

RADIO TEST REPORT

Test Report No. : 10559364M-B-R1

Applicant : Sony Corporation
Type of Equipment : Smart B-Trainer
Model No. : SSE-BTR1
FCC ID : AK8SSEBTR1
Test regulation : FCC Part 15 Subpart C: 2014
Test Result : Complied

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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Kashima has been accredited.
7. This report is a revised version of 10559364M-B. 10559364M-B is replaced with this report on November 27, 2014.

Date of test: November 10 - 12, 18, 2014

Representative test engineer:



Kazuhiro Ando
Manager of EMC Testing Sec.,
Operation Dept.

Approved by:



Go Ishiwata
Department Manager
Operation Dept.



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13-EM-F0429

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REVISION HISTORY

Original Test Report No. 10559364M-B

Revision	Date	Page revised	Revision Description
00	November 21, 2014	-	Original
01	November 25, 2014	P. 4	Correction of typo
01	November 25, 2014	P. 4	Change of note 1 of Clause 3.2
01	November 25, 2014	P. 7	Change of Operating mode(s) of Clause 4.1
01	November 25, 2014	P. 9	Change of description of Section 5 and 6
02	November 27, 2014	P.3	Change of description of FCC 15.31 (e) of Clause 2.2
02	November 27, 2014	P. 4	Change of note of Clause 3.2
02	November 27, 2014	P. 7	Change of Operating mode(s) of Clause 4.1
02	November 27, 2014	ALL	Addition of pages (Number of all page and contents) 10559364M-B was replaced with 10559364M-B-R1 on November 27, 2014.
03	November 28, 2014	P. 18	Change of mode
04	December 1, 2014	P. 11	Modification of 10.4 Test procedure
05	December 2, 2014	P. 19-21	Correction of test date
05	December 2, 2014	P. 17	Correction of test report No. and company name
05	December 2, 2014	P. 18	Correction of test report No.

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SECTION 1: Customer information

Company Name : Sony Corporation
Address : 1-7-1 Konan, Minatoku, Tokyo, 108-0075 Japan
Telephone Number : +81-3-6748-2569
Facsimile Number : +81-3-6748-2574
Contact Person : Hirofumi Kojima

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

2.1 Identification of E.U.T.

Type of Equipment : Smart B-Trainer
Model No. : SSE-BTR1
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.8 V (USB-AC Adapter 5.0 V)
Receipt Date of Sample : Novemeber 6, 2014
Country of Mass-production : Malaysia
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: SSE-BTR1 (referred to as the EUT in this report) is a Smart B-Trainer.

General Specification

Clock frequency(ies) in the system : 24 MHz, 26 MHz, 16.368 MHz, 8 MHz

Radio Specification

Bluetooth specification:

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth / Channel spacing : 1MHz / 2MHz
Type of modulation : GFSK
Antenna type : Monopole
Antenna connector type : None
Antenna gain : 0.5dBi
ITU code : F1D
Operation temperature range : +5 to +35 deg.C

* For Bluetooth (BDR, EDR) part, refer to the test report: 10559364M-A-R1.

FCC 15.31 (e)

The stable voltage (DC1.35V) is constantly provided to RF part through a DCDC converter 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 EUT complies with the 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 August 15, 2014 and effective October 14, 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

* The EUT has been tested for compliance with FCC Part 15 Subpart B by the customer.

3.2 Procedures & Results

Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2009	FCC 15.207	-	N/A *2)	16.0 dB Freq.: 0.15000 MHz Detector: AV Phase: L	Complied
6dB bandwidth	ANSI C63.10:2009	FCC 15.247 (a)(2)	Conducted	N/A	* See data	Complied
Maximum peak output power	ANSI C63.10:2009	FCC 15.247 (b)(3)	Conducted	N/A		Complied
Out of band emission & Restricted band edges	ANSI C63.10:2009	FCC 15.109, 15.247 (d) & 15.209	Conducted / Radiated	N/A	2.5 dB Freq.: 4960.000MHz Polarization: Vertical Detection: AV Mode: Tx 2480 MHz, Tx, Bluetooth, LE	Complied
Power density	ANSI C63.10:2009	FCC 15.247 (e)	Conducted	N/A	* See data	Complied

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

*1) These tests were also referred to KDB 558074 v03r02 (FCC), "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

*2) During the test, the EUT was connected to charging AC adapter only because it performs wireless operation. (The EUT is designed to stop communication while it is connected to PC via USB port.)

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 Kashima'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.

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3.4 Confirmation

UL Kashima, Inc. hereby confirms the E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C: 2014.

3.5 Uncertainty

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

Item	Frequency range	Uncertainty
Conducted emission (AC Mains) AMN	0.15 MHz-30 MHz	2.8 dB
Radiated emission	30 MHz-300 MHz	4.9 dB
	300 MHz-1 GHz	6.3 dB
	1 GHz-6 GHz	4.5 dB
	6 GHz-18 GHz	4.8 dB
	18 GHz-26.5 GHz	4.9 dB

Antenna port conducted test

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

Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (\pm) 1.6dB

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

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

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

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

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3.6 Test Location

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A2LA Accreditation No. : 1266-01

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane/horizontal conducting plane (m)	Maximum measurement distance
No.1 Open site	90558	IC 4659A-1	6.0 x 5.5 x 2.5	20 x 40	10 m
No.2 Open site	510504	IC 4659A-2	4.4 x 4.4 x 2.15	18 x 20	10 m
No.5 Open site	99356	IC 4659A-5	8.6 x 7.1 x 2.4	18 x 23	10 m
No.1 Shielded room	90558	IC 4659A-1	5.4 x 4.5 x 2.3	-	-
No.2 Shielded room	510504	IC 4659A-2	3.6 x 2.7 x 2.3	-	-
No.3 Shielded room	-	-	5.4 x 3.6 x 2.3	-	-
No.4 Shielded Room	-	-	6.1 x 6.1 x 3.1	-	-
No.5 Shielded Room	99356	IC 4659A-5	4.2 x 3.1 x 2.5	-	-
No.3 Fully Anechoic Chamber	-	-	7.0 x 3.5 x 3.5	-	-
No.6 Semi-anechoic Chamber	372431	IC 4659A-6	8.5 x 5.5 x 5.2	-	3 m
No.10 Semi-anechoic Chamber	682397	IC 4659A-10	18.4 x 9.9 x 7.7	-	10 m
No.11 Semi-anechoic Chamber	718605	IC 4659A-7	9.0 x 6.5 x 5.2	-	3 m
No.1 Measurement room	-	-	5.0 x 3.7 x 2.6	-	-
No.6 Measurement room	-	-	4.3 x 4.4 x 2.7	-	-

3.7 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

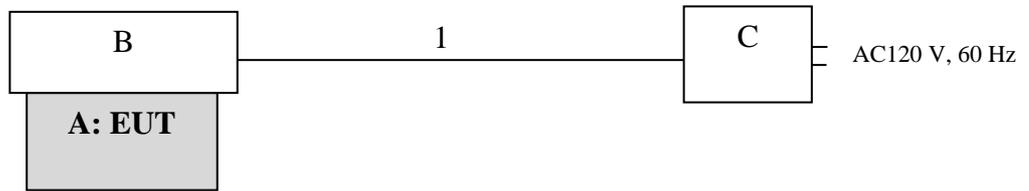
Test item	Mode	Tested frequency
All items	Transmitting Hopping OFF (Low Energy), Payload: PRBS9	2402MHz, 2440MHz, 2480MHz

Software : BlueTest3.exe ver.2.5.0.93
Power Settings : Fixed

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

4.2 Configuration and peripherals

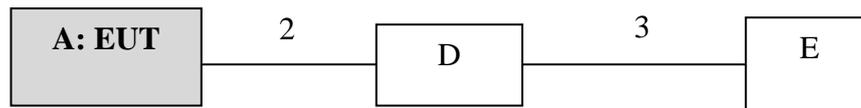
Conducted emission



Radiated emission



Antenna port conducted



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

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Smart B-Trainer	SSE-BTR1	*1)	Sony	EUT
B	USB Cradle	-	-	Sony	-
C	USB Power Adapter	A1357	-	Apple	-
D	Jig	None	None	Sony	-
E	PC	3358-3VJ	LR-L593L	lenovo	-

*1) 001: Antenna port conducted tests, 002: Conducted emission and Radiated emission tests

List of cables used

No.	Name	Length (m)	Shield (Cable)		Remarks
			Cable	Connector	
1	USB	0.5	Shielded	Shielded	Fixed connection to USB Cradle
2	Signal	0.15	Unshielded	Unshielded	-
3	USB	1.5	Shielded	Shielded	-

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SECTION 5: 6dB bandwidth & Occupied bandwidth (99%)

Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.
The test was measured based on Method 8.2 Option 2 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1

SECTION 6: Maximum peak output power

Test procedure

The Maximum Output Power was measured with a power meter connected to the antenna port.
The test was measured based on Method 9.1.2 PKPM1 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Detection type: Peak / Average *1)

Summary of the test results: Pass
Refer to APPENDIX 1

*1) Average detector was used only for Reference data.

SECTION 7: 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.

SECTION 8: Peak power density

Test procedure

The peak power density was measured with a spectrum analyzer connected to the antenna port.

Instrument used : Spectrum Analyzer
RBW / VBW : 3kHz / 9kHz

The test was measured based on Method 10.2 PKPSD of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1

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SECTION 9: Conducted emission

9.1 Operating environment

The test was carried out in a semi-anechoic chamber.

Temperature : Refer to APPENDIX 1.
Humidity : Refer to APPENDIX 1.

9.2 Test configuration

EUT was placed on a platform of nominal size, 1.0m by 2.0m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT was aligned and was flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN. 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.

Each EUT current-carrying power lead was individually connected through a LISN to the input power source. Photographs of the set up are shown in Appendix 3.

9.3 Test conditions

Frequency range : 0.15 - 30MHz
EUT position : Table top

9.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in a semi-anechoic chamber. The EUT was connected to a Line Impedance Stabilization Network (LISN).

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, a CISPR average detector.

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

Detection Type : Quasi-Peak/ CISPR-Average
IF Bandwidth : 9kHz

9.5 Results

Summary of the test results : Pass

Refer to APPENDIX 1.

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 polystyrene platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting 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 *1)	Peak
IF Bandwidth	: 120kHz	RBW:1MHz VBW:3MHz	RBW: 1MHz VBW: 3MHz	RBW: 100kHz, VBW: 300kHz
Detector: Linear voltage averaging				

*1) Average Power Measurement was measured based on 13. 3. 2. 1) 2) of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

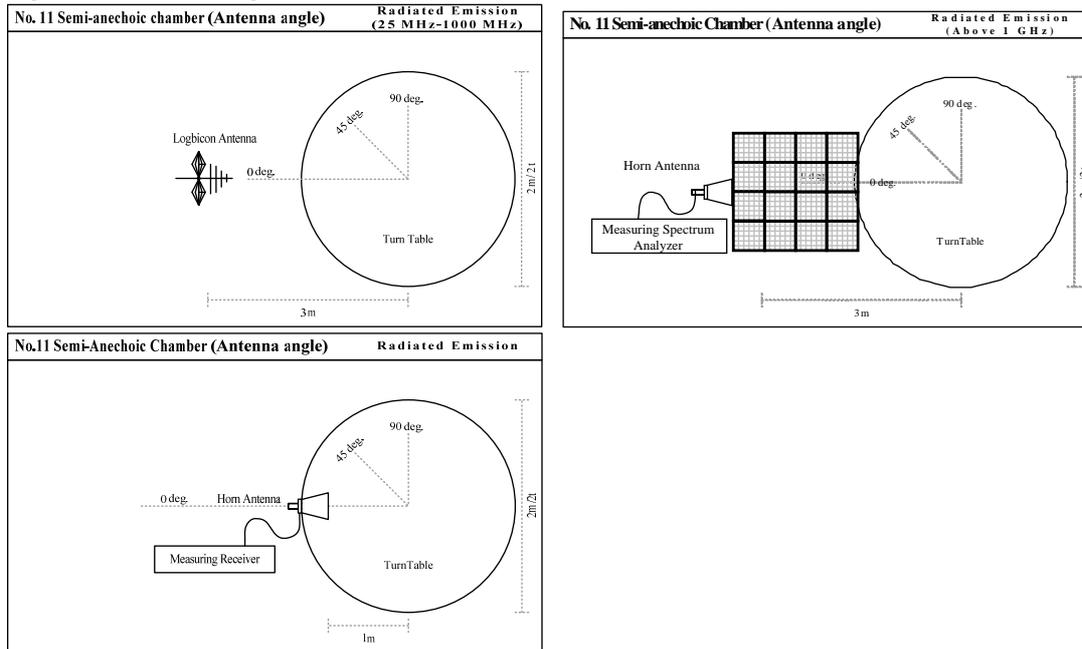
The carrier levels and noise levels were confirmed at each position of X, Y and Z axes to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Carrier	Spurious (Below 1GHz)	Spurious (1-15GHz)	Spurious (15-18GHz)	Spurious (18-25GHz)
Horizontal	Y	Y	Y	Y	Y
Vertical	Y	Y	Y	Y	Y

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Figure 1. Antenna angle



10.5 Band edge

Band edge level is below the limits of FCC 15.209. Refer to the data.

10.6 Results

Summary of the test results: Pass
*No noise was detected above the 3th order harmonics.

Refer to APPENDIX 1.

Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

6dB bandwidth
Maximum peak output power
Conducted emission
Radiated emission
Spurious emission (Antenna port conducted)
Peak power density
Occupied bandwidth

APPENDIX 2: Test instruments

Test instruments

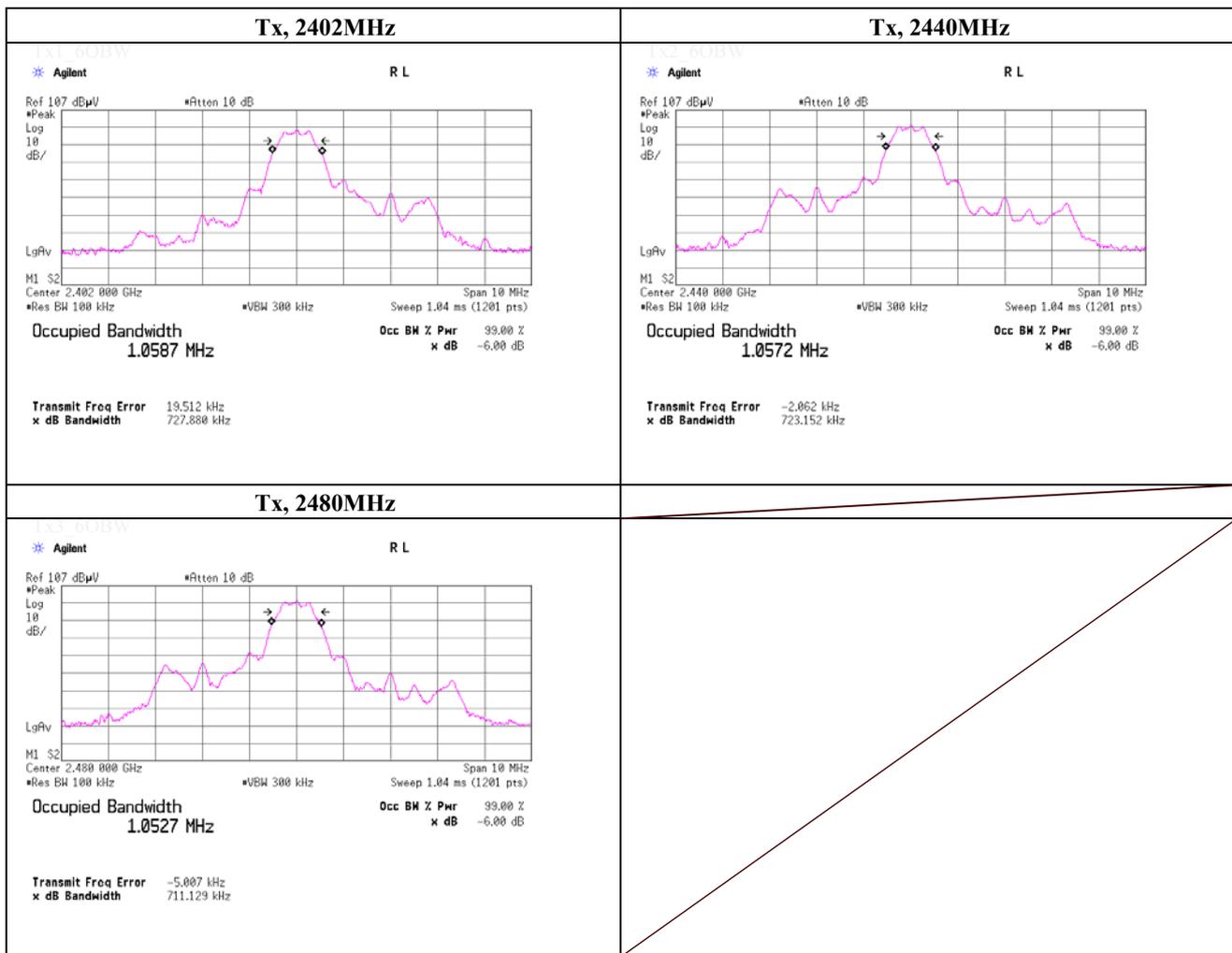
APPENDIX 3: Photographs of test setup

Radiated emission
Pre-check of the worst position

-6dB Bandwidth

Test place	UL Kashima, Inc.	No.1 Measurement Room
Date	November 18, 2014	
Temperature / Humidity	22deg.C , 40%RH	
Engineer	Kazuhiro Ando	
Mode	Tx, Bluetooth LE	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2402.0000	0.728	> 0.500
2440.0000	0.723	> 0.500
2480.0000	0.711	> 0.500



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Maximum Peak Conducted Output Power

(PKPM1)

Test place UL Kashima, Inc. No.1 Measurement Room
 Date November 18, 2014
 Temperature / Humidity 22deg.C , 40%RH
 Engineer Kazuhiro Ando
 Mode Tx, Bluetooth LE

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

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2402.0	-11.12	1.17	10.07	0.12	1.03	30.00	1000	29.88
Mid	2440.0	-8.57	1.18	10.07	2.68	1.85	30.00	1000	27.32
High	2480.0	-8.43	1.18	10.07	2.82	1.91	30.00	1000	27.18

Sample Calculation:

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

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DATA OF CONDUCTED EMISSION TEST

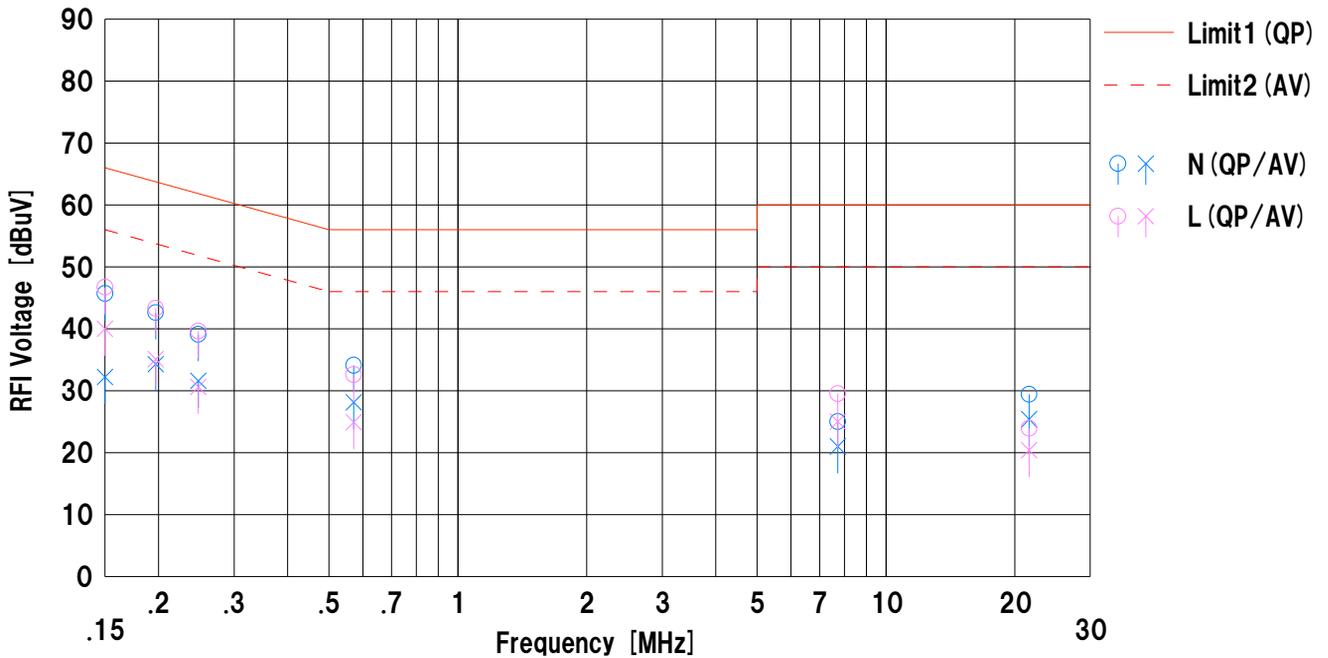
UL Kashima, Inc. No.2 Test Site
Date : 2014/11/18

Company : Sony Corporation
Kind of EUT : Smart B-Trainer
Model No. : SSE-BTR 1
Serial No. : 002
Remarks :

Mode : Tx, BT LE, 2402MHz
Report No. : 10559364M-B-R1
Power : AC120V/60Hz (AC Adapter)
Temp./Humi. : 23deg.C / 45%RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

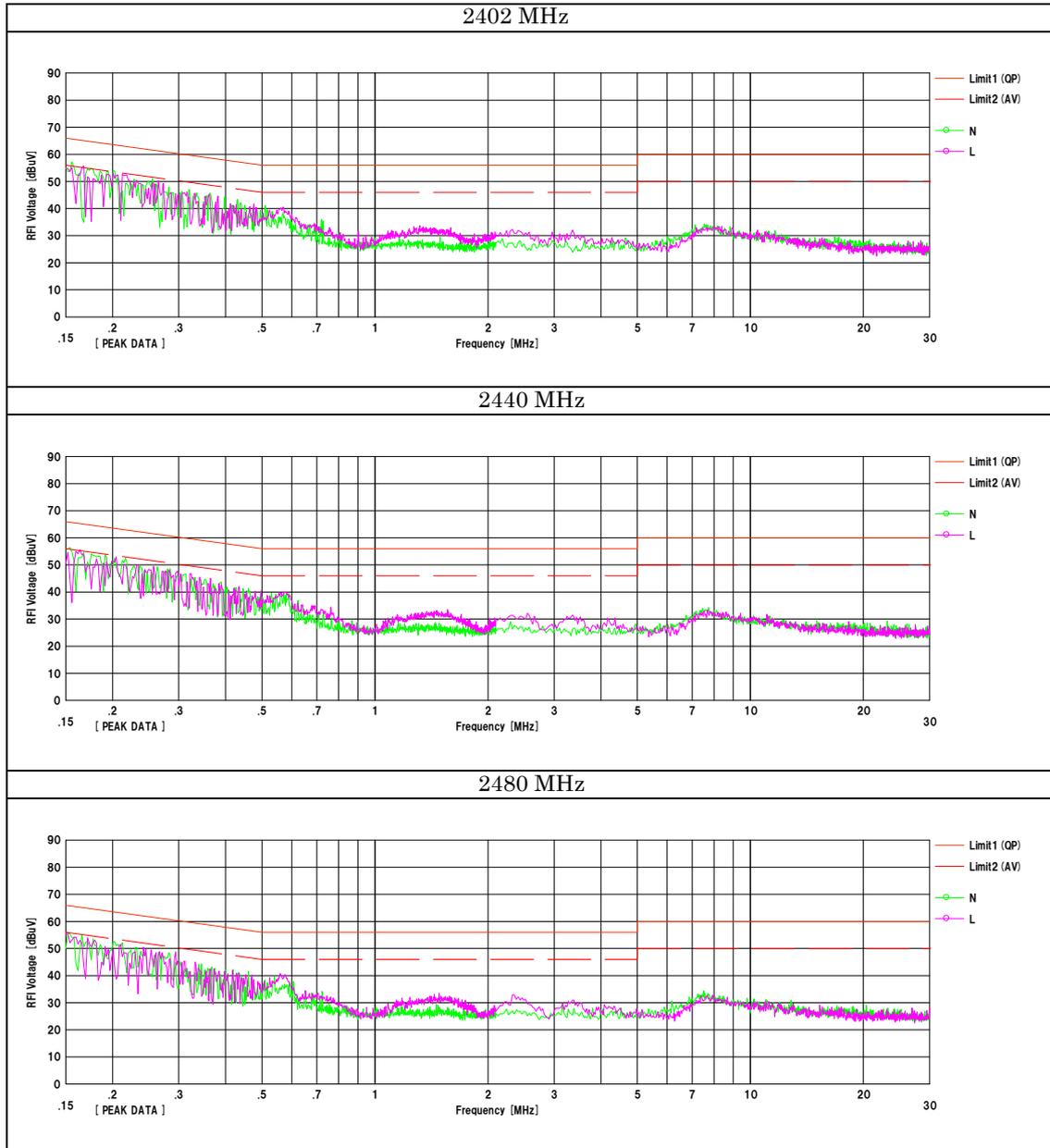
Tested by : Atsushi Ishige



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	36.0	22.5	9.7	45.7	32.2	66.0	56.0	20.3	23.8	N	
2	0.19693	33.0	24.7	9.6	42.6	34.3	63.7	53.7	21.1	19.4	N	
3	0.24745	29.5	22.0	9.6	39.1	31.6	61.8	51.8	22.7	20.2	N	
4	0.57110	24.5	18.5	9.6	34.1	28.1	56.0	46.0	21.9	17.9	N	
5	7.71755	15.0	11.0	10.0	25.0	21.0	60.0	50.0	35.0	29.0	N	
6	21.60000	19.0	15.0	10.4	29.4	25.4	60.0	50.0	30.6	24.6	N	
7	0.15000	37.0	30.3	9.7	46.7	40.0	66.0	56.0	19.3	16.0	L	
8	0.19693	33.7	25.5	9.6	43.3	35.1	63.7	53.7	20.4	18.6	L	
9	0.24745	30.0	21.0	9.6	39.6	30.6	61.8	51.8	22.2	21.2	L	
10	0.57110	23.0	15.3	9.6	32.6	24.9	56.0	46.0	23.4	21.1	L	
11	7.71755	19.5	15.0	10.0	29.5	25.0	60.0	50.0	30.5	25.0	L	
12	21.60000	13.5	10.0	10.4	23.9	20.4	60.0	50.0	36.1	29.6	L	

Conducted Emission

Test Place	UL Kashima, Inc. No.2 Test Site
Report No.	10559364M-B-R1
Tempature/Humidity	2014/11/18
Engineer	23deg.C/45% RH
Mode	Tx, Bluetooth, LE



Radiated Emission

Test place No.11 Semi Anechoic Chamber
 Date November 10, 2014 November 11, 2014 November 12, 2014
 Temperature / Humidity 22 deg.C, 41 %RH 22 deg.C, 50 %RH 22 deg.C, 41 %RH
 Engineer Makoto.Ebato Makoto.Ebato Makoto.Ebato
 Mode Tx, 2402 MHz
 Tx, Bluetooth, LE

(* 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.	32.600	QP	35.4	12.9	6.9	32.2	23.0	40.0	17.0	316	329	
Hori.	255.007	QP	38.7	11.8	8.7	32.0	27.2	46.0	18.8	100	0	
Hori.	438.002	QP	33.7	16.3	9.7	32.0	27.7	46.0	18.3	100	245	
Hori.	2390.000	PK	43.3	27.6	14.0	38.5	46.4	73.9	27.5	100	0	
Hori.	4804.000	PK	56.9	31.3	6.0	39.6	54.6	73.9	19.3	100	38	
Hori.	2390.000	AV	30.6	27.6	14.0	38.5	33.7	53.9	20.2	100	0	
Vert.	39.426	QP	31.2	12.9	7.0	32.2	18.9	40.0	21.1	100	53	
Vert.	149.768	QP	25.8	13.4	8.1	32.1	15.2	43.5	28.3	104	0	
Vert.	438.010	QP	39.2	16.3	9.7	32.0	33.2	46.0	12.8	111	195	
Vert.	2390.000	PK	43.7	27.6	14.0	38.5	46.8	73.9	27.1	100	0	
Vert.	4804.000	PK	57.3	31.3	6.0	39.6	55.0	73.9	18.9	100	271	
Vert.	2390.000	AV	30.7	27.6	14.0	38.5	33.8	53.9	20.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter)(below 18GHz)-Distance factor(above 13GHz) - Gain(Amplifier)

Distance factor : 13GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4804.000	AV	49.2	31.3	6.0	39.6	3.7	50.6	53.9	3.3	
Vert.	4804.000	AV	48.5	31.3	6.0	39.6	3.7	49.9	53.9	4.0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter)(below 18GHz)-Distance factor(above 13GHz) - Gain(Amplifier) + Duty factor

Distance factor : 13GHz -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	87.5	27.5	14.0	38.5	90.5	-	-	
Hori.	2400.000	PK	39.3	27.5	14.0	38.5	42.3	70.5	28.2	
Vert.	2402.000	PK	84.1	27.5	14.0	38.5	87.1	-	-	
Vert.	2400.000	PK	37.6	27.5	14.0	38.5	40.6	67.1	26.5	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator)(below 18GHz) - Gain(Amplifier)

Radiated Emission

Test place No.11 Semi Anechoic Chamber
 Date November 10, 2014 November 11, 2014 November 12, 2014
 Temperature / Humidity 22 deg.C, 41 %RH 22 deg.C, 50 %RH 22 deg.C, 41 %RH
 Engineer Makoto.Ebato Makoto.Ebato Makoto.Ebato
 Mode Tx, 2440 MHz
 Tx, Bluetooth, LE

(* 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.	32.599	QP	35.3	12.9	6.9	32.2	22.9	40.0	17.1	312	130	
Hori.	255.006	QP	38.9	11.8	8.7	32.0	27.4	46.0	18.6	100	0	
Hori.	438.010	QP	33.4	16.3	9.7	32.0	27.4	46.0	18.6	235	253	
Hori.	4880.000	PK	56.7	31.2	6.0	39.6	54.3	73.9	19.6	100	34	
Vert.	39.425	QP	30.8	12.9	7.0	32.2	18.5	40.0	21.5	100	11	
Vert.	147.535	QP	29.6	13.3	8.0	32.1	18.8	43.5	24.7	264	356	
Vert.	438.010	QP	38.8	16.3	9.7	32.0	32.8	46.0	13.2	108	185	
Vert.	4880.000	PK	57.3	31.2	6.0	39.6	54.9	73.9	19.0	100	266	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter)(below 18GHz)-Distance factor(above 13GHz)) - Gain(Amplifier)
 Distance factor : 13GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	47.6	31.2	6.0	39.6	3.7	48.9	53.9	5.0	
Vert.	4880.000	AV	49.2	31.2	6.0	39.6	3.7	50.5	53.9	3.4	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter)(below 18GHz)-Distance factor(above 13GHz)) - Gain(Amplifier) + Duty factor
 Distance factor : 13GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

Radiated Emission

Test place No.11 Semi Anechoic Chamber
 Date November 10, 2014 November 11, 2014 November 12, 2014
 Temperature / Humidity 22 deg.C, 41 %RH 22 deg.C, 50 %RH 22 deg.C, 41 %RH
 Engineer Makoto.Ebato Makoto.Ebato Makoto.Ebato
 Mode Tx, 2480 MHz
 Tx, Bluetooth, LE

(* 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.	32.600	QP	35.5	12.9	6.9	32.2	23.1	40.0	16.9	328	170	
Hori.	255.006	QP	39.3	11.8	8.7	32.0	27.8	46.0	18.2	100	0	
Hori.	438.010	QP	33.5	16.3	9.7	32.0	27.5	46.0	18.5	100	235	
Hori.	2483.500	PK	50.9	27.5	14.1	38.5	54.0	73.9	19.9	113	68	
Hori.	4960.000	PK	56.5	31.5	6.1	39.6	54.5	73.9	19.4	100	35	
Hori.	2483.500	AV	37.7	27.5	14.1	38.5	40.8	53.9	13.1	113	68	
Vert.	39.798	QP	31.4	12.9	7.0	32.2	19.1	40.0	20.9	100	60	
Vert.	150.328	QP	25.1	13.4	8.1	32.1	14.5	43.5	29.0	176	200	
Vert.	438.010	QP	38.8	16.3	9.7	32.0	32.8	46.0	13.2	113	185	
Vert.	2483.500	PK	46.9	27.5	14.1	38.5	50.0	73.9	23.9	100	243	
Vert.	4960.000	PK	57.8	31.5	6.1	39.6	55.8	73.9	18.1	100	267	
Vert.	2483.500	AV	34.0	27.5	14.1	38.5	37.1	53.9	16.8	100	243	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter)(below 18GHz)-Distance factor(above 13GHz) - Gain(Amplifier)

Distance factor : 13GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	AV	48.0	31.5	6.1	39.6	3.7	49.7	53.9	4.2	
Vert.	4960.000	AV	49.7	31.5	6.1	39.6	3.7	51.4	53.9	2.5	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter)(below 18GHz)-Distance factor(above 13GHz) - Gain(Amplifier) + Duty factor

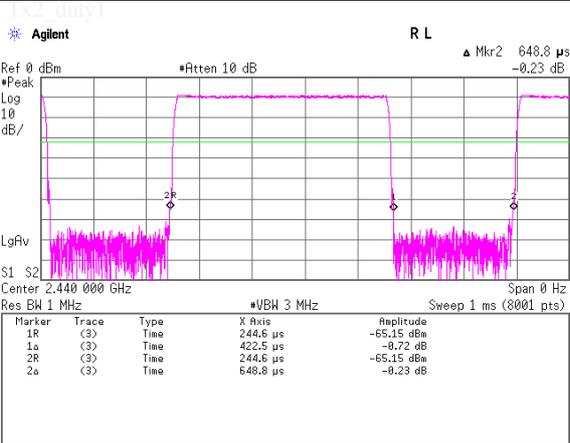
Distance factor : 13GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Burst rate confirmation

Tx, Bluetooth LE

Duty Factor Calculation

Duty Factor: $20\log(1/\text{duty cycle}) = 3.7\text{dB}$
duty cycle = $0.0004225 / 0.00064875 = 0.651 (65.1\%)$



TX2_duty2

UL Kashima, Inc.

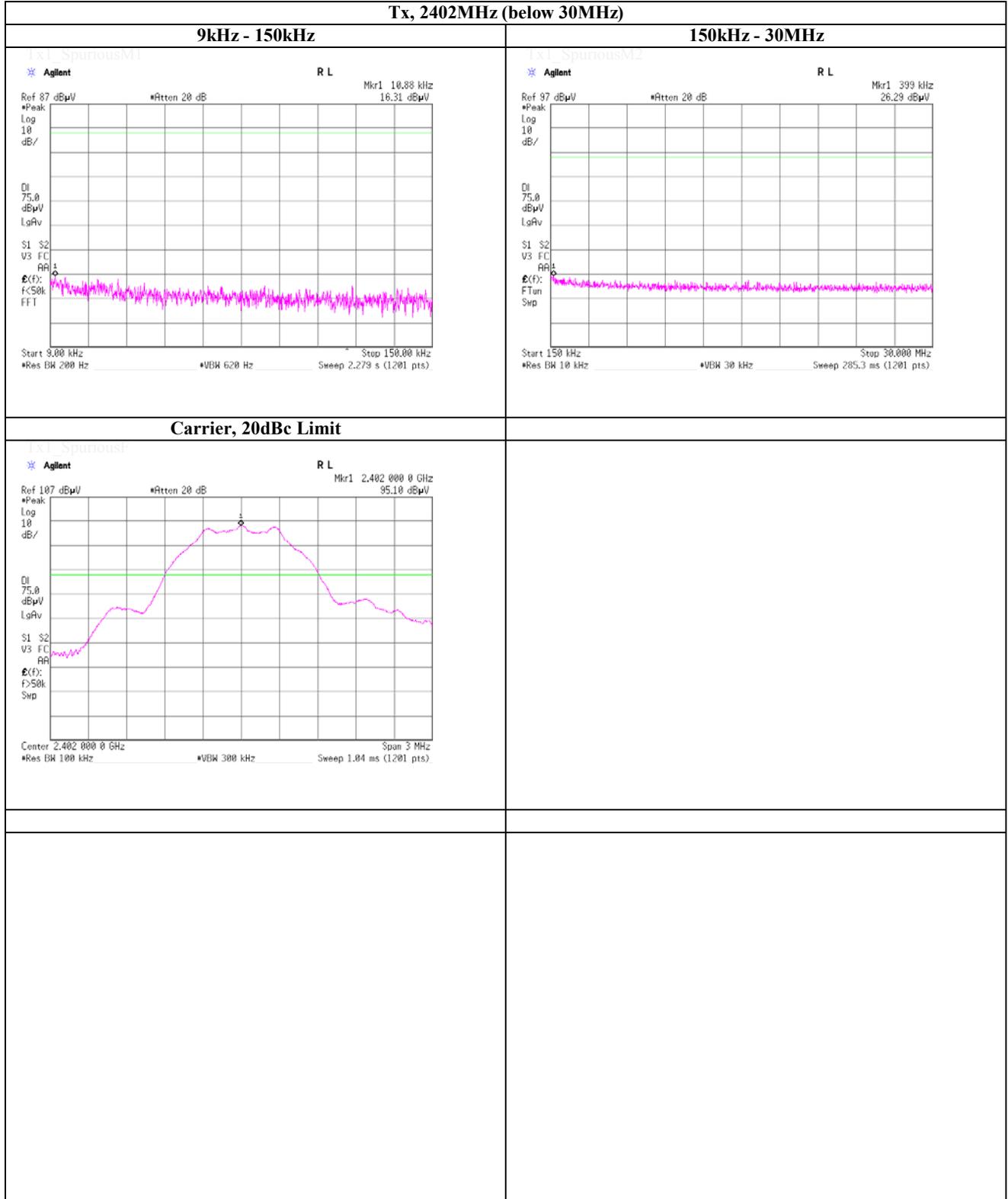
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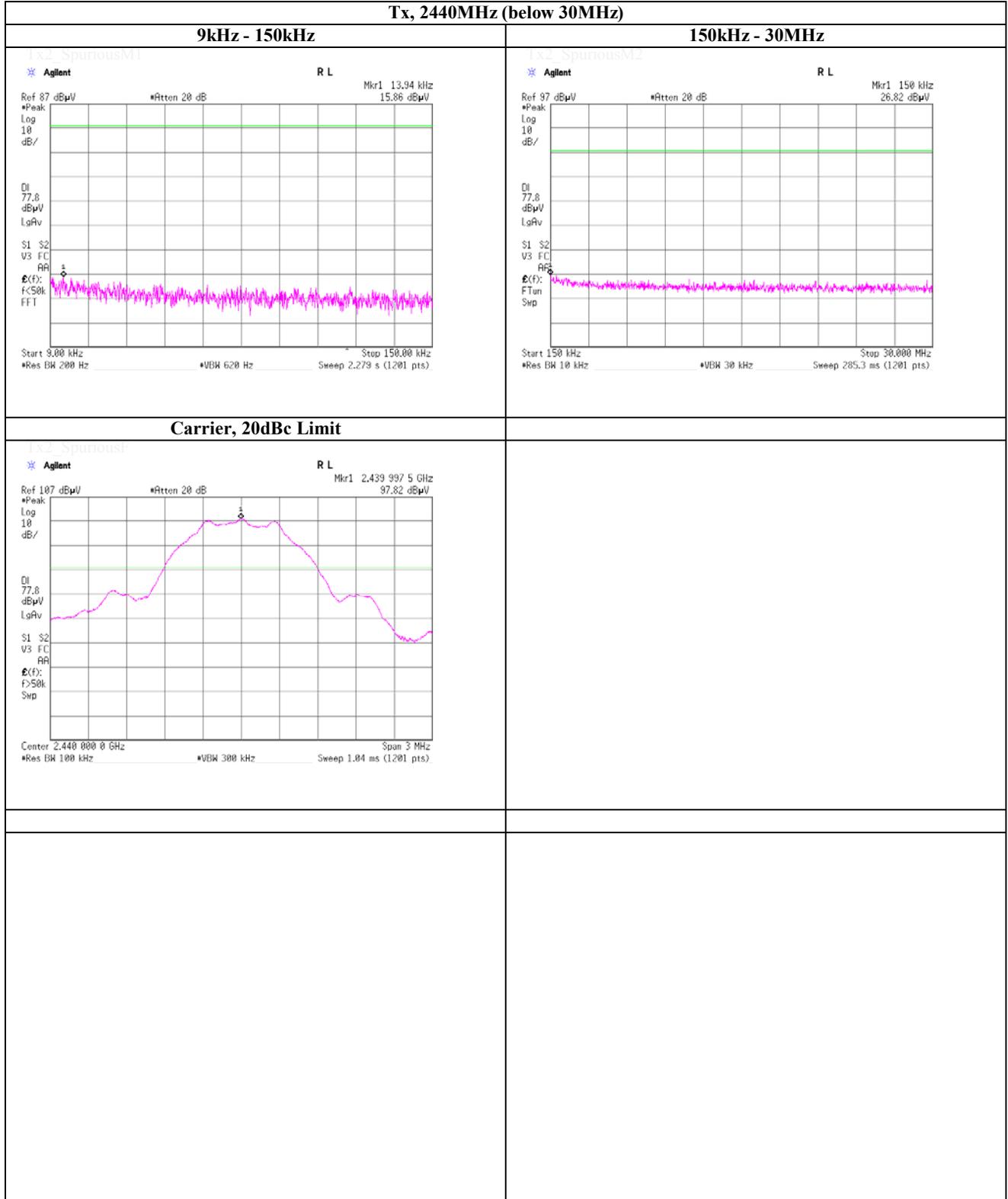
Spurious emission (Conducted)

Tx, Bluetooth LE



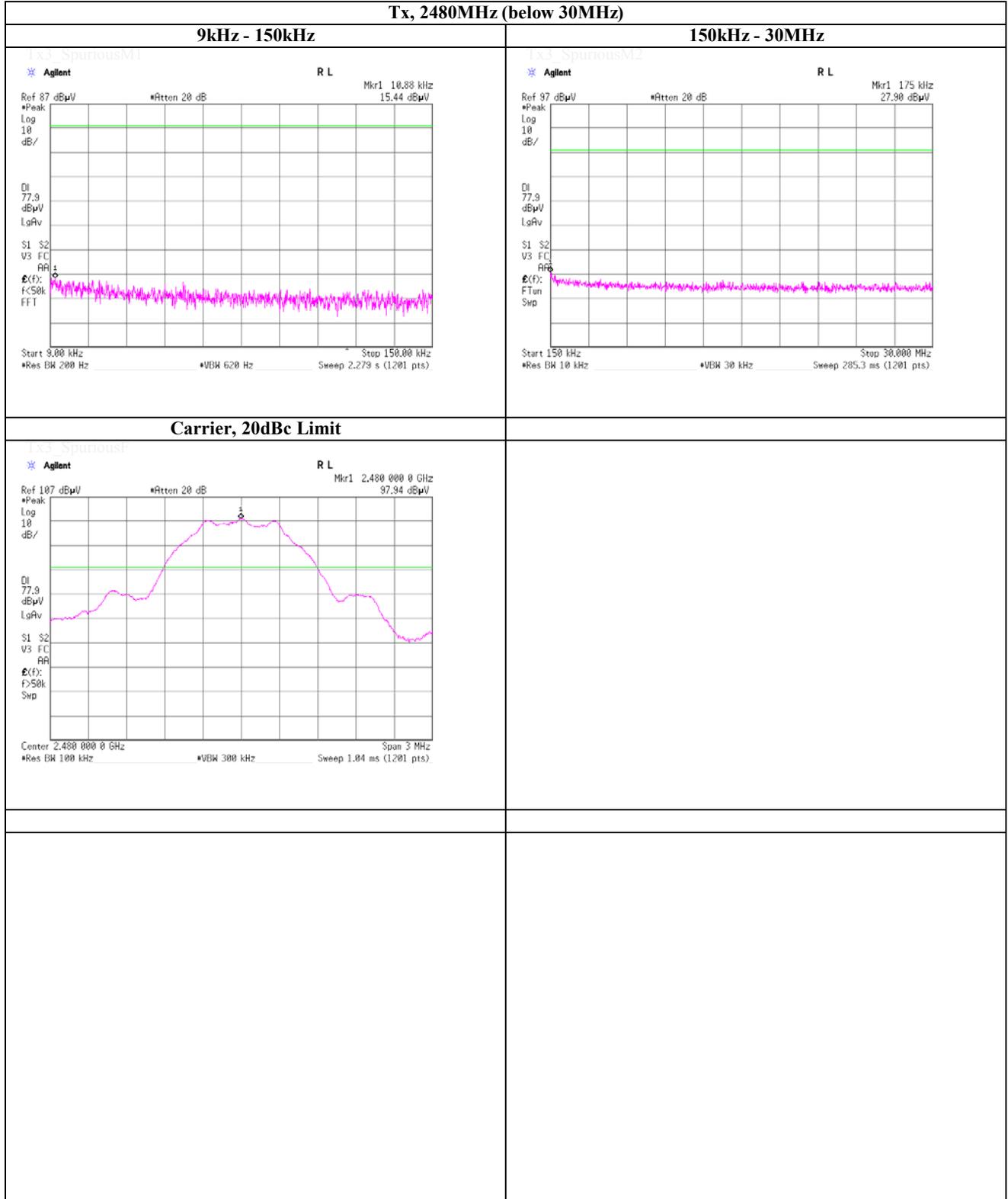
Spurious emission (Conducted)

Tx, Bluetooth LE



Spurious emission (Conducted)

Tx, Bluetooth LE



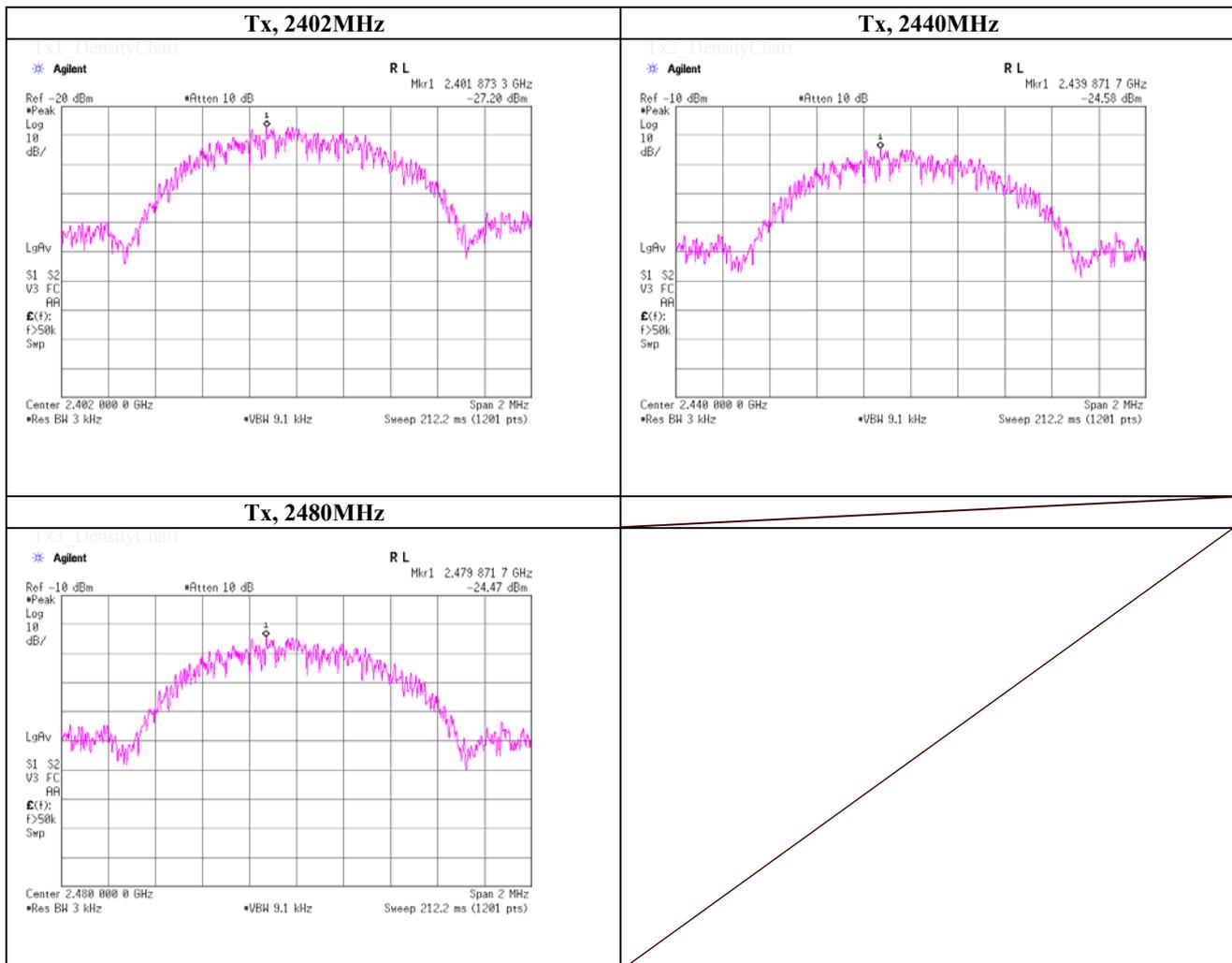
Maximum Power Spectral Density

(PKPSD)

Test place	UL Kashima, Inc.	No.1 Measurement Room
Date	November 18, 2014	
Temperature / Humidity	22deg.C , 40%RH	
Engineer	Kazuhiro Ando	
Mode	Tx, Bluetooth LE	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.0000	2401.87	-27.20	1.17	10.07	-15.96	8.00	23.96
2440.0000	2439.87	-24.58	1.18	10.07	-13.33	8.00	21.33
2480.0000	2479.87	-24.47	1.18	10.07	-13.22	8.00	21.22

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



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99% Occupied Bandwidth

