



HUMAN EXPOSURE TO RF RADIATION IN SRI LANKA

M.A.A. Karunarathna

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Department of Electronic and Telecommunication Engineering
Faculty of Engineering
University of Moratuwa

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Abstract

The deployment of more and more wireless communication systems cause a potential danger to public health due to exposure of the human body to electromagnetic waves from RF and microwave transmissions through free space. The amount of electromagnetic energy absorbed by the body is given by the Specific Absorption Rate or the SAR value given in W/kg. International regulations specify the maximum acceptable SAR value and the maximum permissible electromagnetic field for public safety.

This thesis presents a case study for Sri Lanka. Electric field strengths due to transmissions from FM radio, VHF and UHF TV and Cellular mobile base stations, are measured in different parts of the country at sites which represent a normally high population during day time. SAR values are then calculated for the human eye based on the measured exposure levels due to RF and microwave transmitters radiating in all directions. Results indicate that cellular mobile base stations are the major sources of public exposure to electromagnetic radiation. The maximum exposure level recorded at one site due to all RF and microwave transmissions correspond to a field of approximately 1V/m.

The SAR values are calculated based on the measured exposure levels during the year 2005, using Finite Difference Time Domain (FDTD) method. The maximum SAR for the eye under worst-case conditions is 0.0922 W/kg as compared with the safe limit of 1.6 W/kg for the whole body according to FCC standards. This is an estimated maximum value based on measured field strengths and it is 12 dB below the standards.

The maximum SAR values and the SAR distribution in several organs such as the eye, brain, kidney, testis and neck are also estimated when high frequency signals propagate into the human body. A signal of strength $IVIm$ is considered as the incident wave for calculations. The frequency of the signal is taken from 100MHz to



3.5 GHz which represent FM radio, TV, Cellular mobile, Bluetooth, WiFi and WiMax wireless transmissions. Remarkable variations of SAR distribution are observed in different body organs. Results show that at high enough frequencies into the microwave region, there is an absorption peak near the centre of the eye and the testis. From experimental evidence on animals, such an absorption peak in the eye is considered to be a possible cause of eye cataract. It is also reported that an absorption peak at the centre of the testis could cause temporary sterility in males.

It is observed that electromagnetic absorption depends on the electrical properties of the tissue and not on the shape or the size of the organ.

Our measurements of RF and microwave exposure and calculations of SAR conclude that we are safe at present. However, as the number of wireless transmissions increase, regular monitoring of the exposure levels should be carried out and a proper mechanism of regulation should be established for public safety.