TOMORROW TODAY

SIGNA™ Explorer

AIR™ IQ Edition data sheet

gehealthcare.com/mr

Magnet

The cornerstone of MRI

The SIGNA™ Explorer system features the stable, short-bore, highly homogeneous superconducting LCCw, a modern wide-bore design magnet.

High Homogeneity

The homogeneity of the magnet contributes to consistently achieving high image quality in applications such as:

- Large FOV imaging, up to 50 cm x 50 cm x 50 cm
- Off-center imaging such as Liver, Shoulders and dual-breasts.
- Robust and dependable Fat saturation and
- Other advanced applications such as whole body coverage, Diffusion EPI, Tensor Imaging and Spectroscopy
- Zero boil off*

Operating Field	1.5 Tesla
Magnet shielding	Active Shield with 3 Linear shim channels
Magnet Shimming	Active and passive
EMI shielding	99% shielding factor
Magnet length	195 cm
Magnet weight	3900 kg
Magnet cooling	Liquid Helium only
Long term magnet stability	< 0.1 ppm
Manufacturer	GE Healthcare

*Under normal operating conditions

Magnet Homogeneity‡

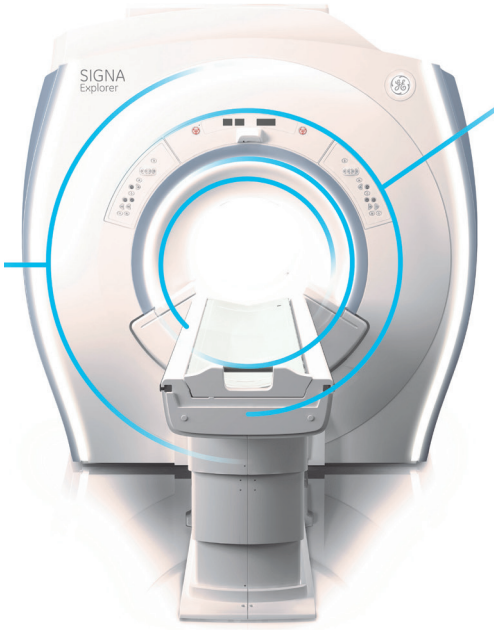
V-RMS Homogeneity Specifications		
Diameter of Spherical Volume -DSV	Guarenteed ppm	Typical ppm
10 cm	0.02	0.007
20 cm	0.06	0.035
30 cm	0.15	0.10
40 cm	0.5	0.40
45 cm	1.25	1.04
48 cm	2.75	2.1

‡ Volume Root-Mean-Square (V - RMS) Values are computed from 24 measurements on each of 32 planes with linear terms set to zero.

Patient comfort features:

The SIGNA™ Explorer magnet enclosures are designed for patient comfort.

- Dual-flared patient bore with 105 cm flare in the front
- 45.7 cm spacious vertical space between the table-top and the gantry inside the bore
- In-bore lighting and ventilation
- Two-way In-bore Intercom system
- Feet-first positioning
- Laser alignments for axial and sagittal reference planes
- Dual sided controls



Patient Table

The SIGNA™ Explorer system can be configured with two patient table options (A) Low Height Fixed Table with Express Posterior Array embedded coil and (B) detachable table.

Low Height Fixed Table

Low Height Fixed table	
Patient Table Height	49.0 cm to 96.5 cm continuous
Patient Table Drive	Automated, power driven Vertical & longitudinal
Longitudinal Speed	10.0 cm/sec (fast) and 1.25 cm/sec (slow)
Vertical Speed	1.7 to 2.6 cm/sec
Total Table Length	215.5 cm
Total Table Travel	244.0 cm
Positioning repeatability	± 1.0 mm
Maximum Patient weight for scanning	200 kg (440 lbs)

Detachable table

The SIGNA™ Explorer detachable table allows your technologists to scan one patient while preparing another outside the scan room. When the scan room is free, the next patient can be moved quickly and easily to the magnet by a single technologist. The detachable table not only enables productivity, but also provides additional patient safety. If an emergency arises, the detachable table is designed to allow a technologist to remove the patient from the scan room in less than 30 seconds.

Lite detachable table	
Patient Table Height	49.0 cm to 96.5 cm continuous
Patient Table Drive	Automated, power driven Vertical & longitudinal
Longitudinal Speed	10.0 cm/sec (fast) and 1.25 cm/sec (slow)
Total Table Length	213.0 cm
Total Table Travel	244.0 cm
Positioning repeatability	± 1.0 mm
Maximum Patient weight for scanning	160kg

Standard detachable table	
Patient Table Height	68.5 cm to 96.5 cm continuous
Patient Table Drive	Automated, power driven Vertical & longitudinal
Longitudinal Speed	10.0 cm/sec (fast) and 1.25 cm/sec (slow)
Total Table Length	225.5 cm
Total Table Travel	244.0 cm
Positioning repeatability	± 1.0 mm
Maximum Patient weight for scanning	160 kg

Gradients

The SIGNA™ Explorer gradients deliver outstanding spatial and temporal resolution. The high slew rate and 100% duty cycle provide short TR, TE and echo spacing (ESP) to achieve adequate temporal resolution.

The SIGNA™ Explorer 1.5T MR system utilizes a single module, consisting of the gradient and RF Body coil. It is epoxy-filled and both water and air-cooled for a high-level duty cycle performance.

The low-power water-cooled gradient amplifier ensures that SIGNA™ Explorer remains highly energy-efficient without compromising the temporal resolution.

Peak Amplitude	33 mT/m
Peak Slew Rate	120 T/m/s
Maximum FOV	50 cm
Gradient Duty Cycle	100%

The gradients are non-resonant and actively shielded to reduce eddy currents.

The gradient coil and Body coil are integrated into a single module.

Vibro-acoustic Isolation

GE has designed a special vibro-acoustic dampening pad to isolate the magnet from the building and thereby reduce the transmission of acoustic noise in the structures in the vicinity. This pad is positioned under the feet of the magnet and its dampening characteristics are optimized for the 1.5T magnet.

3D Geometry Correction

This standard feature applies gradient-position error correction in asymmetric, off-centre and large FOVs to improve the image quality. It is available for gapless 2D prescriptions and all 3D prescriptions except single slice, radial slices, multi-angle and PROPELLER.

Host computer and Recon engine

SIGNA™ Explorer provides adequate processing speed and image storage capacity to handle even the most demanding applications.

Recon Engine

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™ Explorer is designed to meet that challenge with 64 GB-memory and fast recon speed.

Recon Engine	
Main Processor	Dual Intel Xeon Sliver 4110
Clock rate	2.1 GHz
Memory	64 GB
Hard disk storage	1 x 480 GB SSD
Ethernet Transfer speed	Intel i350 QP 1GB Network Card
Reconstruction speed	37,000 FFT/second at 256 x 256 matrix for full FOV

Reconstruction System Gen 7	
PRFORMANCE-DL**	
Operating system	Scientific Linux
Processor	Dual Intel Xeon Silver 4214
Clock rate	2.2 GHz
Memory	>= 128GB
Network	1 GbE
Hard disk storage	>= 960 GB
2D FFT/second	63000
GPU	Nvidia Tesla T4

Host Computer	
Main CPU	Intel Xeon W-2123 CPU (4 core, 8 threads)
Clock rate	3.6 GHz
Main Memory	64 GB
Cabinets	Single Tower
Hard disk	1024 GB SSD
Image Storage	3,300,000 uncompressed 256 x 256 image
Media Drives	CD/DVD drive. Image exchange and short-term storage is possible with DVD writer. The DVD capacity is 35,000 images per 4.7 GB DVD
Network	Gigabit (10/100/1000) Ethernet

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 DISCO.

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.

**AIR Recon DL is not CE marked. It can not be placed on the market until it has been registered in regulated countries.

RF Transmit and Receive

The SIGNA™ Explorer is based on 8/16 high bandwidth receivers. Signals from independent receive coils within an array, are directly connected to independent receive channels for excellent SNR in all applications.

Optical RF

Conventional design of the MR scanner places the RF receivers in the electronics room. In such design strategies, the MR signal is susceptible to random electrical noise prior to being digitized by the ADCs.

The OpTix RF receivers are located inside the magnet enclosures in the shielded scan room, isolated from external noise sources. The MR signal is digitized within the scan room and transmitted via fiber optic cables to the reconstruction engine in the electronics room. The close proximity of the receivers to the patient reduces noise and improves image quality.

Optical RF technology increases SNR for all volume acquisitions, independent of which surface coil is being used.

RF Transmit	
RF amplifier	Water-cooled compact, solid-state
Maximum output power	10 kw for body and 2 kw for head
Maximum RF field	>24 µT
RF Exciter Frequency	63.86 ± 0.65 MHz
Amplitude control	16 bit
Frequency resolution	>0.596Hz/step
Phase resolution	<0.0055 deg/step
Amplitude stability	<0.09 dB/minute
Phase stability	<1.5 deg/minute
Frequency stability	14 parts per billion
RF pulse control	Digital

RF Receive	
Receive channels	16 selectable
Analogue to Digital converters	16 selectable
Sampling rate	80 MHz @ 16 bits per channel
ADC sampling resolution	16 bit
Receive signal filtering/ decimation	Digital, non-recursive, linear FIR
Quadrature demodulation	Digital
Receive dynamic range	>145 dB/Hz
Receive signal resolution	Up to 32 bits
Pre-amplifier noise figure	<0.5 dB for body

RF Coils and Arrays

SIGNA™ Explorer offers an assortment of quadrature and multi-channel array coils to ensure outstanding image quality and coverage.

All configurations include the following two Transmit/Receive coils:

Transmit/Receive coils	
Transmit / Receive head coil	16-rung quadrature birdcage coil with look-out mirror Patient friendly with split-top design 28 cm diameter and 38 cm length Applications include brain, extremities and other miscellaneous applications when other specialty coils are not available
Transmit Receive integrated body coil	16-rung quadrature birdcage coil 60 cm inner diameter for up to 50 cm FOV

The Express coil suite, compatible with the fixed table configuration, is designed to provide outstanding coverage, and convenient workflow.

Express coil suite	
Express Head-Neck array	• 16-element • Optimized for Brain, C-spine and Neuro-Vascular MRA • Removable top with Open-face design • Lookout mirror
Express Posterior Array coil embedded in the cradle	• 12-element coil with superb SI coverage of thorax, abdomen, pelvis, and TL spine • High-sensitivity elements ensure excellent contrast and resolution
Express Anterior array AA coil 9-element for the 16-channel system	• 12-ch imaging of the thorax, abdomen and pelvis in conjuction with Express Posterior Array • Offers improved SNR and coverage up to 56 cm in SI direction • Light weight with openings for EKG leads

Optional Surface coils
8-channel Invivo Brain array
8-channel Breast array
3-channel shoulder array
8-channel Cardiac array
8-channel shoulder array
Quadrature Knee/Foot birdcage coil with chimney design
8-channel Foot/Ankle array
8-channel Transmit/Receive Invivo Knee array
8ch Body array
16ch Flex Array Small 23 x 38 cm
16ch Flex Array Medium 23 x 48 cm
16ch Flex Array Large 23 x 70 cm
Endo-rectal coil with Interface
8-channel Wrist array
4ch Flex Coil Large 53.5 x 24.0 cm
4ch Flex Coil Small 37.5 x 24.0 cm
3” Round coil for orbits. ankle. IAC, wrist and other
small structures
5” Round coil for orbits. ankle. IAC, wrist and other
small structures
Dual Array adapter for simultaneous use of 2 x 3” round coils for the applications such as high-resolution dual TMJ
16ch 29-element Head-Neck-spine array
12-channel Body Array
8-channel Invivo NV array
8-channel CTL spine array
8ch Flex 40 Array 20 x 40 cm
8ch Flex 50 Array 20 x 50 cm
8ch Flex 70 Array 20 x 70 cm

Some of the coils need 16-channel configuration and detachable table. Please contact GE representative for more details or refer to the techno-commercial offer for SIGNA Explorer.

Imaging and Display Parameters

Imaging planes	• Direct axial, sagittal, coronal, oblique and double/triple oblique plane imaging • 3 Plane Localizer pulse sequence
Slice thickness	• 0.1 mm to 100 mm in 0.1 mm increments in 2D mode • 0.05 mm to 10 mm in 0.1 mm increments in 3D mode • Operator variable inter-slice spacing in increments as small as 0.1 mm. Interleave multi-slice imaging • 4 – 512 contiguous slice volume imaging in increments of 2 in 3D mode • 2D Standard Multi-Slice Imaging with as many as 2048 slices
FOV	• 1 to 50 cm in 1 cm increments in all planes • Ability to scan off-center FOV and Asymmetric FOV
Imaging Matrix	• Phase encoding from 32 to 1024 in steps of 32. Frquency ecoding of 64 to 1024 • Respiratory Triggering concurrent with ECG gating • ZIP (Zero Filled Interpolation Processing) methods: • Through-plane ZIP (slice) reconstructs images interpolated between acquired slices for high-resolution 3D reformations • In-plane ZIP (matrix) reconstructs data at a higher resolution matrix than selected, for optimized balance between SNR and spatial resolution. Options include 512 ZIP and 1024 ZIP
Gating	• Peripheral Gating • Respiratory gating • VCG Fating • Cardiac adaptive digital gating
Image Display	• 256 Image buffer (256 x 256) at 35 fps
Image Display Features	• Zoom/Roam/Flip/Rotate/Scroll • Explicit Magnify & 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/ Image Enhance

Image Display Features	• ClariView Image Filtering • 5 image filters to achieve image sharpening and image smoothing • Minified Reference Scoutview • Cine Paging (up to 4 windows and 128 images/window) • Add/Subtract /Edit Patient Data
Image Annotation Features	• 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
Imaging Parameters	• Respiratory Triggered FSE • Flow Compensation • Respiratory Compensation • Peripheral Pulse Gating • Graphic Prescription • Explicit Saturation (SAT outside and inside the FOV and concatenated SAT) • Graphic Saturation (oblique and cursor placement SAT inside the FOV) • No Phase Wrap • Fat/Water (Spectral Chem-Sat) Saturation • Extended Dynamic Range • Phase and Frequency Offset • Asymmetric FOV • Flexible NPW • Square Pixel
Networking Protocols supported	• DICOM 3.0 Basic Grayscale Print Service Class • DICOM 3.0 send, receive and query/retrieve • InSite point-to-point • TCP/IP (for system administration)
DICOM Conformance Standards	• DICOM 3.0 Modality Work List Service Class supported with optional Connect Pro software • DICOM 3.0 Storage Service Class • Service Class User (SCU) for image send • Service Class Provider (SCP) for image receive • DICOM 3.0 Query/Retrieve Service Class • DICOM 3.0 Storage Commitment Service Class • DICOM 3.0 Basic Grayscale Print Service Class

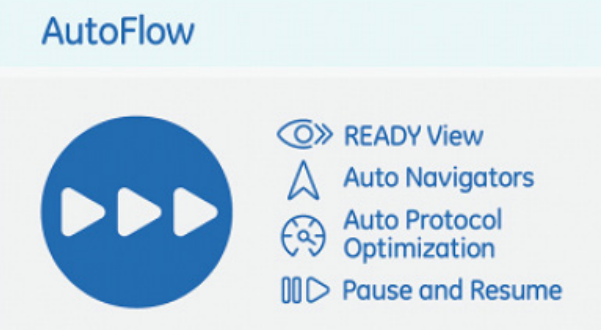
Imaging and Display Parameters (continued)

TR, TE, and Echo Spacing					
Sequences	Parameters	64 x 64	128 x 128	256 x 256	512 x 512
2D Spin Echo	Min. TR	N/A	3 ms	4 ms	5 ms
	Min. TE	N/A	1.712 ms	2.112 ms	2.552 ms
	Min. slice thickness	N/A	0.6 mm	0.6 mm	0.6 mm
2D Fast Spin Echo	Min. TR	N/A	3 ms	4 ms	6 ms
	Min. TE	N/A	1.712 ms	2.112 ms	2.928 ms
	Min. slice thickness	N/A	0.1 mm	0.1 mm	0.1 mm
	Min. ESP	N/A	1.712 ms	2.112 ms	2.928 ms
	Max. ETL	N/A	480	480	480
3D Fast Spin Echo	Min. TR	N/A	61 ms	61 ms	110 ms
	Min. TE	N/A	6 ms	7 ms	16.7 ms
	Min. slice thickness	N/A	0.3 mm	0.3 mm	0.3 mm
	Min. ESP	N/A	1.984 ms	2.552 ms	7.984 ms
	Max. ETL	N/A	329	329	329
2D Fast Gradient Echo	Min. TR	0.7 ms	0.9 ms	1.1 ms	1.6 ms
	Min. TE	0.224 ms	0.224 ms	0.228 ms	0.24 ms
	Min. slice thickness	0.1 mm	0.1 mm	0.1 mm	0.1 mm
3D Fast Gradient Echo	Min. TR	0.7 ms	0.88 ms	1.14 ms	1.54 ms
	Min. TE	0.22 ms	0.22 ms	0.22 ms	0.24 ms
	Min. slice thickness	0.1 mm	0.1 mm	0.1 mm	0.1 mm
Echo Planar Imaging	Min. TR	4 ms	5 ms	5 ms	N/A
	Min. TE	1.1 ms	1.2 ms	1.6 ms	N/A
	Min. slice thickness	0.4 mm	0.4 mm	0.4 mm	N/A
	Min. FOV	40 mm	40 mm	40 mm	N/A
	Min. ESP	0.252 ms	0.352 ms	0.564 ms	N/A
	Images per second	142	78	32	N/A
	Max. b value	10000 s/mm^2	10000 s/mm^2	10000 s/mm^2	N/A
	Max. # for ADC	40	40	40	N/A
	Max. Diffusion Tensor Directions	300	300	300	N/A

Slice Thickness and FOV	
Minimum slice thickness in 2D	0.1 mm
Minimum slice thickness in 3D	0.05 mm
Minimum FOV	10 mm
Maximum FOV	500 mm
Min/Max matrix	32-1024

Autoflow Workflow

SIGNA™ Explorer's AutoFlow suite of features makes workflow easier and more efficient than ever:



Ready Interface System

The SIGNA™ Creator Ready Interface incorporates many features designed to lighten the workload of the technologists. The SIGNA™ Creator includes an automated protocol-driven workflow and user interface designed for consistency in generating high-quality imaging for all patients and from all technologists.Simultaneous scanning, reconstructions, filming, archiving, networking, and post-processing can help achieve productivity, efficiency, and streamlined data management.

Analyze the following type of MR data sets:

- Time series
- Diffusion weighted scan
- Diffusion tensor scan
- Variable echo imaging
- Blood oxygen level dependent imaging
- Spectroscopy (single voxel and 2D or 3D CSI)
- Elastography1 imaging
  - Simple workflow to process and fuse functional data.
  - Select and process functional data with One Touch single click capability.
  - READY View automatically selects the most relevant protocol for you.
  - Efficient multi-contrast exam reading using MR General Review based on smart layout technology.
  - Adaptive multi-parametric protocols as guided workflow to streamline processing and analysis of multi-parametric studies.
  - Display all multi-parametric images and get all related functional values from a single ROI deposition.
  - Fully customizable workflows with adjustable layouts, personalized parameter and settings, custom review steps.
  - Easy-to-use slide bars let you segment parametric images in real time.
  - Display and export ROI statistics from the Summary table
  - Export graph values as csv file
  - Save State let you save and restore the state of the processed images at any stage.
  - Contextual help pages that give general assistance about the image processing algorithms.
  - Save all generated parametric images in one click.

Ready Brain Application

An MRI examination of the brain consists of a number of connected steps. Ready Brain provides the flexibility to automate these connected steps from acquiring a localizer image, prescribing acquisition planes, scanning relevant series, performing post-processing up to transferring the final image data to a reading station. By standardizing the steps of an exam and the location of the scan planes, such automation could result in greater consistency, especially in the longitudinal follow-up.

Ready Brain features an automatic localizer, automatic calculation of the mid-sagittal plane for 2D/3D prescription, determination of the AC-PC line, and correction for extreme (>45 degree) rotation.

Express coil productivity

The Express coil suite, compatible with the fixed table configuration, is designed to provide convenient workflow when imaging the central nervous system, thorax, abdomen and pelvis.

Auto Protocol Optimization (APx)

Auto protocol Optimization enables a simple and automated workflow for breath-hold imaging. Technologists are liberated from torublesome parameter adjustments to optimize scan time and image quality by selecting among protocol parameters automatically calculated by the MR system. Auto Protocol Optimization enables braeth-hold exams with more reliable image quality and more predictable exam duration, regardless of patient profile (breath hold capability and physical characteristics) or operator skill level.

Auto Navigators:

Delivers real-time robust free breathing respiratory motion compensation tostreamline routine and advanced body imaging. They are compatible with DISCO, Turbo LAVA,Turbo LAVA Flex , GE's body and cardiac imaging suite.

Autoflow Workflow (continued)

Pause and Resume:

Eliminates the need to redoscans or retrace your steps, giving you greater flexibility to respond to patient needs mid-scan.

eXpress PreScan 2.0

Optimized PreScan step leading to an increase in efficiency of the calibration process enabled by the new eXpress algorithm 2.0 FSE phase correction algorithms. This leads to as much as a 40% reduction in pre-scan time, translating to a time savings per exam of up to 6 minutes* (Based on a routine MSK protocol containing conventional FSE based sequences).

Modality Worklist

The modality worklist (MWL) provides an automated method of obtaining exam and protocol information for a patient directly from a DICOM Worklist server. The protocol may be selected well in advance of the patient's arrival at the MR suite, thereby simplifying exam preparation and reducing necessary work by the technologist during the time-critical procedure. The ConnectPro software enables the DICOM worklist server class for the SIGNA™ Explorer Operator's Console.

Inline viewing

Inline viewing allows the user to conveniently view, compare, and analyze images without having to switch to the Browser. Simply select the series to view from the Workflow Manager and the images are displayed along with standard image display tools. By selecting multiple series at a time, a user can perform image comparisons. The integrated viewer allows the user to seamlessly move between scanning and image viewing.

Inline processing

The SIGNA™ Explorer workflow automates many of the routine tasks that previously required user interaction. This dramatically reduces the workload for the user and helps ensure that consistent and repeatable images are presented for review. Processing steps are automatically completed immediately after the data has been reconstructed and the images saved into the database. These automated processing steps can be saved in the Protocol Library to ensure consistent exam workflow for each type of patient.

For certain tasks, such as vascular segmentation, the user must accept the results, or complete additional steps prior to saving the images to the database. In these cases the data is automatically loaded into the appropriate tool, then the system will await further instruction by the user. Examples of fully automated and partially automated inline processing include:

Inline processing capabilities	
Diffusion Weighted Images ADC/ eADC Maps	Automatic compute and save
Diffusion Tensor Images FA/ADC Maps	Automatic compute and save
Image Filtering: A-F, SCIC, PURE	Automatic compute and save
Maximum/Minimum Intensity Projection	Automatic compute and save
Reformat to orthogonal planes	Automatic compute and save
T2 Map for cartilage evaluation	Automatic compute and save
FiberTrak	Automatic load
Spectroscopy – Single voxel brain and breast metabolite	Automatic load
3D Volume Viewer	Automatic load
Spectroscopy – 2D/3D Chemical Shift Imaging	Automatic load
BrainStat (Readyview)	Automatic load
Image Fusion	Automatic load
Pasting	Automatic compute and save
SER (Readyview)	Automatic load
eDWI	Automatic compute and save
3D ASL	Automatic compute and save

SIGNA™ Explorer with AutoFlow

Autoflow

The SIGNA™ Explorer with autoflow scan interface incorporates many features designed to lighten the workload by automating many routine steps.

The SIGNA™ Explorer includes an automated protocol-driven user interface designed for consistency in generating high-quality imaging for all patients and from all technologists. Designed for efficiency, the SIGNA™ Explorer computer platform is built upon a parallel, multi-processor design that delivers the simultaneity and speed needed for advanced clinical operation. Productivity, efficiency and streamlined data management are achieved through simultaneous scanning, reconstruction, filming, archiving, networking and post-processing.

Though the protocol-driven workflow can dramatically simplify and automate image acquisition and processing, the flexibility that is synonymous with GE systems is maintained. If desired, the user can have complete control of exact sequence parameters for site optimization and patient specific situations.

Protocol libraries and properties

The SIGNA™ Explorer system provides the user with complete control of protocols for simple prescription, archiving, searching, and sharing. The protocols are organized into two main libraries, GE Optimized and Site Authored. For quick search and selection, each protocol may be archived with independent properties based on patient demographics, anatomy, type of acquisition, or identification number. For commonly used protocols, a favorites flag may be used for quick selection from the Modality Worklist or for sharing across other libraries.

Adult and Pediatric Protocol libraries for simple management of exams

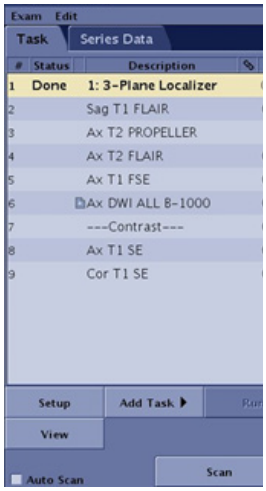
Each protocol or series can be saved with user-defined properties to simplify search and selection for future use. Favorite protocols can be highlighted for quick selection from the Modality Worklist or other libraries.

ProtoCopy

Standard on every SIGNA™ Explorer system, the ProtoCopy feature enables a complete exam protocol to be shared with the click of a mouse. The exam protocol can originate from either a library or previously acquired exam. This enables routine archive of protocols for emergency backup and simple management of libraries across multiple systems.

Workflow manager

Once a protocol has been selected for an exam, it is automatically loaded into the Workflow Manager. The Workflow Manager controls image prescription, acquisition, processing, visualization, and networking and may fully automate these steps if requested.



The Workflow Manager automatically loads the protocol and controls image prescription, acquisition, processing, and visualization

AutoStart*

If AutoStart is selected, once the landmark position has been set and the technologist exits the scan room, the Workflow Manager will automatically start the acquisition.

AutoScan*

With AutoScan enabled, the Workflow Manager will sequentially go through the list of prescribed series without any user interaction. Once a series has been completed, the next series will be scanned automatically. For series requiring contrast, the system will await user interaction.

Auto calibration

A calibration scan is necessary for any acquisition that uses either ASSET parallel imaging or PURE surface coil intensity correction. A system preference can be selected to automatically acquire calibration data if desired. When needed, a calibration scan is automatically prescribed and acquired based on the clinical imaging volumes saved by the user. The reduced time lapse between the calibration and clinical scan minimizes possibility of patient movement and this may help improve image quality.

SIGNA™ Explorer with AutoFlow (continued)

Linking

Linking automates the prescription of images for each series in an exam. Once the targeted anatomical region has been located the Linking feature combines information from a prescribed imaging series to all subsequent series in the Workflow Manager. All series that have been linked may automatically be prescribed (Rx) and no further interaction will be needed by the technologist to initiate the scan. The user has control over which specific parameters can be linked together. Series can have common fields of view, obliquity, slice thickness, anatomical coverage, saturation bands, or shim volumes. Multiple series can be linked together and saved in the Protocol Library or edited in real time. Linking may be used with any anatomy and with any acquisition. Once the first volume is prescribed, all other subsequent series with the same planes can be automatically prescribed and acquired.

Linking

AutoVoice

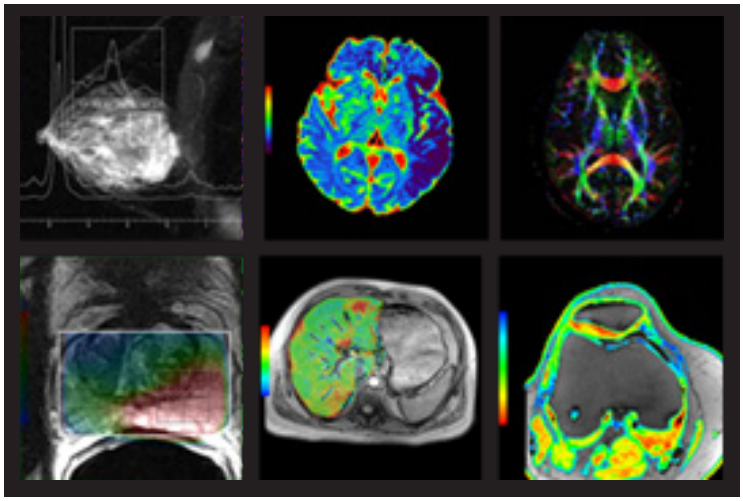
The AutoVoice feature will ensure that consistent and repeatable instructions are presented to the patient for each and every exam. User selectable, pre-recorded instructions are presented at defined points in the acquisition. This helps ensure that the patient is in the right position and is fully aware of the next step in the acquisition process. AutoVoice is particularly helpful during breath-hold exams. The AutoVoice feature includes instructions in over 14 languages and the user can create and include their own unique voice instructions for local needs.

Image fusion

To better visualize tissue and contrast, multiple images from separate acquisitions can be overlaid on one another. With the SIGNA™ Explorer high-resolution 2D and 3D anatomical images can be fused with functional data or parametric maps for improved visualization for the user. The data is registered using translation and rotation to ensure accurate fusion.

The automated workflow features of the system can be used for any anatomy and for any sequence. When combining the technology of AutoStart,* Linking, Inline Processing, AutoVoice,* and the AutoScan* features, an entire exam can be completed with just a few actions. The flexibility of the SIGNA™ Explorer user interface and acquisition parameters helps ensure that each acquisition is tailored for every patient. However, the technologist steps are kept consistent

Image fusion	
MR Standard	3D Registration
ADC/eADC	3D Registration
Diffusion Tensor	3D Registration
BrainSTAT	3D Registration
SER (Signal Enhancement Ratio)	Reformat
T2 Mapping	Reformat
Spectroscopy (Brain and Breast)	Automatic load



Imaging Options and Parallel Imaging Support†

Imaging options			
Pulse sequence imaging options	• 3 D Slice Zip x 2 (Z2)/ • Zip x 4 (Z4) • ARC* • ART • ASSET • Blood Suppression • Cardiac Compensation • Cardiac Gating/ Triggering • Classic • DE Prepared • EDR • Flow Compensation • Fluoro Trigger • Full Echo Train • IDEAL • IR Preparation	• Magnetization Transfer • MRCP • Multi-Phase/Dynaplan • Multi-Station • Navigator • Real Time • Respiratory Compensation • Respiratory Gating/Triggering • Sequential • SmartPrep™ • Spectral Spatial RF • Square Pixel • T2 Prep • Tailored RF • Zip 512/Zip 1024	
Parallel Imaging Array Spatial Sensitivity Encoding Technique (ASSET) imaging option is a 1D image-based parallel imaging technique used to speed data acquisition. For temporally sensitive acquisitions, ASSET reduces image blurring and motion, enables greater anatomical coverage, and reduces SAR. Parallel imaging acceleration factors ranging from 1-3.0 are supported depending on the coil selected. **ASSET 3.0** Next generation reference scan algorithm which provides improved control over motion related artifacts and dephasing which can occur during the reference scan step. The new ASSET 3.0 reference algorithm leads to a reduction in artifacts caused by motion or dephasing in clinical results. The improvement is also utilized in the PURE image uniformity correction. **ARC Parallel Imaging** Auto-Calibrating Reconstruction (ARC) parallel imaging eliminates breath-hold mismatch errors by imbedding the calibration data within the scan data. In addition, this innovative reconstruction permits small FOV imaging by minimizing focal parallel imaging artifacts from the exam. Supporting both 1D and 2D acceleration, net acceleration factors of up to 4 can be achieved. ARC together with CUBE can be used in all anatomies. With the SIGNA™ Explorer, the following applications are parallel imaging enabled:	• 2D DT-EPI • 2D DW-EPI • 2D FGRE • 2D FIESTA • 2D FIESTA FastCARD • 2D FIESTA FastCINE • 2D FIESTA Fat Sat • 2D FRFSE • 2D FRFSE-XL IDEAL • 2D FSE IDEAL • 2D FSE • 2D FSE Double IR • 2D FSE-IR • 2D FSE Triple IR • 2D FSE-XL IDEAL • 2D FSPGR • 2D GRE-EPI • 2D MDE • 2D MFGRE • 2D SE-EPI • 2D SSFSE • 2D SSFSE 3-Plane • 2D SSFSE-IR • 2D SSFSE MRCP • 2D T1FLAIR • 2D T2MAP	• 3D BRAVO • 3D COSMIC • 3D Cube T1 • 3D Cube T2 • 3D Cube T2FLAIR • 3D Cube DIR • 3D Cube PD • 3D Delta Flow • 3D Dual Echo • 3D Fast TOF GRE • 3D Fast TOF SPGR • 3D FGRE • 3D FGRE IDEAL • 3D FIESTA • 3D FIESTA-C • 3D FRFSE • 3D FRFSE MRCP • 3D FSPGR • 3D FSPGR IDEAL • 3D Heart • 3D LAVA • 3D LAVA FLEX • 3D MDE • 3D MERGE • 3D QuickSTEP • 3D SWAN • 3D TOF GRE • 3D TOF SPGR • 3D TRICKS • 3D Velocity Inflow • 3D VIBRANT • 3D VIBRANT FLEX	• Cine IR • eDWI • Fast 2D Phase Contrast • FGRE Timecourse • IFIR • Inhance Inflow • PROPELLER MB • SWAN 2.0 • PS-MDE • BB SSFSE • 3D PROMO • DISCO • DW Duo (LX DWI Propeller) • Flex • HyperSense • IR & SR Prepared • PROMO

†Some product features may not be available in all countries

Post processing

Multi-Projection Volume Reconstruction (MPVR)	Quick way to generate volumetric images for MR or CT Angiography without threshold data or removing unwanted anatomy. An entire volume is used to generate images in any plane, creating real time frames of reference at the same time.
Multi-Planar Reformation (MPR)	Provides real time assessment of anatomy in off-axis planes. Sagittal, coronal, oblique, and curved planar reformations.
Other standard analysis features	Curved reformations Batch reformations Comparison Mode Multi-image ROI
SCIC & PURE	Surface coil intensity correction (SCIC) and phase array uniformity correction (PURE)
MR Pasting	Combines a series of MR images acquired in multiple stations of the body into a single image. Pasting 1.1 provides the convenience of viewing a single image rather than several images. The applications include pasting of multiple images of sagittal spine imaging and carotid to abdominal aorta and peripheral vascular imaging.

READYView

READYView is a visualization platform that enables access to advanced post processing tools that enable both speed and advanced capabilities. It helps the user get the most from multi-parametric exams by enabling analysis of MR data sets with multiple images for each scan location. The user experience driven framework offers a combination of protocols and tools that enables quantified analyses of multiple data sets quickly and easily. Some of the key capabilities of READYView are

Analyze the following type of MR data sets:

- Time series
- Diffusion weighted scan
- Diffusion tensor scan
- Variable echo imaging
- Blood oxygen level dependent imaging
- Spectroscopy (single voxel and 2D or 3D CSI)
- Elastography1 imaging
  - Simple workflow to process and fuse functional data.
  - Select and process functional data with One Touch single click capability.
  - READY View automatically selects the most relevant protocol for you.
  - Efficient multi-contrast exam reading using MR General Review based on smart layout technology.
  - Adaptive multi-parametric protocols as guided workflow to streamline processing and analysis of multi-parametric studies.
  - Display all multi-parametric images and get all related functional values from a single ROI deposition.
  - Fully customizable workflows with adjustable layouts, personalized parameter and settings, custom review steps.
  - Easy-to-use slide bars let you segment parametric images in real time.
  - Display and export ROI statistics from the Summary table
  - Export graph values as csv file
  - Save State let you save and restore the state of the processed images at any stage.
  - Contextual help pages that give general assistance about the image processing algorithms.
  - Save all generated parametric images in one click.

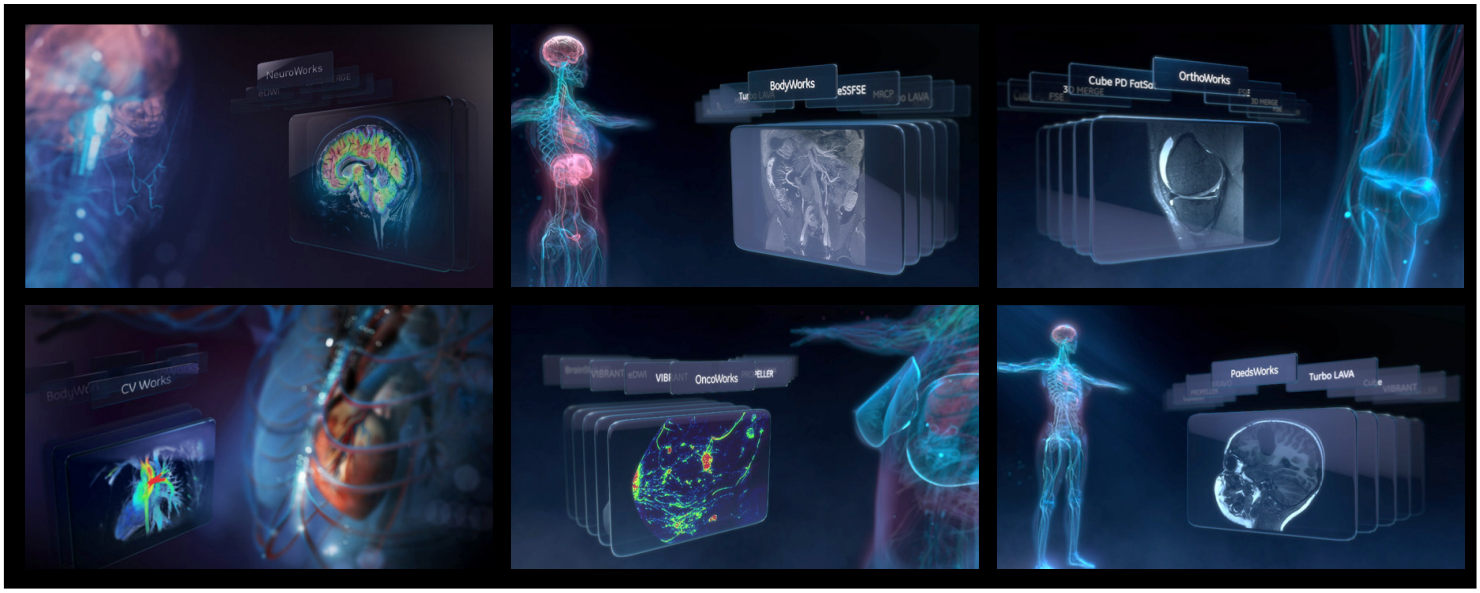
SIGNA™Works

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. SIGNA™Works, 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, SIGNA™Works provides the user with a streamlined and efficient operating environment with in-line processing through single-click outcomes for even the most demanding processes.

SIGNA™Works 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

The following NEURO applications are standard with the SIGNA™ Explorer SIGNA™Works.

- Ready Brain
- Diffusion Weighted EPI
- EPI 2D GRE for BOLD acquisitions
- EPI FLAIR
- 2D STIR
- 3D Cube
- 3D FIESTA
- 3D FIESTA C
- 3D COSMIC
- 2D/3D MERGE
- MR Pasting
- 2D/3D TOF
- 2D/3D Phase Contrast Angio
- Magnetization Transfer Contrast
- T1-SE MEMP
- T1 FLAIR
- T2 FLAIR
- T1/T2 FSE

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	
3D Cube	PD, T1, T2, T1 FLAIR, T2 FLAIR, STIR, MSDE 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	
PROPELLER MB	Multiple contrasts – T1, PD, T2, T1 FLAIR, T2 FLAIR and DWI Motion reduction Magnetic susceptibility effects reduction
Visualization	Registration Motion correction

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

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
Visualization	Brain Spectroscopy

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

Dynamic Brain Function	
BrainSTAT Perfusion and Analysis	EPI-GE/SE T2* pulse sequence for DSC (Dynamic Susceptibility Contrast) Brain Perfusion Blood flow Blood volume Mean transit time Time to peak parametric Fusion
BrainSTAT (AIF) Arterial Input Function	Manage tracer arrival differences due to patient flow dynamics 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

Additional Neuro Imaging Options	
Magnetization Transfer Contrast	
T1-SE MEMP	
Express Spine Annotation	Enables semi-automatic annotation of vertebral bodies on saggital T2W spine images.

BodyWorks

Following BODY applications are standard with the SIGNA™ Explorer SIGNA™Works.

- LAVA and LAVA XV
- 3D FRFSE-XL for high res MRCP
- 2D and 3D Dual Echo
- 2D SSFSE
- 2D FSE-XL
- 2D STIR/ FIRM
- T2 Fatsat FRFSE-XL
- 2D FatSat FIESTA
- LAVA XV
- 3D Cube
- 2D FSPGR with Fatsat
- 3D FSPGR
- Multi-phase variable delays

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 Auto navigator 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
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
	Auto-contour

Motion Correction	
PROPELLER MB	Motion reduction
Auto Navigator	Free-breathing tracker
Respiratory Trigger	Free-breathing bellows
Visualization	Registration
	Motion correction

Enhanced Diffusion Imaging	
eDWI	Multi b-value,
	3:1, Tetrahedral
	Smart NEX
	Inversion recovery for robust Fat Sat
	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 Auto 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

The following Cardiac applications are standard with the SIGNA™ Explorer SIGNA™Works.

- VCG Gating
- VCG Gated GRE and Fast SPGR
- Double and Triple IR
- Fast Cine
- iDRIVE Pro realtime imaging
- Fluro-Trigerred MRA
- TRICKS
- 2D FIESTA Cine
- SmartPrep for vascular runoffs
- SmartStep for vascular runoffs
- MR Pasting
- 2D/3D Phase contrast Angio
- 2D/3D TOF
- 3D Fast TOF with GRE/SPGR for ce-MRA

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	
Adiabatic IR Pulse	Robust Myocardial Suppression Fat Suppression Adiabatic fat suppression pulse Improved characterization of enhancing tissue
MDE PLUS	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
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 Fat Sat 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 vesselsr
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
Visualization	MIP & HD MIP
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.

OrthoWorks

Following ortho applications are standard with the SIGNA™ Explorer SIGNA™Works.

- 2D STIR
- 2D FSE-XL
- 2D GRE
- 3D FIESTA
- 3D Cube
- 3D FSPGR/FGRE
- FATSAT

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
Visualization	3D reformat MPR
	Volume segmentation
	Volume rendering

Motion Correction	
PROPELLER MB	Multiple contrasts – T1, PD, T2 and STIR
	Motion reduction
Visualization	Registration
	Motion correction

T2*-weighted Imaging	
3D MERGE	High SNR T2* contrast
	Visualization of ligaments while adding soft tissue contrast
	Reduced chemical shift
3D COSMIC	Fast, high resolution volumetric imaging
	SSFP to emphasize T2 signal for improved contrast
Visualization	3D reformat MPR
	Volume segmentation
	Volume rendering

Fat Supression	
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

OncoWorks

OncoWorks 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 visualization capabilities so that your results can be a single click away.

Volumetric Imaging	
3D Cube	PD, T1, T2, T1 FLAIR and T2 FLAIR 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	
3D Cube	PD, T1, T2, T1 FLAIR and T2 FLAIR
	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
Auto Navigator	Free-breathing tracker
Respiratory Trigger	Free breathing bellows
Visualization	Registration
	Motion correction

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

Dynamic Brain Function	
BrainSTAT Perfusion and Analysis	Blood flow
	Blood volume
	Mean transit time
	Time to peak parametric
	Fusion
BrainSTAT Arterial Input Function (AIF)	Manage tracer arrival differences due to patient flow dynamics
	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
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

SIGNA™Works

SIGNA™Works is the fuel that drives your imaging to the next level and beyond.

Spin Echo Pulse sequences

Spin Echo and Fast Spin Echo sequences have been the mainstay in MR imaging due to their robust signal and well understood contrast behavior. The XL version of the FSE is designed to enable an extended train of echoes to reduce the T2 blurring and the fast recovery FSE helps in reducing TR without compromising the T2 weighting.

- 2D Spin Echo
- 2D FSE-XL
- 2D SSFSE (single shot)
- 2D SSFSE IR
- 2D FRFSE-XL (Fast Recovery version)

Single-Shot Fast-Spin Echo

An ultra-fast technique that permits complete image acquisition following a single RF excitation. It can acquire slices in less than one second, making it an excellent complement to T2-weighted brain, abdominal imaging and MRCP studies.

SSFSE Snapshot

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 FRFSE

Coupled with respiratory gating, this 3D FSE sequence uses a novel “recovery” pulse at the end of each echo train to recapture signal for the next repetition. These features result in high-resolution three-dimensional images for MR cholangiopancreatography (MRCP) studies.

Gradient Echo Pulse sequences

The main advantage of GRE sequences is its shorter TR enabled by lower flip angles and gradient inversions instead of 180° RF pulses. Consequently, the GRE sequences are better suited to a variety of 3D volumetric applications including ce-MRA techniques.

SIGNA™ Explorer system’s innovative imaging chain and high fidelity gradients offer short TRs and TEs.

- 2D GRE/SPGR
- 2D FGRE/FSPGR
- 3D GRE/SPGR
- 3D FGRE/FSPGR
- ECG gated FGRE
- ECG gated Fast SPGR
- IR-prepared 3D-GRE with ARC parallel imaging for Brain Volume imaging BRAVO

3D Dual Echo

With improvements in parallel imaging and RF coil arrays, volumetric imaging in body is becoming a standard of care. The 2D/3D Dual Echo sequence produces in-phase and out-of-phase images in a single breath-hold. As a result, the high-resolution images are in perfect alignment helping to simplify the diagnostic process. In addition, the excellent SNR of the 3D acquisition permits the thinner slices than are traditionally available using 2D techniques.

LAVA

LAVA delivers excellent spatial and temporal resolution with large volume slice coverage in significantly shorter total scan times than those possible with conventional 3D gradient echo techniques. LAVA provides outstanding Liver breath-held imaging without compromising in-plane spatial resolution.

LAVA-XV

LAVA-XV utilizes auto-calibrating ARC parallel imaging technique that needs no coil sensitivity maps. It is less sensitive to motion artifacts compared to the conventional LAVA based on ASSET.

2D and 3D MERGE

Multiple Echo Recombined Gradient Echo (MERGE) uses multiple echoes to generate high-resolution images of the C-spine with excellent gray-white matter differentiation. By combining early echoes with high SNR and late echoes with improved contrast, the result is improved cord contrast within the spinal column.

2D/3D TOF

2D Gated TOF Imaging, 3D TOF Imaging and enhanced 3D TOF Imaging are based on conventional gradient echo imaging techniques. TOF imaging techniques rely primarily on flow-related enhancements to distinguish the moving spins from the stationary spins.

2D/3D Phase contrast

These techniques demonstrate flow velocities and directional properties in vessels and other moving fluids such as cerebral spinal fluid and aortic flow.

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.

**LAVA Star is not 510(k) cleared and not CE marked. It can not be placed on the market until it has been registered in regulated countries.

SIGNA™Works (continued)

Inversion Recovery Pulse sequences

This is an SE sequence with preparatory 180° pulse to flip the net magnetization vector by 180° to null the signal from a particular entity, very often water. The variants of the IR available with our SIGNA™Works are:

- 2D T1 FLAIR (Fluid Attenuated IR)
- 2D T2 FLAIR (Fluid Attenuated IR)
- STIR – Short TI Inversion Recovery
- Double IR and Triple IR for black blood imaging in assessment of carotid plaques cardiac imaging

Echo Planar sequences

With echo-planar imaging, a single echo train is employed to collect data from all lines of k-space during one TR. In the single shot version, all the k-space lines are collected in a single TR and in case of the multi-shot EPI it is collected over multiple TRs. EPI is an excellent choice for diffusion weighted imaging.

SIGNA™ Explorer offers comprehensive EPI techniques with short echo spacing:

- EPI SE
- EPI GRE
- EPI Diffusion Weighted
- EPI FLAIR (single shot version helps in DWI)

ART Acoustic Reduction Technology

This feature modifies pulse sequences without compromising the image quality to reduce the acoustic noise to improve the patient comfort.

Other SIGNA™Works applications

SIGNA™Works also includes many advanced applications such as real-time imaging, BOLD acquisitions and multistation vascular imaging.

3D Cube

3D Cube has potential to replace several slice-by-slice, plane-after-plane 2D FSE acquisitions with a single 3D volume scan, providing you with T1, T2, T2 FLAIR, PD or DIR sequences. You can easily reformat sub-millimeter isotropic volume data from a single acquisition into any plane without gaps, and with the same resolution as the original plane. Our self-calibrating ARC parallel imaging helps eliminate artifacts while accelerating the image acquisition.

BOLD fMRI analysis on Readyview

Correlation Coefficient algorithm is used to analyze an image set acquired with the EPI. Neuronal activity of either motor or cognitive functions can be mapped by fMRI through changes in signal intensity arising from bulk magnetic susceptibility-induced relaxation changes resulting from variations in blood flow and oxygenation. A BOLD image acquisition is typically a single shot, multiphase, GRE-EPI with high number of phases. Within each series, you can acquire multiple phases and multiple slices.

The pre-selected images from the series can be loaded in to Readyview to automatically compute parametric images. Magnification factor, WW/WL, and threshold functions are available for post processing.

BrainSTAT

BrainSTAT is a standard post processing application that automatically generates parametric maps for neuro Blood Flow, Blood Volume, Mean Transit Time, and Time to Peak signal intensity. A Gamma Variate fitting algorithm is deployed to automatically estimate the values for the four parametric maps. The maps may be saved in DICOM format and fused with high-resolution anatomic datasets to visualization of tissue and anatomy.

An optional add-on to the Brain STAT package enables the user to automatically or manually specify the Arterial-Input Function (AIF) based on the temporal form of the signal, to normalized Blood Flow, Blood Volume, Mean Transit Time, and Time to Peak signal intensity maps based on the patients' vascular flow dynamics.

Diffusion Weighted EPI

Single Shot FLAIR EPI and Single Shot, diffusion-weighted EPI with b-values up to 10,000 s/mm^2 is standard with SIGNA™ Explorer that is based on

- Automatic isotropic diffusion-weighted image generation
- Multi-NEX capability
- Online image processing
- ADC maps

Flow Analysis

Allows Flow Quantification in vasculature such as carotid artery.

i-Drive Pro real-time imaging

i-drive Pro brings real-time interactive imaging to the MR system for imaging of organs such as heart, GI tract and spine. It allows the user to change scan parameters easily, including during scanning, to evaluate the results immediately.

SPECIAL - Spectral Inversion at Lipids

Spectral Inversion at Lipids (SPECIAL) uses an inversion pulse transmitted at the frequency of fat and timed to the null point of fat. This results in higher signal produced from protons bound in water and a decreased signal from nuclei precessing at the frequency of fat. The flip angle of the inversion pulse is optimized based on the prescribed TI, TR, and flip angle. SPECIAL is available with 3D FRGE and 3D Fast TOF sequences.

SIGNA™Works (continued)

SmartPrep

SmartPrep uses a special tracking pulse sequence to monitor the MR signal through a user-prescribed volume to detect the arrival of an injected contrast bolus and to trigger the acquisition, for optimum contrast enhancement. It does so by integrating the following:

- Efficient multi-station scouting capabilities
- Ultra flexible multi station Graphic Rx for precise multi-station RF tuning with pre-scan ahead
- Automated triggering, table motion and coil switching Application of robust fat-suppression with SPECIAL (Spectral Inversion at Lipid)
- The result is acquisition techniques that deliver consistently high-resolution results by making routine use of elliptic-centric encoding and ZIP reconstruction to create images as large as 1024x1024 pixels

SmartStep

The SmartStep adds programmable stepping capability to SmartPrep to plan and optimize your contrast enhancements.

Fluoro-Triggered MRA

Fluoro-Triggered MRA images the selected anatomy continuously, enabling the user to manually trigger each acquisition as soon as the MR-operator is satisfied with the level of vessel enhancement. This switch-over occurs almost instantly, in less than one second.

TRICKS

Time Resolved Imaging of Contrast KineticS (TRICKS) technology is designed to use intricate temporal sampling with complex data recombination to accelerate the temporal resolution of 3D dynamic imaging – without compromising spatial resolution. Easy to set up, TRICKS rapidly generates time-resolved 3D images of blood vessels to help meet the challenge of capturing peak arterial phases. With TRICKS, the different vascular phases can be extracted quickly after image acquisition.

3D FIESTA-C

This phase-cycled FIESTA reduces sensitivity to susceptibilities that may be encountered when imaging in the posterior fossa. It provides exquisite contrast that is equated for visualization of the internal auditory canal. It is also well-suited for T2 imaging through the cervical spine.

3D FIESTA

3D FIESTA (Fast Imaging Employing Steady-state Acquisition) is a technique that uses an extremely short repetition time (TR) between RF pulses such that high-resolution 3D volume images can be acquired rapidly. The 3D FIESTA technique is especially useful for the rapid acquisition of high-spatial-resolution images of static structures such as cochlea, internal auditory canal, or joints.

3D COSMIC

Coherent Oscillatory State Acquisition for the manipulation of imaging contrast is a 3D sequence for imaging of axial c-spine. COSMIC uses modified fast GRE pulse sequence with steady-state free precession segmented multi-shot centric k-space acquisition. This improves the CNR and SNR of c-spine tissue including the spinal cord, vertebral disks, nerve root canal and contrast between CSF and nerve roots.

2D FatSat FIESTA

Fast Imaging Employing STeady-state Acquisition (FIESTA) is designed to produce high SNR images extremely rapidly and with excellent contrast between tissues. The contrast relies on a steady state for the transverse magnetization, which builds as a series of radio frequency pulses and special gradient pulses are repeated after an extremely short repetition time, TR. FIESTA accentuates the signal from tissues that have a long T2 and short T1. FIESTA has the capability to suppress the signal from fat, especially to create more contrast between the vasculature and surrounding tissues.

2D FIESTA CINE

Fast Imaging Employing STeady state Acquisitions is a fully balanced steady-state coherent imaging pulse sequence that has been designed to produce high SNR images at very short TR. The pulse sequence uses fully balanced gradients to re-phase the transverse magnetization at the end of each TR interval. This sequence accentuates the contrast of anatomy with high T2/T1 ratios (such as the cardiac blood pool), while suppressing the signal from tissues with low T2/T1 ratios (such as muscle and myocardium). This enhances the contrast between the myocardium and the blood pool.

VCG Gating

Allows more robust trigger detection.

Connect Pro

ConnectPro software enables the DICOM worklist server class for the operator-console, making it possible for the console to query your HIS/RIS by name, modality, or scheduled date, and to download patient demographics directly to the scanner. This may require separate gateway hardware to connect non DICOM-compatible HIS/RIS systems to the MR system.

Performed Procedure Step

Performed Procedure Step (PPS) is an important automated connectivity capability and a key step towards a film-less and paperless environment. In conjunction with the GE PACS broker, it automatically notifies the HIS/RIS and PACS systems of procedure status, which then closes the loop on the information gathered from patient arrival through billing. This results in improved patient care and enhanced productivity.

SIGNA™Works (continued)

QuickSTEP

QuickSTEP automatically prescribes, acquires, and combines images from multiple stations for fast acquisition and exam completion. To complete the entire exam in as little as 6 minutes, the system will automatically acquire mask datasets from multiple stations without any user intervention. Secondary images are then acquired at the same independent table positions. The system will automatically subtract the mask images from the secondary dataset and combine the resulting images from the multiple stations into one series. The user needs only to complete a quick review of the data prior to insertion of images into the database.

SWAN 2.0

SWAN 2.0 is a high-resolution 3D multi-echo gradient echo sequence that produces weighted averaging across images with different TE's to achieve higher susceptibility weighting. It provides minimum intensity projections over neighboring slices, enhancing contrast for certain tissues containing iron, venous blood, and other substances with susceptibilities that are different than the background tissues. SWAN 2.0 outputs an unwrapped phase image leading to increased delineation between diamagnetic products and paramagnetic products (such as blood or iron). Due to the nature of the weighted averaging of the multi-echo sequence, the SNR of SWAN is higher than that of a single-echo acquisition. SWAN 2.0 helps visualize and delineate small vessels, as well as large vascular structures and iron or calcium deposits in the brain.

IDEAL

This sequence and reconstruction package acquires multiple echoes at different echo times with a fast spin echo readout to create water-only, fat-only, in-phase and out-of-phase images. IDEAL is designed for imaging those difficult regions such as the neck and spine where inhomogeneous magnetic fields yield failures with traditional fat saturation techniques.

IDEAL IQ

IDEAL IQ is a GE exclusive technique that builds upon the original IDEAL (Iterative Decomposition of water and fat with Echo Asymmetry and Least-squares estimation) technique. IDEAL IQ acquires multiple images of the anatomy at separate echo times to calculate the phase differences and determine triglyceride fat and water content per pixel. It exploits the resonance frequency differences between triglyceride-fat and water, measured as phase differences in multiple echoes, to resolve the triglyceride-fat and water. It provides reliable and uniform water-fat separation in the presence of B0 field inhomogeneity and improves the accuracy of waterfat separation by estimating and correcting for T2* decay between echoes and by more accurately modeling triglyceride fat's spectral profile as multiple peaks rather than a single peak. The result is a triglyceride fat-fraction map image that reflects the spatial distribution of relative concentration of triglyceride fat within a voxel.

Diffusion Tensor Imaging with Fiber Tracking

This package expands the EPI capability to include diffusion tensor imaging, a technique that acquires diffusion information in up to 300 different diffusion directions. It generates image contrast based on the degree of diffusion anisotropy in cerebral tissues such as white matter. Readyview capabilities on the console (included with SIGNA™Works) create Fractional Anisotropy (FA), Apparent Diffusion Weighted (ADC) and T2-Weighted TRACE maps. The FiberTrak post-processing utility generates eigen-vector information from the diffusion tensor acquisition and processing. Using a robust and efficient seeding process, three-dimensional renderings of the diffusion along white matter tracts are generated.

PROBE – 2D CSI / 3D CSI

This extends the PROBE-PRESS capabilities with simultaneous multi-voxel in-plane acquisitions. Post-processing, including the generation of metabolite maps is automatically generated with Readyview Performance package.

3D ASL (Arterial Spin labeling)

3D ASL utilizes water in arterial blood as an endogenous contrast medium to help visualize tissue perfusion and provide quantitative assessment of cerebral blood flow (CBF) in ml/100 g/min. 3D ASL deploys stocked spiral FSE readout with modulated fiip angle to acquire 3D volumetric data with increased SNR and less image distortion compared to conventional 2D EPI-bosed ASL techniques. A pulsed continuous labeling is applied to Iobel arteriat blood close to the imaging volume thus improving conspicuity of flowing blood. Selective interwoven pulses are then used to saturate and invert the imaging volume, in order to achieve better background suppression, and reduce sensitivity to motion. The 3D volume can be reformatted to axial sagittal coronal or oblique planes. The quantitative color CBF mops can be generated and stored in

DICOM format. 3D ASL helps generate robust, reproducible images and perfusion maps with high SNR. Reduced motion artifacts and less distortion in high magnetic susceptibility regions.

VIBRANT

VIBRANT* (Volume Imaging for Breast AssessmeNT) permits high definition bilateral imaging of both breasts in the time that it normally takes to image a single breast. VIBRANT integrates ASSET parallel imaging, bilateral shimming, and a patented

fat-suppression technique developed specifically for breast imaging. VIBRANT allows the slices to be acquired in either the sagittal or axial orientation.

VIBRANT Flex

VIBRANT Flex uses a time-efficient dual-echo acquisition with 2D ARC parallel imaging to produce water-only, fat-only, in-phase, and out-of-phase images of the breast in a single scan. The Flex processing eliminates fat saturation failures to provide a clear depiction of the underlying breast anatomy.

SIGNA™Works (continued)

BREASE

BREASE is a TE averaged PRESS spectroscopy acquisition help characterize breast anatomy.

LAVA Flex

LAVA Flex is a 3D FSPGR imaging technique that generates fat/water in-phase and out-of-phase echoes in a single acquisition. Up to 4 types of image contrasts may be achieved within one acquisition: in phase, out of phase, water only, fat only. The water only contrast differs from a conventional fat suppressed image in that an inversion prep pulse is not applied for fat suppression. In fact, the fat information is removed leaving a water only image that may potentially be used in place of a LAVA type image. LAVA Flex uses ARC. (Auto Calibrating Reconstruction for Cartesian Sampling), a 2D self-calibratedparallel imaging technique that allows for acceleration in both phase and slice directions for supported coils.

CartiGram T2 Map

Cartigram is a non-invasive technique for the visualization of subtle changes in the cartilage ultra-structure. It employes special multi-echo T2 weighted technique to generate multiple images per location. The acquired data is processed in Readyview to produce the T2 color maps that better demonstrate subtle changes compared to the conventional gray scale visualization.

Inhance 3D Velocity non-contrast MRA

This technique, based on 3D Phase Contrast, is specially designed for neuro and renal arteries. The role of phase contrast MRA is well established in visualization of complex, multi-directional flow in brain as well as renal arteries. The Inhance 3D Velocity takes this technique few steps ahead by

• 3D Volumetric acquisition with ASSET parallel imaging

• Improved background suppression and Respiratory trigger to enable abdominal applications

• Respiratory trigger to enable abdominal applications

Inhance 2D Inflow non-contrast MRA

This technique is based on 2D TOF, which is known for its speed and simplicity while imaging the unidirectional blood flow such as in carotids, popliteal and femoral.

The Inhance 2D Inflow technique further improves the effectiveness of 2D TOF by employing:

• Peripheral Gating

• Centric k-space acquisition to match peak systolic signal

• Dummy RF for saturating diastolic signal

• More views/segment and

• ASSET parallel imaging

Inhance Inflow IR non-contrast MRA

The high-SNR, bright-blood behavior of the steady-state sequences, such as FIESTA is well known. The Inhance IFIR further enhances this phenomenon by applying a selective inversion pulse over the region of interest to invert arterial, venous and static tissue, and then, at the null point of the venous blood, applying an excitation pulse to generate strong arterial signal.

The other technologies used in this application are – ASSET parallel imaging, SPECIAL spectral fat saturation and respiratory gating.

Inhance 3D DeltaFlow non-contrast MRA

Inhance 3D DeltaFlow, based on 3D FSE, has been specially designed for peripheral arterial imaging.

The cardiac-gated 3D FSE acquires two echoes - one in diastole and the other in systole. The slow arterial flow during diastole results in bright arteries in the diastolic-images while faster arterial flow during systole results in darker arteries in the systolic-images. Subtraction of the two provides arterial-only images with excellent suppression of venous-flow and the background signal.

Interleaved acquisition and ASSET parallel imaging with optimized k-space trajectory helps respectively reduce motion miss-registration and improve vessel visualization. In addition, the use of partial-Fourier and coronal plane acquisition allows for considerably reduced scan time.

iDrive Pro Plus

iDRIVE Pro Plus expands the capabilities of standard iDrive Pro with:

• Geometric changes to image plane location, obliquity, rotation, center FOV and FOV size

• Contrast parameters such as spatial pre-saturation on/off, special sat pulses, flow comp and RF spoiling

• Application of a non-selective IR pulse

• Swapping phase and frequency

It starts with an intuitive point-and-click user interface and live, on-image navigation icons. It continues with click-of-the-mouse image book-marking and a suite of localization and drawing tools, and includes capabilities from 10-level undo/redo,

built-in time, autoNEX and click-of-the-mouse display/review/save, all to streamline even the most complex exams and manipulations.

SIGNA™Works (continued)

3D FatSat FIESTA

3D FatSat FIESTA is software designed for imaging of the coronary arteries. The software acquires 3D images using FIESTA (Fast Imaging Employing STeady-state Acquisition). Fat suppression is applied to accentuate the coronary arteries. The use of VAST (Variable Sampling in Time) technology greatly shortens

breath-holding requirements or allows for higher spatial resolution.

FGRE Time Course

The FGRE Time Course PSD is a fast gradient-echo sequence optimized for time-course studies. FGRE TC utilizes single-echo acquisition to help reduce sensitivity to echo mis-alignment or system calibrations variations. ASSET parallel imaging and shortened RF pulse design are incorporated to help improve temporal resolution and reduce motion related artifacts. In addition to selective notch pulse, it also supports non-selective saturation pulse for excellent background suppression and

multi-plane imaging capability.

2D/3D Myocardial Delayed Enhancement (MDE)

Determine myocardial tissue viability simply and reliably. Performed in a single breath-hold, 2D/3D Myocardial Delayed Enhancement (MDE) provides fast, simple, reliable assessment of myocardial tissue viability or fibrosis by improving the

contrast-to-noise ratio between infarcted and normal myocardium.

Cardiac Tagging

This application is used for the visualization of contractile function. It combines cardiac-gated FastCINE gradientrecalled echo with spatial SAT pulses applied throughout the FOV. Using the operator's choice of diagonal stripes or a grid pattern, tagging is applied once per R-R interval, immediately following the R-wave ECG trigger, just before the start of data acquisition.

PROPELLER MB

PROPELLER MB uses innovative k space filling technique and post processing algorithms to help reduce and correct for motion and minimize magnetic susceptibility artifacts. Radial k space filling pattern causes oversampling of the k space center, generating more SNR and providing excellent tissue contrast. Radial k space filling is inherently less sensitive to motion compared to the Cartesian method. In addition, a sophisticated motion correction post-processing algorithm is deployed to reduce effects of motion originating from CSF flow, breathing, patient tremor or voluntary movements. PROPELLER MB has been enabled for high quality T1 FLAIR, T2, T2 FLAIR imaging in all planes, high quality axial diffusion weighted imaging for brain, high quality T2 weighted imaging for c-spine, excellent T2 weighted imaging for Body, and excellent T2/PD weighted imaging for MSK.

PROBE PRESS single voxel spectroscopy

PROBE PRESS single-voxel spectroscopy allows you to non-invasively evaluate the relative concentrations of in-vivo metabolites and lets you acquire and display volume-localized, water-suppressed H1 spectra in single voxel mode. The package includes automated recon, cquisition set-up and graphic prescription of spectroscopic volumes. The standard sequence consists of three slice-selective RF pulses with crusher gradients. The PRESS sequence makes use of reduced flip angles to decrease TE time of the sequence. The key advantage of PRESS (over STEAM) is that it provides up to twice the SNR and hence decreased exam time or voxel size. It is the sequence of choice for all Hydrogen single voxel spectroscopy data acquisitions with TE values ≥ 35 ms.

Express Spine Annotation

Enables semi-automatic annotation of vertebral bodies on saggital T2W spine images.

eDWI

The enhanced Diffusion Weighted Imaging technique has been designed to provide high signal-to-noise-ratio diffusion images of the liver and brain with short acquisition time Its multi-B feature is designed to provide measurement of apparent diffusion coefficient (ADC) map with reduced effect of perfusion. In addition. "3 in 1" technique applies diffusion weighting to all three grodients simultaneously, helping Improve sensitivity. Built in tetrahedral feature applies four different diffusion weighing combinations of x. y, and z gradients simultaneously to acquire isotropic diffusion weighted images with high signal to noise ratio and shorter TE. Its smart NEX feature significantly reduces the acquisition time. An inversion recovery is deployed to provide robust fat suppression. Enhanced DWl package includes the acquisition sequence and post-processing tools.

3D PROMO

3D PROMO provides a real time 3D navigator based motion correction algorithm correcting for the 6 rigid body terms where re-acquisition of severely corrupted data provides robust high quality motion reduced 3D outcomes. 3D PROMO is compatible with both T2 and T2 FLAIR CUBE acquisitions.

MAVRIC SL*ᵎ HyperMAVRIC SL*

Multi-Spectral imaging technique is designed to reduce metal artifact near MR conditional implants. Improvements have been made with 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.

*Optional

SIGNA™Works (continued)

The Silent Neuro Exam Package

The Silent Neuro Exam Package includes a completed set of sequences designed to generate high-resolution images which delivers T1, T2, Flair, PD and Diffusion weighted contrasts. The new Silenz 2.0 imaging sequence delivers 3D isotropic and non-isotropic images with T1 and/or PD contrast with sound levels that are within 3dB(A) of the ambient conditions. Newly enhanced gradient waveforms have been employed to minimize the acoustic SIGNAture of FSE, 3D Cube and PROPELLER based acquisitions to generate T2 and T2 Flair weighted as well as Diffusion weighted images. In addition, the localizer and pre-scan sequences have been optimized as well to deliver a complete neuro exam at near fully silent levels. In addition, the localizer and pre-scan calibration sequences are optimized to deliver a complete neuro exam at near silent levels.

MAGiC

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.*

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.

StarMap

StarMap is a technique that acquires multiple echoes at different TE times at each location resulting in images that represent different T2 and T2* weighting. Post-processing of the images is employed to generate gray scale and color maps of the T2 or T2* signal decay across the echoes, which can be useful in the assessment of the presence of iron.

2D Delayed Enhancement

This technique uses an IR prepared, cardiac-gated fast gradient echo sequence to acquire images whose appearance depends on the tissue's T1 relaxation time. The IR-preparation step allows various tissues to be suppressed or enhanced. The IR prep pulse in this sequence is non-selective; i.e. it excites the entire volume inside the body coil, rather than a specific slice.

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.

MR Touch

MR-TouchTM is a non-invasive method to measure relative tissue stiffness with MR. MR Touch™ combines hardware, acquisition and reconstruction algorithms to produce color-coded anatomical images, called Elastograms, showing varying degrees of elasticity or stiffness. The image contrast is related to relative stiffness of soft tissue and is generated from the real-time data acquisition during tissue palpation with low amplitude and low frequency sound waves. The hardware component is comprised of an active sound wave generator and a passive transducer that produces small vibrations in the area of the patient to be scanned.

The acquisition software also triggers the sound wave generator to produce synchronized vibrations on the surface of the patient during the data acquisition. The reconstruction algorithms generate images that show the propagation of waves through the tissue (phase images) and also the corresponding strain wave and relative stiffness images. Parallel imaging is used to accelerate image acquisition.

Auto Navigator

Auto Navigator feature is designed to deliver real time robust free breathing respiratory motion compensation to improve routine and advanced body applications. It includes automated tracker placement to detect respiratory motion and delivers a simple workflow to the technologist. Further, the Auto Navigator feature is compatible with DISCO, Turbo LAVA, Turbo LAVA Flex to deliver free-breathing body imaging capability for maximum patient comfort.

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

**Optional package (MAGiC in itself does not deliver advanced imaging)†Some product features may not be available in all countries.

***DISCO Star is not 510(k) cleared and not CE marked. It can not be placed on the market until it has been registered in regulated countries.

SIGNA™Works (continued)

PROSE

PROSE (PROstate Spectroscopy and imaging Examination), is a noninvasive imaging technique to evaluate prostate lesions.

A dedicated prostate spectroscopy sequence that integrates coil corrected MR imaging, and PRESS excitation with 3D multi-voxel acquisition optimized for citrate in the presence of

strong lipid signal.

FOCUS

FOCUS delivers a highly efficient method for increasing the resolution in Single Shot DW EPI sequences. The outcome delivers robust high resolution imaging while removing artifacts typically induced from motion, image back-folding or unsuppressed tissue. In addition, the reduced field of view imaging leads to a reduction in blurring that translates into an overall improvement to the image quality result. The sequence utilizes 2D selective excitation pulses in DW-EPI acquisitions to limit the prescribed phase encoded field of view.

3D Heart

3D Heart has been designed for comprehensive whole heart imaging with

- 3D Fast GRE/SPGR for high resolution myocardial evaluation
- 3D Delayed Enhancement
- Cine IR
- Navigator

The whole heart volume is acquired in several slabs, using a multi-slab localizer that allows easy whole-heart prescription, compared to prescribing specific anatomical views in 2D acquisitions. A T2 preparation is deployed to improve the contrast to noise ratio between myocardium and the coronary for 3D FatSat Fiesta. A navigator echo pulse that detects motion of the diaphragm is utilized to enable free-breathing acquisition. The navigator has been optimized to improve robustness, and includes a slab-tracking feature that automatically shifts slab positions based on the detected diaphragm location to improve motion suppression and increase scan efficiency. The multi-slab acquisition minimizes the effect of respiratory drift and heart rate variability on image quality. Furthermore, the SNR is improved with mulit-slab due to less blood saturation effect. An optimized phase ordering and steady state preparation has also been used to improve CNR and SNR. 3D Fatsat FIESTA is mandatory for the 3D Heart application.

Together with the 3D Fatsat FIESTA, the 3D Heart offers a strong foundation for needle free non-contrast imaging of the Coronary vasculature.

Black Blood Single Shot Fast Spin Echo

Black Blood SSFSE is available for dual or triple inversion pre-pulse single shot FSE based acquisition for morphological imaging of the heart and vessels. The inversion pre-pulses allows for nulling of the blood pool for improved visualization of vessels and heart structures. Utilization of single shot acquisitions enables single breath-hold multi-slice coverage which leads to larger volume coverage in fewer breath-holds for patient tolerance as well as reduction of overall exam times.

CMR42

CMR42 Cardiac MR analysis software from Circle Cardiovascular Imaging Inc, available through GE Healthcare, is a cardiac analysis environment that improves efficacy and performance for all of your cardiac imaging needs. cmr42 delivers the latest in function, flow, tissue analysis and perfusion as a comprehensive base package. When properly equipped, the user can extend capabilities to T1, T2 Mapping and Tissue Tracking.

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.

SIGNA™Works Features

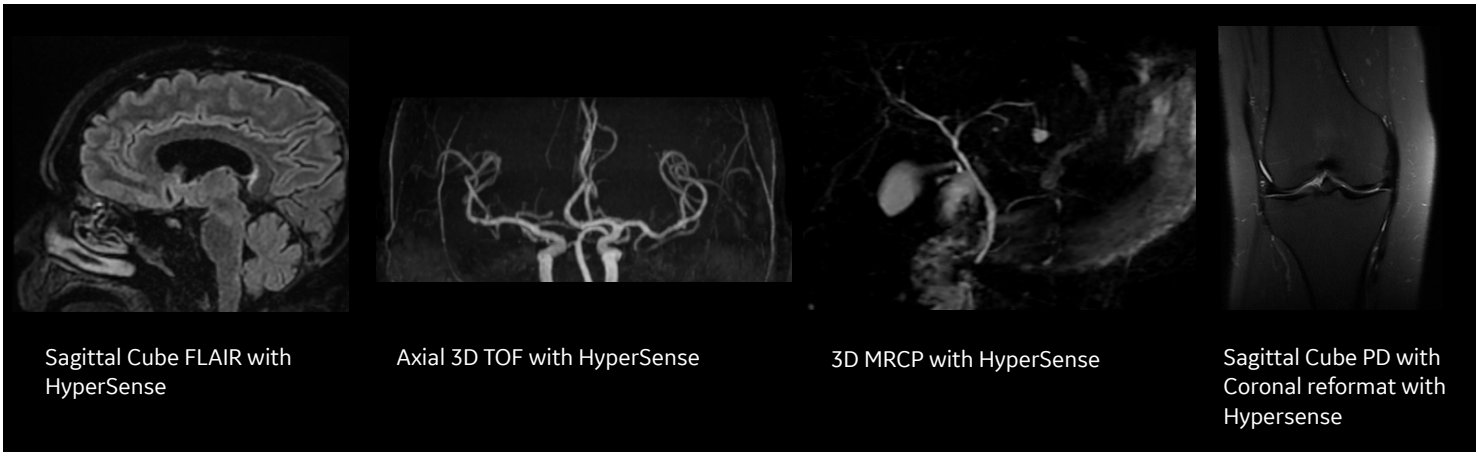
HyperSense*, **

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, extending the capabilities to additional sequences

Benefits

- Increase productivity by reduced scan times
- Combined with ARC for higher acceleration factors
- Reduce breath hold time for dynamic imaging
- Drives higher spatial resolution for 3D imaging



Sagittal Cube FLAIR with HyperSense

Axial 3D TOF with HyperSense

3D MRCP with HyperSense

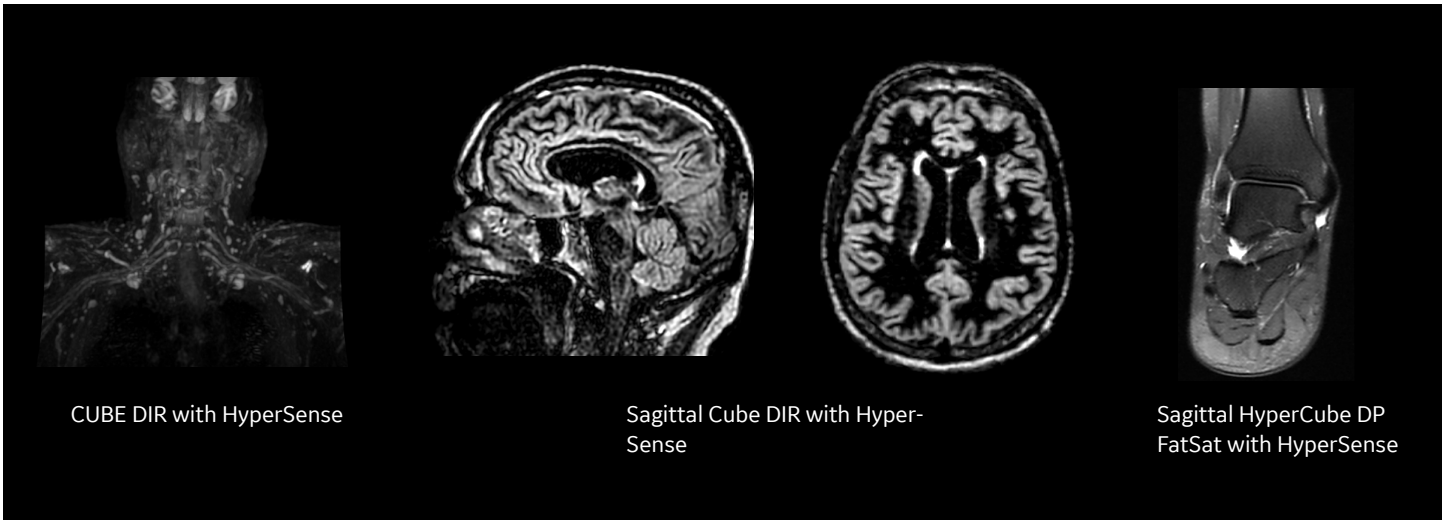
Sagittal Cube PD with Coronal reformat with Hypersense

HyperCube

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



CUBE DIR with HyperSense

Sagittal Cube DIR with Hyper-Sense

Sagittal HyperCube DP FatSat with HyperSense

**HyperSense expansions are not 510(k) cleared and not CE marked. It can not be placed on the market until it has been registered in regulated countries.

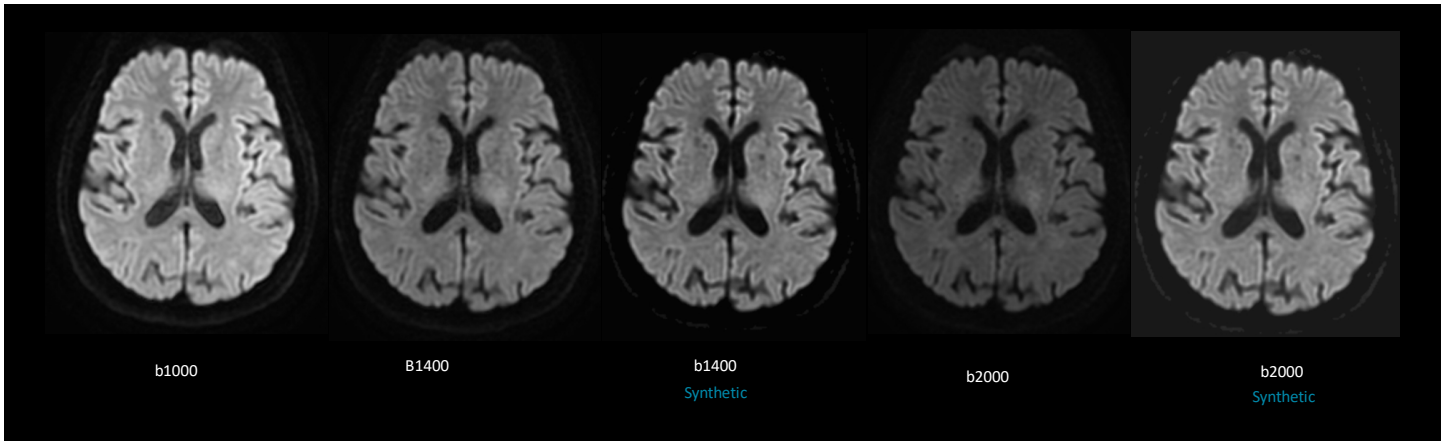
SIGNA™Works Features (continued)

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 and resulting in shorter scan times without sacrificing contrast or anatomy coverage. Synthetic Diffusion is not limited to diffusion directionality or coil type.

Benefits

- Multiple synthetic b-values from a single DWI scan
- High b-values in shorter scan times
- Compatible with FOCUS Diffusion
- Calculates high b-value as required by PIRADS for prostate

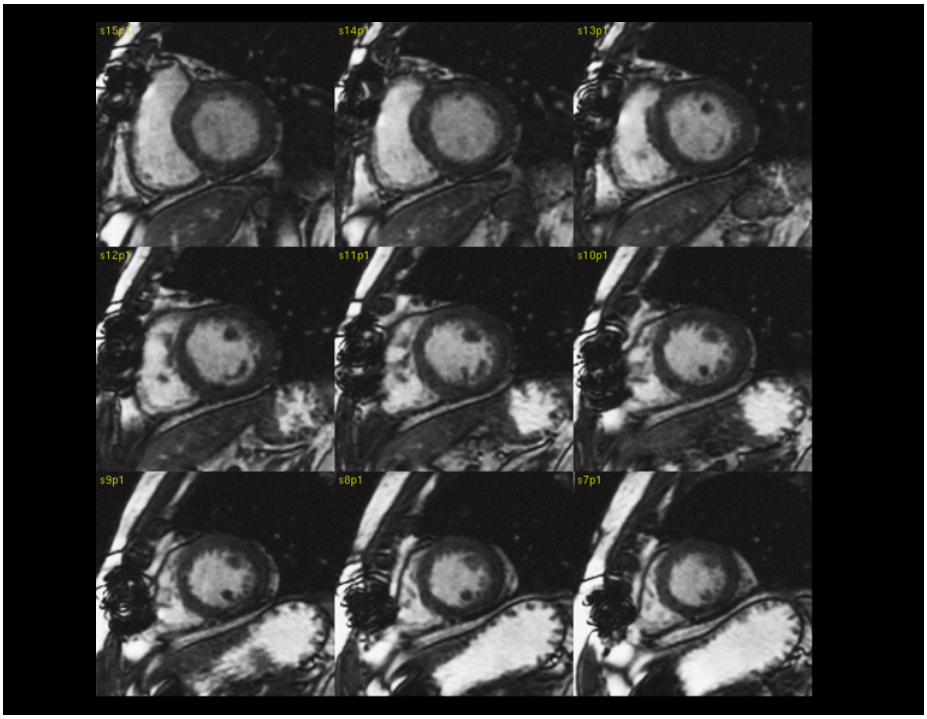


ViosWorks*

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. Provides high spatial resolution to enable visualization of flow through complex structures.

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



*Optional

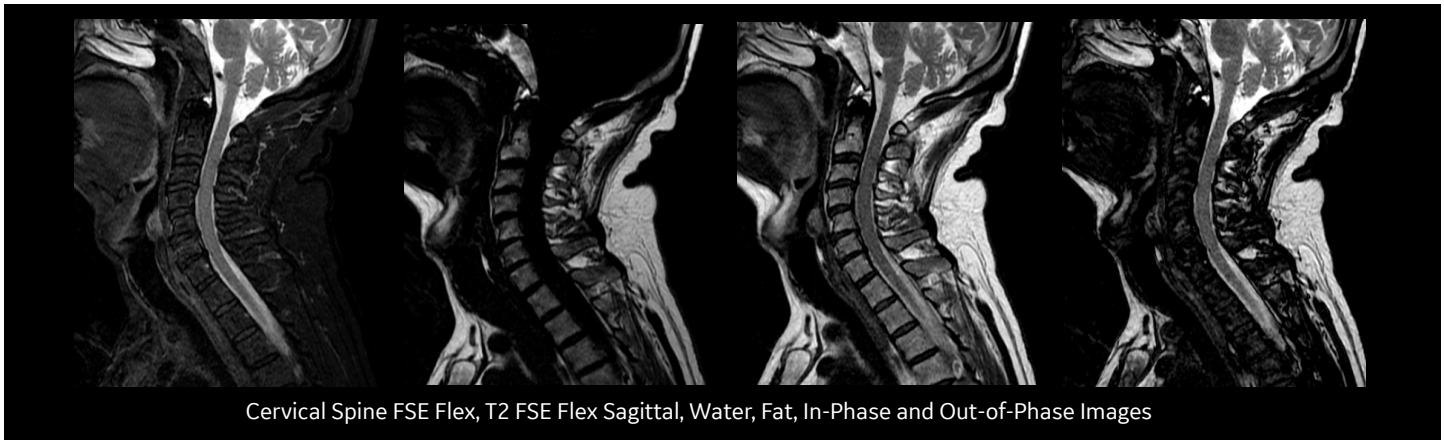
SIGNA™Works Features (continued)

Flex for Cube and FSE

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

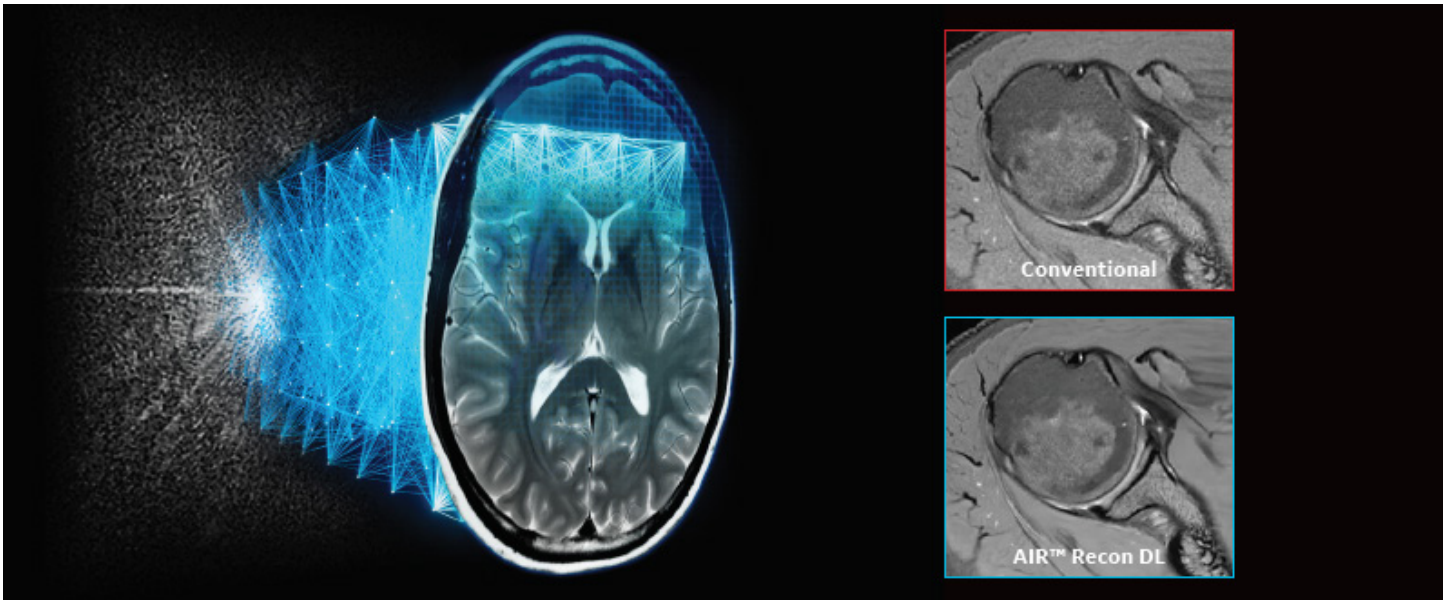
- 2D and 3D dual echo fat-water separation technique
- Uniform fat suppression for large FOV challenging offcenter anatomies
- Dixon-based, less sensitive to B0 inhomogeneity
- Choice of single pass acquisition for significant scan time reduction
- Water, Fat, in-phase and out-of-phase images



Cervical Spine FSE Flex, T2 FSE Flex Sagittal, Water, Fat, In-Phase and Out-of-Phase Images

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. Compatible with most 2D applications, including diffusion weighted EPI.



AIR™ Recon DL is a pioneering, deep-learning based reconstruction software that will change the way you think about MR imaging. Part of GE Healthcare's AIR™ family of products, which includes lightweight coil design and intelligent workflow applications, this software 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 because it's embedded directly in the reconstruction pipeline and is applied to raw data to remove noise and ringing artifacts.

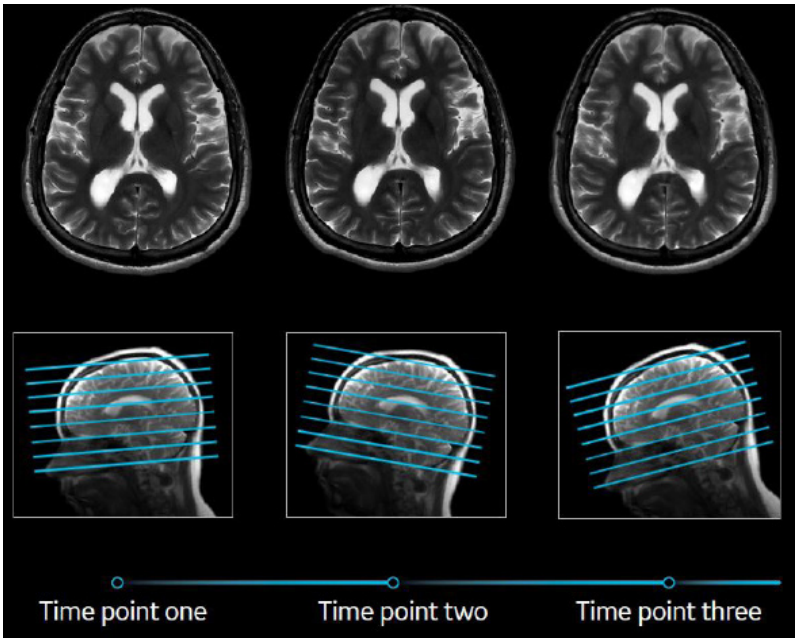
AIR™ RECON DL AT A GLANCE

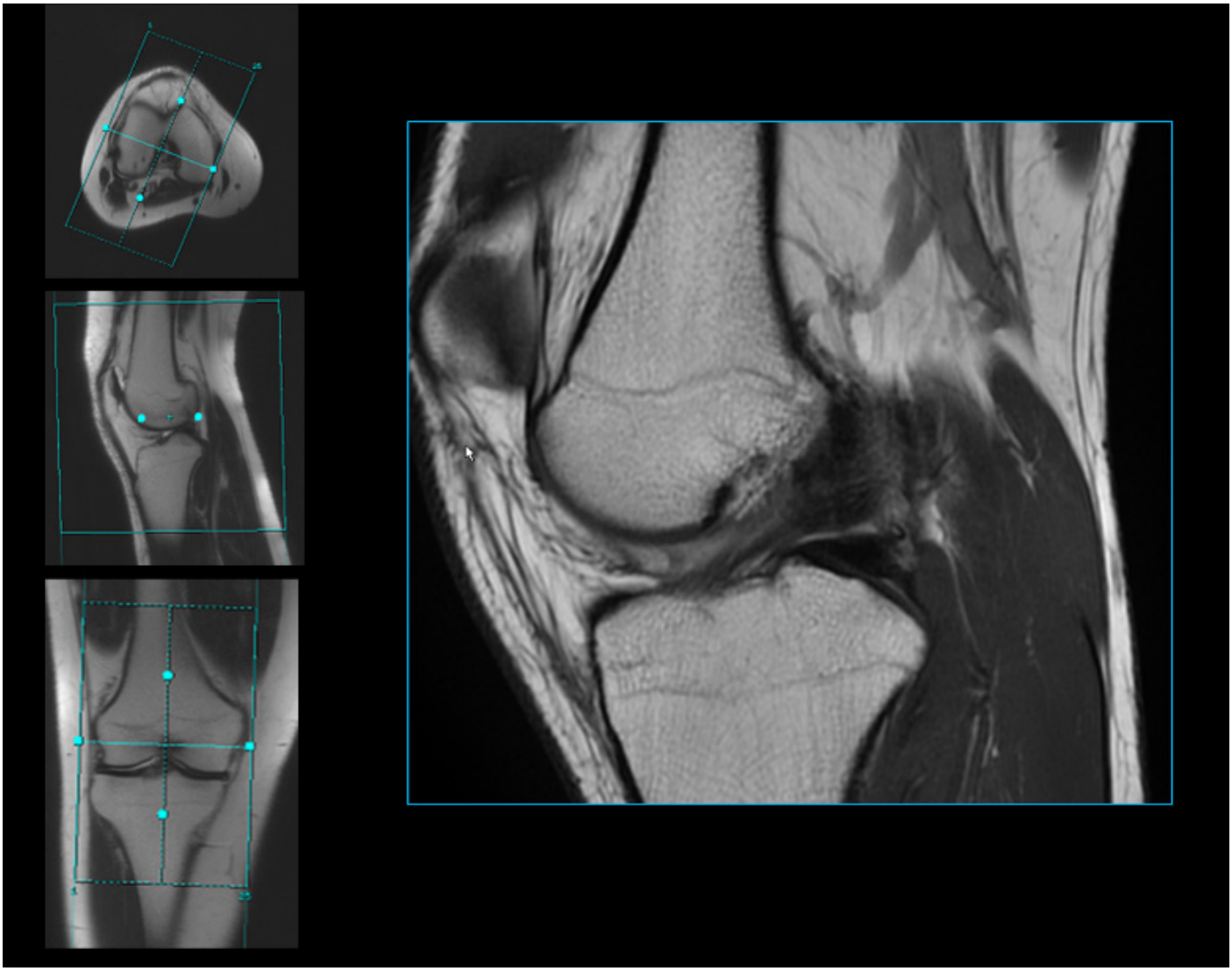
- Increases productivity by enabling shorter scan times
- Removes image noise and ringing by leveraging raw image data
- Delivers sharper and clearer TrueFidelity™ MR images
- Enables you to set your preferred SNR improvement level

*Optional, AIR Recon DL is not CE marked. It can not be placed on the market until it has been registered in regulated countries

AIRx™*

- 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.





*Optional

SIGNA™Works Features (continued)

PROGRES*

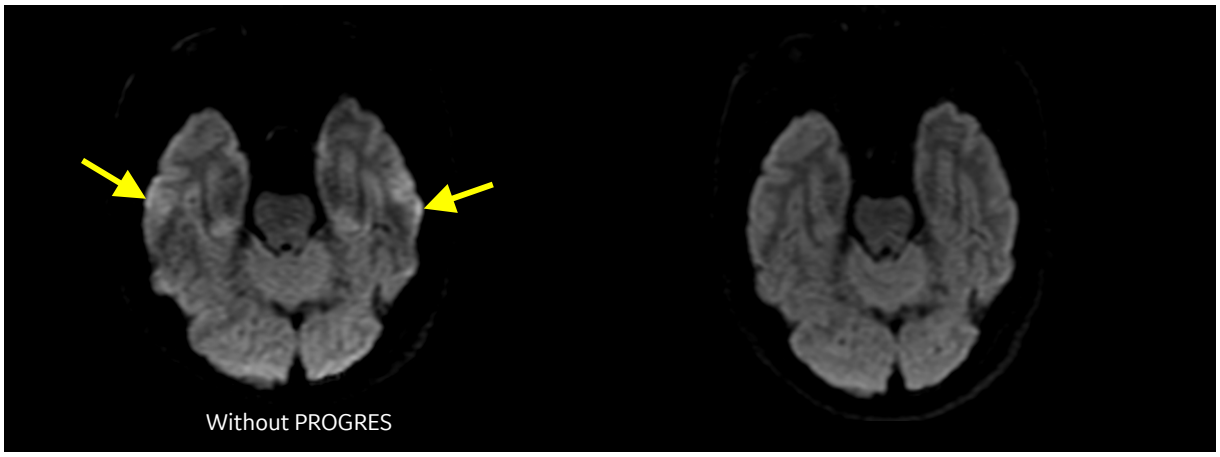
Resolving the limits of diffusion distortion

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



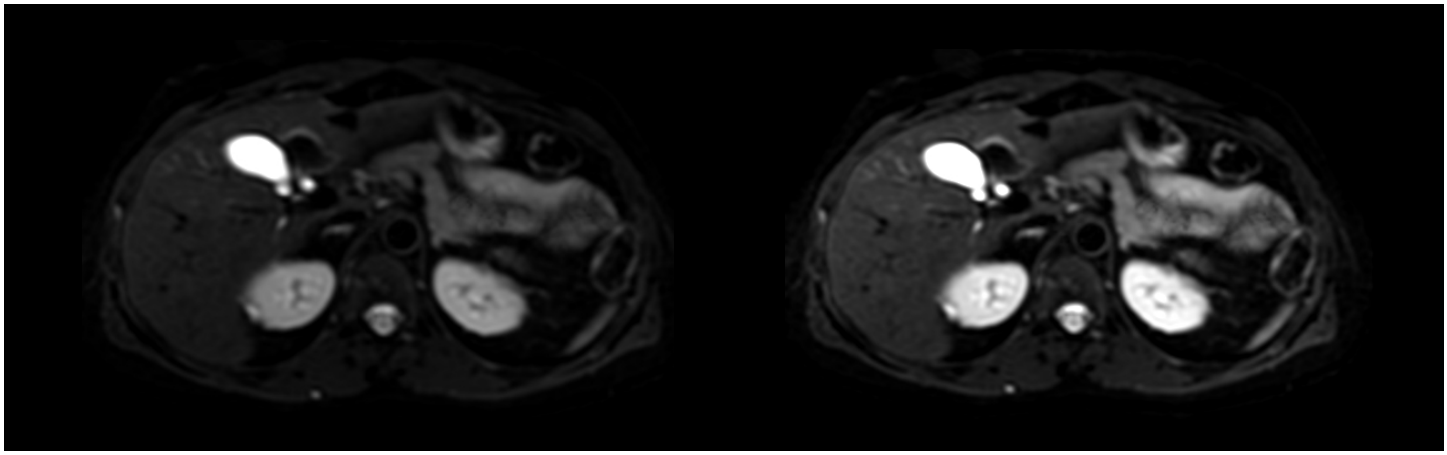
MUSE*

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 well as acceleration such as ARC and 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



*Optional

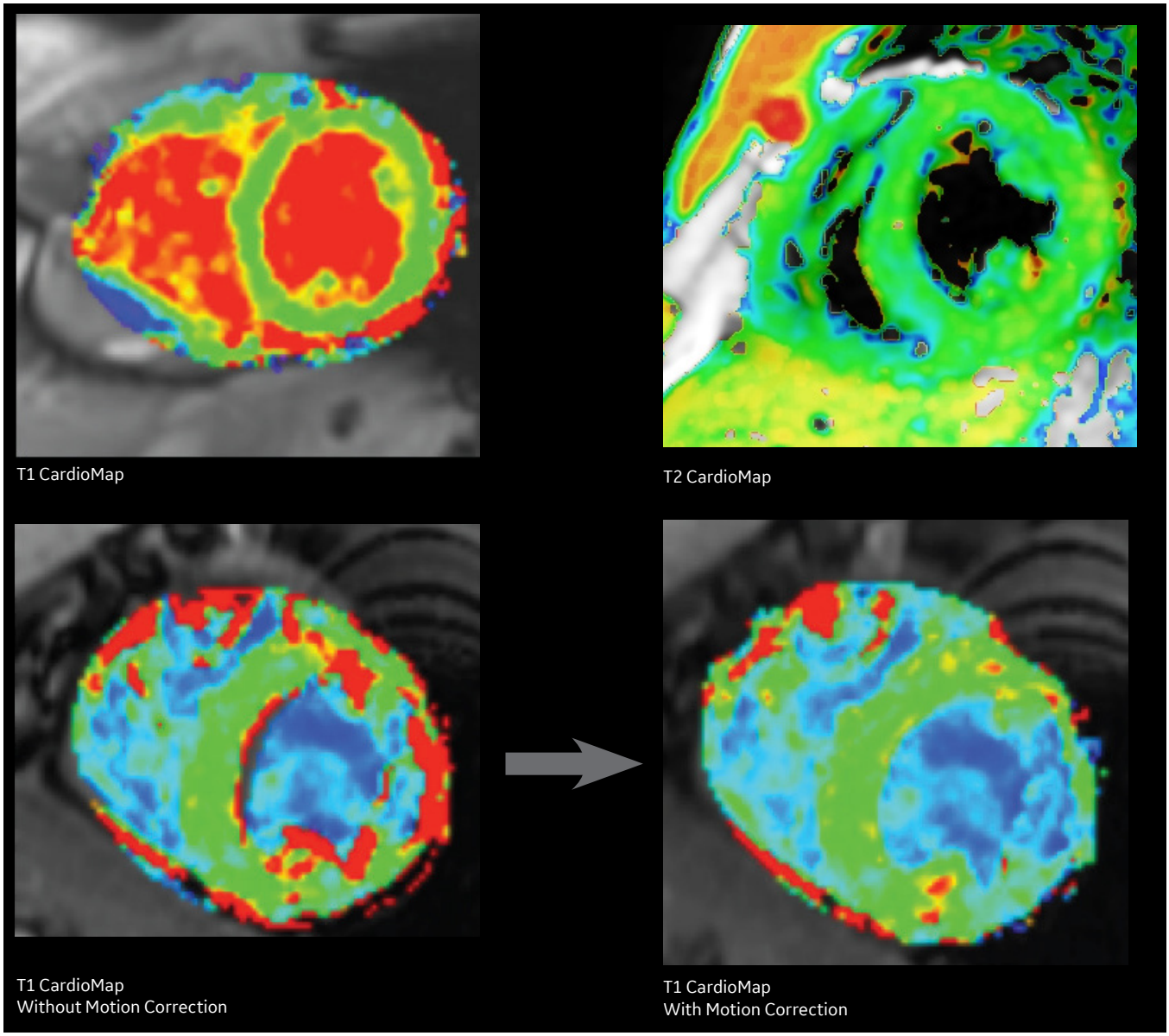
SIGNA™Works Features (continued)

CardioMaps*

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
- R2 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

*Optional

Site Planning and power consumption

Accessory Package

The scanner comes with the Unified coil phantom set, customer diagnostic software, operator manuals, and patient log books.

InSite* Remote Diagnostics

Remote service and applications support including magnet monitoring, is readily available. This capability also allows downloading of applications software including the trial software available to users through our eFlex program.

Warranty

The published Company warranty in effect on the date of shipment shall apply. The Company reserves the right to make changes.

Regulatory Compliance:

The SIGNA™ Explorer 1.5T MR System is 510(k) cleared by the FDA & a CE-marked device that satisfies Electro-Magnetic Compatibility (EMC) and Electro-Magnetic Interface (EMI) regulations, pursuant to IEC-60601. Laser alignment devices contained within this product areappropriately labeled according to the requirements of the Center for Devices and Radiological

Health (CDRH) and IEC 60825-1.

Fringe Field		
	Axial	Radial
0.5 mT	4.00 m	2.5 m
0.1 mT	5.70 m	3.4 m

Weight of the key system component (Shipping data)	
Magnet weight	3900 kg
Magnet with enclosures and cryogen	5320 kg
Electronics Cabinet	950 kg
Low Height Fixed Table	220 kg
Patient table detachable Signa Lite	150 kg

Electrical Power Supply	
Recommended Configuration	3-phase Grounded WYE with Neutral and Ground (5 wire system).
Alternate Configuration	3 phase DELTA with Ground (4 wire). Recommend corner Grounded Delta configuration.
Frequency	50 ± 3.0Hz or 60 ± 3.0 Hz (Local Voltage adoption may be required)
Voltage	480/415/400/380/208/200 Vrms

Temperature and Humidity		
	Temperature in degrees Celsius	Humidity in percent
Magnet Room	15° – 21° C	30 to 60
Control Room	15° – 32° C	30 to 75
Equipment Room	15° – 28° C	30 to 75

For more details, please contact GE representative or refer to the GE pre-install manual.

Site Planning and power consumption (continued)

Power management technology

Due to multiple power supplies and amplifiers employed in a modern day MRI, power surges may occur. SIGNA™ Explorer offers robust power management technology to reduce the peak instantaneous power demand.

Power consumption

Power consumption depends on actual usage. They include consumption by the shield cooler compressor. The following values are approximate and are measured per COCIR standards:

Power Consumption	
Sleep Mode	6.6 kW
Standby (no scan)	9.82 kW
Typical consumption per COCIR standards	14.94 kW
Peak Instantaneous power < 5s	20.4 kW
Continuous sustained power	17.13 kW

Minimum room dimensions		
	With Equip Room	No Equip Room
Magnet Room	3.53m x 5.7m	3.53m x 5.7m
Control Console Room	1.52m x 2.13m	3.334m x 1.9m
Electronics Equipment Room	2.7m x 2.5m	
Total Area needed excluding chillers	31.60m^2	27.39m^2

DICOM Compliance

Images generated by the SIGNA™ Explorer scanner adhere to the 2004 version of the DICOM conformance standard.

Objects created by the system include:

- MR images
- Secondary-capture images, both grayscale and color
- Grayscale Softcopy Presentation State (GSPS)
- Structured reports
- In addition to supporting MOD, CD-R and DVD-R for image exchange and archive
- DICOM interchange, the system also supports:
- CT images
- PET images
- RT structure set
- GEMS PET raw information

Transactions supported as a Storage Class User (SCU) or Store Class Provider (SCP) include:

- DICOM store with storage commit (SCU)
- DICOM store (SCU/SCP)
- DICOM modality worklist (SCU)
- DICOM performed procedure step (SCU)
- DICOM query retrieve (SCU/SCP)
- DICOM print – grayscale and color – (SCU)
- Basic application level confidentiality profile as a de-identifier

Finally, this system supports the following IHE (Integrating the Healthcare Enterprise) Technical Profiles. Scheduled workflow with the following options:

- Patient-based worklist query
- Broad worklist query
- Assisted-acquisition protocol setting
- Patient information reconciliation
- Simple image and numeric report
- Consistent presentation of images

Imagination at work

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