

## **Extremely highly accelerated fat images for motion-navigation at high spatial resolution**

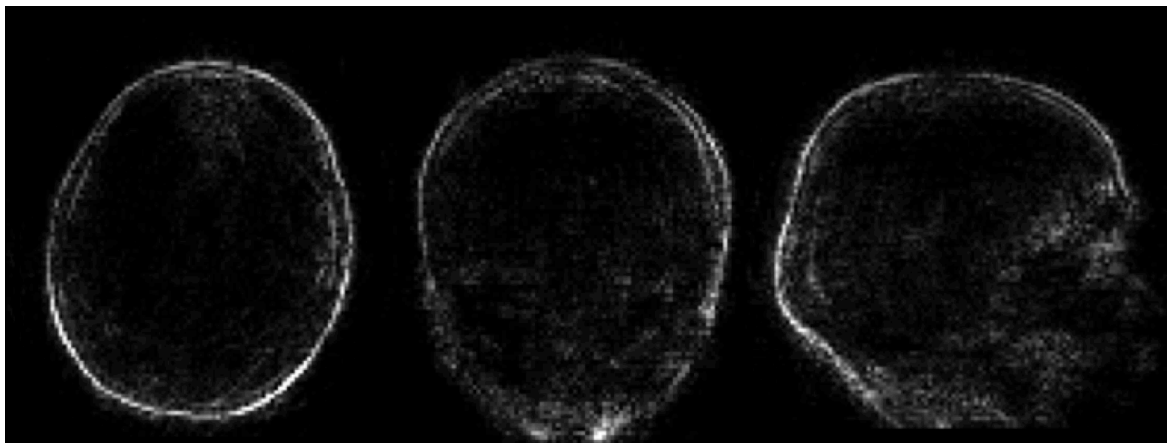
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We recently demonstrated the proof-of-concept of exploiting the natural sparsity of head images acquired with a fat-excitation to achieve extremely high acceleration factors ( $\sim$ factor 50) [1]. Our previous work had assumed that non-Cartesian trajectories would be necessary in order to achieve such high acceleration factors – but testing of this assumption showed that standard Cartesian GRAPPA is able to achieve remarkably good quality images at acceleration factors as high as 64 on these sparse images acquired with a 32-channel RF receive array.

We have now implemented the pulse sequence to interleave a  $8 \times 8 = 64$ -times accelerated fat volume – acquired with full head coverage at 2mm isotropic resolution in 495 ms – with a standard MP-RAGE structural scan. The MP-RAGE sequence already contains sufficient waiting-periods between inversion pulses with standard acquisition parameters to fit the motion-navigator with no additional time penalty – and the low flip-angle fat excitation has a negligible impact on the water signal for the host sequence.

We acquired a single test protocol on a healthy volunteer at 7T (Siemens, Erlangen). We acquired two low-resolution MP-RAGE images (3.8 mm isotropic, 3 mins) with small deliberate motion of the volunteer in order to have data of a more manageable size for optimization of the retrospective motion-correction procedure. We also acquired a high resolution MP-RAGE dataset (0.6 mm isotropic, 22 mins) where there was no deliberate motion of the volunteer.

At the time of writing we have yet to implement the retrospective correction for motion of the MP-RAGE data, but the quality of the 64x GRAPPA accelerated images (see e.g. Fig. 1) suggest that this should work as expected, and by the time of the conference we hope to be able to demonstrate the improvement in image quality at these high resolutions.



**Figure 1:** Example of 64x accelerated GRAPPA acquisition using fat excitation – acquired in 495 ms as an interleaved scan within the MP-RAGE host sequence