RF Exposure Evaluation Report

APPLICANT	:	Motorola Solutions Inc.
EQUIPMENT	:	WAVE Two-Way Mobile Radio
BRAND NAME	:	Motorola Solutions
MODEL NAME	:	TLK150
MODEL NUMBER	:	HK2131A
FCC ID	:	AZ492FT7127
STANDARD	:	47 CFR Part 2.1091 FCC KDB 447498 D01 v06

We, Sporton International (Kunshan) Inc., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Rose Wang

Reviewed by: Rose Wang / Supervisor

Kat Yin

Approved by: Kat Yin / Manager

ACCREDITED Cert #5145.02

Sporton International (Kunshan) Inc.
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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA9N0421	Rev. 01	Initial issue of report.	Jan. 21, 2020
FA9N0421	Rev. 02	Update the equipment name.	Mar. 10, 2020

1. Administration Data

1.1. Testing Laboratory

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory		
Test Firm	Sporton International (Kunshan) Inc.	
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958	
Test Site No.	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CN1257	314309

Applicant	
Company Name	Motorola Solutions Inc.
Address	8000 West Sunrise Boulevard, Fort Lauderdale, Florida

Manufacturer	
Company Name	Motorola Solutions Malaysia Sdn. Bhd.
Address	Plot 2A, Medan Bayan Lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia.

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	WAVE Two-Way Mobile Radio
Brand Name	Motorola Solutions
Model Name	TLK150
Model Number	HK2131A
FCC ID	AZ492FT7127
Wireless Technology and Frequency Range	WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	RMC/AMR 12.2Kbps HSDPA HSUPA LTE: QPSK, 16QAM WLAN 2.4GHz 802.11b/g/n HT20/ HT40 WLAN 5GHz 802.11a/n HT20/ HT40 Bluetooth BR/EDR/LE
HW Version	P2
SW Version	TLK150_BASE_ENG_D03.00.32_APPS_D03.00.36
Antenna Type/ Gain	For WWAN antenna: External Antenna WCDMA Band V: 1.70 dBi WCDMA Band II: 2.80 dBi LTE Band 2 : 2.80 dBi LTE Band 4 : 2.50 dBi LTE Band 5 : 1.70 dBi LTE Band 7 : 1.10 dBi LTE Band 13 : 0.30 dBi LTE Band 17 : 0.90 dBi WLAN2.4GHz antenna: <2412 MHz ~ 2462 MHz > Chip Antenna with gain -0.1 dBi Bluetooth antenna: <2402 MHz ~ 2480 MHz > Chip Antenna with gain -0.1 dBi WLAN5GHz antenna: <5180 MHz ~ 5240 MHz > Chip Antenna with gain 1.9 dBi <5260 MHz ~ 5320 MHz > Chip Antenna with gain 1.8 dBi <5500 MHz ~ 5720 MHz > Chip Antenna with gain 0.9 dBi <5745 MHz ~ 5825 MHz> Chip Antenna with gain 0.1 dBi
EUT Stage	Identical Prototype
Remark: 1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for	

more detailed description.

3. Maximum RF average output power among production units

<WCDMA/LTE >

Mode		Maximum Average power(dBm)
WCDMA	Band II	25.00
	Band V	25.00
LTE	Band 2	25.00
	Band 4	25.00
	Band 5	25.00
	Band 7	25.00
	Band 13	25.00
	Band 17	25.00

<WLAN 2.4GHz>

Mode		Maximum Average Power (dBm)
2.4GHz	802.11b	19.00
	802.11g	15.50
	802.11n-HT20	14.00
	802.11n-HT40	12.00

<Bluetooth > For Bluetooth Module

Band / Mode	Average Power (dBm)			
	BR / EDR			LE
	1M	2M	3M	GFSK
Bluetooth	9.50	6.50	6.50	0.00

<WLAN 5GHz>

Mode		Maximum Average Power (dBm)
5.2GHz	802.11a	15.00
	802.11n-HT20	13.00
	802.11n-HT40	12.00
5.3GHz	802.11a	15.00
	802.11n-HT20	13.00
	802.11n-HT40	12.00
5.5GHz	802.11a	15.00
	802.11n-HT20	13.00
	802.11n-HT40	12.00
5.8GHz	802.11a	15.00
	802.11n-HT20	13.00
	802.11n-HT40	12.00

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

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 Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			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/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$\mathbf{S = \frac{PG}{4\pi R^2}}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
WCDMA Band 2	1852.4	2.80	25.00	27.80	0.60	602.56	0.120	1.000	0.120
WCDMA Band 5	826.4	1.70	25.00	26.70	0.47	467.74	0.093	0.551	0.169
LTE Band 2	1850.7	2.80	25.00	27.80	0.60	602.56	0.120	1.000	0.120
LTE Band 4	1710.7	2.50	25.00	27.50	0.56	562.34	0.112	1.000	0.112
LTE Band 5	824.7	1.70	25.00	26.70	0.47	467.74	0.093	0.550	0.169
LTE Band 7	2502.5	1.10	25.00	26.10	0.41	407.38	0.081	1.000	0.081
LTE Band 13	779.5	0.30	25.00	25.30	0.34	338.84	0.067	0.520	0.130
LTE Band 17	706.5	0.90	25.00	25.90	0.39	389.05	0.077	0.471	0.164
Bluetooth	2402.0	-0.10	9.50	9.40	0.01	8.71	0.002	1.000	0.002
2.4GHz WLAN	2412.0	-0.10	19.00	18.90	0.08	77.62	0.015	1.000	0.015
5.2GHz WLAN	5180.0	1.90	15.00	16.90	0.05	48.98	0.010	1.000	0.010
5.3GHz WLAN	5260.0	1.80	15.00	16.80	0.05	47.86	0.010	1.000	0.010
5.5GHz WLAN	5500.0	0.90	15.00	15.90	0.04	38.90	0.008	1.000	0.008
5.8GHz WLAN	5745.0	0.10	15.00	15.10	0.03	32.36	0.006	1.000	0.006

Note:

1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band
2. Chose the maximum power density to do MPE analysis.

5.2. Collocated Power Density Calculation

WWAN Power Density / Limit	WLAN 2.4GHz Power Density / Limit	WLAN 5GHz Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) of WWAN+ WLAN 2.4GHz	Σ(Power Density / Limit) of WWAN+ WLAN 5GHz	Σ(Power Density / Limit) of WWAN+ Bluetooth	Σ(Power Density / Limit) of WWAN+Bluetooth+ WLAN 5GHz
0.169	0.015	0.010	0.002	0.184	0.179	0.171	0.181

Note:

1. ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN 2.4GHz, WWAN + WLAN 5GHz,WWAN + Bluetooth and WWAN + Bluetooth + WLAN 5GHz.
2. Considering the WWAN collocation with the Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1.
3. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
4. According to the EUT character, WLAN 5GHz and Bluetooth can transmit simultaneously.
5. WLAN2.4GHz and Bluetooth share the same antenna, and they cannot transmit simultaneously each other.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.