Heat Drain Device on Ultrasound Imaging Probe

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Abstract

Self-heating is a problem to consider for Ultrasound Imaging probes. Since the probe is in contact with the skin, it's necessary to find a solution to lower the front face temperature in order to avoid patient discomfort, even at the most demanding operating condition (Doppler CW mode).

One solution consists in the design of a device that drains the heat from the front to the rear of the transducer, where some type of heat dissipation operates (heat sink, PCM material, active cooling system). Such heat drain device consists in a special ultrathin layer of extremely high thermal conductivity material, placed right below the acoustic silicone lens.

A perfect tool for such project is the Comsol Multiphysics® Heat Transfer module: a 3D FEM was developed, tested and optimized, in order to study some possible solution and refine the best one. Many steps of comparison with measurements were performed, to get the best results from the FEM.

Figures used in the abstract

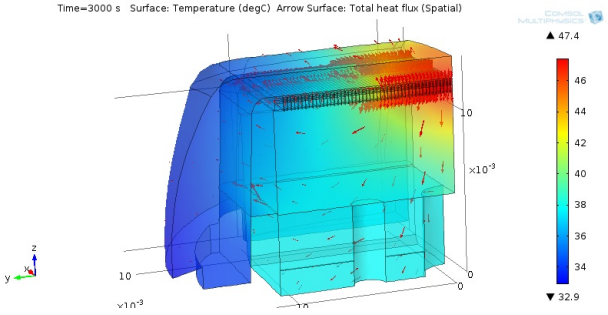

Figure 1: self-heating of standard probe

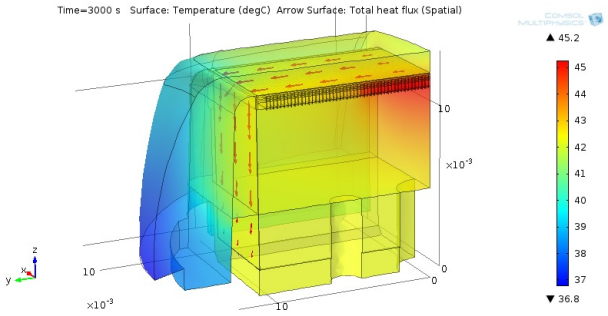

Figure 2: self-heating of probe with 0.02mm conductive layer

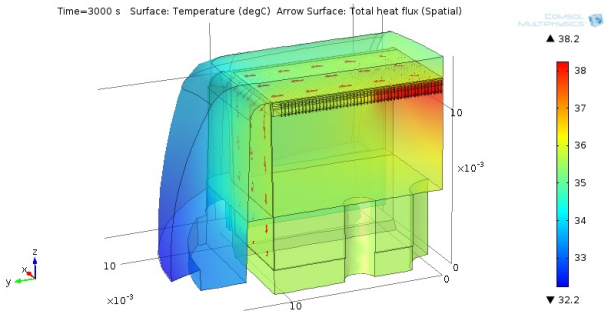

Figure 3: self-heating of probe with 0.05mm conductive layer