TOMORROW TODAY

SIGNA™ Voyager

Premier Edition datasheet

gehealthcare.com/mr

SIGNA™ Voyager

Enter a whole new realm of possibility in MR with the new SIGNA™ Voyager. This system is designed to maximize productivity and workflow while delivering extraordinary clinical potential and exceptional patient comfort. And it has one of the smallest footprints and one of the lowest power consumptions in the industry for a 1.5T wide bore system.

Get ready to experience MR excellence!

SIGNA™ Voyager: Redefine the limits of what's possible.

Through enhanced technology, we've advanced the capabilities of wide-bore MR by delivering 1.5T image quality with both high productivity and an extraordinary patient experience.

Building on the solid foundation of proven 1.5T Innovative Platform Magnet technology SIGNA™ Voyager includes the next generation in RF technology and gradient technology.

Built on the latest GE MR platform, the SIGNA™ Voyager offers a wide range of advanced clinical functionality, making it a workhorse 1.5T system for practices of various sizes and specialties.

Magnet

The foundation for quality and flexibility

When it comes to improving the patient experience and providing high image quality no other component of an MRI system has greater impact than the magnet. The SIGNA™ Voyager features a wide bore magnet that delivers a large field of view. The magnet geometry has been optimized to reduce patient anxiety by providing more space in the bore. The 50cm field of view provides uniform image quality and could reduce exam times since fewer acquisitions may be necessary to cover large anatomy.

Easy siting and affordable operation:

Complemented by GE's active shielding technology, the SIGNA™ Voyager has very flexible installation specification for easy siting. And with zero-boil-off technology helium refills are effectively eliminated, thus reducing operating costs and maximizing uptime.

Magnet Enclosure

This magnet enclosure system is designed to provide several benefits for the patient and technologist:

- Patient anxiety is eased, resulting in reduced exam time for uncooperative patients
- Technologists have easy access to the patient

Magnet shim

High homogeneity is assured – our SIGNA™ Voyager magnet provides excellent results for:

- Large FOV imaging up to 50 cm
- Off-center FOV imaging such as elbow, shoulder and wrist imaging
- Robust fat saturation required for abdominal, breast and musculoskeletal imaging
- High-performance applications, such as cardiac, diffusion tensor and spectroscopy

Magnet Specifications	
Magnet Length	179 cm
Operating field strength	1.5T (63.86 MHz)
Magnet shielding	Active
EMI shielding factor	99%
Size (W x L x H)	2.09 m x 1.79 m x 2.33 m
Magnet weight	7,275 lbs (3,300 kg)
Magnet cooling	Cryogenic (liquid helium)

Magnet Specifications	
Long-term stability	< 0.1 ppm/hour
Cryogen refill period	Zero boil off*
Fringe field – (axial x radial)	5 Gauss = 4.0 m x 2.5 m
Fringe field – (axial x radial)	1 Gauss = 5.8 m x 3.2 m
Manufacturer	GE Healthcare

*Under normal operating conditions

Patient Focused Design	
Patient Bore (L x W x H)	163 cm x 70 cm x 70 cm
Patient Aperture	74 cm
Patient comfort module	Head or feet first entry Dual-flaired patient bore 2 way in-bore intercom system Adjustable in-bore lighting system Adjustable in-bore patient ventilation system

Diameter Volume (x, y, z)	Typical ppm	Guaranteed ppm
10cm DSV	0.007	0.02
20cm DSV	0.035	0.06
30cm DSV	0.10	0.15
40cm DSV	0.33	0.43
45cm DSV	0.88	1.0
48 cm DSV	1.75	2.0
50cm DSV	2.8	3.3

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

Gradients

The gradients of an MR system play a crucial role when it comes to imaging performance, throughput, and consistency during clinical practice. Gradient speed, accuracy, and reproducibility often determine the success of demanding acquisitions like DTI and Fiesta. SIGNA™ Voyager introduces Ultra High Efficiency (UHE) gradient system that includes Intelligent Gradient Control technology. This novel technology enables the SIGNA™ Voyager to deliver excellent TR and TE values that enable a superior clinical performance.

Gradient Performance	
Peak amplitude performance*	45 mT/m
Peak slew-rate performance*	200 T/m/s
Maximum FOV (x,y,z)	50 cm x 50 cm x 50 cm
Duty Cycle	100%

*SIGNA™ Voyager's UHE gradient technology delivers minimal TE and TR values that are equivalent and comparable with other gradient technologies running at 45 mT/m peak amplitude & 200 T/m/s peak slew-rate.

Ultra High Efficiency (UHE) Gradient System

The SIGNA™ Voyager gradient coil is 2x more efficient than previous generation of products (i.e. the Voyager gradient coil requires half the amount of current required by previous designs to generate the same gradient field). This eco-friendly design enables the gradients to deliver superior performance while significantly reducing power consumption. The gradient is non-resonant and actively shielded to minimize eddy currents and mechanical forces within the system. The gradient coil and the RF body coil are integrated into a single module, which is water and air-cooled for optimum duty-cycle performance and patient comfort.

Further, the SIGNA™ Voyager gradient driver includes Intelligent Gradient Control (IGC) technology which employs a digital control system that utilizes predictive models of the electrical and thermal characteristics of the gradient coil to maximize the performance of the gradient system to deliver exceptional clinical performance.

Quiet Technology (ART - Acoustic Reduction Technology)

State-of-the-art clinical imaging demands the routine use of ultra-fast imaging techniques. The strong gradients interact with the magnetic field to create mechanical forces resulting in acoustic noise. GE has implemented Quiet Technology that significantly reduces acoustic noise and improves the patient environment. Acoustic reduction is achieved through a combination of careful system design choices and novel pulse sequence software that reduces the sharp transitions in gradient waveform that are known to generate high levels of acoustic noise.

Gradient Coil Isolation and Acoustic Damping

The full performance of the High Efficiency Gradient System is used while helping to maintain a safe environment for the patient. Clear separation between the gradient coil, RF body coil, and patient support structures ensures minimal component interactions.

RF Coil Isolation

During gradient pulses, the RF body coil acts as secondary source of noise. To further reduce vibration to the patient, the RF body coil mounting has been optimally designed.

Vibro-Acoustic Isolation

To isolate the magnet from the building and reduce the transmission of acoustic noise in the structure, GE has designed a vibroacoustic-dampening pad that sits under the feet of the magnet. The dampening characteristics of the pad are optimized based on the magnet geometry and weight. This kit is not required for the mobile MR configurations.

Fidelity, accuracy, and reproducibility

Gradient systems have historically been defined in terms of peak amplitude (mT/m) and slew rate of the generated field (T/m/s). While these parameters are important in achieving high temporal resolution parameters, such as TRs and TEs, applications such as PROPELLER MB, TRICKS, and spectroscopy rely more heavily on gradient fidelity, accuracy and reproducibility.

Fidelity is defined as the degree to which an electronics system accurately and reproducibly amplifies an input signal. Applied to MR gradient systems, gradient fidelity refers to the system's ability to generate requested waveforms. The high fidelity of the SIGNA™ Voyager gradients is achieved through the use of innovative design of the digital control architecture within the gradient amplifier. This architecture has two digital control paths.

- Dedicated active feedback loop to regulate current errors
- Unique feed-forward model to match amplifier output to gradient coil response

Gradient Amplifier & Coil (water-cooled)	
Control	Optimized digital control system that utilizes Intelligent Gradient Control (IGC) with frequency dependent feed-forward and feed-back model to deliver accurate output with optimized performance
Gradient current accuracy	300 uAs
Shot-to-Shot repeatability ‡	150 uAs
Symmetry ‡	100 uAs

‡ Typical gradient fidelity expressed in terms of the absolute integrated errors in micro-Amperes-second (μAs). Gradient integral precision is the maximum integrated current error over a full-scale, echo-planar gradient waveform. Shot-to-shot repeatability is the largest difference between integrated errors across waveforms.

RF Architecture Total Digital Imaging

The SIGNA™ Voyager offers startling advances in imaging, starting with pioneering technology called TDI. It stands for Total Digital Imaging, and it means greater clarity and increased SNR by up to 30%. TDI is built on three fundamental components:

GE's Direct Digital Interface (DDI) employs an independent analog-to-digital converter to digitize inputs from each RF channel. Every input is captured and every signal digitized, literally redefining the concept of an RF channel. The result? Not only does DDI technology improve SNR of our images, but it also works with legacy GE coils for unmatched flexibility.

TDI RF architecture introduces Digital Surround Technology (DST) with delivers the capability to simultaneously acquire MR signal from the integrated body coil and the surface coil. By combining the digital signal from surface coil elements with the signal from the integrated RF body coil, the superior SNR and sensitivity of the high-density surface coils are combined with the superior homogeneity and deeper signal penetration of the integrated RF Body Coil. The result? Richer, higher quality spine images.

SIGNA™ Voyager's novel RF architecture enables superior image quality, which enhances quantitative imaging capabilities. This unique architecture strengthens applications like 3D ASL, for high SNR quantitative perfusion maps useful in many neurological diagnoses, and IDEAL IQ, for quantitative fat fraction maps of the liver to aid in diagnosis. And neither application requires contrast injections, eliminating both the cost of contrast and the pain of needles.

TDI Receive RF Architecture	
Number of available RF Channels	65/49
Number of available Digitizers (A/D converters)	65/49
Receiver sampling rate per channel	80 MHz
Maximum Samples per second (65ch/49ch/33ch)	5200 Mega Samples/ 3920 Mega Samples/ 2640 Mega samples
Quadrature demodulation Receiver	Digital
Dynamic range at 1 Hz BW Receiver	> 165 dB
Resolution	Up to 32 bits

Transmit RF

Recieve RF Architecture	
RF amplifier	Water cooled, small footprint
Maximum output power	16 kW Body 2 kW Head
Maximum RF field with integrated body coil	>20 uT
Transmit gain	>100 dB (40 dB coarse/ >84 dB instantaneous)
RF exciter frequency range	63.86 ± 0.650 MHz
Frequency resolution	<0.6 Hz/step
Frequency stability	14 part per billion (0 to 50C)
Phase resolution	0.005 degree/step
Amplitude control	16 bit with 12.5 ns resolution
Amplitude stability	<0.1 dB over one min. at rated power
Digital RF pulse control	2 amplitude modulators, 2 frequency/phase modulators

Volume Reconstruction Engine & Host Computer

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

Reconstruction System Gen7	
PERFORMANCE	
Operating system	Scientific Linux
Processor	Dual Intel Xeon Gold 5118
Clock rate	2.3 GHz
Memory	>= 94GB
Network	1 GbE
Hard disk storage	960 GB SSD
2D FFT/second (256 x 256 full FOV)	63,000 2D FFTs/second
GPU	NA

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

AIR Recon™

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

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

*Optional

TDI Coil Suite

Description

The TDI Coil Suite consists of a set of receive-only RF arrays designed for use with the SIGNA Voyager 1.5T MR system. TDI stands for Total Digital Imaging.

The superior flexibility of the TDI RF architecture allows not only newly designed TDI RF Coils, but also existing coils with proven clinical performance, such as the Flex Coil Suite and the 1.5T Anterior Array. The TDI Coil Suite includes the TDI Head Neck Array, a TDI Posterior Array embedded in the Comfort Plus patient table, 1.5T Anterior Array and the Flex coils. The Suite is indicated for use for: head, neck, brachial-plexus, spine, pelvis, hips, prostate, abdominal, cardiac, lower extremities, blood vessels, and long bone imaging. The combined use of the entire TDI Coil Suite will facilitate high-resolution, high-SNR whole-body imaging from the top of the head down to the feet.

TDI Posterior Array (PA)

The TDI Posterior Array is the first coil to include the Digital Micro Switch (DMS) which enables it to achieve ultra-fast coil switching to enable a platform for “zero-TE” imaging capability and further expansion of SilentScan capability.

To simplify the workflow for the technologist and increase efficiency, the system will automatically select the appropriate subset of coil elements based upon the prescribed field-of-view.

Whole body imaging is supported..

TDI Posterior Array Specifications	
Length	120.5 cm (47.4 in)
Width	48.6 cm (19.1 in)
S/I Coverage	113 cm (44.4 in)
Head-first or feet-first imaging Elements	32

Patient Comfort Pads

To improve patient comfort, the TDI Coil Suite includes an innovative set of Patient Comfort pads. The pads are designed with highly reliable uniform density foam that is designed to support a wide range of patient sizes and weights.

The pad coating is strong, easily cleanable, and processed with an Ultra-Fresh treatment. An anti-skid undersurface reduces pad movement and thus may simplify setup and egress.

TDI Head Neck Array (HNA)

The TDI HNA is a standard component of the TDI Coil Suite. The HNA consists of 3 imaging components: a head base-plate, an anterior neuro-vascular face-array, and the open face adapter.

The open-face design provides a patient-friendly feel. The base plate may be used with the open face adapter to accommodate cervical spine exams in large or claustrophobic patients or for patients with intubation. Improved access and patient comfort may be achieved through elevation of the superior end of the coil. The HNA with anterior NV Face-Array consists of 21 elements arranged to provide parallel imaging support in all 3 planes.

The HNA also includes a flexible bill for coverage of aortic arch while also delivering high patient comfort.

TDI Head Neck Array Specifications	
Length	53 cm
Width	35 cm
Height	35 cm
Weight of HNU base and Anterior Adapter	6.5 kg
R/L Coverage in brain mode	24 cm
S/I Coverage in NV mode	45 cm, when combined with TDI PA
R/L Coverage in brain mode	24 cm
R/L Coverage in NV mode	32 cm
Acceleration factors	1D R=3, 2D R=6
Number of elements	Up to 31 elements in the FOV, when combined with TDI PA and TDI AA

TDI Head Neck Array with Open Face Anterior Adapter Specifications	
Length	53 cm
Width	35 cm
Height	21 cm
Weight	5 kg
S/I Coverage	45 cm, when combined with TDI PA
R/L Coverage	24 cm
Number of elements	Up to 20 elements in the FOV, when combined with TDI PA and TDI AA

TDI Coil Suite (continued)

1.5T Anterior Array (AA)

The 1.5T Anterior Array is a standard component of the TDI Coil Suite that facilitates chest, abdomen, pelvis, and cardiac imaging with the TDI RF coil suite. The Anterior Array is lightweight, flexible, thin and pre-formed to conform to the patient's size and shape. With 54 cm of S/I coverage, the coil permits upper abdominal and pelvic imaging without repositioning the patient. The 16 element electrical design supports parallel imaging in all 3 planes.

Two Anterior Arrays can be combined to deliver extended coverage with abdomen imaging and for run-off studies.

Anterior Array Specifications	
Length	55.6 cm (21.9 in)
Width	67.4 cm (26.5 in)
Height	3.3 cm (1.3 in)
Weight	2.8 kgs (6.16 lb) resting on patient 3.9 kgs (8.6 lb) with cable
S/I Coverage	54 cm (21.3 in)
R/L Coverage	to the full 50 cm (19.7 in) FOV of the system
Number of elements	Up to 32 elements in the FOV, when combined with the PA
Acceleration factors (with PA):	1D R=3, 2D R=9

Anterior

Peripheral Vascular / Lower Extremity Array - optional

The PVA is an optional component of the TDI Coil Suite that facilitates imaging of the thighs and lower legs. The high-density layout supports parallel imaging in all 3 planes. The coil incorporates an innovative hinge design between the upper & lower elements to simplify patient setup. In addition, to improve patient comfort, the lower leg section of the coil is fully supported by the Comfort Plus table and not the patient.

Optional Peripheral Vascular/Lower Extremity Array Specifications	
Length	105 cm (41.3 in)
Width	2nd station: 64.2 cm (25.3 in) 3rd station: 51.6 cm (20.3 in)
Height	24.8 cm (9.8 in)
Weight	9.1 kg (20.0 lbs)
S/I Coverage	104 cm (49.9 in) overall 2nd station: 52 cm (20.5 in) 3rd station: 52 cm (20.5 in)
R/L Coverage	to the full 50 cm (19.7 in) FOV of the system
Feet-first imaging	
Number of elements	Up to 36 elements in the FOV, when combined with the TDI PA
Acceleration factors	1D R=3, 2D R=6

PVA in un-folded position

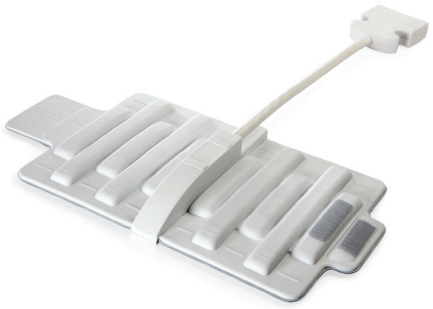
Flex Coil Suite

The Flex Coil Suite is a versatile set of high density 16ch coils designed to give high quality images in a wide range of applications. The high degree of flexibility is particularly advantageous when imaging patients that do not fit the constraints of rigid coils, improving the patient and technologist experience, and enabling most exams to be completed with the same level of image quality expected from dedicated coils.

The coils are available in Small, Medium, and Large. The full Flex Suite is intended to cover a broad range of muscular skeletal applications, including upper and lower extremities of hand, wrist, elbow, shoulder, knee, ankle, and foot.

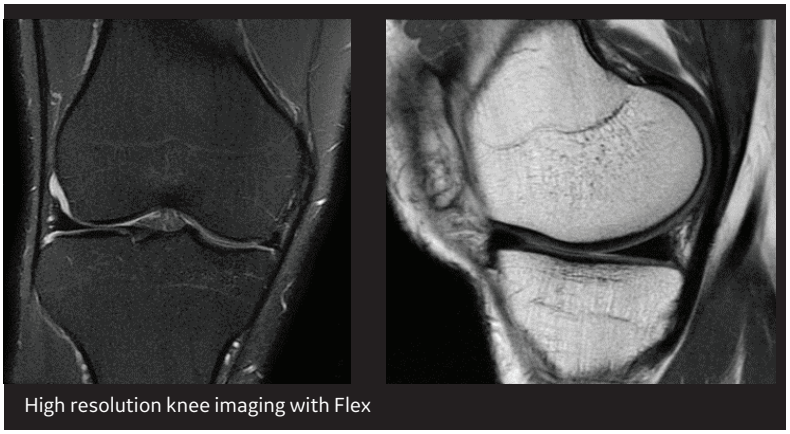
Flex Coil Suite Specifications

Component	Coverage (WxL)	Wrap Diameter	Elements	Weight
Flex Coil, Large	23 cm x 71 cm	15.5 cm – 21.5 cm	16	1.0 kg
Flex Coil, Medium	23 cm x 57 cm	11.5 cm – 15.5 cm	16	0.8 kg
Flex Coil, Small	23 cm x 44 cm	9.0 cm – 12.5 cm	16	0.8 kg



16ch Flex Coil

Interface and Knee



High resolution knee imaging with Flex

RF Coils Suite

There are also optional coils available to configure a SIGNA™ Voyager system to meet specific applications requirements. The coils listed below are commercially available at the time of printing and are optional with the system. Please contact your local GE sales representative for the most current list.

HD Breast Array

- 8-channel phased-array design
- Optimized for uniformity, parallel imaging and VIBRANT
- Bilateral and unilateral breast imaging
- Biopsy plates available
- Coil dimensions: 50 x 54 x 25 cm

Shoulder Phased Array

- 3-channel phased-array coil
- Sleeve design. Comprehensive shoulder imaging

Homogeneous penetration of humeral head and neck, rotator cuff, glenoid labrum, acromium process and glenohumeral articular surfaces

8ch Foot Ankle Coil

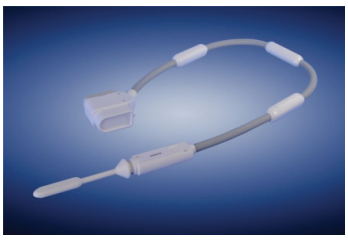
- 8 channel phased array design
- Chimney design adds versatility for high SNR foot and ankle imaging
- Coil dimensions: 53 x 36 x 38 cm

16ch T/R Knee Array

- 16 channel phased array coil Local transmit coil
- Parallel imaging in all 3 directions
- Coil dimensions: 51 x 29 x 55 cm

16ch T/R Hand Wrist Coil

- 16-channel phased array coil, local transmit coil
- Prone or Supine positioning
- Optimized design for Fingers through wrist
- High SNR to enable high resolution images
- Parallel imaging compatible for speed
- Coil dimensions: 46 x 14 x 20 cm



1.5T Endorectal coil by Rapid

- Channel Count: 1 Ch Coil
- Dimensions: 9.7 x 2.5 x 1.7 cm
- Weight; 1 Kg (w/o cable)
- B1rms: 2.5uT
- Scan range: S/I: 8 cm, R/L: 1.6 cm
- Port Campatibilitty: Any
- Head first or Feet first
- Coil Neck: 7.5 x 1.2 cm (Lengh x Diameter)
- House Dimension: 36 x 4.4 x 3.9 cm (Total)

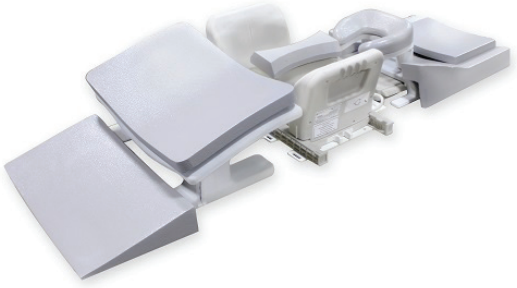
RF Coils Suite (continued)

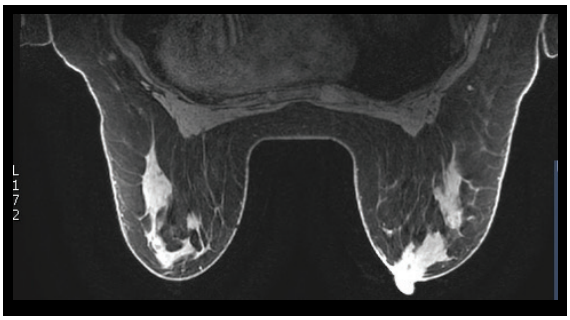
16-channel Breast Coil with Biopsy*

The 16ch Breast Coil with Biopsy is a phased array coil for imaging structures of the breast, axilla and chest wall. The 16ch Breast Coil is a three part receive-only coil designed to provide high resolution imaging. It includes a coil support structure, patient support structure, biopsy components and comfort pads. The 16ch Breast Coil supports both diagnostic and biopsy imaging modalities while accommodating various anatomic shapes and sizes.

Benefits

- Each phased array is optimized to provide deep penetrating SNR and parallel imaging capabilities in axilla, breast and chest wall areas
- The support structures and pads are modular in nature to maximize the patient experience, giving the patient positioning support and comfort for the breast procedure





Specifications			
Coil	Approximate dimensions (W x L x H)	Elements	Approximate Weight
16ch Breast Coil (no pads)	62 x 50 x 23 cm	–	5.6 kg
Lateral Array (each)	25 x 9 x 23 cm	5	0.8 kg
Biopsy Array (each)	25 x 9 x 17 cm	2	0.4 kg
Medial Array	36 x 15 x 18 cm	6 (3 Left, 3 Right)	1.2 kg
Biopsy Grid (each)	24 x 3 x 13 cm	–	0.1 kg

T/R Head Coil

Specifications	
Elements	1
Maximum number of channels in max FOV	1
Dimensions (W x H x L)	42 x 36.6 x 42.5 cm
Weight	5.5 kg
S/I Coverage	38.2 cm
R/L Coverage	28.1 cm
Patient orientation	Head first

*Optional

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, Muskuloskeletal, 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

NeuroWorks includes the basic imaging acquisitions and processing to the latest in motion correction, functional and volumetrics. Supporting both simple reconstruction to real-time perfusion results with BrainSTAT Arterial Input Function (AIF).

Volumetric Imaging	
3D Cube	PD, T1, T2, T1 FLAIR, T2 FLAIR and STIR
	Three-dimensional FSE (3D FSE), with flip angle modulation
	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

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

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

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 Arterial Input Function (AIF)	Manage tracer arrival differences due to patient flow dynamics
	Automatically or manually specify the AIF to normalize maps
Visualization	Brain STAT

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

BodyWorks

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

Volumetric Imaging	
3D Cube	Three-dimensional FSE (3D FSE), with flip angle modulation 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 FatSat RTFA: Increases SNR by 50% and distortion reduction for accurate post processing when compared to dual spin echo

Enhanced Diffusion Imaging	
Visualization	ADC and eADC Fusion

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

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

CVWorks

CVWorks provides GE's extensive coverage for the latest techniques enabling high performance CardioVascular imaging outcomes. Single breath-hold imaging for whole heart coverage are available from Morphology to Delayed enhancement. Enabling simplified generation of superb results including head-to-toe MRA support to single acquisition TOF and additional non-contrast imaging for flow.

Myocardium Delayed Enhancement	
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
Adiabatic IR Pulse	Robust Myocardial Suppression Fat Suppression Adiabatic fat suppression pulse Improved characterization of enhancing tissue
MDE Plus: Phase Sensitive MDE (PSMDE)	Inversion Recovery FGRE sequence Phase-sensitive image reconstruction Consistent myocardial suppression, even with sub-optimal TI Improved contrast for myocardial Potential to shorten overall exam time

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

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

Function	
FIESTA	Fast Cine with retrospective gating Fast Card with prospective gating

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

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

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

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

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

Non-contrast Vascular Imaging	
2D Time of Flight (TOF)	Carotid bifurcation, venous anatomy, aortic arch, peripheral vessels
3D TOF	Circle of willis, intracranial vasculature, abdominal vasculature
3D TOF Multi Slab	Intracranial vasculature, carotid bifurcation, aortic arch, peripheral vessels, venous anatomy
2D Phase Contrast	Localizer, flow direction and velocity for intracranial and extracranial vasculature, portal or hepatic vein, quantitative measurement of flow velocity
3D Phase Contrast	Intracranial vasculature, renal arteries

*Optional

OrthoWorks

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

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

Volumetric Imaging	
3D Cube	PD, T1, T2, STIR Three-dimensional FSE (3D FSE), with flip angle modulation 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, 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

Artifact Reduction Standard Sequence	
MARS	FSE High bandwidth protocols High resolution, small FOV imaging

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, T2 FLAIR and STIR Three-dimensional FSE (3D FSE), with flip angle modulation 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

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, T2 FLAIR and STIR Three-dimensional FSE (3D FSE), with flip angle modulation 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 In-line for auto post processing

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 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 Features

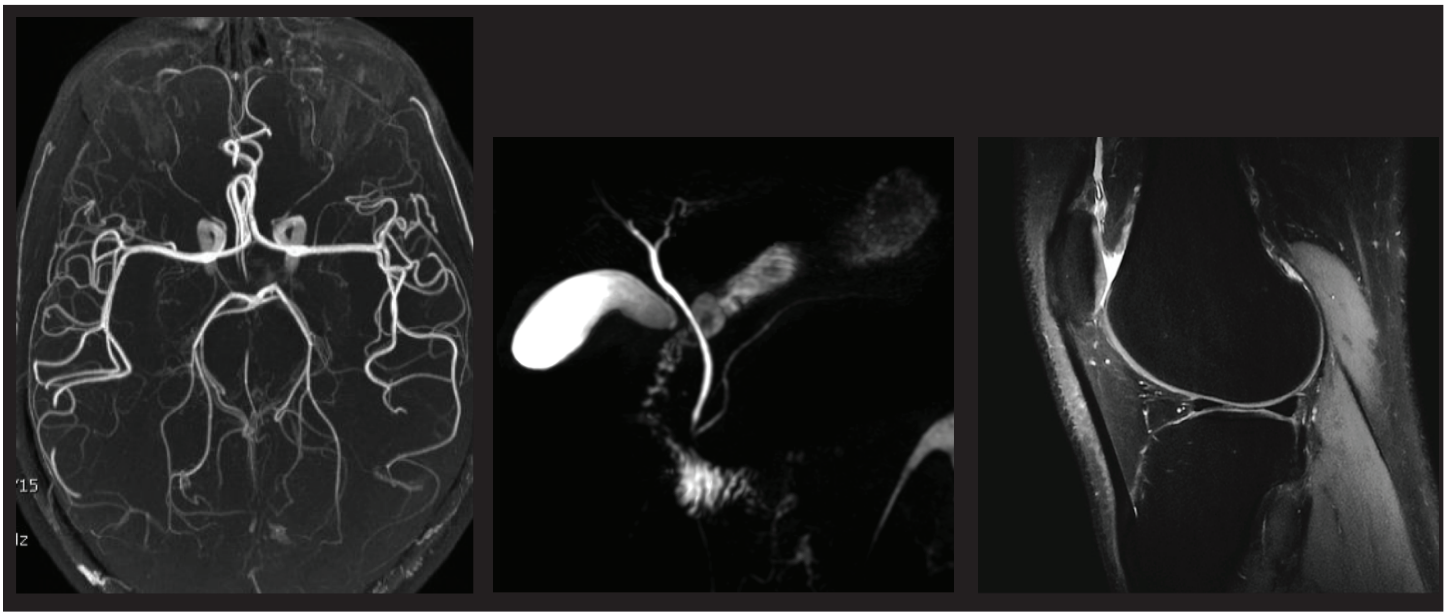
HyperSense*

Going further than common sense

HyperSense is a Compressed Sensing 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

Benefits

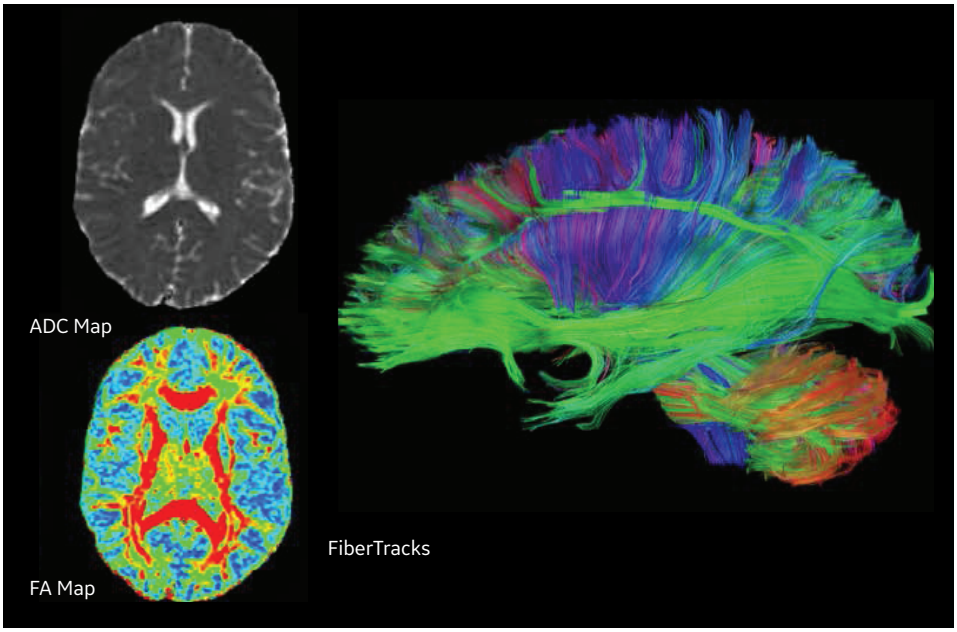
- Increase productivity by reduced scan times
- Faster 3D imaging acquisitions
- Combined with ARC for higher acceleration factors



HyperBand for EPI*

Quality and Speed Synchronized

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



Benefits

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

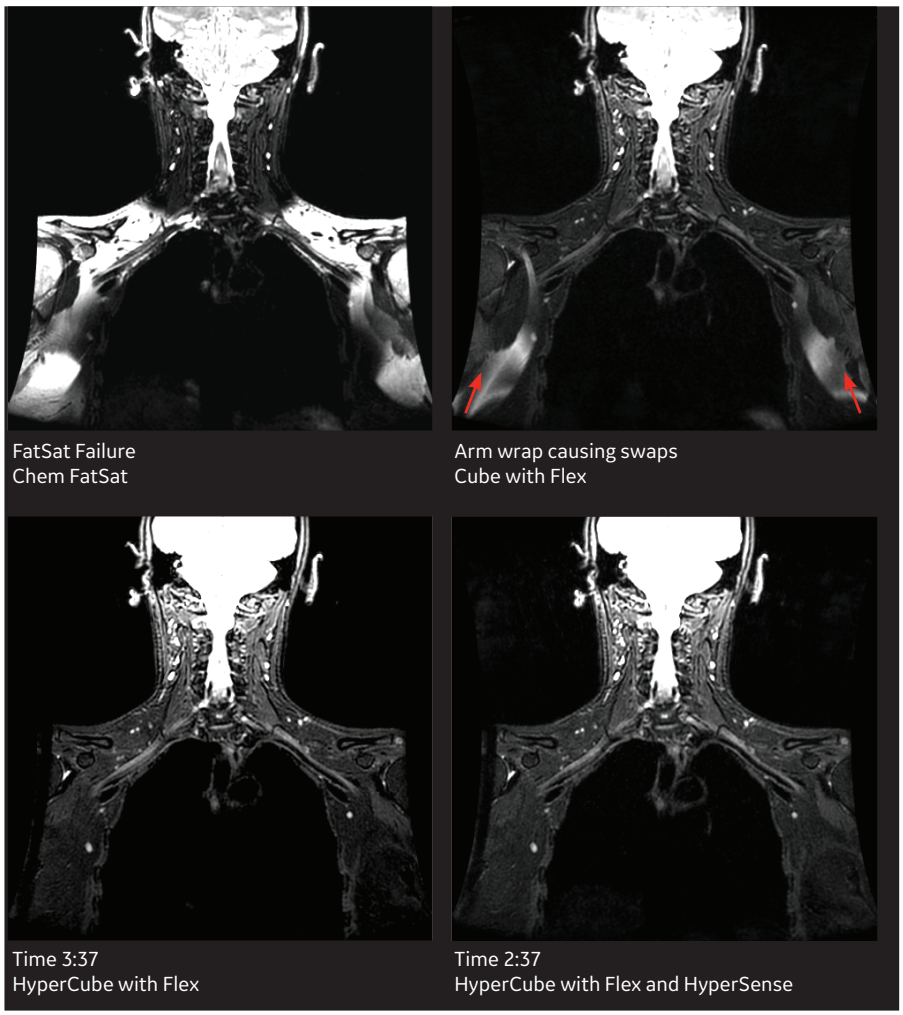
*Optional

SIGNA™Works Features (continued)

HyperCube*

Tailored 3D imaging that fits to perfection

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



FatSat Failure
Chem FatSat

Arm wrap causing swaps
Cube with Flex

Time 3:37
HyperCube with Flex

Time 2:37
HyperCube with Flex and HyperSense

Benefits

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

*Optional

SIGNA™Works Features (continued)

Flex for Cube and FSE*

Unlimited solutions, consistent results

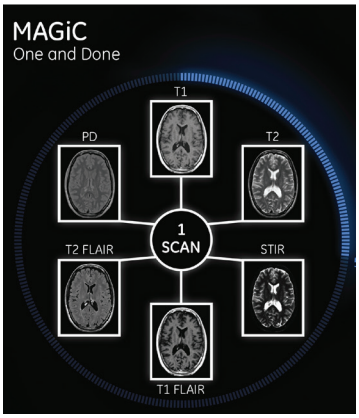
Flex uses a dual echo fat-water separation technology to provide robust and homogeneous fat suppressed images. Flex is compatible with ARC acceleration and can be used with a fast triple echo selection for significant scan time reduction. Enhanced uniformity and control of fat water swaps allow large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

Benefits

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

MAGiC*

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.



One MAGiC scan defivers six contrasts

Benefits

- Multiple contrasts a single scan
- Up to 50% faster than acquiring all contrasts separately*
- Ability to change the contrast after acquisition by modifying TR, TE and/or TI
- Enhanced image slice registration owing to the absence of inter-acquisition patient motion
- Parametric Maps: T1, T2, R1, R2, PD

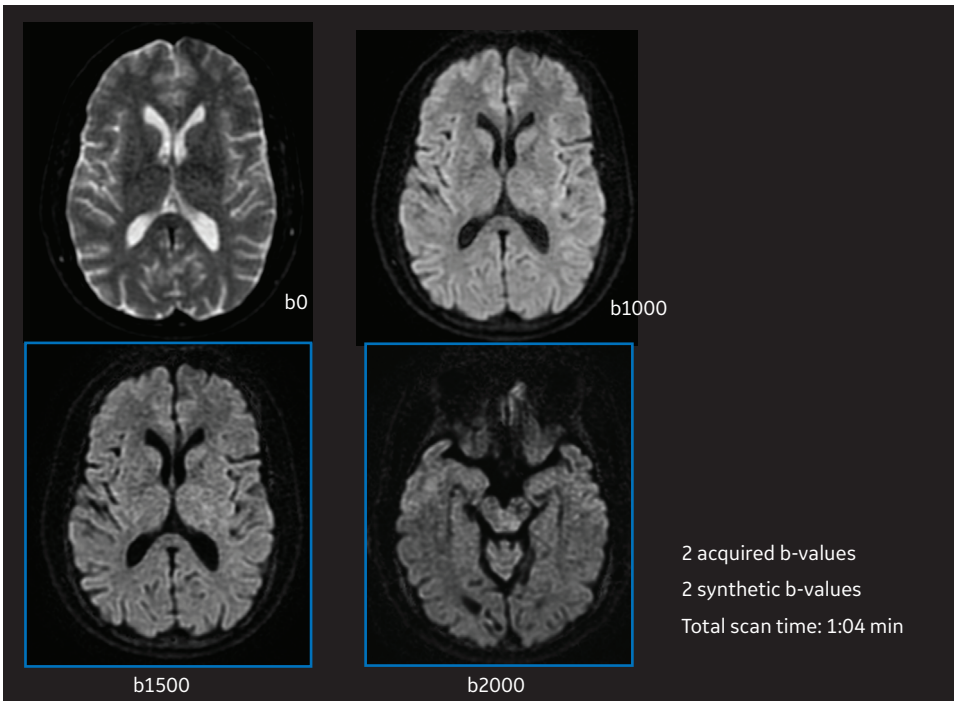
*Optional

**Based on MAGiC clinical study of 109 patients from 6 separate institutions.
***Optional package (MAGiC in itself does not deliver advanced imaging)
It is recommended to acquire conventional T2 FLAIR images in addition to MAGiC

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.



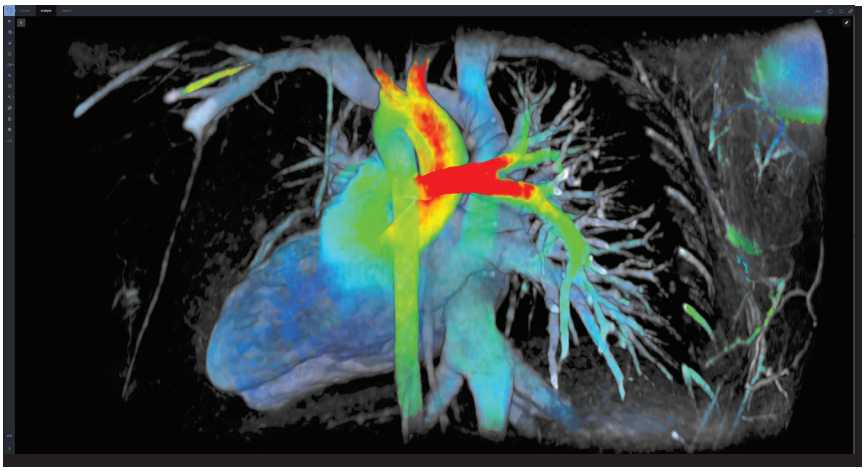
Benefits

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

ViosWorks*

Confident Functional Accuracy

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

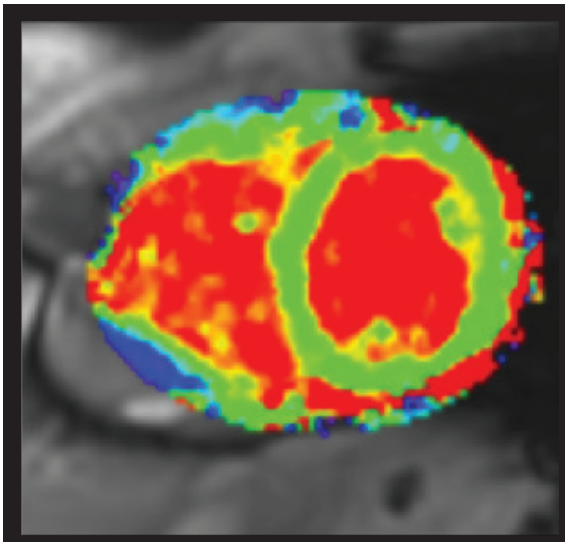
CardioMaps*

Achieving measurable benefits

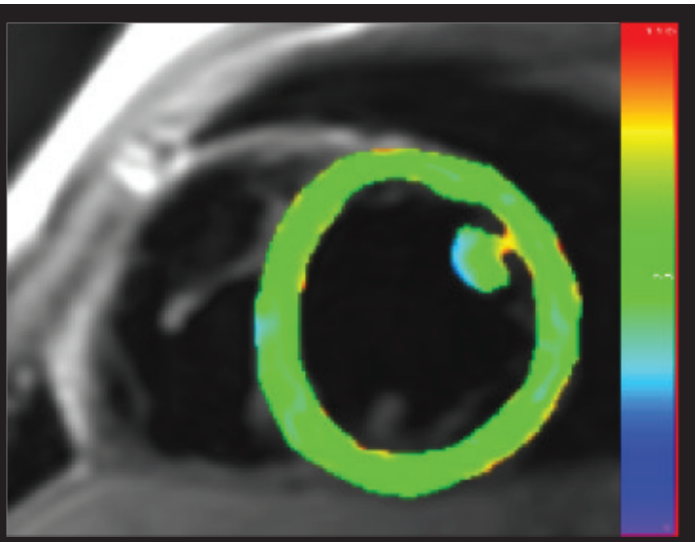
CardioMaps is a powerful diagnostic technique that supports detection of cardiac pathologies by quantitative measurement of T1 and T2 relaxation times. The T1 Mapping acquisition includes automatic motion correction that compensates for cardiac and/or respiratory motion, providing reliable results. T1 Mapping offers two methods of acquisition: Inversion-recovery Look-Locker with FIESTA readout (MOLLI) for apparent T1 (T1*) measurements or saturation-recovery SMART1Map for true T1 measurements.

Benefits

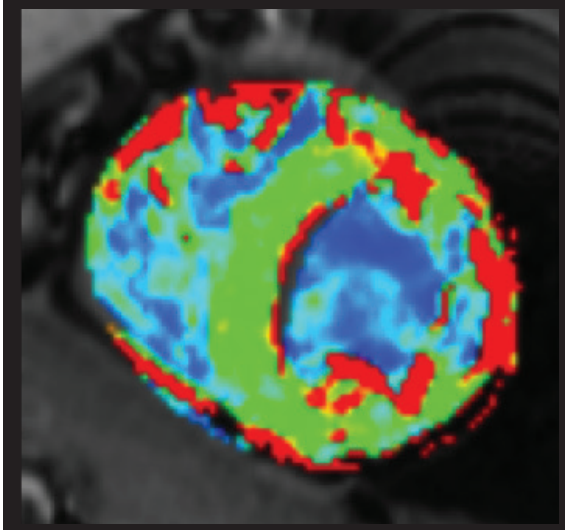
- Quantitative measurement of T1 and T2 relaxation times
- Automatic motion correction for T1 Mapping
- Two methods of acquisition for T1* or true T1 measurements
- **R^2 T1 mapping: R-squared to visualize a good fitting of the T1 mapping** curve curve



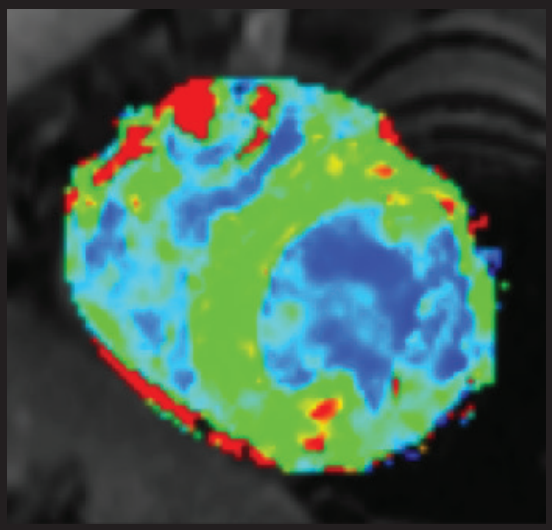
T1 CardioMap



T2 CardioMap



T1 CardioMap
Without Motion Correction



T1 CardioMap
With Motion Correction

*Optional

SIGNA™Works Features (continued)

PROGRES*

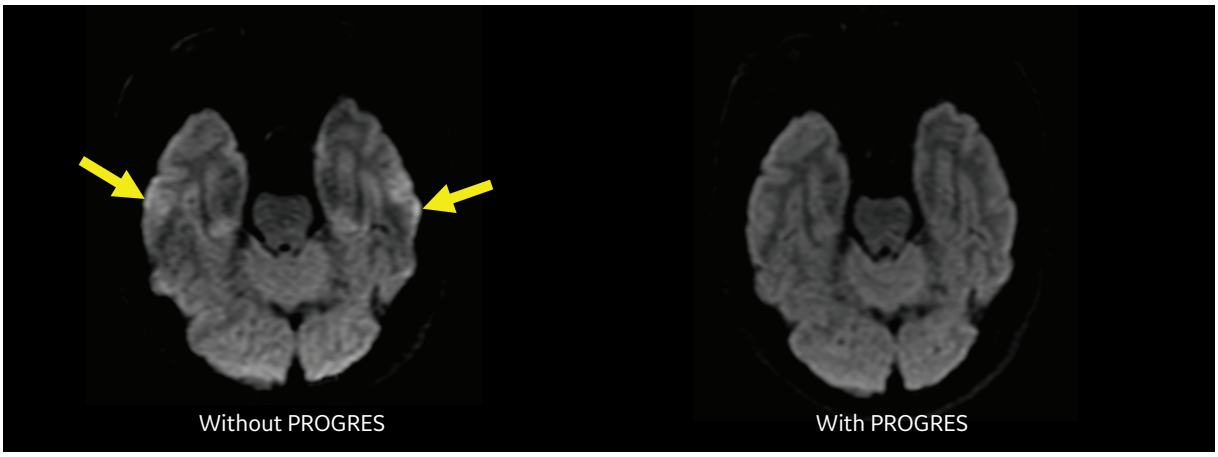
Resolving the limits of diffusion distortion

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



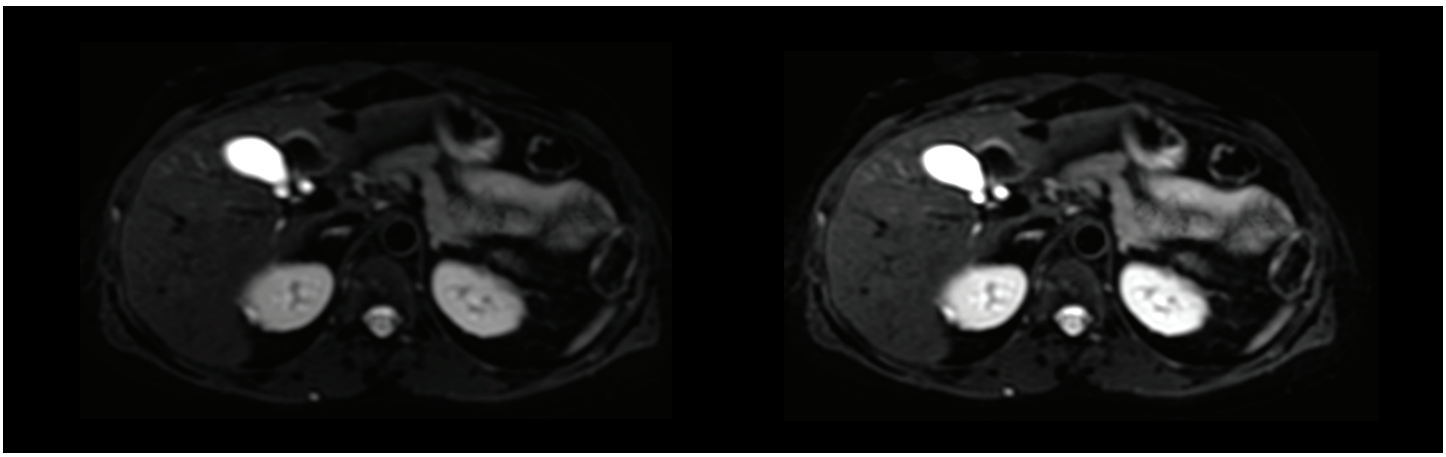
MUSE*

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 inplane parallel imaging acceleration.

Benefits

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



*Optional

Image Acquisition

Pulse Sequences

SPIN Echo	
SE FSE frFSE	Standard pulse sequences that are used to generate T1, Proton Density and T2 contrasts. The FSE technique enables long TR and long TE choices in reduced scan times. frFSE produces images with more T2 contribution allowing shorter TR values and resulting in shorter scan times when compared to FSE.
IR FSE-IR	IR techniques provide uniform suppression of tissues by applying an inversion pulse to null signal. FSE-IR reduces scan time while still achieving efficient tissue suppression. FSE-IR with Water SAT pulse and manual adjustment of Center Frequency location to suppress silicon signal in breast imaging.
3D FSE 3D frFSE	Three-dimensional imaging acquisitions mostly used for T2-weighted contrast.
T1 FLAIR T2 FLAIR	T1 and T2 Fluid Attenuated Inversion Recovery (FLAIR) pulse sequences allow the suppression of signal from cerebrospinal fluid (CSF). This sequence provides contrast to differentiate white and gray matter to T1- and T2-weighted brain and spine imaging.
Double IR/Triple IR (Black Blood)	These pulse sequences are included to allow Black Blood imaging for studies of cardiac morphology (T1, T2, and PD). Triple IR adds fat suppression to Black Blood imaging. It also can be combined with Single Shot.
Double IR/Triple IR Single Shot	Single Shot Black Blood acquisitions allow larger volume acquisitions in fewer breath-holds.
SSFSE SSFSE-IR	Single Shot Fast Spin Echo is a technique that permits single slice data acquisition in less than one second. It is frequently used for MRCP studies in a single breath-hold and myelograms.
3D MRCP	3D frFSE sequence that combined with the T2 Prep option provides improved background tissue suppression for MRCP exams.
T2 MAP*	T2 MAP is a multiple acquisition; multiple echoes FSE based method to obtain images that represent different T2 weighting values. The acquired data is processed to produce T2 color maps that are used for cartilage evaluation.
Cube FLAIR	Three-dimensional FSE (3D FSE), with flip angle modulation. You can easily reformat sub-millimeter isotropic volume data from a single Cube acquisition into any plane – without gaps, and with the same resolution as the native plane. T1 CUBE for blood saturation. 3D FSE technique that applies modified refocusing pulses for increased SNR. It is used to acquire isotropic data that can be reformatted in any plane.
Cube DIR	Cube DIR, double inversion recovery, is designed to achieve signal suppression from either gray or white matter and CSF.
Cube PROMO*	Prospective Motion correction is a real time 3D navigator based motion correction technique compatible with Cube T2, Cube DIR and Cube T2 FLAIR.
2D IDEAL*	2D FSE 3-point Dixon Water Fat Separation method that acquires 4 contrasts in one acquisition: Water, Fat, in-phase and out-of phase.
MAVRIC SL* HyperMAVRIC SL*	Multi-Spectral imaging technique is designed to reduce metal artifact near MR conditional implants. Improvements have been made to the MAVRIC SL feature to reduce scan time through a patient-specific metal analysis scan and allow functionalities, such as Variable flip angles, flow compensation, and No Phase Wrap. In addition to the T1, PD, and STIR contrasts, the sequence now also provides T2 weighting, and a B1-optimized STIR pulse.
3D ASL*	3D FSE based technique that uses a “labeling” pulse to quantify cerebral blood flow.

*Optional

Image Acquisition (continued)

Gradient Echo	
2D and 3D GRE/SPGR 3D GRE Dual Echo 2D and 3D FGRE/FSPGR 2D MFGRE (Multi Echo) 2D CINE GRE/SPGR	Gradient echo basic techniques offer a variety of possibilities to support imaging of all anatomies and can be acquired in 2D, 3D and Cine modes. The sequences generate T1 or T2 contrasts and support single, dual and multi echo acquisitions. 3D T1 weighted Fast Spoiled GRE for DCE (Dynamic Contrast Enhanced) perfusion.
2D and 3D MDE	Myocardial delayed enhancement is a technique used for tissue characterization to provide the assessment of myocardial perfusion.
PSMDE	Phase sensitive MDE increases the contrast between enhanced and normal tissue even with non-optimal inversion delay times.
SSMDE and SSPSMDE	MDE and PSMDE single shot based sequence that provides multi slice coverage with reduced breath-hold times.
2D and 3D FIESTA 2D FIESTA CINE 2D FatSat FIESTA 3D FIESTA-C	Fast imaging employing steady-state acquisition generates great contrast differentiation between tissues of low T2/T1 ratios and high T2/T1 ratios. Provides high SNR images in short acquisition times. FIESTA sequences offer benefits for Neuro, Cardiac and Abdominal imaging.
2D and 3D MERGE FGRE	T2* contrast technique that acquires multiple echoes at several different TE values.
2D Fastcard GRE/SPGR	Prospective gating sequence designed for breath-hold, aortic arch gated imaging.
2D FastCINE GRE/SPGR	Retrospective gating sequence, beneficial to cardiac wall motion studies, assessment of valve function and visualization of regurgitation and stenosis.
2D FGRE-ET* 2D FGRE-ET Real-time*	Fast gradient echo sequence combined with an EPI echo train for acquiring multiple phase encoding steps per TR. Used for first pass myocardial perfusion studies. Compatible with real time for cardiac planning and imaging uncooperative patients.
2D FGRE TC*	Fast Gradient Time Course used for myocardium tissue evaluation on first pass studies. Allows multiple planes radial acquisitions.
2D Fast Spoiled Gradient Echo TC*	Fast Spoiled Gradient Echo Time Course used for myocardium tissue evaluation on first pass studies. Allows multiple planes radial acquisitions.
2D CINE-IR	FAST-CINE GRE IR Prep sequence is designed for myocardial viability studies. Supports TI time selection for consistent results.
2D Real-time FGRE/FIESTA	Free-breathing, Real-time planning sequence for whole heart coverage.
2D FIESTA TC*	2D FIESTA TC is used for myocardium tissue evaluation on first pass studies.
2D Tagging*	Fast Cine GRE based sequence for visualization of cardiac contractile function.
3D Heart*	3D FGRE/FIESTA navigated sequence for free breathing coronary artery imaging.
3D COSMIC	Coherent oscillatory state acquisition for the manipulation of imaging contrast is a modified FGRE sequence with steady-state free precession segmented acquisition for high SNR, high contrast spine imaging.
3D LAVA	Liver Acquisition with Volume Acceleration is a 3D SPGR technique designed to image the liver. SPECIAL is the fat suppression method applied and parallel imaging provides shorter scan times.
3D LAVA Flex*	3D FSPGR technique that acquires in-phase, out-of-phase, water only and fat only images in one acquisition. LAVA Flex uses ARC; a self calibrated 2D parallel imaging technique that allows acceleration in phase and slice direction.

*Optional

Image Acquisition (continued)

Gradient Echo	
3D Turbo LAVA 3D Turbo LAVA Flex*	LAVA Turbo provides a reduction of breath-hold timing for both LAVA and LAVA Flex acquisitions by as much as 20% reduction compared to conventional LAVA and LAVAFlex acquisitions. Available with respiratory triggering.
3D VIBRANT*	Simultaneous bilateral breast imaging technique in the Axial and Sagittal plane. SPECIAL and dual-shim volume capabilities provide homogeneous fat suppression.
3D VIBRANT Flex*	Acquires in-phase, out-of-phase, water only and fat only images in a single scan. It provides robust fat saturation and applies ARC, 2D self calibrated acceleration method for high spatial and temporal resolution images.
3D QuickSTEP	QuickStep is an automated multi-station run-off acquisition. This application automatically prescribes, acquires, and combines images from multiple stations for fast acquisition and simplified workflow.
3D TRICKS*	The time resolved imaging of Contrast KineticS (TRICKS) is a fast 3D dynamic acquisition for high temporal and spatial resolution MR angiography imaging (4D angio). Combined with elliptical-centric data sampling for consistent results.
3D SWAN*	High-resolution susceptibility weighting 3D multi echo gradient acquisition designed for small vessels visualization, as well as large vascular structures and iron or calcium deposits in the brain.
3D IDEAL*	IDEAL is a 3-point dixon water fat separation method that generates in-phase, out-of-phase, water images and fat images in one single scan. Provides homogeneous fat saturation for imaging for challenging anatomies as such as neck and spine.
3D IDEAL-IQ*	Whole liver 3D coverage in a single breath-hold, IDEAL IQ provides a non-invasive, quantitative assessment of triglyceride fat content in the liver that can aid in diagnosing steatosis.
StarMap*	StarMap is an acquisition and post processing technique that helps evaluate iron content in the heart and liver. Multiple echoes are acquired at different TE times for each pixel resulting in images that represent variations of T2* weighting. After the acquisition the images are post processed to generate color and grayscale T2* and R2* Maps.
DISCO* DISCO with FatSat	Differential sub-sampling with cartesian ordering, combine TRICKS and LAVA Flex technologies to acquire high temporal resolution 4D dynamic images with robust fat suppression and without compromising spatial resolution.
MR Touch*	MR Touch is software and hardware application designed to measure relative tissue stiffness with MR. The acquisition uses a GRE based sequence that synchronizes induced vibrations to acquire a series of phase-contrast images over time.
MP-RAGE	MP-RAGE is a (3D) magnetization-prepared, rapid gradient-echo (MP-RAGE) sequence for structural brain imaging. The sequence captures high tissue contrast and provides high spatial resolution with whole brain coverage in short scan times.

Vascular	
Inhance Inflow IR*	3D FIESTA based non-contrast-enhanced MR angiography technique that provides static background tissue and venous flow suppression for imaging arteries. It uses SPECIAL for uniform fat suppression and respiratory gating compatibility reduces respiratory motion artifacts during free-breathing renal exams.
Inhance 3D Velocity*	3D Phase Contrast based technique designed to acquire angiographic images in brain and renal arteries with robust background suppression in a short scan time. Respiratory triggering compatibility enabling abdominal angiography.
Inhance 2D Inflow*	Designed for imaging arteries that follow almost a straight path (i.e. femoral, popliteal, and carotid arteries) Inhance 2D Inflow acquires data during the systolic phase only. Compatible with Peripheral or Cardiac Gating and ASSET.

*Optional

Image Acquisition (continued)

Vascular	
Inhance 3D Delta Flow*	3D FSE cardiac gated based non-contrast-enhanced MRA application designed for peripheral arterial imaging. This technique uses the differences between systolic and diastolic flow to help generate arterial signal contrast with robust background and venous suppression. ASSET compatibility provides shorter scan times.
2D TOF / 2D Gated TOF 2D Fast TOF FGRE/ SPGR 3D TOF 3D Fast TOF FGRE/ SPGR	2D TOF Imaging, 2D Gated TOF Imaging, 3D TOF Imaging and Enhanced 3D TOF Imaging are used for MR angiography imaging. Based on conventional gradient echo scanning, TOF imaging techniques rely primarily on flow-related enhancements to distinguish moving from stationary spins.
2D CINE Phase Contrast 2D FastCINE Phase Contrast	This pulse sequence is included specifically for studies of cardiac function. Through the use of retrospective gating, it allows full R-R coverage.
2D Phase Contrast 3D Phase Contrast	These techniques demonstrate flow velocities and directional properties in vessels and other moving fluids such as CSF and aortic flow.

EPI	
GRE-EPI SE-EPI FLAIR-EPI DW-EPI	Standard on all systems are gradient echo, spin echo, FLAIR, and diffusion weighted echo planar imaging. The EPI sequence supports single and multishot imaging, multi-phase imaging, as well as cardiac gating. Diffusion EPI produces images that can detect acute and hyper-acute stroke with b-value up to 10,000 s/mm2, multi-NEX compatibility and the ability to generate ADC and T2-weighted TRACE images. The FLAIR option suppresses the CSF signal.
DTI*	DTI (Diffusion Tensor Imaging) is an EPI technique that acquires diffusion information in up to 300 different directions. The image contrast is based on the degree of diffusion anisotropy in the tissues. Post processing include Fractional Anisotropy (FA), Apparent Diffusion Coefficient (ADC), 2D directional maps and 3D fiber track models.
eDWI	Enhanced DWI (eDWI) provides high SNR diffusion images with short acquisition times. Supports Multi b-values with SMART NEX for variable NEX selection per B-value, “3 in 1” diffusion weighting to all three gradients simultaneously, tetrahedral selection with four different diffusion weighting combinations for shorter TE values and Inversion recovery for fat signal reduction.
RTFA	The RTFA algorithm leads to a reduction in distortion of the diffusion image per diffusion axis. RTFA is designed to reduce image blurring and distortions typically associated with diffusion imaging throughout the body. RTFA also allows for increased utilization of single spin echo DWI which results in an increase in SNR by up to 50% compared to dual spin echo and, when combined with the improved resolution leads to an increase in image quality that can be utilized for image presentation, fusion and ADC map outputs.
RTCF	Real-Time Center Frequency (RTCF) option can be applied to DWI & DTI to enable using the optimal center frequency for each slice. This is intended to help improve fat suppression and signal drop off at areas of high B_0 inhomogeneity (off-isocenter, or area with high tissue susceptibility). It is also intended to reduce station-to-station misalignment in whole body diffusion imaging.
FOCUS DWI*	FOV Optimized & Constrained Undistorted Single-shot (FOCUS) DWI utilizes 2D selective excitation pulses to limit the prescribed phase encode FOV eliminating artifacts from motion, imaging back folding or unsuppressed tissue.

*Optional

Image Acquisition (continued)

Spectroscopy	
PROBE-PRESS PROBE-STEAM*	PROBE Single-Voxel spectroscopy allows non-invasive evaluation of the relative concentrations of in-vivo metabolites. The sequence provides acquisition and display of volume localized, water-suppressed H1 spectra in single-voxel mode. The sequence consists of three slice selective RF pulses with crusher gradients. PRESS provides up to twice the SNR over STEAM.
PROBE-PRESS CSI (2D & 3D*)	PROBE 2D and 3D CSI enable simultaneous multi-voxel spectroscopic acquisitions in the brain. It is available with PRESS excitation to maximize SNR. Post processing includes automatically generated metabolic maps.
BREASE*	A TE-averaged PRESS (Point RESolved Spectroscopy) acquisition that provides the necessary biochemical information to help characterize breast tissue by assessing the presence of choline.
TEA-PRESS*	TEA PRESS is a TE-Averaged variant of the PRESS CSI pulse sequence. It collects spectra across a range of TE values and averages the results together to reduce the appearance of signals whose intensity varies as a function of TE. This allows signals whose intensity does not vary with TE to be accentuated in comparison. This is the underlying pulse sequence behind the BREASE application.

PROPELLER MB	
Silent T1, PD, T2, DWI, T1 FLAIR and T2 FLAIR PROPELLER MB*	PROPELLER MB is a multi-shot per blade sequence that uses a radial k-space filling pattern acquisition and a post processing correction algorithm to significantly reduce the effects of motion artifacts. PROPELLER MB is compatible with spatial and chemical Sat, ASPIR, STIR T1, PD and T2 Auto TI/TR and Navigator.
T1, PD and T2 PROPELLER MB	
T2 FLAIR PROPELLER MB	
T1 FLAIR PROPELLER MB	
DWI PROPELLER MB	
PROPELLER DUO	PROPELLER DUO is a FSE based technique that is less prone to distortions caused by field inhomogeneities. PROPELLER DUO has a comparable scan time when compared to conventional PROPELLER DWI, and has spatial sat and shim volume capability to further reduce distortions and reduce artifacts and improve image quality.

Silenz*	
Silenz T1 Silenz PD	Silenz is a 3D Zero-TE sequence comprising high bandwidth excitation and reduced gradient-switching radial acquisition that results in sound levels near ambient. Silenz has added flexibility in sequence prescription for anisotropic resolution enabling faster scan times and includes axial as well as oblique geometries.

Fat Suppression Technology	
FatSat	Applies a frequency selective saturation pulse at the frequency of fat before the imaging excitation pulse with the result being a signal measurement primarily from water.
STIR	STIR is an inversion recovery method that takes advantage of the T1 difference between water and fat to allow selection of the signal to suppress. In order to eliminate the signal from tissues, the TI time must match exactly the null point of the tissue that needs to be suppressed.
SPECIAL	Hybrid fat suppression technique that incorporates features from both the frequency selective FatSat and the STIR techniques by using a spectrally selective inversion pulse that inverts only the fat magnetization and leaves the only the water peak available for excitation.

*Optional

Image Acquisition (continued)

Fat Suppression Technology	
Spectral Spatial	Method that applies selective pulses for water excitation only, while fat is left untouched, thereby producing no signal.
ASPIR	ASPIR method is a solution for poor fat suppression due to B_1 inhomogeneity. It is based on the frequency and the relaxation fat behaviors. Applies a spectrally selective adiabatic inversion pulse to excite the fat spins, imaging pulses are then applied after TI null time when longitudinal magnetization of fat crosses zero. The disadvantages include sensitivity to B_0 and longer scan times.
IDEAL*	IDEAL is a 3-point Dixon technique that acquires three images at slightly different echo times to generate phase shifts between water and fat. The water/fat separation method is very efficient at providing homogeneous image quality. One acquisition provides four contrasts: water, fat, in-phase and out-of-phase images.
Flex*	Flex is a 2-point dixon technique delivering faster scan times compared to IDEAL 3-point dixon. It is based on the difference between fat and water resonance frequencies using two flexible echo times for further scan time reduction. One acquisition provides four contrasts: Water, Fat, in-phase and out-of-phase images.

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

Acceleration Technology	
Fractional Nex	Technique in which only partial *k*-space data is collected and the remaining data is estimated. It uses the phase conjugate symmetry reconstruction method, which only half of the phase encode steps are acquired for scan time reduction.
Fractional No Phase Wrap	Selectable on the user interface, Fractional No Phase Wrap allows you to adjust the phase FOV based upon the patient size and shape. Benefits include a physical view of NPW placement on the user interface, flexibility to manage SNR and Scan Time, and the power to scan only the area of interest within the determined FOV.
ASSET	Array spatial sensitivity encoding technique acquires under sampled multicoil data generating aliased images. These are post processed with coil sensitivity maps from the calibration scan to unfold the images.
ARC	Auto-calibrating reconstruction for cartesian imaging is a highly accelerated parallel imaging auto-calibrating method that doesn't require coil sensitivity maps. It enables smaller FOV prescriptions, less sensitivity to motion and prevents artifacts caused by coil calibration inaccuracies.

*Optional

Image Acquisition (continued)

Acceleration Technology	
HyperBand*	HyperBand enables scan time reduction by simultaneously exciting multiple slices at multiple locations. Reconstruction algorithms are then applied in order to separate the images acquired.
HyperSense*	High performance acceleration based on sparse or compressible images. It can be extended to include inherent compressibility in dimensions besides *k*-space. While parallel imaging suffers from SNR loss due to scan time reduction and coil spatial encoding, with HyperSense there is no SNR loss caused by the coil geometric factor.
Hyperkat*	HyperKat s an advanced k-t acceleration method that employs time–shifted sampling in data acquisition and exploits both spatial and temporal correlation with motion-adaptive time window selection in image reconstruction.
HyperCube*	Small FOV organ specific volumetric imaging acquisition method that enables outside phase FOV HyperCube signal suppression. The technique can help to reduce artifacts originated outside of the prescribed field of view.

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

Noise Reduction Technology	
ART	Acoustic Noise Reduction Technology optimizes the gradient waveform to reduce the gradient noise without compromising performance.
Silenz*	Silenz is a 3D Zero-TE sequence comprising high bandwidth excitation and reduced gradientswitching radial acquisition that results in sound levels near ambient. Silenz has added flexibility in sequence prescription for anisotropic resolution enabling faster scan times and includes axial as well as oblique geometries.
Silent PROPELLER*	Silent PROPELLER gradient waveform approach reduces the acoustic noise level to less than 11dB above the ambient room noise.

*Optional

Computing Platform

Operator Console

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

Display and DICOM Data

The SIGNA™ Voyager 1.5T system generates MR Image, Secondary Capture and Grayscale Softcopy Presentation State (GSPS) DICOM objects. The DICOM networking supports both send and query retrieve as well as send with storage commit to integrate with the site's PACS archive. DICOM filming support includes both Basic Grayscale and Basic Color Print Service Classes. Additionally, the SIGNA™ Voyager system supports the CT and PET image objects for display allowing the user to refer to cross-modality studies.

Display	
AutoView	Dedicated image review window
Window/Level (W/L)	6 user-programmable keys on scan control keyboard plus one key for returning to prior setting
	6 user-programmable buttons in image viewer
	Arrow keys on scan control keyboard
	On-image through middle mouse button
	Save State stores user-selected image orientation, user annotation and window level
Image display	Zoom/Roam/Flip/Rotate/Scroll Explicit Magnify and Magnifying Glass
	Image Measurement Tools Grid On/Off
	Cross Reference/User Annotation Exam/ Series Page
	Hide Graphics/Erase Annotation/Screen Save
	Accelerator Command Bar
	Compare Mode/Reference Image
	Minified Reference Scoutview
	Cine Paging (up to 4 windows and 128 images/window)
	Add/Subtract/Edit Patient Data
Image display performance	256 Image buffer (256 x 256) at 30 fps
Image annotation	Shadowed to permit ease in reading
	Two graphic/text planes overlay the entire screen
	Grid placement with anatomical reference on an image
	Drawing and annotation may be added to and removed from images

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

Wide-screen display monitor	
Display monitor	24" Widescreen LCD Flat Panel
	1920 x 1200 dot resolution
	Ability to display DICOM images in 2048x2048 matrix

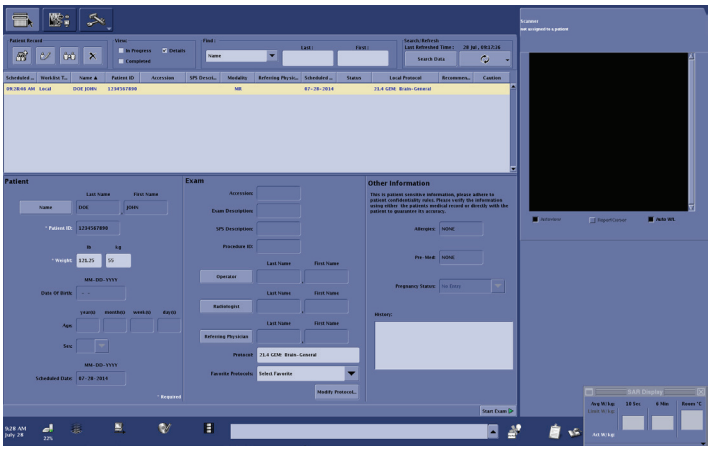
Imaging Options and Parallel Imaging Support

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 • Flow Compensation • Fluoro Trigger • Full Echo Train • IDEAL • IR Preparation	• Magnetization Transfer • MRCP • Multi-Phase/Dynaplan • Multi-Station • Navigator • No Phase Wrap • 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™ Voyager, 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 • HyperBand • HyperSense • IR & SR Prepared • PROMO

SIGNA™ Flow

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

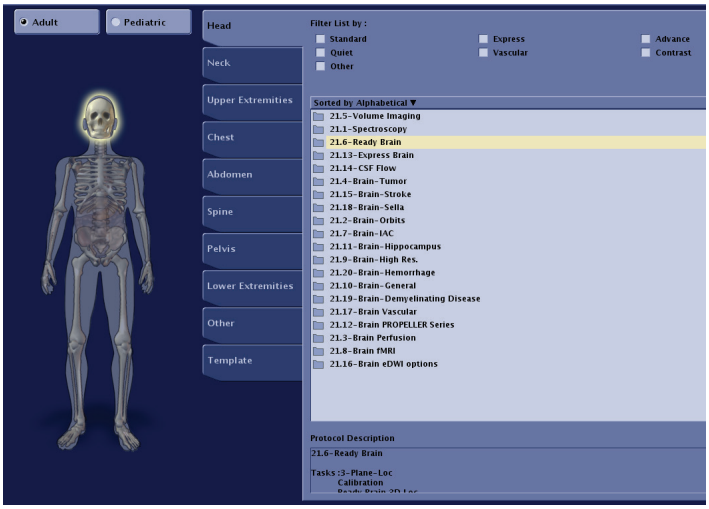
Exam Setup



Modality Worklist

Automated and standardized rapid set up

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



Protocol Tools

Search, select and one click to share

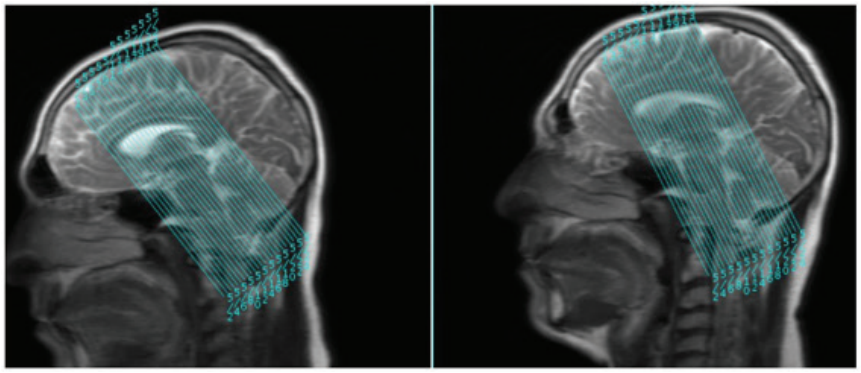
- Protocol Libraries: GE Optimized (preloaded protocols) and Site Authored (customized and saved)
- Protocols can be saved based on patient demographics, anatomy, scan type, or identification number for rapid search
- Commonly used protocols can be flagged for quick selection from the modality worklist
- One-click to share protoCopy – enables a complete exam protocol to be shared with the click of a mouse and provides a process for managing protocols across multiple systems as well as saving protocols for back up

AIR x™

AIR x (auto graphic Rx) – contains deep learning algorithms that automatically identify anatomical structures to prescribe slices for challenging set-up planes , i.e. optic nerve, pituitary, etc.

This offering 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



*Not CE marked. This product cannot be placed on the market or put into service until it has been made to comply with CE marking. Not available for sale in all regions.

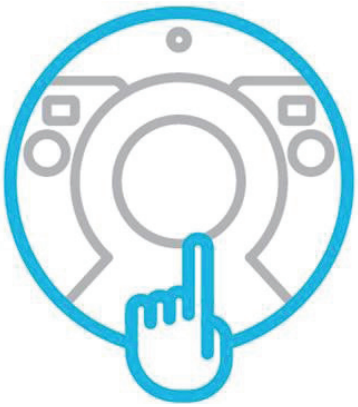
Patient Setup

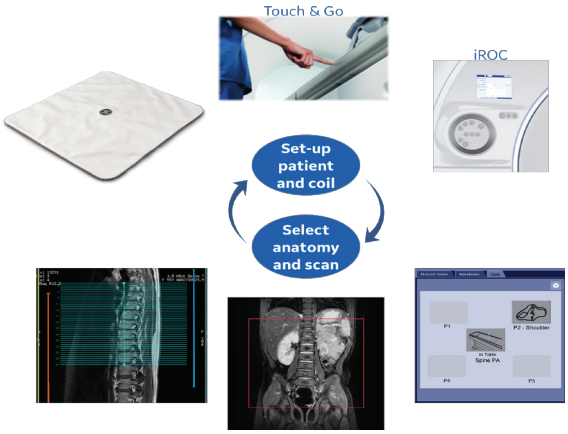
Comfort Plus patient table

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

Comfort Plus Patient Table	
Min/max table height	52 to 93 cm, continuous
Patient table drive	Automated, power driven vertical and longitudinal
Longitudinal speed	25 cm/sec (fast) and 1.9 cm/sec (slow) 15 cm/sec for patient positioning
Total cradle length	244cm
Total cradle travel	264 cm
Scannable range	181 cm
Peripherals connector	on cradle
Maximum patient weight for scanning	250 kgs (550 lbs)
Maximum lift capacity	250 kgs (550 lbs)
Patient transport accessories	Drawers
Landmarking	• Laser alignment with S/I and R/L alignment • IntelliTouch Landmarking Capability
Coil connection ports	Four ports. Three high density auto-coil sensing connection ports, fourth port for embedded PA coil

Patient Setup (continued)





AIR Touch™*

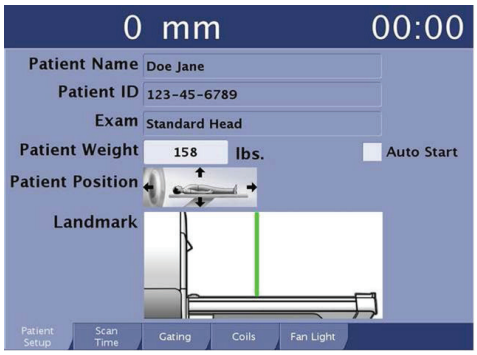
Intelligent coil localization and selection

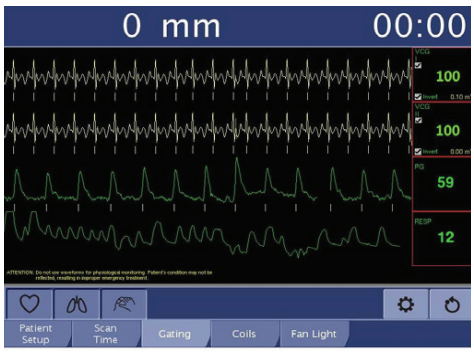
- Dynamically generated coil configurations with elements activated to optimize image quality (coverage, uniformity and parallel imaging acceleration) for every scan
- Coil locations determined automatically
- Calibration scans seamlessly acquired without interrupting workflow
- Dramatically simplified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

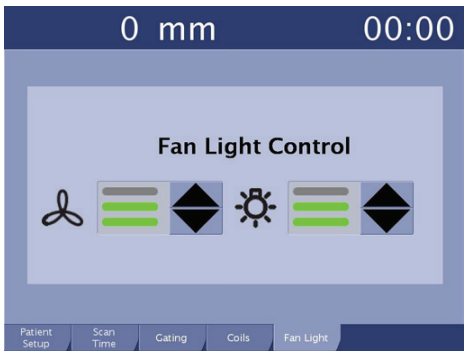
IntelliTouch

Touch to Landmark

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







In-Room Operator Console and Control

Full Control from table side

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

- Position the table
- Return the table to home
- Stop the table movement
- Control multiple levels of in-bore ventilation and lighting
- Display of patient name, ID, study description
- Display patient weight
- Display and entry of patient orientation and patient position
- Cardiac waveform display and ECG/EKG lead confirmation
- Gating control for trigger select, invert and reset
- Respiratory waveform display
- IntelliTouch technology landmarking
- AutoStart to initiate scanning of the selected protocol
- Display connected coils and coil status
- Display of table location and scan time remaining
- Activate Screen Saver

The in-room display also allows for the integration of third-party visualization tools.

In-line Processing & In-line Viewing

In-line Processing

Automated post processing

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

Automatic Pasting and Saving

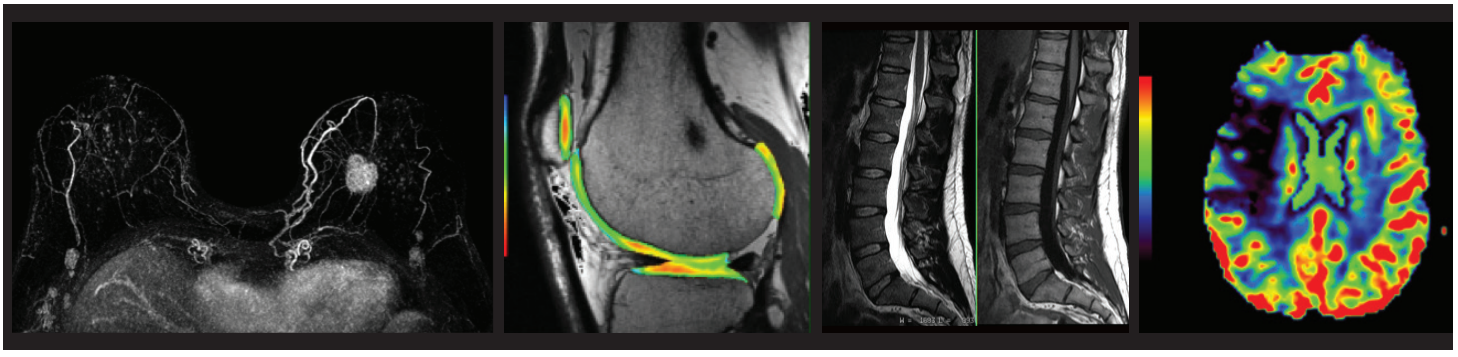
- • MR Pasting: Combine images from separate acquisitions into a single series with MR Pasting. MR Pasting is an image analysis
- software package that facilitates the display and filming of multiple station MR data sets in the body applications (total spine, total
- body) as well as peripheral MR angiography data. MR Pasting will automatically register and combine multiple acquisition stations
- into a single image of covered anatomy

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

In-line Viewing

Enhanced Visualization

In-line viewing allows the user to seamlessly and conveniently view, compare, and analyze images (during scan progress). The user simply selects the series, or multiple series, to view from the workflow manager, and the images are displayed along with the image display tools.



*Optional

Scanning

Workflow Manager

Linking and Auto Functions

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

Visualization

READYView on MR Operator Console

Integrated Post Processing & Advanced Visualization

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

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

Benefits

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

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

READYView

Standard Protocols

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

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

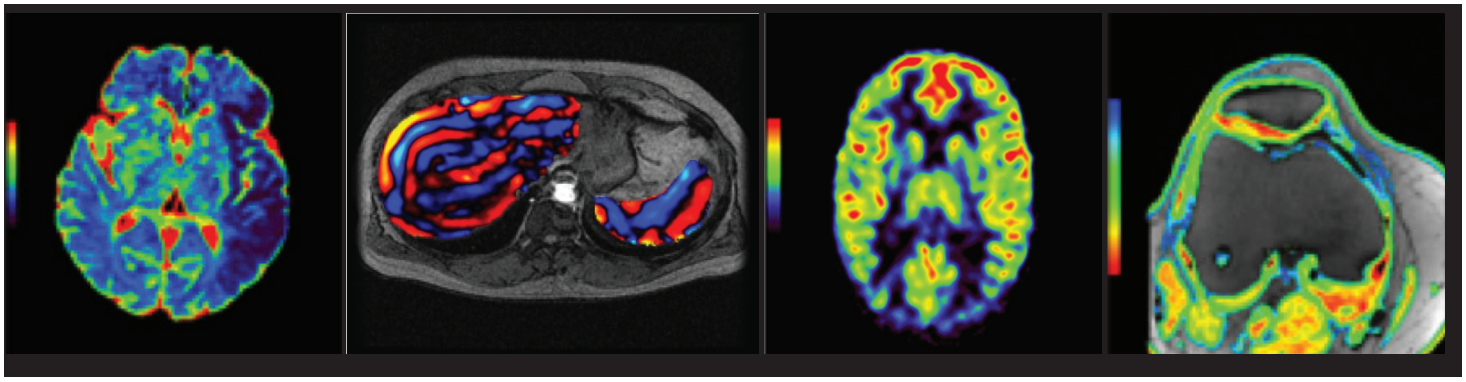
One-Touch ASL*
ASL READYView has algorithms that calculate Cerebral Blood Flow maps from a 3D ASL series. ASL acquisition is a non-invasive, one-click application that allows whole brain CBF measurements.

Ready View Spectroscopy*
The READY View MR spectroscopy protocols are used to display functional maps for metabolites and metabolite ratios in the brain and prostate.

One-Touch Brain*
The READYView Brain protocols are used to display functional maps for metabolites and metabolite ratios in the brain.

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

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



*Optional

READYView (continued)

Integrated Registration provides you with the capability to align and fuse two volumetric acquisitions from either the same or different acquisition modalities. Multiple 2D and 3D fusion capabilities.

The Integrated Registration application automatically detects the series that are the best candidates for registration based on the data set attributes and the use case. After the Reference (i.e., fixed) and Registered data sets are identified, the applicable registration methods will be automatically detected.

After the automatic registration is done, you can either directly accept automatic setup or validate it visually.

If you are still not satisfied with the result of the registration, it can be adjusted manually by translation or rotation, placing common anatomical landmarks, or a Region Of Interest (ROI) on the Registered dataset, where the registration should be performed, can be defined; the regions outside the ROI are ignored by the registration process.

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

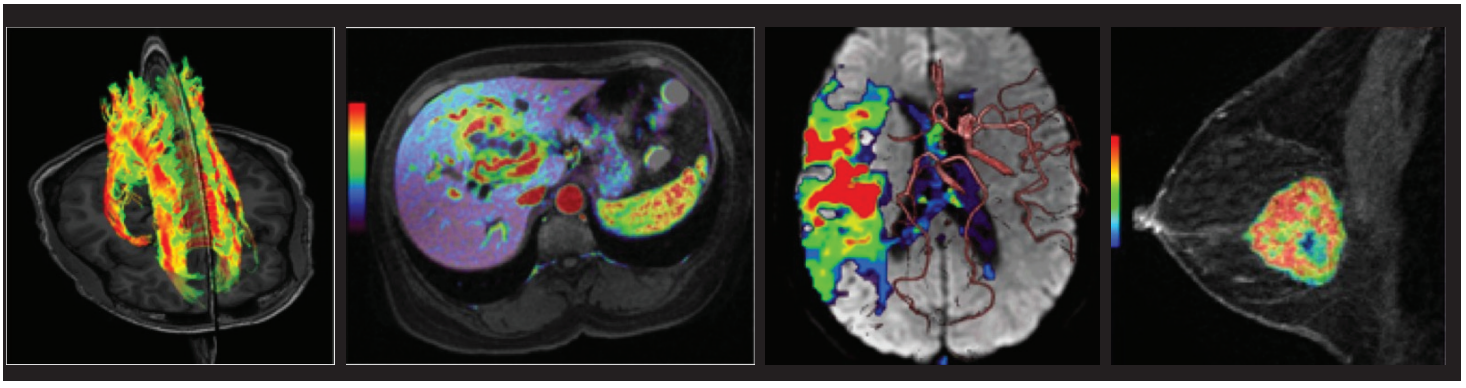
MR Standard
MR Standard is a time course protocol. The READYView MR Standard is a time course protocol that can be used to create the following maps: enhancement integral (negative and positive), time to peak, mean time to enhance, maximum slope of increase, maximum slope of decrease.

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

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

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

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

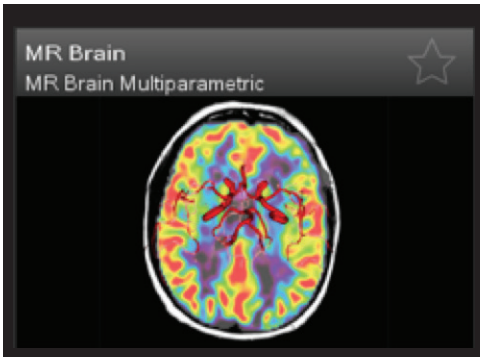


*Optional

READYView (continued)

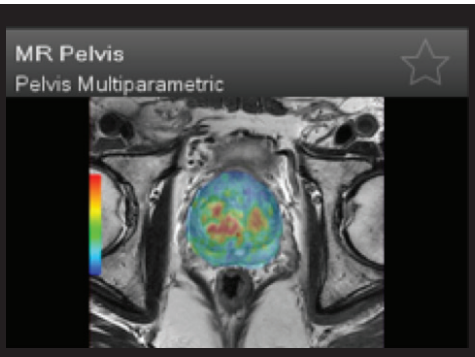
Multiparametric Protocols: Visualization at a Glance

READYView multiparametric protocols provide a guided workflow to streamline post processing and analysis of multiparametric studies. All measurements can be obtained with one ROI and the user customizable workflow has the ability to display all processed maps in one screen.



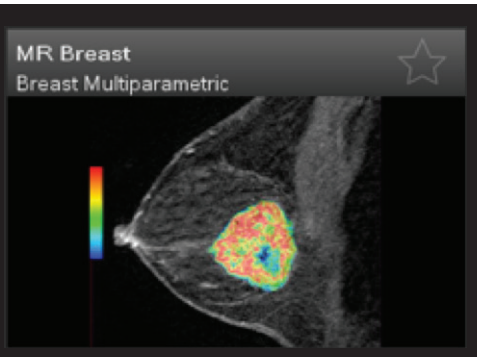
MR Brain*

Diffusion, Perfusion, Brain Spectroscopy, Brain SVQ DTI and ASL



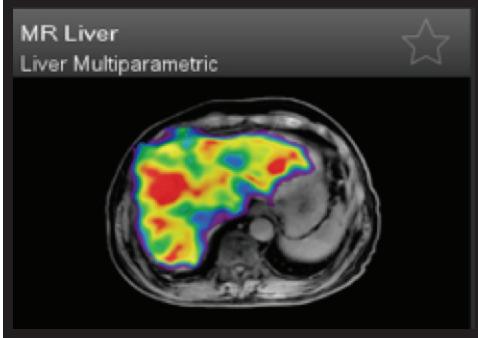
MR Pelvis*

Diffusion, Perfusion, and Prostate Spectroscopy



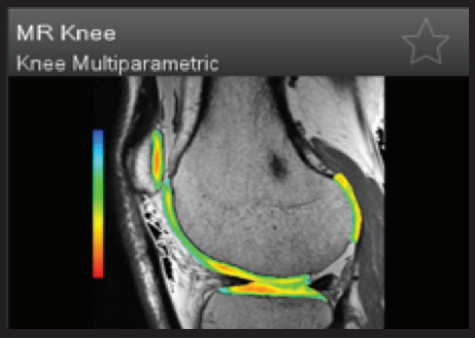
MR Breast*

Diffusion, SER and Breast SVQ



MR Liver*

Diffusion, R2 star or MR Touch



MR Knee*

T2 Map

* Optional and requires two or more of the functional series selected.

SIGNA™ Voyager Scan Parameters

Operator console

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

DICOM

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

Slice thickness and FOV	
Minimum slice thickness in 2D	0.1 mm
Minimum slice thickness in 3D	0.1 mm
Minimum FOV	5 mm
Maximum FOV	500 mm
Min / Max Matrix	32-1024

2D Fast Spin Echo	
Minimum TR (128x128)	3 ms
Minimum TR (256x256)	4 ms
Minimum TE (128x128)	1.648 ms
Minimum TE (256x256)	2.016 ms
Min slice thickness	0.1 mm
Min ESP 128x128	1.648 ms
Min ESP 256x256	2.016 ms
Max ETL	480

3D Fast Spin Echo	
Minimum TR (128x128)	46.0 ms
Minimum TR (256x256)	52.0 ms
Minimum TE (128x128)	5.0 ms
Minimum TE (256x256)	7.0 ms
Min slice thickness	0.3 mm
Min ESP (128x128)	1.568 ms
Max ETL	399

2D Fast Gradient Echo	
Minimum TR (64x64)	0.628 ms
Minimum TR (128x128)	0.768 ms
Minimum TR (256x256)	1.064 ms
Minimum TE (64x64)	0.216 ms
Minimum TE (128x128)	0.216 ms
Minimum TE (256x256)	0.220 ms

3D Fast Gradient Echo	
Minimum TR (64x64)	0.59 ms
Minimum TR (128x128)	0.705 ms
Minimum TR (256x256)	1 ms
Minimum TE (64x64)	0.2 ms
Minimum TE (128x128)	0.2 ms
Minimum TE (256x256)	0.21 ms

2D Spin Echo	
Minimum TR (128x128)	3.0 ms
Minimum TR (256x256)	4.0 ms
Minimum TE (128x128)	1.672 ms
Minimum TE (256x256)	2.048 ms

3D Fiesta	
Minimum TR (64x64)	1.1 ms
Minimum TR (128x128)	1.38 ms
Minimum TR (256x256)	1.9 ms
Minimum TE (64x64)	0.29 ms
Minimum TE (128x128)	0.38 ms
Minimum TE (256x256)	0.48 ms

Echo Planar Imaging (EPI)	
Minimum TR (64x64)	4.0 ms
Minimum TR (128x128)	5.0 ms
Minimum TR (256x256)	5.0 ms
Minimum TE (64x64)	1.1 ms
Minimum TE (128x128)	1.2 ms
Minimum TE (256x256)	1.6 ms
Minimum FOV	4 cm
ESP at 25 cm FOV	64x64: 0.496 ms 128x128: 0.704 ms 256x256: 1.112 ms
ESP at 48 cm FOV	64x64: 0.352 ms 128x128: 0.492 ms 256x256: 0.704 ms
ESP at 99 cm FOV	64x64: 0.24 ms 128x128: 0.336 ms 256x256: 0.572 ms
Images per second	64x64: 168 128x128: 93 256x256: 52
b value	Maximum (s/mm2): 10,000 Max # for ADC: 40
Diffusion Tensor Directions	Max: 300

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

Siting and Other Specifications

This section provides an overview of the siting requirements for a SIGNA™ Voyager. More detailed information is available on request.

Room Layouts	
	System Configuration Minimum Values
Magnet Room WxD Minimum Ceiling Height	3.7 m x 5.8 m 2.5 m (98.5in) min ceiling height
Equipment Room WxD	1.8 m x 2.7 m
Control Room WxD	1.5 m x 2.1 m
Minimum Total Area (M^2)	27m^2

Fringe Field		
	Axial	Radial
0.5 mT (5 Gauss)	4 m	2.5 m
0.1 mT (1 Gauss)	5.8 m	3.2 m

Installation Dimensions and Weights			
	Width	Height	Weight
Magnet assembly – (not including electronics)	2.1 m	2.4 m	3300 kg (7275 lbs) with cryogens
Comfort Plus patient table	70 cm (27.5 in)	93 cm (36.61 in)	257 kg (453 lbs)
Control Room Equipment			69.4 kg (153.0 lbs)
MR Equipment			1631 kg (3596 lbs)

Electrical Supply Requirements

Supply system recommended configuration:

- 3-phase grounded WYE with neutral and ground (5-wire system)
- Note: Neutral must be terminated inside main disconnect control

Alternate configuration:

- 3-phase DELTA with ground (4-wire)

Recommend corner grounded Delta configuration

Voltage/Frequency: 480VAC/60Hz. 415, 400, 380VAC/50,60Hz

Power Consumption

SIGNA™ Voyager is designed with technology that reduces its power footprint. Power consumption is 48% lower than conventional 1.5T systems. Power consumption depends on actual usage. They include consumption by the shield cooler compressor (9 kVA). The following values are approximate and are measured per COCIR standards:

Sleep Mode (a.k.a Power off mode)	5.7kW
Standby (no scan)	11.1kW
Typical Power per COCIR Standards	16.1kW
Maximum Continuous sustained power (> 5 secs)	64 KVA
Peak Instantaneous Power (< 5 secs)	77 KVA

RF Shielding

100dB at 63.86 MHz planewave

Workspace Monitor Position

	Maximum Field Strength
LCD Flat Panel Monitor	5 mT (50 Gauss)

Temperature and Humidity Requirements

	Magnet Room	Control Room	Equipment Room
Temperature	15 - 21 °C	15 - 32 °C	15 - 32 °C
Max. Temperature Change Rate	3 °C / hour	3 °C / hour	3 °C / hour
Humidity (non-condensing)	30 - 60 %	30 - 75 %	30 - 75 %
Max humidity change rate	5% RH/hr	5% RH/hr	5% RH/hr

Altitude Requirements

Lower limit	-30m
Upper limit	2600m

Siting and Other Specifications (continued)

Alternative environments

Modular buildings may also be available (including air-conditioning, heating, chiller, RF shielding, additional magnetic shielding in walls). Contact your local GE representative for GE-certified designs and vendors.

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

Filming considerations

Filming requires the SIGNA™ Voyager analog or digital filming.

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

Accessory Package

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

Emergency stop

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

Warranty

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

InSite* Remote Diagnostics

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

Miscellaneous

Optional capabilities

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

GE regulatory compliance

The SIGNA™ Voyager complies with all applicable safety standards, including but not limited to UL60601-1 and IEC60601-1, IEC60601-2-33, IEC60601-1-2 (Electromagnetic Compatibility).

Laser alignment devices contained within this system are appropriately labeled according to the requirements of the FDA's Center for Devices and Radiological Health (CDRH) and IEC 60825-1:2007.

Mobile MR installations

Trailer-compatible configurations are available. Please contact your nearest GE representative for the list of qualified trailer companies and other details.

Imagination at work

JB81751XG