



FCC PART 15.231

TEST REPORT

For

AIN TECHNICAL (SHENZHEN) CO.,LTD

No. 301A, 3F, C6 Building Hengfeng Industrial Park, Hezhou, Xixiang Bao'an, Shenzhen City
China

FCC ID: 2ALPWAST-40

| | |
|--|---|
| Report Type: Original Report | Product Type: Wireless Passive Infrared Detector |
| Report Number: <u>RSZ170726002-00</u> | |
| Report Date: | <u>2017-09-30</u> |
| | Rocky Kang |
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *AIN TECHNICAL (SHENZHEN) CO.,LTD*'s product, model number: *AST-40* (*FCC ID: 2ALPWAST-40*) (or the "EUT") in this report was a *Wireless Passive Infrared Detector*, which was measured approximately: 123.5 mm (L) * 70 mm (W) * 48 mm (H), rated with input voltage: DC 1.5V*4 AAA from battery.

**All measurement and test data in this report was gathered from production sample serial number: 170726002 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2017-07-26.*

Objective

This test report is prepared on behalf of *AIN TECHNICAL (SHENZHEN) CO.,LTD*. All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

FCC Part 15B CYY submissions with FCC ID: 2ALPWAS-500.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10 - 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

| Item | | Uncertainty |
|--------------------|-------------|-------------|
| Radiated emission | 30MHz~1 GHz | ±5.91 dB |
| | Above 1 GHz | ±4.92 dB |
| Occupied Bandwidth | | ±0.5 kHz |
| Temperature | | ±1.0 °C |
| Humidity | | ±6 % |

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

Bay Area Compliance Laboratories Corp. (Shenzhen) has been accredited to ISO/IEC 17025 by CNAS (Lab code: L2408). And accredited to ISO/IEC 17025 by NVLAP (Lab code: 200707-0), the FCC Designation No. CN5001 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Shenzhen) was registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

Special Accessories

No special accessories was used

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

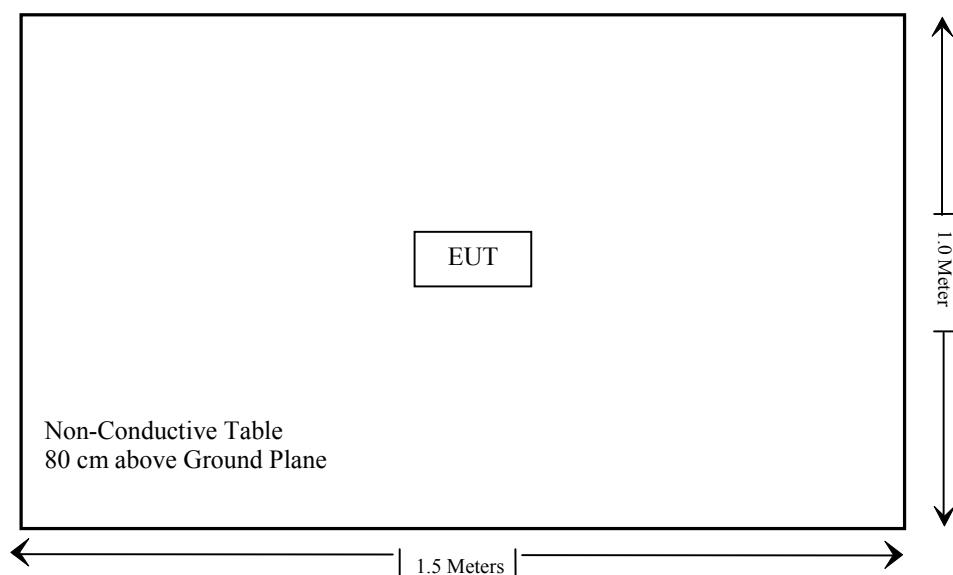
| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|-------|---------------|
| N/A | N/A | N/A | N/A |

External I/O Cable

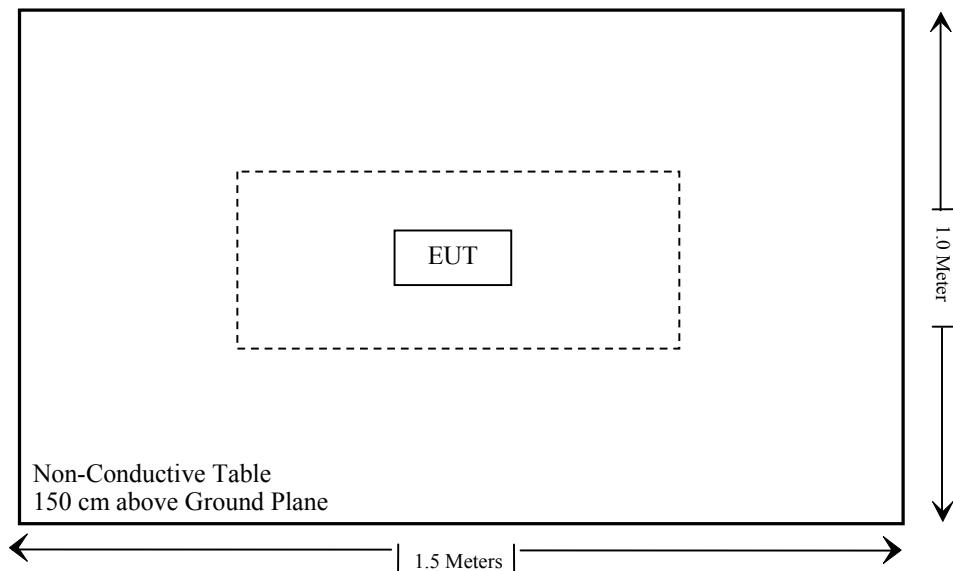
| Cable Description | Length (m) | From / Port | To |
|-------------------|------------|-------------|-----|
| N/A | N/A | N/A | N/A |

Block Diagram of Test Setup

For Radiated Emission: Below 1GHz



For Radiated Emission: Above 1GHz



SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|------------------------------|-------------------------|----------------|
| §15.203 | Antenna Requirement | Compliance |
| §15.207 (a) | Conducted Emissions | Not Applicable |
| §15.205, §15.209, §15.231(b) | Radiated Emissions | Compliance |
| §15.231 (c) | 20dB Emission Bandwidth | Compliance |
| §15.231 (a) (2) | Deactivation | Compliance |

Not Applicable: The EUT is powered by battery only.

TEST EQUIPMENT LIST AND DETAILS

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|-------------------------------|-------------------|-----------------------|------------------------|------------------|----------------------|
| Radiated Emission Test | | | | | |
| Sunol Sciences | Horn Antenna | DRH-118 | A052604 | 2014-12-29 | 2017-12-28 |
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 8386001028 | 2017-04-24 | 2018-04-24 |
| Sunol Sciences | Bi-log Antenna | JB1 | A040904-2 | 2014-12-17 | 2017-12-16 |
| Mini | Pre-amplifier | ZVA-183-S+ | 5969001149 | 2017-05-21 | 2018-11-19 |
| HP | Amplifier | HP8447E | 1937A01046 | 2017-05-21 | 2017-11-19 |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 101120 | 2016-12-07 | 2017-12-07 |
| Rohde & Schwarz | EMI Test Receiver | ESR | 1316.3003K03-101746-zn | 2017-08-19 | 2018-08-19 |
| Rohde & Schwarz | Spectrum Analyzer | FSU26 | 200120 | 2016-12-05 | 2017-12-05 |
| Ducommun technologies | RF Cable | UFA210A-1-4724-30050U | MFR64369 223410-001 | 2017-05-21 | 2017-11-19 |
| Ducommun technologies | RF Cable | 104PEA | 218124002 | 2017-05-21 | 2017-11-19 |
| Ducommun technologies | RF Cable | RG-214 | 1 | 2017-05-21 | 2017-11-19 |
| Ducommun technologies | RF Cable | RG-214 | 2 | 2017-05-22 | 2017-11-22 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Antenna Connector Construction

The EUT has one helical antenna arrangement, which was permanently attached. The antenna is 2.0 dBi, fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

FCC §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

According to FCC §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

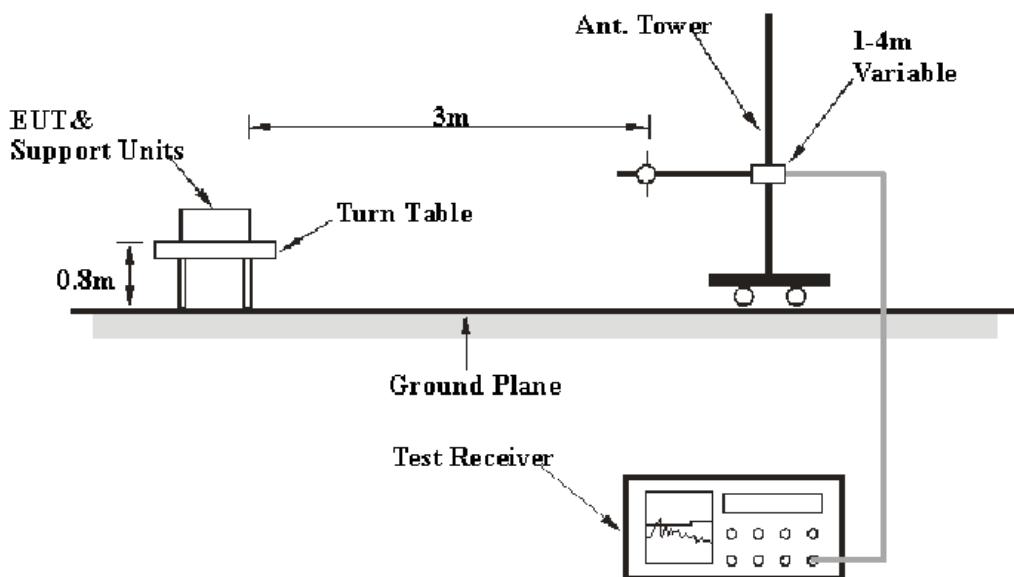
| Fundamental frequency (MHz) | Field Strength of Fundamental (Microvolts /meter) | Field Strength of spurious emissions ((Microvolts /meter) |
|-----------------------------|---|---|
| 40.66-40.70 | 2250 | 225 |
| 70-130 | 1250 | 125 |
| 130-174 | 1250 to 3750** | 125 to 375** |
| 174-260 | 3750 | 375 |
| 260-470 | 3750 to 12500** | 375 to 1250** |
| Above 470 | 12500 | 1250 |

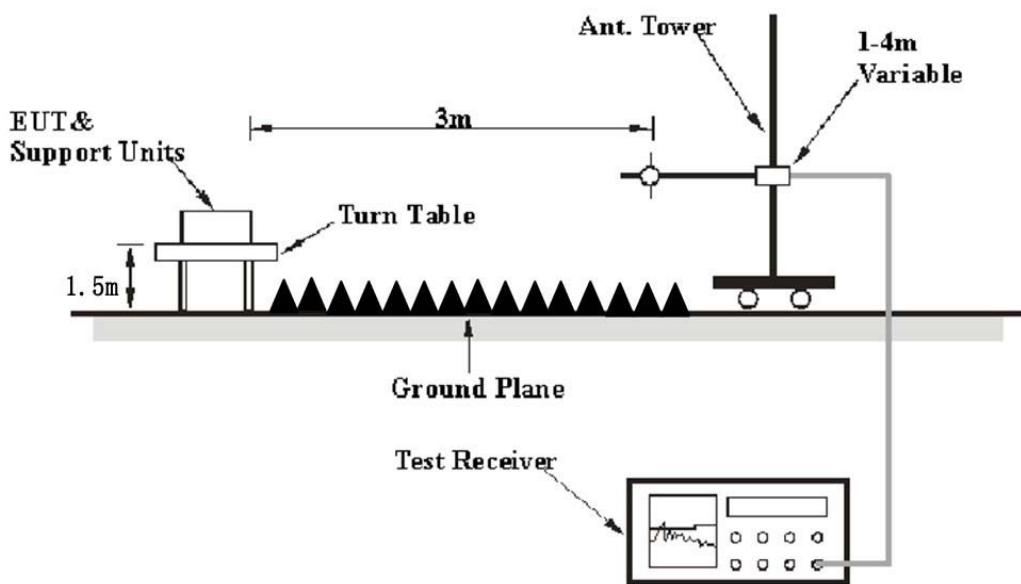
*Linear interpolations.

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

EUT Setup

Below 1 GHz:



Above 1 GHz:

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Detector |
|------------------|---------|-----------|---------|----------|
| 30MHz – 1000 MHz | 100 kHz | 300 kHz | 120 kHz | QP |
| Above 1 GHz | 1 MHz | 3 MHz | / | PK |
| | 1 MHz | 10 Hz | / | Ave. |

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 5.8 dB means the emission is 5.8 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231 (b)

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cisp}}$$

In BACL, $U_{(L_m)}$ is less than U_{cisp} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

| | |
|---------------------------|-----------------|
| Temperature: | 24~26 °C |
| Relative Humidity: | 52~55 % |
| ATM Pressure: | 100.5~101.1 kPa |

The testing was performed by Kobe Li on 2017-09-27 and 2017-09-30.

Test mode: Transmitting

30MHz - 5GHz (FSK):

| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB) | Corrected Amplitude (dB μ V/m) | FCC Part 15.231(b) | | |
|-----------------|----------------------|-----------------------|------------------|------------|-------------|-----------------------|------------------------------------|----------------------|-------------|-------------|
| | Reading (dB μ V) | Detector (PK/QP/Ave.) | | Height (m) | Polar (H/V) | | | Limit (dB μ V/m) | Margin (dB) | Comment |
| PK | | | | | | | | | | |
| 433.00 | 89.73 | PK | 232 | 2.5 | H | -4.07 | 85.66 | 100.8 | 15.14 | Fundamental |
| 433.00 | 81.84 | PK | 4 | 2.3 | V | -4.07 | 77.77 | 100.8 | 23.03 | Fundamental |
| 866.00 | 50.37 | QP | 215 | 1.1 | H | -0.7 | 49.67 | 80.8 | 31.13 | Harmonic |
| 866.00 | 50.57 | QP | 215 | 1.1 | V | -0.7 | 49.87 | 80.8 | 30.93 | Harmonic |
| 1299.00 | 68.10 | PK | 182 | 1.2 | H | -8.04 | 60.06 | 80.8 | 20.74 | Harmonic |
| 1299.00 | 71.84 | PK | 182 | 1.2 | V | -8.04 | 63.80 | 80.8 | 17.00 | Harmonic |
| 1732.00 | 55.13 | PK | 228 | 1.4 | H | -5.23 | 49.90 | 80.8 | 30.90 | Harmonic |
| 1732.00 | 59.75 | PK | 228 | 1.4 | H | -5.23 | 54.52 | 80.8 | 26.28 | Harmonic |
| 2165.00 | 58.63 | PK | 44 | 1.3 | H | -0.97 | 57.66 | 80.8 | 23.14 | Harmonic |
| 2165.00 | 60.67 | PK | 44 | 1.3 | H | -0.97 | 59.70 | 80.8 | 21.10 | Harmonic |
| 2598.00 | 47.23 | PK | 70 | 2.3 | H | -0.72 | 46.51 | 80.8 | 34.29 | Harmonic |
| 2598.00 | 54.89 | PK | 70 | 2.3 | H | -0.72 | 54.17 | 80.8 | 26.63 | Harmonic |
| 3031.00 | 52.56 | PK | 311 | 2.4 | H | 1.21 | 53.77 | 80.8 | 27.03 | Harmonic |
| 3031.00 | 52.04 | PK | 311 | 2.4 | V | 1.21 | 53.25 | 80.8 | 27.55 | Harmonic |
| 3464.00 | 53.28 | PK | 175 | 2.3 | H | 1.32 | 54.60 | 80.8 | 26.20 | Harmonic |
| 3464.00 | 52.33 | PK | 175 | 2.3 | V | 1.32 | 53.65 | 80.8 | 27.15 | Harmonic |

| Field Strength of Average Emission | | | | | | | | |
|------------------------------------|-------------------------------------|-------------|-----------------------------------|------------------------------------|----------------------|-------------|-------------|---------|
| Frequency (MHz) | Peak Measurement @3m (dB μ V/m) | Polar (H/V) | Duty Cycle Correction Factor (dB) | Corrected Amplitude (dB μ V/m) | FCC Part 15.231(b) | | | Comment |
| | | | | | Limit (dB μ V/m) | Margin (dB) | | |
| 433.00 | 85.66 | H | -34.94 | 50.72 | 80.8 | 30.08 | Fundamental | |
| 433.00 | 77.77 | V | -34.94 | 42.83 | 80.8 | 37.97 | Fundamental | |
| 866.00 | 49.67 | H | -34.94 | 14.73 | 60.8 | 46.07 | Harmonic | |
| 866.00 | 49.87 | V | -34.94 | 14.93 | 60.8 | 45.87 | Harmonic | |
| 1299.00 | 60.06 | H | -34.94 | 25.12 | 60.8 | 35.68 | Harmonic | |
| 1299.00 | 63.80 | V | -34.94 | 28.86 | 60.8 | 31.94 | Harmonic | |
| 1732.00 | 49.90 | H | -34.94 | 14.96 | 60.8 | 45.84 | Harmonic | |
| 1732.00 | 54.52 | V | -34.94 | 19.58 | 60.8 | 41.22 | Harmonic | |
| 2165.00 | 57.66 | H | -34.94 | 22.72 | 60.8 | 38.08 | Harmonic | |
| 2165.00 | 59.70 | V | -34.94 | 24.76 | 60.8 | 36.04 | Harmonic | |
| 2598.00 | 46.51 | H | -34.94 | 11.57 | 60.8 | 49.23 | Harmonic | |
| 2598.00 | 54.17 | V | -34.94 | 19.23 | 60.8 | 41.57 | Harmonic | |
| 3031.00 | 53.77 | H | -34.94 | 18.83 | 60.8 | 41.97 | Harmonic | |
| 3031.00 | 53.25 | V | -34.94 | 18.31 | 60.8 | 42.49 | Harmonic | |
| 3464.00 | 54.60 | H | -34.94 | 19.66 | 60.8 | 41.14 | Harmonic | |
| 3464.00 | 53.65 | V | -34.94 | 18.71 | 60.8 | 42.09 | Harmonic | |

Note:

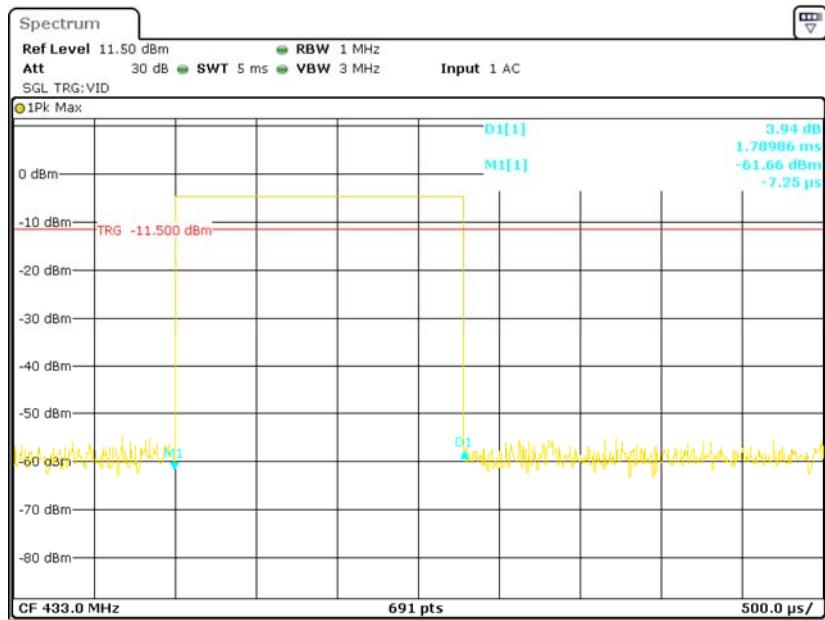
Corrected Amplitude = Corrected Factor + Reading

Corrected Factor = Antenna factor (Rx) + cable loss - amplifier factor

Margin = Limit - Corr. Amplitude

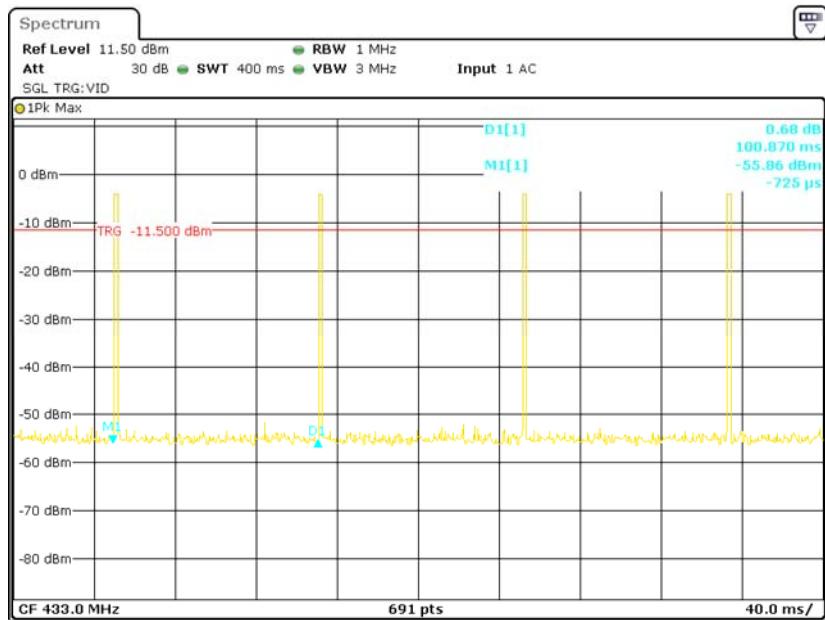
Duty cycle factor = $20 \cdot \lg(T_{on}/T_p) = 20 \cdot \lg(1.79/100) = -34.94$ Ave. = PK + $20 \cdot \lg(\text{Duty Cycle})$

Duty Cycle 1

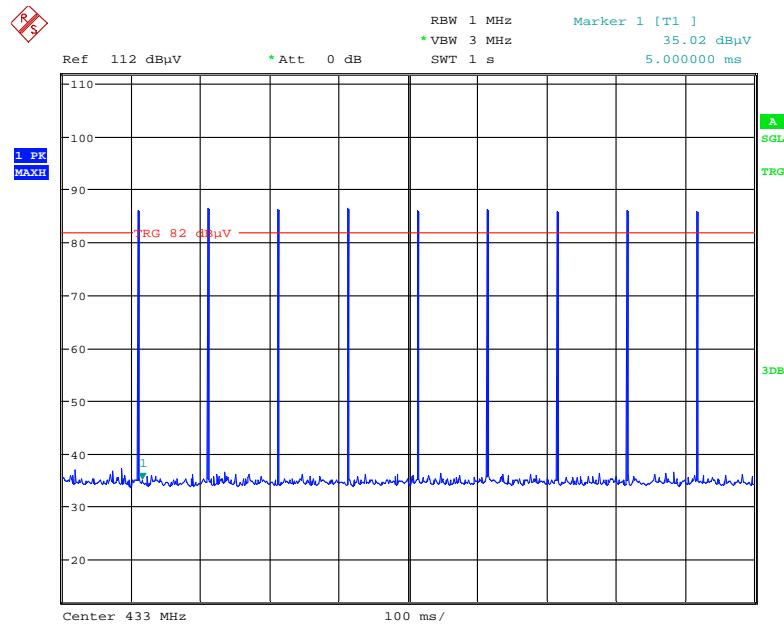


Date: 27.SEP.2017 14:09:32

Duty Cycle 2



Date: 27.SEP.2017 14:06:28

Duty Cycle 3

Date: 30.SEP.2017 17:10:34

FCC §15.231(a) (2) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (2), a transmitter activated automatically shall cease transmission within 5 seconds after activation.

Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100kHz/ VBW=300kHz/ Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

Test Data

Environmental Conditions

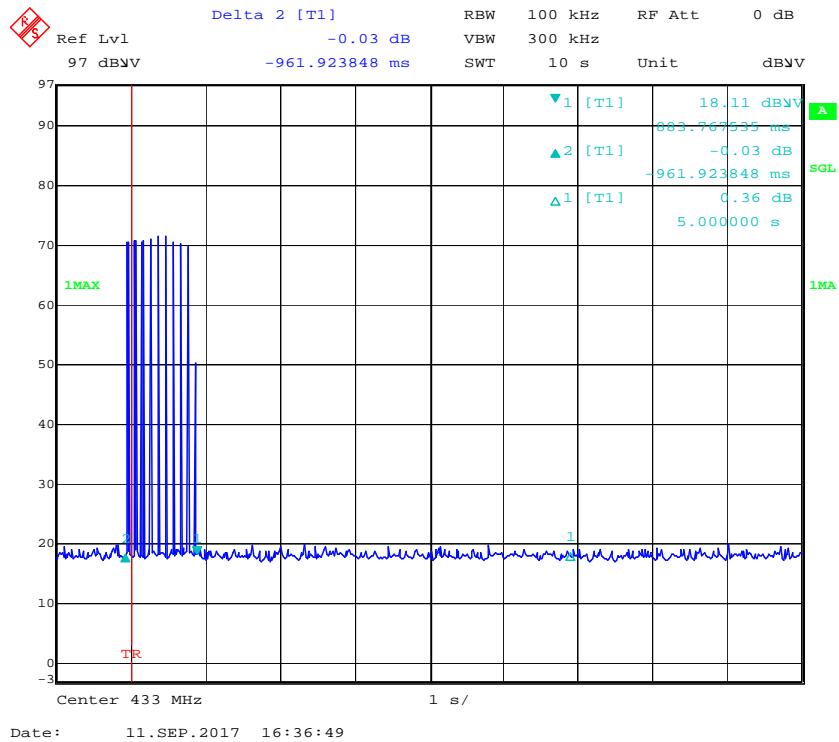
| | |
|--------------------|-----------|
| Temperature: | 26 °C |
| Relative Humidity: | 55 % |
| ATM Pressure: | 100.1 kPa |

The testing was performed by Kobe Li on 2017-09-11.

Test mode: Transmitting

Test Result: Compliant, please refer to following plot.

| Transmission period | Limit | Result |
|---------------------|-------|--------|
| 961.92 ms | < 5 s | Pass |



FCC §15.231(c) – 20 dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.231(c), 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. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 26 °C |
| Relative Humidity: | 55 % |
| ATM Pressure: | 100.1 kPa |

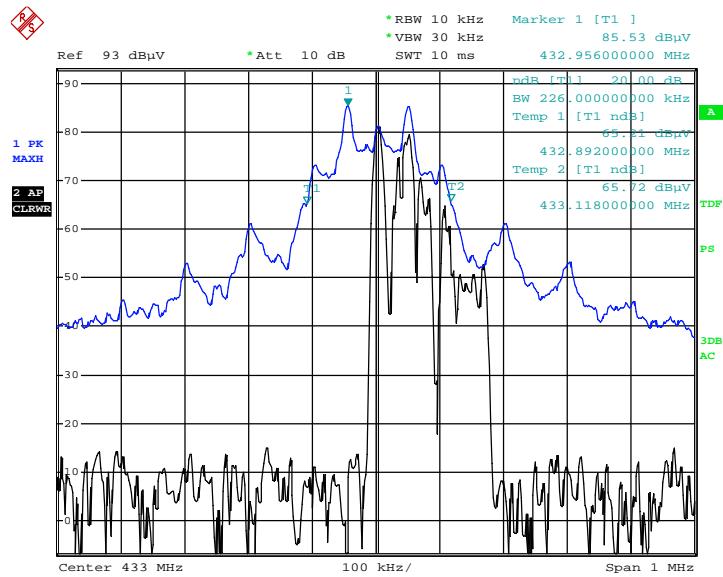
The testing was performed by Kobe Li on 2017-08-29.

Test Mode: Transmitting

Please refer to following table and plot.

| Channel Frequency (MHz) | 20 dB Emission Bandwidth (kHz) | <Limit (kHz) | Result |
|-------------------------|--------------------------------|--------------|--------|
| 433 | 226 | 1082.5 | Pass |

Note: Limit = 0.25% * center frequency = 0.25% * 433 MHz = 1082.5 kHz
20dB bandwidth = 226 kHz < 1082.5 kHz

20 dB Emission Bandwidth

EUT

Date: 29.AUG.2017 14:29:37

******* END OF REPORT *******