

RF Exposure evaluation

Applicant Data: Sensolus
 Moutstraat 54
 9000 Gent
 Belgium

Product Data: NBIOT GPS asset Tracker
 TRACK1100R2
 Sensolus

 with Bluetooth Low Energy and
 mobile 20cm
 General Population/Uncontrolled

FCC ID: 2AQYP-TRACK1100R2

Standards
OET Bulletin 65 Edition 97-01 August 1997

FCC CFR 47, Part 2.1091: Radiofrequency radiation exposure evaluation: mobile devices.
FCC CFR 47, Part 2.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
FCC CFR 47, Part 2.1310: Radiofrequency radiation exposure limits.

RF Exposure evaluation

Maximum Permissible Exposure

As specified in Chapter e(1) of 47 CFR Part 1.1310 – Limits for Maximum Permissible Exposure (MPE)

Table (ii) – Limits for General Population/ Uncontrolled Exposure

Frequency range (MHz)	Power density (mW / cm ²)
300 – 1500	f/1500
1500 - 100000	1.0

Calculations

Equation OET bulletin 65, page 18, edition 97-01:

$$S = P * G / (4 * \pi * R^2)$$

$$R = \sqrt{ (P * G / S_{lim} * 4 * \pi) }$$

$$G = S_{lim} * 4 * \pi * R^2 / P$$

Where:

S = power density (mW/cm²)

P = power input to the antenna (mW)

G = power gain of the antenna (mW)

R = distance to the centre of radiation of the antenna (cm)

S_{lim} = FCC / IC Limit (mW/cm²)

Simultaneous Transmission Considerations

The calculation below is used to consider situations in which simultaneous exposure to fields of different frequencies occur. The calculation is performed by the sum of each relative exposure for each equipment according to the following criteria.

$$\sum_{1}^N \frac{S_{eqn}}{S_{Limn}} = \frac{S_{eq1}}{S_{Lim1}} + \frac{S_{eq2}}{S_{Lim2}} + \dots + \frac{S_{eqN}}{S_{LimN}} \leq 1$$

Where:

S_{eq} = S = power density (mW/cm²)

S_{lim} = FCC / IC Limit (mW/cm²)

RF Exposure evaluation

Assessment

For FCC

With:

Antenna:

custom PCB track antenna (max. gain: 2,33 dBi)

Antenova SR4L002 (integral) (max. gain: 2,5 dBi)

Modul:

STMicroelectronics BLUENRG-248 (not certified)

Quectel BC66-NA (precertified under FCC ID: XMR201907BC66NA)

			G		P		P*G	S	Slim	Seq / Slim	
Operational Bands	Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain - numeric- (mW)	Output Power -conducted- (dBm)	Output Power -conducted- (mW)	Output power (EIRP) (dBm)	Output Power (EIRP) (mW)	Power Density value (mW/cm ²)	FCC Limit (mW/cm ²)	Relative Power Density value	Margin to FCC Limit (mW/cm ²)
BLE	2402	2,33	1,7100	6,90	4,90	9,23	8,38	0,0017	1,0000	0,0017	0,9983
Cat NB2 B2	1850	2,5	1,7783	25,00	316,23	27,50	562,34	0,1119	1,0000	0,1119	0,8881
Cat NB2 B4	1710	2,5	1,7783	25,00	316,23	27,50	562,34	0,1119	1,0000	0,1119	0,8881
Cat NB2 B12	699	2,5	1,7783	25,00	316,23	27,50	562,34	0,1119	0,4660	0,2401	0,3541
Cat NB2 B13	777	2,5	1,7783	25,00	316,23	27,50	562,34	0,1119	0,5180	0,2160	0,4061

Distance to Antenna (R) in cm: 20

Simultaneous (if applicable):

	1 st Technology BTLE	2 nd Technology NB-IOT
(Seq / Slim)	0,0017	0,2401
Sum of (Seq / Slim) BT+NB-IOT	0,2418	
Limit	1,0	
Conclusion	passed	

Note 1: only worst-case values are listed in the table above

Note 2: the duty cycle correction factor is already included in the measurement values