

# FCC Part 15 Subpart E §15.407

## RSS-210 ISSUE No. :9

### Test Report

<b>Equipment Under Test</b>	<b>Pico Projector</b>
<b>Model Name</b>	<b>PicoBit</b>
<b>Variant Model Name</b>	<b>PicoBit-S</b>
<b>Applicant</b>	<b>CELLUON, INC.</b>
<b>FCC ID</b>	<b>TCLPICOBIT</b>
<b>IC Number</b>	<b>10211A-PICOBIT</b>
<b>Manufacturer</b>	<b>CELLUON, INC.</b>
<b>Date of Test(s)</b>	<b>2017. 01.03 ~ 2017. 01. 31</b>
<b>Date of Issue</b>	<b>2017. 02. 10</b>

In the configuration tested, the EUT complied with the standards specified above.

<b>Issue to</b>	<b>Issue by</b>
<p><b>CELLUON, INC.</b> Ace High-End Tower 1101 235-2, Guro-Dong, Guro-Gu, Seoul, Korea, 152-740</p> <p>Tel.: +82-2-6220-3886 Fax: +82-2-6220-3899</p>	<p><b>MOVON CORPORATION</b> 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-812</p> <p>Tel.: +82-31-338-8837 Fax: +82-31-338-8847</p>

### Revision history

Revision	Date of issue	Description	Revised by
--	Jan 16, 2017	Initial	--
1	Jan 25, 2017	Add Test 6	

## Table of contents

1.

**1. General information**

**1.1. Details of applicant**

Applicant : CELLUON, INC.  
 Address : Ace High-End Tower 1101 235-2, Guro-Dong, Guro-Gu, Seoul, Korea, 152-742  
 Contact Person : Chun Bae, Park  
 Telephone : +82-2-6220-3886  
 Fax : +82-2-6220-3899

**1.2. Summary of test results**

The EUT has been tested according to the following specifications;

Section in FCC part 15	Section in RSS-GEN, RSS-210	Description	Result
§15.205(a) §15.209(a)	2.2 2.6 A9.3(2)	Transmitter radiated spurious emissions,	C
§15.109(a)	RSS-Gen 6	Receiver radiated spurious emission	C
§15.207	7.2.2	Conducted power line test	C
§15.407(a)(1)	A9.2(2)	26 dB and 99% BANDWIDTH	C
§15.407(a)(1)	A9.2(2)	Output power	C
§15.407(a)(1)	A9.2(2)	Peak power spectral density	C
§15.407(a)(1)	-	Peak excursion	C
§15.407(g)	A2.1	frequency stability	C
§15.407(e)	-	6 dB bandwidth	C
§1.1307(b)(1)	RSS GEN 5.5 RSS-102	RF exposure evaluation	C

The sample was tested according to the following specification:

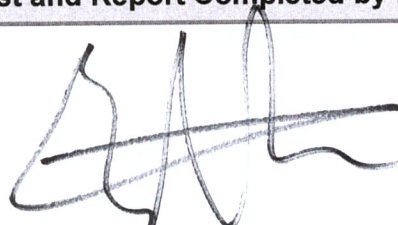
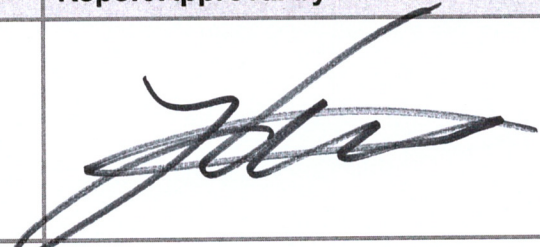
**ANSI C63.10-2013, FCC Public Notice KDB789033 D02 v01r03.**

TEST SITE REGISTRATION NUMBER: FCC(KR0151), IC(6432B-3), IC(21313-1)

※ **Abbreviation**

C Complied  
 N/A Not applicable  
 F Fail

**Approval Signatories**

Test and Report Completed by :	Report Approval by :
	
Kin Son Test Engineer MOVON CORPORATION	Issac Jin Technical Manager MOVON CORPORATION

## 2. EUT Description

<b>Kind of product</b>	Pico projector
<b>Model Name</b>	PicoBit
<b>Variant Model Name</b>	PicoBit-S
<b>FCC ID</b>	TCLPICOBIT
<b>IC Number</b>	10211A-PICOBIT
<b>Serial Number</b>	N/A
<b>Power supply</b>	DC 3.8V
<b>Frequency range</b>	5 180

### 3. Measurement equipment

Equipment	Manufacturer	Model	Serial number	Calibration Interval	Calibration due.
Test Receiver	R&S	ESVS30	829673/015	1 year	2017-12-09
Signal Generator	R&S	SMA100A	102188	1 year	2017-12-09
Spectrum Analyzer	R&S	FSV-40	100832	1 year	2017-11-09
Power Meter	Agilent	E4416A	GB41290645	1 year	2017-06-28
Power Sensor	Agilent	9327A	US40441490	1 year	2017-06-28
Horn Antenna	R&S	HF906	100236	2 year	2017-07-24
Horn Antenna	R&S	HF906	100235	2 year	2017-04-23
Horn Antenna	AH Systems	SAS-573	164	2 year	2018-05-03
TRILOG Supper Broadband test Antenna	SCHWARZBECK	SAS-521-7	9161-4159	2 year	2018-06-14
Power Amplifier	MITEQ	AM-1431	1497315	1 year	2017-06-28
Power Amplifier	MITEQ	AFS43-01002600	1374382	1 year	2017-11-03
High Pass Filter	Wainwright	WHK3.0/18G-10SS	508	1 year	2017-06-29
Controller	INNCO	CO2000	co200/064/6961003/L	N/A	N/A
Antenna Master	INNCO	MA4000	MA4000/038/6961003/L	N/A	N/A
Loop Antenna	ETS LINDGREN	6502	00118166	2 year	2018-02-23
TWO LINE-V-NETWORK	R&S	ESH3-Z5	100296	1 year	2017-12-09
Power Amplifier	MITEQ	AFS43-01002600	1374382	1 year	2016-11-03

#### **4. Transmitter radiated spurious emissions and conducted spurious emissions**

##### **4.1. Test setup**

##### **4.1.1. Transmitter radiated spurious emissions**

The diagram below shows the test setup that is utilized to make the measurements for emission from 9kHz to 30MHz Emissions.

The diagram below shows the test setup that is utilized to make the measurements for emission from 30

The diagram below shows the test setup that is utilized to make the measurements for emission from  
1

According to 15.407(b), (b) Undesirable emission limits: Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15–5.25

### **4.3. Test procedures**

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10:2013. In case of the air temperature of the test site is out of the range is 10 to 40°C before the testing proceeds the warm-up time of EUT maintain adequately.

#### **4.3.1. Test procedures for radiated spurious emissions**

1. The EUT is placed on a turntable, which is 0.8 m (Below 1

#### 4.4. Test result

Ambient temperature: 20



**Operation mode: U-NII-1\_(n HT20)**

**A. Low channel (5 180)**



**Operation mode: U-NII-3**

**A. Low channel (5 745**



**Operation mode: U-NII-3\_(n HT20)**

**A. Low channel (5 745)**

#### **4.4.2. Spurious radiated emission**

The frequency spectrum from 30



**C. High channel (5 240**



**Operation mode: U-NII-1\_(n HT20)**

**A. Low channel (5 180)**



**C. High channel (5 240)**



**Operation mode: U-NII-3**

**A. Low channel (5 745**



**C. High channel (5 805)**



**Operation mode: U-NII-3\_(n HT20)**

**A. Low channel (5 745)**



**C. High channel (5 805)**

#### **4.4.3. Spurious radiated emission**

The frequency spectrum above 1 000



**Operation mode: U-NII-1\_(n HT20)**

**A. Low channel (5 180)**



**Operation mode: U-NII-3**

**A. Low channel (5 745**



**Operation mode: U-NII-3\_(n HT20)**

**A. Low channel (5 745)**

#### **4.4.4. Restricted Band**

##### **A. 4.5 – 5.15**



**Operation mode: U-NII-3**

**\* Low channel (5 745**



**Operation mode: U-NII-3\_nHT20**

**\* Low channel (5 745**

#### 4.4.5. Spurious RF conducted emissions: Plot of spurious RF conducted emission

Band-edge data

Operation mode:           U-NII-1           Frequency(



Operation mode: U-NII-1\_nHT20 Frequency(



Operation mode:           U-NII-3           Frequency(

Operation mode:           U-NII-3           Frequency(

Operation mode: U-NII-3\_nHT20 Frequency(



Operation mode: U-NII-3HT20 Frequency(

## **5. Receiver radiated spurious emissions**

### **5.1. Test setup**

Same as clause 5.1.

#### **5.1.1. Receiver radiated spurious emissions**

Same as clause 5.1.1

### **5.2. Limit**

According to §15.109(a), Except for Class A digital devices, the field strength of radiated emission from unintentional radiator at a distance of 3 m shall not exceed the following values:

**Frequency**

(

#### 5.4. Test results

Ambient temperature: 20



**Operation mode: U-NII-1\_(n HT20)**

**A. Low channel (5 180)**



**Operation mode: U-NII-3**

**A. Low channel (5 745**



**Operation mode: U-NII-3\_(n HT20)**

**A. Low channel (5 745)**

## 6. *Conducted power line test*

### 6.1 Test setup

### 6.2 Limit

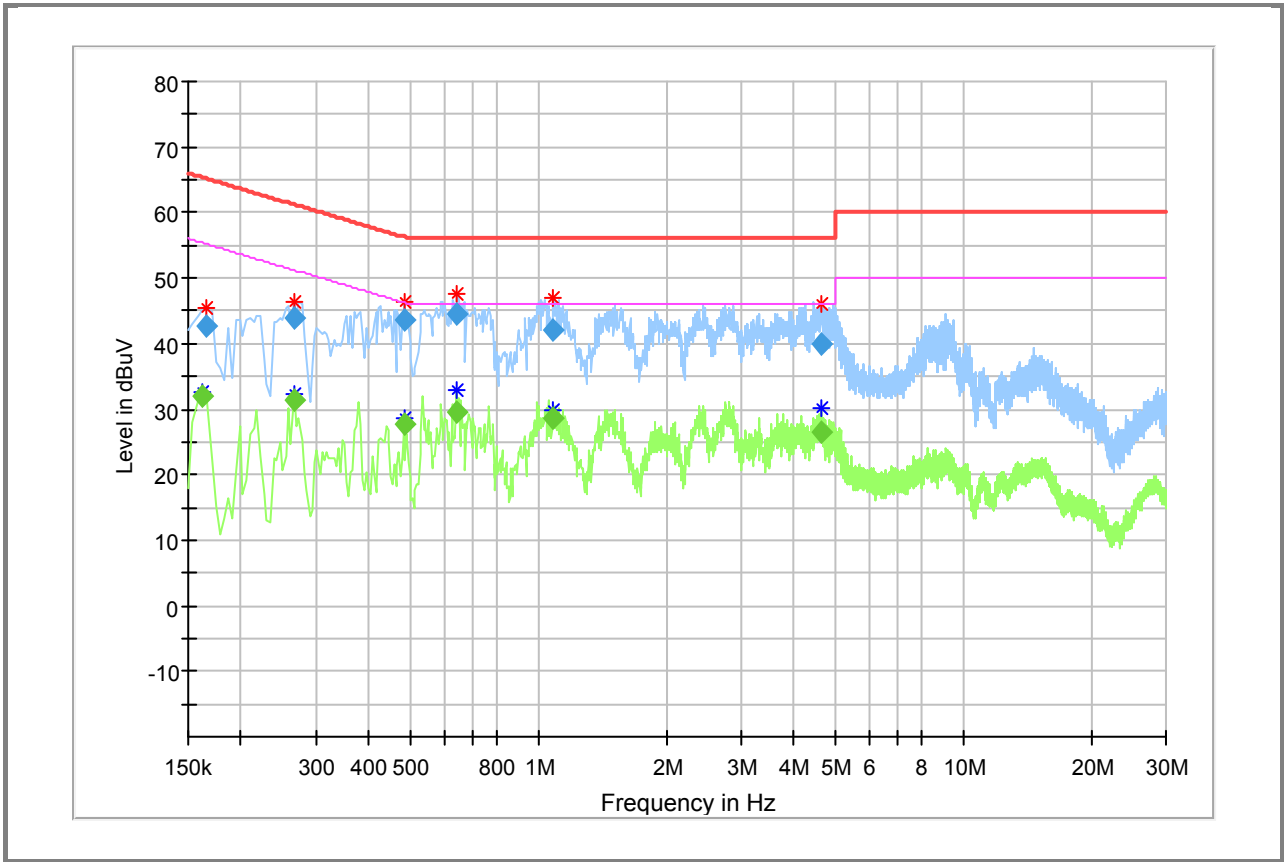
According to §15.107(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150

maximum emission.

#### **6.4 Test results**

Ambient temperature: 23

Plot of conducted power line



7. 26



**Operation mode: U-NII-1**

**A. Low channel (5 180**

**B. Middle channel (5 220**

**C. High channel (5 240**



**Operation mode:** U-NII-1(n\_HT20)

**A. Low channel (5 180**

**B. Middle channel (5 220**

**C. High channel (5 240)**



**Operation mode:** U-NII-3

**A. Low channel (5 745**

**B. Middle channel (5 785**

**C. High channel (5 805)**



**Operation mode:** U-NII-3(n\_HT20)

**A. Low channel (5 745**

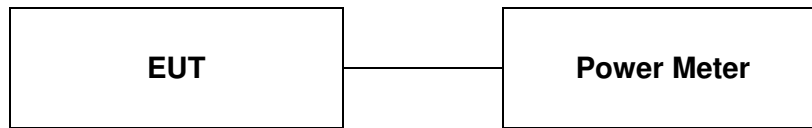
**B. High channel (5 785)**



**C. High channel (5 805**

## 8. Output power

### 8.1. Test setup.



### 8.2. Limit

Band 5.15-5.25GHz:

FCC: For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

IC: The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10\log B$  dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Band 5.725-5.825GHz:

FCC: For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of

operation shall not exceed 1 W.

IC: The maximum conducted output power shall not exceed 1 W.

### 8.3. Test procedure

1. The maximum average conducted output power can be measured using Method PM-G (Measurement using a gated RF average power meter):

2. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

a. The Transmitter output (antenna port) was connected to the power meter.

b. Turn on the EUT and power meter and then record the power value.

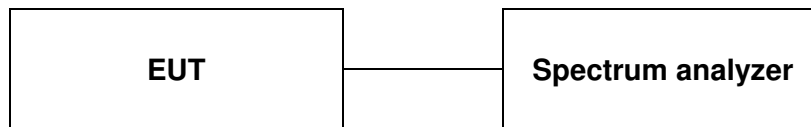
c. Repeat above procedures on all channels needed to be tested.

#### **8.4. Test results**

Ambient temperature: 22

## 9. Peak power spectral density

### 9.1. Test setup



### 9.2. Test Overview and Limit

Band 5.15-5.25GHz:

FCC: In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

IC: The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band..

Band 5.725-5.825GHz:

FCC: In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

IC: The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas

of directional gain greater than 6 dBi are used.

### 9.3. Test procedure (KDB 789033)

Methods refer to FCC KDB 789033

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power..."

2) Use the peak search function on the instrument to find the peak of the spectrum.

3) The result is the PPSD.

4) The above procedures make use of 1 MHz resolution bandwidth to satisfy the 1 MHz measurement bandwidth specified in the 15.407(a)(5). That rule section also permits use of resolution bandwidths less than 1 MHz "provided that the measured power is integrated to show the total power over the measurement bandwidth" (i.e., 1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 1 MHz bandwidth

#### 9.4. Test results

Ambient temperature: 22



**A. Low channel (5 180)**

**C. High channel (5 240**



**B. Middle channel (5 220**



**Operation mode: U-NII-3**

**A. Low channel (5 745**



**C. High channel (5 805)**



**B. Middle channel (5 785**

10. 6



**Operation mode: U-NII-3**

**A. Low channel (5 745**



**C. High channel (5 805)**

**B. Middle channel (5 785**

## 11. Frequency stability

### 11.1. Test setup



### 11.2. Limit

Not applicable

### 11.3. Test procedure

- a. The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage.
- b. Turn the EUT on and couple its output to a spectrum analyzer.
- c. Turn the EUT off and set the chamber to the highest temperature specified.
- d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize.
- e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

#### **11.4. Test results**

**Operation mode: Normal mode**

**Operation Frequency : 5 180**

## 12. RF exposure evaluation

### 12.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to §15.247(e)(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. According to KDB 447498 (2)(a)(i)

#### Limits for maximum permissible exposure (MPE)

### 12.2. Friis transmission formula : $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

Where

$P_d$  = Power density in

## 12.2. Test result of RF exposure evaluation

Test Item