FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

BLUETOOTH MODULE

MODEL NUMBER: WML-C68

FCC ID: POOWML-C68

REPORT NUMBER: 32JE0251-AP-01-B-R1

ISSUE DATE: June 28, 2012

Prepared for
Mitsumi Electric Co., Ltd.
2-11-2, TSURUMAKI, TAMA-SHI, TOKYO, 206-8567 JAPAN

Prepared by
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NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/25/12	Initial Issue	T.Hatakeda
1	06/28/12	Addition of the test procedure (P.21, 24, 46, 49) *This report is a revised version of 32JE0251-AP-01-B, which is replaced with this report.	T.Hatakeda

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Mitsumi Electric Co., Ltd.
2-11-2, TSURUMAKI, TAMA-SHI, TOKYO, 206-8567
JAPAN

EUT DESCRIPTION: BLUETOOTH MODULE

MODEL: WML-C68

SERIAL NUMBER: No. 2 (Radiated and Conducted tests),
No. 3 (Antenna Terminal Conducted test)

DATE TESTED: June 5 to 24, 2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	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. 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:

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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 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0
The full scope of accreditation can be viewed at
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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

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4.3. MEASUREMENT UNCERTAINTY

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

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

Test room (semi-anechoic chamber)	**Conducted emission (±dB)**
	150kHz-30MHz
No.1	3.1dB
No.2	3.3dB
No.3	3.7dB
No.4	3.2dB

Test room (semi-anechoic chamber)	**Radiated emission**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

*3m/1m/0.5m = Measurement distance

Power meter (±dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

Antenna terminal conducted emission and Power density (±dB)			**Antenna terminal conducted emission (±dB)**		**Channel power (±dB)**
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth 4.0 + LE Module.

The radio module is manufactured by Mitsumi.

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	1.43	1.39
2402 - 2480	Enhanced 8PSK	4.47	2.80

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an antenna with a maximum gain of 0.91dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was BT usb driver, v5.6.0.5301.

The test utility software used during testing was Perl Command Line Interpreter.

5.5. WORST-CASE CONFIGURATIONS 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 the worst-case configuration is determined to be the mode and channel with the highest output power.

The EUT was investigated in three different positions, X, Y, & Z and turned out the Z (Horizontal), Y (Vertical) were worst-position. This worst position will be set for all radiated emissions testing.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

	PERIPHERAL SUPPORT EQUIPMENT LIST				
No.	**Description**	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
A	Extension Board	Mitsumi	-	-	N/A
B	Conversion Board	Mitsumi	BTDB02	Z554T	N/A
				AG43T *1)	
C	Laptop PC	IBM	2647	97-ALT8C	DoC
D	AC Adaptor	IBM	02K6750	11S02K6750Z1Z2UP29P0F5	N/A
E	DC Power Supply	Kikusui	PAK35-10A	LF002313	N/A
F	AC Adaptor	Mitsumi	R1305	-	N/A

*1) Used for Conducted emission test only

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical port**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	DC	1	DC	Unshielded	3.0	-
2	USB	1	USB	Shielded	1.9	-
3	DC	1	DC	Unshielded	1.7	-
4	AC	1	AC	Unshielded	2.0	-
5	AC	1	AC	Unshielded	2.0	-
6	DC	1	DC	Unshielded	2.0	-
7	AC	1	AC	Unshielded	2.0	-

TEST SETUP

The EUT is connected to a Jig board and host laptop computer via a USB cable during the tests. Test software exercised the radio module. The Laptop PC is removed after the setup.

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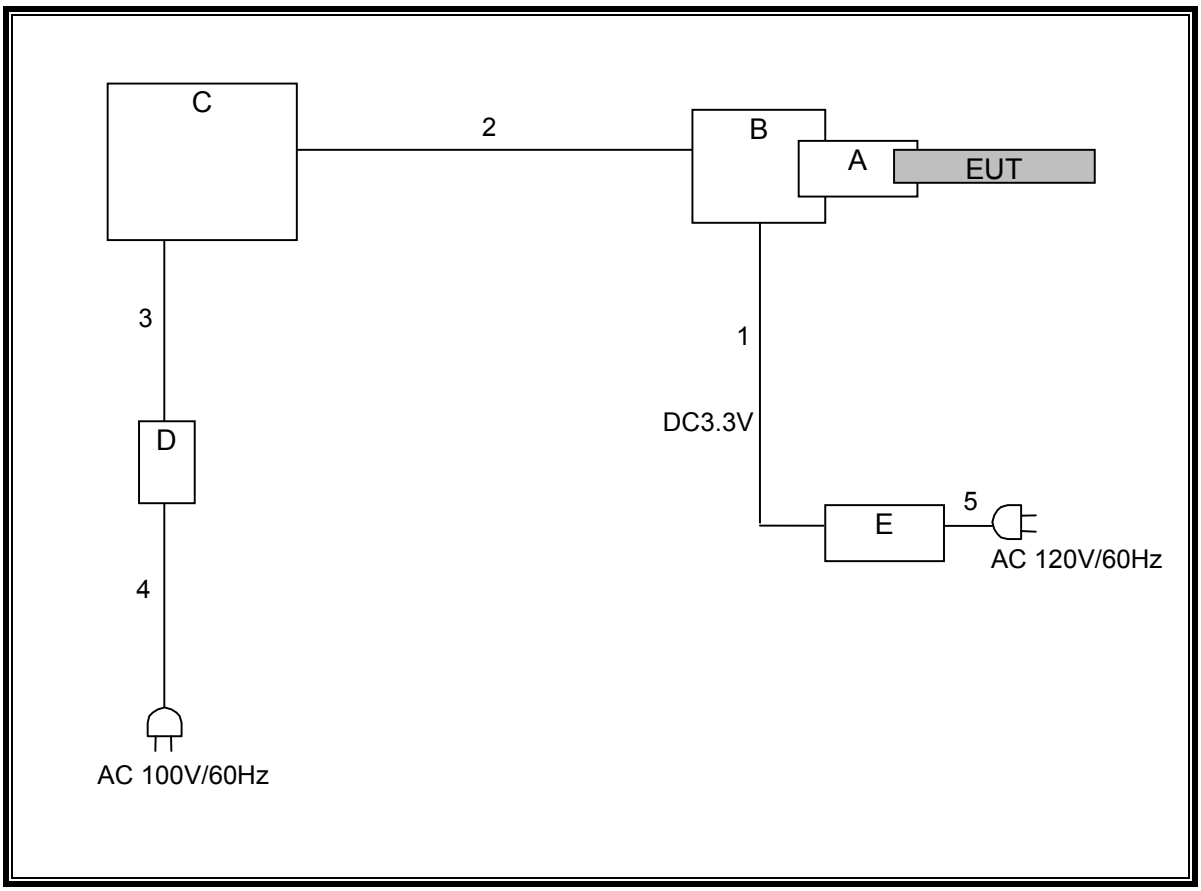
SETUP DIAGRAM FOR ANTENNA PORT TESTS



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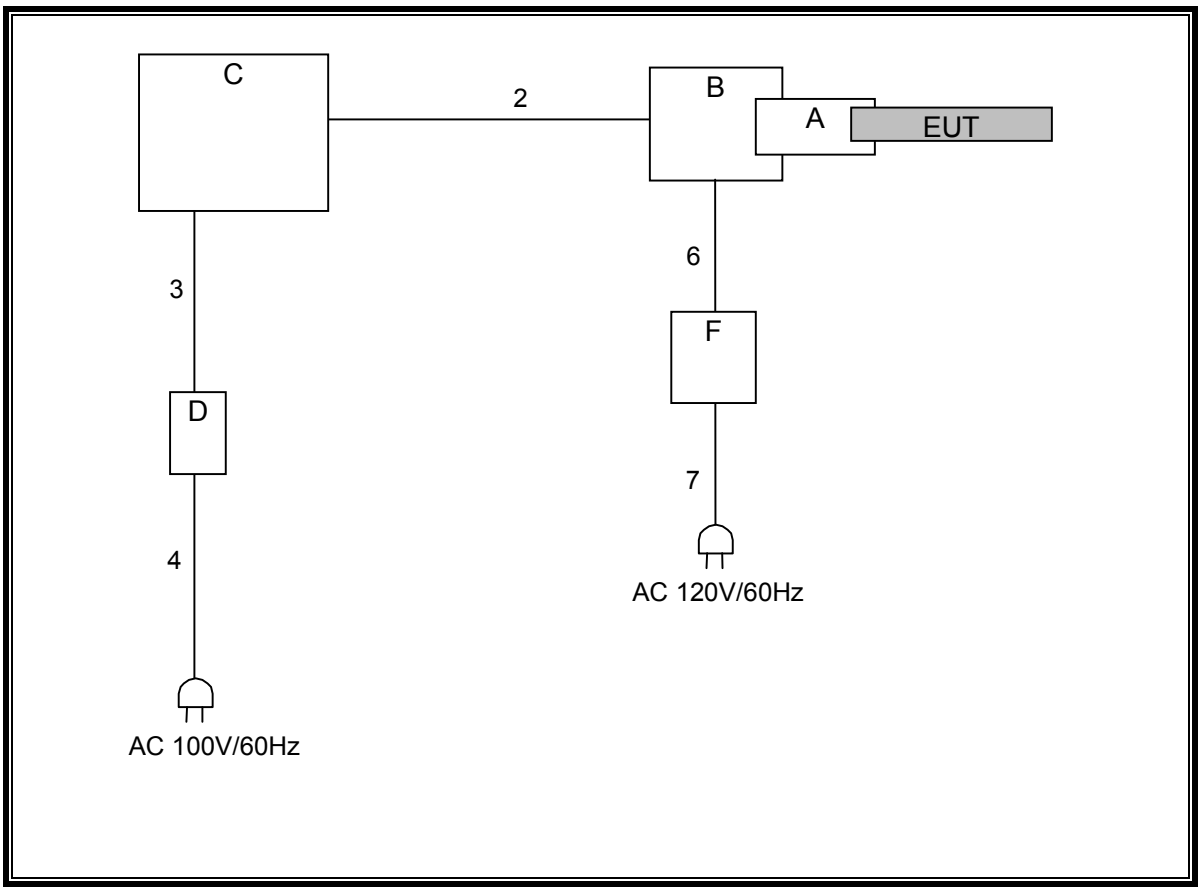
SETUP DIAGRAM FOR CONDUCTED EMISSION



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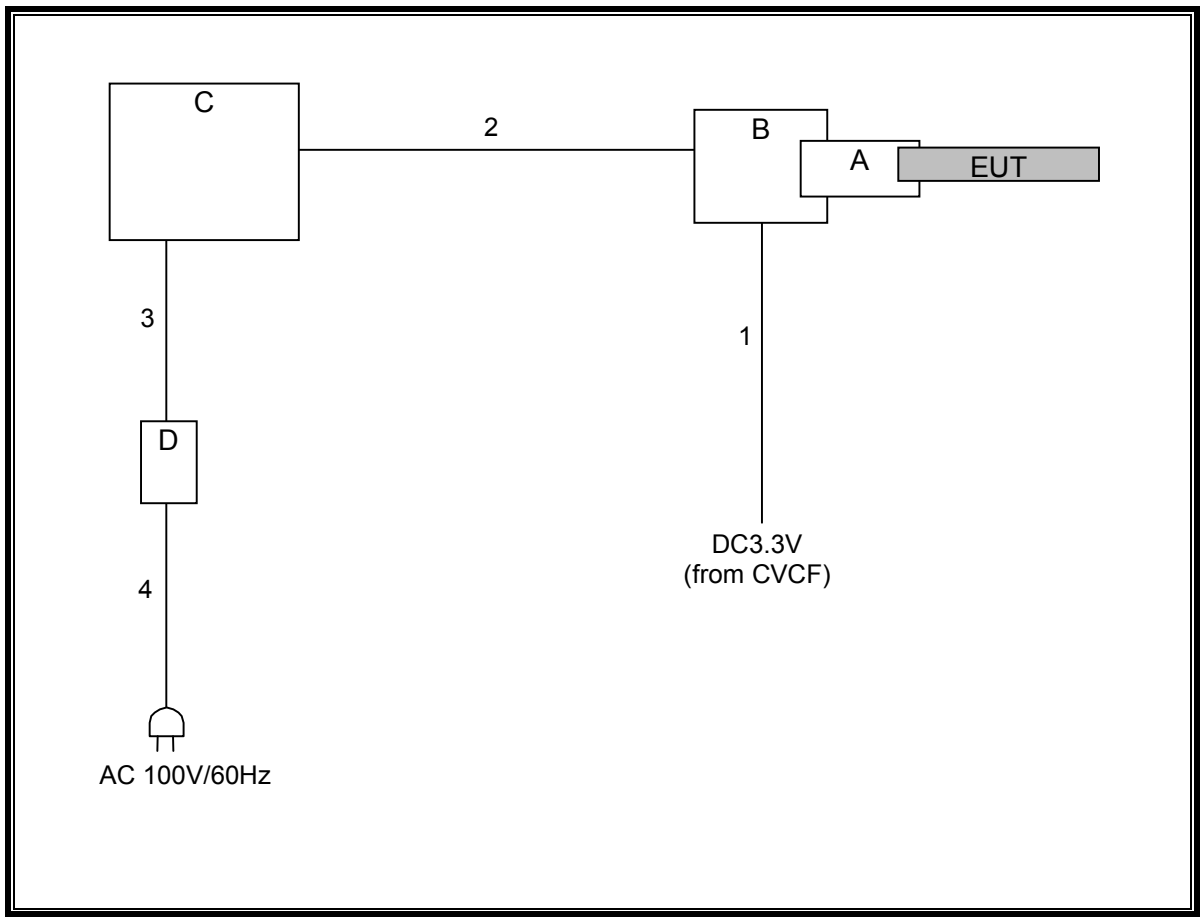
SETUP DIAGRAM FOR RADIATED EMISSIONS TEST



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TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:
(1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT	2011/11/23 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2011/09/13 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2011/09/13 * 12
MCC-138	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37953/2	AT	2011/10/28 * 12
MCC-105	Microwave Cable	Hirose Electric	U.FL-2LP-066J1-A(200)	-	AT	2011/06/24 * 12
MAT-19	Attenuator(6dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-106	-	AT	2012/01/12 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2012/02/06 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/29 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2012/02/03 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1203S212(1m) / 1204S062(5m)	RE	2012/04/23 * 12
MHF-20	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCC	607	RE	2011/09/08 * 12
MCC-79	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278923/4	RE	2011/12/08 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2012/03/28 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2011/07/10 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2012/02/08 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2011/08/11 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2011/11/23 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2011/11/23 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2011/11/02 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/ TSJ	-	-	RE	2011/09/17 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2012/02/20 * 12
MHA-01	Horn Antenna 18-26.5GHz	EMCO	3160-09	1266	RE	2011/06/20 * 12
MCC-134	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336167/4(1m) / 340641(5m)	RE	2011/09/07 * 12
MPA-01	Pre Amplifier	Agilent	8449B	3008A01671	RE	2012/02/28 * 12
MHF-17	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCA	7001	RE	2011/09/08 * 12

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(2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	CE	2011/07/10 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	CE	2012/02/08 * 12
MJM-01	Measure	KDS	ES19-55	-	CE	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2012/04/03 * 12
MLS-03	LISN(AMN)	Schwarzbeck	NSLK8127	8127384	CE(EUT)	2012/03/01 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	-/01068(Switcher)	CE	2012/01/22 * 12
MAT-64	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2012/01/28 * 12

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.
Test Item:
RE: Radiated emission, CE: Conducted emission, AT: Antenna Terminal Conducted test

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6. ANTENNA PORT TEST RESULTS

6.1. BASIC DATA RATE GFSK MODULATION

6.1.1. 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	928.787	870.1044
Middle	2441	927.620	869.1735
High	2480	929.031	867.5438

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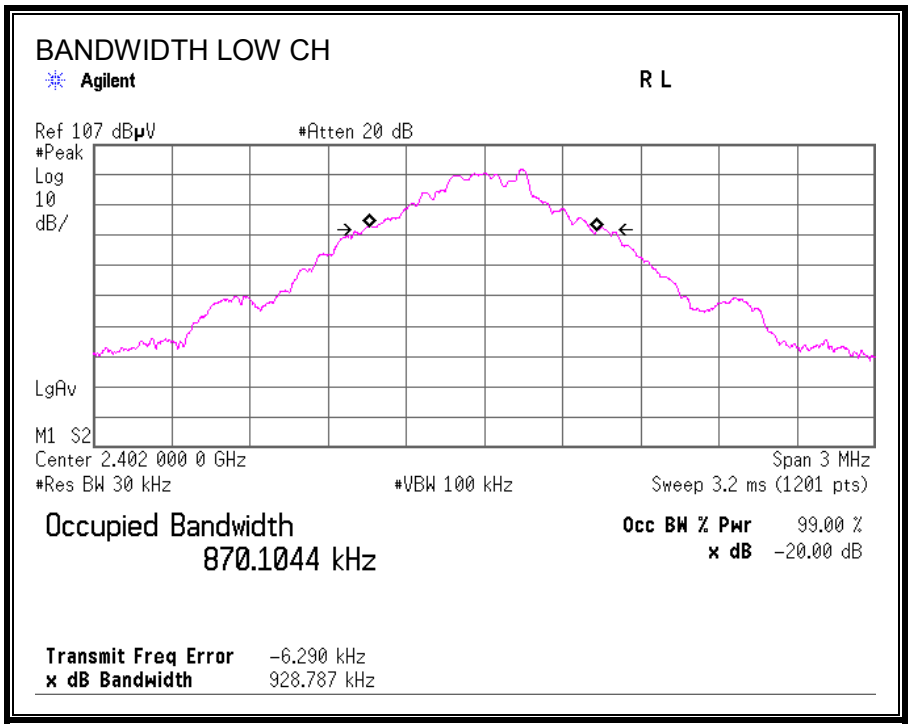
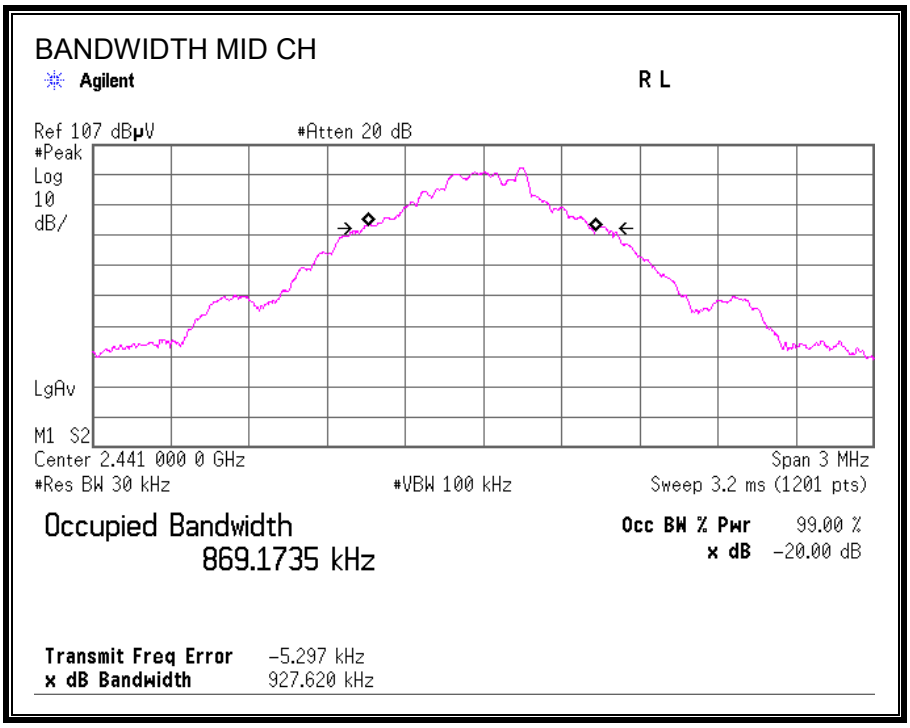
20 dB BANDWIDTH





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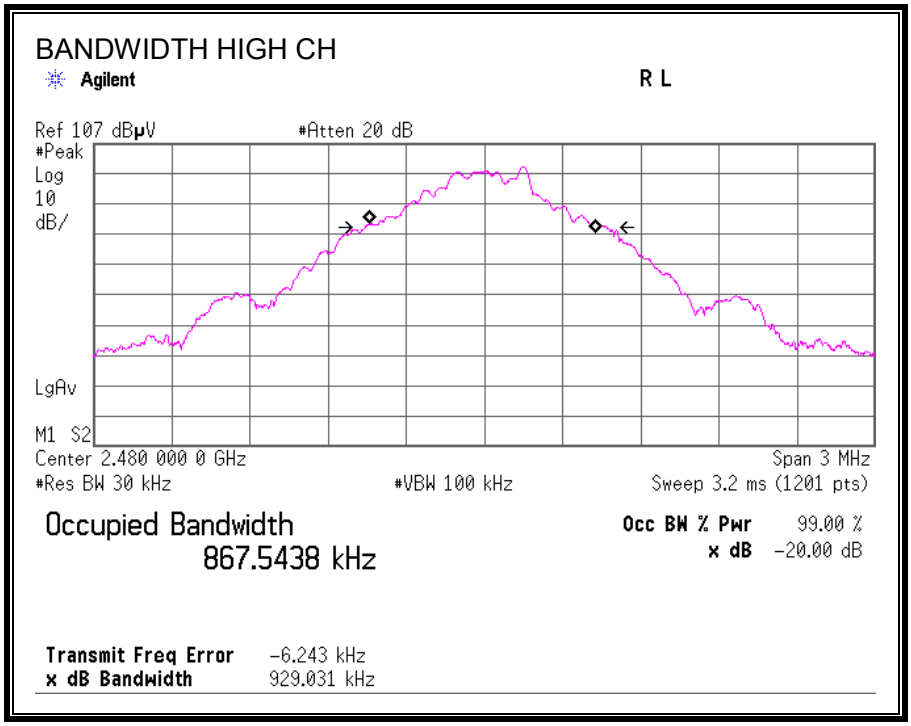

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6.1.2. HOPPING FREQUENCY SEPARATION

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 30 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

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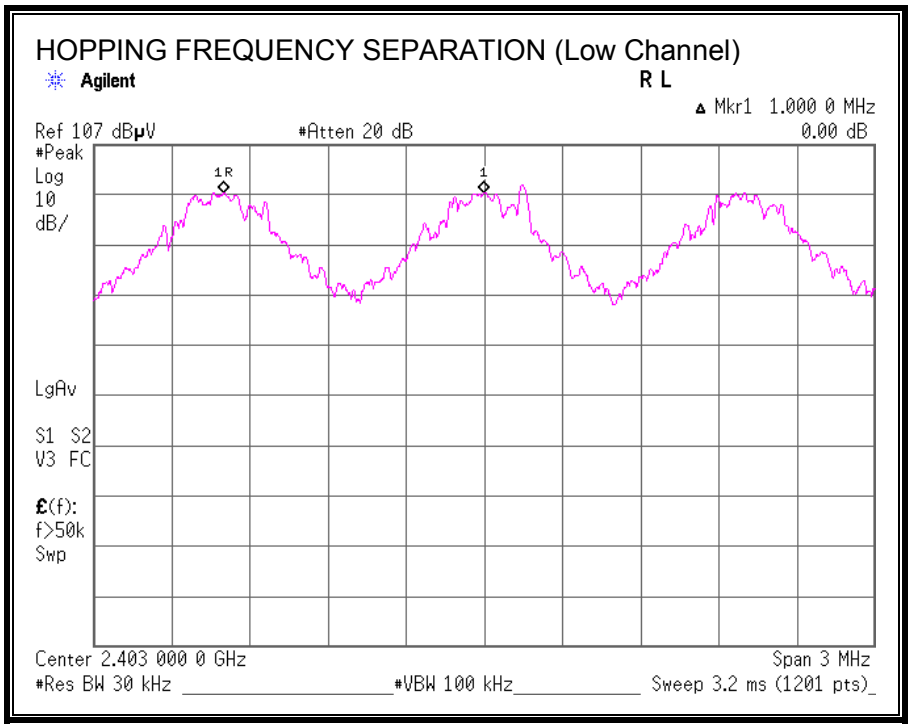
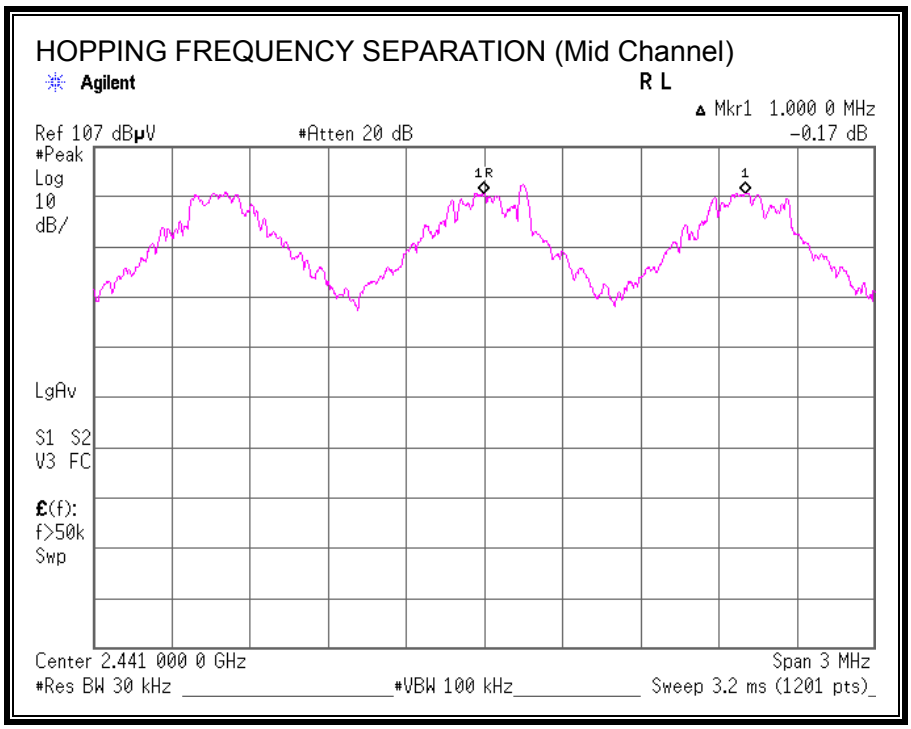
HOPPING FREQUENCY SEPARATION





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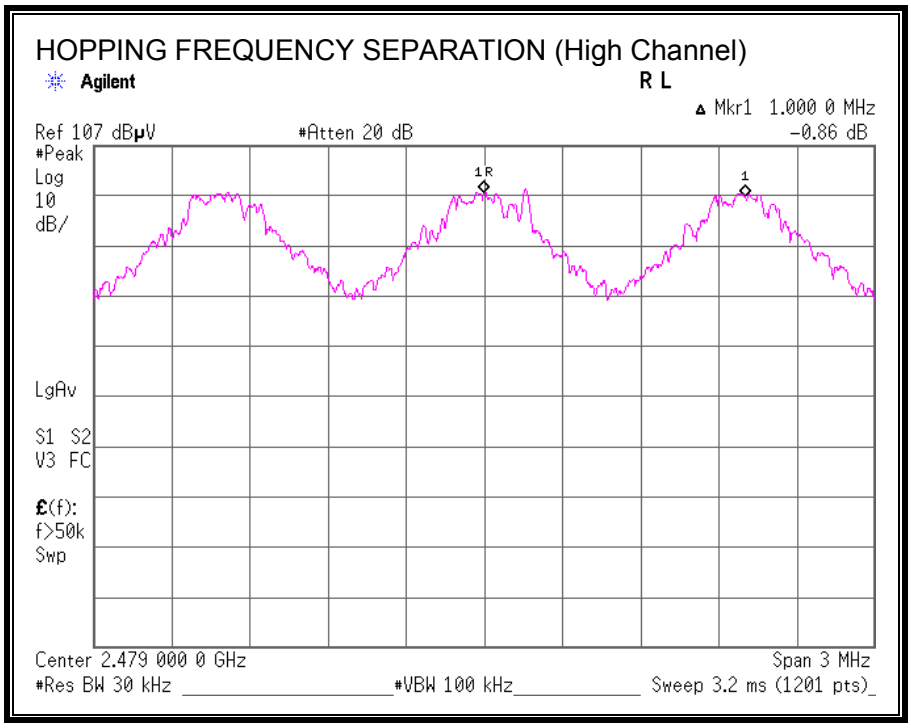
HOPPING FREQUENCY SEPARATION (High Channel)



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6.1.3. 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 4.0.

RESULTS

79 Channels observed.

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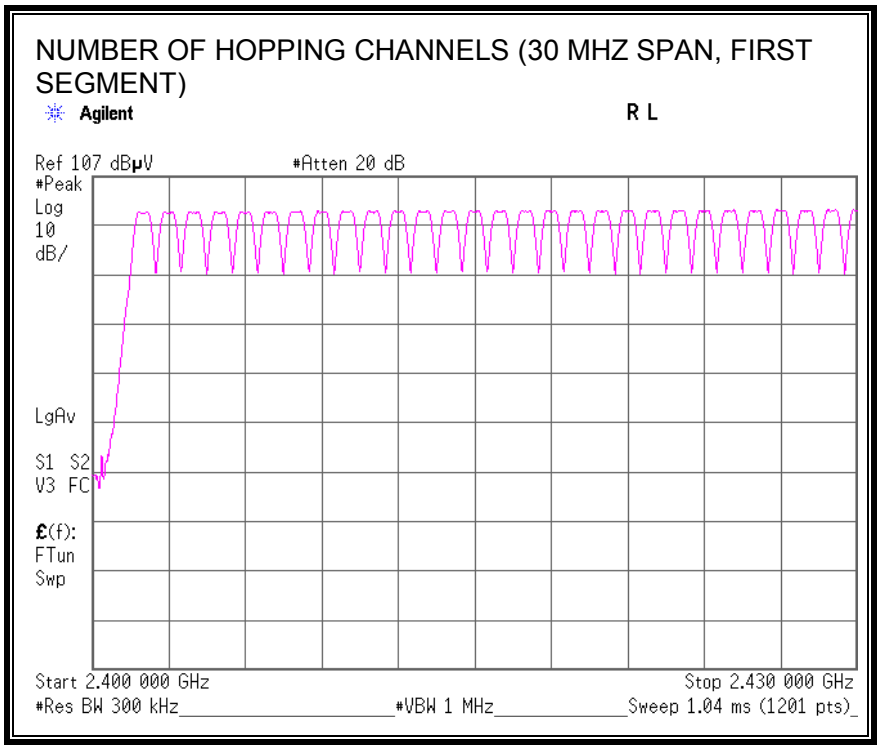
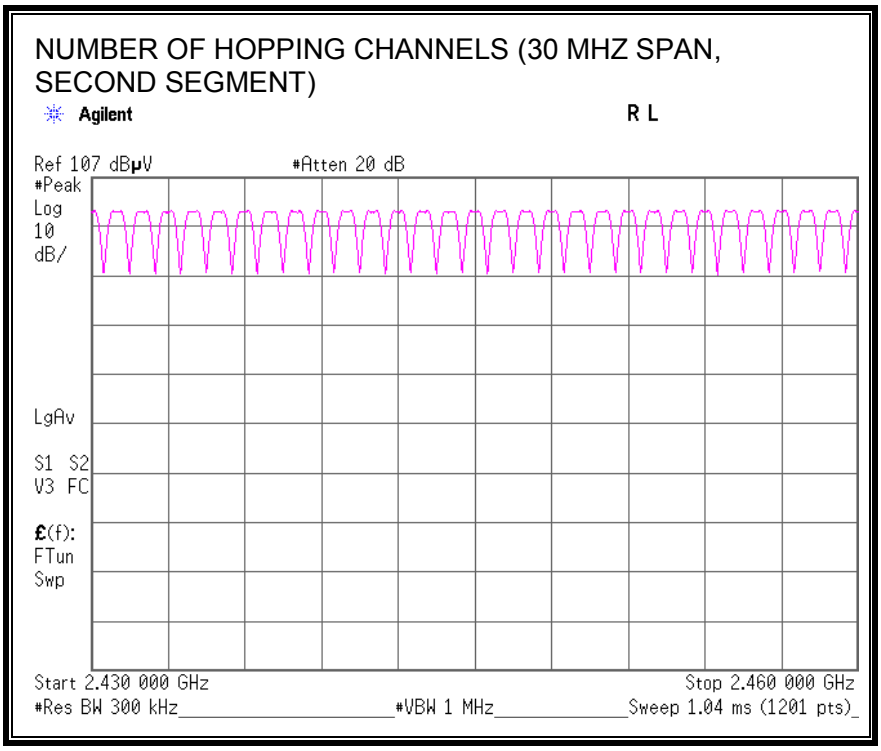
NUMBER OF HOPPING CHANNELS





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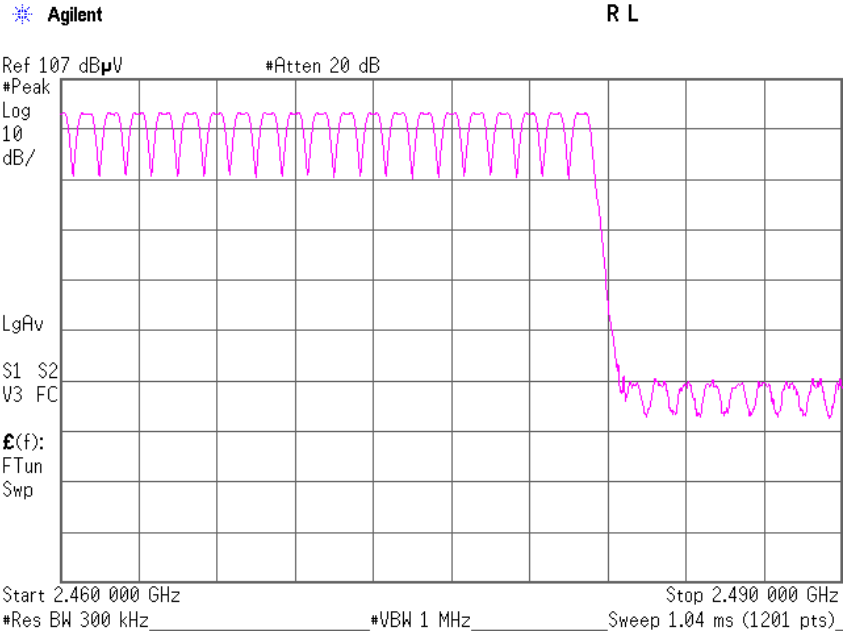
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



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6.1.4. 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 5 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 31.6 * (# of pulses in 5 s / 5 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

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8(32 Hopping x 0.4)second period	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	50.2 times / 5 sec. x 31.6 sec. = 318 times	0.447	142	400
DH3	26.6 times / 5 sec. x 31.6 sec. = 169 times	1.707	288	400
DH5	16.6 times / 5 sec. x 31.6 sec. = 105 times	2.957	310	400

Sample Calculation
Result = Number of transmission x Length of transmition time

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	49	50	50	50.2
DH3	26	26	28	23	30	26.6
DH5	24	17	12	17	13	16.6

Sample Calculation
Average= Summation(Sampling 1 to 5) / 5

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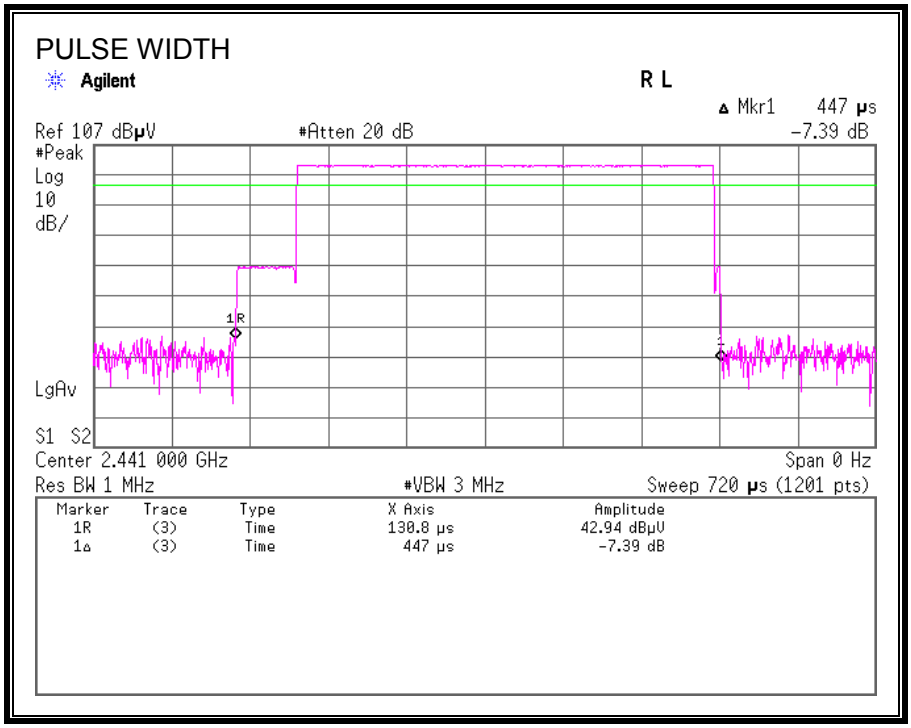
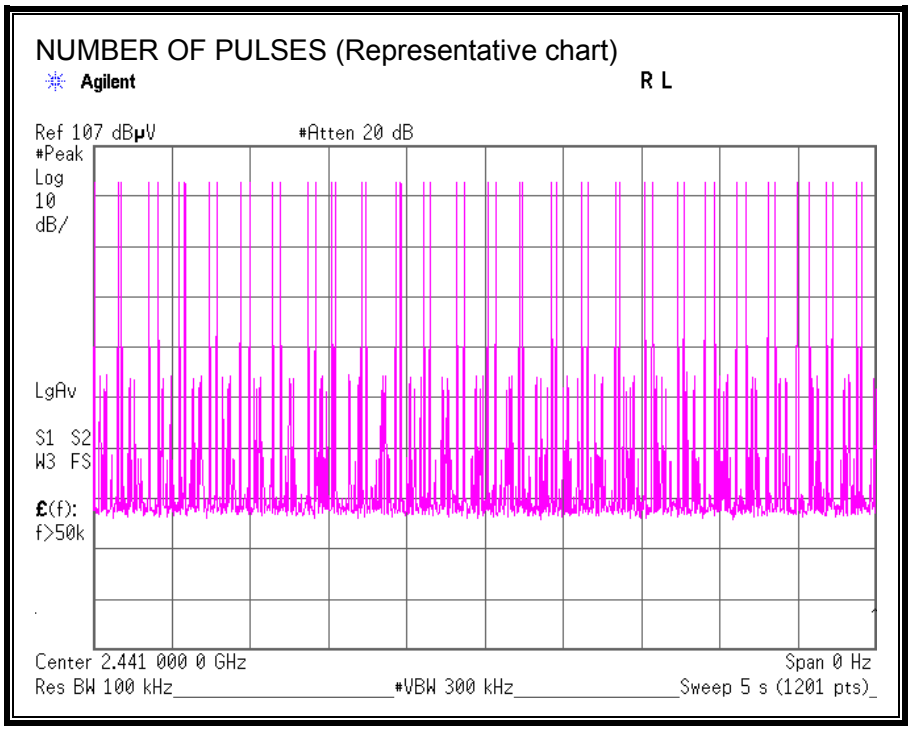
DH1

PULSE WIDTH



NUMBER OF PULSES IN 5 SECOND OBSERVATION PERIOD



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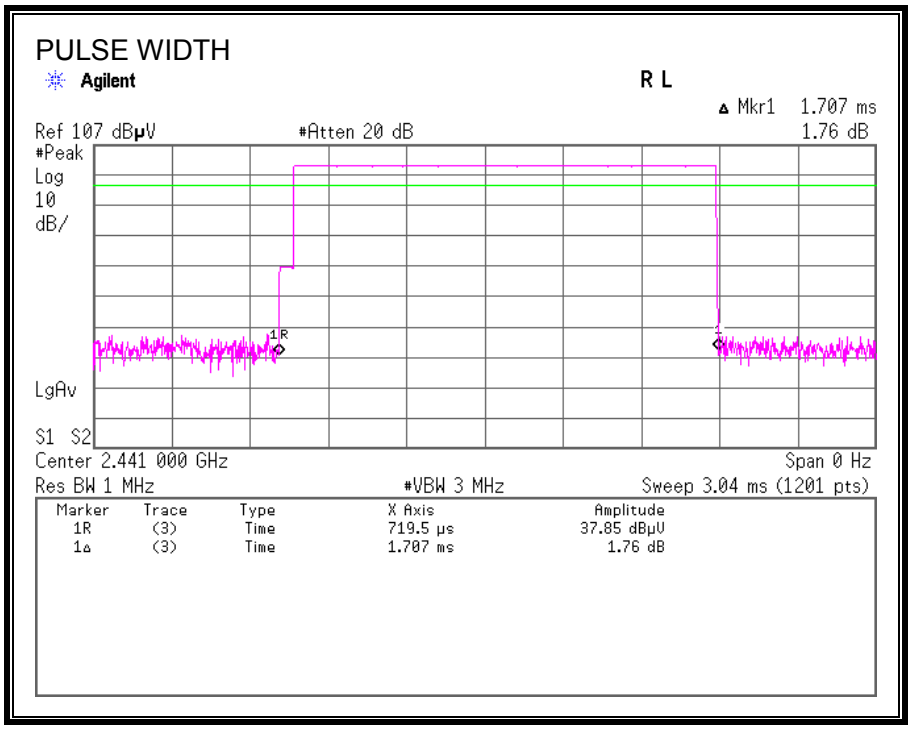
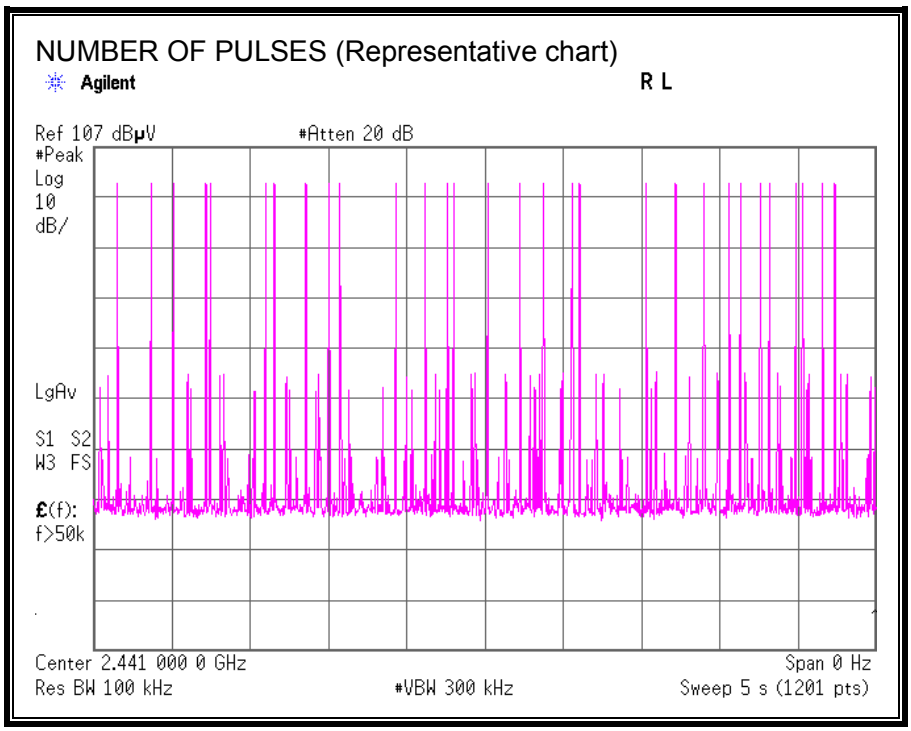
DH3

PULSE WIDTH



NUMBER OF PULSES IN 5 SECOND OBSERVATION PERIOD



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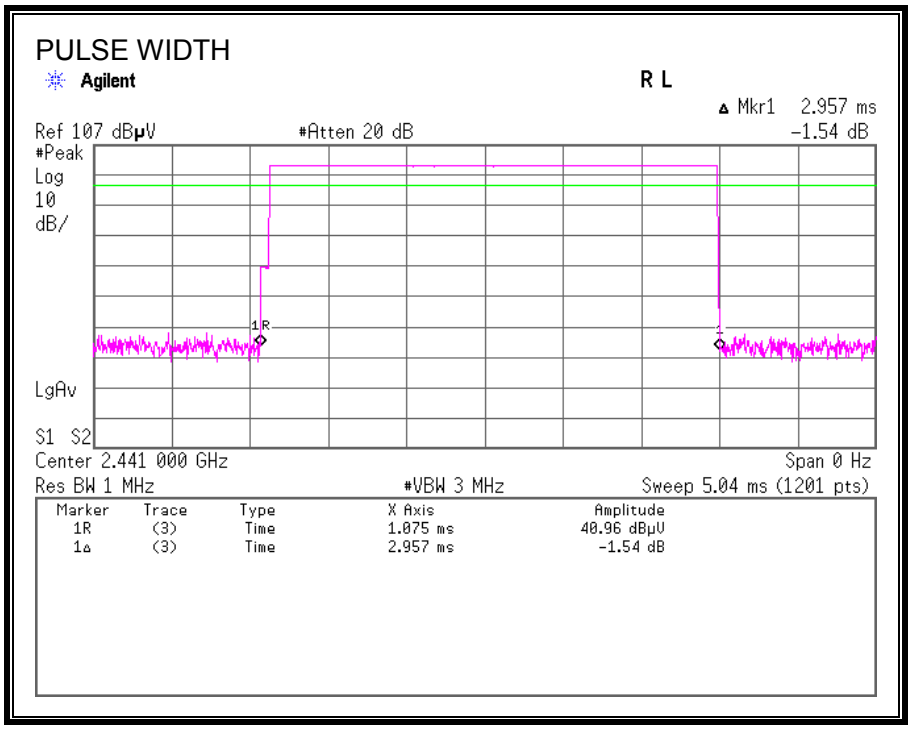
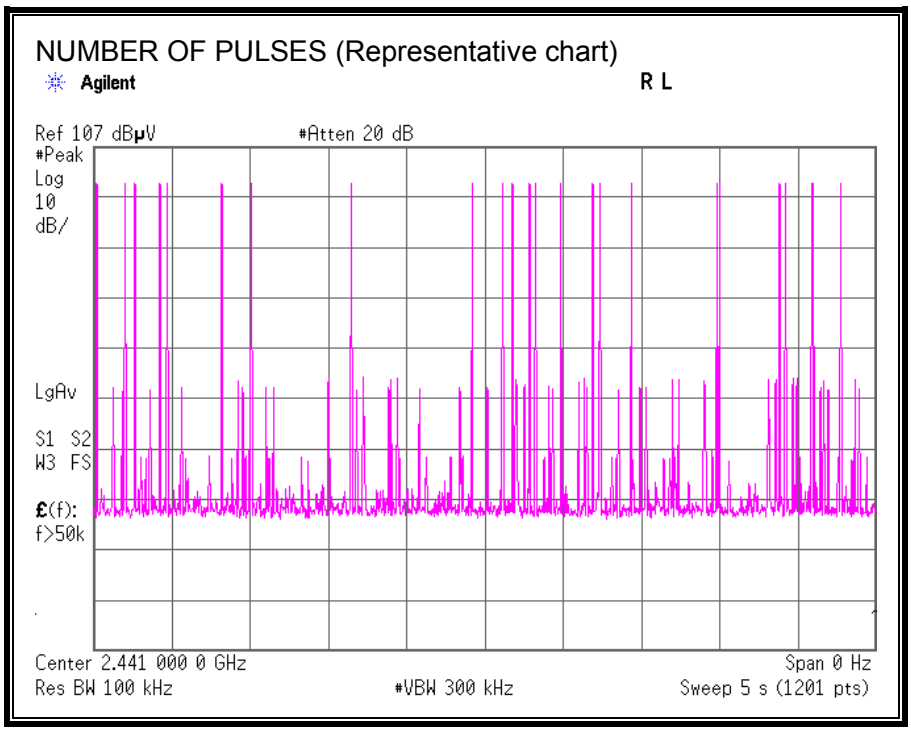
DH5

PULSE WIDTH



NUMBER OF PULSES IN 5 SECOND OBSERVATION PERIOD



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6.1.5. 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 30 dBm.
Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
However, the limit level 125mW of AFH mode was used for the test.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Mode	Freq.	Reading	Cable Loss	Atten.	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-7.20	2.09	6.11	1.00	1.26	20.96	125	19.96
DH5	2441.0	-6.84	2.11	6.11	1.38	1.37	20.96	125	19.58
DH5	2480.0	-6.80	2.12	6.11	1.43	1.39	20.96	125	19.53

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

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6.1.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Mode	Freq.	Reading Power Meter(AV)	Cable Loss	Atten.	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
DH5	2402.0	-8.65	2.09	6.11	-0.45	0.90
DH5	2441.0	-8.40	2.11	6.11	-0.18	0.96
DH5	2480.0	-8.37	2.12	6.11	-0.14	0.97

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

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6.1.7. 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.

The spectrum from 9 kHz to 25 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.

RESULTS

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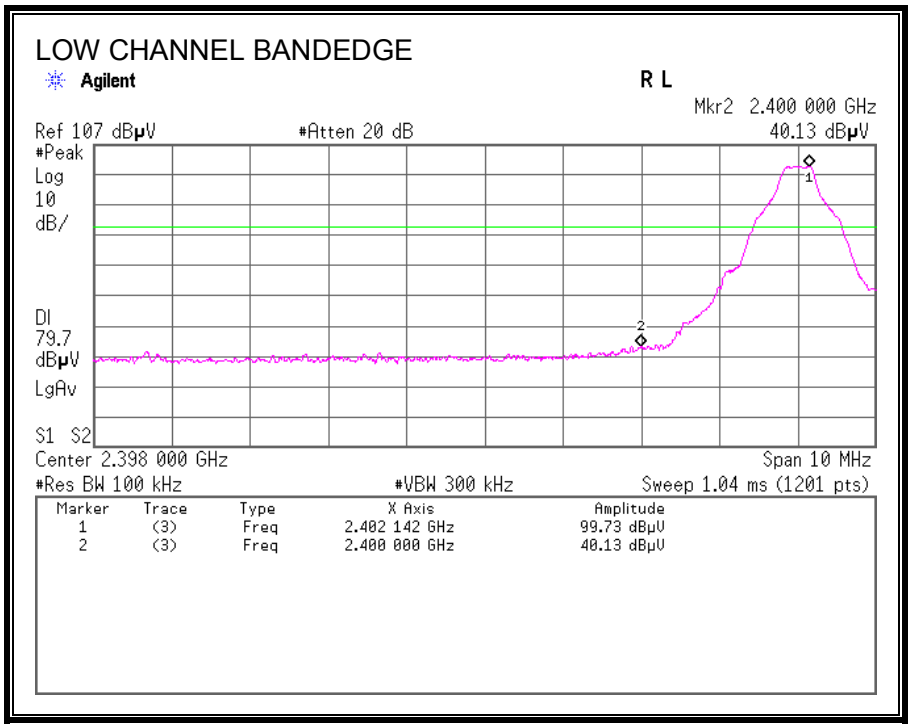
SPURIOUS EMISSIONS, LOW CHANNEL



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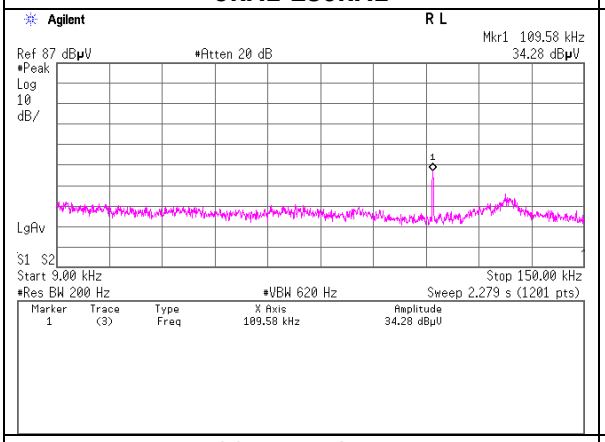
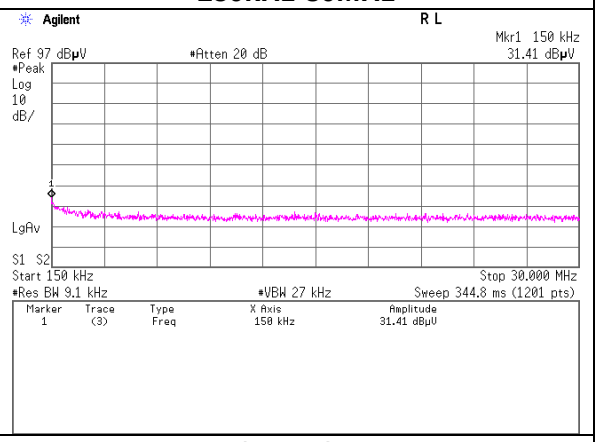
Tx DH5 2402MHz

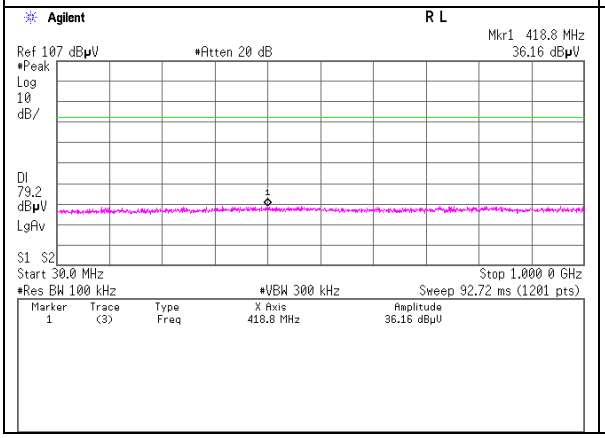
9kHz-150kHz



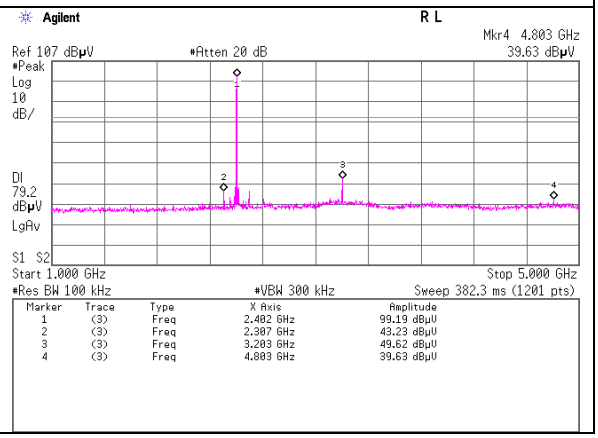
150kHz-30MHz



30MHz-1GHz



1GHz-5GHz



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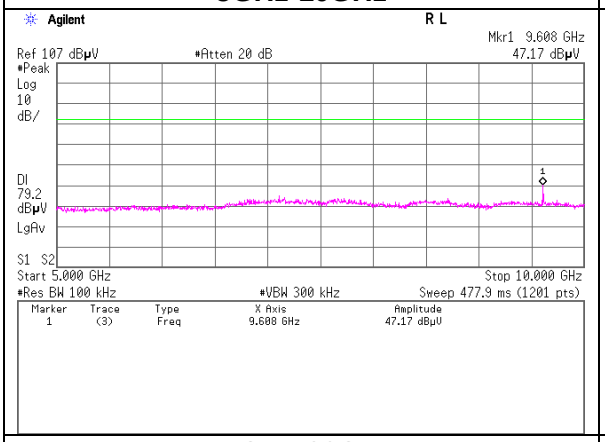
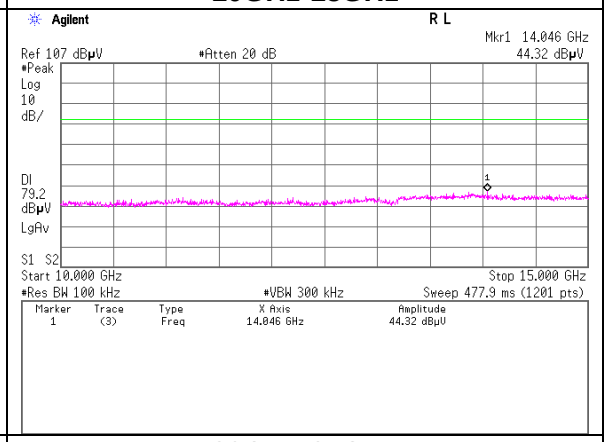
Tx DH5 2402MHz

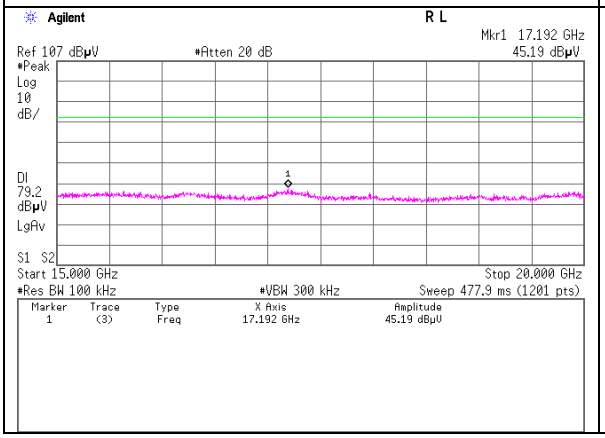
5GHz-10GHz



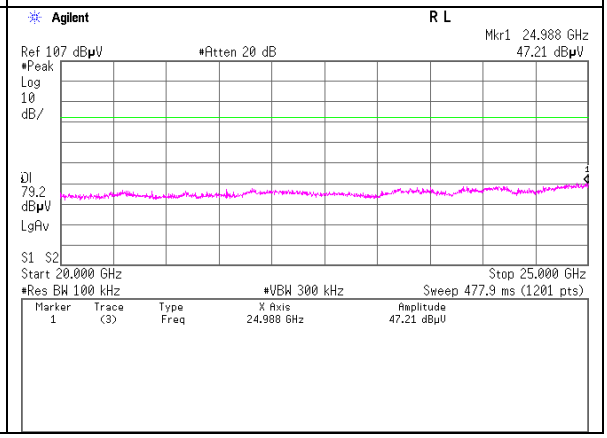
10GHz-15GHz



15GHz-20GHz



20GHz-25GHz



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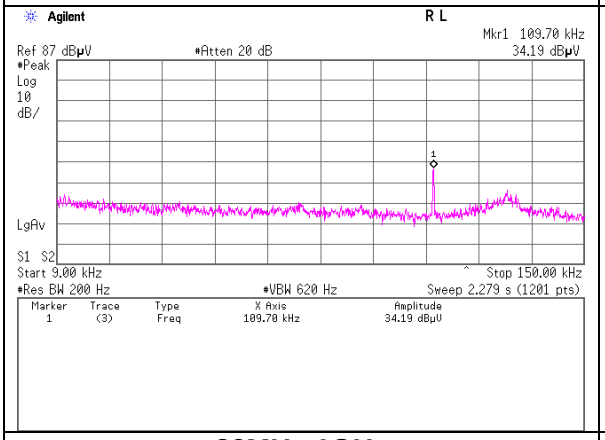
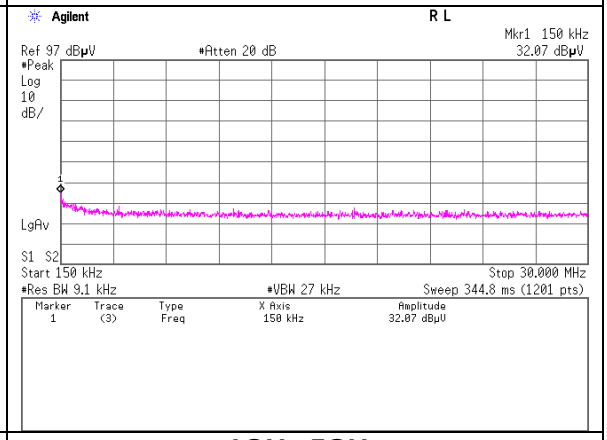
SPURIOUS EMISSIONS, MID CHANNEL

Tx DH5 2441MHz

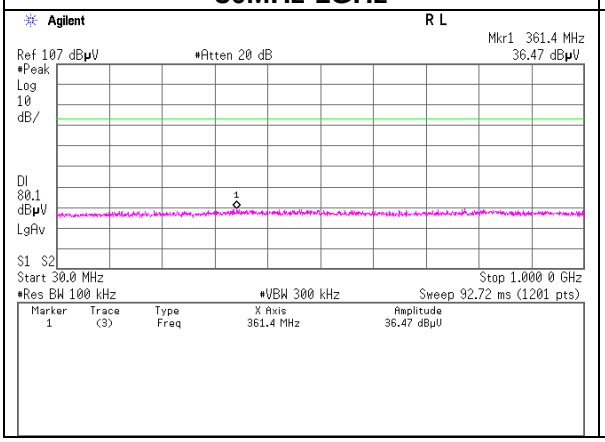
9kHz-150kHz



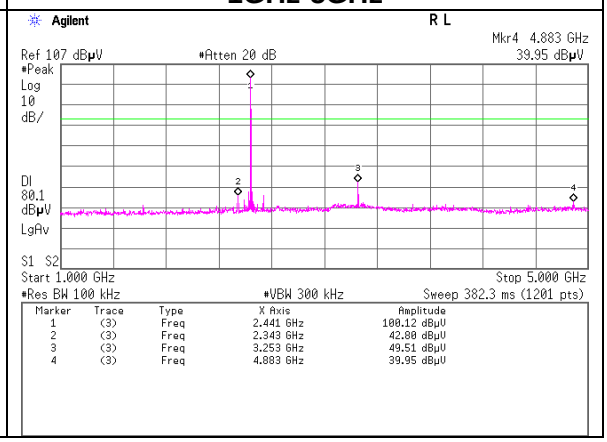
150kHz-30MHz



30MHz-1GHz



1GHz-5GHz



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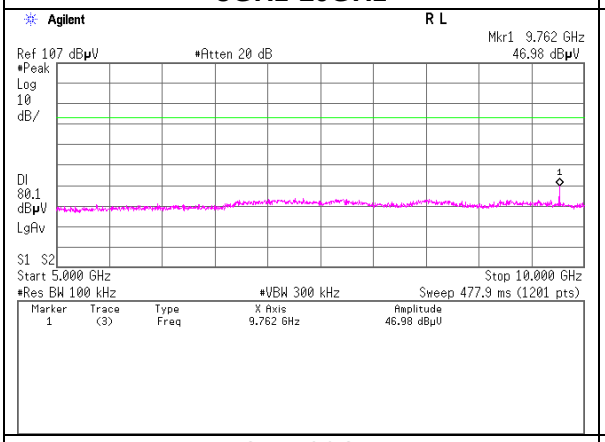
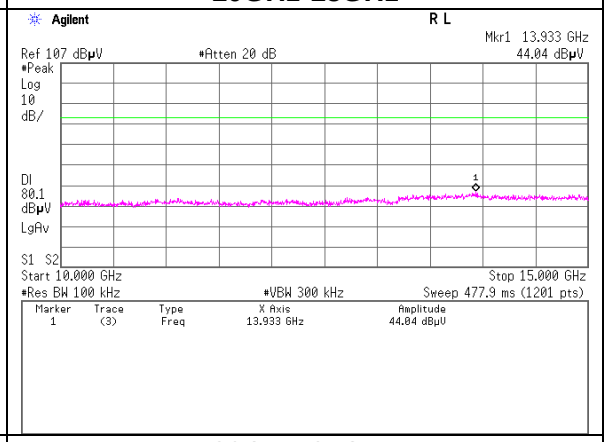
Tx DH5 2441MHz

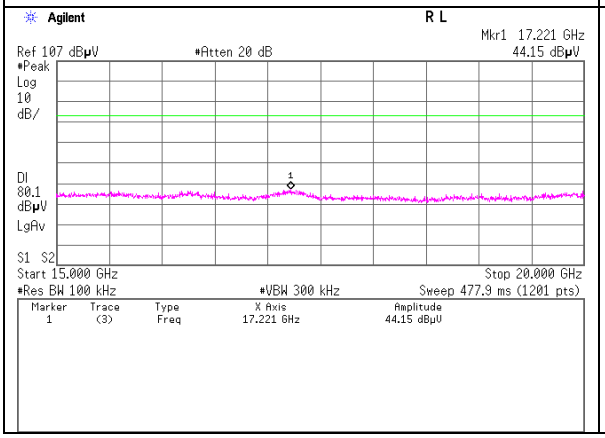
5GHz-10GHz



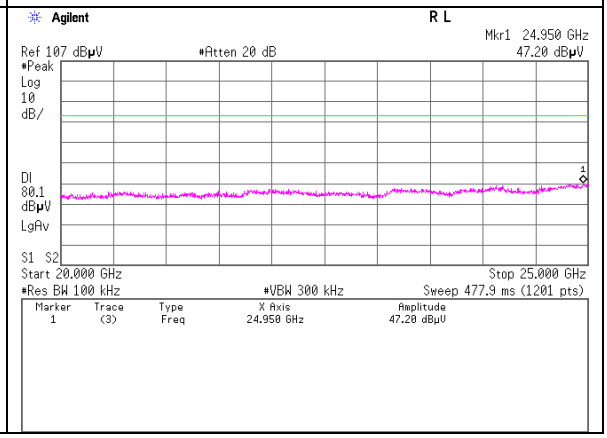
10GHz-15GHz



15GHz-20GHz



20GHz-25GHz



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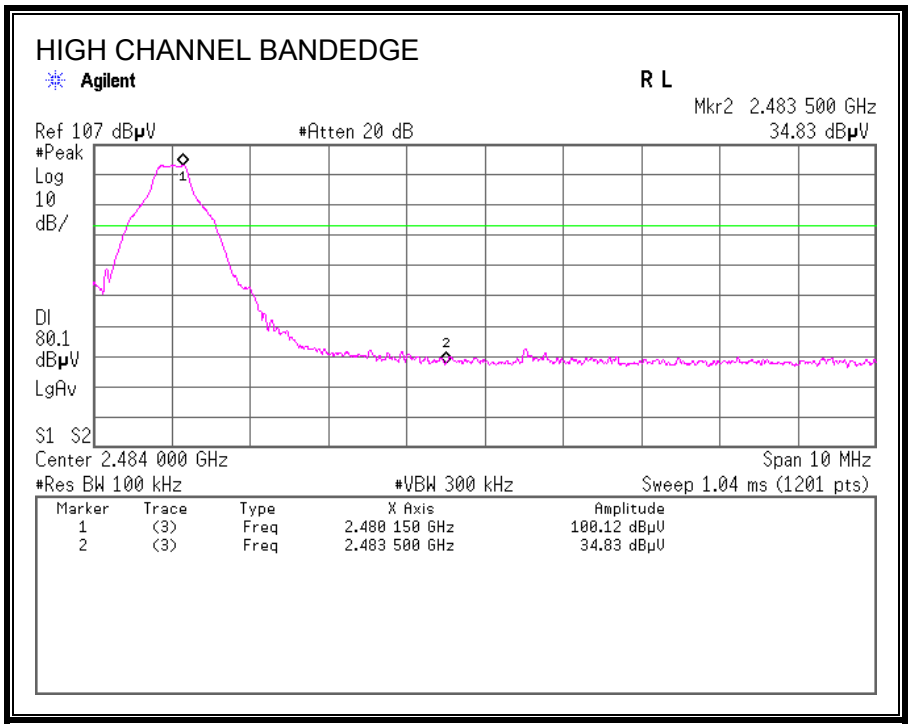
SPURIOUS EMISSIONS, HIGH CHANNEL



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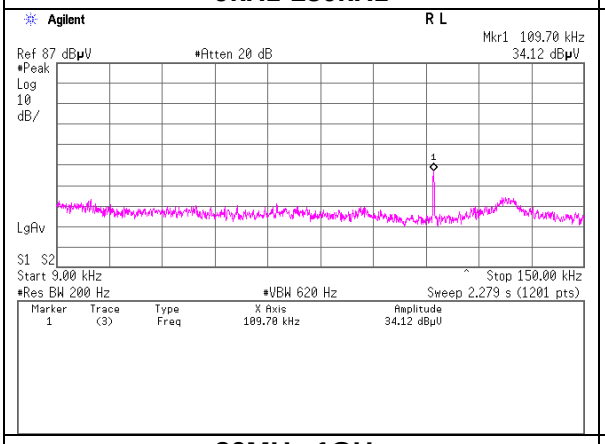
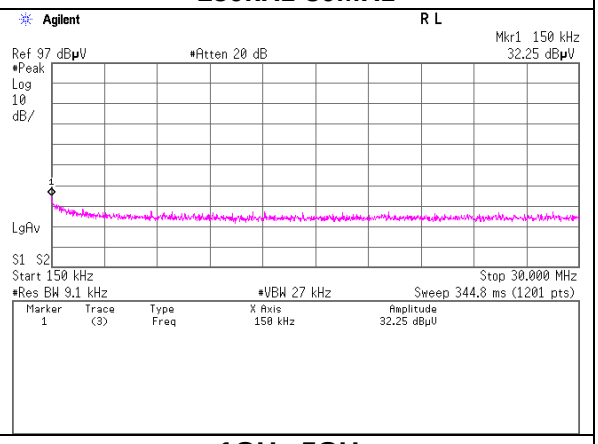
Tx DH5 2480MHz

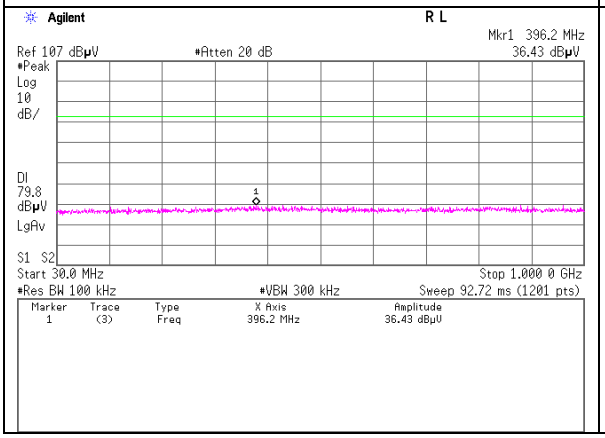
9kHz-150kHz



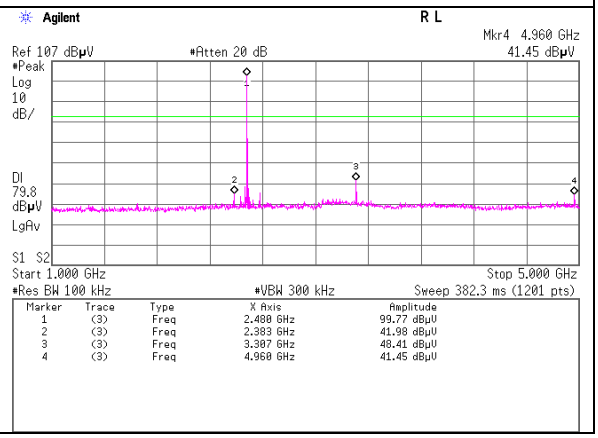
150kHz-30MHz



30MHz-1GHz



1GHz-5GHz



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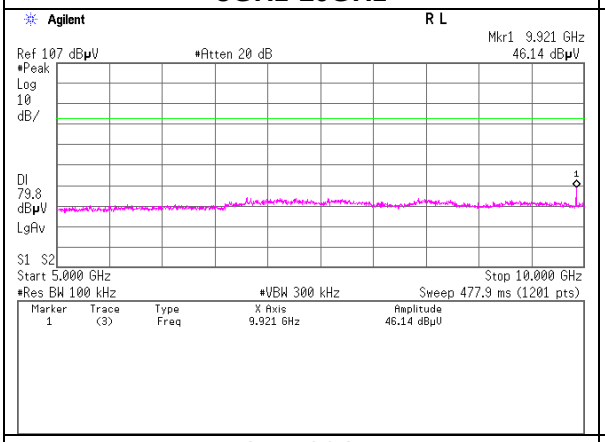
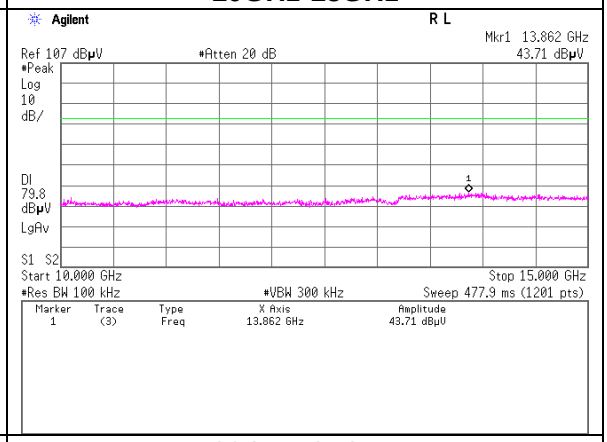
Tx DH5 2480MHz

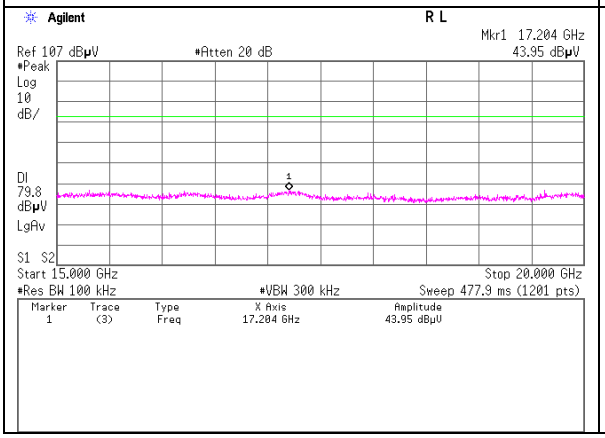
5GHz-10GHz



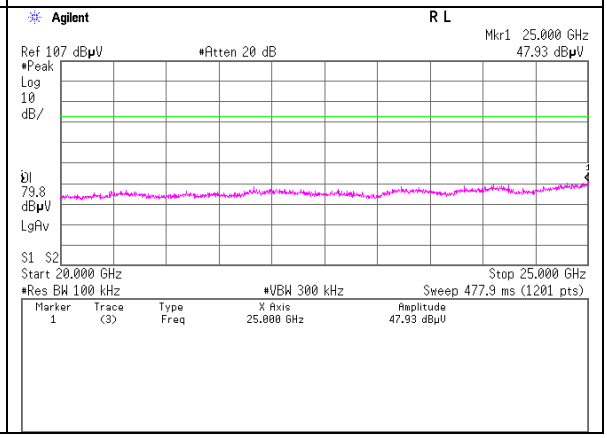
10GHz-15GHz



15GHz-20GHz



20GHz-25GHz



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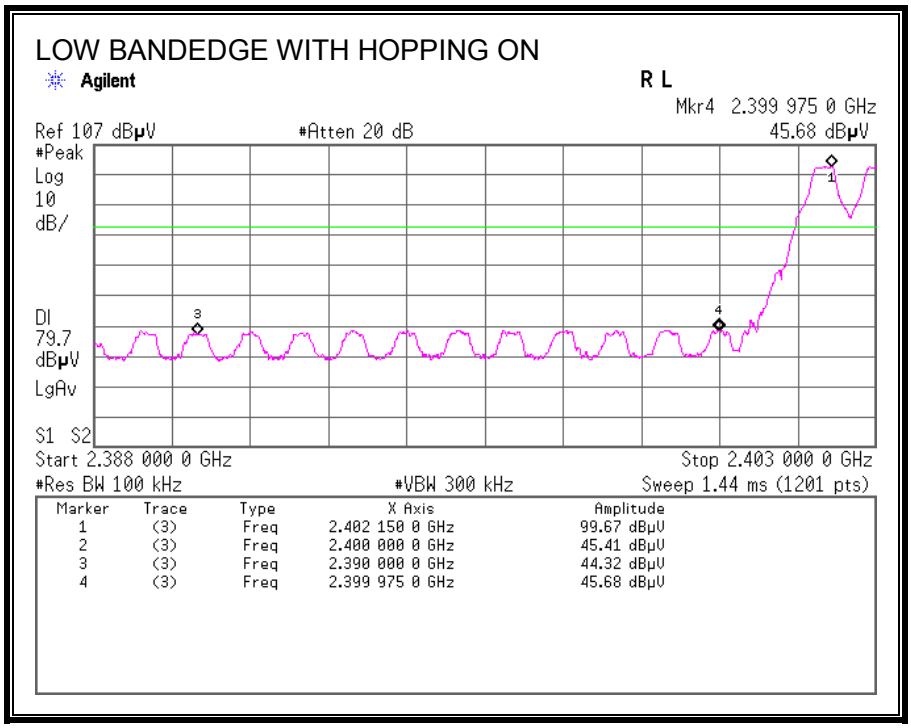
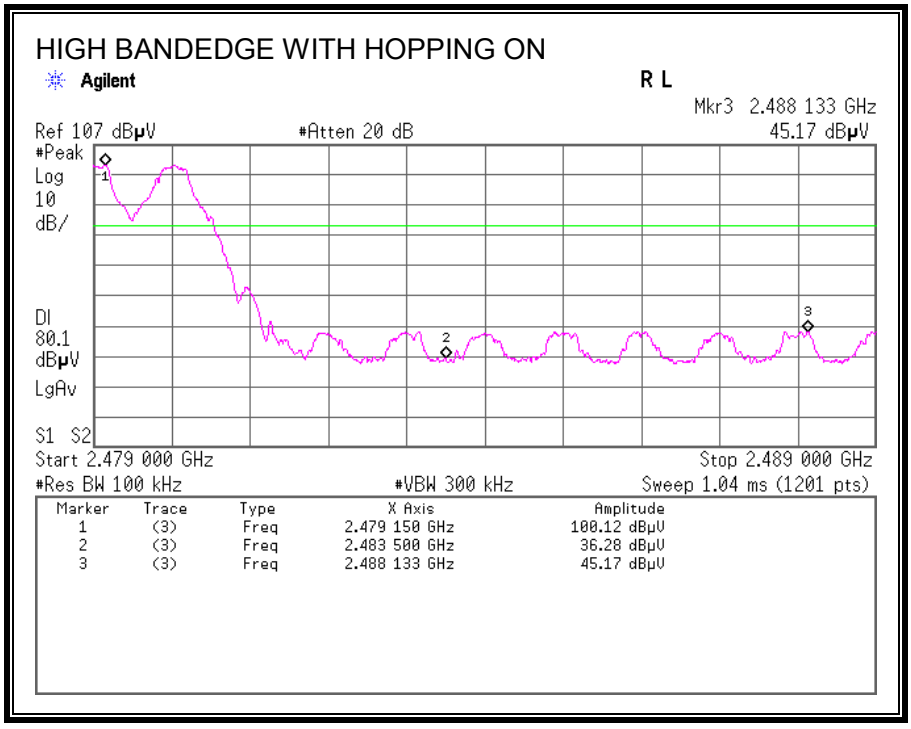
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



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6.2. ENHANCED DATA RATE 8PSK MODULATION

6.2.1. 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	1301	1182.6
Middle	2441	1299	1182.6
High	2480	1299	1185.0

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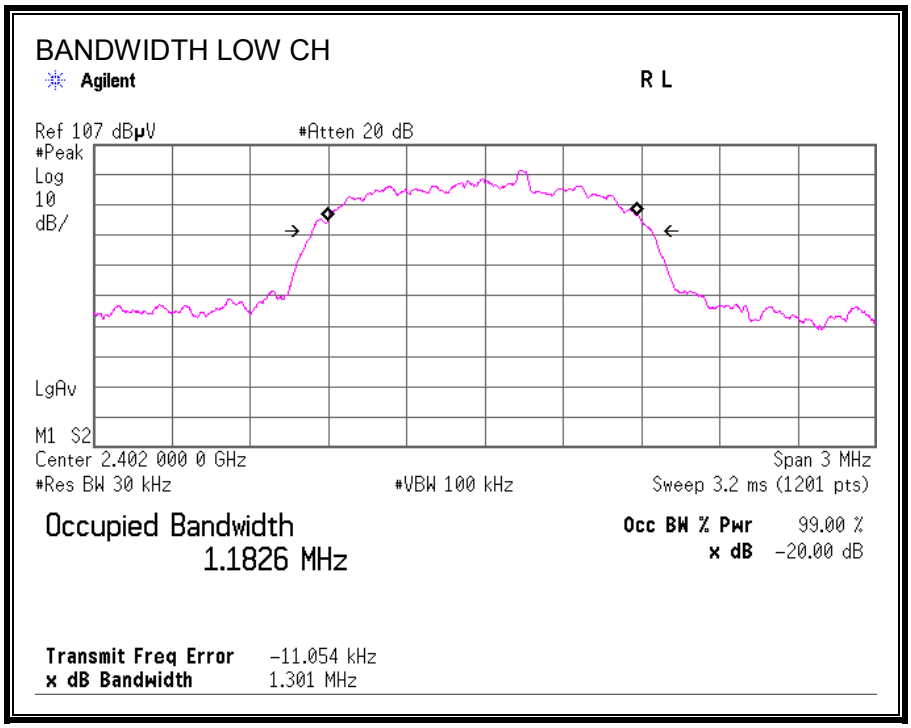
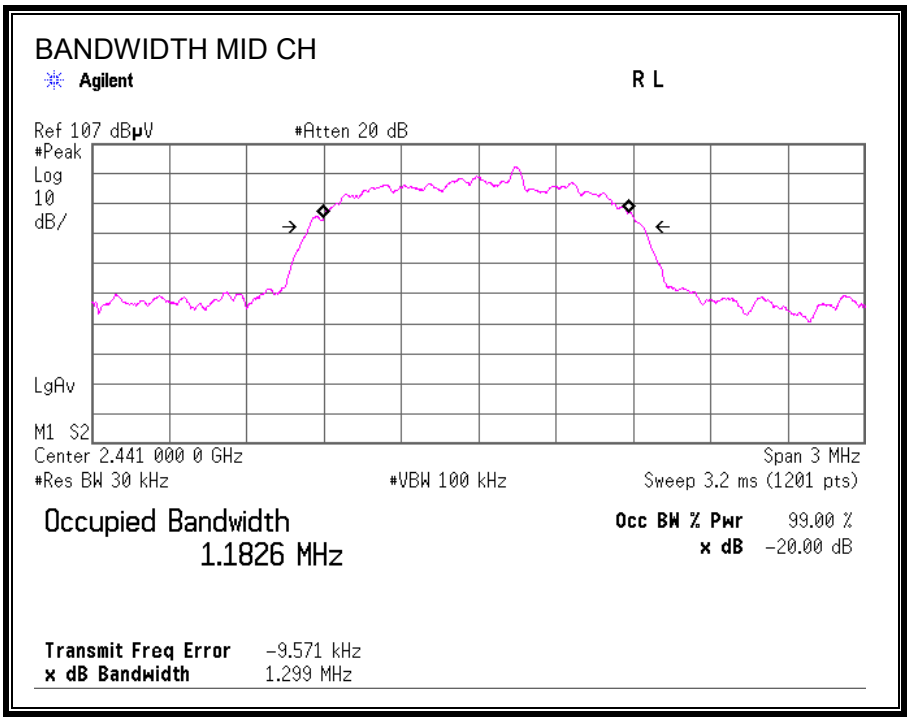
20 dB BANDWIDTH





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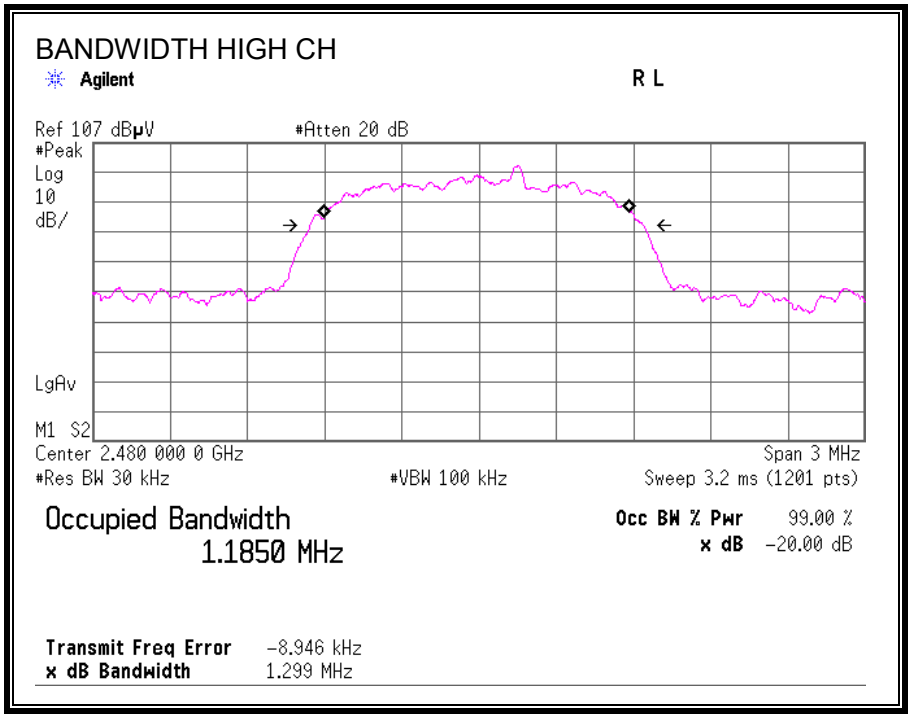

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6.2.2. HOPPING FREQUENCY SEPARATION

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 30 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

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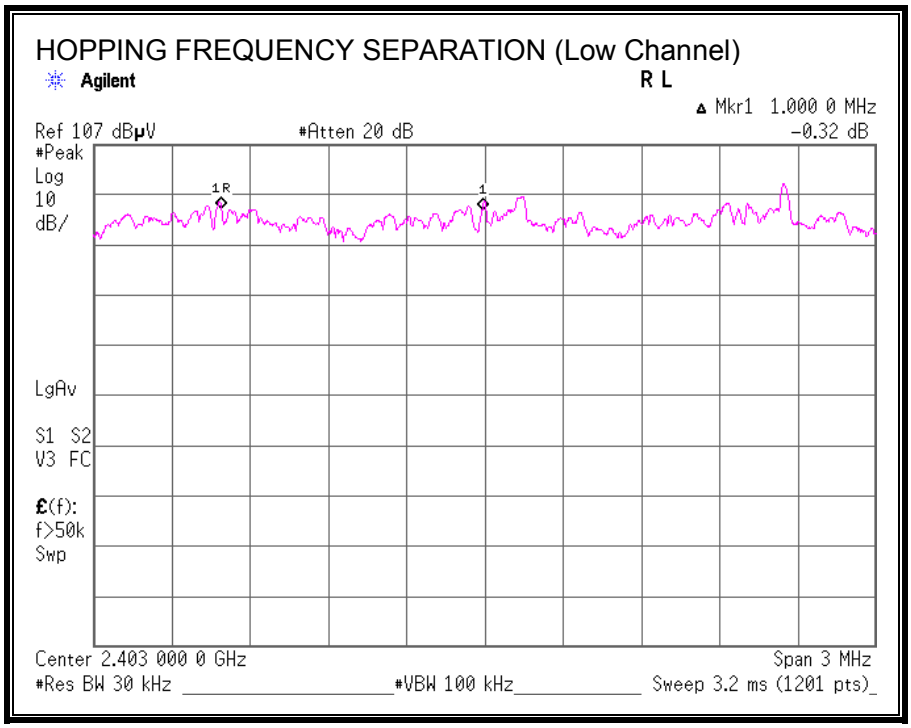
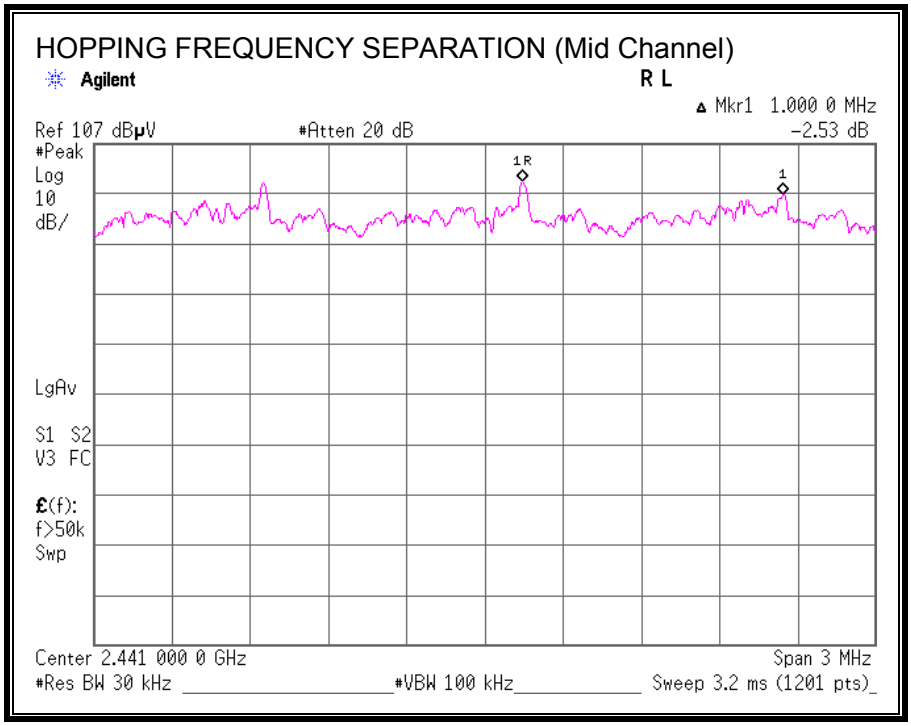
HOPPING FREQUENCY SEPARATION





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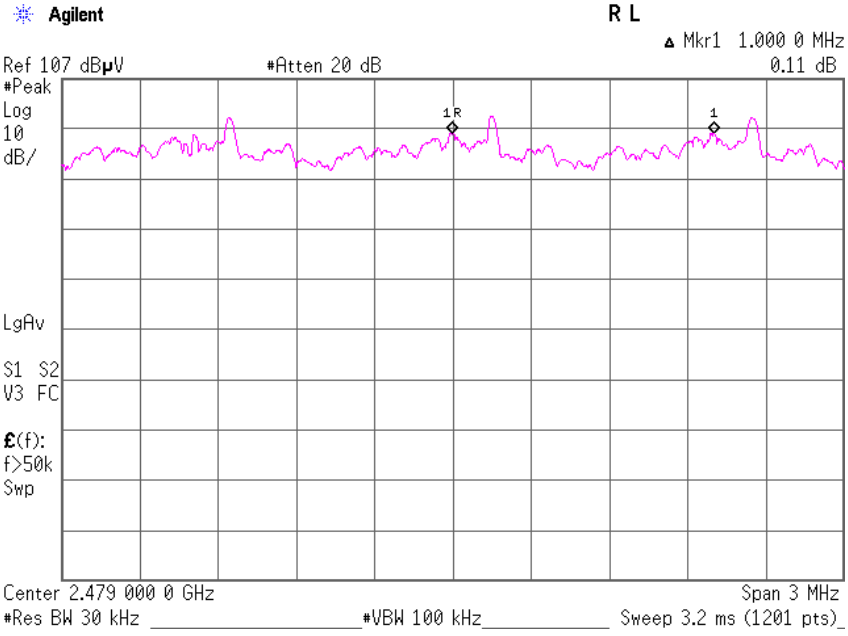
HOPPING FREQUENCY SEPARATION (High Channel)



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6.2.3. 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 4.0.

RESULTS

79 Channels observed.

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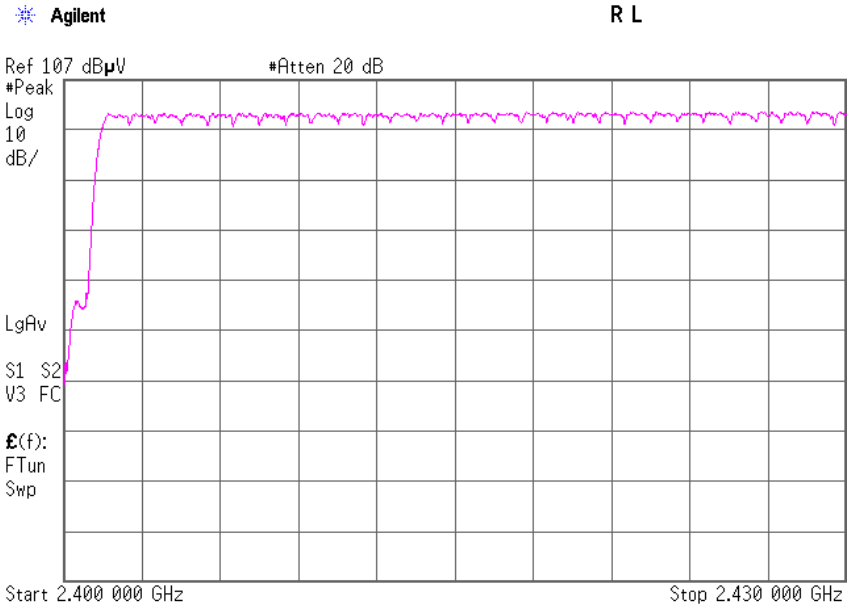
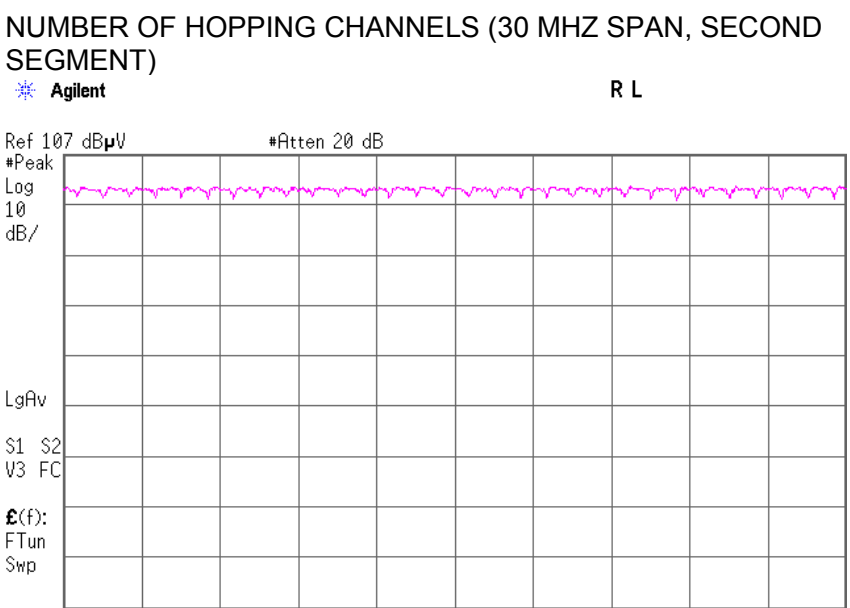
NUMBER OF HOPPING CHANNELS

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



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



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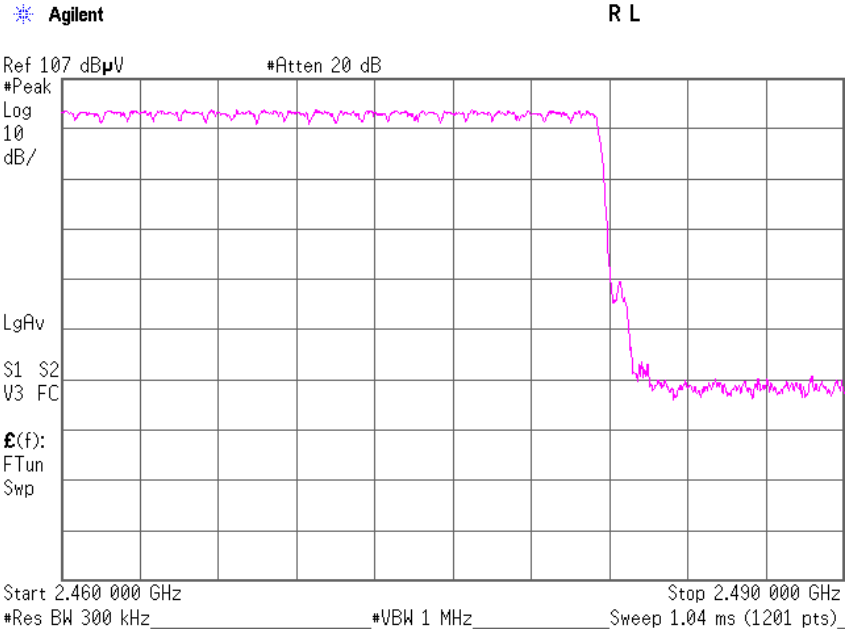
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



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6.2.4. 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 5 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 31.6 * (# of pulses in 5 s / 5 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 (3DH1, 3DH3 or 3DH5). This is confirmed in the test report for N=79.

RESULTS

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8(32 Hopping x 0.4)second period				Length of transmission time [msec]	Result [msec]	Limit [msec]
3DH1	50.4 times	/ 5 sec.	x 31.6 sec.	= 319 times	0.454	145	400
3DH3	25.0 times	/ 5 sec.	x 31.6 sec.	= 158 times	1.707	270	400
3DH5	16.0 times	/ 5 sec.	x 31.6 sec.	= 102 times	2.960	302	400

Sample Calculation
Result = Number of transmission x Length of transmition time

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
3DH1	50	50	51	51	50	50.4
3DH3	25	24	25	27	24	25.0
3DH5	17	19	14	13	17	16.0

Sample Calculation
Average= Summation(Sampling 1 to 5) / 5

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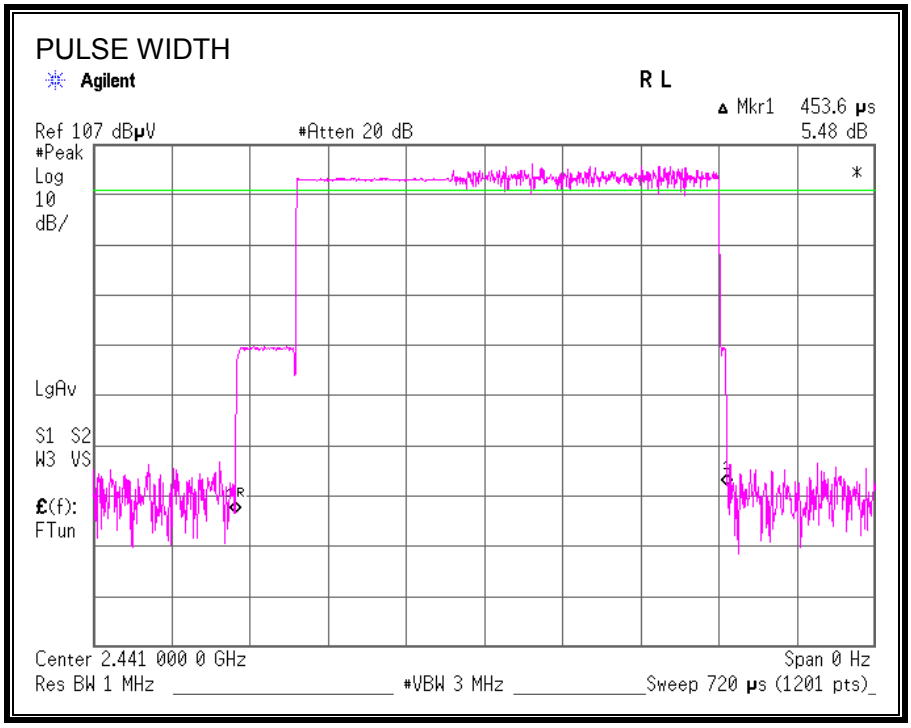
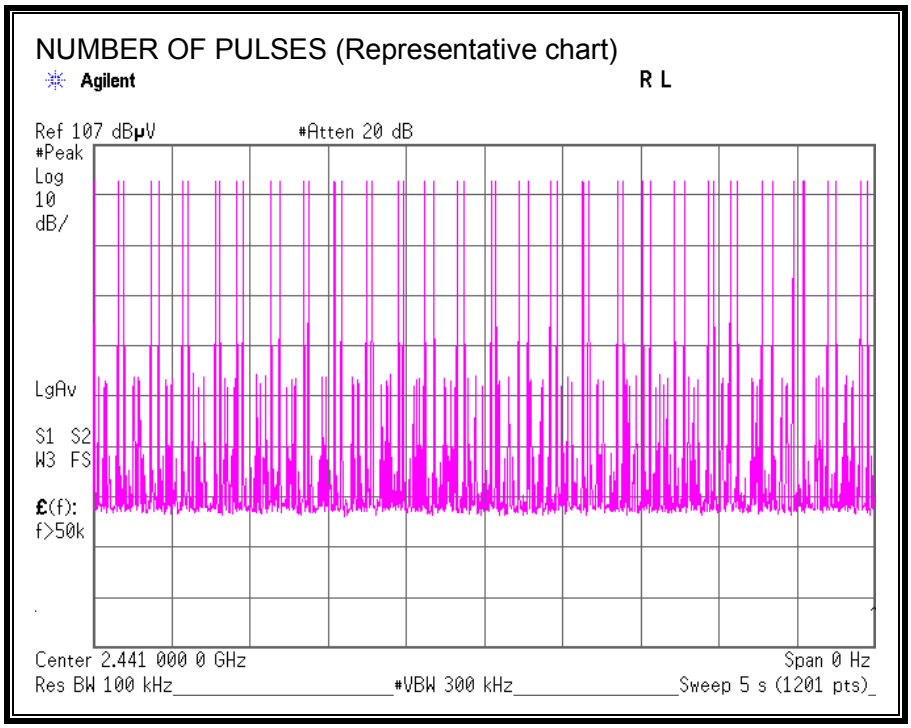
3DH1

PULSE WIDTH



NUMBER OF PULSES IN 5 SECOND OBSERVATION PERIOD



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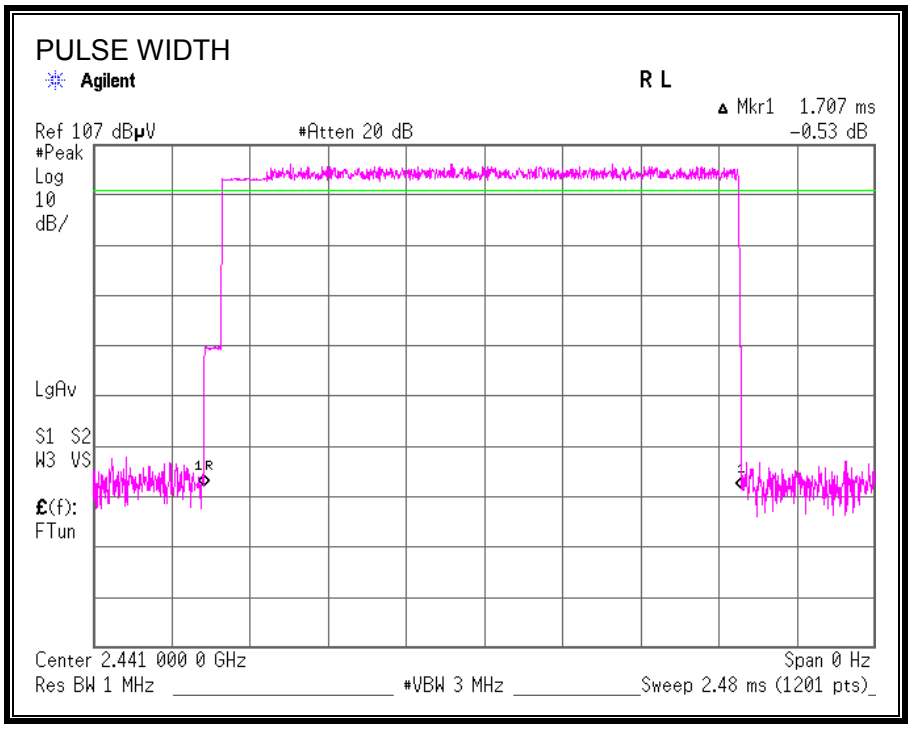
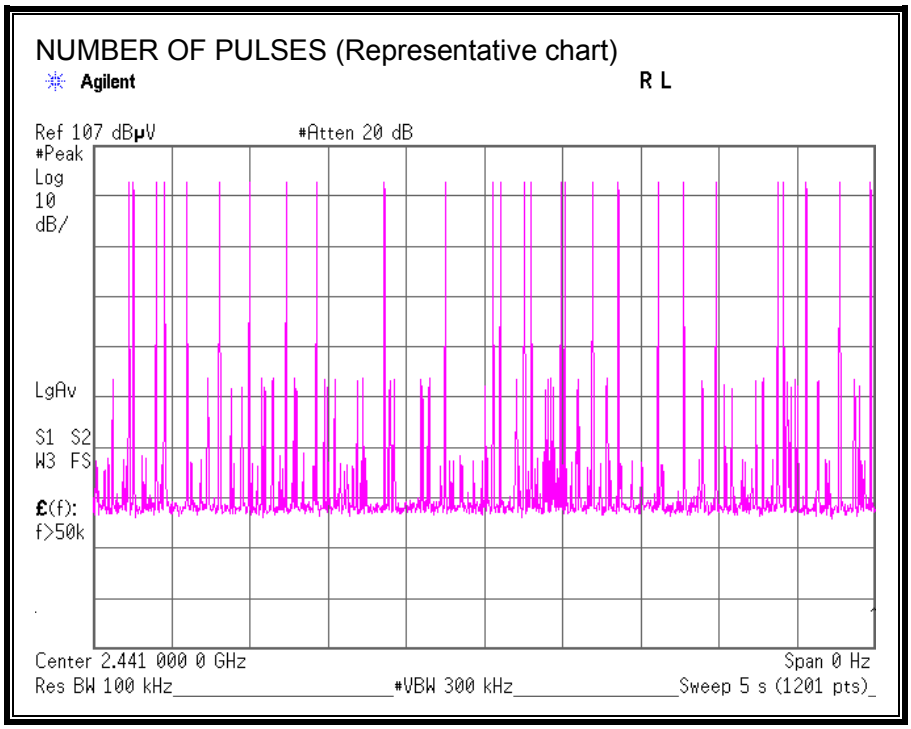
3DH3

PULSE WIDTH



NUMBER OF PULSES IN 5 SECOND OBSERVATION PERIOD



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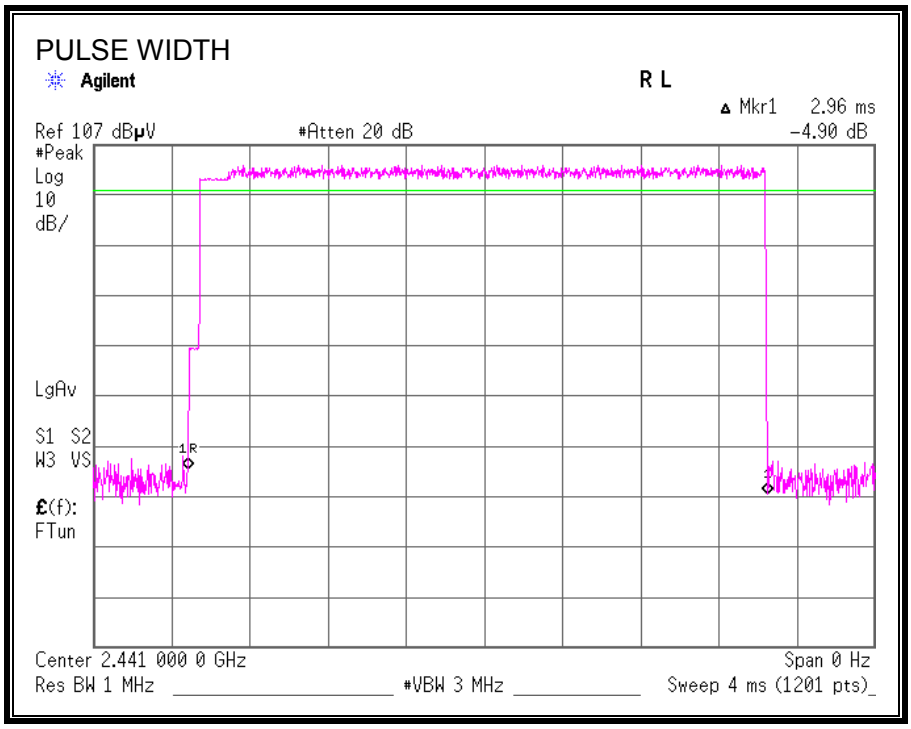
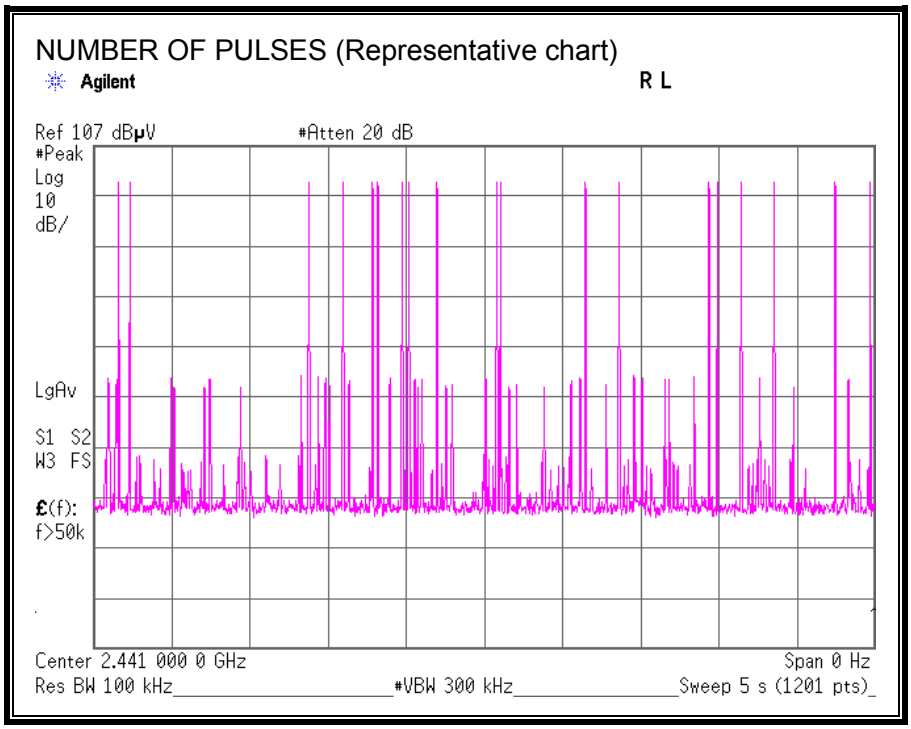
3DH5

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



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6.2.5. 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 30 dBm.

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 power meter.

RESULTS

Mode	Freq.	Reading	Cable Loss	Atten.	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
3DH5	2402.0	-3.95	2.09	6.11	4.25	2.66	20.96	125	16.71
3DH5	2441.0	-3.75	2.11	6.11	4.47	2.80	20.96	125	16.49
3DH5	2480.0	-3.87	2.12	6.11	4.36	2.73	20.96	125	16.60

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

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6.2.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Mode	Freq.	Reading Power Meter(AV)	Cable Loss	Atten.	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
3DH5	2402.0	-8.29	2.09	6.11	-0.09	0.98
3DH5	2441.0	-8.03	2.11	6.11	0.19	1.04
3DH5	2480.0	-8.07	2.12	6.11	0.16	1.04

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

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6.2.7. 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.

The spectrum from 9 kHz to 25 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.

RESULTS

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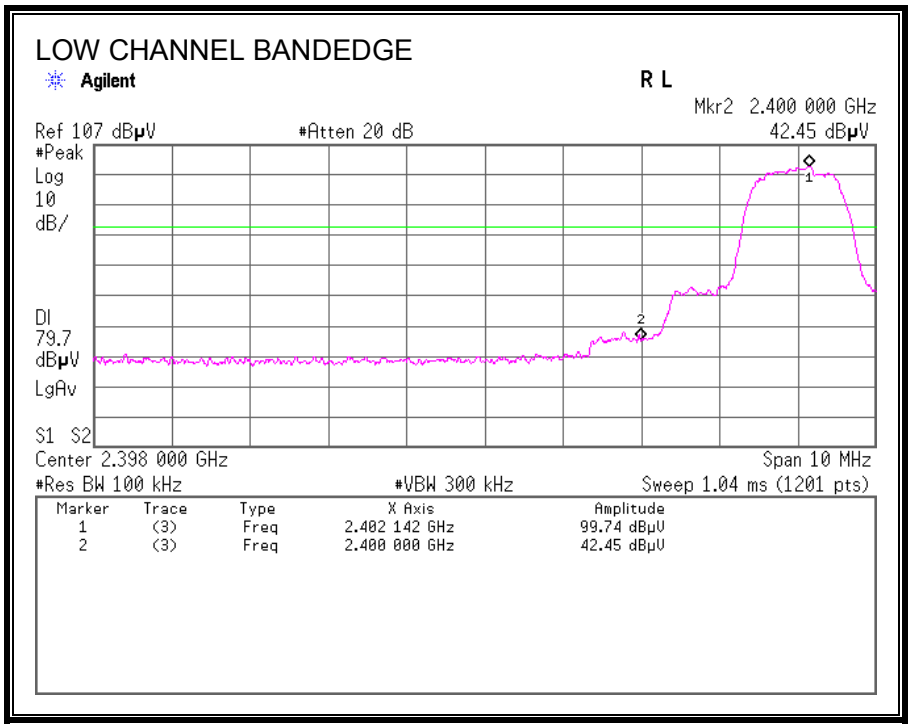
SPURIOUS EMISSIONS, LOW CHANNEL



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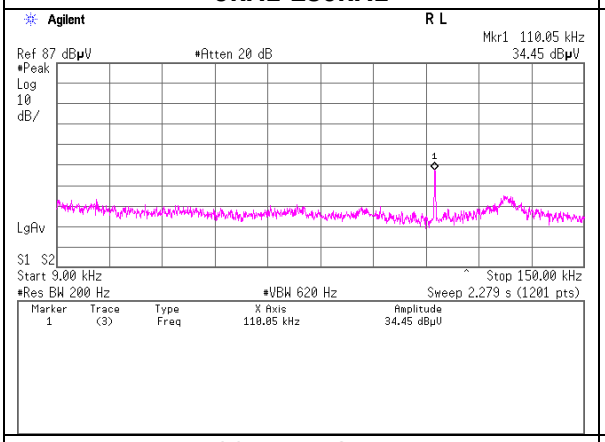
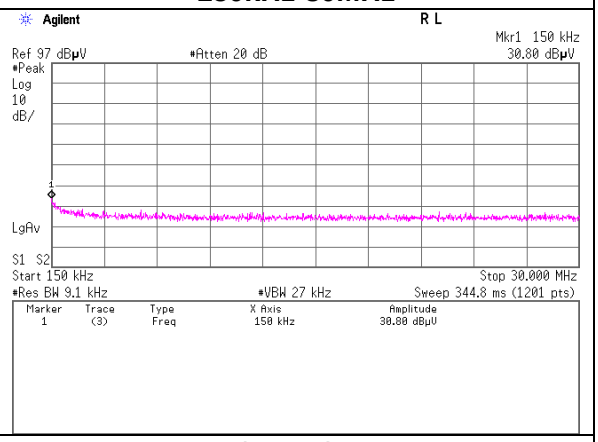
Tx 3DH5 2402MHz

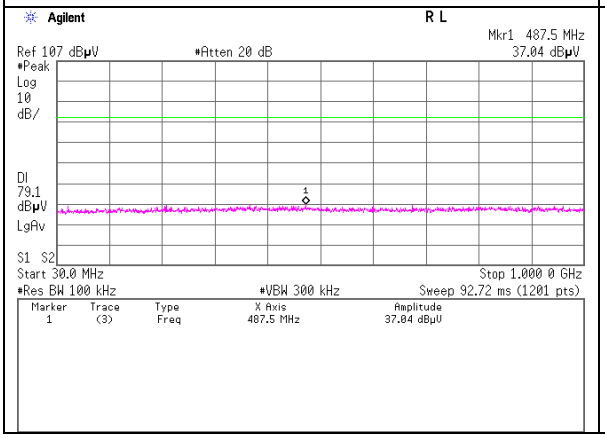
9kHz-150kHz



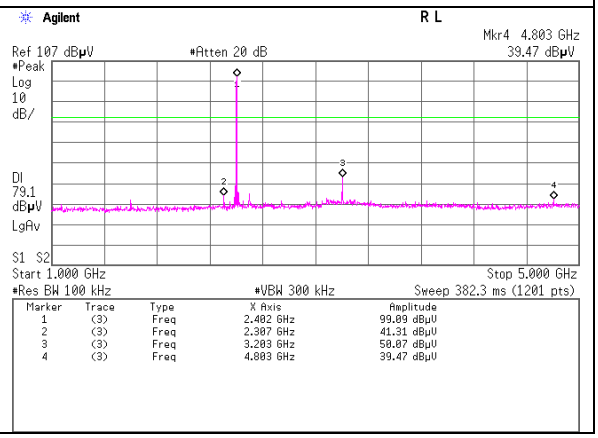
150kHz-30MHz



30MHz-1GHz



1GHz-5GHz



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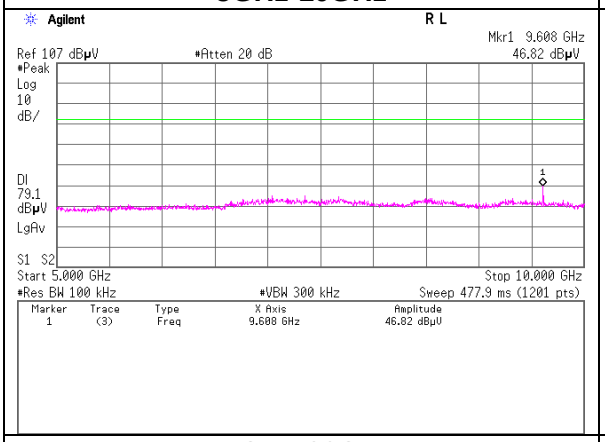
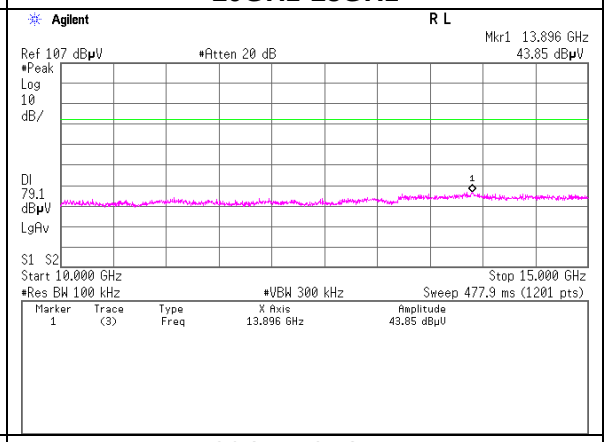
Tx 3DH5 2402MHz

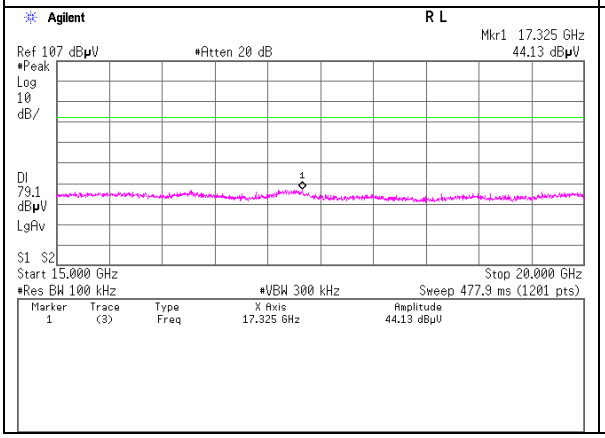
5GHz-10GHz



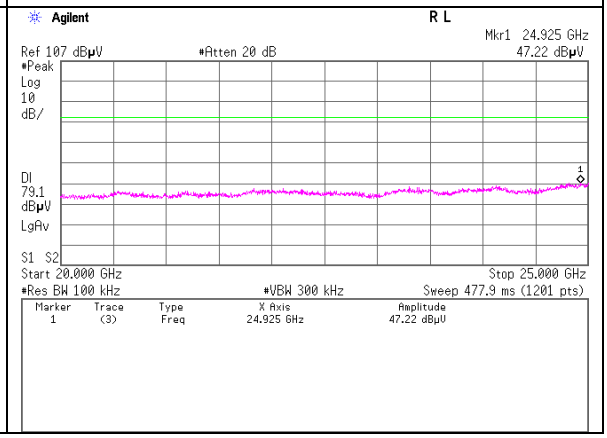
10GHz-15GHz



15GHz-20GHz



20GHz-25GHz



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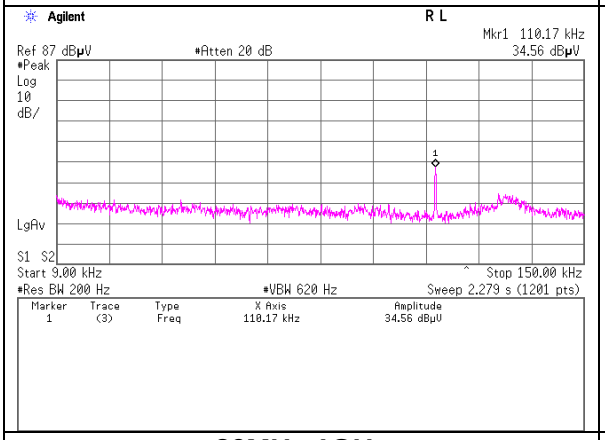
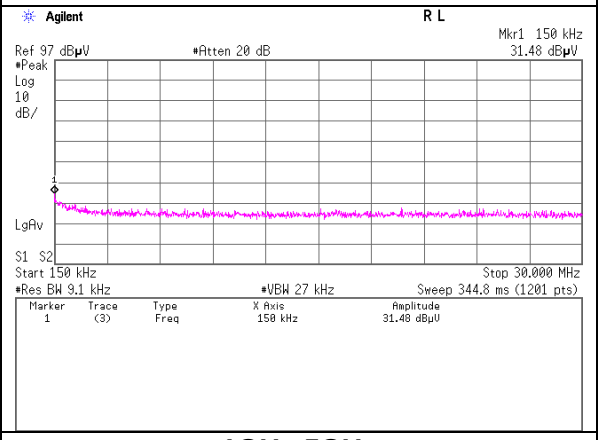
SPURIOUS EMISSIONS, MID CHANNEL

Tx 3DH5 2441MHz

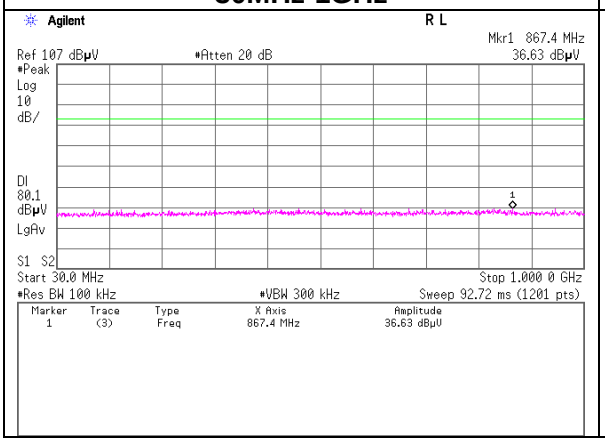
9kHz-150kHz



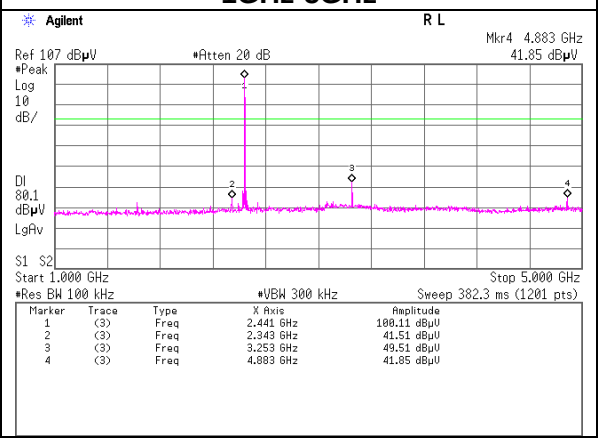
150kHz-30MHz



30MHz-1GHz



1GHz-5GHz



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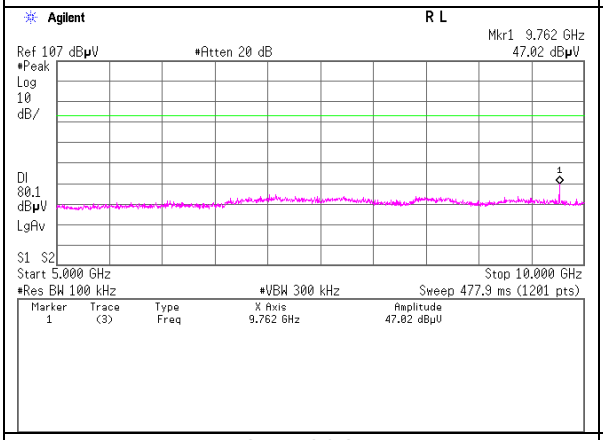
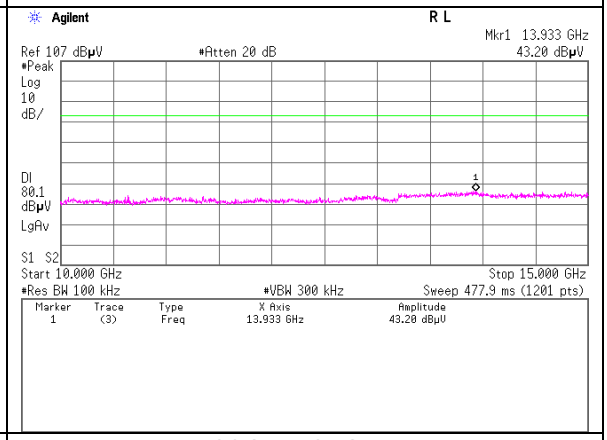
Tx 3DH5 2441MHz

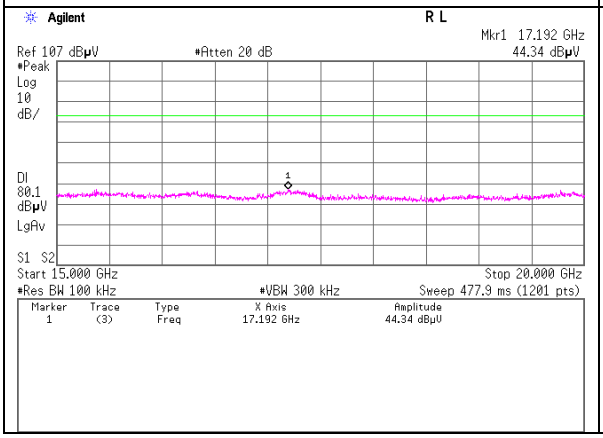
5GHz-10GHz



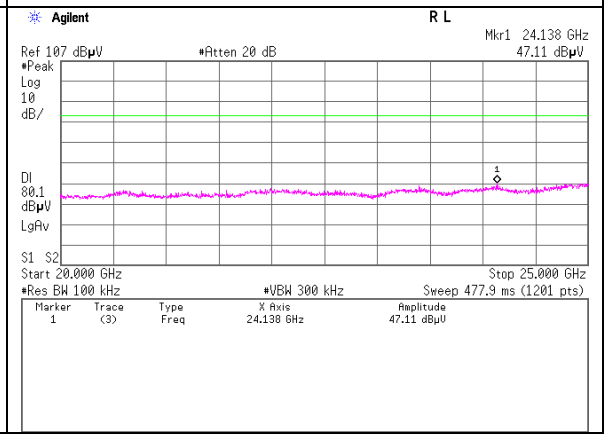
10GHz-15GHz



15GHz-20GHz



20GHz-25GHz



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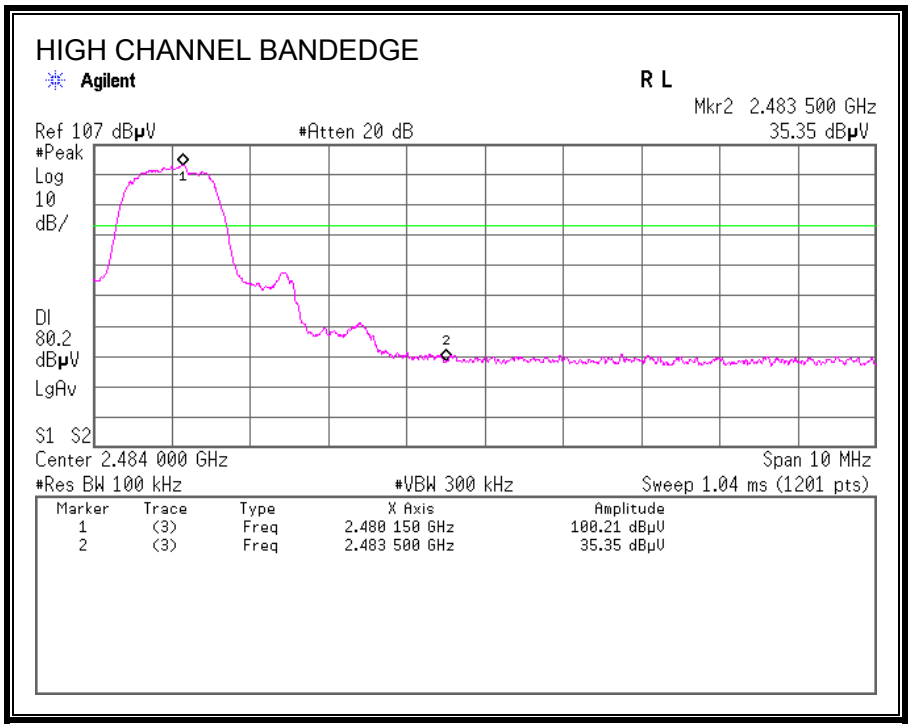
SPURIOUS EMISSIONS, HIGH CHANNEL



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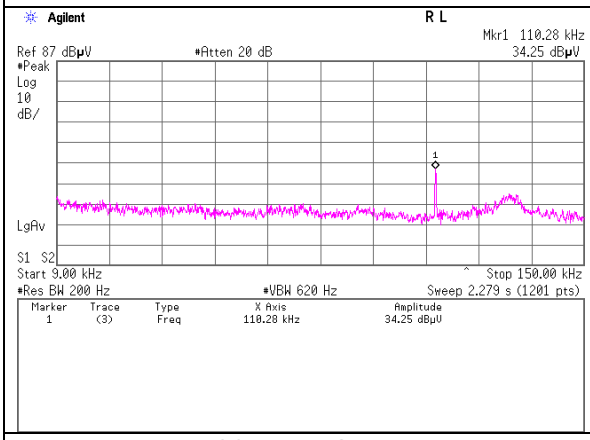
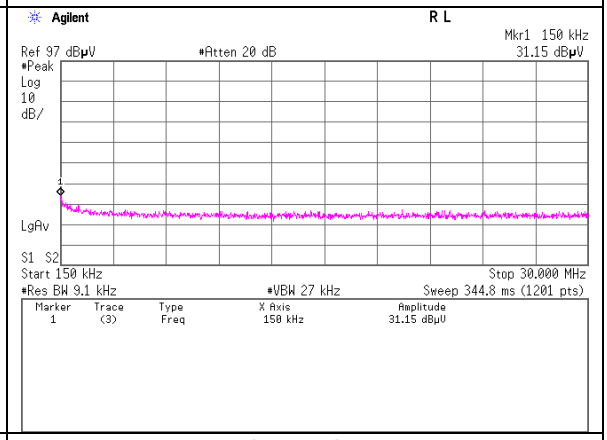
Tx 3DH5 2480MHz

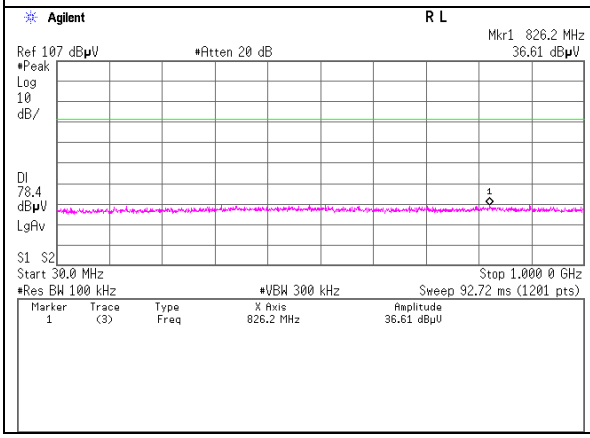
9kHz-150kHz



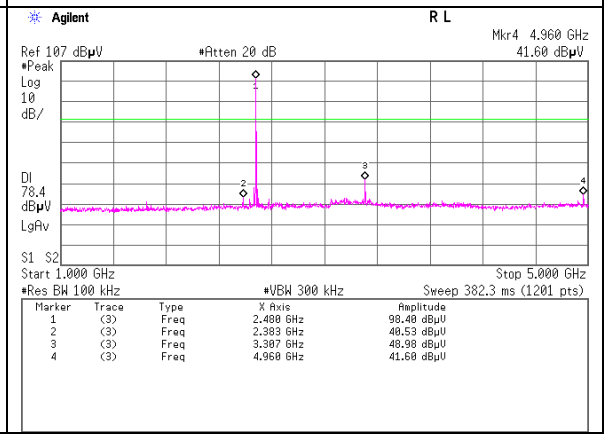
150kHz-30MHz



30MHz-1GHz



1GHz-5GHz



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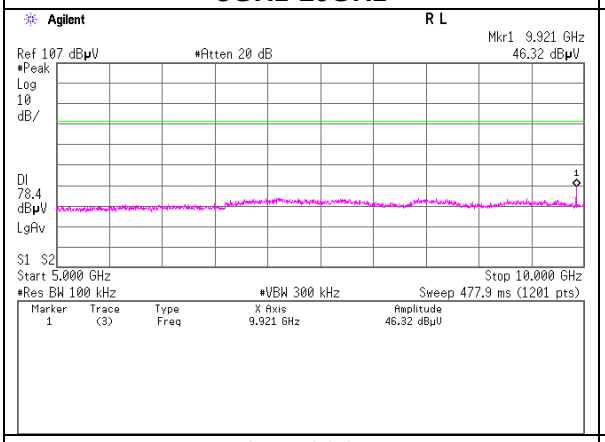
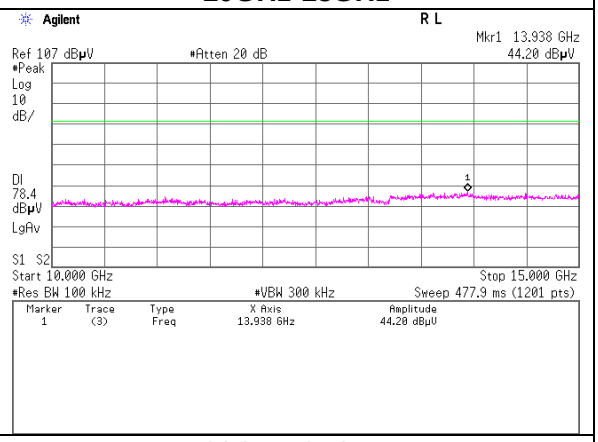
Tx 3DH5 2480MHz

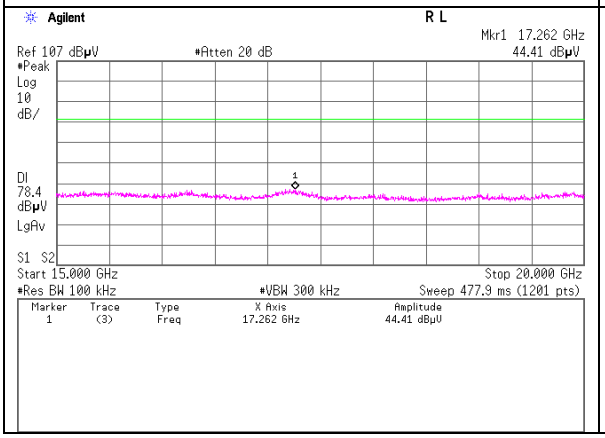
5GHz-10GHz



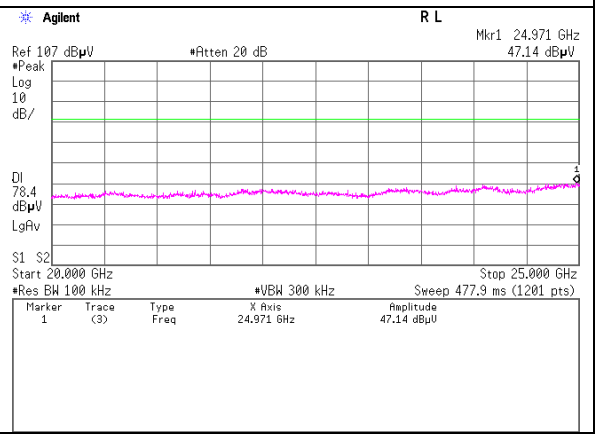
10GHz-15GHz



15GHz-20GHz



20GHz-25GHz



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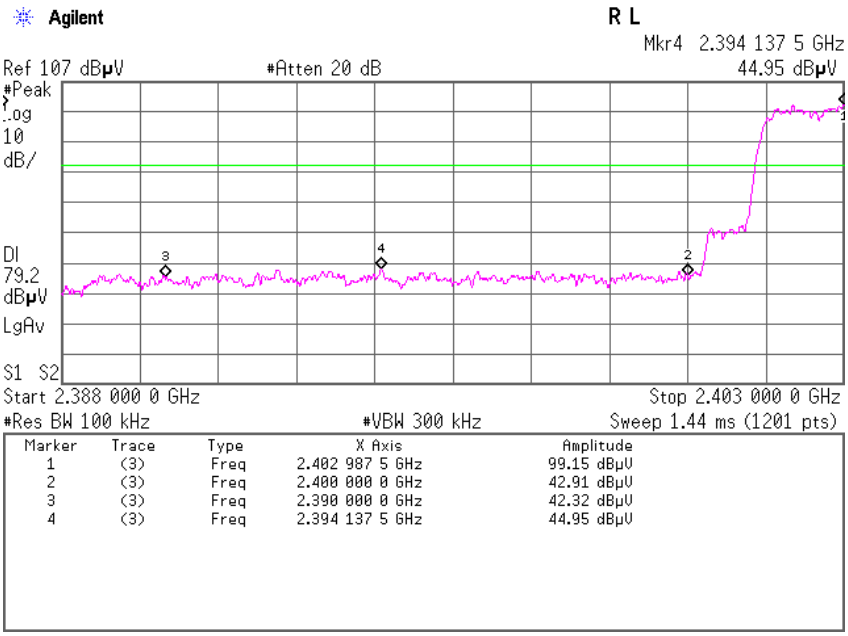
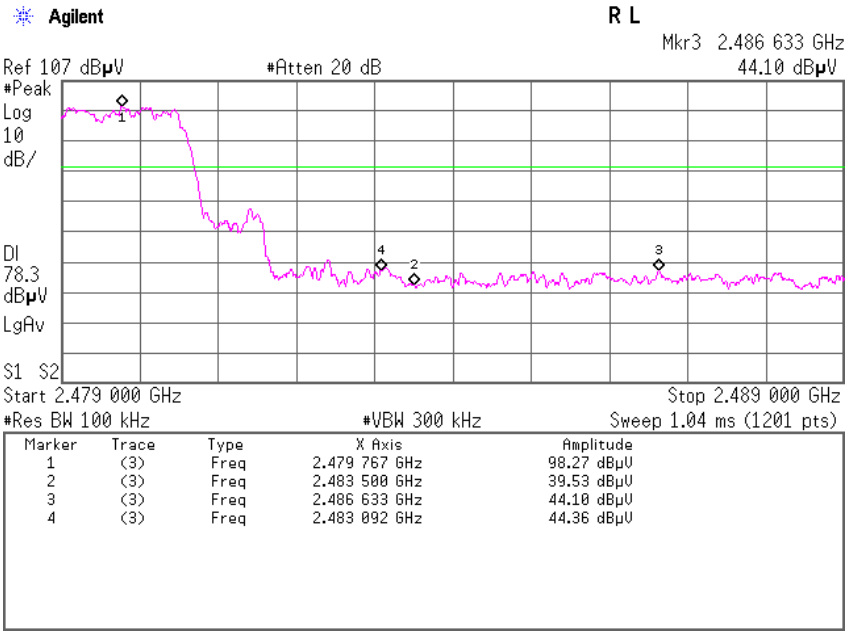
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.402 987 5 GHz	99.15 dBµV
2	(3)	Freq	2.400 000 0 GHz	42.91 dBµV
3	(3)	Freq	2.390 000 0 GHz	42.32 dBµV
4	(3)	Freq	2.394 137 5 GHz	44.95 dBµV

HIGH BANDEDGE WITH HOPPING ON



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.479 767 GHz	98.27 dBµV
2	(3)	Freq	2.483 500 GHz	39.53 dBµV
3	(3)	Freq	2.486 633 GHz	44.10 dBµV
4	(3)	Freq	2.483 092 GHz	44.36 dBµV

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7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.5 (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	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 26.5 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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7.2. TRANSMITTER ABOVE 1GHz (DH5)

Radiated Spurious Emission

Test place	Head Office EMC Lab. No.1 and No.4 Semi Anechoic Chamber	
Report No.	32JE0251-AP-01	
Date	06/08/2012	06/13/2012
Temperature/ Humidity	23 deg.C/ 64% RH	22 deg.C/ 61% RH
Engineer	Hiroshi Kukita (1-10GHz)	Hiroshi Kukita (30-1000MHz, 10GHz-26.5GHz)
Mode	Tx, DH5 2402MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	42.1	28.1	2.4	32.3	40.3	73.9	33.6	
Hori	9608.000	PK	44.6	38.3	7.1	32.9	57.1	73.9	16.8	
Hori	2390.000	AV	29.5	28.1	2.4	32.3	27.7	53.9	26.2	
Hori	9608.000	AV	35.3	38.3	7.1	32.9	47.8	53.9	6.1	
Vert	2390.000	PK	41.2	28.1	2.4	32.3	39.4	73.9	34.5	
Vert	9608.000	PK	43.3	38.3	7.1	32.9	55.8	73.9	18.1	
Vert	2390.000	AV	29.8	28.1	2.4	32.3	28.0	53.9	25.9	
Vert	9608.000	AV	32.0	38.3	7.1	32.9	44.5	53.9	9.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

20dBc Data Sheet

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	92.7	28.1	2.4	32.3	90.9	-	-	Carrier
Hori	2400.000	PK	34.3	28.1	2.4	32.3	32.5	70.9	38.4	
Vert	2402.000	PK	94.6	28.1	2.4	32.3	92.8	-	-	Carrier
Vert	2400.000	PK	34.2	28.1	2.4	32.3	32.4	72.8	40.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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Radiated Spurious Emission

Test place	Head Office EMC Lab. No.1 and No.4 Semi Anechoic Chamber	
Report No.	32JE0251-AP-01	
Date	06/08/2012	06/13/2012
Temperature/ Humidity	23 deg.C/ 64% RH	22 deg.C/ 61% RH
Engineer	Hiroshi Kukita (1-10GHz)	Hiroshi Kukita (30-1000MHz, 10GHz-26.5GHz)
Mode	Tx, DH5 2441MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	9764.000	PK	42.8	38.5	7.4	32.9	55.8	73.9	18.1	
Hori	9764.000	AV	31.0	38.5	7.4	32.9	44.0	53.9	9.9	
Vert	9764.000	PK	42.4	38.5	7.4	32.9	55.4	73.9	18.5	
Vert	9764.000	AV	32.5	38.5	7.4	32.9	45.5	53.9	8.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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Radiated Spurious Emission

Test place	Head Office EMC Lab. No.1 and No.4 Semi Anechoic Chamber	
Report No.	32JE0251-AP-01	
Date	06/08/2012	06/13/2012
Temperature/ Humidity	23 deg.C/ 64% RH	22 deg.C/ 61% RH
Engineer	Hiroshi Kukita (1-10GHz)	Hiroshi Kukita (30-1000MHz, 10GHz-26.5GHz)
Mode	Tx, DH5 2480MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	41.8	28.5	2.4	32.2	40.5	73.9	33.4	
Hori	9920.000	PK	42.5	38.6	7.5	33.0	55.6	73.9	18.3	
Hori	2483.500	AV	29.8	28.5	2.4	32.2	28.5	53.9	25.4	
Hori	9920.000	AV	31.0	38.6	7.5	33.0	44.1	53.9	9.8	
Vert	2483.500	PK	41.8	28.5	2.4	32.2	40.5	73.9	33.4	
Vert	9920.000	PK	43.0	38.6	7.5	33.0	56.1	73.9	17.8	
Vert	2483.500	AV	29.5	28.5	2.4	32.2	28.2	53.9	25.7	
Vert	9920.000	AV	31.8	38.6	7.5	33.0	44.9	53.9	9.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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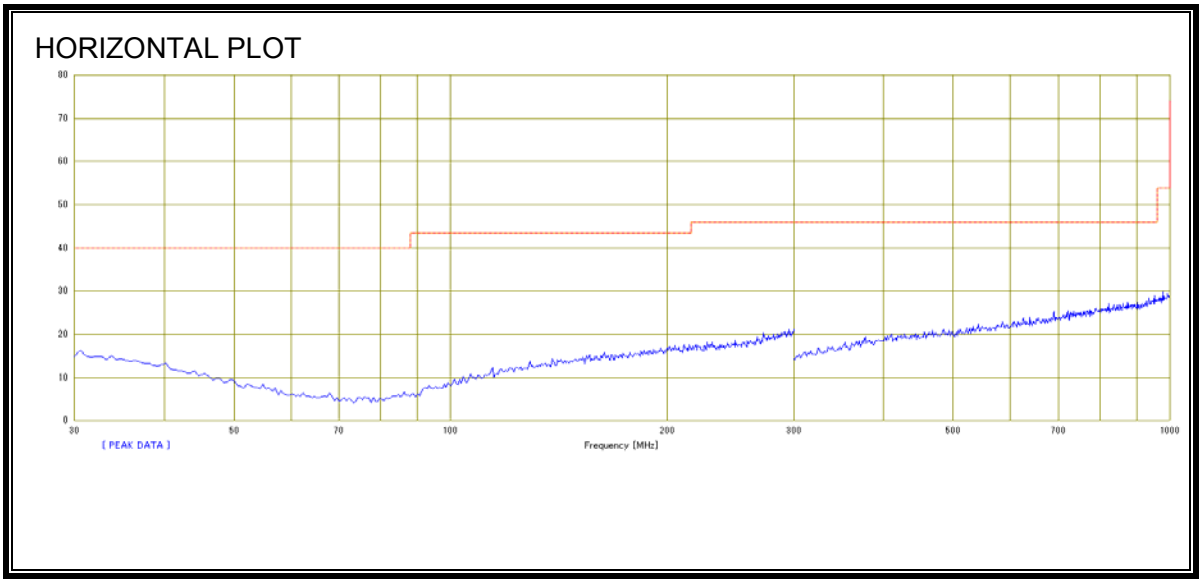
7.3. TRANSMITTER BELOW 1GHz (DH5)

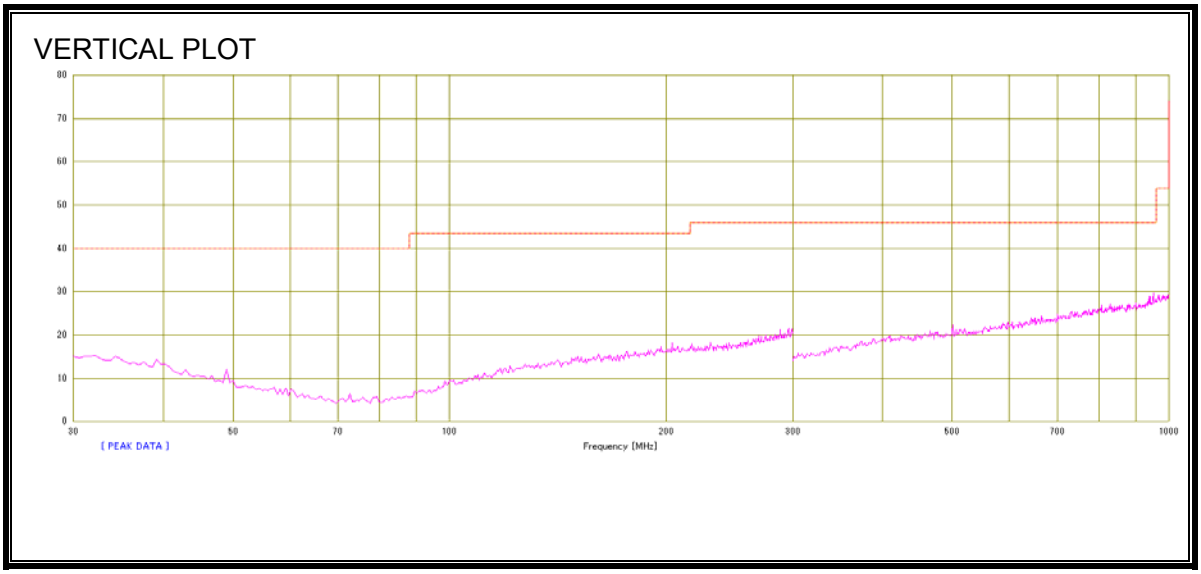
SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)

[Tx DH5 2402MHz]



No signal is detected.

SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



No signal is detected.

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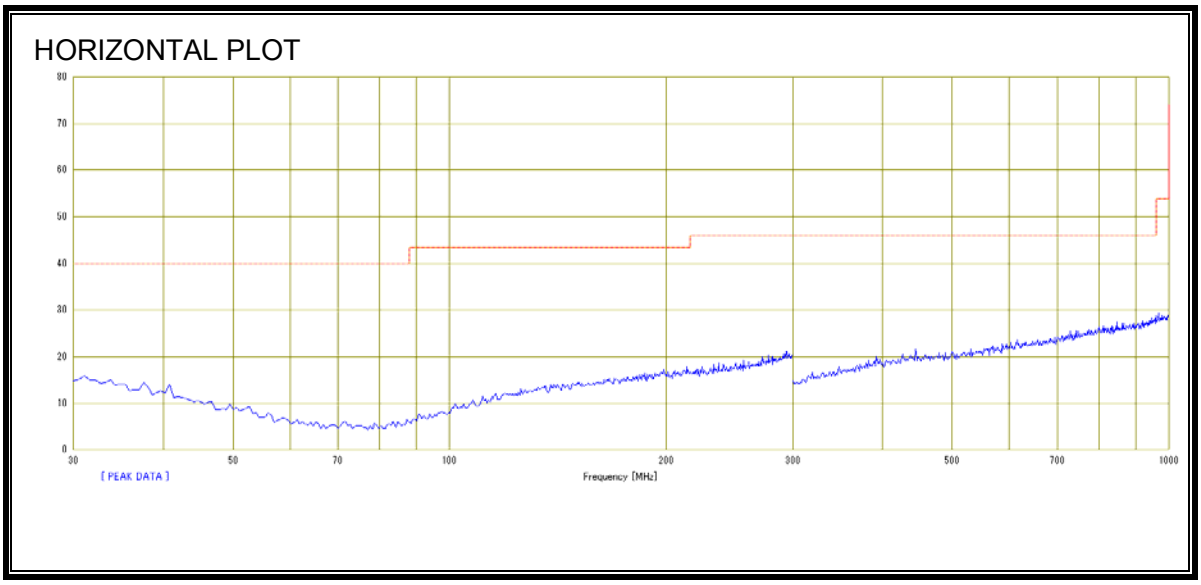
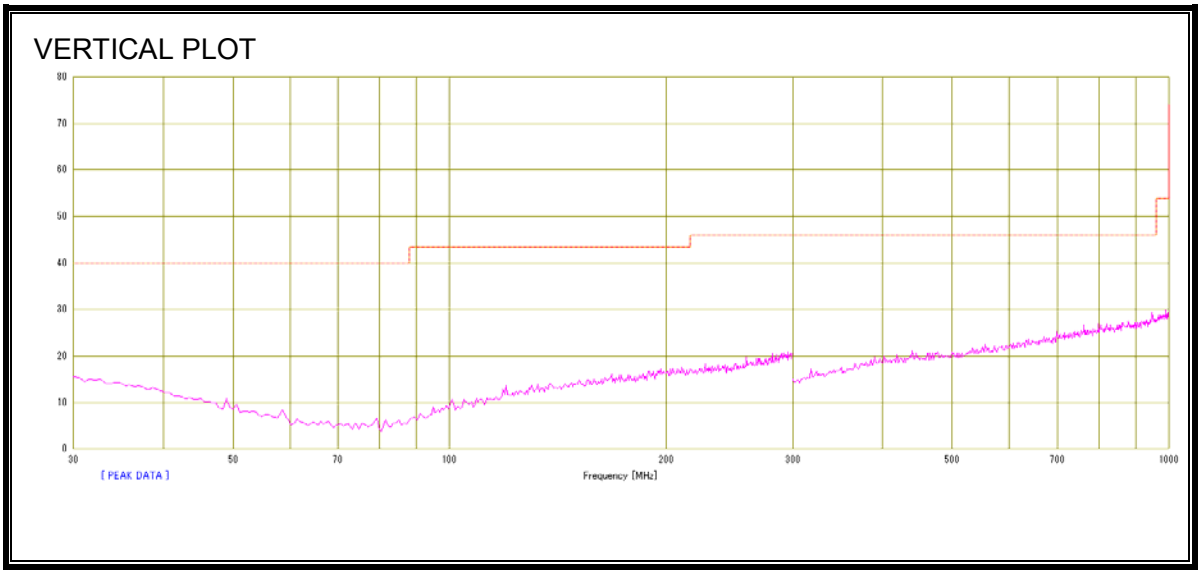
SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)

[Tx DH5 2441MHz]



No signal is detected.

SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



No signal is detected.

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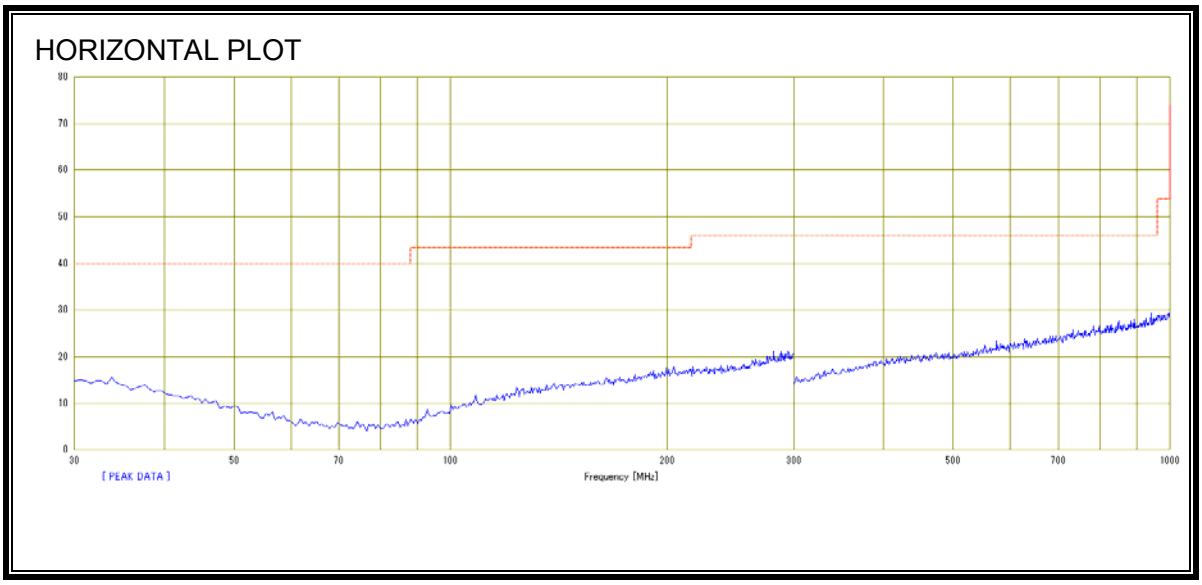
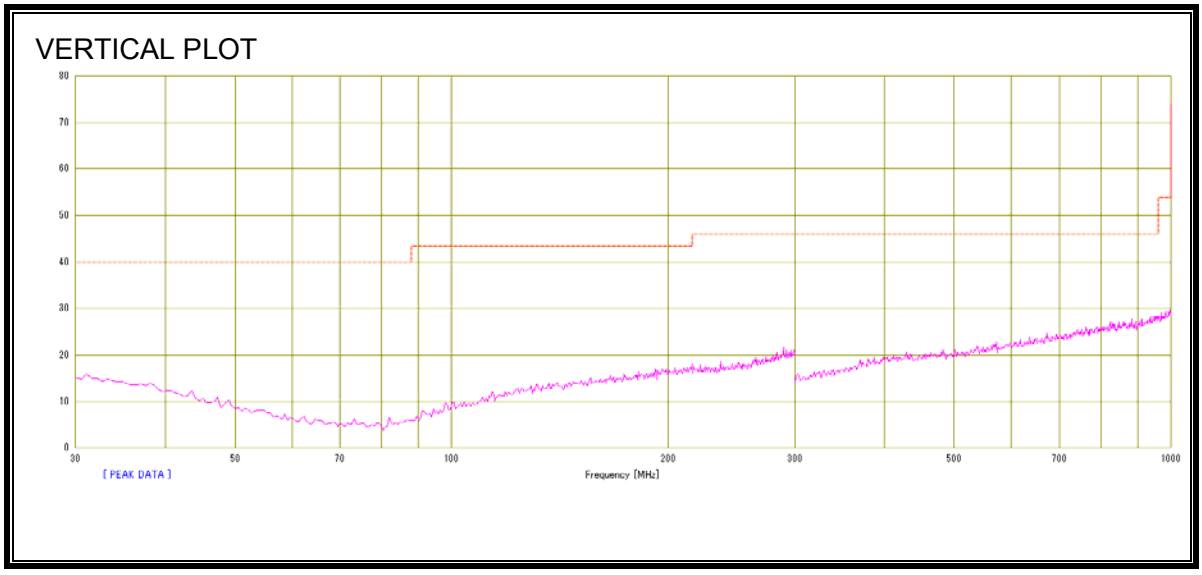
SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)

[Tx DH5 2480MHz]



No signal is detected.

SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



No signal is detected.

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7.4. TRANSMITTER ABOVE 1GHz (3DH5)

Radiated Spurious Emission

Test place	Head Office EMC Lab. No.1 and No.4 Semi Anechoic Chamber	
Report No.	32JE0251-AP-01	
Date	06/08/2012	06/13/2012
Temperature/ Humidity	23 deg.C/ 64% RH	22 deg.C/ 61% RH
Engineer	Hiroshi Kukita (1-10GHz)	Hiroshi Kukita (30-1000MHz, 10GHz-26.5GHz)
Mode	Tx, 3DH5 2402MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	42.2	28.1	2.4	32.3	40.4	73.9	33.5	
Hori	9608.000	PK	43.9	38.3	7.1	32.9	56.4	73.9	17.5	
Hori	2390.000	AV	29.8	28.1	2.4	32.3	28.0	53.9	25.9	
Hori	9608.000	AV	33.5	38.3	7.1	32.9	46.0	53.9	7.9	
Vert	2390.000	PK	42.0	28.1	2.4	32.3	40.2	73.9	33.7	
Vert	9608.000	PK	44.5	38.3	7.1	32.9	57.0	73.9	16.9	
Vert	2390.000	AV	29.8	28.1	2.4	32.3	28.0	53.9	25.9	
Vert	9608.000	AV	36.0	38.3	7.1	32.9	48.5	53.9	5.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

20dBc Data Sheet

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	91.3	28.1	2.4	32.3	89.5	-	-	Carrier
Hori	2400.000	PK	33.9	28.1	2.4	32.3	32.1	69.5	37.4	
Vert	2402.000	PK	92.3	28.1	2.4	32.3	90.5	-	-	Carrier
Vert	2400.000	PK	35.0	28.1	2.4	32.3	33.2	70.5	37.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)

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Radiated Spurious Emission

Test place	Head Office EMC Lab. No.1 and No.4 Semi Anechoic Chamber	
Report No.	32JE0251-AP-01	
Date	06/08/2012	06/13/2012
Temperature/ Humidity	23 deg.C/ 64% RH	22 deg.C/ 61% RH
Engineer	Hiroshi Kukita (1-10GHz)	Hiroshi Kukita (30-1000MHz, 10GHz-26.5GHz)
Mode	Tx, 3DH5 2441MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	9764.000	PK	42.8	38.5	7.4	32.9	55.8	73.9	18.1	
Hori	9764.000	AV	31.8	38.5	7.4	32.9	44.8	53.9	9.1	
Vert	9764.000	PK	44.0	38.5	7.4	32.9	57.0	73.9	16.9	
Vert	9764.000	AV	32.8	38.5	7.4	32.9	45.8	53.9	8.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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Radiated Spurious Emission

Test place	Head Office EMC Lab. No.1 and No.4 Semi Anechoic Chamber	
Report No.	32JE0251-AP-01	
Date	06/08/2012	06/13/2012
Temperature/ Humidity	23 deg.C/ 64% RH	22 deg.C/ 61% RH
Engineer	Hiroshi Kukita (1-10GHz)	Hiroshi Kukita (30-1000MHz, 10GHz-26.5GHz)
Mode	Tx, 3DH5 2480MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	42.0	28.5	2.4	32.2	40.7	73.9	33.2	
Hori	9920.000	PK	43.3	38.6	7.5	33.0	56.4	73.9	17.5	
Hori	2483.500	AV	29.6	28.5	2.4	32.2	28.3	53.9	25.6	
Hori	9920.000	AV	31.0	38.6	7.5	33.0	44.1	53.9	9.8	
Vert	2483.500	PK	42.0	28.5	2.4	32.2	40.7	73.9	33.2	
Vert	9920.000	PK	42.4	38.6	7.5	33.0	55.5	73.9	18.4	
Vert	2483.500	AV	29.5	28.5	2.4	32.2	28.2	53.9	25.7	
Vert	9920.000	AV	32.0	38.6	7.5	33.0	45.1	53.9	8.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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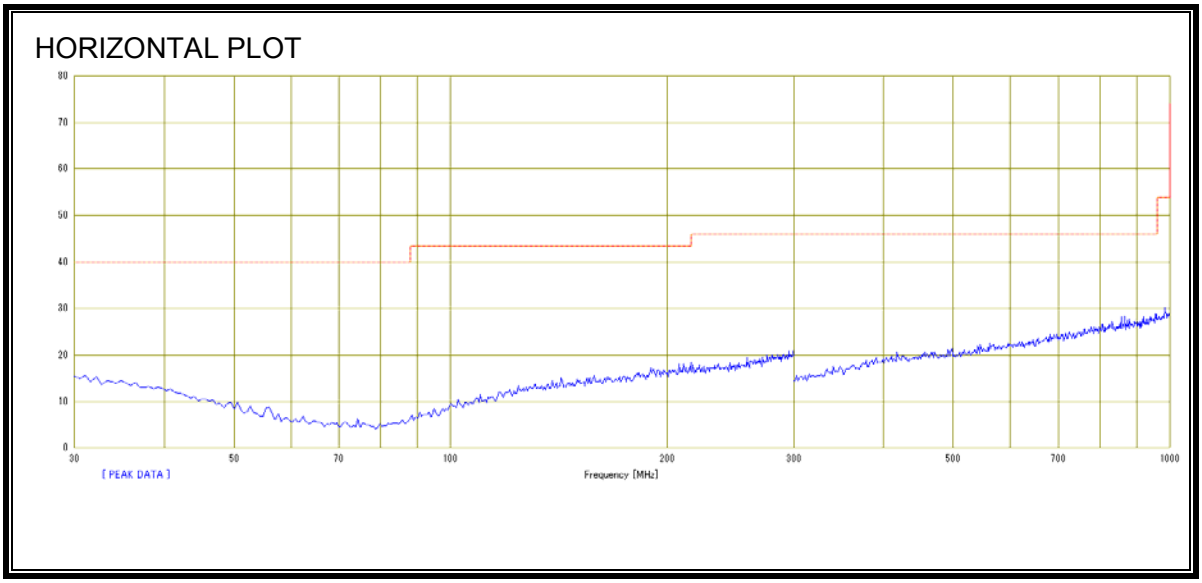
7.5. TRANSMITTER BELOW 1GHz (3DH5)

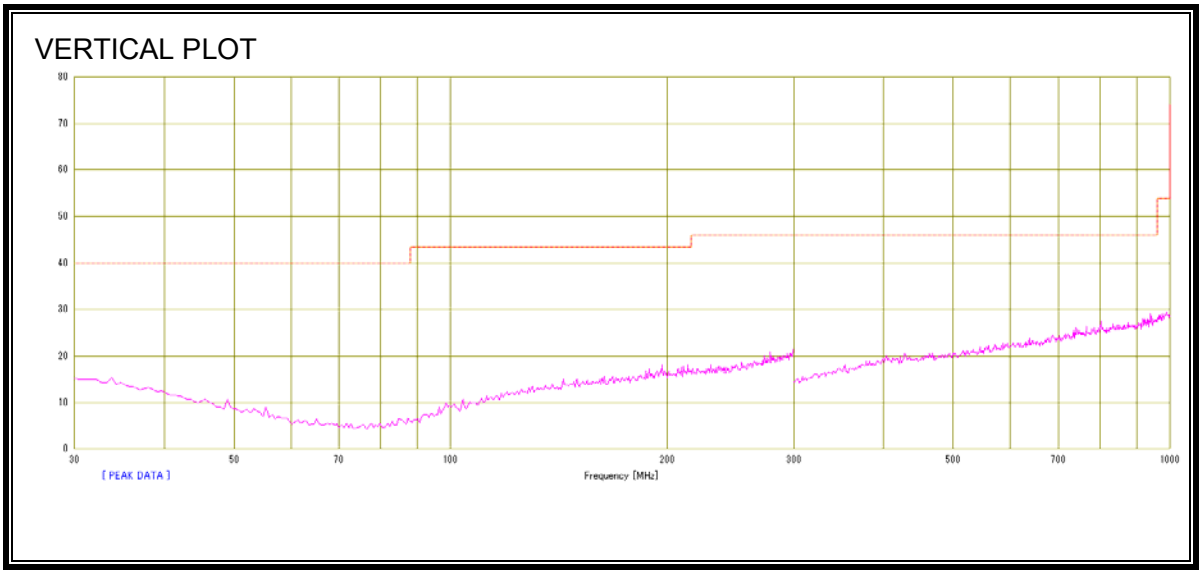
SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)

[Tx 3DH5 2402MHz]



No signal is detected.

SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



No signal is detected.

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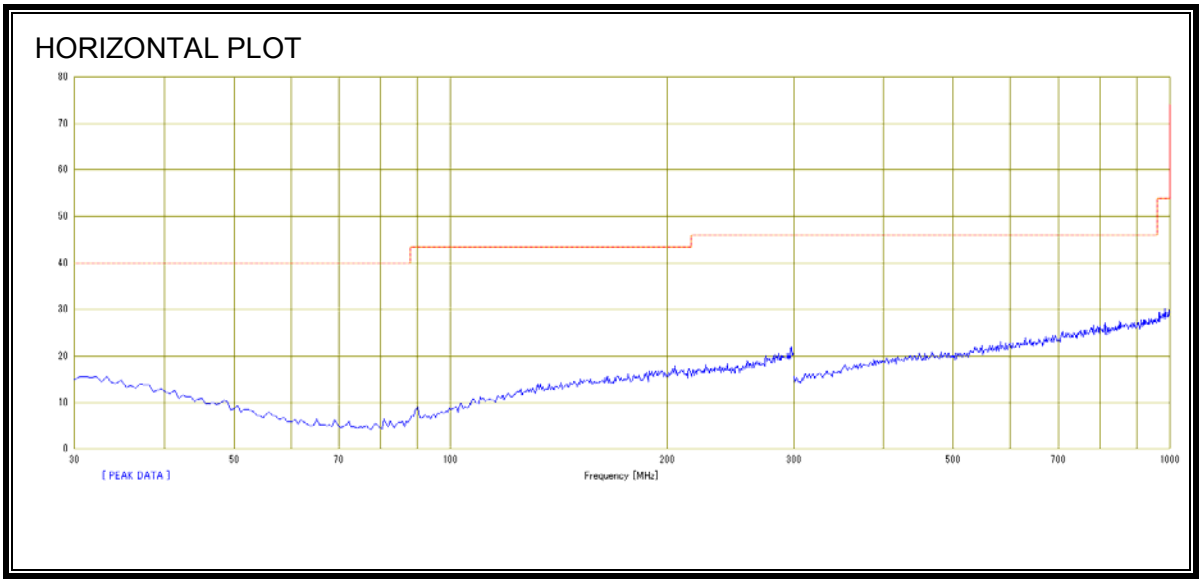
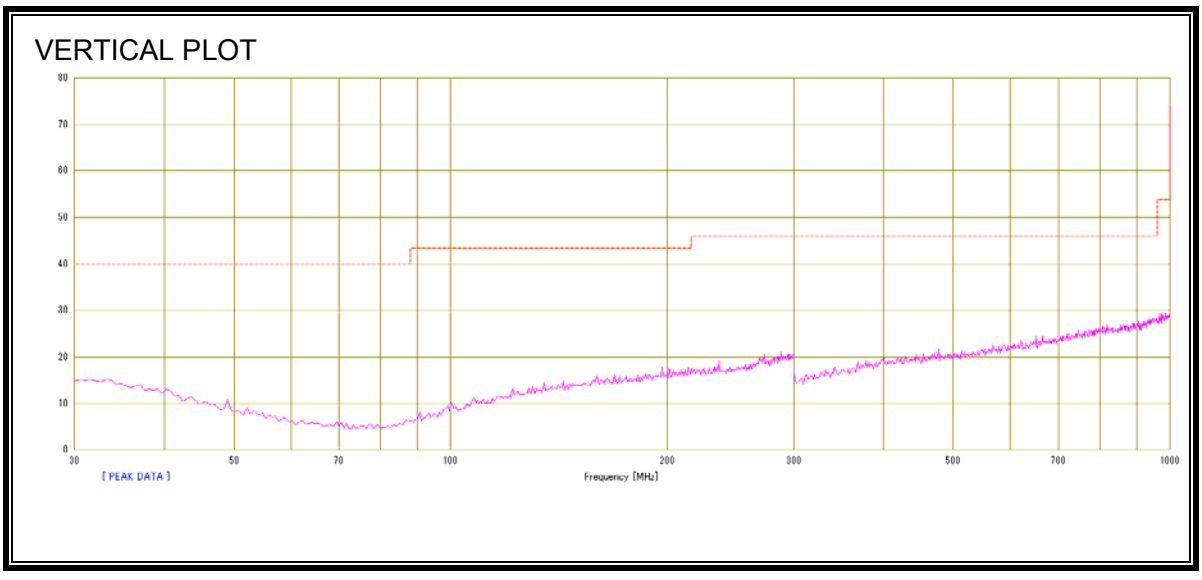
SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)

[Tx 3DH5 2441MHz]



No signal is detected.

SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



No signal is detected.

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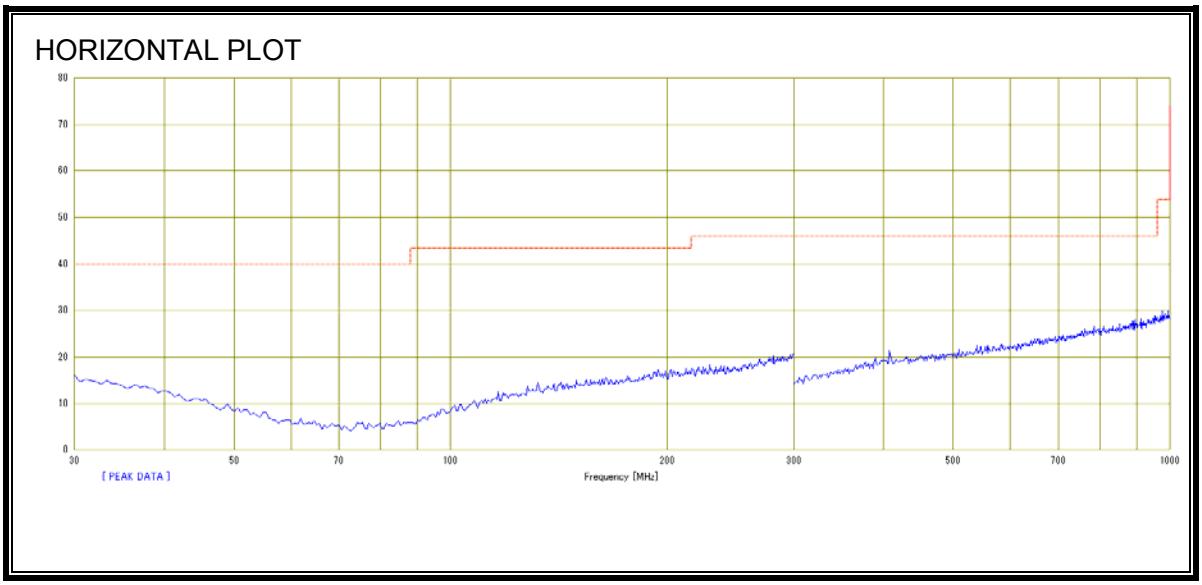
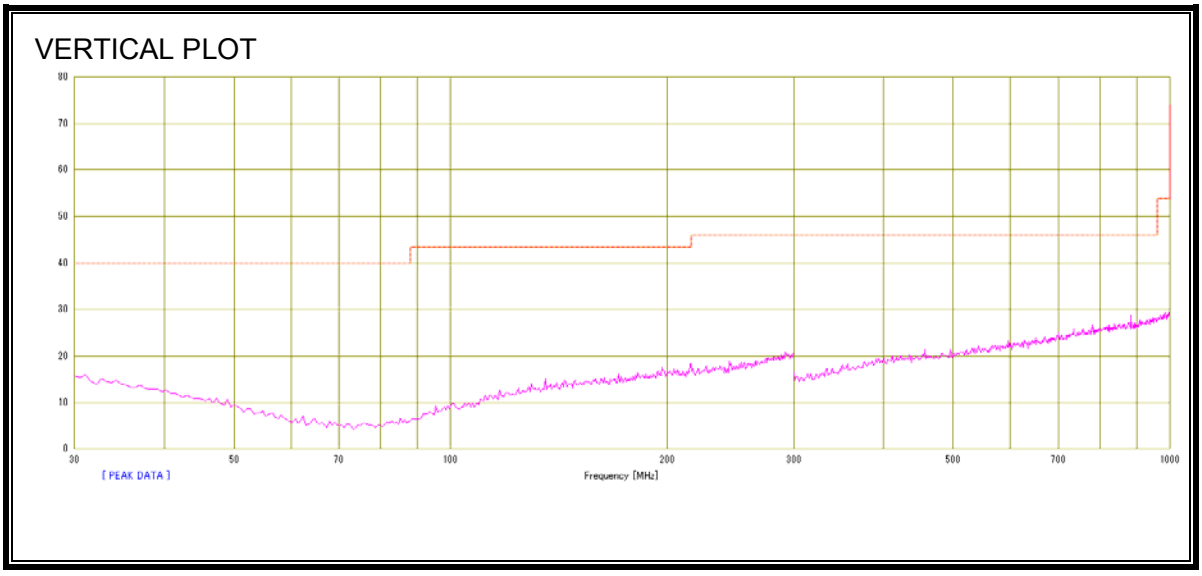
SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)

[Tx 3DH5 2480MHz]



No signal is detected.

SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



No signal is detected.

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8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

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RESULTS

Conducted Emission

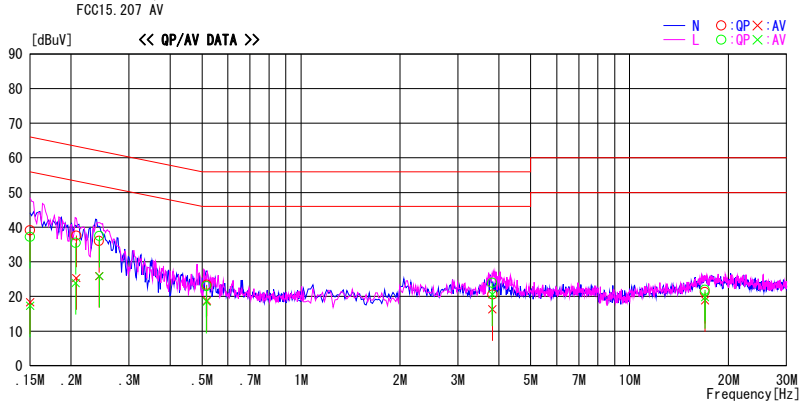
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2012/06/24

Report No. : 32JE0251-AP-01
Power : AC 120V / 60Hz
Temp./Humi. : 21deg. C / 58% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx DH5 2402MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	25.9	5.1	13.2	39.1	18.3	66.0	56.0	26.9	37.7	N	
0.20728	24.4	12.1	13.2	37.6	25.3	63.3	53.3	25.7	28.0	N	
0.24330	22.7	12.6	13.3	36.0	25.9	62.0	52.0	26.0	26.1	N	
0.51768	10.1	5.5	13.3	23.4	18.8	56.0	46.0	32.6	27.2	N	
3.82364	6.7	2.4	13.9	20.6	16.3	56.0	46.0	35.4	29.7	N	
16.93954	6.0	3.6	15.3	21.3	18.9	60.0	50.0	38.7	31.1	N	
0.15000	24.0	4.1	13.2	37.2	17.3	66.0	56.0	28.8	38.7	L	
0.20630	22.3	10.7	13.2	35.5	23.9	63.4	53.4	27.9	29.5	L	
0.24379	24.2	12.6	13.3	37.5	25.9	62.0	52.0	24.5	26.1	L	
0.51652	9.7	5.2	13.3	23.0	18.5	56.0	46.0	33.0	27.5	L	
3.82091	10.0	6.7	13.9	23.9	20.6	56.0	46.0	32.1	25.4	L	
16.93914	6.6	4.5	15.3	21.9	19.8	60.0	50.0	38.1	30.2	L	

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

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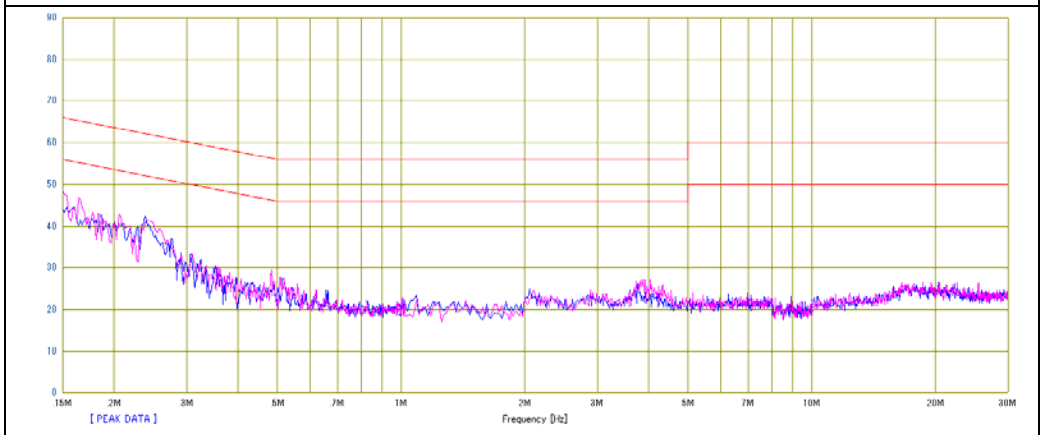
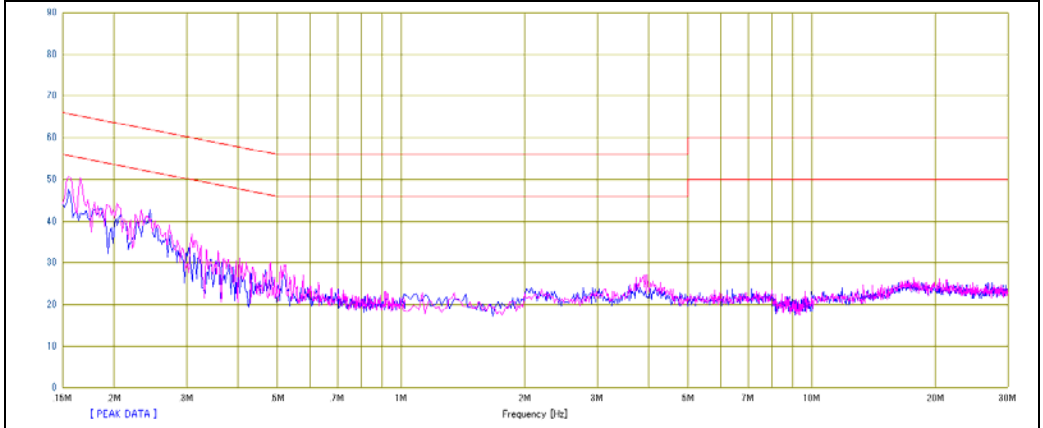
Conducted Emission

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date	06/24/2012
Temperature/ Humidity	21 deg. C/ 58% RH
Engineer	Satofumi Matsuyama
Mode	Tx DH5

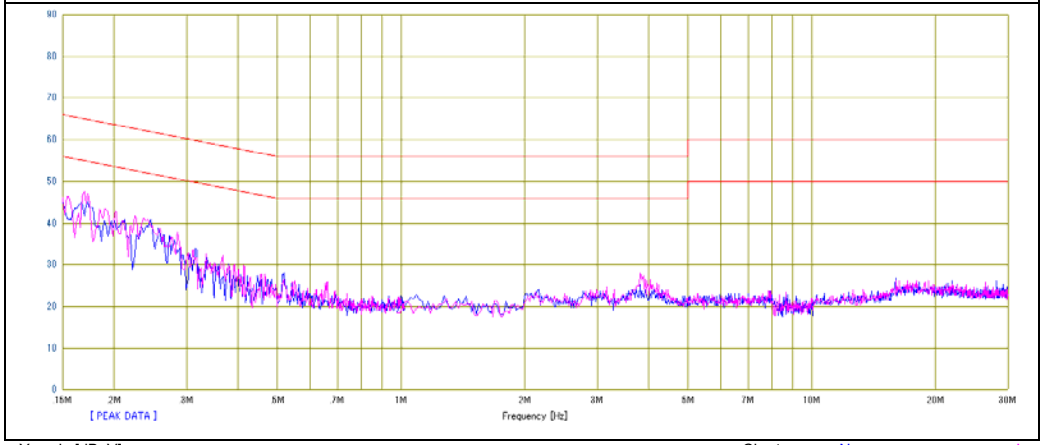
2402MHz



2441MHz



2480MHz



Y scale [dBuV] Chart — N — L

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Conducted Emission

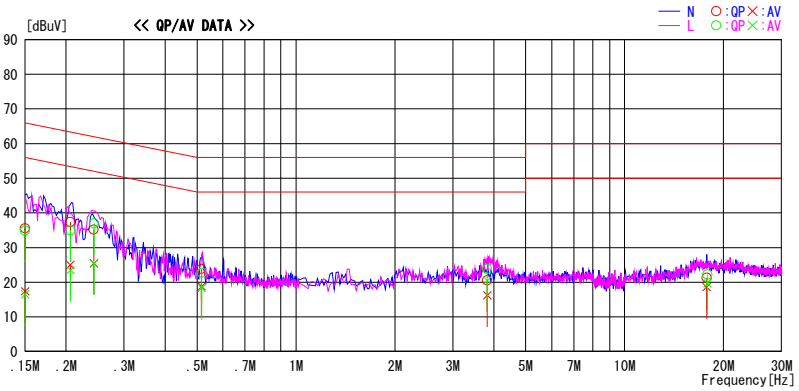
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2012/06/24

Report No. : 32JE0251-AP-01
Power : AC 120V / 60Hz
Temp./Humi. : 21deg. C / 58% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 3DH5 2402MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	22.4	4.2	13.2	35.6	17.4	66.0	56.0	30.4	38.6	N	
0.20604	24.2	11.9	13.2	37.4	25.1	63.4	53.4	26.0	28.3	N	
0.24261	21.9	12.2	13.3	35.2	25.5	62.0	52.0	26.8	26.5	N	
0.51652	10.5	5.5	13.3	23.8	18.8	56.0	46.0	32.2	27.2	N	
3.82212	6.7	2.3	13.9	20.6	16.2	56.0	46.0	35.4	29.8	N	
17.76719	6.0	3.3	15.3	21.3	18.6	60.0	50.0	38.7	31.4	N	
0.15000	21.7	3.3	13.2	34.9	16.5	66.0	56.0	31.1	39.5	L	
0.20610	21.7	10.3	13.2	34.9	23.5	63.4	53.4	28.5	29.9	L	
0.24292	23.7	12.1	13.3	37.0	25.4	62.0	52.0	25.0	26.6	L	
0.51712	9.4	5.0	13.3	22.7	18.3	56.0	46.0	33.3	27.7	L	
3.82149	9.9	6.6	13.9	23.8	20.5	56.0	46.0	32.2	25.5	L	
17.86812	6.8	4.3	15.4	22.2	19.7	60.0	50.0	37.8	30.3	L	

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

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Conducted Emission

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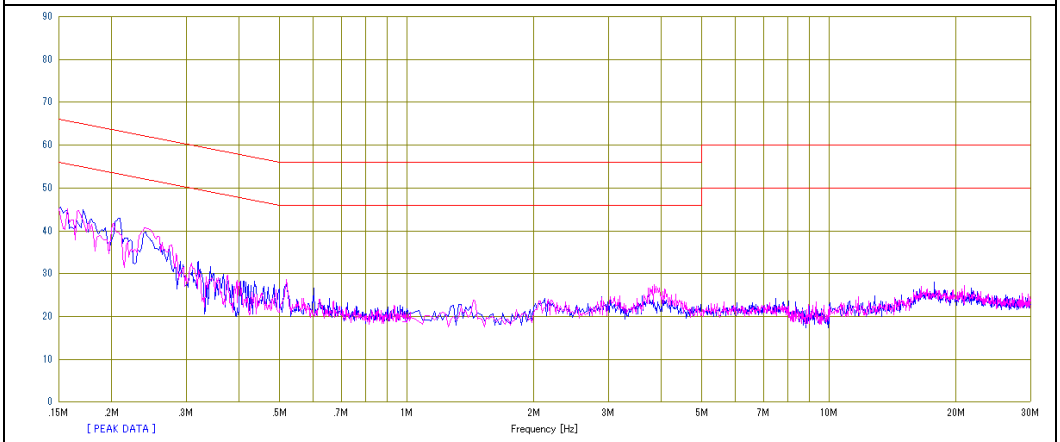
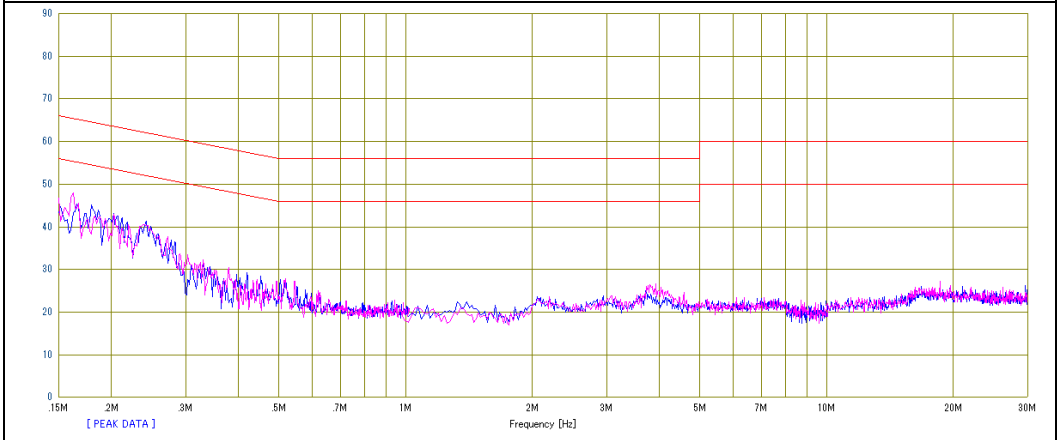
Date	06/24/2012
Temperature/ Humidity	21 deg.C/ 58% RH
Engineer	Satofumi Matsuyama
Mode	Tx 3DH5

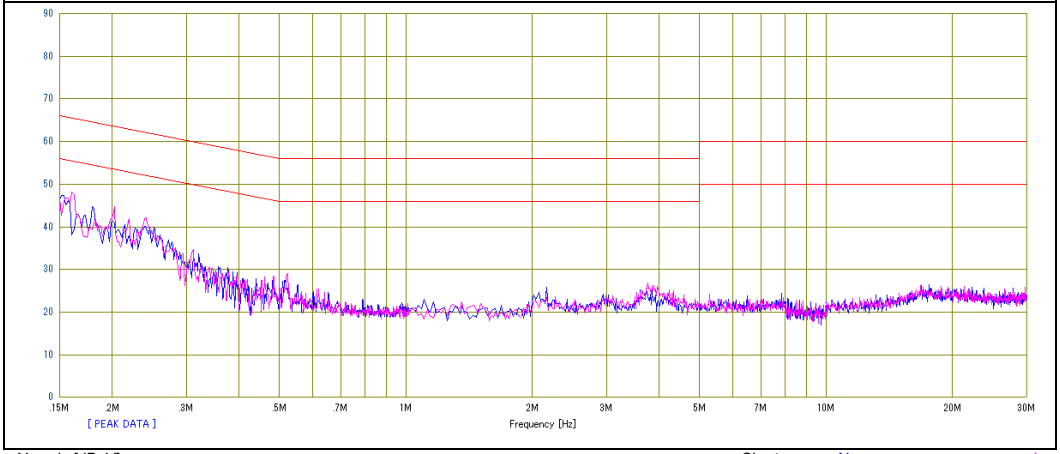
2402MHz



2441MHz



2480MHz



Y scale [dBuV] Chart — N — L

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