

## EMC TEST REPORT For RCM

Test Report No. : KES-EM-23T0026-R2  
Date of Issue : Feb. 24, 2023  
Product name : WALL SPEAKER  
Model/Type No. : SPA-W100W  
Variant Model : SPA-W100B  
Applicant : Hanwha Vision Co., Ltd  
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,  
Gyeonggi-do, Republic of Korea  
Manufacturer : Inter-M Corporation  
Manufacturer Address : 7-18, Gwonyul-ro 1253beon-gil, Baekseok-eup, Yangju-si,  
Gyeonggi-do  
Date of Receipt : Dec. 26, 2022  
Test date : Jan. 03, 2023 ~ Jan. 04, 2023  
Test Results :  **In Compliance**  **Not in Compliance**

Tested by



Eun Gu, Jeon  
EMC Test Engineer

Reviewed by



Dong-Hun, Jang  
EMC Technical Manager

This test report is not related to KS Q ISO/IEC 17025 and KOLAS.



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Report No.:  
KES-EM-23T0026-R2  
Page (2) of (29)

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**REPORT REVISION HISTORY**

<b>Date</b>	<b>Test Report No.</b>	<b>Revision History</b>
Jan. 05, 2023	KES-EM-23T0026	Issued
Jan. 27, 2023	KES-EM-23T0026-R1	Change Manufacturer
Feb. 24, 2023	KES-EM-23T0026-R2	Change the Applicant at the request of the customer

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## TABLE OF CONTENTS

1.0	General Product Description.....	4
1.1	Test Voltage & Frequency .....	5
1.2	Variant Model Differences .....	5
1.3	Device Modifications .....	5
1.4	Equipment Under Test.....	5
1.5	Support Equipments .....	5
1.6	External I/O Cabling .....	6
1.7	EUT Operating Mode(s) .....	6
1.8	Configuration.....	7
1.9	Remarks when standards applied .....	8
1.10	Calibration Details of Equipment Used for Measurement .....	8
1.11	Test Facility .....	8
1.12	Laboratory Accreditations and Listings .....	8
2.0	Test Regulations.....	9
2.1	Conducted Emissions at Mains Power Ports .....	10
2.2	Conducted Emissions at Telecommunication Ports.....	11
2.3	Radiated Electric Field Emissions(Below 1 GHz) .....	12
2.4	Radiated Electric Field Emissions(Above 1 GHz) .....	13
APPENDIX A – TEST DATA.....		14
	Conducted Emissions at Mains Power Ports.....	14
	Conducted Emissions at Telecommunication Ports .....	16
	Radiated Electric Field Emissions(Below 1 GHz) .....	17
	Radiated Electric Field Emissions(Above 1 GHz).....	18
	Test Setup Photos and Configuration .....	19
	Conducted Emissions at Mains Power Ports.....	19
	Conducted Emissions at Telecommunication Ports .....	20
	Radiated Electric Field Emissions(Below 1 GHz) .....	21
	Radiated Electric Field Emissions(Above 1 GHz).....	22
	EUT External Photographs .....	23
	EUT Internal Photographs .....	24



## 1.0 General Product Description

### Main Specifications of EUT are:

<b>Product</b>	Type	Network Wall speaker
<b>MIC Input</b>	Input Sensitivity	-48dBV ±3dB
	Frequency Response	20Hz ~ 20kHz ±3dB
<b>Line Output</b>	Output Level	0 dBV ± 3dB
	Frequency Response	20Hz ~ 20kHz ±3dB
	THD + N Ratio	less than 0.01%
	S/N Ratio (20Hz HPF, 20kHz LPF)	greater than 85dB
<b>Power Amp</b>	Output Power (8Ω, 1kHz Sine wave)	7W(PoE), 15W (PoE+)
	Frequency Response (1W, 8Ω)	20Hz ~ 20kHz ±3dB
	S/N Ratio (20Hz HPF, 20kHz LPF)	greater than 85dB
<b>Network</b>	Ethernet	10/100 Base-T
<b>Memory</b>	Internal Memory	1 GBytes
	External Memory (Micro SD)	SDHC upto 32GB (SANDISK)
<b>Contact</b>	Contact Input	One channel
	Contact Output (Rating : 1A DC 30V, 0.3A AC 125V)	One channel
<b>General</b>	Operating Temperature	-20 ~ 50°C (-4°F ~ 122°F)
	Operating Humidity	10~100% RH Non-condensing
	IP code	IP45
	Weight	2.35Kg
	Size	170(W)*250(H)*134(D)
	Color	White
	Certificate	EMC - FCC part 15 Class A , ICES-003 Class A Safety - UL-60950 , Environment - IEC and NEMA based on the Product specs
<b>Power</b>	PoE	PoE (IEEE 802.3 af type 1 Class 3)
	PoE+	PoE+(IEEE 802.3 at type 2 Class 4)
<b>Audio</b>	Built-in microphone	50~16000 Hz
	Audio Compression	G.711 PCM 8 kHz G.726 ADPCM 8 kHz WAV, MP3 in mono/stereo from 64 kbps to 320 kbps. Sampling rate from 8 kHz up to 48 kHz. PCMU, PCMA, opus, L16/16000, L16/8000, speex/8000, speex/16000, G.726-32
<b>Speaker</b>	Speaker Component	5" LF Drive & 1" HF Drive, 2 way passive type
	Max. Sound Pressure Level (PoE : 7 Watt)	97dB
	Max. Sound Pressure Level (PoE+ : 15 Watt)	100dB
	Max. Power (Peak)	200W
	Frequency Response	87Hz~20kHz
	Sensitivity (1Watt)	89dB
<b>Network</b>	Security	Password protection ; admin,setup,user,guest (sha-2, Digest authentication, User access log)
	Supported Protocols	IPv4, HTTP, SIP, Bonjour, DNS, NTP, TCP, UDP, DHCP, ARP, SSH, ICMP
<b>System Integration</b>	API (Application Programming Interface)	Including SUNAPI Integration with HTW WAVE (VMS)
	Multi-source Dynamic PA control	<Controller Mode> Multi-source up to 48 (Multicast) (Audio 24CH + Mic 24CH) Up to 50 Zone Control (Multicast) Up to 255 Groups  <Speaker Mode> Up to 20 Zone Streaming (Unicast) Up to 50 Zone Streaming (Multicast)  <Streaming Mode> Up to 256 Zone Streaming (Multicast)
	Voice Announcement	Up to 40 pre-recorded voice announcements.
	VoIP	Tested with PBX suppliers such as Cisco and Asterisk. Supported SIP features: DTMF (RFC2976 and RFC2833) Supported codecs: PCMU, PCMA, speex/8000, speex/16000
	TTS	Domestic Version : Korean Export Version : English(US, UK), German, French, Spanish, Russian
	Intelligent Audio	Speaker Test (by built in test tool, bandwidth check also)
	Event Triggers	Virtual Inputs Call : DTMF, State changes
	Functional Monitoring	Connection verification, Built-in system logging
	Supported OS	Windows : Windows 10 MAC : Catalina 10.15.4 1 , Big Sur 11.1 1
	Supported Web viewer	Chrome Version : 91.0.4472.114 1

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## 1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

PoE

## 1.2 Variant Model Differences

Color Differences

## 1.3 Device Modifications

Not applicable

## 1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
WALL SPEAKER	SPA-W100W	-	Inter-M Corporation	EUT
AUDIO MODULE	SPA-D1000	-	Inter-M Corporation	-

## 1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
NOTEBOOK	Latitude 5300	8C47BE45C060	DELL INC.	-
NOTEBOOK ADAPTER	HA65NM130	-	Chicony Power Technology (Suzhou)Co.,Ltd.	-
PoE INJECTOR	PT-PSE109GBRO-AH-S	-	Dongguan PROCET Network Technology Co.,Ltd	-
BUTTON ALARM	-	-	-	-
ALARM	-	-	-	-
Micro SD Card	-	-	-	8 GB
Speaker	E5	-	PreSonus®	-

## 1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
WALL SPEAKER (EUT)	RJ -45	PoE INJECTOR	RJ-45	3.0	U
	Micro SD Slot	Micro SD Card	Micro SD Slot	-	-
	ALARM IN	BUTTON ALARM	Line	3.0	U
	ALARM OUT	ALARM	Line	3.0	U
	Groud	Groud	Groud	1.8	U
	LINE OUT (3 Pin)	Speaker	XLR	1.0	U

\* Unshielded = U, Shielded = S

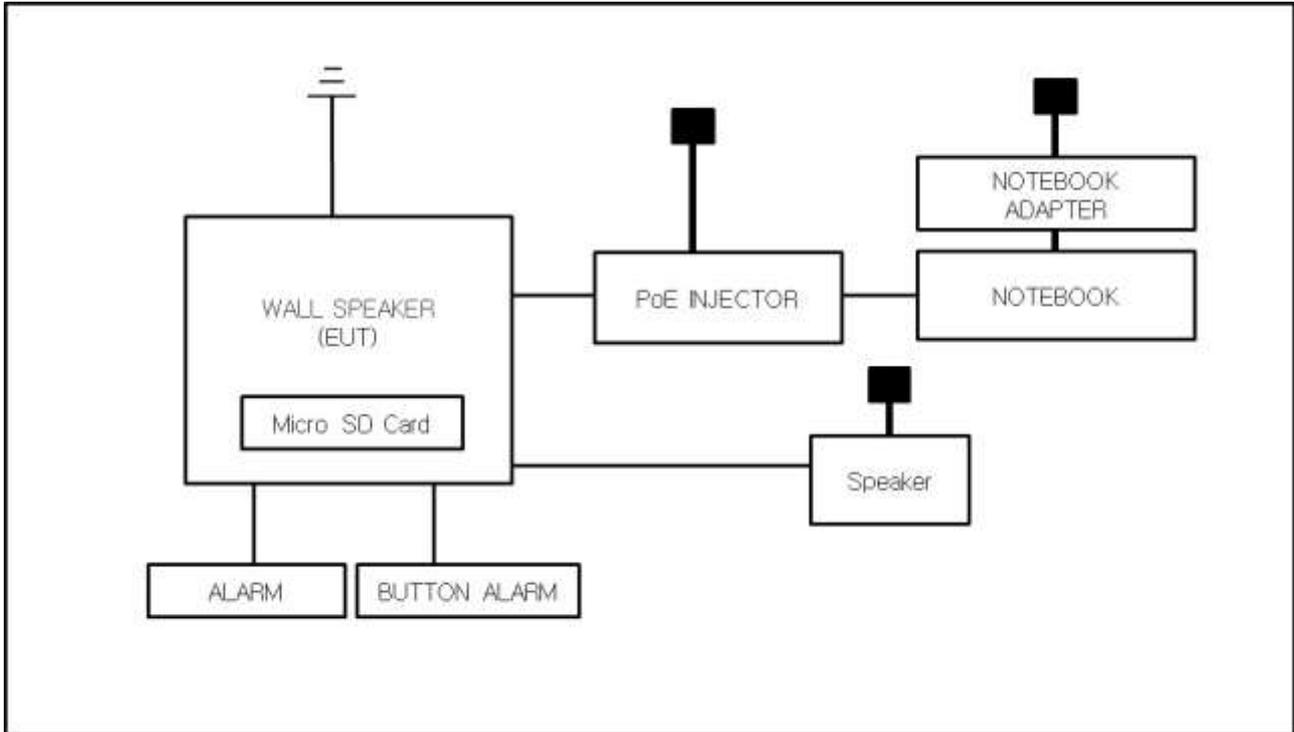
## 1.7 EUT Operating Mode(s)

Test mode	operating
Operation	1. Ping Test Mode. 2. After accessing the web browser, the operation status was checked by playing the 1KHz Tone. 3. Test by uploading the sound source stored on the Micro SD Card through the web viewer 4. Tested while connecting to a web viewer and checking the operation status at the ALARM IN/OUT port.

EUT Test operating S/W		
Name	Version	Manufacture Company
Web Viewer	-	-

## 1.8 Configuration

■ AC Main  
□ DC Main



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## 1.9 Remarks when standards applied

The mains power ports were excluded tested, because the EUT operated by PoE powered.

## 1.10 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.

## 1.11 Test Facility

The measurement facility is located at 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019

## 1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Anechoic Chamber Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	 23298
JAPAN	VCCI	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)	 C-20136, T-20137, R-20181, G-20176
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0004

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Report No.:  
KES-EM-23T0026-R2  
Page (9) of (29)

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## 2.0 Test Regulations

The emissions tests were performed according to following regulations:

- AS/NZS CISPR 32:2015 AMD 1:2020**                       Class A                       Class B

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## 2.1 Conducted Emissions at Mains Power Ports

**Test Date**

N/A

**Test Location**

Electro wave Shieldroom #6

**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	11, 11, 2023
<input type="checkbox"/>	LISN	ENV216	R & S	101787	11, 10, 2023
<input type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	11, 10, 2023
<input type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 10, 2023

**Test Conditions**Temperature: °C  
Relative Humidity: % R.H.**Frequency Range of Measurement**

150 kHz to 30 MHz

**Instrument Settings**

IF Band Width: 9 kHz

**Test Results**

The requirements are:

- PASS  
 NOT PASS  
 NOT APPLICABLE

**Remarks**Refer to 'Remarks when standards applied'

## 2.2 Conducted Emissions at Telecommunication Ports

### Test Date

Jan. 04, 2023

### Test Location

Electro wave Shieldroom #6

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	11, 11, 2023
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	11, 10, 2023
<input checked="" type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	11, 10, 2023
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 10, 2023
<input checked="" type="checkbox"/>	8-WIRE ISN CAT3,5	ENY81	R & S	100174	11, 22, 2023
<input type="checkbox"/>	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	11, 22, 2023
<input type="checkbox"/>	CDN	CDNS502A	TESEQ	40431	11, 10, 2023

### Test Conditions

Temperature: (22,7 ± 0,1) °C  
Relative Humidity: (45,4 ± 0,1) % R.H.

### Frequency Range of Measurement

150 kHz to 30 MHz

### Instrument Settings

IF Band Width: 9 kHz

### Test Results

The requirements are:

- PASS  
 NOT PASS  
 NOT APPLICABLE

### Remarks

- See Appendix A for test data.  
- For Ethernet interfaces, measurements are required at the highest data rate supported by the interface.

## 2.3 Radiated Electric Field Emissions(Below 1 GHz)

**Test Date**

Jan. 03, 2023

**Test Location** OPEN AREA TEST SITE #2       SEMI ANECHOIC CHAMBER #4(10 m)**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESU26	R & S	100551	03, 31, 2023
<input checked="" type="checkbox"/>	AMPLIFIER	SCU 01	R & S	100603	11, 10, 2023
<input checked="" type="checkbox"/>	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 17, 2024
<input checked="" type="checkbox"/>	ATTENUATOR	8491A	HP	32173	03, 08, 2023

**Test Conditions**Temperature: (22,8 ± 0,1) °C  
Relative Humidity: (45,1 ± 0,1) % R.H.**Frequency Range of Measurement**

30 MHz to 1 GHz

**Instrument Settings**

IF Band Width: 120 kHz

**Test Results**

The requirements are:

- PASS  
 NOT PASS  
 NOT APPLICABLE

**Remarks**See Appendix A for test data.

## 2.4 Radiated Electric Field Emissions(Above 1 GHz)

**Test Date**

Jan. 03, 2023

**Test Location**

SEMI ANECHOIC CHAMBER #3

**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR7	R & S	101190	08, 01, 2023
<input checked="" type="checkbox"/>	PREAMPLIFIER	8449B	AGILENT	3008A01967	04, 01, 2023
<input checked="" type="checkbox"/>	ATTENUATOR	8491A	HP	35496	03, 08, 2023
<input checked="" type="checkbox"/>	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 03, 2023

**Test Conditions**

Temperature: (22,1 ± 0,1) °C

Relative Humidity: (45,4 ± 0,2) % R.H.

**Frequency Range of Measurement**

1 GHz to 6 GHz

**Instrument Settings**

IF Band Width: 1 MHz

**Test Results**

The requirements are:

- PASS  
 NOT PASS  
 NOT APPLICABLE

**Remarks**See Appendix A for test data.



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Report No.:  
KES-EM-23T0026-R2  
Page (14) of (29)

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## **APPENDIX A – TEST DATA**

### **Conducted Emissions at Mains Power Ports** HOT LINE

N/A

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Report No.:  
KES-EM-23T0026-R2  
Page (15) of (29)

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NEUTRAL LINE

N/A

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

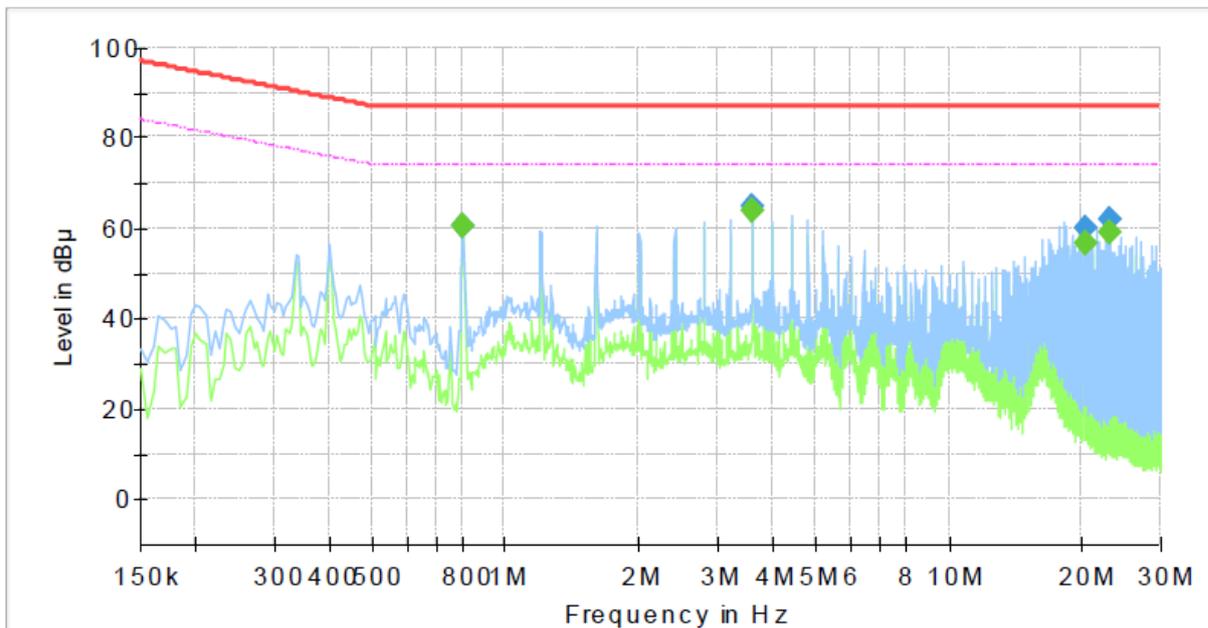
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## Conducted Emissions at Telecommunication Ports [100 Mbps]

### Common Information

Test Description:	Telecommunication Emission
Model No.:	SPA-W100W
Mode :	
Speed :	100 Mbps
Operator Name:	KES



### Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.800000	---	60.47	74.00	13.53	1000.0	9.000	Single Line	20.0
0.800000	60.59	---	87.00	26.41	1000.0	9.000	Single Line	20.0
3.605000	---	63.69	74.00	10.31	1000.0	9.000	Single Line	19.8
3.605000	64.92	---	87.00	22.08	1000.0	9.000	Single Line	19.8
20.260000	---	56.75	74.00	17.25	1000.0	9.000	Single Line	20.0
20.260000	59.79	---	87.00	27.21	1000.0	9.000	Single Line	20.0
23.130000	---	58.85	74.00	15.15	1000.0	9.000	Single Line	20.1
23.130000	61.76	---	87.00	25.24	1000.0	9.000	Single Line	20.1

#### ◆ Calculation

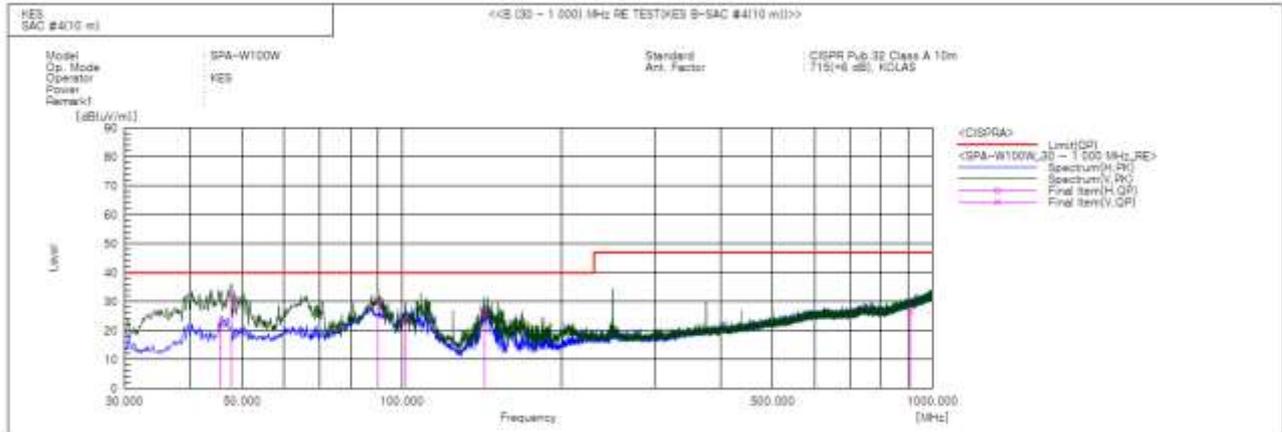
QuasiPeak [dBμV] / CAverage [dBμV] = Reading Value [dBμV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

## Radiated Electric Field Emissions(Below 1 GHz)



### 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]	Remark
1	45.641	H	42.7	-20.8	21.9	40.0	18.1	341.0	172.0	
2	47.703	V	52.4	-20.6	31.8	40.0	8.2	121.0	27.0	
3	90.383	V	53.3	-23.6	29.7	40.0	10.3	166.0	214.0	
4	101.901	H	45.4	-22.0	23.4	40.0	16.6	391.0	303.0	
5	143.248	H	51.1	-25.0	26.1	40.0	13.9	394.0	35.0	
6	907.971	V	30.6	-3.8	26.8	47.0	20.2	162.0	278.0	

### ◆ Calculation

Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)])

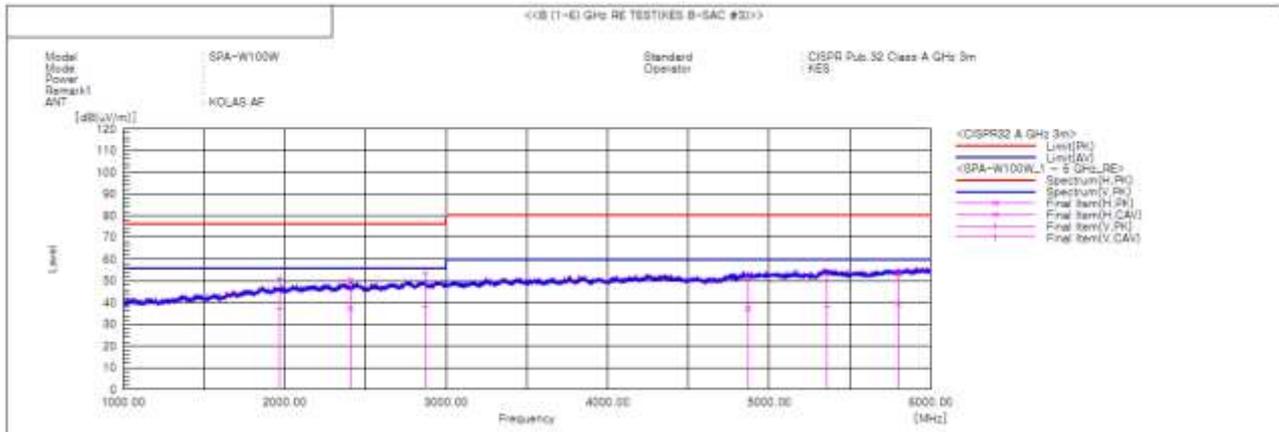
Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

Reading(QP) : Reading value, Result(QP) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value



## Radiated Electric Field Emissions(Above 1 GHz)



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1970.236	V	46.6	32.9	4.5	51.1	37.4	76.0	56.0	24.9	18.6	100.0	101.9	
2	2406.236	H	43.8	31.1	6.3	50.1	37.4	76.0	56.0	25.9	18.6	100.0	331.4	
3	2669.235	V	45.5	30.3	7.8	53.3	38.1	76.0	56.0	22.7	17.9	100.0	215.8	
4	4869.023	H	38.1	23.5	13.8	51.9	37.3	80.0	60.0	28.1	22.7	100.0	72.2	
5	5355.437	V	37.7	23.4	15.0	52.7	38.4	80.0	60.0	27.3	21.6	100.0	2.1	
6	5800.045	H	37.3	23.4	16.0	53.3	39.4	80.0	60.0	26.7	20.6	100.0	126.5	

◆ Calculation

$$\text{Result(PK/CAV)} [dB(\mu V/m)] = (\text{Reading(PK/CAV)}[dB(\mu V)] + c.f[dB(1/m)])$$

$$\text{Margin(PK/CAV)}[dB] = \text{Limit}[dB(\mu V/m)] - \text{Result(PK/CAV)} [dB(\mu V/m)]$$

Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

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Report No.:  
KES-EM-23T0026-R2  
Page (19) of (29)

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## **Test Setup Photos and Configuration Conducted Emissions at Mains Power Ports**

N/A

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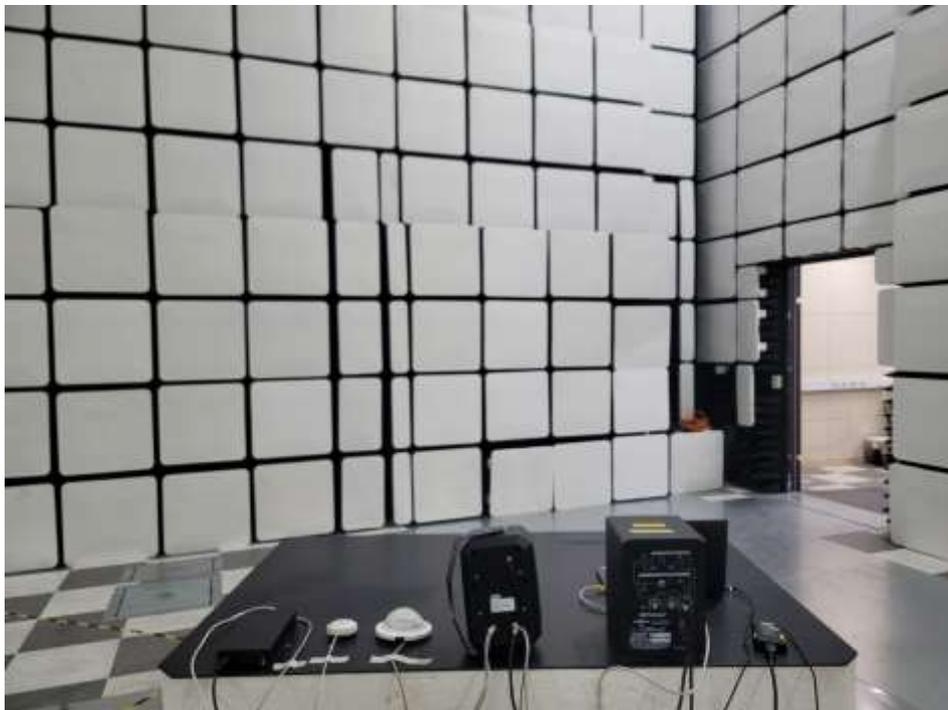
## Conducted Emissions at Telecommunication Ports



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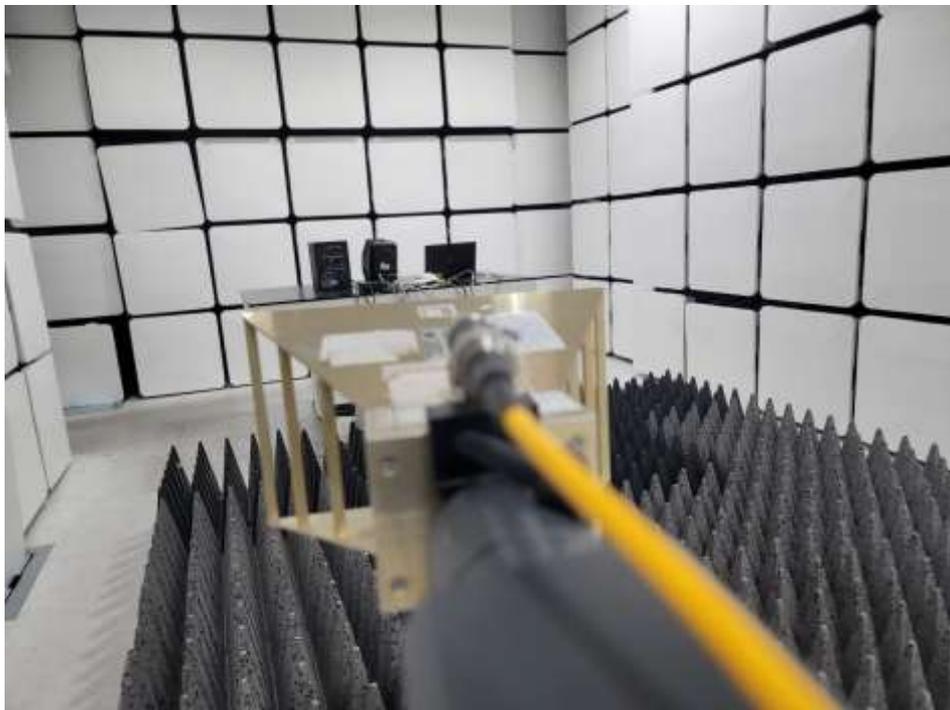
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## Radiated Electric Field Emissions(Below 1 GHz)



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## Radiated Electric Field Emissions(Above 1 GHz)



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## EUT External Photographs

(Top)



(Bottom)



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## EUT Internal Photographs

(Internal View)



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## EUT Internal View – Board 1

(Top)



(Bottom)



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## EUT Internal View – Board 2

(Top)



(Bottom)



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### EUT Internal View – Board 3

(Top)



(Bottom)



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## EUT Internal View – Speake 1

(Top)



(Bottom)



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## EUT Internal View – Speake 2

(Top)



(Bottom)



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