RF Exposure Analysis – Routine Evaluation Exemption

Applicant: ABB S.p.A.
FCC ID: 2AW2L-TSENSEAMB
Model number/name: T-Sense Ambient

The above device operates in the 2402-2483.5 MHz frequency band (BLE).

The following FCC Rule Parts are applicable:
Part 2.1091 – Radiofrequency radiation exposure evaluation: mobile devices

Part 1.1307(b)(3)(i)(A) – 1 mW Blanket Exemption (i)

Part 1.1307(b)(3)(i)(C) – MPE-based Exemption (ii)

Part 1.1307(b)(3)(i)(B) – SAR-based Exemption (iii)

For the above device:

Transmitter frequency range = 2402 MHz to 2483.5 MHz

Maximum Conducted Power = 7.42 dBm (including tune-up tolerance)

Antenna gain: 2.7 dBi

Duty Cycle: 100 %

EIRP = 7.42 dBm + 2.7 dBi = 10.12 dBm

ERP = EIRP - 2.15 dBm = 7.97 dBm (6.27 **mW**)

Minimum separation distance (R) to be considered: **0.2 m**

Evaluation:

RF exemption applies if the maximum time-averaged transmitted power is less than the maximum of the following three criteria:

i) Less than 1 mw Blanket exemption. P_{TH} = 0.001 W – §1.1307(b)(3)(i)(A) – not met
ii) determination of exemption under the MPE-based §1.1307(b)(3)(i)(C), if i) not met - met
iii) determination of exemption under the SAR-based §1.1307(b)(3)(i)(B) if both i) and ii) are not met;

Determination of exemption under the MPE-based §1.1307(b)(3)(i)(C):

This is only applicable at a separation distance greater than λ/2π and at frequencies from 0.3 MHz to 100 GHz.

For 2.4 GHz operation: λ/2π = 0.02 m
It follows that this clause is applicable since the separation distance (R) equals **0.2 m** which is greater than **0.02 m**.

Threshold ERP P_{TH} (watts) for the frequency range of 1.5-100 GHz: $19.2 * R^2$

R = 0.2 m

$P_{TH} = (19.2 * 0.2^2)$ W = 0.768 W (**768 mW**)

Determination of exemption under the SAR-based §1.1307(b)(3)(i)(B):

This method shall only be used at separation distances from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz.

$$Pth\ (mW) = \begin{cases} ERP_{20cm} * (d/20\ cm)^x & d\ \leq 20cm \\ ERP_{20cm} & 20cm\ < d\ \leq 40cm \end{cases}$$

Where

$$x = -log10\left(\frac{60}{ERP_{20cm} * \sqrt{f}}\right) \qquad and\ f\ is\ in\ GHz$$

and

$$ERP_{20cm}\ (mW) = \begin{cases} 2040 * f & 0.3\ GHz\ \leq f\ < 1.5\ GHz \\ 3060 & 1.5\ GHz\ \leq f\ \leq 6\ GHz \end{cases}$$

For a minimum separation distance of 0.2 m, the threshold for operation at 2.4 GHz is 3060 mw

Conclusion:

The maximum ERP of **6.27 mW** is below the applicable **768 mW** threshold for operation at 2.4GHz, and therefore the above device is exempt from evaluation in accordance with §1.1307(b)(3)(i)(C).

Certification Body

UL International (UK) Ltd