

TEST REPORT

Report No: KST-FCR-090002

Applicant	Name	BiSRO Co.,Ltd.
	Address	JoongAng ilbo 9F 778, Wonsi-Dong, Danwon-Gu, Ansan-Si, Gyeonggi-Do, Korea
Manufacturer	Name	BiSRO Co.,Ltd.
	Address	JoongAng ilbo 9F 778, Wonsi-Dong, Danwon-Gu, Ansan-Si, Gyeonggi-Do, Korea

Equipment	Name	Two-way Car Main Controller
	Model No	MB-SFG
	Serial No	-
	FCC ID	WJ3MB-SFG

Test Standard	FCC CFR 47, Part15, Subpart C -15.231, 15.209, 15.205
Test Date(s)	2009. 08. 10 ~ 2009. 08. 12
Issue Date	2009. 08. 13
Test Result	Compliance

Supplementary Information

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

IC Company Number(C,N) : 8305A

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	Two-way Car Main Controller
2) Model No	MB-SFG
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	433.920 MHz
10) RF Field Strength	0.005 W (Conducted power)
11) Channel Number	One Channel
12) Communication Type	Simplex(Two-way)
13) Final Amplifier	Q6 (4226)
14) Weight / Dimension	Controller: 2.7 kg / 140 (L) mm x 90 (W) mm x 28 (D) mm
	RF Part: 250 g / 50 (L) mm x 30 (W) mm x 12 (D) mm
15) Operation temperature	(-) 40 °C ~ (+) 80 °C
16) Power Source	12 Vd.c.(From Car battery)
17) Antenna Description	Connect type: Fixed, Type: Helical, Length: 75 mm

3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

This device is Two-way Car Main controller for Car's Engine start/stop and door open/close, it is named transceiver, the receiver portion of the device will be take a DoC under the Verification procedure and also it is design to RF Part with control part, Rated power source was supplied 12Vdc from Car battery Operation type is after response and send a short message to remote controller When user is push button at the remote controller

3.2 Used Product list

Description	Model No.	Serial No.	Manufacture	Remark
Main Controller	MB-SFG	-	BiSRO Co., Ltd.	Two-way type
Power supply	E3610A	KR24104505	Agilent Technology	Power source: 12Vdc

3.3 Product Modification

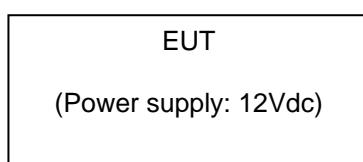
N/A

3.4 Operating Mode

Radiated operating mode was set forth the maximum emissions from EUT, unless otherwise it 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 place: 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	2010.05.20	<input checked="" type="checkbox"/>
2	Test Receiver	ESCS30	100111	Rohde & Schwarz	2010.03.07	<input checked="" type="checkbox"/>
3	Test Receiver	ESPI3	100109	Rohde & Schwarz	2010.03.07	<input checked="" type="checkbox"/>
4	LISN	ESH2-Z5	100044	Rohde & Schwarz	2010.04.30	<input type="checkbox"/>
5	LISN	ESH3-Z5	100147	Rohde & Schwarz	2010.06.25	<input type="checkbox"/>
6	Ultra broadband Antenna	HL562	100075	Rohde & Schwarz	2010.03.20	<input checked="" type="checkbox"/>
7	Horn Antenna	3115	2996	EMCO	2010.06.13	<input checked="" type="checkbox"/>
8	Loop Antenna	6502	9203-0493	EMCO	2011.06.11	<input type="checkbox"/>
9	RF Power Amplifier	8347A	3307A01571	HP	2010.05.20	<input checked="" type="checkbox"/>
10	Microwave Amplifier	8349B	2627A01037	HP	2010.05.20	<input checked="" type="checkbox"/>
11	Attenuator	8498A	3318A09485	HP	2010.05.20	<input checked="" type="checkbox"/>
12	Temperature & Humidity Chamber	EY-101	90E14260	TABAI ESPEC	2010.03.16	<input type="checkbox"/>
13	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2010.05.20	<input type="checkbox"/>
14	RF Power Sensor	ECP-E18A	US37181768	Agilent Technology	2010.05.20	<input type="checkbox"/>
15	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2010.05.20	<input type="checkbox"/>
16	Tunable Notch Filter	3TNF-0008	317	Dover Technology	2010.05.20	<input checked="" type="checkbox"/>
17	SLIDAC	None	0207-4	Myoung-Sung Electronic Co., Ltd.	2010.05.20	<input type="checkbox"/>
18	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2010.05.20	<input type="checkbox"/>
19	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2010.05.20	<input type="checkbox"/>
20	DC Power supply	E3610A	KR24104505	Agilent Technology	2010.05.20	<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
Compliance : The EUT complies with the essential requirements in the standard. Not Compliance : The EUT does not comply with the essential requirements in the standard. N/A : The test was not applicable in the standard.			

5. MEASUREMENT RESULTS

5.1 20 dB 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.

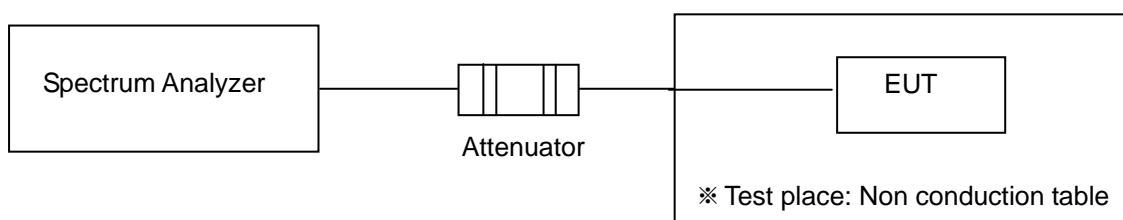
5.1.2 Test Conditions

- Operation Mode : Continuous maximum data frame Transmitting
- Environmental Conditions :
 - Normal temperature : 23 °C, Relative Humidity: (56 ~ 57) % 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 measurement result is record the test report

5.1.4 Test Setup Layout



5.1.5 Measurement Result

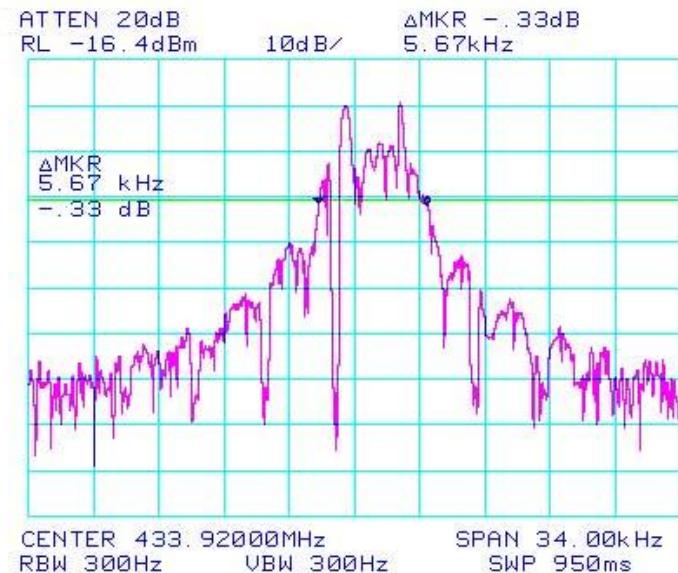
The test result is as below formula ;

$$\blacktriangleright 20\text{dB BW Limit} = \text{Frequency} \times 0.25\% = 433.920 \times 0.25\% = 1.085 \text{ MHz}$$

Operating frequency (MHz)	20 dB Bandwidth (MHz)	Limit (MHz)	Result
433.920	0.00567	1.085	Compliance

5.1.6 Test Plot (20dB Bandwidth)

- Setting frequency : 433.920 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.

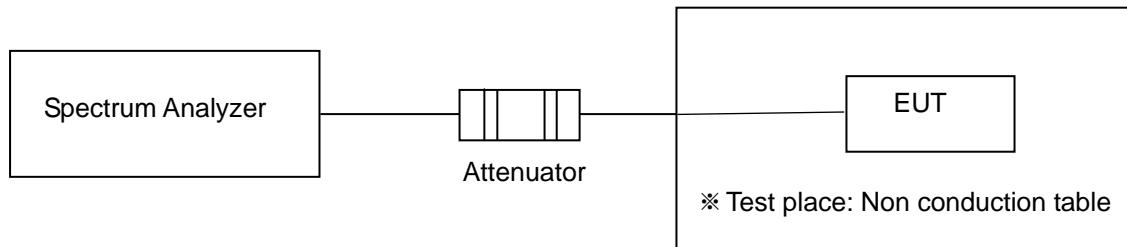
5.2.2 Test Conditions

- Operation Mode : Transmitting normal operation mode
- Environmental Conditions :
 - Normal temperature : 23 °C, Relative Humidity: (56 ~ 57) % R.H.

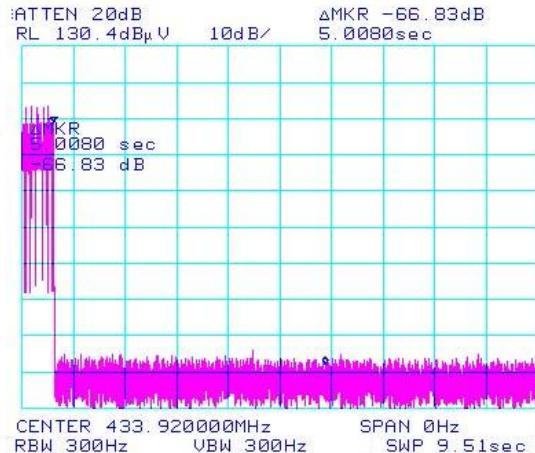
5.2.3 Measurement Procedures

- 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 measurement result is record the test report

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, Only this clause is in order to supplementation for above Clause
 (5.2 deactivation testing)

5.3.2 Test Conditions

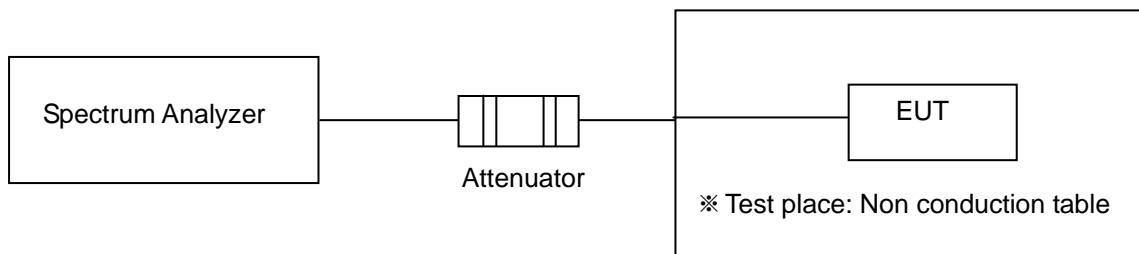
- Operation Mode : Transmitting normal operation mode
- Environmental Conditions :
 - Normal temperature : 23 °C, Relative Humidity: (56 ~ 57) % R.H.

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 (433.920 MHz)
- 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	Auto
- ⑤ Repeat above procedures until all frequency measured was complete.

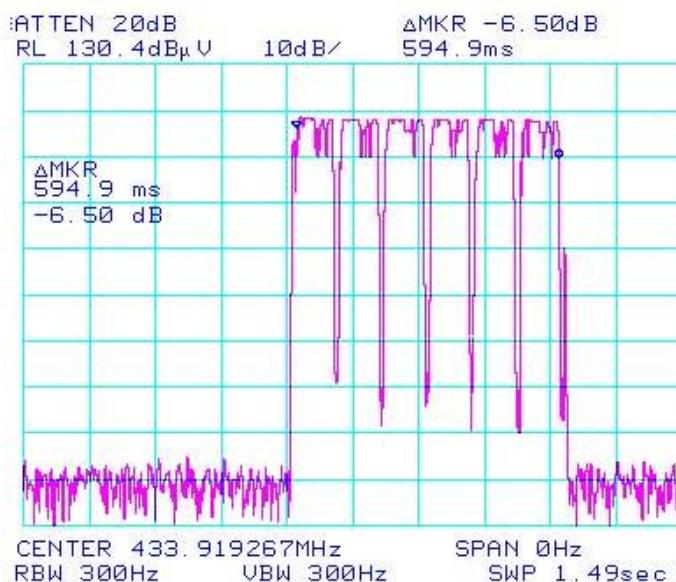
5.3.4 Test Setup Layout



5.3.5 Measurement Result

- ※ When push button in it and then emitting modulated frequency periodically 6(six) data frame length time about 600 ms (accordingly one data frame length time about 100 ms, Please see as a below plot

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 (μ V/m)	Field strength of Spurious Emissions (μ 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 (μ V/m)	Field strength of Fundamental (dB μ 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

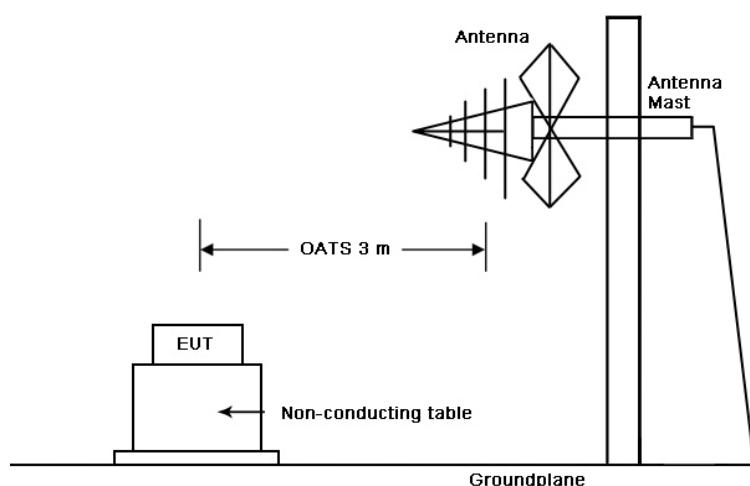
The technique used to find the spurious emissions of the transmitter was the preliminary measurement and the final Measurement. The suspected frequencies are searched for in preliminary measurement with absorbers on the floor in a anechoic chamber and final measurement is performed in the OATS(Open-Area Test –Site)

The following test procedure as below;

- ① The EUT was powered ON and placed on a 0.8 meter high non-conductive table.
- ② The measuring antenna was place at 3 meter distance from standalone EUT with maximum transmitting mode
- ③ The receive antenna is used on horn antenna at above 1GHz(if used on Broadband antenna at below 1 GHz) and then setting in both vertical and horizontal polarization
- ④ The transmitter was maximized on the test receiver display by Step ③ and then EUT is located Position X,Y,Z axis on rotating (360 degrees) the turntable.
- ⑤ The receiver was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the equipment and then the maximum meter reading was recorded. The radiated emissions were measured with detector and Resolution bandwidth according to requirement standard

The measurement results are obtained as described below:

- Result(dB μ V/m) = Reading(dB μ V/m) + Antenna factor(dB/m)+ CL(dB)



[Test Configuration_ Below 1 GHz]

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 maximum transmit
- Environmental Conditions :
 - Normal temperature : 24 °C, Relative Humidity: (56 ~ 57) % R.H. Pressure : 101.5 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, μ 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. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Verdict	Remark
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
433.920	48.10	85	1.8	V	13.50	8.60	70.20	80.83	10.63	Pass	Fundamental
867.840	16.40	105	1.4	V	15.20	10.10	41.70	46.00	4.30	Pass	Harmonic

※ Please see a below clause 5.4.6 Test Plot

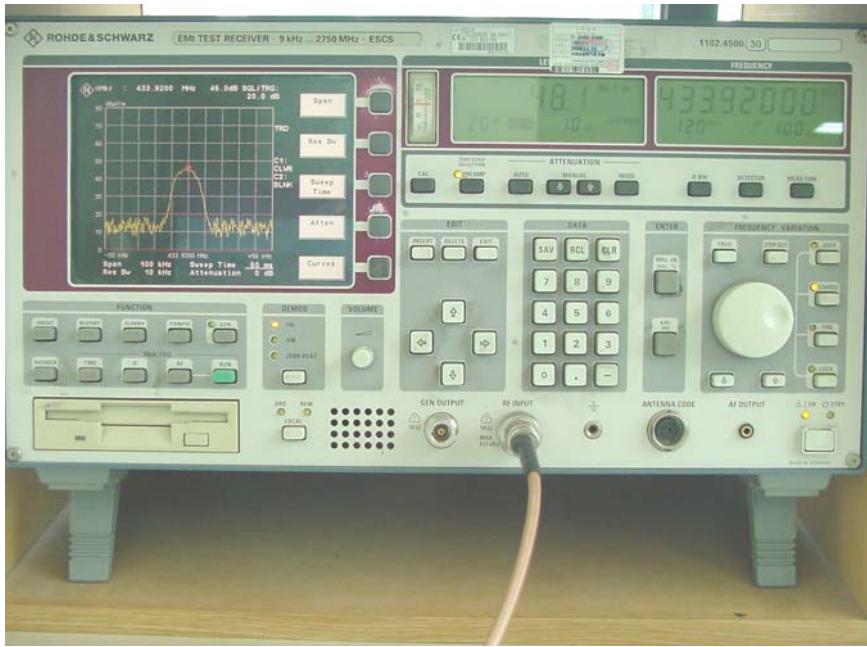
Above 1 GHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn. (dB)	Verdict	Remark
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
Above 1GHz	The signal is not detected						54.00			Pass	

※ Regend: See as below table

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

5.4.6 Test Plot



[Fundamental signal detected in Test receiver_ Reading value]



[Harmonic signal detected in Test receiver_ Reading value]

5.5 Antenna Requirement

Per 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that user a unique coupling to the intentional radiator shall be considered sufficient to comply with the provision of this section.

The manufacturer may design the unit so that broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

According to above requirement standard, This product's Antenna type is an Helical type and permanently attached inner product and also radiated emission field strength from EUT is below requirement standard limit [§15.205, §15.209, §15.231(c)] So, comply with the above requirement standard.

* Attention: it is included in the user manual that this antenna is comply with a FCC required standard section

15.203