EMC TEST REPORT

Test Report No.	:	KES-EM-21T0749
Date of Issue	:	Aug. 27, 2021
Product name	:	ANESTHESIA INJECTION SYSTEM(CRADLE)
Model/Type No.	:	AN100-C
Variant Model	:	-
Applicant	:	DENTIS CO., LTD.
Applicant Address	:	99, Seongseoseo-ro, Dalseo-gu, Daegu, Republic of Korea
Manufacturer	:	DENTIS CO., LTD.
Manufacturer Address	:	99, Seongseoseo-ro, Dalseo-gu, Daegu, Republic of Korea
FCC ID	:	2AXRNAN100-C
Date of Receipt	:	Jul. 12, 2021
Test date	:	Jul. 13, 2021 ~ Jul. 14, 2021
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Min Seong, Kim
EMC Test Engineer

Reviewed by

Dong Hun, Jang
EMC Technical Manager

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Aug. 27, 2021	KES-EM-21T0749	Issued

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1.0 General Product Description

Main Specifications of EUT are:

List	Category	Unit	Specification	etc
ANESTHESIA INJECTION SYSTEM(CRADLE)	Weight	g	140	
	Size	㎜	176 X 41.4 X 75.3	
Adapter	Rated input	V	AC 100 – 240	
		Hz	50/60	
	Rated output	V	DC 5	
		A	2.0	
	Weight	g	104	

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.

☒ AC 120 V, 60 Hz

1.2 Variant Model Differences

Not applicable

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
ANESTHESIA INJECTION SYSTEM(CRADLE)	AN100-C	-	DENTIS CO., LTD.	EUT
ANESTHESIA INJECTION SYSTEM	AN100	-	DENTIS CO., LTD.	-
Adapter	ATM012T-W050V	-	Adapter Technology Co., Ltd.	EUT
Battery	TW 601750 3.7 V	-	-	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
-	-	-	-	-

1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
ANESTHESIA INJECTION SYSTEM	Charging	ANESTHESIA INJECTION SYSTEM(CRADLE) _EUT	Charging	-	-
Adapter (EUT)	DC Jack		DC Jack	2.0	U

* Unshielded = U, Shielded = S

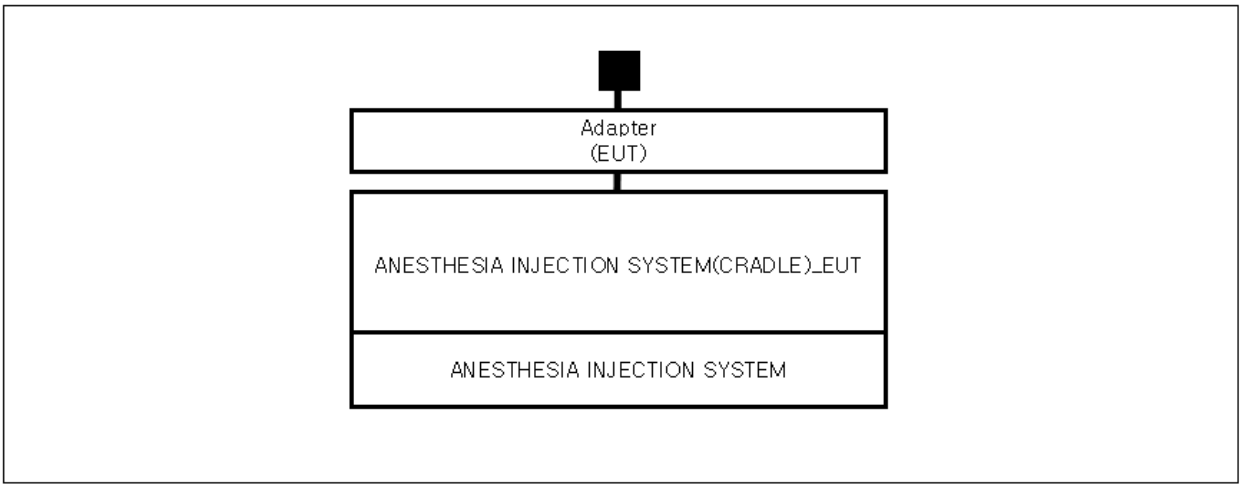
1.7 EUT Operating Mode(s)

Test mode	operating	Test Voltages
Charging	Check the LED while charging the ANESTHESIA INJECTION SYSTEM with the ANESTHESIA INJECTION SYSTEM(CRADLE).	120 V, 60 Hz

EUT Test operating S/W		
Name	**Version**	**Manufacture Company**
-	-	-

1.8 Configuration

■ AC Main
□ DC Main



1.9 Remarks when standards applied

N/A

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, Yeoju-si, Gyeonggi-do, 12658, Korea. The sites are constructed in conformance with the requirements of ANSI C63.4:2014 and CISPR 16-1-4:2019

1.12 Measurement Procedure

- Conducted Emissions

The conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emission exceed the average limit with the instrument set to the quasi-peak mode, the measurements are made in the average mode. The emission spectrum was scanned from 150 ㎑ to 30 ㎒. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded. Quasi-peak readings are distinguished with a "QP".

- Radiated Electric Field Emissions

The test was done at a SEMI ANECHOIC CHAMBER with quasi-peak detector. The final test data was measured using a Quasi-Peak detector below 1㎓ at 10 m or 3 m distance and a Peak and Average detector above 1 ㎓ at 3 m distance. Test was proceeded worst case test mode and cable configuration.
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.

Measurement procedures was In accordance with ANSI C63.4-2014 7.3.3, 7.3.4, 8.3.1.1, 8.3.1.2, 8.3.2.1, 8.3.2.2

1.13 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	**RRA**	EMI (3 m & 10 m Semi-Aechoic Chamber ,10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	KR0100
International	**KOLAS**	EMI (3 m & 10 m Semi-Aechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	KT489
USA	**FCC**	3 m & 10 m Semi-Aechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	KR0100
Canada	**ISED**	3 m & 10 m Semi-Aechoic Chamber and Conducted test site	23298-1
JAPAN	**VCCI**	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz	R-20056, C-20036 T-20040, G-20057
Europe	**TÜV SÜD**	EMI (3 m & 10 m Semi-Aechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	CARAT 001633 0004

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☐ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010 ☐ Group 1 ☐ Group 2
☐ Class A ☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 55032:2015 ☐ Class A ☐ Class B

☐ EN 55024:2010

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013

☐ **VCCI V-3 / 2015.04**	☐ Class A	☐ Class B
☐ **AS/NZS:2013**	☐ Class A	☐ Class B
☒ **47 CFR Part 15, Subpart B**		
☐ CISPR 22:2009 +A1:2010	☐ Class A	☐ Class B
☒ ANSI C63.4-2017	☐ Class A	☒ Class B
☐ **IC Regulation ICES-003 : 2016**		
☐ CAN/CSA CISPR 22-10	☐ Class A	☐ Class B
☐ ANSI C63.4-2014	☐ Class A	☐ Class B

☐ **RE– Directive 2014/53/EU**

☐ EN 301 489-1 V1.9.2

- ☐ Equipment for fixed use
- ☐ Equipment for vehicular use
- ☐ Equipment for portable use

☐ EN 301 489-3 V1.6.1

☐ EN 301 489-17 V2.2.1

☐ EN 60945:2002

2.1 Conducted Emissions at Mains Power Ports

Test Date
Jul. 13, 2021

Test Location
Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☒	EMI Test S/W	EMC32	R & S	9.12.00	-	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	01, 15, 2022	1 Year
☒	LISN	ENV216	R & S	101787	12, 29, 2021	1 Year
☐	LISN	ESH2-Z5	R & S	100450	12, 29, 2021	1 Year
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021	1 Year

Test Conditions
Temperature: (24,7 ± 0,1) ℃
Relative Humidity: (47,1 ± 0,1) % R.H.

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.2 Radiated Electric Field Emissions(Below 1 ㎓)

Test Date
Jul. 13, 2021

Test Location
☐ OPEN AREA TEST SITE #2 ☒ SEMI ANECHOIC CHAMBER #4

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 01, 2022	1 Year
☒	AMPLIFIER	SCU 01	R & S	100603	11, 25, 2021	2 Year
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022	1 Year
☒	ATTENUATOR	8491A	HP	32173	03, 10, 2022	1 Year

Test Conditions
Temperature: (24,6 ± 0,2) ℃
Relative Humidity: (46,7 ± 0,4) % R.H.

Frequency Range of Measurement
30 ㎒ to 1 ㎓

Instrument Settings
IF Band Width: 120 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
- See Appendix A for test data.
- The fundamental of the EUT was investigated in there orthogonal orientations X, Y and Z.

2.3 Radiated Electric Field Emissions(Above 1 ㎓)

Test Date
Jul. 14, 2021

Test Location
SEMI ANECHOIC CHAMBER #4(10 m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 01, 2022	1 Year
☒	PREAMPLIFIER	8449B	AGILENT	3008A01742	12, 29, 2021	1 Year
☐	ATTENUATOR	8491A	HP	35496	03, 10, 2022	1 Year
☒	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	12, 14, 2021	1 Year

Test Conditions
Temperature: (24,9 ± 0,3) ℃
Relative Humidity: (47,0 ± 0,5) % R.H.

Frequency Range of Measurement
1 ㎓ to 18 ㎓

Instrument Settings
IF Band Width: 1 ㎒

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
- See Appendix A for test data.
- The fundamental of the EUT was investigated in there orthogonal orientations X, Y and Z.

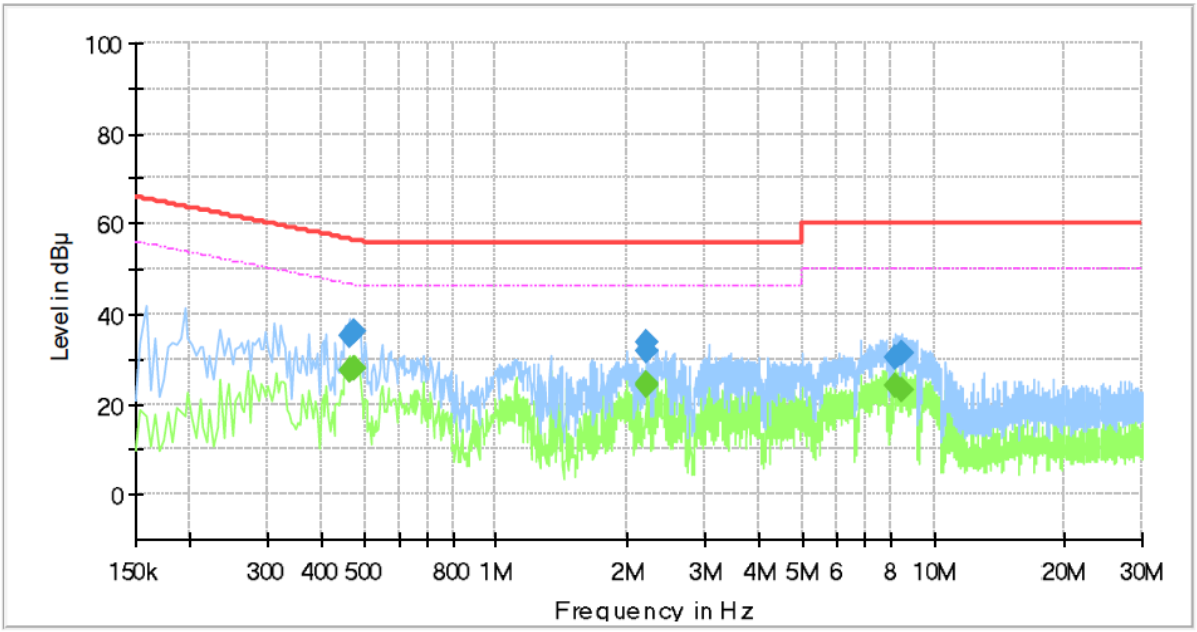
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

Common Information

Test Description:	Conducted Emission
Model No.:	AN100
Phase:	H
Mode:	Charging
Operator Name:	KES



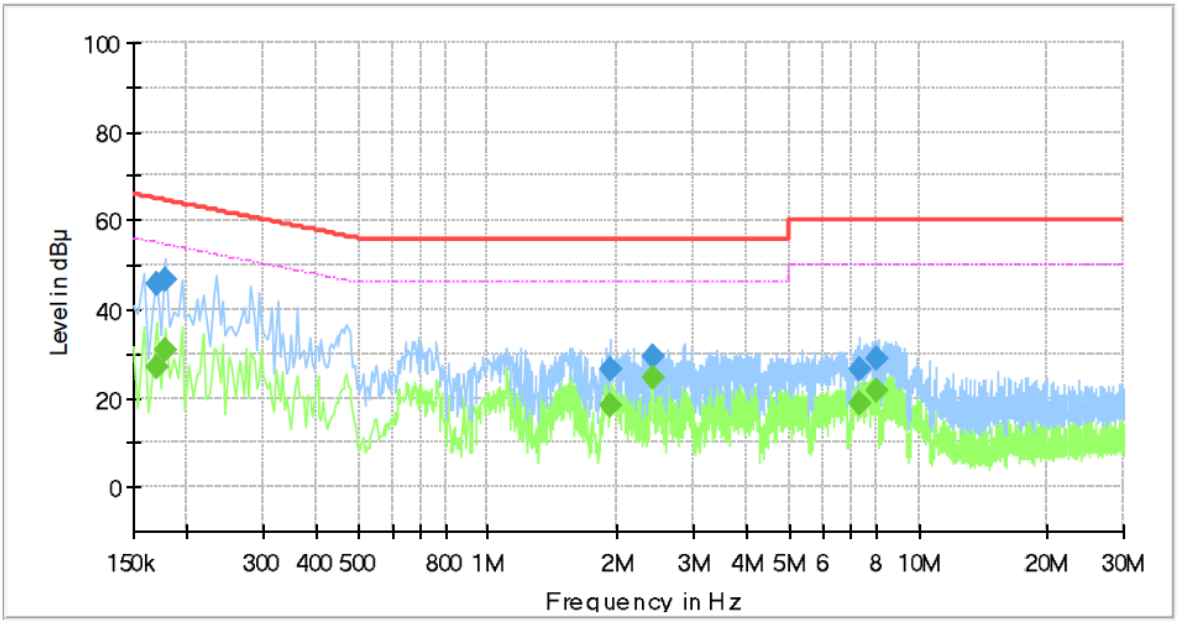
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.462000	---	27.60	46.66	19.06	1000.0	9.000	L1	20.0
0.462000	35.35	---	56.66	21.31	1000.0	9.000	L1	20.0
0.474000	---	28.15	46.44	18.29	1000.0	9.000	L1	20.0
0.474000	36.22	---	56.44	20.22	1000.0	9.000	L1	20.0
2.214000	---	24.48	46.00	21.52	1000.0	9.000	L1	20.6
2.214000	31.64	---	56.00	24.36	1000.0	9.000	L1	20.6
2.218000	---	24.20	46.00	21.80	1000.0	9.000	L1	20.6
2.218000	33.64	---	56.00	22.36	1000.0	9.000	L1	20.6
8.170000	---	23.98	50.00	26.02	1000.0	9.000	L1	20.1
8.170000	30.54	---	60.00	29.46	1000.0	9.000	L1	20.1
8.426000	---	22.97	50.00	27.03	1000.0	9.000	L1	20.2
8.426000	31.20	---	60.00	28.80	1000.0	9.000	L1	20.2

NEUTRAL LINE

Common Information

Test Description:	Conducted Emission
Model No.:	AN100
Phase:	N
Mode:	Charging
Operator Name:	KES

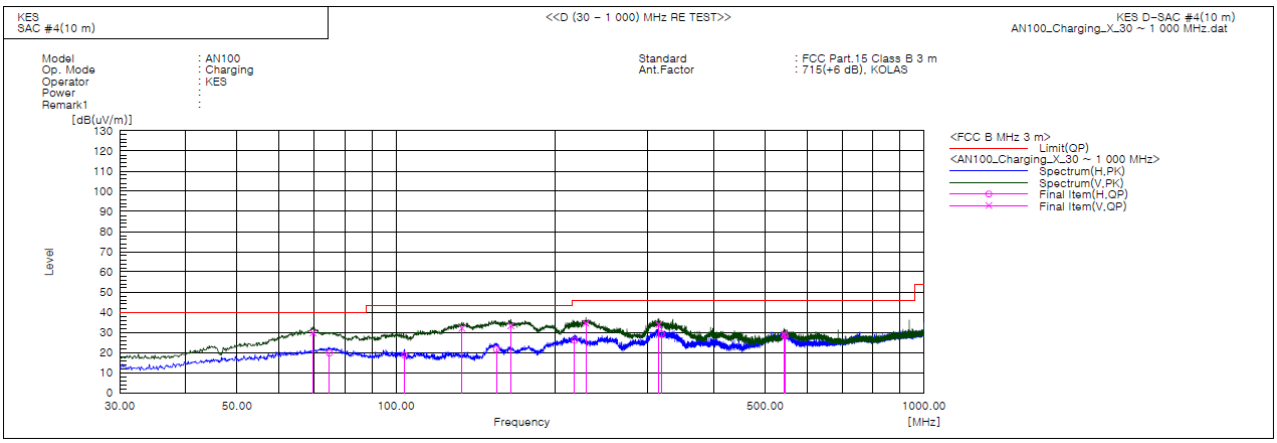


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.170000	---	26.76	54.96	28.20	1000.0	9.000	N	19.7
0.170000	45.90	---	64.96	19.06	1000.0	9.000	N	19.7
0.178000	---	30.96	54.58	23.62	1000.0	9.000	N	19.7
0.178000	46.77	---	64.58	17.81	1000.0	9.000	N	19.7
1.930000	---	18.54	46.00	27.46	1000.0	9.000	N	20.6
1.930000	26.60	---	56.00	29.40	1000.0	9.000	N	20.6
2.410000	---	24.78	46.00	21.22	1000.0	9.000	N	20.6
2.410000	29.34	---	56.00	26.66	1000.0	9.000	N	20.6
7.314000	---	18.78	50.00	31.22	1000.0	9.000	N	20.0
7.314000	26.32	---	60.00	33.68	1000.0	9.000	N	20.0
8.002000	---	21.50	50.00	28.50	1000.0	9.000	N	20.1
8.002000	28.69	---	60.00	31.31	1000.0	9.000	N	20.1

♦ 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))

Radiated Electric Field Emissions(Below 1 ㎓)



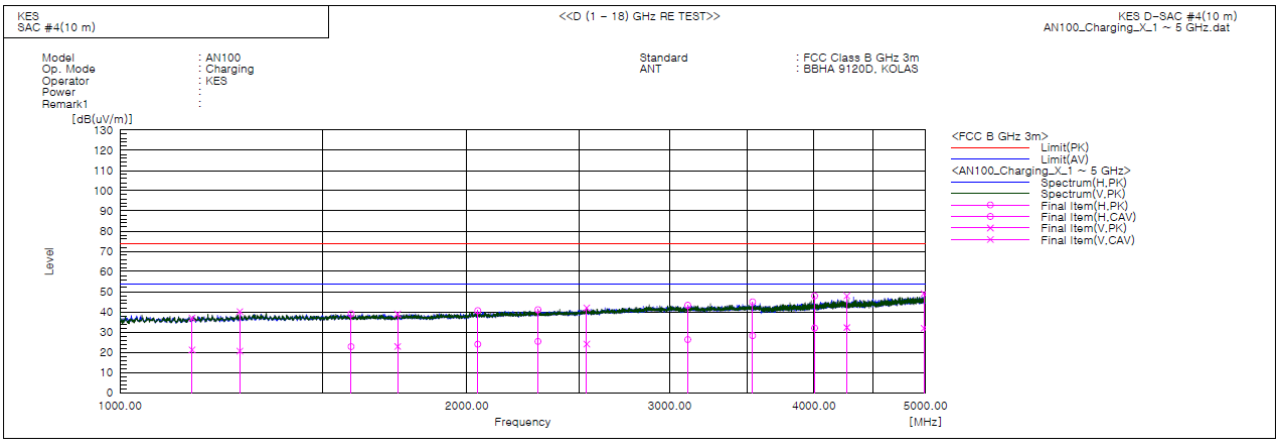
Final Result

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	69.649	V	54.9	-25.2	29.7	40.0	10.3	124.0	263.0	
2	74.863	H	47.0	-27.3	19.7	40.0	20.3	375.0	105.0	
3	103.841	H	41.7	-23.1	18.6	43.5	24.9	400.0	272.0	
4	133.305	V	58.0	-26.0	32.0	43.5	11.5	153.0	147.0	
5	155.009	H	47.1	-25.5	21.6	43.5	21.9	338.0	231.0	
6	165.073	V	58.3	-25.0	33.3	43.5	10.2	100.0	181.0	
7	217.938	H	47.1	-21.1	26.0	46.0	20.0	312.0	20.0	
8	228.971	V	55.2	-20.7	34.5	46.0	11.5	100.0	133.0	
9	314.816	V	51.9	-18.1	33.8	46.0	12.2	138.0	226.0	
10	318.090	H	47.2	-17.9	29.3	46.0	16.7	398.0	75.0	
11	542.645	V	41.1	-12.0	29.1	46.0	16.9	127.0	25.0	
12	545.313	H	40.1	-12.0	28.1	46.0	17.9	400.0	102.0	

it was determined that X orientation was worst-case orientation; therefore, al final radiated testing was performed with the EUT in X orientation.

♦ Calculation – SAC #4(10 m)
Result(QP) [㏈(㎶/m)] = (Reading(QP)[㏈(㎶)] + c.f[㏈(1/m)]
Margin(QP)[㏈] = Limit[㏈(㎶/m)] - Result(QP) [㏈(㎶/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

Radiated Electric Field Emissions(Above 1 ㎓)



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	1155.005	V	41.5	25.7	-4.5	37.0	21.2	74.0	54.0	37.0	32.8	147.0	76.0	
2	1270.430	V	44.0	24.4	-3.8	40.2	20.6	74.0	54.0	33.8	33.4	100.0	344.0	
3	1586.745	H	41.2	24.9	-2.1	39.1	22.8	74.0	54.0	34.9	31.2	334.0	53.0	
4	1741.505	V	40.4	24.3	-1.4	39.0	22.9	74.0	54.0	35.0	31.1	141.0	239.0	
5	2043.520	H	40.6	24.0	0.0	40.6	24.0	74.0	54.0	33.4	30.0	358.0	128.0	
6	2305.045	H	39.8	24.1	1.3	41.1	25.4	74.0	54.0	32.9	28.6	400.0	317.0	
7	2540.120	V	39.5	21.6	2.5	42.0	24.1	74.0	54.0	32.0	29.9	100.0	174.0	
8	3109.345	H	38.5	21.5	4.8	43.3	26.3	74.0	54.0	30.7	27.7	368.0	128.0	
9	3539.450	H	39.0	22.2	6.0	45.0	28.2	74.0	54.0	29.0	25.8	344.0	30.0	
10	4006.015	H	39.4	23.5	8.5	47.9	32.0	74.0	54.0	26.1	22.0	396.0	128.0	
11	4272.535	V	38.6	22.9	9.4	48.0	32.3	74.0	54.0	26.0	21.7	108.0	53.0	
12	4982.570	V	36.9	19.7	12.2	49.1	31.9	74.0	54.0	24.9	22.1	100.0	243.0	

- No spurious emission were detected above 6 ㎓.

it was determined that X orientation was worst-case orientation; therefore, al final radiated testing was performed with the EUT in X orientation.

♦ Calculation

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

Margin(PK/CAV)[dB] = Limit[dB(㎶/m)] - Result(PK/CAV) [dB(㎶/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: Marjin value