

May 7, 2001

Federal Communications Commission
Authorization and Evaluation Division
Equipment Authorization Branch
7435 Oakland Mills Road
Columbia, MD 21046

Re: NPD-R240-v01

Gentlemen:

Please find attached an update of the MPE calculations for NPD-R240-v01. In the attached calculations, the duty-cycle of 75%, as originally submitted in the MPE derivations, has been omitted.

As is shown, even with a duty-cycle of 100%, the RF safety distance to comply with the MPE values in FCC part 1.1310, Table 1 is met using an RF safety distance of 20 cm, both for the single antenna case, and for the case in which up to 6 antennas are installed at least one meter apart.

Sincerely,

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Nokia R240/R240A MPE calculations

The system will be factory calibrated, such that the intentional emissions remain under the 36 dBm (4000 mW) max. EIRP as required by Part 15.247 for the 8 dBi omni-antenna. For the 10 dBi sector antenna, the professional installer must select the appropriate antenna type in the management software, which reduces the amplifier by 2 dB, resulting also in a maximum intentional emission of 4000 mW.

This EIRP value is used to calculate the MPE limits.

FCC part 1.1310, Table 1 limits the power density for uncontrolled exposure to $1\text{mW}/\text{cm}^2$. The distance, $d(\text{cm})$ from the antenna at which the power density, $P_d (\text{mW}/\text{cm}^2)$ is below this limit is calculated from the maximum EIRP, $E(\text{mW})$ using the equation:

$$P_d = E/(4\pi d^2)$$

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

$$d = \sqrt{\frac{E}{4\pi}}$$

So, the minimum separation that must be maintained from the antenna to ensure the RF exposure limits are not exceeded in a single antenna installation is:

$$d = \sqrt{\frac{4000}{4\pi}} = 17.8\text{cm}$$

All manuals have a statement advising the user/installer of a safety distance of 20cm.

For co-located installations, a distance of at least 1 meter (3 feet) between antennas is required, which does not increase the safety distance to each antenna significantly:

At one meter, $P_d = 0.0318 \text{ mW}/\text{cm}^2$, which increases the safety distance of co-located antennas to:

$$d = \sqrt{\frac{4000}{4\pi(1 - 0.0239 * N)}} = 19.5\text{cm} \text{ for } N=5$$

which is less than the required safety distance of 20 cm.

$N+1$ is the total number of devices co-located and limited to 6. Therefore $N \leq 5$. The safety distance for up to 6 co-located devices with one meter separation between devices therefor is at least 15.5 cm and at most 16.4 cm.

In conclusion:

When co-locating up to six devices with at least one meter separation between devices, a safety distance of 20 cm is always more than sufficient to meet the regulatory requirements set in FCC part 1.1310, Table 1.

User Manual Warning Statements:

The user-manual warns against going closer than 20cm to the antenna when the unit is powered on:

Hazard Warnings

- **Environment** - Do not place the Network/Power Unit in a very cold, dusty, wet or high humidity environment. The unit should be situated away from all heat sources such as radiators, heat registers, stoves, amplifiers and other heat producing appliances.
- **Fire or Electric Shock** - Do not expose the Network/Power Unit to any type of moisture, including rain. Do not use or install near water-related environments such as sinks, bathtubs, laundry areas, spas, swimming pools, or in wet basements. Take care not to spill any liquids on the unit.
- **RF Exposure** To comply with RF safety requirements, do not go closer than 20 cm of the antenna on the roof when the Network/Power Unit is plugged in.

User Installation Manual Warning Statements:

The user installation manual requires professional installation for co-location. It also discusses the need for the 20cm separation distance when the unit is powered on

Co-location - In certain situations, multiple wireless routers may be co-located on the rooftop of a residential subscriber. To comply with RF safety requirements, there must be a minimum distance of one meter (either horizontally or vertically, depending on the rooftop environment) between each wireless router. Wireless routers may not be co-located with or work in conjunction with other transmitting devices without professional installation.

•**RF exposure** - To comply with RF safety requirements, do not go closer than 20 cm of the antenna on the roof when the Network/Power Unit is plugged in.

Professional Installation Warning Statements:

The professional installation manual addresses the requirements for the antenna to be located such that it is permanently mounted. It discusses the use of Nokia's approved antennas for instances where the omni-directional antenna (with unique connector).

2.1.1 Hazard warnings

- **Environment** - The Network/Power Unit (NPU) is an electrical device. Place it away from all heat sources such as radiators, heat registers, stoves, amplifiers and other heat producing appliances. It should also be kept out of cold, dusty, wet, or high humidity areas.
- **Fire or electric shock** - Keep the NPU away from moisture or water-related environments such as sinks, bathtubs, laundry areas, spas, swimming pools, or wet basements. Take care not to spill any liquid on the unit.
- **Installation** - Outdoor antennas and their supporting masts, wires, and cables are electrical conductors. Use extreme caution when installing antennas in areas with overhead power lines. Contact with high-voltage electrical wires can cause serious injury or death.
- **Medical devices** - If you have a pacemaker do not go close to the router on the roof. If you have any discomfort, switch off the router immediately.
- **Lightning** - Routers are elevated metal objects and they attract lightning and are subject to voltage surges and built-up static charges. Make sure the router and antenna are attached to a grounding wire to provide a safe path to the ground.
- **Interference** - The router can cause electrical interference. Do not install the router near medical equipment or in a hospital or medical environment without first ensuring that there will be no interference with such equipment.
- **Co-located antennas** - Up to six sector antennas or three omni-directional antennas may be co-located provided that they are permanently mounted on a rooftop or antenna tower where access by the general public is restricted. In order to comply with RF safety regulations, antennas shall be placed at least 1 meter (3 feet) apart. The warning sticker provided with the equipment has to be attached on the co-located devices.
- **RF Exposure** - The system shall be permanently mounted on a rooftop or antenna tower. To comply with RF safety requirements, always disconnect power from the wireless router whenever working within 20cm of the antenna. When the RF adapter is used, only Nokia approved antennas may be used.

Further to this, the installation manual requires that, where antennas are co-located, there is at least a one meter separation between antennas as detailed in the MPE calculations.