JQA File No. : KL80120110
Issue Date : June 11, 2012

TEST REPORT

APPLICANT	:	Sharp Corporation, Communication Systems Group
ADDRESS	:	2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, JAPAN
PRODUCTS	:	Cellular Phone
MODEL NO.	:	108SH
SERIAL NO.	:	004401/11/406840/2 004401/11/406806/3
FCC ID	:	APYHRO00176
TEST STANDARD	:	CFR 47 FCC Rules and Regulations Part 15
TESTING LOCATION	:	Japan Quality Assurance Organization KITA-KANSAI Testing Center 1-7-7, Ishimaru, Minoh-shi, Osaka 562-0027, Japan
TEST RESULTS	:	**Passed**
DATE OF TEST	:	May 22 ~ 31, 2012

ilac-MRA VLAC Lab Accreditation VLAC-001-2

Kousei Shibata
Manager
Japan Quality Assurance Organization
KITA-KANSAI Testing Center
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan and National Institute of Information and Communications Technology (NICT) of Japan.
- The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
- The test results presented in this report relate only to the offered test sample.
- The contents of this test report cannot be used for the purposes, such as advertisement for consumers.
- This test report shall not be reproduced except in full without the written approval of JQA.
- VLAC does not approve, certify or warrant the product by this test report.

TABLE OF CONTENTS

DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT

EUT : Equipment Under Test
AE : Associated Equipment
N/A : Not Applicable
N/T : Not Tested
EMC : Electromagnetic Compatibility
EMI : Electromagnetic Interference
EMS : Electromagnetic Susceptibility

☒ - indicates that the listed condition, standard or equipment is applicable for this report.
☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

Documentation

1 Test Regulation

Applied Standard : CFR 47 FCC Rules and Regulations Part 15
Subpart C – Intentional Radiators

Test Requirements : §15.247, §15.207 and §15.209

Test Procedure : ANSI C63.4–2003
The tests were performed with reference to the FCC Public Notice DA 00-705, released March 30, 2000.
The test set-up was made in accordance to the general provisions of ANSI C63.4-2003.

2 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan
MINOH Test Site (KITA-KANSAI Testing Center)
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-cho, Kameoka-shi, Kyoto, 621-0126, Japan

3 Recognition of Test Laboratory

JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility of Testing Division is registered by the following bodies.

VLAC Code : VLAC-001-2 (Effective through : March 30, 2014)
VCCI Registration No. : A-0002 (Expiry date : March 30, 2014)
BSMI Recognition No. : SL2-IS-E-6006, SL2-IN-E-6006, SL2-AI-E-6006
(Effective through : September 14, 2013)
IC Registration No. : 2079E-3, 2079E-4 (Effective through : July 20, 2014)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI.
(Effective through : February 22, 2013)

4 Description of the Equipment Under Test

4.1 General Information

1.	Manufacturer	:	Sharp Corporation, Communication Systems Group 2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, JAPAN
2.	Products	:	Cellular Phone
3.	Model No.	:	108SH
4.	Serial No.	:	004401/11/406840/2
		:	004401/11/406806/3
5.	Product Type	:	Pre-production
6.	Date of Manufacture	:	April, 2012
7.	Transmitting Frequency	:	2402.0 MHz(00CH) –2480.0MHz(78CH)
8.	Receiving Frequency	:	2402.0 MHz(00CH) –2480.0MHz(78CH)
9.	Max. RF Output Power	:	1.60dBm(Measure Value)
10.	Power Rating	:	4.0VDC (Lithium-ion Battery Pack SHBCU1 770mAh)
11.	EUT Grounding	:	None
12.	Category	:	Spread Spectrum Transmitter(FHSS).
13.	EUT Authorization	:	Certification
14.	Receive Date of EUT	:	May 18, 2012

4.2 Channel Plan

The carrier spacing is 1 MHz.
The carrier frequency is designated by the absolute frequency channel number (ARFCN).
The carrier frequency is expressed in the equation shown as follows:

Transmitting Frequency (in MHz) = 2402.0 + n
Receiving Frequency (in MHz) = 2402.0 + n
where, n : channel number ($0 \leq n \leq 78$)

5 Test Condition

5.1 Channel Separation

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : SAITO ☐ - Shielded room (S1) ☐ - Shielded room (S2)
☐ - Shielded room (S3) ☒ - Shielded room (S4)
MINOH ☐ - Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

5.2 Minimum Hopping Channel

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : SAITO ☐ - Shielded room (S1) ☐ - Shielded room (S2)
☐ - Shielded room (S3) ☒ - Shielded room (S4)
MINOH ☐ - Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

5.3 Occupied Bandwidth

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : SAITO ☐ - Shielded room (S1) ☐ - Shielded room (S2)
☐ - Shielded room (S3) ☒ - Shielded room (S4)
MINOH ☐ - Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

5.4 Dwell Time

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : SAITO ☐ - Shielded room (S1) ☐ - Shielded room (S2)
☐ - Shielded room (S3) ☒ - Shielded room (S4)
MINOH ☐ - Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

5.5 Peak Output Power (Conduction)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : SAITO ☐ - Shielded room (S1) ☐ - Shielded room (S2)
☐ - Shielded room (S3) ☒ - Shielded room (S4)
MINOH ☐ - Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

5.6 Spurious Emission (Conduction)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : SAITO ☐ - Shielded room (S1) ☐ - Shielded room (S2)
☐ - Shielded room (S3) ☒ - Shielded room (S4)
MINOH ☐ - Shielded room
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility

Test instruments : Refer to Appendix C.

5.7 AC Powerline Conducted Emission

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Test site : SAITO ☐ - Anechoic chamber (A1) ☐ - Measurement room (M1)
☐ - Measurement room (M2) ☐ - Measurement room (M3)
☐ - Shielded room (S1) ☒ - Shielded room (S2)
MINOH ☐ - Shielded room
☐ - Anechoic chamber
KAMEOKA ☐ - Shielded room ☐ - Conducted emission facility
☐ - 1st open site

Test instruments : Refer to Appendix C.

5.8 Field Strength of Spurious Radiation

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

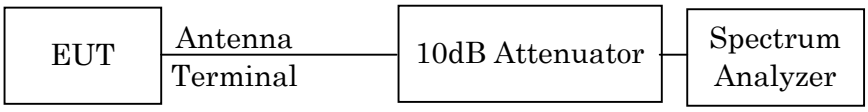
Test site : SAITO ☐ - Anechoic chamber (A1) ☒ - Anechoic chamber (A2)
KAMEOKA ☐ - 1st open site

Test instruments : Refer to Appendix C.

6 Preliminary Test and Test Setup

6.1 Channel Separation

The test system is shown as follows:

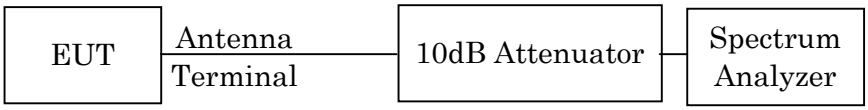


The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	100 kHz
Video Bandwidth	300 kHz
Span	3 MHz / 5 MHz
Sweep Time	AUTO
Trace	Maxhold

6.2 Minimum Hopping Channel

The test system is shown as follows:

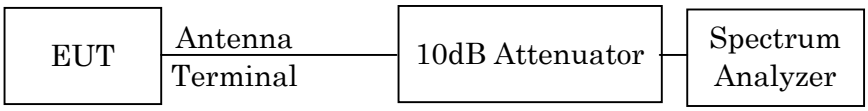


The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	300 kHz
Video Bandwidth	300 kHz
Span	30 MHz
Sweep Time	AUTO
Trace	Maxhold

6.3 Occupied Bandwidth

The test system is shown as follows:

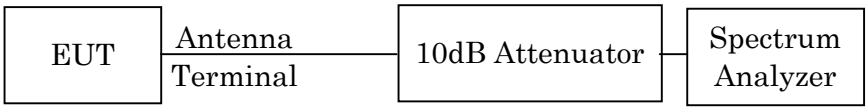


The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	10 kHz
Video Bandwidth	30 kHz
Span	3 MHz
Sweep Time	AUTO
Trace	Maxhold

6.4 Dwell Time

The test system is shown as follows:

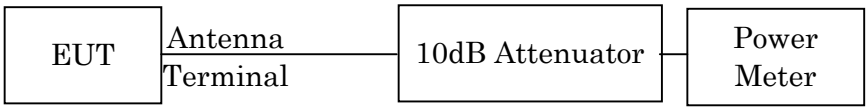


The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	1 MHz
Video Bandwidth	1 MHz
Span	Zero Span

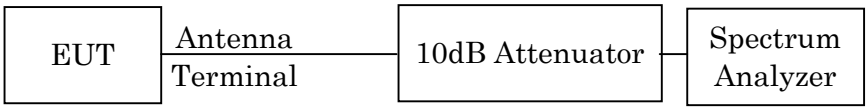
6.5 Peak Output Power

The Conducted RF Power Output was measured with a power meter, one 10dB attenuator and a short, low loss cable.



6.6 Spurious Emission(Conduction)

The test system is shown as follows:



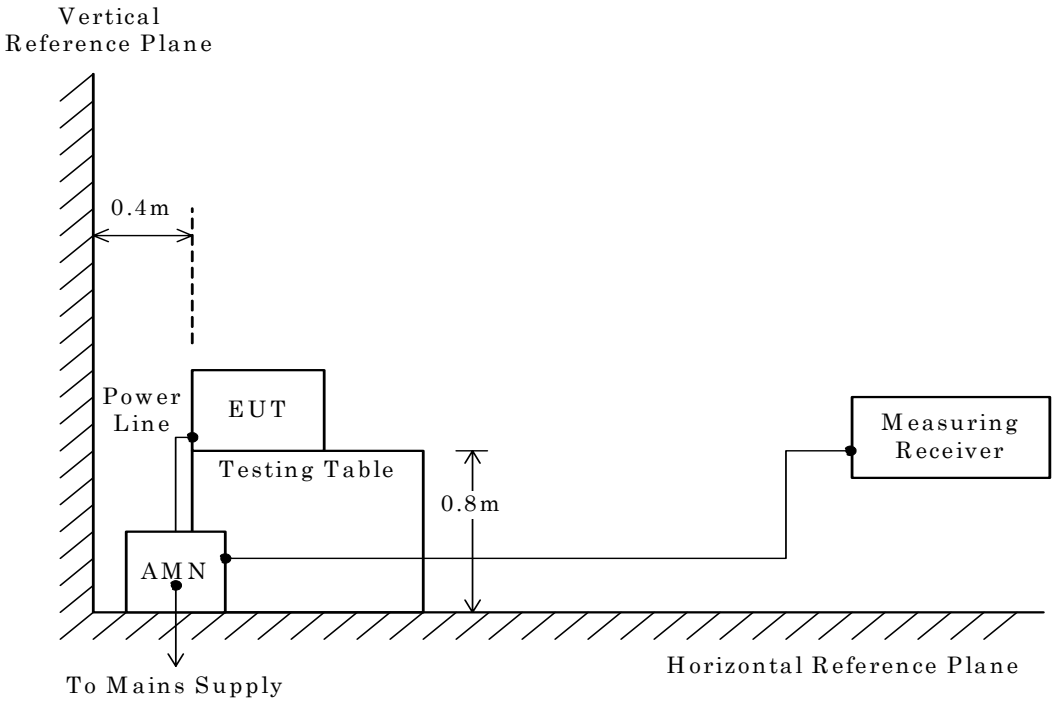
The setting of the spectrum analyzer are shown as follows:

Frequency Range	30 MHz - 25 GHz	Band-Edge
Res. Bandwidth	100 kHz	100 kHz
Video Bandwidth	300 kHz	300 kHz
Sweep Time	AUTO	AUTO
Trace	Maxhold	Maxhold

6.7 AC Powerline Conducted Emission

The preliminary tests were performed using the scan mode of test receiver or spectrum analyzer to observe the emissions characteristics of the EUT.
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for final tests.

– Side View –



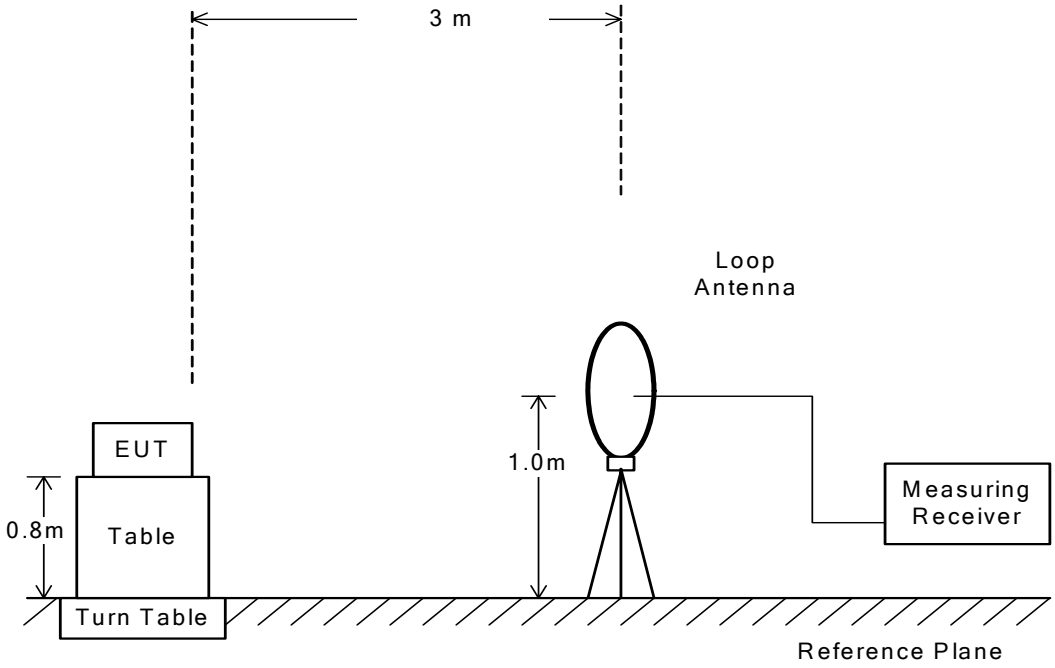
NOTE
AMN : Artificial Mains Network

6.8 Field Strength of Spurious Emission

6.8.1 Field Strength of Spurious Emission 9 kHz – 30 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.

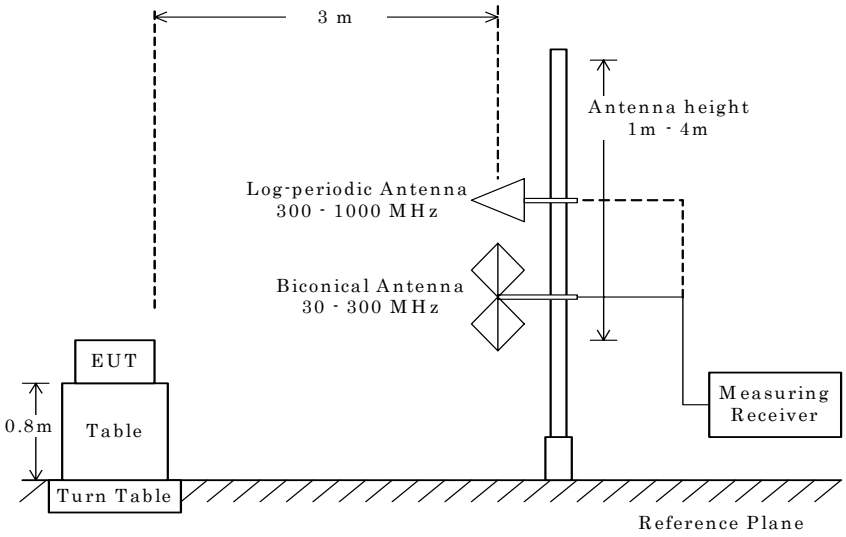
– Side View –



6.8.2 Field Strength of Spurious Emission 30 MHz – 1000 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.

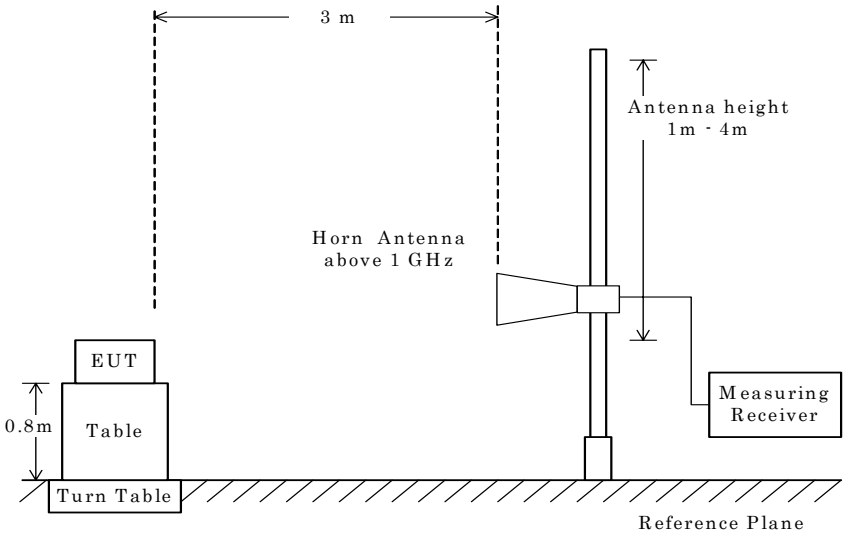
– Side View –



6.8.3 Field Strength of Spurious Emission above 1 GHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.

– Side View –



NOTE
The antenna height is scanned depending on the EUT's size and mounting height.

7 Equipment Under Test Modification

☒ - No modifications were conducted by JQA to achieve compliance to the limitations.
☐ - To achieve compliance to the limitations, the following changes were made by JQA during the compliance test.

The modifications will be implemented in all production models of this equipment.

Applicant : Not Applicable
Date : Not Applicable
Typed Name : Not Applicable
Position : Not Applicable Signatory : Not Applicable

8 Responsible Party

Responsible Party of Test Item (Product)

Responsible Party :

Contact Person :

Signatory

9 Deviation from Standard

☒ - No deviations from the standard described in clause 1.
☐ - The following deviations were employed from the standard described in clause 1.

10 Test Results

10.1 RF Power Output (§2.1046)

10.1.1 Channel Separation

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Channel Separation is 1.002 MHz
Channel Separation(Inquiry) is 2.005 MHz

Uncertainty of Measurement Results +/-0.9 %(2σ)

Remarks :

10.1.2 Minimum Hopping Channel

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Number of Channel is 79
Number of Channel (Inquiry) is 32
Number of Channel (AFH) is 20

Remarks :

10.1.3 Occupied Bandwidth

The requirements are ☒ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

The 99% Bandwidth is 1196.8 kHz at 2402.0 MHz
The 20dB Bandwidth is 1321.0 kHz at 2441.0 MHz

Uncertainty of Measurement Results +/-0.9 %(2σ)

Remarks :

10.1.4 Dwell Time

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Dwell Time is	308.1	msec
Dwell Time (Inquiry) is	71.4	msec
Dwell Time (AFH) is	308.1	msec

Uncertainty of Measurement Results +/-0.6 %(2σ)

Remarks : _____

10.1.5 Peak Output Power(Conduction)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

Transmitter Power is 1.60 dBm at 2441.0 MHz

Uncertainty of Measurement Results at Amplitude +/-0.8 dB(2σ)

Remarks : _____

10.1.6 Spurious Emissions(Conduction)

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Uncertainty of Measurement Results

9 kHz – 1GHz	+/-1.0	dB(2σ)
1GHz – 18GHz	+/-1.2	dB(2σ)
18GHz – 40GHz	+/-1.6	dB(2σ)

Remarks : _____

10.1.7 AC Powerline Conducted Emission

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin (Quasi-Peak)	18.6	dB	at	1.72 MHz
Max. Limit Exceeding (Quasi-Peak)		dB	at	MHz
Uncertainty of Measurement Results				+/-2.7 dB(2σ)

Remarks :

10.1.8 Field Strength of Spurious Emission

The requirements are ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

☒ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin (Average)	>5.3	dB	at	22320.0 MHz
Max. Limit Exceeding (Average)		dB	at	MHz

Uncertainty of Measurement Results

9 kHz – 30 MHz	+/-1.9 dB(2σ)
30 MHz – 300 MHz	+/-4.3 dB(2σ)
300 MHz – 1000 MHz	+/-5.4 dB(2σ)
1 GHz – 6 GHz	+/-4.6 dB(2σ)
6 GHz – 18 GHz	+/-5.2 dB(2σ)
18 GHz – 40 GHz	+/-5.4 dB(2σ)

Remarks :

11 Summary

General Remarks :

The EUT was tested according to the requirements of the following standard.
CFR 47 FCC Rules and Regulations Part 15
The test configuration is shown in clause 12 to 14.
The conclusion for the test items of which are required by the applied regulation is indicated under the test results.
Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Test Results :

The "as received" sample;

☒ - fulfill the test requirements of the regulation mentioned on clause 1.
☐ - doesn't fulfill the test requirements of the regulation mentioned on clause 1.

Reviewed by:

Shigeru Kinoshita
Deputy Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

Tested by:

Shigeru Osawa
Deputy Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

12 Operating Condition

Transmitting/Receiving

Transmitting frequency : 2402.0 MHz(0CH) – 2480.0 MHz(78CH)
Receiver frequency : 2402.0 MHz(0CH) – 2480.0 MHz(78CH)

Modulation Type
1.DH1, DH3, DH5(Modulation Type : GFSK)
2.2DH1, 2DH3, 2DH5(Modulation Type : pi/4-DQPSK)
3.3DH1, 3DH3, 3DH5(Modulation Type : 8DPSK)

Other Clock Frequency
32.768 kHz, 26 MHz

13 Test Configuration

The equipment under test (EUT) consists of :

	Item	Manufacturer	Model No.	Serial No.	FCC ID
A	Cellular Phone	Sharp	108SH	004401/11/406840/2*1) 004401/11/406806/3*2)	APYHRO00176
B	Lithium-ion Battery	Sharp	SHBCU1	--	N/A
C	AC Adapter	Sharp	ZTDAA1	--	N/A
D	Headset (Include Conversion cable)	Softbank Mobile	ZTCAA1	--	N/A

*1) Used for AC Powerline Conducted Emission and Field Strength of Spurious Emission
*2) Used for Antenna Conducted Emission

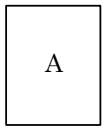
The auxiliary equipment used for testing :
None

Type of Cable:

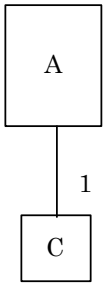
No.	Description	Identification (Manu. etc.)	Connector Shielded	Cable Shielded	Ferrite Core	Length (m)
1	DC Power Cord	--	NO	--	NO	1.5
2	Headset Cable	--	NO	--	NO	0.6

14 Equipment Under Test Arrangement (Drawings)

a) Single Unit

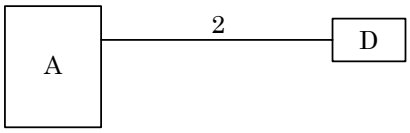


b) AC Adapter used



120VAC 60Hz

c) Headset used



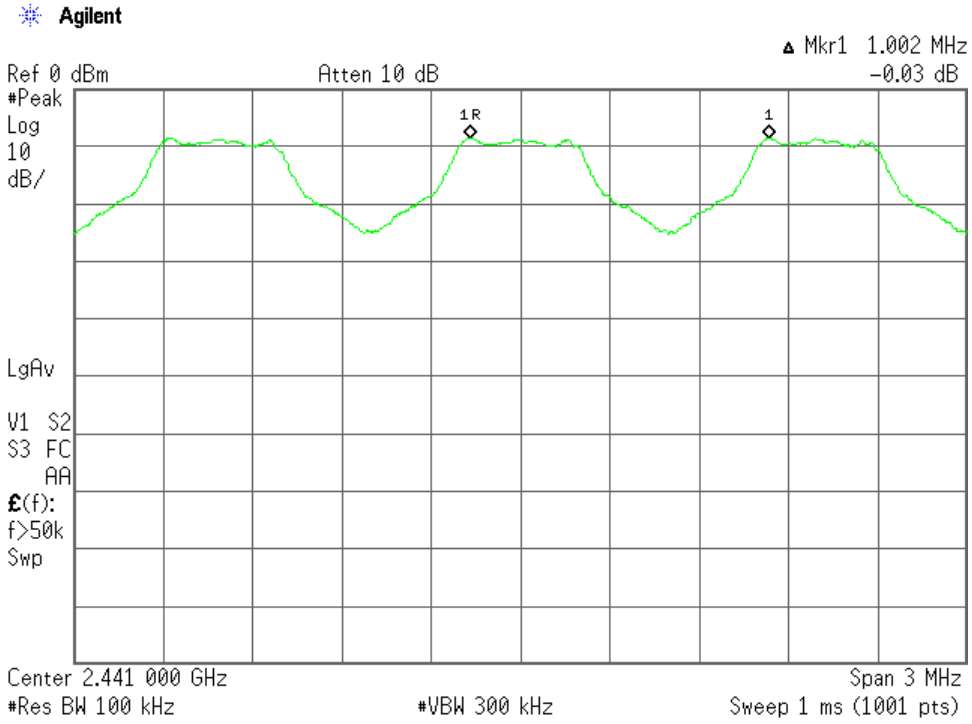
Appendix A: Test Data

Test Date : May 22, 2012
Temp.:26°C, Humi:47%

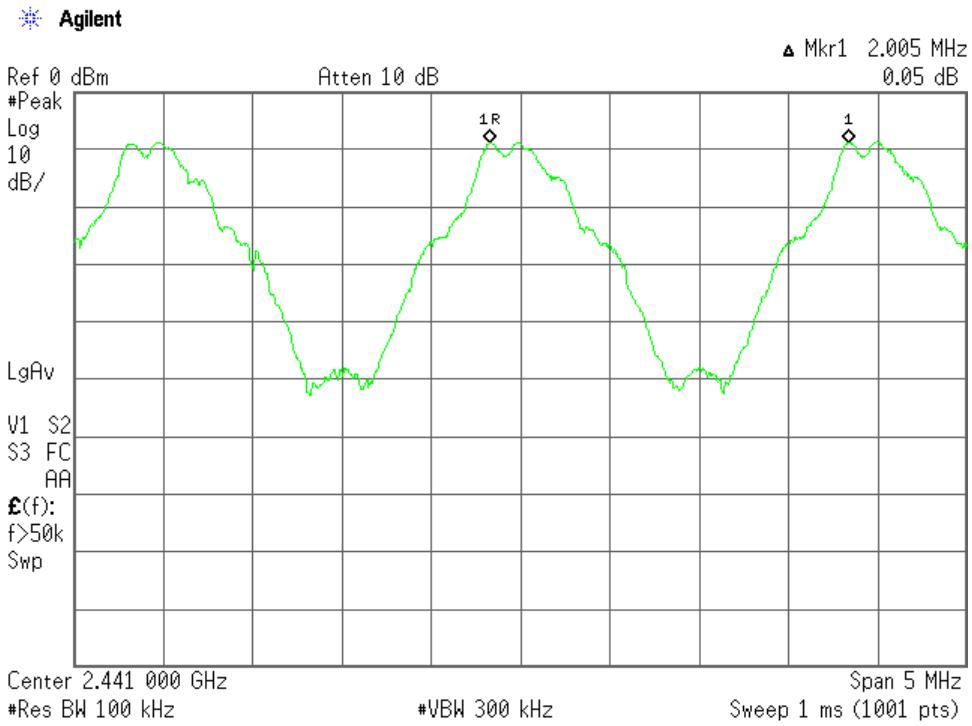
A.1 Channel Separation

Mode of EUT	Channel Separation (MHz)
Hopping	1.002
Inquiry	2.005

Mode of EUT : Hopping



Mode of EUT : Inquiry

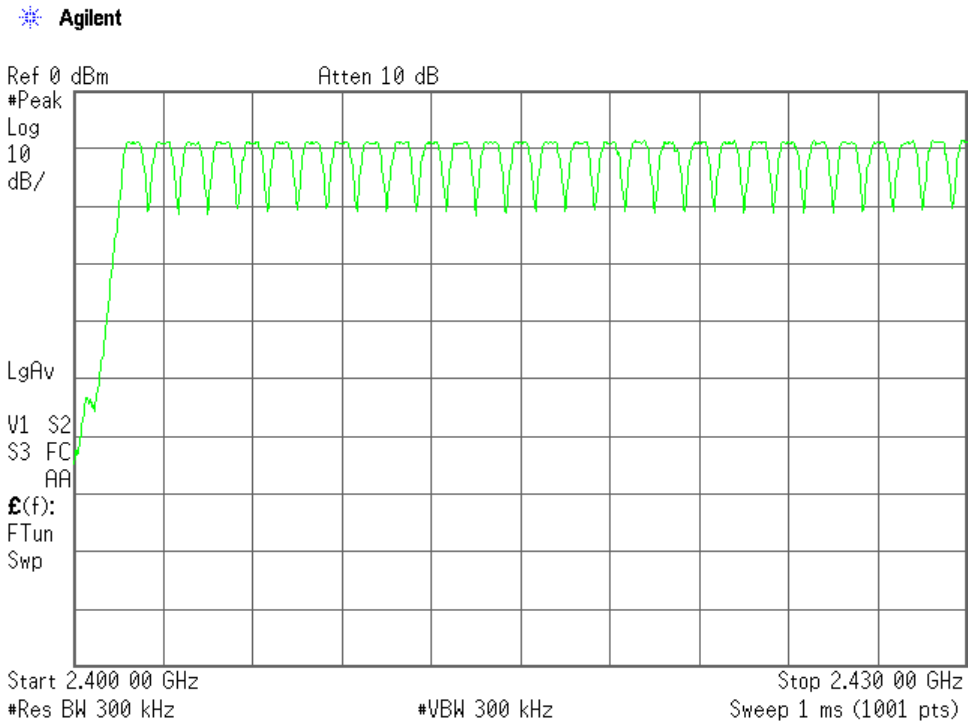


A.2 Minimum Hopping Channel

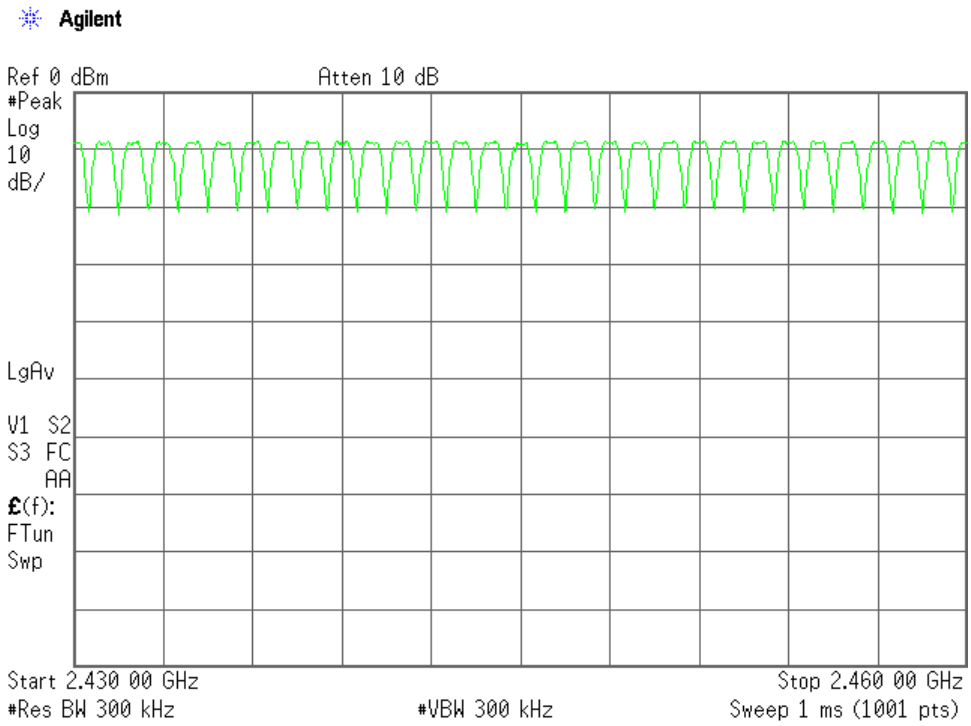
Test Date : May 22, 2012
Temp.:26°C, Humi:47%

Mode of EUT	Minimum Hopping Channel
Hopping	79
Inquiry	32
AFH(minimum)	20

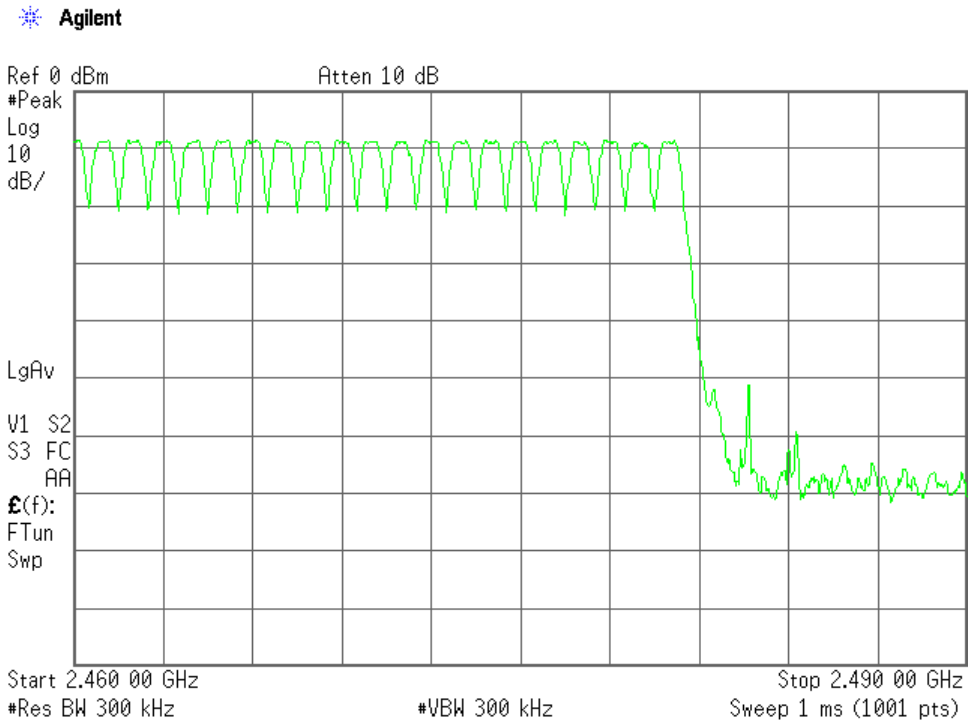
Mode of EUT : Hopping(1/3)



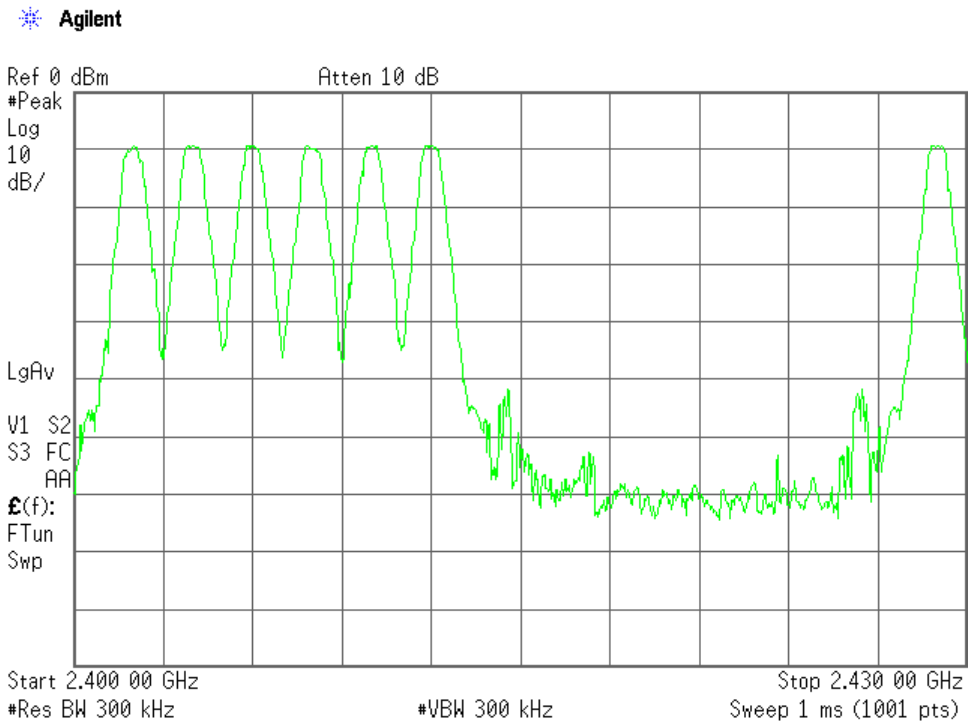
Mode of EUT : Hopping(2/3)



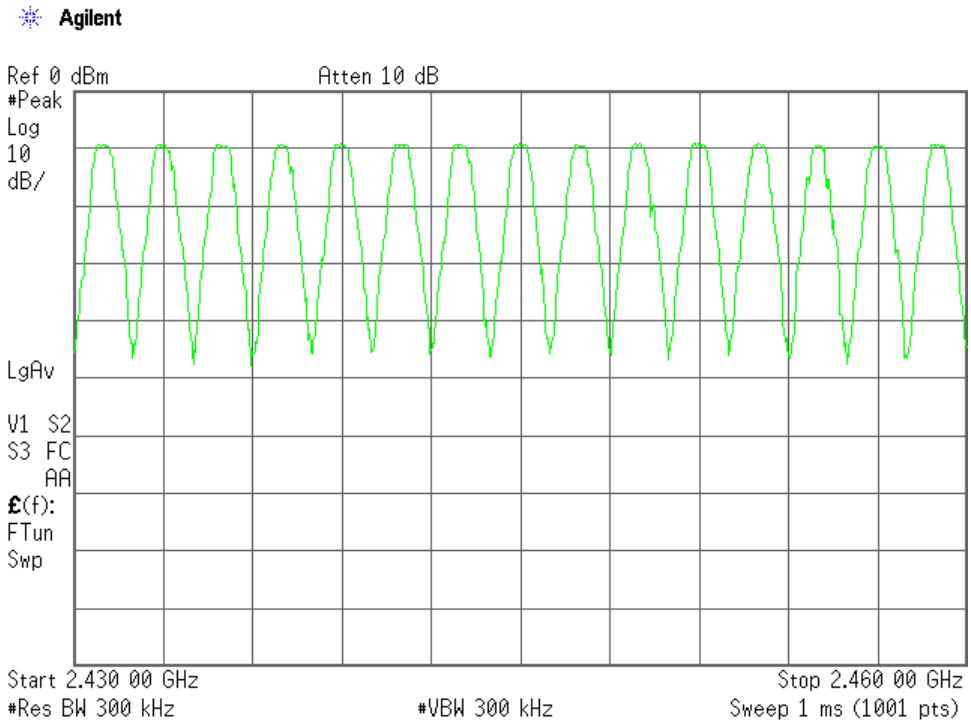
Mode of EUT : Hopping(3/3)



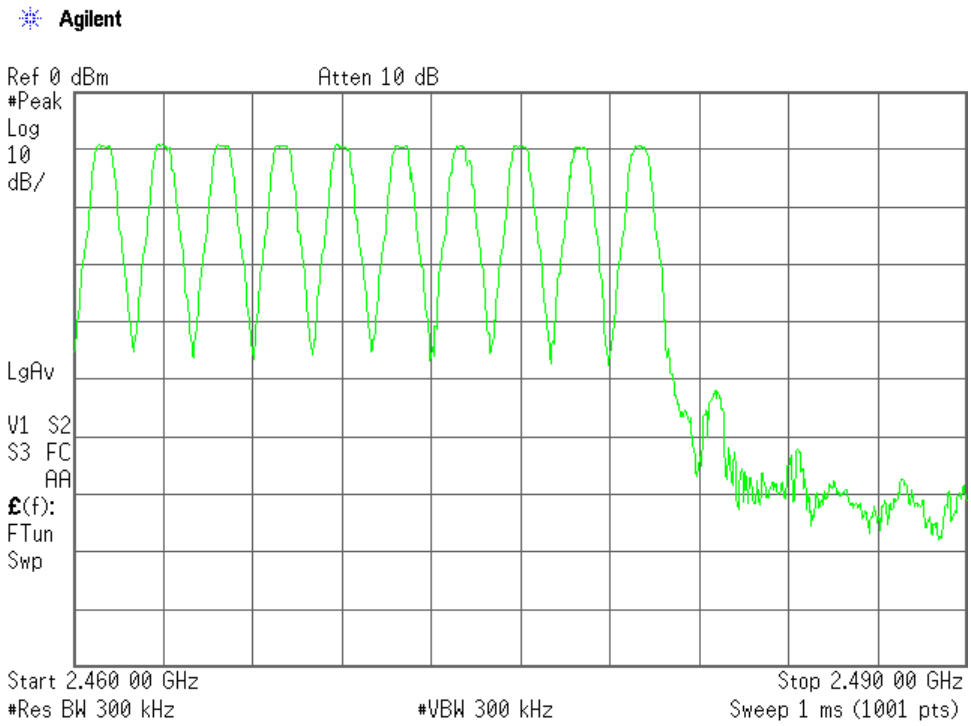
Mode of EUT : Inquiry(1/3)



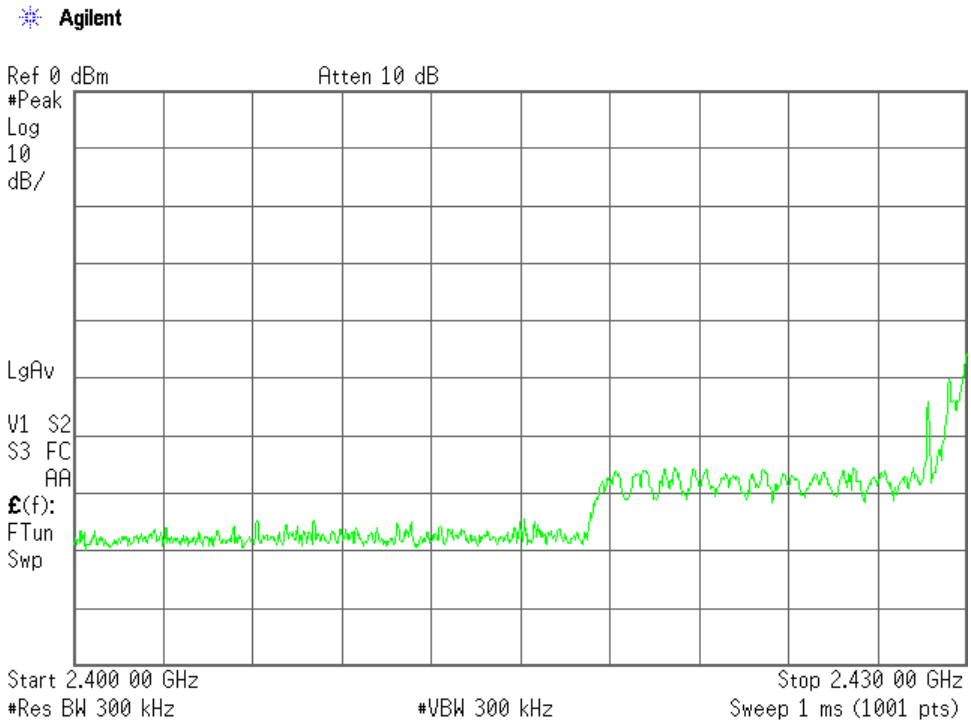
Mode of EUT : Inquiry(2/3)



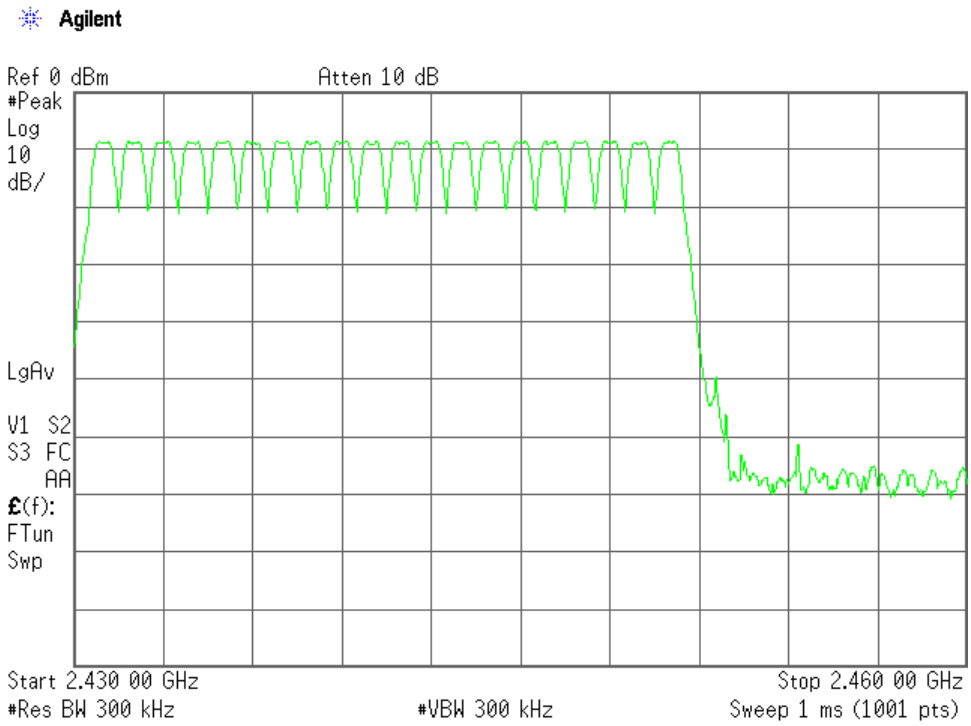
Mode of EUT : Inquiry(3/3)



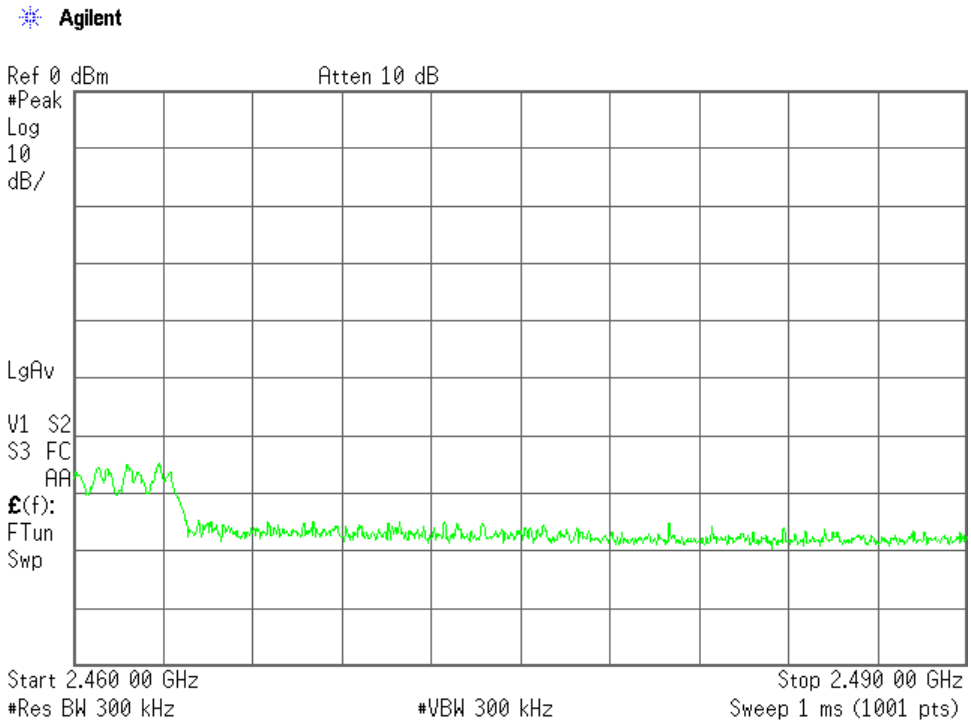
Mode of EUT : AFH(minimum)(1/3)



Mode of EUT : AFH(minimum) (2/3)



Mode of EUT : AFH(minimum) (3/3)



A.3 Occupied Bandwidth

Test Date : May 22, 2012
Temp.:26°C, Humi:47%

The resolution bandwidth was set to about 1% of emission bandwidth, -20dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

1)Packet Setting : DH5(Modulation type : GFSK)

Channel	Frequency (MHz)	99% Bandwidth (kHz)	-20dBc Bandwidth (kHz)
00	2402.0	867.4	925.6
39	2441.0	868.2	927.7
78	2480.0	868.9	930.0

2)Packet Setting : 2DH5(Modulation type : pi/4-DQPSK)

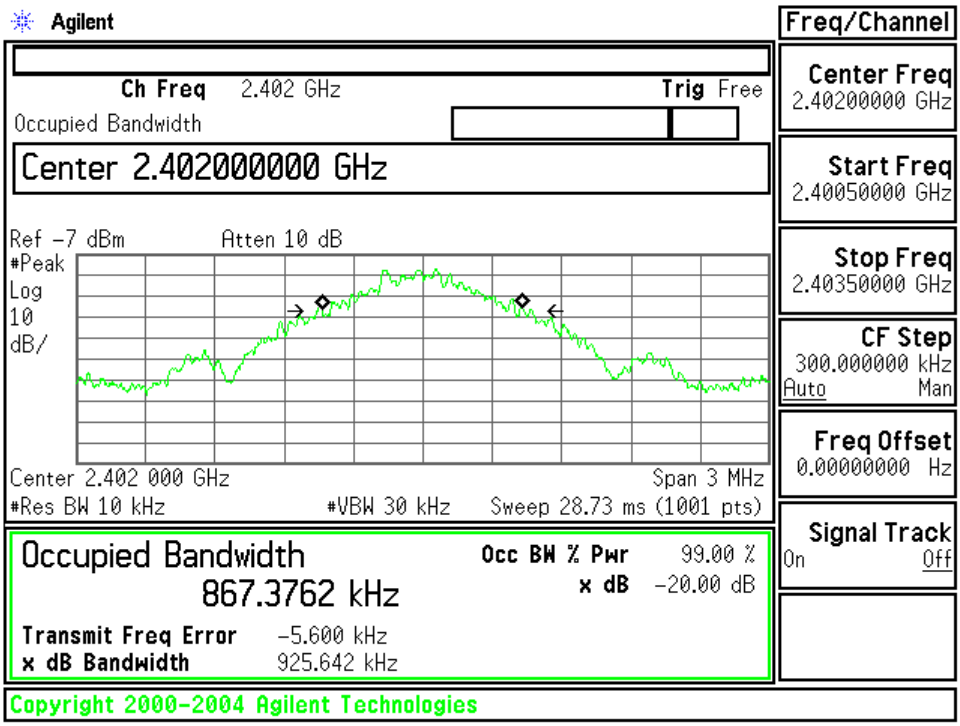
Channel	Frequency (MHz)	99% Bandwidth (kHz)	-20dBc Bandwidth (kHz)
00	2402.0	1187.8	1316.0
39	2441.0	1187.9	1321.0
78	2480.0	1185.4	1316.0

3)Packet Setting : 3 DH5(Modulation type : 8DPSK)

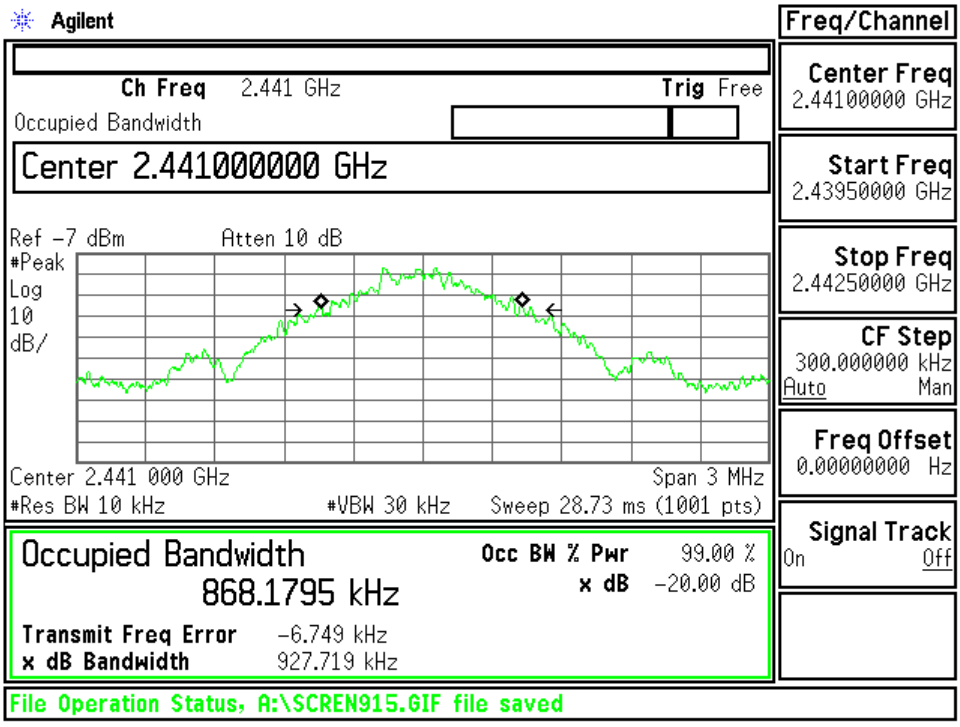
Channel	Frequency (MHz)	99% Bandwidth (kHz)	-20dBc Bandwidth (kHz)
00	2402.0	1196.8	1265.0
39	2441.0	1196.4	1264.0
78	2480.0	1195.0	1264.0

1)Packet Setting : DH5(Modulation type : GFSK)

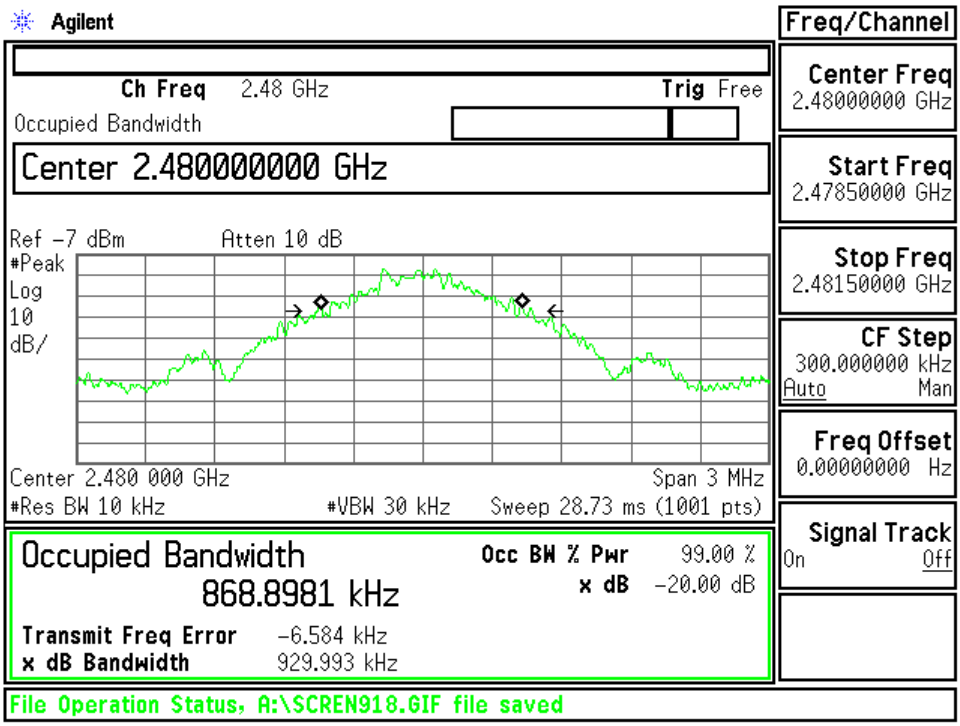
Low Channel



Middle Channel

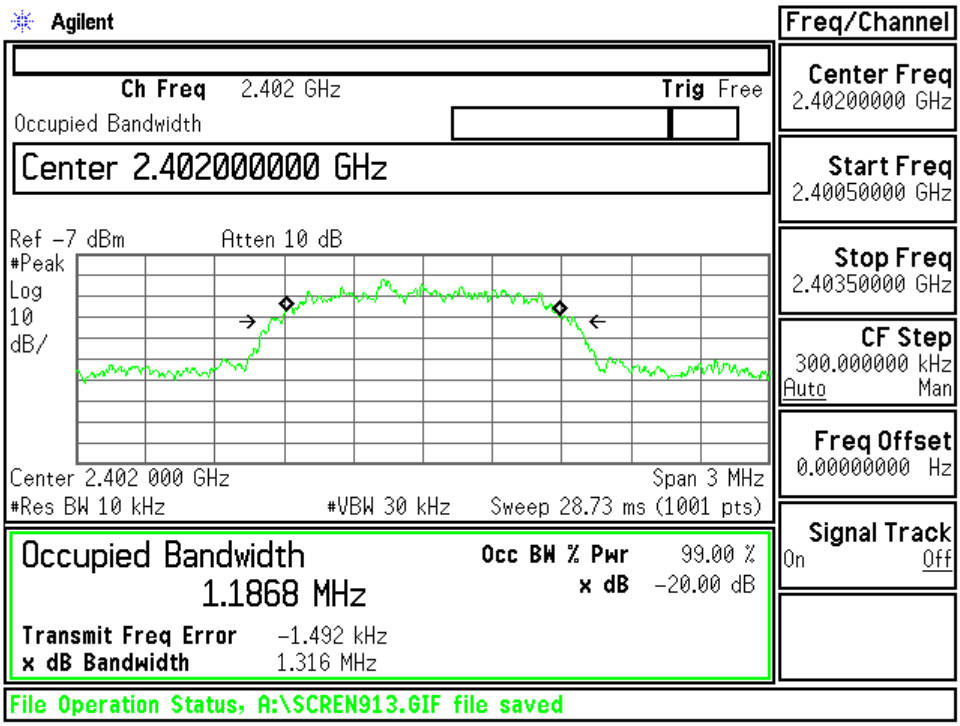


High Channel

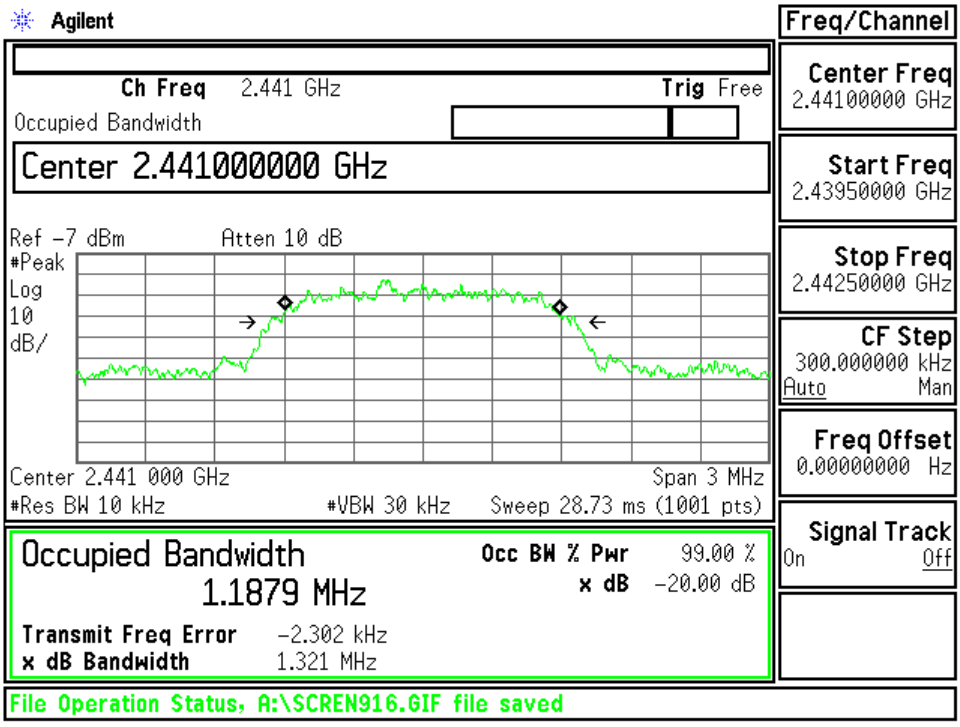


2)Packet Setting : 2DH5(Modulation type : pi/4-DQPSK)

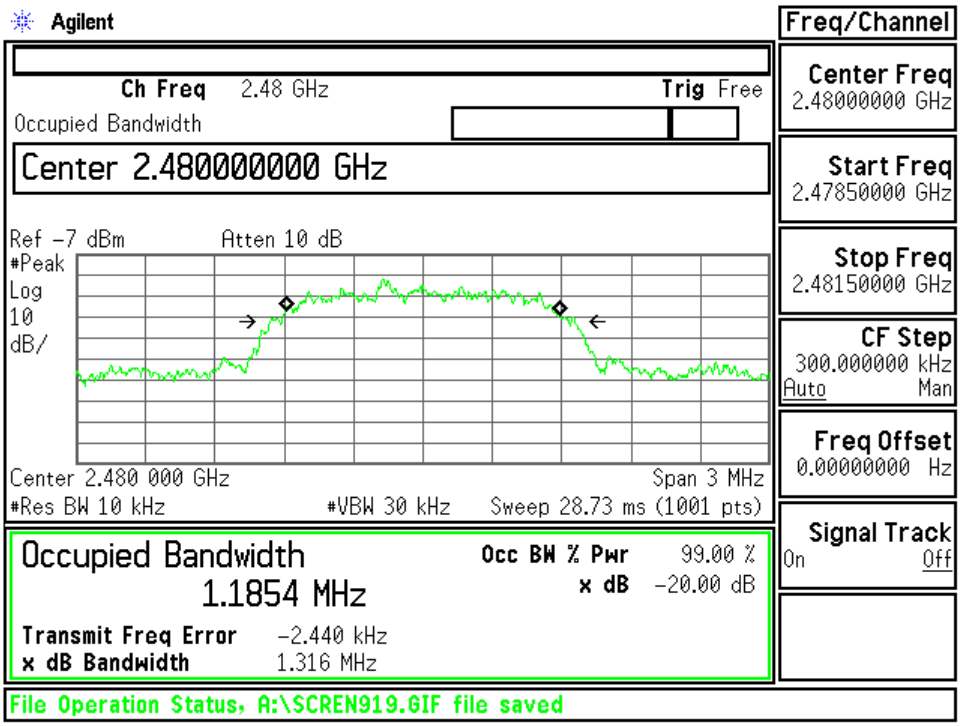
Low Channel



Middle Channel

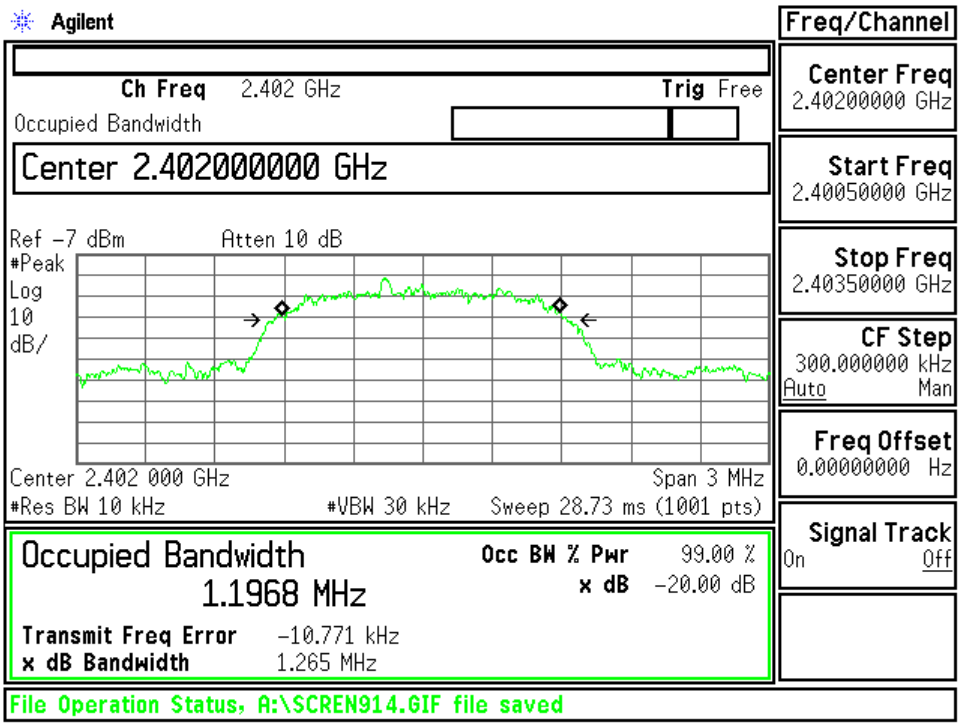


High Channel

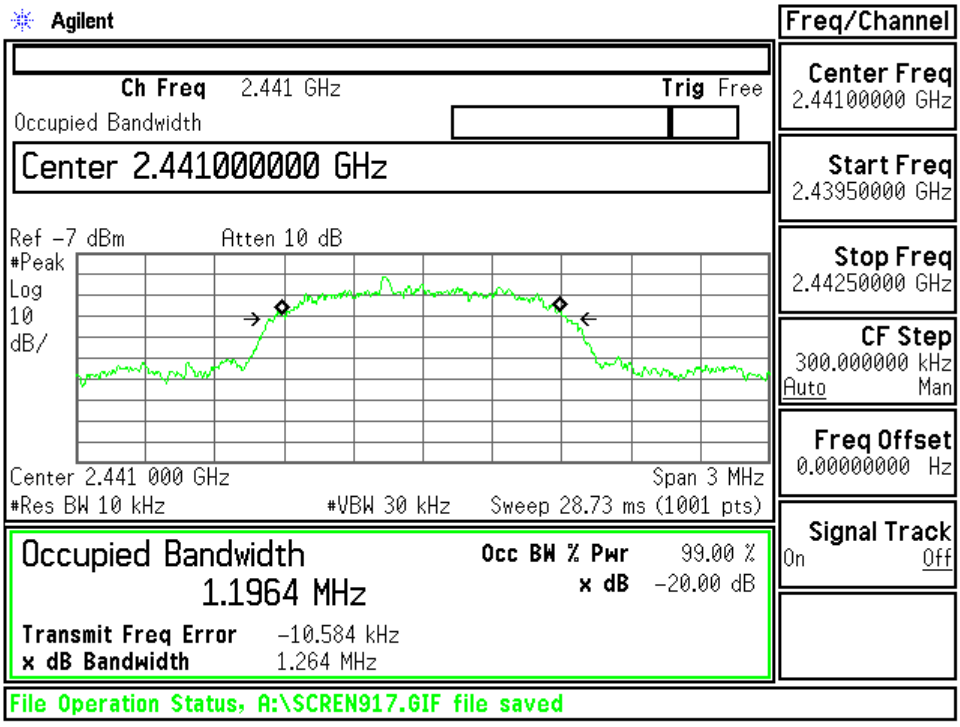


3)Packet Setting : 3 DH5(Modulation type : 8DPSK)

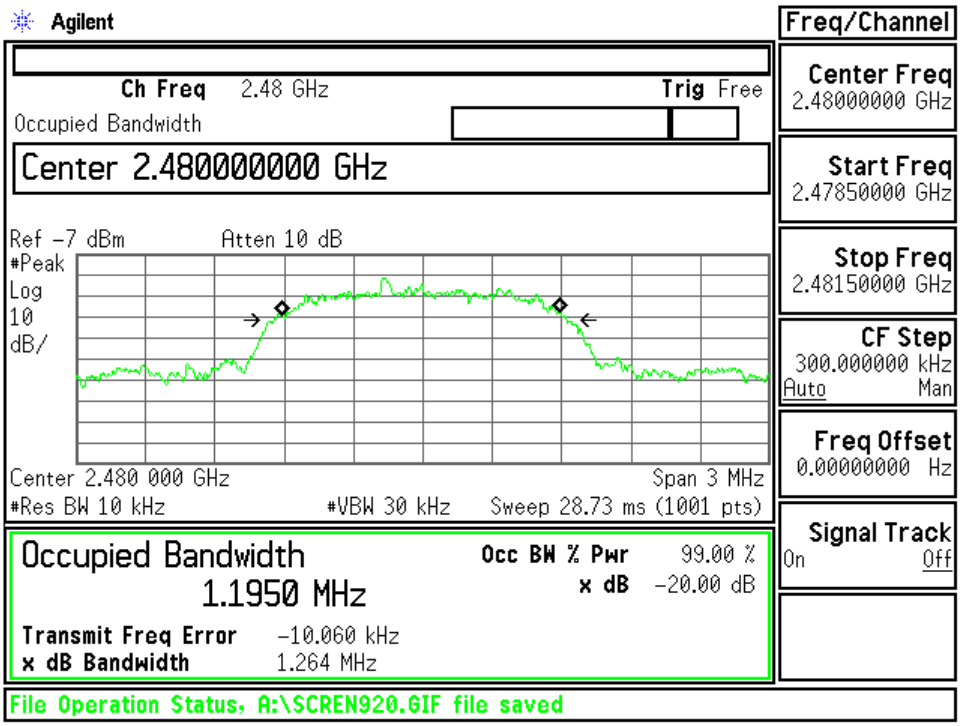
Low Channel



Middle Channel



High Channel

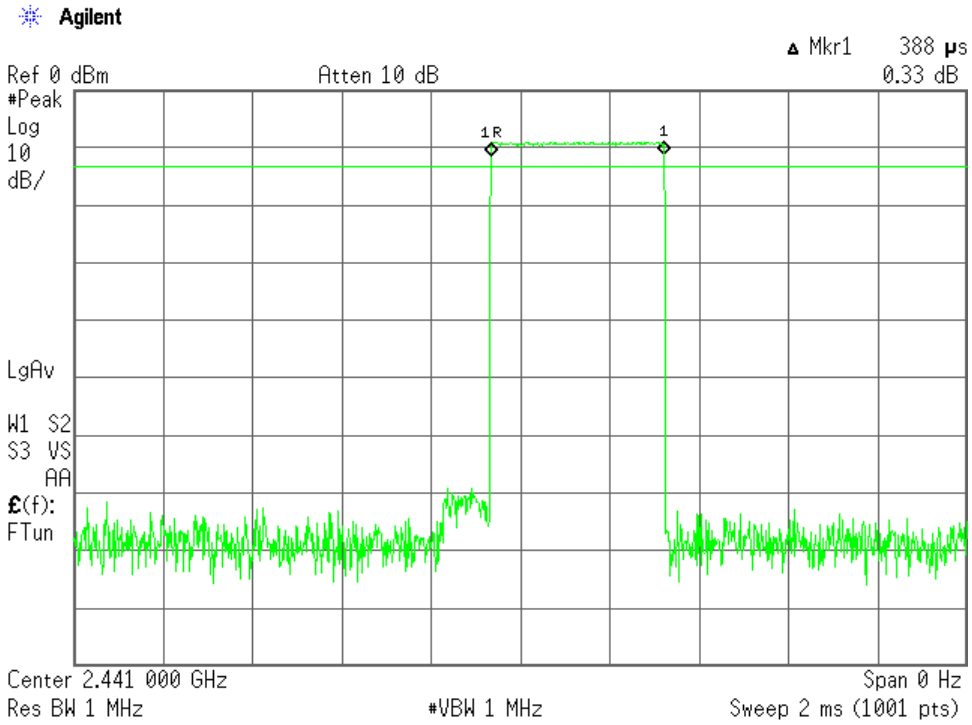


A.4 Dwell Time

Test Date : May 22, 2012
Temp.:26°C, Humi:47%

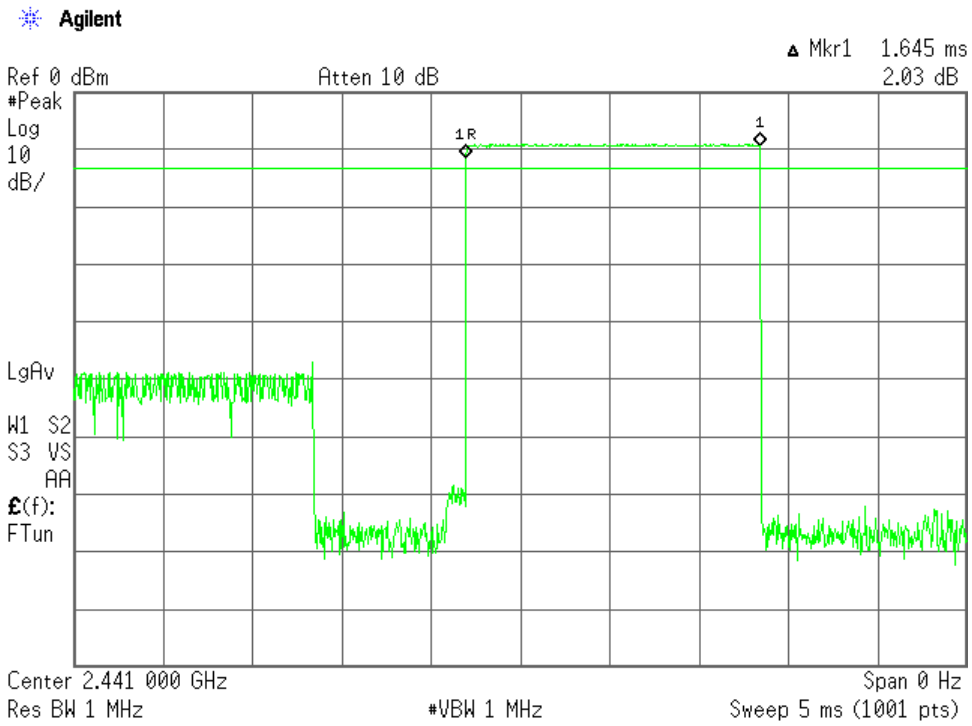
Mode of EUT	Dwell Time (msec)
DH1	124.2
DH3	263.2
DH5	308.1
Inquiry	71.4

DH1(Modulation type : GFSK)



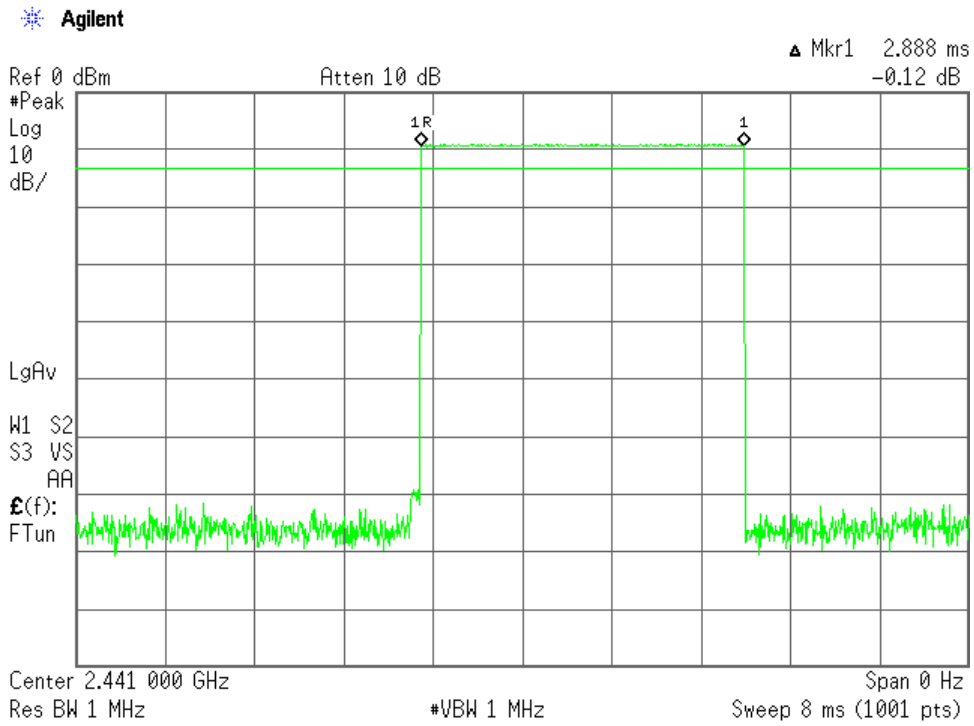
Note : The system makes worst case 1600 hops per second or 1 time slot has a length of 625 µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 79 channels. So the system has each channel 10.1266 times per second and so for 31.6 seconds the system have 320.0 times of appearance.
Each tx-time per appearance is 0.388 ms.
Dwell time = 320.0 * 0.388 = 124.2 ms

DH3(Modulation type : GFSK)



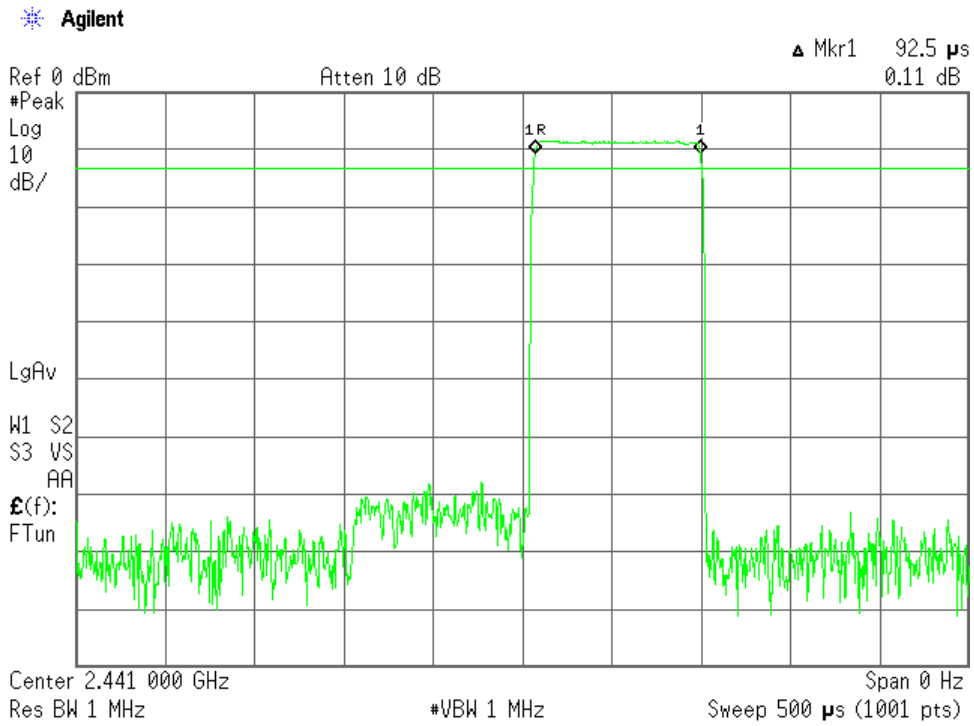
Note : A DH3 Packet need 3 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 400 hops per second with 79 channels. So the system have each channel 5.063 times per second and so for 31.6 seconds the system have 160.0 times of appearance.
Each tx-time per appearance is 1.645 ms.
Dwell time = 160.0 * 1.645 = 263.2 ms

DH5(Modulation type : GFSK)



Note : A DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 266.667 hops per second with 79 channels. So the system have each channel 3.3755 times per second and so for 31.6 seconds the system have 106.7 times of appearance.
Each tx-time per appearance is 2.888 ms.
Dwell time = 106.7 * 2.888 = 308.1 ms

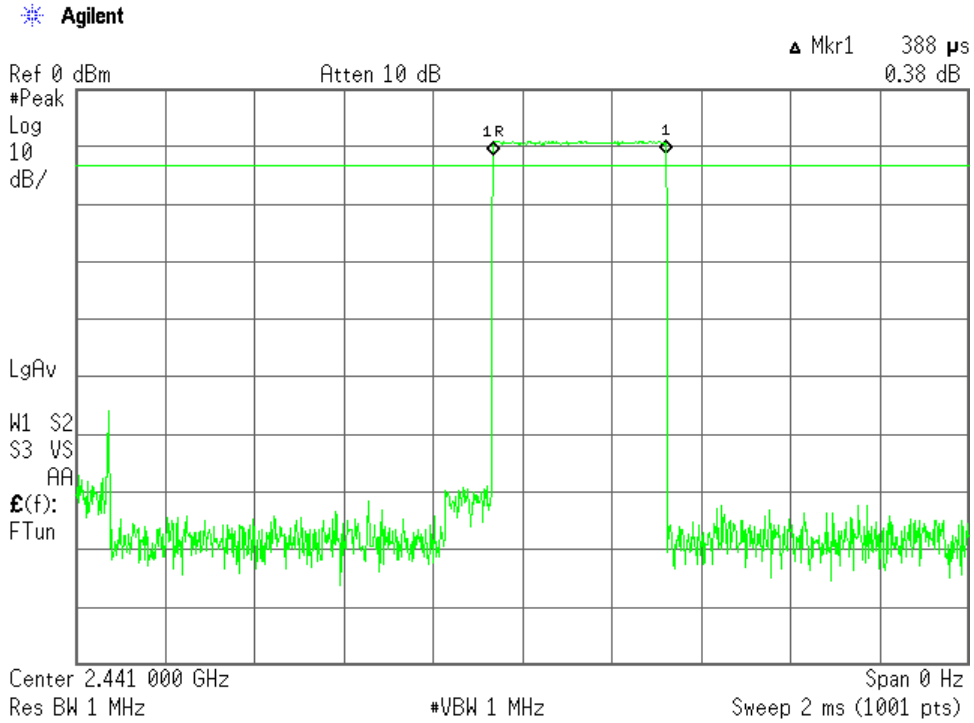
Inquiry



Note : The system have 32 hopping channel in Inquiry mode.
The time period = 32 * 0.4 = 12.8 seconds
In maximum case the Bluetooth system have three blocks of 2560 ms in 12.8 s period. One block has 256 burst at each hopping channel.
Each tx-time per appearance is 0.093 ms.
Dwell time = 0.093 * 256 * 3 = 71.4 ms

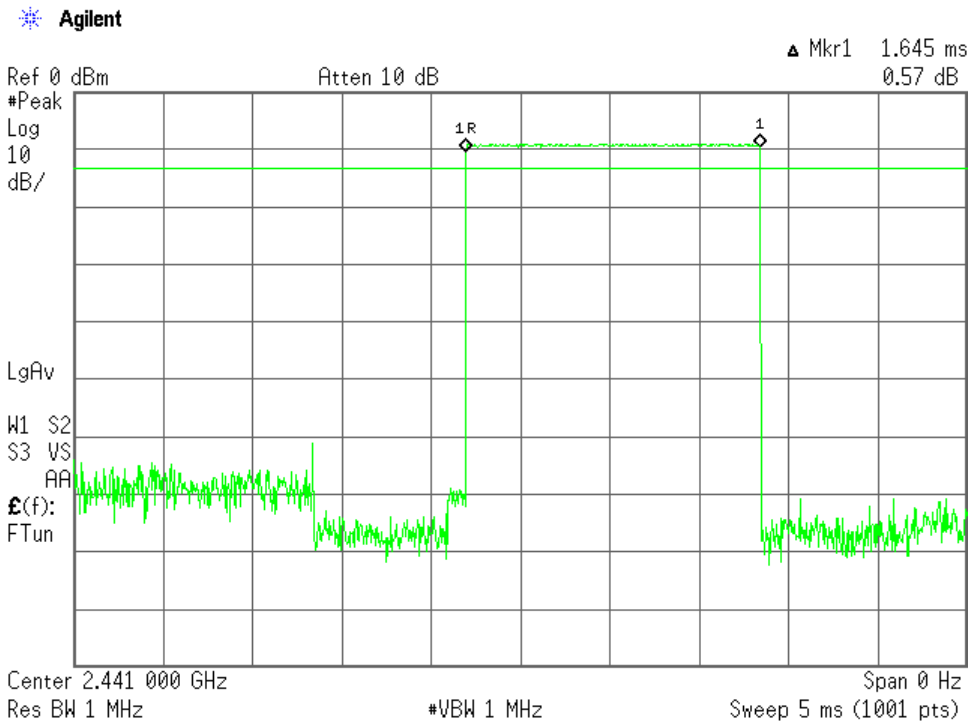
Mode of EUT	Dwell Time (msec)
DH1(AFH)	124.2
DH3(AFH)	263.2
DH5(AFH)	308.1

DH1(AFH mode, Modulation type : GFSK)



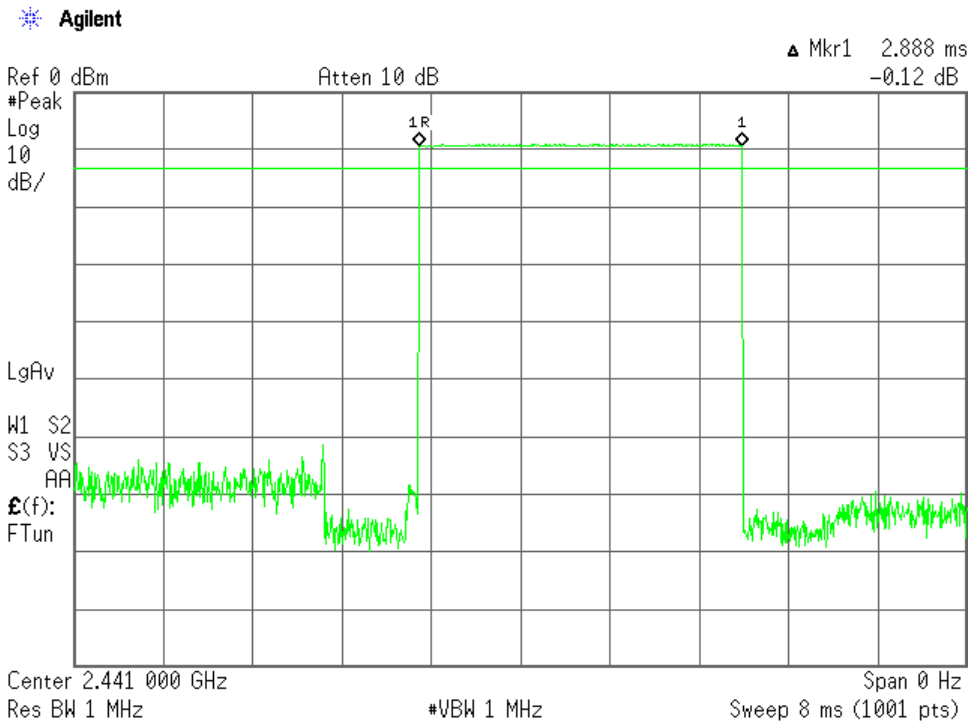
Note : The system makes worst case 1600 hops per second or 1 time slot has a length of 625 µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 20 channels. So the system has each channel 40 times per second and so for 8 seconds the system have 320.0 times of appearance.
Each tx-time per appearance is 0.388 ms.
Dwell time = 320.0 * 0.388 = 124.2 ms

DH3(AFH mode, Modulation type : GFSK)



Note : A DH3 Packet need 3 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 400 hops per second with 20 channels. So the system have each channel 20 times per second and so for 8 seconds the system have 160.0 times of appearance.
Each tx-time per appearance is 1.645 ms.
Dwell time = 160.0 * 1.645 = 263.2 ms

DH5(AFH mode, Modulation type : GFSK)



Note : A DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 266.667 hops per second with 20 channels. So the system have each channel 13.33335 times per second and so for 8 seconds the system have 106.7 times of appearance.
Each tx-time per appearance is 2.888 ms.
Dwell time = 106.7 * 2.888 = 308.1 ms

A.5 Peak Output Power(Conduction)

1)DH5(Modulation type : GFSK)

Test Date: May 22, 2012
Temp.: 26 °C, Humi: 47 %

Transmitting Frequency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
CH	[MHz]	[dB]	[dBm]	[dBm]	[mW]	[dBm]	[dB]
00	2402	10.19	-8.72	1.47	1.40	20.97	+19.50
39	2441	10.19	-8.59	1.60	1.45	20.97	+19.37
78	2480	10.19	-8.60	1.59	1.44	20.97	+19.38

Calculated result at 2441.000 MHz, as the worst point shown on underline:

	Correction Factor	=	10.19 dB	
+)	Meter Reading	=	-8.59 dBm	
	Result	=	1.60 dBm	= 1.45 mW

Minimum Margin: 20.97 - 1.60 = 19.37 (dB)

NOTES
1. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W.
Peak	Off

2)2DH5(Modulation type : pi/4-DQPSK)

Test Date: May 22, 2012
Temp.: 26 °C, Humi: 47 %

Transmitting Frequency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
CH	[MHz]	[dB]	[dBm]	[dBm]	[mW]	[dBm]	[dB]
00	2402	10.19	-10.40	-0.21	0.95	20.97	+21.18
39	2441	10.19	-10.38	-0.19	0.96	20.97	+21.16
78	2480	10.19	-10.47	-0.28	0.94	20.97	+21.25

Calculated result at 2441.000 MHz, as the worst point shown on underline:

	Correction Factor	=	10.19 dB
+)	Meter Reading	=	-10.38 dBm
	Result	=	-0.19 dBm = 0.96 mW

Minimum Margin: 20.97 - -0.19 = 21.16 (dB)

NOTES
1. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W.
Peak	Off

3)3DH5(Modulation type : 8DPSK)

Test Date: May 22, 2012
Temp.: 26 °C, Humi: 47 %

Transmitting Frequency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
CH	[MHz]	[dB]	[dBm]	[dBm]	[mW]	[dBm]	[dB]
00	2402	10.19	-9.95	0.24	1.06	20.97	+20.73
39	2441	10.19	-9.97	0.22	1.05	20.97	+20.75
78	2480	10.19	-9.96	0.23	1.05	20.97	+20.74

Calculated result at 2402.000 MHz, as the worst point shown on underline:

	Correction Factor	=	10.19 dB
+)	Meter Reading	=	-9.95 dBm
	Result	=	0.24 dBm = 1.06 mW

Minimum Margin: 20.97 - 0.24 = 20.73 (dB)

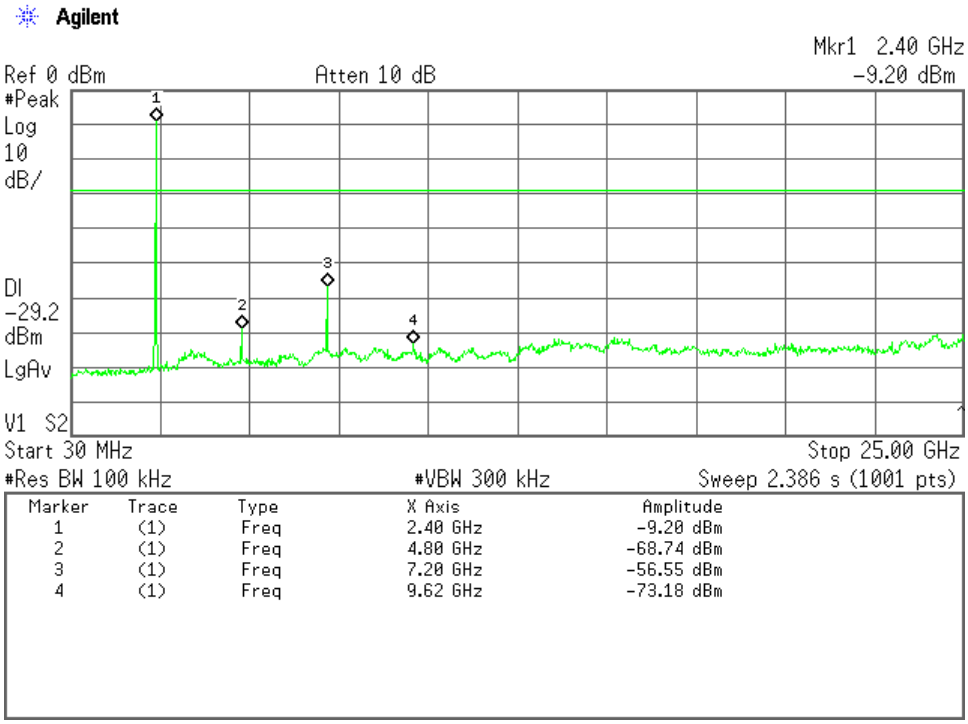
NOTES
1. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W.
Peak	Off

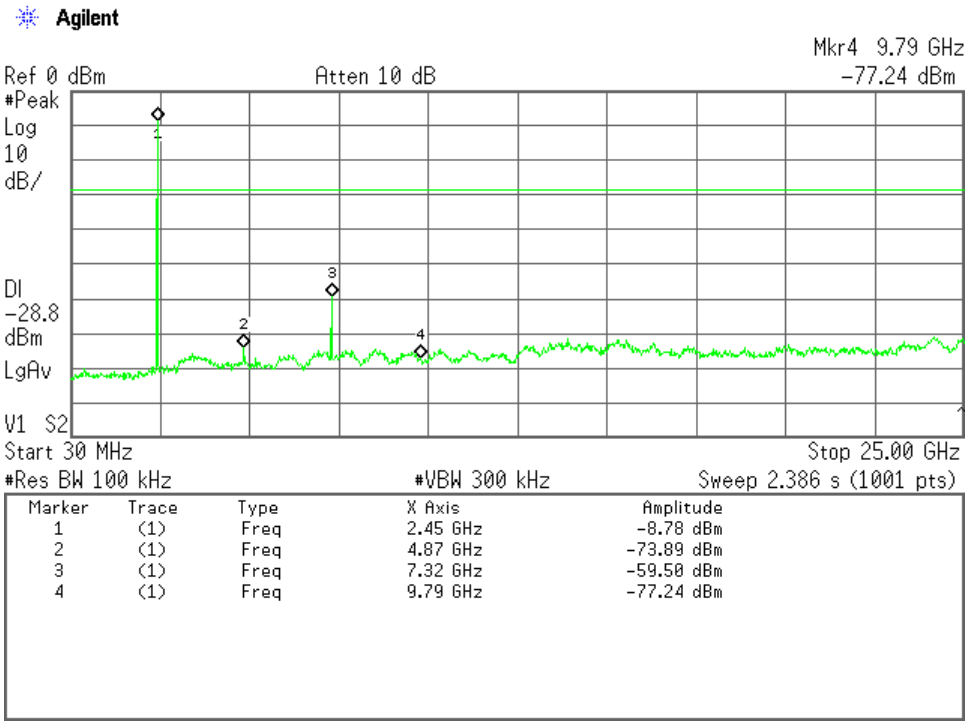
A.6 Spurious Emission(Conduction)

Test Date : May 22, 2012
Temp.:26°C, Humi:47%

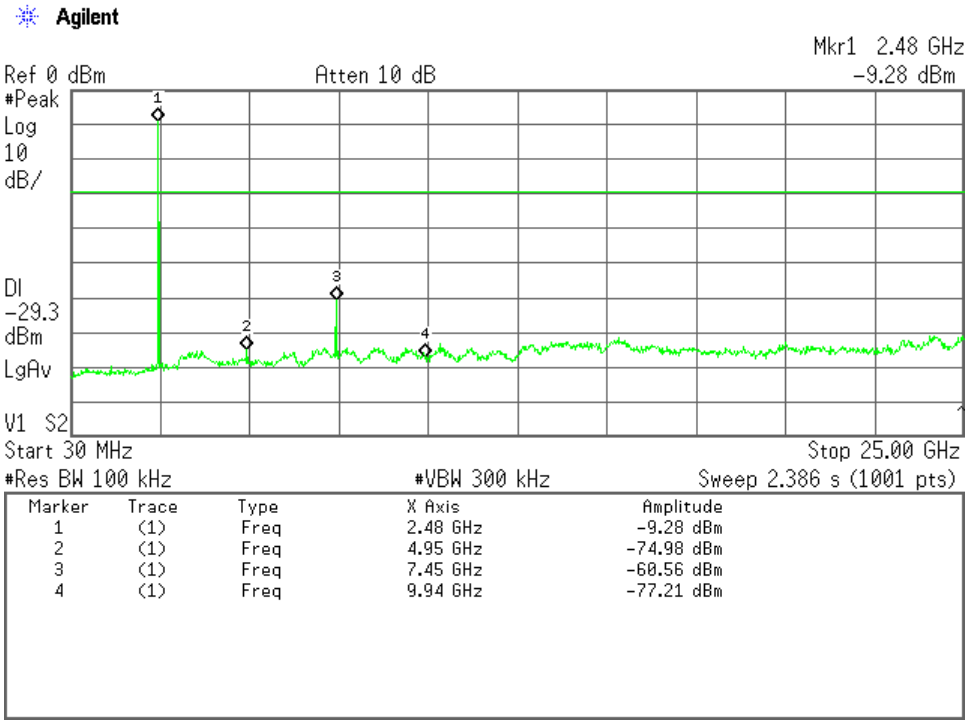
Low Channel



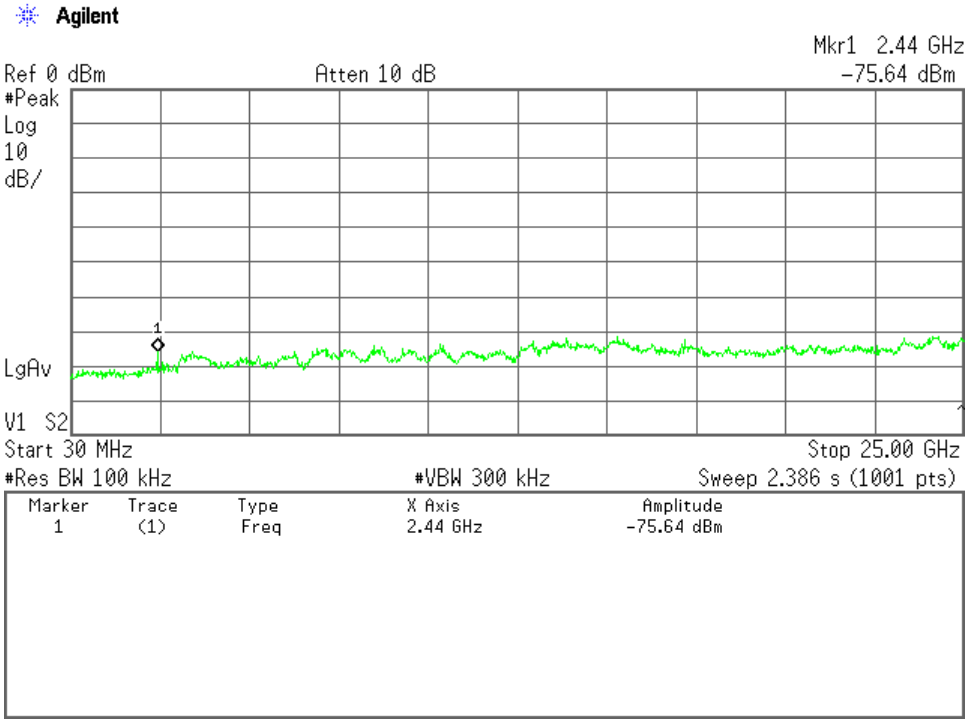
Middle Channel



High Channel

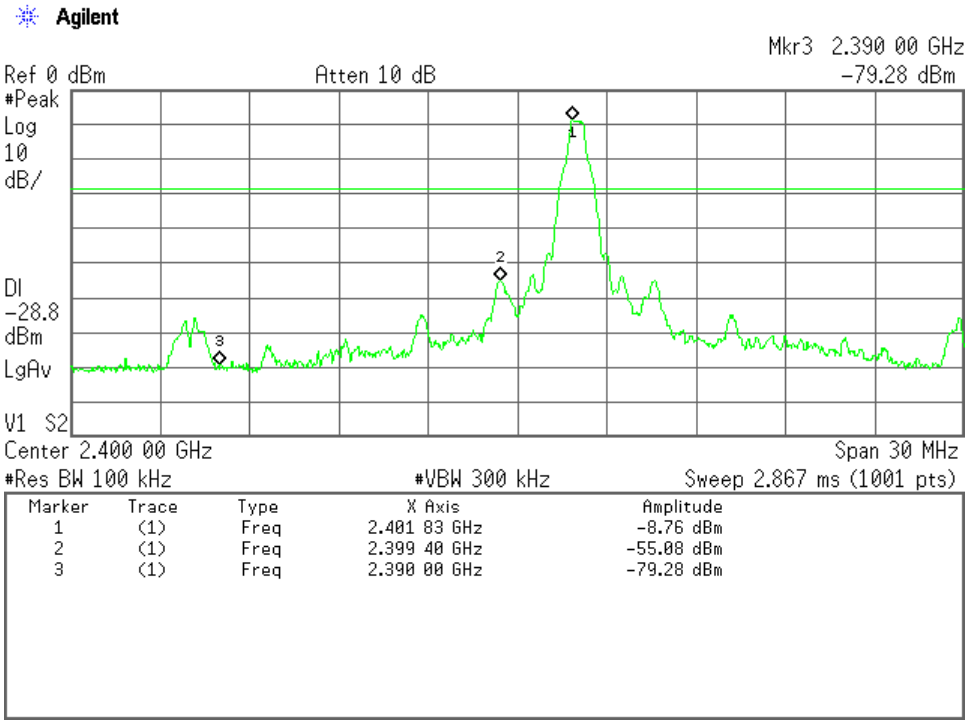


Receiving(Middle Channel)

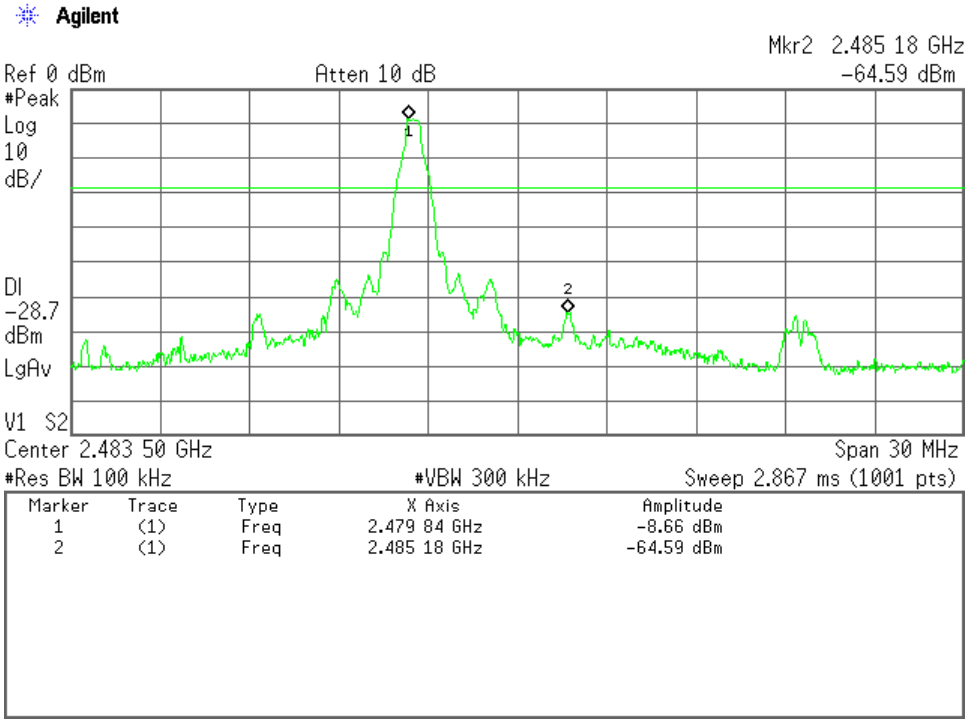


Band-Edge Emission

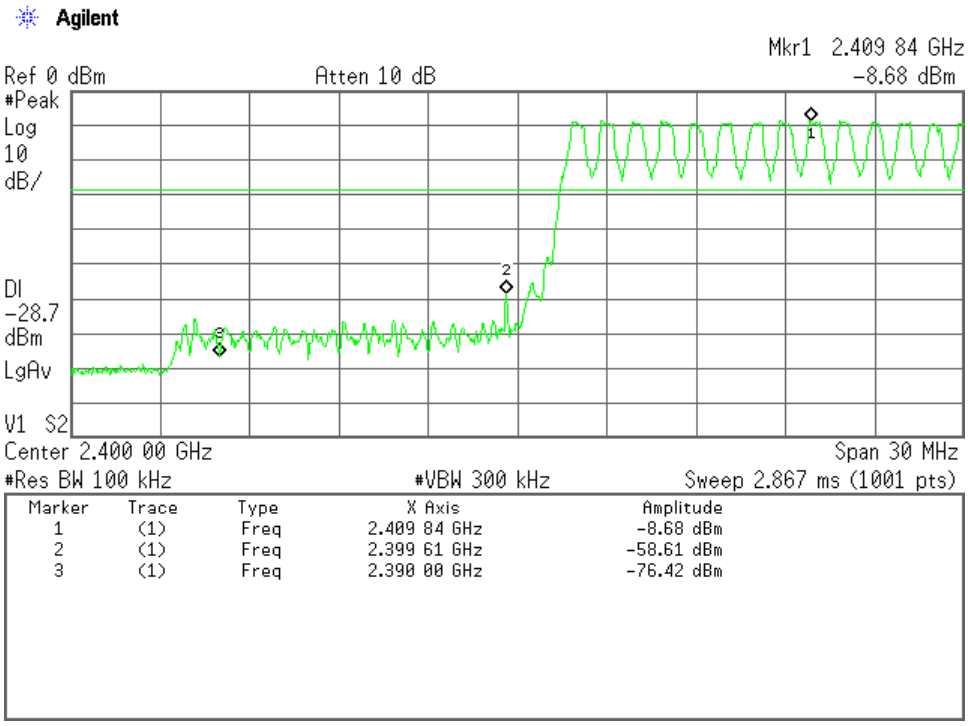
Low Channel(Hopping off), Band-Edge Emission



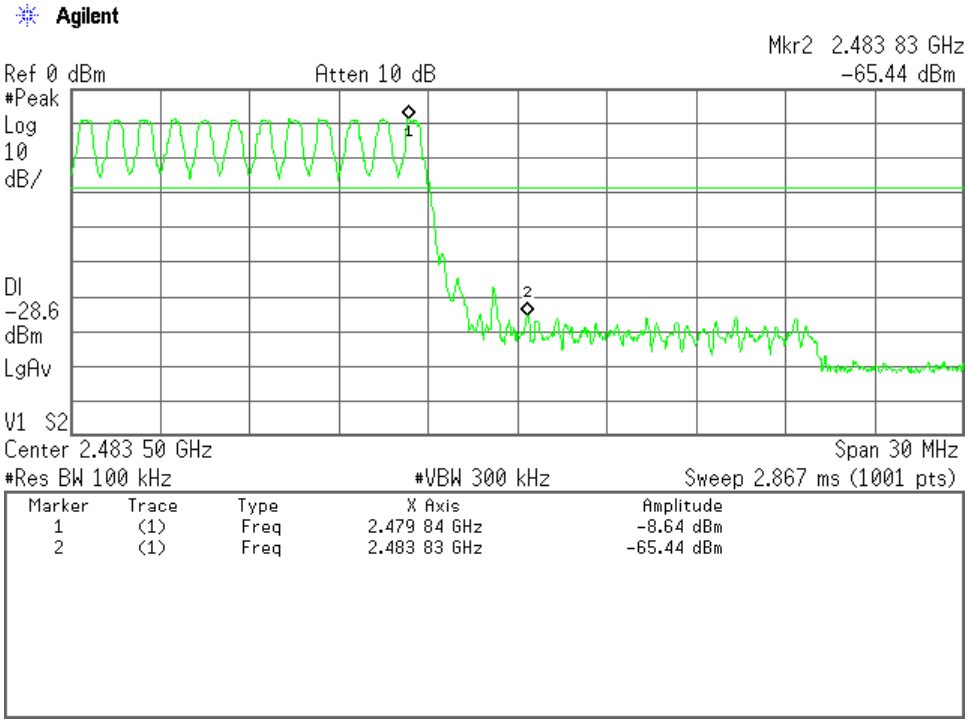
High Channel(Hopping off), Band-Edge Emission



Low Channel(Hopping on), Band-Edge Emission



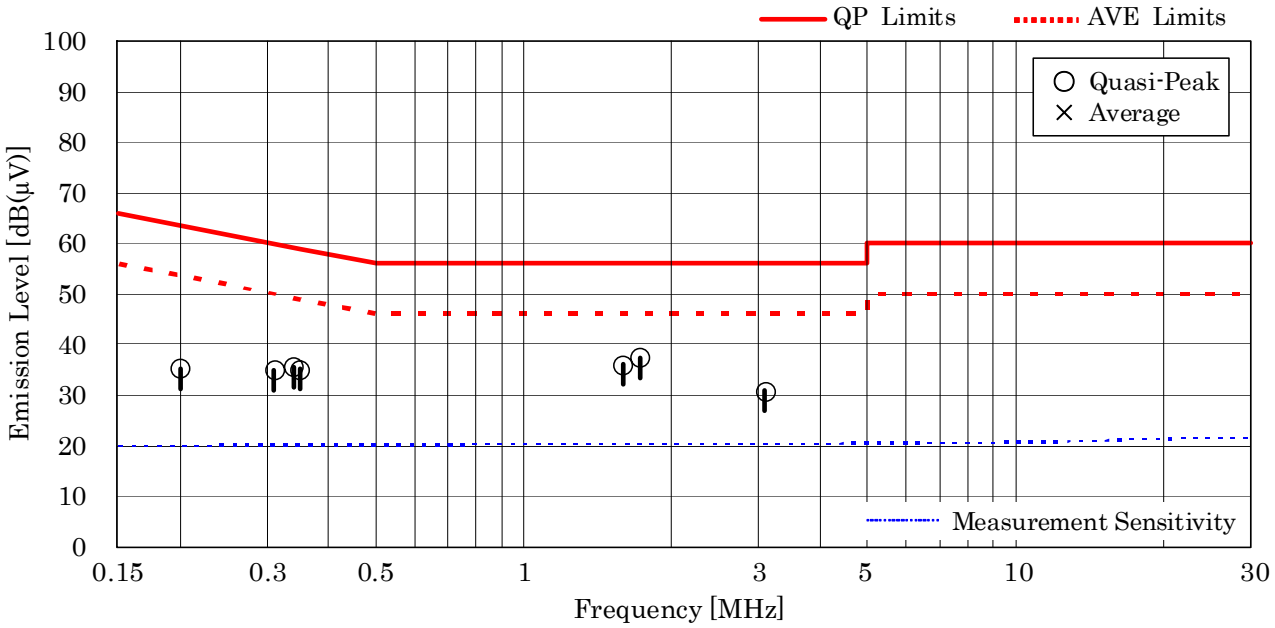
High Channel(Hopping on), Band-Edge Emission



A.7 AC Powerline Conducted Emission

Test Date: May 28, 2012
Temp.: 23 °C, Humi.: 45 %

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)] VA QP	VA AVE	VB QP	VB AVE	Limits [dB(μV)] QP	Limits [dB(μV)] AVE	Results [dB(μV)] QP	Results [dB(μV)] AVE	Margin [dB]	Remarks
0.20	10.1	25.2	--	24.0	--	63.6	53.6	35.3	--	+28.3	-
0.31	10.2	24.7	--	11.6	--	60.0	50.0	34.9	--	+25.1	-
0.34	10.2	25.4	--	21.9	--	59.2	49.2	35.6	--	+23.6	-
0.35	10.2	24.9	--	21.1	--	59.0	49.0	35.1	--	+23.9	-
1.59	10.3	21.9	--	25.8	--	56.0	46.0	36.1	--	+19.9	-
1.72	10.3	22.5	--	27.1	--	56.0	46.0	37.4	--	+18.6	-
3.09	10.3	20.5	--	20.2	--	56.0	46.0	30.8	--	+25.2	-



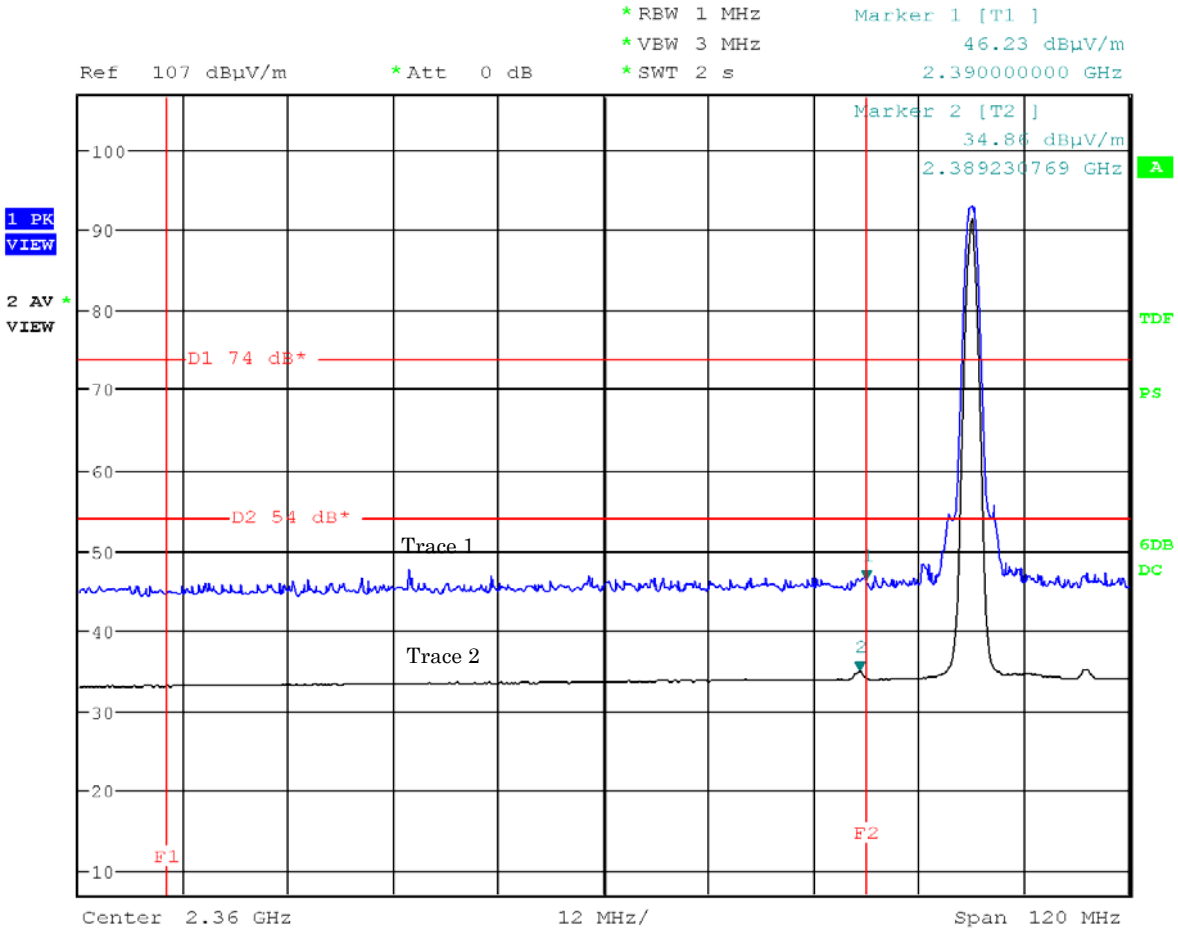
NOTES
1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 1.72 MHz, as the worst point shown on underline:
   Correction Factor + Meter Reading = 10.3 + 27.1 = 37.4 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

A.8 Field Strength of Spurious Radiation

A.8.1 Band-edge Compliance

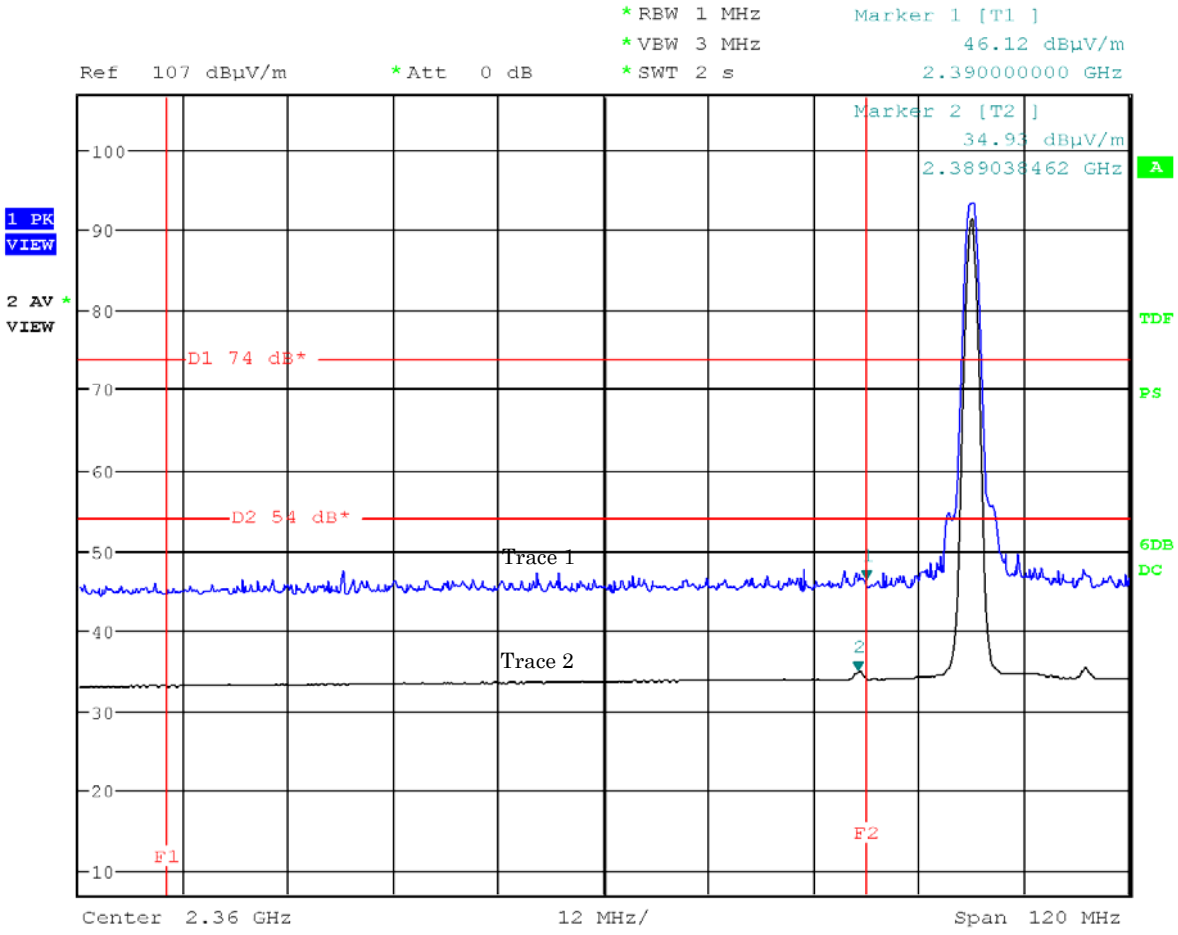
Test Date : May 31, 2012
Temp.:23°C, Humi:55%

Mode of EUT : Hopping off (0ch: 2402 MHz)
Antenna Polarization : Horizontal



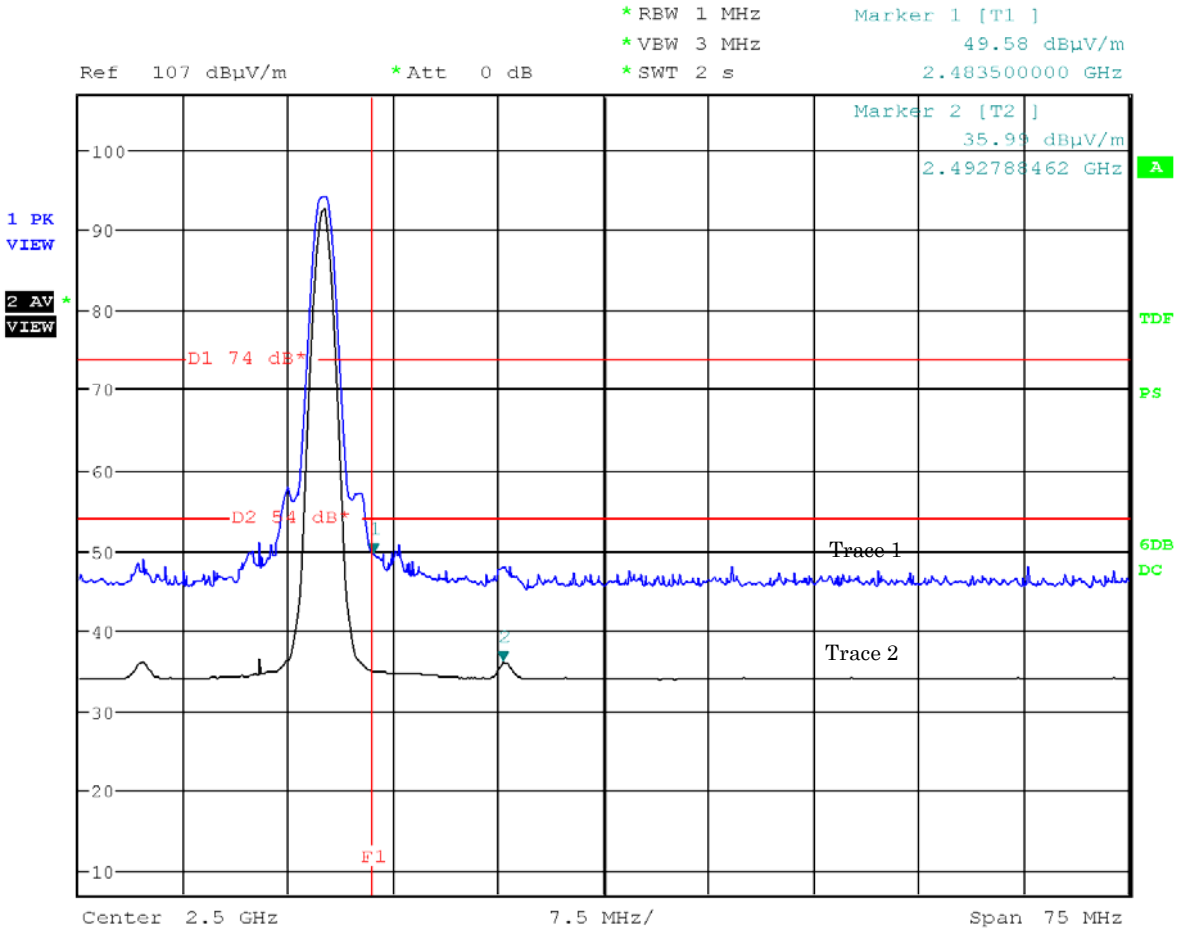
Note: The trace 1 is Peak detection. The trace 2 is Average detection.

Mode of EUT : Hopping off (0ch: 2402 MHz)
Antenna Polarization : Vertical



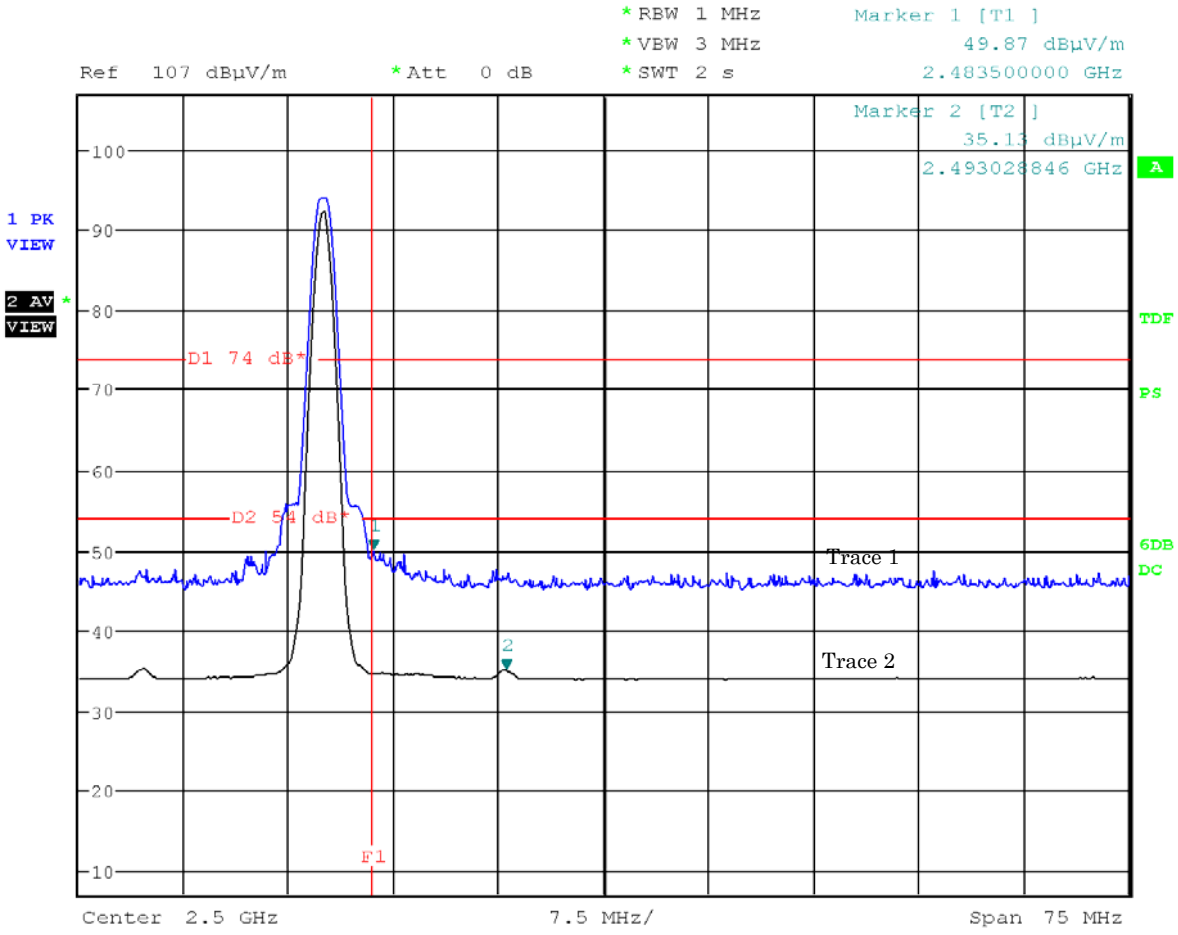
Note: The trace 1 is Peak detection. The trace 2 is Average detection.

Mode of EUT : Hopping off (78ch: 2480 MHz)
Antenna Polarization : Horizontal



Note: The trace 1 is Peak detection. The trace 2 is Average detection.

Mode of EUT : Hopping off (78ch: 2480 MHz)
Antenna Polarization : Vertical



Note: The trace 1 is Peak detection. The trace 2 is Average detection.

A.8.2 Other Spurious Emission

A.8.2.1 Other Spurious Emission(9kHz – 30MHz)

Test Date : May 25, 2012
Temp.:20°C, Humi:50%

Mode of EUT : All modes have been investigated and the worst case mode for channel (39ch: 2441MHz) has been listed.

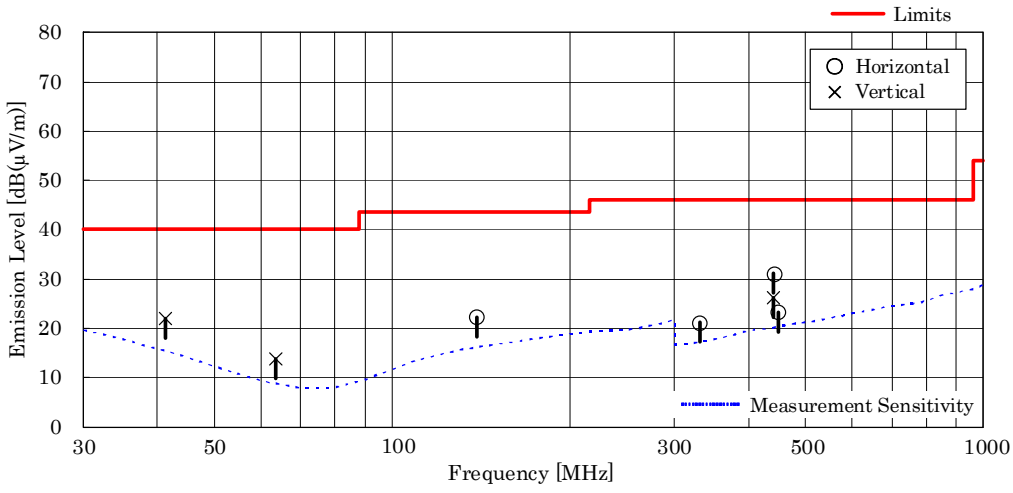
Results : No spurious emissions in the range 20dB below the limit.

A.8.2.2 Other Spurious Emission(30MHz – 1000MHz)

Mode of EUT : All modes have been investigated and the worst case mode for channel (39ch: 2441MHz) has been listed.

Test Date: May 25, 2012
Temp.: 21 °C, Humi: 50 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Cable Loss [dB]	Meter Readings [dB(μV)] Hori.	Meter Readings [dB(μV)] Vert.	Limits [dB(μV/m)]	Results [dB(μV/m)] Hori.	Results [dB(μV/m)] Vert.	Margin [dB]	Remarks
41.3	14.4	1.0	< 0.0	6.5	40.0	< 15.4	21.9	+18.1	-
63.5	7.6	1.2	< 0.0	5.0	40.0	< 8.8	13.8	+26.2	-
123.9	13.3	1.8	< 0.0	< 0.0	43.5	< 15.1	< 15.1	> +28.4	-
138.6	14.2	1.9	6.2	< 0.0	43.5	22.3	< 16.1	+21.2	-
169.0	15.6	2.1	< 0.0	< 0.0	43.5	< 17.7	< 17.7	> +25.8	-
331.0	14.2	3.0	4.0	< 0.0	46.0	21.2	< 17.2	+24.8	-
441.6	16.6	3.5	11.0	6.1	46.0	31.1	26.2	+14.9	-
448.8	16.7	3.5	3.1	< 0.0	46.0	23.3	< 20.2	+22.7	-



NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. Calculated result at 441.6 MHz, as the worst point shown on underline:
   Antenna Factor + Cable Loss + Meter Reading = 16.6 + 3.5 + 11.0 = 31.1 dB(μV/m)
6. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

A.8.2.3 Other Spurious Emission(Above 1000MHz)

Test Date: May 31, 2012
Temp.: 23 °C, Humi: 55 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx Low Ch												
4804.0	27.3	-21.2	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 46.1	< 36.1	> +17.9	A/B
12010.0	33.6	-27.3	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 46.3	< 36.3	> +17.7	A/B
19216.0	40.2	-22.6	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 57.6	< 47.6	> + 6.4	A/B
Test condition : TX Middle Ch												
4882.0	27.3	-21.3	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 46.0	< 36.0	> +18.0	A/B
7323.0	29.9	-19.6	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 50.3	< 40.3	> +13.7	A/B
12205.0	33.5	-27.0	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 46.5	< 36.5	> +17.5	A/B
19528.0	40.3	-22.6	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 57.7	< 47.7	> + 6.3	A/B
Test condition : TX High Ch												
4960.0	27.3	-21.4	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 45.9	< 35.9	> +18.1	A/B
7440.0	29.9	-19.5	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 50.4	< 40.4	> +13.6	A/B
12400.0	33.5	-26.7	< 40.0	< 30.0	40.0	< 30.0	74.0	54.0	< 46.8	< 36.8	> +17.2	A/B
19840.0	40.3	-22.5	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 57.8	< 47.8	> + 6.2	A/B
22320.0	40.4	-21.7	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 58.7	< 48.7	> + 5.3	A/B

Calculated result at 22320.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	40.4 dB(1/m)
	Corr. Factor	=	-21.7 dB
+)	Meter Reading	=	<30.0 dB(μV)
	Result	=	<48.7 dB(μV/m)

Minimum Margin: 54.0 - <48.7 = >5.3 (dB)

NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak Detector / AVE : Average Detector
7. Setting of measuring instrument(s) :

	Detector Function	Resolution B.W.	Video B.W.	Sweep Time
A	Peak	1 MHz	1 MHz	AUTO
B	Peak	1 MHz	10 Hz	AUTO

Test Date: May 31, 2012
Temp.: 23 °C, Humi: 55 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : RX Middle Ch												
2441.0	21.5	-22.0	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 39.5	< 29.5	> +24.5	A/B
4882.0	27.3	-21.6	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 45.7	< 35.7	> +18.3	A/B
7323.0	29.9	-19.9	< 40.0	< 30.0	< 40.0	< 30.0	74.0	54.0	< 50.0	< 40.0	> +14.0	A/B

Calculated result at 7323.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	29.9 dB(1/m)
	Corr. Factor	=	-19.9 dB
+)	Meter Reading	=	<30.0 dB(μV)
	Result	=	<40.0 dB(μV/m)

Minimum Margin: 54.0 - <40.0 = >14.0 (dB)

NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 7.5 GHz .
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak Detector / AVE : Average Detector
7. Setting of measuring instrument(s) :

	Detector Function	Resolution B.W.	Video B.W.	Sweep Time
A	Peak	1 MHz	1 MHz	AUTO
B	Peak	1 MHz	10 Hz	AUTO

Appendix C: Test Instruments

C.1 Channel Separation

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Spectrum Analyzer	E4446A	Agilent	A-39	2011/9	1 Year
Attenuator	54A-10	Weinschel	D-28	2011/9	1 Year
RF Cable	SUCOFLEX102	SUHNER	C-52	2011/6	1 Year

C.2 Minimum Hopping Channel

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Spectrum Analyzer	E4446A	Agilent	A-39	2011/9	1 Year
Attenuator	54A-10	Weinschel	D-28	2011/9	1 Year
RF Cable	SUCOFLEX102	SUHNER	C-52	2011/6	1 Year

C.3 Occupied Bandwidth

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Spectrum Analyzer	E4446A	Agilent	A-39	2011/9	1 Year
Attenuator	54A-10	Weinschel	D-28	2011/9	1 Year
RF Cable	SUCOFLEX102	SUHNER	C-52	2011/6	1 Year

C.4 Dwell Time

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Spectrum Analyzer	E4446A	Agilent	A-39	2011/9	1 Year
Attenuator	54A-10	Weinschel	D-28	2011/9	1 Year
RF Cable	SUCOFLEX102	SUHNER	C-52	2011/6	1 Year

C.5 Peak Output Power (Conduction)

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Power Meter	N1911A	Agilent	B-63	2011/7	1 Year
Power Sensor	N1921A	Agilent	B-64	2011/7	1 Year
Attenuator	54A-10	Weinschel	D-28	2011/9	1 Year
RF Cable	SUCOFLEX102	SUHNER	C-52	2011/6	1 Year

C.6 Spurious Emission (Conduction)

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Spectrum Analyzer	E4446A	Agilent	A-39	2011/9	1 Year
Attenuator	54A-10	Weinschel	D-28	2011/9	1 Year
RF Cable	SUCOFLEX102	SUHNER	C-52	2011/6	1 Year

C.7 AC Power Conducted Emission

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESCI	Rohde & Schwarz	A-42	2011/12	1 Year
AMN (main)	ESH3-Z5	Rohde & Schwarz	D-12	2011/8	1 Year
RF Cable	RG223/U	SUHNER	H-35	2011/6	1 Year

C.8 Radiated Emission

C.8.1 Radiated Emission 9 kHz – 30 MHz

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESU 26	Rohde & Schwarz	A-6	2012/4	1 Year
Loop Antenna	HFH2-Z2	Rohde & Schwarz	C-2	2011/8	1 Year
RF Cable	RG213/U	SUHNER	H-28	2011/8	1 Year

C.8.2 Radiated Emission 30MHz – 1000 MHz

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESU 26	Rohde & Schwarz	A-6	2012/4	1 Year
Biconical Antenna	VHA9103/BBA9106	Schwarzbeck	C-30	2012/5	1 Year
Log-periodic Antenna	UHALP9108-A1	Schwarzbeck	C-31	2012/5	1 Year
RF Cable	S 10162 B-11 etc.	SUHNER	H-4	2012/3	1 Year
Site Attenuation	--	----	H-15	2012/2	1 Year

C.8.3 Radiated Emission Above 1000 MHz

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESU 26	Rohde & Schwarz	A-6	2012/4	1 Year
Pre-Amplifier	WJ-6882-824	Watkins Johnson	A-21	2012/1	1 Year
Pre-Amplifier	WJ-6611-513	Watkins Johnson	A-23	2012/1	1 Year
Pre-Amplifier	BZ1840LD1	B&Z	A-29	2012/1	1 Year
Pre-Amplifier	DBL-0618N515	DBS Microwave	A-33	2012/1	1 Year
Horn Antenna	91888-2	EATON	C-41-1	2011/6	1 Year
Horn Antenna	91889-2	EATON	C-41-2	2011/6	1 Year
Horn Antenna	3160-04	EMCO	C-55	2011/6	2 Years
Horn Antenna	3160-05	EMCO	C-56	2011/6	2 Years
Horn Antenna	3160-06	EMCO	C-57	2011/6	2 Years
Horn Antenna	3160-07	EMCO	C-58	2011/6	2 Years
Horn Antenna	3160-08	EMCO	C-59	2011/6	2 Years
Horn Antenna	3160-09	EMCO	C-48	2011/6	2 Years
Attenuator	54A-10	Weinschel	D-29	2011/9	1 Year
Attenuator	2-10	Weinschel	D-79	2011/11	1 Year
Band Rejection Filter	BRM50701	MICRO-TRONICS	D-93	2012/2	1 Year
RF Cable	SUCOFLEX102	SUHNER	C-52	2011/6	1 Year
RF Cable	SUCOFLEX104	SUHNER	C-66	2012/1	1 Year
RF Cable	SUCOFLEX104	SUHNER	C-67	2012/1	1 Year
RF Cable	SUCOFLEX102EA	SUHNER	C-69	2012/1	1 Year
SVSWR	--	----	H-19	2012/2	1 Year