CommScope Technologies, LLC

MPE TEST REPORT

SCOPE OF WORK
MPE CALCULATION ON RPM-A5A11-B66 (Band 10)

REPORT NUMBER
105081151BOX-002.1

ISSUE DATE **[REVISED DATE]**
June 13, 2022

PAGES
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DOCUMENT CONTROL NUMBER
Non-Specific Radio Report Shell Rev. December 2017

MPE TEST REPORT

(FULL COMPLIANCE)

Report Number: 105081151BOX-002.1
Project Number: G105081151

Report Issue Date: 06/13/2022

Model(s) Tested:	RPM-A5A11-B66 (Band 10)
Model(s) Partially Tested:	None
Model(s) Not Tested but declared equivalent by the client:	None

Standards: FCC Part 1 Subpart I, October 2019
Procedures Implementing the National Environmental Policy Act of 1969
§1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
CommScope Technologies LLC
900 Chelmsford St.
Lowell, MA 01851
USA

Report prepared by

Vathana Ven / EMC Engineering Supervisor

Report reviewed by

Kouma Sinn / EMC Engineering Supervisor

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	MPE Calculation (FCC §1.1310)	Pass
7	Revision History	--

Notes: Band 10 is a subset of Band 66 the hardware is identical. It was added as a class 2 permissive change to Band 66 module.

3 Client Information

This EUT was tested at the request of:

Client: CommScope Technologies LLC
900 Chelmsford St.
Lowell, MA 01851
USA

Contact: Mr. Zac Johnson
Telephone: (978) 250-2678
Fax: None
Email: zac.johnson@commscope.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: CommScope Telecommunications (China) Ltd.
68 Su Hong Xi Lu, Suzhou Industrial Park.
Suzhou, Jiangsu, 215021, China

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Band 10 Radio Module	CommScope Technologies LLC	RPM-A5A11-B66 (Band 10)	19473000001

Notes: Band 10 is a subset of Band 66 the hardware is identical. It was added as a class 2 permissive change to Band 66 module.

Receive Date:	06/03/2022
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
The Radio Module is band specific using the Analog devices RF Agile Transceiver IC, AD936x. The device combines an RF front end with a flexible mixed-signal baseband section and integrated frequency synthesizers providing a configurable digital interface to the processor. The Radio Module also contains a band specific front end, band specific antenna and required power rails. All power rails required are derived from the 12 VDC bus supplied by the Baseband card. The reference frequency for the radio IC is 38.4 MHz is derived from the from an OCXO which is disciplined from a 1588 reference clock. It supports bandwidths of 5, 10, 15, and 20 MHz with four modulations; TM1.1-QPSK, TM3.2-16QAM, TM3.1-64QAM, and TM3.1a-256QAM. The radio is fixed.

Description of Radio Host (provided by client)
The OneCell® RP5100 family is factory configurable with 2 – 4 Radios Modules mounted to a Baseband card. The same PCB's will be used in both indoor and outdoor version of the radio point. The device is fixed. The baseband card is the host for the modular radios. It contains a two ethernet PHY's with one supporting 100M/1G/2.5G/5G/10G ethernet and the other supporting 100M/1G. The main processor is Zylinx Ultrascale+ MPSoC with 2 GB DDR3 and 4 GB Flash memory. The baseband PCBA converts POE power to +12 VDC bus voltage require as input to the radio modules.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
48 VDC	0.960 mA per pair max	DC	N/A

Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

5 MPE Calculation

Limit for Maximum Permissible Exposure (MPE)

FCC Human RF Exposure Limits:

The FCC §1.1310 The criteria listed in table 1 was used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices shall be evaluated according to the provisions of §2.1093 of this chapter.

Part §1.1310 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	$*900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

(1) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of *transient* persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. Such training is not required for *transient* persons, but they must receive written and/or verbal information and notification (for example, using signs) concerning their exposure potential and appropriate means available to mitigate their exposure. The phrase *exercise control* means that an exposed person is allowed to and knows how to reduce or avoid exposure by administrative or engineering controls and work practices, such as use of personal protective equipment or time averaging of exposure.

(2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Test Procedure

RF exposure for licensed transmitter is handled at the time of licensing, however, an MPE calculation was performed in order to show the distance at which the device is compliant with the limits of §1.1310, assuming antenna gains of 0 dBi and 4 dBi. The highest measured conducted output power was used, adjusted by +3 dB to account for two antenna MIMO operation.

FCC Limit For General Population/Uncontrolled Exposure at 2.155 GHz = 1 mW/cm^2

Power Density = [EIRP] / [4π x $(D_{cm})^2$]

Where EIRP is in milliwatts and D is in centimeters. Setting the power density equal to the limit of 1 mW/cm^2 and solving for D_{cm} yields the following results.

Results:

EUT EIRP = Conducted power + Array Gain + Antenna gain in dBi

Power Density Limit = [EIRP] / [4π x $(D_{cm})^2$]
1 mW/cm^2 = [EIRP] / [4π x $(D_{cm})^2$]
D_{cm} = ([EIRP] / [4π])$^{1/2}$

For Gain = 0 dBi,
EIRP = 22.73 dBm + 10*LOG(2) + 0 dBi = 22.73 dBm + 3 dB + 0dBi
EIRP = 25.73 dBm or 374.11 mW
Therefore, the minimum safe distance D_{cm} = ([374.11] / [4π])$^{1/2}$
D_{cm} = 5.46 cm at 0 dBi gain two antenna MIMO

For Gain = 4 dBi,
EIRP = 22.73 dBm + 10*LOG(2) + 4 dBi = 22.73 dBm + 3 dB + 4dBi
EIRP = 29.73 dBm or 939.72 mW
Therefore, the minimum safe distance D_{cm} = ([939.72] / [4π])$^{1/2}$
D_{cm} = 8.65 cm at 4 dBi gain two antenna MIMO

For Gain = X dBi,
EIRP = 22.73 dBm + 10*LOG(2) + X dBi = 22.73dBm + 3 dB + XdBi
EIRP = 25.73+X dBm or 374.11 + 10^(X/10) mW
Therefore, the minimum safe distance D_{cm} = ([472.06 + 10^(X/10)] / [4π])$^{1/2}$
D_{cm} = 0.282 * (374.11 + 10^(X/10))$^{1/2}$ cm at X dBi gain two antenna MIMO

Note: Peak Output Power from report #105081151BOX-002 was used for calculation.

Test Personnel:	Vathana Ven VSV	Test Date:	06/07/2022
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 27	Limit Applied:	1 mW/cm^2
Input Voltage:	48 VDC (POE)		
Pretest Verification w/ Ambient Signals or BB Source:	N/A	Ambient Temperature:	25 ºC
		Relative Humidity:	43 %
		Atmospheric Pressure:	1006 mbars

Deviations, Additions, or Exclusions: None

6 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	06/13/2022	105081151BOX-002.1	VFV	KPS	Original Issue