APPENDIX C - RF EXPOSURE EVALUATION

Maximum Permissible Exposure (MPE)

Applicable Standard

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
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

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Procedure

Prediction of power density at the distance of the applicable MPE limit
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Measurement Result

For Radar:

Frequency (GHz)	Peak EIRP including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBm)	(mW)			
76-81	2	1.58	20	0.001	1.0

The devices contain a certified BLE module, FCC ID: 2ABN2-BG22A3:

Operation Modes	Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	-0.02	1.00	5.97	3.95	20.00	0.0008	1.0

The BLE and Radar can transmit simultaneously:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$=S_{BLE}/S_{limit-\ BLE}+ S_{Radar}/S_{limit-\ Radar}$

=0.001/1+0.0008/1

=0.0018

< 1.0

Result: The device meet FCC MPE at 20 cm distance.

Exemption Limits For Routine Evaluation-RF Exposure Evaluation

Applicable Standard

According to RSS-102 Clause 2.5.2:

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

• below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

• at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;

• at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);

• at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

• at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Calculated Data:

For Radar:

Frequency (GHz)	Peak EIRP including Tune-up Tolerance		Exemption limits (mW)
	(dBm)	(mW)	
76-81	2	1.58	5000

Note:The Conducted output power including Tune-up Tolerance provided by manufacturer.

The devices contain a certified BLE module, IC: 23949-BG22A3

Frequency (MHz)	Conducted Output power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	EIRP		Exemption limits (mW)
			dBm	mW	
2402-2480	5.97	-0.02	5.95	3.94	2676

Result: Compliant, the device is compliance exemption from Routine Evaluation Limits –RF exposure Evaluation.

******* END OF REPORT *******