

Electromagnetic Compatibility

Test of: Lotus Key Fob

Model Number: 457 801

Applicant: PFK Electronics

Test Type: Compliance

Test Specification: FCC CFR47, part 15.231

SGS Serial Number: EMC122031/1/ST/08

Date of Receipt: 25th September 2008

Date of Test(s): 10th November 2008 to 13th November 2008

Date of Issue: 12th December 2008

Issue Number: 2

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Authorised Signatory

S. Thompson
Test Engineer

CONTENTS	Page Number
1. Client Information.....	3
2. Details Of Test Laboratory.....	3
3. Equipment Under Test (EUT)	4
3.1 Identification Of EUT.....	4
4. Test Specification, Methods and Procedures	4
4.1 Test Specification(s)	4
4.2 Purpose Of Test.....	4
4.3 Methods and Procedures.....	5
4.3 Methods and Procedures.....	5
5. Deviations or Exclusions from the Test Specifications	6
5. Deviations or Exclusions from the Test Specifications	6
6. Operation of the EUT During Testing / Configuration and Peripherals	7
6.1 Operation of EUT during testing.	7
6.2 Configuration and Peripherals	7
7. Test Results	8
7.1 General Comments.....	8
7.2 Modifications Made to the EUT.....	8
7.3 Summary of Test Results	9
7.4 Radiated Emissions Test Results 15.231	10
7.5 Occupied Bandwidth 15.231	14

1. Client Information

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2. Details Of Test Laboratory

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3. Equipment Under Test (EUT)

3.1 Identification Of EUT

Model Number:	457 801
Unique Identifier:	Not Supplied
Description of EUT:	Lotus Key Fob
Intentional Radiator:	433.92MHz
Supply Voltage:	3V (Battery)
Ports present:	Enclosure
Accessories Supplied:	None

4. Test Specification, Methods and Procedures

4.1 Test Specification(s)

Specification(s)	Title
FCC CFR 47 : October 2007 Part 15.231	Code Of Federal Regulations part 15 Telecommunication – Radio frequency devices

4.2 Purpose Of Test

To perform the relevant tests and assess the product for compliance with the above specification (s).

4.3 Methods and Procedures

The standards listed on the previous page refer to the following tests: -

CFR 47 Clause	Test
15.231	Radiated Emissions
15.231	Occupied Bandwidth

All tests were conducted using the procedures in ANSI C63.4 2003 as required by 47 CFR Part 15 Subpart A paragraph 15.31 (a)(3).

5. Deviations or Exclusions from the Test Specifications

There were no deviations from the test specifications.

6. Operation of the EUT During Testing / Configuration and Peripherals

6.1 Operation of EUT during testing.

The EUT was tested whilst constantly transmitting.

6.2 Configuration and Peripherals

No peripherals were used during the testing.

7. Test Results

7.1 General Comments

The test methods used are referred to in the individual test results sections of this test report.

7.2 Modifications Made to the EUT

No modifications were made to the EUT during the testing.

7.3 Summary of Test Results

CFR 47 Clause	Test	Result
15.231	Radiated Emissions	Complied
15.231	Occupied Bandwidth	Complied

Result

In the configuration tested, the EUT complies with the requirements of Clause 15.231 of CFR 47.

Full details of all tests can be found in the test results section of this report.

7.4 Radiated Emissions Test Results 15.231

CFR Clause	15.231
Frequency Range	30MHz – 4500MHz

Operating Mode

The compliance test was performed whilst the EUT was transmitting continuously.

All measurements below are peak measurements.

Test Results

Worse Case Peak Measurements (30-1000MHz)

Measurements made at 3m

Frequency (MHz)	S.A. Measurement (dBuV)	Cable loss (dB)	Antenna Factor (dB)	Pre-amplifier gain (dB)	Corrected measurement (dBuV/m)	Limit (15.231) dBuV/m	Antenna Polarity
433.808	67.83	5.9	16.0	30.3	59.43	80.82*	Vertical
867.617	37.00	9.7	22.3	30.0	39.00	60.82	Vertical
433.808	79.17	5.9	16.0	30.3	70.77	80.82*	Horizontal
867.625	45.33	9.7	22.3	30.0	47.33	60.82	Horizontal

* Carrier frequency limit, 15.231 (b)

Measurement bandwidth 100kHz

Worst case peak measurements 1000-4500MHz

Measurements made at 3m

Frequency (GHz)	Peak measurement (dBuV)	Cable loss (dB)	Antenna Factor (dB)	Pre-amplifier Gain	Corrected measurement (dBuV/m)	Limit 15.231 (dBuV/m)	Limit 15.209 (dBuV/m)	Measurement Distance (meters)
1.301424	65.17	0.33	23.53	38.96	52.07		53.98	3
1.735232	65.17	0.33	27.71	38.07	55.14	60.82		3
2.168998	66.00	0.67	27.71	37.67	56.71	60.82		3
2.6027	56.00	1.17	28.8	37.48	48.49	60.82		3
3.036492	46.97	1.17	30.54	37.39	41.29	60.82		3
3.47005	47.17	1.83	31.78	37.00	43.78	60.82		3
3.9043	46.50	1.83	33.01	36.27	45.07		53.98	3
4.337897	42.67	2.00	32.65	36.84	40.48		53.98	3
1.301217	58.17	0.33	25.53	38.96	45.07		53.98	3
1.735292	59.17	0.33	27.71	38.07	49.14	60.82		3
2.168933	48.67	0.67	27.71	37.67	39.38	60.82		3
2.602778	59.67	1.17	28.8	37.48	52.16	60.82		3
3.036808	54.33	1.17	30.54	37.39	48.65	60.82		3
3.470442	47.00	1.83	31.78	37.00	43.61	60.82		3
3.904	44.50	1.83	33.01	36.27	43.07	60.82		3
4.3378	44.50	2.00	32.65	36.84	42.31	60.82		3

Measurement bandwidth 1MHz

15.209 limit used where frequency lies in bands specified in 15.205

Radiated Emissions Test Configuration 30-1000MHz



Radiated Emissions Test Configuration 1000-4500MHz



Radiated Emissions Environmental Conditions

Power Supply	3V, 60 Hz
Temperature	9°C
Relative Humidity	48%
Barometric Pressure	1004mb

Radiated Emissions Measurement Uncertainties

Frequency	± 200kHz
Amplitude	± 4.6dB

The uncertainties stated are calculated in accordance with the requirements of UKAS with a confidence level of 95%.

Radiated Emissions Test Equipment Used

Equipment Type	Model Number	Calibration Date	Calibration Cycle
Antenna	EMCO 3146	5 th September 2008	3 years
Antenna	EMCO 3115	20 th March 2007	3 years
Pre-amplifier (30-1000MHz)	ZHL-1042J	25 th March 2008	2 years
Pre-amplifier (1000-4500MHz)	HP8449B	17 th July 2008	2 years
Spectrum an aly ser	HP8563E	13 th March 2008	2 years
Cables (30-1000MHz)	OATS 1,2,3	2 nd April 2008	1 Year
Cables (1000-4500MHz)	RI 10, RI20	10 th November 2008	2 years
Receiver	HP Receiver System (85733)	4 th September 2008	2 years

7.5 Occupied Bandwidth 15.231

Operating mode

The compliance test was performed whilst the EUT was transmitting continuously.

Requirement:

15.231 (c) "The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

15.231 (a) (1) "A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released."

Test Results (normal conditions 19°C)

Bandwidth	Lower Frequency	Upper Frequency
-20 dB	433.795MHz	433.827MHz

Test Results (Extreme -20°C)

Bandwidth point	Lower Frequencies	Upper Frequencies
-20 dB	433.778MHz	433.830MHz

Test Results (Extreme 65°C)

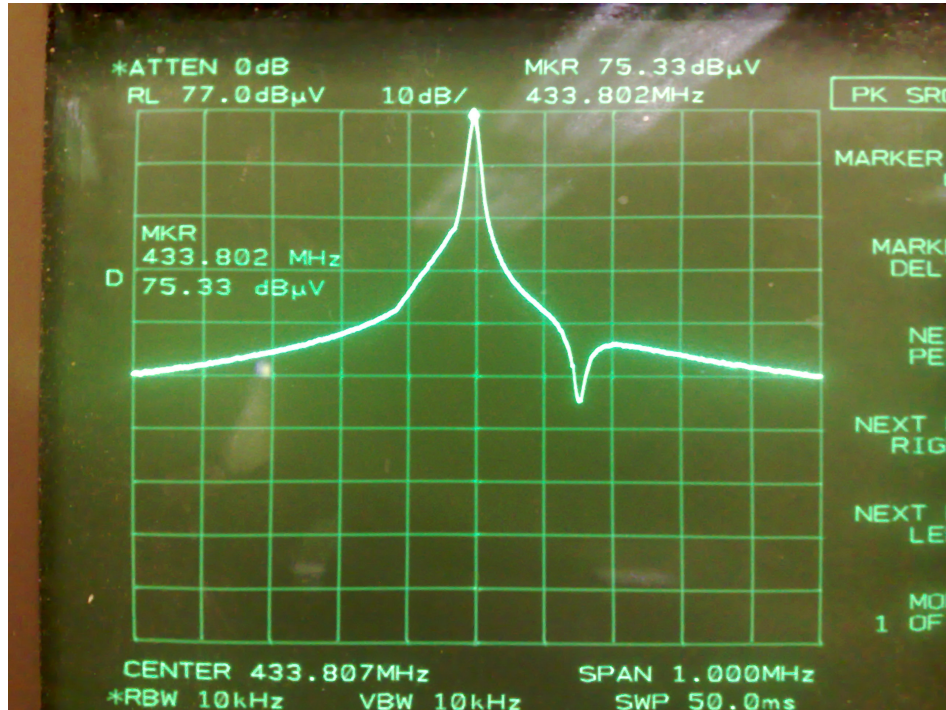
Bandwidth point	Lower Frequencies	Upper Frequencies
-20 dB	433.743MHz	433.797MHz

Allocated band is 0.25% of the centre frequency = 1.084505MHz

Test Results 15.231 (a) (1)

The transmitter was observed by SGS to cease transmission immediately (within 5 seconds) when any of the buttons were pressed and released. Meeting the requirements of 15.231 (a) (1).

Carrier Frequency



Occupied Bandwidth Environmental Condition

Power Supply	3V DC
Temperature	19°C
Relative Humidity	46%
Barometric Pressure	1003 mb

Test Equipment Used

Equipment Type	Model Number
Spectrum Analyser	HP 8563E
Environmental Chamber	