Addendum to Theory of Operations for Nokia FHSS Radio – MPE Calculation

The radio can be configured with and without an external amplifier with 6dBi gain. With the amplifier in place, ignoring loss of cables, the maximum output power is 29dBm. Without the amplifier in place the maximum output power, neglecting cable loss, is 24.4dBm.

With the external amplifier, the maximum gain antenna that can be used is an 8dBi Omni antenna. Without the amplifier the maximum antenna gain is 17dBi. The combination of 17dBi antenna and un-amplified output gives the highest EIRP possible from the system. This EIRP, 41.4Bm, will be used to determine the MPE "safe" distance.

FCC part 1.1310, Table 1 limits the power density for uncontrolled exposure to $1mW/cm^2$. The distance, d(cm) from the antenna at which the power density, Pd (mW/cm^2) is below this limit is calculated from the transmit power, Pt (mW) and Antenna Gain (G) using the equation:

$$Pd = \frac{Pt\,G}{4\pi d^2}$$

Re-arranging for the distance at which the power density is $1mW/cm^2$ gives:

$$d^2 = \frac{Pt\,G}{4\pi}$$

So, the minimum separation that must be maintained from the antenna to ensure the rf exposure limits are not exceeded are:

For an un-amplified system with an EIRP of 41.4dBm (13803mW): **33.1 cm**

The Nokia user's manual and installation guide both reference a safe distance to ensure this separation. The User Guide contains the following statement:

> **RF Exposure** – Disconnect power from the wireless router when working within 2 meters of the antenna.

The Installation Manual contains the following statement on page 3:

> THE ANTENNA FOR THIS TRANSMITTER MUST BE INSTALLED TO PROVIDE A SEPARATION DISTANCE OF 2 METERS OR MORE FROM PERSONS TO ENSURE COMPLIANCE WITH EXPOSURE GUIDELINES.