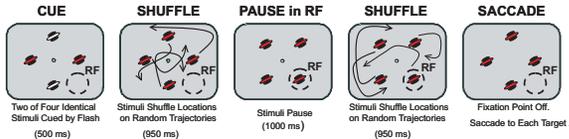


# Attention-dependent reductions in response variability in area V4 associated with changes in spike power spectra and burstiness

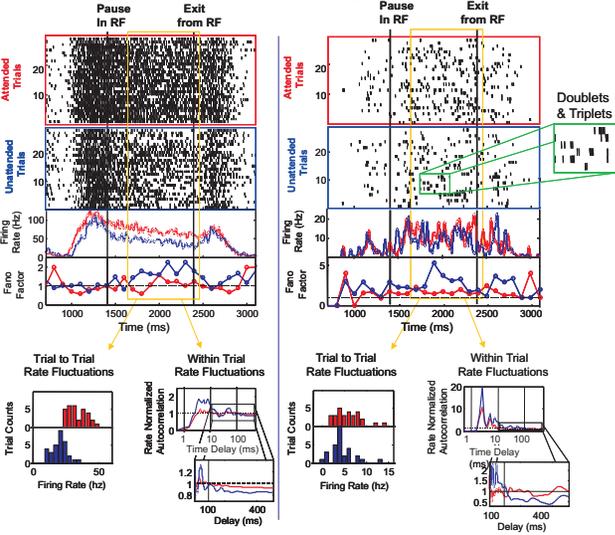
Jude F. Mitchell, Kristy A. Sundberg & John H. Reynolds\*

III-99

## Behavioral Task:



## Single Unit Examples:

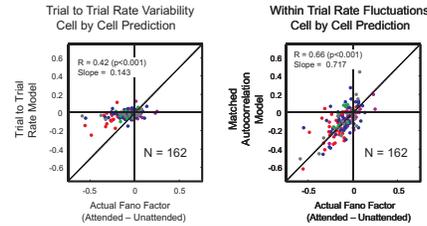


Single units were recorded in macaque area V4 as either an attended or an unattended stimulus entered and paused in the receptive field for 1000ms. Neurons typically showed an increase in rate and a reduction in variability as measured by the Fano Factor (spike count variance / mean in 100 ms counting intervals). We analyzed the period of sustained response (yellow box). Mean firing rate varied from trial to trial (histograms, bottom left) but also within trials as indicated by modulation of the spike autocorrelation (bottom right).

### References

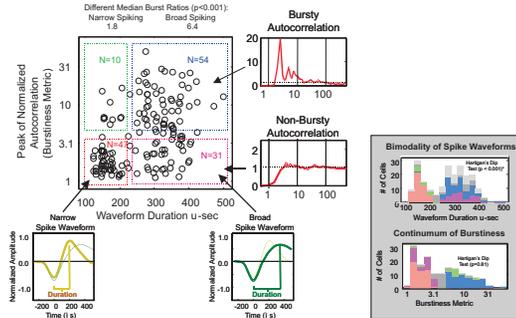
1. Pylyshyn ZW and Storm RW (1988) Tracking multiple independent targets: evidence for a parallel tracking mechanism. *Spat Vis.* 3(3):179-97.
2. Green CR and Pylyshyn ZW (2000) Multiple object tracking and attentional processing. *Can J Exp Psychol.* 54(1):1-14.
3. Mitchell JM, Sundberg KS, Reynolds (2007). Differential attention-dependent response modulation across cell classes in macaque visual area V4. *Neuron* 55, 131-141.

## Reductions in Fano Factor are due to within trial rate fluctuations.

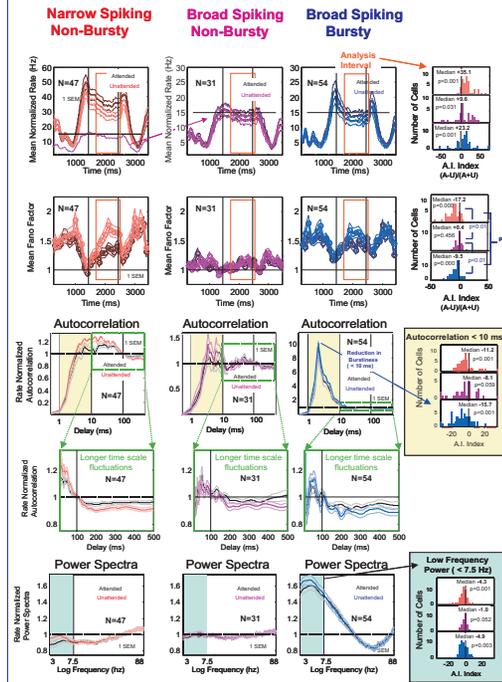


Methods: for each neuron, random spike trains were generated by two models and tested to determine if they exhibited similar changes in Fano Factor. For an accurate model points would fall along the line of unity above. One model had Poisson spiking with rates matched trial to trial. The second model generated spike trains matched in their spike autocorrelation for attended and unattended

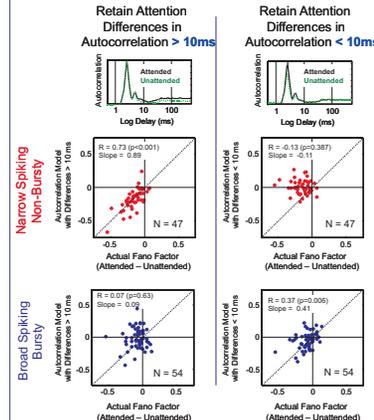
## The distribution of burstiness differs between narrow and broad spiking neuron categories.



## Attention-dependent modulation differs between classes defined by waveform duration and burstiness.



## Low frequency fluctuations and burstiness account differently for Fano Factor reductions depending on class.



- 1) Within trial rate fluctuations account for attention-dependent reductions in Fano Factor in a sustained attention task.
- 2) Rate fluctuations can be captured in the spike autocorrelation.
- 3) Broad spiking neurons exhibit more burstiness in firing.
- 4) Narrow spiking neurons (putative fast spiking interneurons) show reductions in variability due to reductions in low frequency fluctuations.
- 5) Burst firing broad spiking neurons show reductions in variability at least partially due to reductions in the burstiness of their firing.