NORTEL

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To To Whom It May Concern

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From Product Approvals Team

NORTEL CONFIDENTIAL

Subject Health protection and BTS Radiation hazards for S8000 and S12000
Reference Nortel/PA/05026

1. Introduction

This memo provides inputs with regard to the assessments of Health protection and radiation hazards expected from Nortel S8000 and S12000 BTS equipped with high power amplifier HePA, operating in the 1900 Mhz and 850 Mhz band, compliant with the North American requirements (FCC OET Bulletin 65) through calculation as described below.

Note: HePA may be configured with Diplexer or 2 ways combiner H2D or 4 ways combiner H4D in the same configurations of S12000 and S8000 BTS. Therefore, the same evaluation may be used for these equipments.

2. Radiation hazards

a. iBTS 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 iBTS 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/cm²)
30 – 300	0.2
300 – 1500	f/1500
1500 – 12750	1.0

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b. Radiation of a system

The power delivered to the antenna (per PA) is given by
P(antenna) (in Watts)= (PA(power)– losses) x G(antenna)

Different power amplifier(s) and coupling configuration :

- Diplexer : 1 Power Amplifiers (PA) in a sector,
  PA configured to deliver maximum output power 47.8 dbm (60W) with GMSK modulation, Diplexer loss is 0dB.
  Therefore power output is : 47,8 dBm
- H2D diplexer : 2 Power Amplifiers (PA) in a sector,
  Pas configured to deliver maximum output power 47.8 dbm (60W) with GMSK modulation. H2D power loss is 3dB.
  Therefore power output is :
  47,8 dBm +3dB (2 Pas) – 3dB (loss)= 47,8dBm
- H4D diplexer : 4 Power Amplifiers (PA) in a sector,
  Pas configured to deliver maximum output power 47.8 dbm (60W) with GMSK modulation. H4D power loss is 7dB.
  Therefore power output is :
  47,8dBm +6dB (4 Pas) –7dB (loss)=46,8dBm
- Feeder and jumper losses # 1 dB.
- Antenna gain G=18 dBi # 63.

As described in FCC OET Bulletin 65, the power density can be estimated by $S=P*G/4\pi R^2$ where R is the distance to the source (the antenna).
The Maximum Permissible Exposure (MPE) level for uncontrolled access locations is S = 1 mW/cm² at the frequency of GSM 1900 signal and S = 0.57 mW/cm² at the frequency of GSM 850 signal.

Note: Calculation is done in the worst case of maximum power radiated. Therefore, the calculation is done in Diplexer or H2D configuration (47,8dBm radiated) with GMSK modulation and for S=0.57 mW/cm².

As a consequence, the safe distance approach is with the aforementioned considerations R = 8.7 m.

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 S8000 and S12000 BTS comply 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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