

RF EXPOSURE ANALYSIS

EQUIPMENT

Type of equipment:	ZigBee radio module
Type / Model:	ICC-1
Brand name:	IKEA
Manufacturer:	IKEA of Sweden AB
By request of:	IKEA of Sweden AB Box 702 343 81 Älmhult Sweden

Operating range: 2405 – 2480 MHz

REQUIREMENT

EN 62479:2010
CFR 47 §1.1310
RSS-102 issue 5 (2015)

SUMMARY

The purpose is to analyse rf exposure compliance with FCC rules and RSS standards in portable and mobile conditions. Portable usage is limited to limb-worn conditions.

CALCULATIONS

Portable requirement calculations:

Highest declared conducted output power is 14 dBm or 25.1 mW.
With a maximum duty cycle of 24 % the average conducted output power is
 $25.1 \times 0.24 = 6.0$ mW.

With -2.5 dBi antenna gain EIRP is 11.5 dBm or 14 mW.

All values in table 1 are based on the average conducted output power.

Note:

Highest measured output power to antenna is 13.1 dBm peak.
With -2.5 dBi antenna gain EIRP is 10.6 dBm or 11.5 mW.

Mobile requirement calculations:

A worst case calculation for Maximum Permissible Exposure (MPE) is as follows:

$$S = \frac{dc \times EIRP}{4 \times \pi \times r^2}$$

Where:

dc = duty cycle, 24 %

EIRP = 14 dBm

r = distance to the center of radiation of the antenna, 20 cm

This gives:

$$S = 0.24 \times 14 / (4 \times \pi \times 20^2) = 0.0007 \text{ mW/ cm}^2$$

Reference report:

Intertek Radio Test Report 1516318STO-001.

LIMITS & EVALUATIONS:**Portable limits**

Standard	Reference for limit	Limit	Unit	Values	Result
EN 62479	EN 62479 ¹	40	mW	6.0	PASS
CFR 47 §1.1310	KDB 447498 D01 ²	7.5	N/A	1.9	PASS
RSS-102 issue 5 (2015)	RSS-102 issue 5 (2015) ³	10	mW	6.0	PASS

Table 1

¹From Table A.1 for general public and limbs exposure.

²10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by: $[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 7.5$. Test separation distance is taken as 5 mm and maximum power is 6.0 mW at 2.445 GHz.

³Section 2.5.1, table 1, based on a separation distance of 5 mm and frequency of 2450 MHz.

Mobile limits

Standard	Reference for limit	Limit	Unit	Values	Result
CFR 47 §2.1091	CFR 47 §1.1310 ¹	1.0	mW/cm ²	0.0007	PASS
RSS-102 issue 5 (2015)	RSS-102 issue 5 (2015) ²	2712.9	mW	14	PASS

Table 2

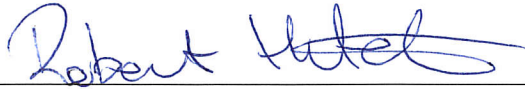
¹From table 1, section "(B) Limits for General Population/Uncontrolled Exposure" for frequency range 1,500 – 100,000 MHz in CFR §1.1310.

²Section 2.5.2, at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} \cdot f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz and taken as 2450 MHz.

Conclusion:

All requirements are fulfilled

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