

COIL ARRAY WITH FIELD MONITORING AND IMAGE RECONSTRUCTION ROBUST IMAGING WITH SPEED, SENSITIVITY AND EASE



Plug-and-play concurrent magnetic field monitoring

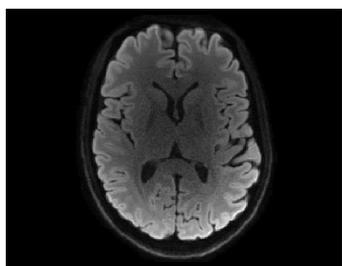
Fast and quantitative MRI methods are commonly limited by inaccurate or unstable image encoding. These limitations can be elegantly avoided by using the actual encoding for image reconstruction. The NeuroCam provides an integrated solution for acquiring the image encoding. Together with the skope-i image reconstruction software, it provides all of the benefits of cutting-edge field monitoring and push-button image reconstruction. The combination enables a focus on ground-breaking research and a move towards more reliable diagnosis.



Accelerated brain imaging: T1 weighted MP-RAGE

Excellent SNR and parallel imaging performance

A challenging requirement from MR imaging is increasing SNR while shortening acquisition time. The NeuroCam's integrated MR receiver array was specifically designed to provide researchers with optimum SNR and parallel imaging performance in specialized imaging of the whole brain. Because the NeuroCam also includes an integrated field monitoring array, it delivers a considerable increase in quality and resolution of single-shot images. This enables the elucidation of small pathologies and performing of advanced research.



Diffusion imaging with highest SNR
Single-shot spiral DWI

Unprecedented fMRI and diffusion imaging performance

Diffusion MRI and fMRI are commonly limited by image artifacts and low SNR. In DWI, the NeuroCam removes image distortions, and the coil's intrinsic high SNR can be further boosted by using spiral readouts enabled by field monitoring. Thereby, the NeuroCam can deliver highest spatial resolution images and most accurate quantification results. In fMRI, high parallel imaging acceleration reduces artifacts and increases the temporal resolution. Moreover, spiral acquisitions widen the horizons for fMRI investigations by the possibility to combine outside-in and inside-out variants and fully flexible TE to control signal dropout.

Monitored neuromaging powering data driven MR

NeuroCam and skope-i, image production software

- ▶ Coil array with integrated field monitoring and image reconstruction
- ▶ Whole-brain coverage
- ▶ Robust imaging for data consistency



NeuroCam for 3T

Physical dimensions

Housing (w x d x h), incl. base 60 cm x 46 cm x 30 cm
 Head fit > 95% of adult population
 Full face access open view and possibility to use eye tracking tools

Dynamic field measurement

Measurable variable Magnetic field magnitude
 Temporal resolution 1 μ s
 intrinsic k_{max} \pm 9580 rad/m

Spatial field expansion

Basis Real-valued spherical harmonics up to 3rd order
 Output terms for image correction Generalized k-space (16 terms: $k_0 - k_{15}$)
 - 3D k-space ($k_1 - k_3$)
 - Dynamic B_0 perturbation (k_0)
 - 2nd order perturbations ($k_4 - k_8$)
 - 3rd order perturbations ($k_9 - k_{15}$)

Camera Acquisition System

The field sensor signals of the NeuroCam are acquired by the 16-channel Skope Camera Acquisition System and automatically processed to provide the actual magnetic field dynamics. The field dynamics can be conveniently displayed in the user interface or piped directly into the skope-i, image production software.

skope-i, image production software

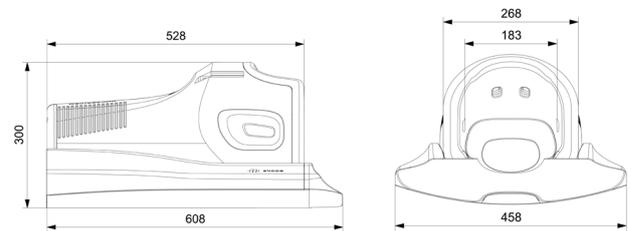
The image production software complements the NeuroCam and takes into account

- ▶ Measured/simulated gradient encoding
- ▶ Coil sensitivity information (SENSE)
- ▶ Static B_0 maps
- ▶ Higher order field evolution

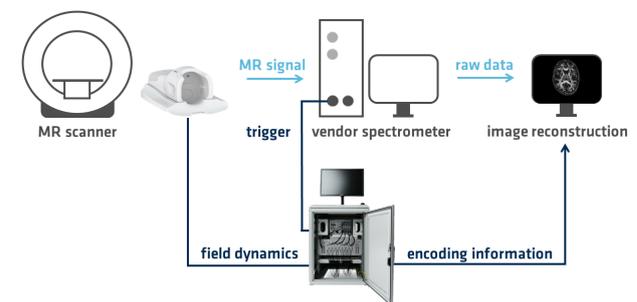
Parallel imaging performance

The NeuroCam is developed for fast and robust neuroimaging by advanced radiofrequency design with low SNR penalty for accelerated Cartesian and spiral imaging.

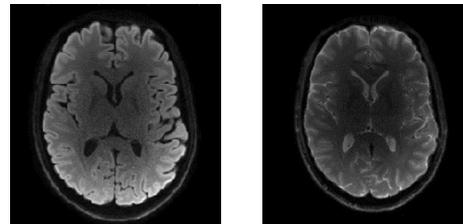
NeuroCam - Technical illustration



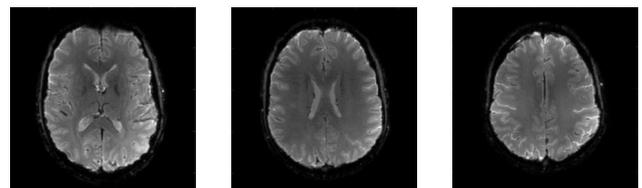
NeuroCam - Integration into MRI set-up



NeuroCam - Acquired images



Single-shot spin-echo spiral DWI (averaged), 1.0 mm in-plane resolution, undersampling R=4, TE = 42 ms



Single-shot spiral gradient echo images (averaged), 1.3 mm in-plane resolution, undersampling R=4, TE = 40 ms

NeuroCam - Parallel imaging performance

