EMC TEST REPORT

Test Report No.	:	KES-EM-20T0143
Date of Issue	:	Feb. 19, 2020
Product name	:	Dash Cam
Model/Type No.	:	XW2
Variant Mode	:	TW2
Applicant	:	SOULTEK Co., Ltd.
Applicant Address	:	#1506,Daeryung Technotown 18th, 19, Gasan digital 1-ro, Geunmchoen-gu, Seoul, 08594, Republic of Korea
Manufacturer	:	SOULTEK Co., Ltd.
Manufacturer Address	:	#1506,Daeryung Technotown 18th, 19, Gasan digital 1-ro, Geunmchoen-gu, Seoul, 08594, Republic of Korea
FCC ID	:	2AU6Y-XW2
Date of Receipt	:	Oct. 23, 2019
Test date	:	Nov. 10, 2019
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Dae Hyun, Kim
EMC Test Engineer

Reviewed by

Dong Hun, Jang
EMC Technical Manager

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Feb. 19, 2020	KES-EM-20T0143	Issued

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1.0 General Product Description

Main Specifications of EUT are:

Item	Details
Operating Frequency	Wifi 2.4 ㎓
Power	DC 12 V / DC 24 V
Dimension	(100 x 44 x 18) ㎜
Weight	158 g

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.

Voltage ☐ 230Vac ☐ 100 Vac ☒ DC 12 V ☒ DC 24 V ☐ PoE

Frequency ☐ 50 Hz ☐ 60 Hz ☐ Hz

1.2 Variant Model Differences

The color is different from the basic model.

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
Dash Cam	XW2	-	SOULTEK Co., Ltd.	EUT
Rear Camera	-	-	-	
Micro SD card	-	-	-	

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
SmartPhone	SM-G955N	R33D713KA3F	Samsung Electronics Co., Ltd.	-
GPS Antenna	-	-	-	-

1.6 External I/O Cabling

■ DC 12 V / DC 24 V Mode

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
Dash Cam (EUT)	Wireless	SmartPhone	Wireless	-	-
	2.5 ㎜	Rear Camera	2.5 ㎜	5.0	U
	2.5 ㎜	GPS Antenna	2.5 ㎜	0.5	U
	Micro SD Card Slot	Micro SD Card	Micro SD Card Slot	-	-

1.7 EUT Operating Mode(s)

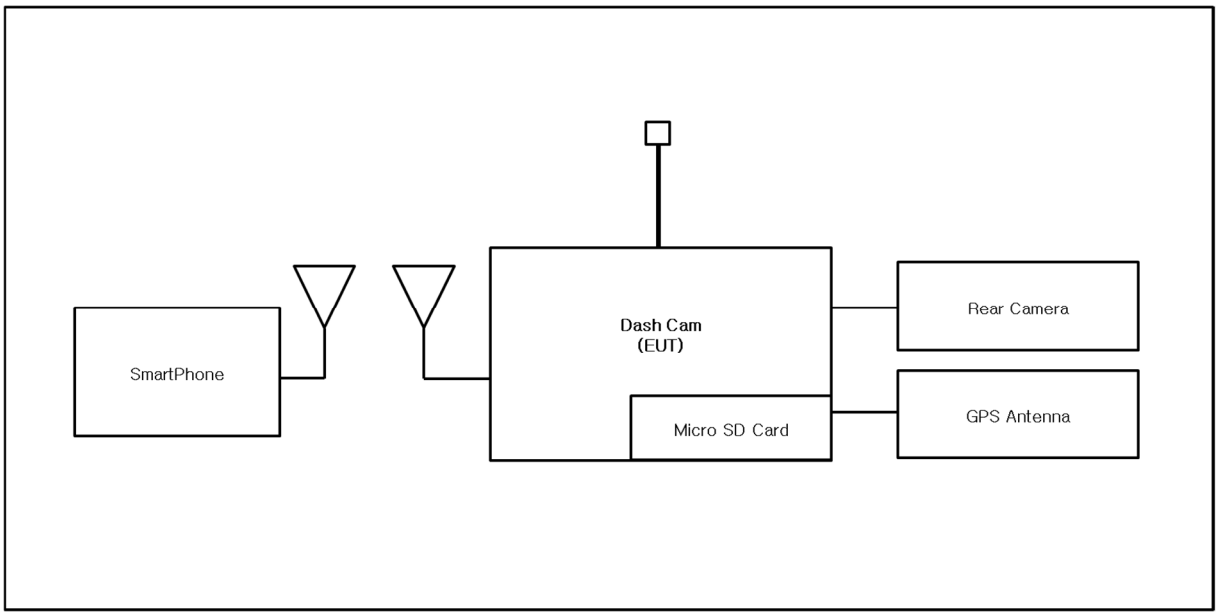
Test mode	operating
DC 12 V / DC 24 V	1. Connect the EUT and SmartPhone wirelessly and check network status on SmartPhone. 2. During the test, the EUT operation was confirmed with REC LED. 3. After the test, it was confirmed that the images of the EUT were recorded on the Micro SD card.

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

1.8 Configuration

■ AC Main
□ DC Main

■ DC 12 V / DC 24 V Mode



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 16-1-4:2012

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 0003

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 ☐ Class A ☐ Group 2 ☐ 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 C63.4-2014 ☐ 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
N/A

Test Location
Electro wave Shieldroom

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	101781	04, 22, 2020	1 Year
☐	LISN	ENV216	R & S	101787	01, 04, 2020 (01, 02, 2021)	1 Year
☐	LISN	ESH2-Z5	R & S	100450	04, 22, 2020 (01, 02, 2021)	1 Year
☐	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 25, 2020 (01, 02, 2021)	1 Year

Test Conditions
Temperature: ℃
Relative Humidity: % 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
N/A

2.2 Radiated Electric Field Emissions(Below 1 ㎓)

Test Date
Nov. 10, 2019

Test Location
☐ OPEN AREA TEST SITE #2 ☒ 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, 09, 2020	1 Year
☒	AMPLIFIER	SCU 01	R & S	100603	11, 26, 2019 (11, 25, 2020)	1 Year
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 29, 2020	2 Year
☒	ATTENUATOR	8491A	HP	32173	03, 11, 2020	1 Year

Test Conditions
Temperature: 23,3 ℃
Relative Humidity: 52,9 % 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.

2.3 Radiated Electric Field Emissions(Above 1 ㎓)

Test Date
Nov. 10, 2019

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, 09, 2020	1 Year
☒	PREAMPLIFIER	8449B	AGILENT	3008A01742	01, 08, 2020 (01, 02, 2021)	1 Year
☒	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	12, 13, 2020	2 Year

Test Conditions
Temperature: 23,3 ℃
Relative Humidity: 52,9 % R.H.

Frequency Range of Measurement
1 ㎓ to 12.4 ㎓

Instrument Settings
IF Band Width: 1 ㎒

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
- See Appendix A for test data.

APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

N/A

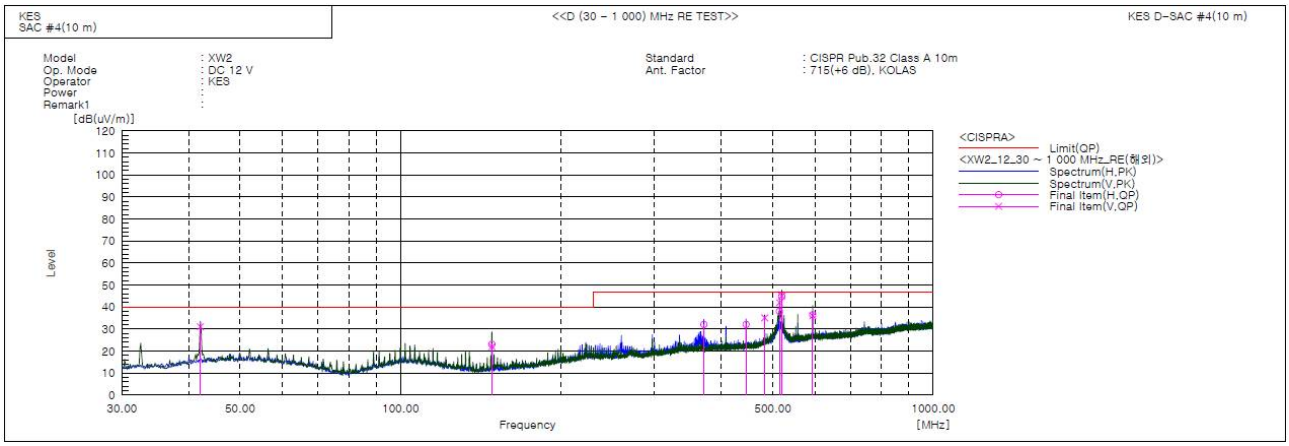
NEUTRAL LINE

N/A

♦ 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 ㎓)

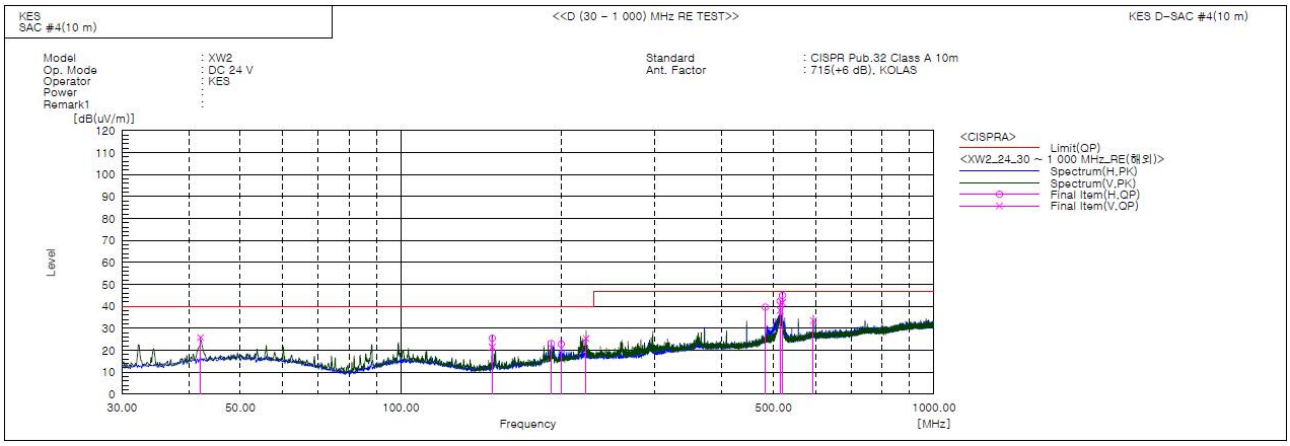
■ DC 12 V Moade



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	42.125	V	53.4	-22.3	31.1	40.0	8.9	112.0	253.0	
2	148.461	V	48.0	-25.9	22.1	40.0	17.9	102.0	289.0	
3	148.472	H	49.0	-25.9	23.1	40.0	16.9	299.0	17.0	
4	371.198	H	47.9	-15.8	32.1	47.0	14.9	205.0	237.0	
5	445.524	H	46.8	-14.7	32.1	47.0	14.9	299.0	200.0	
6	482.626	V	48.4	-13.3	35.1	47.0	11.9	122.0	274.0	
7	514.636	V	54.4	-12.4	42.0	47.0	5.0	259.0	206.0	
8	514.636	H	50.5	-12.4	38.1	47.0	8.9	365.0	220.0	
9	519.729	V	57.4	-12.3	45.1	47.0	1.9	335.0	290.0	
10	519.729	H	57.2	-12.3	44.9	47.0	2.1	372.0	308.0	
11	594.055	V	46.0	-9.9	36.1	47.0	10.9	203.0	277.0	
12	594.055	H	46.4	-9.9	36.5	47.0	10.5	204.0	262.0	

■ DC 24 V Moade



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	42.132	V	48.1	-22.3	25.8	40.0	14.2	111.0	164.0	
2	148.458	V	47.4	-25.9	21.5	40.0	18.5	100.0	80.0	
3	148.477	H	51.4	-25.9	25.5	40.0	14.5	388.0	5.0	
4	191.639	H	45.7	-22.6	23.1	40.0	16.9	214.0	147.0	
5	199.999	H	44.6	-21.8	22.8	40.0	17.2	400.0	151.0	
6	222.695	V	45.9	-20.5	25.4	40.0	14.6	124.0	48.0	
7	482.632	H	53.0	-13.3	39.7	47.0	7.3	248.0	223.0	
8	514.624	H	54.8	-12.4	42.4	47.0	4.6	337.0	211.0	
9	514.769	V	50.6	-12.4	38.2	47.0	8.8	137.0	171.0	
10	519.739	H	57.3	-12.3	45.0	47.0	2.0	203.0	211.0	
11	519.745	V	54.1	-12.3	41.8	47.0	5.2	284.0	294.0	
12	594.059	V	43.4	-9.9	33.5	47.0	13.5	200.0	163.0	

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

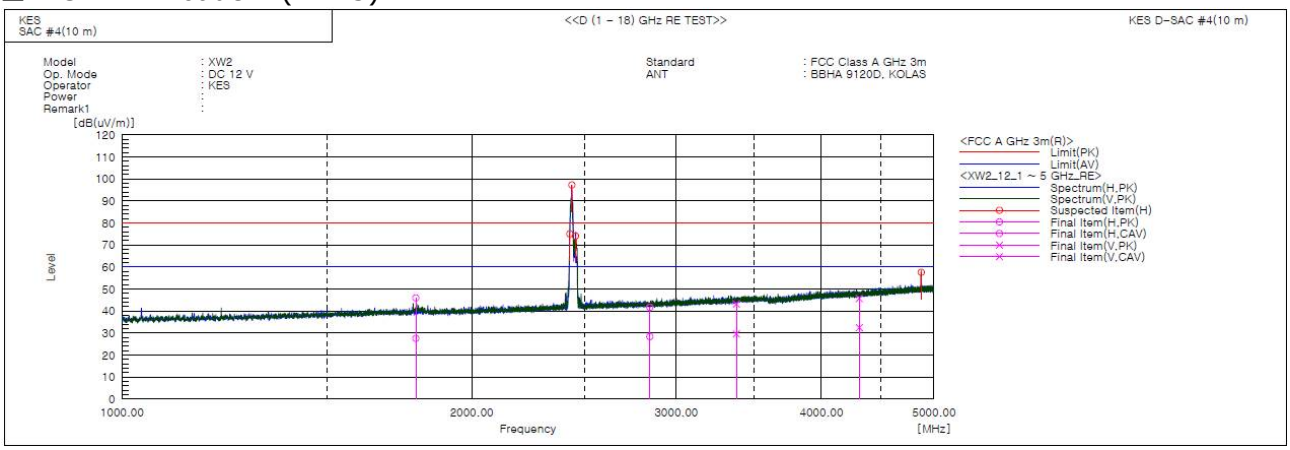
Uncertainty of measurement

Horizontal : Uncertainty of measurement 4.16 dB
(Confidence level: Approx. 95 %, *k*=2)

Vertical : Uncertainty of measurement 4.24 dB
(Confidence level: Approx. 95 %, *k*=2)

Radiated Electric Field Emissions(Above 1 ㎓)

■ DC 12 V Moade – (1 ~ 5) ㎓

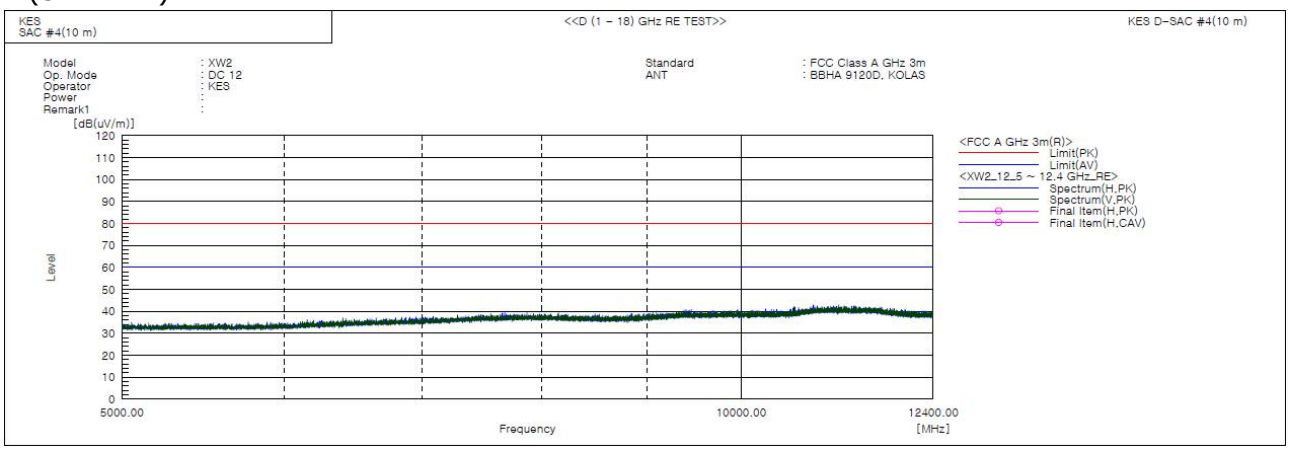


Final Result

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	1790.360	H	47.4	29.0	-1.4	46.0	27.6	80.0	60.0	34.0	32.4	241.0	56.0	
2	2846.825	H	38.5	25.2	3.2	41.7	28.4	80.0	60.0	38.3	31.6	203.0	39.0	
3	3379.835	V	38.3	24.8	4.9	43.2	29.7	80.0	60.0	36.8	30.3	119.0	275.0	
4	4311.885	V	36.9	23.7	8.8	45.7	32.5	80.0	60.0	34.3	27.5	158.0	116.0	
5	2429.500	H	----------	----------	1.5	----------	----------	80.0	60.0	----------	----------	100.0	250.0	
6	2439.500	H	----------	----------	1.5	----------	----------	80.0	60.0	----------	----------	100.0	76.0	
7	2457.000	H	----------	----------	1.6	----------	----------	80.0	60.0	----------	----------	100.0	100.0	
8	4876.000	H	----------	----------	11.0	----------	----------	80.0	60.0	----------	----------	100.0	92.0	

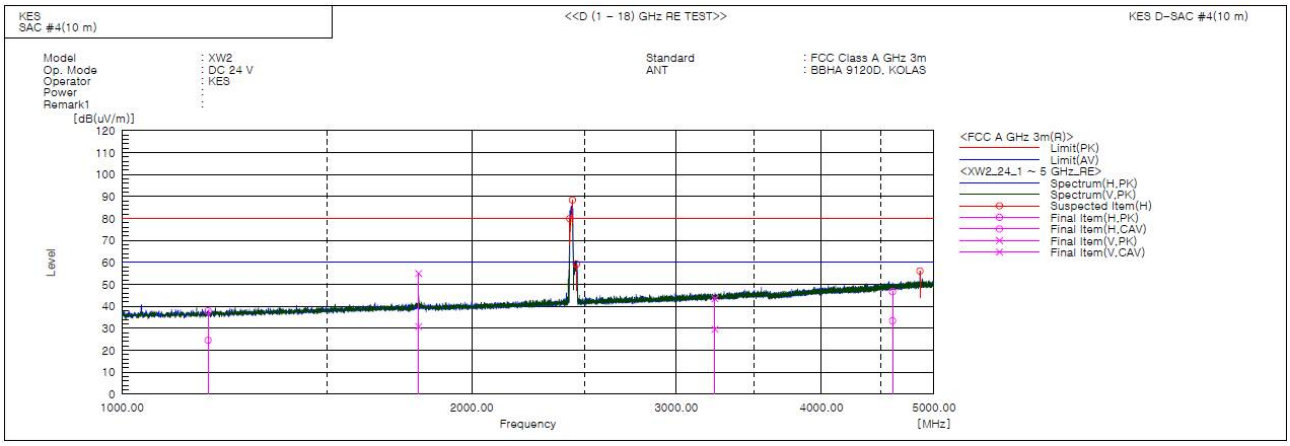
* DC 12 V Moade Exclusion Band
- Fundamental Frequency: 2.4 ㎓
- Harmonic Frequency : 4.8 ㎓

– (5 ~ 12.4) GHz



* No spurious emission were detected above 5 GHz.

■ DC 24 V Moade – (1 ~ 5) GHz

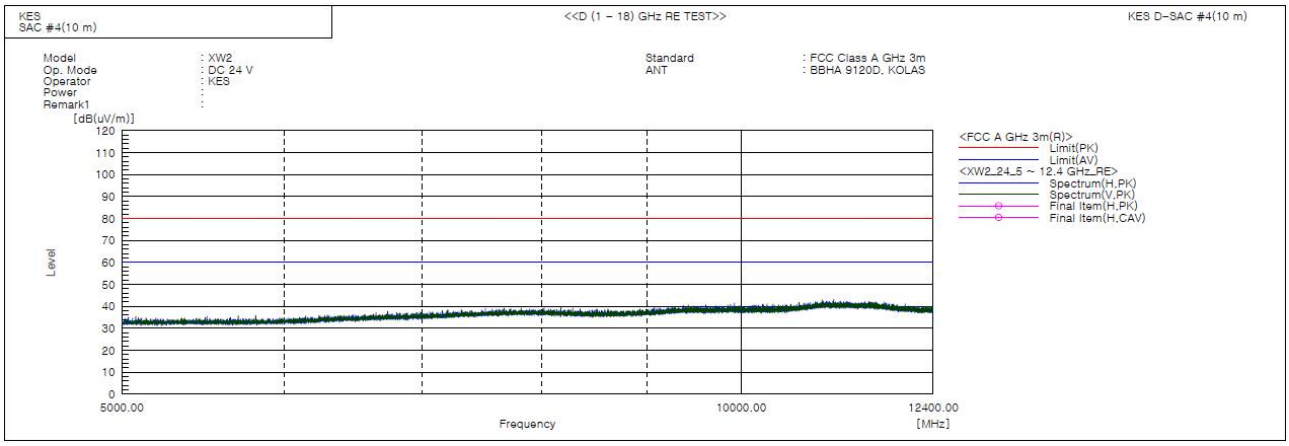


Final Result

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	1186.225	H	43.0	29.6	-5.0	38.0	24.6	80.0	60.0	42.0	35.4	221.0	155.0	
2	1800.275	V	56.4	32.2	-1.4	55.0	30.8	80.0	60.0	25.0	29.2	152.0	194.0	
3	3239.705	V	39.0	25.1	4.5	43.5	29.6	80.0	60.0	36.5	30.4	106.0	106.0	
4	4605.740	H	36.7	23.4	10.0	46.7	33.4	80.0	60.0	33.3	26.6	337.0	354.0	
5	2428.500	H	----------	----------	1.5	----------	----------	80.0	60.0	----------	----------	100.0	309.0	
6	2442.000	H	----------	----------	1.6	----------	----------	80.0	60.0	----------	----------	100.0	154.0	
7	2461.500	H	----------	----------	1.7	----------	----------	80.0	60.0	----------	----------	100.0	146.0	
8	4863.500	H	----------	----------	10.9	----------	----------	80.0	60.0	----------	----------	100.0	138.0	

* DC 24 V Moade Exclusion Band
- Fundamental Frequency: 2.4 GHz
- Harmonic Frequency : 4.8 GHz

– (5 ~ 12.4) ㎓



* No spurious emission were detected above 5 ㎓.

♦ Calculation

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

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

Uncertainty of measurement

Uncertainty of measurement 5.76 ㏈
(Confidence level: Approx. 95 %, *k*=2)