

RF EXPOSURE ANALYSIS

EQUIPMENT

Type of equipment:	Data Collection Unit
Brand name:	SCA
Type / Model:	DCU / 682860
Manufacturer:	SCA Hygiene products AB
By request of:	SCA Hygiene products AB

Operating frequency: 2405 MHz

REQUIREMENT

CFR 47 §1.1310
RSS-102 issue 5 (2014)
Radiocommunications (Electromagnetic Radiation — Human Exposure) Standard 2014

CALCULATIONS

2,4 GHz radio's Highest output power to antenna is 1.4 dBm
With +2 dBi antenna gain EIRP is 3.4 dBm or 2.2 mW

850 MHz cellular radio's highest output power to antenna is 1.904 W or 32.79 dBm
With +1 dBi antenna gain EIRP is 33.79 dBm or 2.39 W

1900 MHz cellular radio's radio's highest output power to antenna is 0.964 W or 29.84 dBm
With +2.0 dBi antenna gain EIRP is 31.84 dBm or 1.53 W

A test separation distance of 20 cm is used.

A worst case calculation is as follows:

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

Maximum power densities are

$$S = 0.0022 / (4 \times \pi \times 0,2^2) = 0.0044 \text{ W/m}^2 = 0.00044 \text{ mW/cm}^2 \text{ at 2405 MHz}$$

$$S = 2.39 / (4 \times \pi \times 0,2^2) = 4.761 \text{ W/m}^2 = 0.476 \text{ mW/cm}^2 \text{ at 824.2 MHz}$$

$$S = 1.53 / (4 \times \pi \times 0,2^2) = 3.044 \text{ W/m}^2 = 0.344 \text{ mW/cm}^2 \text{ 1850.2 MHz}$$

LIMITS & EVALUATIONS:

Standard	Limit	Unit	Values	Result
CFR 47 §1.1310	1	mW / cm ²	0.0004 at 2405 MHz	PASS
CFR 47 §1.1310	824.2 / 1500	mW / cm ²	0.549 at 824.2 MHz	PASS
CFR 47 §1.1310	1	mW / cm ²	0.344 at 1850.2 MHz	PASS

Simultaneous transmission

KDB 447498 D01 section 7.2: Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

GSM 850 and 2.4 GHz transmitter transmitting simultaneously
 $0.476/(824.2/1500) + 0.00044/1 = 0.866$

GSM 1900 and 2.4 GHz transmitter transmitting simultaneously
 $0.344/1 + 0.0004/1 = 0.344$

The EUT is exempted from rf-evaluation in simultaneous transmission

RSS 102

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment) between 300 and 6000 MHz is $0.02619 f^{0.6834} \text{ W / m}^2$.

Standard	Reference for limit	Limit	Unit
RSS-102 issue 5 (2014) section 2.5.2	$0.02619 f^{0.6834}$	5.35 at 2405 MHz	W/m ²
RSS-102 issue 5 (2014) section 2.5.2	$0.02619 f^{0.6834}$	2.576 at 824.2 MHz	W/m ²
RSS-102 issue 5 (2014) section 2.5.2	$0.02619 f^{0.6834}$	4.476 at 1850.2 MHz	W/m ²

The EUT doesn't fulfil requirement in 20 cm distance.

Minimum safe use distance is $(\text{EIRP} / 4\pi S)^{0.5}$

Frequency (MHz)	Limit	Use distance	Unit
2405	5.355	0.20	m
824.2	2.576	0.28	m
1850.2	4.476	0.20	m

Minimum safe use distance for EUT per RSS 102 issue 5 is 28 cm.

For simultaneous transmission of GSM 850 and 2,4 GHz transmitter minimum safe use distance is 28 cm.

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