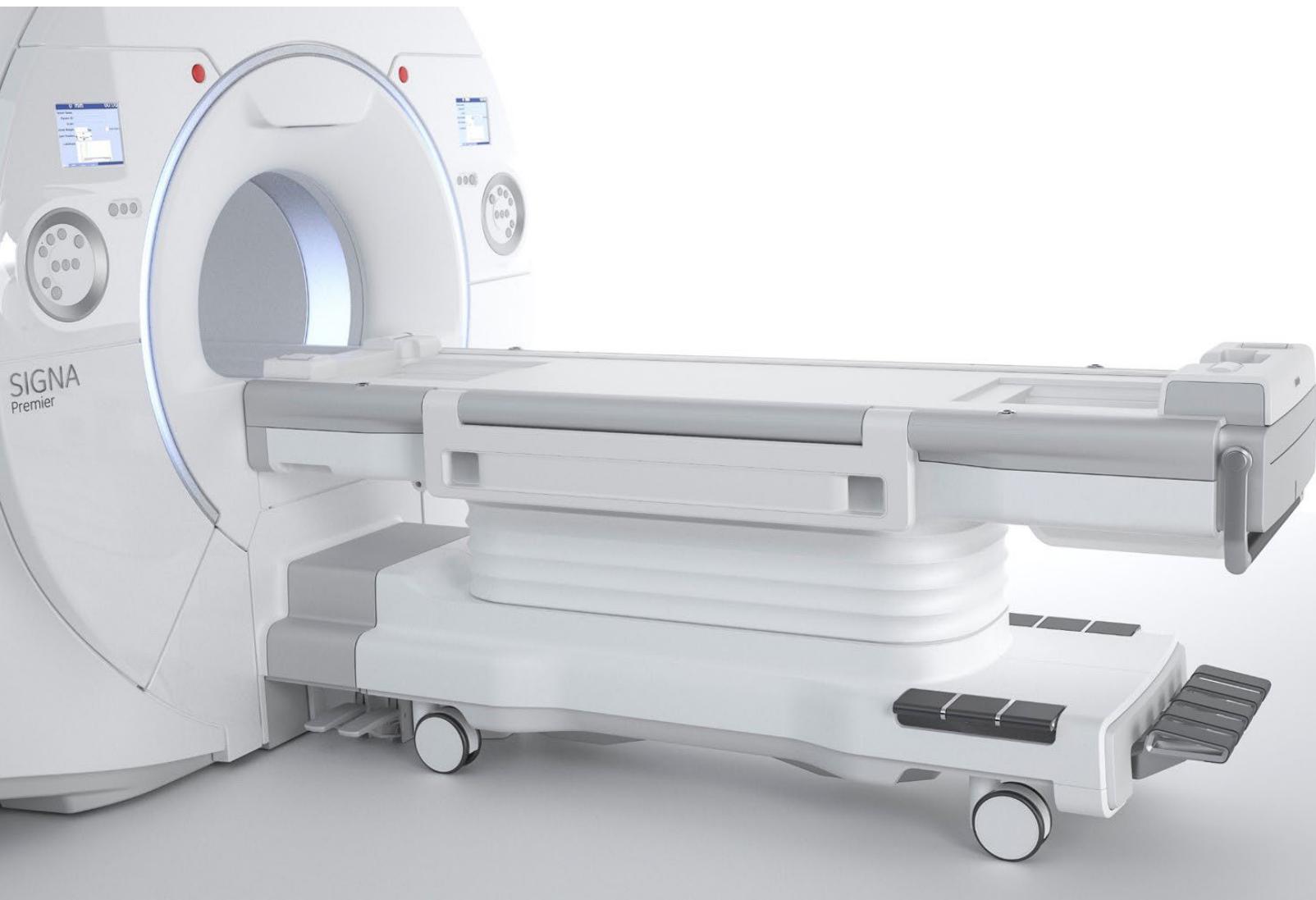




SIGNA™ Premier XT

MR 30 Data Sheet



Magnet	3
Gradient	4
RF.....	5
Volume Reconstruction Engine & Host Computer	6
Computing Platform	7
Scan Parameters	8
MR 30 for SIGNA™	9
NeuroWorks.....	10
BodyWorks.....	11
CVWorks	12
OrthoWorks.....	13
OncoWorks.....	14
PaedWorks.....	15
MR 30 for SIGNA™ Features.....	16
Image Acquisition.....	22
RF Coils Suite.....	29
SIGNA™ Flow	34
AIR x™	35
AIR™ Recon DL	36
Sonic DL™	37
oZTEo MR bone imaging	38
Patient Setup.....	39
In-line Processing & In-line Viewing	42
Scanning	43
Visualization.....	44
READYView.....	45
BrainWave	48
Siting.....	49
Cybersecurity.....	50
Miscellaneous	51

Magnet

The Foundation of Quality

When it comes to delivering on the promise of 3.0T image quality while enhancing the openness and patient experience, no other MR component has greater impact than the magnet. The SIGNA™ Premier system features a compact, lightweight, superconducting magnet designed to provide excellent homogeneity ensuring uniform signal and fat-suppression over a larger FOV. While improving the patient experience with a 70 cm bore size, the SIGNA™ Premier magnet supports a large 50 cm FOV and may reduce exam time since fewer acquisitions are needed to cover a large anatomy.

Magnet Specifications

Operating field strength	3.0 Tesla
Magnet shielding	Active
EMI shielding factor	97.5% 0.6 hertz excitation and 94.5% dc step
Size (without enclosures) (L x W x H)	1.74m x 2.09m x 2.28m (Platform) 1.74 x 2.12 x 2.40 meters (3TLC)
Size (with enclosures) (L x W x H)	2.09 x 2.52 x 2.50 meters
Magnet weight with cryogens	9,837 lbs (4,462 kg) (Platform) 14,060 lbs (6,378 kg) (3TLC)
Magnet cooling	Cryogenic
Long-term stability	< 0.1 ppm per hour over a 24 hour period
Cryogen refill period	Zero-Boil Off [†]
He Boil-off rate	Zero-Boil Off [†]
Manufacturer	GE Healthcare

[†]Normal Operating Conditions

Patient Focused Design

Patient Bore (L x W x H)	163 cm x 70 cm x 70 cm
Patient Aperture	74 cm at magnet flare 70 cm at isocenter
	Head or feet-first imaging Dual-flared patient bore
	2 way in-bore intercom system
Patient comfort module	Adjustable in-bore lighting system Adjustable in-bore patient ventilation system

V-RMS Homogeneity Specifications*

Diameter of Spherical Volume – DSV	Guaranteed ppm	Typical ppm
10 cm		0.005
20 cm	< 0.050	0.02
30 cm	< 0.150	0.06
40 cm	< 0.500	0.25
45 cm	< 1.500	0.7
45 (z) x 50 cm	< 3.000	1.73
50 (z) x 50 cm	< 4.000	2.29

*Specifications correspond to forward production systems. This procedure utilizes a field mapping shim camera that samples the field at 32 points in each of the 24 planes at 50 cm DSV.

Gradient

The SuperG gradients introduce exceptional performance and superb stability, delivering a new way of thinking about wide bore platforms. The SuperG gradient coil uses a hollow conductor, water-cooled design for all axes and a force-balanced layout to maximize overall gradient performance and minimize vibro-acoustic effects on the patient. The SuperG Gradient Amplifier outputs 2.4MW* of power to maximize outcomes in high demanding cases.

ART (Acoustic Reduction Technology) Quiet Technology state-of-the-art clinical imaging demands the routine use of ultra-fast imaging techniques. At 3.0T, the strong gradients interact with the magnetic field to create mechanical forces resulting in acoustic noise. GE has implemented Quiet Technology on many components of the system to reduce acoustic noise and improve the patient environment.

Gradient Coil Isolation and Acoustic Damping

The SIGNA™ Premier Gradient Driver in conjunction with the force-balanced SuperG gradient coil deliver superb performance, while helping to maintain a safe environment for the patient. The interactions between the magnet, gradient coil, RF body coil and patient support structures have been minimized to reduce mechanical vibrations and acoustic and thermal effects.

RF Coil Isolation

During gradient pulses, the RF body coil acts as a secondary source of noise. To further reduce the noise heard by the patient, the RF body coil mounting has been optimally designed and separated from patient support structures.

Vibro-Acoustic Isolation

To isolate the magnet from the building and reduce the transmission of acoustic noise in the structure, GE has designed a vibro-acoustic dampening pad that sits under the feet of the magnet. The dampening characteristics of the pad are optimized based on the magnet geometry and weight.

Gradient Waveform Optimization

User selectable mode to further reduce acoustic noise.

Gradient Performance

	Premier XT
Peak amplitude	80 mT/m
Peak slew-rate	200 T/m/s
Maximum FOV (x,y,z)	50 cm x 50 cm x 50 cm
Duty Cycle	100%

Gradient Amplifier & Coil

Peak amplifier current and voltage	1034A/2324V
Control	Optimized-digital control
Intelligent Gradient Control with load-optimized feed forward and feedback control algorithms that deliver accurate and repeatable output performance	
Dedicated active feedback control loop to regulate current errors	
Gradient current accuracy	300 uAs
Shot-to-shot repeatability [†]	100 uAs
Symmetry [‡]	200 uAs

High Order Shim

The SIGNA™ Premier gradient coil comes with 5 second order and 3 third order shim coils integrated into the gradient coil structure.

- Linear terms: X, Y, Z
- 2nd order terms: XY, ZX, ZY, Z2, X2-Y2
- 3rd order terms: Z3, Z2X, Z2Y

*Product of peak output current and peak output voltage

[†]Typical gradient fit expressed in terms of the absolute integrated errors in micro- Amperes-second (μ As). Gradient integral precision is the maximum integrated current error over a full-scale, echo-planar gradient waveform. Shot-to-shot repeatability is the largest difference between integrated errors across waveforms. Symmetry is the largest difference in integrated current error when comparing positive and negative gradient waveforms.

RF

The RF acquisition technology of the SIGNA™ Premier enables greater clinical performance and higher image quality especially for data-intensive applications and provides an improvement in SNR versus previous generation based on GE's Total Digital Imaging (TDI) RF architecture.

Direct Digital Interface (DDI) which employs an independent analog-to-digital converter to digitize inputs from 146 RF channels, eliminating unnecessary noise enhancement. In other words, every element translates to a digitized signal. The result? Not only does DDI technology improve SNR of our images but it also works with legacy GE coils for unmatched flexibility.

TDI RF Architecture

	Premier XT
Simultaneous RF Receivers (A/D Converters)	146
Receiver sampling per channel	80 Mhz
Quadrature demodulation	Digital
Receiver dynamic range at 1 Hz BW	> 165 dB
Receiver resolution	Up to 32 bits

TDI Receive RF Architecture for 146 channels system

Number of available RF Channels *	146
Maximum number of channels per Field of View without table movement each generating an independent partial image	146

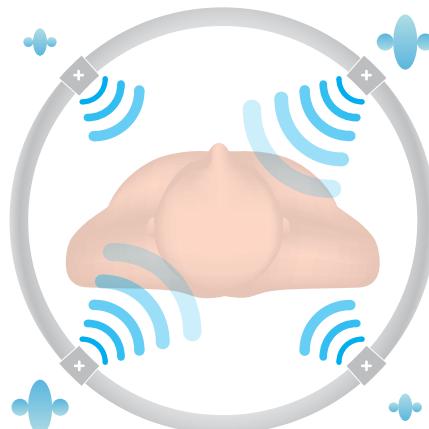
*Independent number of digitizers

RF Transmit Architecture

RF amplifier	Multiple output Small footprint Water cooled
Maximum output power	15 kW body per channel (30 kW peak total) 4.5 kW Head
Maximum B ₁ field with whole body RF coil	19 uT at 75 kg (> 25 uT at 20 kg)
Transmit gain	40 db coarse, > 84 dB instantaneous
RF exciter frequency range	127.72+/-0.650MHz
Receiver resolution	< 0.6 Hz/step
Frequency stability	14 parts per billion (0 to 50 C)
Phase resolution	0.005 deg/step
Amplitude control	16 bit with 12.5 ns resolution
Amplitude stability	< 0.1 dB over one minute at rated power
Digital RF pulse control	2 amplitude modulators 2 frequency/phase modulators
Transmit/Receive Body Coil	Fully integrated 16 rung quadrature Birdcage 70 cm inner diameter 50 cm FOV

MultiDrive

At 3.0T, precise control over the RF environment in a 70 cm patient bore has been challenging until now. The SIGNA™ Premier RF transmit architecture consists of two liquid-cooled 15 kW solid-state RF power amplifiers. By optimizing the phase and amplitude of each RF amplifier output channel that is applied to GE's 70 cm whole-body RF transmit coil, the RF uniformity and signal homogeneity improves regardless of patient shape, size, and/or body habitus.



Volume Reconstruction Engine & Host Computer

Reconstruction performance today is challenged by explosive growth in data, and increased computational complexity. The amount of data to be stored and processed continues to increase with the advances in MR system technology. The SIGNA™ Premier meets that challenge head-on with innovations in reconstruction to take full advantage of computing power and by leveraging both hardware and software technology.

Reconstruction System Gen7		
	ADVANCED	ADVANCED DL
Operating system	SUSE® Linux Enterprise Server (SLES)	SUSE® Linux Enterprise Server (SLES)
Processor	Dual Intel ® Xeon® Gold 6130	Dual Intel ® Xeon® Gold 5218
Clock rate	2.1 GHz	2.3 GHz
Memory	≥ 192 GB	≥ 160 GB
Network	10 GbE	1 GbE
Hard disk storage	1440 GB SSD	1440 GB SSD
2D FFT/second (256 x 256 full FOV)	81,000 2D FFTs/second	81,000 2D FFTs/second
GPU	N/A	Nvidia T4

Host Computer	
Operating system	SUSE® Linux Enterprise Server (SLES)
Processor	Intel® Xeon® W-2123 CPU
Clock rate	3.6 GHz
Memory	64 GB
Network	Gigabit (10/100/1000) Ethernet
Hard disk storage	1024 GB SSD
Graphics subsystem	NVIDIA Quadro with minimum of 1 TFLOPS performance
Media drives	CD/DVD drive
Cabinets	Single, tower configuration

AIR™ Recon

Reconstruction is at the heart of every scan, and reducing noise during reconstruction is critical to achieving clear images.

With AIR™ Recon, GE's smart reconstruction algorithm available on several key applications like PROPELLER, Cube, FSE and Flex, you can reduce background noise and out-of-FOV artifacts while improving SNR. The result is cleaner, crisper images without having to overcompensate in your scanning protocol.

AIR™ Recon DL*

Deep Learning based reconstruction to reduce noise, blurring and ringing artifacts for MR images. AIR™ Recon DL, a GE-first deep-learning application for MR image reconstruction, is designed to improve signal-to-noise and image sharpness, enabling shorter scan times. It uses trained neural networks to remove noise and ringing from the reconstructed image.

Orchestra Reconstruction Platform

Orchestra is a high performance computing software library toolbox that enables new possibilities for integration of advanced reconstruction elements. Delivering enhanced productivity gains by increased image reconstruction speed and minimizing workflow disruptions. A powerful platform not only built to support the most demanding application such as HyperSense, but also to provide our collaborators with easy access to the product reconstruction algorithms.

Computing Platform

Operator Console

The SIGNA™ Premier system comes equipped with a scan control keyboard assembly that contains intercom speaker, microphone and volume controls, and an emergency stop switch. Start-scan, pause-scan, stop-scan, and table advance to isocenter hot keys are also included.

Display and DICOM Data

The SIGNA™ Premier system generates MR Image, Secondary Capture, and Grayscale Softcopy Presentation State (GSPS) DICOM objects. The DICOM networking supports both send and query retrieve as well as send with storage commit to integrate with the site's PACS archive. DICOM filming support includes both Basic Grayscale and Basic Color Print Service Classes. Additionally, the SIGNA™ Premier system supports the CT and PET image objects for display allowing the user to refer to cross-modality studies.

Display

AutoView	560 x 560 Image Window (standard)
Window/Level (W/L)	7 user-programmable keys on scan control keyboard plus one key for returning to prior setting 6 user-programmable buttons in image viewer Arrow keys on scan control keyboard On-image through middle mouse button Save State stores user-selected image orientation, user annotation and window level
Image display	Zoom/Roam/Flip/Rotate/Scroll/Explicit Magnify and Magnifying Glass Image Measurement Tools Grid On/Off Cross Reference/User Annotation Exam/Series Page Hide Graphics/Erase Annotation/Screen Save Accelerator Command Bar Compare Mode/Reference Image Scoutview Cine Paging (up to 4 windows and 128 images/window) Add/Subtract/Edit Patient Data
Split Exam	Provides the capability to extract a subset of series from an exam and create a separate exam Performed on the locally-accessible image database
Image display performance	Performed on the locally-accessible image database

Display

Image annotation	Shadowed to permit ease in reading Two graphic/text planes overlay the entire screen Grid placement with anatomical reference on an image Drawing and annotation may be added to and removed from images
------------------	---

Filming

Filming	Drag and Drop filming One-button Print Series One-button Print Page Multi-image formats – from 1 to 24 images displayed simultaneously in various layouts DICOM Basic Grayscale Print Service Class DICOM Basic Color Print Service Class
---------	--

Wide-screen display monitor

Display monitor	24" Widescreen LCD Flat Panel 1920 x 1200 dot resolution Non-interlaced, flicker-free presentation Contrast ratio 1000:1 Digital DVI Interface
-----------------	--

Scan Parameters

Sequences	Parameters	Matrix 64	Matrix 128	Matrix 256	Matrix 512
2D Spin Echo	Min. TR (ms)	N/A	2.8 ms	3.193 ms	4.39 ms
	Min. TE (ms)	N/A	1.52 ms	1.848 ms	2.64 ms
2D Fast Spin Echo	Min. TR (ms)	N/A	3.3 ms	3.7 ms	5 ms
	Min. TE (ms)	N/A	1.564 ms	1.832 ms	2.64 ms
2D Fast Spin Echo	Min. slice thickness		0.1 mm		
	Min. ESP (ms)	N/A	1.564 ms	1.832 ms	2.64 ms
	Max. ETL		480		
3D Fast Spin Echo	Min. TR (ms)	N/A	43 ms	52 ms	70 ms
	Min. TE (ms)	N/A	5.0 ms	6.0 ms	10.0 ms
	Min. slice thickness		0.3 mm		
2D Fast Gradient Echo	Min. ESP (ms)	N/A	1.56 ms	2.16 ms	3.504 ms
	Max. ETL		399		
	Min. TR (ms)	0.532 ms	0.66 ms	0.916 ms	1.2 ms
3D Fast Gradient Echo	Min. TE (ms)	0.184 ms	0.184 ms	0.188 ms	0.192 ms
	Min. TR (ms)	0.53 ms	0.67 ms	0.84 ms	1.21 ms
	Min. TE (ms)	0.176 ms	0.176 ms	0.18 ms	0.184 ms
Inversion Recovery	Min. TR (ms)	N/A	58 ms	58.5 ms	60.5 ms
	Min. TE (ms)	N/A	1.536 ms	1.832 ms	2.64 ms
	Min. TI (ms)	N/A	50 ms	50 ms	50 ms
3D FIESTA	Min. TR (ms)	0.92 ms	1.19 ms	1.66 ms	2.2 ms
	Min. TE (ms)	0.224 ms	0.288 ms	0.38 ms	0.544 ms
	Min. TR (ms)	4.0 ms	5.0 ms	6.0 ms	N/A
Echo Planar Imaging	Min. TE (ms)	1 ms	1.2 ms	1.6 ms	N/A
	Min. FOV		4 cm		
	ESP at 25 cm	0.404 ms	0.572 ms	0.908 ms	N/A
Diffusion tensor directions	ESP at 48 cm	0.28 ms	0.396 ms	0.58 ms	N/A
	ESP at 99 cm	0.196 ms	0.296 ms	0.564 ms	N/A
	Images per second	157	93	36	N/A
Minimum slice thickness in 2D	b value		Maximum(s/mm ²): 10.000	Max # for ADC: 40	
	Diffusion tensor directions		Max: 300		
	Minimum slice thickness in 3D				0.1 mm
Min/Max FOV	Min/Max Matrix				0.1 mm
	Highest in-plane resolution				10 mm / 500 mm
Min/Max Matrix	Min/Max Matrix				32-1024
	Highest in-plane resolution				5 µm

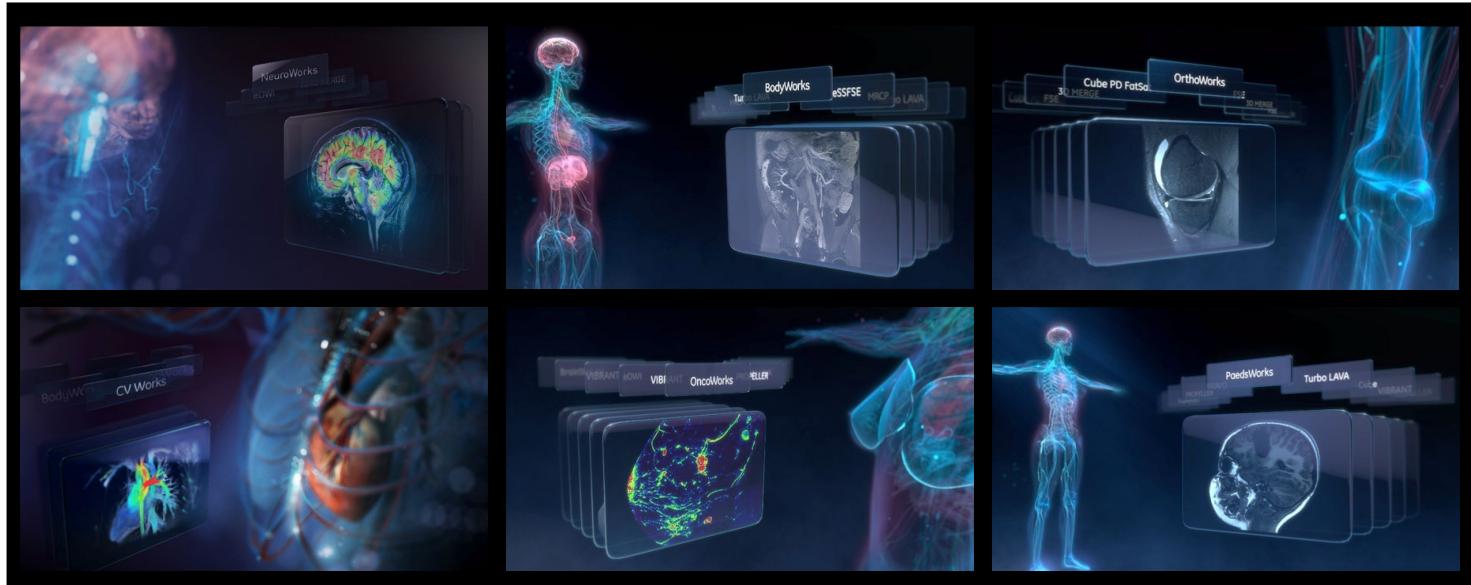
Note: Optional software packages may be required to achieve certain specifications above.

MR 30 for SIGNA™

The latest software platform provided by GE, it includes the base pulse sequences, workflow enhancements and visualization tools to enable high productivity with exceptional quality and outcomes. MR 30 for SIGNA™, starting with the acquisition provides the tools needed to enable superb results in the various clinical fields. With 6 optimized Works categories, GE delivers preset protocols for the most demanding Neuro, Musculoskeletal Cardiovascular, Body, Oncology and Paediatric areas. In addition to enabling the routine imaging, MR 30 for SIGNA™ provides the user with a streamlined and efficient operating environment with in-line processing through single-click outcomes for even the most demanding processes.

MR 30 for SIGNA™ provides:

- Software platform with a wider range of assets for image acquisition, display and post processing.
- Strategically packaged to deliver speed, high quality diagnostic images and reliable post processing to each clinical area.
- An intelligent combination of MR pulse sequences and advanced techniques, designed to bring solutions for enhanced care and productivity.
- From SE, FSE, frFSE, Inversion Recovery, SSFSE, SSFSE-IR, GRE, FGRE, SPGR, FSPGR to Volumetric imaging, Motion Correction, Diffusion Weighted, Vascular imaging and beyond.



NeuroWorks

NeuroWorks includes the basic imaging acquisitions and processing along with the latest in motion correction, functional and volumetrics. Supporting both simple reconstruction and real-time perfusion results with Brainstat AIF.

Volumetric Imaging

	PD, T1, T2, T1 FLAIR, T2 FLAIR, STIR, MSDE*
3D Cube	Isotropic high resolution volumetric One sequence, reformat in all planes
3D Cube DIR	DIR, typically but not limited to CSF and white matter suppression
BRAVO T1	< 1 mm isotropic, MP-RAGE optional sequence of choice for functional data overlay
Visualization	3D reformat MPR Volume segmentation Volume rendering Auto-contour

Motion Correction

	Multiple contrasts – T1, PD, T2, T1 FLAIR, T2 FLAIR
PROPELLER MB	Motion reduction
	Magnetic susceptibility effects reduction
Visualization	Registration Motion correction

One Touch Protocol

	Automated multi-series, multi-plane prescription
READYBrain	Combine with Auto Scan for one touch protocol
	In-line for auto post processing

Enhanced Diffusion Weighted

	Multi b-value
	3:1, Tetrahedral
	Smart NEX
eDWI*	Inversion recovery for robust FatSat
	RTFA: Increases SNR by 50% and distortion reduction for accurate post processing when compared to dual spin echo
Visualization	ADC and eADC

Spectroscopy

PROBE PRESS	Concentrations of in-vivo metabolites evaluation Acquisition and display Reduced flip angles for lower min TE values Up to twice the SNR when compared to PROBE STEAM
semiLASER	semiLASER provides adiabatic spin echo localization for single voxel spectroscopy
Visualization	Brain Spectroscopy

Dynamic Brain Function

BrainSTAT	Blood flow
Perfusion and Analysis	Blood volume Mean transit time Time to peak Fusion
BrainSTAT (AIF)	Manage tracer arrival differences due to patient flow dynamics
Arterial Input Function	Automatically or manually specify the AIF to normalize maps
Visualization	Brain STAT

Spine Imaging

2D/3D MERGE	High SNR T2* contrast Gray/white matter differentiation Foraminal detail
3D COSMIC	SSFP to emphasize T2 signal for improved contrast Nerve root and disc detail
Visualization	3D reformat MPR Volume segmentation Volume rendering

Inversion Recovery

PSIR	Phase Sensitive Inversion Recovery
------	------------------------------------

BodyWorks

The latest in torso imaging is delivered with volumetric imaging supporting advanced parallel imaging standard. Including, Snapshot imaging with optimized Single Shot FSE, 3D isotropic imaging for MRCP, Dynamic Imaging and Routine Volumetric imaging enabled with Motion Free navigation for post-contrast uses with high temporal resolution results. Motion correction is further enhanced with both the PB navigators as well as PROPELLER including T1-weighted results. Turbo class of acquisitions, streamlines the speed and enables higher quality results. Advanced processing is made one-touch with the new READYView on Console capabilities.

Volumetric Imaging

3D Cube	Isotropic high resolution volumetric One sequence, reformat in all planes In- and out-of-phase
3D Dual Echo	Used to help identifying fatty infiltration, focal fatty sparing, liver lesions, and other conditions High spatial resolution
Visualization	3D reformat MPR Volume segmentation Volume rendering Auto-contour

Motion Correction

PROPELLER MB	Motion reduction
PB Navigators	Free breathing tracker
Respiratory Trigger	Free breathing gating
Visualization	Registration Motion correction

Enhanced Diffusion Imaging

eDWI*	Multi b-value, 3:1, Tetrahedral Smart NEX Inversion recovery for robust FatSat RTFA: Increases SNR by 50% and distortion reduction for accurate post processing when compared to dual spin echo
Visualization	ADC and eADC Fusion

Dynamic Body Imaging

LAVA	SPGR Fast Liver Acquisition SPECIAL for robust fat suppression
LAVA Turbo	ARC acceleration for full organ coverage Shorter breath-holds
Multi Phase Dynaplan	Customizable phase delay for dynamic studies Series per phase Auto subtraction Pause after mask
Visualization	MR standard SER

Non-Invasive Non Contrast Biliary System - MRCP

3D frFSE MRCP	T2 Prep for background suppression Breath-hold and PB navigator
2D SSFSE	T2-weighted, with sub second single slice acquisition High signal from fluids Good suppression of other tissues Snapshot acquisition, motion artifacts virtually eliminated Thin slices and thick slab protocols Single breath-hold acquisition MIP post processing
2D FatSat FIESTA	Excellent contrast between ducts and gallbladder with surrounding anatomy FatSat for increased conspicuity
2D frFSE	T2-weighted High resolution Supplementary information for assessment of extra ductal masses
Visualization	3D Reformat MPR MIP & HD MIP

CVWorks

CVWorks provides GE's extensive coverage for the latest techniques enabling high performance CardioVascular imaging outcomes. Single Breath-hold imaging for whole heart coverage are available from Morphology to Delayed enhancement. Enabling simplified generation of superb results including head-to-toe MRA support to single acquisition Time of Flight and additional non-contrast imaging for flow. With SmartPrep and Fluoro triggering enable for first-time right contrast injections.

Myocardium Delayed Enhancement

MDE PLUS	Provides a Single Shot Fiesta-based MDE acquisitions used to suppress myocardial signal with the Single Shot Fiesta-based method a reduction of breath-hold times allowing multi-slice coverage in minimal number of breath-holds.
3D MDE FS	3D MDE with Fat Saturation
Single-Shot Myocardial Delayed Enhancement (SSH MDE)	Shorten breath-holds or free breathing for better patient tolerance Potential for reduced scan time Imaging arrhythmic patients Snapshot imaging for motion reduction
Adiabatic IR Pulse	Robust Myocardial Suppression Fat Suppression Adiabatic fat suppression pulse Improved characterization of enhancing tissue
MDE Plus: Phase Sensitive MDE (PSMDE)	Inversion Recovery FGRE sequence Phase-sensitive image reconstruction Consistent myocardial suppression, even with sub-optimal TI Improved contrast for myocardial Potential to shorten overall exam time

Single Breath Hold Whole Heart

Black Blood SSFSE	Difficult patients with irregular heartbeats or limited breath-hold capacity Potential to shorten exam times Shorten breath-holds for better patient tolerance Whole chest survey
-------------------	--

Viability Imaging

CINE IR	Multiphase FGRE Cine acquisition...quick assessment of optimal TI time for MDE Captures image contrast evolution at different TI times Adiabatic Inversion Recovery for uniform myocardial suppression Support both 1 RR and 2 RR mode
---------	---

T2* Mapping

StarMap	T2* mapping compatible with gating for cardiac evaluation Non-invasive evaluation of the entire organ
READYView	R2 Star

Navigator Free Breathing Acquisition

Navigators	Used with 3D IR Prepared FGRE or 3D FatSat FIESTA Free breathing navigator diaphragm tracking
------------	--

Flow Imaging

Flow Analysis	Flow velocity and volume flow quantification Peak and average flow charts and graphics Automated contour detection Brain, chest and abdominal clinical applications
---------------	--

Contrast Enhancement Tracking

SmartPrep	Automated bolus tracking
Fluoro triggered	Real Time bolus tracking
Visualization	MIP & HD MIP

Peripheral Vascular Runoff

QuickStep	Multi-station, multi phase acquisition Automatically prescribes, acquires, and combines images from multiple stations Entire exam complete with no user intervention in as little as 7 minutes Auto subtraction
-----------	--

Non Contrast Vascular Imaging

2D TOF	Carotid bifurcation, venous anatomy, aortic arch, peripheral vessels
3D TOF	Circle of willis, intracranial vasculature, abdominal vasculature
3D TOF Multi Slab	Intracranial vasculature, carotid bifurcation, aortic arch, peripheral vessels, venous anatomy
2D Phase Contrast	Localizer, flow direction and velocity for intracranial and extracranial vasculature, portal or hepatic vein, quantitative measurement of flow velocity
3D Phase Contrast	Intracranial vasculature, renal arteries
Inline Self Calibrating Phase Contrast	The feature provides an inline post-processing task that automatically corrects phase-contrast images from background phase error for MR flow imaging by using areas in the image that are known to have zero velocity.
Visualization	MIP & HD MIP

OrthoWorks

OrthoWorks delivers routine imaging that is not always a given. From motion correction to advanced volumetric imaging, GE's latest MSK techniques provide you with the contrasts you need for the basic imaging to enhanced cartilage imaging. And with multiple tissue suppression methods available, OrthoWorks enables the best of what can be achieved in a standard configuration.

High Resolution Imaging

FSE & frFSE

- Intermediate PD, T1, T2-weighted imaging
- Compatible with FatSat, ASPIR, STIR and SPECIAL
- Gold standard for articular cartilage, cartilage ligaments, menisci and subcondral bone

Volumetric Imaging

3D Cube

- PD, T1, T2, STIR
- Isotropic high resolution volumetric
- One sequence, reformat in all planes

MENSA NERVE

- For optimized nerve contrast

Visualization

- 3D reformat MPR
- Volume segmentation
- Volume rendering

Motion Correction

PROPELLER MB

- Multiple contrasts – T1, PD, T2, STIR
- Motion reduction

Visualization

- Registration
- Motion correction

T2*-weighted Imaging

3D MERGE

- High SNR T2* contrast

3D COSMIC

- Visualization of ligaments while adding soft tissue contrast
- Reduced chemical shift
- Fast, high resolution volumetric imaging
- SSFP to emphasize T2 signal for improved contrast

Visualization

- 3D reformat MPR
- Volume segmentation
- Volume rendering

Artifact Reduction Standard Sequence

MARS

- FSE High bandwidth protocols
- High resolution, small FOV imaging

Fat Suppression

Chemical FatSat

- Frequency selective fat saturation

STIR

- Inversion recovery fat null point method

ASPIR

- Solution for poor fat suppression due to B_1 inhomogeneity

SPECIAL

- Hybrid method between chemical FatSat and STIR

Spectral Spatial

- Water excitation only

OncоЩorks

OncоЩorks delivers a complete platform for your needs in prostate, breast and radiation therapy planning. From the basic routine acquisitions to whole body imaging including volumetric and enhanced diffusion capabilities, GE enables superb linearity from the gradient platform and hardware performance. GE provides the necessary preset protocols to supply you with optimal imaging for your oncology needs that is further enhanced by visualization capabilities so that your results can be a single click away.

Volumetric Imaging

	PD, T1, T2, T1 FLAIR, T2 FLAIR and STIR
3D Cube	Isotropic high resolution volumetric One sequence, reformat in all planes
3D Cube DIR	DIR, typically but not limited to CSF and white matter suppression
BRAVO T1	< 1 mm isotropic, MP-RAGE optional sequence of choice for functional data overlay
Visualization	3D reformat MPR Volume segmentation Volume rendering Auto-contour

Enhanced Diffusion Weighted

eDWI*	Multi b-value 3:1, Tetrahedral Smart NEX Inversion recovery for robust FatSat RTFA: Increases SNR by 50% and distortion reduction for accurate post processing when compared to dual spin echo
Visualization	ADC and eADC

Dynamic Imaging

Multi-phase SPGR	SPGR dynamic fast acquisition SPECIAL for robust fat suppression
Visualization	MR standard SER

Whole Body Scanning

FSE-IR/3D SPGR/ DWI	Whole body imaging Multiple stations with large FOV Metastasis screening
Multi-station localizer	Consistent set-up Auto-table movement Auto-pasting Efficient work-flow

PaedWorks

PaedWorks is the GE solution to address your specific needs in paediatric imaging, from standard sequences supported with the latest in motion control for brain to toes. GE delivers standard acoustic reduction technologies and further addresses clinical needs for volumetric imaging, whole body imaging and enhanced diffusion results. The streamlined processing enables simplified one-click processing and visualization of complex results. PaedWorks covers your needs for all anatomies and provides optimized protocols and preset procedures.

Volumetric Imaging

	PD, T1, T2, T1 FLAIR, T2 FLAIR and STIR
3D Cube	Isotropic high resolution volumetric One sequence, reformat in all planes
3D Cube DIR	DIR, typically but not limited to CSF and white matter suppression
BRAVO T1	< 1 mm isotropic, MP-RAGE optional sequence of choice for functional data overlay
3D Dual Echo	In- and out-of-phase used to help identifying fatty infiltration, focal fatty sparing, liver lesions, and other conditions High spatial resolution
Visualization	3D reformat MPR Volume segmentation Volume rendering

Motion Correction

PROPELLER MB	Motion reduction
PB Navigators	Free breathing tracker
Respiratory Trigger	Free breathing gating
Visualization	Registration Motion correction

One Touch Protocol

READYBrain	Automated multi series, multi plane prescription
(Not recommended for under 1 year of age)	Combine with auto scan for one touch protocol Inline for auto post processing

Dynamic Brain Function

BrainSTAT	Blood flow
Perfusion and Analysis	Blood volume
	Mean transit time
	Time to peak parametric
	Fusion
BrainSTAT	Manage tracer arrival differences due to patient flow dynamics
Arterial Input Function (AIF)	Automatically or manually specify the AIF to normalize maps
Visualization	BrainSTAT

Spectroscopy

PROBE PRESS	Concentrations of in-vivo metabolites evaluation
	Acquisition and display
	Reduced flip angles for lower min TE values
	Up to Twice the SNR when compared to PROBE STEAM
semiLASER	semiLASER provides adiabatic spin echo localization for single voxel spectroscopy
Visualization	Brain spectroscopy

Spine Imaging

2D/3D MERGE	High SNR T2* contrast
	Gray/white matter differentiation
	Foraminal detail
3D COSMIC	SSFP to emphasize T2 signal for improved contrast
	Nerve root and disc detail
Visualization	3D reformat MPR
	Volume segmentation
	Volume rendering

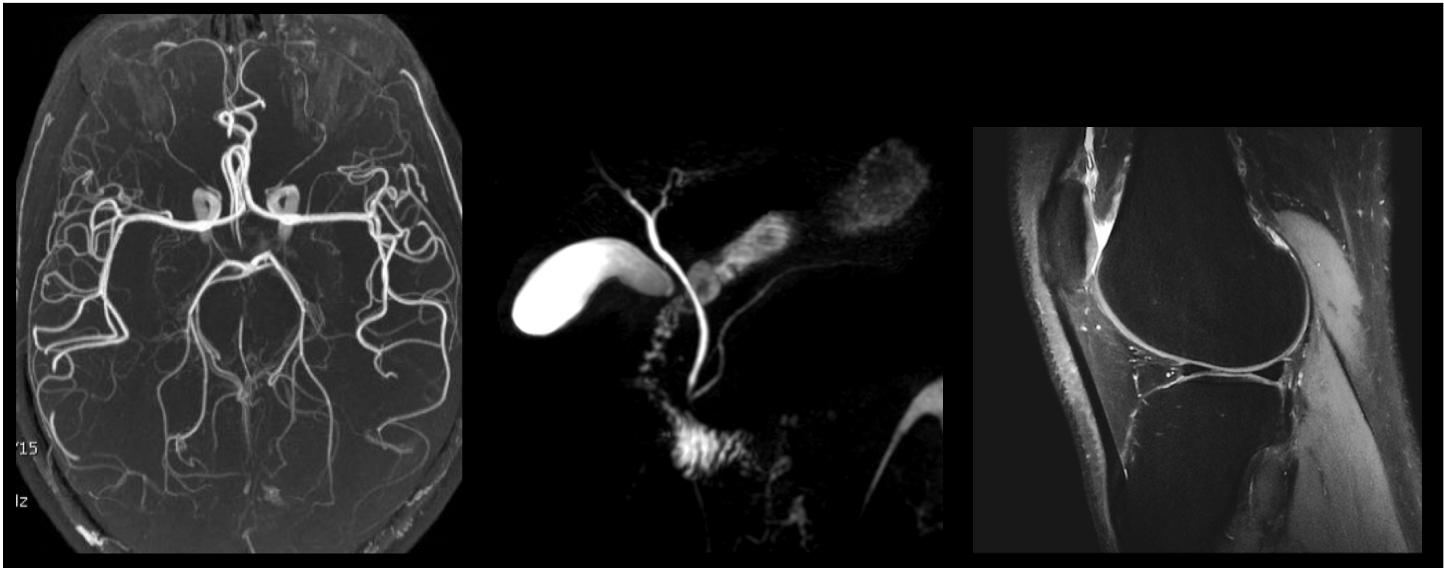
MR 30 for SIGNA™ Features

HyperSense*

Going further than common sense

HyperSense is an acceleration technique based on sparse data sampling enabling faster imaging without the penalties commonly found with conventional parallel imaging.

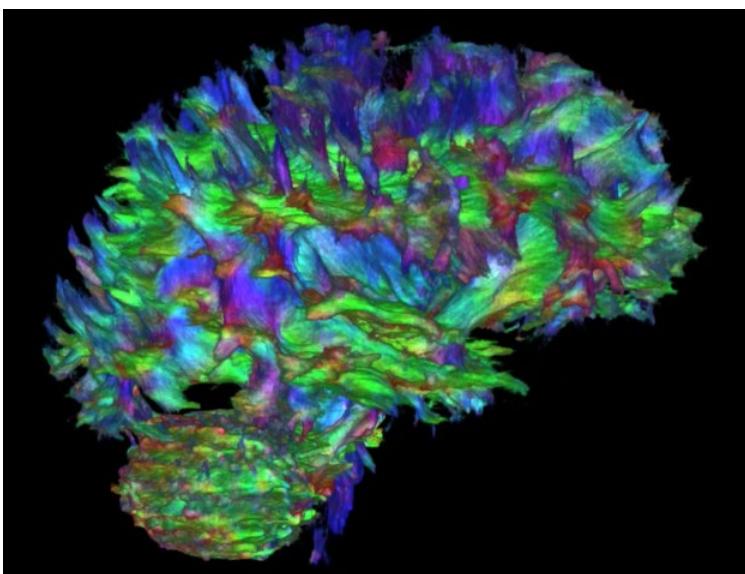
HyperSense is intended to be used with volumetric acquisitions, it is combined with (ARC) parallel imaging delivering optimal signal to noise ratio with shorter acquisition times.



Hyperband for EPI*

Quality and Speed Synchronized

HyperBand provides a reduction in scan time by simultaneously exciting multiple slices at multiple locations. It can lead to higher acceleration reduction factors when combined to other methods of parallel imaging. The benefits of HyperBand acceleration include enhancements on productivity and patient experience, increased anatomy coverage and higher resolution image acquisition.



Benefits

- Increase productivity by reduced scan times
- Combined with ARC for higher acceleration factors
- Reduce breath hold time for dynamic imaging

Benefits

- Simultaneous excitation: multiple slices at multiple locations
- Acquisition time reduction without compromising post processing metrics
- More diffusion directions, number of slices or higher temporal resolution without extra scan time
- Combine with ARC for higher acceleration factor
- Used for DWI, DTI, Gradient Echo EPI & fMRI imaging

MR 30 for SIGNA™ Features (continued)

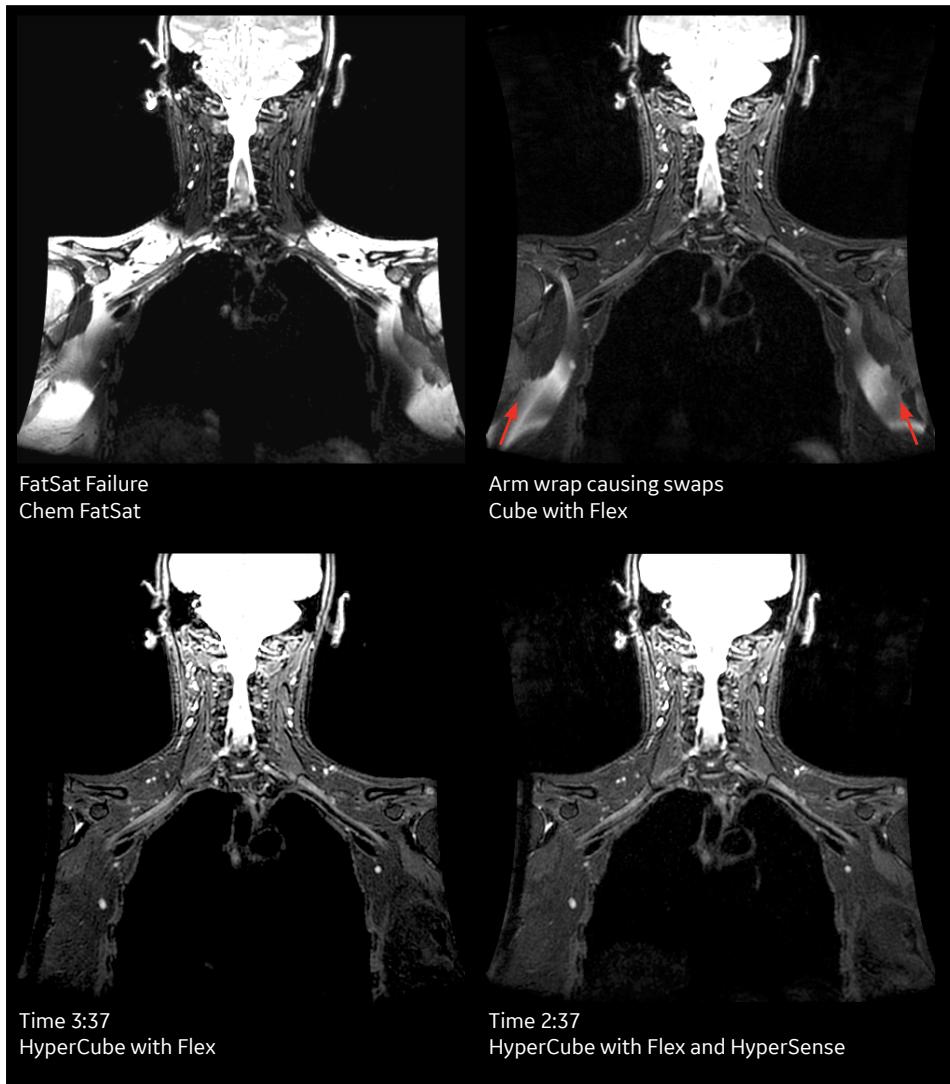
HyperCube*

Tailored 3D imaging that fits to perfection

Delivers small field-of-view organ-specific volumetric imaging acquisition that can reduce artifacts originating from outside of the prescribed FOV. HyperCube can be applied with or without fat suppression using Flex or chemical saturation methods. Provides significant savings of imaging time without sacrificing contrast quality and it can be used across the entire body.

Benefits

- Significant scan time reduction while maintaining SNR efficiency
- High resolution small FOV isotropic volumetric imaging
- FLEX for large FOV robust fat suppression



MR 30 for SIGNA™ Features (continued)

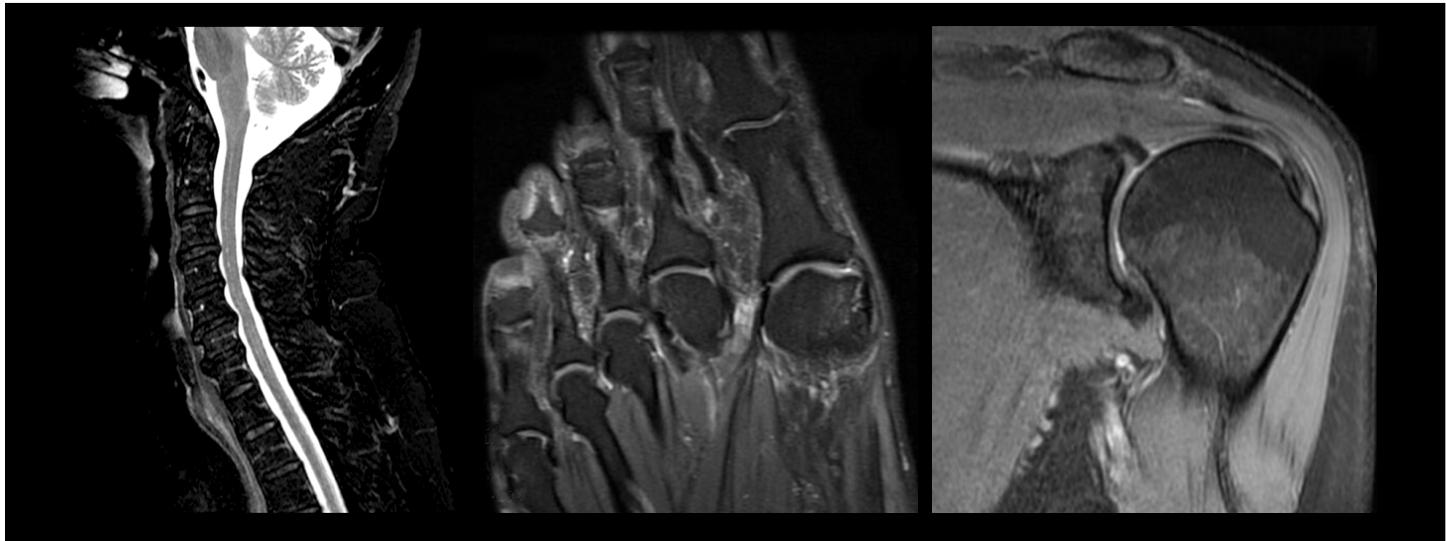
Flex for Cube and FSE*

Unlimited solutions, consistent results

Flex uses a dual echo fat-water separation technology to provide robust and homogeneous fat suppressed images. Flex is compatible with ARC acceleration and can be used with a fast triple echo selection for significant scan time reduction. Enhanced uniformity and control of fat water swaps allow large field of view and off-center imaging where uniformity is a challenge. Delivering fast 2D and 3D acquisitions with reconstructed in-phase, out-of-phase, water and fat images, Flex represents productivity gains in all clinical areas.

Benefits

- 2D and 3D dual echo fat-water separation technique
- Uniform fat suppression for large FOV challenging offcenter anatomies
- Dixon-based , less sensitive to B_0 inhomogeneity
- Choice of single pass acquisition for significant scan time reduction
- Water, Fat, in-phase and out-of-phase images

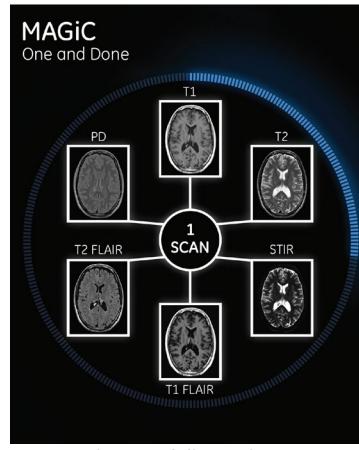


MAGiC*

One and Done

MAGiC (MAGnetic resonance image Compilation), enables one and done imaging capability by delivering multiple contrasts in a single scan. MAGiC utilizes a multi-delay, multi-echo acquisition. The data acquired is processed using a technique to generate T1, T2, PD and Inversion Recovery (IR) weighted images (including: T1-FLAIR, T2-FLAIR, STIR, Dual IR and PSIR weighted images), all at once, reducing scan time by up to 50% compared to acquiring all contrasts separately^t. MAGiC generates all the different contrasts from the same acquisition, leading to enhanced image slice registration, owing to the absence of inter-acquisition patient movement. Because of the efficiency of MAGiC, the user has the flexibility to explore more advanced imaging, such as Spectroscopy**, Susceptibility Weighted Imaging** etc.,

in the same time required to perform the routine exam without MAGiC. MAGiC provides the user the ability to change the contrast of the images after acquisition. This is performed by adjusting the TR, TE, and/or TI parameters post-acquisition, to generate the specific contrast desired. MAGiC also enables users to generate parametric T1, T2, R1, R2, PD maps for further analysis of MRI acquisition data.



One MAGiC scan delivers six contrasts

Benefits

- Multiple contrasts in a single scan
- Up to 50% faster than acquiring all contrasts separately^t
- Ability to change the contrast after acquisition by modifying TR, TE and/ or TI values
- Enhanced image slice registration owing to the absence of inter-acquisition patient motion
- Parametric Maps: T1, T2, R1, R2, PD
- User Mask: manually mark regions of interest
- Auto ROI: after user selects a pixel, an ROI will be created from neighboring pixels with similar R1, R2 and PD
- Multiple layouts can be saved

*Optional

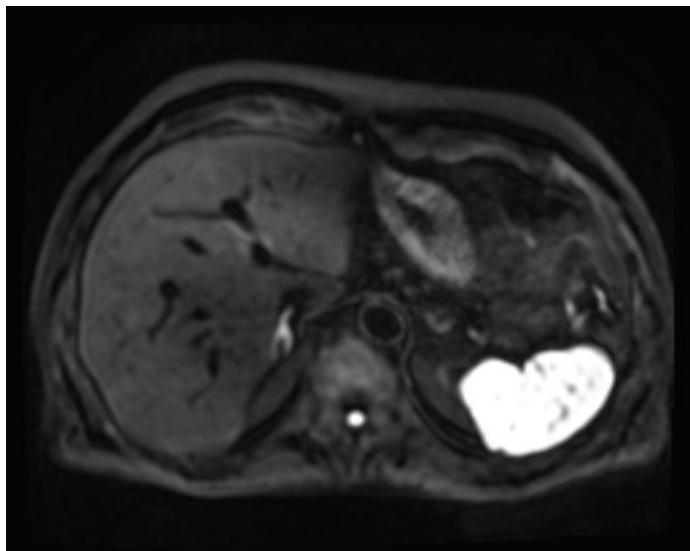
^t Based on MAGiC clinical study of 109 patients from 6 separate institutions.

**Optional package (MAGiC in itself does not deliver advanced imaging)

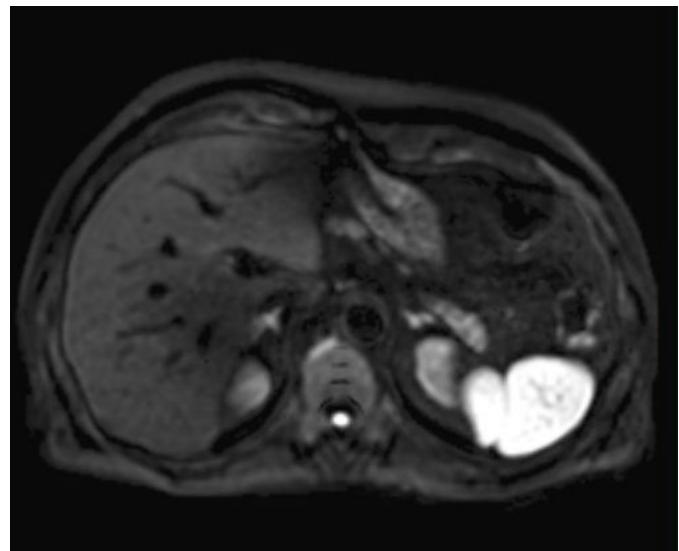
MR 30 for SIGNA™ Features (continued)

MAGiC DWI*

MAGiC DWI generates multiple synthetic b-values from a single DWI scanned series allowing the user to view diffusion contrasts changes in real time after the acquisition. It delivers high b-values without stressing protocol parameters resulting in shorter scan times without sacrificing contrast or anatomy coverage. Synthetic Diffusion is not limited to diffusion directionality or coil type.



DWI B700

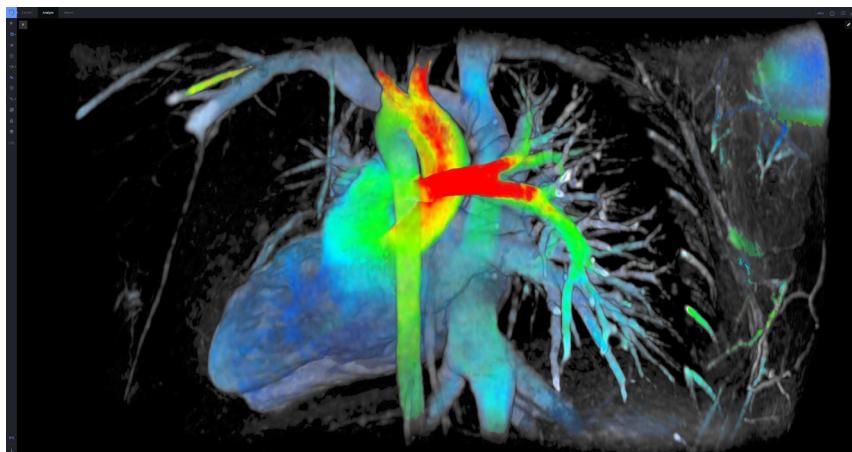


MAGiC DWI B700

ViosWorks*

Confident Functional Accuracy

ViosWorks is a 3D cine-based acquisition that can be planned in any dimension and allows for velocity encoding in all directions to assess vascular flow. The acquisition delivers fast imaging with the use of Hyperkat acceleration including both, single and view sharing frames for higher temporal results. ViosWorks provides high spatial resolution to enable visualization of flow through complex structures.



Benefits

- Multiple synthetic b-values from a single DWI scan
- High b-values in shorter scan times
- Compatible with FOCUS Diffusion

Benefits

- 3D cine acquisition in any dimension
- Free breathing whole chest coverage
- Allows velocity encoding in all directions
- Single and view sharing frames for higher temporal resolution
- Effortless workflow

MR 30 for SIGNA™ Features (continued)

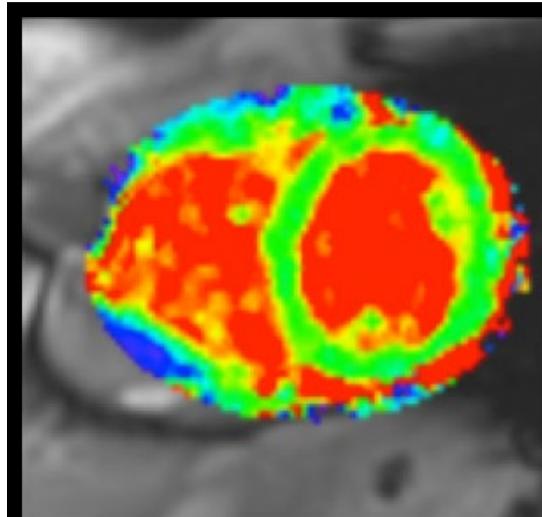
CardioMaps*

Achieving measurable benefits

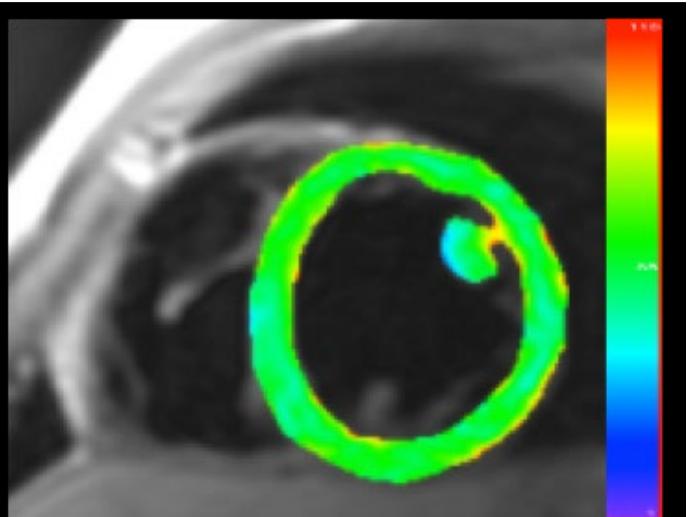
CardioMaps is a powerful diagnostic technique that supports detection of cardiac pathologies by quantitative measurement of T1 and T2 relaxation times. The T1 Mapping acquisition includes automatic motion correction that compensates for cardiac and/or respiratory motion, providing reliable results. T1 Mapping offers two methods of acquisition: Inversion-recovery Look-Locker with FIESTA readout (MOLLI) for apparent T1 (T1*) measurements or saturation-recovery SMART1 Map for true T1 measurements.

Benefits

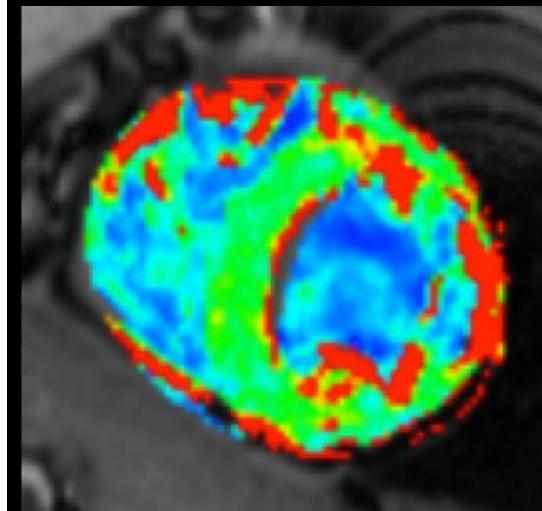
- Quantitative measurement of T1 and T2 relaxation times
- Automatic motion correction for T1 Mapping
- Two methods of acquisition for T1* or true T1 measurements
- R^2 T1 mapping: R-squared to visualize a good fitting of the T1 mapping curve.



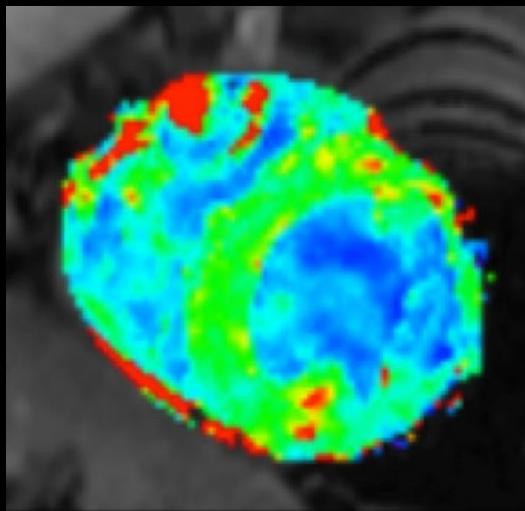
T1 CardioMap



T2 CardioMap



T1 CardioMap
Without Motion Correction



T1 CardioMap
With Motion Correction

MR 30 for SIGNA™ Features (continued)

PROGRES*

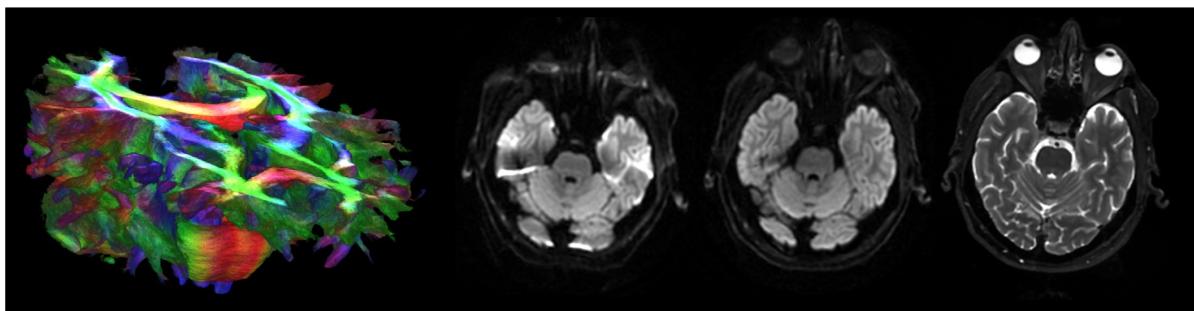
Resolving the limits of diffusion distortion

PROGRES is a series of optimizations that enhance the performance of diffusion imaging. It delivers:

- An automated distortion, motion and eddy current correction technique, based on an integrated reversed polarity gradient acquisition. Using a rigid affine registration, the technique outputs images with reduced susceptibility artifacts at no significant impact in overall scan time.
- Extended DTI capabilities allowing the selection and customization of up to 300 diffusion-encoding directions, resulting in more accurate diffusion tensor estimations.

Benefits

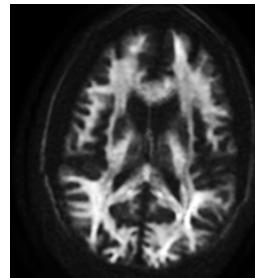
- Distortion and motion correction
- Up to 300 diffusion directions
- Improved image fusion



SuperG Boost*

Resolving the limits of diffusion SNR

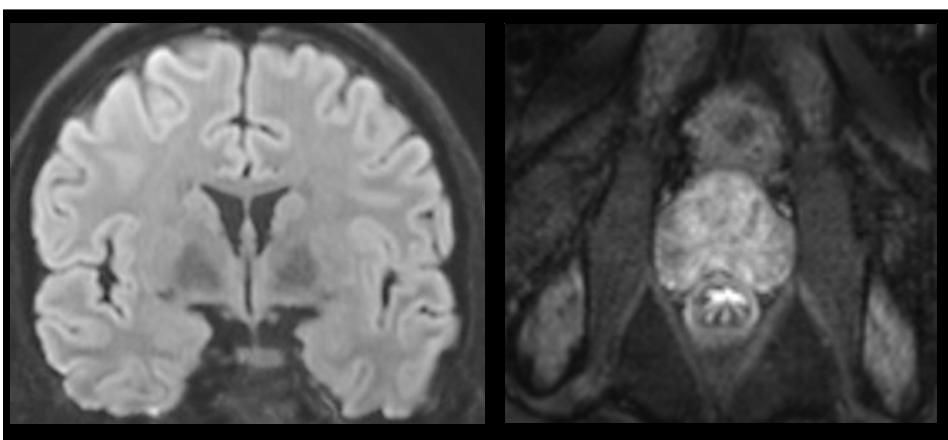
A performance boost in diffusion weighted and tensor imaging by further reducing the minimum echo time at higher b-values.



MUSE*

Resolving the limits of diffusion resolution

MUSE is a diffusion weighted and diffusion tensor technique that allows higher spatial resolution with reduced EPI-based distortions. MUSE implements a segmented readout approach along the phase encoding direction and utilizes a dedicated image reconstruction algorithm to mitigate shot-to-shot motion-induced phase errors inherent to multi-shot diffusion. The technique is compatible with Auto Navigators, cardiac and respiratory gating, as well as acceleration such as ASSET. MUSE is also compatible with fat sat and STIR.



Benefits

- High resolution diffusion imaging
- Reduced blurring and susceptibility artifacts
- Compatible with parallel imaging acceleration

Image Acquisition

Pulse Sequences

SPIN Echo

SE	Standard pulse sequences that are used to generate T1, Proton Density and T2 contrasts.
FSE frFSE	The FSE technique enables long TR and long TE choices in reduced scan times. frFSE produces images with more T2 contribution allowing shorter TR values and resulting in shorter scan times when compared to FSE.
IR FSE-IR PSIR	IR techniques provide uniform suppression of tissues by applying an inversion pulse to null signal. FSE-IR reduces scan time while still achieving efficient tissue suppression. PSIR is Phase Sensitive Inversion Recovery
3D FSE 3D frFSE	Three-dimensional imaging acquisitions mostly used for T2-weighted contrast.
T1 FLAIR T2 FLAIR	T1 and T2 Fluid Attenuated Inversion Recovery (FLAIR) pulse sequences allow the suppression of signal from cerebrospinal fluid (CSF). This sequence provides contrast to differentiate white and gray matter to T1- and T2-weighted brain and spine imaging.
Double IR / Triple IR (Black Blood)	These pulse sequences are included to allow Black Blood imaging for studies of cardiac morphology. Triple IR adds fat suppression to Black Blood imaging. It also can be combined with Single Shot.
Double IR / Triple IR Single Shot	Single Shot Black Blood acquisitions allow larger volume acquisitions in fewer breath-holds.
SSFSE SSFSE-IR	Single Shot Fast Spin Echo is a technique that permits single slice data acquisition in less than one second. It is frequently used for MRCP studies in a single breath-hold and myelograms.
SSFSE Snapshot	The imaging efficiency of navigated/respiratory triggered SSFSE can be improved by imaging multiple slice locations per trigger event with SSFSE Snapshot.
3D MRCP	3D frFSE sequence that combined with the T2 Prep option provides improved background tissue suppression for MRCP exams.
T2 MAP*	T2 MAP is a multiple acquisition, multiple echo FSE based method to obtain images that represent different T2 weighting values. The acquired data is processed to produce T2 color maps that are used for cartilage evaluation.
Cube Cube FLAIR	3D FSE technique that applies modified refocusing pulses for increased SNR. It is used to acquire isotropic data that can be reformatted in any plane.
Cube DIR	Cube DIR, Double Inversion Recovery, is designed to achieve signal suppression from either gray or white matter and CSF.
Cube PROMO*	Prospective Motion correction is a real time 3D navigator based motion correction technique compatible with Cube T2, Cube DIR and Cube T2 FLAIR.
Cube MSDE*	MR vessel wall imaging is enabled with a new imaging option for 3D Cube called MSDE (Motion Sensitive Driven Equilibrium). MSDE is a preparation pulse that suppresses flowing blood signal for better vessel wall contrast and depiction of plaque, also known as black-blood imaging, and is supported for Cube and compatible with HyperSense and ASPIR fat saturation.
2D IDEAL*	2D FSE 3-point Dixon Water Fat Separation method that acquires 4 contrasts in one acquisition: Water, Fat, in-phase and out-of phase.
MAVRIC SL* HyperMAVRIC SL*	Multi-Spectral imaging technique is designed to reduce metal artifact near MR conditional implants. Improvements have been made to the HyperMAVRIC SL feature to reduce scan time through a patient-specific metal analysis scan and allow functionalities, such as Variable flip angles, flow compensation, and No Phase Wrap. In addition to the T1, PD, and STIR contrasts, the sequence now also provides T2 weighting, and a B1-optimized STIR pulse.
3D ASL*	3D FSE based technique that uses a “labeling” pulse to quantify cerebral blood flow.

Gradient Echo

2D and 3D GRE/SPGR
3D GRE Dual Echo
2D and 3D FGRE/FSPGR
2D MFGRE (Multi Echo)
2D CINE GRE / SPGR

Gradient echo basic techniques offer a variety of possibilities to support imaging of all anatomies and can be acquired in 2D, 3D and Cine modes. The sequences generate T1 or T2 contrasts and support single, dual and multi echo acquisitions.

Image Acquisition (continued)

Gradient Echo	
2D and 3D MDE	Myocardial delayed enhancement is a technique used for tissue characterization to provide the assessment of myocardial perfusion. 3D MDE is compatible with the Fat Saturation option.
PSMDE	Phase sensitive MDE increases the contrast between enhanced and normal tissue even with non-optimal inversion delay times.
SSMDE and SSPSMDE	MDE and PSMDE single shot based sequence that provides multi slice coverage with reduced breath-hold times.
2D and 3D FIESTA 2D FIESTA CINE 2D FatSat FIESTA 3D FIESTA-C	Fast imaging employing steady-state acquisition generates great contrast differentiation between tissues of low T2/T1 ratios and high T2/T1 ratios. Provides high SNR images in short acquisition times. FIESTA sequences offer benefits for Neuro, Cardiac and Abdominal imaging.
2D and 3D MERGE FGRE	T2* contrast technique that acquires multiple echoes at several different TE values.
2D Fastcard GRE/SPGR	Prospective gating sequence designed for breath-hold, aortic arch gated imaging.
2D FastCINE GRE/SPGR	Retrospective gating sequence, beneficial to cardiac wall motion studies, assessment of valve function and visualization of regurgitation and stenosis.
2D FGRE-ET* 2D FGRE-ET Real-time*	Fast gradient echo sequence combined with an EPI echo train for acquiring multiple phase encoding steps per TR. Used for first pass myocardial perfusion studies. Compatible with real time for cardiac planning and imaging uncooperative patients.
2D FGRE TC*	Fast Gradient Echo Time Course used for myocardium tissue evaluation on first pass studies which integrates automatic motion correction (MoCo) that compensates for cardiac and/or respiratory motion, providing reliable results.
2D Fast Spoiled Gradient Echo TC*	Fast Spoiled Gradient Echo Time Course used for myocardium tissue evaluation on first pass studies which integrates automatic motion correction (MoCo) that compensates for cardiac and/or respiratory motion, providing reliable results.
2D CINE-IR	FAST-CINE GRE IR Prep sequence is designed for myocardial viability studies. Supports TI time selection for consistent results.
2D Real-time FGRE/FIESTA	Free breathing, Real-time planning sequence for whole heart coverage.
2D FIESTA TC*	2D FIESTA TC is used for myocardium tissue evaluation on first pass studies which integrates automatic motion correction (MoCo) that compensates for cardiac and/or respiratory motion, providing reliable results.
2D Tagging*	Fast Cine GRE based sequence for visualization of cardiac contractile function.
3D Heart*	3D FGRE/FIESTA navigated sequence for free breathing coronary artery imaging.
3D COSMIC	Coherent oscillatory state acquisition for the manipulation of imaging contrast is a modified FGRE sequence with steady-state free precession segmented acquisition for high SNR, high contrast spine imaging.
3D LAVA	Liver Acquisition with Volume Acceleration is a 3D SPGR technique designed to image the liver. SPECIAL is the fat suppression method applied and parallel imaging provides shorter scan times.
3D LAVA Star*	LAVA Star is free breathing, single-phase, motion robust, 3D radial scan (stack of stars) technique. It is used for single phase (pre-contrast or delayed) imaging to produce worry-free, consistent image quality regardless of the patient's condition. LAVA Star employs radial in-plane trajectory to provide active motion compensation without navigators or bellows.
3D LAVA Flex*	3D FSPGR technique that acquires in-phase, out-of-phase, water only and fat only images in one acquisition. LAVA Flex uses ARC; a self calibrated 2D parallel imaging technique that allows acceleration in phase and slice direction. Available with respiratory triggering.
3D Turbo LAVA 3D Turbo LAVA Flex*	LAVA Turbo provides a reduction of breath-hold timing for both LAVA and LAVA Flex acquisitions by as much as 20% reduction compared to conventional LAVA and LAVAFlex acquisitions.
3D VIBRANT*	Simultaneous bilateral breast imaging technique in the Axial and Sagittal plane. SPECIAL and dual-shim volume capabilities provide homogeneous fat suppression.

Image Acquisition (continued)

Gradient Echo	
3D VIBRANT Flex*	Acquires in-phase, out-of-phase, water only and fat only images in a single scan. It provides robust fat saturation and applies ARC, 2D self calibrated acceleration method for high spatial and temporal resolution images.
3D QuickStep	QuickStep is an automated multi-station run-off acquisition. This application automatically prescribes, acquires, and combines images from multiple stations for fast acquisition and simplified workflow.
3D TRICKS*	The Time Resolved Imaging of Contrast KineticS (TRICKS) is a fast 3D dynamic acquisition for high temporal and spatial resolution MR angiography imaging. Combined with elliptical-centric data sampling for consistent results.
3D SWAN*	High-resolution susceptibility weighting 3D multi echo gradient acquisition designed for small vessels visualization, as well as large vascular structures and iron or calcium deposits in the brain.
3D IDEAL*	IDEAL is a 3-point dixon water fat separation method that generates in-phase, out-of-phase, water images and fat images in one single scan. Provides homogeneous fat saturation for imaging for challenging anatomies as such as neck and spine.
3D IDEAL-IQ*	Whole liver 3D coverage in a single breath-hold, IDEAL IQ provides a non-invasive, quantitative assessment of triglyceride fat content in the liver that can aid in diagnosing steatosis.
StarMap*	StarMap is an acquisition and post processing technique that helps evaluate iron content in the heart and liver. Multiple echoes are acquired at different TE times for each pixel resulting in images that represent variations of T2* weighting. After the acquisition the images are post processed to generate color and grayscale T2* and R2* Maps.
DISCO*	Differential sub-sampling with cartesian ordering, combine TRICKS and LAVA Flex technologies to acquire
DISCO with FatSat	high temporal resolution 3D dynamic images with robust fat suppression and without compromising spatial resolution.
DISCO Star*	DISCO Star is a free-breathing, multi-phase, motion robust, 3D radial scan (stack of stars) technique. It is acquired in one continuous dynamic arterial phase to produce worry-free, consistent image quality regardless of the patient's condition. DISCO Star employs radial in-plane trajectory to provide active motion compensation without navigators or bellows.
MP-RAGE	MP-RAGE is a (3D) magnetization-prepared, rapid gradient-echo (MP-RAGE) sequence for structural brain imaging. The sequence captures high tissue contrast and provides high spatial resolution with whole brain coverage in short scan times.
Vascular	
Inhance Inflow IR*	3D FIESTA based non-contrast-enhanced MR angiography technique that provides static background tissue and venous flow suppression for imaging arteries. It uses SPECIAL for uniform fat suppression and respiratory gating compatibility reduces respiratory motion artifacts during free-breathing renal exams.
Inhance 3D Velocity*	3D Phase Contrast based technique designed to acquire angiographic images in brain and renal arteries with robust background suppression in a short scan time. Respiratory triggering compatibility enabling abdominal angiography.
Inhance 2D Inflow*	Designed for imaging arteries that follow almost a straight path (i.e. femoral, popliteal, and carotid arteries) Inhance 2D Inflow acquires data during the systolic phase only. Compatible with Peripheral or Cardiac Gating and ASSET.
Inhance 3D Delta Flow*	3D FSE cardiac gated based non-contrast-enhanced MRA application designed for peripheral arterial imaging. This technique uses the differences between systolic and diastolic flow to help generate arterial signal contrast with robust background and venous suppression. ASSET compatibility provides shorter scan times.
2D TOF	
2D Gated TOF	2D TOF Imaging, 2D Gated TOF Imaging, 3D TOF Imaging and Enhanced 3D TOF Imaging are used for MR angiography imaging. Based on conventional gradient echo scanning, TOF imaging techniques rely primarily on flow-related enhancements to distinguish moving from stationary spins.
2D Fast TOF FGRE/SPGR	
3D TOF	
3D Fast TOF FGRE/SPGR	

Image Acquisition (continued)

Vascular

2D CINE Phase Contrast	This pulse sequence is included specifically for studies of cardiac function. Through the use of retrospective gating, it allows full R-R coverage.
2D Phase Contrast 3D Phase Contrast	These techniques demonstrate flow velocities and directional properties in vessels and other moving fluids such as CSF and aortic flow.

EPI

fMRI – BrainWave RT*	BrainWave RT provides real-time acquisition, processing and display of functional results. It allows a single technologist to acquire, process and display BOLD (Blood Oxygen Level Dependent) fMRI studies acquired with synchronized stimuli. It is comprehensive, equipping you with all the real-time functionality you need – including paradigm control and development, and real-time display of color activation, overlaid on source EPI images.
GRE-EPI SE-EPI FLAIR-EPI DW-EPI	Standard on all systems are gradient echo, spin echo, FLAIR, and diffusion weighted echo planar imaging. The EPI sequence supports single and multishot imaging, multi-phase imaging, as well as cardiac gating. Diffusion EPI produces images that can detect acute and hyper-acute stroke with b-value up to 10,000 s/mm ² , multi-NEX compatibility and the ability to generate ADC and T2-weighted TRACE images. The FLAIR option suppresses the CSF signal.
DTI*	DTI (Diffusion Tensor Imaging) is an EPI technique that acquires diffusion information in up to 300 different directions. The image contrast is based on the degree of diffusion anisotropy in the tissues. Post processing include Fractional Anisotropy (FA), Apparent Diffusion Coefficient (ADC), 2D directional maps and 3D fiber track models. Multi-shell DTI acquisition is available in clinical mode.
eDWI*	Enhanced DWI (eDWI) provides high SNR diffusion images with short acquisition times. Supports Multi b-values with SMART NEX for variable NEX selection per B-value, "3 in 1" diffusion weighting to all three gradients simultaneously, tetrahedral selection with four different diffusion weighting combinations for shorter TE values and Inversion recovery for fat signal reduction.
RTFA	The RTFA algorithm leads to a reduction in distortion of the diffusion image per diffusion axis. RTFA is designed to reduce image blurring and distortions typically associated with diffusion imaging throughout the body. RTFA also allows for increased utilization of single spin echo DWI which results in an increase in SNR by up to 50% compared to dual spin echo and, when combined with the improved resolution leads to an increase in image quality that can be utilized for image presentation, fusion and ADC map outputs.
RTCF	Real-Time Center Frequency (RTCF) option can be applied to DWI & DTI to enable using the optimal center frequency for each slice. This is intended to help improve fat suppression and signal drop off at areas of high B_0 inhomogeneity (off-isocenter, or area with high tissue susceptibility). It is also intended to reduce station-to-station misalignment in whole body diffusion imaging.
FOCUS DWI*	FOV Optimized & Constrained Undistorted Single-shot (FOCUS) DWI utilizes 2D selective excitation pulses to limit the prescribed phase encode FOV eliminating artifacts from motion, imaging back folding or unsuppressed tissue.
MR-Touch*	MR-Touch is software and hardware application designed to measure relative tissue stiffness with MR. The acquisition uses a EPI based sequence that synchronizes induced vibrations to acquire a series of phase-contrast images over time.

Spectroscopy

PROBE-PRESS PROBE-STEAM*	PROBE Single-Voxel spectroscopy allows non-invasive evaluation of the relative concentrations of in-vivo metabolites. The sequence provides acquisition and display of volume localized, water-suppressed H ₁ spectra in single-voxel mode. The sequence consists of three slice selective RF pulses with crusher gradients. PRESS provides up to twice the SNR over STEAM.
semiLASER	semiLASER provides adiabatic spin echo localization for single voxel spectroscopy
PROBE-PRESS CSI 2D & 3D*	PROBE 2D and 3D CSI enable simultaneous multi-voxel spectroscopic acquisitions in the brain. It is available with PRESS excitation to maximize SNR. Post processing includes automatically generated metabolic maps.
BREASE*	A TE-averaged PRESS (Point RESolved Spectroscopy) acquisition that provides the necessary biochemical information to help characterize breast tissue by assessing the presence of choline.

Image Acquisition (continued)

Spectroscopy

TEA-PRESS*

TEA PRESS is a TE-Averaged variant of the PRESS CSI pulse sequence. It collects spectra across a range of TE values and averages the results together to reduce the appearance of signals whose intensity varies as a function of TE. This allows signals whose intensity does not vary with TE to be accentuated in comparison. This is the underlying pulse sequence behind the BREASE application.

Multi Nuclear Spectroscopy (MNS)

The Multi Nuclear spectroscopy option consists of software and hardware necessary to acquire, display and store multi-spectroscopy signals. The MNS pulse sequences are FID CSI, Echo CSI and Spin Echo (MRS). Sage 7 is the software tool that allows MNS data processing, display and storage.

Features:

- MNS Transmit (8kW Broadband Amplifier)
- 32ch receive + 1ch transmit
- Power / SAR Monitoring for each isotope using Forward and Reflected couplers
- Support for 3rd party-MNS coils & T/R Switches
- Compatible with Premier eXpress detachable patient table and AIR Posterior Array

PROPELLER

Silent T1, PD, T2, DWI, T1 FLAIR and T2 FLAIR PROPELLER MB*

T1, PD and T2 PROPELLER MB

T2 FLAIR PROPELLER MB

T1 FLAIR PROPELLER MB

PROPELLER Duo

PROPELLER MB is a multi-shot per blade sequence that uses a radial k-space filling pattern acquisition and a post processing correction algorithm to significantly reduce the effects of motion artifacts. PROPELLER MB is compatible with spatial and chemical Sat, ASPIR, STIR T1, PD and T2 Auto TI/TR and Navigator.

PROPELLER DUO is a FSE based technique that is less prone to distortions caused by field inhomogeneities. PROPELLER DUO has a comparable scan time when compared to conventional PROPELLER DWI, and has spatial sat and shim volume capability to further reduce distortions and reduce artifacts and improve image quality.

Silenz*

Silenz T1 Silenz PD Silenz MRA

Silenz is a 3D Zero-TE sequence comprising high bandwidth excitation and reduced gradient-switching radial acquisition that results in sound levels near ambient. Silenz has added flexibility in sequence prescription for anisotropic resolution enabling faster scan times and includes axial as well as oblique geometries.

Fat Suppression Technology

FatSat

Applies a frequency selective saturation pulse at the frequency of fat before the imaging excitation pulse with the result being a signal measurement primarily from water.

STIR

STIR is an inversion recovery method that takes advantage of the T1 difference between water and fat to allow selection of the signal to suppress. In order to eliminate the signal from tissues, the TI time must match exactly the null point of the tissue that needs to be suppressed.

SPECIAL

Hybrid fat suppression technique that incorporates features from both the frequency selective FatSat and the STIR techniques by using a spectrally selective inversion pulse that inverts only the fat magnetization and leaves the only the water peak available for excitation.

Spectral Spatial

Method that applies selective pulses for water excitation only, while fat is left untouched, thereby producing no signal.

Image Acquisition (continued)

Fat Suppression Technology

ASPIR	ASPIR method is a solution for poor fat suppression due to B_1 inhomogeneity. It is based on the frequency and the relaxation fat behaviors. Applies a spectrally selective adiabatic inversion pulse to excite the fat spins, imaging pulses are then applied after TI null time when longitudinal magnetization of fat crosses zero. The disadvantages include sensitivity to B_0 and longer scan times.
IDEAL*	IDEAL is a 3-point Dixon technique that acquires three images at slightly different echo times to generate phase shifts between water and fat. The water/fat separation method is very efficient at providing homogeneous image quality. One acquisition provides four contrasts: water, fat, in-phase and out-of-phase images.
Flex*	Flex is a 2-point dixon technique delivering faster scan times compared to IDEAL 3-point dixon. It is based on the difference between fat and water resonance frequencies using two flexible echo times for further scan time reduction. One acquisition provides four contrasts: Water, Fat, in-phase and out-of-phase images.

Motion Correction Technology

PROPELLER MB	PROPELLER MB is a multi-shot per blade sequence that uses a radial k -space filling pattern acquisition and a post processing correction algorithm to significantly reduce the effects of motion artifacts. It is compatible with spatial and chemical Sat, ASPIR, STIR Auto TI/TR and navigator.
PROMO*	Prospective motion correction is a real time 3D navigator based motion correction technique compatible with Cube T2, Cube DIR, Cube T1/T2 FLAIR, BRAVO and MP-RAGE.
PB Navigators	Pencil beam navigators allow free breathing body and cardiac imaging by tracking the motion of the diaphragm. There are two navigator modes: navigator gating, uses a predefined signal acceptable range during the expiration and navigator triggering, uses signal to trigger data collection during the expiration.
Respiratory Trigger	Reduces breathing motion artifacts by synchronizing the acquisition with the respiratory cycle.
VCG	Vector cardiac gating reduces motion artifacts by synchronizing the acquisition with the cardiac cycle.
PG	Peripheral gating reduces motion artifacts caused by pulsating blood.
Wireless gating*	Supports physiological data acquisition through wireless transceivers to improve patient handling and signal quality.

Acceleration Technology

Fractional Nex	Technique in which only partial k -space data is collected and the remaining data is estimated. It uses the phase conjugate symmetry reconstruction method, which only half of the phase encode steps are acquired for scan time reduction.
Fractional No Phase Wrap	Selectable on the user interface, Fractional No Phase Wrap allows you to adjust the phase FOV based upon the patient size and shape. Benefits include a physical view of NPW placement on the user interface, flexibility to manage SNR and Scan Time, and the power to scan only the area of interest within the determined FOV.
ASSET	Array spatial sensitivity encoding technique acquires under sampled multicoil data generating aliased images. These are post processed with coil sensitivity maps from the calibration scan to unfold the images.
ARC	Auto-calibrating reconstruction for cartesian imaging is a highly accelerated parallel imaging auto-calibrating method that doesn't require coil sensitivity maps. It enables smaller FOV prescriptions, less sensitivity to motion and prevents artifacts caused by coil calibration inaccuracies.
HyperSense*	HyperSense has been expanded to include T1 acquisitions including MP-RAGE & BRAVO for neuro imaging and LAVA, LAVA-Flex, DISCO and DISCO-Flex for body applications, and Vibrant for breast applications. In addition, HyperSense is now compatible with other 3D gradient echo sequences, such as MERGE, FIESTA, COSMIC and CE-MRA.
Hyperkat*	HyperKat is an advanced k-t acceleration method that employs time-shifted sampling in data acquisition and exploits both spatial and temporal correlation with motion-adaptive time window selection in image reconstruction.

Image Acquisition (continued)

Acceleration Technology

HyperCube*	Small FOV organ specific volumetric imaging acquisition method that enables outside phase FOV HyperCube signal suppression. The technique can help to reduce artifacts originated outside of the prescribed field of view.
HyperBand*	HyperBand enables scan time reduction by simultaneously exciting multiple slices at multiple locations. Reconstruction algorithms are then applied in order to separate the images acquired.

Uniformity Correction Technology

SCENIC	SCENIC (Surface Coil ENhancement for Imaging Clarity) is an advanced image uniformity correction that further improves upon the previous reFINE algorithm. By using the biased field, SCENIC utilizes B-Splines to iteratively determine the best sharpening algorithm. This results in improved contrast, reduced shading, and consistent sharpening when compared to conventional imaging filtering techniques.
PURE	PURE corrects the field inhomogeneity by collecting a calibration scan from the (uniform) body coil and the (non-uniform) surface coil and calculating maps that relate the intensity correction values to the images.
deFINE	deFINE is an integrated in-line imaging processing method that provides edge enhancement and smoothing algorithms allowing the user to customize the image appearance.
reFINE	reFINE is an advanced image uniformity correction that consists of SCENIC and PURE that addresses non-uniformity due to coil sensitivity profiles and dielectric shading effects. It reduces organ-motion induced misregistration artifacts, effects of low signal in dark regions and edge effects at tissue interfaces and borders. Refine optimizes parameter settings for each application, coil, and body anatomy maximizing image uniformity results.

Noise Reduction Technology

ART	Acoustic Noise Reduction Technology optimizes the gradient waveform to reduce the gradient noise without compromising performance.
Silenz*	Silenz is a 3D Zero-TE sequence comprising high bandwidth excitation and reduced gradientswitching radial acquisition that results in sound levels near ambient. Silenz has added flexibility in sequence prescription for anisotropic resolution enabling faster scan times and includes axial as well as oblique geometries.
Silent PROPELLER*	Silent PROPELLER gradient waveform approach results in notably quieter sound levels.

RF Coils Suite

Head & Neck Array



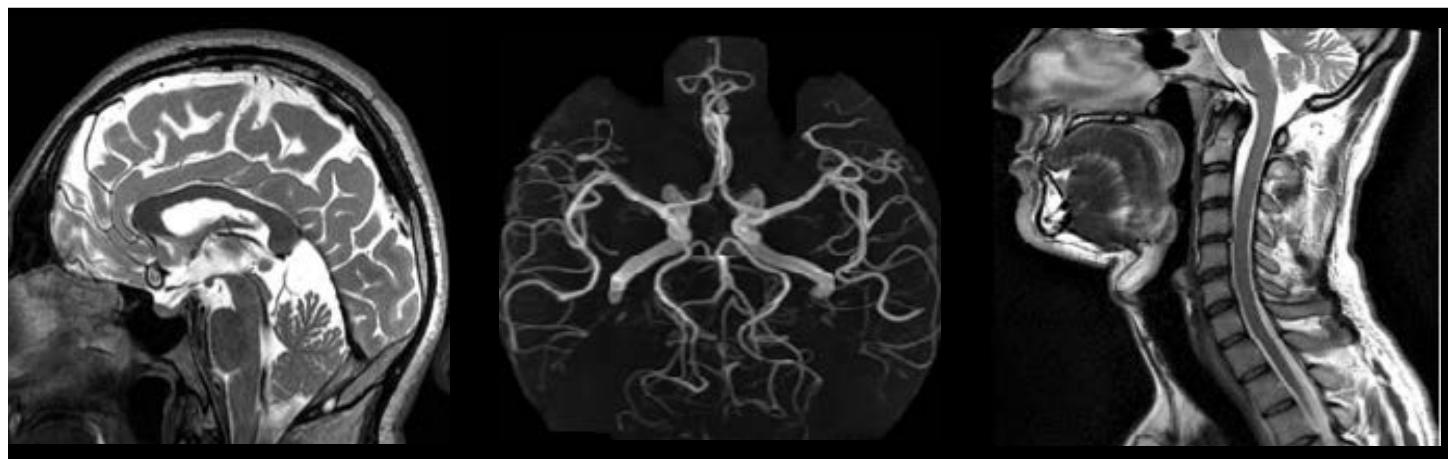
Head Neck Array with NV adapter



Head Neck Array with Open Face adapter



Comfort Tilt



Head Neck Array with NV Adapter

Elements	21
Maximum number of channels in max FOV	Up to 61, when combined with the AIR Posterior Array and AIR™ Anterior Array Up to 41, when combined with the TDI Posterior Array and TDI Anterior Array
Dimensions	53 cm x 35 cm x 35 cm
Weight of HNA base & NV Adapter	6.5kg (14.3 lb)
S/I Coverage	45 cm (17.7 in), when combined with the PA
R/L Coverage	32 cm (12.6 in)
Patient orientation	Head first / Feet first

Head Neck Array with Open Face Adapter

Elements	10
Maximum number of channels in max FOV	Up to 50, when combined with the AIR Posterior Array and AIR™ Anterior Array Up to 30, when combined with the TDI Posterior Array and TDI Anterior Array
Dimensions	53 cm x 35 cm x 21 cm
Weight of HNA base & Open Face Adapter	5 kg (11 lbs)
S/I Coverage	45 cm (17.7 in) when combined with the PA
R/L Coverage	24 cm (9.4 in)
Patient orientation	Head first / Feet first

RF Coils Suite (continued)

TDI Posterior Array*

The TDI Posterior Array (PA) is a 32 channel array that is embedded in the patient table. The TDI PA is indicated for use for spine, abdomen, torso, pelvis, prostate, hips, cardiac, lower extremities, blood vessels, long bone, and whole body imaging. It has been designed to become transparent when additional surface coils are placed directly on top of the table.

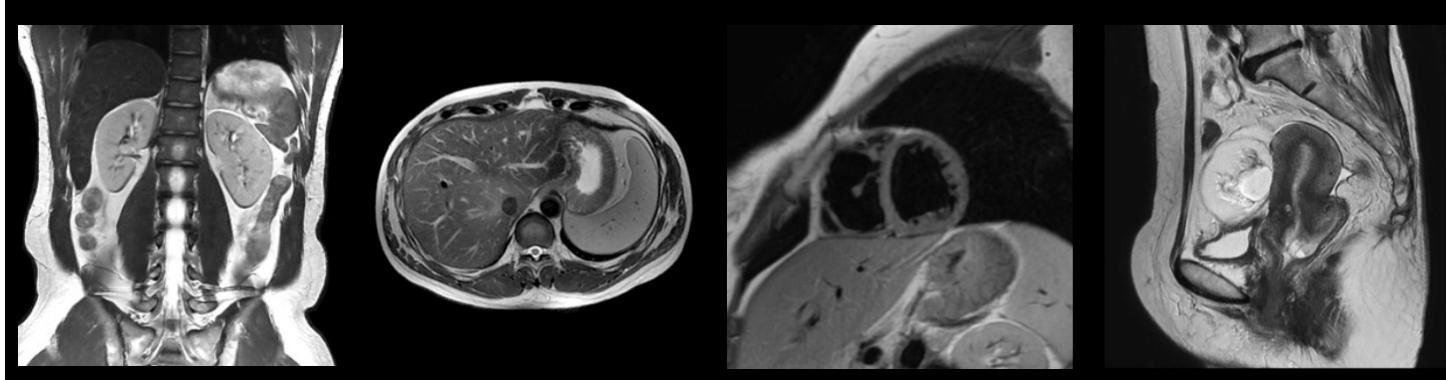
TDI Spine Posterior Array specifications	
Elements	32
R/L coverage	48.6 cm (19.1 in)
S/I coverage	113 cm (44.4 in)
Patient orientation	Head first or feet first
Coil combinations	<p>Can be combined with the following coils:</p> <ul style="list-style-type: none">• AIR™ 48-channel Head Coil• Head-Neck Array• TDI Anterior Array• 2nd TDI Anterior Array• Peripheral Vascular Array• 16ch Flex suite

RF Coils Suite (continued)

TDI Anterior Array*

TDI Anterior Array

The TDI Anterior Array (AA) is a 16ch array coil that can be used for abdomen, torso, pelvis, prostate, hips, cardiac, lower extremities, blood vessels, long bone, and whole body imaging, in conjunction with other coils.



TDI Body Anterior Array Specifications

Elements	16
Maximum number of channels in the maximum FOV	40, when combined with the TDI Posterior Array
Maximum number of channels in head-to-thighs imaging (S/I 140cm)	85, when combined with the Head-Neck Array, TDI Posterior Array and 2 nd TDI Anterior Array
Dimensions	55.6 cm x 67.4 cm x 3.3 cm
Weight	2.8 kg (6.16 lb) resting on patient 3.9 kg (8.6 lb) with cable
S/I Coverage	54 cm (21.3 in)
R/L Coverage	64 cm
Patient orientation	Head first or feet first
Coil combinations	Can be combined with the following coils: <ul style="list-style-type: none">• AIR™ 48-channel Head coil• Head-Neck Array• TDI Posterior Array• 2nd TDI Anterior Array• Peripheral Vascular

RF Coils Suite (continued)

AIR Posterior Array*

AIR Posterior Array

The 60-channel AIR Posterior Array (PA) is the next generation posterior array, embedded in the patient table and fully integrated with the system. The AIR PA allows faster imaging with higher acceleration factors, while improving the SNR profile in the spine and deeper anatomical structures in the body.

The AIR PA is indicated for use of spine, torso, cardiac, abdomen, prostate, pelvis and hip conjunction with other coils.

AIR™ Spine Posterior Array specifications

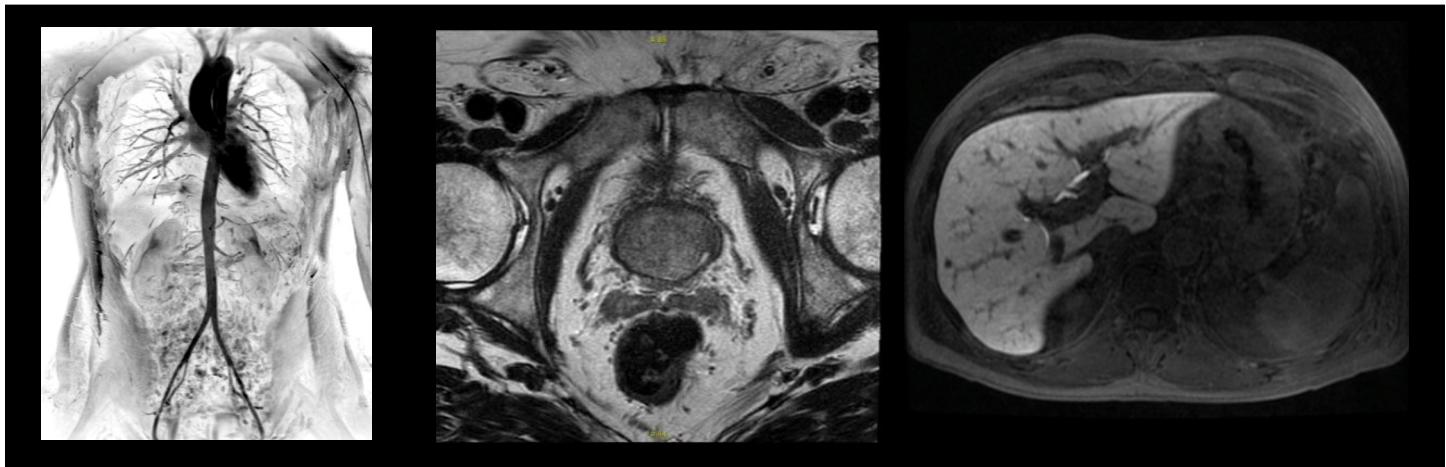
Elements	60
R/L coverage	48.6 cm (19.1 in)
S/I coverage	113 cm (44.4 in)
Patient orientation	Head-first or feet-first
Coil combinations	Can be combined with the following coils: <ul style="list-style-type: none">• AIR™ 48-channel Head Coil• Head-Neck Array• AIR™ Anterior Array AIR™• 2nd AIR™ Anterior Array Coil• Peripheral Vascular Array• 16ch Flex suite



RF Coils Suite (continued)

AIR™ Anterior Array*

The 30-channel AIR™ Anterior Array (AA) is the next generation anterior array coil that allows flexibility in any direction to conform to the patient's anatomy. Based on the innovative technologies behind the Inca conductor and the E-mode module, the AIR™ AA provides superb SNR and acceleration performance, while improving the overall patient and user experience. The coil has been designed to adapt various patient shapes and sizes, with an ultra lightweight distribution of less than 0.5 grams/cm². The AIR™ AA can be used for torso, cardiac, abdomen, prostate, pelvis, hip, peripheral vascular and long bone examinations in conjunction with other coils.



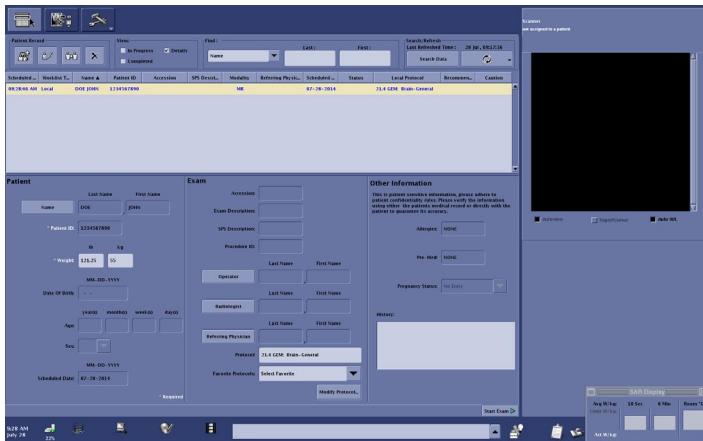
AIR™ Anterior Array Coil specifications

Elements	30
Maximum number of channels in the maximum FOV	60, when combined with the AIR Posterior Array
Maximum number of channels in head-to-thighs imaging (S/I 145cm)	141, when combined with the Head-Neck Array, AIR Posterior Array and 2 nd AIR™ Anterior Array Coil
Weight	2.7 kg (6 lbs) resting on patient, 3.6 kg (8 lbs) with the cable
R/L Coverage	60 cm
S/I Coverage	65 cm
Dimensions (W x L x H)	66 cm x 79 cm x 1.2 cm
Patient orientation	Head first or feet first
Coil combinations	<p>Can be combined with the following coils:</p> <ul style="list-style-type: none">• AIR™ 48-channel Head Coil• Head-Neck Array• AIR Posterior Array• 2nd AIR™ Anterior Array Coil• Peripheral Vascular• 16ch Flex Coil Medium and Small• Rapid Endorectal Coil

SIGNA™ Flow

SIGNA™ Flow is designed to standardize and accelerate workflows for patient setup, exam prescription, scanning and post processing. SIGNA™ Flow can begin before the patient enters the magnet room and exams can be completed within a few mouse clicks – delivering quality and consistency for all patients and from all technologists. At the same time, SIGNA™ Flow maintains the flexibility needed to rapidly adapt and optimize exams for patient specific situations.

Exam Setup



Modality Worklist

Automated and standardized rapid set up

- Allows the MR protocol to be selected and linked to the patient record in advance of the patient's arrival
- For sites with full DICOM connectivity, select the patient from the Modality Worklist, start a new session and view the relevant exam details on the in-room operator console
- Add critical patient information such as allergies, pre-medication, pregnancy status and history



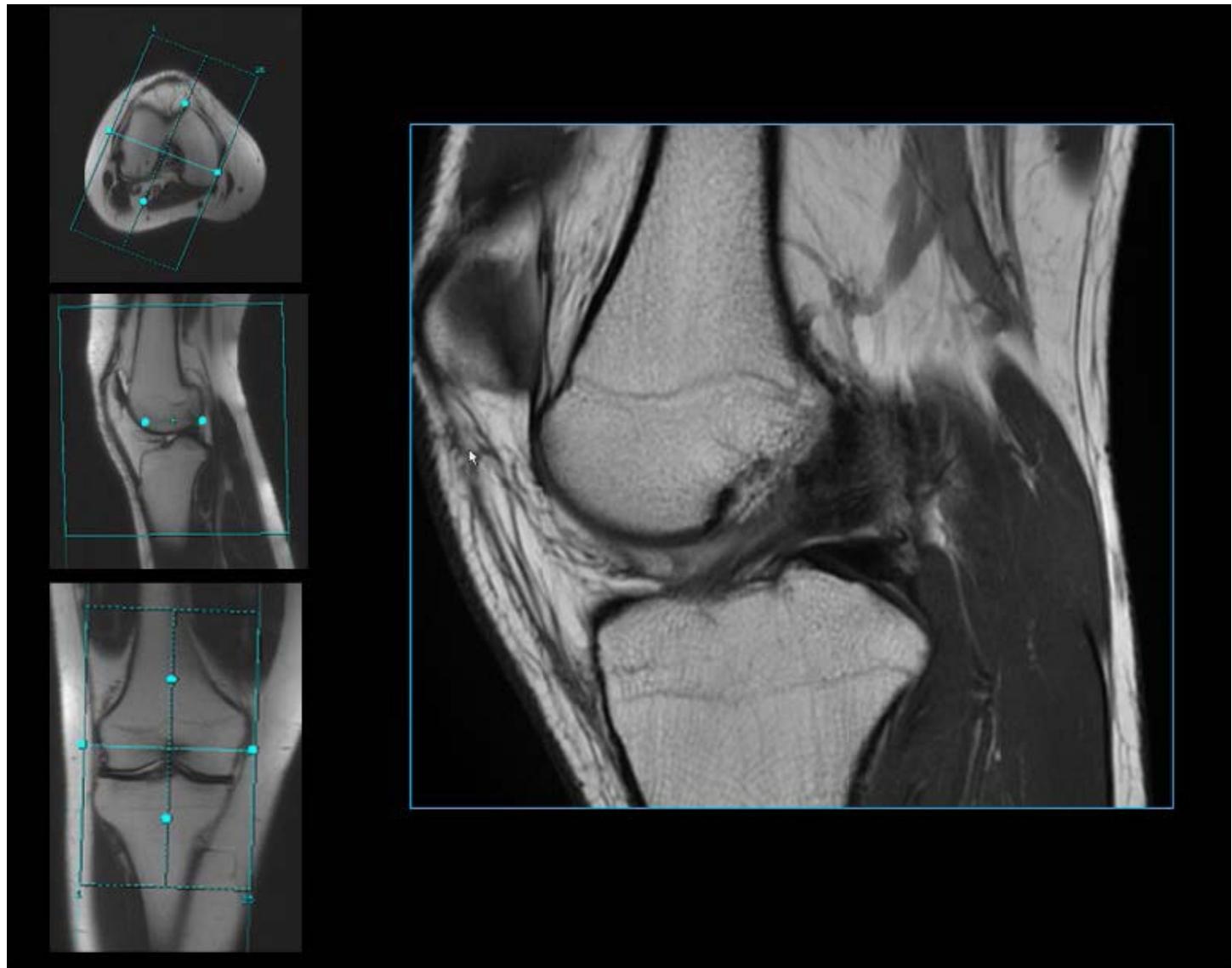
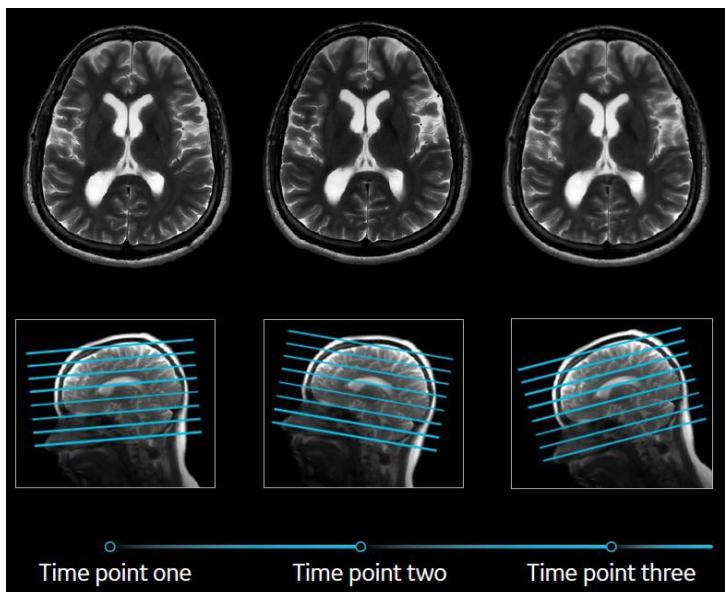
Protocol Tools

Search, select and one click to share

- Protocol Libraries: GE Optimized (preloaded protocols) and Site Authored (customized and saved)
- Protocols can be saved based on patient demographics, anatomy, scan type, or identification number for rapid search
- Commonly used protocols can be flagged for quick selection from the modality worklist
- One-click to share protoCopy – enables a complete exam protocol to be shared with the click of a mouse and provides a process for managing protocols across multiple systems as well as saving protocols for back up
- Step-by-step protocol notes – guide the user through the entire clinical routine procedure via expert inputs, can be edited by the user for site specific instructions

AIR x™*

- AIR x™ (auto graphic Rx) – contains deep learning algorithms that automatically identify anatomical structures to prescribe slices for challenging setup planes for brain and knee**. This workflow tool enables consistency and productivity improvements for routine and follow-up examinations and extends research/clinical capabilities for longitudinal quantification studies.
- Increases productivity by simplifying workflow steps, thus reducing prescription times
- Improves consistency and reduces slice positioning variation amongst different technologists
- Automatically adapts slice prescriptions to various patient anatomies and structures.

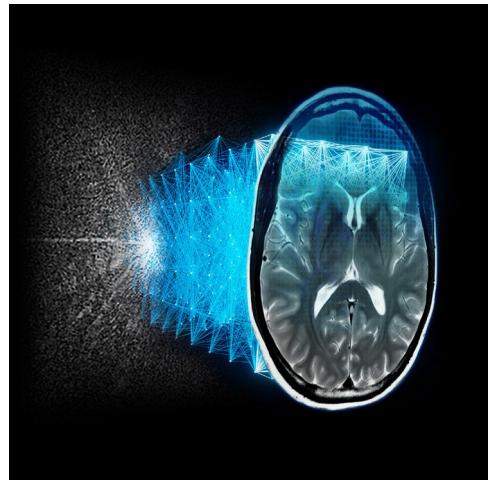


AIR™ Recon DL†

Simply better image quality‡

AIR™ Recon DL is a pioneering, deep-learning based reconstruction, which challenges the inherent trade-off between SNR, scan time and image resolution.

AIR™ Recon DL is not a filter or a post-processing technique. It improves image quality at the foundational level, and with trained neural networks embedded directly in the reconstruction pipeline, noise and ringing artifacts are removed in the raw data to deliver final reconstructed images with higher SNR and sharpness.



Benefits

- Removes image noise and ringing by leveraging raw image data
- Enables shorter scan times while preserving signal to noise ratio and image sharpness
- Enhance image sharpness by fully using the acquired k-space data
- Increases productivity by enabling shorter scan times
- Delivers sharper, clearer and accurate MR images
- Enables you to set your preferred SNR improvement level

AIR™ Recon DL general specifications

Base technology	<ul style="list-style-type: none">• Deep-Learning with convolutional neural network powered by Edison™• Simultaneous noise reduction and resolution improvement• Model updates and application expansion through regular software releases• Applied directly in reconstruction to fully leverage acquired raw data
Reconstruction engine	Delivered with TPU (Tensor Core GPU) based reconstruction engine
Anatomical coverage	Body, breast, pelvis, chest, cardiac, orthopedic, neuro, spine, vascular - no anatomical limitations
Coil compatibility	No coil limitations <ul style="list-style-type: none">• 2D Spin Echo (SE), Fast Spin Echo (FSE/FSE Flex, Phase Sensitive Inversion Recovery (PSIR)), Single Shot Fast Spin Echo (SSFSE) family of sequences• MAGiC, Single scan multi contrast (T1, T2, PD, FLAIR, STIR and DIR)• 2D Gradient Echo (GRE/SPGR), 2D Fast Gradient Echo (FGRE/FIESTA/FSPGR) family of sequences, including myocardial delayed enhancement (MDE) and time-course• Phase sensitive reconstruction• Echo Planar Imaging Diffusion weighted (EPI DWI/DTI) family of sequences including FOCUS, PROGRES• Motion-insensitive PROPELLER (FSE/DWI) family of sequences• 3D Fast Spin Echo (FSE; including Cube T2/T1, Cube T2Flair/T1Flair, Cube DIR) and 3D Fast Gradient Echo (FGRE/FIESTA/FSPGR; including BRAVO, MPRAGE, LAVA, VIBRANT, IFIR, MENSA Nerve, 3D Heart and 3D MDE) family of sequences.• Includes PD, T1, T2, T2*, Diffusion, FLAIR and STIR weightings• Quantitative mapping, including DWI ADC map, DTI, Cartigram (T2 Mapping), CardioMaps (T1/T2 Mapping).• CE (contrast enhanced) and non-CE• Preserves tissue contrast and quantitative accuracy
Imaging option compatibility	Compatible with standard imaging options including acceleration techniques (ASSET, ARC, HyperSense and HyperBand)

† optional

‡ compared with conventional technology

Sonic DL™*

Life-speed imaging

Sonic DL™ is a Deep Learning based acquisition and reconstruction technique that can enable higher acceleration factors resulting in significantly reduced scan time. Sonic DL™ uses a neural network in the reconstruction to generate images from highly under-sampled data, delivering astonishing new levels of acceleration. Sonic DL™ is currently compatible with Cardiac Cine for rapid functional imaging.

Benefits

- Enables significantly shorter scan times while preserving image quality
- Fewer breath holds for better patient experience
- Single-heart-beat (per slice) Cardiac Cine imaging
 - Arrhythmia robust
 - Free-breathing compatible
- Rapid free-breathing cardiac functional imaging
- Improved temporal sharpness
- Reduced overall cardiac exam times

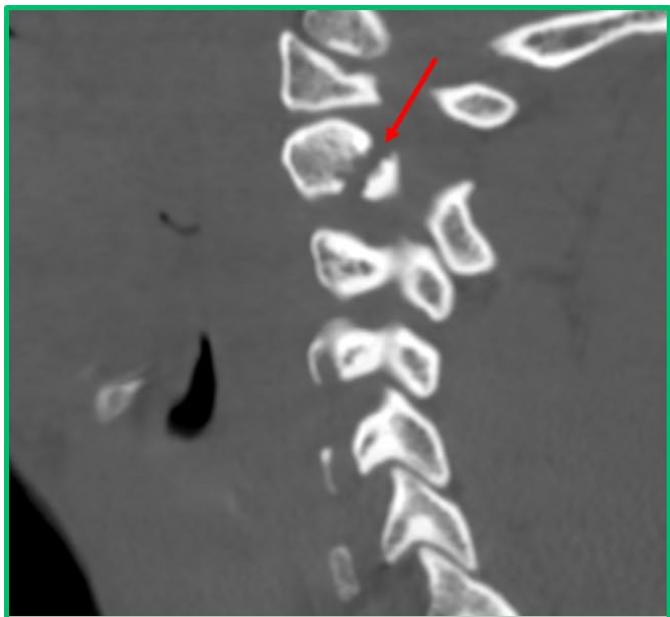


Sonic DL™* general specifications

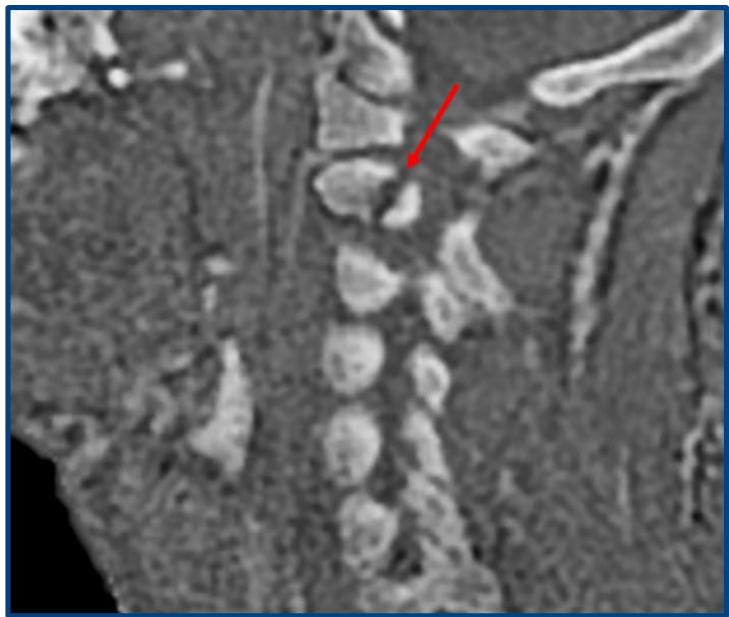
Base technology	<ul style="list-style-type: none">• Deep-Learning with convolutional neural network powered by Edison™• Shorten scan times by highly under-sampling k-space. Uses a neural network to reconstruct image from under-sampled acquisitions.
Reconstruction engine	Delivered with TPU (Tensor Core GPU) based reconstruction engine
Anatomical coverage	Cardiac
Coil compatibility	All compatible coils for cardiac, grater or equal to 8ch
Range of imaging contrast weighting and pulse sequences	<ul style="list-style-type: none">• 2D FIESTA Cine
Scanning compatibility	<ul style="list-style-type: none">• Breath hold• Free breathing (1R-R)
Imaging option compatibility	ZIP512, Square Pixel and Respiratory Gating/Triggering
Net acceleration	Up to 12x

oZTEo* MR bone imaging

GE's unique MR bone imaging application, oZTEo, is based on the zero echo time (ZTE) acquisition that is also used in the Silent Suite (Silenz) application. oZTEo complements the conventional soft tissue exam by providing cortical bone surface information. Automated grayscale inversion provides positive bone contrast that is more familiar to visualize for surgeons and clinicians. The ZTE sequence can be used for 3D isotropic resolution and adapts to the patient by providing a inherent motion insensitivity from a radial acquisition. oZTEo can be used with any surface coil that is compatible with SCENIC and includes protocols for common joints such as hip, shoulder, wrist, ankle and knee.



CT SCAN



ZTE MRI



CT



ZTE

Patient Setup

Comfort Plus Patient Table

Safety, Comfort and Efficiency

The SIGNA™ Premier offers a fully integrated Comfort Plus patient table (also known as TDI patient table), which features the embedded Posterior Array, helps improve exam efficiency, and patient comfort. The Comfort Plus patient table can be lowered to very low heights for easy and fast transfer of wheelchair patients. The cradle width has also been increased by 30% from previous generations to enable a more comfortable experience for patients.



Patient Table

Configuration	Fixed
Minimum & Maximum Height	53.5 cm to 93 cm continuous
Table Drive	Automated power-driven vertical and longitudinal
Longitudinal Speed	25 cm/sec (fast), 1.9 cm/sec (slow), 15 cm/sec (patient positioning)
Total Scanable Range	182 cm
Cradle length and width	245 cm x 56 cm (L x W)
Maximum Patient Weight Detached and Mobile	250 kgs (550 lbs)
Maximum Load Capacity	279 kgs (615 lbs)
Patient Transport Accessories	Drawers
Landmarking	Laser alignment with S/I and R/L alignment IntelliTouch touch sensors
Total Cradle Travel	264 cm
Coil connection ports	Five ports. Four high density auto-coil sensing connection ports, fifth port for embedded PA coil

Patient Setup (Continued)

eXpress Patient Table with embedded Posterior Array



Safety, Comfort and Efficiency

- Accelerate emergency egress – can be undocked and removed by one user in under 30 seconds
- Feet-first or head-first positioning for most exams
- Reduce in-room patient setup and address privacy by fully preparing the patient and coils for an exam outside of the magnet room
- Integrated arm-boards and IV pole to support patient for transport
- IntelliTouch landmarking sensors
- Optional second table - scan one patient while preparing the next patient outside the magnet room
- 113 cm S/I coverage
- Up to 60 Elements with dedicated spine configurations
- Automatic coil mode selection

eXpress Patient Table

Configuration	Detachable and mobile
Minimum & Maximum Height	70 cm to 93 cm continuous
Table Drive	Automated power-driven vertical, automated power-driven longitudinal, powered patient egress
Longitudinal Speed	30 cm/sec (fast) and 25 cm/sec (return to home)
Total cradle travel	294 cm
Total Scanable Range	205 cm
Cradle size	236 cm (length) x 56 cm (width)
Coil connection ports	5 (4 high-density auto-coil sensing and 1 embedded PA coil)
Maximum Patient Weight for Scanning	250 kgs (550 lbs)
Maximum Patient Weight Detached and Mobile	250 kgs (550 lbs)
Maximum Load Capacity	279 kgs (615 lbs)
Patient Transport Accessories	Self-storing non-ferrous IV pole Positioning pads Immobilization straps
Landmarking	Laser alignment with S/I and R/L alignment IntelliTouch touch sensors

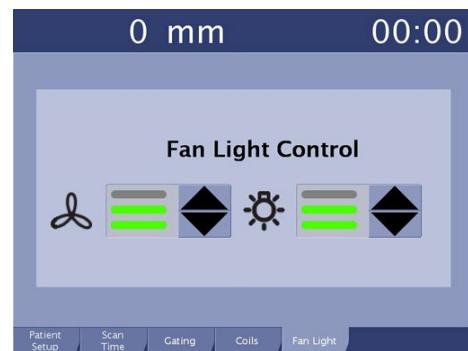
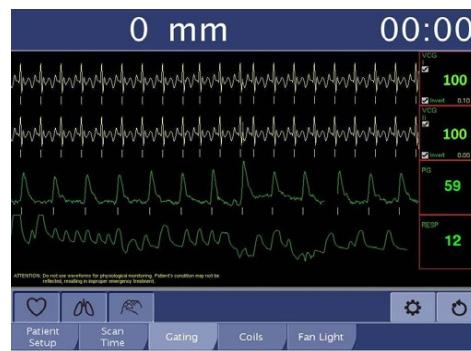
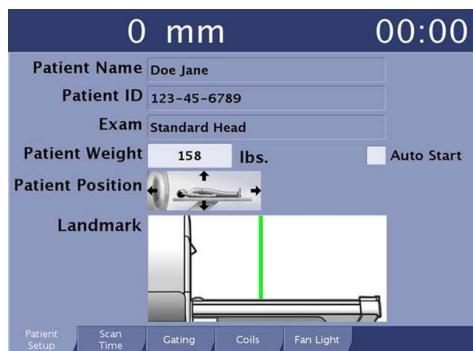
Patient Setup (continued)

AIR Touch™

Intelligent coil localization and selection

Accelerate your scanning process the minute the patient gets on the table with AIR Touch™, a new workflow application that automates coil selection and landmarking. With AIR Touch™, you simply use IntelliTouch, GE's 1-touch landmarking tool, to activate an optimized set of coils that is selected based on the patient's anatomy. This advanced technology selects from numerous coil combinations such as the posterior array (PA) and flexible coils, to efficiently set up patients. With the anatomical-based protocol optimization, AIR Touch™ optimizes for the anatomy and the protocol parameters with a single touch, delivering a significant productivity gain from plan to scan. AIR Touch™ automatically integrates all calibration scans, providing uninterrupted workflow for the technologist. Further scan times savings are realized with Flexible No Phase Wrap (NPW) to scan only what you need while allowing you to focus on your patient, not the scanner.

- Dynamically generated coil configurations with elements activated to optimize image quality (coverage, uniformity and parallel imaging acceleration) for every scan
- Coil locations determined automatically
- Calibration scans seamlessly acquired without interrupting workflow
- Dramatically simplified coil selection UI; no need to touch it for most exams



In-Room Operator Console and Control

Full Control from table side

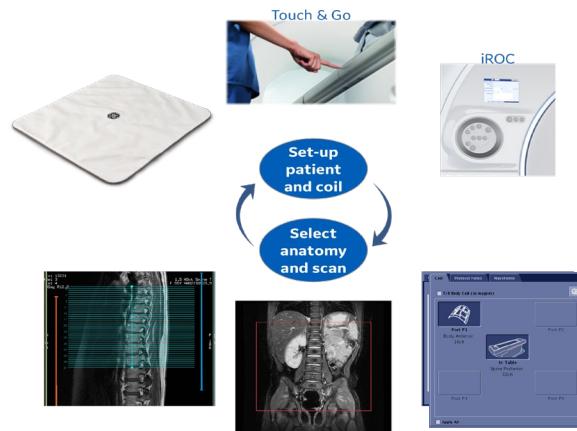
From the in-room operator console and controls, the user can:

- Position the table
- Return the table to home
- Stop the table movement
- Control multiple levels of in-bore ventilation and lighting
- Display of patient name, ID, study description
- Display and entry of patient weight

IntelliTouch

Touch to Landmark

- IntelliTouch sensors for simplified non-laser patient landmarking
- With IntelliTouch technology, the user can touch to complete
 - Patient landmarking
 - Move patient to scan
 - Start scanning (with AutoStart activated)
 - Acquire, process and network images



- Display and entry of patient orientation and patient position
- Cardiac waveform display and ECG/EKG lead confirmation
- Gating control for trigger select, invert and reset
- Respiratory waveform display
- IntelliTouch technology landmarking
- AutoStart to initiate scanning of the selected protocol
- Display connected coils and coil status
- Display of table location and scan time remaining
- Activate Screen Saver

In-line Processing & In-line Viewing

In-line Processing

Automated post processing

- Automated post processing of specific applications
- Automatic opening and loading to advanced visualization tools when appropriate
- Automated in-line processing can be stored within the protocol

3D ASL series	Automatic compute and save
Diffusion Weighted series	Automatic compute and save
Diffusion tensor series	Automatic compute and save
eDWI series	Automatic compute and save
Image filtering: A-E, deFINE	Automatic compute and save
Maximum/Minimum Intensity Projection	Automatic compute and save
Reformat to orthogonal plane	Automatic compute and save
T2 map for cartilage evaluation	Automatic compute and save
3D Volume Viewer	Automatic load
BrainStat	Automatic load
FiberTrak	Automatic load
Image Fusion	Automatic load
Interactive Vascular Imaging	Automatic load
Pasting	Automatic load

In-line Viewing

Enhanced Visualization

In-line viewing allows the user to seamlessly and conveniently view, compare, and analyze images (during scan progress). The

user simply selects the series, or multiple series, to view from the workflow manager, and the images are displayed along with the image display tools.



Scanning

Workflow Manager

Linking and Auto Functions

AutoStart	Automatically initiates scanning of the selected protocol upon closure of the scan room door.
AutoCoil	Automatically determines the optimum coil elements to activate for scanning. If the prescribed field-of-view changes, AutoCoil automatically adjust the selection. The user has the option to review and edit the selection.
AutoScan	Automatically scans the prescribed series without user interaction. For series requiring a contrast injection, the Workflow Manager will pause and await user interaction.
Auto-calibration	For acquisitions that utilize ASSET parallel imaging or PURE surface coil intensity correction, Auto-Cal will prescribe and acquire a calibration scan based on the prescribed imaging volume.
AutoVoice	Delivers user selected, pre-recorded instructions to the patient at defined points in the acquisition to help ensure exam consistency. AutoVoice includes instructions in 14 languages and also allows the user to create and save unique instructions for specific local needs.
PB Navigators	Enable free-breathing body imaging for patients unable to breath-hold. The diaphragm tracker pulse automatically places and updates to streamline workflow and eliminate the setup time associated with respiratory triggering. Auto Navigators can be used with a broad range of imaging techniques including dynamic contrast enhanced T1-weighted imaging.
READYBrain	Automates localizer acquisition, scan plane prescription, scanning, and post processing for brain exams. READYBrain automatically calculates the mid-sagittal plane and determines the AC-PC line/OM line for 2D/3D prescription as well as corrects for extreme (>45 degree) rotation.
QuickSTEP	Automatically prescribes, acquires, and combines images from multiple stations. QuickSTEP acquires mask datasets and then secondary datasets from multiple stations (same locations), and automatically subtracts the mask datasets from the secondary datasets to create one subtracted series.
eXpress Prescan 2.0	Reduces pre-scan time for FSE-based techniques by up to 40% with a new calibration algorithm that reduces pre-scan time and consequently overall exam time.
Pause and Resume	Allows the user to pause a scan in progress, to respond to a patient need, and then resume mid-scan (without repeating scan).

Visualization

READYView on MR Operator Console

Integrated Post Processing & Advanced Visualization

READYView is an image analysis software that allows the user to process dynamic or functional volumetric data and to generate maps that display changes in image intensity over time, echo time, b-value (diffusion imaging), frequency (spectroscopy). The combination of acquired images, reconstructed images, calculated parametric images, tissue segmentation, annotations and measurement performed by the clinician allows multiparametric analysis and may provide clinically relevant information for diagnosis.

- Automatically selects the most relevant post processing protocol*
- Provides guided workflow and general assistance for the processing algorithms
- Multiparametric protocols selection for Brain, Breast, Liver, Knee and Pelvis studies when two or more functional series are present
- MR general review enables efficient reading of multi-contrast exams based on Smart Layout Technology
- One-click – to select and process functional data
- One-click – to save all generated parametric images
- One-click – to save and restore the state of processed images at any stage
- One ROI – display all multi-parametric images and get all related functional values from a single ROI
- Export – display and export ROI statistics from the summary table
- Export graph values as csv files
- Customize workflows with adjustable layouts, personalized parameter settings, and custom review steps

Benefits

- 3D ROI
- 3D Reformat MPR
- Auto-contour
- Distortion Correction
- Fusion & Registration
- MIP & HD MIP
- Motion Correction
- Multiparametric protocols
- Multiple graphics display
- Ratio AB/CD
- Reformat & Graphview
- Subtraction
- Volume Rendering
- Volume segmentation ROI



* When only one protocol is compatible with the selected data, the access is made through the One-Touch mode. If more than one protocol is compatible, the Protocol page opens for user selection.

READYView

Standard Protocols

READYView One-Touch

Protocols uses display intelligence with pulse sequence, image contrast and scan plane recognition to enable direct access between a unique post processing that is associated with the series selection.

One-Touch ADC and eADC

Provide algorithms to process DWI images to generate ADC maps and eADC maps to eliminate T2 “shine through” in the isotropic (trace) DWI.

One-Touch ASL

ASL READYView has algorithms that calculate Cerebral Blood Flow maps from a 3D ASL series. ASL acquisition is a non-invasive, one-click application that allows whole brain CBF measurements.

One-Touch Brain & Prostate Spectroscopy

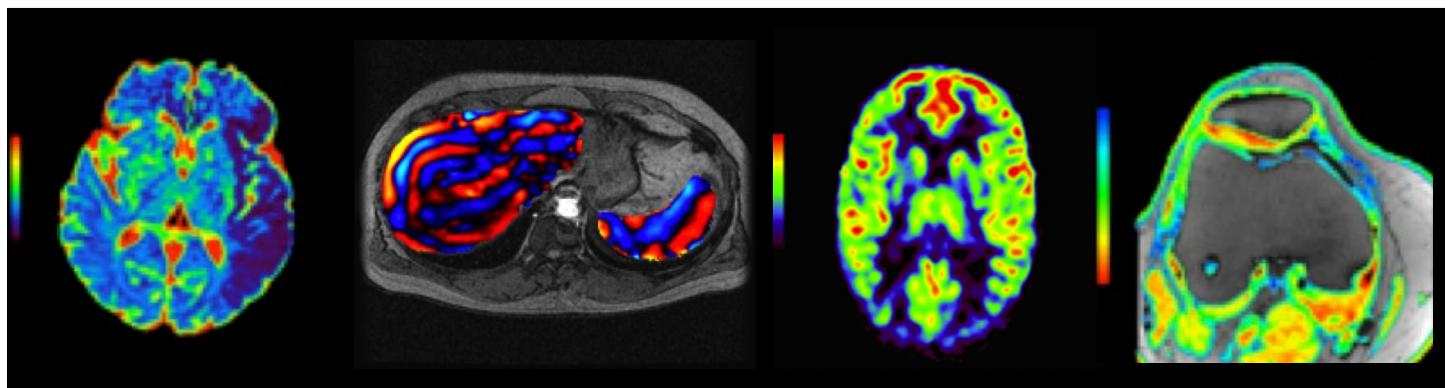
The READYView Brain and Prostate MR spectroscopy protocols are used to display functional maps for metabolites and metabolite ratios in the brain and prostate.

One-Touch MR-Touch

READYView MR-Touch is a post process of an MR-Touch acquisition, which is a Phase Contrast (PC) application that generates an image contrast related to the shear stiffness of soft tissue. An algorithm is used to derive a relative stiffness map (Elastogram) and wave images from the phase images.

One-Touch T2 MAP

The READYView T2 Map protocol post processes data sets acquired using the T2 Map (CartiGram) application. The T2 Map acquisition is displayed in READYView, where the T2 relaxation time color map is coded to capture T2 values from the TE range of the acquired images.



READYView (continued)

BrainStat

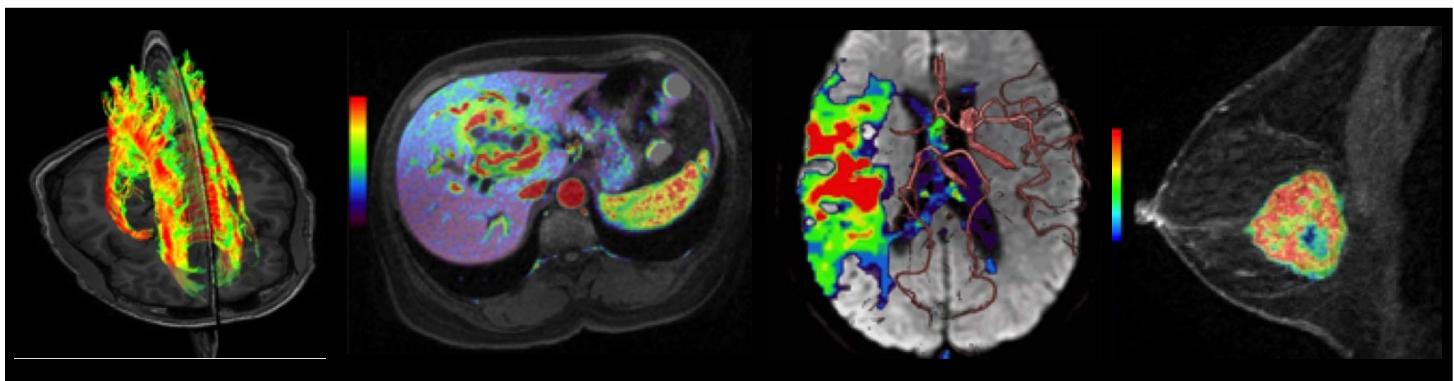
BrainStat is an MR Time Course imaging READYView protocol that provides accurate spatial resolution for brain tissue viability given by hemodynamic parameters: BV, BF, TTP, MTT (SVD), BAT, Tmax. These hemodynamic parameters can provide unique information on tissue changes and improve delineation of vascular-deficient or vascular-rich regions in normal and abnormal anatomy.

MR Standard

MR Standard is a time course protocol. The READYView MR Standard is a time course protocol that can be used to create the following maps: enhancement integral (negative and positive), time to peak, mean time to enhance, maximum slope of increase, maximum slope of decrease.

SER

SER is a time course protocol for analyzing T1-contrast changes. The READYView SER protocol can be used to create the following maps: Positive enhancement integral, signal enhancement ratio and maximum slope of increase.



FiberTrak

FiberTrak is designed for the advanced analysis of MR images acquired with a DTI technique. It allows for processing of isotropic, ADC and FA maps among other options. The FiberTrak option augments this functionality to allow DTI processing to create: 2D color orientation maps, 2D color eigenvector maps and 3D tractography maps.

fMRI

Functional imaging or BOLD provides fMRI analysis using the correlation coefficient algorithm to analyze an image set. Neuronal activity of either motor or cognitive functions can be mapped by fMRI through changes in signal intensity. The resulting functional maps can be used for mapping the motor cortex and higher cognitive regions of the brain.

R2 Star

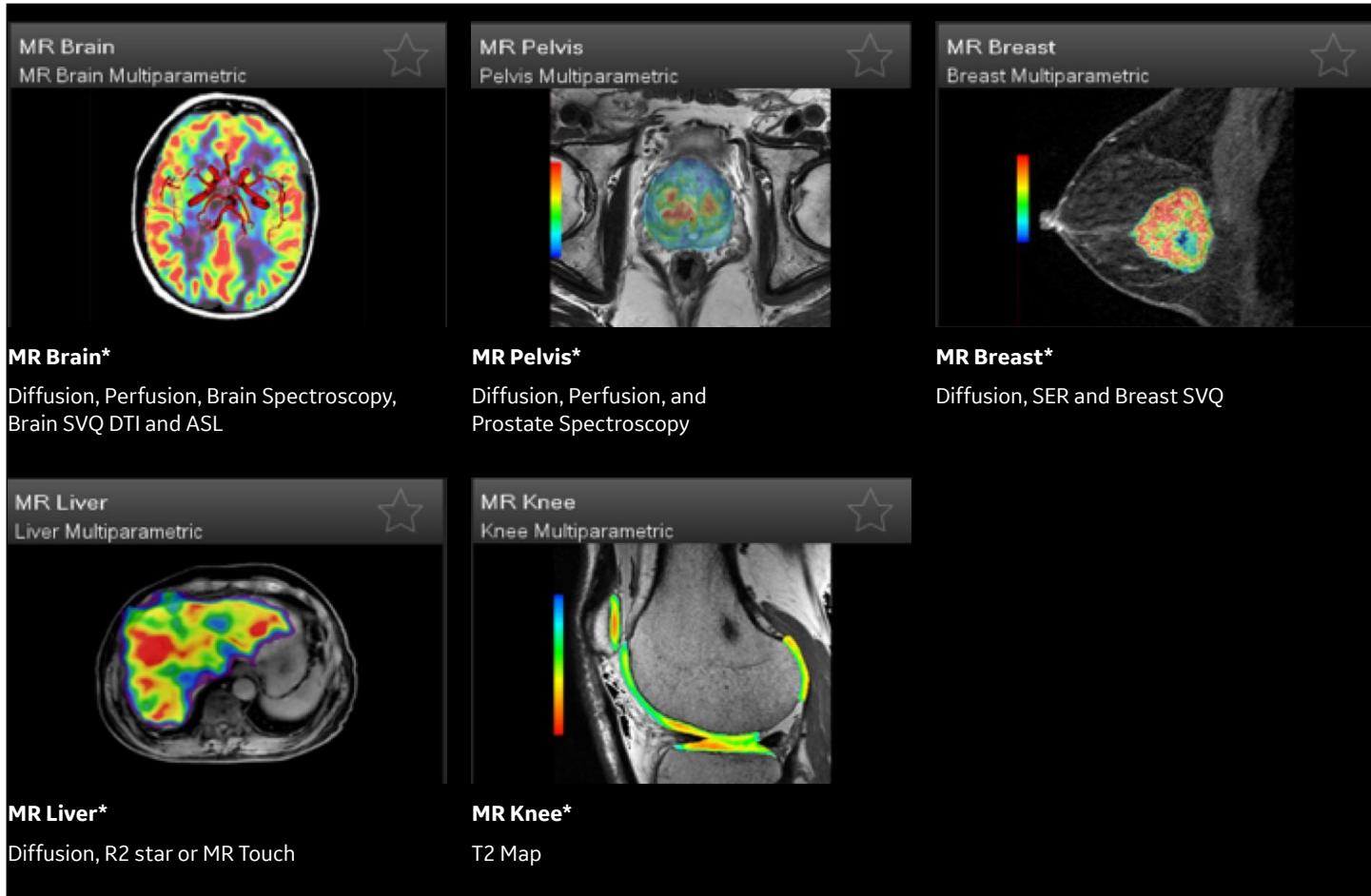
The R2 Star feature uses water proton transverse relaxation rates (R2) technique. It provides parametric maps for R2* (Hz) and T2* (ms). The R2* values vary with tissue characteristics such as iron concentration.

READYView (continued)

Multiparametric Protocols: Visualization at a Glance

READYView multiparametric protocols provide a guided workflow to streamline post processing and analysis of multiparametric studies. All measurements can be obtained

with one ROI and the user customizable workflow has the ability to display all processed maps in one screen.



BrainWave

BrainWave fMRI post processing, analysis and visualization

BrainWave PA and Skull Stripping

This high-performance software allows you to produce, from raw fMRI data, 3D brain renderings displaying functional activation. Display alternatives for these maps include cross sectional displays, activation Z-maps and composite paradigm displays. In addition, the Skull Stripping BrainWave plug in provides the ability to remove the skull tissue to enhance the functional MR image display of activation over anatomical underlay image.

BrainWave Fusion

BrainWave Fusion is a post processing plug-in that enables the fusion of Diffusion Tensor tractography data with functional activation areas into a single data set. The data are superimposed atop high-resolution anatomic image data that can be reformatted into any plane. The results can then be saved in DICOM format for transfer to PAC or surgical navigation workstations.

BrainWave Advanced Visualization

BrainWave delivers tools for fMRI analysis starting with segmentation and skull stripping of anatomical structures, and data processing to include motion correction and smoothing. Paradigm supports both block single and multi-conditions, as well as event related conditions. Registration of anatomical imaging to fMRI outputs with color overlays and fusion through BIP (fused functional to anatomical maps). Supplied interface supports control between the scanner hardware and the paradigm generation device to control experiments.

BrainWave CSD & Probabilistic Tractography*

This introduces CSD (Constrained Spherical Deconvolution-based) tractography, and Diffusion maps (FA, ADC, eADC, AD, RD, Trace) for multi-shell DTI studies. This feature offers preprocessing options for MP-PCA denoising, bias correction and corrections for eddy current, motion, and susceptibility artifacts.

BrainWave Structured Reporting

Reporting of cases is provided in simplified format that streamlines the report structure and process while providing a detailed description of experiment methods, output of patient centric feedback (task response, motion plot and activation curves), delivery of color screenshots of results and clinical report fields for summary outcome. The export format provides user-defined threshold DICOM format activation maps for reformation and display for surgical navigation or PACS review.

BrainWave resting state

Resting State based processing for fMRI includes real-time results, patient response graph and quality assurance graph.

BrainWave Advanced DTI Tracking and HARDI Generation

The DTI Tracking tool enables directionally encoded FA maps to be presented in both gray and color scales for 3 plane presentation. Seed placement is provided in either 3D seeds, inclusion and/or exclusion ROIs as well as multiple ROI formats. The display is provided in real time to control tract settings based on FA, fiber length or angle. The output formats for tracts is via DICOM format. BrainWave HARDI Tract Generation includes advanced diffusion processing for use of HARDI algorithm.

Siting

Siting and Other Specifications

Typical Room Layouts		RF Shielding	
System configuration minimum values		100 db. for 10 - 100 MHz plane wave	
Magnet Room	Area: 18.8 sq m (202.2 sq ft) Ceiling height: 2.50 m (8 ft 2.5 in)	LCD flat panel monitor	Maximum field strength 5 mT (50 Gauss)
Equipment Room	Area: 6.4 sq m (69.2 sq ft) Ceiling height: 2.68 m (8 ft 9.5 in)		
Control Room	Area: 3.2 sq m (35 sq ft)		
Fringe Field		Water Requirements	
		Premier XT	
0.5 mT (5 Gauss) 3TLC	Axial 5.2 m	Maximum heat removal to customer-supplied water	94 kW
0.5 mT (5 Gauss) Platform	Radial 2.8 m		
0.1 mT (1 Gauss) 3TLC	Axial 5.0 m	Water flow	114 liters/min (30 gpm) minimum at a maximum temperature of 12 degrees C
0.1 mT (1 Gauss) Platform	Radial 2.75 m		
0.1 mT (1 Gauss) 3TLC	Axial 7.8 m		
0.1 mT (1 Gauss) Platform	Radial 4.8 m		
0.1 mT (1 Gauss) 3TLC	Axial 7.4 m		
0.1 mT (1 Gauss) Platform	Radial 4.7 m		
Altitude Requirements		Temperature and Humidity Requirements	
		Magnet Room	Control Room
Upper limit	2600 m	Temperature	15 - 32 °C
Lower limit	-30 m	Max. Temperature Change Rate	3 °C / hour
		Humidity (non-condensing)	30 - 75 %
		Max humidity change rate	5% RH/hr
Electrical Supply Requirements		Equipment Room	30 - 75 %
Supply system recommended configuration:			
<ul style="list-style-type: none"> 3-phase grounded WYE with neutral and ground (5-wire system) 			
Note: Neutral must be terminated inside main disconnect control			
<ul style="list-style-type: none"> 3-phase DELTA with ground (4-wire) Voltage: 480/415/400/380/Vrms 			
Power Consumption			
Power consumption depends on actual usage. They exclude consumption by the shield cooler compressor (9 kVA). The following values are approximate:			
Standby (no scan)	<17 kVA		
Maximum continuous sustained power (> 5 secs)	144 kVA		
Peak instantaneous power (< 50 ms)	349 kVA		

Cybersecurity

The MR 30 for SIGNA™ software is designed for maximum security protection, employing comprehensive defense strategies that incorporate security and access controls, while protecting your system and data against any attack. Security features are customizable by your organization to support your operations and security practices.

ACCESS MANAGEMENT

MR 30 for SIGNA™ offers a wide variety of industry-standard capabilities to customize and control access to the system and its data. The system offers comprehensive enterprise authentication, authorization and a comprehensive audit trail (EA3) capabilities to meet your organization's access and security policies. MR 30 for SIGNA™ supports role-based access (RBA). User permissions can be controlled at a granular level to allow "minimum access" to users while permitting them to perform their jobs. A flexible design allows customized access for individuals or groups to make system administration more efficient.

NETWORK & DATA SECURITY

Machine and patient data are encrypted while at rest and in transit, ensuring risks from exposures, breaches and unauthorized access is significantly reduced. Data at rest resides on fully encrypted hard drive drives (HDDs), while data in transit can be configured to adhere to the DICOM TLS (transit layer security) standard. A suite of certificate management features supports TLS/SSL and/or digital certificate trust management. The scanner BIOS prevents the system from booting from removable media such as USB memory keys.

The MR system is equipped with capabilities to de-identify patient data (both anonymization and pseudonymization) to protect patient privacy. The MR scanner also supports

comprehensive audit logging across user access, patient data transfer, operating system access and events, antivirus events. These audit logs can be configured to be sent to a remote archive as part of the organization's privacy & security policy.

The system is equipped with a product network filter (PNF) that supports a software firewall to prevent inbound connections to the scanner and can be configured to permit access only by authorized devices. GE HealthCare's InSite Remote Service platform is integrated in the scanner, and enables real-time application support, problem diagnosis and repair. The remote connection is secure and adheres to a comprehensive set of security policies to ensure it is not compromised.

ENTERPRISE INTEROPERABILITY

MR 30 for SIGNA™ software makes it easy to integrate your scanner with your existing network infrastructure, including LDAP user and group management that easily integrates with Microsoft Active Directory or Novell eDirectory services to make user management easy. EA3 permissions management features allow for network security groups to have scanner permissions provisioned automatically by a centralized administrator.

At the heart of the scanner is an enterprise-grade, highly robust operating system (OS) – SUSE Linux, also known as SLES – that is secure and designed to adapt to the evolving cyber-risk environment. Only the essential components of the OS are installed, minimizing risk from unused software components. The modern design of SLES also ensures a long usable life of the scanner, no matter your budget for software upgrades. Built into MR30 for SIGNA™ is McAfee Antivirus, an industry-leading anti-malware and antivirus software suite that ensures your scanner is hardened against cyber threats. Access to an updates channel ensures your scanner maintains protection against the latest threats and vulnerabilities.

Miscellaneous

Alternative environments

SIGNA™ Premier is a fixed installation system. Modular buildings may also be available (including air conditioning, heating, chiller, RF shielding, additional magnetic shielding in walls). Contact your local GE representative for GE certified designs and vendors.

Please ask your local GE project manager for a comprehensive installation and siting manual.

Filming considerations

Filming requires the SIGNA™ Premier analog or digital filming.

Interface (purchased separately) unless DICOM print will be used exclusively for software filming to DICOM print peripheral devices. An Analog/VDB or Digital/LCAM camera interface is typically required for most installations.

Accessory Package

- SPT phantom set with storage cart
- Customer diagnostic software
- Operator manuals
- Patient log books

Emergency stop

Disconnects electrical power from RF and gradient components in the magnet room (duplicate control at the magnet).

Warranty

The published GE warranty in effect on the date of shipment shall apply.

InSite* Remote Diagnostics

GE's unique remote service and applications support including magnet monitoring. Also allows downloading of applications software such as eFlexTrials program.

Optional capabilities

Some features and capabilities listed in this data sheet are optional with a SIGNA™ Premier and are subject to change without notice. Contact a GE representative for the most recent data.

GE regulatory compliance

The SIGNA™ Premier complies with all applicable safety standards including but not limited to IEC 60601-1, IEC 60601-1-2 (Electromagnetic Compatibility), and IEC 60601-2-33 (MR). The Peak Acoustic Output of the system is ≤ 140 dB. The A-weighted Acoustic Output of the system is ≤ 124 dBA.

Laser alignment devices contained within this system are appropriately labeled according to the requirements of the FDA's Center for Devices and Radiological Health (CDRH) and IEC 60825-1.





Products mentioned in the material may be subject to government regulations and may not be available in all countries. Shipment and effective sale can only occur after approval from the regulator. Please check with local GE HealthCare representative for details.

©2023 GE HealthCare. SIGNA, AIR, AIR x, and AIR Touch are trademarks of GE HealthCare. Intel and Xeon are trademarks of Intel Corporation or its subsidiaries in the U.S. and/or other countries. NVidia and Quadro are trademarks of NVIDIA Corporation. GE is a trademark of General Electric Company used under trademark license.

September 2023

DOC1948285 - Global version