

FCC TEST REPORT

Job No. : GPWE2107000132EC

Applicant Name : SmartWitness USA, LLC

Equipment Under Test (EUT) :

Product Name : Vehicle Recorder

Model Name : KP2-NA

Alt. Model Name : See 1.3 General Information of E.U.T.

FCC Authorization Type : Certification

Applied Standards : FCC Part 15 Subpart B, Class B

ANSI C63.4a:2017

Date of Receipt : July 8, 2021

Date of Test : July 23, 2021

Date of Issue : July 29, 2021

Test Results : Complied

Tested by :



Youngsik Na

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.

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Revision History

Revision	Report number	Description
0	F690501-RF-EMC000023	Initial

1. General Information

1.1 Client Information

Applicant	SmartWitness USA, LLC
Applicant Address	1016 Lunt Avenue Schaumburg, IL 60193 United States
Manufacturer	D-TEG Co., Ltd
Manufacturer Address	3F, Jungmin Bldg, 53 Maewha-ro, Bundang-gu, Seongnam, Gyeonggi-do 13505, Korea
Factory	DaWoo Telecom Co., Ltd
Factory Address	#57, Gunpocheomdansaneop 2-ro, Gunpo-si, Gyeonggi-do, 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	Vehicle Recorder	
Model Name	KP2-NA	
Alt. Model Name	KP2, KP2-VZ, KP2-DFC, KP2-NA-64, KP2-NA-DFC-64, KP2-VZ-64, KP2-VZ-DFC-64, KP2-NA-128, KP2-NA-DFC-128, KP2-VZ-128, KP2-VZ-DFC-128	
Model Differences	KP2	Printed sentence on appearance is different.
	KP2-VZ	
	KP2-DFC	
	KP2-NA-64	Printed sentence on appearance and inboxed Micro SD card capacity are different.(Micro SD Card 64GB)
	KP2-NA-DFC-64	
	KP2-VZ-64	
	KP2-VZ-DFC-64	Printed sentence on appearance and inboxed Micro SD card capacity are different.(Micro SD Card 128GB)
	KP2-NA-128	
	KP2-NA-DFC-128	
	KP2-VZ-128	
KP2-VZ-DFC-128		
Serial No	HQNA62100119	
EMI Classification	Class B	
Test Power	DC 12 V , DC 24 V	
Rated Power	DC 12 / 24 V , 1.5 A	
Internal Clock Freq.	2.4 GHz	
Operating Temperature	- 10 ~ + 55 ℃	
H/W Version	1.0.0	
S/W Version	1.0.0	
Port	Power Cable(DC IN, TX(Administrator), RX(Administrator)), Micro 5 pin USB(Administrator), USIM slot, MicroSD card slot	
Function	It is a vehicle recorder that equipped with Bluetooth, Wi-Fi, LTE, GPS functions and recording video in microSD card	

1.4 Operating Modes and Conditions

Operating mode	Operating Condition
1) Camera + MicroSD card + LTE FDD5 attached _ DC 12 V	It was status that received DC 12 V power through car battery and recorded the video in the SD CARD. And the EUT is on connecting status of the LTE FDD 5 by using CMW500 at the same time.
2) Camera + MicroSD card + LTE FDD5 attached _ DC 24 V	It was status that received DC 24 V power through car battery and recorded the video in the SD CARD. And the EUT is on connecting status of the LTE FDD 5 by using CMW500 at the same time.

1.5 Peripheral Equipments

Description	Model	Serial No.	Manufacturer
Car Battery1	Car battery	GB40R	-
Car Battery2	Car battery	GB40R	-
USIM card	-	-	-

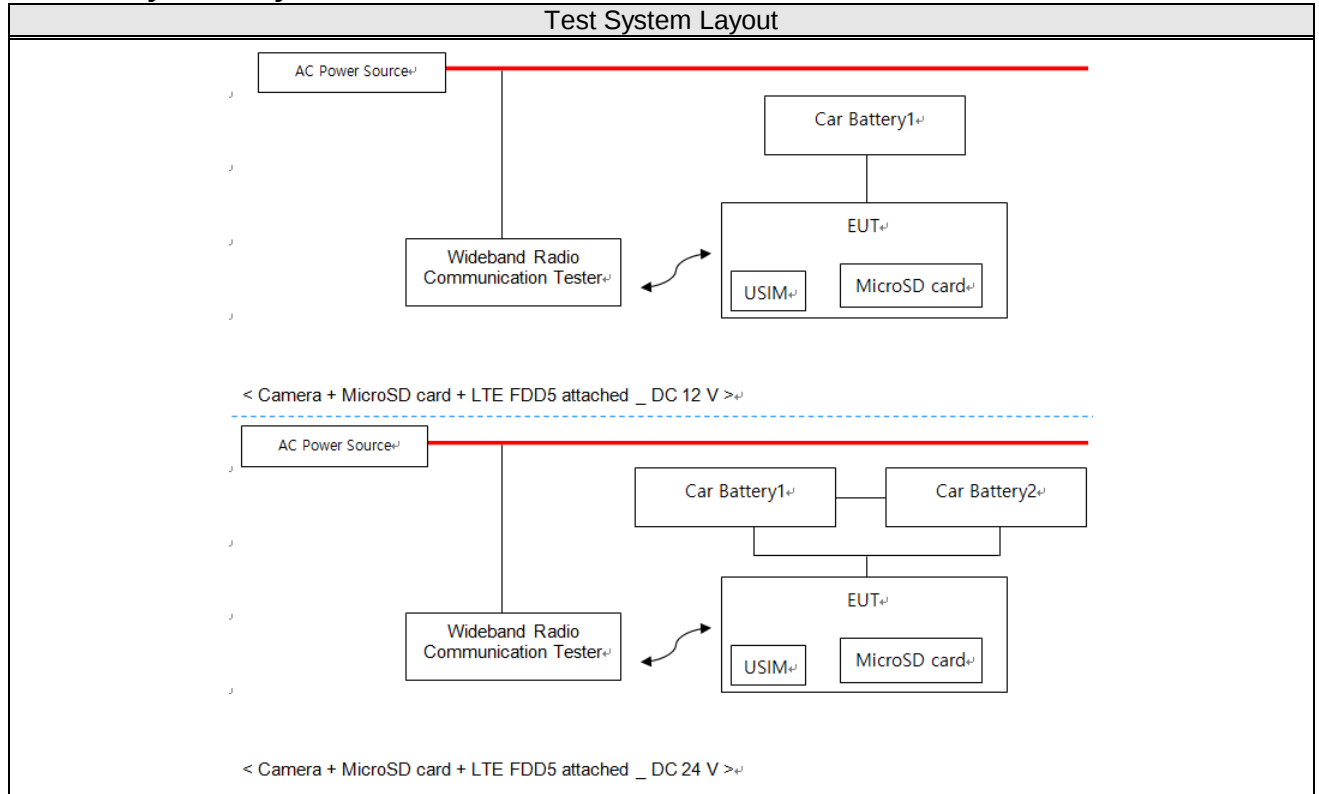
1.6 Cable List

Start		END		Cable Spec.		Used core
Name	I/O Port	Name	I/O Port	Length (m)	Shield	
< Test Mode 1 >						
EUT	DC IN	Car Battery1	DC OUT	5.0	Unshield	No
	USIM slot	USIM	-	-	-	-
	Micro SD card slot	Micro SD card	-	-	-	-
	-	Wideband Radio Communication Tester	-	-	-	-
Wideband Radio Communication Tester	AC IN	AC Power Source	-	1.6	Unshield	No
< Test Mode 2 >						
EUT	DC IN(+)	Car Battery1	DC OUT(+)	5.0	Unshield	No
	DC IN(-)	Car Battery2	DC OUT(-)	5.0	Unshield	No
	USIM slot	USIM	-	-	-	-
	MicroSD card slot	Micro SD card	-	-	-	-
	-	Wideband Radio Communication Tester	-	-	-	-
Wideband Radio Communication Tester	AC IN	AC Power Source	-	1.6	Unshield	No

1.7 System Configurations

Description	Model	Serial No.	Manufacturer	Note
Battery	WEC6R0505QA	-	-	-
CCD Board1	FFS6-B4-V07	-	-	-
CCD Board2	PV3209K_IR_FHD	-	-	-
Cradle Board	CRADLE V100	-	PHOENIX	-
LTE Main Antenna	-	-	PHOENIX	-
LTE Sub Antenna	-	-	PHOENIX	-
Main Board	MAIN V100	MC1C52100095	PHOENIX	-
Sub Board	SUB V100	-	PHOENIX	-
Wireless Module	SC606T-NA	P1A21AN0F00020	QUECTEL	FCC ID : XMR2020SC606NA
Micro SD card	-	-	-	-

1.8 Test System Layout



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 15.107	N/A
Radiated Emission	FCC Part 15 Subpart B Section 15.109	Complied

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

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2.1 Test Results

Test Items	Standards	Test Results
Conducted Emission	FCC Part 15 Subpart B Section 15.107	N/A
Radiated Emission	FCC Part 15 Subpart B Section 15.109	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 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

2.3.1 Test Equipments

Equipment	Model	Manufacturer	Serial No	Cal Due. Date
EMI TEST RECEIVER	ESU40	R&S	100075	2021.08.18
Hybrid ANTENNA	VULB 9163	SCHWARZBECK	9163-390	2022.02.15
Double Ridged Horn Antenna	HF907	R&S	102578	2022.04.15
Low Noise Amplifier	TK-PA01S	200110-L	TESTEK	2022.06.21
Microwave Preamplifier	PAM-118A	Com-Power	551074	2021.10.13
Wideband Radio Communication Tester	CMW 500	R&S	106844	2021.08.11

2.3.2 Test Site

3m SEMI-ANECHOIC CHAMBER in Giheung 2 Laboratory

2.3.3 Environment Conditions

① Below 1 GHz

Temperature	(Minimum 21.0, Maximum 22.0) °C
Humidity	(Minimum 37.0, Maximum 38.0) % R.H..
Atmospheric Pressure	(Minimum 100.4, Maximum 100.4) kPa
Test Date	July 23, 2021

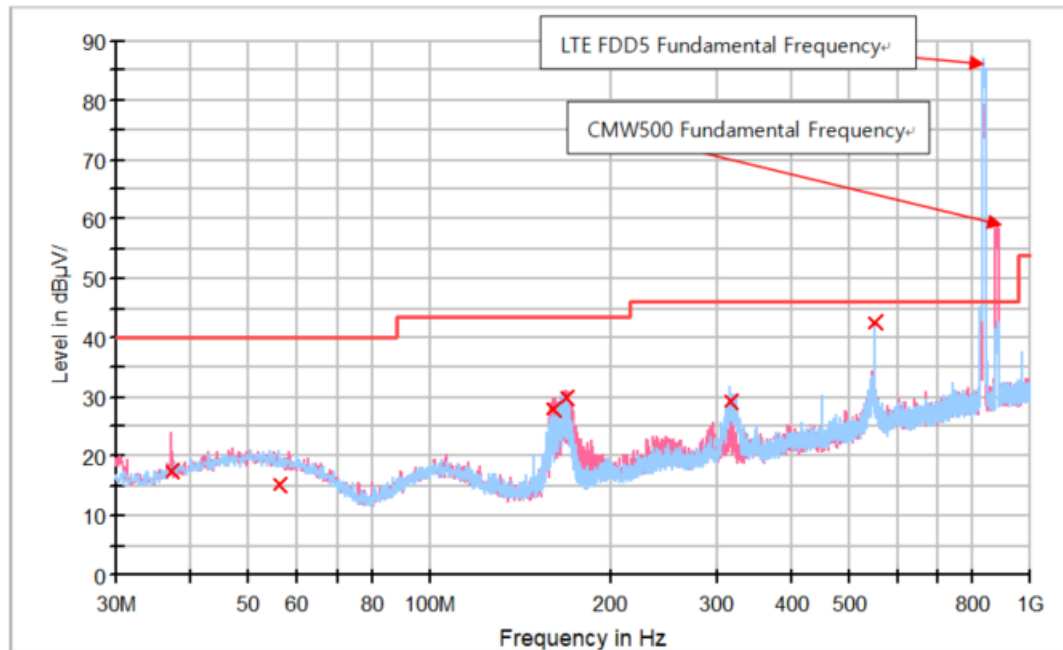
② Above 1 GHz

Temperature	(Minimum 21.0, Maximum 22.0) °C
Humidity	(Minimum 37.0, Maximum 38.0) % R.H..
Atmospheric Pressure	(Minimum 100.4, Maximum 100.4) kPa
Test Date	July 23, 2021

2.3.4 Test Results

① Below 1 GHz (3 m method)

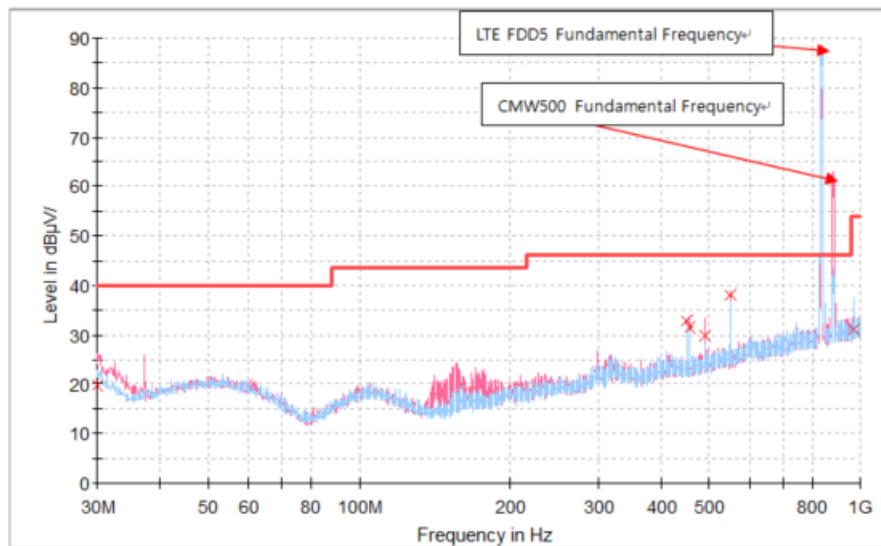
● Test Mode: 1)



Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.178	17.60	40.00	22.40	15 000.0	120.000	141.0	V	219.0	-19.8
56.093	15.32	40.00	24.68	15 000.0	120.000	385.0	H	251.0	-17.9
160.756	27.81	43.50	15.69	15 000.0	120.000	114.0	V	139.0	-22.3
169.195	29.94	43.50	13.56	15 000.0	120.000	100.0	V	107.0	-21.9
316.732	29.37	46.00	16.63	15 000.0	120.000	105.0	H	151.0	-16.5
550.017	42.56	46.00	3.44	15 000.0	120.000	216.0	H	51.0	-11.3

●Test Mode: 2)



Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.097	19.95	40.00	20.05	15 000.0	120.000	118.0	V	347.0	-20.8
450.010	32.81	46.00	13.19	15 000.0	120.000	150.0	H	62.0	-13.4
456.994	31.63	46.00	14.37	15 000.0	120.000	141.0	V	300.0	-13.3
489.683	29.89	46.00	16.11	15 000.0	120.000	100.0	V	0.0	-12.3
550.017	38.02	46.00	7.98	15 000.0	120.000	109.0	V	239.0	-11.2
968.378	31.33	54.00	22.67	15 000.0	120.000	111.0	H	14.0	-5.4

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(μV/m), AF ; 10 dB/m, CL ; 4 dB, Amp ; 25 dB

Result = Level + AF + CL – Amp

= 30 + 10 + 4 - 25

= 19

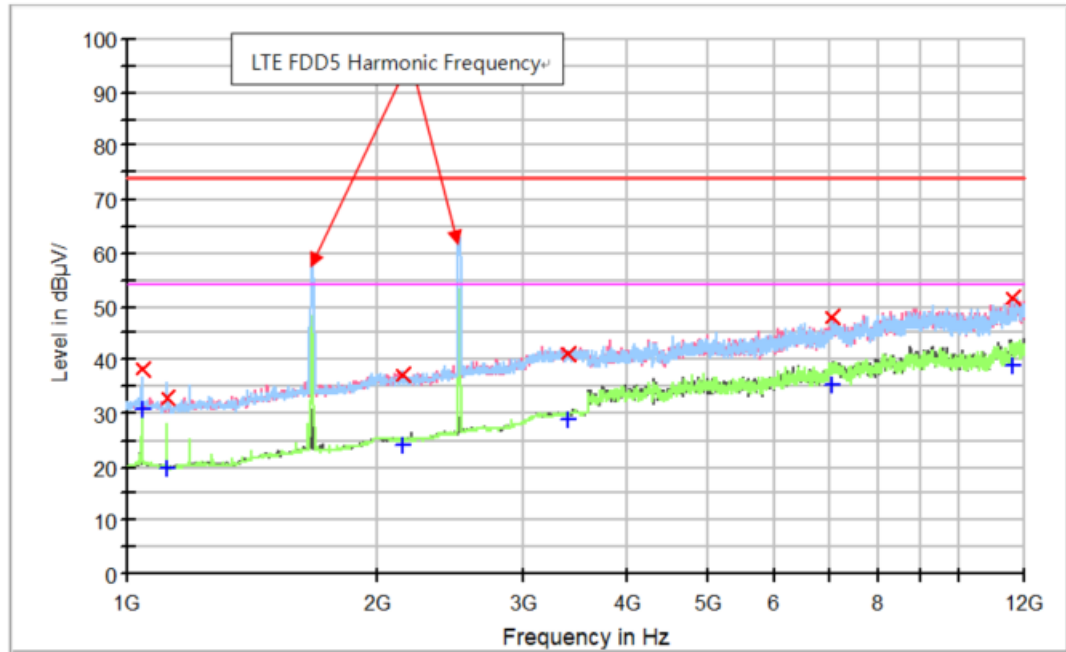
Margin = Limit – Result

= 43.5 – 19

= 24.5

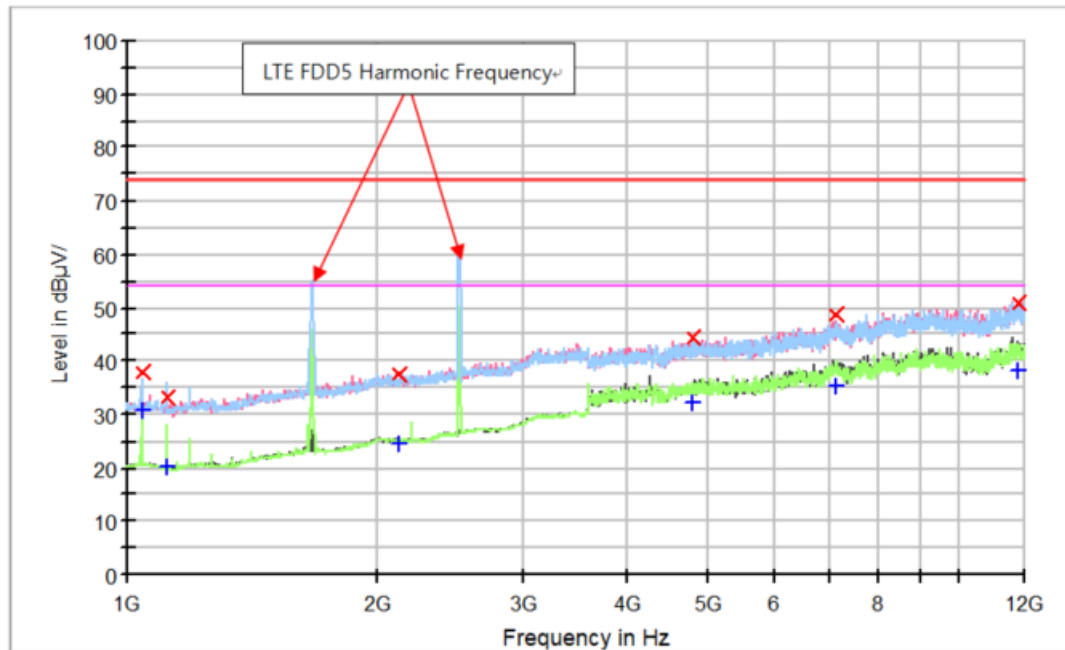
② Above 1 GHz (3 m method)

- Test Mode : 1)



Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1 042.500	---	30.53	54.00	23.47	15 000.0	1 000.000	100.0	H	0.0	-13.6
1 042.500	38.18	---	74.00	35.82	15 000.0	1 000.000	100.0	H	0.0	-13.6
1 115.600	32.94	---	74.00	41.06	15 000.0	1 000.000	216.0	H	0.0	-14.0
1 115.600	---	20.02	54.00	33.98	15 000.0	1 000.000	216.0	H	0.0	-14.0
2 147.500	37.26	---	74.00	36.74	15 000.0	1 000.000	200.0	H	48.0	-9.4
2 147.500	---	24.36	54.00	29.64	15 000.0	1 000.000	200.0	H	48.0	-9.4
3 388.500	---	28.83	54.00	25.17	15 000.0	1 000.000	150.0	H	359.0	-5.5
3 388.500	41.23	---	74.00	32.77	15 000.0	1 000.000	150.0	H	359.0	-5.5
7 048.600	---	35.22	54.00	18.78	15 000.0	1 000.000	198.0	H	334.0	2.8
7 048.600	47.83	---	74.00	26.17	15 000.0	1 000.000	198.0	H	334.0	2.8
11 601.200	---	39.12	54.00	14.88	15 000.0	1 000.000	205.0	V	334.0	6.7
11 601.200	51.60	---	74.00	22.40	15 000.0	1 000.000	205.0	V	334.0	6.7

- Test Mode : 2)



Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1 042.500	---	30.79	54.00	23.21	15 000.0	1 000.000	116.0	H	0.0	-13.6
1 042.500	37.89	---	74.00	36.11	15 000.0	1 000.000	116.0	H	0.0	-13.6
1 115.600	---	20.31	54.00	33.69	15 000.0	1 000.000	350.0	H	174.0	-14.0
1 115.600	33.35	---	74.00	40.65	15 000.0	1 000.000	350.0	H	174.0	-14.0
2 123.700	37.54	---	74.00	36.46	15 000.0	1 000.000	244.0	V	210.0	-9.5
2 123.700	---	24.45	54.00	29.55	15 000.0	1 000.000	244.0	V	210.0	-9.5
4 794.400	---	32.11	54.00	21.89	15 000.0	1 000.000	300.0	V	0.0	-1.5
4 794.400	44.53	---	74.00	29.47	15 000.0	1 000.000	300.0	V	0.0	-1.5
7 125.100	---	35.40	54.00	18.60	15 000.0	1 000.000	385.0	V	68.0	2.8
7 125.100	48.66	---	74.00	25.34	15 000.0	1 000.000	385.0	V	68.0	2.8
11 779.700	50.97	---	74.00	23.03	15 000.0	1 000.000	300.0	H	174.0	6.8
11 779.700	---	38.36	54.00	15.64	15 000.0	1 000.000	300.0	H	174.0	6.8

Measurement Uncertainty : See Appendix A

- Note :
- AF = Antenna Factor
 - POL H = Horizontal
 - H = Height
 - CL = Cable Loss
 - POL V = Vertical
 - Margin = Limit – Result
 - AMP = Amplifier Gain
 - A = Angle
 - Result = Level + AF + CL – AMP

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 -