Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT	:	Scanner
MODEL/TYPE NO	:	cSCAN8500-C / NONE
FCC ID	:	NB5-CSCAN8500-C
MULTIPLE MODEL	:	-
BRAND NAME	:	-
APPLICANT	:	Chatsworth Data 9735 Lurline Avenue, Chatsworth, CA 91311, USA Attn.: Armando Ponce / Vice President
MANUFACTURER	:	WITEK SYSTEM INC. 3 Fl, Bum-A bldg, 66-5 Yangjae-dong, Seocho-gu, Seoul, Korea
FCC CLASSIFICATION	:	Class B Personal computers and peripherals
RULE PART(S)	:	FCC Part 15 Subpart B
TEST PROCEDURE	:	ANSI C63.4-2003
TEST REPORT No.	:	ETLE120810.0950
DATES OF TEST	:	August 16, 2012 to August 17, 2012
REPORT ISSUE DATE	:	August 28, 2012
TEST LABORATORY	:	ETL Inc. (FCC Designation Number: KR0022)

This Scanner, Model cSCAN8500-C has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B:
I attest to the accuracy of data. All measurement herein was performed by me or was made under my supervision and is correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared by:
Jae Young, Kwon (Test Engineer)
August 28, 2012

Reviewed by:
Hyung Min, Choi (Chief Engineer)
August 28, 2012

ETL Inc.
#371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
Tel: 82-2-858-0786 Fax: 82-2-858-0788

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FCC MEASUREMENT REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

General Information

Applicant Name : Chatsworth Data

Address : 9735 Lurline Avenue, Chatsworth, CA 91311, USA

Attention : Armando Ponce / Vice President

- **EUT Type :** Scanner
- **Model Number :** cSCAN8500-C
- **S/N :** -
- **Frequency Range :** OSC → 24.000 MHz
- **Rule Part(s) :** FCC Part 15 Subpart B
- **Test Procedure :** ANSI C63.4-2003
- **FCC Classification :** Class B Personal computers and peripherals
- **Dates of Tests :** August 16, 2012 to August 17, 2012
- **Place of Tests :** ETL Inc. Testing Lab. (FCC Designation Number : KR0022)

  Radiated Emission test;
  #499-1, Sagot-ri, Seosin-myeon, Hwaseong-si,
  Gyeonggi-do, 445-882, Korea

  Conducted Emission test;
  ETL Inc. Testing Lab. (FCC Designation Number : KR0022)
  371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No. :** ETLE120810.0950

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1. INTRODUCTION

The measurement tests for radiated and conducted emission test were conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.4-2003 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 m and 10 m site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2003 and registered to the Federal Communications Commission (FCC Designation Number : KR0022).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions from the Chatsworth Data, Model: cSCAN8500-C.

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2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the Scanner (model: cSCAN8500-C).

2.2 General Specification

Paper Path:
The cSCAN8500-C Reader has a paper path that is easily accessible for clearing jams and cleaning the optic head. A simple hinged connection allows the upper assembly to open for complete access to the paper path

Communication Interface:
USB 1.1, USB 2.0 Driver-Windows, Linux

Scan Resolution:
200 dpi x 200 dpi

Scan Light Source:
Visible 660 nm red light, Dual row illumination for wrinkle removal

Feed Method:
Manual insertion with powered transport feed through, software controlled, eject front or eject rear

Scanning Speed:
Up to 17.7 Inches (45 cm) per second

Throughput:
Approx. (25 - 35) slips per minute

Form Size:
From 3.25” x 3.00” to 8.50” x 32.90”

Paper Weight:
18 lb to 100 lb bond, ledger, index or OCR - .004 Inches to .010 Inches thick

Optional Duplex Scanning:
Dual scan heads at 200 dpi to scan both sides of a form in a single pass

Optional thermal brander:
1” thermal brander (right-top side)

Data Output:
Bit map image file – 256 gray scale,
Black & white

From Marking (Visible Red):
#2 Pencil
Blue or black ball point pen
Blue or black felt-tip pen
Pre-printed marks

Read Technique:
8.5”, 200 dpi high speed CIS (Contact Image Sensor) using red LED (660 nm) illumination

Power:
Universal power adapter
(100 – 240) VAC input, 24 VDC @ 2.7 A output

Operating Conditions:
(77 ± 36) ℉
(25 ± 20) ℃
(55 ± 25) % R.H., non-condensing

Weight:
3.6 kg (8 lb)

Dimensions:
(without exit tray)
11.75” (W) x 5.85” (H) x 6.00” (D)
29.85 cm (W) x 14.86 cm (H) x 15.24 cm (D)
(with exit tray)
11.75” (W) x 5.85” (H) x 13.00” (D)
29.85 cm (W) x 14.86 cm (H) x 33.00 cm (D)

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3. DESCRIPTION OF TESTS

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to a Spectrum Analyzer or a Test Receiver. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 9 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1 m x 1.5 m x 0.8 m wooden table which is placed 40 cm away from the vertical wall and 1.5 m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2 cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN. Non-inductive bundling to a 1 m length shortened all interconnecting cables more than 1 m. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the EMI Test Receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 MHz to 30 MHz. The bandwidth of the spectrum analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup in Appendix B.

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3.2 Radiated Emission Measurement

Radiated emission measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. The measurements were performed over the frequency range of 30 MHz to 40 GHz (or 5th harmonic of the highest frequency) in using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements below 1 GHz were made with the detector set for "Quasi-peak" within a bandwidth of 120 kHz. The measurements above 1 GHz were made with the detector set for "Peak and Average" within a bandwidth of 1 MHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determined the frequency producing the maximum emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1 000 MHz using Log-Bicon antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 3 m. The test equipment was placed on a wooden turn-table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high nonmetallic 1 m x 1.5 m table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 m to 4 m and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

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4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner and which tends to maximize its emission level in a typical application.

4.2 EUT operation

The equipment under test was operated during the measurement under following conditions:

	Conditions	Remark
■	Stand by	
■	During the test, EUT was the continuous scanning mode *	

* The worst case was investigated for emission test.

4.3 Support Equipment Used

Description	Model Name	Serial No.	Manufacturer	FCC
Adapter (for EUT)	STD-2427P	1124S09617	Adapter Technology Co., Ltd.	-
Notebook Computer	6730b	CNU8390GPZ	Hewlett-Packard Company	DoC
Adapter (for Notebook Computer)	Series PPP014H-S	F1-08070401760A	Hipro Electronics(Suzhou) Co., Ltd.	-

4.4 Type of Cables Used

Device from	Device to	Type of I/O port	Length[m]	Type of shield	Used ferrite core
EUT	Notebook Computer	USB	1.5	Shielded	O
EUT	Adapter	DC Input	1.2	Shielded	O
Notebook Computer	Adapter	DC Input	1.2	Shielded	O

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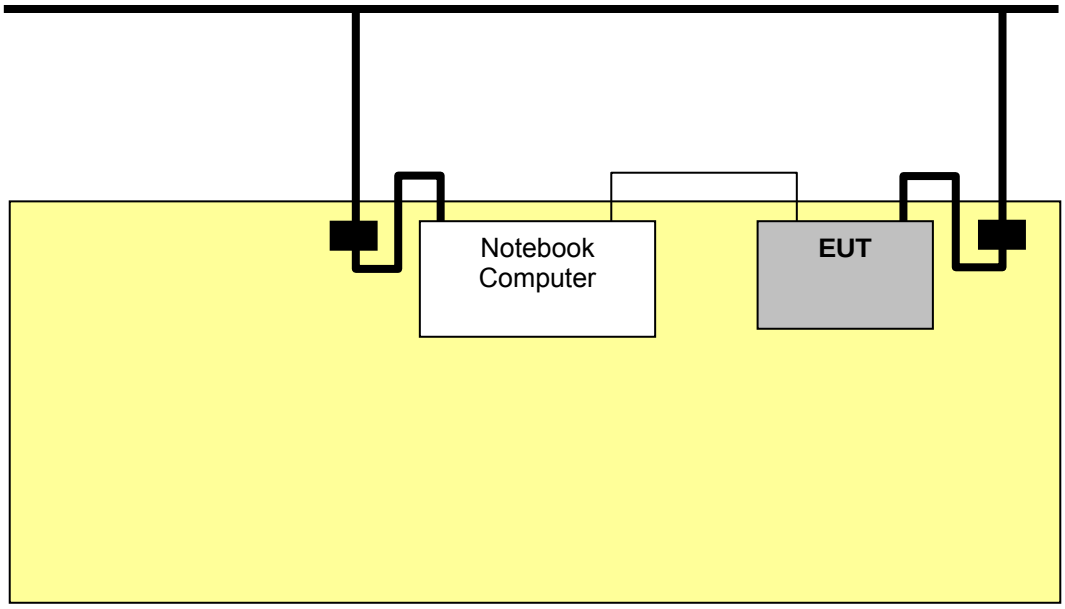
4.5 The setup drawing(s)



: Signal line

: Power line

: Adapter

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5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule	Measurement Required	Result
15.107(a)	Conducted Emission Measurement	**Passed by 13.00 dB**
15.109(a)	Radiated Emission Measurement	**Passed by 3.10 dB**

The data collected shows that the **Chatsworth Data / Scanner / cSCAN8500-C** complied with technical requirements of above rules part 15.107(a) and 15.109(a) Class B Limits.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

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5.2 Conducted Emissions Measurement

5.2.1 Conducted Emissions Data

EUT	Scanner / cSCAN8500-C (S/N: N/A)
Limit apply to	FCC Part 15.107(a) Class B
Test Date	August 17, 2012
Operating Condition	Continuous scanning mode
Result	Passed by 13.00 dB

Conducted Emission Test Data

The following graph shows the highest levels of conducted emissions on both polarizations of hot and neutral line.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 9 kHz)

NOTES:

1. **Please see the measured data and graph in next page.**
2. **The c.f value was included the antenna factor and cable loss.**
3. **Result value = Reading + c.f**
4. **Margin = Limit - Result**
5. **Measurement were performed at the AC Power Inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC Part 15.107(a) Class B.**
6. **If the average limit is met when using a Quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.**

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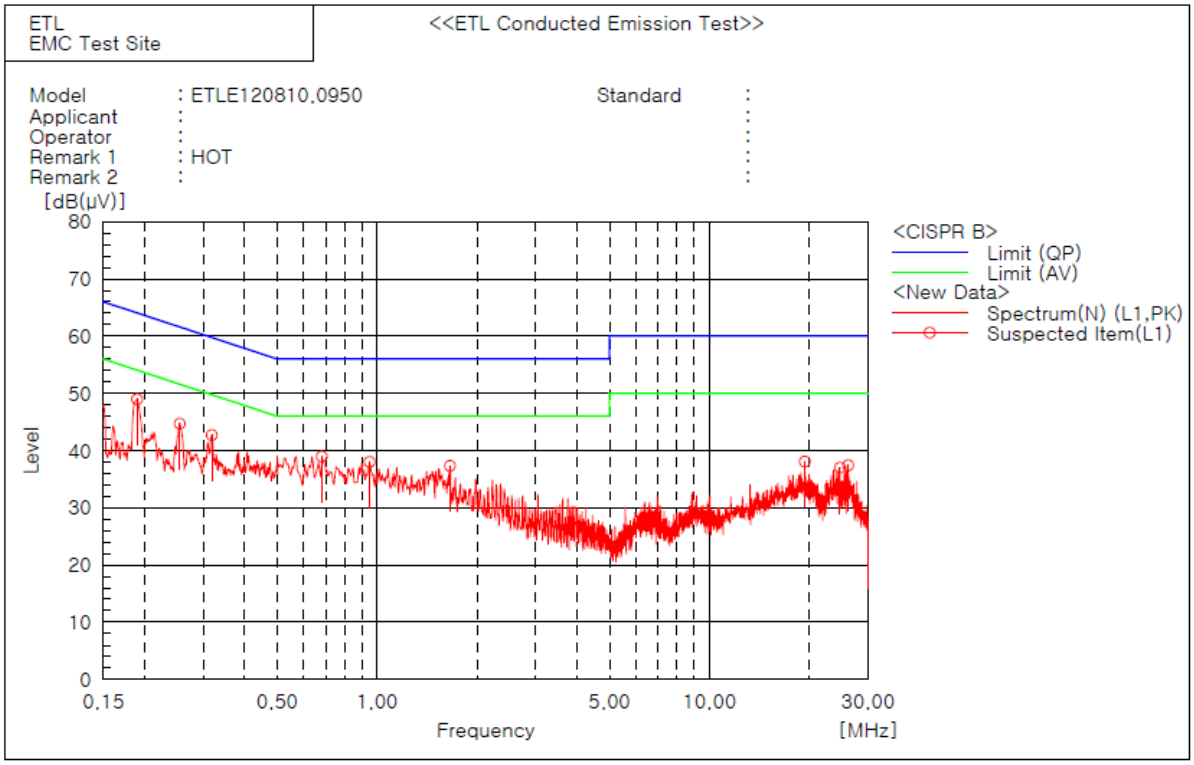
Line: HOT



Spectrum Selection

--- L1 Phase ---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB]	Result PK [dB(μV)]	Limit QP [dB(μV)]	Margin QP [dB]	Remark
1	0.18959	39.3	9.7	49.0	64.1	15.1	
2	0.25464	35.0	9.7	44.7	61.6	16.9	
3	0.31827	33.0	9.7	42.7	59.8	17.1	
4	0.6818	29.2	9.7	38.9	56.0	17.1	
5	0.94945	28.3	9.7	38.0	56.0	18.0	
6	1.65645	27.6	9.7	37.3	56.0	18.7	
7	19.3728	28.0	10.1	38.1	60.0	21.9	
8	24.7268	26.8	10.2	37.0	60.0	23.0	
9	26.1812	27.2	10.2	37.4	60.0	22.6	

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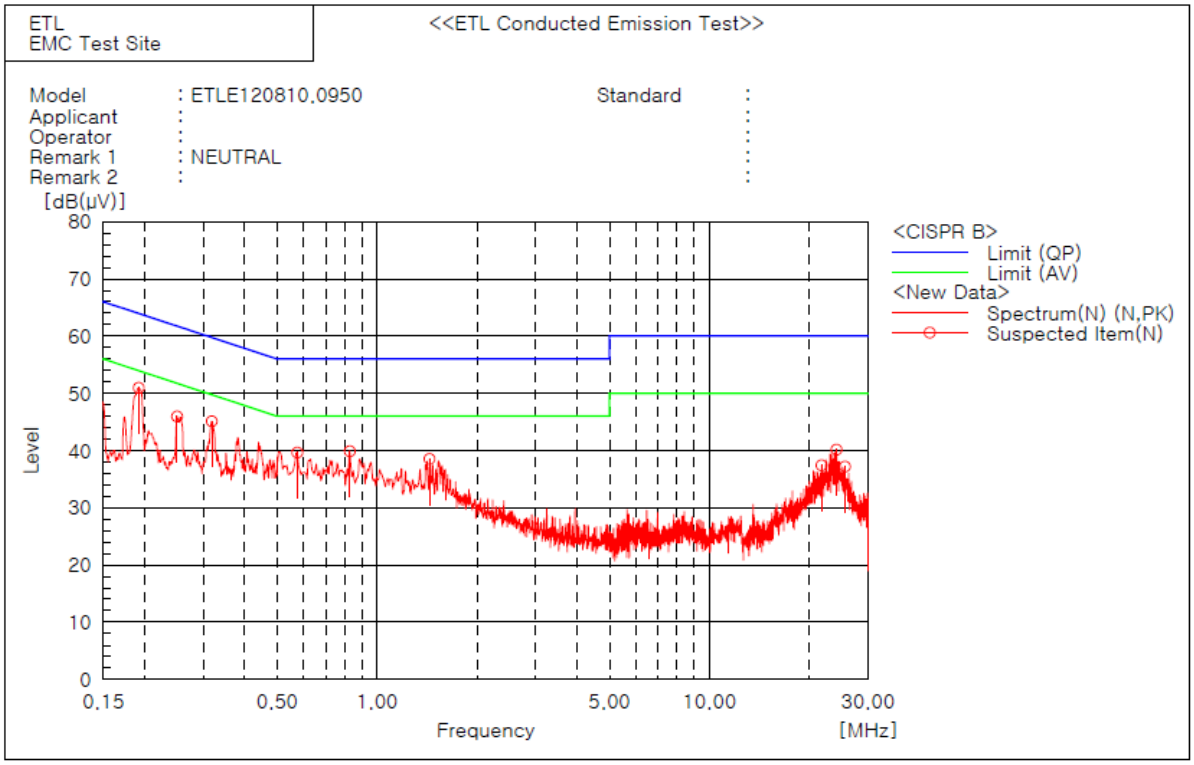
Line: Neutral



Spectrum Selection

--- N Phase ---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB]	Result PK [dB(μV)]	Limit QP [dB(μV)]	Margin QP [dB]	Remark
1	0.19171	41.3	9.7	51.0	64.0	13.0	
2	0.25039	36.2	9.7	45.9	61.7	15.8	
3	0.31827	35.4	9.7	45.1	59.8	14.7	
4	0.57575	30.0	9.7	39.7	56.0	16.3	
5	0.82825	30.2	9.7	39.9	56.0	16.1	
6	1.4393	28.8	9.7	38.5	56.0	17.5	
7	21.7574	27.3	10.1	37.4	60.0	22.6	
8	24.141	30.0	10.2	40.2	60.0	19.8	
9	25.5954	27.0	10.2	37.2	60.0	22.8	

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5.3 Radiated Emissions Measurement

5.3.1 Radiated Emissions Data

- Below 1 GHz

EUT	Scanner / cSCAN8500-C (S/N: N/A)
Limit apply to	FCC Part 15.109(a) Class B
Test Date	August 16, 2012
Operating Condition	Continuous scanning mode
Result	Passed by 3.10 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 120 kHz)

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB(μV)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
34.10	22.81	V	11.38	1.41	35.60	40.00	4.40
123.50	21.54	V	11.48	1.88	34.90	43.50	8.60
139.20	20.80	V	12.44	1.96	35.20	43.50	8.30
148.00	20.82	V	12.78	2.00	35.60	43.50	7.90
206.00	22.42	V	10.22	2.26	34.90	43.50	8.60
240.00	29.15	H	11.35	2.40	42.90	46.00	3.10
308.50	26.56	H	13.52	2.72	42.80	46.00	3.20
378.00	24.12	H	15.15	2.93	42.20	46.00	3.80
446.50	22.33	H	16.58	3.19	42.10	46.00	3.90
515.50	20.04	H	17.99	3.47	41.50	46.00	4.50

NOTES:

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Result = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Result**
4. **The measurement was performed for the frequency range 30 MHz ~ 1 000 MHz according to the FCC Part 15.109(a) Class B.**

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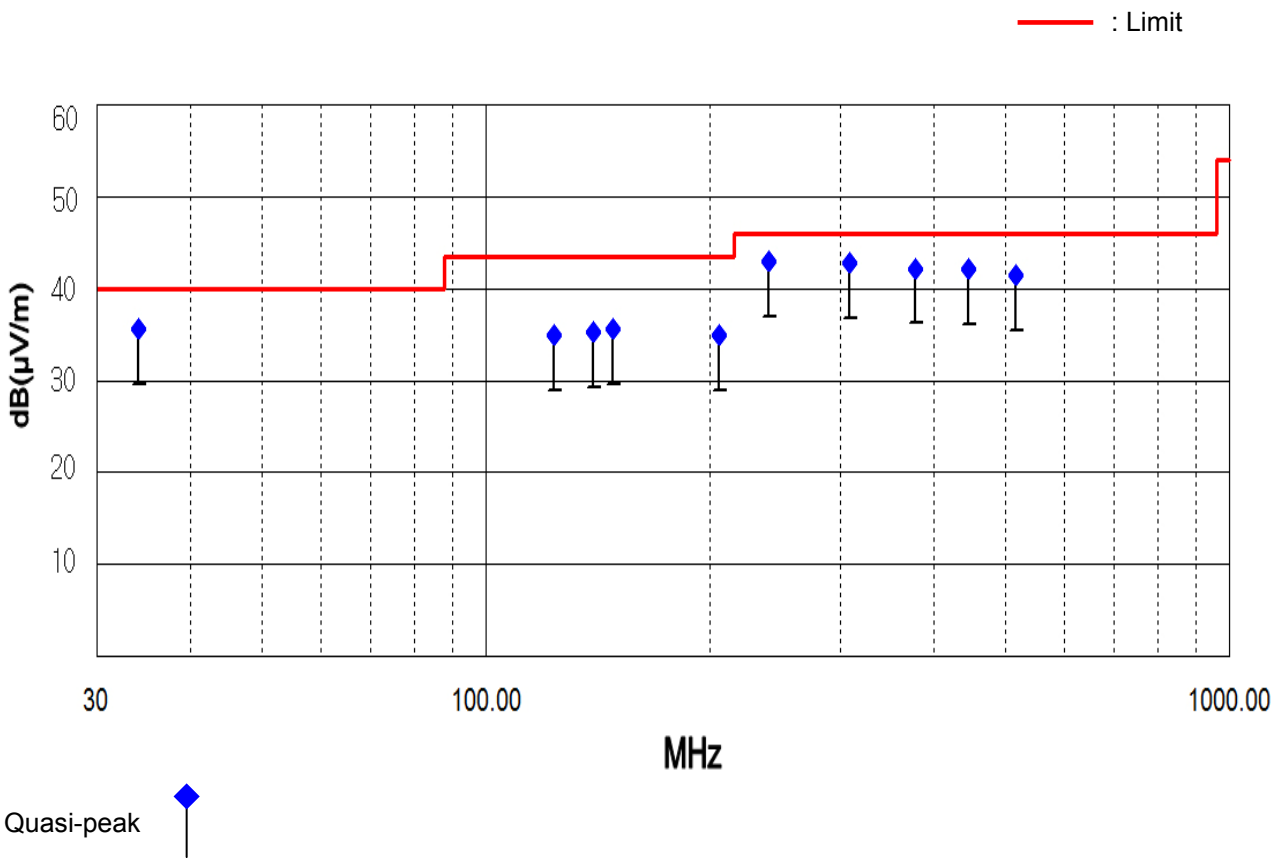

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- Above 1 GHz

EUT	Scanner / cSCAN8500-C (S/N: N/A)
Limit apply to	FCC Part 15.109(a) Class B
Test Date	August 16, 2012
Operating Condition	Continuous scanning mode
Result	Passed by 34.47 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Peak mode, Average mode

Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
1 496.92	40.94	21.74	H	25.21	-30.65	35.50	16.30	73.97	53.97	38.47	37.67
1 593.88	41.63	21.13	V	25.37	-30.60	36.40	15.90	73.97	53.97	37.57	38.07
2 155.44	40.25	23.45	V	26.43	-30.38	36.30	19.50	73.97	53.97	37.67	34.47
2 660.44	41.86	20.96	V	27.70	-30.47	39.10	18.20	73.97	53.97	34.87	35.77

NOTES:

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Cable loss = Cable loss + Amp. Gain**
3. **Result = Reading + Antenna factor + Cable loss**
4. **Margin value = Limit - Result**
5. **The measurement was performed for the frequency range 1 GHz ~ 6 GHz according to FCC Part 15.109(a) Class B.**
6. **Upper frequency of measurement range: 5th harmonic of the highest frequency.**

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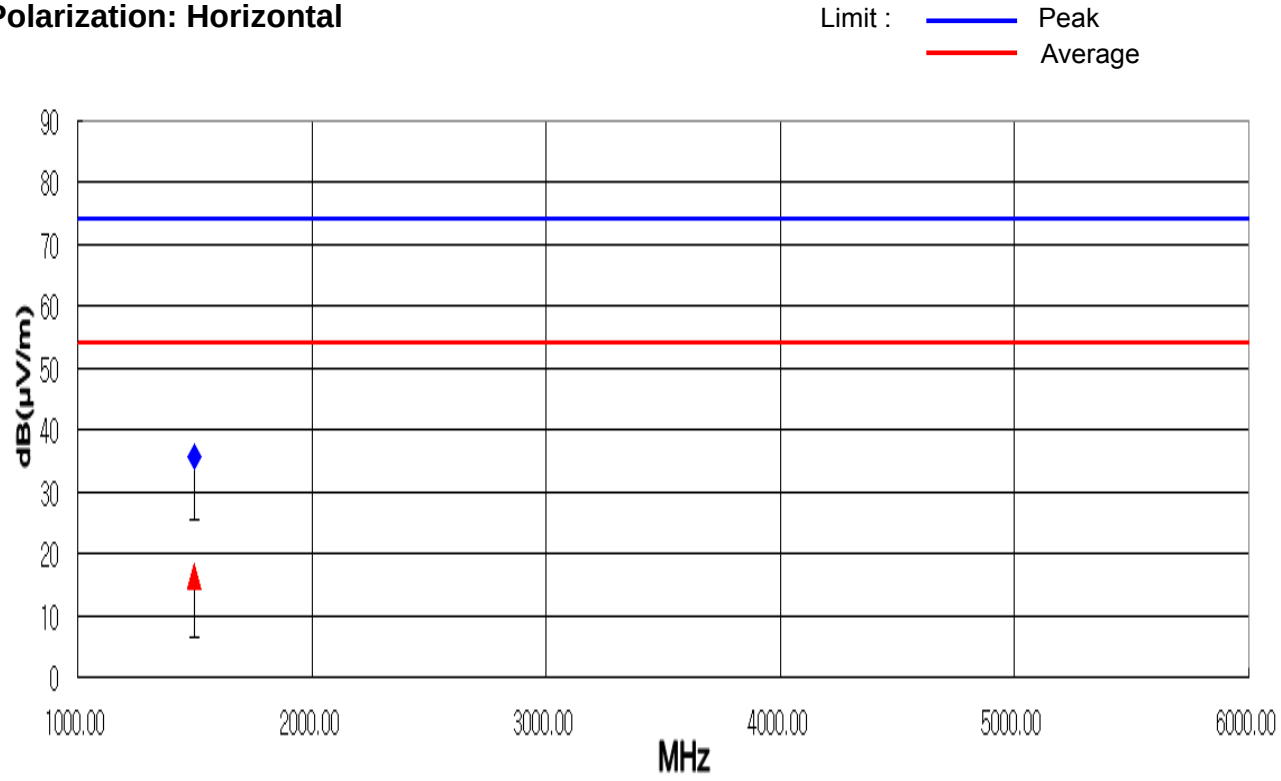
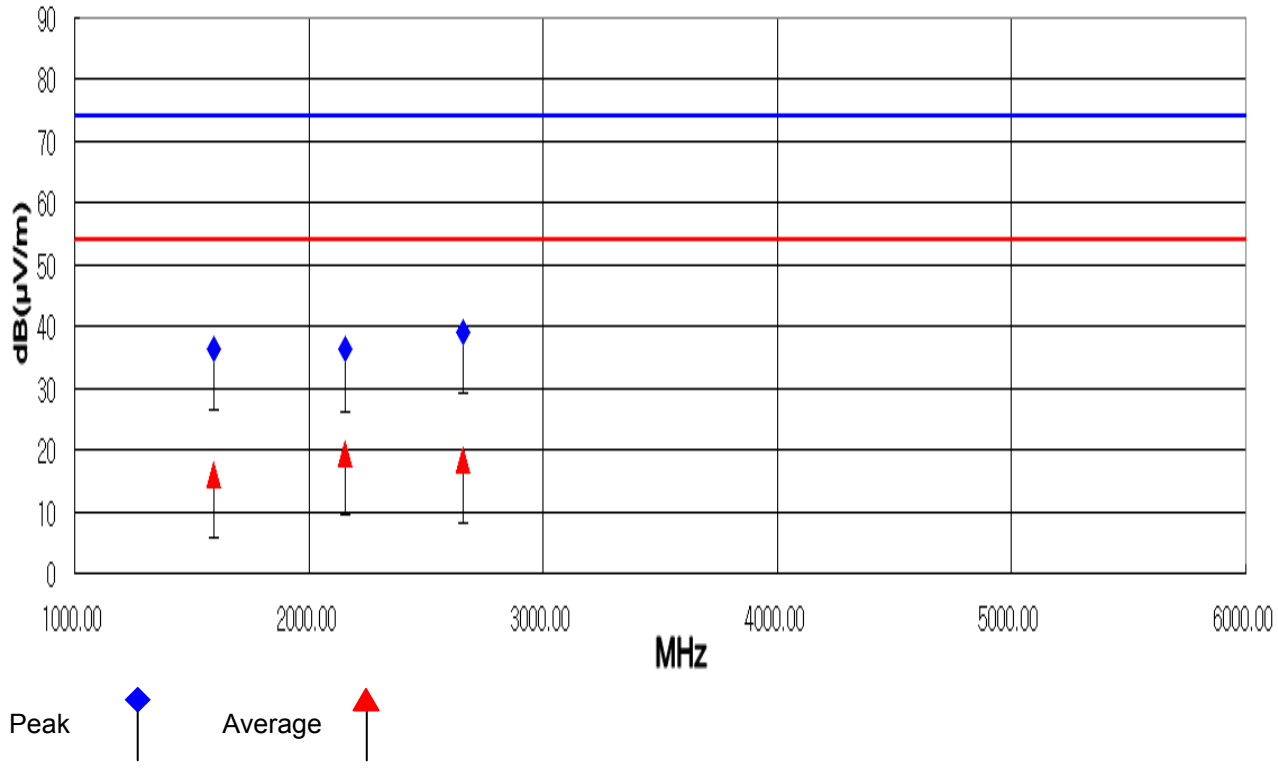
Polarization: Horizontal



Polarization: Vertical



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6. SAMPLE CALCULATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.
The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor

$dB(\mu V) = 20 \log_{10} (\mu V)$
$dB(\mu V) = dBm + 107$

Example : @ 240.00 MHz

Class B Limit = 46.00 dB(μV/m)

Reading = 29.15 dB(μV)

Antenna Factor + Cable Loss = 11.35 + 2.40 = 13.75 dB(μV/m)

Total = 42.90 dB(μV/m)

Margin = 46.00 – 42.90 = 3.10 dB

= 3.10 dB below Limit

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7. List of test equipments used for measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
☒	EMI Test Receiver	ESVS 10	R&S	835165/001	12.03.20	13.03.20
☒	EMI Test Receiver	ESPI3	R&S	100478	11.09.15	12.09.15
☒	EMI Test Receiver	ESCI7	R&S	100851	11.09.15	12.09.15
☒	Two-Line V-Network	ENV216	R&S	958599/106	12.03.19	13.03.19
☒	LISN	3816-2	EMCO	1002	11.09.15	12.09.15
☒	Horn Antenna	BBHA 9120D	Schwarzbeck	277	11.03.22	13.03.22
☒	Amplifier	AFS42-01001800-28-10P-42	MITEQ Inc.	1565819	12.02.06	13.02.06
☒	LogBicon Antenna	VULB9160	Schwarzbeck	3128	12.02.22	14.02.22
☒	Turn-Table	MFT-120S	Max-Full Antenna Corp	-	N/A	N/A
☒	Antenna Master	MFA-440E	Max-Full Antenna Corp	-	N/A	N/A

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