




시험 성적서

TEST REPORT

페이지(page) : (1) / (총(Total) 21)

성적서 번호 Report No.		ICRT-TR-E231037-0A	
신청자 Client	기관명 Name	Sense Monitoring Sp. z o.o.	
	주소 Address	ul. Zofii Nałkowskiej 11, 38-500 Sanok	
시험대상품목 Sample description		Gateway S-One	
모델명 Type designation		gw-sona-2.0	
정격 Ratings		AC 120 V, 60 Hz	
시험장소 Place of test		<input checked="" type="checkbox"/> 고정시험실(Permanent Testing Lab) <input type="checkbox"/> 현장시험(On Site Testing) 주소지(Address): 112, Hwanggeum3-ro 7beon-gil, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea	
시험기간 Date of test		2023. 04. 25 ~ 2023. 04. 28	
시험방법/항목 Test Method/Item		FCC CFR 47 Part 15, Subpart B / ICES-003 (Other Class B digital devices & peripherals)	
시험결과 Test Results		Refer to summary of test results	
확인 Affirmation	작성자 Tested by	기술책임자 Technical Manager	
	성명 Name	강웅걸 (서명) Kang, Woong-gul (Signature)	성명 Name
		박명철 (서명) Park, Myeongcheol (Signature)	
<input type="checkbox"/> 위 성적서는 고객이 제공한 시료에 대한 시험결과입니다. This is certified that the above mentioned products have been tested for the sample.			
<input type="checkbox"/> 위 성적서는 KS Q ISO/IEC 17025 및 한국인정기구(KOLAS)인정과 관련이 없습니다. The above test report is not related to accreditation by KS Q ISO/IEC 17025 and Korea Laboratory Accreditation scheme.			
<input type="checkbox"/> 위 성적서는 주식회사 아이씨알의 승인 없이는 일부 복제에 대해 금지됩니다. The test report is prohibited for some reproduction without the approval of the ICR.			
<p>2023. 05. 10</p> <p>주식회사 아이씨알 대표이사</p> <p>The head of INTERNATIONAL CERTIFICATION REGISTRAR</p> 			



본 성적서의 진위 확인은 G4B 혹은 ICR 홈페이지에서 가능합니다.

The authenticity of the test report can be checked on the G4B or ICR website.

경기도 김포시 양촌읍 황금 3로 7번길 112 / Tel: 02-6351-9001 ~ 6





페이지(page) : (2) / (총(Total) 21)

Contents

1. Applicant Information.....	3
1.1 Applicant	3
1.2 Manufacture	3
2. Laboratory.....	3
2.1 Information.....	3
3. Revision History	3
4. List of EUT and Accessory	4
4.1 Used equipment.....	4
4.2 Test Configuration	4
4.3 Cable List.....	4
4.4 Mode of Operating during the test	5
4.5 EUT Modifications	5
4.6 Family Model Name	5
5. Summary of test result	6
5.1 Test Summary.....	6
6. Test Description	7
6.1 Facility	7
6.2 Test Procedure	7
7. EMISSION	9
7.1 Radiated emission.....	9
7.2 Conducted emission.....	13
Attachment I.....	16





페이지(page) : (3) / (총(Total) 21)

1. Applicant Information

1.1 Applicant

Applicant : Sense Monitoring Sp. z o.o.
Address : ul. Zofii Nałkowskiej 11, 38-500 Sanok

1.2 Manufacture

Applicant : Sense Monitoring Sp. z o.o.
Address : ul. Zofii Nałkowskiej 11, 38-500 Sanok

2. Laboratory

2.1 Information

Laboratory : ICR Co., Ltd
Address : 112, Hwanggeum3-ro 7beon-gil, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
Telephone No. : +82-2-6351-9001
Facsimile No. : +82-2-6351-9007

KOLAS No. : KT652
RRA No. : KR0165

3. Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
ICRT-TR-E231037-0A	2023. 05. 10	First issue.	-





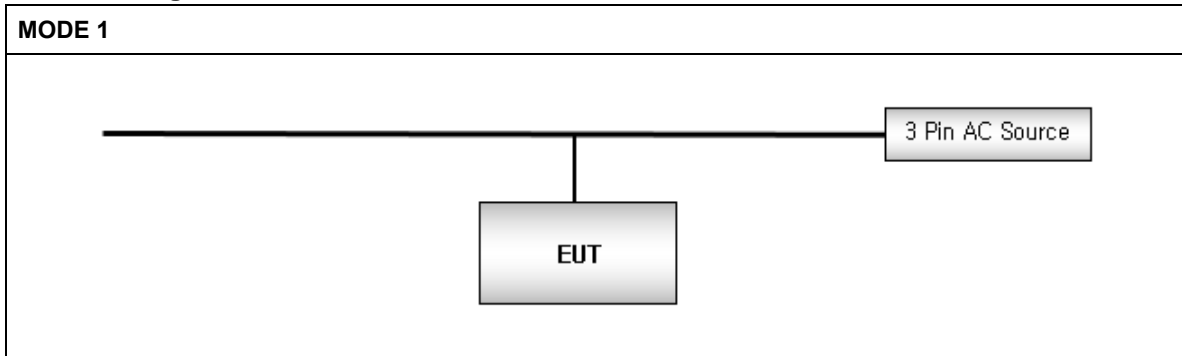
페이지(page) : (4) / (총(Total) 21)

4. List of EUT and Accessory

4.1 Used equipment

Description	Model	Manufacturer	Remark
Gateway S-One	gw-sone-2.0	Sense Monitoring Sp. z o.o.	EUT
Spectrum Analyzer	FSH8	Rohde&Schwarz	AE

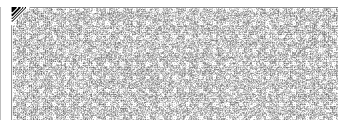
4.2 Test Configuration



——— : Signal line ——— : Power line △ : GROUND ● : Adapter

4.3 Cable List

Equipment	Port	Equipment	Port	Length (m)	Shielded
EUT (MODE 1)	AC IN	3 PIN AC SOURCE	AC OUT	0.8	Unshielded





4.4 Mode of Operating during the test

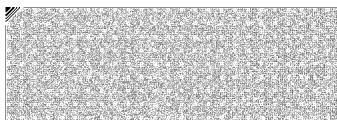
[MODE 1] : After placing the EUT as shown in the layout, test it with RF RX Mode. (AC 120 V, 60 Hz)

4.5 EUT Modifications

- None.

4.6 Family Model Name

- None.





5. Summary of test result

5.1 Test Summary

Standard	Test items	Applied	Results
FCC Part 15.109	Radiated emission	☒	Pass
FCC Part 15.107	Conducted emission	☒	Pass

* The data in this test report are traceable to the national or international standards.

Frequency range to be scanned:

0.15 MHz to 30 MHz as Conducted measurement

5th harmonic of the highest frequency or 40 GHz, whichever is lower as Radiated measurement

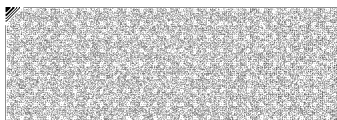
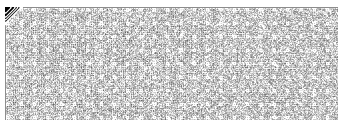
Bandwidth:

Measured by the CISPR quasi-peak function Bandwidth is 9 kHz in the frequency 0.15 MHz ~ 30 MHz and 120 kHz in the frequency 30 MHz ~ 1 000 MHz.

Measured by the CISPR Peak function Bandwidth is 1 MHz in the frequency 1 GHz ~ 40 GHz.

The EUT is powered by a vehicle battery, and the conduction disturbance test is excluded.

- Maximum operating frequency: 108 MHz or higher
- Frequency CH: 12_2.410 GHz, CH:19_2.445 GHz, CH 25_2.475 GHz
- RF Module 1 (MODEL: XBee3, FCC ID: MCQ-XBEE3)
- RF Modele 2 (MODEL: RUT240, FCC ID: XMR201605SEC25A)





6. Test Description

6.1 Facility

All the testing facilities are periodically serviced as a daily check for equipment and cables systems, an every 6 months facility check for the facilities and a monthly check and annual calibration for testing equipment according to ISO/IEC 17025. All the testing facilities are used as the same specifications shown below. There are descriptions both for radiated disturbance measurement and conducted disturbance measurement conformed by ANSI C 63.4-2014.

6.2 Test Procedure

6.2.1 Radiated Disturbance Measurements – Below 1 GHz

- Test site is met the requirements of ANSI C 63.4-2014 and the distance between the EUT and the antenna is adjusted 3 m/10 m.
- The turntable can be rotated 360 degrees.
- The antenna can be adjusted between 1 m and 4 m in height above the ground.
- The EUT is placed on the non-conducting table with 0.8 m height on the turntable.
- Measurements are carried out using a EMI test receiver with peak detectors (100 kHz bandwidth) and an EMI receiver with quasi-peak detectors(120 kHz bandwidth).
- Refer to the list of test equipment used for the test.
- Trilog antenna are used as Broadband antenna.
- The Trilog antenna is used in the frequency range of 30 ~ 1 000MHz, the Horn antenna is used in the frequency range of 1 GHz ~ 18 GHz.
- A variable attenuator is used for verifying amplifier's linearity.
- Rotating the turntable and adjusting the height of the antenna are carried out by control buttons on the console.
- Refer to "Brief Information"(page 4-5) about details of the EUT and configuration of the cables.
- Measurement is carried out by a ICR operator as manual operation.
- searching for some of High disturbance frequency points than the other points with the following settings;
 - bandwidth 100 kHz, frequency range 10 MHz between 30 MHz and 300 MHz and frequency range 50 MHz between 300 MHz and 1 GHz.
- searching the worst direction with the maximum level of the disturbance wave in rotating the turntable 360 degrees at each searched frequency point.
- setting the height of the antenna with the maximum level of the disturbance wave from 1 m ~ 4 m.
- reading the disturbance level by the EMI receiver with quasi-peak detectors (120 kHz bandwidth) according to ANSI C 63.4-2014.
- measuring to vertical and horizontal polarization.
- calculating the measurement result with the following formula or equation:
[Measurement result= measured value + Antenna factor + Cable loss - (Amp.)]

6.2.2 Radiated Disturbance Measurements – Above 1 GHz

- Test site is met the requirements of ANSI C 63.4-2014 and the distance between the EUT and the antenna is adjusted 3 m.
- The turntable can be rotated 360 degrees.
- The antenna can be adjusted between 1 m in height above the ground.
- The EUT is placed on the non-conducting table with 1 m height on the turntable.
- Measurements are carried out using a EMI test receiver with peak detectors (1 MHz bandwidth) and an EMI receiver with peak and average detectors(1 MHz bandwidth).
- Refer to the list of test equipment used for the test.
- HORN ANTENNA are used as WIDEBAND ANTENNA.
- The HORN ANTENNA is used in the frequency range of 1 GHz ~ 18 GHz.
- A variable attenuator is used for verifying amplifier's linearity.
- Rotating the turntable and adjusting the height of the antenna are carried out by control buttons on the console.
- Refer to "Brief Information"(page 4-5) about details of the EUT and configuration of the cables.





- Measurement is carried out by a ICR operator as manual operation.
- searching the worst direction with the maximum level of the disturbance wave in rotating the turntable 360 degrees at each searched frequency point. – setting the height of the antenna with the maximum level of the disturbance wave from 1 m
- reading the disturbance level by the EMI receiver with peak and average detectors (1 MHz bandwidth) according to ANSI C 63.4-2014.
- measuring to vertical and horizontal polarization.
- calculating the measurement result with the following formula or equation:
[Measurement result= measured value + Antenna factor + Cable loss - (Amp.)]

6.2.3 Conducted Disturbance Measurements

- The measurement is carried out on an open site with horizontal and metallic ground plane.
- An AMN(Artificial Mains Network) with a nominal impedance (50 Ω/50 μH) as defined in ANSIC 63.4-2014., shall be utilized.
- The AMN is grounded on a horizontal metal ground plane.
- Measurement is carried out using an EMI receiver with quasi-peak detectors and average detector. (Refer to the List of test equipment used for the test.)
- The shortest distance between the EUT and the AMN is 0.8 m.
- The EUT is placed on the non-conducting table with 0.8 m height.
- A remote switch is used for changing phases between Line (L) and Neutral (N).
- Refer to "Brief Information"(page 4-5) about details of the EUT and configuration of the cables.
- Measurement is carried out as manual operation.
- detecting the maximized emission level using the maxhold function after setting the spectrum analyzer bandwidth 1 kHz and the frequency range from 150 kHz ~ 1 MHz, 1 MHz ~ 5 MHz and 5 MHz ~ 30 MHz.
- searching the maximum frequency point of the disturbance wave in each frequency range.
- reading the disturbance level of quasi-peak, average and Line (L) and Neutral (N) in 9 kHz bandwidth by the EMI receiver.
- calculating the measurement result with the following formula or equation.
(Result = Reading + Corr)
(Margin = Limit - Result)





7. EMISSION

7.1 Radiated emission

Definition:

The test assesses the ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

Test method : FCC Part 15.109

[Below 1 GHz]

Test Date : 2023. 04. 26
 Temperature, Humidity : 23.4 °C ~ 24.2 °C, 42.2 % R.H. ~ 42.9 % R.H.
 Measurement Frequency range : 30 MHz ~ 1 GHz
 Measurement Distance : 3 m
 Measurement RBW : 120 kHz

[Above 1 GHz]

Test Date : 2023. 04. 28
 Temperature, Humidity : 23.4 °C ~ 24.2 °C, 42.2 % R.H. ~ 42.9 % R.H.
 Measurement Frequency range : 1 GHz ~ 18 GHz
 Measurement Distance : 3 m
 Measurement RBW : 1 000 kHz

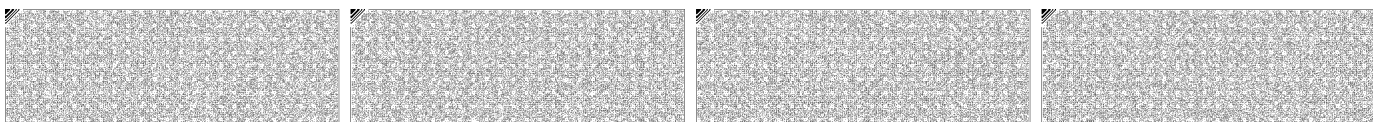
Test mode : MODE 1 (refer to 4.4)

U_t : AC 120 V, 60 Hz

Result : Pass

A sample calculation:

- Corr (correction factor) = Ant. Factor + Cable loss – (Amp.)
- Emission Level = meter reading + Corr
- Sample calculation ; Below 1 GHz: MODE 1 (Quasi-Peak)
 At Frequency : 262.412 MHz Result = Reading + Corr = 62.58 dB(μV/m) + (-22.6) dB = 39.98 dB(μV/m)
- Sample calculation ; Above 1 GHz : MODE 1 (CAverage)
 At Frequency : 17 916.700 MHz Result = Reading + Corr = 24.07 dB(μV/m) + (16.9) dB = 40.97 dB(μV/m)
- Measurement Data kept in ICR





페이지(page) : (10) / (총(Total) 21)

Limits of below 1 GHz - CLASS A

Frequency Range (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Distance (m)
30 ~ 88	90	10
88 ~ 216	150	
216 ~ 960	210	
Above 960	300	

Limits of below 1 GHz - CLASS B

Frequency Range (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Distance (m)
30 ~ 88	100	3
88 ~ 216	150	
216 ~ 960	200	
Above 960	500	

Used equipments:

- Below 1 GHz

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR26	R&S	101462	2024. 04. 04
<input checked="" type="checkbox"/>	TRILOG BROAD BAND ANTENNA	VULB 9162	SCHWARZBECK	120	2024. 12. 26
<input type="checkbox"/>	LOOP Antenna	HFH2-Z2	R&S	100506	2023. 07. 05
<input checked="" type="checkbox"/>	RF Pre Amplifier	SCU 08	R&S	100746	2024. 04. 03
<input checked="" type="checkbox"/>	HUMIDITY/TEMP. DATA RECORDER	MHT-381SD	LUTRON	AI.63107	2024. 02. 07

- Above 1 GHz

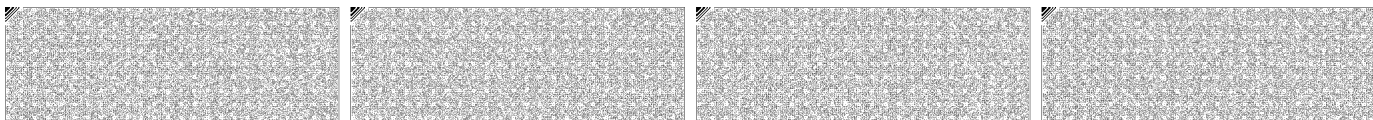
Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR26	R&S	101461	2024. 04. 04
<input checked="" type="checkbox"/>	HORN ANTENNA	HF907	R&S	102556	2023. 08. 22
<input checked="" type="checkbox"/>	RF Pre Amplifier	SCU 18	R&S	102342	2024. 04. 03
<input checked="" type="checkbox"/>	HUMIDITY/TEMP. DATA RECORDER	MHT-381SD	LUTRON	AI.63106	2024. 02. 07

Test Software:

Used	Description	Model name	Manufacturer	Version.
<input checked="" type="checkbox"/>	EMI Test Software	EMC32	R & S	10.01.00

Measurement Data:

- Refer to the Next page.



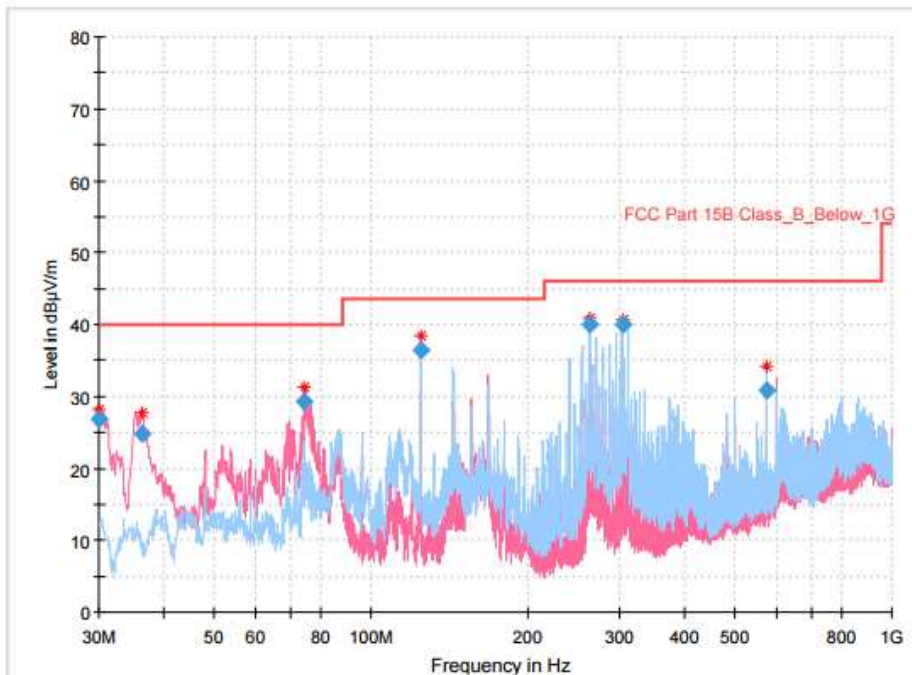


**[Below 1 GHz : MODE 1]
DATA**

Test Report

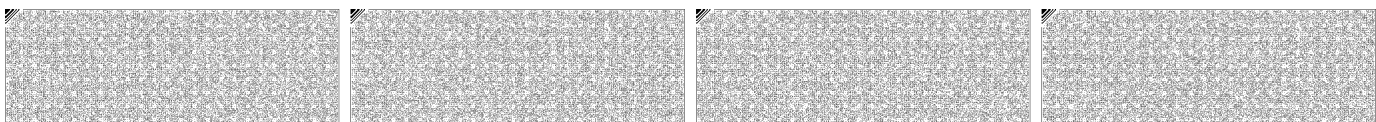
Common Information

Test Description: 2023-1705
 Operating Conditions: ICR 3 m Chamber
 Operator Name: KWG
 Comment: RE_MODE 1



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.097000	26.77	40.00	13.23	1000.0	120.000	100.1	V	135.0	-26.6
36.402000	24.72	40.00	15.28	1000.0	120.000	100.1	V	0.0	-25.6
74.523000	29.30	40.00	10.70	1000.0	120.000	100.1	V	224.0	-29.0
124.963000	36.53	43.50	6.97	1000.0	120.000	200.1	H	79.0	-27.3
262.412000	39.98	46.00	6.02	1000.0	120.000	100.1	H	76.0	-22.6
303.734000	39.91	46.00	6.09	1000.0	120.000	100.1	H	0.0	-21.6
576.207000	30.79	46.00	15.21	1000.0	120.000	200.1	H	229.0	-15.2



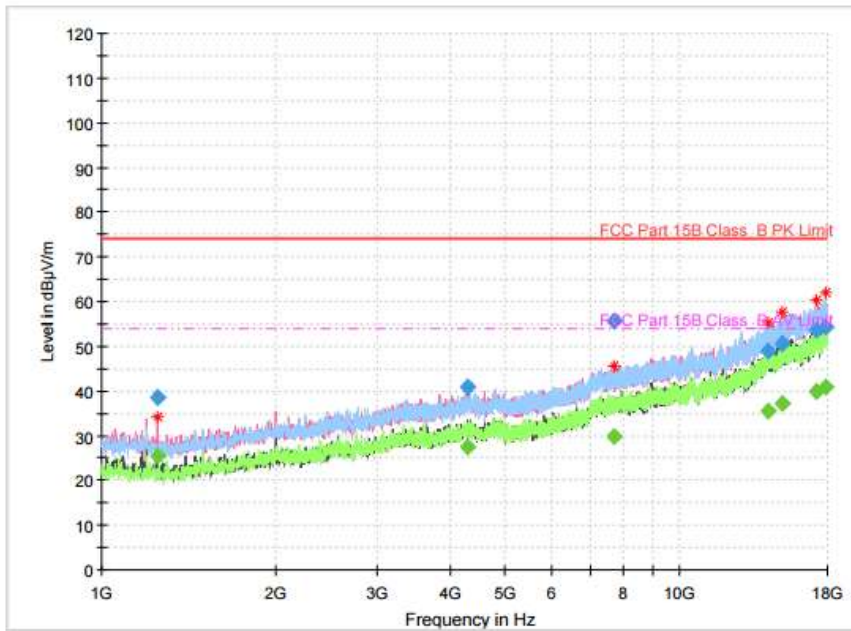


[Above 1 GHz : MODE 1]
DATA

Test Report

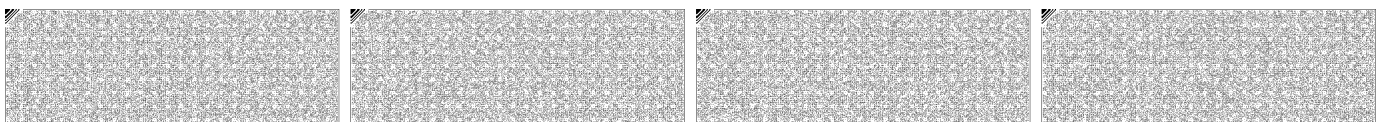
Common Information

Test Description: 2023-1705
 Test Site: ICR 3 m Chamber
 Operator Name: KWG
 Comment: ABOVE_MODE 1



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1249.900	38.44	---	74.00	35.56	10000.0	1000.000	149.8	V	75.0	-16.3
1249.900	---	25.55	54.00	28.45	10000.0	1000.000	149.8	V	75.0	-16.3
4292.900	---	27.34	54.00	26.66	10000.0	1000.000	149.8	V	35.0	-1.5
4292.900	40.74	---	74.00	33.26	10000.0	1000.000	149.8	V	35.0	-1.5
7706.500	---	29.94	54.00	24.06	10000.0	1000.000	300.2	V	141.0	4.0
7706.500	55.71	---	74.00	18.29	10000.0	1000.000	300.2	V	141.0	4.0
14232.800	---	35.44	54.00	18.56	10000.0	1000.000	300.2	V	0.0	12.1
14232.800	49.08	---	74.00	24.92	10000.0	1000.000	300.2	V	0.0	12.1
15062.400	50.64	---	74.00	23.36	10000.0	1000.000	300.2	V	179.0	13.0
15062.400	---	37.17	54.00	16.83	10000.0	1000.000	300.2	V	179.0	13.0
17277.500	53.57	---	74.00	20.43	10000.0	1000.000	300.2	V	324.0	15.4
17277.500	---	39.74	54.00	14.26	10000.0	1000.000	300.2	V	324.0	15.4
17916.700	54.31	---	74.00	19.69	10000.0	1000.000	149.8	H	138.0	16.9
17916.700	---	40.97	54.00	13.03	10000.0	1000.000	149.8	H	138.0	16.9





7.2 Conducted emission

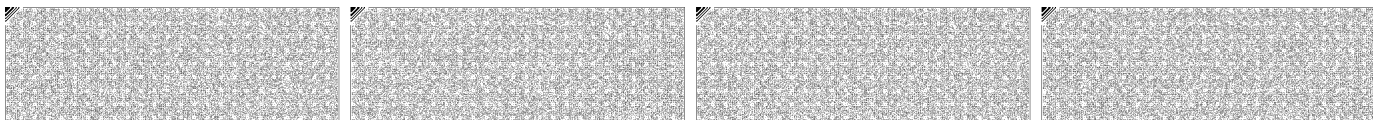
Definition:

The test assesses the ability of the EUT to limit its internal noise from being present on the AC mains Power and Signal Line In / Output ports.

Test method	: FCC Part 15.107
Test Date	: 2023. 04. 25
Temperature, Humidity	: 23.4 °C ~ 24.2 °C, 42.2 % R.H. ~ 42.9 % R.H.
Measurement Frequency range and RBW	: 150 kHz ~ 30 MHz
Test mode	: MODE 1 (refer to 4.4)
<i>Ut</i>	: AC 120 V, 60 Hz
Result	Pass

A sample calculation:

- Corr (correction factor) = LISN Insertion loss + Cable loss
- Emission Level = meter reading + Corr
- Sample calculation; MODE 1
- At Frequency: 0.150 MHz Result = Reading + Corr = 43.79 dB(μV) + 9.7 dB = 53.49 dB(μV)
- (Quasi-peak, CISPR-Average)
- Measurement Data kept in ICR





페이지(page) : (14) / (총(Total) 21)

Limits for conducted emissions from the AC mains ports of class A equipment.

Applicable to AC mains power port		
Frequency Range (MHz)	Quasi-Peak [dB(μV)]	CISPR-Average [dB(μV)]
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

Limits for conducted emissions from the AC mains ports of class B equipment.

Applicable to AC mains power port		
Frequency Range (MHz)	Quasi-Peak [dB(μV)]	CISPR-Average [dB(μV)]
0.15 ~ 0.5	66 ~ 56*	56 ~ 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Used equipments:

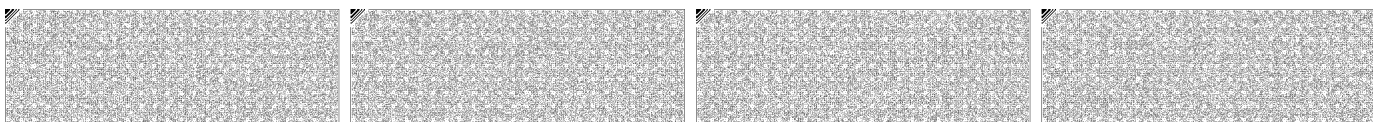
Used	Equipment	Model no.	Makers	Serial no.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR3	R&S	102119	2024. 04. 04
<input checked="" type="checkbox"/>	LISN(main)	ENV216	R&S	102194	2024. 04. 03
<input type="checkbox"/>	LISN(sub)	ENV216	R&S	102193	2024. 04. 03
<input type="checkbox"/>	LISN	NNLK 8130	SCHWARZBECK	05184	2023. 08. 11
<input type="checkbox"/>	LISN	NNLK 8121	SCHWARZBECK	8121-668	2023. 12. 08
<input checked="" type="checkbox"/>	HUMIDITY/TEMP. DATA RECORDER	MHT-381SD	LUTRON	AI.63101	2024. 02. 07

Test Software:

Used	Description	Model name	Manufacturer	Version.
<input checked="" type="checkbox"/>	EMI Test Software	EMC32	R & S	10.01.02

Measurement Data:

- Refer to the Next page.



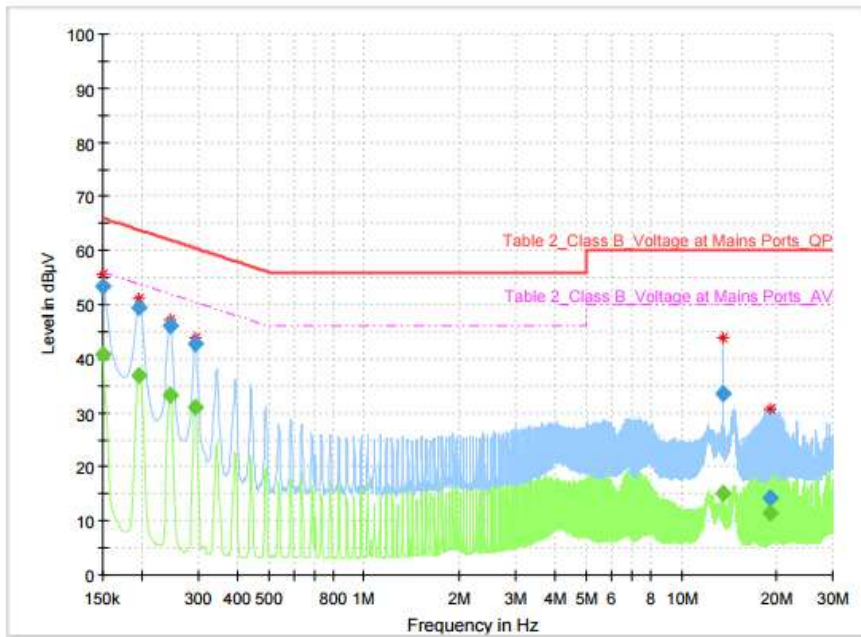


**[MODE 1]
DATA**

Test Report

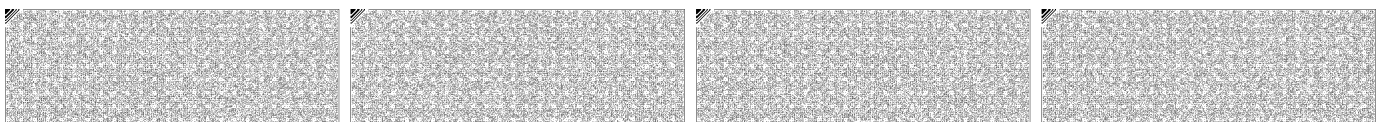
Common Information

Test Description: 2023-1705
 Test Site: ICR Shield Room
 Operator Name: KWG
 Comment: CE_MODE 1



Final Result

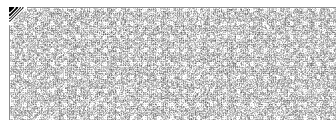
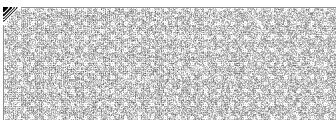
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	53.49	---	66.00	12.51	5000.0	9.000	N	9.7
0.150000	---	40.73	56.00	15.27	5000.0	9.000	N	9.7
0.195000	49.52	---	63.82	14.30	5000.0	9.000	N	9.9
0.195000	---	36.74	53.82	17.08	5000.0	9.000	N	9.9
0.244500	46.17	---	61.94	15.77	5000.0	9.000	L1	9.7
0.244500	---	33.17	51.94	18.77	5000.0	9.000	L1	9.7
0.294000	42.67	---	60.41	17.74	5000.0	9.000	N	9.7
0.294000	---	31.08	50.41	19.33	5000.0	9.000	N	9.7
13.560000	---	14.98	50.00	35.02	5000.0	9.000	L1	9.9
13.560000	33.51	---	60.00	26.49	5000.0	9.000	L1	9.9
19.099500	---	11.53	50.00	38.47	5000.0	9.000	N	9.9
19.099500	14.31	---	60.00	45.69	5000.0	9.000	N	9.9





Attachment I

PHOTOGRAPHS



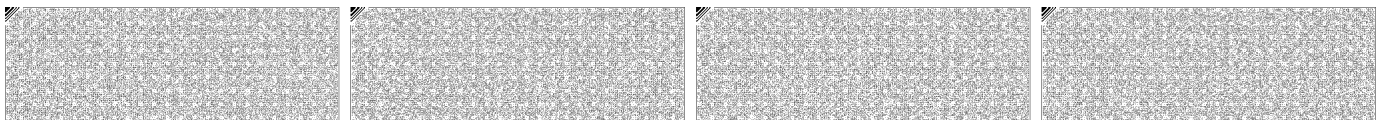


Radiated emission (Below 1 GHz)

[Front]



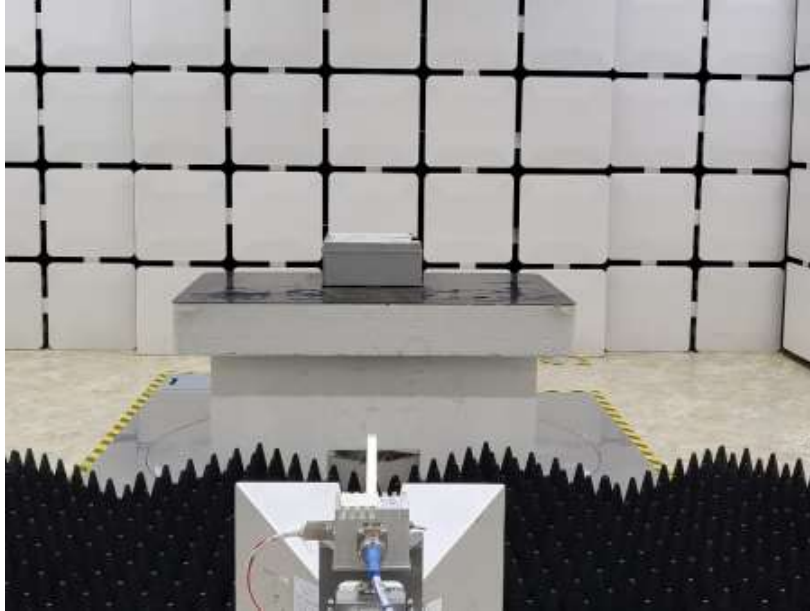
[Rear]



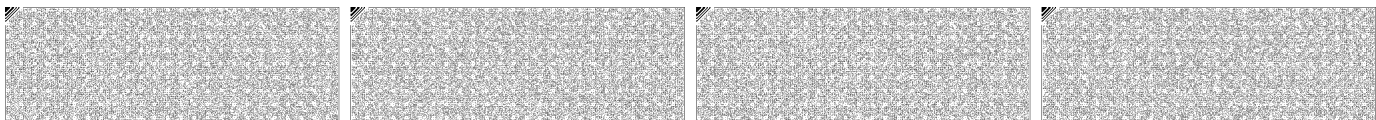
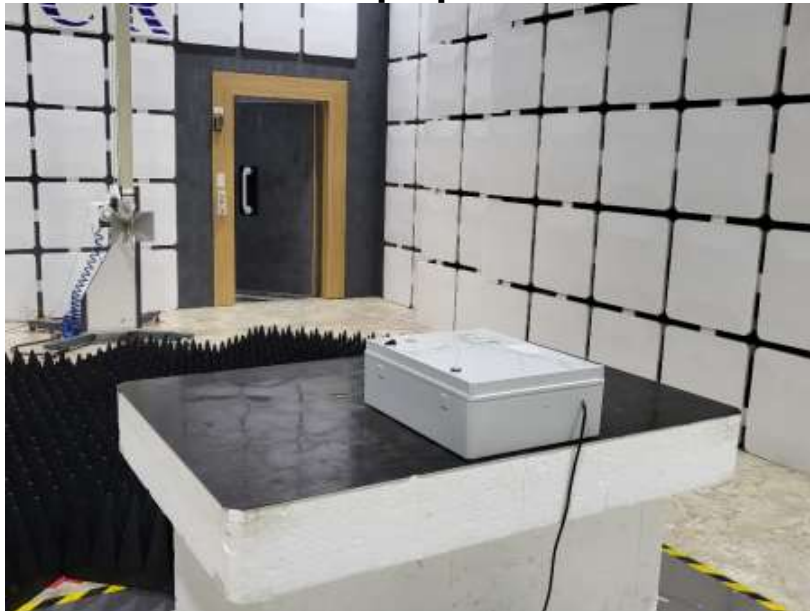


Radiated emission (Above 1 GHz)

[Front]



[Rear]



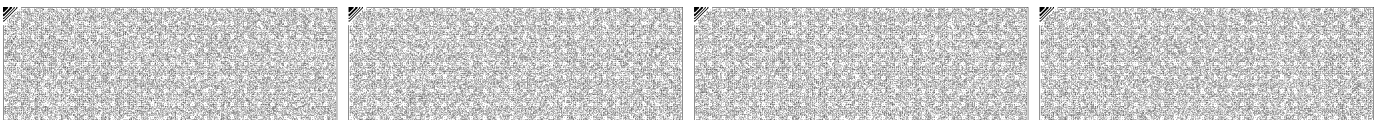


Conducted emission

[Front]



[Rear]





EUT

[Front]

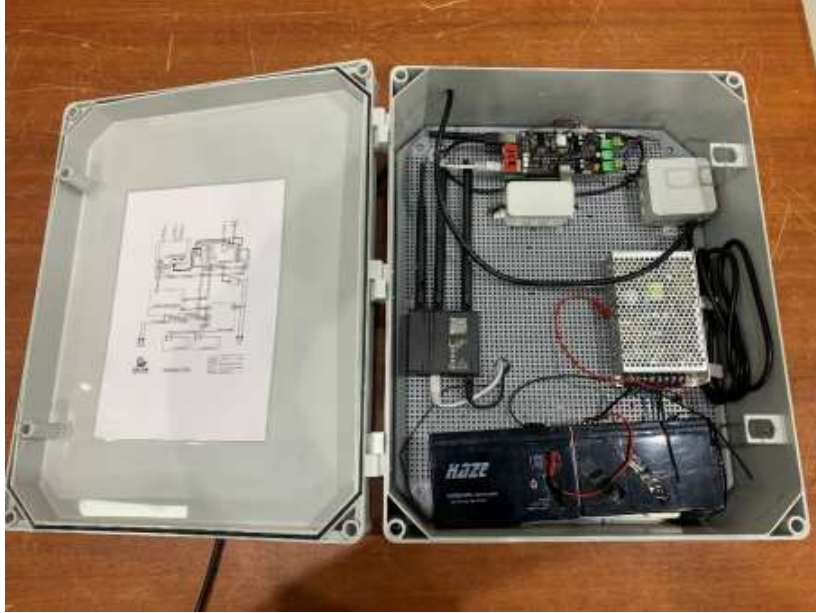


[Rear]





[Inside]



- END -

