RR051-13-105730-1-A Ed. 0

Certification test report

Permissive change

According to the standard:
CFR47 FCC PART 15

Equipment under test:
RF module

Model: PS5005

FCCID:
OQMSA

Company:
JAY ELECTRONIQUE

DISTRIBUTION: Mr CANNAVO (Company: JAY ELECTRONIQUE)

Number of pages: 22 with 3 appendixes

Ed.	Date	Modified pages	Written by Name	Written by Visa	Technical Verification and Quality Approval Name	Technical Verification and Quality Approval Visa
0	11/02/2014	Creation	M. DUMESNIL	M. D.	BERTHAUD L.	

Duplication of this test report is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above.
This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

DESIGNATION OF PRODUCT:	RF module
Serial number (S/N):	Not communicated
Reference / model (P/N):	PS5005
Software version:	not communicated
MANUFACTURER:	JAY ELECTRONIQUE

COMPANY SUBMITTING THE PRODUCT:

Company:	JAY ELECTRONIQUE
Address:	ZAC La Bâtie Rue Champrond 38334 ST ISMIER CEDEX FRANCE
Responsible:	Mr CANNAVO
Person(s) present(s) during the tests:	-
DATE(S) OF TEST:	8, 9, 16 and 17 January 2014 11 and 14 April 2014
TESTING LOCATION:	EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE EMITECH ANGERS open area test site in JUIGNE SUR LOIRE (49) FRANCE FCC Accredited under US-EU MRA Designation Number: FR0009 Test Firm Registration Number: 873677 FCC 2.948 Listed Site Registration Number: 90469 EMITECH ANGERS open area test site in Beaucouzé (49) FRANCE FCC 2.948 Listed Site Registration Number: 101696
TESTED BY:	M. DUMESNIL

CONTENTS

1. INTRODUCTION

This document presents the result of Certification tests carried out on the following equipment: RF module PS5005, in accordance with normative reference.

2. PRODUCT DESCRIPTION

ITU Emission code:	34K0F7D
Class:	B (residential)
Utilization:	radio modules with or without integral antenna.
Antenna type and gain:	BETA: integral antenna, type Fractus EZC Connect Zigbee Chip P/N: FR05-S1-R-0-105, antenna gain 0 dBi
Operating frequency range:	from 911.8 MHz to 918.2 MHz
Number of channels:	64
Channel spacing:	100 kHz
Frequency generation:	Integrated fractional synthesis rate in the radio chip
Modulation:	FSK
Power source:	3.7Vdc Li-ion battery

Power level, frequency range and channels characteristics are not user adjustable.
The details pictures of the product and the circuit boards are joined with this file.

3. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below.
They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

CFR 47 FCC Part 15 (2014)	Radio Frequency Devices
ANSI C63.4 (2003)	Methods of Measurement of Radio-Noise Emissions from Low- voltage Electrical and Electronics Equipment in the range of 9 kHz to 40 GHz.

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart B –Unintentional Radiators
- Paragraph 107: Conducted limits
- Paragraph 109: Radiated emission limits
- Paragraph 111: Antenna power conduction limits for receivers

Subpart C – Intentional Radiators
- Paragraph 203: Antenna requirement
- Paragraph 205: Restricted bands of operation
- Paragraph 207: Conducted limits
- Paragraph 209: Radiated emission limits; general requirements
- Paragraph 212: Modular transmitter
- Paragraph 215: Additional provisions to the general radiated emission limitations
- Paragraph 249: Operation within the bands 902-928 MHZ, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz.

5. TEST EQUIPMENT CALIBRATION DATES

Equipment	Model	Type	Last verification	Next verification	Validity
0000	BAT-EMC	Software	/	/	/
0728	HP 11966C	Biconical antenna	03/09/2012	03/09/2016	03/11/2016
1219	R&S ESVS10	Test receiver	05/09/2013	05/09/2015	05/11/2015
1274	Emitech La pouèze	OATS	05/03/2013	05/03/2016	05/05/2016
1539	Oregon Scientific AB888	Meteo station	09/11/2012	09/11/2014	09/01/2015
1922	Microwave DB C020180F-4B1	Low-noise amplifier 1 to 18 GHz	12/09/2013	12/09/2014	12/11/2014
1999	R&S HL223	Log periodic antenna	03/09/2012	03/09/2016	03/11/2016
4088	R&S FSP40	Spectrum Analyzer	22/08/2013	22/08/2015	22/10/2015
4393	Wainwright WLJS800-C11/60EE	Low pass filter	24/01/2012	24/01/2014	24/03/2014
6609	MICRO-TRONICS HPM11630	high-pass filter	24/01/2012	24/01/2014	24/03/2014
8511	Hewlett Packard 8447D	Low noise amplifier	22/08/2013	22/08/2014	22/10/2014
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2012	12/06/2016	12/08/2016
8535	Emco 3115	Horn antenna	29/10/2012	29/10/2016	29/12/2016
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2012	12/06/2016	12/08/2016
8593	SIDT Cage 2	Full anechoic room	/	/	/

Equipment	Model	Type	Last verification	Next verification	Validity
8676	IDM106N	Multimeter	24/04/2013	24/04/2015	24/06/2015
8677	IDM106N	Multimeter	24/04/2013	24/04/2015	24/06/2015
8707	R&S ESI7	Test receiver	03/10/2012	03/10/2014	03/12/2014
8732	Emitech	OATS	23/08/2013	23/08/2016	23/10/2016
8749	La Crosse Technology WS-9232	Meteo station	20/07/2012	20/07/2014	20/09/2014
8750	La Crosse Technology WS-9232	Meteo station	20/07/2012	20/07/2014	20/09/2014
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
8972	K&L Microwave 500-1000MHz	Notch filter	/	/	/

6. TESTS AND CONCLUSIONS

6.1 unintentional radiator (subpart B)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.107	CONDUCTED LIMITS			X		Battery powered device
FCC Part 15.109	RADIATED EMISSION LIMITS	X				
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable NAs: Not Asked

6.2 intentional radiator (subpart C)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				Note 1
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS			X		Battery powered device
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC Part 15.212	MODULAR TRANSMITTERS	X				Note 3
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.249 frequency bands	X				Note 4
	(c) 20 dB bandwidth and band-edge compliance				X	C2PC
FCC Part 15.249	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz, 5725-5850 MHz AND 24.0-24.25 GHz					
	(a) Fundamental and harmonics field strength	X				
	(b) Fixed point-to-point operation		X			
	(c) Measurement distance	X				
	(d) Out-of-band emissions	X				
	(e) Field strength limits above 1 GHz	X				

NAp: Not Applicable NAs: Not Asked

Note 1: Integral antenna.

Note 2: See FCC part 15.249 (d).

Note 3: Single modular transmitter.
The host devices of the certified modules shall be properly labeled to identify the module within.

Note 4: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

RF EXPOSURE:

*Maximum measured power = 86.5 dBµV/m = 0.134 mW **

** P = (E×d)^2 / (30×Gp) with d = 3 m and Gp = 1*

*PSD = EIRP/4*π*R^2=0.134/ 4*π*(20 cm)² = 26.66×10^{-6} mW/cm² (limit= 0.612 mW/cm²).*
The equipment fulfils the requirements on power density for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310.

« To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the result(s) »

7. RADIATED EMISSION LIMITS

Standard: FCC Part 15

Test procedure: paragraph 109

Limit class: Class B

Test set up:

The system is tested in an open area test site (OATS). The EUT is placed on a rotating table, 0.8m from a ground plane. Zero degree azimuths correspond to the front of the device under test.

See photos in appendix 2

Frequency range: From 30 MHz to 5th harmonic of the highest frequency used (918.2 MHz).

Detection mode: Quasi-peak (F < 1 GHz) Average (F > 1 GHz)

Bandwidth: 120 kHz (F < 1 GHz) 1 MHz (F > 1 GHz)

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment is blocked in standby / reception mode.

Results:

Ambient temperature (°C): 16
Relative humidity (%): 66

We used for power source the internal battery of the equipment and we noted:

Voltage at the beginning of test (V): 4.22
Voltage at the end of test (V): 4.17
Percentage of voltage drop during the test (%): 1.18

Sample N° 1

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
384	QP	125	130	V	24.7	46	21.3
432	QP	115	135	V	28.8	46	17.2
459	QP	100	90	V	30.2	46	15.8
480	QP	100	65	V	35.4	46	10.6
576	QP	100	120	V	33	46	13
672	QP	170	221	V	28.8	46	17.2

Applicable limits:
for 30 MHz ≤ F ≤ 88 MHz : 40 dBµV/m at 3 meters
for 88 MHz < F ≤ 216 MHz : 43.5 dBµV/m at 3 meters
for 216 MHz < F ≤ 960 MHz : 46 dBµV/m at 3 meters
above 960 MHz : 54 dBµV/m at 3 meters

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Test conclusion:
RESPECTED STANDARD

8. FUNDAMENTAL AND HARMONICS FIELDS STRENGTH

Standard: FCC Part 15

Test procedure: paragraph 15.249 (a)

Test set up:

For the range 9 kHz to 1 GHz, the system is tested in an open area test site (OATS). The EUT is placed on a rotating table, 0.8m from a ground plane. Zero degree azimuth corresponds to the front of the device under test.

Above 1 GHz the system is tested in anechoic chamber. The EUT is placed on a rotating table, 1.5m from a ground plane. Zero degree azimuth corresponds to the front of the device under test.

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency (918.2 MHz).

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

The measure are realized on PS5005 RF module with integral antenna and compared with results PS5005 RF module with dedicated 50Ω antenna (see Emitech test report RR051-13-105730-5-A Ed. 0).

Results:

Ambient temperature (°C):	22.9	21.9
Relative humidity (%):	37…..	39

We used for power source the internal battery of the equipment and we noted:

Voltage at the beginning of test (V):	4.18	4.21
Voltage at the end of test (V):	4.14	4.15
Percentage of voltage drop during the test (%):	0.96	1.43

Power order: 3

Sample N° 1 Channel 1

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
911.8	QP	175	33	120	H	85.99*	94	8.01
1823.6	P	150	340	1000	H	40.30	54	13.70
3647.2	P	150	165	1000	V	46.90	54	7.10

* *Fundamental emission*

Sample N° 1 Channel 32

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
915	QP	176	39	120	H	86.36*	94	7.64
1830	P	150	330	1000	H	41.30	54	12.70
3660	P	150	110	1000	V	46.60	54	7.40

Sample N° 1 Channel 64

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
918.2	QP	180	38	120	H	86.50*	94	7.50
1836.4	P	150	325	1000	H	42.50	54	11.50
3672.8	P	150	170	1000	V	46.70	54	7.30

* *Fundamental emission*

Note: any spurious which has more than 20 dB of margin compared to the limit is not necessarily reported.

Test conclusion:

RESPECTED STANDARD, no increase of output power and no increase of up to 3 dB on any harmonic has been observed .

□□□ End of report, 3 appendixes to be forwarded □□□

APPENDIX 1: Photos of the equipment under test

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

APPENDIX 2: Test set up

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

APPENDIX 3: Test equipment list

Radiated emission limits

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	1274
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESVS10	Rohde & Schwarz	1219
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna 11966C	Hewlett Packard	0728
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna HL223	Rohde & Schwarz	1999
Antenna 3115	Electrometrics	8535
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier C020180F-4B1	Microwave DB	1922
Multimeter IDM106N	ISOTECH	8676
Multimeter IDM106N	ISOTECH	8677
Meteo station AB888	Oregon Scientific	1539
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC	0000

Fundamental and harmonics field strength

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Antenna 3115	Electrometrics	8535
Low-noise amplifier C020180F-4B1	Microwave DB	1922
Notch filter 500-1000MHz	K&L Microwave	8972
Low pass filter WLJS800-C11/60EE	Wainwright	4393
High pass filter HPM11630	Hewlett Packard	6609
Multimeter IDM106N	ISOTECH	8676
Multimeter IDM106N	ISOTECH	8677
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC	0000