TEST REPORT

1. Applicant

Name : I2Synergy Co., Ltd.
Address : #1310, 1601-2 Seocho-Dong, Seocho-Gu, Seoul, Korea

2. Products

Name : 2.4G RF Wireless Page Tuner
Model/Type : AT-104
Manufacturer : Chois Technology Co., Ltd

3. Test Standard : FCC CFR 47 Part 15, Subpart C section 15.247

4. Test Method : ANSI C63.4-2003

5. Test Result : Positive

6. Date of Application : Nov. 26, 2008

7. Date of Issue : Nov. 28, 2008

Tested by

Sung-kyu Cho
Telecommunication Team
Engineer

Approved by

Seok-Jin Kim
Telecommunication Team
Manager

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1. GENERAL INFORMATIONS

1.1. Applicant (Client)

Name	I2Synergy Co., Ltd
Address	#1310, 1601-2 Seocho-Dong, Seocho-Gu, Seoul, Korea
Contact Person	Mr. Park Soo Hong
Telephone No.	+82-2-6677-9131
Facsimile No.	+82-2-6677-9132
E-mail address	inquiry@choistec.com
Manufacturer Name	Chois Technology Co., Ltd
Manufacturer Address	#1102, Incheon IT Tower, 592-5, Dowha1Dong, Namgu, Incheon, Korea

1.2. Equipment (EUT)

FCC Classification	DTS – Digital Transmission System
Model Name	AT-104
FCC ID	WWHAT104T
Frequency Band	2405 ~ 2480 MHz
Battery Type	AA(1.5V) x 2EA
Max RF Output Power	-0.443 dBm
Type of Modulation	GFSK
Number of Channels	76 channels
Max Antenna Gain	- 2.613 dBi
Function Type	Transmitter
Hardware Version	1.0
Software Version	1.0

1.3. Testing Laboratory

Testing Place	Korea Testing Labortory (KTL) 1271-12, Sa-Dong Sangnok-Gu, Ansan-si Gyunggi-Do , Korea
FCC registration number	408324
Industry Canada filing number	6298
Test Engineer	Sung-kyu Cho
Telephone number	+82 31 5000 132
Facsimile number	+82 31 5000 159
E-mail address	skcho@ktl.re.kr
Other Comments	-

2. SUMMARY OF TEST RESULTS

Testing performed for :.I2Synergy Co., Ltd.

Equipment Under Test : AT-104

Receipt of Test Sample : 2008. 11. 26

Test Start Date : 2008. 11. 26

Test End Date : 2008. 11. 28

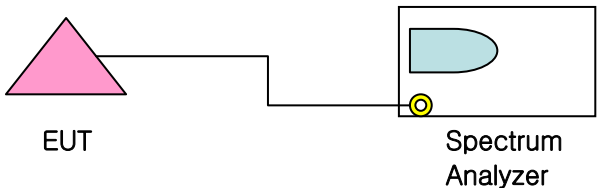
The following table represents the list of measurements required under the FCC CFR47 15.247, and 15.209

FCC Rules	Test Requirements	Result	Comments
15.247(a)(2)	6dB Bandwidth	Pass	See Data sheets
15.247(b)(3)	Maximum Peak Power	Pass	See Data sheets
15.247(d)	100 KHz Bandwidth of Frequency Band Edges	Pass	See Data sheets
15.247(e)	Power Spectrum Density	Pass	See Data sheets

3. Measurement & Results

3.1. 6 dB Bandwidth

Test Setup Layout

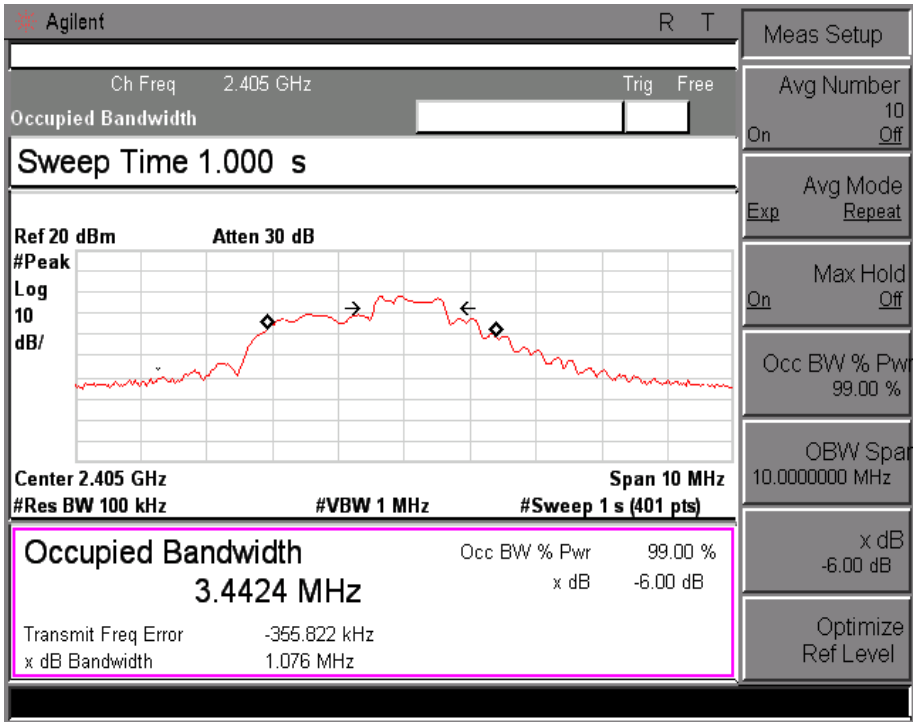


Test Condition

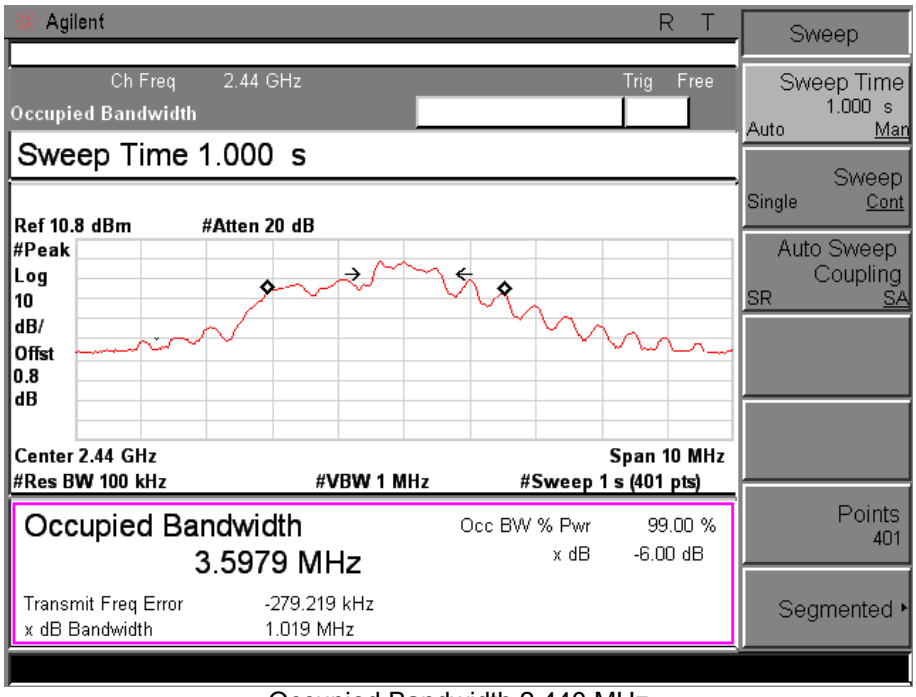
- Set RBW of Spectrum analyzer to 100 kHz
- Systems using digital modulation techniques may operate in the 2400 – 2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test result

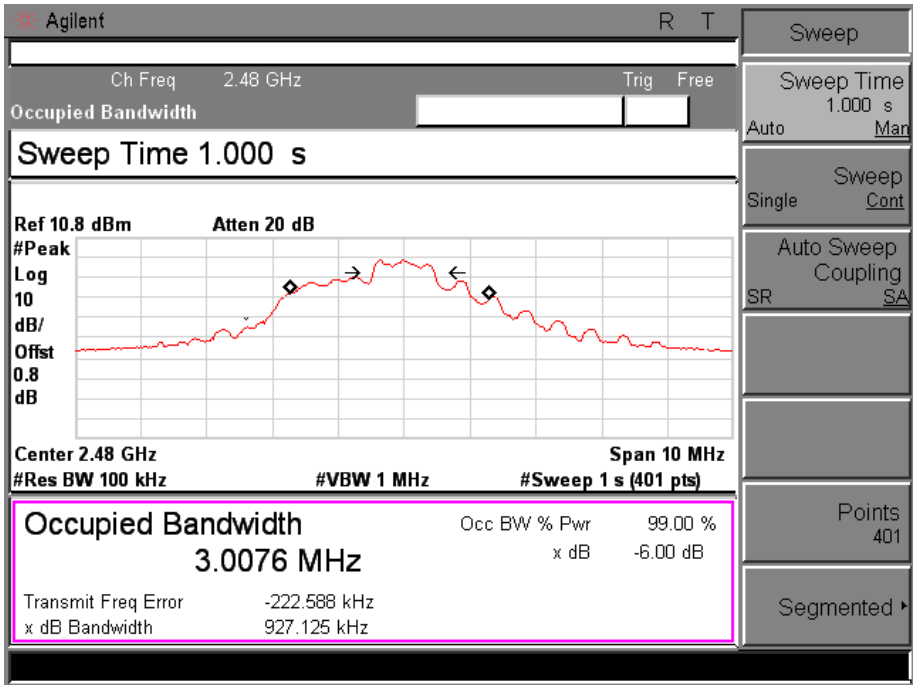
Frequency (MHz)	Result (MHz)	Verdict
2,405	1.076	Pass
2,440	1.019	Pass
2,480	0.927	Pass



- Occupied Bandwidth 2,405 MHz -



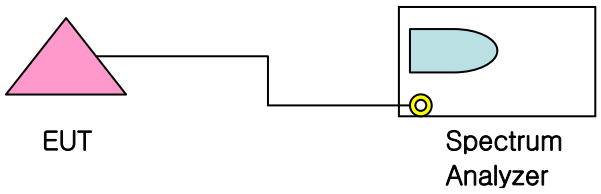
- Occupied Bandwidth 2,440 MHz -



- Occupied Bandwidth 2,480 MHz -

3.2. Maximum Peak Power

Test Setup Layout

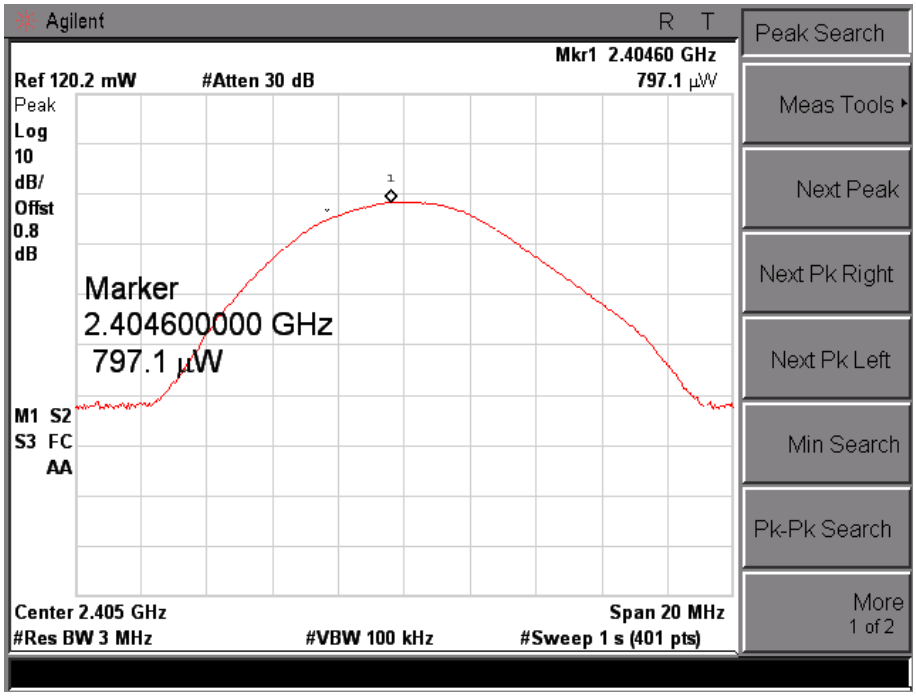


Test Condition

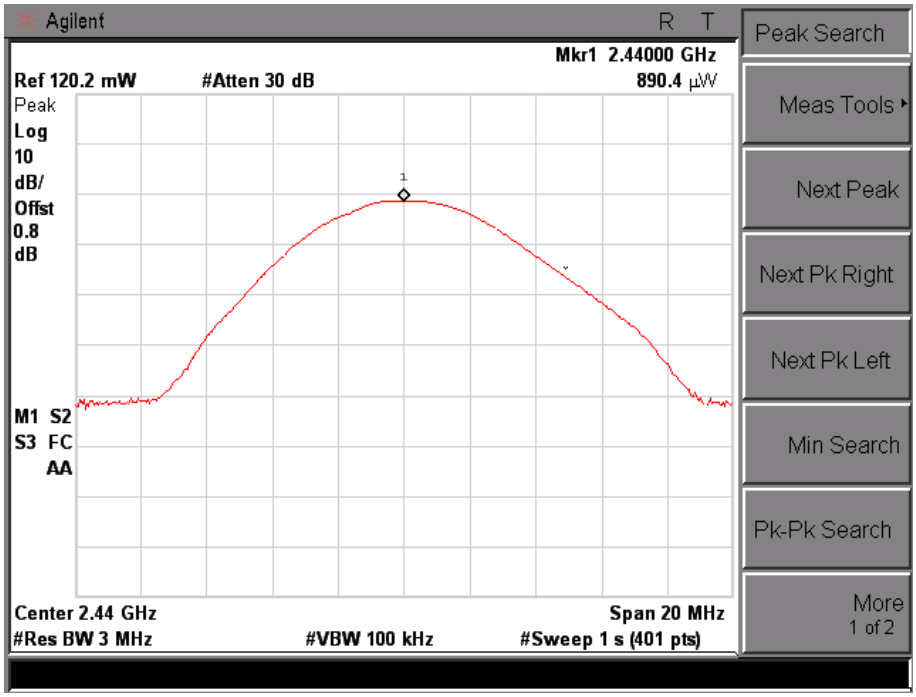
- Set RBW of Spectrum analyzer to 3 MHz
- For systems using digital modulation in the 2400-2483.5 MHz. 1 Wat. As an altenative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

Test result

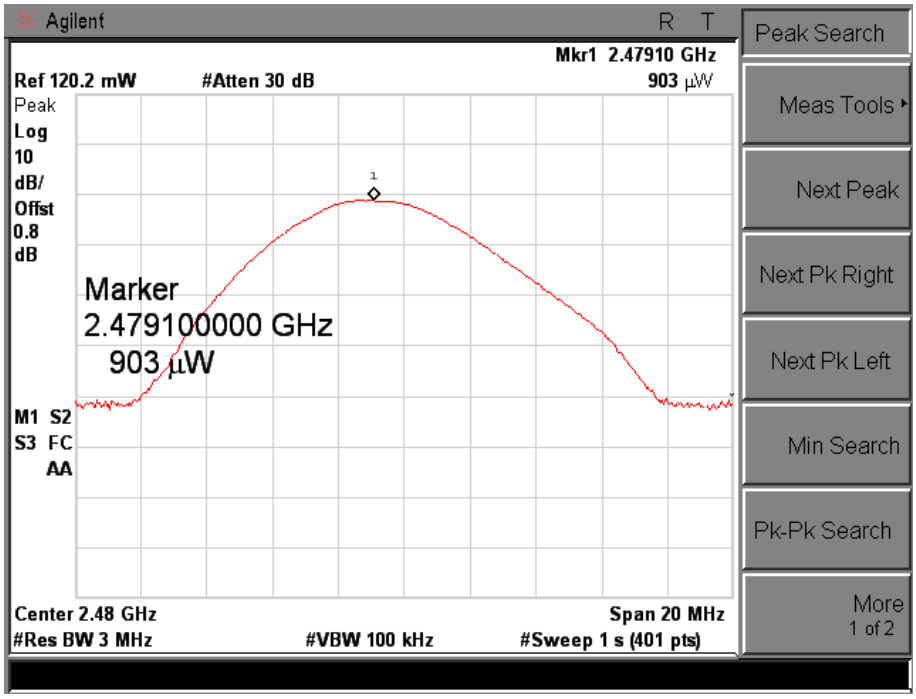
Frequency (MHz)	Result (㎼)	Limit (W)	Verdict
2,405	791.1	1	Pass
2,440	890.4	1	Pass
2,480	903	1	Pass



- Output Power 2,405 MHz -



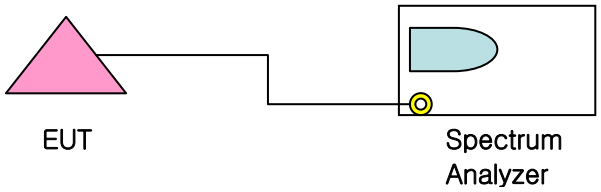
- Output Power 2,440 MHz -



- Output Power 2,480 MHz –

3.3. 100 KHz Bandwidth of Frequency Band Edges

Test Setup Layout

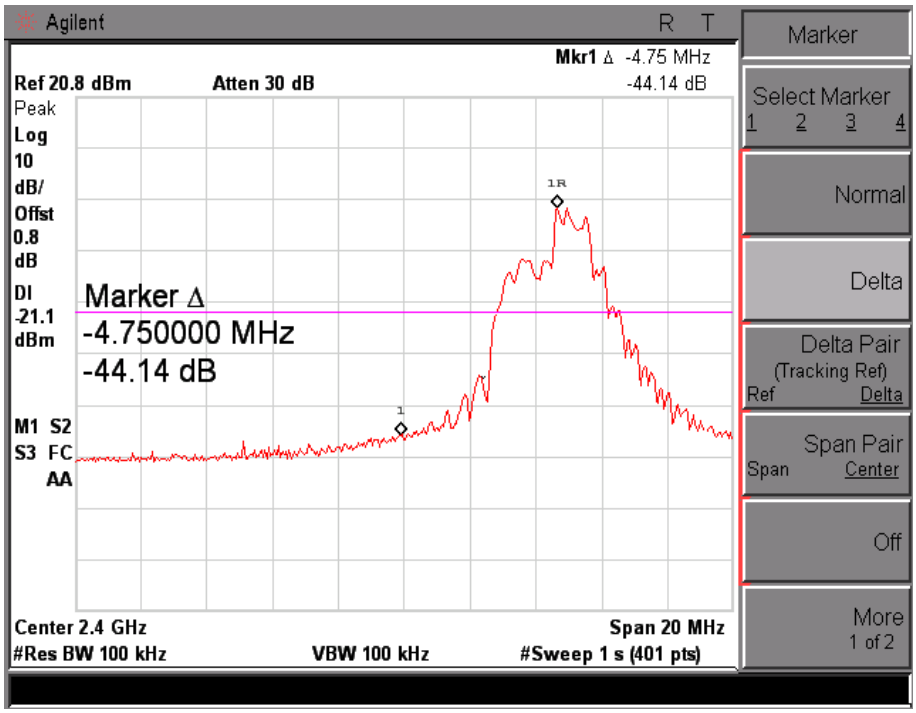


Test Condition

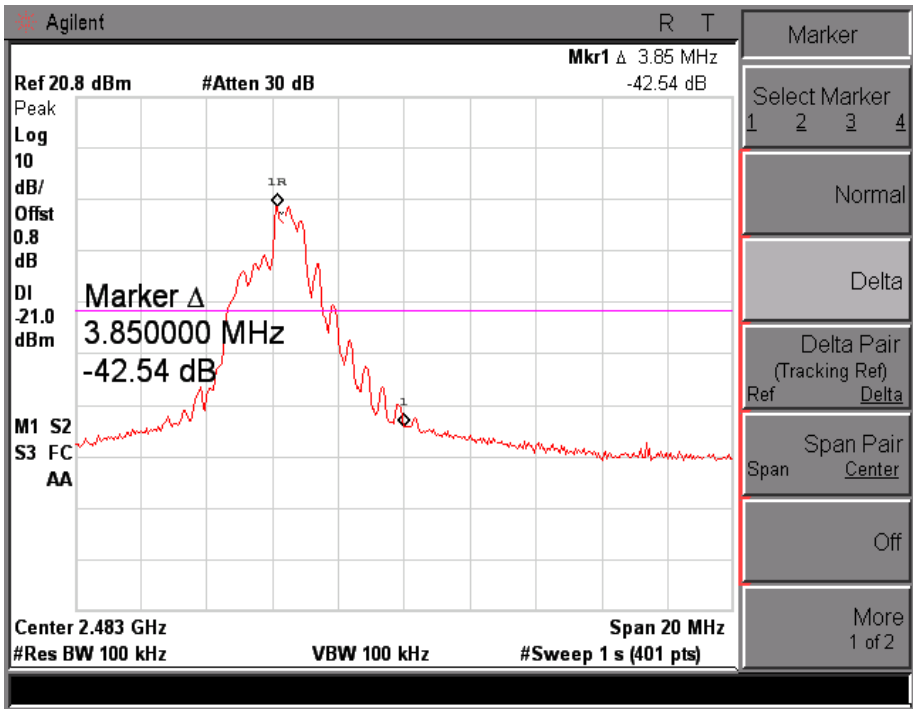
- Set RBW of Spectrum analyzer to 100 kHz
- The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.
- The maximum frequency range measuring with the spectrum from 30 MHz to 20 GHz is investigated with the transmitter

Test result

Frequency (MHz)	Result (dBc)	Limit (dBc)	Verdict
2,405	40 >	20	Pass
2,480	40 >	20	Pass



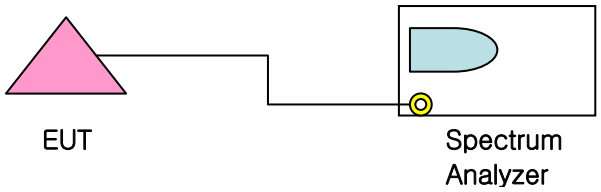
- Lower side band edge -



- Upper side band edge –

3.4. Conducted Spurious Emission

Test Setup Layout

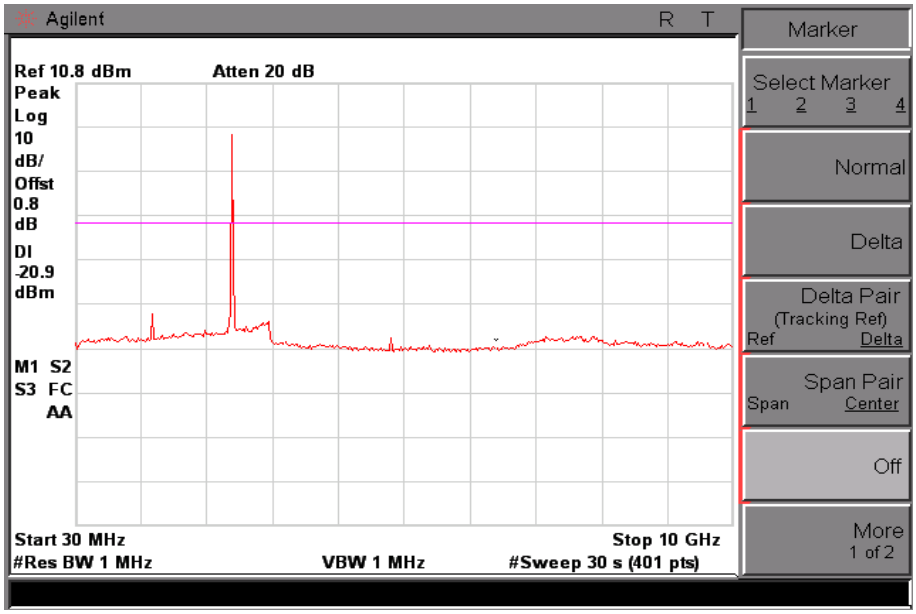


Test Condition

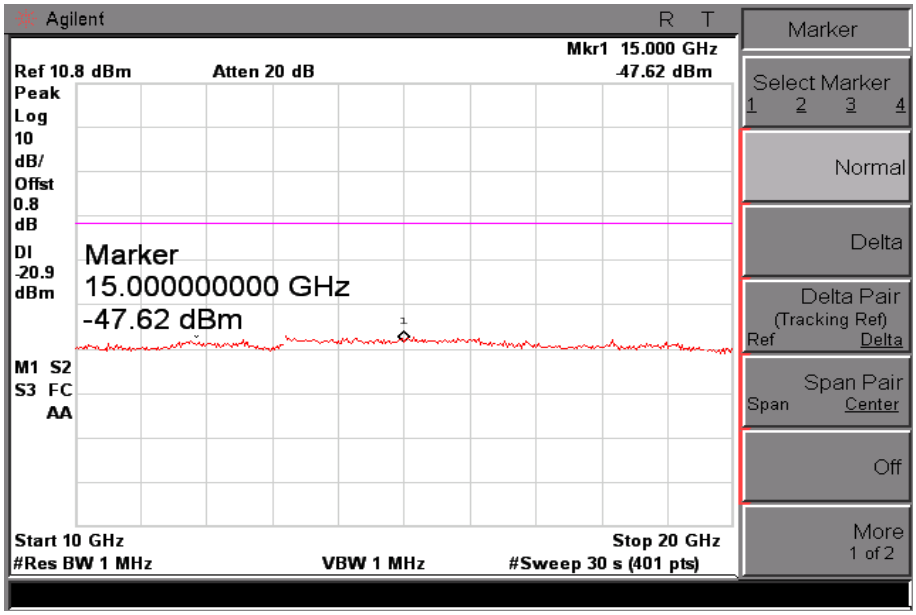
- The Equipment Under Test (EUT) was set up in a shielded room to perform the spurious emissions measurements.
- The EUT was connected to the spectrum analyzer.
- The reference value for the measurement of the spurious RF conducted emissions is determined during the test “band edge compliance” (cf. chapter 4.5). This value is used to calculate the 20 dBc limit.

Test result

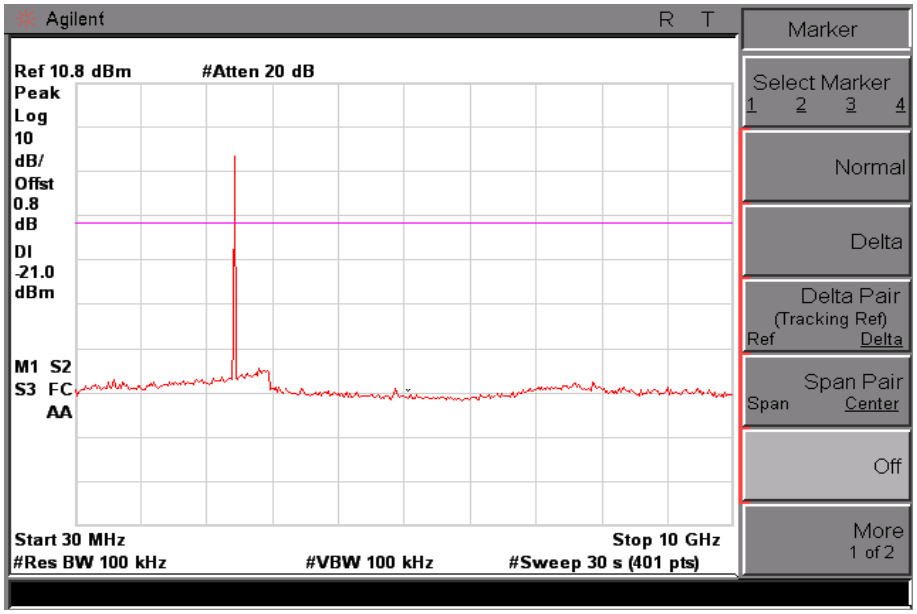
Frequency (MHz)	Result (dBc)	Limit (dBc)	Verdict
2,405	40 >	20	Pass
2,440	40 >	20	Pass
2,480	40 >	20	Pass



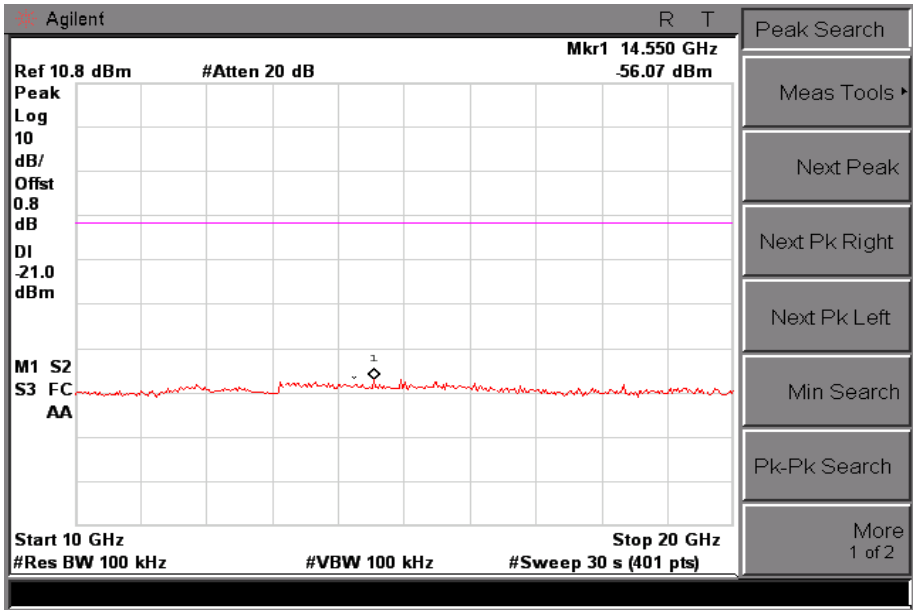
- Spurious emission of 2,405 MHz –



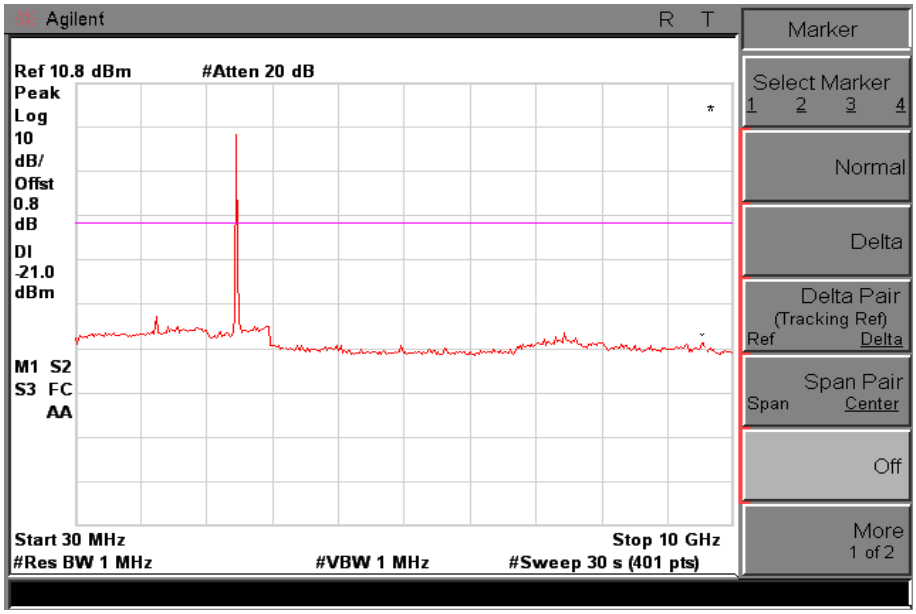
- Spurious emission of 2,405 MHz –



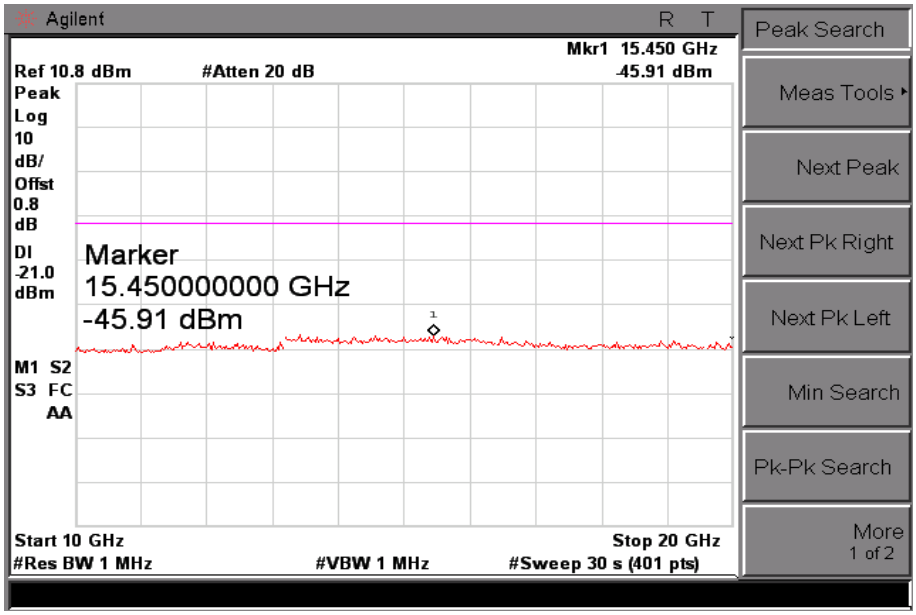
– Spurious emission of 2,440 MHz –



– Spurious emission of 2,440 MHz –



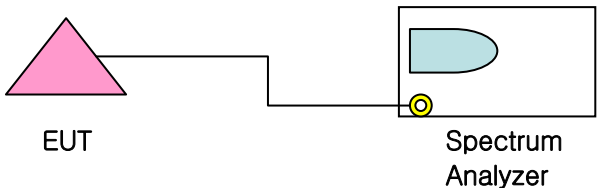
– Spurious emission of 2,480 MHz –



– Spurious emission of 2,480 MHz –

3.5. Power Spectrum Density Measurement

Test Setup Layout

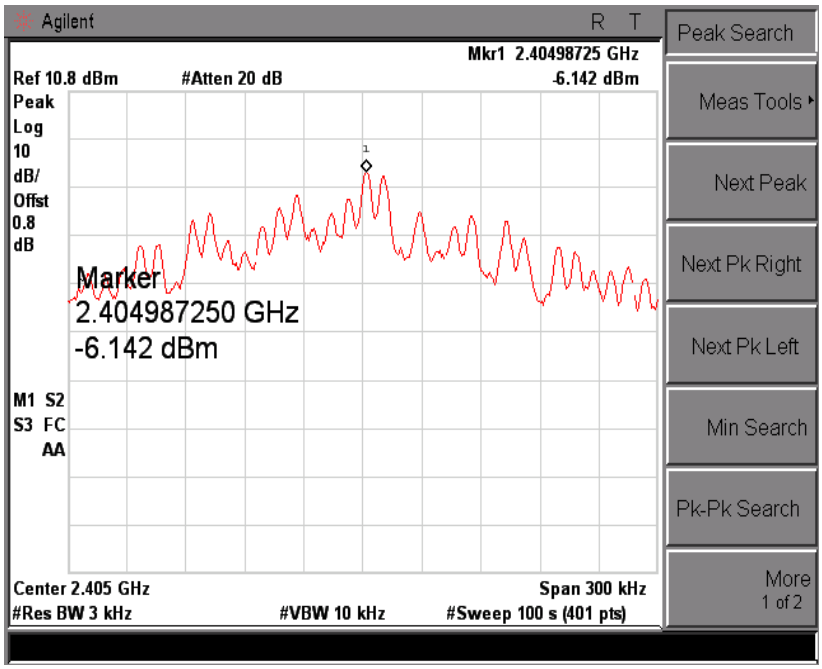


Test Condition

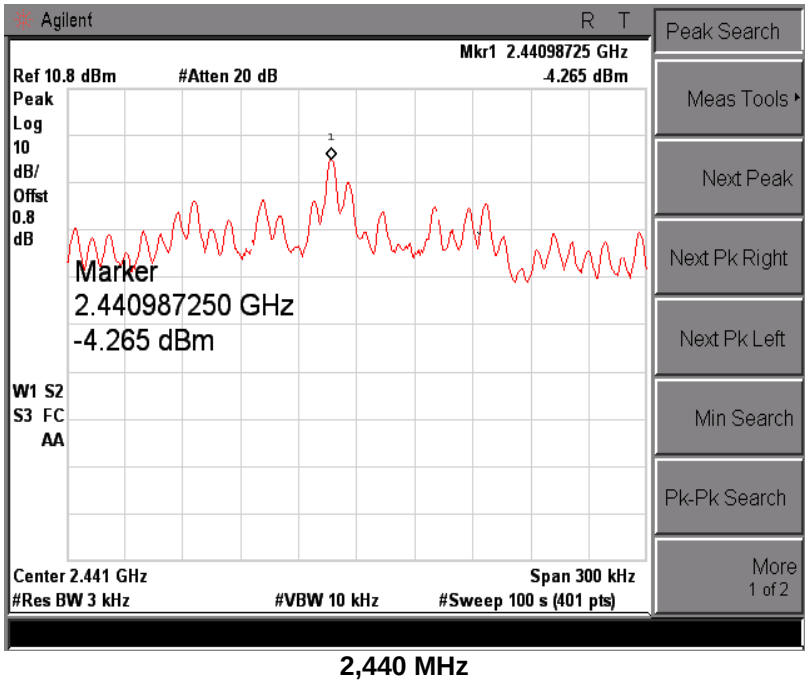
- The EUT output was connected to the spectrum analyzer, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 10kHz VBW, set sweep time = span/3kHz. (sweep time = 100 kHz)

Test result

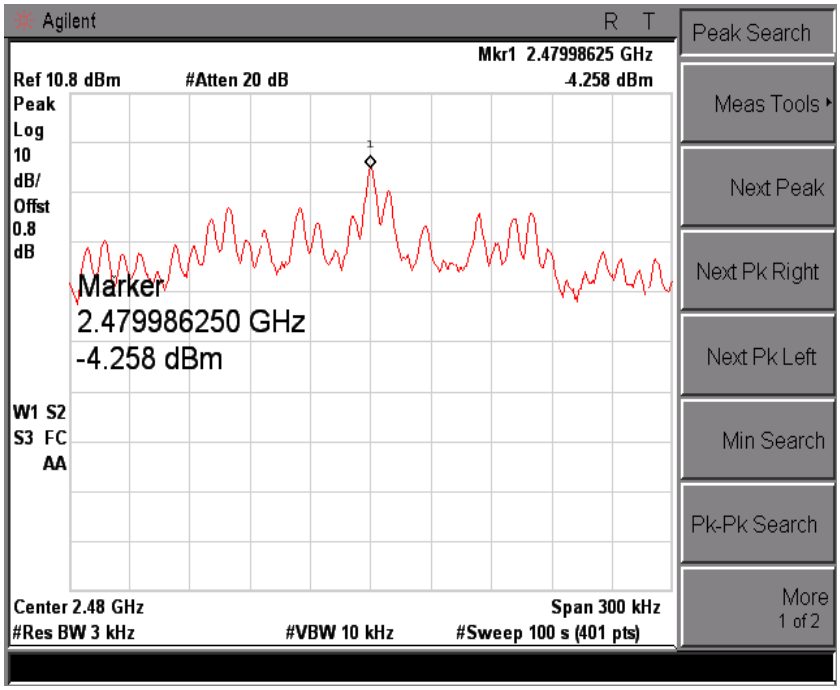
Frequency (MHz)	Result (dBm)	Limit (dBm)	Verdict
2,405	-6.142	8	Pass
2,440	-4.265	8	Pass
2,480	-4.258	8	Pass



2,405 MHz



2,440 MHz


Agilent
R T
Mkr1 2.47998625 GHz
Ref 10.8 dBm
#Atten 20 dB
-4.258 dBm
Peak
Log
10
dB/
Offst
0.8
dB
Marker
2.479986250 GHz
-4.258 dBm
W1 S2
S3 FC
AA
Center 2.48 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

2,480 MHz

3.6. Radiated Spurious Emission

Test Results

3.5.5.1 Spurious Radiated Emission (Section 15.209)

Model No. : AT-104
Test distance : 3m
Test mode : Continuous TX
Dat : Nov 27, 2008

Frequncy MHz	Antenna Pol. H/V	Detector	Reading Level dBμV	Correction (AF+CL) dB/m	Emission Level dBμV/m	Limit dBμV/m	Margin +/-
30.54	V	Q	0.53	12.9	13.43	40	26.57
30.72	H	Q	14.22	12.9	27.12	40	12.88
32.16	V	Q	9.38	12.9	22.28	40	17.72
234.12	V	Q	2.94	12.6	15.54	46	30.46
303	V	Q	5.21	15.2	20.41	46	25.59
384	V	Q	3.12	17.3	20.42	46	25.58

Note : 1. Measurement was done over the frequency range from 30 MHz to 10th harmonic. The EUT was rotated and the antenna was changed to a range of height of from 1 m to 4 m above the ground plane for maximum response.
2. The observed EMI Receiver (ESIB26) noise floor level was 2.0 dBμV. And all other emissions not reported on data were more than 40 dB below the permitted level.

* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
Antenna Polarization (H : Horizontal, V : Vertical)
A.F. : Antenna Factor
C.L. : Cable Loss
A.G. : Amplifier Gain

Remark : Emission level (dBμV/m) = Reading level (dBμV) + Correction (dB/m) + Amplifier Gain (dB)
Margin (dB) = Limit (dBμV/m) – Emission level (dBμV/m)
The "+" sign of the margin means that emission level are within the limit and the "-" sign means over the limit.

3.5.5.3 Spurious Radiated Emission (Section 15.247(d))

Model No. : AT-104
Test distance : 3m
Test mode : Continuous TX
Test Frequency : 2,405 MHz
Date : Nov 14, 2008

Frequncy MHz	Antenna Pol. H/V	Detector	Reading Level dBµV	Correction (AF+CL+AG) dB/m	Emission Level dBµV/m	Limit dBµV/m	Margin +/-
4,808	V	P	48.7	24.6	73.3	74.0	+0.7
4,808	V	A	28.6	24.6	53.2	54.0	+0.8

Note : 1. Measurement was done over the frequency range from 30 MHz to 10th hramonic. The EUT was rotated and the antenna was changed to a range of height of from 1 m to 4 m above the ground plane for maximum response.
2. The observed Spectrum Analyzer (E4448A) noise floor level was 2.0 dBµV. And all other emissions not reported on data were more than 40 dB below the permitted level.
3. For measurement the video bandwidth is set to 10 Hz for average measurements.

* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
Antenna Polarization (H : Horizontal, V : Vertical)
A.F. : Antenna Factor
C.L. : Cable Loss
A.G. : Amplifier Gain

Remark : Emission level (dBµV/m) = Reading level (dBµV) + Correction (dB/m) + Amplifier Gain (dB)
Margin (dB) = Limit (dBµV/m) – Emission level (dBµV/m)
The "+" sign of the margin means that emission level are within the limit and the "-" sign means over the limit.

3.5.5.4 Spurious Radiated Emission (Section 15.247(d))

Model No. : AT-104
Test distance : 3m
Test mode : Continuous TX
Test Frequency : 2,440 MHz
Date : Nov 27, 2008

Frequncy MHz	Antenna Pol. H/V	Detector	Reading Level dBµV	Correction (AF+CL+AG) dB/m	Emission Level dBµV/m	Limit dBµV/m	Margin +/-
4,880	V	P	49.5	24.0	73.5	74.0	+0.5
4,880	V	A	29.6	24.0	53.6	54.0	+0.4

Note : 1. Measurement was done over the frequency range from 30 MHz to 10th hramonic. The EUT was rotated and the antenna was changed to a range of height of from 1 m to 4 m above the ground plane for maximum response.
2. The observed Spectrum Analyzer (E4448A) noise floor level was 2.0 dBµV. And all other emissions not reported on data were more than 40 dB below the permitted level.
3. For measurement the video bandwidth is set to 10 Hz for average measurements.

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* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
Antenna Polarization (H : Horizontal, V : Vertical)
A.F. : Antenna Factor
C.L. : Cable Loss
A.G. : Amplifier Gain

Remark : Emission level (dBµV/m) = Reading level (dBµV) + Correction (dB/m) + Amplifier Gain (dB)
Margin (dB) = Limit (dBµV/m) – Emission level (dBµV/m)
The "+" sign of the margin means that emission level are within the limit and the "-" sign means over the limit.

3.5.5.5 Spurious Radiated Emission (Section 15.247(d))

Model No. : AT-104
Test distance : 3m
Test mode : Continuous TX
Test Frequency : 2,480 MHz
Date : Nov 27, 2008

Frequncy MHz	Antenna Pol. H/V	Detector	Reading Level dBµV	Correction (AF+CL+AG) dB/m	Emission Level dBµV/m	Limit dBµV/m	Margin +/-
4,956	V	P	49.1	24.3	73.4	74.0	+0.6
4,956	V	A	29.3	24.3	53.6	54.0	+0.4

Note : 1. Measurement was done over the frequency range from 30 MHz to 10th hramonic. The EUT was rotated and the antenna was changed to a range of height of from 1 m to 4 m above the ground plane for maximum response.
2. The observed Spectrum Analyzer (E4448A) noise floor level was 2.0 dBµV. And all other emissions not reported on data were more than 40 dB below the permitted level.
3. For measurement the video bandwidth is set to 10 Hz for average measurements.

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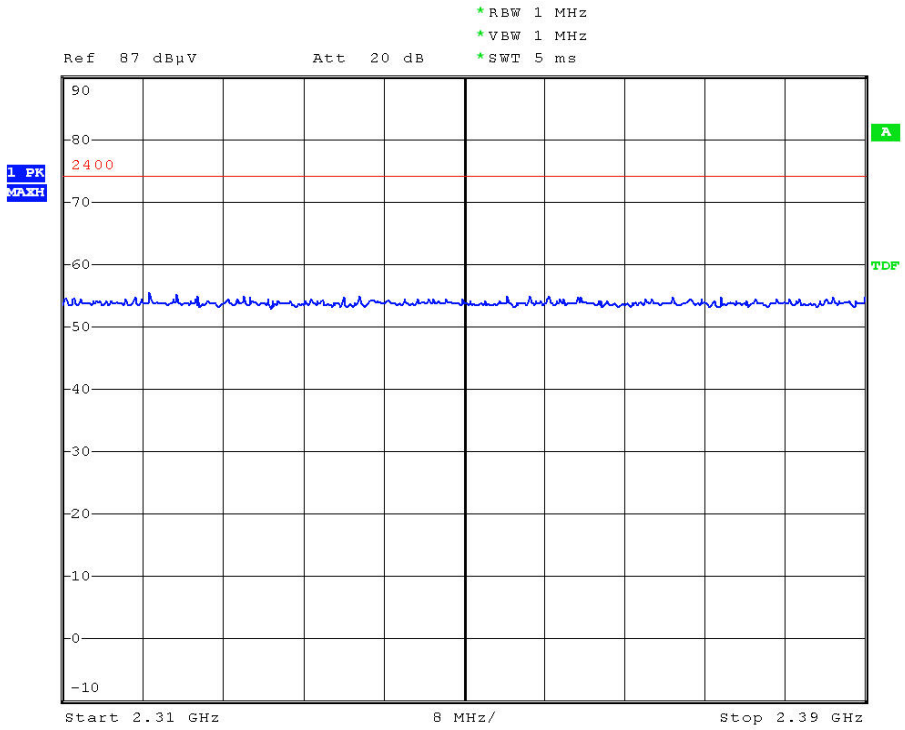
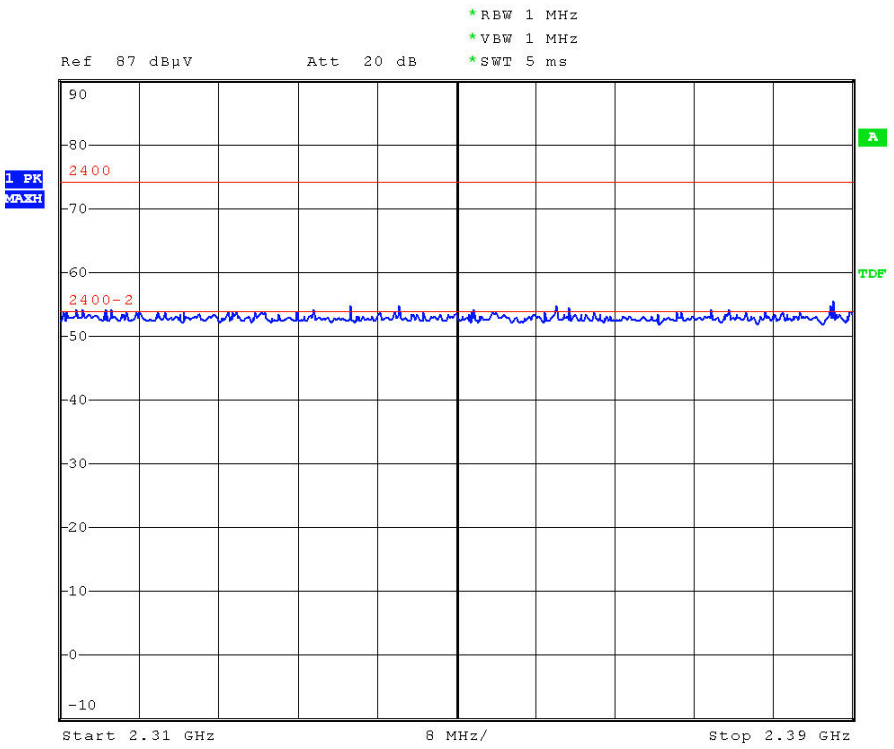
* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
Antenna Polarization (H : Horizontal, V : Vertical)
A.F. : Antenna Factor
C.L. : Cable Loss
A.G. : Amplifier Gain

Remark : Emission level (dBµV/m) = Reading level (dBµV) + Correction (dB/m) + Amplifier Gain (dB)
Margin (dB) = Limit (dBµV/m) – Emission level (dBµV/m)
The "+" sign of the margin means that emission level are within the limit and the "-" sign means over the limit.

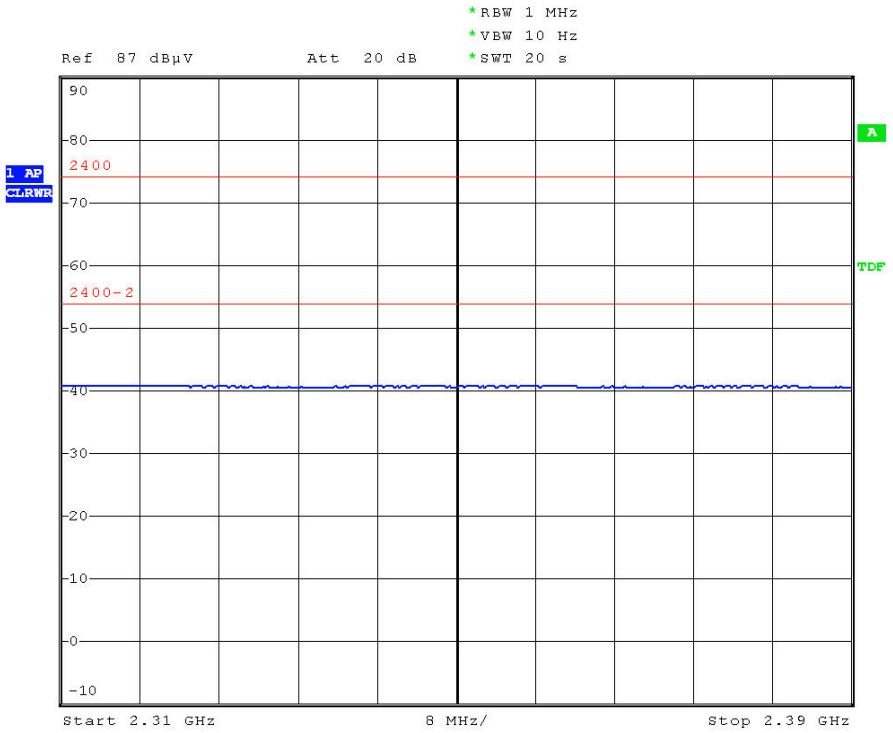
3.5.5.6 Restricted Bandedge



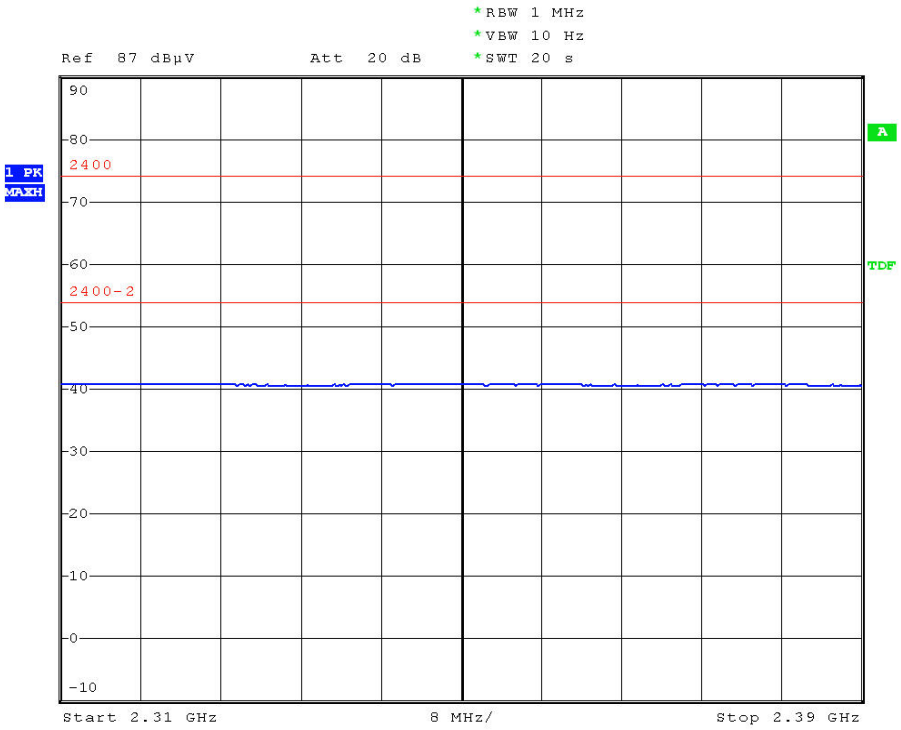
– Low channel restricted bandedge, Peak, Horizontal –



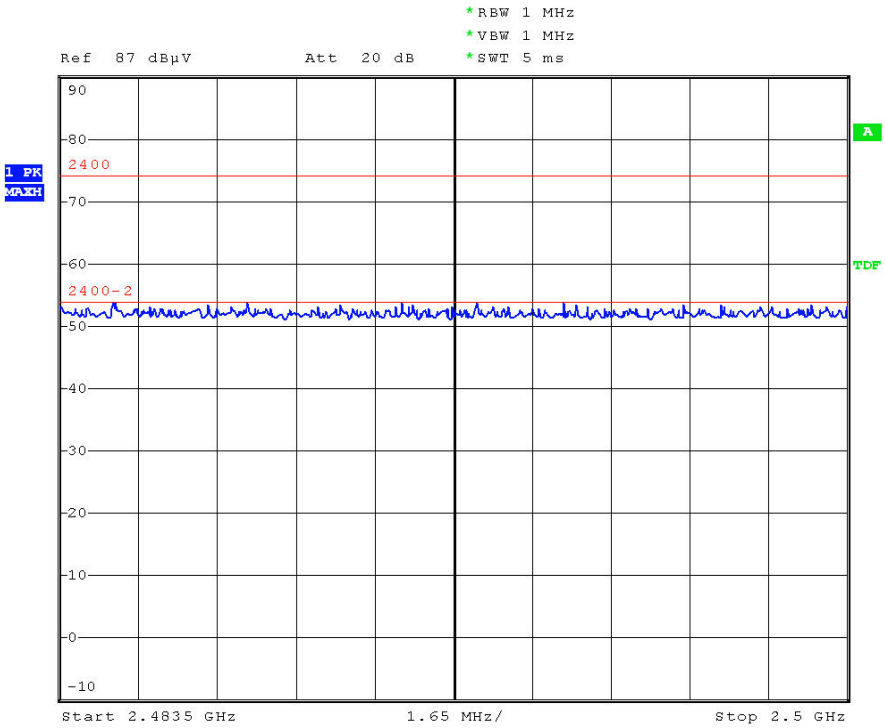
– Low channel restricted bandedge, Peak, Vertical –



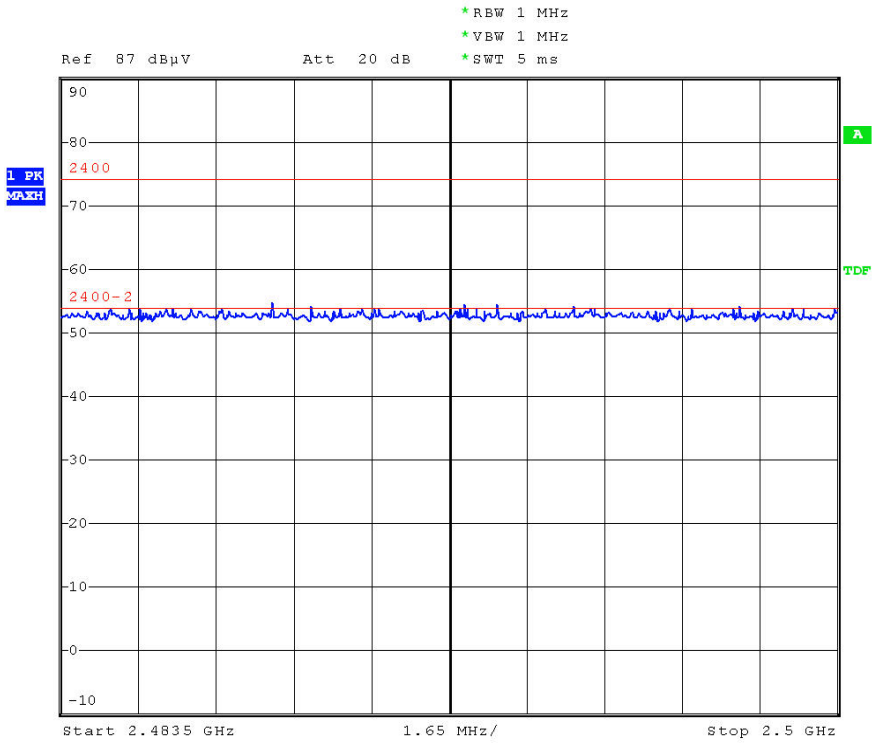
– Low channel restricted bandedge, Average, Horizontal –



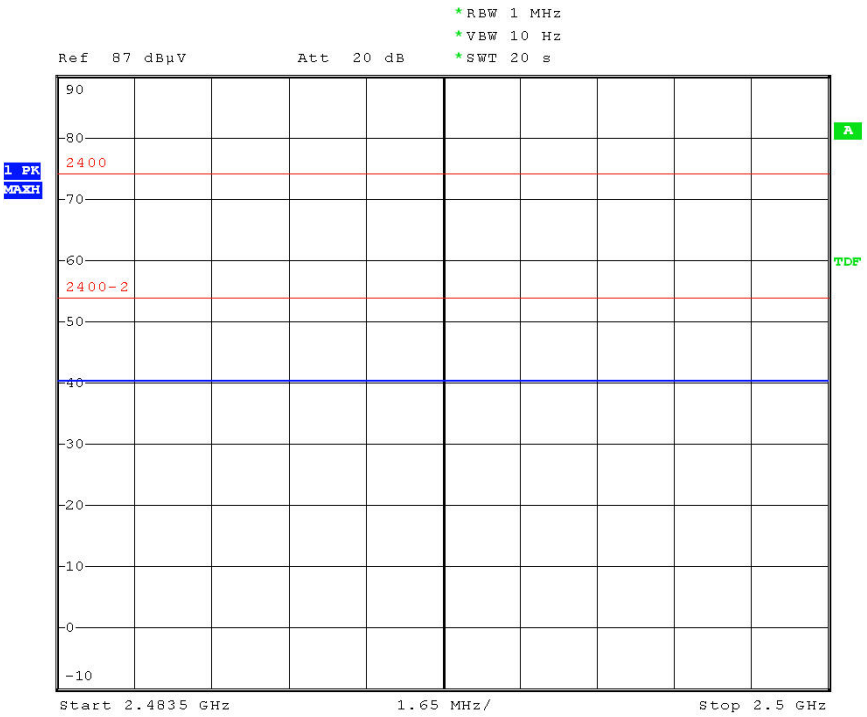
– Low channel restricted bandedge, Average, Vertical –



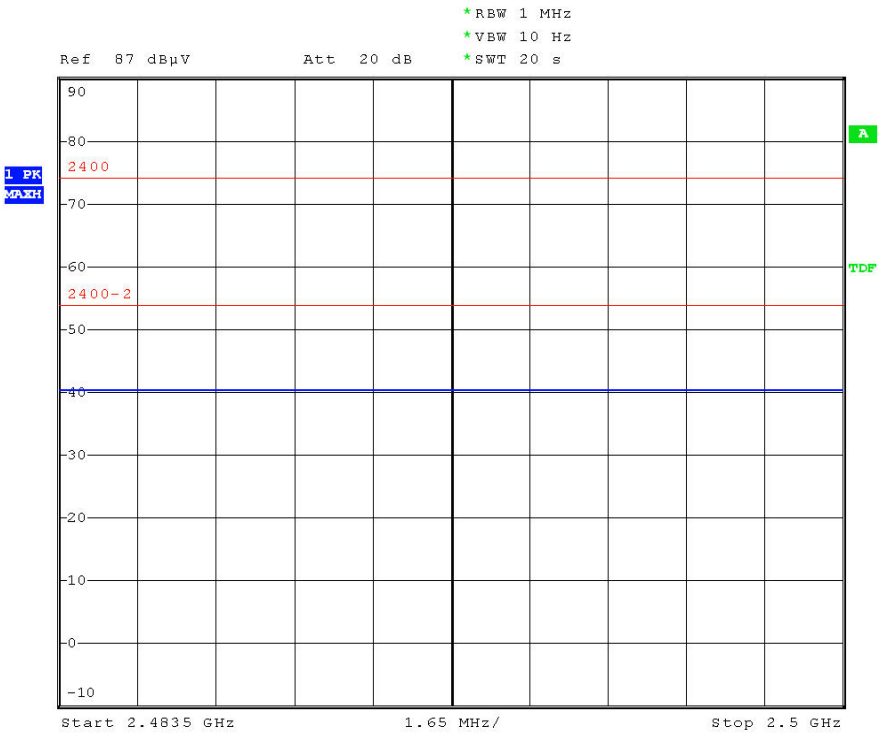
– High channel restricted bandedge, Peak, Horizontal –



– Low channel restricted bandedge, Peak, Vertical –



– High channel restricted bandedge, Average, Horizontal –

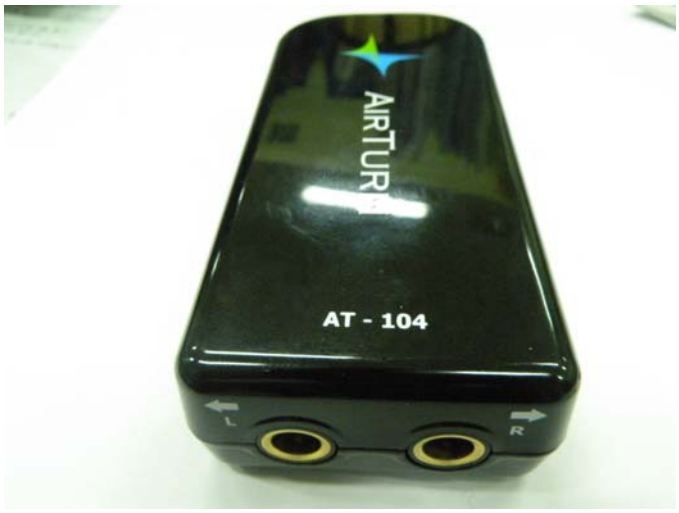


– Low channel restricted bandedge, Average, Vertical –

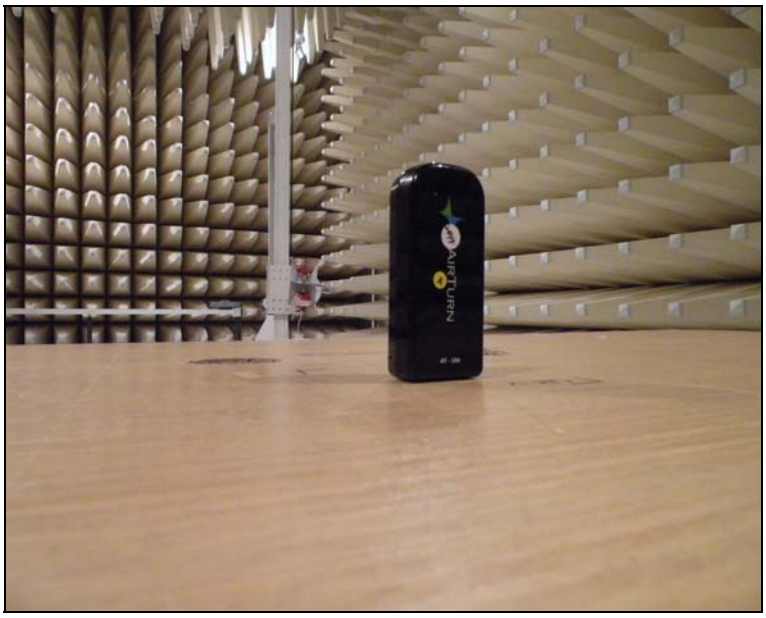
4. TEST EQUIPMENTS

No.	Equipment	Manufacturer	Model	S/N	Effective Cal.Duration
1	EMI Receiver (20 Hz ~ 26.5 GHz)	R&S	ESIB	100280	08/17/2008 ~ 08/17/2009
2	Spectrum Analyzer (100 Hz ~ 26.5 GHz)	Agilent	E4407B	US41443316	12/01/2007 ~ 12/01/2008
3	Spectrum Analyzer (3 Hz ~ 50 GHz)	Agilent	E4448A	MY43360322	08/30/2008 ~ 08/30/2009
4	Pre-Amplifier (100 kHz ~ 1 GHz)	SONOMA.	310N	186270	08/25/2008 ~ 08/25/2009
5	Pre-Amplifier (0.5 GHz ~ 26.5 GHz)	Agilent	83017A	MY39500982	04/02/2008 ~ 04/02/2009
6	LISN(50 Ω , 50 μH) (10 kHz ~ 100 MHz)	R&S	ESH3-Z5	826789009	07/05/2008 ~ 07/05/2009
7	Biconi-Log Ant. (30 MHz ~ 1000 MHz)	Schwarzbeck	VULB9168	9168-180	08/24/2008 ~ 08/24/2009
8	Horn Ant. (1 GHz ~ 18 GHz)	EMCO	3115	9012-3595	03/26/2007 ~ 03/26/2009
9	Horn Ant. (18 GHz ~ 40 GHz)	EMCO	3116	2664	03/26/2007 ~ 03/26/2009
10	Active Loop Ant. (9 kHz ~ 30 MHz)	EMCO	6502	2532	06/08/2008 ~ 06/08/2009
11	DC Power Supply	Agilent	E4356A	MY41000296	10/01/2008 ~ 10/01/2009
12	Power Meter	Agilent	E4417A	GB4129075	09/17/2008 ~ 09/17/2009
13	Bluetooth tester	anrisu	MT8852B	6K00006994	03/03/2008 ~ 03/03/2009

Appendix.1 EUT photo

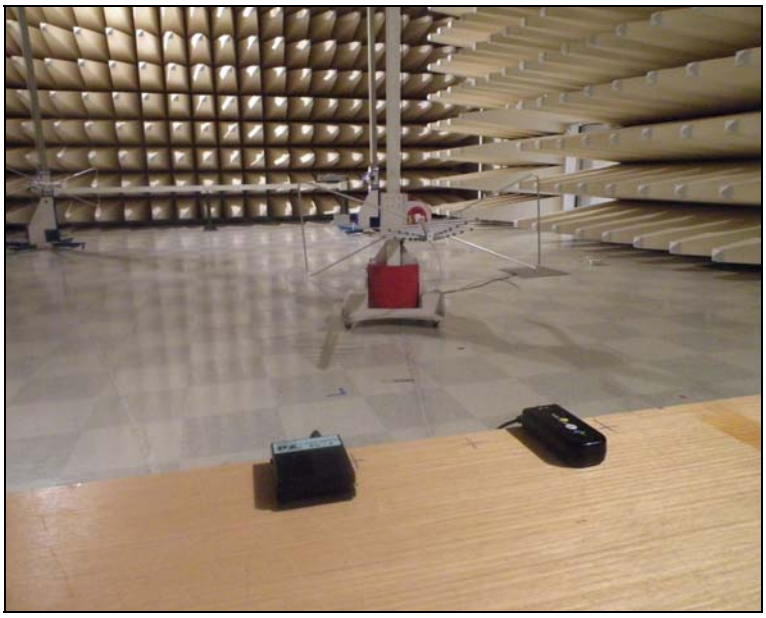


Appendix.2 Test setup photo

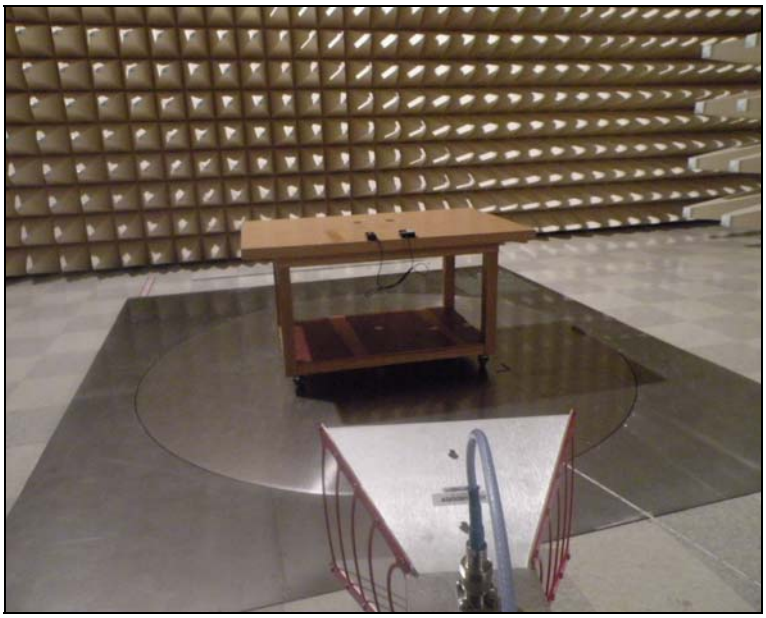


<Radiated Emission>

<Radiated Emission>



<Radiated Emission>



<Restricted Band edge>