

Appendix A: RF Exposure FCC Part 1.1307, 1.1310, 2.1091, 2.1093; ISED RSS-102

1. Introduction

This report evaluates RF exposure compliance of the Bluetooth Low Energy (BLE) transmitter integrated into the CSM-200. Evaluation is performed in accordance with:

- FCC 47 CFR §1.1307
- 47 CFR §1.1310
- 47 CFR §2.1091 (Mobile Devices)
- OET Bulletin 65
- ISED RSS-102 Issue 6

The BLE transmitter is classified as a Mobile RF device. The user manual specifies a minimum separation distance of 20 cm between the radiator and the user. Portable exposure conditions (<20 cm) are not permitted. Accordingly, RF exposure compliance is demonstrated only by the Mobile MPE evaluation at 20 cm.

2. RF Exposure Calculations

The maximum permissible RF exposure for the general population/uncontrolled environment is specified in 47 CFR §1.1310 Table 1B for FCC and RSS-102 Issue 6 for ISED.

From OET 65, $S = \text{EIRP} / 4\pi R^2$

where:

S = Power density (mW/cm²)

EIRP = Equivalent Isotropic Radiated Power
R = 20 cm separation distance

3. Power Density for BLE

The maximum rated conducted power is 2.8 dBm, with an additional 1 dB tuning tolerance, for a total of 3.8 dBm. The maximum antenna gain is -1 dBi. Therefore, the conservative mobile MPE evaluation, the worst-case conducted power (2.4 mW), is used directly in the power density calculation.

TX	Transmit Frequencies (MHz)	FCC General/Uncontrolled Exposure Limits	ISED General Population RSS-102 Issue 6: General Exposure Limits.
		FCC Limit (mW/cm ²)	ISED Limit (mW/cm ²)
Bluetooth LE	2402 – 2480.5	1.0	0.54

4. Power Density Calculation at 20 cm

From OET 65:

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

Where:

- $P = 2.4\text{mW}$
- $R = 20\text{cm}$

$$4\pi R^2 = 4\pi(20^2) = 5026.55 \text{ cm}^2$$

$$S = \frac{2.4}{5026.55}$$

$$S = 0.000477 \text{ mW/cm}^2$$

5. Comparison to Exposure Limits

- **FCC Limit:** 1.0 mW/cm²
- Calculated value: 0.000477 mW/cm²

The calculated exposure level is approximately 2,100 times below the FCC limit.

- **ISED Limit:** 0.54 mW/cm²
- Calculated value: 0.000477 mW/cm²

The calculated exposure level is approximately 1,130 times below the ISED limit.

6. FRL/MPE Compliance Classification

The BLE transmitter is classified as a mobile device. The user manual mandates a minimum separation distance of 20 cm from the user, and operation at distances less than 20 cm is not permitted. Accordingly, portable exposure evaluation (FRL or SAR testing at separation distances less than 20 cm) does not apply to this device. RF exposure compliance is demonstrated solely through the mobile MPE/FRL evaluation at 20 cm using EIRP, as documented in Sections 3 through 5 above.

7. Conclusion

The BLE transmitter complies with all applicable MPE/FRL limits for mobile devices under both FCC and ISED requirements at the minimum separation distance of 20 cm. No additional RF exposure evaluation is required.

8. Compliance Statement

The BLE transmitter in the CSM-200 complies with FCC and ISED RF exposure requirements for the general population under uncontrolled exposure conditions at a minimum separation distance of 20 cm. No additional RF exposure testing is required.