


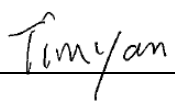
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**FCC Test report for M18 One Key adaptor
Model 2700-20**

Guangzhou, date of issue: 2015-05-21

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

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Pages : 29 pages	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.
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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: QQQBLE112. 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

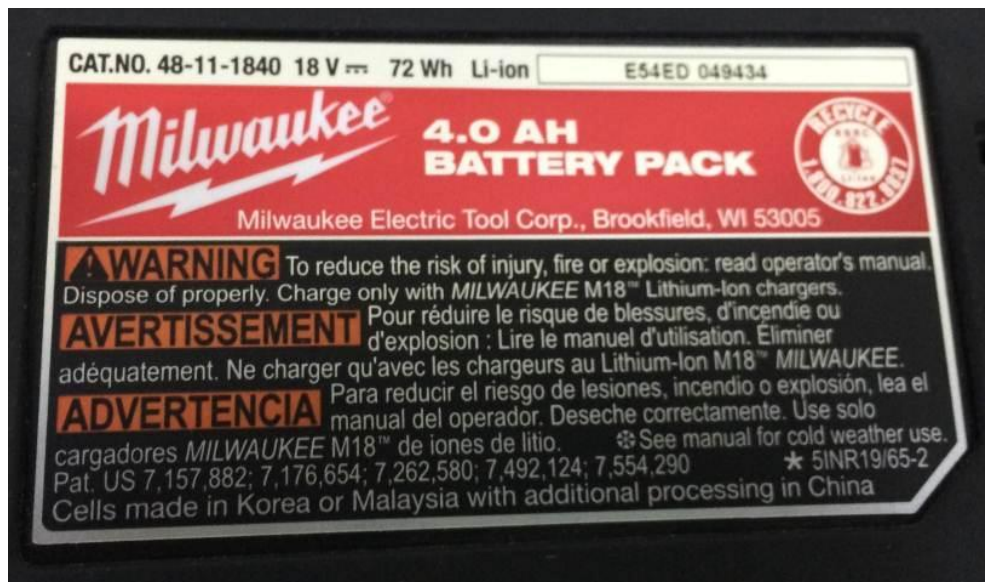


Figure 3 rechargeable DC battery



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

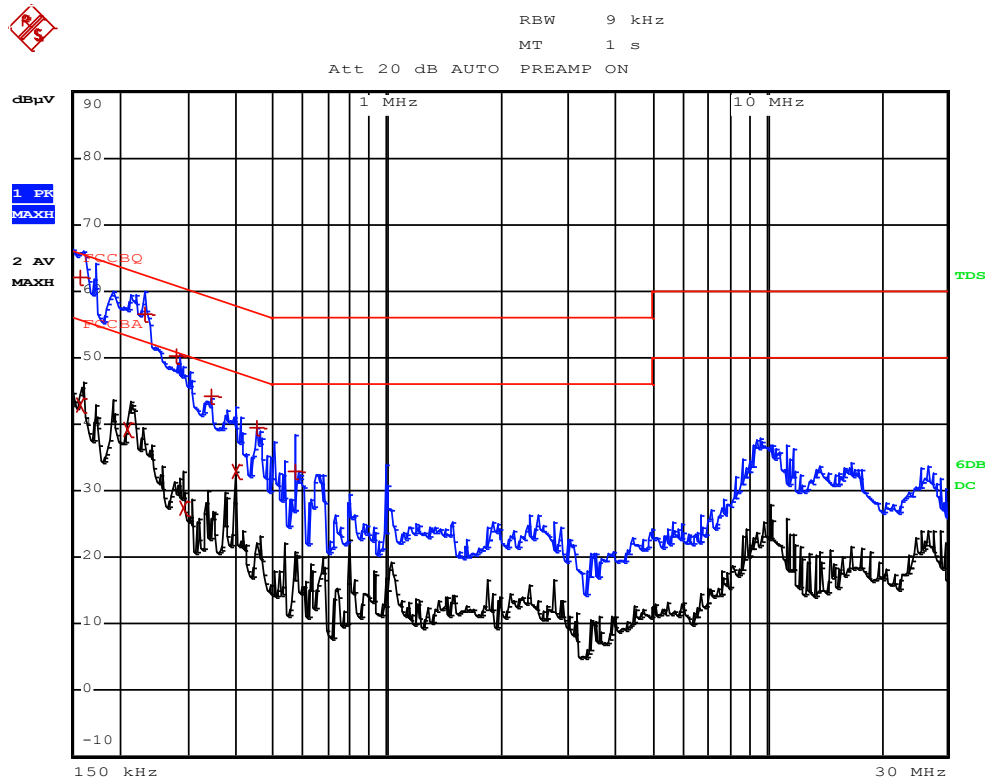
Standard	47CFR part 15 subpart B clause 15.107 (a) (Class B)	
Frequency [MHz]	Limit QP [dB(μV)]	Limit AV [dB(μV)]
0,15 – 0,50	66 to 56 *)	56 to 46 *)
0,50 – 5	56	46
5 – 30	60	50

*) 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

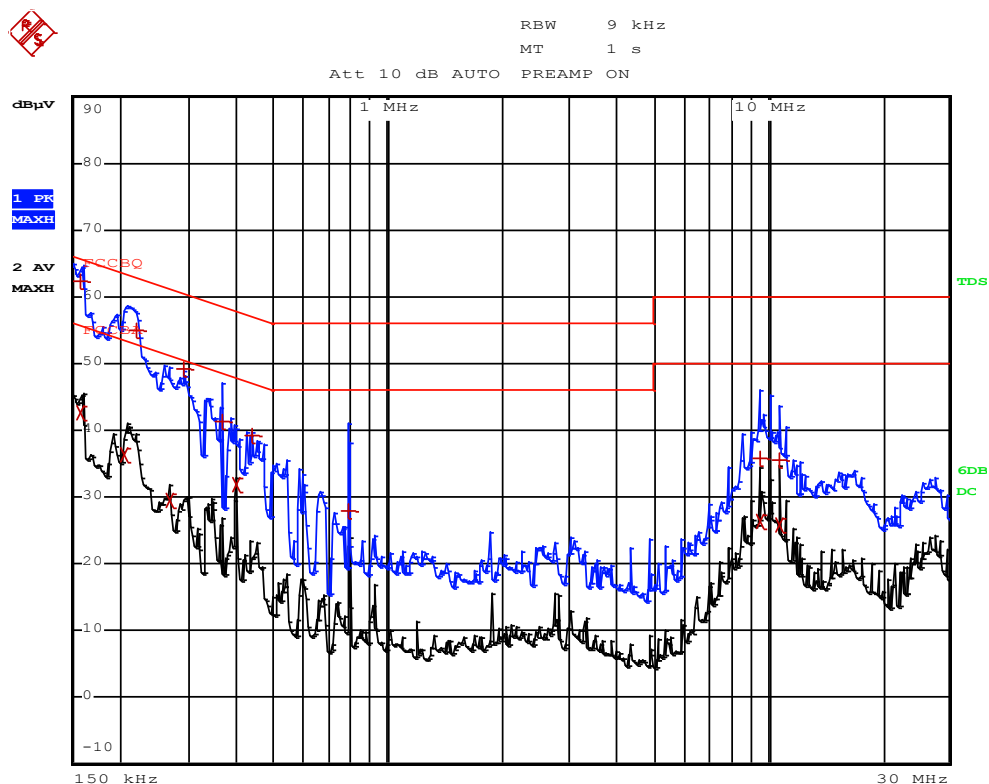
Live



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCCBQ		
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:	FCCBQ		
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

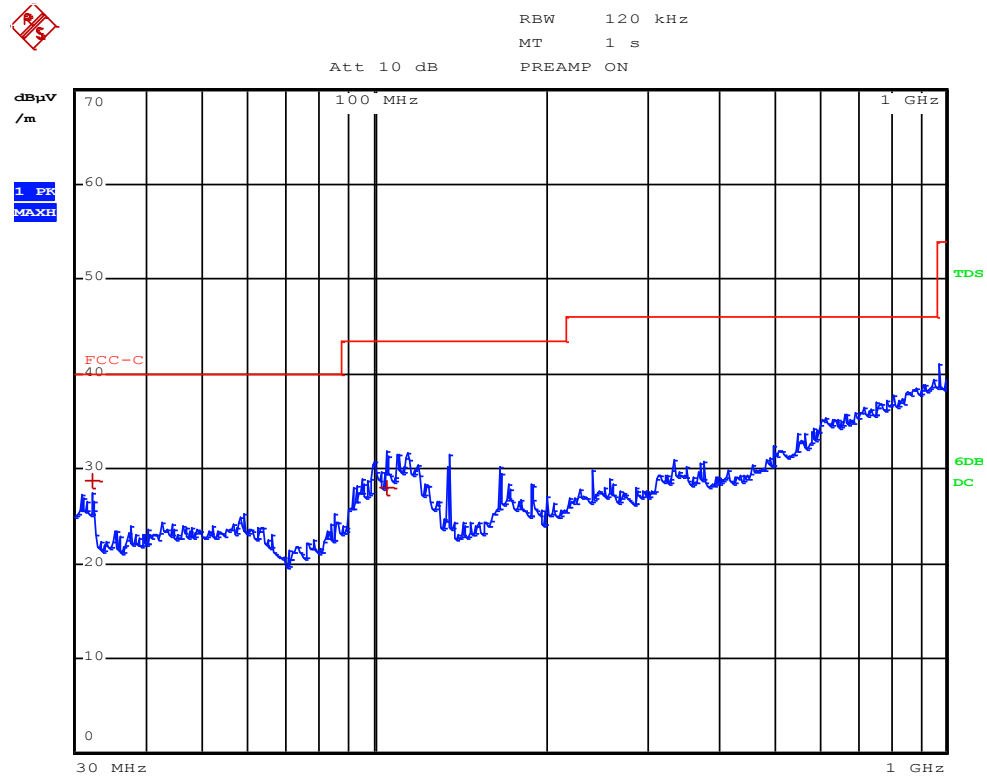
Limits

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

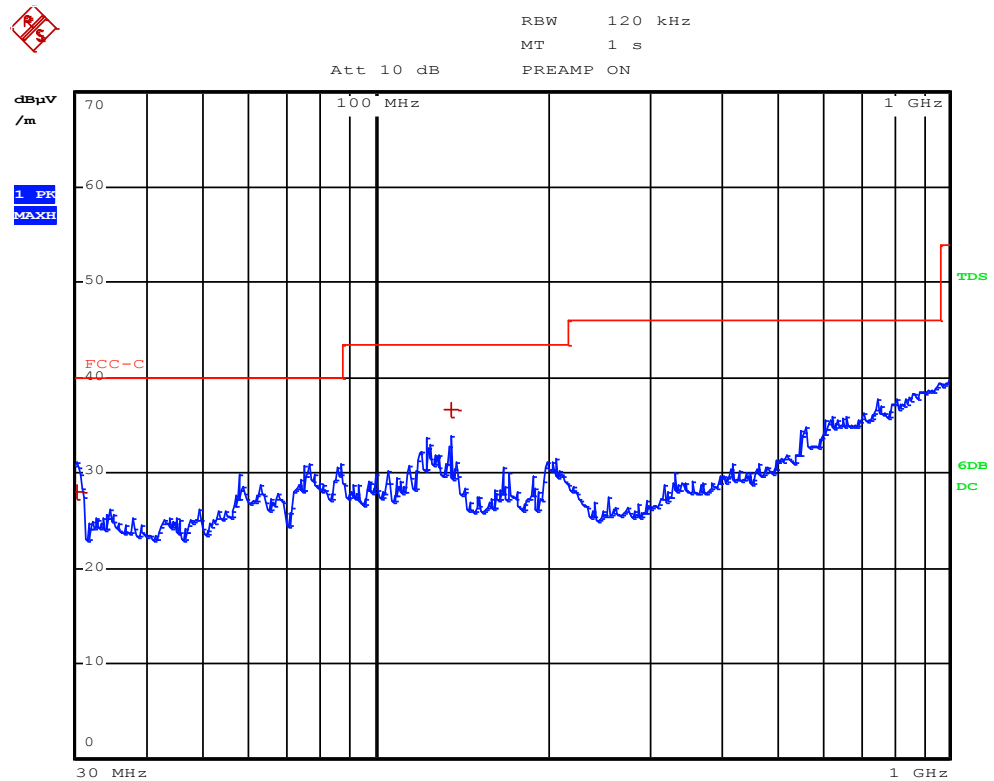
Horizontal



Frequency [MHz]	QP [dB(μV/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

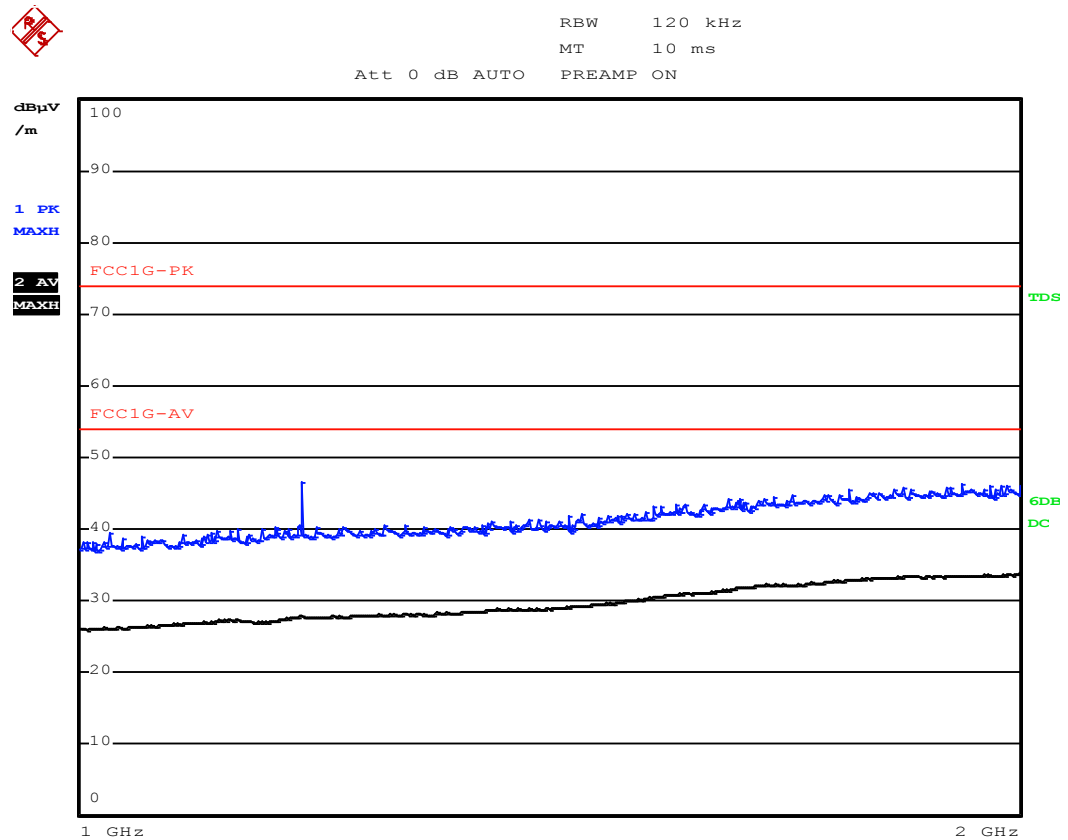


Frequency [MHz]	QP [dB(μV/m)] 3m distance	
	Level	Limit
30,24	27,9	40,0
58,90	25,5	40,0
77,43	26,3	40,0
86,75	26,0	40,0
135,00	36,6	43,5
980,01	37,3	54,0

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

Results for 1-2 GHz

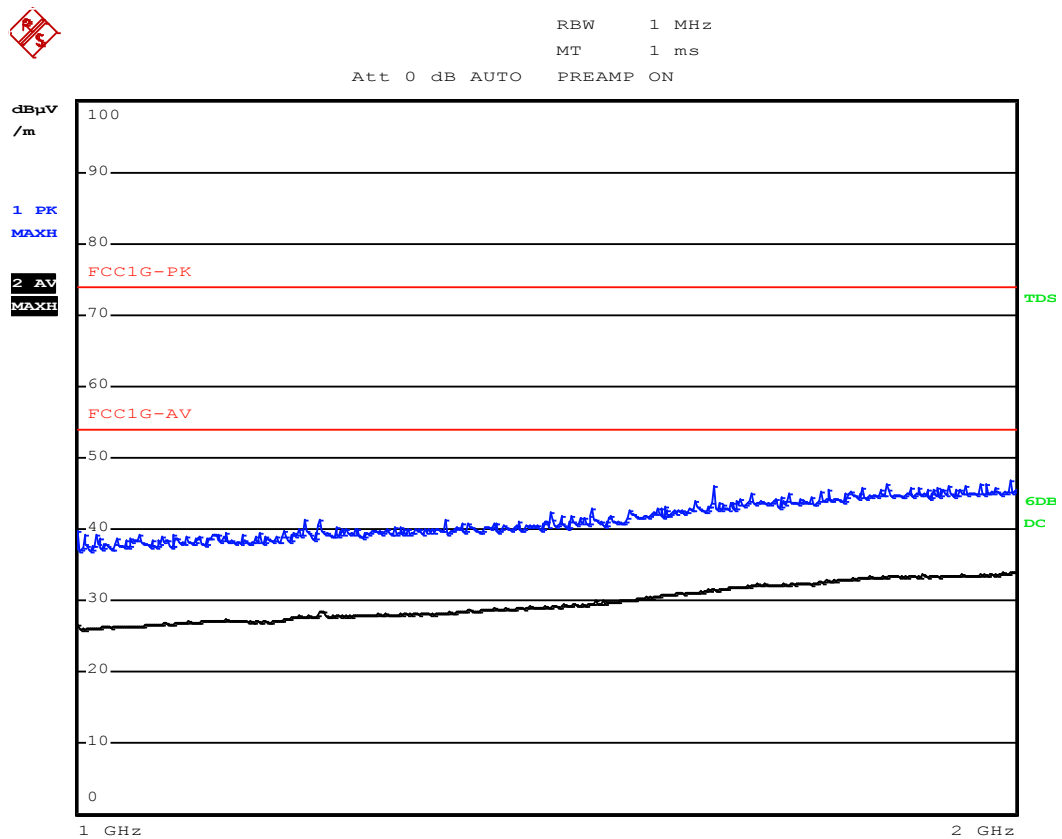
Horizontal



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(μV/m)] 3m distance		AV [dB(μV/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

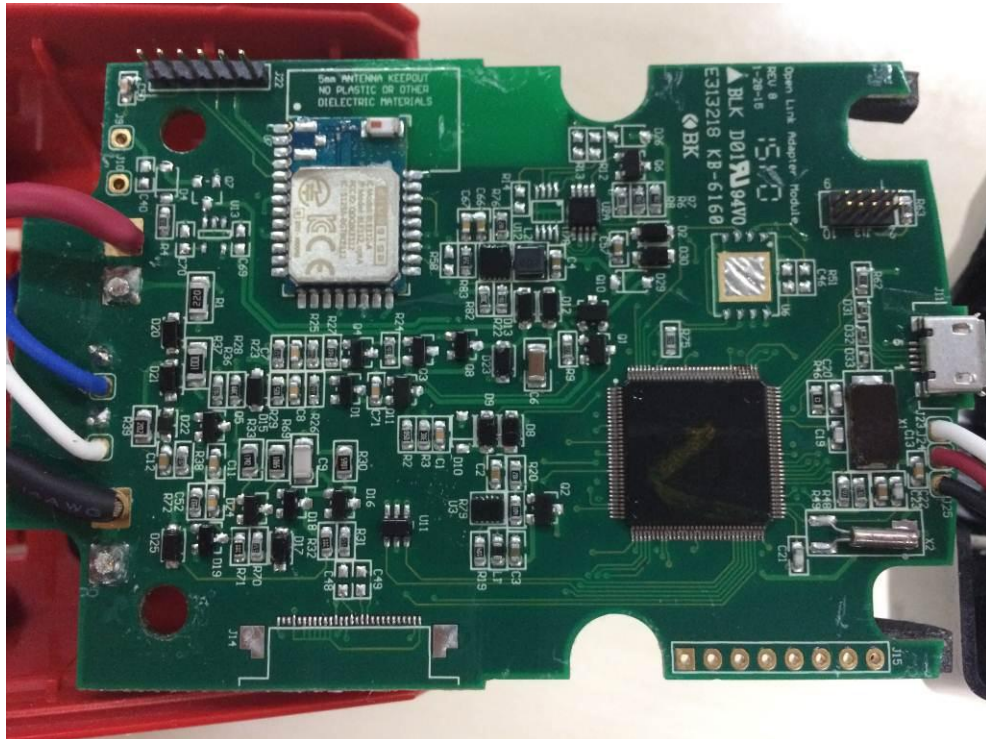


Figure 6 Radiated Emission test setup below 1 GHz

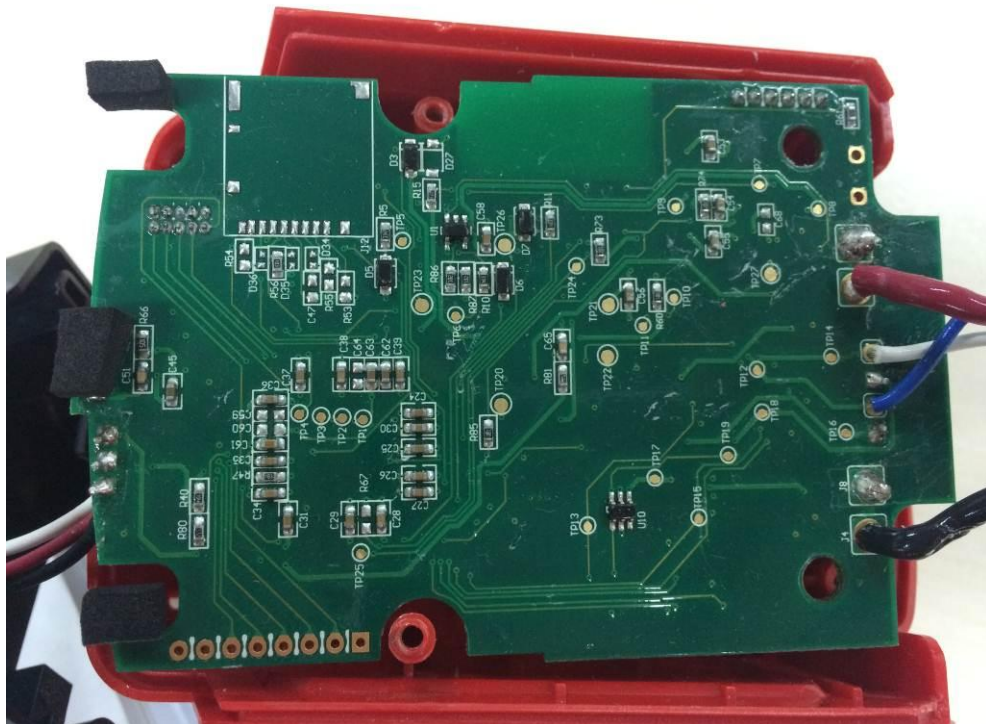


Figure 7 Radiated Emission test setup above 1 GHz

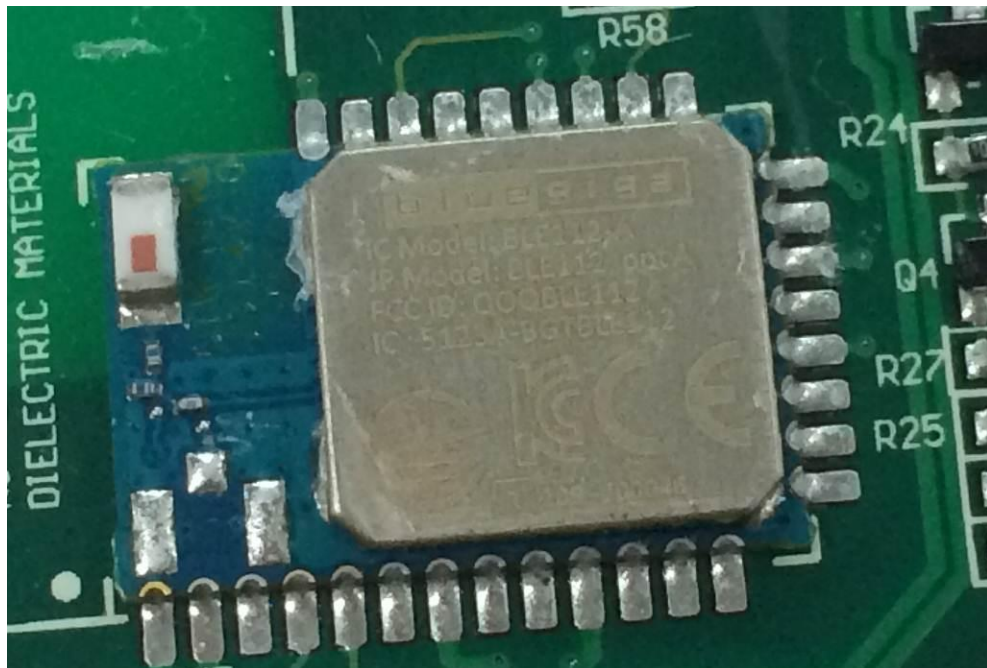
9 PRODUCT INTERNAL VIEW



Main PCB



Main PCB



Blue tooth module



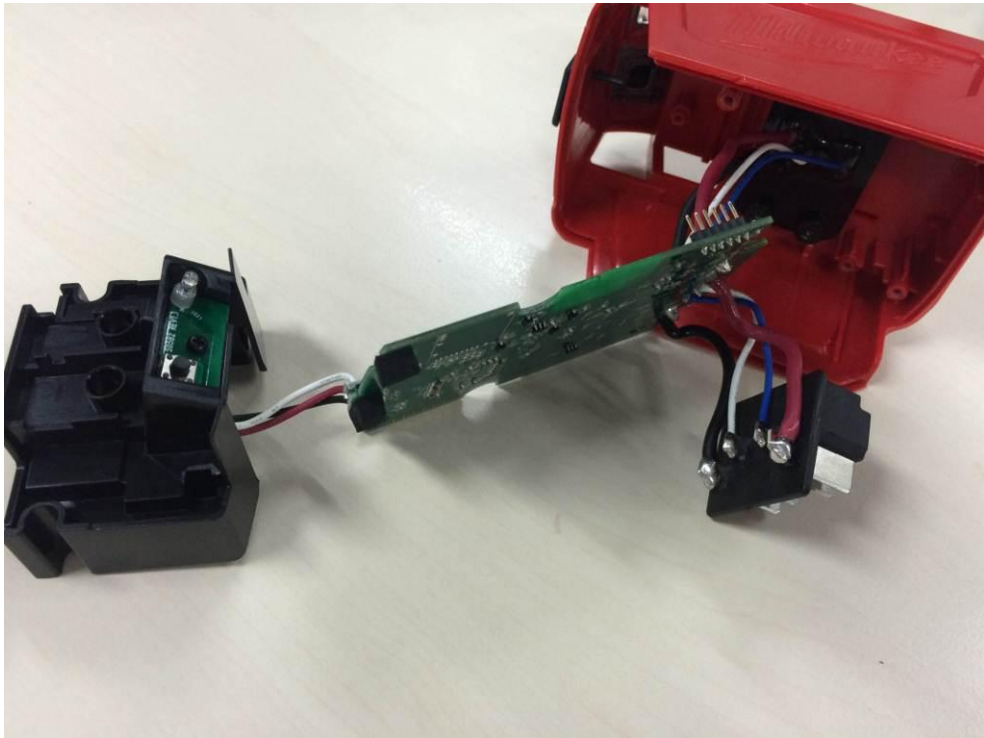
MCU: TM4C129 and crystal oscillator



Button PCB



Button PCB



Wiring