

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 B

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

The test results contained apply only to the test sample(s) supplied by the applicant, and this test report shall not be reproduced in full or in part without approval of the KTL in advance.

Korea Testing Laboratory

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1. GENERAL INFORMATION

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	JBP – Part 15 Class B Computing Device Peripheral
Model Name	AT-104
FCC ID	WWHAT104R
Frequency Band	2405 ~ 2480 MHz
Type of Modulation	GFSK
Number of Channels	76 channels
Max Antenna Gain	- 2.613 dBi
Function Type	Receiver
Hardware version	1.0
Software version	1.0

1.3. Testing Laboratory

Testing Place	Korea Testing Laboratory (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@ctl.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 Part 15.207, 15.247, and 15.209

FCC Rules	Test Requirements	Result	Comments
15.107	AC conducted Emission	Pass	See Data sheets
15.109(a)	Radiated Emission	Pass	See Data sheets

Note 1 : Test results reported in this document relate only to the items tested

Note 2 : The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria

Note 3 : Test results apply only to the item(s) tested

*** Modifications required for compliance**

No modifications were implemented by KTL.

All results in this report pertain to the un-modified sample provided to KTL.

3. Measurement & Results

3.1. AC Conducted Emissions

3.1.1. Test Procedure

Conducted emission measurements on the EUT were performed by "AC Power Line Conducted Emissions Testing" procedure as per ANSI C63.4. The EUT was set up on a wooden table 0.8 meters height, 1.0 by 1.5 meters in size, placed in the shielded enclosed with a side of wall of which constituted a vertical conducting surface of 2.2 m x 3.1 m in size to maintain 40 cm from the rear of EUT

LISN(Line Impedance Stabilization Network, ROHDE & SCHWARZ, ESH3-Z5, 50 ohm / 50 μ H) was installed and electrically boned to the conducting ground plane. The EUT was connected to the LISN using a typical power adapter.

One of two 50 ohm output terminals of the LISN was connected to the EMI Receiver (ROHDE & SCHWARZ, ESCI, 9 kHz to 3 GHz) and the other was terminated in 50 ohms. Measurements were again performed after interchanging such a connection oppositely.

The frequency range from 150 kHz to 30 MHz was examined and the remarkable frequencies were measured with Quasi-peak and Average values using the EMI receiver instrument (ROHDE & SCHWARZ, ESIB, 9 kHz to 26.5 GHz ; Detector Function ; CISPR Quasi-Peak & Average). The 6 dB bandwidth of the Receiver was set to 9 kHz

The position of connecting cables of the EUT was changed to find the worst case configuration during measurements. The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

Every Mode were investigated and worst value was recorded.

3.1.2.Limits

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges

Frequency (MHz)	Conducted Limits (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

- Decreases with the logarithm of the frequency.

3.1.3. Sample calculation

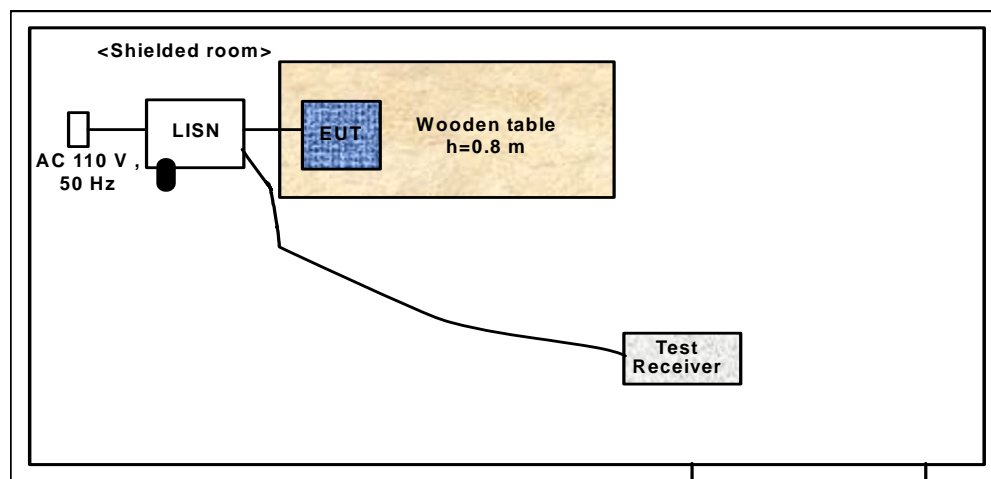
The emission level measured in decibels above one microvolt (dB μ V) was converted into microvolt (μ V) as shown in following sample calculation.

For example :

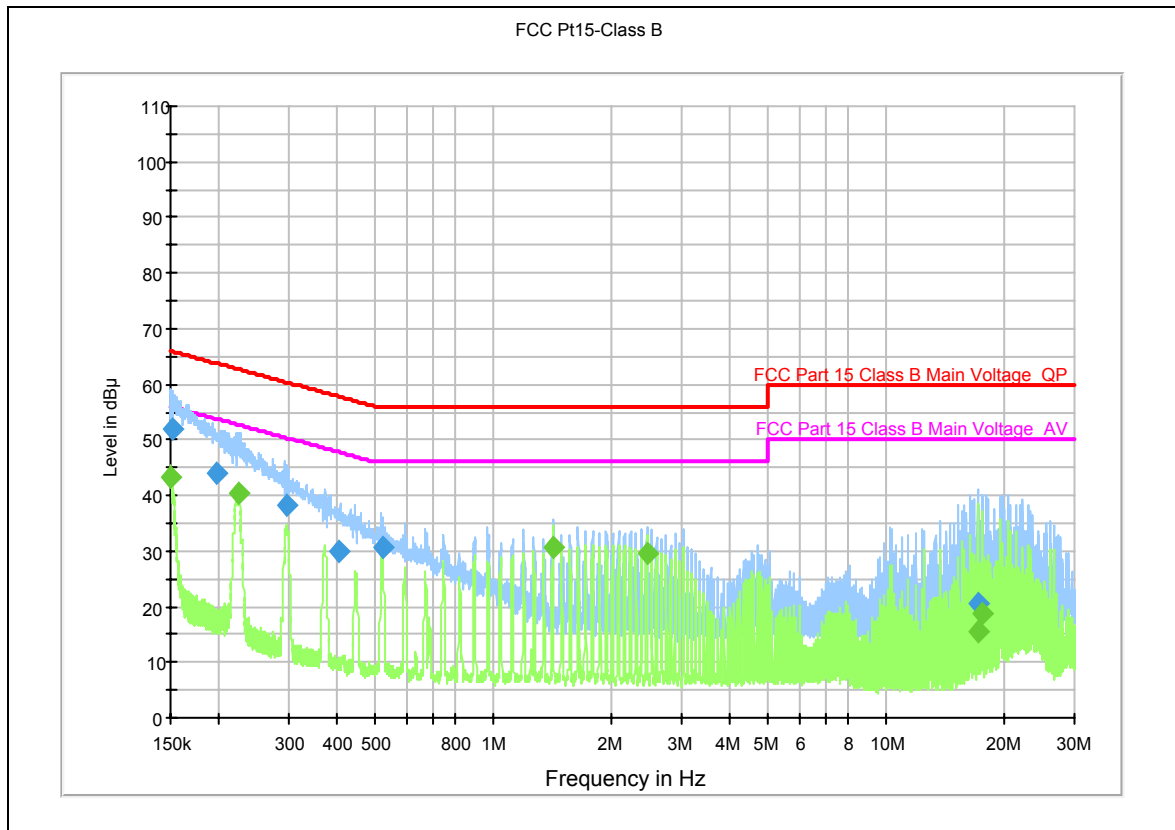
Measured Value at	0.32 MHz	36.7dB μ V @ Q-Peak mode
+ Correct factor *		9.7 dB
= Conducted Emission		46.4dB μ V

* Correct factor is adding RF cable loss and Attenuation

3.1.4. Test configuration



3.1.5. Test Results



Final Measurement QuasiPeak

Frequency (MHz)	QuasiPeak (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.151507	52	L1	9.7	13.9	65.9
0.196811	43.9	L1	9.7	19.8	63.7
0.296937	38.1	N	9.7	22.2	60.3
0.403135	29.8	N	9.8	28	57.8
0.520294	30.8	N	9.8	25.2	56
16.981514	20.5	L1	10.5	39.5	60

Final Measurement Average

Frequency (MHz)	Average (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.15015	43.2	N	9.7	12.8	56
0.222635	40.4	N	9.7	12.3	52.7
1.410065	30.7	N	10	15.3	46
2.446798	29.4	L1	10	16.6	46
16.981514	15.6	L1	10.5	34.4	50
17.429667	18.9	L1	10.5	31.1	50

3.2. Radiated Spurious Emissions

3.2.1. Test procedure

3.2.1.1 Preliminary Testing for Reference

Preliminary testing was performed in a KTL absorber-lined room to determine the emission characteristics of the EUT. The EUT was placed on the wooden table which has dimensions of 0.8 meters in height, 1 meter in length and 1.5 meters in width. Receiving antenna (Biconi-Log antenna : 30 to 1000 MHz or Horn Antenna : 1 to 40 GHz) was placed at the distance of 3 meter from the EUT.

An attempt was made to maximize the emission level with the various configurations of the EUT. Emission levels from the EUT with various configurations were examined on a spectrum analyzer connected with a RF amplifier and graphed.

The emission was within the illumination area of the 3 dB beam width of the antenna so that the maximum emission from the EUT is measured.

3.2.1.2 Final Radiated Emission Test at an Absorber-Lined Room

The final measurement of radiated field strength was carried out in a KTL Absorber-Lined Room that was listed up at FCC according to the "Radiated Emissions Testing" procedure specified by ANSI C63.4.

Based on the test results in preliminary test, measurement was made in same test set up and configuration which produced maximum emission level. Receiving antenna was installed at 3-meter distance from the EUT, and was connected to an EMI receiver.

Turntable was rotated through 360 degrees and receiving antenna height was varied from 1 to 4 meters above the ground plane to read maximum emission level. Receiving antenna polarization was changed vertical and horizontal. The worst value was recorded.

If necessary, the radiated emission measurements could be performed at a closer distance than specified distance to ensure higher accuracy and their results were extrapolated to the specified distance using an inverse linear distance extrapolation factor (20 dB/decade) as per Section 15.31(f).

The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

Tested in x, y, z axis and worst case results are reported

The maximum frequency range measuring with the spectrum from 30 MHz to 2 GHz is investigated with the transmitter

3.2.2. Limits

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field strength (Microvolts/meters)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following :

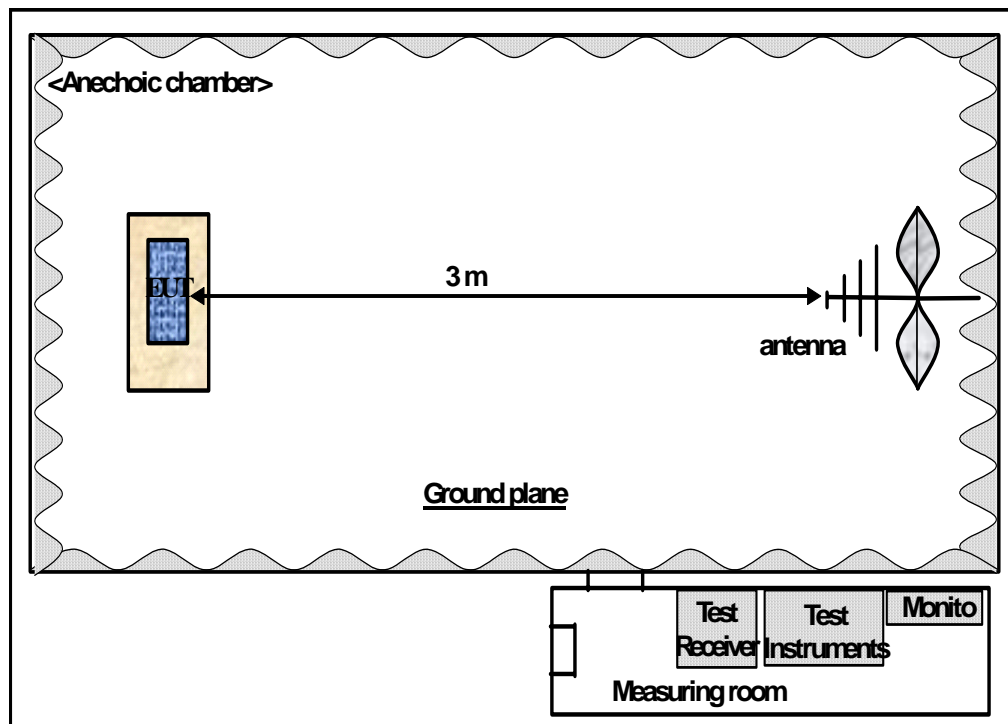
Frequency of Emission (MHz)	Field strength (Microvolts/meters)
30 – 88	90
88 – 216	150
216 – 960	210
Above 960	300

3.2.3. Sample Calculation

The emission level measured in decibels above one microvolt ($\text{dB}\mu\text{V}$) was following sample calculation.
For example :

Measured Value at <u>48.2 MHz</u>	17.6 $\text{dB}\mu\text{V}$
Antenna Factor & Cable loss	14.3 dB
- Preamplifier	0.0 dB
<hr/>	
= Radiated Emission	31.9 $\text{dB}\mu\text{V}/\text{m}$

3.2.4. Photograph for the test configuration



3.2.5. Test Results

3.2.5.1 Radiated Emission (Section 15.109)

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

Frequency MHz	Antenna Pol. H/V	Detector	Reading Level dB μ V	Correction (AF+CL) dB/m	Emission Level dB μ V/m	Limit dB μ V/m	Margin +/-
199.44	H	Q	10.64	11.3	21.94	43.5	21.56
300.36	H	Q	9.59	15.0	24.59	46	21.41
330.78	H	Q	12.21	15.8	28.01	46	17.99
331.02	H	Q	12.85	15.8	28.65	46	17.35
367.74	H	Q	12.45	16.8	29.25	46	16.75
122.04	V	Q	9.71	12.4	22.11	43.5	21.39
401.22	V	Q	15.37	17.6	32.97	46	13.03
434.7	V	Q	12.7	18.7	31.4	46	14.6
498.36	V	Q	12.28	19.9	32.18	46	13.82
635.28	V	Q	10.64	23.1	33.74	46	12.26

Note : 1. Measurement was done over the frequency range from 30 MHz to 1 GHz. 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 dB μ V. 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 (dB μ V/m) = Reading level (dB μ V) + Correction (dB/m) + Amplifier Gain (dB)
 Margin (dB) = Limit (dB μ V/m) – Emission level (dB μ V/m)
 The “+” sign of the margin means that emission level are within the limit and the “-” sign means over the limit.

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 μ H) (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

