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**Fast magnetic resonance imaging of the internal impact response of dense granular suspensions** CHRISTOPH MLLER, Laboratory for Energy Science and Engineering, ETH Zurich, ALEXANDER PENN, Laboratory for Energy Science and Engineering, ETH Zurich and Institute for Biomedical Engineering, University and ETH Zurich, KLAAS P. PRUESSMANN, Institute for Biomedical Engineering, University and ETH Zurich — Dense granular suspensions exhibit a number of intriguing properties such as discontinuous shear-thickening and the formation of dynamic jamming fronts when impacted by a solid. Probing non-intrusively these phenomena experimentally in full three-dimensional systems is, however, highly challenging as suspensions are commonly opaque and thus, not accessible optically. Here we report the development and implementation of a fast magnetic resonance imaging (MRI) methodology allowing us to image the internal dynamics of dense granular suspensions at high temporal resolutions. An important facet of this work is the implementation of parallel MRI using tailored multi-channel receive hardware and the optimization of magnetic properties (susceptibility and NMR relaxivity) of the liquid phase. These two improvements enable us to utilize fast single-shot pulse sequences while yielding sufficient signal intensity at temporal resolutions of less than 50 ms. Furthermore, using motion-sensitive MR pulse sequences we are able to image bulk motion within the system and the response of dense granular suspensions to fast impacts.

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