



# RADIO TEST REPORT

<b>47 CFR FCC PART 15.249</b>
<b>RSS-GEN ISSUE 4</b>
<b>RSS-210 ISSUE 8</b>

<b>Report Number:</b>	CFR-GLSLDLEXBATT-07162015
<b>Test Dates:</b>	June 22 through 24 of 2015

<b>EWO:</b>	2049
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<b>Model:</b>	GLS-LDL-EX-BATT
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<b>FCC ID:</b>	EROGLSLDLBAT
<b>IC:</b>	5683C-GLSLDLBAT

<b>FRN:</b>	0005022819
<b>ADDRESS:</b>	15 Volvo Dr, Rockleigh, NJ 07647

**Report Date:** July 16, 2015

<b>Test Result:</b>	PASS
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Prepared by: C.N. Patel  
Chirag Patel, Compliance Engineer

Date: Jul. 16, 2015

Reviewed by: Mairaj Hussain  
Mairaj Hussain, Global Compliance Manager

Date: Jul. 16, 2015

**Crestron Electronics, Inc.**  
22 Link Drive  
Rockleigh, New Jersey 07647  
Office 201.767.3400  
Fax 201.767.1905  
www.crestron.com

FCC Registration #412871    Industry Canada Site #5683C-1    VCCI#3551

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### Revision History

Revision	Description	Date
00	Initial release	06-25-2015



## **1. Reference Standards**

Measurements were performed according to the following procedures and standards:

- 1) ANSI C63.4: 2014
- 2) Industry Canada RSS-Gen Issue 4
- 3) Industry Canada RSS-210 Issue 8
- 4) Industry Canada ICES-003 Issue 5

All measurements were performed in a 3-meter semi-anechoic chamber and the control room.

### **1.1 Test Facility**

The 3-meter semi-anechoic chamber used to collect conducted and radiated emission data is located at 22 Link Drive, Rockleigh, New Jersey. This test facility has been placed on file with the FCC, Registration Number: 412871, and Industry Canada, Site Number: 5683C-1.

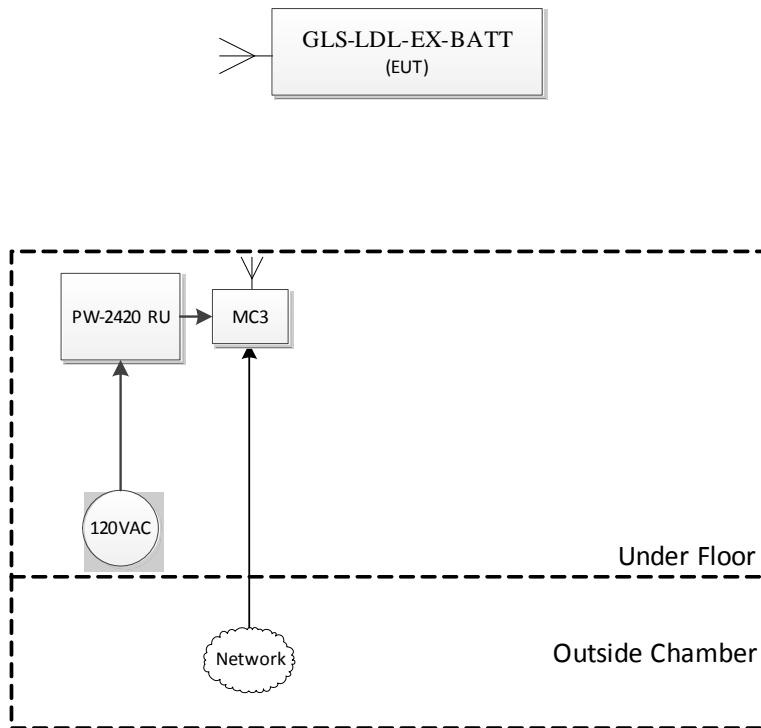
## 2. System Test Configuration

### 2.1 Product Description

The equipment under test (EUT) is a Crestron Ambient Light Sensor, Dual Loop, model: GLS-LDL-EX-BATT manufactured by Crestron Electronics, Inc.

Model Number: GLS-LDL-EX-BATT

### 2.2 Block Diagram





### **2.3 EUT Setup Justification**

The system was configured for testing in a representative user configuration with nominal interface data activity and typical loading. Fresh batteries were used for testing.

### **2.4 EUT Exercise Software and Mode(s) of Operation**

The EUT was configured to transmit continuously.

Channel 11 (2405 MHz)

Channel 18 (2440 MHz)

Channel 26 (2480 MHz)

Power setting used during testing 8.

### **2.5 Cables**

EUT has no cables.

### **2.6 Special Accessories**

There are no special accessories for compliance of this EUT.



## **2.7 Support equipment**

No	Description	Manufacturer	Model No	Serial No
1	POWER SUPPLY	CRESTRON	PW-2420RU	N/A
1	CONTROL SYASTEM	CRESTRON	MC3	N/A

## **2.8 Equipment Modification**

There were no modifications installed during compliance measurements.



## 2.9 Test Equipment

Equipment Type	Frequency Range	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
R&S EMI Receiver	20 Hz – 40 GHz	ROHDE & SCHWARZ	ESU40	100076	10/23/2014	10/23/2016
Teseq Bilog Antenna	30 MHz – 2 GHz	Teseq	CBL 6112D	25231	12/16/2014	12/16/2016
ETS-Lindgren Double Ridge Horn Antenna	1 GHz – 18 GHz	ETS	3117	00047560	12/1/2014	12/1/2016
R&S Preamplifier	1GHz – 18 GHz	ROHDE & SCHWARZ	TS-PR18	100044	12/18/2013	12/18/2015
ETS-Lindgren Standard Gain Horn Antenna	18 GHz – 26.5 GHz	ETS	3160-09	00078911	12/3/2014	12/3/2016
R&S Preamplifier	18 GHz – 26.5 GHz	ROHDE & SCHWARZ	TS-PR26	100030	12/18/2013	12/18/2015

All instruments are calibrated in accordance with the manufacturer's recommendations.  
All antennas are calibrated per ANSI C63.5.  
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration system.



### 3. Test Results

#### 3.1 Compliance Statement

Rule Section		Description	Date of Test (mm/dd/yy)	Test Engineer	Test Result (Pass or Fail)	Results
FCC	IC					
§15.203	§8.3 of RSS-Gen	Antenna Requirement	-	-	-	Complies
§15.249(a)	§A2.9 of RSS-210	Fundamental and harmonics field strength requirement	June 18	HK	Pass	Complies
N/A	§6.6 of RSS-Gen	99% Occupied Bandwidth	06/23/2015	HK	Pass	(for reporting purpose)
§15.249(d)	§A2.9(b) of RSS-210	Spurious emissions	June 19	HK	Pass	Complies
§15.247(d)	§A8.5 of RSS-210	Band Edge	June 23	HK	Pass	Complies
§15.207	§8.8 of RSS-Gen	Transmitter AC Power Line Conducted Emissions	-	-	NA	Battery powered

**Note:**

The channels selected for test were 11, 18, and 26.





### **3.2 Antenna Requirements**

This module GLS-LDL-EX-BATT is validated with SMD antennas with antenna gain of and 2.1 dBi (the antenna mounted on the PCB of the module).

The Rufa 2.4 GHz SMD Antenna is unique in the sense of complying with FCC §15.203, §15.204(b), and §15.204(c).

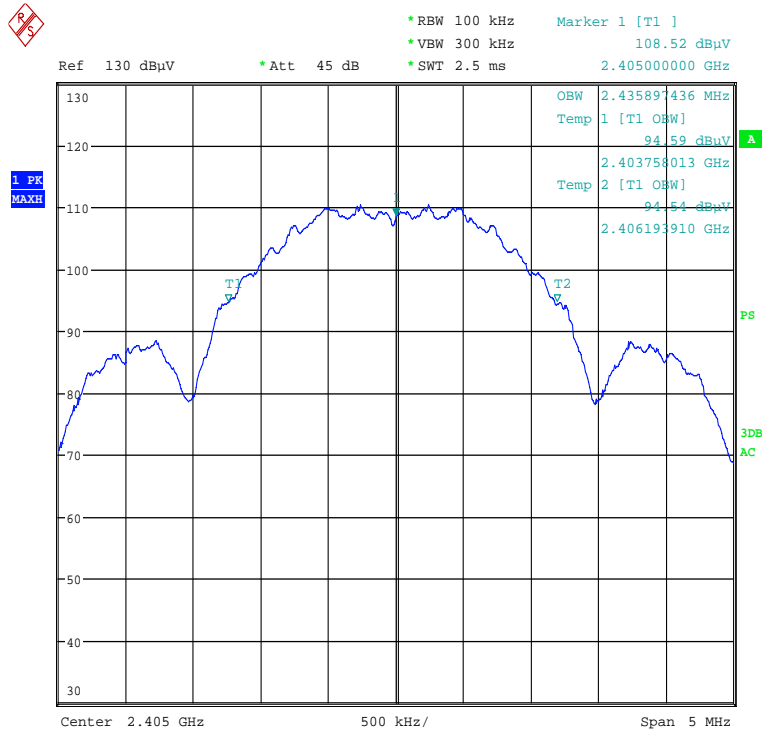


### 3.3 99% Bandwidth

Performance Criterion: OBW reported below.

Channel	Frequency(MHz)	99% dB Bandwidth(MHz)
11	2405	2.43
18	2440	2.42
26	2480	2.40

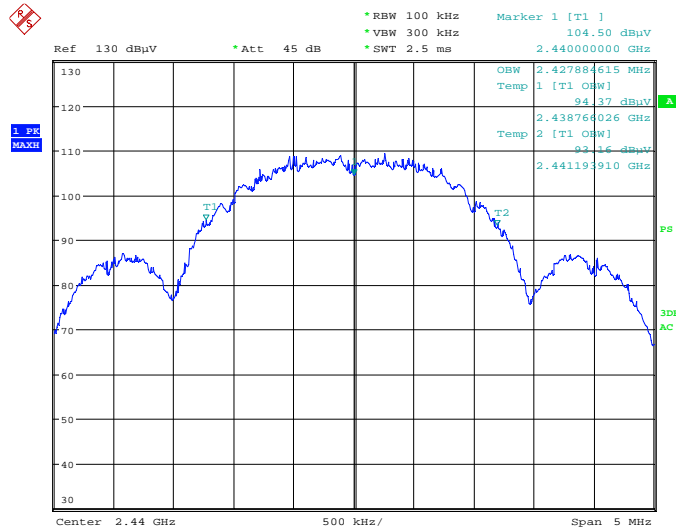
#### 99% dB Bandwidth, Channel 11:



Date: 23.JUN.2015 16:14:24

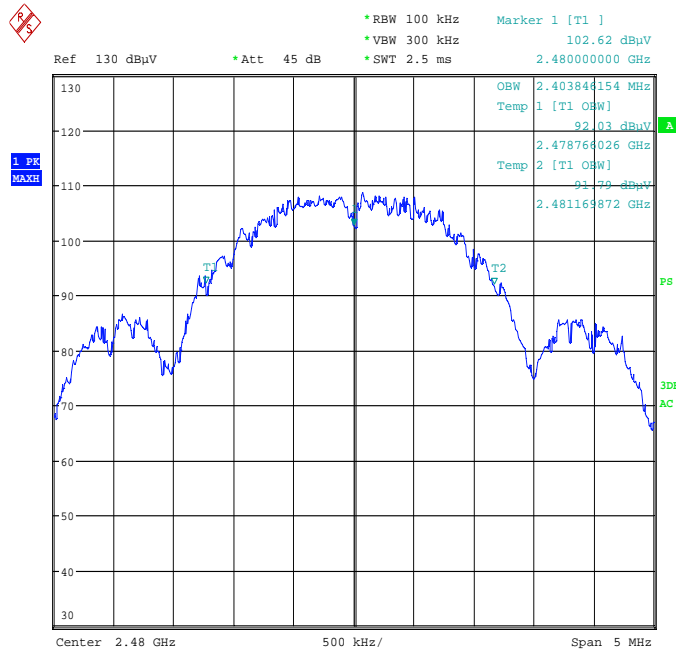


### 99% dB Bandwidth, Channel 18:



Date: 23.JUN.2015 16:19:56

### 99% dB Bandwidth, Channel 26:



Date: 23.JUN.2015 16:22:20



### 3.4 Fundamental Field Strength

Criterion:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

Test Procedure: Per ANSI C63.4

Channel	Frequency(MHz)	Field Strength Measured (PK) (dBuV/m)	Field Strength (AVG) (dBuV/m)	Limit (dBuV/m) (PK)	Limit (dBuV/m) (AVG)
11	2405	107.3	90.56	113.97	93.97
18	2440	106.2	89.46	113.97	93.97
26	2480	106.2	89.46	113.97	93.97

Duty Cycle Correction Factor: 16.74dB used to calculate average reading.  
Wall mount orientation provided the worst case readings.

Sample Calculation:

$$PK \text{ (dBuV/m)} = \text{Reading(dBuV/m)} - PA(\text{dB}) + \text{Antenna Factor (dB/m)} + \text{Cable loss(dB)}$$

$$\text{Avg (dBuV/m)} = PK_{\text{reading}} - \text{Duty Cycle Correction Factor}$$

All factors are pre stored in the R & S receiver.

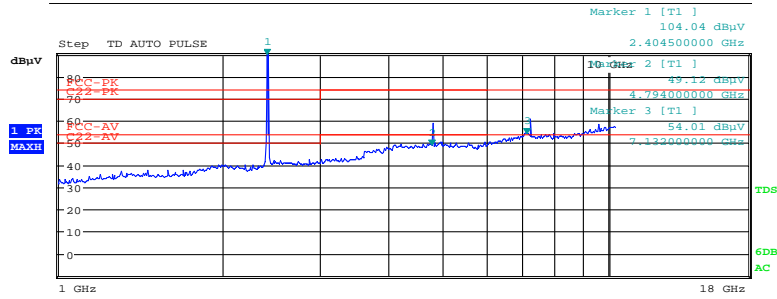


Channel 11:



Att 10 dB  
 RBW 1 MHz  
 MT 100 ms  
 PREAMP OFF

**FREQUENCY 2.404500000 GHz**  
 PK+ 104.15 dBμV (107.3 2.40450 GHz)  
 AV 98.65 dBμV (101.8 2.40450 GHz)

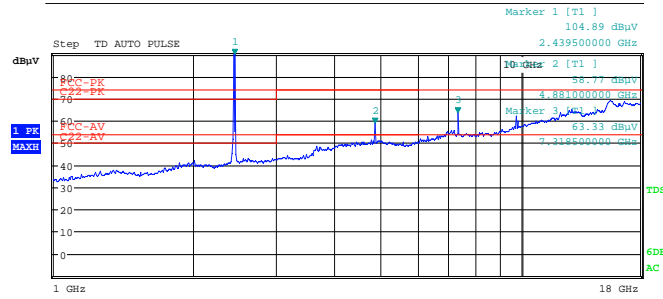
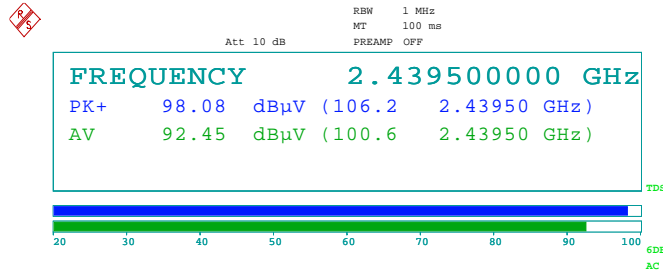


Date: 18.JUN.2015 11:48:46





Channel 18:



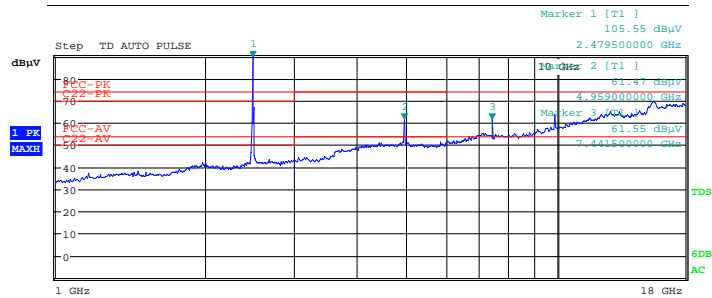
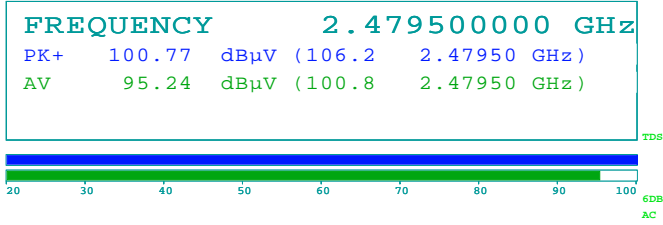
Date: 18.JUN.2015 12:15:20



Channel 26:



Att 10 dB RBW 1 MHz  
MT 100 ms  
PREAMP OFF



Date: 18.JUN.2015 12:40:49

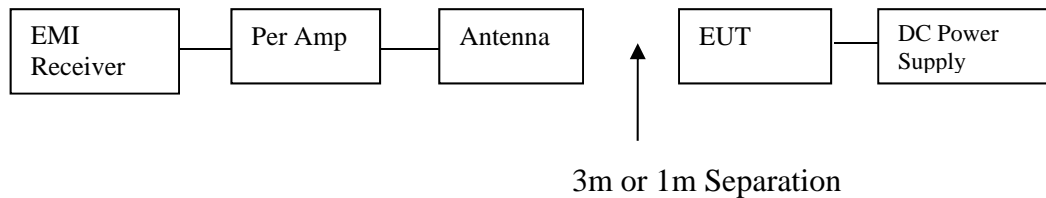
### 3.5 Radiated Spurious Emissions

**Criterion:** Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

**Test Procedure:** Per ANSI c63.4  
A factor of 20 dB/decade applies to measurements made at a closer distance than the limit distance before comparing to the limits.

EUT was tested in three orthogonal orientations (XY, YZ, and ZX planes). EUT antenna cannot be maximized separately because it is hard wired to the board.

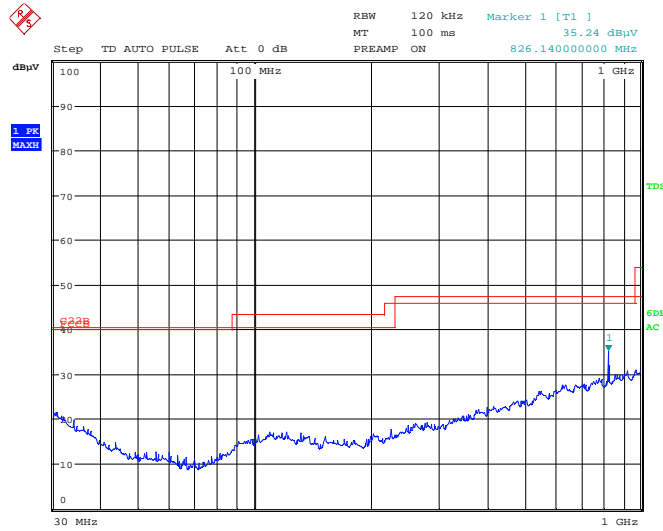
**Block Diagram:**





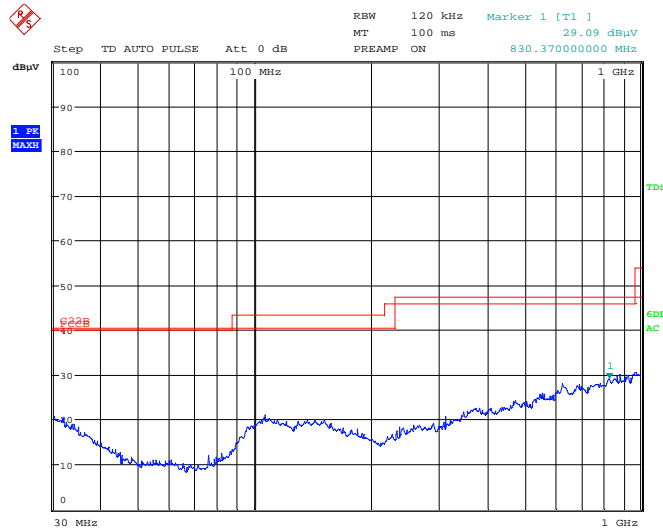
### Radiated Emissions Data:

#### 30-1GHz Vertical:



Date: 19.JUN.2015 15:37:52

#### 30-1GHz Horizontal:



Date: 19.JUN.2015 15:41:34



**1-18GHz:**

ANTENNA ORIENTATION	Frequency(MHz)	Field Strength Measured (PK) (dBuV/m)	Field Strength (AVG) (dBuV/m)	Limit (dBuV/m) (PK)	Limit (dBuV/m) (AVG)
H	2483.5	70.4	46.56	74	54
V	2400	72.8	47.16	74	54
V	4810	65.3	46.56	74	54
V	7216	69.3	52.56	74	54
V	4881	62.7	45.96	74	54
V	7318	65.9	49.16	74	54
V	4959	63.4	46.66	74	54
V	7441	65.9	49.16	74	54

Duty Cycle Correction Factor: 16.74dB used to calculate average reading.  
Wall mount orientation provided the worst case readings.

Sample Calculation:

$$PK \text{ (dBuV/m)} = \text{Reading(dBuV/m)} - PA(\text{dB}) + \text{Antenna Factor (dB/m)} + \text{Cable loss(dB)}$$

$$\text{Avg (dBuV/m)} = PK_{\text{reading}} - \text{Duty Cycle Correction Factor}$$

All factors are pre stored in the R & S receiver.

**18-24GHz:**

No Emissions Found.

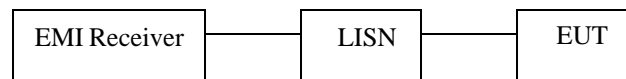


### 3.6 Transmitter AC Power line Conducted Emissions

**Performance Criterion:** AC power line conducted emissions shall not exceed the limits specified in FCC § 15.207 and Table 4 of IC RSS-Gen.

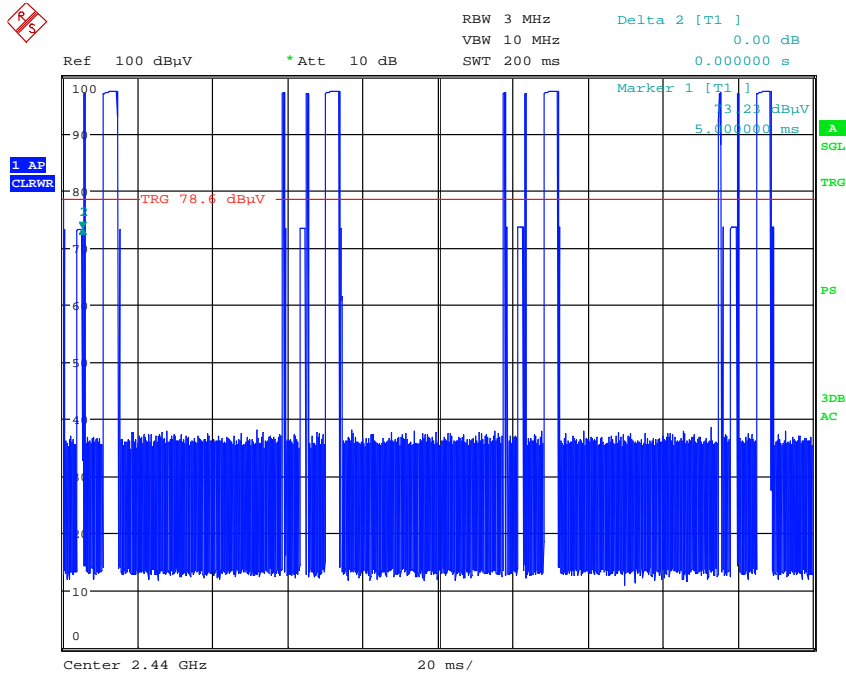
**Test Details:** AC power line conducted emissions were performed from 150 kHz to 30 MHz and measured with a resolution bandwidth of 9 kHz. EUT was set in the receiving mode. Refers to the following screen captures (using a peak detector) and block diagram

**Block Diagram:**



Test Result: NA – EUT is battery powered.

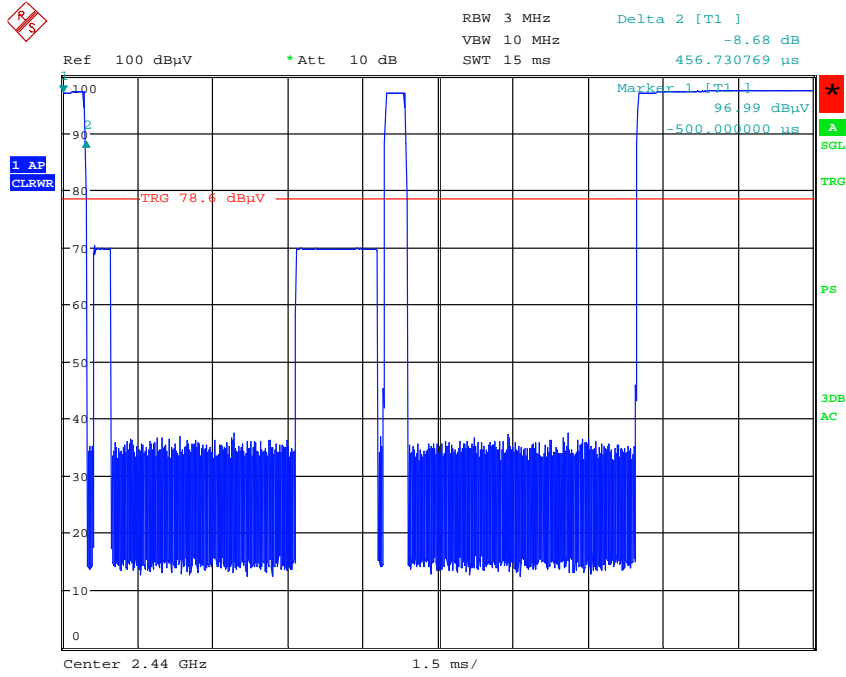
### 3.7 Duty Cycle Correction Factor (DCCF)



Date: 19.JUN.2015 12:18:23

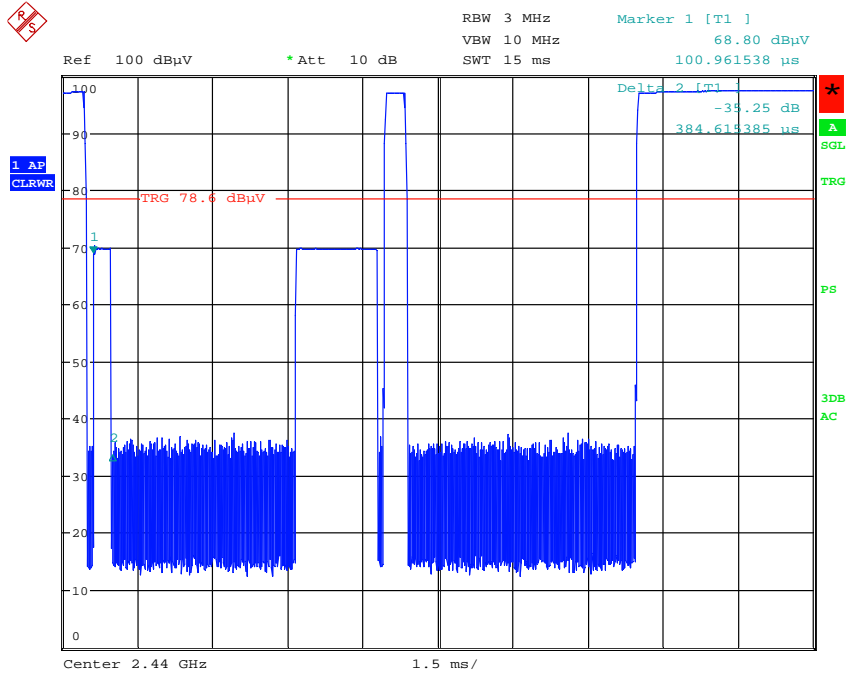
Fig(1)

Two sets of pulses in 100ms.



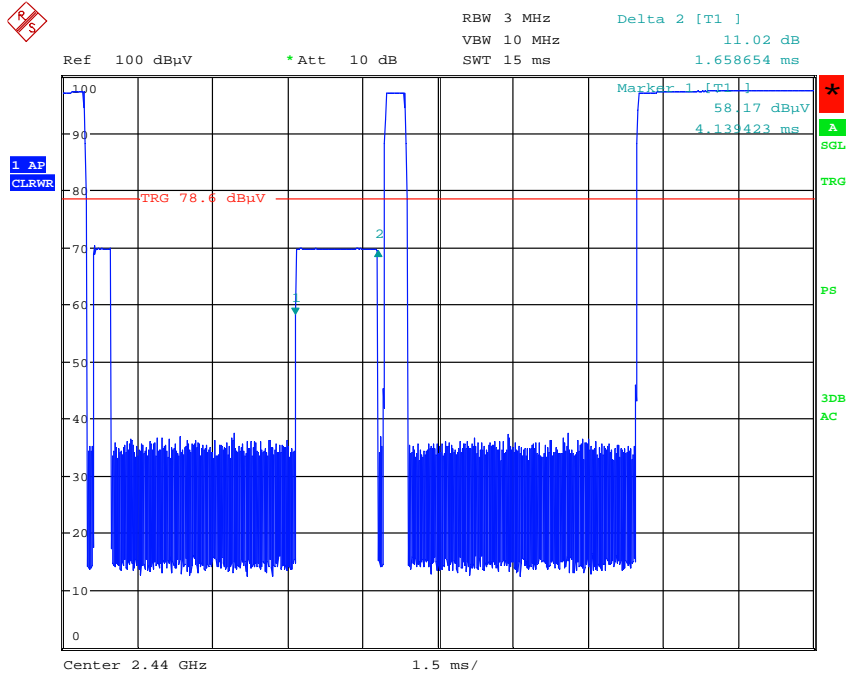
Date: 19.JUN.2015 12:44:04

Fig(2)



Date: 19.JUN.2015 12:44:46

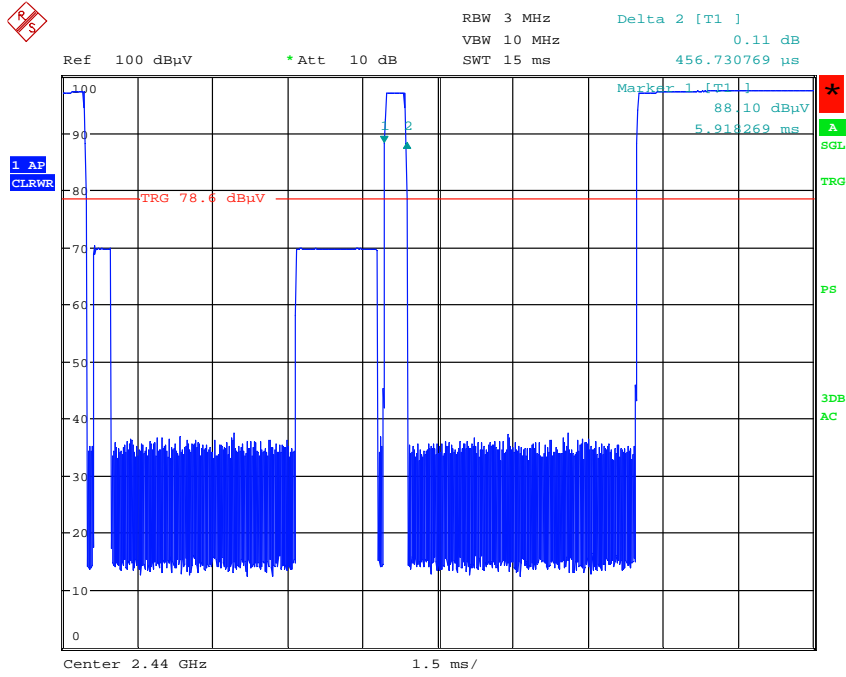
Fig(3)



Date: 19.JUN.2015 12:45:25

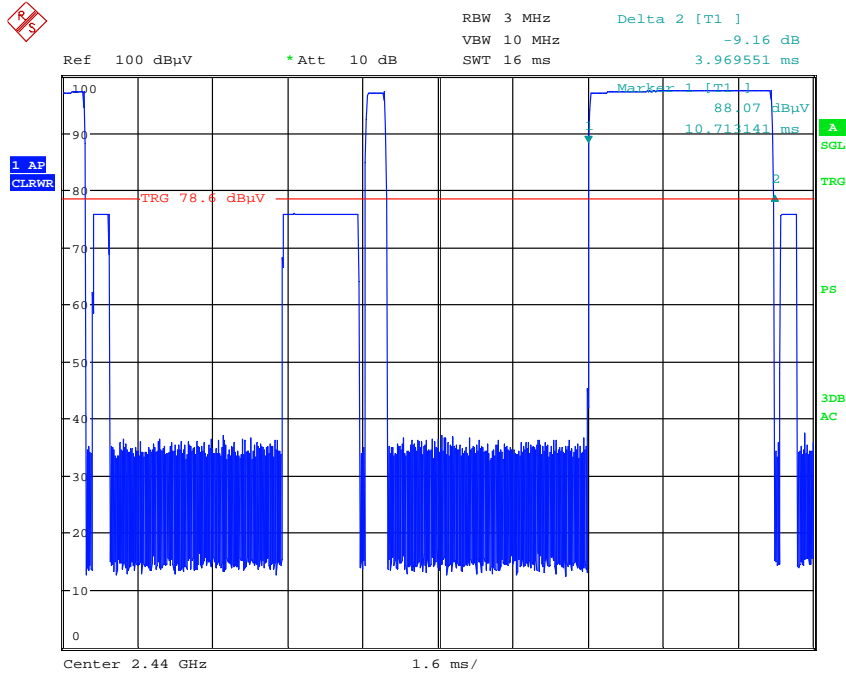
Fig(4)





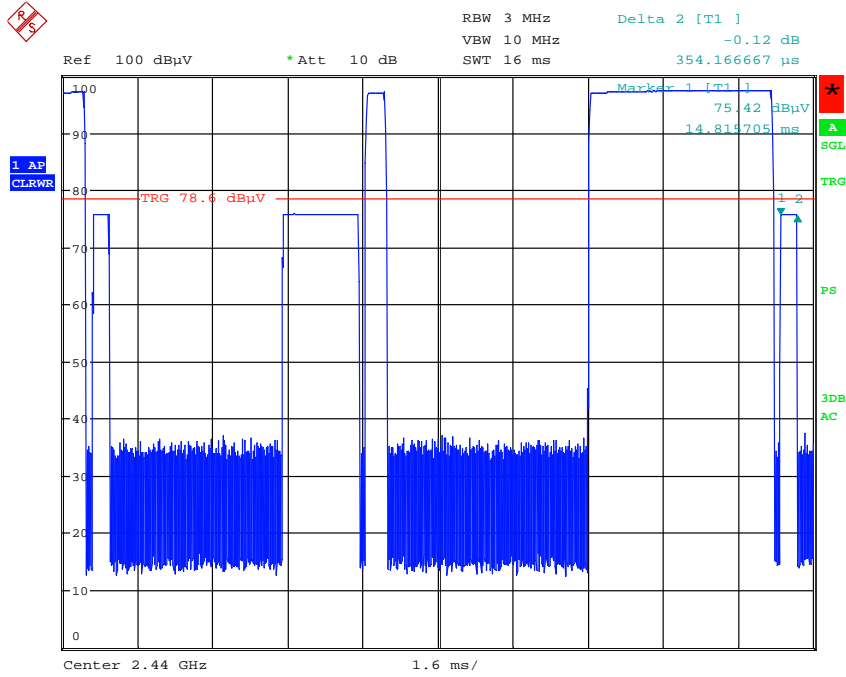
Date: 19.JUN.2015 12:46:03

Fig(5)



Date: 19.JUN.2015 12:47:52

Fig(6)



Date: 19.JUN.2015 12:48:57

Fig(7)

Summing ON time for all the pulses:

No of times pulse repeat in 100ms = 2

ON Time (ms)	
0.45673	Fig(2)
0.38462	Fig(3)
1.65865	Fig(4)
0.45673	Fig(5)
3.96	Fig(6)
0.35417	Fig(7)
Total ON Time = 2 *7.27 = 14.54ms	

$$\begin{aligned} \text{DCCF} &= 20 \cdot 8 \cdot \text{Log} (14.54/100) \\ &= -16.74\text{dB} \end{aligned}$$