

TESTING CERTIFICATE

EMC Compliance Ltd.

480-5 Sin-dong, Yeongtong-gu,
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Certificate No.: EMC-CE-4447

Page(1) / (54) Pages

**1. Applicant**

Name: Samsung Techwin Co., Ltd.
Address: #42 Seongju-Dong, Changwon-Shi,
Kyungsangnam-Do, Korea
Date of Receipt: October 21, 2013

2. Manufacturer

Name: win4NET CO., LTD
Address: WIN4NET BUILDING, 1027-5 HOGYE-DONG, DONGAN-GU,
ANYANG-SI, KOREA

3. Use of Report: Completed report

4. Test Sample: 8CH MOBILE VIDEO RECORDER, SRM-872

5. Date of Test: December 03, 2013

6. Test method used: AS/NZS CISPR 22:2009+A1:2010, Class A

7. Testing Environment: Temperature: $(23.0 \pm 2.4) ^\circ\text{C}$,
Relative Humidity: $(25.4 \pm 3.0) \% \text{ R.H.}$

8. Test Results: Refer to page 13 ~ page 29
(Measurement uncertainty: Refer to page 6)

This result shown in this report refer only to the sample(s) tested unless otherwise stated.

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EMC Compliance Laboratory.

Affirmation	Tested by	Technical Manager
	Name: SUNG, KI-MUN	Name: YEOM, HAN-SEOK

The above test certificate is the accredited test results by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2013. 12. 24

EMC Compliance Ltd.

Accredited by KOLAS, Republic of KOREA



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1. Applicant information

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Manufacturer: win4NET CO., LTD
Address: WIN4NET BUILDING, 1027-5 HOGYE-DONG,
DONGAN-GU, ANYANG-SI, KOREA

2. Laboratory information

Address

EMC compliance Ltd.

480-5 Sin-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, 443-390, Korea

Telephone Number: 82 31 336 9919

Facsimile Number: 82 505 299 8311

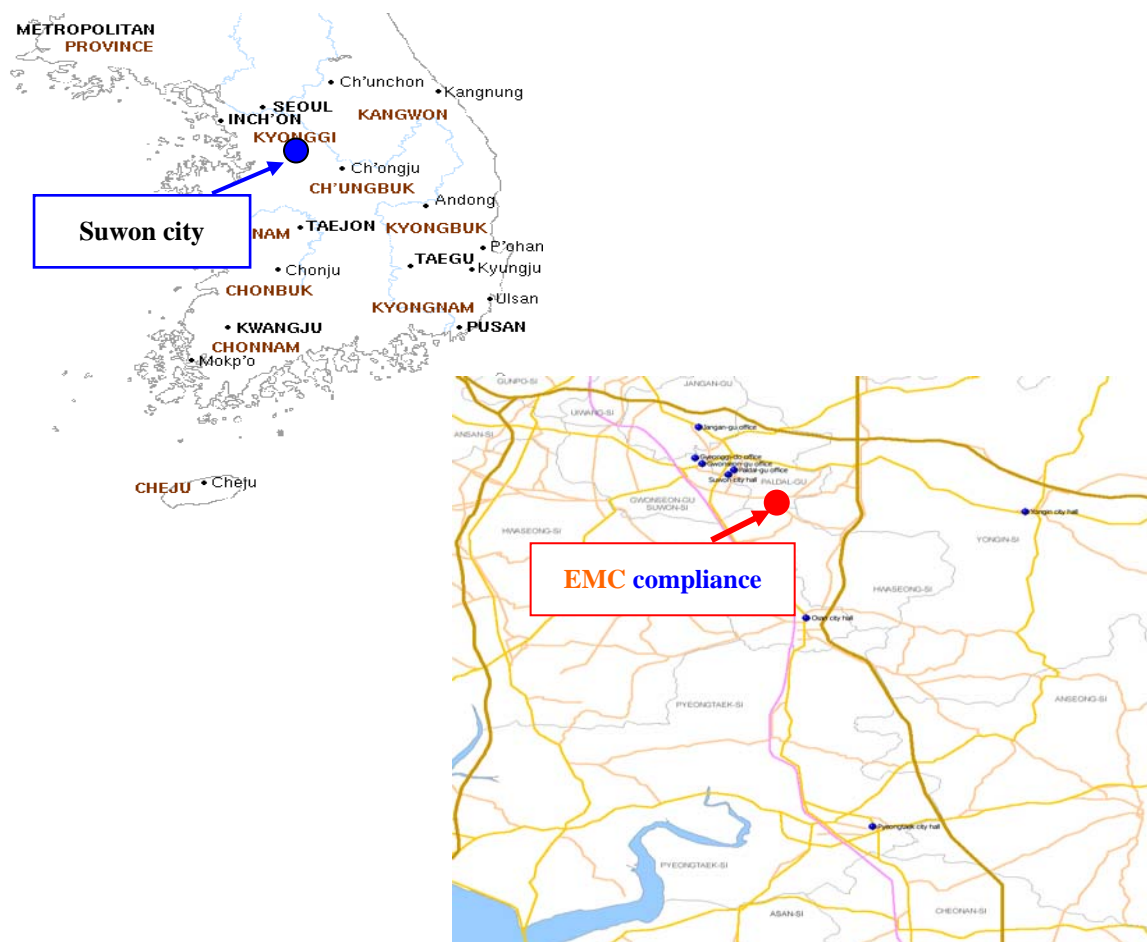
FCC CAB.: KR0040

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No.: 8035A

KOLAS NO.: 231

SITE MAP



3. Test system configuration

3.1 Operation environment

	Temperature	Humidity	Pressure
Chamber(10 m)	: 20.6 °C	28.9 % R.H.	-
Shielded room(CE)	: 25.4 °C	21.9 % R.H.	-

Test site

These testing items were performed following locations;

Test item	Test site
Conducted Emission	Shielded Room
Radiated Emission	10 m Chamber

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC.

The factors contributing to uncertainties are test receiver, cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna frequency interpolation, measurement distance variation, site imperfection, mismatch, and system repeatability. Based on CISPR 16-4-2, the measurement uncertainty level with a 95 % confidence level was applied.

Conducted emission measurement (C.L: Approx 95 %, k = 2)		
Shielded Room (CE#1)	9 kHz ~ 150 kHz	± 3.82 dB
	150 kHz ~ 30 MHz	± 3.43 dB
Shielded Room (CE#2)	9 kHz ~ 150 kHz	± 3.82 dB
	150 kHz ~ 30 MHz	± 3.43 dB
Shielded Room (CE#3)	9 kHz ~ 150 kHz	± 4.00 dB
	150 kHz ~ 30 MHz	± 3.63 dB
Radiated Emission measurement (C.L: Approx 95 %, k = 2)		
10 m Chamber (#F4)	30 MHz ~ 300 MHz	3 m: + 4.56 dB, - 4.58 dB 10 m: + 4.56 dB, - 4.56 dB
	300 MHz ~ 1 000 MHz	3 m: + 4.84 dB, - 4.85 dB 10 m: + 4.71 dB, - 4.72 dB
	1 GHz ~ 6 GHz	3 m: + 6.19 dB, - 6.20 dB
10 m Chamber (#F2)	30 MHz ~ 300 MHz	3 m: + 4.86 dB, - 4.88 dB 10 m: + 4.86 dB, - 4.86 dB
	300 MHz ~ 1 000 MHz	3 m: + 4.98 dB, - 4.99 dB 10 m: + 4.85 dB, - 4.87 dB
	1 GHz ~ 6 GHz	3 m: + 6.19 dB, - 6.20 dB

4. Description of E.U.T.

4.1 General information

Video		SRM-872
N/W Camera	Inputs	Up to 8CH
	Resolution	CIF, VGA, 4CIF, 1.3M, 2M, 3M
	Protocols	ONVIF
Installation	Camera Setup	Resolution, Frame rate, bit rate setup.
	Viewer	Built-in Webviewer
	Multi Screen Monitor display	1/4/9
Performance		
OS		Embedded Linux
Recording	Compression	H.264, MJPEG
	Rec. bit rate	64Mbps
	Record Rate	Up to 240fps @1280 x 720 (1.3M)
	Record Mode	Emergency, Schedule (Time/Event)
	Overwrite modes	Continuous, Auto Deletion w/ Retention duration
	Pre-alarm	Up to 30 sec.
	Post-Alarm	Up to 6 hour.
Event	Source	Sensor, MD, V-Loss, G-Sensor, IP camera event
Network	Ethernet	Gigabit Ethernet x 1, FE x8 w/PSE
	Transmission speed	Up to 1Gbps.
	Max. Remote users	Live (10)/ Search(3)/ Setup (1)
	Protocol support	TCP/IP, DHCP, SMTP, NTP, HTTP, DDNS, RTP, RTSP
	Monitoring	CMS, Webviewer, Smart-phone Viewer.
	Connection Mode	Static/DHCP
Storage	Internal HDD	1 HDD(2.5") or 1 SSD
	Removable	Micro SD(Industrial, 최대 32GB 까지 지원)
Backup	USB	2 USB Ports (아래쪽 2 개 포트만 사용 가능)
	File Format	STRG(NVR Player), EXE(Include Player), AVI
Search	Backup Viewer	Search Playback on Google Map

	Function	8ch Search/Playback, GPS information, G-Sensor
Interface		
Video	Inputs	8 RJ-45 (PoE Support)
	Output	1 HDMI, 1 VGA, Upto 1080p
Audio	Inputs	Network Camera audio input, up to 8CH
	Compression	G.711, G.726
	Ext. Audio Output	1 Phone Jack (main unit), 1 RCA Connector(Control BOX)
Alarm	Inputs	Terminal 8 inputs, NO/NC
	Outputs	Terminal 2 relay outputs, NO/NC
Others	Ethernet	1 RJ45 (10/100/1000 Base-T Ethernet)
	USB	3 USB(2.0 High Speed)
	GPS	1 SMA
Functions		
Power Management	Shutdown Delay	1 Min. ~ 30 Min. (User selectable)
General		
Electrical	Input Voltage	12V ~ 24V DC
	Power consumption	Max. 30 W
	Camera Power Output	Max. 8 W per channel, Total 64W(PoE, IEEE 802.3af)
Environmental	Operating Temp./Humidity	-25°C to +50°C (-13°F to +122°F) / 20% to 85% RH
Mechanical	Dimension (W x H x D)	<ul style="list-style-type: none"> • SYSTEM :225.5(W)x 59(H) x 312.2(D) mm • I/O Box : 155(W) X 44(H) X 70(D) mm • Control Box : 121(W) X 32(H) X 75(D) mm
	Weight (With Out HDD)	<ul style="list-style-type: none"> • SYSTEM : 2.83 Kg • I/O Box : 0.35Kg • Control Box : 0.18Kg
Approvals	EMC/Safety	CE, FCC, cUL, e-Mark, KCC, EN50155
	Shock, Vibration	MIL STD-810F method 514.5, EN61373

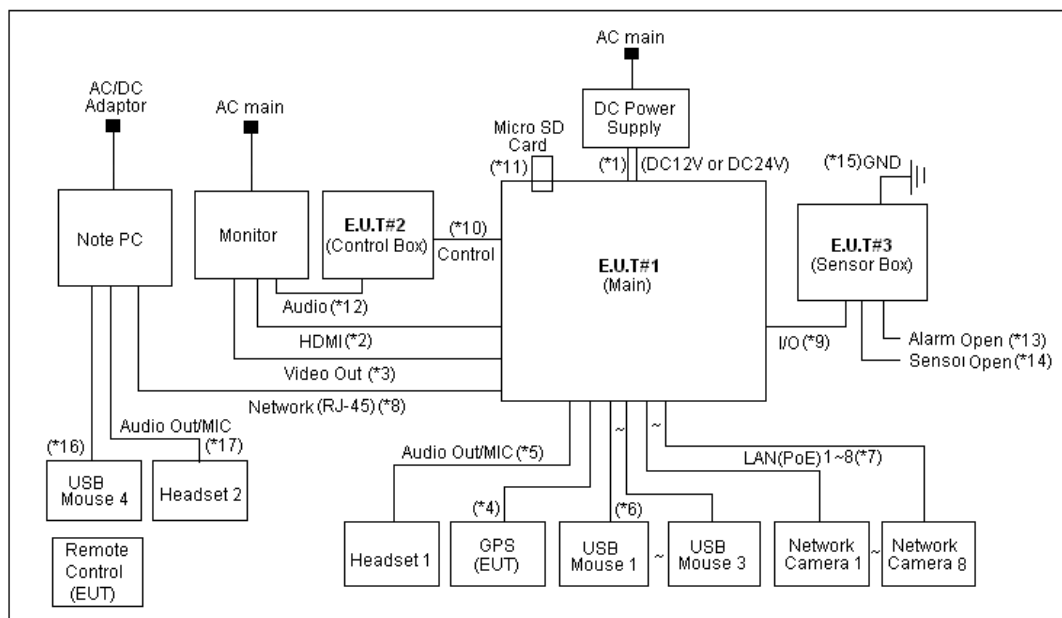
4.2 Product description

Type of product	8CH MOBILE VIDEO RECORDER
Model name (Basic)	SRM-872
Model name (Variant)	-
Difference	-
Trade name	-
Serial no	Engineering Sample
Testing voltage	DC 12 V , DC 24 V
Product rating	DC 12 V , DC 24 V
Internal clock frequency	Above 108 Mhz
Note	-

4.3 Auxiliary equipments

Type	Model / Part #	Serial number	Manufacturer
Monitor	PM24KO	ZQ9XH1HBA01776V	SAMSUNG
DC Power Supply	6032A	-	HP
Note PC	C1410	473680121639	FUJITSU
USB Mouse 1	1088	8165906051010	Microsoft
USB Mouse 2	1088	8165906051216	Microsoft
USB Mouse 3	1088	8165906051224	Microsoft
USB Mouse 4	1088	8165900112700	Microsoft
Headset 1	SHS-250V	-	SAMSUNG
Headset 2	SHS-250V	-	SAMSUNG
Micro SD Card(2GB)	-	-	SanDisk
Network Camera 1~8	SNV-6012N	-	SAMSUNG

4.4 Test configuration



Note	Start		End		Cable	
*	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	EUT#1 (Main)	Power	DC Power Supply	Power	1.8	Non-Shield
2		HDMI	Monitor	HDMI	1.5	Shield
3		Video Out	Monitor	Video In	1.5	Shield
4		GPS	GPS(EUT)	GPS	2.5	Non-Shield
5		Audio Out/MIC	Headset 1	Audio In/MIC	2.0	Non-Shield
6		USB 1~3	USB Mouse 1~3	USB 1~3	2.0	Shield
7		LAN(PoE) 1~8	Network Camera 1~8	LAN(PoE) 1~8	3.0	Non-Shield
8		Network (RJ-45)	Note PC	Network (RJ-45)	3.0	Non-Shield
9		I/O	EUT#3 (Sensor Box)	I/O	3.0	Non-Shield
10	EUT#2 (Control Box)	Control	EUT#2 (Control Box)	Control	3.0	Non-Shield
11		Micro SD	Micro SD Card	Micro SD	Direct	-
12		Audio	Monitor	Audio	1.4	Shield
13	EUT#3 (Sensor Box)	Alarm	Open	-	3.0	Non-Shield
14		Sensor	Open	-	3.0	Non-Shield
15		GND	GND	GND	1.8	Non-Shield
16	Note PC	USB	USB Mouse 4	USB	2.0	Shield
17		Audio Out/MIC	Headset 2	Audio In/MIC	2.0	Non-Shield

4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode	Normal operating
1	Web view test
	Video REC, Monitoring test

* Note: 2 types of powers are available for the product, that are DC Power Supply (DC 12 V, DC 24 V).

Therefore, tests were performed for 2 different types of powers.

5. Summary of test results

5.1 Summary of EMI emission test results

Applied	Test items	Test method	Result
<input checked="" type="checkbox"/>	Conducted Emission	AS/NZS CISPR 22:2009+A1:2010, Class A	13 Page ~ 21 Page
<input checked="" type="checkbox"/>	Radiated Emission	AS/NZS CISPR 22:2009+A1:2010, Class A	22 Page ~ 29 Page

6. Test results

6.1 Conducted Emission

Test specification	AS/NZS CISPR 22:2009+A1:2010, Class A		
Testing voltage	DC 12 V, DC 24 V		
Test facility	Shielded room (CE#2)		
Date	2013. 12. 03		
Temperature (°C)	25.4 °C	Humidity (% R.H.)	21.9 % R.H.
Remarks	Complied		

6.1.1 Limits of conducted emission measurement

☐ AC main

Frequency MHz	Class A $\text{dB}\mu\text{V}$		Class B $\text{dB}\mu\text{V}$	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	79	66	66 ~ 56 *	56 ~ 46*
0.5 ~ 5	73	60	56	46
5 ~ 30	73	60	60	50

*The limit decreases linearly with the logarithm of frequency.

☒ Telecommunication

Frequency MHz	Class A Voltage Limits $\text{dB}\mu\text{V}$		Current Limits $\text{dB}\mu\text{A}$	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15 ~ 0.5	97 to 87	84 to 74	53 to 43	40 to 30
0.5 ~ 30	87	74	43	30
Frequency MHz	Class B Limits $\text{dB}\mu\text{V}$		Current Limits $\text{dB}\mu\text{A}$	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15 ~ 0.5	84 to 74	74 to 64	40 to 30	30 to 20
0.5 ~ 30	74	64	30	20

* The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz

* 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 $20 \log_{10} 150/I = 44 \text{ dB}$).

6.1.2 Measurement procedure

The measurements were performed in a shielded room. EUT was setup as shown in photograph and placed on a non-metallic table height of 0.8 m above the reference ground plane. The rear of table was located 0.4 m to the vertical conducted plane. EUT was power through the LISN, which was bonded to the ground plane. The LISN power was filtered. Each EUT power lead, except ground (safety) lead was individually connected through a LISN to input power source. EUT signal cables that hung closer than 0.4 m to the Horizontal metal ground 0.3 m ~ 0.4 m long. The power cord was bundles in the center. All peripheral equipment was powered from a sub LISN. The LISN and ISN were positioned 0.8 m from the EUT. Peak and Average detection were used in preliminary testing and Quasi-peak and Average detections were used at final measurement. Both lines of power cord, hot and neutral, were measured.

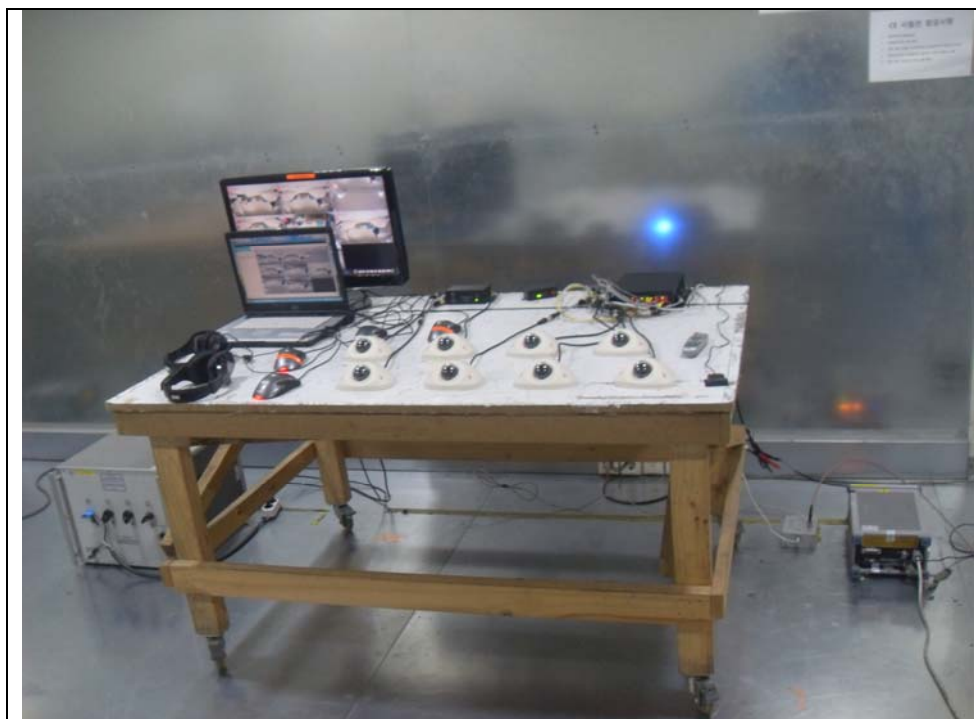
6.1.3 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
Test Receiver	ESHS30	844827/011	R&S	2014.08.05	<input type="checkbox"/>
Test Receiver	ESCI7	100732	R&S	2014.02.18	<input type="checkbox"/>
Test Receiver	ESCI	100001	R&S	2014.07.25	<input checked="" type="checkbox"/>
Test Receiver	ESCI	100710	R&S	2014.10.28	<input type="checkbox"/>
LISN	ENV216	101352	R&S	2014.01.07	<input checked="" type="checkbox"/>
LISN	NNLK8121	8121-472	SCHWARZBECK	2014.07.08	<input checked="" type="checkbox"/>
8-WIRE ISN	NTFM 8158 CAT5	CAT5-8158-0028	SCHWARZBECK	2014.04.13	<input checked="" type="checkbox"/>
8-WIRE ISN	NTFM 8158 CAT3	CAT3-8158-0020	SCHWARZBECK	2014.04.13	<input checked="" type="checkbox"/>
ISN	ST08	24342	TESEQ	2014.06.21	<input type="checkbox"/>
ISN	ENY81	101545	R&S	2014.08.29	<input checked="" type="checkbox"/>

6.1.4 Photographs of test setup

* Telecommunication

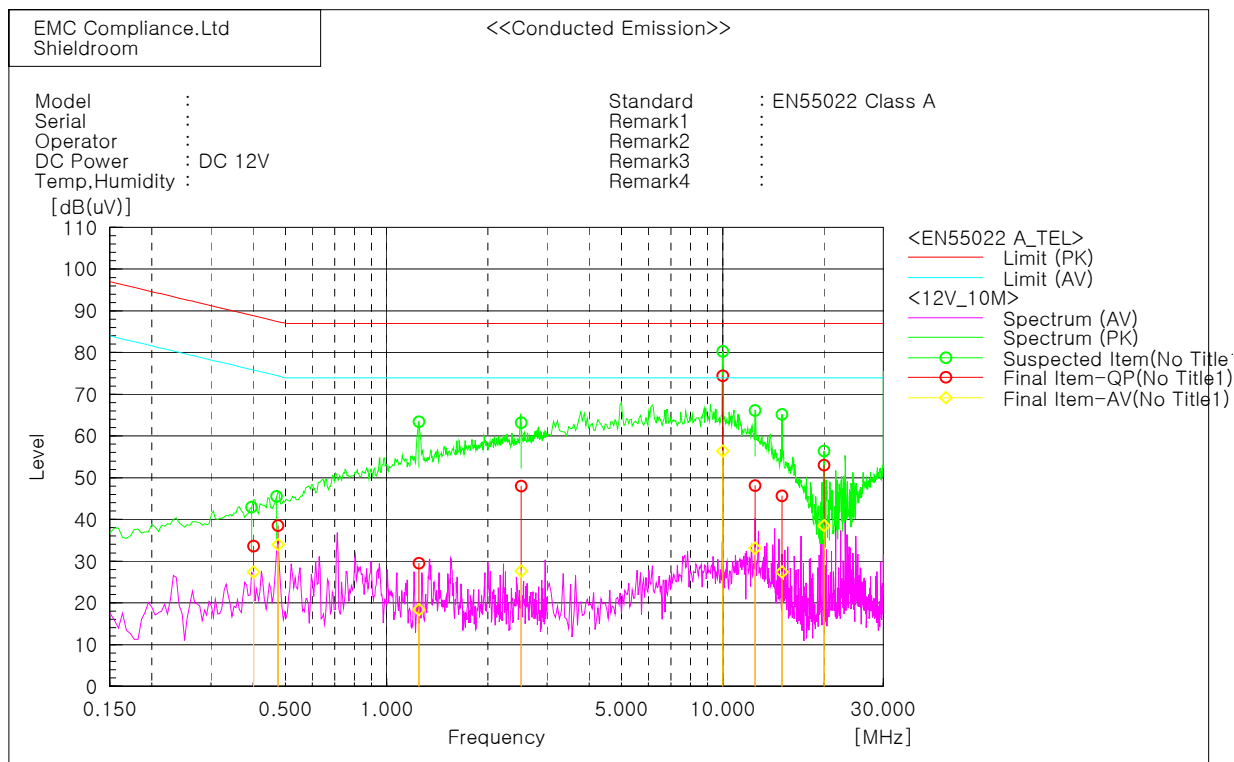
#1-DC 12V, #2-DC 24V



6.1.5 Conducted emission measurement result

* Telecommunication port

#1-DC 12V _LCL 55 dB (Network(RJ-45) Port) _10 Mbps_(SRM-872)

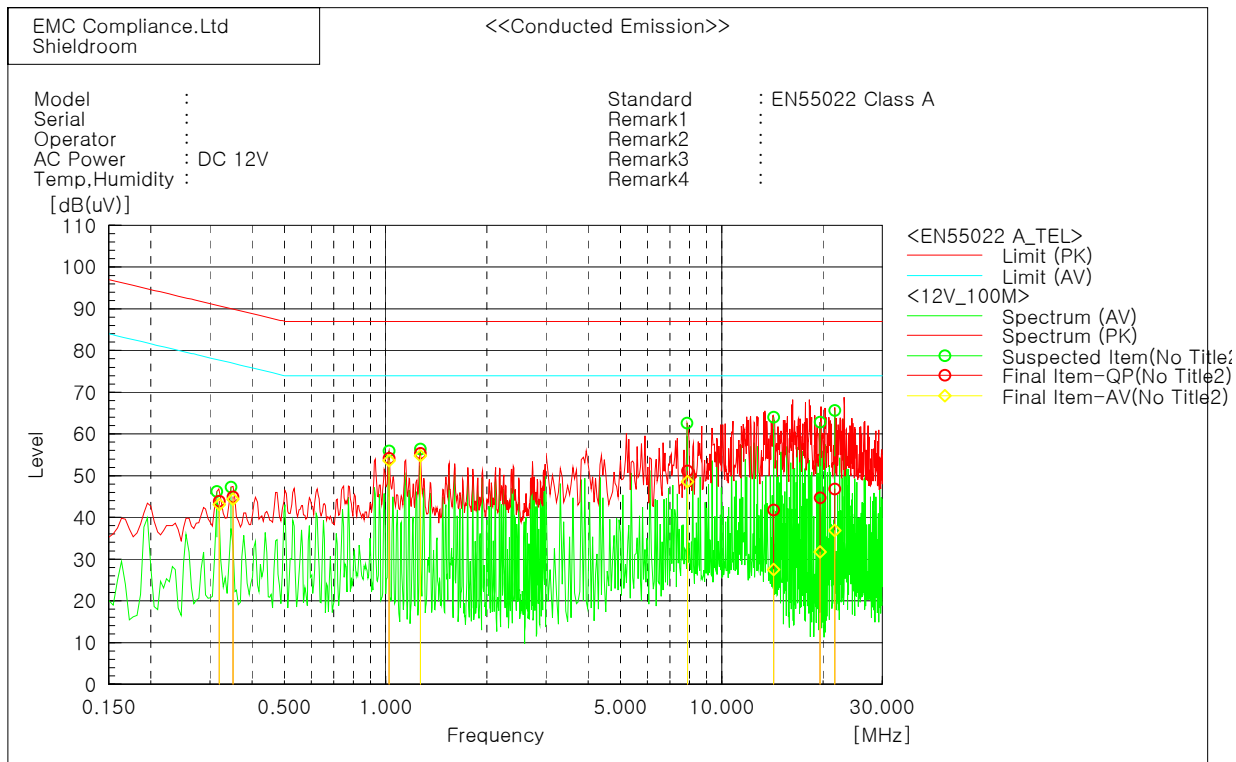


Final Result

--- ISN-CAT3 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB]	Result QP [dB(μV)]	Result CAV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin CAV [dB]
1	0.40163	23.8	17.7	9.7	33.5	27.4	88.8	75.8	55.3	48.4
2	0.4747	29.0	24.3	9.6	38.6	33.9	87.4	74.4	48.8	40.5
3	1.24668	20.0	8.9	9.5	29.5	18.4	87.0	74.0	57.5	55.6
4	2.51573	38.5	18.1	9.5	48.0	27.6	87.0	74.0	39.0	46.4
5	10.00463	65.0	47.0	9.4	74.4	56.4	87.0	74.0	12.6	17.6
6	12.47206	38.6	23.6	9.5	48.1	33.1	87.0	74.0	38.9	40.9
7	14.99057	36.2	17.9	9.5	45.7	27.4	87.0	74.0	41.3	46.6
8	20.00036	43.5	29.0	9.5	53.0	38.5	87.0	74.0	34.0	35.5

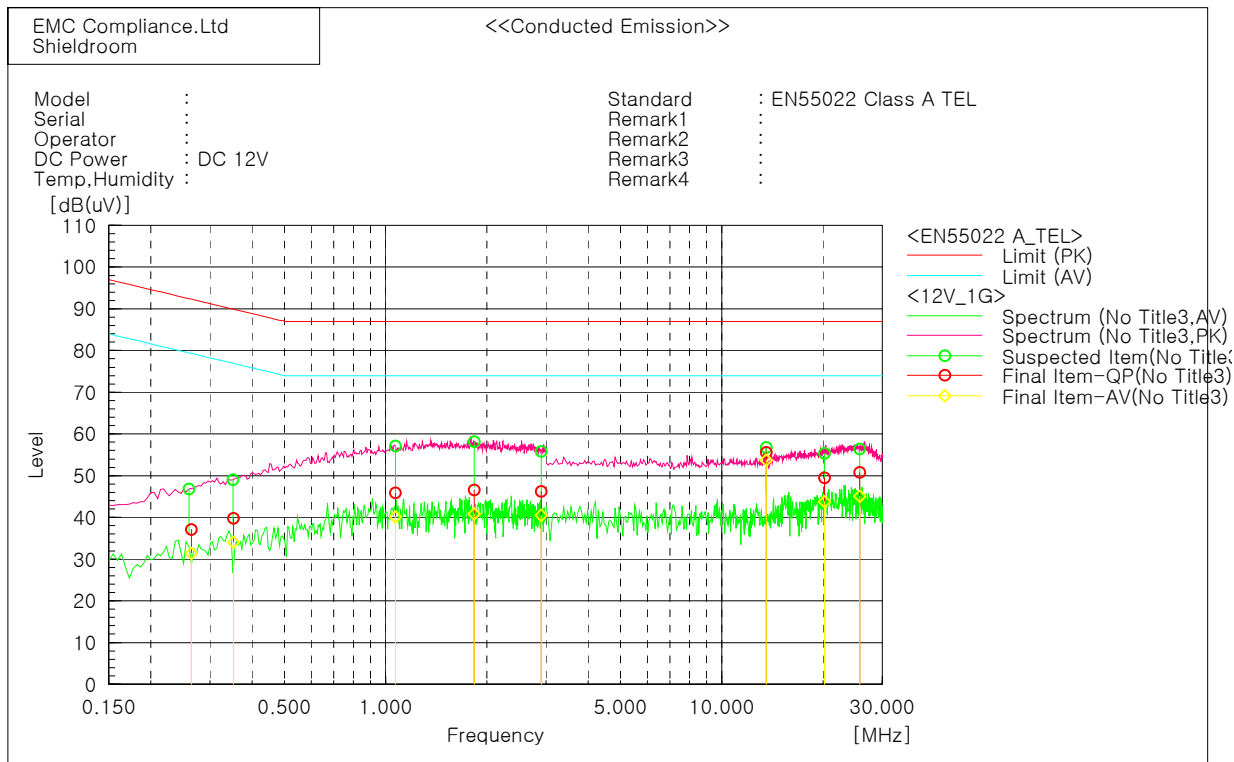
#1-DC 12V_LCL 65 dB (Network(RJ-45) Port)_100 Mbps_(SRM-872)



Final Result

--- ISN-CAT5 Phase ---											
No.	Frequency	Reading QP	Reading CAV	c. f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV	
	[MHz]	[dB(μV)]	[dB(μV)]	[dB]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB]	[dB]	
1	0.31942	33.8	33.0	10.1	43.9	43.1	90.7	77.7	46.8	34.6	
2	0.35139	34.9	34.3	10.0	44.9	44.3	89.9	76.9	45.0	32.6	
3	1.0229	44.3	43.8	9.8	54.1	53.6	87.0	74.0	32.9	20.4	
4	1.26702	45.5	45.0	9.8	55.3	54.8	87.0	74.0	31.7	19.2	
5	7.89291	41.5	38.9	9.6	51.1	48.5	87.0	74.0	35.9	25.5	
6	14.25499	32.1	17.9	9.6	41.7	27.5	87.0	74.0	45.3	46.5	
7	19.57711	35.0	22.1	9.7	44.7	31.8	87.0	74.0	42.3	42.2	
8	21.65403	37.1	27.2	9.7	46.8	36.9	87.0	74.0	40.2	37.1	

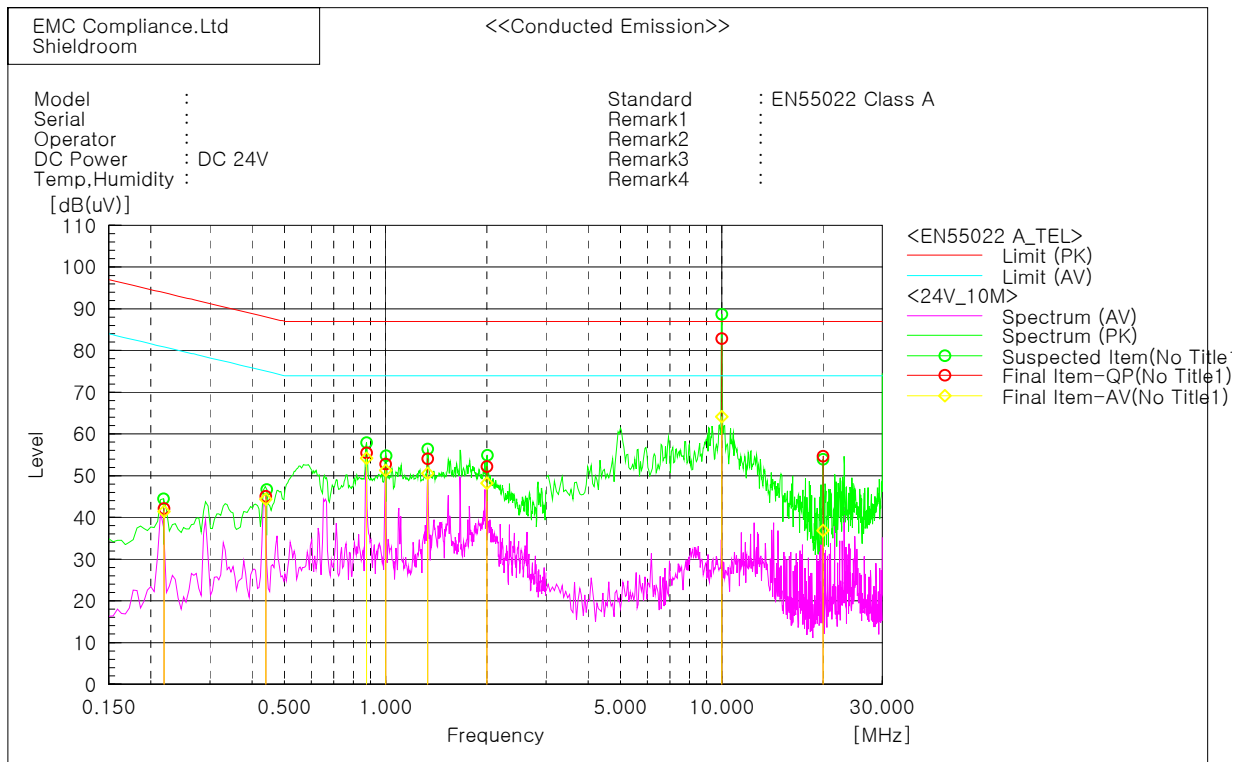
#1-DC 12V_LCL 75 dB (Network(RJ-45) Port)_1000 Mbps_(SRM-872)



Final Result

--- ENY81-CAT6 Phase ---											
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c. f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]	
1	0.26461	27.2	21.5	9.9	37.1	31.4	92.3	79.3	55.2	47.9	
2	0.35295	30.0	24.3	9.8	39.8	34.1	89.9	76.9	50.1	42.8	
3	1.06881	36.3	30.5	9.6	45.9	40.1	87.0	74.0	41.1	33.9	
4	1.83423	37.0	31.2	9.6	46.6	40.8	87.0	74.0	40.4	33.2	
5	2.90451	36.7	30.9	9.6	46.3	40.5	87.0	74.0	40.7	33.5	
6	13.56033	46.0	44.1	9.6	55.6	53.7	87.0	74.0	31.4	20.3	
7	20.17289	39.9	34.1	9.6	49.5	43.7	87.0	74.0	37.5	30.3	
8	25.67273	41.2	35.4	9.6	50.8	45.0	87.0	74.0	36.2	29.0	

#2-DC 24V_LCL 55 dB (Network(RJ-45) Port)_10 Mbps_(SRM-872)

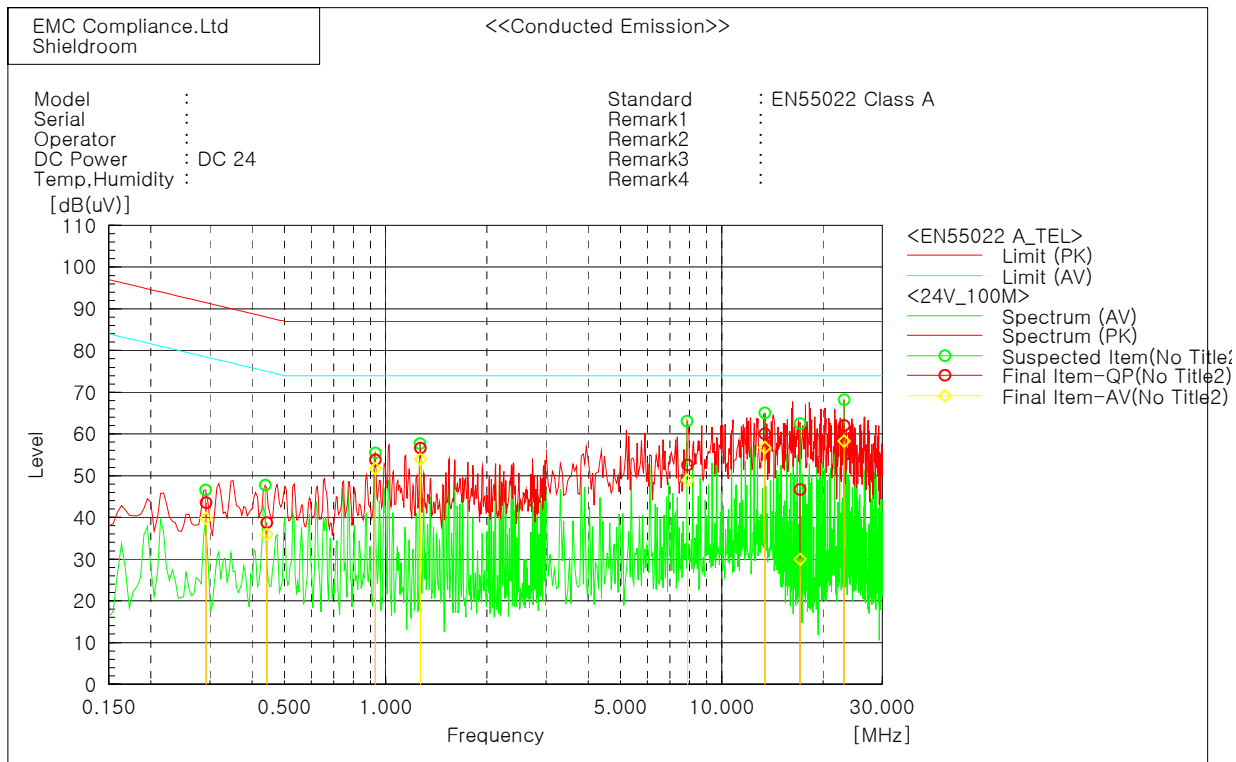


Final Result

--- ISN-CAT3 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB]	Result QP [dB(μV)]	Result CAV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin CAV [dB]
1	0.21907	32.3	31.6	9.8	42.1	41.4	93.9	80.9	51.8	39.5
2	0.43917	35.4	34.6	9.7	45.1	44.3	88.1	75.1	43.0	30.8
3	0.8767	45.9	44.6	9.6	55.5	54.2	87.0	74.0	31.5	19.8
4	1.00012	43.3	41.7	9.5	52.8	51.2	87.0	74.0	34.2	22.8
5	1.33408	44.5	41.1	9.5	54.0	50.6	87.0	74.0	33.0	23.4
6	2.00105	42.7	38.7	9.5	52.2	48.2	87.0	74.0	34.8	25.8
7	10.00463	73.5	54.7	9.4	82.9	64.1	87.0	74.0	4.1	9.9
8	20.00062	45.2	27.4	9.5	54.7	36.9	87.0	74.0	32.3	37.1

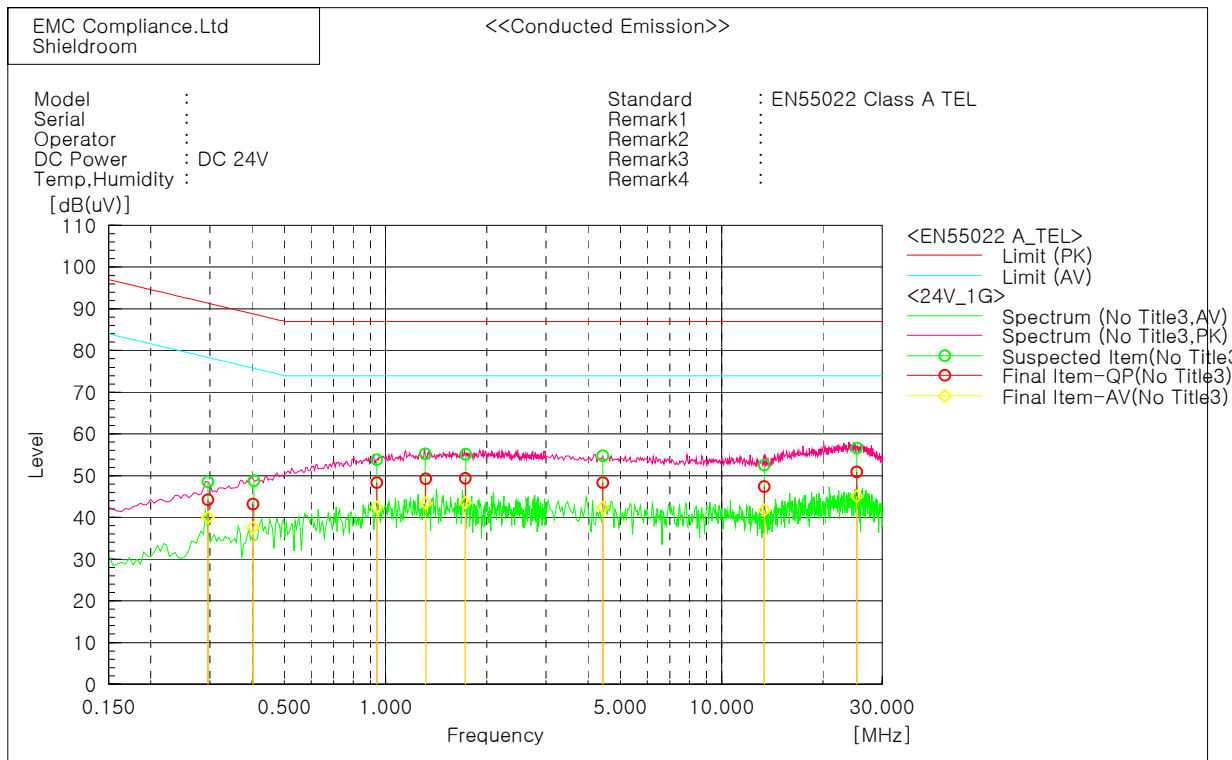
#2-DC 24V_LCL 65 dB (Network(RJ-45) Port)_100 Mbps_(SRM-872)



Final Result

--- ISN-CAT5 Phase ---											
No.	Frequency	Reading	Reading	c.f	Result	Result	Limit	Limit	Margin	Margin	
	[MHz]	QP	CAV		QP	CAV	QP	AV	QP	CAV	
		[dB(μV)]	[dB(μV)]	[dB]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB]	[dB]	
1	0.29226	33.5	29.7	10.1	43.6	39.8	91.5	78.5	47.9	38.7	
2	0.44273	28.7	26.0	10.0	38.7	36.0	88.0	75.0	49.3	39.0	
3	0.93122	44.0	41.9	9.8	53.8	51.7	87.0	74.0	33.2	22.3	
4	1.26714	46.8	44.1	9.8	56.6	53.9	87.0	74.0	30.4	20.1	
5	7.89302	42.9	39.3	9.6	52.5	48.9	87.0	74.0	34.5	25.1	
6	13.42289	50.5	47.1	9.6	60.1	56.7	87.0	74.0	26.9	17.3	
7	17.06749	37.0	20.2	9.7	46.7	29.9	87.0	74.0	40.3	44.1	
8	23.12518	52.3	48.6	9.7	62.0	58.3	87.0	74.0	25.0	15.7	

#2-DC 24V_LCL 75 dB (Network(RJ-45) Port)_1000 Mbps_(SRM-872)



Final Result

--- ENY81-CAT6 Phase ---											
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]	
1	0.29575	34.3	30.1	9.9	44.2	40.0	91.4	78.4	47.2	38.4	
2	0.40255	33.4	27.7	9.8	43.2	37.5	88.8	75.8	45.6	38.3	
3	0.94242	38.7	32.8	9.7	48.4	42.5	87.0	74.0	38.6	31.5	
4	1.31509	39.7	33.8	9.6	49.3	43.4	87.0	74.0	37.7	30.6	
5	1.72603	39.7	33.9	9.6	49.3	43.5	87.0	74.0	37.7	30.5	
6	4.42656	38.7	32.8	9.6	48.3	42.4	87.0	74.0	38.7	31.6	
7	13.38961	37.8	32.2	9.6	47.4	41.8	87.0	74.0	39.6	32.2	
8	25.20094	41.3	35.5	9.6	50.9	45.1	87.0	74.0	36.1	28.9	

6.2 Radiated Emission

Test specification	AS/NZS CISPR 22:2009+A1:2010, Class A		
Testing voltage	DC 12 V, DC 24 V		
Test facility	10 m Chamber (#F2)		
Test distance	10 m, 3 m		
Date	2013. 12. 03		
Temperature (°C)	20.6 °C	Humidity (% R.H.)	28.9 % R.H.
Remarks	Complied		

6.2.1 Limits of radiated emission measurement

☒ Limits below 1 GHz

Frequency MHz	Class A dB μ V/m @ 10 m	Class B dB μ V/m @ 10 m
30 ~ 230	40	30
230 ~ 1 000	47	37

☒ Limits above 1 GHz

Frequency MHz	Class A @ 3 m		Class B @ 3 m	
	Average limit dB μ V/m	Peak limit dB μ V/m	Average limit dB μ V/m	Peak limit dB μ V/m
1 ~ 3	56	76	50	70
3 ~ 6	60	80	54	74

Note - The lower limit applies at the transition frequency.

6.2.2 Measurement procedure

The test was done at a 10 m chamber with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane. Cables were folded back and forth forming a bundle 0.3 m to 0.4 m long and were hanged at a 0.4 m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.2.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
Test Receiver	ESCI7	100732	R&S	2014.02.18	<input checked="" type="checkbox"/>
Test Receiver	ESCI	100001	R&S	2014.07.25	<input type="checkbox"/>
Test Receiver	ESCI	100710	R&S	2014.10.28	<input type="checkbox"/>
Test Receiver	ESR	101078	R&S	2014.10.17	<input type="checkbox"/>
Bi-Log Antenna	VULB 9168	375	SCHWARZBECK	2015.10.16	<input checked="" type="checkbox"/>
Amplifier	310N	186280	SONOMA INSTRUMENT	2014.02.15	<input checked="" type="checkbox"/>
3 dB Attenuator	8491A	16861	HP	2014.07.08	<input checked="" type="checkbox"/>
Antenna Mast	AM4.0	079/3440509	MATURO	-	<input checked="" type="checkbox"/>
Turn Table	CO2000-SOFT	-	MATURO	-	<input checked="" type="checkbox"/>
Amplifier	8449B	3008A02343	AGILENT	2014.10.31	<input checked="" type="checkbox"/>
Horn ANT	3115	00086706	ETS	2014.09.05	<input checked="" type="checkbox"/>
Spectrum Analyzer	FSP7	100289	R&S	2013.12.14	<input type="checkbox"/>

6.2.4 Sample calculation

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follow:

$$\text{Result} = \text{M.R} + \text{C.F}(\text{A.F} + \text{C.L} + 3 \text{ dB Att} - \text{A.G})$$

M.R = Meter Reading

C.F = Correction Factor

A.F = Antenna Factor

C.L = Cable Loss

A.G= Amplifier Gain

3 dB Att = 3 dB Attenuator

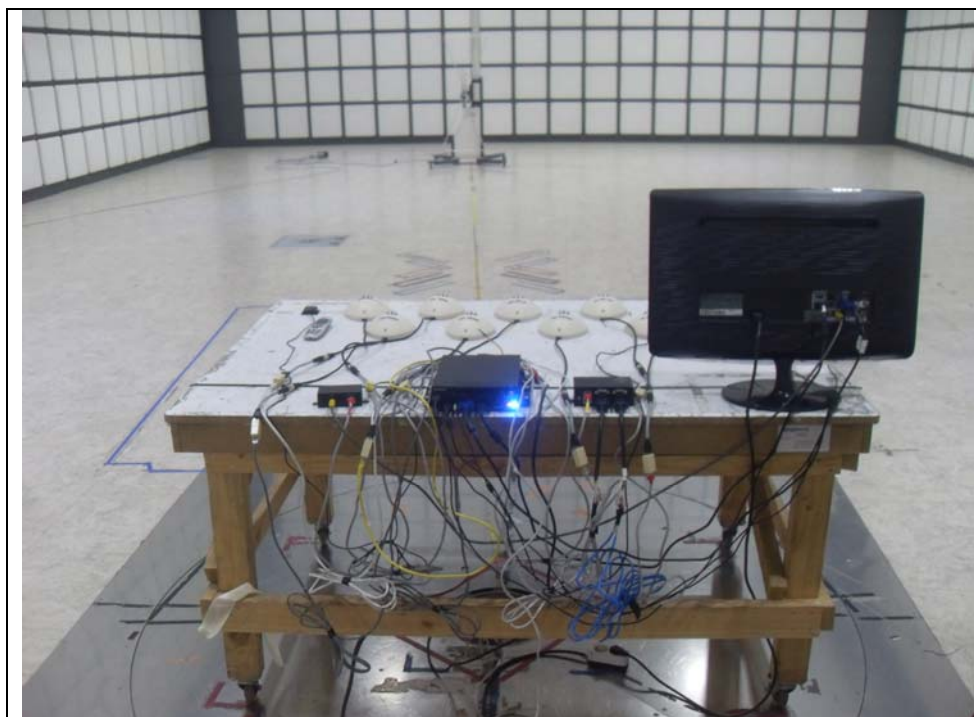
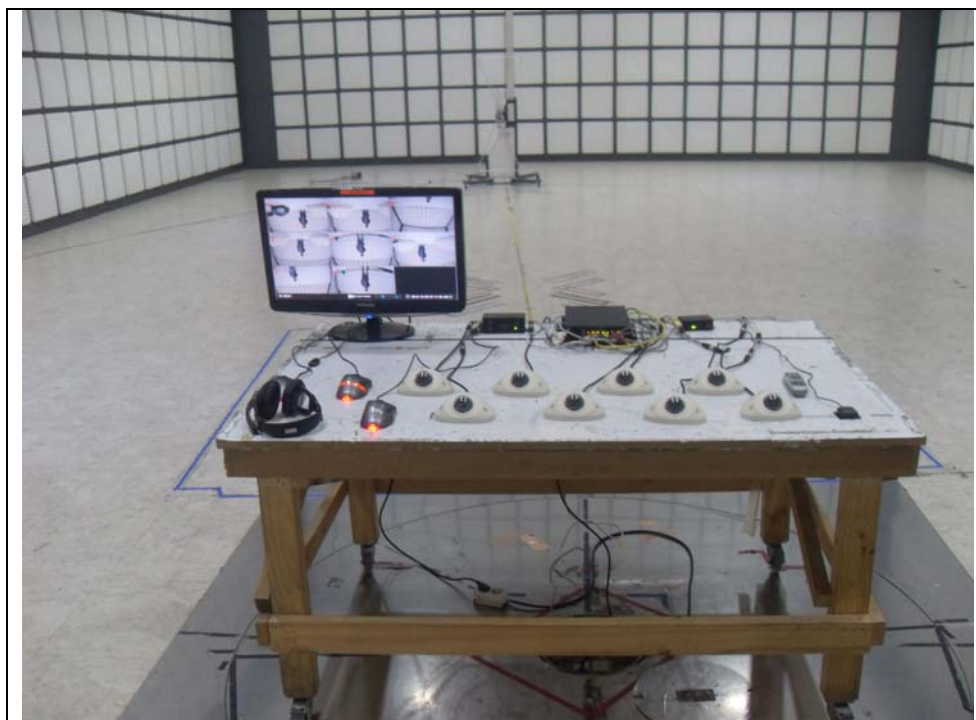
If M.R is 30 dB, A.F 12 dB, C.L 5 dB, 3 dB, A.G 35 dB

The result is

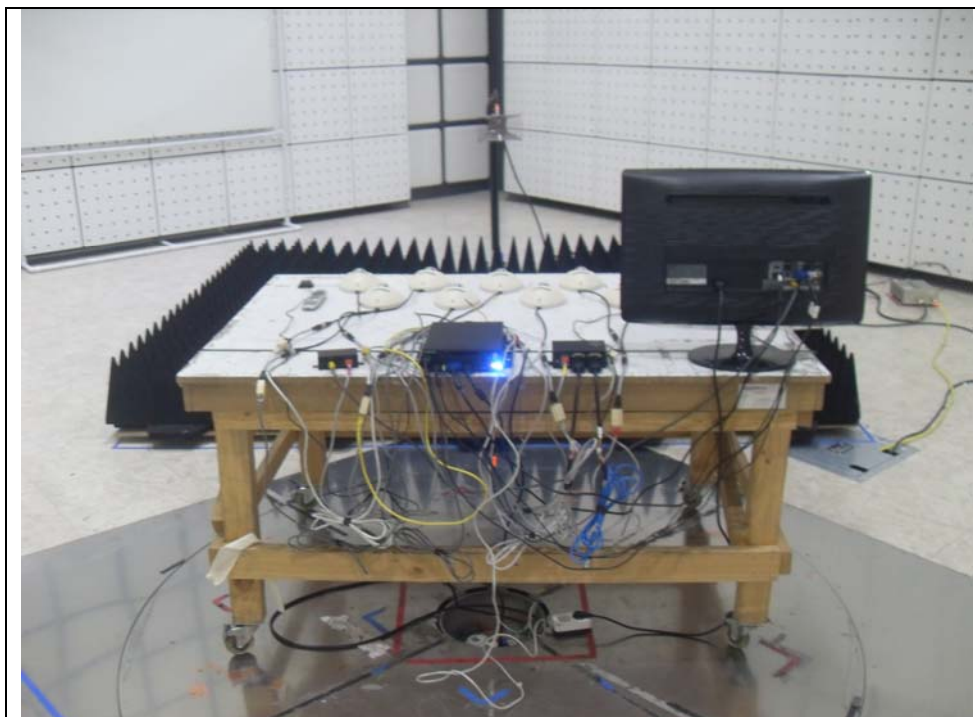
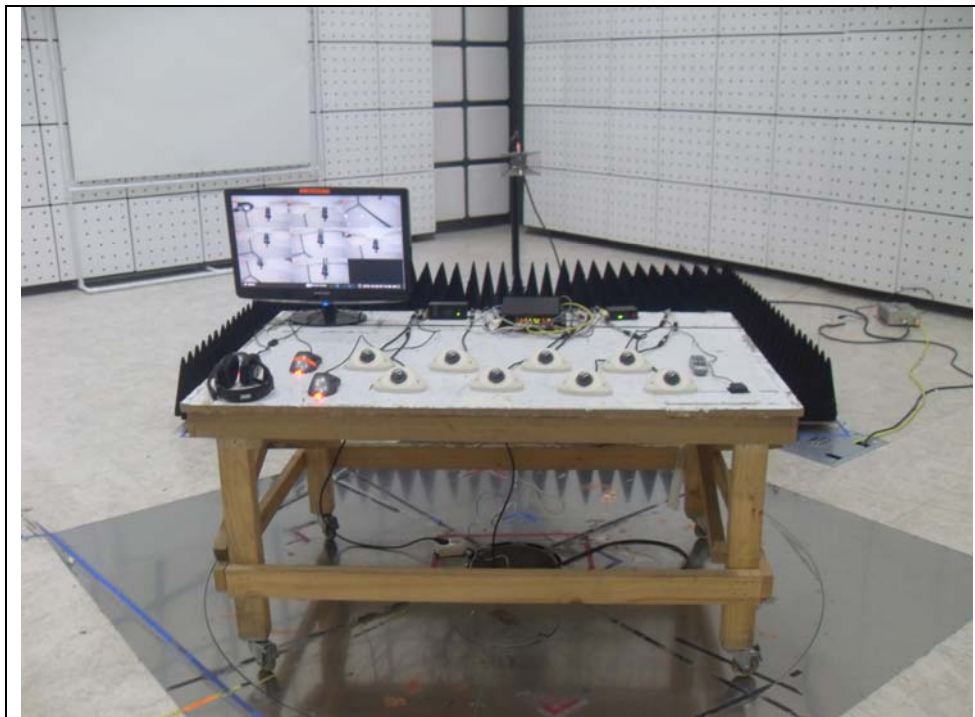
$$30 + 12 + 5 + 3 - 35 = 15 \text{ dB}\mu\text{V/m}$$

6.2.5 Photographs of test setup

* 30 MHz ~ 1 GHz (#1-DC 12V, #2-DC 24V)



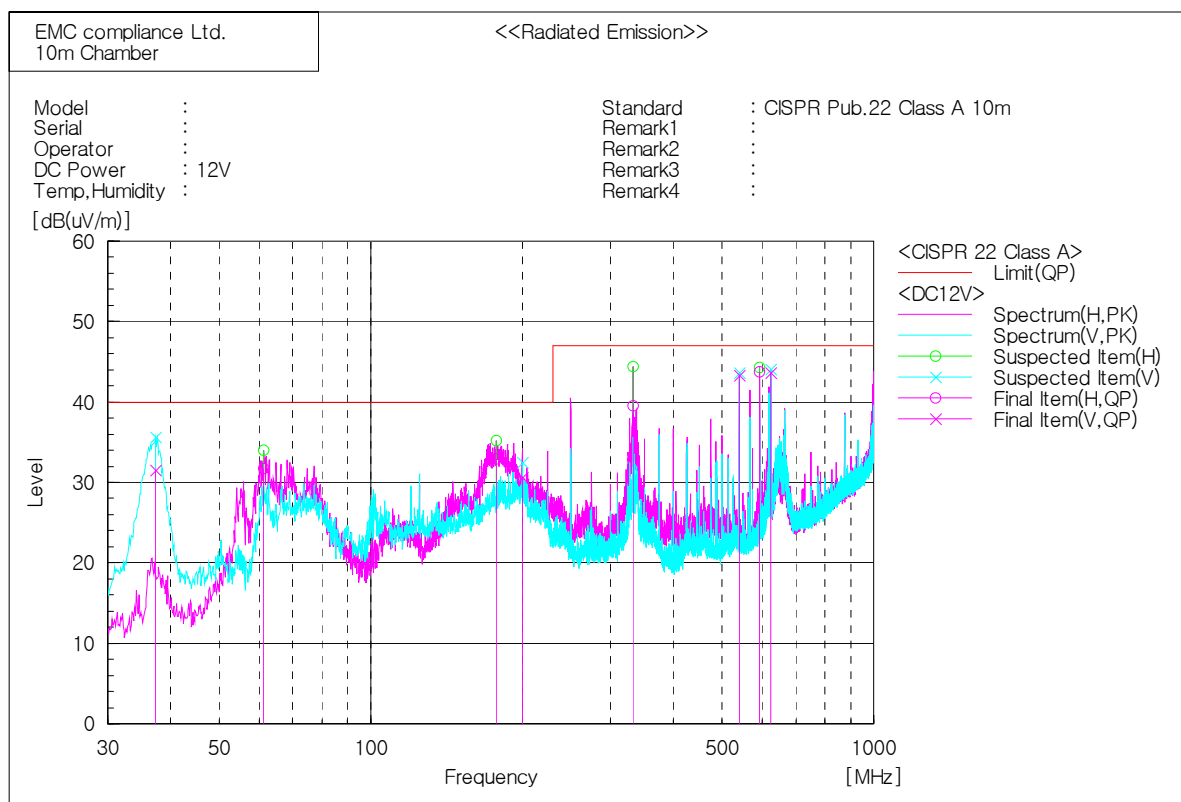
* 1 GHz ~ 6 GHz(#1-DC 12V, #2-DC 24V)



6.2.6 Radiated emission measurement result

* Graph and Data

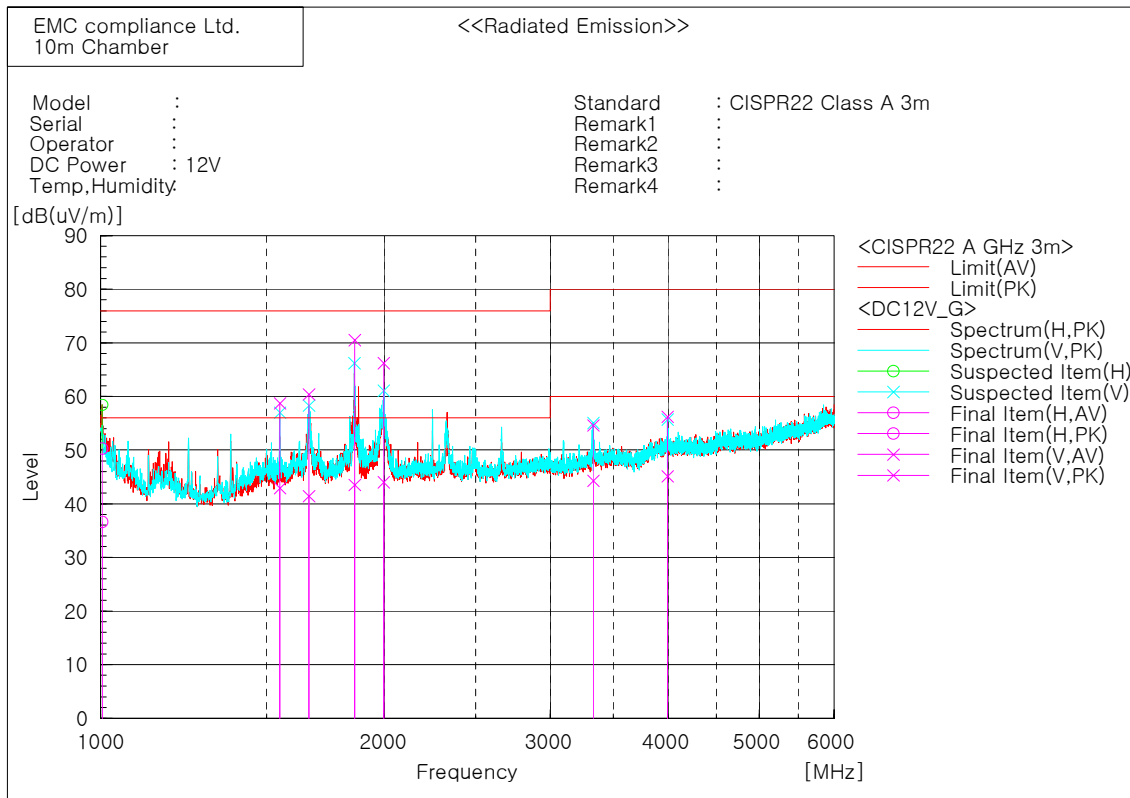
* 30 MHz ~ 1 GHz (SRM-872) (#1-DC 12V)



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	37.396	V	45.8	-14.3	31.5	40.0	8.5	400.0	241.7
2	61.283	H	46.1	-14.4	31.7	40.0	8.3	300.0	124.4
3	177.804	H	46.0	-13.1	32.9	40.0	7.1	400.0	274.9
4	199.993	V	45.5	-14.8	30.7	40.0	9.3	100.0	160.0
5	333.004	H	48.6	-9.1	39.5	47.0	7.5	300.0	302.0
6	539.978	V	46.7	-3.4	43.3	47.0	3.7	298.0	220.9
7	594.055	H	45.8	-2.0	43.8	47.0	3.2	201.0	357.4
8	624.974	V	45.1	-1.5	43.6	47.0	3.4	100.0	202.0

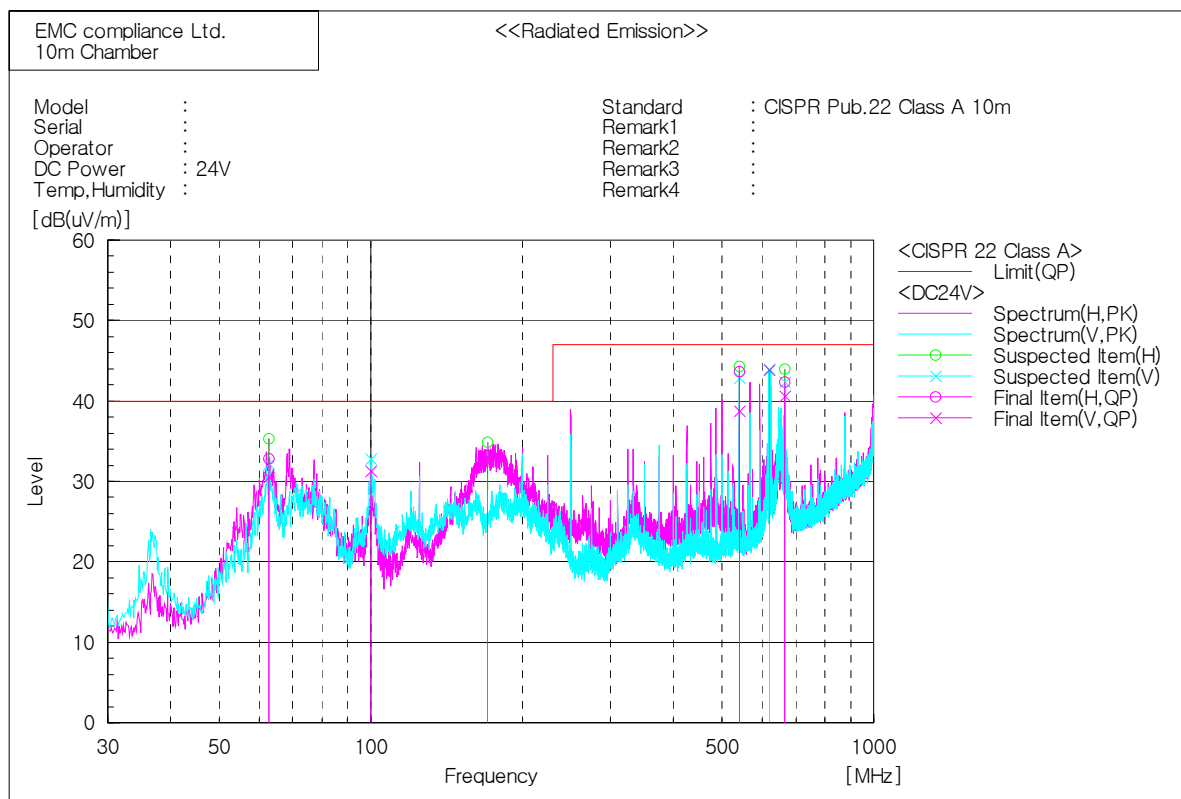
* 1 GHz ~ 6 GHz (SRM-872) (#1-DC 12V)



Final Result

No.	Frequency [MHz]	(P)	Reading AV [dB(μV)]	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result AV [dB(μV/m)]	Result PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [deg]
1	1004.375	H	43.5	57.2	-6.9	36.6	50.3	56.0	76.0	19.4	25.7	100.0	357.4
2	1550.000	V	44.2	60.0	-1.3	42.9	58.7	56.0	76.0	13.1	17.3	100.0	44.3
3	1663.750	V	42.1	61.1	-0.7	41.4	60.4	56.0	76.0	14.6	15.6	100.0	152.3
4	1860.325	V	42.9	69.9	0.6	43.5	70.5	56.0	76.0	12.5	5.5	100.0	30.9
5	1996.875	V	42.7	64.9	1.3	44.0	66.2	56.0	76.0	12.0	9.8	100.0	165.8
6	3331.250	V	38.2	48.5	6.1	44.3	54.6	60.0	80.0	15.7	25.4	100.0	189.9
7	3995.625	V	35.9	47.0	9.2	45.1	56.2	60.0	80.0	14.9	23.8	100.0	165.8

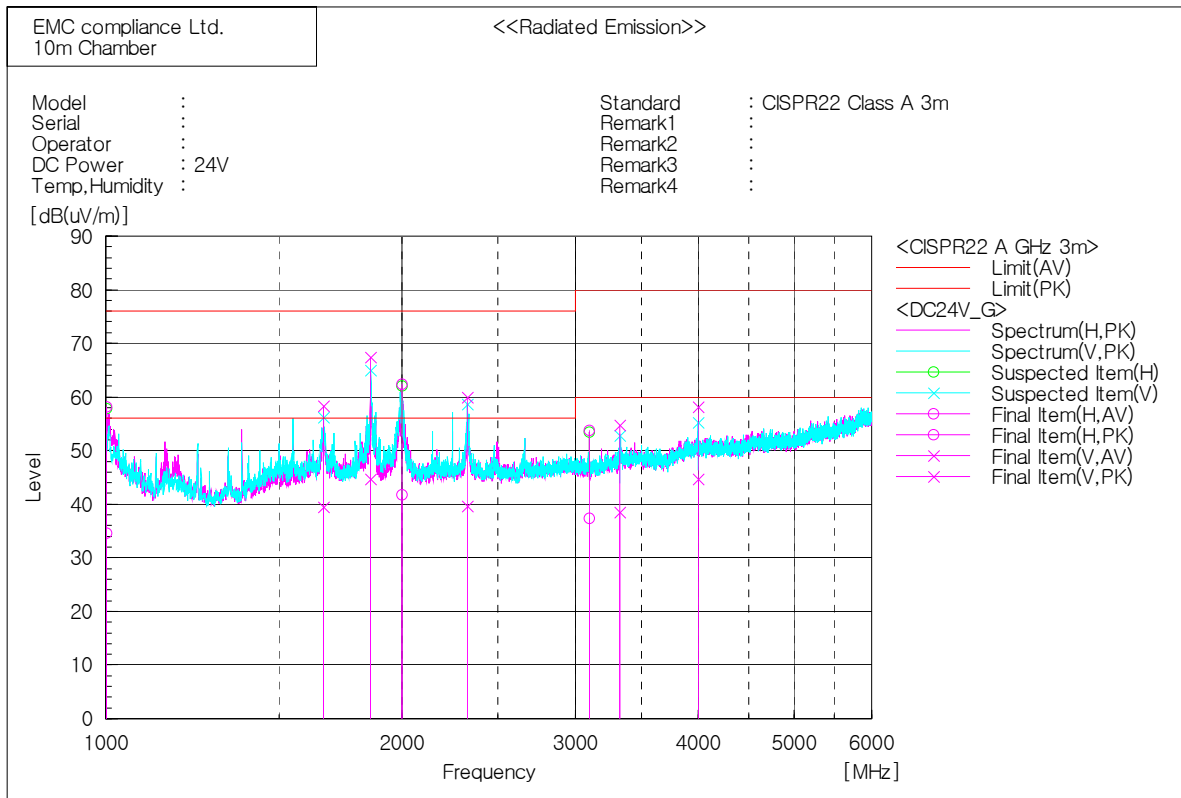
* 30 MHz ~ 1 GHz (SRM-872) (#2-DC 24V)



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	62.738	H	47.4	-14.6	32.8	40.0	7.2	400.0	350.1
2	62.738	V	45.1	-14.6	30.5	40.0	9.5	400.0	226.9
3	100.204	V	48.7	-17.4	31.3	40.0	8.7	298.0	358.6
4	171.135	H	46.2	-13.1	33.1	40.0	6.9	400.0	284.3
5	539.978	H	47.0	-3.4	43.6	47.0	3.4	202.0	220.4
6	539.978	V	42.2	-3.4	38.8	47.0	8.2	298.0	322.0
7	620.003	V	45.4	-1.5	43.9	47.0	3.1	298.0	153.7
8	666.078	H	43.2	-0.9	42.3	47.0	4.7	202.0	347.3
9	666.078	V	41.5	-0.9	40.6	47.0	6.4	199.0	115.1

* 1 GHz ~ 6 GHz (SRM-872) (#2-DC 24V)



Final Result

No.	Frequency [MHz]	(P)	Reading AV [dB(μV)]	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result AV [dB(μV/m)]	Result PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [deg]
1	1001.875	H	41.5	65.0	-6.9	34.6	58.1	56.0	76.0	21.4	17.9	100.0	329.7
2	1665.763	V	40.2	59.0	-0.7	39.5	58.3	56.0	76.0	16.5	17.7	100.0	181.9
3	1860.108	V	44.1	66.8	0.6	44.7	67.4	56.0	76.0	11.3	8.6	100.0	346.9
4	1999.375	H	40.5	61.1	1.3	41.8	62.4	56.0	76.0	14.2	13.6	100.0	89.1
5	2331.063	V	37.2	57.4	2.5	39.7	59.9	56.0	76.0	16.3	16.1	100.0	301.9
6	3100.625	H	32.5	49.0	4.8	37.3	53.8	60.0	80.0	22.7	26.2	100.0	348.5
7	3328.288	V	32.4	48.7	6.1	38.5	54.8	60.0	80.0	21.5	25.2	100.0	192.4
8	3995.675	V	35.5	49.0	9.2	44.7	58.2	60.0	80.0	15.3	21.8	100.0	157.9

7. E.U.T. photographs

Whole



*** Main**

Front View



Rear View



Left View



Right View



Top View



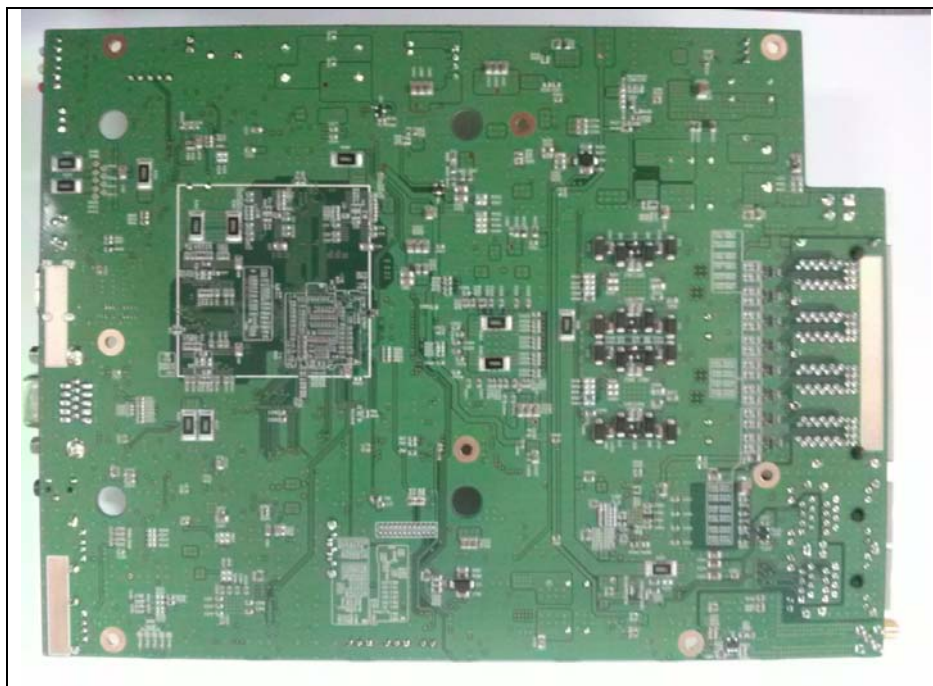
Bottom View



Inside



Main Board



HDD(1TB)

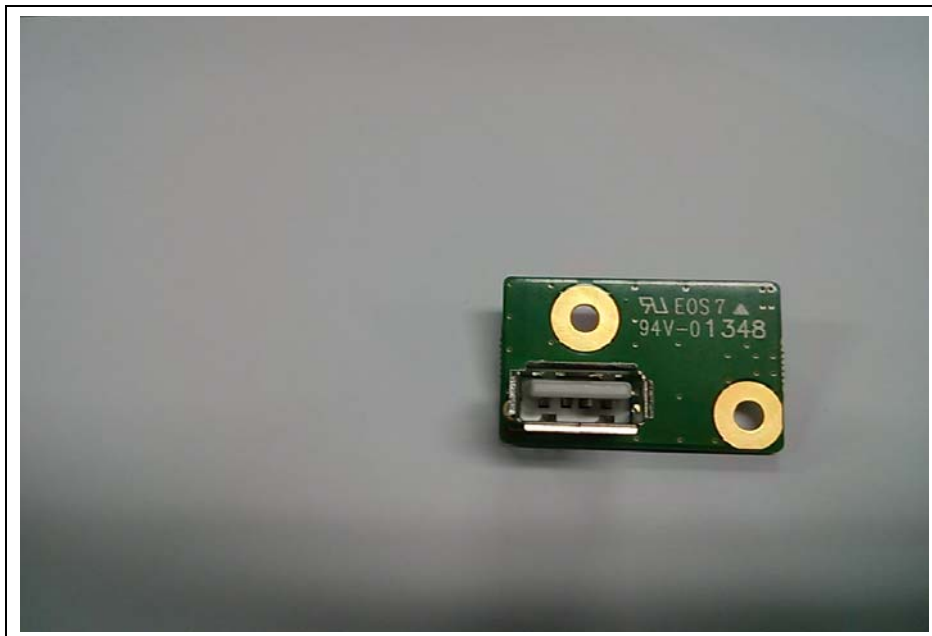




HDD Rack Board



Front USB Board



*** Control Box**

Front View



Rear View



Left View



Right View



Top View



Bottom View



Inside



Main Board



*** Sensor Box**

Front View



Rear View



Left View



Right View



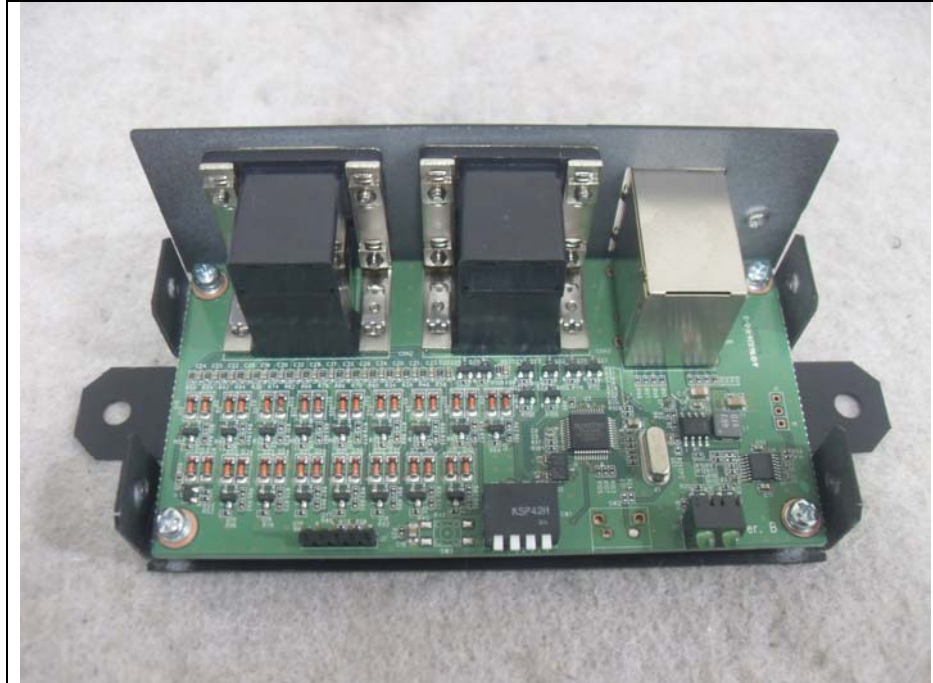
Top View



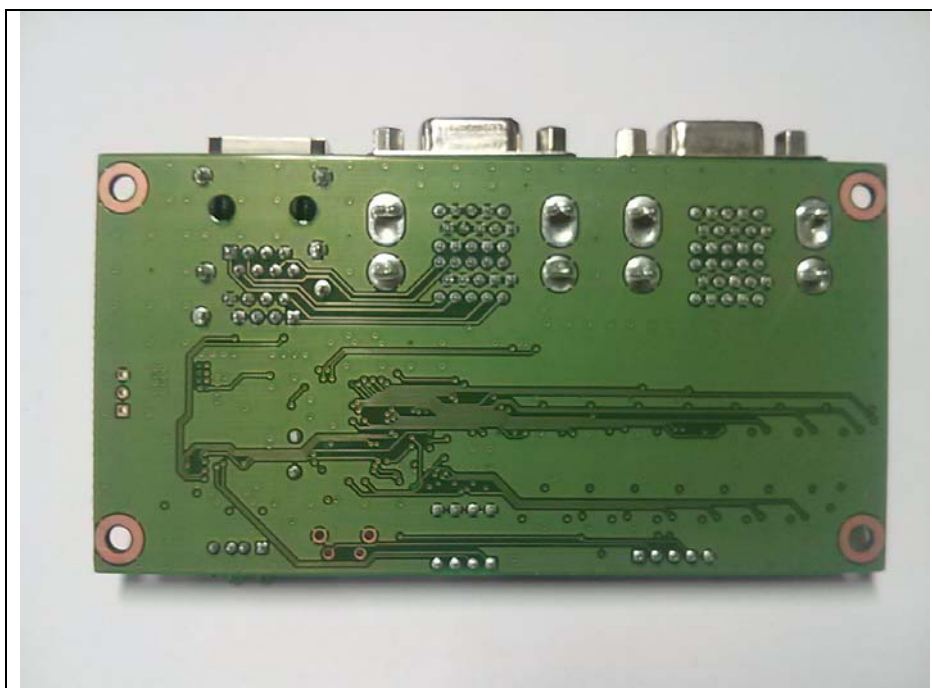
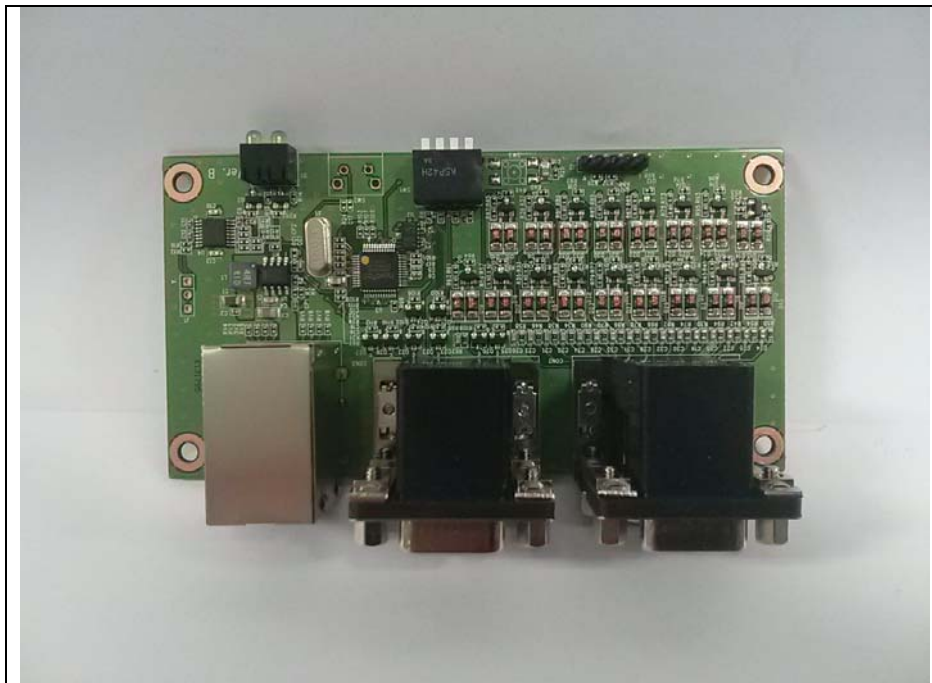
Bottom View



Inside



Main Board



GPS



Remote Control



