

# *Focusing EIT reconstructions using two electrode planes*

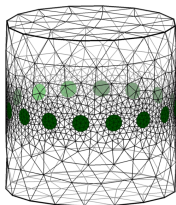
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Auer<sup>2</sup> Martina Mosing<sup>3</sup> Christina Braun<sup>2</sup> Andreas  
Waldmann<sup>4</sup> Stephan Böhm<sup>4</sup> Andy Adler<sup>5</sup>

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Landquart, Switzerland <sup>5</sup>Carleton University, Ottawa, Canada

EIT 2017  
June 21–24, Dartmouth College  
Hanover, New Hampshire, USA

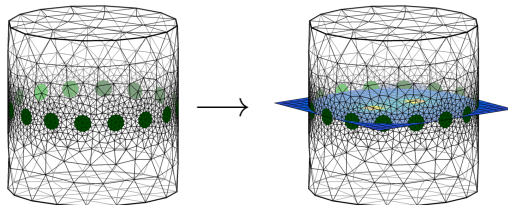
# Background

## EIT with a single electrode plane



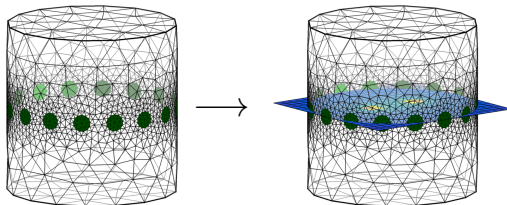
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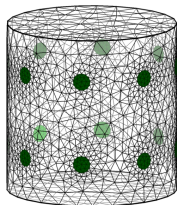


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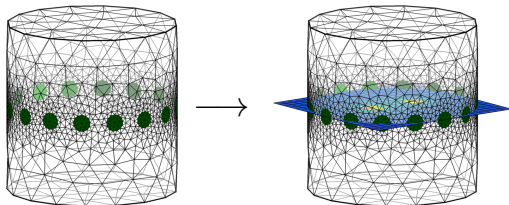


## EIT with multiple electrode planes

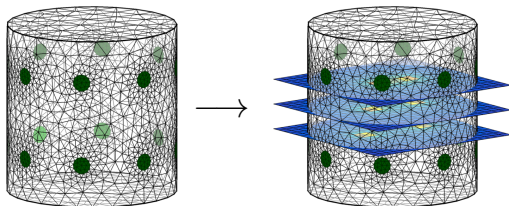


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## EIT with a single electrode plane



## EIT with multiple electrode planes



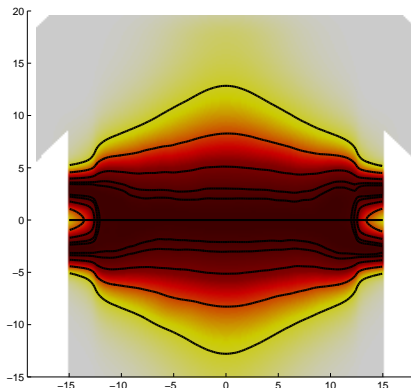
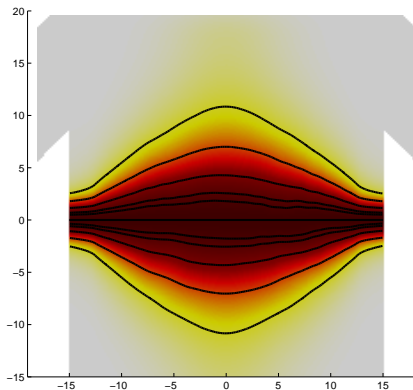
# Single vs multiple electrode planes

Single plane:  $1 \times 32$

- Off-plane sensitivity
- + Well understood

Multiple planes:  $2 \times 16$

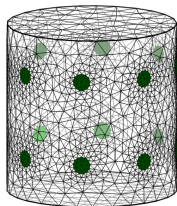
- + Better off-plane sensitivity
- Less well studied (plane separation, stim patterns, ...)



Each vertical pixel is calculated with respect to the on-plane value, and shown by the contours (indicating 95%, 90%, 75%, 50% and 25% of the maximum).

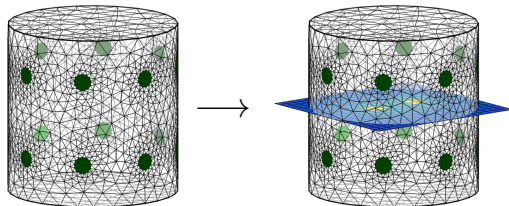
## Goal: better in-plane imaging

Can we use  $2 \times 16$  placement to give better single slice measurements?



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Use this to study (heterogeneous) horse lungs:

- gravity-related pressure changes
- abdomen (with lots of gas) diagonally under lungs
- equine asthma  $\rightarrow$  inhomogeneous lung changes

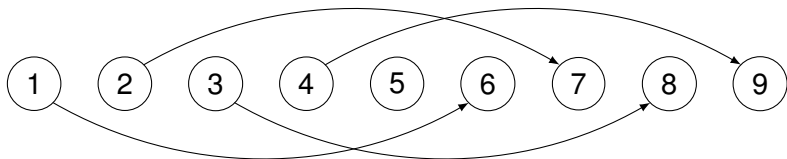


## Methods: Data collection

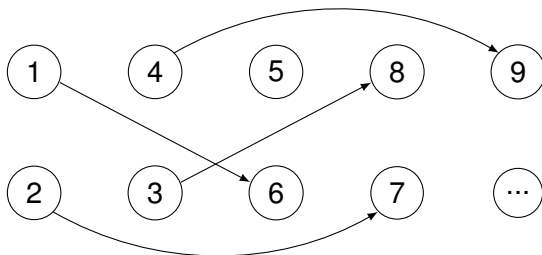


## Methods: Electrodes

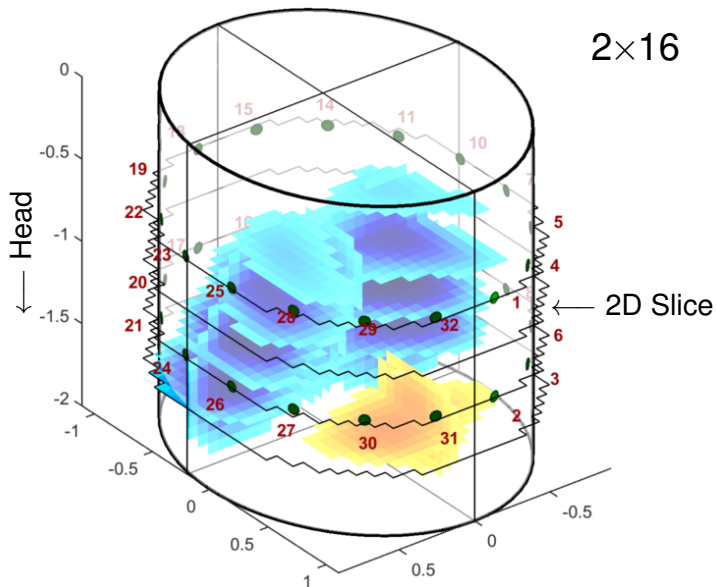
- Electrode belt:  $1 \times 32$  or  $2 \times 16$
- EIT system: Swisstom BBVet (32 elec at 50 frames/s)
- Stim/meas pattern:  $1 \times 32$  (skip 4)



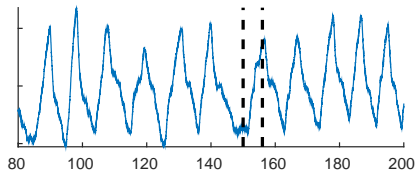
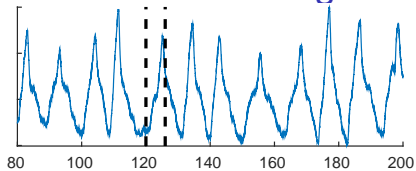
- Stim/meas pattern:  $2 \times 16$  (skip 4 “square” pattern)



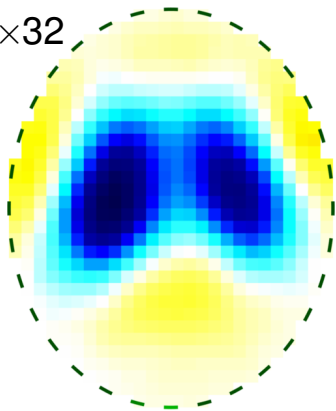
# Methods: 3D Reconstruction



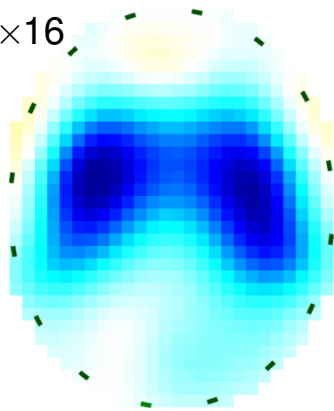
## Cross-sectional images



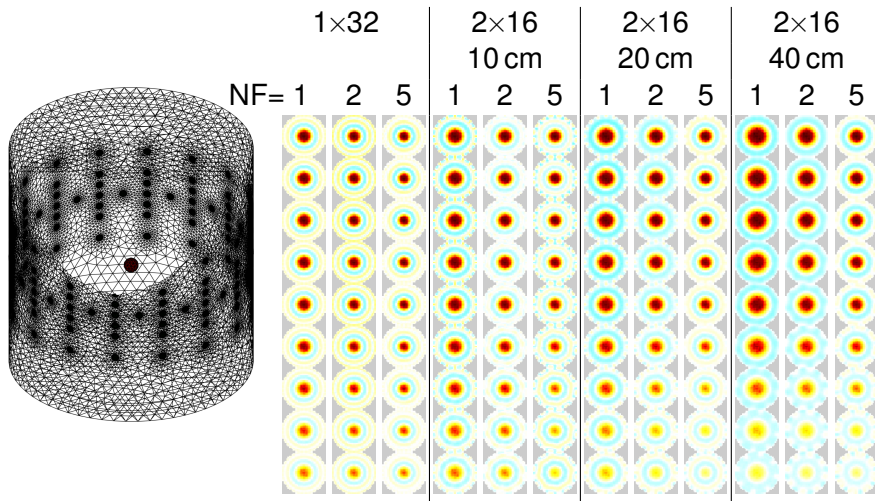
$1 \times 32$



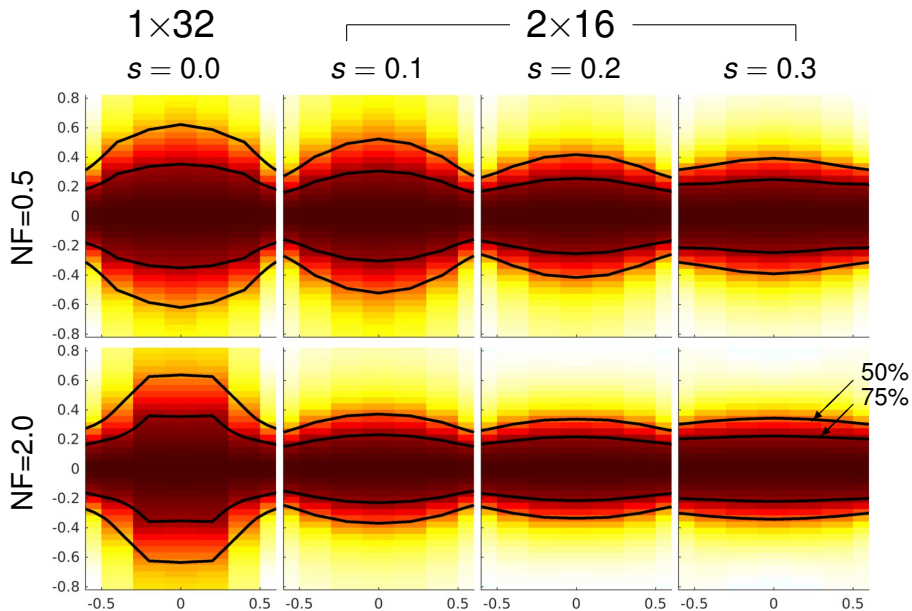
$2 \times 16$



# Simulation images



# Vertical resolution vs. Plane separation (s)



# Discussion

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- Appears to have improved slice width
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  - Plane separation
  - Stim/meas patterns
  - How to choose reconstruction parameters ( $\lambda$ )
  - Effect of electrode errors
  - Efficient algorithm calculation



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- Need a better term: “*stimulation & measurement patterns*”