

FCC - TEST REPORT

Report Number	:	60.790.16.039.01R01	Date of Issue	:	August 26, 2016		
Model	:	mcMod120					
Product Type	:	Wireless Module					
Applicant	:	MC-THINGS INC					
Address	:	P.O. Box 687 Stn Main, Cochrane A.B. Canada					
Production Facility	:	MC-THINGS INC					
Address	:	P.O. Box 687 Stn Main,	Cochrane A.B. Cana	ada			
Test Result	:	■Positive	□Negative				
Total pages including	:	29					

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2 Description of Equipment Under Test

Description of the Equipment Under Test

Product: Wireless Module

Model no.: mcMod120

FCC ID: 2AGBO-MCMOD120

Rating: 3.0VDC (1 x 3.0VDC size "CR2032" batteries)

Frequency: 2402-2480MHz

Antenna gain: +3.3 dBi

Modulation: GFSK

Report Number: 60.790.16.039.01R01



3 Summary of Test Standards

Test Standards

FCC Part 15 Subpart C 10-1-14 Edition

Federal Communications Commission, PART 15 — Radio Frequency Devices,

Subpart C — Unintentional Radiators



4 Details about the Test Laboratory

Site 1

Company name: TÜV SÜD Hong Kong Ltd.

3/F, West Wing, Lakeside 2, 10 Science Park West Avenue, Science Park, Shatin, Hong Kong

Site 2

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

Building 12&13 Zhiheng Wisdomland Business Park,

Nantou Checkpoint Road 2, Shenzhen 518052, P.R.China FCC Registration Number: 502708

Emission Tests					
Test Item	Test Site				
FCC Part 15 Subpart C					
FCC Title 47 Part 15.249 & 15.209 Radiated Emission	Site 2				
FCC Title 47 Part 15.249 & 15.207 Conduct Emission	NIL				
FCC Title 47 Part 15.215 20dB & 99% Bandwidth	Site 2				
FCC Title 47 Part 15.249 Bandedge Emission	Site 2				



4.1 Test Equipment Site List

Site 2:

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	17-Aug-17
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	17-Aug-17
Horn Antenna	Rohde & Schwarz	HF907	102294	17-Aug-17
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	17-Aug-17
3m Semi-anechoic chamber	TDK	9X6X6		29-May-19
Signal Generator	Rohde & Schwarz	SMB100A	108272	17-Aug-17
Signal Analyzer	Rohde & Schwarz	FSV40	101030	17-Aug-17
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	17-Aug-17
RF Switch Module	Rohde & Schwarz	OSP120/OSP- B157	101226/100851	17-Aug-17



4.2 Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty					
Items Extended Uncertainty					
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.54dB				
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;				
Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;				
Uncertainty for Conducted RF test	2.04dB				

Report Number: 60.790.16.039.01R01



5 Summary of Test Results

Emission Tests						
FCC Part 15 Subpart C						
Test Condition	Pages	Te	est Result			
		Pass	Fail	N/A		
FCC Title 47 Part 15.249 & 15.209 Radiated Emission	10-15	\boxtimes				
FCC Title 47 Part 15.249 & 15.207 Conduct Emission	NIL					
FCC Title 47 Part 15.215 20dB & 99% Bandwidth	16-21					
FCC Title 47 Part 15.249 Bandedge Emission	22-23	\boxtimes				



6 General Remarks

Remarks

NIL

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: May 31, 2016

Testing Start Date: June 1, 2016

Testing End Date: August 1, 2016

- TÜV SÜD HONG KONG LTD. -

Reviewed by:

TSENG Chi Kit EMC Project Engineer NONG Prepared by:

CHAN Kwong Ngai EMC Test Engineer



7 Emission Test Results

7.1 Radiated Emission

EUT: mcMod120

Op Condition: Operated, TX Mode (2402MHz)

Test Specifica

Comment:

	mcMod120	Test Result ⊠ Passed
	Operated, TX Mode (2402MHz)	
ation:	FCC15.249 & 15.209, Antenna: Horizontal	☐ Not Passed
	3.0VDC	
	9kHz to 25GHz	

Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBμV/m	dB	
45.255	21.80	40	-18.20	Quasi Peak
58.561	20.60	40	-19.40	Quasi Peak
275.248	18.49	46	-27.51	Quasi Peak
888.503	27.28	46	-18.72	Quasi Peak
1255.065	28.98	74	-45.02	Peak
1255.065	18.45	54	-35.55	Average
2013.600	29.06	74	-44.94	Peak
2013.600	20.54	54	-33.46	Average
2402.000	93.91	114	-20.09	Peak
2402.000	82.68	94	-11.32	Average
4804.000	46.54	74	-27.46	Peak
4804.000	35.88	54	-18.12	Average
7206.000	44.35	74	-29.65	Peak
7206.000	34.01	54	-19.99	Average
9608.000	51.51	74	-22.49	Peak
9608.000	40.78	54	-13.22	Average



Test Result

Radiated Emission

EUT: mcMod120

Operated TX Mode (2402MHz) Op Condition:

Test Specifica

Comment:

	momoure	rootrioodit
า:	Operated, TX Mode (2402MHz)	□ Passed
ation:	FCC15.249 & 15.209, Antenna: Vertical	☐ Not Passed
	3.0VDC	
	9kHz to 25GHz	

	Frequency	Result	Limit	Margin	Detector
_	MHz	dBµV/m	dBµV/m	dB	
	45.255	22.41	40	-17.59	Quasi Peak
	58.561	21.15	40	-18.85	Quasi Peak
	275.248	19.84	46	-26.16	Quasi Peak
	888.503	29.52	46	-16.48	Quasi Peak
	1255.065	28.85	74	-45.15	Peak
	1255.065	19.21	54	-34.79	Average
	2013.600	28.64	74	-45.36	Peak
	2013.600	19.91	54	-34.09	Average
	2402.000	84.15	114	-29.85	Peak
	2402.000	73.39	94	-20.61	Average
	4804.000	40.25	74	-33.75	Peak
	4804.000	30.18	54	-23.82	Average
	7206.000	41.63	74	-32.37	Peak
	7206.000	30.95	54	-23.05	Average
	9608.000	51.06	74	-22.94	Peak
	9608.000	41.55	54	-12.45	Average



Test Result

□ Passed

Radiated Emission

EUT: mcMod120

Op Condition: Operated, TX Mode (2440MHz)

Test Specification: FCC15.249 & 15.209. Antenna: Horizontal

Comment:

	_				
MHz		dBμV/m	dBμV/m	dB	
Frequer	псу	Result	Limit	Margin	Detector
	3.0V 9kHz	DC z to 25GHz			
ication:	FĊC	15.249 & 15.20	9, Antenna: H	Iorizontal	Not Passed

	Frequency	Result	Limit	Margin	Detector
_	MHz	dBμV/m	dBµV/m	dB	
	45.168	20.15	40	-19.85	Quasi Peak
	58.512	19.65	40	-20.35	Quasi Peak
	275.985	20.07	46	-25.93	Quasi Peak
	890.210	28.15	46	-17.85	Quasi Peak
	1230.550	30.68	74	-43.32	Peak
	1230.550	20.52	54	-33.48	Average
	1764.530	28.85	74	-45.15	Peak
	1764.530	19.48	54	-34.52	Average
	2440.000	92.52	114	-21.48	Peak
	2440.000	81.85	94	-12.15	Average
	4884.000	44.14	74	-29.86	Peak
	4884.000	33.85	54	-20.15	Average
	7320.000	46.66	74	-27.34	Peak
	7320.000	37.55	54	-16.45	Average
	9760.000	50.94	74	-23.06	Peak
	9760.000	41.68	54	-12.32	Average



Test Result

Radiated Emission

EUT: mcMod120

Operated TX Mode (2440MHz) Op Condition:

Test Specifica

Comment:

ation:	FCC15.249 & 15.209, Antenna: Vertical	☐ Not Passed
	3.0VDC 9kHz to 25GHz	

Frequency Result		Limit	Margin	Detector	
	MHz	dBμV/m	dBµV/m	dB	
	45.168	20.88	40	-19.12	Quasi Peak
	58.512	19.92	40	-20.08	Quasi Peak
	275.985	21.15	46	-24.85	Quasi Peak
	890.210	29.40	46	-16.60	Quasi Peak
	1230.550	28.97	74	-45.03	Peak
	1230.550	18.42	54	-35.58	Average
	1764.530	27.68	74	-46.32	Peak
	1764.530	16.71	54	-37.29	Average
	2440.000	82.45	114	-31.55	Peak
	2440.000	71.56	94	-22.44	Average
	4884.000	40.11	74	-33.89	Peak
	4884.000	31.58	54	-22.42	Average
	7320.000	40.22	74	-33.78	Peak
	7320.000	20.37	54	-33.63	Average
	9760.000	50.81	74	-23.19	Peak
	9760.000	40.93	54	-13.07	Average



China

Radiated Emission

EUT: mcMod120

Op Condition: Operated, TX Mode (2480MHz)

Test Specification: FCC15.249 & 15.209, Antenna: Horizontal

Comment: 3.0VDC

Remark: 9kHz to 25GHz

	Test Result
	⊠ Passed
	Not Passed
•	

Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBµV/m	dB	
45.150	21.68	40	-18.32	Quasi Peak
60.250	22.43	40	-17.57	Quasi Peak
280.445	20.58	46	-19.42	Quasi Peak
895.885	27.40	46	-18.60	Quasi Peak
1258.600	29.61	74	-44.39	Peak
1258.600	20.14	54	-33.86	Average
2351.805	32.47	74	-41.53	Peak
2351.805	21.75	54	-32.25	Average
2480.000	91.06	114	-22.94	Peak
2480.000	81.71	94	-12.29	Average
4960.000	41.72	74	-32.28	Peak
4960.000	31.30	54	-22.70	Average
7440.000	47.96	74	-26.04	Peak
7440.000	38.58	54	-15.42	Average
9920.000	43.95	74	-30.05	Peak
9920.000	35.10	54	-18.90	Average



Radiated Emission

EUT: mcMod120

Op Condition: Operated, TX Mode (2480MHz)

Test Specification: FCC15.249 & 15.209, Antenna: Vertical

Comment: 3.0VDC

Remark: 9kHz to 25GHz

Test Result			
□ Passed			
☐ Not Passed			

Frequency R		Result	Limit	Margin	Detector
	MHz	dBμV/m	dBµV/m	dB	
	45.150	20.18	40	-19.82	Quasi Peak
	60.250	21.94	40	-18.06	Quasi Peak
	280.445	19.92	46	-20.08	Quasi Peak
	895.885	26.88	46	-19.12	Quasi Peak
	1258.600	29.57	74	-44.43	Peak
	1258.600	20.15	54	-33.85	Average
	2351.805	28.26	74	-45.74	Peak
	2351.805	18.96	54	-35.04	Average
	2480.000	84.48	114	-29.52	Peak
	2480.000	73.55	94	-20.45	Average
	4960.000	41.52	74	-32.48	Peak
	4960.000	32.04	54	-21.96	Average
	7440.000	40.11	74	-33.89	Peak
	7440.000	28.60	54	-25.40	Average
	9920.000	50.50	74	-23.50	Peak
	9920.000	40.11	54	-13.89	Average

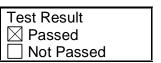


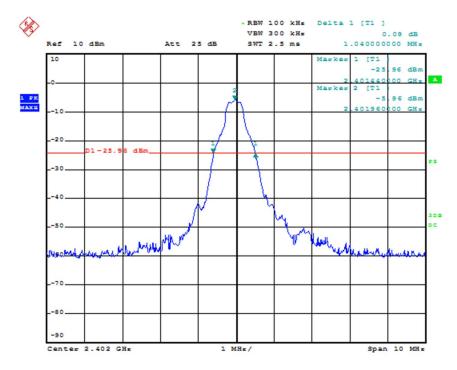
7.2 20dB & 99% Bandwidth

EUT: Coach Smart

Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.215, 20dB Bandwidth

Comment: 3.0VDC





20dB bandwidth 1040 kHz



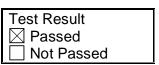
China

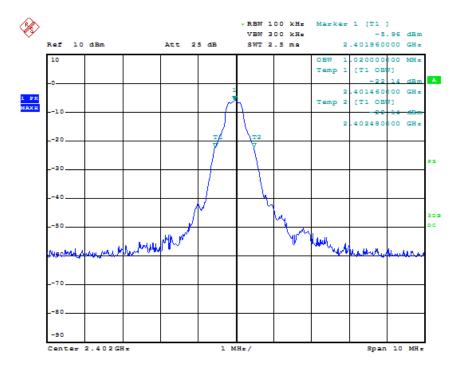
20dB & 99% Bandwidth

EUT: mcMod120

Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.215, 99% Bandwidth

Comment: 3.0VDC





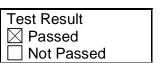
99% bandwidth 1020 kHz

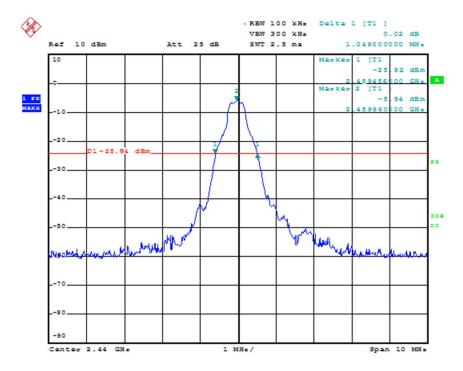


EUT: Coach Smart

Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.215, 20dB Bandwidth

Comment: 3.0VDC





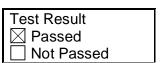
20dB bandwidth 1048 kHz

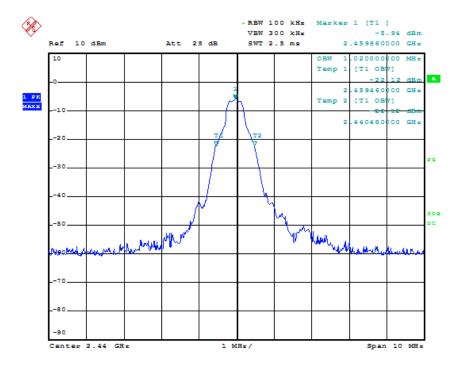


EUT: mcMod120

Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.215, 99% Bandwidth

Comment: 3.0VDC





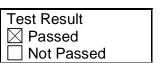
20dB bandwidth 1020 kHz

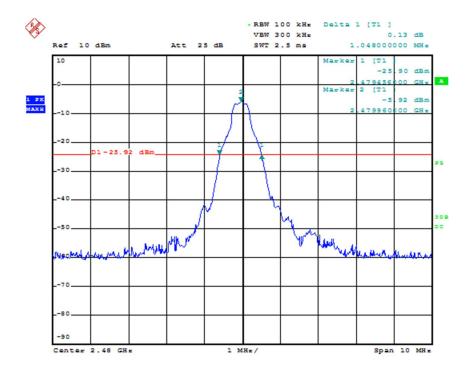


EUT: Coach Smart

Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.215, 20dB Bandwidth

Comment: 3.0VDC





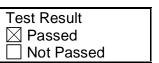
20dB bandwidth 1048 kHz

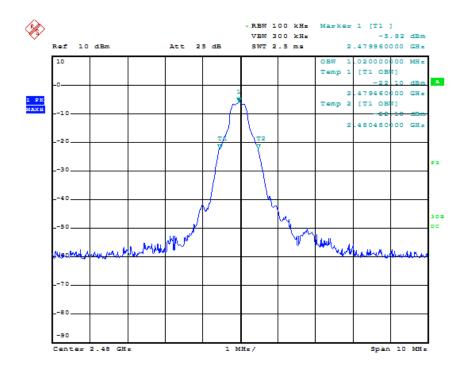


EUT: mcMod120

Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.215, 99% Bandwidth

Comment: 3.0VDC





20dB bandwidth 1020 kHz



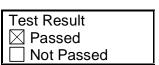
7.3 Bandedge Emission

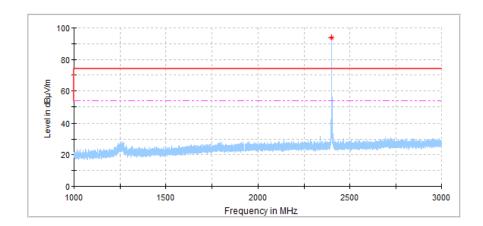
EUT: mcMod120

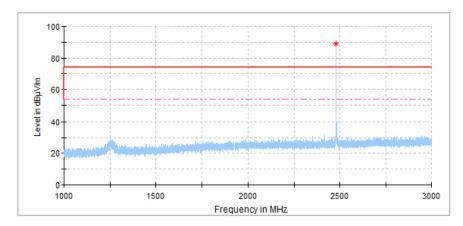
Op Condition: Operated, TX Mode (2402MHz / 2480MHz))

Test Specification: FCC15.247, Antenna: Horizontal

Comment: 3.0VDC







Band	Frequency	Result	Limit	Margin	Detector
	MHz	dBµV/m	dBµV/m	dB	
Low	2390.000	30.50	74	43.50	Peak
Low	2390.000	20.14	54	33.86	Average
High	2483.500	35.03	74	38.97	Peak
High	2483.500	24.44	54	29.56	Average



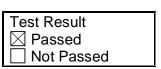
Bandedge Emission

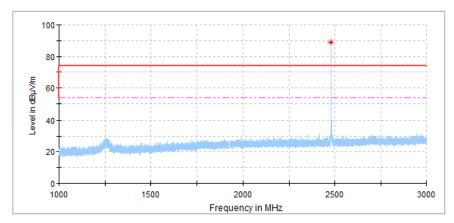
EUT: mcMod120

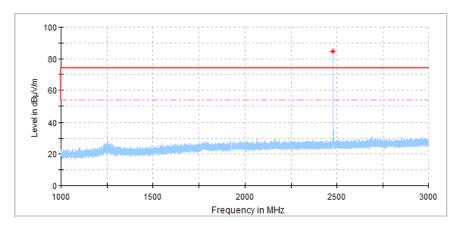
Op Condition: Operated, TX Mode (2402MHz / 2480MHz)

Test Specification: FCC15.247, Antenna: Vertical

Comment: 3.0VDC



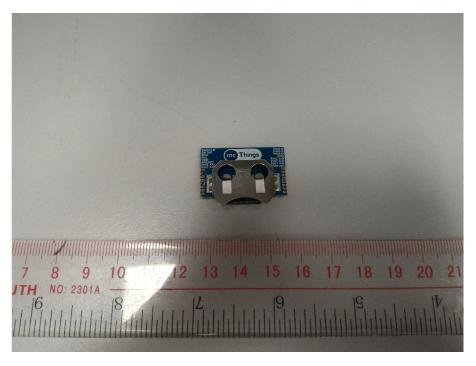


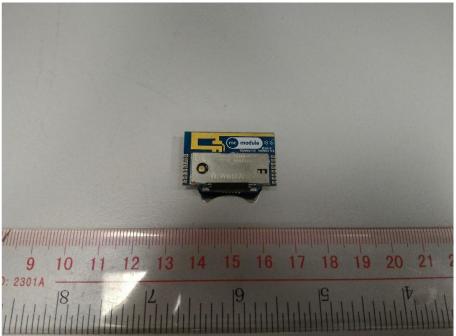


Band	Frequency	Result	Limit	Margin	Detector
	MHz	dBµV/m	dBµV/m	dB	
Low	2390.000	33.54	74	-40.46	Peak
Low	2390.000	22.02	54	-31.98	Average
High	2483.500	33.91	74	-40.09	Peak
High	2483.500	23.03	54	-30.97	Average



8 Appendix A - Photographs of EUT

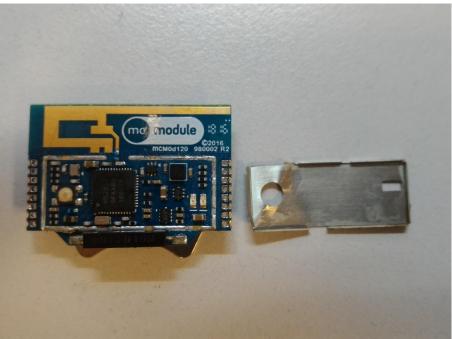






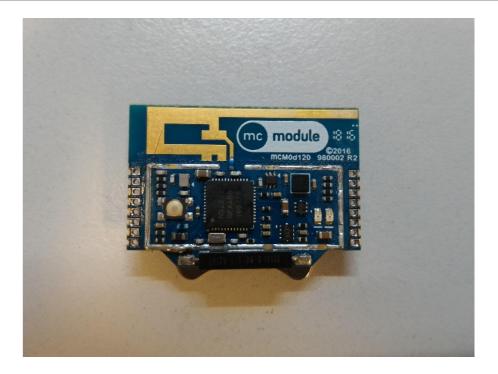
Appendix A







Appendix A





9 Appendix B - Setup Photographs of EUT







Appendix B





10 Appendix C - General Product Information

Radiofrequency radiation exposure evaluation

According to KDB 447498 D01v06 section 4.3.1,

>> The 1-g SAR test exclusion thresholds, for 100MHz to 6GHz, at test separation distances ≤ 50 mm are determined by:

```
Power at 2.402GHz = 0.7381 mW EIRP
Power at 2.440GHz = 0.5359 mW EIRP
Power at 2.480GHz = 0.3829 mW EIRP
```

```
 \begin{array}{l} \hbox{[(0.7381 \ mW)\ /\ (20 \ mm)]} \cdot \hbox{[sqrt\ (2.402 \ GHz)]} = 0.057197 \ which is \le 3.0 \ for \ 1-g \ SAR. \\ \hbox{[(0.5359 \ mW)\ /\ (20 \ mm)]} \cdot \hbox{[sqrt\ (2.440 \ GHz)]} = 0.041855 \ which is \le 3.0 \ for \ 1-g \ SAR. \\ \hbox{[(0.3829 \ mW)\ /\ (20 \ mm)]} \cdot \hbox{[sqrt\ (2.480 \ GHz)]} = 0.030149 \ which is \le 3.0 \ for \ 1-g \ SAR. \\ \end{array}
```

Therefore the device is exempt from stand-alone SAR test requirements.

- >> The fundamental frequency of the EUT is 2402MHz-2480MHz, the test separation distance is < 50mm. (Manufacturer specified the separation distance is: 20mm)
- >> The power of EUT measured is:
 - For 2402MHz: $0.7381mW = 10 \log (0.7381) dBm \sim -1.32dBm$ For 2440MHz: $0.5359mW = 10 \log (0.5359) dBm \sim -2.71dBm$ For 2480MHz: $0.3829mW = 10 \log (0.3829) dBm \sim -4.17dBm$