

# DATA SHEET: Clip-on Camera™

Diffusion Imaging

fMRI

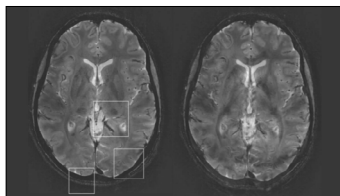
Ultra-High-Field Imaging

## NEUROIMAGING WITH FIELD MONITORING

### Your Partner in Scientific MR Imaging

Flexible field monitoring for novel research & development

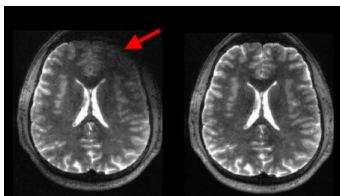
- ▶ Achieve robust imaging for critical *in-vivo* MR experiments
- ▶ Explore novel research using your existing RF coils
- ▶ Flexible solution to measure both system and subject induced field fluctuations



T<sub>2</sub>\* maps reconstructed with field monitoring (left) and without (right)<sup>3</sup>

### Achieve robust imaging for critical *in-vivo* MR experiments

Quantitative MR imaging relies on acquiring accurate MR data. These data are often perturbed by field fluctuations due to hardware imperfections and physiological effects. The Clip-on Camera can be used to measure dynamic fluctuations, allowing users to develop strategies to mitigate their effects. Ultra-high field applications, including diffusion<sup>1</sup>, EPI, T<sub>2</sub>\* mapping<sup>2</sup>, and Quantative Susceptibility Mapping<sup>4</sup> benefit from measuring breathing-induced field fluctuations.



Field monitoring helps improve fidelity of complex waveforms including wave-CAIPI TSE<sup>5</sup>

### Explore novel research using your existing RF coils

Research is progressing beyond cartesian acquisitions to reduce scan time and increase image resolution. Novel readout trajectories are difficult to acquire well without measuring dynamic field fluctuations. The Clip-on Camera integrates with your existing RF coils, capturing trajectory and encoding information while the subject is being scanned, allowing you to explore novel trajectories for your research.



The Clip-on Camera can be adapted to many novel coil geometries.

### Flexible solution to measure both system and subject induced field fluctuations

Spatiotemporal field fluctuations in MR data can be caused by reproducible and non-reproducible sources including hardware imperfections, i.e. eddy currents and thermal drift, and physiological processes, i.e. breathing- and cardiac-induced. These fluctuations add uncertainty to your encoding and your MR image. The Clip-on Camera allows you to directly capture hardware and physiological field fluctuations, forming the foundation for an accurate image reconstruction.

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## NMR field probes

Coherence lifetime at 3T and a main field inhomogeneity < 0.1mT/m	100 ms (typical)
Minimum repetition time (depending on NMR field probe T2 value)	3 x coherence lifetime (typical)
SNR- $\sqrt{BW}$ (the sensitivity at FID start)	65'000
Achievable $k_{max}$	$\pm 7800$ rad/m

## Physical Dimensions (in-bore electronics box)

Housing (w x d x h)	24 cm x 20 cm x 13 cm
Cable diameter	3 cm
Cable length	1 m to 10 m

## Physical Dimensions (single probe)

Housing (w x d x h)	24 mm x 60 mm x 9 mm
Cable diameter	6 mm
Cable length	15 cm to 30 cm

## Dynamic field measurement

Data types	Unit	Temporal resolution
Gradients	[mT/m]	1 $\mu$ s
B0	[mT]	1 $\mu$ s
k-space values	[rad/m] and k0 [rad]	1 $\mu$ s
k-higher order	up to 3 <sup>rd</sup> spatial order	1 $\mu$ s

Bfit, Gfit      fitted field value for each interleave/dynamic

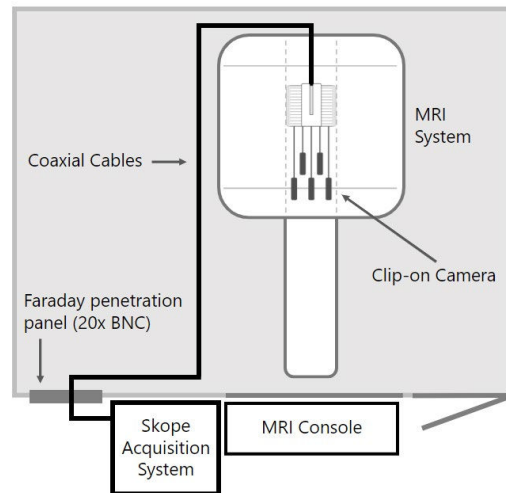
## Camera Acquisition System



The field sensor signals of the Clip-on Camera are acquired by the 16-channel Skope Camera Acquisition System and automatically processed to provide the actual magnetic field dynamics.

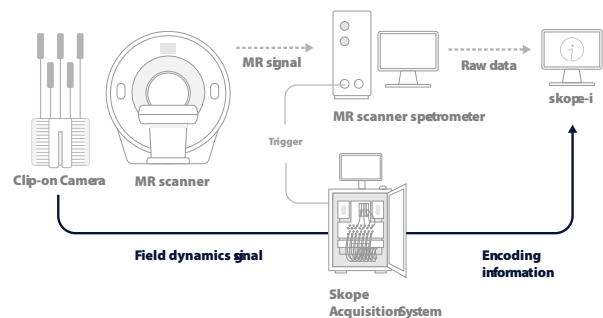
1. Wilm et al. (2017) doi: 10.1002/mrm.26493
2. Duerst et al. (2015) doi: 10.1002/mrm.25167
3. Vannesjo et al. (2015) doi: 10.1002/mrm.25303
4. Özbay et al. (2018) doi: 10.1002/mrm.26735
5. Jolanda M., Schwarz: <https://hdl.handle.net/20.500.11811/8442>

## Site Overview

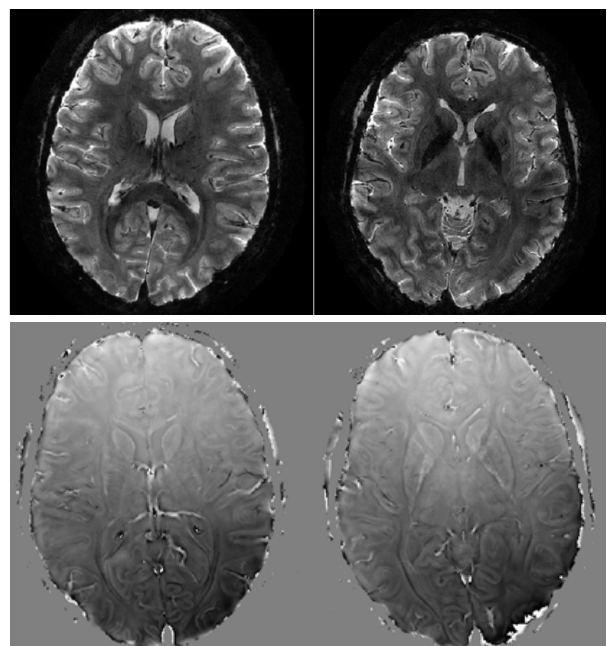


Example configuration of Skope Acquisition System in MRI operator room. The Skope Acquisition System can be placed in either the MRI operator room or the scanner equipment room.

## Integration into MRI setup



## Acquired Images



T2\*W GRE (magnitude, above; phase, below) SENSE Factor 3, 25 ms, 0.5x0.5x2.5mm, 36 slices, 30 sec acquisition time<sup>3</sup>

