

Test Report of FCC CFR 47 Part 15 Subpart B

On Behalf of

Graupner CO.,Ltd

FCC ID: SNL-16006200
Product Description: 2.4GHz Radio Control Computer Receiver
Test Model No.: X-8N
Supplementary Model: N/A
Brand Name: HoTT

Prepared for: **Graupner CO.,Ltd**
8th F,202 Dong,Chunui Techno-Park2,18, Bucheon-ro 198beon-gil,Wonmi-gu,Bucheon-si,Kyungki-do, South Korea

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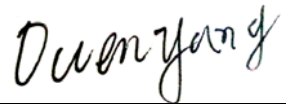
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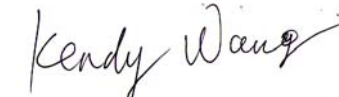
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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Graupner CO., Ltd
Address of Applicant:	8 th F,202 Dong,Chunui Techno-Park2,18, Bucheon-ro 198beon-gil,Wonmi-gu,Bucheon-si,Kyungki-do, South Korea
Manufacturer 1:	SJ Technology(Shenzhen)Co., Ltd
Address of manufacturer:	F6, 1 Bldg, A Area, Yintianxifa Industrial Area, Xixiang Town, Baoan District Shenzhen, Guangdong Province, China
Manufacturer 2:	Graupner CO., Ltd
Address of Manufacturer:	8 th F,202 Dong,Chunui Techno-Park2,18, Bucheon-ro 198beon-gil,Wonmi-gu, Bucheon-si,Kyungki-do, South Korea

General Description of E.U.T

Items	Description
EUT Description:	2.4GHz Radio Control Computer Receiver
Model No.:	X-8N
Trade Name:	HoTT
Supplementary Model:	N/A
Frequency Band:	2403.920~2472.056MHz
Number of Channels:	75
Type of Modulation:	FHSS
Antenna Gain:	1.2dBi
Antenna Type:	Integral Antenna
Rated Voltage:	Input: DC 3.6V~6V
Adapter description:	Model: N/A Input: N/A Output: N/A

Remark: * The test data gathered are from the production sample provided by the manufacturer.

1.2 Test Standards

The report of EUT is prepared in accordance with FCC Rules and Regulations Part 15 Subpart B 2006
The objective of the manufacturer is to demonstrate compliance with the described above standards.

1.3 Test Facility

All measurement required was performed at laboratory of Shenzhen CTL Testing Technology Co., Ltd. at Floor 1-A, Baisha Technology Park, No.3011, Shahe Xi Road, Nanshan District, Shenzhen, China 518055.

The test facility is recognized, certified, or accredited by the following organizations:

FCC – Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December, 2013.

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 Support Equipments

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 or 10 meters from the leading edge of the turntable.

Support equipments or special accessories in test configuration:

AUX Description:	Manufacturer	Model No.	Certificate	CABLE
Host Computer	Dell	78MD82X	CE, FCC	1.5m Unshielded Power Cord
Monitor	Dell	E178Pc	CE, FCC	1.5m Unshielded Power Cord 1.8m shielded data Cable with core
Keyboard	Dell	L100	CE, FCC	1.8m shielded data Cable with core
Mouse	Dell	OCJ339	CE, FCC	1.8m shielded data Cable with core
Printer	EPSON	P330A	CE, FCC	1.2m Unshielded Power Cord 1.5m shielded data Cable

2.3 General Test Procedures

Conducted Emissions: The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 7.1 of ANSI C63.4-2003 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

Radiated Emissions: The EUT is placed on a turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4-2003.

2.4 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

Uncertainty figures are valid to a confidence level of 95%.

2.5 List of Measuring Equipments Used

Test equipments list of Shenzhen CTL Testing Technology Co., Ltd.

No.	Instrument no.	Equipment	Manufacturer	Model No.	S/N	Last Calculator	Due Calculator
1	BCT-EMC001	EMI Test Receiver	R&S	ESCI	100687	2014-4-25	2015-4-24
2	BCT-EMC002	EMI Test Receiver	R&S	ESPI	100097	2013-11-1	2014-10-31
3	BCT-EMC003	Amplifier	HP	8447D	1937A02492	2014-4-25	2015-4-24
4	BCT-EMC018	TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB9163	9163-324	2014-4-25	2015-4-24
5	BCT-EMC021	Triple-Loop Antenna	EVERFINE	LLA-2	711002	2013-11-1	2014-10-31
6	BCT-EMC026	RF POWER AMPLIFIER	FRANKONIA	FLL-75	1020A1109	2014-4-25	2015-4-24
7	BCT-EMC029	6DB Attenuator	FRANKONIA	N/A	1001698	2014-4-25	2015-4-24
8	BCT-EMC032	10dB attenuator	ELECTRO-METRICS	EM-7600	836	2014-4-25	2015-4-24
9	BCT-EMC036	Spectrum Analyzer	R&S	FSP	100397	2013-11-1	2014-10-31
10	BCT-EMC037	Broadband preamplifier	SCHWARZBECK	BBV9718	9718-182	2014-4-25	2015-4-24
11	BCT-EMC039	Horn Antenna	SCHWARZBECK	BBHA 9120D	0437	2014-4-25	2015-4-24
12	BCT-EMC038	Horn Antenna	SCHWARZBECK	BBHA9170	0483	2014-4-25	2015-4-24

3. SUMMARY OF TEST RESULTS

Standard	Test Items	Result
FCC Part 15 Subpart B	Conduction Emission, 0.15MHz to 30MHz	Pass
FCC Part 15 Subpart B	Radiation Emission, 30MHz to 1000MHz	Pass

4. TEST OF AC POWER LINE CONDUCTED EMISSION

4.1 Limit of AC Power Line Conducted Emission

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150~0.500	66~56	56~46
0.500~5.000	56	46
5.000~30.00	60	50

4.2 EUT Setup

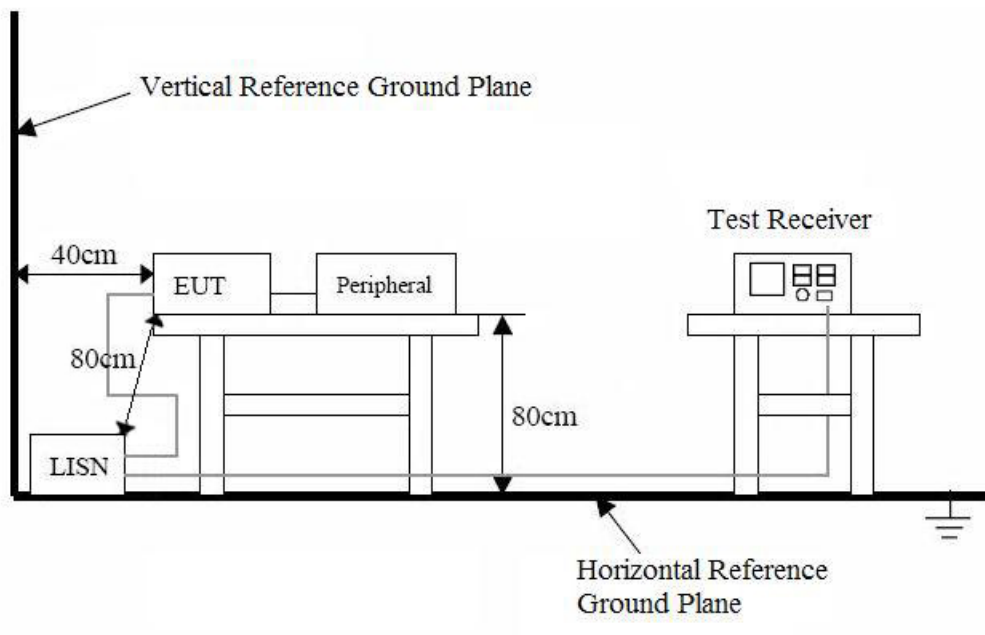
The setup of EUT is according with ANSI C63.4-2003 measurement procedure. The specification used was the FCC Rules and Regulations Part 15 Subpart B limits.

The EUT was placed center and the back edge of the test table.

The AV cables were draped along the test table and bundled to 30-40cm in the middle.

The spacing between the peripherals was 10 cm.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.



Remark: The EUT was connected to a 120VAC/ 60Hz power source.

4.3 Instrument Setup

The test receiver was set with the following configurations:

Test Receiver Setting:

Frequency Range.....150 KHz to 30 MHz
Detector.....Peak & Quasi-Peak & Average
Sweep Speed.....Auto
IF Band Width.....9 KHz

4.4 Test Procedure

During the conducted emission test, the EUT power cord was connected to the auxiliary outlet of the first Artificial Mains.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.

All data was recorded in the peak detection mode. Quasi-peak and Average readings were only performed when an emission was found to be marginal (within -10 dB μ V of specification limits). Quasi-peak readings are distinguished with a "QP". Average readings are distinguished with a "AV".

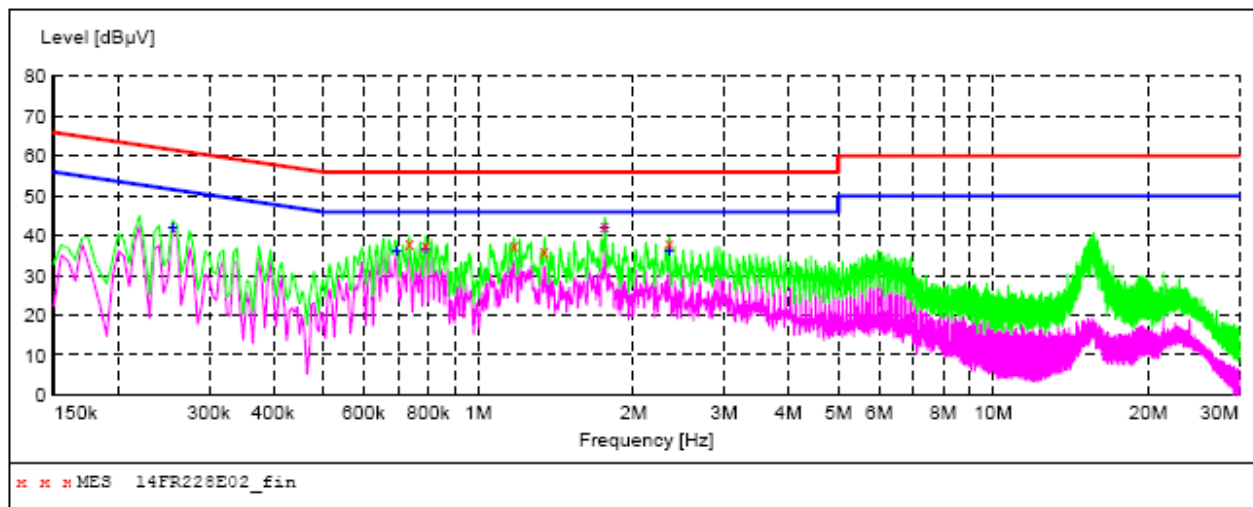
4.5 Test Result

Temperature (°C) : 22~23	EUT: 2.4GHz Radio Control Computer Receiver
Humidity (%RH) : 50~54	M/N: X-8N
Barometric Pressure (mbar) : 950~1000	Operation Condition: Connect to PC

Conducted Emission:

EUT: 2.4GHz Radio Control Computer Receiver
M/N: X-8N
Operating Condition: Connect to PC
Test Site: Shielded Room
Operator: Yang
Test Specification: AC 120V/60Hz for PC
Comment: L Line

SCAN TABLE: "Voltage (150K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT:

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Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.735000	38.00	10.4	56	18.0	QP	L1	GND
0.790000	37.90	10.4	56	18.1	QP	L1	GND
1.175000	37.80	10.4	56	18.2	QP	L1	GND
1.345000	36.10	10.4	56	19.9	QP	L1	GND
1.760000	42.50	10.4	56	13.5	QP	L1	GND
2.350000	38.40	10.4	56	17.6	QP	L1	GND

MEASUREMENT RESULT:

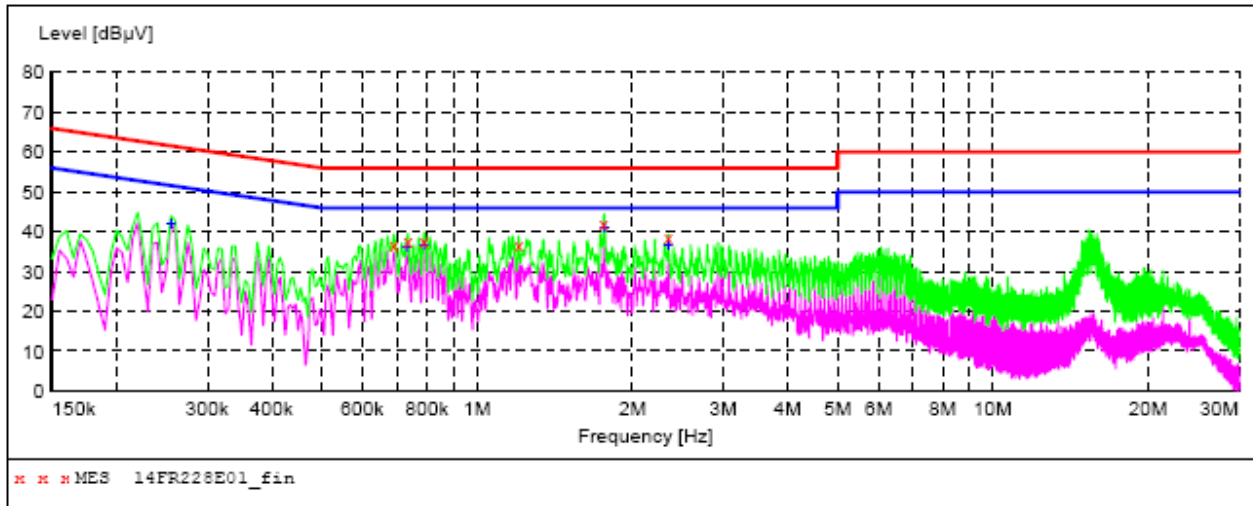
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Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.255000	42.10	11.1	52	9.5	AV	L1	GND
0.695000	36.10	10.4	46	9.9	AV	L1	GND
0.790000	36.70	10.4	46	9.3	AV	L1	GND
1.760000	41.90	10.4	46	4.1	AV	L1	GND
2.350000	36.40	10.4	46	9.6	AV	L1	GND

Conducted Emission:

EUT: 2.4GHz Radio Control Computer Receiver
M/N: X-8N
Operating Condition: Connect to PC
Test Site: Shielded Room
Operator: Yang
Test Specification: AC 120V/60Hz for PC
Comment: N Line

SCAN TABLE: "Voltage (150K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT:

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Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.690000	36.90	10.4	56	19.1	QP	N	GND
0.735000	37.60	10.4	56	18.4	QP	N	GND
0.790000	37.80	10.4	56	18.2	QP	N	GND
1.205000	36.60	10.4	56	19.4	QP	N	GND
1.760000	42.20	10.4	56	13.8	QP	N	GND
2.350000	38.70	10.4	56	17.3	QP	N	GND

MEASUREMENT RESULT:

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Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.255000	42.20	11.1	52	9.4	AV	N	GND
0.730000	36.30	10.4	46	9.7	AV	N	GND
0.790000	36.50	10.4	46	9.5	AV	N	GND
1.765000	40.90	10.4	46	5.1	AV	N	GND
2.350000	36.50	10.4	46	9.5	AV	N	GND

5 - RADIATED DISTURBANCES

5.1 Limit of Radiated Disturbances

Frequency (MHz)	Distance (Meters)	Field Strengths Limits (dB μ V/m)
30 ~ 88	3	40
88~216	3	43.5
216 ~ 960	3	46
960 ~ 1000	3	54

Note:

- (1) The tighter limit shall apply at the edge between two frequency bands.
- (2) Distance refers to the distance in meters between the test instrument antenna and the closest point of any part of the E.U.T.

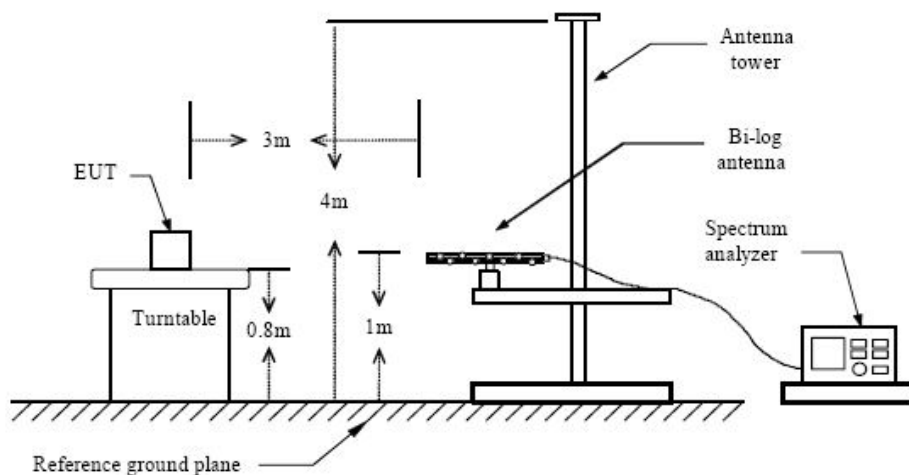
5.2 EUT Setup

The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part 15 Subpart B limits.

The EUT was placed on the center of the test table.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

Below 1 GHz



5.3 Test Receiver Setup

According to FCC Part 15 rule, the frequency was investigated from 30 to 1000 MHz. During the radiated emission test, the test receiver was set with the following configurations:

Test Receiver Setting:

Detector.....Peak & Quasi-Peak
IF Band Width.....120KHz
Frequency Range.....30MHz to 1000MHz
Turntable Rotated.....0 to 360 degrees

Antenna Position:

Height.....1m to 4m
Polarity.....Horizontal and Vertical

5.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -10 dB μ V of specification limits), and are distinguished with a "QP" in the data table.

5.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB μ V means the emission is 7dB μ V below the maximum limit for Subpart B. The equation for margin calculation is as follows:

Margin = Limit – Corr. Ampl.

5.6 Radiated Emissions Test Result

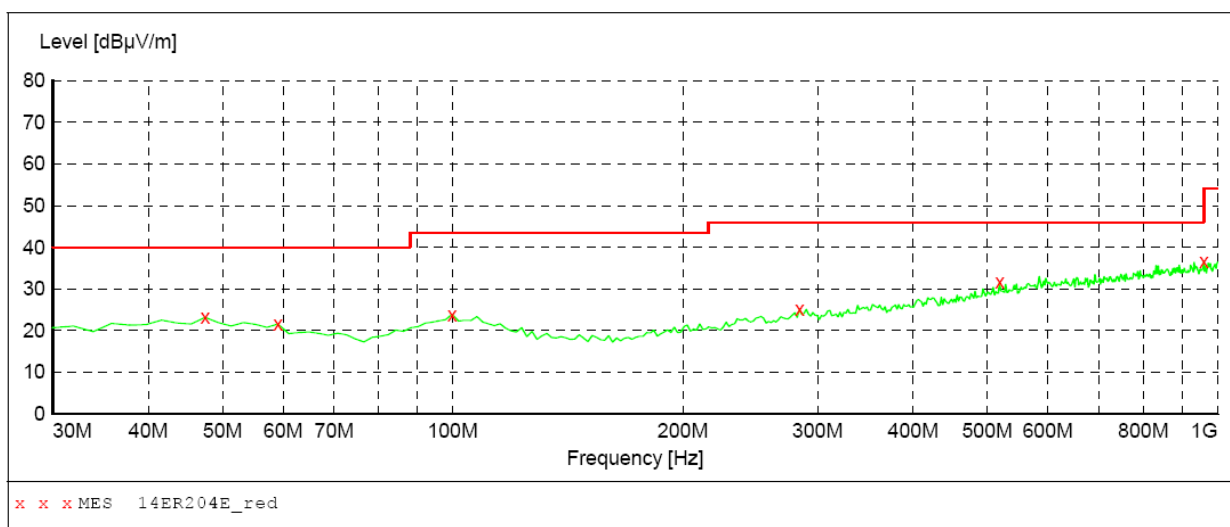
Temperature (°C) : 22~23	EUT: 2.4GHz Radio Control Computer Receiver
Humidity (%RH) : 50~54	M/N: X-8N
Barometric Pressure (mbar) : 950~1000	Operation Condition: Connect to PC

Radiated Emission Test Data(30~1000M):

EUT: 2.4GHz Radio Control Computer Receiver
M/N: X-8N
Operating Condition: Connect to PC
Test Site: 3m CHAMBER
Operator: Chen
Test Specification: AC 120V/60Hz for PC
Comment: Polarization: Horizontal

SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT: "14ER204E_red"

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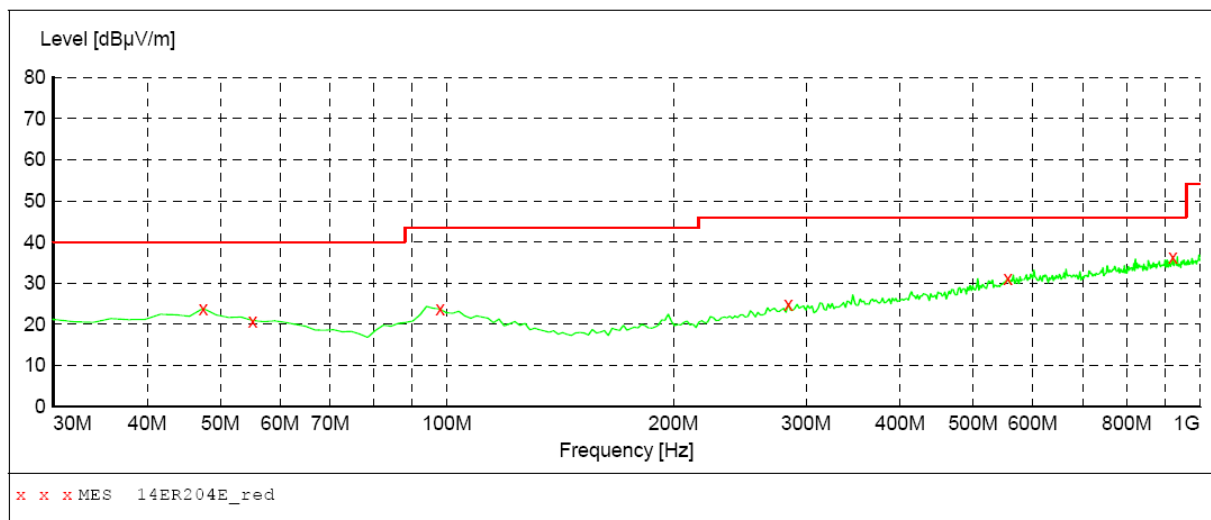
Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	23.20	15.8	40.0	16.8	QP	100.0	0.00	HORIZONTAL
59.100000	21.60	14.6	40.0	18.4	QP	100.0	0.00	HORIZONTAL
99.840000	23.90	17.5	43.5	19.6	QP	100.0	0.00	HORIZONTAL
284.140000	25.10	18.3	46.0	20.9	QP	100.0	0.00	HORIZONTAL
518.880000	31.60	24.3	46.0	14.4	QP	100.0	0.00	HORIZONTAL
959.260000	36.60	29.6	46.0	9.4	QP	100.0	0.00	HORIZONTAL

Radiated Emission Test Data(30~1000M):

EUT: 2.4GHz Radio Control Computer Receiver
M/N: X-8N
Operating Condition: Connect to PC
Test Site: 3m CHAMBER
Operator: Chen
Test Specification: AC 120V/60Hz for PC
Comment: Polarization: Vertical

SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT: "14ER204E_red"

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Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	23.90	15.8	40.0	16.1	QP	100.0	0.00	VERTICAL
55.220000	20.90	15.6	40.0	19.1	QP	100.0	0.00	VERTICAL
97.900000	23.70	17.4	43.5	19.8	QP	100.0	0.00	VERTICAL
284.140000	25.00	18.3	46.0	21.0	QP	100.0	0.00	VERTICAL
555.740000	31.20	25.1	46.0	14.8	QP	100.0	0.00	VERTICAL
920.460000	36.40	29.3	46.0	9.6	QP	100.0	0.00	VERTICAL