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

CERTIFICATION TEST REPORT

FOR

BLUETOOTH INTERFACE BOARD FOR MOBILE PRINTER

MODEL NUMBER: M291A

FCC ID: BKMFBM291A

REPORT NUMBER: 32LE0152-SH-A-R1

ISSUE DATE: AUGUST 27, 2012

Prepared for
SEIKO EPSON CORPORATION
3-3-5 Owa Suwa-Shi, Nagano-Ken 392-8502 Japan

Prepared by
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JAB Accreditation No. : RTL02610

JAB Testing
RTL2610

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/06/12	Initial Issue	S.Takano
1	08/27/12	Correction of misdescription (limit value) (P34,P69) *This report is a revised version of 32LE0152-SH-A, which is replaced with this report.	S.Takano

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SEIKO EPSON CORPORATION
3-3-5 Owa Suwa-Shi, Nagano-Ken 392-8502 Japan

EUT DESCRIPTION: Bluetooth Interface board for mobile printer

MODEL: M291A

SERIAL NUMBER: 2 (Antenna port tests),
1 (other tests),

DATE TESTED: JULY 12 and 13, 2012

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.

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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(3m)	+/- 4.9 dB
	300MHz-1000MHz(3m)	+/- 4.9 dB
	1000MHz-15GHz(3m)	+/- 4.9 dB
	15GHz-18GHz(1m)	+/- 5.6 dB
	18GHz-26.5GHz(1m)	+/- 4.4 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth Module (Power Class 2).

The radio module is manufactured by SMK Corporation.

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	2.74	1.88
2402 - 2480	Enhanced 8PSK	2.94	1.97

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes Chip 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 for Bluetooth Device Ver1.2.2.

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5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate for each mode is determined to be as follows, based on preliminary tests of the chipset utilized in this radio.

All final tests in the GFSK mode were made at 1 Mb/s.
All final tests in the 8PSK mode were made at 3 Mb/s.

For radiated emissions below 1 GHz, all modes and channels are measured and the worst result is described.

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
Carrier	Y	Z
Spurious (below 1GHz)	X	X
Spurious (above 1GHz)	Z	Y
Spurious (Harmonics)	Y	Z

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Jig	SMK	BE005-A	-
Jig	SMK	BE005-B	-

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	FLAT	1	FPC	Un-Shielded	0.3m	N/A
2	Jig	1	PIN	Un-Shielded	0.2m	N/A
3	DC	1	DC	Un-Shielded	1.6m	N/A

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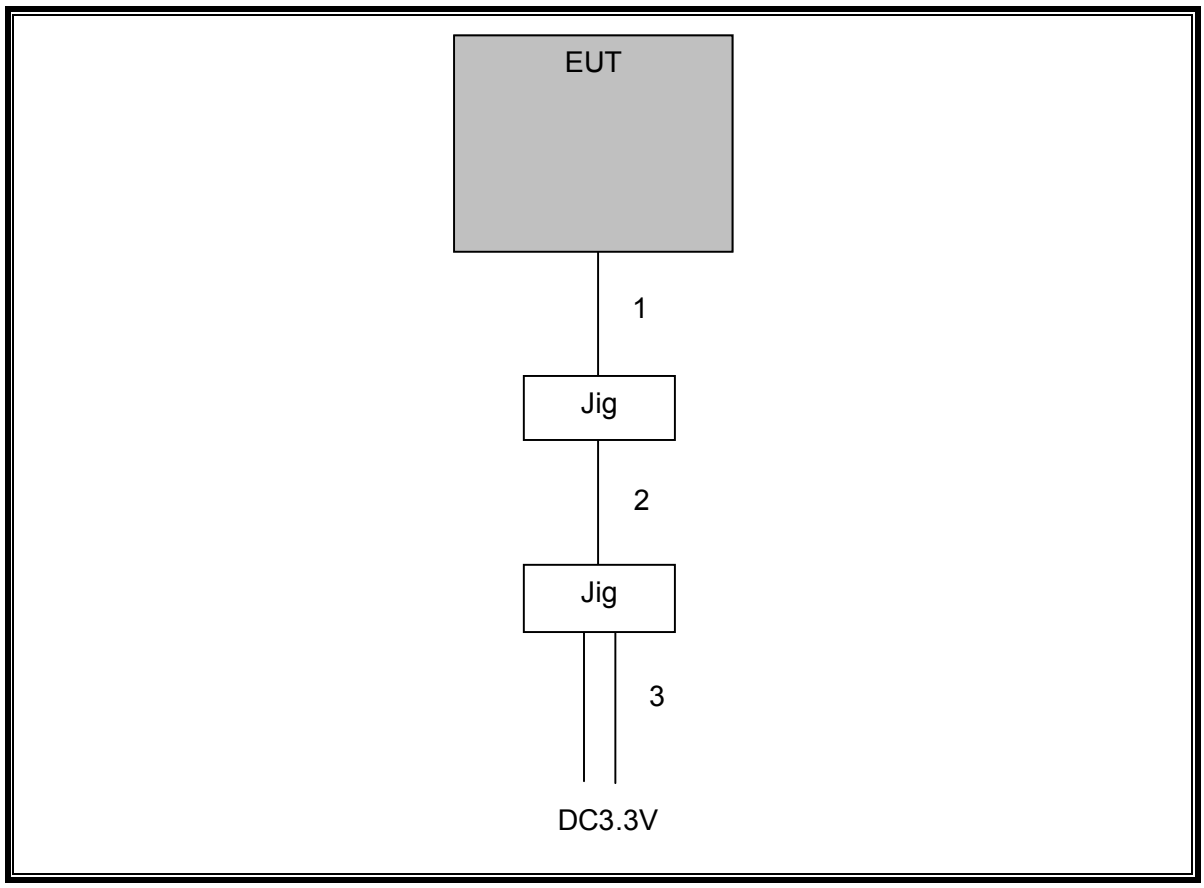
SETUP DIAGRAM FOR RADIATED TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

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

Test and Measurement Equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2012/02/10 * 12
SAT6-03	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2011/10/23 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2012/04/10 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2011/10/23 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2012/02/06 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE,CE	2012/02/07 * 12
SJM-10	Measure	PROMART	SEN1935	-	RE,CE	-
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2011/09/23 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE,CE	-
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2011/07/19 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2012/04/10 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2012/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2011/08/28 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2012/03/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2011/12/27 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2011/12/27 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2012/03/30 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2012/03/12 * 12
SCC-G18	Coaxial Cable	Suhner	SUCOFLEX 104A	46292/4A	RE	2012/03/12 * 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 test

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Test and Measurement Equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2012/02/16 * 12
SCC-G11	Coaxial Cable	Suhner	SUCOFLEX 102	31595/2	AT	2012/03/12 * 12
SAT10-08	Attenuator	Weinschel	W54-10	-	AT	2012/03/12 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2012/04/19 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2012/04/19 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2012/03/26 * 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
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2012/02/23 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2012/02/17 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2012/03/26 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2012/01/05 * 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.

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Test Item:
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RE: Radiated emission,
AT: Antenna terminal conducted test

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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	923.446	905.3156
Middle	2441	921.996	906.5016
High	2480	919.833	902.2642

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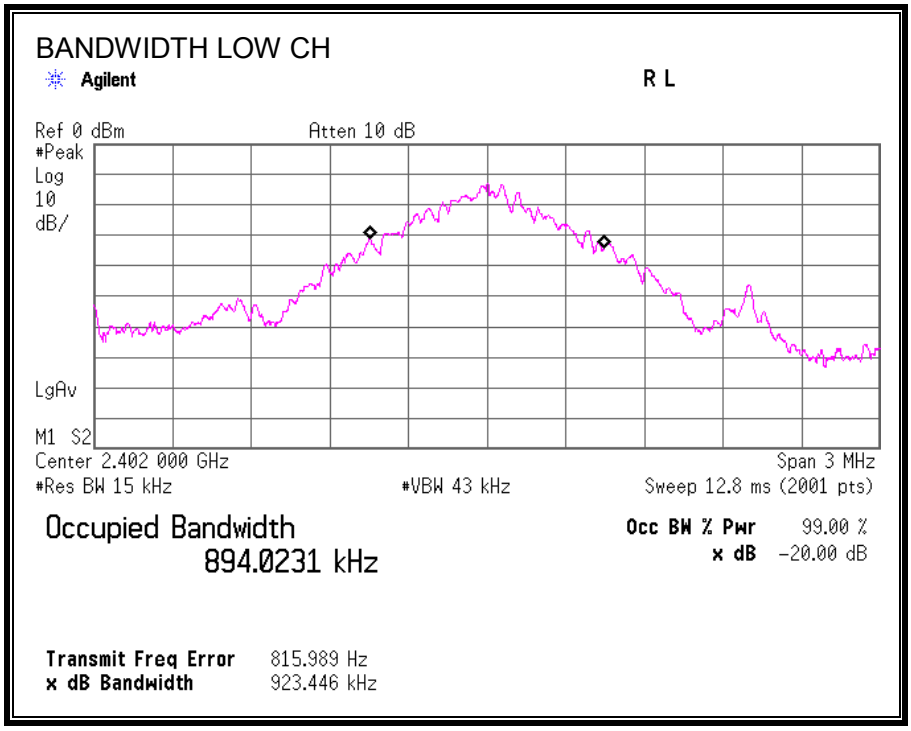
20 dB BANDWIDTH



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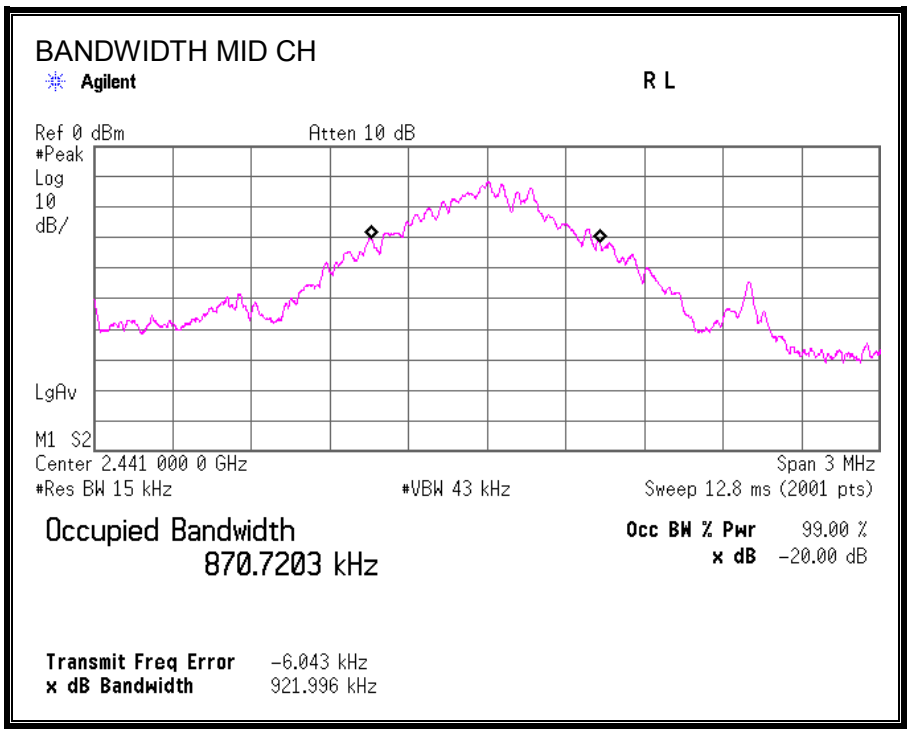

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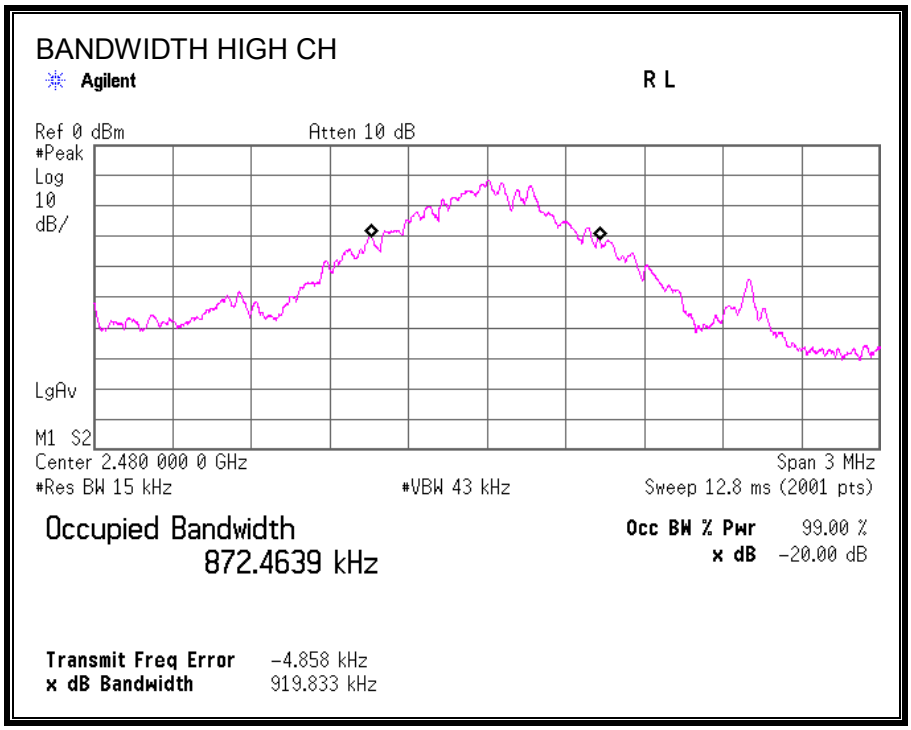

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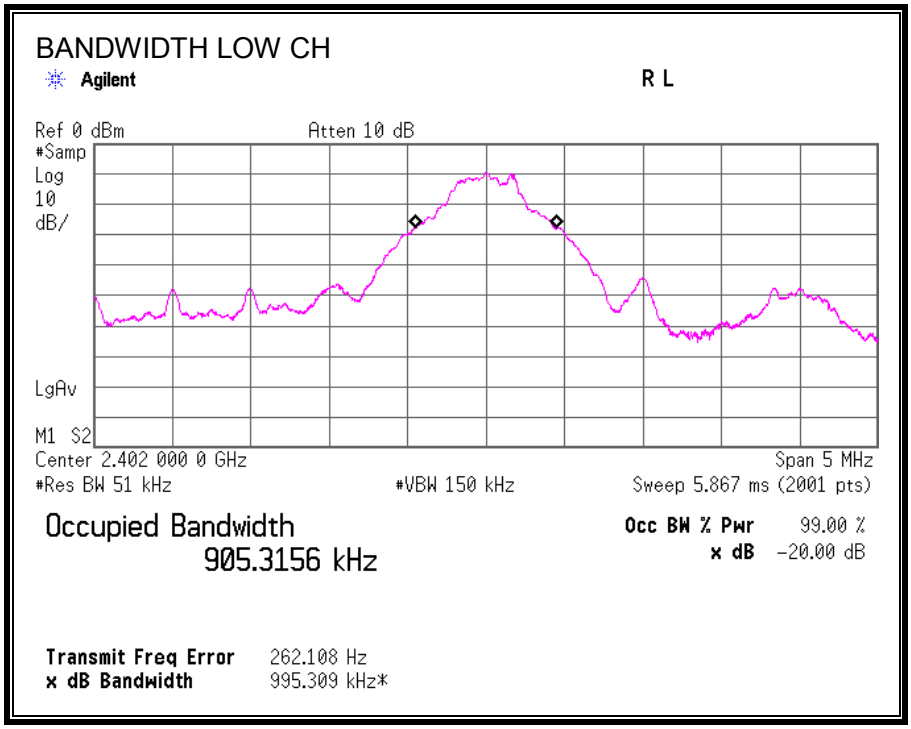
99% BANDWIDTH



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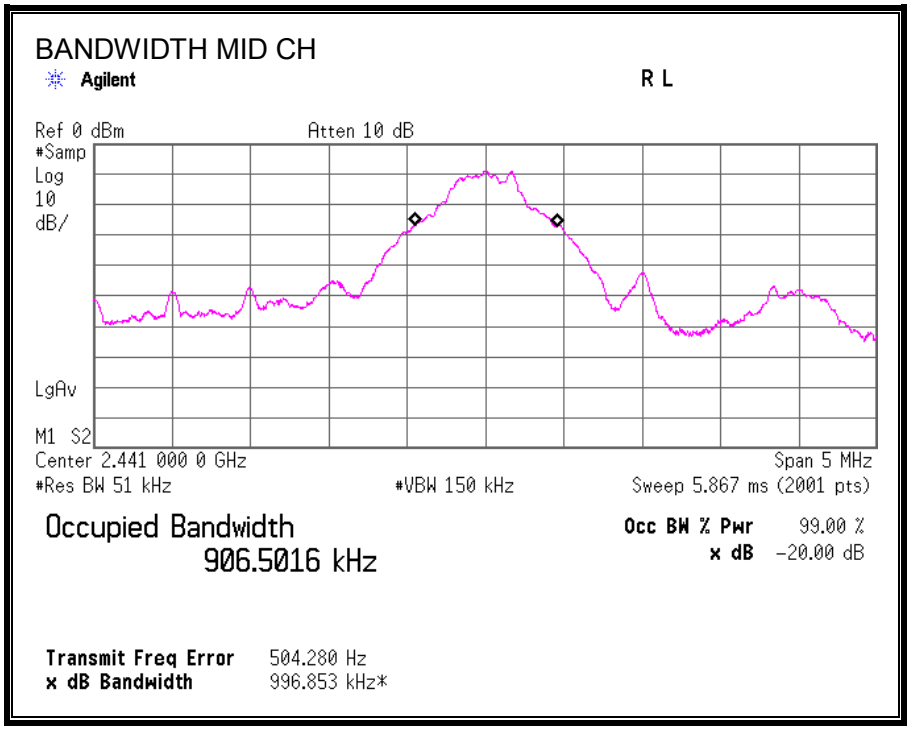

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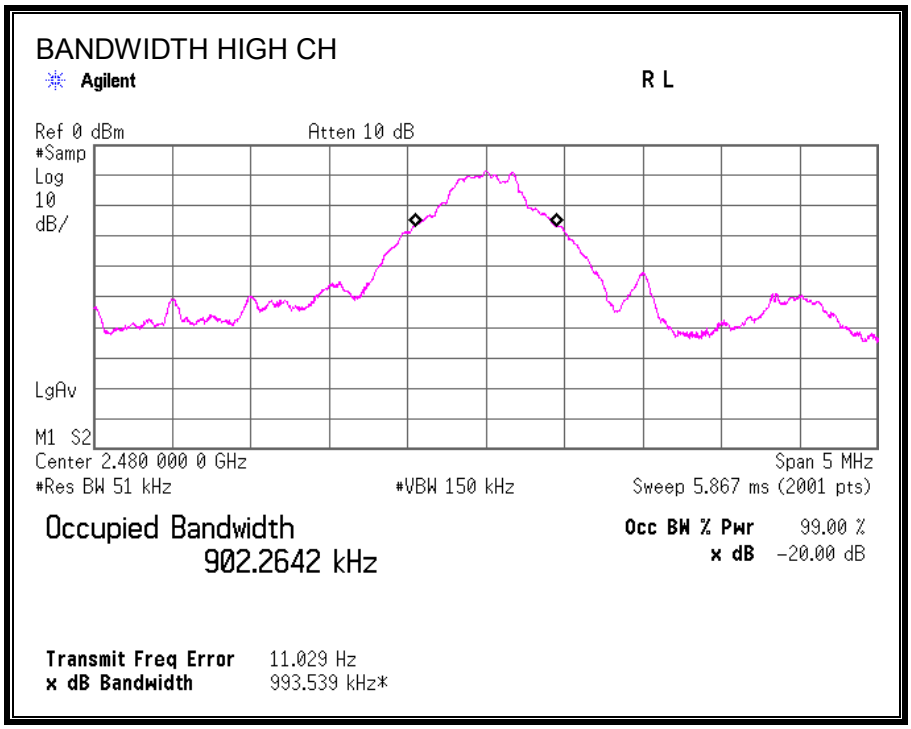

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7.1.2. HOPPING FREQUENCY SEPARATION

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.

RESULTS

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

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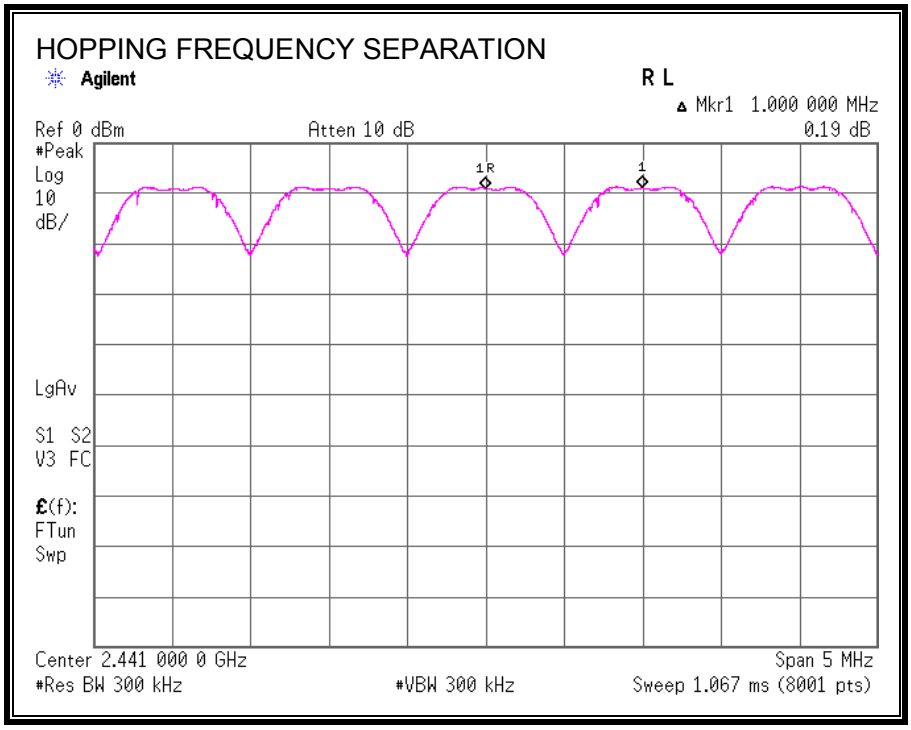
RESULTS

HOPPING FREQUENCY SEPARATION



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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 Specification 2.1.

RESULTS

79 Channels observed.

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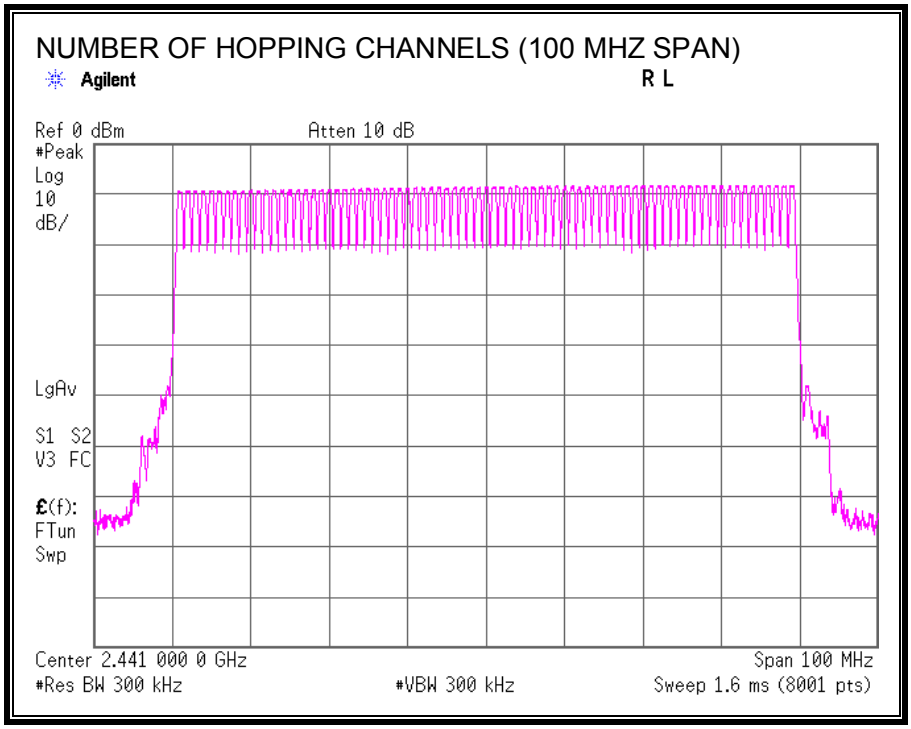
NUMBER OF HOPPING CHANNELS



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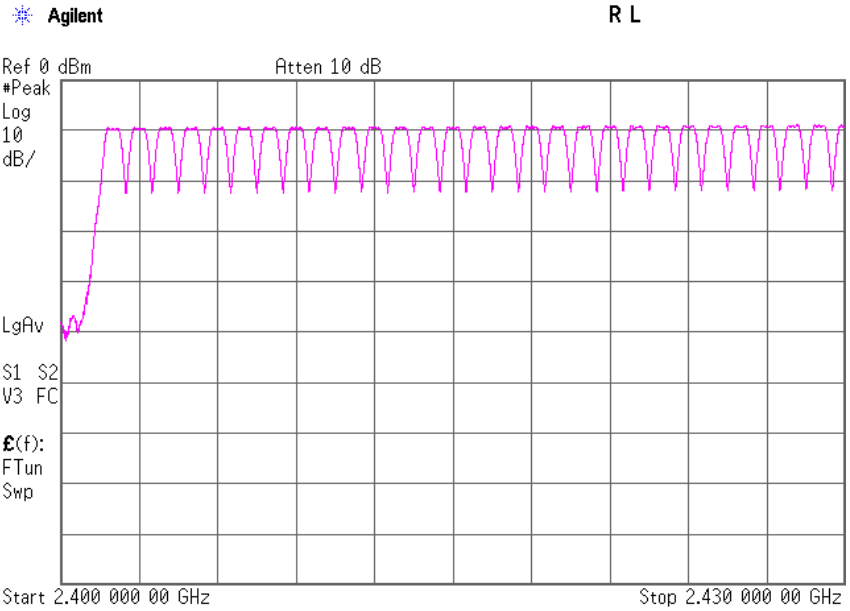
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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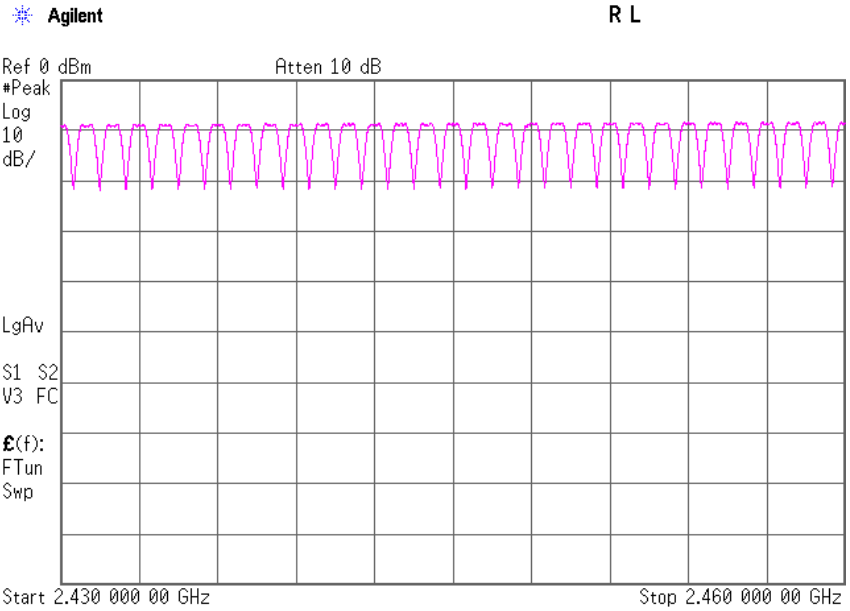
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



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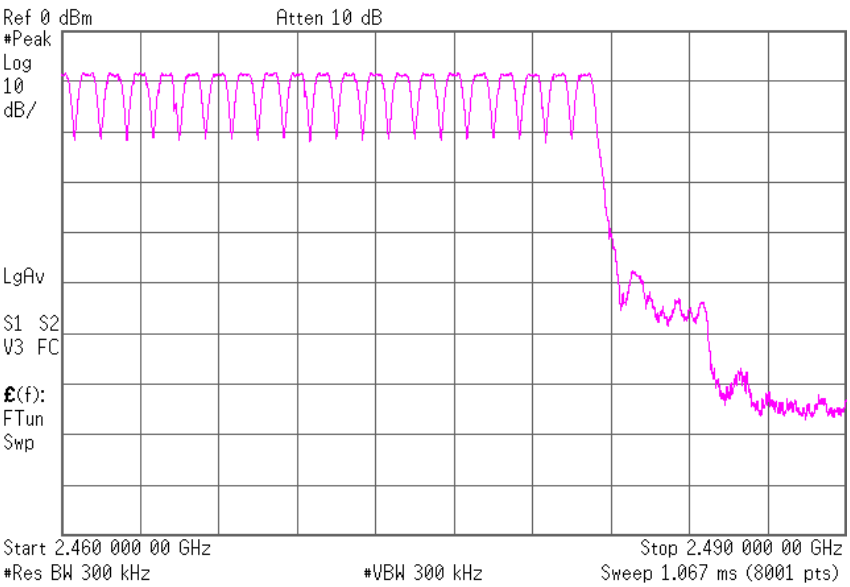
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



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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 ≥ 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.

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	0.4060	32	0.1299	0.4	0.2701
DH3	1.6620	16	0.2659	0.4	0.1341
DH5	2.9150	11	0.3207	0.4	0.0794

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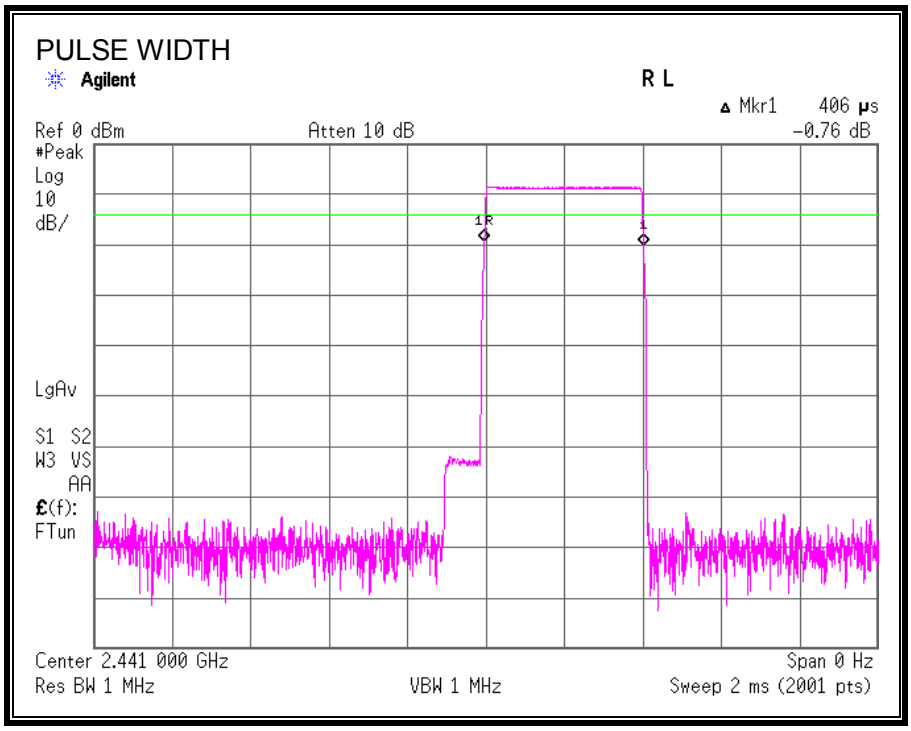
DH1 PULSE WIDTH



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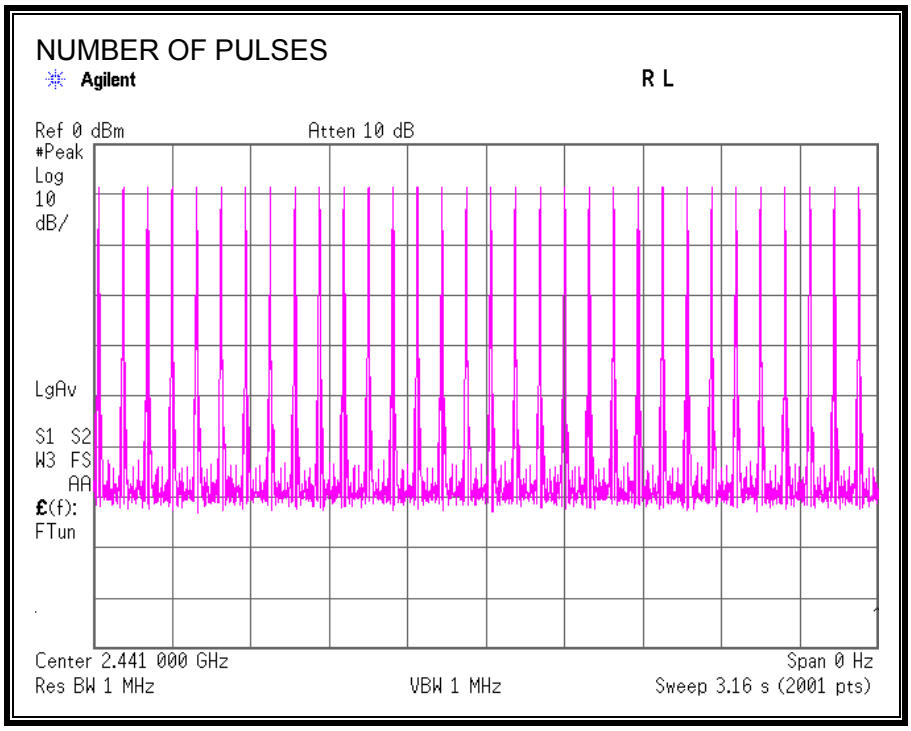
DH1 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



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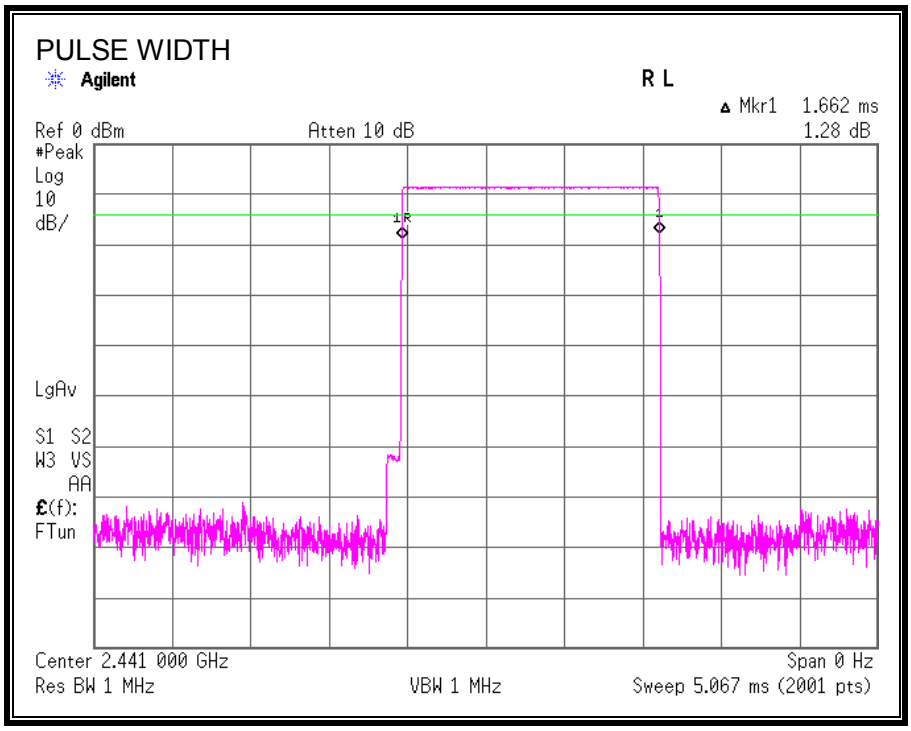
DH3 PULSE WIDTH



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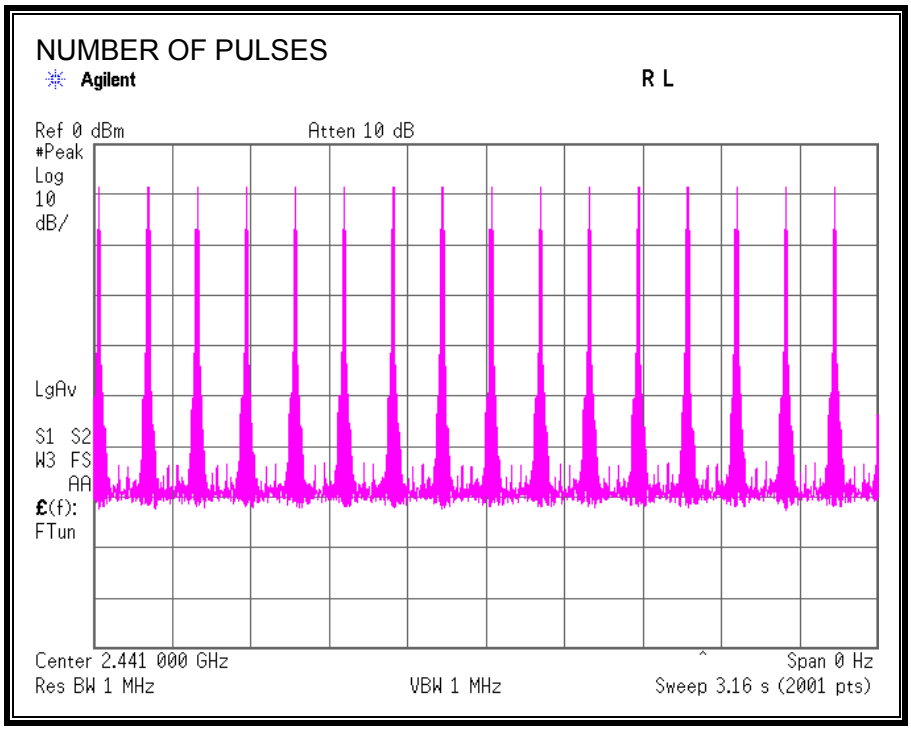
DH3 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



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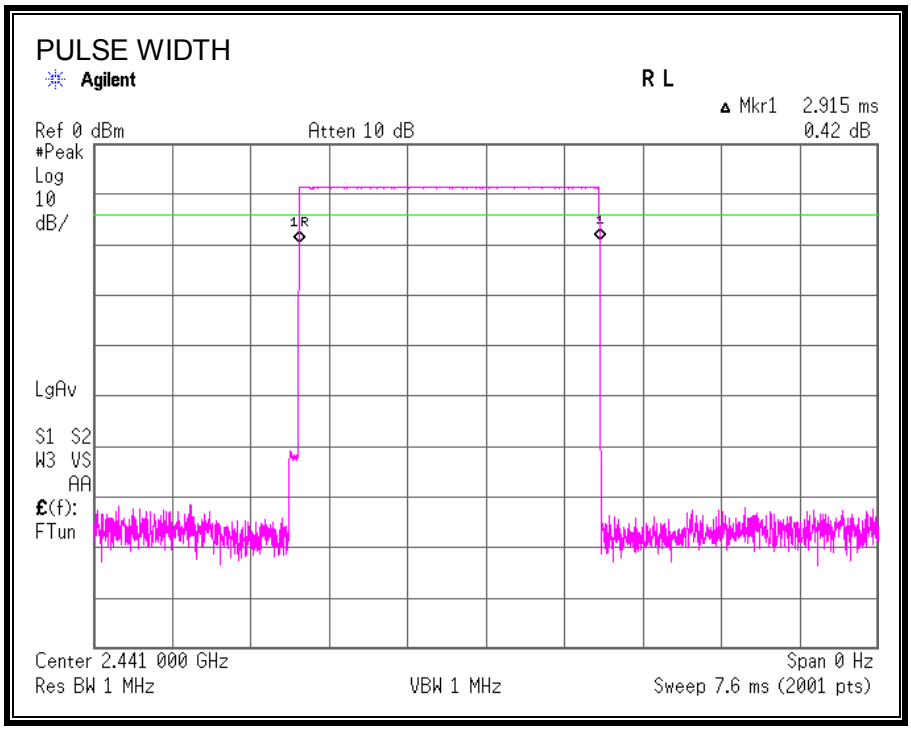
DH5 PULSE WIDTH



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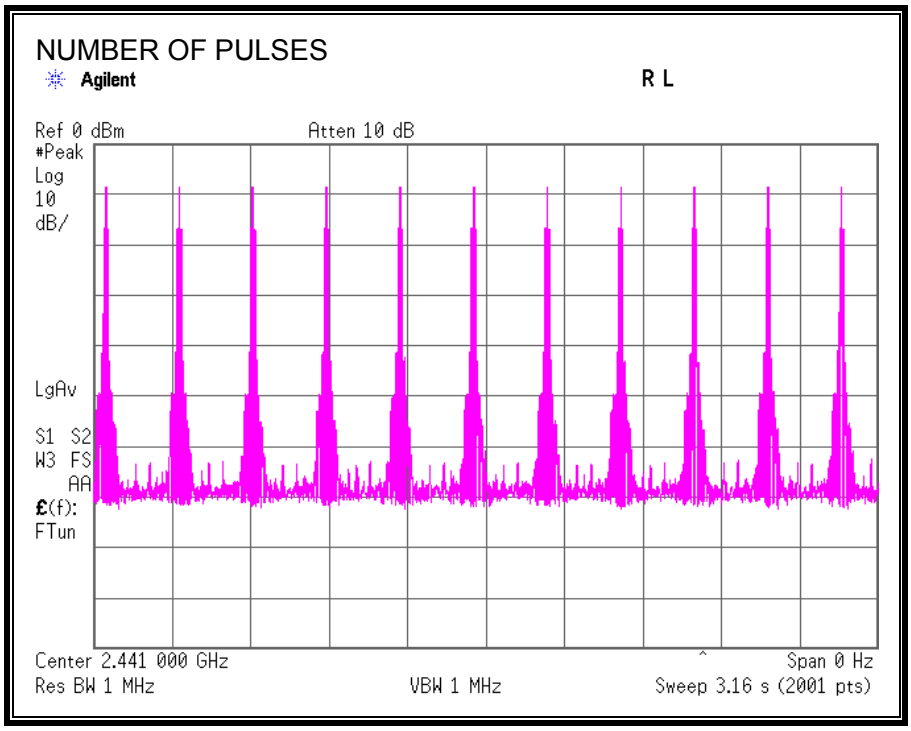
DH5 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



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7.1.5. MAXIMUM PEAK 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	-8.81	10.70	1.89	20.96	19.07
Middle	2441	-8.10	10.71	2.61	20.96	18.35
High	2480	-7.97	10.71	2.74	20.96	18.22

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 2.1 and the output power at non-AFH mode is less than 20.96dBm.

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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 10.70 – 10.71 dB (including 9.86 dB pad and 0.84 - 0.85 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	-0.92
Middle	2441	-0.61
High	2480	-0.87

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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.

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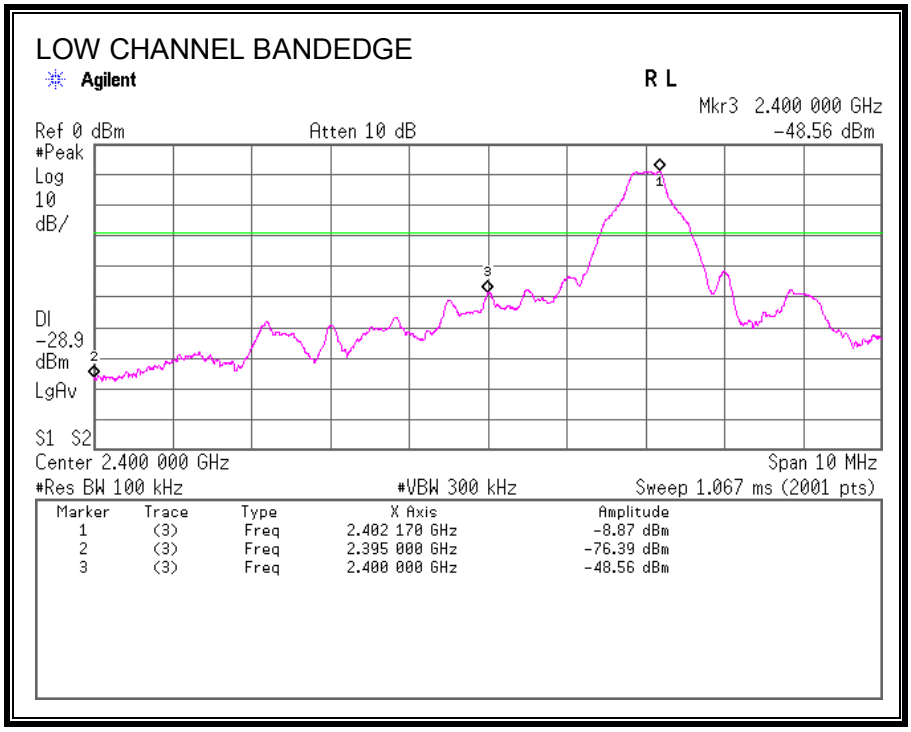
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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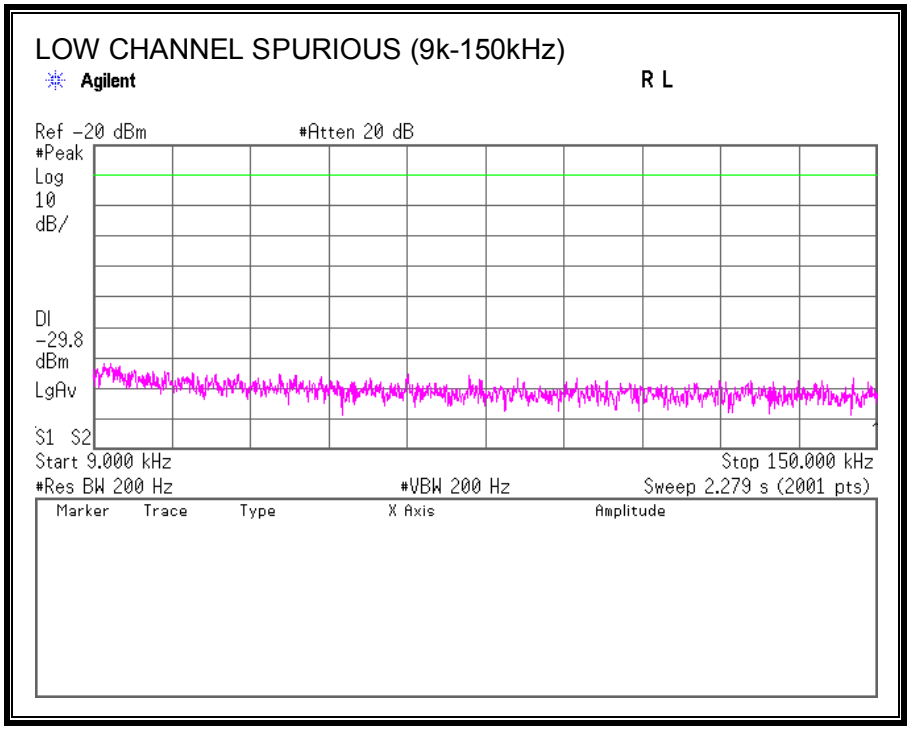

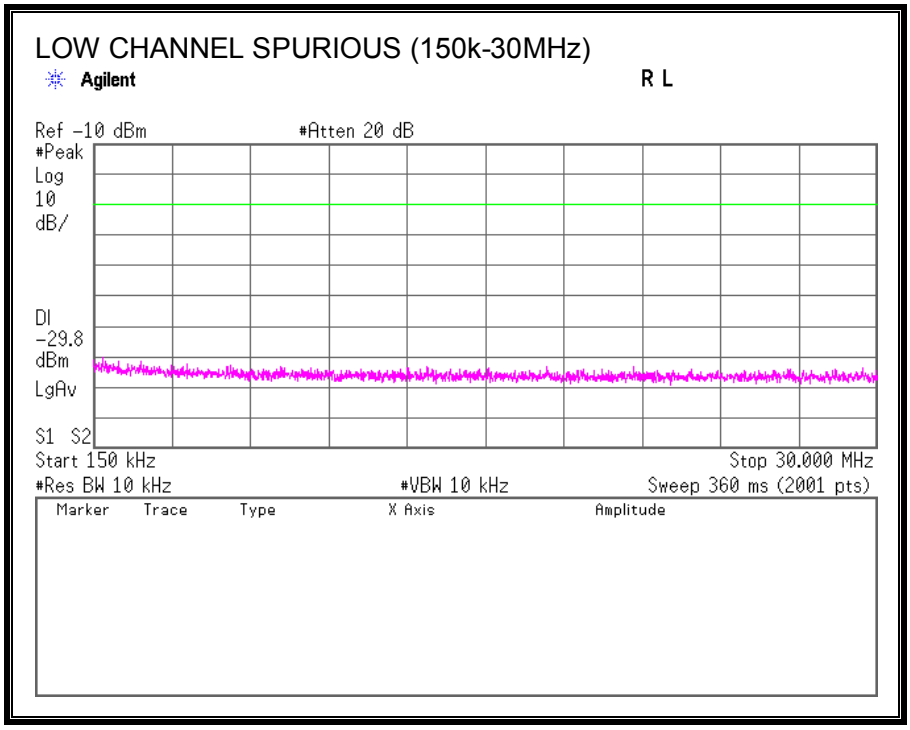

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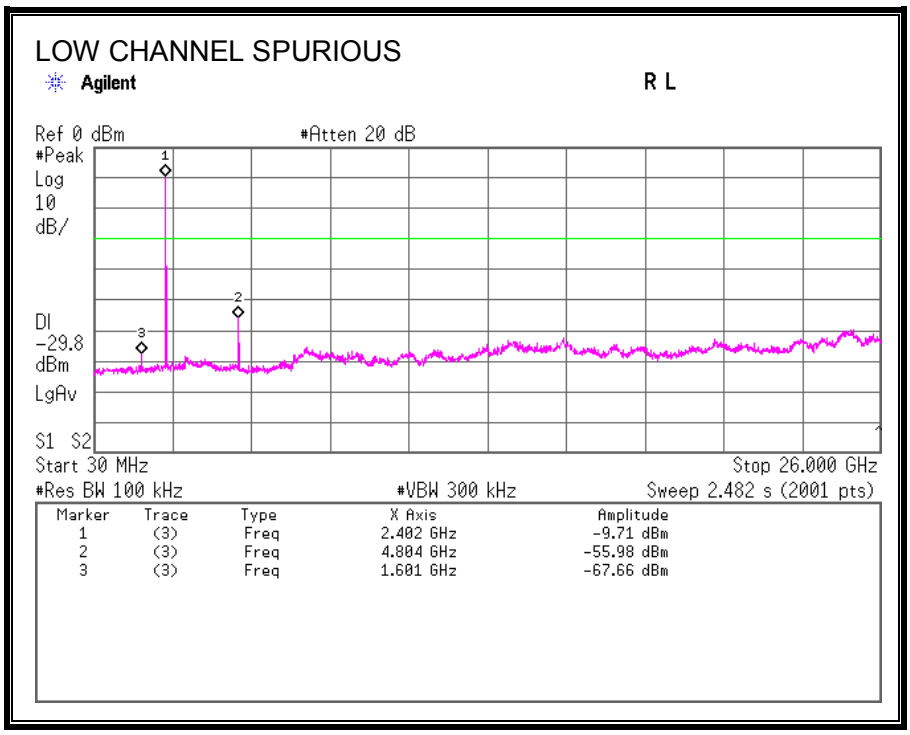

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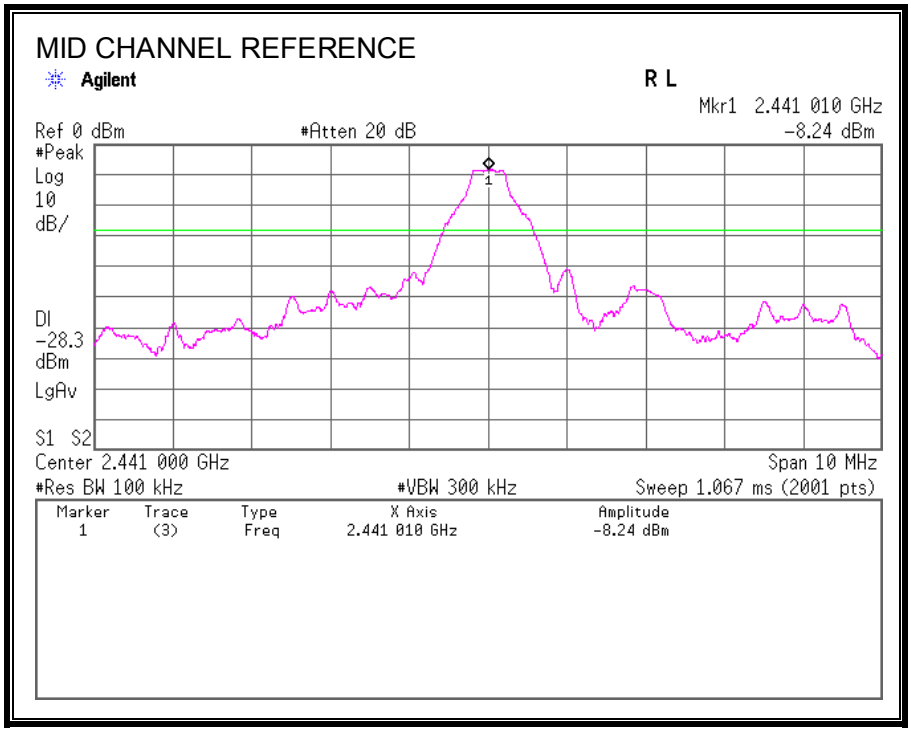
SPURIOUS EMISSIONS, MID CHANNEL



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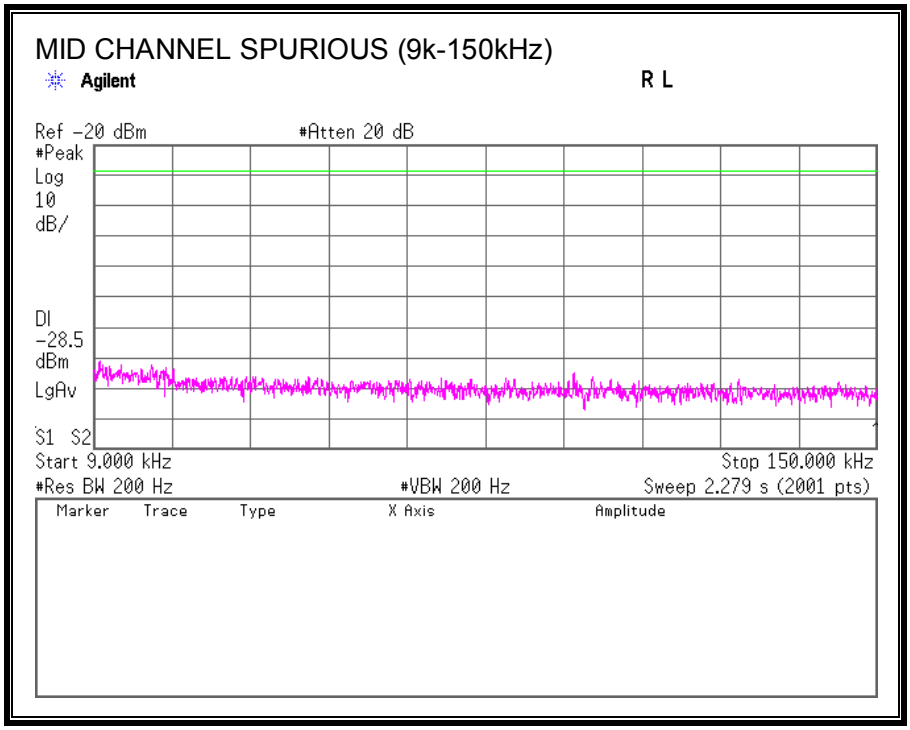

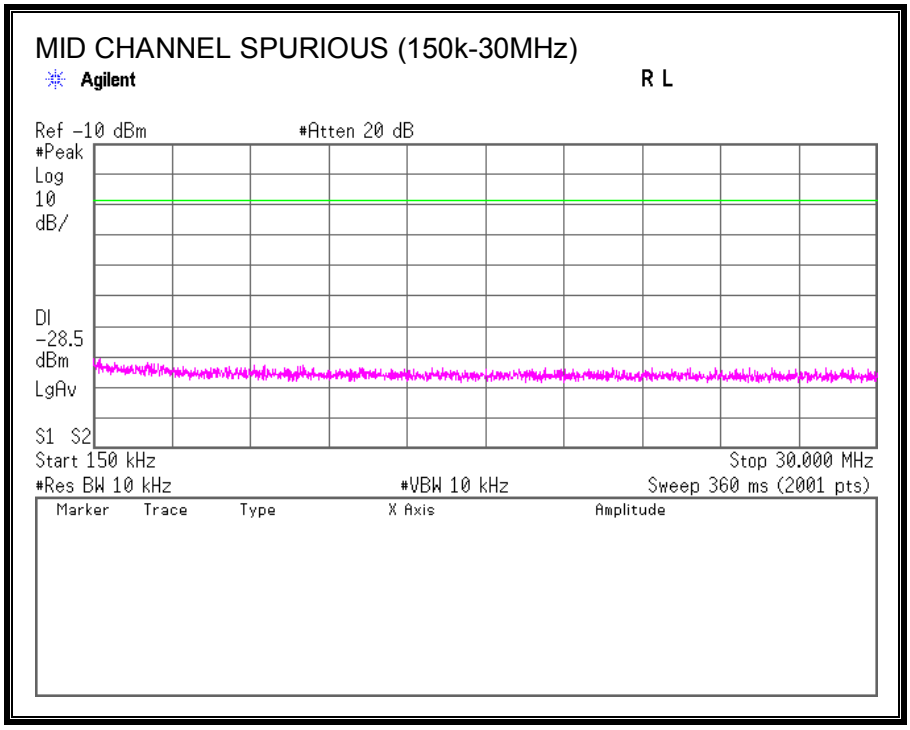

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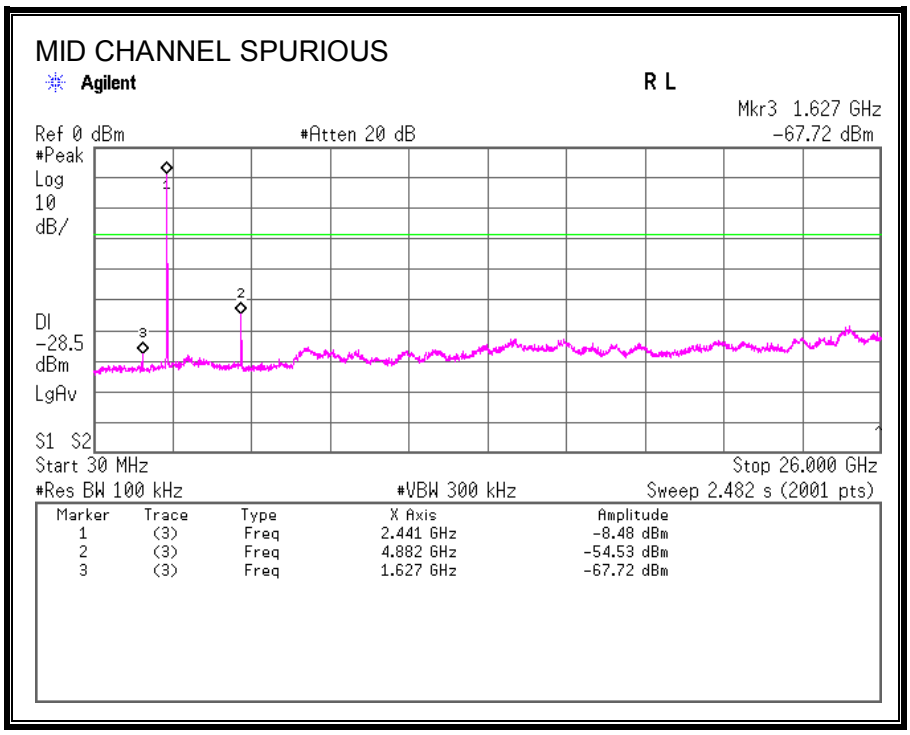

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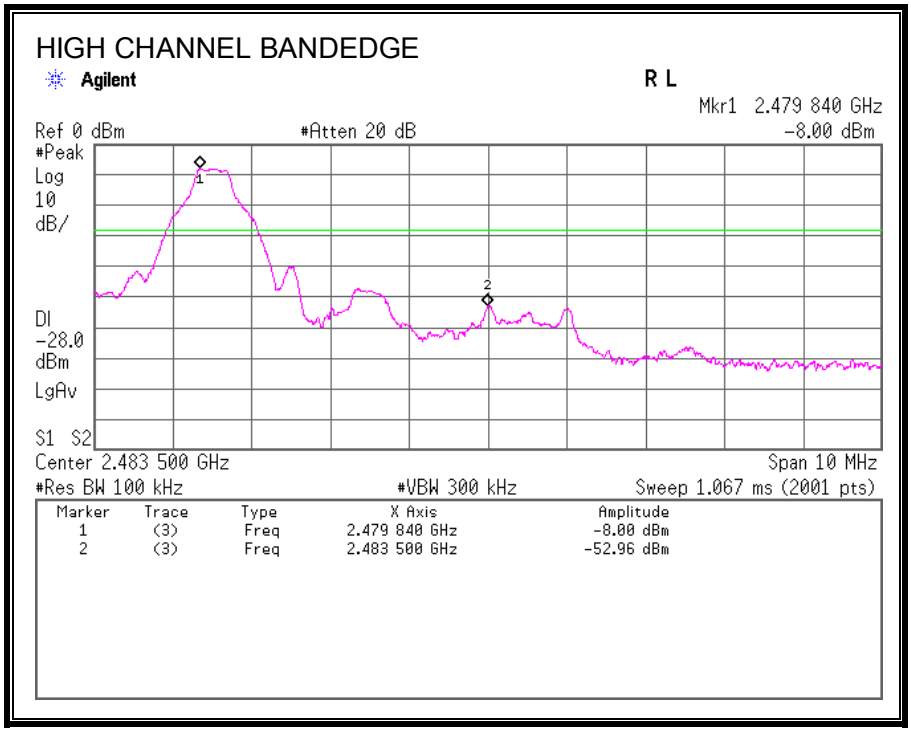
SPURIOUS EMISSIONS, HIGH CHANNEL



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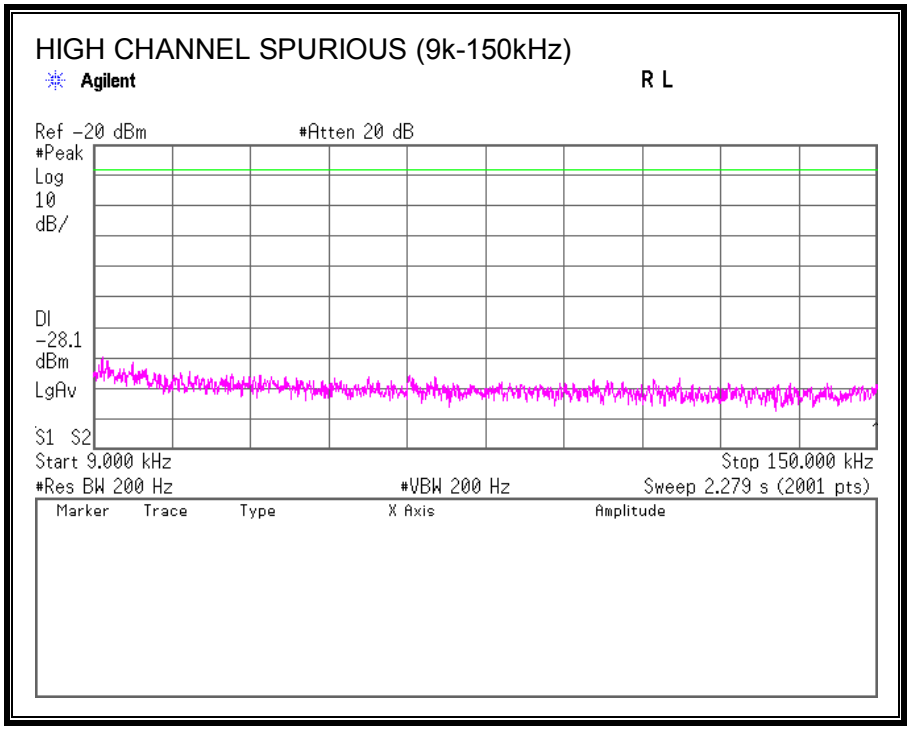

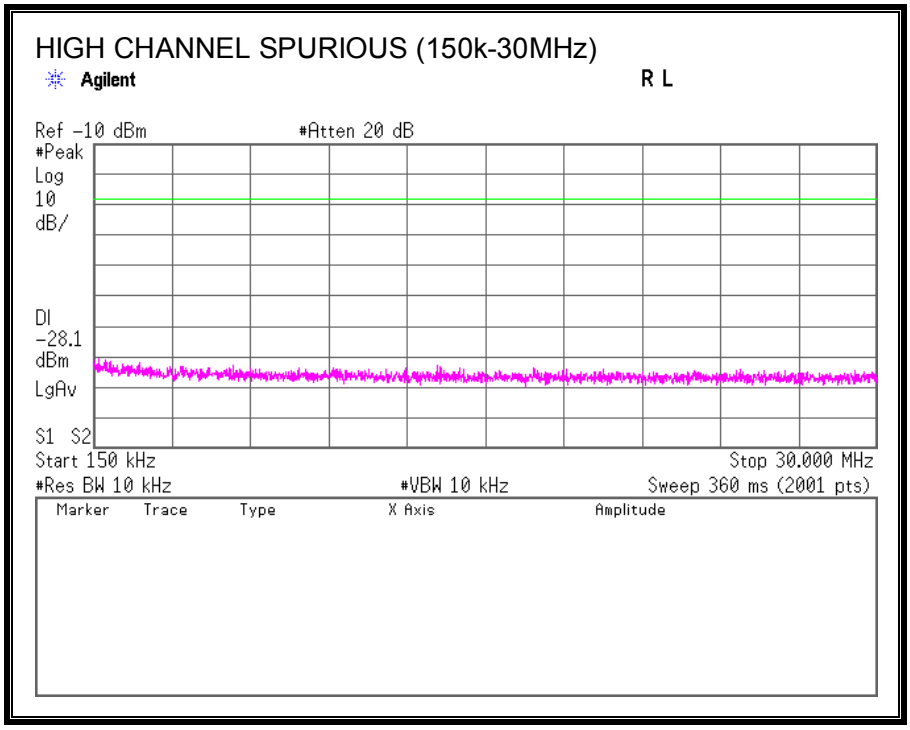

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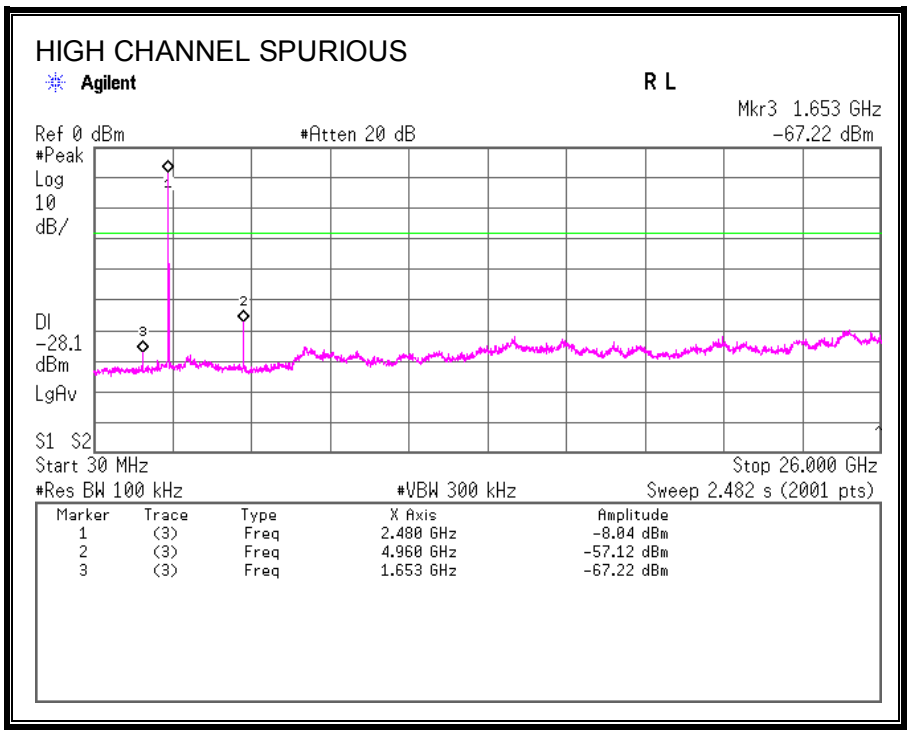

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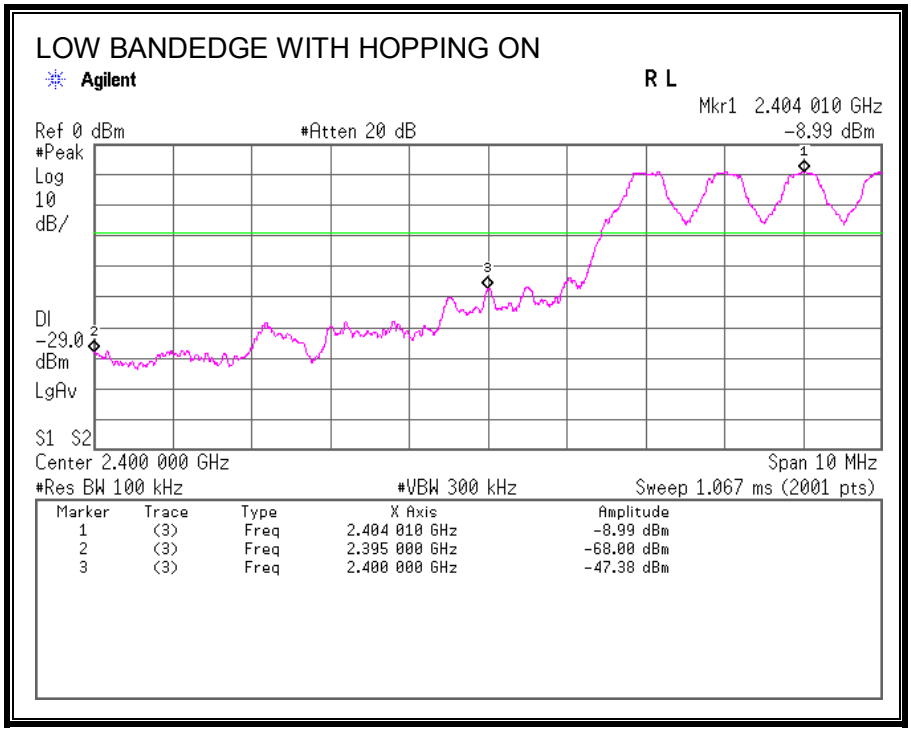
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



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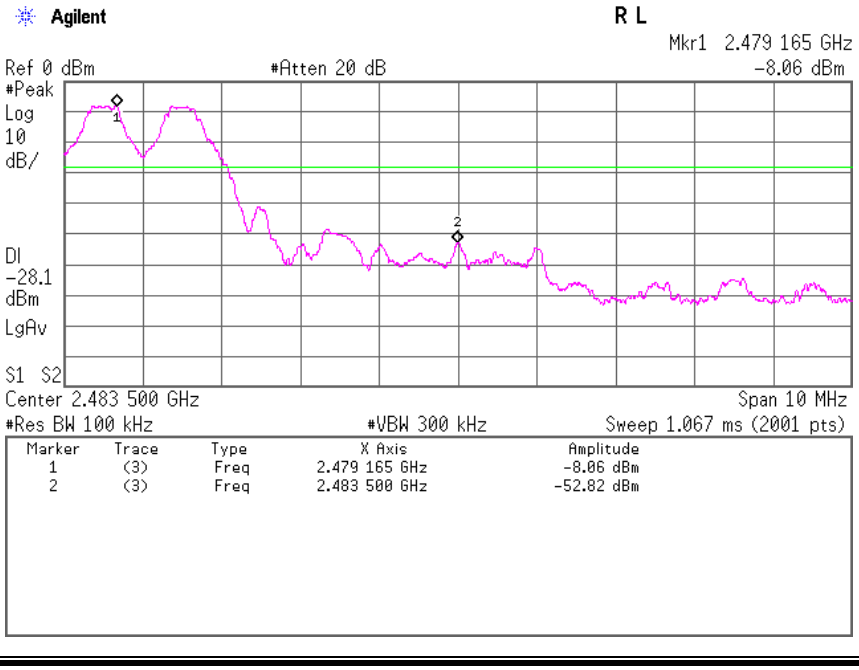
HIGH BANDEDGE WITH HOPPING ON



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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	1243	1169.7
Middle	2441	1244	1169.2
High	2480	1240	1173.3

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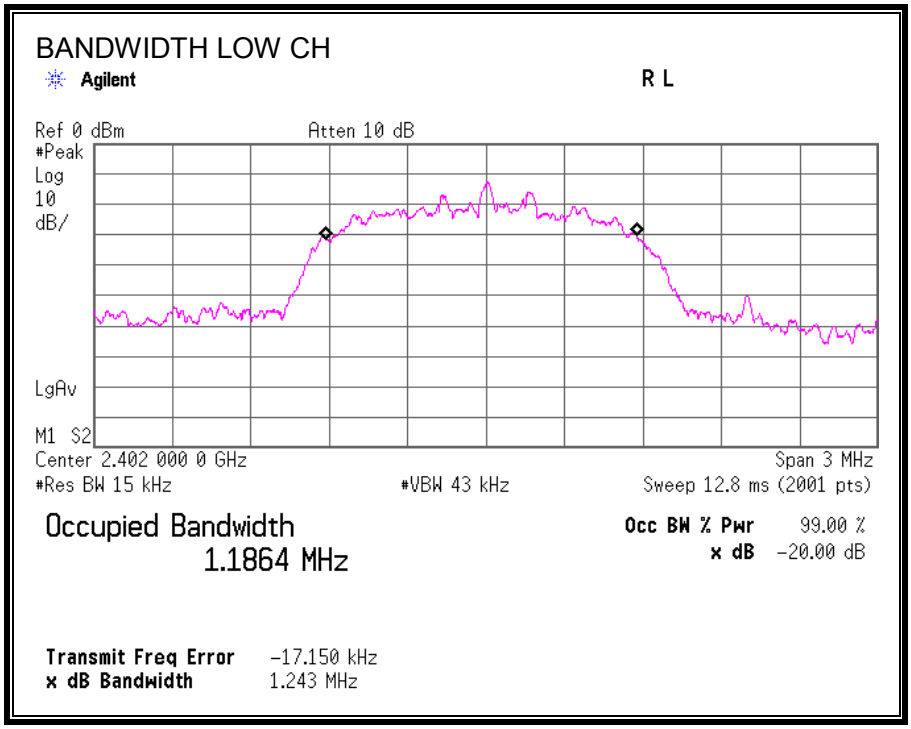
20 dB BANDWIDTH



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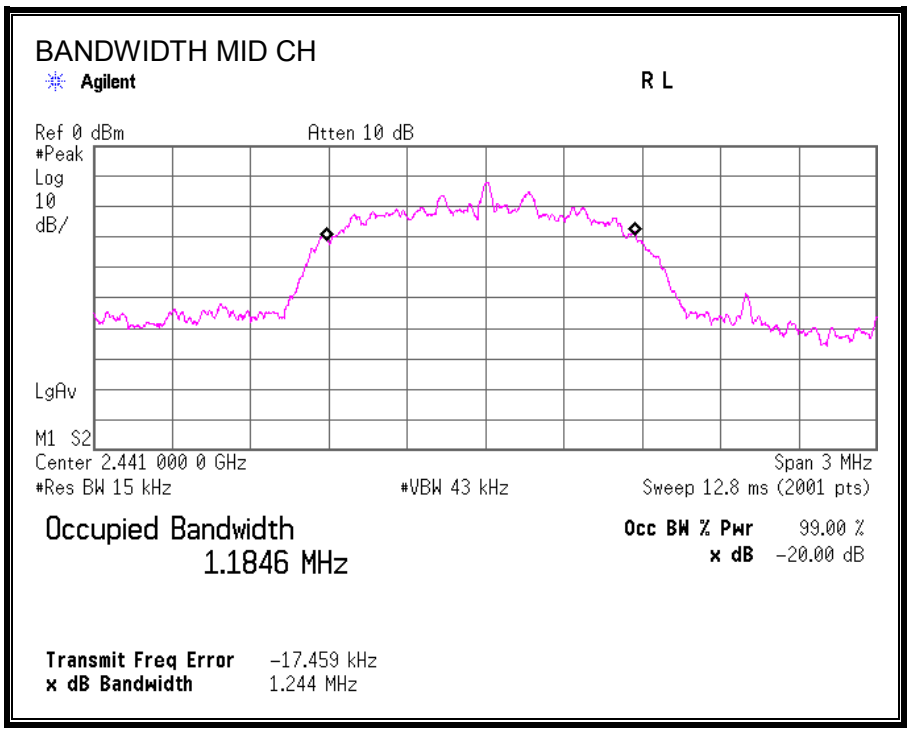

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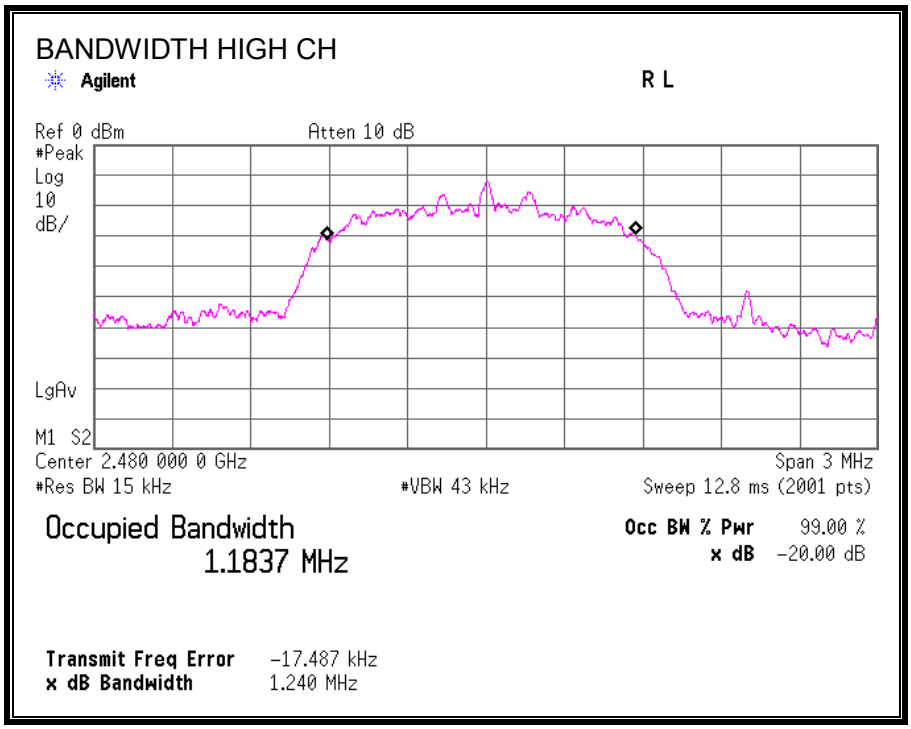

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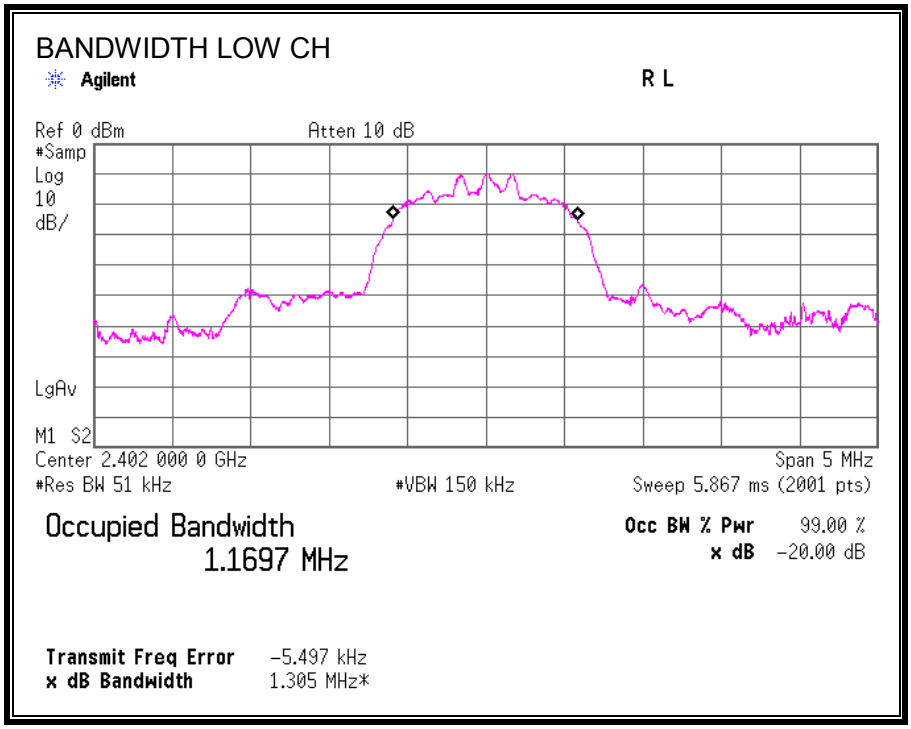
99% BANDWIDTH



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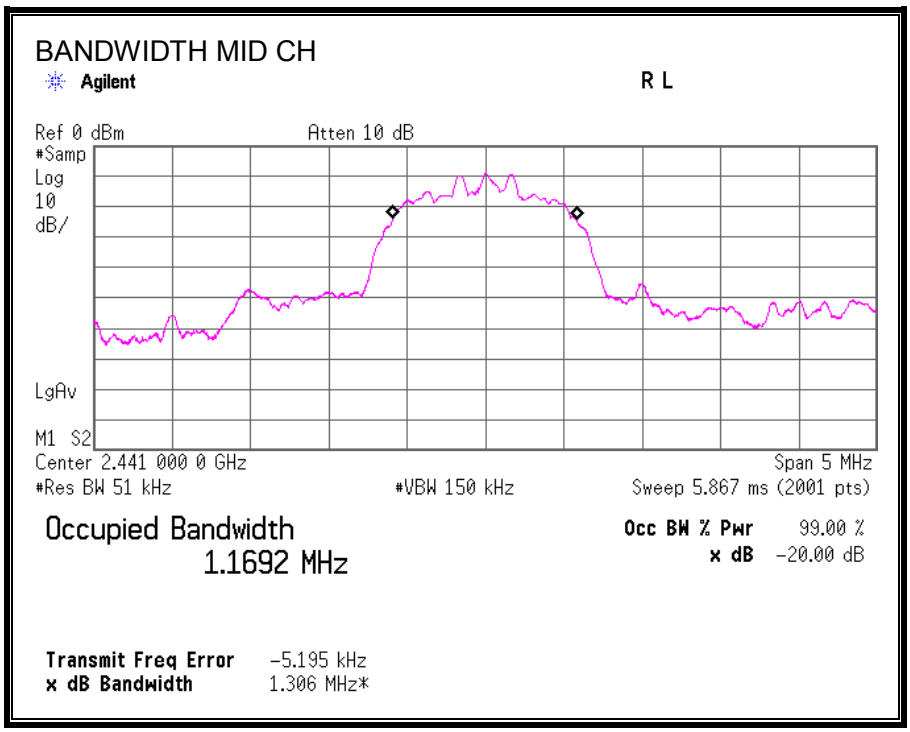

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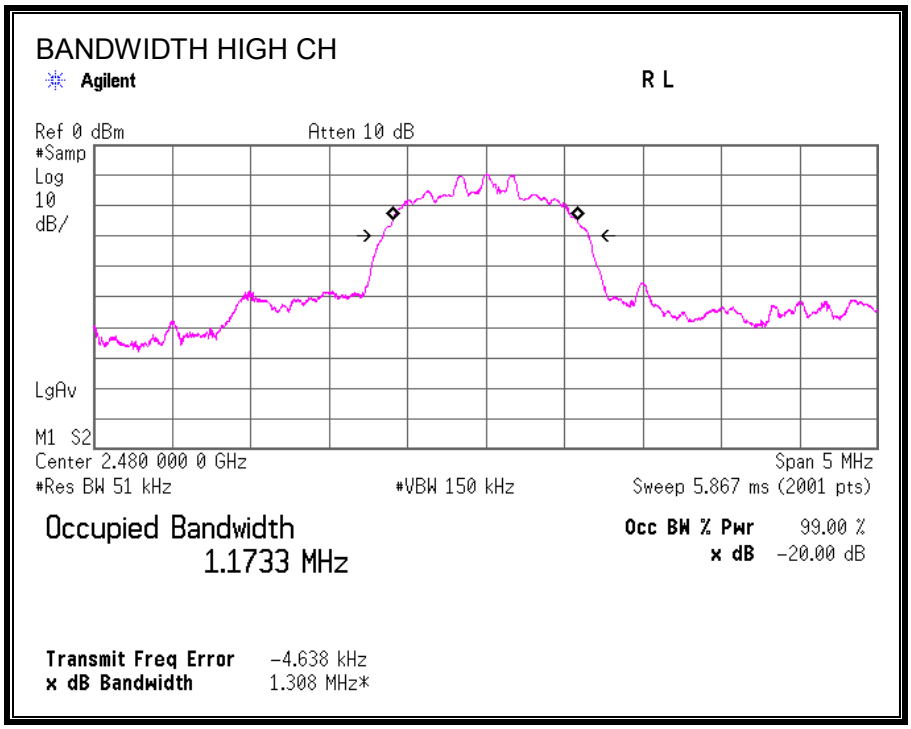

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7.2.2. HOPPING FREQUENCY SEPARATION

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 100 kHz and the VBW is set to 100 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.

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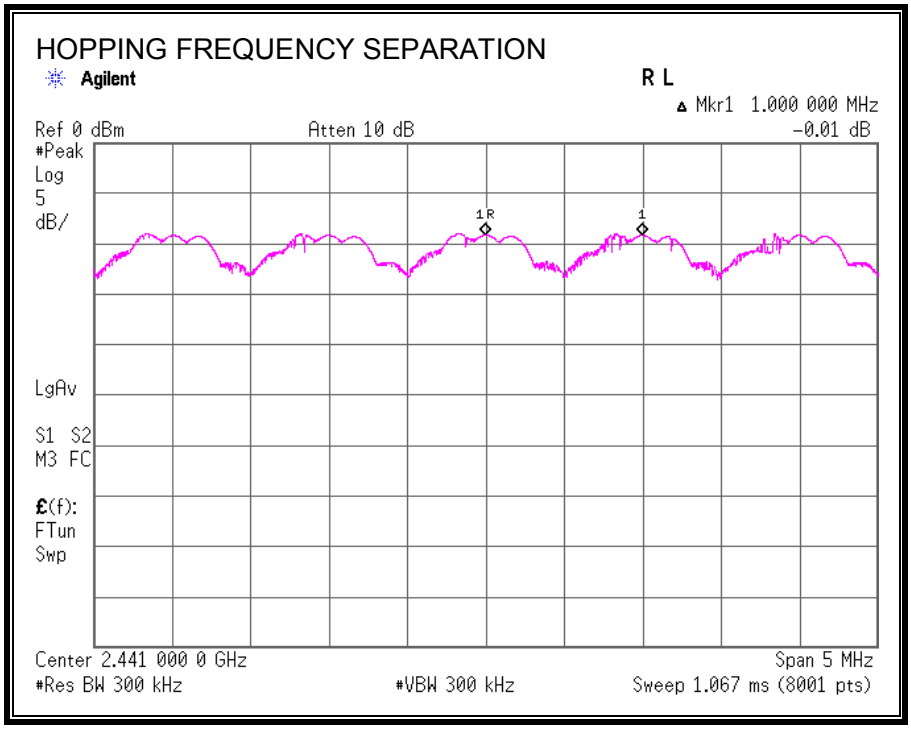
RESULTS

HOPPING FREQUENCY SEPARATION



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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 Specification 2.1.

RESULTS

79 Channels observed.

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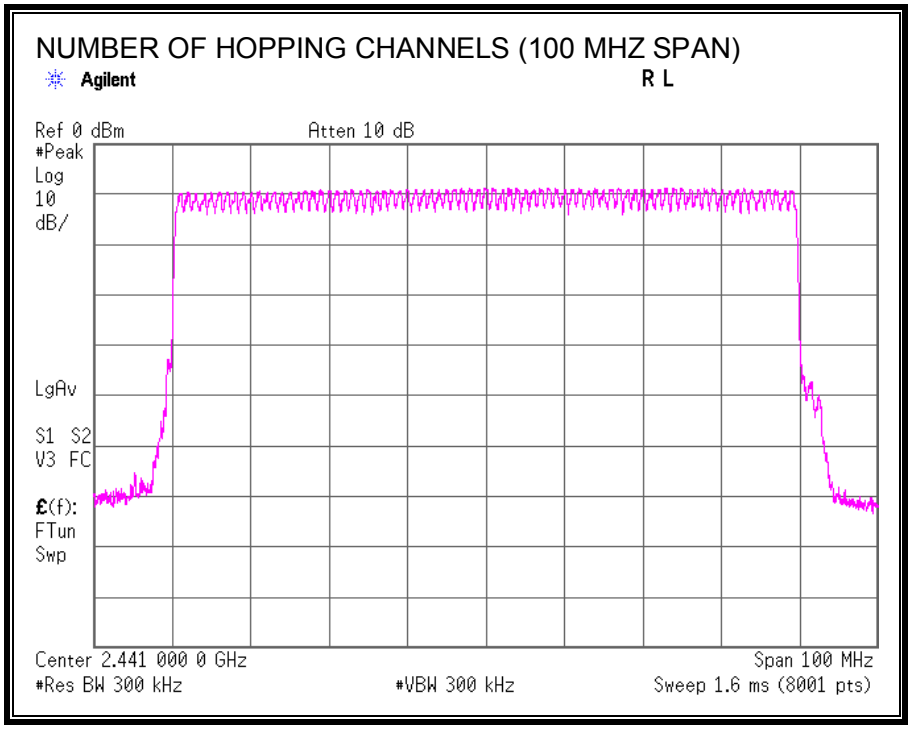
NUMBER OF HOPPING CHANNELS



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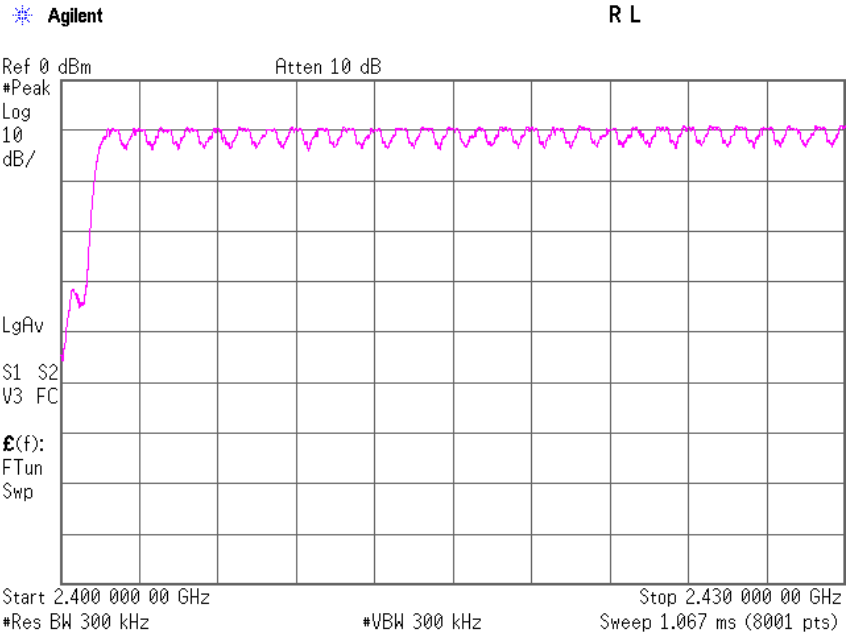
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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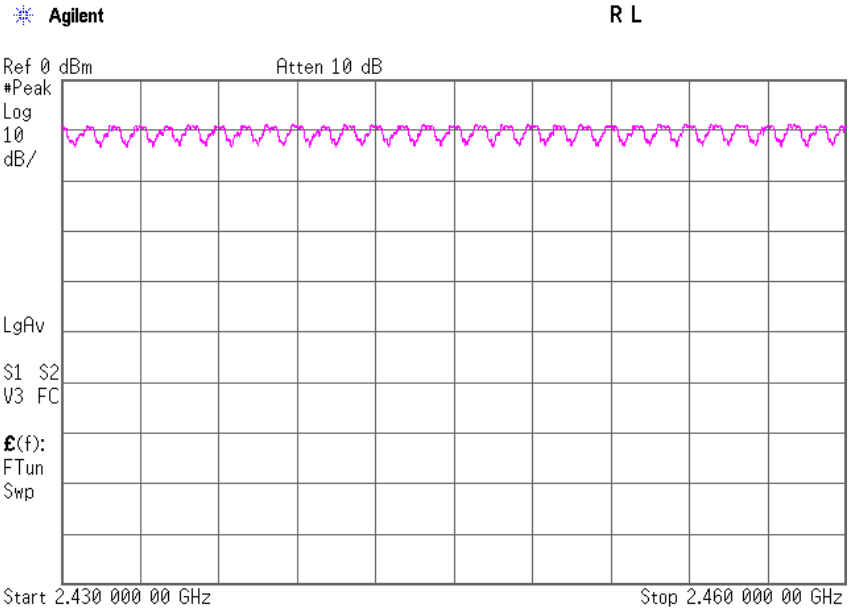
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



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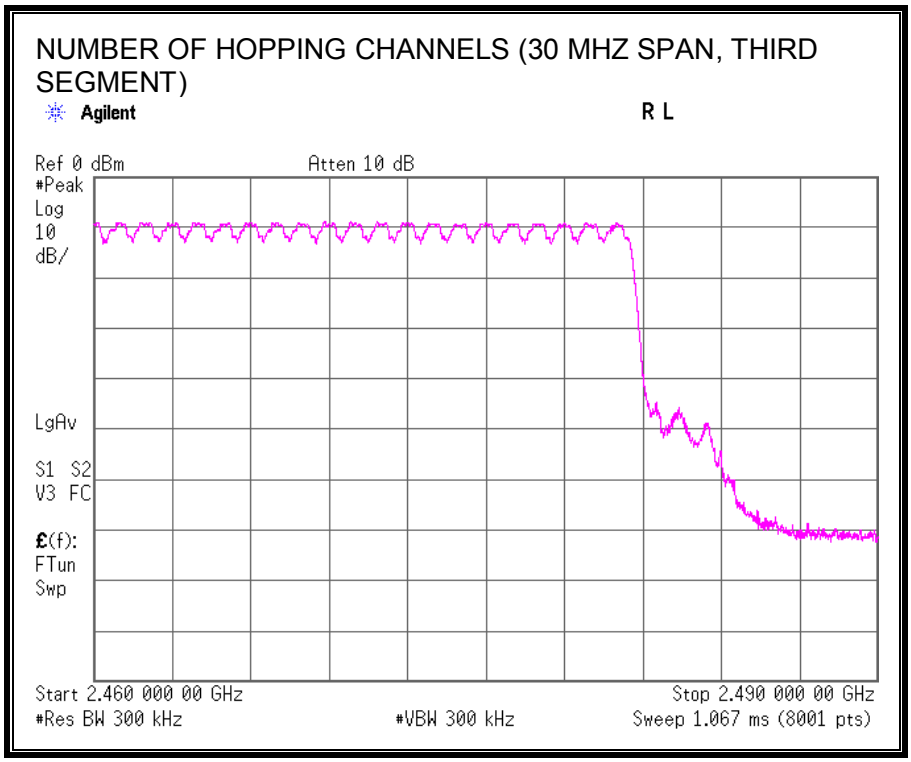
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



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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 ≥ 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.

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	0.42	32	0.134	0.4	0.266
3DH3	1.672	16	0.268	0.4	0.132
3DH5	2.926	11	0.322	0.4	0.078

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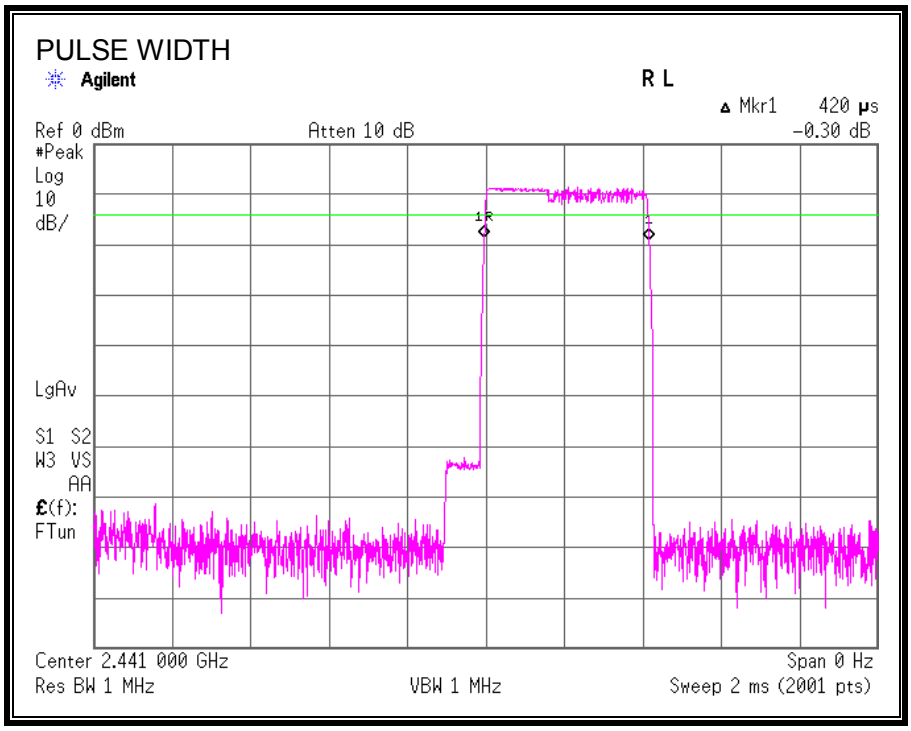
3DH1 PULSE WIDTH



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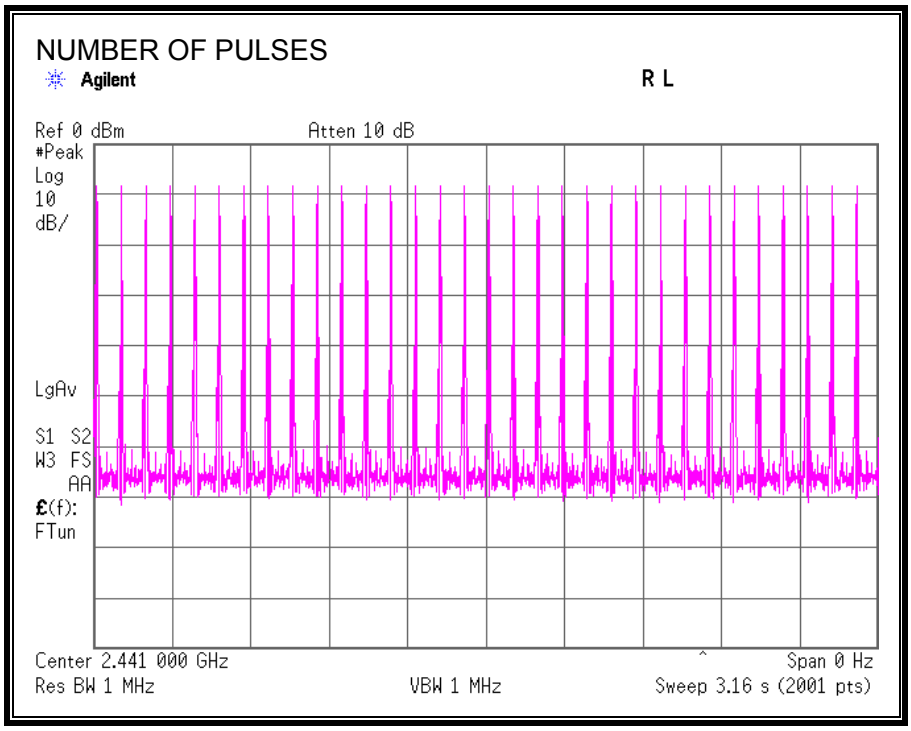
3DH1 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



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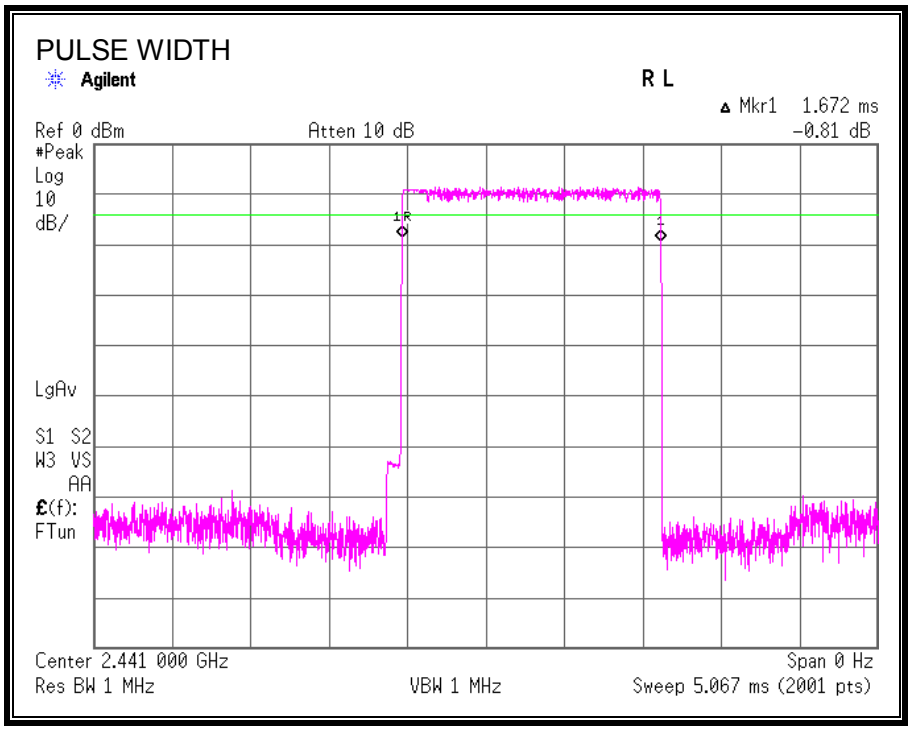
3DH3 PULSE WIDTH



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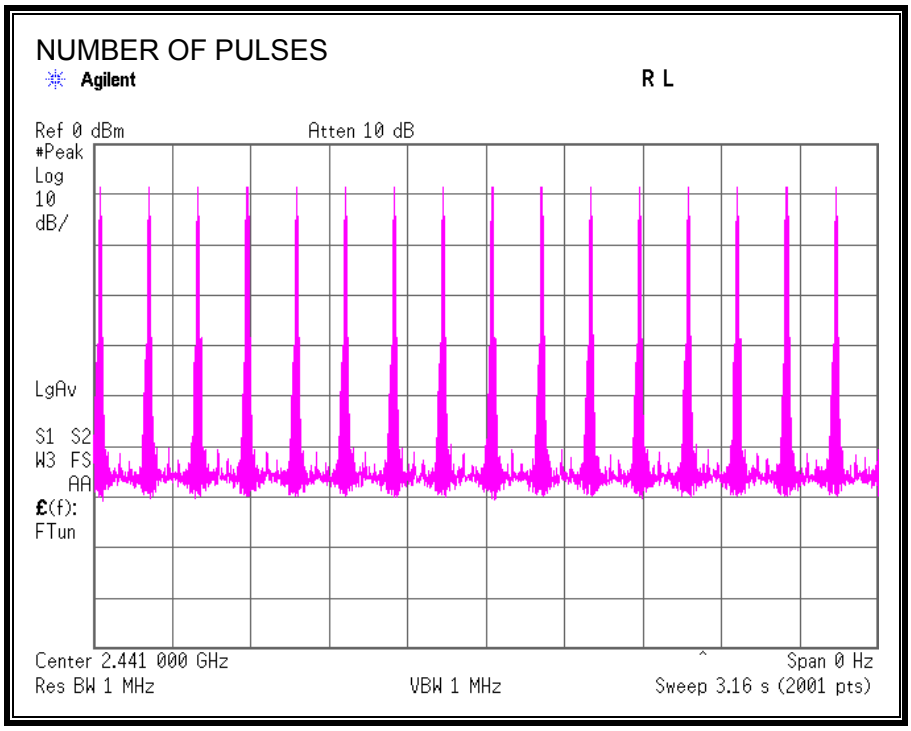

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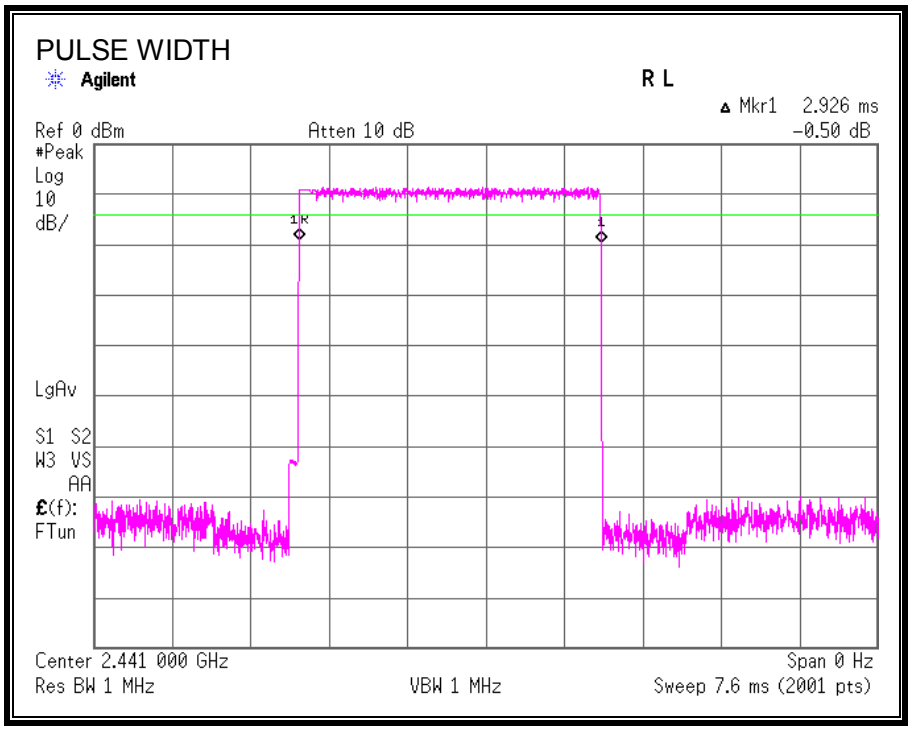
3DH5 PULSE WIDTH



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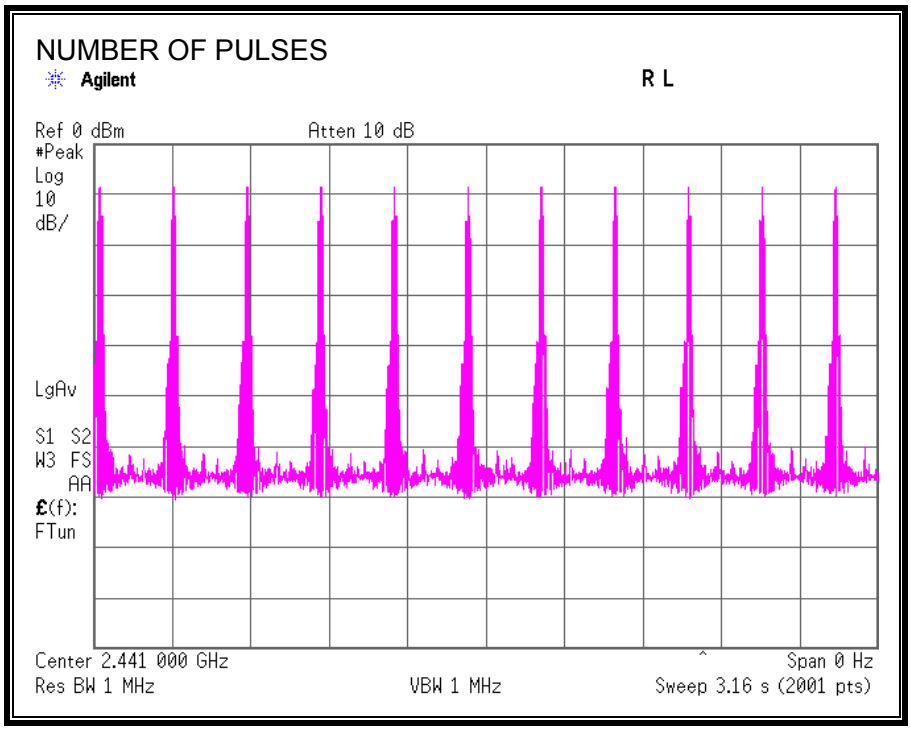
3DH5 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



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7.2.5. MAXIMUM PEAK 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	-7.98	10.70	2.72	20.96	18.24
Middle	2441	-7.77	10.71	2.94	20.96	18.02
High	2480	-7.95	10.71	2.76	20.96	18.20

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 2.1 and the output power at non-AFH mode is less than 20.96dBm.

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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 10.70 – 10.71 dB (including 9.86 dB pad and 0.84 - 0.85 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	-1.11
Middle	2441	-0.61
High	2480	-0.87

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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.

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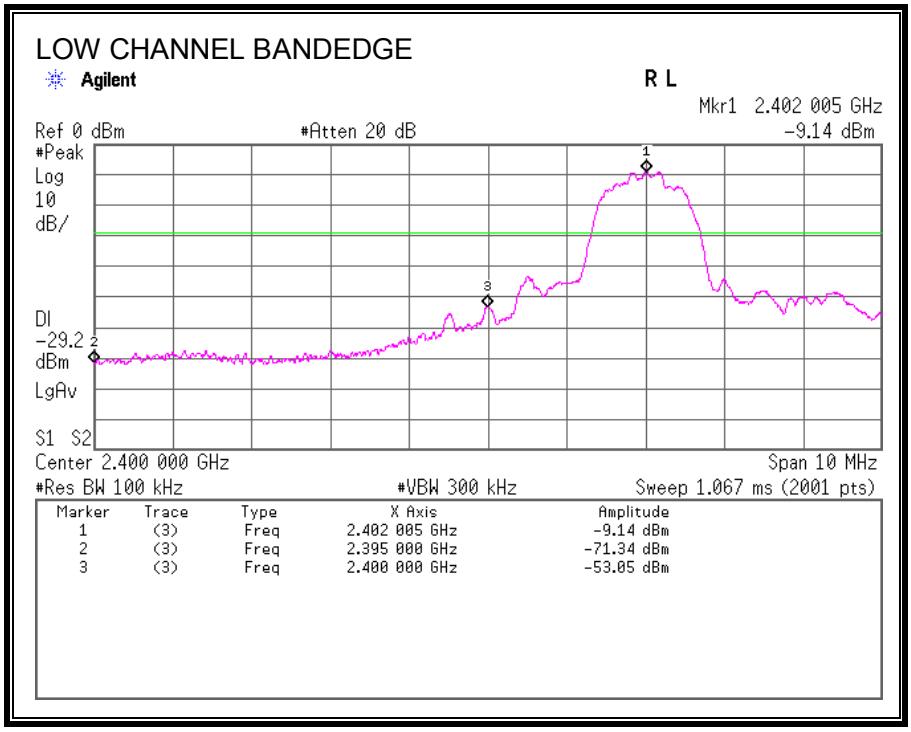
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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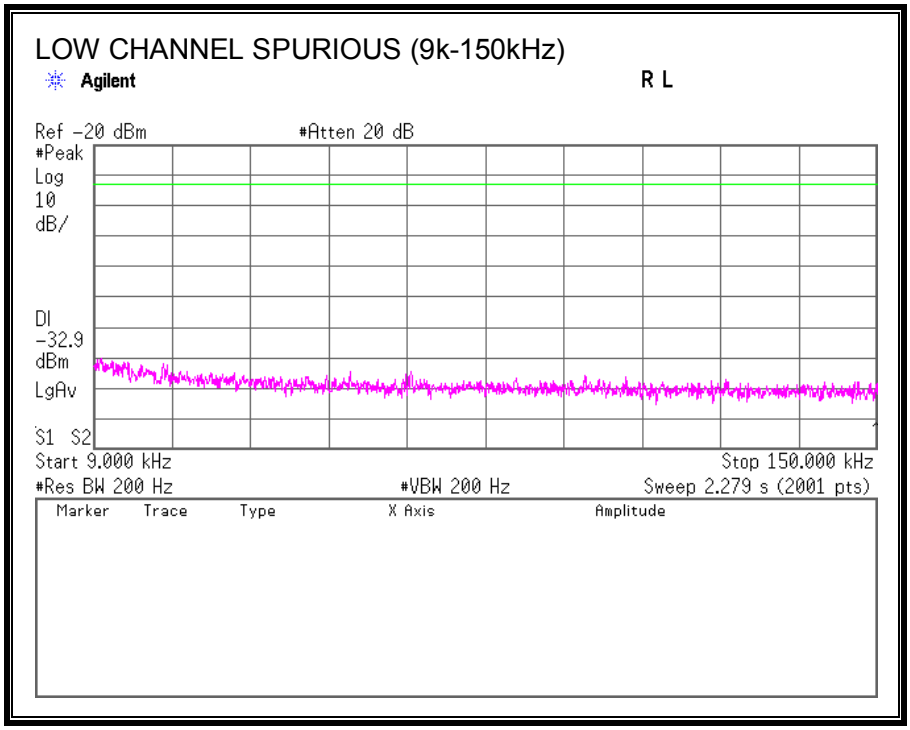

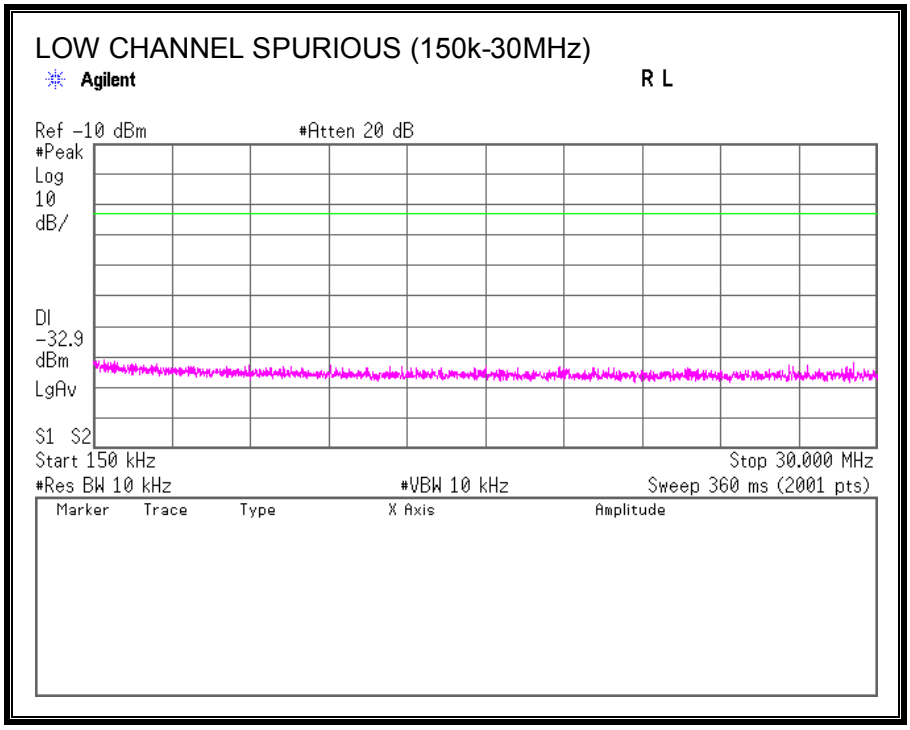

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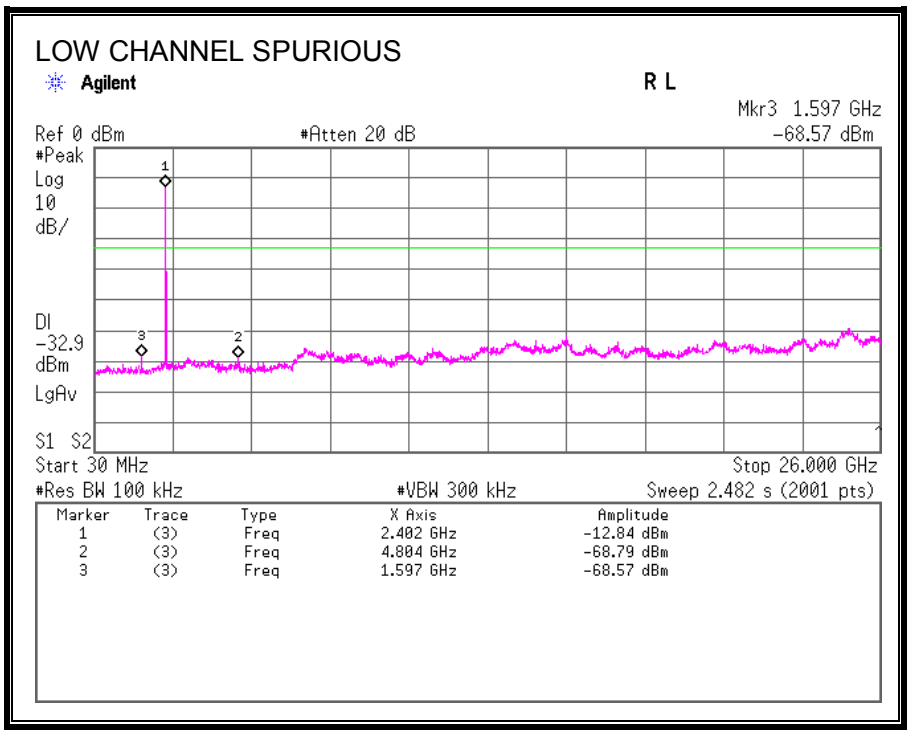

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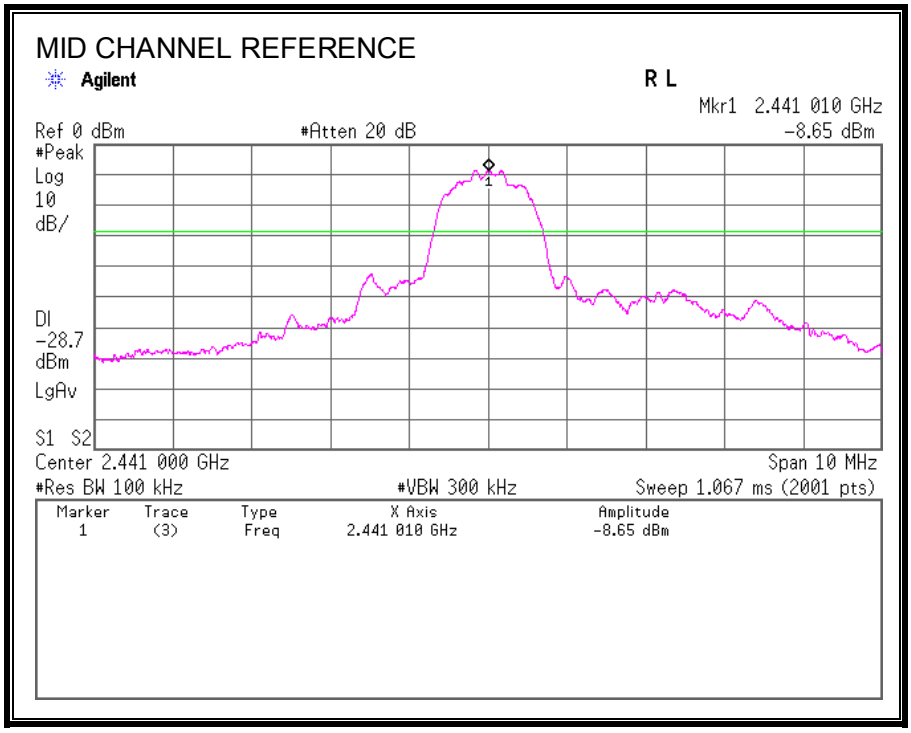
SPURIOUS EMISSIONS, MID CHANNEL



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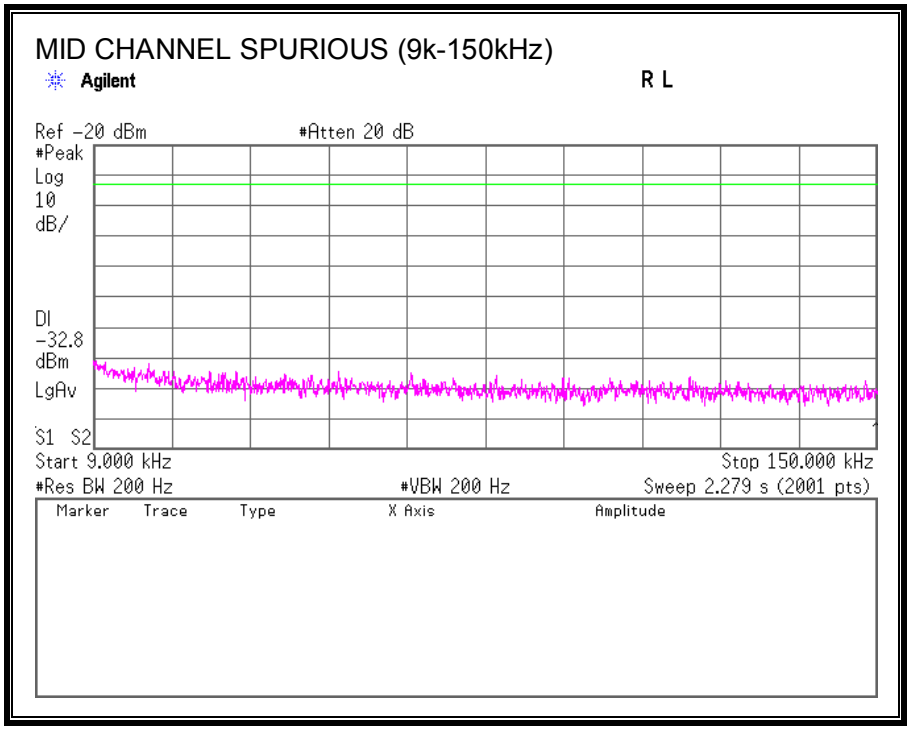

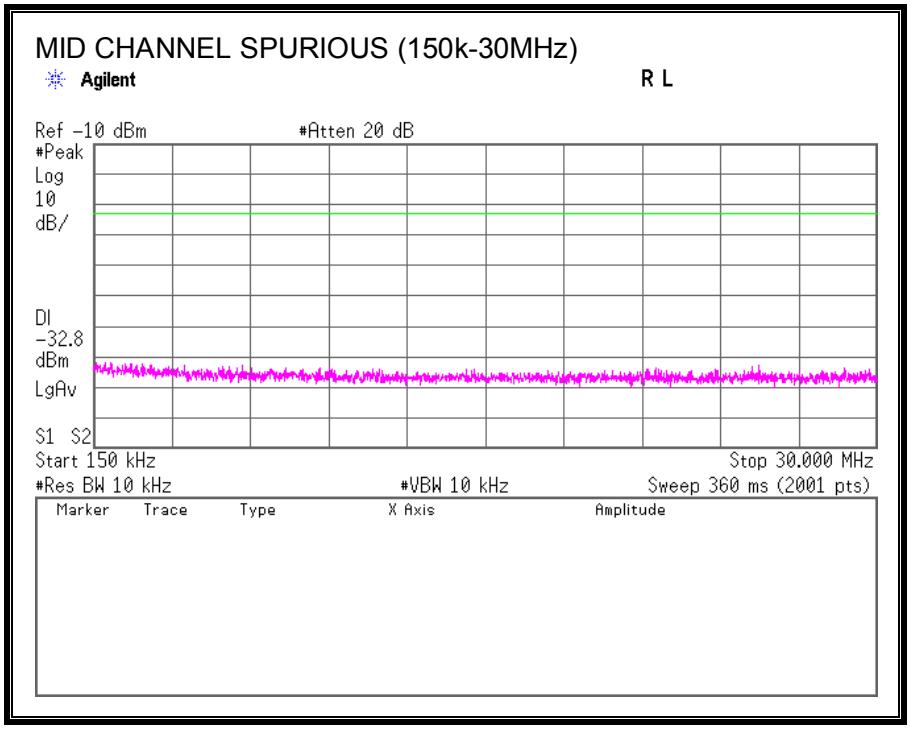

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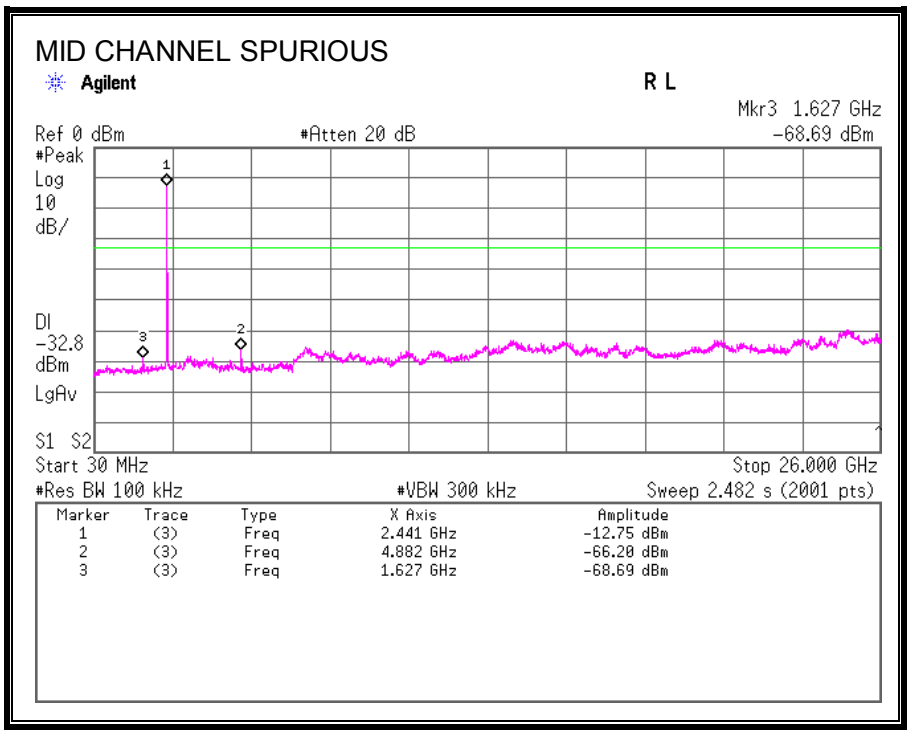

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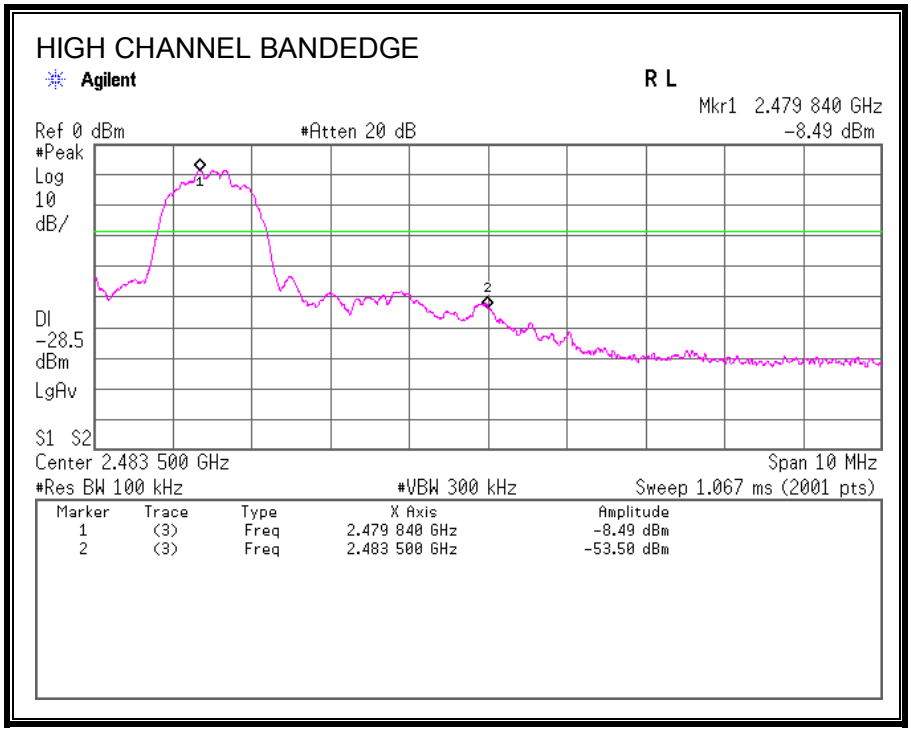
SPURIOUS EMISSIONS, HIGH CHANNEL



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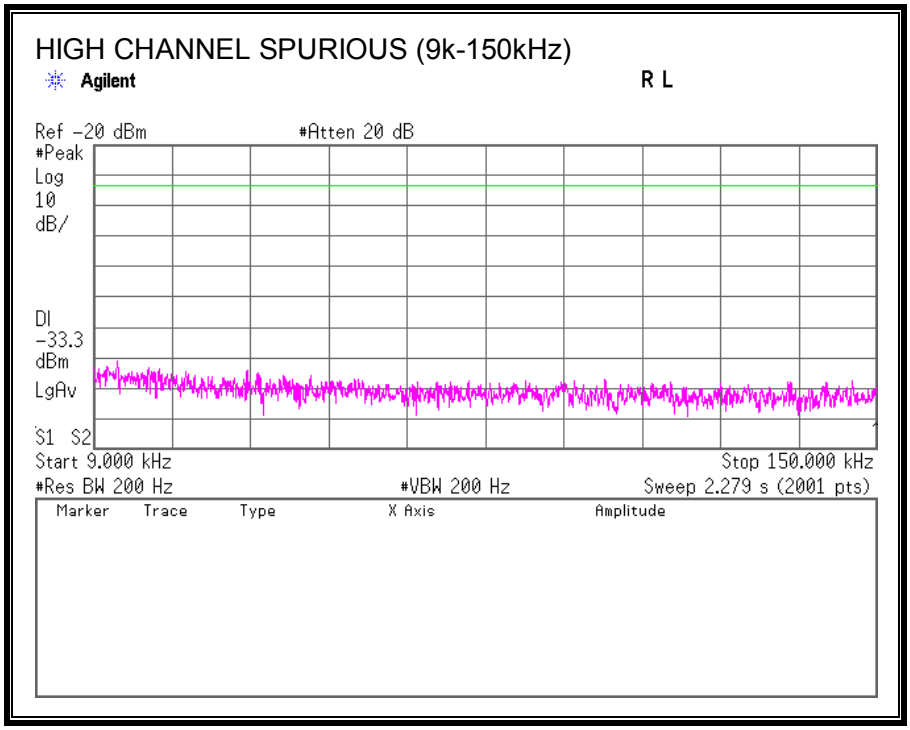

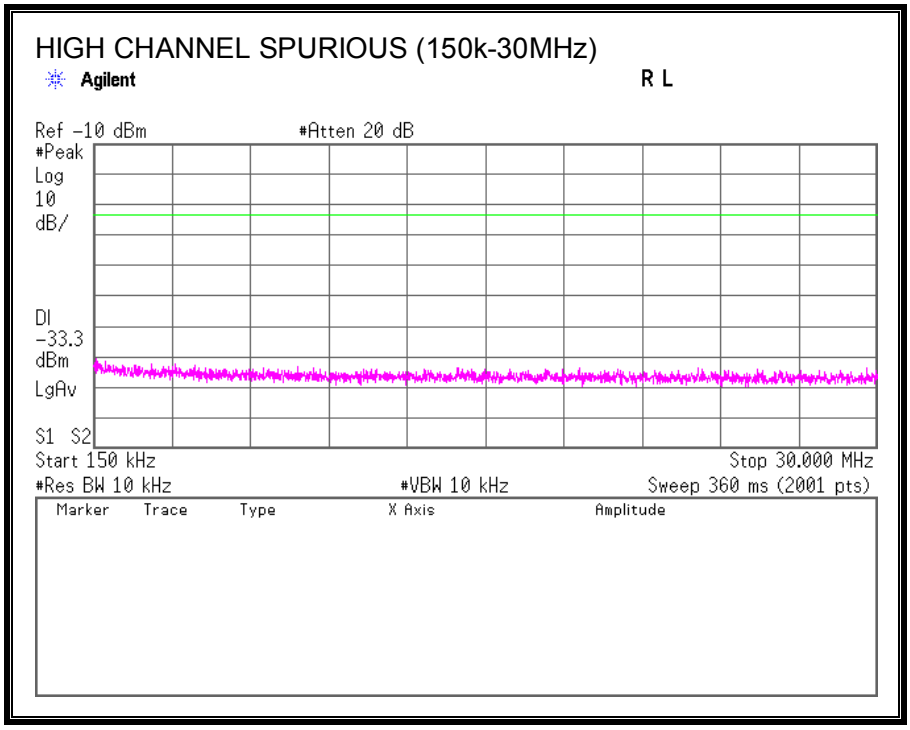

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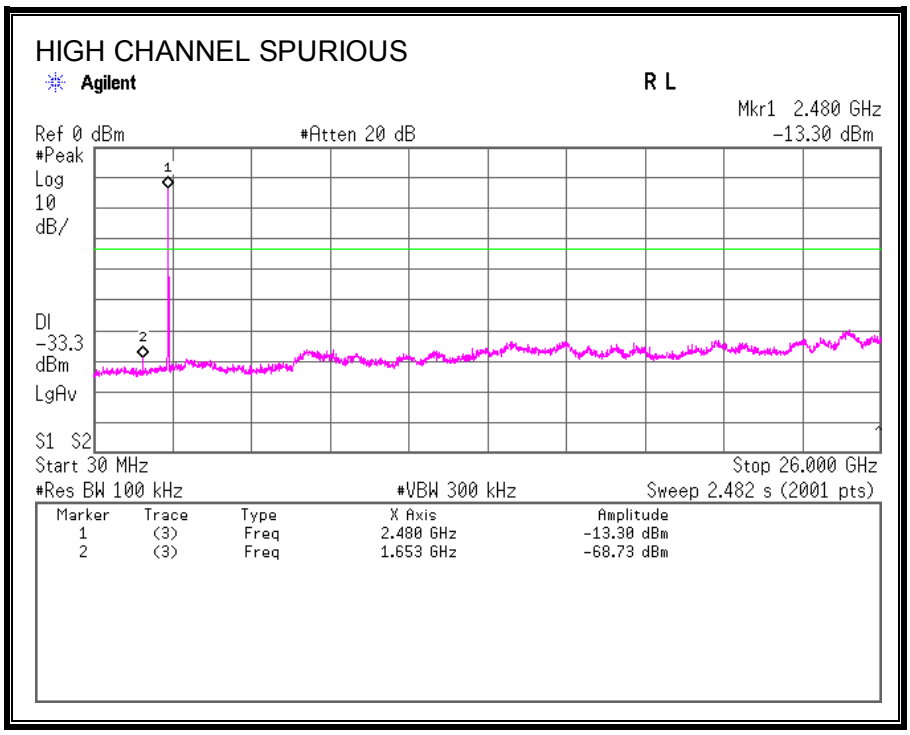

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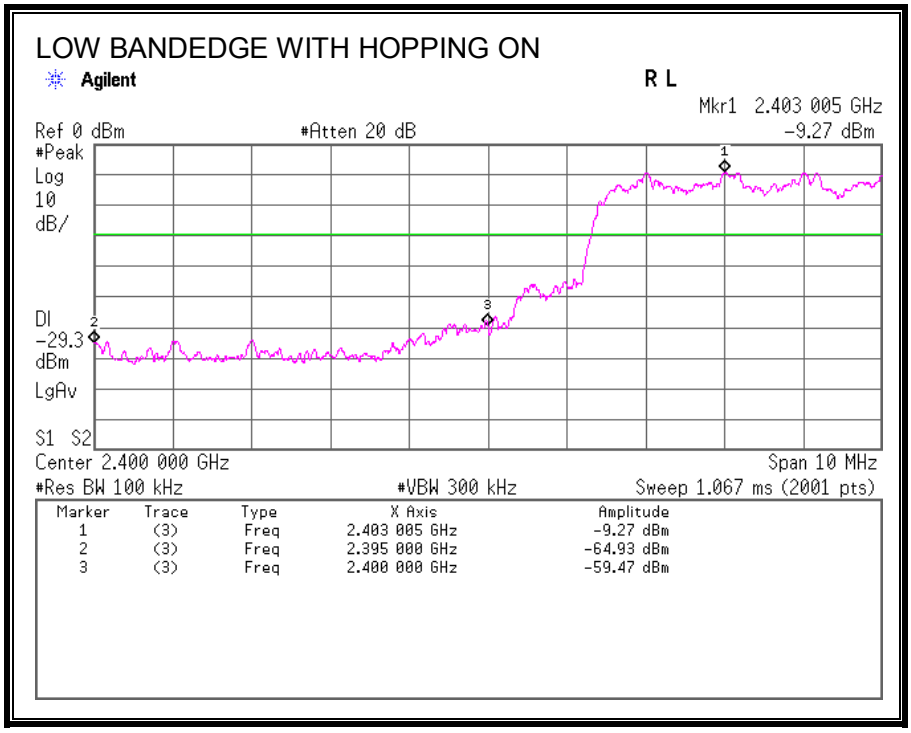
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



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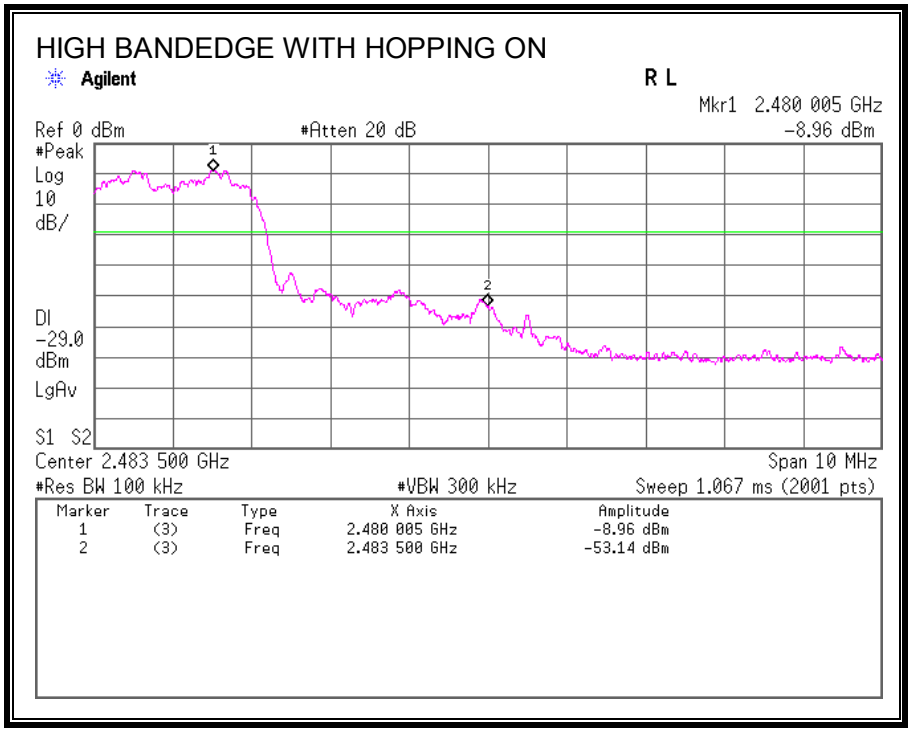

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8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.5

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	54

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.

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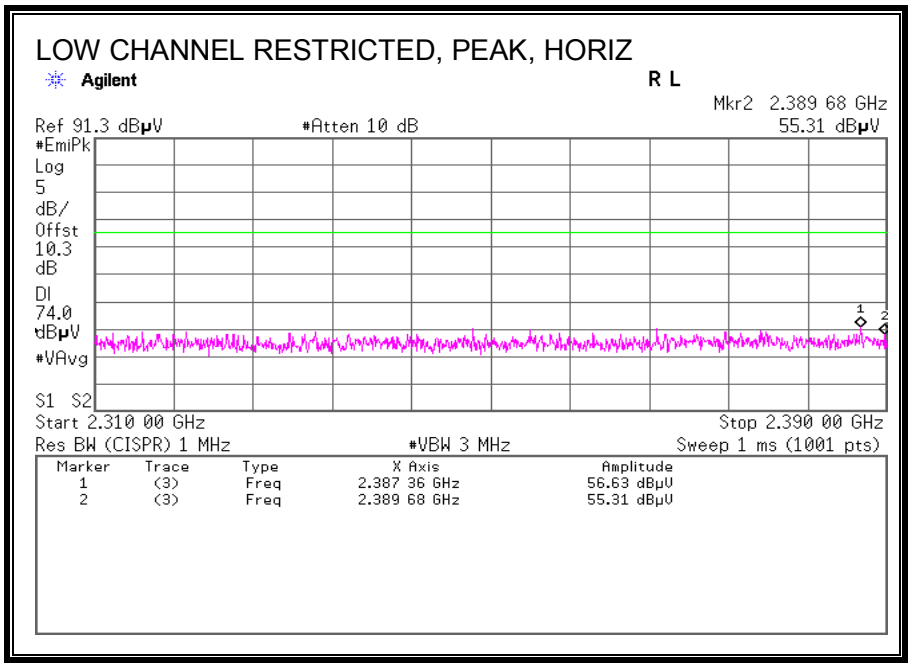
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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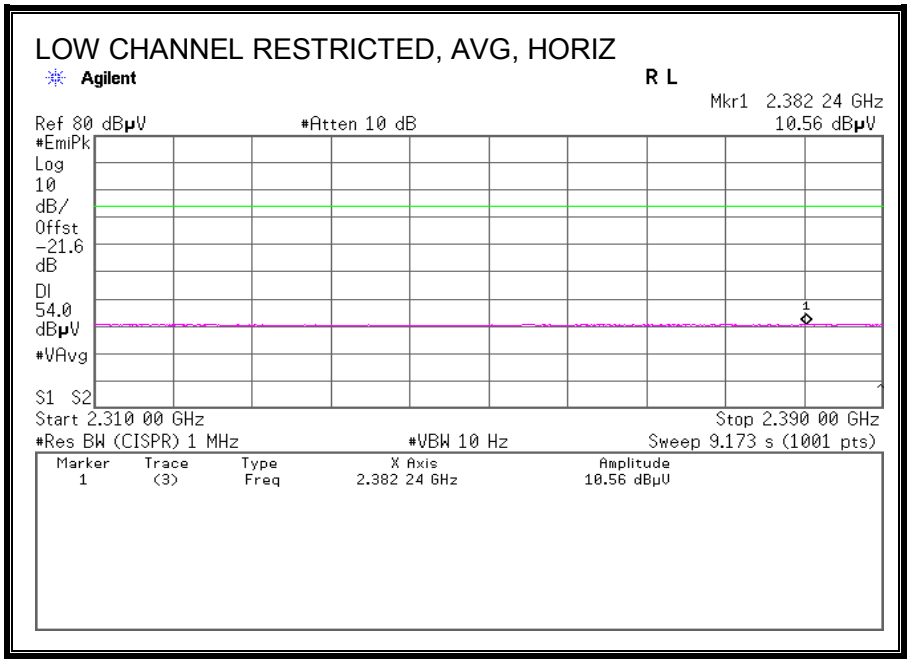

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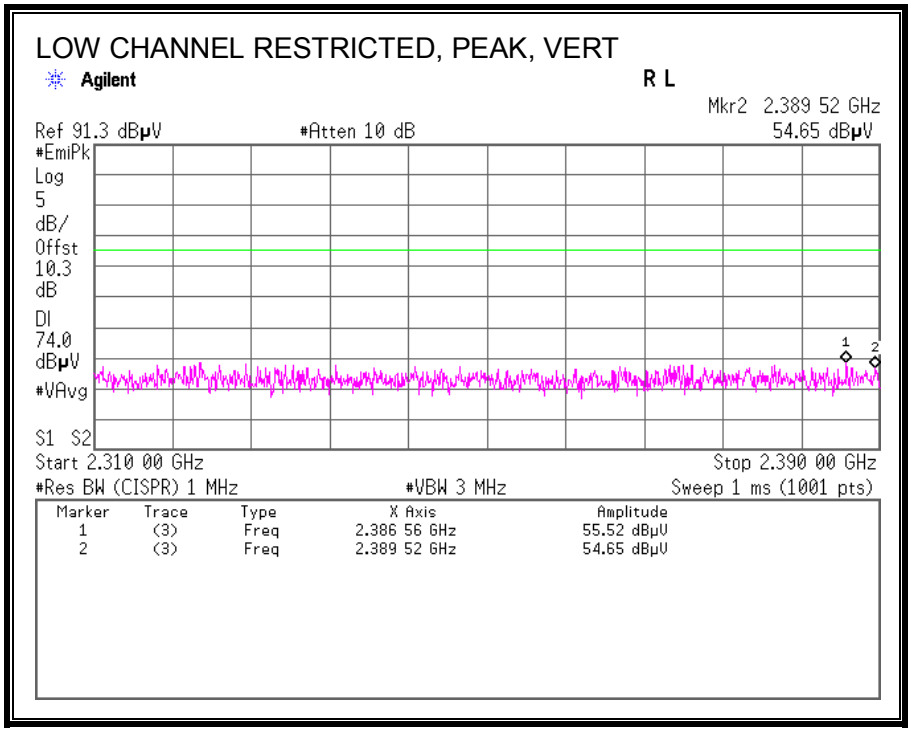
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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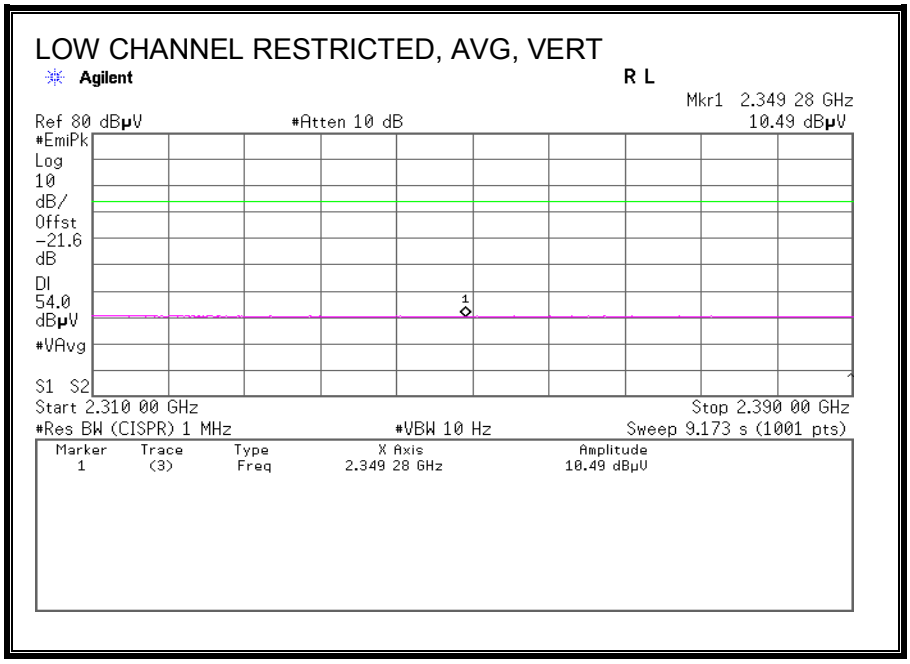

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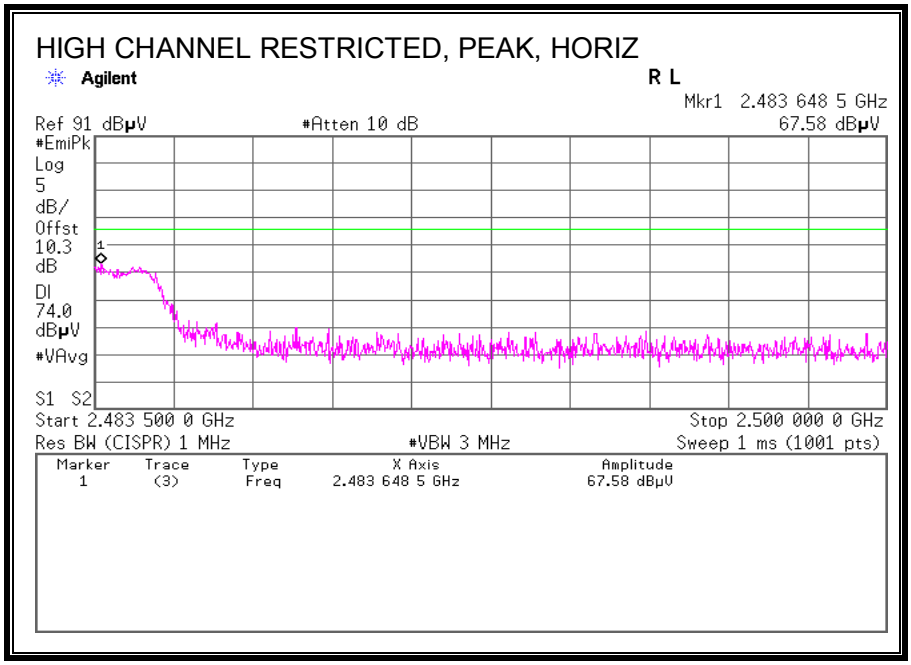
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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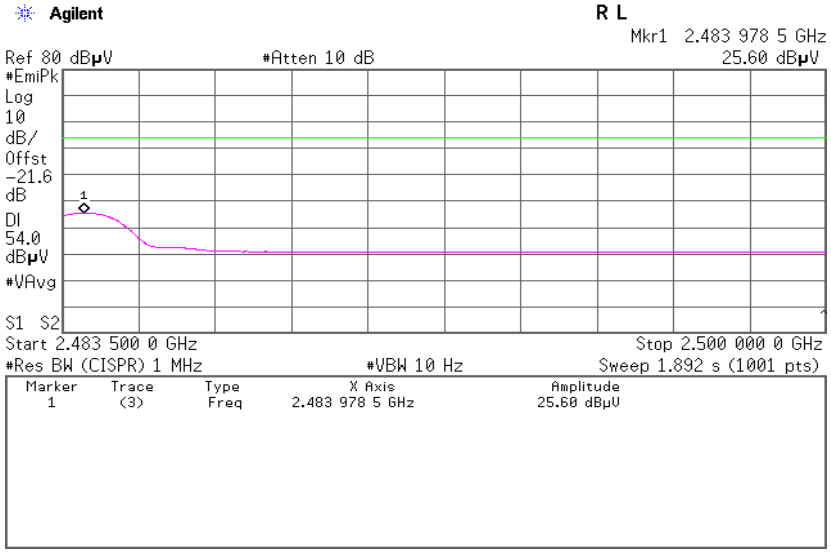
HIGH CHANNEL RESTRICTED, AVG, HORIZ



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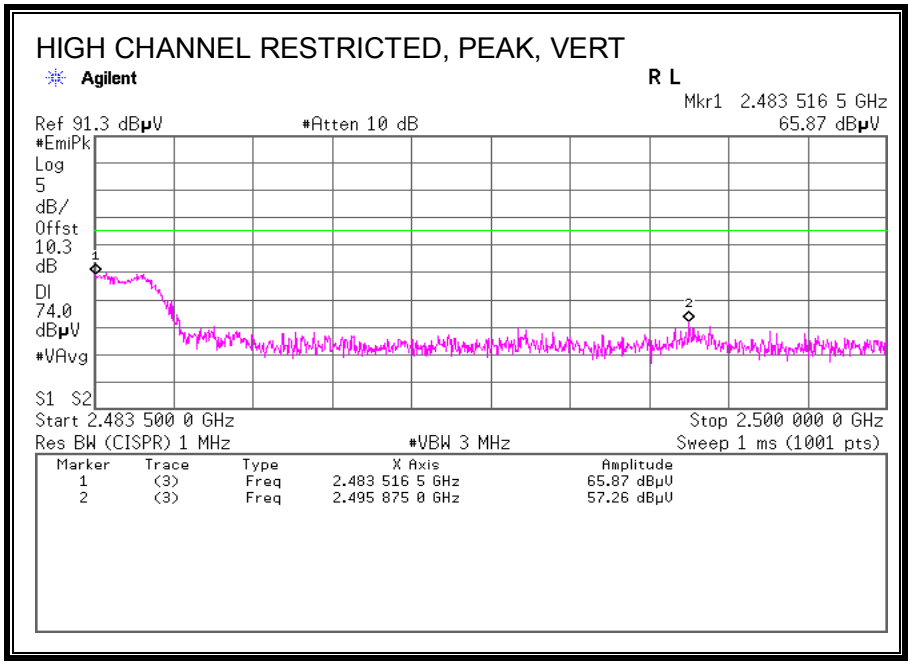
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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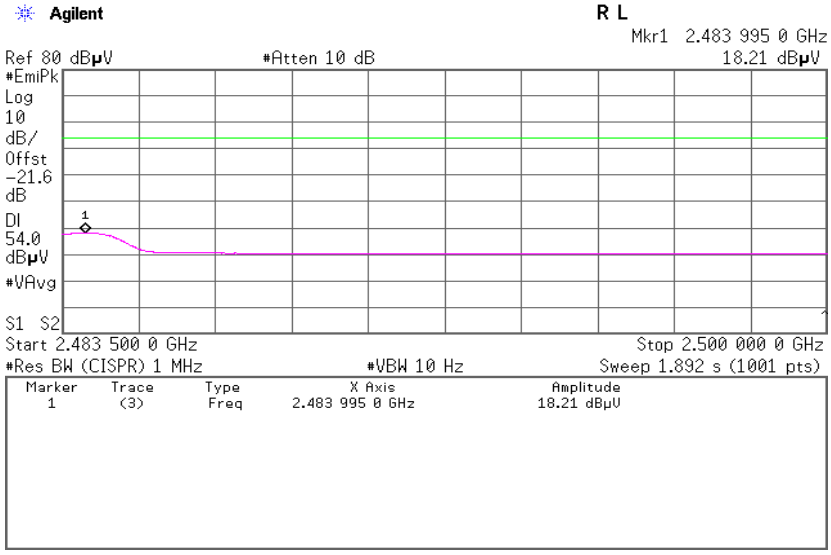
HIGH CHANNEL RESTRICTED, AVG, VERT



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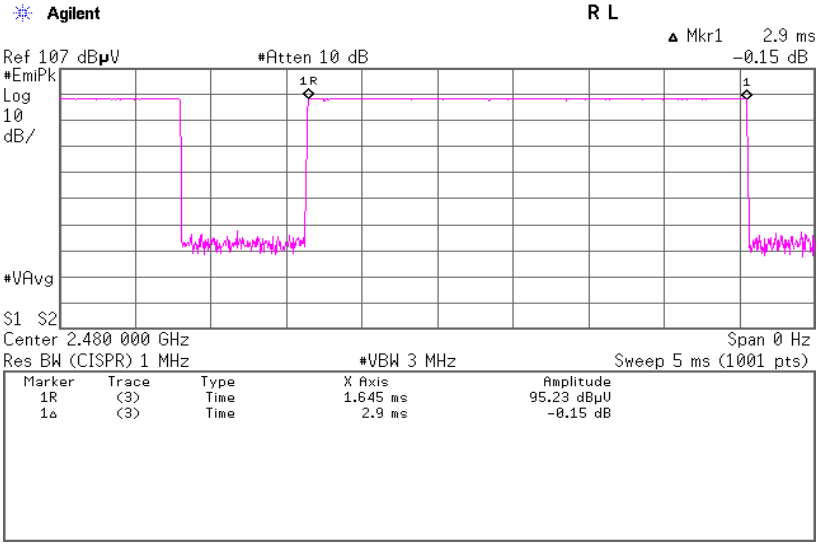
Dwell time factor Calculation

Tx, Bluetooth, BDR, PRBS9
1 cycle On time: 2.9ms
Dwell time factor=20log((2.9 x 2)/100)=-24.73dB



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

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HARMONICS AND SPURIOUS EMISSIONS

Radiated Emission

Test place: UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date: July 13, 2012
Temperature / Humidity: 22 deg.C , 61 %RH
Engineer: Takahiro Suzuki
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.	1601.000	PK	43.5	25.4	13.3	40.9		41.3	73.9	32.6	115	67	
Hori.	2390.000	PK	44.6	27.2	14.2	41.1		44.9	73.9	29.0	143	133	
Hori.	3204.000	PK	46.3	29.0	5.7	41.5		39.5	73.9	34.4	102	148	
Hori.	4804.000	PK	63.3	31.1	6.8	41.1		60.1	73.9	13.8	125	169	
Hori.	1601.000	AV	33.9	25.4	13.3	40.9		31.7	53.9	22.2	115	67	
Hori.	3204.000	AV	39.4	29.0	5.7	41.5		32.6	53.9	21.3	102	148	
Vert.	1601.000	PK	43.3	25.4	13.3	40.9		41.1	73.9	32.8	100	8	
Vert.	2390.000	PK	45.8	27.2	14.2	41.1		46.1	73.9	27.8	152	232	
Vert.	3204.000	PK	44.5	29.0	5.7	41.5		37.7	73.9	36.2	100	44	
Vert.	4804.000	PK	58.2	31.1	6.8	41.1		55.0	73.9	18.9	144	318	
Vert.	1601.000	AV	34.4	25.4	13.3	40.9		32.2	53.9	21.7	100	8	
Vert.	3204.000	AV	36.8	29.0	5.7	41.5		30.0	53.9	23.9	100	44	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	35.4	27.2	14.2	41.1	-24.7	11.0	53.9	42.9	(AV)VBW:10Hz
Hori.	4804.000	AV	62.6	31.1	6.8	41.1	-24.7	34.7	53.9	19.2	(AV)VBW:10Hz
Vert.	2390.000	AV	35.4	27.2	14.2	41.1	-24.7	11.0	53.9	42.9	(AV)VBW:10Hz
Vert.	4804.000	AV	57.5	31.1	6.8	41.1	-24.7	29.6	53.9	24.3	(AV)VBW:10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amprifier) + Dwell time factor (refer to "Dwell time factor Calculation")
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*No noise was detected above the 3th order harmonics.
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	97.6	27.3	14.2	41.1		98.0	-	-	Carrier
Hori.	2400.000	PK	51.8	27.3	14.2	41.1		52.2	78.0	25.8	
Vert.	2402.000	PK	85.8	27.3	14.2	41.1		86.2	-	-	Carrier
Vert.	2400.000	PK	51.1	27.3	14.2	41.1		51.5	66.2	14.7	

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

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HARMONICS AND SPURIOUS EMISSIONS

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	July 13, 2012	
Temperature / Humidity	22 deg.C , 61 %RH	
Engineer	Takahiro Suzuki	
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.	1627.000	PK	45.6	25.4	13.4	40.9		41.3	73.9	32.6	115	67	
Hori.	4882.000	PK	65.7	31.2	6.9	40.9		44.9	73.9	29.0	143	133	
Hori.	1627.000	AV	35.4	25.4	13.4	40.9		39.5	73.9	34.4	102	148	
Vert.	1628.031	PK	45.4	25.4	13.4	40.9		60.1	73.9	13.8	125	169	
Vert.	4882.000	PK	56.9	31.2	6.9	40.9		31.7	53.9	22.2	115	67	
Vert.	1628.031	AV	35.6	25.4	13.4	40.9		32.6	53.9	21.3	102	148	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	63.3	31.2	6.9	40.9	-24.7	35.8	53.9	18.1	(AV)VBW:10Hz
Vert.	4882.000	AV	55.6	31.2	6.9	40.9	-24.7	28.1	53.9	25.8	(AV)VBW:10Hz

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

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

*No noise was detected above the 3th order harmonics.

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

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HARMONICS AND SPURIOUS EMISSIONS

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	July 13, 2012	
Temperature / Humidity	22 deg.C , 61 %RH	
Engineer	Takahiro Suzuki	
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.	1653.000	PK	52.6	25.5	13.4	40.9		50.6	73.9	23.3	112	284	
Hori.	2483.500	PK	56.6	27.5	14.3	41.1		57.3	73.9	16.6	100	90	
Hori.	4960.000	PK	59.1	31.4	6.9	40.8		56.6	73.9	17.3	100	5	
Hori.	1653.000	AV	44.5	25.5	13.4	40.9		42.5	53.9	11.4	112	284	
Vert.	1653.000	PK	46.2	25.5	13.4	40.9		44.2	73.9	29.7	102	346	
Vert.	2483.500	PK	56.3	27.5	14.3	41.1		57.0	73.9	16.9	100	190	
Vert.	4960.000	PK	64.3	31.4	6.9	40.8		61.8	73.9	12.1	100	354	
Vert.	1653.000	AV	34.3	25.5	13.4	40.9		32.3	53.9	21.6	102	346	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	48.2	27.5	14.3	41.1	-24.7	24.2	53.9	29.7	(AV)VBW:10Hz
Hori.	4960.000	AV	58.8	31.4	6.9	40.8	-24.7	31.6	53.9	22.3	(AV)VBW:10Hz
Vert.	2483.500	AV	47.2	27.5	14.3	41.1	-24.7	23.2	53.9	30.7	(AV)VBW:10Hz
Vert.	4960.000	AV	62.3	31.4	6.9	40.8	-24.7	35.1	53.9	18.8	(AV)VBW:10Hz

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

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

*No noise was detected above the 3th order harmonics.

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

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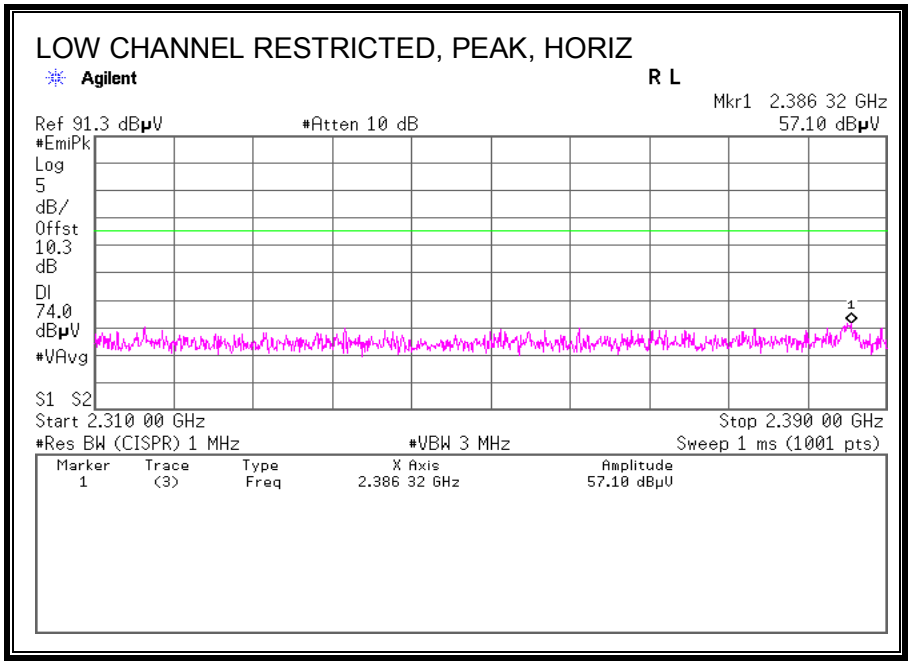
8.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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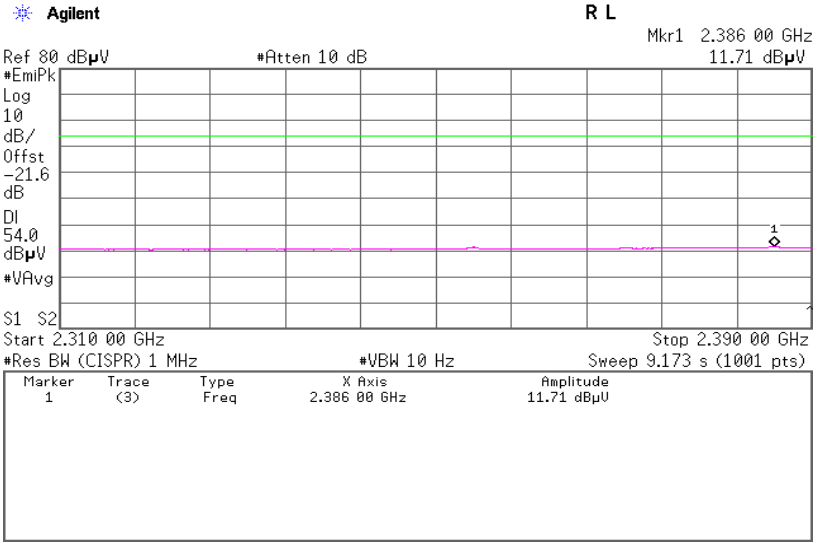
LOW CHANNEL RESTRICTED, AVG, HORIZ



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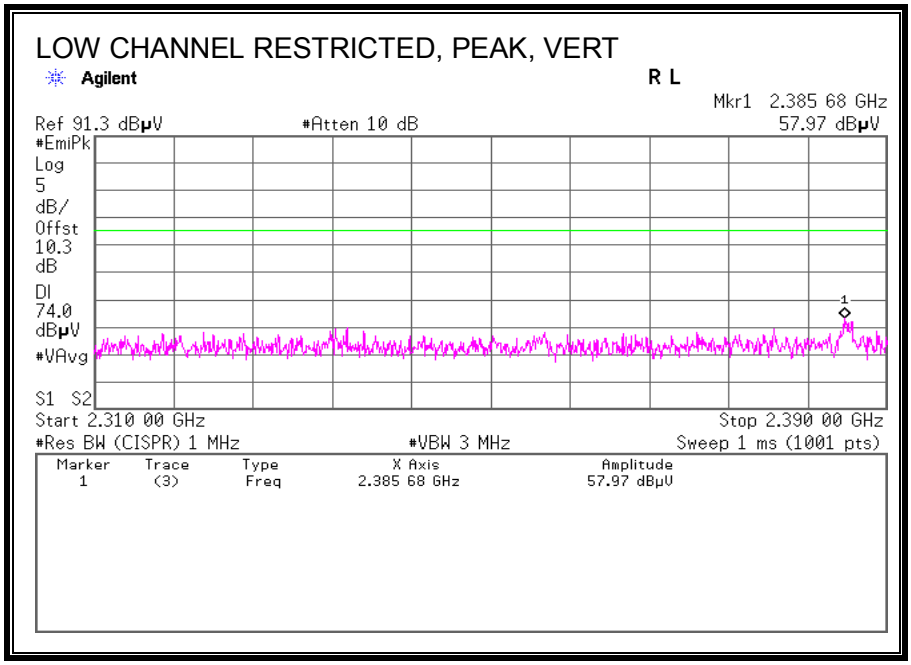
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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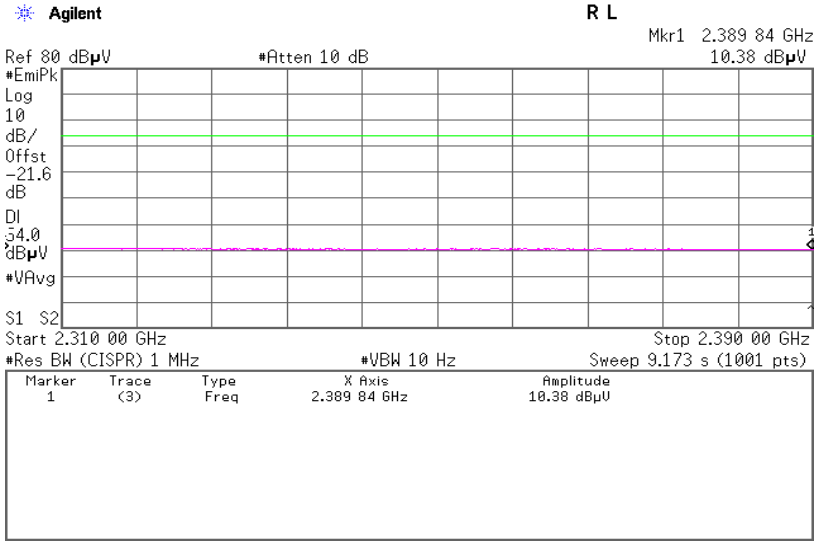
LOW CHANNEL RESTRICTED, AVG, VERT



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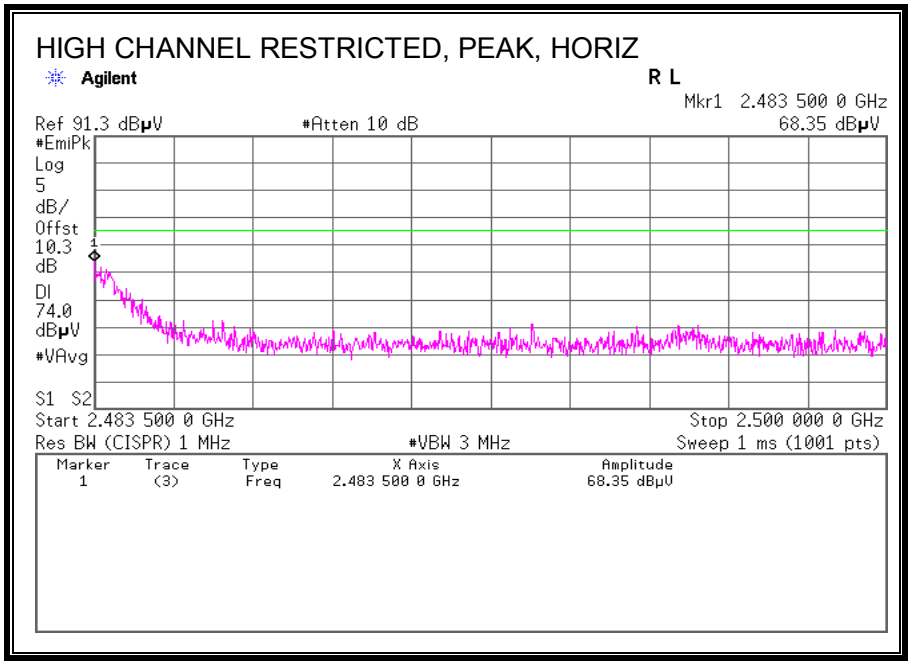
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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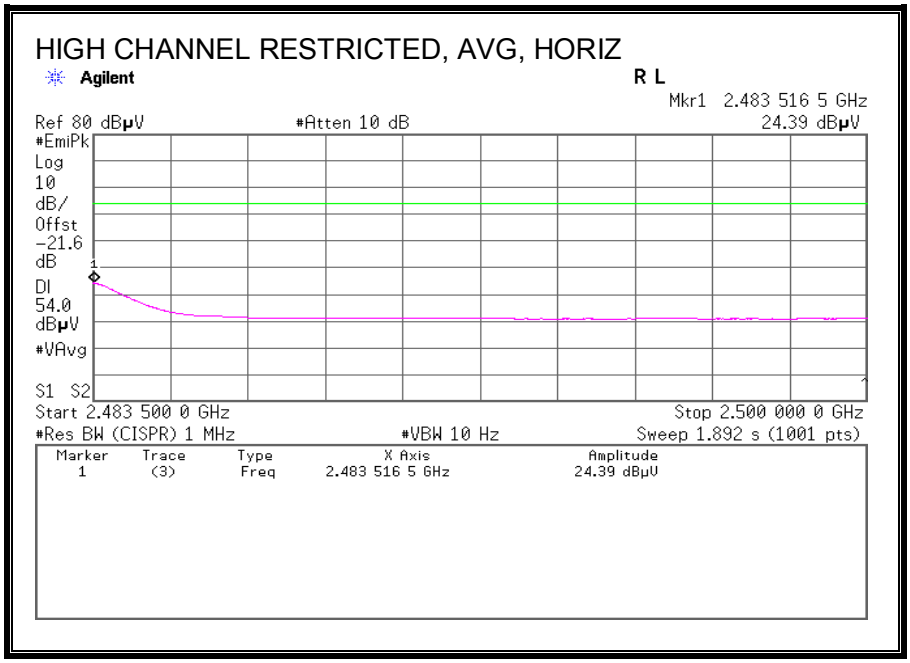

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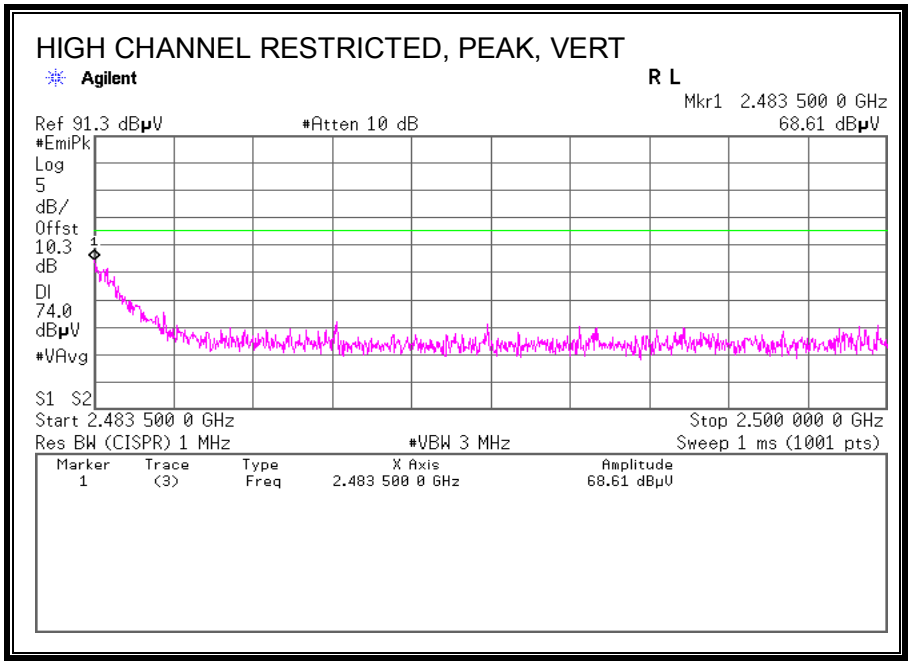
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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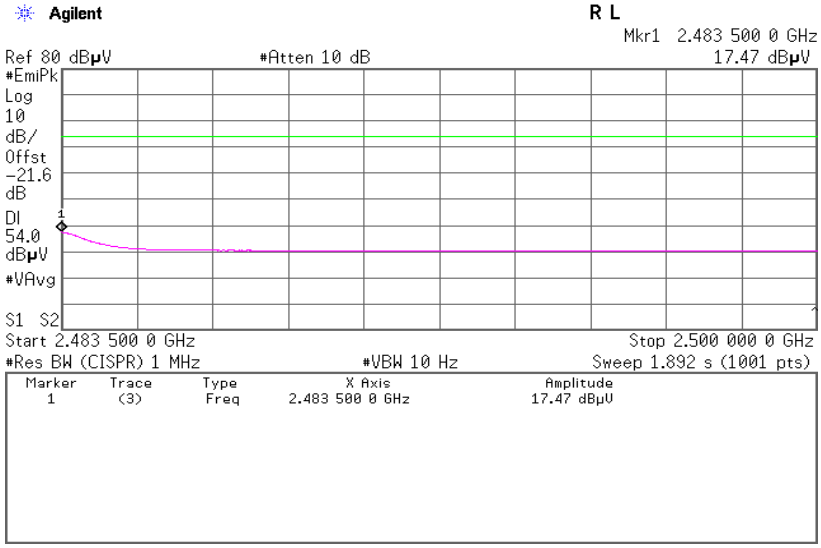
HIGH CHANNEL RESTRICTED, AVG, VERT



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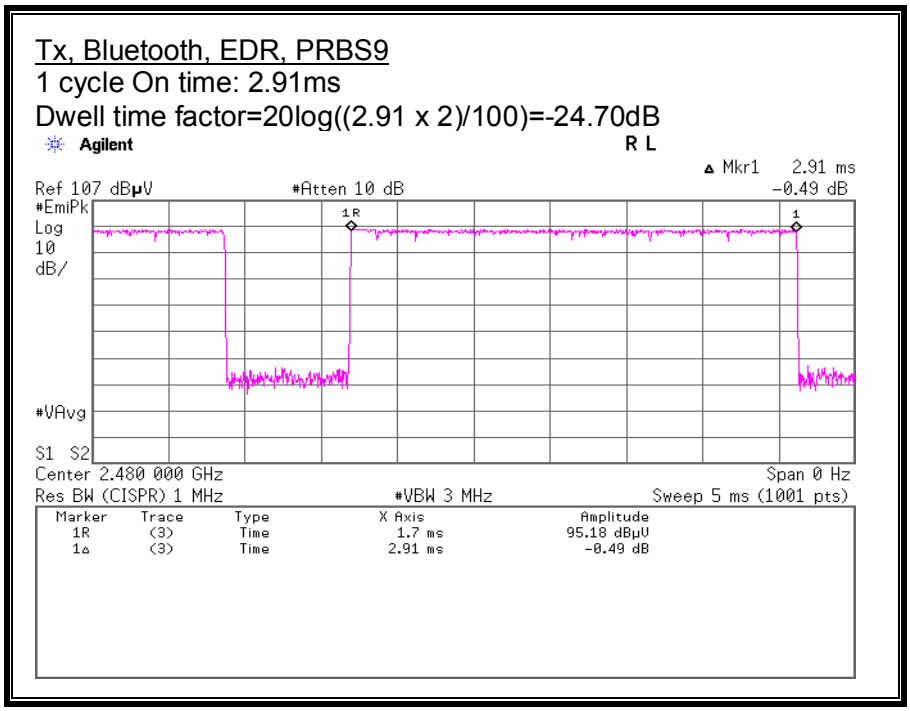
Dwell time factor Calculation



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

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HARMONICS AND SPURIOUS EMISSIONS

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	July 13, 2012	
Temperature / Humidity	22 deg.C , 61 %RH	
Engineer	Takahiro Suzuki	
Mode	Tx, 2402 MHz	
	Tx, Bluetooth, EDR, PRBS9	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	1597.000	PK	45.9	25.4	13.3	40.9		43.7	73.9	30.2	100	18	
Hori.	2390.000	PK	46.9	27.2	14.2	41.1		47.2	73.9	26.7	100	247	
Hori.	4804.000	PK	61.5	31.1	6.8	41.1		58.3	73.9	15.6	100	109	
Hori.	1597.000	AV	34.3	25.4	13.3	40.9		32.1	53.9	21.8	100	18	
Vert.	1597.000	PK	45.2	25.4	13.3	40.9		43.0	73.9	30.9	100	184	
Vert.	2390.000	PK	44.7	27.2	14.2	41.1		45.0	73.9	28.9	100	232	
Vert.	4804.000	PK	55.3	31.1	6.8	41.1		52.1	73.9	21.8	102	148	
Vert.	1597.000	AV	34.0	25.4	13.3	40.9		31.8	53.9	22.1	100	184	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	34.8	27.2	14.2	41.1	-24.7	10.4	53.9	43.5	(AV)VBW:10Hz
Hori.	4804.000	AV	44.7	31.1	6.8	41.1	-24.7	16.8	53.9	37.1	(AV)VBW:10Hz
Vert.	2390.000	AV	35.3	27.2	14.2	41.1	-24.7	10.9	53.9	43.0	(AV)VBW:10Hz
Vert.	4804.000	AV	39.8	31.1	6.8	41.1	-24.7	11.9	53.9	42.0	(AV)VBW:10Hz

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

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

*No noise was detected above the 3th order harmonics.

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	95.9	27.3	14.2	41.1		96.3	-	-	Carrier
Hori.	2400.000	PK	45.7	27.3	14.2	41.1		46.1	76.3	30.2	
Vert.	2402.000	PK	96.1	27.3	14.2	41.1		96.5	-	-	Carrier
Vert.	2400.000	PK	45.5	27.3	14.2	41.1		45.9	76.5	30.6	

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

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HARMONICS AND SPURIOUS EMISSIONS

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	July 13, 2012	
Temperature / Humidity	22 deg.C , 61 %RH	
Engineer	Takahiro Suzuki	
Mode	Tx, 2441 MHz	
	Tx, Blutooth, 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.	1627.000	PK	46.4	25.4	13.4	40.9		44.3	73.9	29.6	100	247	
Hori.	4882.000	PK	61.6	31.2	6.9	40.9		58.8	73.9	15.1	100	104	
Hori.	1627.000	AV	34.3	25.4	13.4	40.9		32.2	53.9	21.7	100	247	
Vert.	1627.000	PK	46.2	25.4	13.4	40.9		44.1	73.9	29.8	100	18	
Vert.	4882.000	PK	56.5	31.2	6.9	40.9		53.7	73.9	20.2	100	358	
Vert.	1627.000	AV	34.2	25.4	13.4	40.9		32.1	53.9	21.8	100	18	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	45.6	31.2	6.9	40.9	-24.7	18.1	53.9	35.8	(AV)VBW:10Hz
Vert.	4882.000	AV	42.3	31.2	6.9	40.9	-24.7	14.8	53.9	39.1	(AV)VBW:10Hz

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

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

*No noise was detected above the 3th order harmonics.

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

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HARMONICS AND SPURIOUS EMISSIONS

Radiated Emission

Test place: UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date: July 13, 2012
Temperature / Humidity: 22 deg.C , 61 %RH
Engineer: Takahiro Suzuki
Mode: Tx, 2480 MHz
Tx, Blutooth, 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.	1653.000	PK	46.2	25.5	13.4	40.9		44.2	73.9	29.7	100	184	
Hori.	2483.500	PK	56.2	27.5	14.3	41.1		56.9	73.9	17.0	100	105	
Hori.	4960.000	PK	62.8	31.4	6.9	40.8		60.3	73.9	13.6	100	83	
Hori.	1653.000	AV	33.9	25.5	13.4	40.9		31.9	53.9	22.0	100	184	
Vert.	1653.000	PK	48.2	25.5	13.4	40.9		46.2	73.9	27.7	100	9	
Vert.	2483.500	PK	57.2	27.5	14.3	41.1		57.9	73.9	16.0	100	152	
Vert.	4960.000	PK	54.1	31.4	6.9	40.8		51.6	73.9	22.3	100	254	
Vert.	1653.000	AV	33.0	25.5	13.4	40.9		31	53.9	22.9	100	9	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	48.0	27.5	14.3	41.1	-24.7	24.0	53.9	29.9	(AV)VBW:10Hz
Hori.	4960.000	AV	48.9	31.4	6.9	40.8	-24.7	21.7	53.9	32.2	(AV)VBW:10Hz
Vert.	2483.500	AV	47.5	27.5	14.3	41.1	-24.7	23.5	53.9	30.4	(AV)VBW:10Hz
Vert.	4960.000	AV	39.6	31.4	6.9	40.8	-24.7	12.4	53.9	41.5	(AV)VBW:10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amprifier) + Dwell time factor (refer to "Dwell time factor Calculation")
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*No noise was detected above the 3th order harmonics.
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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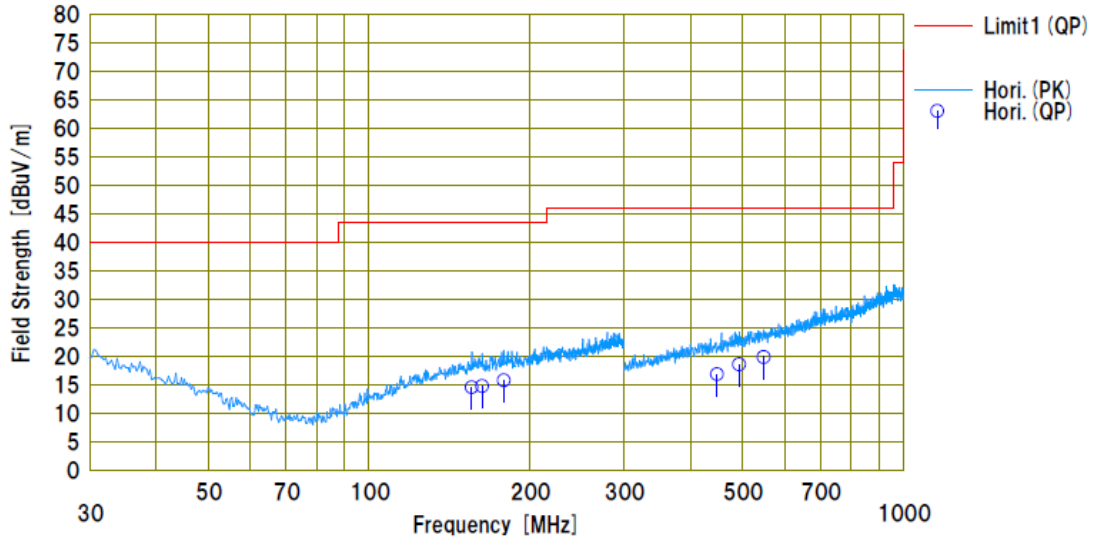
8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



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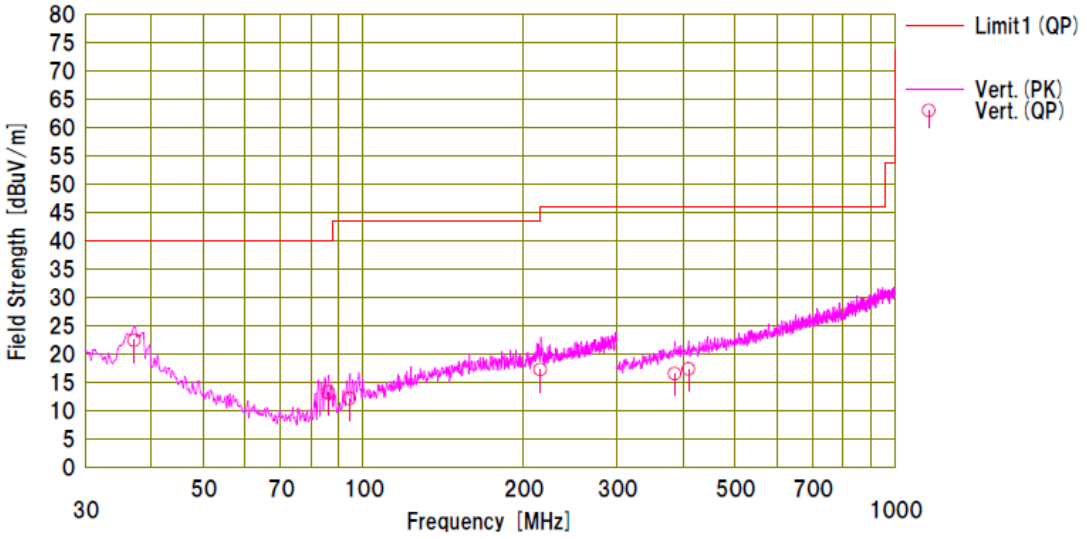
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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HORIZONTAL AND VERTICAL DATA

DATA OF RADIATED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2012/07/12

Company : SEIKO EPSON Corporation
Kind of EUT : Blutooth Interface board Module
Model No. : M219A
Serial No. : 1

Mode : Tx DH5 2402MHz
Report No. : 32LE0152-SH
Power : DC3.3V
Temp./Humi. : 23deg.C. / 63%RH

Remarks : Hor:X, Ver:X-axis

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

Engineer : Takahiro Suzuki

<< 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	155.899	24.0	15.0	7.6	32.1	14.5	43.5	29.0	Hori.	366	359	BC	
2	163.073	23.8	15.3	7.7	32.1	14.7	43.5	28.8	Hori.	259	8	BC	
3	179.028	24.2	15.8	7.8	32.1	15.7	43.5	27.8	Hori.	326	1	BC	
4	449.085	22.6	17.0	9.2	32.0	16.8	46.0	29.2	Hori.	100	297	LP	
5	493.866	23.4	17.7	9.4	32.0	18.5	46.0	27.5	Hori.	146	330	LP	
6	548.906	23.8	18.4	9.6	32.0	19.8	46.0	26.2	Hori.	118	358	LP	
7	37.117	32.9	15.1	6.6	32.2	22.4	40.0	17.6	Vert.	100	174	BC	
8	86.067	31.3	7.0	7.1	32.2	13.2	40.0	26.8	Vert.	100	185	BC	
9	94.373	28.6	8.5	7.2	32.2	12.1	43.5	31.4	Vert.	100	57	BC	
10	215.785	24.8	16.4	8.0	32.0	17.2	43.5	26.3	Vert.	100	286	BC	
11	388.005	23.5	16.0	9.0	32.0	16.5	46.0	29.5	Vert.	100	195	LP	
12	409.800	23.7	16.5	9.1	32.0	17.3	46.0	28.7	Vert.	100	159	LP	

Calculation:Result [dBuV/m] =Reading [dBuV] +Ant.Fac [dB/m] +Loss (Cable+ATT) [dB] -Gain (AMP) [dB]
Ant.Type=BC:Biconical Antenna, LP:Logperiodic Antenna, SHA03:Horn Antenna

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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

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RESULTS

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2012/07/12

Company : SEIKO EPSON Corporation
Kind of EUT : Blutooth Interface board Module
Model No. : M219A
Serial No. : 1
Remarks : -

Mode : Tx DH5 2441MHz
Report No. : 32LE0152-SH-A
Power : DC3.3V
Temp./Humi. : 22deg.C. / 57%RH

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

Engineer : Takahiro Suzuki

<< 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	0.17397	27.2	7.1	12.7	39.9	19.8	64.7	54.7	24.8	34.9	N	
2	0.23366	25.8	6.3	12.7	38.5	19.0	62.3	52.3	23.8	33.3	N	
3	0.25514	26.0	8.6	12.7	38.7	21.3	61.5	51.5	22.8	30.2	N	
4	0.28267	25.7	7.0	12.7	38.4	19.7	60.7	50.7	22.3	31.0	N	
5	0.35173	25.2	8.7	12.7	37.9	21.4	58.9	48.9	21.0	27.5	N	
6	0.42019	23.3	5.5	12.7	36.0	18.2	57.4	47.4	21.4	29.2	N	
7	0.47380	22.7	6.3	12.7	35.4	19.0	56.4	46.4	21.0	27.4	N	
8	0.59985	26.1	7.2	12.7	38.8	19.9	56.0	46.0	17.2	26.1	N	
9	0.17397	26.0	6.7	12.7	38.7	19.4	64.7	54.7	26.0	35.3	L1	
10	0.23366	25.4	7.1	12.7	38.1	19.8	62.3	52.3	24.2	32.5	L1	
11	0.25514	25.9	5.4	12.7	38.6	18.1	61.5	51.5	22.9	33.4	L1	
12	0.28267	26.0	6.1	12.7	38.7	18.8	60.7	50.7	22.0	31.9	L1	
13	0.35173	25.9	7.5	12.7	38.6	20.2	58.9	48.9	20.3	28.7	L1	
14	0.42019	25.2	8.0	12.7	37.9	20.7	57.4	47.4	19.5	26.7	L1	
15	0.47380	23.7	7.6	12.7	36.4	20.3	56.4	46.4	20.0	26.1	L1	
16	0.59985	22.7	5.1	12.7	35.4	17.8	56.0	46.0	20.6	28.2	L1	

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

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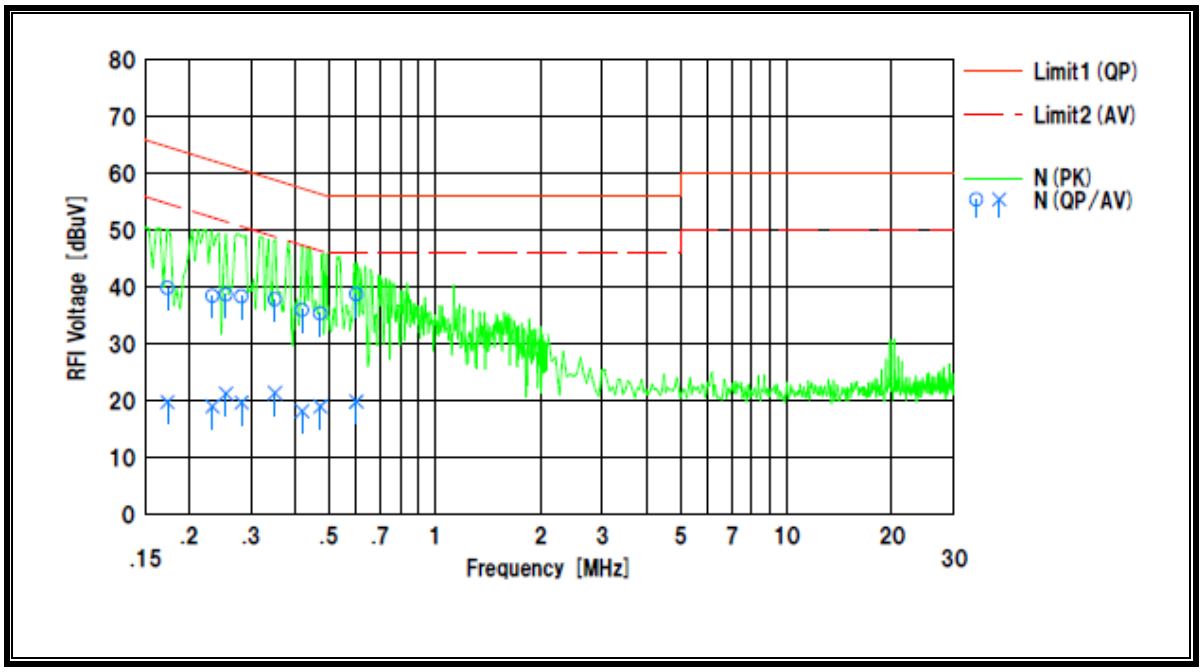
LINE 1 RESULTS



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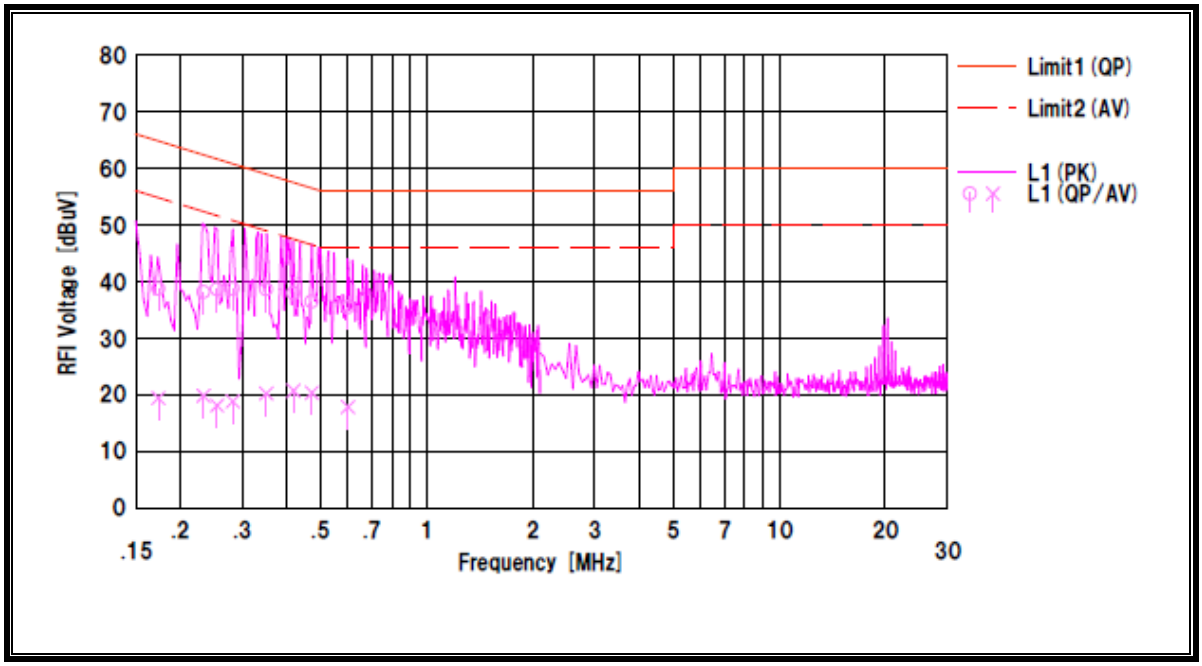
LINE 2 RESULTS



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