# Does SNR of visually evoked BOLD responses change with rapid multiplexed fMRI? Peter J. Kohler & Anthony M. Norcia

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### Background

Multiplexed (MUX) fMRI allows for sub-second acquisition of whole-brain images (Feinberg, 2010). What happens to the signal-to-noise ratio (SNR) of fMRI BOLD responses as acquisitions get faster? We tested this using a flickering grating undergoing periodic contrast modulation, while acquiring multiplexed fMRI. This protocol yields a direct measure of a stimulus-evoked BOLD response.

In *Experiment 1*, we manipulated sampling frequency using four different MUX factors, while keeping the stimulus frequency constant.

In *Experiment 2*, we manipulated both stimulus frequency and sampling frequency. In *Experiment 3*, we used the same sampling frequency, and 4 different stimulus frequencies, including 60 cycles per scan (4 second cycle).

## Stimulus: Dynamic-contrast grating

16 degrees of visual angle



Constant factors: Spatial frequency: 3 cpd Phase reversal: 5Hz Scan time: 240 seconds



We can change the sampling frequency (TR) and stimulus frequency (cycles per scan - cps), but keep all others factors constant.

### Analytical Approach

- 1) Preprocessing: Slice-time correction, volume registration, detrending.
- 2) Align functionally defined regions-of-interests (ROIs) to the functional data.
- 3) Average time-courses across scans and voxels within each ROI.
- 4) Transform average time-courses into the frequency domain, and compute SNR as the ratio of the signal at the stimulus frequency to the signal at four sidebands.





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Friston, K.J., Fletcher, P., Josephs, O., Holmes, A., Rugg, M.D., & Turner, R. (1998). Event-related fMRI: