FCC Measurement/Technical Report on

Smart Wireless Flower Pot
Parrot POT

FCC ID: 2AG6IPOT
IC: 21053-POT

Test Report Reference: MDE_PARRO_1518_FCCb

Test Laboratory:
7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany

DAkkS Deutsche Akkreditierungsstelle D-PL-12140-01-01

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1 Applied Standards and Test Summary

1.1 Applied Standards

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 15 (10-1-15 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart B – Unintentional Radiators

§ 15.107 Conducted limits

§ 15.109 Radiated emission limits; general requirements

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 1.3 Measurement Summary / Signatures.

1.2 FCC-IC Correlation Table

Correlation of measurement requirements for Information Technology Equipment (ITE) from FCC and IC

Measurement	FCC reference	IC reference
Conducted Emissions (AC Power Line)	§15.107	ICES-003 Issue 6: 6.1
Radiated Spurious Emissions	§15.109	ICES-003 Issue 6: 6.2

Remarks:

1. FCC Part 15 subpart B, ICES 003 and CISPR 22 contain different definitions of Class A and Class B limits, i.e. which class is applicable to which kind of EUT.
   ICES 003 and CISPR 22 distinguish between the location where the EUT is intended to operate whilst FCC refers to the method of commercial distribution (distributive trades).
2. The correct assignment of the appropriate class to the concrete EUT is not scope of this test report!
3. A radio apparatus that is specifically subject to an Industry Canada Radio Standard Specification (RSS) and which contains an ITE is not subject to ICES-003 provided the ITE is used only to enable operation of the radio apparatus and the ITE does not control additional functions or capabilities.
4. ISM (Industrial, Scientific or Medical) radio frequency generators, though they may contain ITE, are excluded from the definition of ITE and are not subject to ICES-003. They are instead subject to the Interference-Causing Equipment Standard ICES-001, which specifically addresses ISM radio frequency generators.

1.3 Measurement Summary / Signatures

47 CFR CHAPTER I FCC PART 15 Subpart B	**§ 15.109**		
Radiated Emissions The measurement was performed according to ANSI C63.4-2014		**Final Result**	
OP-Mode AC mains connection, Measurement range, Test setup	**Setup**	**FCC**	**IC**
no connection, 30 MHz - 1 GHz, stand-alone	Setup_03_app	passed	passed

(responsible for accreditation scope)
Dipl.-Ing. Marco Kullik

(responsible for testing and report)
Dipl.-Ing. Andreas Petz

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40880 Ratingen, Germany
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2 Administrative Data

2.1 Testing Laboratory

Company Name:	7layers GmbH
Address:	Borsigstr. 11 40880 Ratingen Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716.

This facility has been fully described in a report submitted to the IC and accepted under the registration number: Site# 3699A-1.

The test facility is also accredited by the following accreditation organisation:

Laboratory accreditation no:	DAkkS D-PL-12140-01-01
Responsible for accreditation scope:	Dipl.-Ing. Marco Kullik
Report Template Version:	2016-02-29

2.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Employees who performed the tests:	documented internally at 7Layers
Date of Report:	2016-04-27
Testing Period:	2016-04-08 to 2016-04-08

2.3 Applicant Data

Company Name:	Parrot Drones SAS
Address:	174 quai de jemmapes Paris France
Contact Person:	Mr. Cherif Si Ahmed

2.4 Manufacturer Data

Company Name:	please see applicant data
Address:	
Contact Person:	

3 Test object Data

3.1 General EUT Description

Kind of Device product description	Connected plant pot
Product name	Hawai2-POT
Type	Parrot POT
Declared EUT data by the supplier	
Power Supply Type	DC
Comment	Primary Cells
Nominal Voltage / Frequency	6 V
Test Voltage / Frequency	6 V DC (new batteries)
Highest internal frequency	32 MHz
General Description	The EUT is a Bluetooth Low Energy transceiver operating in the 2.4 GHz ISM band.
Ports	Enclosure

The main components of the EUT are listed and described in chapter 3.2 EUT Main components.

3.2 EUT Main components

Sample Name	Sample Code	Description
Standard sample #3	ac01	sample in BTLE application mode, integral antenna
Sample Parameter	**Value**	
Serial No.	PI040366P16C000084	
HW Version	HW08	
SW Version	Hawai2-0.25.0	
Comment		

NOTE:The short description is used to simplify the identification of the EUT in this test report.

3.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Device	Details (Manufacturer, Type Model, OUT Code)	Description
-	-	-

3.4 Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it.
But nevertheless Auxiliary Equipment can influence the test results.

Device	Details (Manufacturer, HW, SW, S/N)	Description
iPod	Apple Inc., ME643NF/A, iOS 9.2.1 (13D15) , CCQM187PFFCJ	Monitoring Device

3.5 EUT Setups

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup Name	Sample Code	Ancillary Equip-ment	Auxiliary Equip-ment (by applicant)	Auxiliary Equipment (by laboratory)	Description and Rationale for usage
Setup_03_app	ac01	-	iPod	-	Representative setup for unintentional radiation measurements

3.6 Operating Modes

The EUT operates in its normal application / hopping mode in the 2.4 GHz ISM band.

3.7 Special Software used for testing

No special software is used, all devices are operated in their normal mode.

3.8 Product labelling

FCC ID label
Please refer to the documentation of the applicant.

3.8.1 Location of the label on the EUT

Please refer to the documentation of the applicant.

4 Test Results

4.1 Radiated Emissions

Standard **47 CFR CHAPTER I FCC PART 15 Subpart B**

The test was performed according to: ANSI C63.4-2014

4.1.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C63.4 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m² in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.
The measurement procedure is implemented into the EMI test software EMC32 from R&S. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is also performed at 3 axes. A pre-check is performed while the EUT is powered from a DC power source.

1. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan
This is a preliminary test to identify the highest amplitudes relative to the limit.
Settings for step 1:
- Antenna distance: 3 m
- Detector: Peak-Maxhold / Quasipeak (FFT-based)
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 ms
- Turntable angle range: –180° to 90°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: Adjustment measurement
In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.
For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will slowly vary by ± 45° around this value. During this action, the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position, the antenna height will also slowly vary by ± 100 cm around the antenna height determined. During this action, the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz

- Measuring time: 100 ms
- Turntable angle range: ± 45 ° around the determined value
- Height variation range: ± 100 cm around the determined value
- Antenna Polarisation: max. value determined in step 1

Step 3: Final measurement with QP detector
With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Quasi-Peak (< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

3. Measurement above 1 GHz
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
Step 1:
The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.
All steps were performed with one height (1.5 m) of the receiving antenna only.
The EUT is turned during the preliminary measurement across the elevation axis, with a step size of 90 °.
The turn table step size (azimuth angle) for the preliminary measurement is 45 °.
Step 2:
Due to the fact, that in this frequency range the test is performed in a fully anechoic room, the height scan of the receiving antenna instep 2 is omitted. Instead of this, a maximum search with a step size ± 45° for the elevation axis is performed.
The turn table azimuth will slowly vary by ± 22.5°.
The elevation angle will slowly vary by ± 45°
EMI receiver settings (for all steps):
- Detector: Peak, Average
- IF Bandwidth = 1 MHz
Step 3:
Spectrum analyser settings for step 3:
- Detector: Peak / Average
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz
- Measuring time: 1 s

4.1.2 Test Requirements / Limits

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits

Class B:

Frequency (MHz)	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 - 26000	500@3m	3	54.0@3m
26000 - 40000	500@3m	1	54.0@3m

Class A:

Frequency (MHz)	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	90@10m	3	39.1@10m
88 – 216	150@10m	3	43.5@10m
216 – 960	210@10m	3	46.4@10m
960 - 26000	300@10m	3	49.5@10m
26000 - 40000	300@10m	1	49.5@10m

If the measurement distance is different to the specified, then the measured values are corrected with an inverse linear distance extrapolation factor (20 dB/decade).

§15.35(b) ..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

4.1.3 Test Protocol

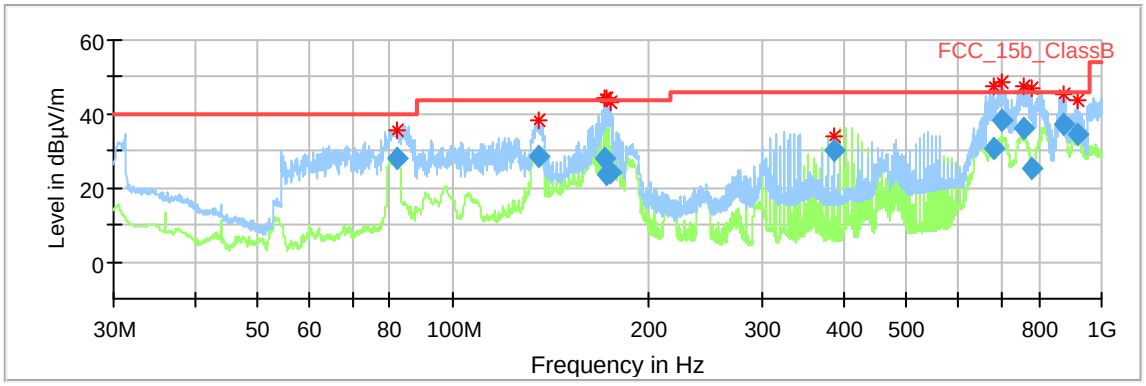
Setup: Setup_03_app
Ambient temperature: 24 °C
Air Pressure: 1006 hPa
Humidity: 37 %
No AC connection

Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detector	RBW [kHz]	Limit [dBµV/m]	Margin to Limit [dB]
81.9	27.7	QP	120.0	40.0	12.3
135.5	28.6	QP	120.0	43.5	14.9
171.8	27.9	QP	120.0	43.5	15.7
172.6	23.9	QP	120.0	43.5	19.6
174.8	24.1	QP	120.0	43.5	19.4
388.0	30.2	QP	120.0	46.0	15.8
683.8	30.5	QP	120.0	46.0	15.5
701.0	38.2	QP	120.0	46.0	7.8
756.9	35.9	QP	120.0	46.0	10.1
781.3	25.4	QP	120.0	46.0	20.6
873.5	37.1	QP	120.0	46.0	8.9
917.0	34.6	QP	120.0	46.0	11.4

Remark: Please see next sub-clause for the measurement plot.

4.1.4 Measurement Plot (showing the highest value, “worst case”)

AC mains connection = no connection, Measurement range = 30 MHz - 1 GHz, Test setup = stand-alone



4.1.5 Test Equipment used

Radiated Emissions

5 Test Equipment

1 Radiated Emissions

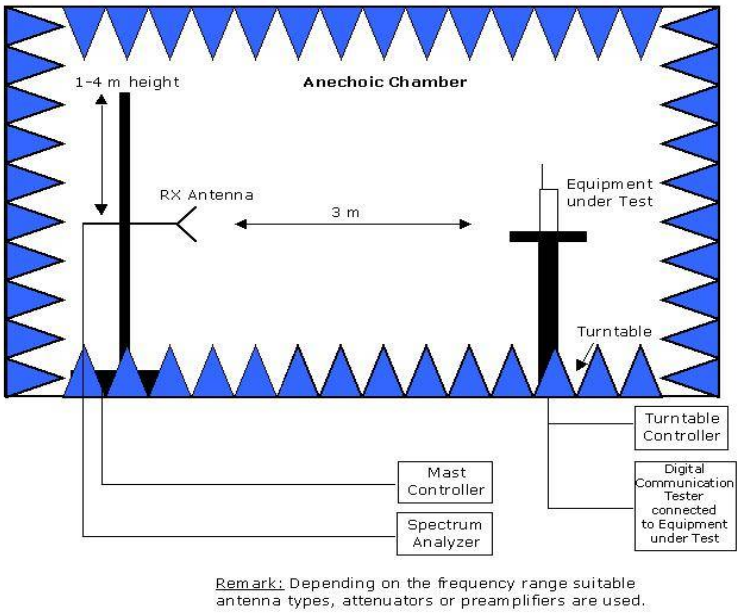
Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Calibration Due
1.1	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronic GmbH	00083069	
1.2	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright	09	
1.3	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008	
1.4	Fully Anechoic Room	8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	
1.5	AM 4.0	Antenna mast	Maturo GmbH	AM4.0/180/11920513	
1.6	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11-13
1.7	Anechoic Chamber	10.58 x 6.38 x 6.00 m³	Frankonia	none	2017-01-09
1.8	ESIB 26	Spectrum Analyzer	Rohde & Schwarz	830482/004	2017-12-08
1.9	Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	Maturo GmbH	TD1.5-10kg/024/3790709	
1.10	5HC2700/12750-1.5-KK	High Pass Filter	Trilithic	9942012	
1.11	AS 620 P	Antenna mast	HD GmbH	620/37	
1.12	NRV-Z1	Sensor Head A	Rohde & Schwarz	827753/005	2016-05-11
1.13	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011	
1.14	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785	
1.15	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037	
1.16	HL 562	Ultralog new biconicals	Rohde & Schwarz GmbH & Co. KG	830547/003	2018-06-30
1.17	Opus10 THI (8152.00)	ThermoHygro Datalogger 12 (Environ)	Lufft Mess- und Regeltechnik GmbH	12482	2017-03-10
1.18	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368	

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Calibration Due
1.19	HFH2-Z2	Loop Antenna	Rohde & Schwarz GmbH & Co. KG	829324/006	2017-11-27
1.20	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2016-11-17
1.21	Opus10 TPR (8253.00)	ThermoAirpressure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2017-02-27
1.22	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304	
1.23	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675	
1.24	HL 562 Ultralog	Log.-per. Antenna	Rohde & Schwarz GmbH & Co. KG	100609	
1.25	HF 907	Double-ridged horn	Rohde & Schwarz GmbH & Co. KG	102444	2018-05-11

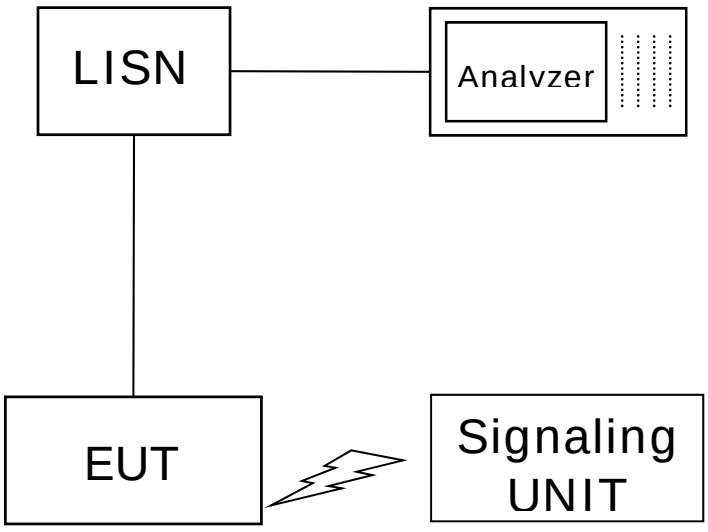
6 Setup Drawings

Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.



Setup in the shielded room for conducted measurements at AC mains port

7 Measurement Uncertainties

Test Case	Parameter	Uncertainty
Conducted Emissions at AC mains	Voltage	± 3.4 dB
Radiated Emissions	Field Strength	± 5.5 dB

8 Photo Report

Please see separate photo report.