

TEST REPORT



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
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Report No.:
CTK-2017-01315
Page (1) / (27) Pages

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu Suwon-si, Gyeonggi-do,
16677 Republic of Korea
- Date of Receipt : 2017-06-10

2. Manufacturer

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu Suwon-si, Gyeonggi-do,
16677 Republic of Korea

3. Use of Report : For FCC Report

4. Test Sample / Model: WLAN Access Point / WEA524i

5. Date of Test : 2017-07-08 to 2017-07-09

6. FCC ID : A3LWEA524I

7. Certification Number IC : 649E-WEA524I

8. Test Standard(method) used : FCC Part 15 Subpart B / ICES-003 Issue 6

9. FCC Classification : JBP (Part 15 B – Class B Computing Device Peripheral)

10. Testing Environment: refer to 12 pages to 21 pages

11. Test Results : refer to 13 pages to 21 pages

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by Park Sangkyun: (Signature) EMC Test Engineer	Approved by Lee Eunwon: (Signature) Technical Manager
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2017-07-21

Republic of KOREA **CTK Co., Ltd.**



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Report No.:
CTK-2017-01315
Page (2) / (27) Pages

REPORT REVISION HISTORY

Date	Revision	Page No
2017-07-21	Issued (CTK-2017-01315)	All

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Report No.:
CTK-2017-01315
Page (3) / (27) Pages

TABLE OF CONTENTS

REPORT REVISION HISTORY	2
1.0 General Product Description	4
1.1 Model Differences	4
1.2 Device Modifications.....	4
1.3 EUT Configuration(s).....	5
1.4 Test Software	6
1.5 EUT Operating Mode(s)	6
1.6 Configuration	7
1.7 Calibration Details of Equipment Used for Measurement	9
1.8 Test Facility.....	9
1.9 Measurement Procedure	9
1.10 Laboratory Accreditations and Listings.....	10
1.11 Measurement Uncertainty	10
2.0 EMC Test Regulations/Standards.....	11
3.0 Results of Individual Test	12
3.1 Conducted Voltage Emissions of Mains ports	12
3.2 Radiated Electric Field Emissions (Below 1 GHz).....	18
3.3 Radiated Electric Field Emissions (Above 1 GHz)	21

1.0 General Product Description

No.	ITEM		APPLICATION	
1	Test Sample		WLAN Access Point	
2	Model		WEA524i	
3	Variant Model		-	
4	Mobility		<input type="checkbox"/> Table-top <input type="checkbox"/> Floor-standing <input checked="" type="checkbox"/> Built-in <input type="checkbox"/> Portable	
5	Maximum Clock Frequency		WLAN 5.825 GHz	
6	Electrical Ratings	AC/DC Adapter	Input:	AC 100 V - AC 240 V, 50 Hz / 60 Hz, 0.7 A
			Output:	DC 48 V, 0.5 A
		PoE	Input:	DC 48 V, 0.5 A
			Output:	-
		EUT	Input:	DC 48 V
			Output:	-
7	Test Voltage / Frequency		Voltage:	AC 120 V
			Frequency:	60 Hz

1.1 Model Differences

Not applicable

1.2 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.3 EUT Configuration(s)

See Appendix A for individual test set-up configuration(s). The following peripheral devices and/or interface cables were connected during the measurement:

Peripheral Devices

[ADAPTER Mode]

Device	Model No.	Serial No.	Manufacturer
USB Memory	x750w	-	PNY Technologies CO.,LTD
AC/DC ADAPTER1	A2448N_NT	-	SoluM Co., LTD.
Notebook1	NT550P5C	JATQ91ID500086A	Samsung Electronics Co., Ltd.
AC/DC ADAPTER2	A10-090P1A	-	Chicony Power Technology Co., Ltd.
Notebook2	7260HMW	-	INTEL CORPORATION
AC/DC ADAPTER3	PPP012D-S	-	DELTA ELECTRONICS(JIANGSU) LTD.
Mobile phone1	SM-C115	-	Samsung Electronics Co., Ltd.
Mobile phone2	SM-G5109	-	Samsung Electronics Co., Ltd.

[PoE Mode]

Device	Model No.	Serial No.	Manufacturer
USB Memory	x750w	-	PNY Technologies CO.,LTD
Notebook1	NT550P5C	JATQ91ID500086A	Samsung Electronics Co., Ltd.
AC/DC ADAPTER1	A10-090P1A	-	Chicony Power Technology Co., Ltd.
Notebook2	7260HMW	-	INTEL CORPORATION
AC/DC ADAPTER2	PPP012D-S	-	DELTA ELECTRONICS(JIANGSU) LTD.
Mobile phone1	SM-C115	-	Samsung Electronics Co., Ltd.
Mobile phone2	SM-G5109	-	Samsung Electronics Co., Ltd.
PoE Switch	GS110TP	-	NETGEAR INC.

Cable Description

[ADAPTER Mode]

No.	From		To		Type of Cable		
	Device	I/O Port	Device	I/O Port	Length (m)	Shielded or Unshielded	Ferrite Core [Y/N]
1	EUT	2.4 GHz WLAN communication	Mobile phone1	2.4 GHz WLAN communication	-	-	-
2		5 GHz WLAN communication	Mobile phone2	5 GHz WLAN communication	-	-	-
3		USB	USB Memory	-	-	-	-
4		ETHERNET	Notebook1	LAN	3.0	U	N
5		ETHERNET(PoE)	Notebook2	LAN	3.0	U	N
6		DC Input	AC/DC ADAPTER1	DC Output	1.5	U	Y
7	AC/DC ADAPTER1	AC Power	AC Mains	-	-	-	
8	Notebook1	DC Input	AC/DC ADAPTER2	DC Output	1.2	U	Y
9	AC/DC ADAPTER2	AC Power	AC Mains	-	1.8	U	N
10	Notebook2	DC Input	AC/DC ADAPTER3	DC Output	1.2	U	Y
11	AC/DC ADAPTER3	AC Power	AC Mains	-	1.8	U	N

* Shielded or Unshielded : Unshielded=U, Shielded=S

[PoE Mode]

No.	From		To		Type of Cable		
	Device	I/O Port	Device	I/O Port	Length (m)	Shielded or Unshielded	Ferrite Core [Y/N]
1	EUT	2.4 GHz WLAN communication	Mobile phone1	2.4 GHz WLAN communication	-	-	-
2		5 GHz WLAN communication	Mobile phone2	5 GHz WLAN communication	-	-	-
3		USB	USB Memory	-	-	-	-
4		ETHERNET	Notebook1	LAN	3.0	U	N
5		ETHERNET(PoE)	PoE Switch	LAN1	3.0	U	N
6	Notebook1	DC Input	AC/DC ADAPTER1	DC Output	1.2	U	Y
7	AC/DC ADAPTER1	AC Power	AC Mains	-	1.8	U	N
8	Notebook2	LAN	PoE Switch	LAN2	3.0	U	N
9		DC Input	AC/DC ADAPTER2	DC Output	1.2	U	Y
10	AC/DC ADAPTER2	AC Power	AC Mains	-	1.8	U	N
11	PoE Swich	AC Power	AC Mains	-	1.5	U	N

* Shielded or Unshielded : Unshielded=U, Shielded=S

1.4 Test Software

- EMC Test V 1.0
- Display Test Patterns - V1.5
- Ping.exe
- Not applicable

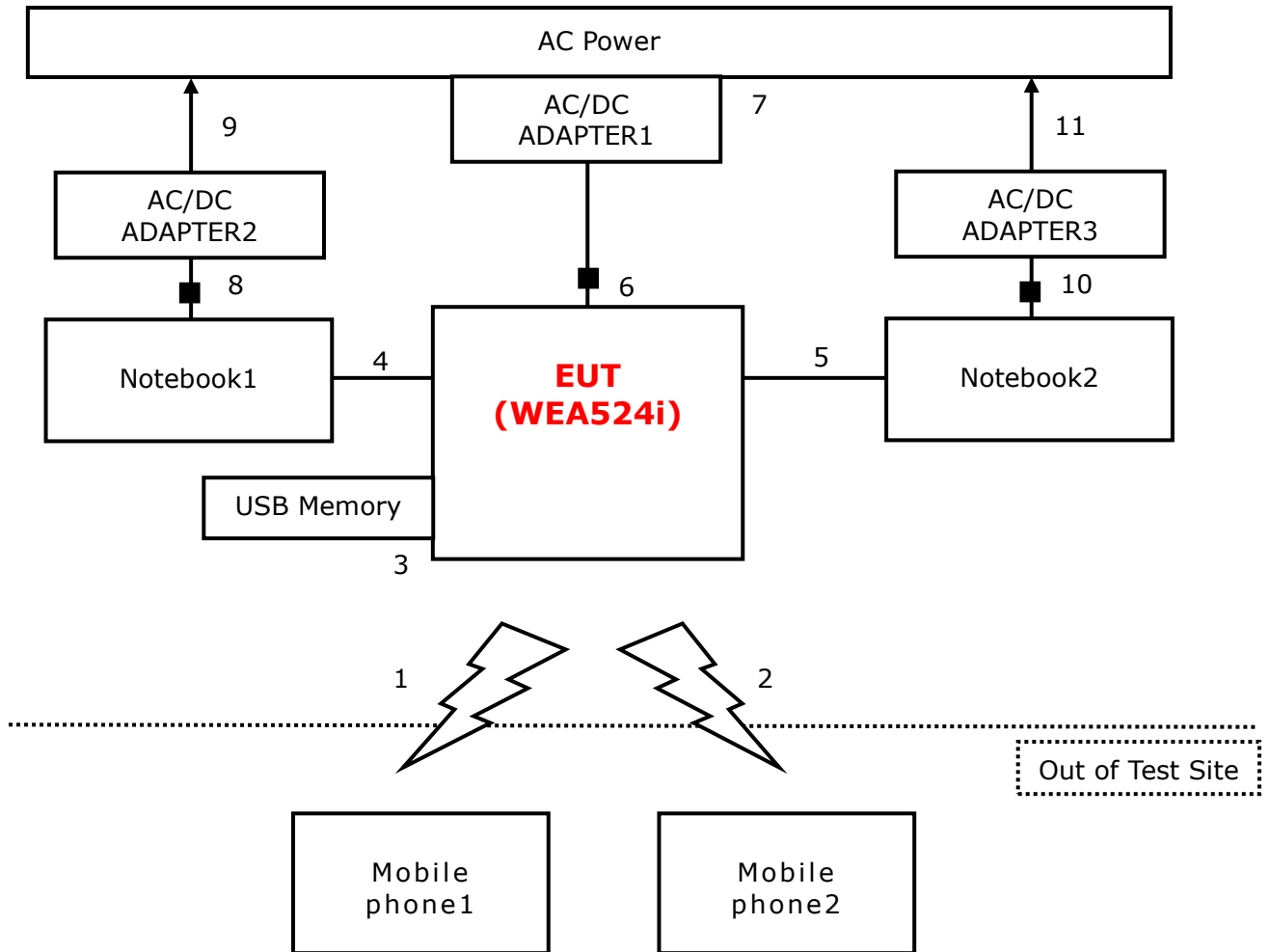
1.5 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

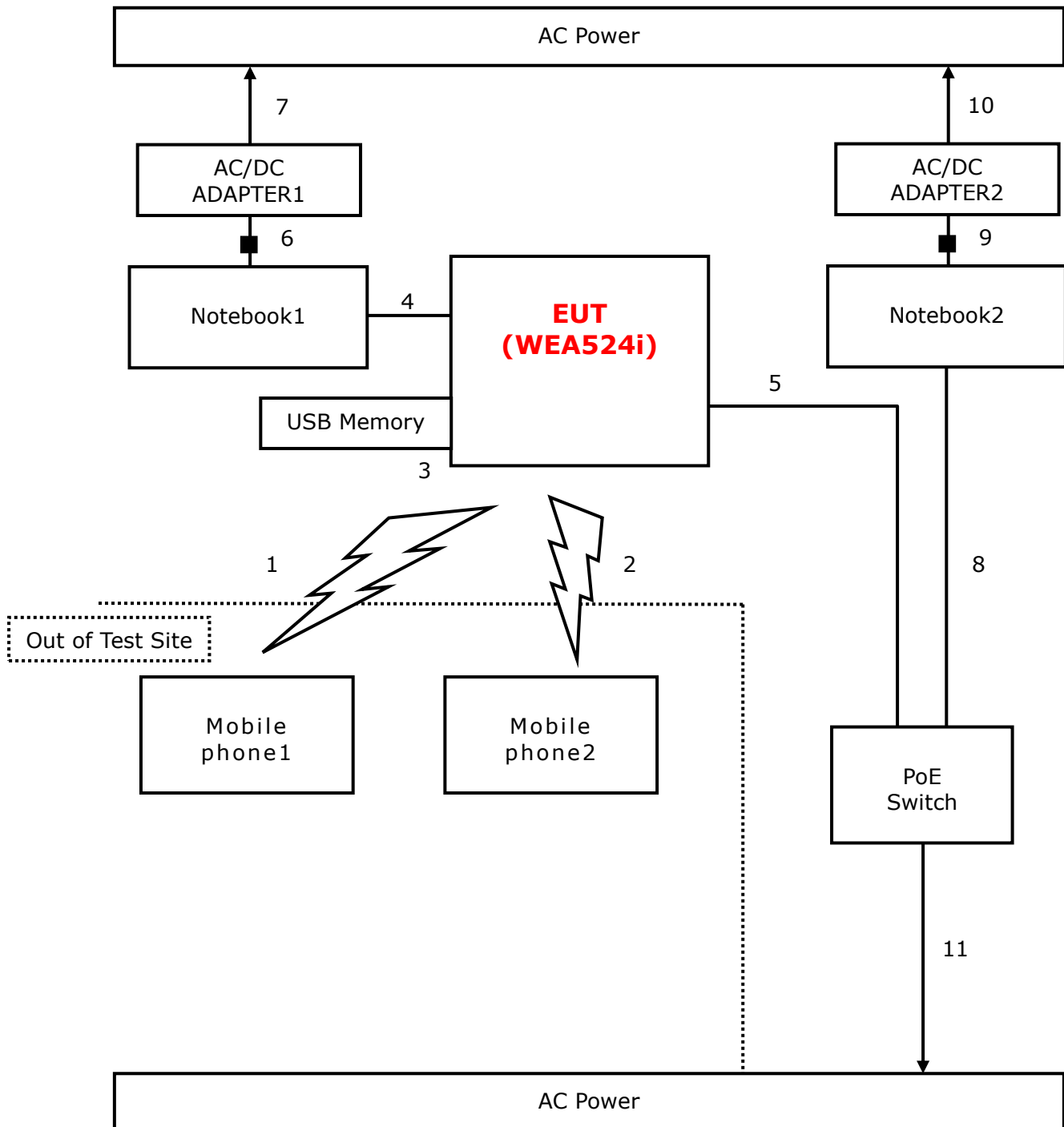
- ADAPTER Mode
- PoE Mode

1.6 Configuration

[ADAPTER Mode]



[PoE Mode]





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Report No.:
CTK-2017-01315
Page (9) / (27) Pages

1.7 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.8 Test Facility

The measurement facility is located at (Ho-dong) 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.9 Measurement Procedure

Preliminary AC power line conducted emissions tests were performed shielded room. To find worst mode, several typical mode and typical cable position were tested. Final AC power line conducted emissions test was performed shielded room. (location is same as Preliminary test)

Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.




Preliminary radiated emissions test were performed Semi-Anechoic Chamber or anechoic chamber (Distance of antenna and EUT was 3 m). To find worst mode, several typical mode and typical cable position were tested and peak level and frequency were recorded.

Final radiated emissions test was performed Semi-Anechoic Chamber. Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

* Measurement procedures was In accordance with ANSI C63.4-2014 7.3.3, 7.3.4, 8.3.1.1, 8.3.1.2, 8.3.2.1, 8.3.2.2

Note #1: These results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations.

1.10 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	

1.11 Measurement Uncertainty

Compliance of the product is based on the measured value.

However, the measurement uncertainty is included for information purposes.

The measurement uncertainties given below are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

Measurement Type	Frequency Range	Expanded Uncertainty
Conducted Emission	150 kHz to 30 MHz	2.62 dB (C.L.: Approx. 95 %, $k=2$)
Radiated Emission	30 MHz to 1 000 MHz	4.54 dB (C.L.: Approx. 95 %, $k=2$)
Radiated Emission	1 GHz Above	4.98 dB (C.L.: Approx. 95 %, $k=2$)



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Report No.:
CTK-2017-01315
Page (11) / (27) Pages

2.0 EMC Test Regulations/Standards

The tests were performed according to following regulations:

Applied standard	Title	Applied	Test Result
FCC Part 15 Subpart B / ICES-003 Issue 6 <input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B	Section 15.107: Conducted Voltage Emissions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> MET <input type="checkbox"/> NOT MET
	Section 15.109: Radiated Electric Field Emissions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> MET <input type="checkbox"/> NOT MET



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Report No.:
CTK-2017-01315
Page (12) / (27) Pages

3.0 Results of Individual Test

3.1 Conducted Voltage Emissions of Mains ports

Test Date

2017-07-08

Test Location

Shielded Room

Test Equipment

Name of Equipment	Model No.	Manufacturer	Serial No.	Due Date	Applied
EMI Test Receiver	ESCI3	Rohde & Schwarz	100032	2018-02-02	<input type="checkbox"/>
LISN	ENV216	Rohde & Schwarz	101235	2018-05-09	<input type="checkbox"/>
LISN	ENV216	Rohde & Schwarz	101236	2017-08-02	<input type="checkbox"/>
EMI Test Receiver	ESR7	Rohde & Schwarz	101088	2018-05-10	<input type="checkbox"/>
LISN	ENV216	Rohde & Schwarz	101151	2017-11-01	<input type="checkbox"/>
LISN	ESH3-Z5	Rohde & Schwarz	100207	2017-11-01	<input type="checkbox"/>
EMI Test Receiver	ESU40	Rohde & Schwarz	100336	2018-05-12	<input checked="" type="checkbox"/>
LISN	ENV216	Rohde & Schwarz	101760	2018-02-03	<input checked="" type="checkbox"/>
LISN	NNLK 8121	SCHWARZBECK	8121-644	2018-05-09	<input checked="" type="checkbox"/>
Pulse Limiter	VTSD 9561-F	SCHWARZBECK	9561-F064	2018-05-08	<input type="checkbox"/>
LISN	ENV216	Rohde & Schwarz	101150	2018-02-03	<input type="checkbox"/>

Test Software

ESCI7, ESCI3 : EMC32 Ver. 8.50.0

ESR7 : EMC32 Ver. 8.53.0

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Setting

IF Band Width: 9 kHz

Climate Condition

Temperature: (23 ± 1) °C

Relative Humidity: (46 ± 1) %

Atmospheric Pressure: 99 kPa



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Report No.:
CTK-2017-01315
Page (13) / (27) Pages

Test Result

The requirements are: MET NOT MET

Test Mode	Frequency (MHz)	Measured Data (dB μ V)	Margin (dB)	Remark
ADAPTER Mode	0.433 500	35.1	12.1	CAverage

The Result is calculated by using the following formula;

* Result = Limit - Margin (Result included the correction factor)

* Correction factor = Cable Loss + Insertion loss of LISN



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Report No.:
CTK-2017-01315
Page (14) / (27) Pages

Test Data

[Line: L1]

Test

1 / 2

Test Report

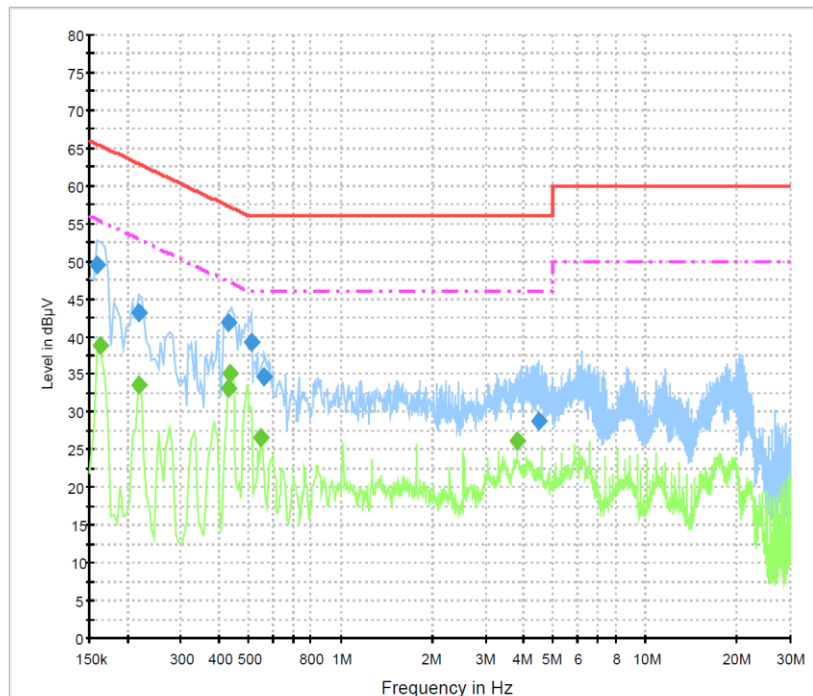
Common Information

Test Model Name: WEA524i
Test Mode: Operating
Manufacturer: Samsung Electronics Co.,Ltd.
Tester: PARK SANG KYUN

Hardware Setup: EMI conducted/Voltage with ENV216_FO(101760) - [EMI conducted]

Subrange 1
Frequency Range: 150 kHz - 30 MHz
Receiver: ESU 40 [ESU 40]
@ GPIB0 (ADR 20), SN 100336/040, FW 4.43
Signal Path: ESU 40-ENV216 FO(101760)
FW 1.0
Correction Table: 3-2 CE Cable Loss
LISN: ENV216 FO(101760)
Correction Table (Line 0): ENV216_FO_N(101760)
Correction Table (Line 1): ENV216_FO_L1(101760)

Class B_L1



7/8/2017

7:24:30



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Report No.:
CTK-2017-01315
Page (15) / (27) Pages

Test

2 / 2

Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.159000	49.5	1000.0	9.000	On	L1	9.8	16.0	65.5
0.217500	43.1	1000.0	9.000	On	L1	9.8	19.8	62.9
0.429000	41.9	1000.0	9.000	On	L1	9.9	15.4	57.3
0.510000	39.2	1000.0	9.000	On	L1	9.9	16.8	56.0
0.564000	34.6	1000.0	9.000	On	L1	9.9	21.4	56.0
4.465500	28.8	1000.0	9.000	On	L1	9.8	27.2	56.0

Final Result 2

Frequency (MHz)	CAverage (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.163500	38.7	1000.0	9.000	On	L1	9.8	16.6	55.3
0.217500	33.5	1000.0	9.000	On	L1	9.8	19.4	52.9
0.429000	33.2	1000.0	9.000	On	L1	9.9	14.1	47.3
0.433500	35.1	1000.0	9.000	On	L1	9.9	12.1	47.2
0.550500	26.6	1000.0	9.000	On	L1	9.9	19.4	46.0
3.813000	26.3	1000.0	9.000	On	L1	9.8	19.7	46.0

7/8/2017

7:24:30

[Line : Neutral]

Test

1 / 2

Test Report

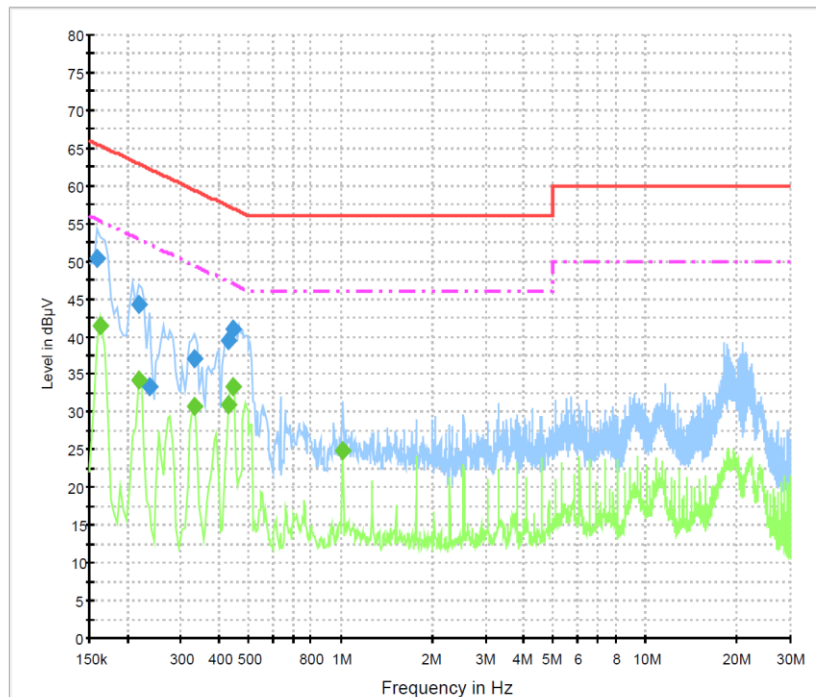
Common Information

Test Model Name: WEA524i
Test Mode: Operating
Manufacturer: Samsung Electronics Co.,Ltd.
Tester: PARK SANG KYUN

Hardware Setup: EMI conducted Voltage with ENV216_FO(101760) - [EMI conducted]

Subrange 1
Frequency Range: 150 kHz - 30 MHz
Receiver: ESU 40 [ESU 40]
@ GPIB0 (ADR 20), SN 100336/040, FW 4.43
Signal Path: ESU 40-ENV216 FO(101760)
FW 1.0
Correction Table: 3-2 CE Cable Loss
LISN: ENV216 FO(101760)
Correction Table (Line 0): ENV216_FO_N(101760)
Correction Table (Line 1): ENV216_FO_L1(101760)

Class B_N



7/8/2017

7:29:21



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Report No.:
CTK-2017-01315
Page (17) / (27) Pages

Test

2 / 2

Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.159000	50.4	1000.0	9.000	On	N	9.8	15.1	65.5
0.217500	44.3	1000.0	9.000	On	N	9.8	18.6	62.9
0.235500	33.3	1000.0	9.000	On	N	9.7	29.0	62.3
0.330000	37.0	1000.0	9.000	On	N	9.8	22.4	59.5
0.429000	39.5	1000.0	9.000	On	N	9.9	17.7	57.3
0.442500	40.9	1000.0	9.000	On	N	9.9	16.1	57.0

Final Result 2

Frequency (MHz)	CAverage (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.163500	41.5	1000.0	9.000	On	N	9.8	13.8	55.3
0.217500	34.1	1000.0	9.000	On	N	9.8	18.8	52.9
0.330000	30.7	1000.0	9.000	On	N	9.8	18.7	49.5
0.429000	31.0	1000.0	9.000	On	N	9.9	16.2	47.3
0.442500	33.3	1000.0	9.000	On	N	9.9	13.7	47.0
1.018500	24.8	1000.0	9.000	On	N	9.8	21.2	46.0

7/8/2017

7:29:21



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Report No.:
 CTK-2017-01315
 Page (18) / (27) Pages

3.2 Radiated Electric Field Emissions (Below 1 GHz)

Test Date

2017-07-09

Test Location

10 m SAC (test distance : 10 m, 3 m)

Test Equipment

Name of Equipment	Model No.	Manufacturer	Serial No.	Due Date	Applied
EMI Test Receiver	ESCI7	Rohde & Schwarz	100814	2017-11-01	<input checked="" type="checkbox"/>
Bilog Antenna	CBL6111C	Schaffner	2551	2018-05-13	<input checked="" type="checkbox"/>
6dB Attenuator	DNF	Rohde & Schwarz	272.4110.50-2	2017-11-01	<input checked="" type="checkbox"/>
Amplifier	310	Sonoma Instrument Co.	291721	2018-02-02	<input checked="" type="checkbox"/>

Test Software

TOYO EMI software Ver. 5.1.0

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Setting

IF Band Width: 120 kHz

Climate Condition

Temperature: (22 ± 1) °C

Relative Humidity: (48 ± 1) %

Atmospheric Pressure: 99 kPa

Test Result

The requirements are: MET NOT MET

Test Mode	Frequency (MHz)	Measured Data (dBµV/m)	Margin (dB)	Remark
ADAPTER Mode	875.112	38.7	7.3	Quasi-peak
PoE Mode	33.274	35.1	4.9	Quasi-peak

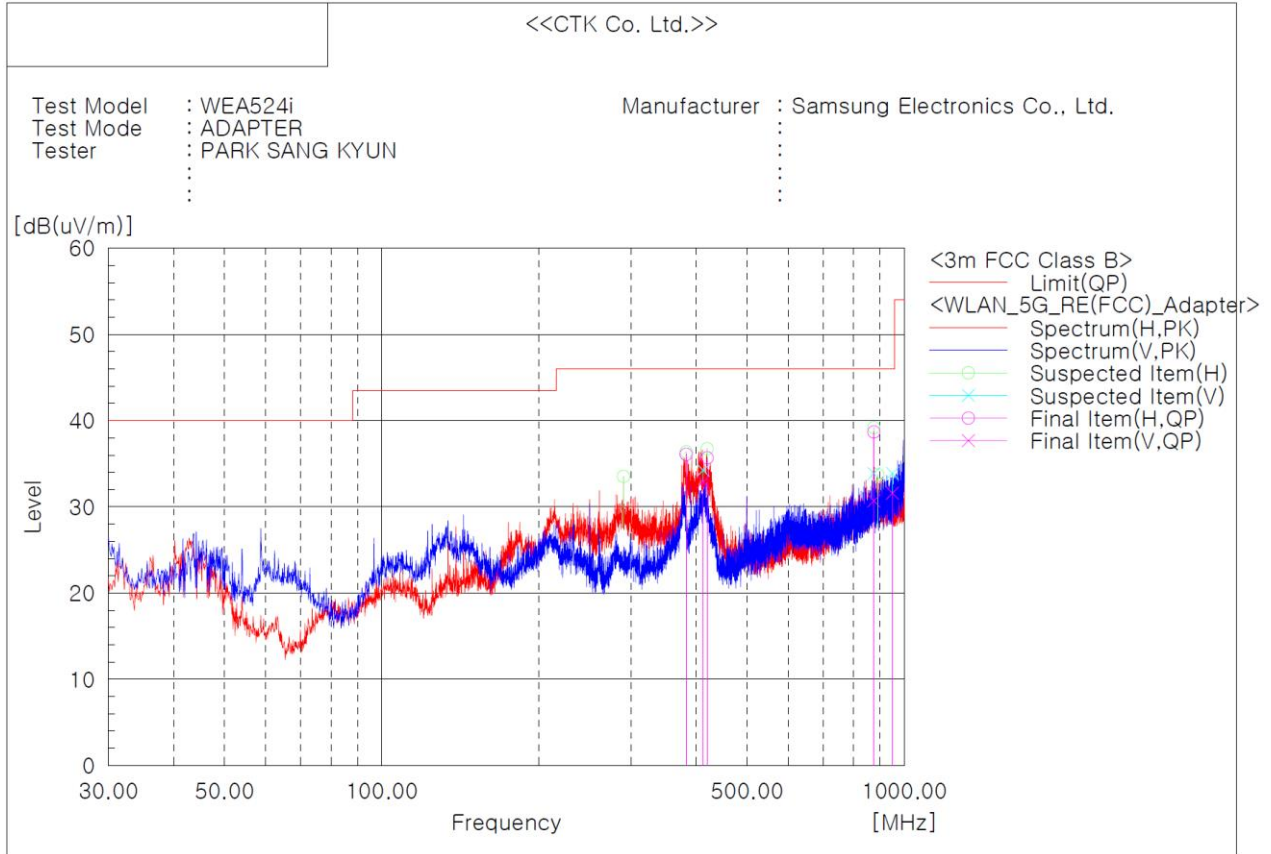
The Result is calculated by using the following formula;

* Result = Reading + Correction factor

* Correction factor = Antenna Factor + Cable Loss + 6 dB attenuator – Amp Gain

Test Data

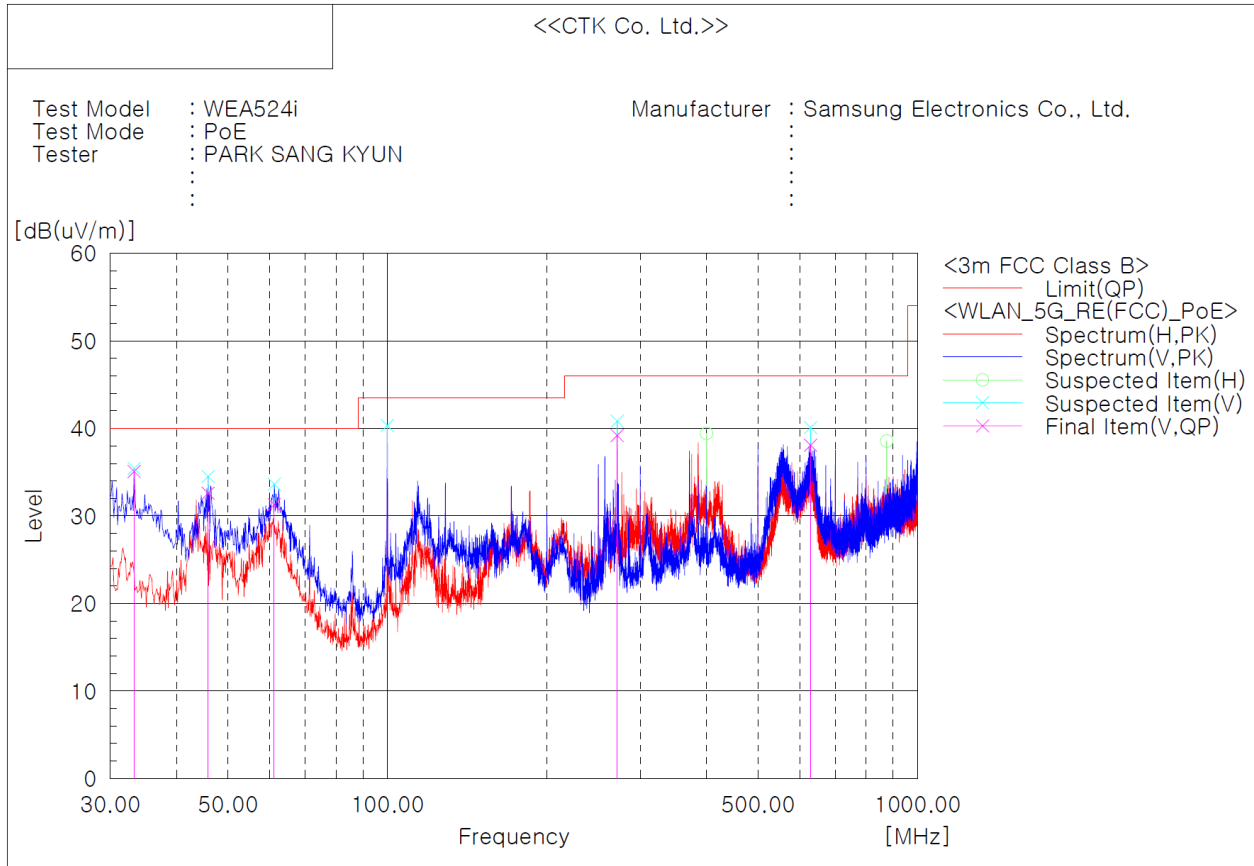
[ADAPTER Mode]



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	382.716	H	42.3	-6.2	36.1	46.0	9.9	100.0	358.0
2	412.301	V	38.1	-5.2	32.9	46.0	13.1	200.0	38.0
3	419.819	H	40.7	-5.0	35.7	46.0	10.3	100.0	358.0
4	875.112	H	34.5	4.2	38.7	46.0	7.3	100.0	248.0
5	875.112	V	26.5	4.2	30.7	46.0	15.3	100.0	269.0
6	949.317	V	25.7	5.9	31.6	46.0	14.4	100.0	269.0

[PoE Mode]



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	33.274	V	42.7	-7.6	35.1	40.0	4.9	101.0	321.0
2	45.884	V	46.2	-13.6	32.6	40.0	7.4	101.0	190.0
3	61.161	V	49.8	-18.5	31.3	40.0	8.7	200.0	117.0
4	99.961	V	54.0	-13.8	40.2	43.5	3.3	200.0	117.0
5	271.409	V	48.7	-9.5	39.2	46.0	6.8	101.0	295.0
6	628.733	V	38.5	-0.4	38.1	46.0	7.9	101.0	86.0



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Report No.:
 CTK-2017-01315
 Page (21) / (27) Pages

3.3 Radiated Electric Field Emissions (Above 1 GHz)

Test Date

2017-07-09

Test Location

3 m SAC

Test Equipment

Name of Equipment	Model No.	Manufacturer	Serial No.	Due Date	Applied
EMI Test Receiver	ESU40	Rohde & Schwarz	10336	2018-05-12	<input checked="" type="checkbox"/>
Double Ridged Guide Antenna	3117	ETS-Lindgren	00154525	2017-09-02	<input checked="" type="checkbox"/>
Double Ridged Guide Antenna	3116	ETS-Lindgren	00062504	2017-09-04	<input checked="" type="checkbox"/>
Singnal Conditioning Unit	SCU-40	Rohde & Schwarz	10023	2017-11-03	<input checked="" type="checkbox"/>
Preamplifier	8449B	Agilent Technologies	3008A02011	2017-12-01	<input checked="" type="checkbox"/>

Test Software

TOYO EMI software Ver. 5.1.0

Frequency Range of Measurement

1 GHz to 30 GHz

Instrument Setting

IF Band Width: 1 MHz

Climate Condition

Temperature: (23 ± 1) °C

Relative Humidity: (47 ± 1) %

Atmospheric Pressure: 99 kPa

Test Result

The requirements are: MET NOT MET

Test Mode	Frequency (MHz)	Measured Data (dBµV/m)	Margin (dB)	Remark
ADAPTER Mode	3 229.040	41.7	12.3	CAverage
PoE Mode	3 229.040	41.9	12.1	CAverage

The Result is calculated by using the following formula;

* Result = Reading + Correction factor

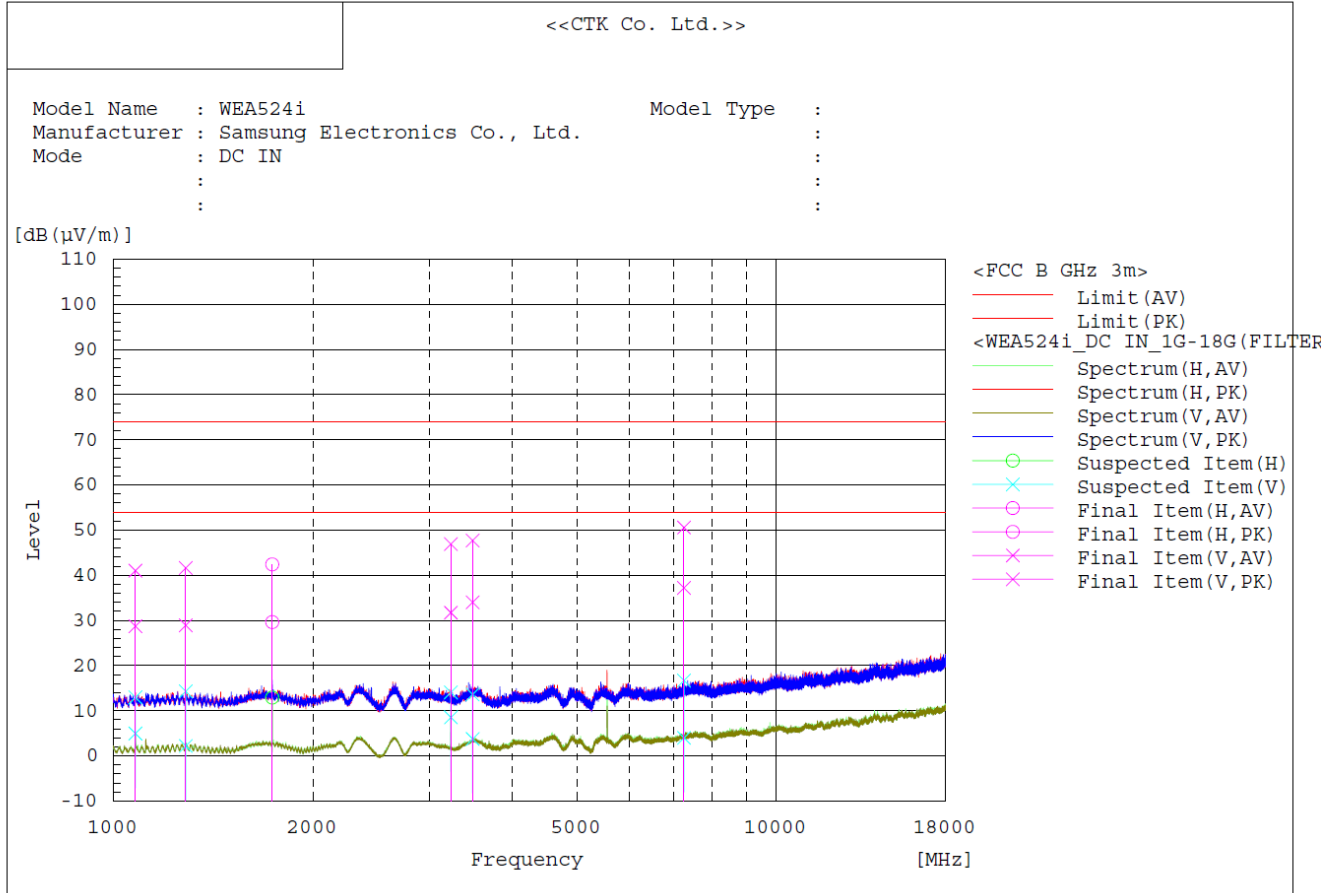
* Correction factor = Antenna Factor + Cable Loss- Amp Gain

* Antenna factor does not apply to spectrum mode, only final result is applied.

No emission were detected at above 8 GHz

Test Data

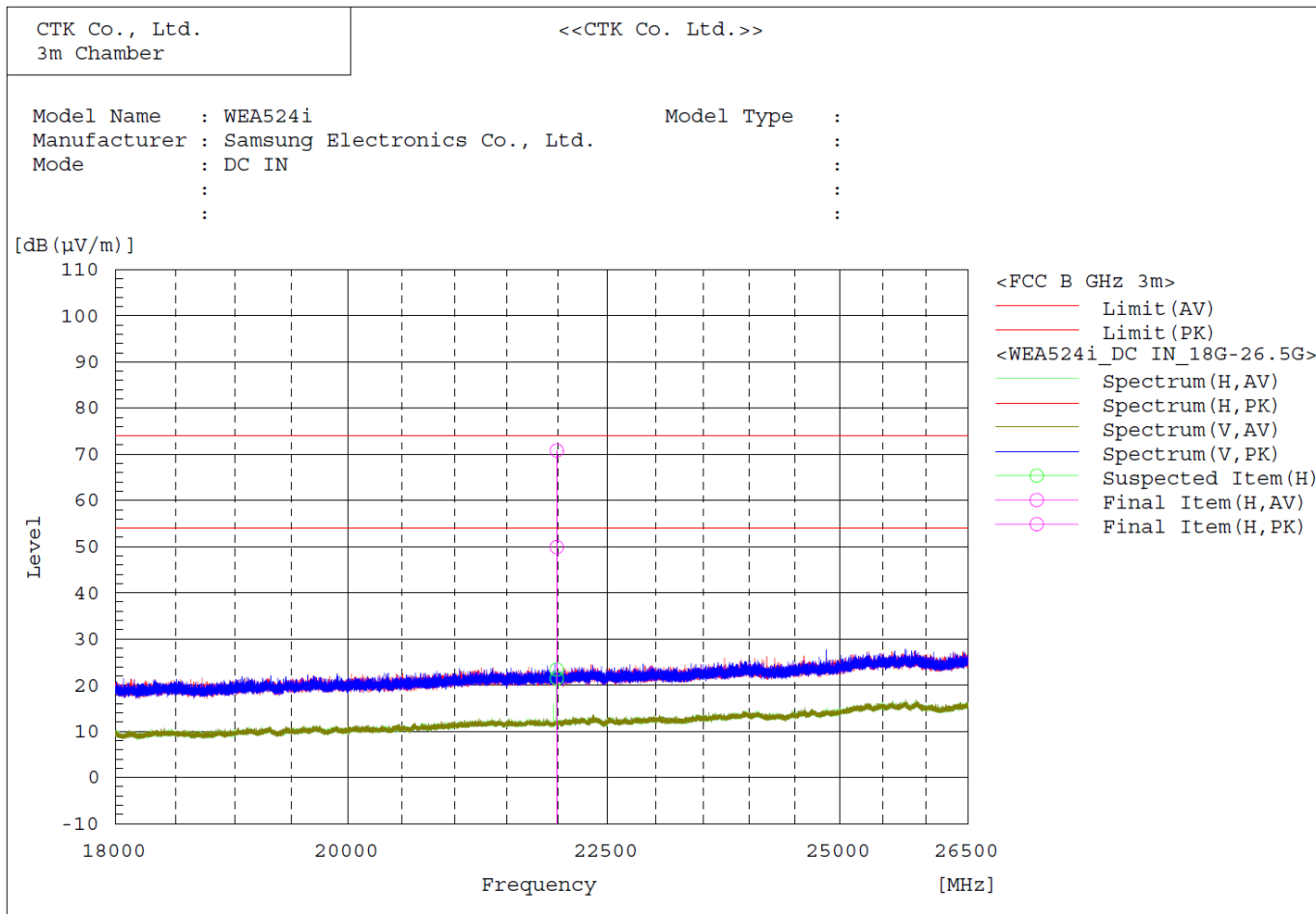
[ADAPTER Mode]
[1 GHz to 18 GHz]



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 [°]
1	1079.560	V	38.1	50.4	-9.4	28.7	41.0	54.0	74.0	25.3	33.0	342.5	19.2
2	1286.280	V	37.4	50.1	-8.5	28.9	41.6	54.0	74.0	25.1	32.4	234.7	19.8
3	1736.440	H	35.9	48.7	-6.3	29.6	42.4	54.0	74.0	24.4	31.6	99.8	302.5
4	3229.040	V	33.5	48.7	-1.8	31.7	46.9	54.0	74.0	22.3	27.1	224.7	99.1
5	3482.000	V	35.2	48.9	-1.2	34.0	47.7	54.0	74.0	20.0	26.3	464.2	207.6
6	7254.640	V	33.3	46.7	3.9	37.2	50.6	54.0	74.0	16.8	23.4	464.2	187.5

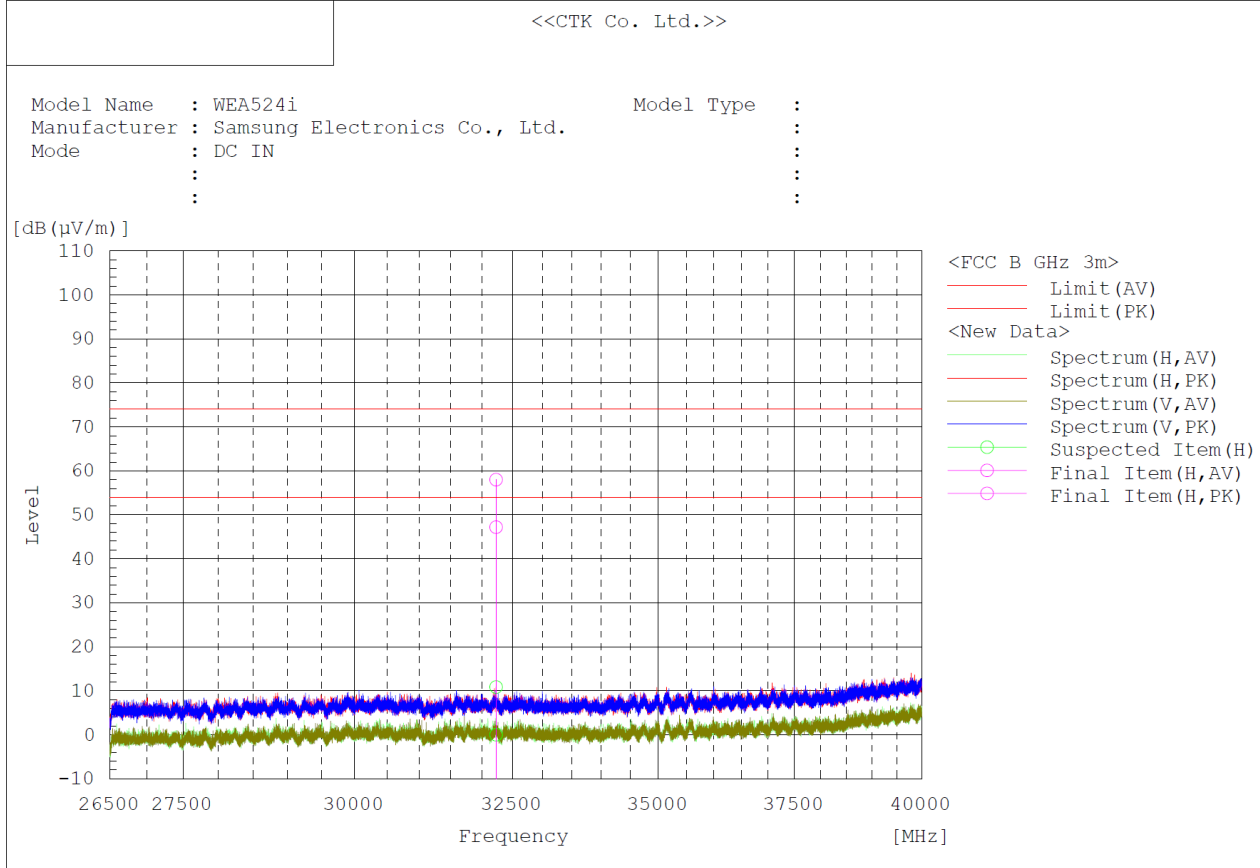
[18 GHz to 26.5 GHz]



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 [°]
1	21990.578	H	30.9	51.8	19.0	49.9	70.8	54.0	74.0	4.1	3.2	100.0	171.0

[26.5 GHz to 40 GHz]



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 [°]
1	32233.720	H	36.5	47.3	10.7	47.2	58.0	54.0	74.0	6.8	16.0	100.0	356.8

