

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C AND ISED CANADA REQUIREMENTS

Equipment Under Test:	Indoor mini Drone system with UWB radio technology
Trademark:	Intel
Model:	Shooting Star Mini Drone
Applicant:	Intel Corporation 2200 Mission College Blvd Santa Clara, CA 95054 USA
Manufacturer:	Intel Behringstraße 10 82152 Planegg GERMANY
FCC Rule Part:	Part 15 C
IC Rule Part:	RSS-GEN Issue 4, 2014

- *Partial testing, see test suite*

Date: 12 October 2018

Issued by:

Mikko Halonen
Testing Engineer

Date: 12 October 2018

Checked by:

Rauno Repo
Testing Engineer

PRODUCT DESCRIPTION	3
Equipment Under Test (EUT)	3
General Description	3
Samples and Modifications	3
Specifications	3
Power Requirements	3
Cable Lengths and Types	4
Peripherals	4
GENERAL REMARKS.....	5
Disclaimer	5
TEST CONDITIONS.....	6
EUT Test Conditions during Testing	6
SUMMARY OF TESTING.....	7
Summary of Testing	7
TEST RESULTS.....	8
Conducted Emissions In The Frequency Range 150 kHz - 30 MHz.....	8
TEST EQUIPMENT	11

Equipment Under Test (EUT)

Type:	Indoor mini Drone system with UWB radio technology
Model:	Shooting Star Mini Drone
Trade Mark:	Intel
Serial no:	-
Software version:	-
Hardware version:	-

General Description

The Intel Shooting Star Mini Drone system is an UAV dedicated for aerial displays.

The Shooting Star Mini system contains three main components:

1. The Aerial Drone. This is the lightweight UAV that contains the LED light used to produce the show effects. No serial numbers.
2. The Launch Pad provides the launch and charging facilities for fifteen (15) drones. No serial number.
3. The Anchors for control and indoor positioning. No serial number.

The system uses 6.5 GHz UWB radio module. The module is FCC certified and CE marked.

According to the manufacturer the highest clock frequency is under 108 MHz.

Samples and Modifications

No.	Name	Description
1	Launchpad	Normal sample, no modifications
2	Anchor	Normal sample, no modifications
3	Drones	15 drones, Normal sample, no modifications

Specifications

Nominal frequency:	6489.6 MHz
Nominal Channel Bandwidth:	500 MHz
Highest Internal Frequency:	<108 MHz

Power Requirements

Launch Pad:

Rated voltage: 100 – 240 VAC ~ 50 – 60Hz

Rated current: 1.7 A

Anchor:

Rated voltage: 5 VDC (USB)

Aerial Drone:

Battery operated: 3.7 VDC internal Li-ion battery

Cable Lengths and Types

Cable:	Length:	Type:
Mains power	0.3 - 5 m	unshielded (L,N,PE)
USB cable	<3 m	unshielded

Peripherals

- Huawei Power Bank model: AP007
- Intel NUC PC model: NUC7i5BNK, S/N: G6BN81500TS1
- FSP AC/DC adaptor model: FSP065-10AABA
- PC Laptop HP Elitebook 8540w

All peripherals were supplied by the manufacturer.

Disclaimer

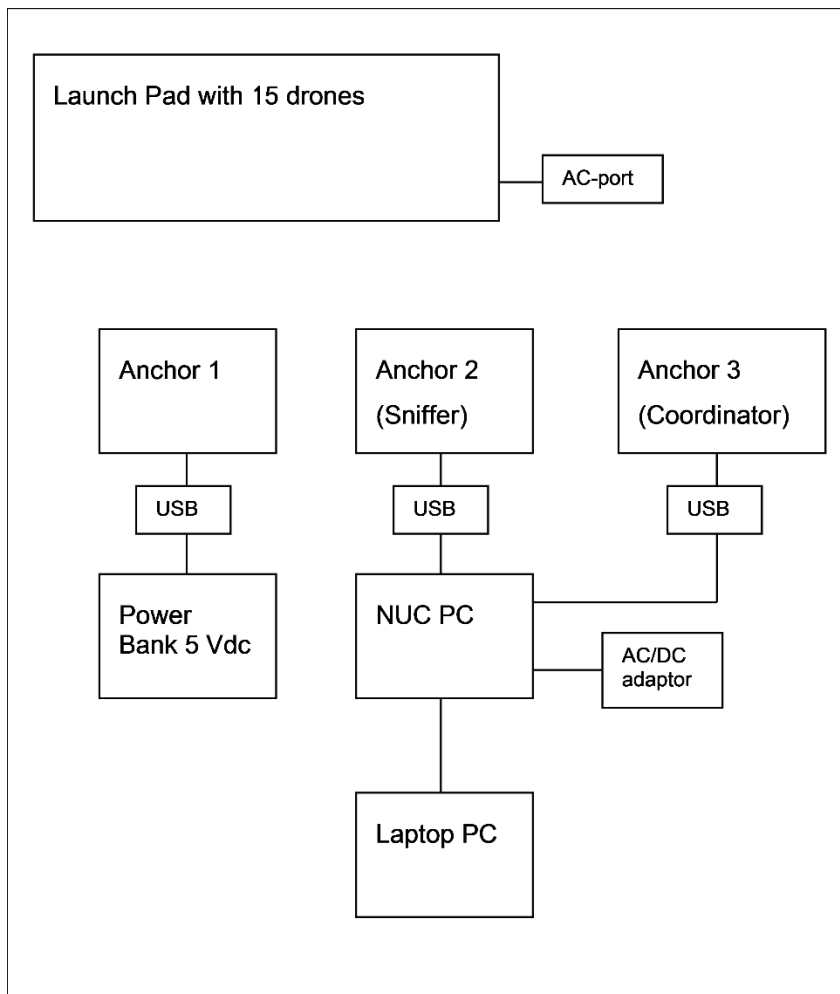
This document is issued by the Company under its General Conditions of service accessible at [http://www.sgs.com/terms and conditions.htm](http://www.sgs.com/terms_and_conditions.htm). attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. This document cannot be reproduced except in full, without prior approval of the Company.

EUT Test Conditions during Testing

Configuration of the EUT was made to correspond to the actual assembling conditions as far as possible. The functionality and the communication link were monitored with customer control program. Fifteen Aerial Drones were set on the Launch Pad for recharging. Rotors were not rotating during they were on the Launch Pad. This setup with 15 drones charging simultaneously and radio communications on, represents worst case mode of operation. Radiated emissions were also measured for the Aerial Drone alone in hovering mode. The EUTs were also monitored with a video camera.



Picture 1. Block diagram of the test setup

Conducted Emissions In The Frequency Range 150 kHz – 30 MHz

Summary of Testing

Test Specification	Description of Test	Result
§15.207(a) / RSS-GEN 8.8	Conducted Emissions on Power Supply Lines	PASS

Test Facility

Testing Laboratory / address: FCC registration number: 904175	SGS Fimko Ltd Särkiniementie 3 FI-00210, HELSINKI FINLAND
Test Site:	☐ Kara 10, ISED Canada registration number: 8708A-1 ☒ Kara 5, ISED Canada registration number: 8708A-2 ☐ Laru 3 ☐ Kallio 10

Conducted Emissions In The Frequency Range 150 kHz – 30 MHz

TEST RESULTS

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz.

Standard: ANSI C63.10 (2013)
Tested by: MIH
Date: 27 August 2018
Temperature: 20 °C
Humidity: 54 % RH
Measurement uncertainty: ± 2.9 dB Level of confidence 95 % ($k = 2$)

FCC Rule: 15.207 (a)
RSS-GEN 8.8

Test plan

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with 4.5 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors. During the test the EUT was powered from the separate power supply (115 VAC / 60 Hz) through the LISN.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Conducted Emissions In The Frequency Range 150 kHz – 30 MHz

Full Spectrum

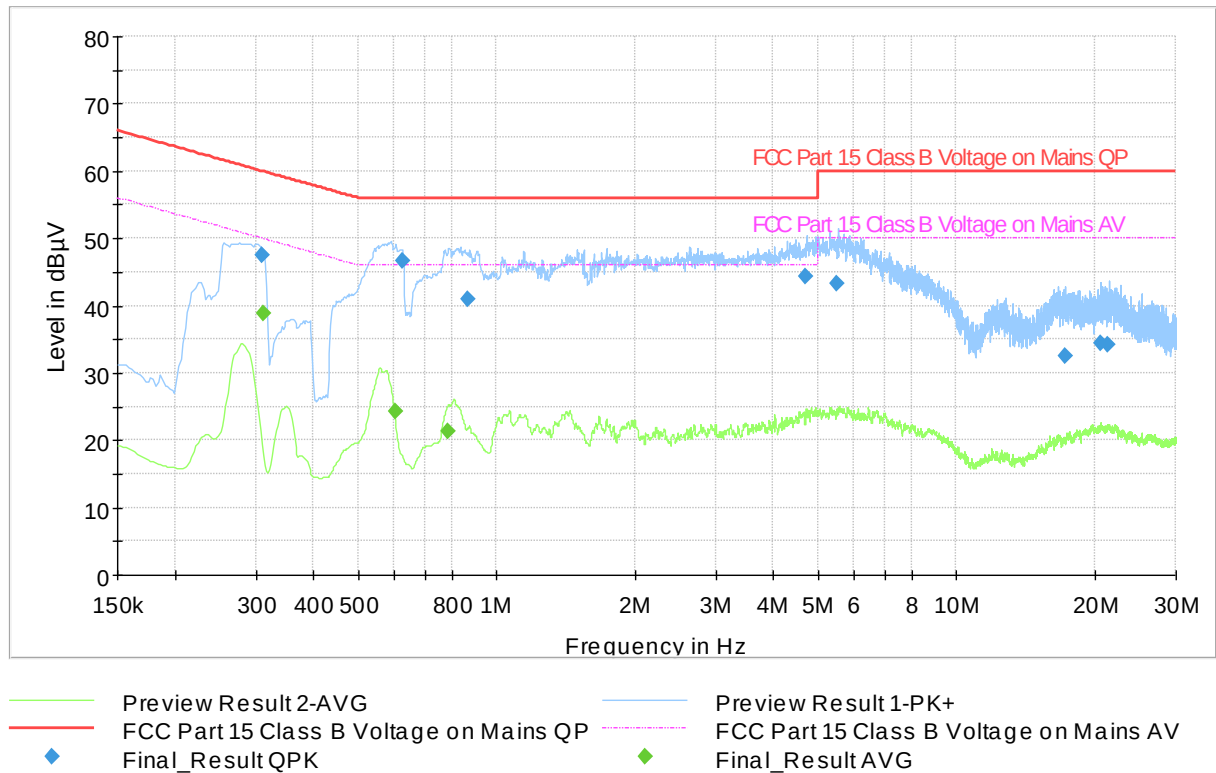


Figure 1. The measured results with peak- and average detectors at the Launch AC-port

Table 1. Final Quasipeak and Average results (Launch pad AC-port)

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.310000	47.53	---	59.97	12.44	1000.0	9.000	N	ON	10.2
0.311500	---	38.79	49.93	11.14	1000.0	9.000	N	ON	10.2
0.602250	---	24.17	46.00	21.83	1000.0	9.000	N	ON	10.3
0.623750	46.72	---	56.00	9.28	1000.0	9.000	N	ON	10.2
0.786000	---	21.23	46.00	24.77	1000.0	9.000	N	ON	10.3
0.869000	41.01	---	56.00	14.99	1000.0	9.000	N	ON	10.3
4.706750	44.34	---	56.00	11.66	1000.0	9.000	N	ON	10.4
5.497750	43.37	---	60.00	16.63	1000.0	9.000	N	ON	10.4
17.232750	32.47	---	60.00	27.53	1000.0	9.000	L1	ON	10.5
20.582750	34.36	---	60.00	25.64	1000.0	9.000	N	ON	10.7
21.407750	34.09	---	60.00	25.91	1000.0	9.000	N	ON	10.6

The presented final values contain the correction factors and can be directly compare with the limits.

Conducted Emissions In The Frequency Range 150 kHz – 30 MHz

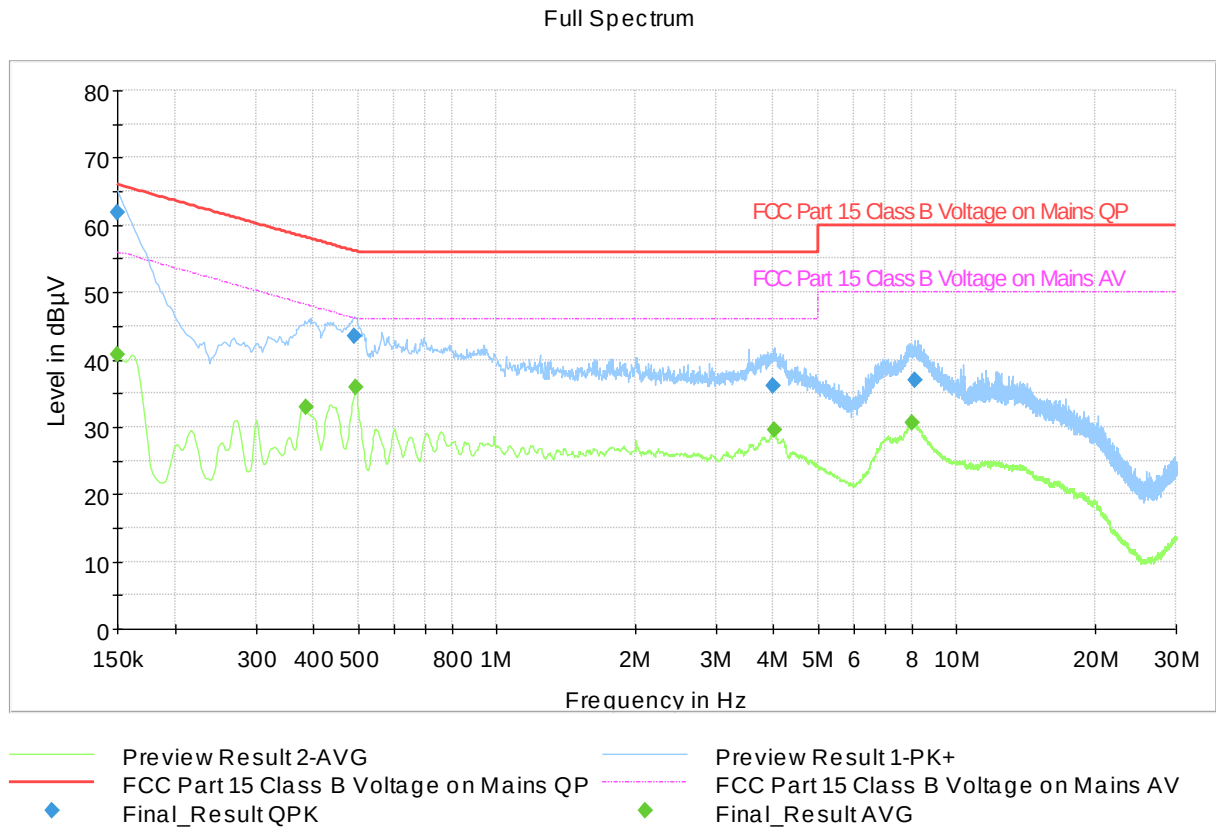


Figure 2. The measured results with peak- and average detectors at the NUC power adaptor

Table 2. Final Quasipeak and Average results (NUC power adaptor)

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	40.70	56.00	15.30	1000.0	9.000	L1	ON	9.9
0.150000	61.86	---	66.00	4.14	1000.0	9.000	N	ON	10.1
0.386500	---	32.87	48.14	15.27	1000.0	9.000	N	ON	10.3
0.491000	43.50	---	56.15	12.65	1000.0	9.000	N	ON	10.3
0.493250	---	35.98	46.11	10.13	1000.0	9.000	N	ON	10.3
3.982000	36.12	---	56.00	19.88	1000.0	9.000	L1	ON	10.0
4.015250	---	29.52	46.00	16.48	1000.0	9.000	L1	ON	10.0
8.023750	---	30.59	50.00	19.41	1000.0	9.000	N	ON	10.5
8.135750	37.03	---	60.00	22.97	1000.0	9.000	N	ON	10.5

The presented final values contain the correction factors and can be directly compare with the limits.

Conducted Emissions

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
LISN	ROHDE & SCHWARZ	ENV216	inv:9611	2018-03-01	2019-03-01
LISN	ROHDE & SCHWARZ	ESH3-Z5	inv:8019	2018-05-24	2019-05-24
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU 26	inv:8453	2018-06-27	2019-06-27
ATTENUATOR	PASTERNAK	PE 7004-4	inv:10126	2017-12-01	2019-12-01
POWER SUPPLY	CALIFORNIA INSTR.	5001 iX Series II	inv:7826	-	-