



July 24, 2022

TUV SUD America CB
10 Centennial Drive FL2
Peabody, MA 01960

Attention: Director of Certification

RE: Analysis of RF Exposure per KDB 447498 D01 RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices v06 and RSS-102 Issue 5 March 2015.

FCC ID: ASU-DIRECTOR

ISED Certification Number IC: 10052A-DIRECTOR

1. General Information:

Applicant: Savant Systems, Inc.
Environment: General Population/Uncontrolled Exposure
Exposure Conditions: Mobile

2. Technical Information:

Minimum Test Separation Distance: 20 cm
Operating Frequency: 2402 MHz to 2480 MHz
Antenna Type: Wi-Fi Dual-band Stubby Antenna
Antenna Gain: 2.0 dBi
Maximum Transmitter Conducted Power: 6.1 dBm
Maximum Transmitter EIRP: 8.1 dBm

3. Limits:

Limits for General Population/Uncontrolled Exposure (Title 47 Subpart J §2.1091 and KDB 447498 D01 referring to limits under §1.1310)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Electric Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time (minutes)
0.3 - 1.34	614	1.63	*(100)	<30
1.34 - 30	824/f	2.19/f	*(180/f ²)	<30
30 - 300	27.5	0.073	0.2	<30
300 - 1500	-	-	f/1500	<30
1500 - 100,000	-	-	1.0	<30

f = frequency in MHz

*Plane-wave equivalent power density



Limits for Devices Used by the General Public (Uncontrolled Environment (RSS-102 Issue 5 March 2015))

Frequency Range (MHz)	Electric Field Strength (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003 - 10 ²¹	83	90	-	Instantaneous
0.1 - 10	-	0.73/f	-	6**
1.1 - 10	87/f ^{0.5}	-	-	6**
10 - 20	27.46	0.0728	2	6
20 - 48	-58.07/f ^{0.25}	0.1540/f ^{0.25}	8.944/f ^{0.5}	6
48 - 300	22.06	0.05852	1.291	6
300 - 6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}	6
6000 - 15000	61.4	0.163	10	6
15000 - 150000	61.4	0.163	10	616000/f ^{1.2}
150000 - 300000	0.158f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/f ^{1.2}

f is frequency in MHz

*Based on nerve stimulation (NS)

** Based on specific absorption rate (SAR)

4. Mobile MPE Calculation Summary using a 20cm separation distance:

Mode	Output Power	Power Density
BLE 5.1	4.07 mW	0.0013 mW/cm ²
Murata BLE	3.357 mW	0.0015 mW/cm ²
Murata WLAN 2.4GHz	75.162 mW	0.0343 mW/cm ²
Murata WLAN 5 GHz	148.252 mW	0.0882 mW/cm ²

Murata figures are from the original filing MPE Exhibit

5. Co-Located Transmitters transmission table:

Transmitter type	Transmitter type that can transmit at the same time
BLE 5.1	BLE 5.1 + BLE
BLE 5.1	BLE 5.1 + WLAN 2.4GHz
BLE 5.1	BLE 5.1 + WLAN 5 GHz

EUT contains FCC ID: VPYLB1ZM and IC: 772C-LB1ZM



6. Simultaneous Transmission MPE (BLE 5.1 + BLE 5.1 + BLE):

Transmitter type	MPE (mw/cm ²)	FCC Limit (mW/cm ²)	IC Limit (mW/cm ²)	FCC MPE ratio (MPE/Limit)	ISED MPE ratio (MPE/Limit)
BLE 5.1	0.0013	1.0	0.54351	0.0013	0.00239
BLE 5.1	0.0013	1.0	0.54351	0.0013	0.00239
Murata BLE	0.0015	1.0	0.54689	0.0015	0.00274
Sum of the ratios (should be <1.0)				0.0041	0.00753

7. Simultaneous Transmission MPE (BLE 5.1 + BLE 5.1 + 2.4GHz WLAN):

Transmitter type	MPE (mw/cm ²)	FCC Limit (mW/cm ²)	IC Limit (mW/cm ²)	FCC MPE ratio (MPE/Limit)	ISED MPE ratio (MPE/Limit)
BLE 5.1	0.0013	1.0	0.54351	0.0013	0.00239
BLE 5.1	0.0013	1.0	0.54351	0.0013	0.00239
Murata 2.4GHz	0.0343	1.0	0.54039	0.0343	0.06347
Sum of the ratios (should be <1.0)				0.0369	0.06826

8. Simultaneous Transmission MPE (BLE 5.1 + BLE 5.1 + 5GHz WLAN):

Transmitter type	MPE (mw/cm ²)	FCC Limit (mW/cm ²)	IC Limit (mW/cm ²)	FCC MPE ratio (MPE/Limit)	ISED MPE ratio (MPE/Limit)
BLE 5.1	0.0013	1.0	0.54351	0.0013	0.00239
BLE 5.1	0.0013	1.0	0.54351	0.0013	0.00239
Murata 5GHz	0.0882	1.0	0.96582	0.0882	0.09132
Sum of the ratios (should be <1.0)				0.0908	0.09611

9. FCC Mobile MPE Calculation Nordic BLE 5.1 using a 20cm separation distance:

Using Power Density formula:

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

where: S = power density

P = power input to the antenna



G = power gain of the antenna in the direction of interest relative to isotropic
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	6.10	(dBm)
Maximum peak output power at antenna input terminal:	4.07	(mW)
Antenna gain(typical):	2	(dBi)
Maximum antenna gain:	1.585	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2402	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.544	(mW/cm ²)
Power density at prediction frequency:	0.00128	(mW/cm ²)
Power density at prediction frequency:	0.013	(W/m ²)
Margin of Compliance:	-26.26	(dB)

Calculation Note: ISED calculation only presented as FCC limit at this frequency is less stringent (1.0 mW/cm²). Margin of compliance is -28.91dB for FCC and -26.26dB for ISED.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ferdie S. Custodio', written over a horizontal line.

Ferdie S. Custodio

Name

Authorized Signatory

Title: Senior EMC Test Engineer /Wireless Team Lead