EMC TEST REPORT

Test Report No.	:	KES-E1-18T0696-R1
Date of Issue	:	Apr. 29, 2019
Product name	:	Base station
Model/Type No.	:	TGBS900BA
Variant Mode	:	-
Applicant	:	Trianglecnc co., Ltd..
Applicant Address	:	B-720, Building Kumkang Penterium IT tower, 282, Hagui-ro, Dongang-gu, Anyang-si, Gyeonggi-do, Rep. of Korea
Manufacturer	:	Trianglecnc co., Ltd..
Manufacturer Address	:	B-720, Building Kumkang Penterium IT tower, 282, Hagui-ro, Dongang-gu, Anyang-si, Gyeonggi-do, Rep. of Korea
Equipment authorization	:	Certification
Date of Receipt	:	Sep. 13, 2018
Test date	:	Apr. 23, 2019
Test Results	:	☒ In Compliance ☐ Not in Compliance

Tested by

Dong Il, Lee
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

This test report is not related to KOLAS.

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Dec. 26, 2018	KES-E1-18T0696	Issued
Apr. 29, 2019	KES-E1-18T0696-R1	Reissue due to retest

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1.0 General Product Description

Main Specifications of EUT are:

Item	Description
Product Input Voltage	100 ~ 240 VAC 50 ㎐ / 60 ㎐(external power source)
Internal Input Voltage	DC 12 V(9 ~ 15 V) (input voltage of board)
Current	300Ma @ 12 V
OS	Linux
Ethernet	10/100 Mbps
Internal Connector	RF module connector
External Connector	RJ45 JACK (Ethernet 10/100 Mbps)
Frequency range	906.4 ㎒ ~ 923.5 ㎒

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 ☐ 230 Vac ☒ 120 Vac ☐ 24 Vac ☐ 12 Vdc ☐ PoE

Frequency ☐ 50 Hz ☒ 60 Hz ☐ 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
Base station	TGBS900BA	-	Trianglecnc co., Ltd..	EUT
Antenna	-	-	-	-

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	NT500R5M	0Q7491AJ800552B	Samsung	-
AC/DC Adapter	A13-040N2A	AD-4019C	Chicony Power Technology Co., Ltd.	-
Keyboard	-	-	Logitech	-
Mouse	M-U0026	1505HS0687	Logitech	-

1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
Base station (EUT)	SMA Type	Antenna (EUT)	N Type	1.5	S
Base station (EUT)	RJ-45	Notebook	RJ-45	2.2	U
Notebook	USB	Keyboard	USB	1.2	U
Notebook	USB	Mouse	USB	1.8	U

* Unshielded=U, Shielded=S

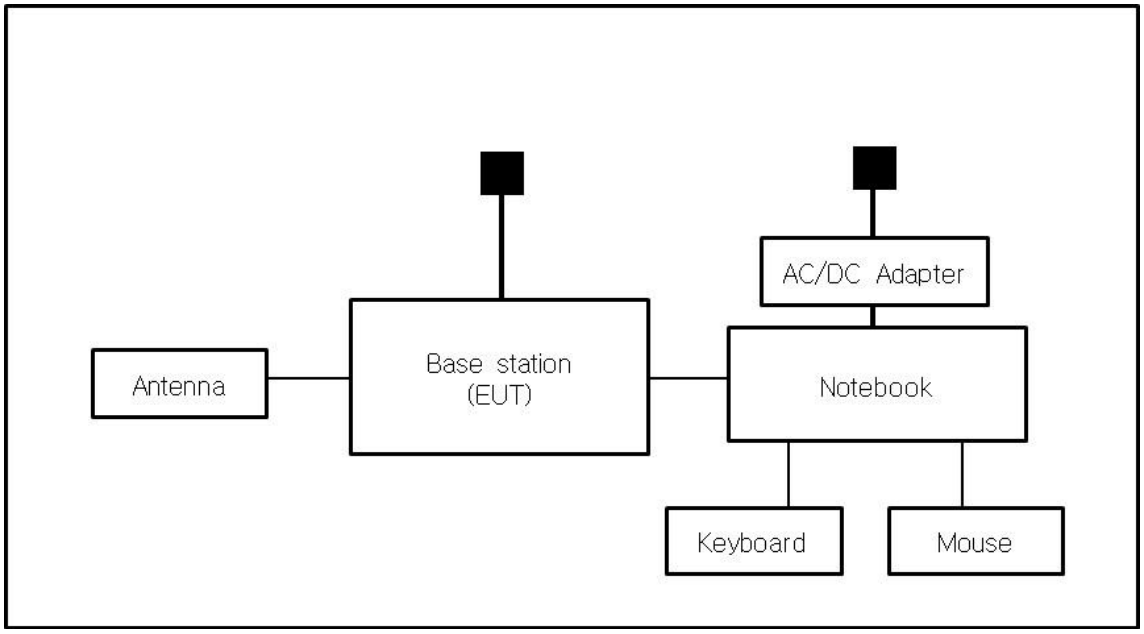
1.7 EUT Operating Mode(s)

Test mode	operating
OPerate	Tested by monitoring on the notebook to see if the test equipment was transmitting.

EUT Test operating S/W		
Name	Version	Manufacture Company
Hercules_3-2-8	3.2.8.3	HW group, s.r.o.

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 16-1-4:2012

1.12 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-4308, C-4798, T-2311, G-914
Europe	TÜ V SÜ D	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 17 07 01633 001

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
Apr. 23, 2018

Test Location
Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101781	04, 22, 2020
☒	LISN	ENV216	R & S	101787	01, 04, 2020
☒	LISN	ESH2-Z5	R & S	100450	04, 22, 2020
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 26, 2019

Test Conditions
Temperature: 22,8 ℃
Relative Humidity: 42,3 % 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
Apr. 23, 2018

Test Location
☐ OPEN AREA TEST SITE #2 ☒ SEMI ANECHOIC CHAMBER #4(10 m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 09, 2020
☒	AMPLIFIER	SCU 01	R & S	100603	11, 26, 2019
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 29, 2020
☒	ATTENUATOR	8491A	HP	32173	03, 11, 2020

Test Conditions
Temperature: 23,1 ℃
Relative Humidity: 43,0 % 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
Apr. 23, 2018

Test Location
SEMI ANECHOIC CHAMBER #4(10 m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 09, 2020
☒	PREAMPLIFIER	8449B	AGILENT	3008A01742	01, 08, 2020
☒	ATTENUATOR	8491A	HP	35496	03, 11, 2020
☒	High Pass Filter	WHKX1.2/15G-6TT	Weinschel	1	06, 29, 2019
☒	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	03, 12, 2020

Test Conditions
Temperature: 23,1 ℃
Relative Humidity: 42,0 % R.H.

Frequency Range of Measurement
1 ㎓ to 5 ㎓

Instrument Settings
IF Band Width: 1 ㎒

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

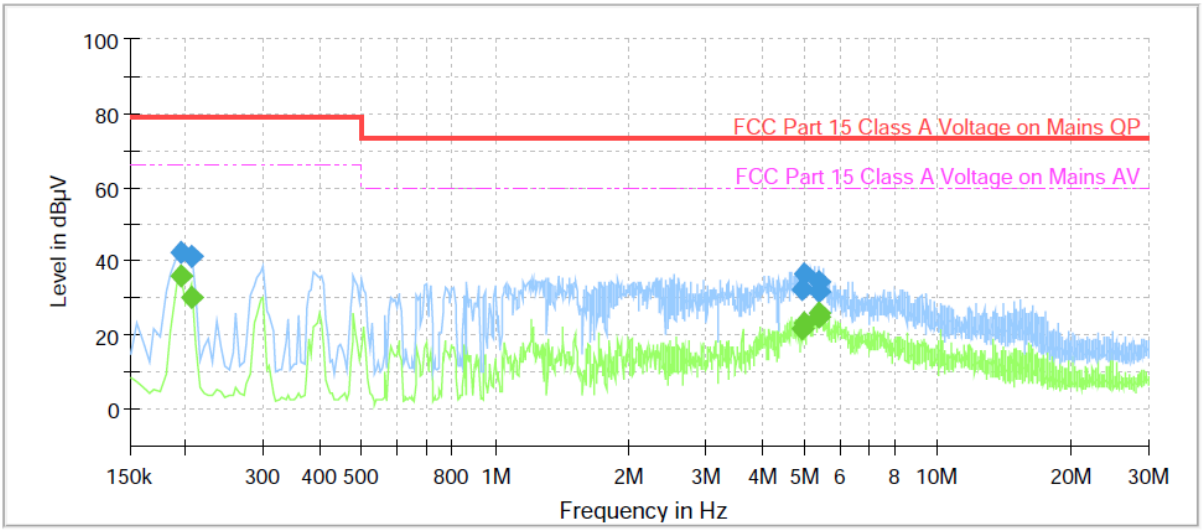
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

Common Information

Test Description:	Conducted Emission
Model No.:	TGBS900BA
Mode	
Operator Name:	KES



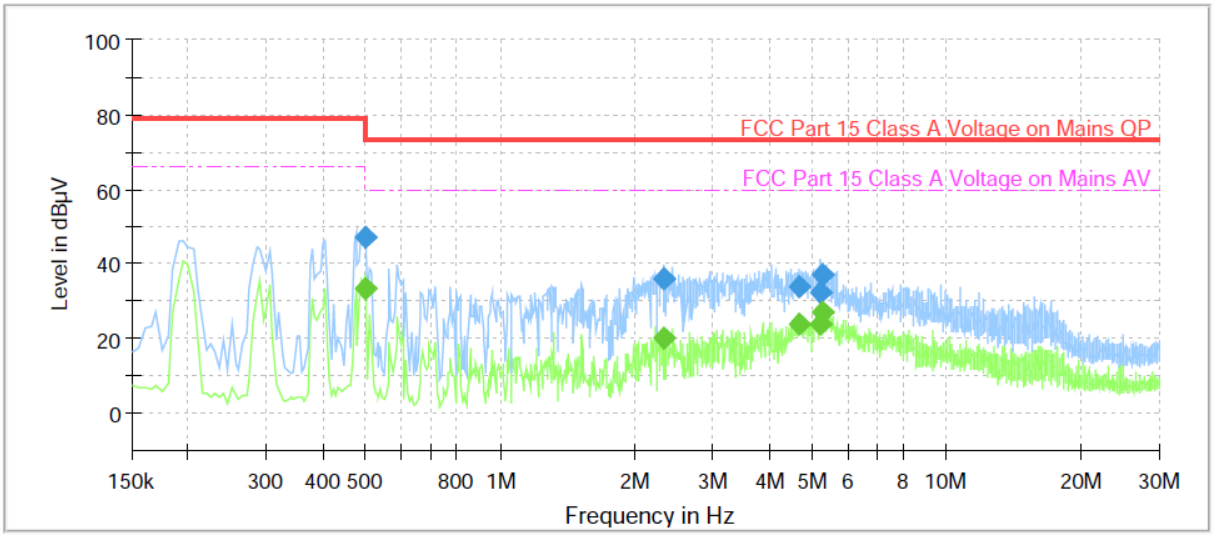
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.195000	---	35.78	66.00	30.22	1000.0	9.000	L1	19.5
0.195000	42.19	---	79.00	36.81	1000.0	9.000	L1	19.5
0.205000	---	30.33	66.00	35.67	1000.0	9.000	L1	19.5
0.205000	41.07	---	79.00	37.93	1000.0	9.000	L1	19.5
4.925000	---	21.58	60.00	38.42	1000.0	9.000	L1	19.8
4.925000	32.39	---	73.00	40.61	1000.0	9.000	L1	19.8
4.990000	---	23.23	60.00	36.77	1000.0	9.000	L1	19.8
4.990000	36.34	---	73.00	36.66	1000.0	9.000	L1	19.8
5.395000	---	25.79	60.00	34.21	1000.0	9.000	L1	19.8
5.395000	34.23	---	73.00	38.77	1000.0	9.000	L1	19.8
5.420000	---	24.67	60.00	35.33	1000.0	9.000	L1	19.8
5.420000	31.53	---	73.00	41.47	1000.0	9.000	L1	19.8

NEUTRAL LINE

Common Information

Test Description:	Conducted Emission
Model No.:	TGBS900BA
Mode	
Operator Name:	KES

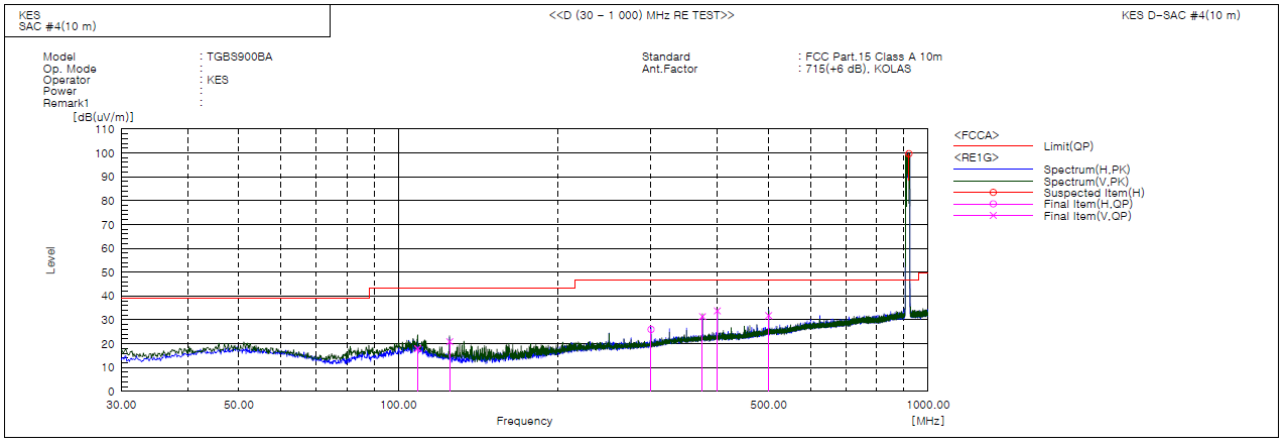


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.500000	---	33.15	60.00	26.85	1000.0	9.000	N	19.6
0.500000	46.91	---	79.00	32.09	1000.0	9.000	N	19.6
2.340000	---	20.04	60.00	39.96	1000.0	9.000	N	19.7
2.340000	36.16	---	73.00	36.84	1000.0	9.000	N	19.7
4.680000	---	24.01	60.00	35.99	1000.0	9.000	N	19.8
4.680000	33.75	---	73.00	39.25	1000.0	9.000	N	19.8
5.200000	---	23.74	60.00	36.26	1000.0	9.000	N	19.8
5.200000	32.46	---	73.00	40.54	1000.0	9.000	N	19.8
5.295000	---	26.80	60.00	33.20	1000.0	9.000	N	19.8
5.295000	37.32	---	73.00	35.68	1000.0	9.000	N	19.8

◆ 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 ㎓)



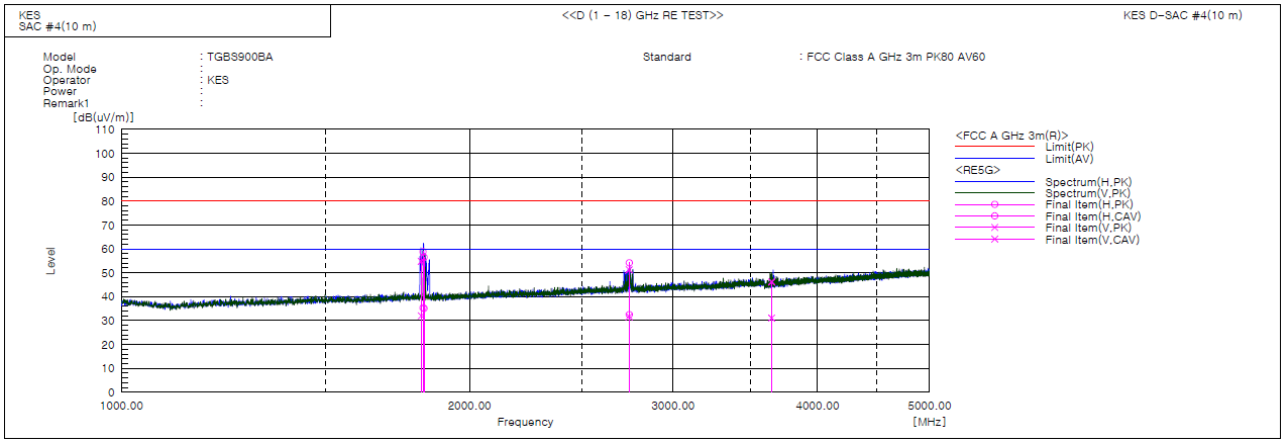
Final Result

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	108.816	V	40.6	-22.7	17.9	43.5	25.6	111.0	40.0	
2	125.016	V	45.7	-24.8	20.9	43.5	22.6	378.0	108.0	
3	300.012	H	44.7	-18.7	26.0	46.5	20.5	400.0	70.0	
4	375.001	V	47.2	-15.8	31.4	46.5	15.1	100.0	278.0	
5	400.011	V	49.1	-15.3	33.8	46.5	12.7	106.0	342.0	
6	500.001	V	44.6	-12.8	31.8	46.5	14.7	128.0	305.0	
7	920.096	H	--------	-5.6	--------	46.5	--------	200.0	193.0	

* Exclusion Band : 960 MHz

♦ 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

Radiated Electric Field Emissions(Above 1 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	1816.790	V	56.0	33.2	-1.2	54.8	32.0	80.0	60.0	25.2	28.0	100.0	328.0	
2	1823.200	H	60.0	36.6	-1.2	58.8	35.4	80.0	60.0	21.2	24.6	342.0	325.0	
3	1827.335	H	57.7	36.3	-1.2	56.5	35.1	80.0	60.0	23.5	24.9	400.0	4.0	
4	2749.560	H	51.3	29.6	2.9	54.2	32.5	80.0	60.0	25.8	27.5	274.0	316.0	
5	2748.415	V	48.5	28.9	2.8	51.3	31.7	80.0	60.0	28.7	28.3	135.0	32.0	
6	3650.595	V	40.3	25.2	5.9	46.2	31.1	80.0	60.0	33.8	28.9	202.0	23.0	

* measurement distance : 3 m

♦ Calculation

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

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