



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AV0069003(7) Date : 06 Dec 2017

Application No. : LV037963(6)

Applicant : Digital Gallery Global Limited
Flat 20, 11/F, BLK A, Hoi Luen Industrial Centre,
55 Hoi Yuen Road, Kwun Tong, Kowloon,
Hong Kong

Brand name : Sharp

Sample Description : One(1) item of submitted sample stated to be Atomic Wall Clock of ModelNo. SPC1034

Sample registration No. : RV046050-001
Radio Frequency : 433.920MHz
Supply voltage : 2 x 1.5V AA size batteries
No. of submitted sample : One (1) set(s)

Date Received : 20 Nov 2017.

Test Period : 20 Nov 2017 to 04 Dec 2017.

Test Requested : FCC Part 15 Certification

Test Method : 47 CFR Part 15 (02 Nov 2017)
ANSI C63.10 – 2013


Test Engineer : Mr. Leung Shu Kan, Ken

Test Result : See attached sheet(s) from page 2 to 25.

Conclusion : The submitted sample was found to comply with requirement of FCC Part 15 Subpart C.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : _____


Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

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2 General Information

2.1 General Description

The Atomic Wall Clock outdoor sensor responsible to detect outdoor temperature from -10°C to 60°C, and humidity from 20% RH to 95%RH. After the proper installation, it detects environment temperature/humidity, and sending data to Wall Clock unit. The sensor unit support 3 channels (CH1, CH2 and CH3) in user setting. The combination of transmission duty cycle is 50s for channel 1, 53s for channel 2 and 56s for channel 3. All 3 channels are operated in 433.920MHz only.

The brief circuit description is listed as follows:

- X1, Q2 and its associated circuit act as oscillator for 433.92MHz .
- Q1 and its associated circuit act as RF amplifier.
- X100 and its associated circuit act as crystal for MCU IC100.
- RT and its associated circuit act as sensor.
- IC100 and its associated circuit act as MCU control and encoder.

2.2 Related Submittal Grants

This is a single application for certification of a transmitter. The receiver for this transmitter is under SDoC procedure of clause 15.101.



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2.3 Location of the test site

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.4 – 2014 and ANSI C63.10 – 2013. A Semi-Anechoic Chamber Testing Site is set up for investigation and located at:

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2014 and ANSI C63.10 – 2013. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
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2.4 List of measuring equipment

Measurement equipment:

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date	Calibration Period
EMI Test Receiver	Rohde & Schwarz	ESCS30	100001	01 Feb 2018	1 Year
Spectrum Analyzer	Rohde & Schwarz	FSP30	100628	28 Mar 2018	1 Year
Biconical Antenna	Rohde & Schwarz	HK116	837414/004	18 Aug 2018	2 Years
Log Periodic Antenna	Teseq	UPA6109	43666	27 Jul 2018	2 Years
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	21 Dec 2017	2 Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	21 Dec 2017	2 Years
Coaxial Cable	Schaffner	RG 213/U	N/A	18 May 2018	1 Year
Coaxial Cable	Suhner	RG 214/U	N/A	18 May 2018	1 Year
Coaxial Cable	Suhner	Art. No 84225426	N/A	21 Dec 2017	1 Year

Supporting equipment: Nil



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2.5 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Radiated emissions

Frequency	Uncertainty (U_{lab})
30MHz ~ 200MHz (Horizontal)	4.59dB
30MHz ~ 200MHz (Vertical)	4.49dB
200MHz ~1000MHz (Horizontal)	4.94dB
200MHz ~1000MHz (Vertical)	4.97dB
1GHz ~6GHz	4.52dB
6GHz ~18GHz	4.58dB

Line-conducted emissions

Frequency	Uncertainty (U_{lab})
150kHz~30MHz	2.80dB



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3 Description of the emission test

3.1 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013.

The equipment under test (EUT) was placed on a non-conductive turntable with dimensions of 1.5m x 0.4m and 0.8m high above the ground for below 1GHz measurement and 1.5m high above the ground for above 1GHz measurement. 3m from the EUT, a broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was then moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated.

For 30MHz to 200MHz, biconical antenna with its vertical and horizontal plane is placed 3m from the EUT and rotated about its vertical and horizontal axis for maximum response at each azimuth about the EUT. And the reference point of antenna shall be 1 m above the ground. Same procedure for frequency 200MHz to 1000MHz but Log-periodic antenna is used for final measurements.

For above 1GHz, horn antenna with its vertical and horizontal plane is placed 3m from the EUT and rotated about its vertical and horizontal axis for maximum response at each azimuth about the EUT.

The device was rotated through three orthogonal axes to determine which attitude and configuration produce the highest emission during measurement.

The Frequencies from fundamental up to the tenth harmonics were investigated, and emissions more 20dB below limit were not reported.

Peak Detector data was measured unless otherwise stated.

An engineer sample with continuous transmission was used for measurements.

Test Result:

It was found that the EUT meet the FCC requirement.



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3.2 Radiated Emission Measurement Data

Measurement Data

Radiated emission

pursuant to

the requirement of FCC Part 15, section 15.231(b) and (e)

Mode: Continuous transmission

Environmental conditions

Ambient temperature : 25.0

Relative humidity : 60.0%

Frequency (MHz)	Antenna Polarity (H/V)	Reading at 3m (dB μ V)	Antenna Factor and Cable Loss (dB/m)	Peak Field Strength at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)	Detector
433.812	H	57.8	20.9	78.7	92.9	-14.2	PK
433.816	V	59.2	20.9	80.1	92.9	-12.8	PK
867.658	H	24.0	26.9	50.9	74.0	-23.1	PK
867.642	V	21.9	26.9	48.8	74.0	-25.2	PK
*1301.528	H	53.4	-7.8	45.6	74.0	-28.4	PK
*1301.456	V	53.3	-7.8	45.5	74.0	-28.5	PK
2169.176	H	55.9	-6.7	49.2	74.0	-24.8	PK
2169.120	V	53.4	-6.7	46.7	74.0	-27.3	PK

Remark:

- * means emissions appearing within the restricted bands shall follow the requirement of section 15.205.
- Peak Field Strength at 3m = Reading at 3m + Antenna Factor and Cable Loss



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Measurement Data

Radiated emission

pursuant to

the requirement of FCC Part 15 section 15.231(b) and (e)

Mode: Continuous transmission

Environmental conditions

Ambient temperature : 25.0

Relative humidity : 60.0%

Frequency (MHz)	Antenna Polarity (H/V)	Peak Field Strength at 3m (dB μ V)	Average Factor (dB)	Average Field Strength at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
433.812	H	78.7	-14.9	63.8	72.9	-9.1
433.816	V	80.1	-14.9	65.2	72.9	-7.7
867.658	H	50.9	-14.9	36.0	54.0	-18.0
867.642	V	48.8	-14.9	33.9	54.0	-20.1
*1301.528	H	45.6	-14.9	30.7	54.0	-23.3
*1301.456	V	45.5	-14.9	30.6	54.0	-23.4
2169.176	H	49.2	-14.9	34.3	54.0	-19.7
2169.120	V	46.7	-14.9	31.8	54.0	-22.2

Remark:

- 1) * means emissions appearing within the restricted bands shall follow the requirement of section 15.205.
- 2) Average Field Strength at 3m = Peak Field Strength at 3m + Average factor



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3.3 Average Factor

The average factor is simply the on-time divided by the period:

Each pulse width = 0.5ms

Number of pulse for worst case duty cycle = 36 pulses

Note: Where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval.

Duty Cycle = $(0.5 \times 36 / 100) = 0.18$

Therefore, the average factor is found by $20 \log_{10} 0.18 = -14.8 \text{ dB}$

The Appendix A5 shows the plot of duty cycle.

3.4 Transmission time

Transmission time = 900ms Requirement: below 1000ms

Silent time = 49.6s Requirement: longer than 10s and 27s (0.9s x 30)

The transmission time was complied with 15.231(e) requirements.



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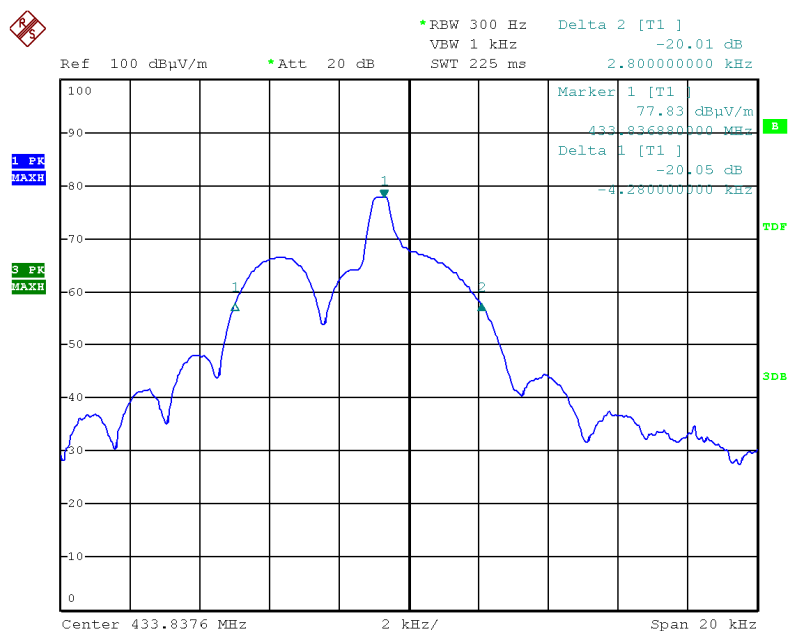
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3.5 Bandwidth

Below plot shows the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Measurement is determined at the points 20 dB down from the modulated carrier.

Center Frequency : 433.867MHz
Limit 0.25% of center frequency : 1.085MHz



Measurement result : (2.8 + 4.28) kHz = 6.48kHz



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4 Description of the Line-conducted Test

4.1 Test Procedure

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2014 and ANSI C63.10 – 2013. The EUT was setup as described in the procedures, and both lines were measured.

4.2 Test Result

No measurement is required as the EUT is a battery-operated product.

4.3 Graph and Table of Conducted Emission Measurement Data

Not Applicable



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5 Photograph

5.1 Photographs of the Test Setup for Radiated Emission and Conducted Emission

For electronic filing, the photos are saved with filename P5FSPC1034 Test Setup Photo.pdf.

5.2 Photographs of the External and Internal Configurations of the EUT

For electronic filing, the photos are saved with filename P5FSPC1034 External Photo.pdf
P5FSPC1034 Internal Photo.pdf.

5.3 Antenna requirement

The Appendices A3 shows an integrated coil antenna is permanently attached inside of EUT and cannot be changed. Therefore it fulfils the section 15.203 requirement.



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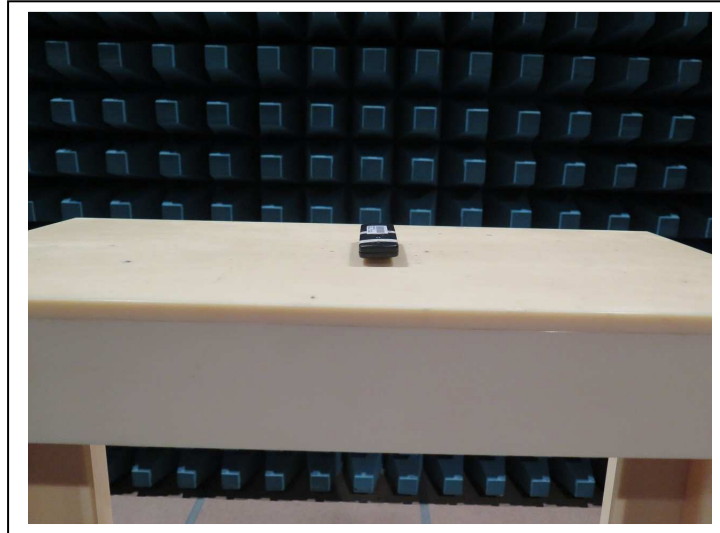
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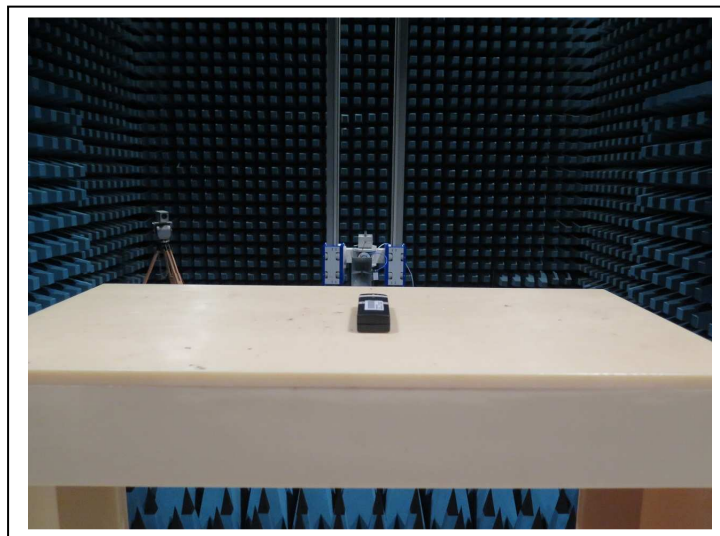
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A1. Photos of the set-up of Radiated Emissions



Test setup for highest emission



Test setup for highest emission

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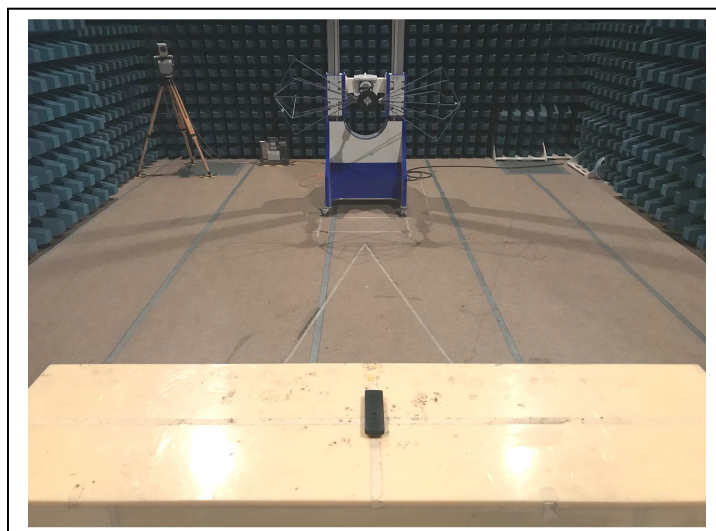
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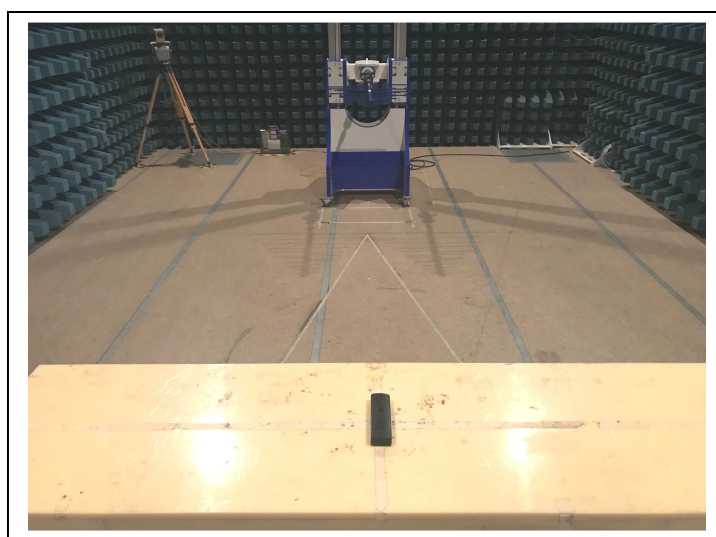
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Photos of the set-up of Radiated Emissions



Test setup for 30MHz to 200MHz



Test setup for 200MHz to 1000MHz

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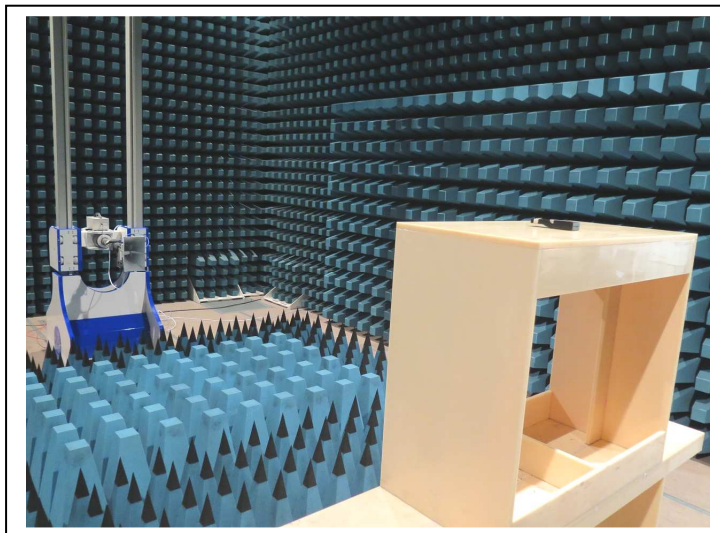
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Photos of the set-up of Radiated Emissions



Test setup for above 1000MHz

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A2 Photos of External Configurations



External Configuration 1



External Configuration 2

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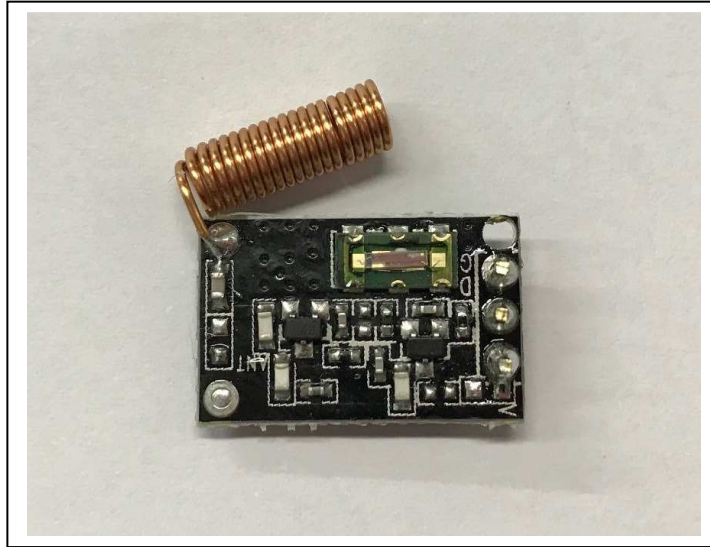
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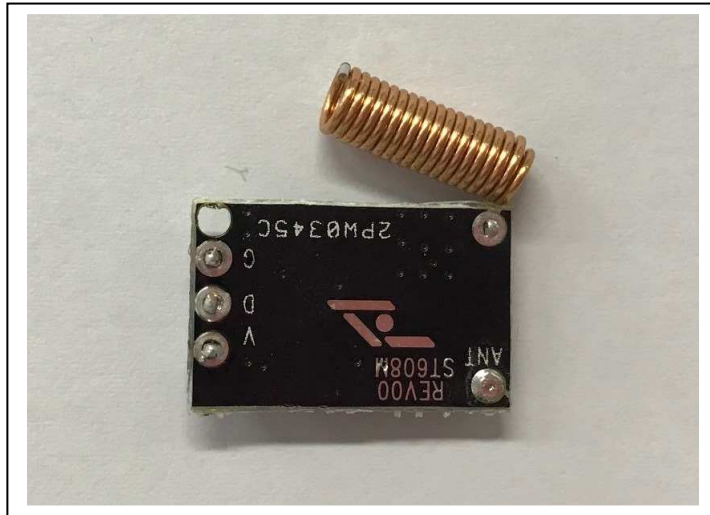
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A3 Photos of Internal Configurations



Internal Configuration 1



Internal Configuration 2

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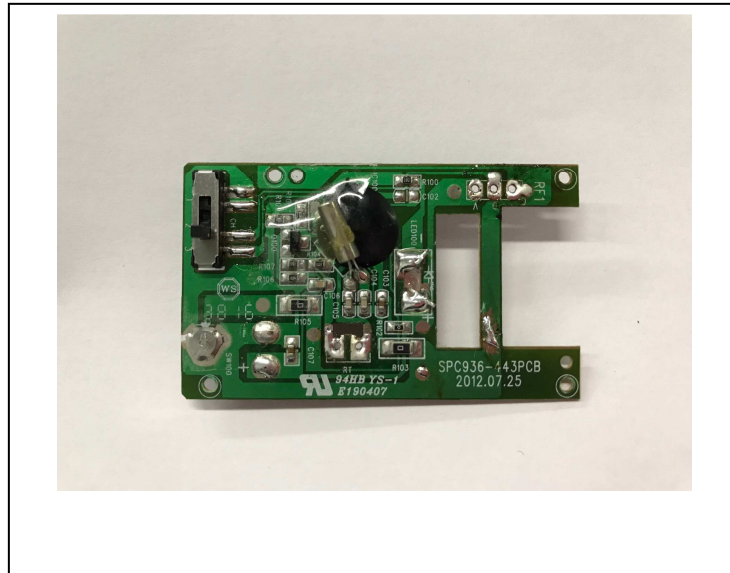
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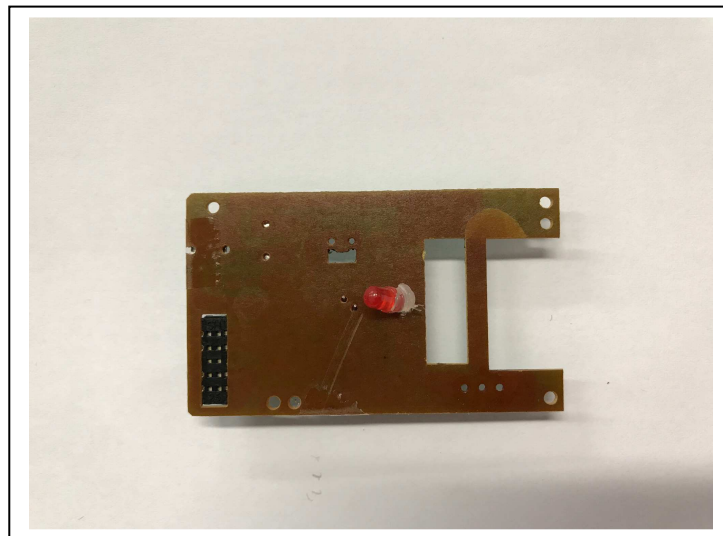
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Photos of Internal Configurations



Internal Configuration 3



Internal Configuration 4

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Photos of Internal Configurations



Internal Configuration 5



Internal Configuration 6

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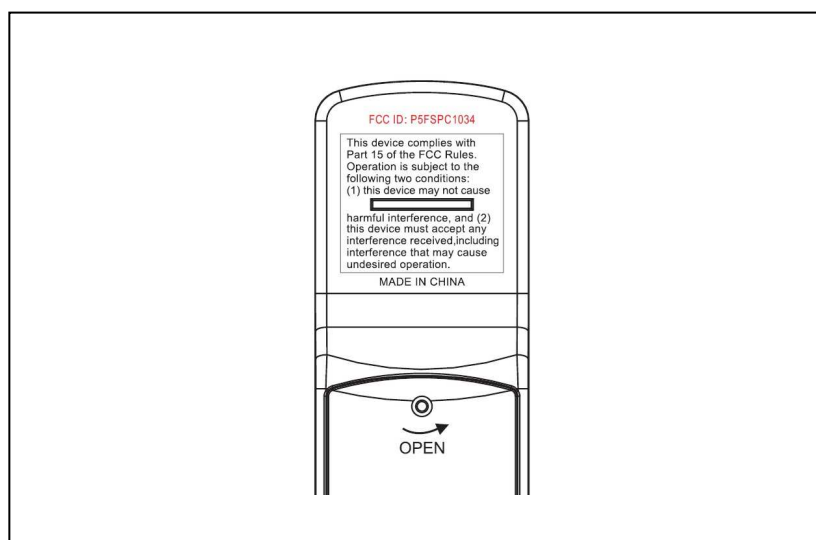
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A4 ID label / Location



ID Label / Location1

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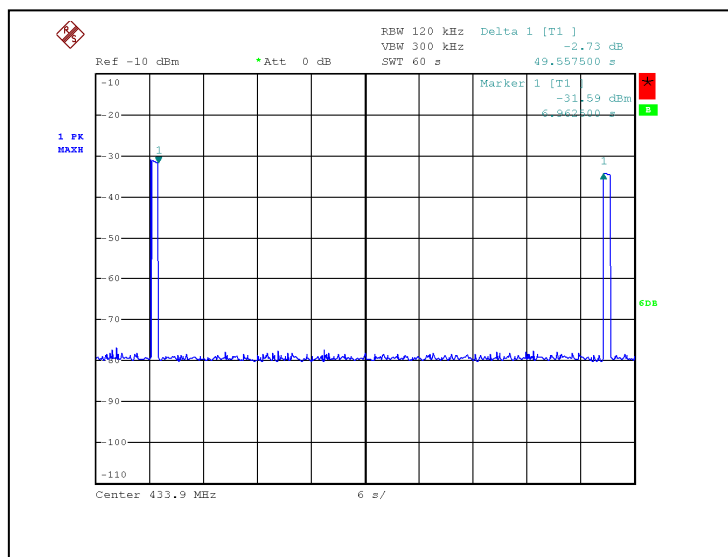
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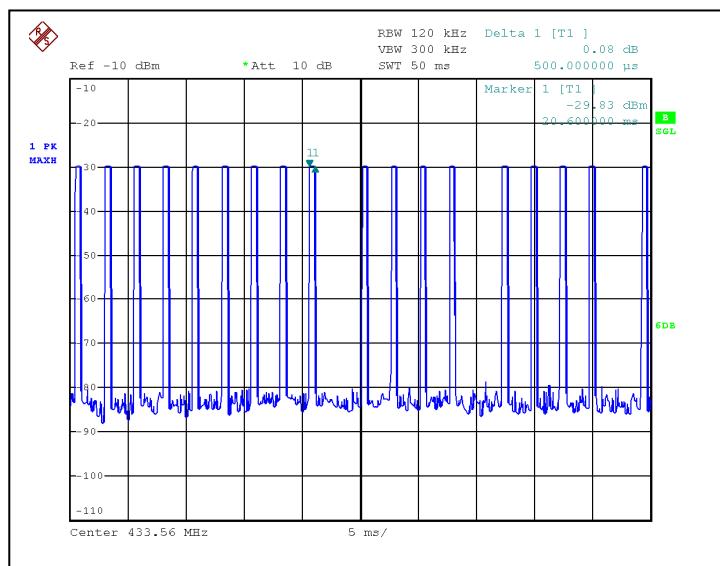
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A5 Duty cycle



Duty Cycle 1



Duty Cycle 2

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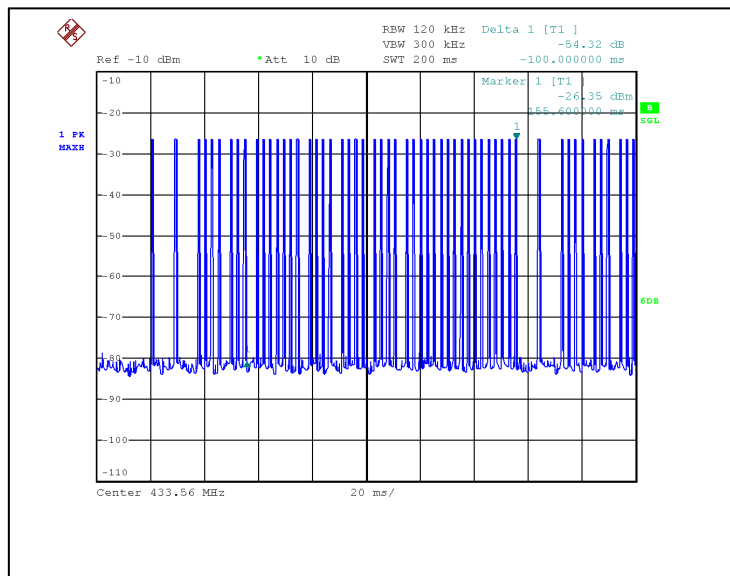
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Duty cycle



Duty Cycle 3

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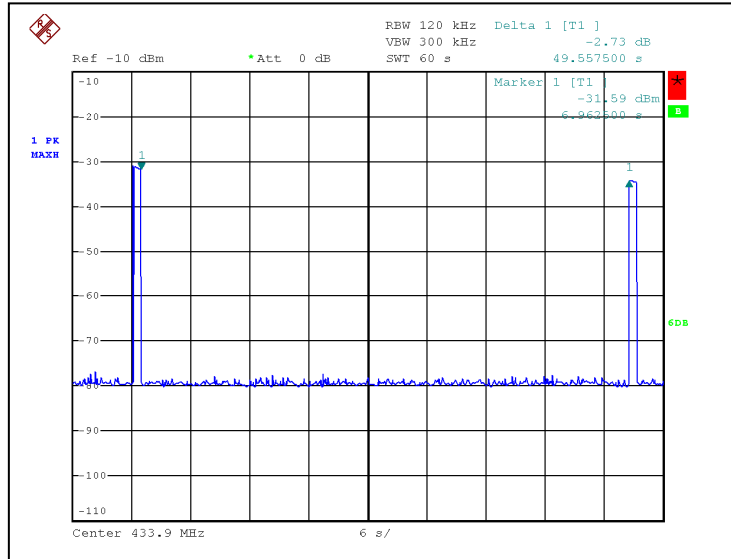
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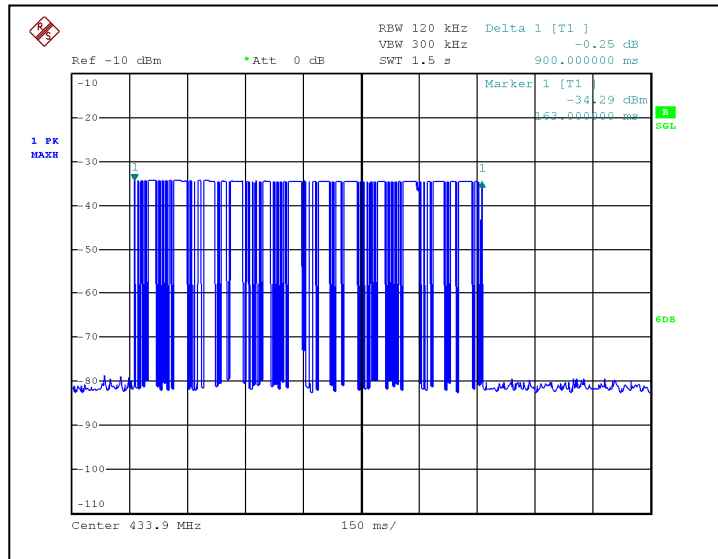
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A6 Transmission time



Duration



Transmission time

***** End of Report *****

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