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Evaluation of Temperature Gradient within Different Head Tissue Layers Exposed to Radiofrequency Radiation Emitted by GSM Transceiver Base Station Using Pennes Model of the Bio-Heat Equation

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Abstract
While the spectrum growth of radiofrequency (RF) emission is likely to experience astronomical increase in the years to come, the imminent query would be whether the current spectrum management process is capable of fulfilling all future requirements. Public interest in the potential health issues relating to cellular or mobile communication transceiver base station antennas (BSA) emphasize on the importance of having an accessible and easy to understand information on electromagnetic (EM) and radiofrequency radiation (RFR) levels in the surrounding environment.
In this study, measurements of electric field and magnetic field level were made around selected transceiver base station antennas in selected South-South States Nigeria, with the aid of frequency-selective equipment (CORNET, Electrosmog meter ED78S EMF RF/LF Dual mode model).
Pennes Bio-heat equation was employed to compute the temperature gradient in biological materials due to EM exposure, which takes into account the heat exchange mechanisms such as heat conduction, blood flow, EM energy dissipation, and metabolism. Using the local operator's technical parameters, a theoretical simulation/estimation was done for comparative analysis. This perfectly agrees with other models and it also shows how RF radiation affects biological materials/tissues. It proves that the most vulnerable part of the head when exposed to RF radiation is the brain with temperature gradient of 0.087934oC/mm.

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