



MRI Method Reduces Peak Power for Multiband Images (20120077, Dr. Kamil Ugurbil)

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Power Reduction by Time Shifting Multiband RF Pulses

A new magnetic resonance imaging (MRI) method for multiband imaging (MB), also known as Simultaneous Multi Slice (SMS) imaging, significantly reduces required peak power. The technology improves MB performance by time shifting the RF pulses of a multiband RF pulse. Normally, all of the multiband pulses (at different frequency bands) are applied at the same time. In this new method, the pulses are partially or fully separated relative to each other in time by using a “time-shift” in between: the idea is not to fully overlap the pulses but to separate them partially or fully. Time-shifting the individual components (or subgroups of individual components) of a multiband RF pulses(s) can be applied to a number of spatial encoding strategies, and it offers a significant reduction in required peak power and expands potential applications of MB/SMS imaging approach that increasingly occupies a prominent place in magnetic resonance imaging.

Overcomes Peak Power Limitations

Since their initial applications, fast acquisition sequences such as echo planar imaging (EPI) or SPIRAL type approaches have not seen substantial improvements in overall scan time. Nearly all the successful efforts to shorten acquisition times have aimed to reduce read-out times for spatial encoding to form an image, but these approaches have not significantly reduced image acquisition time for volume coverage, (e.g. whole brain coverage). However, significant shortening of the volume coverage has been achieved by simultaneously exciting and recording signals from multiple slices and subsequently unaliasing them using information inherent in an array coil composed of multiple elements.(multiband imaging, simultaneous multi slice imaging) or MB, SMS). However, the power requirements for this technology have greatly affected its potential. This new time-shifted multiband approach overcomes the peak power limitations problem and reduces peak voltage used in the MB pulse.

BENEFITS AND FEATURES:

- Significant reduction in required peak power
- Expands potential applications of multiband/SMS
- May allow scans previously not possible
- Installed on scanners via software upgrade

APPLICATIONS:

- MRI applications
- Brain imaging
- EPI
- SPIRAL
- Turbo Spin Echo
- Variety of MR imaging techniques

Phase of Development - Pilot scale demonstration. Successfully implemented at clinical field strength (3T scanner).

Researchers

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