



# Generalized Multiband Slice Accelerated Imaging (20140093, Dr. Dingxin Wang)

**IP Status:** Issued US Patent; **Application #:** 14/521,976

## Generalized Multiband Slice Accelerated Imaging for All Pulse Sequences

A new method performs simultaneous multislice (SMS) MR imaging using multiband RF excitation, enabling generalized multiband slice accelerated imaging for any type of MR pulse sequence (e.g. SE, TSE, HASTE, GRASE, GRE, SSFP, etc.). This method acquires reference scan images and uses balanced gradients to realize CAIPIRINHA FOV (field-of-view) shift. Overlapped signals from simultaneously excited slices can be separated using the different spatial sensitivities of the multiple receiver coils. Receiver coil sensitivity profiles estimated from a reference scan aid in separating these aliased signals, and the CAIPIRINHA method reduces noise amplification and residual aliasing artifact through multiband slice separation. This technology has a very wide range of MRI clinical applications, as it can shorten total acquisition time or improve the spatial coverage within a given imaging time. One study concluded a “four-fold-accelerated TSE through the combination of PAT2 and SMS2 enables approximately 50% shorter acquisition times compared with regular PAT2 acceleration, similar quantitative and qualitative image quality, and holds promise for a meaningful increase of the efficiency of clinical 2-dimensional MRI” of certain applications such as the knee.

## Improves MR Imaging Efficiency

Multiband (MB), also known as Simultaneous Multislice (SMS) magnetic resonance (MR) imaging, promises to enable greater patient throughput and allow scans previously not practical clinically due to time/motion constraints. Most clinically relevant scans would not benefit from the MB method since they do not need repeated measurements and the single band reference scan obviates the need for a slice accelerated imaging scan. This new multiband slice accelerated imaging approach improves MR imaging efficiency by a factor equal to the number of simultaneously excited slices. Decoupling of reference scan sequence from the imaging scan sequence makes a generalized method of realizing multiband imaging, and enables any MR pulse sequence to exploit the advantages of multiband imaging. Balancing the gradients used for FOV shift phase modulation enables generalized application of CAIPIRINHA technique to any MR pulse sequence for reducing g-factor penalty and residual aliasing artifact with multiband imaging.

### BENEFITS AND FEATURES:

- Enables generalized multiband slice accelerated imaging for any type of MR pulse sequence
- CAIPIRINHA method
- Expands potential applications of multiband
- May allow scans previously not possible
- Allows greater patient throughput
- Shorten total acquisition time; improves spatial coverage within a given imaging time
- Software upgrade or sold with new scanners

### APPLICATIONS:

### Technology ID

20140093

### Category

Engineering & Physical  
Sciences/MRI & Spectroscopy  
Life Sciences/Diagnostics &  
Imaging  
Life Sciences/Human Health  
Life Sciences/MRI &  
Spectroscopy  
Software & IT/Algorithms  
Agriculture &  
Veterinary/Veterinary Medicine

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- MRI clinical applications
- Spin-echo (SE), turbo spin-echo (TSE), gradient echo (GRE), SSFP sequences (and variant versions)
- Clinical applications in brain, spine, musculoskeletal, body and cardiac imaging

**Phase of Development** - Pilot scale demonstration

#### Researchers

Dingxin Wang, PhD

*MR Collaboration Manager, Siemens Medical Solutions USA Inc.*

Vibhas Deshpande, PhD

*Director of Engineering, MR R&D, Siemens Medical Solutions USA Inc.*

Kamil Ugurbil, PhD

*Professor of Medicine, Department of Radiology, Center for Magnetic Resonance Research*

[External Link](http://neurosci.umn.edu) (neurosci.umn.edu)

Xiufeng Li, PhD

*Assistant Professor, Department of Radiology, Center for Magnetic Resonance Research*

[External Link](http://www.cmrr.umn.edu) (www.cmrr.umn.edu)

#### Publications

[\*Simultaneous Multislice Accelerated Turbo Spin Echo Magnetic Resonance Imaging: Comparison and Combination With In-Plane Parallel Imaging Acceleration for High-Resolution Magnetic Resonance Imaging of the Knee\*](#)

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