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Test Report

Prepared for u-blox AG

This report presents Maximum Permissible Exposure for

NORA-W3 series

Prepared by

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Engineer II

Approved by

Jason Kanakry

General Manager

Issue date: 05/16/2024

Report No: J23220_FCC_RF_MPE v1.3

Contents

1. Test Request Information

Test Request #:	24660
Test Requested By:	Bob Recny
	u-blox AG, Zürcherstrasse 68, Thalwil, 8800, Switzerland
Test item Description:	NORA-W3 series stand-alone dual-band Wi-Fi and Bluetooth modules
Part Number:	NORA-W300, NORA-W301, NORA-W306,
	NORA-W360, NORA-W361, NORA-W366
DUT Sample Number:	J23220-W300#1
	J23220-W301#2
	J23220-W306#1
Hardware Version of DUT:	Rev 03
Software Version of DUT:	MP v2.5 or newer (Test Mode)
	u-connectXpress v0.28.0d-281 or newer (Normal Operation)
Component Category of DUT:	N/A
FCC ID:	XPYNORAW3
Type of Test:	FCC/ISED Certification
Test Method:	CFR Title 47 FCC Part 15.247, 1.1307, 1.1310, 2.1091
	KDB 447498 D04 General RF Exposure Guidance v01
Deviations from standard:	None
Approved Test Plan Number:	N/A
Test Plan Revision:	N/A
Date Test Sample Received:	10-04-2023
Date Test Started:	12-04-2023
Date Test Finished:	05-13-2024

2. Test Laboratory Information

Location of Test Lab:	The radiated and conducted emissions test sites are located at Bureau Veritas 815 N. Opdyke Rd #100, Auburn Hills, MI 48326, Phone: +1-248-836-4700
Key Contact:	Jason Kanakry (General Manager) Jason.Kanakry@BureauVeritas.com Phone: +1-248-836-4747
Laboratory Accreditations:	BUREAU VERITAS CONSUMER PRODUCTS SERVICES, INC is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.
ISO/IEC 17025:2017:	5678.01
FCC Test Site Number:	US1278 (242530)
IC Test Site Number:	US0229 (26240)

3. RF Exposure

3.1 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as a Mobile Device.

3.2 Antenna Information

Band	Model	Brand	Type	Gain(dBi)
Bluetooth LE	ANTX100P001B24553	YAGEO	Patch	5.3
	ANT-DB1-RAF-RPS	TE	Dipole	1.9
	NORA-W3x6 trace	U-BLOX	Internal	0.5
	AFG4507W2S	ABRACON	Patch	3.5
	GW.59	TAOLGAS	Dipole	3.8
WLAN 2.4G	ANTX100P001B24553	YAGEO	Pulse	5.3
	GW.59	TAOLGAS	Dipole	3.8
	NORA-W3x6 trace	U-BLOX	Internal	0.5
	AFG4507W2S	ABRACON	Patch	3.5
	ANT-DB1-RAF-RPS	TE	Dipole	1.9
WLAN 5G	AFG4507W2S	ABRACON	Patch	5.3
	GW.59	TAOLGAS	Dipole	3.2
	NORA-W3x6 trace	U-BLOX	Internal	2.4
	ANTX100P001B24553	YAGEO	Pulse	4.6
	ANT-DB1-RAF-RPS	TE	Dipole	4.7

Note: Highest gain antennas considered for MPE calculations.

3.3 Max Conducted Power and Antenna Information

Band	Antenna Type	Max Conducted Power (dBm)	Max Conducted Power (mW)	EIRP (W)	ERP (mW)	Antenna Gain (dBi)
BLE	External antenna	6.4	4.365158322	0.014791084	9.015711376	5.3
WLAN 2.4G	External antenna	19.693	93.17512842	0.315718478	192.4420613	5.3
WLAN 5G (UNII-1)	External antenna	17.268	53.30893422	0.180634208	110.1032149	5.3
WLAN 5G (UNII-2A & 2C)	External antenna	17.3	53.70317964	0.181970086	110.9174815	5.3
WLAN 5G (UNII-3)	External antenna	17.927	62.04403012	0.21023257	128.1445086	5.3

3.4 Calculation for MPE

Band	Transmit Frequency (MHz)	λ/2π (m)	Separation Distance (m)	Radio Power (dBm)	Radio Power (W)	Antenna Gain (dBi)	Antenna Gain (Lin eq.)	ERP (W)	Threshold ERP (W)	Result ERP(W)/ERPth
BLE	2440	0.019554693	0.2	6.4	0.004365158	5.3	3.3884416	0.009015711	0.768	0.011739208
WLAN 2.4G	2437	0.019578766	0.2	19.693	0.093175128	5.3	3.3884416	0.192442061	0.768	0.250575601
WLAN 5G (UNI-1)	5240	0.009105621	0.2	17.268	0.053308934	5.3	3.3884416	0.110103215	0.768	0.143363561
WLAN 5G (UNI-2A/2C)	5260	0.009070998	0.2	17.3	0.05370318	5.3	3.3884416	0.110917482	0.768	0.144423804
5G WLAN (UNII-3)	5745	0.008305214	0.2	17.927	0.06204403	5.3	3.3884416	0.128144509	0.768	0.166854829

Notes:-

- Minimum separation distance must be >=wavelength/2PI meters
  Where Wavelength = (speed of light constant / Transmit Frequency*10^6)
- Threshold ERP as per Transmit frequency.

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1{,}920\ R^2$.
1.34-30	$3{,}450\ R^2/f^2$.
30-300	$3.83\ R^2$.
300-1,500	$0.0128\ R^2 f$.
1,500-100,000	$19.2R^2$.

3.5 Conclusion

The maximum calculations of above situations, the ERP (W) is less than equal to ERP Threshold.
Therefore, as per the FCC rule § 1.1307(b)(3)(i)(B), device is exempt from RF exposure evaluation.

Document Revisions

Version	Date	Modifier	Changes
1.0	03/20/2024	Aravind Buddana	• Initial release
1.1	04/01/2024	Aravind Buddana	• Updated Section 1 Test Requested by Information • Corrected typo in Section 3.2 Internal antenna Model name. • Updated Section 3.3 and 3.4 BLE Conducted power and calculations.
1.2	05/13/2024	Abhijit P	• Update Section 3.2 with additional antenna Information. • Corrected wavelength formula in Section 3.4 Notes • Updated Section 3.5 with applicable FCC rule.
1.3	05/16/2024	Aravind Buddana	• Updated Section 3.2 Antenna Gain for Bluetooth LE

End of Report