



RADIO TEST REPORT

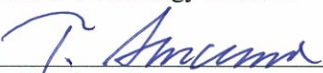
Test Report No.: 33BE0311-SH-03-B

Applicant : ALPINE ELECTRONICS, INC.
Type of Equipment : KIT ASSY AVN
Model No. : BDHK222A01
FCC ID : A269ZUA142
Test regulation : FCC Part15 Subpart C: 2014
Test result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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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: November 12 to 13, 2012

Tested by: 
Kenichi Adachi
Engineer
Consumer Technology Division

Approved by : 
Toyokazu Imamura
Leader
Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

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Shonan EMC Lab.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 33BE0311-SH-03-B

[illegible]

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SECTION 1: Customer information

Company Name : ALPINE ELECTRONICS, INC.
Brand Name : ALPINE
Address : 20-1 Yoshima-kogyodanchi, Iwaki-city, Fukushima, 970-1192, Japan
Telephone Number : +81-246-36-4111
Facsimile Number : +81-246-36-6090
Contact Person : Kenji Kuroda

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

2.1 Identification of E.U.T.

Type of Equipment : KIT ASSY AVN
Model Number : BDHK222A01
Serial Number : Refer to Section 4.2
Rating : DC 12V (typical) (DC 10V to 16V)
Country of Mass-production : China
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : November 1, 2012
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: BDHK222A01 (referred to as the EUT in this report) is a KIT ASSY AVN.

Clock frequency(ies) in the system : MCU 25MHz, RTC 32.768kHz, GPS/OSC 26MHz, ARM 27MHz

<Radio part>

Equipment type : Transceiver
Frequency of operation : 2402MHz to 2480MHz
Radio part clock frequency : 26MHz
Channel spacing : 1MHz
Type of modulation : GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna type : $1/4\lambda$ Wave Antenna
Antenna connector type : None
Antenna gain : -4.43dBi
ITU code : F1D, G1D
Operating Voltage (Radio part) : DC 2.8V
Operation temperature range : -20 deg.C to +70deg.C

FCC 15.31 (e)

This EUT provides stable voltage (DC2.8V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC 15.203

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.

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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 December 23, 2014
Title : FCC 47CFR Part 15 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 revision on December 23, 2014 does not affect the test specification applied to the EUT.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4: 2009 Section 7	FCC Section 15.207	-	N/A *1)	-	N/A
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4: 2009 Section 13	FCC Section 15.247 (a)(1)	Conducted	N/A	*See data.	Complied
20dB bandwidth	FCC Public Notice DA 00-705 & ANSI C63.4: 2009 Section 13	FCC Section 15.247 (a)(1)	Conducted	N/A		Complied
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4: 2009 Section 13	FCC Section 15.247 (a)(1)(iii)	Conducted	N/A		Complied
Dwell time	FCC Public Notice DA 00-705 & ANSI C63.4: 2009 Section 13	FCC Section 15.247 (a)(1)(iii)	Conducted	N/A		Complied
Maximum peak conducted output power	FCC Public Notice DA 00-705 & ANSI C63.4: 2009 Section 13	FCC Section 15.247 (b)(1)	Conducted	N/A		Complied
Band edge compliance & Spurious emission	FCC Public Notice DA 00-705 & ANSI C63.4: 2009 Section 13	FCC Section 15.247 (d) Section 15.209	Conducted/ Radiated	N/A	2.1dB (312.019MHz, PK, Horizontal, Tx 2441MHz, 3-DH5)	Complied

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

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line (used battery).

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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 EMI 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)	30MHz-300MHz	4.9 dB	5.1 dB	4.9 dB
	300MHz-1GHz	5.0 dB	5.2 dB	4.9 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	4.6 dB	4.3 dB	4.4 dB

*1: SAC=Semi-Anechoic Chamber

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

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

Antenna port conducted test

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

Conducted emissions Measurement (below 1GHz) uncertainty for this test was: (±) 1.7dB

Conducted emissions Measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB

Conducted emissions Measurement (3G-18GHz) uncertainty for this test was: (±) 3.0dB

Conducted emissions 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
☐ No.1 Semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 Semi-anechoic chamber	697847	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	-

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 / 3-DH5)/Inquiry, Payload pattern: 1100	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 3-DH5) / Inquiry, Payload pattern: 1100	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 3-DH5)/Inquiry, Payload pattern: 1100	-
Dwell time	Transmitting (Hopping ON), Payload pattern: 1100 - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5 - Inquiry	-
Maximum peak conducted output power	Transmitting Hopping OFF (DH5 / 2-DH5 / 3-DH5) / Inquiry, Payload pattern: 1100 - DH5 - 2-DH5 - 3-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted)	Transmitting (DH5 / 3-DH5), Payload pattern: 1100 -Hopping ON / Inquiry -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz
(Radiated)	Transmitting (DH5 / 3-DH5), Payload pattern: 1100	Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5 / 3-DH5), Payload pattern: 1100 -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 packet type / payload (except Dwell time test) * 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. * Payload pattern worst mode was pattern "1100". * Power settings: Fixed Test software: bttest (= BSP ver.2.21, APP Ver.9.39 and MCU Ver.611) (for except Inquiry mode) BSP ver.2.22, APP Ver.9.39 and MCU Ver.611 (for Inquiry mode only)		

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

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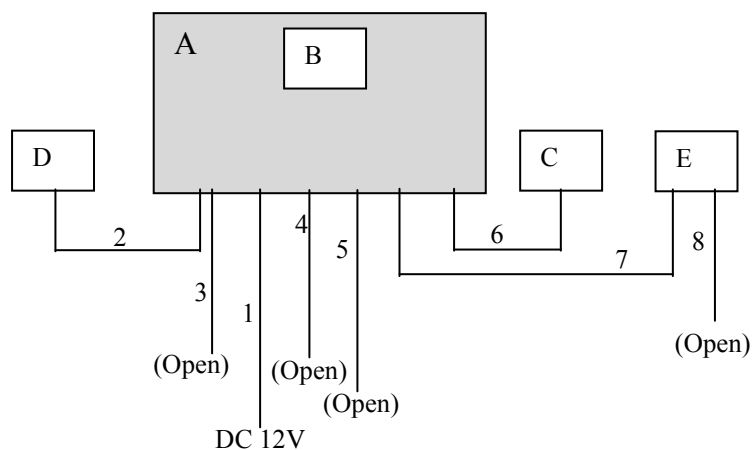
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4.2 Configuration of tested system



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	KIT ASSY AVN	BDHK222A01	APNCTY5D12900014 *1) APNCTY5D12900015 *2)	ALPINE ELECTRONICS,INC.	EUT
B	Micro SD card	MMBTR04GUBCA-ME	-	Transcend	-
C	GPS antenna	-	-	ALPINE ELECTRONICS,INC.	-
D	Rear Camera	-	-	ALPINE ELECTRONICS,INC.	-
E	iPod Box	-	-	ALPINE ELECTRONICS,INC.	-

*1) Used for Radiated emission tests.

*2) Used for Antenna terminal tests.

List of cables used

No.	Cable Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	1.9	Unshielded	Unshielded	-
2	CAMERA Cable	7.0	Unshielded	Unshielded	-
3	AUX Cable	1.1	Shielded	Unshielded	-
4	RADIO ANT Cable	0.2	Shielded	Shielded	-
5	USB Cable	0.8	Shielded	Shielded	-
6	GPS ANT Cable	1.4	Shielded	Shielded	-
7	IPOD Cable	0.6	Shielded	Shielded	-
8	30P IPOD Cable	0.1	Shielded	Shielded	-

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SECTION 5: Radiated emission

5.1 Operating environment

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

5.2 Test configuration

EUT was placed on a polystyrene platform of nominal size, 0.5m by 0.5m, raised 80cm above the conducting ground plane. 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.

5.3 Test conditions

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

5.4 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	Above 1GHz		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 EUT was set at 30 degree as normal position according to the EUT's specification.

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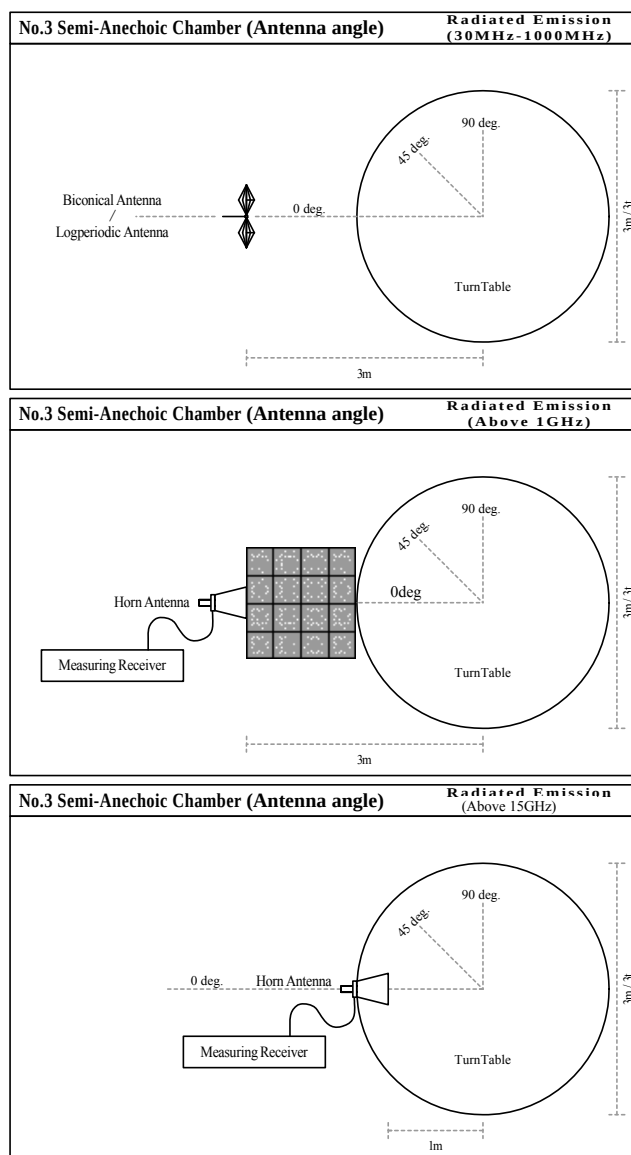


Figure 1. Antenna angle

5.5 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.

5.6 Results

Summary of the test results : Pass *No noise was detected above the 2nd order harmonics.

Refer to APPENDIX 1

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SECTION 6: Out of band 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

SECTION 7: 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 8: 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 9: 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 10: 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 11: Maximum peak conducted output power

Test procedure

The Maximum peak conducted 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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Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

20dB bandwidth and Carrier frequency separation
Number of Hopping Frequency
Dwell time
Maximum peak conducted 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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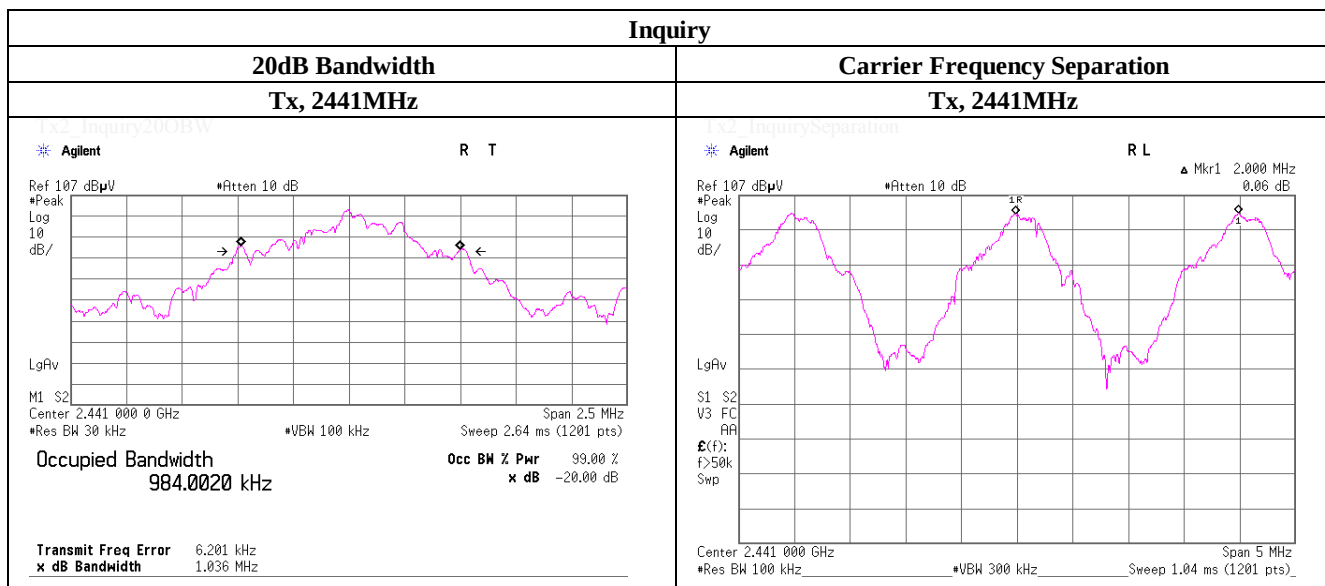
APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date November 12, 2012
Temperature / Humidity 25 deg.C , 51 %RH
Engineer Hikaru Shirasawa
Mode Tx, Bluetooth, BDR, 1100

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.887	1.000	>= 0.591
DH5	2441.0	0.910	1.003	>= 0.607
DH5	2480.0	0.923	1.003	>= 0.615
Inquiry	2441.0	1.036	2.000	>= 0.691

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



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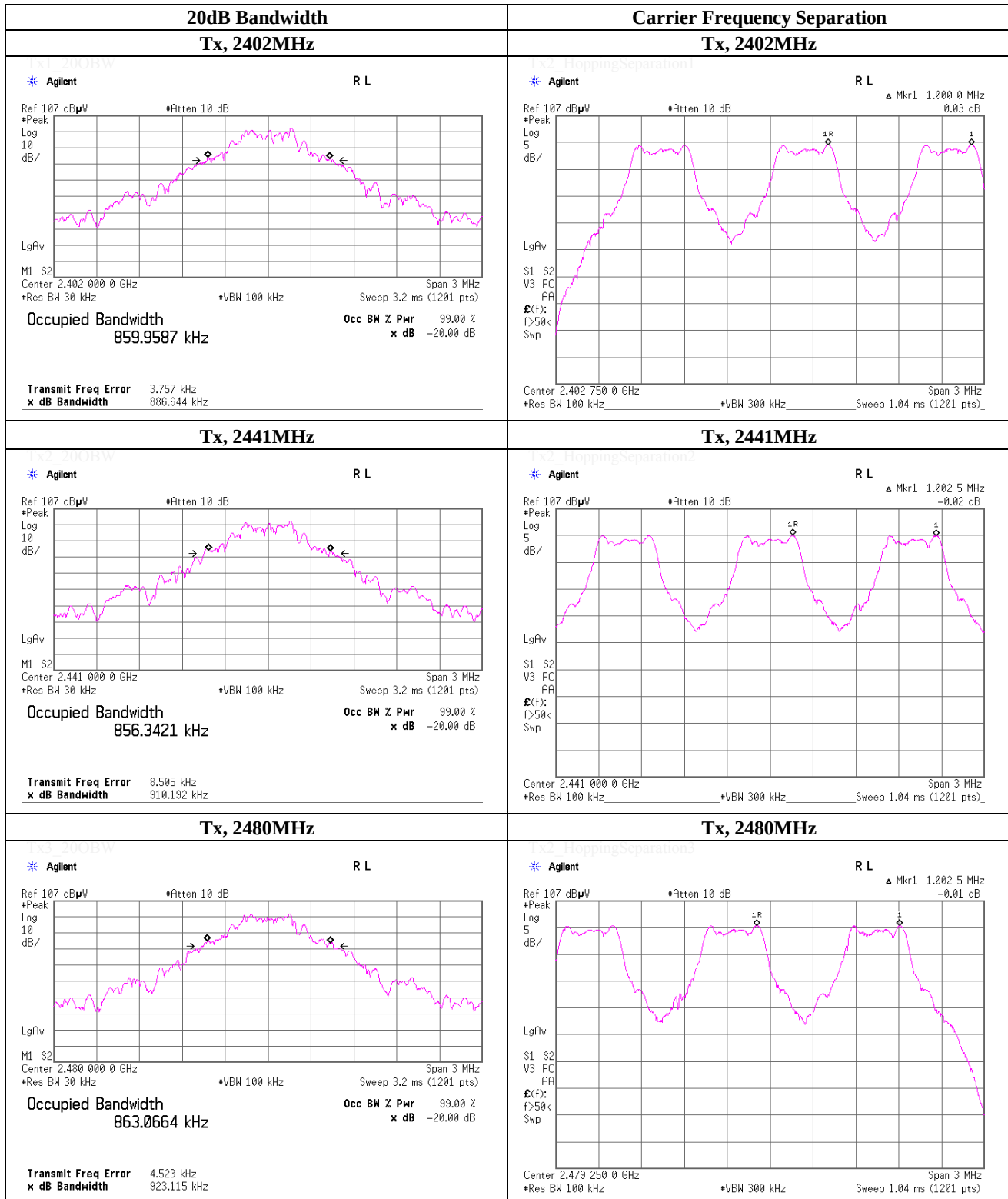
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, 1100



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20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date November 12, 2012
Temperature / Humidity 25 deg.C , 51 %RH
Engineer Hikaru Shirasawa
Mode Tx, Bluetooth, EDR, 1100

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.182	1.008	>= 0.788
3-DH5	2441.0	1.208	1.003	>= 0.805
3-DH5	2480.0	1.221	1.000	>= 0.814

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

Tx2_Inquiry200BW

Tx2_InquirySeparation

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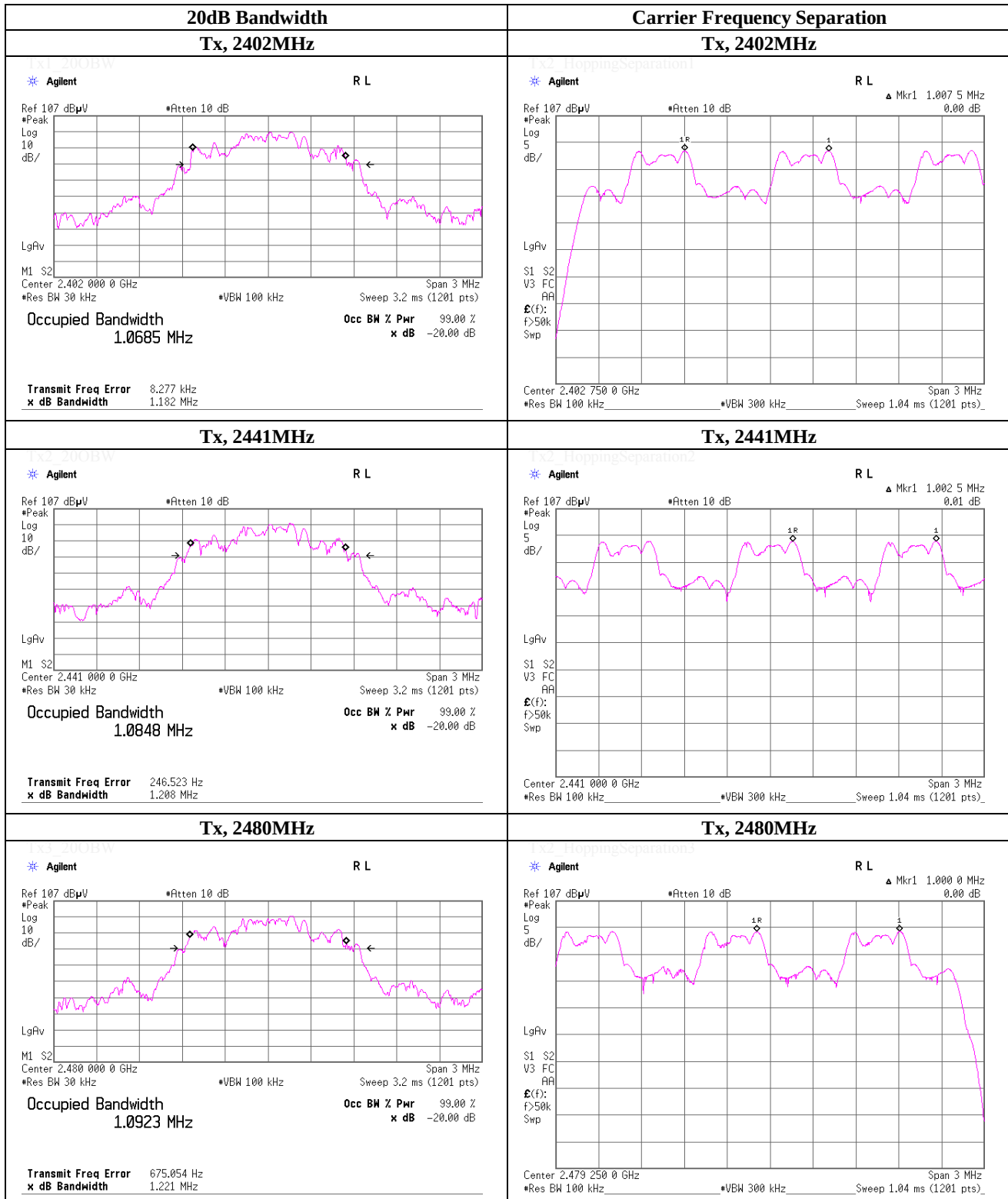
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, 1100



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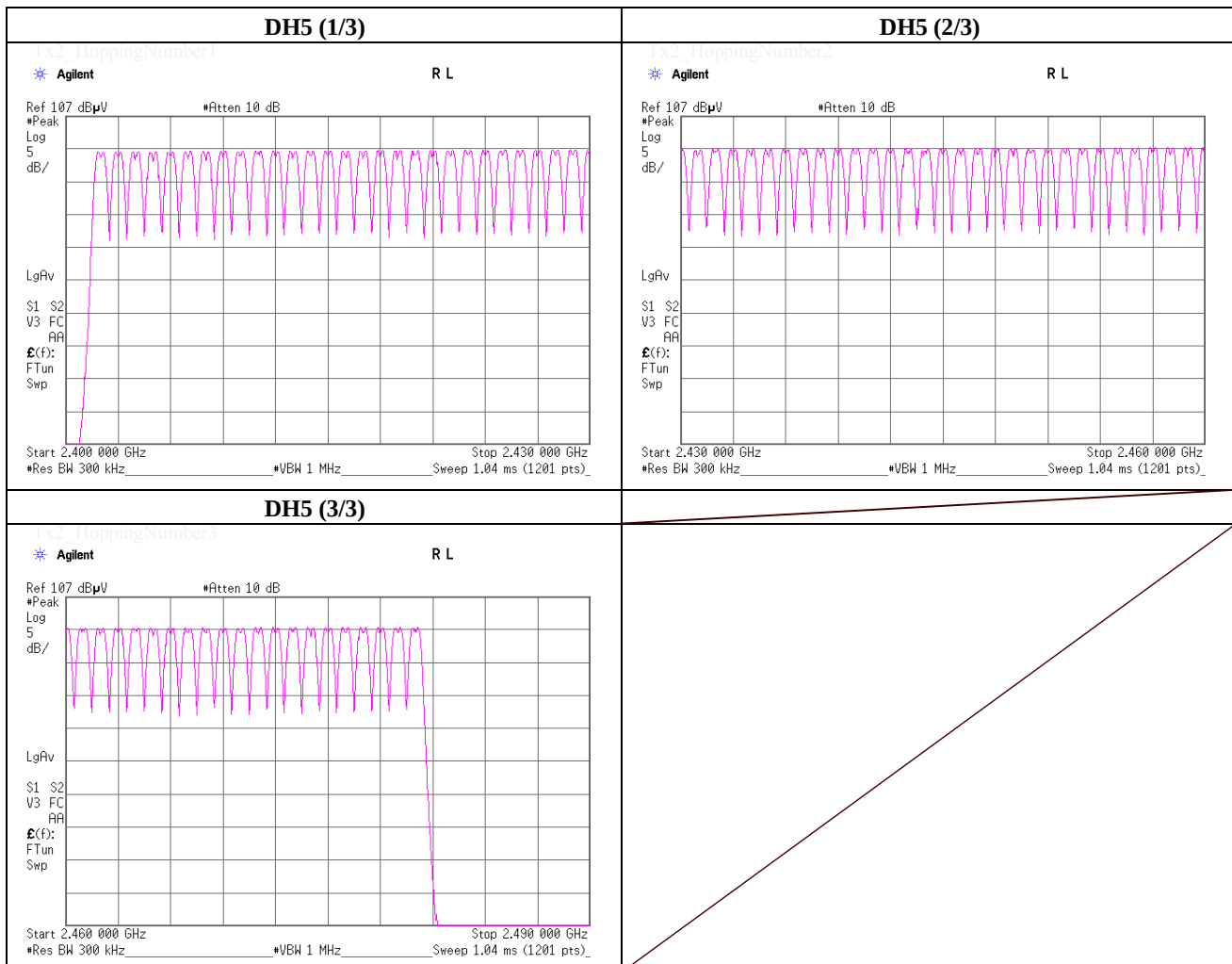
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	November 12, 2012	
Temperature / Humidity	25 deg.C , 51 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, BDR, 1100	

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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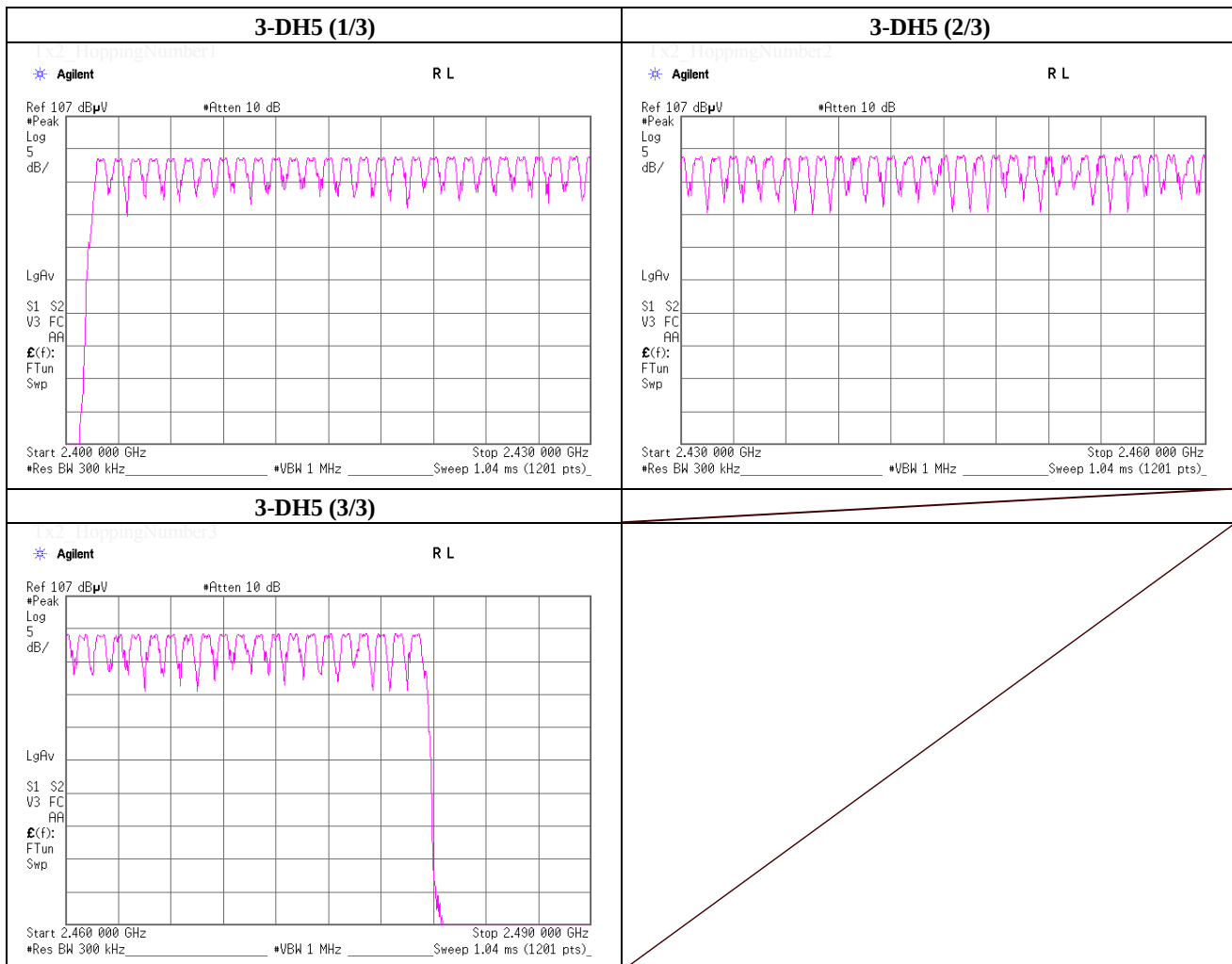
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	November 12, 2012	
Temperature / Humidity	25 deg.C , 51 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, EDR, 1100	

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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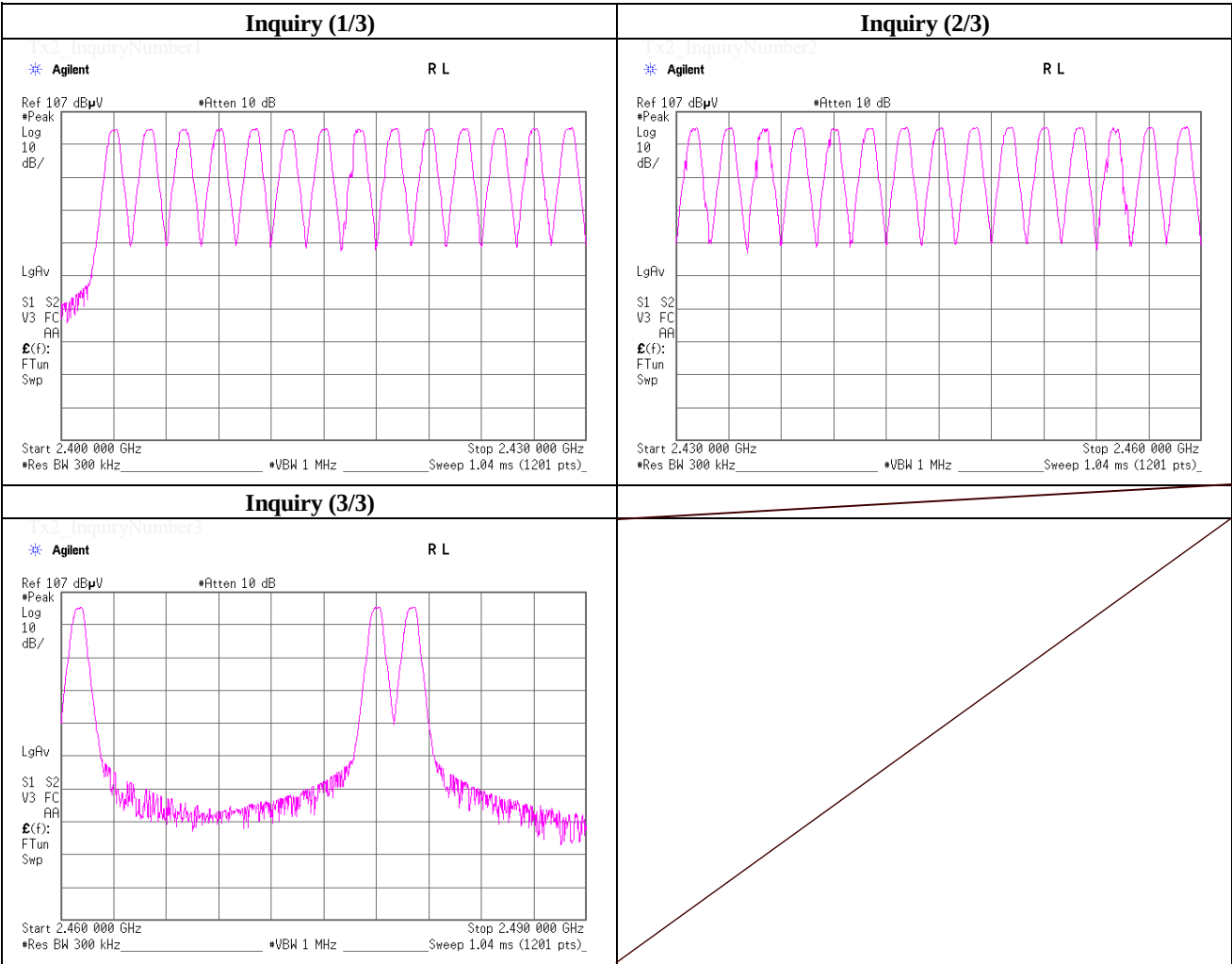
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	November 12, 2012	
Temperature / Humidity	25 deg.C , 51 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, Inquiry	

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



Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date November 12, 2012
Temperature / Humidity 25 deg.C , 51 %RH
Engineer Hikaru Shirasawa
Mode Tx, Bluetooth, BDR, 1100

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	47.6	/ 5.0 sec. x 31.6 sec. = 301 times	0.370	111	400
DH3	24.6	/ 5.0 sec. x 31.6 sec. = 156 times	1.626	254	400
DH5	20.4	/ 5.0 sec. x 31.6 sec. = 129 times	2.875	371	400
Inquiry	100.0	/ 1.0 sec. x 12.8 sec. = 1280 times	0.073	93	400

Sample Calculation

Result = Number of transmission x Length of transmission time

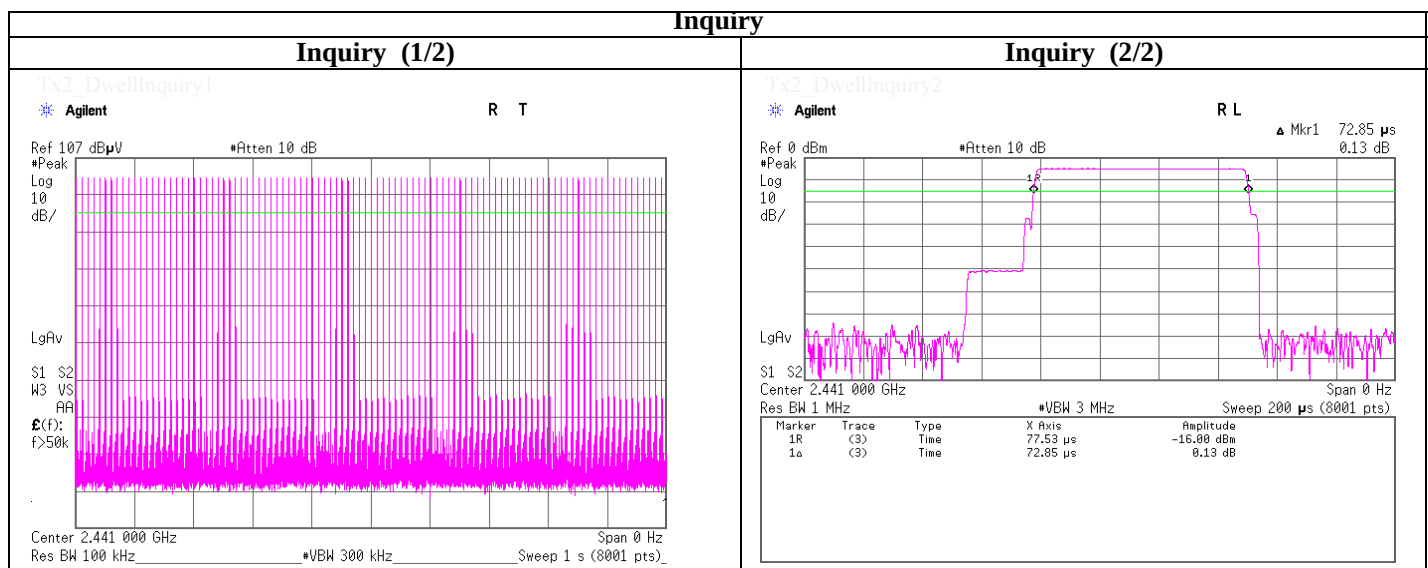
*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	46	48	48	47	49	47.6
DH3	26	25	24	23	25	24.6
DH5	20	21	25	17	19	20.4
Inquiry	100	100	100	100	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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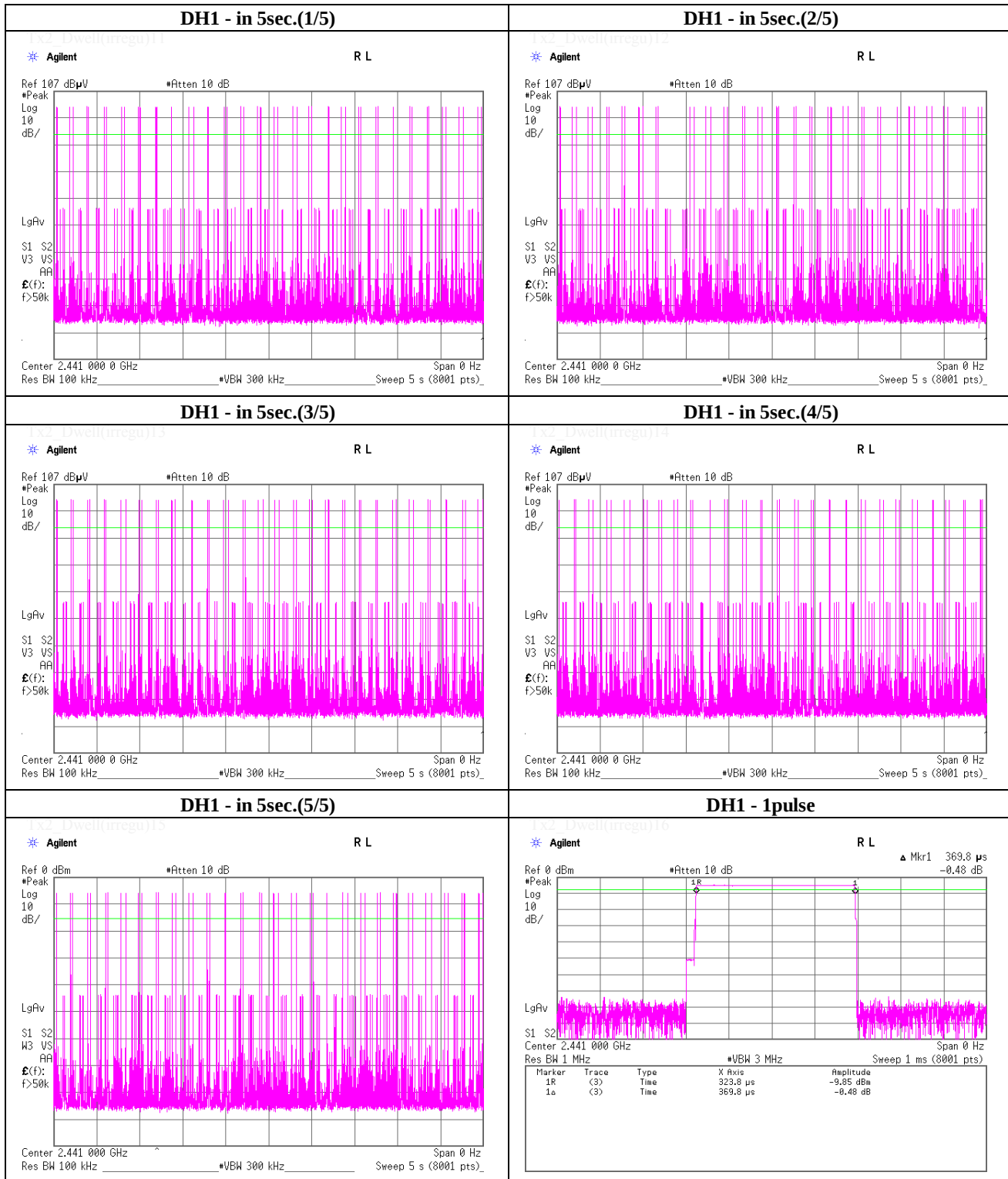
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, 1100



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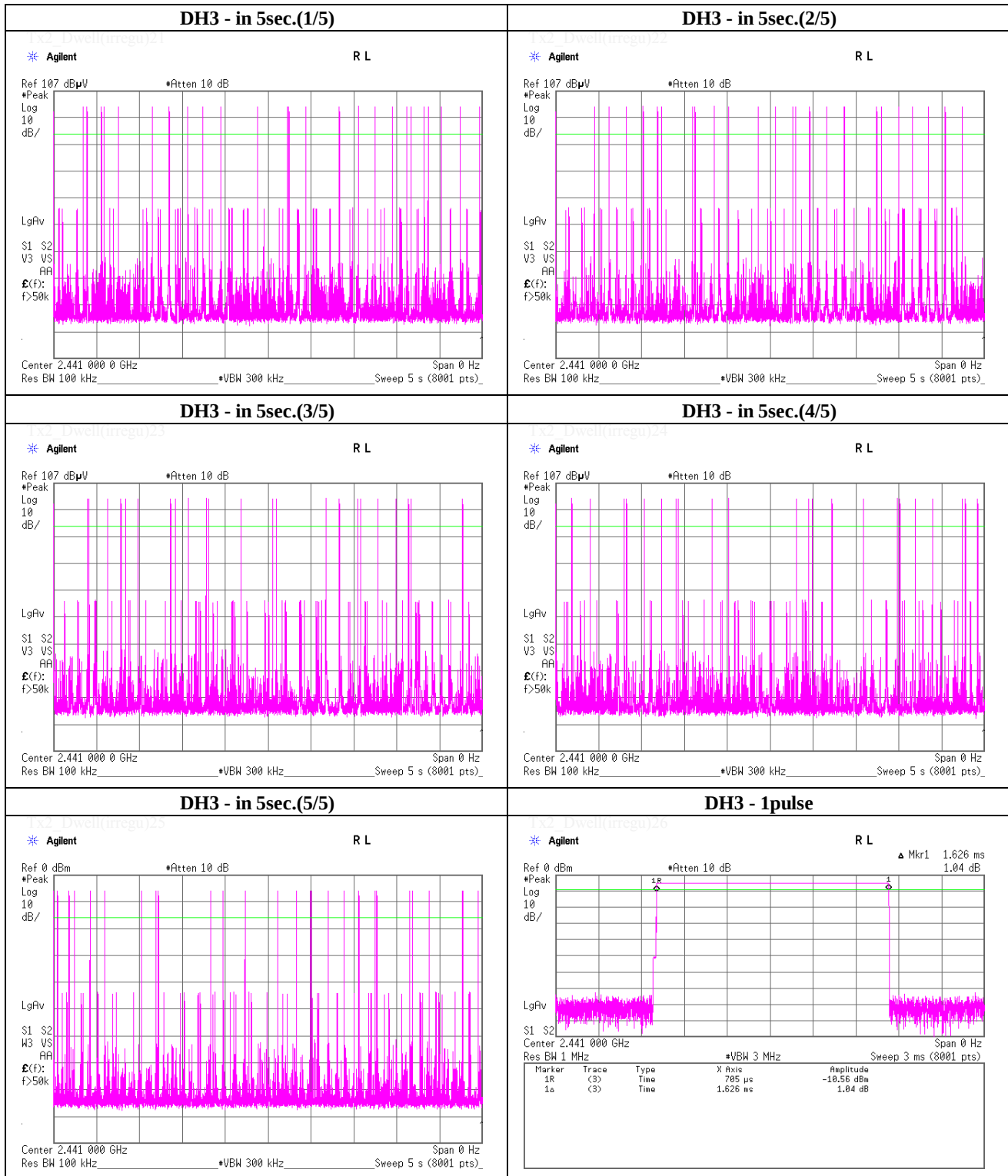
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, 1100



UL Japan, Inc.

Shonan EMC Lab.

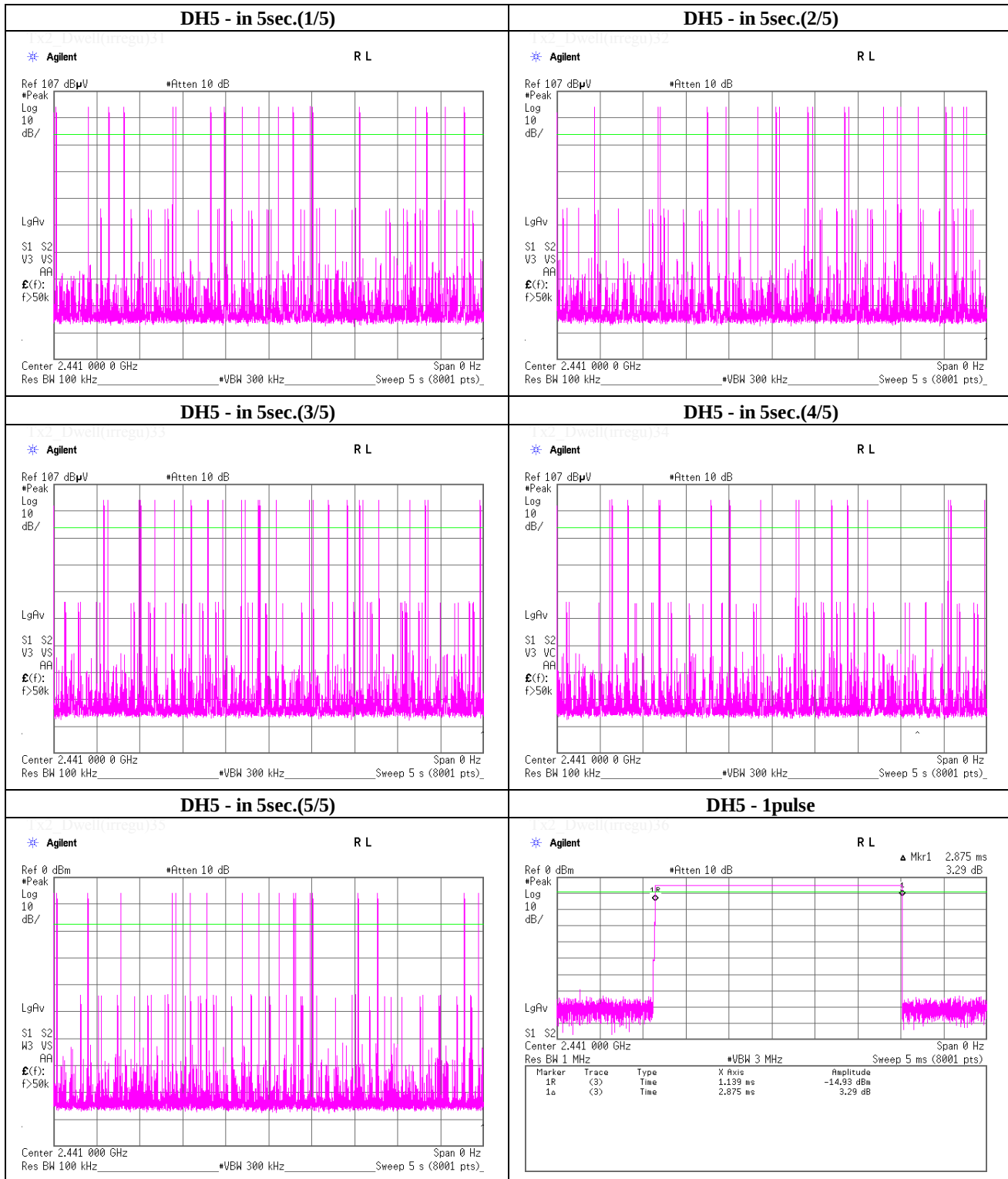
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, 1100



UL Japan, Inc.

Shonan EMC Lab.

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Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date November 12, 2012
Temperature / Humidity 25 deg.C , 51 %RH
Engineer Hikaru Shirasawa
Mode Tx, Bluetooth, EDR, 1100

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	47.6 / 5.0 sec. x 31.6 sec. = 301 times	0.378	114	400
3-DH3	24.8 / 5.0 sec. x 31.6 sec. = 157 times	1.629	256	400
3-DH5	20.0 / 5.0 sec. x 31.6 sec. = 127 times	2.881	366	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	47	50	45	48	48	47.6
3-DH3	26	21	24	22	31	24.8
3-DH5	23	17	22	23	15	20.0

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

Tx2_DwellInquiry1

Tx2_DwellInquiry2

UL Japan, Inc.

Shonan EMC Lab.

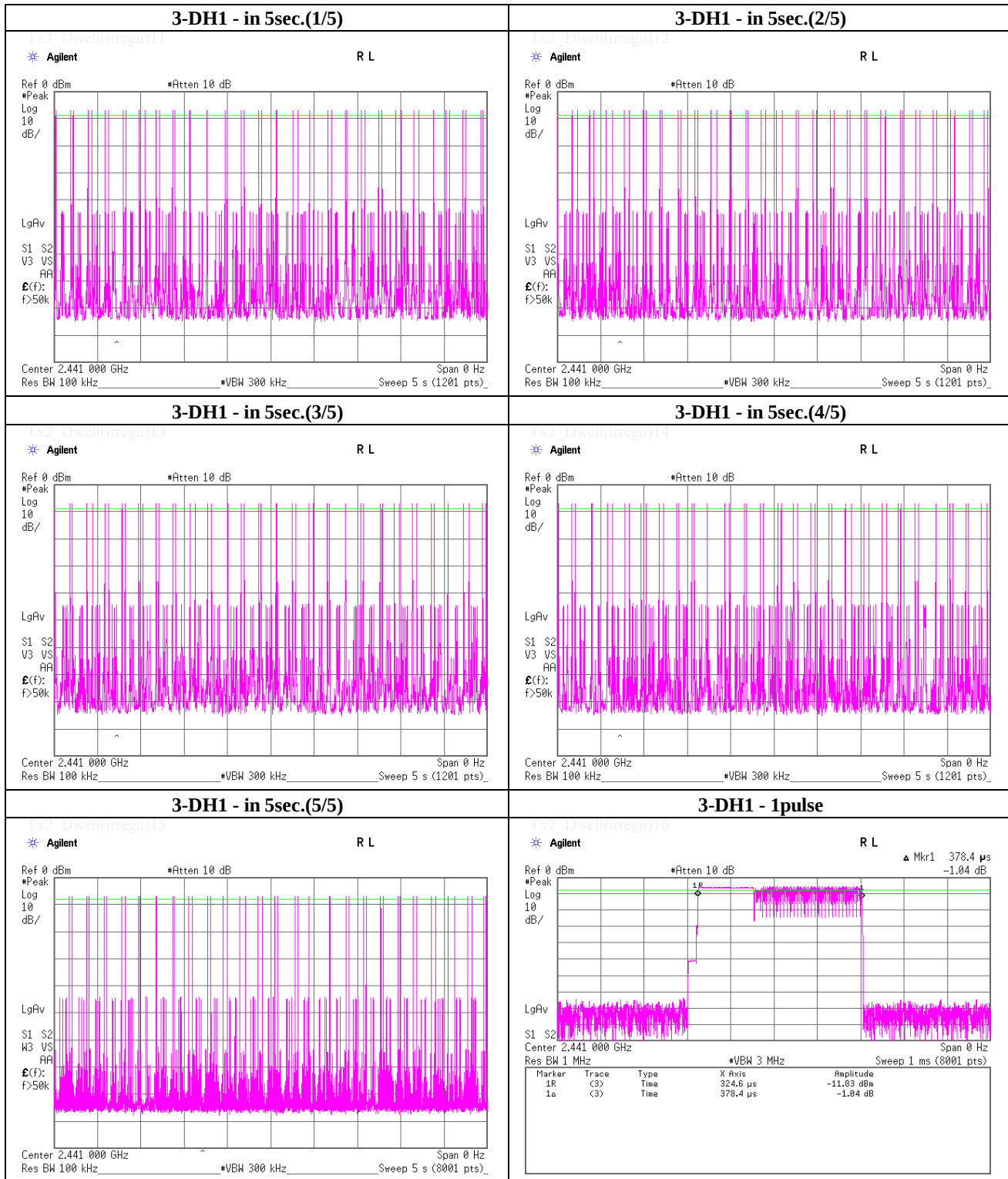
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, 1100



UL Japan, Inc.

Shonan EMC Lab.

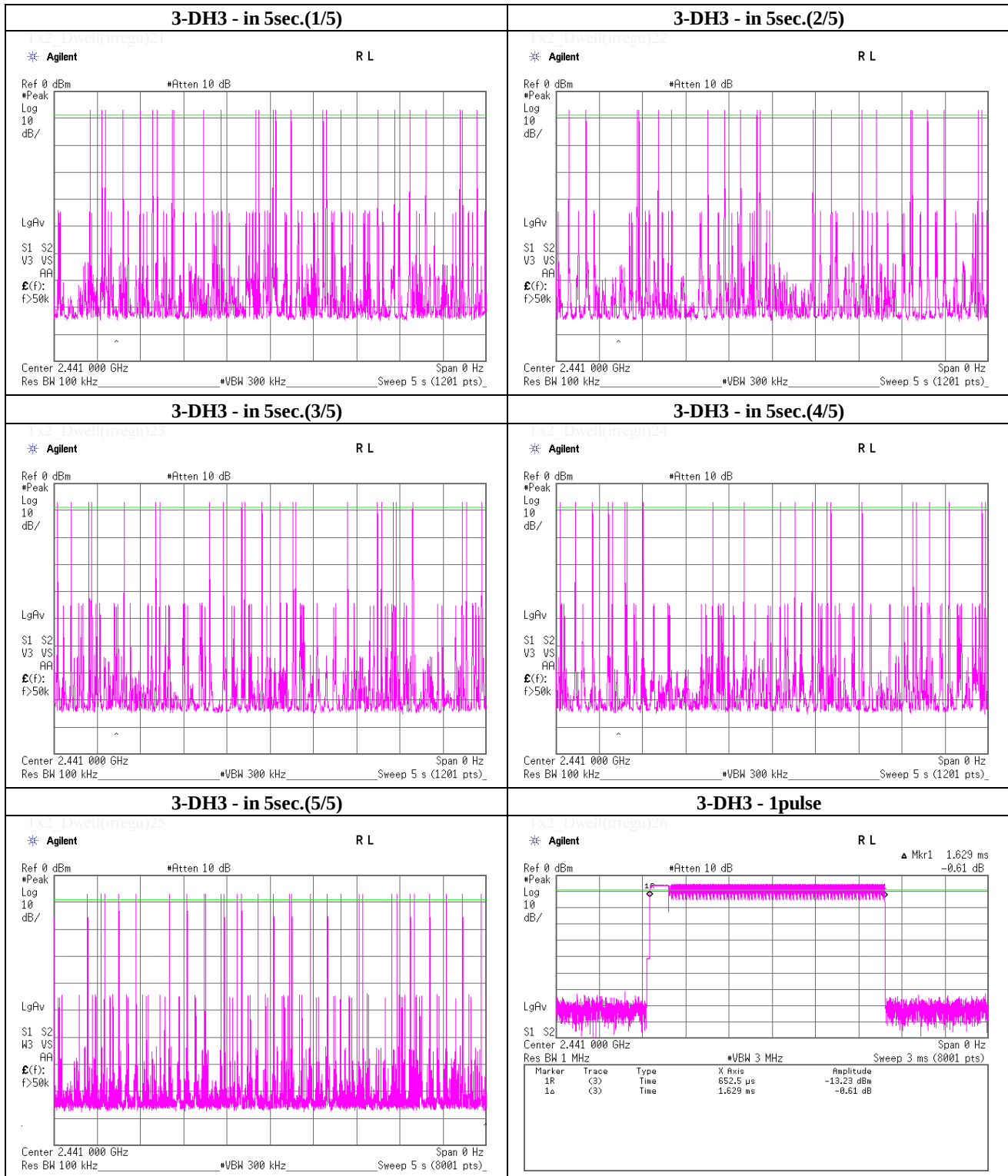
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, 1100



UL Japan, Inc.

Shonan EMC Lab.

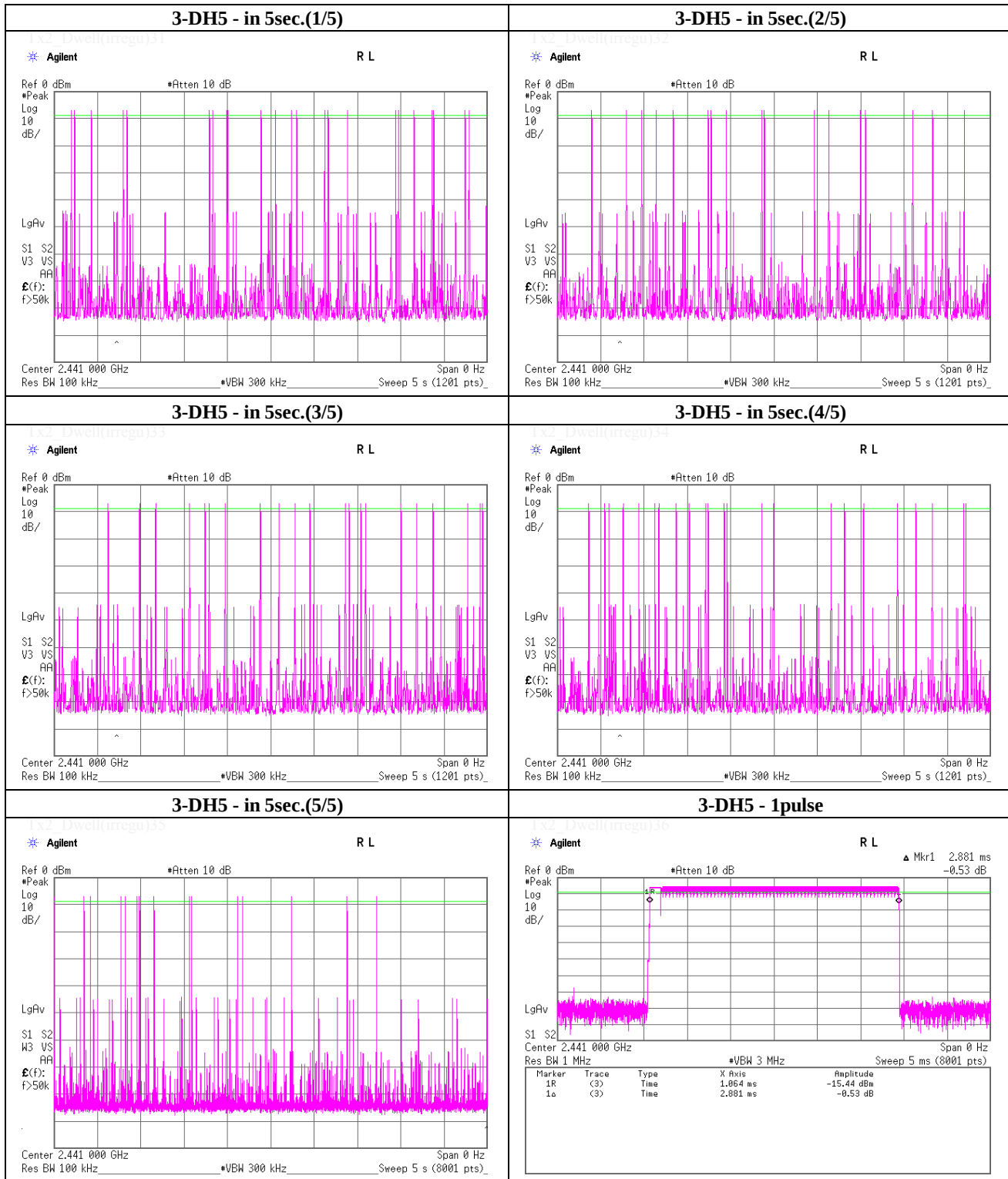
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, 1100



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Maximum Peak Conducted Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date November 12, 2012
Temperature / Humidity 25 deg.C , 51 %RH
Engineer Hikaru Shirasawa
Mode Tx, Bluetooth

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

	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-5.16	1.31	10.00	6.15	4.12	20.97	125	14.82
DH5	2441.0	-4.69	1.32	10.00	6.63	4.60	20.97	125	14.34
DH5	2480.0	-4.43	1.33	10.00	6.90	4.90	20.97	125	14.07
2-DH5	2402.0	-5.76	1.31	10.00	5.55	3.59	20.97	125	15.42
2-DH5	2441.0	-5.27	1.32	10.00	6.05	4.03	20.97	125	14.92
2-DH5	2480.0	-5.00	1.33	10.00	6.33	4.30	20.97	125	14.64
3-DH5	2402.0	-5.19	1.31	10.00	6.12	4.09	20.97	125	14.85
3-DH5	2441.0	-4.72	1.32	10.00	6.60	4.57	20.97	125	14.37
3-DH5	2480.0	-4.45	1.33	10.00	6.88	4.88	20.97	125	14.09

Sample Calculation:

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

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Revised date : January 22, 2015

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 12, 2012 November 13, 2012
Temperature / Humidity 26deg.C, 37%RH 26deg.C, 33%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode DH5, Tx 2402MHz

(* 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.	2390.000	PK	45.9	27.4	14.2	41.4	46.1	73.9	27.8	100	51	noise floor level
Hori.	4804.000	PK	46.8	31.1	6.8	41.2	43.5	73.9	30.4	100	0	noise floor level
Hori.	7206.000	PK	46.9	36.6	8.3	41.4	50.4	73.9	23.5	122	359	noise floor level
Hori.	9608.000	PK	45.8	38.5	9.4	38.9	54.8	73.9	19.1	100	0	noise floor level
Hori.	12010.000	PK	44.3	39.4	10.7	39.4	55.0	73.9	18.9	100	0	noise floor level
Hori.	24020.000	PK	45.2	40.9	-1.4	46.9	37.8	73.9	36.1	100	0	noise floor level
Hori.	2390.000	AV	33.7	27.4	14.2	41.4	33.9	53.9	20.0	100	51	noise floor level
Hori.	4804.000	AV	34.0	31.1	6.8	41.2	30.7	53.9	23.2	100	0	noise floor level
Hori.	7206.000	AV	34.4	36.6	8.3	41.4	37.9	53.9	16.0	122	359	noise floor level
Hori.	9608.000	AV	32.8	38.5	9.4	38.9	41.8	53.9	12.1	100	0	noise floor level
Hori.	12010.000	AV	32.1	39.4	10.7	39.4	42.8	53.9	11.1	100	0	noise floor level
Hori.	24020.000	AV	32.8	40.9	-1.4	46.9	25.4	53.9	28.5	100	0	noise floor level
Vert.	2390.000	PK	45.8	27.4	14.2	41.4	46.0	73.9	27.9	100	41	noise floor level
Vert.	4804.000	PK	46.9	31.1	6.8	41.2	43.6	73.9	30.3	100	0	noise floor level
Vert.	7206.000	PK	46.8	36.6	8.3	41.4	50.3	73.9	23.6	126	24	noise floor level
Vert.	9608.000	PK	45.9	38.5	9.4	38.9	54.9	73.9	19.0	100	0	noise floor level
Vert.	12010.000	PK	44.4	39.4	10.7	39.4	55.1	73.9	18.8	100	0	noise floor level
Vert.	24020.000	PK	45.3	40.9	-1.4	46.9	37.9	73.9	36.0	100	0	noise floor level
Vert.	2390.000	AV	33.6	27.4	14.2	41.4	33.8	53.9	20.1	100	41	noise floor level
Vert.	4804.000	AV	34.0	31.1	6.8	41.2	30.7	53.9	23.2	100	0	noise floor level
Vert.	7206.000	AV	34.6	36.6	8.3	41.4	38.1	53.9	15.8	126	24	noise floor level
Vert.	9608.000	AV	32.8	38.5	9.4	38.9	41.8	53.9	12.1	100	0	noise floor level
Vert.	12010.000	AV	32.2	39.4	10.7	39.4	42.9	53.9	11.0	100	0	noise floor level
Vert.	24020.000	AV	32.9	40.9	-1.4	46.9	25.5	53.9	28.4	100	0	noise floor level

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

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

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]	Height [cm]	Angle [deg]	Remark
Hori.	2402.000	PK	89.0	27.4	14.2	41.4	89.2	-	-	100	51	carrier
Hori.	312.016	PK	73.6	14.2	8.6	32.0	64.4	69.2	4.8	100	96	*1)
Hori.	2400.000	PK	39.3	27.4	14.2	41.4	39.5	69.2	29.7	100	51	
Vert.	2402.000	PK	88.6	27.4	14.2	41.4	88.8	-	-	100	41	carrier
Vert.	312.016	PK	68.1	14.2	8.6	32.0	58.9	68.8	9.9	168	222	*1)
Vert.	2400.000	PK	39.2	27.4	14.2	41.4	39.4	68.8	29.4	100	41	

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

*1) The noise of this frequency is a noise that originates in the radio circuit.

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Revised date : January 22, 2015

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 12, 2012 November 13, 2012
Temperature / Humidity 26deg.C, 37%RH 26deg.C, 33%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode DH5, Tx 2441MHz

(* 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.	4882.000	PK	46.9	31.3	6.9	41.1	44.0	73.9	29.9	100	0	noise floor level
Hori.	7323.000	PK	46.9	36.6	8.6	41.4	50.7	73.9	23.2	122	356	noise floor level
Hori.	12205.000	PK	44.6	39.5	10.8	39.3	55.6	73.9	18.3	100	0	noise floor level
Hori.	24410.000	PK	45.1	40.7	-1.5	47.1	37.2	73.9	36.7	100	0	noise floor level
Hori.	4882.000	AV	34.0	31.3	6.9	41.1	31.1	53.9	22.8	100	0	noise floor level
Hori.	7323.000	AV	34.5	36.6	8.6	41.4	38.3	53.9	15.6	122	356	noise floor level
Hori.	12205.000	AV	32.3	39.5	10.8	39.3	43.3	53.9	10.6	100	0	noise floor level
Hori.	24410.000	AV	32.7	40.7	-1.5	47.1	24.8	53.9	29.1	100	0	noise floor level
Vert.	4882.000	PK	46.8	31.3	6.9	41.1	43.9	73.9	30.0	100	0	noise floor level
Vert.	7323.000	PK	47.0	36.6	8.6	41.4	50.8	73.9	23.1	148	12	noise floor level
Vert.	12205.000	PK	44.7	39.5	10.8	39.3	55.7	73.9	18.2	100	0	noise floor level
Vert.	24410.000	PK	45.0	40.7	-1.5	47.1	37.1	73.9	36.8	100	0	noise floor level
Vert.	4882.000	AV	33.9	31.3	6.9	41.1	31.0	53.9	22.9	100	0	noise floor level
Vert.	7323.000	AV	34.8	36.6	8.6	41.4	38.6	53.9	15.3	148	12	noise floor level
Vert.	12205.000	AV	32.4	39.5	10.8	39.3	43.4	53.9	10.5	100	0	noise floor level
Vert.	24410.000	AV	32.6	40.7	-1.5	47.1	24.7	53.9	29.2	100	0	noise floor level

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

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

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]	Height [cm]	Angle [deg]	Remark
Hori.	2441.000	PK	87.1	27.5	14.2	41.4	87.4	-	-	148	43	carrier
Hori.	312.018	PK	73.5	14.2	8.6	32.0	64.3	67.4	3.1	100	92	*1)
Vert.	2441.000	PK	88.3	27.5	14.2	41.4	88.6	-	-	108	34	carrier
Vert.	312.018	PK	68.1	14.2	8.6	32.0	58.9	68.6	9.7	170	225	*1)

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

*1) The noise of this frequency is a noise that originates in the radio circuit.

UL Japan, Inc.

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Revised date : January 22, 2015

Radiated Emission

Test place : UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date : November 12, 2012 November 13, 2012
Temperature / Humidity : 26deg.C, 37%RH 26deg.C, 33%RH
Engineer : Kenichi Adachi Kenichi Adachi
Mode : DH5, Tx 2480MHz

(* 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.	2483.500	PK	46.0	27.5	14.3	41.4	46.4	73.9	27.5	122	30	noise floor level
Hori.	4960.000	PK	47.1	31.6	6.9	41.0	44.6	73.9	29.3	100	0	noise floor level
Hori.	7440.000	PK	47.8	36.7	8.8	41.5	51.8	73.9	22.1	125	359	noise floor level
Hori.	12400.000	PK	45.8	39.5	10.8	39.3	56.8	73.9	17.1	100	0	noise floor level
Hori.	24800.000	PK	45.5	40.5	-1.5	47.1	37.4	73.9	36.5	100	0	noise floor level
Hori.	2483.500	AV	34.0	27.5	14.3	41.4	34.4	53.9	19.5	122	30	noise floor level
Hori.	4960.000	AV	33.9	31.6	6.9	41.0	31.4	53.9	22.5	100	0	noise floor level
Hori.	7440.000	AV	35.2	36.7	8.8	41.5	39.2	53.9	14.7	125	359	noise floor level
Hori.	12400.000	AV	33.2	39.5	10.8	39.3	44.2	53.9	9.7	100	0	noise floor level
Hori.	24800.000	AV	32.8	40.5	-1.5	47.1	24.7	53.9	29.2	100	0	noise floor level
Vert.	2483.500	PK	45.9	27.5	14.3	41.4	46.3	73.9	27.6	100	33	noise floor level
Vert.	4960.000	PK	47.0	31.6	6.9	41.0	44.5	73.9	29.4	100	0	noise floor level
Vert.	7440.000	PK	47.9	36.7	8.8	41.5	51.9	73.9	22.0	138	15	noise floor level
Vert.	12400.000	PK	45.7	39.5	10.8	39.3	56.7	73.9	17.2	100	0	noise floor level
Vert.	24800.000	PK	45.4	40.5	-1.5	47.1	37.3	73.9	36.6	100	0	noise floor level
Vert.	2483.500	AV	34.1	27.5	14.3	41.4	34.5	53.9	19.4	100	33	noise floor level
Vert.	4960.000	AV	34.0	31.6	6.9	41.0	31.5	53.9	22.4	100	0	noise floor level
Vert.	7440.000	AV	35.6	36.7	8.8	41.5	39.6	53.9	14.3	138	15	noise floor level
Vert.	12400.000	AV	33.1	39.5	10.8	39.3	44.1	53.9	9.8	100	0	noise floor level
Vert.	24800.000	AV	32.7	40.5	-1.5	47.1	24.6	53.9	29.3	100	0	noise floor level

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

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

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]	Height [cm]	Angle [deg]	Remark
Hori.	2480.000	PK	87.6	27.5	14.3	41.4	88.0	-	-	122	30	carrier
Hori.	312.015	PK	73.5	14.2	8.6	32.0	64.3	68.0	3.7	100	95	*1)
Vert.	2480.000	PK	88.6	27.5	14.3	41.4	89.0	-	-	100	33	carrier
Vert.	312.015	PK	68.0	14.2	8.6	32.0	58.8	69.0	10.2	172	223	*1)

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

*1) The noise of this frequency is a noise that originates in the radio circuit.

Revised date : January 22, 2015

Radiated Emission

Test place : UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date : November 12, 2012 November 13, 2012
Temperature / Humidity : 26deg.C, 37%RH 26deg.C, 33%RH
Engineer : Kenichi Adachi Kenichi Adachi
Mode : 3-DH5, Tx 2402MHz

(* 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.	2390.000	PK	46.0	27.4	14.2	41.4	46.2	73.9	27.7	105	49	noise floor level
Hori.	4804.000	PK	47.1	31.1	6.8	41.2	43.8	73.9	30.1	100	0	noise floor level
Hori.	7206.000	PK	46.9	36.6	8.3	41.4	50.4	73.9	23.5	142	253	noise floor level
Hori.	9608.000	PK	46.0	38.5	9.4	38.9	55.0	73.9	18.9	100	0	noise floor level
Hori.	12010.000	PK	44.5	39.4	10.7	39.4	55.2	73.9	18.7	100	0	noise floor level
Hori.	2390.000	AV	33.6	27.4	14.2	41.4	33.8	53.9	20.1	105	49	noise floor level
Hori.	4804.000	AV	34.1	31.1	6.8	41.2	30.8	53.9	23.1	100	0	noise floor level
Hori.	7206.000	AV	34.4	36.6	8.3	41.4	37.9	53.9	16.0	142	253	noise floor level
Hori.	9608.000	AV	32.9	38.5	9.4	38.9	41.9	53.9	12.0	100	0	noise floor level
Hori.	12010.000	AV	32.2	39.4	10.7	39.4	42.9	53.9	11.0	100	0	noise floor level
Vert.	2390.000	PK	45.9	27.4	14.2	41.4	46.1	73.9	27.8	109	36	noise floor level
Vert.	4804.000	PK	47.0	31.1	6.8	41.2	43.7	73.9	30.2	100	0	noise floor level
Vert.	7206.000	PK	46.9	36.6	8.3	41.4	50.4	73.9	23.5	138	32	noise floor level
Vert.	9608.000	PK	45.8	38.5	9.4	38.9	54.8	73.9	19.1	100	0	noise floor level
Vert.	12010.000	PK	44.4	39.4	10.7	39.4	55.1	73.9	18.8	100	0	noise floor level
Vert.	2390.000	AV	33.7	27.4	14.2	41.4	33.9	53.9	20.0	109	36	noise floor level
Vert.	4804.000	AV	34.0	31.1	6.8	41.2	30.7	53.9	23.2	100	0	noise floor level
Vert.	7206.000	AV	34.7	36.6	8.3	41.4	38.2	53.9	15.7	138	32	noise floor level
Vert.	9608.000	AV	32.8	38.5	9.4	38.9	41.8	53.9	12.1	100	0	noise floor level
Vert.	12010.000	AV	32.1	39.4	10.7	39.4	42.8	53.9	11.1	100	0	noise floor level

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

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

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]	Height [cm]	Angle [deg]	Remark
Hori.	2402.000	PK	86.8	27.4	14.2	41.4	87.0	-	-	105	48	carrier
Hori.	71.998	PK	58.0	6.5	7.0	32.2	39.3	67.0	27.7	155	283	*2)
Hori.	216.005	PK	69.2	16.6	8.0	32.0	61.8	67.0	5.2	156	68	*2)
Hori.	288.004	PK	55.7	19.0	8.5	32.0	51.2	67.0	15.8	118	40	*2)
Hori.	312.017	PK	73.5	14.2	8.6	32.0	64.3	67.0	2.7	100	94	*1)
Hori.	336.019	PK	57.2	14.8	8.7	32.0	48.7	67.0	18.3	100	98	*2)
Hori.	360.025	PK	64.9	15.3	8.8	32.0	57.0	67.0	10.0	100	107	*2)
Hori.	696.044	PK	46.9	20.2	10.1	31.9	45.3	67.0	21.7	135	235	*2)
Hori.	744.046	PK	50.2	20.5	10.3	31.8	49.2	67.0	17.8	100	118	*2)
Hori.	840.052	PK	45.6	21.4	10.5	31.4	46.1	67.0	20.9	100	221	*2)
Hori.	888.055	PK	46.9	22.1	10.7	31.2	48.5	67.0	18.5	114	159	*2)
Hori.	912.057	PK	43.7	22.3	10.7	31.0	45.7	67.0	21.3	141	171	*2)
Hori.	936.058	PK	43.4	22.5	10.8	30.8	45.9	67.0	21.1	142	165	*1)
Hori.	2400.000	PK	38.7	27.4	14.2	41.4	38.9	67.0	28.1	105	48	
Vert.	2402.000	PK	87.4	27.4	14.2	41.4	87.6	-	-	109	36	carrier
Vert.	71.998	PK	58.6	6.5	7.0	32.2	39.9	67.6	27.7	100	272	*2)
Vert.	216.005	PK	65.1	16.6	8.0	32.0	57.7	67.6	9.9	100	253	*2)
Vert.	288.004	PK	52.3	19.0	8.5	32.0	47.8	67.6	19.8	100	224	*2)
Vert.	312.017	PK	68.2	14.2	8.6	32.0	59.0	67.6	8.6	173	220	*1)
Vert.	336.019	PK	53.2	14.8	8.7	32.0	44.7	67.6	22.9	130	218	*2)
Vert.	360.025	PK	62.9	15.3	8.8	32.0	55.0	67.6	12.6	139	227	*2)
Vert.	696.044	PK	46.7	20.2	10.1	31.9	45.1	67.6	22.5	100	265	*2)
Vert.	744.046	PK	43.8	20.5	10.3	31.8	42.8	67.6	24.8	100	244	*2)
Vert.	888.055	PK	41.6	22.1	10.7	31.2	43.2	67.6	24.4	154	230	*2)
Vert.	936.058	PK	42.3	22.5	10.8	30.8	44.8	67.6	22.8	100	13	*1)
Vert.	2400.000	PK	39.0	27.4	14.2	41.4	39.2	67.6	28.4	109	36	

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

*1) The noise of this frequency is a noise that originates in the radio circuit.

*2) 20dBc limit was applied for the noise that originate in-vehicle equipment part and the noise that did not originate in the radio part, because EUT is in-vehicle equipment and it is an equipment that should not suit FCC15B.

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Revised date : January 22, 2015

Radiated Emission

Test place : UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date : November 12, 2012 November 13, 2012
Temperature / Humidity : 26deg.C, 37%RH 26deg.C, 33%RH
Engineer : Kenichi Adachi Kenichi Adachi
Mode : 3-DH5, Tx 2441MHz

(* 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.	4882.000	PK	47.1	31.3	6.9	41.1	44.2	73.9	29.7	100	0	noise floor level
Hori.	7323.000	PK	47.8	36.6	8.6	41.4	51.6	73.9	22.3	117	12	noise floor level
Hori.	12205.000	PK	44.7	39.5	10.8	39.3	55.7	73.9	18.2	100	0	noise floor level
Hori.	24410.000	PK	45.0	40.7	-1.5	47.1	37.1	73.9	36.8	100	0	noise floor level
Hori.	4882.000	AV	34.0	31.3	6.9	41.1	31.1	53.9	22.8	100	0	noise floor level
Hori.	7323.000	AV	35.6	36.6	8.6	41.4	39.4	53.9	14.5	117	12	noise floor level
Hori.	12205.000	AV	32.4	39.5	10.8	39.3	43.4	53.9	10.5	100	0	noise floor level
Hori.	24410.000	AV	32.6	40.7	-1.5	47.1	24.7	53.9	29.2	100	0	noise floor level
Vert.	4882.000	PK	46.9	31.3	6.9	41.1	44.0	73.9	29.9	100	0	noise floor level
Vert.	7323.000	PK	48.6	36.6	8.6	41.4	52.4	73.9	21.5	142	16	noise floor level
Vert.	12205.000	PK	44.6	39.5	10.8	39.3	55.6	73.9	18.3	100	0	noise floor level
Vert.	24410.000	PK	45.1	40.7	-1.5	47.1	37.2	73.9	36.7	100	0	noise floor level
Vert.	4882.000	AV	34.0	31.3	6.9	41.1	31.1	53.9	22.8	100	0	noise floor level
Vert.	7323.000	AV	36.1	36.6	8.6	41.4	39.9	53.9	14.0	142	16	noise floor level
Vert.	12205.000	AV	32.3	39.5	10.8	39.3	43.3	53.9	10.6	100	0	noise floor level
Vert.	24410.000	AV	32.7	40.7	-1.5	47.1	24.8	53.9	29.1	100	0	noise floor level

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

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

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]	Height [cm]	Angle [deg]	Remark
Hori.	2441.000	PK	86.0	27.5	14.2	41.4	86.3	-	-	154	41	carrier
Hori.	312.019	PK	73.4	14.2	8.6	32.0	64.2	66.3	2.1	100	95	*1)
Vert.	2441.000	PK	86.7	27.5	14.2	41.4	87.0	-	-	104	33	carrier
Vert.	312.019	PK	68.2	14.2	8.6	32.0	59.0	67.0	8.0	169	227	*1)

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

*1) The noise of this frequency is a noise that originates in the radio circuit.

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 12, 2012 November 13, 2012
Temperature / Humidity 26deg.C, 37%RH 26deg.C, 33%RH
Engineer Kenichi Adachi Kenichi Adachi
Mode 3-DH5, Tx 2480MHz

(* 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.	2483.500	PK	46.0	27.5	14.3	41.4	46.4	73.9	27.5	120	30	noise floor level
Hori.	4960.000	PK	47.0	31.6	6.9	41.0	44.5	73.9	29.4	100	0	noise floor level
Hori.	7440.000	PK	49.0	36.7	8.8	41.5	53.0	73.9	20.9	124	257	noise floor level
Hori.	12400.000	PK	45.7	39.5	10.8	39.3	56.7	73.9	17.2	100	0	noise floor level
Hori.	24800.000	PK	45.4	40.5	-1.5	47.1	37.3	73.9	36.6	100	0	noise floor level
Hori.	2483.500	AV	34.0	27.5	14.3	41.4	34.4	53.9	19.5	120	30	noise floor level
Hori.	4960.000	AV	34.0	31.6	6.9	41.0	31.5	53.9	22.4	100	0	noise floor level
Hori.	7440.000	AV	35.9	36.7	8.8	41.5	39.9	53.9	14.0	124	257	noise floor level
Hori.	12400.000	AV	33.1	39.5	10.8	39.3	44.1	53.9	9.8	100	0	noise floor level
Hori.	24800.000	AV	32.7	40.5	-1.5	47.1	24.6	53.9	29.3	100	0	noise floor level
Vert.	2483.500	PK	46.1	27.5	14.3	41.4	46.5	73.9	27.4	100	34	noise floor level
Vert.	4960.000	PK	46.9	31.6	6.9	41.0	44.4	73.9	29.5	100	0	noise floor level
Vert.	7440.000	PK	48.9	36.7	8.8	41.5	52.9	73.9	21.0	100	259	noise floor level
Vert.	12400.000	PK	45.8	39.5	10.8	39.3	56.8	73.9	17.1	100	0	noise floor level
Vert.	24800.000	PK	45.5	40.5	-1.5	47.1	37.4	73.9	36.5	100	0	noise floor level
Vert.	2483.500	AV	34.0	27.5	14.3	41.4	34.4	53.9	19.5	100	34	noise floor level
Vert.	4960.000	AV	34.0	31.6	6.9	41.0	31.5	53.9	22.4	100	0	noise floor level
Vert.	7440.000	AV	36.7	36.7	8.8	41.5	40.7	53.9	13.2	100	259	noise floor level
Vert.	12400.000	AV	33.2	39.5	10.8	39.3	44.2	53.9	9.7	100	0	noise floor level
Vert.	24800.000	AV	32.7	40.5	-1.5	47.1	24.6	53.9	29.3	100	0	noise floor level

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

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

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]	Height [cm]	Angle [deg]	Remark
Hori.	2480.000	PK	86.1	27.5	14.3	41.4	86.5	-	-	120	30	carrier
Hori.	312.017	PK	73.4	14.2	8.6	32.0	64.2	66.5	2.3	100	93	*1)
Vert.	2480.000	PK	87.5	27.5	14.3	41.4	87.9	-	-	100	34	carrier
Vert.	312.017	PK	67.9	14.2	8.6	32.0	58.7	67.9	9.2	166	224	*1)

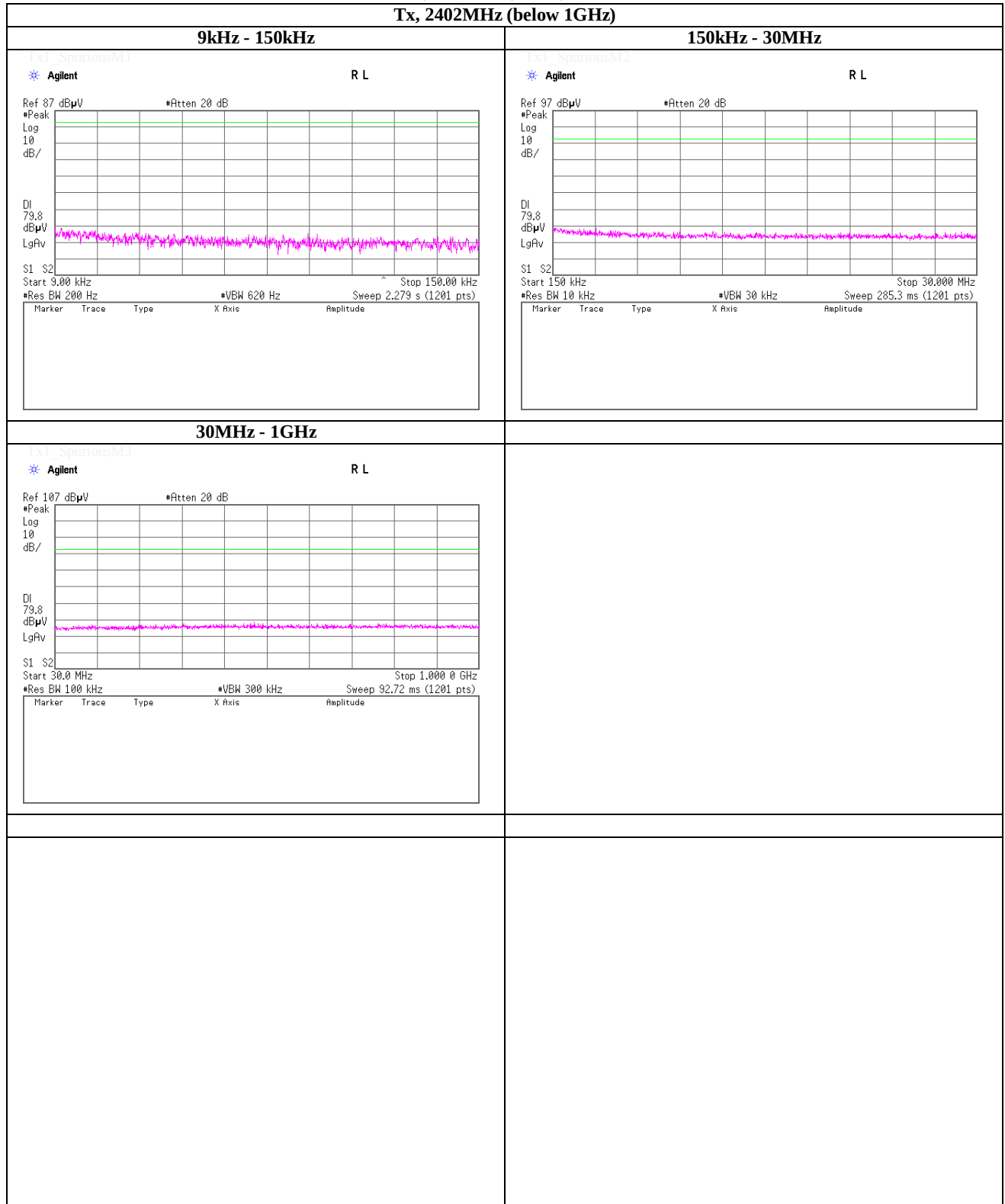
Result = Reading + Ant Factor + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

*1) The noise of this frequency is a noise that originates in the radio circuit.

Spurious emission (Conducted)

Tx, Bluetooth, BDR, 1100

Tx, 2402MHz (below 1GHz)



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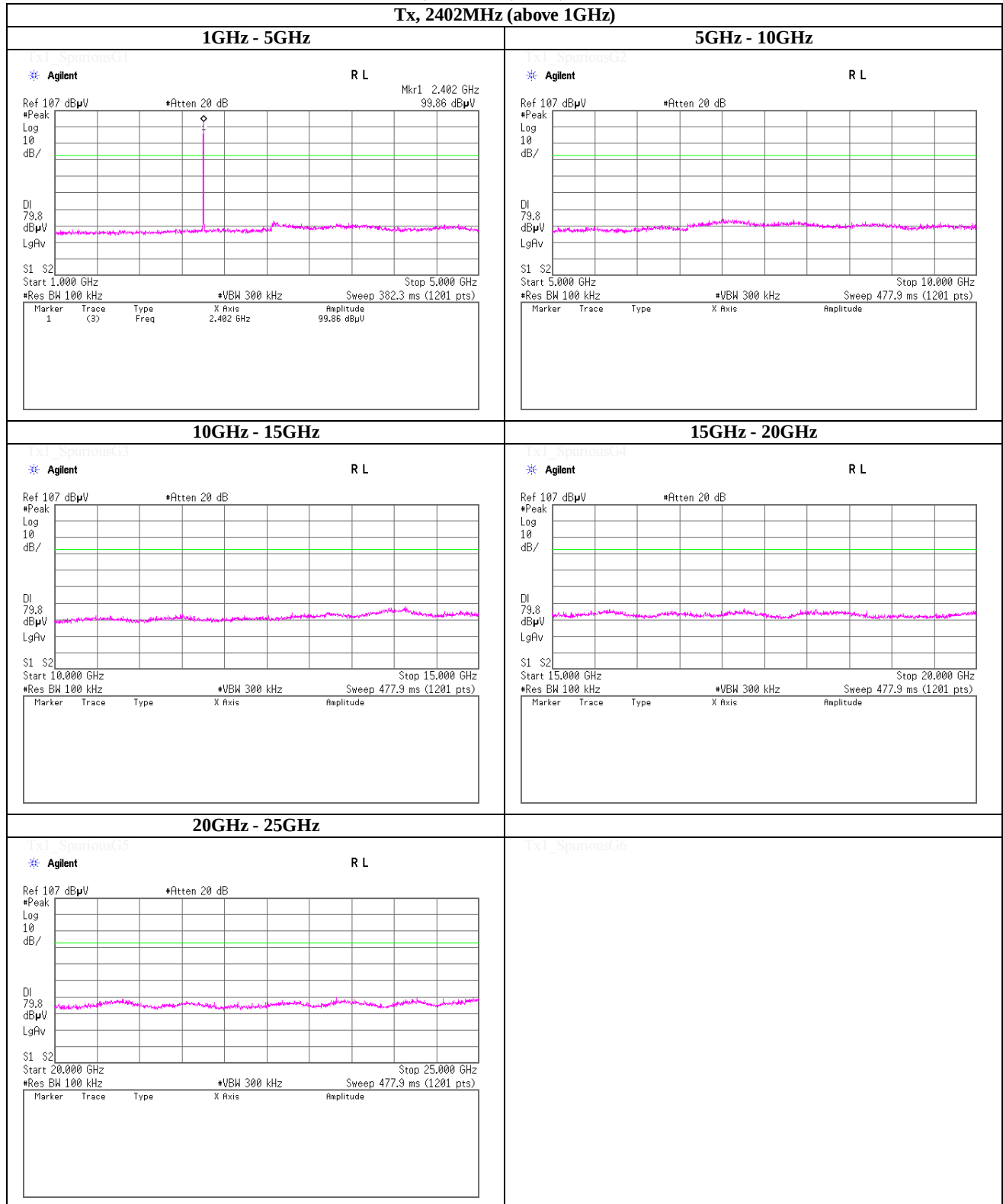
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, 1100

Tx, 2402MHz (above 1GHz)



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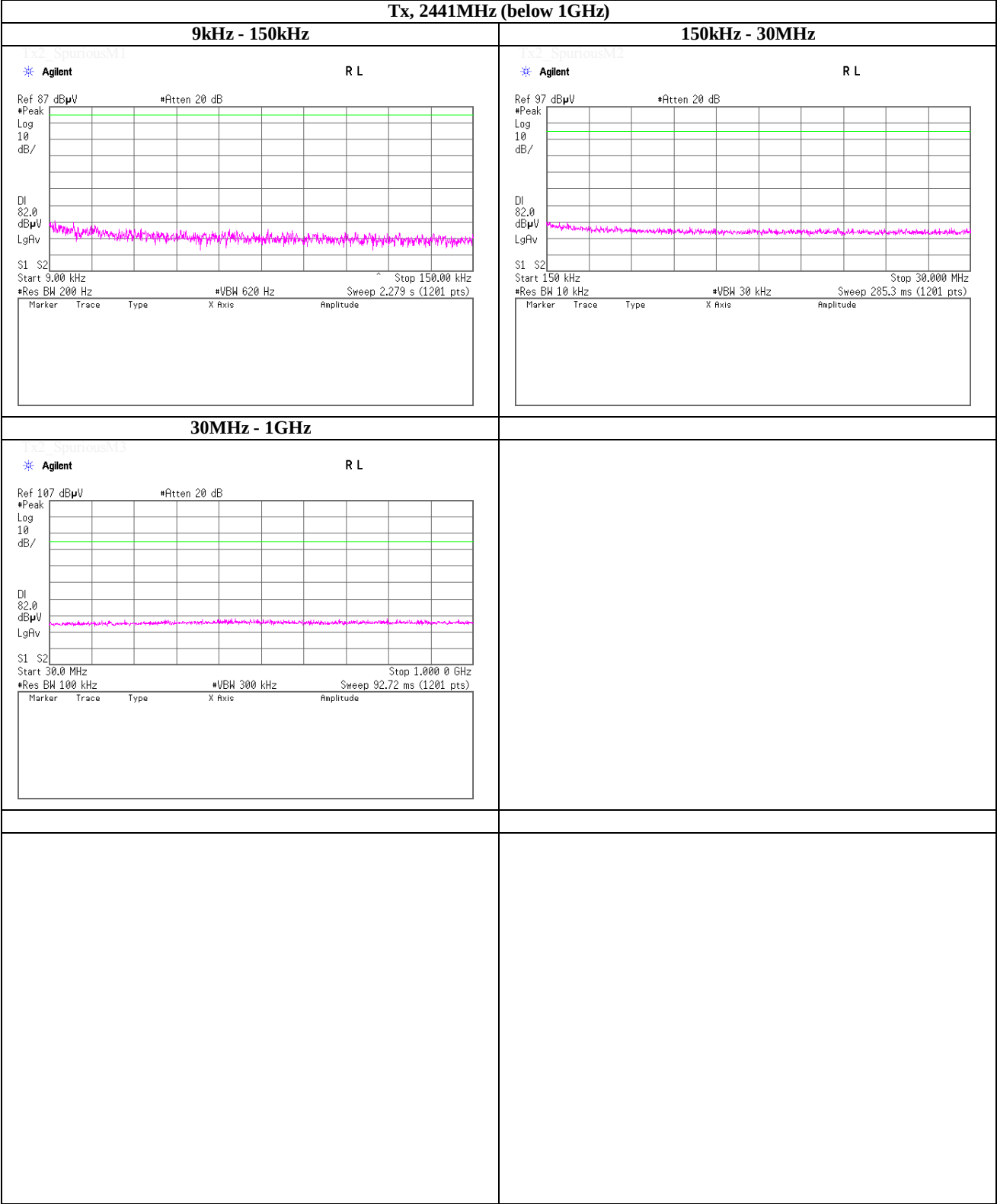
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, BDR, 1100

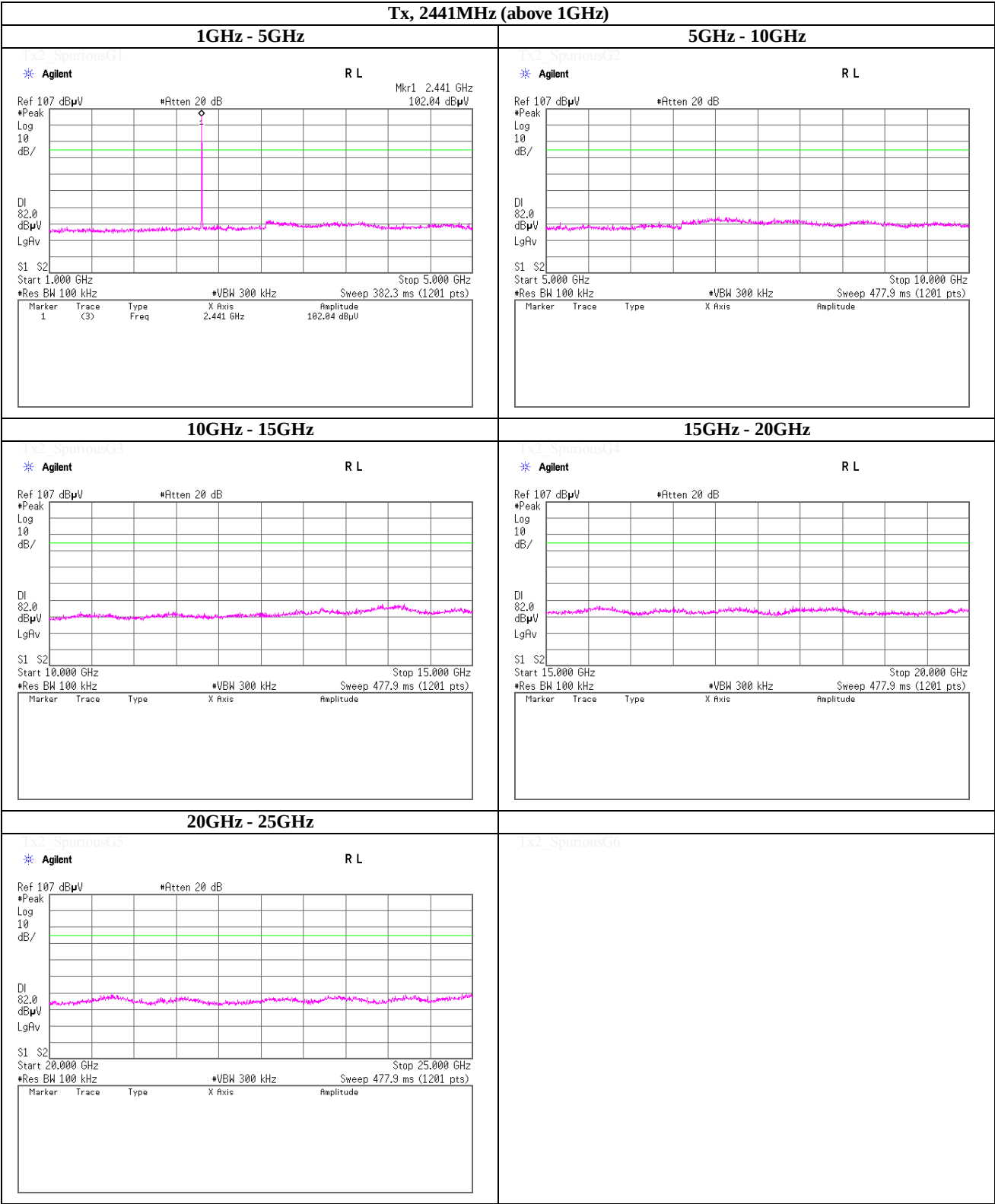
Tx, 2441MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, 1100

Tx, 2441MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, 1100

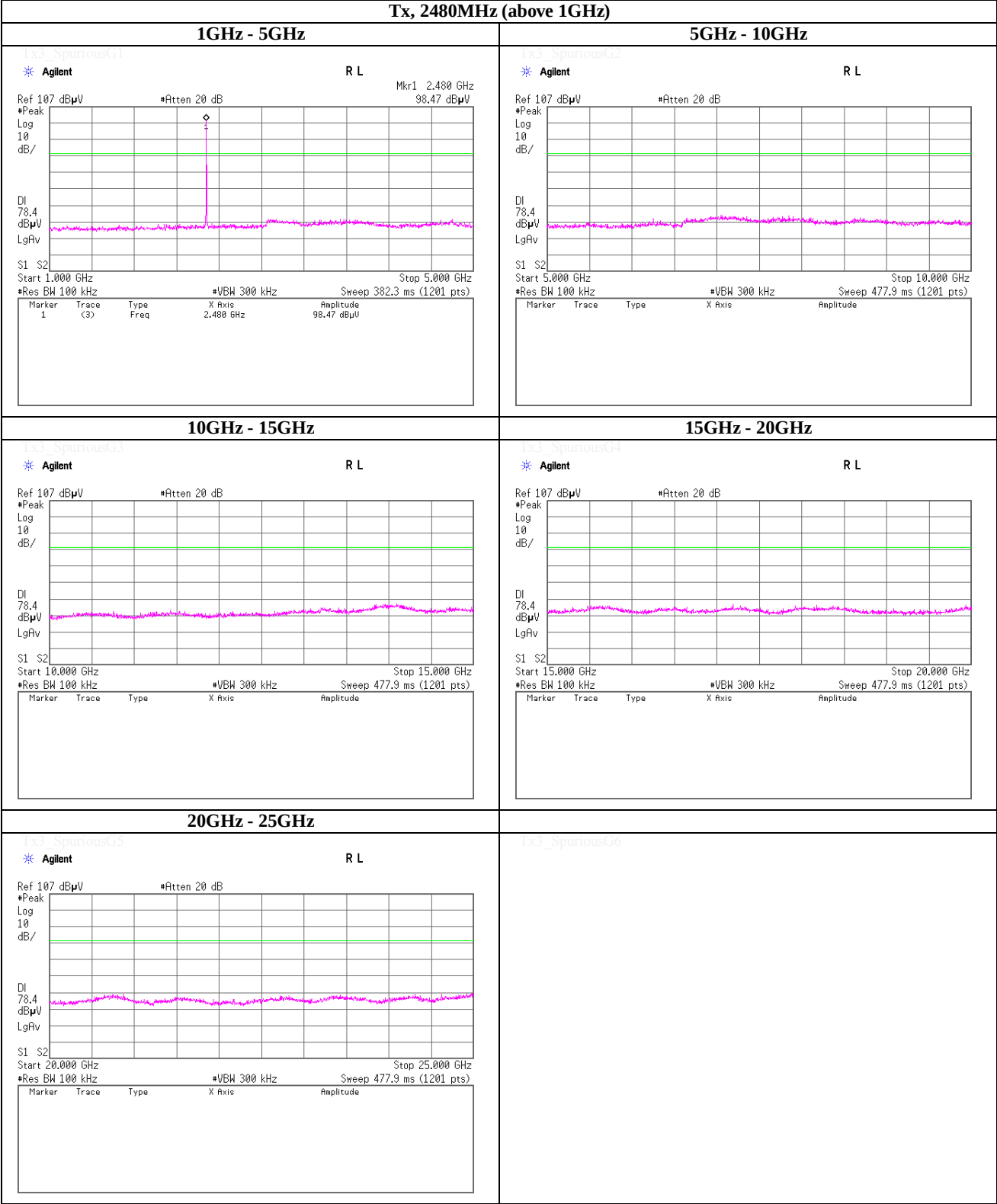
Tx, 2480MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, 1100

Tx, 2480MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, 1100

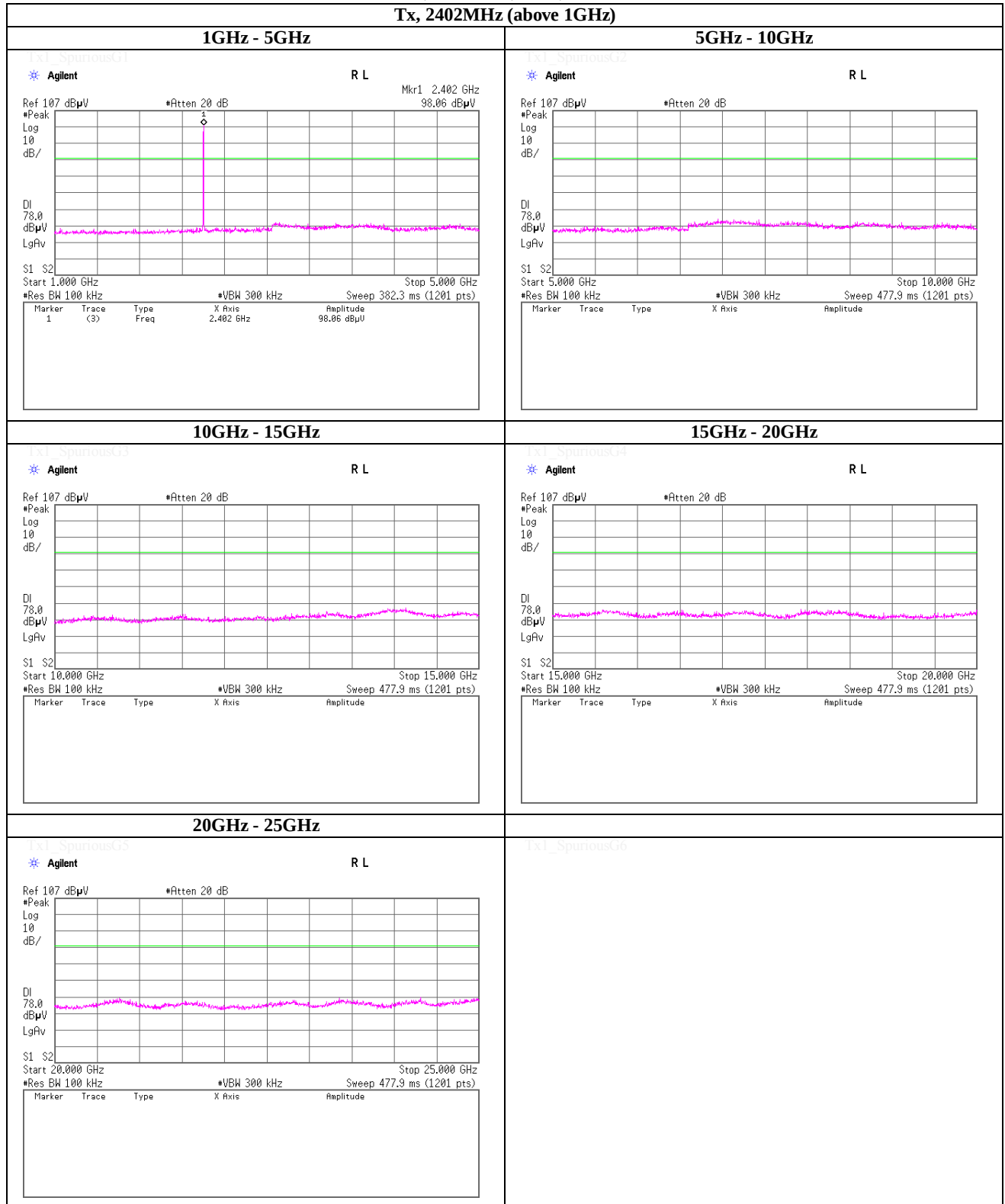
Tx, 2402MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, 1100

Tx, 2402MHz (above 1GHz)



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Spurious emission (Conducted)

Tx, Bluetooth, EDR, 1100

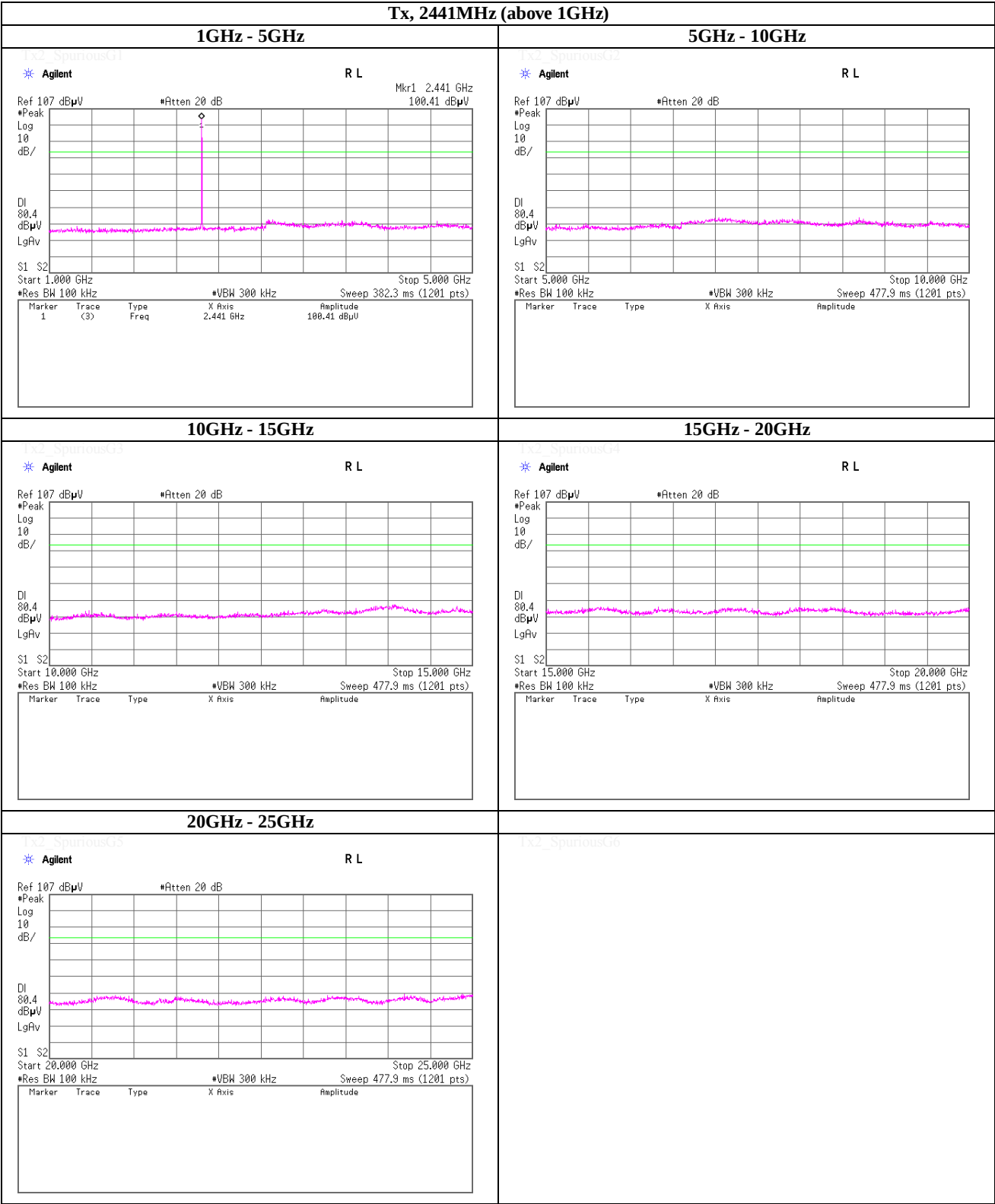
Tx, 2441MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, 1100

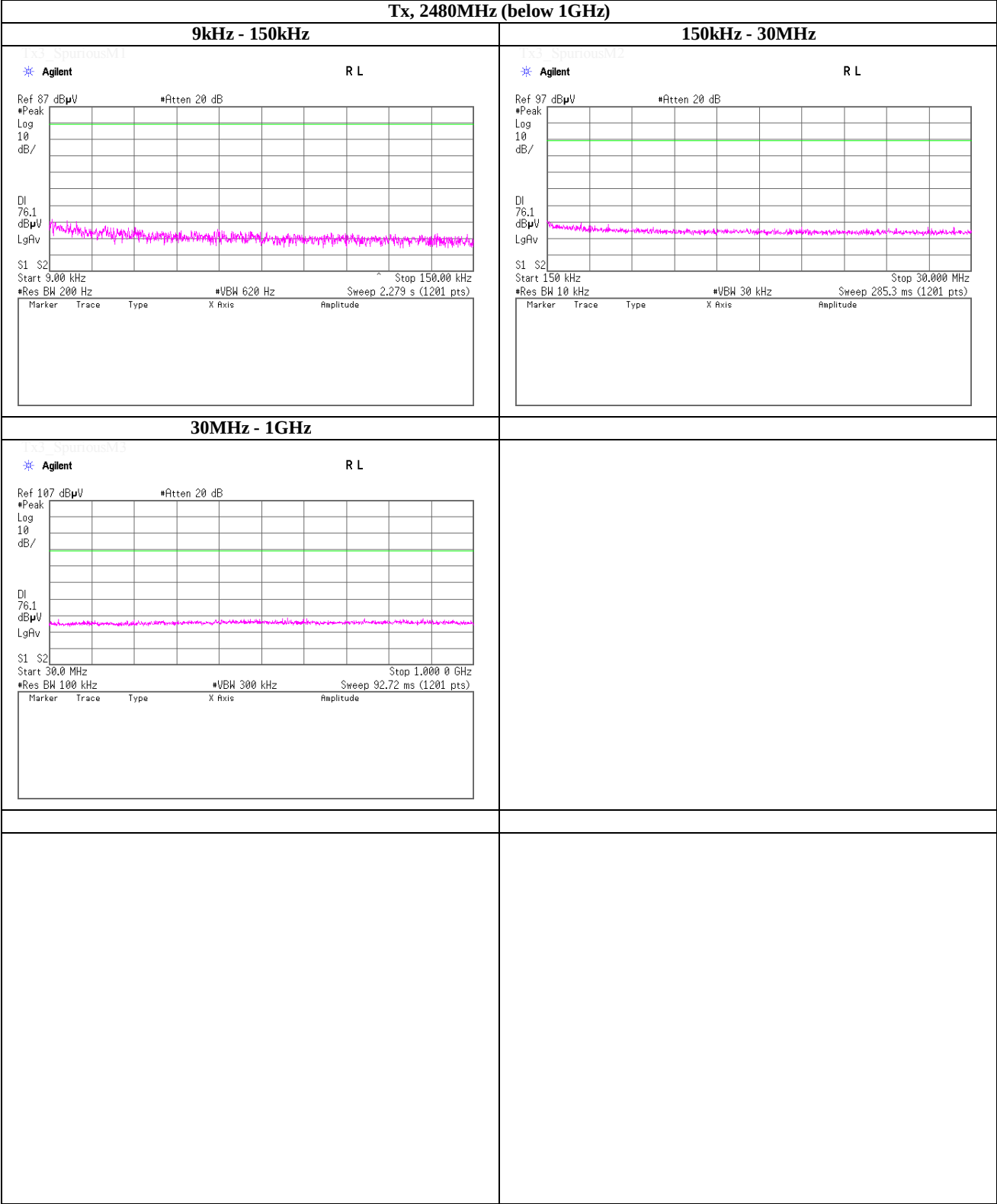
Tx, 2441MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, 1100

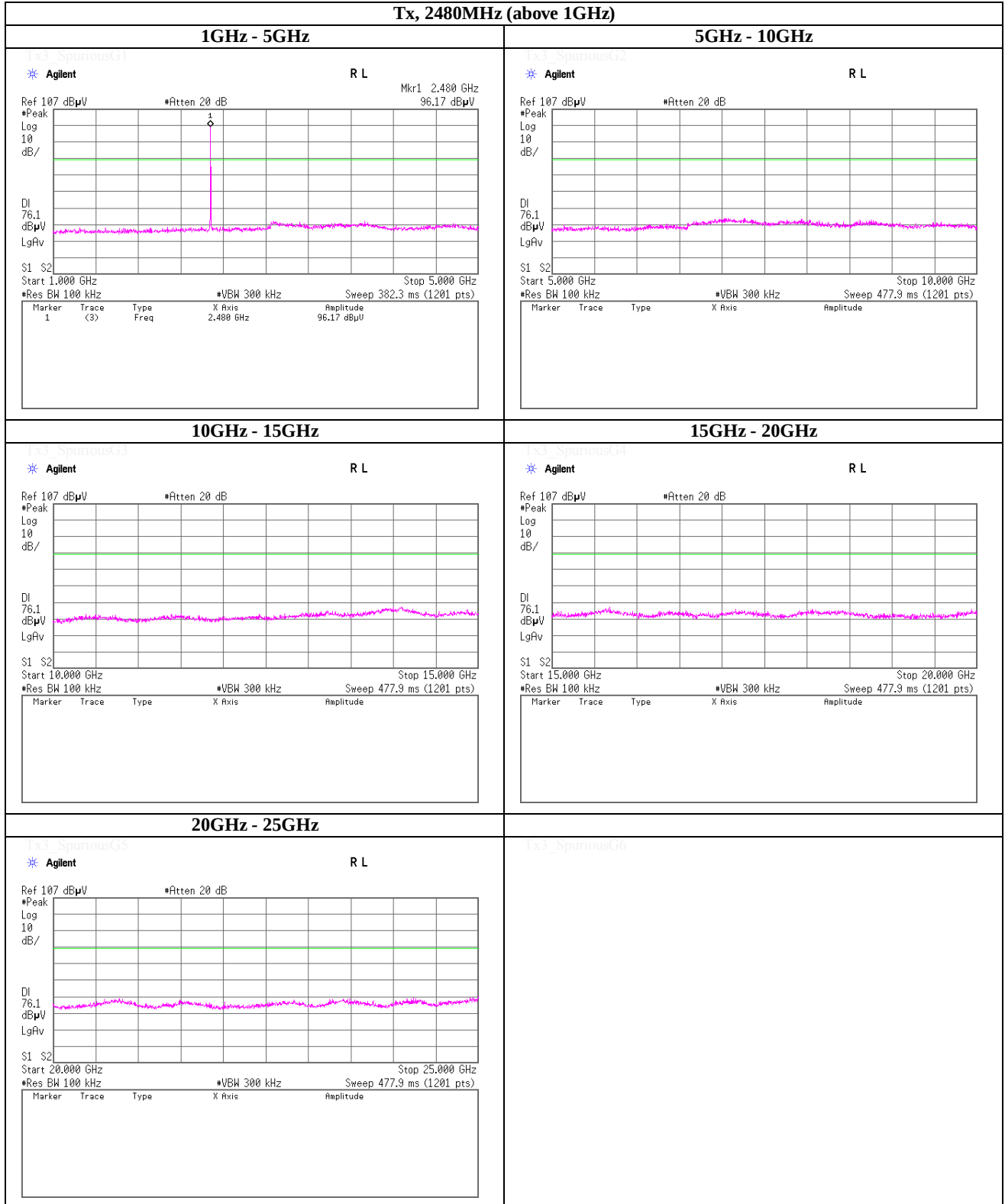
Tx, 2480MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, 1100

Tx, 2480MHz (above 1GHz)



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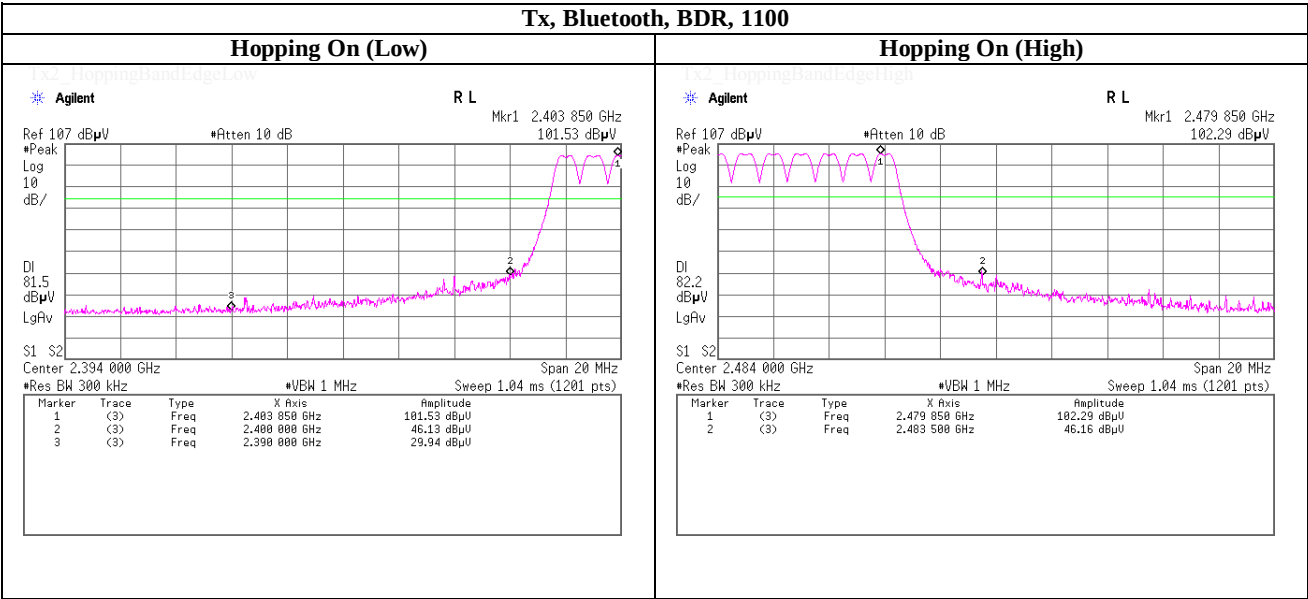
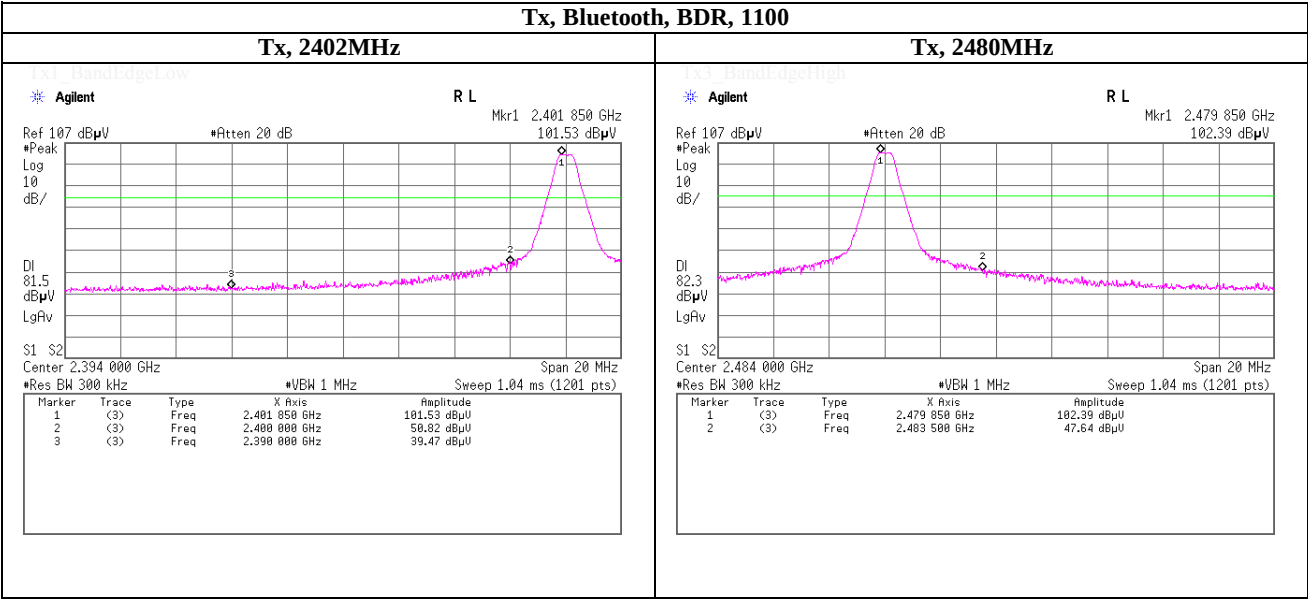
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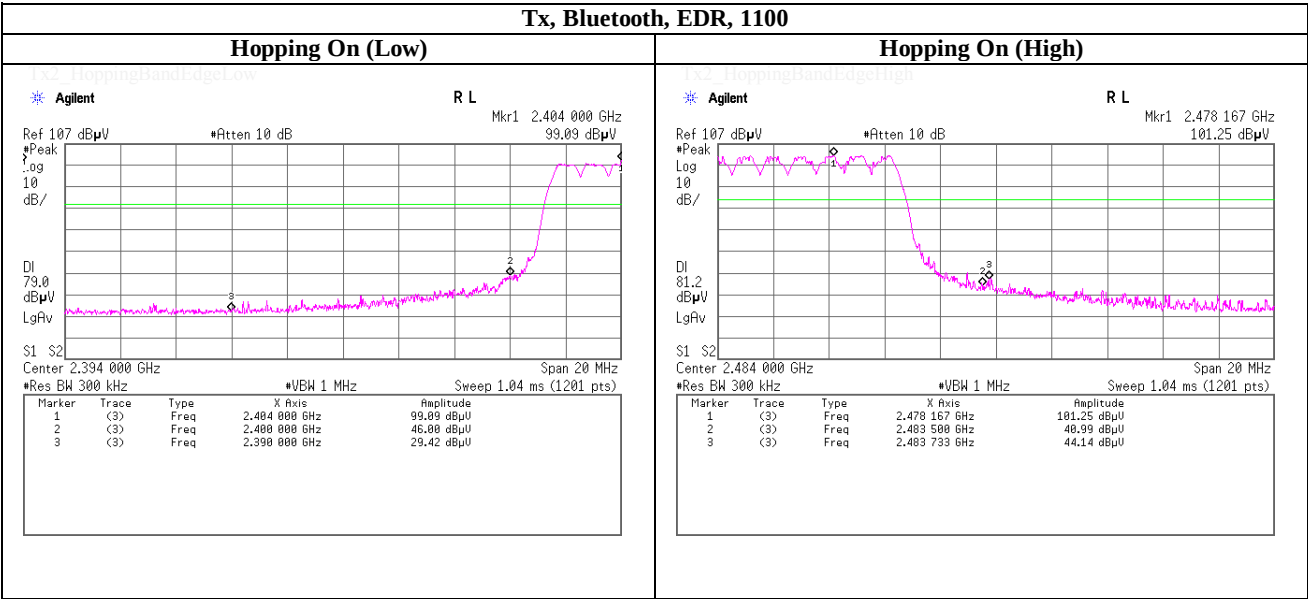
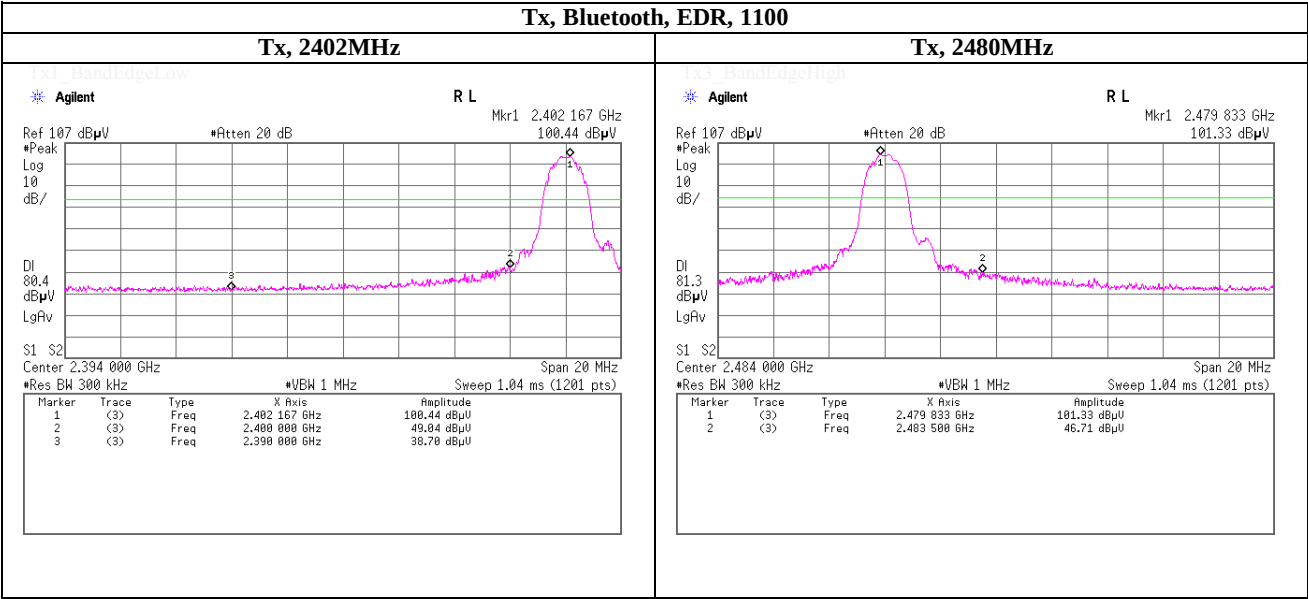
Spurious emission (Conducted)

Band Edge compliance

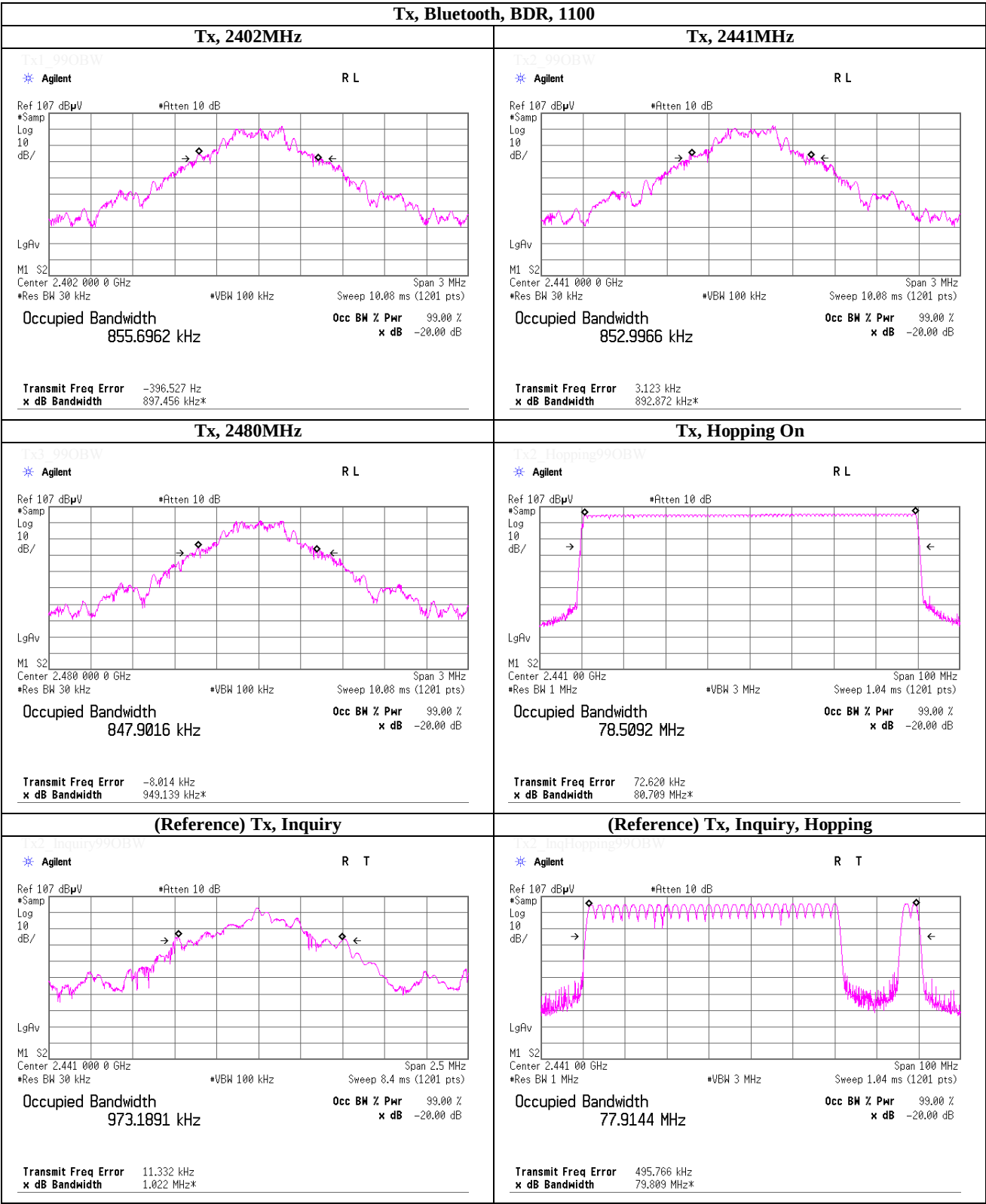


Spurious emission (Conducted)

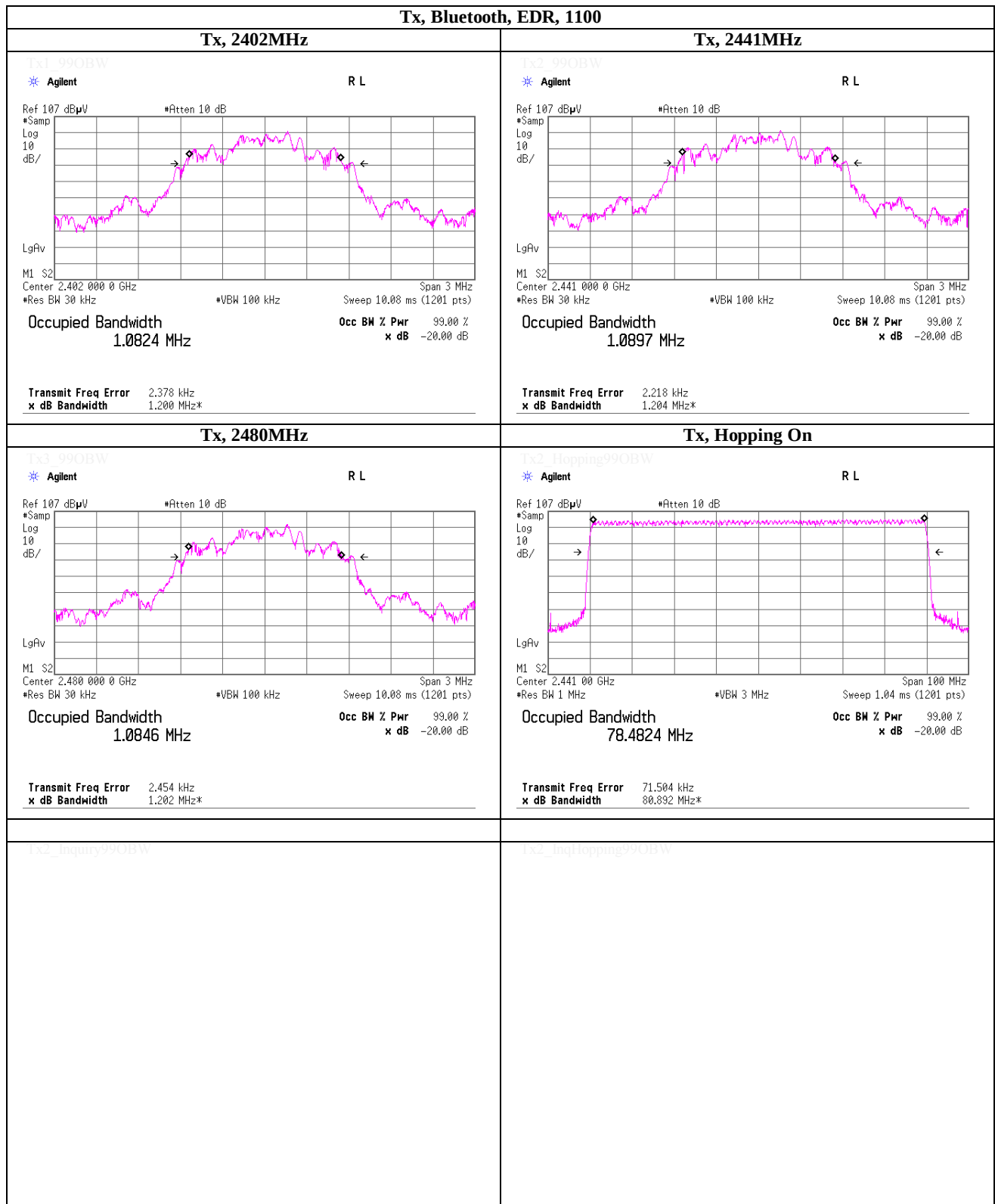
Band Edge compliance



99% Occupied Bandwidth



99% Occupied Bandwidth



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Test Report No : 33BE0311-SH-03-B

APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2011/12/05 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2012/04/19 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2012/04/19 * 12
SCC-G27	Coaxial Cable	Junkosha	MWX241-01000KM SKMS	SEP-20-12-001	AT	2012/09/26 * 12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2012/04/06 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2012/03/26 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2012/09/21 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2011/12/27 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2011/12/27 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2012/07/18 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2012/04/10 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2012/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2012/08/17 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2012/02/06 * 12
STR-03	Test Receiver	Rohde & Schwarz	ES140	100054/040	RE	2012/06/14 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFL,MF)	-	RE	-
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-271 (RF Selector)	RE	2012/04/10 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2012/02/10 * 12
SAT6-03	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2012/10/08 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2012/10/08 * 12
SCC-G17	Coaxial Cable	Suhner	SUCOFLEX 104A	46291/4A	RE	2012/03/12 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2012/03/12 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2012/03/30 * 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 ,