

Prüfbericht-Nr.: <i>Test report no.:</i>	CN239YP4 003	Auftrags-Nr.: <i>Order no.:</i>	168450098 P01226673	Seite 1 von 12 <i>Page 1 of 12</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2023-09-22	
Auftraggeber: <i>Client:</i>	Mavenir Systems Inc 1700 International Pkwy Suite 200, Richardson, TX 75081 USA			
Prüfgegenstand: <i>Test item:</i>	Remote Radio Unit			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	MR44MOA			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	47 CFR Part 2 Subpart J Section 2.0191 RSS-102 Issue 5, March 2015			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-10-30	Refer to Photo Documentation		
Prüfmuster-Nr.: <i>Test sample no:</i>	A003591764-001			
Prüfzeitraum: <i>Testing period:</i>	2023-11-01 – 2023-11-10			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i>	Ausstellungsdatum: <i>Issue date:</i>			
Stellung / Position:	Stellung / Position:			
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	* Legend:			
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Anmerkungen

Remarks

- | | |
|----------|---|
| 1 | <p>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.</p> <p>Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</p> <p><i>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.</i></p> <p><i>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</i></p> |
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| 3 | <p>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</p> <p><i>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</i></p> |
| 4 | <p>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</p> <p><i>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</i></p> |

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TEST SUMMARY

5.1.1 RF EXPOSURE EVALUATION

RESULT: Pass

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1. GENERAL REMARKS

1.1 COMPLEMENTARY MATERIALS

None.

1.2 List of Document Change

No.	Report No.	Description
1	CN239YP4 001	First release.
2	CN239YP4 003	Revised bandwidth information for Band 66 in Table 6.

2. TEST SITES

2.1 TEST FACILITIES

TÜV Rheinland (Shenzhen) Co., Ltd.

Address: No. 362, Huanguan Road Middle, Longhua District, Shenzhen 518110, P.R. China

A2LA accreditation certification number: 5162.01

2.2 TEST DATE

Date of test: 2023-11-01 to 2023-11-10

2.3 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Table 1: List of Test and Measurement Equipment

☑ Radio Spectrum Testing				
Description	Manufacturer	Model	Serial No.	Calibrated until (DD.MM.YYYY)
MXA Signal Analyzer	Keysight	N9020B	MY60112371	27.05.2024
Signal Analyzer	Rohde & Schwarz	FSV 40	101475	25.07.2024
MXG Vector Signal Generator	Keysight	N5182B	MY62220506	06.04.2024
MXG Vector Signal Generator	Keysight	N5182B	MY61252887	16.05.2024
Temp.&Humidity Chamber	GIANT FORCE	ITH-150-40-CP-AR	IAA1406-004	31.10.2024

2.4 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.5 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. facility located at No. 362, Huanguan Road Middle, Longhua District, Shenzhen 518110, P.R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3. GENERAL PRODUCT INFORMATION

3.1 GENERAL DESCRIPTION

The EUT is an outdoor remote radio unit. It's the radio frequency (RF) part of a distributed base station. For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 TECHNICAL DATA

Table 2: Rating of EUT

General Information of EUT	Description
Kind of Equipment:	Remote Radio Unit
Type Designation:	MR44MOA
Trademark:	Mavenir
FCC ID:	2AWAS-901-00094B
Type of Equipment:	Cellular Network – Base Station
Operating Voltage:	DC -48V
Extreme Voltage:	DC -38.5V ~ -57.5V
Operating Temperature Range:	-40 °C - +55 °C

Table 3: Technical Specification of EUT

Characteristic	Description
Operated Modes:	LTE
Operational Frequency Band(s):	Band 25; Band 66
Operating Frequency Range:	Band 25: Downlink: 1930-1995 MHz / Uplink: 1850-1915 MHz Band 66: Downlink: 2110-2200 MHz / Uplink: 1710-1780 MHz
Testing Frequency Range:	Band 25: Downlink: 1950-1970 MHz / Uplink: 1870-1890 MHz Band 66: Downlink: 2140-2155 MHz / Uplink: 1740-1755 MHz
Type of Base Station:	Non-AAS Base Station
Rated RF Output Power:	46.0 dBm per port
Modulation Type:	QPSK, 16QAM, 64QAM, 256QAM
Antenna Ports:	4 TRX ports
Antenna Type:	External Antenna
Antenna Gain:	No dedicated antenna, Maximum allowed Gain against to ERP/EIRP limit and MPE evaluation.
Supported Channel Bandwidth:	Band 25: 20 MHz Band 66: 15 MHz
Supported Carriers	1 carrier
Maximum Occupied Bandwidth:	Band 25: 20 MHz

	Band 66: 15 MHz
Maximum RF Bandwidth:	Band 25: 20 MHz Band 66: 15 MHz

3.3 INDEPENDENT OPERATION MODES

The basic operation modes are:

- A. On, Transmitting
 - 1) Bottom channel (B)
 - 2) Middle channel (M)
 - 3) Top channel (T)
- B. On, Receiving
 - 1) Bottom channel (B)
 - 2) Middle channel (M)
 - 3) Top channel (T)
- C. Idle
- D. Off

3.4 NOISE GENERATING AND NOISE SUPPRESSING PARTS

Refer to the Circuit Diagram.

3.5 SUBMITTED DOCUMENTS

- | | |
|---|--|
| ☒ User Manual | ☒ Rating Label |
| ☒ Circuit Diagram | ☒ PCB Layout |
| ☒ Block Diagram | ☒ Photo Document |
| ☒ Schematics | ☒ Parts List |
| ☐ Model Difference Letter | |

4. TEST SET-UP AND OPERATION MODES

4.1 PRINCIPLE OF CONFIGURATION SELECTION

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 TEST OPERATION AND TEST SOFTWARE

Test operation refers to test setup in chapter 5.

Diagram of Measurement Equipment Configuration for Transmitter Conducted Measurement



4.3 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT

The EUT was tested together with the following accessories:

Table 4: Cables used during test

Port	Quantity	Length (m)	Type of Cable
SPF Port	1	10	Optical fiber cable

Table 5: Auxiliary Equipment used during test

Name	Model	Manufacturer	S/N
Laptop PC	Dell P98G	DELL	P98G007
DELL EMC	PowerEdge R740 6230R	DELL	3L9PWC3
DU	LTE_L1_FDD_4_10_1_70	Mavenir	N/A
GNSS Antenna	QG2 Qulsar Grand Master	Coolshark	N/A
Power Unit	W1500-26S48M	ShenZhen DCTEC	N/A
Programmable DC power supply	ADG-L-330-75-12	Preen	N/A

4.4 COUNTERMEASURES TO ACHIEVE RADIO SPECTRUM COMPLIANCE

The test sample, which has been tested, contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

5. TEST RESULTS

5.1 ESSENTIAL REQUIREMENTS OF RF EXPOSURE

5.1.1 RF EXPOSURE EVALUATION

RESULT: **Pass**

Test date	:	2023-11-01 to 2023-11-10
Test standard	:	RSS-102 Issue 5
		47 CFR Part 2 Subpart J Section 2.1091
Limit	:	Table 4 of RSS-102 Issue 5
		Table 1 of 47 CFR Part 2 Subpart J Section 1.1310
Kind of test site	:	Shielded room

Test Setup

Date of testing	:	2023-11-01 to 2023-11-10
Input Voltage	:	DC -48V
Operation mode	:	A
Test conditions	:	☒ Normal conditions
Ambient temperature	:	22.1 °C
Relative humidity	:	50%
Atmospheric pressure	:	101.0 kPa

This device is fixed device, and the applicant declares that the minimum separation distance is greater than 13 m. Therefore RF exposure evaluation or computational modeling should be used to determine compliance.

Compliance Evaluation

MPE Calculation is based on the conducted power, and considering maximum power and antenna gain. The following formula is used to MPE evaluation.

$$P_d = \frac{P_{out} * G}{4R^2 \pi}$$

Where

P_d = power density in mW/cm² or W/m²

P_{out} = output power to antenna in mW or W

G_{num} = Antenna gain in numeric

π = 3.14159

R = Distance between observation point and the center of radiator in cm or m

For single or multiple RF sources, the calculated power density should comply with following:

$$\sum_i \frac{Pd_i}{Pd_{Limit,i}} \leq 1$$

Where:

Pd_i = the power density when the f is i .

$Pd_{Limit,i}$ = the reference level requirement for power density when f is i .

Table 6: Evaluation Results of Single Source

Operation Mode	Frequency	P	Gain	R	P _{output}	$G_{(\theta, \phi)}$	Calculated Pd		Limit		Result
	(MHz)	(dBm)	(dBi)	(m)	(W)		FCC (mW/cm ²)	ISED (W/m ²)	Pd _{Limit} (mW/cm ²)	Pd _{Limit} (W/m ²)	
LTE B25, G7D, 20MHz, 1TX	1950.00	46.27	22.00	25	42.36	158.49	0.09	0.85	1	4.64	Pass
LTE B25, W7D, 20MHz, 1TX	1950.00	45.67	22.00	25	36.90	158.49	0.07	0.74	1	4.64	Pass
LTE B25, G7D, 20MHz, 4TX	1950.00	52.07	22.00	25	161.06	158.49	0.33	3.25	1	4.64	Pass
LTE B25, W7D, 20MHz, 4TX	1950.00	51.68	22.00	25	147.23	158.49	0.30	2.97	1	4.64	Pass
LTE B66, G7D, 15MHz, 1TX	2140.00	45.62	22.00	25	36.48	158.49	0.07	0.74	1	4.94	Pass
LTE B66, W7D, 15MHz, 1TX	2140.00	45.78	22.00	25	37.84	158.49	0.08	0.76	1	4.94	Pass
LTE B66, G7D, 15MHz, 4TX	2140.00	51.56	22.00	25	143.22	158.49	0.29	2.89	1	4.94	Pass
LTE B66, W7D, 15MHz, 4TX	2140.00	51.39	22.00	25	137.72	158.49	0.28	2.78	1	4.94	Pass

Note:

1. P is maximum measured RF output power with tolerance.
2. This MPE evaluation is based upon the max. allowed antenna gain.
3. RF exposure compliance is addressed at the time of licensing.

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