

Siemens Healthineers

A paradigm shift in MRI and CT

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Imaging diagnostico in Sanità – Stato Attuale e prospettive

Pisa – 20 Dicembre 2016



What are some of the challenges radiology faces today?

How can I **maximize MRI scanner utilization** in the face of falling reimbursements?

How can I **expand my clinical capabilities** to offer new MRI services?

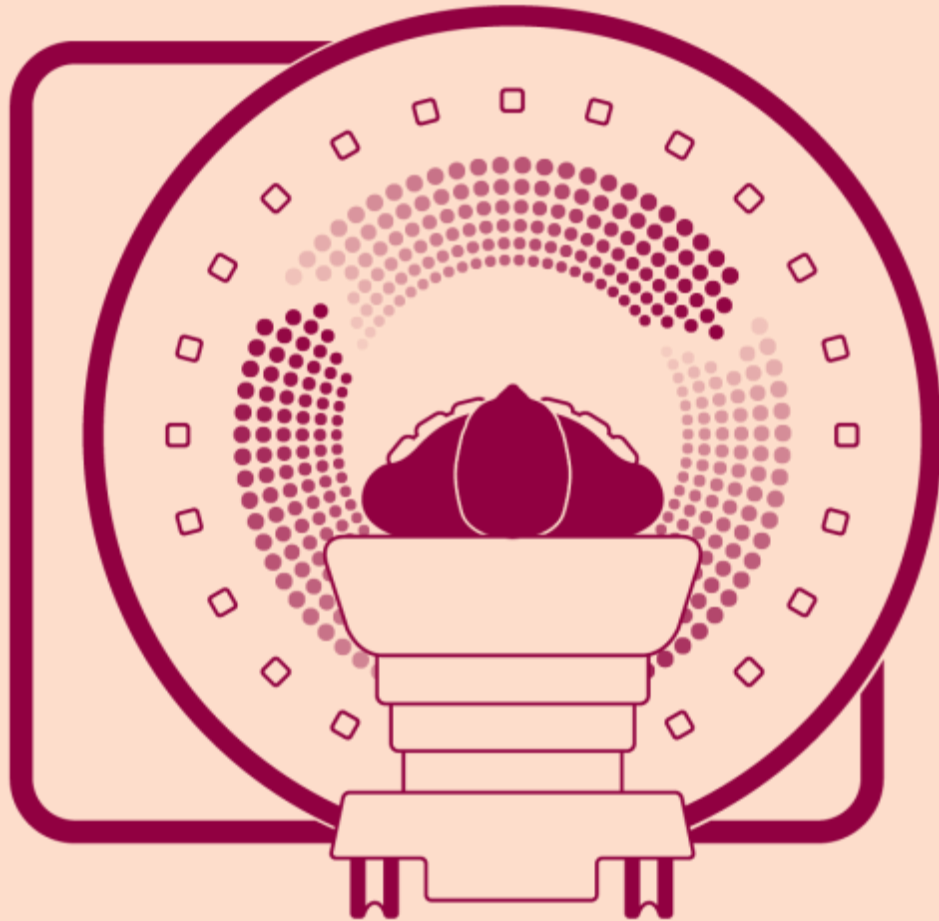
How can I **achieve consistent image quality** in every exam?



How can I **increase patient comfort** and satisfy the needs of patients and referrers?

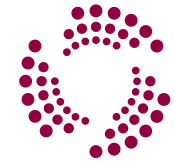
How can I **address increasing financial pressure** by reducing my overhead costs?

The DNA of Siemens MR.



Tim Technology

Deliver exceptional image quality and speed in MRI



DotGO Workflow

Go for consistent results, efficiently



Trendsetting Applications

Expand your MRI services



Life Design

Maximize patient friendliness and investment protection

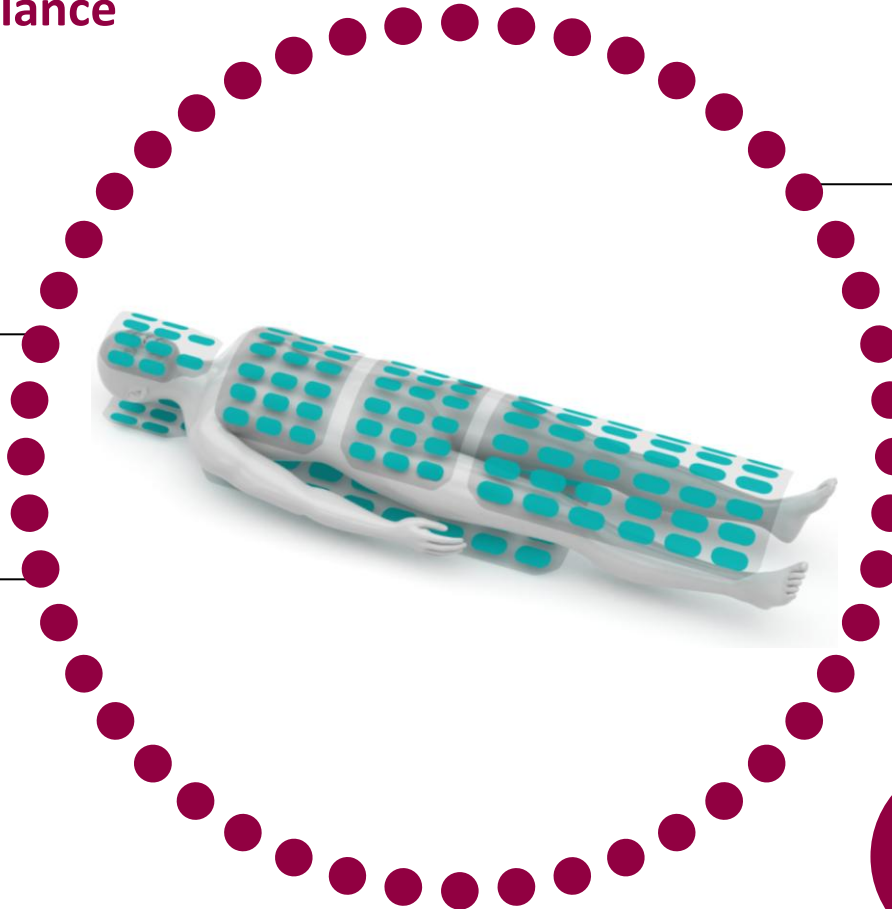
Tim Technology

Deliver exceptional image quality and speed in MRI

Tim Technology – benefits at a glance

Ultra-high coil element density

44% higher SNR¹
46% faster exams²



Light-weight coils; quick setup

All digital-in/digital-out
with DirectRF

**For superior image quality
and highest patient comfort**

¹ Comparison of average SNR between Tim 4G and first generation Tim integrated coil technology.

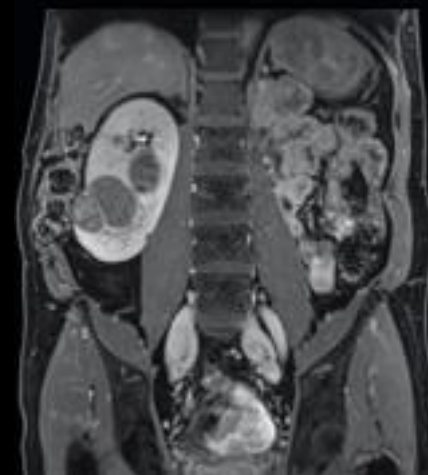
² Comparison of Tim 4G and first generation integrated coil technology: based on the scan time difference between a 16-channel setup and 8-channel setup with otherwise identical parameters and same SNR.

Powered by **Tim 4G**
High-resolution 3D imaging
with reduced
breath-hold times

CAIPIRINHA



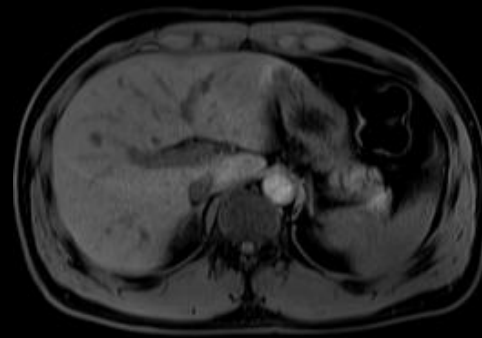
GRAPPA 3, TA 19.2 s



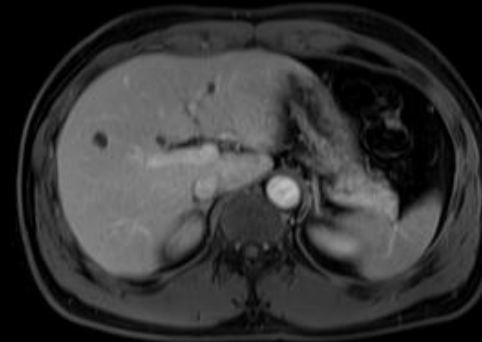
CAIPI 6, TA 12.1 s

Fast imaging and excellent quality in body imaging with Tim 4G

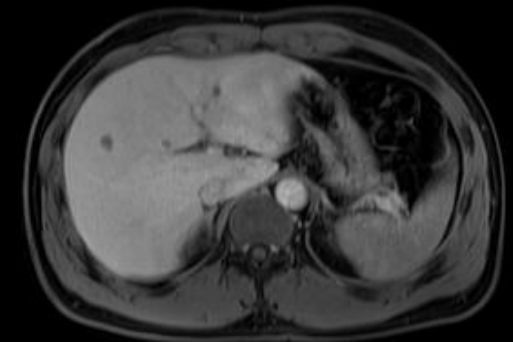
Ultra-short breath-hold times and excellent image quality enabled by Tim 4G's high channel coils and Siemens-unique CAIPIRINHA.



Pre
7.05 s



Post
7.05 s



Delayed
7.05 s

3D Dixon, matrix 308 x 512, SL 3 mm

**Go for consistent
results, efficiently**

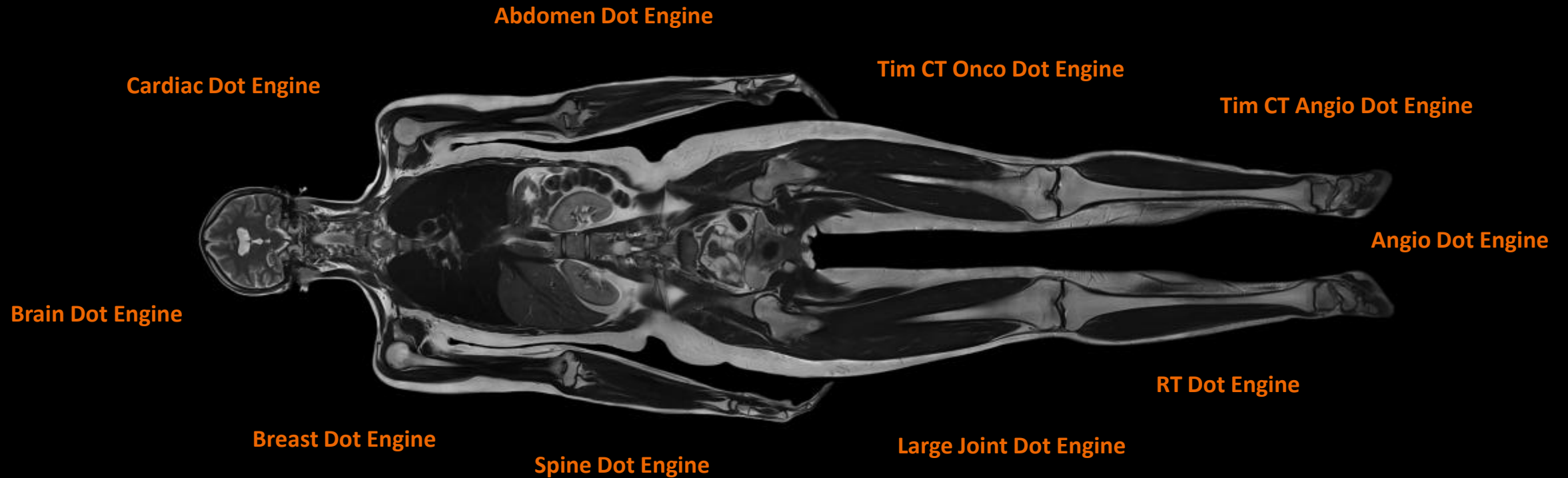
DotGO

Go for consistent
results, efficiently

Flexibility. Easily adjust your exam strategies with the Dot Cockpit



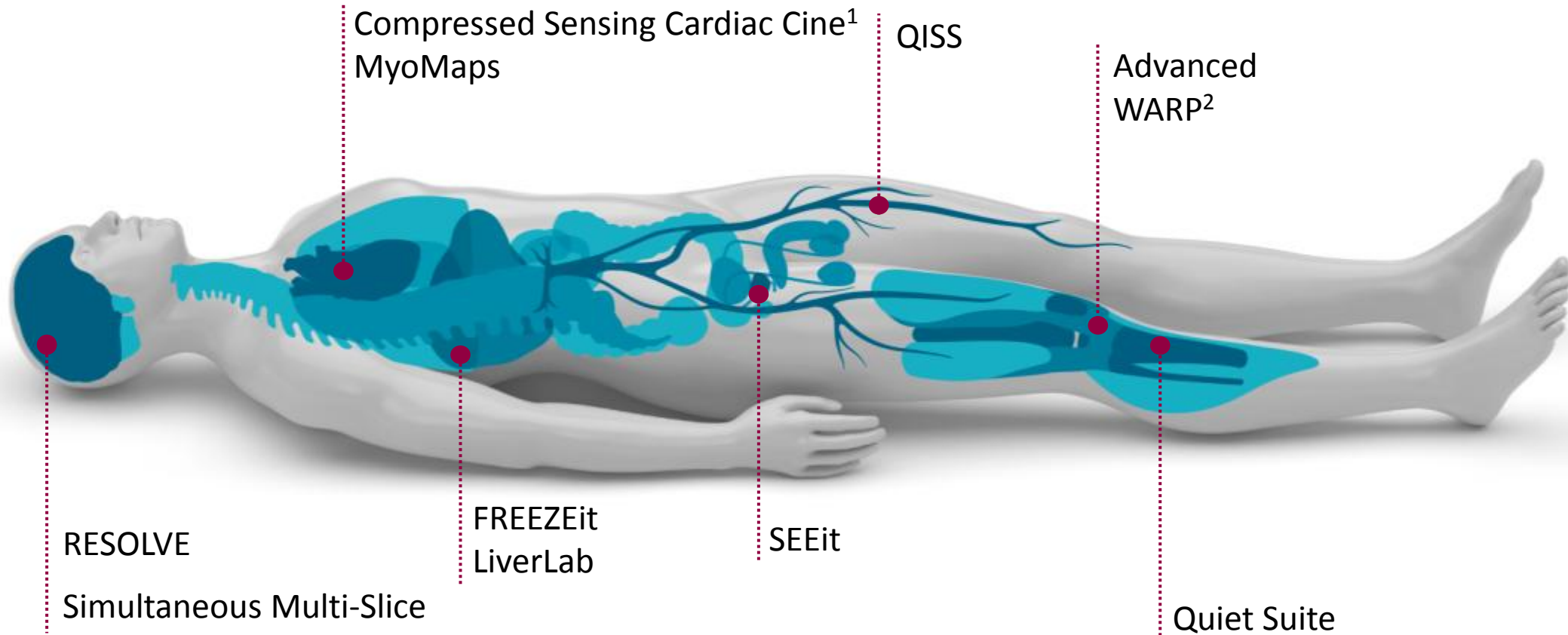
Dot engines. Quality results for each exam.



Over 90%¹ of MRI exam requests covered by the Dot engines.

¹ Evaluation of 9 million Siemens MR exams, 2014.

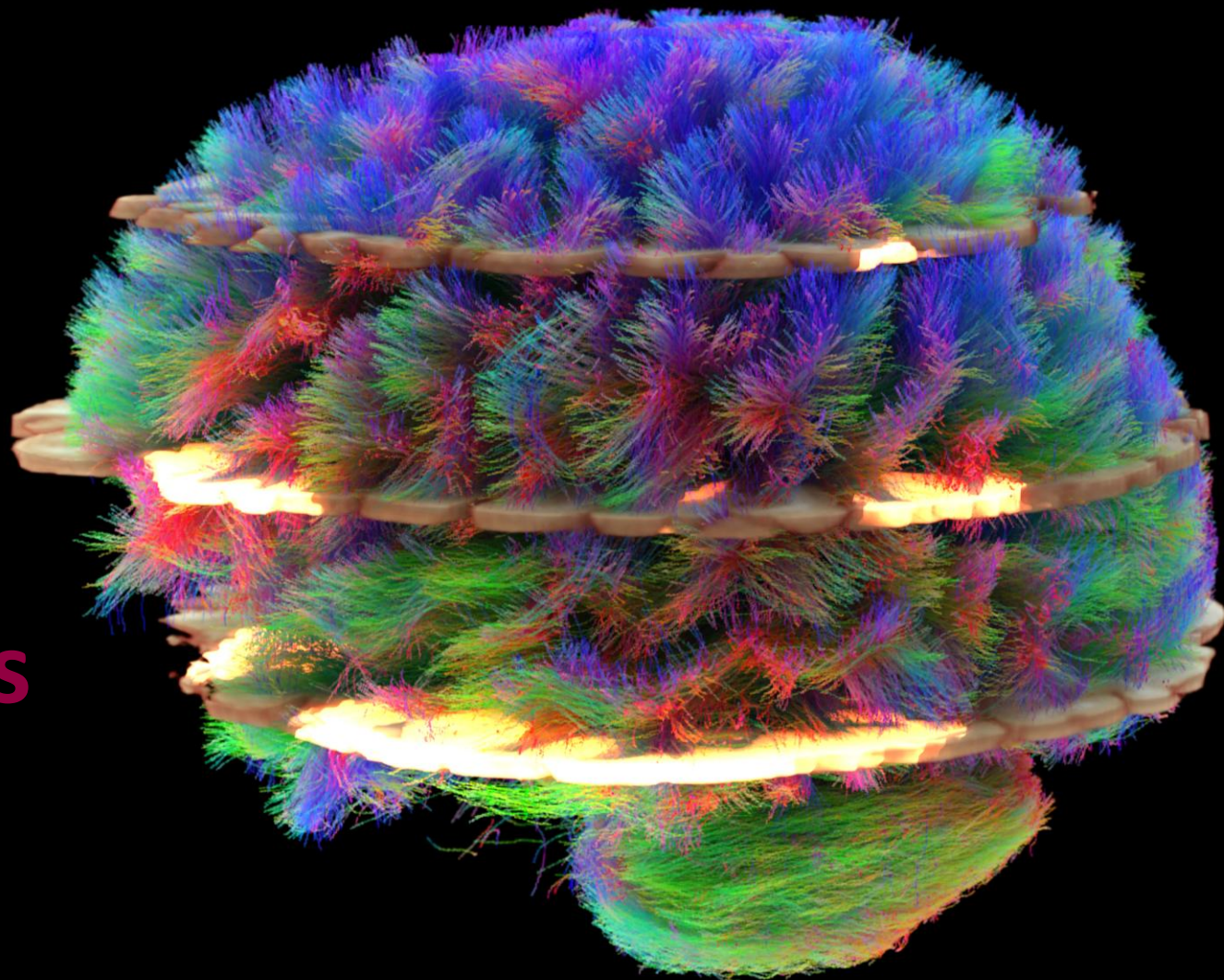
Expand your MRI services with Trendsetting Applications



¹ 510(k) pending.

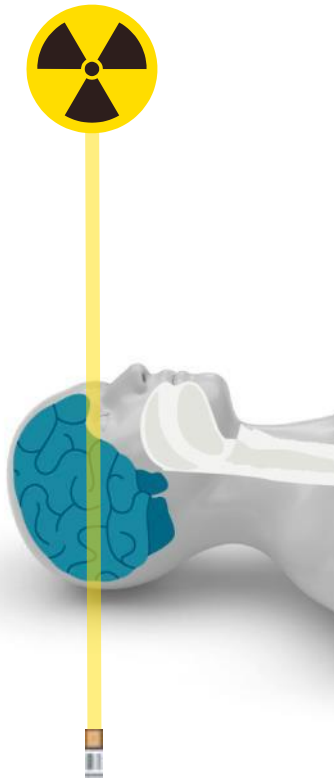
² The MRI restrictions (if any) of the metal implant must be considered prior to patient undergoing MRI exam. MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

Simultaneous Multi-Slice
Accelerate advanced
neuro applications
for clinical routine

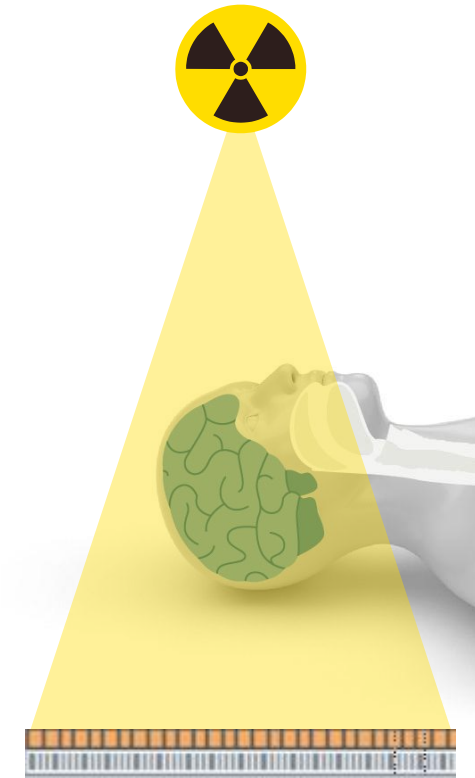


Simultaneous Multi-Slice - Analogous to the revolution brought to CT by multi-slice technology

Single-Slice CT

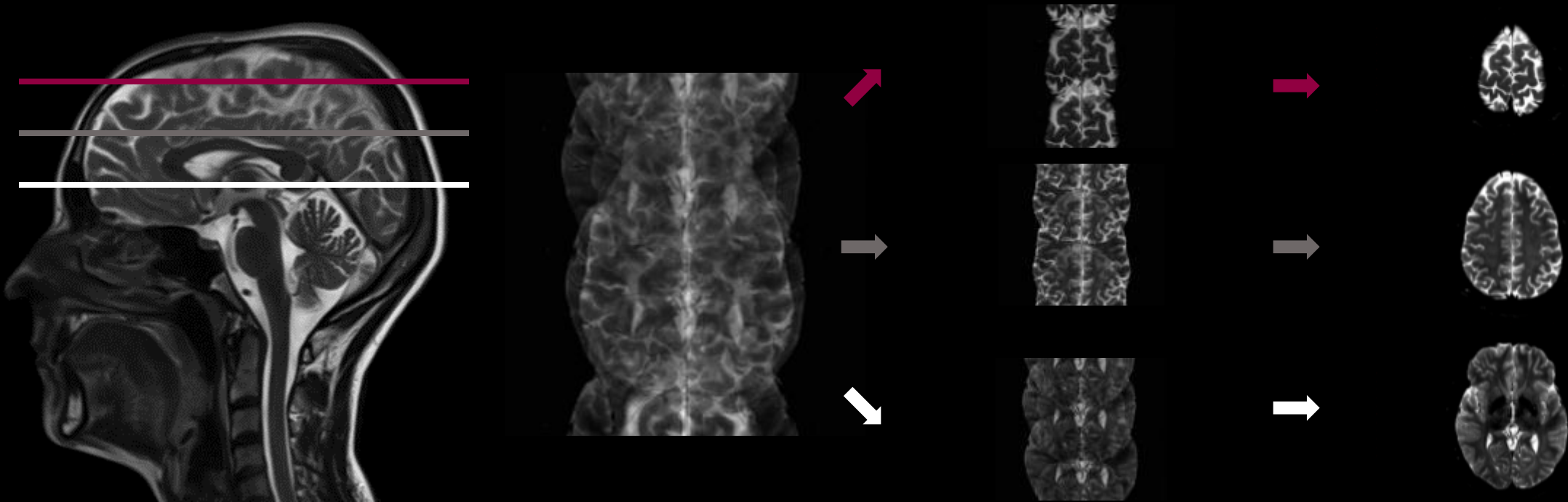


Multi-Slice CT



Multi-slice technology was the key behind the significant acceleration of CT imaging

Simultaneous Multi-Slice – Simultaneous excitation of multiple slices with blipped CAIPIRINHA¹



Multiple slices excited
simultaneously

Blipped CAIPIRINHA
applied during echo train
*Minimization of g-factor
related SNR loss*

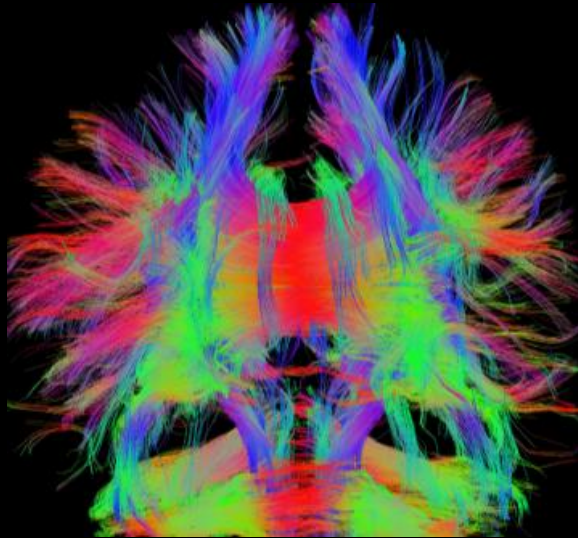
Slice **GRAPPA**
based unaliasing

Inplane **GRAPPA**
based unaliasing

¹Setsompop, K. (2012). Blipped-controlled aliasing in parallel imaging for simultaneous multi-slice echo planar imaging with reduced f-factor penalty. Magn Reson Med, 67, 1210-1224.

Simultaneous Multi-Slice: Diffusion and BOLD – The benefits of acceleration can be invested in many ways

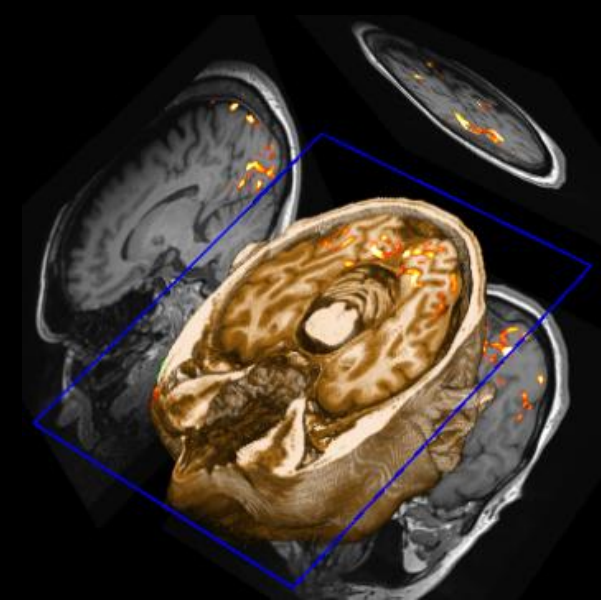
68% reduction in scan time



Simultaneous Multi-Slice Diffusion

Benefits

- Scan time reductions as a factor of slice acceleration¹
- Higher spatial resolution (thinner slices)
- Improved diffusion resolution (more directions and b values)

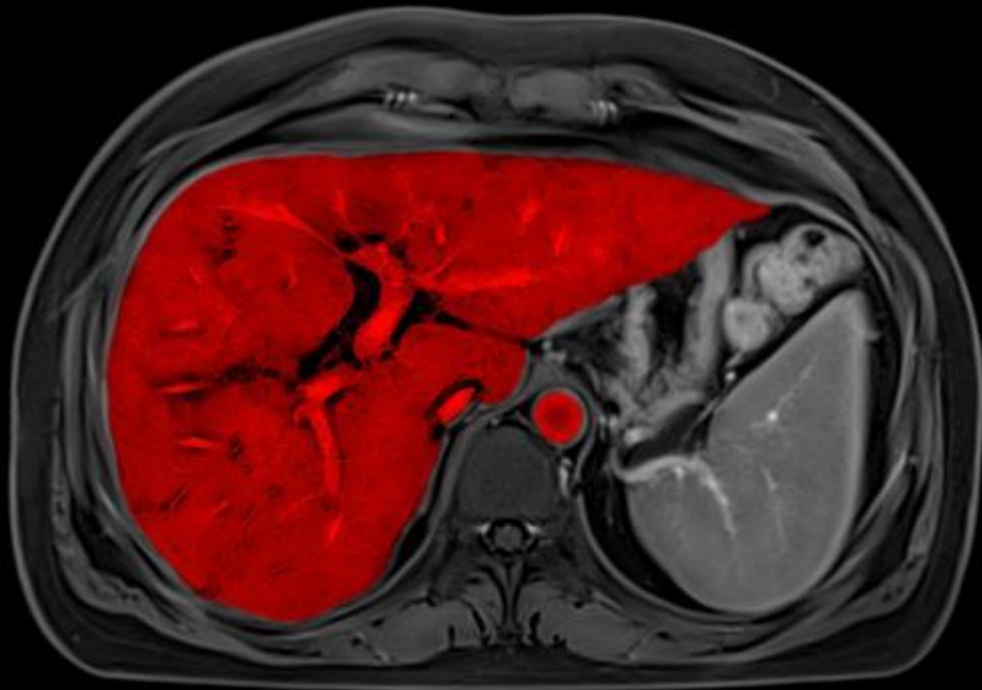


Simultaneous Multi-Slice BOLD

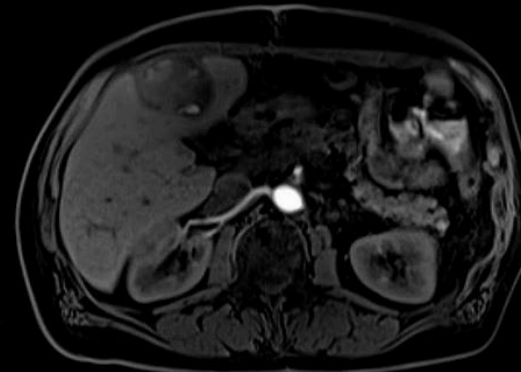
Benefits

- Greater slice coverage
- Higher spatial resolution (thinner slices)
- Increased temporal resolution for sensitivity to BOLD signal

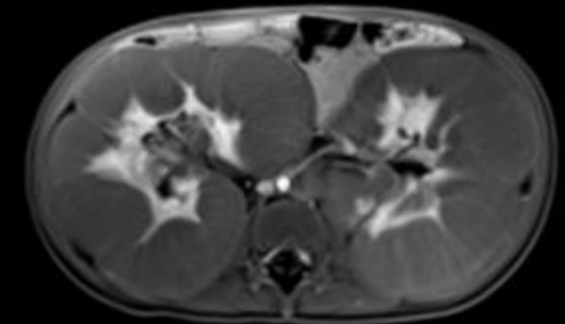
¹Note that scan time reduction is not an exact factor of slice acceleration due to a fast reference scan required for slice separation



FREEZEit – embrace motion



Ludwig Maximilian University, Munich, Germany;



female, 18-months-old¹, free-breathing
Royal Childrens Hospital, Melbourne, Australia

TWIST-VIBE

Always the right contrast
in dynamic liver MRI.

StarVIBE

Free-breathing contrast-
enhanced body imaging.

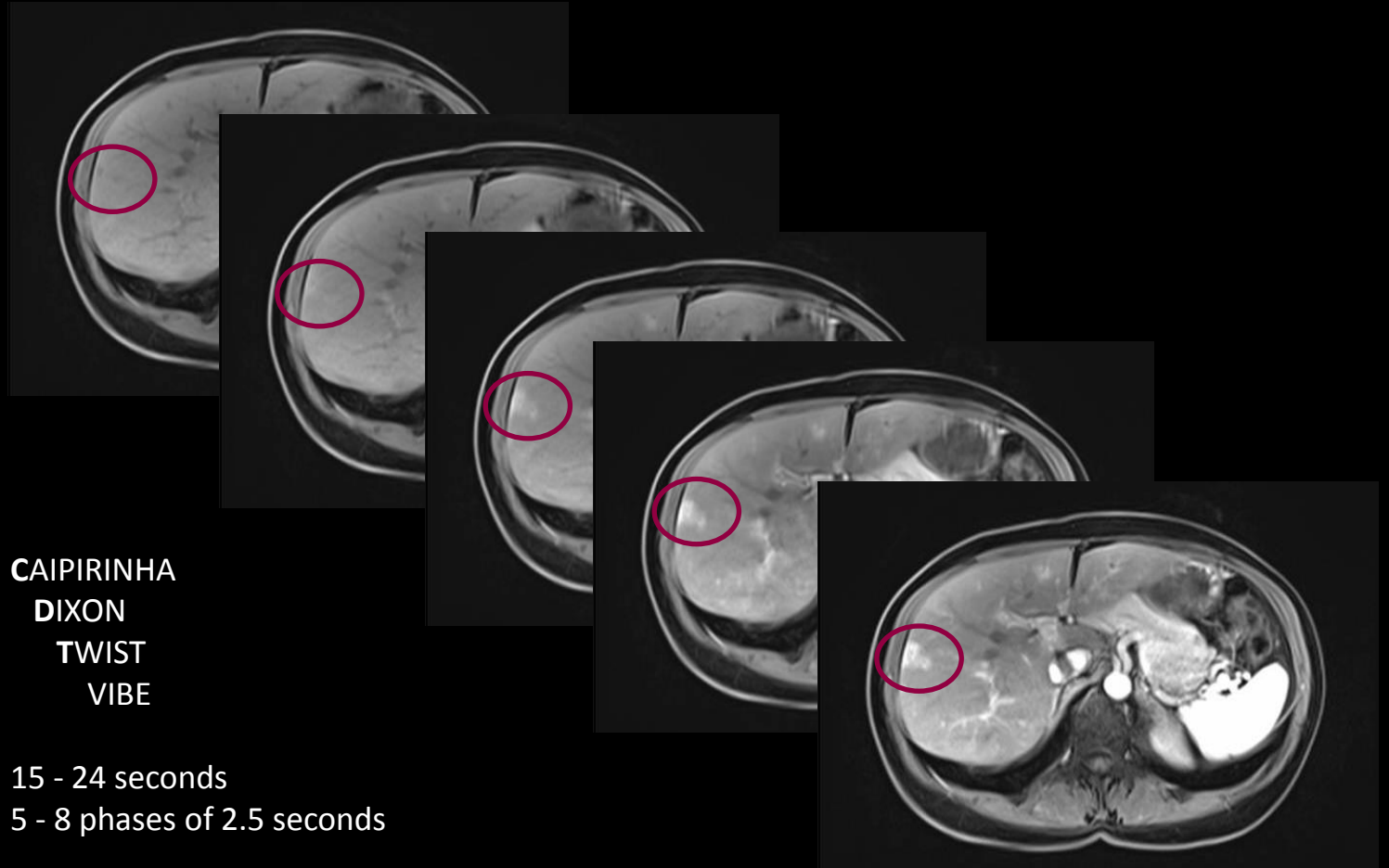
TWIST-VIBE

Shown to “increase lesion detection by up to 20%”¹

TWIST-VIBE

Always the right contrast

Up to 20% more¹ lesions can be identified compared to conventional techniques.



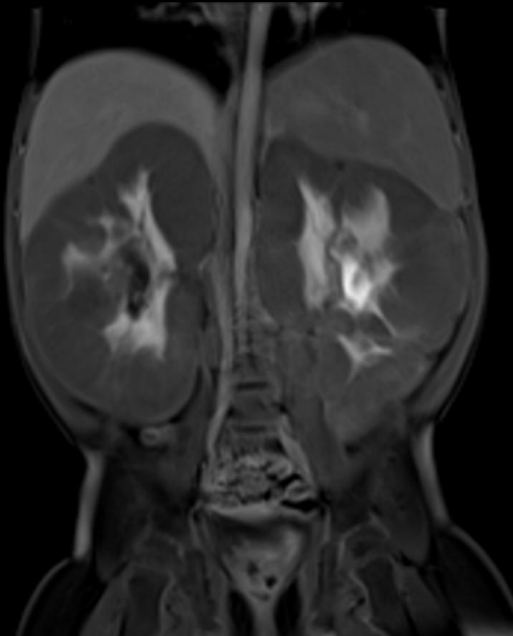
CAIPIRINHA
DIXON
TWIST
VIBE

15 - 24 seconds
5 - 8 phases of 2.5 seconds

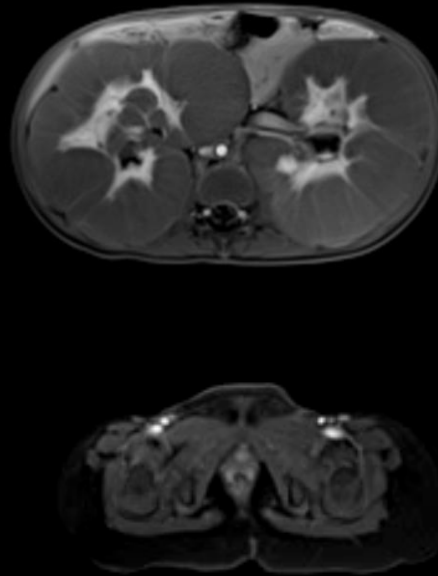
Growth in Body MRI

FREEZEit – Kidney

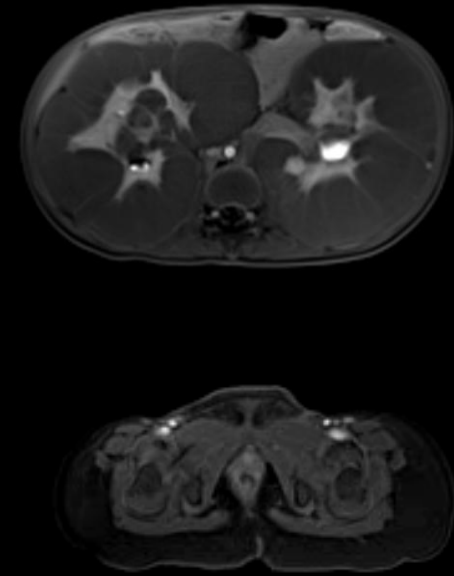
Case study: StarVIBE in free-breathing for non-compliant children
18-month-old¹ female with nephroblastoma



StarVIBE FatSat, matrix 224,
SL 3 mm, 64 slices, TA 2:14 min

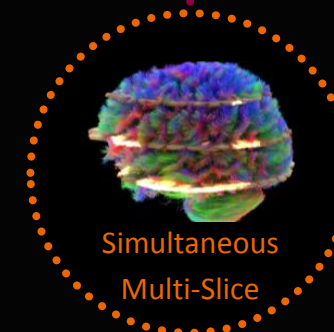
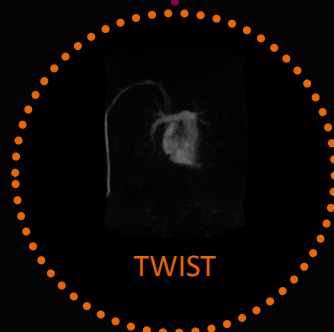
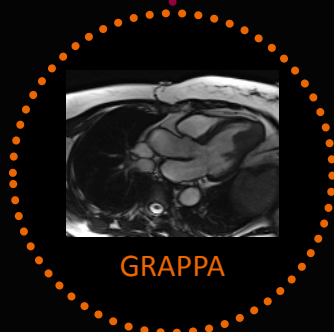
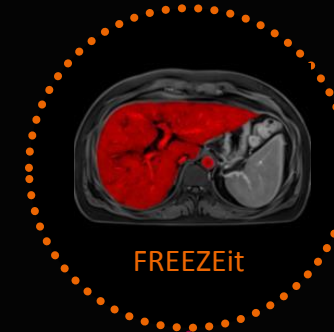
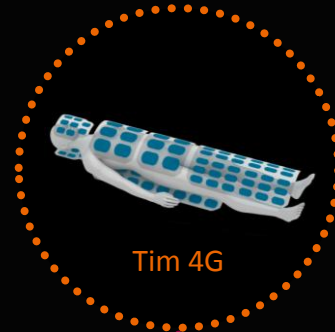
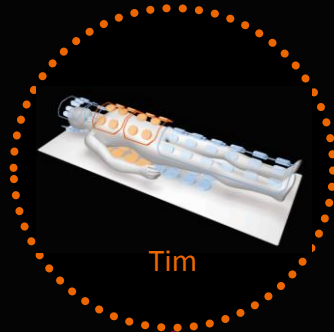
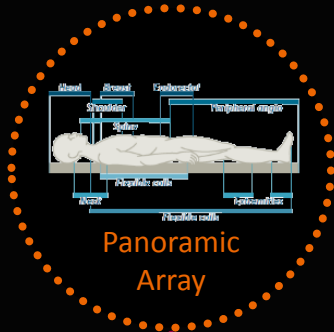


StarVIBE FatSat, matrix 224,
SL 3 mm, 72 slices, TA 3:05 min



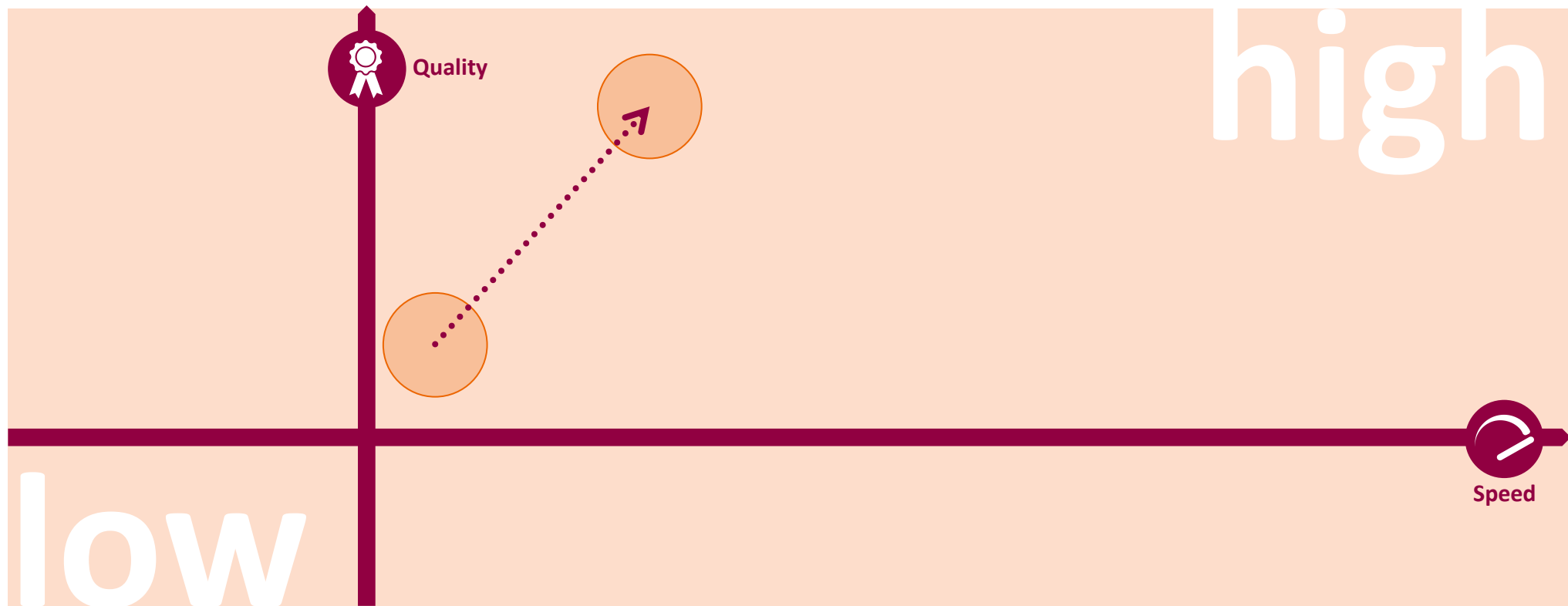
StarVIBE FatSat, matrix 224,
SL 3 mm, 72 slices, TA 2:28 min

Continuously driving speed and quality in MRI



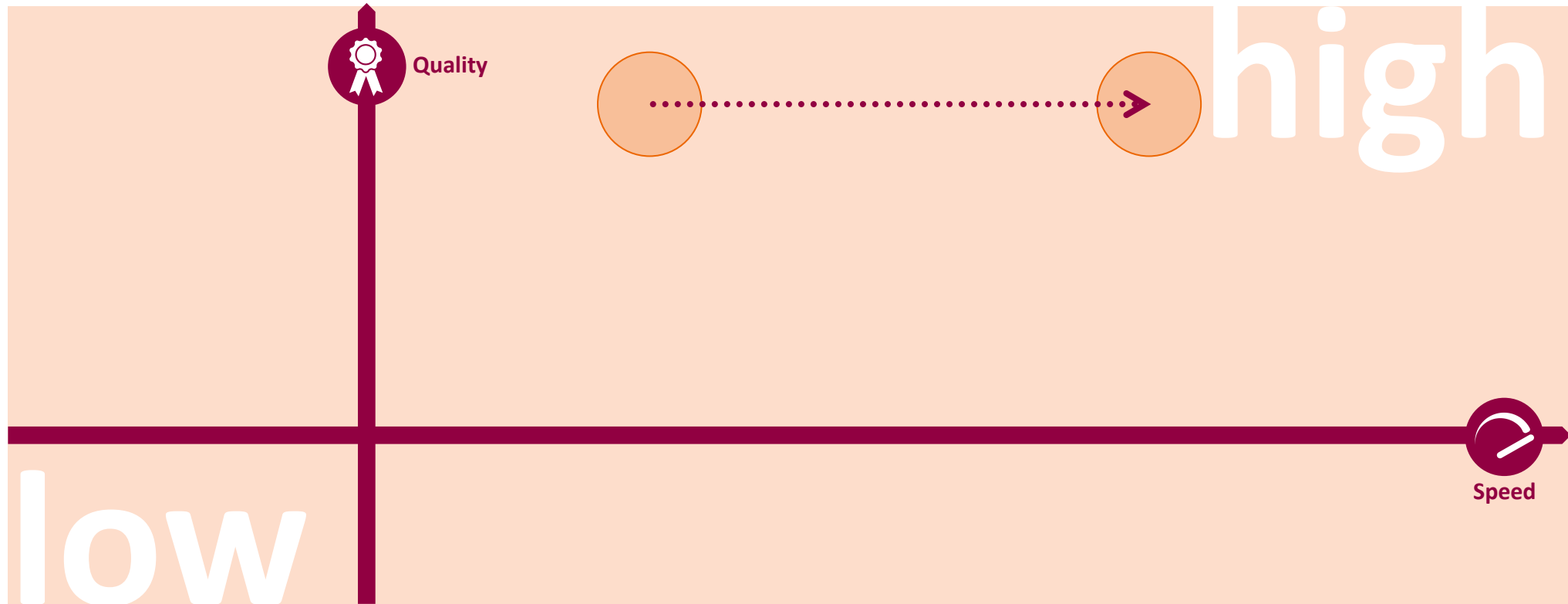
 A history of success with Siemens Healthineers

To what level has MRI made it today?



The classical trade-off between speed and quality

Now the speed is to be increased



 How can we boost speed without compromising on quality?

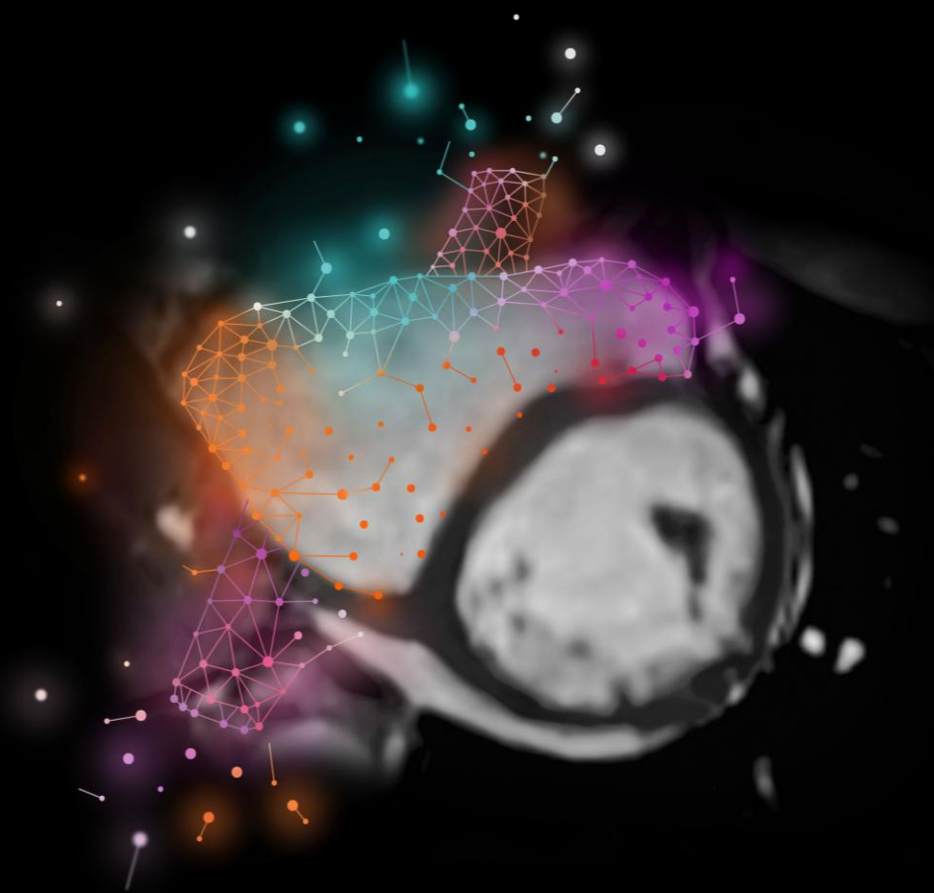
Compressed Sensing Cardiac Cine¹

Beyond speed. Beyond breath-holds.

Acquire **free-breathing**, high-resolution **Cardiac Cine** images.

Capture the **whole cardiac cycle** for **precise quantification**.

Expand patient population eligible for cardiac MRI.



Leveraging a simple fact

If this ...



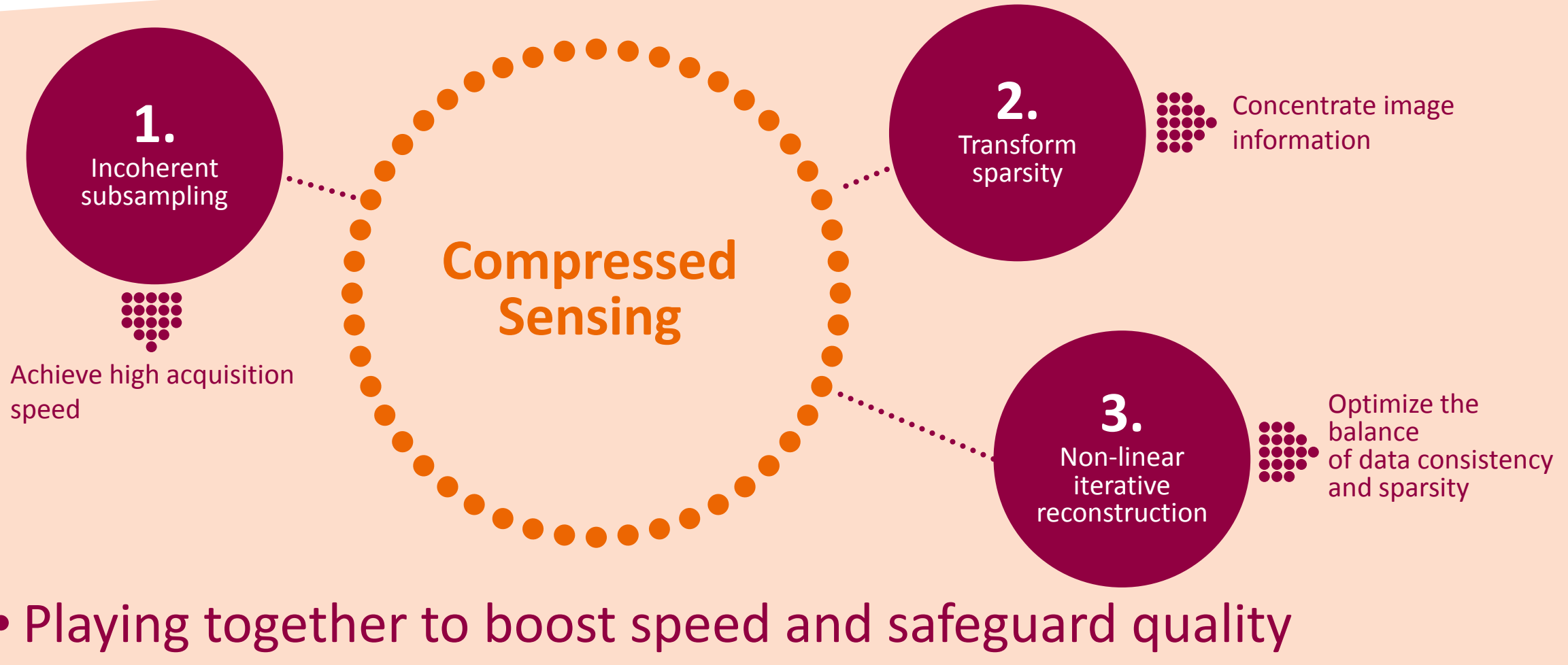
... is possible with no significant loss in image quality, why sample the **complete MR data in the k-space?**

“ If it is possible to compress measured data, one might argue that **too many measurements** were taken.¹ ”

David J. Brady, M.S., Ph. D.

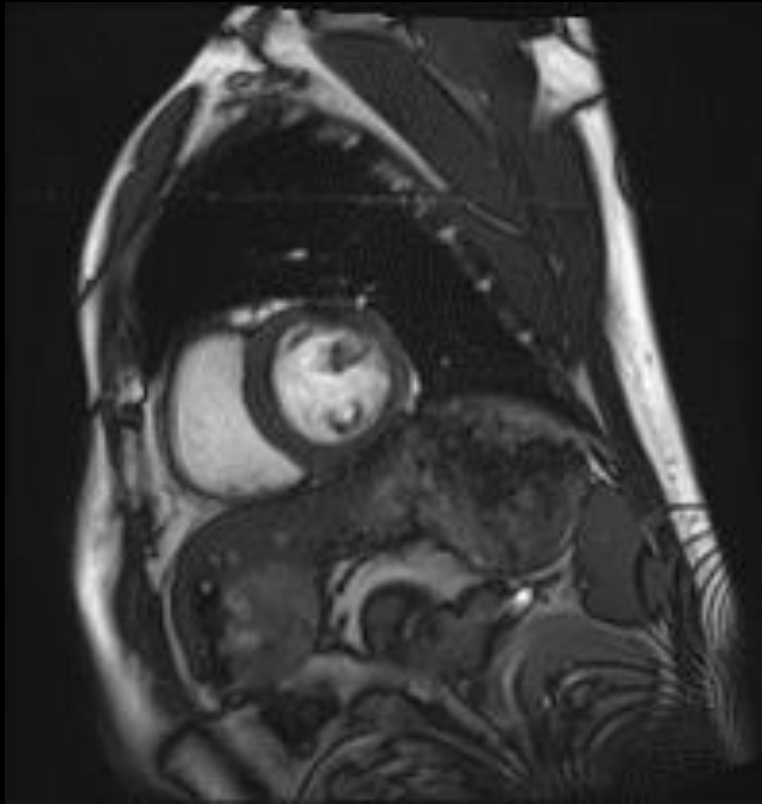
Professor of Electrical and Computer Engineering in the Pratt School of Engineering at Duke University, USA

Compressed Sensing¹ – a revolution based on three rules



Patient case: 50-year-old male atrial fibrillation

Good image quality without artifacts



Standard segmented
(iPAT 3), 8 heart beats



Standard real-time
(TPAT 3), 1 heart beat

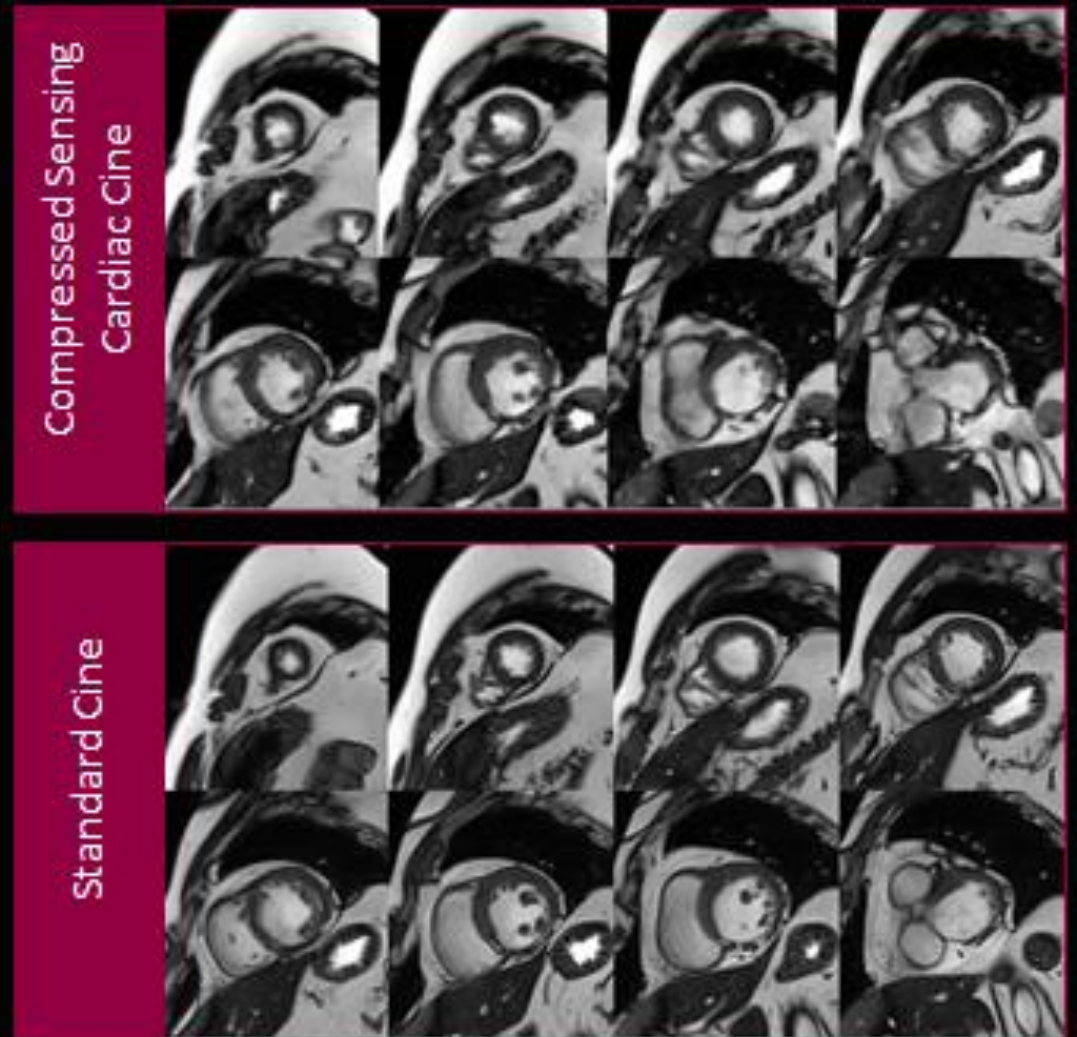


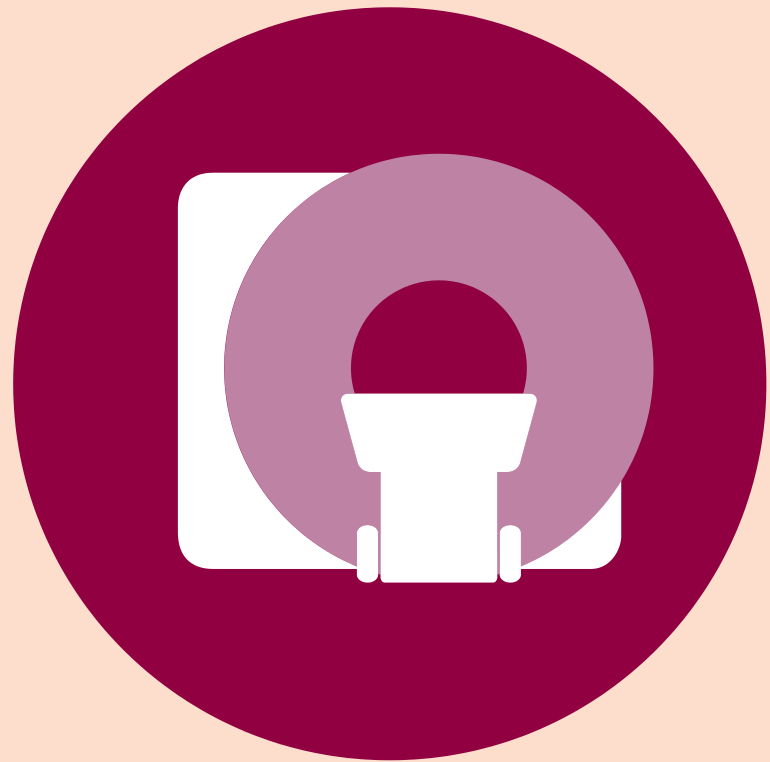
Compressed Sensing
Cardiac Cine¹
(Acc. 11.5), 1 heart beat

Comparison of quantitation of LV volume parameters between standard SSFP Cine and Compressed Sensing¹

Single breath-hold
Compressed Sensing Cardiac Cine¹
(TA ~ 25 s) is designed to meet
equivalent image quality and LV
volume assessment.²

Compared to segmented multi
breath-hold Cine (TA ~ 6 min).²





Maximize patient friendliness and investment protection with Life Design

Expand your MRI services with maximized patient satisfaction



More head-out exams: **70 cm** Open Bore and ultra-short system length



Focus on the patient: Light-weight, flexible coils for **fast patient setup**



Unique **patient experience**: Illumination MoodLight, in-bore illumination and complete quiet neuro and ortho exams

“ The most common complaint we hear from our patients when having an MRI is the loudness of the acquisition techniques. Siemens Quiet Suite is an essential innovation in improving patient experience and outcomes by significantly reducing acoustic noise during complete MR exams¹

¹ Bob Day, Zwanger-Pesiri Radiology, NY, US.

The statements by Siemens' customers described herein are based on results that were achieved in the customer's unique setting.

Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that other customers will achieve the same results. This statement is from a person, who or whose institution is engaged in a collaboration with Siemens.



Full focus on enhancing patient friendliness

Quiet Suite – Images should be seen, not heard



Quiet Suite
Imaging is
to be seen,
not heard

- **Complete, quiet** examinations for neuro and orthopedics.
- Up to **99%** reduction in sound pressure.¹
- **No compromises** in image quality, no need for hardware modification.

Siemens sets the standard in efficient MR operation



Short installation
time



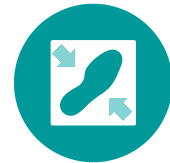
GREEN Cooling
Option



Eco-Chiller/
Optimized Separator



Small
footprint



Zero helium
boil-off



Power saving
technology



DEfinitely
Siemens

True Dual Energy

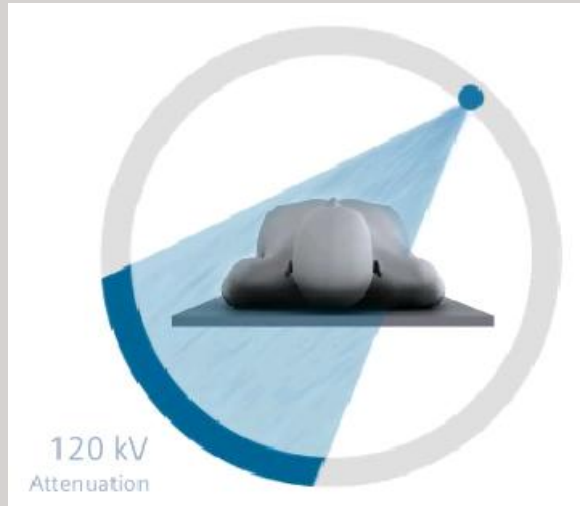


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The products/features (here mentioned) are not commercially available in all countries. Due to regulatory reasons their future availability cannot be guaranteed. Please contact your local Siemens organization for further details.

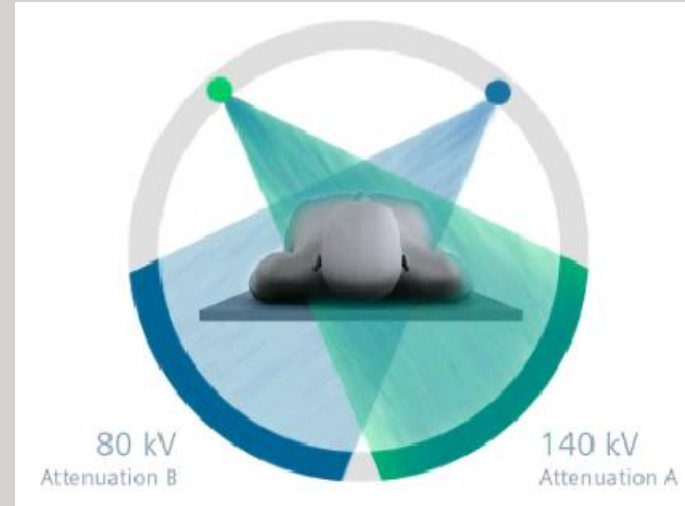
Conventional Technology VS Dual Energy Technology

Conventional Technology



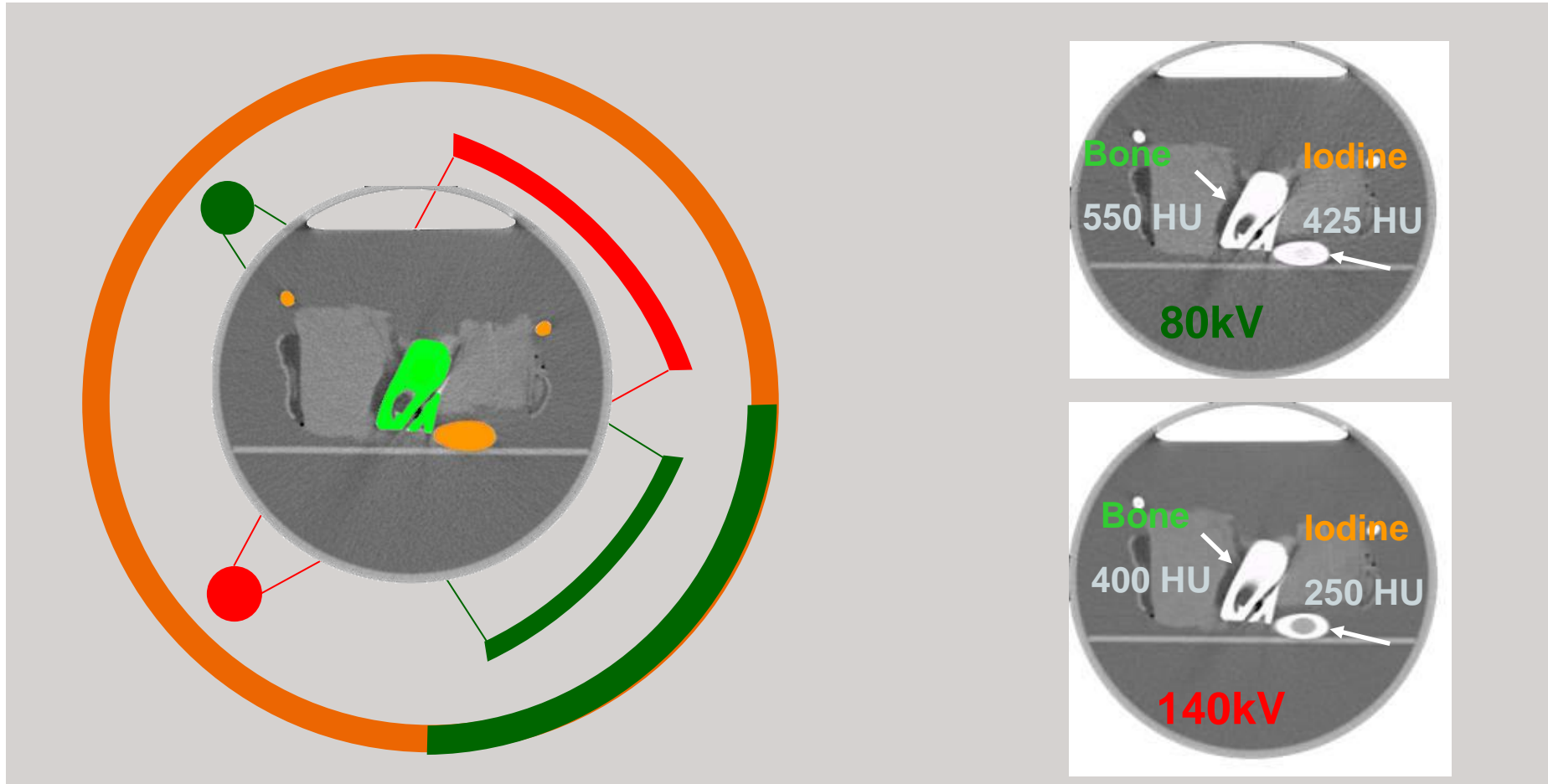
- Limited to one contrast
- Display of pure morphological information only

DSCT Dual Energy



- Two energies acquired simultaneously to display functional information
- Characterize, highlight and quantify material

Dual Energy principle

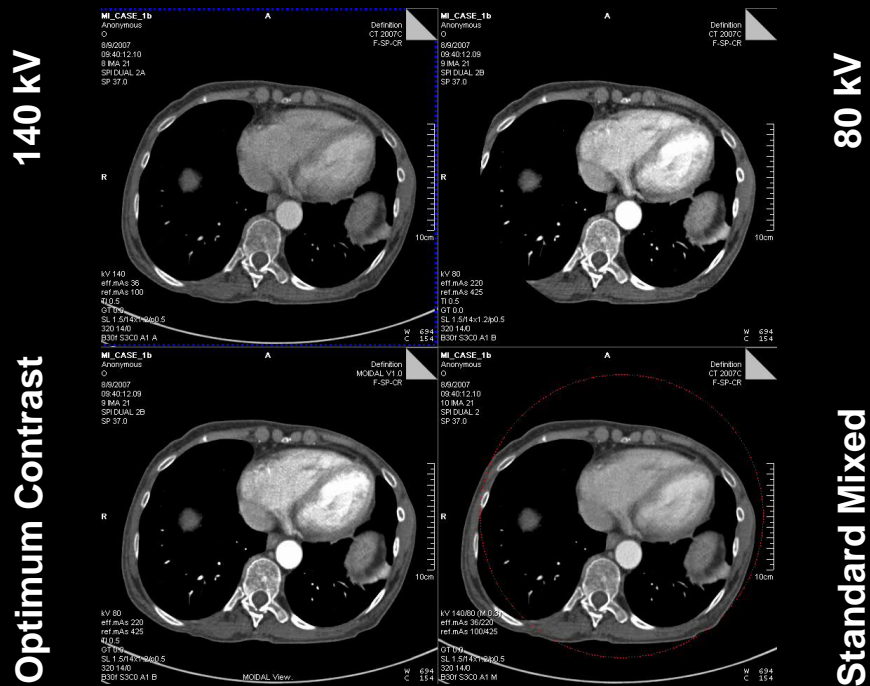


Dual Source DE for all patients

General image optimization

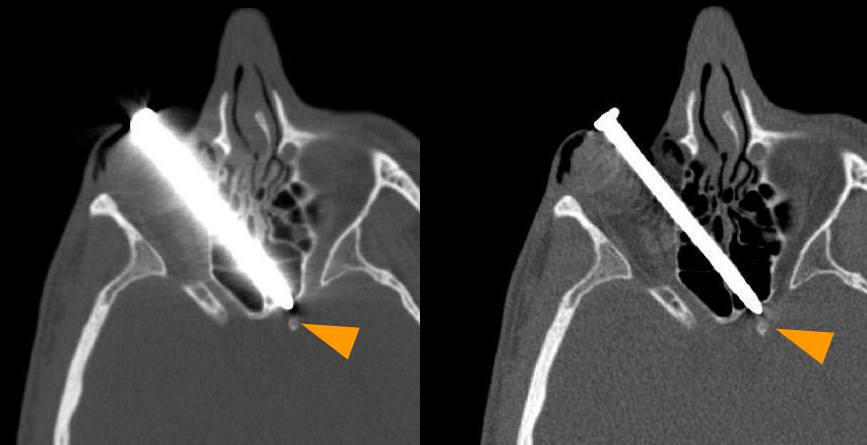
Optimum Contrast

- Combines high iodine contrast of 80 kV with low noise of 140 kV into a single dataset



Monoenergetic images

- Images of 151 energies calculated out of DE datasets (40 – 190 keV)
- Example: metal artifact reduction

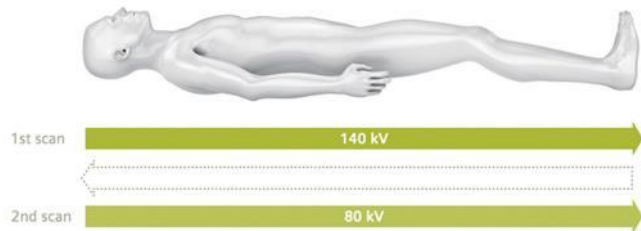


Metal blurring with
conventional CT

Improved metal display
with Dual Energy

Most sophisticated Dual Energy portfolio

Dual Spiral Dual Energy



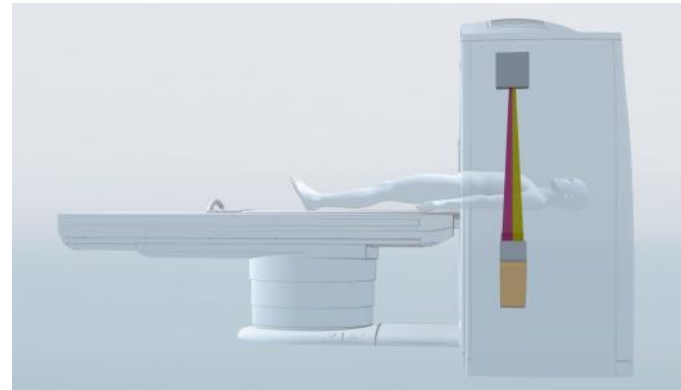
SOMATOM
Scope Power

SOMATOM
Perspective

SOMATOM
Definition AS

SOMATOM
Definition Edge

TwinBeam Dual Energy



SOMATOM
Definition AS+

SOMATOM
Definition Edge

Dual Source Dual Energy



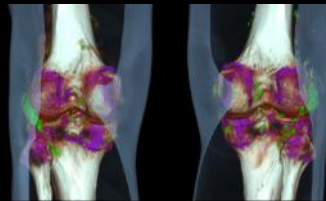
SOMATOM
Definition Flash

SOMATOM
Drive

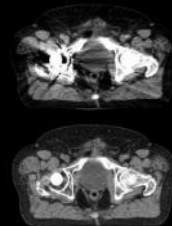
SOMATOM
Force

True Dual Energy CT

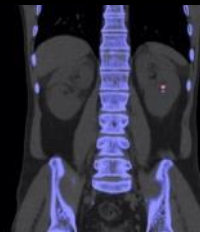
Expand your clinical capabilities for Dual Spiral Dual Energy



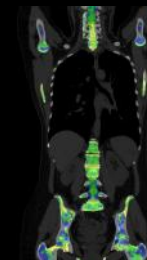
syngo.CT DE Gout



Monoenergetic



syngo.CT DE
Calculi Characterization



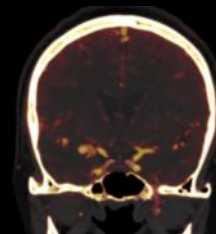
syngo.CT DE
Bone Marrow



syngo.CT DE Rho/Z



syngo.CT DE (Liver VNC)
Virtual Unenhanced



syngo.CT DE
Brain Hemorrhage

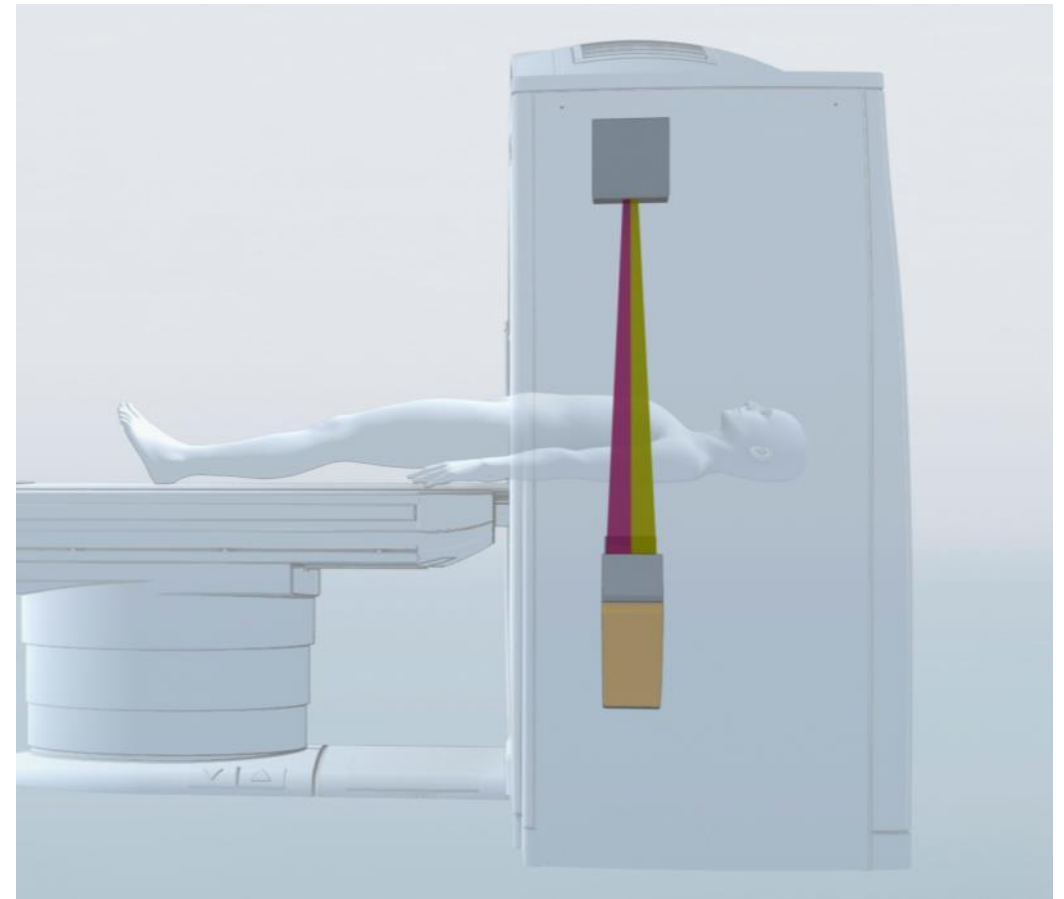


syngo.CT DE
Monoenergetic Plus

SOMATOM Definition Edge and SOMATOM Definition AS+ Improve Patient Outcome with TwinBeam Dual Energy

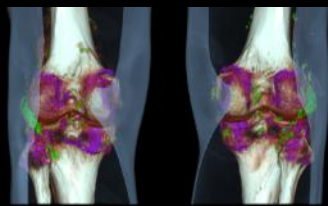
TwinBeam Dual Energy

- Simultaneous acquisition of high and low energy spectra
- Enables high contrast dynamic applications

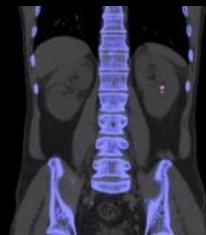


True Dual Energy CT

Expand your clinical capabilities for TwinBeam Dual Energy



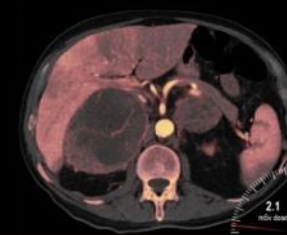
syngo.CT DE Gout



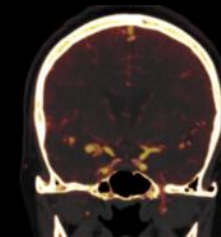
syngo.CT DE
Calculi Characterization



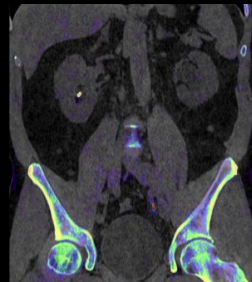
syngo.CT DE
Direct Angio



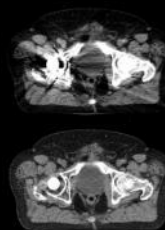
syngo.CT DE
Virtual Unenhanced



syngo.CT DE
Brain Hemorrhage



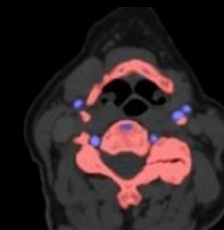
syngo.CT DE Rho/Z



Monoenergetic



syngo.CT DE
Monoenergetic Plus

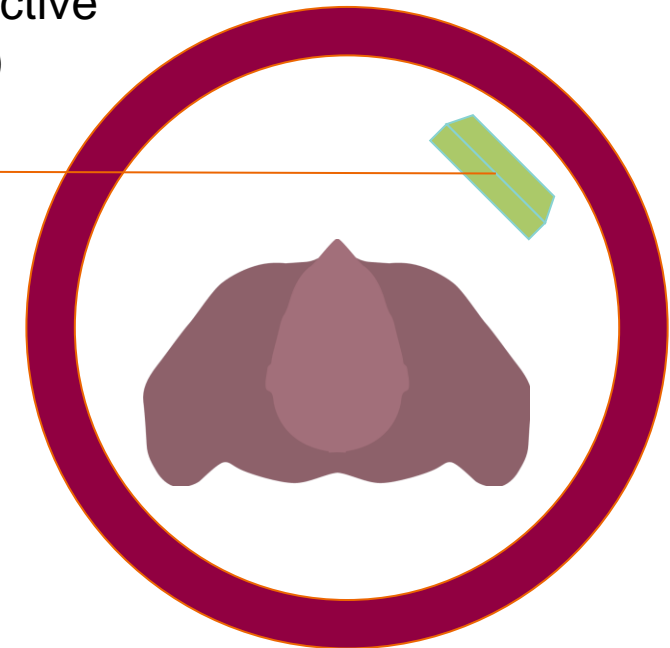


syngo.CT DE
Hardplaque Display

DE with Tin Filter (Selective Photon Shield)

- Characterize, highlight and quantify material
- Dose-neutral compared to a single 120 kV scan
- Improved spectral separation

Tin Filter (Selective Photon Shield)



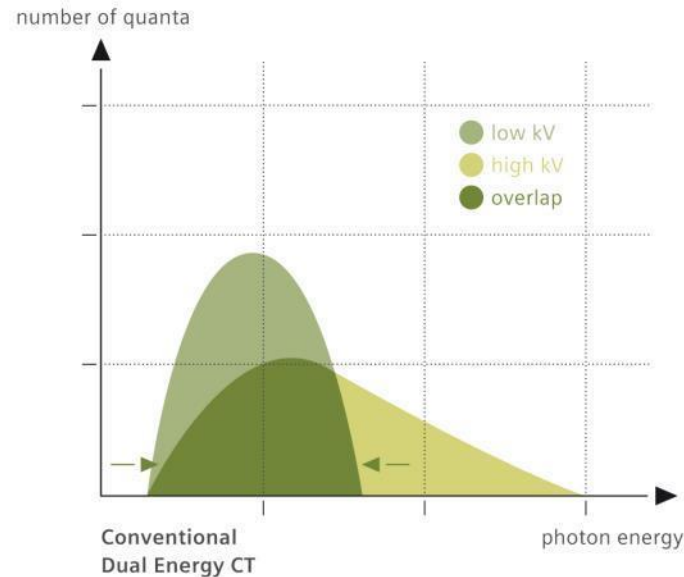
High kV

Attenuation B

Low kV

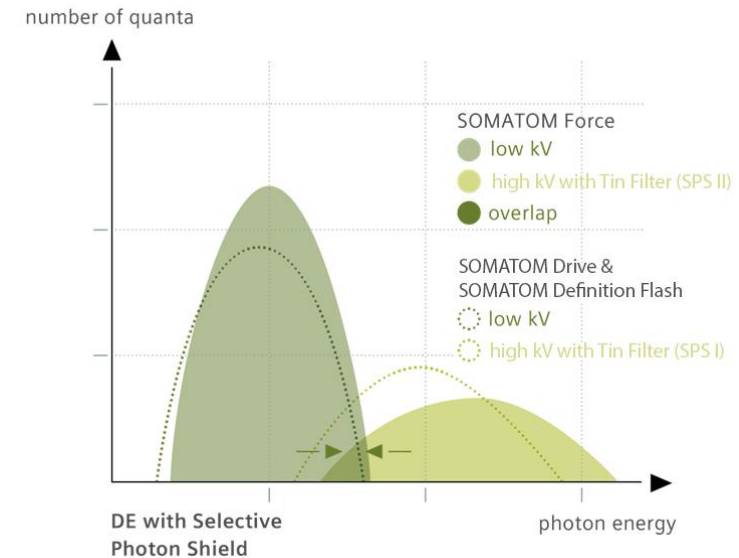
Attenuation A

Conventional Dual Energy CT



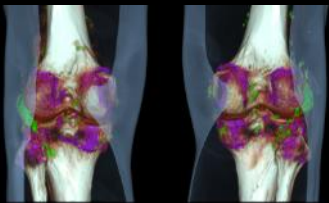
- Significant spectral overlap
- Limits energy separation
- Limits dose efficiency

DE with Tin Filter (Selective Photon Shield)



- Minimized spectral overlap
- Increased energy separation
- Complete dose neutrality

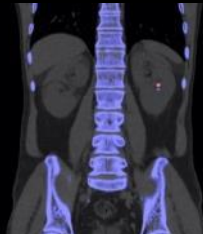
Expand your clinical capabilities for Dual Source Dual Energy



syngo.CT DE Gout



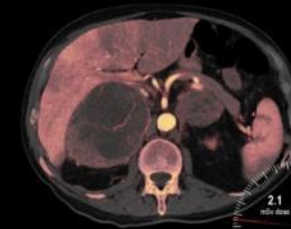
Optimum Contrast



syngo.CT DE
Calculi Characterization



syngo.CT DE
Direct Angio



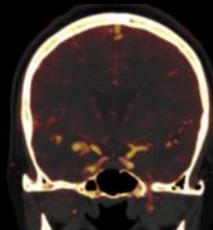
syngo.CT DE
Virtual Unenhanced



syngo.CT DE Rho/Z



Monoenergetic



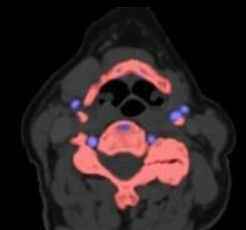
syngo.CT DE
Brain Hemorrhage



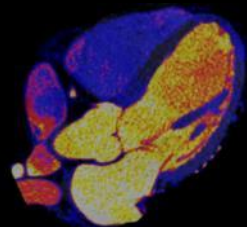
syngo.CT DE
Lung Nodules



syngo.CT DE
Monoenergetic Plus



syngo.CT DE
Hardplaque Display



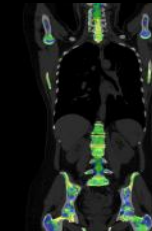
syngo.CT DE
Heart PBV



syngo DE
Xenon



syngo DE
Musculoskeletal



syngo.CT DE
Bone Marrow

Grazie per l'attenzione

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