Neural Mechanisms of top-down control in contour grouping

TeaP 2013, Wien

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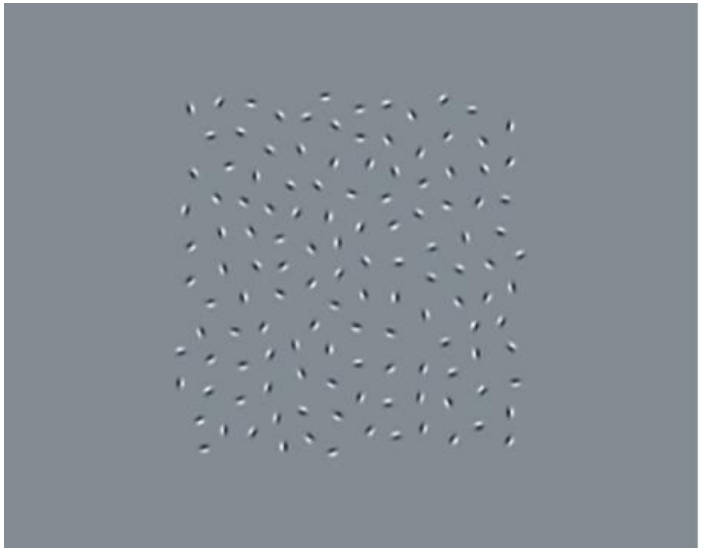
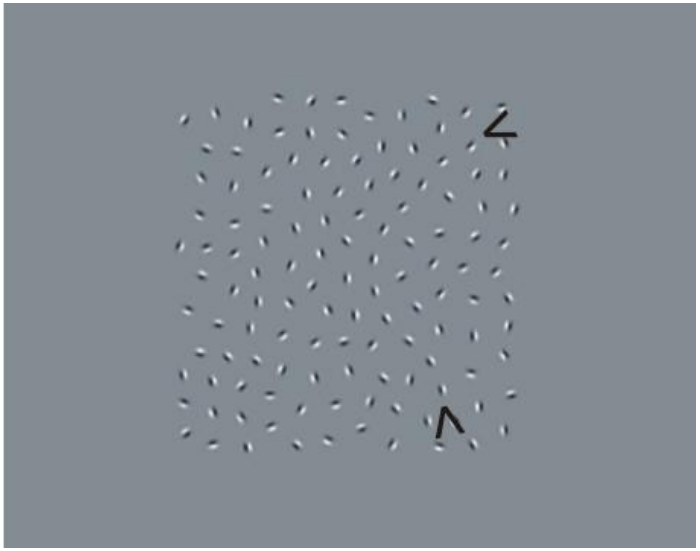
Stimuli used in the Gabor path paradigm

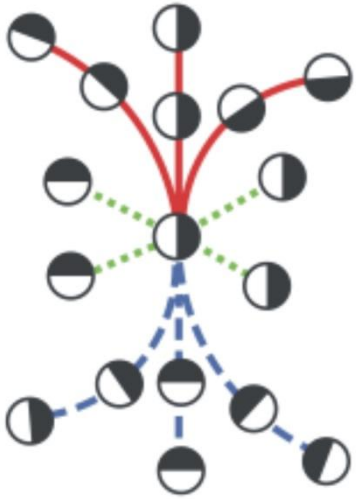


non-contour



contour

Contour integration mediated by lateral interactions in V1

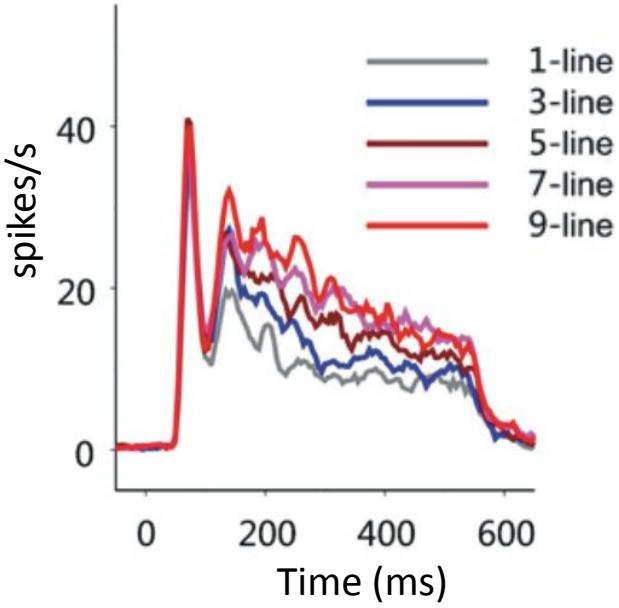


V1 neurons:
excitation
inhibition

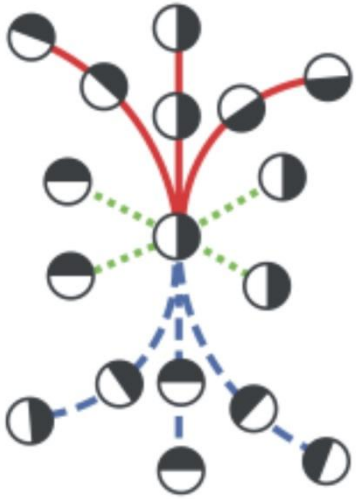
Dakin & Baruch, 2009

Contour integration mediated by lateral interactions in V1

monkey V1, detecion task



Li et al., 2008



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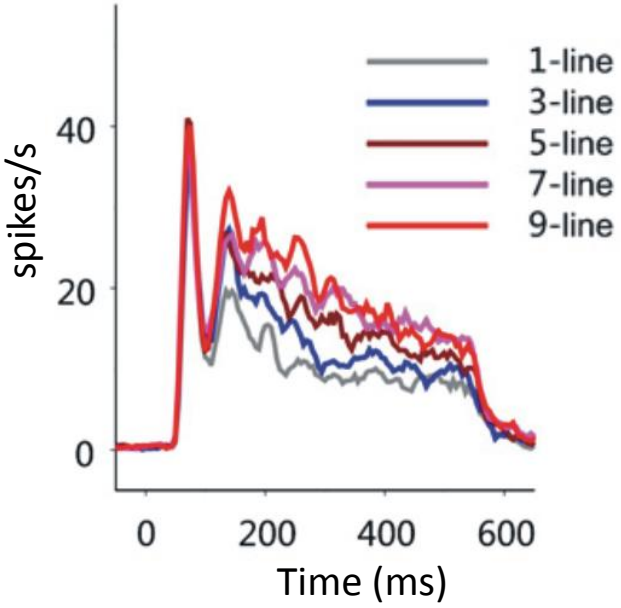
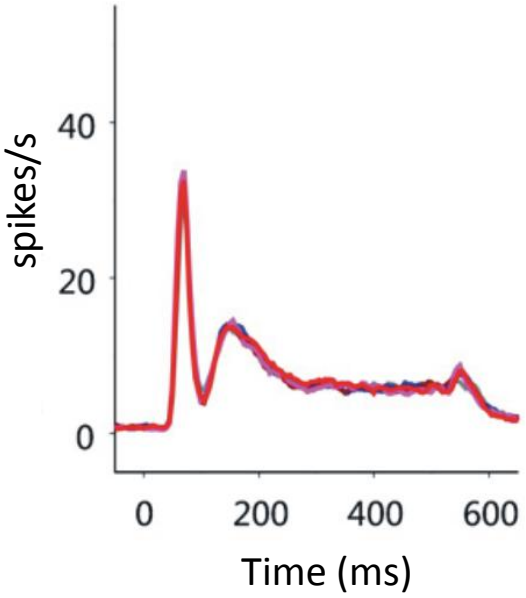
Contour integration mediated by lateral interactions in V1?

monkey V1, detecion task

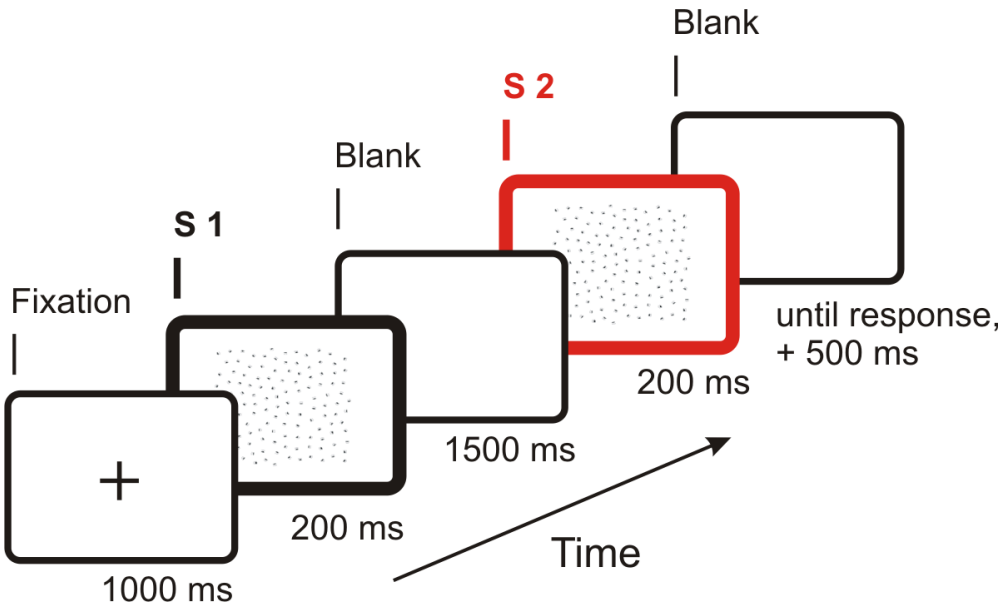


monkey V1, dimming task



Li et al., 2008

Our two-interval forced choice paradigm.

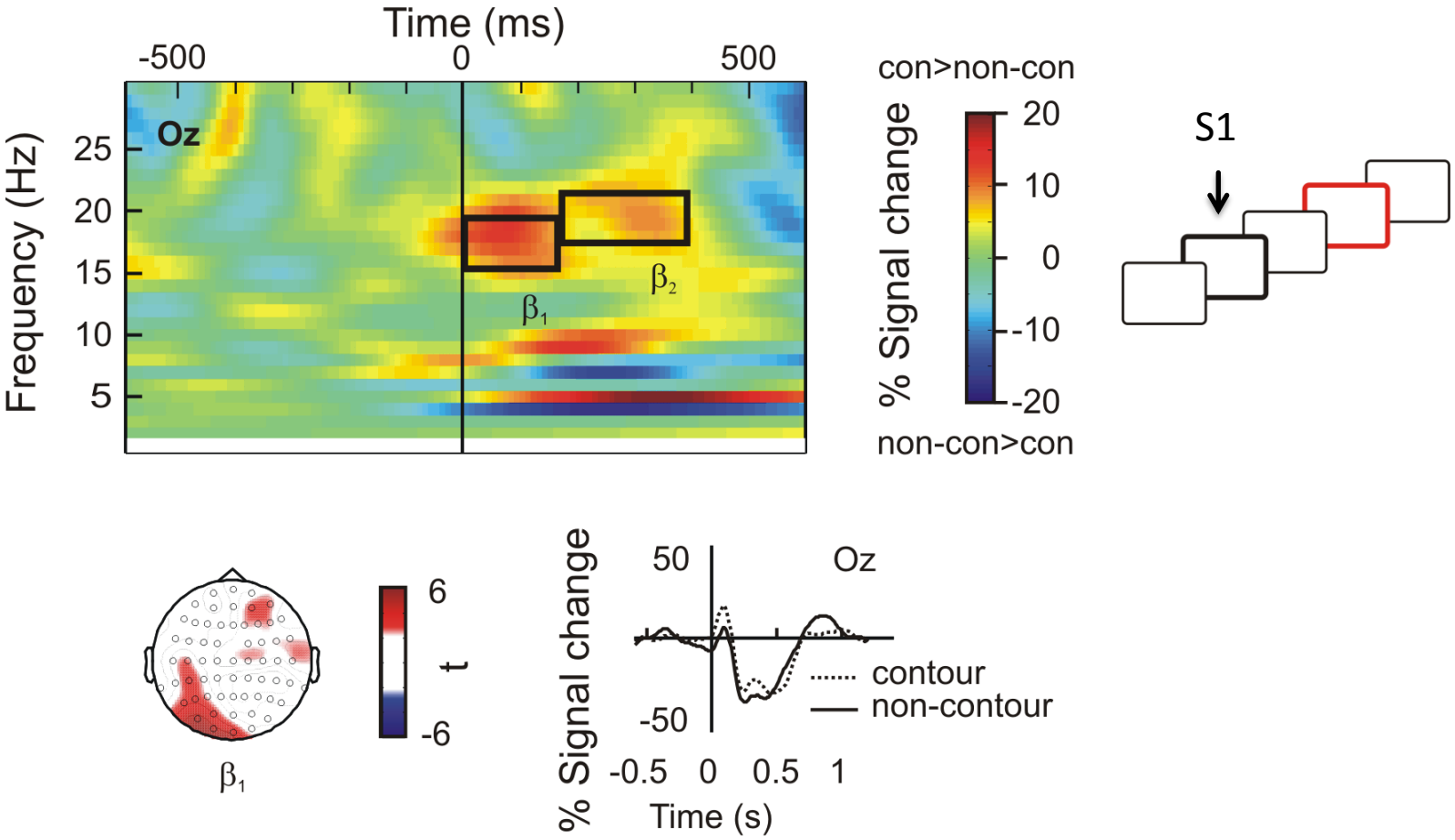


Subjects and task
- 6f, 8,m 19-32 years
- 2IFC task
- Top-down preparation observable prior to S2

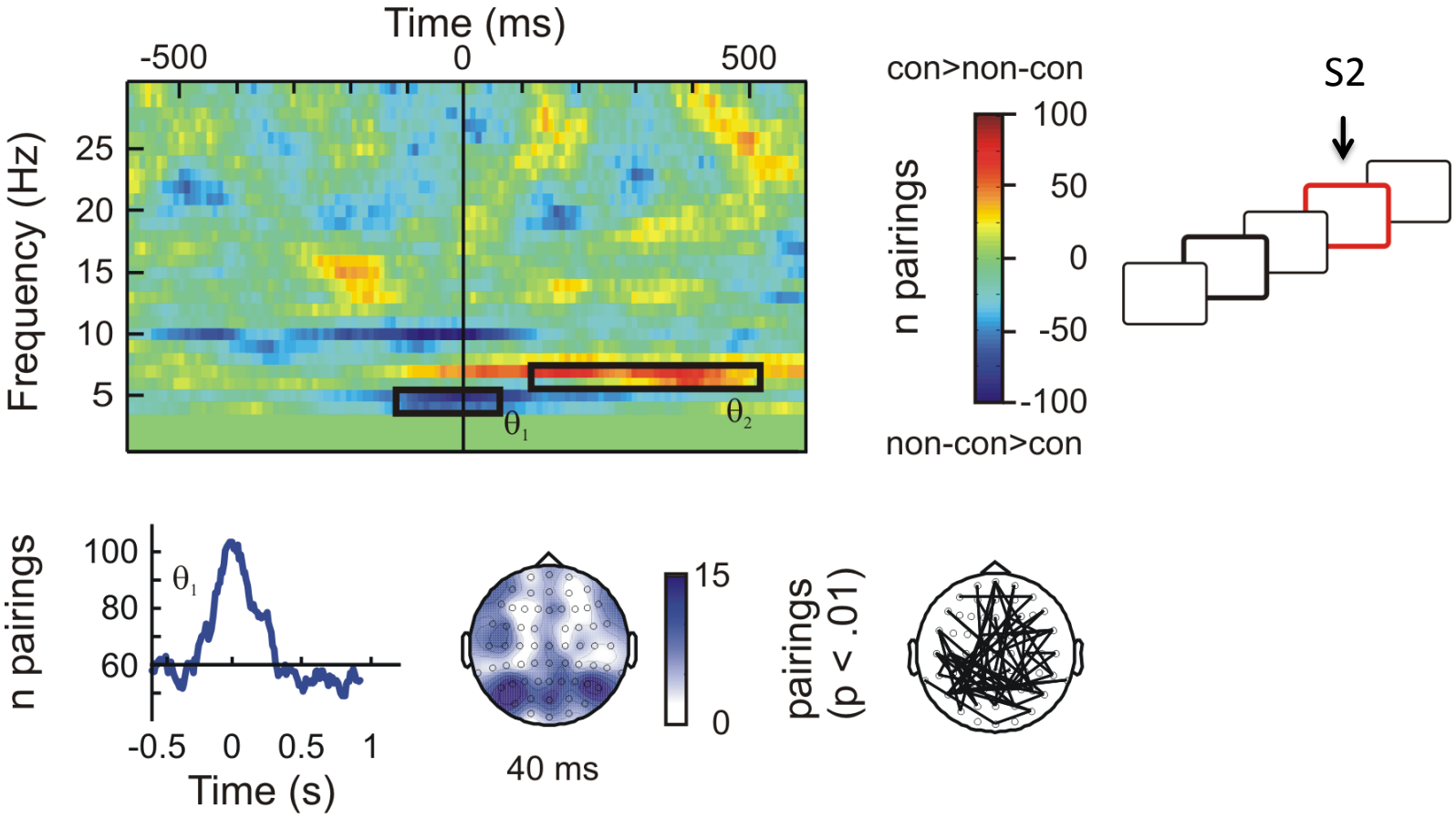
EEG
- 62 channel EEG
- 500 Hz
- Power and PLV analysis

Performance
- Accuracy 71.01±4.8%
- RT 791±237 ms

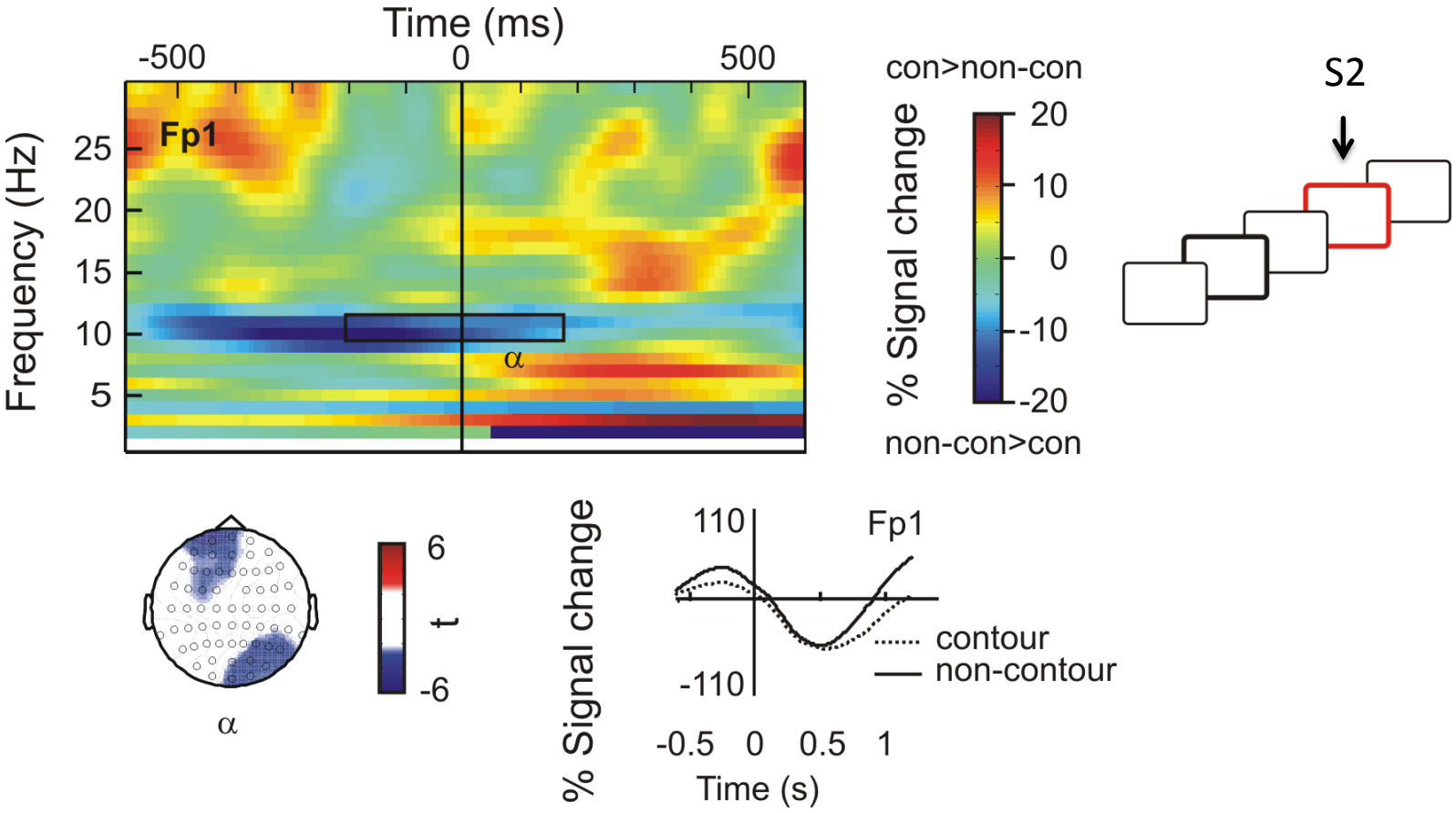
Power, contour vs. non-contour



Phase-locking value, contour vs. non-contour



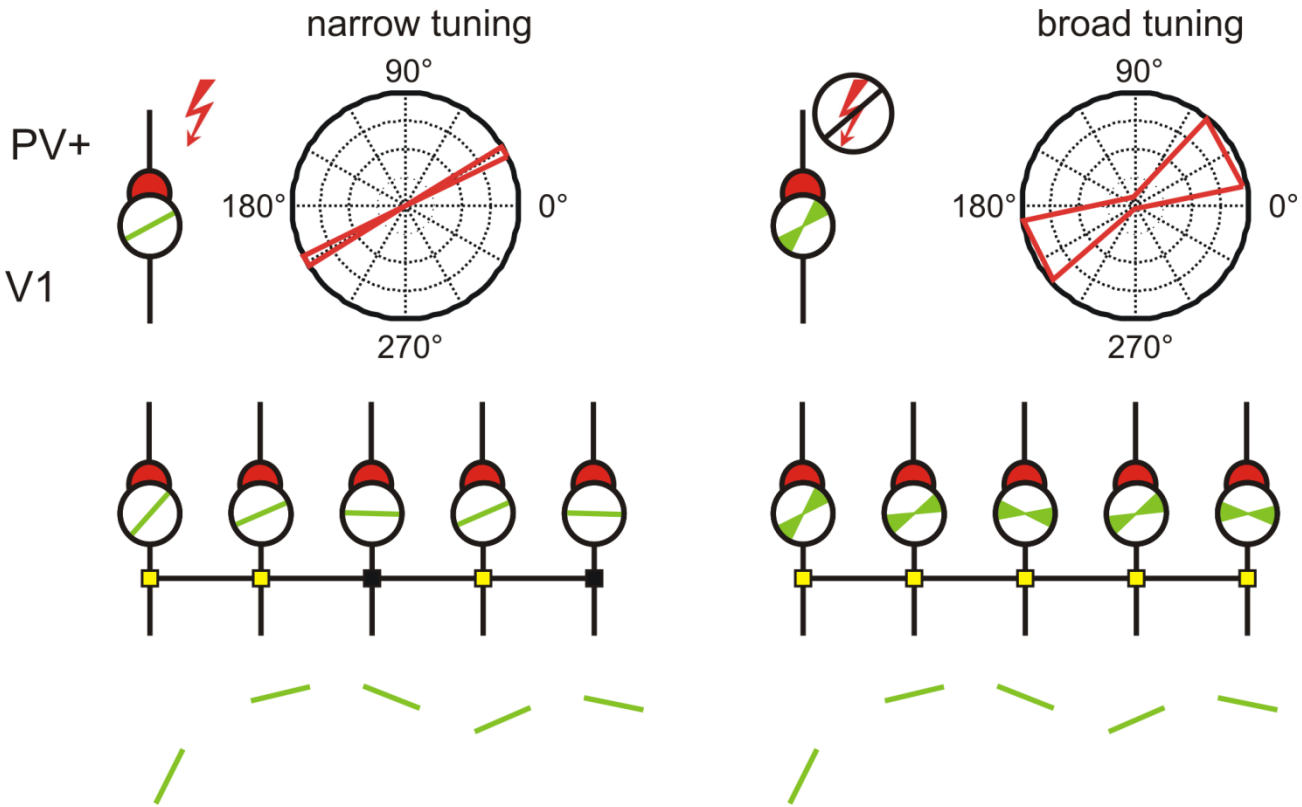
Power, contour vs. non-contour



Summary, Part I

- **We investigated** top-down control in contour grouping in a 2IFC paradigm.
- **We found**...
  - a lower number of theta couplings and a lower alpha power for contours compared to non-contours presented in S2,
  - and increased beta power for contours compared to non-contours in S1, but not in S2.
- **We conclude** that contour integration involves top-down control, and that this top-down control modulates contour processing during early vision.

Discussion



Hofer et al., 2011, Nat Neurosci; Lee et al., 2012, Nature; Wulff, et al., 2009, PNAS

Full Summary

- **We investigated** top-down control in contour grouping in a 2IFC paradigm.
- **We found**...
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  - and increased beta power for contours compared to non-contours in S1, but not in S2.
- **We conclude** that contour integration involves top-down control, and that this top-down control modulates contour processing during early vision.
- **We propose** that top-down control in contour grouping might be achieved by modulating the tuning profiles of orientation-selective neurons in V1.

Volberg G, Wutz A, Greenlee MW (2013) Top-Down Control in Contour Grouping. PLoS ONE 8(1): e54085.