Radio Frequency Exposure Evaluation Report

FOR:
Jio, Inc.

Model Number:
11062015

Product Description:
Jiobit Smart Tag Location Tracker

FCC ID: 2AKLI-080716

Applied Rules and Standards:
CFR 47 Part 2 (2.1093),
FCC KDB 447498 D01 General RF Exposure Guidance v06

Report number: EMC_JIOBI-002-20001_FCC_SAR_EX

DATE: 2021-01-20

A2LA Accredited

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1. Assessment

The following device was evaluated against the limits for general population uncontrolled exposure specified in CFR 47 Part 2.1093 according to SAR evaluation exclusion requirements specified in FCC regulation as listed in KDB 447498.

The device meets the requirements for SAR exclusion as stipulated by the above given FCC rules.

Company	Description	Model #
Jio, Inc.	Jiobit Smart Tag Location Tracker	11062015

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2021-01-20	Compliance	Cindy Li (Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2021-01-20	Compliance	Yuchan Lu (Test Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2021.01.20 18:39:46 -08'00'

2. Administrative Data

2.1. Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Lab Manager:	Cindy Li
Responsible Project Leader:	Cathy Palacios

2.2. Identification of the Client / Manufacturer

Client's Name:	Jio, Inc.
Street Address:	30 N LaSalle Suite 2630
City/Zip Code	Chicago, IL 60602
Country	USA

Manufacturer's Name:	Same as Client
Manufacturers Address:	
City/Zip Code	
Country	

3. Equipment under Assessment

Model No	11062015
HW Version	Revision A
SW Version	Release 8.75
FCC-ID	2AKLI-080716
Product Description	Jiobit Smart Tag Location Tracker
Device Category	☐ Fixed Installation ■ Mobile ☐ Portable ☐ Mixed Mobile and Portable
Frequency Range / number of channels	LTE Band 13: 777 – 787 MHz; BT LE: 2402(ch 0) – 2480(ch 39), 40 channels WLAN: 2400 MHz (ch 1) – 2483.5 MHz (ch 11), 11 channels
Type(s) of Modulation	LTE Band 13: QPSK Modulation Bluetooth version 4.0: GFSK modulation 802.11.b,g,n: BPSK, QPSK, 16 QAM, 64 QAM
Modes of Operation / Declared Output power	LTE Band 13 = 23.67 dBm Bluetooth LE= 8.68 dBm Average Power: WLAN = 17.17 dBm
Max. declared antenna gain	LTE Band 13: Planar Inverted-F, -5.5 dBi BTLE/WLAN: Planar Inverted-F, 1.24 dBi
Minimum distance of antenna or radiating parts to user	6.5 mm
Power Supply/ Rated Operating Voltage Range	Vmin: 2.9 V DC / Vmax: 4.35 V DC
Operating Temperature Range	-10 °C to 50 °C
Other Radios included in the device	N/A
Co-located Transmitters / Antennas	■ Yes ☐ No
Sample Revision	☐Prototype ■ Production ☐ Pre-Production
Exposure Category	☐ Occupational/ Controlled ■ General Population/ Uncontrolled

4. FCC Exemption Limits for Routine Evaluation

4.1. FCC SAR test exclusions per KDB 447498

KDB 447498 D01 General RF Exposure Guidance v06 Section: 4.3.1.
Standalone SAR test exclusion considerations states

4) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, 30 where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as *numeric thresholds.*

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

5. Stand-alone Transmission SAR Exclusion Evaluation

5.1. Justification for using the 6.5 mm Distance

The devise intends to be used on human body. The conservative distance of 6.5 mm is an estimate of how close a human body can be to the device in its typical application.

5.2. Justification for use of load based time averaging

The worst case loading for each of the radios was determined from the following information provided by the manufacturer:

EUT Operating Conditions

No simultaneous transmission of WIFI and cellular occurs due to algorithmic controls that allow only one to transmit at a time

No simultaneous transmission of WIFI and BT occurs since they are in the same module sharing several key RF components and circuits.

Co-transmission is only possible with Cellular and BT LE.

5.3. SAR Exclusion Calculation Table

FCC Standalone Transmission SAR Exclusion Calculations								
Band	**d [mm]**	**f [GHz]**	**Max Power + Tune Up [mW]**	**Source Based Duty Cycle**	**Load based duty cycle based on Maximum payload.[2]**	**Effective Time Average Max Power [mW]**	**FCC Limit [1] @ 6.5 mm [mW]**	**SAR Exclusion applicable (Yes/No)**
LTE Band 13	6.5	0.787	233	1	0.074	17.23	21.98	Yes
WiFi 2.4 GHz	6.5	2.4835	52	1	0.09	4.69	12.37	Yes
BTLE	6.5	2.48	7	1	0.05	0.37	12.38	Yes

Note 1: The FCC limit was derived by calculating the maximum output power passing the threshold for 1-g SAR exclusion

Note 2: RRC connection setup in LTE:

The connection setup is not be affected by our transmission control mechanism as there is not user plane data involved here.

MSG1 (RACH preamble) is a maximum 2.3 ms in length.

MSG3 (RRC connection request) is a maximum of 100 bits long. In worst-case resource allocation of 16 bits /ms this will lead to a 7 ms transmission time

MSG5 (RRC connection setup complete) is a maximum of 100 Bytes long. In worst-case resource allocation of 16 bits /ms this will lead to a 50 ms transmission time.

In case the RRC connection is not successful because the MSG5 does not get through, a conservative RRC timeout is defined by T300 with 800 ms. Only after this timer runs down the UE may attempt another connection requests.

59.3 ms in 800 ms leads to a worst-case duty cycle of **7.4%.**

All above values have been taken from the LTE physical layer standard 3GPP TS 36.213 and the LTE MAC layer standard 3GPP TS 36.321.

Transmission of user plane data over LTE:

Transmitting 26,300 bytes of user plane data at a worst-case resource allocation of 16 bits / ms will translate into 13.15 seconds transmission time. This will be used once per every 5-minute widow based on our control mechanism resulting in a maximum duty cycle of 4.4%. There is a chance of re-transmissions in the MAC layer (HARQ, ARQ) as well as a chance of retransmissions on TCP layer. If accounting for 50% retransmissions through ARQ, HARQ as well as on the TCP layer the resulting duty cycle is 6.6%

Transmission of user plane data over 802.11:

The minimum data rate in 802.11 is 1Mbit/second. 2,250,000 bytes will thus be transmitted within 18 s with a 50% retransmission rate the transmission will take 27 s. A maximum of one transmission in any 5-minute window will result in a duty cycle of **9%**

6. Simultaneous Transmission SAR Exclusion Evaluation

6.1. FCC 1-g Standalone Transmitter Calculation for Simultaneous Transmitter SAR Exclusion

Band	d [mm]	f [GHz]	Max Power + Tune Up [mW]	Source Based Duty Cycle	Load based duty cycle based on Maximum payload.	Effective Time Average Max Power [mW]	FCC 1-g SAR Exclusion calculation [W/kg]
LTE Band 13	6.5	0.787	233	1	0.074	17.23	2.35
WiFi 2.4 GHz	6.5	2.4835	52	1	0.09	4.69	1.14
BTLE	6.5	2.48	7	1	0.05	0.37	0.09

6.2. Simultaneous Transmission FCC 1-g SAR Exclusion calculation

Based on the information provided by the manufacturer there is only one mode of possible simultaneous transmission. The mode was evaluated against the FCC 1-g SAR exclusion threshold in the table below.

Transmission Mode	Simultaneous Transmission FCC 1-g SAR Exclusion calculation [W/kg]	FCC 1-g SAR Exclusion Threshold [W/kg]	SAR Exclusion applicable (Yes/No)
LTE B13 and BLE	0.3254	< 0.4	Yes

7. Revision History

Date	Report Name	Changes to report	Report prepared by
2021-01-20	EMC_JIOBI-002-20001_FCC _SAR_EX	Initial version	Yuchan Lu