

RF exposure Estimation

Introduction

S1-Z (FCC ID: 2AK7XS1-Z) is a Photoelectric Smoke Alarm operating at 908.4MHz, 916MHz.

1. Limit and Guidelines on Exposure to Electromagnetic Fields

According to 4.3 General SAR test exclusion guidance of KDB 447498 RF Exposure, no SAR required if power is lower than the flowing threshold:

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:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})]$

$[\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation²⁵
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.3 is applied to determine SAR test exclusion.

2. Calculation method

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$

According to ANSI C63.10-2013 (9.5 Equations to calculate EIRP),

For 908.4MHz.

Field Strength (E_{Meas}):	77.15 (dBuV/m) ($f=908.4\text{MHz}$)
Measurement Distance(d_{Meas}):	3 (m)
Equivalent Isotropically Radiated Power(EIRP):	0.000001(mW)

$$0.000001 \leq 3.0$$

For 916MHz.

Field Strength (E_{Meas}):	83.52 (dBuV/m) ($f=916\text{ MHz}$)
Measurement Distance(d_{Meas}):	3 (m)
Equivalent Isotropically Radiated Power(EIRP):	0.000009(mW)

$$0.000001 \leq 3.0$$

Therefore, excluded from SAR testing.

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