

**KES Co., Ltd.**

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Report No.:

KES-EM-23T0021-R2

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EMC TEST REPORT For RCM

Test Report No. : KES-EM-23T0021-R2
Date of Issue : Feb. 24, 2023
Product name : CEILING SPEAKER
Model/Type No. : SPA-C100W
Variant Model : SPA-C100B
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. 02, 2023 ~ Jan. 03, 2023
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Jun Soo, Jung
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 REVISION HISTORY

Date	Test Report No.	Revision History
Jan. 05, 2023	KES-EM-23T0021	Issued
Jan. 27, 2023	KES-EM-23T0021-R1	Change Manufacturer
Feb. 24, 2023	KES-EM-23T0021-R2	Change the Applicant at the request of the customer

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1.0 General Product Description

Main Specifications of EUT are:

Product	Type	Network Ceiling Speaker
MIC Input	Input Sensitivity	-48dBV $\pm$ 3dB
	Frequency Response	20Hz ~ 20kHz $\pm$ 3dB
Line Output	Output Level	0 dBV $\pm$ 3dB
	Frequency Response	20Hz ~ 20kHz $\pm$ 3dB
	THD + N Ratio	less than 0.01%
	S/N Ratio (20Hz HPF, 20kHz LPF)	greater than 85dB
Power Amp	Output Power (8 Ω , 1kHz Sine wave)	7W(PoE), 15W (PoE+)
	Frequency Response (1W, 8 Ω)	20Hz ~ 20kHz $\pm$ 3dB
	S/N Ratio (20Hz HPF, 20kHz LPF)	greater than 85dB
Network	Ethernet	10/100 Base-T
Memory	Internal Memory	1 GBytes
	External Memory (Micro SD)	SDHC upto 32GB (SANDISK)
Contact	Contact Input	One channel
	Contact Output (Rating : 1A DC 30V, 0.3A AC 125V)	One channel
General	Operating Temperature	-20 ~ 50°C (-4°F ~ 122°F)
	Operating Humidity	10~100% RH Non-condensing
	IP code	-
	Weight	1.95Kg
	Size	Φ 269*142.5(H)
	Color	Black
	Certificate	EMC – FCC part 15 Class A , ICES-003 Class A Safety – UL-60950 , Environment – IEC and NEMA based on the Product specs
Power	PoE	PoE (IEEE 802.3 af type 1 Class 3)
	PoE+	PoE+(IEEE 802.3 at type 2 Class 4)
Audio	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
Speaker	Speaker Component	8" Coaxial Cone type
	Max. Sound Pressure Level (PoE : 7 Watt)	100dB
	Max. Sound Pressure Level (PoE+ : 15 Watt)	103dB
	Max. Power (Peak)	120W
	Frequency Response	99Hz~20kHz
	Sensitivity (1Watt)	92dB
	Coverage Pattern	120°
Network	Security	Password protection : admin,setup,user,guest (sha-2, Digest authentication, User access log) Digest authentication, User access log
	Supported Protocols	IPv4, HTTP, SIP, Bonjour, DNS, NTP, TCP, UDP, DHCP, ARP, SSH, ICMP
System Integration	API (Application Programming Interface)	Including SUNAPI Integration with HTW WAVE (VMS)
	Multi-source Dynamic PA control	<Controler 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
	Intelligent Audio	Export Version : English(US, UK), German, French, Spanish, Russian 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 ↑ , Big Sur 11.1 ↑
	Supported Web viewer	Chrome Version : 91.0.4472.114 ↑

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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
CEILING SPEAKER	SPA-C100W	-	Inter-M Corporation	EUT
AUDIO MODULE	SPA-D1000	-	Inter-M Corporation	-

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	P95G001	8KM8HT2	DELL INC.	-
Notebook adapter	LA65NS2-01	-	LITE-ON TECHNOLOGY(CHANGZHOU)CO.,LTD..	-
Speaker	E5	-	PreSonus®	-
PoE INJECTOR	PT-PSE109GBRO-AH-S	-	Dongguan PROCET Network Technology Co.,Ltd	-
Button Alram	-	-	-	-
LED Alram	PRO-SL	-	SENSOR PRO	-
Micro SD card	-	-	SanDisk	4 GB



1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
CEILING SPEAKER (EUT)	RJ-45	PoE INJECTOR	RJ-45	3.0	U
	Micro SD card Slot	Micro SD card	Micro SD card Slot	-	-
	LINE OUT	Speaker	XLR	2.0	U
	Alarm IN	Button Alram	Line	3.0	U
	Alarm OUT	LED Alram	Line	3.0	U
	Ground Port	Ground	Ground Port	2.0	U

* Unshielded = U, Shielded = S

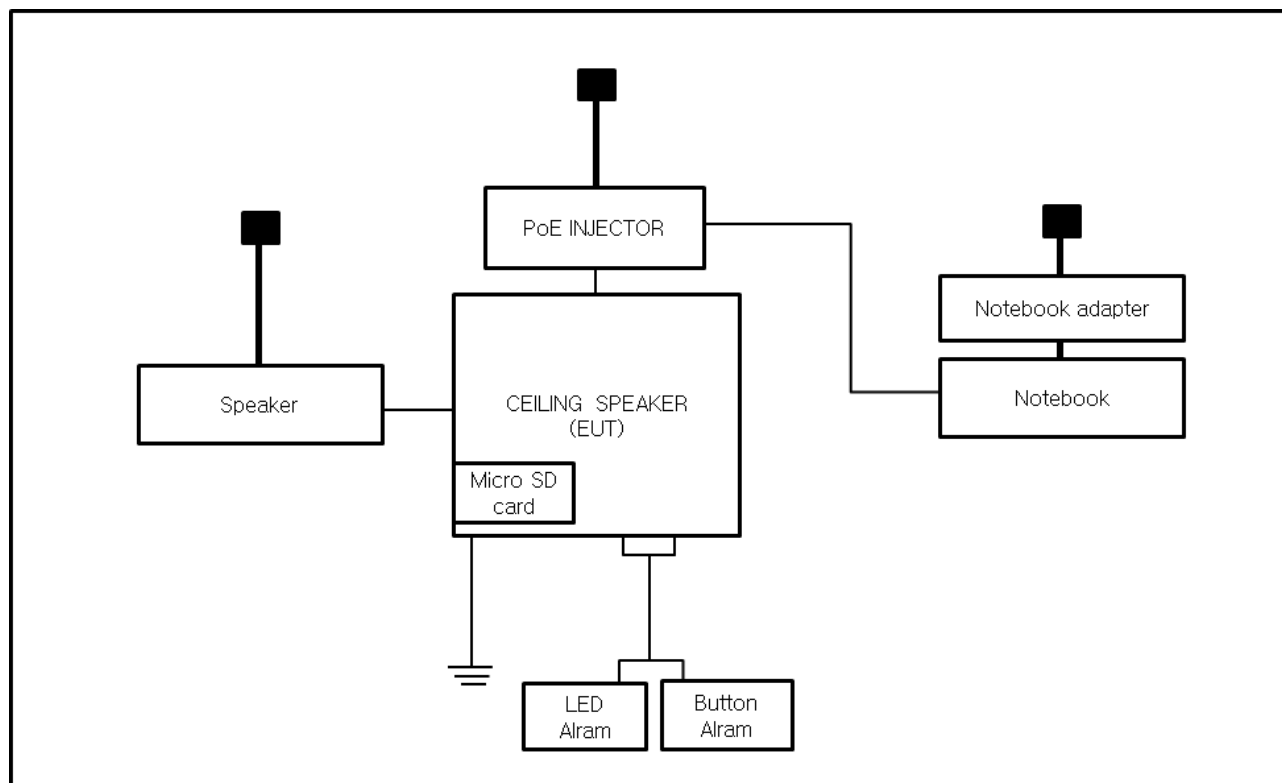
1.7 EUT Operating Mode(s)

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

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

1.8 Configuration

■ AC Main
 □ DC Main



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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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
☐	EMI Test S/W	EMC32	R & S	9.12.00	-
☐	EMI TEST RECEIVER	ESR3	R & S	101783	11, 11, 2023
☐	LISN	ENV216	R & S	101787	11, 10, 2023
☐	LISN	ESH2-Z5	R & S	100450	11, 10, 2023
☐	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. 03, 2023

Test Location

Electro wave Shieldroom #6

Test Equipment

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

Test Conditions

Temperature: (22,6 ± 0,1) °C

Relative Humidity: (46,1 ± 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
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	03, 31, 2023
☒	AMPLIFIER	SCU 01	R & S	100603	11, 10, 2023
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 17, 2024
☒	ATTENUATOR	8491A	HP	32173	03, 08, 2023

Test Conditions

Temperature: (22,3 ± 0,1) °C

Relative Humidity: (44,6 ± 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
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESR7	R & S	101190	08, 01, 2023
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	04, 01, 2023
☒	ATTENUATOR	8491A	HP	35496	03, 08, 2023
☒	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 ± 0,1) % 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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APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

N/A

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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.

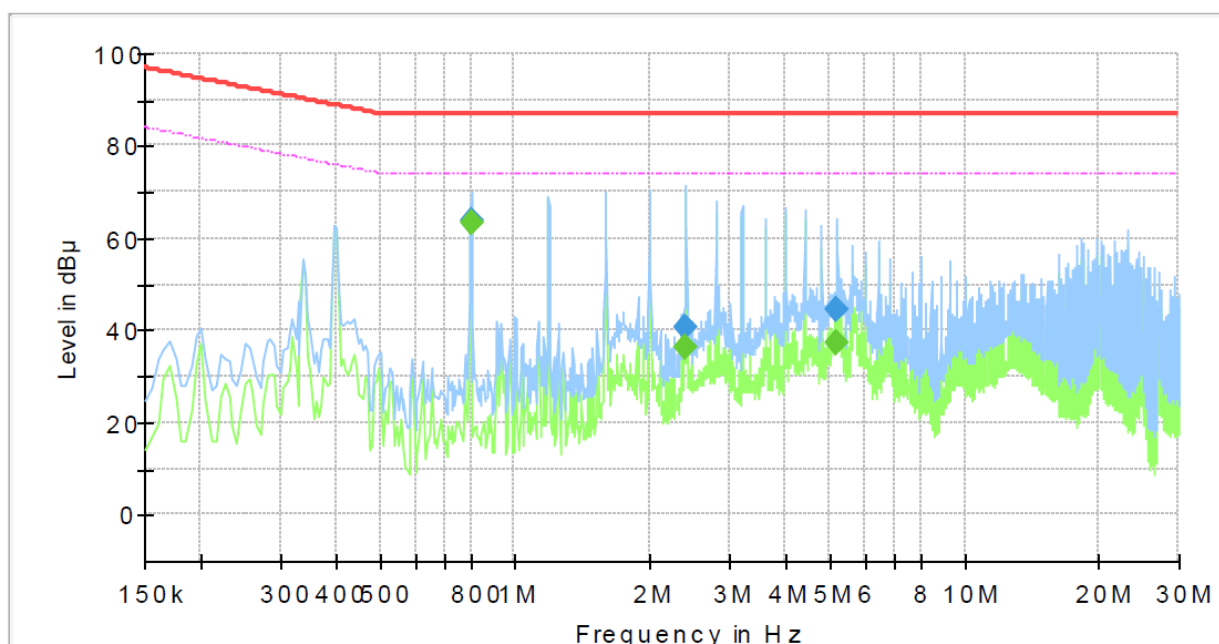
Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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Conducted Emissions at Telecommunication Ports [100 Mbps]

Common Information

Test Description: Telecommunication Emission
 Model No.: SPA-C100W
 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	---	63.41	74.00	10.59	1000.0	9.000	Single Line	20.0
0.800000	63.83	---	87.00	23.17	1000.0	9.000	Single Line	20.0
2.395000	---	36.28	74.00	37.72	1000.0	9.000	Single Line	20.1
2.395000	40.73	---	87.00	46.27	1000.0	9.000	Single Line	20.1
5.210000	---	37.13	74.00	36.87	1000.0	9.000	Single Line	19.4
5.210000	44.75	---	87.00	42.25	1000.0	9.000	Single Line	19.4

◆ Calculation

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

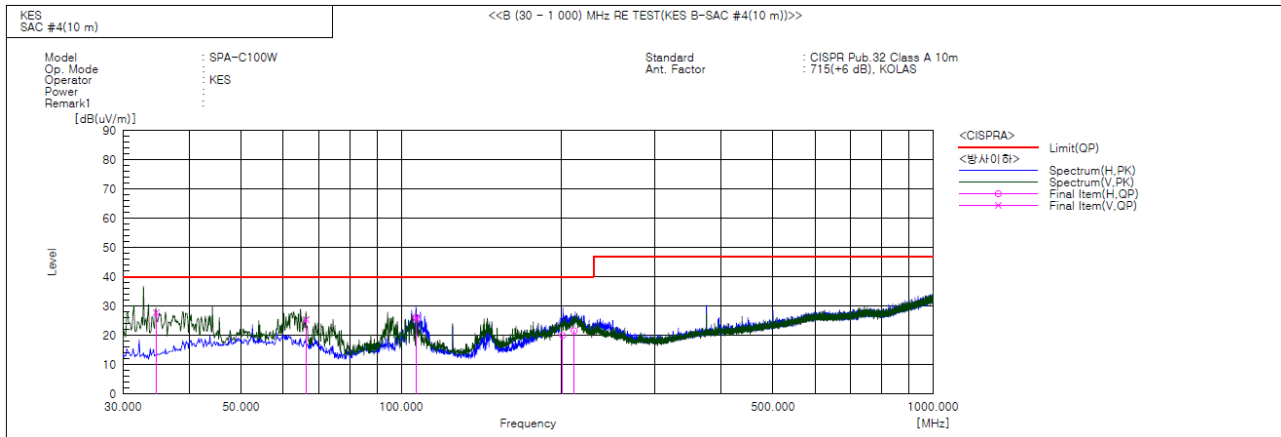
QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (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	34.639	V	52.0	-24.3	27.7	40.0	12.3	103.0	242.0	
2	66.266	V	48.6	-23.2	25.4	40.0	14.6	106.0	158.0	
3	106.696	H	48.6	-22.3	26.3	40.0	13.7	399.0	333.0	
4	106.720	V	48.1	-22.3	25.8	40.0	14.2	100.0	63.0	
5	201.221	H	40.9	-20.9	20.0	40.0	20.0	227.0	184.0	
6	211.338	H	41.7	-20.1	21.6	40.0	18.4	397.0	179.0	

◆ 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



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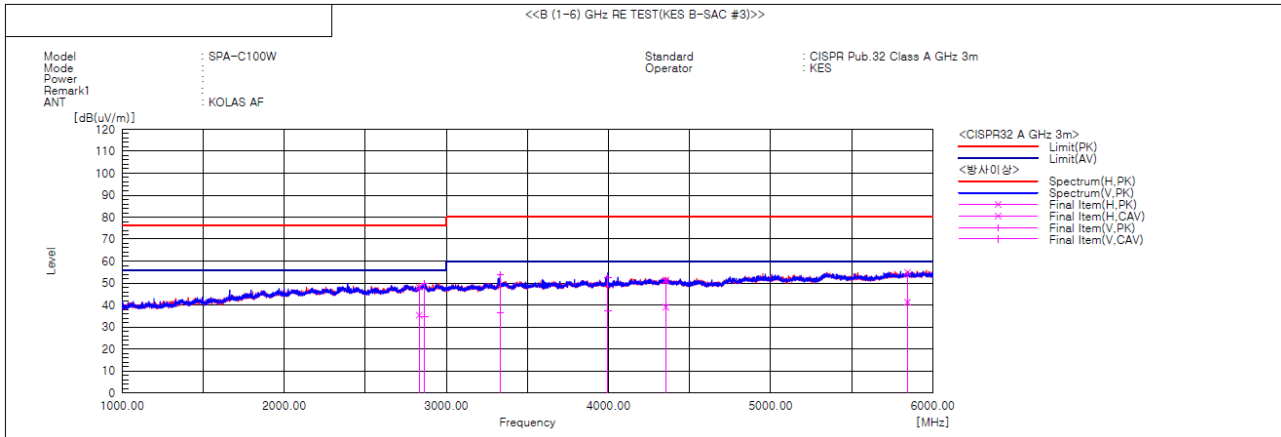
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Radiated Electric Field Emissions(Above 1 GHz)



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	2831.838	H	40.4	27.7	7.7	48.1	35.4	76.0	56.0	27.9	20.6	100.0	275.8	
2	2867.227	V	41.9	26.9	7.8	49.7	34.7	76.0	56.0	26.3	21.3	100.0	334.9	
3	3331.752	V	44.4	27.0	9.4	53.8	36.4	80.0	60.0	26.2	23.6	100.0	146.1	
4	3995.118	V	41.6	26.7	10.8	52.4	37.5	80.0	60.0	27.6	22.5	100.0	128.0	
5	4352.518	H	39.1	26.8	12.2	51.3	39.0	80.0	60.0	28.7	21.0	100.0	86.7	
6	5843.907	H	38.8	25.2	16.1	54.9	41.3	80.0	60.0	25.1	18.7	100.0	130.9	

◆ Calculation

Result(PK/CAV) [dB(μ V/m)] = (Reading(PK/CAV)[dB(μ V)] + c.f[dB(1/m)])

Margin(PK/CAV)[dB] = Limit[dB(μ V/m)] - Result(PK/CAV) [dB(μ 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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Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

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Conducted Emissions at Telecommunication Ports



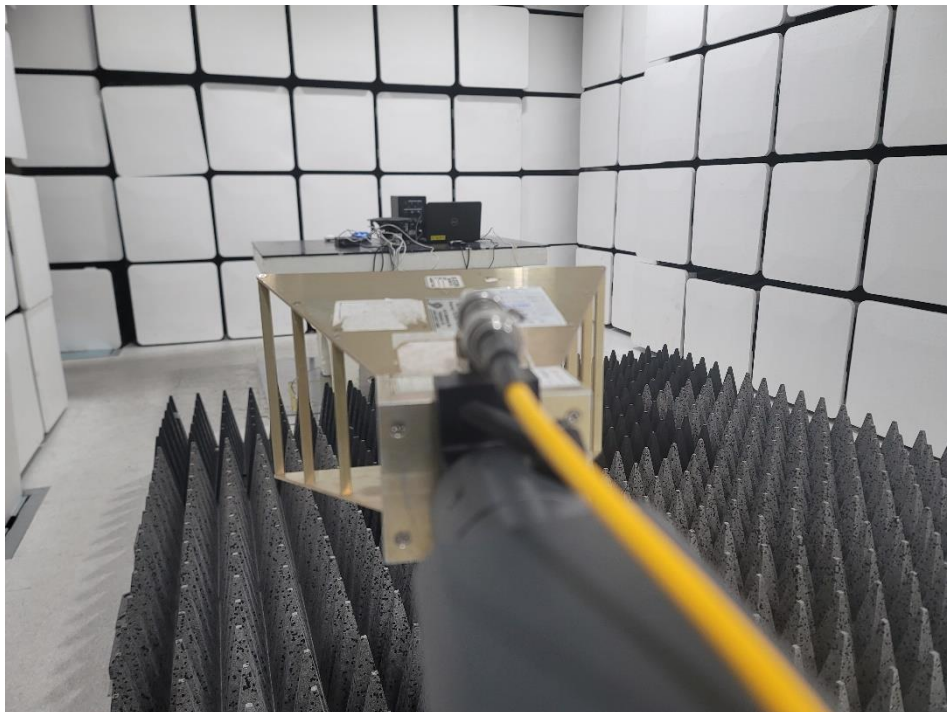
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Radiated Electric Field Emissions(Below 1 GHz)



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Radiated Electric Field Emissions(Above 1 GHz)



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EUT External Photographs

(Top)



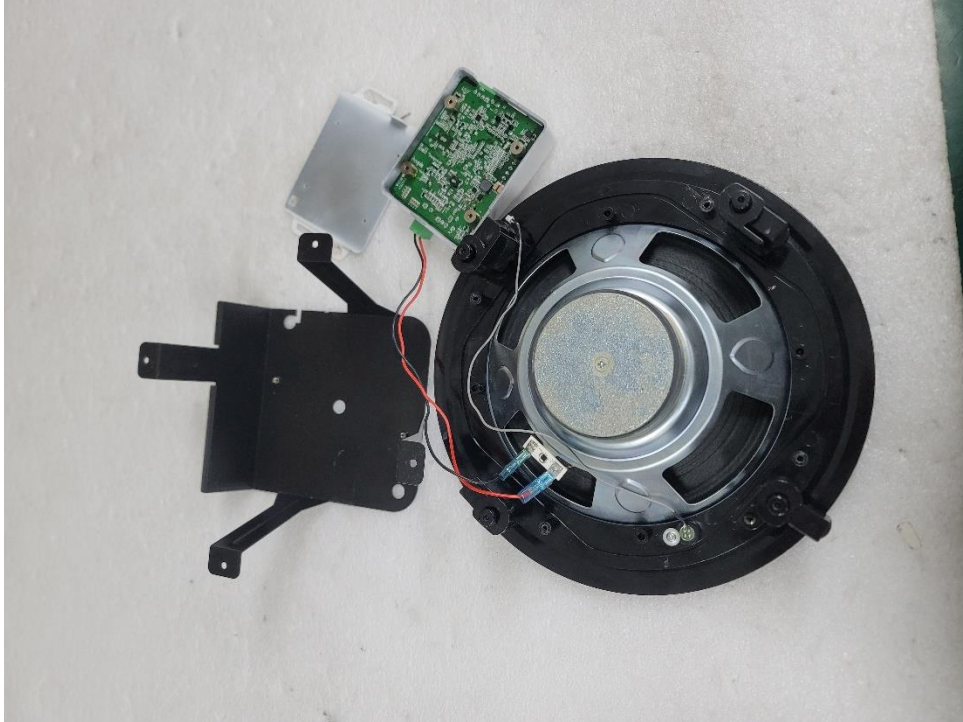
(Bottom)



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EUT Internal Photographs

(Internal View)



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EUT Internal View – Module Board

(Top)



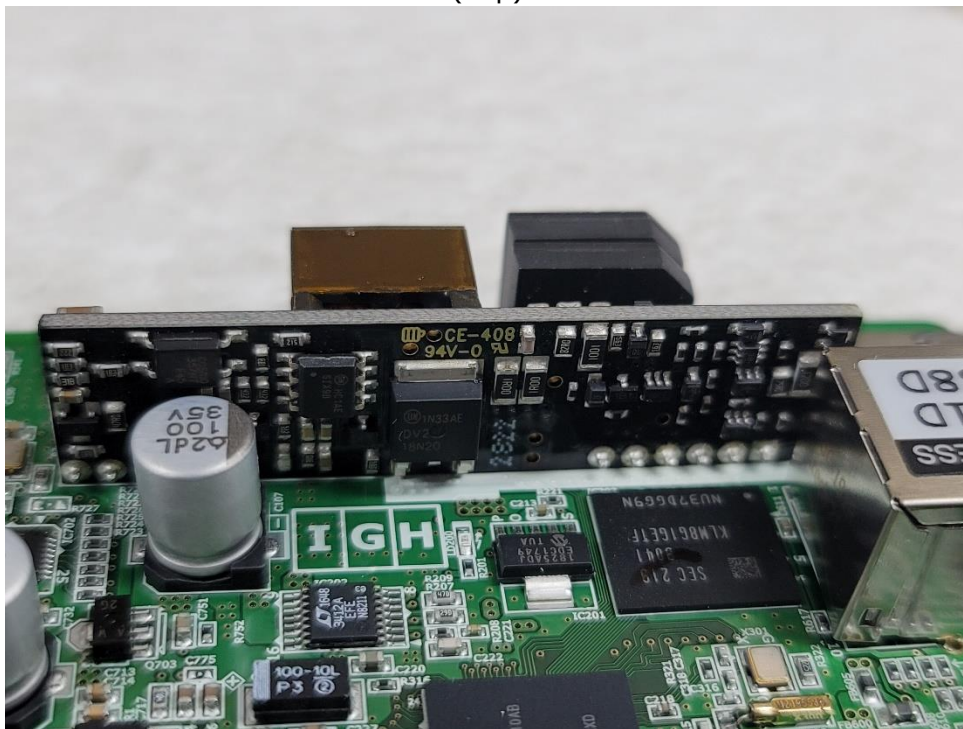
(Bottom)



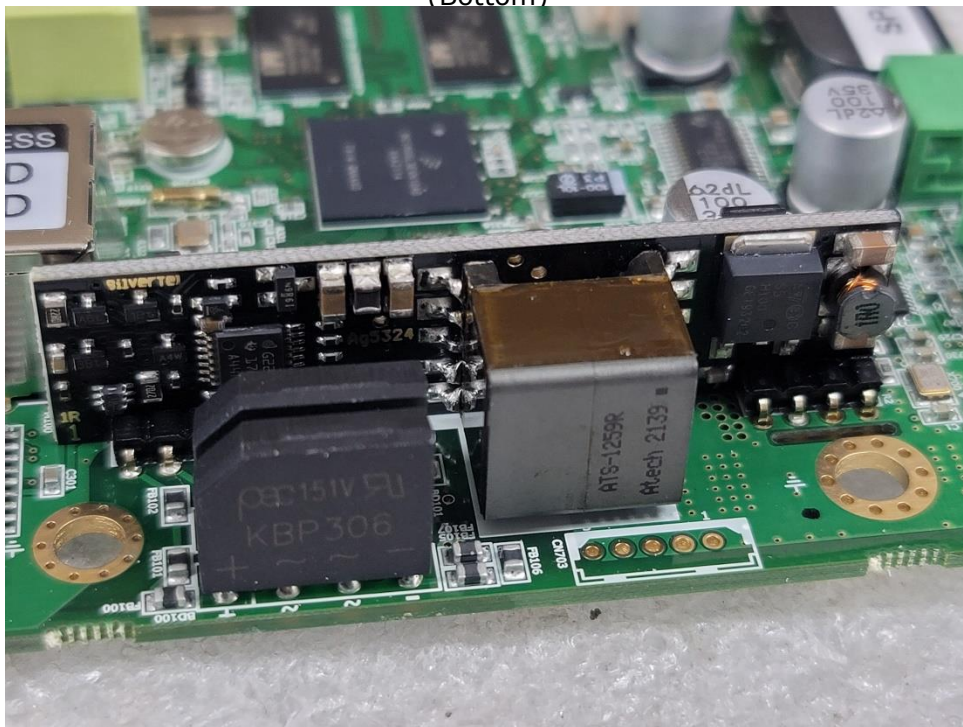
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EUT Internal View – Module Sub Board

(Top)



(Bottom)



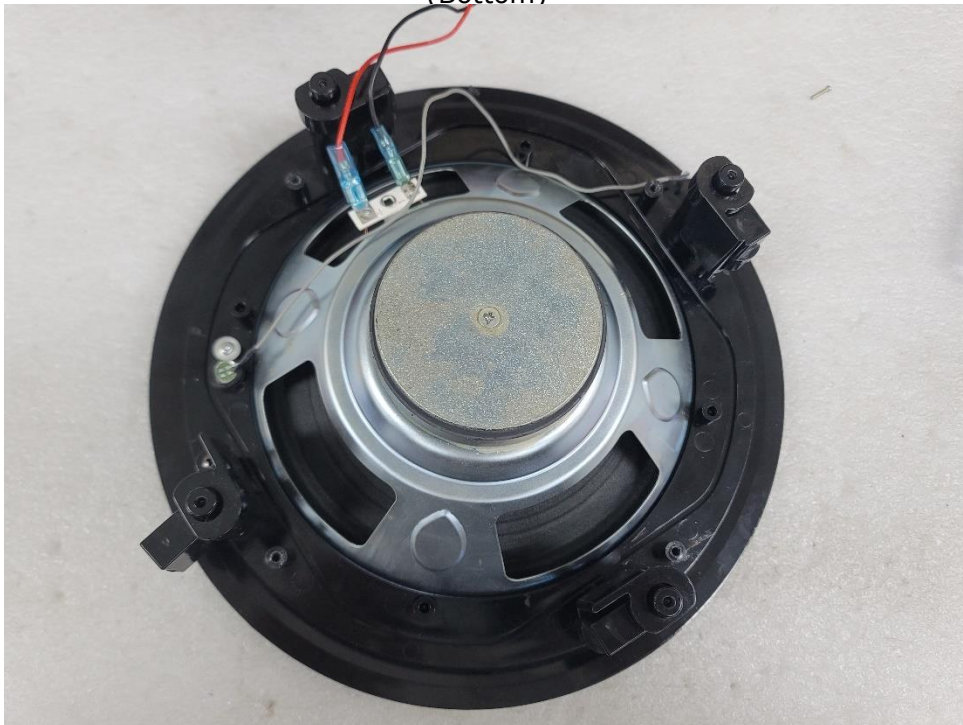
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EUT Internal View – Speaker

(Top)



(Bottom)



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