TEST REPORT

KCTL Inc.
28 Mosan-gil, Jeongnam-myeon, Hwaseong-si,
Gyeonggi-do, Republic of Korea(18516)
TEL: 82-31-286-5881 FAX: 82-31-8059-1154
www.kctl.co.kr

1. Client

- Name : FINEDIGITAL Inc.
- Address : 7th Floor, Fine Venture Bldg., 345-1 Yatap-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-828 KOREA
- Date of Receipt : 2019-08-08

2. Use of Report : -

3. Name of Product and Model : DASH CAM / X500

4. Manufacturer and Country of Origin : FINEDIGITAL Inc. / Korea

5. Date of Test : 2019-08-16 - 2019-08-19

6. Test method used : ANSI C63.4:2014
FCC Part 15 Subpart B, Class A

7. Test Results : Complied

Affirmation	Tested by	Technical Manager
	Name : Minwoo Kang (Signature)	Name : Jaehyun Park (Signature)

2019-09-24

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2019-08-22	Originally issued	-
2019-09-20	Describe reason for skipping conducted emissions.	12
2019-09-24	To add 15.107 and 15.109 in the table.	1, 12

Contents

1. Applicant information

Applicant:	FINEDIGITAL Inc.
Address:	7th Floor, Fine Venture Bldg., 345-1 Yatap-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-828 KOREA
Telephone:	+82-31-788-8713
Fax:	+82-31-788-8890
E-mail:	hkkwon@finedigital.com
Contact name:	Hyukkil Kwon

Manufacturer:	FINEDIGITAL Inc.
Address:	7th Floor, Fine Venture Bldg., 345-1 Yatap-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-828 KOREA
Telephone:	+82-31-788-8713
Fax:	+82-31-788-8890
E-mail:	hkkwon@finedigital.com
Contact name:	Hyukkil Kwon

2. Laboratory information

Address

KCTL Inc. (Hwaseong Lab.)

28, Mosan-gil, Jeongnam-myeon, Hwaseong-si, Gyeonggi-do, 18516, Korea

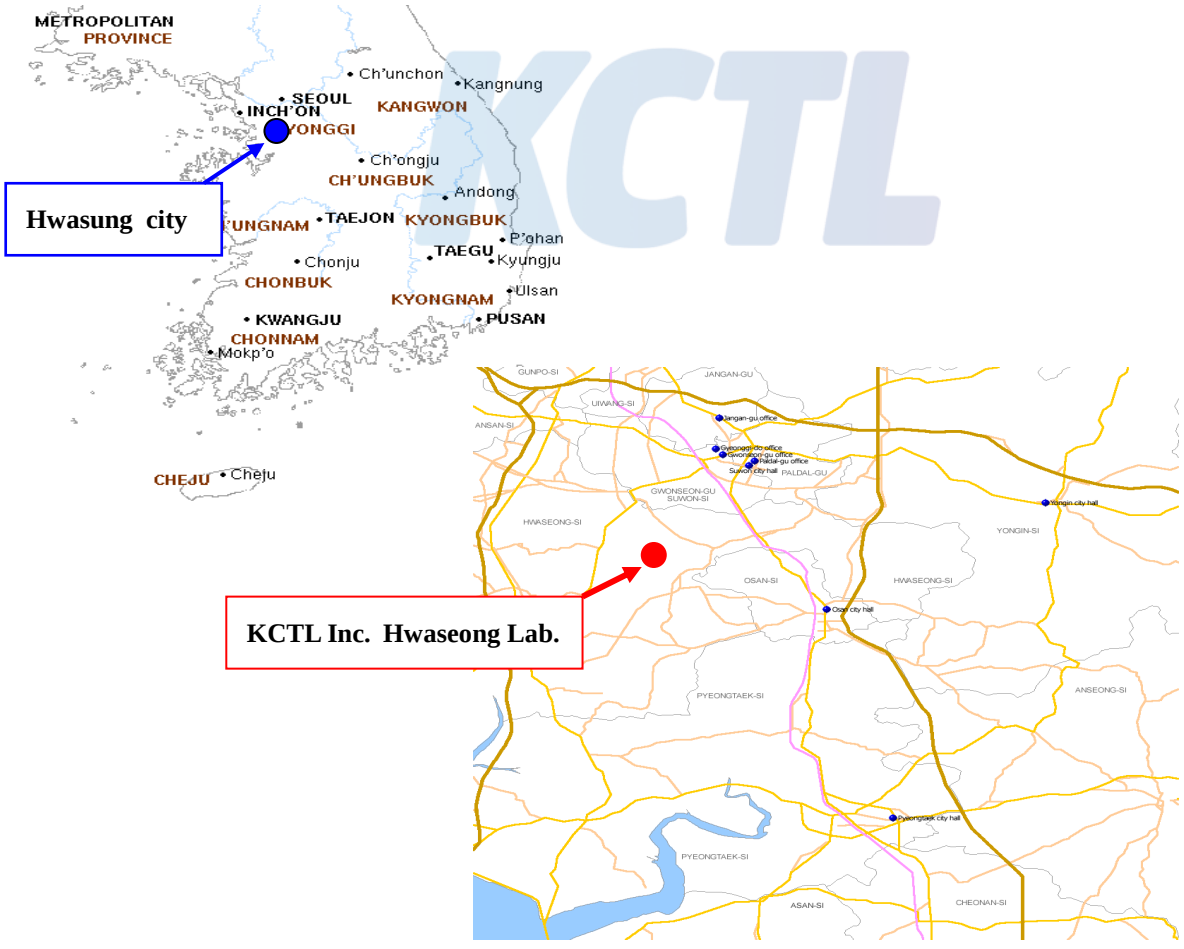
Telephone Number: 82 31 286 5881

Facsimile Number: 82 31 8059 1154

FCC Site Designation No: KR0040

KOLAS NO.: KT231

SITE MAP



3. Test system configuration

3.1 Operation environment

	Temperature	Humidity	Pressure
Chamber 10 m (RE)	24.5 °C	56.2 % R.H.	-
Chamber 3 m (RE)	25.0 °C	56.7 % R.H.	-

Test site

These testing items were performed following locations;

Test item	Test site
Radiated Emission (Below 1 GHz)	10 m Chamber
Radiated Emission (Above 1 GHz)	3 m Chamber

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC.
The factors contributing to uncertainties are test receiver, cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna frequency interpolation, measurement distance variation, site imperfection, mismatch, and system repeatability. Based on CISPR 16-4-2, the measurement uncertainty level with a 95 % confidence level was applied.

Radiated Emission measurement (Confidence level about 95 %, k = 2)		
10 m Chamber	30 MHz ~ 1 GHz	3 m : 4.96 dB
		10 m : 4.96 dB
3 m Chamber	1 GHz ~ 6 GHz	3 m : 6.24 dB

3.3 Measurement Program

These test items were performed by software programs;

Test item	Measurement Program	Used
Radiated Emission(Below 1 GHz)	EMI_V 2.01.0060 (tsj corporation)	☒
Radiated Emission(Above 1 GHz)	TEPTO-DV/RE V 3.1.0047 (tsj corporation)	☒

4. Description of EUT

4.1 General information

Channel	2CH
Video Resolution	FRONT&REAR: FHD 1080p@30fps
LCD	3.5" 800X480 IPS LCD touch screen
View Angle	155°/140°
Processor / Image Sensor	Allwinner V3
Front Camera/ Lens	2M pixels CMOS image sensor 4Glass With IR cut filter
Rear Camera/ Lens	2M pixels CMOS image sensor 4Glass With IR cut filter
WiFi/Bluetooth	NO
Smart Time Laps	YES
Auto Night Vision	YES
ADAS Plus	YES
Format Free	YES
안전운전 도우미	YES
Parking Mode	YES
Battery Discharge Prevention	YES
High Temperature Protection	YES
G-Sensor	YES
External GPS	YES
Operation Temperature	-10 ~ 60 ° C
Storage Temperature	-20 ~ 70 ° C
Power	DC 12/24V
Power cable	Continuous power cable
PC Viewer (FineVu Player)	YES
Mobile Application	N/A
Storage	Micro SD Card (16G/32G/64G)
LED Indicators	Front : Security LED , Rear : Status LED

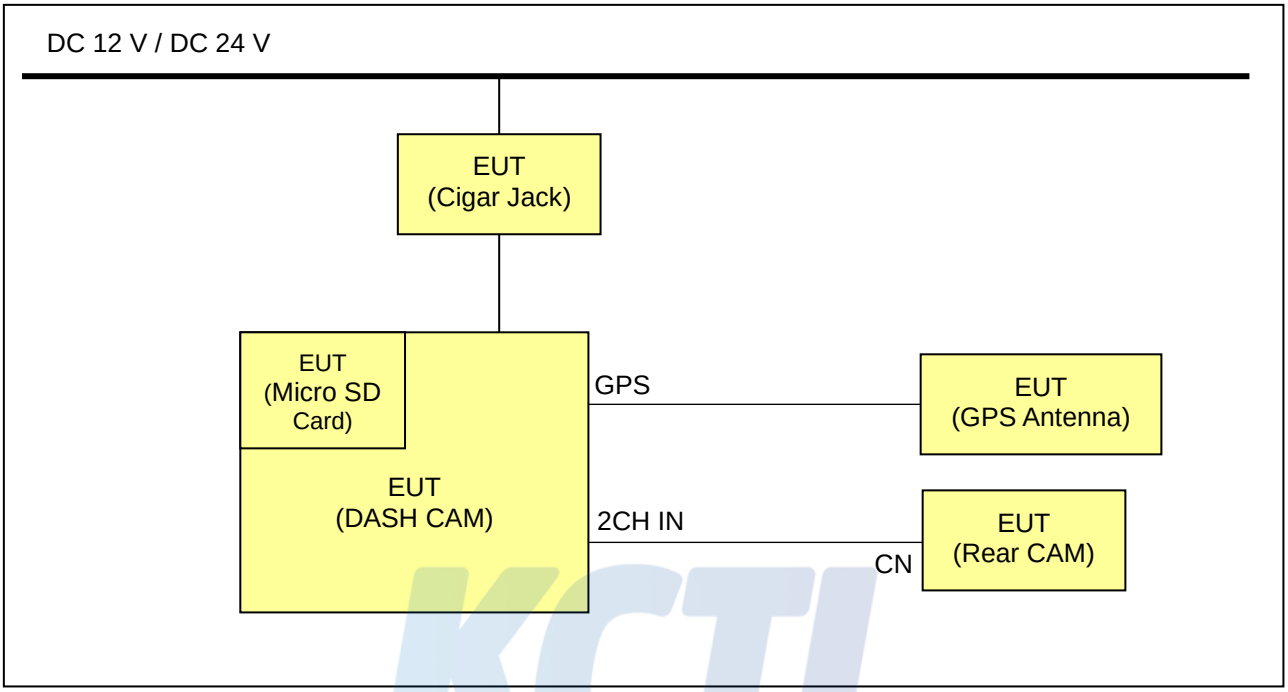
4.2 Product description

Type of product	DASH CAM
Model name (Basic)	X500
Model name (Variant)	-
Difference	-
Trade name	-
Serial no	-
Testing voltage	DC 12 V / DC 24 V
Input range	DC 12 V / DC 24 V
Internal clock frequency	1.15 GHz

4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
-	-	-	-

4.4 Test configuration



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	**DASH CAM (EUT)**	POWER	Cigar Jack (EUT)	-	3.0	shield
2		2CH IN	Rear CAM (EUT)	CN	6.4	shield
3		GPS	GPS Antenna(EUT)	-	0.8	shield
4		Micro SD	Micro SD Card(EUT)	-	-	-

4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode	Normal operating
1 [F-CAM MODE]	After connecting the EUT with the peripherals, it was tested while checking the images taken by the DASH CAM.
2 [R-CAM MODE]	After connecting the EUT with the peripherals, it was tested while monitoring the image recording to the EUT through DASH CAM.

5. Summary of test results

In the above configuration tested, The EUT complied with the requirement of the specification

5.1 Summary of EMI emission test results

FCC Part 15 Subpart B (Class A)

ANSI C63.4 – 2014

Applied	Test items	Test method	Result
☐	Conducted Emission	ANSI C63.4:2014 FCC Part 15 Subpart B, Class A	N/A
☒	Radiated Emission	ANSI C63.4:2014 FCC Part 15 Subpart B, Class A	Pass

Note: The Conducted Emission test was not apply to the EUT is powered by DC Power.

The data collected shows that EUT the complied with technical requirements of above rules part 15.107(a), (d) and 15.109(a).

6. Test results

6.1 Radiated Emission

Test specification	FCC Part 15, Section 15.109, Class A		
Testing voltage	DC 12 V / DC 24 V		
Test facility	10 m Chamber / 3 m Chamber		
Test distance	10 m / 3 m		
Date	2019-08-16 / 2019-08-19		
Temperature (°C)	24.5 °C / 25.0 °C	Humidity (% R.H.)	56.2 % R.H. / 56.7 % R.H.
Remarks	Pass		

6.1.1 Limits of radiated emission measurement

☒ Limits below 1 ㎓

Frequency [㎒]	Class A (dB(㎶/m)) @ 10 m	Class B (dB(㎶/m)) @ 3 m
30-88	39	40
88-216	43.5	43.5
216-960	46.4	46
Above 960	49.5	54

☒ Limits above 1 ㎓

Frequency [㎓]	Class A @ 3 m		Class B @ 3 m	
	Average limit (dB(㎶/m))	Peak limit (dB(㎶/m))	Average limit (dB(㎶/m))	Peak limit (dB(㎶/m))
1 ~	60	80	54	74
Note - The lower limit applies at the transition frequency.				

6.1.2 Measurement procedure

The test was done at a 10 m Chamber with a quasi-peak detector.
EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane.
Cables were folded back and forth forming a bundle 0.3 m to 0.4 m long and were hanged at a 0.4 m height to the ground plane. Cables connected to EUT were fixed to cause maximum emission.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.
The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.1.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
Test Receiver	ESCI	100561	Rohde & Schwarz	2019-09-20	☒
BI-LOG Ant.	VULB9160	3049	Schwarzbeck	2019-08-31	☒
Amplifier	310N	185938	SONOMA	2020-01-03	☒
Double Ridge Horn Antenna	SAS-571	500	A.H. SYSTEMS	2019-10-16	☒
PREAMPLIFIER	87405C	MY47010666	AGILENT	2020-01-03	☒
SIGNAL ANALYZER	FSV	101244	Rohde & Schwarz	2020-02-19	☒

6.1.4 Sample calculation

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.
The sample calculation is as follow:

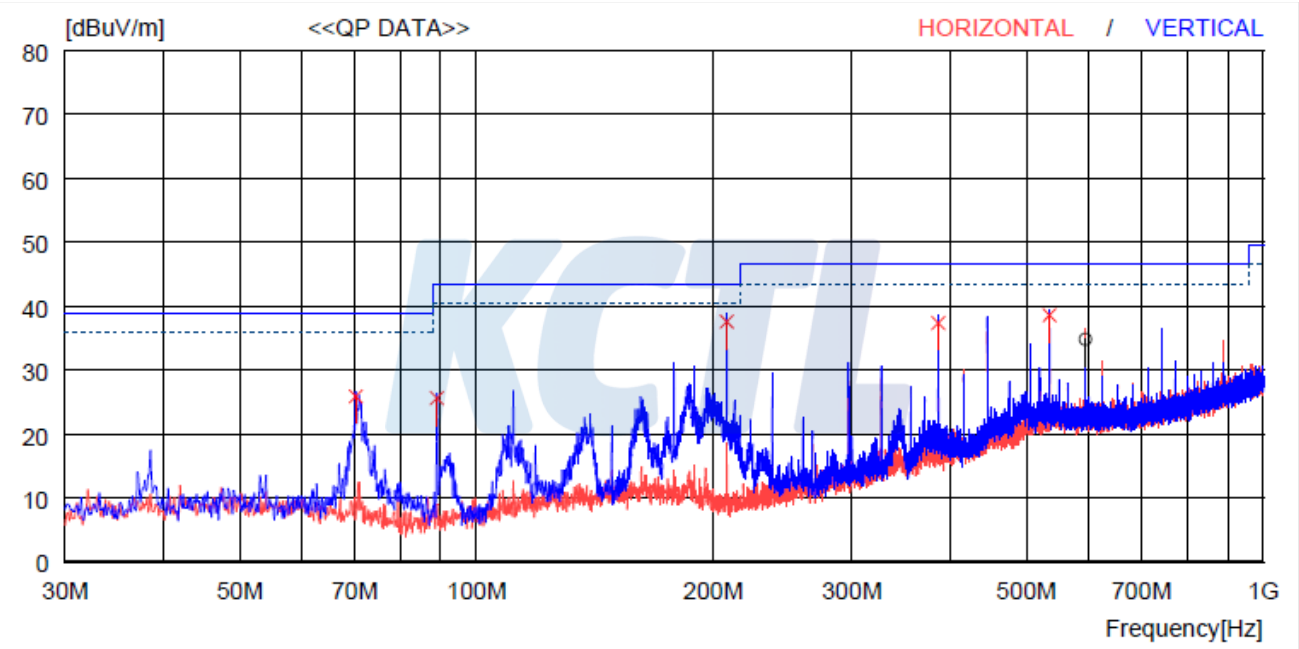
Result QP[dB(μV/m)] = Reading QP[dB(μV)] + ANT FACTOR [dB/m] + LOSS [dB] - GAIN [dB]
Result QP : The final measure
Reading QP : Instrument readings
ANT FACTOR: Antenna Factor
LOSS: Cable Loss
GAIN: Amplifier Gain

6.1.5 Radiated emission measurement result

Graph and Data

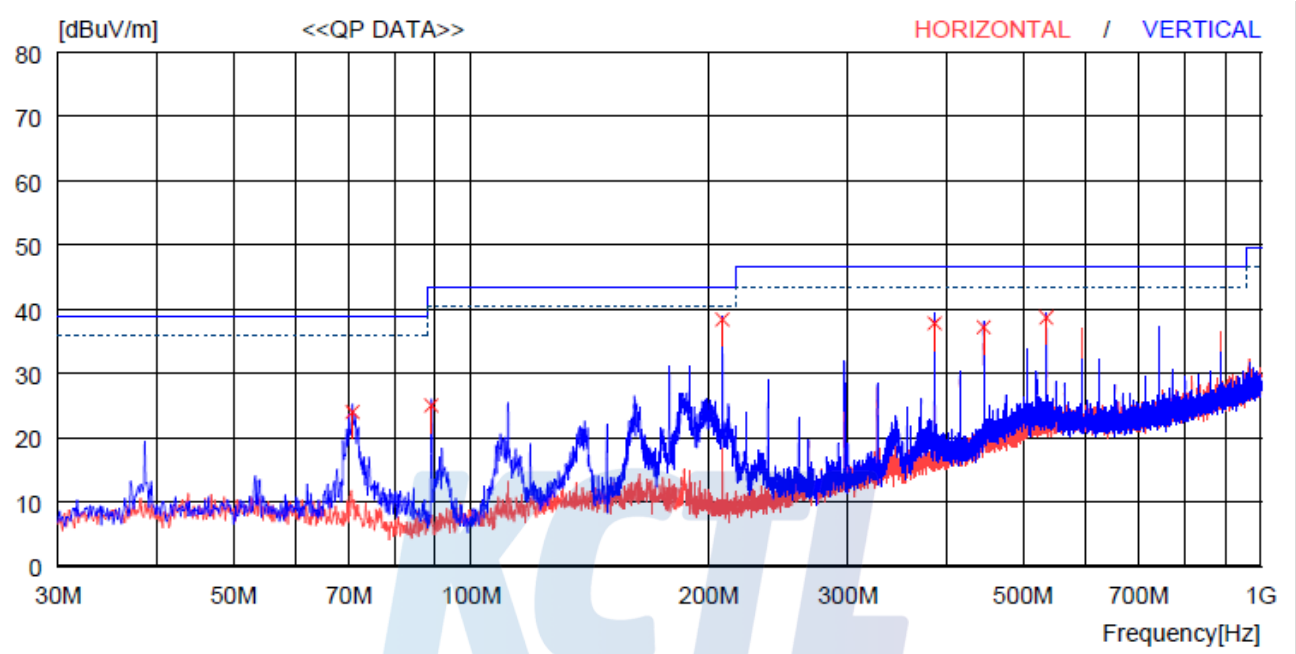
30 ㎒ ~ 1 ㎓

[DC 12 V - F-CAM MODE]



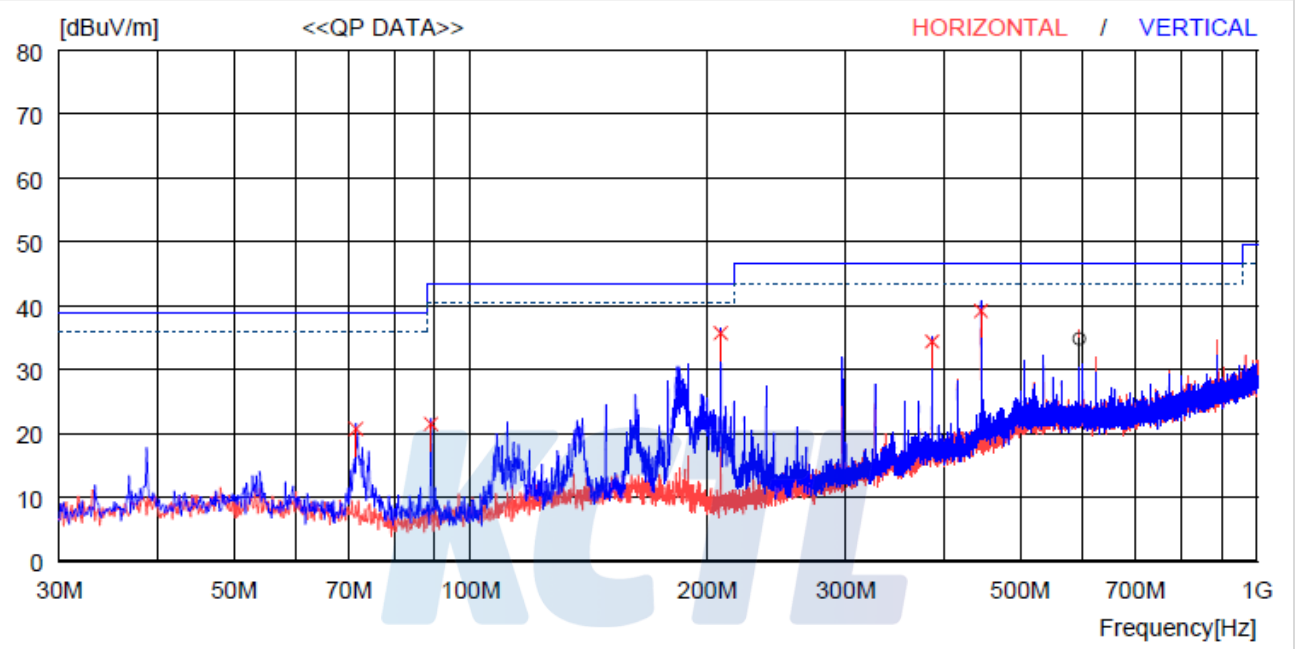
No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT QP [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [deg]
----- Horizontal ------										
1	594.055	35.1	25.2	6.2	31.7	34.8	46.5	11.7	102	22
----- Vertical ------										
2	70.255	40.2	16.0	1.3	31.6	25.9	39.0	13.1	143	261
3	89.049	41.8	13.9	1.5	31.6	25.6	43.5	17.9	247	252
4	207.874	51.1	15.5	2.5	31.5	37.6	43.5	5.9	103	317
5	386.111	43.7	20.9	4.2	31.4	37.4	46.5	9.1	119	19
6	534.643	39.5	24.1	6.6	31.6	38.6	46.5	7.9	165	347

[DC 12 V - R-CAM MODE]



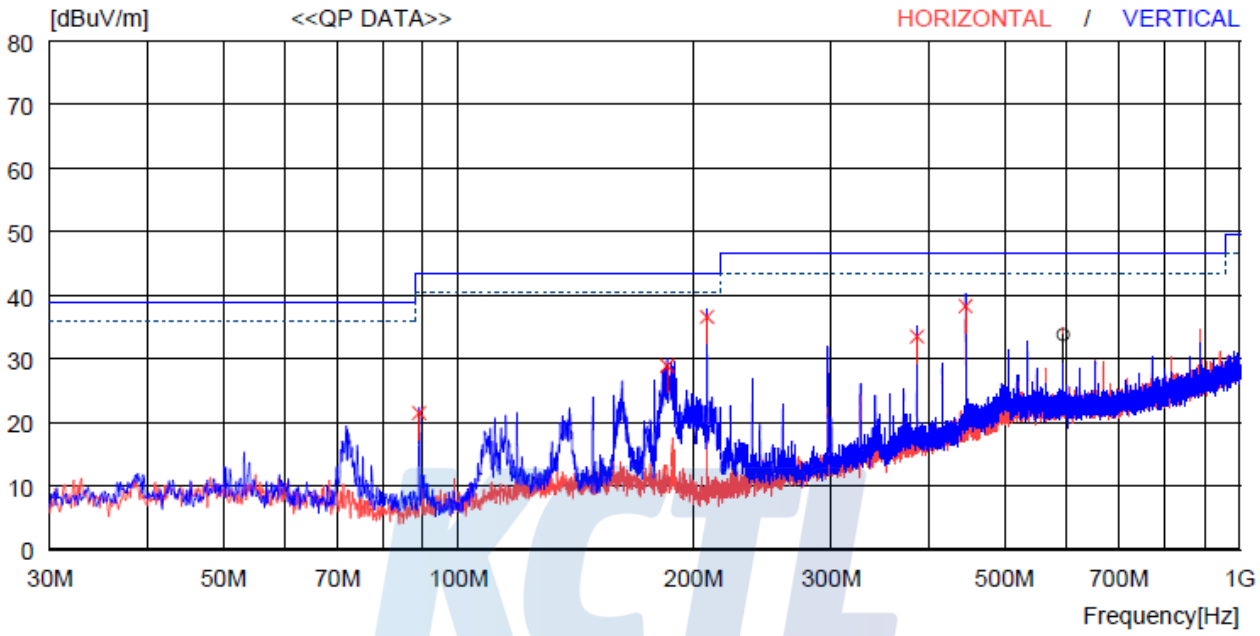
No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT QP [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [deg]
----- Vertical ------										
1	70.740	38.4	15.9	1.3	31.6	24.0	39.0	15.0	134	280
2	89.049	41.2	13.9	1.5	31.6	25.0	43.5	18.5	157	242
3	207.874	51.9	15.5	2.5	31.5	38.4	43.5	5.1	136	345
4	386.111	44.1	20.9	4.2	31.4	37.8	46.5	8.7	208	111
5	445.524	40.8	22.6	5.3	31.5	37.2	46.5	9.3	374	308
6	534.643	39.6	24.1	6.6	31.6	38.7	46.5	7.8	101	186

[DC 24 V - F-CAM MODE]



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT QP [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [deg]
----- Horizontal ------										
1	594.055	35.1	25.2	6.2	31.7	34.8	46.5	11.7	142	63
----- Vertical ------										
2	71.468	35.2	15.8	1.3	31.6	20.7	39.0	18.3	107	287
3	89.049	37.7	13.9	1.5	31.6	21.5	43.5	22.0	164	243
4	207.874	49.2	15.5	2.5	31.5	35.7	43.5	7.8	278	19
5	386.111	40.7	20.9	4.2	31.4	34.4	46.5	12.1	124	131
6	445.524	42.8	22.6	5.3	31.5	39.2	46.5	7.3	116	44

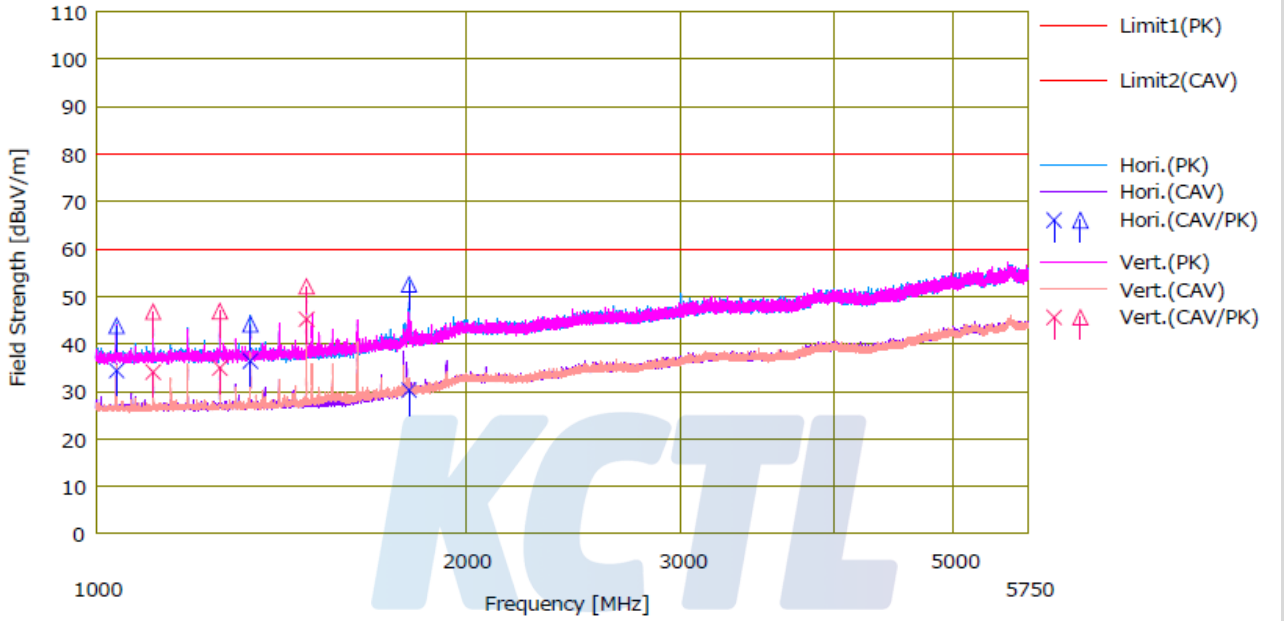
[DC 24 V - R-CAM MODE]



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT QP [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [deg]
----- Horizontal ------										
1	594.055	34.1	25.2	6.2	31.7	33.8	46.5	12.7	134	87
----- Vertical ------										
2	89.049	37.7	13.9	1.5	31.6	21.5	43.5	22.0	188	252
3	184.958	41.2	16.8	2.4	31.5	28.9	43.5	14.6	206	55
4	207.874	50.1	15.5	2.5	31.5	36.6	43.5	6.9	100	327
5	386.111	39.8	20.9	4.2	31.4	33.5	46.5	13.0	124	357
6	445.524	41.9	22.6	5.3	31.5	38.3	46.5	8.2	169	13

1 ㎓ – 5.75 ㎓

[DC 12 V - F-CAM MODE]



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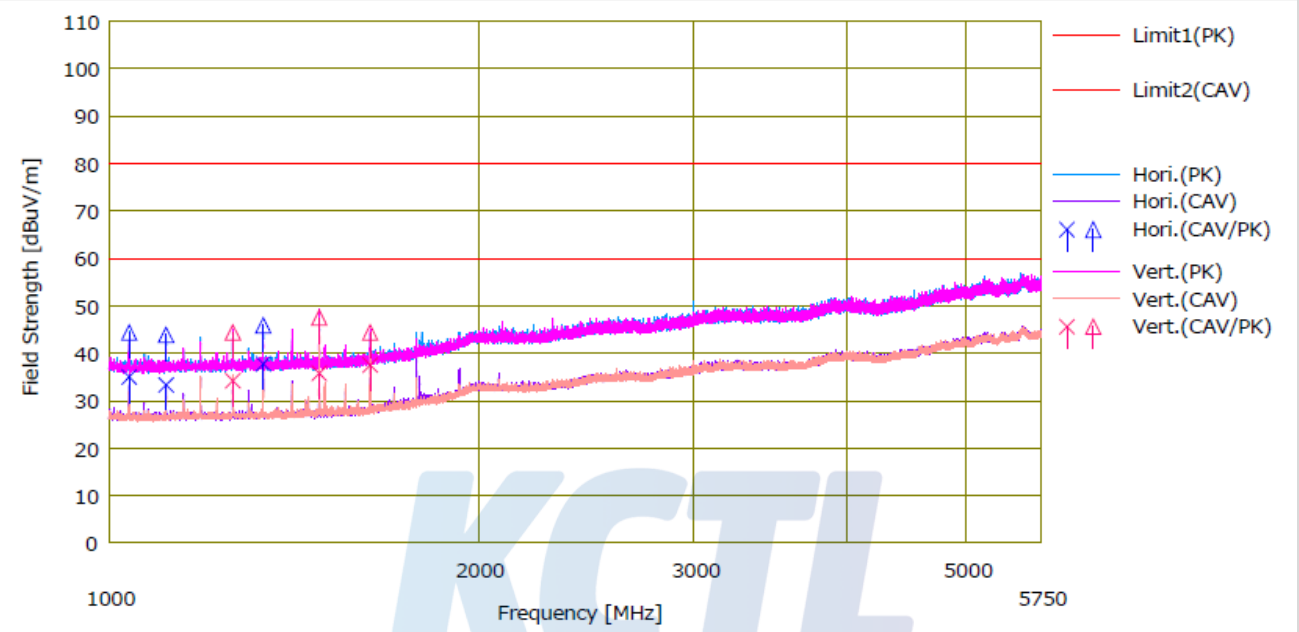
	[MHz]	[dBuV]	[dBuV]	[dB/m]	dBuV/m	dBuV/m	dBuV/m	dBuV/m	[dB]	[dB]	[H/V]	[cm]	[deg]		
1	1039.501	35.69	45.08	-1.25	34.44	43.83	80.00	60.00	36.17	25.56	Hori.	354	110	Horn	
2	1113.500	35.12	47.85	-1.06	34.06	46.79	80.00	60.00	33.21	25.94	Vert.	256	165	Horn	
3	1262.001	35.86	47.79	-0.90	34.96	46.89	80.00	60.00	33.11	25.04	Vert.	386	133	Horn	
4	1336.251	37.18	44.93	-0.76	36.42	44.17	80.00	60.00	35.83	23.58	Hori.	367	341	Horn	
5	1484.999	45.85	52.71	-0.60	45.25	52.11	80.00	60.00	27.89	14.75	Vert.	213	360	Horn	
6	1800.251	28.88	51.19	1.37	30.25	52.56	80.00	60.00	27.44	29.75	Hori.	258	359	Horn	

[DC 12 V - R-CAM MODE]



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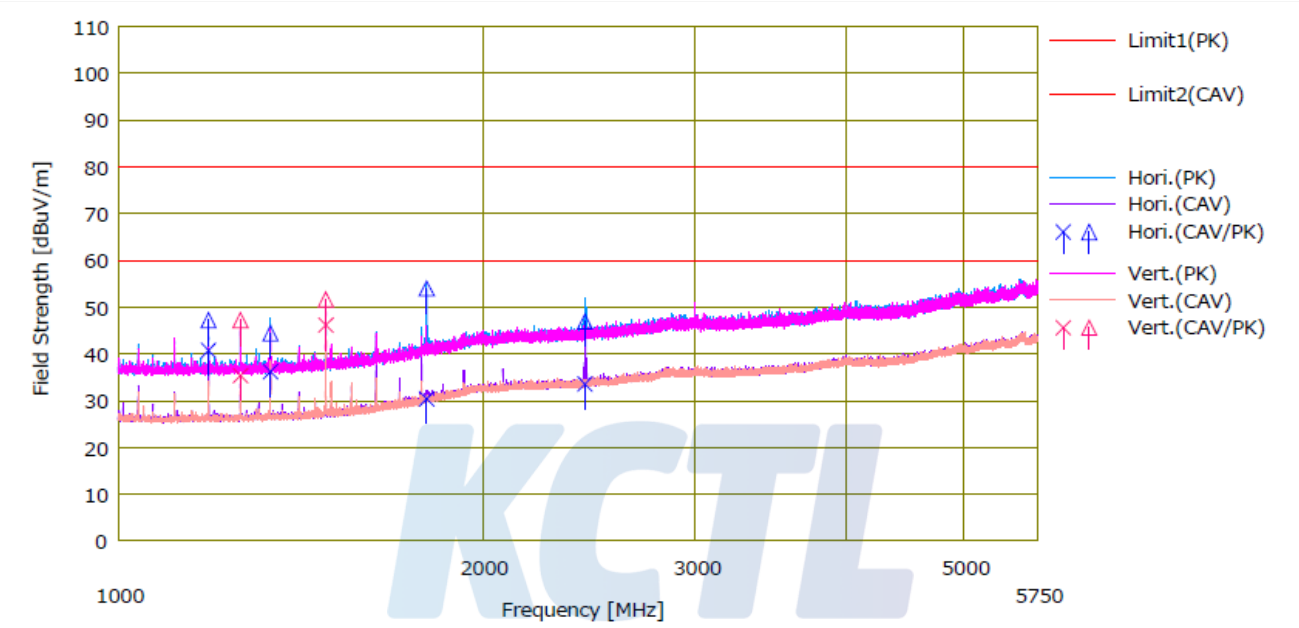
	[MHz]	[dBuV]	[dBuV]	[dB/m]	dBuV/m	dBuV/m	dBuV/m	dBuV/m	[dB]	[dB]	[H/V]	[cm]	[deg]		
1	1039.250	36.28	45.63	-1.25	35.03	44.38	80.00	60.00	35.62	24.97	Hori.	186	324	Horn	
2	1113.751	34.41	44.98	-1.07	33.34	43.91	80.00	60.00	36.09	26.66	Hori.	394	138	Horn	
3	1262.254	35.09	45.31	-0.90	34.19	44.41	80.00	60.00	35.59	25.81	Vert.	319	132	Horn	
4	1336.500	38.51	46.64	-0.76	37.75	45.88	80.00	60.00	34.12	22.25	Hori.	138	351	Horn	
5	1484.751	36.38	48.13	-0.60	35.78	47.53	80.00	60.00	32.47	24.22	Vert.	189	28	Horn	
6	1633.251	37.52	44.39	-0.01	37.51	44.38	80.00	60.00	35.62	22.49	Vert.	357	9	Horn	

[DC 24 V - F-CAM MODE]



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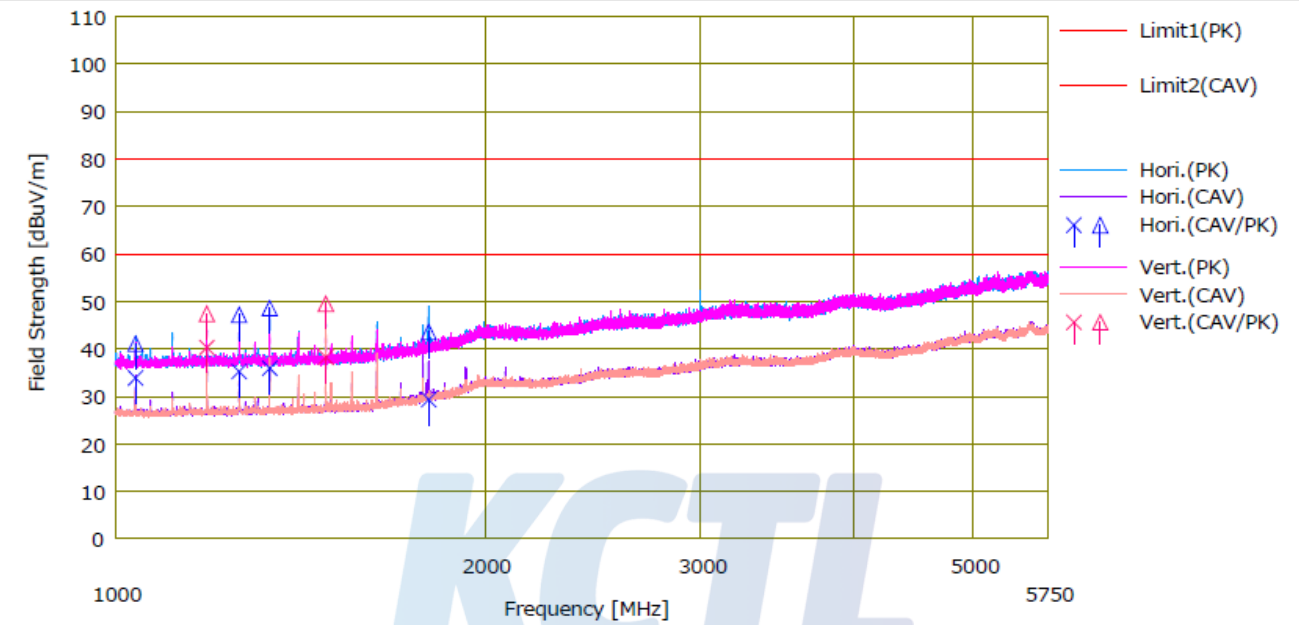
	[MHz]	[dBuV]	[dBuV]	[dB/m]	dBuV/m	dBuV/m	dBuV/m	dBuV/m	[dB]	[dB]	[H/V]	[cm]	[deg]		
1	1187.939	41.70	48.15	-0.94	40.76	47.21	80.00	60.00	32.79	19.24	Hori.	391	63	Horn	
2	1262.227	36.26	48.11	-0.90	35.36	47.21	80.00	60.00	32.79	24.64	Vert.	100	120	Horn	
3	1336.439	36.97	45.20	-0.76	36.21	44.44	80.00	60.00	35.56	23.79	Hori.	369	301	Horn	
4	1484.966	46.78	52.24	-0.60	46.18	51.64	80.00	60.00	28.36	13.82	Vert.	200	16	Horn	
5	1799.628	29.05	52.65	1.36	30.41	54.01	80.00	60.00	25.99	29.59	Hori.	273	0	Horn	
6	2431.738	27.71	41.08	5.85	33.56	46.93	80.00	60.00	33.07	26.44	Hori.	125	258	Horn	

[DC 24 V - R-CAM MODE]



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	[MHz]	[dBuV]	[dBuV]	[dB/m]	dBuV/m	dBuV/m	dBuV/m	dBuV/m	[dB]	[dB]	[H/V]	[cm]	[deg]		
1	1039.250	35.16	42.35	-1.25	33.91	41.10	80.00	60.00	38.90	26.09	Hori.	302	95	Horn	
2	1187.757	41.23	48.37	-0.94	40.29	47.43	80.00	60.00	32.57	19.71	Vert.	367	113	Horn	
3	1262.001	36.17	48.09	-0.90	35.27	47.19	80.00	60.00	32.81	24.73	Hori.	100	156	Horn	
4	1336.251	36.72	49.31	-0.76	35.96	48.55	80.00	60.00	31.45	24.04	Hori.	384	304	Horn	
5	1485.002	38.87	50.13	-0.60	38.27	49.53	80.00	60.00	30.47	21.73	Vert.	248	27	Horn	
6	1800.752	27.95	42.18	1.38	29.33	43.56	80.00	60.00	36.44	30.67	Hori.	154	297	Horn	