

# FCC Part 15C

## Measurement and Test Report

### For

### Groupe Akisens

3166 Joseph-Monier, Terrebonne, Canada

**FCC ID: 2ASQRAKI-MC005W**

|                                      |   |
|--------------------------------------|---|
| <b>FCC Rule(s):</b>                  | <u>FCC Part 15.231</u>  |
| <b>Product Description:</b>          | <u>water leak sensor</u>  |
| <b>Tested Model:</b>                 | <u>AKI-MC005W</u>   |
| <b>Report No.:</b>                   | <u>STR19018079I</u>   |
| <b>Sample Receipt Date:</b>          | <u>2019-01-10</u>   |
| <b>Tested Date:</b>                  | <u>2019-01-10 to 2019-03-18</u>   |
| <b>Issued Date:</b>                  | <u>2019-03-20</u>   |
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| <b>Reviewed By:</b>                  | <u>Silin Chen / EMC Manager</u>   |
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permission by Shenzhen SEM Test Technology Co., Ltd.

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## 1. GENERAL INFORMATION

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### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: Groupe Akisens  
Address of applicant: 3166 Joseph-Monier, Terrebonne, Canada

Manufacturer: Soan Electronic Technology Co., Ltd  
Address of manufacturer: 3/F, Building D, Xinhelianyou industrial area, No.28 xinhe industrial road, fuyong, BaoAn, ShenZhen, China

| <b>General Description of EUT</b>   |                   |
|---|-------------------|
| Product Name:   | water leak sensor |
| Trade Name:   | Akisens           |
| Model No.:  | AKI-MC005W        |
| Adding Model(s):  | /                 |
| Rated Voltage:  | Battery:DC1.5V*2  |
| Power Adaptor :   | /                 |
| Software Version:   | V2.01             |
| Hardware Version:   | V3.02             |
| <i>Note: The test data is gathered from a production sample provided by the manufacturer.</i> |                   |

| <b>Technical Characteristics of EUT</b> |                  |
|---|------------------|
| Frequency Range:                        | 433.92 MHz       |
| Max. Field Strength:                    | 72.33dBuV/m(3m)  |
| Modulation:                             | ASK              |
| Antenna Type:                           | Integral Antenna |
| Antenna Gain:                           | 0dBi             |

## 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.231:** Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

**ANSI C63.10-2013:** American National Standard for Testing Unlicensed Wireless Devices

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013,

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

## 1.4 Test Facility

### FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

### Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

## 1.5 EUT Setup and Test Mode

The EUT was operated at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

| Test Mode List |              |           |
|----------------|--------------|-----------|
| Test Mode      | Description  | Remark    |
| TM1            | Transmitting | 433.92MHz |

| Test Conditions   |           |
|-------------------|-----------|
| Temperature:      | 22~25 °C  |
| Relative humidity | 50~55 %.  |
| ATM Pressure:     | 1019 mbar |

| EUT Cable List and Details |            |                     |                        |
|----------------------------|------------|---------------------|------------------------|
| Cable Description          | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| /                          | /          | /                   | /                      |

| Special Cable List and Details |            |                     |                        |
|--------------------------------|------------|---------------------|------------------------|
| Cable Description              | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| /                              | /          | /                   | /                      |

| Auxiliary Equipment List and Details |              |       |               |
|--------------------------------------|--------------|-------|---------------|
| Description                          | Manufacturer | Model | Serial Number |
| /                                    | /            | /     | /             |

## 1.6 Measurement Uncertainty

| Measurement uncertainty        |            |  |  |
|--------------------------------|------------|--|--|
| Parameter                      | Conditions | Uncertainty  |  |
| Occupied Bandwidth             | Conducted  | ± 1.5%   |  |
| Conducted Spurious Emission    | Conducted  | ± 2.17dB   |  |
| Transmission Time              | Conducted  | ± 5%   |  |
| Conducted Emissions            | Conducted  | 9-150kHz ± 3.74dB<br>0.15-30MHz ± 3.34dB                                       |  |
| Transmitter Spurious Emissions | Radiated   | 30-200MHz ± 4.52dB<br>0.2-1GHz ± 5.56dB<br>1-6GHz ± 3.84dB<br>6-18GHz ± 3.92dB |  |

## 1.7 Test Equipment List and Details

| No.       | Description       | Manufacturer    | Model                 | Serial No. | Cal Date   | Due Date   |
|-----------|-------------------|-----------------|-----------------------|------------|------------|------------|
| SEMT-1072 | Spectrum Analyzer | Agilent         | E4407B                | MY41440400 | 2018-05-22 | 2019-05-21 |
| SEMT-1031 | Spectrum Analyzer | Rohde & Schwarz | FSP30                 | 836079/035 | 2018-05-22 | 2019-05-21 |
| SEMT-1007 | EMI Test Receiver | Rohde & Schwarz | ESVB                  | 825471/005 | 2018-05-22 | 2019-05-21 |
| SEMT-1008 | Amplifier         | Agilent         | 8447F                 | 3113A06717 | 2018-05-22 | 2019-05-21 |
| SEMT-1043 | Amplifier         | C&D             | PAP-1G18              | 2002       | 2018-05-22 | 2019-05-21 |
| SEMT-1011 | Broadband Antenna | Schwarz beck    | VULB9163              | 9163-333   | 2017-06-08 | 2020-06-07 |
| SEMT-1042 | Horn Antenna      | ETS             | 3117                  | 00086197   | 2017-06-08 | 2020-06-07 |
| SEMT-1069 | Loop Antenna      | Schwarz beck    | FMZB 1516             | 9773       | 2017-06-08 | 2020-06-07 |
| SEMT-1001 | EMI Test Receiver | Rohde & Schwarz | ESPI                  | 101611     | 2018-05-22 | 2019-05-21 |
| SEMT-1003 | L.I.S.N           | Schwarz beck    | NSLK8126              | 8126-224   | 2018-05-22 | 2019-05-21 |
| SEMT-1166 | Power Limiter     | Agilent         | N9356B                | MY45450376 | 2018-05-22 | 2019-05-21 |
| SEMT-1048 | RF Limiter        | ATTEN           | AT-BSF-2400~2500      | /          | 2018-05-22 | 2019-05-21 |
| SEMT-1076 | RF Switcher       | Top Precision   | RCS03-A2              | /          | 2018-05-22 | 2019-05-21 |
| SEMT-C001 | Cable             | Zheng DI        | LL142-07-07-10M(A)    | /          | 2018-03-19 | 2019-03-18 |
| SEMT-C002 | Cable             | Zheng DI        | ZT40-2.92J-2.92J-6M   | /          | 2018-03-19 | 2019-03-18 |
| SEMT-C003 | Cable             | Zheng DI        | ZT40-2.92J-2.92J-2.5M | /          | 2018-03-19 | 2019-03-18 |
| SEMT-C004 | Cable             | Zheng DI        | 2M0RFC                | /          | 2018-03-19 | 2019-03-18 |
| SEMT-C005 | Cable             | Zheng DI        | 1M0RFC                | /          | 2018-03-19 | 2019-03-18 |
| SEMT-C006 | Cable             | Zheng DI        | 1M0RFC                | /          | 2018-03-19 | 2019-03-18 |

## 2. SUMMARY OF TEST RESULTS

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| FCC Rules   | Description of Test Item     | Result    |
|-------------|------------------------------|-----------|
| § 15.203    | Antenna Requirement          | Compliant |
| §15.205     | Restricted Band of Operation | Compliant |
| § 15.209    | Radiated Spurious Emissions  | Compliant |
| §15.231(a)  | Deactivation Testing         | Compliant |
| §15.231(b)  | Radiated Emissions           | Compliant |
| §15.231(c)  | 20dB Bandwidth Testing       | Compliant |
| § 15.207(a) | Conducted Emission           | N/A       |

N/A: Not applicable

\*Remark: The AC Line Conducted Emissions testing is exempted because it is powered solely by batteries. Thus, the AC Line Conducted Emissions testing is not applicable.

### **3. Antenna Requirement**

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#### **3.1 Standard Applicable**

According to FCC Part 15.203, 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.

#### **3.2 Test Result**

This product has an integral antenna, fulfill the requirement of this section.

## 4. Radiated Emissions

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### 4.1 Standard Applicable

According to §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               | 2,250  | 225   |
| 70 - 130                    | 1,250  | 125   |
| 130 - 174                   | 1,250 to 3,750 **                                | 125 to 375 **   |
| 174 - 260                   | 3,750  | 375   |
| 260 - 470                   | 3,750 to 12,500 **                               | 375 to 1,250 **   |
| Above 470                   | 12,500   | 1,250   |

\*\* linear interpolations

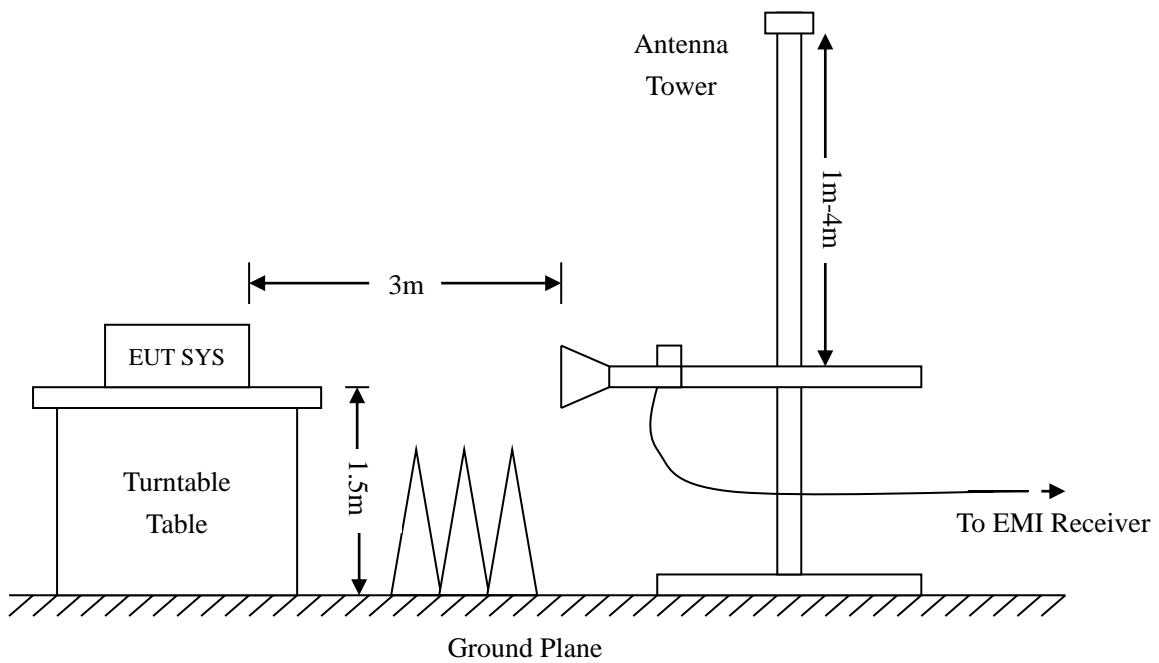
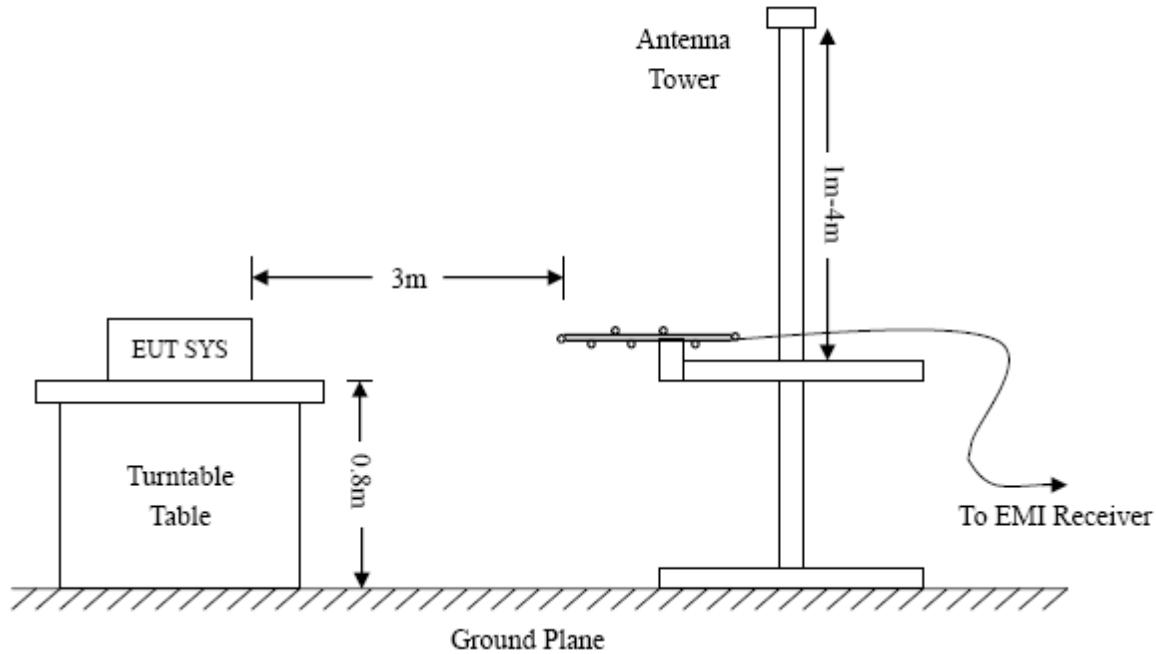
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

## 4.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.



### 4.3 Corrected Amplitude & Margin Calculation

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

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant.Loss} + \text{Cab. Loss} - \text{Ampl.Gain}$$

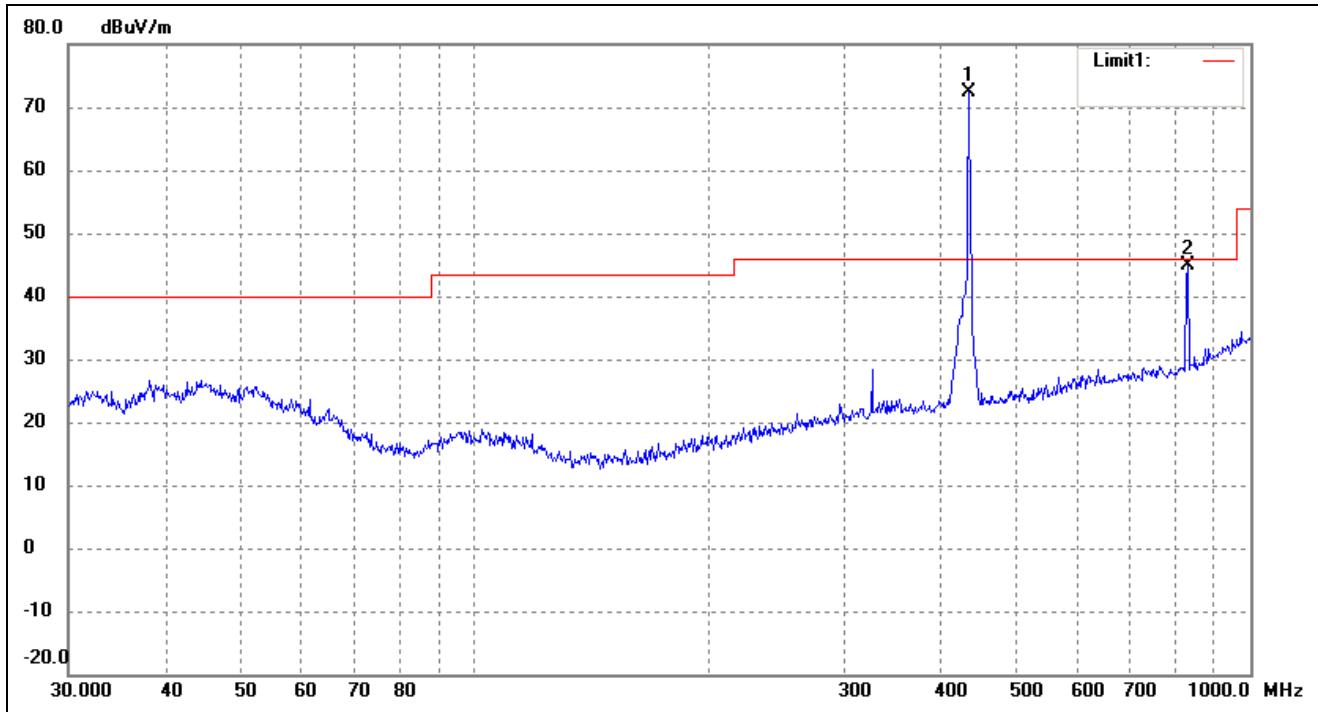
The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of  $-6\text{dB}\mu\text{V}$  means the emission is  $6\text{dB}\mu\text{V}$  below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

### 4.4 Summary of Test Results/Plots

*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

|           |     |           |            |
|-----------|-----|-----------|------------|
| Test Mode | TM1 | Polarity: | Horizontal |
|-----------|-----|-----------|------------|

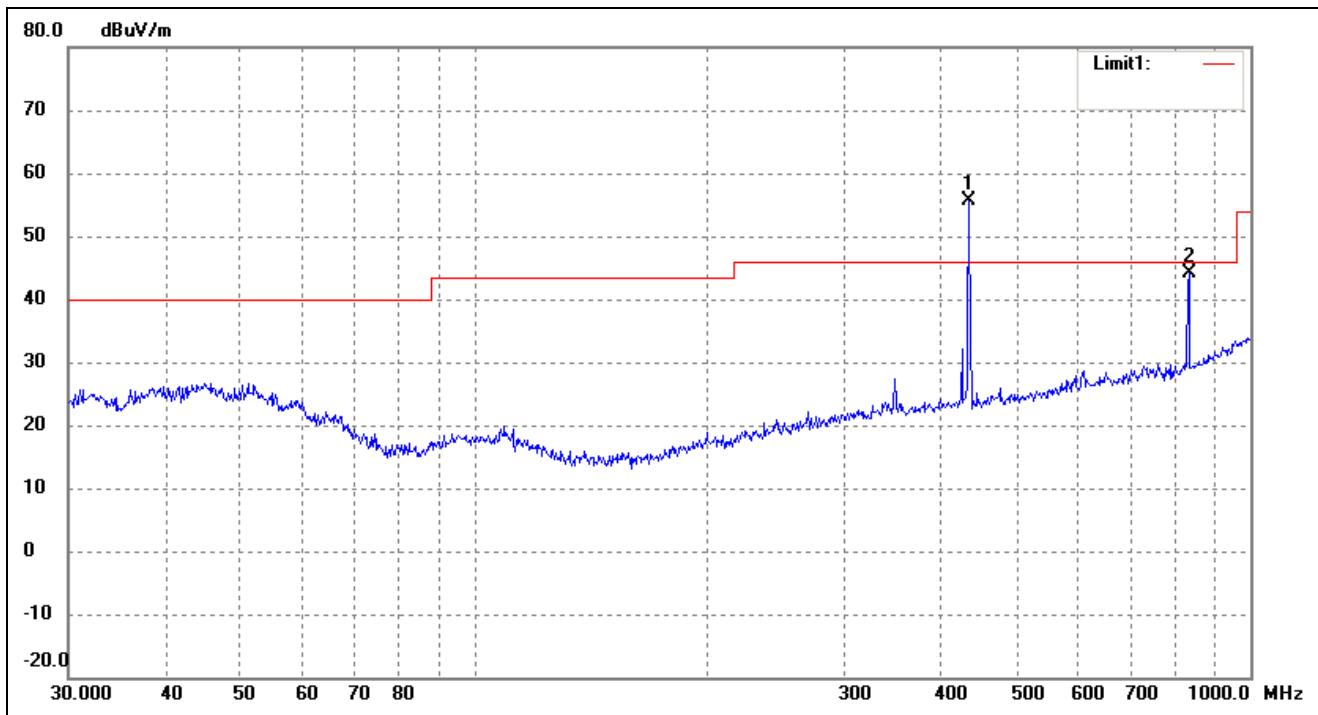


| No. | Frequency | Reading  | Correct | Dutycycle   | Result   | Limit    | Margin | Deg. | Height | Remark |
|-----|-----------|----------|---------|-------------|----------|----------|--------|------|--------|--------|
|     | (MHz)     | (dBuV/m) | dB/m    | Factor (dB) | (dBuV/m) | (dBuV/m) | (dB)   | ( )  | (cm)   |        |
| 1   | 433.92    | 79.32    | -6.99   | N/A         | 72.33    | 100.82   | -28.49 | 165  | 100    | peak   |
|     | 433.92    | /        | /       | -8.86       | 63.47    | 80.82    | -17.35 | 165  | 100    | AVG    |
| 2   | 867.84    | 45.52    | -0.70   | N/A         | 44.82    | 80.82    | -36    | 243  | 100    | peak   |
|     | 867.84    | /        | /       | -8.86       | 35.96    | 60.82    | -24.86 | 243  | 100    | AVG    |

## Above 1GHz

| No. | Frequency | Reading | Corr.       | Dutycycle   | Result | Limit  | Margin | Deg. | Height | Remark |
|-----|-----------|---------|-------------|-------------|--------|--------|--------|------|--------|--------|
|     | MHz       | dBuV/m  | Factor (dB) | Factor (dB) | dBuV/m | dBuV/m | dB     | (° ) | (cm)   |        |
| 1   | 1301.76   | 28.65   | 26.95       | N/A         | 55.6   | 74     | -18.40 | 45   | 150    | Peak   |
|     | 1301.76   | /       | /           | -8.86       | 46.74  | 54     | -7.26  | 321  | 150    | AVG    |
| 2   | 1735.68   | 29.55   | 27.77       | N/A         | 57.32  | 74     | -16.68 | 231  | 150    | Peak   |
|     | 1735.68   | /       | /           | -8.86       | 48.46  | 54     | -5.54  | 32   | 150    | AVG    |

|           |     |           |          |
|-----------|-----|-----------|----------|
| Test Mode | TM1 | Polarity: | Vertical |
|-----------|-----|-----------|----------|



| No. | Frequency | Reading  | Correct | Dutycycle   | Result   | Limit    | Margin | Deg. | Height | Remark |
|-----|-----------|----------|---------|-------------|----------|----------|--------|------|--------|--------|
|     | (MHz)     | (dBuV/m) | dB/m    | Factor (dB) | (dBuV/m) | (dBuV/m) | (dB)   | ( )  | (cm)   |        |
| 1   | 433.92    | 62.66    | -6.99   | N/A         | 55.67    | 100.82   | -45.15 | 48   | 100    | Peak   |
|     | 433.92    | /        | /       | -8.86       | 46.81    | 80.82    | -34.01 | 85   | 100    | AVG    |
| 2   | 867.84    | 44.72    | -0.59   | N/A         | 44.13    | 80.82    | -36.69 | 259  | 100    | Peak   |
|     | 867.84    | /        | /       | -8.86       | 35.27    | 60.82    | -25.55 | 335  | 100    | AVG    |

#### Above 1GHz

| No. | Frequency | Reading | Corr.       | Dutycycle   | Result | Limit  | Margin | Deg. | Heigh t | Remark |
|-----|-----------|---------|-------------|-------------|--------|--------|--------|------|---------|--------|
|     | MHz       | dBuV/m  | Factor (dB) | Factor (dB) | dBuV/m | dBuV/m | dB     | (° ) | (cm)    |        |
| 1   | 1301.76   | 28.99   | 26.95       | N/A         | 55.94  | 74     | -18.06 | 45   | 150     | Peak   |
|     | 1301.76   | /       | /           | -8.86       | 47.08  | 54     | -6.92  | 321  | 150     | AVG    |
| 2   | 1735.68   | 25.85   | 27.77       | N/A         | 53.62  | 74     | -20.38 | 231  | 150     | Peak   |
|     | 1735.68   | /       | /           | -8.86       | 44.76  | 54     | -9.24  | 32   | 150     | AVG    |

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 4<sup>th</sup> Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 433.92MHz.

## 5. 20dB Bandwidth

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### 5.1 Standard Applicable

According to FCC Part 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.

### 5.1 Test Procedure

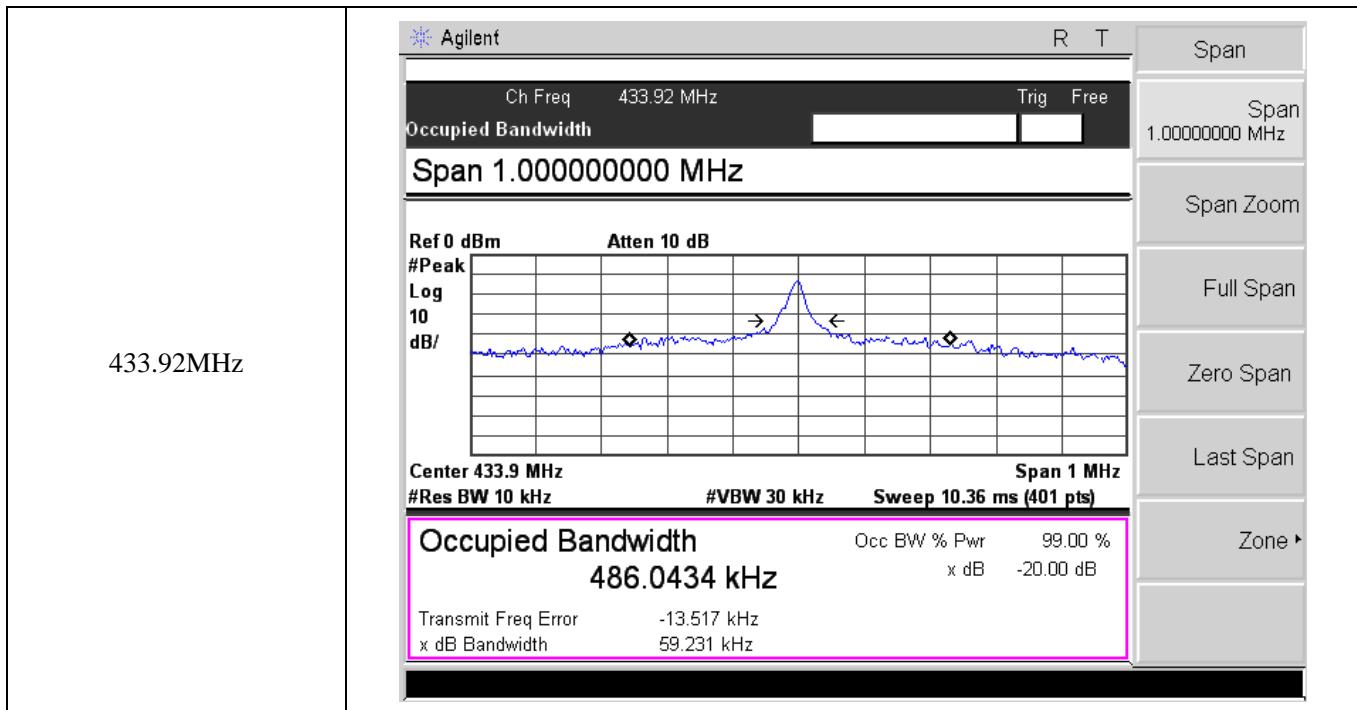
With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

### 5.2 Summary of Test Results/Plots

| Test Frequency<br>MHz | 20dB Bandwidth<br>kHz | Limit<br>kHz | Result |
|-----------------------|-----------------------|--------------|--------|
| 433.92                | 59.231                | 1084.8       | Pass   |

Limit = Fundamental Frequency X 0.25% = 433.92 MHz X 0.25% = 1084.8 kHz

*Please refer to the attached plots.*



## 6. Transmission Time

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### 6.1 Standard Applicable

According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:

- 1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

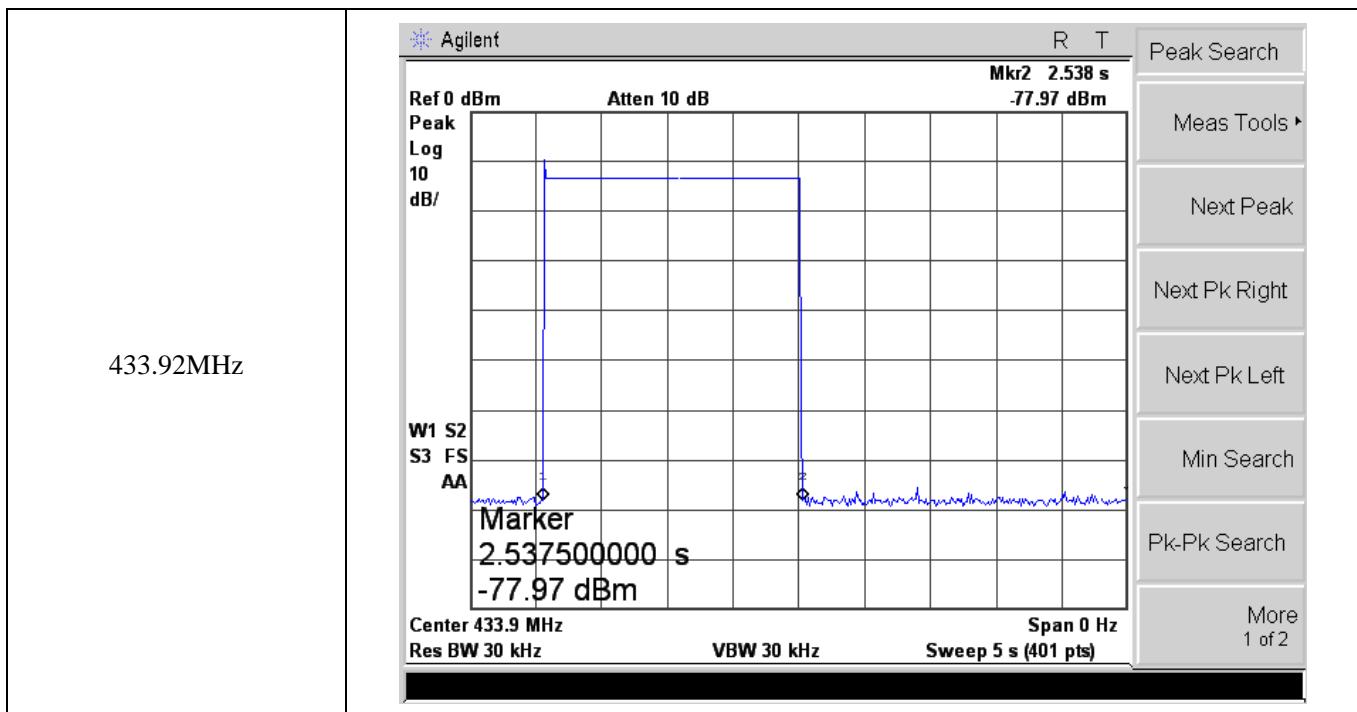
### 6.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

### 6.3 Summary of Test Results/Plots

| Transmission Type | Test Frequency(MHz) | Transmission Time(s) | Limit(s) | Result |
|-------------------|---------------------|----------------------|----------|--------|
| Manually          | 433.92              | 2.538                | 5        | Pass   |

*Please refer to the attached plots.*



## 7. Duty Cycle

### 7.1 Standard Applicable

According to FCC Part 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

### 7.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

### 7.3 Summary of Test Results/Plots

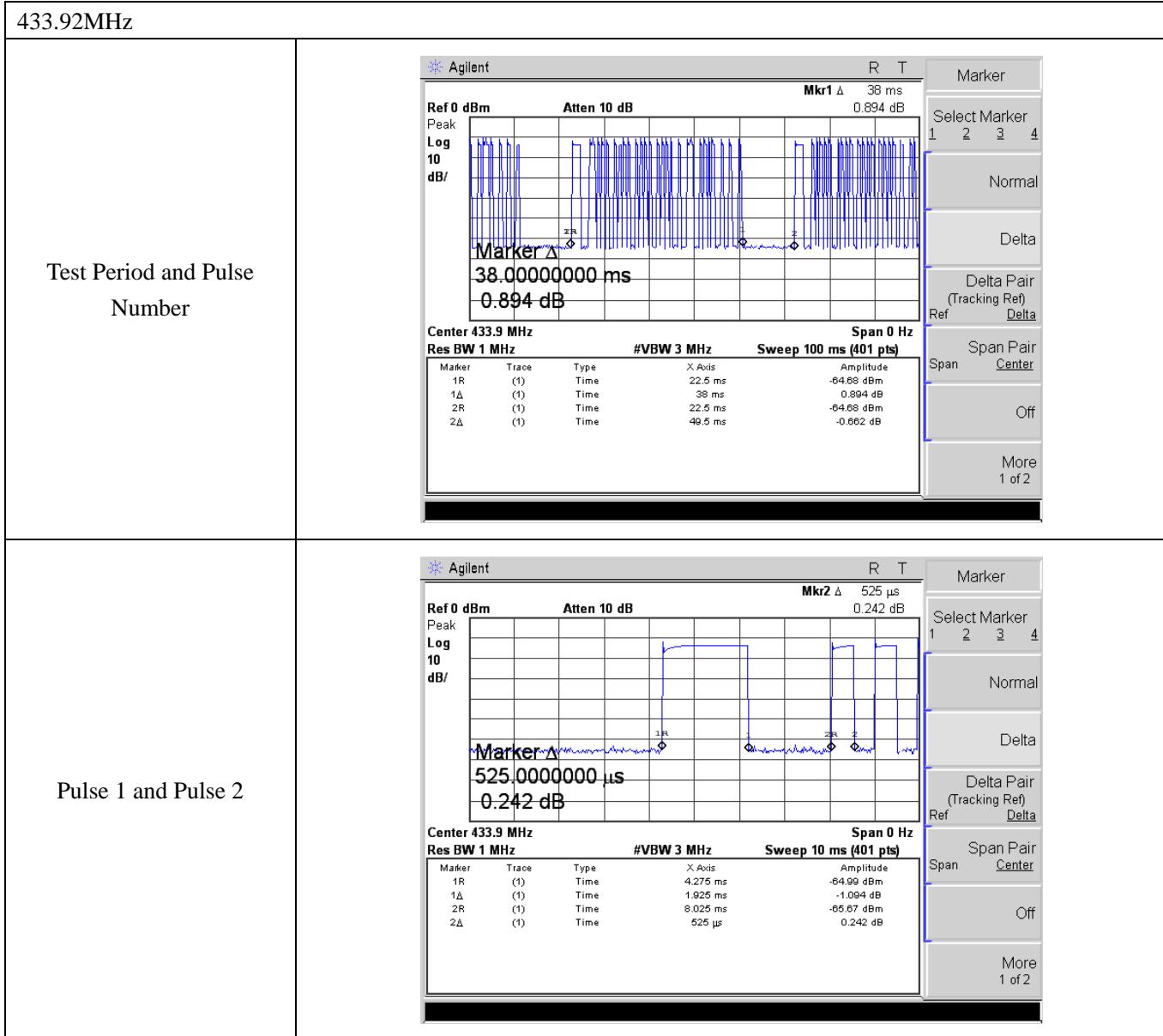
433.93MHz:

| Type of Pulse    | Width of Pulse (ms) | Quantity of Pulse | Transmission Time (ms) | Total Time (T <sub>on</sub> ) (ms) |
|------------------|---------------------|-------------------|------------------------|------------------------------------|
| Pulse 1 (Wide)   | 1.925               | 3                 | 5.775                  | 17.85                              |
| Pulse 2 (Narrow) | 0.525               | 23                | 12.075                 |                                    |

| Test Period (T <sub>p</sub> ) | Total Time (T <sub>on</sub> ) | Duty Cycle | Duty Cycle Factor |
|-------------------------------|-------------------------------|------------|-------------------|
| ms                            | ms                            | %          | dB                |
| 49.50                         | 17.85                         | 36.06      | -8.86             |

Remark: Duty Cycle Factor=20\*log(Duty Cycle)

*Please refer to the attached test plots*



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