

FCC TEST REPORT

Job No. : GPEM2106000317EH

Applicant Name : i3system, Inc.

Equipment Under Test (EUT) :

Product Name : Portable Infrared Camera

Model Name : TE-SQ1

FCC Authorization Type : Certification

Applied Standards : FCC Part 15 Subpart B, Class A
ANSI C63.4a:2017

Date of Receipt : May 17, 2021

Date of Test : September 7, 2021 ~ September 9, 2021

Date of Issue : September 28, 2021

Test Results : Complied

Tested by

:



Inso Yoon

Reviewed by

:



Julia Choi

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.

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Revision History

Revision	Report number	Description
0	F690501-RF-EMH001478	Initial

1. General Information

1.1 Client Information

Applicant	i3system, Inc.
Applicant Address	69, Techno 5-ro Yuseong-gu, Daejeon, Republic of Korea
Manufacturer	i3system, Inc.
Manufacturer Address	69, Techno 5-ro Yuseong-gu, Daejeon, 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
FCC Registration No.	KR0150
IC Registration No.	7837B
Phone	+ 82 31 548 0710
Fax	+ 82 31 548 0719
e-mail	julia.choi@sgs.com

1.3 General Information of E.U.T.

Classification	Specification
Product Name	Portable Infrared Camera
Model Name	TE-SQ1
Serial No.	None
Device Class	Class A
Test Power	AC 120 V, 60 Hz
Rated Power	DC 5 V
Internal Clock Frequency	2.4 GHz
Dimension	(34 x 38 x 24.5) mm
Operating Time	3 Hours
Port	MicroSD, DC IN, Mini HDMI(Not for user)
Function	Thermal Imaging camera
FCC ID	2A28DQVGA12-TE-SQ1

1.4 Operating Modes and Conditions

Operating mode	Operating Condition
1) Camera	A state that the EUT was being charged through the AC/DC adapter and the EUT was recording video and saving the video on SD card

1.5 Peripheral Equipments

Description	Model	Serial No.	Manufacturer
Micro SD card	MB-MC64G	KNGDD2QAH923	SAMSUNG

1.6 Cable List

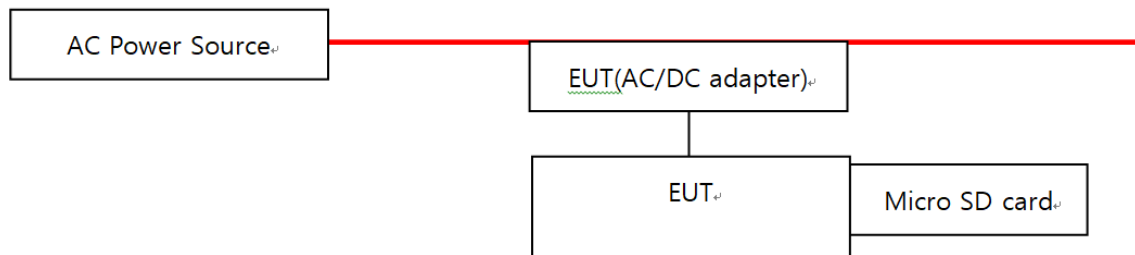
Start		END		Cable Spec.		Used core
Name	I/O Port	Name	I/O Port	Length(m)	Shield	
EUT	MicroSD	Micro SD card	MicroSD	-	-	-
	DC IN	EUT (AC/DC adapter)	USB(A-type)	1.0	Unshield	1ea
AC Power Source	-		AC IN	-	-	-

1.7 System Configurations

Description	Model	Serial No.	Manufacturer	Note
-------------	-------	------------	--------------	------

AC/DC adapter	W&T-AD1812A050200KU	-	W&T ELECTRONICS CO.,LTD.	-
Cable	-	-	-	-
Main board	TE-SA_R03_2020.03.02	-	-	-
Sub board1	TE-SA Thermal Board V1.1.3	30359	-	-
Sub board2	L323-P V1.0	-	-	
Lens1	-	-	-	
Lens2	-	-	-	
LED board	TE-SA LED R03	-	-	
Button board	-	-	-	
Battery	DTP105565	XU100782-17004E	-	
Battery board	-	-	-	
Display board	CK49503S0-40 JXS5086WB	-	-	
Display connector	-	-	-	
Ferrite core	ZCAT 2035-0930	-	TDK	

1.8 Test System Layout



1.9 Modifications/Note

- There was no modified item during the test.

Standards	Status	Deviation
FCC Part 15 : Subpart B	Applicable	No Deviation

1.10 Applicable Standards for Testing

1.11 Summary of Test Results

Test Item	Standards	Results
Conducted Emission	FCC Part 15 Subpart B Section 15.107 ANSI C63.4a:2017	Complied
Radiated Emission	FCC Part 15 Subpart B Section 15.109 ANSI C63.4a:2017	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	Standards	Test Results
Conducted Emission	FCC Part 15 Subpart B Section 15.107 ANSI C63.4a:2017	Complied
Radiated Emission	FCC Part 15 Subpart B Section 15.109 ANSI C63.4a:2017	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

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	39.0	Class A (10 m 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 (3 m 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 (3 m 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 Disturbance

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 CISPR-Average detector and using the EMI measuring software. The final test data was measured using a Quasi-Peak detector and CISPR-Average detector.

Note. Measuring software

- Giheung 1Lab.. : EMC32(V10.40.10) from R&S

- Giheung 2Lab.. : EMC32(V10.40.00) from R&S

2.3.1 Test Equipments

Equipment	Model	Manufacturer	Serial No	Cal Due. Date
EMI TEST RECEIVER	ESU26	R&S	100493	2022.08.23
2-LINE V-NETWORK	ENV216	R&S	101180	2022.08.21
PULSE LIMITER	ESH3-Z2	R&S	100283	2022.08.21
RF Cable	EMH-1Lab-CE-01	-	-	2022.02.21

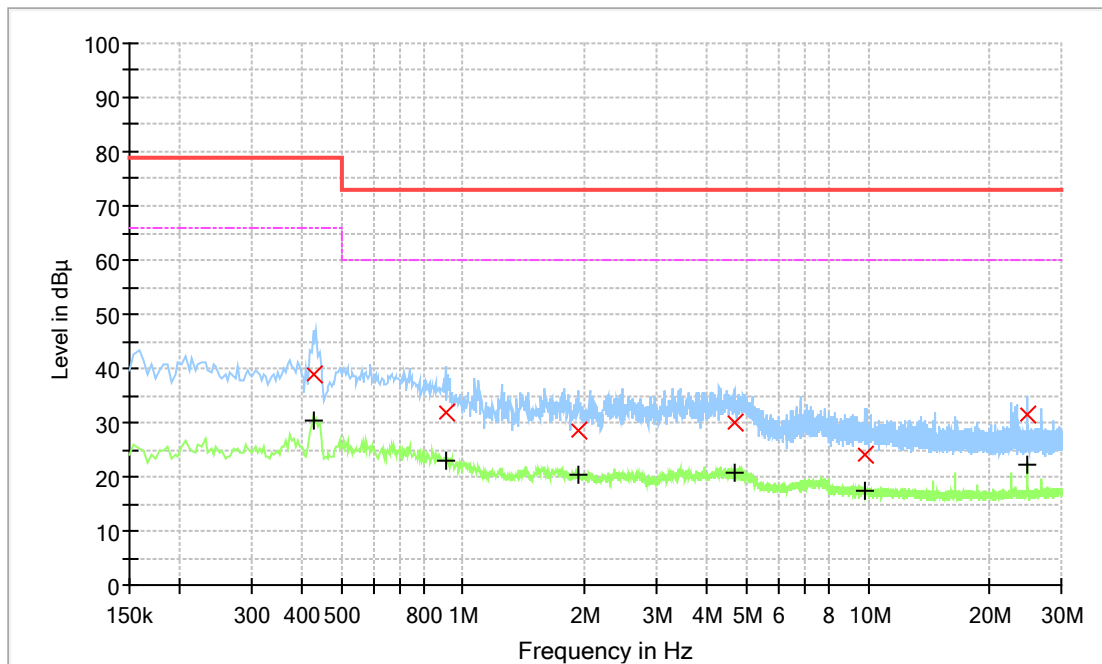
2.3.2 Test Site

Shield Room in Giheung 1 Laboratory

2.3.3 Environment Conditions

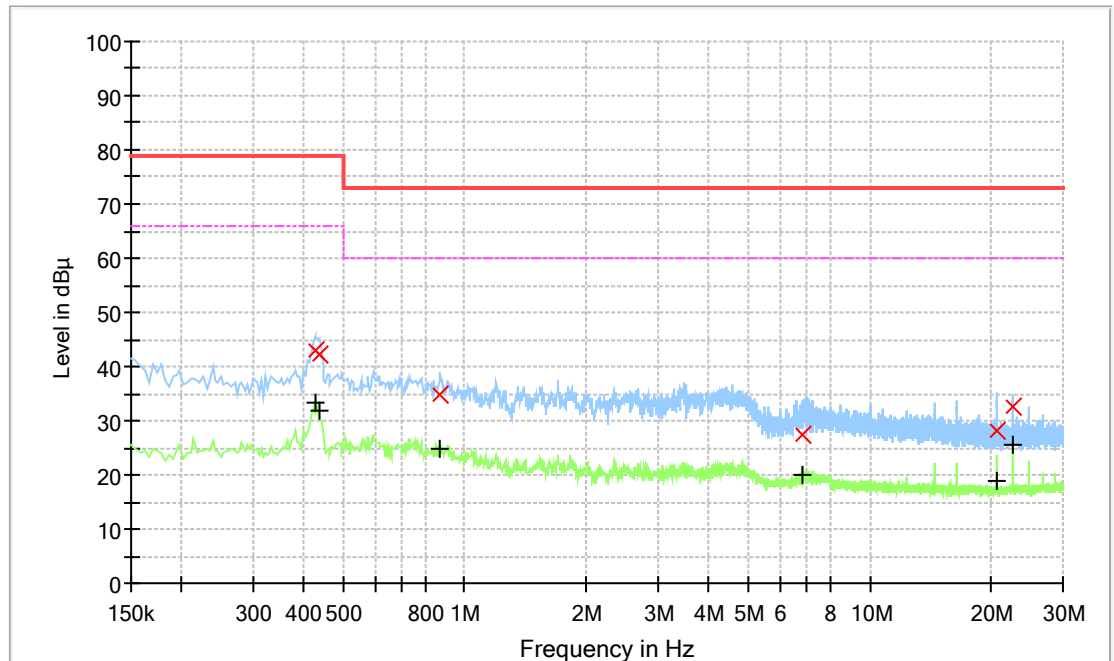
Temperature	(Minimum 17.0, Maximum 17.2) °C
Humidity	(Minimum 45.0, Maximum 46.0) %R.H.
Atmospheric Pressure	(Minimum 100.1, Maximum 100.2) kPa
Test Date	September 8, 2021

2.3.4 Test Results



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.426	---	30.19	66.00	35.81	15 000.0	9.000	L1	ON	20.0
0.426	38.97	---	79.00	40.03	15 000.0	9.000	L1	ON	20.0
0.906	---	23.12	60.00	36.88	15 000.0	9.000	L1	ON	19.9
0.906	31.81	---	73.00	41.19	15 000.0	9.000	L1	ON	19.9
1.922	---	20.53	60.00	39.47	15 000.0	9.000	L1	ON	19.8
1.922	28.37	---	73.00	44.63	15 000.0	9.000	L1	ON	19.8
4.686	---	20.67	60.00	39.33	15 000.0	9.000	L1	ON	19.9
4.686	29.90	---	73.00	43.10	15 000.0	9.000	L1	ON	19.9
9.866	---	17.35	60.00	42.65	15 000.0	9.000	L1	ON	20.2
9.866	24.19	---	73.00	48.81	15 000.0	9.000	L1	ON	20.2
24.706	---	22.28	60.00	37.72	15 000.0	9.000	L1	ON	20.8
24.706	31.55	---	73.00	41.45	15 000.0	9.000	L1	ON	20.8



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.426	---	33.21	66.00	32.79	15 000.0	9.000	N	ON	19.9
0.426	43.01	---	79.00	35.99	15 000.0	9.000	N	ON	19.9
0.438	---	31.81	66.00	34.19	15 000.0	9.000	N	ON	19.9
0.438	42.36	---	79.00	36.64	15 000.0	9.000	N	ON	19.9
0.870	---	24.99	60.00	35.01	15 000.0	9.000	N	ON	19.8
0.870	34.65	---	73.00	38.35	15 000.0	9.000	N	ON	19.8
6.858	---	19.84	60.00	40.16	15 000.0	9.000	N	ON	19.9
6.858	27.34	---	73.00	45.66	15 000.0	9.000	N	ON	19.9
20.570	---	18.72	60.00	41.28	15 000.0	9.000	N	ON	20.8
20.570	28.19	---	73.00	44.81	15 000.0	9.000	N	ON	20.8
22.642	---	25.66	60.00	34.34	15 000.0	9.000	N	ON	20.9
22.642	32.60	---	73.00	40.40	15 000.0	9.000	N	ON	20.9

Measurement Uncertainty : See Appendix A

Note1 : • Line (L1) : Hot • Line (N) : Neutral

- Margin = Limit – Quasi Peak or CAverage
- Corr. = LISN Factor + Cable loss + Pulse Limiter Factor

Ex) In case

Freq ; 0.5 MHz, level ; 30 dB(μV), CL ; 0.2 dB, LISN ; 9.5 dB, P/L: 9.8 dB

Result = Level + CL + LISN + P/L

$$= 30 + 0.2 + 9.5 + 9.8$$

$$= 49.5$$

Margin = Limit – Result

$$= 79 - 49.5$$

$$= 29.5$$

2.4 Radiated Emission

The initial preliminary exploratory scans were performed over the measuring frequency range (30 MHz to 13 GHz) using a max hold mode incorporating a Peak detector by using the EMI measuring software. The final test data was measured using a Quasi-Peak detector below 1 GHz, Peak and CISPR-Average detector above 1 GHz. 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.

Note. Measuring software

-Giheung 1Lab. : EMC32(V9.26.01) from R&S

-Giheung 2Lab. : EMC32(V10.40.10) from R&S

2.4.1 Test Equipments

Equipment	Model	Manufacturer	Serial No	Cal Due. Date
EMI TEST RECEIVER	ESU26	R&S	100570	2022.02.24
EMI TEST RECEIVER	ESU26	R&S	100368	2021.11.05
Hybrid ANTENNA	VULB 9163	SCHWARZBECK	9163-437	2022.05.14
Double Ridged Horn Antenna	HF907	R&S	102578	2022.04.15
PREAMPLIFIER	AM-1431	MITEQ	1336160	2022.05.24
Microwave Preamplifier	PAM-118A	Com-Power	551074	2021.10.13
RF Cable	EMH-2Lab-RE-01	-	-	2022.01.21
RF Cable	EMH-2Lab-RE-06	-	-	2022.01.21
RF Cable	EMH-2Lab-RE-07	-	-	2022.01.21
RF Cable	EMH-1Lab-RE-02	-	-	2022.01.26
RF Cable	EMH-1Lab-RE-03	-	-	2022.01.26
RF Cable	EMH-1Lab-RE-04	-	-	2022.01.26

2.4.2 Test Site

10m SEMI-ANECHOIC CHAMBER in Giheung 1 Laboratory

3m SEMI-ANECHOIC CHAMBER in Giheung 2 Laboratory

2.4.3 Environment Conditions

① Below 1 GHz

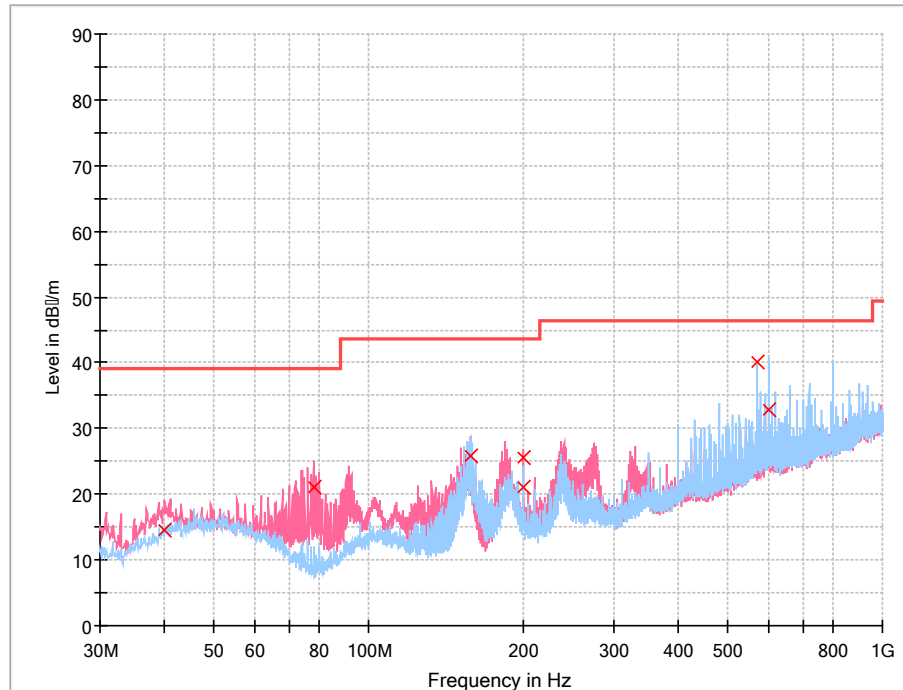
Temperature	(Minimum 18.5, Maximum 18.7) °C
Humidity	(Minimum 50.0, Maximum 51.0) %R.H.
Atmospheric Pressure	(Minimum 99.80, Maximum 99.8) kPa
Test Date	September 7, 2021

② Above 1 GHz

Temperature	(Minimum 20.0, Maximum 21.0) °C
Humidity	(Minimum 32.0, Maximum 33.0) %R.H.
Atmospheric Pressure	(Minimum 100.7, Maximum 100.7) kPa
Test Date	September 9, 2021

2.4.4 Test Results

① Below 1 GHz (10 m method)



Final Result

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.088	14.53	39.10	24.57	15 000.0	120.000	200.0	V	0.0	-17.8
78.112	20.97	39.10	18.13	15 000.0	120.000	200.0	V	251.0	-23.3
157.361	25.88	43.52	17.64	15 000.0	120.000	100.0	V	318.0	-21.3
199.944	21.07	43.52	22.45	15 000.0	120.000	100.0	V	163.0	-18.0
200.000	25.68	43.52	17.84	15 000.0	120.000	100.0	V	163.0	-18.0
569.999	40.22	46.50	6.28	15 000.0	120.000	200.0	H	338.0	-7.6
600.069	32.80	46.50	13.70	15 000.0	120.000	100.0	H	212.0	-6.2

Measurement Uncertainty : See Appendix A

Note : • POL H = Horizontal

• Margin = Limit – Quasi Peak

• POL V = Vertical

• Corr. = Antenna Factor + Cable loss – Amplifier Gain

Ex) In case

Freq ; 100 MHz, level ; 30 dB(μ V/m), AF ; 10 dB/m, CL ; 4 dB, Amp ; 25 dB

Result = Level + AF + CL – Amp

= 30 + 10 + 4 - 25

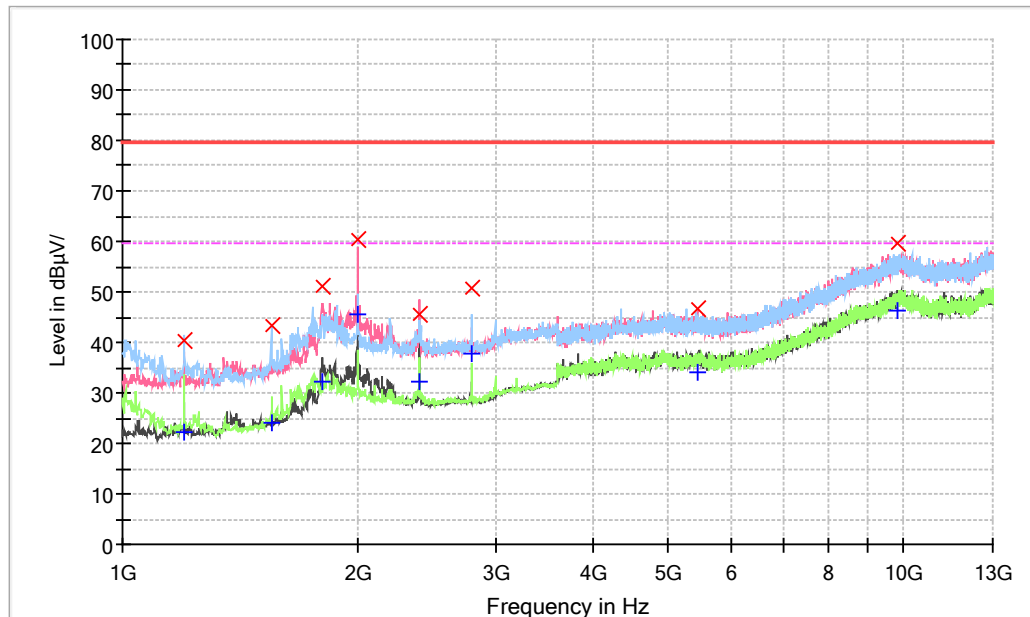
= 19

Margin = Limit – Result

= 43.5 – 19

= 24.5

②Above 1 GHz (3 m method)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Cverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1 198.900	40.27	---	79.50	39.23	15 000.0	1 000.000	100.0	H	55.0	-13.3
1 198.900	---	22.22	59.50	37.28	15 000.0	1 000.000	100.0	H	55.0	-13.3
1 549.100	---	23.92	59.50	35.58	15 000.0	1 000.000	100.0	H	1.0	-11.2
1 549.100	43.34	---	79.50	36.16	15 000.0	1 000.000	100.0	H	1.0	-11.2
1 804.100	---	32.35	59.50	27.15	15 000.0	1 000.000	100.0	V	349.0	-9.4
1 804.100	51.09	---	79.50	28.41	15 000.0	1 000.000	100.0	V	349.0	-9.4
1 999.600	---	45.39	59.50	14.11	15 000.0	1 000.000	100.0	V	197.0	-6.9
1 999.600	60.39	---	79.50	19.11	15 000.0	1 000.000	100.0	V	197.0	-6.9
2 399.100	---	32.16	59.50	27.34	15 000.0	1 000.000	100.0	V	327.0	-7.7
2 399.100	45.74	---	79.50	33.76	15 000.0	1 000.000	100.0	V	327.0	-7.7
2 800.300	---	37.68	59.50	21.82	15 000.0	1 000.000	100.0	H	131.0	-7.2
2 800.300	50.89	---	79.50	28.61	15 000.0	1 000.000	100.0	H	131.0	-7.2
5 443.800	---	34.24	59.50	25.26	15 000.0	1 000.000	100.0	V	0.0	0.3
5 443.800	46.69	---	79.50	32.81	15 000.0	1 000.000	100.0	V	0.0	0.3
9 807.700	59.50	---	79.50	20.00	15 000.0	1 000.000	100.0	H	25.0	12.0
9 807.700	---	46.18	59.50	13.32	15 000.0	1 000.000	100.0	H	25.0	12.0

Measurement Uncertainty : See Appendix A

Note : • POL H = Horizontal

• Margin = Limit – Quasi Peak

• POL V = Vertical

• Corr. = Antenna Factor + Cable loss – Amplifier Gain

Ex) In case

Freq ; 100 MHz, level ; 30 dB(μ V/m), AF ; 10 dB/m, CL ; 4 dB, Amp ; 25 dB

Result = Level + AF + CL – Amp

= 30 + 10 + 4 - 25

= 19

Margin = Limit – Result

= 43.5 – 19

= 24.5

Appendix A : Measurement Uncertainty

- Giheung 1 Laboratory

Test Method		Measurement Uncertainty	
Conducted Emission		ENV216	3.70 dB (The confidential level is 95 %, k=2)
		ESH2-Z5	3.58 dB (The confidential level is 95 %, k=2)
		ESH3-Z6	3.54 dB (The confidential level is 95 %, k=2)
Conducted Emission - Signal		ISN T800	5.12 dB (The confidential level is 95 %, k=2)
		ISNT8-Cat6	5.14 dB (The confidential level is 95 %, k=2)
		ISN S751	5.20 dB (The confidential level is 95 %, k=2)
Radiated Emission	9 kHz ~30 MHz (3m chamber)	Horizontal	3.64 dB (The confidential level is 95 %, k=2)
		Vertical	3.64 dB (The confidential level is 95 %, k=2)
	30 MHz ~ 1 000 MHz (10m chamber)	Horizontal	4.26 dB (The confidential level is 95 %, k=2)
		Vertical	4.39 dB (The confidential level is 95 %, k=2)
	1 GHz ~ 18 GHz (3m chamber)	Horizontal	3.59 dB (The confidential level is 95 %, k=2)
		Vertical	3.59 dB (The confidential level is 95 %, k=2)
Radiated Immunity Test		0.86 dB (The confidential level is 95 %, k=2)	
Conducted Immunity Test		2.23 dB (The confidential level is 95 %, k=2)	
Magnetic Field		5.78 dB (The confidential level is 95 %, k=2)	

- Giheung 2 Laboratory

Test Method		Measurement Uncertainty	
Conducted Emission		ENV216	3.54 dB (The confidential level is 95 %, k=2)
		ESH2-Z5	3.53 dB (The confidential level is 95 %, k=2)
		ESH3-Z6	3.49 dB (The confidential level is 95 %, k=2)
Conducted Emission - Signal		ISN T800	5.03 dB (The confidential level is 95 %, k=2)
		ISNT8-Cat6	5.15 dB (The confidential level is 95 %, k=2)
		ISN S751	5.15 dB (The confidential level is 95 %, k=2)
Discontinuous		3.02 dB (The confidential level is 95 %, k=2)	
Disturbance Power		3.66 dB (The confidential level is 95 %, k=2)	
Radiated Emission	9 kHz ~30 MHz (3m chamber)	Horizontal	3.84 dB (The confidential level is 95 %, k=2)
		Vertical	3.84 dB (The confidential level is 95 %, k=2)
	30 MHz ~ 1 000 MHz (10m chamber)	Horizontal	5.18 dB (The confidential level is 95 %, k=2)
		Vertical	5.32 dB (The confidential level is 95 %, k=2)
	1 GHz ~ 18 GHz (3m chamber)	Horizontal	3.62 dB (The confidential level is 95 %, k=2)
		Vertical	3.67 dB (The confidential level is 95 %, k=2)
Radiated Immunity Test		1.47 dB (The confidential level is 95 %, k=2)	
Conducted Immunity Test		2.23 dB (The confidential level is 95 %, k=2)	
Magnetic Field		5.78 dB (The confidential level is 95 %, k=2)	

- End of Test Report -