

RF Exposure

The Nomadic NMX920 Radio Modem has been evaluated for compliance with RF Exposure requirements. SAR testing was performed by Aprel Laboratories with the following results:

“The maximum Specific Absorption Rate (SAR) averaged over 1 g, determined at 901MHz (high channel), of the Nomadic Communications OEM radio modem, NMX920, is 1.41 W/kg when operating with an 9 % duty factor. The overall margin of uncertainty for this measurement is \pm 16.2 % (Appendix C). The SAR limit given in the FCC 96-326 safety guideline is 1.6 W/kg. This unit as tested, and as it will be marketed, is found to be compliant with this requirement”

The following 2 pages are taken from the Nomadic’s NMX920 OEM Integrators Guide.

7. Notes for Integrators

Application developers should be aware of the following hardware firmware and operational issues prior to commencement of integration of the NMX920. These issues impact hardware design, application software and application certification by the network operator.

7.1. Antenna

The NMX920 requires a $50\ \Omega$ matched antenna with a VSWR no greater than 1.5:1 over the transmission band.

The provision of the antenna system is the responsibility of the system integrator. The design and location of the antenna system will be largely dictated by system requirements, and may have system implications with respect to RF exposure, see regulatory issues below. During certification testing, the NMX920 was tested using a unity gain (dipole), ground independent antenna, and a printed circuit antenna of proprietary design.

The unity gain (dipole), ground independent antenna used was manufactured by ZCG Scalar has the following characteristics, but these characteristics are common to both ground independent and ground referenced antennas from a number of manufacturers.

Frequency 890 – 960 MHz
Gain Unity, (0 dBd)
Mounting Straight Connection TNC
Power 5 Watts
Impedance (Nom.) 50 Ohm
Polarisation Vertical polarisation
Construction Delrin, brass and steel
Tuning Factory

7.2. Human Exposure Issues

The NMX920 has been evaluated for human exposure to RF radiation under Specific Absorption Rate (SAR) guidelines by APREL Laboratories. The NMX920 was battery powered, and utilised the antenna detailed above. The NMX920 was run with development firmware which restricted the maximum transmit duty cycle to 9%. All production with firmware above R2.00 are limited to a maximum of 9% transmit duty cycle. This parameter is not alterable in the field. The configuration used for SAR testing was

- NMX920, pre-production sample (DUT)
- 7.2 V Li-Ion battery pack
- DYNMAST A-409T 800-900 MHz vertical handheld antenna (described above)

The results of the SAR testing are summarised as

“The maximum Specific Absorption Rate (SAR) averaged over 1 g, determined at 901MHz (high channel), of the Nomadic Communications OEM radio modem, NMX920, is 1.41 W/kg when operating with a 9 % duty factor. The overall margin

NMX920 OEM Integrators Guide

Page 14 of 21

of uncertainty for this measurement is $\pm 16.2\%$ (Appendix C). The SAR limit given in the FCC 96-326 safety guideline is 1.6 W/kg. This unit as tested, and as it will be marketed, is found to be compliant with this requirement”

The complete SAR report is available on request from Nomadic Communications. If the final integration uses a different antenna configuration, the entire system will need to be re-evaluated for human exposure to RF radiation. Human exposure to RF radiation is a very complex system issue. It is affected by parameters (but not limited to) such as

- Antenna
- Power Supply
- Application
- Case
- Accessories
- Antenna placement.

If the complete system is operated in a fixed location, mobile application or portable application with a unity gain (0 dBd) antenna and a guaranteed minimum separation of at least 20 cm between the antenna and any body then the NMX920 can be used in the system without further evaluation.

If a higher gain antenna is used then Maximum Permissible Exposure guidelines must be checked, and application possibly made for change in licence conditions.

If the NMX920 is to be used in a body worn application, or if a 20 cm separation between antenna and body cannot be guaranteed by obstruction, then the entire integrated system must be re-evaluated for SAR. SAR evaluation will need to be done for all available options for the final systems – all different battery packs, cases, antennas, power supplies, attached peripherals, after market accessories etc.