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# Report On

RF Exposure Assessment of the  
Motorola Solutions  
LXN 500 LTE B14 Ultra-Portable Infrastructure

FCC ID: AZ492FT7102

Document 75939219 Report 04 Issue 1

October 2017



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**REPORT ON**

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19 October 2017



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## **SECTION 1**

### **REPORT SUMMARY**

RF Exposure Assessment of the  
Motorola Solutions  
LXN 500 LTE B14 Ultra-Portable Infrastructure



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## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the RF Exposure Assessment of the Motorola Solutions LTE B14 Ultra-Portable Infrastructure to the requirements of the applied test specifications.

Objective	To perform RF Exposure Assessment to determine the Equipment Under Test's (EUT's) compliance of the applied rules.
Applicant	Motorola Solutions Inc
Manufacturer	Motorola Solutions Israel Ltd
Manufacturing Description	LTE B14 Ultra-Portable Infrastructure
Model Number(s)	SQM01SUM0309A
Product Name	LXN 500
Test Specification/Issue/Date	CFR 47 Pt1.1310 (2016)



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## 1.2 REGIONAL REQUIREMENTS

The table below shows the regional requirements that are referenced in this test report. A full list of the requirements is shown in Annex A.

Report Reference	Regional Requirement
FCC	CFR 47 Pt1.1310 (2016)



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### 1.3 PRODUCT INFORMATION

#### 1.3.1 Technical Description

The Equipment under test was a Motorola Solutions LXN 500 Ultra-Portable Infrastructure. A full technical description can be found in the manufacturer's documentation.

All reported calculations were carried out on the relevant information supplied for the LXN 500 to demonstrate compliance with the applied test specification(s). The sample assessed was found to comply with the requirements of the applied rules.

#### 1.3.2 Supported Features

The following radio access technologies and frequency bands are supported by the equipment under test.

Radio Access Technology	LTE FDD 14 MIMO
	LTE FDD14 SISO
	WLAN
Frequency Band	760.5 to 765.5
	2400 to 2483

#### 1.3.3 Antennas

The following antennas are supported by the equipment under test.

No.	Model	Gain (dBi)
1	LTE FDD 14 MIMO	6
2	LTE FDD 14 SISO	6
3	WLAN	10



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### 1.3.4 Support equipment and ancillaries

Vehicle 4 port antenna and cables:

AN000226A01	Laird Combo antenna VLQ69273 (4 ports)
CB000613A01	Laird Combo LTE antenna VLQ69273 (4 ports) cable
CB000548A01	Laird Combo WiFi antenna VLQ69273 (4 ports) cable
CB000133A01	Laird Combo GPS antenna VLQ69273 (4 ports) cable

Vehicle 3 port antenna and cables:

AN000036A01	Laird combo antenna (3 ports) - Base
85013016001	Laird combo antenna (3 ports) - Whip
CB000613A01	Laird combo antenna (3 ports) LTE cable
CB000133A01	Laird combo antenna (3 ports) GPS cable
CB000548A01	Laird combo antenna (3 ports) WiFi cable

Vehicle power cable

CB000540A01	Vehicle power cable
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Backpack antennas and cables

CB000541A01	Backpack power cable
BT000390A01	Battery, Ultralife UBBL13-01-CB
AN000250A01	Antenna - PCTEL (LTE)
CH0002	Charger
CB000544A01	LTE Antenna cable

### 1.3.5 EUT Configurations

Ultra-Portable Infrastructure operating in LTE Band 14 and WLAN 2.4 GHz modes.





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#### 1.4 BRIEF SUMMARY OF RESULTS

The wireless device described within this report has been shown to be capable of compliance with the basic restrictions related to human exposure to electromagnetic fields for both General Public and Occupational. The calculations shown in this report were made in accordance with the procedures specified in the applied test specification(s).

Configuration	Required Compliance Boundary (m)	
	Occupational	General Population
LTE FDD 14 MIMO	0.16	0.36
LTE FDD 14 SISO	0.12	0.25
WLAN	0.06	0.13
LTE FDD 14 MIMO + WLAN	0.17	0.38
LTE FDD 14 SISO + WLAN	0.13	0.28

**Table 1 – Compliance Boundary Results**



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**1.4.1 Configuration 1 - LTE FDD 14 MIMO**

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.16 m					
	S Field (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
FCC*	2.4692	2.5373	N/A	N/A	N/A	N/A

\* Requirement and Result in mW/cm<sup>2</sup>

**Table 2 – Occupational Results**

The calculations show that the EUT complies with the occupational exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.16 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.36 m					
	S Field (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
FCC*	0.4877	0.5075	N/A	N/A	N/A	N/A

\* Requirement and Result in mW/cm<sup>2</sup>

**Table 3 – General Population Results**

The calculations show that the EUT complies with the occupational exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.36 m.



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### 1.4.2 Configuration 2 - LTE FDD 14 SISO

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.12 m					
	S Field (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
FCC*	2.2000	2.5373	N/A	N/A	N/A	N/A

\* Requirement and Result in mW/cm<sup>2</sup>

**Table 4 – Occupational Results**

The calculations show that the EUT complies with the occupational exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.12 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.25 m					
	S Field (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
FCC*	0.5069	0.5075	N/A	N/A	N/A	N/A

\* Requirement and Result in mW/cm<sup>2</sup>

**Table 5 – General Population Results**

The calculations show that the EUT complies with the occupational exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.25 m.



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### 1.4.3 Configuration 3 - WLAN

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.06 m					
	S Field (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
FCC*	4.4207	5.0000	N/A	N/A	N/A	N/A

\* Requirement and Result in mW/cm<sup>2</sup>

**Table 6 – Occupational Results**

The calculations show that the EUT complies with the occupational exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.06 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.13 m					
	S Field (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
FCC*	0.9417	1.0000	N/A	N/A	N/A	N/A

\* Requirement and Result in mW/cm<sup>2</sup>

**Table 7 – General Population Results**

The calculations show that the EUT complies with the occupational exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.13 m.



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#### 1.4.4 Configuration 4 - LTE FDD 14 MIMO + WLAN

The tables below show the summed fractional results from the antenna port summary in section 2.2. Where the result is less than one, the EUT is deemed compliant.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.17 m as a Fraction of the Limit		
	S Field	E Field	H Field
FCC	0.9721	N/A	N/A

**Table 8 – Occupational Results**

The calculations show that the EUT complies with the occupational exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.17 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.38 m as a Fraction of the Limit		
	S Field	E Field	H Field
FCC	0.9728	N/A	N/A

**Table 9 – General Population Results**

The calculations show that the EUT complies with the general population exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.38 m.



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#### 1.4.5 Configuration 5 - LTE FDD 14 SISO + WLAN

The tables below show the summed fractional results from the antenna port summary in section 2.2. Where the result is less than one, the EUT is deemed compliant.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.13 m as a Fraction of the Limit		
	S Field	E Field	H Field
FCC	0.9271	N/A	N/A

**Table 10 – Occupational Results**

The calculations show that the EUT complies with the occupational exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.13 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.28 m as a Fraction of the Limit		
	S Field	E Field	H Field
FCC	0.9993	N/A	N/A

**Table 11 – General Population Results**

The calculations show that the EUT complies with the general population exposure levels described in the and CFR 47 Pt1.1310 (2016) at the point of investigation, 0.28 m.



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## **SECTION 2**

### **TEST DETAILS**



## 2.1 RATIONALE FOR ASSESSMENT OF THE RF EXPOSURE

The aim of the assessment report is to evaluate the compliance boundary for a set of given input power(s) according to the basic restrictions (directly or indirectly via compliance with reference levels) related to human exposure to radio frequency electromagnetic fields. The chosen assessment method to establish the compliance boundary in the far-field region is the reference method as defined in the relevant specifications.

The RF exposure assessment is based upon the following criteria:

The SQM01SUM0309A Mobile LTE base station (LXN 500) operates with the following transmitters active on the antenna ports shown in Section 1.3.3. For each transmitter, the Radio Access Technology (RAT), EIRP inclusive of antenna gain and duty cycle, gain of the antenna and lowest frequency of operation are shown as they contribute to the calculation of S Field, E field and H field values according to the following formulas.

The power flux (S Field):

$$S = \frac{PG_{(\theta, \phi)}}{4\pi r^2}$$

The electric field strength (E Field):

$$E = \frac{\sqrt{30PG_{(\theta, \phi)}}}{r}$$

The magnetic field strength (H Field):

$$H = \frac{E}{\eta_0}$$

Where:

P = Average Power (W)

G = Antenna Gain (dBi)

r = Distance (cm) or (m)

$\eta_0 = 377$





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## 2.2 TEST RESULT DETAILS

The frequencies shown in the tables below have been chosen based on the lowest possible frequency that the EUT can transmit.

### 2.2.1 Configuration 1 - LTE FDD 14 MIMO

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.16 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	1	LTE FDD 14 MIMO	7.943	100	6	761.2	24.6917	96.4807	0.2559

**Table 12 – Occupational Transmitter Summary**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.36 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	1	LTE FDD 14 MIMO	7.943	100	6	761.2	4.8774	42.8803	0.1137

**Table 13 – General Population Transmitter Summary**



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**2.2.2 Configuration 2 - LTE FDD 14 SISO**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.12 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	2	LTE FDD14 SISO	3.981	100	6	761.2	22.0003	91.0708	0.2416

**Table 14 – Occupational Transmitter Summary**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.25 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	2	LTE FDD14 SISO	3.981	100	6	761.2	5.0689	43.7140	0.1160

**Table 15 – General Population Transmitter Summary**



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**2.2.3 Configuration 3 - WLAN**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.06 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	3	WLAN	2.000	100	10	2400.7	44.2067	129.0950	0.3424

**Table 16 – Occupational Transmitter Summary**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.13 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	3	WLAN	2.000	100	10	2400.7	9.4168	59.5823	0.1580

**Table 17 – General Population Transmitter Summary**



**2.2.4 Configuration 4 - LTE FDD 14 MIMO + WLAN**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.17 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	1	LTE FDD 14 MIMO	7.943	100	6	761.2	21.8722	90.8054	0.2409
2	1	3	WLAN	2.000	100	10	2400.7	5.5067	45.5629	0.1209

**Table 18 – Occupational Transmitter Summary**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.38 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	1	LTE FDD 14 MIMO	7.943	100	6	761.2	4.3775	40.6235	0.1078
2	1	3	WLAN	2.000	100	10	2400.7	1.1021	20.3834	0.0541

**Table 19 – General Population Transmitter Summary**

The following tables show the regional requirements for the frequencies used in the RF exposure calculation. A full list of the requirements is shown in Annex A.

Frequency (MHz)	Occupational Limit			General Population Limit		
	S Field (mW/cm <sup>2</sup> )	E Field (V/m)	H Field (A/m)	S Field (mW/cm <sup>2</sup> )	E Field (V/m)	H Field (A/m)
761.2	2.5373	-	-	0.5075	-	-
2400.7	5.0000	-	-	1.0000	-	-

**Table 20 – CFR 47 Pt1.1310 (2016) Limits**



**2.2.5 Configuration 5 - LTE FDD 14 SISO + WLAN**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.13 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	2	LTE FDD14 SISO	3.981	100	6	761.2	18.7458	84.0654	0.2230
2	1	3	WLAN	2.000	100	10	2400.7	9.4168	59.5823	0.1580

**Table 21 – Occupational Transmitter Summary**

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.28 m		
								S Field (W/m <sup>2</sup> )	E Field (V/m)	H Field (A/m)
1	1	2	LTE FDD14 SISO	3.981	100	6	761.2	4.0409	39.0304	0.1035
2	1	3	WLAN	2.000	100	10	2400.7	2.0299	27.6632	0.0734

**Table 22 – General Population Transmitter Summary**

The following tables show the regional requirements for the frequencies used in the RF exposure calculation. A full list of the requirements is shown in Annex A.

Frequency (MHz)	Occupational Limit			General Population Limit		
	S Field (mW/cm <sup>2</sup> )	E Field (V/m)	H Field (A/m)	S Field (mW/cm <sup>2</sup> )	E Field (V/m)	H Field (A/m)
761.2	2.5373	-	-	0.5075	-	-
2400.7	5.0000	-	-	1.0000	-	-

**Table 23 – CFR 47 Pt1.1310 (2016) Limits**



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## 2.2.6 Configuration 4 - LTE FDD 14 MIMO + WLAN

As the frequency of operation for each transmitter is not the same, in order to evaluate compliance with the limit which is dependent on frequency, the calculated RF exposure fields are divided by the limit to get a fractional exposure value. Any values less than one are compliant with the limit. Table 2 shows a summary of each antenna port and the summation of the fractional RF exposure results of each transmitter.

Antenna Port	EIRP (W)	Regional Requirement	Calculated RF exposure level at compliance boundary of 0.17 m as a Fraction of the Limit		
			S Field	E Field	H Field
1	7.943	FCC	0.8620	N/A	N/A
2	2.000	FCC	0.1101	N/A	N/A

**Table 24 – Occupational Antenna Port Summary**

Antenna Port	EIRP (W)	Regional Requirement	Calculated RF exposure level at compliance boundary of 0.38 m as a Fraction of the Limit		
			S Field	E Field	H Field
1	7.943	FCC	0.8626	N/A	N/A
2	2.000	FCC	0.1102	N/A	N/A

**Table 25 – General Population Antenna Port Summary**



**2.2.7 Configuration 5 - LTE FDD 14 SISO + WLAN**

As the frequency of operation for each transmitter is not the same, in order to evaluate compliance with the limit which is dependent on frequency, the calculated RF exposure fields are divided by the limit to get a fractional exposure value. Any values less than one are compliant with the limit. Table 2 shows a summary of each antenna port and the summation of the fractional RF exposure results of each transmitter.

Antenna Port	EIRP (W)	Regional Requirement	Calculated RF exposure level at compliance boundary of 0.13 m as a Fraction of the Limit		
			S Field	E Field	H Field
1	3.981	FCC	0.7388	N/A	N/A
2	2.000	FCC	0.1883	N/A	N/A

**Table 26 – Occupational Antenna Port Summary**

Antenna Port	EIRP (W)	Regional Requirement	Calculated RF exposure level at compliance boundary of 0.28 m as a Fraction of the Limit		
			S Field	E Field	H Field
1	3.981	FCC	0.7963	N/A	N/A
2	2.000	FCC	0.2030	N/A	N/A

**Table 27 – General Population Antenna Port Summary**



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## **SECTION 3**

### **DISCLAIMERS AND COPYRIGHT**





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### 3.1 DISCLAIMERS AND COPYRIGHT

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## **ANNEX A**

### **REGIONAL REQUIREMENTS**



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Frequency Range (MHz)	S Field (mW/cm <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0 - 0.3	-	-	-
0.3 - 3	100	614	1.63
3 - 30	$900/f^2$	$1842/f$	$4.89/f$
30 - 300	1	61.4	0.163
300 - 1500	$f/300$	-	-
1500 - 100000	5	-	-

**Table A.1 – CFR 47 Pt1.1310 (2016) Occupational Limits**

Frequency Range (MHz)	S Field (mW/cm <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0 - 0.3	-	-	-
0.3 - 3	100	614	1.63
3 - 30	$180/f^2$	$824/f$	$2.19/f$
30 - 300	0.2	27.5	0.073
300 - 1500	$f/1500$	-	-
1500 - 100000	1	-	-

**Table A.2 – CFR 47 Pt1.1310 (2016) General Population Limits**