VALIDATION AND APPLICATION OF THERMAL MODELING IN HUMAN FOR LOCALIZED HEAT EXPOSURE

Kazuya Kojima, Sachiko Kodera, Akimasa Hirata [(1)]
(1) Department of Electrical and Mechanical Engineering, Nagoya Institute of Technology, Japan

Extended Abstract

Thermal modeling of human considering the thermoregulation has been becoming practical with the progress of computer resources. The thermal modeling can be applied not only to thermal comfort but also to the safety for heat load (ambient temperature, electromagnetic fields). In the International Commission on Non-Ionizing Radiation Protection (ICNIRP) workshop, one of the key topics was '*Is our thermoregulation (evolved to respond to physical work and hot environments) effective in responding to local (internal) HF-induced heating?*'. This topic becomes important as new wireless technology '5th generation wireless communication' is emerging (e.g, [1]-[3]). Most measurements of temperature variation and sweating in human were conducted for whole-body heat exposure (e.g., [4]) or partial body (but with relatively large area) exposure (e.g. [5]). Alekseeve *et al* [6] measured temperature elevation and blood flow rate for vasodilator cream on the forearm skin. They then found that the thermoregulatory response works well even for such localized agent. Then they developed a computational model for the temperature elevation considering thermoregulation. In the study, equivalent thermal conductivity was introduced to consider the vasodilation. Then, the model was applied for localized millimeter wave exposure. Recently, more detailed themoregulatory response has been proposed by different groups. If we could demonstrate its effectiveness for different exposure scenarios, we can apply the computational model for setting the limit in the safety guidelines.

This study validates our computational thermodynamics model by comparing with measurement for different heat load. The computation has been conducted for different electromagnetic exposure scenarios, especially for frequencies over 6 GHz.

References

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