NexGen 7T Project Application Guidelines

The NIH BRAIN Initiative is providing funding to make the next generation (NexGen) 7T scanner at University of California Berkeley available to the international neuroscience community for ultra-high resolution (mesoscale) fMRI research and related projects. This BRAIN Initiative U24 dissemination funding facilitates NexGen 7T neuroscience pilot projects by providing scan time, subject recruitment and onsite personnel to conduct these research projects. It also provides remote scanning capabilities to minimize the need for long-distance investigator travel (researchers can travel to Berkeley if they wish to, but no travel funds are included in this project).

The Berkeley NexGen 7T brain scanner is a major collaborative development between Berkeley, Siemens and other institutions over the last 5 years, creating the Impulse head gradient (200mT/m, 900T/m/s) together with a 128 channel receiver system to perform human fMRI at up to 0.35-0.65 mm resolution.

Pulse Sequences

Example protocols achievable for different methods on the NexGen 7T are listed below (with hyperlinked references). Proposals requiring methods not currently offered on the NexGen 7T should address how these methods can be incorporated on the scanner.

- 0.4mm isotropic 3D EPI VASO
- 0.45mm isotropic 2D EPI BOLD
- 1.16mm isotropic ME EPI BOLD
- 0.64mm isotropic whole-brain 3D EPI BOLD
- 0.35mm isotropic small slab 3D EPI BOLD
- 0.21mm GRE SWI
- 0.8mm isotropic 2D EPI Diffusion
- 0.8mm accelerated single shot 3D GRASE

Peripherals

The scanner is equipped with a VPixx projector for visual stimulus presentation, Sensimetrics earbuds for auditory stimulus presentation, and a Current Designs 4 button response box for recording behavioral responses. These peripherals are connected to a Mac Mini desktop computer running PsychoPy for stimulus presentation and response recording.

IRB Protocol

Projects undertaken on the NexGen 7T should be covered by UC Berkeley's IRB protocol. The IRB covers sensory stimuli (visual and auditory), basic behavioral responses (finger tapping) and simple cognitive tasks, and allows for normal participants over the age of 18. Experiments beyond this remit (e.g., pediatric populations, specific patient populations, emotional or physically distressing stimuli, breathing manipulations, etc.) will need additional IRB approval. Projects should also be compatible with IRB regulations local to the investigators. A Data Use Agreement (DUA) may need to be completed prior to the sharing of data collected on the Berkeley NexGen 7T with your home institution.

Instructions

Your proposal should clearly and succinctly describe the project's aims, previous work, background, methods, significance, and an estimated amount of scantime required. Completed submissions should be emailed as a single pdf file to nexgen7t@berkeley.edu.

This opportunity is open to PIs from the international academic community. Special attention will be paid to alignment of the proposal to BRAIN 2.0 goals, and ensuring project PIs come from a diverse range of geographic locations and backgrounds.

Your proposal should contain the following sections, clearly indicated. Please respect the indicated page limits. If it's a resubmission, please indicate so in the beginning of the proposal and highlight the revisions in red font. Font should be Arial, 11 pt and page margins: at least 0.5 inch on all sides.

Summary (100 words total)
Briefly summarize the significance, innovation, objectives, and approach of the proposed research.

Research Plan (2 pages total)

A. **Project Title.** Put the project title, principal investigator's name(s) and email address(s) at the top of the first page
B. **Project Aims**. Concisely state the objectives of the project and the goals to be reached during the project.
C. **Background, significance, and innovation.** Provide a description of the relevant literature and the BRAIN 2.0 goals the project aims to address. Indicate how the proposed project leverages the NexGen 7T hardware and the increased resolution achievable on the NexGen 7T system.
D. **Approach.** Describe the methodology to achieve the pilot project within 12 months. List any specific needs for the proposal including pulse sequences, peripheral equipment or presentation software, and describe how these will be obtained if not already available on the NexGen 7T. Include an estimated timeline for milestones and the anticipated amount of sequence testing scantime and subject scantime needed. Include a data analysis plan and expected outcomes.
E. **Potential pitfalls, and alternatives.** Discuss alternative approaches if initial piloting indicates the proposed protocol has insufficient SNR.
F. **Impact and Sustainability.** Discuss the importance of successful outcomes and the plan for extramural funding.

References (1 page, not included in the 2-page limit of the Research Plan)

Study Team Info (1 page, not included in the 2-page limit of the Research Plan)
Name the principal investigator(s) and co-investigator(s) and briefly outline their respective unique contributions to their fields (including to the diversity of geographic locations and backgrounds). If relevant, state the previous collaborative experience between the study team including evidence of productivity (shared grants and publications). Up to 2 PIs are allowable per submission.