1. We need an MPE calculation to prove that the device is safe at 20cm.

The power density associated with a particular electric field intensity is:

$$W = \frac{|E|^2}{h} = \frac{|E|^2}{120p} = \frac{|E|^2}{377}; \frac{\left(V/m\right)^2}{Ohms} = \frac{Watts}{m^2}$$

The power density at a distance from an isotropic radiating source is:

$$W(r) = \frac{W_t}{4p\,r^2}\,; \frac{Watts}{m^2}$$

If identical isotropic transmitting and receiving antennas are used, the received power at a distance from an isotropic radiating source is:

$$P(r) = W(r) \cdot A = \frac{W_t \cdot A}{4pr^2} = \frac{P_t}{4pr^2} \;;\quad Watts$$

Solving for transmit power and expressing the received power in terms of received electric field intensity:

$$P_t = P(r)4pr^2 = \frac{|E|^2}{120p}4pr^2; \quad Watts$$

Since the electric field intensity is specified at a 3 meter distance and we are interested in the effective transmit power in dBm:

r = 3 meters

P (W)=P(mW) x 1000

E(V) = E(uV) x 10^{-6}

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$$P_t = 10\log_{10}\left(\frac{|E|^2}{30}3^2 \cdot 1000\right) = 20\log_{10}(|E|) + 20\log_{10}(3) + 10\log_{10}(1000) - 10\log_{10}(30) \quad dBm$$

$$P_t = 20\log_{10}(|E_{mV}|) - 20\log_{10}(10^{-6}) + 20\log_{10}(3) + 10\log_{10}(1000) - 10\log_{10}(30) \quad dBm$$

$$P_t = 20\log_{10}(|E_{mV}|) - 120 + 9.54 + 30 - 14.77 \quad dBm$$

$$P_t = 20\log_{10}(|E_{mV}|) - 95.23 \quad dBm$$

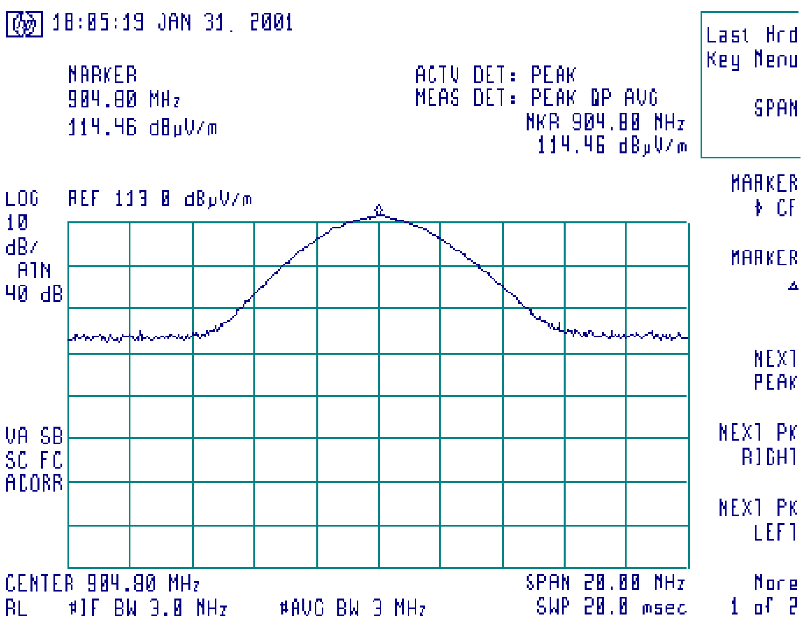
The conversion between effective radiated power and the magnitude of the electric field intensity at a 3 meter distance from the transmitting source are related by:

$$P_t = |E_{dBmV}| - 95.23 \quad dBm$$

The reported intentional emissions of the base-station are as follows.

channel 1	114.5 dBuV/m
channel 9	114.1 dBuV/m
channel 13	113.5 dBuV/m

The worst case is channel 1. A graph of the actual test indication is presented below for reference:



The effective radiated power for this worst case emission is:

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$$P_t = 114.5 \left.\frac{dBmV}{m}\right|_{r=3m} - 95.23 = 19.27 \quad dBm$$

The expected power density at a 20 centimeter distance is:

$$W(r) = \frac{W_t}{4p\, r^2} = \frac{10^{\left(\frac{19.27\, dBm}{10}\right)} \cdot \frac{10^{-3}\, mW}{W}}{4p\left(20\times 10^{-2}\, m\right)^2} = 168.2\ \frac{mW}{m^2}$$

Re-normalizing this power density on a per square centimeter basis:

$$W(r) = 168.2\ \frac{mW}{m^2} \cdot \frac{10^{-4}\, m^2}{cm^2} = 16.82\frac{mW}{cm^2}$$

The limit for Maximum Permissible Exposure (MPE) given in Table 1 of §1.1310 is given as

$$W_{\max}(r) = \frac{f\,(MHz)}{1500\frac{MHz - cm^2}{mW}} = \frac{928MHz}{1500\frac{MHz - cm^2}{mW}} = 618.7\frac{mW}{cm^2}$$

The base-station uses a Time-Division-Duplex Protocol where the transmitter has a constant duty factor of 50%. Section 2.1091 allows for time averaging of the transmit power for the purposes of the MPE calculations. This fact would reduce the average power to one-half the constantly transmitting value:

$$W(r) = 8.41\frac{mW}{cm^2}$$

Since:

$$W(r) = 8.41\frac{mW}{cm^2} < W_{\max}(r) = 618.7\frac{mW}{cm^2}$$

Therefore, the device in question meets the MPE requirement.

5. The output power needs to be measured with a bandwidth which captures the full power of the signal. A power meter is the preferred

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