7 Annex A: MPE calculation

7.1 Antenna configurations

The EUT can be used with different antenna configurations:

- Internal PCB-antenna
- External window-antenna
- External roof-antenna

The EUT is equipped with a switching MCX-connector to switch between internal and external antenna.

Maximum conducted output power configurations:

850 MHz:	GPRS multi-slot class 12	1.549 W
1900 MHz:	GPRS multi-slot class 12	0.813 W

Maximum antenna gain for internal PCB-antenna

850 MHz:	Gain -0.3 dBi
1900 MHz:	Gain 0.5 dBi

Maximum antenna Gain for external window-antenna (datasheet in chapter 7.3)

850 MHz:	Gain 2.15 dBi
1900 MHz:	Gain 2.15 dBi

Maximum antenna Gain for external roof-antenna (datasheets in chapter 7.3)

850 MHz:	Gain 11.0 dBi	(antenna)
1900 MHz:	Gain 11.0 dBi	(antenna)

This antenna will be delivered with 10 m antenna cable and an attenuator of 3 dB.

So the effective gain can be calculated as follows:

Gain = Gain(Antenna) – Attenuation(attenuator) – Attenuation(cable)

850 MHz: **Gain(eff) =** 11 dBi – 3 dBi – 10*0.45 dB/m **= 3.5 dBi**

1900 MHz: **Gain(eff) =** 11 dBi – 3 dBi – 10*0.72 dB/m **= 0.8 dBi**

7.2 MPE calculation

Maximum possible radiated output power configurations

850 MHz: 31.9 dBm + 3.5 dBi = 35.4 dBm = 3467 mW (EIRP) = 2118 mW (ERP) (with roof-antenna)

1900 MHz: 29.1 dBm + 2.15 dBi = 31.25 dBm = 1334 mW (EIRP) (with window-antenna)

Maximum permissive exposure (MPE)

850 MHz: Limit 0.57 mW/cm²

$PD = P_{rad} * DF / (4 * Л * r²)$

PD = 3467 mW * 0.5 / (4 * Л * 20² cm²)

PD = 0.345 mW/cm²

Result: The device complies with the rules for a distance of 20 cm.

1900 MHz: Limit 1.00 mW/cm²

$PD = P_{rad} * DF / (4 * Л * r²)$

PD = 1334 mW * 0.5 / (4 * Л * 20² cm²)

PD = 0.133 mW/cm²

Result: The device complies with the rules for a distance of 20 cm.

PD = Power Density
P_{rad} = Maximum radiated output power in mW
DF = Duty factor
r = Distance in cm