

FCC - TEST REPORT

Report Number : **60.790.18.058.01R01** Date of Issue : December 5, 2018Model : **165-00645, 165-00670**Product Type : **Remote Access Module**Applicant : Mobile Technologies Inc.Address : 1050 NE 67th Ave, Hillsboro, Oregon, U.S, 97124Production Facility : Jabil Circuit (Guangzhou) Limited.Address : 128, Jun Cheng Road, Guangzhou Economic And Technological.Test Result : **Positive** **Negative**Total pages including Appendices : 19

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.

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(VT94 20)	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:

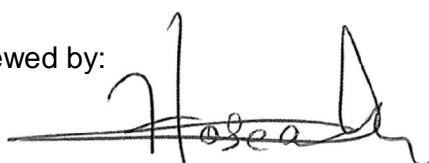
- All tests according to the regulations cited on page 8 were
 - - Performed
 - **Not** Performed
- The Equipment Under Test
 - - **Fulfills** the general approval requirements.
 - **Does not** fulfill the general approval requirements.

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

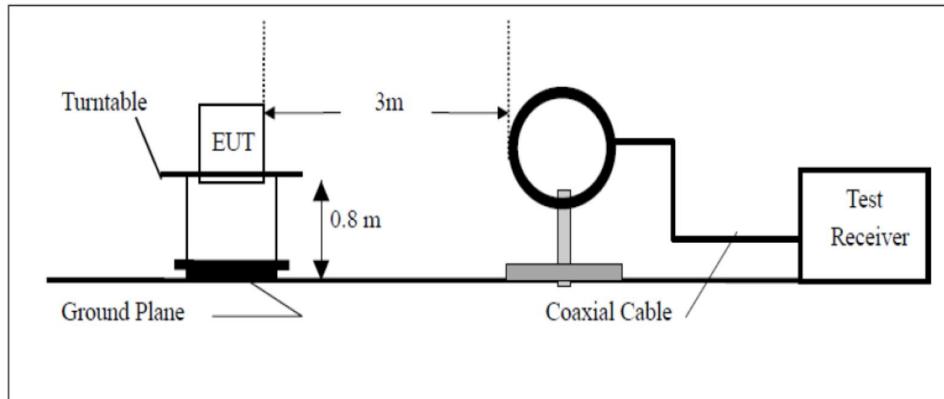
Prepared by:



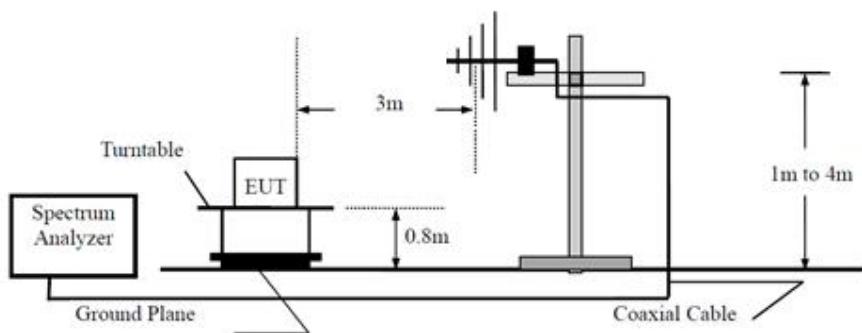
Eric LI
EMC Senior Project Engineer

7 Test Setups

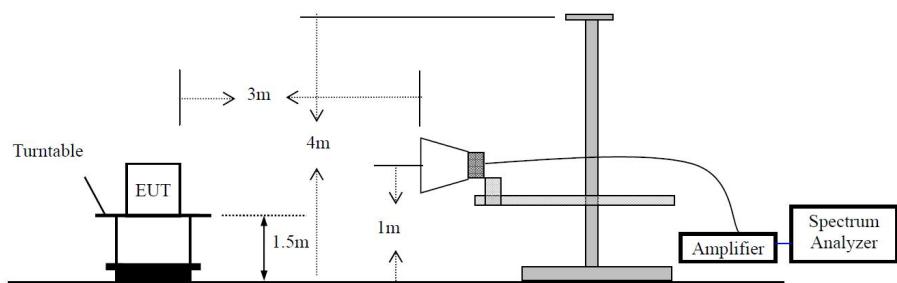
7.1 Radiated test setups 9kHz-30MHz



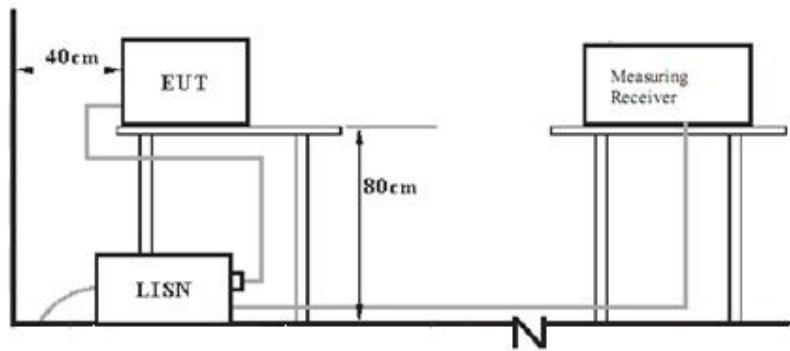
7.2 Radiated test setups Below 1GHz



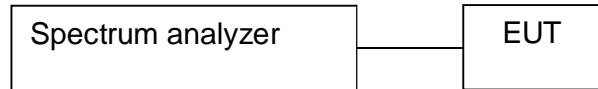
7.3 Radiated test setups Above 1GHz



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

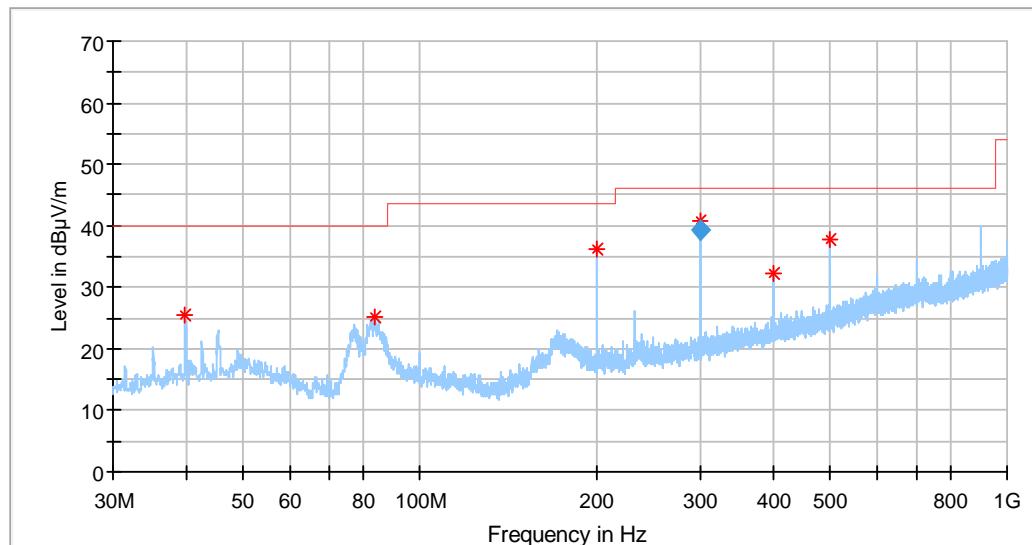
Test Result
 Passed
 Not Passed

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
 Passed
 Not Passed



Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/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

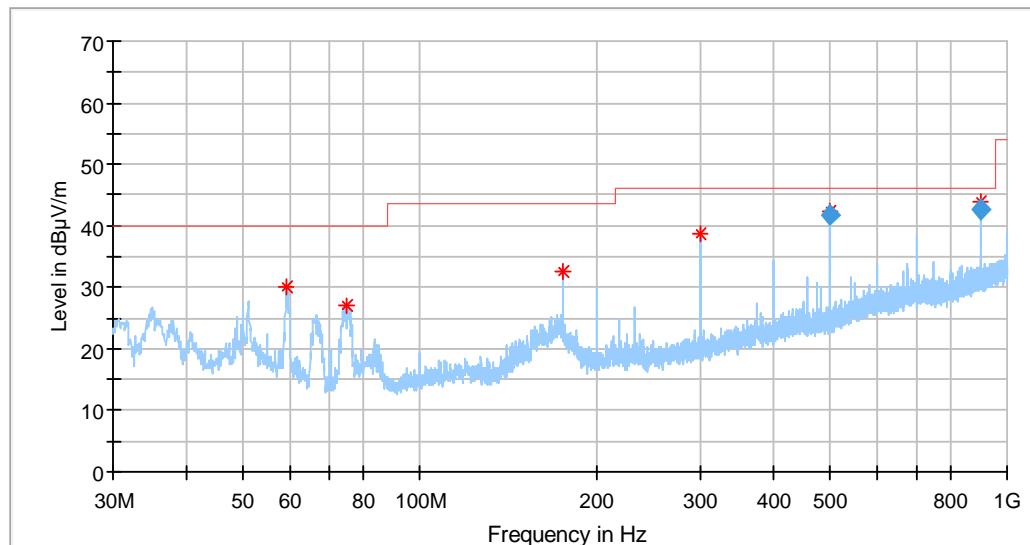
Final Result

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/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

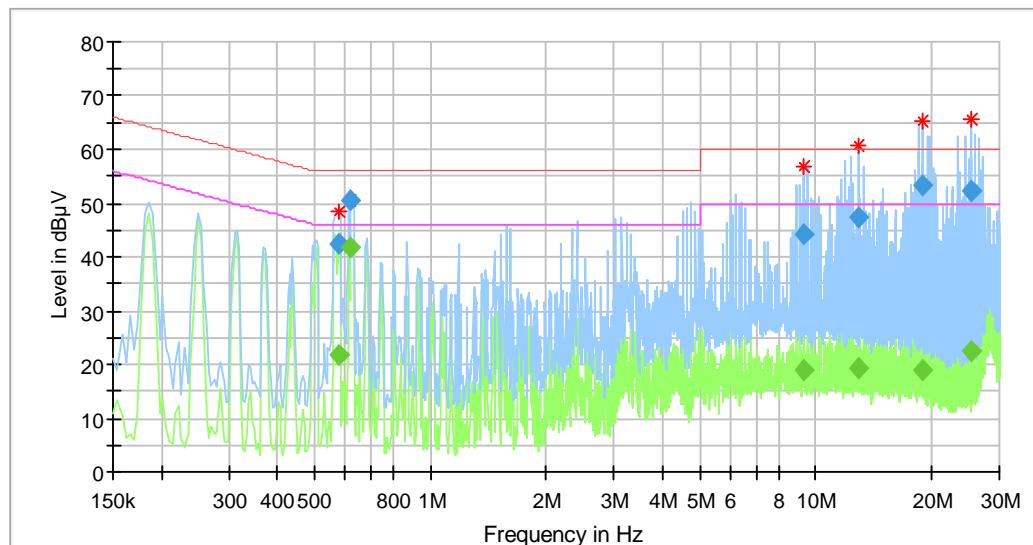
Final Result

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
 Passed
 Not Passed



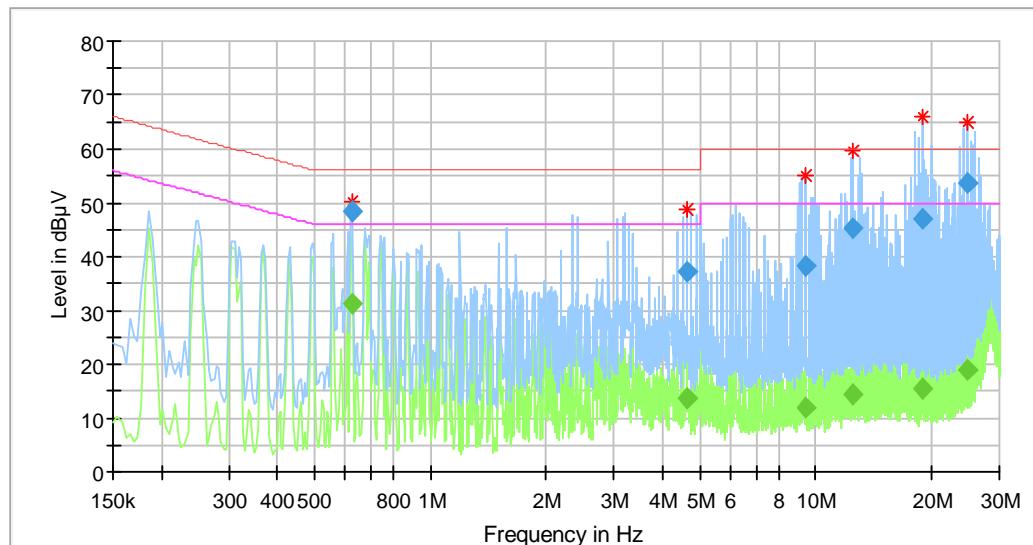
Final Result

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	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



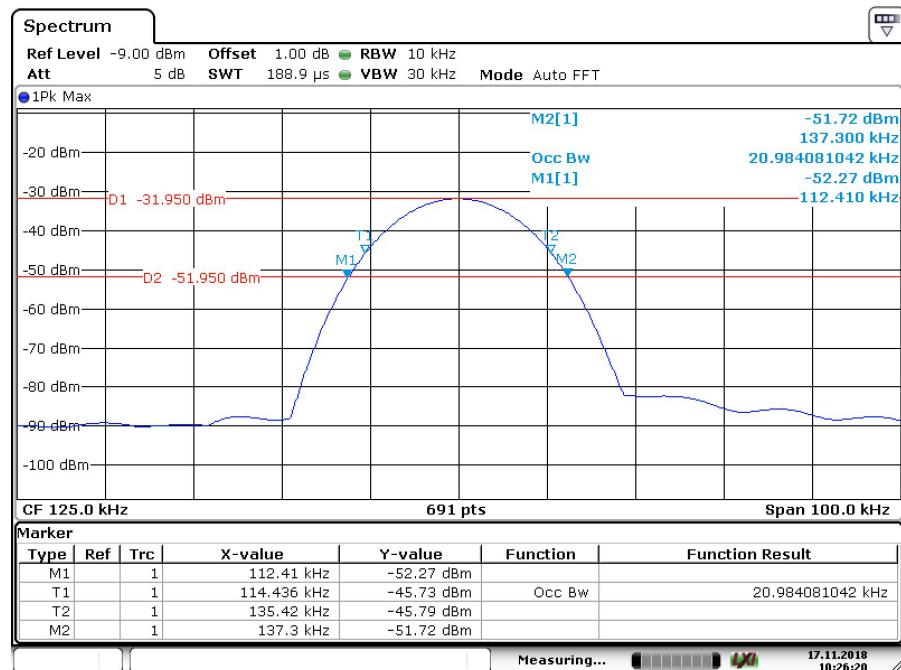
Final Result

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
 Passed
 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 \leq 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)

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

Step c) 1)

For test separation distances $>$ 50mm and $<$ 200mm, 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 50mm, 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 50mm.
(Manufacturer specified the separation distance is: 20mm)

Step a)

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

Step b)

>> Numeric threshold \leq 474.3mW + (50mm-50mm * 100MHz/150)
Numeric threshold \leq 474.3mW

Step c) 1) & c) 2)

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

>> 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
TÜV 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