

RADIO TEST REPORT

FOR

Shenzhen Bada Sheng Electronic Co., Ltd

2.4G Wireless Transmission Box

Model No.: 390TB

Prepared for : Shenzhen Bada Sheng Electronic Co., Ltd
Address : Rm 10, 6/F, Fonda Ind. Bldg, 37-39 Au Pui Wan St., Fotan, Shatin,
N.T. Hong Kong

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : 1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd., Bao'an
District, Shenzhen, Guangdong, China

Date of receipt of test sample : May 08, 2011
Number of tested samples : 1
Serial number : Prototype
Date of Test : May 08, 2011 – June 08, 2012
Date of Report : June 08, 2012

TEST REPORT
FCC CFR 47 PART 15 C(15.247)

Report Reference No. : LCS120508040TF

Date of Issue : June 08, 2012

Testing Laboratory Name..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Address : 1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd.,
Bao'an District, Shenzhen, Guangdong, China

Testing Location/ Procedure..... : Full application of Harmonised standards
Partial application of Harmonised standards
Other standard testing method

Applicant's Name : Shenzhen Bada Sheng Electronic Co., Ltd

Address : Rm 10, 6/F, Fonda Ind. Bldg, 37-39 Au Pui Wan St., Fotan,
Shatin, N.T. Hong Kong

Test Specification

Standard : FCC CFR 47 PART 15 Subpart C, ANSI C63.4-2003

Test Report Form No. : LCSEMC-1.0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF..... : Dated 2011-03

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen LCS Compliance Testing Laboratory Ltd. is acknowledged as copyright owner and source of the material. Shenzhen LCS Compliance Testing Laboratory Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test Item Description..... : 2.4G Wireless Transmission Box

Trade Mark : BADA

Manufacturer : Shenzhen Bada Sheng Electronic Co., Ltd

Model/ Type reference : 390TB

Ratings : DC 5.0V

Result : **Positive**

Compiled by:

Ada Liang

Supervised by:

Vito Cao

Approved by:

Gavin Liang

Ada Liang/ File administrators

Vito Cao/ Technique principal

Gavin Liang/ Manager

EMC -- TEST REPORT

Test Report No. : LCS120508040TF	<u>June 08, 2012</u> Date of issue
-----------------------------------------	---------------------------------------

Type / Model.....	: 390TB
EUT.....	: 2.4G Wireless Transmission Box
Applicant.....	: Shenzhen Bada Sheng Electronic Co., Ltd
Address.....	: Rm 10, 6/F, Fonda Ind. Bldg, 37-39 Au Pui Wan St., Fotan, Shatin, N.T. Hong Kong
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: Shenzhen Bada Sheng Electronic Co., Ltd
Address.....	: Rm 10, 6/F, Fonda Ind. Bldg, 37-39 Au Pui Wan St., Fotan, Shatin, N.T. Hong Kong
Telephone.....	: /
Fax.....	: /
Factory.....	: Shenzhen Bada Sheng Electronic Co., Ltd
Address.....	: Rm 10, 6/F, Fonda Ind. Bldg, 37-39 Au Pui Wan St., Fotan, Shatin, N.T. Hong Kong
Telephone.....	: /
Fax.....	: /

Test Result:	Positive
---------------------	-----------------

The test report merely corresponds to the test sample.
 It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	5
1.1 Description of Device (EUT).....	5
1.2 Host System Configuration List and Details	5
1.3 External I/O Cable	5
1.4 Description of Test Facility	5
1.5 Statement of The Measurement Uncertainty	6
1.6 Measurement Uncertainty	6
1.7 Description Of Test Modes.....	6
2. TEST METHODOLOGY	7
2.1 EUT Configuration	7
2.2 EUT Exercise.....	7
2.3 General Test Procedures	7
3. SYSTEM TEST CONFIGURATION.....	8
3.1 Justification.....	8
3.2 EUT Exercise Software	8
3.3 Special Accessories.....	8
3.4 Block Diagram/Schematics.....	8
3.5 Equipment Modifications	8
3.6 Block Diagram of Test Setup.....	8
4. FCC PART 15.247 REQUIREMENTS	9
4.1 Peak Power	9
4.2 Band Edges Measurement	10
4.3 Frequency Separation	14
4.4 Number Of Hopping Frequency	18
4.5 Time Of Occupancy (Dwell Time).....	20
4.6 Spurious Emissions.....	23
5. RADIATED EMISSION MEASUREMENT	27
5.1 Test Equipment.....	27
5.2 Block Diagram of Test Setup.....	27
5.3 Radiated Emission Limit	28
5.4 Test Results.....	28
6. POWER LINE CONDUCTED EMISSIONS.....	31
6.1 Test Equipment.....	31
6.2 Block Diagram of Test Setup.....	31
6.3 Conducted Emission Limit	31
6.4 Test Results.....	31
7. ANTENNA REQUIREMENT	33
7.1 Standard Applicable.....	33
7.2 Antenna Connected Construction	33
8. MANUFACTURER/ APPROVAL HOLDER DECLARATION	34

1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT	: 2.4G Wireless Transmission Box
Model Number	: 390TB
Power Supply	: DC 5.0V
Frequency Range	: 2402.00-2480.00MHz,(Channel Frequency=2402+1(K-1), K=1, 2, 379)
Modulation Type	: GFSK
Antenna Gain	: 1.8dBi (Isotropic)
Module Channel	: 79
Channel Spacing	: 1MHz

1.2 Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	Notebook	Lenovo B470	WB05067151	DoC

1.3 External I/O Cable

Cable Description	Length (M)	From/Port	To
Unshielded	0.5	EUT	PC

1.4 Description of Test Facility

Site Description

EMC Lab. : Accredited by CNAS, June 04, 2010
 The Certificate Registration Number. is L4595.
 Accredited by FCC, July 14, 2011
 The Certificate Registration Number. is 899208.
 Accredited by Industry Canada, May. 02, 2011
 The Certificate Registration Number. is 9642A-1

1.5 Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiation Uncertainty	30MHz~200MHz	$\pm 2.96\text{dB}$	(1)
	200MHz~1000MHz	$\pm 3.10\text{dB}$	(1)
	1GHz~26.5GHz	$\pm 3.80\text{dB}$	(1)
Conduction Uncertainty	150kHz~30MHz	$\pm 1.63\text{dB}$	(1)
Power disturbance	30MHz~300MHz	$\pm 1.60\text{dB}$	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

1.7 Description Of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

Then, the worst case is FHSS Channel Low (2402MHz), Mid (2442MHz) and High (2480MHz), these were chosen for full testing.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR PART 15C 15.207, 15.209, 15.247 and DA 00-705

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

2.3 General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

3.2 EUT Exercise Software

N/A.

3.3 Special Accessories

N/A.

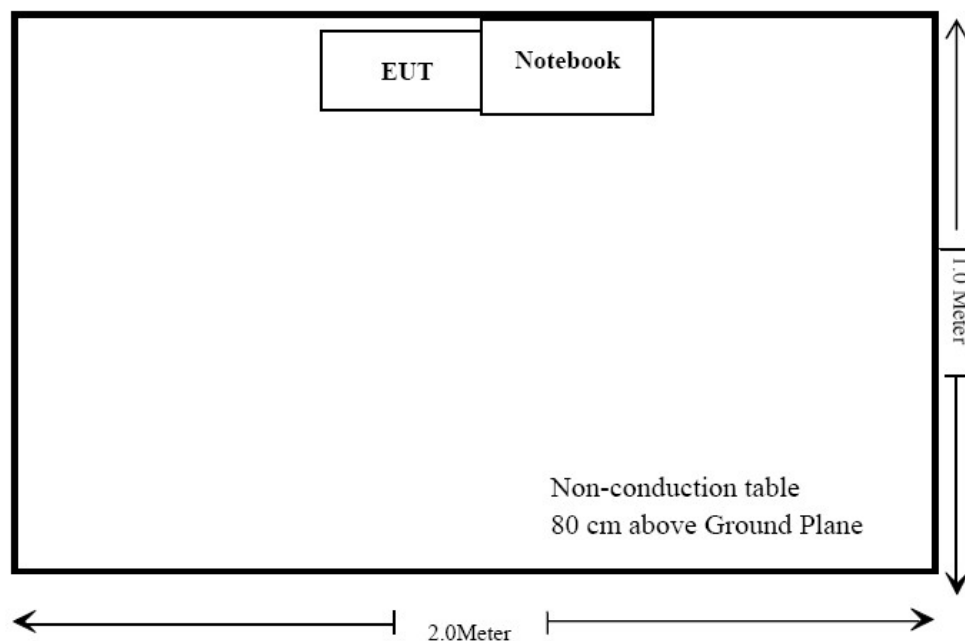
3.4 Block Diagram/Schematics

Please refer to the report

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Block Diagram of Test Setup



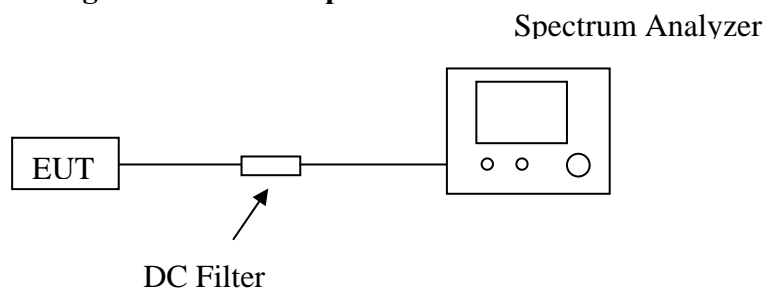
4. FCC PART 15.247 REQUIREMENTS

4.1 Peak Power

4.1.1 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Agilent	E4407B	MY41440292	2011-06-21
2	Power Sensor	Agilent	E9327A	US40441788	2011-06-21
3	Power Meter	Agilent	E4416A	QB41292714	2011-06-21
4	DC Filter	MPE	23872C	N/A	2011-06-21

4.1.2 Block Diagram of Test Setup



4.1.3 Limit

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping 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.

According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.

4.1.4 Test Procedure

The transmitter output is connected to the Power Meter or spectrum analyzer.

4.1.5 Test Results

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (mW)	Result
Low	2402	2.83	1.92	125	Pass
Mid	2441	3.63	2.31	125	Pass
High	2480	2.76	1.89	125	Pass

4.2 Band Edges Measurement

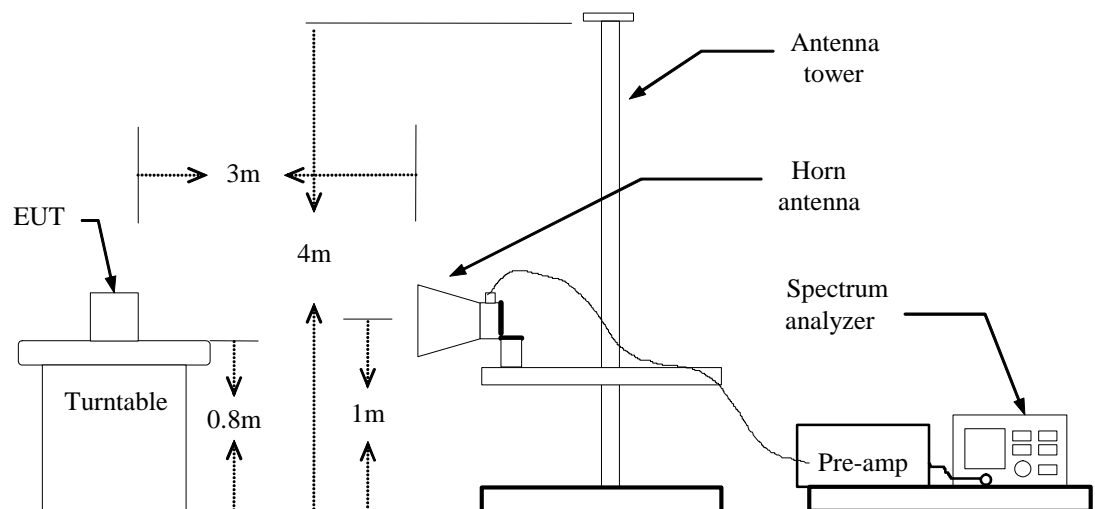
4.2.1 Limit

According to §15.247(c), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

4.2.2 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Agilent	E4407B	MY41440292	2011-06-21
2	Antenna	Schwarzbeck	VULB9163	142	2011-06-21
3	Horn-antenna	Schwarzbeck	BBHA9120D	D:266	2011-06-21
4	DC Filter	MPE	23872C	N/A	2011-06-21

4.2.3 Block Diagram of Test Setup



4.2.4 Test Procedure

The EUT is placed on a turntable, which is 0.8m above the ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

Peak: RBW=VBW=1MHz / Sweep=AUTO

Repeat the procedures until the peak versus polarization are measured.

4.2.5 Test Results

CH Low

Frequency (MHz)	Ant Pol H/V	PK Value (dBuV)	Ave Value (dBuV)	PK Limit (dBuV)	Ave Limit (dBuV)	PK Margin (dB)	Ave Margin (dB)
2390.00	V	43.19	33.27	74.00	54.00	30.81	20.73
2390.00	H	43.22	33.56	74.00	54.00	30.78	20.44

CH High

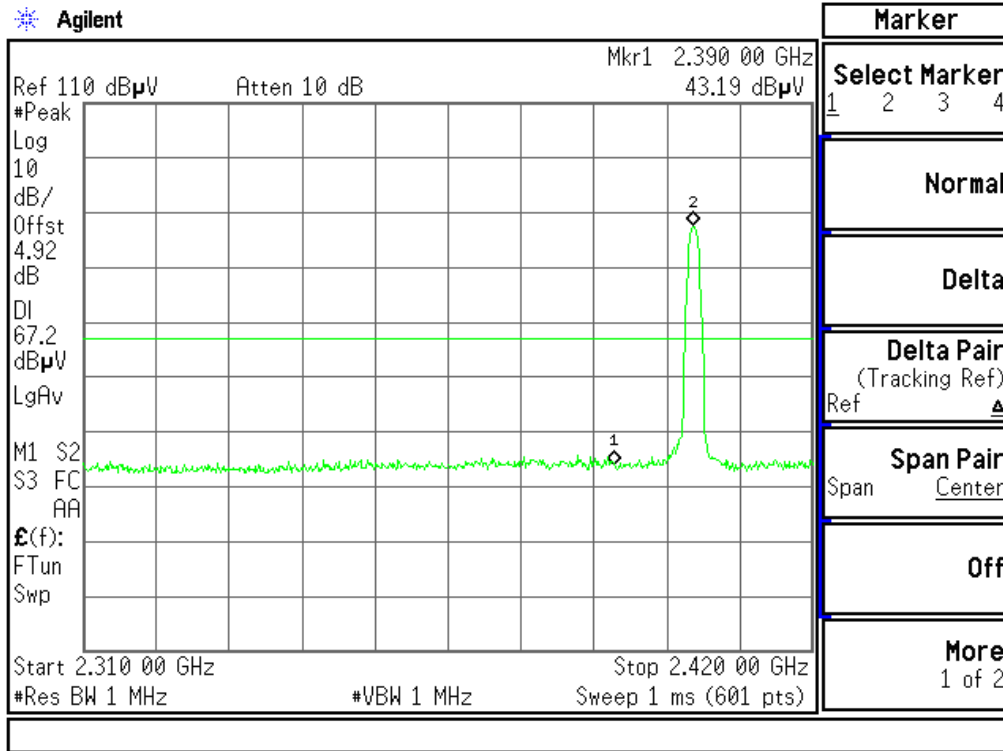
Frequency (MHz)	Ant Pol H/V	PK Value (dBuV)	Ave Value (dBuV)	PK Limit (dBuV)	Ave Limit (dBuV)	PK Margin (dB)	Ave Margin (dB)
2483.50	V	42.38	33.48	74.00	54.00	31.62	20.52
2483.50	H	43.15	33.62	74.00	54.00	30.85	20.38

** The test data graph please refer to the following page.*

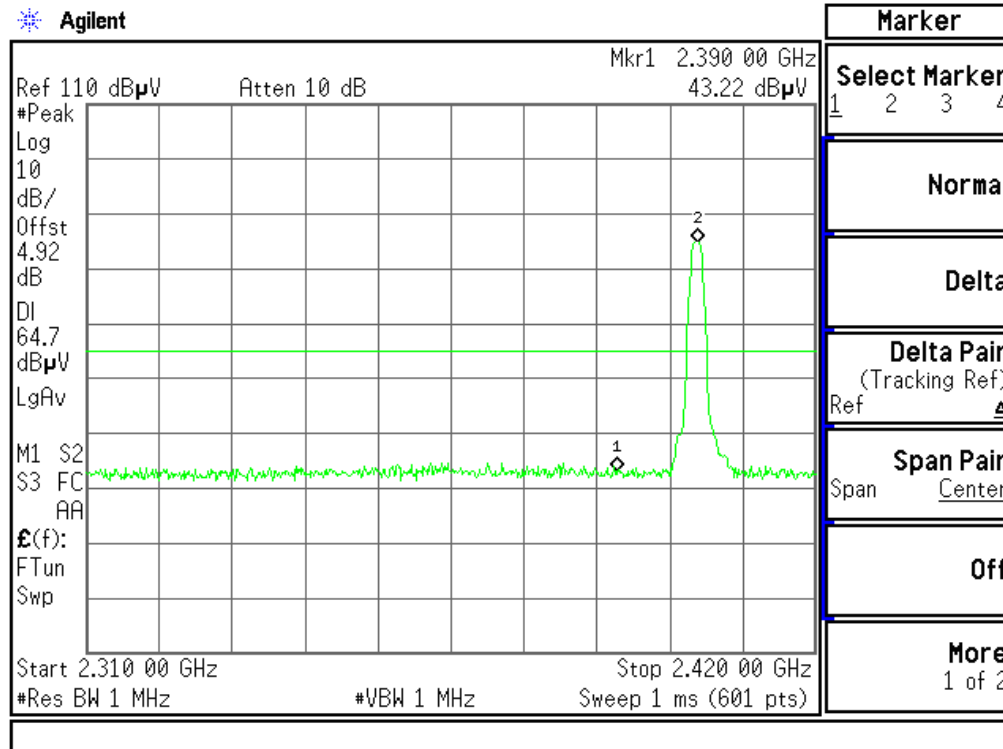
Note : The attenuate 20 below fundamental level is less then FCC 15.209 limit, the attenuate 20 below fundamental level is marked in the test data graph.

Band Edges (CH Low)

Detector mode: Peak Polarity: Vertical



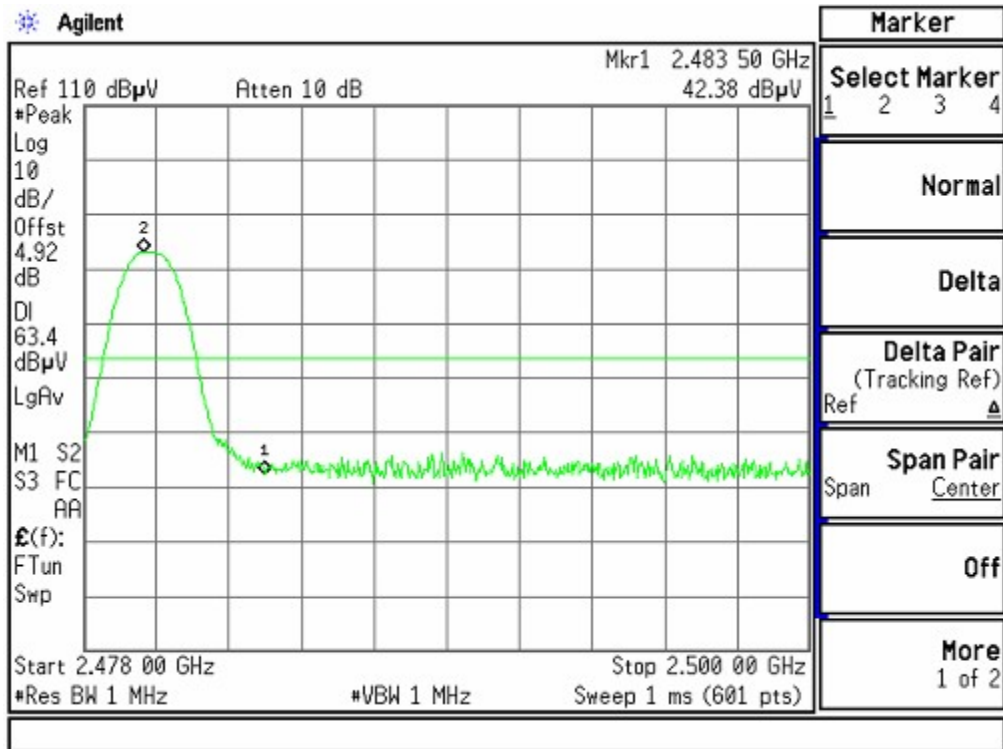
Detector mode: Peak Polarity: Horizontal



Band Edges (CH High)

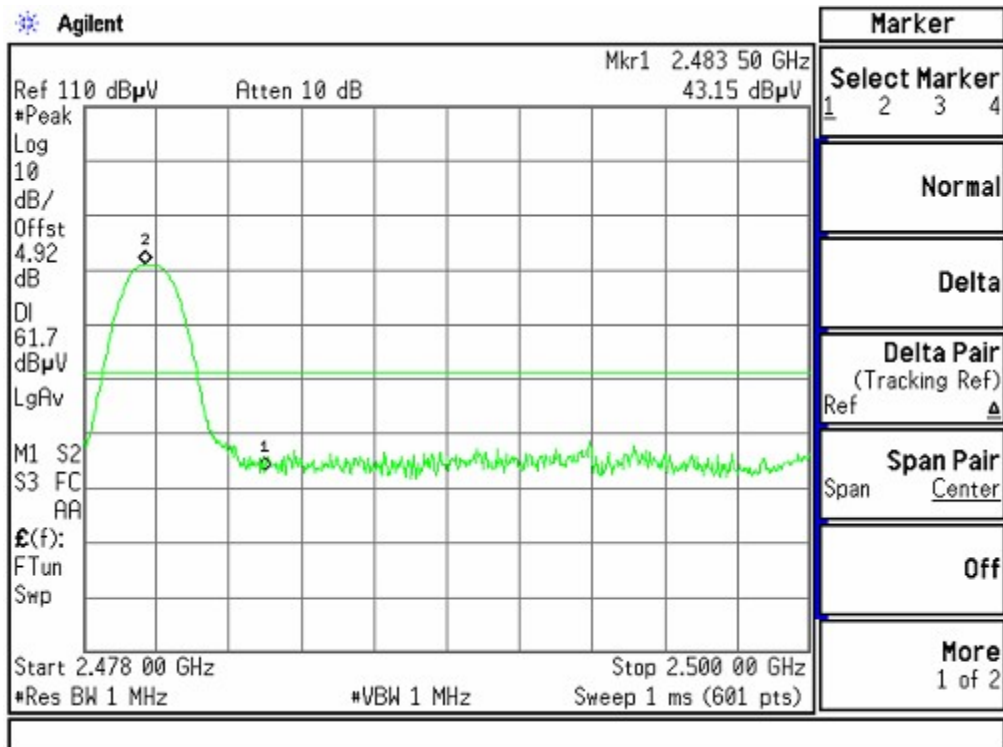
Detector mode: Peak

Polarity: Vertical



Detector mode: Peak

Polarity: Horizontal



4.3 Frequency Separation

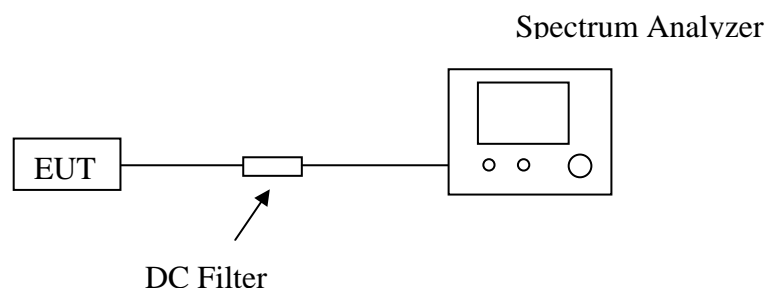
4.3.1 Limit

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping 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.

4.3.2 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Agilent	E4407B	MY41440292	2011-06-21
2	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2011-06-21
3	DC Filter	MPE	23872C	N/A	2011-06-21

4.3.3 Block Diagram of Test Setup



4.3.4 Test Procedure

- Place the EUT on the table and set it in transmitting mode.
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
- Set center frequency of Spectrum Analyzer = middle of hopping channel.
- Set the Spectrum Analyzer as RBW = 30kHz, VBW = 100kHz, Span = 4MHz, Sweep = auto.
- Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

4.3.5 Test Results

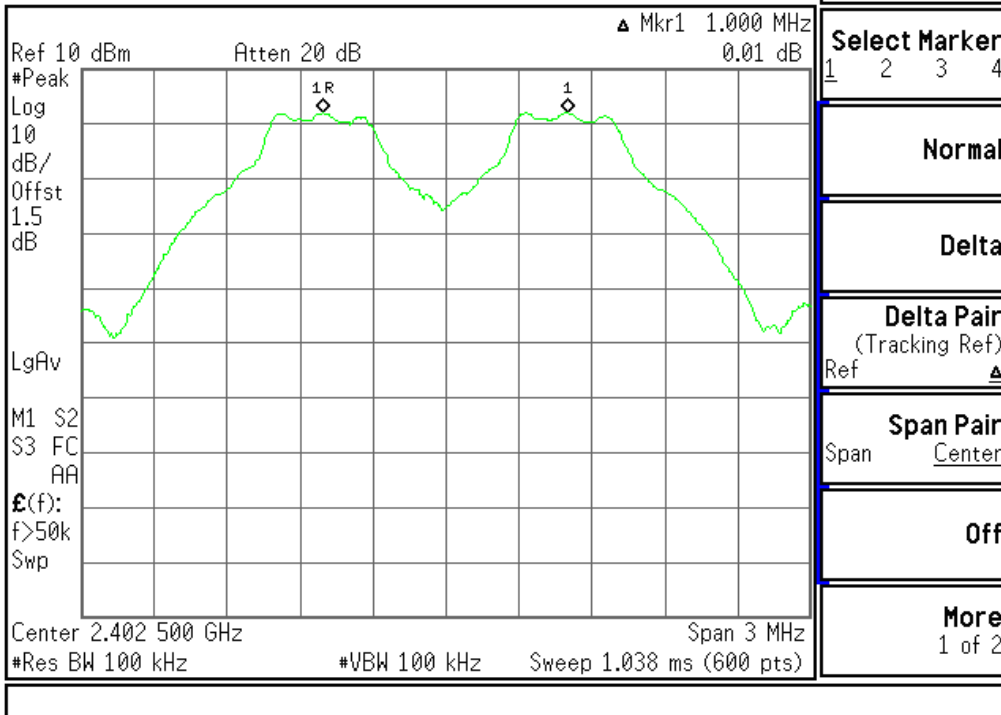
Channel Separation (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Result
1.000	942.569	>628.38	Pass

The test data graph please refer to the following page.

Measurement of Channel Separation

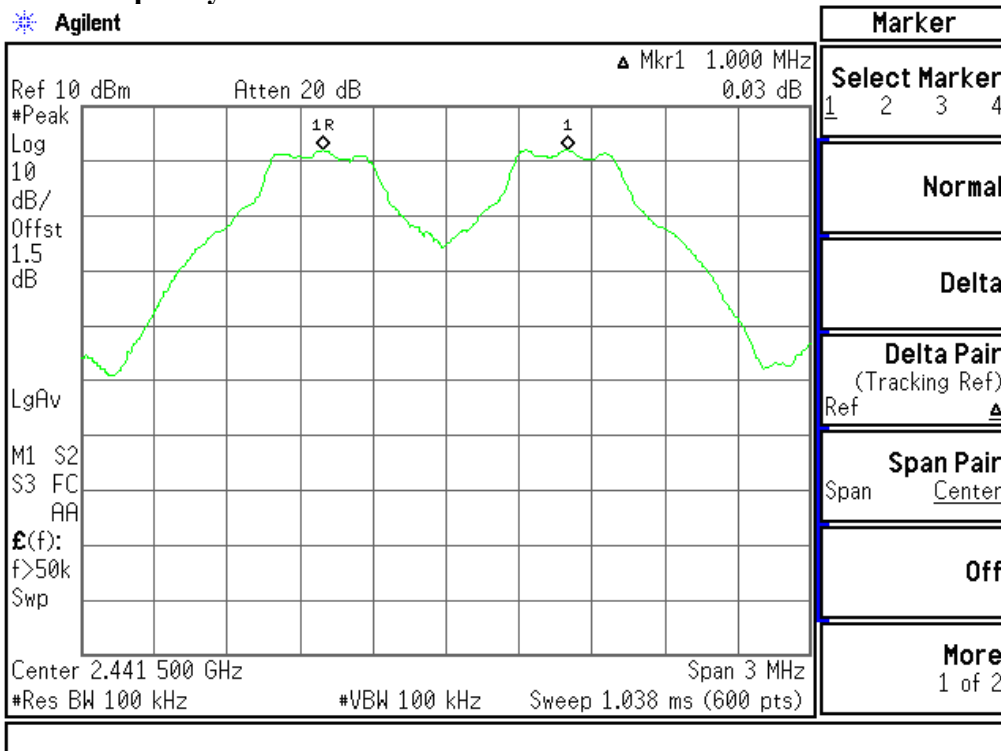
Test frequency: 2402MHz

Agilent



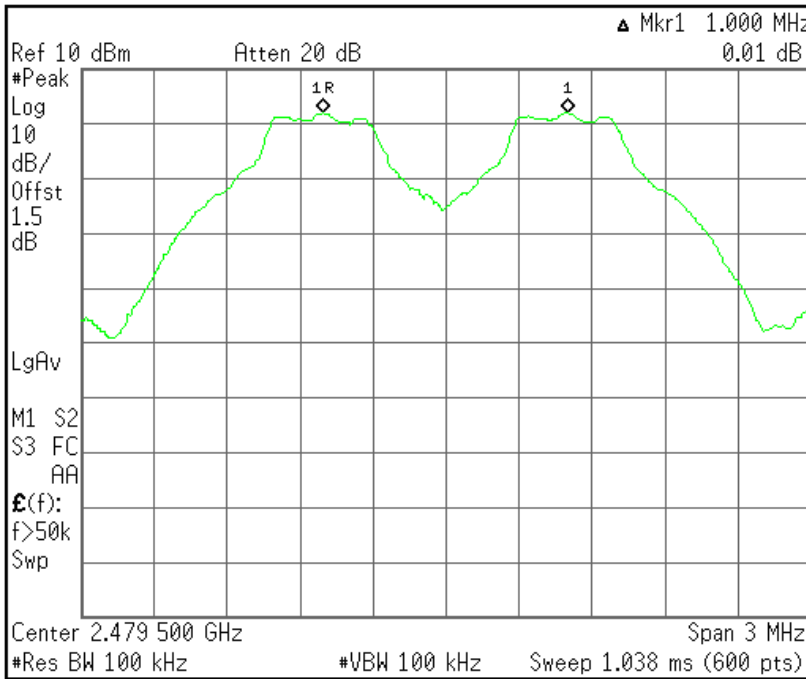
Test frequency: 2441MHz

Agilent



Test frequency: 2480MHz

Agilent

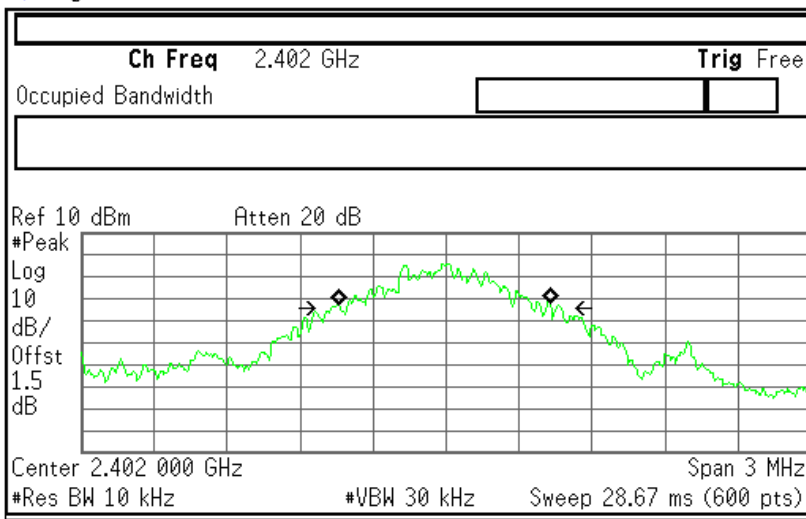


Marker
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref ▲
Span Pair Span Center
Off
More 1 of 2

Measurement of 20dB Bandwidth

Test frequency: 2402MHz

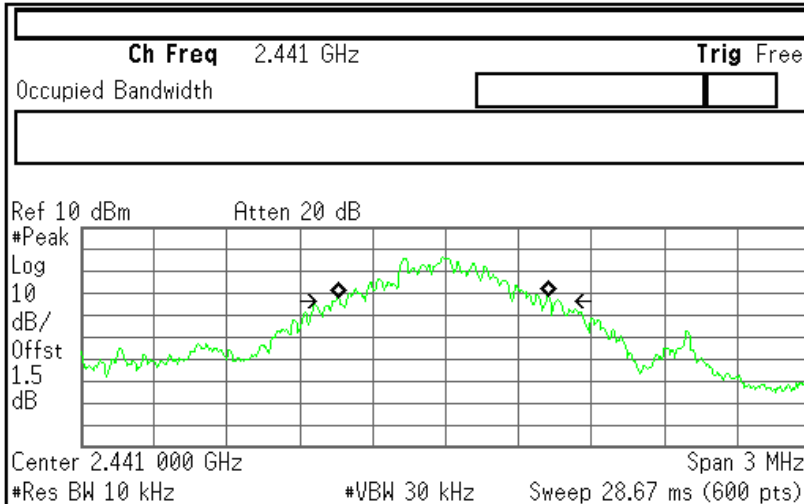
Agilent



Freq/Channel
Center Freq 2.40200000 GHz
Start Freq 2.40050000 GHz
Stop Freq 2.40350000 GHz
CF Step 300.000000 kHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Occupied Bandwidth	Occ BW % Pwr	99.00 %
871.9222 kHz	x dB	-20.00 dB
Transmit Freq Error	-9.691 kHz	
x dB Bandwidth	942.569 kHz	

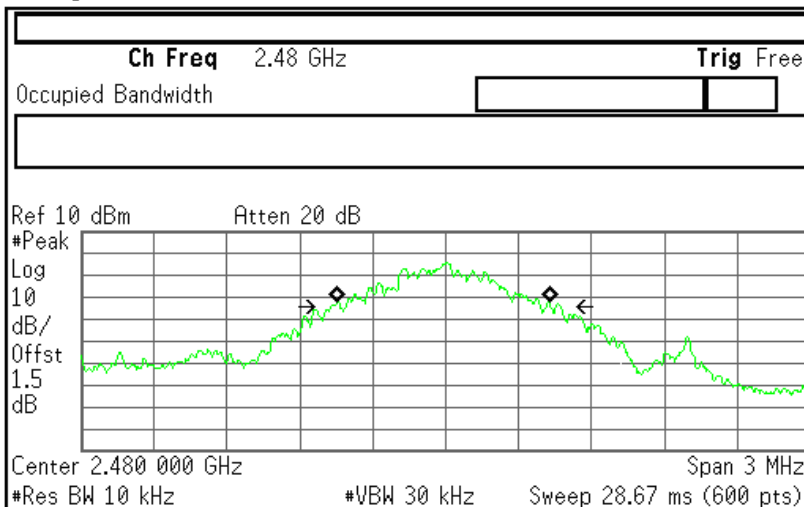
Test frequency: 2441MHz



Freq/Channel
Center Freq 2.44100000 GHz
Start Freq 2.43950000 GHz
Stop Freq 2.44250000 GHz
CF Step 300.000000 kHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Occupied Bandwidth	Occ BW % Pwr	99.00 %
868.3955 kHz	x dB	-20.00 dB
Transmit Freq Error	-9.516 kHz	
x dB Bandwidth	936.278 kHz	

Test frequency: 2480MHz



Freq/Channel
Center Freq 2.48000000 GHz
Start Freq 2.47850000 GHz
Stop Freq 2.48150000 GHz
CF Step 300.000000 kHz Auto Man
Freq Offset 0.00000000 Hz
Signal Track On Off

Occupied Bandwidth	Occ BW % Pwr	99.00 %
873.2332 kHz	x dB	-20.00 dB
Transmit Freq Error	-11.134 kHz	
x dB Bandwidth	935.031 kHz	

4.4 Number Of Hopping Frequency

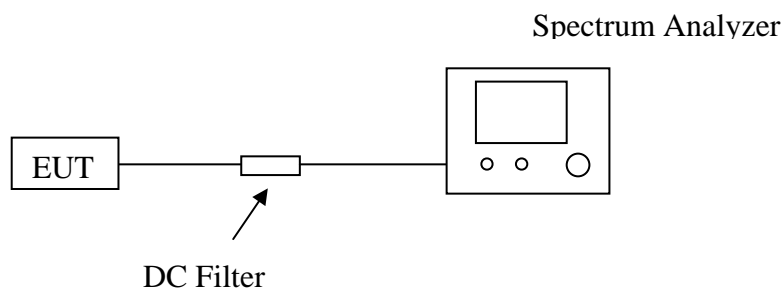
4.4.1 Limit

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 75 hopping frequencies.

4.4.2 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Agilent	E4407B	MY41440292	2011-06-21
2	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2011-06-21
3	DC Filter	MPE	23872C	N/A	2011-06-21

4.4.3 Block Diagram of Test Setup



4.4.4 Test Procedure

- Place the EUT on the table and set it in transmitting mode.
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
- Set Spectrum Analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
- Set the Spectrum Analyzer as RBW, VBW=100kHz.
- Max hold, view and count how many channel in the band.

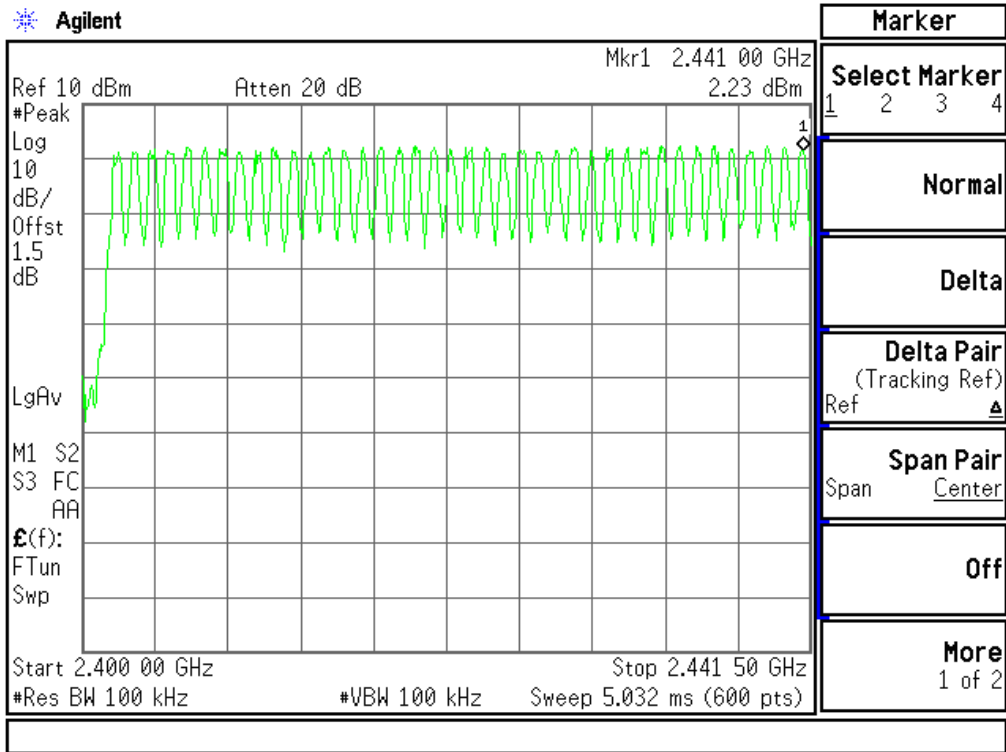
4.4.5 Test Results

Result (No. of CH)	Limit (No. of CH)	Result
79	>75	PASS

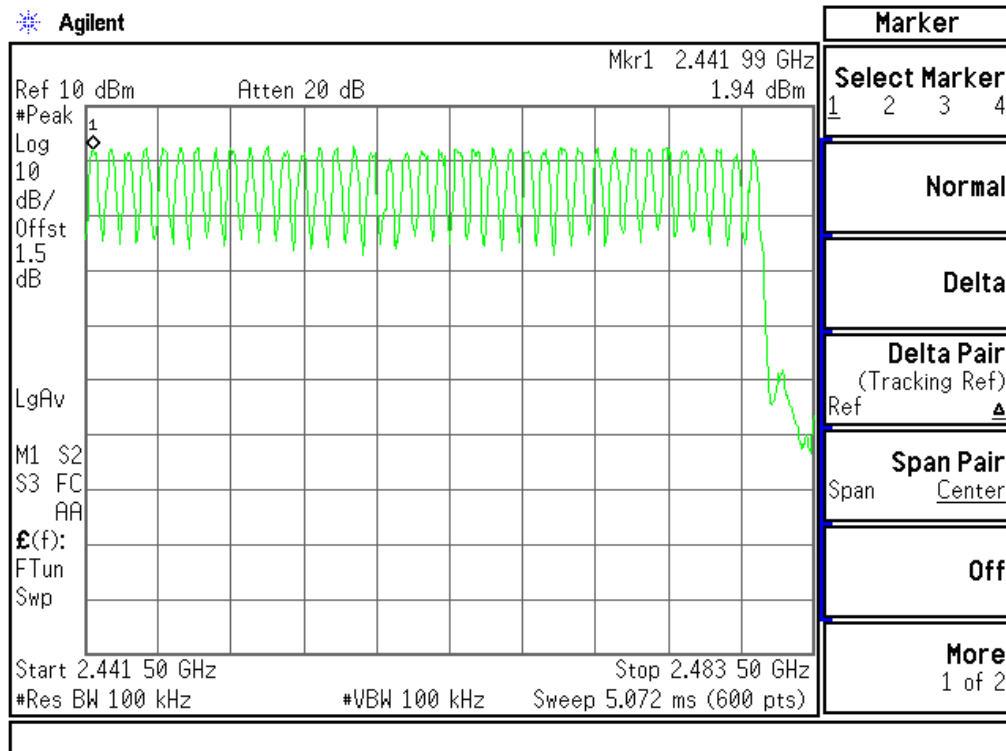
The test data graph please refer to the following page.

Channel Number

2.4 GHz – 2.4415 GHz



2.4415 GHz – 2.4835 GHz



4.5 Time Of Occupancy (Dwell Time)

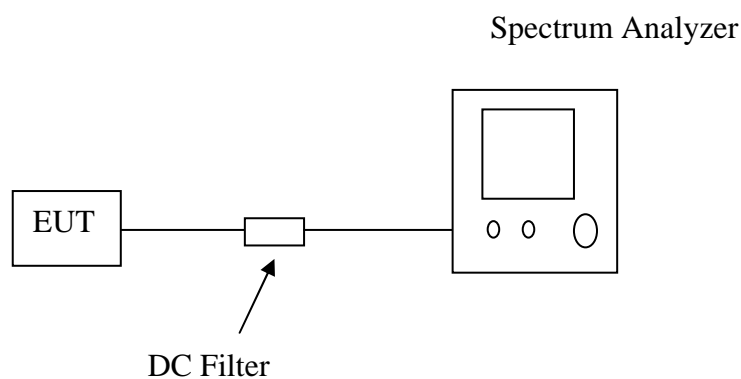
4.5.1 Limit

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

4.5.2 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Agilent	E4407B	MY41440292	2011-06-21
2	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2011-06-21
3	DC Filter	MPE	23872C	N/A	2011-06-21

4.5.3 Block Diagram of Test Setup



4.5.4 Test Procedure

- Place the EUT on the table and set it in transmitting mode.
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
- Set center frequency of Spectrum Analyzer = operating frequency.
- Set the Spectrum Analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.
- Repeat above procedures until all frequency measured were complete.

4.5.5 Test Results

DH 1

$$0.402 * (1600/2)/79 * 31.6 = 128.64 \text{ (ms)}$$

DH 3

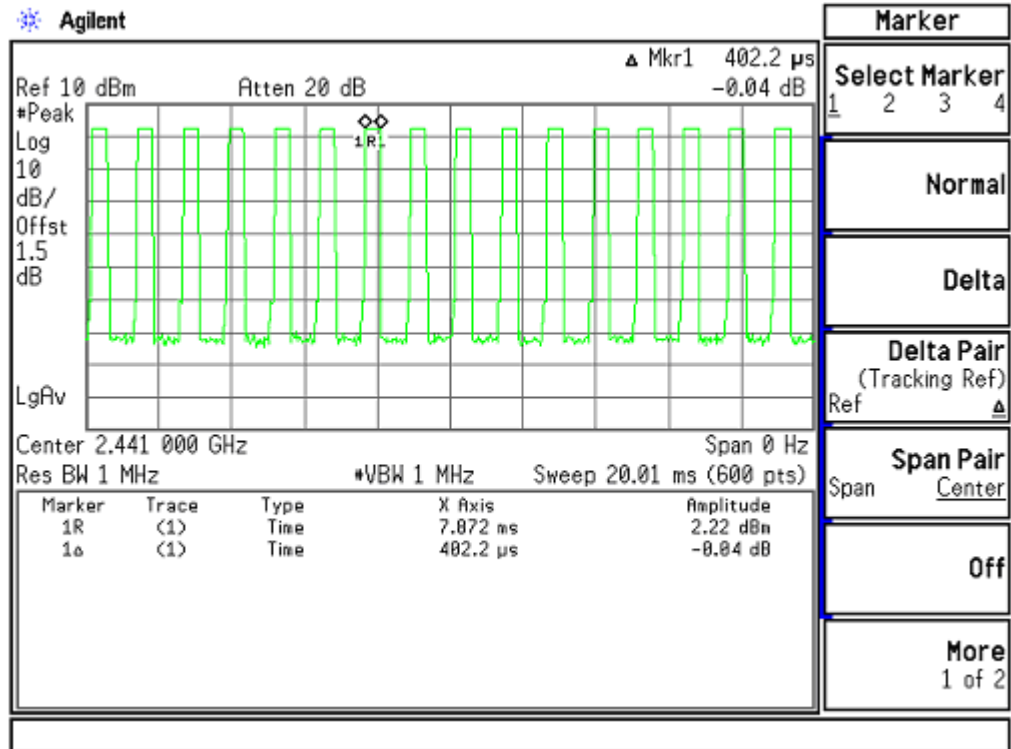
$$1.64 * (1600/4)/79 * 31.6 = 262.40 \text{ (ms)}$$

DH 5

$$2.932 * (1600/6)/79 * 31.6 = 312.77 \text{ (ms)}$$

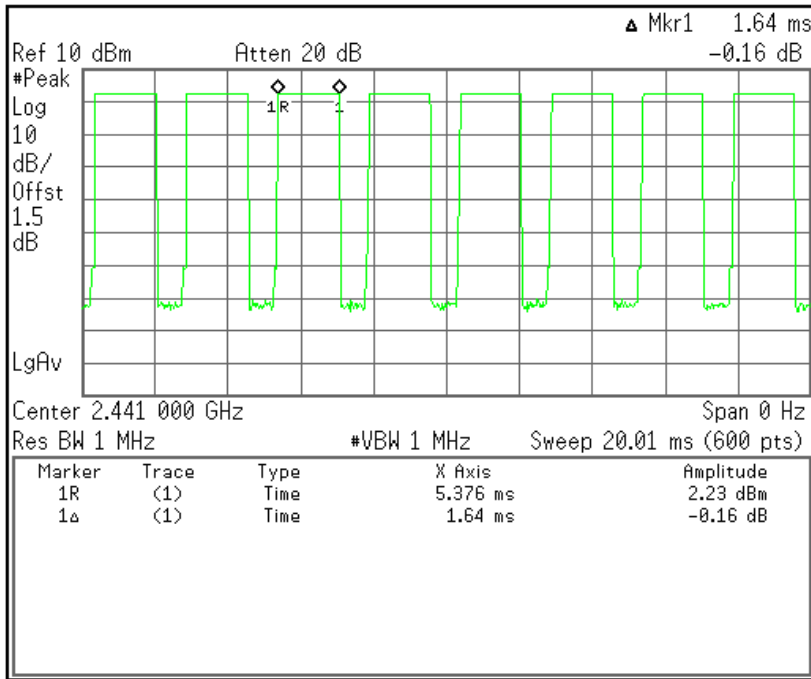
The test data graph please refer to the following:

Middle Channel For DH1



Middle Channel For DH3

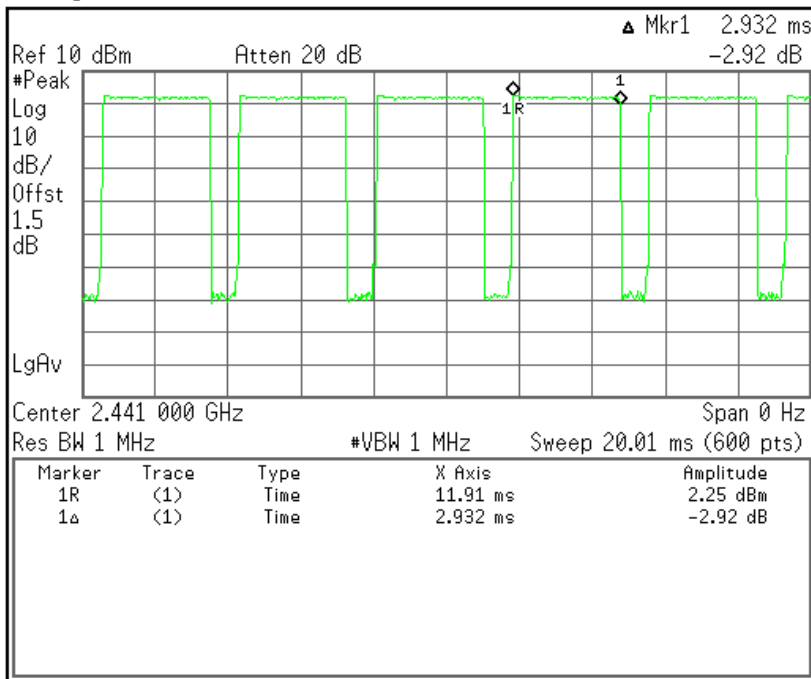
Agilent



Marker
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref ▲
Span Pair Span Center
Off
More 1 of 2

Middle Channel For DH5

Agilent



Marker
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref ▲
Span Pair Span Center
Off
More 1 of 2

4.6 Spurious Emissions

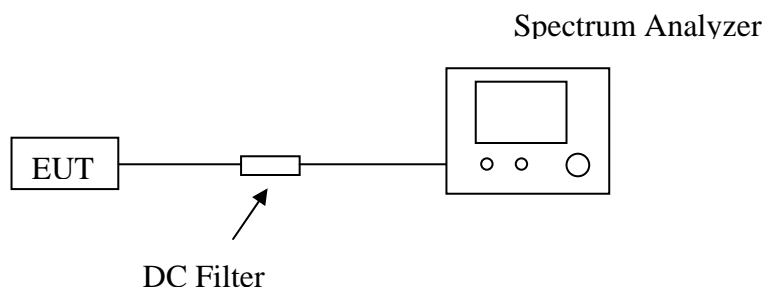
4.6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

4.6.2 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Agilent	E4407B	MY41440292	2011-06-21
2	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2011-06-21
3	DC Filter	MPE	23872C	N/A	2011-06-21

4.6.3 Block Diagram of Test Setup



4.6.4 Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 100 KHz.

Measurements are made over the 9kHz to 26.5GHz range with the transmitter set to the lowest, middle, and highest channels. *No emission found between lowest internal used/generated frequency to 30 MHz.*

4.6.5 Test Results

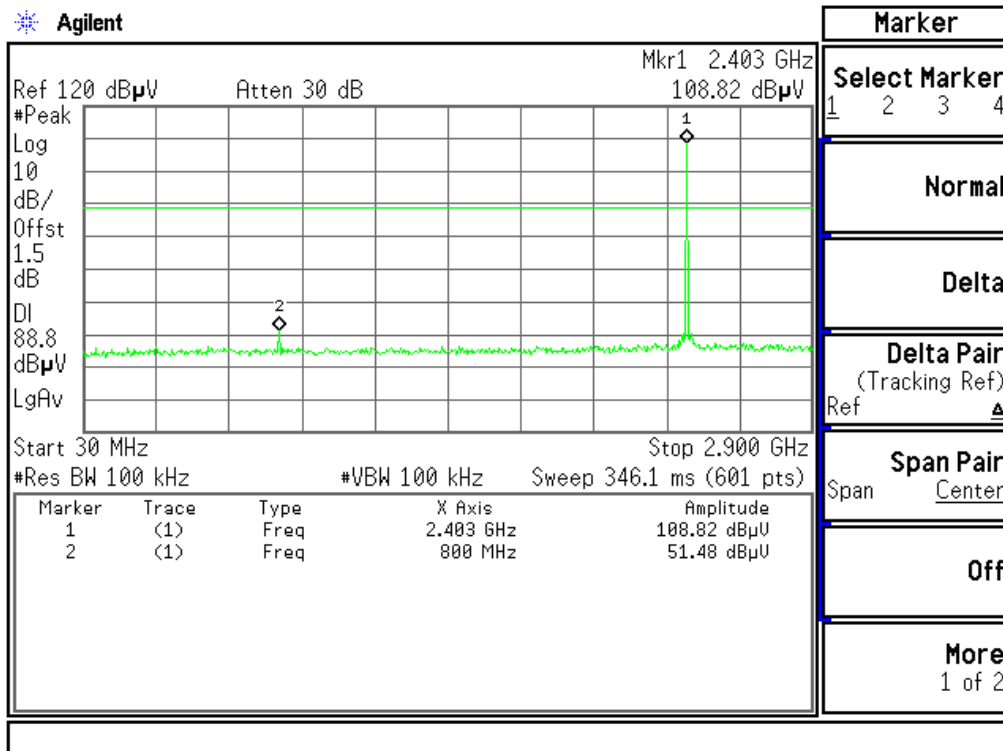
No non-compliance noted

The test data graph please refer to the following page.

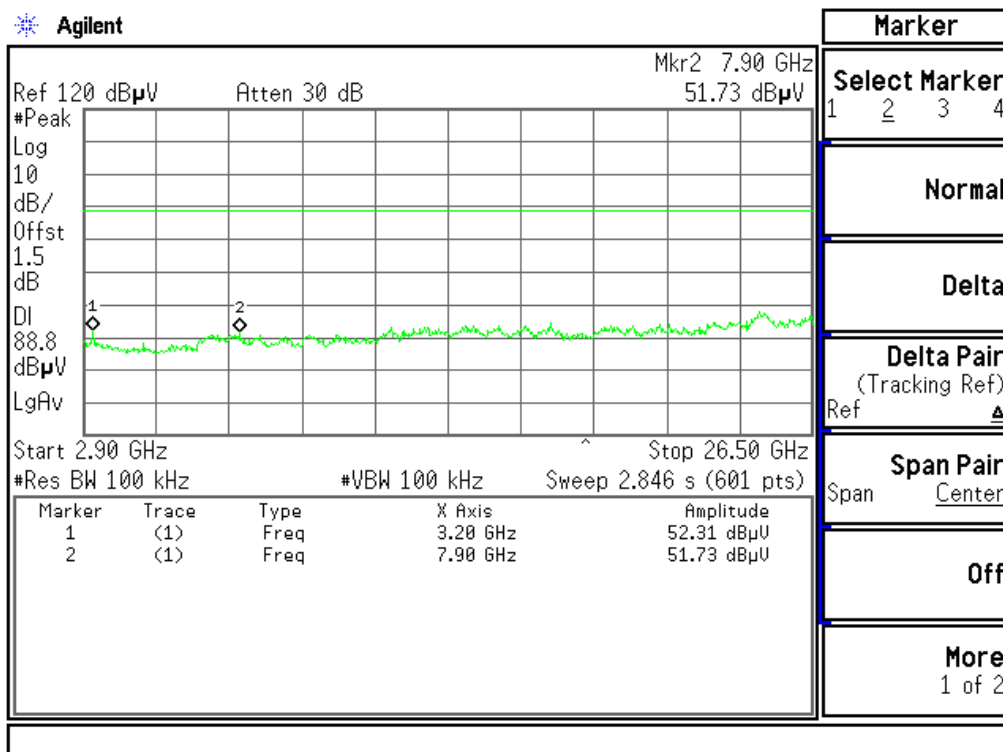
Test Plot

CH Low

30MHz ~ 2.9GHz

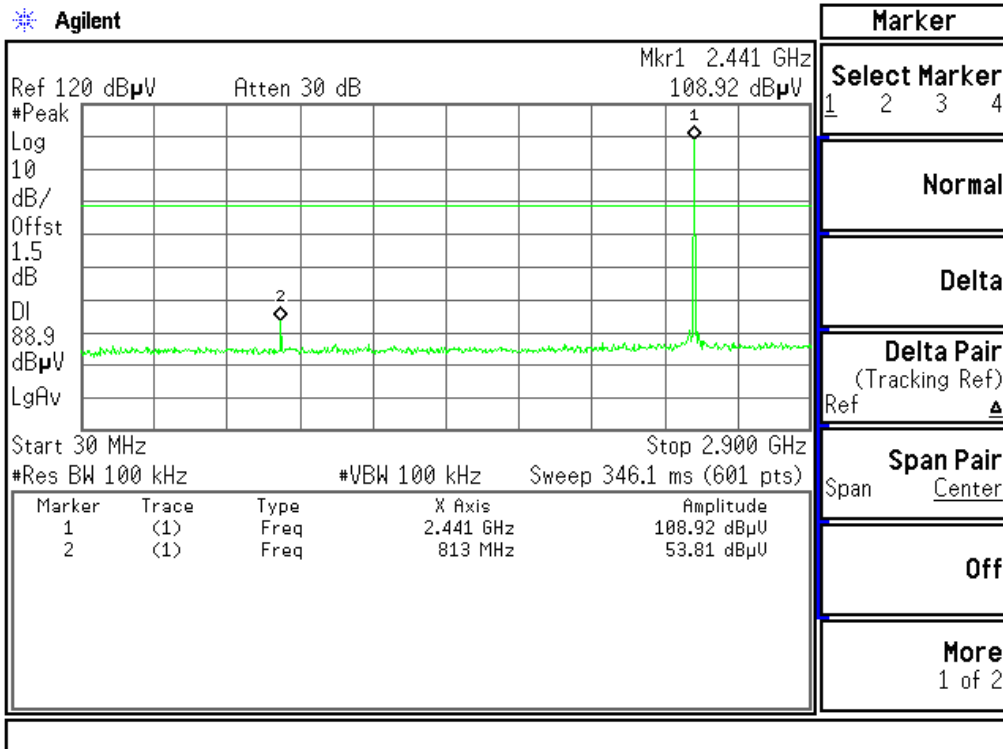


2.9GHz ~ 26.5GHz

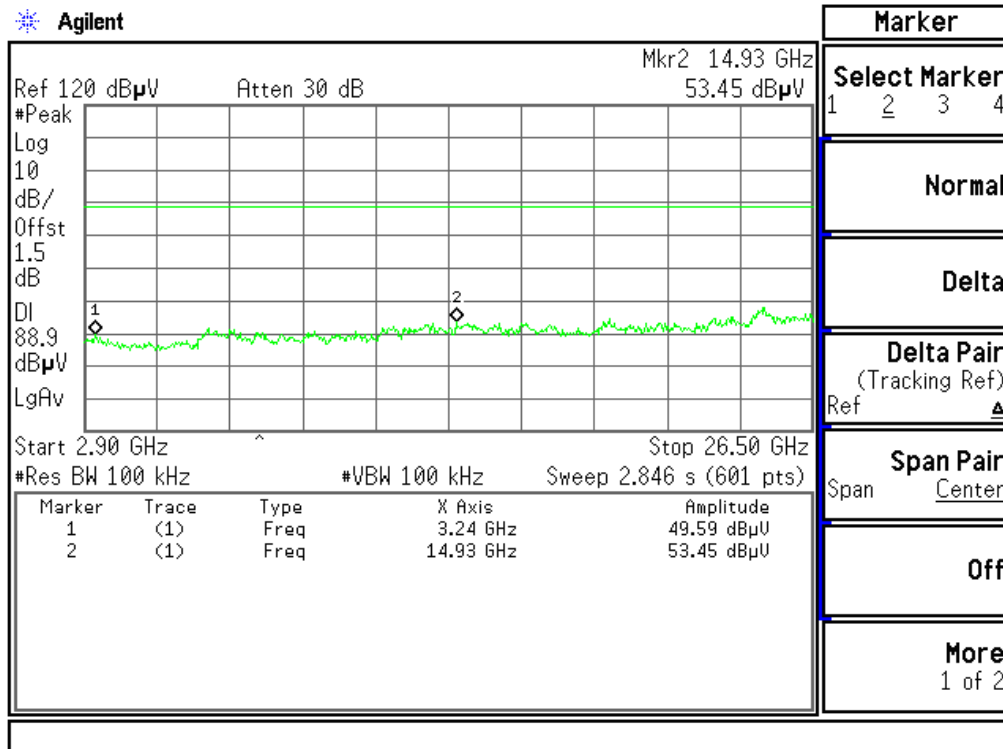


CH Mid

30MHz ~ 2.9GHz

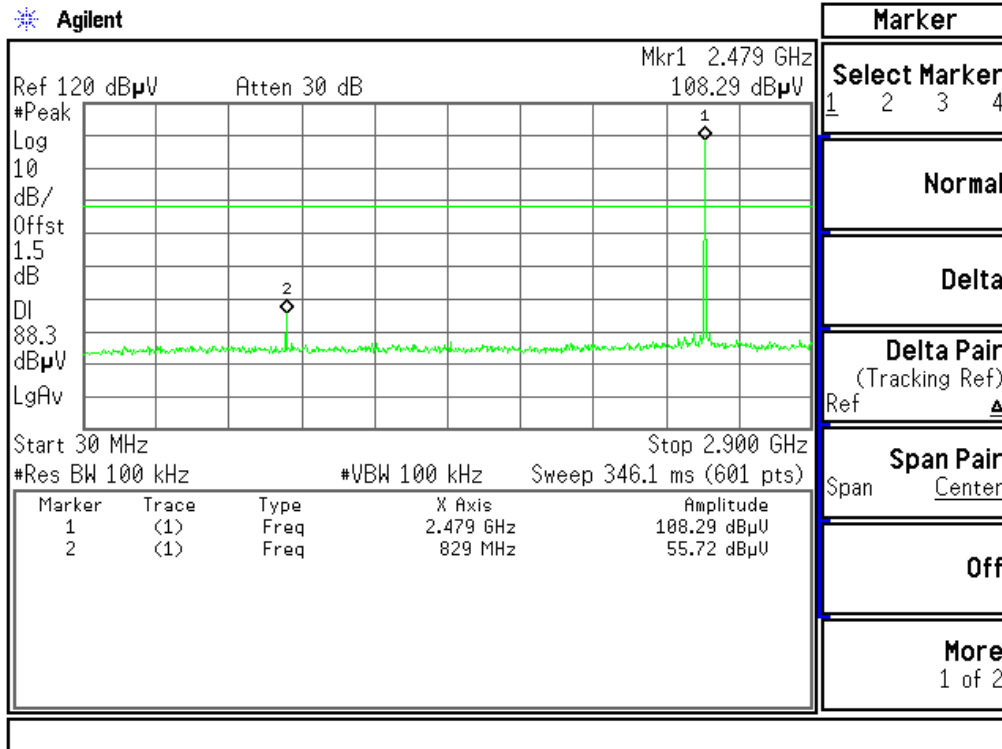


2.9GHz ~ 26.5GHz

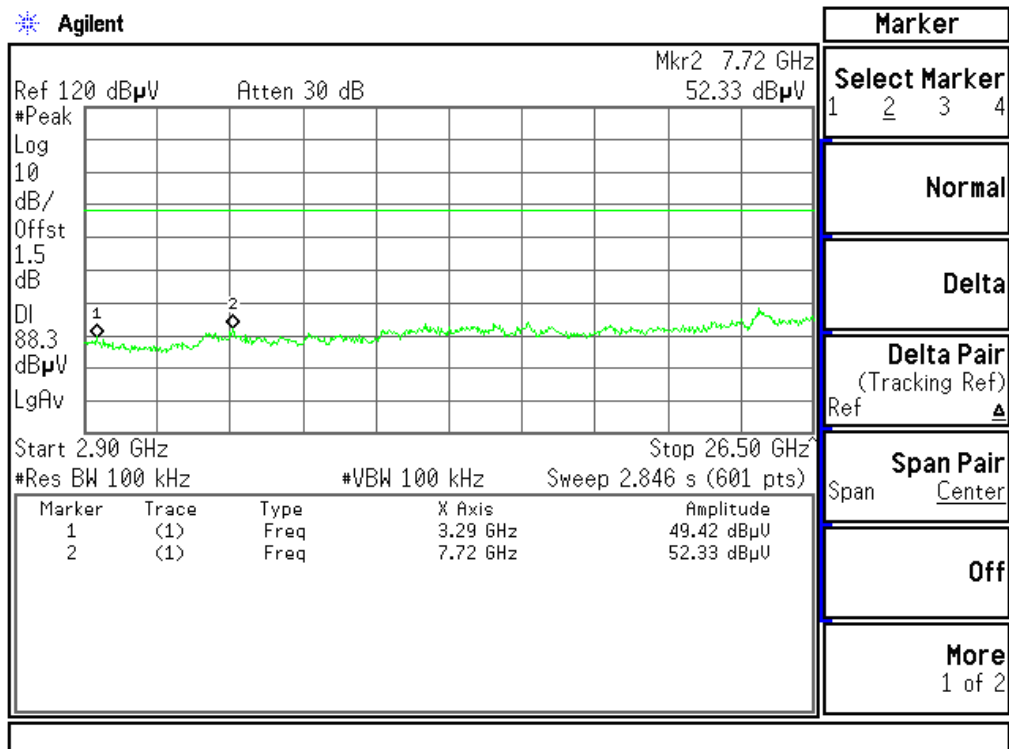


CH High

30MHz ~ 2.9GHz



2.9GHz ~ 26.5GHz

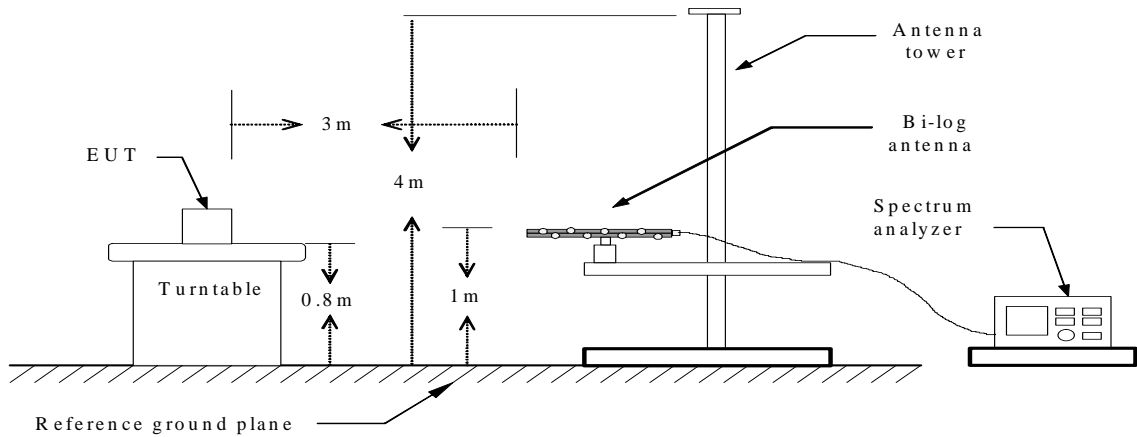


5. RADIATED EMISSION MEASUREMENT

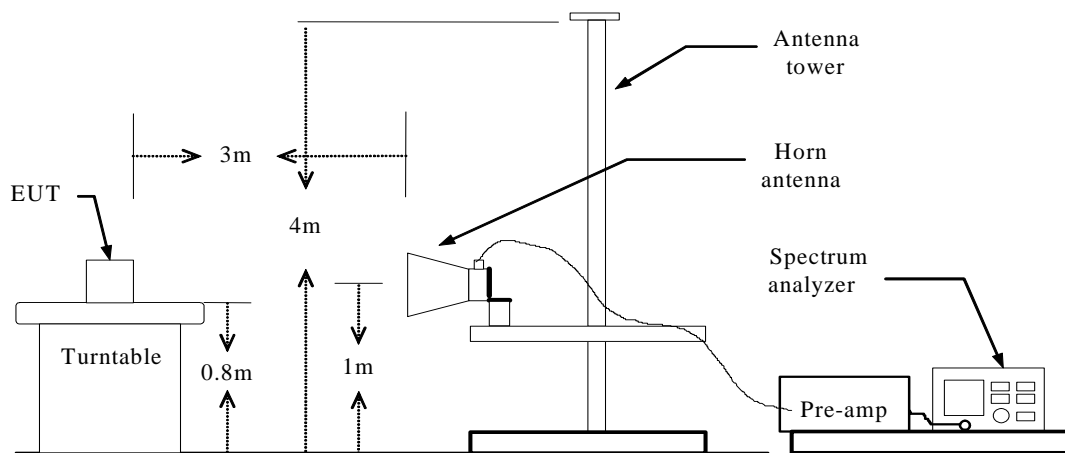
5.1 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Agilent	E4407B	MY41440292	2011-06-21
2	Test Receiver	Rohde & Schwarz	ESCS30	828985/018	2011-06-21
3	Loop antenna	EMCO	6502	0042963	2011-06-21
4	Log per Antenna	Schwarzbeck	VULB9163	142	2011-06-21
5	Horn-antenna	SCHWARZBECK	BBHA9120D	D:266	2011-06-21
6	DC Filter	MPE	23872C	N/A	2011-06-21

5.2 Block Diagram of Test Setup



Below 1 GHz



Above 1 GHz

5.3 Radiated Emission Limit

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

Part 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector.

Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

Part 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

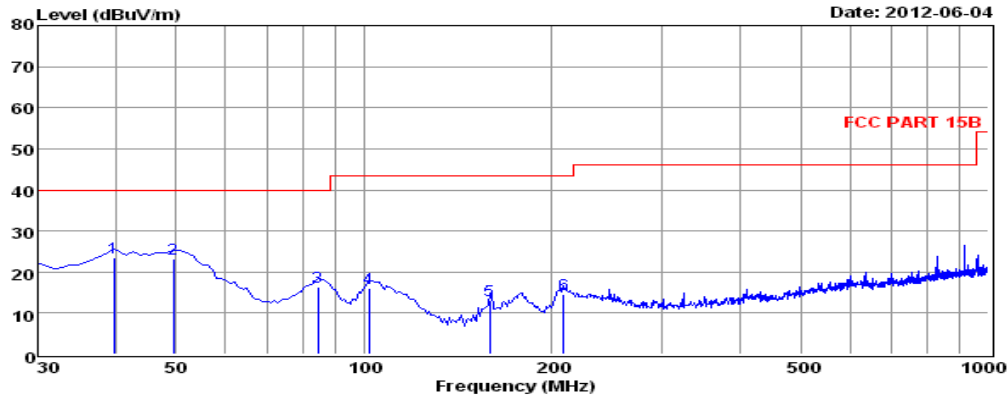
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

5.4 Test Results

PASS.

The test data please refer to following page.

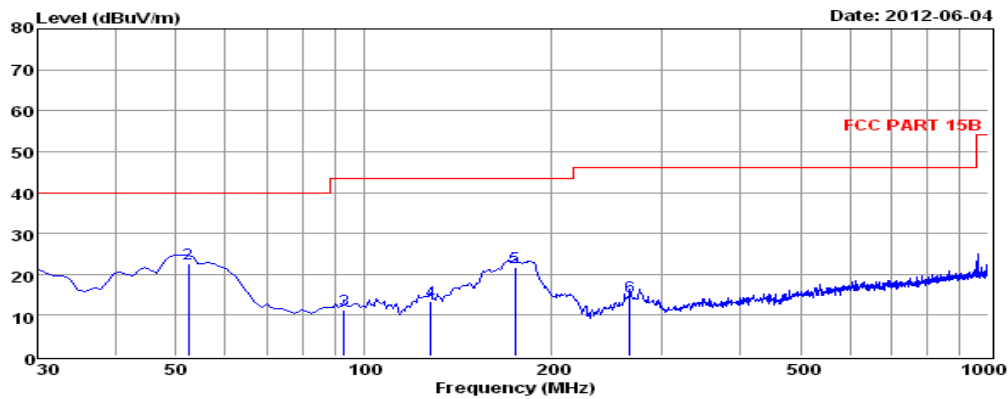
Below 1GHz



Env. /Ins: 24°C/56%
 EUT: 2.4G Wireless Transmission BOX
 M/N: 390TB
 Power Rating: DC 5V from PC Input AC 120V/60Hz
 Test Mode: On
 Operator: fox
 Memo:
 pol: VERTICAL

	Freq.	Reading	CabLos	AntFac	PreFac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	39.70	39.76	0.38	13.50	30.13	23.51	40.00	-16.49	QP
2	49.40	39.58	0.54	13.29	30.14	23.27	40.00	-16.73	QP
3	84.32	35.96	0.54	10.07	30.18	16.39	40.00	-23.61	QP
4	101.78	32.53	0.60	13.00	30.20	15.93	43.50	-27.57	QP
5	159.01	33.71	0.83	8.63	30.20	12.97	43.50	-30.53	QP
6	208.48	33.03	0.86	10.84	30.20	14.53	43.50	-28.97	QP

Note: 1. All readings are Quasi-peak values.
 2. Measured = Reading + Antenna Factor + Cable Loss - Amp Factor.
 3. The emission levels that are 20dB below the official limit are not reported.



Env. /Ins: 24°C/56%
 EUT: 2.4G Wireless Transmission BOX
 M/N: 390TB
 Power Rating: DC 5V from PC Input AC 120V/60Hz
 Test Mode: On
 Operator: fox
 Memo:
 pol: HORIZONTAL

	Freq.	Reading	CabLos	AntFac	PreFac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	30.00	36.71	0.39	12.33	30.12	19.31	40.00	-20.69	QP
2	52.31	39.17	0.46	13.14	30.15	22.62	40.00	-17.38	QP
3	93.05	28.46	0.56	12.47	30.19	11.30	43.50	-32.20	QP
4	127.97	33.73	0.67	9.24	30.20	13.44	43.50	-30.06	QP
5	174.53	41.90	0.73	9.29	30.20	21.72	43.50	-21.78	QP
6	266.68	31.39	1.00	12.26	30.17	14.48	46.00	-31.52	QP

Note: 1. All readings are Quasi-peak values.
 2. Measured = Reading + Antenna Factor + Cable Loss - Amp Factor.
 3. The emission levels that are 20dB below the official limit are not reported.

Above 1GHz

Operation Mode: TX/ CH Low **Test Date:** 2012-06-04
Temperature: 23°C **Humidity:** 50 % RH

Freq.	Ant. Pol	Peak	AV	Ant. / CL	Actual Fs		Peak	AV	PK Margin	AV Margin
					Reading (dBuV)	Reading (dBuV)				
(MHz)	H/V	Reading (dBuV)	Reading (dBuV)	CF (dB)	Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	(dB)	(dB)
4804.23	V	42.37	29.46	10.98	53.35	40.44	74	54	-20.65	-13.56
7207.74	V	33.28	20.75	18.54	51.82	39.29	74	54	-22.18	-14.71
4804.48	H	42.13	30.52	10.98	53.11	41.5	74	54	-20.89	-12.5
7206.62	H	34.27	22.67	18.53	52.80	41.2	74	54	-21.20	-12.8

Operation Mode: TX/ CH Mid **Test Date:** 2012-06-04
Temperature: 23°C **Humidity:** 50 % RH

Freq.	Ant. Pol	Peak	AV	Ant. / CL	Actual Fs		Peak	AV	PK Margin	AV Margin
					Reading (dBuV)	Reading (dBuV)				
(MHz)	H/V	Reading (dBuV)	Reading (dBuV)	CF (dB)	Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	(dB)	(dB)
4882.78	V	41.22	27.52	10.98	52.20	38.50	74	54	-21.80	-15.5
7324.49	V	31.64	21.93	18.54	50.18	40.47	74	54	-23.82	-13.53
4882.72	H	41.68	30.17	10.98	52.66	41.15	74	54	-21.34	-12.85
7324.13	H	34.16	22.43	18.53	52.69	40.96	74	54	-21.31	-13.04

Operation Mode: TX/ CH High **Test Date:** 2012-06-04
Temperature: 23°C **Humidity:** 50 % RH

Freq.	Ant. Pol	Peak	AV	Ant. / CL	Actual Fs		Peak	AV	PK Margin	AV Margin
					Reading (dBuV)	Reading (dBuV)				
(MHz)	H/V	Reading (dBuV)	Reading (dBuV)	CF (dB)	Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	(dB)	(dB)
4960.11	V	42.06	28.24	10.98	53.04	39.22	74	54	-23.96	-14.78
7441.69	V	32.16	21.69	18.54	50.70	40.23	74	54	-23.30	-13.77
4960.25	H	39.45	27.61	10.98	50.43	38.59	74	54	-51.53	-15.41
7440.00	H	32.21	21.36	18.53	50.74	39.89	74	54	-51.26	-14.11

Notes:

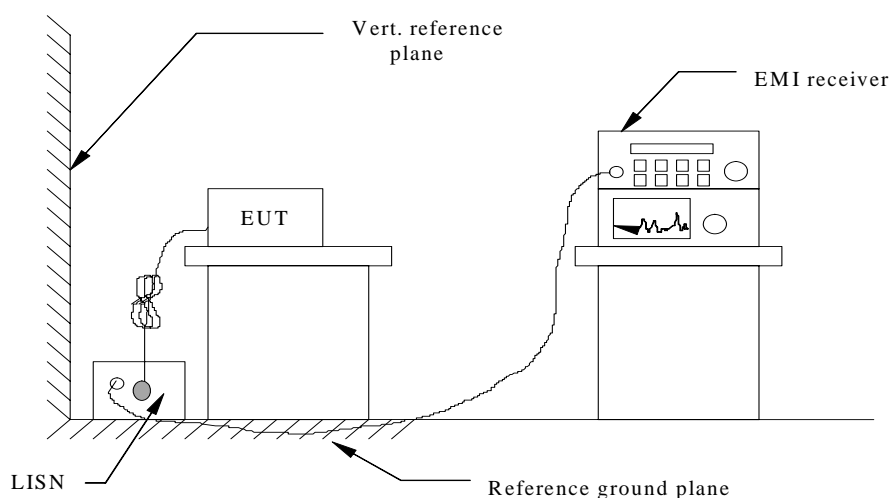
1. Measuring frequencies from 9 kHz to the 1GHz, No emission found between lowest internal used/generated frequency to 30 MHz.
2. Radiated emissions measured in frequency range from 9 kHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.

6. POWER LINE CONDUCTED EMISSIONS

6.1 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Test Receiver	Rohde & Schwarz	ESCS30	828985/018	2011-06-21
2	L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	2011-06-21
3	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	2011-06-21
4	50Ω Coaxial Switch	Anritsu	MP59B	M20531	2011-06-21

6.2 Block Diagram of Test Setup



6.3 Conducted Emission Limit

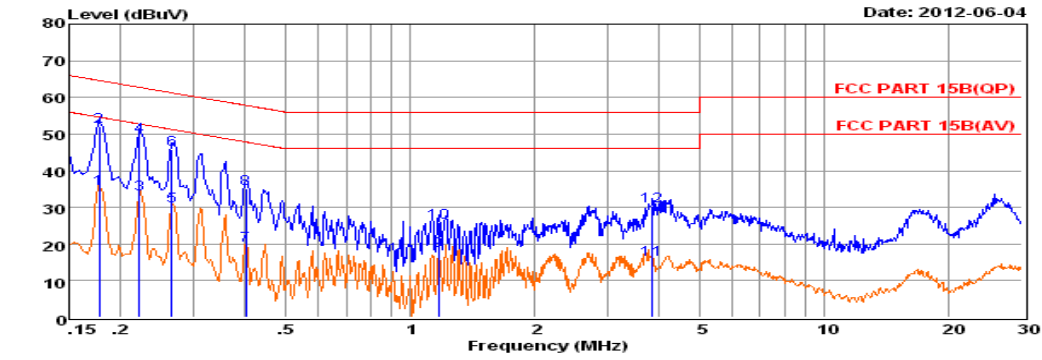
For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

6.4 Test Results

PASS.

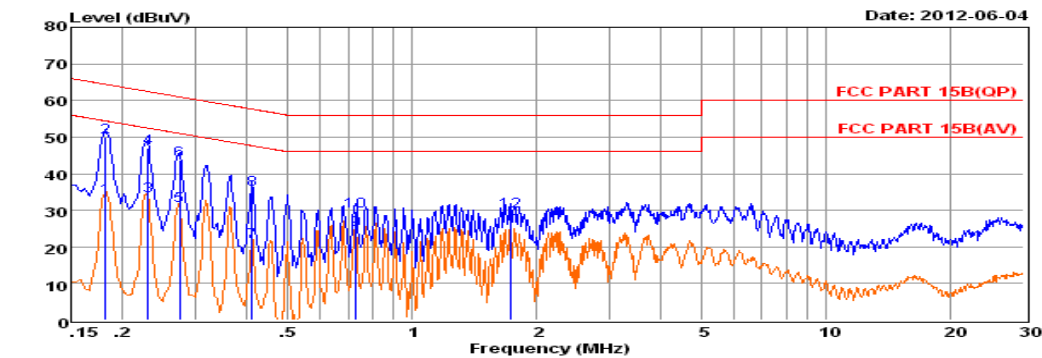
The test data please refer to following page.



Env. Ins: 24*/56%
 EUT: 2.4G Wireless Transmission Box
 M/N: 390TB
 Power Rating: DC 5V from PC Input AC 120V/60Hz
 Test Mode: On
 Operator: FOX
 Memo:
 Pol: LINE

	Freq	Reading	LisnFac	CabLos	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.18	25.32	9.61	0.02	34.95	54.59	-19.64	Average
2	0.18	42.43	9.61	0.02	52.06	64.59	-12.53	QP
3	0.22	24.00	9.63	0.03	33.66	52.74	-19.08	Average
4	0.22	39.80	9.63	0.03	49.46	62.74	-13.28	QP
5	0.27	20.60	9.63	0.03	30.26	51.25	-20.99	Average
6	0.27	36.06	9.63	0.03	45.72	61.25	-15.53	QP
7	0.40	10.03	9.62	0.04	19.69	47.81	-28.12	Average
8	0.40	25.55	9.62	0.04	35.21	57.81	-22.60	QP
9	1.17	8.46	9.63	0.05	18.14	46.00	-27.86	Average
10	1.17	16.15	9.63	0.05	25.83	56.00	-30.17	QP
11	3.84	6.16	9.65	0.06	15.87	46.00	-30.13	Average
12	3.84	20.71	9.65	0.06	30.42	56.00	-25.58	QP

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss.
 2. The emission levels that are 20dB below the official limit are not reported.



Env. Ins: 24*/56%
 EUT: 2.4G Wireless Transmission Box
 M/N: 390TB
 Power Rating: DC 5V from PC Input AC 120V/60Hz
 Test Mode: On
 Operator: FOX
 Memo:
 Pol: NEUTRAL

	Freq	Reading	LisnFac	CabLos	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.18	23.89	9.63	0.02	33.54	54.42	-20.88	Average
2	0.18	40.45	9.63	0.02	50.10	64.42	-14.32	QP
3	0.23	24.28	9.59	0.03	33.90	52.44	-18.54	Average
4	0.23	37.33	9.59	0.03	46.95	62.44	-15.49	QP
5	0.27	21.63	9.60	0.03	31.26	50.98	-19.72	Average
6	0.27	34.06	9.60	0.03	43.69	60.98	-17.29	QP
7	0.41	11.77	9.61	0.04	21.42	47.64	-26.22	Average
8	0.41	26.08	9.61	0.04	35.73	57.64	-21.91	QP
9	0.73	14.97	9.63	0.04	24.64	46.00	-21.36	Average
10	0.73	20.20	9.63	0.04	29.87	56.00	-26.13	QP
11	1.73	15.84	9.63	0.05	25.52	46.00	-20.48	Average
12	1.73	20.08	9.63	0.05	29.76	56.00	-26.24	QP

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss.
 2. The emission levels that are 20dB below the official limit are not reported.

7. ANTENNA REQUIREMENT

7.1 Standard Applicable

According to §15.203, Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

7.2 Antenna Connected Construction

The directional gains of antenna used for transmitting is 1.8dBi, and the antenna connector is de-signed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

8. MANUFACTURER/ APPROVAL HOLDER DECLARATION

The following identical model(s):

390TA	680TA	--
-------	-------	----

Belong to the tested device:

Product description : 2.4G Wireless Transmission Box

Model name : 390TB

No additional models were tested.

-----THE END OF REPORT-----