

Simultaneous transmission exclusion calculation

The 418 / 433.92MHz radio link can transmit at the same time as the cellular radio. According to the manufacturer it is used for the system activation, status updates and administration purposes. The cellular radio was measured for 10-g extremity SAR but the 418 / 433.92MHz radio met the standalone SAR exclusion threshold. The calculations below address the simultaneous transmission condition for SAR exclusion.

Estimated Standalone SAR for 418/433.92MHz radio:

According to KDB447498 Section 4.3.2 (b) for simultaneous transmission SAR test exclusion, when an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

$$\left[\frac{\text{(max. power of channel, including tune-up tolerance, mW)}}{\text{(min. test separation distance, mm)}} \right] \cdot \sqrt{f(\text{GHz})/x} \text{ W/kg, for test separation distances } \leq 50 \text{ mm}$$

where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

In order to estimate the stand alone SAR for the 418 / 433.92MHz radio the following values are used:

- Max power of channel: 2mW (estimated from field strength reading)
- Min test distance: 5mm
- F(GHz): 0.43392GHz
- X: 18.75 (for 10-g SAR)

Estimated Standalone 10-g SAR for 418 / 433.92MHz radio is therefore:

$$(2\text{mW} / 5\text{mm}) \times (0.66 / 18.75) = 0.4 \times 0.0352 = 0.01\text{W/kg}$$

Simultaneous SAR exclusion (418/433.92MHz radio and cellular radio):

The worst case measured 10-g SAR from the cellular radio was **0.62W/kg** (see SAR report for details)

The estimated worst case SAR from the 418 / 433.92MHz radio was **0.01W/kg**

The combined 10-g SAR between these two radios is $0.62\text{W/kg} + 0.01\text{W/kg} = 0.63\text{W/kg}$.

Conclusion:

Since the sum of the worst case 10-g SAR value for the cellular radio and worst case estimated 10-g SAR value is less than the 10-g SAR limit (4W/kg), the simultaneous transmit condition is excluded from the actual SAR test.

