



RC-032-C42-08-101503-1-A

E.M.C Test Report

According to the standard:
FCC PART 15 : 2007

Equipment under test:
SPY RF Relay


Company:
JULES RICHARD INSTRUMENTS

FCC listed : 910 701

DISTRIBUTION: Mr PEYRICHOU

(Company: JULES RICHARD INSTRUMENTS)

Number of pages: 20 with 3 annexes

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TEST CERTIFICATION FOR: Fcc Certification

NAME OF THE EQUIPMENT UNDER TEST:

Reference: 06215

Serial number: A16107

NAME OF THE MANUFACTURER: JULES RICHARD INSTRUMENTS

ADDRESS OF THE APPLICANT:

Company: JULES RICHARD INSTRUMENTS

Address: 116 Quai de Bezons
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Person in charge: Mr PEYRICHOU

DATES OF TESTS: 2008, the 30th of June and the 01st of July

TESTS LOCATIONS: Open area test site in Aunainville (28) - FRANCE
EMITECH Laboratory in Montigny le Bretonneux (78)
FRANCE

TESTS OPERATORS: B. PELLERIN / F. LHEUREUX

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Annex 1: Antenna factors, insertion losses and amplifier values

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1. INTRODUCTION

This document presents the results of Electromagnetic Compatibility tests performed on the equipment «SPY RF Relay» according to reference document listed below.

2. REFERENCE DOCUMENT

FCC Part 15: 2007
Code of Federal Regulations
Title 47- Telecommunication
Chapter 1- Federal Communication Commission
Part 15- Radio frequency devices

3. PRODUCT DESCRIPTION

ITU Emission code:	Not communicated
Class:	Not communicated
Utilization:	Relay
Operating frequency range:	From 902 MHz to 928 MHz
Number of channels:	1
Channel spacing:	-
Frequency generation:	Not communicated
Modulation:	GFSK
Power source:	110 Vdc – 60 Hz

4. EQUIPMENT UNDER TEST (EUT) CONFIGURATION

- See antenna factors, insertion losses and amplifier values in annex 1.
- See internal photographs in annex 2.
- See setup photographs in annex 3.

Modification of the equipment during the tests: Yes
As a value to software – 2 dBm, the tests are carried out with a value – 10 dBm.

5. SUMMARY OF TEST RESULTS

The following table summarizes test results of the EUT.

Test procedure	Designation of test	Test results				Comments
		Pass	Fail	N.A.	N.P.	
15.207	Measurement of conducted emission on AC mains ports	X				
15.249	Intentional radiated emissions in the band 902 - 928 MHz	X				
15.205 and 15.209	Unintentional radiated emissions in the band 30 MHz - 10 GHz	X				

N.A.: Not Applicable

N.P.: Not Performed

Conclusion:

The tested sample "SPY RF Relay" submitted to the tests complies with the requirements of the standard:

- FCC PART 15 : 2007

According to the limits specified in this report.

6. MEASUREMENT OF CONDUCTED EMISSION ON AC MAINS PORTS

Standard: FCC Part 15 : 2007

Section: 15.207

Test configuration:

The equipment under test (EUT) is operating on a non conductive test table at 0.8 m above the horizontal metal ground plane and at 0.4 m above the vertical metal ground plane.

The EUT is supplied through LISN (Line Impedance Stabilization Network) bonded to the ground reference plane.

Tested cable	Measure with	E.U.T. height (cm)
110 Vac (60 Hz) power supply	LISN	80

Frequency band	Tested cable	Resolution bandwidth	Video bandwidth	Detection mode
150 kHz – 30 MHz	110 Vac (60 Hz) power supply	10 kHz	30 kHz	Peak

Test method deviation: None

Detection mode: Peak

Limit: The EUT must satisfy requirements of the standard as shown in table below.

Frequency range (MHz)	Limit (dB μ V)	
	Quasi-peak	Average
0,15 to 0,5	66 - 56	56 - 46
0,5 to 5	56	46
5 to 30	60	50

Operating mode during the test:

The equipment under test is in continuous transmission with a SPY RF Modem.

Instrumentation test list:

CATEGORY	BRAND	TYPE	Nr EMITECH
Cable	-	N-4m	2809
Cable	-	N-2m	2812
LISN	Rohde & Schwarz	ESH2-Z5	3290
Logiciel software	Nexio	BAT EMC V 3.4.1.7	0000
Power supply	CHROMA	6415	5331
Quasi peak unit	Hewlett Packard	85650 A	491
Spectrum analyzer	Hewlett Packard	8568 B	19
Test enclosure	Emitech	JD	1804
Transient limiter	Hewlett Packard	11947A	1094

Results:

Curve reference	Comments
Curve 1	Measurement of peak and average detection on wire 1
Curve 2	Measurement of peak and average detection on wire 2

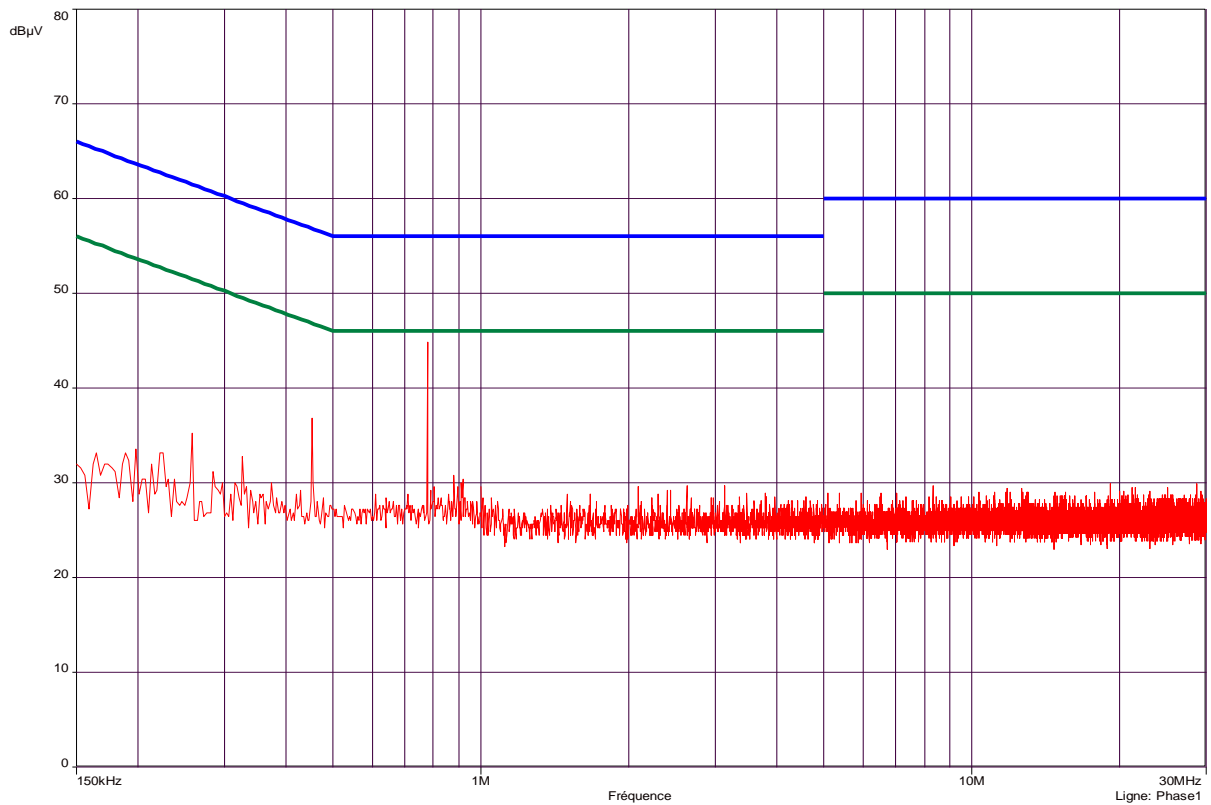
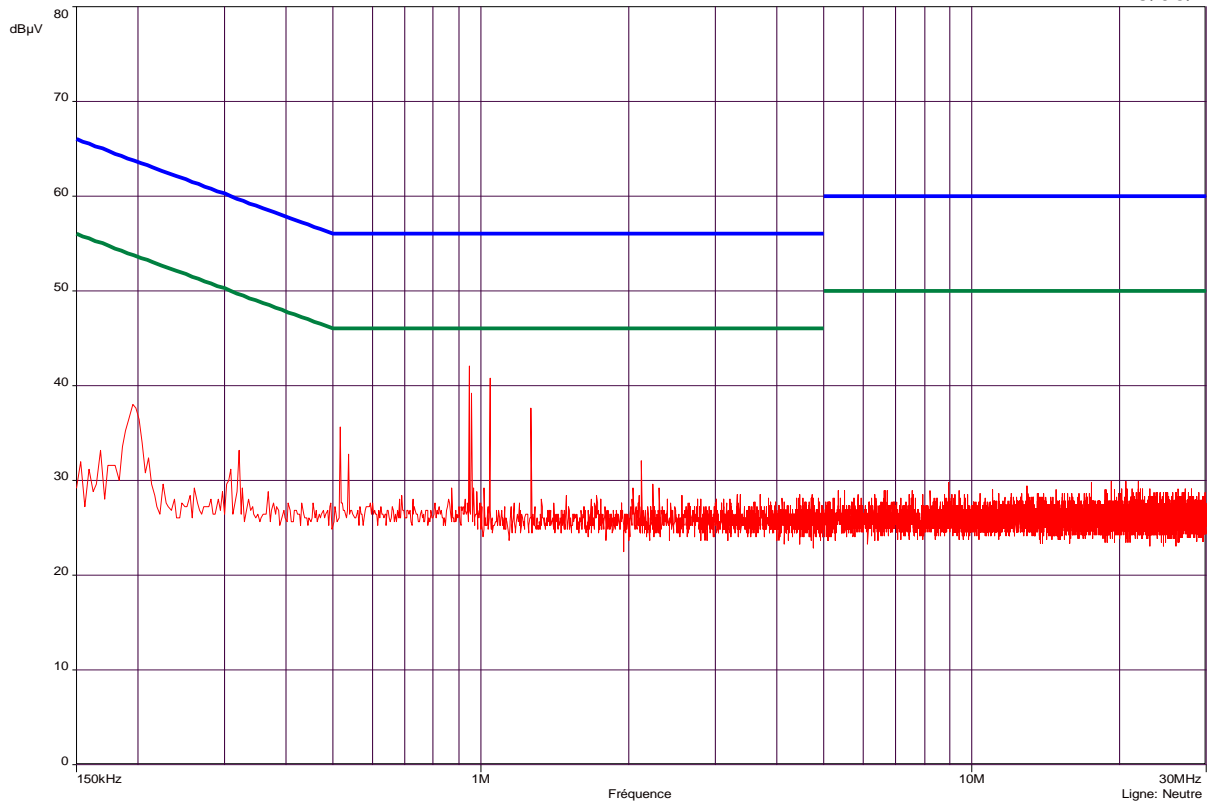
Observation during the test:

The equipment complies with the requirement of the FCC PART 15.207 : 2007.

SPY RF RELAY

Measurement of conducted emission on AC mains ports
 Peak detection, in communication continues with a SPY RF MODEM.

23/06/2008



Results:

Polarization of test antenna: vertical (height: 187 cm, Az: 236°).
 Position of equipment: see photography in annex

Frequency (902.648 MHz)

		Level dB μ V/m	Cable loss dB	Antenna factor dB	Electro-magnetic field (dB μ V/m)
Normal test conditions	Nominal power source (V): 110	38.5	4.4	21.7	64.6

Test conclusion: Complies with the requirements of the standard.

8. UNINTENTIONAL RADIATED EMISSIONS IN THE BAND 30 MHZ - 10 GHZ

Standard: FCC PART 15 : 2007

Sections: 15.205, 15.209 and 15.247

Equipment under test arrangement:

The equipment under test (EUT) is placed on a non-conductive test table at 0.8 m above the horizontal metal ground plane.

For maximum meter reading at each frequency, the antenna height is adjusted between 1 m and 4 m above the ground plane. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization. The frequency azimuth and antenna height are presented in the table on the next pages.

The equipment is not in continuous transmission. No possibility to choice particular frequency channel.

Frequency range: 30 MHz - 1 GHz
1 GHz - 10 GHz

Detection mode: Quasi-peak for 30 MHz - 1 GHz
Average for 1 GHz - 10 GHz

Resolution bandwidth: 120 kHz for 30 MHz - 1 GHz
1 MHz for 1 GHz - 10 GHz

Measurement distance: 3 meters

Limit: For restrictive bands (see paragraph 15.205), the EUT must satisfy requirements of the section 15.209 as shown in table below.

Frequency range (MHz)	Limit (dB μ V/m)
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
960 to 18000	54.0

Instrumentation test list:

CATEGORY	MARQUE	TYPE	Nr EMITECH
Antenna	Schwarzbeck	UHALP 9108	3106
Antenna	Emco	3115	3374
Antenna mast	HD GmbH	MA 240	2341
Biconical antenna	Schwarzbeck	VHBA 9123	1144
Cable	Cables & Connectiques	HF 12m	2450
Cable	Cables & Connectiques	HF 2m	2451
Cable	Cables & Connectiques	HF 13m	2452
Cable	Cables & Connectiques	N-SMA	2864
Filter	Micro-tronics	HPM 14758	4691
High pass filter	Trilithic	6HC1300-2.5-KK	1097
Mast controller	HD GmbH	HD 100	2342
Open site	Emitech	Aunainville	0187
Preamplifier	Miteq	AMF-6D-010250-70-7P	3229
Receiver	Rohde & Schwarz	ESVP	1057
Spectrum analyzer	Rohde & Schwarz	FSP40	5175

Results:

No frequencies are observed between 30 MHz to 10 GHz for both polarizations.

Test conclusion:

The equipment complies with the requirements of the standard.

« □□□ End of report, 3 annexes to be forwarded □□□ »

ANNEX 1

ANTENNA FACTORS, INSERTION LOSSES AND AMPLIFIER VALUES

BILL OF MATERIAL

The test antenna used for the radiated emission between 30 MHz and 200 MHz is the biconical antenna n°1144. Antenna factors are given in table 1.

The test antenna used for the radiated emission between 200 MHz and 1 GHz is the log-periodic antenna n°3106. Antenna factors are given in table 2.

The measuring receiver n°1057 used in the frequency range 30 MHz to 1 GHz has an integrated preamplifier.

The test cable used between 30 MHz and 1 GHz to connect the antennas to the receiver for measurements at a distance of 3 meters has losses given in table 3.

The test antenna used for the radiated emission between 1 GHz and 18 GHz is the horn antenna n°3374. Antenna factors are given in table 4.

The amplifier n°3229 and its cable used to connect the spectrum analyzer to the test cable has gain values given in the table 5.

The test cable used between 1 GHz and 18 GHz to connect the horn antenna to the amplifier for measurements at a distance of 3 meters has losses given in table 6.

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
30	12.5	90	9.5
35	10.4	100	10
40	9.3	120	10.9
45	8.9	140	11.1
50	8.4	160	12.9
60	8.5	180	14.1
70	8.5	200	15.8
80	9.2	-	-
90	9.5	-	-
100	10.0	-	-

TABLE 1 : BICONICAL ANTENNA

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
200	23.6	700	20.4
300	14.3	800	20.6
400	16.1	900	21.7
500	17.4	1000	22.0
600	18.6	-	-

TABLE 2 : LOG-PERIODIC ANTENNA

Frequency (MHz)	loss (dB)	Frequency (MHz)	loss (dB)
30	0.6	160	1.8
35	0.8	180	2.0
40	0.8	200	2.1
45	1.0	300	2.7
50	1.0	400	2.9
60	1.1	500	3.1
70	1.1	600	3.4
80	1.2	700	3.7
90	1.3	800	4.0
100	1.5	900	4.4
120	1.5	1000	4.8
140	1.7	-	-

TABLE 3 : TEST CABLE FOR 3M MEASUREMENT INTO 30MHz and 1GHz

Frequency (GHz)	Antenna factor (dB/m)	Frequency (GHz)	Antenna factor (dB/m)	Frequency (GHz)	Antenna factor (dB/m)
1.0	23.6	6.0	34.4	11.0	38.3
1.5	25.2	6.5	34.2	11.5	38.8
2.0	27.5	7.0	35.3	12.0	39.2
2.5	29.0	7.5	36.7	13.0	39.9
3.0	29.9	8.0	36.9	14.0	41.9
3.5	31.1	8.5	37.6	15.0	41.0
4.0	32.6	9.0	38.0	16.0	38.0
4.5	32.3	9.5	37.9	17.0	39.9
5.0	33.5	10.0	38.3	18.0	47.4
5.5	34.2	10.5	38.1	-	-

TABLE 4 : HORN ANTENNA 3374 (1 to 18 GHz)

Frequency (GHz)	Gain value (dB)	Frequency (GHz)	Gain value (dB)	Frequency (GHz)	Gain value (dB)
1.0	25.3	7.0	27.5	15	25.2
1.5	25.8	8.0	27.3	16	22.8
2.0	25.3	9.0	25.3	17	23.8
2.5	24.5	10.0	25.1	18	24.8
3.0	24.0	11.0	25.3	20	24.0
4.0	23.0	12.0	26.8	22	25.2
5.0	23.6	13.0	29.5	-	-
6.0	25.7	14	28.6	-	-

TABLE 5 : AMPLIFIER (1 – 26 GHz)

Frequency (GHz)	loss (dB)	Frequency (GHz)	loss (dB)	Frequency (GHz)	Loss (dB)
1.0	2.4	4.0	5.0	12	9.0
1.5	2.9	4.5	5.2	15	10.2
2.0	3.5	5	5.6	18	11.2
2.5	3.9	6	6.2	21	13.3
3.0	4.2	8	7.2	24	14.9
3.5	4.6	10	8.2	-	-

TABLE 6: TEST CABLE FOR 3 M MEASUREMENT

ANNEX 2

EUT PHOTOGRAPHIES



ANNEX 3

TEST SETUP PHOTOGRAPHIES

