EMC Test Report

Project Number: 3543693

Report Number: 3543693EMC01 **Revision Level:** 1

Client: Digital Dream Labs, LLC, Inc.

Equipment Under Test: Ludos Gameboard

Model: cloudBoard

Applicable Standards: FCC Part 15 Subpart C, § 15.209

RSS-GEN, Issue 3, December 2010

ANSI C63.10: 2009

Report issued on: 25 August 2014

Test Result: Compliant

Tested by: _____
Jeremy O. Pickens, Senior EMC Engineer

Reviewed by: _____
David Schramm, EMC Manager

Remarks:
This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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1 Summary of Test Results

Basic Standards	Test Result
Emissions Testing	
FCC Part 15, Subpart C, 15.209 / RSS-Gen S7.2.5 - Radiated Emissions	Compliant
FCC Part 15, Subpart C, 15.207 / RSS-Gen S7.2.4 - Conducted Emissions	NA(1)

(1) The device does not connect to the AC mains

1.1 *Modifications Required to Compliance*

None

2 General Information

2.1 *Client Information*

Name: Digital Dream Labs, LLC, Inc.
Address: 6024 Broad Street, Suite 2R
City, State, Zip, Country: Pittsburgh, PA 15206

2.2 *Test Laboratory*

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

2.3 *General Information of EUT*

Tyoe of Product: Ludos Gameboard
Model: cloudBoard
Serial Number: 25140021, 25140002

Frequency Range: 2402 to 2480 MHz
Data Modes: Bluetooth LE
Antenna: Integral / PCB

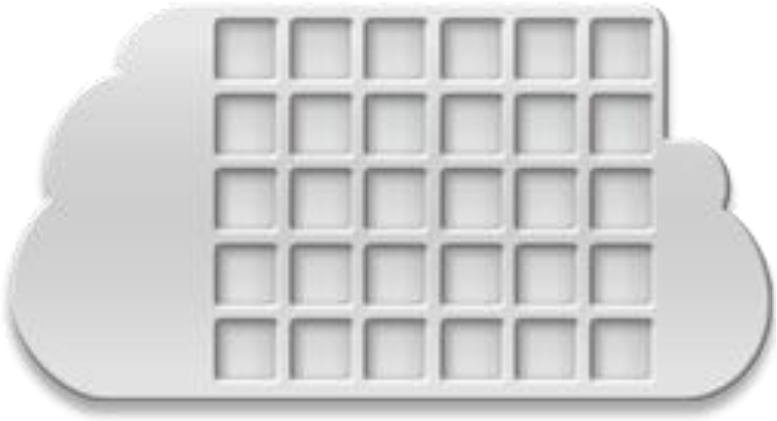
Rated Voltage: 3.7 VDC Internal Li-Ion Battery

Sample Received Date: 21 July 2014
Dates of testing: 21 July – 25 July 2014

2.4 *Operating Modes and Conditions*

The cloudBoard contained thirty RFID interfaces. Software was provided that allowed control of which RFID antenna was being used at a given time. Pretesting was performed to determine which RFID interface provided the worst-case emissions and final measurements were recorded using that antenna.

2.5 *EUT Connection Block Diagram*



2.6 *System Configurations*

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Digital Dream Labs, LLC	Ludos Gameboard	cloudBoard	25140021, 25140002

3 Occupied Bandwidth

3.1 *Test Result*

Test Description	Basic Standards	Test Result
99% Bandwidth	RSS-GEN 4.6.1	Reported

3.2 *Test Method*

The 99% occupied bandwidth measurement function of the spectrum analyzer was employed.

3.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.4 °C
Relative Humidity: 32.8 %

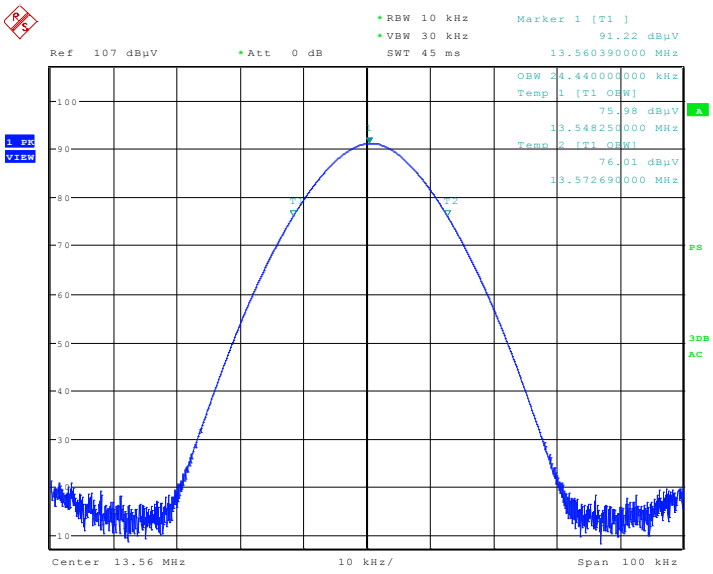
3.4 *Test Equipment*

Test Date: 23-Jul-2014 Eng: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	26-Jun-2015
ANTENNA, BILOG	JB6	SUNOL	B079689	22-Aug-2014
RF CABLE - 7500MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079711	16-Sep-2014
RF CABLE - 7500MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079713	7-Aug-2014
RF CABLE	SF106	HUBER&SUHNER	B085892	16-Oct-2014
PREAMPLIFIER-ANTENNA SYS	TS-PR18	ROHDE & SCHWARZ	B094463	13-Feb-2015

Note: The calibration period equipment is 1 year.

3.5 *Test Data*



Date: 29.JUL.2014 12:54:26

Occupied Bandwidth = 24.4kHz

4 Radiated Emissions

4.1 *Test Result*

Test Description	Basic Standards	Test Result
Radiated Emissions	FCC Part 15, Subpart C ANSI C63.4:2009	Compliant

4.2 *Test Method*

Exploratory scans were performed over the frequency range as indicated in the tables below using the max hold function and incorporating a Peak detector and using TILE! software. The final test data was measured using a Quasi-Peak detector below 1GHz and a Peak and Average detector above 1GHz. The receivers resolution bandwidth was set to 1kHz for measurements taken below 150kHz, 9kHz for in the 150kHz to 30MHz range, 120 kHz in the 30MHz to 1GHz frequency range, and 1MHz for measurements of 1GHz and higher. For testing below 30MHz, a loop antenna was employed, and peak scans were taken with the loop open towards the EUT (Co-Axial) and with the loop in-line with the EUT (Co-Planar). Above 30MHz, a biconilog antenna was used and measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency. The radiated measurements were recorded and compared to the limits indicated in the table below.

Radiated emissions limits

Frequency Range (MHz)	Limits (uV/m) Quasi-Peak or Average	Measurement Distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note: Limits were converted to dBuV/m using the equation 20*LOG(x). Additionally, for measurements below 30MHz, the limits were adjusted to a distance of 3m using a 40dB/decade correction per §15.31(f)(2)

Example: at 20MHz, the limit is expressed as 30uV/m at 30m
20*log(30) = 29.5dBuV/m
30 to 3 meters is a single decade, so 29.5 + 40 = 69.5dBuV/m

4.3 *Test Site*

10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions

Temperature:	23.5 °C
Relative Humidity:	37.0 %
Atmospheric Pressure:	98.2 kPa

4.4 *Test Equipment*

Test Date: 24-Jul-2014 Eng: JOP

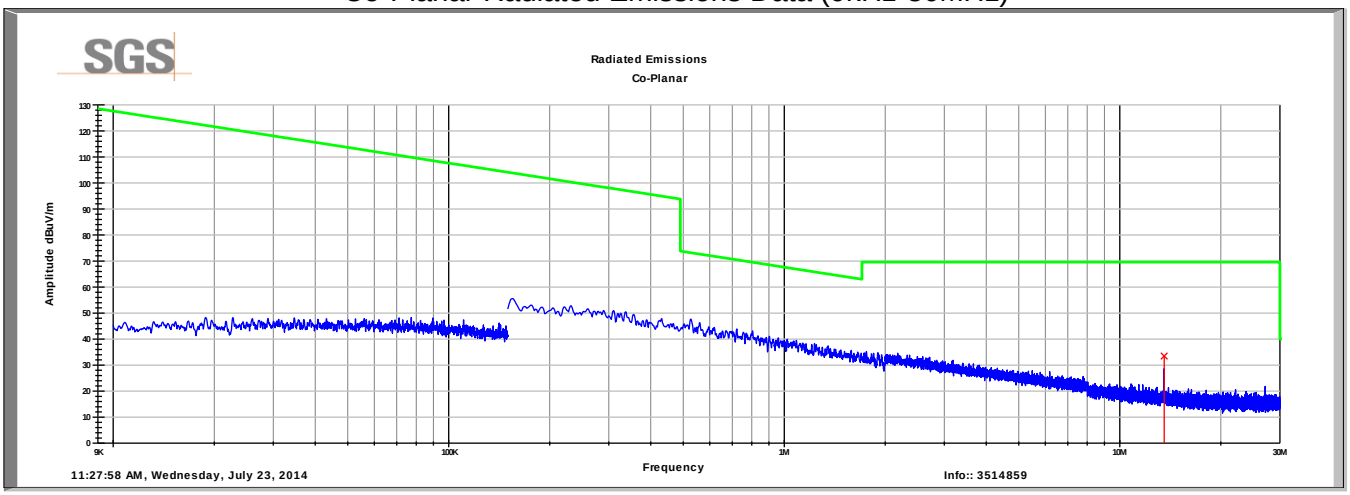
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	26-Jun-2015
ANTENNA, BILOG	JB6	SUNOL	B079689	22-Aug-2014
RF CABLE - 7500MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079711	16-Sep-2014
RF CABLE - 7500MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079713	7-Aug-2014
RF CABLE	SF106	HUBER&SUHNER	B085892	16-Oct-2014
PREAMPLIFIER-ANTENNA SYS	TS-PR18	ROHDE & SCHWARZ	B094463	13-Feb-2015
LOOP (ACTIVE)	6502	EMCO	B085752	24-Jun-2015

Note: The calibration period equipment is 1 year.

Software:
“Radiated Emissions” TILE! profile dated 15 Oct 2011

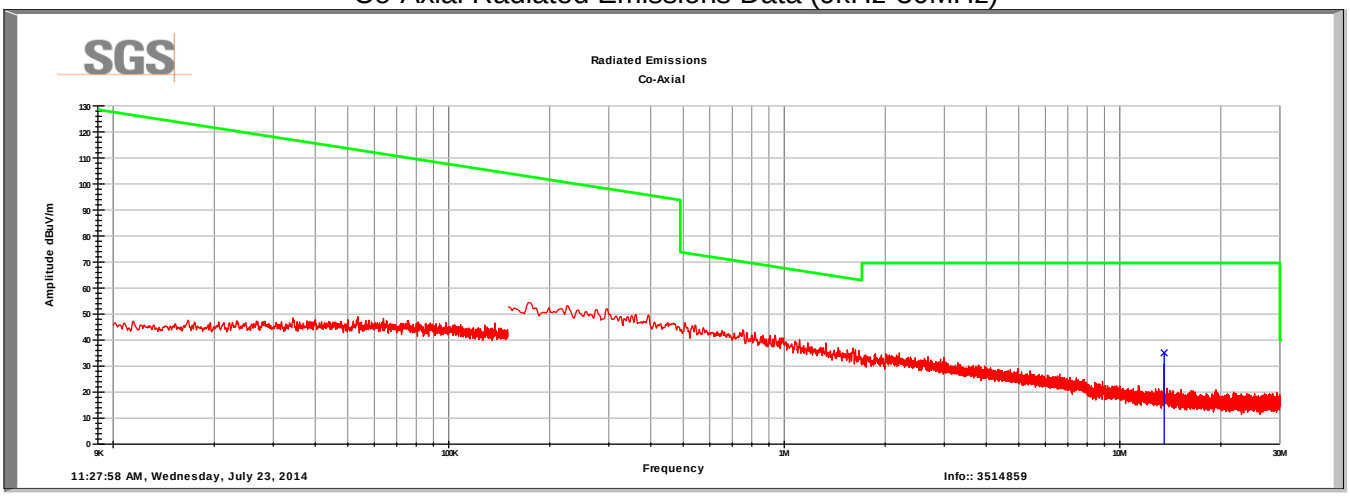
4.5 *Test Data*

Co-Planar Radiated Emissions Data (9kHz-30MHz)



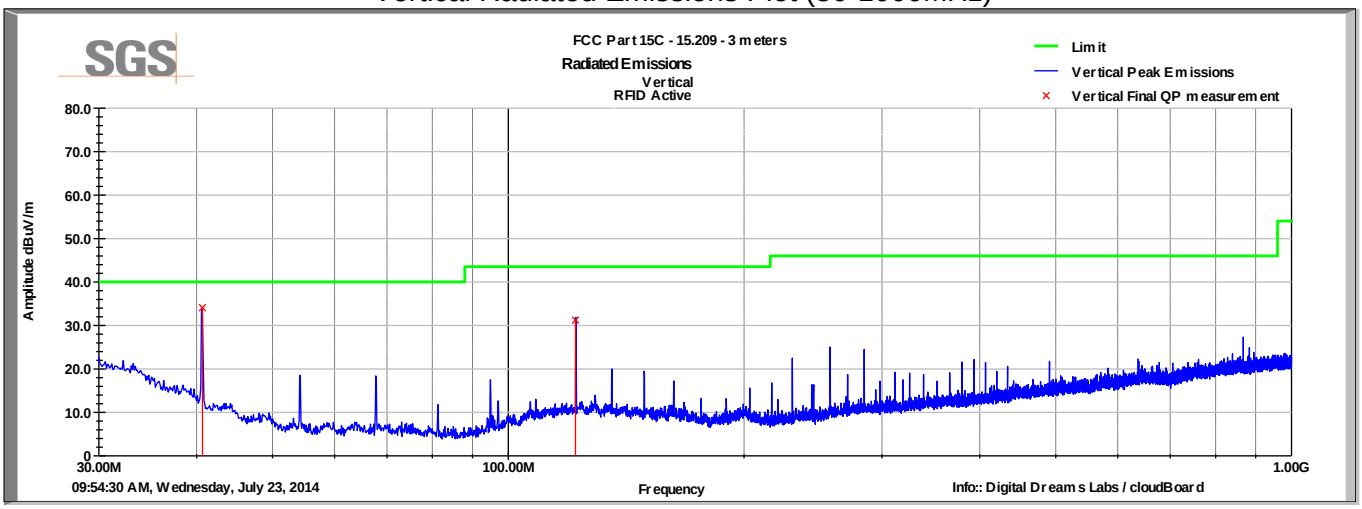
Frequency MHz	Raw QP (dBuV)	Polarity (CA/CP)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Dist Conv (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
13.56	22.4	CP	258.0	152.0	10.8	0.3	0.0	33.5	69.5	-36.1
QP Value = Level + AF + CL - Amp										

Co-Axial Radiated Emissions Data (9kHz-30MHz)



Frequency MHz	Raw QP (dBuV)	Polarity (CA/CP)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Dist Conv (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
13.56	24.0	CA	187.0	147.0	10.8	0.3	0.0	35.1	69.5	-34.5
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

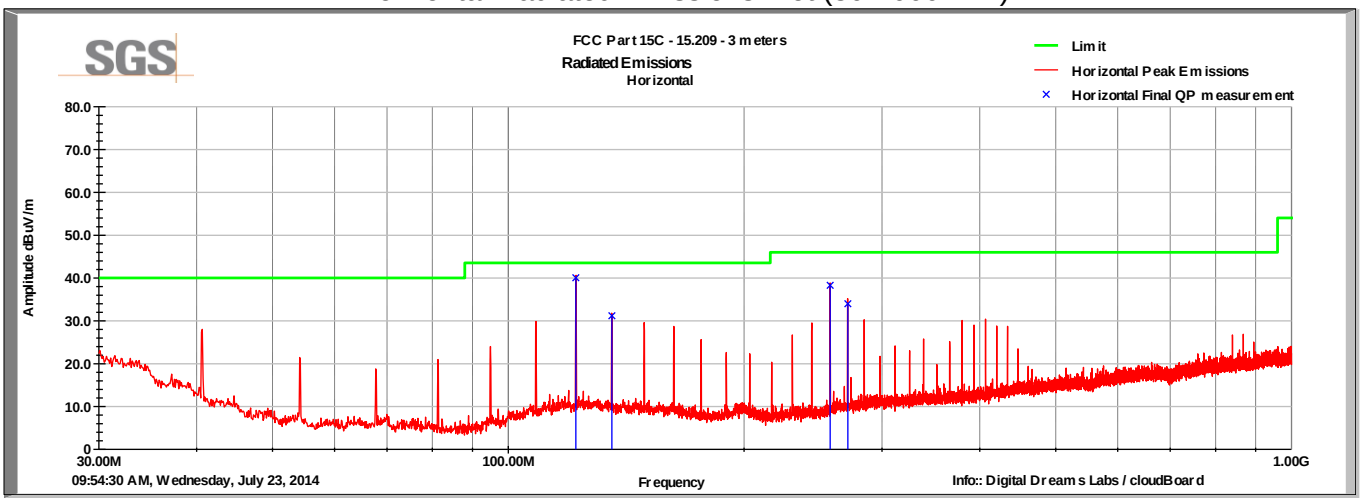
Vertical Radiated Emissions Plot (30-1000MHz)



Vertical Radiated Emissions Data (30-1000MHz)

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
40.69	52.5	V	329.0	247.0	13.8	0.4	32.7	34.1	40.0	-5.9
121.84	50.2	V	4.0	278.0	13.8	0.8	33.5	31.2	43.5	-12.3
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Horizontal Radiated Emissions Plot (30-1000MHz)



Horizontal Radiated Emissions Data (30-1000MHz)

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
121.94	59.0	H	165.0	134.0	13.8	0.8	33.5	40.0	43.5	-3.5
135.60	50.5	H	136.0	235.0	13.3	0.8	33.5	31.2	43.5	-12.3
257.66	57.8	H	138.0	100.0	12.7	1.2	33.4	38.3	46.0	-7.7
271.36	52.3	H	149.0	142.0	13.8	1.2	33.4	34.0	46.0	-12.0
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

5 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	30 July 2014
1	- Updated radiated test method to include technique and bandwidths used below 30MHz - Added calculations below the limit table to account for units and measurement distance used - Added occupied bandwidth section	25 August 2014