FCC Test Report
(TR-1302-006-06)

Applicant	:	GP Electronics (HK) Ltd.
Address	:	6/F Gold Peak Building, 30 Kwai Wing Road, Kwai Chung, N.T., Hong Kong
Manufacturer	:	GP Electronics (Huizhou) Co. Ltd.
Address	:	No.76, Hui Feng Si Road, Zhong Kai Hi-Tech Industrial Development Zone, Huizhou, Guangdong, P.R.China 516006
Product Name	:	GPE Subwoofer Transmitter Module
Trademark	:	KEF
Model(s)	:	GPE Sub TX
Standard(s)	:	FCC Part 15 Subpart C
Test Result	:	Pass
Date of Test	:	Jul 03, 2013 to Aug 02, 2013
Report issued Dated	:	Aug 29, 2013

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	:	2013.08.29	Technical manager / Date	:	2013.08.29

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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 (November 2011)	:	Reg. No. R-4814, C-3733, G-473, T-1212
FCC site registration (August, 2011)	:	Reg. No. 732901
IC registration (January,2011)	:	Reg. No. 7993A
CNAS(August, 2010)	:	Reg. No. L4677

1.3 Test Scope

EMC and RF 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., Hong Kong
Phone no.	:	NIL
Fax no.	:	NIL

2.2 Identification of EUT

Trademark	:	KEF
Model(s)	:	GPE Sub TX
Serial No.	:	None

2.3 Spec of EUT

Description of Antenna	:	fixed, built-in antenna, 1.3dBi
Power Supply	:	DC 5V 150mA
Operation Frequency	:	2404 MHz ~ 2476 MHz
Number of Channels	:	18
Spread Spectrum	:	FHSS
Type of Modulation	:	shaped-8FSK

2.4 Test Standards List

FCC Part 15 (2012)
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.

FCC PUBLIC NOTICE DA 00-705
Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

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	N/A
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

3.3 Test mode

The EUT has been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode is programmed.

Channel 1(2406MHz), Channel 9(2438MHz), Channel 18(2474MHz) are chosen for the final testing.

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 jack 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

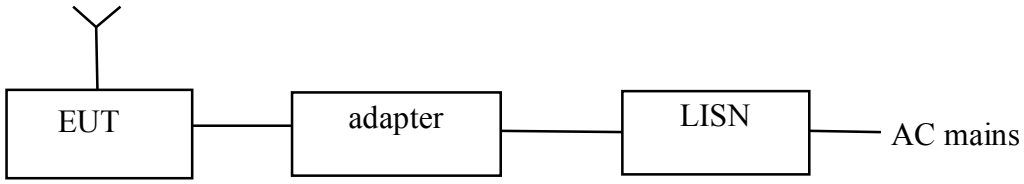
The antenna connector is designed with permanent attachment and no consideration of replacement.
Transmitter antennas of directional gain is 1.3dBi.

4.2 Conducted Emission (mains)

4.2.1 Test Summary

Test Room	:	Shielded Room
Power Source	:	AC 120V / 60Hz
Standards:	:	FCC Part15 B : 2012
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

N/A

4.3 Hopping Channel Bandwidth

4.3.1 Applicable Standard

Section 15.247(a)(1): 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(20.96dBm).

4.3.2 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.

4.3.3 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.

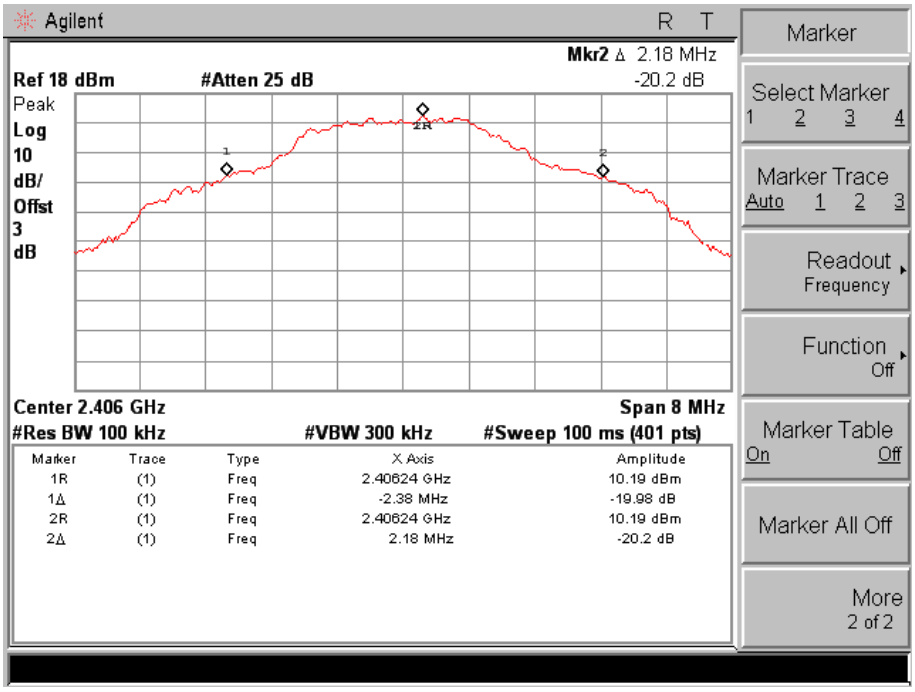
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

4.3.4. Result

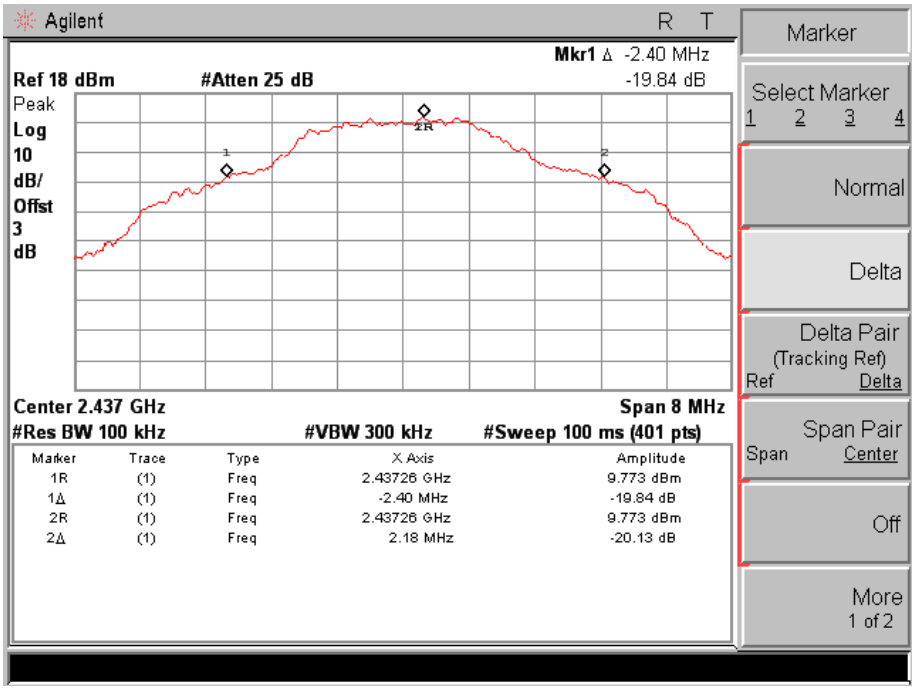
Temperature (℃) : 22~23	EUT: GPE Subwoofer Transmitter Module
Humidity (%RH): 50~54	M/N: GPE Sub TX
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Aug 02, 2012	Test engineer: Phenix

Channel No.	Frequency (MHz)	20dB Bandwidth (MHz)	Min. Limit (kHz)
LOW	2406	4.56	>25
MID	2438	4.58	>25
HIG	2474	4.54	>25

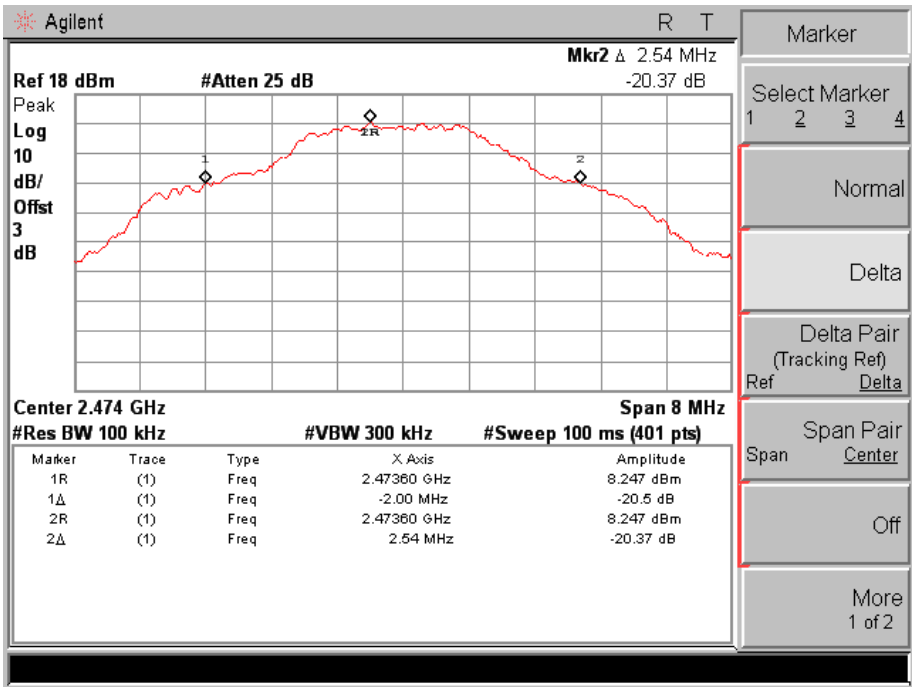
Channel LOW：



Channel MID：



Channel HIG：



4.4 Hopping Channel Separation

4.4.1 Applicable Standard

Section 15.247(a)(1): 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(20.96dBm).

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

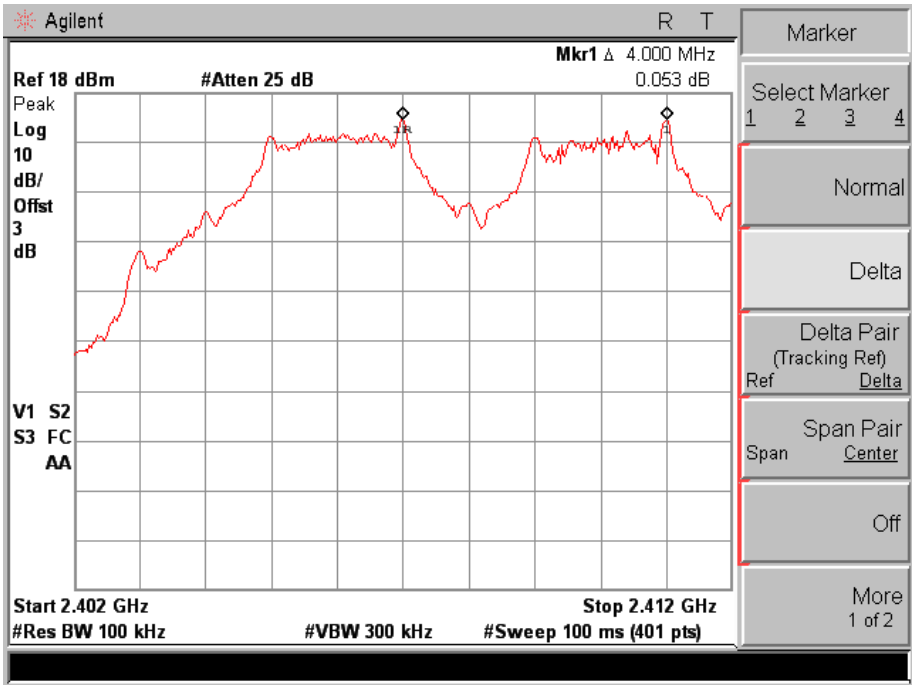
PASS

Temperature (℃) : 22~23	EUT: GPE Subwoofer Transmitter Module
Humidity (%RH): 50~54	M/N: GPE Sub TX
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Aug 02, 2012	Test engineer: Phenix

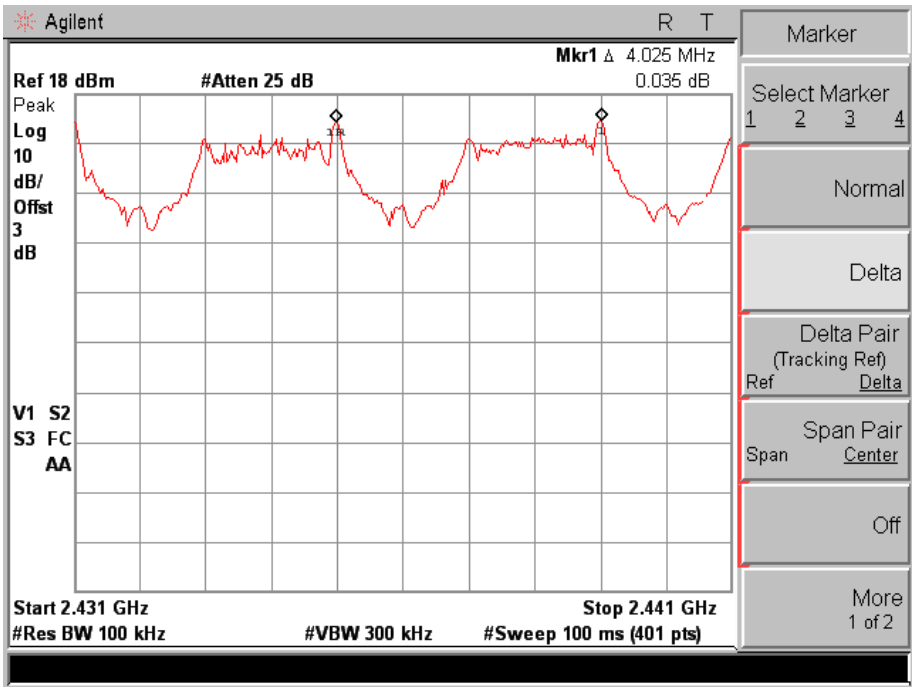
Channel No.	Frequency (MHz)	Channel Separation (MHz)	20dB Bandwidth (MHz)
LOW(channel 1)	2406	4.0	4.56
MID(channel 9)	2438	4.025	4.58
HIG(channel 18)	2474	4.0	4.54

Conclusion: 2/3rd of the largest 20dB Bandwidth = 2/3 x 4.58 MHz = 3.053 MHz(see section 4.3), which is less than the carrier channel separation of 4.025 MHz. In addition, the output power is less than 125 mW. See section 4.7 for the measurement of output power.

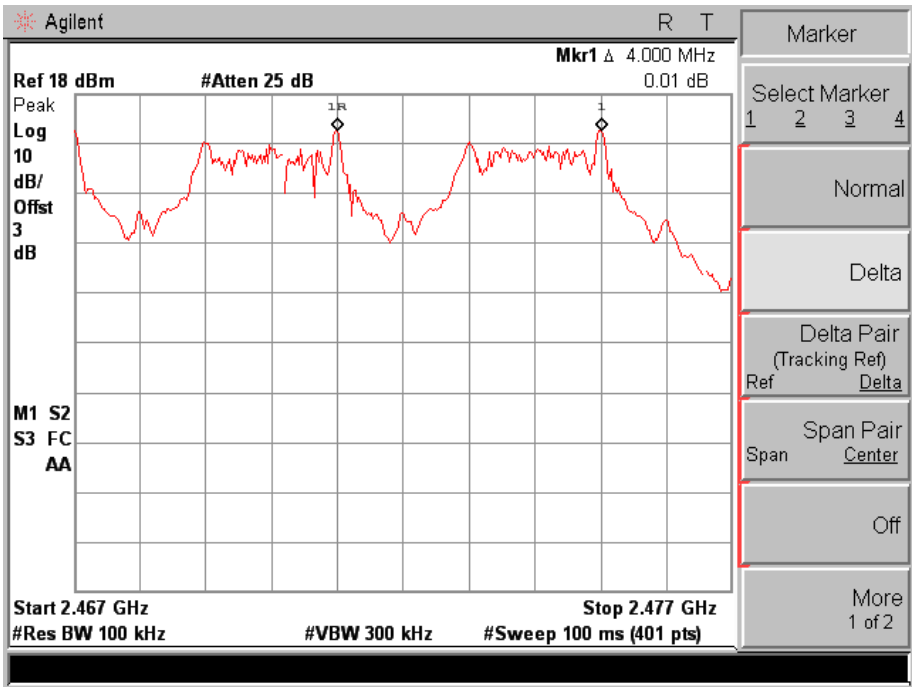
Channel Low：



Channel MID：



Channel HIG：



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

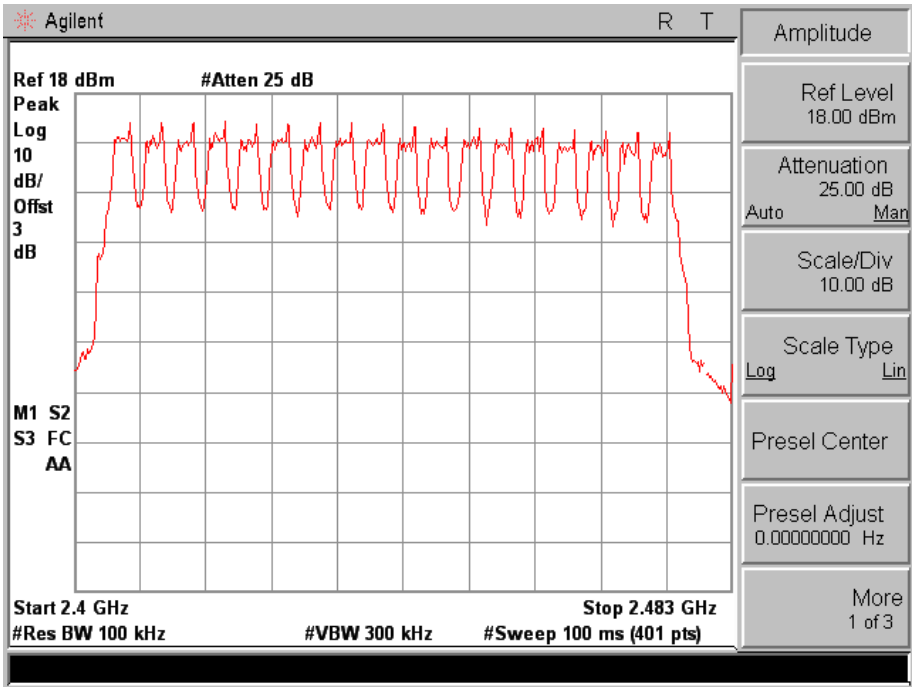
1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. Observe frequency hopping in 2400MHz~2483.5MHz, there are 18 non-overlapping channels.

4.5.4. Result

Temperature (℃) : 22~23	EUT: GPE Subwoofer Transmitter Module
Humidity (%RH): 50~54	M/N: GPE Sub TX
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Aug 02, 2012	Test engineer: Phenix

Frequency (MHz)	Number of Hopping Channel	Min. Limit (Channels)
2400~2483	18	>15

Test Plot:



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: GPE Subwoofer Transmitter Module
Humidity (%RH): 50~54	M/N: GPE Sub TX
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Aug 02, 2012	Test engineer: Phenix

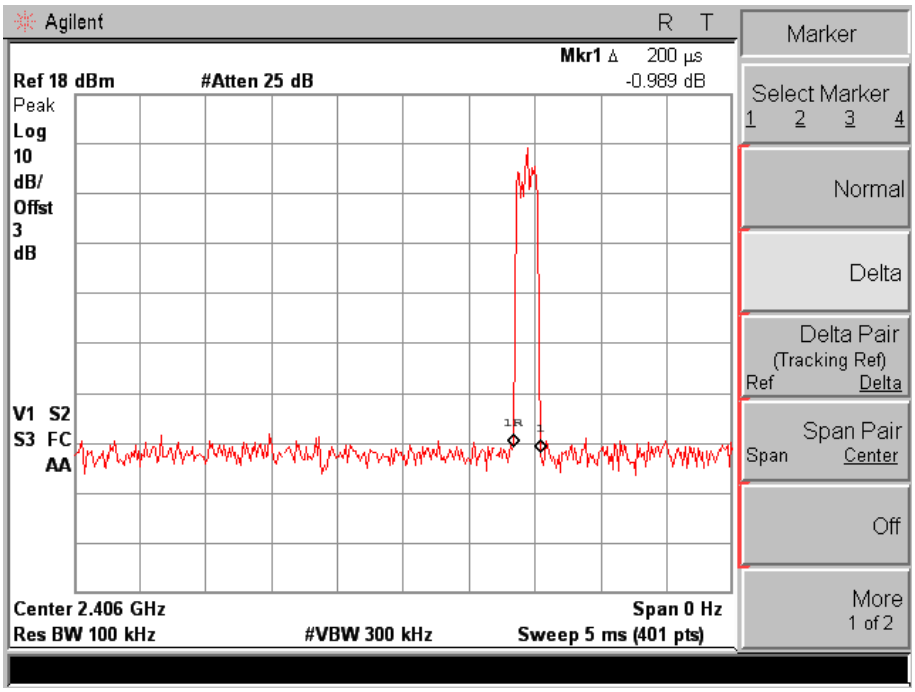
Calculate:
The Dwell Time = (time of Pulse / Pulse Cycle) x 0.4(second) x 18(channels)

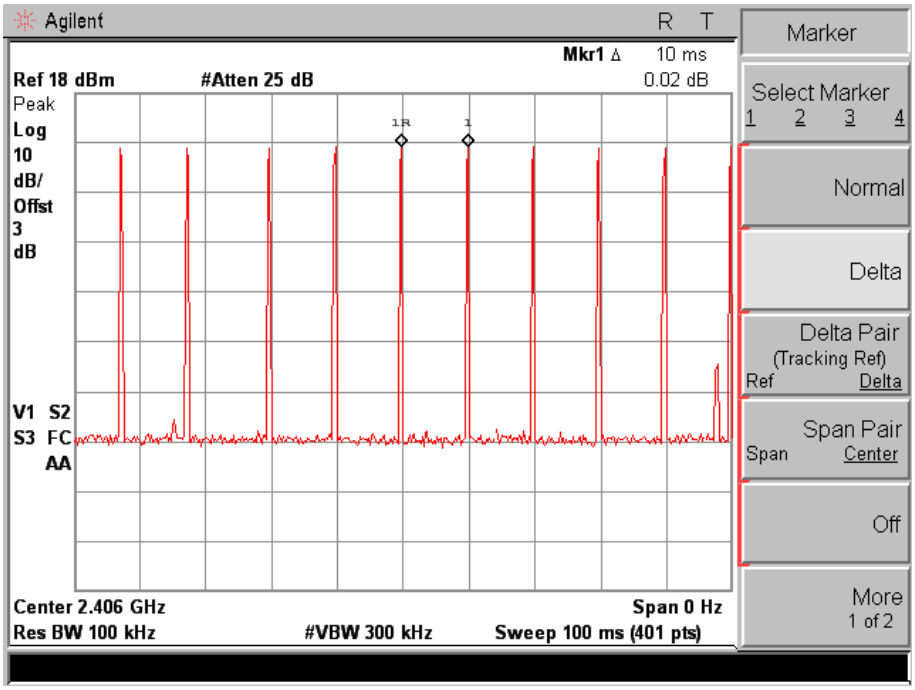
Channel	Time of Pulse (ms)	Pulse Cycle (ms)	Dwell Time (ms)	Limit (ms)	Result
LOW	0.2	10	144	400	Pass
MID	0.2	10	144	400	Pass
HIG	0.2	10	144	400	Pass

The maximum time of occupancy for a particular channel is 144 ms, which is less than the 400 ms allowed by the rules; therefore, it meets the requirements of this section.

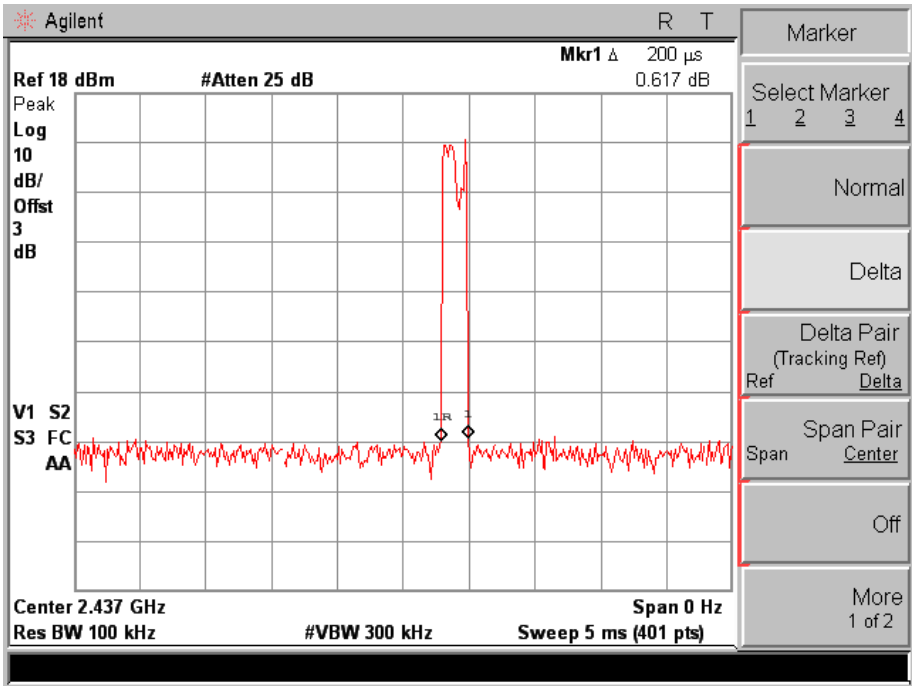
Test Plot:

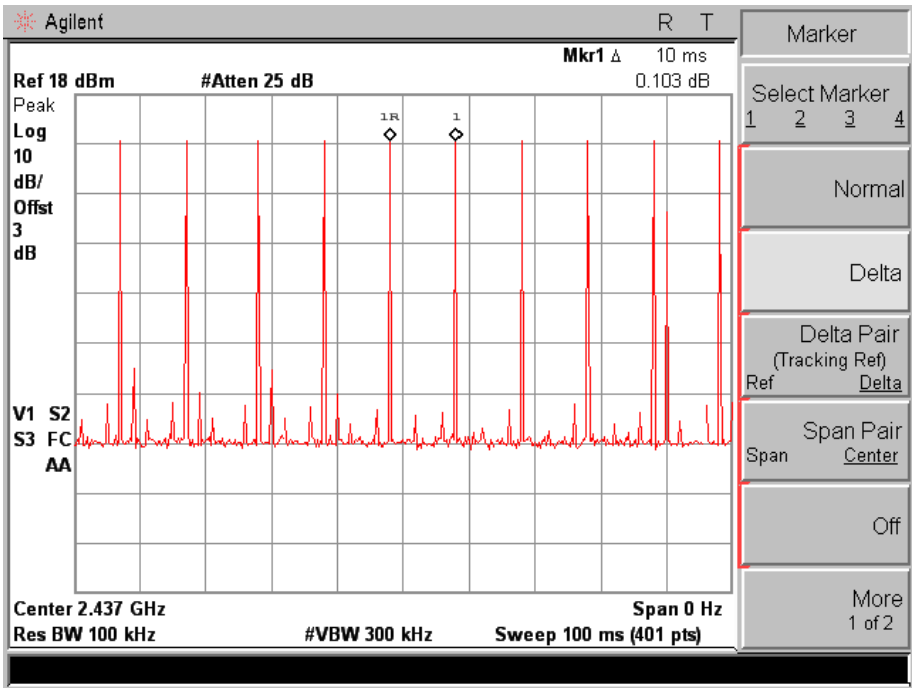
Channel LOW：



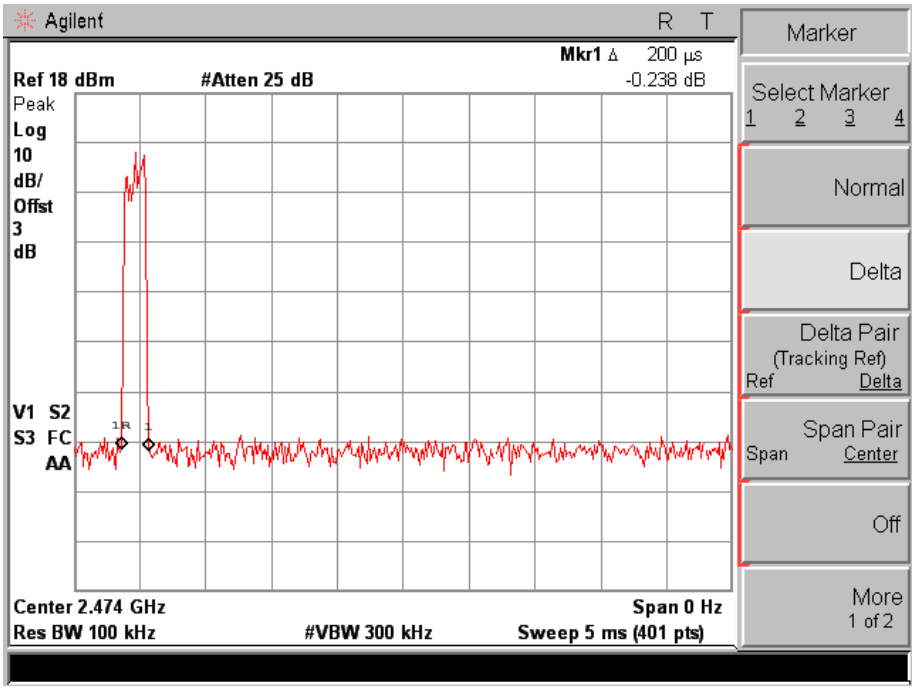


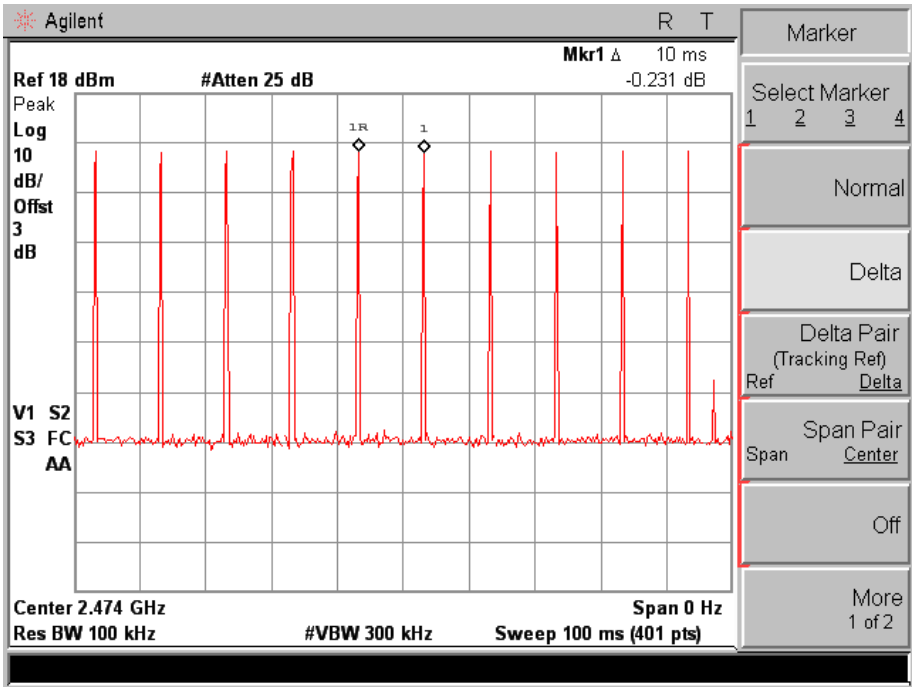
Channel MID：


Agilent
R T
Mkr1 Δ 200 µs
0.617 dB
Ref 18 dBm
#Atten 25 dB
Peak
Log
10
dB/
Offst
3
dB
V1 S2
S3 FC
AA
Center 2.437 GHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 5 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
R T
Mkr1 Δ 10 ms
0.103 dB
Ref 18 dBm
#Atten 25 dB
Peak
Log
10
dB/
Offst
3
dB
V1 S2
S3 FC
AA
Center 2.437 GHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 100 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

Channel HIG：


Agilent
R T
Mkr1 Δ 200 µs
-0.238 dB
Ref 18 dBm
#Atten 25 dB
Peak
Log
10
dB/
Offst
3
dB
V1 S2
S3 FC
AA
Center 2.474 GHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 5 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
R T
Mkr1 Δ 10 ms
-0.231 dB
Ref 18 dBm
#Atten 25 dB
Peak
Log
10
dB/
Offst
3
dB
V1 S2
S3 FC
AA
Center 2.474 GHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 100 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

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

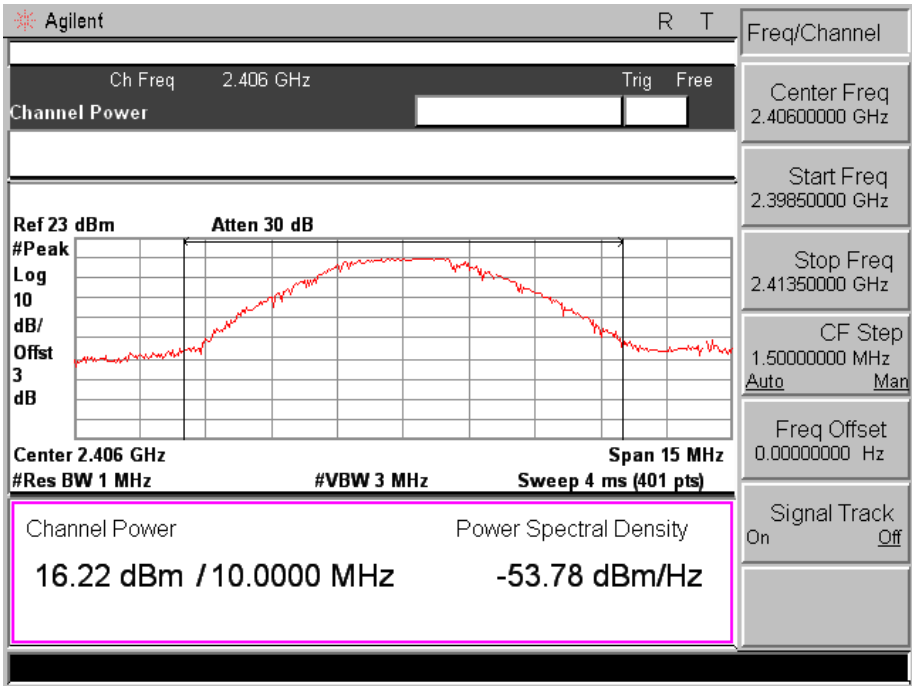
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in above figure without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument 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: GPE Subwoofer Transmitter Module
Humidity (%RH): 50~54	M/N: GPE Sub TX
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Aug 02, 2012	Test engineer: Phenix

Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
LOW	2406	16.22	20.96
MID	2438	16.16	20.96
HIG	2474	14.76	20.96

Channel LOW：



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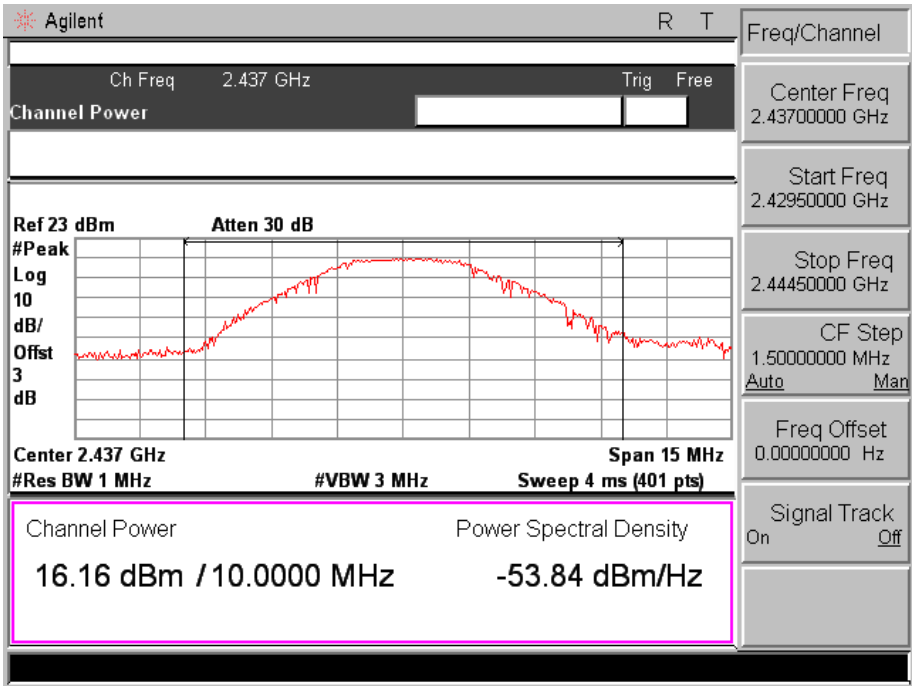
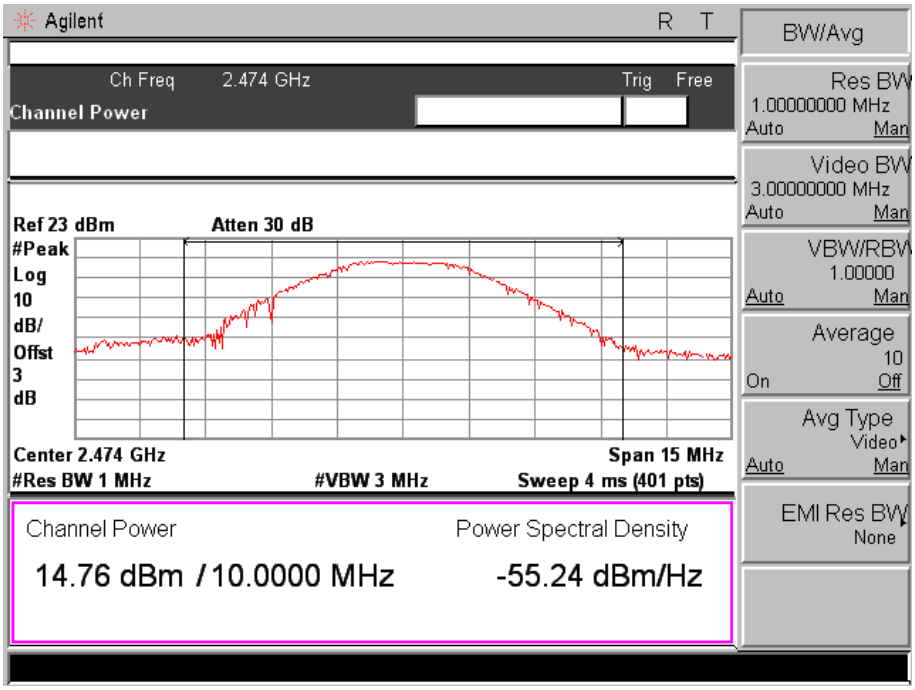


Channel HIG：



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.

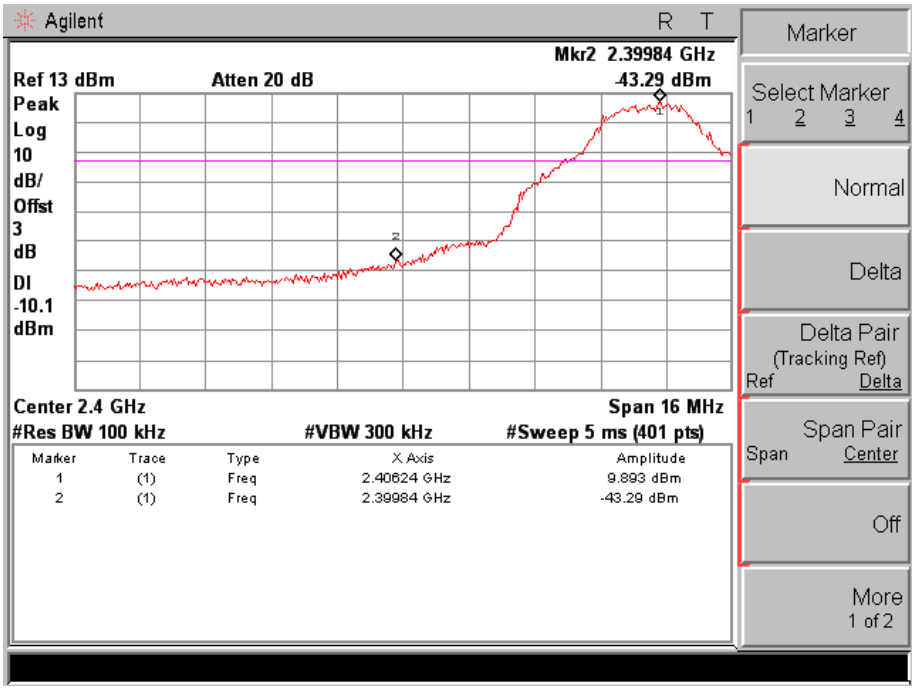
4.8.4. Result

Temperature (℃) : 22~23	EUT: GPE Subwoofer Transmitter Module
Humidity (%RH): 50~54	M/N: GPE Sub TX
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode
Test data: Aug 02, 2012	Test engineer: Phenix

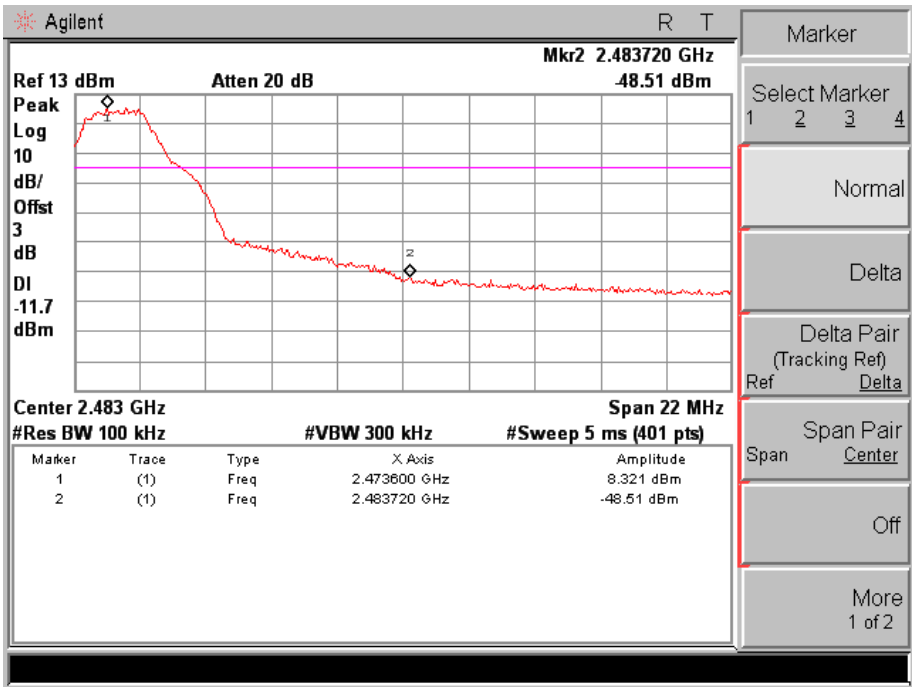
Conducted:

Frequency (MHz)	Read Delta (dB)	Limits (dB)	Margin (dB)
2400	53.18	-20	33.18
2483.5	56.83	-20	36.83

Channel LOW：



Channel HIG：



Radiated:

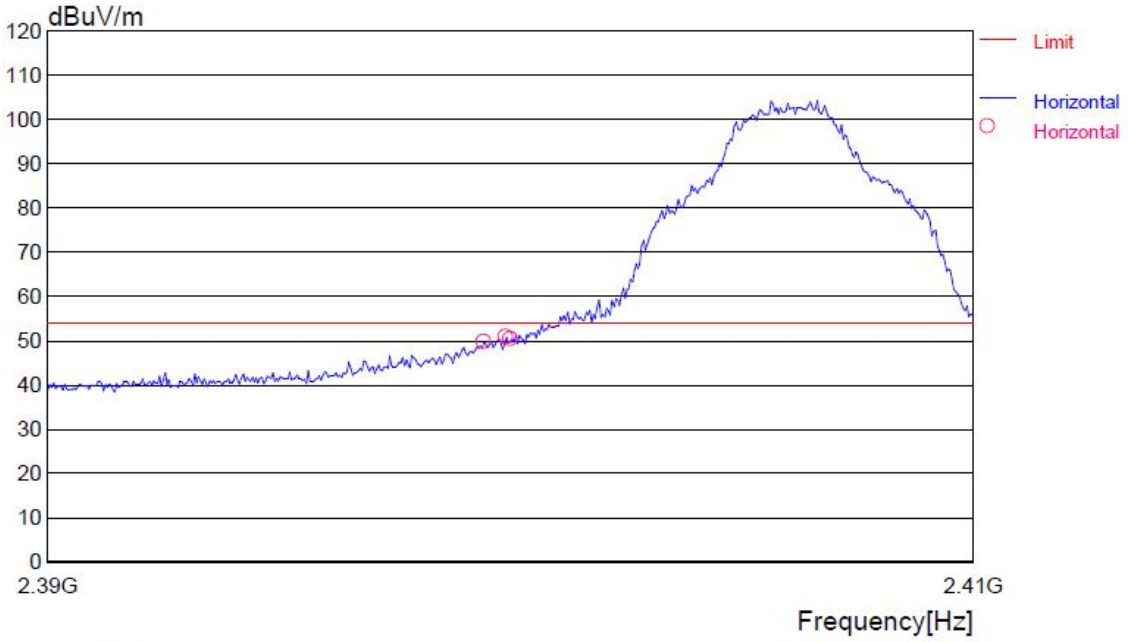
CH LOW:

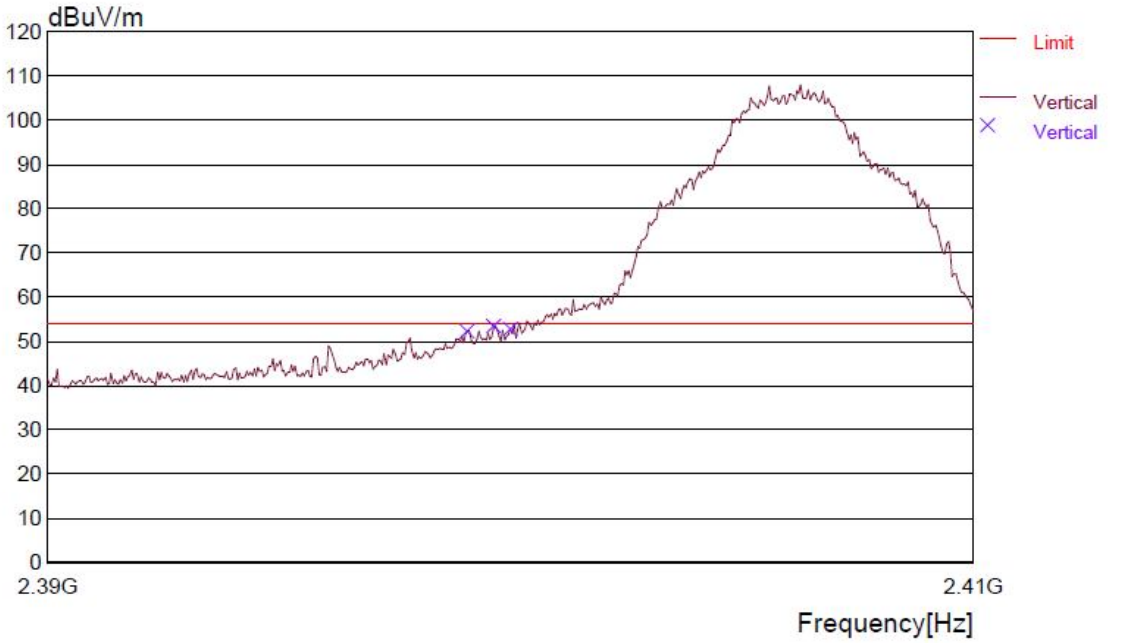
RADIATED EMISSION

Date : 2013/07/04 09:56:28

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-L	Operator	:	pang
Memo	:	X-Y plane			

LIMIT : FCC Part15 C transmitter spurious above1G(average)





RADIATED EMISSION

Date : 2013/07/04 09:56:28

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-L	Operator	:	pang

Memo : X-Y plane

LIMIT : FCC Part15 C transmitter spurious above1G(average)

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2399.049	54.9	HRN	PK	31.4	-34.0	52.3	3	1.00	Vert.	54.0	1.7
2399.409	52.5	HRN	PK	31.4	-34.0	49.9	22	2.00	Hori.	54.0	4.1
2399.649	56.0	HRN	PK	31.4	-34.0	53.4	22	1.00	Vert.	54.0	0.6
2399.890	53.3	HRN	PK	31.4	-34.0	50.7	62	2.00	Hori.	54.0	3.3
2399.970	55.4	HRN	PK	31.4	-34.0	52.8	29	1.00	Vert.	54.0	1.2
2400.010	53.0	HRN	PK	31.4	-34.0	50.4	54	2.00	Hori.	54.0	3.6

Note:
The X-Y plane has been chose for the final test. Because it's the worst case of the three axes(X-Y plane, X-Z plane and Y-Z plane) in pre-test.

CH HIG:

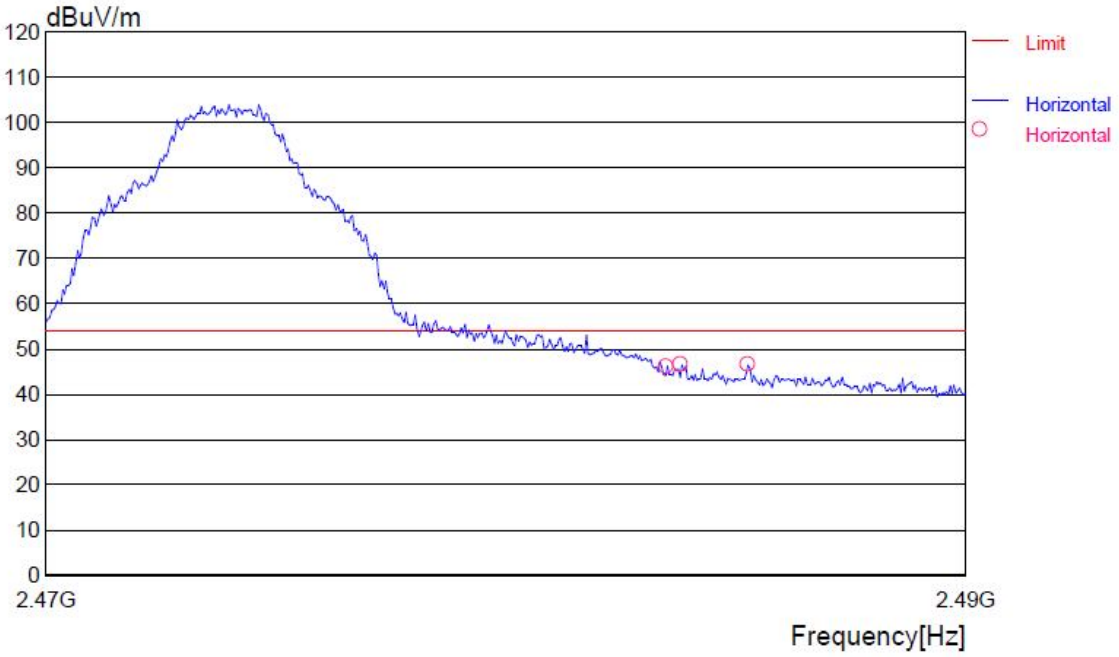
RADIATED EMISSION

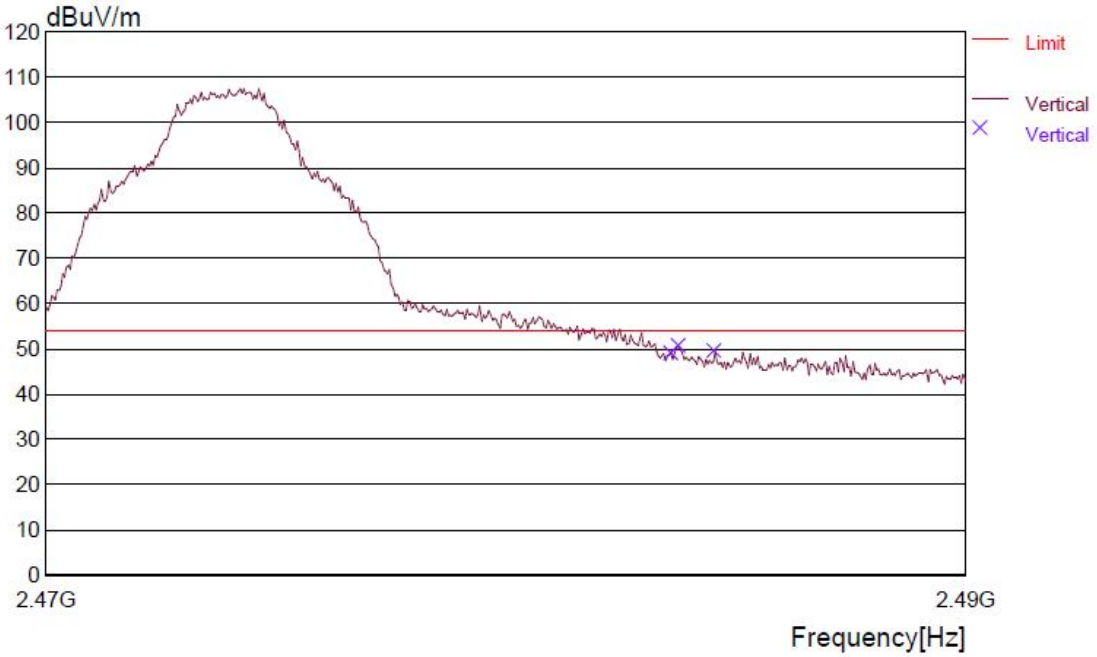
Date : 2013/07/04 09:49:56

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-H	Operator	:	pang

Memo : Y-Z plane

LIMIT : FCC Part15 C transmitter spurious above1G(average)





RADIATED EMISSION

Date : 2013/07/04 09:49:56

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-H	Operator	:	pang

Memo : Y-Z plane

LIMIT : FCC Part15 C transmitter spurious above1G(average)

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2483.493	48.8	HRN	PK	31.2	-33.8	46.2	33	2.00	Hori.	54.0	7.8
2483.573	51.4	HRN	PK	31.2	-33.8	48.8	175	1.00	Vert.	54.0	5.2
2483.733	53.1	HRN	PK	31.2	-33.8	50.5	10	2.00	Vert.	54.0	3.5
2483.813	49.0	HRN	PK	31.2	-33.8	46.4	26	2.00	Hori.	54.0	7.6
2484.534	52.1	HRN	PK	31.2	-33.8	49.5	175	1.00	Vert.	54.0	4.5
2485.255	49.0	HRN	PK	31.2	-33.8	46.4	33	2.00	Hori.	54.0	7.6

Note:
The Y-Z plane has been chose for the final test. Because it's the worst case of the three axes(X-Y plane, X-Z plane and Y-Z plane) in pre-test.

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:

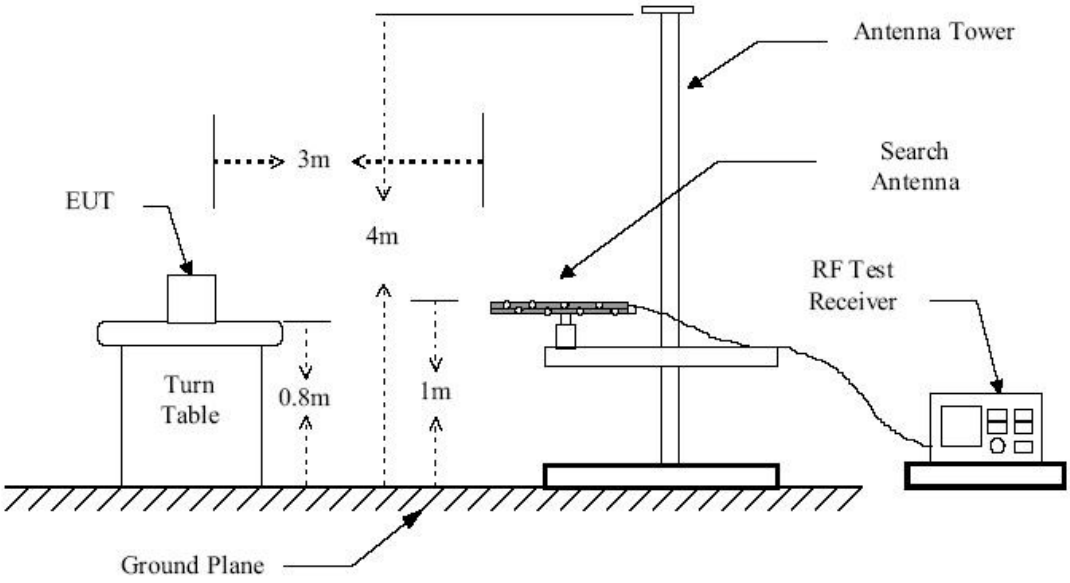


Figure 1 : Frequencies measured below 1 GHz configuration

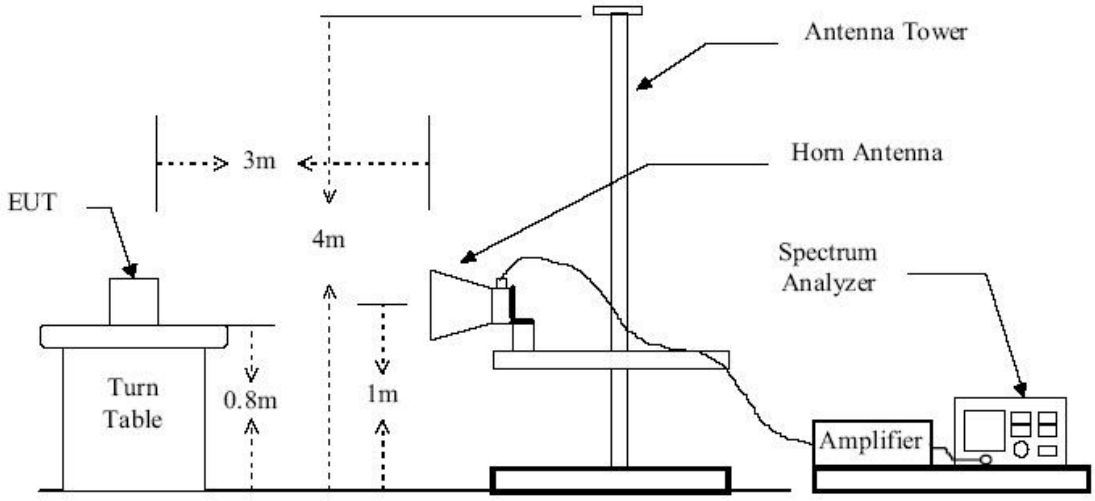


Figure 2 : Frequencies measured above 1 GHz configuration

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 (2003).
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 30MHz:

No further spurious emissions has been found between 9kHz and 30 MHz.

30M- 1GHz:

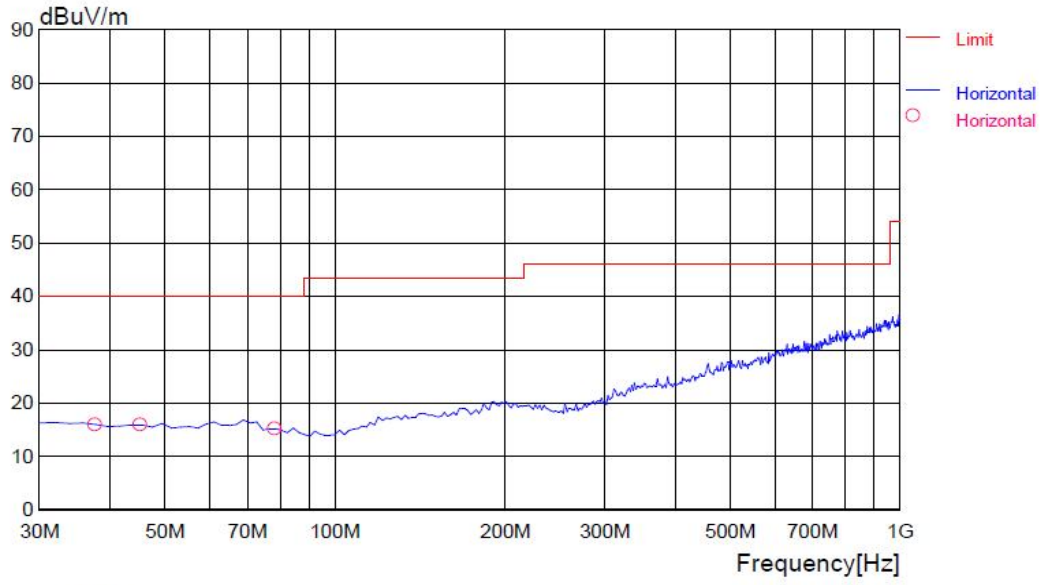
RADIATED EMISSION

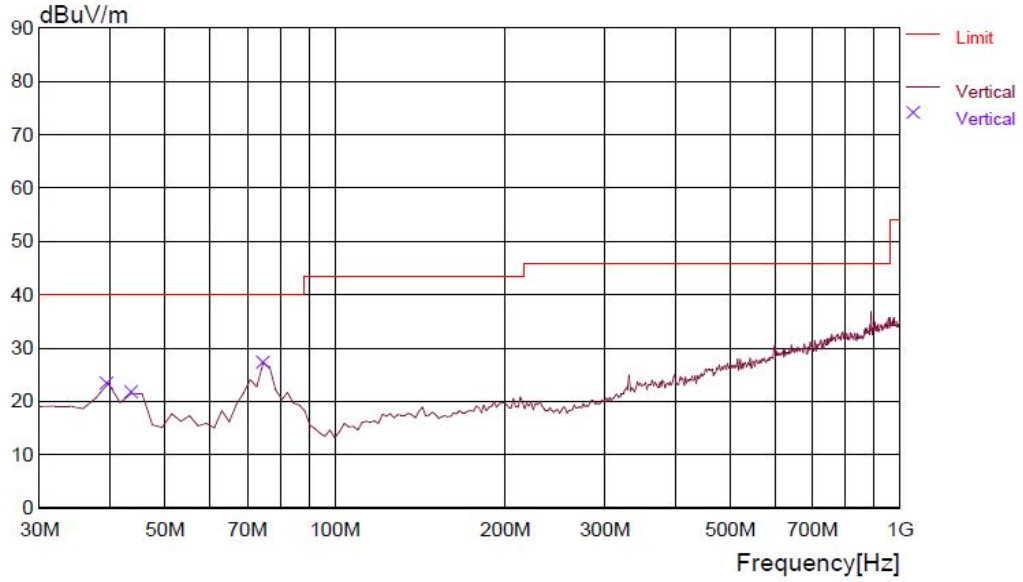
Date : 2013/07/05 16:38:36

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	TX MODE	Operator	:	pang

Memo :

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





RADIATED EMISSION

Date : 2013/07/05 16:38:36

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	TX MODE	Operator	:	pang

Memo :

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

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]	COMMENT
----- Horizontal ------											
1	37.776	29.4	11.3	6.9	31.6	16.0	40	24.0	200	145	
2	45.551	29.5	11.1	6.9	31.6	15.9	40	24.1	100	71	
3	78.597	30.2	9.4	7.2	31.6	15.2	40	24.8	200	219	
----- Vertical ------											
4	39.719	36.8	11.3	6.9	31.6	23.4	40	16.6	200	200	
5	43.607	35.0	11.2	6.9	31.6	21.5	40	18.5	200	171	
6	74.709	41.8	9.8	7.2	31.6	27.2	40	12.8	200	162	

Above 1GHz:

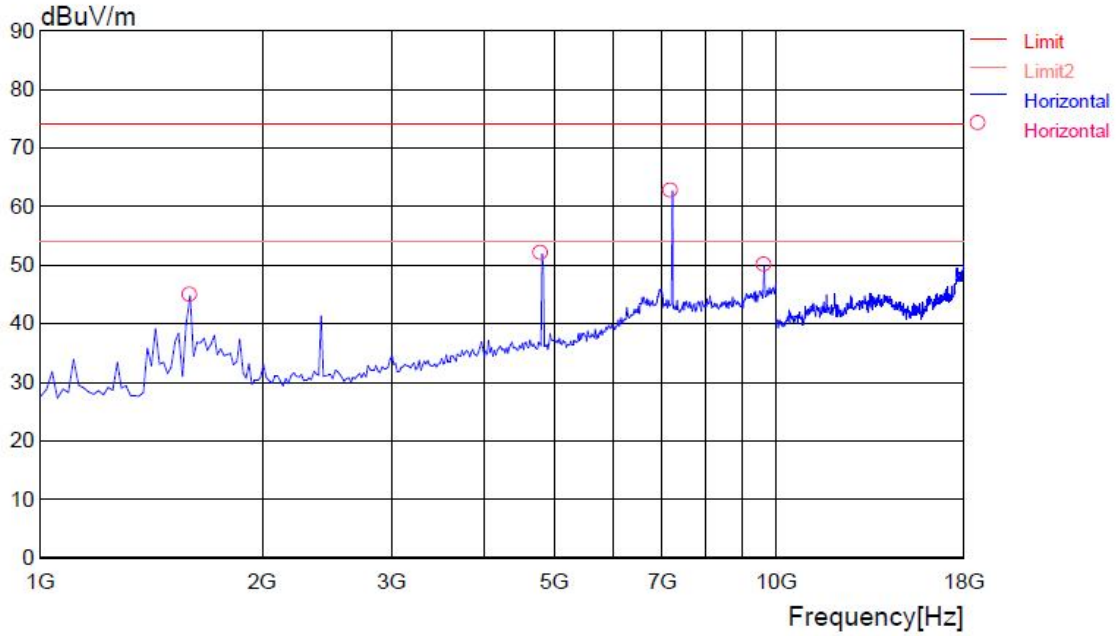
CH LOW(X-Y plane):

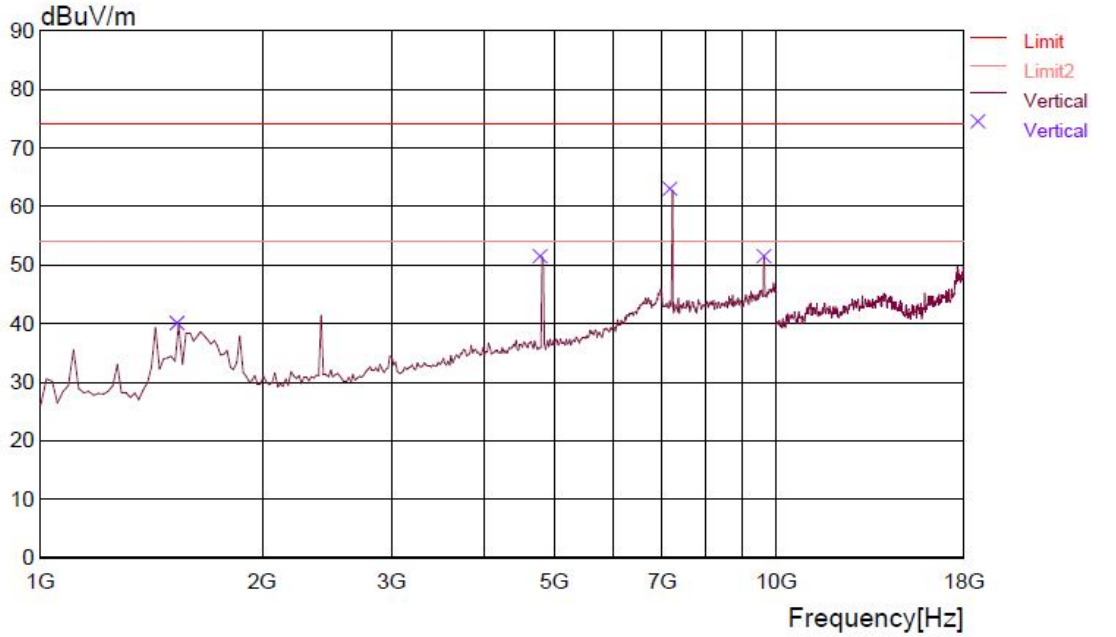
RADIATED EMISSION

Date : 2013/07/03 15:51:20

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-L	Operator	:	pang
Memo	:	X-Y plane			

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/03 15:51:20

Trade Name	:		Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-L	Operator	:	pang

Memo : X-Y plane

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

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
1541.084	46.4	HRN	PK	29.0	-35.7	39.7	284	1.00	Vert.	74.0	34.3
1595.192	51.4	HRN	PK	29.0	-35.7	44.7	105	1.00	Hori.	74.0	29.3
4805.624	46.3	HRN	PK	36.4	-31.3	51.4	228	2.00	Vert.	74.0	22.6
4805.624	46.7	HRN	PK	36.4	-31.3	51.8	26	2.00	Hori.	74.0	22.2
7222.465	50.5	HRN	PK	41.4	-29.2	62.7	261	2.00	Vert.	74.0	11.3
7222.465	50.4	HRN	PK	41.4	-29.2	62.6	256	2.00	Hori.	74.0	11.4
9639.307	37.1	HRN	PK	42.3	-28.1	51.3	265	2.00	Vert.	74.0	22.7
9639.307	35.6	HRN	PK	42.3	-28.1	49.8	55	1.00	Hori.	74.0	24.2

Retest as FCC DA-00-705A1 required for VBW=10Hz:

Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
7222.465	42.1	Hor	54	11.9
7222.465	41.5	Ver	54	12.5

CH LOW(X-Z plane):

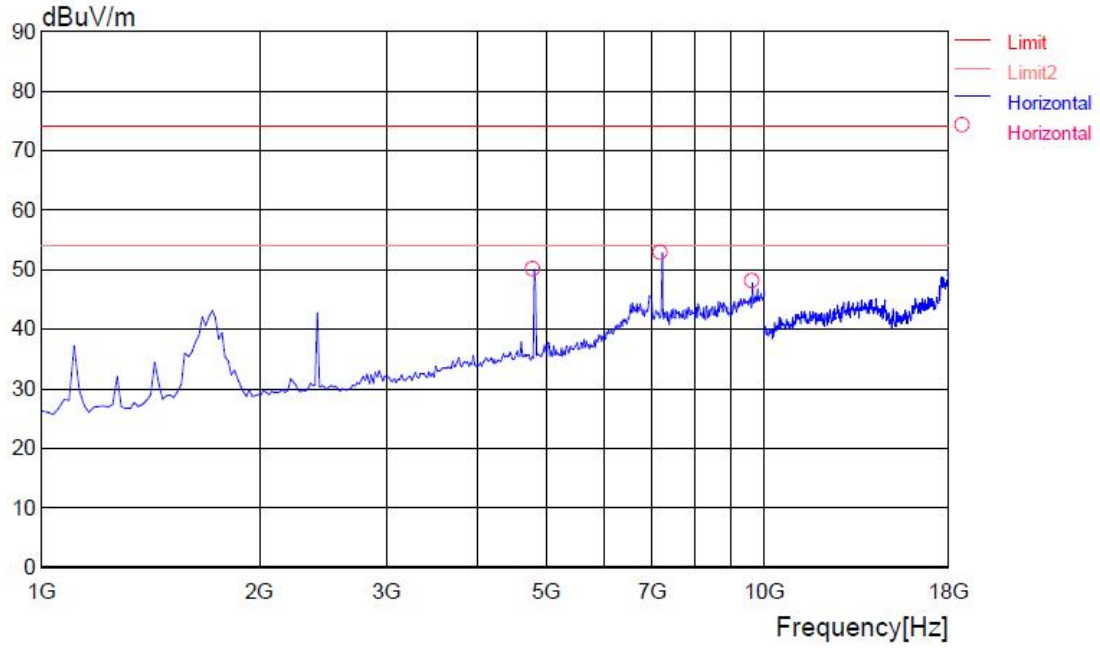
RADIATED EMISSION

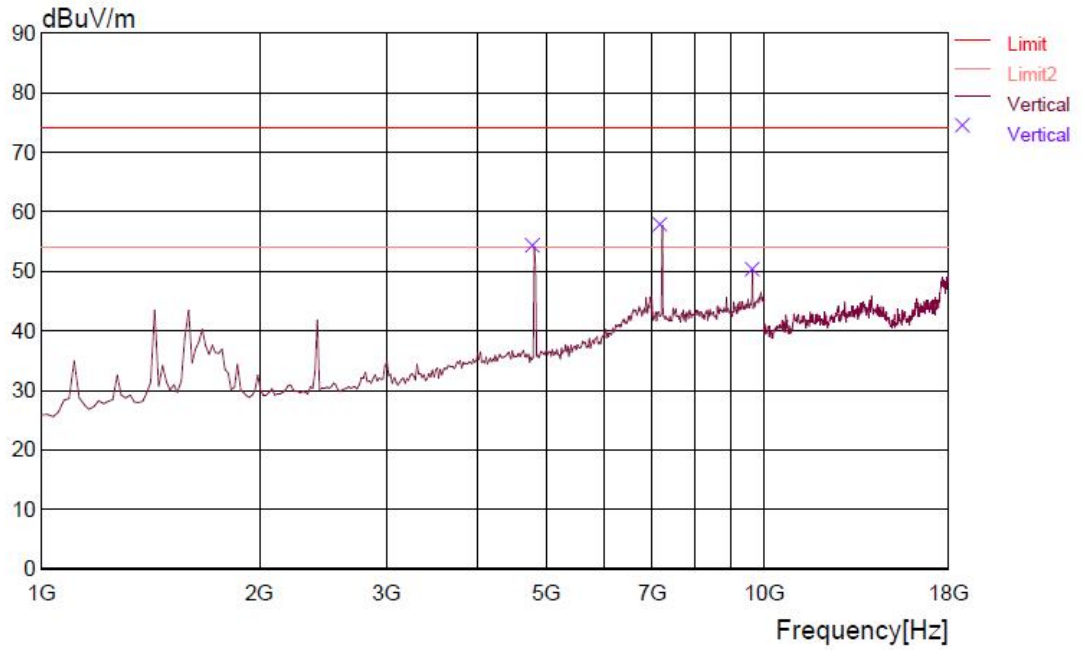
Date : 2013/07/03 16:05:25

Trade Name	:	KEF	Document No.		
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-L	Operator	:	pang

Memo : X-Z plane

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/03 16:05:25

Trade Name	:	KEF	Document No.		
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-L	Operator	:	pang

Memo : X-Z plane

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

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
4805.624	44.9	HRN	PK	36.4	-31.3	50.0	79	2.00	Hori.	74.0	24.0
4805.624	49.0	HRN	PK	36.4	-31.3	54.1	182	1.00	Vert.	74.0	19.9
7222.465	40.6	HRN	PK	41.4	-29.2	52.8	331	1.00	Hori.	74.0	21.2
7222.465	45.5	HRN	PK	41.4	-29.2	57.7	163	2.00	Vert.	74.0	16.3
9639.307	33.6	HRN	PK	42.3	-28.1	47.8	116	2.00	Hori.	74.0	26.2
9639.307	35.9	HRN	PK	42.3	-28.1	50.1	66	1.00	Vert.	74.0	23.9

Retest as FCC DA-00-705A1 required for VBW=10Hz:

Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
4805.624	33.8	Ver	54	20.2
7222.465	37.0	Ver	54	17.0

CH LOW(Y-Z plane):

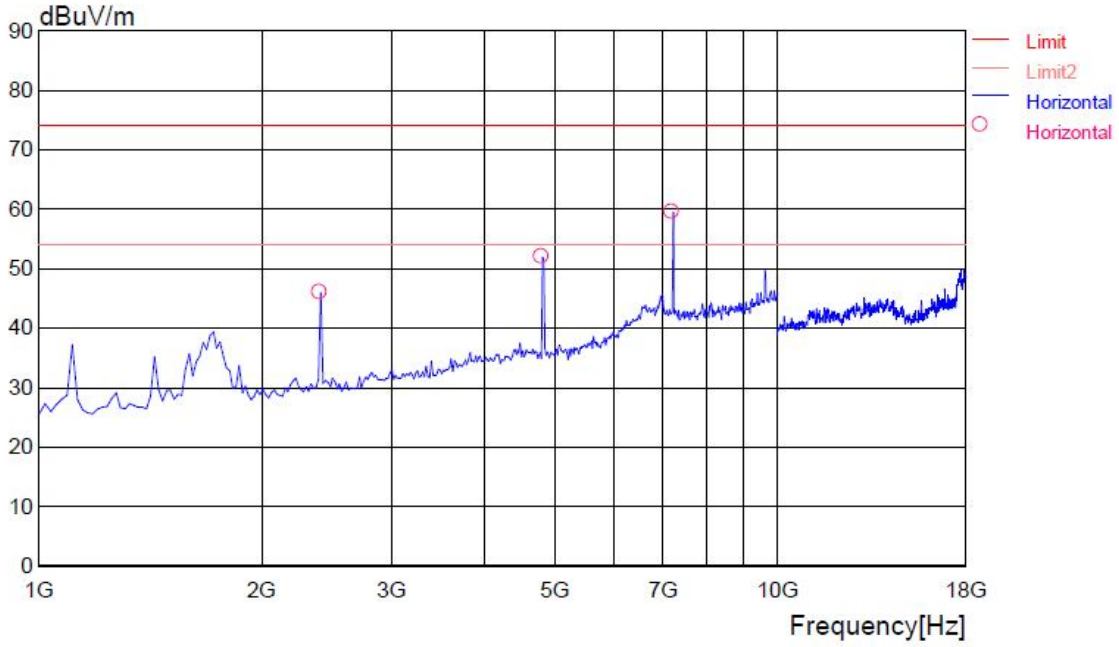
RADIATED EMISSION

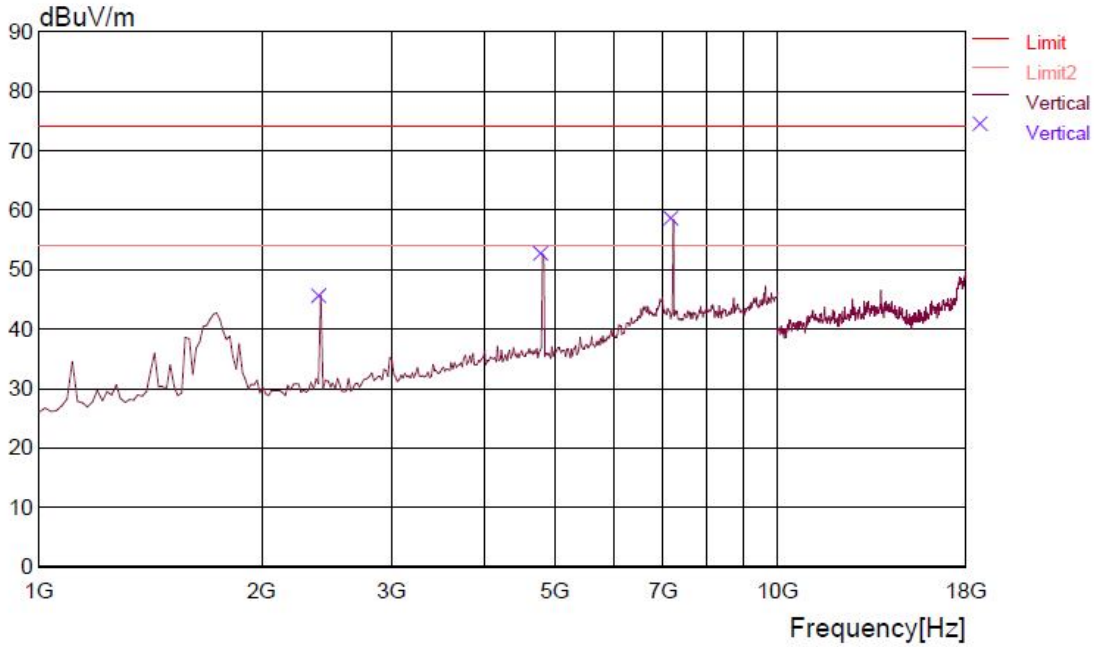
Date : 2013/07/03 16:19:35

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-L	Operator	:	pang

Memo : Y-Z plane

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/03 16:19:35

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-L	Operator	:	pang

Memo : Y-Z plane

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

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2406.818	48.5	HRN	PK	31.4	-33.9	46.0	50	2.00	Hori.	74.0	28.0
2406.818	48.1	HRN	PK	31.4	-33.9	45.6	55	2.00	Vert.	74.0	28.4
4805.624	46.8	HRN	PK	36.4	-31.3	51.9	228	2.00	Hori.	74.0	22.1
4805.624	47.5	HRN	PK	36.4	-31.3	52.6	359	1.00	Vert.	74.0	21.4
7222.465	47.3	HRN	PK	41.4	-29.2	59.5	199	2.00	Hori.	74.0	14.5
7222.465	46.2	HRN	PK	41.4	-29.2	58.4	68	2.00	Vert.	74.0	15.6

Retest as FCC DA-00-705A1 required for VBW=10Hz:

Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
7222.465	39.9	Hor	54	14.1
7222.465	37.4	Ver	54	16.6

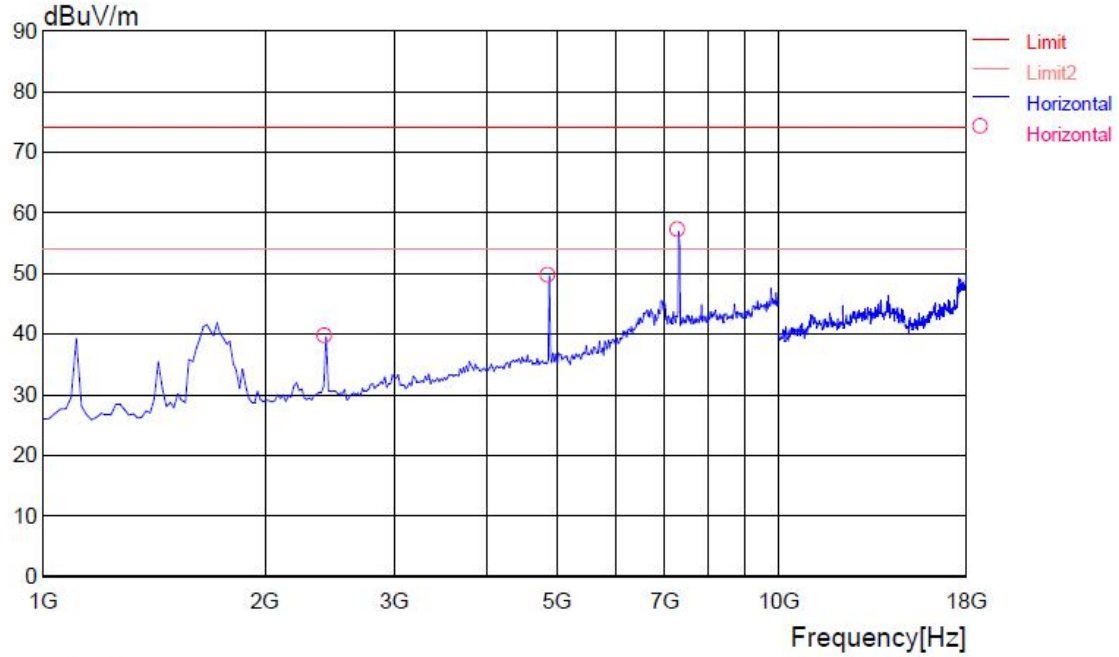
CH MID(X-Y plane):

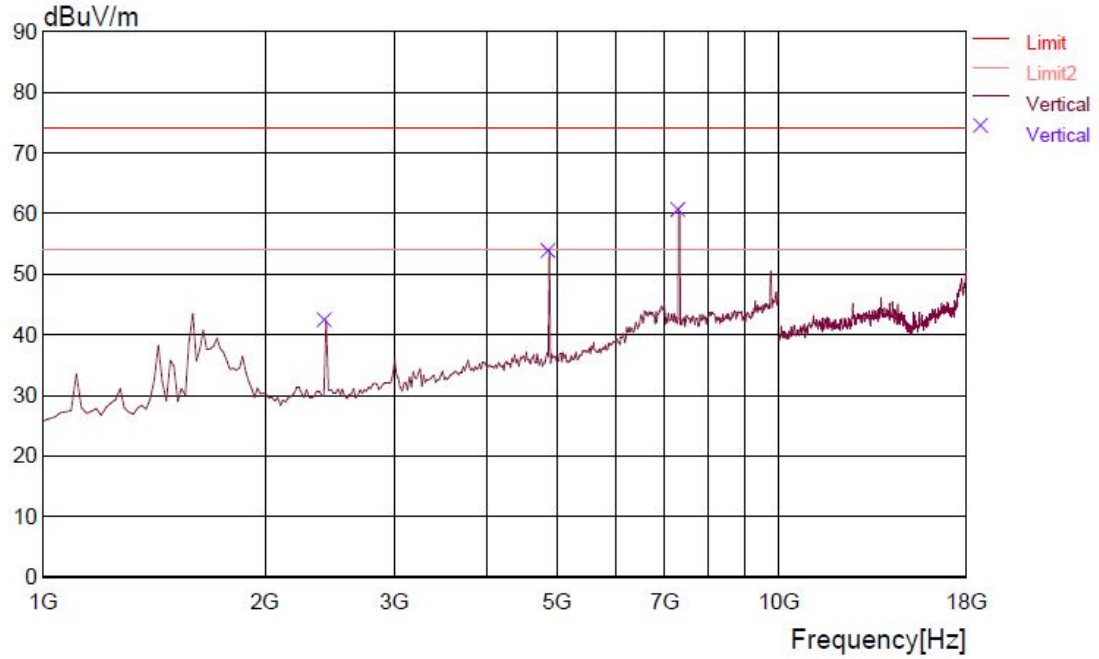
RADIATED EMISSION

Date : 2013/07/03 16:42:44

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-M	Operator	:	pang
Memo	:	X-Y plane			

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/03 16:42:44

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-M	Operator	:	pang

Memo : X-Y plane

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

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2424.854	42.0	HRN	PK	31.4	-33.9	39.5	311	1.00	Hori.	74.0	34.5
2424.854	44.8	HRN	PK	31.4	-33.9	42.3	257	2.00	Vert.	74.0	31.7
4877.768	44.3	HRN	PK	36.5	-31.2	49.6	205	2.00	Hori.	74.0	24.4
4877.768	48.5	HRN	PK	36.5	-31.2	53.8	92	2.00	Vert.	74.0	20.2
7312.646	45.0	HRN	PK	41.1	-29.2	56.9	267	2.00	Hori.	74.0	17.1
7312.646	48.5	HRN	PK	41.1	-29.2	60.4	270	2.00	Vert.	74.0	13.6

Retest as FCC DA-00-705A1 required for VBW=10Hz:

Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
7312.646	36.4	Hor	54	17.6
4877.768	33.2	Ver	54	20.8
7312.646	40.8	Ver	54	13.2

CH MID(X-Z plane):

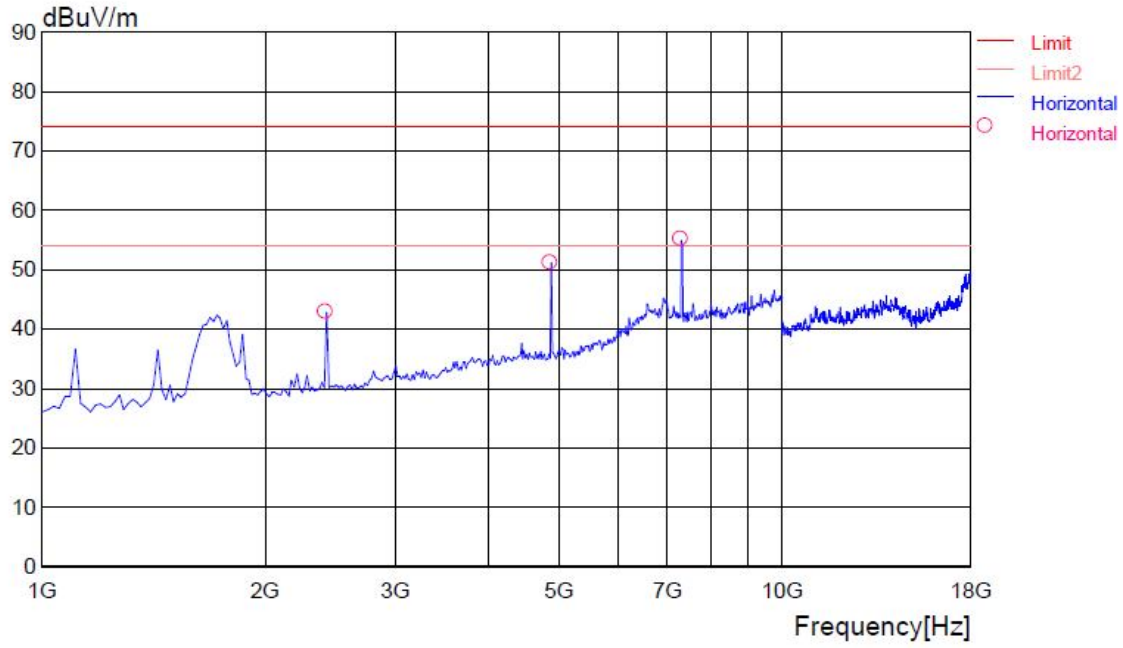
RADIATED EMISSION

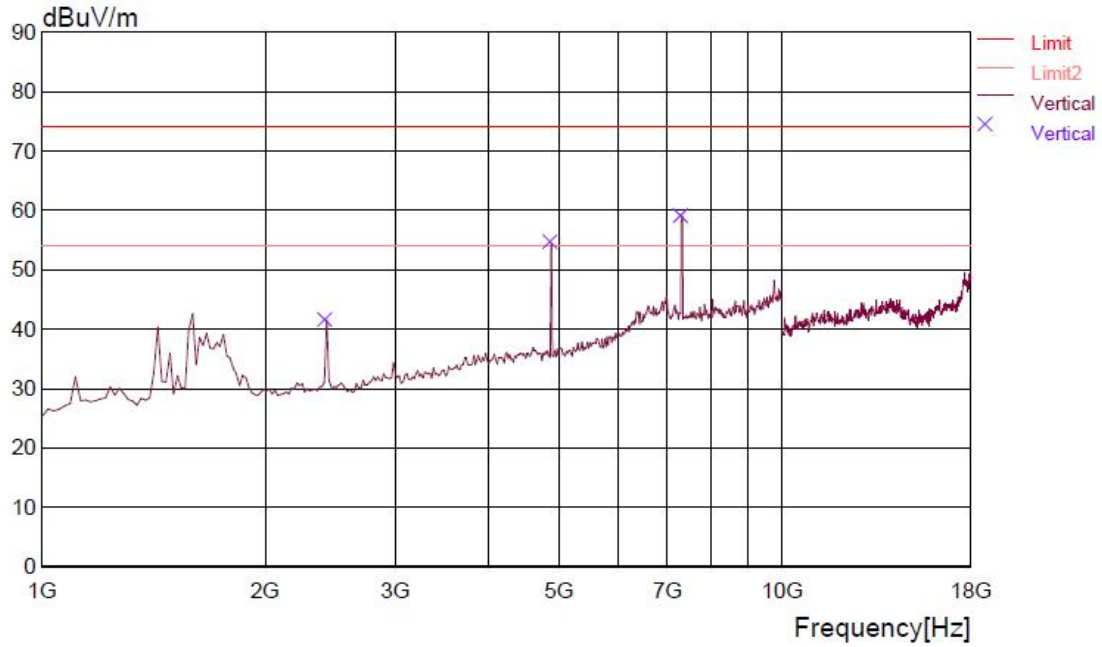
Date : 2013/07/03 16:36:04

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-M	Operator	:	pang

Memo : X-Z plane

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/03 16:36:04

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-M	Operator	:	pang

Memo : X-Z plane

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

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2424.854	45.3	HRN	PK	31.4	-33.9	42.8	307	1.00	Hori.	74.0	31.2
2424.854	44.1	HRN	PK	31.4	-33.9	41.6	315	2.00	Vert.	74.0	32.4
4877.768	45.9	HRN	PK	36.5	-31.2	51.2	69	2.00	Hori.	74.0	22.8
4877.768	49.2	HRN	PK	36.5	-31.2	54.5	199	1.00	Vert.	74.0	19.5
7312.646	43.0	HRN	PK	41.1	-29.2	54.9	276	2.00	Hori.	74.0	19.1
7330.682	47.2	HRN	PK	41.0	-29.2	59.0	244	1.00	Vert.	74.0	15.0

Retest as FCC DA-00-705A1 required for VBW=10Hz:

Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
7312.646	34.2	Hor	54	19.8
4877.768	34.0	Ver	54	20.0
7312.646	38.5	Ver	54	15.5

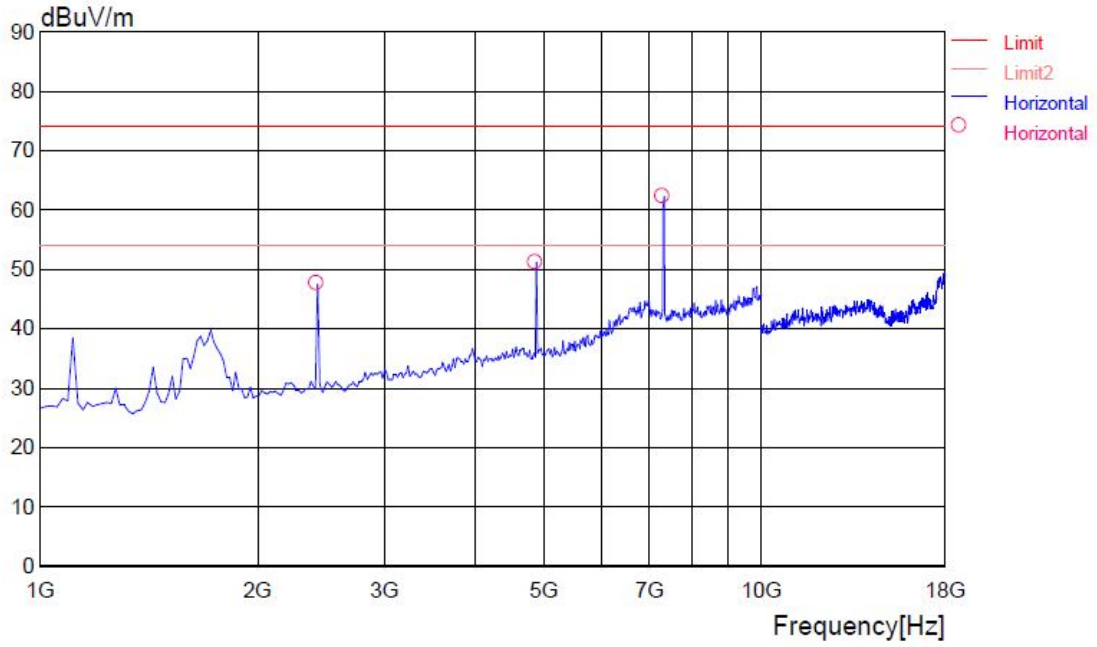
CH MID(Y-Z plane):

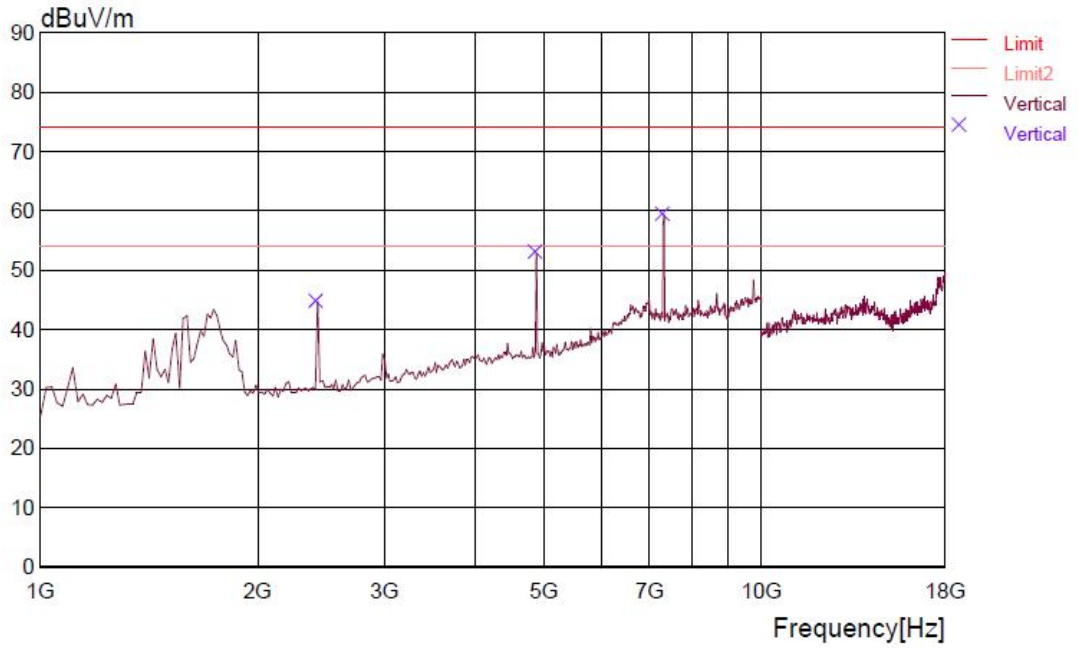
RADIATED EMISSION

Date : 2013/07/03 16:27:08

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-M	Operator	:	pang
Memo	:	Y-Z plane			

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/03 16:27:08

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-M	Operator	:	pang

Memo : Y-Z plane

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

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2424.854	50.0	HRN	PK	31.4	-33.9	47.5	67	2.00	Hori.	74.0	26.5
2424.854	47.2	HRN	PK	31.4	-33.9	44.7	294	2.00	Vert.	74.0	29.3
4877.768	45.9	HRN	PK	36.5	-31.2	51.2	228	2.00	Hori.	74.0	22.8
4877.768	47.5	HRN	PK	36.5	-31.2	52.8	157	1.00	Vert.	74.0	21.2
7330.682	50.4	HRN	PK	41.0	-29.2	62.2	207	2.00	Hori.	74.0	11.8
7330.682	47.5	HRN	PK	41.0	-29.2	59.3	4	1.00	Vert.	74.0	14.7

Retest as FCC DA-00-705A1 required for VBW=10Hz:

Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
7330.682	41.7	Hor	54	12.3
7330.682	38.6	Ver	54	15.4

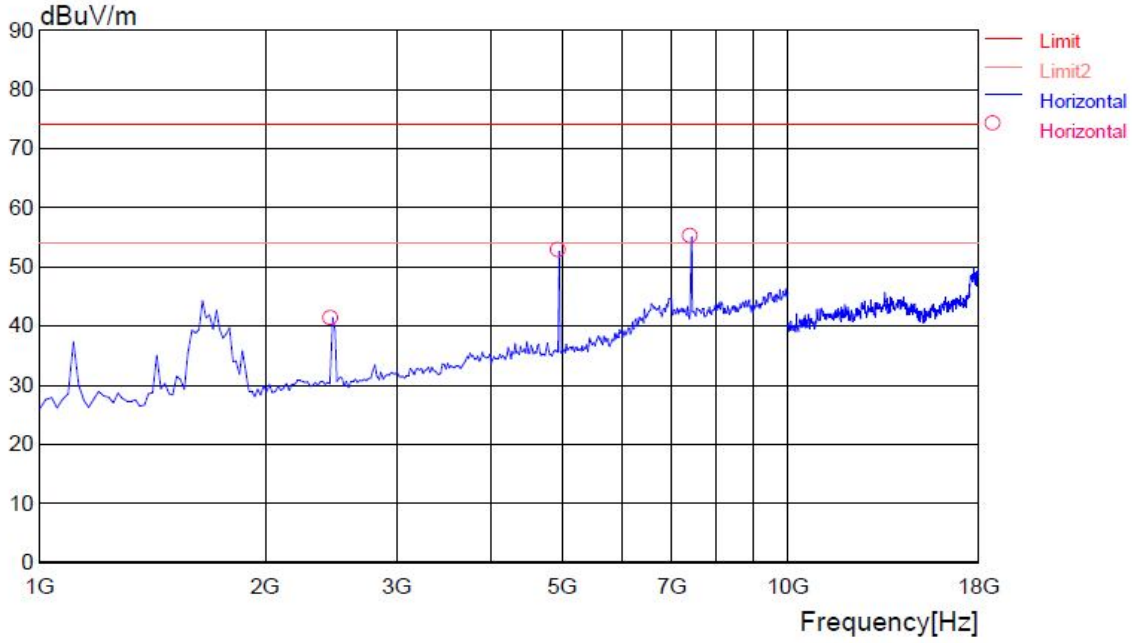
CH HIG(X-Y plane):

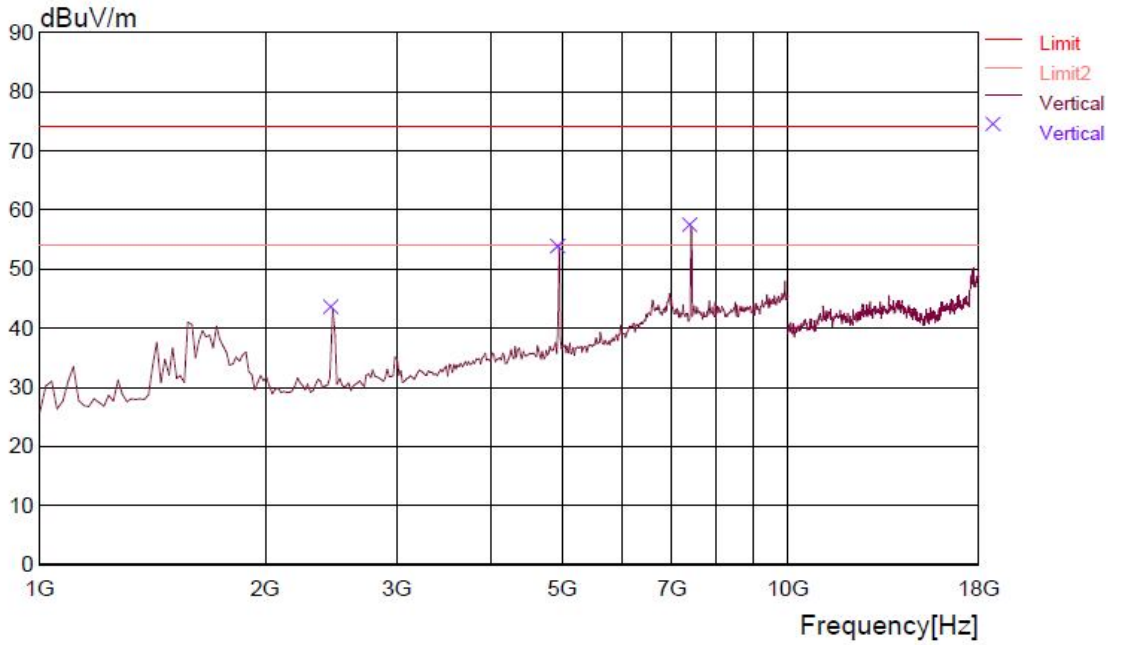
RADIATED EMISSION

Date : 2013/07/03 16:57:33

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-H	Operator	:	pang
Memo	:	X-Y plane			

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/03 16:57:33

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-H	Operator	:	pang

Memo : X-Y plane

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

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2460.927	43.9	HRN	PK	31.3	-33.8	41.4	358	1.00	Hori.	74.0	32.6
2460.927	45.8	HRN	PK	31.3	-33.8	43.3	266	2.00	Vert.	74.0	30.7
4949.913	47.1	HRN	PK	36.6	-31.1	52.6	175	1.00	Hori.	74.0	21.4
4949.913	48.2	HRN	PK	36.6	-31.1	53.7	354	1.00	Vert.	74.0	20.3
7420.863	45.6	HRN	PK	40.8	-29.2	57.2	266	2.00	Vert.	74.0	16.8
7438.899	43.5	HRN	PK	40.8	-29.2	55.1	265	2.00	Hori.	74.0	18.9

Retest as FCC DA-00-705A1 required for VBW=10Hz:

Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
7420.863	36.4	Ver	54	17.6
4949.913	33.2	Ver	54	20.8
7438.899	34.5	Hor	54	19.5

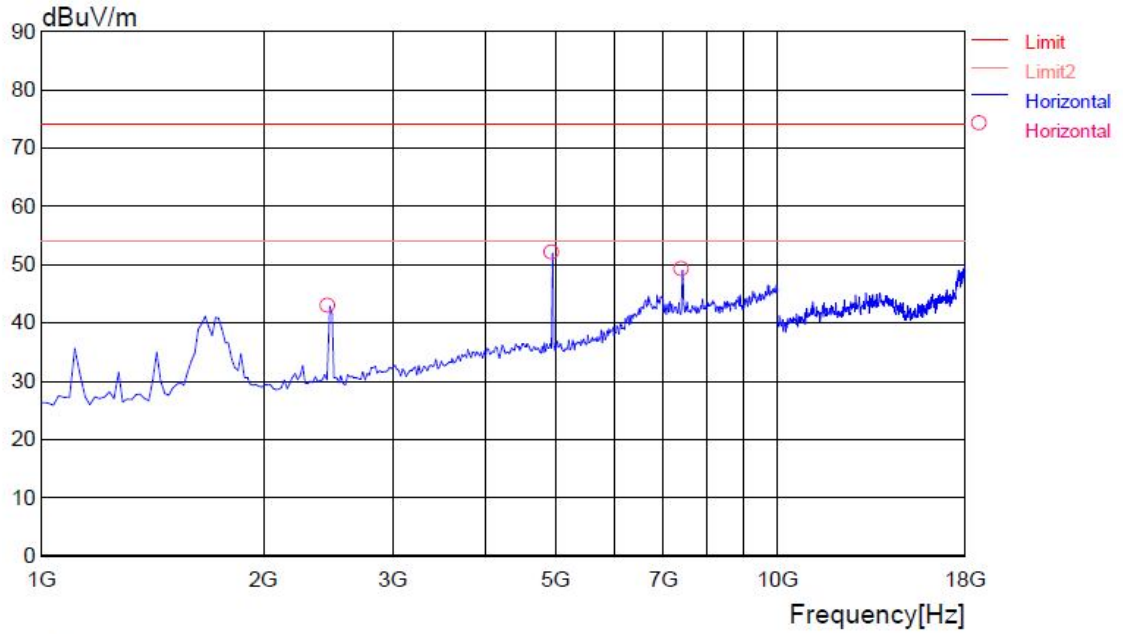
CH HIG(X-Z plane):

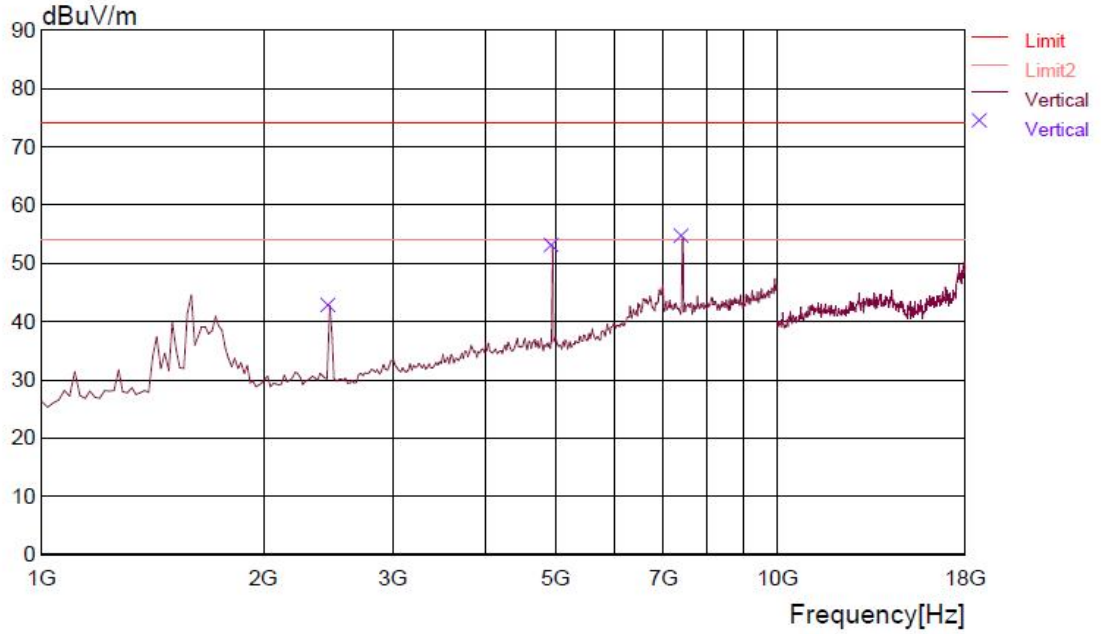
RADIATED EMISSION

Date : 2013/07/03 17:12:50

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-H	Operator	:	pang
Memo	:	X-Z plane			

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/03 17:12:50

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-H	Operator	:	pang

Memo : X-Z plane

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

Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2460.927	45.3	HRN	PK	31.3	-33.8	42.8	78	2.00	Hori.	74.0	31.2
2460.927	45.2	HRN	PK	31.3	-33.8	42.7	115	2.00	Vert.	74.0	31.3
4949.913	46.4	HRN	PK	36.6	-31.1	51.9	317	2.00	Hori.	74.0	22.1
4949.913	47.5	HRN	PK	36.6	-31.1	53.0	189	2.00	Vert.	74.0	21.0
7420.863	37.4	HRN	PK	40.8	-29.2	49.0	263	2.00	Hori.	74.0	25.0
7438.899	42.8	HRN	PK	40.8	-29.2	54.4	82	2.00	Vert.	74.0	19.6

Retest as FCC DA-00-705A1 required for VBW=10Hz:

Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
7438.899	34.2	Ver	54	19.8

CH HIG(Y-Z plane):

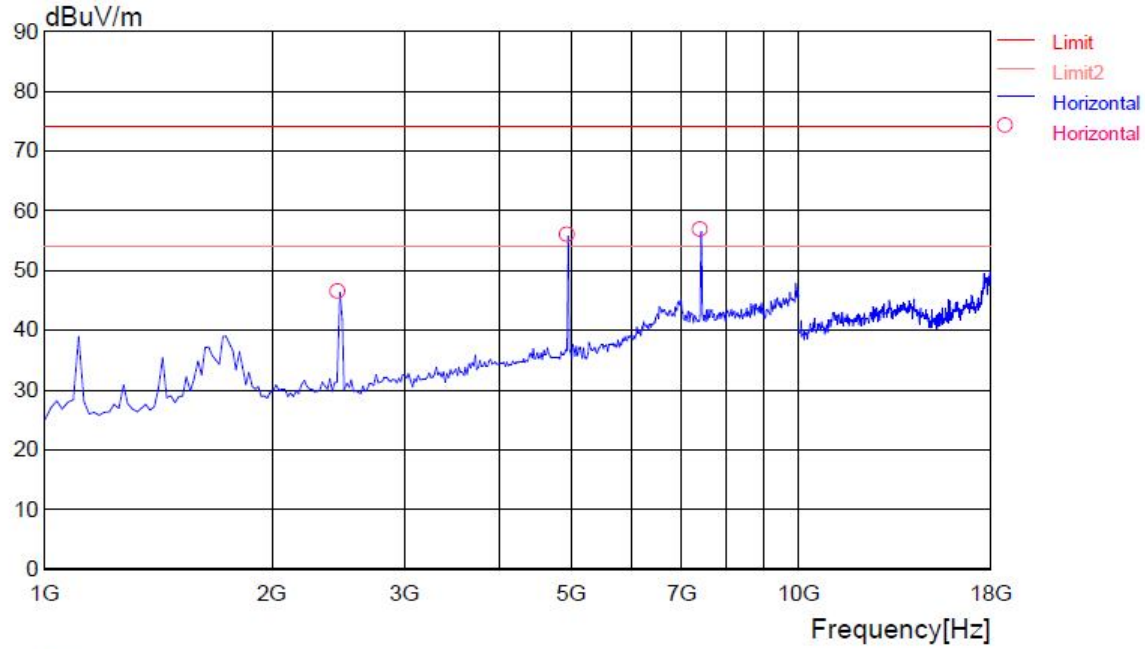
RADIATED EMISSION

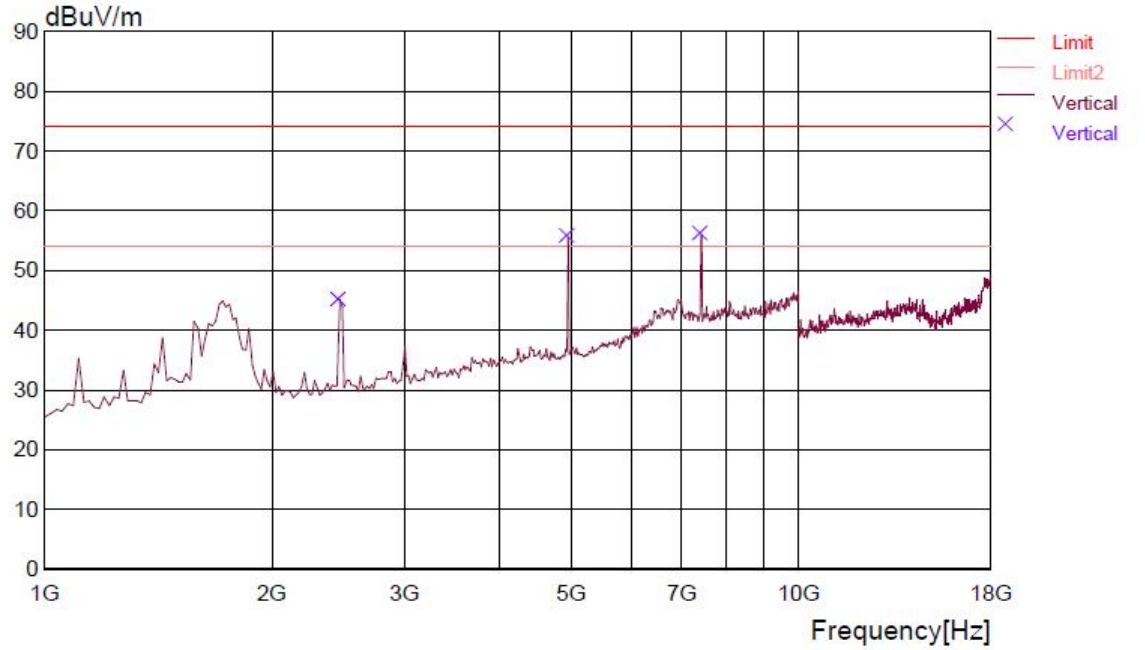
Date : 2013/07/04 08:53:4

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-H	Operator	:	pang

Memo : Y-Z plane

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





No further spurious emissions found between highest frequency in the table and 25GHz.

RADIATED EMISSION

Date : 2013/07/04 08:53:46

Trade Name	:	KEF	Document No.	:	
Model Name	:	GPE Sub TX	Power Supply	:	DC 5V
Product Name	:	GPE Subwoofer Transmitter Module	Temp/Humi	:	27/55RH%
Test Condition	:	CH-H	Operator	:	pang

Memo : Y-Z plane

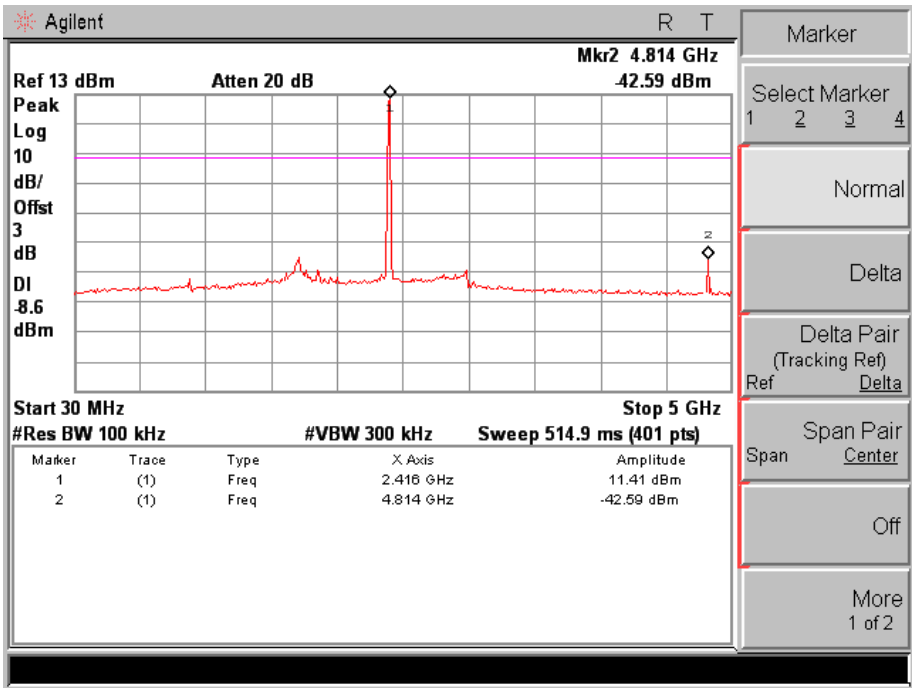
LIMIT : FCC Part15 C transmitter spurious above1G(peak)
FCC Part15 C transmitter spurious above1G(average)

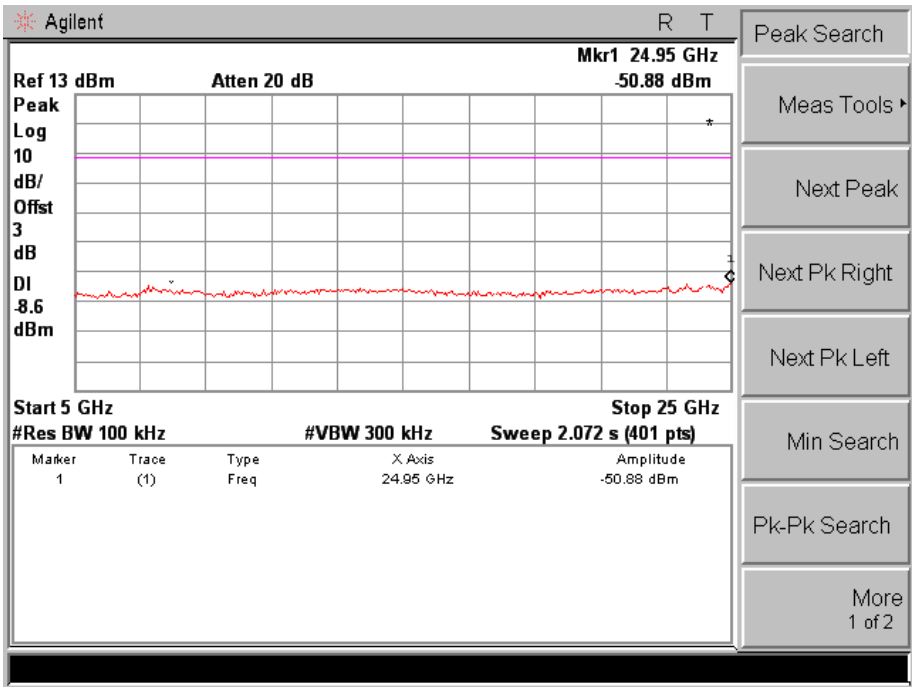
Frequency [MHz]	Meter (PK) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (PK) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
2460.927	48.8	HRN	PK	31.3	-33.8	46.3	295	1.00	Hori.	74.0	27.7
2460.927	47.6	HRN	PK	31.3	-33.8	45.1	180	1.00	Vert.	74.0	28.9
4949.913	50.3	HRN	PK	36.6	-31.1	55.8	98	2.00	Hori.	74.0	18.2
4949.913	50.1	HRN	PK	36.6	-31.1	55.6	233	2.00	Vert.	74.0	18.4
7420.863	44.9	HRN	PK	40.8	-29.2	56.5	150	1.00	Hori.	74.0	17.5
7438.899	44.4	HRN	PK	40.8	-29.2	56.0	158	2.00	Vert.	74.0	18.0

Retest as FCC DA-00-705A1 required for VBW=10Hz:

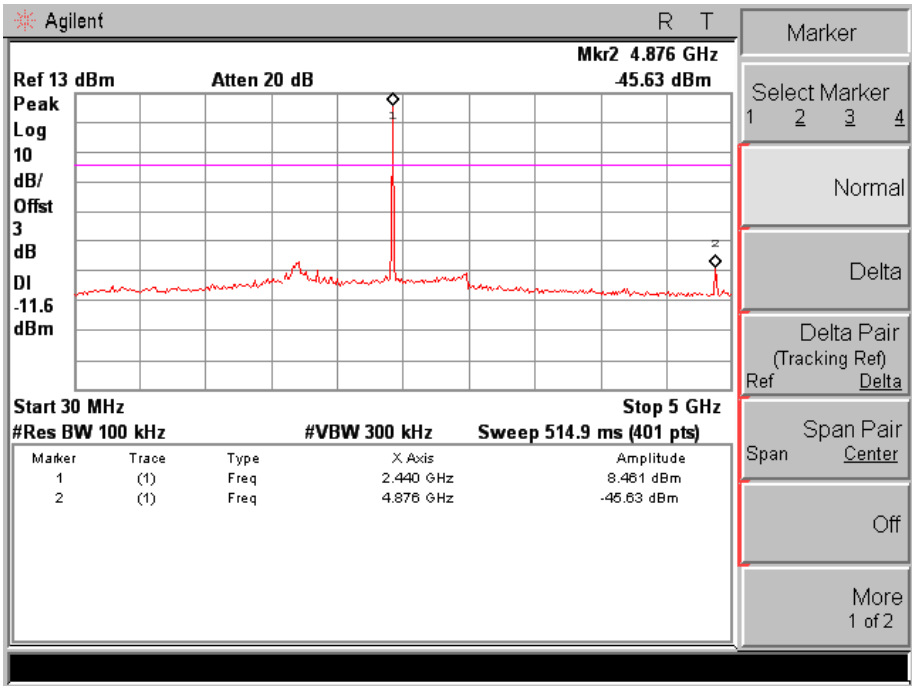
Frequency (MHz)	Result at VBW=10Hz (dBuv)	Pola.	Limit (dBuv)	Margin (dB)
4949.913	35.4	Hor	54	18.6
7420.863	36.9	Hor	54	17.1
4949.913	35.1	Ver	54	18.9
7438.899	35.5	Ver	54	18.5

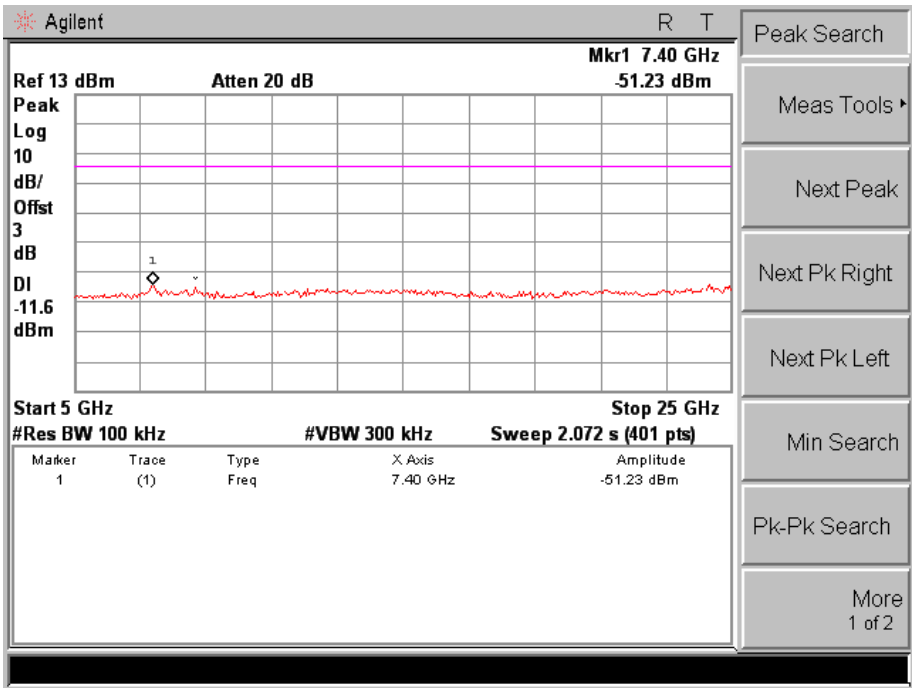
Conducted:
Channel LOW：



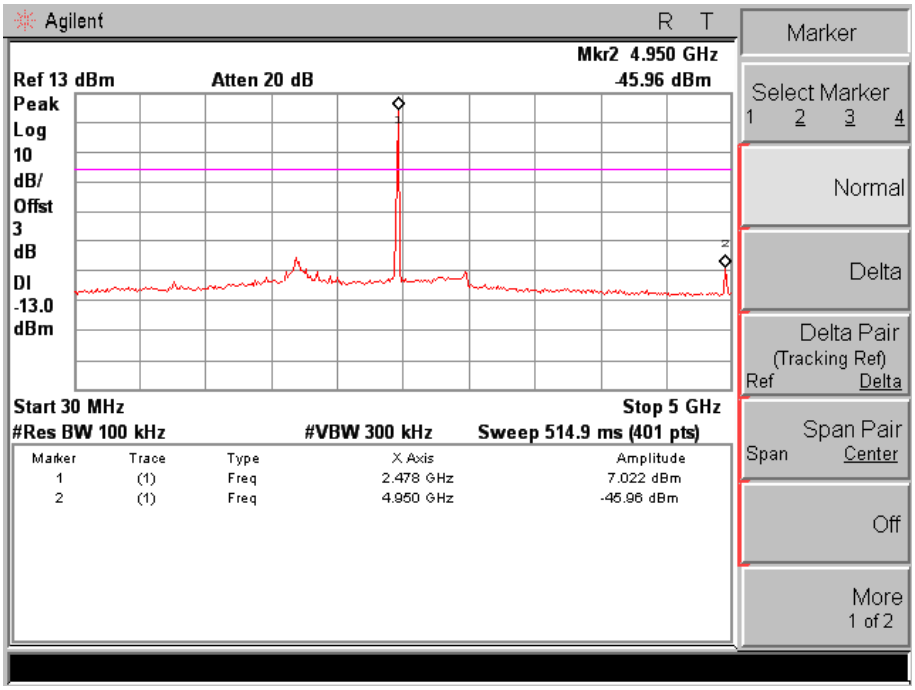


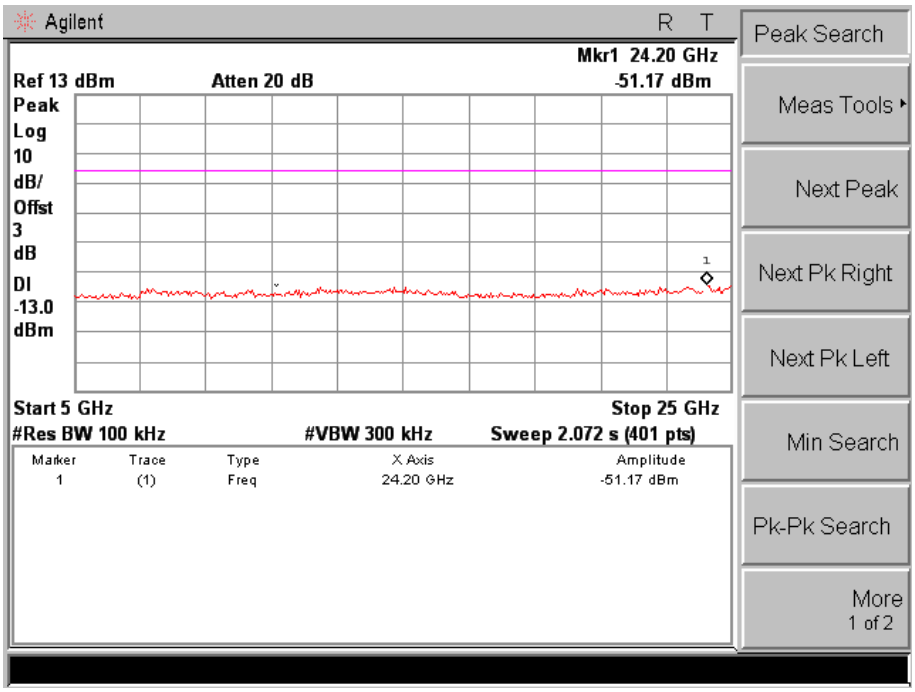
Channel MID：


Agilent
R T
Mkr2 4.876 GHz
Ref 13 dBm
Atten 20 dB
-45.63 dBm
Peak
Log
10
dB/
Offst
3
dB
Dl
-11.6
dBm
Start 30 MHz
Stop 5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 514.9 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.440 GHz 8.461 dBm
2 (1) Freq 4.876 GHz -45.63 dBm
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
R T
Mkr1 7.40 GHz
Ref 13 dBm
Atten 20 dB
-51.23 dBm
Peak
Log
10
dB/
Offst
3
dB
Dl
-11.6
dBm
Start 5 GHz
Stop 25 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.072 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 7.40 GHz -51.23 dBm
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

Channel HIG：


Agilent
R T
Mkr2 4.950 GHz
Ref 13 dBm
Atten 20 dB
-45.96 dBm
Peak
Log
10
dB/
Offst
3
dB
Dl
-13.0
dBm
Start 30 MHz
Stop 5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 514.9 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.478 GHz 7.022 dBm
2 (1) Freq 4.950 GHz -45.96 dBm
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
R T
Mkr1 24.20 GHz
Ref 13 dBm
Atten 20 dB
-51.17 dBm
Peak
Log
10
dB/
Offst
3
dB
Dl
-13.0
dBm
Start 5 GHz
Stop 25 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.072 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 24.20 GHz -51.17 dBm
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

5. Test Setup

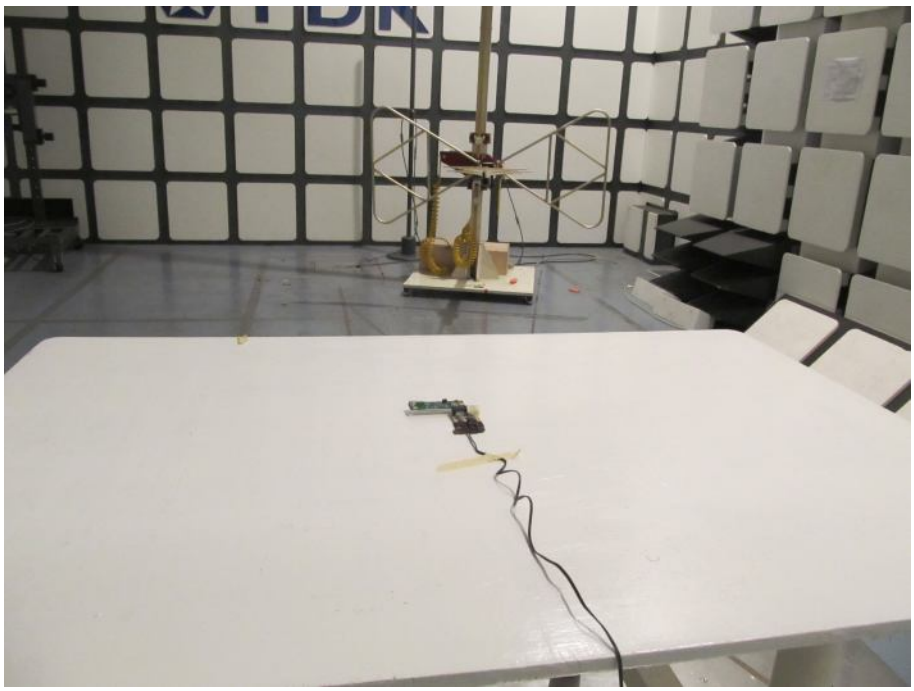
5.1 Ancillary and Accessory Equipment Used

No.	Description	Specification	Quantity
1.	DC Power supply	KIKUSUI, M/N: PAN 60-10A	1

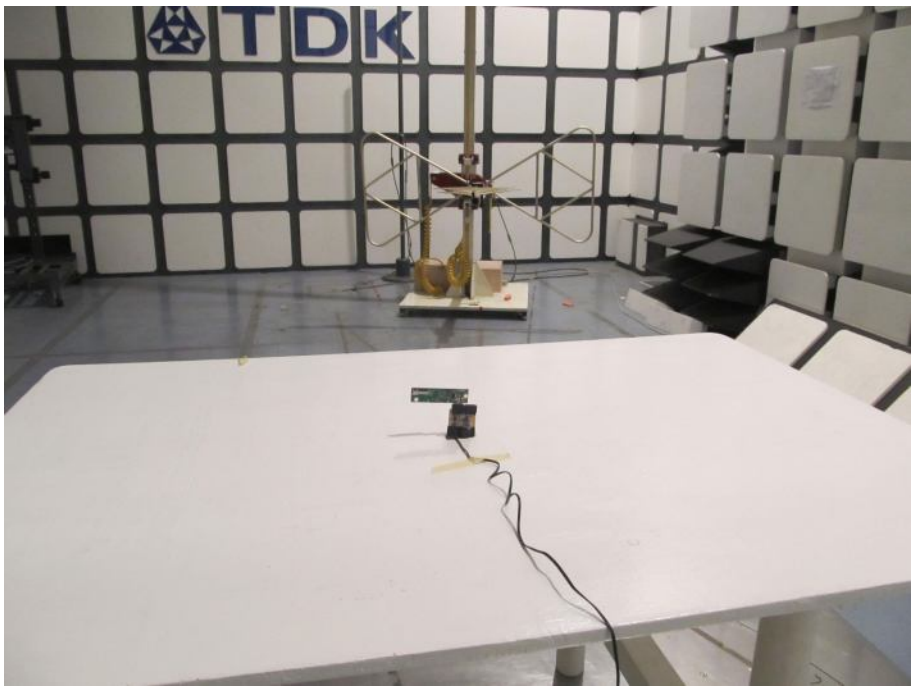
5.2 Photographs of the Test Configuration

5.2.1 Radiated emission

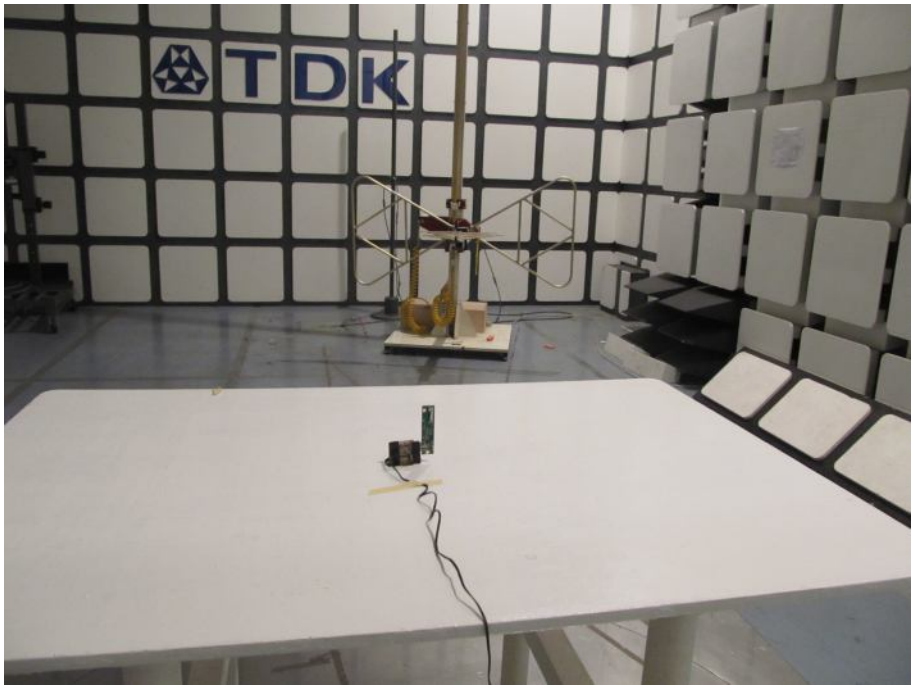
Below 1GHz:



X-Y plane

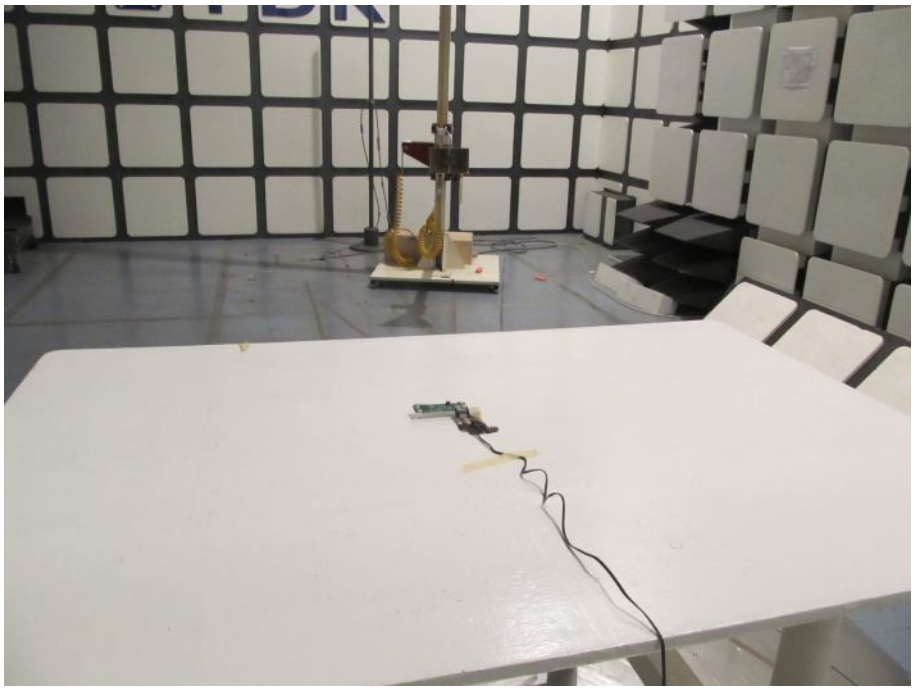


X-Z plane

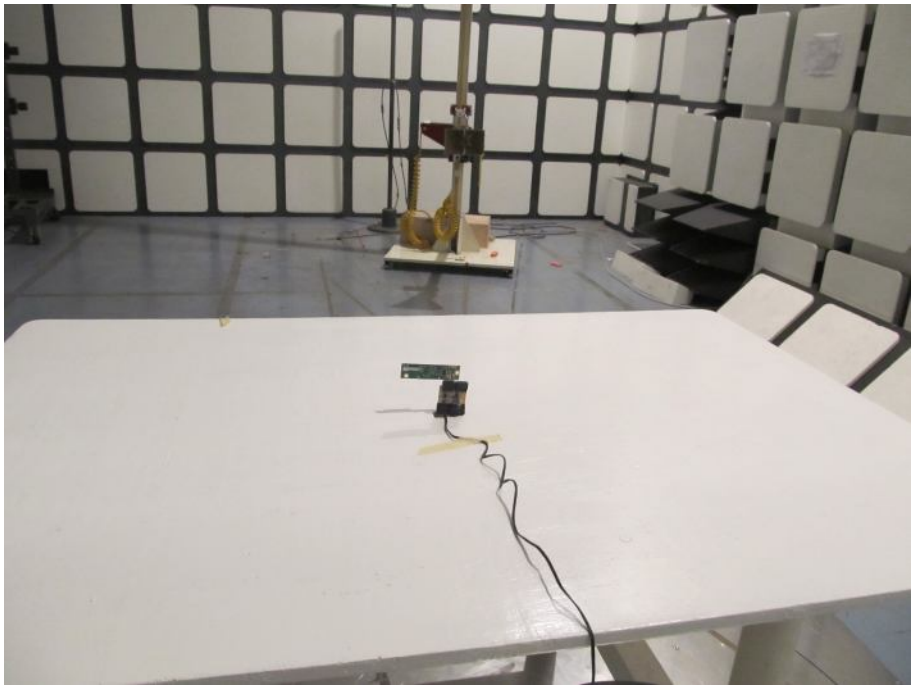


Y-Z plane

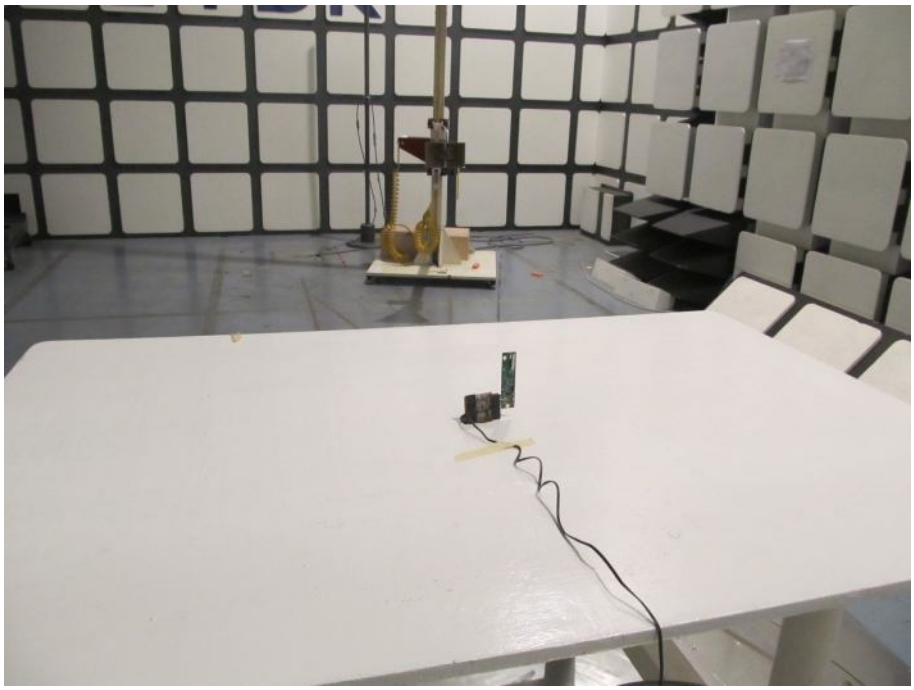
Above 1GHz:



X-Y plane

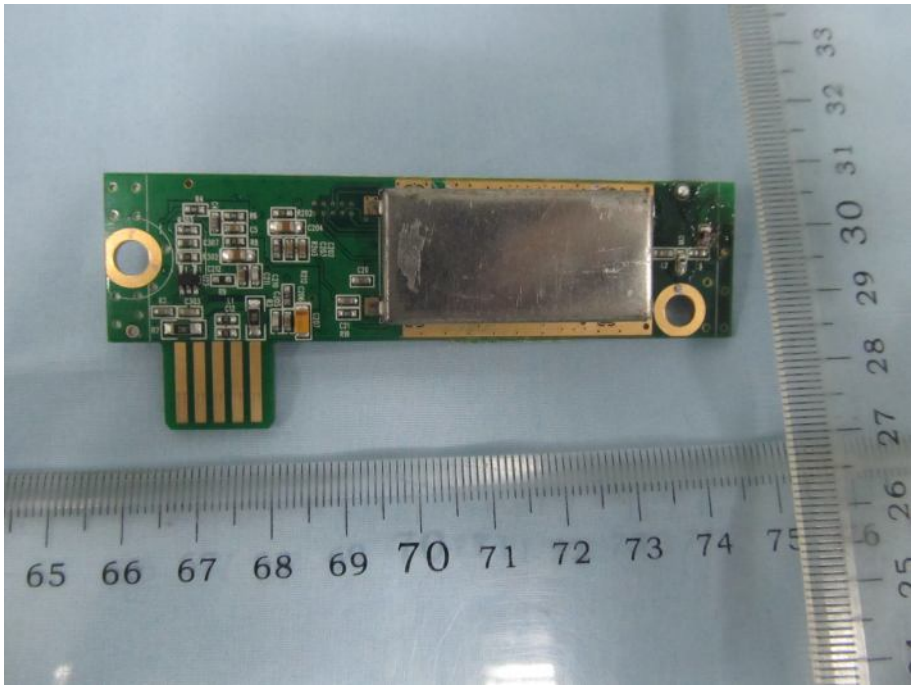


X-Z plane

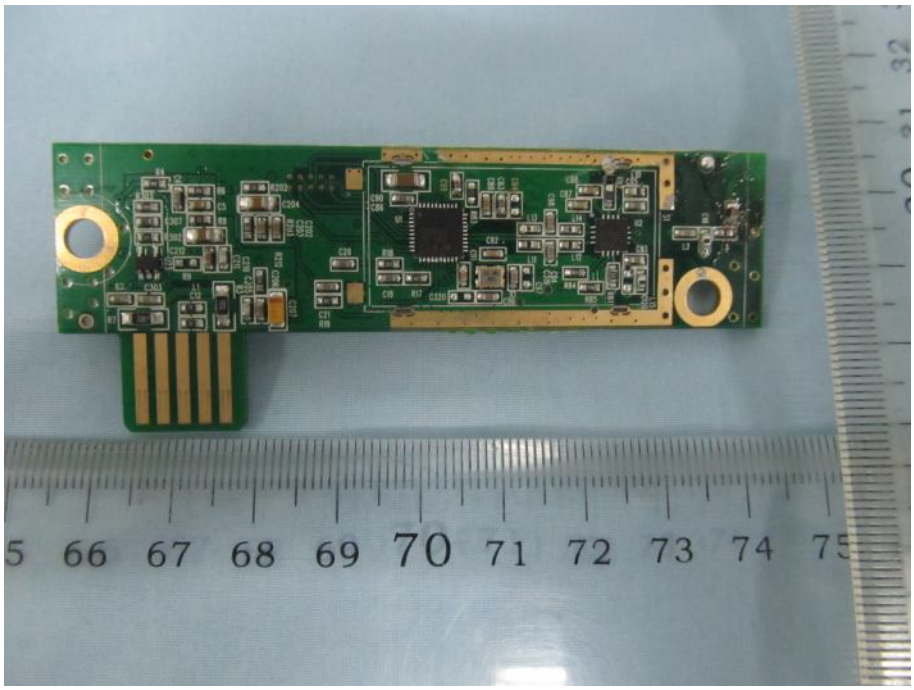


Y-Z plane

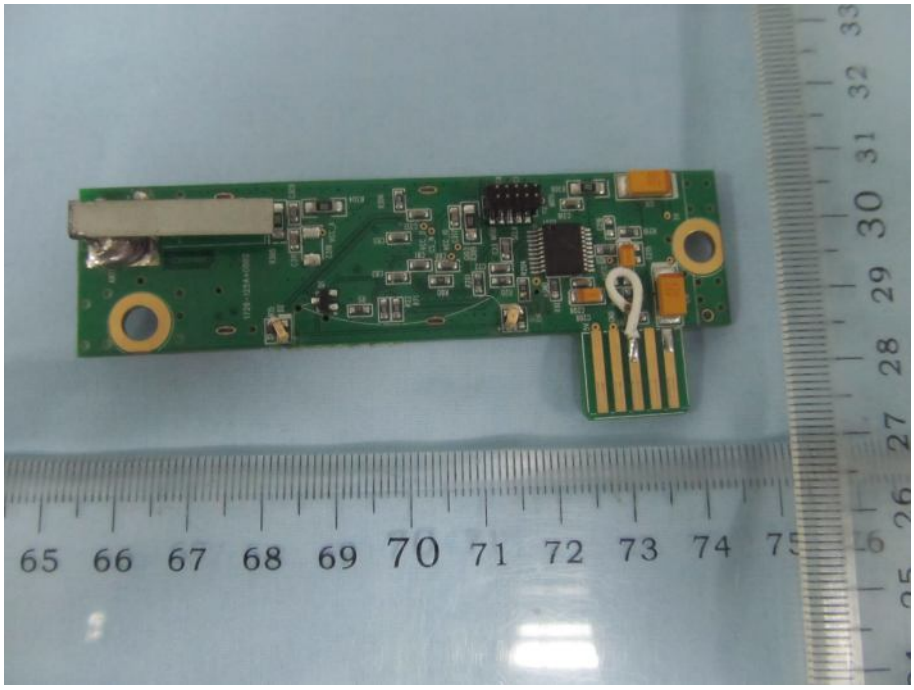
5.3 Photographs of the EUT



Enclosure of EUT



Shielding removed



Enclosure of EUT

6. Equipment List

No.	Equipment	Manufacturer	Model	Serial No.	Last Cal. Date	Cal. Period
1	Precision Biconical Antenna	TDK Co.	PBA-2030	090500	2012-09-18	1Y
2	Precision Log Periodic Antenna	TDK Co.	PLP-3003	061001	2012-09-18	1Y
3	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130174	2012-09-18	1Y
4	Horn antenna	TDK	HRN-0118	130174	2013-04-07	1Y
5	Horn antenna	TDK	HRN-0118	130186	2013-04-07	1Y
6	Horn antenna	SCHWARZBECK	BBHA 9170	208	2013-04-07	1Y
7	Attenuator 6 dB	Agilent	8491B	MY39260147	2012-09-18	1Y
8	Preamplifier	TDK Sonoma	310	242803	2013-04-07	1Y
9	Preamplifier	ELENA	EAU-3718GXA	A070701	2013-04-07	1Y
10	EMI Receiver	Rohde & Schwarz	ESIB26	100234	2013-04-07	1Y
11	EMI Receiver	Rohde & Schwarz	ESCS30	100350	2013-04-07	1Y
12	Spectrum Analyzer	Agilent	E4403B	MY44210199	2013-04-07	1Y
13	Art. Mains Network	EMCO	3816/2	00044921	2013-04-07	1Y
14	Transient Limiter(10 dB)	Agilent	11947A	3107A03736	2013-04-07	1Y
15	Personal Computer	HP	DX2000MT	MXD4250FZM	N/A	
16	Personal Computer	HP	DX2000MT	MXD4130B2N	N/A	
17	Semi-Anechoic Chamber	TDK Co.	N/A	N/A	2013-04-07	1Y
18	Shielded Room	TDK Co.	N/A	N/A	N/A	
19	Loop Antenna	EMCO	6502	9107-2440	2013-04-07	1Y

7. Test Uncertainty

Test	Range	Confidence Level	Calculated Uncertainty
Radiated emission(3m)	9kHz-30MHz	95%	3.6dB
Radiated emission(3m)	30-1000MHz	95%	4.3dB
Radiated emission(3m)	1-25GHz	95%	5.4dB
Conducted emission	0.15-30MHz	95%	3.3dB
RF power, Spurious(conducted)	30M-25GHz	95%	3.0dB

8. Appendix

8.1 Confirmation of Compliance within the Limits

8.1.1 Method of calculating measurement result

Radiated Emission

	Reading	+	Antenna factor	+	Cable loss	-	Gain	=	Result
Example	45.2	+	11.9	+	6.7	-	31.6	=	32.2

Conducted Emission

	Reading	+	C. FACTOR	=	Result
Example	34.4	+	10.0	=	44.4

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 frequency hopping algorithm, when using all 18 channels and no swaps between the active and trial channel sets occur, goes through a sequence of 70 hops over the course of which every RF channel has been used.

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.
18 RF channels with a 4-MHz bandwidth are defined. The hopping frequency range is 72 MHz and channel bandwidth is 4MHz for both transmitter and receiver. When the receiver receives a good data packet from a transmitter, the receiver sends an acknowledgment back to the transmitter. Once the receiver has responded to the transmitter, then both the transmitter and receiver units each hop to the next frequency channel and the process is repeated.

Subclause 15.247 (a) – Receiver Hopping Capability
Requirement: The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals.
Radio transceiver CC85xx has ●An integrated frequency synthesizer with 1 MHz step size for any frequency in the range 2400-2483 MHz. ●Complex 3 MHz IF TX signal chain with programmable gain PA ●Complex zero-IF RX signal chain with 36 dB variable gain in the LNAs and 70 dB dynamic range ADCs Changing the receiver channel is achieved by changing the frequency of the PLL controlled local oscillator. The signal from the local oscillator is fed to the mixer which convert the received signal to the baseband signal. Base-band filtering are contained within the integrated circuit. The incoming RF signal is then filtered and demodulated. Upon startup the receiver searches for a transmitter on all 18 channels. When the receiver joins

the audio network with chip ID exchange. The receiver captures the packet sent by the transmitter. It extracts the current hopping channels and matches the hopping sequence. At this point the transmitter and receiver have a connection and are now synchronized to the hopping time.

The transmitter sends the change request to the receiver before the hopping sequence adapts. The hop set change does not occur until the receiver has acknowledged the change. This way the transceivers within the system maintain synchronization.

Subclause 15.247 (a) – Hopping Sequence

Requirement: The hopping sequence is generated and provided with an example.

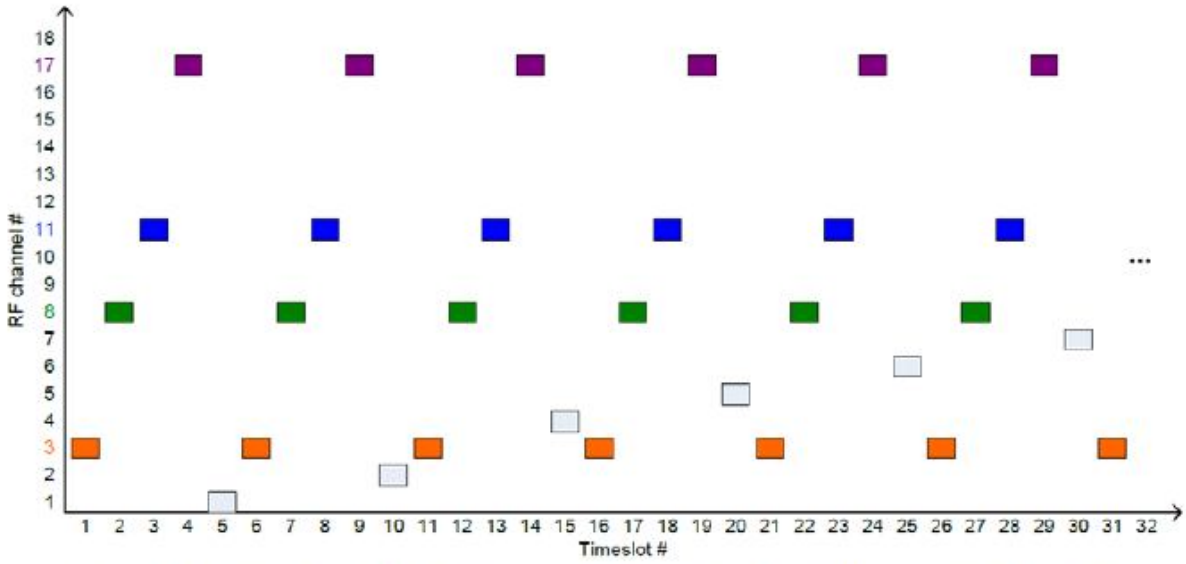


Figure 36 – Example of AFH hop sequence (active set in color, trial set in black/gray)

This 70-hop macrosequence consists of 14 repetitions of a

o 5-hop microsequence during which

Each of the four active RF channels are used once

One of the trial RF channels is used once

(cycling through all trial channels over the course of a macrosequence)

Figure 36 illustrates this concept. This gives an average steady-state RF channel usage of:

Each of the four active channels are used 20% of the time

Each trial channel is used 1.43% of the time