

# Single Shot Spiral TSE

J.Hennig

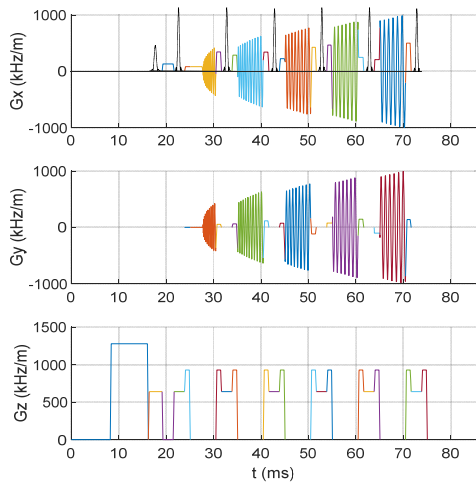
Dept.of Radiology, Medical Physics

# **Declaration of Financial Interests or Relationships**

Speaker Name: Hennig

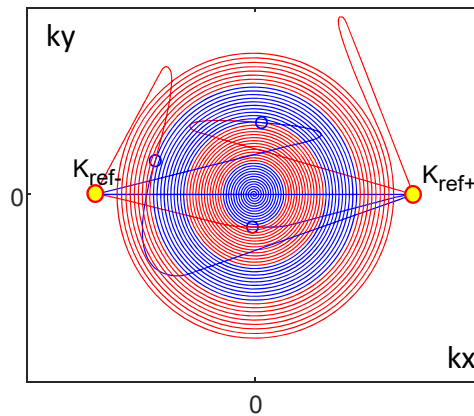
I have no financial interests or relationships to disclose with regard to the subject matter of this presentation.

# Single Shot spiralTSE with Annulated Segmentation



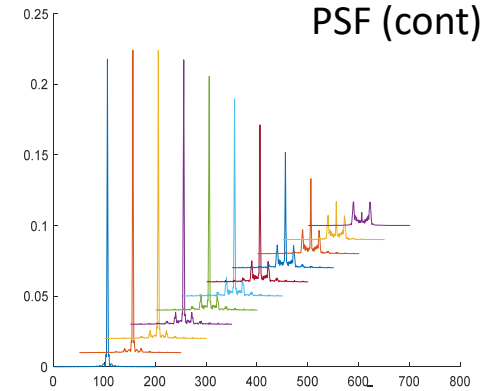
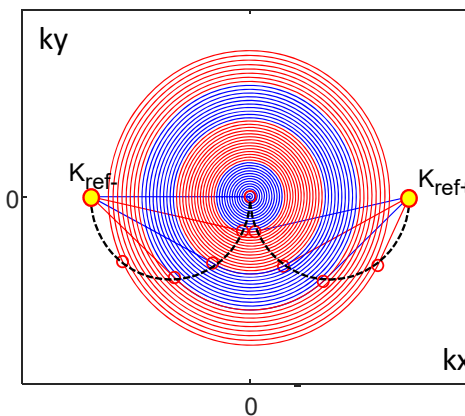
spiralTSE

fixed mode

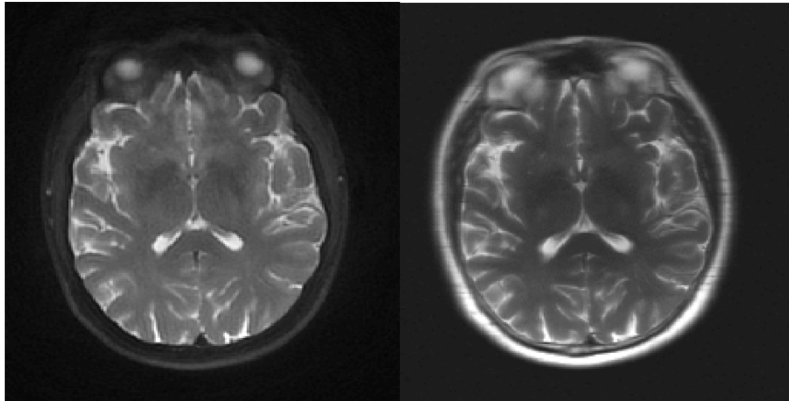


HASTE

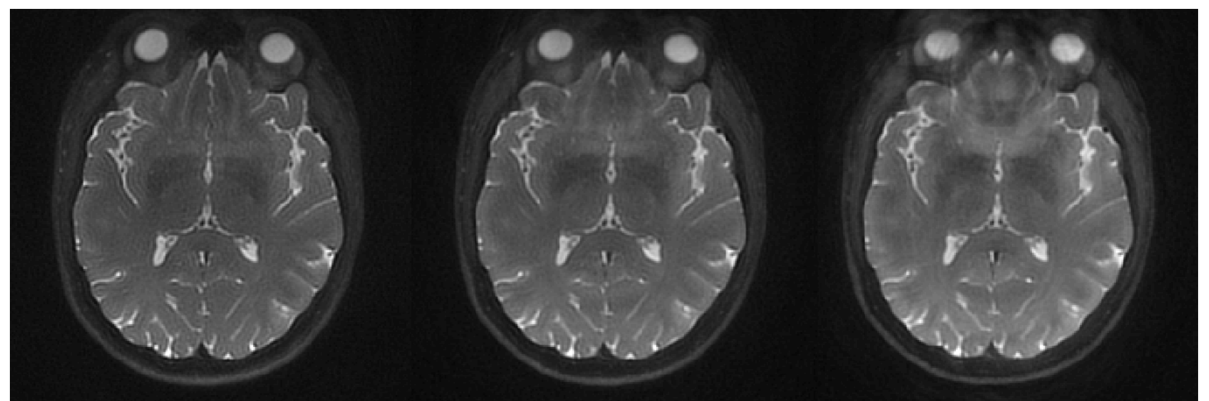
tangential mode.



16 ms



ESP



<https://github.com/HennigJue/single-shot-spiral-TSE>

Hennig J, Barghoorn A, Zhang S, Zaitsev M (2022) Single shot spiral TSE with annulated segmentation. *Magnetic Resonance in Medicine* 88:651–662.

Block W, Pauly J, Nishimura D (1997) RARE spiral T2-weighted imaging. *Magnetic Resonance in Medicine* 37:582–590.

Wang Z, Allen SP, Feng X, Mugler III JP, Meyer CH (2022) SPRING-RIO TSE: 2D T2-Weighted Turbo Spin-Echo brain imaging using SPiral RINGS with retraced in/out trajectories. *MRM* 88:601–616.

# Hot Topics In The Early 1980s: Quantitative MRI

## CATEGORY 1: APPROACHES TO TISSUE CHARACTERISATION

### Invited Symposium Papers

#### The Role of $T_1$ and $T_2$ In Tissue Identification

L.E. Crooks

#### Image Contrast and Relaxation Times

J. Mallard, J.M.S. Hutchison, M. Foster and L. Eastwood

#### Artifacts in the Measurement of $T_1$ and $T_2$

I.R. Young

### Contributed Papers

#### Tissue Differentiation in MRI by Means of Pattern Recognition

R. Bachus, H. Koenig, G. Lenz, M. Deimling, E.R. Reinhardt

#### Calculation of $T_1$ Pictures by the Null-Method

C.J.G. Bakker and C.N. de Graaf

#### A method for a Multiparametric Tissue Characterization in NMR-Imaging

G. Bielke, A. Brückner, S. Meindl, W.V. Seelen, H.P. Higer, P. Pfannenstiel, M. Meves

#### Characterization of Human Endocrine Pancreatic Tumors

C.A. Boicelli, R. Toni, A.M. Baldassarri, A. Bondi, P. Vezzadini

#### Quantitative Images in Magnetic Resonance

G. Borasi, S. Bradamente, P. Zaniol, G. Alberti

#### Relaxation in Pathology: Are $T_1$ 's and $T_2$ 's Diagnostic?

P.A. Bottomley, C.J. Hardy, R.E. Argersinger and G.R. Allen

#### Relaxation Time Measurements in Human Breast Tissue

M.J. Bronskill

#### A Comparison of

R.A. Brooks, G.

#### An Analytic Simu

M.H. Buonocor

13

15

16

18

20

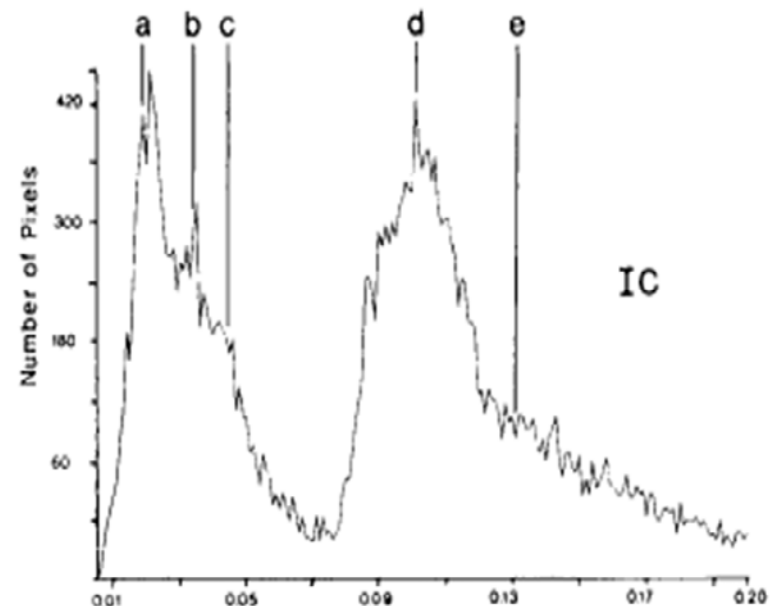
22

24

26

28

30



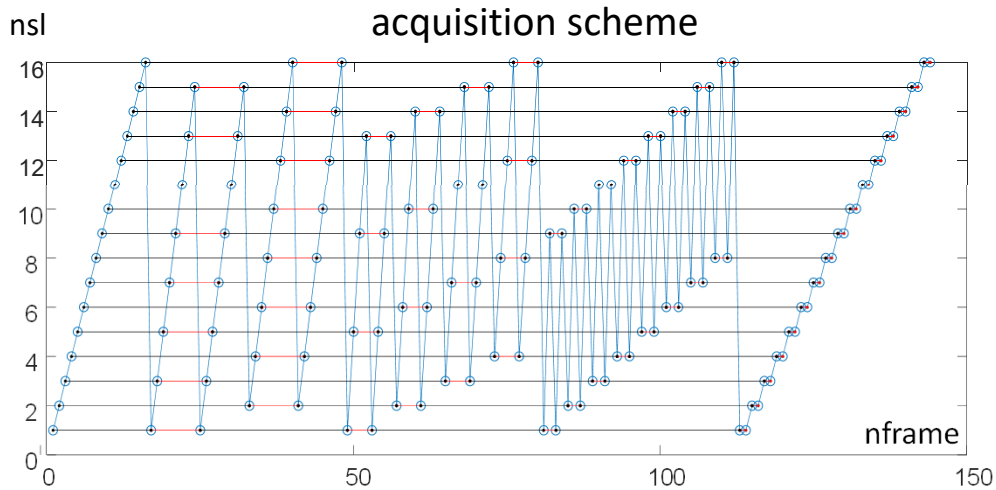
(Single valued)  $T_1$ - and  $T_2$ - values do **NOT** represent tissue properties.

Tissues are characterized by spectra of different  $T_1$ s and  $T_2$ s.

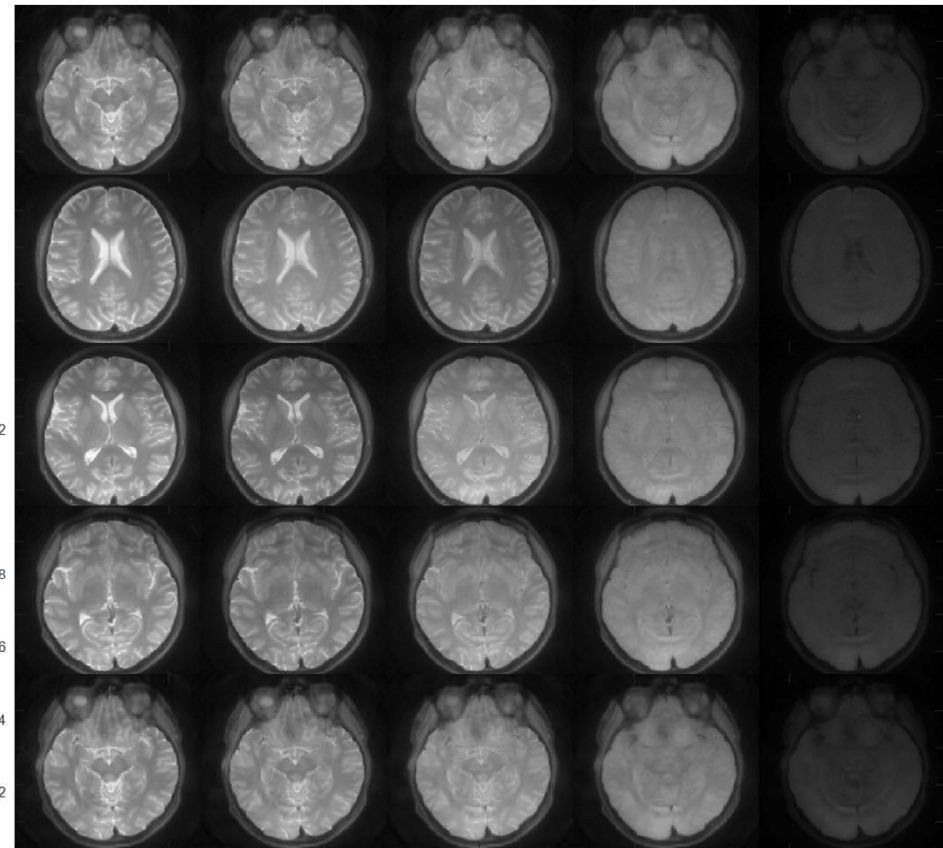
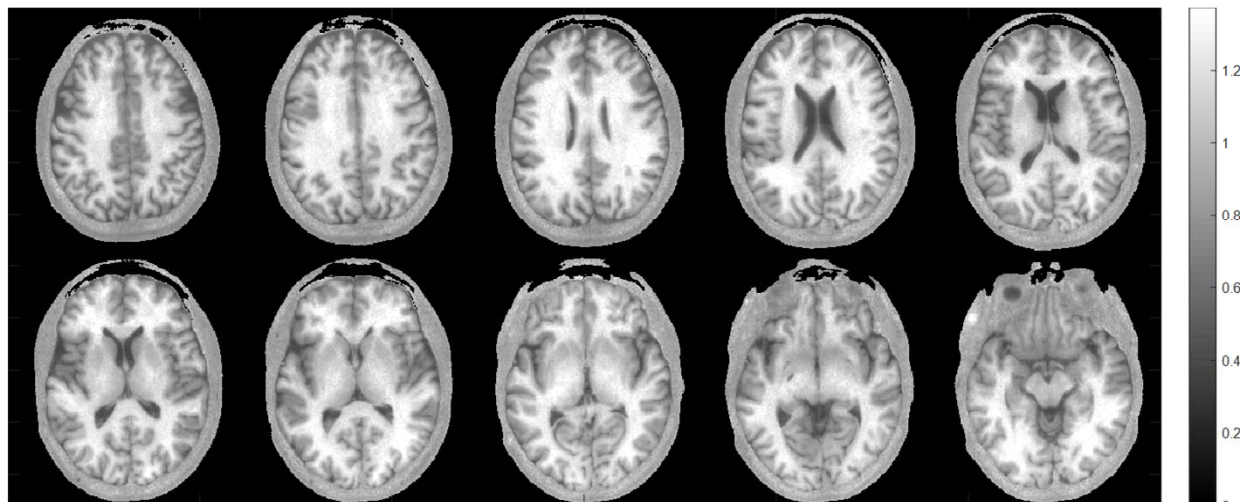
Measured values depend on the way they are measured and are affected by other mechanisms like chemical exchange, magnetization transfer, diffusion, J-coupling,...

l, DB.  
lead and  
ONANCE

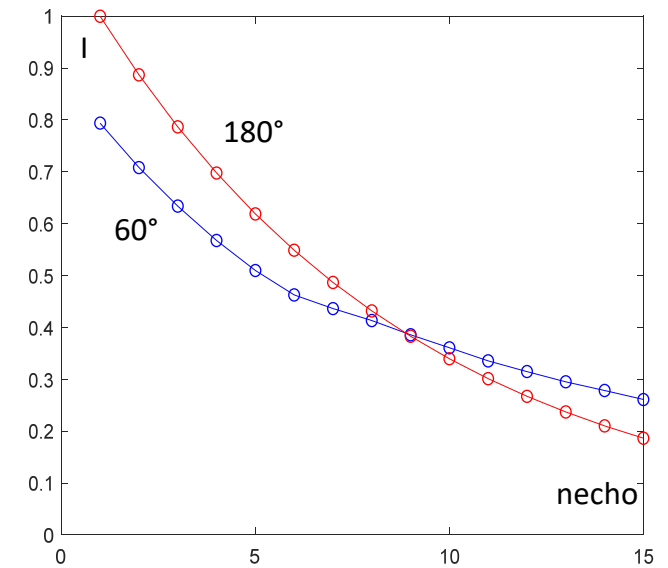
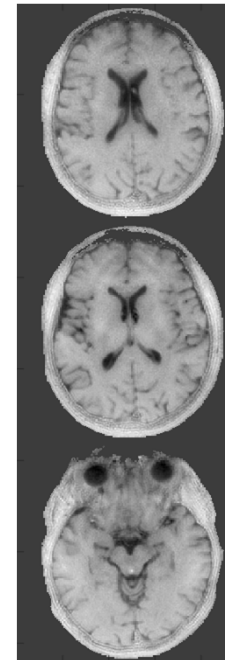
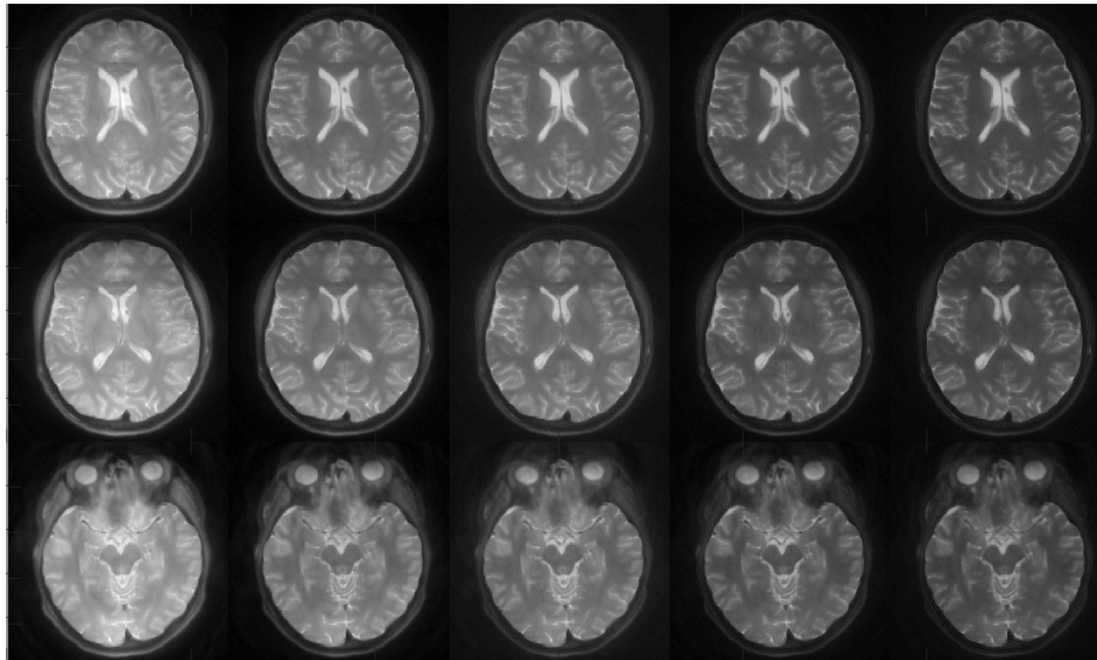
# Parametric Imaging with Single Shot spiralTSE: T1



For 16 slices acquisition is performed such, that each slice is acquired with 9 different TRs. Total number of frames =144 acquired in ~ 36s.



# Parametric Imaging with Single Shot spiralTSE: T2



todo:

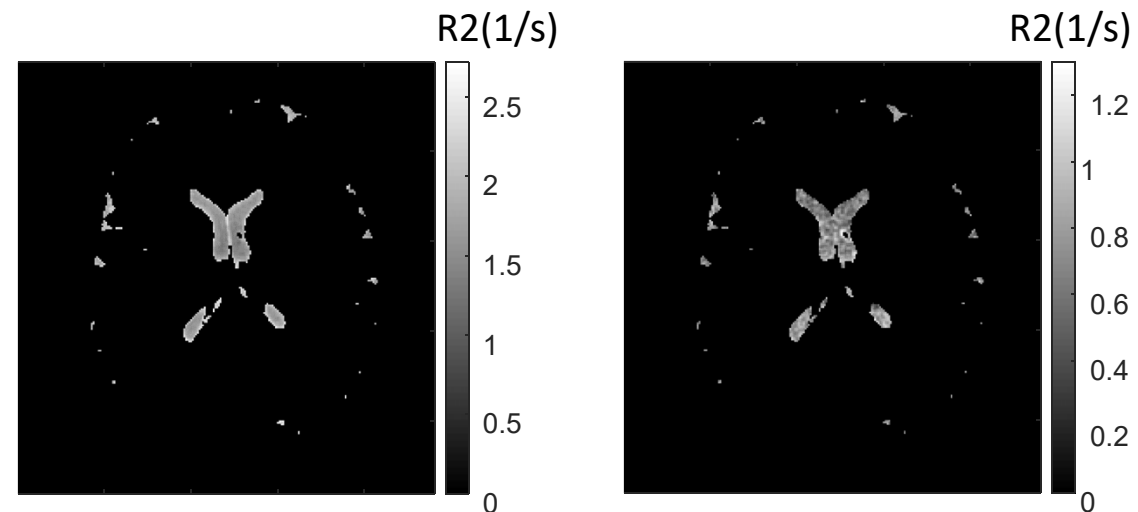
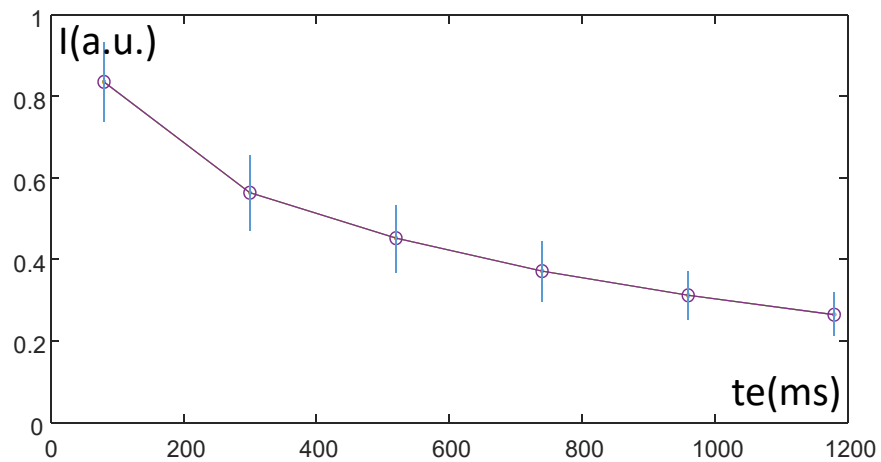
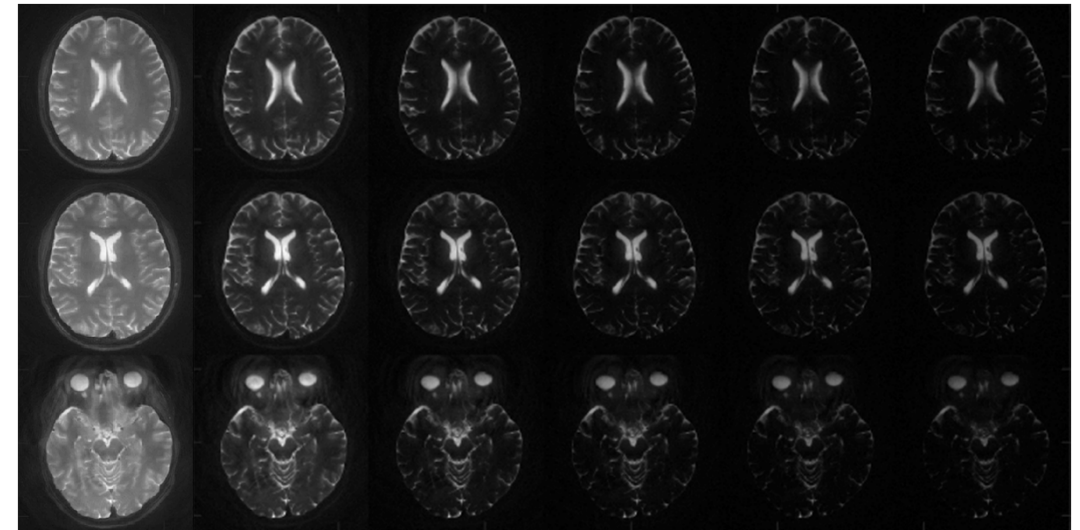
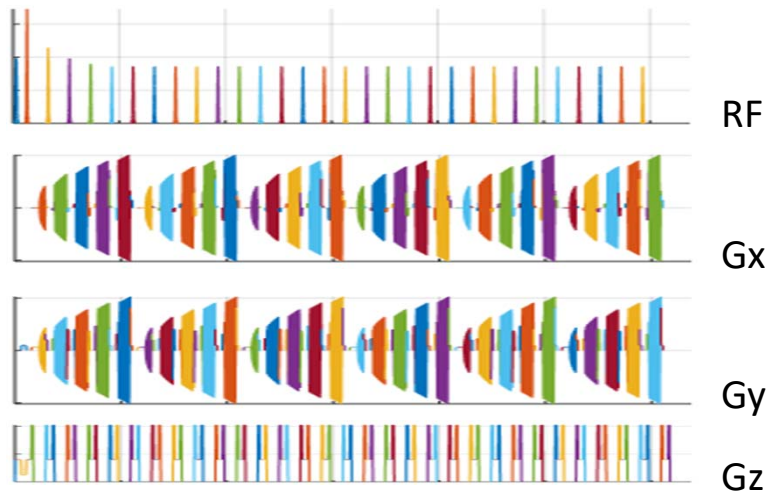
T2-Quantitation with template fitting to a library generated with the EPG (including slice profiles)



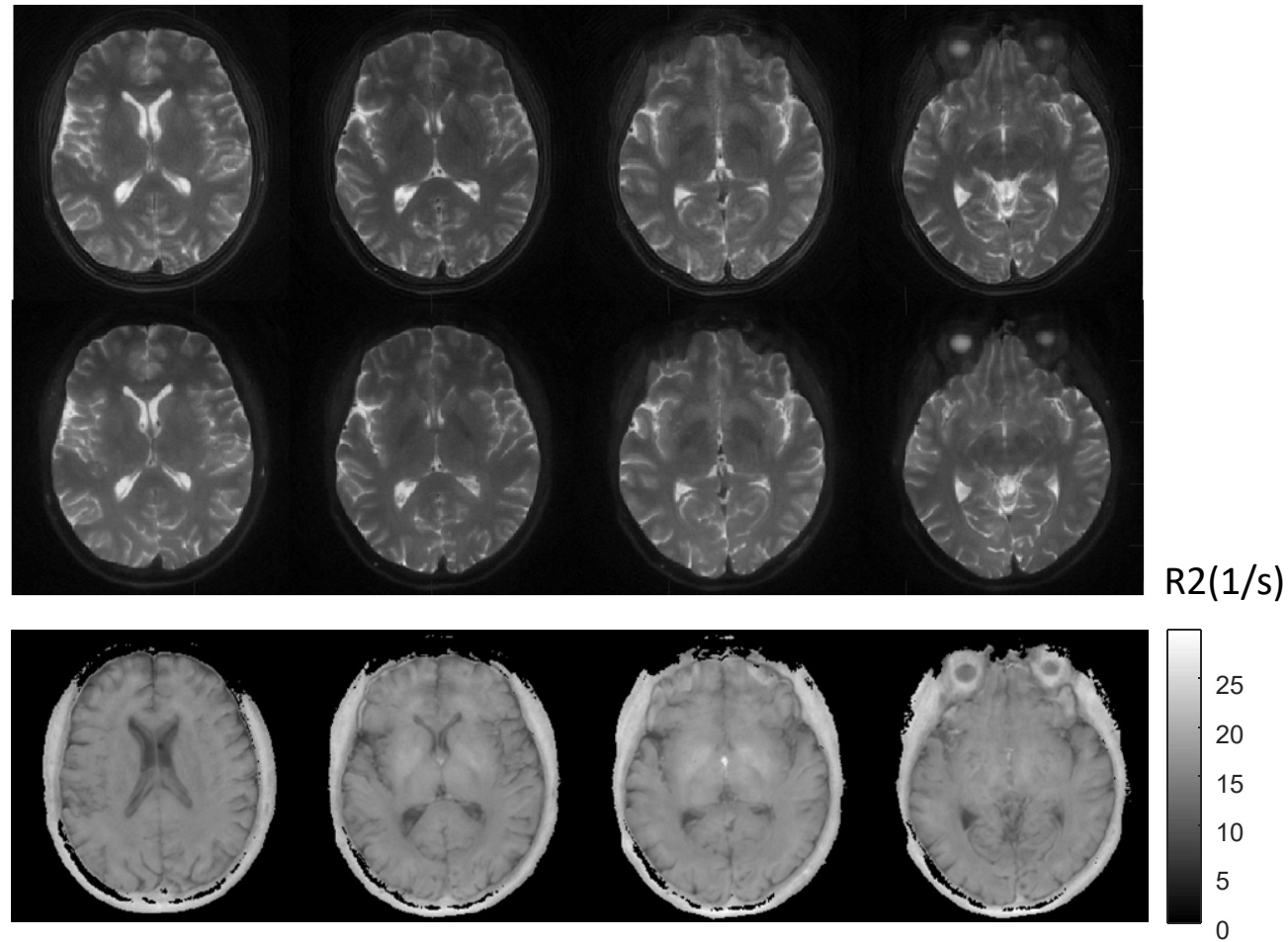
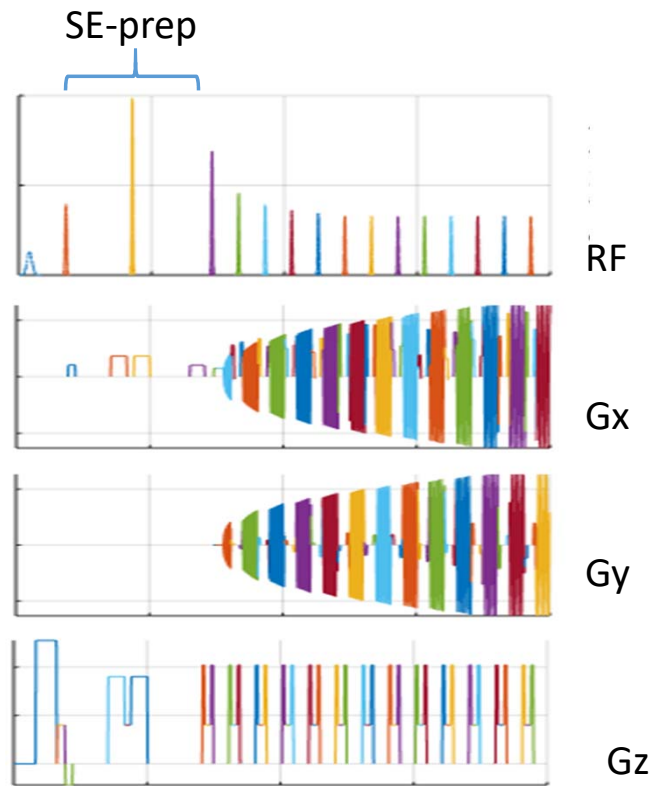


# Parametric Imaging with Single Shot spiralTSE: long T2

multiple images acquired in one echo train

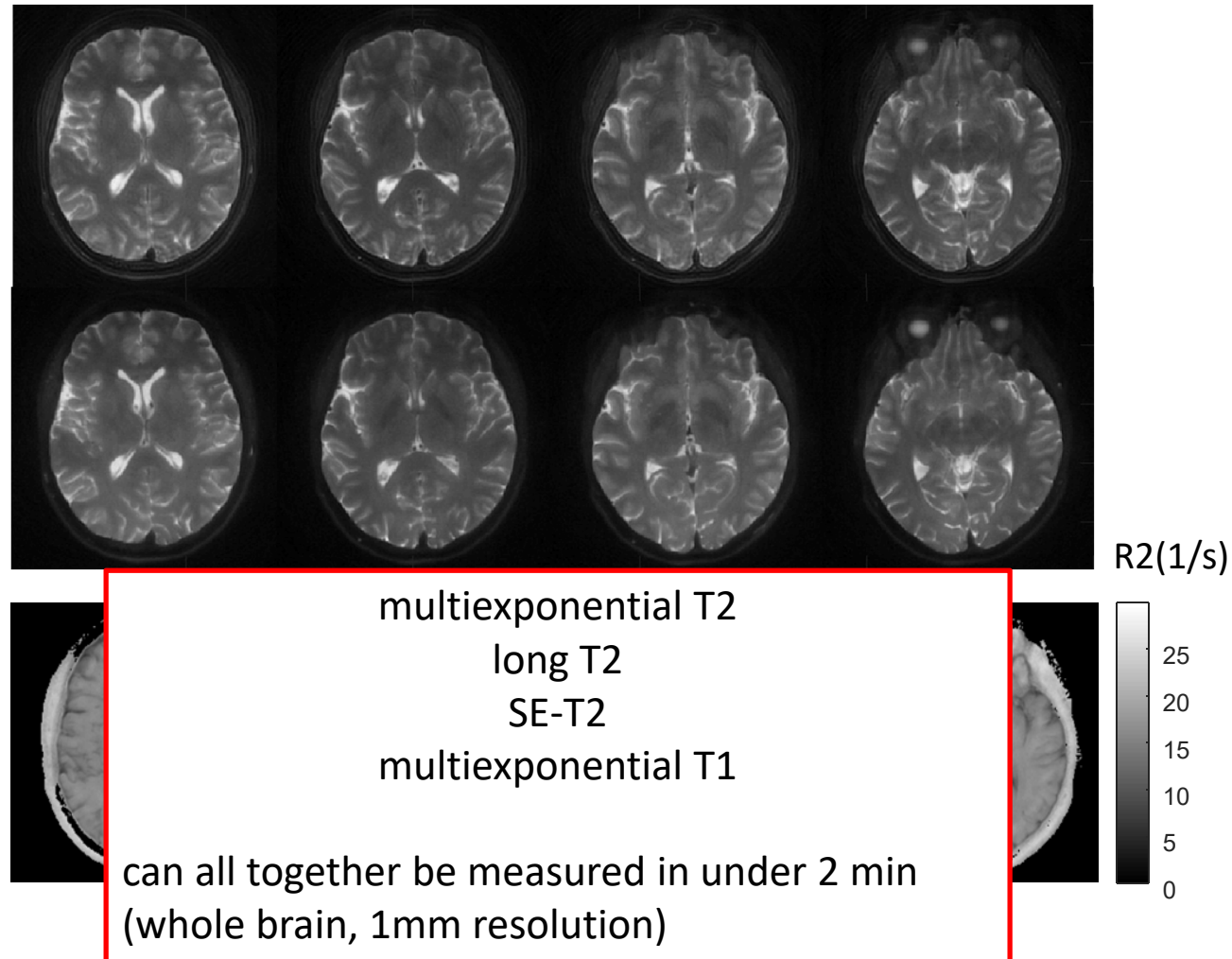
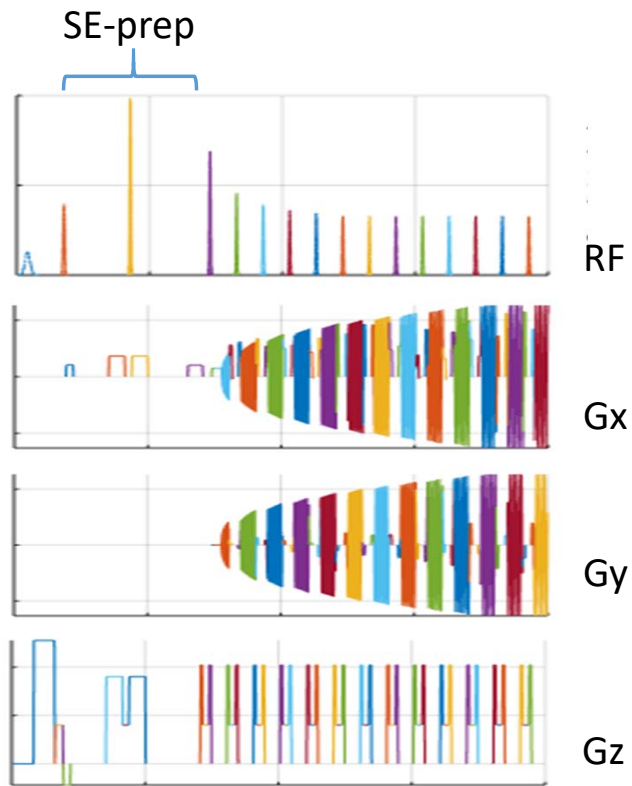


# Parametric Imaging with Single Shot spiralTSE: spin echo T2

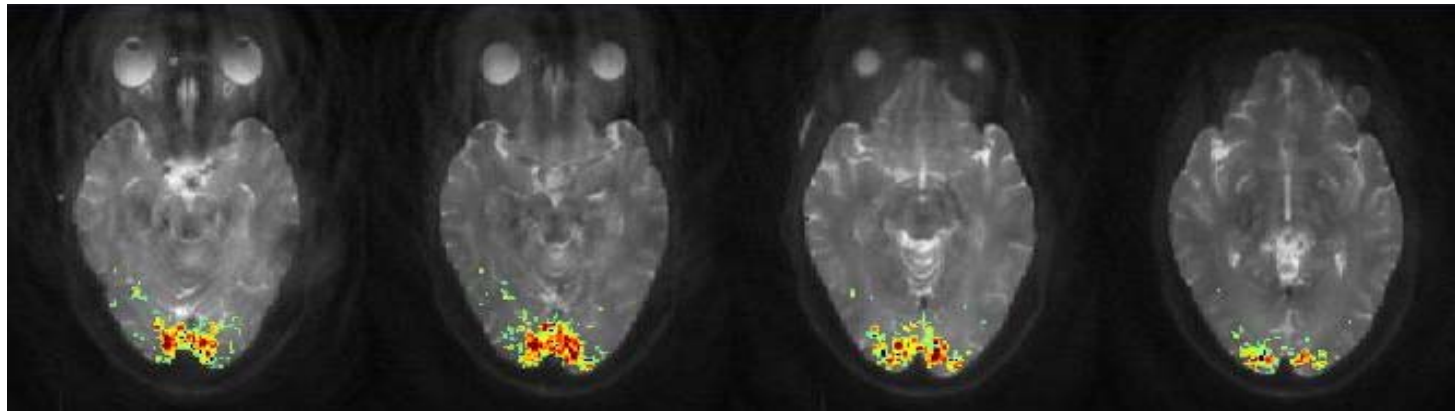




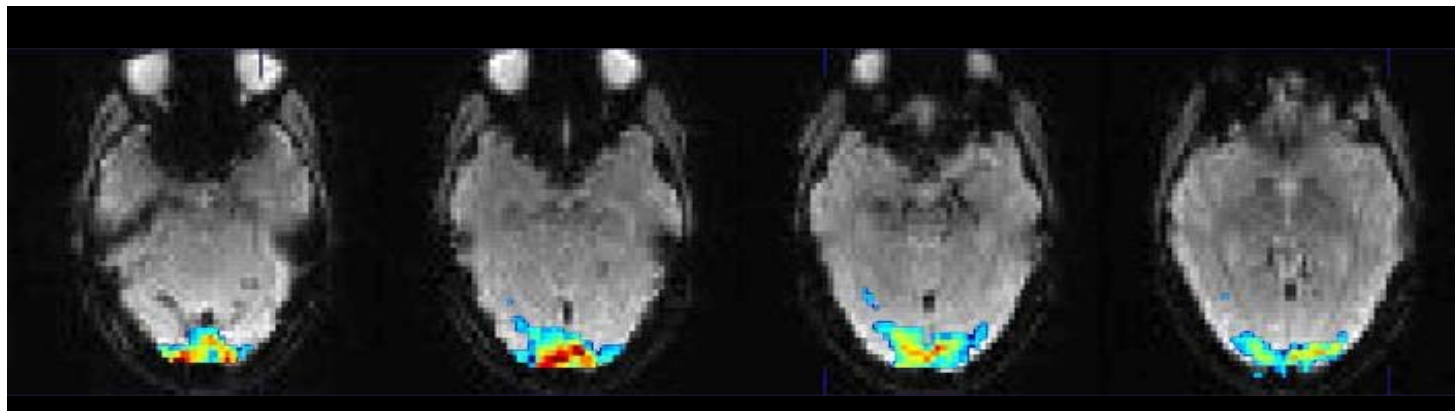
# Parametric Imaging with Single Shot spiralTSE: spin echo T2



## fMRI with Single Shot spiralTSE



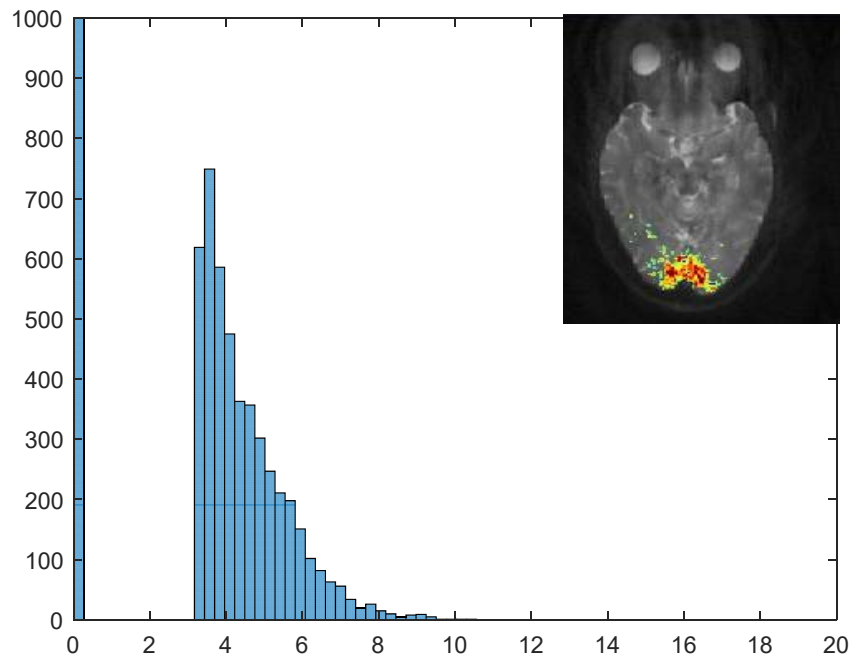
spiralTSE



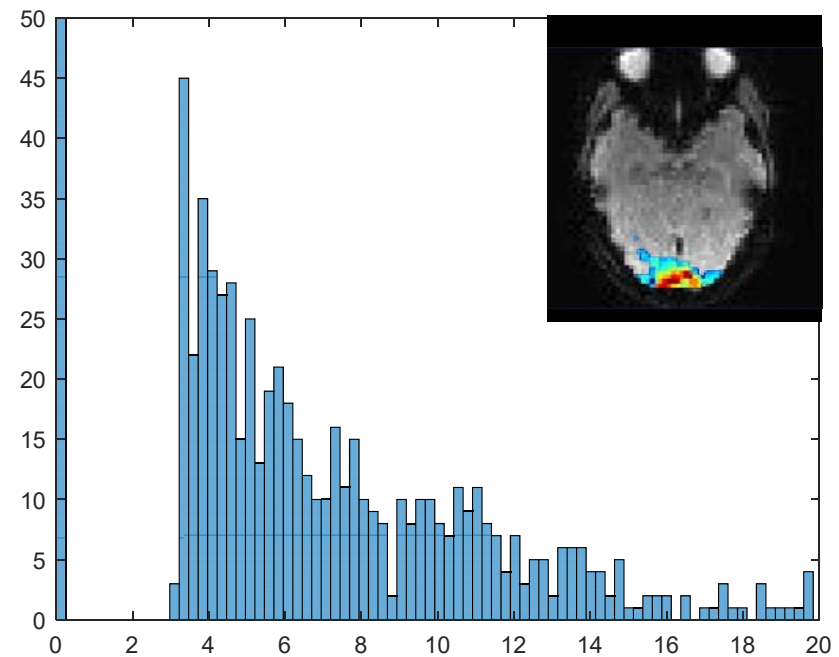
EPI

# Histogram of t-Values

spiralTSE



EPI



spiralTSE shows a much more narrow distribution of T-values compared to EPI.  
-> no ,BOLD'-blurring by macroscopic susceptibility.

# spiralTSE

---

## Todo:

- concomitant gradient correction
- get reconstructed images on scanner
- fMRI studies
- qMRI applications

<https://github.com/HennigJue/single-shot-spiral-TSE>

*Hennig J, Barghoorn A, Zhang S, Zaitsev M (2022) Single shot spiral TSE with annulated segmentation. Magnetic Resonance in Medicine 88:651–662.*

*Block W, Pauly J, Nishimura D (1997) RARE spiral T2-weighted imaging. Magnetic Resonance in Medicine 37:582–590.*

*Wang Z, Allen SP, Feng X, Mugler III JP, Meyer CH (2022) SPRING-RIO TSE: 2D T2-Weighted Turbo Spin-Echo brain imaging using SPiral RINGs with retraced in/out trajectories. MRM 88:601–616.*

Thanks to....



IDEA



Pulseq

Maxim for providing the Pulseq sequence development platform

....and you for your attention