

FCC TEST REPORT

Reference No. : GPER2105000054EG
Applicant : Apulse Technology Co.,Ltd
Equipment Under Test (EUT) :
Product Name : RFID Smart Reader
Model Name : a611

FCC Authorization Type : Certificate of Conformity
Applied Standards : FCC Part 15 Subpart B,
ANSI C 63.4:2014

FCC ID : 2AWMDA611

Date of Receipt : 2021-04-28
Date of Test : 2021-06-01 ~ 2021-06-02
Date of Issue : 2021-06-17
Test Results : Complied

Tested by :



Jaehyeok Lee

Reviewed by :



Paul Kang

This test report does not assure KOLAS accreditation.

- 1) The results of this test report are effective only to the items tested.
- 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.

Remarks :

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Revision History

Revision	Report Number	Description
0	F690501-RF-EMG000599	Initial
1		
2		



1. General Information

1.1 Client Information

Applicant : Apulse Technology Co.,Ltd
- Address of Applicant : A-1403, 60, Haan-ro, Gwangmyeong-si, Gyeonggi-do, Republic of Korea.

Manufacturer : Apulse Technology Co.,Ltd
- Address of Manufacturer : A-1403, 60, Haan-ro, Gwangmyeong-si, Gyeonggi-do, Republic of Korea.

1.2 Test Laboratory

Name and Address : SGS Korea Co., Ltd.
- Giheung 1 Laboratory : 35, Giheungdanji-ro 121beon-gil, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea
- Giheung 2 Laboratory : 23, Giheungdanji-ro 24beon-gil, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea
- Gunpo Laboratory : 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, 15807, Republic of Korea.

FCC Registration No. : KR0150

Phone : + 82 31 428 5719
Fax : + 82 31 427 2370
e-mail : paul.kang@sgs.com

1.3 General Information of E.U.T.

Classification	Description
Product Name	RFID Smart Reader
Model Name	a611
Serial No.	-
EMI Classification	Class A
Internal Clock Frequency	2 402 ~ 2 480 MHz
Test Voltage	120 V~, 60 Hz
Rated Voltage	5 Vd.c., 2 A(For Adaptor), 5 Vd.c.(For Cradle), 3.7 Vd.c., 3 400 mA(For Battery)
H/W Version	V1.0
S/W Version	V095
Function	It is a RF communication device

1.4 Operating Modes and Conditions

Operating Mode	Operating Condition
1) Charge + TA	State of charging EUT with Travel Adapter.
2) Charge + Cradle	State of charging EUT with Cradle.

1.5 Auxiliary Equipments

Description	Model	Serial No.	Manufacturer	FCC ID
Travel Adapter	EP-TA12KWK	-	SAMSUNG	-
Cradle	-	-	-	-
Battery	-	-	-	-

1.6 Cable List

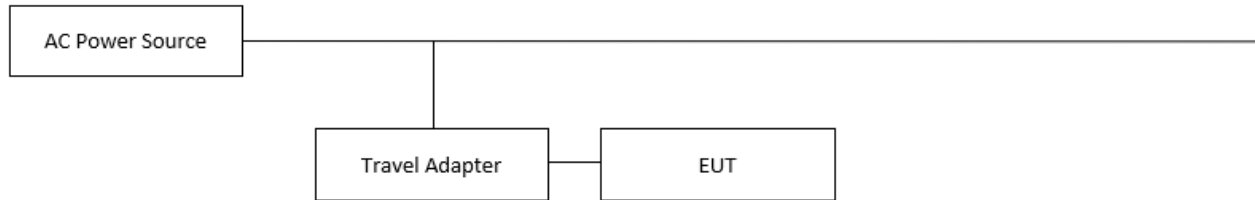
Start		END		Cable Spec.		Used core
Name	I/O Port	Name	I/O Port	Length	Shield	
< Charge + TA Mode >						
AC Power Source	AC OUT	Travel Adapter	AC IN	-	-	-
Travel Adapter	USB Cable	EUT	USB Cable	0.8	Unshield	-
< Charge + Cradle Mode >						
AC Power Source	AC OUT	Travel Adapter	AC IN	-	Unshield	-
Travel Adapter	USB Cable	Cradle	USB Cable	0.8	Unshield	-
Cradle	-	EUT	-	-	-	-

1.7 System Configurations

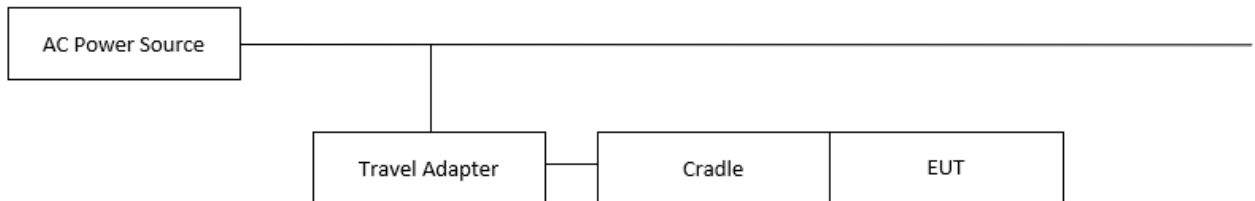
Description	Model	Serial No.	Manufacturer	Note.
Main Board	a611_MAIN_Rev1.0	-	Apulse Technology Co., Ltd.	-
Gun Main Board	a611_GUN_MAIN_Rev0.1	-	Apulse Technology Co., Ltd.	-
Sub Board	-	-	Apulse Technology Co., Ltd.	-
Scan Board	-	-	Apulse Technology Co., Ltd.	-

1.8 Test System Layout

- Test Mode : Charge + TA



- Test Mode : Charge + Cradle



1.9 Modifications

There was no modified item during the test.

1.10 Applicable Standards for Testing

Standards	Status	Deviation
FCC Part 15 Subpart B	Applicable	No Deviation

1.11 Summary of Test Results

Test Item	Standards	Results
Conducted Emission	FCC Part 15 Subpart B Section 15.109, ANSI C 63.4:2014	Complied
Radiated Emission	FCC Part 15 Subpart B Section 15.109, ANSI C 63.4:2014	Complied

Note : Test methods of all test items are performed according to the basic standards in this table.

EMISSION

2.1 Test Results

Test Items	Basic Standards	Test Results
Conducted Emission	FCC Part 15 Subpart B Section 15.109, ANSI C 63.4:2014	Complied
Radiated Emission	FCC Part 15 Subpart B Section 15.109, ANSI C 63.4:2014	Complied

2.2 Test Method and Limits

2.2.1 Test Method

Test Items	Measuring Frequency Range	RBW	Measuring Distance
Conducted Emission	0.15 MHz ~ 30 MHz	9 kHz	-
Radiated Emission	30 MHz ~ 1 GHz	120 kHz	10 m & 3 m
	Above 1 GHz	1 MHz	3 m

Note : 10 m method of radiated emission measurement is only applied to Class A equipment over the frequency range of 30 MHz ~ 1 GHz. Except this, 3 m method is applied to Class B equipment over the frequency range of 30 MHz ~ 1 GHz and Class A and Class B equipment above 1 GHz.

2.2.2 Test Limits

-Conducted Emission Limits at Mains Port

Frequency Range	Limits(dB(μ V))		Class
	Quasi-peak	Average	
0.15 MHz ~ 0.5 MHz	79	66	Class A
0.5 MHz ~ 30 MHz	73	60	
0.15 MHz ~ 0.5 MHz	66 to 56	56 to 46	Class B
0.5 MHz ~ 5 MHz	56	46	
5 MHz ~ 30 MHz	60	50	

Note : The lower limit shall apply at the transition frequencies. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

-Radiated Emission Limits below 1 GHz

Frequency Range	Limits(dB(μ V/m))	Class
	Quasi-peak	
30 MHz ~ 88 MHz	39.1	Class A (10m method)
88 MHz ~ 216 MHz	43.5	
216 MHz ~ 960 MHz	46.4	
960 MHz ~ 1 GHz	49.5	
30 MHz ~ 88 MHz	40.0	Class B (3m method)
88 MHz ~ 216 MHz	43.5	
216 MHz ~ 960 MHz	46.0	
960 MHz ~ 1 GHz	54.0	

-Radiated Emission Limits above 1 GHz (3m method)

Frequency Range	Limits(dB(μ V/m))		Class
	Average	Peak	
Above 1 GHz	59.5	79.5	Class A
Above 1 GHz	54.0	74.0	Class B

Note : The limits of class A equipment is extrapolated using an extrapolation factor of 20 dB/decade because it was measured at 3 m distance not 10 m distance.

2.3 Conducted Emission

The initial preliminary exploratory scans were performed over the measuring frequency range(0.15 MHz to 30 MHz) using a max hold mode incorporating a Peak detector and C-Average detector and using the software of EMC32(Version V8.52.0 from R&S). The final test data was measured using a Quasi-Peak detector and C-Average detector.

2.3.1 Test Equipments

Description	Model No.	Manufacturer	S/N	Cal Due. Date
Two-Line V-Network	ENV216	R & S	100190	2022-05-04
Test Receiver	ESCI 7	R & S	100911	2022-02-19
Shield Room	-	SY CORPORATION	-	-

Note : The calibration period of every equipment is 1 year.

2.3.2 Test Site

Shield Room in Gunpo Laboratory

2.3.3 Environment Conditions and data

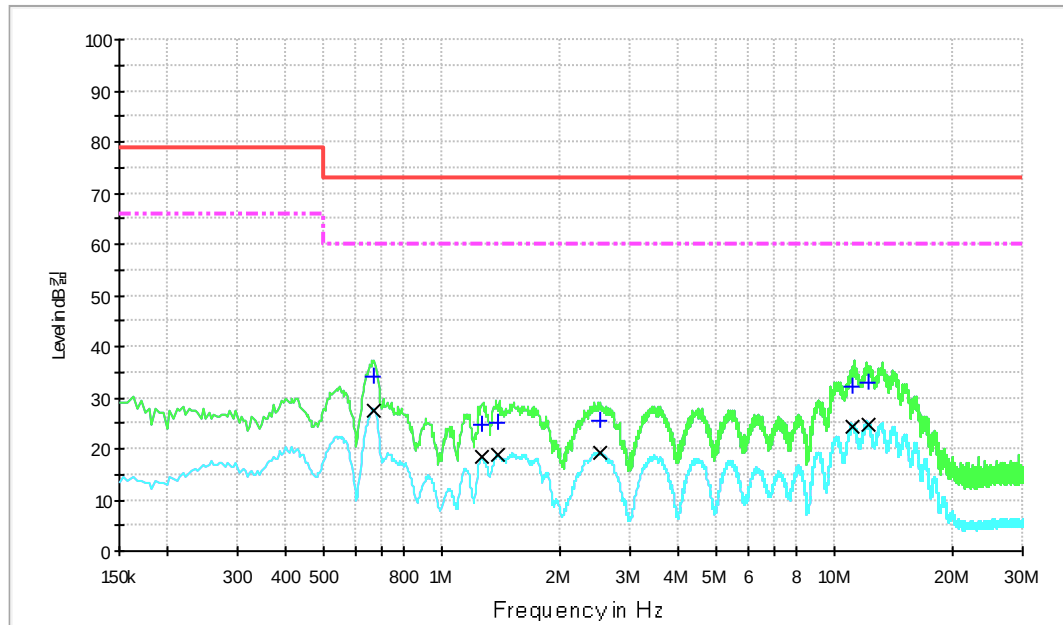
- Conducted Emission at AC Mains Port

Temperature (Minimum 23.0, Maximum 23.6) °C,
Humidity (Minimum 41.0, Maximum 43.0) % R.H.,
Atmospheric Pressure (Minimum 100.5, Maximum 100.5) kPa

Test Date : 2021-06-02

- Test Mode : Charge + TA

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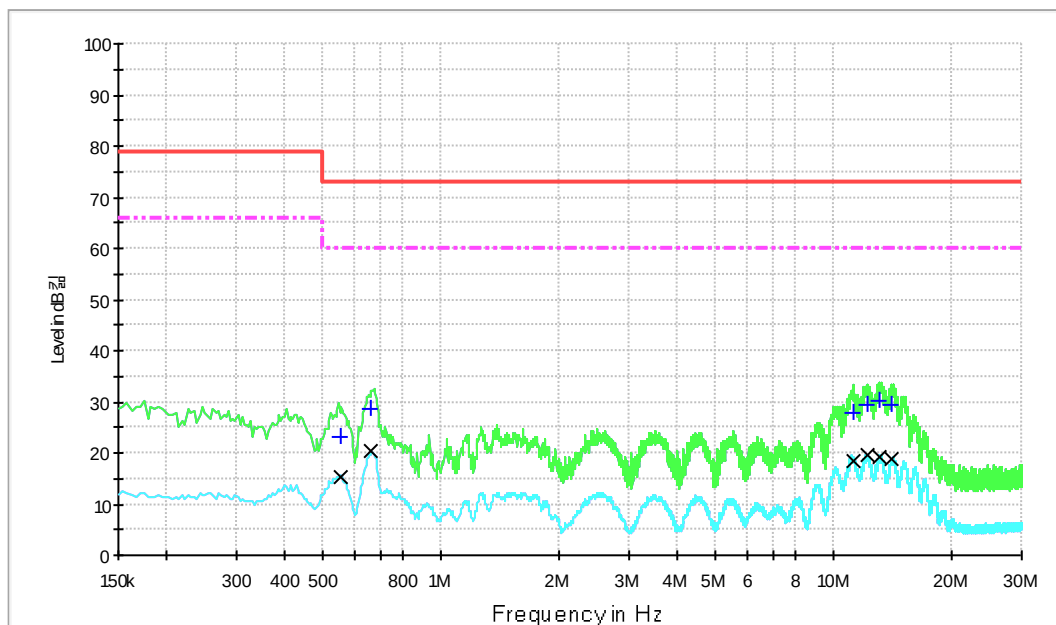
Limit and Margin-QP

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)
0.670 000	34.1	9.000	Off	L1	9.8	38.9	73.0
1.254 000	24.6	9.000	Off	L1	9.7	48.4	73.0
1.374 000	24.9	9.000	Off	L1	9.8	48.1	73.0
2.526 000	25.5	9.000	Off	L1	9.9	47.5	73.0
11.066 000	32.3	9.000	Off	L1	10.3	40.7	73.0
12.154 000	32.9	9.000	Off	L1	10.3	40.1	73.0

Limit and Margin-CAV

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.670 000	27.6	9.000	Off	L1	9.8	32.4	60.0
1.254 000	18.3	9.000	Off	L1	9.7	41.7	60.0
1.374 000	18.7	9.000	Off	L1	9.8	41.3	60.0
2.526 000	19.0	9.000	Off	L1	9.9	41.0	60.0
11.066 000	24.5	9.000	Off	L1	10.3	35.5	60.0
12.154 000	24.7	9.000	Off	L1	10.3	35.3	60.0

<N>



Limit and Margin-QP

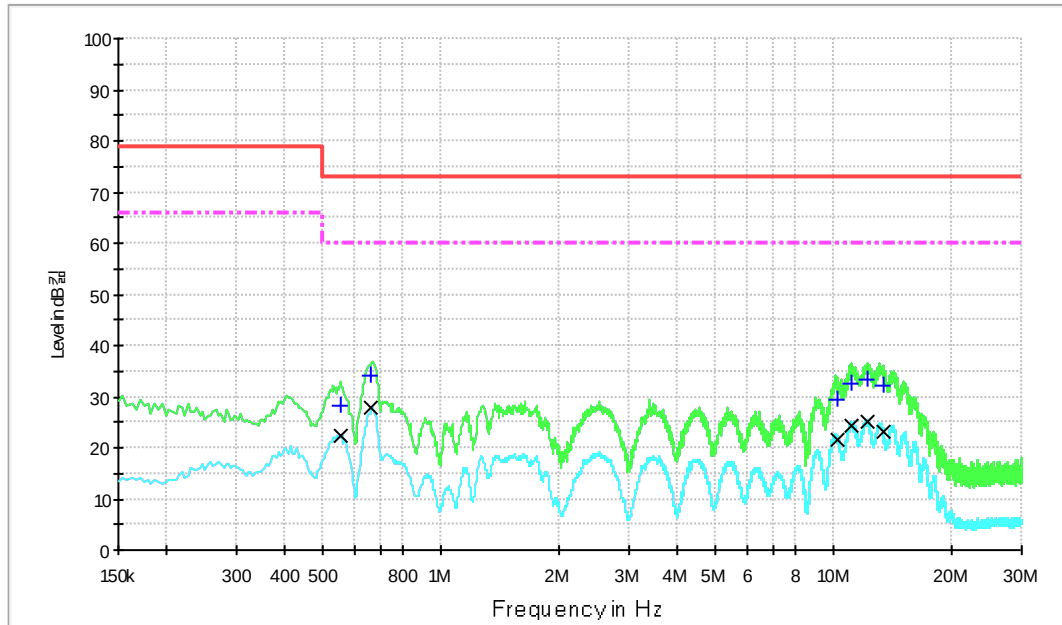
Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)
0.550 000	23.3	9.000	Off	N	9.8	49.7	73.0
0.662 000	28.6	9.000	Off	N	9.9	44.4	73.0
11.234 000	27.8	9.000	Off	N	10.4	45.2	73.0
12.082 000	29.3	9.000	Off	N	10.5	43.7	73.0
13.098 000	30.0	9.000	Off	N	10.5	43.0	73.0
14.022 000	29.4	9.000	Off	N	10.6	43.6	73.0

Limit and Margin-CAV

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.550 000	15.1	9.000	Off	N	9.8	44.9	60.0
0.662 000	20.3	9.000	Off	N	9.9	39.7	60.0
11.234 000	18.3	9.000	Off	N	10.4	41.7	60.0
12.082 000	19.5	9.000	Off	N	10.5	40.5	60.0
13.098 000	19.3	9.000	Off	N	10.5	40.7	60.0
14.022 000	18.8	9.000	Off	N	10.6	41.2	60.0

- Test Mode : Charge + Cradle

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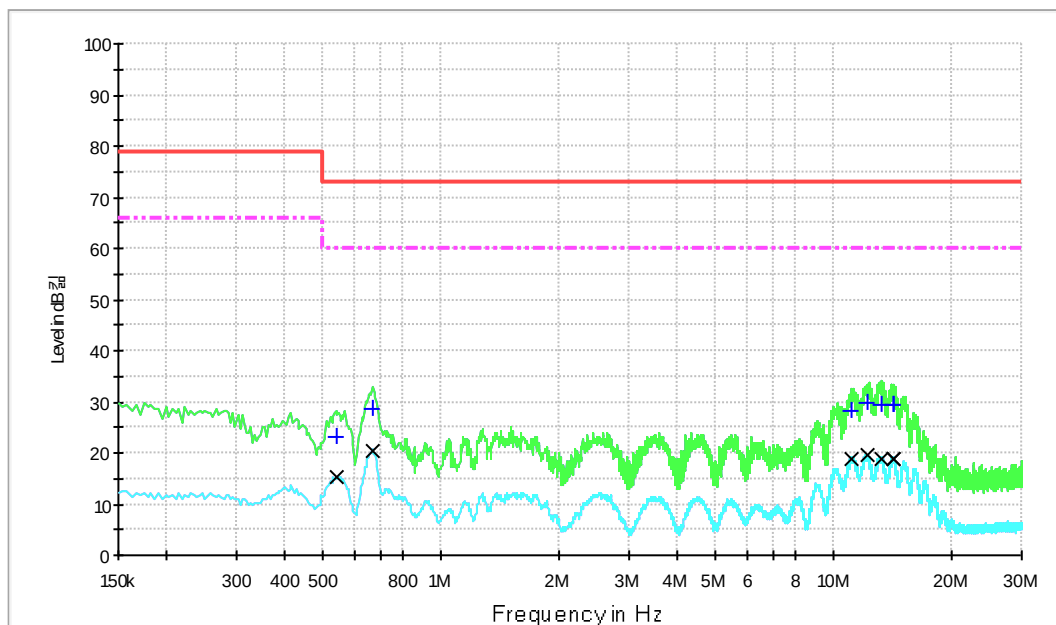
Limit and Margin-QP

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)
0.554 000	28.4	9.000	Off	L1	9.7	44.6	73.0
0.662 000	34.2	9.000	Off	L1	9.8	38.8	73.0
10.214 000	29.5	9.000	Off	L1	10.2	43.5	73.0
11.086 000	32.4	9.000	Off	L1	10.3	40.6	73.0
12.138 000	33.2	9.000	Off	L1	10.3	39.8	73.0
13.302 000	32.1	9.000	Off	L1	10.4	40.9	73.0

Limit and Margin-CAV

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.554 000	22.2	9.000	Off	L1	9.7	37.8	60.0
0.662 000	27.7	9.000	Off	L1	9.8	32.3	60.0
10.214 000	21.4	9.000	Off	L1	10.2	38.6	60.0
11.086 000	24.4	9.000	Off	L1	10.3	35.6	60.0
12.138 000	25.0	9.000	Off	L1	10.3	35.0	60.0
13.302 000	23.1	9.000	Off	L1	10.4	36.9	60.0

<N>



Limit and Margin-QP

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)
0.542 000	23.2	9.000	Off	N	9.8	49.8	73.0
0.666 000	28.5	9.000	Off	N	9.9	44.5	73.0
11.110 000	28.1	9.000	Off	N	10.4	44.9	73.0
12.126 000	29.7	9.000	Off	N	10.5	43.3	73.0
13.222 000	29.4	9.000	Off	N	10.5	43.6	73.0
14.090 000	29.3	9.000	Off	N	10.6	43.7	73.0

Limit and Margin-CAV

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.542 000	15.2	9.000	Off	N	9.8	44.8	60.0
0.666 000	20.5	9.000	Off	N	9.9	39.5	60.0
11.110 000	18.9	9.000	Off	N	10.4	41.1	60.0
12.126 000	19.5	9.000	Off	N	10.5	40.5	60.0
13.222 000	18.7	9.000	Off	N	10.5	41.3	60.0
14.090 000	18.8	9.000	Off	N	10.6	41.2	60.0

Measurement Uncertainty : 3.45 dB (The confidential level is about 95%, $k=2$)

Note : • Corr.: Cable Loss + LISN Factor • Result = Level + Corr. • Margin = Limit – Result

2.4 Radiated Emission

The initial preliminary exploratory scans were performed at 3 m distance over the measuring frequency range(30 MHz to 18 GHz) using a max hold mode incorporating a Peak detector and using the software of EP5RE(Version Ver5.3.70 from TOYO). The final test data was measured using a Quasi-Peak detector below 1 GHz at 3 m distance and a Peak and C-Average detector above 1 GHz at 3 m distance. Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency.

2.4.1 Test Equipments

Description	Model No.	Manufacturer	S/N	Cal Due. Date
Horn Antenna	HF906	R & S	100326	2022-02-04
Signal Conditioning Unit	SCU 18	R & S	10117	2021-06-10
Test Receiver	ESU26	R & S	100109	2022-02-19
Hybrid Antenna	VULB9163	SCHWARZBECK	01126	2021-12-22
Amplifier	8447F	HP	2944A03909	2021-08-06
3m SEMI-ANECHOIC CHAMBER	-	SY CORPORATION	-	-

Note : The Hybrid Antenna calibration period is 2 years, but the other equipment calibration period are 1 year.

2.4.2 Test Site

3m SEMI-ANECHOIC CHAMBER Gunpo Laboratory (Below 1 GHz, Above 1 GHz)

2.4.3 Environment Conditions and data

Radiated Emission Test

- Below 1 GHz (3 m method)

Temperature (Minimum 23.4, Maximum 24.1) °C,
Humidity (Minimum 38.0, Maximum 40.0) % R.H.,
Atmospheric Pressure (Minimum 100.8, Maximum 100.8) kPa

Test Date : 2021-06-01

- Above 1 GHz (3 m method)

Temperature (Minimum 23.4, Maximum 24.1) °C,
Humidity (Minimum 38.0, Maximum 40.0) % R.H.,
Atmospheric Pressure (Minimum 100.8, Maximum 100.8) kPa

Test Date : 2021-06-01

Radiated Emission Test Data

-Below 1 GHz (3 m method)

- Test Mode : Charge + TA

Freq. (MHz)	Reading (dB μ V)	Pol. (H/V)	A (°)	H (cm)	AF (dB/m)	CL (dB)	Amp. (dB)	F/S (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
55.75	34.70	V	352	101	19.08	0.91	28.09	26.60	49.10	22.50
56.07	34.30	H	353	138	19.04	0.91	28.09	26.16	49.10	22.94
60.76	32.00	H	89	293	18.31	0.95	28.08	23.18	49.10	25.92
128.98	36.20	V	334	228	14.58	1.47	27.88	24.37	53.50	29.13
160.26	37.10	V	334	173	14.22	1.68	27.74	25.26	53.50	28.24
197.49	35.50	H	94	269	16.91	1.79	27.52	26.68	53.50	26.82

- Test Mode : Charge + Cradle

Freq. (MHz)	Reading (dB μ V)	Pol. (H/V)	A (°)	H (cm)	AF (dB/m)	CL (dB)	Amp. (dB)	F/S (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
42.00	32.10	V	167	101	19.24	0.81	28.10	24.05	49.10	25.05
47.54	30.40	H	186	200	19.82	0.85	28.10	22.97	49.10	26.13
48.79	30.50	H	128	146	19.79	0.86	28.10	23.05	49.10	26.05
56.19	32.00	V	6	186	19.02	0.91	28.09	23.84	49.10	25.26
62.66	32.00	V	352	313	17.66	0.97	28.07	22.56	49.10	26.54
126.84	35.20	V	352	273	14.74	1.46	27.89	23.51	53.50	29.99

Measurement Uncertainty (Horizontal) : 4.90 dB (The confidential level is about 95%, $k=2$)

Measurement Uncertainty (Vertical) : 4.82 dB (The confidential level is about 95%, $k=2$)

Note: • AF = Antenna Factor

• Pol.(H) = Horizontal

• Margin = Limit – F/S

• A : Angle

• CL = Cable Loss

• Pol.(V) = Vertical

• F/S = Level + AF + CL – Amp.

• H : Height

• F/S = Field Strength

• Amp. = Amplifier Gain

- Above 1 GHz (3 m method)

- Test Mode : Charge + TA

Freq. (MHz)	Level (dBμV)		Pol. (H/V)	A (°)	H (cm)	AF (dB)	CL (dB)	Amp. (dB)	CF (dB)	F/S (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Peak	C-AV										
1 303.17	45.80	-	H	214	101	24.98	4.74	45.45	0.00	30.07	79.50	49.43
1 303.17	-	30.10	H	214	101	24.98	4.74	45.45	0.00	14.37	59.50	45.13
2 005.83	45.70	-	H	84	164	27.67	5.95	45.50	0.00	33.82	79.50	45.68
2 005.83	-	33.80	H	84	164	27.67	5.95	45.50	0.00	21.92	59.50	37.58
11 014.42	39.50	-	H	72	199	38.20	15.13	45.69	0.00	47.14	79.50	32.36
11 014.42	-	32.10	H	72	199	38.20	15.13	45.69	0.00	39.74	59.50	19.76
11 212.75	38.60	-	V	3	144	38.20	15.43	45.55	0.00	46.68	79.50	32.82
11 212.75	-	33.60	V	3	144	38.20	15.43	45.55	0.00	41.68	59.50	17.82
11 320.42	38.00	-	H	238	178	38.34	15.28	45.48	0.00	46.14	79.50	33.36
11 320.42	-	33.00	H	238	178	38.34	15.28	45.48	0.00	41.14	59.50	18.36
11 524.42	38.30	-	V	5	132	38.65	15.85	45.33	0.00	47.47	79.50	32.03
11 524.42	-	34.40	V	5	132	38.65	15.85	45.33	0.00	43.57	59.50	15.93

- Test Mode : Charge + Cradle

Freq. (MHz)	Level (dBμV)		Pol. (H/V)	A (°)	H (cm)	AF (dB)	CL (dB)	Amp. (dB)	CF (dB)	F/S (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Peak	C-AV										
1 763.58	45.50	-	V	326	101	26.90	5.54	45.38	0.00	32.56	79.50	46.94
1 763.58	-	32.70	V	326	101	26.90	5.54	45.38	0.00	19.76	59.50	39.74
2 389.04	45.00	-	H	205	168	28.39	6.58	45.31	0.00	34.66	79.50	44.84
2 389.04	-	34.40	H	205	168	28.39	6.58	45.31	0.00	24.06	59.50	35.44
2 432.25	44.90	-	V	97	129	28.33	6.59	45.28	0.00	34.54	79.50	44.96
2 432.25	-	34.60	V	97	129	28.33	6.59	45.28	0.00	24.24	59.50	35.26
11 565.50	38.10	-	H	294	138	38.70	16.02	45.30	0.00	47.52	79.50	31.98
11 565.50	-	32.50	H	294	138	38.70	16.02	45.30	0.00	41.92	59.50	17.58
12 073.37	38.90	-	H	32	196	38.50	15.82	44.95	0.00	48.27	79.50	31.23
12 073.37	-	35.30	H	32	196	38.50	15.82	44.95	0.00	44.67	59.50	14.83
12 133.58	39.00	-	V	259	198	38.50	15.93	44.91	0.00	48.52	79.50	30.98
12 133.58	-	35.40	V	259	198	38.50	15.93	44.91	0.00	44.92	59.50	14.58

Measurement Uncertainty (Horizontal) : 3.62 dB (The confidential level is about 95%, k=2)

Measurement Uncertainty (Vertical) : 3.64 dB (The confidential level is about 95%, k=2)

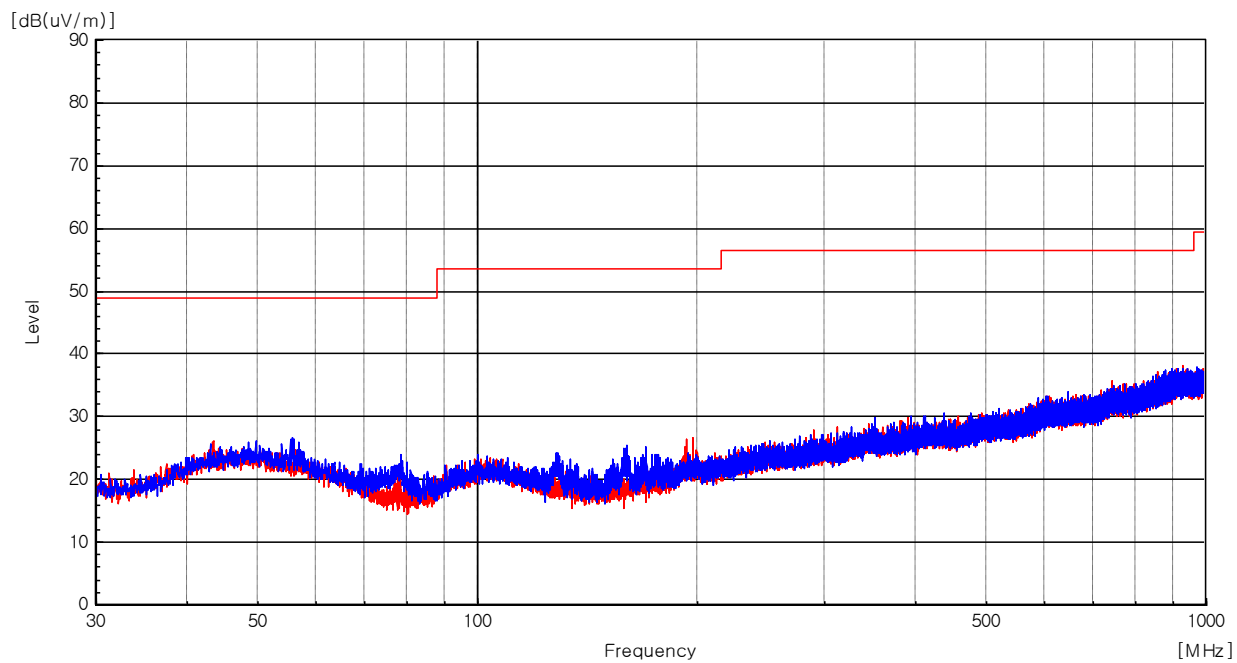
Note: • AF = Antenna Factor
• Pol.(H) = Horizontal
• Margin = Limit – F/S
• A : Angle
• CL = Cable Loss
• Pol.(V) = Vertical
• F/S = Level + AF + CL – Amp.
• H : Height
• F/S = Field Strength
• Amp. = Amplifier Gain

See Appendix A (Radiated Emission)

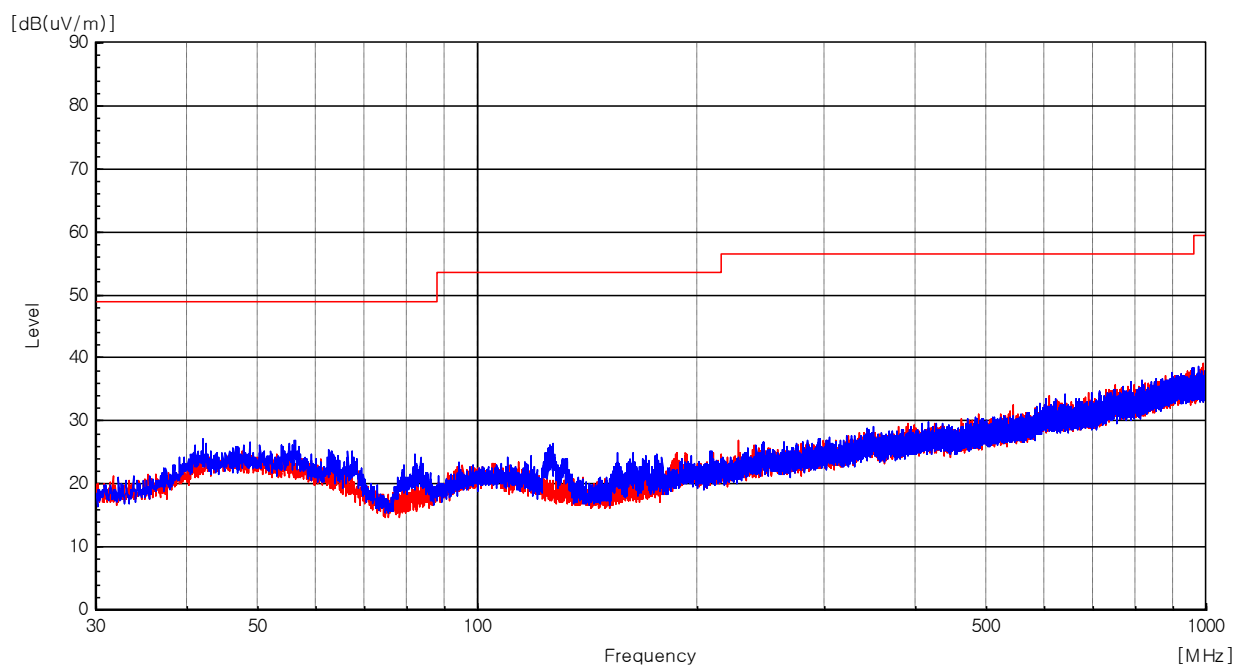
Appendix A : Radiated Emission

Below 1 GHz

- Test Mode : Charge + TA

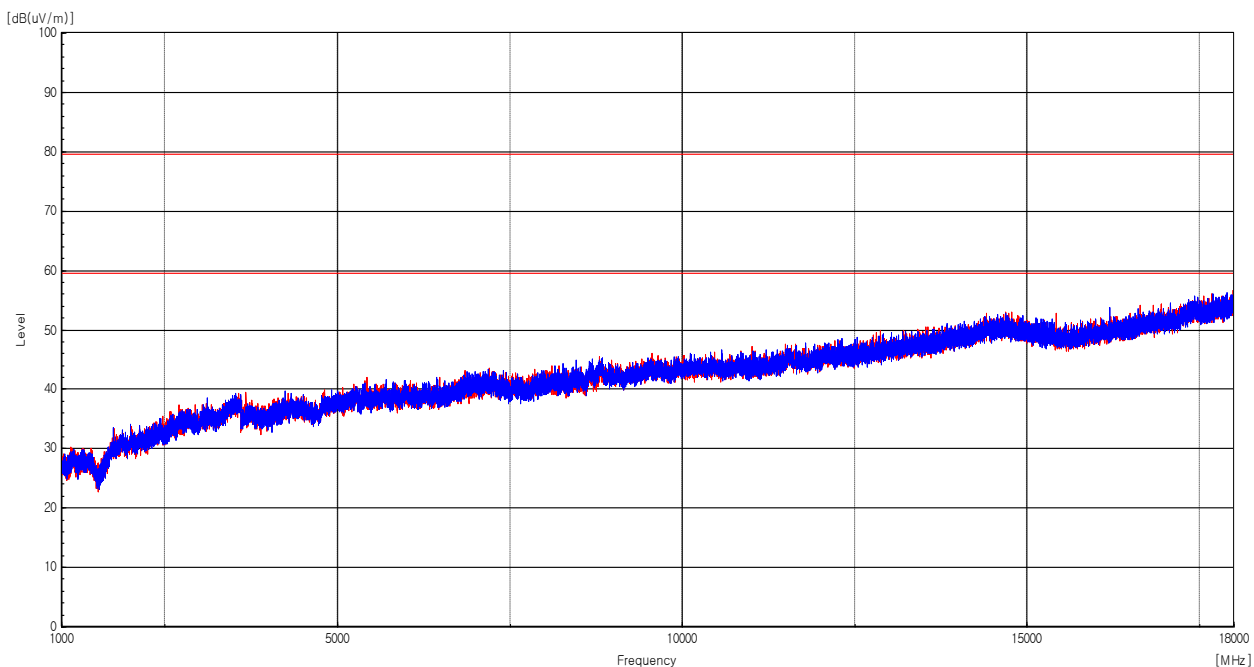


- Test Mode : Charge + Cradle

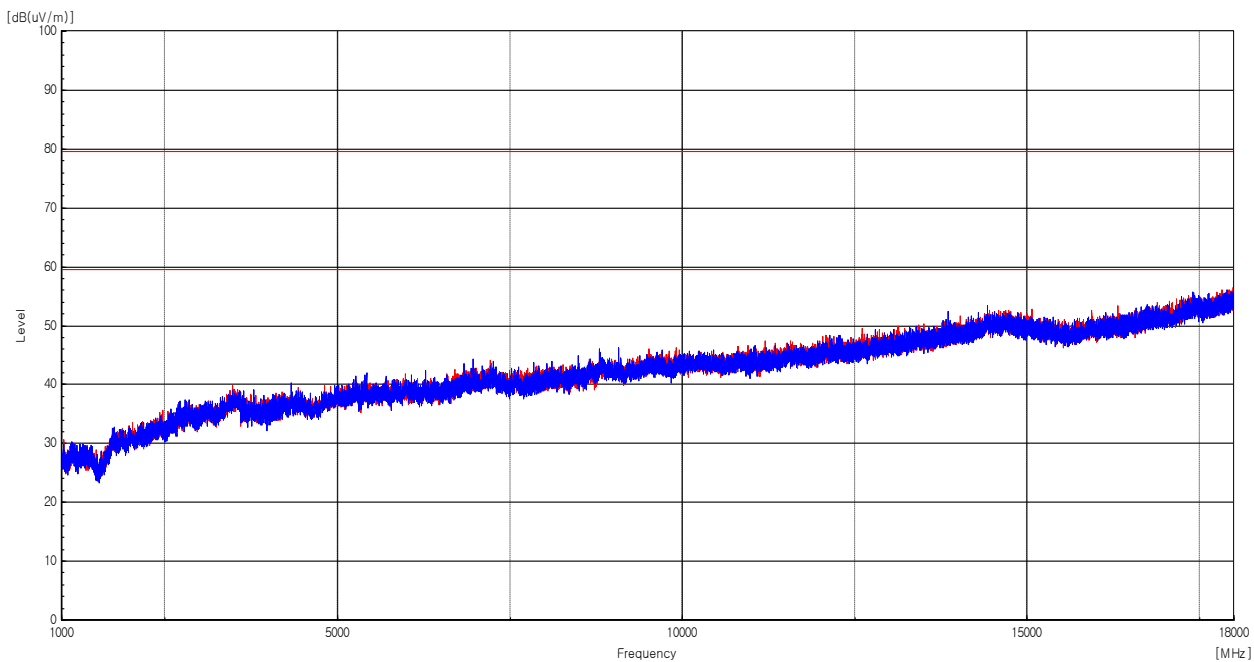


Above 1 GHz

- Test Mode : Charge + TA



- Test Mode : Charge + Cradle



- End of the Report -