

ONLINE STEERING CONTROL BY MR-THERMOMETRY

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Introduction:

RF-hyperthermia can be planned by different calculation methods like FDTD or FE. To overcome existing differences between the calculation and the real SAR distribution it is possible to correct the calculation by the use of MR-thermometry.

Material and Methods:

In phantom measurements we used the double-echo proton resonance frequency method for MR-thermometry performing a drift correction with silicone oil tubes. For SAR calculation the FDTD method on a regular voxel grid was used. For each experiment a planning was performed with the exact position of the applicator to the phantom. After a transformation of the basefields in the grid of the MR measurements we performed an adaptation of the basefields by the results of the MR thermometry with known phase settings. Therefore a Gauss-Newton algorithm was used. The resulting adapted planning was used to steer the SAR in the region of interest.

Results:

The FDTD planning itself shows good similarity to the MR measurement, but the adaptation of planning by MR-Thermometry improves the congruence with the real situation. The adapted planning is used for steering the SAR virtually in a region of interest. The result of a following experiment with the new calculated phases with the MR-thermometry of the experiment shows quite good congruence with the reality and better than the FDTD planning alone.

Discussion:

In comparison to a standard planning the adapted planning by use of MR-thermometry shows an improvement of accuracy. Using the adapted planning for further optimisation gives better results than using FDTD planning alone. In the near future we hope to improve the velocity of the calculation for using it in patient treatments.