

C-TICK AS/NZS CISPR 22**TEST REPORT****For****IP Cam****Model : D510E****Trade Name : ZAVIO****Issued for****ZAVIO Inc.****B3,1F,NO. 1,Lising 1st Rd., Science-Based Industrial Park,Hsinchu,Taiwan****Issued by****Compliance Certification Services Inc.****Hsinchu Lab.**NO. 989-1 Wen Shan Rd., Shang Shan Village,
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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	12/25/2009	Initial Issue	All Page 28	Alan Fan



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1. TEST REPORT CERTIFICATION

Applicant : ZAVIO Inc.
Address : B3,1F,NO. 1,Lising 1st Rd., Science-Based Industrial
Park,Hsinchu,Taiwan
Equipment Under Test : IP Cam
Model : D510E
Trade Name : ZAVIO
Tested Date : December 07 ~ 10, 2009

APPLICABLE STANDARD	
STANDARD	TEST RESULT
AS/NZS CISPR 22, CLASS B:2006	PASS

Approved by:

Alan Fan
Section Manager

Reviewed by:

Vic Lin
Team Leader

WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.

2. EUT DESCRIPTION

2.1 DESCRIPTION OF EUT & POWER

Product Name	IP Cam
Model Number	D510E
Trade Name	ZAVIO
Power Source	12VDC(From Power Adapter)
DC Power Cord Type	Unshielded cable, 1.8 m (no detachable)
I/O Port	RJ-45 port × 1, Audio In port × 1, Audio Out port × 1, Power port × 1, DI/DO port × 1

Power Adapter :

No.	Manufacturer	Model No.	Power Input	Power Output
1	FAIRWAY	WRG15F-120B	100-240VAC , 1.0A max , 50/60Hz	12V, 1.25A

Remark: For more details, please refer to the User's manual of the EUT.

3. DESCRIPTION OF TEST MODES

Radiation test mode	AC mode (From Adapter power supply)
	POE mode(From POE switch Hub)
Conduction test mode	AC mode (From Adapter power supply)

Remark: The EUT had been tested under normal operating condition

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with AS/NZS CISPR 22.



5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at NO. 989-1 Wen Shan Rd., Shang Shan Village, Qionglin Shiang Hsinchu County 30741, Taiwan, R.O.C

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 : 2003 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.




Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 LABORATORY ACCREDITATIONS LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by Taiwan Accreditation Foundation for the specific scope of accreditation under Lab Code: 0240 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by TAF or any agency of the Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: 90585 and 90584).

5.4 LABORATORY ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 90585, 90584
Taiwan	TAF	FCC Method-47 CFR Part 15 Subpart C,D,E CISPR 11, FCC METHOD-47 CFR Part 18, EN 55011, CNS 13803, CISPR 13, CNS 13439, FCC Method-47 CFR Part 15 Subpart B, CISPR 14-1, EN 55014-1, CNS 13783-1, EN 55015, CNS 14115, CISPR 22, EN 55022, VCCI CNS 13438, EN 61000-4-2/3/4/5/6/8/11	
Taiwan	BSMI	CNS 13803, CNS 13438, CNS 13439, CNS 13783-1, CNS 14115	 SL2-IS-E-0002 SL2-IN-E-0002 SL2-A1-E-0002 SL2-R1-E-0002 SL2-R2-E-0002 SL2-L1-E-0002

** No part of this report may be used to claim or imply product endorsement by TAF or any agency of the US Government.*



6. CALIBRATION AND UNCERTAINTY

6.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

6.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 1000 MHz	+/- 3.2 dB
Radiated Emission, 1 to 26.5 GHz	+/- 3.2 dB
Power Line Conducted Emission	+/- 2.1 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



7. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.	FCC ID
1	Notebook PC	DELL	PP01L	CN-09C748-48155-1AP-6630	DOC
2	Multi-media Stereo Headset	KINYO	EM-3000	4712257589073	-----
3	8-poer fast Ethernet PoE Switch	Air Live	POE-FSH804	POEF80411700328	DOC

No.	Signal cable description
1	Unshielded RJ-45 cable , 10 m × 1
2	Unshielded RJ-45 cable , 1.8 m × 1

SETUP DIAGRAM FOR TESTS

EUT & peripherals setup diagram is shown in appendix setup photos.

EUT OPERATING CONDITION

All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

1. Setup whole system for test as shown on diagram
2. Notebook PC ping 192.168.1.81 to EUT.
3. Audio In/Out link Headset/Microphone.
4. All of the function are under run.
5. Start test.



8. EMISSION TEST

8.1 RADIATED EMISSIONS

LIMITS

All emanation from a class B computing device or system , including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below :

For Frequency Below 1GHz

Frequency range (MHz)	Field Strength Quasi-peak limits (dB μ V/m)		Distance (meters)
	Class A	Class B	
30 - 230	40	30	10
230 - 1000	47	37	10

Note : (1) The lower limit shall apply at the transition frequency.

(2) Additional provisions may be required for cases where interference occurs.

(3) The tighten limit shall apply at the edge between two frequency bands.

(4) Distance refers to the distance in meters between the measuring instrument antenna and the closest point of any part of the device or system.

For Frequency Above 1GHz

Frequency range (GHz)	Field Strength Limit (dB μ V/m)				Distance (meters)
	Class A		Class B		
	Peak	Average	Peak	Average	
1 - 3	76	56	70	50	3
3 - 6	80	60	74	54	3

Note : (1) The lower limit applies at the transition frequency.

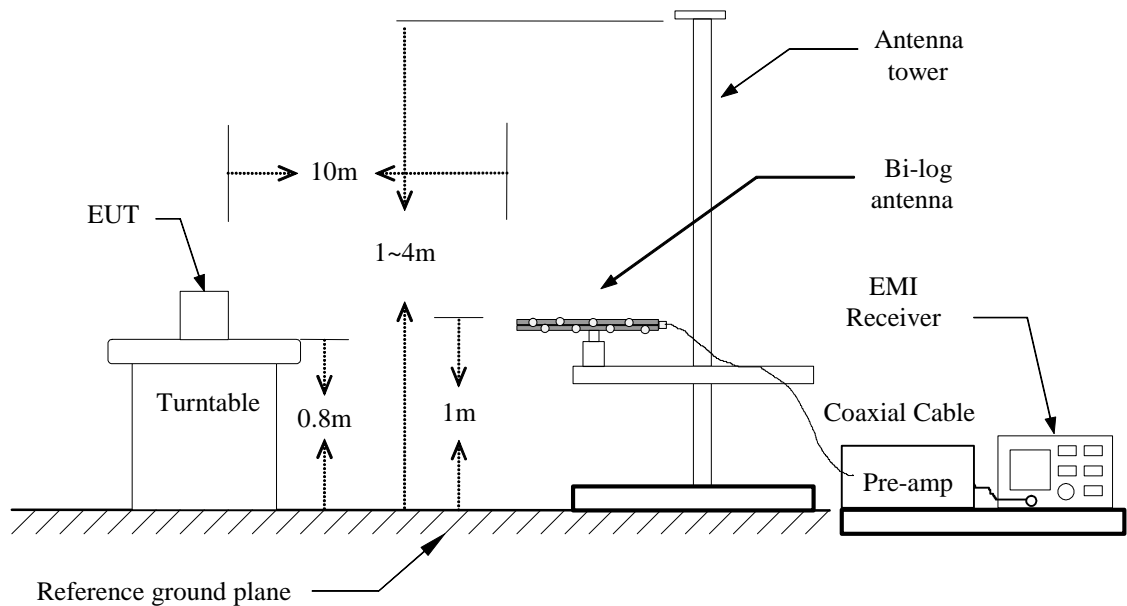
TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
BILOG ANTENNA	SCHAFFER	CBL6112B	2696	09/09/2010
EMI TEST RECEIVER	R & S	ESCS30	835418/008	10/14/2010
N TYPE COAXIAL CABLE	MIYAZAKIN	8D-FB	03	07/26/2010
Pre-amplifier	Agilent	8447D	2944A10052	07/26/2010
SPECTRUM ANALYZER	AGILENT	E4446A	MY43360132	06/09/2010
SPECTRUM ANALYZER	AGILENT	E4446A	MY46180323	05/26/2010
EMI TEST RECEIVER	R & S	ESCI	100221	05/17/2010
BILOG ANTENNA	SCHWARZBECK	VULB	9168_249	09/17/2010
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00078732	06/30/2010
Notch Filters Band Reject	Micro-Tronics	BRM50702-01	009	N.C.R.
RF COAXIAL CABLE	HUBERSUHNER	SUCOFLEX 104PEA	SN31350	07/21/2010

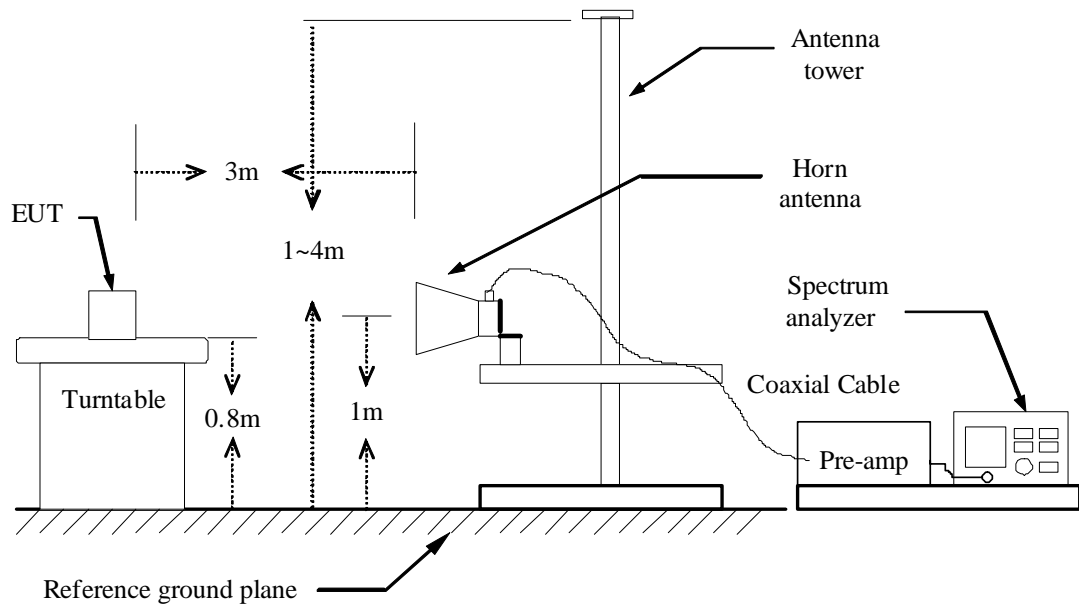
Remark: 1. Each piece of equipment is scheduled for calibration once a year.
 2. N.C.R = No Calibration Request.

TEST SETUP

The diagram below shows the test setup which is utilized to make these measurements for emission from so to 1GHz



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



TEST PROCEDURE

The devices under test were placed on a rotatable table top 0.8 meter above ground. The table was rotated 360 degrees to determine the position of the highest radiation. EUT is set 3 or 10 meters from the interference receiving antenna which is mounted on the top of a variable height mast. The antenna height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.

Note :

1. The bandwidth setting on the E.M.I. meter (R/S TEST RECEIVER) is 120 KHz. The levels are quasi peak value readings. The frequency spectrum from 30MHz to 1000MHz was investigated.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

**TEST RESULTS****Below 1GHz**

Product Name	IP Cam	Test Date	2009/12/09
Model	D510E	Test By	Eden Zhan
Test Mode	Normal operating / AC Mode	TEMP & Humidity	21°C, 74%

Open Site at 10Meter / Horizontal								
Frequency (MHz)	Antenna Factor (dB/m)	Pre Amp. Gain (dB)	Cable Loss (dB)	Meter Reading (dBμV)	Limits (dBμV/m)	Emission Level (dBμV/m)	Margin Limit (dB)	Remark
125.00	11.51	29.10	1.69	43.70	30.00	27.80	-2.20	QP
199.07	9.03	28.71	2.18	40.30	30.00	22.80	-7.20	QP
298.61	13.18	28.39	2.88	47.50	37.00	35.16	-1.84	QP
398.15	15.63	29.10	3.44	40.50	37.00	30.48	-6.52	QP
696.76	18.86	29.70	4.90	37.30	37.00	31.36	-5.64	QP
791.99	19.83	29.50	5.33	37.20	37.00	32.86	-4.14	QP
887.99	20.61	29.02	5.71	36.30	37.00	33.60	-3.40	QP
935.99	20.96	28.76	5.91	34.00	37.00	32.11	-4.89	QP
Open Site at 10Meter / Vertical								
Frequency (MHz)	Antenna Factor (dB/m)	Pre Amp. Gain (dB)	Cable Loss (dB)	Meter Reading (dBμV)	Limits (dBμV/m)	Emission Level (dBμV/m)	Margin Limit (dB)	Remark
86.99	8.51	29.41	1.41	47.14	30.00	27.66	-2.34	QP
96.69	9.88	29.26	1.48	45.60	30.00	27.70	-2.30	QP
108.00	10.85	29.15	1.57	43.98	30.00	27.25	-2.75	QP
125.00	11.51	29.10	1.69	45.50	30.00	29.60	-0.40	QP
199.07	9.03	28.71	2.18	43.50	30.00	26.00	-4.00	QP
298.61	13.18	28.39	2.88	46.50	37.00	34.16	-2.84	QP
398.15	15.63	29.10	3.44	38.80	37.00	28.78	-8.22	QP
695.99	18.85	29.70	4.90	32.10	37.00	26.16	-10.84	QP
791.99	19.83	29.50	5.33	37.00	37.00	32.66	-4.34	QP
887.99	20.61	29.02	5.71	37.80	37.00	35.10	-1.90	QP
935.99	20.96	28.76	5.91	34.90	37.00	33.01	-3.99	QP

Remark:

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Emission Level = Antenna Factor (dB/m) + Cable Loss (dB) + Meter Reading (dBμV) – PreAmp.Gain (dB)
4. Margin (dB) = Emission Level (dBμV/m) - Quasi-peak limit (dBμV/m)



Product Name	IP Cam	Test Date	2009/12/09
Model	D510E	Test By	Eden Zhan
Test Mode	Normal operating / POE Mode	TEMP & Humidity	21 , 74%

Open Site at 10Meter / Horizontal								
Frequency (MHz)	Antenna Factor (dB/m)	Pre Amp. Gain (dB)	Cable Loss (dB)	Meter Reading (dBμV)	Limits (dBμV/m)	Emission Level (dBμV/m)	Margin Limit (dB)	Remark
125.00	11.51	29.10	1.69	30.50	30.00	14.60	-15.40	QP
199.07	9.03	28.71	2.18	33.50	30.00	16.00	-14.00	QP
298.61	13.18	28.39	2.88	47.50	37.00	35.16	-1.84	QP
398.15	15.63	29.10	3.44	40.50	37.00	30.48	-6.52	QP
696.76	18.86	29.70	4.90	36.20	37.00	30.26	-6.74	QP
791.99	19.83	29.50	5.33	37.90	37.00	33.56	-3.44	QP
887.99	20.61	29.02	5.71	36.40	37.00	33.70	-3.30	QP
935.99	20.96	28.76	5.91	33.70	37.00	31.81	-5.19	QP
Open Site at 10Meter / Vertical								
Frequency (MHz)	Antenna Factor (dB/m)	Pre Amp. Gain (dB)	Cable Loss (dB)	Meter Reading (dBμV)	Limits (dBμV/m)	Emission Level (dBμV/m)	Margin Limit (dB)	Remark
91.69	9.20	29.36	1.44	46.21	30.00	27.49	-2.51	QP
106.00	10.72	29.16	1.56	43.91	30.00	27.02	-2.98	QP
125.00	11.51	29.10	1.69	42.70	30.00	26.80	-3.20	QP
199.07	9.03	28.71	2.18	42.60	30.00	25.10	-4.90	QP
216.00	10.13	28.65	2.29	43.60	30.00	27.37	-2.63	QP
298.61	13.18	28.39	2.88	46.20	37.00	33.86	-3.14	QP
398.15	15.63	29.10	3.44	39.50	37.00	29.48	-7.52	QP
695.99	18.85	29.70	4.90	32.30	37.00	26.36	-10.64	QP
791.99	19.83	29.50	5.33	37.30	37.00	32.96	-4.04	QP
887.99	20.61	29.02	5.71	37.50	37.00	34.80	-2.20	QP
935.99	20.96	28.76	5.91	33.50	37.00	31.61	-5.39	QP

Remark:

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Emission Level = Antenna Factor (dB/m) + Cable Loss (dB) + Meter Reading (dBμV) – PreAmp.Gain (dB)
4. Margin (dB) = Emission Level (dBμV/m) - Quasi-peak limit (dBμV/m)



8.2 POWERLINE CONDUCTED EMISSIONS

LIMITS

(1) Power Line Conducted Emission

Frequency range (MHz)	Voltage Limits (dB μ V)			
	Class A		Class B	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.50	79	66	66 - 56*	56 - 46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

Note: (1) The limit decreases linearly with logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

(2) The lower limit shall apply at the transition frequency.

(3) * Decreasing linearly with the logarithm of the frequency.

(2) Common Mode Conducted Emission (Telecommunication Ports)

Frequency range (MHz)	Voltage Limits (dB μ V)				Current Limits (dB μ A)			
	Class A		Class B		Class A		Class B	
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.50	97 - 87	84 - 74	84 - 74	74 - 64	53 - 43	40 - 30	40 - 30	30 - 20
0.50 - 30.0	87	74	74	64	43	30	30	20

Note: (1) The limit decreases linearly with logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

(2) The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is $20 \log_{10} 150 / I = 44$ dB).

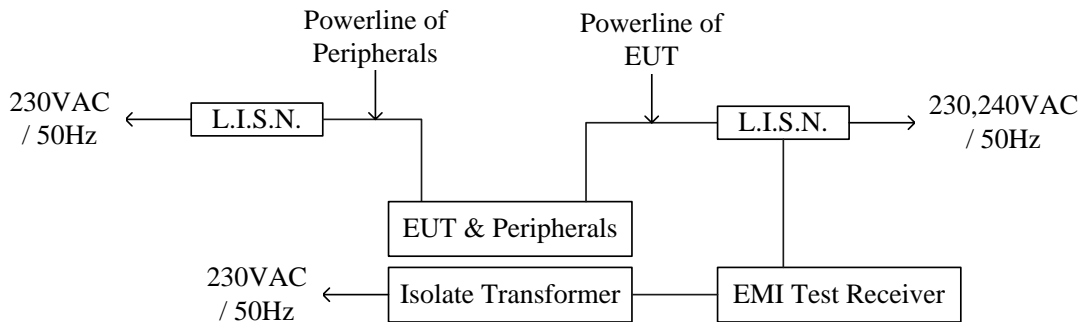
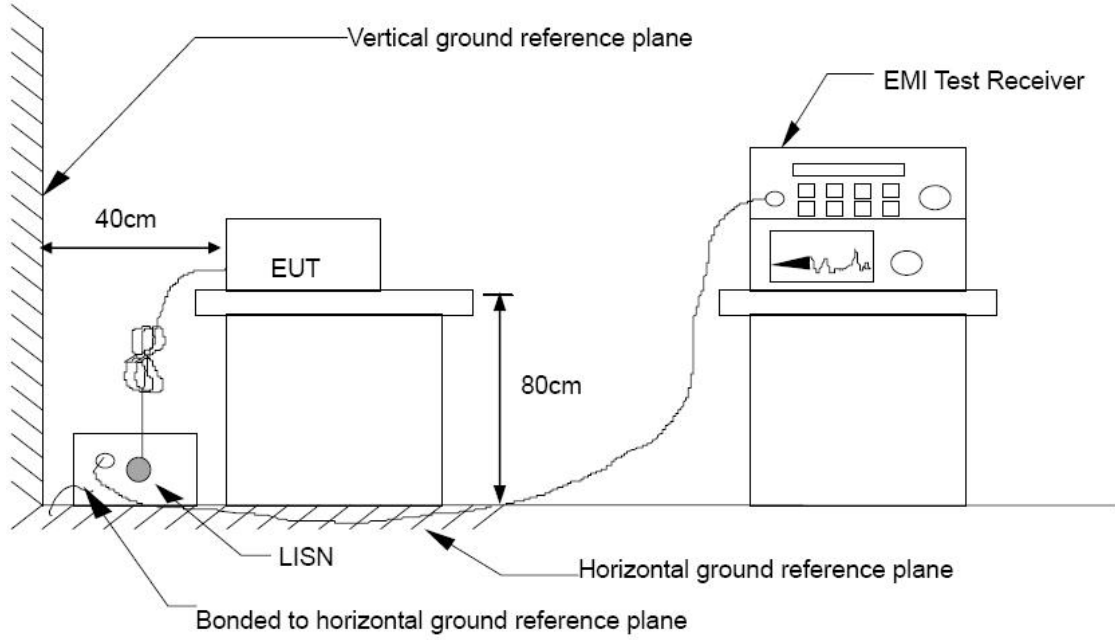
TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-465	08/13/2010
TEST RECEIVER	R & S	ESHS 30	838550/003	02/02/2010
TEST RECEIVER	R & S	ESCS 30	826547/004	08/05/2010
PULSE LIMIT	R & S	ESH3-Z2	100117	09/17/2010
N TYPE COAXIAL CABLE	BELDEN	8268 M17/164	003	07/09/2010
I.S.N.	SCHAFFNER	T800	24313	05/25/2010
CURRENT PROBE	SCHAFFNER	SMZ11	14802	11/30/2010
FERRITE CLAMP	SCHAFFNER	KEMA 801	15937	05/25/2010

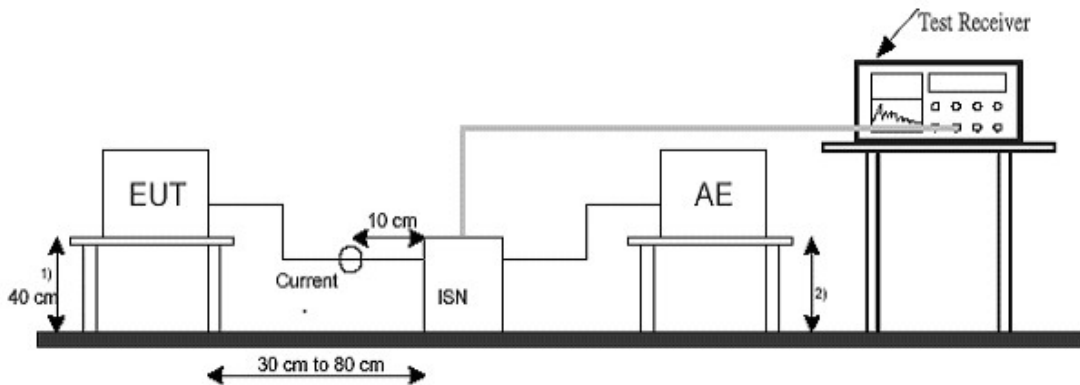
Remark: Each piece of equipment is scheduled for calibration once a year.

TEST SETUP

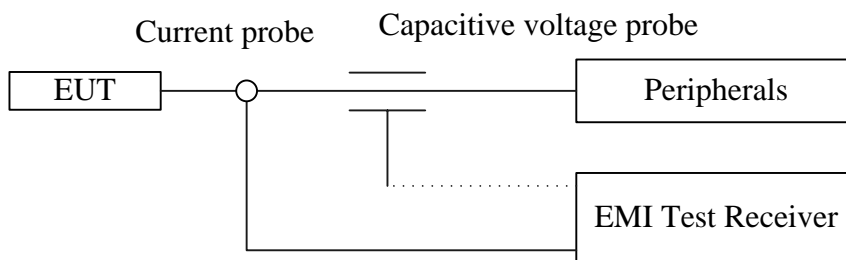
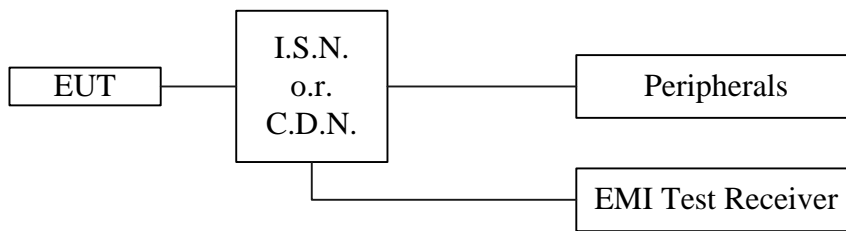
(1) Power Line



(2) Common Mode



- 1) Distance to the ground reference plane (vertical or horizontal).
- 2) Distance to the ground reference plane is not critical.



TEST PROCEDURE

(1) Power Line

The test procedure is performed in a 4m × 3m × 2.4m(L×W×H) shielded room.

The EUT along with its peripherals were placed on a 1.0m(W)× 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

(2) Common Mode

For I.S.N. or C.D.N.

The test is performed in a 4m × 3m × 2.4m(L×W×H) shielded room. The EUT was placed on a 1.0m(W)× 1.5m(L) and 0.8m (H) wooden table and the EUT was adjusted to maintain a 0.8m space from the used I.S.N. or C.D.N. The used I.S.N. or C.D.N. is bonded to the horizontal ground plane of the shielded room. The Telecom port of EUT is connected to the I.S.N. or C.D.N through the designated cable with specified longitudinal conversion loss (LCL). Also the telecom port of relevant peripheral is connected to the I.S.N or C.D.N. through the designated cable. RF output port of I.S.N. or C.D.N. is connected to test receiver through coaxial cable for measurement.

For Current probe / Capacitive voltage probe

The test is performed in a 4m × 3m × 2.4m(L×W×H) shielded room. The EUT was placed on a 1.0m(W) × 1.5m(L) and 0.8m (H) wooden table and the current probe / capacitive voltage probe is adjusted to maintain a 0.3m to 0.8m space from the EUT. The telecom port of the EUT is connected to the relevant peripheral through the designated cable with specified longitudinal conversion loss (LCL). RF output port of the probes is connected to test receiver through coaxial cable for measurement. When deriving final result, the transfer factor of probe should be taken into consideration.

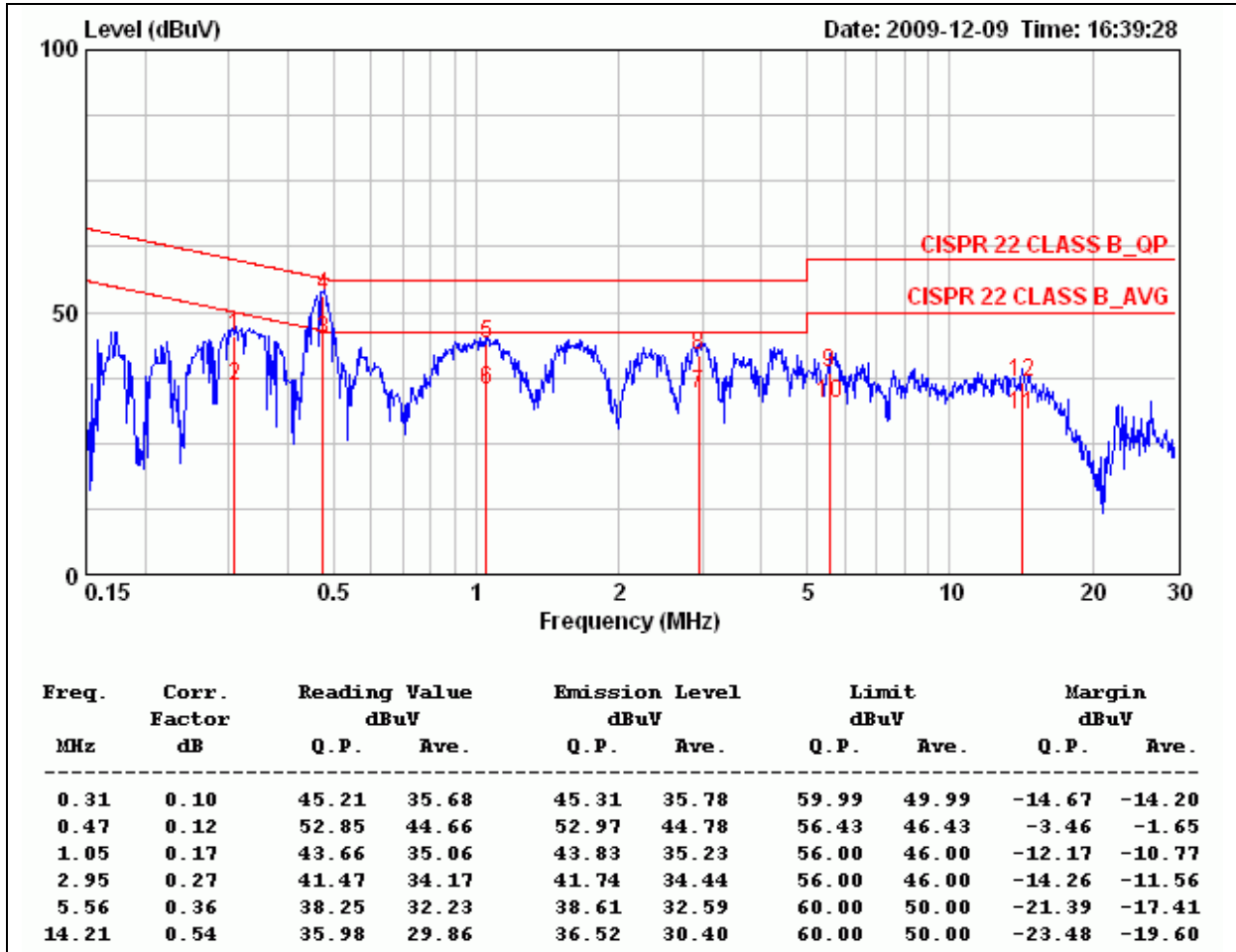


TEST RESULTS

Power Line

Product Name	IP Cam	Test Date	2009/12/09
Model	D510E	Test By	Joe Peng
Test Mode	Normal operating	TEMP & Humidity	22.4°C, 47%

LINE



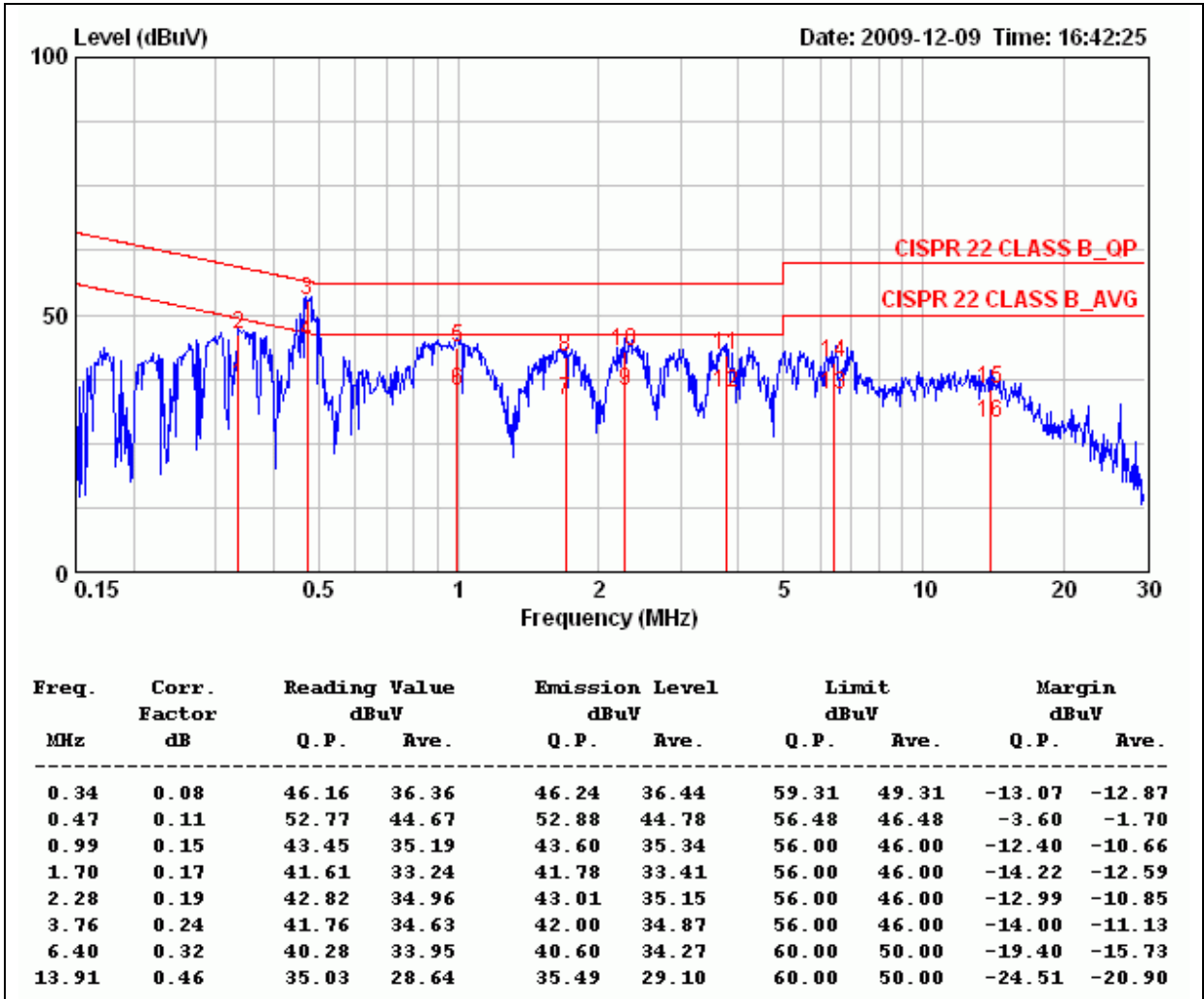
Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value
3. For 230VAC



Product Name	IP Cam	Test Date	2009/12/09
Model	D510E	Test By	Joe Peng
Test Mode	Normal operating	TEMP & Humidity	22.4°C, 47%

NEUTRAL



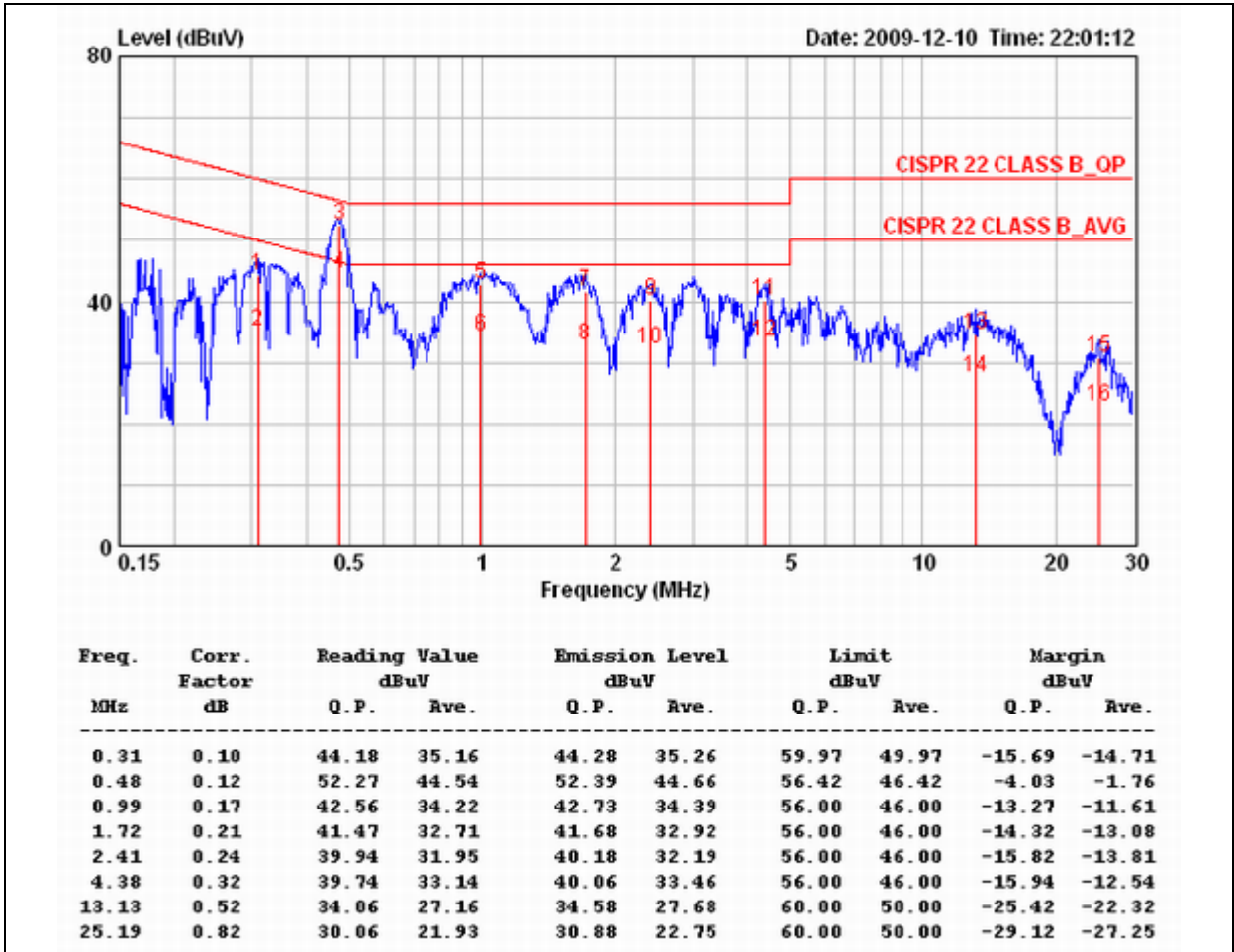
Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value
3. For 230VAC.



Product Name	IP Cam	Test Date	2009/12/10
Model	D510E	Test By	Eden Zhan
Test Mode	Normal operating	TEMP & Humidity	22.4°C, 47%

LINE



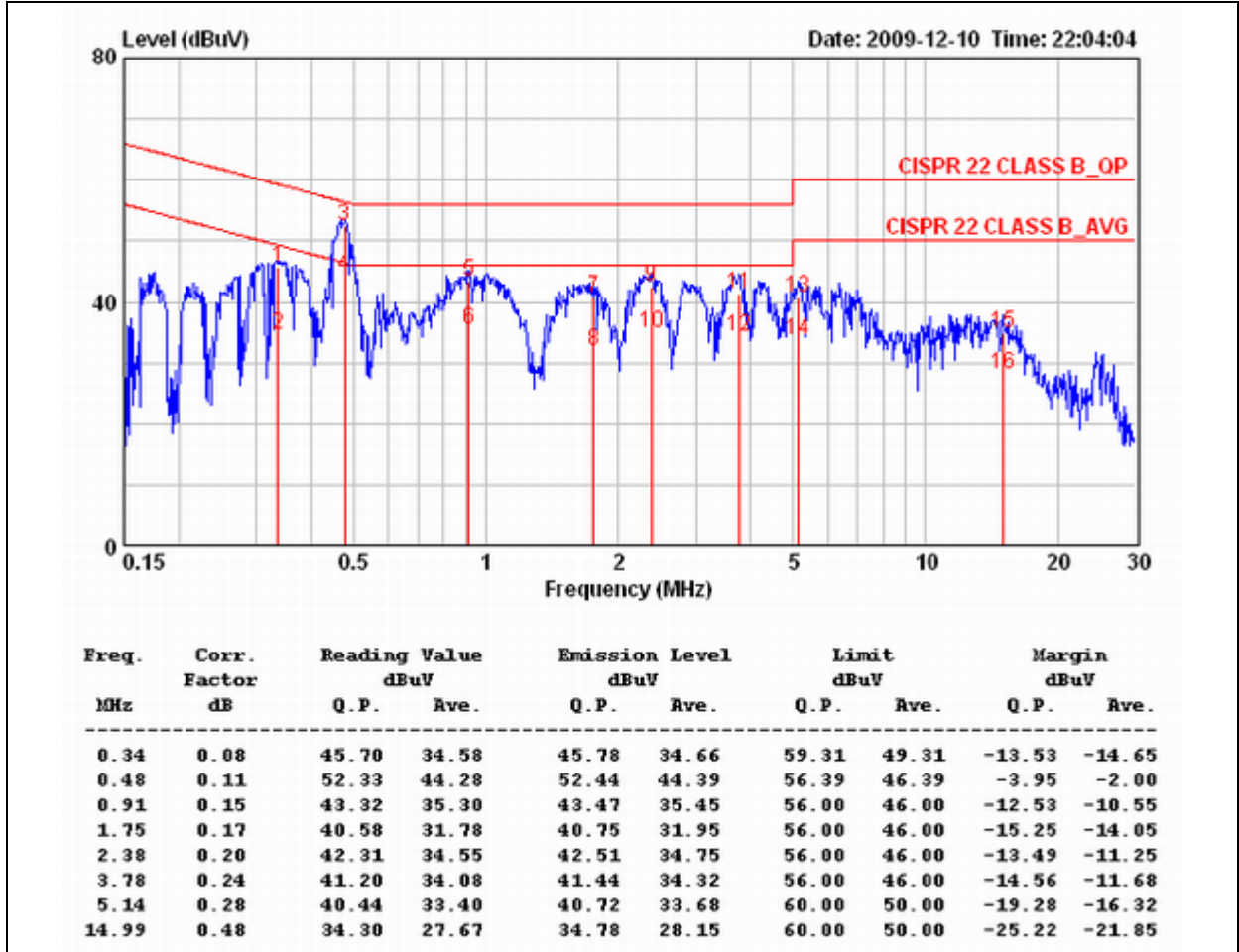
Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value
3. For 240VAC.



Product Name	IP Cam	Test Date	2009/12/10
Model	D510E	Test By	Eden Zhan
Test Mode	Normal operating	TEMP & Humidity	22.4°C, 47%

NEUTRAL

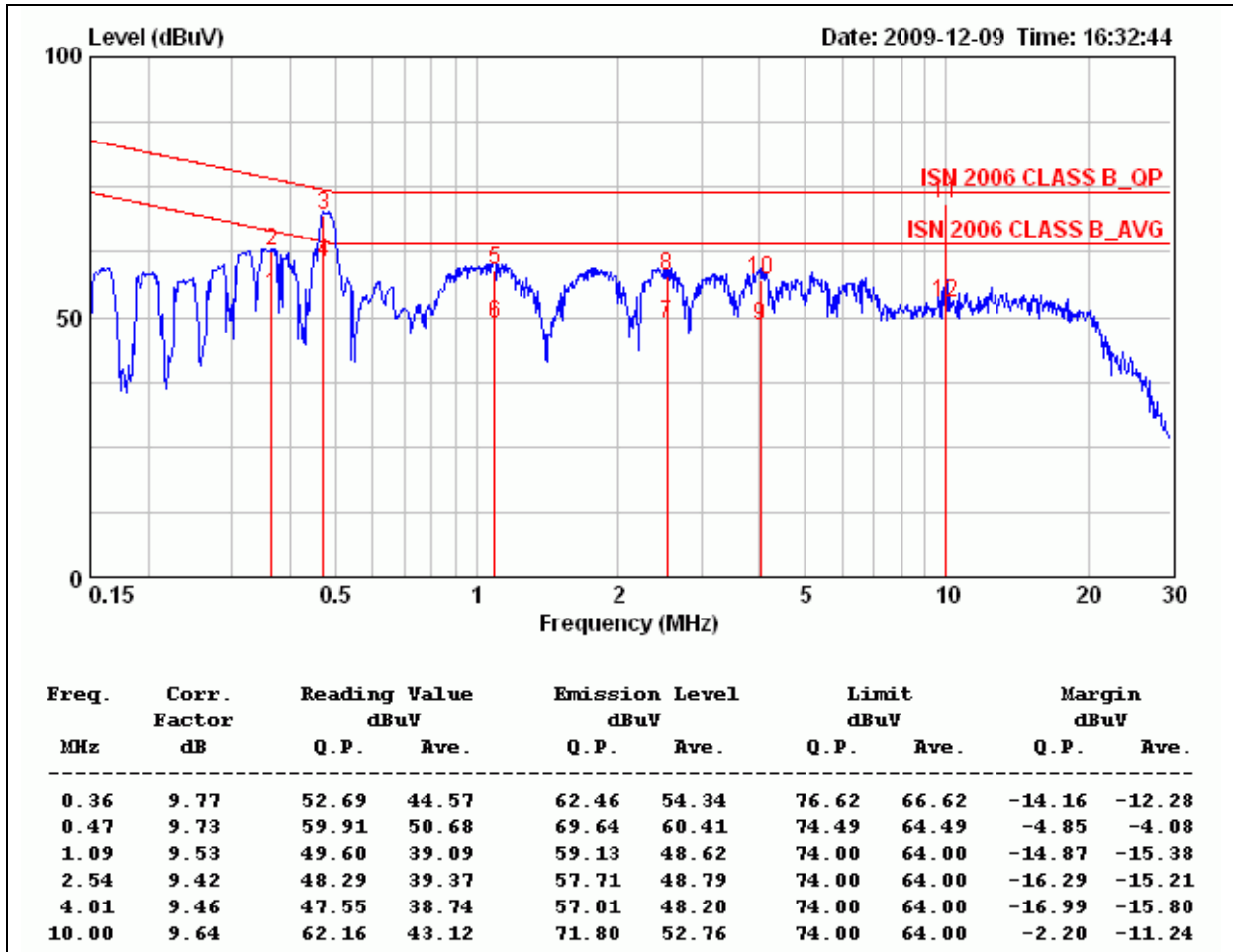


Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value
3. For 240VAC.

**Common Mode**

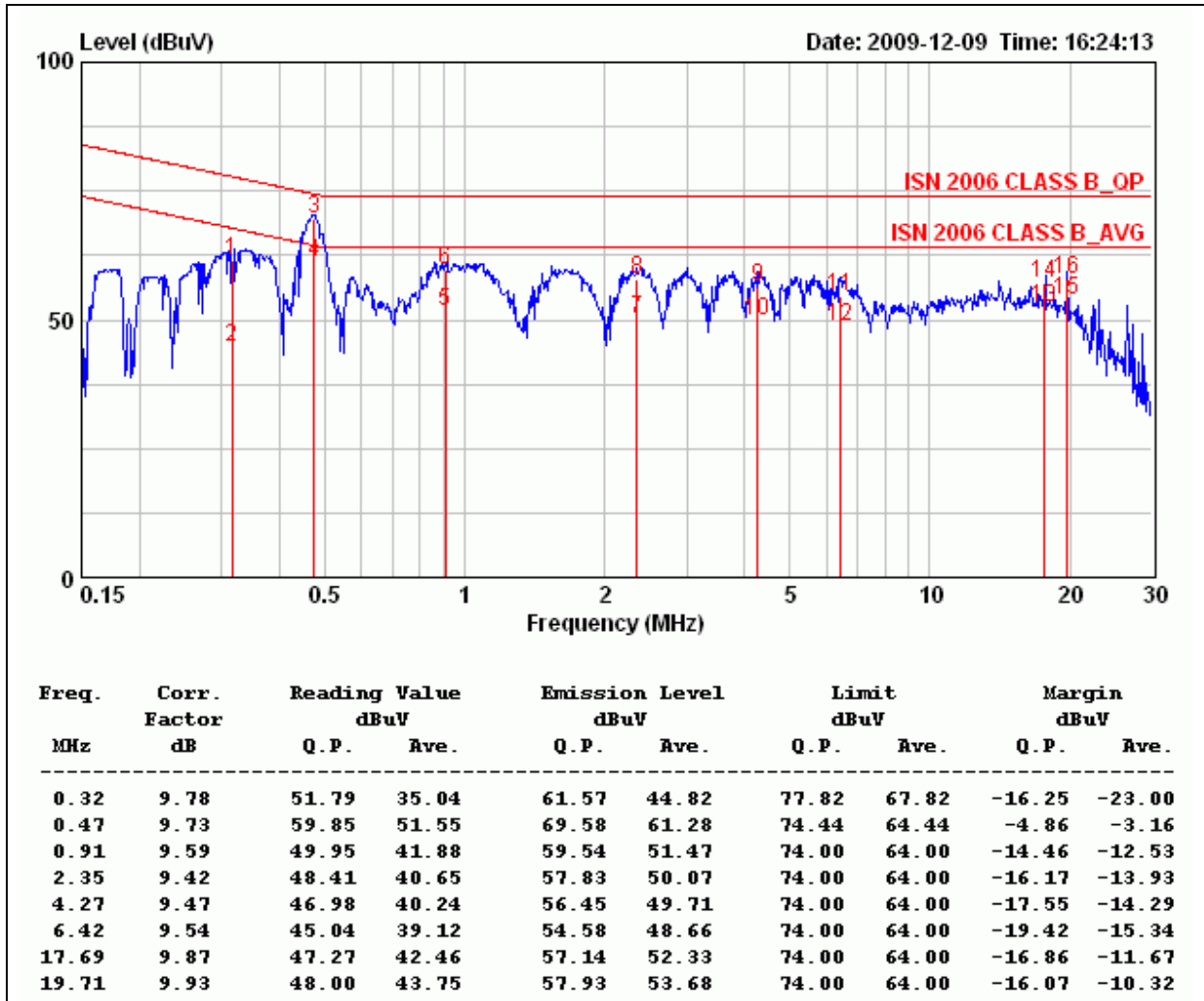
Product Name	IP Cam	Test Date	2009/12/09
Model	D510E	Test By	Joe Peng
Test Mode	LAN – 10Mbps	TEMP & Humidity	22.4°C, 47%

**Remark:**

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value



Product Name	IP Cam	Test Date	2009/12/09
Model	D510E	Test By	Joe Peng
Test Mode	LAN – 100Mbps	TEMP & Humidity	22.4°C, 47%



Remark:

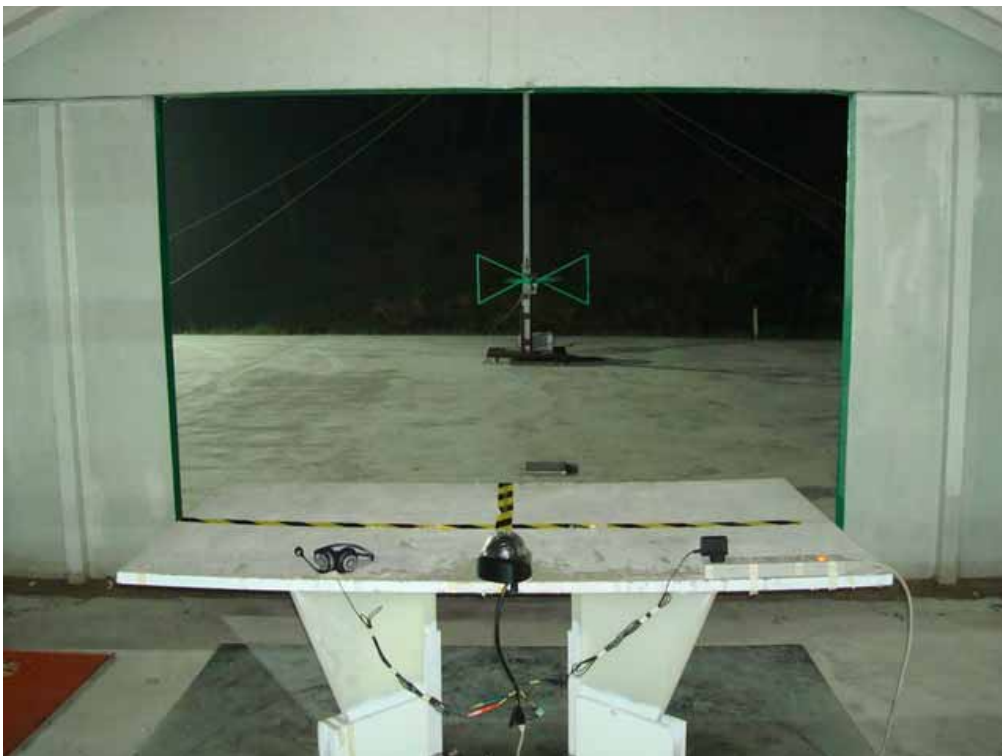
1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value

APPENDIX SETUP PHOTOS

RADIATED EMISSION MEASUREMENT SETUP

Below 1GHz

AC Mode



POE Mode



POWERLINE CONDUCTED EMISSION MEASUREMENT SETUP

Power Line



Common Mode

