

TEST REPORT

**For
FrSky Electronic Co., Ltd.**

2.4G Radio System

Model: V8FT, V8JT, V8R, V8R4, V814R, DFT, DJT, D8R, D14R

PREPARED FOR : FRISKY ELECTRONIC CO., LTD.

100 JINXI ROAD, WUXI, JIANGSU, CHINA

PREPARED BY : BEIDE PRODUCT SERVICE LIMITED

**U.K.: 10 COPTIC STREET, LONDON WC1A 1NH, ENGLAND,
UNITED KINGDOM**

**CHINA: 5-1301, BLDG. 1, ZONE 14, QIANJIN 2ND RD., BAO'AN
DISTRICT, SHENZHEN, CHINA**

**Report Number: B-RT09121004
Date of Test: Dec. 17-19, 2009
Date of Report: Dec. 20, 2009**

TEST REPORT DECLARATION

Applicant : FrSky Electronic Co., Ltd.
Address : 100 Jinxi Road, Wuxi, Jiangsu, China
Client No. : 05101459
Manufacturer : FrSky Electronic Co., Ltd.
Address : 100 Jinxi Road, Wuxi, Jiangsu, China
EUT Description : 2.4G Radio System
Brand Name : -
Model No. : V8FT, V8JT, V8R, V8R4, V814R, DFT, DJT, D8R, D14R
Remark : Use V8FT, V8R do all tests.
Input Power : DC 6-13V

Test Procedure Used:

ETSI EN 300 328 V1.7.1 (2006-10)
ETSI EN 301 489-1 V1.8.1 (2008-04)
ETSI EN 301 489-17 V1.3.2 (2008-04)

The device described above is tested by BEIDE PRODUCT SERVICE LIMITED to determine the maximum emission levels emanating from the device, the severe levels which the device can endure and EUT's performance criterion. The test results are contained in this test report. BEIDE PRODUCT SERVICE LIMITED is assumed of full responsibility for the accuracy and completeness of these tests.

This report applies to above tested sample only and shall not be reproduced in part without written approval of BEIDE PRODUCT SERVICE LIMITED.

Date of Test : Dec. 17-19, 2009

Prepared by : Jack
(Jack Long)

Checked by : Moirca
(Moirca Kang)

Approved by : [Signature]
(Michael Wang)



1. GENERAL INFORMATION

1.1. Report Information

1.1.1. This report is not a certificate of quality, it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BEIDE approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BEIDE in any way guarantees the later performance of the product/equipment.

1.1.2. The sample/s mentioned in this report is/are supplied by applicant, BEIDE therefore assumes no responsibility for the accuracy of information on the brand names, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the applicant at an additional fee. No third part can obtain a copy of this report through BEIDE, unless the applicant has authorized BEIDE in writing to do so.

1.2. Description of Device

Description : 2.4G Radio System
Number Model : V8FT, V8R
Applicant : FrSky Electronic Co., Ltd.
: 100 Jinxi Road, Wuxi, Jiangsu, China
Manufacturer : FrSky Electronic Co., Ltd.
: 100 Jinxi Road, Wuxi, Jiangsu, China

1.3. Test Facility

Tested by BEIDE PRODUCT SERVICE LIMITED
Site Location 5-1301, Bldg. 1, Zone 14, Qianjin 2nd Rd., Bao'an District, Shenzhen, China

1.4. Test Uncertainty

Conducted Emission Uncertainty = ± 2.66 dB
Radiated Emission Uncertainty = ± 4.26 dB

1.5. Test Condition

Test Mode: ON

1.6. Test Conditions

Temperature: 26
Relative Humidity: 63%

1.7. Equipment Under Test [EUT]

No. of units:	4		
No. of deviating variants:	None		
Application:			
Type:	2402-2480MHz Transmitter		
RF Operating Frequency(ies):	2403.962-2477.484MHz		
Serial No.:	N/A		
Type of modulation	FSK		
Duty cycle:	20%		
Specification(s):	ETSI EN 300 328 V1.7.1 (2006-10); ETSI EN 301 489-1 V1.8.1 (2008-04); ETSI EN 301 489-17 V1.3.2 (2008-04)		
Output power:	60mW(< 100mW)		
Frequency alignment range:	2400MHz – 2483.5MHz		
Category of alignment range:	AR0		
Channel spacing:	Nil		
Number of Channels :	49		
Equipment Category:	FHSS		
TRX Power source:	Normal Voltage: 13.0Vdc.	Extreme Lower: 6.0Vdc Extreme upper: Nil	
Antenna:	Integral		
Extreme temperature range:	<input checked="" type="checkbox"/> Category I: -20°C to + 55°C	<input type="checkbox"/> Category II: -10°C to + 55°C	<input type="checkbox"/> Category III: 0°C to + 55°C
Ports/connectors:	Nil		
	Port	Max. cable length (m)	Connector/remarks
<input type="checkbox"/>	Antenna connector:	Nil	Nil
Ancillaries to be tested with:	None		
Charger adapter for Tx	<input type="checkbox"/> Provide <input checked="" type="checkbox"/> Not Provide Details: Nil		
Charger adapter for Rx	<input type="checkbox"/> Provide <input checked="" type="checkbox"/> Not Provide Details: Nil		

2. TECHNICAL DETAILS

2.1. Investigations Requested

The Complete list of measurement called of short range devices in ETSI EN 300 328 V1.7.1 (2006-10) with a list of essential requirement of article 3.2 of R&TTE Directive as well as CEPT/ERC/REC 70-03E

Perform Electromagnetic Interference [EMI] & Electromagnetic Susceptibility [EMS] tests for CE Marking

2.2. Test Standards and Results Summary Tables

Test Standards	
ETSI EN 300 328 V1.7.1 (2006-10)	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

Test Standards	
ETSI EN 301 489-1 V1.8.1 (2008-04)	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
ETSI EN 301 489-17 V1.3.2 (2008-04)	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2,4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment

EMISSION						
Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Effective isotropic radiated power	ETSI EN 300 328 V1.7.1 (2006-10)	ETSI EN 300 328 V1.7.1 (2006-10)	Clause 5.7.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frequency Range	ETSI EN 300 328 V1.7.1 (2006-10)	ETSI EN 300 328 V1.7.1 (2006-10)	Clause 5.7.4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transmitter spurious emission	ETSI EN 300 328 V1.7.1 (2006-10)	ETSI EN 300 328 V1.7.1 (2006-10)	Clause 5.7.5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Receiver spurious emission	ETSI EN 300 328 V1.7.1 (2006-10)	ETSI EN 300 328 V1.7.1 (2006-10)	Clause 5.7.6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emission, 30MHz to 6GHz	ETSI EN 301 489-1 V1.8.1 (2008-04)	EN 55022: 2006	Class B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

IMMUNITY						
Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Electrostatic Discharge	ETSI EN 301 489-1 V1.8.1 (2008-04)	EN 61000-4-2: 2009	±4.0kV Contact ±8.0kV Air	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Immunity 80MHz to 2700MHz	ETSI EN 301 489-1 V1.8.1 (2008-04)	EN 61000-4-3: 2006+A1:2008	1V/m 3V/m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remarks:

N/A - Not Applicable

U_T - The nominal supply voltage

2.3. Test Instrument Used

2.3.1. For Radiation Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	ANRITSU	MS2661C	6200140915	2009.08.18	1 Year
2.	Bilog Antenna	Schwarzbeck	VULB9163	142	2009.08.18	1 Year
3.	50 Coaxial Switch	Anritsu Corp	MP59B	6100237248	2009.08.18	1 Year
4.	EMI Power Line Filter	DUOJI EME	FNF 201 B 16	N/A	2009.08.18	1 Year
5.	EMI Power Line Filter	JIANLI	DL-40C	N/A	2009.08.18	1 Year
6.	Cable	Schwarzbeck	AK9513	ACRX1	2009.08.18	1 Year
7.	Cable	Rosenberger	N/A	FP2RX2	2009.08.18	1 Year
8.	Cable	Schwarzbeck	AK9513	CRPX1	2009.08.18	1 Year
9.	Cable	Schwarzbeck	Ak9513	CRRX2	2009.08.18	1 Year
10.	Singal Generator	HP	8648A	3625U00573	2009.08.18	1 Year
11.	Spectrum Analyzer	HP	8564 E	N/A	2009.08.18	1 Year
12.	EMI Receiver	Rohde & Schwarz	ESPI 3	N/A	2009.08.18	1 Year
13.	Antenna (30MHz~2GHz)	Sunol Sciences	JB1	N/A	2009.08.18	1 Year
14.	Horn Antenna (1~18GHz)	A-INFOMW	JXTXLB-10180	N/A	2009.08.18	1 Year
15.	Pre-Amplifier (0.01~1.3GHz)	HP	8447F	N/A	2009.08.18	1 Year
16.	Horn Antenna (18~40GHz)	Com Power	AH-840	N/A	2009.08.18	1 Year
17.	Microwave Pre Amp (18~40GHz)	Com Power	PA-840	N/A	2009.08.18	1 Year

2.3.2. For Electrostatic Discharge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	KIKUSUI	KES4021	H708159	2009.08.18	1 Year

2.3.3. For Radio Frequency Electromagnetic Field

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	RF Power Meter Dual Channel	BOONTON	4232A	10539	2009.08.18	1 Year
2.	50ohm Diode Power Sensor	BOONTON	51011EMC	34236/34238	2009.08.18	1 Year
3.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120L3F	332	2009.08.18	1 Year
4.	Power Amplifer	PRANA		N/A	2009.08.18	1 Year

5.	Power Amplifer	MILMEGA	AS0102-55	N/A	2009.08.18	1 Year
6.	Signal Generator	AEROFLEX	20238	N/A	2009.08.18	1 Year
7.	Field Strength Meter	HOLADY	HI-6005	N/A	2009.08.18	1 Year
8.	RS232 Fiber Optic Modem	HOLADAY	HI-4413P	N/A	2009.08.18	1 Year
9.	Log.-per.Antenna	SCHWARZBECK	VULP9118 E	N/A	2009.08.18	1 Year

3. TEST RESULTS

3.1. TRANSMITTER MEASUREMENTS

3.1.1 Equivalent isotropic radiated power

Ambient temperature 23°C

Relative humidity 56%

Nominal transmit frequency: 2403.962MHz

Polarization of the measurement for the larger power level: vertical

Result (dBm)	Limit (dBm)
13.69	20
Measurement uncertainty	±1.5dB (substituted)

Nominal transmit frequency: 2439.930MHz

Polarization of the measurement for the larger power level: vertical

Result (dBm)	Limit (dBm)
12.93	20
Measurement uncertainty	±1.5dB (substituted)

Nominal transmit frequency: 2477.484MHz

Polarization of the measurement for the larger power level: vertical

Result (dBm)	Limit (dBm)
12.89	20
Measurement uncertainty	±1.5dB (substituted)

$P=A+G+10\log(1/x)$ dBm

A, measured power output

G, antenna gain(s) in dBi

X, duty cycle

P, converted from dBm to mW

Maximum e.i.r.p. spectral density

Ambient temperature 23°C

Relative humidity 53%

Occupied frequency range (2400-2483.5 MHz)	Max. e.i.r.p. spectral density (mW/MHz)
Lowest frequency	-50.17
Middle frequency	-48.16
Highest frequency	-50.82
Measurement uncertainty	±3dB

LIMIT: 10mW/MHz

3.1.3 Frequency Range

Ambient temperature 23°C

Relative humidity 56%

Transmitter modulated Nominal frequency as stated by the manufacturer:
2403.962-2477.484 MHz

TEST CONDITIONS		Occupied frequency range	
		Fl (MHz)	Fh (MHz)
Tnom: 20 °C	Vlow: 11.05Vd.c.	2403.712	2477.930
	Vnom: 14.95Vd.c.	2403.714	2477.932
Tlow: -20°C	Vlow: 11.05Vd.c.	2403.718	2477.939
	Vnom: 14.95Vd.c.	2403.722	2477.931
Tmax: +55°C	Vlow: 11.05Vd.c.	2403.720	2477.933
	Vnom: 14.95Vd.c.	2403.719	2477.937
Max. occupied frequency range (MHz)		2403.712	2477.939
Measurement uncertainty		±4.7* 10 ⁻⁶	

LIMIT: ERC/REC 70-03 Annex 3, Wideband Data Transmission systems

Annex 3 Frequency Band A	Frequency range (MHz)
	2400-2483.5

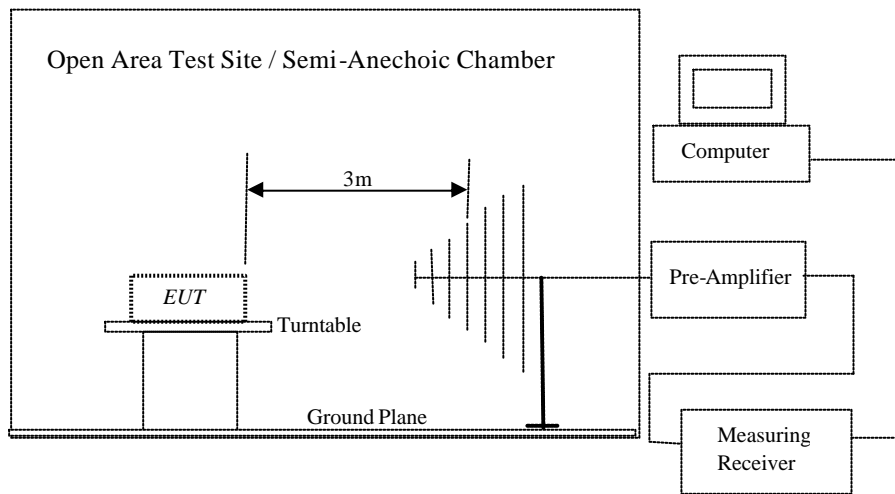
3.2. Radiated Emission (30MHz to 6GHz)

Test Requirement: ETSI EN 301 489-1 V1.8.1
 Test Method: EN 55022
 Level: Class B
 Test Date(s): 2009-12-17
 Mode of Operation: ON

Test Method:

The test was performed in accordance with CISPR 22 at 3m test distance on an Open Area Test Site (OATS)/ Semi-Anechoic Chamber. The quasi-peak measurement will be performed if the peak measurement exceeded 6dB below the corresponding Class B quasi-peak limit line.

Test Setup:



Limits for Radiated Emission:

Frequency of Emission (MHz)	Quasi-Peak Limits (dB μ V/m)
30-230	40
230-1000	47

Frequency of Emission (MHz)	Average Limit (dB μ V/m)	Peak Limits (dB μ V/m)
1000-3000	50	70
3000-6000	54	74

NOTE: The lower limit applies at the transition frequency.

Results of Communication mode: PASS

Please refer to the following table for result details

30-1000MHz

F(MHz)	Reading (dBuV/m)	Direction Degree	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)
952.83	35.42	52.90	V	400.00	-18.61	47.00	-11.58
945.92	34.27	52.90	V	400.00	-19.32	47.00	-12.73
819.10	33.74	259.90	H	100.00	-19.97	47.00	-13.26
832.07	33.71	232.00	V	100.00	-19.06	47.00	-13.29
845.04	32.85	218.30	V	100.00	-19.36	47.00	-14.15
780.05	32.46	261.80	V	100.00	-19.91	47.00	-14.54

1-6GHz

F(GHz)	Reading (dBuV/m)	Direction Degree	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)	Comments
2403.962MHz 3 Meter								
4.80	52.76	120.00	V	110.00	4.64	74.00	-21.24	Peak
4.80	51.86	102.00	H	120.00	4.64	74.00	-22.14	Peak
4.80	45.95	315.00	V	130.00	4.64	54.00	-8.05	Ave
4.80	41.76	180.00	H	130.00	4.64	54.00	-12.24	Ave
2439.930MHz 3 Meter								
4.88	55.76	223.00	V	110.00	4.64	74.00	-18.24	Peak
4.88	55.32	112.00	H	100.00	4.64	74.00	-18.68	Peak
4.88	43.95	223.00	V	110.00	4.64	54.00	-10.05	Ave
4.88	41.97	110.00	H	130.00	4.64	54.00	-12.03	Ave
7.32	59.03	204.00	V	110.00	8.83	74.00	-14.97	Peak
7.32	56.48	110.00	H	110.00	8.83	74.00	-17.52	Peak
7.32	42.95	216.00	V	130.00	8.83	54.00	-11.05	Ave
7.32	38.06	168.00	H	140.00	8.83	54.00	-15.94	Ave
2477.484MHz 3 Meter								
4.95	53.76	262.00	V	130.00	4.64	74.00	-20.24	Peak
4.95	56.32	102.00	H	120.00	4.64	74.00	-17.68	Peak
4.95	44.97	255.00	V	110.00	4.64	54.00	-9.03	Ave
4.95	43.86	150.00	H	130.00	4.64	54.00	-10.14	Ave
7.43	60.03	271.00	V	140.00	8.83	74.00	-13.97	Peak
7.43	59.5	170.00	H	150.00	8.83	74.00	-14.5	Peak
7.43	44.95	271.00	V	130.00	8.83	54.00	-9.05	Ave
7.43	37.06	119.00	H	140.00	8.83	54.00	-16.94	Ave

Remark:

*Correction factor included the values of antenna factor and cable loss.

The measurement uncertainty (with a 95% confidence level) for this test :

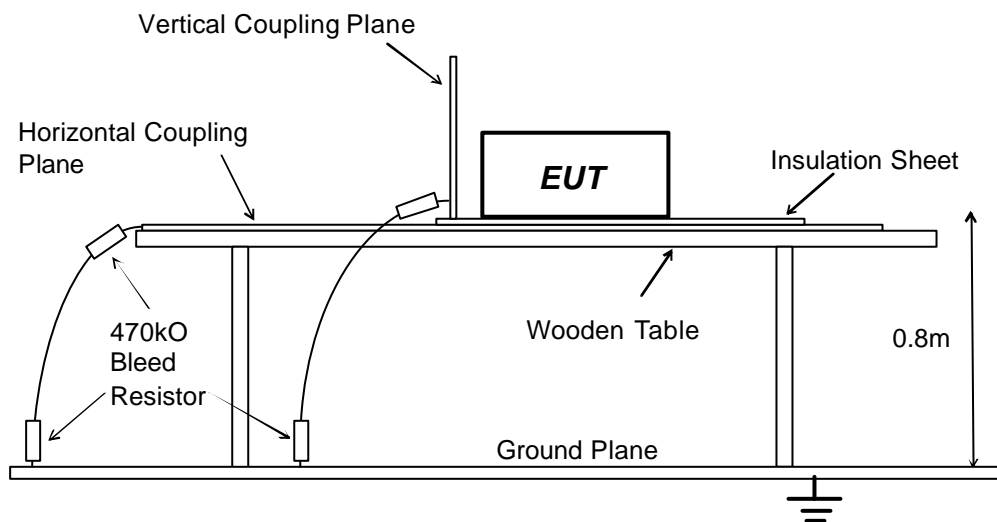
3.3. Electrostatic Discharge

Test Requirement:	ETSI EN 301 489-1 V1.8.1
Test Method:	EN 61000-4-2
Severity:	±2kV, ±4kV for Direct & Indirect Contact Discharge ±2kV, ±4kV, ±8kV for Air Discharge
Performance Criteria Required:	B
Ambient Temperature:	22 °C
Relative Humidity:	54 %
Atmospheric Pressure:	102 kPa
Test Date(s):	2009-12-17
Mode of Operation:	ON

Test Method:

The test was performed in accordance with EN 61000-4-2.

Test Setup:



Severity Levels for Electrostatic Discharge:

Level	Test Voltage Direct & Indirect Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1	±2	±2
2	±4	±4
3	±6	±8
4	±8	±15

Results of Communication mode: PASS

Operating Condition: During the test, transmitter would be keep communication with receiver, no unintentional response and normal charging of battery

Refer to the following table for individual results.

Location	Discharge Method	Test Voltage (kV)	Individual Results	
			Pass	Fail
HCP [Horizontal Coupling Plane]	Indirect Contact	±2kV, ±4kV	<input checked="" type="checkbox"/>	<input type="checkbox"/>
VCP [Vertical Coupling Plane]	Indirect Contact	±2kV, ±4kV	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Button	Air	±2kV, ±4kV, ±8kV	<input checked="" type="checkbox"/>	<input type="checkbox"/>
LED	Air	±2kV, ±4kV, ±8kV	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Gap	Air	±2kV, ±4kV, ±8kV	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Remarks:

The measurement uncertainty (with a 95% confidence level) for this test was:

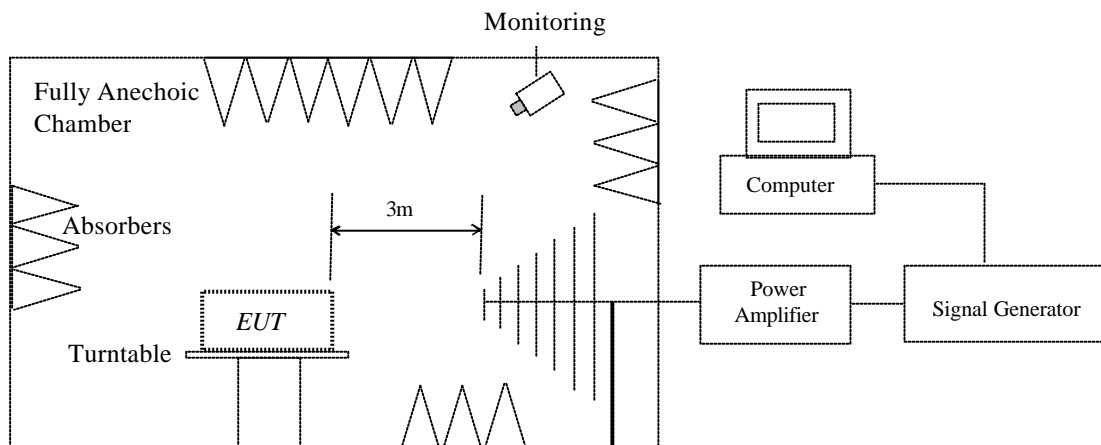
3.4. Radiated Immunity [80MHz to 1000MHz, 1400MHz to 2700MHz]

Test Requirement:	ETSI EN 301 489-1 V1.8.1
Test Method:	EN 61000-4-3
Severity:	Level 1 [1V/m] Level 2 [3V/m]
Modulation:	80% 1kHz AM
Performance Criteria required:	A
Ambient Temperature:	23 °C
Relative Humidity:	54 %
Test Date(s):	2009-12-17
Mode of Operation:	ON

Test Method:

The test was performed in accordance with IEC 61000-4-3.

Test Setup:



Severity Levels for Radiated Immunity:

Level	Field Strength (V/m)
1	1
2	3
3	10

Results of Communication mode: PASS

Operating Condition: During the test, transmitter would be keep communication with receiver, no unintentional response and normal charging of battery

Refer to the following table for individual details

Frequency (MHz)	Face of EUT	E-Field Polarity	Field Strength (V/m)	Dwell Time (sec.)	Frequency Step (%)	Individual Results	
						Pass	Fail
80-1000 1400-2000 2000-2700	0°	Horizontal	3 3 1	1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
80-1000 1400-2000 2000-2700	90°	Horizontal	3 3 1	1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
80-1000 1400-2000 2000-2700	180°	Horizontal	3 3 1	1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
80-1000 1400-2000 2000-2700	270°	Horizontal	3 3 1	1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>

80-1000 1400-2000 2000-2700	0°	Vertical	3 3 1	1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
80-1000 1400-2000 2000-2700	90°	Vertical	3 3 1	1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
80-1000 1400-2000 2000-2700	180°	Vertical	3 3 1	1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
80-1000 1400-2000 2000-2700	270°	Vertical	3 3 1	1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Remarks:

The measurement uncertainty (with a 95% confidence level) for this test was:

Calculated measurement uncertainty:

3.5.Susceptibility Performance Criteria

For transmitter the performance criteria for transient phenomena for transmitter shall apply (see clause 6 of the relevant part of the present dealing with the particular type of radio equipment).

For receivers the performance criteria for transient phenomena for receivers shall apply (see clause 6 of the relevant part of the present document dealing with the particular type of radio equipment).

For ancillary equipment the pass/failure criteria supplied by the manufacturer (see subclause 6.4) shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria above shall apply.

APPENDIX I (EUT PHOTOS)

Figure 1
Radiation Test (Below 1GHz)

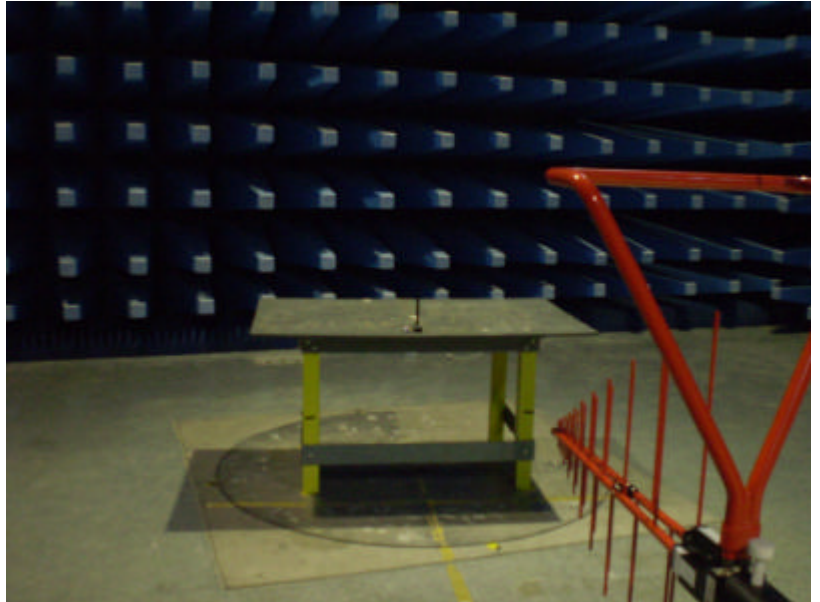


Figure 2
Radiation Test (above 1GHz)

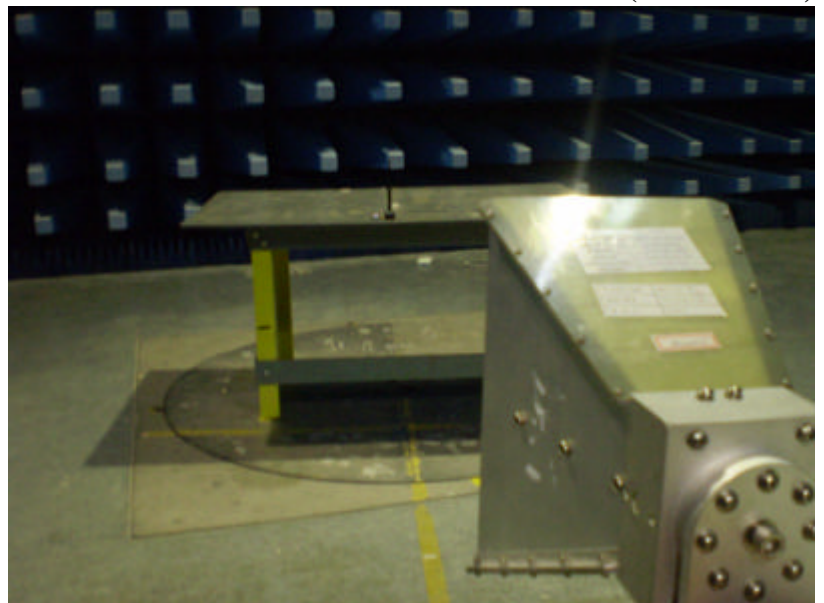


Figure 3
APPEARANCE OF EUT



Figure 4
INSIDE OF EUT

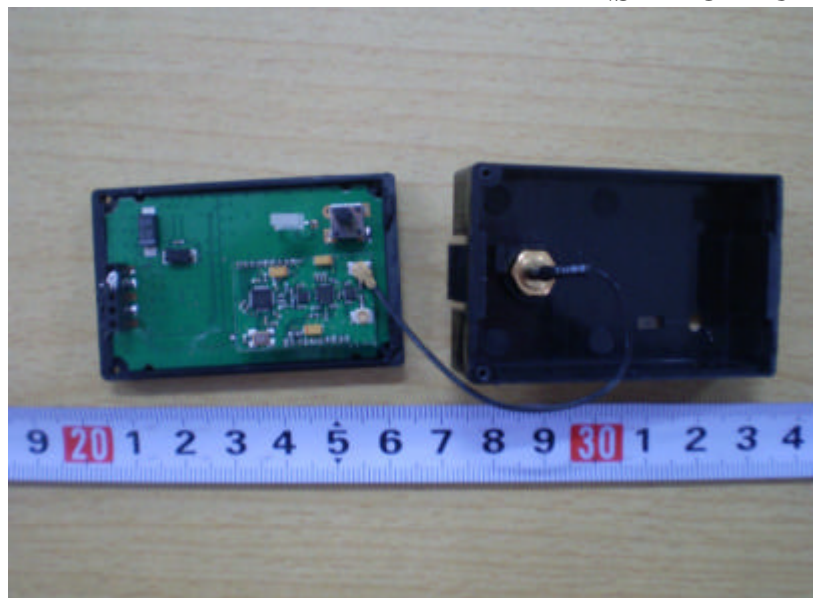


Figure 5
PCB OF EUT



Figure 6
APPEARANCE OF EUT

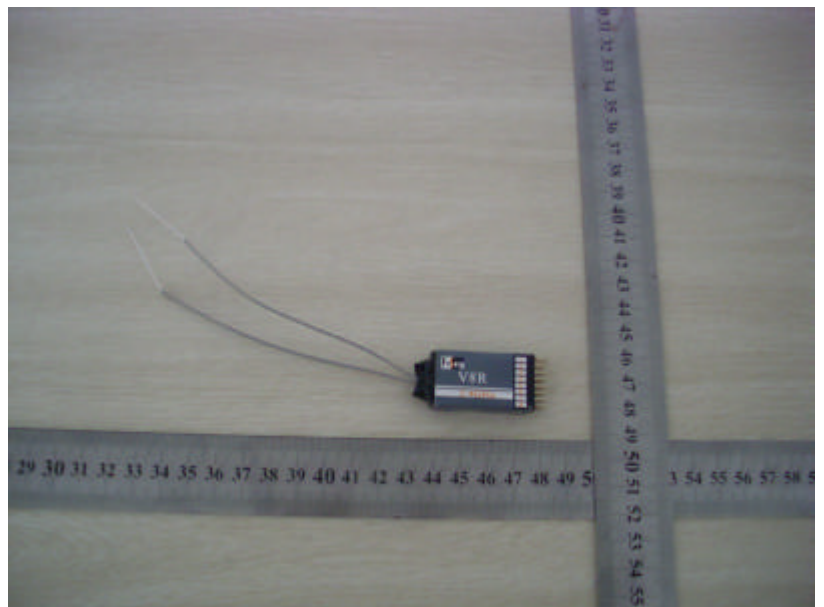


Figure 7
PCB OF EUT

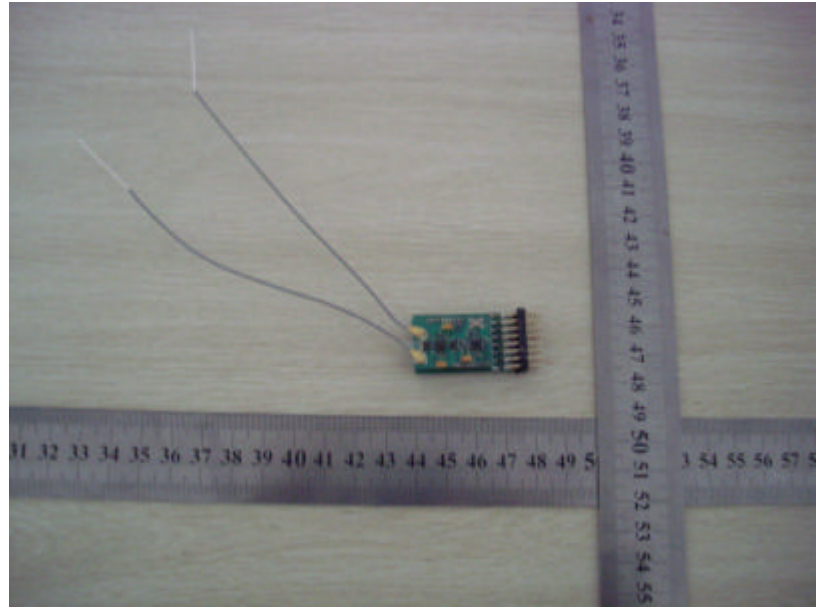


Figure 8
PCB OF EUT

