



Electromagnetic Emission

FCC MEASUREMENT REPORT

PRODUCT : Access Control System
MODEL/TYPE NO. : ASP-2000
Derived Models : ASP-19, AIC-1000, SZ-1082D, SZ-1081D, SW-1081-D, SW-1080-D, SW-1082D, SW-1081D, SV-1082D, SV-1081D, FPS-1000R, CRS-100, ASP-1000, ASP-19F, ASP-19E, ASP-19D
FCC ID : 2AXQD-ASP-2000
TRADE NAME : 
APPLICANT : AHA INC CO.,LTD
 67, Hwanggeum-ro, 109 beon-gil, Yangchon-eup, Gimpo-si, Geonggi-do, 10048, korea
FCC CLASSIFICATION : Class B Digital Device
FCC RULE PART(S) : FCC Part 15 Subpart B
FCC PROCEDURE : Certification
DATES OF TEST : September 27, 2020
DATES OF ISSUE : October 7, 2020
TEST REPORT No. : BWS-20-EF-0014-R1
TEST LAB. : BWS TECH Inc. (Designation Number : KR0017)

This Access Control System(ASP-2000) has been tested in accordance with the measurement procedures specified in ANSI C63.4-2014 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic emission limits specified in FCC Rule Part15 Subpart B Section15.107 and 15.109. I attest to the accuracy of data. All measurement herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

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

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Description of Version

Edition No.	Data of Revision	Revision Summary	Report No.
0	September 28, 2020	Original Report	BWS-20-EF-0014
1	October 7, 2020	Changed Model Name	BWS-20-EF-0014-R1

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FCC TEST REPORT

Scope – Measurement and determination of electromagnetic emission (EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission (FCC)

1. General Information

1.1 Applicant Information

Company Name : AHA INC CO.,LTD
Company Address : 67, Hwanggeum-ro, 109 beon-gil, Yangchon-eup, Gimpo-si, Geonggi-do, 10048, korea
Tel / Fax : Tel No. : +82-31-8048-7232 Fax No. : +82-31-997-0911

1.2 Manufacturer Information

Company Name : AHA INC CO.,LTD
Company Address : 67, Hwanggeum-ro, 109 beon-gil, Yangchon-eup, Gimpo-si, Geonggi-do, 10048, korea
Tel / Fax : Tel No. : +82-31-8048-7232 Fax No. : +82-31-997-0911

- **EUT Type** : Access Control System
- **Model Number** : ASP-2000
- **Derived Models** : ASP-19, AIC-1000, SZ-1082D, SZ-1081D, SW-1081-D, SW-1080-D, SW-1082D, SW-1081D, SV-1082D, SV-1081D, FPS-1000R, CRS-100, ASP-2000, ASP-19F, ASP-19E, ASP-19D
- **Test Voltage** : AC 120 V, 60 Hz
- **FCC Identifier** : 2AXQD-ASP-2000
- **S/N** : Prototype
- **FCC Rule Part(s)** : CFR Title 47 Part 15 Subpart B
- **Test Procedure** : ANSI C63.4-2014
- **Dates of Tests** : September 27, 2020
- **Place of Tests :** : BWS TECH Inc.
EMC Testing Lab (NRRRA Designation Number : KR0017)
23, Gokhyeon-ro 480 Beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17031, Korea
TEL: +82 31 333 5997 FAX: +82 31 333 0017
- **Test Report No.** : BWS-20-EF-0014-R1

2. Description of Test Facility

The measurement for radiated emission test were practiced at the 10 m Semi-Anechoic Chamber of BWS TECH Inc. Measurement for conducted emission test were practiced at the EMC shielded room of BWS TECH Inc. facility located at **23, Gokhyeon-ro 480 Beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17031, Korea.**

The site is constructed in conformance with the requirements of the ANSI C63.4-2014 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10 meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2014 and registered to the Federal Communications Commission.

Accredited by RRA(National Radio Research Agency), Jul 18,2017 (The Designation Number is KR0017).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014) was used in determining radiated and conducted emissions from the Access Control System(Model: ASP-2000) of AHA INC CO.,LTD

3. Measurement Uncertainty

The measurement uncertainties show below were calculated in accordance with the requirements of ANSI C63.4-2014.

All measurement uncertainty vales are shown with a coverage factor of $k = 2$ to indicate a 95 % Level of confidence. The measurement data shown herein meets the CISPR measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Emission (0.15 MHz to 30 MHz)	± 1.92 dB ($k = 2$)
Radiated Emission (30 MHz to 1 GHz)	± 5.32 dB ($k = 2$)
Radiated Emission (1 GHz to 6 GHz)	± 3.96 dB ($k = 2$)

4. Product Information

4.1 Variations covered by this report

4.2 Additional Information Related to Testing

Test results apply only to the particular sample tested and functionality described in this test report. This report may be reproduced in full. Partial reproduction may only be made with the written permission of the BWS TECH Inc.

4.3 Derived Models

ASP-19, AIC-1000, SZ-1082D, SZ-1081D, SW-1081-D, SW-1080-D, SW-1082D, SW-1081D, SV-1082D, SV-1081D, FPS-1000R, CRS-100, ASP-2000, ASP-19F, ASP-19E, ASP-19D

5. Description of Tests

5.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The Frequency range from 150 kHz to 30 MHz was searched.

5.1.1 Conducted Limits [§15.107 (a)_CLASS B]

Frequency of emission (MHz)	Resolution Bandwidth (kHz)	Conducted limit (dBμV)	
		Quasi-Peak	Average
0.15 to 0.5	9	66 to 56*	56 to 46*
0.5 to 5	9	56	46
5 to 30	9	60	50

5.1.2 Conducted Limits [§15.107 (b)_CLASS A]

Frequency of emission (MHz)	Resolution Bandwidth (kHz)	Conducted limit (dBμV)	
		Quasi-Peak	Average
0.15 to 0.5	9	79	66
0.5 to 30	9	73	60

* Decreases with the logarithm of the frequency.

5.2 §15.109 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014

- a. The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi anechoic chamber. The Table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- g. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. (1 GHz to 40 GHz)

5.2.1 Radiated Emission Limits [§15.109 (a)_CLASS B]

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak ($\text{dB}\mu\text{V/m}$)
30 to 88	3	100	40.00
88 to 216	3	150	43.52
216 to 960	3	200	46.02
Above 960	3	500	53.98
Frequency of emission (MHz)	Antenna Distance (m)	Peak ($\text{dB}\mu\text{V/m}$)	Average ($\text{dB}\mu\text{V/m}$)
Above 1000	3	74	54

5.2.2 Radiated Emission Limits [§15.109 (b)_CLASS A]

The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of emission (MHz)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak ($\text{dB}\mu\text{V/m}$)
30 to 88	10	90	39.08
88 to 216	10	150	43.52
216 to 960	10	210	46.44
Above 960	10	300	49.54
Frequency of emission (MHz)	Antenna Distance (m)	Peak ($\text{dB}\mu\text{V/m}$)	Average ($\text{dB}\mu\text{V/m}$)
Above 1000	3	80	60

5.2.3 Frequency Range of Radiated Measurements [§15.33]

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)	Test frequency marking
Below 1.705	30	☐
1.705 to 108	1 000	☐
108 to 500	2 000	☐
500 to 1 000	5 000	☒
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower	☐

6. Test Condition

6.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipment were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

Radiated Emission Test

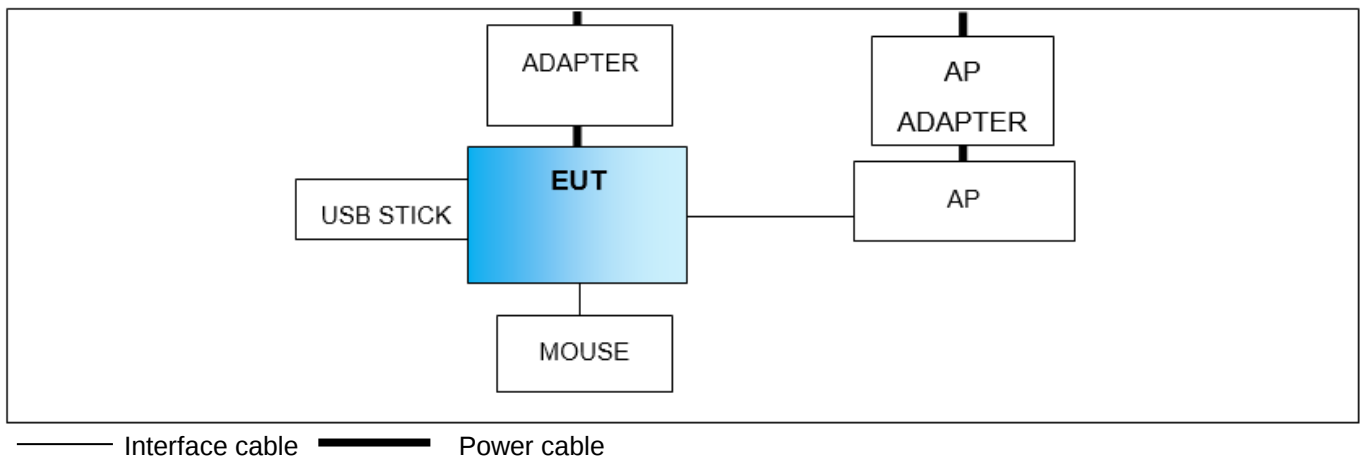
Preliminary radiated emission tests were conducted using the procedure in ANSI C63.4/2014 Clause 8.3.1.1 to determine the worst operating condition. Final radiated emission tests were conducted at 10 m Semi-Anechoic Chamber.

6.2 EUT operation

EUT was tested according to the following operation modes provided by the specifications given by the manufacturer

Operation Modes	The environment(s) in which the equipment is intended to be used.
Normal operating mode	The test was conducted while EUT continuously measured the temperature of the object taken by the camera.

6.3 Test System layout on EUT and peripherals



6.4 System configuration

Description	Model Name	Serial No.	Manufacturer	Remarks
ADAPTER	TEKA060-1203000	N/A	SHENZHEN TEKA TECHNOLOGY CO.,LTD.	Component

6.5 Peripherals / Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

6.5.1 Type of Peripheral Equipment Used

Description	Model Name	Serial No.	Manufacturer	FCC ID
Access Control System	ASP-2000	N/A	AHA INC CO.,LTD	2AXQD-ASP-2000
USB STICK	N/A	N/A	Sandisk	N/A
MOUSE	AA-SM7PCP	CN57B5903634 BDVBJ61L3591	Samsung Eletronics Co.,Ltd.	N/A
AP	IPTIME1004	N/A	EFM Networks	N/A
AP ADAPER	DCF0050905 OK	N/A	Zionnom Electronics	N/A

6.5.2 Type of Cables Used

Device from	I/O Port	Device to	I/O Port	Length(m)	Type of Shield
EUT	DC IN	ADAPTER	DC OUT	1.2	Unshielded
	LAN	AP	LAN	3.0	Unshielded
	USB	MOUSE	USB	1.0	Unshielded
	USB	USB STICK	-	DIRECT	-
Adapter	AC IN	AC Power Source	AC OUT	1.3	Unshielded
AP	DC IN	AP ADAPTER	DC OUT	1.0	Unshielded
AP ADAPTER	AC IN	AC POWER SOURCE	AC OUT	DIRECT	-

7. Test Results

7.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and photos showing the maximum emission of the EUT are reported.

FCC Rule Parts	Measurement Required	Result
15.107 (b)	Conducted Emissions	Passed by – 20.13 dB (Quasi-Peak)
15.109 (b)	Radiated Emissions Below 1 GHz	Passed by – 1.90 dB (Quasi-Peak)
15.109 (b)	Radiated Emissions Above 1 GHz	Passed by – 16.91 dB (Max-Peak)

The data collected shows that the Access Control System (Model: ASP-2000) of AHA INC CO.,LTD complies with technical requirements of the Part 15.107 and 15.109 of the FCC Rules.

7.2 Conducted Emissions

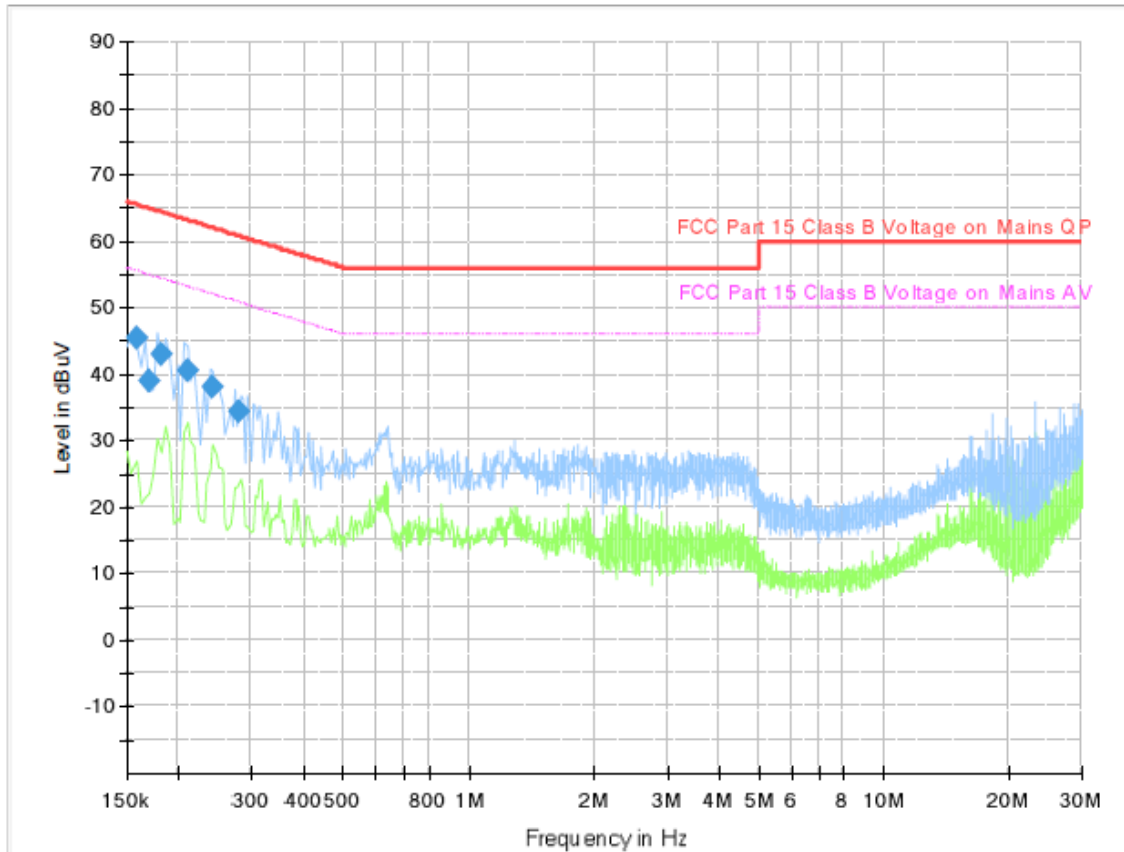
The Test results of conducted emission at mains ports provide the following information:

Rule Part / Standard	: 15.107 (b)
Detector	: Quasi-Peak, CISPR-Average
Bandwidth	: 9 kHz (6 dB)
Operation Mode	: Normal operation mode
Kind of Test Site	: EMI Shielded Room
Temperature	: 22.4 °C
Relative Humidity	: 47.6 %
Atmospheric pressure	: 100.2 kPa
Test Date	: September 27, 2020

※ Calculation Formula:

1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss + Pulse limiter Factor
3. Quasi Peak or CAverage = Receiver Reading + Corr.
4. Margin = Limit – Quasi Peak of CAverage

Conducted Emission Test Data L1

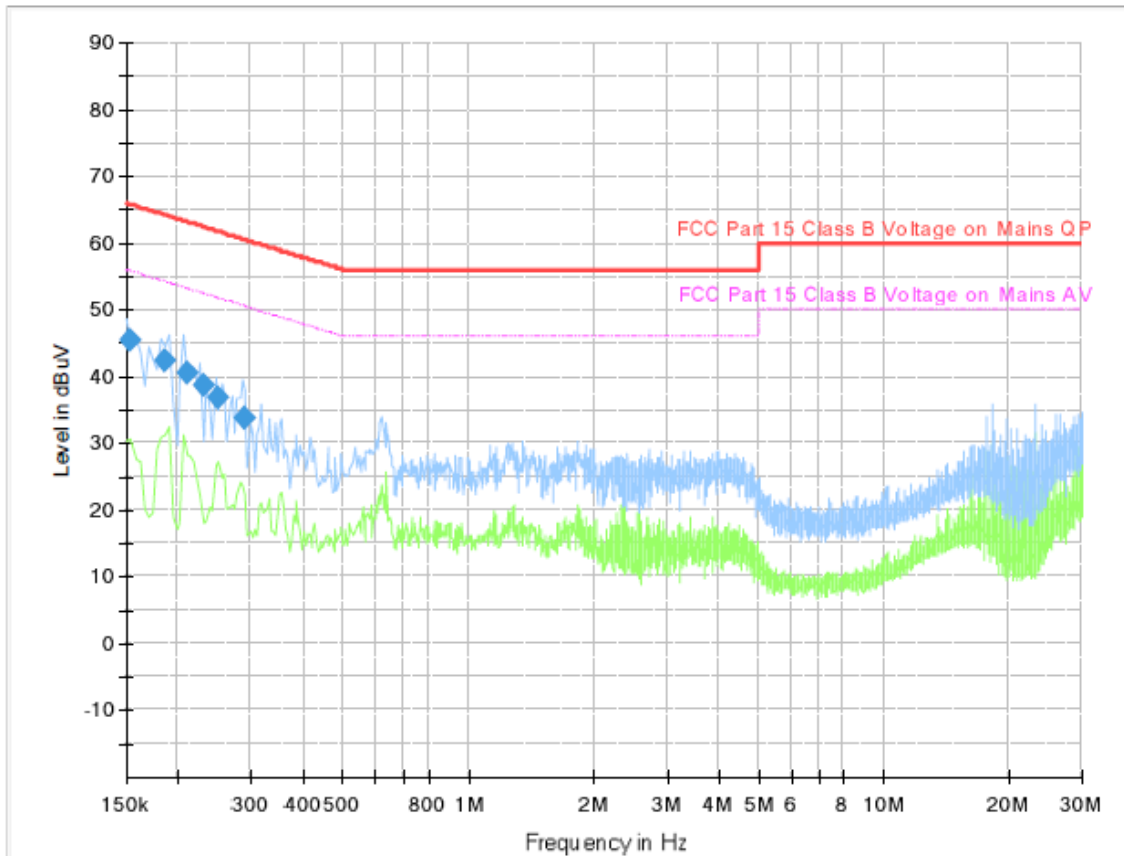


Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.158000	45.44	---	65.57	20.13	3000.0	9.000	L1	GND	7.7
0.170501	38.95	---	64.94	25.98	3000.0	9.000	L1	GND	7.7
0.182500	42.98	---	64.37	21.39	3000.0	9.000	L1	GND	7.7
0.210500	40.65	---	63.19	22.53	3000.0	9.000	L1	GND	7.7
0.241500	38.14	---	62.04	23.91	3000.0	9.000	L1	GND	7.7
0.278501	34.35	---	60.86	26.51	3000.0	9.000	L1	GND	7.7

Conducted Emission Test Data

N



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.154000	45.51	---	65.78	20.27	3000.0	9.000	N	GND	7.7
0.185500	42.40	---	64.24	21.84	3000.0	9.000	N	GND	7.7
0.210500	40.63	---	63.19	22.56	3000.0	9.000	N	GND	7.7
0.229500	38.56	---	62.47	23.91	3000.0	9.000	N	GND	7.7
0.249500	37.00	---	61.77	24.78	3000.0	9.000	N	GND	7.7
0.290500	33.91	---	60.51	26.60	3000.0	9.000	N	GND	7.7

7.3 Radiated Emissions

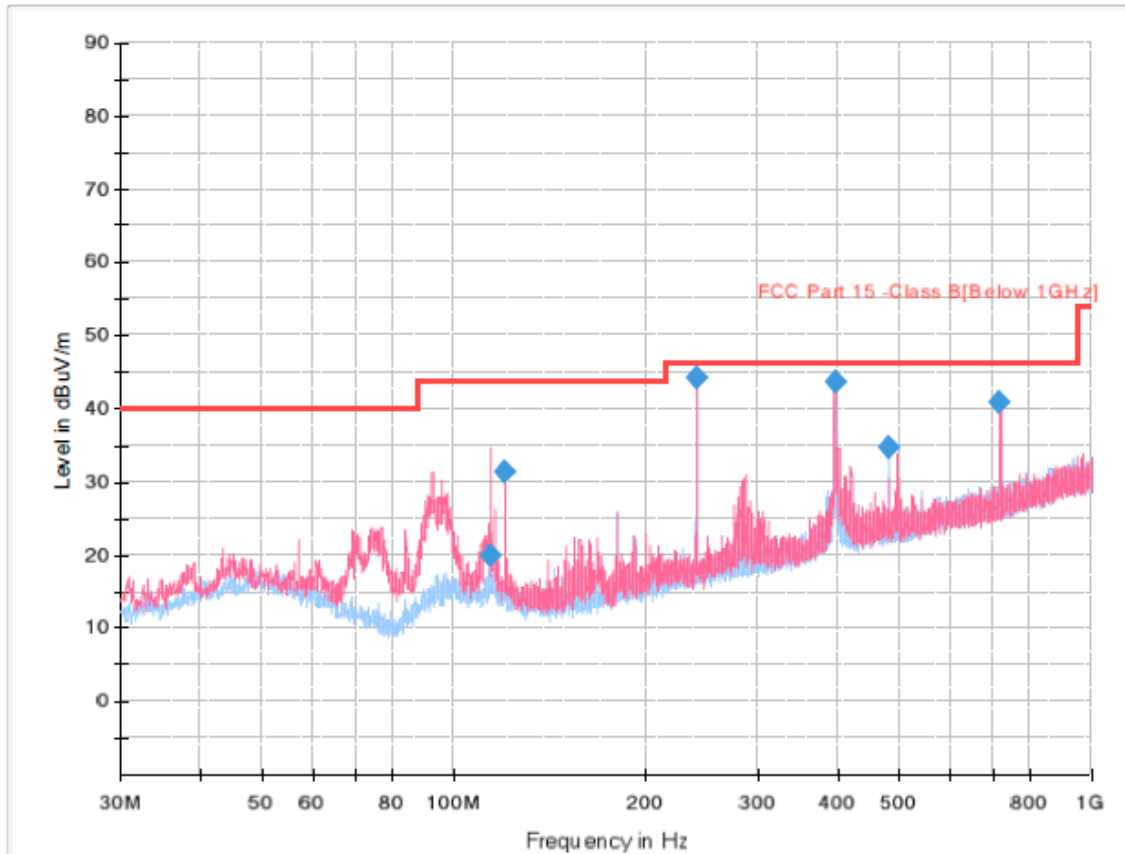
The Test results of radiated emission provide the following information:

Rule Part / Standard	:	15.109 (b)
Detector	:	Quasi-Peak
Bandwidth	:	120 kHz (6 dB)
Operation Mode	:	Normal operation mode
Kind of Test Site	:	10 m chamber
Measurement Distance	:	3 meters
Temperature	:	22.1 °C
Relative Humidity	:	47.2 %
Atmospheric pressure	:	100.2 kPa
Test Date	:	September 27, 2020

✳ Calculation Formula:

1. POL. H: Horizontal, POL. V: Vertical
2. Quasi Peak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit – Quasi Peak

Radiated Emission Test Data Below 1 GHz



Final Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
114.130000	19.93	43.52	23.59	15000.0	120.000	110.0	V	58.0	-20.9
120.008125	31.34	43.52	12.18	15000.0	120.000	125.0	V	288.0	-21.3
239.985000	44.12	46.02	1.90	15000.0	120.000	125.0	H	253.0	-17.8
395.973125	43.63	46.02	2.39	15000.0	120.000	175.0	V	293.0	-13.0
479.999375	34.76	46.02	11.26	15000.0	120.000	175.0	H	150.0	-11.4
719.973750	40.91	46.02	5.11	15000.0	120.000	100.0	V	156.0	-6.2

7.4 Radiated Emissions (Above 1 GHz)

The Test results of radiated emission provide the following information:

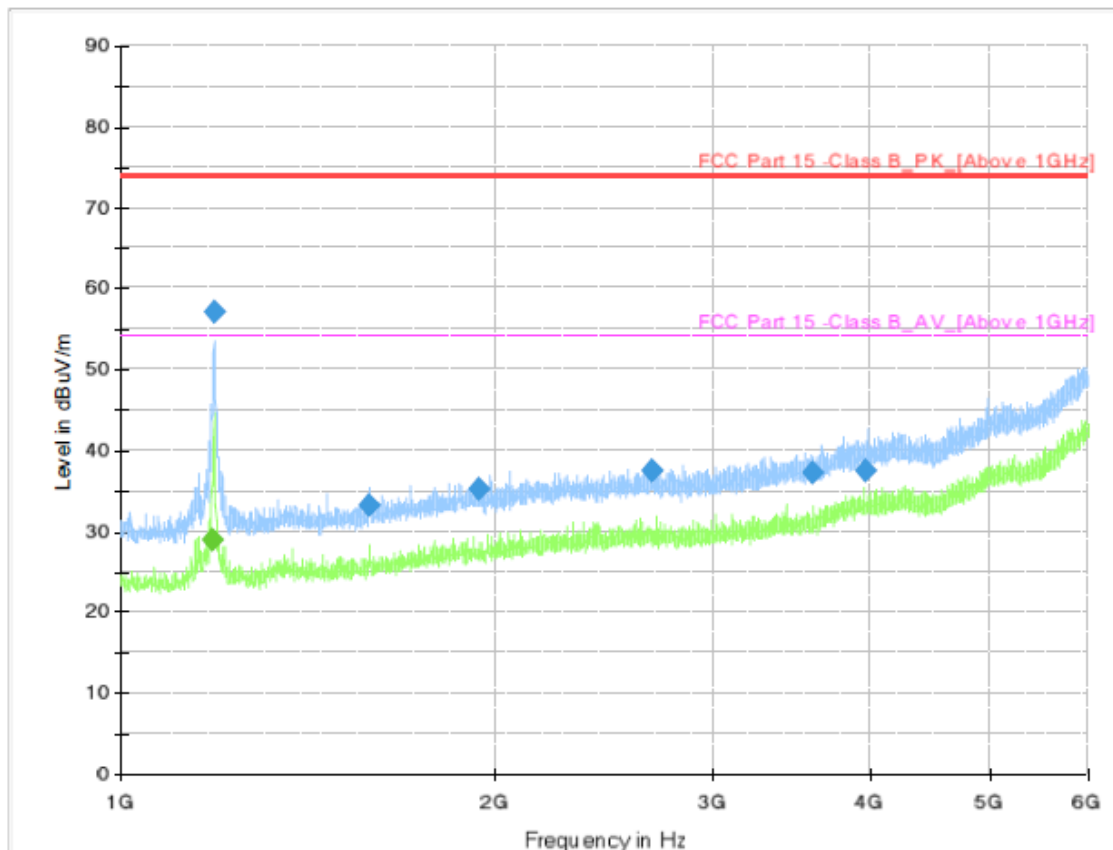
Rule Part / Standard	: 15.109 (b)
Detector	: Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: (RBW: 1 MHz, VBW: 10 MHz)
Highest Operating Frequency	: 950 MHz
Upper Frequency of Measurement Range	: 5 000 MHz
Operation Mode	: Normal operation mode
Kind of Test Site	: 10 m chamber
Measurement Distance	3 meters
Temperature	: 22.1 °C
Relative Humidity	: 47.2 %
Atmospheric pressure	100.2 kPa
Test Date	September 27, 2020

※ Calculation Formula:

1. POL. H: Horizontal, POL. V: Vertical
2. Quasi Peak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss – Amplifier Gain
4. Margin = Limit – Quasi Peak

Radiated Emission Test Data

Above 1 GHz Horizontal

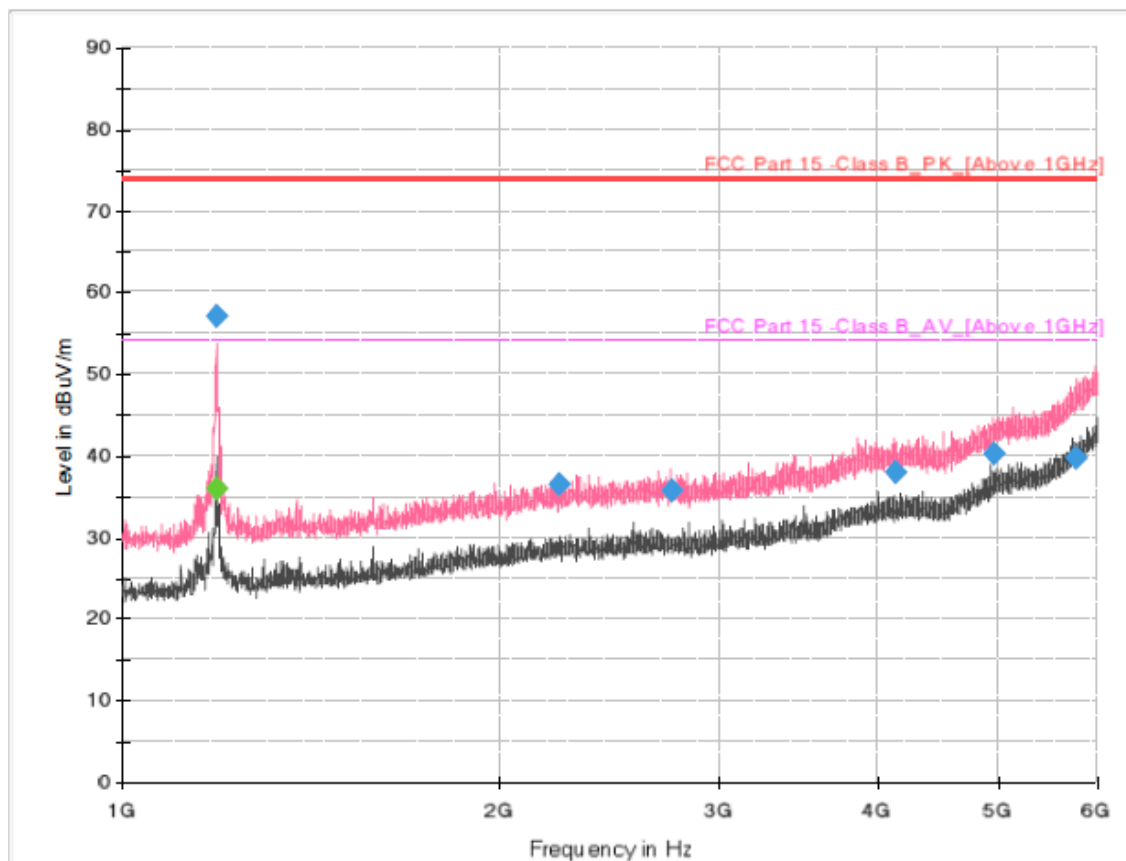


Final Result

Frequency (MHz)	MaxPeak (dBuV/m)	CAverage (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1185.151719	---	28.81	54.00	25.19	1000.0	1000.000	100.0	H	7.0	-11.3
1188.015078	57.03	---	74.00	16.97	1000.0	1000.000	100.0	H	7.0	-11.3
1583.330348	33.28	---	74.00	40.72	1000.0	1000.000	100.0	H	234.0	-9.5
1942.219084	35.10	---	74.00	38.90	1000.0	1000.000	100.0	H	82.0	-7.3
2678.438900	37.40	---	74.00	36.60	1000.0	1000.000	100.0	H	176.0	-5.4
3602.249151	37.13	---	74.00	36.87	1000.0	1000.000	100.0	H	190.0	-3.6
3981.947406	37.38	---	74.00	36.62	1000.0	1000.000	100.0	H	92.0	-1.8

Radiated Emission Test Data

Above 1 GHz Vertical



Final Result

Frequency (MHz)	MaxPeak (dBuV/m)	CAverage (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1187.869609	---	35.96	54.00	18.04	1000.0	1000.000	100.0	V	199.0	-11.3
1187.900781	57.09	---	74.00	16.91	1000.0	1000.000	100.0	V	199.0	-11.3
2236.494301	36.57	---	74.00	37.43	1000.0	1000.000	100.0	V	230.0	-6.2
2749.200415	35.68	---	74.00	38.32	1000.0	1000.000	100.0	V	6.0	-5.4
4142.129579	37.89	---	74.00	36.11	1000.0	1000.000	100.0	V	60.0	-1.6
4967.092742	40.25	---	74.00	33.75	1000.0	1000.000	100.0	V	240.0	2.3
5779.696798	39.62	---	74.00	34.38	1000.0	1000.000	100.0	V	111.0	5.2

8 Test Equipment List

The listing below denotes the test equipment utilized for the test(s).

Equipment Type	Model	Manufacturer	Serial No	Cal Due Date	Use
EMI Test Receiver	ESPI	ROHDE & SCHWARZ	101224	2020-12-12	☒
Impulse-Begrenzer Pulse Limiter	ESH3-Z2	ROHDE & SCHWARZ	100er092	2020-12-12	☒
LISN	LN2-16N	EMCIS	LN16005	2020-12-12	☒
LISN	LN2-16N	EMCIS	LN16004	2020-12-12	☒
EMI Test Receiver	ESR	ROHDE & SCHWARZ	101450	2020-12-12	☒
TRILOG Broadband Antenna	VULB9163	SCHWARZBECK	01063	2021-04-30	☒
RF Amplifier	MPA-10-40	RF Bay, Inc.	21163921	2021-06-04	☒
Antenna Mast (4.0 m)	225	maturio GmbH	17240915	N/A	☒
Maturio control unit	459	maturio GmbH	17240915	N/A	☒
Horn Antenna	AHA-118	COM-POWER CORP.	701064	2021-04-30	☒
Antenna Mast (2.5 m)	226	maturio GmbH	17240915	N/A	☒

END