

FCC - TEST REPORT

Report Number : **60.790.18.058.01R01** Date of Issue : December 5, 2018

Model : 165-00645, 165-00670

Product Type : Remote Access Module

Applicant : Mobile Technologies Inc.

Address : 1050 NE 67th Ave, Hillsboro, Oregon, U.S, 97124

Production Facility : Jabil Circuit (Guangzhou) Limited.

Address : 128, Jun Cheng Road, Guangzhou Economic And Technological.

Test Result : Positive Negative

Total pages including Appendices : 19

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1 Table of Contents

1 Table of Contents.....	2
2 Description of Equipment Under Test	3
3 Summary of Test Standards	4
4 Details about the Test Laboratory	5
4.1 Test Equipment Site List	6
4.2 Measurement System Uncertainty	7
5 Summary of Test Results.....	8
6 General Remarks	9
7 Test Setups.....	10
7.1 Radiated test setups 9kHz-30MHz.....	10
7.2 Radiated test setups Below 1GHz.....	10
7.3 Radiated test setups Above 1GHz	10
7.4 AC Power Line Conducted Emission test setups	11
7.5 Conducted RF test setups.....	11
8 Emission Test Results	12
8.1 Spurious Radiated Emission	12
8.2 Conducted Emission at AC Power Line.....	15
8.3 6dB & 99% Bandwidth	17
9 Appendix A General Product Information.....	18

2 Description of Equipment Under Test

Description of the Equipment Under Test

Product:	Remote Access Module
Model no.:	165-00645, 165-00670
FCC ID:	2AA2X-165-00645-24
Rating:	5V DC (Powered by Power Distribution Unit)
Frequency:	125kHz (Tx and Rx)
Modulation:	AM

3 Summary of Test Standards

Test Standards
FCC Part 15 Subpart C 10-1-17 Edition Federal Communications Commission, PART 15 — Radio Frequency Devices, Subpart C — Unintentional Radiators

All the tests were performed using the procedures from ANSI C63.4(2014) and ANSI C63.10 (2013).

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: 514049

Emission Tests	
Test Item	Test Site
FCC Part 15 Subpart C	
FCC Title 47 Part 15.205, 15.209 Spurious Radiated Emission	Site 2
FCC Title 47 Part 15.207 Conduct Emission	Site 2
FCC Title 47 Part 15.215 20dB Bandwidth	Site 2

4.1 Test Equipment Site List

Radiated emission Test – Site 2

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2019-7-6
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2019-7-6
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2019-6-28
Horn Antenna	Rohde & Schwarz	HF907	102294	2019-6-28
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2019-7-6
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2019-7-6
Attenuator	Agilent	8491A	MY39264334	2019-7-6
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

Conducted Emission Test – Site 2

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2019-7-6
LISN	Rohde & Schwarz	ENV4200	100249	2019-7-6
LISN	Rohde & Schwarz	ENV432	101318	2019-7-6
LISN	Rohde & Schwarz	ENV216	100326	2019-7-6
ISN	Rohde & Schwarz	ENY81	100177	2019-7-6
ISN	Rohde & Schwarz	ENY81-CA6	101664	2019-7-6
High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	9420-584	2019-6-30
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2019-6-30
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2019-7-6
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

20dB Bandwidth– Site 2

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2019-7-6

4.2 Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty	
Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.46dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.91dB; Vertical: 4.89dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-18000MHz	Horizontal: 4.80dB; Vertical: 4.79dB;
Uncertainty for Conducted Emission at AC Power Line 150kHz-30MHz	3.21dB
Uncertainty for frequency test	0.6×10 ⁻⁷

5 Summary of Test Results

Emission Tests				
FCC Part 15 Subpart C				
Test Condition	Pages	Test Result		
		Pass	Fail	N/A
FCC Title 47 Part 15.205, 15.209 Spurious Radiated Emission	12-14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC Title 47 Part 15.207 Conduct Emission (1)	15-16	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC Title 47 Part 15.215 20dB Bandwidth	17	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark:

1. This test is performed on the AC power port of the Power Distribution Unit which supply the 5V DC power to EUT.

6 General Remarks

Remarks

Client informs that the **165-00670** has the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, with **Remote Access Module, 165-00645**. The difference lies only on different color of the different models. (Client's conformation letter shown at appendix A)

EMC tests were performed on model: **165-00645**.

This submittal(s) (test report) is intended for **FCC ID: 2AA2X-165-00645-24**, complies with Section 15.205, 15.207, 15.209, 15.215 of the FCC Part 15, Subpart C rules.

The TX and RX range is 125kHz.

SUMMARY:

- All tests according to the regulations cited on page 8 were

- Performed

- **Not** Performed

- The Equipment Under Test

- **Fulfills** the general approval requirements.

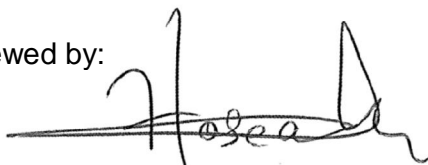
- **Does not** fulfill the general approval requirements.

Sample Received Date: November 15, 2018

Testing Start Date: November 16, 2018

Testing End Date: November 28, 2018

Reviewed by:



Hosea CHAN
EMC Project Engineer

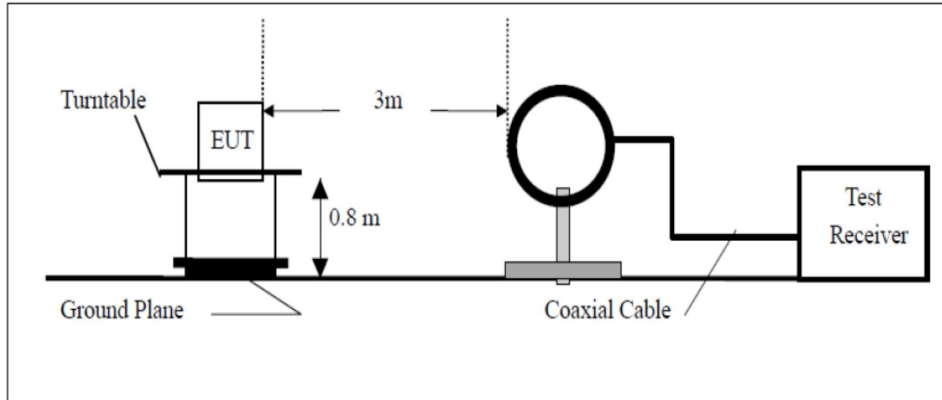
Prepared by:



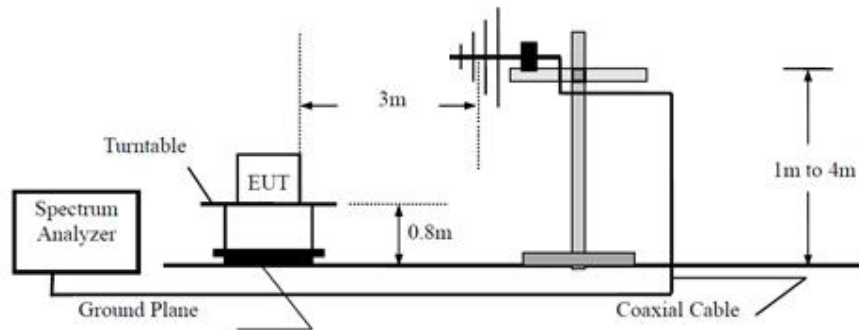
Eric LI
EMC Senior Project Engineer

7 Test Setups

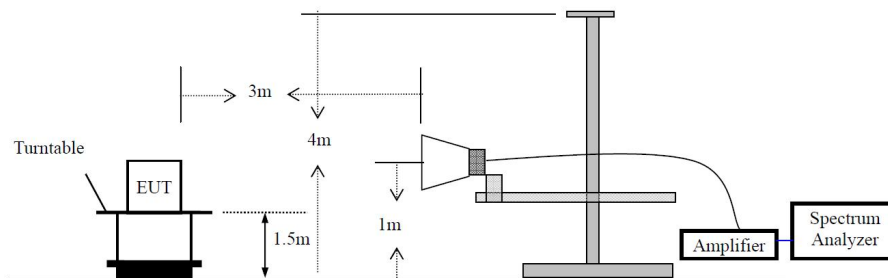
7.1 Radiated test setups 9kHz-30MHz



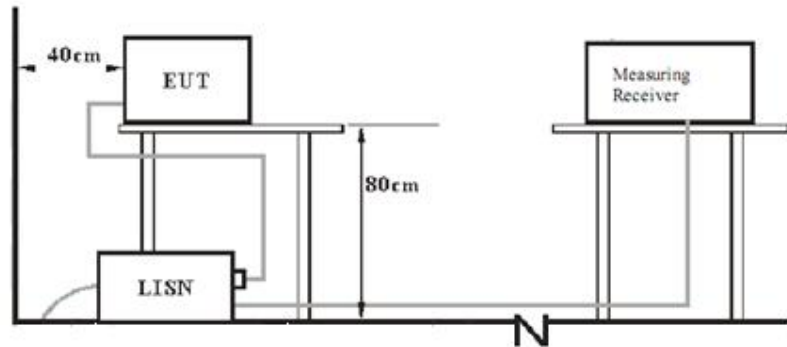
7.2 Radiated test setups Below 1GHz



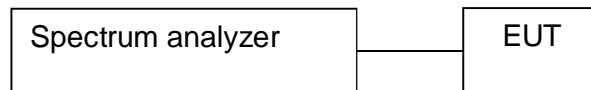
7.3 Radiated test setups Above 1GHz



7.4 AC Power Line Conducted Emission test setups



7.5 Conducted RF test setups



8 Emission Test Results

8.1 Spurious Radiated Emission

EUT: 165-00645
 Op Condition: Operated, TX Mode
 Test Specification: FCC15.205, 15.209
 Comment: 5V DC
 Remark: 9kHz to 30MHz

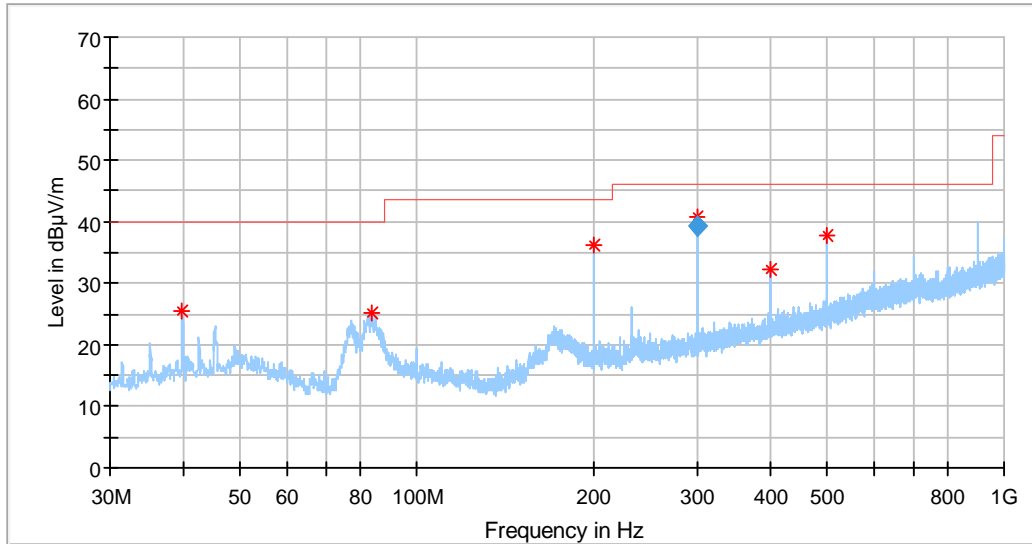
Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Detector PK/QP/AV
0.125	57.18	105.67	-48.49	Peak
0.250	57.15	99.65	-42.50	Peak
0.477	56.34	94.16	-37.82	Peak

Spurious Radiated Emission

EUT: 165-00645
 Op Condition: Operated, TX Mode
 Test Specification: FCC15.205, 15.209
 Comment: 5V DC
 Remark: 30MHz to 1GHz, Antenna: Horizontal

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
39.821250	25.64	40.00	-14.36
83.835000	25.21	40.00	-14.79
199.992500	36.31	43.50	-7.19
299.963125	40.85	46.00	-5.15
399.994375	32.24	46.00	-13.76
499.965000	37.88	46.00	-8.12

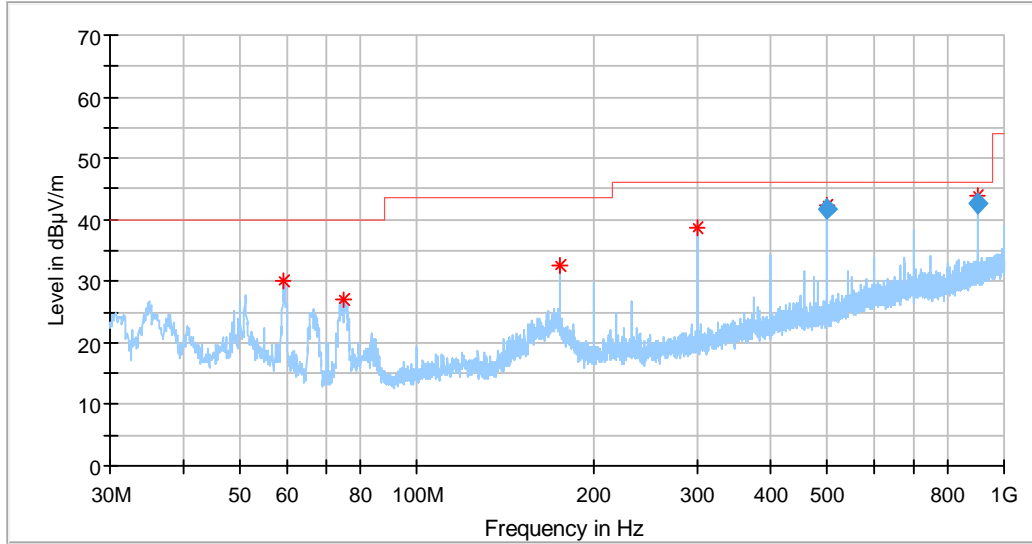
Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
299.963125	39.25	46.00	-6.75

Spurious Radiated Emission

EUT: 165-00645
 Op Condition: Operated, TX Mode
 Test Specification: FCC15.205, 15.209
 Comment: 5V DC
 Remark: 30MHz to 1GHz, Antenna: Vertical

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
59.342500	29.98	40.00	-10.02
74.741250	26.92	40.00	-13.08
174.954375	32.57	43.50	-10.93
299.963125	38.69	46.00	-7.31
499.965000	42.23	46.00	-3.77
899.999975	44.01	46.00	-1.99

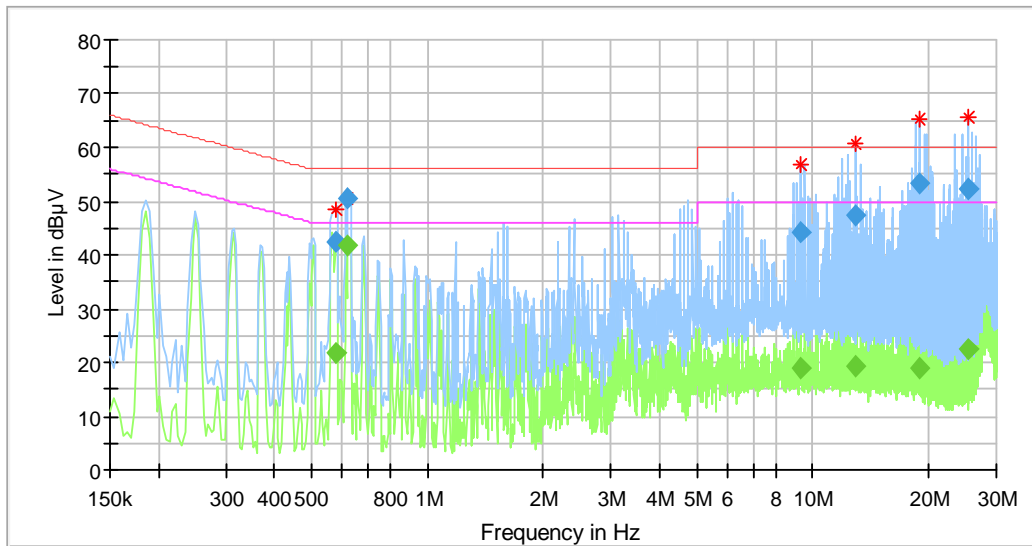
Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
499.965000	41.74	46.00	-4.26
899.999975	42.71	46.00	-3.29

8.2 Conducted Emission at AC Power Line

EUT: 165-00645
 Op Condition: Operated, TX Mode
 Test Specification: FCC15.207
 Comment: 120V AC
 Remark: L Line

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed



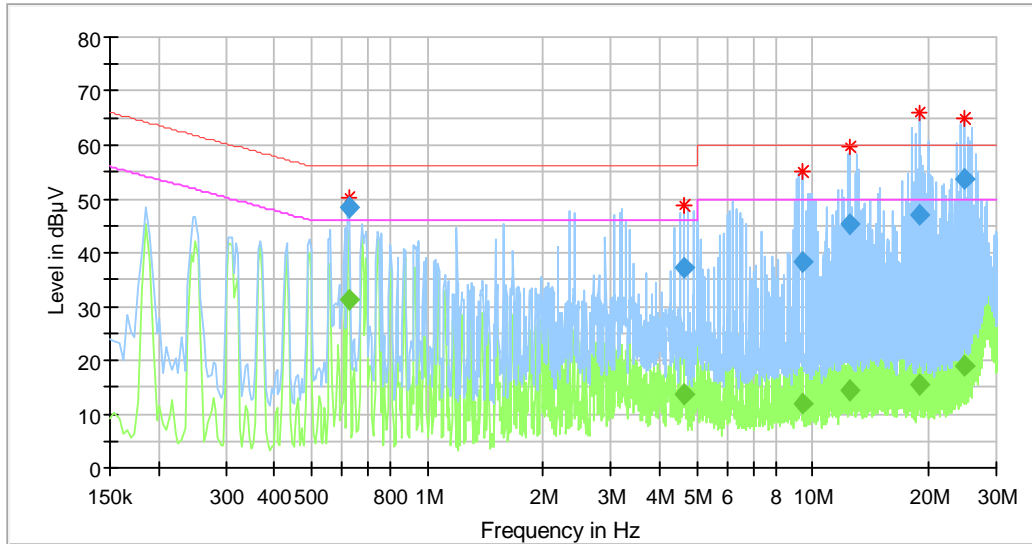
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)
0.577500	42.62	---	56.00	-13.38
0.577500	---	21.60	46.00	-24.40
0.621500	---	41.65	46.00	-4.35
0.621500	50.47	---	56.00	-5.53
9.357500	---	18.91	50.00	-31.09
9.357500	44.13	---	60.00	-15.87
12.893500	---	19.26	50.00	-30.74
12.893500	47.42	---	60.00	-12.58
18.945500	---	18.97	50.00	-31.03
18.945500	53.36	---	60.00	-6.64
25.397500	---	22.35	50.00	-27.65
25.397500	52.33	---	60.00	-7.67

Conducted Emission at AC Power Line

EUT: 165-00645
 Op Condition: Operated, TX Mode
 Test Specification: FCC15.207
 Comment: 120V AC
 Remark: N Line

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed



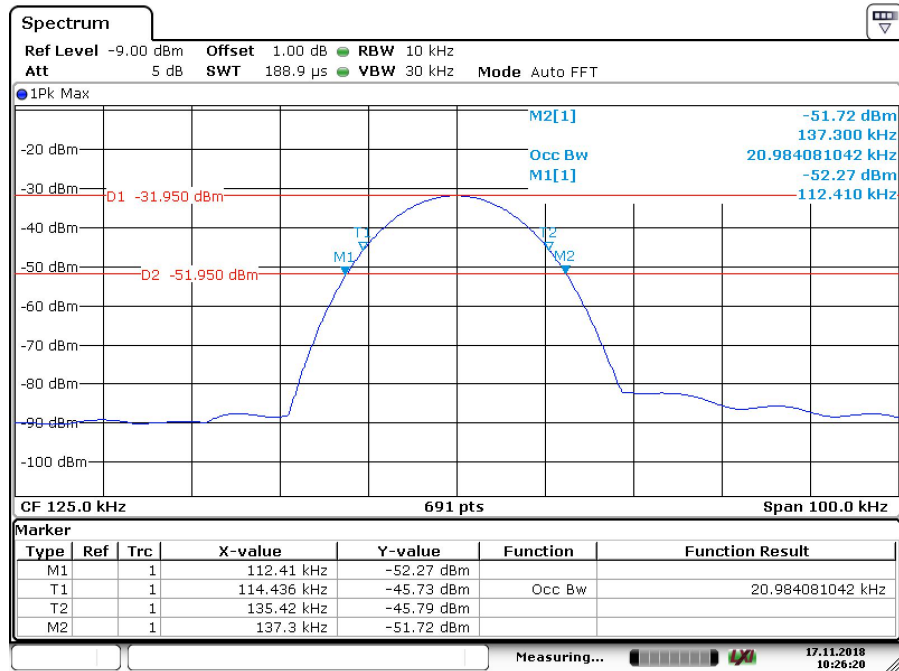
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)
0.625500	---	31.13	46.00	-14.87
0.625500	48.51	---	56.00	-7.49
4.629500	---	13.51	46.00	-32.49
4.629500	37.20	---	56.00	-18.80
9.461500	---	12.00	50.00	-38.00
9.461500	38.22	---	60.00	-21.78
12.449500	---	14.44	50.00	-35.56
12.449500	45.30	---	60.00	-14.70
18.986500	---	15.28	50.00	-34.72
18.986500	47.00	---	60.00	-13.00
24.801500	---	19.11	50.00	-30.89
24.801500	53.77	---	60.00	-6.23

8.3 6dB & 99% Bandwidth

EUT: 165-00645
 Op Condition: Operated, TX Mode
 Test Specification: FCC15.215, 20dB Bandwidth
 Comment: 5V DC

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed



Date: 17.NOV.2018 10:26:20

Bandwidth	Measured Value
20dB bandwidth	24.9 kHz
99% bandwidth	21.0 kHz

9 Appendix A General Product Information

Radiofrequency radiation exposure evaluation

According to KDB 447498 D01v06 section 4.3.1, For frequencies below 100 MHz and test separation distances ≤ 50 mm, the Numeric threshold is determined as:

Step a)

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR

Step b)

$\{[\text{Power allowed at numeric threshold for 50mm in step a)}] + [(\text{test separation distance} - 50\text{mm}) \cdot (f(\text{MHz})/150)]\}$ mW

Step c) 1)

For test separation distances $> 50\text{mm}$ and $< 200\text{mm}$, the power threshold at the corresponding test separation distance at 100MHz in step b) is multiplied by $[1 + \log(100/f(\text{MHz}))]$

Step c) 2)

For test separation distances $\leq 50\text{mm}$, the power threshold determined by the equation in c) 1) for 50mm and 100MHz is multiplied by $\frac{1}{2}$.

>> The fundamental frequency of the EUT is 125kHz, the test separation distance is $\leq 50\text{mm}$.
(Manufacturer specified the separation distance is: 20mm)

Step a)

>> Numeric threshold, $\text{mW} / 50\text{mm} \cdot \sqrt{0.1\text{GHz}} \leq 3.0$
Numeric threshold $\leq 474.3\text{mW}$

Step b)

>> Numeric threshold $\leq 474.3\text{mW} + (50\text{mm} - 50\text{mm} \cdot 100\text{MHz}/150)$
Numeric threshold $\leq 474.3\text{mW}$

Step c) 1) & c) 2)

>> Numeric threshold $\leq 474.3\text{mW} \cdot [1 + \log 100/100\text{MHz}] \cdot \frac{1}{2}$
Numeric threshold $\leq 237.15\text{mW}$

>> The transmitter strength of EUT measured is: 57.18 dB μ V/m
The power calculated is 0.00001042317mW
Which is smaller than the Numeric threshold.
Therefore, the device is exempt from stand-alone SAR test requirements.

General Product Information

Declaration letter of model difference



DECEMBER 4, 2018

Mr. Edmund Fung
TUV SUD Hong Kong Limited

Re: Subject: Models Similarity Declaration Letter; Remote Access Module (RAM)

We, Mobile Technologies Inc, officially notify TÜV SÜD Hong Kong Limited that the models 165-00645 RAM has the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction with the model 165-00670 RAM.

The model difference lies only with the enclosure color.

Sincerely,



Travis Hooper
VP – Products & Strategy
Mobile Technologies Inc.

TUVSUD similarity letter_RAM.docx