Docket #: S14-319

Iterative Minimization Procedure with Uncompressed Local SAR Estimate (IMPULSE): A Generalized and Scalable Framework for Joint Design of pTx RF Pulses

Stanford researchers have developed an algorithm to achieve uniform excitation and image uniformity in the presence of a non-uniform transmit field while limiting local power deposition or "hot spots" using multiple transmit channels and the methid of "parallel transmit" or pTx. . This algorithm solves the long-standing technical challenge that has limited clinical application of ultra-high-field MRI.

Applications

- All applications in which parallel transmit is relevant including counteracting B1+ inhomogeneity and spatially selective excitation.

Advantages

- Overestimation of peak local SAR due to compression is eliminated;
- Time-consuming compression procedure is eliminated allowing pulse design to be performed directly once SAR is estimated;
- Scalable with the number of terms in the cost function, it is possible to use multiple closely (but not exactly) patient-matched body models for local SAR estimation by concatenating the local SAR terms from all voxels across all body models into the cost function;

- Reduces the risk of SAR amplification that has been demonstrated to occur in certain cases when optimizing with an incorrect local SAR estimate using a single mismatched body model;
- Reduces the need to accurately model all loss mechanisms in the transmit chain that would be required to estimate local SAR in absolute units; and
- The algorithm is such that all RF pulses can be designed with a single time-averaged local SAR estimate in a way that scales favorably with total number of RF pulses

Patents

- Published Application: 20160128574
- Issued: 9,939,501 (USA)

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