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**FCC Test report for M18 One Key adaptor
Model 2700-20**

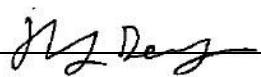
Guangzhou, date of issue: 2015-05-21

Author Harry Deng

By order of Sunstrong Industrial Limited at N.T., Hong Kong

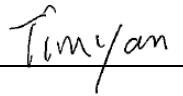
Author : Harry Deng

Pages : 29 pages



Reviewed : Tim Yan

Annex : NIL



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1 CONCLUSION

The device under test (DUT) as mentioned in this report complies with the stated requirements of the FCC Part 15, Class B.

The tested system is classified as digital device Class B, marketed for use in a residential environment notwithstanding use in commercial, business and industrial environment.

The conclusion and results stated in this test report are based on a non-recurrent examination of sample(s) provided by the applicant.

The tests described in this report do not result in the right to use any approval mark as conferred by DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch As far as the tests were based on certain specifications; these are mentioned in the report.

2 SUMMARY

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

2.1 Applied standards

| Standard | Year | Title |
|-------------|------|---|
| FCC part 15 | 2015 | Federal Communications Commission (FCC) – Radio Frequency Devices |

2.2 Reference standards

| Standard | Year | Title |
|------------|------|---|
| ANSI C63.4 | 2009 | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |

2.3 Overview of results

| Emission tests | Result |
|--------------------|-------------|
| Conducted emission | PASS |
| Radiated emission | PASS |

2.4 Overview of measurement uncertainty

| Measurement | Uncertainty |
|---|-------------|
| Mains disturbance voltage (9 kHz – 30MHz) | ± 1,66 dB |
| Radiated disturbance (30MHz– 1000MHz) | ± 3,32 dB |
| Radiated disturbance (1GHz– 3GHz) | ± 2,73 dB |

3 CLASSIFICATION

This chapter presents an overview of the applicable classification and procedure.

The following procedure has been selected to confirm the compliance of the device under test:

| | |
|--|---|
| | Verification procedure: The Device under Test (DUT) is subject to the Verification procedure. The Verification procedure is defined in 47CFR Part 2 section 2.902 and described in section 2.951 through 2.957 of the FCC rules. |
|--|---|

Base on client's declaration, the following applicable Class has been selected:

| | |
|---|---|
| | Class A : The intended user environment of the device under test is limited to industrial environments and classified as a digital device class A. |
| ✓ | Class B : The intended user environment of the device under tests is in commercial and light-industrial environments and classified as a digital device class B. |

For the device under test the following measurement clauses are applicable:

| | |
|---|---|
| ✓ | 47CFR Part 15 Subpart B Unintentional radiators. |
| | Section 15.107(b) Conducted emissions – Class A |
| ✓ | Section 15.107(a) Conducted emissions – Class B |
| | Section 15.109(b) Radiated emissions – Class A |
| ✓ | Section 15.109(a) Radiated emissions – Class B |

4 GENERAL INFORMATION

4.1 Model description

The apparatus as supplied for the test is a M18 One Key adaptor, model 2700-20 intended for residential use, the product contains electronic circuitry but no component susceptible to magnetic fields.

The product was powered by appropriate DC battery (rechargeable, refer to Figure 3). And the product also contains a Bluetooth module which FCC ID: QOQBLE112. The data of power tool operation status can be transmitted to PC or similar by the USB port or Bluetooth module.



Figure 1 front view of model 2700-20



Figure 2 back view of model 2700-20

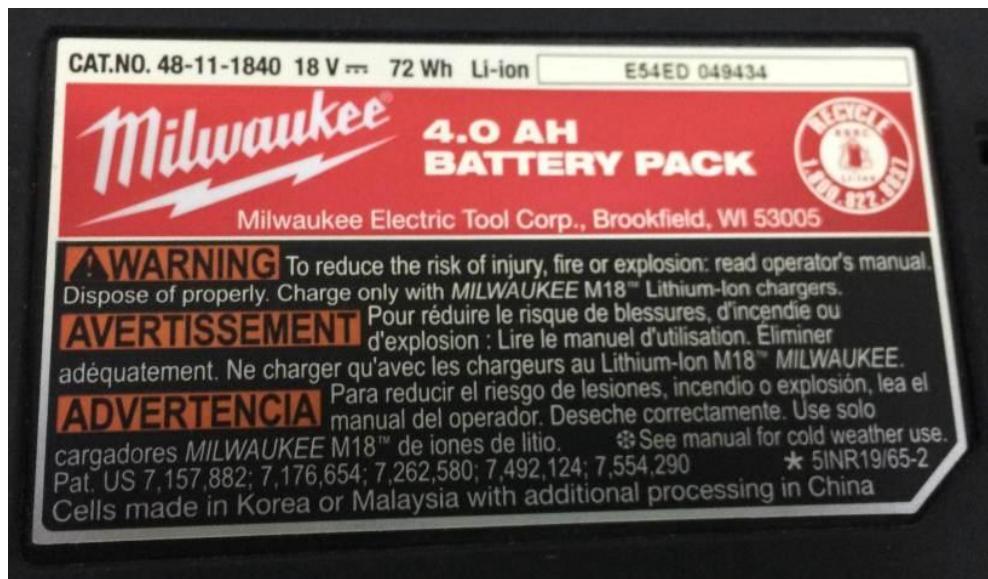


Figure 3 rechargeable DC battery



Figure 4 the used USB cable (non-screened)

The Operating Modes as stated in the User Manual is Bluetooth on and USB data transmitting mode.

4.2 Product Information

| | |
|---|---|
| Equipment under test | M18 One Key adaptor |
| Trade mark | Milwaukee |
| Tested Type | 2700-20 |
| FCC ID | 2AEMT2700180KA |
| Input | 18 Vdc (rechargeable battery, Figure 3) |
| The highest frequency of the internal sources | 120 MHz |

| | |
|---------------------|----------|
| Accessory equipment | Computer |
| Type | E6400 |
| Manufacture | Dell |

| | |
|---------------------|------------|
| Accessory equipment | LCD Screen |
| Type | F178FPc |
| Manufacture | Dell |

| | |
|---------------------|----------|
| Accessory equipment | USD disk |
| Type | DT101G2 |
| Manufacture | KINGSTON |

4.3 Customer Information

| | |
|--------------------------|---|
| Applicant / Manufacturer | Sunstrong Industrial Limited |
| Contact person | / |
| Telephone | / |
| Telefax | / |
| Address | Flat 5-9, 10/F, Wing King Industrial Building, 83-93 Chai Wan Kok |

| | |
|----------------|---|
| Factory | Dongguan Sunstrong Electric Machine Company Limited |
| Contact person | Ms Belinda |
| Telephone | +86 769 8792 5083 |
| Telefax | / |
| Address | Sunstrong Industrial Park, Sicun Administration Zone, Tangxia Town, Dongguan City, Guangdong, P.R.China |

4.4 Product labeling

According to section 15.19, the DUT shall have the following statement labeled to its housing on a conspicuous location:

“This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation”.

(Remark: When the device is so small or for such use that it is not practicable to place the statement specified under paragraph of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed)

4.5 User information

The user- or instruction manual shall:

Caution the user that changes or modifications not expressly approved by the responsible party for compliance could void the user's authority to operate the equipment.

Inform the user about special RF emission protection measures, which are delivered with the product, for example shielded cables.

Contain the following statement in case of a Class B digital device:

“This device has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

5 TEST INFORMATION

5.1 Test facility

The FCC has per public notice declared these measurement facilities to be reviewed and to be in compliance with the requirements of Section 2.948 of the FCC Rules.

The test laboratory DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch (Building A3, No.3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P.R. China), registration number: 245651.

5.2 Measurement procedure

The DUT was configured for testing in a typical user configuration. The maximum test configuration was put to the tests. The DUT was tested as complete system.

5.3 Test data

| | |
|---------------|--|
| Location | DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch |
| Address | Building A3, No.3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P.R. China |
| Date | 2015-04-10 to 2015-05-06 |
| Supervised by | Harry Deng |

5.4 Environmental conditions

Tests have been performed in a controlled laboratory environment, where the environmental conditions are maintained within the applicable ranges.

| | |
|-----------------------|---------------|
| Ambient temperature | 15 °C – 25 °C |
| Relative Humidity air | 30% - 60% |

6 CONDUCTED EMISSIONS

6.1 Measurement procedure

In accordance with section 15.107(a) the conducted radio frequency disturbance voltages between each of the power lines (live and neutral) and the ground terminal are determined over the frequency range from 150 kHz to 30 MHz.

The test set-up is in accordance with the requirements of ANSI C63.4: 2009

The AC power line conducted emission measurements were performed at the line voltage of 120 Vac and at the power frequency of 60 Hz.

The initial step in collecting conducted data is a peak scan measurement over the frequency range of interest. Significant peaks are marked, and these peaks are re-measured using a quasi peak and average detector. This procedure is implemented in the utilized test receiver by the incorporated EMI firmware. The test receiver used also meets the requirement as mentioned in section 15.35 "measurement detector functions and bandwidths". The test receiver employs a CISPR quasi-peak detector function with a bandwidth of 9-10 kHz.

6.2 Measurement equipment

| Instrumentation | Brand | Model | Cal interval |
|-----------------|------------------|--------|-----------------|
| EMI receiver | R&S | ESCI | 2014-12-27 |
| | | | - 2015-12-27 |
| LISN | R&S | ENV216 | 2014-12-27 |
| | | | - 2015-12-27 |
| Shielded room | Feite Electronic | -- | 2014-12-27 |
| | | | - 2015-12-27 |

6.3 Measurement data

Limits

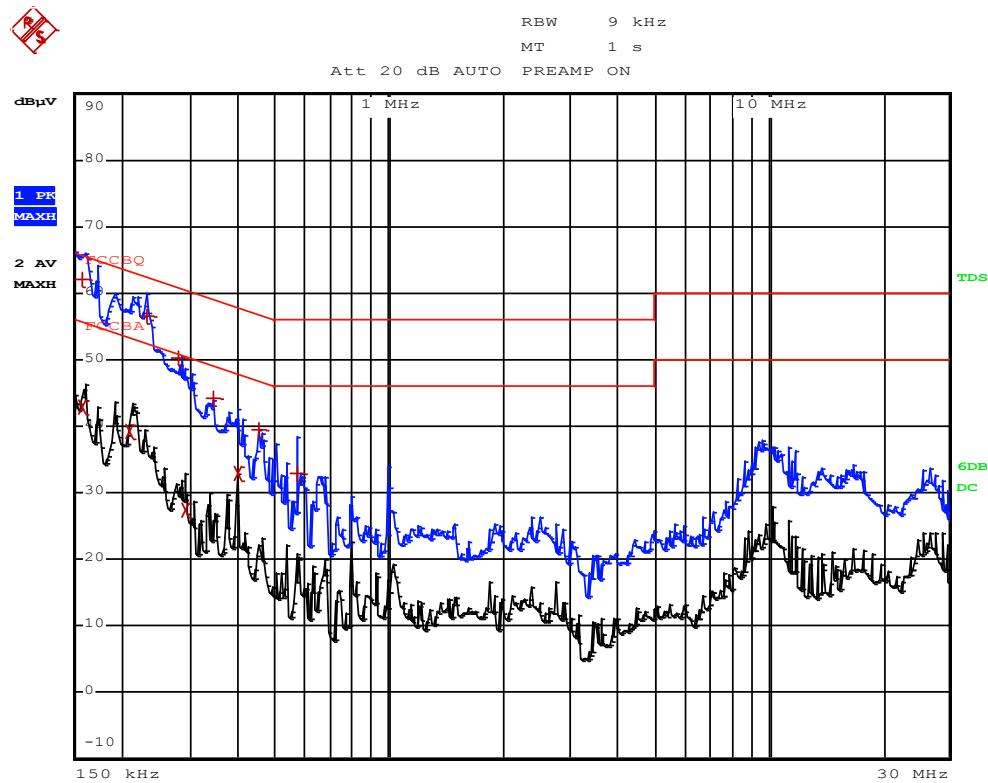
| Standard | | 47CFR part 15 subpart B clause 15.107 (a) (Class B) | |
|-----------------|--|---|-------------------|
| Frequency [MHz] | | Limit QP [dB(µV)] | Limit AV [dB(µV)] |
| 0,15 – 0,50 | | 66 to 56 *) | 56 to 46 *) |
| 0,50 – 5 | | 56 | 46 |
| 5 – 30 | | 60 | 50 |

*) Limits decreasing linearly with the logarithm of the frequency

| | |
|-------------|---|
| Port | AC mains |
| Test method | LISN |
| Test-mode | Connected to the computer and transmitting data by USB port |

Results

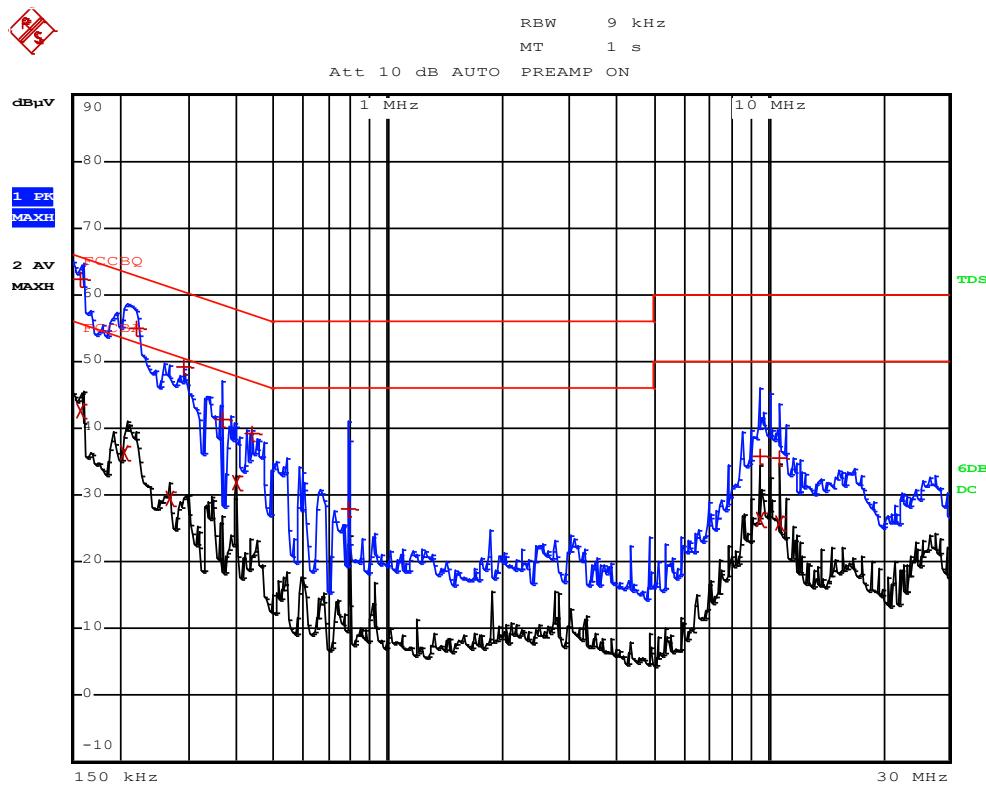
Live



| EDIT PEAK LIST (Final Measurement Results) | | | | |
|--|-----------|------------|-------|----------|
| Trace1: | FCCBΩ | | | |
| Trace2: | FCCBA | | | |
| Trace3: | --- | | | |
| TRACE | FREQUENCY | LEVEL dBµV | DELTA | LIMIT dB |
| 1 Quasi Peak | 158 kHz | 62.11 | - | -3.45 |
| 2 Average | 158 kHz | 42.83 | - | -12.73 |
| 2 Average | 210 kHz | 39.29 | - | -13.91 |
| 1 Quasi Peak | 230 kHz | 56.50 | - | -5.94 |
| 1 Quasi Peak | 282 kHz | 50.26 | - | -10.49 |
| 2 Average | 290 kHz | 27.51 | - | -23.00 |
| 1 Quasi Peak | 342 kHz | 44.29 | - | -14.86 |
| 2 Average | 398 kHz | 32.86 | - | -15.03 |
| 1 Quasi Peak | 454 kHz | 39.48 | - | -17.31 |
| 1 Quasi Peak | 570 kHz | 32.84 | - | -23.15 |

No other significant emissions were measured at the frequency range of interest employing both the QP and AV detectors.

Neutral



| EDIT PEAK LIST (Final Measurement Results) | | | | |
|--|-----------|------------|--------|----------|
| Trace1: | FCCBΩ | | | |
| Trace2: | FCCBA | | | |
| Trace3: | --- | | | |
| TRACE | FREQUENCY | LEVEL dBµV | DELTA | LIMIT dB |
| 1 Quasi Peak | 158 kHz | 62.40 | -3.16 | |
| 1 Quasi Peak | 218 kHz | 55.05 | -7.84 | |
| 1 Quasi Peak | 290 kHz | 49.21 | -11.30 | |
| 2 Average | 158 kHz | 42.60 | -12.96 | |
| 2 Average | 398 kHz | 31.96 | -15.92 | |
| 2 Average | 206 kHz | 36.21 | -17.15 | |
| 1 Quasi Peak | 366 kHz | 41.31 | -17.27 | |
| 1 Quasi Peak | 438 kHz | 39.18 | -17.91 | |
| 2 Average | 266 kHz | 29.54 | -21.69 | |

No other significant emissions were measured at the frequency range of interest employing both the QP and AV detectors.

Refer to chapter 8 for the test set-up.

Conclusion:

PASS

7 RADIATED EMISSIONS

7.1 Measurement procedure

In accordance with section 15.109(a) the field strength levels of radiated emissions from this digital device class B at a measurement distance of 3 meters were determined.

The highest levels measured with horizontal or vertical polarization are mentioned on the next page.

7.2 Measurement equipment

| Instrumentation | Brand | Model | Cal interval |
|-------------------------|--------------|----------|-------------------------------|
| EMI receiver | R&S | ESCI | 2014-12-27 |
| | | | - 2015-12-27 |
| Antenna (30MHz-3GHz) | SCHWARZBECK | VULB9163 | 2014-12-27 - 2015-12-27 |
| Chamber | ETS.LINDGREN | 9*6*6 | 2014-12-27 - 2017-12-27 |

7.3 Measurement data

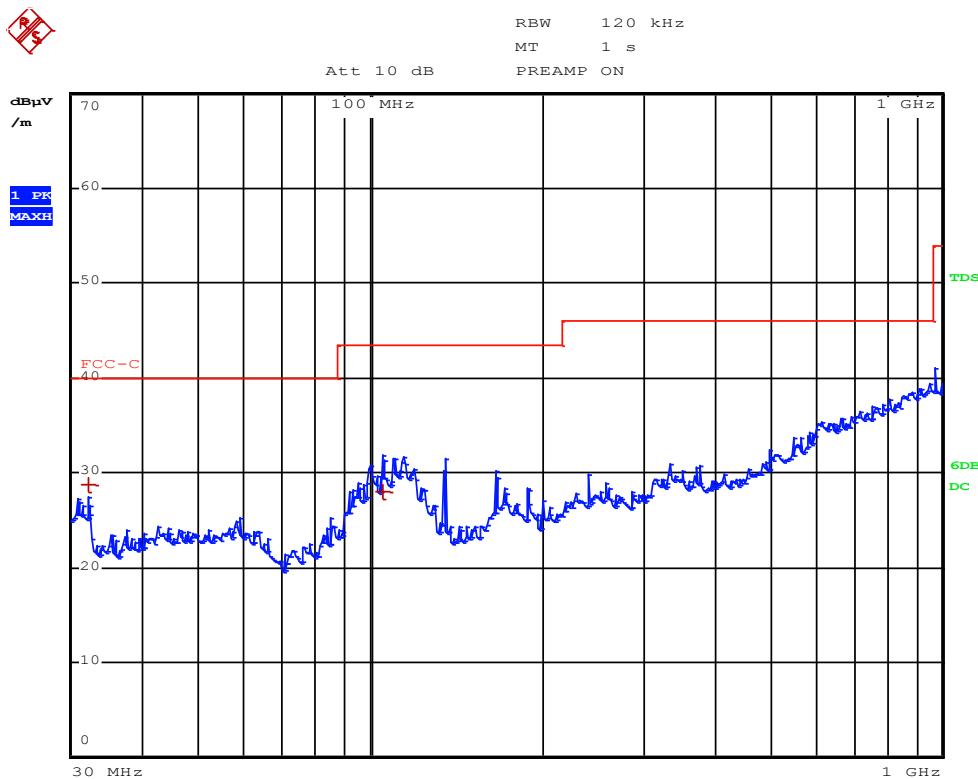
Limits

| | | |
|--------------------|---|------------------|
| Standard | 47CFR part 15 subpart B clause 15.109(a) (Class B) | |
| Measuring distance | 3 meters | |
| Frequency [MHz] | Limits | |
| | QP [dB(μ V/m)] | microvolts/meter |
| 30 – 88 | 40,0 | 100 |
| 88 – 216 | 43,5 | 150 |
| 216 – 960 | 46,0 | 200 |
| > 960 | 54,0 | 500 |

| | |
|-------------|---|
| Port | Enclosure with cabling |
| Test set-up | 3 m Semi-Anechoic chamber |
| Test mode | Connected to the computer and transmitting data by USB port |

Results for below 1GHz

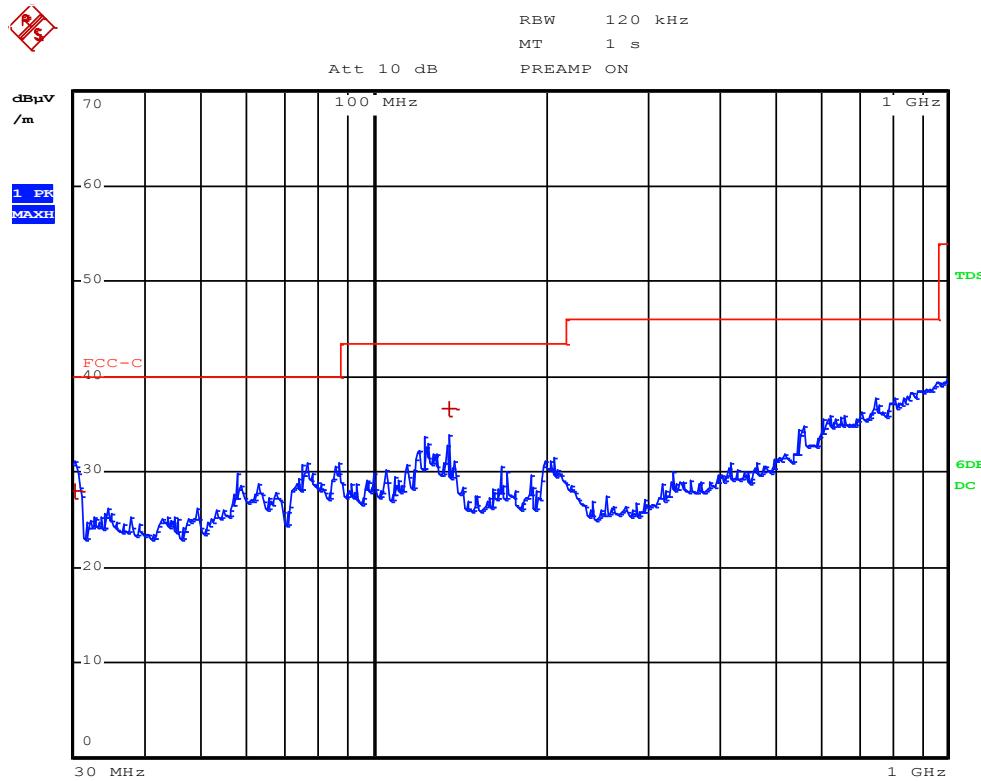
Horizontal



| Frequency [MHz] | QP [dB(μ V/m)] 3m distance | |
|-----------------|---------------------------------|-------|
| | Level | Limit |
| 32,2 | 28,8 | 40,0 |
| 47,80 | 23,4 | 40,0 |
| 105,04 | 28,1 | 43,5 |
| 146,78 | 27,3 | 43,5 |
| 612,34 | 29,8 | 46,0 |
| 970,52 | 39,4 | 54,0 |

No other significant emissions were recorded employing the QP detector at the frequency range of interest.

Vertical

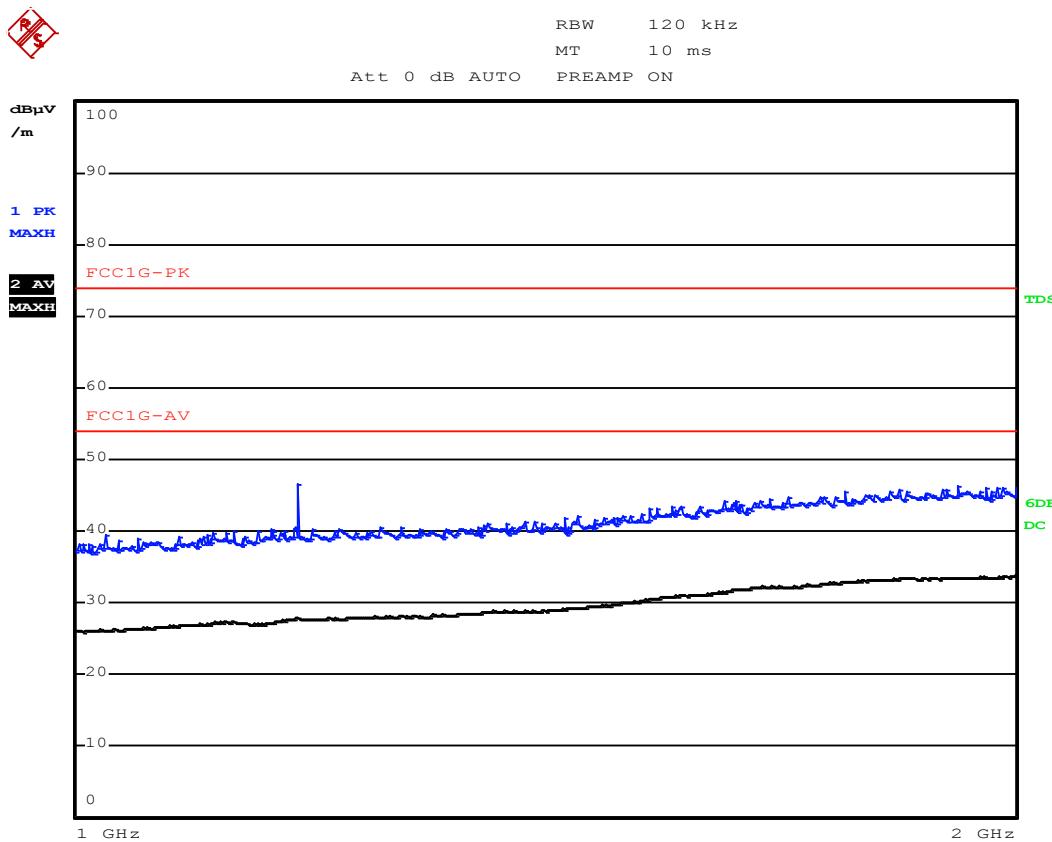


| Frequency [MHz] | QP [dB(μV/m)] 3m distance | |
|--------------------|---------------------------|-------|
| | Level | Limit |
| 30,24 | 27,9 | 40,0 |
| 58,90 | 25,5 | 40,0 |
| 77,43 | 26,3 | 40,0 |
| 86,75 | 26,0 | 40,0 |
| 135,00 | 36,6 | 43,5 |
| 980,01 | 37,3 | 54,0 |

No other significant emissions were recorded employing the QP detector at the frequency range of interest.

Results for 1-2 GHz

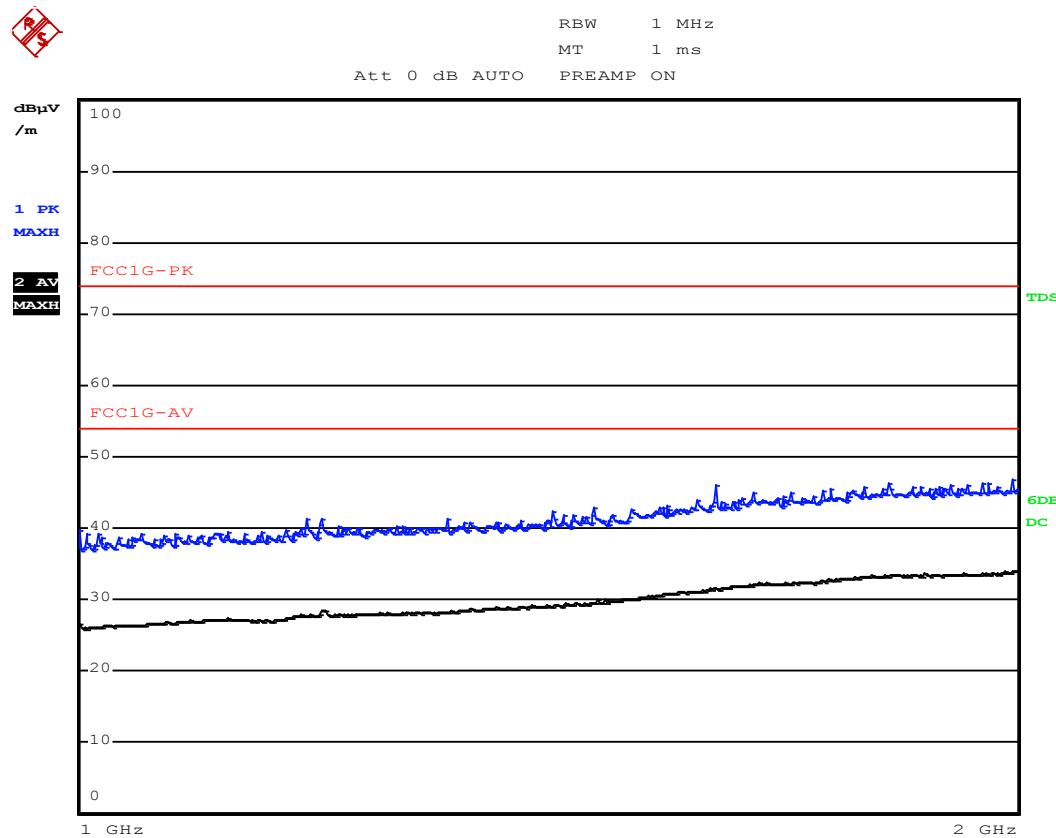
Horizontal



| Frequency [GHz] | PK [dB(μ V/m)] 3m distance | | AV [dB(μ V/m)] 3m distance | |
|-----------------|---------------------------------|-------|---------------------------------|-------|
| | Level | Level | Limit | Limit |
| 1,15 | 37,7 | 74,0 | 25,5 | 54,0 |
| 1,30 | 45,5 | 74,0 | 27,6 | 54,0 |
| 1,45 | 40,0 | 74,0 | 28,9 | 54,0 |
| 1,60 | 42,2 | 74,0 | 30,2 | 54,0 |
| 1,75 | 43,4 | 74,0 | 32,3 | 54,0 |
| 1,90 | 45,0 | 74,0 | 34,2 | 54,0 |

No other significant emissions were recorded employing the both PK and AV detector at the frequency range of interest.

Vertical



| Frequency [GHz] | PK [dB(μ V/m)] 3m distance | | AV [dB(μ V/m)] 3m distance | |
|-----------------|---------------------------------|-------------|---------------------------------|-------|
| | Level | Limit Level | Level | Limit |
| 1,15 | 37,7 | 74,0 | 26,7 | 54,0 |
| 1,30 | 40,1 | 74,0 | 28,4 | 54,0 |
| 1,45 | 40,9 | 74,0 | 26,8 | 54,0 |
| 1,60 | 42,3 | 74,0 | 3,13 | 54,0 |
| 1,75 | 43,4 | 74,0 | 32,3 | 54,0 |
| 1,90 | 45,1 | 74,0 | 33,6 | 54,0 |

No other significant emissions were recorded employing the both PK and AV detector at the frequency range of interest.

Refer to chapter 8 for the test set-up.

Conclusion:

PASS

8

TEST SETUP AND ARRANGEMENT

The photograph shows the tested device.

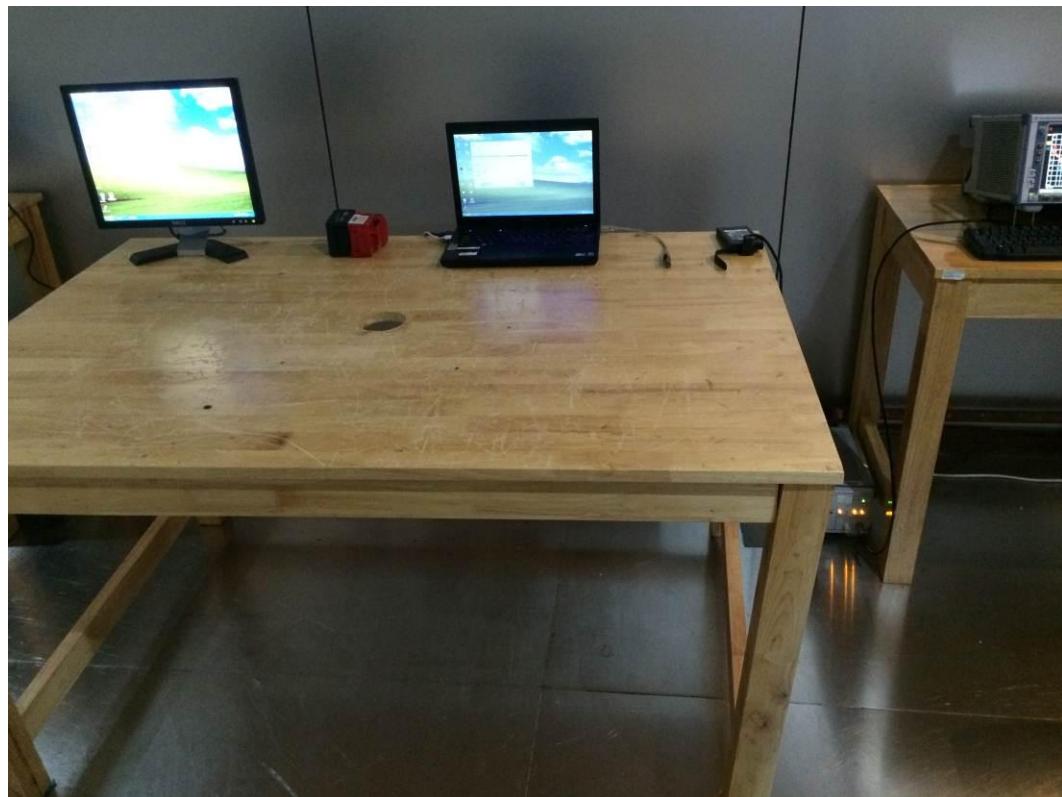


Figure 5 Conducted Emission test setup



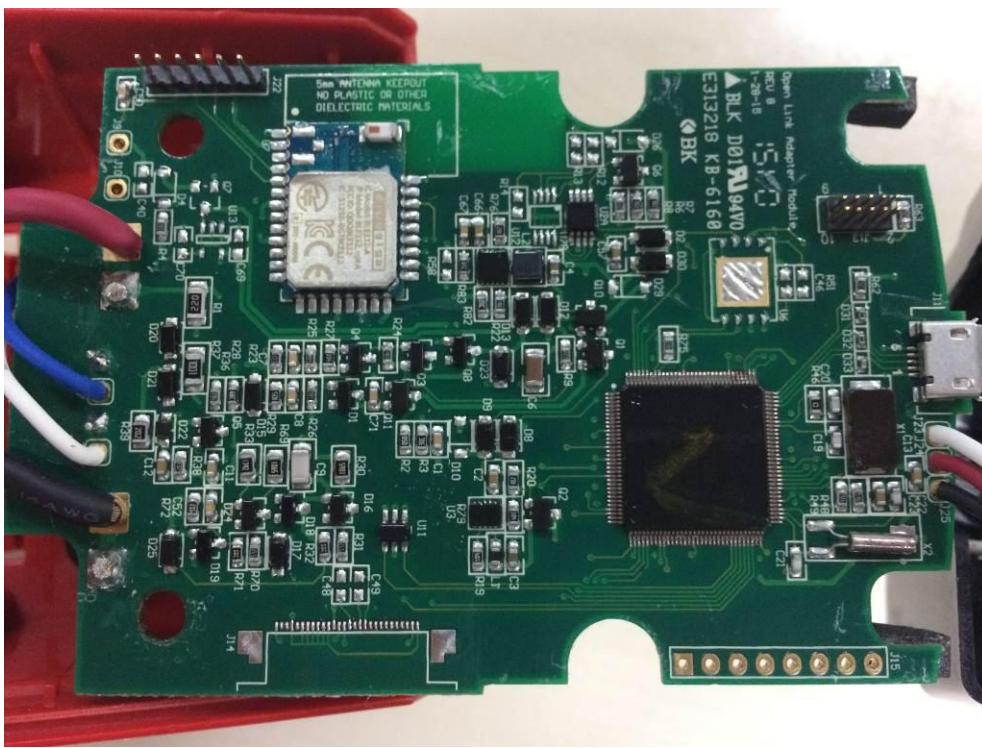
Figure 6 Radiated Emission test setup below 1 GHz



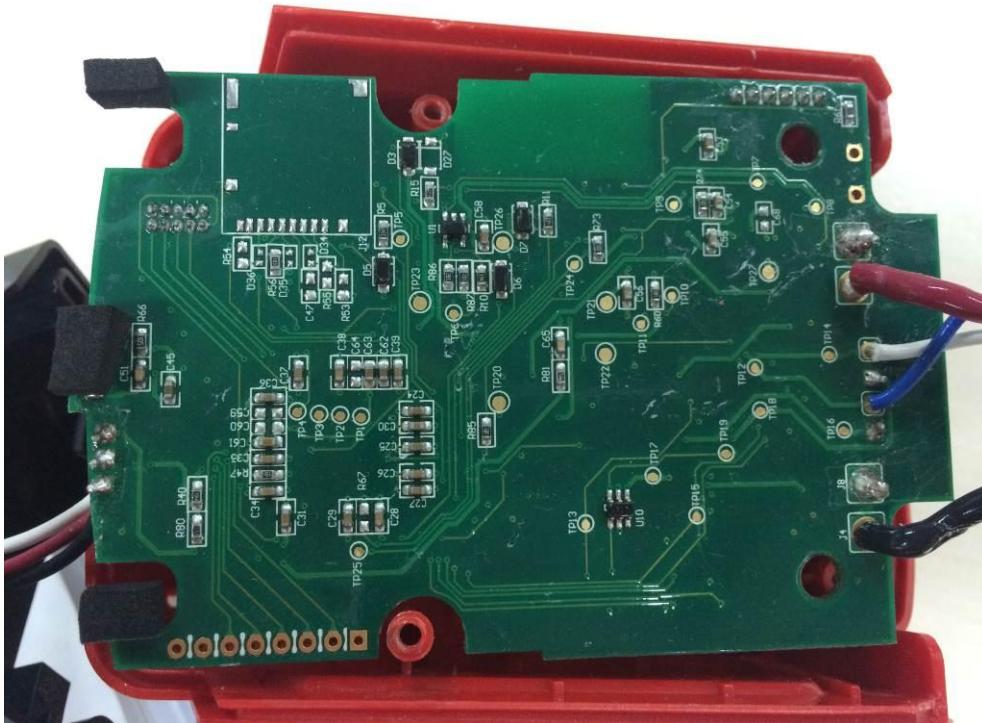
Figure 7 Radiated Emission test setup above 1 GHz

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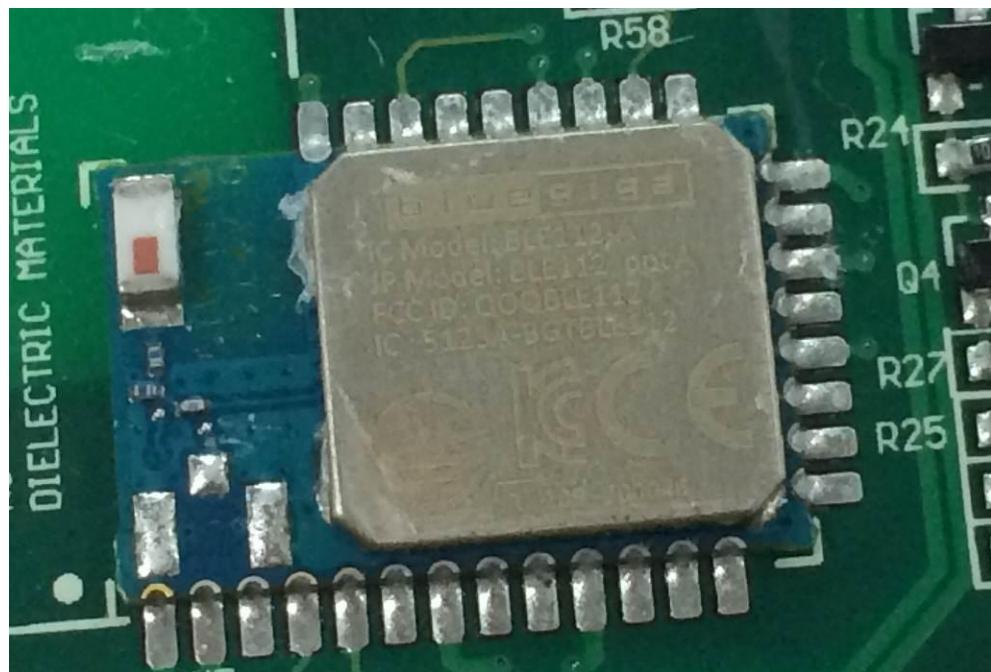
PRODUCT INTERNAL VIEW



Main PCB



Main PCB



Blue tooth module



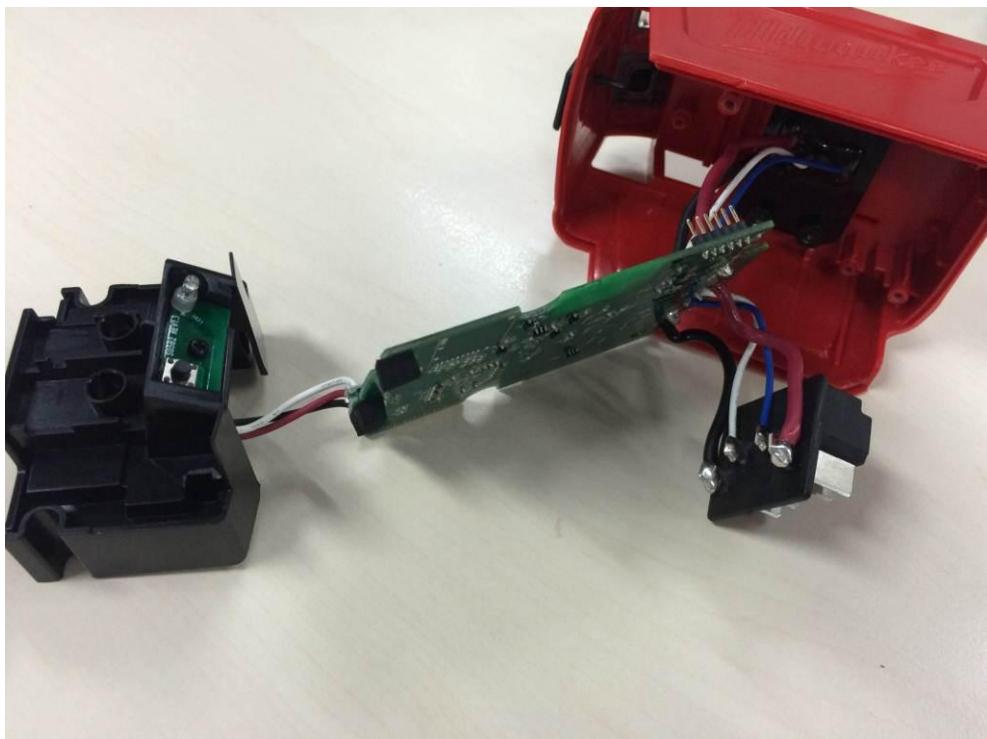
MCU: TM4C129 and crystal oscillator



Button PCB



Button PCB



Wiring