FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

Bluetooth Module

MODEL NUMBER: BT401

FCC ID: GT3FC018
IC: 3683A-FC018

REPORT NUMBER: 33HE0044-SH-A

ISSUE DATE: April 16, 2013
REVISED DATE: April 17, 2013

Prepared for
SMK Corporation
5-5, Togoshi 6-chome, Shinagawa-ku,
Tokyo, 142-8511, JAPAN

Prepared by
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone number : +81 463 50 6400
Facsimile number : +81 463 50 6401
JAB Accreditation No. : RTL02610

JAB Testing
RTL2610

Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/16/13	Initial Issue	T. Arai
1	04/17/13	p.10, change (STR-03)"Test Receiver" to "EMI Test Receiver". p.20, p.55 added "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." in TEST PROCEDURE. p.25, added "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 x 0.4s, where N is the number of channels being used in the hopping sequence (20 ≤ N ≤ 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." in TEST PROCEDURE. p.60, added "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 x 0.4s, where N is the number of channels being used in the hopping sequence (20 ≤ N ≤ 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." in TEST PROCEDURE.	T. Arai

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

TABLE OF CONTENTS

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SMK Corporation
5-5,Togoshi 6-chome, Shinagawa-ku, Tokyo, 142-8511, JAPAN

EUT DESCRIPTION: Bluetooth Module

MODEL: BT401

SERIAL NUMBER: 000190F07F85, 000190F08231

DATE TESTED: March 30 to April 12, 2013

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Japan Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Japan, Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Japan, Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Japan, Inc. will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by any government agency.

Approved & Released For UL Japan, Inc. By:

Toyokazu Imamura
Manager of WiSE Japan,
UL Verification Service

Tested By:

Tatsuya Arai
Engineer of WiSE Japan,
UL Verification Service

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN.

UL Japan is accredited by JAB, Laboratory Code RTL02610. The full scope of accreditation can be viewed at
http://www.jab.or.jp/cgi-bin/jab_exam_proof_j.cgi?page=2&authorization_number=RTL02610

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER		UNCERTAINTY
Power Line Conducted Emission	150kHz-30MHz	+/- 3.5 dB
Radiated Emission	30MHz-300MHz	+/- 4.9 dB
	300MHz-1000MHz	+/- 4.9 dB
	1000MHz-15GHz	+/- 4.9 dB
	15GHz-18GHz	+/- 5.6 dB
	18GHz-26.5GHz	+/- 4.4 dB

Uncertainty figures are valid to a confidence level of 95% using a coverage factor k=2..

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth Module (Power Class 2), powered by DC power supply.
The radio module is manufactured by CSR.

GENERAL INFORMATION

Power Requirements	DC 2.7-3.6V
List of frequencies generated or used by the EUT	26MHz

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	3.80	2.40
2402 - 2480	Enhanced 8PSK	2.89	1.95

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes PCB antenna, with a maximum gain of 2.0 dBi.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was RF test tool Ver.1.2.4.

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

5.5. WORST-CASE CONFIGURATION AND MODE

The fundamental and spurious was measured in three different orientations X, Y and Z to find worst-case orientation, and final testing for radiated emissions was performed with EUT in following orientation.

	Horizontal		Vertical	
	Tx	Rx	Tx	Rx
Spurious (below 1GHz)	X	X	X	X
Spurious (1 - 15GHz)	X	Z	Z	X
Spurious (above 15GHz)	X	X	X	X

The worst-case channel is determined as the channel with the highest output power, radiated emissions below 1 GHz and power line conducted emissions were performed with the EUT set to the channel with highest output power.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

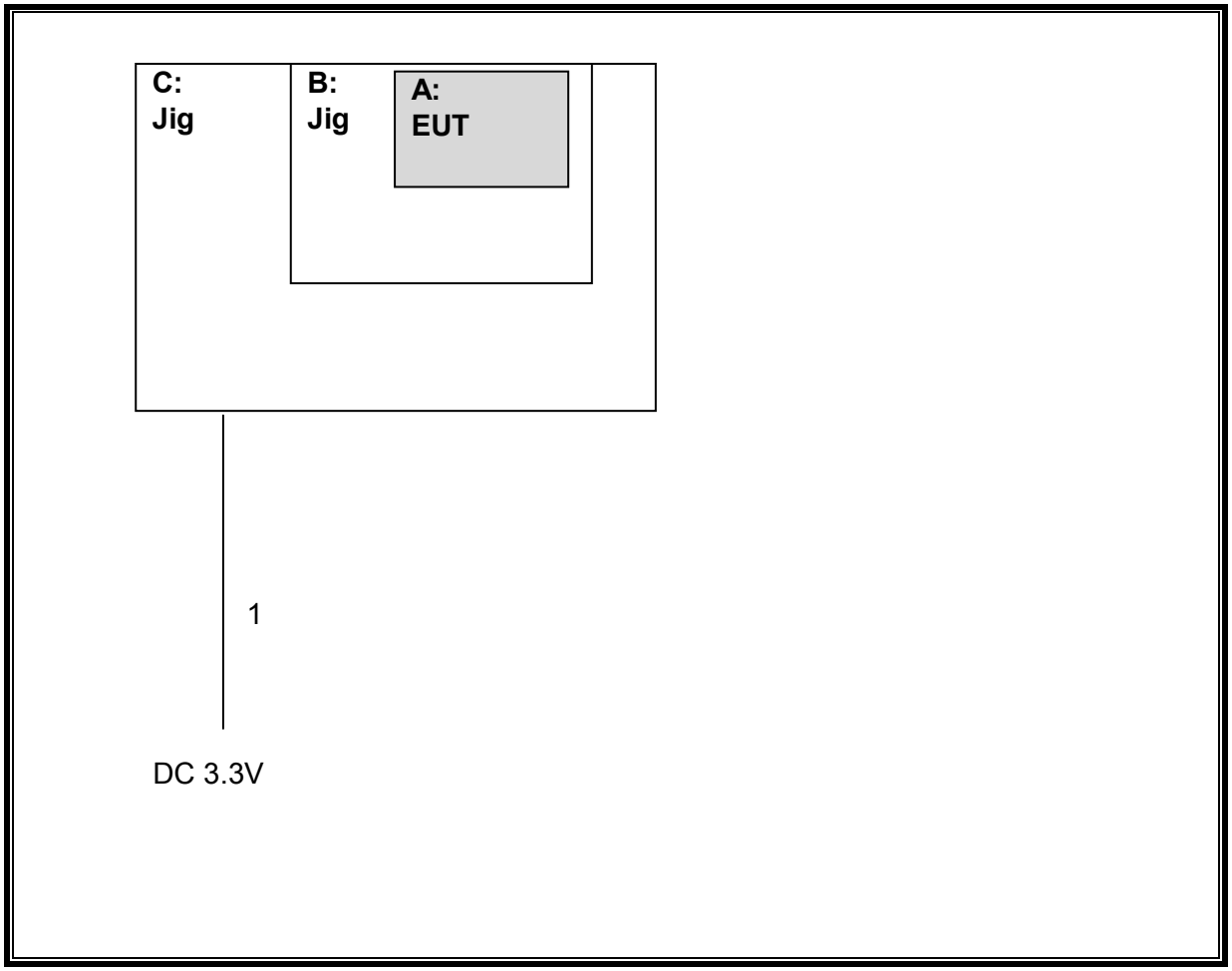
PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
B: Jig	SMK	BT401-CB 001	-
C: Jig	SMK	BE005	-

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	DC cable	1	DC	Un-Shielded	1.4m	N/A

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

SETUP DIAGRAM FOR RADIATED TESTS



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2012/09/21 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2012/08/17 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2012/04/10 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2012/12/18 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	51	RE	2012/12/18 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2012/07/18 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2012/05/22 * 12
STR-03	EMI Test Receiver	Rohde & Schwarz	ESI40	100054/040	RE, CE	2012/06/14 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE, CE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI, MF)	-	RE, CE	-
SHA-05	Horn Antenna	ETS LINDGREN	Sep-60	LM4210	RE	2013/03/14 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	18	RE	2013/03/19 * 12
SCC-G18	Coaxial Cable	Suhner	SUCOFLEX 104A	46292/4A	RE	2013/03/16 * 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
SAT6-03	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2012/04/10 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SCC-C9/C10/SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271(RF Selector)	CE	2012/04/10 * 12
SAT3-05	Attenuator	JFW	50HF-003N	-	CE	2013/02/12 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2013/02/25 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2013/03/07 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2013/03/28 * 12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2012/04/06 * 12
SCC-G11	Coaxial Cable	Suhner	SUCOFLEX 102	31595/2	AT	2013/03/16 * 12
SPM-06	Power Meter	Anritsu	ML2495A	850009	AT	2012/04/19 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	917063	AT	2012/04/19 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2013/03/07 * 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:

CE: Conducted emission, RE: Radiated emission, AT: Antenna terminal conducted tests

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

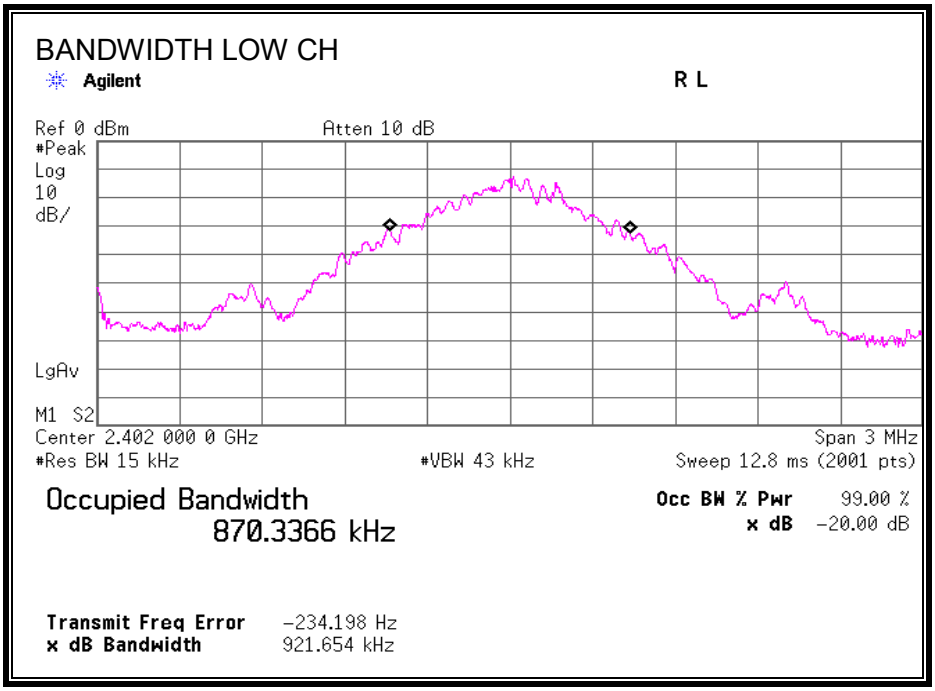
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

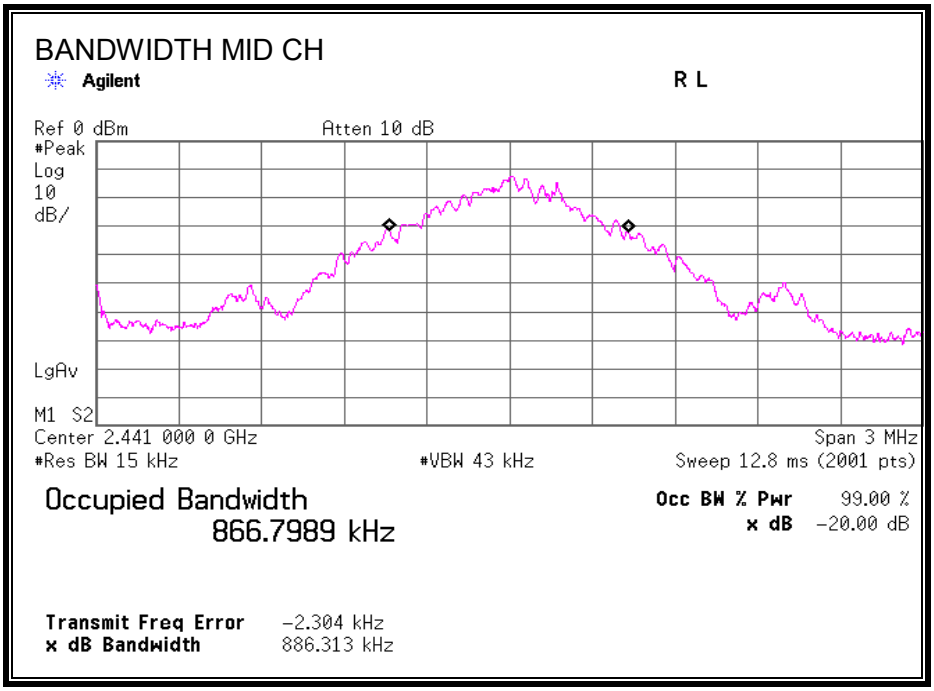
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	921.654	899.5593
Middle	2441	886.313	897.7218
High	2480	934.756	902.7653

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

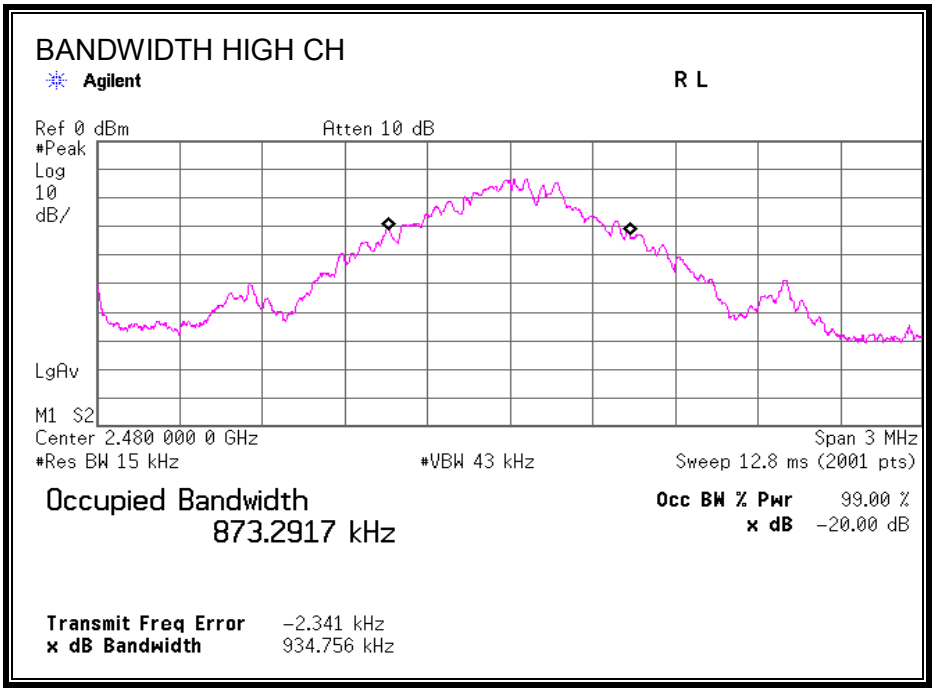
20 dB BANDWIDTH



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

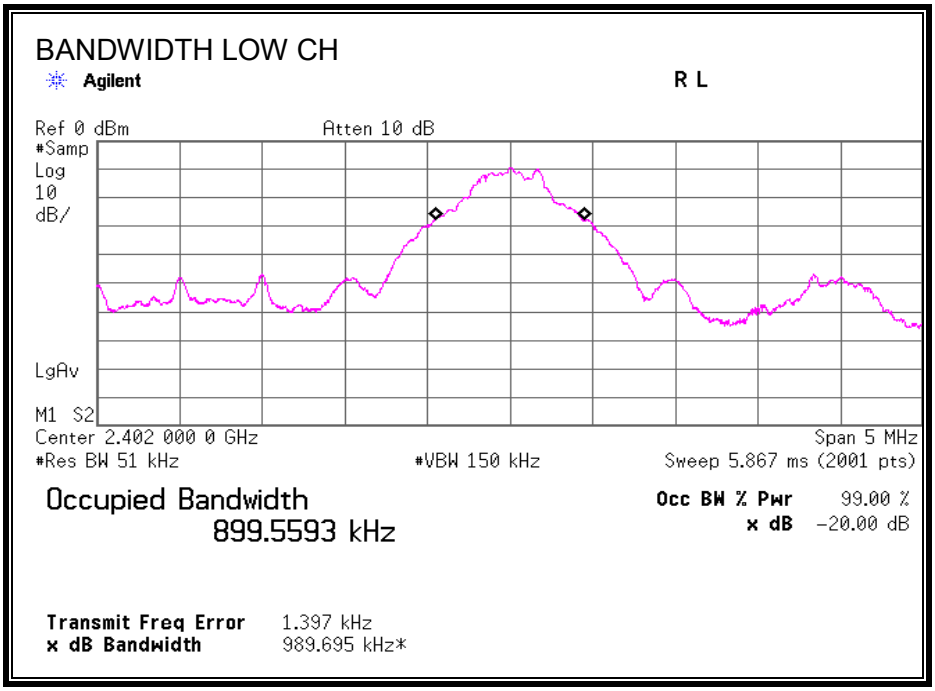


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

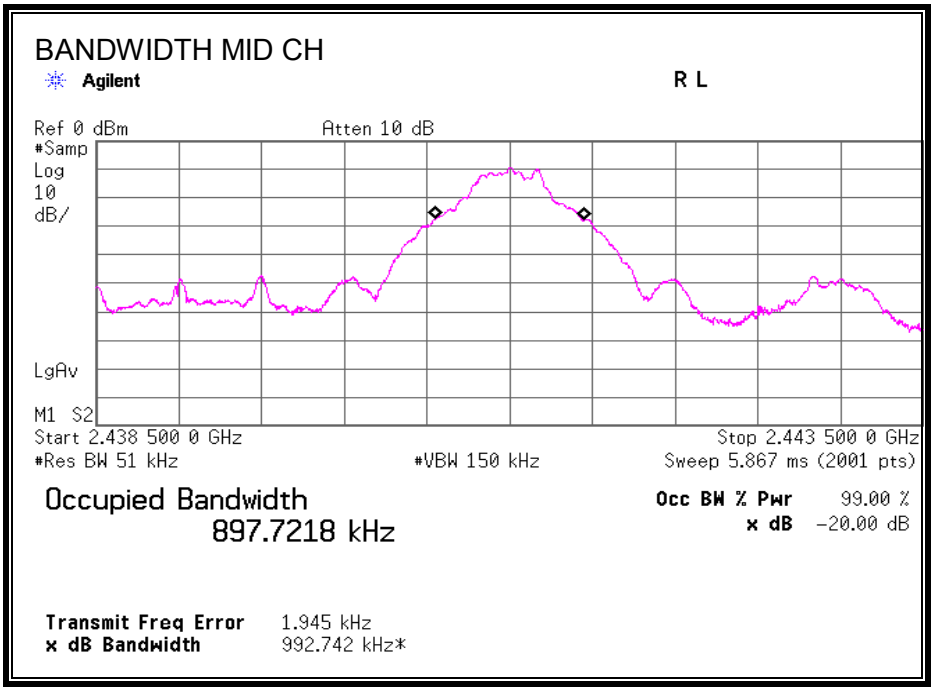


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

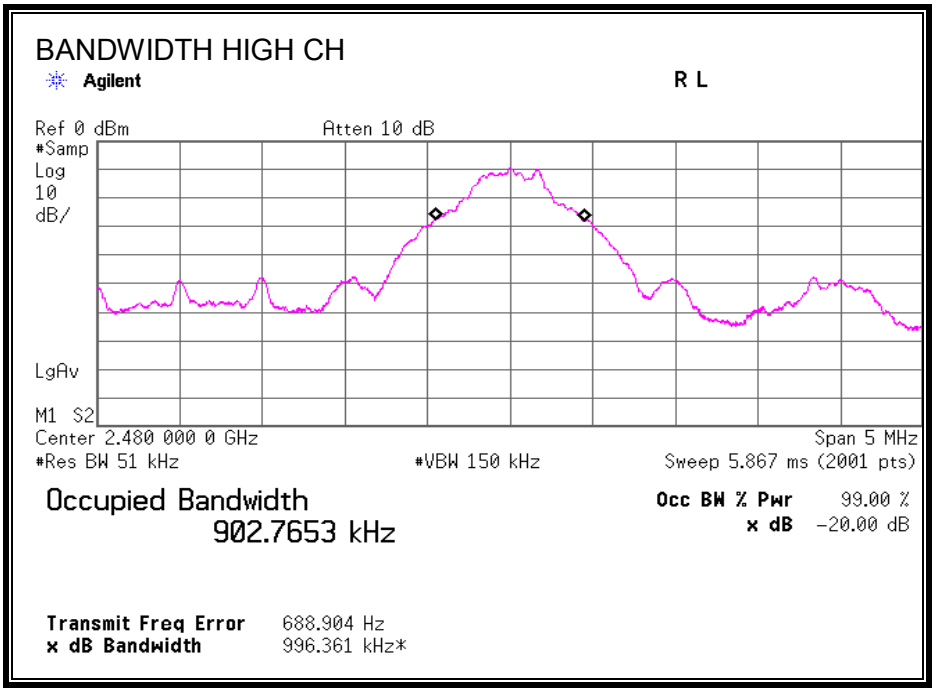
99% BANDWIDTH



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

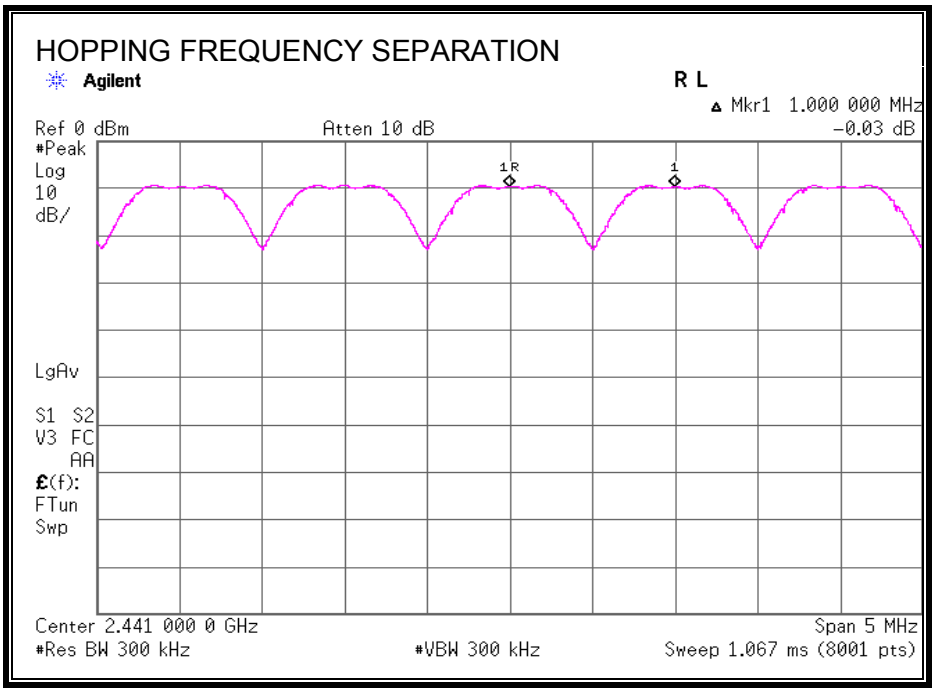
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESULTS

HOPPING FREQUENCY SEPARATION



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.1.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

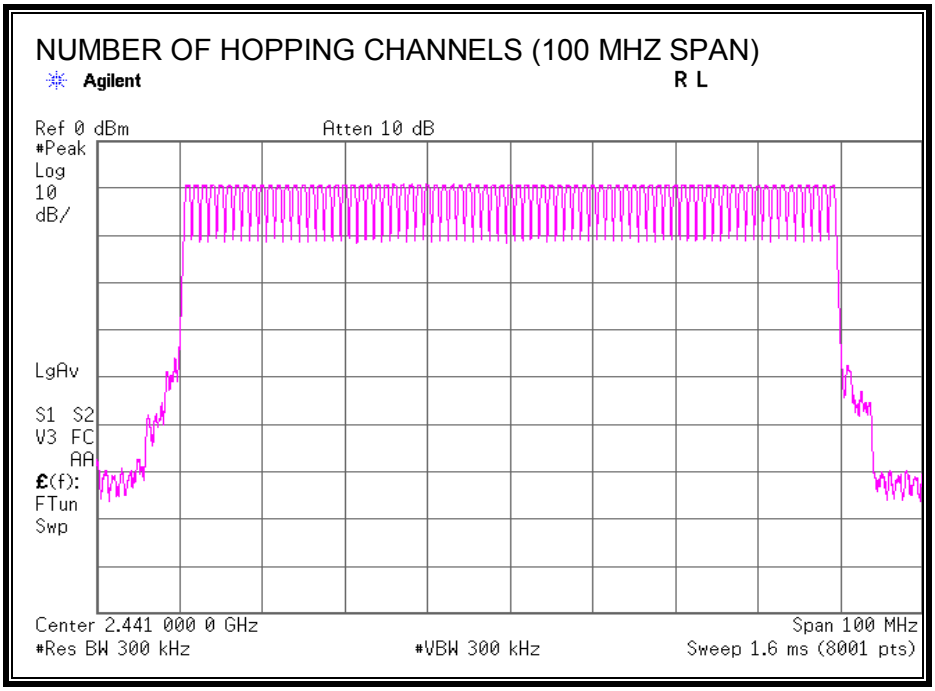
Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth 3.0 Specification.

RESULTS

79 Channels observed.

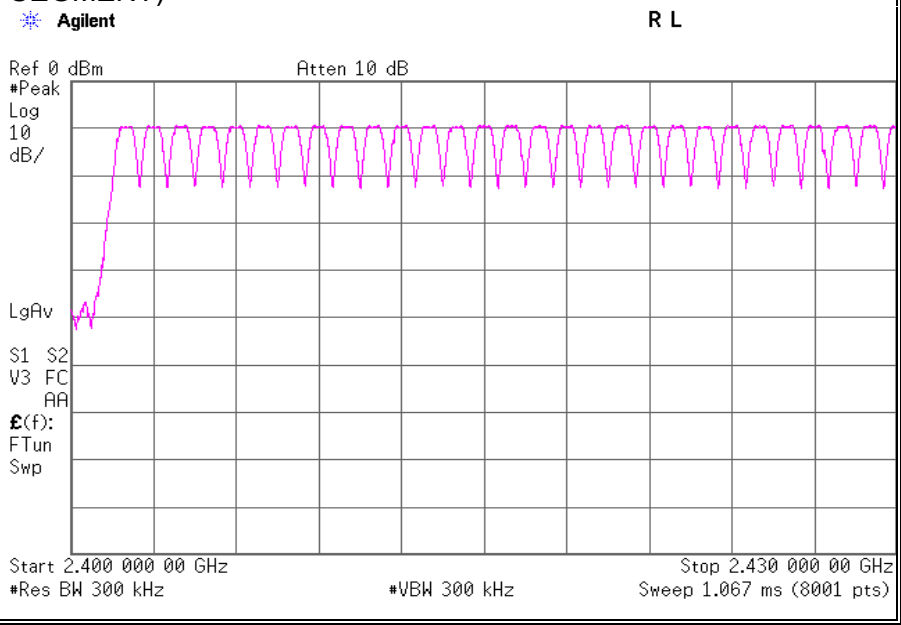
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

NUMBER OF HOPPING CHANNELS



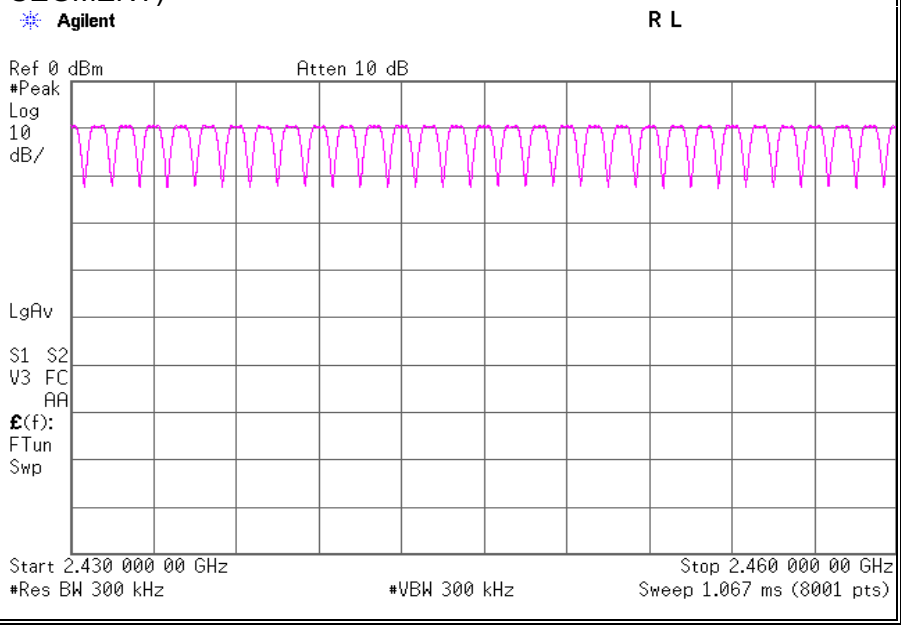
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



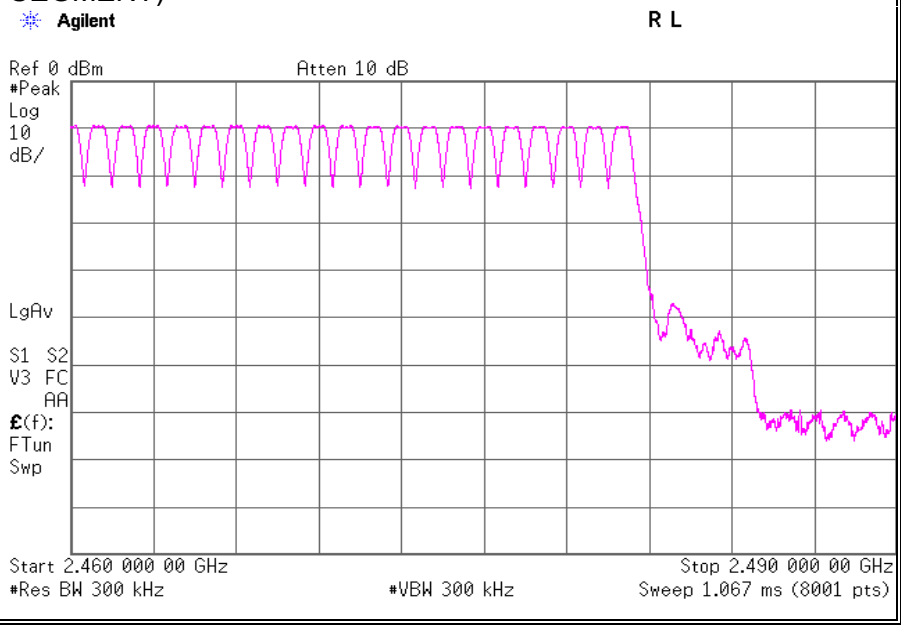
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.1.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

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 x 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.

RESULTS

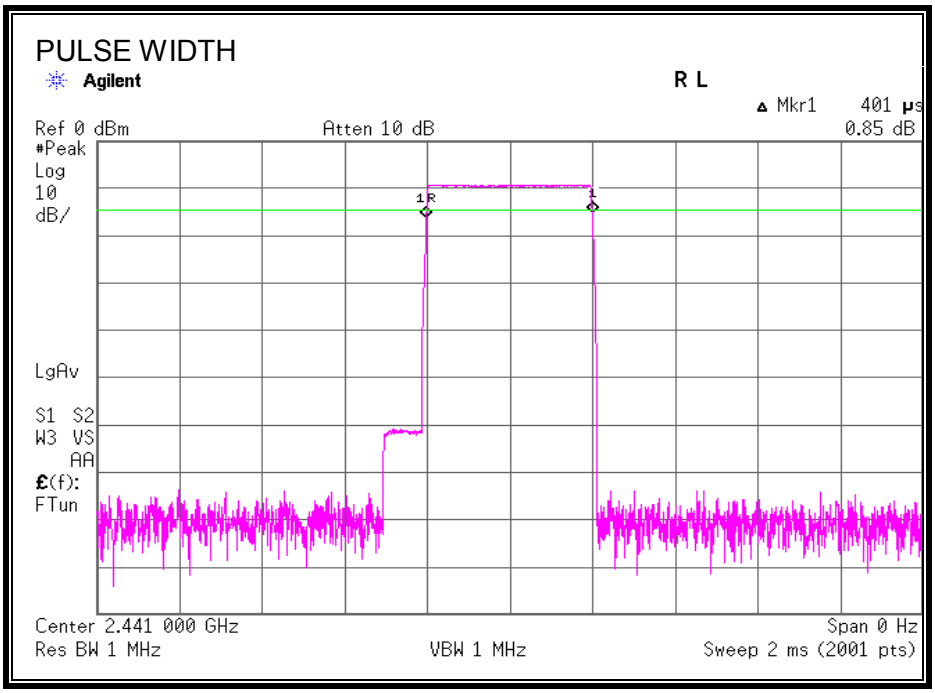
Time Of Occupancy = 10 * xx pulses * yy msec = zz msec

GFSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.4010	32	0.1283	0.4	0.2717
DH3	1.6620	16	0.2659	0.4	0.1341
DH5	2.9110	11	0.3202	0.4	0.0798

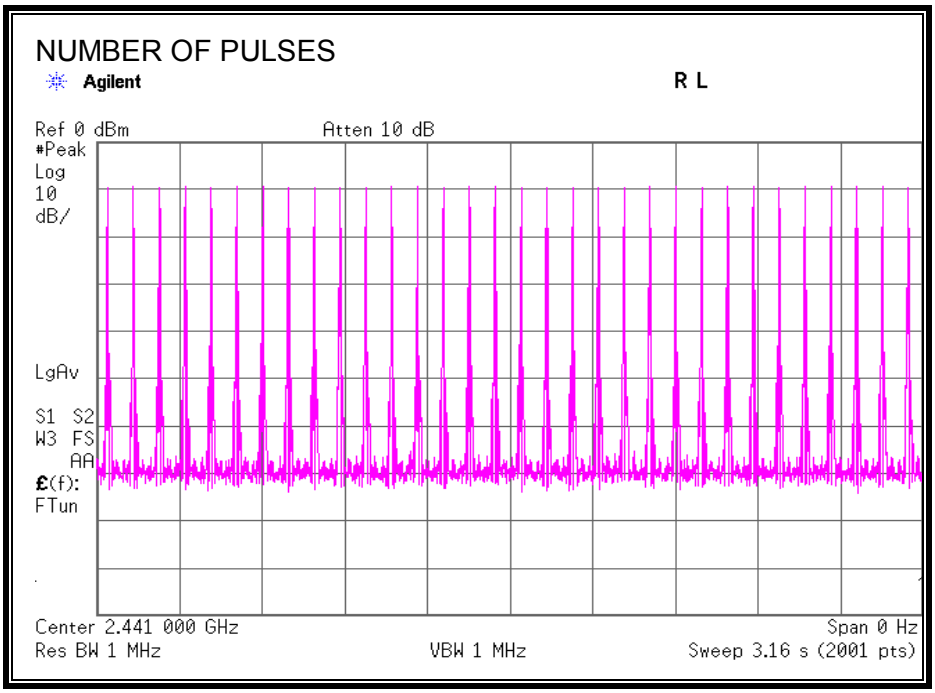
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

DH1 PULSE WIDTH



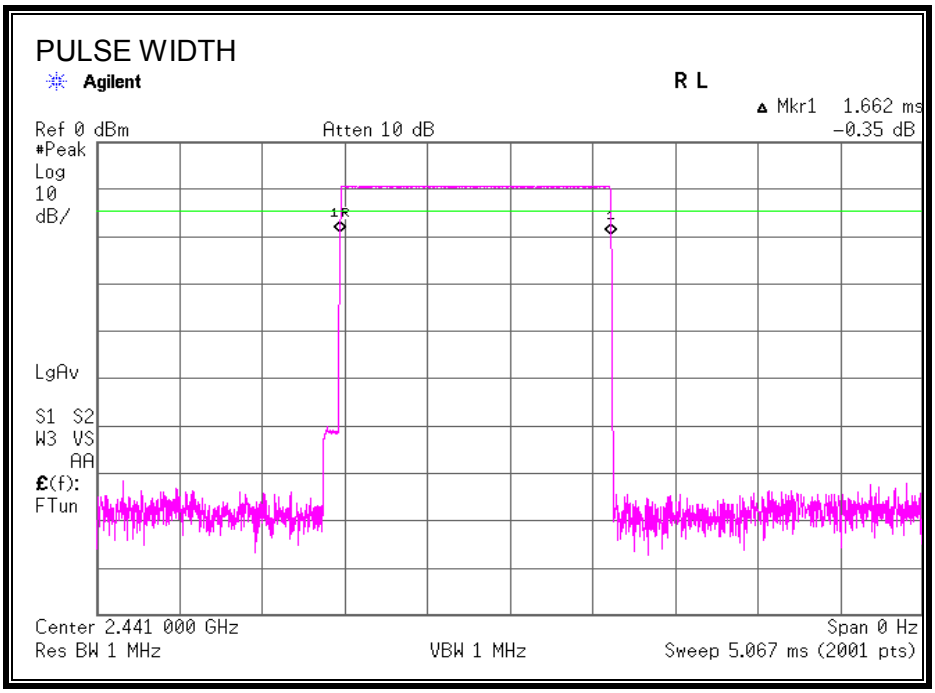
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

DH1 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



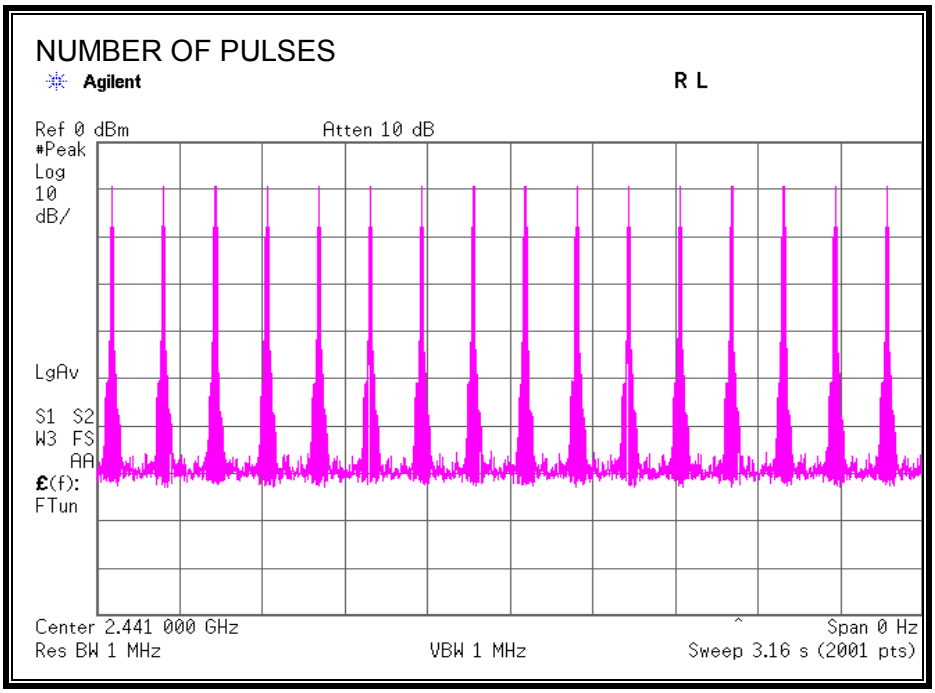
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

DH3 PULSE WIDTH



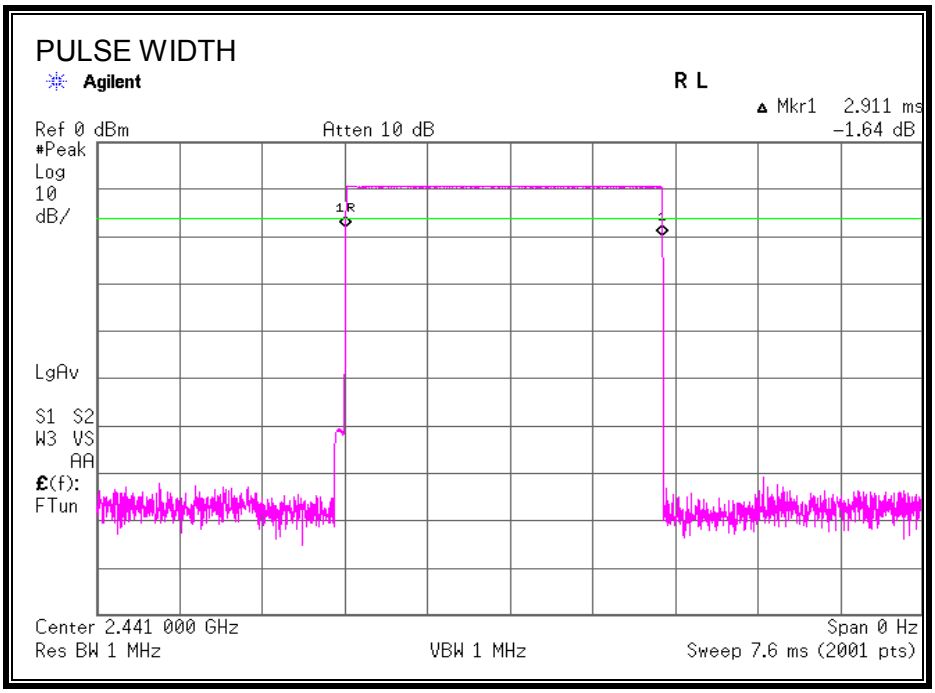
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

DH3 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



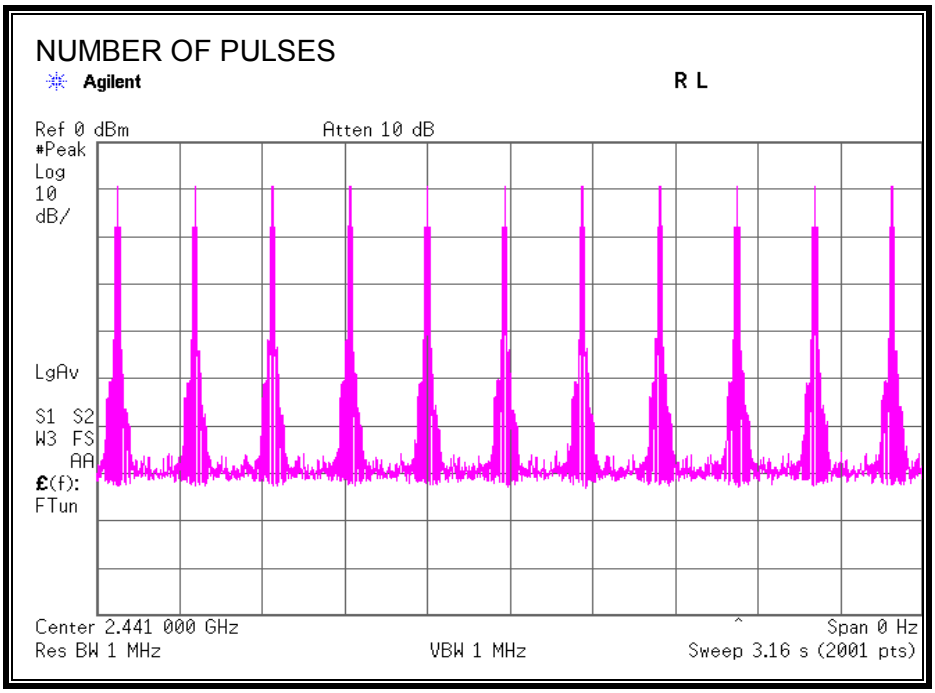
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

DH5 PULSE WIDTH



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

DH5 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.1.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 20.96 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Output Power Reading (dBm)	factor (cable ,ATT) (dB)	Output Power Result (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-7.05	10.67	3.62	20.96	17.34
Middle	2441	-6.88	10.68	3.80	20.96	17.16
High	2480	-7.04	10.68	3.64	20.96	17.32

Sample calculation: Output Power Reading [dBm] + factor [dB]
Test was not performed at AFH mode because this Bluetooth radio is in compliance of Bluetooth Specification 3.0 and the output power at non-AFH mode is less than 20.96dBm.

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.1.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.67 – 10.68 dB (including 10.00 dB pad and 0.67 - 0.68 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	2.46
Middle	2441	2.62
High	2480	2.49

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.
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)

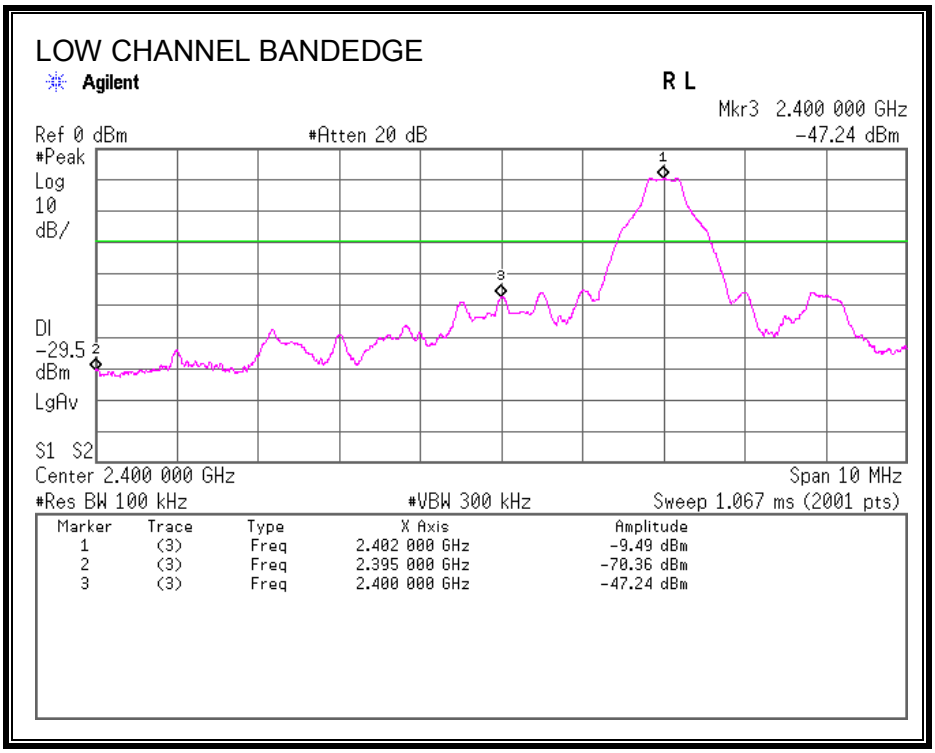
The spectrum from 9 kHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

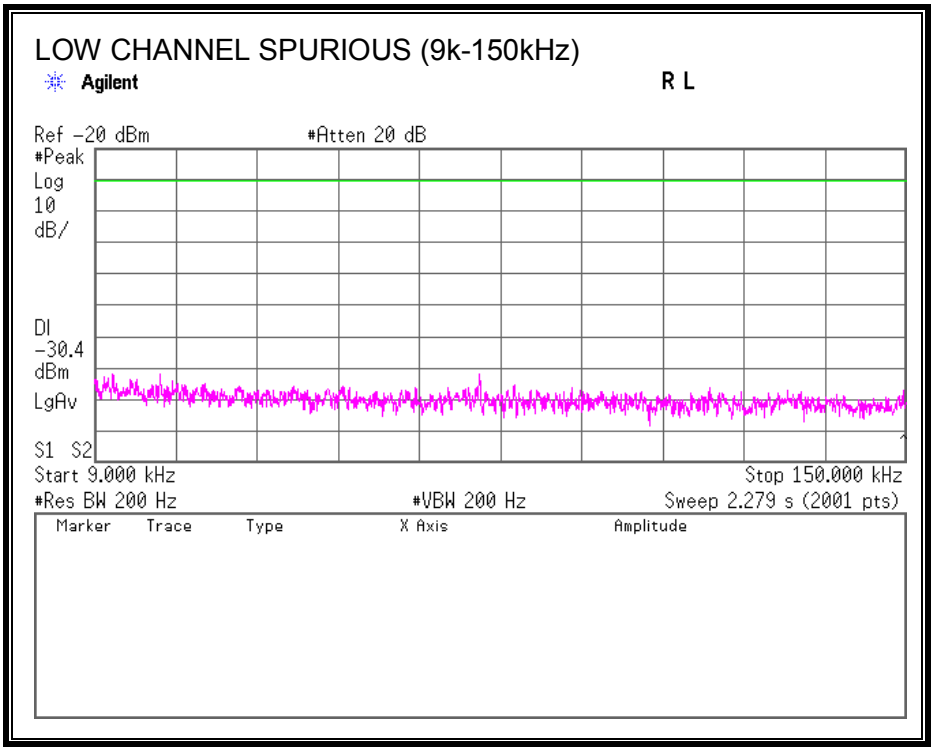
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

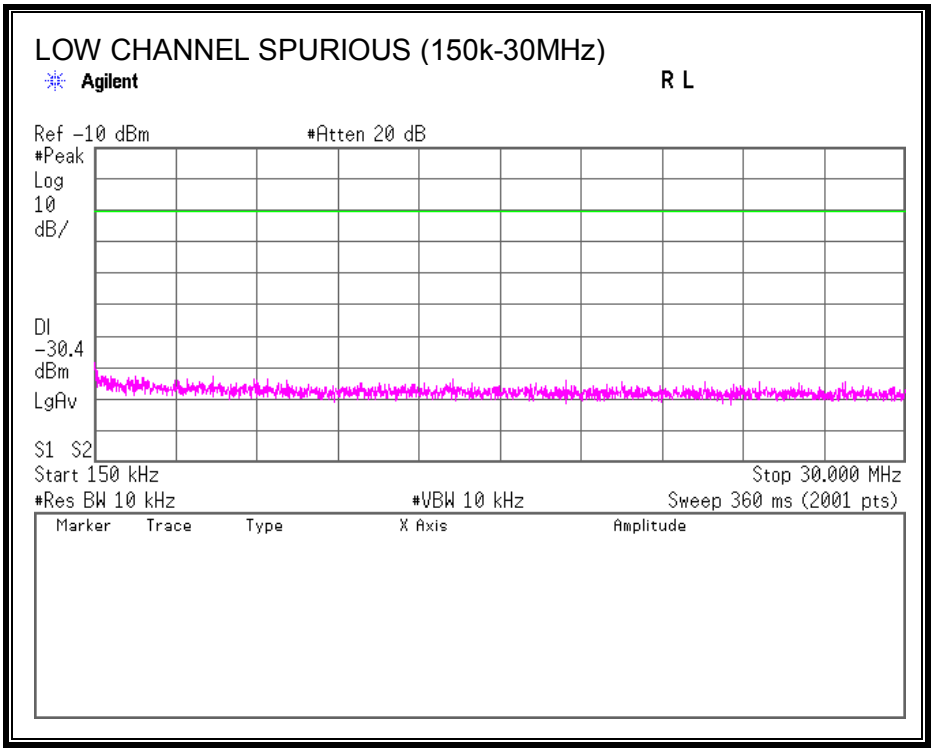
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

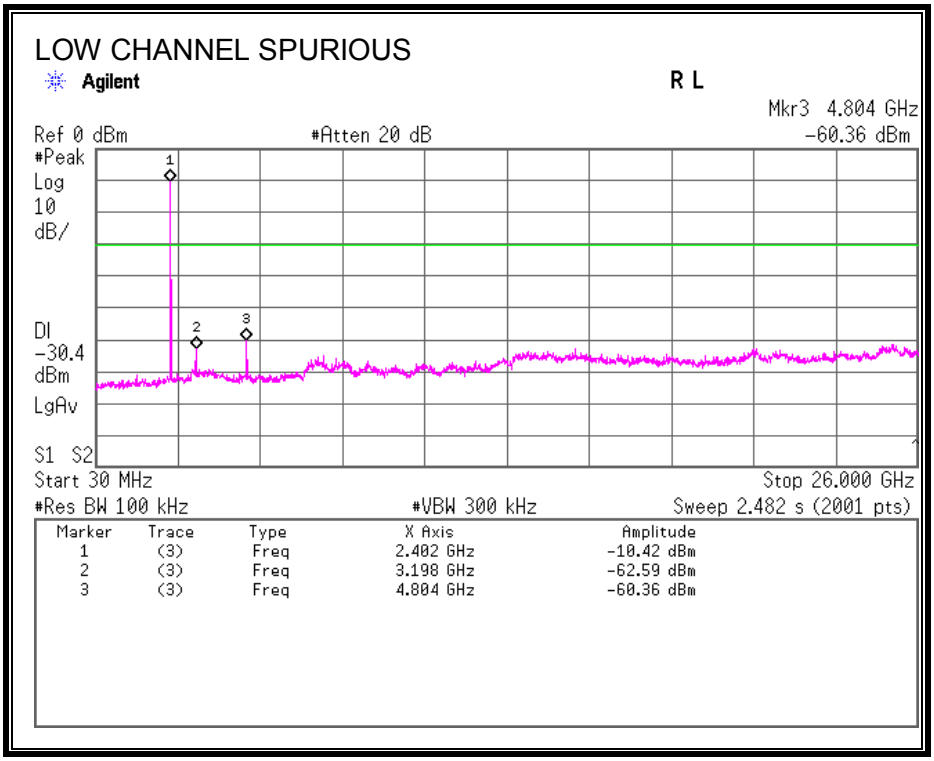


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



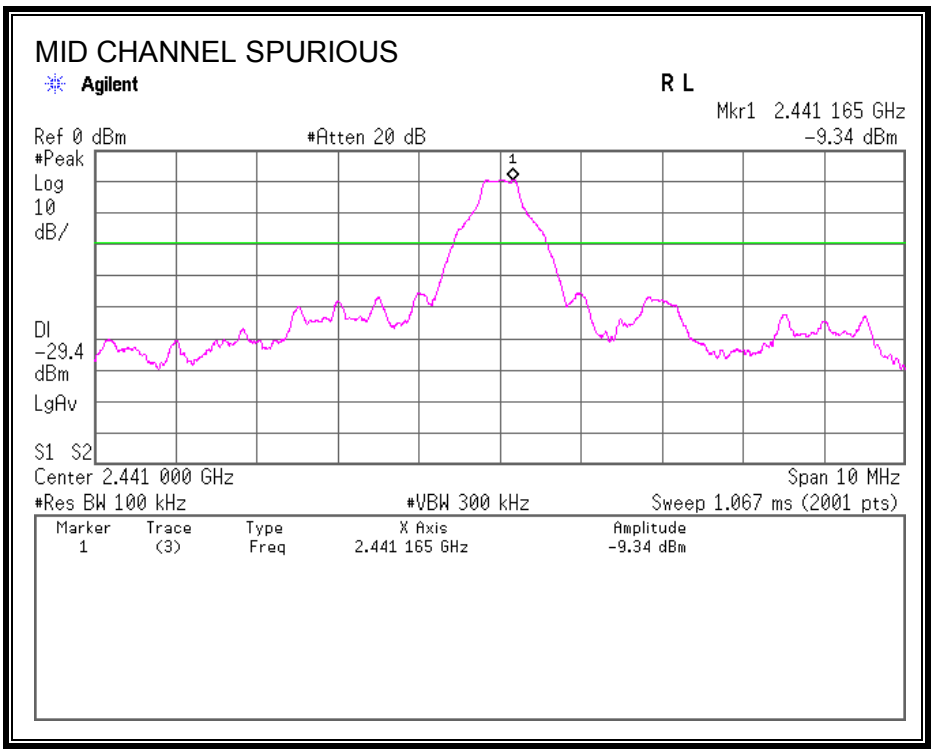


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

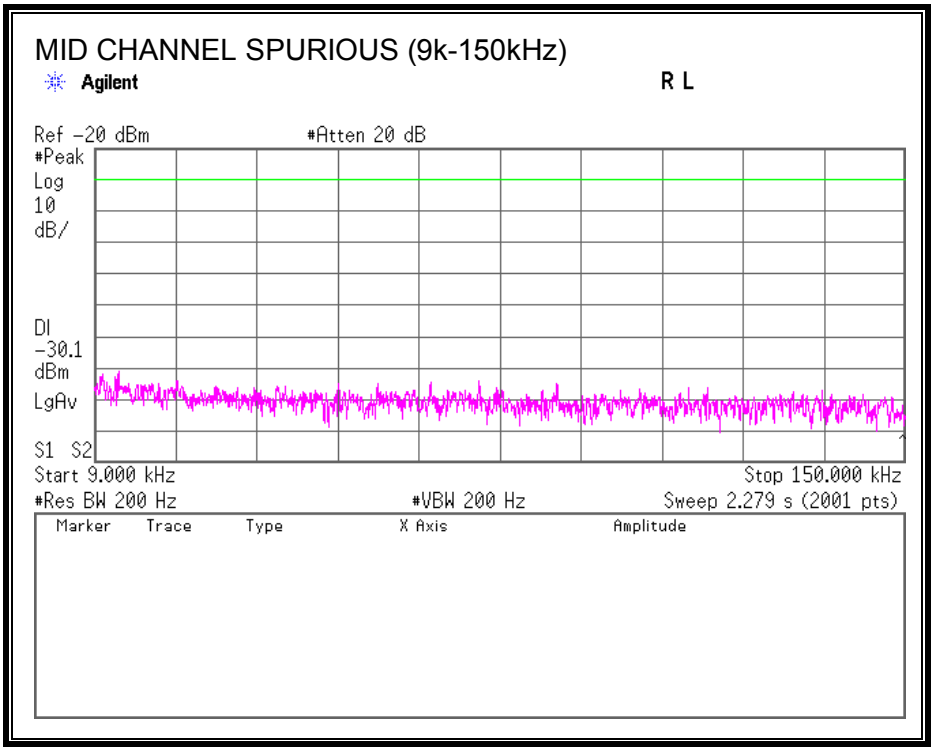


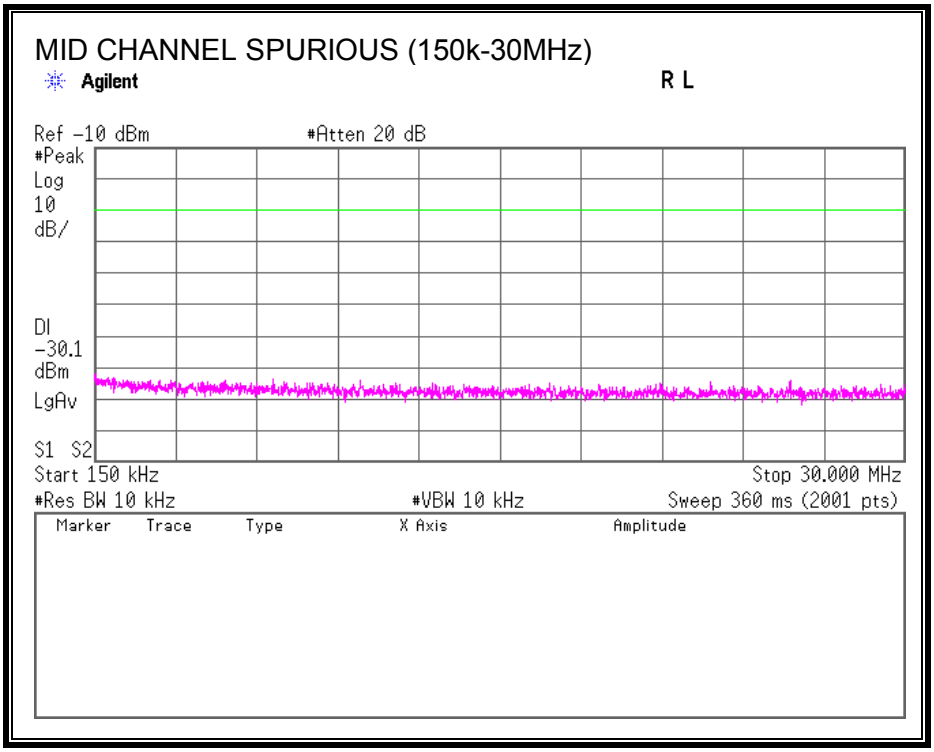
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

SPURIOUS EMISSIONS, MID CHANNEL

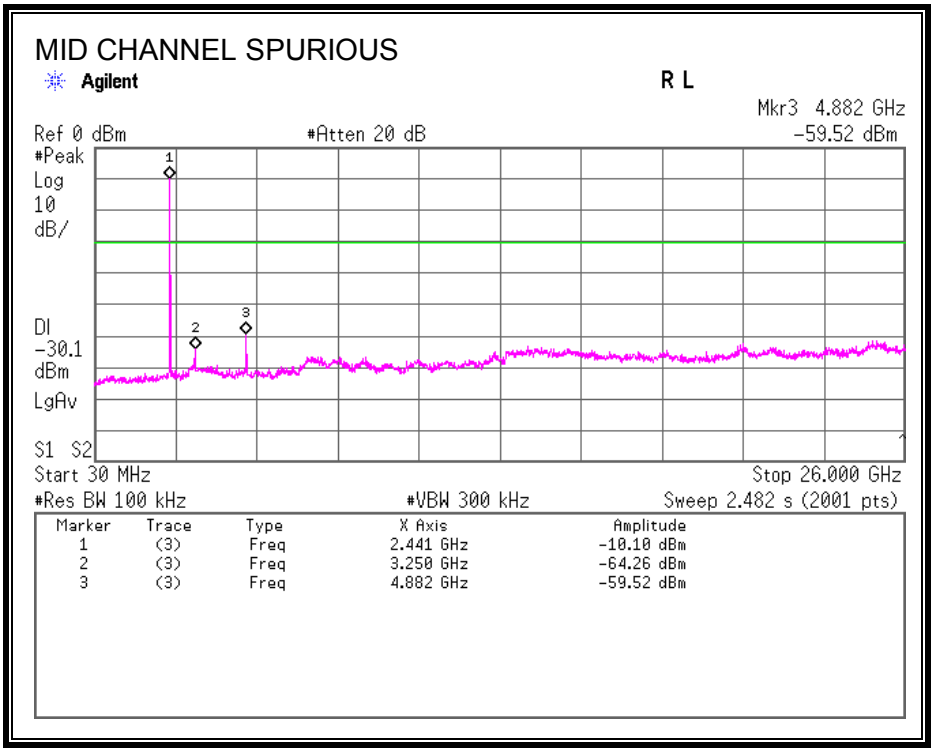


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



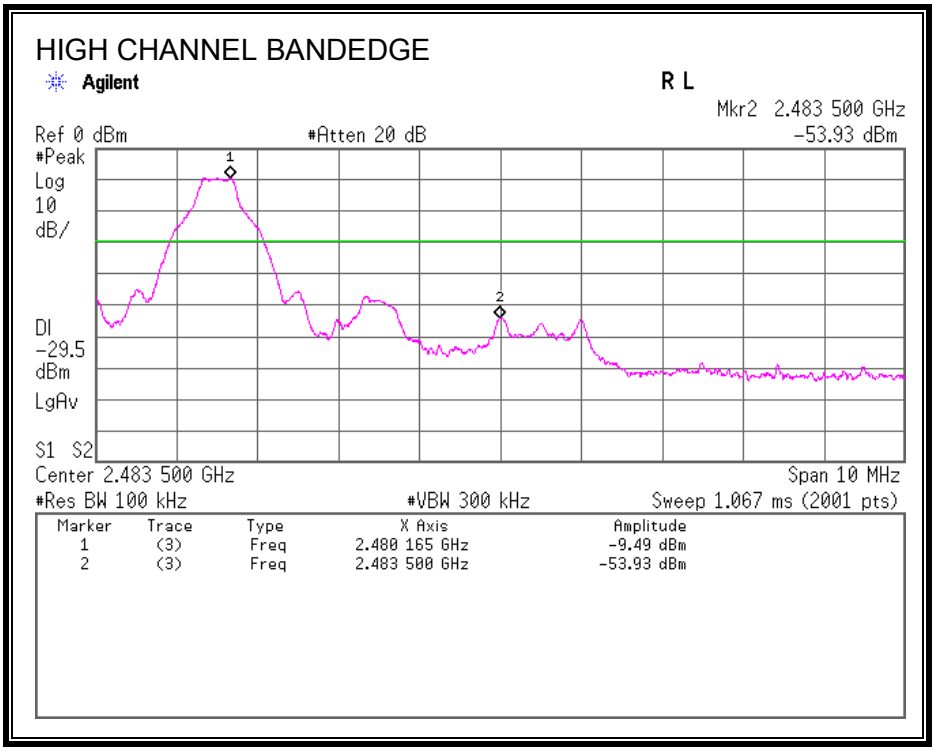


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

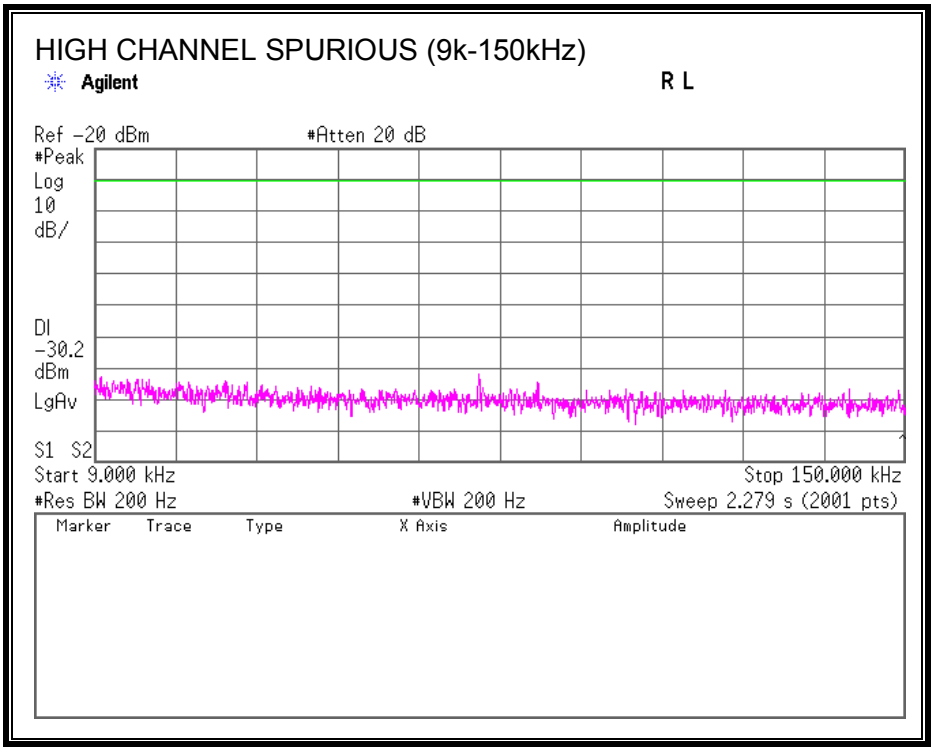


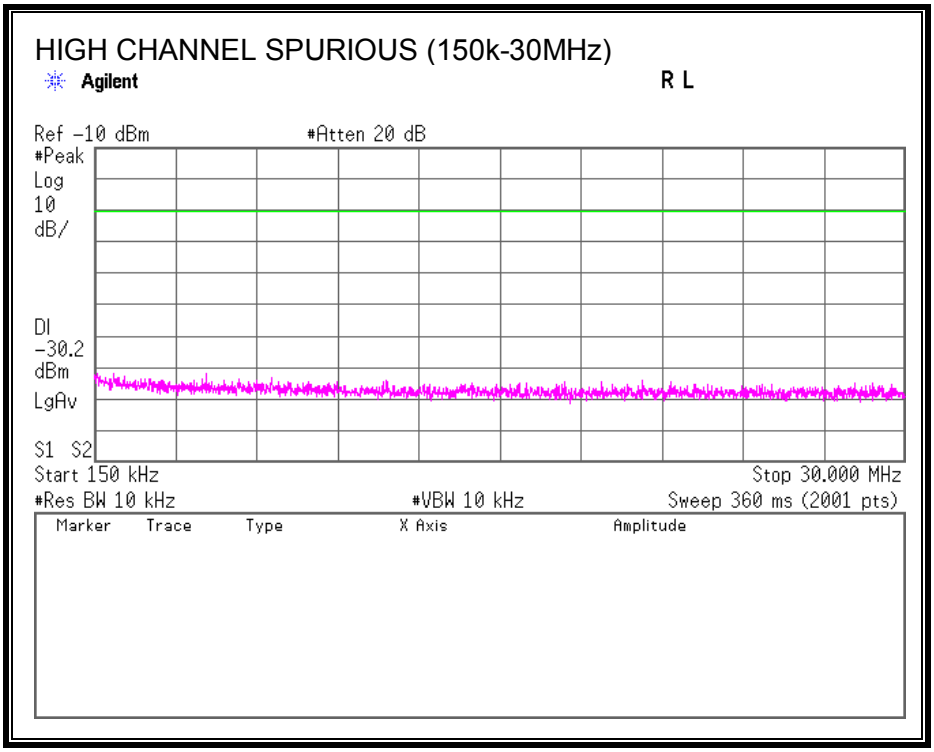
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

SPURIOUS EMISSIONS, HIGH CHANNEL

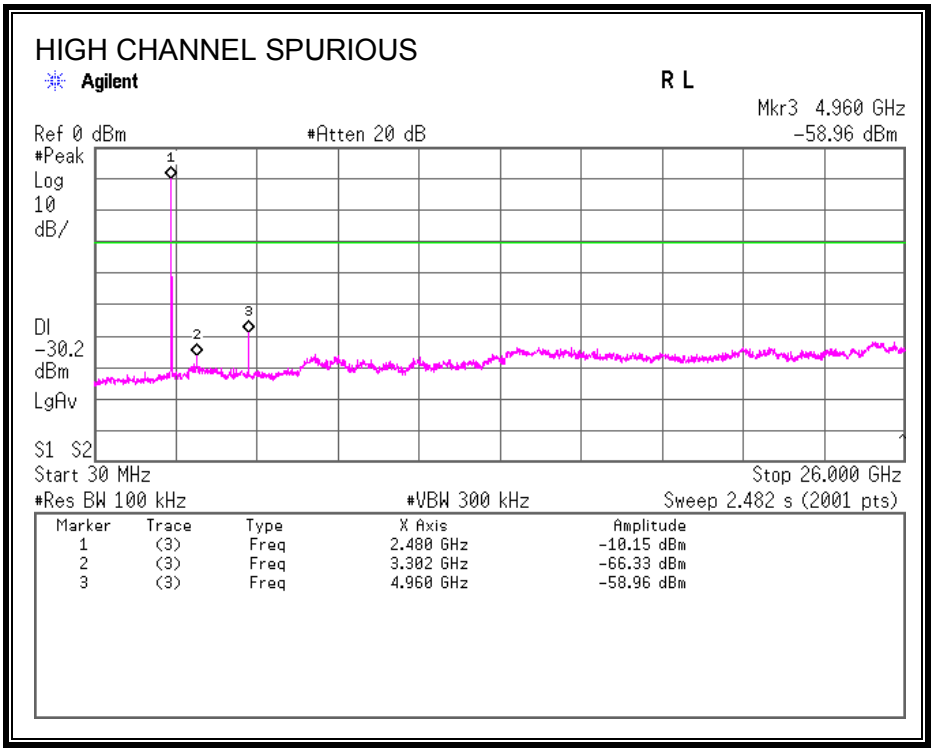


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401





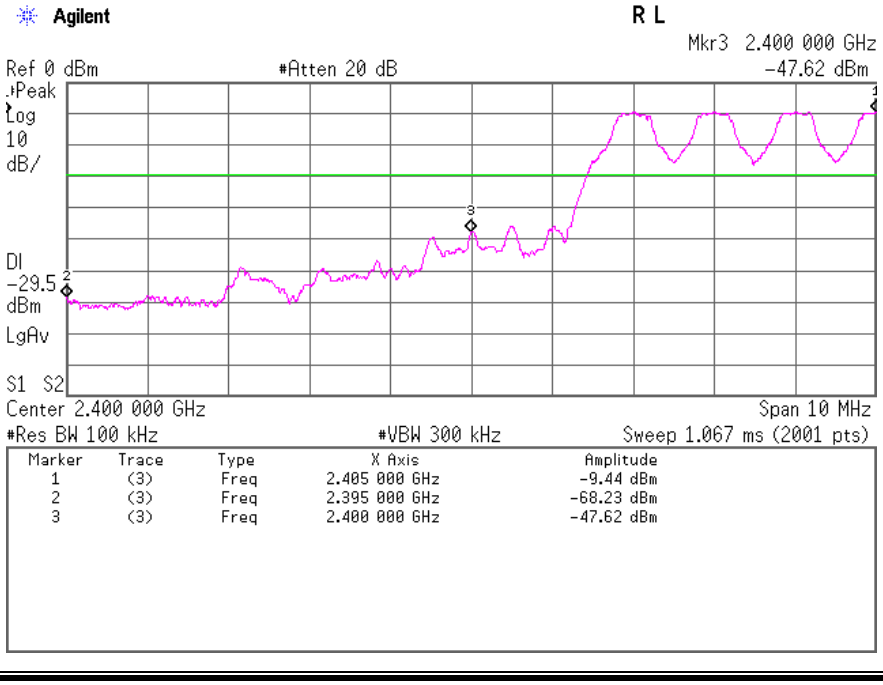
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

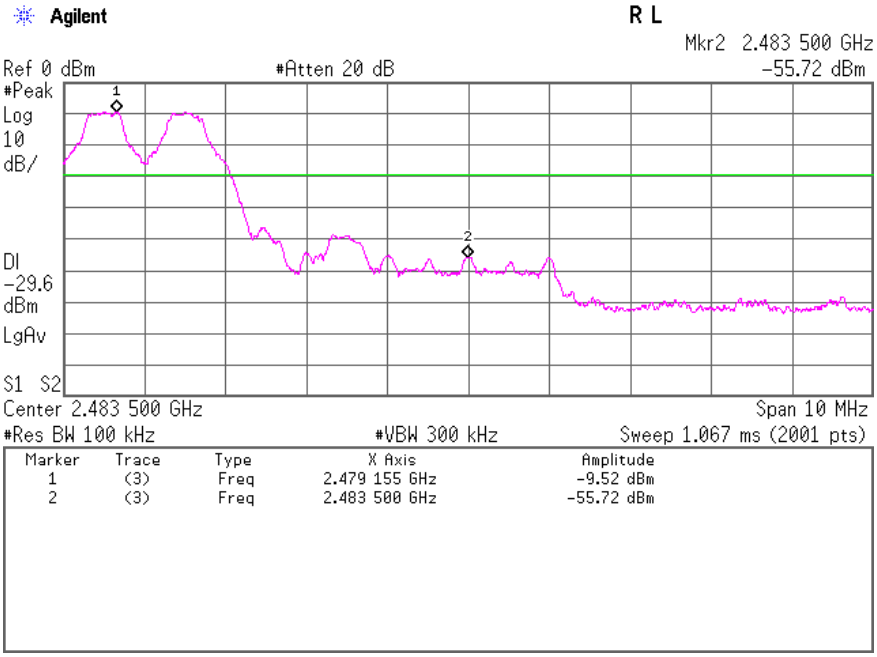
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HIGH BANDEDGE WITH HOPPING ON



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

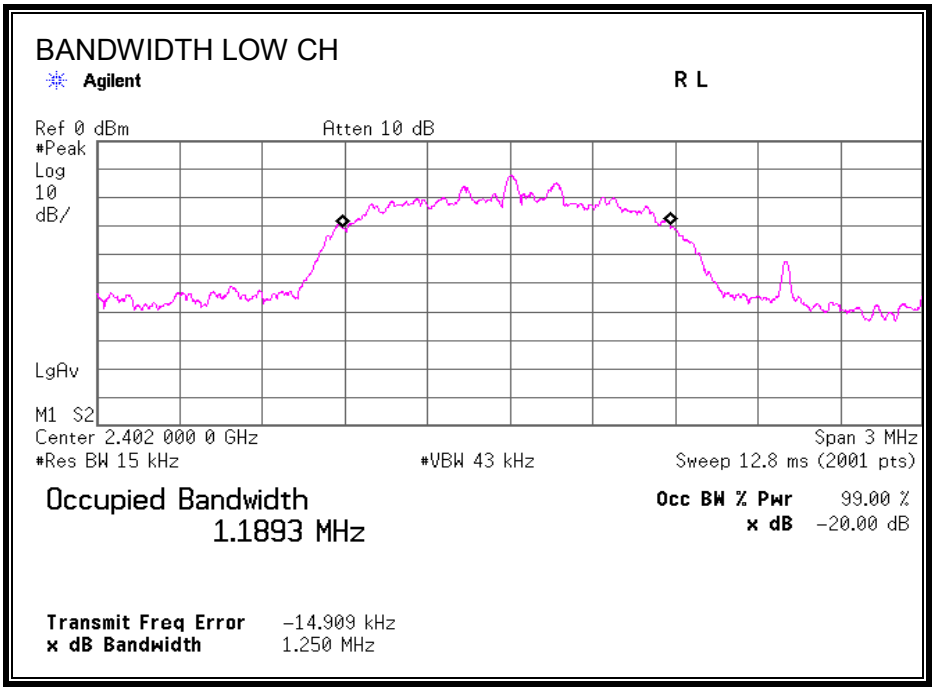
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

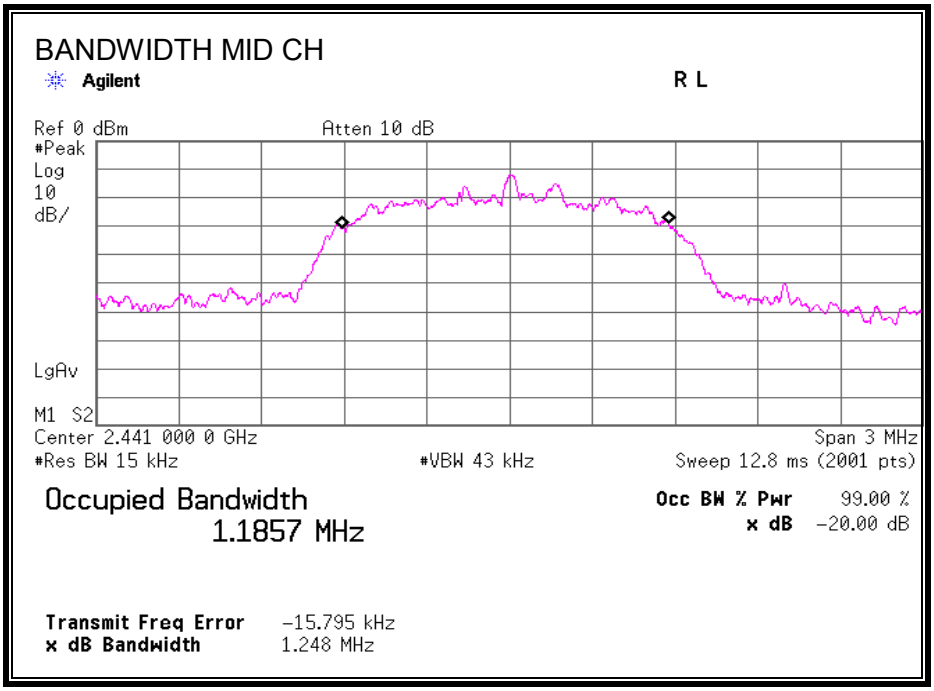
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1250	1174.3
Middle	2441	1248	1174.9
High	2480	1246	1174.0

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

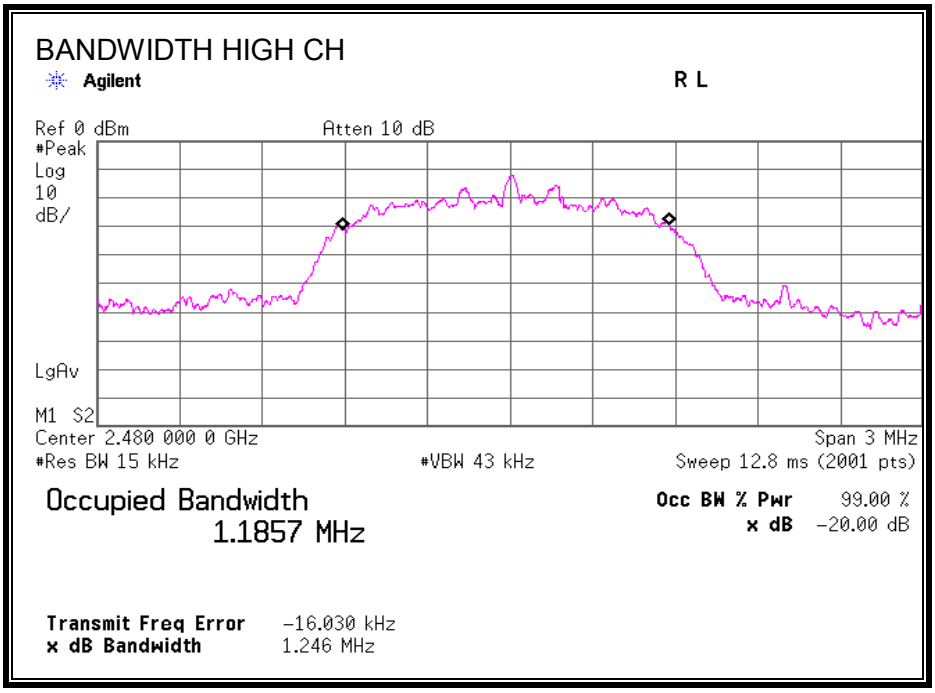
20 dB BANDWIDTH



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

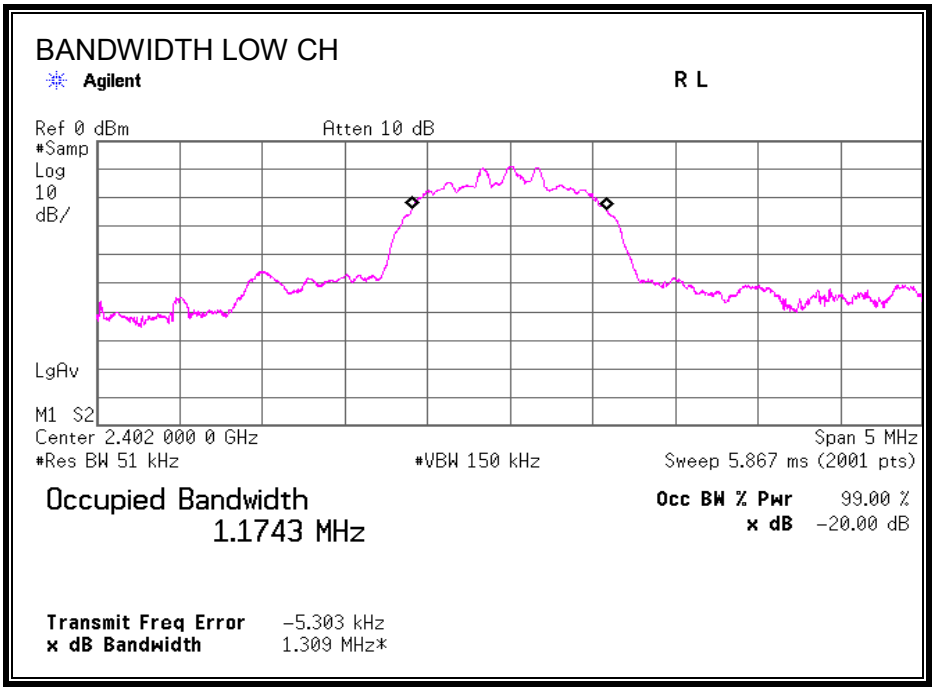


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

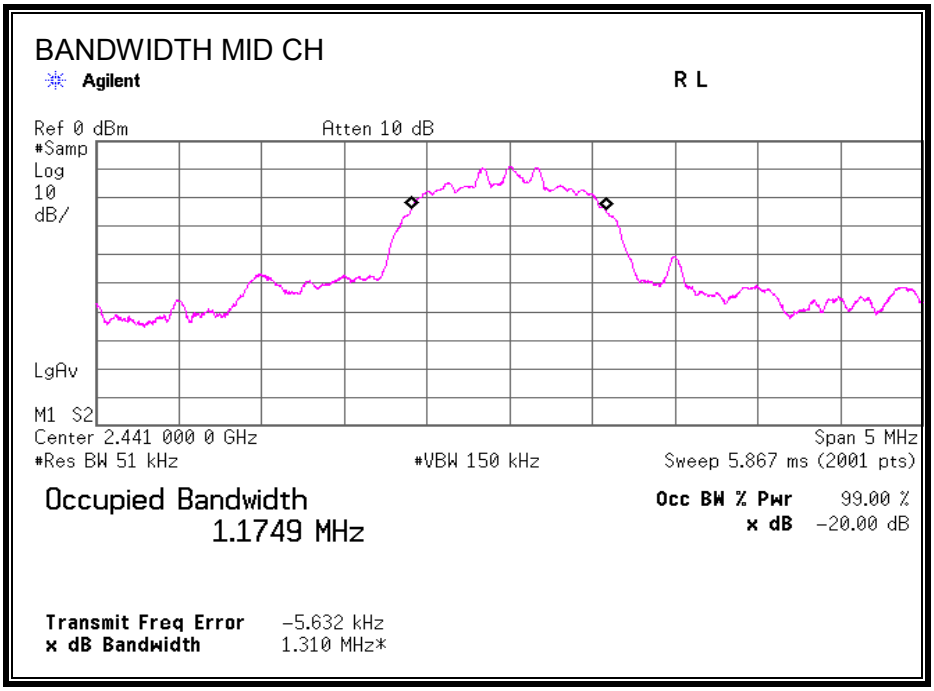


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

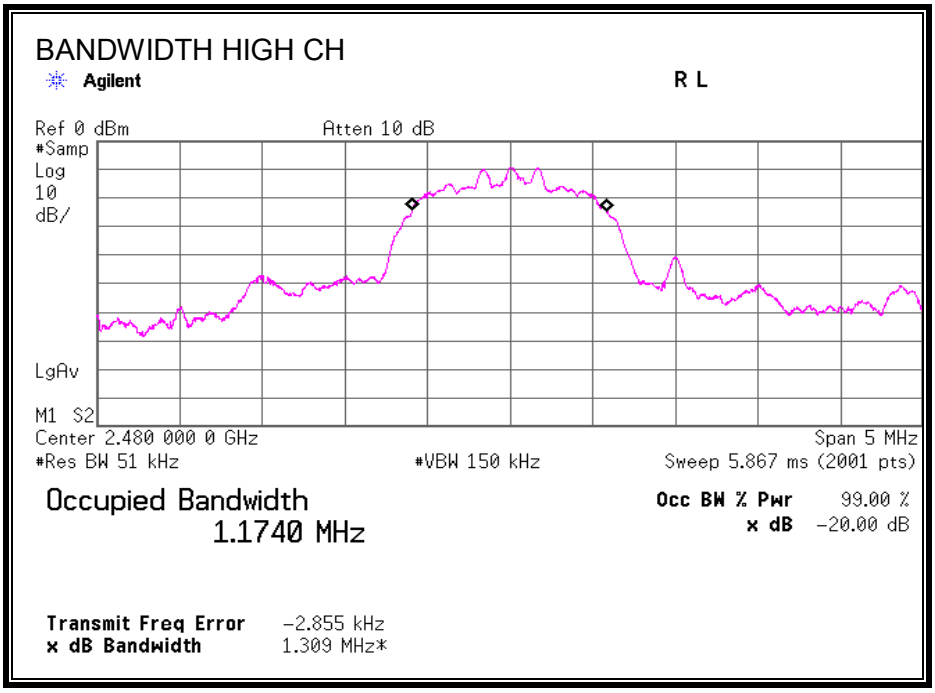
99% BANDWIDTH



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

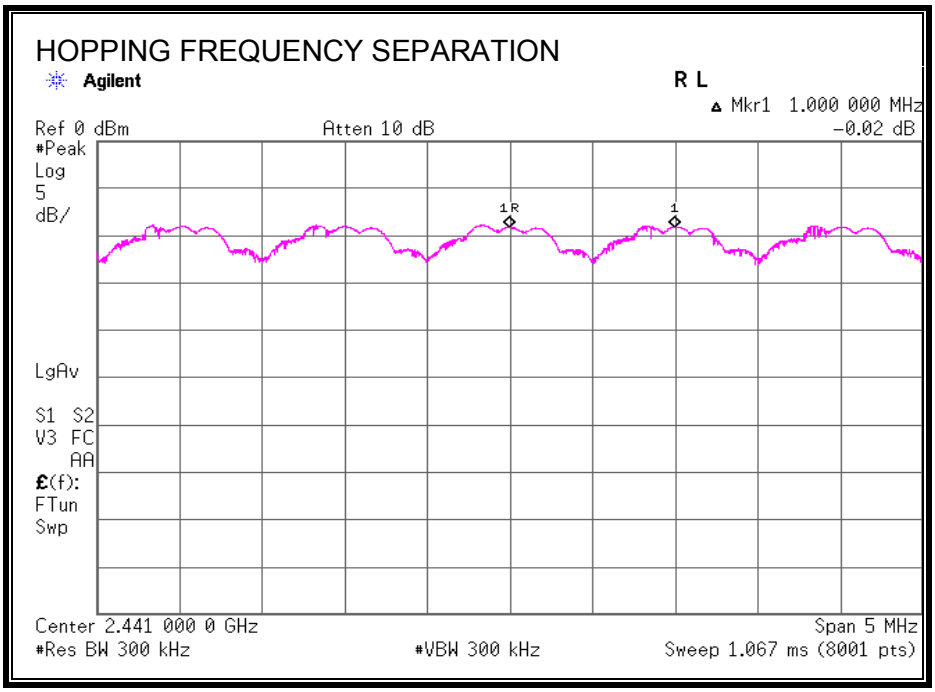
RESULTS

The channel separation was 1MHz and the test result was greater than the requirement that was 2/3 of 20 dB channel bandwidth.

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESULTS

HOPPING FREQUENCY SEPARATION



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.2.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

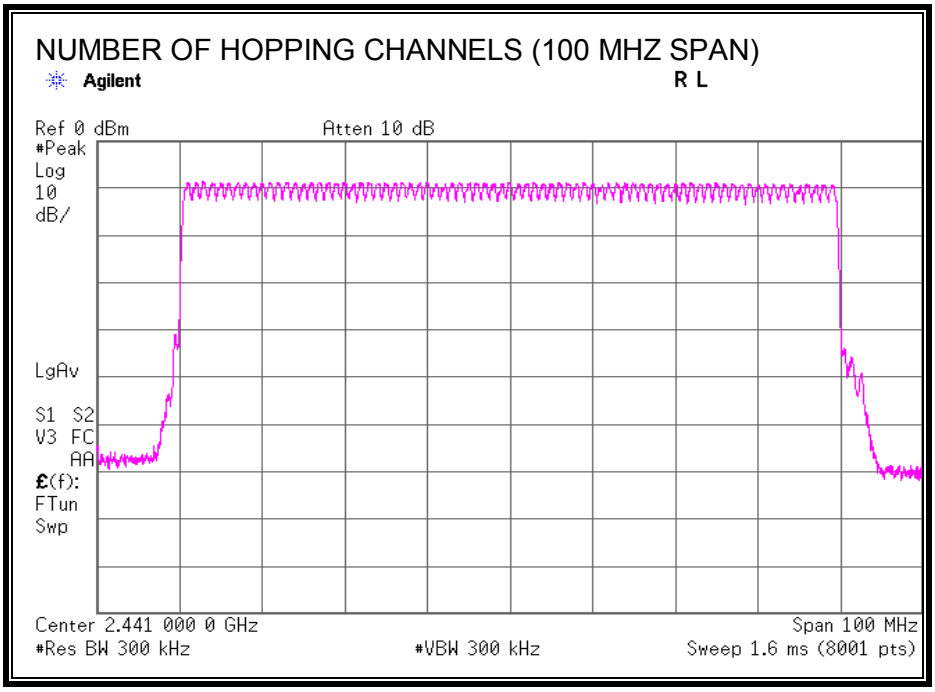
Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth 3.0 Specification.

RESULTS

79 Channels observed.

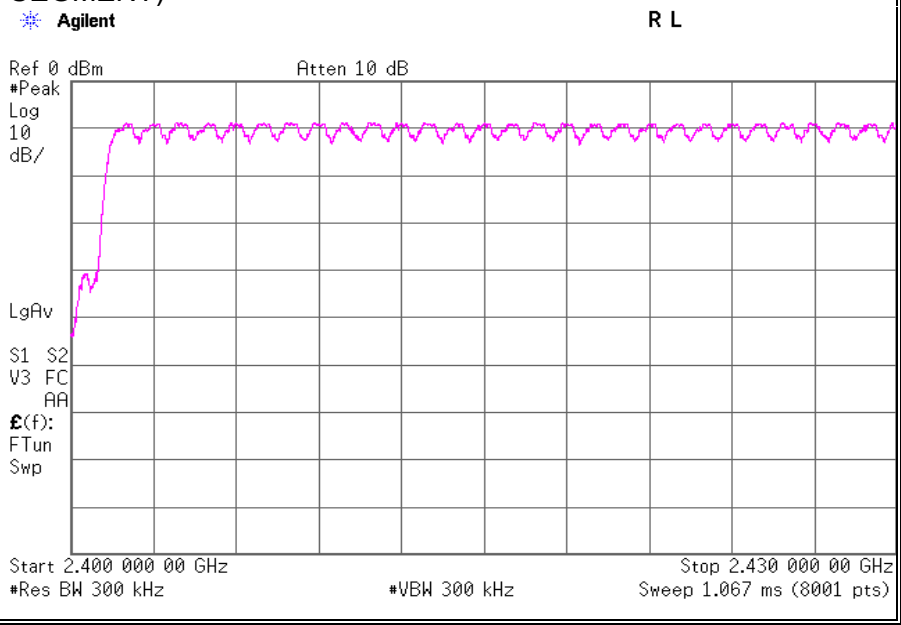
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

NUMBER OF HOPPING CHANNELS



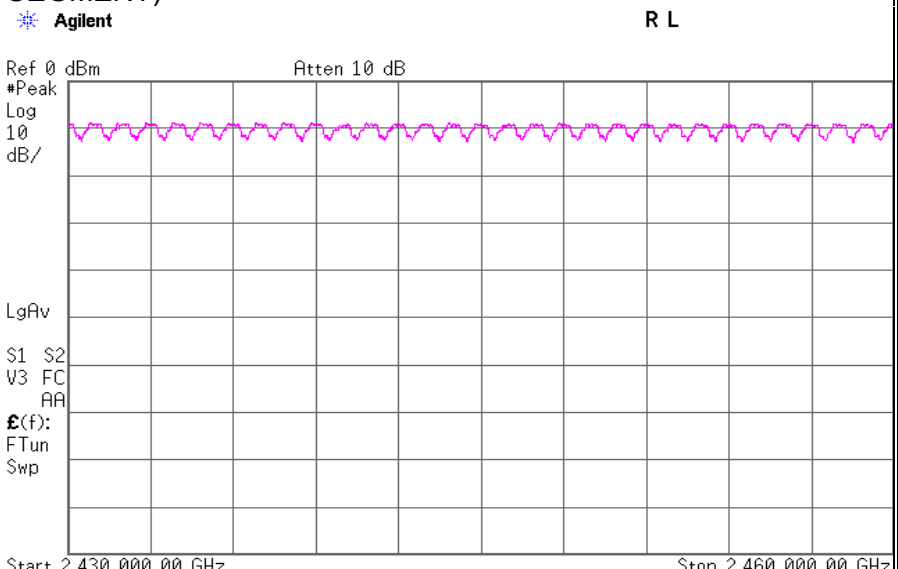
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



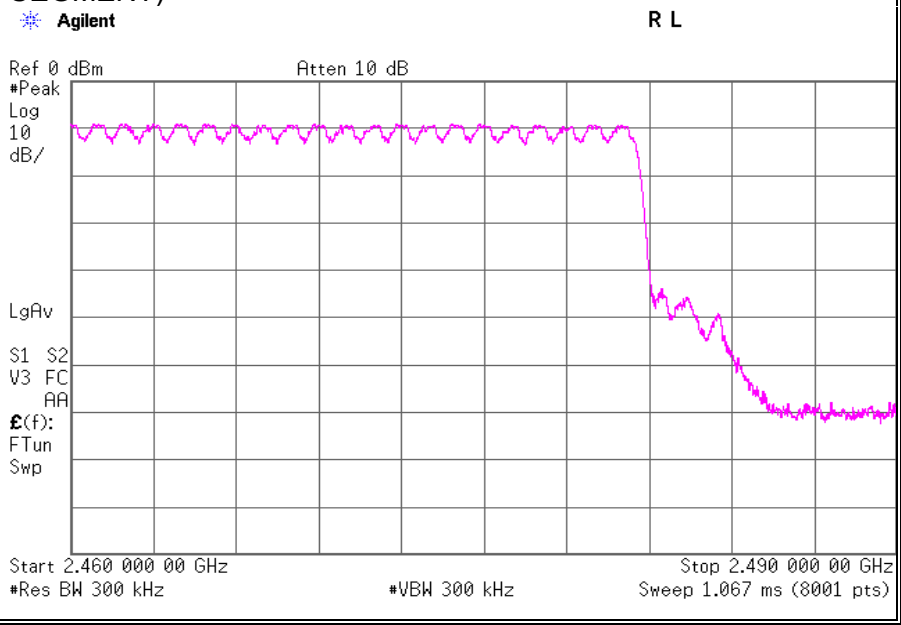
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

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 x 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.

RESULTS

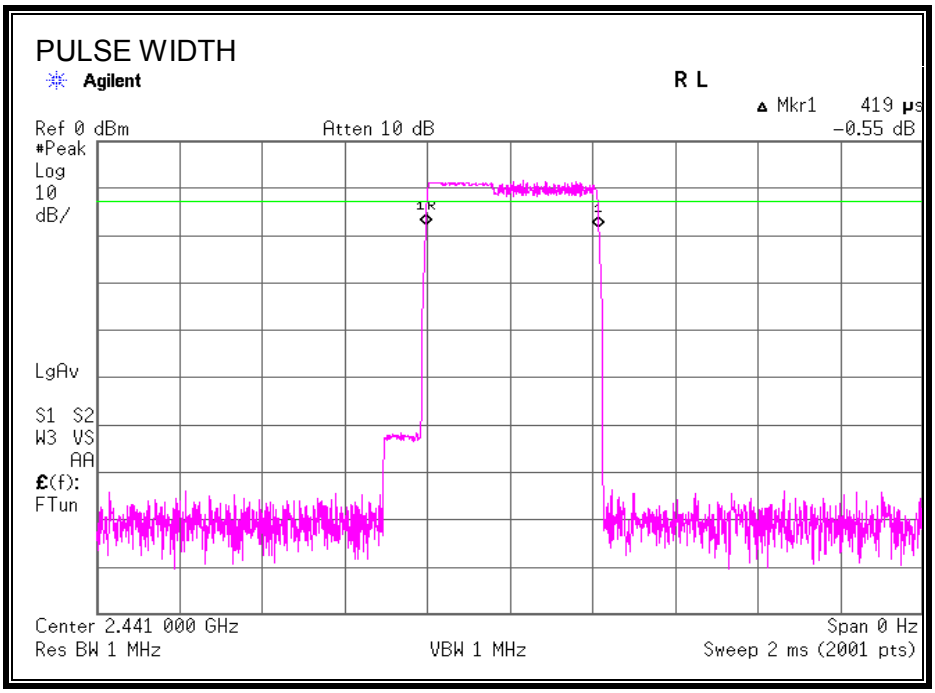
Time of Occupancy = 10 * xx pulses * yy msec = zz msec

8PSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
3DH1	0.419	32	0.134	0.4	0.266
3DH3	1.669	16	0.267	0.4	0.133
3DH5	2.922	11	0.321	0.4	0.079

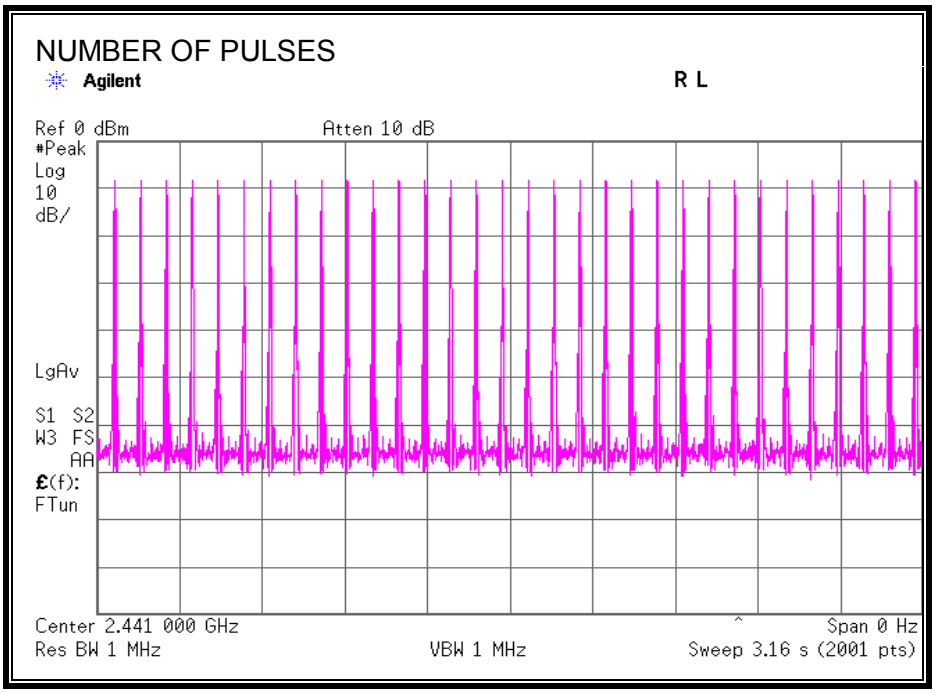
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

3DH1 PULSE WIDTH



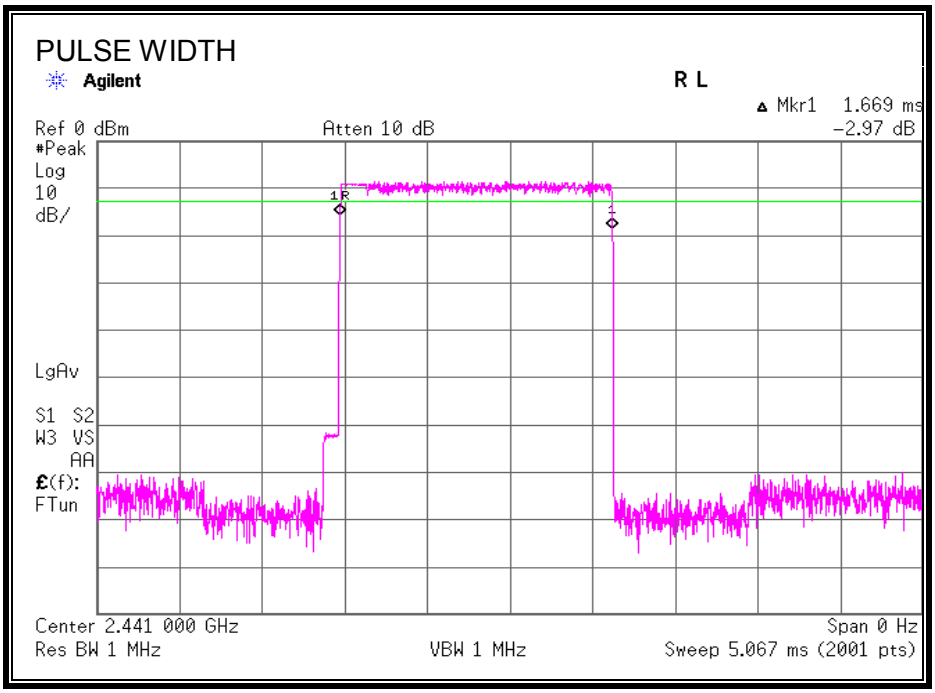
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

3DH1 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



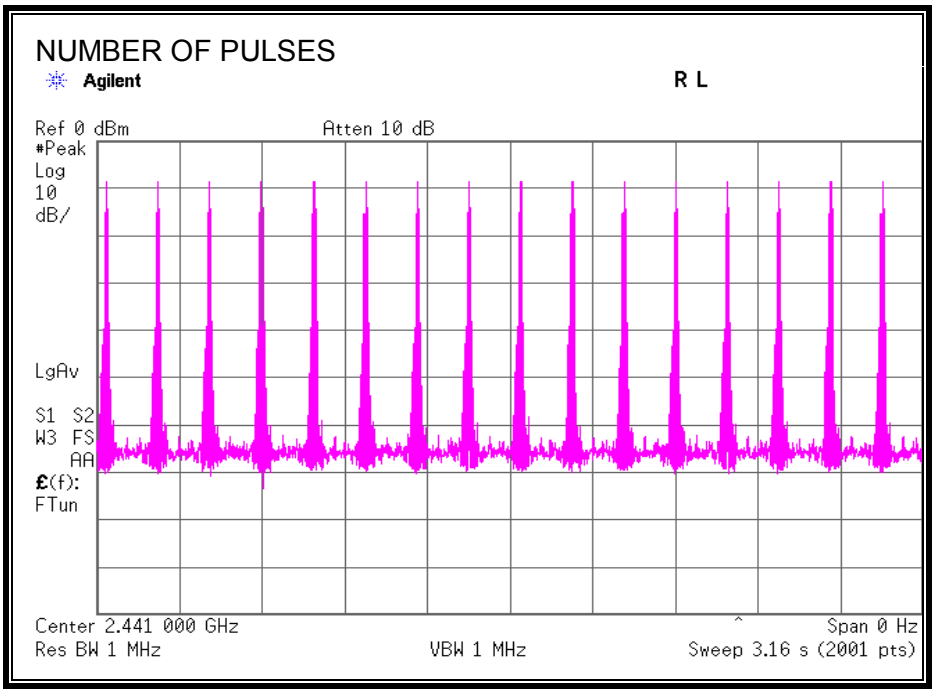
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

3DH3 PULSE WIDTH



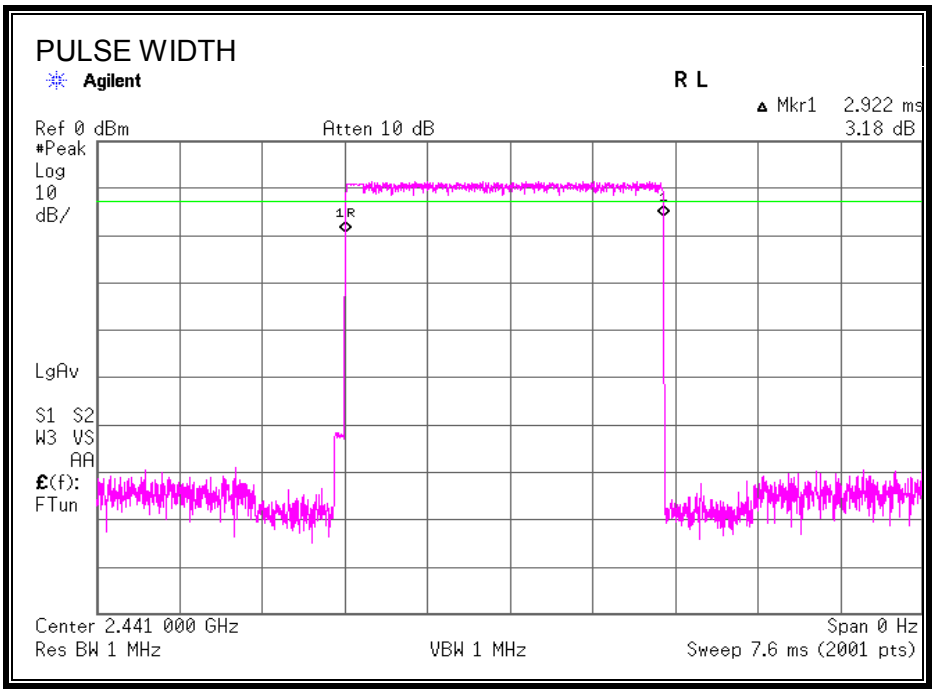
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

3DH3 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



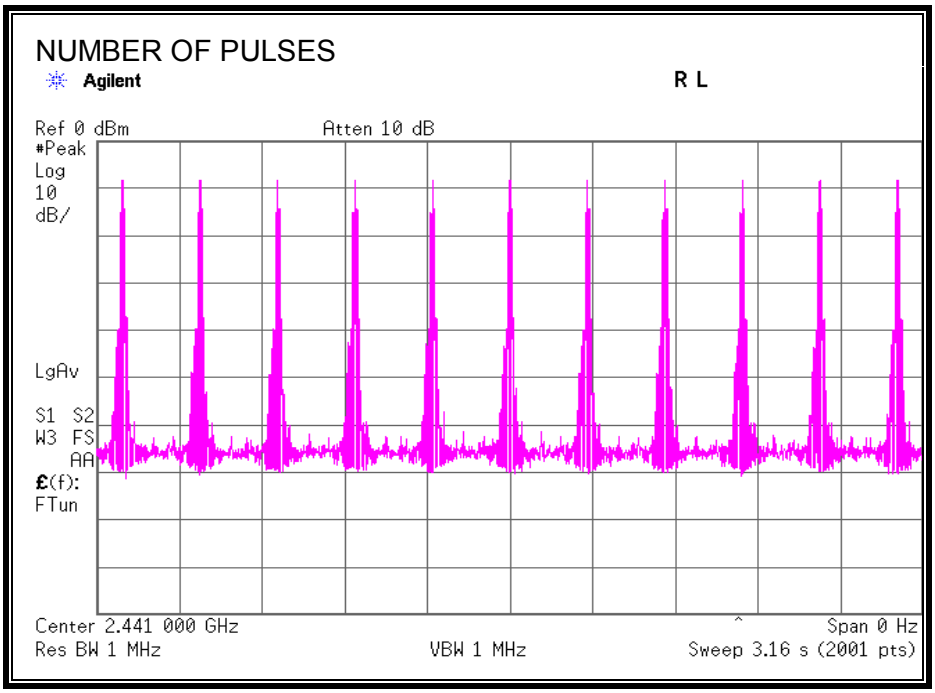
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

3DH5 PULSE WIDTH



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

3DH5 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.2.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 20.96 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Output Power Reading (dBm)	factor (cable ,ATT) (dB)	Output Power Result (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-7.81	10.67	2.86	20.96	18.10
Middle	2441	-7.79	10.68	2.89	20.96	18.07
High	2480	-8.21	10.68	2.47	20.96	18.49

Sample calculation: Output Power Reading [dBm] + factor [dB]
Test was not performed at AFH mode because this Bluetooth radio is in compliance of Bluetooth Specification 3.0 and the output power at non-AFH mode is less than 20.96dBm.

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.2.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.67 – 10.68 dB (including 10.00 dB pad and 0.67 - 0.68 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	-0.62
Middle	2441	-0.72
High	2480	-1.12

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.
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)

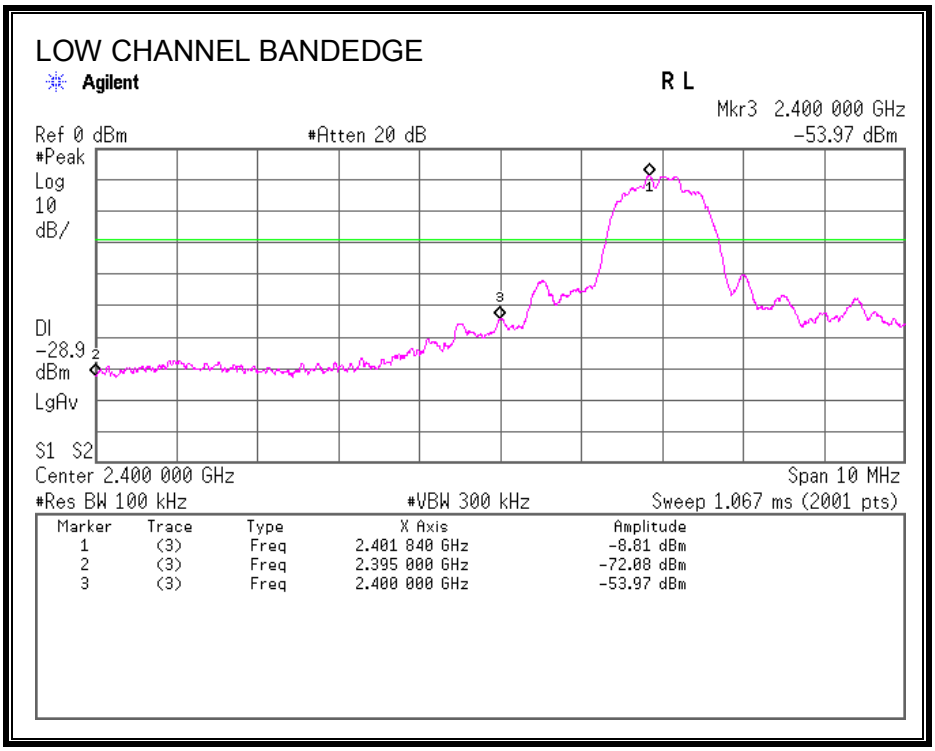
The spectrum from 9 kHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

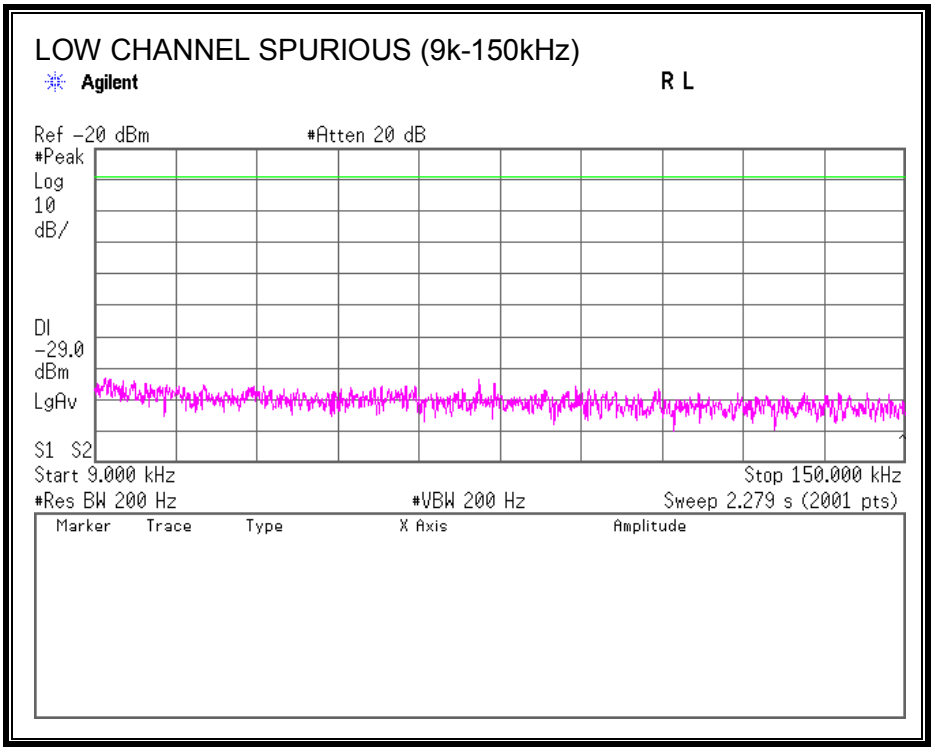
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

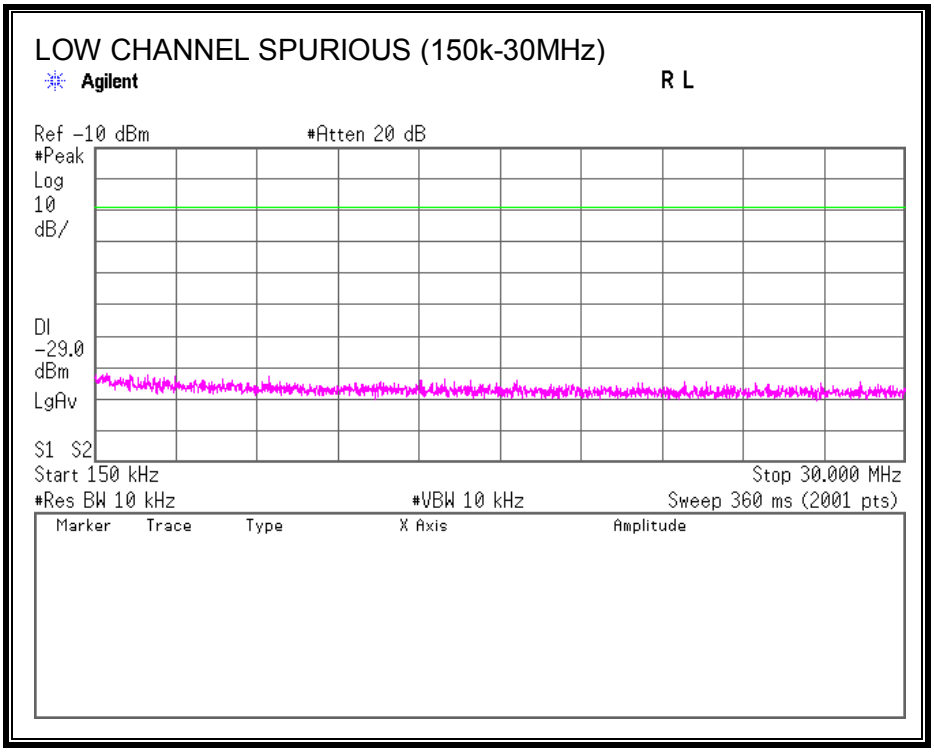
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

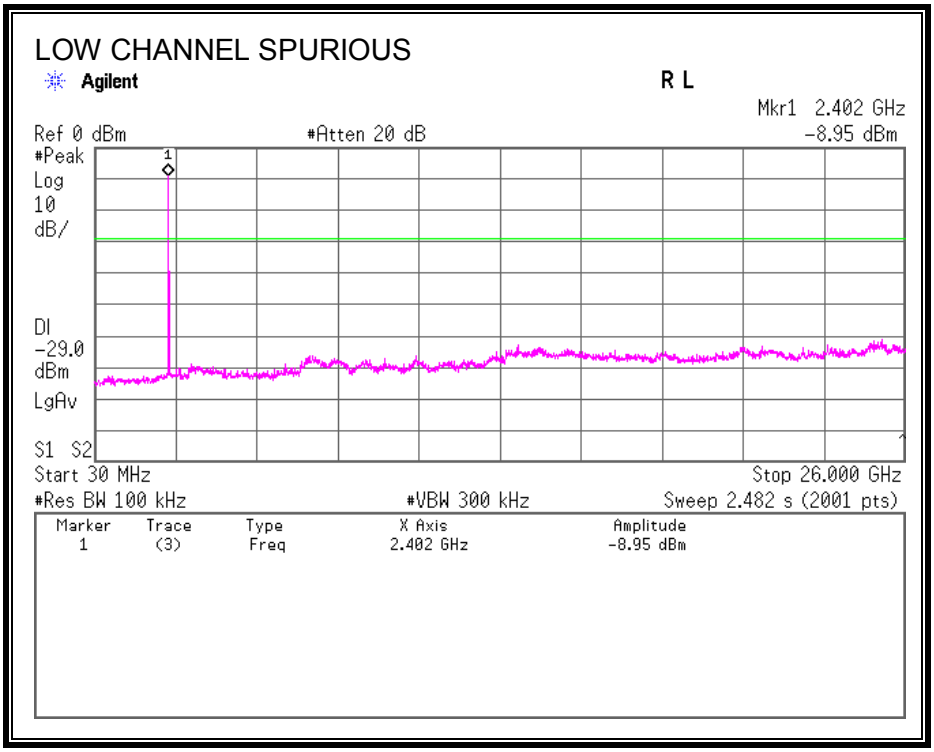


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



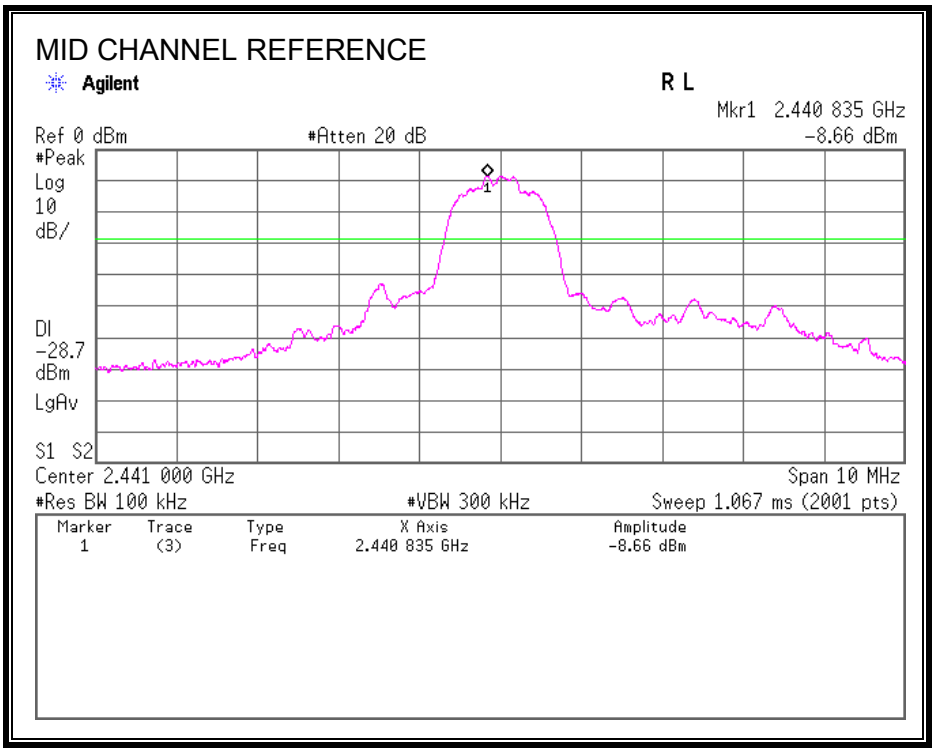


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

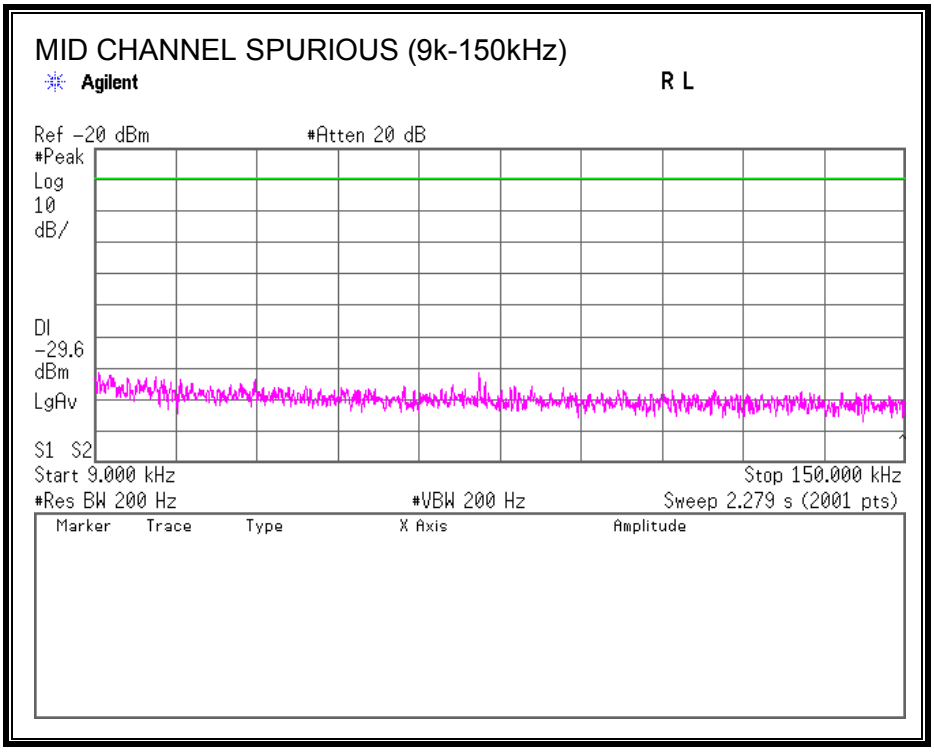


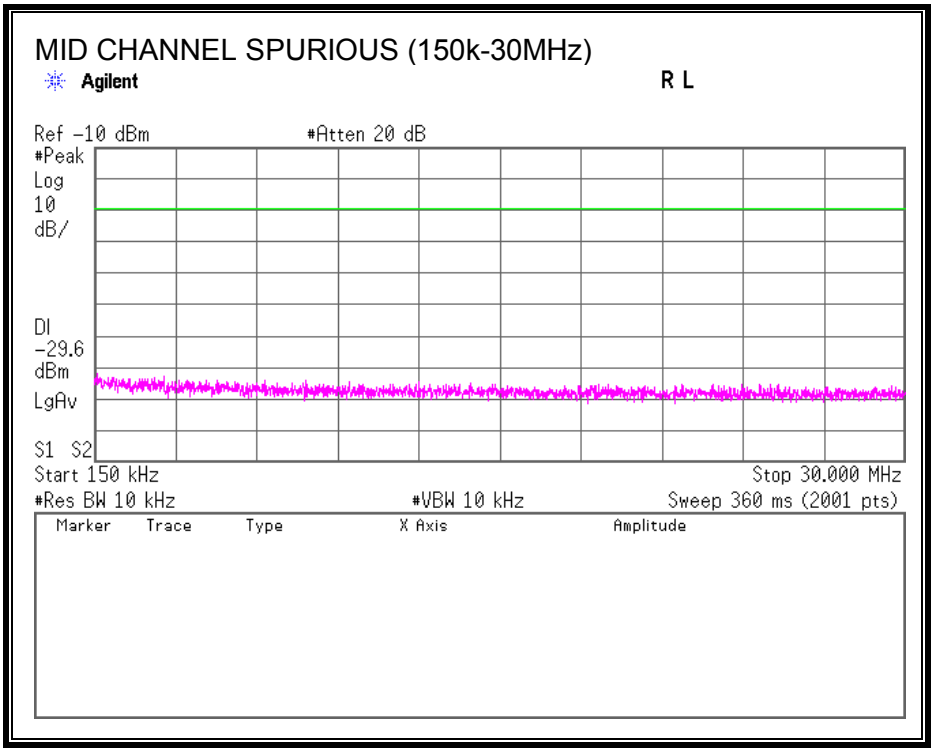
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

SPURIOUS EMISSIONS, MID CHANNEL

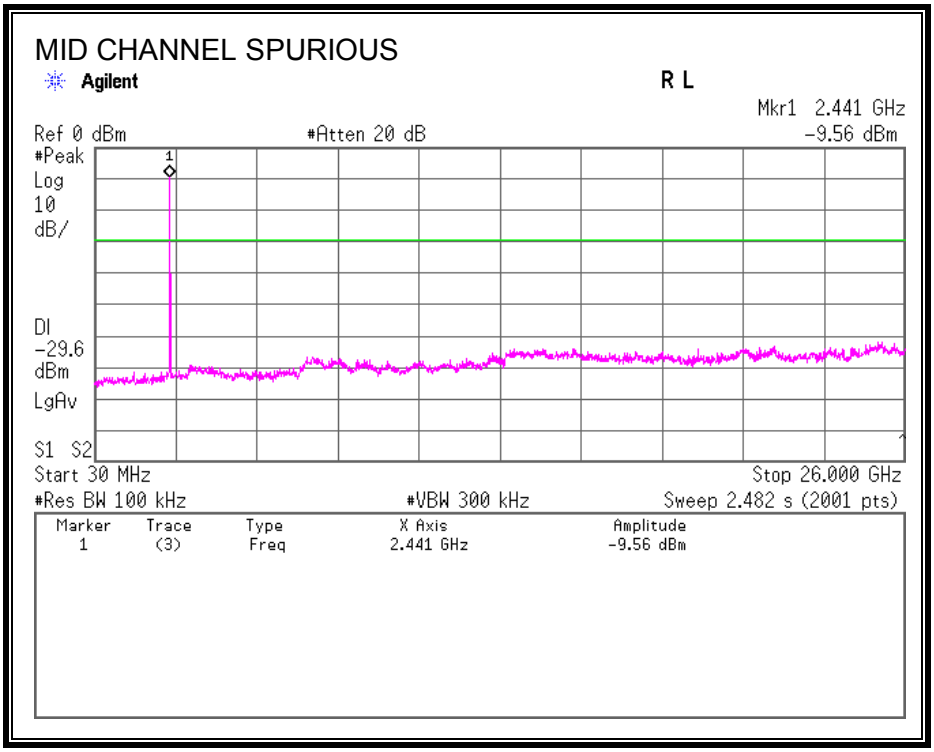


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



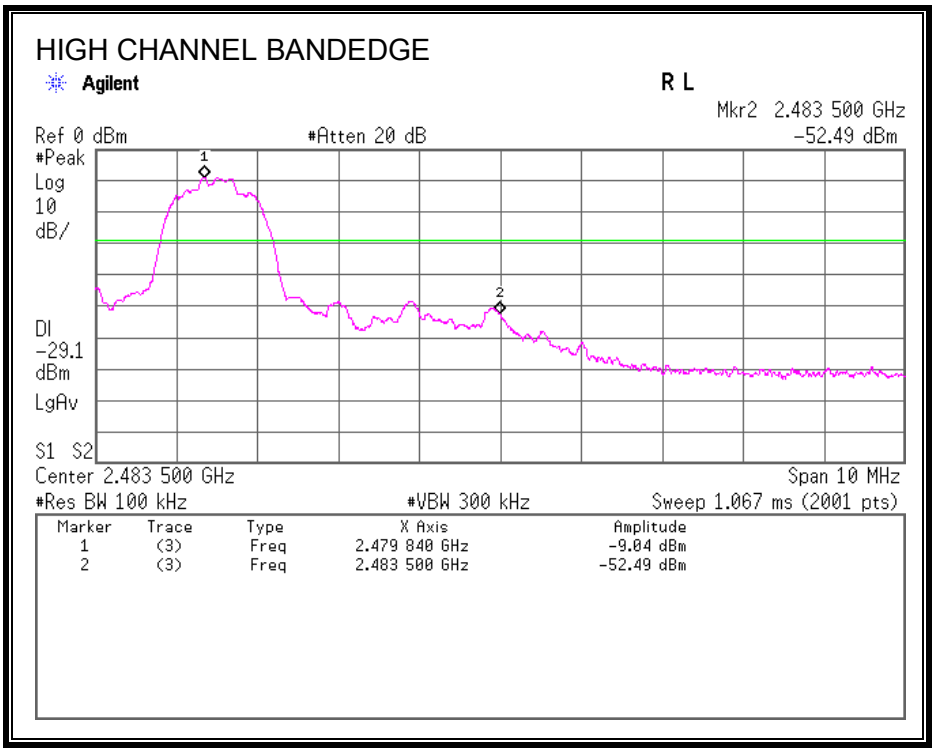


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

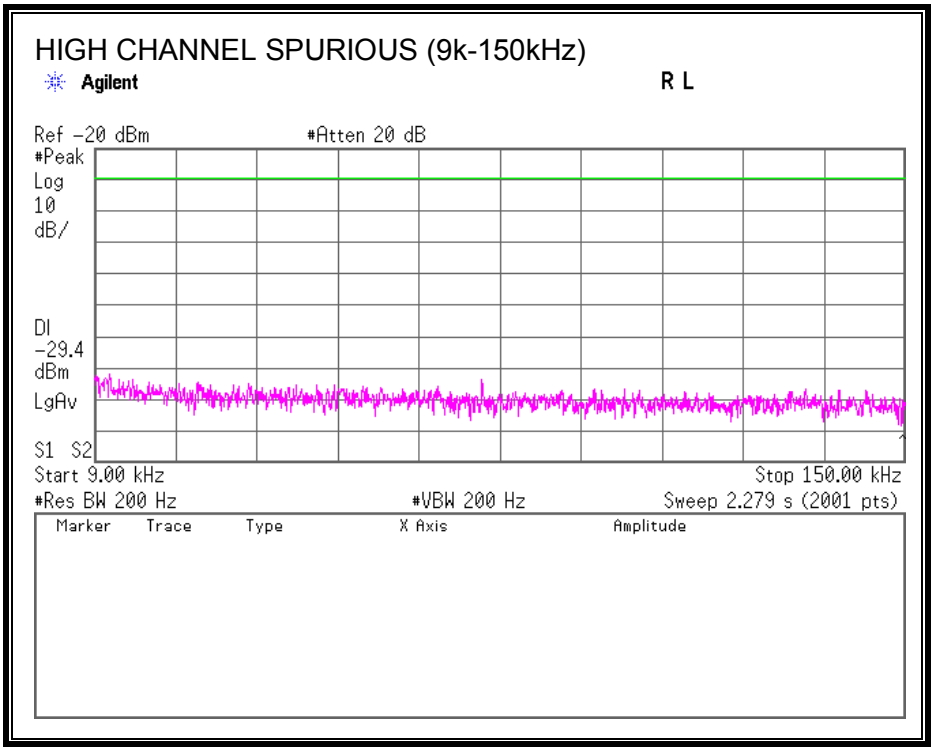


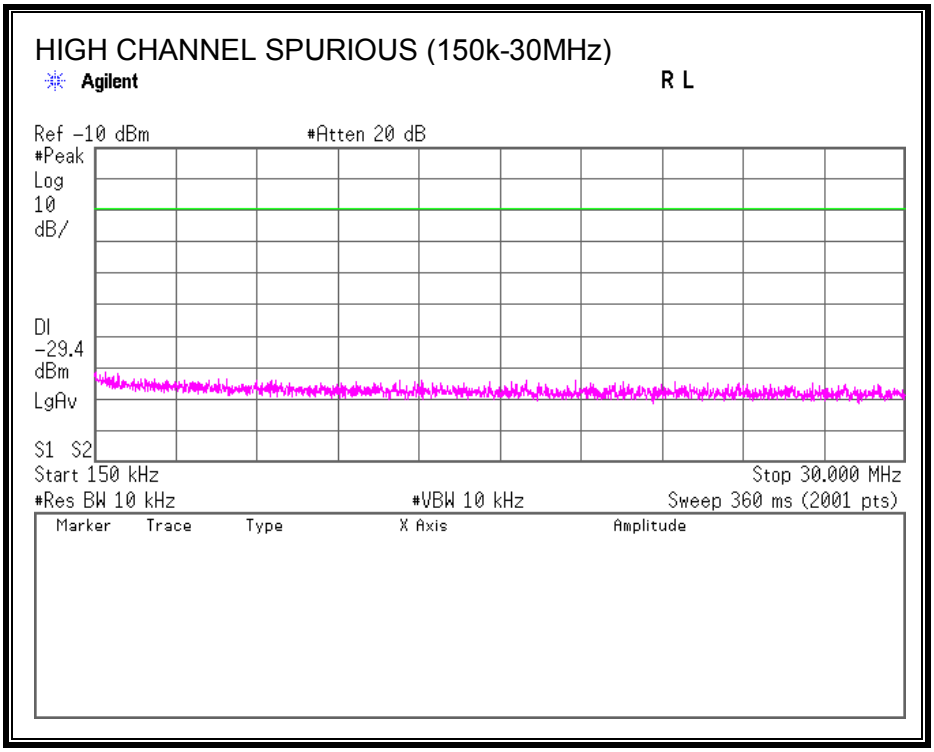
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

SPURIOUS EMISSIONS, HIGH CHANNEL

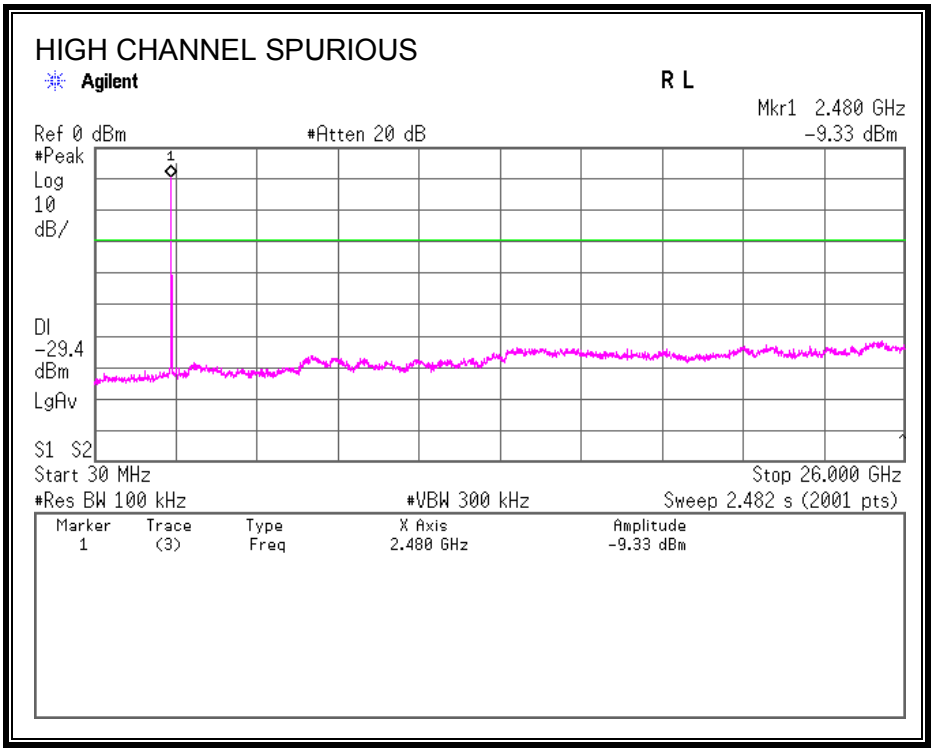


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



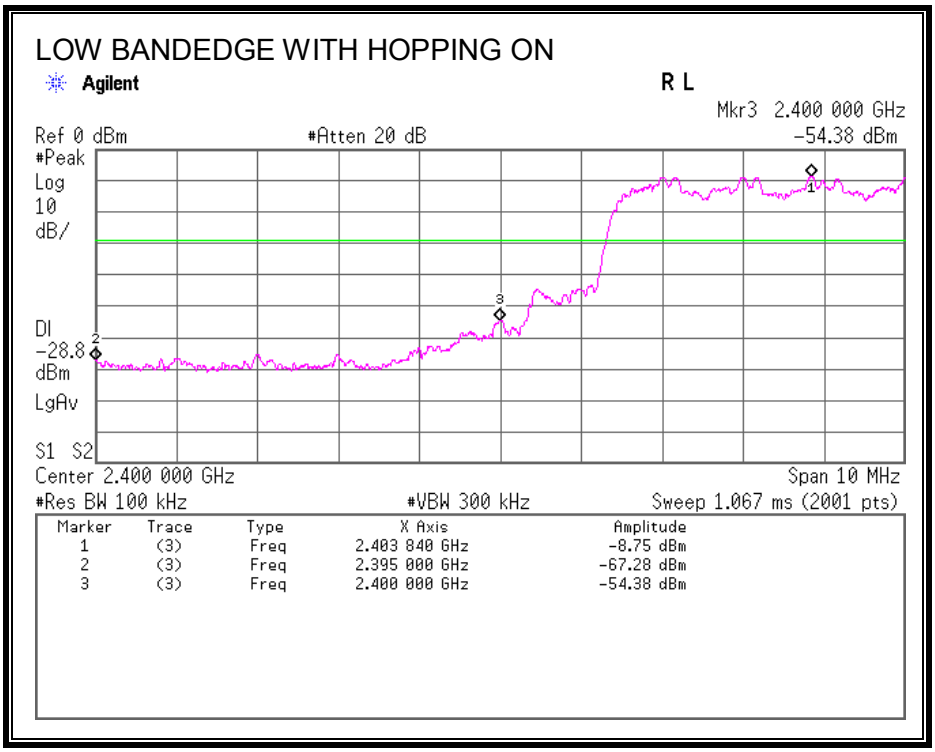


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

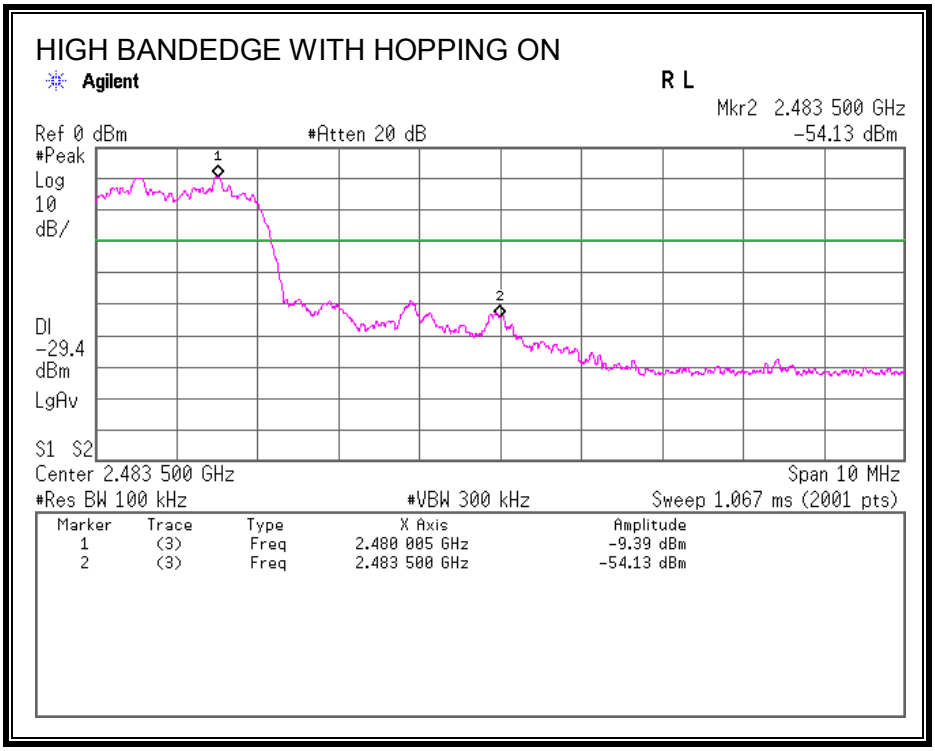


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	53.9

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

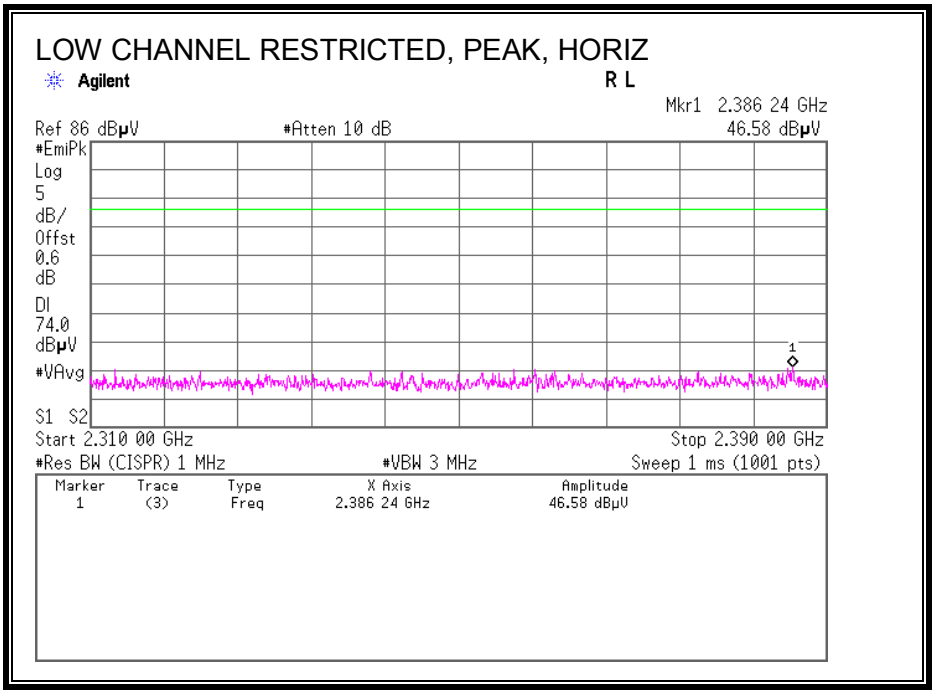
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

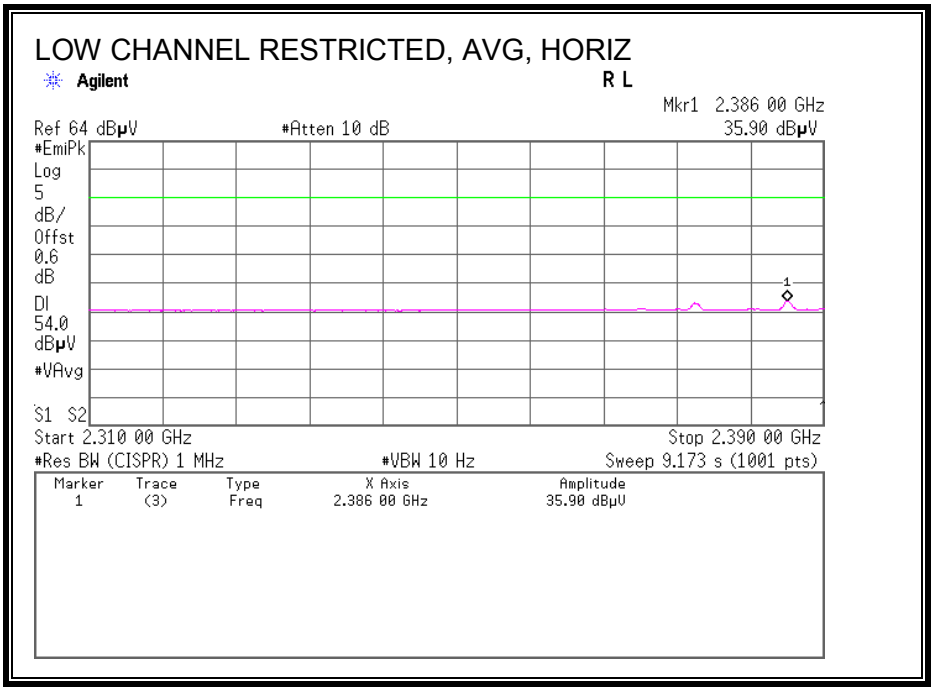
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

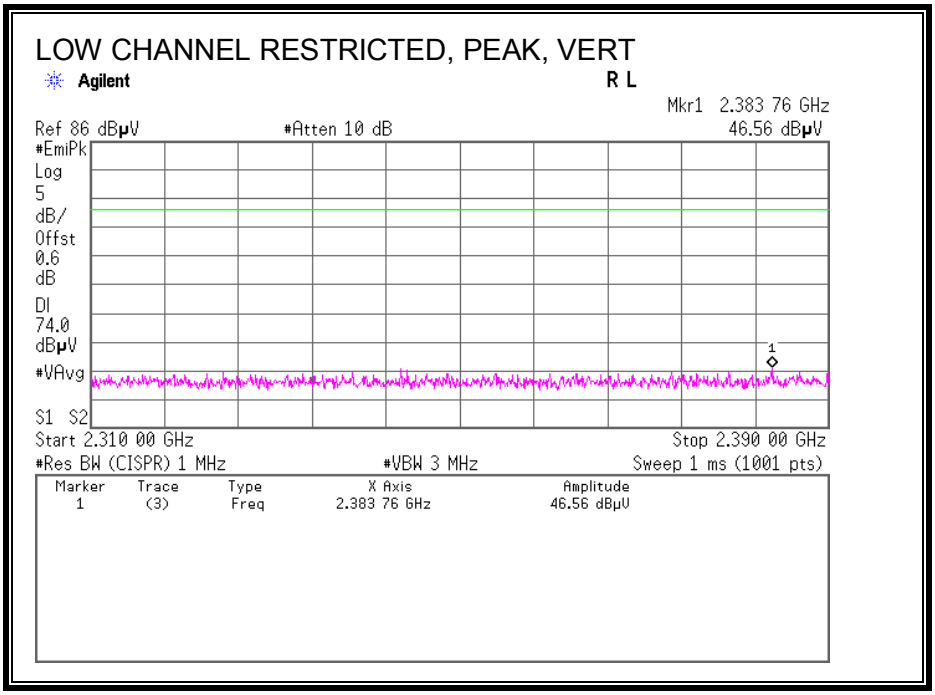


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



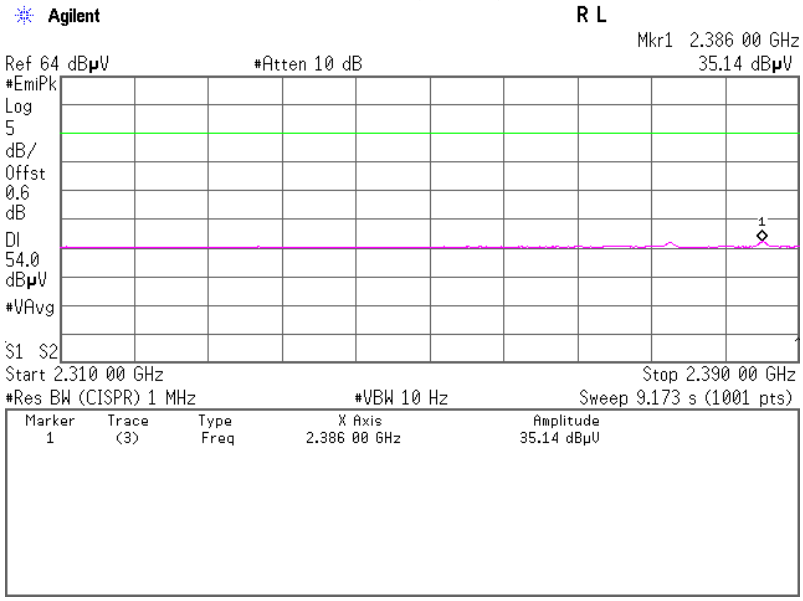
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



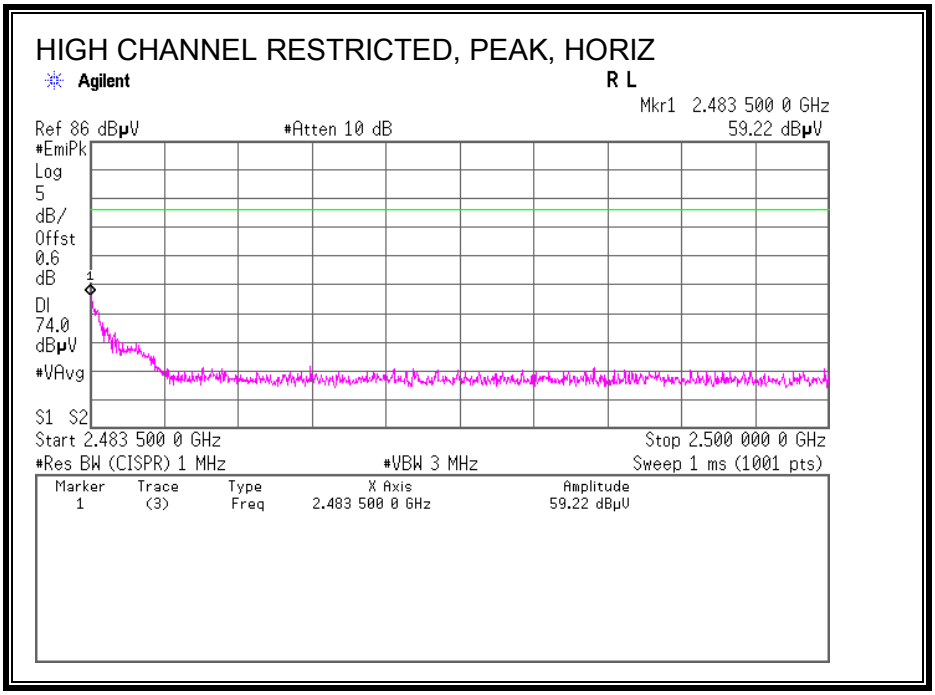
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

LOW CHANNEL RESTRICTED, AVG, VERT



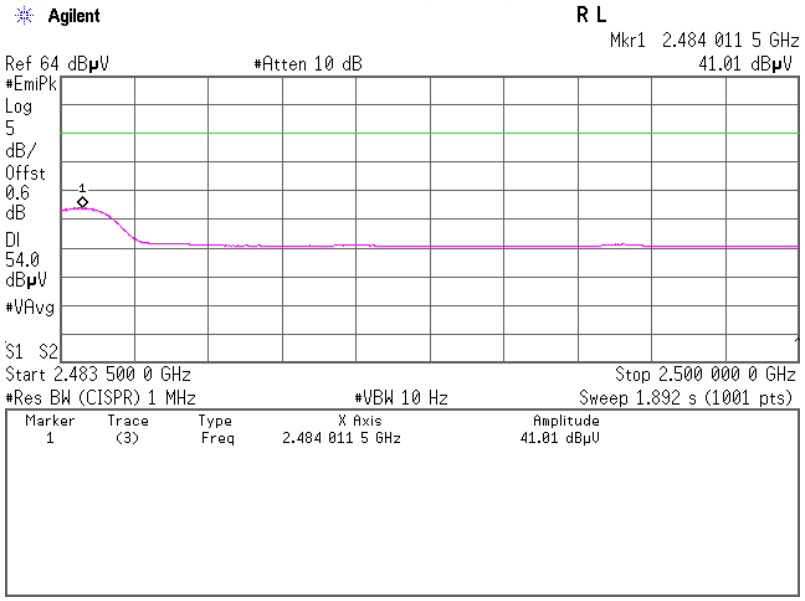
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



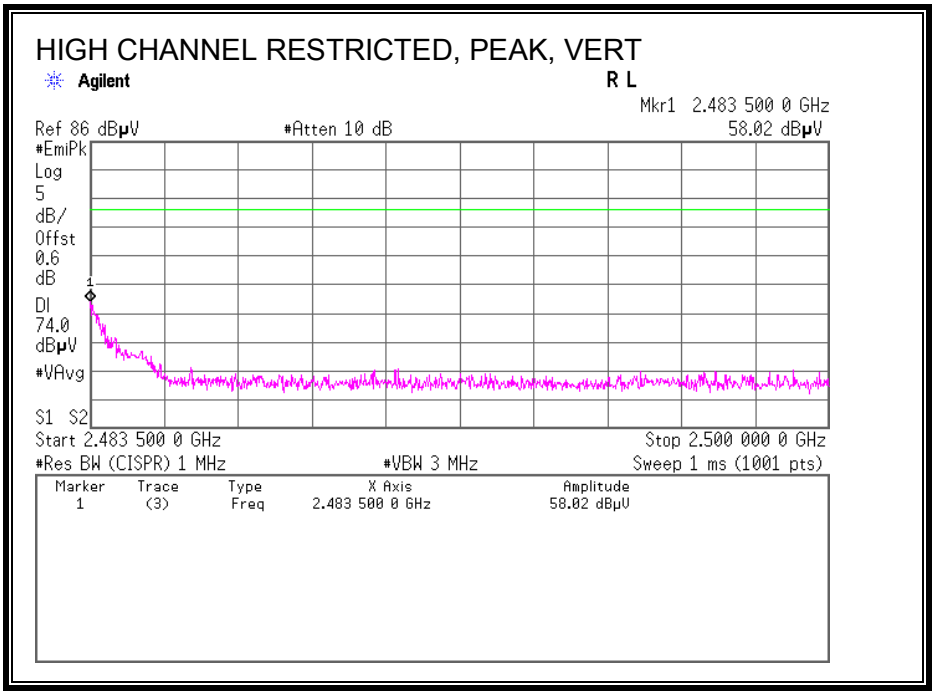
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HIGH CHANNEL RESTRICTED, AVG, HORIZ



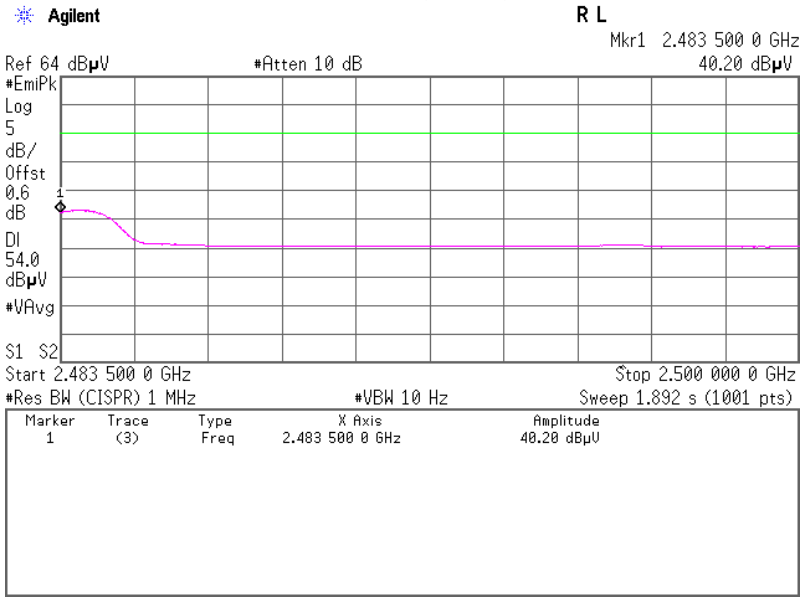
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



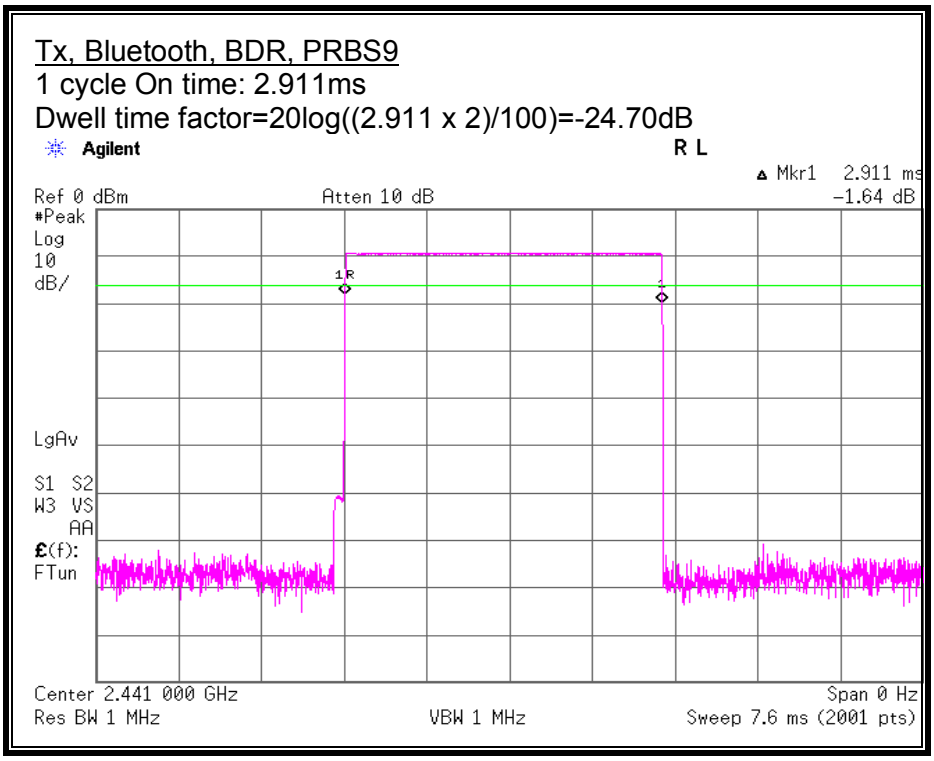
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HIGH CHANNEL RESTRICTED, AVG, VERT



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

Dwell time factor Calculation chart



On time of some channel during 100ms: Twice
This is the worst case in hopping sequence of Bluetooth.

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HARMONICS AND SPURIOUS EMISSIONS

DH5, 2402MHz (LOW)

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	March 30, 2013	March 31, 2013
Temperature / Humidity	24 deg.C, 39 %RH	23 deg.C, 34 %RH
Engineer	Kenichi Adachi	Kenichi Adachi
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.	1602.021	PK	51.7	25.1	13.3	40.8	49.3	73.9	24.6	111	237	
Hori.	3203.981	PK	48.1	28.8	5.7	41.6	41.0	73.9	32.9	109	327	
Hori.	4804.000	PK	66.0	31.1	6.8	41.2	62.7	73.9	11.2	100	11	
Hori.	7206.000	PK	47.7	36.6	8.3	41.4	51.2	73.9	22.7	100	332	
Hori.	24020.000	PK	45.0	39.8	-1.9	46.5	36.4	73.9	37.5	100	0	
Hori.	1602.021	AV	46.8	25.1	13.3	40.8	44.4	53.9	9.5	111	237	
Hori.	3203.981	AV	38.7	28.8	5.7	41.6	31.6	53.9	22.3	109	327	
Hori.	24020.000	AV	32.3	39.8	-1.9	46.5	23.7	53.9	30.2	100	0	
Vert.	1602.021	PK	50.3	25.1	13.3	40.8	47.9	73.9	26.0	131	262	
Vert.	3203.981	PK	47.9	28.8	5.7	41.6	40.8	73.9	33.1	100	7	
Vert.	4804.000	PK	68.9	31.1	6.8	41.2	65.6	73.9	8.3	100	22	
Vert.	7206.000	PK	47.8	36.6	8.3	41.4	51.3	73.9	22.6	101	182	
Vert.	24020.000	PK	45.1	39.8	-1.9	46.5	36.5	73.9	37.4	100	0	
Vert.	1602.021	AV	44.4	25.1	13.3	40.8	42.0	53.9	11.9	131	262	
Vert.	3203.981	AV	38.1	28.8	5.7	41.6	31.0	53.9	22.9	100	7	
Vert.	24020.000	AV	32.4	39.8	-1.9	46.5	23.8	53.9	30.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

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	58.6	31.1	6.8	41.2	-24.7	30.5	53.9	23.4	
Hori.	7206.000	AV	34.9	36.6	8.3	41.4	-24.7	13.6	53.9	40.3	
Vert.	4804.000	AV	62.8	31.1	6.8	41.2	-24.7	34.7	53.9	19.2	
Vert.	7206.000	AV	35.0	36.6	8.3	41.4	-24.7	13.7	53.9	40.2	

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

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HARMONICS AND SPURIOUS EMISSIONS

DH5, 2441MHz (MIDDLE)

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	March 30, 2013	March 31, 2013
Temperature / Humidity	24 deg.C, 39 %RH	23 deg.C, 34 %RH
Engineer	Kenichi Adachi	Kenichi Adachi
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.	1627.989	PK	49.7	25.3	13.4	40.8	47.6	73.9	26.3	113	233	
Hori.	3255.979	PK	48.5	28.9	5.7	41.6	41.5	73.9	32.4	110	323	
Hori.	4882.000	PK	65.7	31.3	6.9	41.1	62.8	73.9	11.1	100	9	
Hori.	7323.000	PK	47.6	36.6	8.4	41.4	51.2	73.9	22.7	100	358	
Hori.	24410.000	PK	44.8	39.7	-1.8	46.7	36.0	73.9	37.9	100	0	
Hori.	1627.989	AV	44.9	25.3	13.4	40.8	42.8	53.9	11.1	113	233	
Hori.	3255.979	AV	38.8	28.9	5.7	41.6	31.8	53.9	22.1	110	323	
Hori.	24410.000	AV	32.5	39.7	-1.8	46.7	23.7	53.9	30.2	100	0	
Vert.	1627.989	PK	48.5	25.3	13.4	40.8	46.4	73.9	27.5	128	265	
Vert.	3255.979	PK	48.3	28.9	5.7	41.6	41.3	73.9	32.6	100	11	
Vert.	4882.000	PK	67.9	31.3	6.9	41.1	65.0	73.9	8.9	100	25	
Vert.	7323.000	PK	47.5	36.6	8.4	41.4	51.1	73.9	22.8	100	181	
Vert.	24410.000	PK	44.9	39.7	-1.8	46.7	36.1	73.9	37.8	100	0	
Vert.	1627.989	AV	42.7	25.3	13.4	40.8	40.6	53.9	13.3	128	265	
Vert.	3255.979	AV	38.3	28.9	5.7	41.6	31.3	53.9	22.6	100	11	
Vert.	24410.000	AV	32.6	39.7	-1.8	46.7	23.8	53.9	30.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

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	58.4	31.3	6.9	41.1	-24.7	30.7	53.9	23.2	
Hori.	7323.000	AV	34.8	36.6	8.4	41.4	-24.7	13.6	53.9	40.3	
Vert.	4882.000	AV	62.4	31.3	6.9	41.1	-24.7	34.7	53.9	19.2	
Vert.	7323.000	AV	34.7	36.6	8.4	41.4	-24.7	13.5	53.9	40.4	

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

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HARMONICS AND SPURIOUS EMISSIONS

DH5, 2480MHz (HIGH)

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	March 30, 2013	March 31, 2013
Temperature / Humidity	24 deg.C, 39 %RH	23 deg.C, 34 %RH
Engineer	Kenichi Adachi	Kenichi Adachi
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.	1653.979	PK	51.0	25.4	13.4	40.9	48.9	73.9	25.0	108	235	
Hori.	3307.997	PK	47.9	29.0	5.7	41.7	40.9	73.9	33.0	107	330	
Hori.	4960.000	PK	66.2	31.6	6.9	41.0	63.7	73.9	10.2	100	14	
Hori.	7440.000	PK	47.5	36.7	8.5	41.5	51.2	73.9	22.7	100	359	
Hori.	24800.000	PK	44.7	39.6	-1.6	46.7	36.0	73.9	37.9	100	0	
Hori.	1653.979	AV	46.4	25.4	13.4	40.9	44.3	53.9	9.6	108	235	
Hori.	3307.997	AV	37.9	29.0	5.7	41.7	30.9	53.9	23.0	107	330	
Hori.	24800.000	AV	32.3	39.6	-1.6	46.7	23.6	53.9	30.3	100	0	
Vert.	1653.979	PK	49.9	25.4	13.4	40.9	47.8	73.9	26.1	133	261	
Vert.	3307.997	PK	47.8	29.0	5.7	41.7	40.8	73.9	33.1	100	6	
Vert.	4960.000	PK	68.1	31.6	6.9	41.0	65.6	73.9	8.3	100	20	
Vert.	7440.000	PK	47.6	36.7	8.5	41.5	51.3	73.9	22.6	100	184	
Vert.	24800.000	PK	44.6	39.6	-1.6	46.7	35.9	73.9	38.0	100	0	
Vert.	1653.979	AV	44.2	25.4	13.4	40.9	42.1	53.9	11.8	133	261	
Vert.	3307.997	AV	37.8	29.0	5.7	41.7	30.8	53.9	23.1	100	6	
Vert.	24800.000	AV	32.3	39.6	-1.6	46.7	23.6	53.9	30.3	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

Dwell time factor relaxation

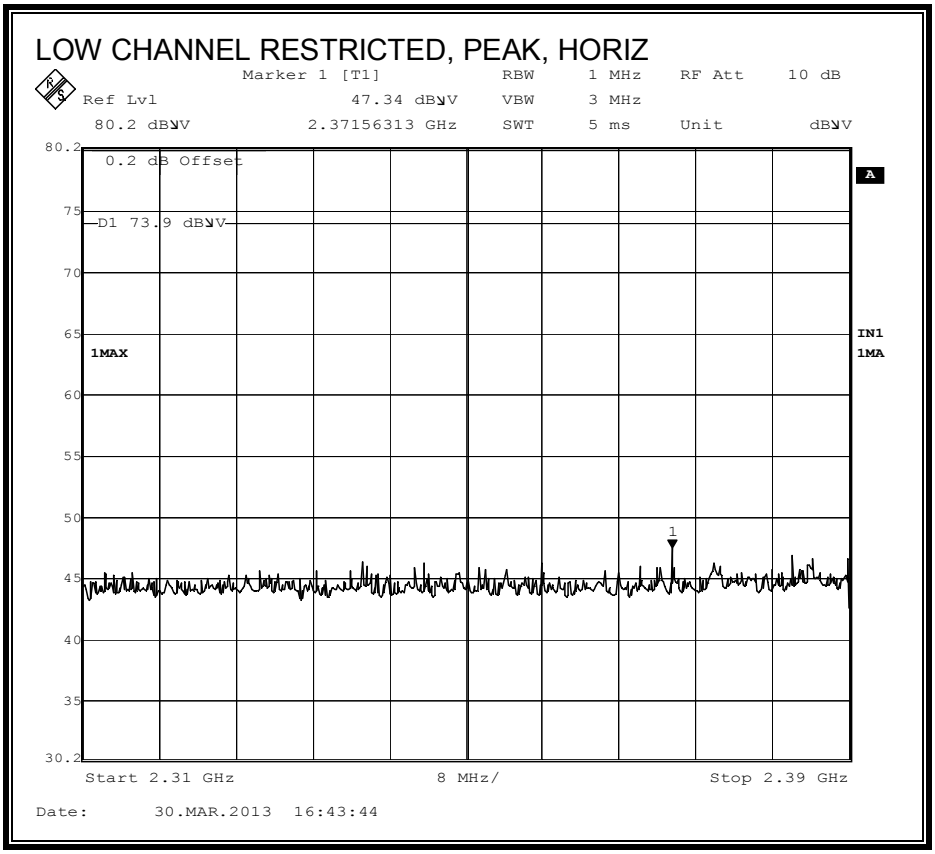
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	AV	58.1	31.6	6.9	41.0	-24.7	30.8	53.9	23.1	
Hori.	7440.000	AV	34.8	36.7	8.5	41.5	-24.7	13.7	53.9	40.2	
Vert.	4960.000	AV	62.2	31.6	6.9	41.0	-24.7	34.9	53.9	19.0	
Vert.	7440.000	AV	34.9	36.7	8.5	41.5	-24.7	13.8	53.9	40.1	

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

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

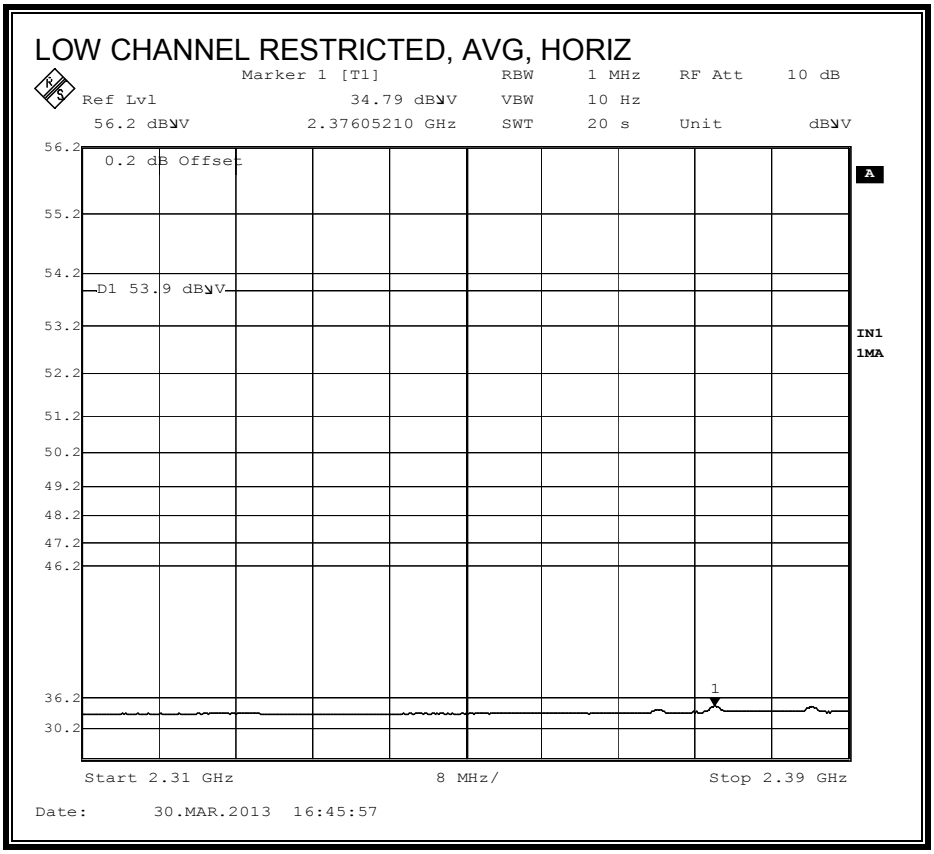
ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



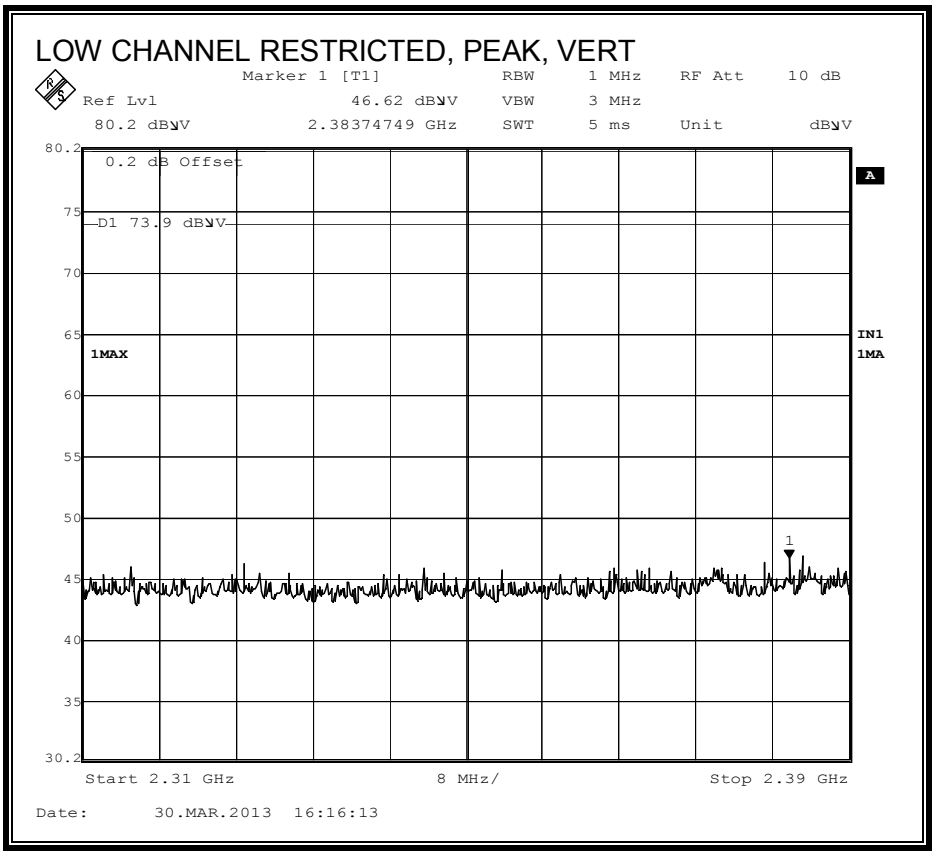
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

LOW CHANNEL RESTRICTED, AVG, HORIZ



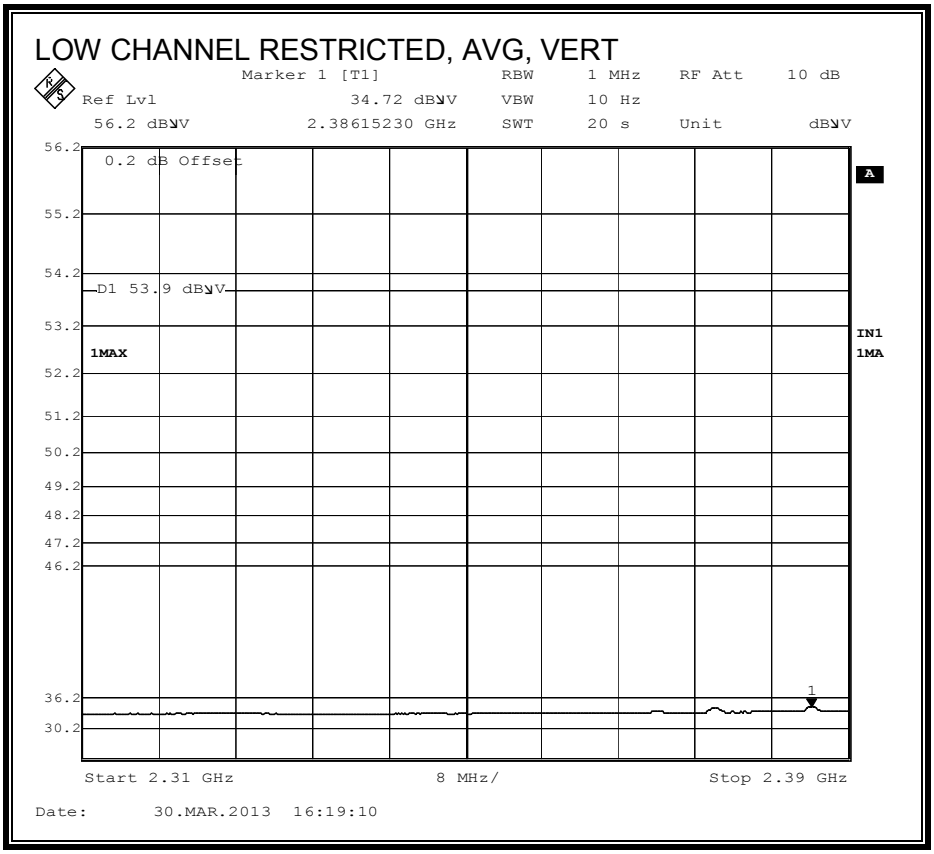
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



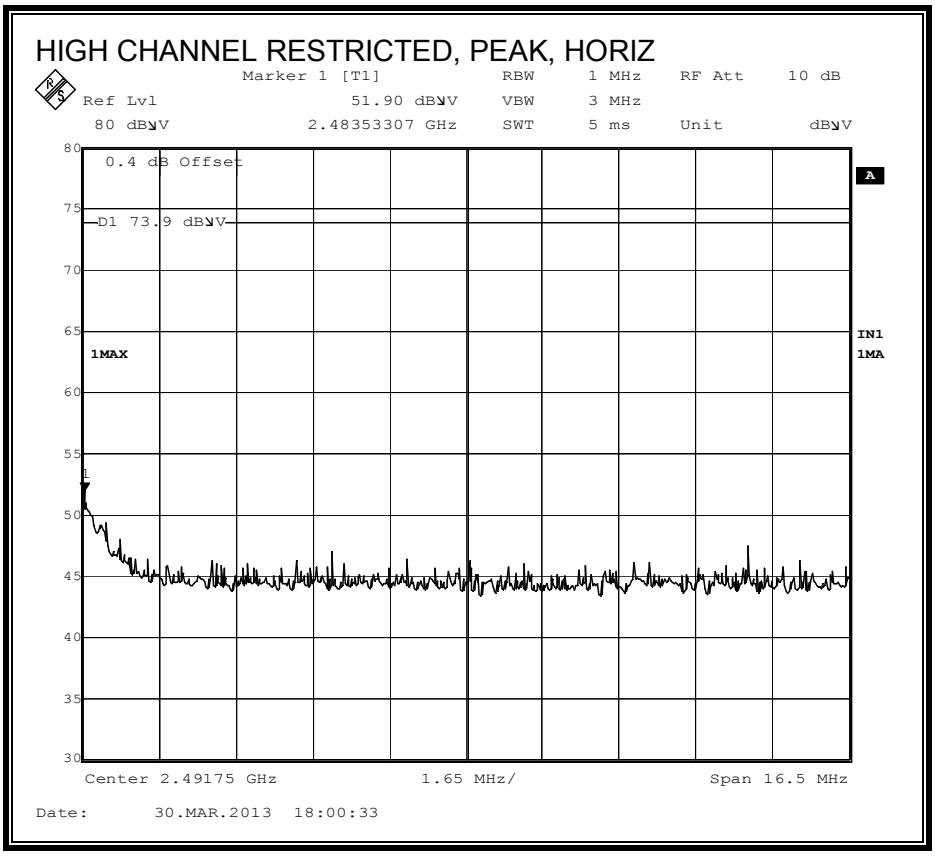
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

LOW CHANNEL RESTRICTED, AVG, VERT

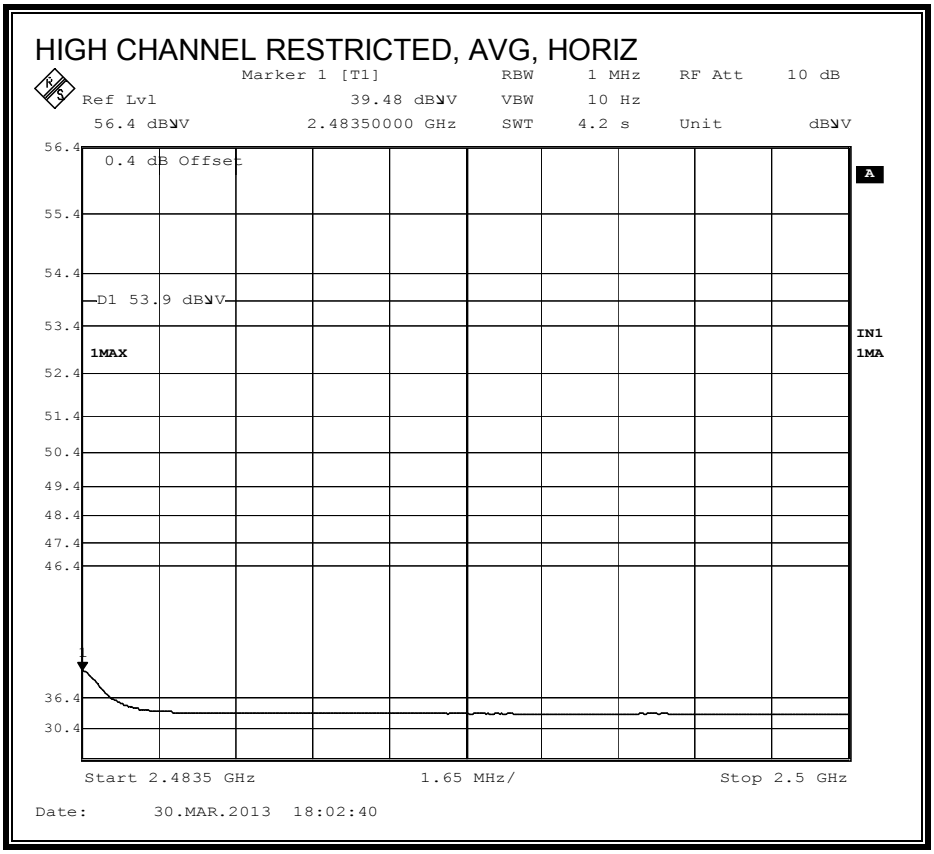


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

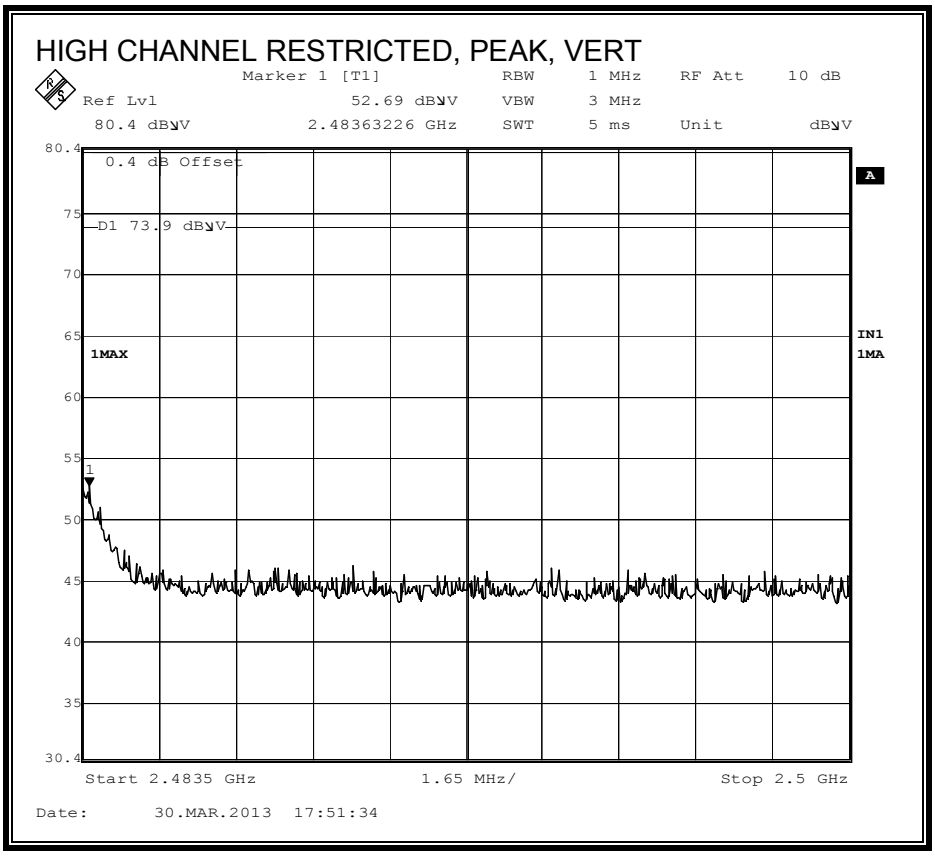


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

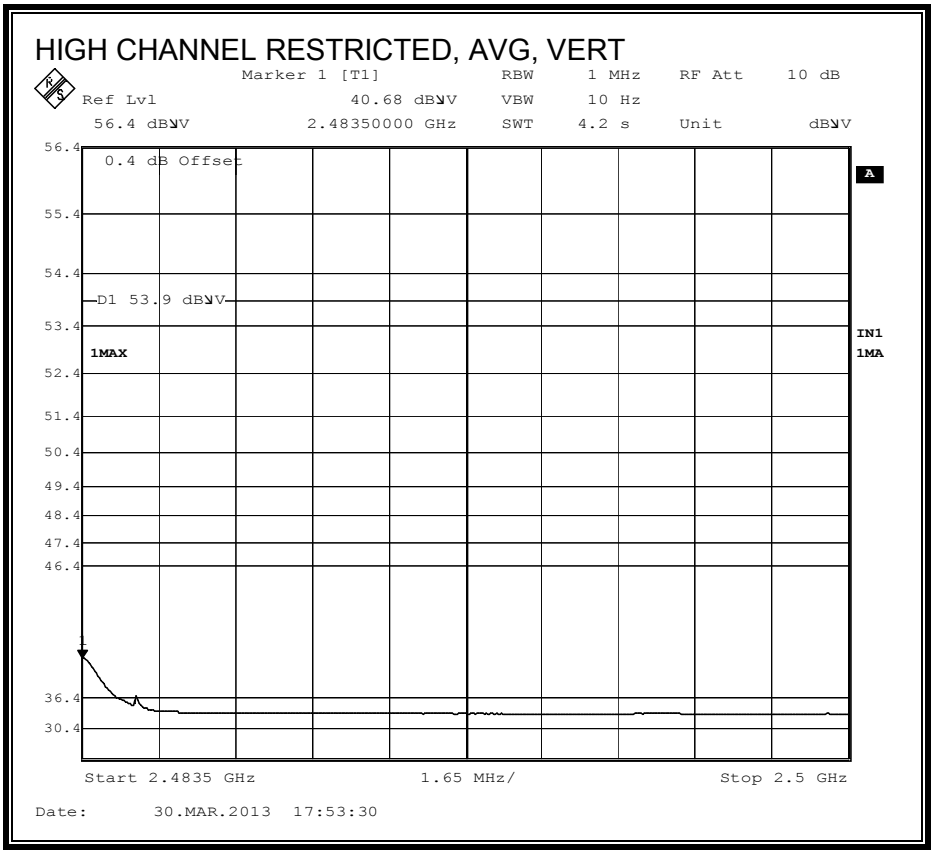


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

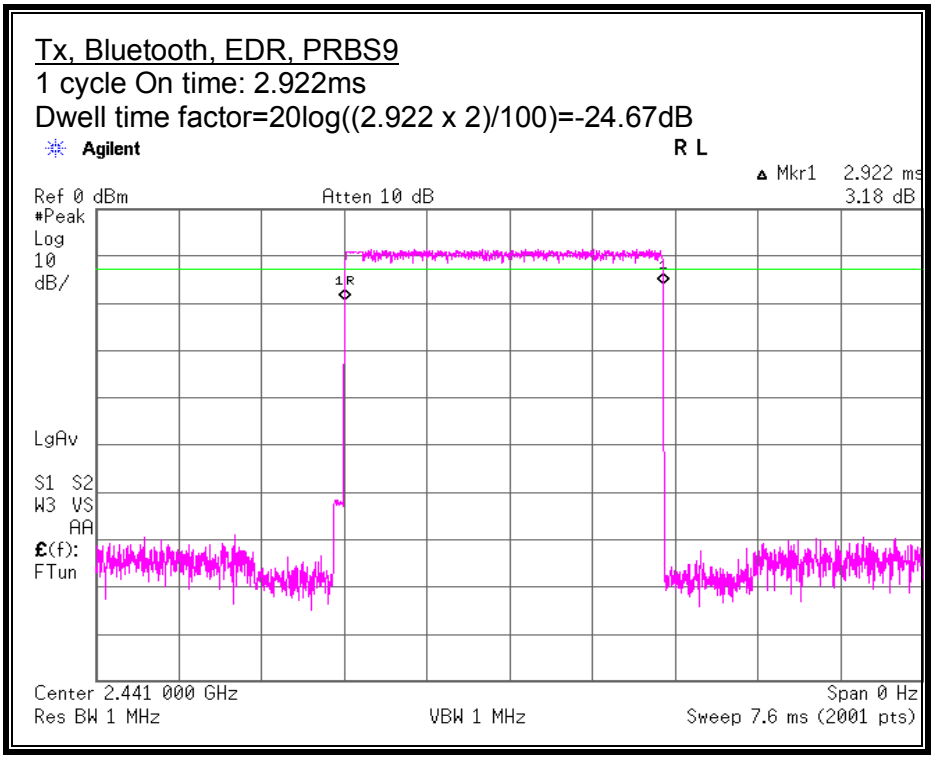


UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

Dwell time factor Calculation chart



On time of some channel during 100ms: Twice
This is the worst case in hopping sequence of Bluetooth.

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HARMONICS AND SPURIOUS EMISSIONS

3-DH5, 2402MHz (LOW)

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	March 30, 2013	March 31, 2013
Temperature / Humidity	24 deg.C, 39 %RH	23 deg.C, 34 %RH
Engineer	Kenichi Adachi	Kenichi Adachi
Mode	Tx, 2402	
	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.	1602.017	PK	51.3	25.1	13.3	40.8	48.9	73.9	25.0	107	230	
Hori.	3203.978	PK	46.5	28.8	5.7	41.6	39.4	73.9	34.5	104	323	
Hori.	4804.000	PK	59.2	31.1	6.8	41.2	55.9	73.9	18.0	100	9	
Hori.	7206.000	PK	47.7	36.6	8.3	41.4	51.2	73.9	22.7	100	0	
Hori.	24020.000	PK	45.1	39.8	-1.9	46.5	36.5	73.9	37.4	100	0	
Hori.	1602.017	AV	46.3	25.1	13.3	40.8	43.9	53.9	**10.0**	107	230	
Hori.	3203.978	AV	37.0	28.8	5.7	41.6	29.9	53.9	24.0	104	323	
Hori.	24020.000	AV	32.3	39.8	-1.9	46.5	23.7	53.9	30.2	100	0	
Vert.	1602.017	PK	51.5	25.1	13.3	40.8	49.1	73.9	24.8	135	258	
Vert.	3203.978	PK	46.6	28.8	5.7	41.6	39.5	73.9	34.4	100	11	
Vert.	4804.000	PK	62.1	31.1	6.8	41.2	58.8	73.9	15.1	100	23	
Vert.	7206.000	PK	47.6	36.6	8.3	41.4	51.1	73.9	22.8	100	180	
Vert.	24020.000	PK	45.0	39.8	-1.9	46.5	36.4	73.9	37.5	100	0	
Vert.	1602.017	AV	44.2	25.1	13.3	40.8	41.8	53.9	12.1	135	258	
Vert.	3203.978	AV	37.3	28.8	5.7	41.6	30.2	53.9	23.7	100	11	
Vert.	24020.000	AV	32.3	39.8	-1.9	46.5	23.7	53.9	30.2	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

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	36.8	31.1	6.8	41.2	-24.7	8.7	53.9	45.2	
Hori.	7206.000	AV	34.9	36.6	8.3	41.4	-24.7	13.6	53.9	40.3	
Vert.	4804.000	AV	38.7	31.1	6.8	41.2	-24.7	10.6	53.9	43.3	
Vert.	7206.000	AV	34.8	36.6	8.3	41.4	-24.7	13.5	53.9	40.4	

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

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HARMONICS AND SPURIOUS EMISSIONS

3-DH5, 2441MHz (MIDDLE)

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	March 30, 2013	March 31, 2013
Temperature / Humidity	24 deg.C, 39 %RH	23 deg.C, 34 %RH
Engineer	Kenichi Adachi	Kenichi Adachi
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.	1627.993	PK	49.3	25.3	13.4	40.8	47.2	73.9	26.7	108	228	
Hori.	3255.982	PK	46.6	28.9	5.7	41.6	39.6	73.9	34.3	112	321	
Hori.	4882.000	PK	58.8	31.3	6.9	41.1	55.9	73.9	18.0	100	12	
Hori.	7323.000	PK	47.5	36.6	8.4	41.4	51.1	73.9	22.8	100	359	
Hori.	24410.000	PK	45.0	39.7	-1.8	46.7	36.2	73.9	37.7	100	0	
Hori.	1627.993	AV	44.7	25.3	13.4	40.8	42.6	53.9	**11.3**	108	228	
Hori.	3255.982	AV	36.8	28.9	5.7	41.6	29.8	53.9	24.1	112	321	
Hori.	24410.000	AV	32.5	39.7	-1.8	46.7	23.7	53.9	30.2	100	0	
Vert.	1627.993	PK	48.4	25.3	13.4	40.8	46.3	73.9	27.6	130	269	
Vert.	3255.982	PK	46.8	28.9	5.7	41.6	39.8	73.9	34.1	100	13	
Vert.	4882.000	PK	61.3	31.3	6.9	41.1	58.4	73.9	15.5	100	27	
Vert.	7323.000	PK	47.5	36.6	8.4	41.4	51.1	73.9	22.8	100	183	
Vert.	24410.000	PK	44.9	39.7	-1.8	46.7	36.1	73.9	37.8	100	0	
Vert.	1627.993	AV	42.4	25.3	13.4	40.8	40.3	53.9	13.6	130	269	
Vert.	3255.982	AV	36.8	28.9	5.7	41.6	29.8	53.9	24.1	100	13	
Vert.	24410.000	AV	32.5	39.7	-1.8	46.7	23.7	53.9	30.2	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

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	36.6	31.3	6.9	41.1	-24.7	8.9	53.9	45.0	
Hori.	7323.000	AV	34.9	36.6	8.4	41.4	-24.7	13.7	53.9	40.2	
Vert.	4882.000	AV	38.4	31.3	6.9	41.1	-24.7	10.7	53.9	43.2	
Vert.	7323.000	AV	34.8	36.6	8.4	41.4	-24.7	13.6	53.9	40.3	

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

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HARMONICS AND SPURIOUS EMISSIONS

3-DH5, 2480MHz (HIGH)

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	March 30, 2013	March 31, 2013
Temperature / Humidity	24 deg.C, 39 %RH	23 deg.C, 34 %RH
Engineer	Kenichi Adachi	Kenichi Adachi
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.	1653.984	PK	50.1	25.4	13.4	40.9	48.0	73.9	25.9	112	233	
Hori.	3307.996	PK	47.0	29.0	5.7	41.7	40.0	73.9	33.9	110	317	
Hori.	4960.000	PK	59.7	31.6	6.9	41.0	57.2	73.9	16.7	100	14	
Hori.	7440.000	PK	47.8	36.7	8.5	41.5	51.5	73.9	22.4	100	355	
Hori.	24800.000	PK	44.8	39.6	-1.6	46.7	36.1	73.9	37.8	100	0	
Hori.	1653.984	AV	45.2	25.4	13.4	40.9	43.1	53.9	**10.8**	112	233	
Hori.	3307.996	AV	37.2	29.0	5.7	41.7	30.2	53.9	23.7	110	317	
Hori.	24800.000	AV	32.4	39.6	-1.6	46.7	23.7	53.9	30.2	100	0	
Vert.	1653.984	PK	49.9	25.4	13.4	40.9	47.8	73.9	26.1	132	263	
Vert.	3307.996	PK	47.3	29.0	5.7	41.7	40.3	73.9	33.6	100	11	
Vert.	4960.000	PK	60.4	31.6	6.9	41.0	57.9	73.9	16.0	100	22	
Vert.	7440.000	PK	47.7	36.7	8.5	41.5	51.4	73.9	22.5	100	180	
Vert.	24800.000	PK	44.7	39.6	-1.6	46.7	36.0	73.9	37.9	100	0	
Vert.	1653.984	AV	44.4	25.4	13.4	40.9	42.3	53.9	11.6	132	263	
Vert.	3307.996	AV	37.4	29.0	5.7	41.7	30.4	53.9	23.5	100	11	
Vert.	24800.000	AV	32.3	39.6	-1.6	46.7	23.6	53.9	30.3	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

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	36.9	31.6	6.9	41.0	-24.7	9.6	53.9	44.3	
Hori.	7440.000	AV	34.9	36.7	8.5	41.5	-24.7	13.8	53.9	40.1	
Vert.	4960.000	AV	38.1	31.6	6.9	41.0	-24.7	10.8	53.9	43.1	
Vert.	7440.000	AV	34.8	36.7	8.5	41.5	-24.7	13.7	53.9	40.2	

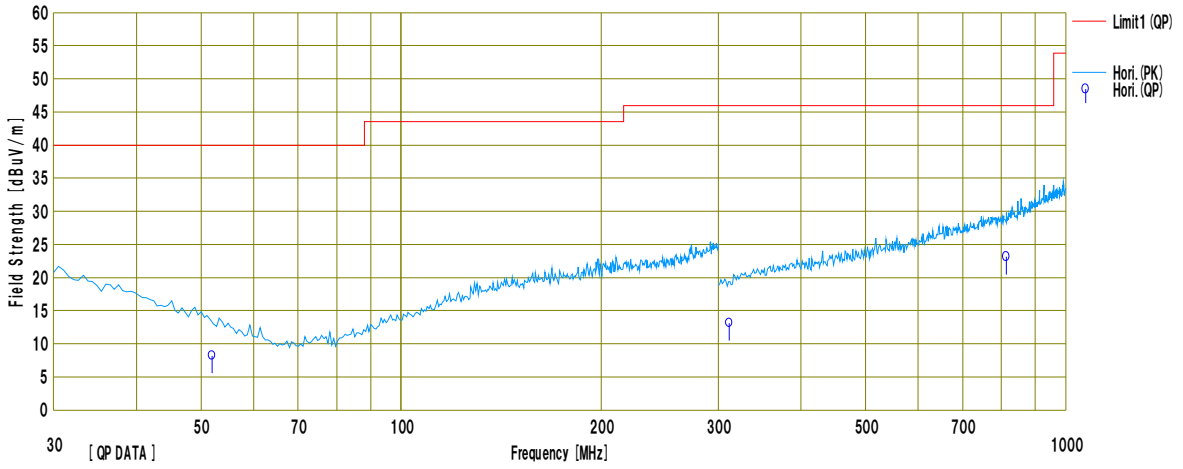
Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell(time)factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

8.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

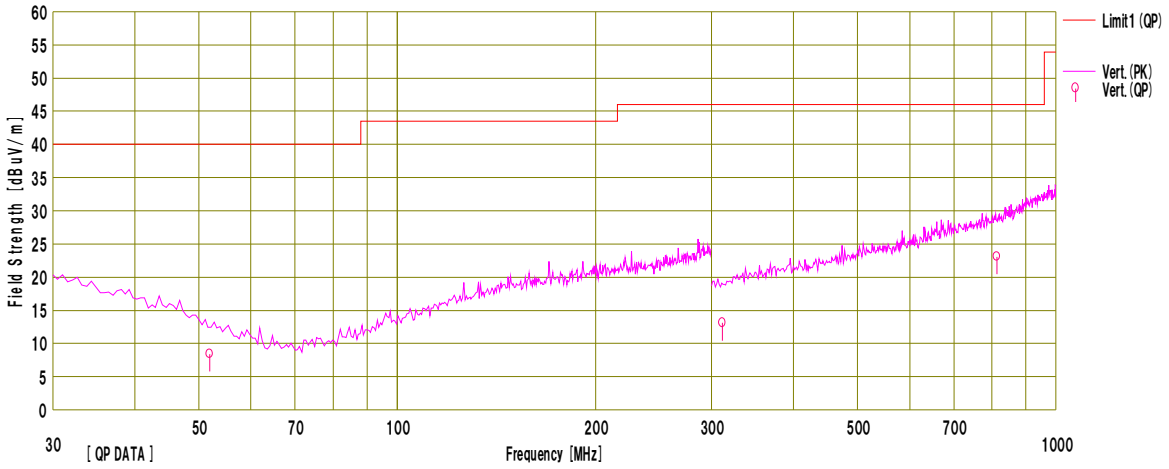
HORIZONTAL PLOT



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

HORIZONTAL AND VERTICAL DATA

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/03/31

Company : SMK Corporation
Kind of EUT : Bluetooth Module
Model No. : BT401
Serial No. : 000190F08231

Mode : Transmitting, 3-DH5, 2441MHz
Order No. : 33HE0044-SH
Power : DC 3.3V
Temp./Humi. : 23deg.C / 34%RH

Remarks : EUT-worst-axis: H: X, V: X

Limit1 : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV

Engineer : Kenichi Adachi

<< QP DATA >>

No.	Freq.	Reading <QP>	Ant.Fac	Loss	Gain	Result <QP>	Limit <QP>	Margin <QP>	Pola.	Height	Angle	Ant. Type	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]		
1	52.000	23.4	10.3	6.7	32.2	8.2	40.0	31.8	Hori.	100	0	BC	
2	312.000	22.3	14.2	8.6	32.0	13.1	46.0	32.9	Hori.	100	0	LP	
3	814.000	23.1	21.1	10.5	31.6	23.1	46.0	22.9	Hori.	100	0	LP	
4	52.000	23.6	10.3	6.7	32.2	8.4	40.0	31.6	Vert.	100	0	BC	
5	312.000	22.3	14.2	8.6	32.0	13.1	46.0	32.9	Vert.	100	0	LP	
6	814.000	23.1	21.1	10.5	31.6	23.1	46.0	22.9	Vert.	100	0	LP	

Calculation:Result [dBuV/m] =Reading [dBuV] +Ant.Fac [dB/m] +Loss (Cable+ATT+⊿AF) [dB] -Gain (AMP) [dB]
Ant.Type=BC:Biconical Antenna, LP:Logperiodic Antenna, SHA**:Horn Antenna

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

RESULTS

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/03/31

Company : SMK Corporation
Kind of EUT : Bluetooth Module
Model No. : BT401
Serial No. : 000190F08231
Remarks :

Mode : Transmitting, DH5, 2402MHz
Order No. : 33HE0044-SH
Power : DC 3.3V (DC supply:AC120V/60Hz)
Temp./Humi. : 23deg.C / 33%RH

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

Engineer : Kenichi Adachi

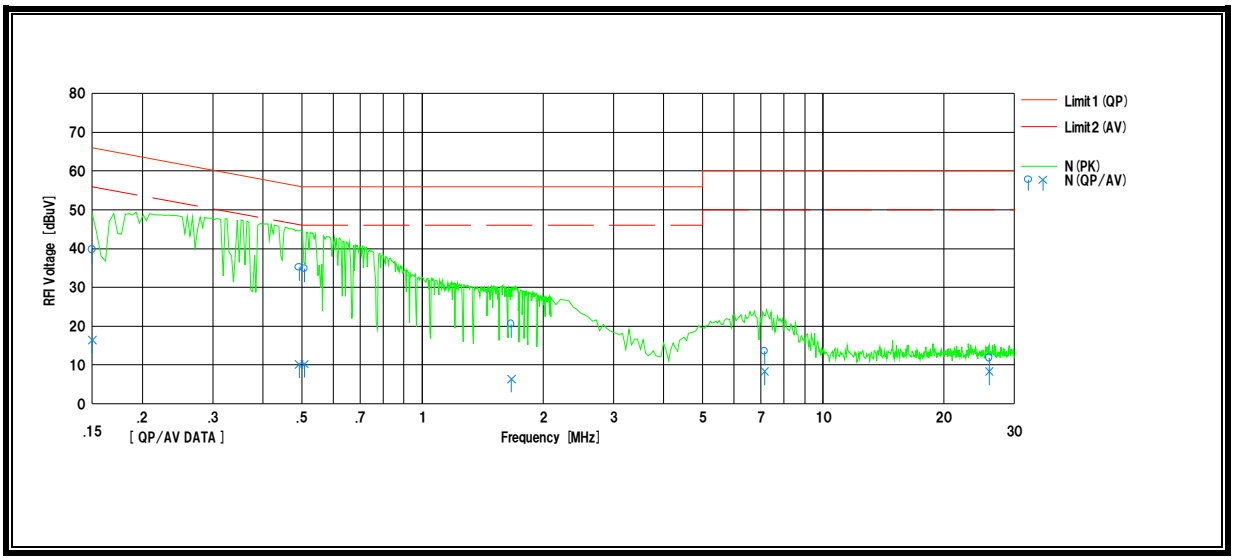
<< QP/AV DATA >>

No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	27.0	3.7	12.7	39.7	16.4	66.0	56.0	26.3	39.6	N	
2	0.49299	22.4	-2.6	12.7	35.1	10.1	56.1	46.1	21.0	36.0	N	
3	0.50782	22.1	-2.5	12.7	34.8	10.2	56.0	46.0	21.2	35.8	N	
4	1.66803	7.7	-6.4	12.8	20.5	6.4	56.0	46.0	35.5	39.6	N	
5	7.15179	0.5	-4.7	13.0	13.5	8.3	60.0	50.0	46.5	41.7	N	
6	26.00000	-2.0	-5.5	13.8	11.8	8.3	60.0	50.0	48.2	41.7	N	
7	0.15000	27.0	3.7	12.7	39.7	16.4	66.0	56.0	26.3	39.6	L1	
8	0.49299	22.3	-2.6	12.7	35.0	10.1	56.1	46.1	21.1	36.0	L1	
9	0.50782	22.1	-2.6	12.7	34.8	10.1	56.0	46.0	21.2	35.9	L1	
10	1.69558	11.3	-5.5	12.8	24.1	7.3	56.0	46.0	31.9	38.7	L1	
11	6.11729	-0.9	-5.5	13.0	12.1	7.5	60.0	50.0	47.9	42.5	L1	
12	26.00000	-2.0	-5.5	13.8	11.8	8.3	60.0	50.0	48.2	41.7	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN+Cable+ATT)[dB]
LISN:SLS-05

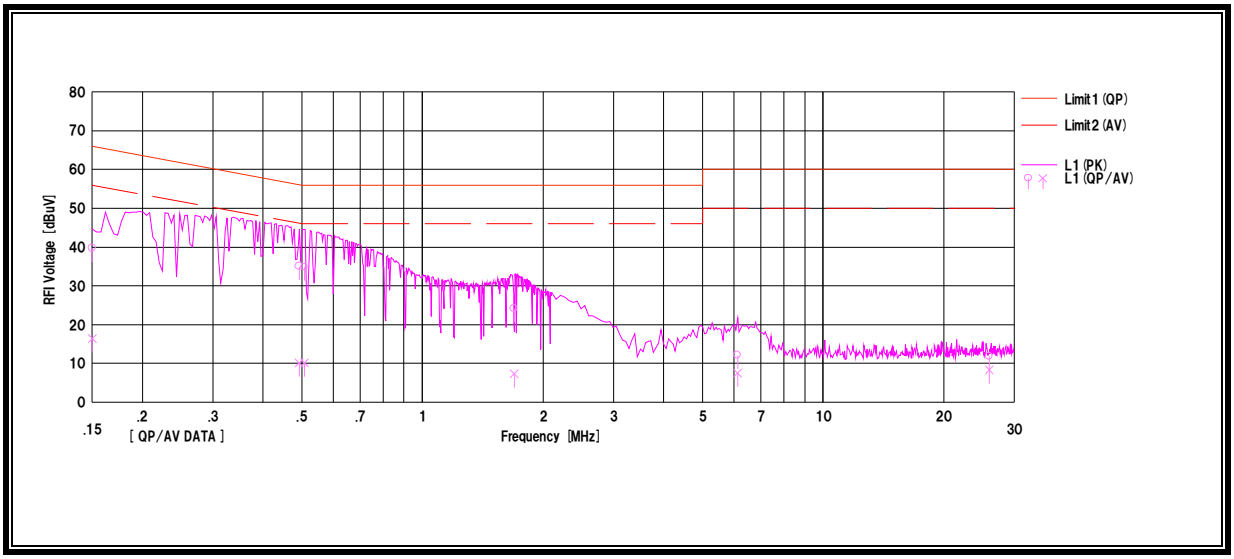
UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

LINE 1 RESULTS



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401

LINE 2 RESULTS



UL Japan, Inc. Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
TEL: +81 463 50 6400 FAX: +81 463 50 6401