FCC Test Report
(TR-0907-007-01)

Applicant	**:**	GP Electronics (HK) Ltd.
Address	**:**	6/F Gold Peak Building, 30 Kwai Wing Road, Kwai Chung, N.T., HK
Manufacturer	**:**	GP Electronics (Huizhou) Co. Ltd.
Address	**:**	No.76, Hui Feng Si Road, Zhong Kai Hi-Tech Inductrial Development Zone, Huizhou, Guangdong, P.R.China 516006
Product Name	**:**	KEF Wireless Subwoofer (Transmitter)
Trademark	**:**	KEF
Model(s)	**:**	HTB2SE-W
Standard(s)	:	FCC Part 15 Subpart C
Test Result	**:**	Pass
Date of Test	**:**	Jul 29, 2009 to Aug 21, 2009
Report issued Dated	**:**	Aug 21, 2009

The results in this report apply only to the sample(s) tested. The production units are required to conform to the initial sample as received when the units are placed in the market.

Responsible Engineer	:	Phenix Zhang	Approved by	:	CHAN king-chui
Date	:	2009.08.21	Technical manager / Date	:	2009.08.21

Table of Contents

1. Description of the Test Site

1.1 Test Site Location:

Laboratory	:	TDK South China EMC Center SAE Technologies Development (Dongguan) Co., Ltd. Changan Branch
Address	:	Zhenan Hi-tech Industrial Park, Dongguang City, Guangdong Province, China
Phone no.	:	(86)-769-8564-4678
Fax no.	:	(86)-769-8564-4499
Email	:	emc@cn.tdk.com

1.2 Site Registration

VCCI (September, 2008)	:	Reg. No. R-2205, C-2392
FCC site registration (July, 2008)	:	Reg. No. 732901
IC registration	:	Reg. No. 7993
EMCC (September, 2008)	:	Reg. No. NAR/tl-060330

1.3 Test Scope

EMC testing according to national / international standards

2. Description of the Tested Samples

2.1 Customer Information

Customer	:	GP Electronics (HK) Ltd.
Address	:	6/F Gold Peak Building, 30 Kwai Wing Road, Kwai Chung, N.T., HK
Phone no.	:	852-24243521
Fax no.	:	852-24891309

2.2 Identification of EUT

Trademark	:	KEF
Model(s) No.	:	KEF Wireless Subwoofer (Transmitter)
Serial No.	:	None

2.3 Spec of EUT

Description of Antenna	:	fixed, built-in antenna, 3dBi
Power Supply	:	100-240V 50/60Hz
Operation Frequency	:	2402 MHz ~ 2480 MHz
Number of Channels	:	20
Type of Modulation	:	FHSS

2.4 Test Standards List

FCC Part 15 (2008)

American national standard for methods of measurement of radio noise emissions from low-voltage electrical and electronic equipment in the range of 9KHz to 40GHz.

3. Test Specifications

3.1 Standard(s) Used

FCC Rules	Description Of Test	Result
15.203/15.247(b)	Antenna Requirement	Pass
15.207	Conducted Emission	Pass
15.247(a)(1)	Hopping Channel Bandwidth	Pass
15.247(a)(1)	Hopping Channel Separation	Pass
15.247(a)(1)	Number of Hopping Frequency Used	Pass
15.247(a)(1)(iii)	Dwell Time of Each Frequency	Pass
15.247(b)(1)	Maximum Peak Output Power	Pass
15.247(d)	Band Edges Emission	Pass
15.247(d)	Spurious Radiated Emission	Pass

3.2 Deviations from the Test Specification

N/A

4. Test Result

4.1 Antenna Requirement

4.1.1 Standard Applicable

Section 15.203:

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 replaced by the user, but the use of a standard antenna James or electrical connector is prohibited.

Section 15.247(b):

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.1.2 Antenna Connected Construction

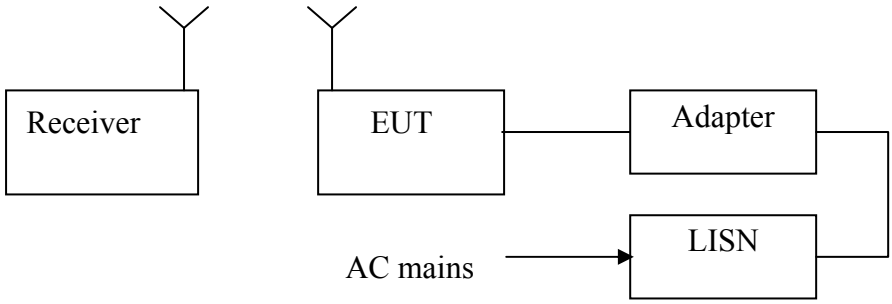
The antenna connector is designed with permanent attachment and no consideration of replacement.
Transmitter antenna of directional gain is 3dBi.

4.2 Conducted Emission (mains)

4.2.1 Test Summary

Test Room	:	Shielded Room
Power Source	:	AC 120V / 60Hz
Standards:	:	FCC Part15 B : 2008
EUT Type	:	Table Top
EUT configuration	:	EUT's highest possible emission level

4.2.2 Block diagram of test setup



4.2.3 Measurement method

The EUT along with its peripherals were placed on a 1.0m (W) x 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4m space from a vertical reference plane. The EUT was connected to power mains through a Artificial Mains Network(AMN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.

The excess power cable between the EUT and the AMN was bundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

4.2.4. Result

PASS

2009-07-29 13:55:49

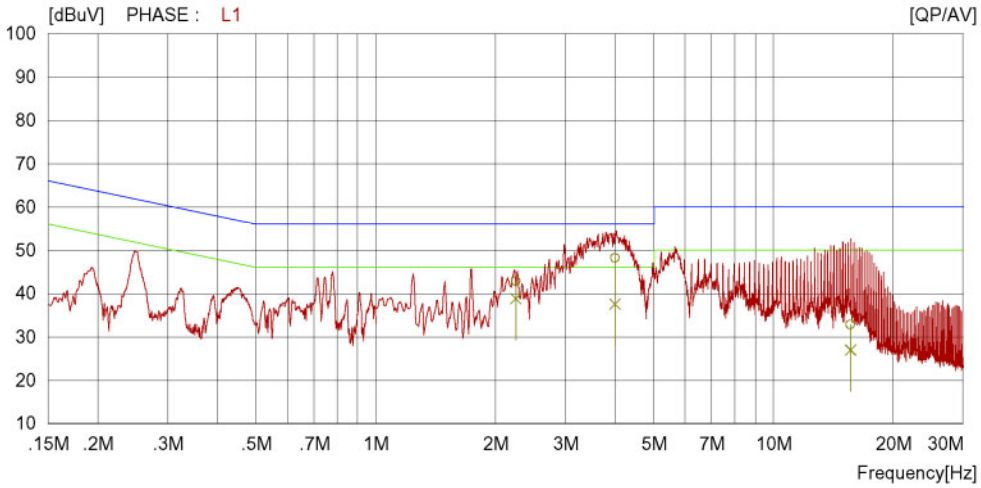
Conducted Emission

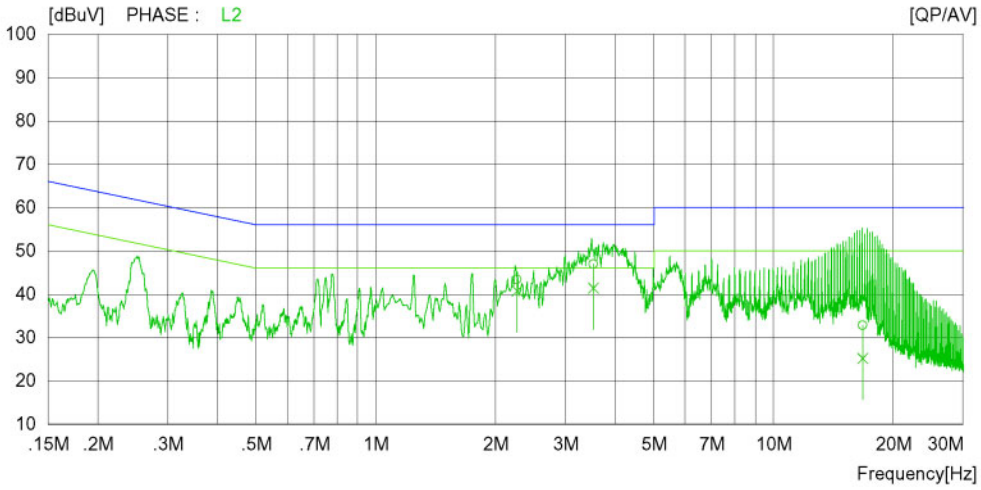
TDK South China EMC Centre
Date : 2009-07-29 13:55:43

Company Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC120V/60Hz
Serial No.	:		Temp/Humi	:	25deg / 52%RH
Test condition	:	Normal	Operator	:	Phenix

Memo : Product: KEF Wireless Subwoofer (Transmitter) input: sony MP3 Playing Pinknoise

LIMIT : FCC Part 15 B QP
FCC Part 15 B AV





TDK South China EMC Centre Tell:0769-8564-4678 Fax:0769-8564-4499

2009-07-29 13:55:49

Conducted Emission

TDK South China EMC Centre
Date : 2009-07-29 13:55:43

Company Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC120V/60Hz
Serial No.	:		Temp/Humi	:	25deg / 52%RH
Test condition	:	Normal	Operator	:	Phenix

Memo : Product: KEF Wireless Subwoofer (Transmitter) input: sony MP3 Playing Pinknoise

LIMIT : FCC Part 15 B QP
FCC Part 15 B AV

NO	FREQ	READING		C.FACTOR	RESULT		LIMIT		MARGIN		PHASE
		QP	AV		QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	2.24800	33.2	29.2	9.6	42.8	38.8	56.0	46.0	13.2	7.2	L1
2	3.99000	38.3	27.6	9.9	48.2	37.5	56.0	46.0	7.8	8.5	L1
3	15.62000	23.1	17.3	9.7	32.8	27.0	60.0	50.0	27.2	23.0	L1
4	2.26300	33.8	31.1	9.6	43.4	40.7	56.0	46.0	12.6	5.3	L2
5	3.52200	37.0	31.5	9.9	46.9	41.4	56.0	46.0	9.1	4.6	L2
6	16.75100	23.1	15.5	9.7	32.8	25.2	60.0	50.0	27.2	24.8	L2

TDK South China EMC Centre Tell:0769-8564-4678 Fax:0769-8564-4499

4.3 Hopping Channel Bandwidth

4.3.1 Applicable Standard

Section 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.

4.2.2 Block diagram of test setup

Spectrum

Connection method: delete the antenna of EUT and connect receiver with a cable. The connector of cable is N type. The Zc of the cable is 50 OHM. The other side of cable solder on the antenna terminal. Because the impedance of antennal terminal is 50 OHM,and the impedance of receiver is also 50 OHM, so this connection is matching.

4.2.3 Measurement method

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.

3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.

4. Measure spectrum width with level more than 20dB below the peak level.

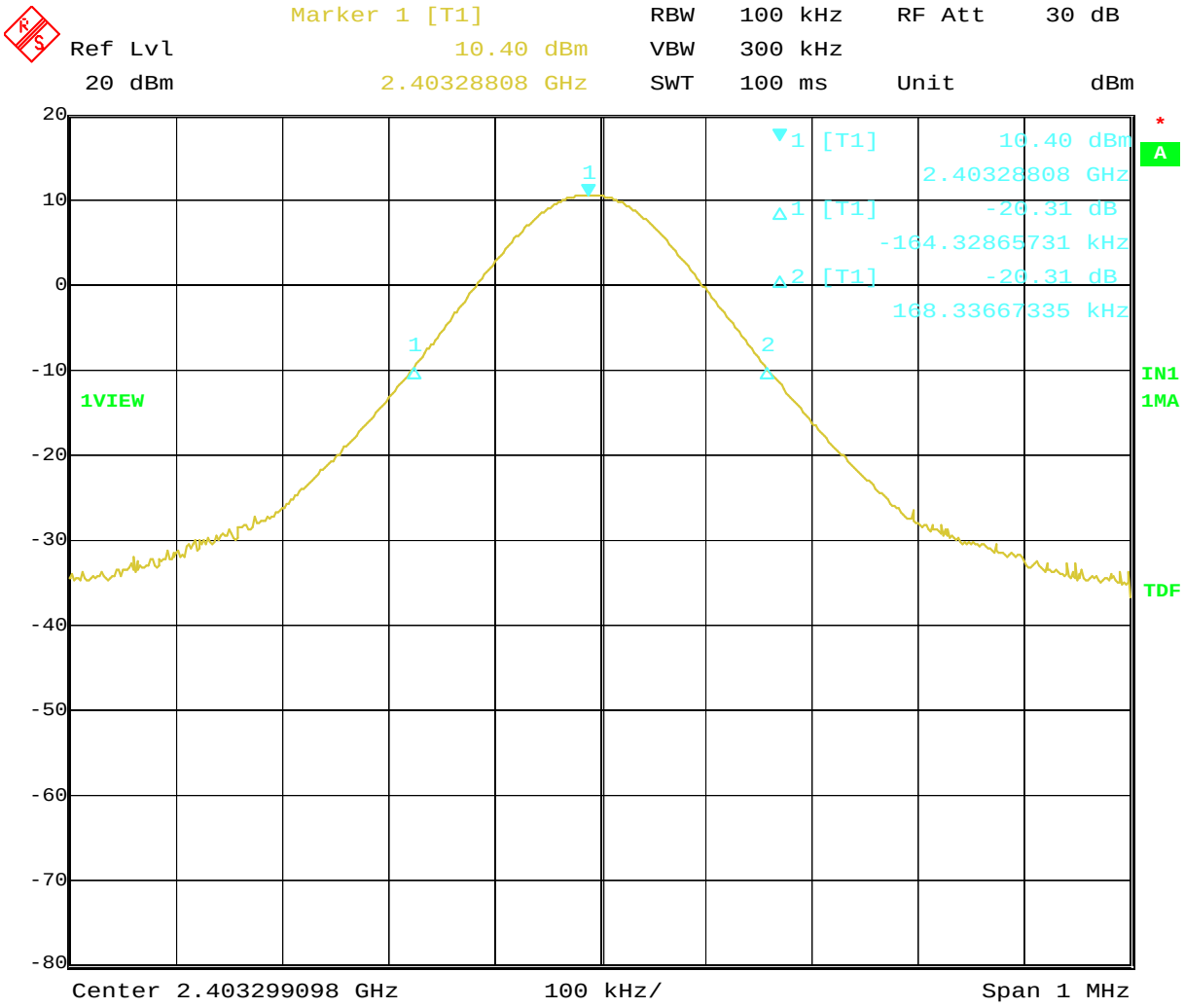
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

4.2.4. Result

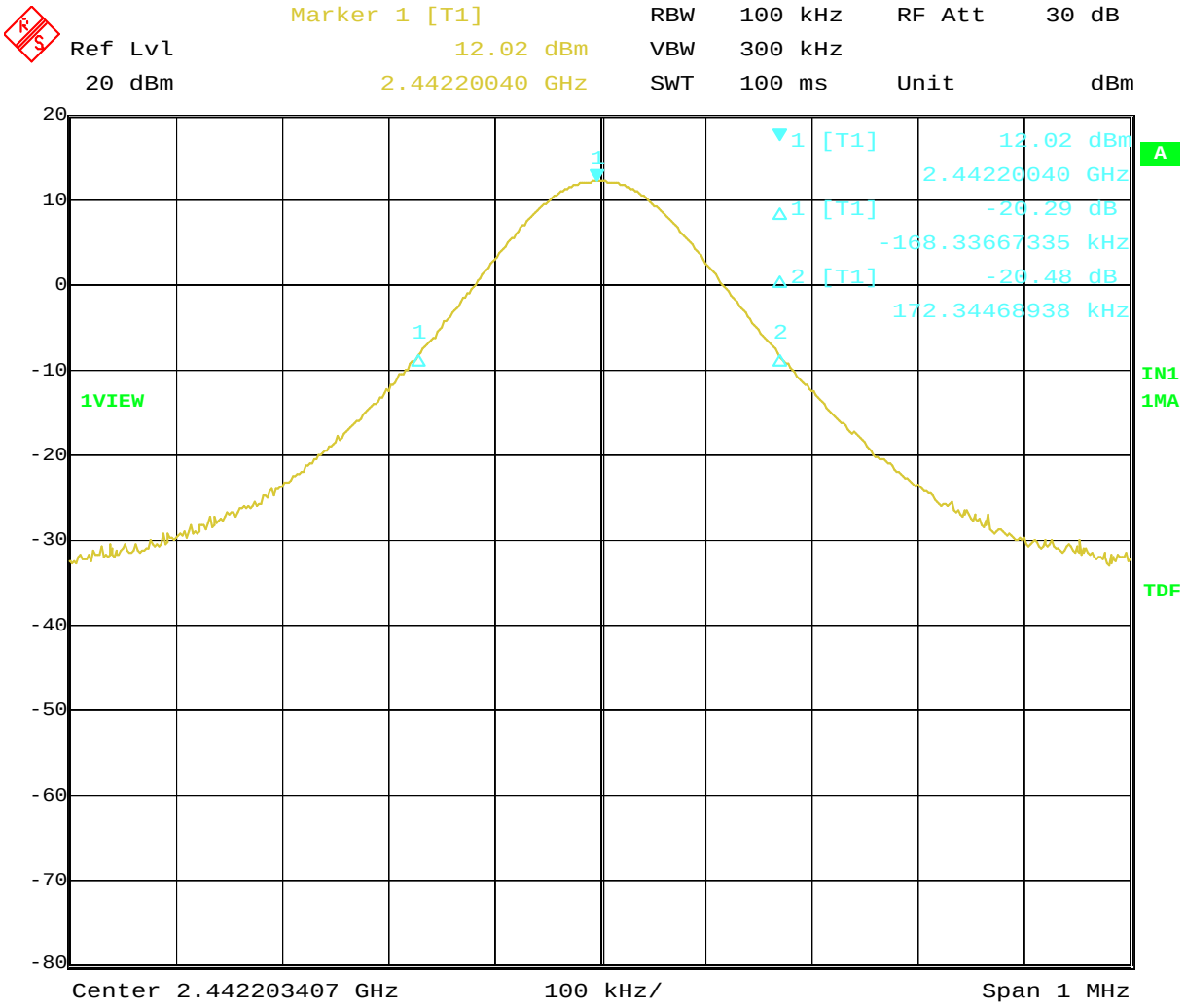
Temperature (℃) : 22~23	EUT: KEF Wireless Subwoofer (Transmitter)
Humidity (%RH): 50~54	M/N: HTB2SE-W
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Jul 31, 2009	Test engineer: Phenix

Channel No.	**Frequency (MHz)**	**20dB Bandwidth (kHz)**	**Min. Limit (kHz)**
LOW	2403	332.6	>25
MID	2442	340.6	>25
HIG	2479	338.6	>25

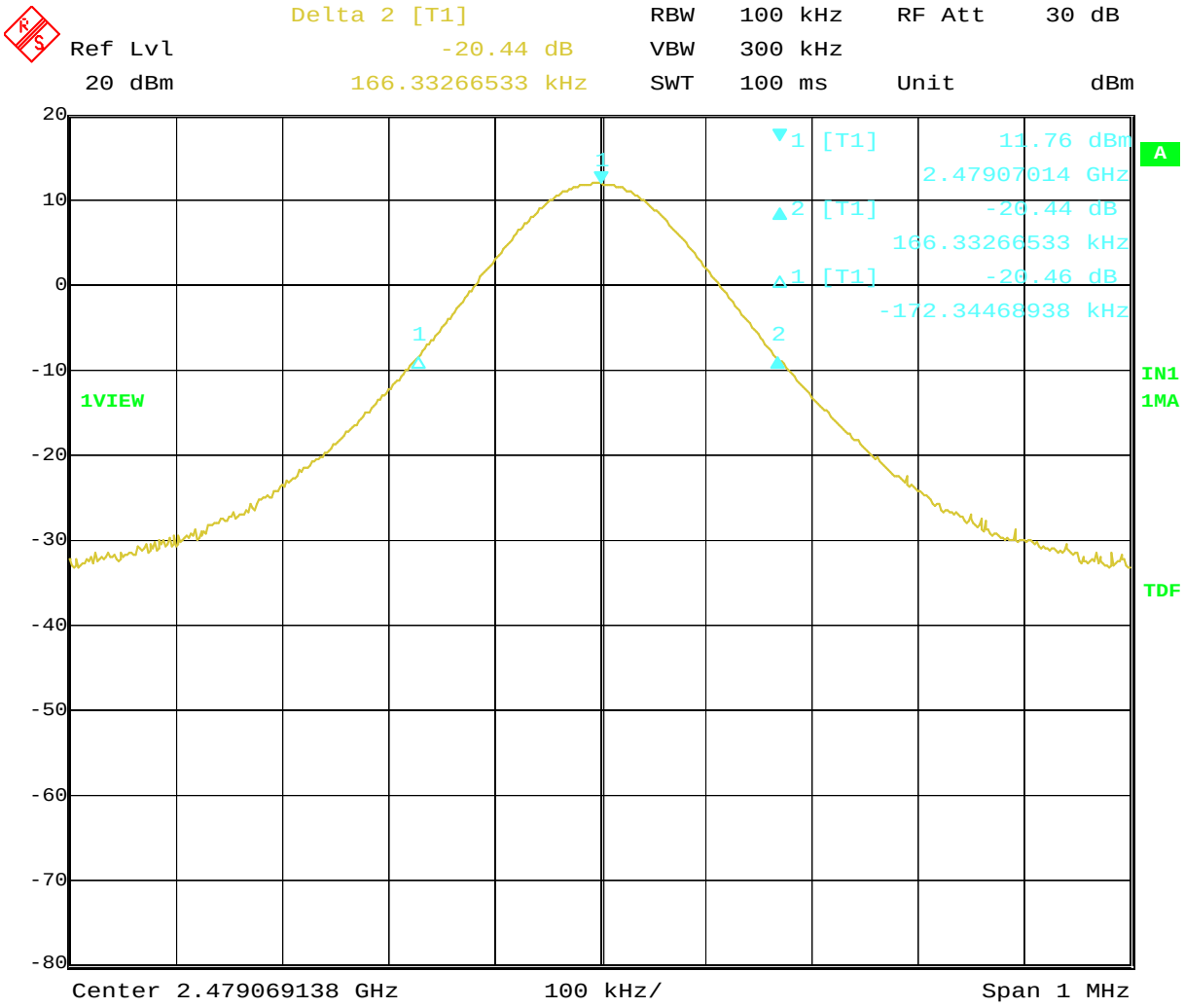
Channel LOW：


Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl 10.40 dBm
VBW 300 kHz
20 dBm 2.40328808 GHz
SWT 100 ms
Unit dBm
1 [T1] 10.40 dBm
2.40328808 GHz
Δ1 [T1] -20.31 dB
-164.32865731 kHz
Δ2 [T1] -20.31 dB
168.33667335 kHz
1VIEW
IN1
1MA
TDF
Center 2.403299098 GHz
100 kHz/
Span 1 MHz
Date: 31.JUL.2009 02:45:44

Channel MID：


Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
12.02 dBm
VBW 300 kHz
20 dBm
2.44220040 GHz
SWT 100 ms
Unit dBm
1 [T1] 12.02 dBm
2.44220040 GHz
Δ1 [T1] -20.29 dB
-168.33667335 kHz
Δ2 [T1] -20.48 dB
172.34468938 kHz
A
IN1
1MA
TDF
1VIEW
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.442203407 GHz
100 kHz/
Span 1 MHz
Date: 31.JUL.2009 03:54:08

Channel HIG：


Delta 2 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-20.44 dB
VBW 300 kHz
20 dBm
166.33266533 kHz
SWT 100 ms
Unit dBm
1 [T1] 11.76 dBm
2.47907014 GHz
2 [T1] -20.44 dB
166.33266533 kHz
1 [T1] -20.46 dB
-172.34468938 kHz
A
IN1
1MA
TDF
1VIEW
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.479069138 GHz
100 kHz/
Span 1 MHz
Date: 31.JUL.2009 03:34:41

4.4 Hopping Channel Separation

4.4.1 Applicable Standard

Section 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.

4.4.2 Block diagram of test setup

Spectrum

Connection method: delete the antenna of EUT and connect receiver with a cable. The connector of cable is N type. The Zc of the cable is 50 OHM. The other side of cable solder on the antenna terminal. Because the impedance of antennal terminal is 50 OHM,and the impedance of receiver is also 50 OHM, so this connection is matching.

4.4.3 Measurement method

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.

3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.

4. The Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.

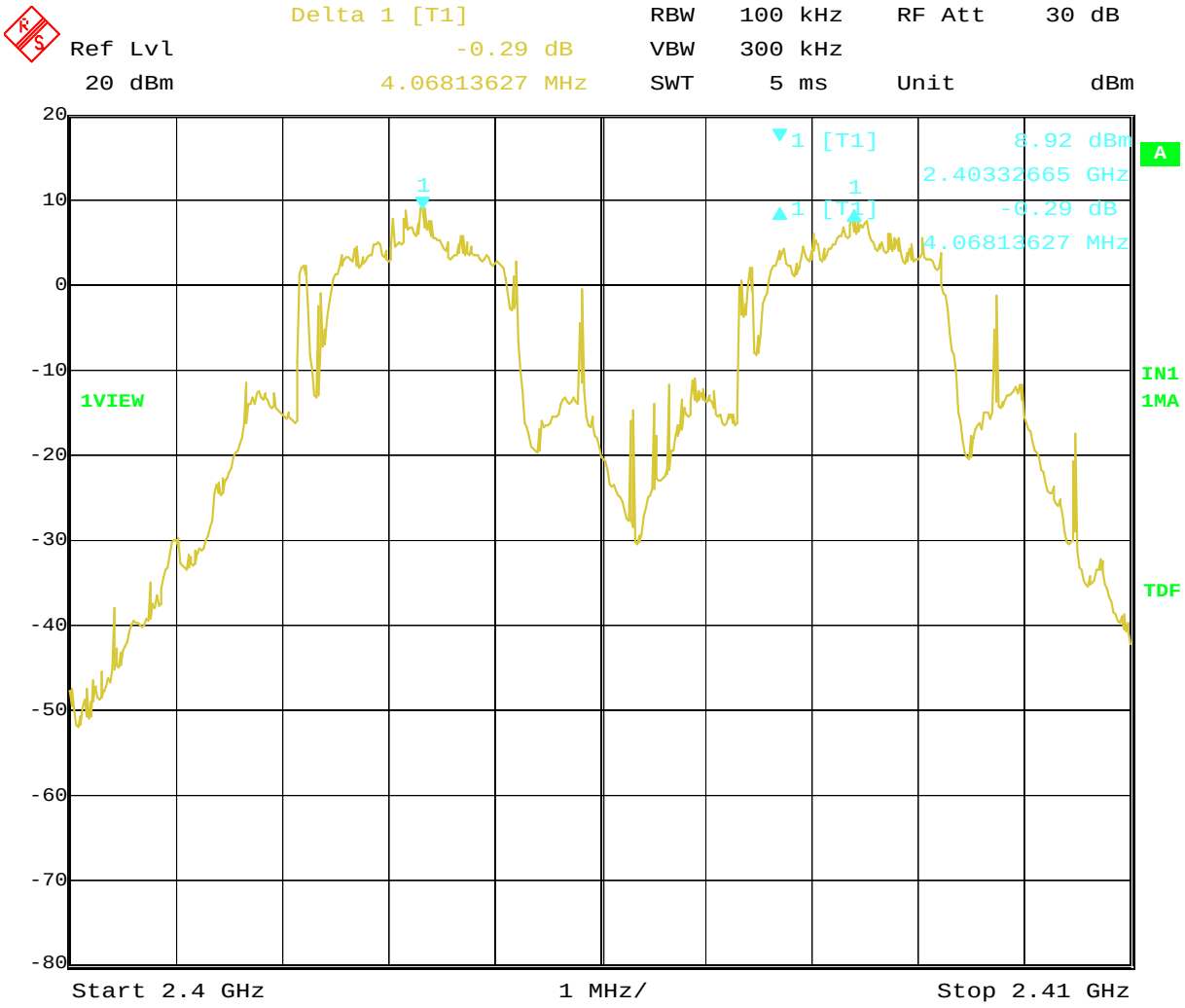
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

4.4.4. Result

Temperature (℃) : 22~23	EUT: KEF Wireless Subwoofer (Transmitter)
Humidity (%RH): 50~54	M/N: HTB2SE-W
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Jul 31, 2009	Test engineer: Phenix

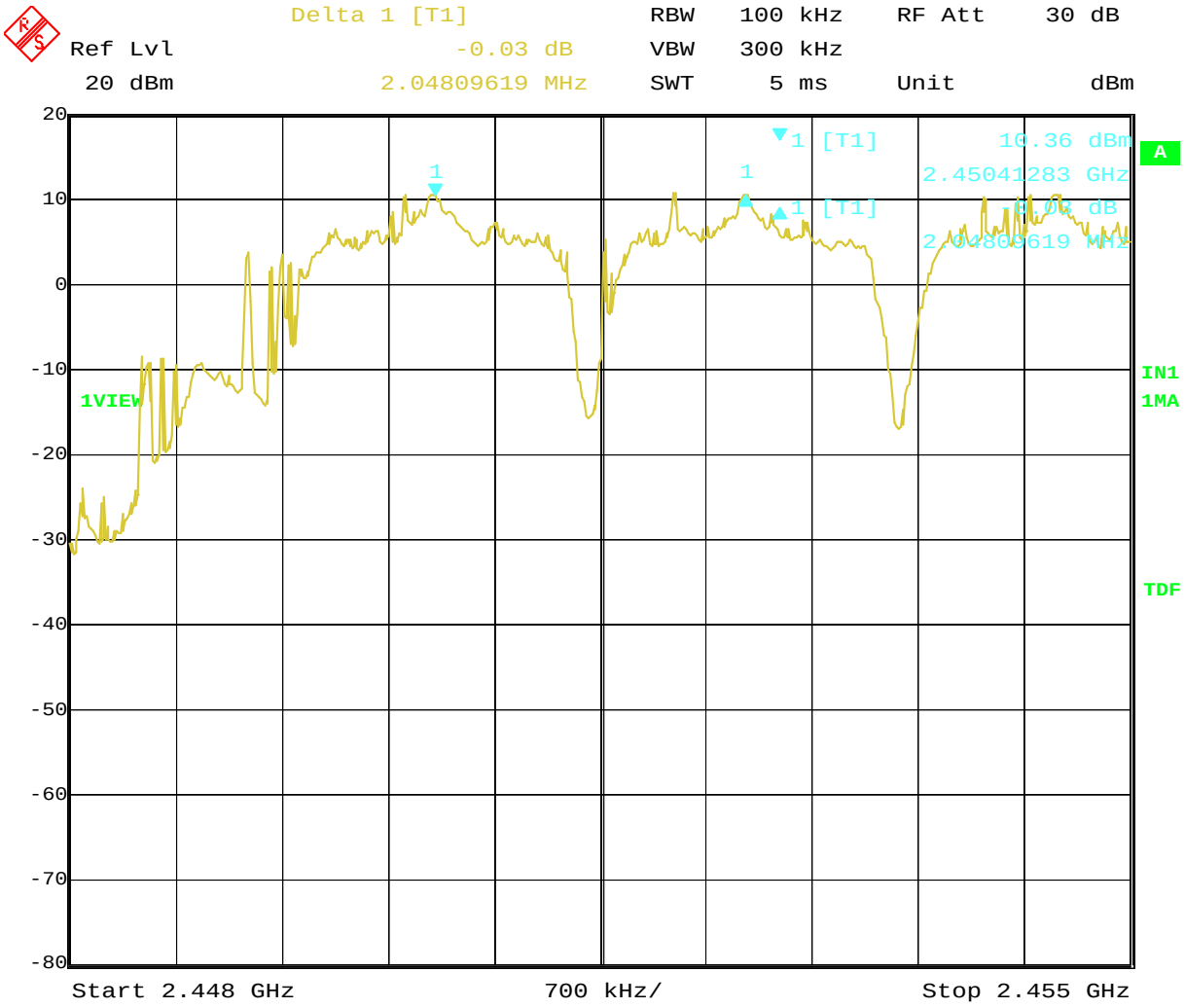
Channel No.	**Frequency (MHz)**	**Channel Separation (MHz)**
LOW(channel 1)	2403	4.068
MID(channel 11)	2442	2.048
HIG(channel 20)	2479	4.094

Channel Low：



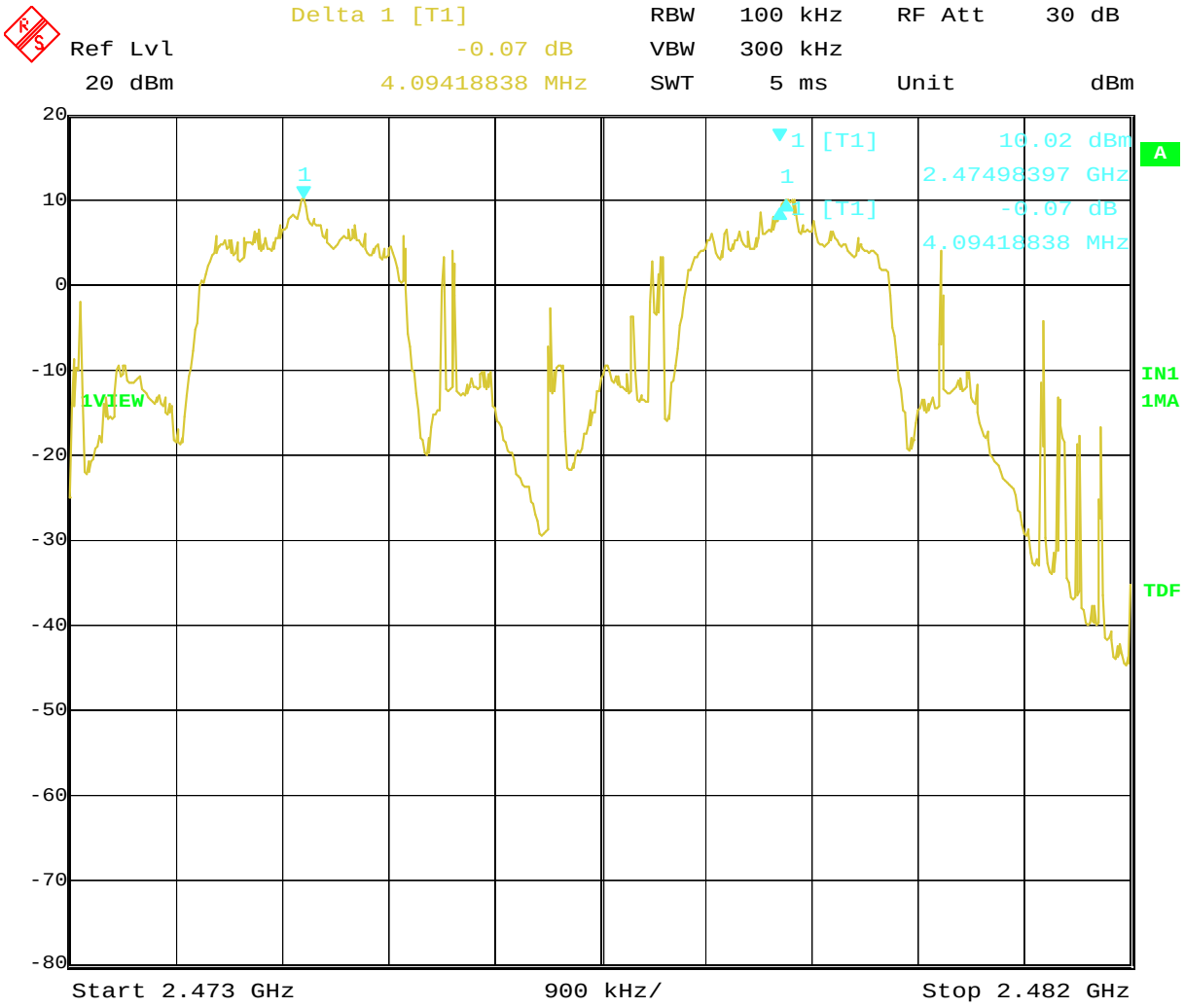
Date: 31.JUL.2009 04:19:26

Channel MID：



Date: 31.JUL.2009 04:38:34

Channel HIG：


Delta 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-0.07 dB
VBW 300 kHz
20 dBm
4.09418838 MHz
SWT 5 ms
Unit dBm
1 [T1]
10.02 dBm
2.47498397 GHz
1 [T1]
-0.07 dB
4.09418838 MHz
A
IN1
1MA
TDF
1VIEW
Start 2.473 GHz
900 kHz/
Stop 2.482 GHz
Date: 31.JUL.2009 04:41:11

4.5 Number of Hopping Frequency

4.5.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 15 non-overlapping hopping channels. Frequency hopping system which use fewer than 75 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping system may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

4.5.2 Block diagram of test setup

Spectrum

Connection method: delete the antenna of EUT and connect receiver with a cable. The connector of cable is N type. The Zc of the cable is 50 OHM. The other side of cable solder on the antenna terminal. Because the impedance of antennal terminal is 50 OHM,and the impedance of receiver is also 50 OHM, so this connection is matching.

4.5.3 Measurement method

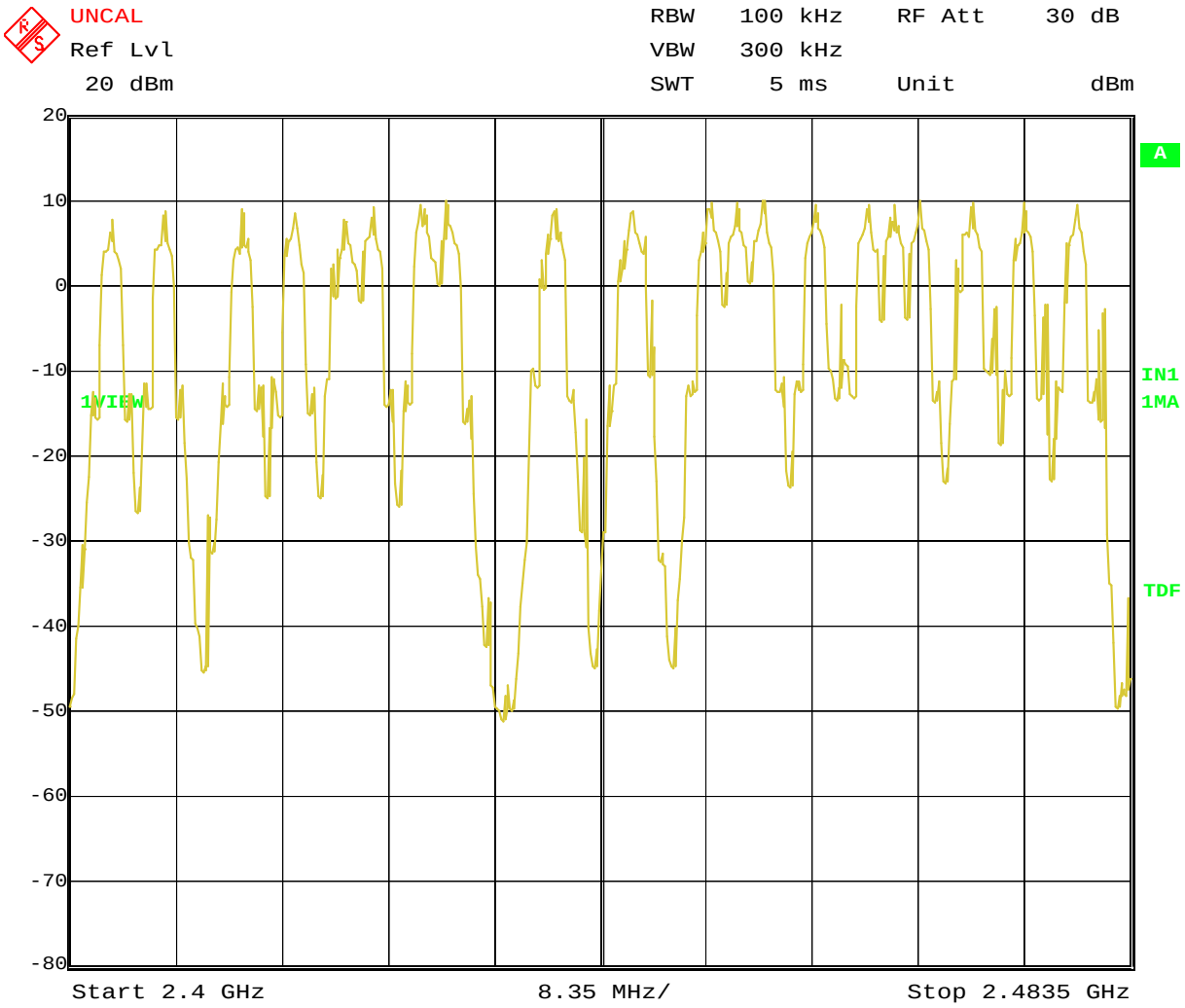
1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. Observe frequency hopping in 2400MHz~2483.5MHz, there are 20 non-overlapping channels.

4.5.4. Result

Temperature (℃) : 22~23	EUT: KEF Wireless Subwoofer (Transmitter)
Humidity (%RH): 50~54	M/N: HTB2SE-W
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Jul 31, 2009	Test engineer: Phenix

Frequency (MHz)	Number of Hopping Channel	Min. Limit (Channels)
2400~2483	20	>15

Test Plot:



Date: 31.JUL.2009 04:17:05

4.6 Dwell Time of Each Frequency

4.6.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4seconds multiplied by the number of hopping channels employed.

4.6.2 Block diagram of test setup

Spectrum

Connection method: delete the antenna of EUT and connect receiver with a cable. The connector of cable is N type. The Zc of the cable is 50 OHM. The other side of cable solder on the antenna terminal. Because the impedance of antennal terminal is 50 OHM,and the impedance of receiver is also 50 OHM, so this connection is matching.

4.6.3 Measurement method

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is more than once pulse time.
4. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
5. Measure the maximum time duration of one single pulse.

4.6.4. Result

Temperature (℃) : 22~23	EUT: KEF Wireless Subwoofer (Transmitter)
Humidity (%RH): 50~54	M/N: HTB2SE-W
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Jul 31, 2009	Test engineer: Phenix

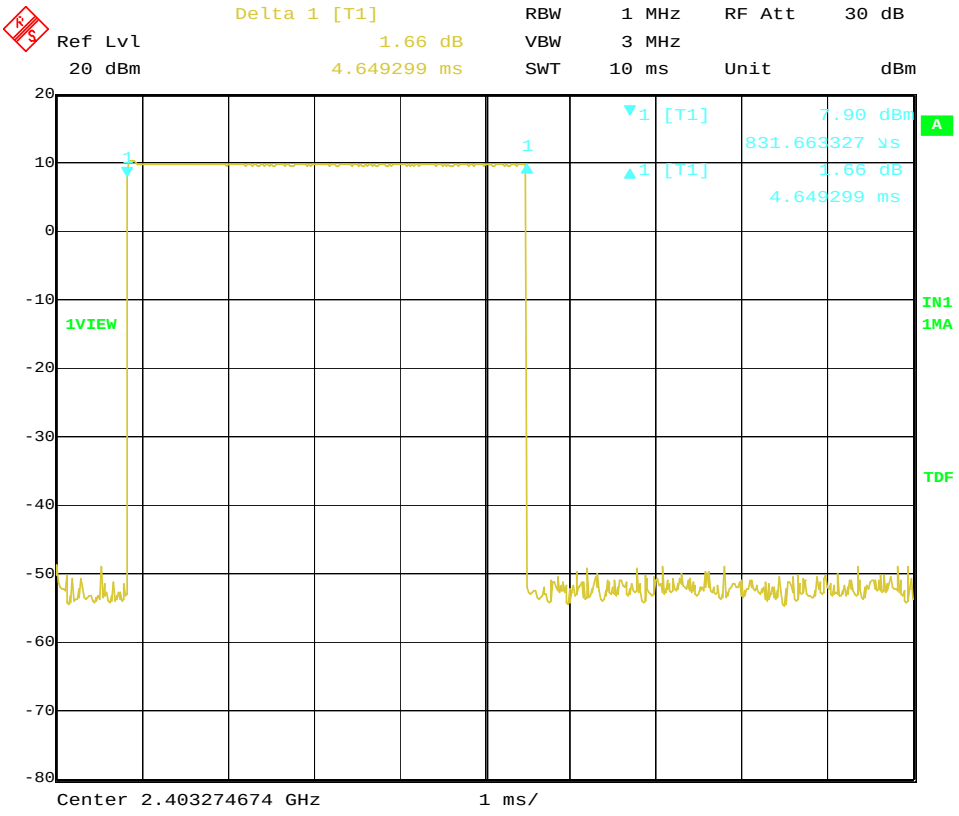
Calculate:
The Dwell Time = (time of Pulse / Pulse Cycle) x 0.4(second) x 20(channels)

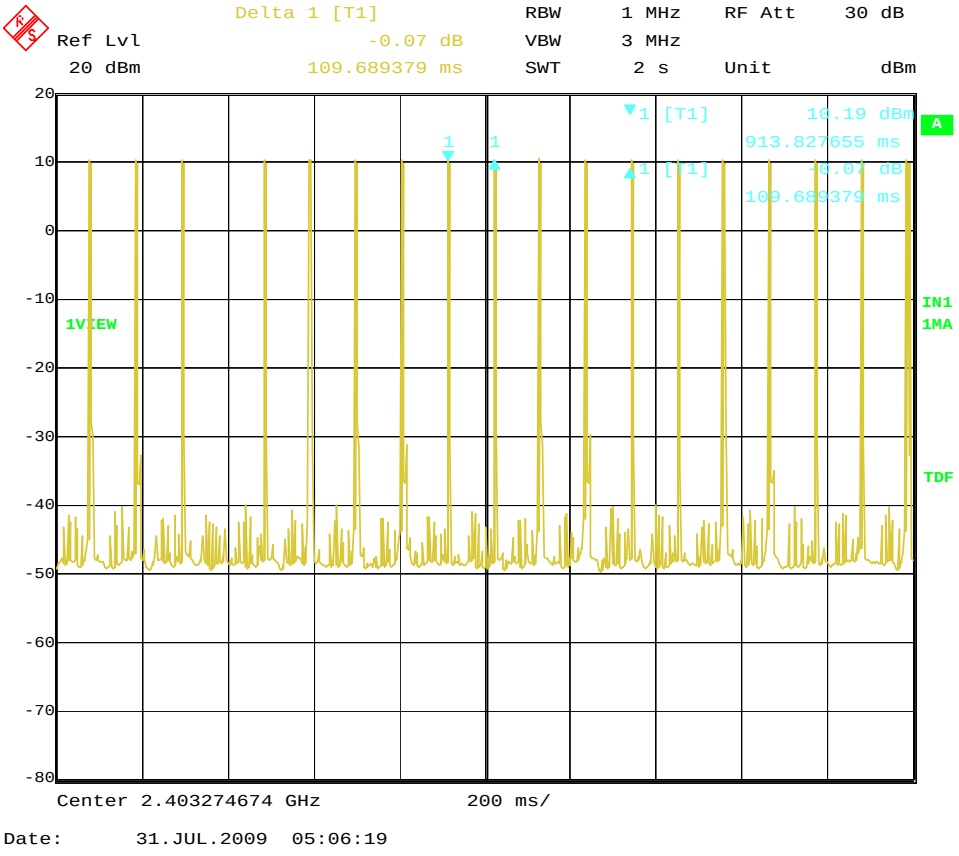
Channel	Time of Pulse (ms)	Pulse Cycle (ms)	Dwell Time (ms)	Limit (ms)	Result
LOW	4.65	109.7	339.1	400	Pass
MID	4.65	108.9	341.6	400	Pass
HIG	4.65	108.9	341.6	400	Pass

The maximum time of occupancy for a particular channel is 341.6 ms, which is less than the 400 ms allowed by the rules; therefore, it meets the requirements of this section.

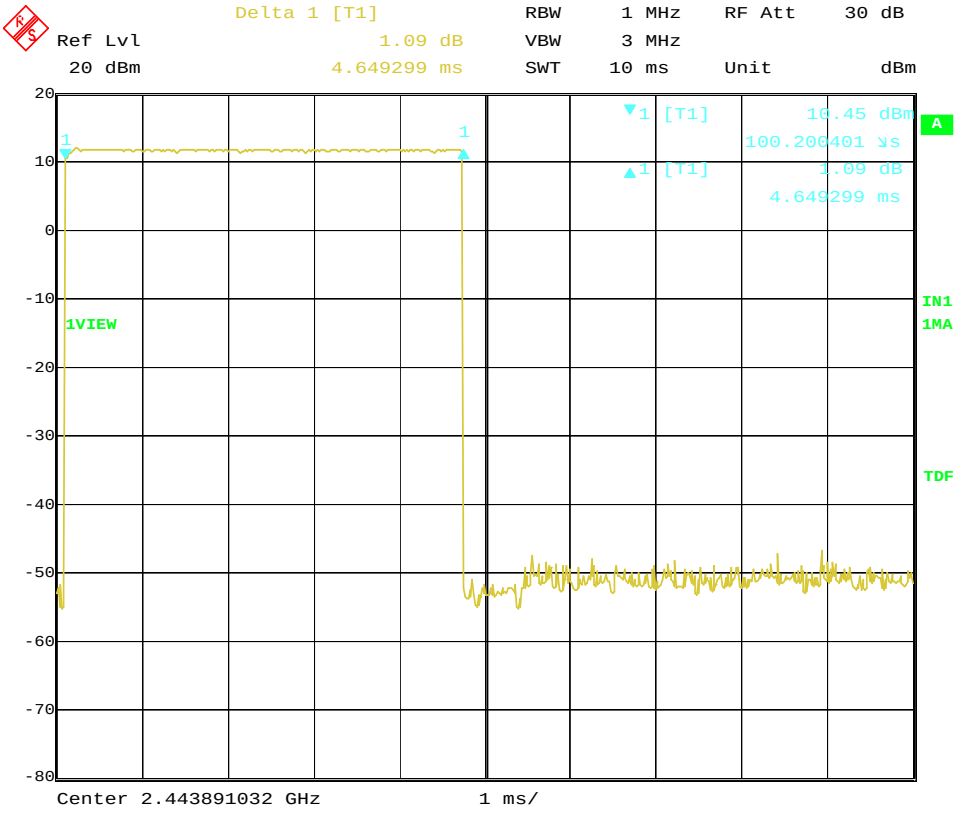
Test Plot:

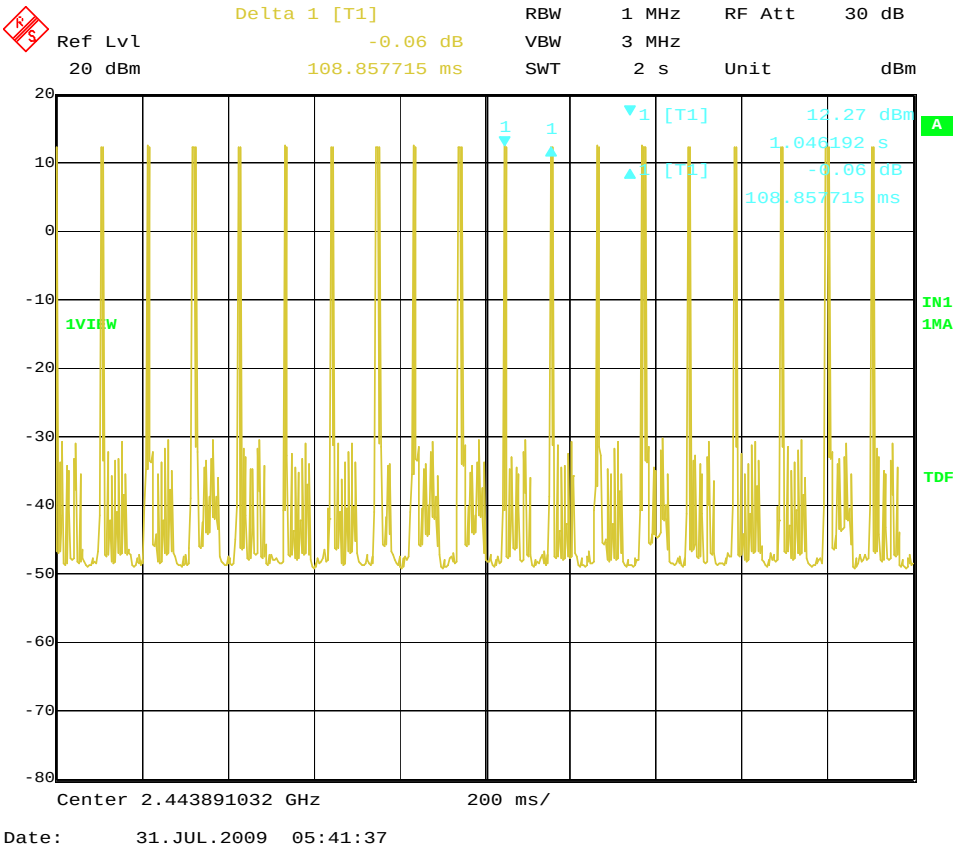
Channel LOW：



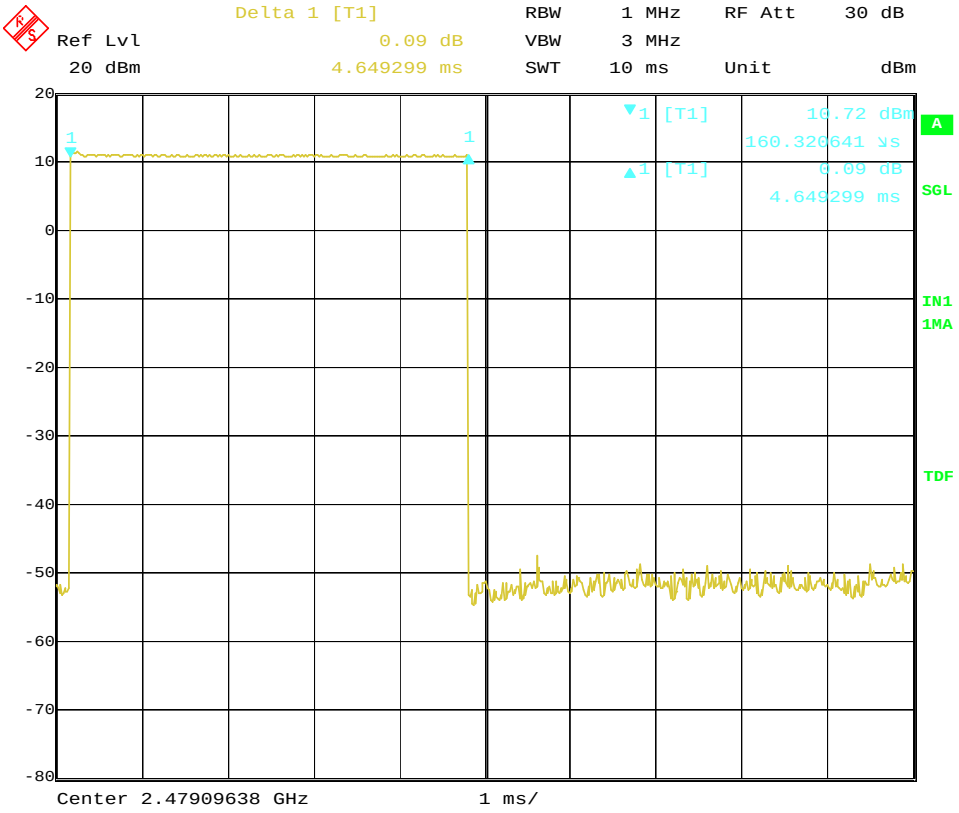


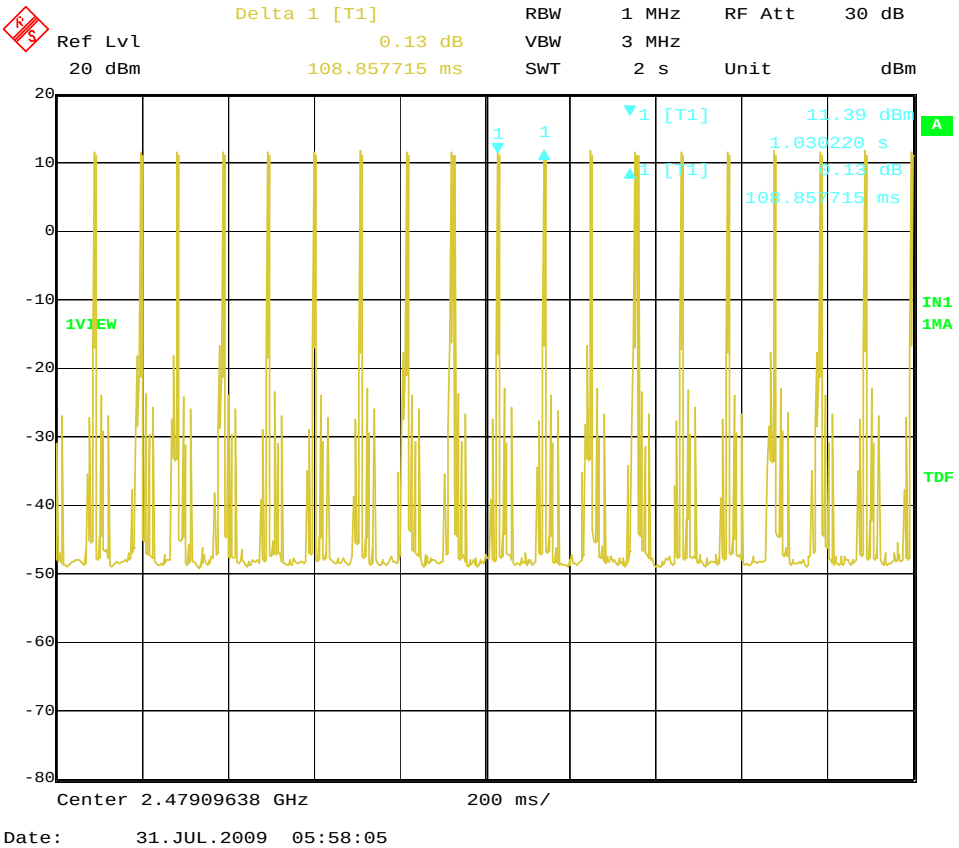
Channel MID：


Delta 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
1.09 dB
VBW 3 MHz
20 dBm
4.649299 ms
SWT 10 ms
Unit dBm
1 [T1]
10.45 dBm
100.200401 µs
1 [T1]
1.09 dB
4.649299 ms
1VIEW
A
IN1
1MA
TDF
Center 2.443891032 GHz
1 ms/
Date: 31.JUL.2009 05:14:09


Delta 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
-0.06 dB
VBW 3 MHz
20 dBm
108.857715 ms
SWT 2 s
Unit dBm
1 [T1]
12.27 dBm
1.046192 s
1 [T1]
-0.06 dB
108.857715 ms
1VIEW
A
IN1
1MA
TDF
Center 2.443891032 GHz
200 ms/
Date: 31.JUL.2009 05:41:37

Channel HIG：


Delta 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
0.09 dB
VBW 3 MHz
20 dBm
4.649299 ms
SWT 10 ms
Unit dBm
1 [T1]
10.72 dBm
160.320641 µs
1 [T1]
0.09 dB
4.649299 ms
A
SGL
IN1
1MA
TDF
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.47909638 GHz
1 ms/
Date: 31.JUL.2009 05:56:45


Delta 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
0.13 dB
VBW 3 MHz
20 dBm
108.857715 ms
SWT 2 s
Unit dBm
1 [T1]
11.39 dBm
1.030220 s
1 [T1]
0.13 dB
108.857715 ms
A
1VIEW
IN1
1MA
TDF
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.47909638 GHz
200 ms/
Date: 31.JUL.2009 05:58:05

4.7 Maximum Peak Output Power

4.7.1 Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels and The maximum peak output power shall not exceed 1 watt. For all other frequency hopping systems in this frequency band, The maximum peak output power shall not exceed 0.125 watt.

4.7.2 Block diagram of test setup

Spectrum

Connection method: delete the antenna of EUT and connect receiver with a cable. The connector of cable is N type. The Zc of the cable is 50 OHM. The other side of cable solder on the antenna terminal. Because the impedance of antennal terminal is 50 OHM,and the impedance of receiver is also 50 OHM, so this connection is matching.

4.7.3 Measurement method

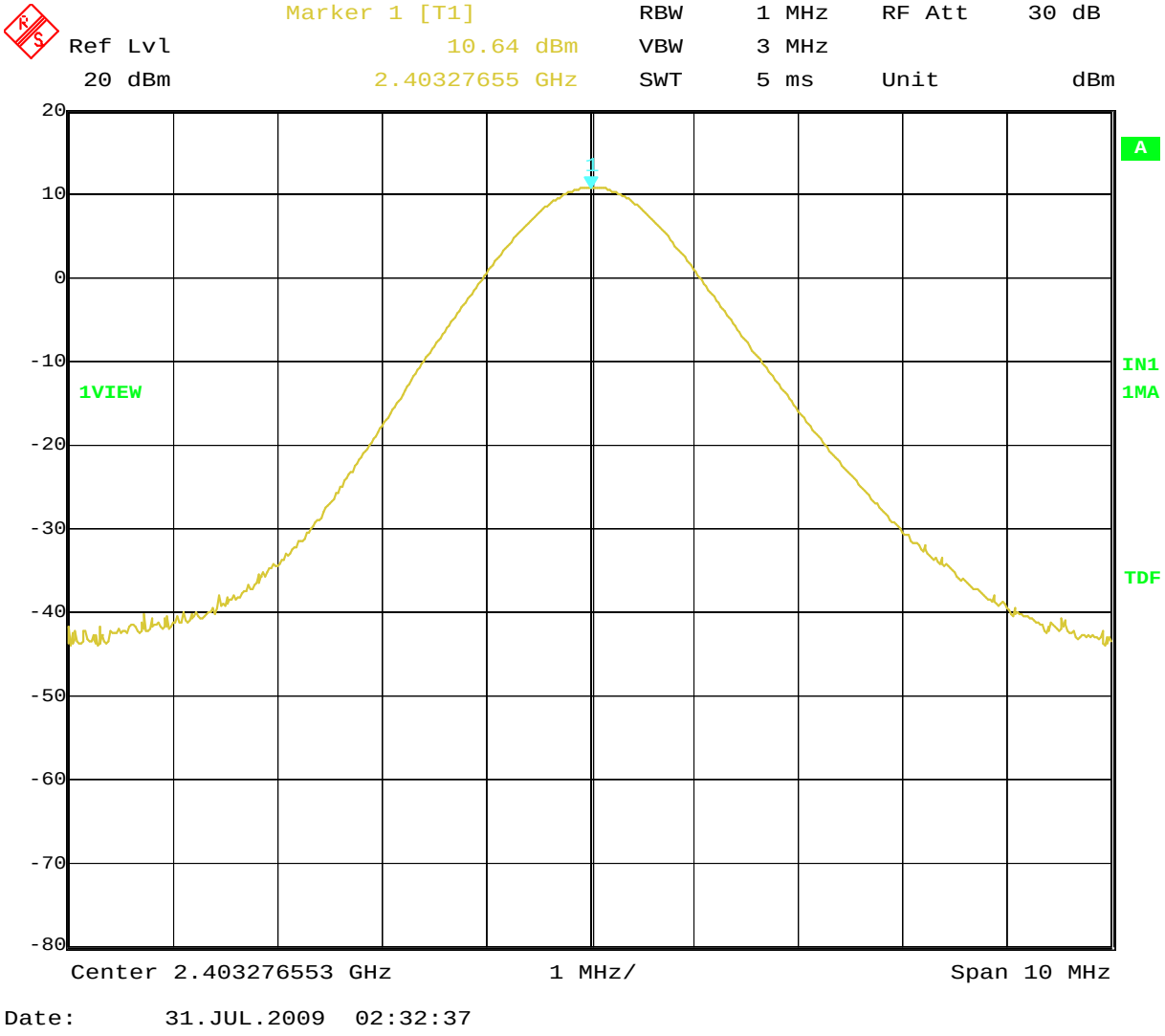
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in above figure without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
   RBW > the 20 dB bandwidth of the emission being measured
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

4.7.4. Result

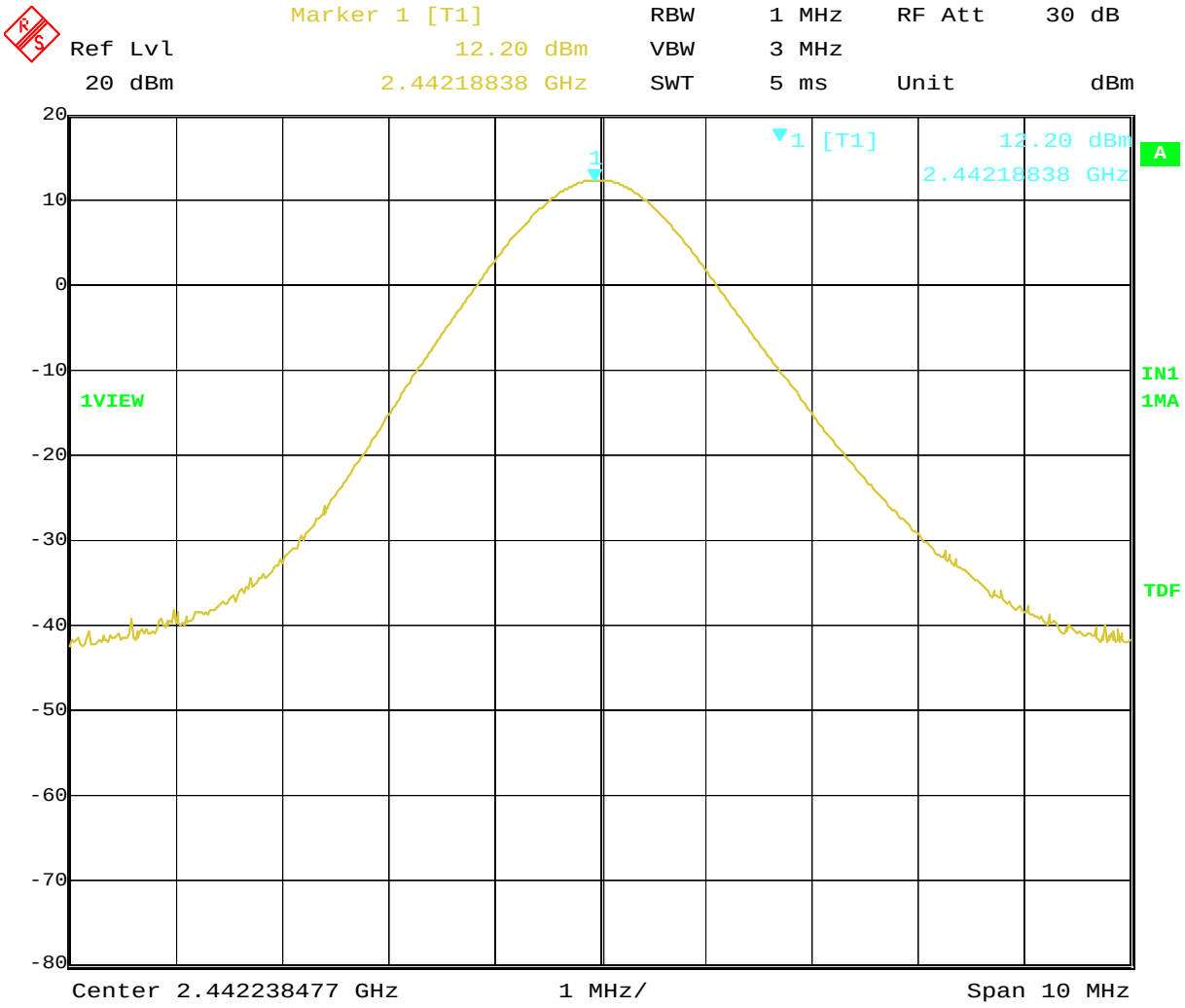
Temperature (℃) : 22~23	EUT: KEF Wireless Subwoofer (Transmitter)
Humidity (%RH): 50~54	M/N: HTB2SE-W
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Jul 31, 2009	Test engineer: Phenix

Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
LOW	2403	10.64	20.97
MID	2442	12.20	20.97
HIG	2479	11.96	20.97

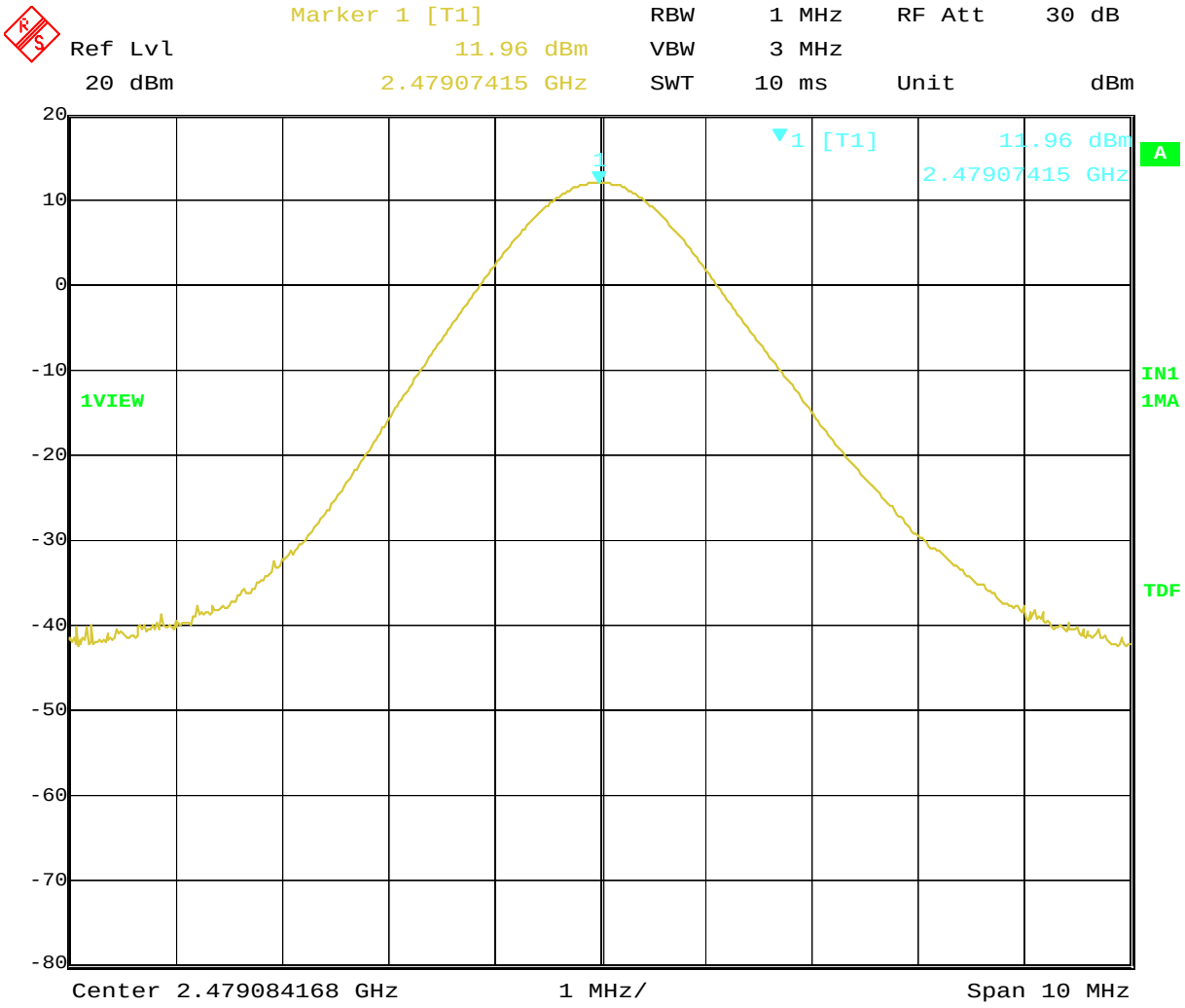
Channel LOW：



Channel MID：


Marker 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
12.20 dBm
VBW 3 MHz
20 dBm
2.44218838 GHz
SWT 5 ms
Unit dBm
1 [T1]
12.20 dBm
2.44218838 GHz
A
IN1
1MA
1VIEW
TDF
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.442238477 GHz
1 MHz/
Span 10 MHz
Date: 31.JUL.2009 03:51:30

Channel HIG：


Marker 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
11.96 dBm
VBW 3 MHz
20 dBm
2.47907415 GHz
SWT 10 ms
Unit dBm
1 [T1]
11.96 dBm
2.47907415 GHz
A
IN1
1MA
1VIEW
TDF
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.479084168 GHz
1 MHz/
Span 10 MHz
Date: 31.JUL.2009 03:31:32

4.8 Band Edges Emission

4.8.1 Applicable Standard

Section 15.247(d): 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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

4.8.2 Block diagram of test setup

Spectrum

Connection method: delete the antenna of EUT and connect receiver with a cable. The connector of cable is N type. The Zc of the cable is 50 OHM. The other side of cable solder on the antenna terminal. Because the impedance of antennal terminal is 50 OHM,and the impedance of receiver is also 50 OHM, so this connection is matching.

4.8.3 Measurement method

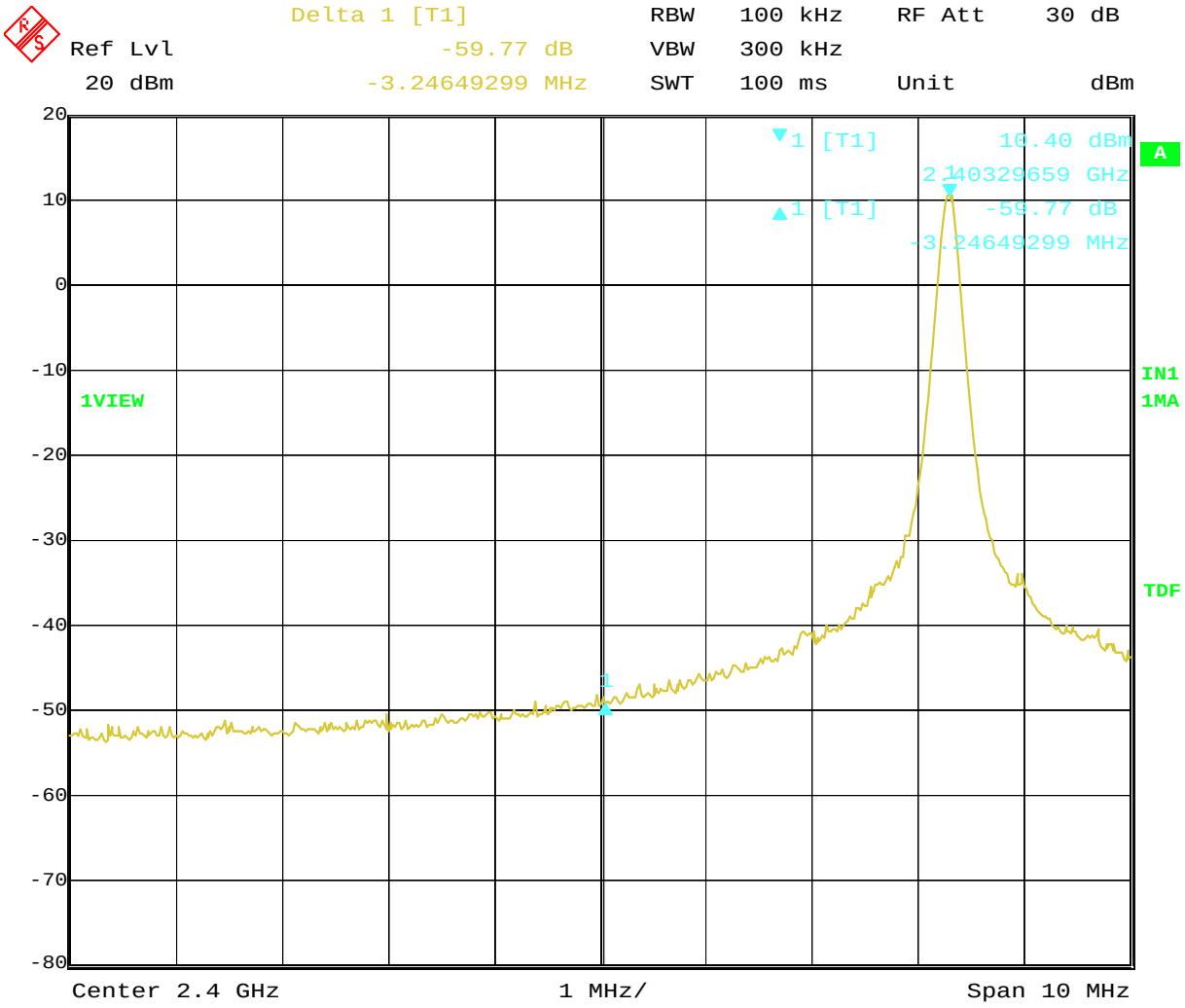
1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 10MHz bandwidth from lower band edge. Then detector set to peak and max hold this trace.
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

4.8.4. Result

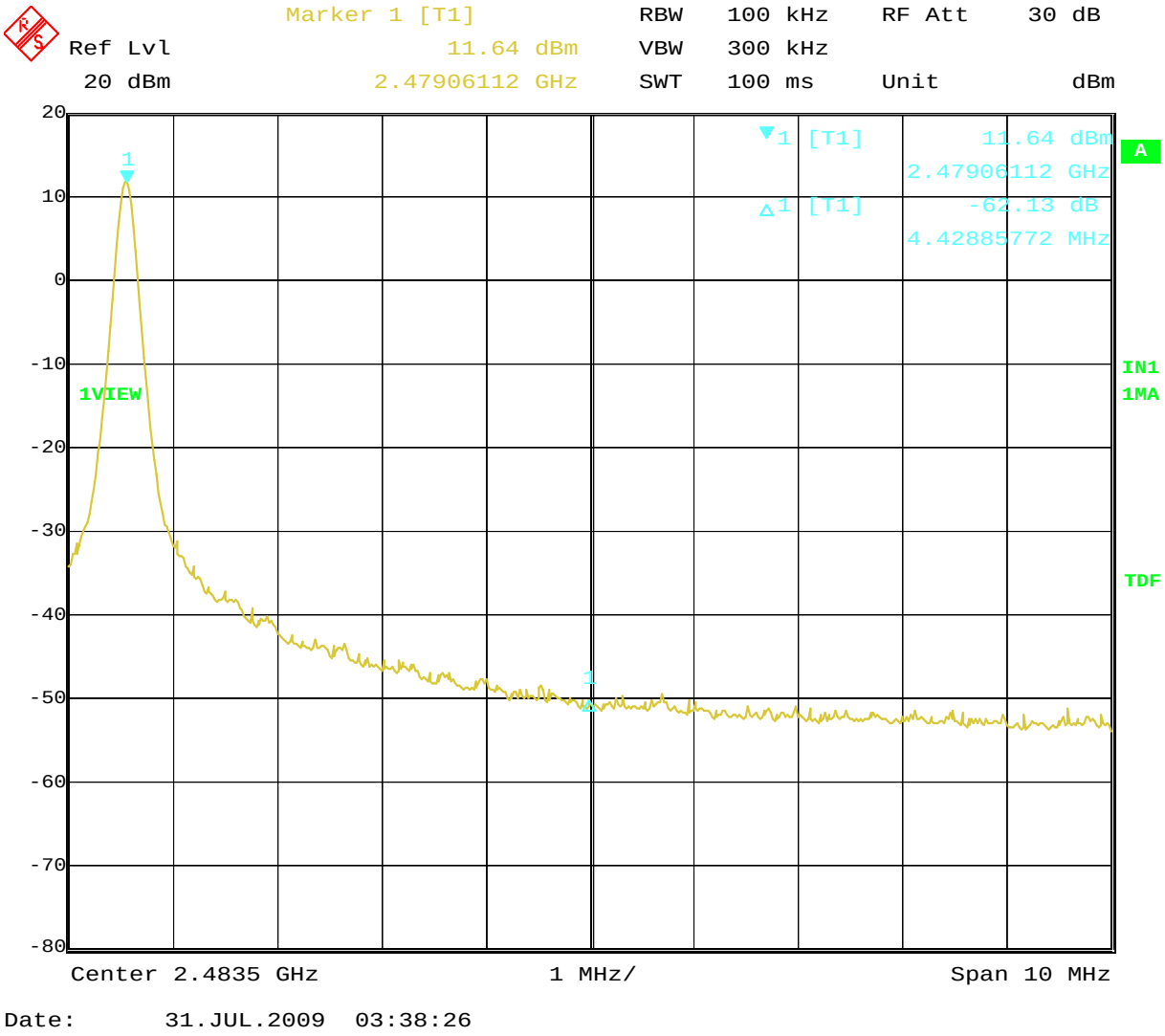
Temperature (℃) : 22~23	EUT: KEF Wireless Subwoofer (Transmitter)
Humidity (%RH): 50~54	M/N: HTB2SE-W
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Jul 31, 2009	Test engineer: Phenix

Frequency (MHz)	Read Delta (dB)	Limits (dB)	Margin (dB)
2400	-59.77	-20	39.77
2483.5	-62.13	-20	42.13

Channel LOW：


Delta 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-59.77 dB
VBW 300 kHz
20 dBm
-3.24649299 MHz
SWT 100 ms
Unit dBm
1 [T1]
10.40 dBm
2.40329659 GHz
1 [T1]
-59.77 dB
-3.24649299 MHz
1VIEW
A
IN1
1MA
TDF
Center 2.4 GHz
1 MHz/
Span 10 MHz
Date: 31.JUL.2009 02:52:25

Channel HIG：


Marker 1 [T1]
Ref Lvl
20 dBm
11.64 dBm
2.47906112 GHz
RBW 100 kHz
VBW 300 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
1 [T1]
11.64 dBm
2.47906112 GHz
Δ1 [T1]
-62.13 dB
4.42885772 MHz
A
IN1
1MA
TDF
1VIEW
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4835 GHz
1 MHz/
Span 10 MHz
Date: 31.JUL.2009 03:38:26

4.9 Spurious Radiated Emission

4.9.1 Applicable Standard

Section 15.247(d): 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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

4.9.2 Block diagram of test setup

Radiated Measurement Setup:

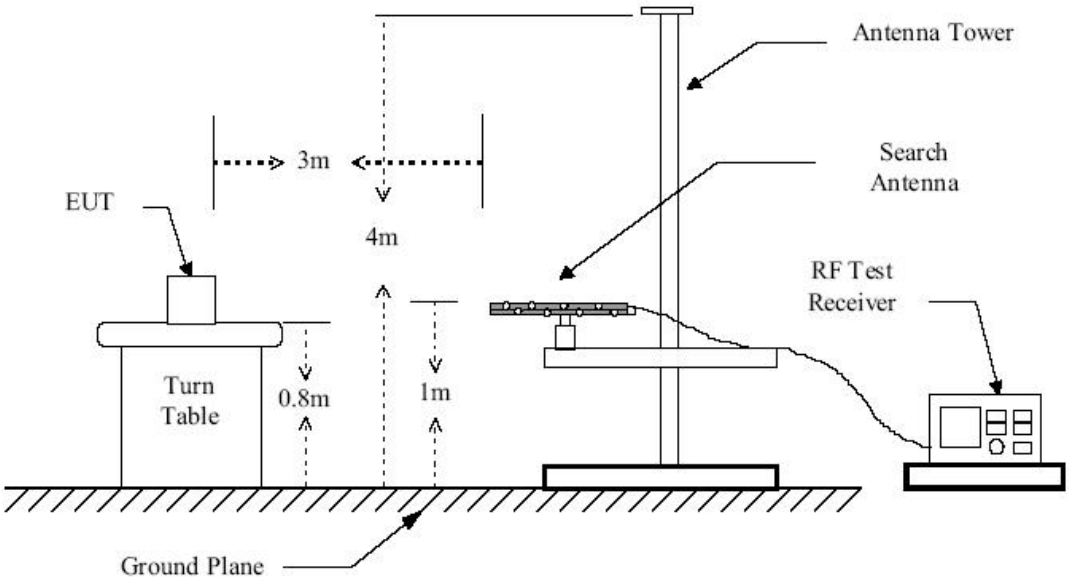


Figure 1 : Frequencies measured below 1 GHz configuration

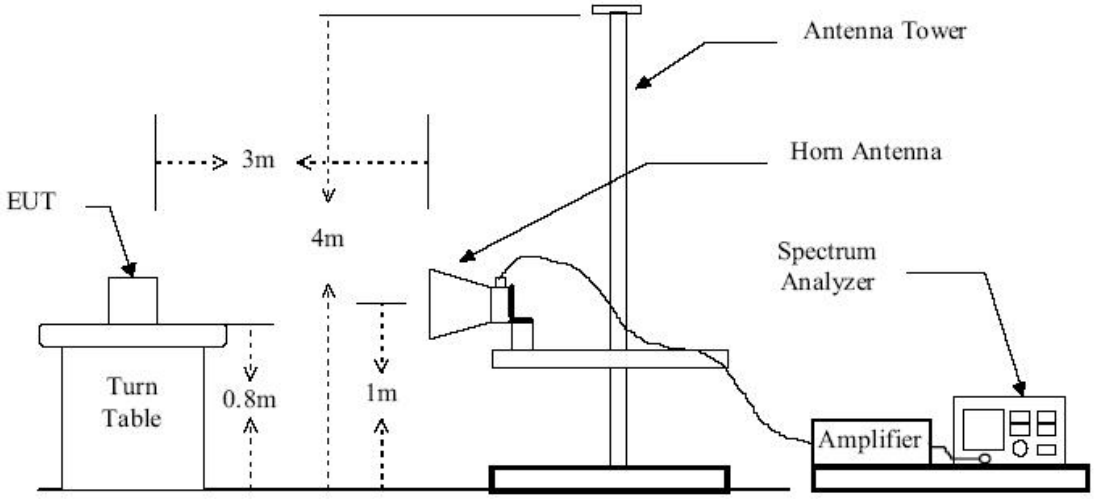


Figure 2 : Frequencies measured above 1 GHz configuration

Conducted Measurement Setup:

Spectrum

Connection method: delete the antenna of EUT and connect receiver with a cable. The connector of cable is N type. The Zc of the cable is 50 OHM. The other side of cable solder on the antenna terminal. Because the impedance of antennal terminal is 50 OHM,and the impedance of receiver is also 50 OHM, so this connection is matching.

4.9.3 Measurement method

Radiated Measurement

1. Configure the EUT according to ANSI C63.4.

2. The EUT was placed on the top of the turntable 0.8 meter above ground.

3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.

4. Power on the EUT and all the supporting units.

5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.

7. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.

8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.

Conducted Measurement

1. For emission above 1GHz, conducted measurement method is used.

2. The transmitter is set to the lowest channel.

3. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.

4. Set RBW to 100KHz and VBW to 300 KHz, Then detector set to peak and max hold this trace.

5. The lowest band edges emission was measured and recorded.

6. The transmitter set to the highest channel and repeated 2~4.

4.9.4. Result

PASS

Radiated:

Below 1GHz:

2009-07-30 14:23:42

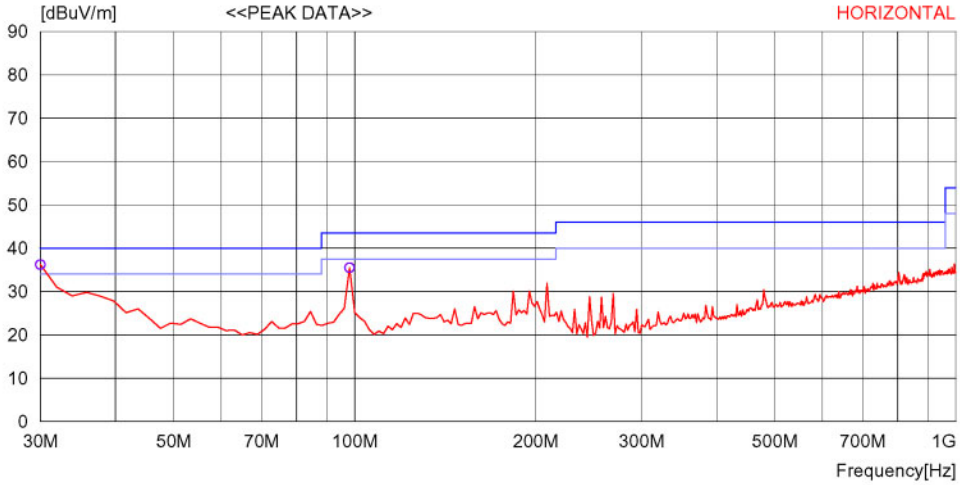
RADIATED EMISSION

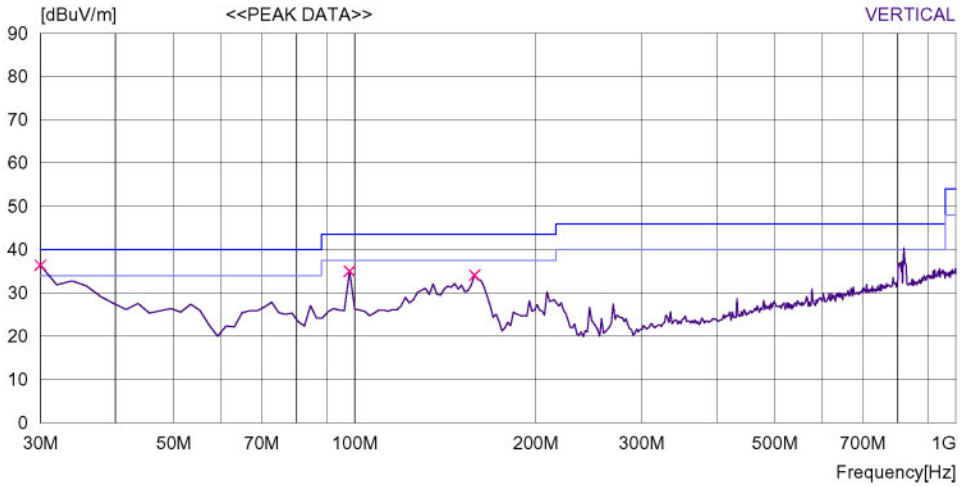
Date : 2009-07-30 14:23:29

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	sony MP3, playing Pinknoise	Operator	:	Phenix

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 Class B(3m)/USA
MARGIN: 6 dB





2009-07-30 14:23:42

RADIATED EMISSION

Date : 2009-07-30 14:23:29

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	sony MP3, playing Pinknoise	Operator	:	Phenix

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 Class B(3m)/USA
MARGIN: 6 dB

No.	FREQ	READING PEAK	ANT FACTOR	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal ------										
1	30.000	48.7	12.5	6.7	31.7	36.2	40	3.8	400	152
2	98.036	51.3	8.3	7.5	31.6	35.5	43.5	8.0	300	85
----- Vertical ------										
3	30.000	48.9	12.5	6.7	31.7	36.4	40	3.6	400	76
4	98.036	50.8	8.3	7.5	31.6	35.0	43.5	8.5	100	246
5	158.297	46.0	11.8	7.8	31.5	34.1	43.5	9.4	100	189

Above 1GHz:

Normal mode:

2009-08-21 15:54:10

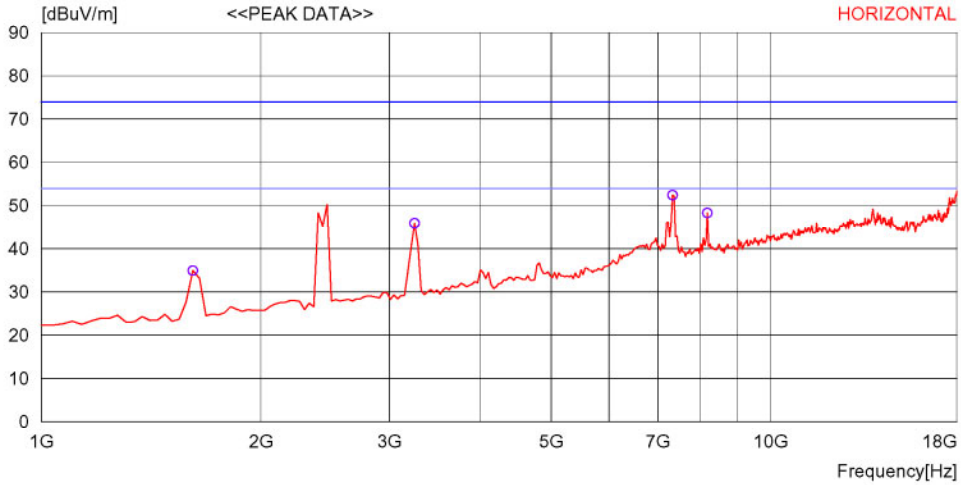
RADIATED EMISSION

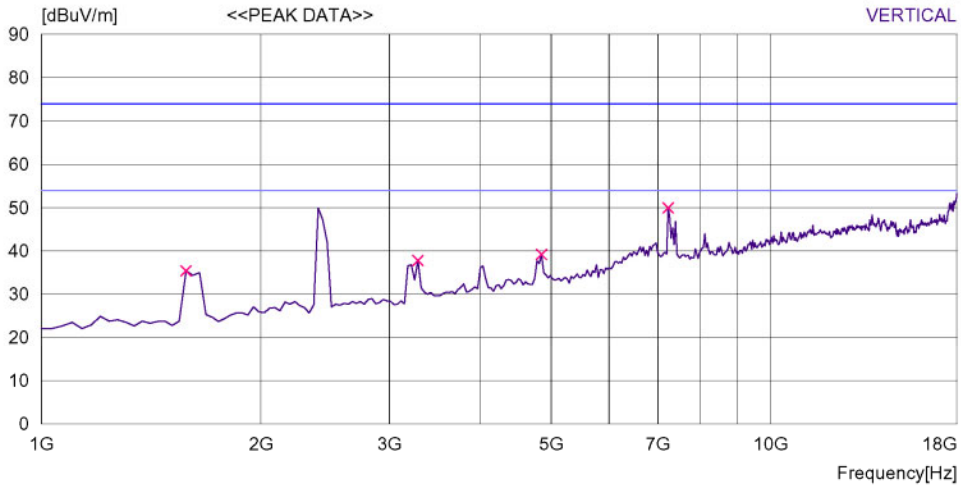
Date : 2009-08-21 15:53:53

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	Normal mode	Operator	:	Phenix zhang

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)





2009-08-21 15:54:10

RADIATED EMISSION

Date : 2009-08-21 15:53:53

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	Normal mode	Operator	:	Phenix zhang

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	1613.226	41.3	29.1	4.5	40.0	34.9	74	39.1	100	354
2	3248.496	45.2	33.3	6.5	39.1	45.9	74	28.1	200	328
3	7336.693	40.6	41.0	9.9	39.1	52.4	74	21.6	200	164
4	8188.402	35.8	40.9	10.6	39.0	48.3	74	25.7	100	14
----- Vertical ------										
5	1579.158	42.1	29.0	4.4	40.1	35.4	74	38.6	200	346
6	3282.564	37.0	33.4	6.5	39.1	37.8	74	36.2	200	350
7	4849.703	33.9	36.5	7.9	39.1	39.2	74	34.8	200	18
8	7234.488	37.8	41.4	9.9	39.1	50.0	74	24.0	200	358

Continuous transmit mode:

2009-08-05 16:09:32

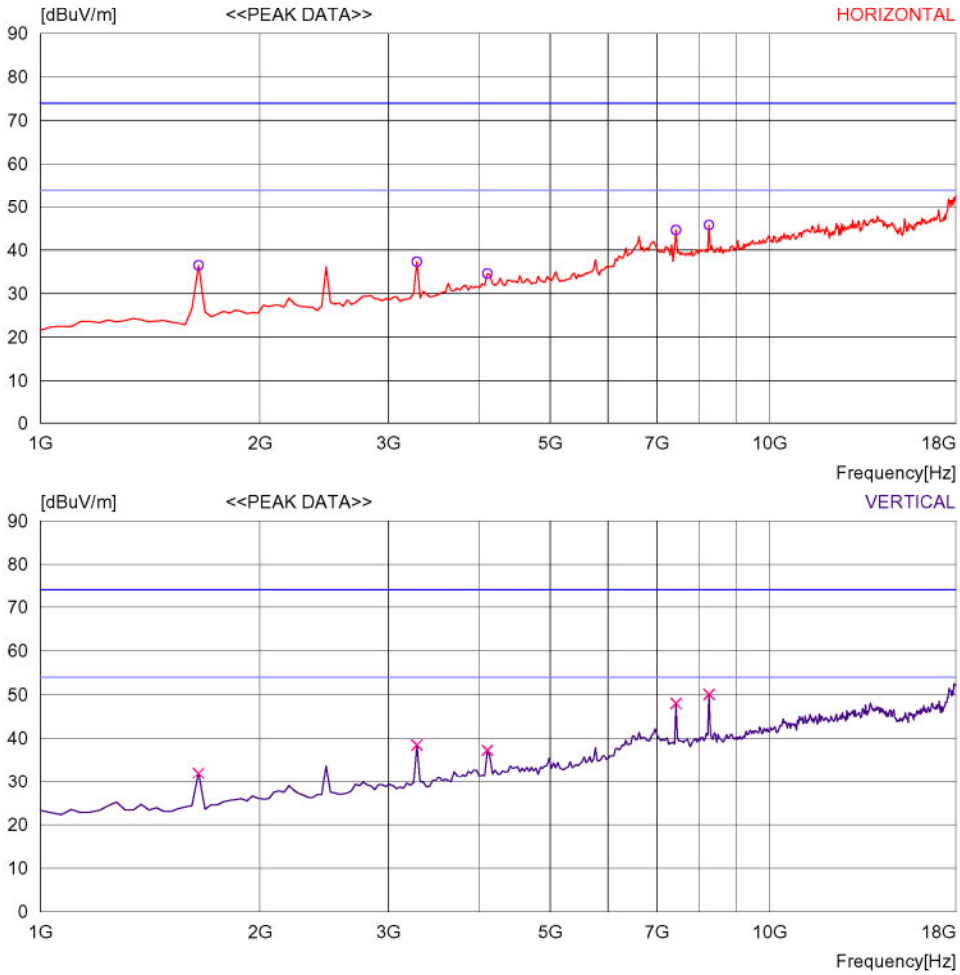
RADIATED EMISSION

Date : 2009-08-05 16:09:24

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	TX MODE, CH HIG	Operator	:	Phenix zhang

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)



2009-08-05 16:09:32

RADIATED EMISSION

Date : 2009-08-05 16:09:24

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	TX MODE, CH HIG	Operator	:	Phenix zhang

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	1647.294	42.8	29.2	4.5	40.0	36.5	74	37.5	100	175
2	3282.564	36.5	33.4	6.5	39.1	37.3	74	36.7	200	133
3	4100.199	30.9	35.5	7.1	38.9	34.6	74	39.4	200	1
4	7438.898	33.0	40.8	9.9	39.1	44.6	74	29.4	200	191
5	8256.538	33.2	40.9	10.7	39.1	45.7	74	28.3	200	67
----- Vertical ------										
6	1647.294	38.3	29.2	4.5	40.0	32.0	74	42.0	200	355
7	3282.564	37.7	33.4	6.5	39.1	38.5	74	35.5	100	220
8	4100.199	33.6	35.5	7.1	38.9	37.3	74	36.7	200	263
9	7438.898	36.4	40.8	9.9	39.1	48.0	74	26.0	200	94
10	8256.538	37.6	40.9	10.7	39.1	50.1	74	23.9	100	47

2009-08-05 17:24:26

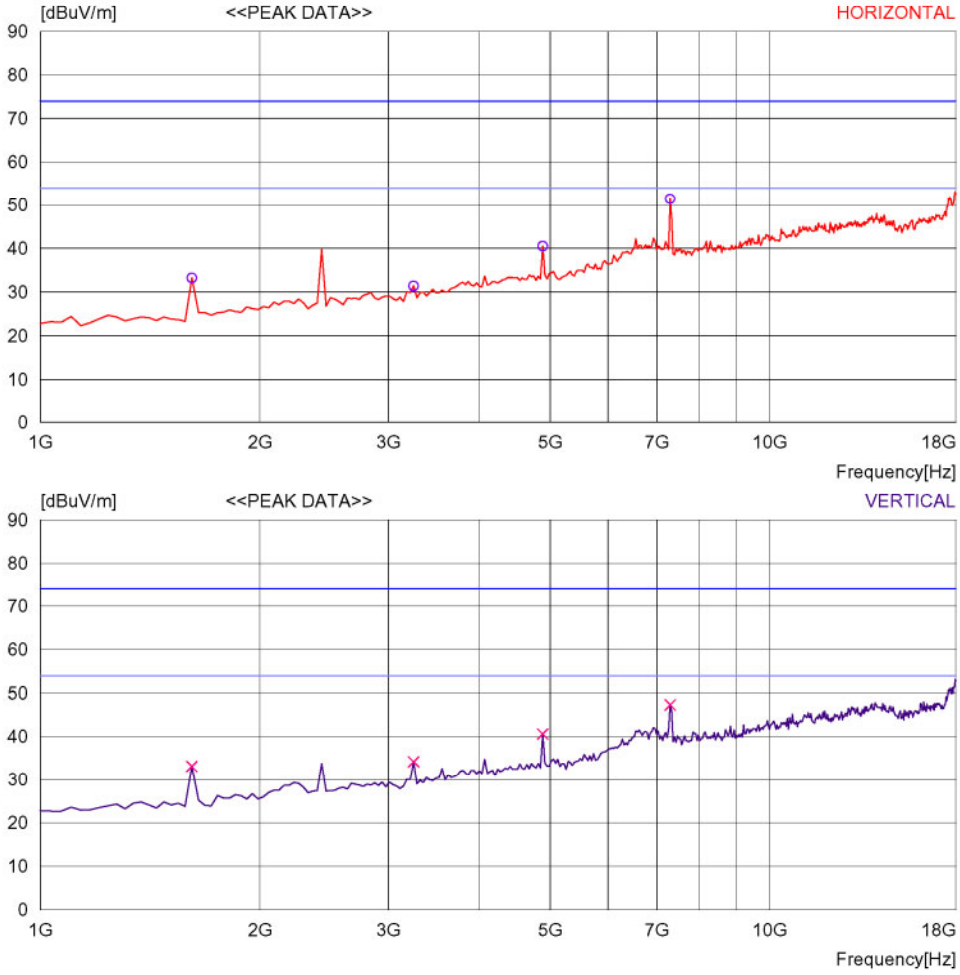
RADIATED EMISSION

Date : 2009-08-05 17:24:12

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	TX MODE, CH MID	Operator	:	Phenix zhang

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)



2009-08-05 17:24:26

RADIATED EMISSION

Date : 2009-08-05 17:24:12

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	TX MODE, CH MID	Operator	:	Phenix zhang

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	1613.226	39.6	29.1	4.5	40.0	33.2	74	40.8	200	137
2	3248.496	30.7	33.3	6.5	39.1	31.4	74	42.6	200	310
3	4883.771	35.2	36.5	7.9	39.1	40.5	74	33.5	200	80
4	7302.625	39.5	41.1	9.9	39.1	51.4	74	22.6	200	5
----- Vertical ------										
5	1613.226	39.5	29.1	4.5	40.0	33.1	74	40.9	100	320
6	3248.496	33.5	33.3	6.5	39.1	34.2	74	39.8	200	36
7	4883.771	35.3	36.5	7.9	39.1	40.6	74	33.4	200	217
8	7302.625	35.4	41.1	9.9	39.1	47.3	74	26.7	100	76

2009-08-05 17:34:19

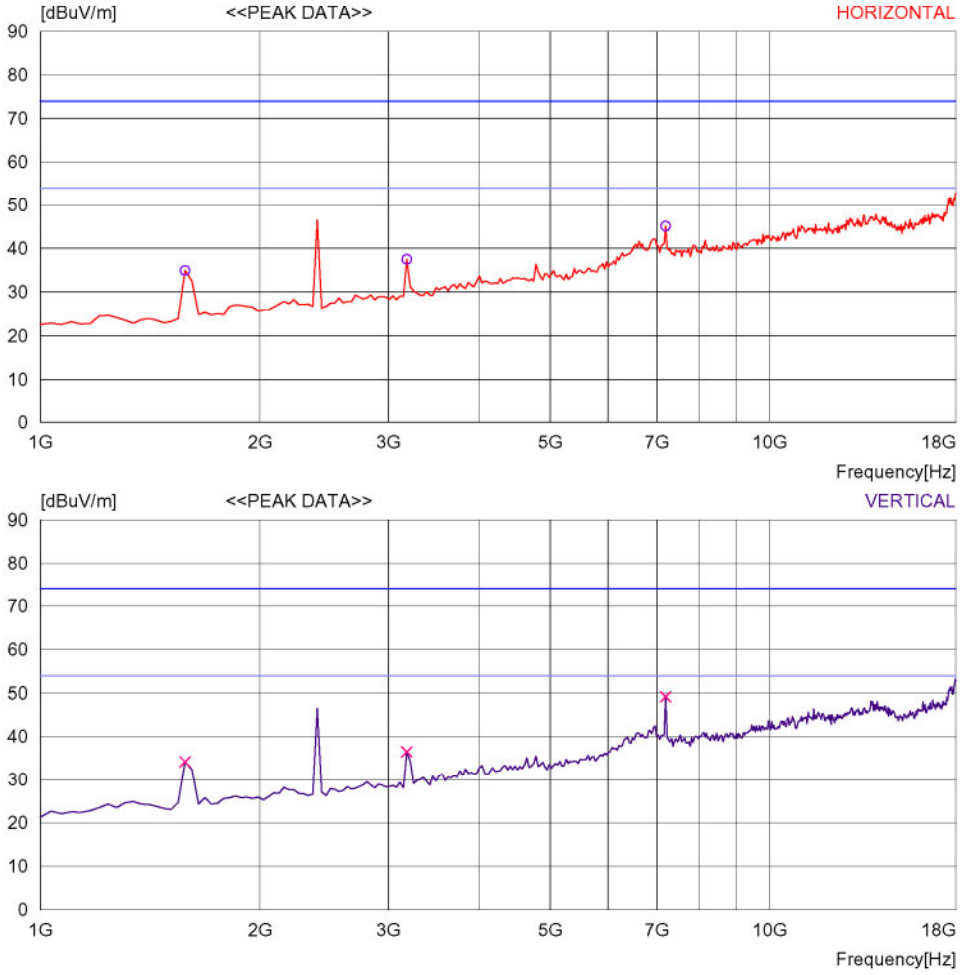
RADIATED EMISSION

Date : 2009-08-05 17:34:12

Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	TX MODE, CH LOW	Operator	:	Phenix zhang

Memo : KEF Wireless Subwoofer (Transmitter)

LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)



2009-08-05 17:34:19

RADIATED EMISSION

Date : 2009-08-05 17:34:12

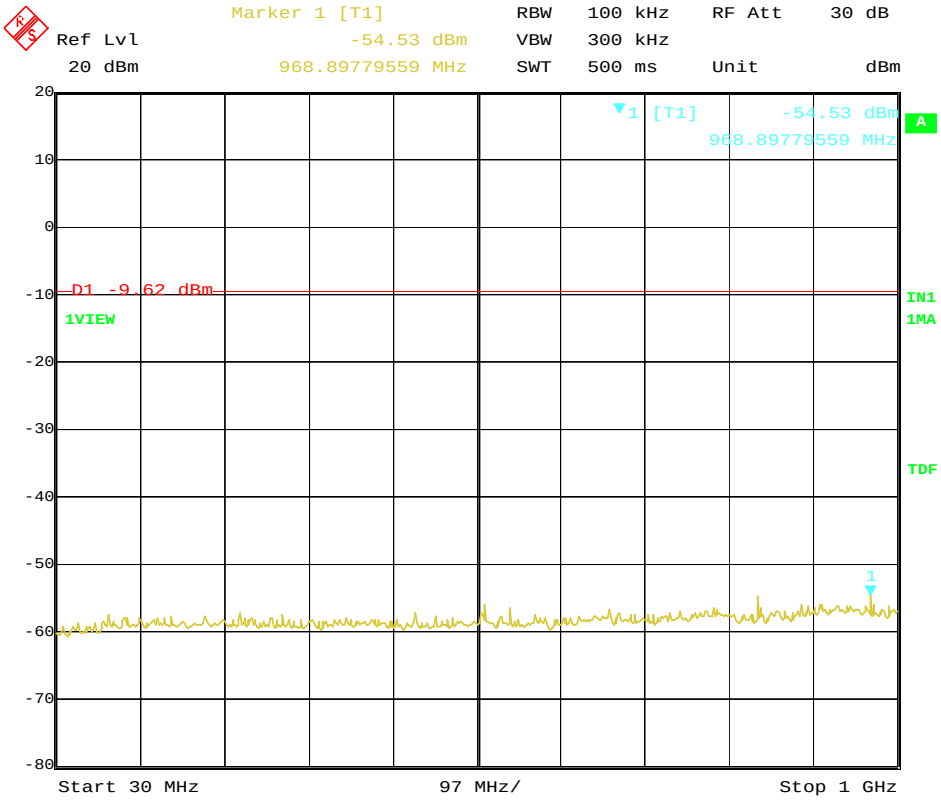
Trade Name	:	GP	Document No.	:	
Model Name	:	HTB2SE-W	Power Supply	:	AC 120V/60Hz
Serial No.	:		Temp/Humi	:	27/55RH%
Test Condition	:	TX MODE, CH LOW	Operator	:	Phenix zhang

Memo : KEF Wireless Subwoofer (Transmitter)

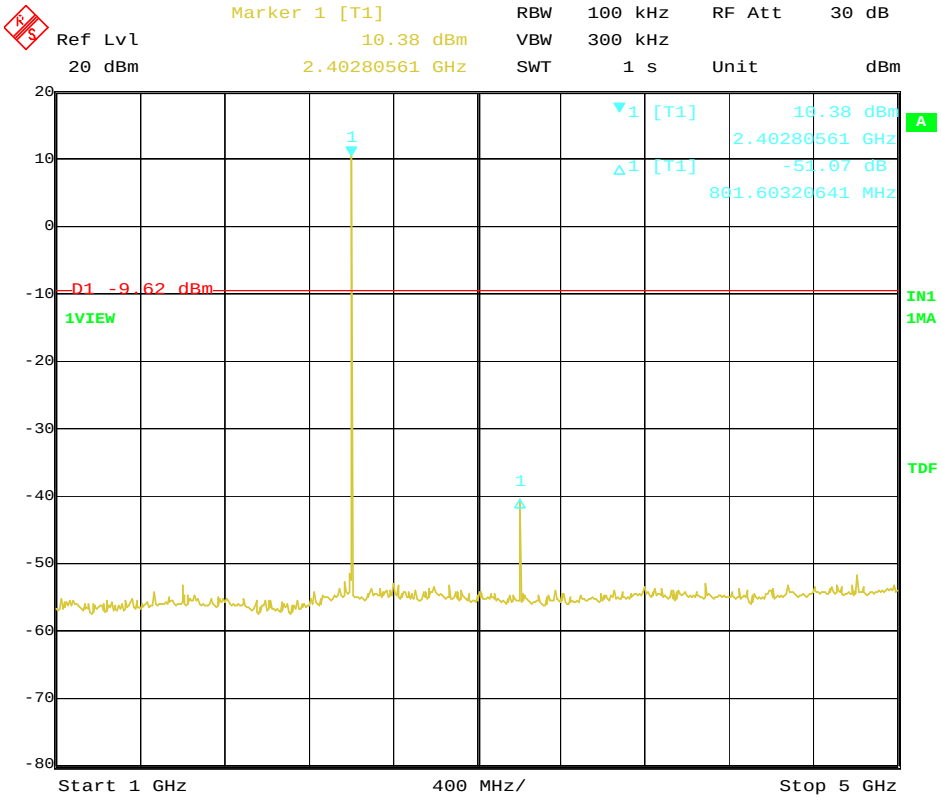
LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	1579.158	41.6	29.0	4.4	40.1	34.9	74	39.1	200	283
2	3180.359	37.1	33.2	6.4	39.2	37.5	74	36.5	200	333
3	7200.419	32.8	41.5	9.9	39.1	45.1	74	28.9	200	8
----- Vertical ------										
4	1579.158	40.9	29.0	4.4	40.1	34.2	74	39.8	200	343
5	3180.359	36.1	33.2	6.4	39.2	36.5	74	37.5	200	34
6	7200.419	36.9	41.5	9.9	39.1	49.2	74	24.8	200	79

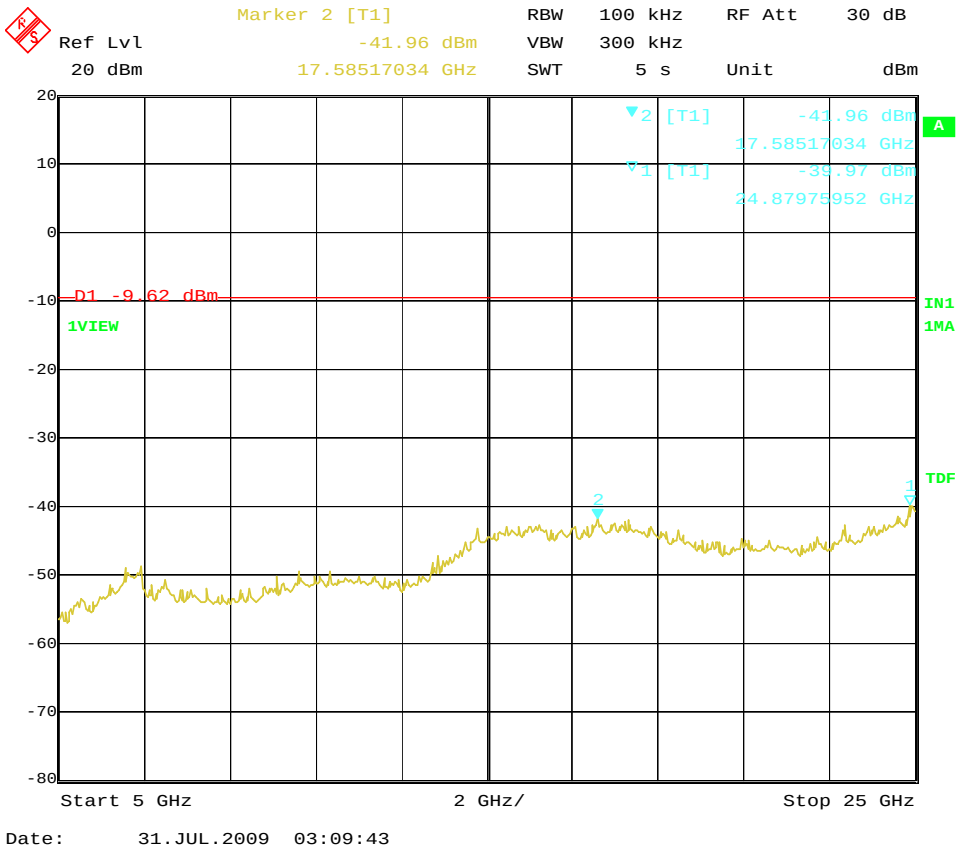
Conducted:
Channel LOW：



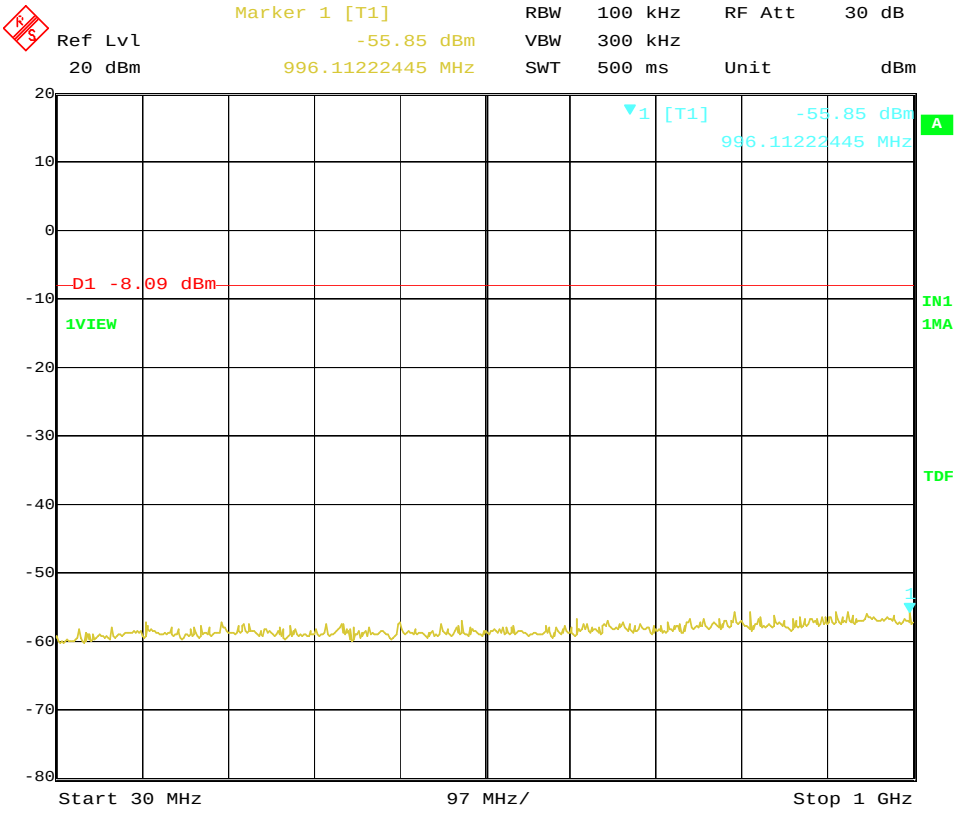
Date: 31.JUL.2009 03:08:20

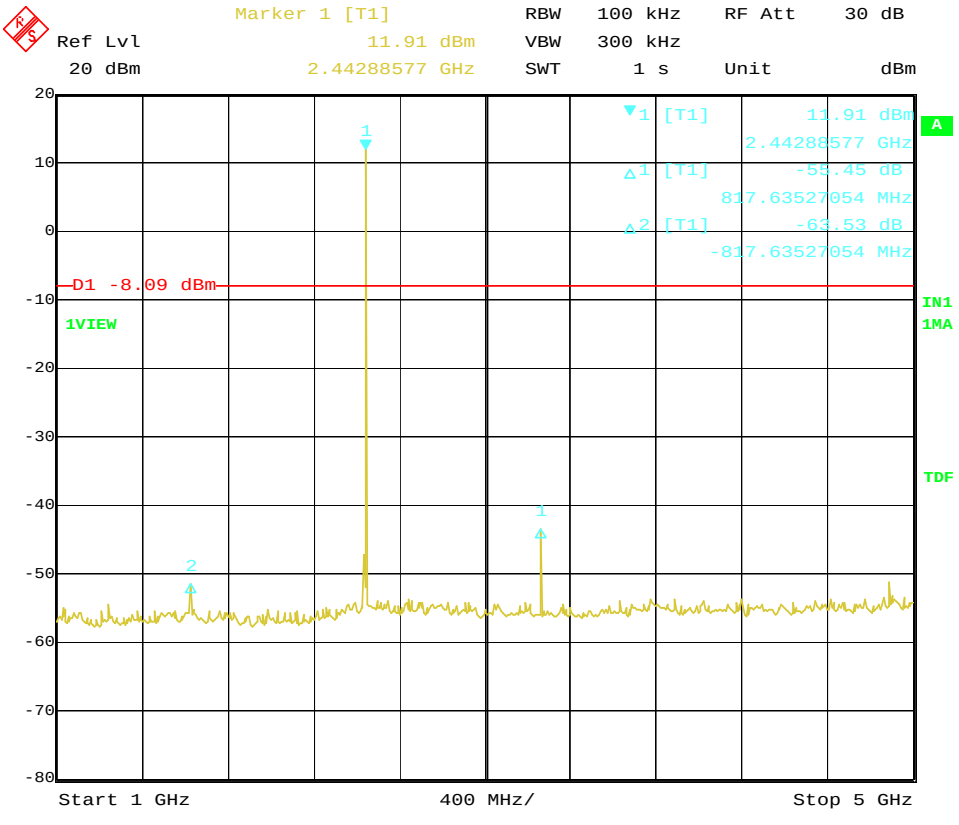


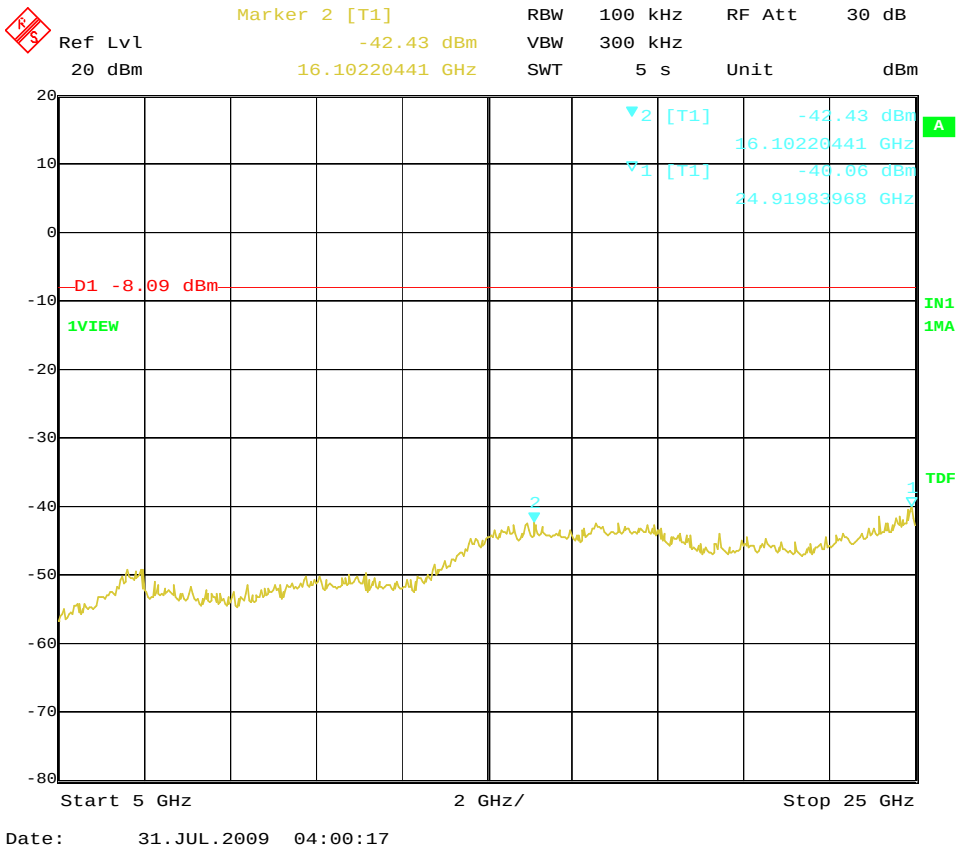
Date: 31.JUL.2009 03:06:51


Marker 2 [T1]
Ref Lvl
20 dBm
-41.96 dBm
17.58517034 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 s
RF Att 30 dB
Unit dBm
2 [T1] -41.96 dBm
17.58517034 GHz
1 [T1] -39.97 dBm
24.87975952 GHz
D1 -9.62 dBm
1VIEW
A
IN1
1MA
TDF
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 5 GHz
2 GHz/
Stop 25 GHz
Date: 31.JUL.2009 03:09:43

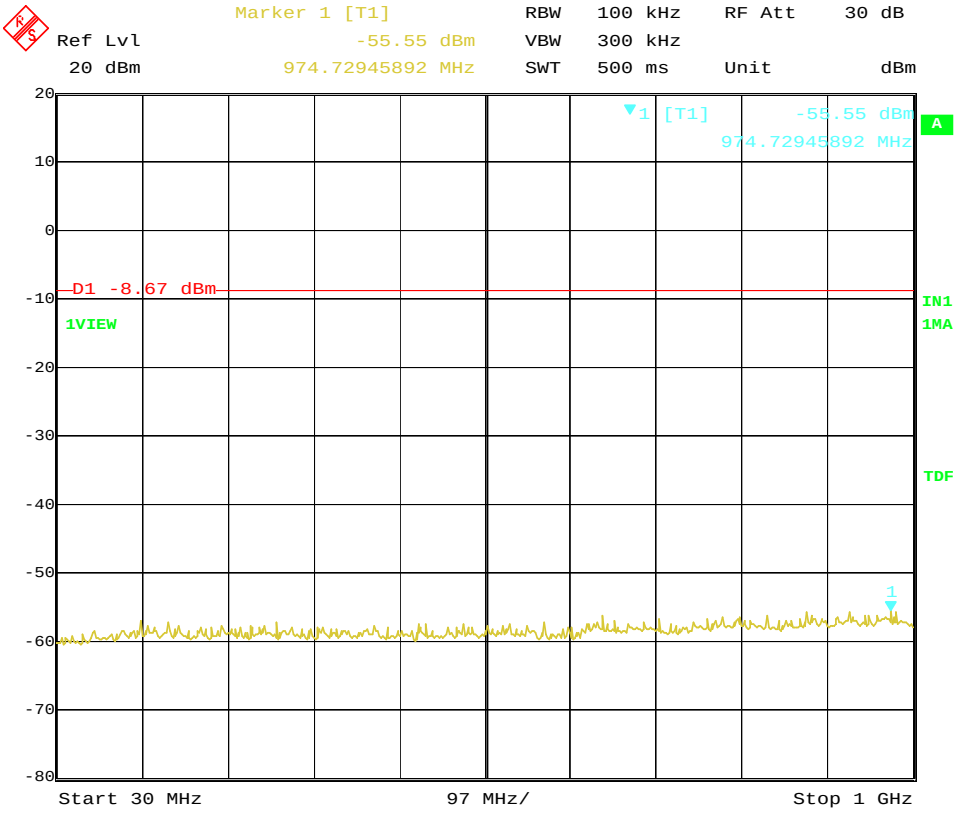
Channel MID：


Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-55.85 dBm
VBW 300 kHz
20 dBm
996.11222445 MHz
SWT 500 ms
Unit dBm
1 [T1] -58.85 dBm
996.11222445 MHz
D1 -8.09 dBm
1VIEW
A
IN1
1MA
TDF
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 31.JUL.2009 03:58:47

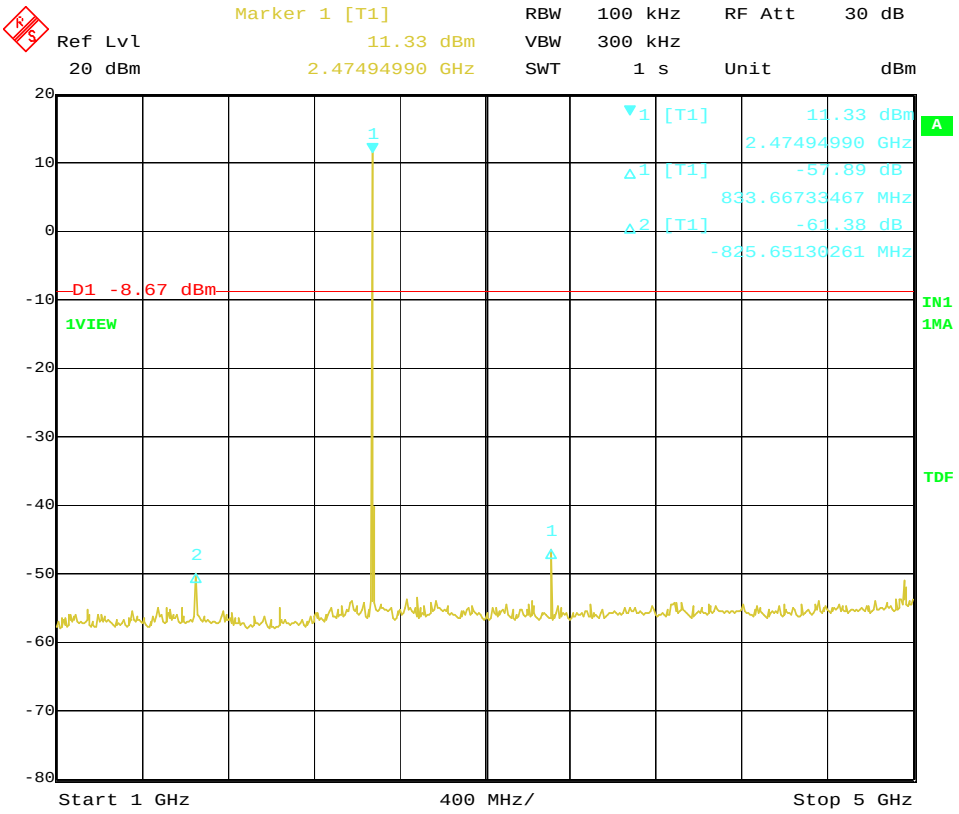

Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
11.91 dBm
VBW 300 kHz
20 dBm
2.44288577 GHz
SWT 1 s
Unit dBm
1 [T1] 11.91 dBm
2.44288577 GHz
Δ1 [T1] -58.45 dB
817.63527054 MHz
Δ2 [T1] -63.53 dB
-817.63527054 MHz
D1 -8.09 dBm
1VIEW
A
IN1
1MA
TDF
Start 1 GHz
400 MHz/
Stop 5 GHz
Date: 31.JUL.2009 03:57:02


Marker 2 [T1]
Ref Lvl
20 dBm
-42.43 dBm
16.10220441 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 s
RF Att 30 dB
Unit dBm
2 [T1] -42.43 dBm
16.10220441 GHz
1 [T1] -40.06 dBm
24.91983968 GHz
D1 -8.09 dBm
1VIEW
A
IN1
1MA
TDF
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 5 GHz
2 GHz/
Stop 25 GHz
Date: 31.JUL.2009 04:00:17

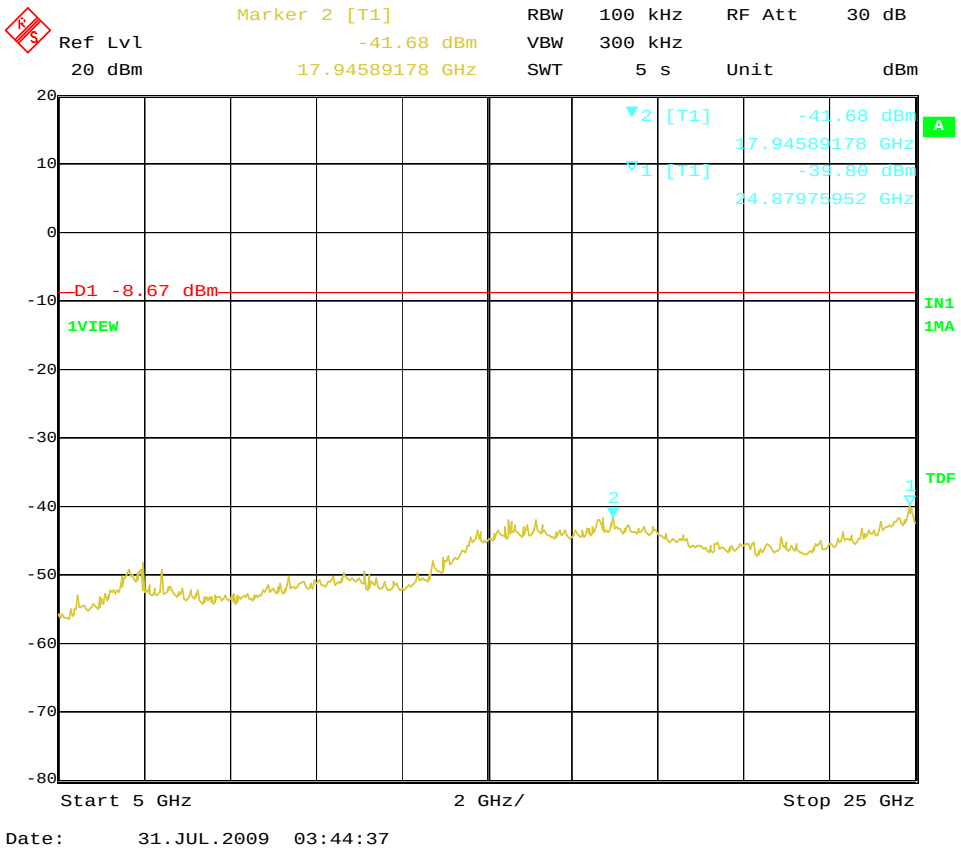
Channel HIG：



Date: 31.JUL.2009 03:42:52



Date: 31.JUL.2009 03:41:25


Marker 2 [T1]
Ref Lvl
20 dBm
-41.68 dBm
17.94589178 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 s
RF Att 30 dB
Unit dBm
2 [T1] -41.68 dBm
17.94589178 GHz
1 [T1] -39.80 dBm
24.87975952 GHz
D1 -8.67 dBm
1VIEW
A
IN1
1MA
TDF
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 5 GHz
2 GHz/
Stop 25 GHz
Date: 31.JUL.2009 03:44:37

5. FCC ID Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:(1)this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Mark Location:

5. Test Setup

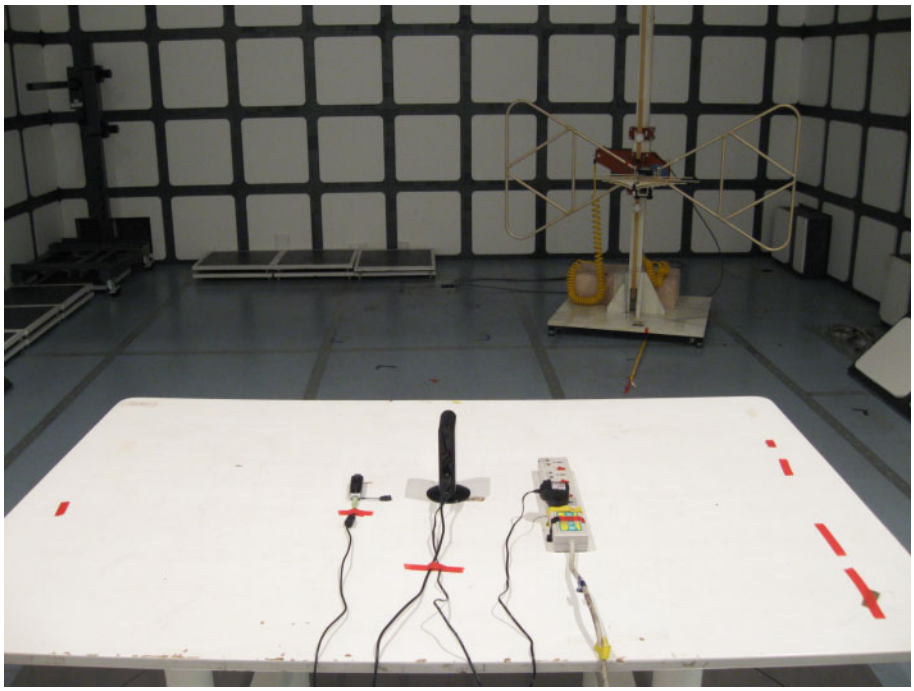
5.1 Ancillary and Accessory Equipment Used

No.	Description	Specification	Quantity
1.	MP3 Player	SONY, M/N: NWZ-B135F, S/N:7138661	1
2.	Audio Line	1.5m, with 2 cores	1

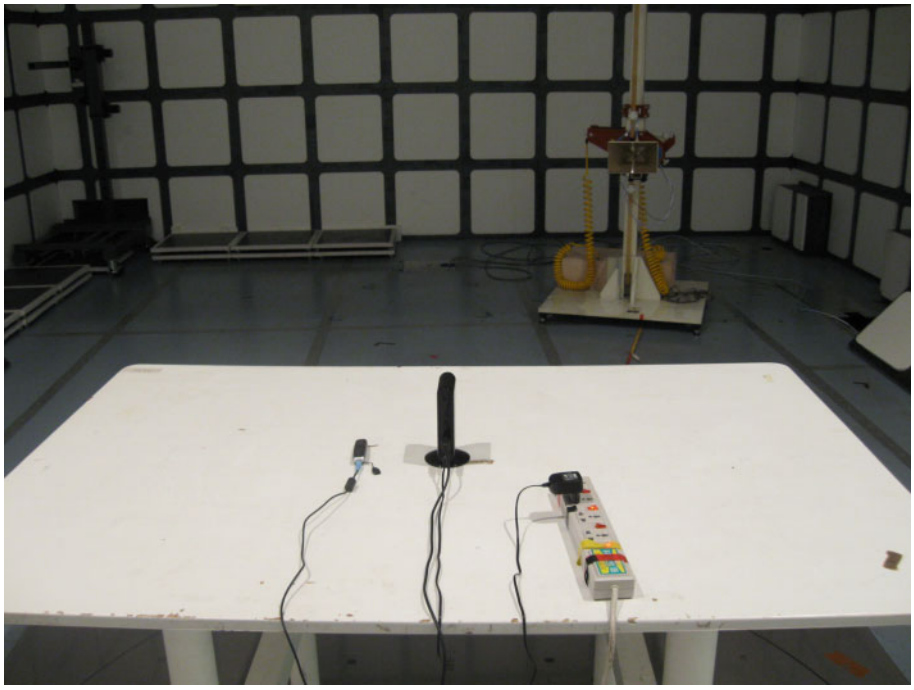
5.2 Photographs of the Test Configuration

5.2.1 Radiated emission

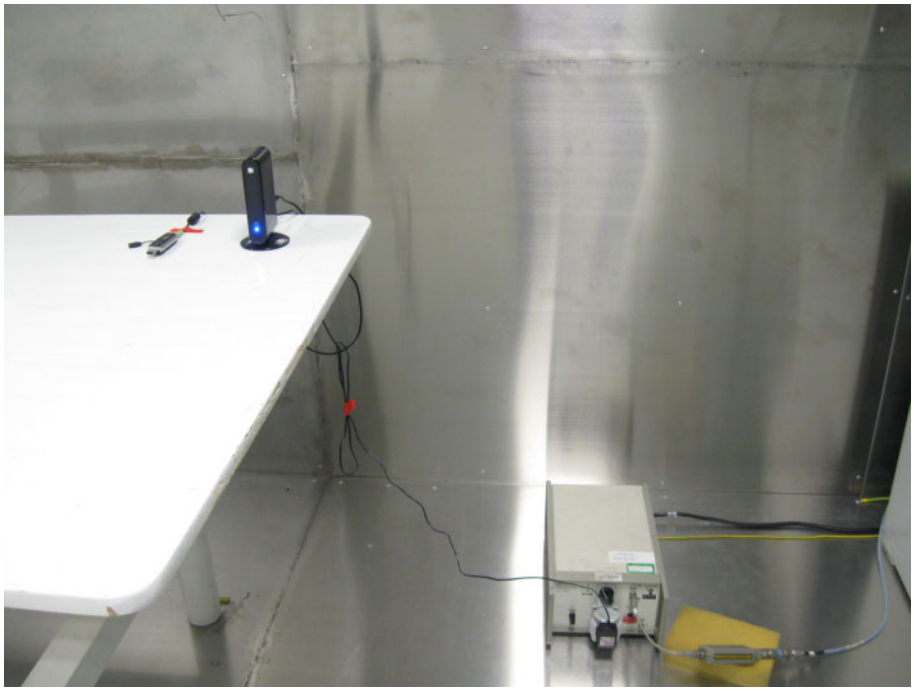
Below 1GHz:



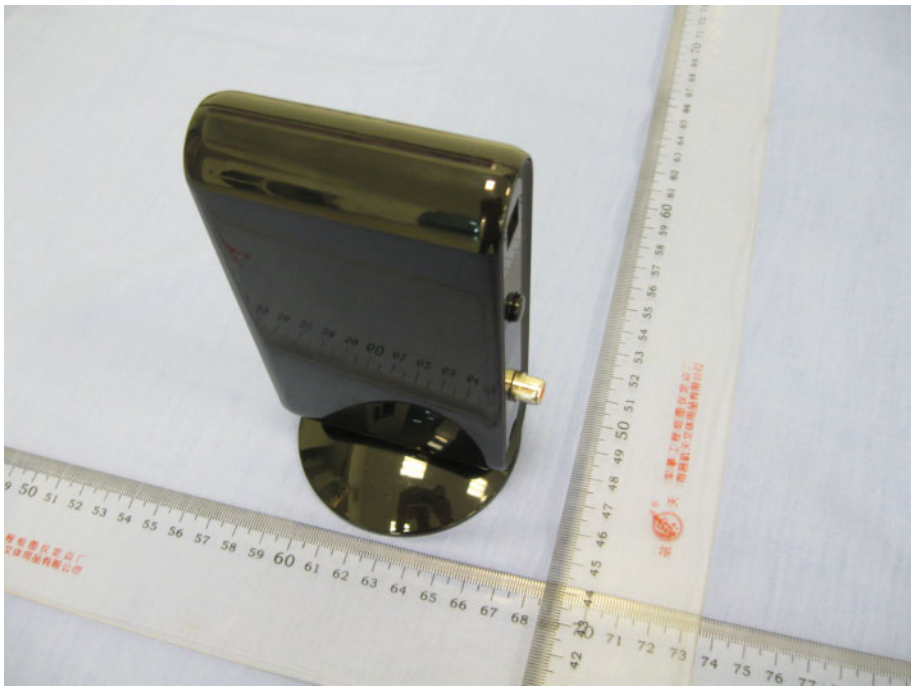
Above 1GHz:



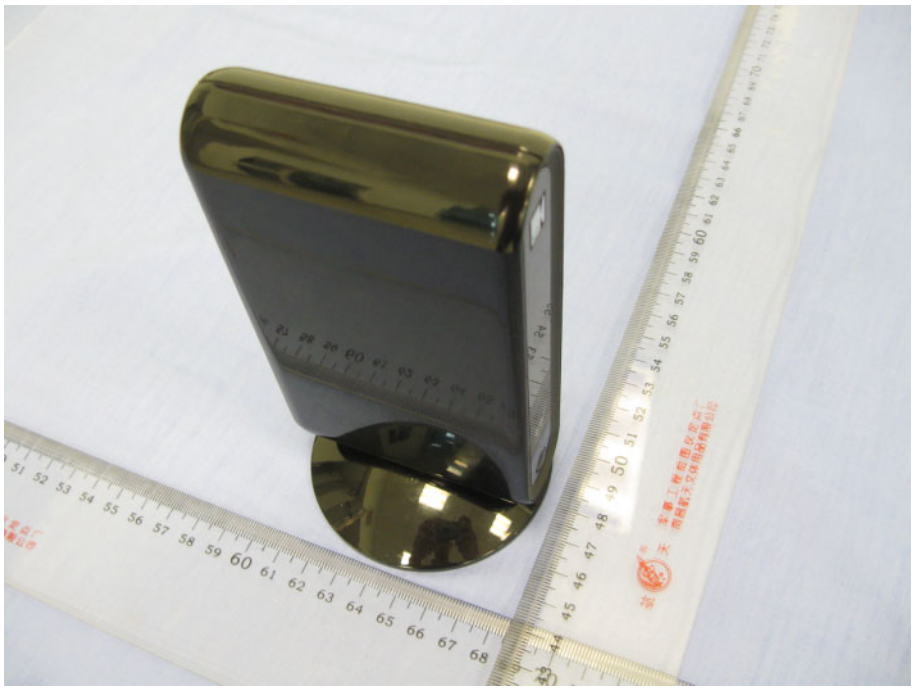
5.2.2 Conducted emission



5.3 Photographs of the EUT

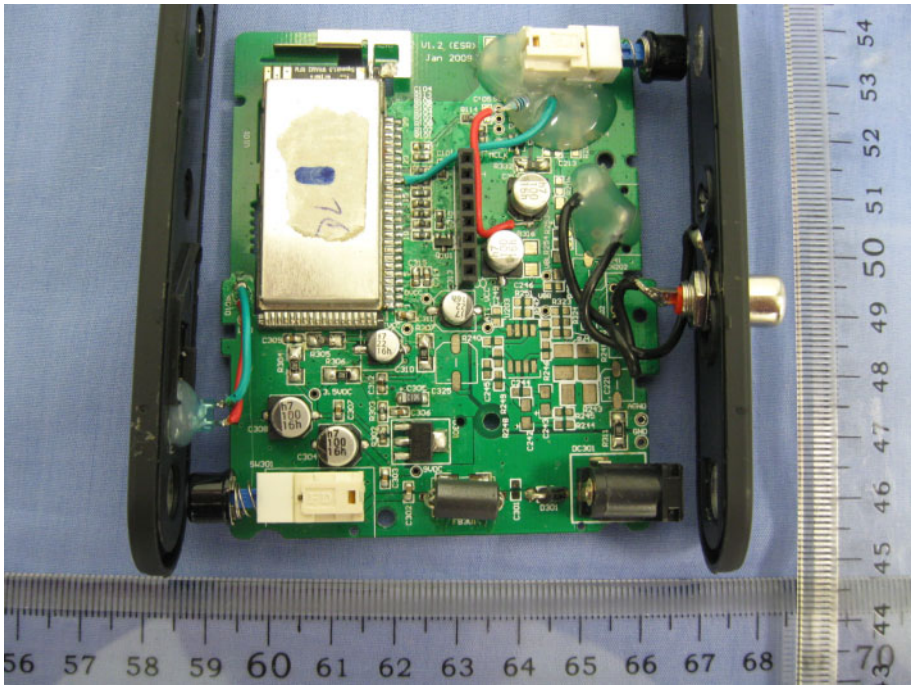


Enclosure of EUT

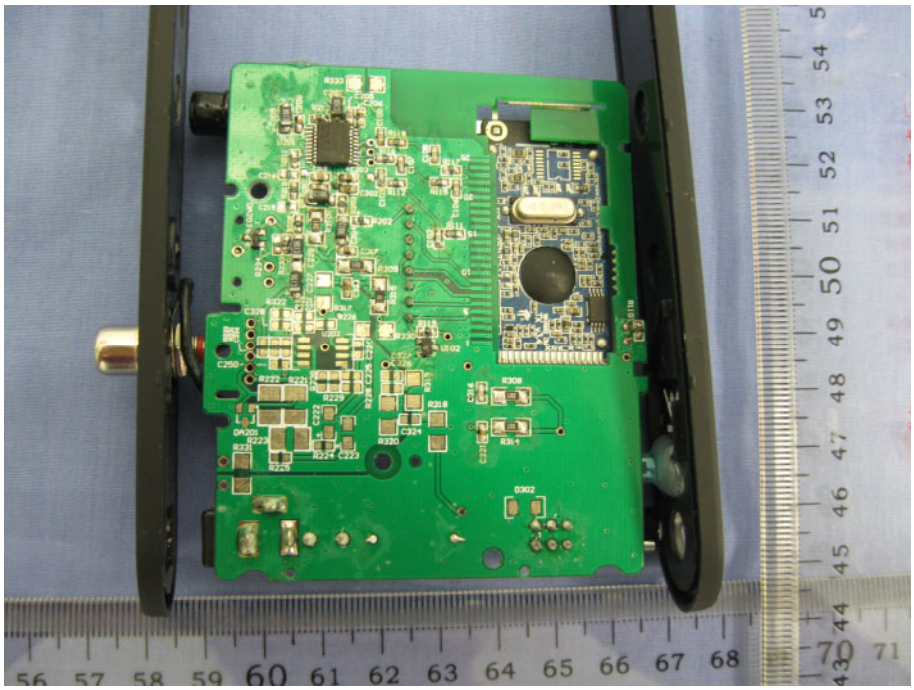


Enclosure of EUT

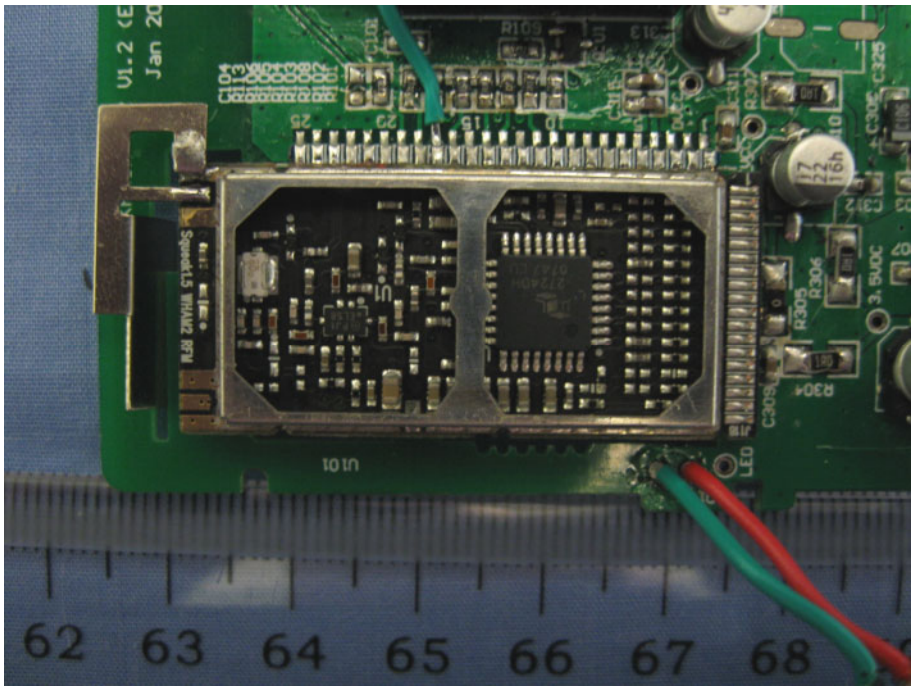
Internal of EUT



PCB of EUT



PCB of EUT



PCB of RF modular

Photo of adapter

6. Equipment List

No.	Equipment	Manufacturer	Model	Serial No.	Calibration Date
1	Precision Biconical Antenna	TDK Co.	PBA-2030	090500	2008-09-18
2	Precision Log Periodic Antenna	TDK Co.	PLP-3003	061001	2008-09-18
3	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130174	2008-09-18
4	Horn antenna	TDK	HRN-0118	130186	2008-04-07
5	Attenuator 6 dB	Agilent	8491B	MY39260147	2008-09-18
6	Preamplifier	TDK Sonoma	310	242803	2009-04-07
7	Preamplifier	ELENA	EAU-3718 GXA	A070701	2009-04-07
8	EMI Receiver	Rohde & Schwarz	ESIB26	100234	2009-04-07
9	EMI Receiver	Rohde & Schwarz	ESCS30	100350	2009-04-07
10	Spectrum Analyzer	Agilent	E4403B	MY44210199	2009-04-07
11	Art. Mains Network	EMCO	3816/2	00044921	2009-04-07
12	Transient Limiter(10 dB)	Agilent	11947A	3107A03736	2009-04-07
13	Personal Computer	HP	DX2000MT	MXD4250FZM	N/A
14	Personal Computer	HP	DX2000MT	MXD4130B2N	N/A
15	Semi-Anechoic Chamber	TDK Co.	N/A	N/A	2009-04-07
16	Shielded Room	TDK Co.	N/A	N/A	N/A

7. Test Uncertainty

Test	Range	Confidence Level	Calculated Uncertainty
Radiated emission(3m)	30-1000MHz	95%	4.3dB
Conducted emission	0.15-30MHz	95%	3.3dB

8. Appendix

8.1 Confirmation of Compliance within the Limits

8.1.1 Method of calculating measurement result

Radiated Emission

For example the point of 30.00MHz, vertical, Page 39.

	Reading	+	Antenna factor	+	Cable loss	-	Gain	=	Result
Example	48.9	+	12.5	+	6.7	-	31.7	=	36.4

Conducted Emission

For example the point of 2.248MHz, L1, Page 9.

	Reading	+	C. FACTOR	=	Result
Example	33.2	+	9.6	=	42.8

8.2 Compliance Statements

Subclause 15.247 (a) – Equal Hopping Frequency Use
Requirement: Each of the transmitter's hopping channels is used equally on average.
The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

Subclause 15.247 (a) – Receiver Input Bandwidth
Requirement: The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal.
The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing.

Subclause 15.247 (a) – Receiver Hopping Capability
Requirement: The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals.
The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

Subclause 15.247 (a) – Hopping Sequence
Requirement: The hopping sequence is generated and provided with an example.
This product firmware operates by selecting a palette (or group) of random channels out of the total 20. Any channels with poor transmission rates are replaced with better channels from the remaining unused channels. The switching pattern from channel to channel is a random pattern. In addition, each customer is assigned a "License ID" number. Upon accepting the Software License Agreement, each customer agrees to incorporate their license ID number into their Tx and Rx firmware versions. Once the ID is imbedded in the firmware, then only Rx products with the customer's specific license ID can receive and decode the digitized audio.