

TEST REPORT

Report No: KST-FCR-090001

Applicant	Name	BiSRO Co.,Ltd.
	Address	POST-BI Center, 932, Wongok-Dong, Danwon-Gu, Ansan-Shi, Gyeonggi-Do, South Korea
Manufacturer	Name	BiSRO Co.,Ltd.
	Address	POST-BI Center, 932, Wongok-Dong, Danwon-Gu, Ansan-Shi, Gyeonggi-Do, South Korea
Equipment	Name	Car Remote Controller
	Model No	ALC-502
	Serial No	None
	Usage	Car Alarm System
Test Standard	FCC CFR 47, Part15, Subpart C -15.231, 15.209, 15.205	
Test Date(s)	2009. 01. 07 ~ 2009. 01. 13	
Issue Date	2009. 01. 14	
Test Result	Compliance	

Supplementary Information

The device bearing the brand name specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with measurement procedures specified in ANSI C 63.4 2003.

We attest to the accuracy of data and all measurements reported herein were performed by KOSTEC Co., Ltd. and were made under Chief Engineer's supervision. We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by Mi Young, Lee

Approved by Gyeong Hyeon, Park

Signature



Signature




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1. GENERAL INFORMATION

1.1 Test Facility

Test laboratory and address

KOSTEC Co., Ltd.

180-254, Annyeong-dong, Hwaseong-si, Gyeonggi-do, South Korea

The open area field test site and conducted measurement facility are used for these testing. This site at was fully described in a reports submitted to the Federal Communications Commission (FCC).

The details of these reports have been found to be in complies with the requirements of Section 2.948 of the FCC Rules on November 14, 2002. The facility also complies with the radiated and conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission (FCC) has the reports on file and KOSTEC Co., Ltd. is listed under FCC Registration No.525762. The test site has been approved by the FCC for public use and is List in the FCC Public Access Link CORES (Commission Registration System)

Registration information

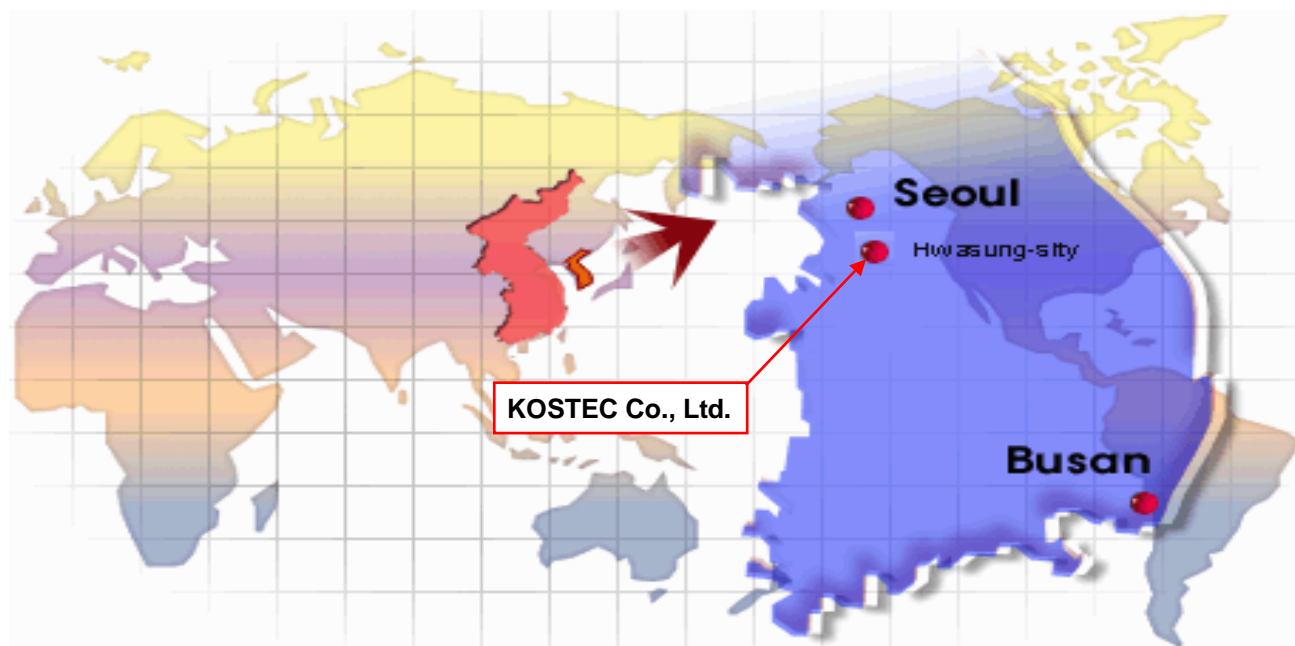
KCC (Korea Communications Commission) Number : KR0041

KOLAS(Korea laboratory accreditation Scheme) Number : 232

FCC Registration Number(FRN) : 525762

VCCI Registration Number : R-1657 / C -1763

1.2 Location



2. EQUIPMENT DESCRIPTION

The product specification described herein was declared by manufacturer. And refer to user's manual for the details.

1) Equipment Name	Car Remote Controller
2) Model No	ALC-502
3) Usage	Car Alarm System
4) Serial Number	Prototype
5) ITU emission Code	8K50F1D
6) Oscillation Type	X-TAL
7) Modulation Type	FSK (Frequency shift keying)
8) Data Rate (Mbps)	1200 bps
9) Operated Frequency	447.925 MHz
10) RF Field Strength	62.09 dBμV (Fundamental frequency level)
11) Channel spacing / Number	Not applicable / 1(one)
12) Communication Type	Two-Way, Simplex
13) Final Amplifier	Q7 (KRA305)
14) Weight / Dimension	250 g / 66 (L) mm x 30 (W) mm x 15 (D) mm
15) Operation temperature	(-) 40 °C ~ (+) 80 °C
16) Power Source	DC 1.5 V (Cell battery)
17) Antenna Description	Connect type: Fixed, Length: 15 mm, Max.Gain: 1.10 dBi

3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

This device is remote control for Car's Engine start/stop and door open/close, it is Consist of transmit and Receive part circuit and design to stand along type without peripheral device, rated power source was supply internal cell battery, it is only operated when user is push button in it (EUT). The rated working frequency is 447.925 MHz.

3.2 Used Product list

Description	Model No.	Serial No.	Manufacture	Remark
Remote Controller	WLC-502	None	BiSRO Co., Ltd.	None
Cell battery	None	None	ativa	Internal with R/C*

R/C* : Remote Controller

3.3 Product Modification

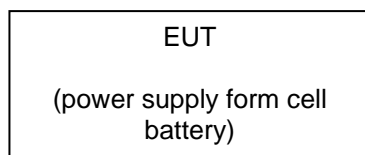
N/A

3.4 Operating Mode

Radiated measurement were intentional to maximum the emissions from EUT, and other test is applied for Applicable Requirement standard

3.5 Test Setup of EUT

The measurements were taken in maximum transmit mode using a push button



※ Test table: Non-conduction table

3.6 Used Test Equipment List

No.	Instrument	Model	Serial No.	Manufacturer	Due to Cal. Date	Used
1	Spectrum Analyzer	8563E	3846A10662	Agilent Technology	2009.05.20	<input checked="" type="checkbox"/>
2	Test Receiver	ESCS30	100111	Rohde & Schwarz	2009.03.07	<input checked="" type="checkbox"/>
3	Test Receiver	ESPI3	100109	Rohde & Schwarz	2009.03.03	<input checked="" type="checkbox"/>
4	LISN	ESH2-Z5	100044	Rohde & Schwarz	2009.04.30	<input type="checkbox"/>
5	LISN	ESH3-Z5	100147	Rohde & Schwarz	2009.06.25	<input type="checkbox"/>
6	Ultra broadband Antenna	HL562	100075	Rohde & Schwarz	2010.03.20	<input checked="" type="checkbox"/>
7	Horn Antenna	3115	2996	EMCO	2009.06.13	<input checked="" type="checkbox"/>
8	Loop Antenna	6502	9203-0493	EMCO	2009.06.15	<input type="checkbox"/>
9	RF Power Amplifier	8347A	3307A01571	HP	2009.05.20	<input checked="" type="checkbox"/>
10	Microwave Amplifier	8349B	2627A01037	HP	2009.05.20	<input checked="" type="checkbox"/>
11	Attenuator	8498A	3318A09485	HP	2009.05.20	<input checked="" type="checkbox"/>
12	Temperature & Humidity Chamber	EY-101	90E14260	TABAI ESPEC	2009.03.26	<input type="checkbox"/>
13	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2009.05.20	<input type="checkbox"/>
14	RF Power Sensor	ECP-E18A	US37181768	Agilent Technology	2009.05.20	<input type="checkbox"/>
15	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2009.05.20	<input type="checkbox"/>
16	Tunable Notch Filter	3TNF-0008	317	Dover Technology	2009.06.04	<input checked="" type="checkbox"/>
17	SLIDAC	None	0207-4	Myoung-Sung Electronic Co., Ltd.	2009.05.20	<input type="checkbox"/>
18	DC Power supply	DRP-5030	9028029	Digital Electronic Co., Ltd	2009.06.04	<input type="checkbox"/>
19	DC Power supply	UP-3005T	68	Unicon Co., Ltd	2009.05.20	<input type="checkbox"/>
20	DC Power supply	E3610A	KR24104505	Agilent Technology	2009.05.20	<input checked="" type="checkbox"/>
21	Antenna Master	-	-	Daeil EMC	-	<input checked="" type="checkbox"/>
22	Turn Table	-	-	Daeil EMC	-	<input checked="" type="checkbox"/>

4. SUMMARY TEST RESULTS

Description of Test	ETSI Rule	Reference Clause	Test Result
20 dB Bandwidth testing	Subpart 15.231 (c)	Clause 5.1	Compliance
Deactivation testing	Subpart 15.231 (1) of (a)	Clause 5.2	Compliance
Duty Cycle	Not applicable	Clause 5.3	Compliance
Transmitter radiated emission	Subpart 15.231(b)	Clause 5.4	Compliance
<p>Compliance : The EUT complies with the essential requirements in the standard.</p> <p>Not Compliance : The EUT does not comply with the essential requirements in the standard.</p> <p>N/A : The test was not applicable in the standard.</p>			

5. MEASUREMENT RESULTS

5.1 20dB Bandwidth testing

5.1.1 Standard Applicable [Subpart C-15.231(c)]

The bandwidth of the emission shall be no wider than 0.25 % of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

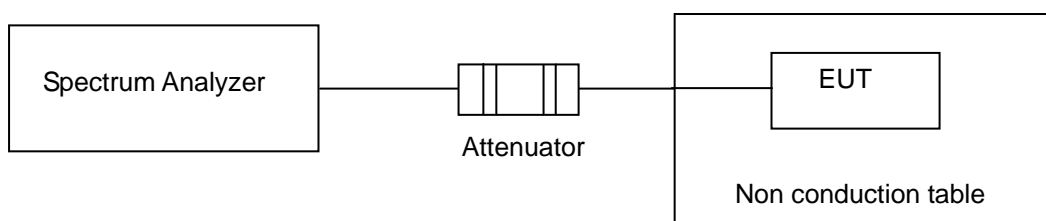
5.1.2 Test Conditions

- Operation Mode : Continuous data frame Transmitting
- Environmental Conditions :
 - Normal temperature : 23 °C, Relative Humidity: (55 ~ 58) % R.H.

5.1.3 Measurement Procedures

- ① Place the EUT on the table and set it in TX continuous mode
- ② Remove the antenna from the EUT and then connected to spectrum analyzer via a suitable low loss RF cable and attenuator.
- ③ Finally test is performed according to above standard

5.1.4 Test Setup Layout



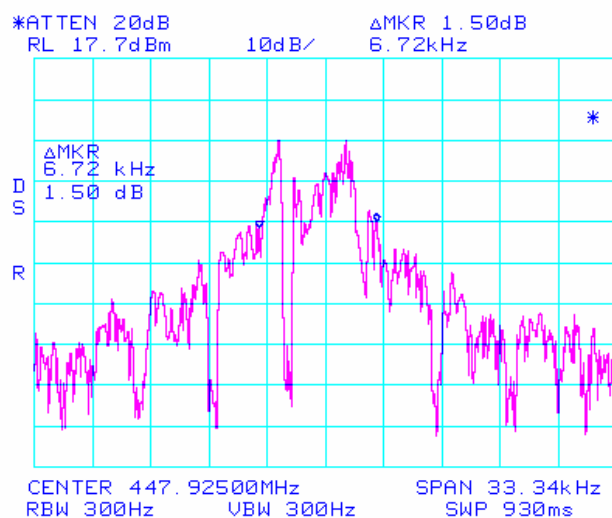
5.1.5 Measurement Result

※ 20 dB BW Limit = Frequency x 0.25 % = 447.925 x 0.25 % = 1.119 MHz

Operating frequency (MHz)	20 dB Bandwidth (MHz)	Limit (MHz)	Result
447.925	0.00672	1.119	Compliance
* Measurement uncertainty : ± 0.082 MHz			

5.1.6 Test Plot (20 dB Bandwidth)

- Frequency : 447.925 MHz



5.2 Deactivation testing

5.2.1 Standard Applicable [Subpart C-15.231 (1) of (a)]

A manually operated Transmitter shall employ a switch that will automatically deactivate the Transmitter within not more than 5 seconds of being released.

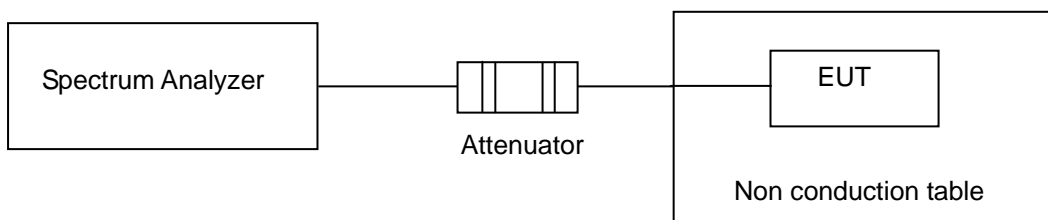
5.2.2 Test Conditions

- Operation Mode : Transmitting normal operation mode
- Environmental Conditions :
 - Normal temperature : 23 °C, Relative Humidity: (55 ~ 58) % R.H.

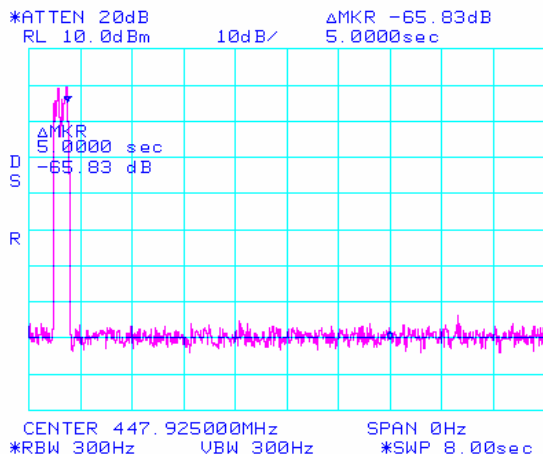
5.2.3 Measurement Procedures

- ① Place the EUT on the table and set it in TX Normal operating mode
- ② Remove the antenna from the EUT and then connected to spectrum analyzer via a suitable low loss RF cable and attenuator.
- ③ Finally test is perform according to above standard

5.2.4 Test Setup Layout



5.2.5 Test Plot



* Result of test deactivation time is more than 5 second of being release

5.3 Dwell Time

5.3.1 Standard Applicable [Not Applicable]

No dedicated limit specified in the Rules

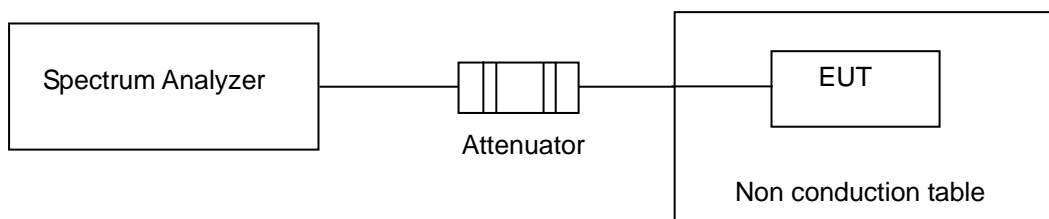
5.3.2 Test Conditions

- Operation Mode : Transmitting normal operation mode
- Environmental Conditions :
 - Normal temperature : 23 °C , Relative Humidity: (55 ~ 58) % R.H.

5.3.3 Measurement Procedures

- ① Place the EUT on the table and set it in TX Normal operating mode
- ② Remove the antenna from the EUT and then connected to spectrum analyzer via a suitable low loss RF cable and attenuator.
- ③ Set center frequency of spectrum analyzer: operating frequency.
- ④ Spectrum analyzer was set as follows :
 - Resolution BW 300 Hz
 - Video BW 300 Hz
 - Span 0 Hz
 - Detector Normal mode
 - Trigger Video(80 % set of signal)
 - Sweep time 428 ms
- ⑤ Repeat above procedures until all frequency measured was complete.

5.3.4 Test Setup Layout

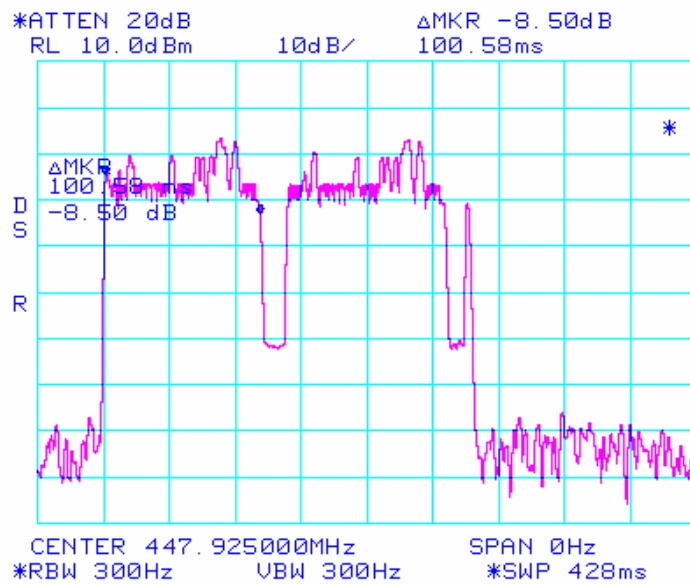


5.3.5 Measurement Result

※ When it is operating, emitted modulated RF periodically two data frame length time 201 ms

One data frame is about 102 ms

5.3.6 Test Plot



5.4 Transmitter radiated emission

5.4.1 Standard Applicable [Subpart C-15.231, 15.209, 15.205]

Radiated emission from intentional radiators operated under this Section shall comply with as below follow table ;

(1) Intentional Radiated emission Limits ; §15.231

Periodic operation in the band 40.66-40.70 MHz and above 70 MHz,

The field strength of emissions from intentional radiators operated under this section shall not exceed the following ;

Frequency Band	Field strength of Fundamental ($\mu\text{V/m}$)	Field strength of Spurious Emissions ($\mu\text{V/m}$)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 **	125 to 375 **
174-260	3,750	375
260-470	3,750 to 12,500 **	375 to 1250 **
Above 470	12,500	1250
** Linear interpolations		

(2) Radiated emission limits, general requirements ; §15.209

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in §15.209, as following Table :

Frequency Band	Field strength of Fundamental ($\mu\text{V/m}$)	Field strength of Fundamental ($\text{dB}\mu\text{V/m}$)
30 - 88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0
as shown in 15.35(b), for frequencies above 100 MHz, the field strength limits are based on average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 under any condition of modulation		

5.4.2 Measurement Procedure

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the OATS(Open-Area Test –Site), if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

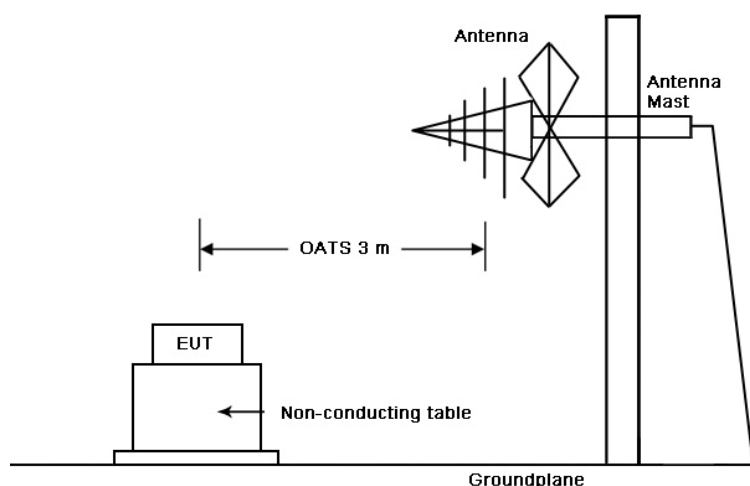
For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m.

This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$\text{Result(dB}\mu\text{V/m)} = \text{Reading(dB}\mu\text{V/m)} + \text{Antenna factor(dB/m)} + \text{CL(dB)}$$



※ More detail of test procedure is performed according to ANSI 63.4: 2003

5.4.3 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 NIS 80,81, The measurement uncertainty level with a 95 % confidence level were apply to Uncertainty of a radiation emissions measurement at OATS(Open Area Test Site) of KOSTEC is ± 4.0 dB

5.4.4 Test Conditions

- Operation Mode : Continuous Transmitting
- Environmental Conditions :
 - Normal temperature : 23 °C, Relative Humidity: (56 ~ 58) % R.H. Pressure : 100.5 kPa

5.4.5 Measurement Result

Method of calculation formula about linear interpolations of §15.231 are as follows ;

[Where F is the frequency in MHz, the formulas for calculation the maximum permitted fundamental field strengths are as follows ;

For the band 260 - 470 MHz, $\mu V/m$ at 3meter = $41.667(F) - 7083.3333$

According to above method of calculation formula, limit Value of FCC Part 15.231 in the table

※ As a below table, test result is comply with applicable requirement standard

Below 1 GHz

Freq.	Reading	Table	Antenna			CL	Pre-amp	Result	Limit	Mgn	Remark
(MHz)	(dB $\mu V/m$)	(Deg)	Height (m)	Pol. (H/V)	Fctr. (dB/m)	(dB)	(dB)	(dB $\mu V/m$)	(dB $\mu V/m$)	(dB)	
95.60	27.65	83	2.7	H	9.37	3.12	-20	20.14	43.50	23.36	Spurious
193.260	29.30	220	2.3	V	7.54	4.48	-20	21.32	43.50	22.18	Spurious
447.925	40.42	80	1.8	V	14.51	7.16	-	62.09	81.27	19.18	Fundamental
895.850	23.68	105	2.1	V	20.81	10.62	-20	35.11	46.00	10.89	Harmonic

※ Above Result value is applied subpartC-15.231 and 15.209 according measurement frequency

Above 1 GHz

Freq.	Reading	Table	Antenna			CL	Pre-amp	Result	Limit	Mgn.	Remark
(MHz)	(dB $\mu V/m$)	(Deg)	Height (m)	Pol. (H/V)	Fctr. (dB/m)	(dB)	(dB)	(dB $\mu V/m$)	(dB $\mu V/m$)	(dB)	
Above 1GHz	Measured signal is not detected								54.00		

※ Regend: See as below table

Freq.(MHz) : Measurement frequency, Reading(dB $\mu V/m$) : Indicated value for test receiver,
Table (Deg) : Directional degree of Turn table, Antenna(Pol, Fctr) : Polarization and Factor
CL(dB) : Cable loss, Result (dB $\mu V/m$) : Reading(dB $\mu V/m$) + Antenna factor.(dB/m) + CL(dB) - Preamp gain(dB)
FCC Limit(dB $\mu V/m$): Limit value specified with FCC Rule, FCC Mgn(dB) : FCC Limit (dB $\mu V/m$) - Result(dB $\mu V/m$),