GE HealthCare

SIGNA™ Champion

Datasheet

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SIGNA™ Champion

Enter a whole new realm of possibility in MR with the new SIGNA™ Champion. This system is designed with AI in its genes 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.

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™ Champion includes the next generation in RF technology and gradient technology.

Built on the latest GE HealthCare MR platform, the SIGNA™ Champion 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™ Champion features a platform 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 HealthCare's active shielding technology, the SIGNA™ Champion 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™ Champion 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	174 cm
Operating field strength	1.5T (63.86 MHz)
Magnet Shielding	Active
Magnet Shimming	Active and passive
EMI shielding factor	99%
Magnet weight with cryogens	7,275 lbs (3,300 kg)
Magnet cooling	Cryogenic (liquid helium)

Patient Focused Design	
Patient Bore (L x W x H)	163 cm x 70 cm x 70 cm
Patient Aperture	76 cm
Patient Weight for Scanning	Max. 250 kg (550 lbs)
Patient comfort module	Head or feet first entry Dual-flaired patient bore 2 way in-bore intercom system In-bore lighting and ventilation Dual sided controls and touch-screen In-room display monitors

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
48cm 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™ Champion introduces Ultra High Efficiency (UHE) gradient system that includes Intelligent Gradient Control technology. This novel technology enables the SIGNA™ Champion to deliver excellent TR and TE values that enable a superior clinical performance.

Gradient Imaging Performance	
Maximum Amplitude Performance	35 mT/m
Maximum Slew-Rate Performance	140 T/m/s
Maximum FOV (x,y,z)	50 cm x 50 cm x 50 cm
Duty Cycle	100%

Ultra High Efficiency (UHE) Gradient System

The SIGNA™ Champion gradient coil is 2x more efficient than previous generation of products (i.e. the Champion 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™ Champion 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 HealthCare 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 HealthCare 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.

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™ Champion 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 (uAs). 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 Transmit and Receive

End to end Digital - TDI 2.0

The SIGNA™ Champion offers the new generation Total Digital Imaging technology, called TDI 2.0. This end to end digital RF architecture brings higher precision and greater image quality to the scanning. TDI 2.0 is built on two fundamental designs:

Direct Digital Transmit

Direct Digital Transmit (DDT) is a magnet-compatible and reliable subsystem in scan room which integrates all RF transmit parts, with digital interface to system cabinet in equipment room, and direct connect to transmit coils. DDT provides 100% better stability and 200% higher accuracy in typical RF transmission*. With great efficiency and full digitalization compensation technology, ultra linearity of the exciting B1 field is achieved with variable patient sizes and coils. Based on these powerful improvements, it's easy to generate excellent RF profile and benefit the image quality. In addition, the compact design also makes it fast to install.

Direct Digital Receive

Direct Digital Receive (DDR) employs independent analog-to-digital converters to digitize inputs from each RF channel. The digital receivers are located in the shielded scan room, isolated from external noise sources. Every MR signal input is captured and digitized independently, literally redefining the concept of an RF channel. The result shows greater clarity and increased SNR by up to 30%. All the volume acquisitions can benefit from DDR, independent of which surface coil is used in the scanning.

TDI - RF Transmit	
RF amplifier	Water-cooled compact, solidstate, non-magnetic
Maximum output capacity	16 kw for body 2 kw for head
Maximum RF field	24 µT
RF Exciter frequency	63.86 ± 0.65 MHz
Amplitude control	16 bit with 1.6 ns resolution
Frequency resolution	<0.6Hz/step
Phase resolution	0.005 deg/step
Amplitude stability	<0.05 dB/1 s <0.09 dB/1 min <0.1 dB/5 min
Phase stability	<1.5 deg/minute
Frequency stability	14 parts per billion
RF pulse control	Digital

TDI - RF Receive	
Independent Receive channels	32, 48, 64
Analogue to Digital converters	Up to 64
Sampling rate	80 MHz @ 16 bits per channel
ADC sampling resolution	16 bit
Receive signal filtering/ decimation	Digital
Quadrature demodulation	Digital
Dynamic range at 1 Hz BW	>165 dB
Receive signal resolution	32 bits
Receive bandwidth	± 250 kHz
Pre-amplifier noise figure	<0.5 dB for body

*Gain & phase stability, linearity accuracy

Host Computer and Recon Engine

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

Recon Engine

Reconstruction performance today is challenged by explosive growth in data, and increased computational complexity. The amount of data to be stored and processed continues to increase with the advances in MR system technology. The SIGNA™ Champion is designed to meet that challenge with at least 64 GB-memory and fast recon speed.

Recon Engine Gen 7	
Operating system	Linux
Processor	Dual Intel Xeon Sliver 4110
Clock rate	2.1 GHz
Memory	64 GB
Network	1 GbE
Hard disk storage	1 x 480 GB SSD
Reconstruction speed	37,000 FFT/second at 256 x 256 matrix for full FOV

Recon Engine Gen 7 DL*	
Operating system	Linux
Processor	Dual Intel Xeon Silver 4214
Clock rate	2.2 GHz
Memory	>= 128GB
Network	1 GbE
Hard disk storage	>= 960 GB
Reconstruction speed	63,000 FFT/second at 256 x 256 matrix for full FOV
GPU	Nvidia Tesla T4

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

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

AIR™ Recon DL*

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

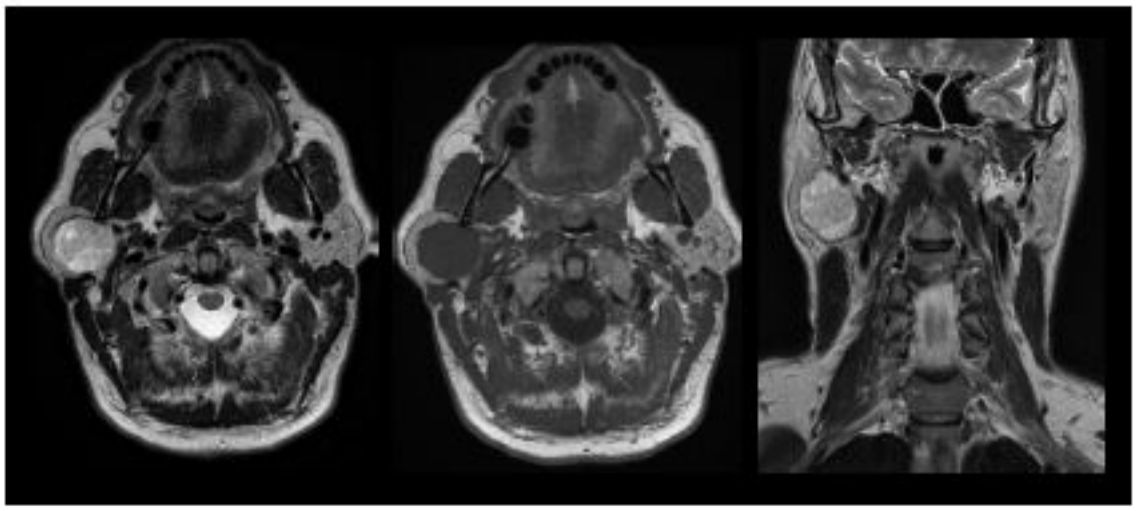
*Optional, may not be available in all markets.

RF Coils and Arrays

SIGNA™ Champion offers an assortment of quadrature and multi-channel array coils to ensure outstanding image quality and coverage. The TDI Express coil suite, compatible with the fixed table configuration, is designed to provide outstanding coverage and convenient workflow.

1.5T Head Neck Array

The 1.5T Head Neck Array (HNA) comes with the anterior array, a removable top for open-face scans and a lookout mirror. It has 16 elements with the anterior array, optimized for brain, cervical spine and neuro-vascular MRI. The HNA supports head-first imaging and may remain in place for all body and spine.



HNA with Anterior adapter specifications	
Elements	16
Weight	7.5 kg (16.53 lbs)
Dimensions (L x W x H)	55.0 cm x 42.0 cm x 37.5 cm (21.7 in x 16.5 in x 14.8 in)
R/L Coverage in brain mode	24 cm (9.4 in)
R/L Coverage in NV mode	30 cm (11.8 in)
S/I Coverage	43.5 cm (17.1 in)
Patient orientation	Head first

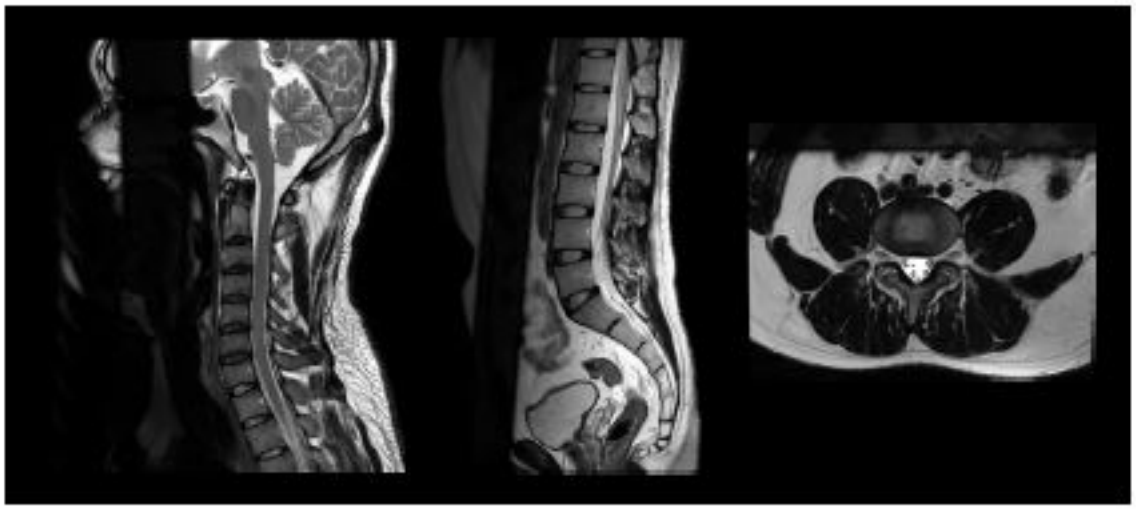
HNA with Open-Face adapter specifications	
Elements	10
Weight	6.2 kg (13.67 lbs)
Dimensions (L x W x H)	55.0 cm x 42.0 cm x 21.5 cm (21.7 in x 16.5 in x 8.5 in)
R/L Coverage in brain mode	24 cm (9.4 in)
R/L Coverage in NV mode	30 cm (11.8 in)
S/I Coverage	43.5 cm (17.1 in)
Patient orientation	Head first

Coil compatibility	
Maximum number of channels in the maximum FOV	Up to 52, when combined with the 24E Posterior Array and AIR™ Multi-Purpose Coil Large Up to 47, when combined with the 24E Posterior Array Array and 16ch AIR™ Anterior Array
Coil combination	• 24E Posterior Array • 16ch AIR™ Anterior Array • 9E Express Anterior Array • AIR™ Multi-Purpose Coil Large or Medium • 16h Flex Coil Large, Medium or Small • 8ch Flex 70 Array, 50 Array or 40 Array

RF Coils and Arrays *(cont.)*

1.5T 24E Posterior Array

The 24E Posterior Array (PA) is a 24-element array coil which is embedded in the table and can ensure excellent contrast and resolution for thorax, abdomen, pelvis, and TL spine with 91 cm of S/I coverage. 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. The innovative curved design of the PA coil enables SIGNA Champion to have a curved table top, improving patient experience and offering a larger distance to the bore top.



1.5T 24E Posterior Array specifications	
Elements	24
Weight	20.9 kg (46 lbs)
Dimensions (W x L x H)	40.5 cm x 91.4 cm x 11.5 cm (15.9 in x 36.0 in x 4.5 in)
R/L Coverage	34 cm (13.4 in)
S/I Coverage	91 cm (35.8 in)
Patient orientation	Head first / Feet first

Coil compatibility	
Maximum number of channels in the maximum FOV	Up to 52, when combined with the Express Head Neck Unit and the AIR™ Multi-Purpose Coil Large Up to 47, when combined with the Express Head Neck Unit and 16ch AIR™ Anterior Array
Coil combinations	• 16ch Head Neck Array • 16ch AIR™ Anterior Array • 9E Express Anterior Array • AIR™ Multi-Purpose Coil Large or Medium • 16ch Flex Coil Large, Medium or Small • 8ch Flex 70 Array, 50 Array or 40 Array • Rapid Endorectal Coil

MR 30 for SIGNA™

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

MR 30 for SIGNA™ provides:

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

NeuroWorks

NeuroWorks includes the basic imaging acquisitions and processing 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, STIR, MSDE* 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

Inversion Recovery	
PSIR	Phase Sensitive Inversion Recovery

*Optional

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

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

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

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-breathing Acquisition	
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

*Optional

CVWorks *(cont.)*

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
Visualization	MIP & HD MIP
Inline Self Calibrating Phase Contrast	The feature provides an inline post-processing task that automatically corrects phase-contrast images from background phase error for MR flow imaging by using areas in the image that are known to have zero velocity.

OrthoWorks

OrthoWorks delivers routine imaging that is not always a given. From motion correction to advanced volumetric imaging, GE HealthCare'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
MENSA NERVE	For optimized nerve contrast*
Visualization	3D reformat MPR
	Volume segmentation
	Volume rendering

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

T2*-weighted Imaging	
3D MERGE	High SNR T2* contrast
	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 HealthCare enables superb linearity from the gradient platform and hardware performance. GE HealthCare 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
Multi-station localizer	Consistent set-up
	Auto-table movement
	Auto-pasting
	Efficient work-flow

PaedWorks

PaedWorks is the GE HealthCare solution to address your specific needs in paediatric imaging, from standard sequences supported with the latest in motion control for brain to toes. GE HealthCare 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

MR 30 for SIGNA™ Features

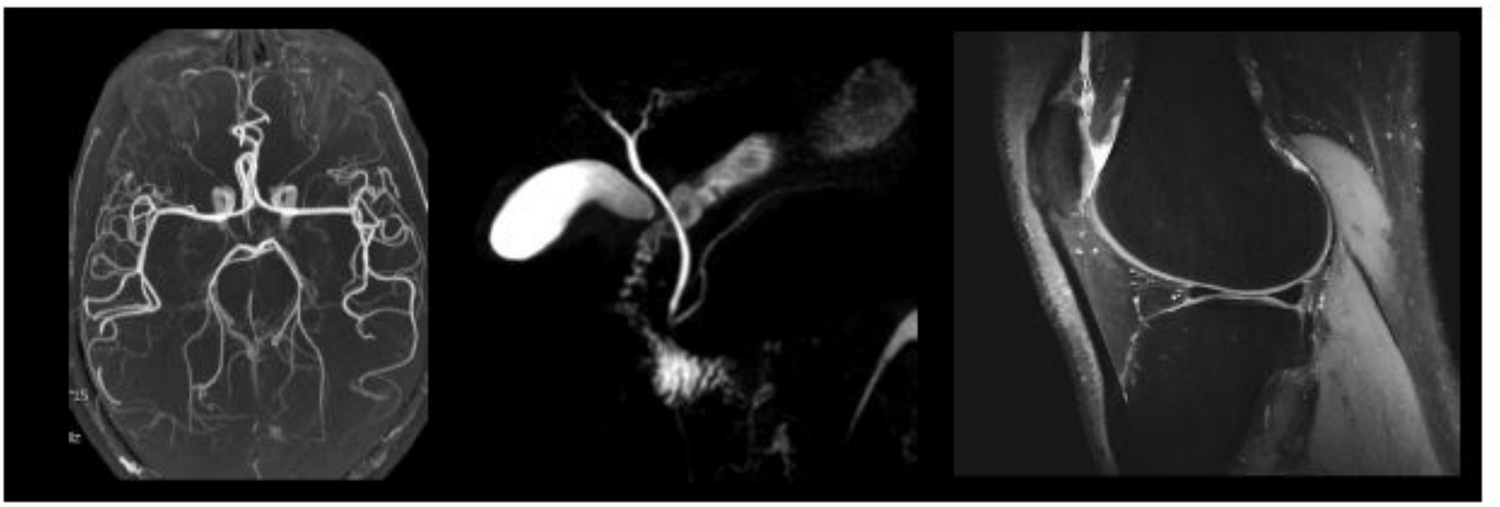
HyperSense*

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 ratio with shorter acquisition times, extending the capabilities to additional sequences.

Benefits

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



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

MR 30 for SIGNA™ Features *(cont.)*

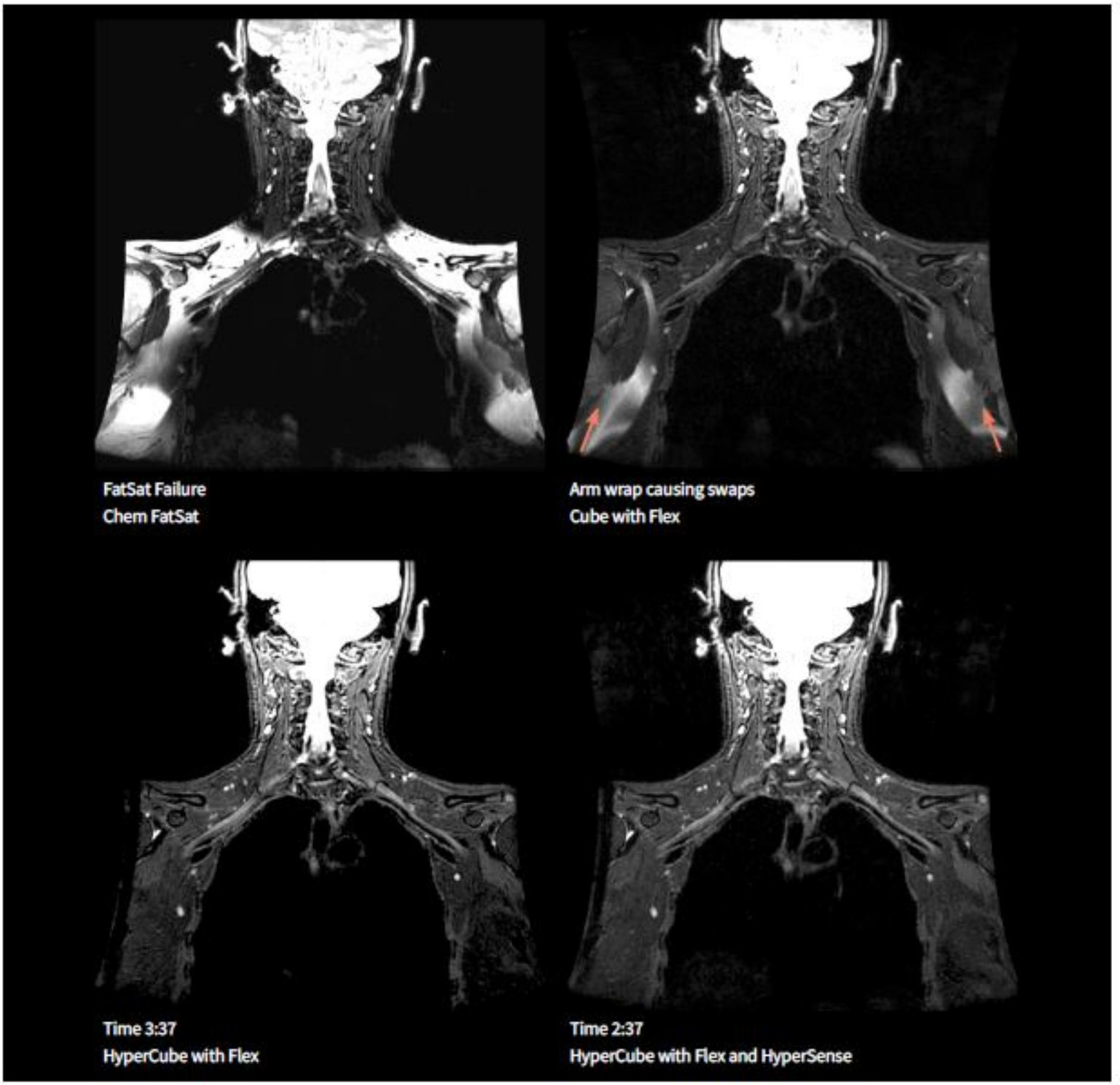
HyperCube*

Tailored 3D imaging that fits to perfection

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

Benefits

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



*Optional

MR 30 for SIGNA™ Features *(cont.)*

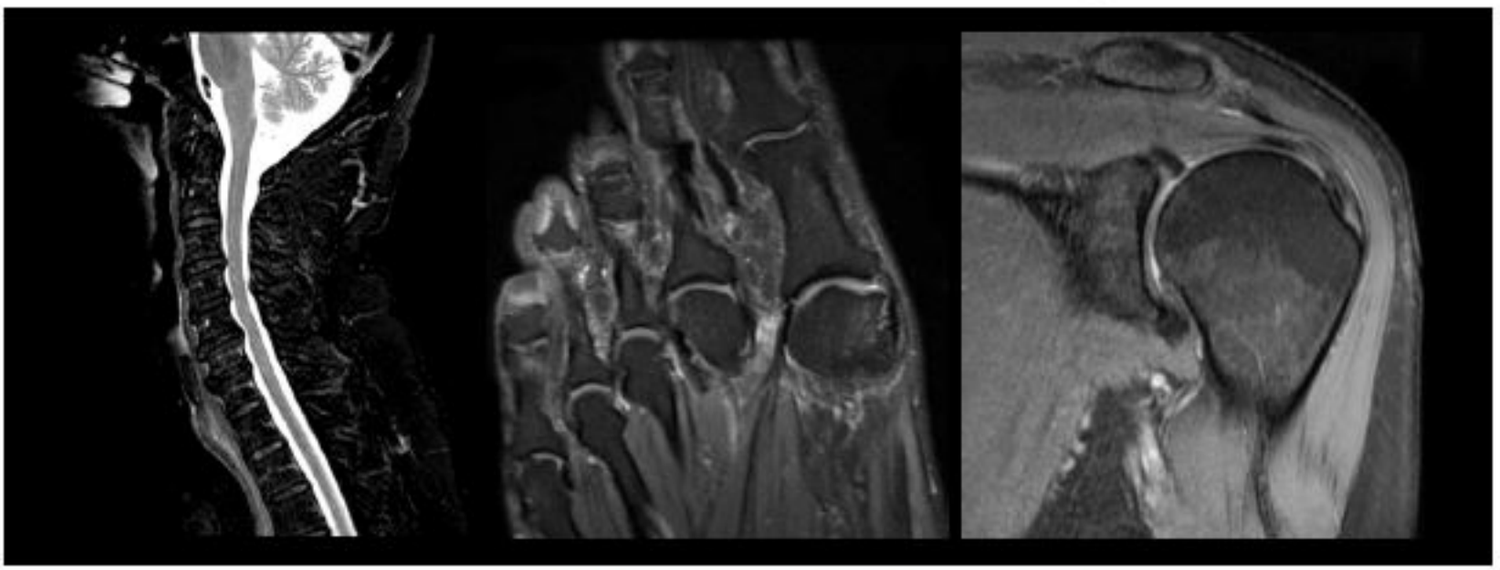
Flex for Cube and FSE*

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.

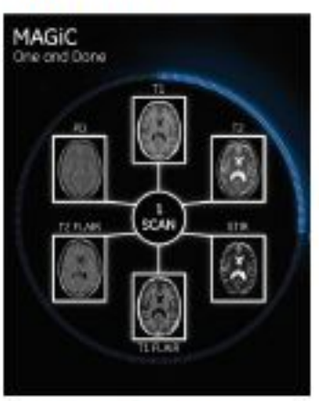
Benefits

- 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 delivers 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
- User Mask: manually mark regions of interest
- Auto ROI: after user selects a pixel, an ROI will be created from neighboring pixels with similar R1, R2 and PD
- Multiple layouts can be saved

*Optional
**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

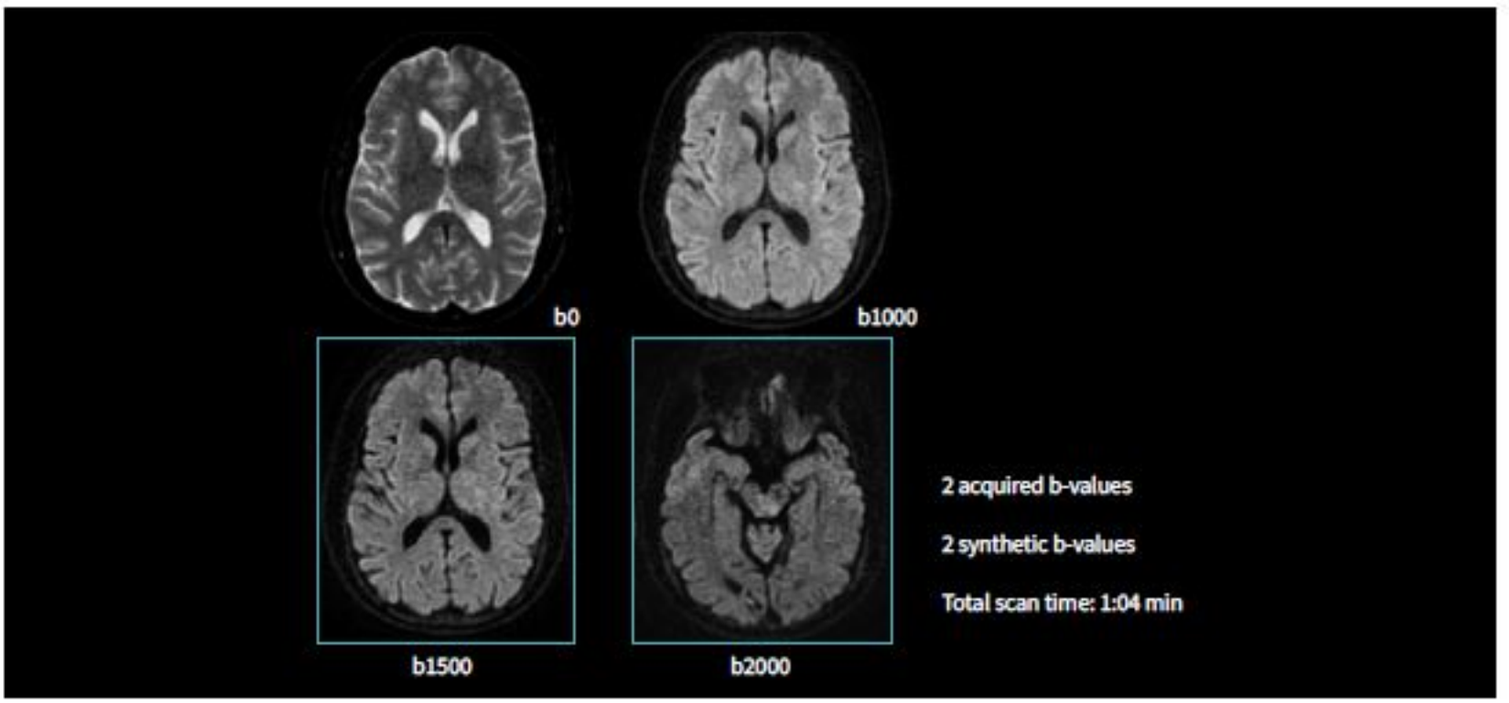
MR 30 for SIGNA™ Features *(cont.)*

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



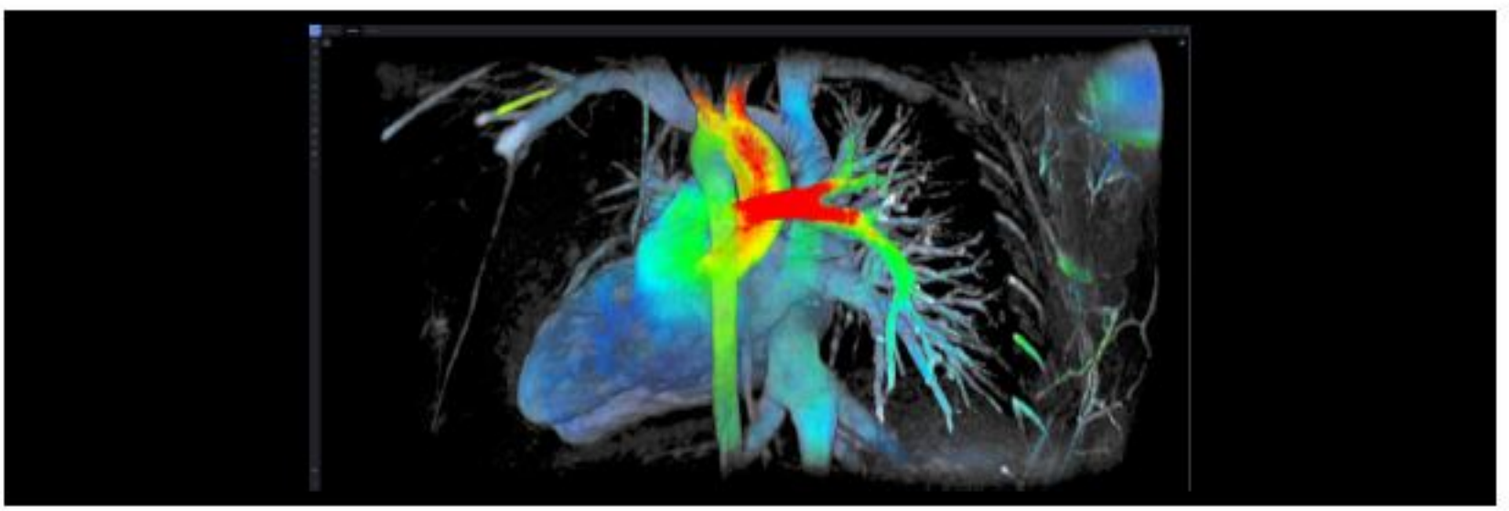
ViosWorks*

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

MR 30 for SIGNA™ Features *(cont.)*

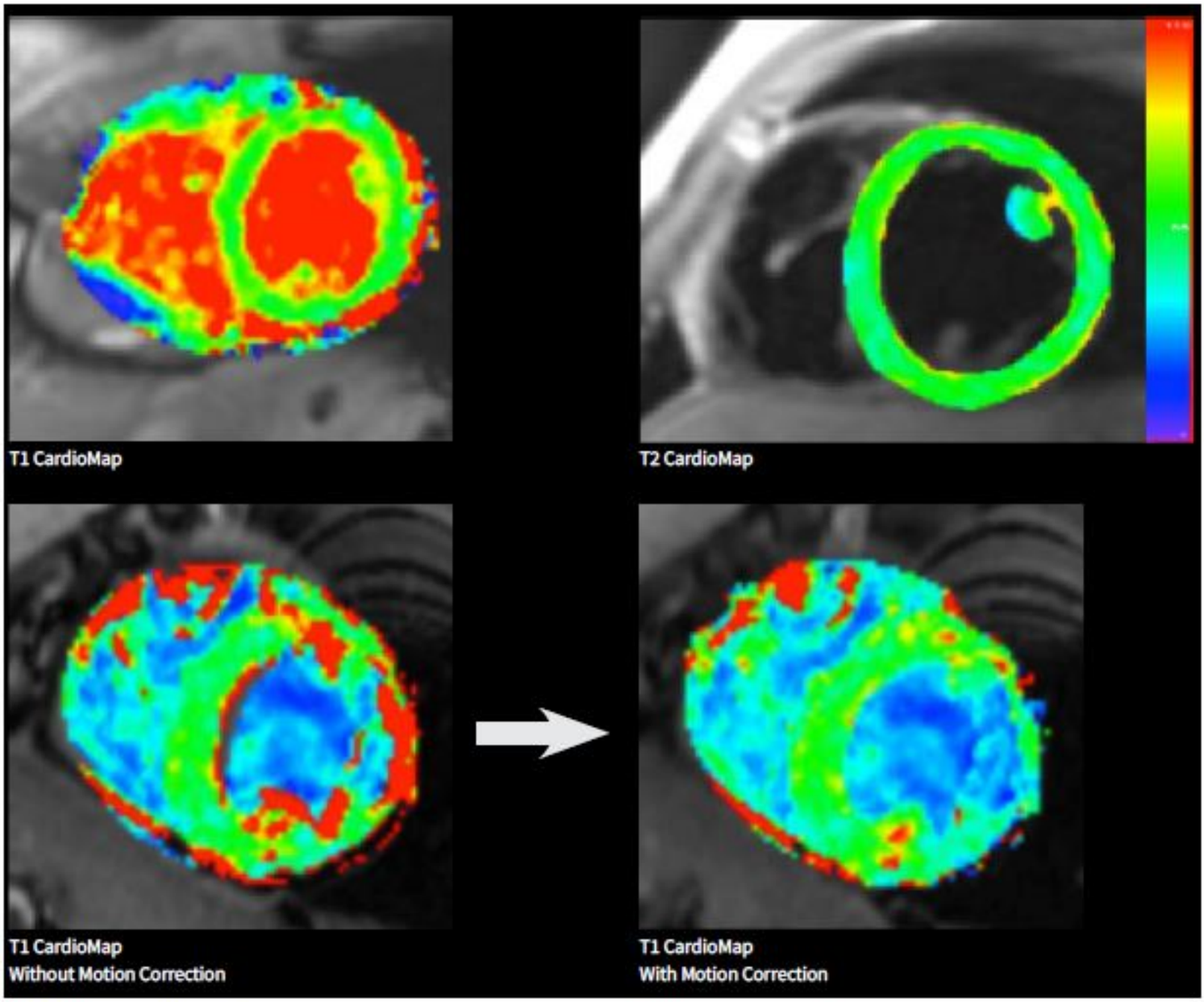
CardioMaps*

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.**



T1 CardioMap

T2 CardioMap

T1 CardioMap
Without Motion Correction

T1 CardioMap
With Motion Correction

*Optional

MR 30 for SIGNA™ Features *(cont.)*

PROGRES*

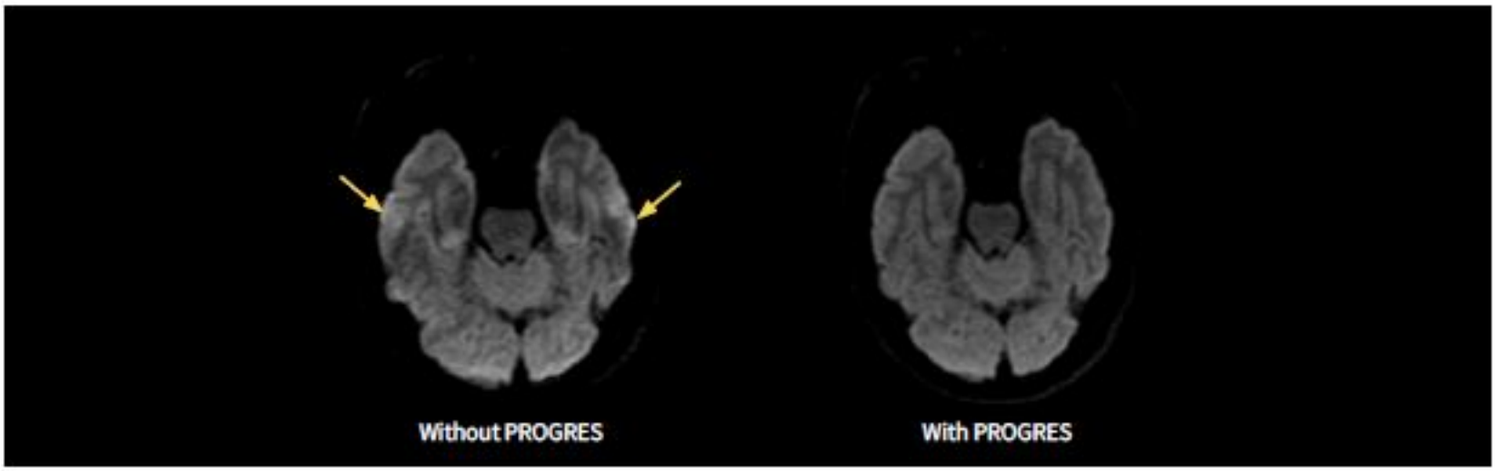
Resolving the limits of diffusion distortion

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



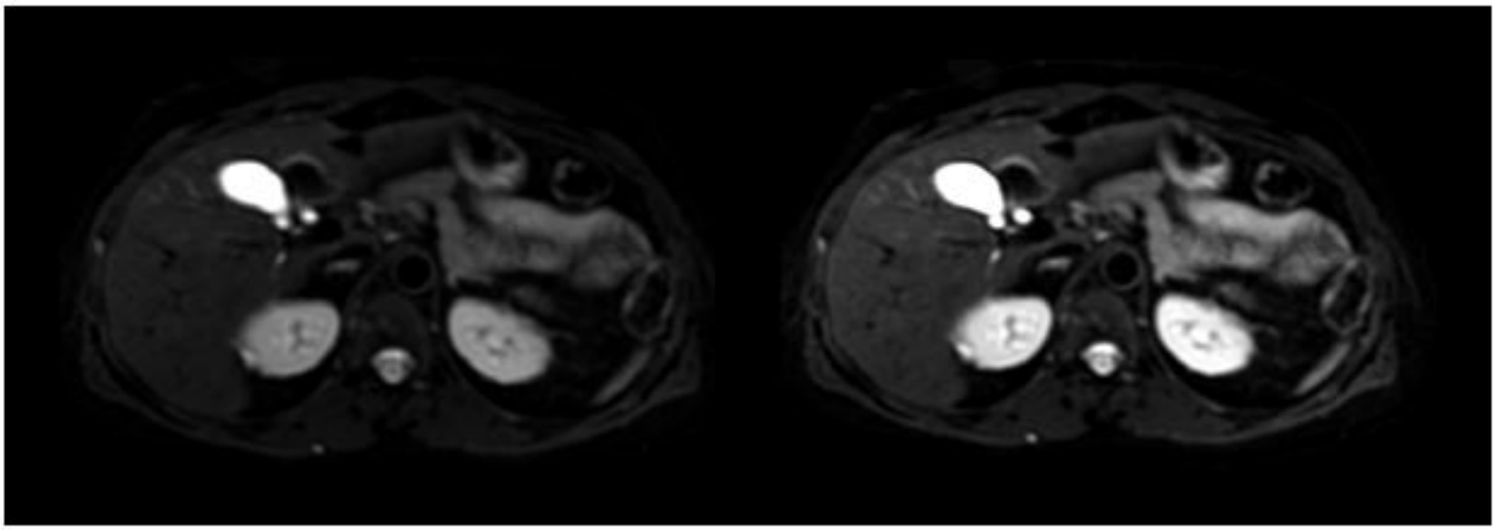
MUSE*

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 PSIR	IR techniques provide uniform suppression of tissues by applying an inversion pulse to null signal. FSE-IR reduces scan time while still achieving efficient tissue suppression. FSE-IR with Water SAT pulse and manual adjustment of Center Frequency location to suppress silicon signal in breast imaging. PSIR is Phase Sensitive Inversion Recovery
3D FSE 3D frFSE	Three-dimensional imaging acquisitions mostly used for T2-weighted contrast.
T1 FLAIR T2 FLAIR	T1 and T2 Fluid Attenuated Inversion Recovery (FLAIR) pulse sequences allow the suppression of signal from cerebrospinal fluid (CSF). This sequence provides contrast to differentiate white and gray matter to T1- and T2-weighted brain and spine imaging.
Double IR/Triple IR (Black Blood)	These pulse sequences are included to allow Black Blood imaging for studies of cardiac morphology (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.
SSFSE Snapshot	The imaging efficiency of navigated/respiratory triggered SSFSE can be improved by imaging multiple slice locations per trigger event with SSFSE Snapshot.
3D MRCP	3D frFSE sequence that combined with the T2 Prep option provides improved background tissue suppression for MRCP exams.
T2 MAP*	T2 MAP is a multiple acquisition; multiple 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 *(cont.)*

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

*Optional

Image Acquisition *(cont.)*

Gradient Echo *(cont.)*	
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.
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.
DISCO Star*	DISCO Star is a free-breathing, multi-phase, motion robust, 3D radial scan (stack of stars) technique. It is acquired in one continuous dynamic arterial phase to produce worry-free, consistent image quality regardless of the patient's condition. DISCO Star employs radial in-plane trajectory to provide active motion compensation without navigators or bellows.
MR Touch*	MR 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.

*Optional

Image Acquisition *(cont.)*

Vascular	
Inhance Inflow IR*	3D FIESTA based non-contrast-enhanced MR angiography technique that provides static background tissue and venous flow suppression for imaging arteries. It uses SPECIAL for uniform fat suppression and respiratory gating compatibility reduces respiratory motion artifacts during free-breathing renal exams.
Inhance 3D Velocity*	3D Phase Contrast based technique designed to acquire angiographic images in brain and renal arteries with robust background suppression in a short scan time. Respiratory triggering compatibility enabling abdominal angiography.
Inhance 2D Inflow*	Designed for imaging arteries that follow almost a straight path (i.e. femoral, popliteal, and carotid arteries) Inhance 2D Inflow acquires data during the systolic phase only. Compatible with Peripheral or Cardiac Gating and ASSET.
Inhance 3D Delta Flow*	3D FSE cardiac gated based non-contrast-enhanced MRA application designed for peripheral arterial imaging. This technique uses the differences between systolic and diastolic flow to help generate arterial signal contrast with robust background and venous suppression. ASSET compatibility provides shorter scan times.
2D TOF / 2D Gated TOF 2D 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. Multi-shell DTI is available in clinical mode.
eDWI	Enhanced DWI (eDWI) provides high SNR diffusion images with short acquisition times. Supports Multi b-values with SMART NEX for variable NEX selection per B-value, "3 in 1" diffusion weighting to all three gradients simultaneously, tetrahedral selection with four different diffusion weighting combinations for shorter TE values and Inversion recovery for fat signal reduction.
RTFA	The RTFA algorithm leads to a reduction in distortion of the diffusion image per diffusion axis. RTFA is designed to reduce image blurring and distortions typically associated with diffusion imaging throughout the body. RTFA also allows for increased utilization of single spin echo DWI which results in an increase in SNR by up to 50% compared to dual spin echo and, when combined with the improved resolution leads to an increase in image quality that can be utilized for image presentation, fusion and ADC map outputs.
RTCF	Real-Time Center Frequency (RTCF) option can be applied to DWI & DTI to enable using the optimal center frequency for each slice. This is intended to help improve fat suppression and signal drop off at areas of high B_0 inhomogeneity (off-isocenter, or area with high tissue susceptibility). It is also intended to reduce station-to-station misalignment in whole body diffusion imaging.
FOCUS DWI*	FOV Optimized & Constrained Undistorted Single-shot (FOCUS) DWI utilizes 2D selective excitation pulses to limit the prescribed phase encode FOV eliminating artifacts from motion, imaging back folding or unsuppressed tissue.

*Optional

Image Acquisition *(cont.)*

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*	
T1, PD and T2 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.
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.
Spectral Spatial	Method that applies selective pulses for water excitation only, while fat is left untouched, thereby producing no signal.

*Optional

Image Acquisition *(cont.)*

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

Motion Correction Technology	
PROPELLER MB	PROPELLER MB is a multi-shot per blade sequence that uses a radial k-space filling pattern acquisition and a post processing correction algorithm to significantly reduce the effects of motion artifacts. It is compatible with spatial and chemical Sat, ASPIR, STIR Auto TI/TR and navigator.
PROMO*	Prospective motion correction is a real time 3D navigator based motion correction technique compatible with Cube T2, Cube DIR, Cube T2 FLAIR, BRAVO and MPRAGE.
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.
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*	HyperSense has been expanded to include T1 acquisitions including MP-RAGE & BRAVO for neuro imaging and LAVA, LAVA-Flex, DISCO and DISCO-Flex for body applications, and Vibrant for breast applications. In addition, HyperSense is now compatible with other 3D gradient echo sequences, such as MERGE, FIESTA, COSMIC, fast 3D TOF and SWAN.

*Optional

Image Acquisition *(cont.)*

Acceleration Technology *(cont.)*	
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.

Magnetization Transfer Contrast
Used to improve the Magnetization Transfer Imaging Option to improve contrast between blood flow and surrounding tissue in 3D TOF images, to augment post-contrast T1-weighted brain images, and to increase myelographic effect for improved disc and cord lesion visualization

Blood Saturation
Use Blood Suppression to obtain "black blood" cardiac images and reduce flow-related ghosting.

*Optional

Computing Platform

Operator Console

The SIGNA™ Champion 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™ Champion 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™ Champion 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
Split Exam	Provides the capability to extract a subset of series from an exam and create a separate exam
	Performed on the locally-accessible image database
Image display performance	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.

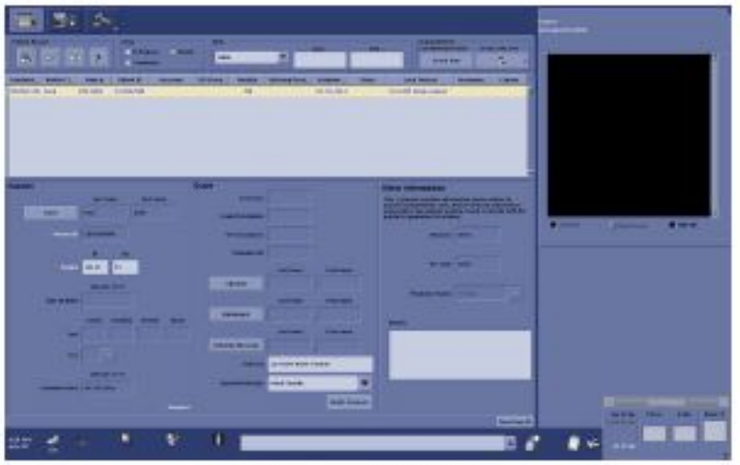
With the SIGNA™ Champion, the following applications are parallel imaging enabled:

- 2D DT-EPI
- 2D DW-EPI
- 2D FGRE
- 2D FIESTA
- 2D FIESTA FastCARD
- 2D FIESTA FastCINE
- 2D FIESTA Fat Sat
- 2D FRFSE
- 2D FRFSE-XL IDEAL
- 2D FSE IDEAL
- 2D FSE
- 2D FSE Double IR
- 2D FSE-IR
- 2D FSE Triple IR
- 2D FSE-XL IDEAL
- 2D FSPGR
- 2D GRE-EPI
- 2D MDE
- 2D MFGRE
- 2D SE-EPI
- 2D SSFSE
- 2D SSFSE 3-Plane
- 2D SSFSE-IR
- 2D SSFSE MRCP
- 2D T1FLAIR
- 2D T2MAP
- 3D BRAVO
- 3D COSMIC
- 3D Cube T1
- 3D Cube T2
- 3D Cube T2FLAIR
- 3D Cube DIR
- 3D Cube PD
- 3D Delta Flow
- 3D Dual Echo
- 3D Fast TOF GRE
- 3D Fast TOF SPGR
- 3D FGRE
- 3D FGRE IDEAL
- 3D FIESTA
- 3D FIESTA-C
- 3D FRFSE
- 3D FRFSE MRCP
- 3D FSPGR
- 3D FSPGR IDEAL
- 3D Heart
- 3D LAVA
- 3D LAVA FLEX
- 3D MDE
- 3D MERGE
- 3D QuickSTEP
- 3D SWAN
- 3D TOF GRE
- 3D TOF SPGR
- 3D TRICKS
- 3D Velocity Inflow
- 3D VIBRANT
- 3D VIBRANT FLEX
- Cine IR
- eDWI
- Fast 2D Phase Contrast
- FGRE Timecourse
- IFIR
- Inhance Inflow
- PROPELLER MB
- SWAN 2.0
- PS-MDE
- BB SSFSE
- 3D PROMO
- DISCO
- DW Duo (LX DWI Propeller)
- Flex
- HyperSense
- IR & SR Prepared
- PROMO

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, premedication, pregnancy status and history

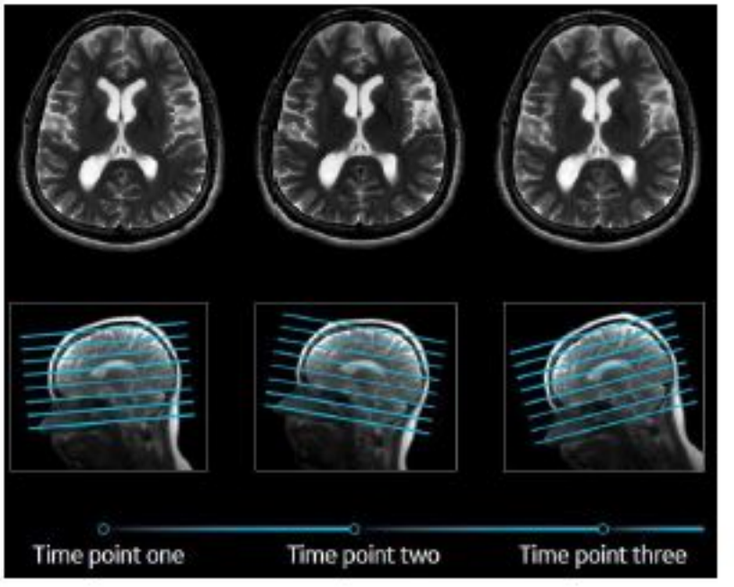
Protocol Tools

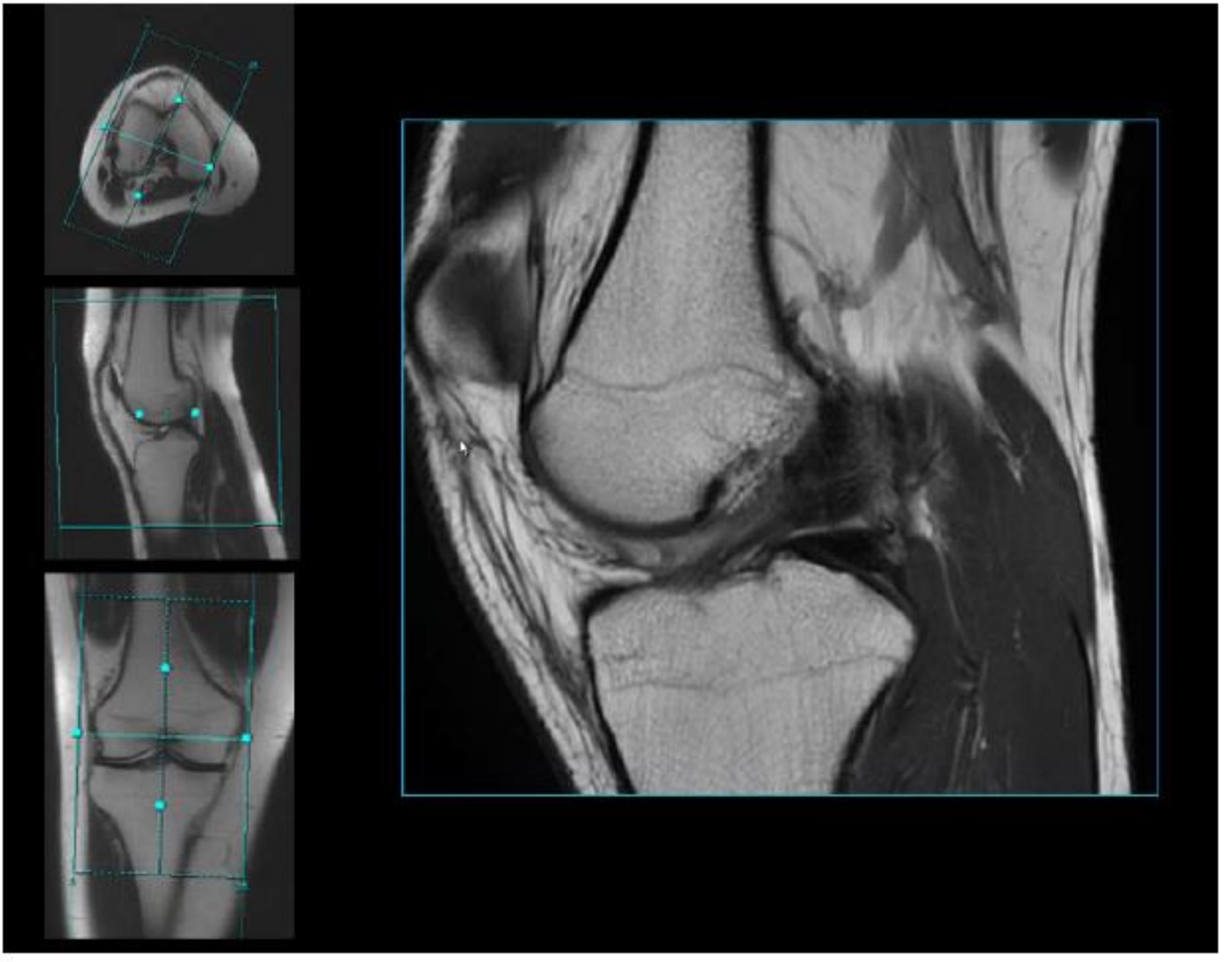
Search, select and one click to share

- Protocol Libraries: GE HealthCare 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 setup planes for brain and knee. This workflow tool enables consistency and productivity improvements for routine and follow-up examinations and extends research/clinical capabilities for longitudinal quantification studies.
- Increases productivity by simplifying workflow steps, thus reducing prescription times
- Improves consistency and reduces slice positioning variation amongst different technologists
- Automatically adapts slice prescriptions to various patient anatomies and structures.





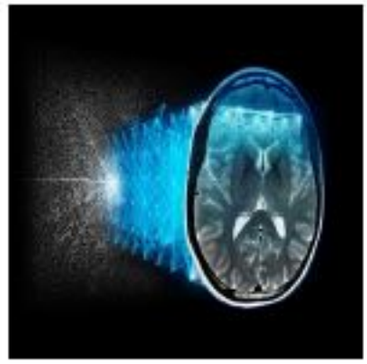
*Optional

AIR™ Recon DL†

Simply better image quality‡

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

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



Benefits

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

AIR™ Recon DL general specifications	
Base technology	• Deep-Learning with convolutional neural network powered by Edison™ • Simultaneous noise reduction and resolution improvement • Model updates and application expansion through regular software releases • Applied directly in reconstruction to fully leverage acquired raw data
Reconstruction engine	Delivered with TPU (Tensor Core GPU) based reconstruction engine
Compatible field strength	1.5T, 3.0T and 7.0T*
Anatomical coverage	Body, breast, pelvis, chest, cardiac, orthopedic, neuro, spine, vascular - no anatomical limitations
Coil compatibility	No coil limitations
Range of imaging contrast weighting and pulse sequences	• 2D Spin Echo (SE), Fast Spin Echo (FSE/FSE Flex, Phase Sensitive Inversion Recovery (PSIR)), Single Shot Fast Spin Echo (SSFSE) family of sequences • MAGiC, Single scan multi contrast (T1, T2, PD, FLAIR, STIR and DIR) • 2D Gradient Echo (GRE/SPGR), 2D Fast Gradient Echo (FGRE/FIESTA/FSPGR) family of sequences, including myocardial delayed enhancement (MDE) and time-course • Phase sensitive reconstruction • Echo Planar Imaging Diffusion weighted (EPI DWI/DTI) family of sequences including FOCUS, PROGRES • Motion-insensitive PROPELLER (FSE/DWI) family of sequences • 3D Fast Spin Echo (FSE; including Cube T2/T1, Cube T2Flair/T1Flair, Cube DIR) and 3D Fast Gradient Echo (FGRE FIESTA/FSPGR; including BRAVO, MPRAGE, LAVA, VIBRANT, IFIR, MENSA Nerve, 3D Heart and 3D MDE) family of sequences. • Includes PD, T1, T2, T2*, Diffusion, FLAIR and STIR weightings • Quantitative mapping, including DWI ADC map, DTI, Cartigram (T2 Mapping), CardioMaps (T1/T2 Mapping). • CE (contrast enhanced) and non-CE • Preserves tissue contrast and quantitative accuracy
Imaging option compatibility	Compatible with standard imaging options including acceleration techniques (ASSET, ARC, HyperSense and HyperBand)

† optional on 1.5T, 3.0T and 7.0T
‡ compared with conventional technology
* SIGNA™ 7.0T is FDA cleared in the USA. Not CE Marked.

Sonic DL™*

Life-speed imaging

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

Benefits

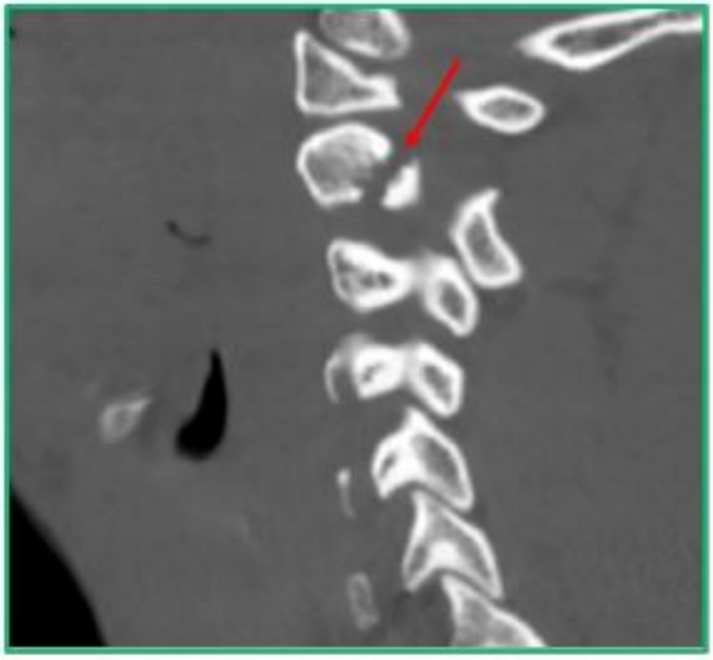
- Enables significantly shorter scan times while preserving image quality
- Fewer breath holds for better patient experience
- Single-heart-beat (per slice) Cardiac Cine imaging
  - Arrhythmia robust
  - Free-breathing compatible
- Rapid free-breathing cardiac functional imaging
- Improved temporal sharpness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

Sonic DL™* general specifications	
Base technology	• Deep-Learning with convolutional neural network powered by Edison™ • Shorten scan times by highly under-sampling k-space. Uses a neural network to reconstruct image from under-sampled acquisitions.
Reconstruction engine	Delivered with TPU (Tensor Core GPU) based reconstruction engine
Anatomical coverage	Cardiac
Coil compatibility	All compatible coils for cardiac, greater or equal to 8ch
Range of imaging contrast weighting and pulse sequences	2D FIESTA Cine
Scanning compatibility	• Breath hold • Free breathing (1R-R)
Imaging option compatibility	ZIP512, Square Pixel and Respiratory Gating/Triggering
Net acceleration	Up to 12x

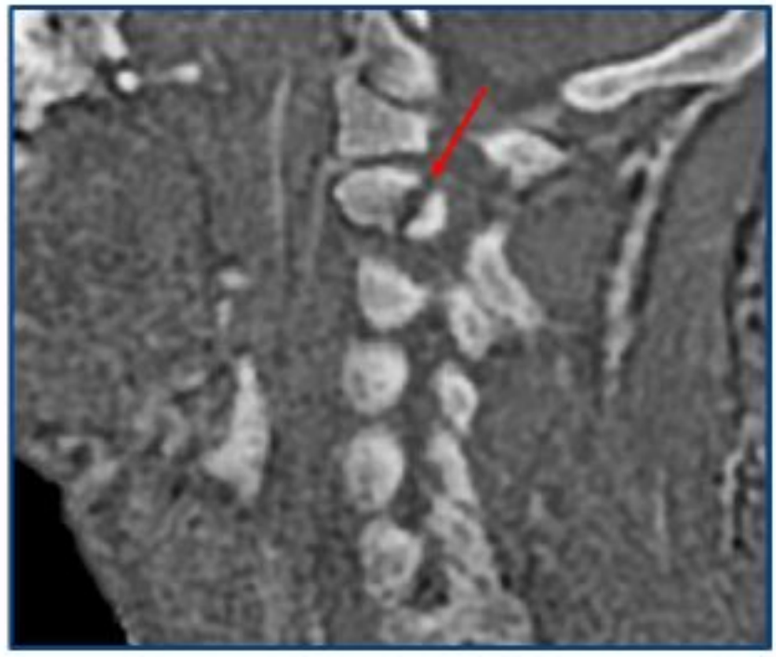
*Optional

oZTEo* MR bone imaging

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



CT SCAN



ZTE MRI

*Optional

Patient Table

The SIGNA™ Champion offers fully integrated patient table solutions, Low Height Fixed Table and Fixed Height Fixed Table, which feature the embedded Posterior Array, help to improve exam efficiency, and patient comfort. The Low Height Fixed Table can move down to very low height for easy and fast transfer of wheelchair patients.

Patient Table	
Min. Patient Table Height*	49.0 cm
Max. Patient Table Height	96.5 cm
Longitudinal Speed	10.0 cm/sec (fast) and 1.25 cm/sec (slow)
Vertical Speed*	1.2 to 2.4 cm/sec
Total Table Length	215.5 cm
Total Table Travel	244.0 cm
Scannable range	192.0 cm
Positioning repeatability	± 1.0 mm

* Only applicable to Low Height Fixed Table

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
Pasting	Automatic load

In-line Viewing

Enhanced Visualization

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

*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*

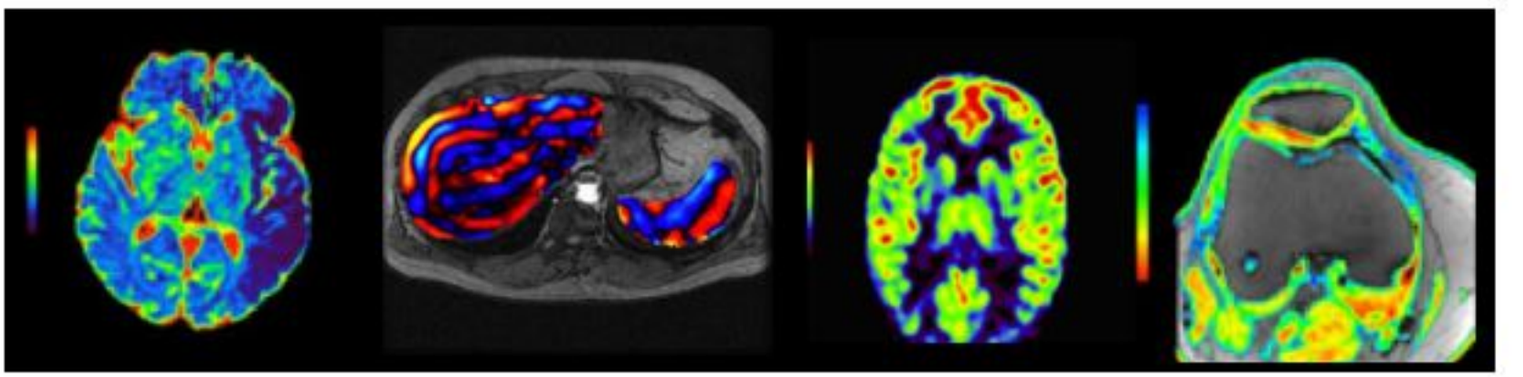
The READYView Brain protocols are used to display functional maps for metabolites and metabolite ratios in the brain.

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 *(cont.)*

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*

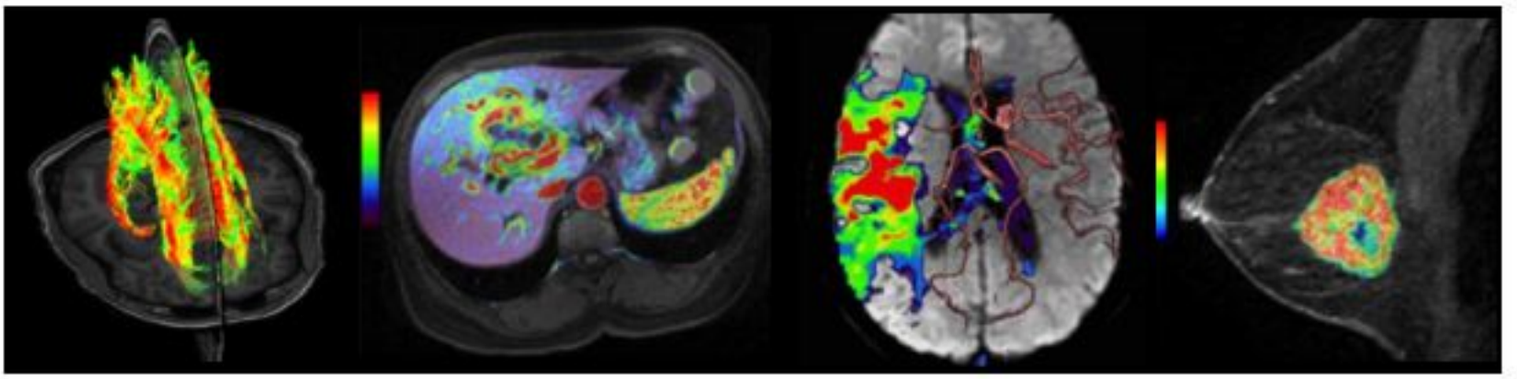
FiberTrak is designed for the advanced analysis of MR images acquired with a DTI technique. It allows for processing of isotropic, ADC and FA maps among other options. The FiberTrak option augments this functionality to allow DTI processing to create: 2D color orientation maps, 2D color eigenvector maps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

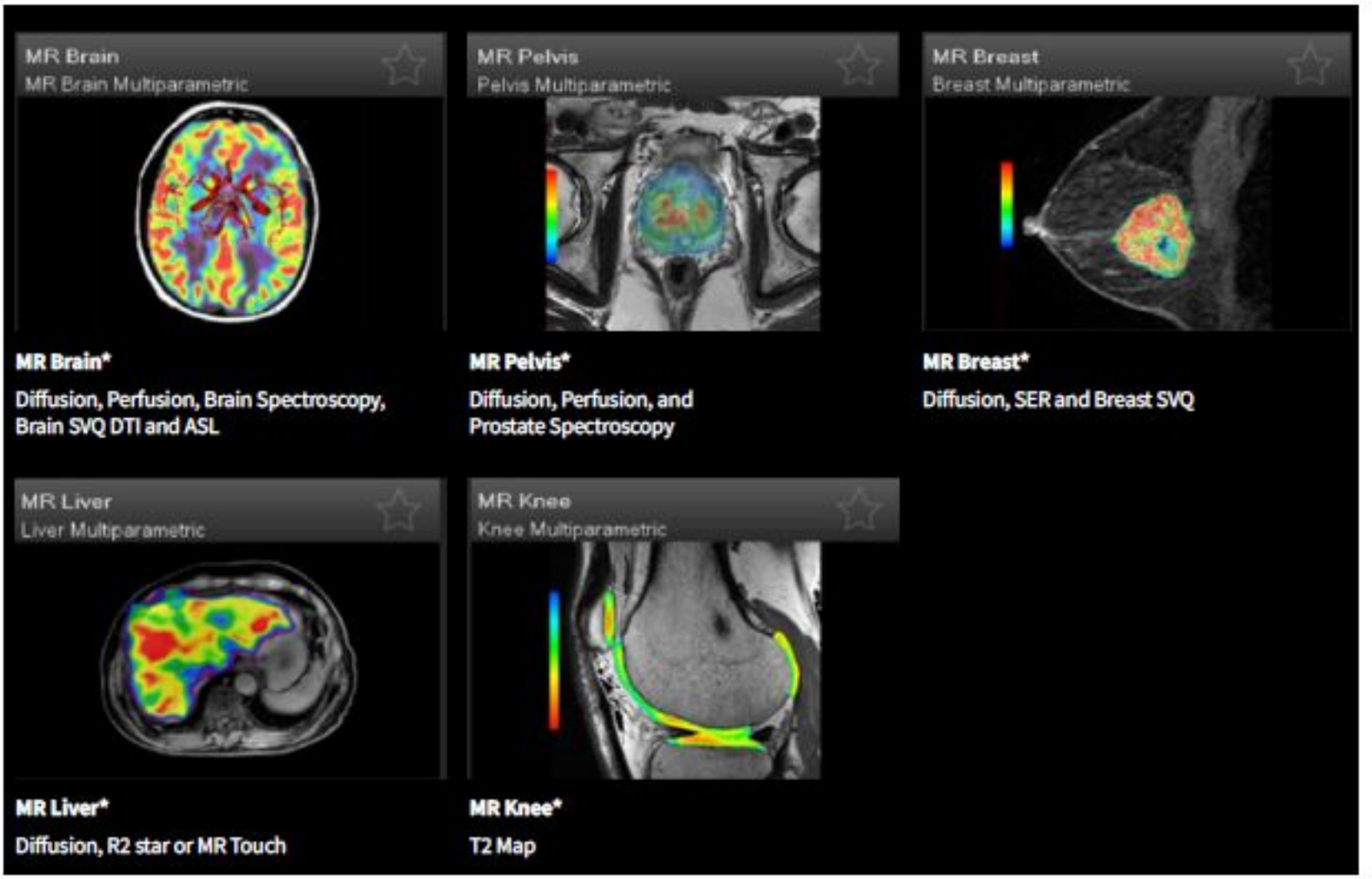


*Optional

READYView *(cont.)*

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™ Champion Scan Parameters

Operator console

The SIGNA™ Champion 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™ Champion 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™ Champion 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	0.05 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)	1.690 ms
Minimum TE (256x256)	2.092 ms
Min ESP 128x128	1.690 ms
Min ESP 256x256	2.092 ms
Max ETL	480

2D Spin Echo	
Minimum TR (128x128)	3.0 ms
Minimum TR (256x256)	4.0 ms
Minimum TE (128x128)	1.682 ms
Minimum TE (256x256)	2.088 ms

2D Fast Gradient Echo	
Minimum TR (64x64)	0.688 ms
Minimum TR (128x128)	0.820 ms
Minimum TR (256x256)	1.082ms
Minimum TE (64x64)	0.218 ms
Minimum TE (128x128)	0.218 ms
Minimum TE (256x256)	0.222 ms

3D Fast Gradient Echo	
Minimum TR (64x64)	0.66 ms
Minimum TR (128x128)	0.78 ms
Minimum TR (256x256)	1.10 ms
Minimum TE (64x64)	0.20 ms
Minimum TE (128x128)	0.20 ms
Minimum TE (256x256)	0.22 ms

3D Fiesta	
Minimum TR (64x64)	1.16 ms
Minimum TR (128x128)	1.52 ms
Minimum TR (256x256)	2.04 ms
Minimum TE (64x64)	0.312 ms
Minimum TE (128x128)	0.396 ms
Minimum TE (256x256)	0.520 ms

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

SIGNA™ Champion Scan Parameters *(cont.)*

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	64 x 64: 0.248 ms 128 x 128: 0.344 ms 256 x 256: 0.572 ms
Images per second	64 x 64: 142 128 x 128: 78 256 x 256: 32
b value	Maximum (s/mm2): 10,000 Maximum # for ADC: 40
Diffusion Tensor Directions	Maximum: 300

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

Site Planning and Other Specifications

Accessory Package

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

InSite Remote Diagnostics

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

Warranty

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

Regulatory Compliance

The SIGNA™ Champion 1.5T MR System satisfies Electro-Magnetic Compatibility (EMC) and Electro-Magnetic Interface (EMI) regulations, pursuant to IEC 60601. Laser alignment devices contained within this product are appropriately labeled according to the requirements of the Center for Devices and Radiological Health (CDRH) and IEC 60825-1.

Fringe Field		
	Axial	**Radial**
0.5 mT	4.00 m	2.5 m
0.1 mT	5.80 m	3.2 m

Weight of the key system component	
Magnet weight (incl. cryogen)	3300 kg
Magnet with enclosures and electronics assembly	4553 kg
Electronics Cabinet	1116 kg
Low Height Fixed Table	136 kg

Electrical Power Supply	
Recommended Configuration	3-phase grounded WYE with neutral and ground (5-wire system); Neutral wire must be terminated inside the MDP
Alternate Configuration	A 3-phase floating DELTA with ground (3 wire + Ground); Do not connect a corner grounded Delta source
Voltage/Frequency	480VAC/60Hz; 415, 400, 380VAC/50,60Hz

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

* Absolute humidity requirement is less than 11g/kg.

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

Site Planning and Other Specifications *(cont.)*

Power management technology

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

Power consumption

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

Power Consumption	
System off	5.38 kw
Standby (Low power mode)	7.24 kw
Scan (Typical Power per COCIR standards)	15.74 kw

Minimum room dimensions	
Magnet Room	3.37m x 5.4 m
Control Console Room	1.5 m x 2.1 m
Electronics Equipment Room	1.8 m x 2.7 m
Total Area needed excluding chillers	23.38 m^2

DICOM Compliance

Images generated by the SIGNA™ Champion scanner adhere to the DICOM conformance standard.

Objects created by the system include:

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

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

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

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

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

Cybersecurity

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

Access Management

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

Network & Data Security

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

The MR system is equipped with capabilities to de-identify patient data (both anonymization and pseudonymization) to protect patient privacy. The MR scanner also supports comprehensive audit logging across user access, patient data transfer, operating system access and events, antivirus events. These audit logs can be configured to be sent to a remote archive as part of the organization's privacy & security policy.

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

Enterprise Interoperability

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

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

About GE HealthCare

GE HealthCare is a leading global medical technology, pharmaceutical diagnostics, and digital solutions innovator, dedicated to providing integrated solutions, services, and data analytics to make hospitals more efficient, clinicians more effective, therapies more precise, and patients healthier and happier. Serving patients and providers for more than 100 years, GE HealthCare is advancing personalized, connected, and compassionate care, while simplifying the patient's journey across the care pathway. Together our Imaging, Ultrasound, Patient Care Solutions, and Pharmaceutical Diagnostics businesses help improve patient care from prevention and screening, to diagnosis, treatment, therapy, and monitoring. We are an $18 billion business with 51,000 employees working to create a world where healthcare has no limits.

Follow us on Facebook, LinkedIn, Twitter, Instagram and Insights for the latest news, or visit our website gehealthcare.com for more information.

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