



FCC/IC - TEST REPORT

Report Number : **68.910.16.008.01** Date of Issue: June 01, 2016

Model : **DM45CEQ/S-10/9, DM45LEQ/S-10/9, DM45CEQ/S-3/28, DM45LEQ/S-3/28**

Product Type : Tubular Motor

Applicant : Ningbo Dooya Mechanic & Electronic Technology Co., Ltd.

Address : No.168 Shengguang Road, Luotuo, Zhenhai, Ningbo,
Zhejiang province, P.R.China 315202

Production Facility : Ningbo Dooya Mechanic & Electronic Technology Co., Ltd.

Address : No.168 Shengguang Road, Luotuo, Zhenhai, Ningbo,
Zhejiang province, P.R.China 315202

Test Result : Positive Negative

Total pages including Appendices : 18

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

FCC Registration Number: 502708

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

3 Description of the Equipment Under Test

| | |
|----------------------------|---|
| Product: | Tubular Motor |
| Model no.: | DM45LEQ/S-10/9 |
| FCC ID: | VYYDM451009 |
| Options and accessories: | AC Adapter (Supplied by Dooya) Model: DC264 Input: 100 – 240VAC, 50/60Hz, 0.4A Output: 12.6VDC, 1000mA |
| Rating: | 11.1VDC (Supplied by Internal rechargeable battery.) 12.6VDC, 1.0A (Charging for Battery.) |
| RF Transmission Frequency: | 433.925MHz |
| Modulation: | 2GFSK |
| Antenna Type: | Integrated antenna |
| Antenna Gain: | 0.5dBi |
| Description of the EUT: | The Equipment Under Test (EUT) is a Tubular Motor operated at 433.925MHz |

4 Summary of Test Standards

| Test Standards | |
|--|---|
| FCC Part 15 Subpart C 10-1-2015 Edition | PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators |
| RSS-210 Issue 8 | Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment |

All the test methods were according to ANSI C63.10(2013).

5 Summary of Test Results

| Technical Requirements | | | | | |
|---|-------------------|---------------------------------------|-------|-----------|-------------|
| FCC Part 15 Subpart C, RSS-210 Issue 8 | | | | | |
| Test Condition | | | Pages | Test Site | Test Result |
| §15.207 | RSS-GEN 8.8 | Conducted emission AC power port | 10 | Site 1 | Pass |
| §15.205, §15.209, 15.35 (c)§15.231 (b) | RSS-210 A1.1 | Radiated Emission, 30MHz to 4.5GHz | 13 | Site 1 | Pass |
| §15.231(c) | RSS-210 A1.1.3 | Bandwidth Measurement | 15 | Site 1 | Pass |
| §15.231 (a) (1) | RSS-210 A1.1.1 | Deactivation Time | 16 | Site 1 | Pass |

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an integrated antenna, which gain is 0.5dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: VYYDM451009 complies with Section 15.207, 15.209, 15.231 of the FCC Part 15, Subpart C Rules.

Model DM45CEQ/S-10/9, DM45CEQ/S-3/28, DM45LEQ/S-3/28 are identical with DM45LEQ/S-10/9 except model name and length, and also DM45CEQ/S-10/9, DM45CEQ/S-3/28 without internal battery, but DM45LEQ/S-3/28, DM45LEQ/S-10/9 with internal battery in it. So full testing was applied on DM45CEQ/S-10/9, the other models were deemed to fulfill the EMC test requirement without further testing.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed

- **Not** Performed

The Equipment Under Test

- **Fulfills** the general approval requirements.

- **Does not** fulfill the general approval requirements.

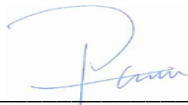
Sample Received Date: March 1, 2016

Testing Start Date: March 1, 2016

Testing End Date: March 18, 2016

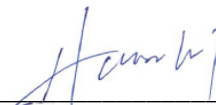
TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Reviewed by:



Phoebe Hu
EMC Project Manager

Prepared by:



Aaron Lai
EMC Project Engineer

7 Systems test configuration

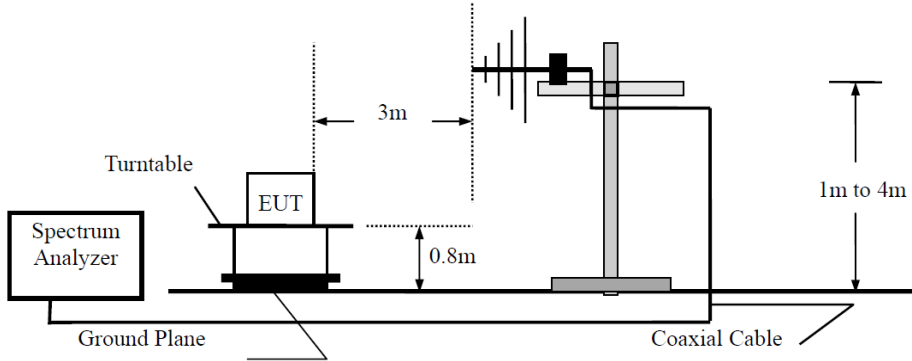
Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) | S/N(LENGTH) |
|-------------|--------------|-------------------|-------------|
| Adapter | -- | -- | -- |

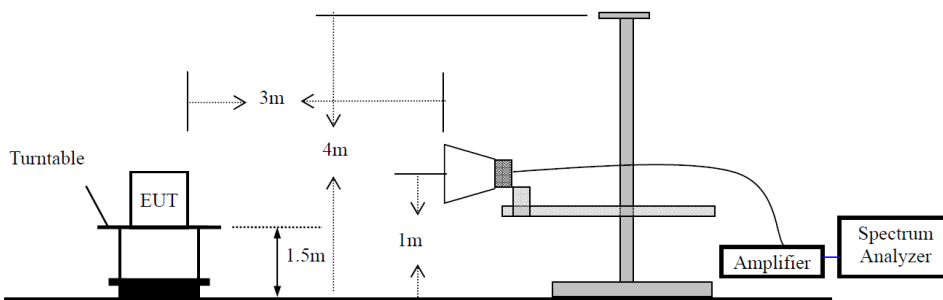
8 Test Setups

7.1 Radiated test setups

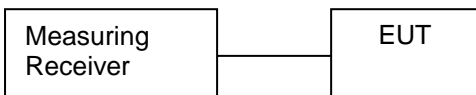
Below 1GHz



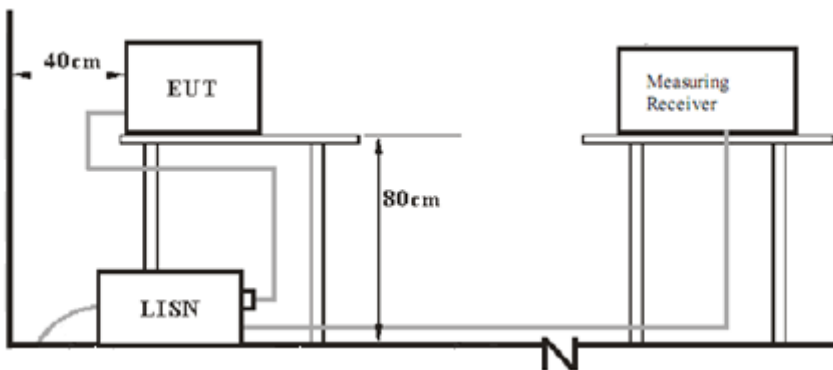
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



9 Test Methodology

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

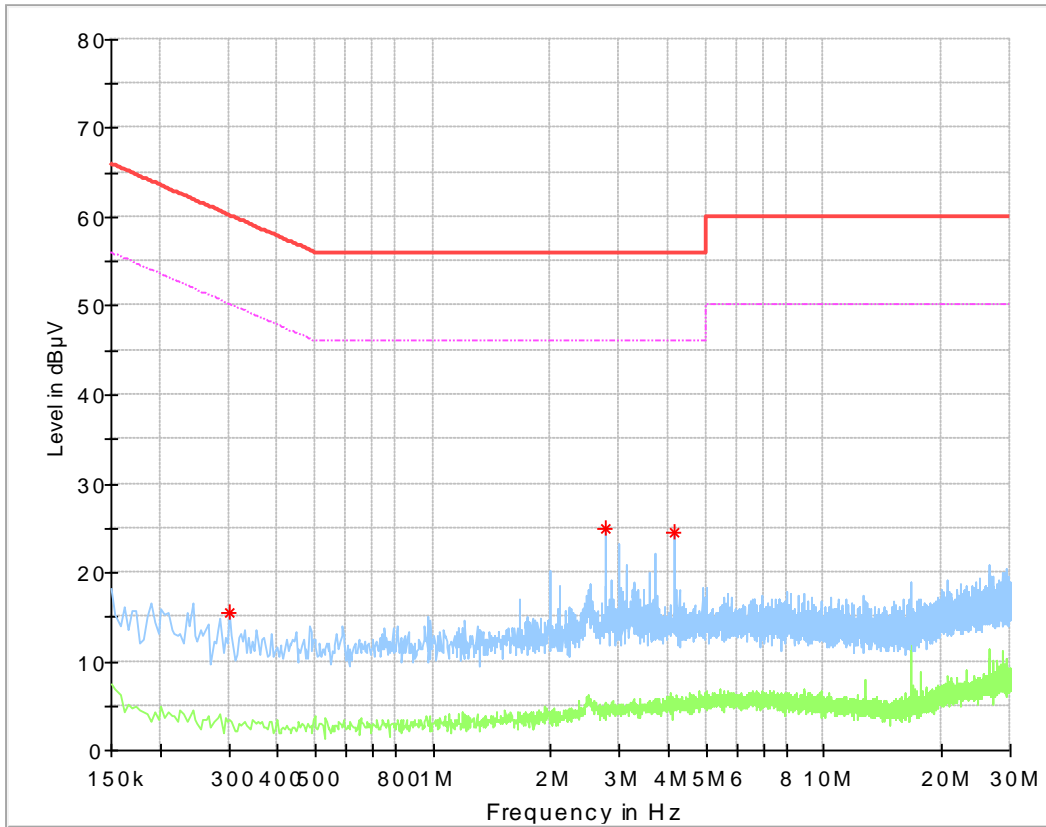
Limit

| Frequency MHz | QP Limit dB μ V | AV Limit dB μ V |
|------------------|------------------------|------------------------|
| 0.150-0.500 | 66-56* | 56-46* |
| 0.500-5 | 56 | 46 |
| 5-30 | 60 | 50 |

Decreasing linea

Conducted Emission

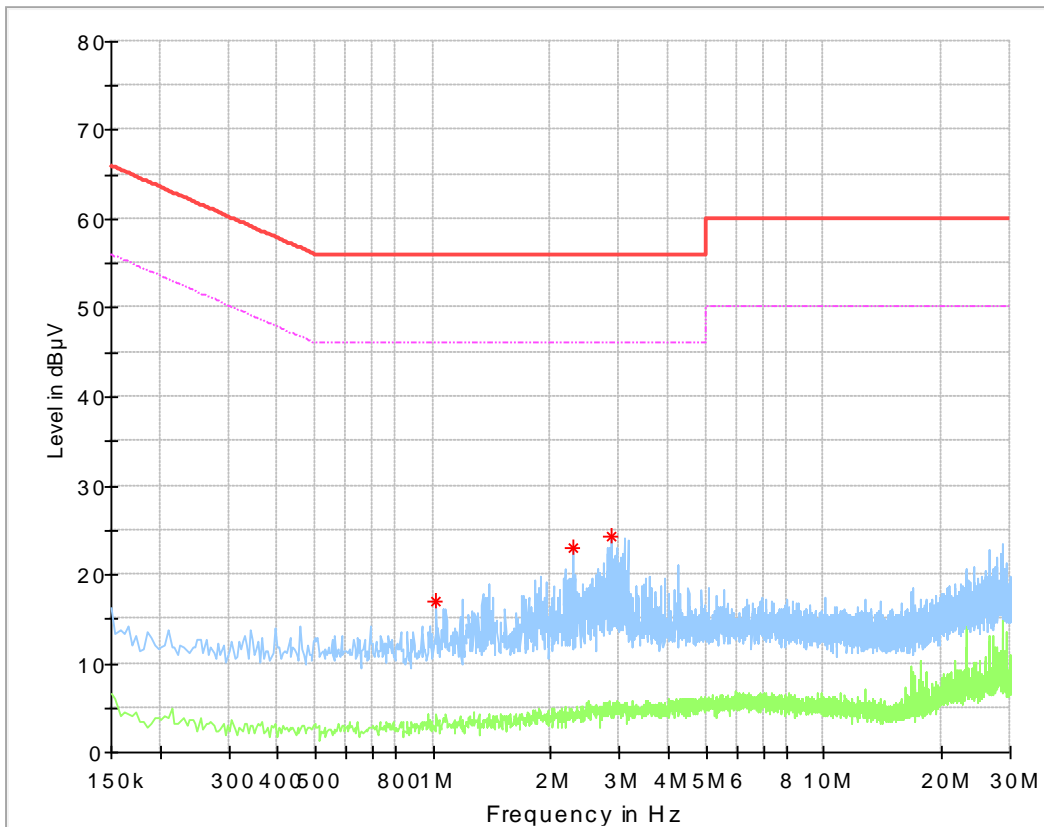
Product Type : Tubular Motor
M/N : DM45LEQ/S-10/9
Operating Condition : Charging & TX
Test Specification : Live
Comment : AC 120V/60Hz



| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line |
|-----------------|----------------|----------------|--------------|-------------|------|
| 0.302000 | 15.55 | --- | 60.19 | 44.64 | L1 |
| 2.758000 | 24.97 | --- | 56.00 | 31.03 | L1 |
| 4.142000 | 24.53 | --- | 56.00 | 31.47 | L1 |

Conducted Emission

Product Type : Tubular Motor
 M/N : DM45LEQ/S-10/9
 Operating Condition : Charging & TX
 Test Specification : Neutral
 Comment : AC 120V/60Hz



| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line |
|-----------------|----------------|----------------|--------------|-------------|------|
| 1.018000 | 16.98 | --- | 56.00 | 39.02 | N |
| 2.282000 | 23.06 | --- | 56.00 | 32.94 | N |
| 2.850000 | 24.37 | --- | 56.00 | 31.63 | N |

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules.

9.2 Radiated Emission

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 1MHz, VBW \geq RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 100 KHz, VBW \geq RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Limit

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 3,370 * | 125 to 375 * |
| 174-260 | 3,750 | 375 |
| 260-470 \checkmark | 3,750 to 12,500* | 375 to 1,250* |
| Above 470 | 12,500 | 1,250 |

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

| Below 1GHz | | | | | | | | |
|------------|-----------|---|-------|--------|-------|--------|-------|-------------|
| PK | 433.925 | H | 84.40 | 0.00 | 84.40 | 100.83 | 16.43 | Fundamental |
| AV | 433.925 | H | 84.40 | -23.52 | 60.88 | 80.83 | 19.95 | Fundamental |
| PK | 433.925 | V | 85.73 | 0.00 | 85.73 | 100.83 | 15.10 | Fundamental |
| AV | 433.925 | V | 85.73 | -23.52 | 62.21 | 80.83 | 18.62 | Fundamental |
| PK | 867.860 | H | 62.43 | 0.00 | 62.43 | 80.83 | 18.40 | Spurious |
| AV | 867.860 | H | 62.43 | -23.52 | 38.91 | 60.83 | 21.92 | Spurious |
| PK | 867.910 | V | 64.08 | 0.00 | 64.08 | 80.83 | 16.75 | Spurious |
| AV | 867.910 | V | 64.08 | -23.52 | 40.56 | 60.83 | 20.27 | Spurious |
| Above 1GHz | | | | | | | | |
| PK | 1301.46 * | H | 57.43 | 0.00 | 57.43 | 74 | 16.57 | Spurious |
| AV | 1301.46 * | H | 57.43 | -23.52 | 33.91 | 54 | 20.09 | Spurious |
| PK | 1301.46 * | V | 58.37 | 0.00 | 58.37 | 74 | 15.63 | Spurious |
| AV | 1301.46 * | V | 58.37 | -23.52 | 34.85 | 54 | 19.15 | Spurious |
| PK | / | H | / | / | / | 74 | / | Spurious |
| AV | / | V | / | / | / | 54 | / | Spurious |

Remark:

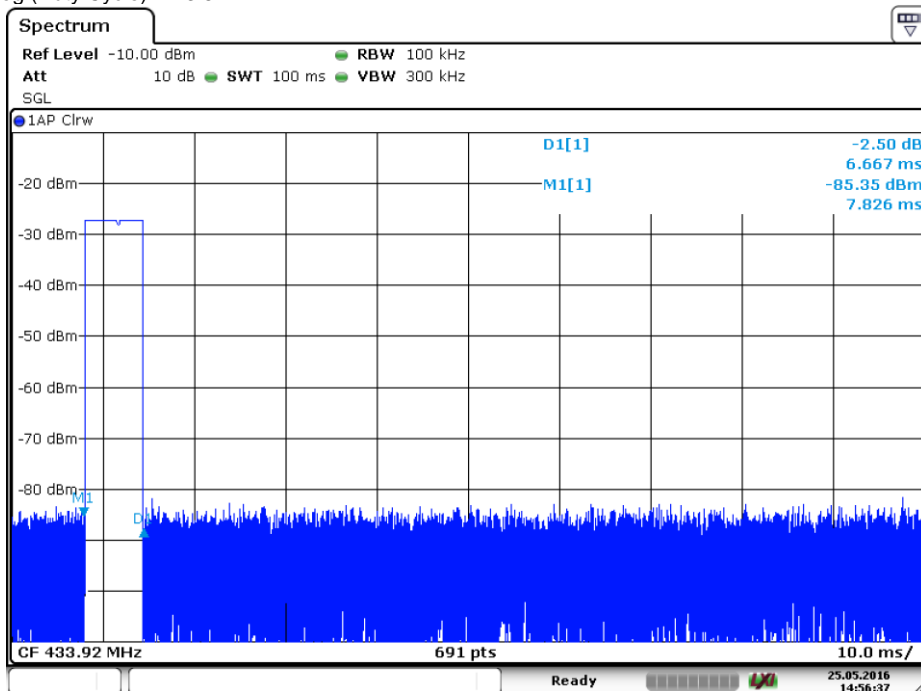
1: AV Emission Level= PK Emission Level+20log(dutycycle)

2: Data of measurement within this frequency range shown “/” in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

3: “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

Duty Cycle =6.667 (ms)/100 (ms) =6.6%

Duty Cycle Factor =20log (Duty Cycle) =-23.52



9.3 Bandwidth Measurement

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

The limit for the EUT = 0.25% * 433.925 MHz = 1084 kHz

Test Result

| Channel | 20dB Bandwidth (KHz) | 99% bandwidth (KHz) | Limit (KHz) |
|---------|----------------------|---------------------|-------------|
| 1 | 83.79KHz | 77.71KHz | 1085KHz |



9.4 Deactivation Time

Test Method

1. Place the EUT in the chamber and set it in transmitting mode.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=1MHz, VBW=1MkHz, Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

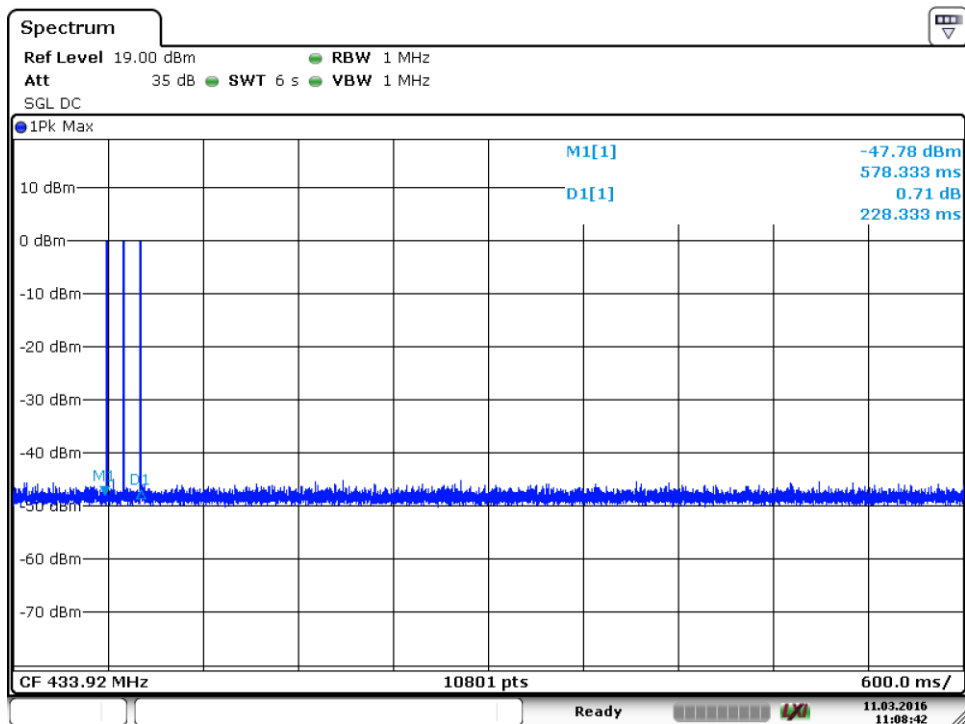
Limit

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.

Test Result

| Channel | Frequency | Deactivation Time | Result |
|---------|------------|-------------------|--------|
| 1 | 433.925MHz | 228.333ms | Pass |



10 Test Equipment List

List of Test Instruments

| | DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|----|-------------------------------------|-----------------|-----------------|------------|---------------|
| C | Signal Analyzer | Rohde & Schwarz | FSV40 | 101031 | 2016-7-24 |
| RE | EMI Test Receiver | Rohde & Schwarz | ESR 26 | 101269 | 2016-7-24 |
| | Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9163 | 707 | 2016-8-14 |
| | Horn Antenna | Rohde & Schwarz | HF907 | 102294 | 2016-7-24 |
| | Pre-amplifier | Rohde & Schwarz | SCU 18 | 102230 | 2016-7-24 |
| | 3m Semi-anechoic chamber | TDK | 9X6X6 | ---- | 2019-5-29 |
| CE | EMI Test Receiver | Rohde & Schwarz | ESR 3 | 101782 | 2016-7-24 |
| | LISN | Rohde & Schwarz | ENV4200 | 100249 | 2016-7-24 |
| | LISN | Rohde & Schwarz | ENV216 | 100326 | 2016-7-24 |
| | ISN | Rohde & Schwarz | ENY81 | 100177 | 2016-7-24 |
| | ISN | Rohde & Schwarz | ENY81-CA6 | 101664 | 2016-7-24 |
| | High Voltage Probe | Rohde & Schwarz | TK9420(VT9 420) | 9420-58 | 2016-7-24 |

C - Conducted RF tests

- 20dB bandwidth and 99% bandwidth
- Deactivation Time

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

| Items | Extended Uncertainty |
|---|--|
| Radiated spurious emission | Horizontal: $U=\pm 4.83\text{dB}$ (30MHz~1GHz) Vertical: $U=\pm 4.91\text{dB}$ (30MHz~1GHz) Horizontal: $U=\pm 4.89\text{dB}$ (1GHz~18GHz) Vertical: $U=\pm 4.88\text{dB}$ (1GHz~18GHz) |
| Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV216 or ENV4200) | 3.50dB |
| Uncertainty for Conducted RF test with TS 8997 | 2.04dB |