FCC§15.247 (i), §1.1307 (b) (1) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance.

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Measurement Result

LoRa Mode:
For Master Condition:

Frequency (MHz)	Maximum Tune-up peak power (mW)	Duty cycle (%)	Time-base Average power (mW)	Threshold (1-g SAR) (mW)	SAR Test Exclusion
927.5	1000	1.06	10.6	15.58	Yes

Note 1: The worst case duty cycle is (60 ms+600ms)/ (60ms+2000ms+60000ms)=0.0106

For Client Condition:

Frequency (MHz)	Maximum Tune-up peak power (mW)	Duty cycle (%)	Time-base Average power (mW)	Threshold (1-g SAR) (mW)	SAR Test Exclusion
927.5	1000	1.0	10.0	15.58	Yes

Note 1: The duty cycle is 600 ms/ 60000ms=0.01

For BLE mode:

Mode	Frequency (MHz)	Max Tune-up Conducted Power (dBm)	Max Tune-up Conducted Power (mW)	Calculated Distance (mm)	Calculated value	Threshold (1-g SAR)	SAR Test Exclusion
BLE	2480	-2.0	0.63	5	0.2	3.0	Yes

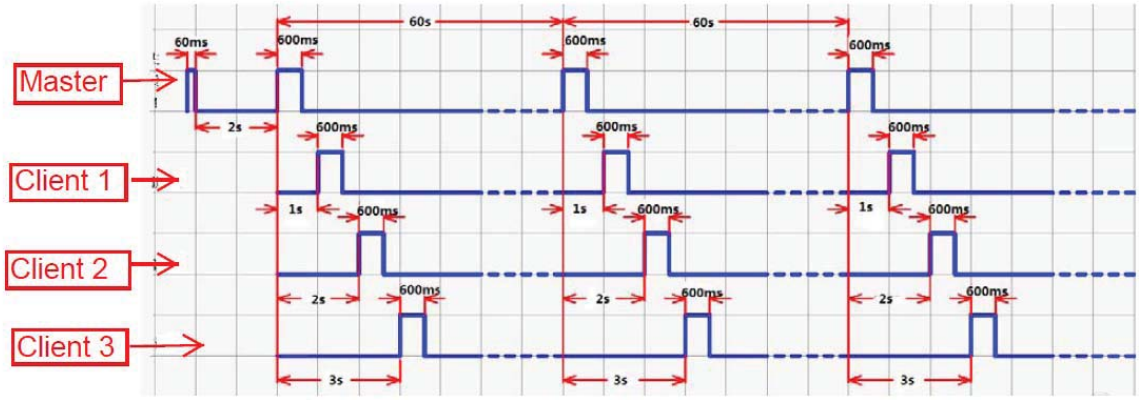
Simultaneous transmitting consideration:

When standalone SAR exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR exclusion:
For BLE mode:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)/x]=0.63mW/5*(√2.48GHz/7.5)=0.026 W/kg < 1.6 W/kg
Where x=7.5 for 1-g SAR.

For LoRa mode:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)/x]=10.6mW/5*(√0.9275GHz/7.5)=0.272 W/kg < 1.6 W/kg
Where x=7.5 for 1-g SAR.

The ratio=RF Expouser$_{BLE}$/limit + RF Expouser$_{LoRa}$/limit=0.026/1.6+0.272/1.6=0.19＜1.0, simultaneous exposure is not required.

LoRa duty cycle:



Result: No SAR test is required