

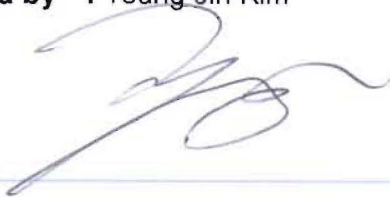
EMC TEST REPORT

Project No.	LBE20142414	Issue No.	0
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	(Maetan dong) 129, Samsung-ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do 443-742 Korea	
	Date of application	May 2, 2014	
EUT	Type of device	Class B personal computers and peripherals	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LWEA403I	
	Kind of product	WLAN Access Point	
	Model No.	WEA403i	
	Variant Model No.	-	
	Manufacturer	Samsung Electronics Co.,Ltd. #244, 1Gongdan-ro, Gumi-Si, Gyeongsangbuk-Do, 730-030, Korea	
Applied Standards		47 CFR Part 15, Subpart B / ANSI C63.4-2009	
		ICES-003 Issue 5	
Test Period		May 19, 2014 ~ May 20, 2014	
Issue date		June 2, 2014	

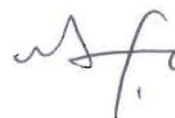
Test result : Complied

The equipment under test has found to be compliant with the applied standards.
 The result is not applied the uncertainty concept.
 This mean that the result is applied the original (standard) limit.
 (Refer to the attached test result for more detail.)

Tested by : Young Jin Kim



Reviewed by : Min Gon Kim



The test results in this report only apply to the tested sample. This report must not be reproduced, except in full, without written permission from CS & Environment center.



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1. Report information

1.1 Revision history

No.	Revised detailed information
Issue 0	There are no revisions and this version is basic test report.

1.2 Sample calculation

1.2.1 Conducted disturbance (at 10 MHz)

- Limit = 60 dB μ V (Quasi-peak limit)
- Level (50 dB μ V) = Meter Reading (40.2 dB μ V) + Factor (9.8 dB = AMN factor 9.7 dB + Cable loss 0.1 dB)
- Margin (10 dB) = Limit (60 dB μ V) - Level (50 dB μ V) = 10 dB below limit

1.2.2 Radiated disturbance (at 100 MHz)

- Limit = 30 dB μ V/m at 10 m
- Level (20 dB μ V/m)
= Meter Reading (40 dB μ V) + Factor (- 20 dB (1/m) = antenna factor + cable loss – amplifier gain)
- Margin (10 dB) = Limit (30 dB μ V/m) - Level (20 dB μ V/m) = 10 dB below limit

2. Summary of test results

2.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result
☒	Conducted Disturbance (Mains Port)	47 CFR Part 15, Subpart B / ANSI C63.4-2009 (Class B)	Complied
☒	Radiated Disturbance		Complied

- Note : These results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference – Causing Equipment Regulations

3. General Information

3.1 Test facility

The CS & Environment center is located on Samsung Electronics Co., Ltd. at (Maetan dong) 129, Samsung-ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do 443-742 Korea. All testing are performed in Semi-anechoic chambers conforming to the site attenuation Characteristics defined by ANSI C63.4, CISPR 22, 16-1 and 16-2. and Shielded rooms.

The CS & Environment Centre is operated as EMC testing laboratory in accordance with the requirements of ISO/IEC 17025:2005.

4. Test Setup configuration

4.1 Test Peripherals

The cables used for these peripherals are either permanently attached by the peripheral manufacturer or coupled with an assigned cable as defined below.

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Description	Model No.	Serial No.	Manufacturer	Fcc ID / DoC
WLAN Access Point	WEA403i	-	Samsung	A3LWEA403I
AC Adapter	AP36-48	007751141100032	HCT	-
PoE Switch	JG236A	CN27F5Y1XY	HP	DoC
Note PC	NT-P580	ZSVB93EZ601245J	Samsung	DoC
AC Adapter	AD-9019S	CNBA4400215AD2VH05P00V6	Samsung	-
Note PC	NT-200B5C	J9RW91JCB00661N	Samsung	DoC
AC Adapter	AD-9019S	CNBA4400215AD2VH05Q006Q	Samsung	

4.2 EUT operating mode

To achieve compliance applied standard specification, the following mode(s) were made during compliance testing:

Operating Mode 1 (Test mode)	LAN Communication using AC Adapter
Operating Mode 2 (Test mode)	LAN Communication using PoE

4.3 Details of Sampling

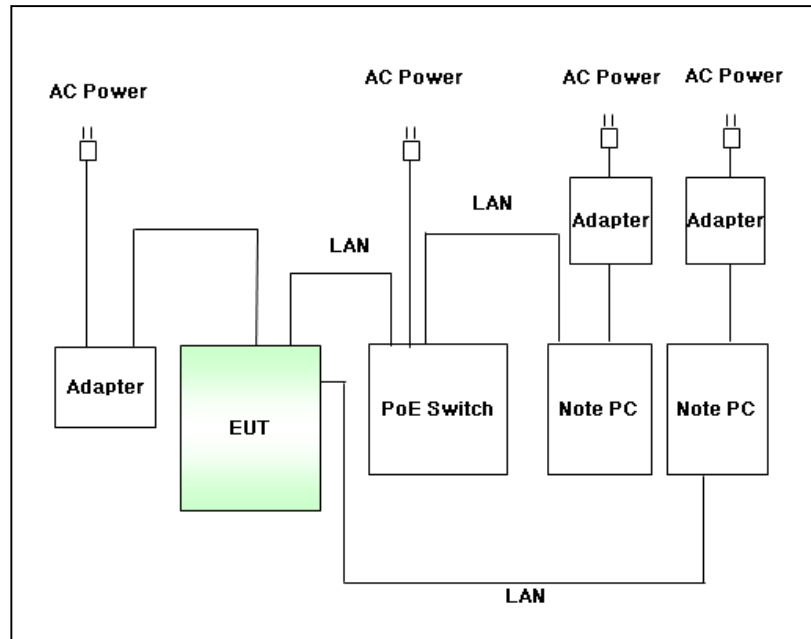
Customer selected, single unit.

4.4 Used cable description

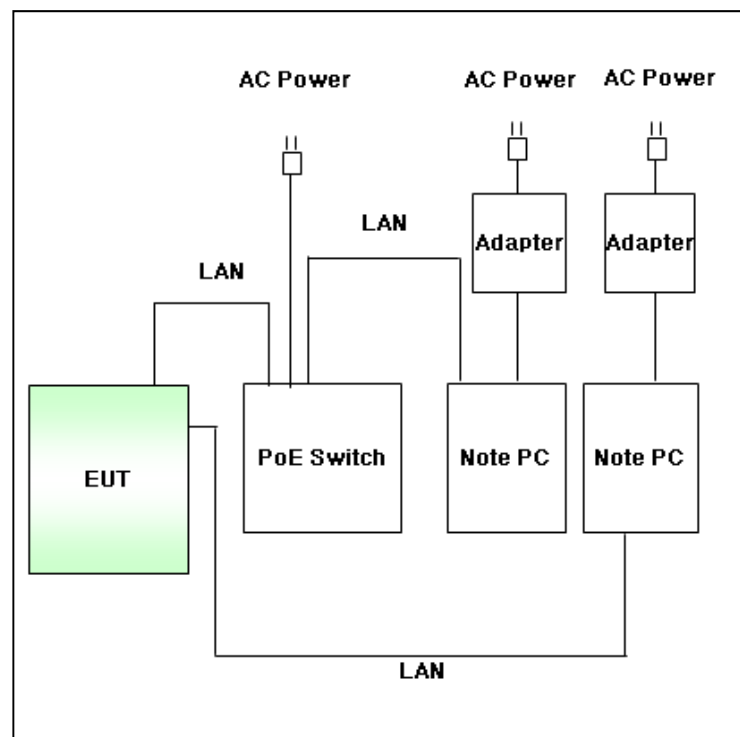
The EUT is configured, installed, arranged and operated in a manner consistent with typical applications. Interface cables/loads/devices are connected to at least one of each type of interface port of the EUT, and where practical, each cable shall be terminated in a device typical of actual usage. The type(s) of interconnecting cables to be used and the interface port (of the EUT) to which these were connected;

No.	Connected cable	Length [m]	Shielded [Y/N]	Note
1	Power	1.8	No	For EUT
2	Power	1.5	Yes	For PoE Switch
3	Power	1.5	Yes	For Note PC
4	Power	1.5	Yes	For Note PC
5	LAN	2.0	Yes	From EUT to Note PC
6	LAN	2.0	No	From EUT to PoE Switch
7	LAN	2.0	No	From Note PC to PoE Switch

4.5 Test arrangement



[Mode 1]



[Mode 2]

4.6 EUT Description

The following features describe EUT represented by this report:

Wireless	Standard	802.11a/b/g/n/ac
	# of radio	Dual Concurrent Radio
	Frequency	2.4 GHz, 5 GHz
	Antennas	Internal Type
	MIMO	3 X 3 MIMO, 3 Spatial Streams
	PHY Rate	1.3 Gbps
H/W	Network I/F	2 GE (RJ45). 1 Console (RJ45)
	PoE	802.3at
	Environment Class	Indoor
Dimension	Diameter / Height	205 mm / 45 mm
	Weight	920 g
Security	Standard	802.11i, WPA/WPA2
	Multi SSID	Maximum 16
	# of Multi VLAN over SSID	Maximum 1,024
	Encryption	DTLS
QoS	Standard	802.11e
	WMM	Yes
Management	Operation	Controller Based
Certification	WiFi Certified	WPA/WPA2, WMM, WMM-PS
	KC	Yes

4.7 Clock Frequencies

Kind of Clocks	Frequency[MHz]	Kind of Clocks	Frequency[MHz]
Main Processor	1 000	DDR3	800
OSC for Processor	25	PCIe Reference	100
X-TAL for RF IC	40	-	-

4.8 Test configuration and condition

The interface cables were connected to one of each type of functional interface port on the EUT, the system was configured for testing in a typical fashion that a customer would normally use.

The EUT was connected to a PC through the Ethernet port with Unshielded Twisted Pair Ethernet cable.

Additionally, the EUT tested when supplied of power using PoE Switch.

- **Testing Voltage : AC 120 V, 60 Hz**

4.9 Measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus: (According to CISPR 16-4 and UKAS Lab 34.)

4.9.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	Main terminal	3.31 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.69 dB
	Vertical	4.83 dB
Radiated Disturbance (Above 1 GHz)	Horizontal	5.61 dB
	Vertical	5.60 dB

5. Results of individual test

5.1 Conducted disturbance

Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration. The EUT measured in accordance with the methods described in standards.

Limits for conducted disturbance at the mains ports

Frequency range Limits(MHz)	Resolution Bandwidth(kHz)	Limits of Class A, dB(μV)		Limits of Class B, dB(μV)	
		Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.50	9	79	66	66 ~ 56	56 ~ 46
0.50 ~ 5	9	73	60	56	46
5 ~ 30	9			60	50
NOTE 1 The lower limit shall apply at the transition frequency					
NOTE 2 The Class B limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.					

If the reading on the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 seconds at each measurement frequency, the highest reading shall be recorded, with the exception of any brief isolated high reading (which shall be ignored).

5.1.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
EMI TEST RECEIVER	ESU	R&S	100482	2013-08-29	12
Artificial Mains Network	ENV216	R&S	101369	2013-11-17	12
Artificial Mains Network	ENV216	R&S	101366	2013-07-28	12

5.1.2 Temperature and humidity condition

Test date	May 20, 2014	Test engineer		Young Jin Kim	
Climate condition	Ambient temperature	22.5 ℃	Relative humidity		32 %
	Atmospheric pressure	100.4 kPa			
Test place	Shielded Room #8				

5.1.3 Photograph of Test Setup



Front

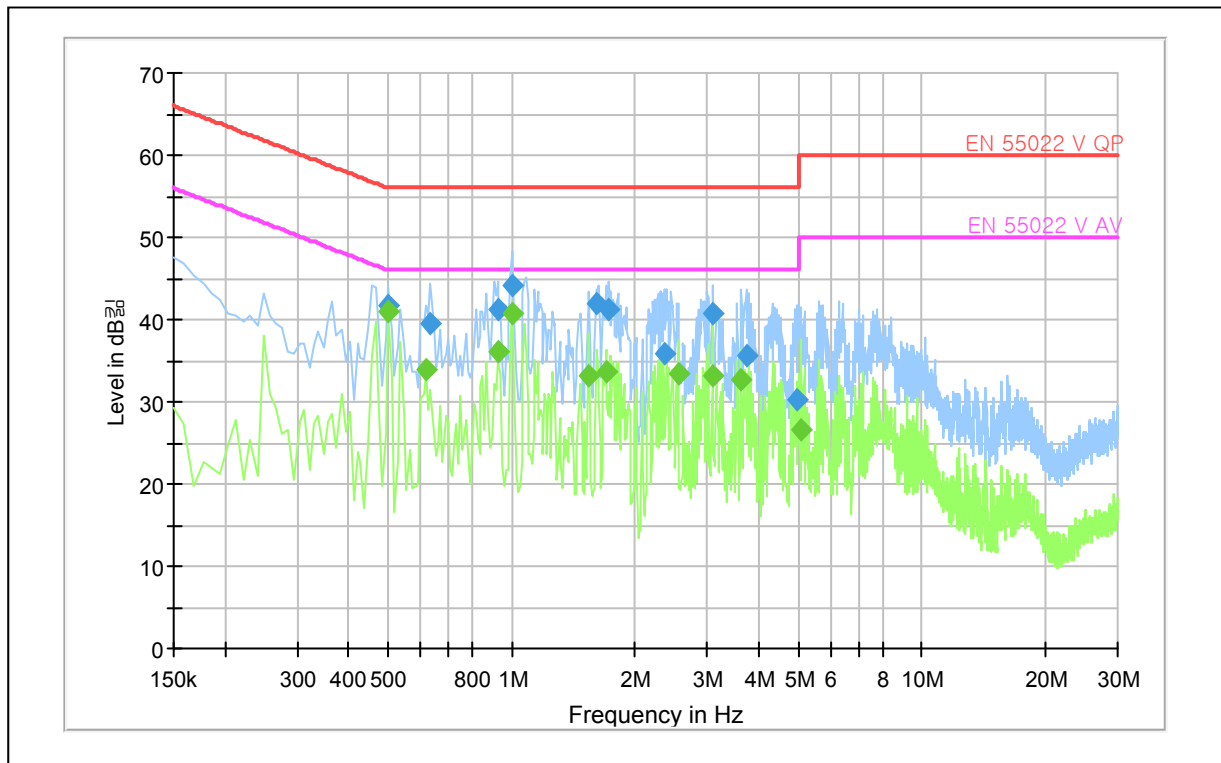


Rear

5.1.4 Test results (mains port)

- Operating Mode : 1

Test Graph



Note) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Test Results (Quasi-Peak and C/Average)

Quasi-peak final measurement results table

Frequency (MHz)	Level ¹⁾ Quasi-Peak (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.501	41.7	N	10.0	14.3	56.0
0.636	39.5	N	9.9	16.5	56.0
0.924	41.2	L1	9.8	14.8	56.0
1.005	44.1	N	9.9	11.9	56.0
1.617	41.9	N	9.8	14.1	56.0
1.725	41.2	L1	9.7	14.8	56.0
2.364	35.9	N	9.8	20.1	56.0
3.084	40.8	N	9.8	15.2	56.0
3.723	35.5	N	9.7	20.5	56.0
4.956	30.2	N	9.7	25.8	56.0

C/Average final measurement results table

Frequency (MHz)	Level ¹⁾ C/Average (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.501	41.0	N	10.0	5.0	46.0
0.618	34.0	N	9.9	12.0	46.0
0.924	36.2	N	9.9	9.8	46.0
1.005	40.7	N	9.9	5.3	46.0
1.545	33.3	N	9.8	12.7	46.0
1.698	33.7	N	9.8	12.3	46.0
2.544	33.5	N	9.8	12.5	46.0
3.084	33.3	N	9.8	12.7	46.0
3.624	32.8	N	9.7	13.2	46.0
5.091	26.6	L1	9.7	23.4	50.0

Note1) Level (Quasi-Peak and/or C/Average) = Meter Reading + Factor

Note2) Line = Polarity of input power (Live or Neutral)

N : Abbreviation of Neutral Polarity, L1 : Abbreviation of Live Polarity,

Note3) Factor = LISN Insertion Loss + Cable Loss

Note4) Margin = Limit – Level (Quasi-Peak and/or C/Average)

Note5) C/Average = CISPR-Average

5.2 Radiated disturbance

Of those disturbances above ($L - 20$ dB), where L is the limit level in logarithmic units, record at least the disturbance levels and the frequencies of the six highest disturbances.

The following data lists the significant emission frequencies, measured levels, correction factors (for antenna and cables), orientation of table, polarization and height of antenna, the corrected reading, the limit, and the amount of margin. All measurements were taken utilizing quasi-peak detection unless stated otherwise.

Measurements were performed at an antenna to EUT distance of 10 meters and elevated between 1 and 4 meters. Both vertical and horizontal antenna polarizations were measured.

Limits for radiated disturbance of ITE at a measuring distance of 10 m

Frequency range Limits (MHz)	Resolution Bandwidth(kHz)	Quasi-peak Limits, dB(μ V/m)	
		Class A	Class B
30 ~ 230	120	40	30
230 ~ 1 000	120	47	37
NOTE 1 The lower limit shall apply at the transition frequency			
NOTE 2 Additional provisions may be required for cases where interference occurs.			

Peak measurements were made over the changeable frequency range 1 GHz to 40 GHz in accordance with internal maximum operating frequency at a measurement distance of 3 m for the following antenna and turntable arrangements:

Antenna Height (cm)	Antenna Polarisation	Turntable position (degrees)
100 ~ 400	Horizontal, Vertical	Continuous

Limits for Class B equipment at a measurement distance of 3 m

Frequency range Limits GHz	Peak Limits dB μ V/m	Average Limits dB μ V/m
Above 1 GHz	74	54
NOTE The lower limit shall apply at the transition frequency		

Measurements within 20 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using a average detector.

Results checked manually; and points close to the limit line were re-measured.

5.2.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Antenna Mast	AM 4.0	Maturo	AM4.0/061/2410908	-	-
Antenna Mast	AM 4.0	Maturo	AM4.0/060/2410908	-	-
Controller	MCU	Maturo	MCU/100/2410908	-	-
Controller	HD100	HD	100/723	-	-
Controller	CO2000	Innco	CO2000/212/9700305/L	-	-
Preamplifier	317	SONOMA	282424	2013-11-13	12
Preamplifier	317	SONOMA	282425	2013-11-13	12
BILOG Antenna	CBL6112B	Schaffner	2804	2013-09-16	24
BILOG Antenna	CBL6112D	TESEQ	25513	2013-08-01	24
EMI TEST RECEIVER	ESU-26	R&S	100364	2013-07-25	12
EMI TEST RECEIVER	ESU-08	R&S	100485	2013-07-25	12
EMI Test Receiver	ESIB-26	R&S	100291	2013-11-28	12
Horn Antenna	HF906	R&S	100291	2012-12-27	24
Test Software	EP5/RE	TOYO	Ver 3.10.20	-	-

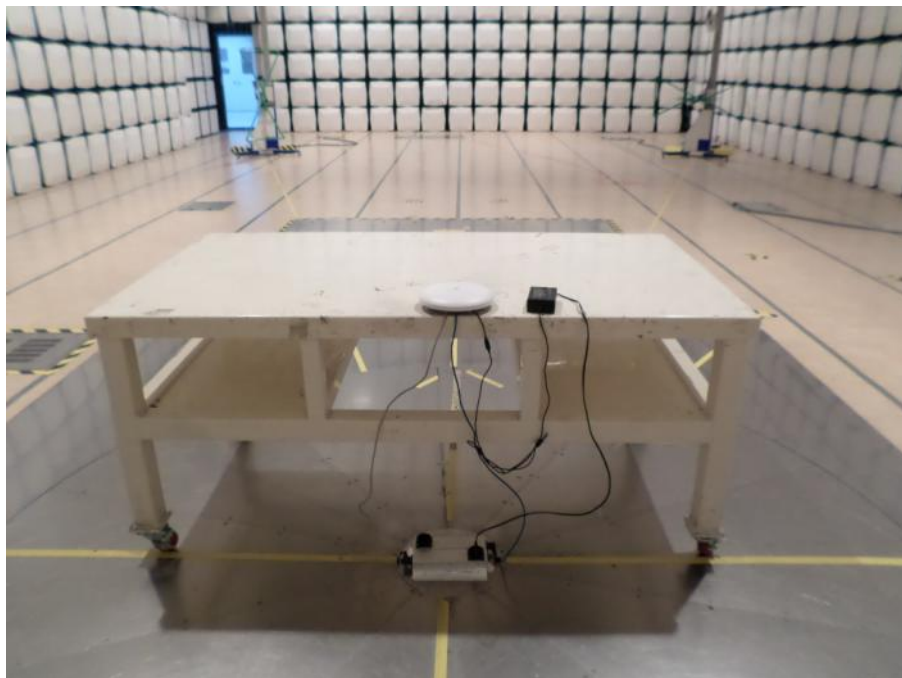
5.2.2 Temperature and humidity condition

Test date	May 19, 2014	Test engineer	Young Jin Kim	
Climate condition	Ambient temperature	23.0 ℃	Relative humidity	33 %
	Atmospheric pressure	101.1 kPa		
Test place	Semi-Anechoic Chamber (SAC4)			

5.2.3.1 Photograph of Test Setup (30 ~ 1 000 MHz)

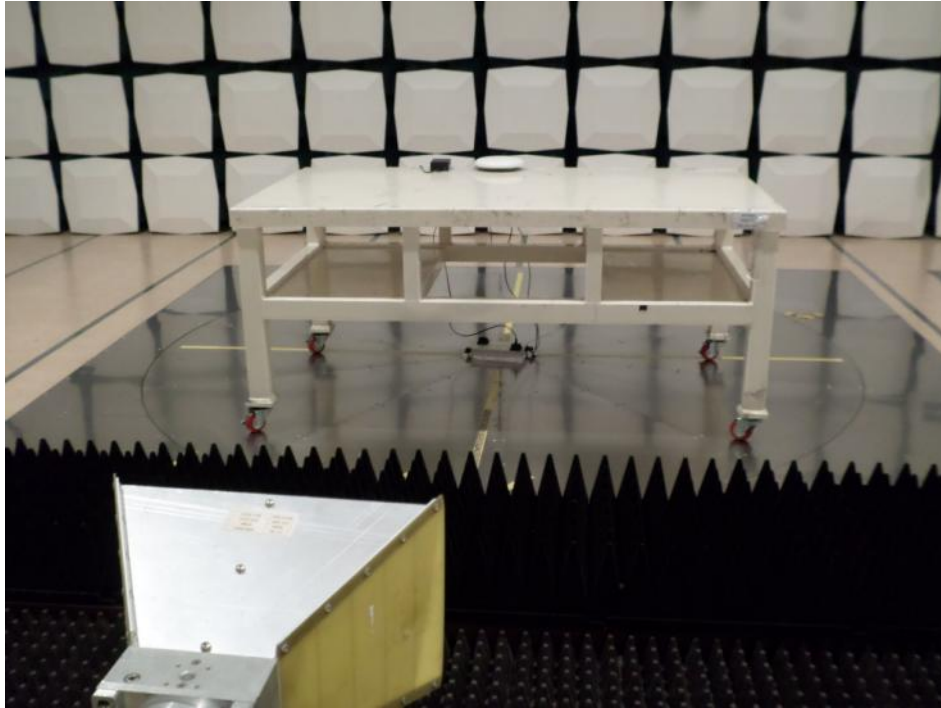


Front

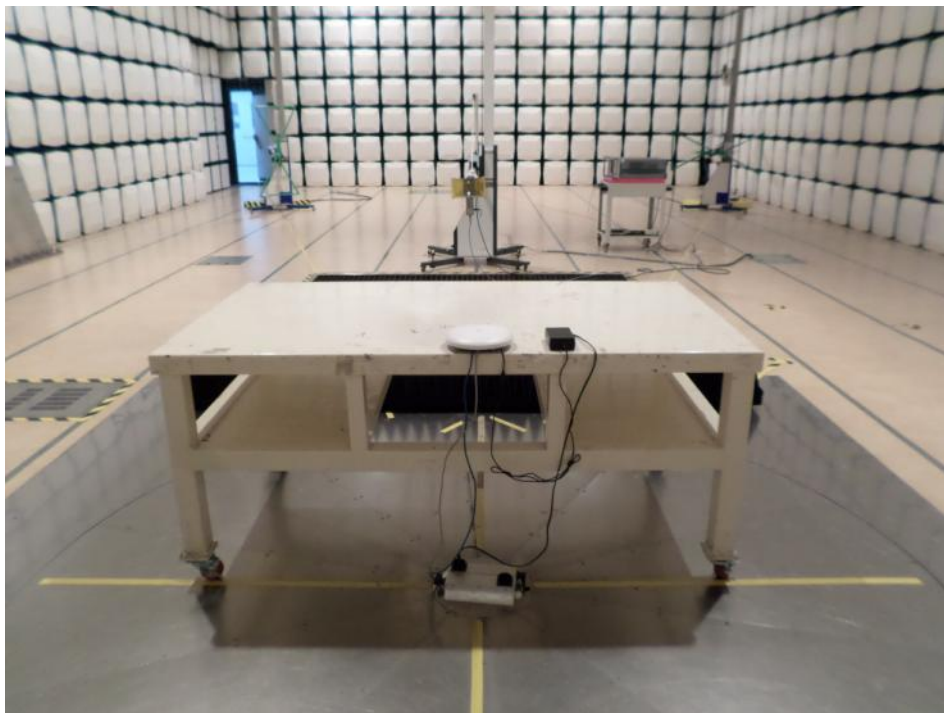


Rear

5.2.3.2 Photograph of Test Setup (Above 1 GHz)



Front



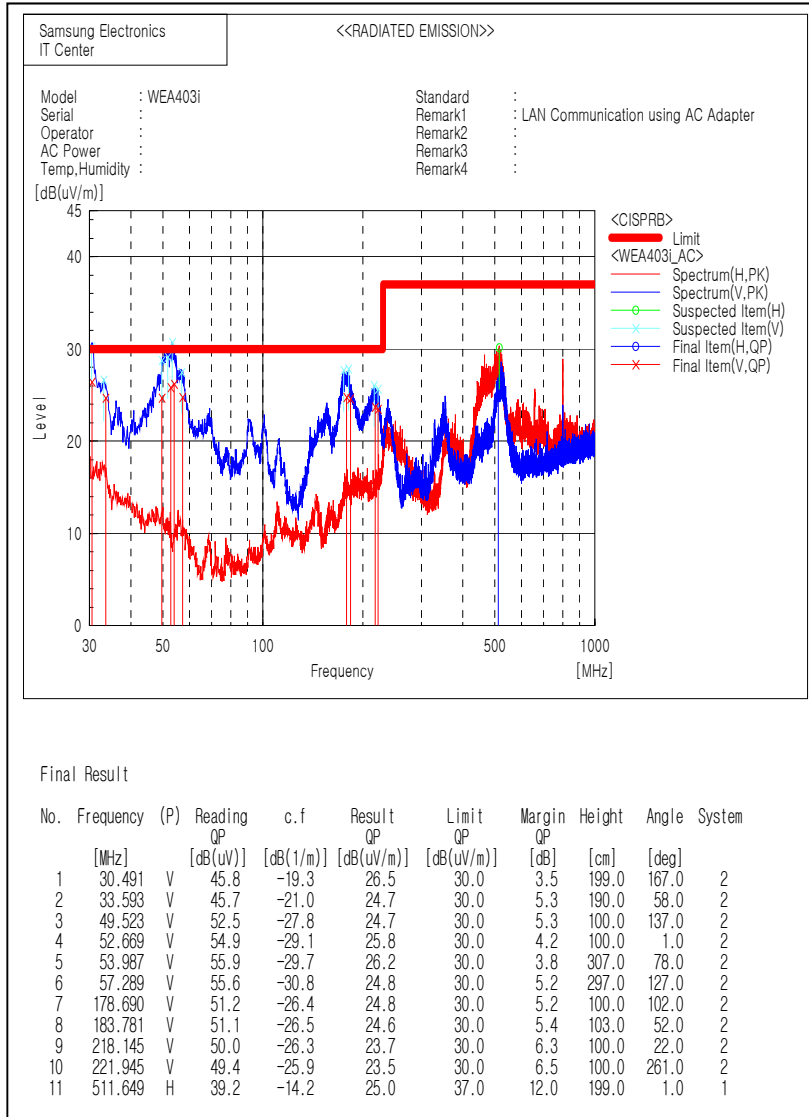
Rear

5.2.4 Test results

5.2.4.1 Below 1 GHz results

- Operating Mode : 1

Test Graph and Results



Note1) (P) : Abbreviation of Antenna Polarity

Note2) Reading QP : Received raw Quasi-peak signal

Note3) c.f = Factor = Antenna factor + Cable loss – Amplifier gain

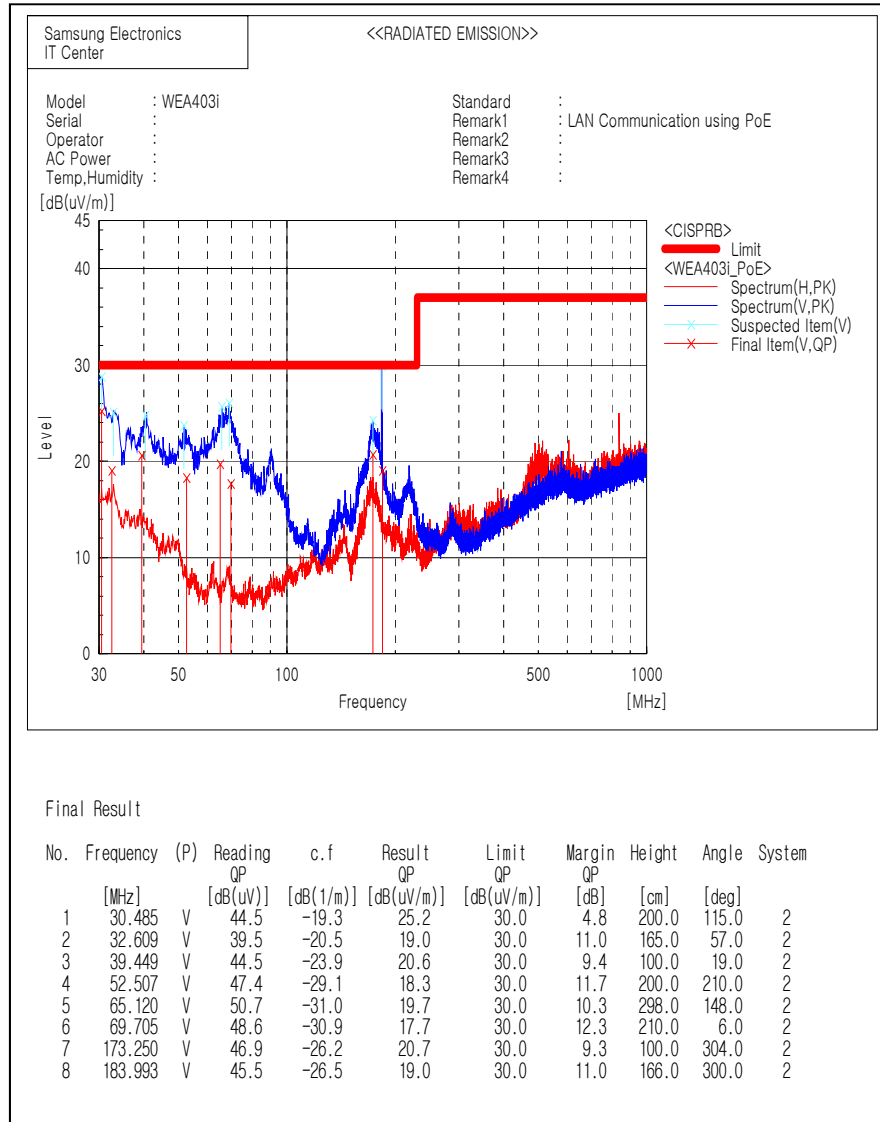
Note4) Result Qp = Level QP = Reading QP + Factor, Real signal Quasi-peak level

Note5) Margin QP = Limit – Level QP

QP : Abbreviation of Quasi-peak

- Operating Mode : 2

Test Graph and Results



Note1) (P) : Abbreviation of Antenna Polarity

Note2) Reading QP : Received raw Quasi-peak signal

Note3) c.f = Factor = Antenna factor + Cable loss – Amplifier gain

Note4) Result Qp = Level QP = Reading QP + Factor, Real signal Quasi-peak level

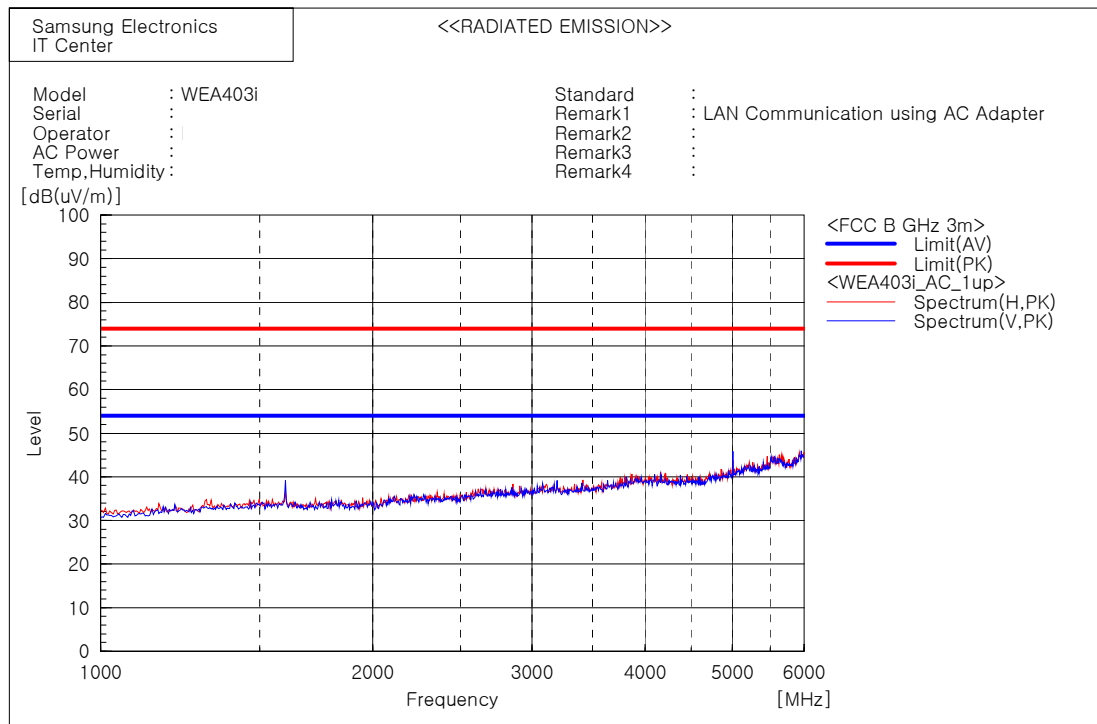
Note5) Margin QP = Limit – Level QP

QP : Abbreviation of Quasi-peak

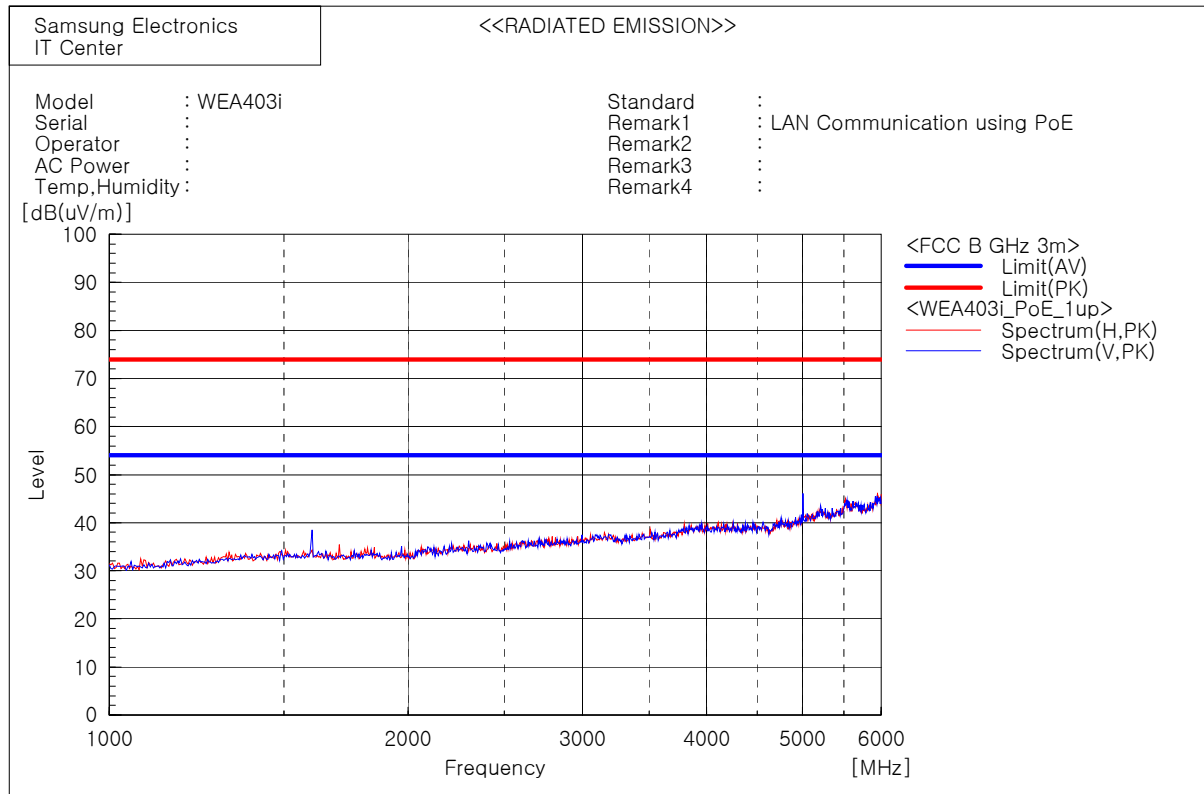
5.2.4.2 Above 1 GHz results

- Operating Mode : 1

Test Graph and Results



Note 1) There were no emissions from 1 GHz to 6 GHz.

- Operating Mode : 2**Test Graph and Results**

Note 1) There were no emissions from 1 GHz to 6 GHz.

Appendix – EUT photography



Front View



Rear View & Label Location



Label Location



Label