



MEMO

NORTEL CONFIDENTIAL

Date: 14 / February / 2007
To: To Whom It May Concern
Copy:
From: Product Approvals Team
Subject: Health protection and BTS Radiation hazards
Reference: Nortel/PA/05015/V02.01

1. Introduction

This memo provides inputs with regard to the assessments of Health protection and radiation hazards expected from Nortel GSM 18000 BTS Indoor compliant with the North American requirements (FCC OET Bulletin 65) through calculation as described below.

2. Radiation hazards

a. BTS radiations

The maximum radiated power level authorized by the EMC specifications is:

- -36 dBm (or $E=2.7$ mV/m) for frequencies between 30 MHz and 1 GHz,
- -30 dBm (or $E=5.4$ mV/m) for frequencies above 1 GHz.

According to FCC OET bulletin 65, the power density is linked to the E field by the relation $S=E^2/3770$.

As a consequence, the maximum power density radiated by the BTS will be:

- $S=1.9*10^{-9}$ mW/cm² for frequencies between 30 MHz and 1 GHz,
- $S=7.9*10^{-9}$ mW/cm² for frequencies above 1 GHz.

The North American Maximum Permissible Exposure (MPE) levels for general population (uncontrolled exposure areas) are defined in the table below:



Frequency range (MHz)	MPE (S, mW/cm ²)
30 – 300	0.2
300 – 1500	f/1500
1500 – 12750	1.0

b. Radiation of a system

Considerations:

- BTS configured with 1 Power Amplifier (PA) by sector, PA configured at maximum output power (60 Watts for the GSM 850MHz band, and 45 Watts for the GSM 1900MHz band).
- DDM losses # 0,53 dB.
- Feeder losses # 1 dB.
- Antenna gain G=18 dBi # 63.

The power delivered to the antenna (per PA) is given by:

$P_{(850\text{MHz})} = \text{PA_power} - \text{DDM_losses} - \text{Feeder_losses} \# 46.25$
dBm (or 42.17 Watts).

$P_{(1900\text{MHz})} = \text{PA_power} - \text{DDM_losses} - \text{Feeder_losses} \# 45$
dBm (or 31.6 Watts)

As described in FCC OET Bulletin 65, the power density can be estimated by $S = P \cdot G / 4\pi R^2$ where R is the distance to the source (the antenna).

The Maximum Permissible Exposure (MPE) level for uncontrolled access locations is $S = 0.56 \text{ mW/cm}^2$ at the frequency of GSM 850 signal, and $S = 1 \text{ mW/cm}^2$ at the frequency of GSM 1900 signal.

As a consequence, the safe distance approach is with the aforementioned considerations $R = 6.1 \text{ m}$ when using the GSM band 850MHz, and $R = 3.98 \text{ m}$ when using the GSM band 1900MHz.

This distance is the one at which the limit level will be reached in the main beam of the antenna and would usually be achieved by the fact that this antenna is mounted on a pole.

3. Conclusion

As demonstrated before, it is deemed that Nortel 850/1900 MHz GSM 18000 Indoor BTS complies with the general requirements (FCC OET bulletin 65) for health protection.

It should also be noted that exposures inside a building can be expected to be reduced by at least 10 to 20 dB due to the attenuation caused by building materials in the wall and roof of the building (source : FCC OET Bulletin 65).

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