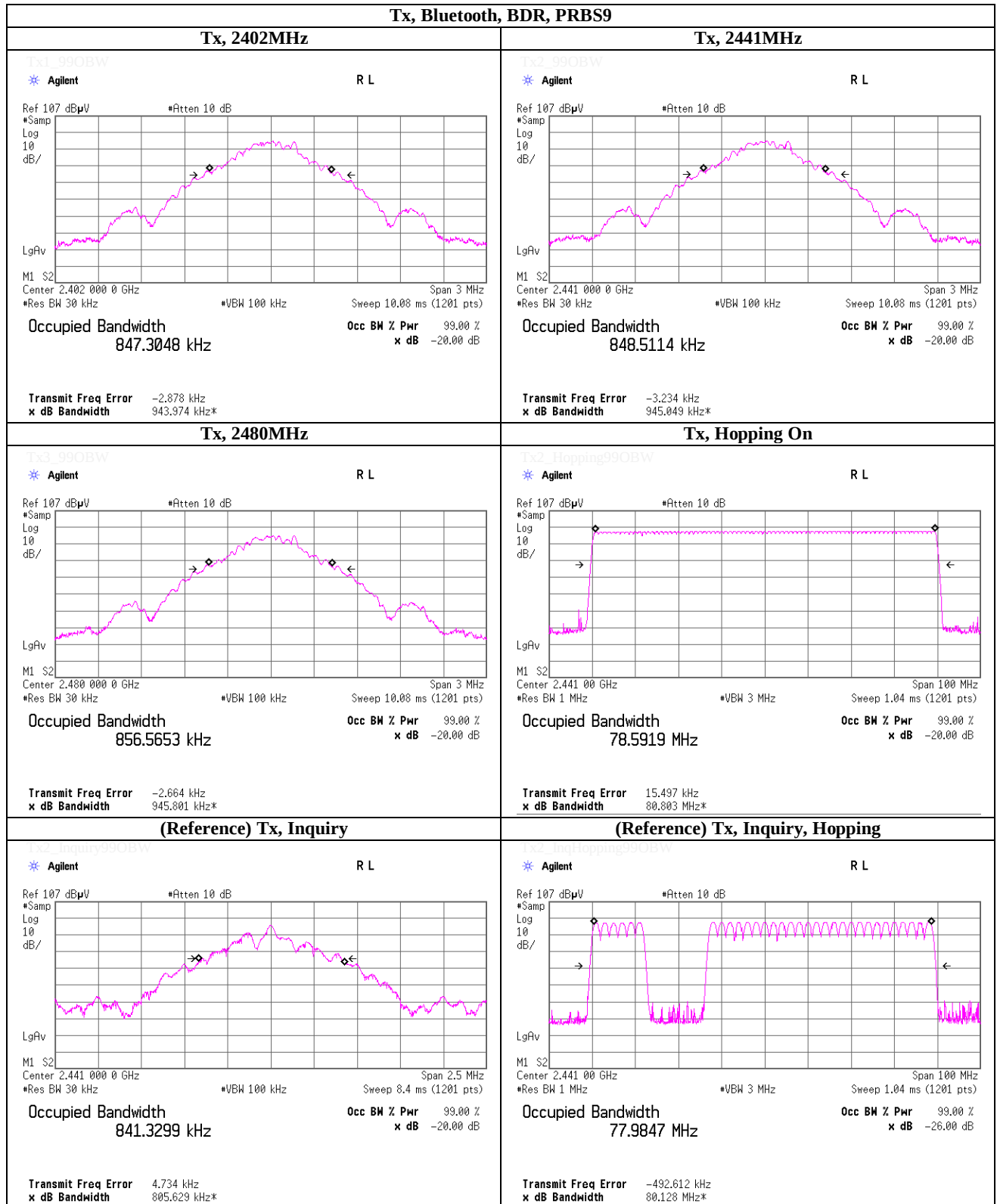
Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Band Edge compliance



99% Occupied Bandwidth



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99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9	
Tx, 2402MHz Tx1_99OBW Agilent R L Ref 107 dBμV #Atten 10 dB #Samp Log 10 dB/ LgAv M1 S2 Center 2.402 000 0 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 10.00 ms (1201 pts) Occupied Bandwidth 1.1981 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -3.577 kHz x dB Bandwidth 1.319 MHz*	Tx, 2441MHz Tx2_99OBW Agilent R L Ref 107 dBμV #Atten 10 dB #Samp Log 10 dB/ LgAv M1 S2 Center 2.441 000 0 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 10.00 ms (1201 pts) Occupied Bandwidth 1.2010 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -4.353 kHz x dB Bandwidth 1.321 MHz*
Tx, 2480MHz Tx3_99OBW Agilent R L Ref 107 dBμV #Atten 10 dB #Samp Log 10 dB/ LgAv M1 S2 Center 2.480 000 0 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz Sweep 10.00 ms (1201 pts) Occupied Bandwidth 1.1997 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -3.050 kHz x dB Bandwidth 1.323 MHz*	Tx, Hopping On Tx2_HoppingOBW Agilent R L Ref 107 dBμV #Atten 10 dB #Samp Log 10 dB/ LgAv M1 S2 Center 2.441 00 GHz Span 100 MHz #Res BW 1 MHz #VBW 3 MHz Sweep 1.00 ms (1201 pts) Occupied Bandwidth 78.7495 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error 14.745 kHz x dB Bandwidth 81.034 MHz*

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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)
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2014/07/09 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2014/03/14 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2014/04/22 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2014/05/15 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2014/08/12 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2014/02/21 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	RE	2014/02/03 * 12
SJM-13	Measure	ASKUL	-	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFLMF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2013/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2014/04/22 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2014/07/08 * 12
SCC-G18	Coaxial Cable	Suhner	SUCOFLEX 104A	46292/4A	RE	2014/03/14 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2014/05/15 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2014/03/15 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2014/02/21 * 12
SSA-01	Spectrum Analyzer	Agilent	N9010A-526	MY48031482	RE	2014/04/07 * 12
SJM-14	Measure	ASKUL	-	-	RE	-
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2014/02/17 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2014/02/17 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2014/08/27 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2013/11/24 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2014/04/25 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2014/04/25 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2013/11/24 * 12
STR-02	Test Receiver	Rohde & Schwarz	ESCI	100575	RE	2013/09/24 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2014/02/03 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2014/03/13 * 12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2014/04/22 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2014/04/08 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2014/04/08 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	AT	2014/03/07 * 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 test