

GE Healthcare

# Optima™ MR360 1.5T

## Technical Data



The Optima MR360 1.5T MRI System...Versatile Value



# Magnet

## The cornerstone of MRI

The Optima™ MR360 system features a short-bore, superconducting magnet that creates outstanding homogeneity throughout the imaging volume, which translates into excellent image quality. In addition, the zero boiloff CXK4 magnet technology saves money and down time.

## High Homogeneity

Superb homogeneity is essential for providing outstanding image quality. The highly homogeneous magnet of the Optima MR360 delivers consistent image quality that is observed in applications such as:

- Large FOV imaging, up to 48 cm x 48 cm x 48 cm
- Off-center imaging
- Fat saturation techniques
- Other advanced applications such as spectroscopy and DTI

Operating Field	1.5 Tesla
Shim coils	Exclusive 18 superconducting coils
Patient bore (L x W x H)	70 x 60 x 60 cm
Magnet shielding	Active Shield
EMI shielding	99% shielding factor
Size (L x W x H) with enclosures in cm	196 x 208 x 241
Magnet cooling	Liquid Helium only
Temporal field stability	< 0.1 ppm/hr
Long term magnet stability	< 0.1 ppm
Manufacturer	GE Healthcare
Cryogen Tank	2,000 Lit capacity
Boil off rate	Zero boil off
Cryogen refill period	Typically 4 years

## Magnet Homogeneity\*

V-RMS Homogeneity Specifications		
Diameter of Spherical Volume -DSV	Specified Minimum ppm	Typical ppm
10 cm	< 0.02	< 0.004
20 cm	< 0.06	< 0.02
30 cm	< 0.14	< 0.06
40 cm	< 0.35	< 0.27
45 cm	< 0.97	< 0.81
48 cm	< 2.00	< 1.65

\* **Volume Root-Mean-Square (V – RMS) method with 24 measurements in each of 13 planes**

## Other magnet features:

The Optima MR360 1.5T MR system magnet enclosures are designed to Improve patient comfort.

- Laser alignments for axial and sagittal reference planes
- Dual-flared patient bore
- Dual sided controls
- Two-way In-bore Intercom system
- In-bore music system (optional)
- Feet-first positioning for many applications
- In-bore lighting and ventilation

# Patient Table Options

The Optima MR360 system can be configured with three patient table options (A) fixed table with Express coil suite (B) Classical Liberty detachable table and (C) Signa Lite detachable table.

## Fixed table:

Patient Table Height	68.0 cm to 96.5 cm continuous
Patient Table Drive	Automated, power driven Vertical & longitudinal
Longitudinal Speed	10.0 cm/sec (fast) and 1.25cm/sec (slow)
Vertical Speed	1.2 to 2.4 cm/sec
Total Cradle Length	213.4 cm
Total Table Travel	225.5 cm
Positioning repeatability	± 0.05 cm
Maximum Patient weight for scanning	159kg (350lb)

## Detachable tables:

The Optima MR360 features the detachable Liberty table that allows your technologists to scan one patient while preparing another outside the scan room. Then, when the scan room is free, the next patient can be moved quickly and easily to the magnet by a single technologist. The detachable table not only enables improved productivity, it also provides additional patient safety. If an emergency arises, it takes less than 30 seconds to remove a patient from the magnet and scan room; such rapid egress could make all the difference.



## Liberty table specifications:

Patient Table Height	68.5 cm (27 inches) to 96.5 cm (38 inches) continuous
Patient Table Drive	Automated, power driven vertical & longitudinal
Longitudinal Speed	10 cm/sec (fast) and 1.2 cm/sec (slow)
Vertical Speed	1.4 cm to 2.8 cm/sec
Total Cradle Length	225.5 cm
Total Table Travel	244.0 cm (96.25 inches)
Positioning repeatability	± 0.05 cm
Maximum Patient Weight for Scanning	159 kg (350 lbs)
Compatibility	Also compatible with other Signa 1.5T systems EXCITE, HDe, HDi, HDxt and 3.0T HDxt

## Signa Lite table specifications:

Patient Table Height	49 cm to 96.5 cm continuous
Patient Table Drive	Automated, power driven vertical & longitudinal
Longitudinal Speed	10 cm/sec (fast) and 1.2 cm/sec (slow)
Vertical Speed	1.4 cm to 2.8 cm/sec
Total Cradle Length	210.8 cm (83 inches)
Total Table Travel	225.5 cm
Positioning repeatability	± 0.05 cm
Maximum Patient Weight for Scanning	159 kg (350 lbs)
Compatibility	Also compatible with other Signa 1.5T systems HDe, HDi, HDxt and 3.0T HDxt

# Gradient System

The Optima MR360 gradients deliver outstanding spatial and temporal resolution. The high slew rate and 100% duty cycle provide short TR, TE and echo spacing (ESP) to Improve temporal resolution.

The Optima MR360 1.5T MR system utilizes a single module, consisting of the gradient and RF Body coil. This module is epoxy-filled and both water and air-cooled for a high-level duty cycle performance.

Peak Amplitude	33 mT/m per axis
Slew rate	100 T/m/s per axis
Maximum Effective Amplitude	57 mT/m
Maximum Effective Slew Rate	173 T/m/s
Rise time to maximum Amplitude	332 micro seconds
Gradient Duty Cycle	100%
Gradient amplifier current and voltage	300 Amps/1400 Volts peak

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

## Host computer and Recon engine

Employing the latest processors, Optima MR360 provides a system that is highly responsive and has the processing speed and image storage capacity to handle even the most demanding applications.

### Operator console:

Scan control keyboard assembly with intercom speaker, microphone and volume controls, and emergency stop switch.

An enhanced multi-tasking, simultaneous processing architecture manages all processes to prevent lost of work and disruption when desktops are switched.

Main CPU	Intel Xeon Quad core E5420
Clock rate	2.5 GHz
Main Memory	8 GB
Cabinets	Single, tower configuration
Hard disk	320GB Hard-disk for system software, database and image storage
Image Storage	400,000 uncompressed 512 x 512 image storage
DVD	Image exchange and short-term storage is possible with DVD writer  The DVD capacity is 35,000 images per 4.7GB DVD

### Display Monitor:

- 24.1" LCD landscape Color Monitor
- Flicker free and High 1920 x 1200 dot resolution
- Automatic backlight technology
- Wide Viewing Angle Technology with 1000:1 contrast ratio
- Digital DVI interface

### 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 Optima MR360 meets that challenge with power reconstruction processor with 8GB-memory and fast recon speed.

Main Processor	Dual Core AMD Opteron 2218
Clock rate	2.6 GHz
Memory	8 GB
Hard disk storage	2 x 73GB
Ethernet Transfer speed	1GBPS
2D FFT/second for full FOV	1,250 FFT/second for 256 x 256

# RF Transmit and Receive

The Optima MR360 is based on 8 channels and 8 high bandwidth receivers. Signals from independent receive coils within an array, are directly connected to independent receive channels to improve SNR in all applications.

Resonance Frequency	63.86MHz
RF amplifier	10 kW Water- cooled
Maximum RF field with body coil	>19 $\mu$ T
RF exciter frequency range	63.86 $\pm$ 0.65 MHz
Number of Channels	8-channel with superb detection and digitization capability
Number of Receivers	8 receivers with bandwidth of 1MHz/receiver

## RF Coils and arrays

The versatile Optima MR360 offers complete assortment of quadrature and multi-channel array coils to help ensure outstanding image quality and coverage.

### All the configurations include following Transmit/Receive coils:

Transmit /Receive head coil	<ul style="list-style-type: none"><li>• 16-rung quadrature birdcage coil with look-out mirror</li><li>• Patient friendly with split-top design</li><li>• 28 cm diameter and 38 cm length</li><li>• Applications include brain, extremities and other miscellaneous applications when other specialty coils are not available</li></ul>
Transmit Receive body coil	<ul style="list-style-type: none"><li>• 16-rung quadrature birdcage coil for Transmit receive applications</li><li>• 60 cm inner diameter for up to 48 cm FOV allows general-purpose applications</li></ul>

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

Express Head-Neck array	<ul style="list-style-type: none"><li>• 8-channel 14-element</li><li>• Optimized for brain and C-spine imaging.</li><li>• MRA of Aortic Arch to Circle of Willis with 40-cm SI coverage</li><li>• Removable top improves patient comfort during CNS scans</li><li>• Lookout mirror</li></ul>
Express Posterior array PA coil embedded in the cradle	<ul style="list-style-type: none"><li>• 8-channel, 12-element coil with superb SI coverage of thorax, abdomen, pelvis, and TL spine</li><li>• High-sensitivity elements ensure excellent contrast and resolution</li></ul>
Express Anterior array AA coil	<ul style="list-style-type: none"><li>• 8-channel imaging of the thorax, abdomen and pelvis in conjunction with the PA coil</li><li>• Offers excellent SI and axial coverage</li><li>• Lightweight with openings for EKG leads</li><li>• The AA coil contains 4-elements</li></ul>

## Optional surface coils

- 8-channel Breast Array coil for large FOV breast imaging with excellent soft tissue resolution
- 4-channel Breast Array coil – for single and bilateral breast imaging
- 3-channel Shoulder phased array coil
- 8-channel Shoulder coil
- Quadrature Knee/Foot coil – birdcage coil with unique chimney design for knee and foot
- 8-channel Foot/Ankle coil
- 8-channel Transmit/Receive Extremity array coil
- 4-channel Wrist array coil for imaging of wrist
- 8-channel Wrist Array coil
- General Purpose Flex coil: For anatomical regions with irregular shapes such as Hip, shoulder, large knee, thigh, elbow, neck, brachial plexus and shoulder
- 3" Round coil for orbits, ankle, IAC, wrist and other small structures
- 5" Round coil for c-spine, thoracic spine, shoulder, ankle, foot and other medium size structures
- Dual Array Adaptor to enable simultaneous use of 2 x 3" coils for applications such as in high resolution TMJ imaging
- 8-channel 8-element brain coil. High-resolution brain imaging, optimized for ARC parallel imaging
- 8-channel NV coil. ARC optimized Extensive coverage & uniformity. Combined head and neck imaging including spectroscopy\*
- 8-channel body array. ARC optimized for Thorax, abdomen and pelvis. Broad Z-axis coverage\*
- 4-channel Torso array\*
- 8-channel CTL array coil. Exceptional volume coverage uniformity for imaging of cervical, thoracic and lumbar spine. 75cm total S/I coverage\*

\* Not compatible with fixed table configuration

## Imaging and display parameters

Imaging planes	Direct axial, sagittal, coronal, oblique and double/triple oblique plane imaging 3 Plane Localizer pulse sequence
Slice thickness	<ul style="list-style-type: none"> <li>• 0.6 mm to 100 mm slice-thickness in 0.1 mm increments in 2D mode</li> <li>• 0.1mm to 10 mm slice thickness in 0.1 mm increments in 3D mode</li> <li>• Operator variable inter-slice spacing in increments as small as 0.1 mm. Interleave multi-slice imaging</li> <li>• 4 – 512 contiguous slice volume imaging in increments of 2 in 3D mode</li> <li>• 2D Standard Multi-Slice Imaging with as many as 2048 slices</li> </ul>
FOV	<ul style="list-style-type: none"> <li>• Body Coil: 1 to 48 cm in 1 cm increments in all planes</li> <li>• Ability to scan off-center FOV and Asymmetric FOV</li> <li>• Cardiac Adaptive Digital Gating</li> </ul>
Imaging Matrix	<ul style="list-style-type: none"> <li>• Phase encoding from 32 to 1024 in steps of 32. Frequency encoding of 64 to 1024</li> <li>• Respiratory Triggering concurrent with ECG gating</li> <li>• ZIP™ (Zero Filled Interpolation Processing) methods: <ul style="list-style-type: none"> <li>• Through-plane ZIP (slice) reconstructs images interpolated between acquired slices for high-resolution 3D reformations</li> <li>• In-plane ZIP (matrix) reconstructs data at a higher resolution matrix than selected, for optimized balance between SNR and spatial resolution. Options include 512 ZIP and 1024 ZIP</li> </ul> </li> </ul>
Gating	<ul style="list-style-type: none"> <li>• Peripheral Gating</li> <li>• Respiratory gating</li> <li>• VCG Fating</li> </ul>
Image Display	256 Image buffer (256 x 256) at 35 fps

Image Display Features	<ul style="list-style-type: none"> <li>• Zoom/Roam/Flip/Rotate/Scroll</li> <li>• Explicit Magnify &amp; Magnifying Glass</li> <li>• Image Measurement Tools Grid On/Off</li> <li>• Cross Reference/User Annotation</li> <li>• Exam/Series Page</li> <li>• Hide Graphics/Erase Annotation/Screen Save</li> <li>• Accelerator Command Bar</li> <li>• Compare Mode/Reference Image/Image Enhance</li> <li>• ClariView Image Filtering</li> <li>• Smooth and Sharpen Edge Filters</li> <li>• Minified Reference Scoutview</li> <li>• Cine Paging (up to 4 windows and 128 images/window)</li> <li>• Add/Subtract /Edit Patient Data</li> </ul>
Image Annotation Features	<ul style="list-style-type: none"> <li>• Shadowed to permit ease in reading</li> <li>• Two Graphic/Text planes overlay the entire screen</li> <li>• Grid placement with anatomical reference on an image</li> <li>• Drawing and annotation may be added to and removed from images</li> </ul>
Imaging Parameters	<ul style="list-style-type: none"> <li>• Respiratory Triggered FSE</li> <li>• Flow Compensation</li> <li>• Respiratory Compensation</li> <li>• Peripheral Pulse Gating</li> <li>• Graphic Prescription</li> <li>• Explicit Saturation (SAT outside and inside the FOV and concatenated SAT)</li> <li>• Graphic Saturation (oblique and cursor placement SAT inside the FOV)</li> <li>• No Phase Wrap</li> <li>• Fat/Water (Spectral Chem-Sat) Saturation</li> <li>• Extended Dynamic Range</li> <li>• Phase and Frequency Offset</li> <li>• Asymmetric FOV</li> <li>• Square Pixel</li> </ul>

Networking Protocols supported	<ul style="list-style-type: none"> <li>• DICOM 3.0 Basic Grayscale Print Service Class</li> <li>• DICOM 3.0 send, receive and query/retrieve</li> <li>• InSite point-to-point</li> <li>• TCP/IP (for system administration)</li> </ul>
DICOM Conformance Standards	<ul style="list-style-type: none"> <li>• DICOM 3.0 Modality Work List Service Class supported with optional Connect Pro software</li> <li>• DICOM 3.0 Storage Service Class</li> <li>• Service Class User (SCU) for image send</li> <li>• Service Class Provider (SCP) for image receive</li> <li>• DICOM 3.0 Query/Retrieve Service Class</li> <li>• DICOM 3.0 Storage Commitment Service Class</li> <li>• DICOM 3.0 Basic Grayscale Print Service Class</li> </ul>

# Imaging and display parameters

## TR, TE, and Echo Spacing Parameters

	128x128	256x256
<b>2D Spin Echo</b>		
Shortest TR in ms	10.0	10.0
Shortest TE in ms	2.6	2.7
Min. Slice Thickness	0.6 mm	0.6 mm
Minimum FOV	10 mm	10 mm
Maximum FOV	480 mm	480 mm
<b>2D Fast Spin Echo</b>		
Shortest TR in ms	10.5	10.5
Shortest TE in ms	2.5	2.6
Min. Slice Thickness	0.5 mm	0.5 mm
Maximum FOV	480 mm	480 mm
Min. Echo Spacing	2.24	2.2
Max ETL in SSFSE	264	264
<b>2D Fast Grad. Echo</b>		
Shortest TR in ms	2.4	2.9
Shortest TE in ms	1.0	1.1
Min. Slice Thickness	0.7 mm	0.7 mm
Minimum FOV	10 mm	10 mm
Maximum FOV	480 mm	480 mm
<b>3D Fast Grad. Echo</b>		
Shortest TR in ms	1.1	1.3
Shortest TE in ms	0.5	0.5
Min. Slice Thickness	0.1 mm	0.1 mm
<b>EPI</b>		
Shortest TR in ms	5.0	6.0
Shortest TE in ms	1.2	1.7
Min. Slice Thickness	0.6 mm	0.6 mm
Minimum FOV	40 mm	40 mm
Min. Echo Spacing at 25 cm FOV	0.80	1.10
Min. Echo Spacing at 48 cm FOV	0.504	0.716
Minimum shots	1	1
Maximum b value s/mm <sup>2</sup>	7,000	7,000



# Workflow

## Ready Interface System

The Optima MR360 Ready Interface incorporates many features designed to lighten the workload of the technologists, beginning with an optimized, intuitive and flexible 3-plane graphic localizer process. The Optima MR360 includes an automated protocol-driven workflow and user interface designed for consistency in generating high-quality imaging for all patients and from all technologists. Productivity, efficiency and streamlined data management are assured through simultaneous scanning, reconstruction, filming, archiving, networking and post-processing. If desired, the user can have complete control of sequence parameters for site optimization and patient specific situations.

## Ready Brain Application

Ready Brain automates scan prescription for brain exams, improving precision, repeatability, and workflow for both advanced and inexperienced MR operators.

## Express coil productivity

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

## AutoStart

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

## Modality Worklist

The modality worklist (MWL) provides an automated method of obtaining exam and protocol information for a patient directly from a DICOM Worklist server. The protocol may be selected well in advance of the patient's arrival at the MR suite, thereby simplifying exam preparation and reducing necessary work by the technologist during the time-critical procedure. The ConnectPro software enables the DICOM worklist server class for the Optima MR360 Operator's Console.

## Protocol libraries and properties

The Optima MR360 system protocols are organized into two main libraries, GE Optimized and Site Authored. For quick search and selection, each protocol may be archived with independent properties based on patient demographics, anatomy, type of acquisition, or identification number.

## ProtoCopy

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

## Workflow Manager

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

## Inline viewing

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

## Linking

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

# Parallel Imaging

## **ASSET - 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 and enables greater anatomical coverage.

Parallel imaging acceleration factors ranging from 1 to 3.0 are supported depending on the coil.

## **ARC – Auto Calibrating Reconstruction**

ARC helps to eliminate breath-hold mismatch errors by imbedding the calibration data within the scan data. In addition, this unique reconstruction permits small FOV imaging by reducing focal parallel imaging artifacts from the exam. Supporting both 1D and 2D acceleration, net acceleration factors of up to 3.4 can be achieved.

With the Optima MR360 system, the following applications are parallel imaging enabled.

- 2D Spin Echo
- 2D T2 FLAIR
- 2D FLAIR EPI
- 3D FIESTA-C
- Inhance non-contrast MRA
- 3D SWAN
- 2D FSE
- 2D FRFSE
- 2D FSE-IR
- 2D T1FLAIR
- 2D FSE Double IR
- 2D FSE Triple IR
- 2D T2MAP
- 2D FSE-XL IDEAL
- 2D FRFSE-XL IDEAL
- 2D SSFSE
- 2D SSFSE-IR
- 2D SSFSE MRCP
- 2D SSFSE 3-plane
- 3D FRFSE
- 3D CUBE T2
- 3D CUBE T2 FLAIR
- 2D FGRE
- 2D FSPGR
- 2D FIESTA
- 2D FIESTA Fat Sat
- 2D FIESTA Fast CINE
- 2D MDE
- 2D MFGRE
- 3D TOF GRE
- 3D TOF SPGR
- 3D FGRE
- 3D FSPGR
- 3D FGRE IDEAL
- 3D FSPGR IDEAL
- 3D Quick STEP
- 3D Fast TOF GRE
- 3D Fast TOF SPGR
- 3D FIESTA
- 3D MDE
- 3D TRICKS
- 3D LAVA
- 3D Dual Echo
- 3D VIBRANT
- 2D GRE-EPI
- 2D SE-EPI
- 2D DW-EPI
- 2D DT-EPI
- iDRIVE Pro real-time imaging

# Post processing with FuncTool Performance

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

## FuncTool Performance

FuncTool Performance is an advanced MR-specific post-processing package with multiple algorithms to help you analyze and visualize the spatial and time-course based MR data. The package runs on the main console and optionally on the Advantage™ Workstation.

Results are displayed in various formats including time-intensity curves, parametric color overlays and metabolite ratio maps.

These include:

- ADC and eADC maps
- Correlation coefficients for mapping of motor strip and visual/auditory stimuli
- NEI (Negative Enhancement Integral)
- MTE (mean time to enhance)
- Positive Enhancement Integral
- Signal Enhancement Ratio
- Maximum Slope Increase
- Maximum Difference Function
- Difference Function
- Metabolite maps (needs 2D CSI package)

# ScanTools

GE ScanTools have evolved in to a comprehensive suite of pulse sequences and applications ranging from the basic Spin Echo to advanced single shot EPI and Fat saturation sequences for variety of imaging applications.

## Spin Echo Pulse sequences

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

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

## Single-Shot Fast-Spin Echo

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

## 3D FRFSE

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

## Gradient Echo Pulse sequences

The main advantage of GRE sequences is its shorter TR enabled by lower flip angles and gradient inversions instead of 1800 RF pulses. Consequently, the GRE sequences are better suited to a variety of 3D volumetric applications including ce-MRA techniques.

Optima MR360 system’s unique imaging chain and high fidelity gradients assure shortest TRs and TEs for your efficiency.

- 2D GRE/SPGR
- 2D FGRE/FSPGR
- 3D GRE/SPGR
- 3D FGRE/FSPGR
- ECG gated FGRE
- ECG gated Fast SPGR

## 3D Dual Echo

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

## LAVA

Liver Acquisition with Volume Attenuation provides imaging in both slice and imaging planes, using acceleration factors up to two. LAVA delivers excellent spatial and temporal resolution, and performs large volume slice coverage in significantly shorter total scan times than those possible with conventional techniques. LAVA is outstanding for high-quality, liver breath-hold applications, without compromising in-plane spatial resolution with data interpolation.

## 2D MERGE

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

## 2D/3D TOF

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

## 2D/3D Phase contrast Angio

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

## Inversion Recovery Pulse sequences

This is an SE sequence with preparatory 1800 pulse to flip the net magnetization vector by 1800 to null the signal from a particular entity, very often water. The interval between this 1800 prep pulse the 900 RF pulse is know as TI. The variants of the IR available with our ScanTools are:

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

### Echo Planar sequences

With echo-planar imaging, a single echo train is employed to collect data from all lines of k-space during one TR. In the single shot version, all the k-space lines are collected in a single TR and in case of the multi-shot EPI it is collected over multiple TRs. EPI is now the technique of choice for diffusion weighted imaging. The time of imaging, consequently for ss-EPI is echo spacing x Ny x NEX.

Optima MR360 offers comprehensive EPI techniques with short echo spacing:

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

### Other ScanTools applications

ScanTools include, not only the pulse sequences but also many advanced applications such as real-time imaging, BOLD acquisitions and multistation vascular imaging.

#### **BOLD fMRI analysis on FuncTool**

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

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

#### **Diffusion Weighted EPI**

Single Shot FLAIR EPI and Single Shot, diffusion-weighted EPI with b-values up to 3,000 s/mm<sup>2</sup> is standard with Optima MR360 that is based on

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

### *i-Drive Pro real-time imaging*

i-drive Pro brings real-time interactive imaging to the MR system, making it easier to generate detailed diagnostic information on just about any anatomy. This includes organs that are subject to motion artifacts, such as spine, heart, diaphragm and GI tract. The i-Drive Pro technique allows the user to change scan parameters on the fly, during scanning – and, to evaluate the results immediately. It starts with an intuitive point-and-click user interface and live, on-image navigation icons. Continues with click-of-the-mouse image book marking and a suite of localization and drawing tools.

### **SPECIAL - Spectral Inversion at Lipids**

This is a spectral spatial inversion technique for fat saturation in 3D FGRE pulse sequences.

### **SmartPrep**

SmartPrep allows users to automate multi-station, contrast-enhanced MRA as well as peripheral Angio run-offs. It does so by integrating the following:

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

### **SmartStep**

The SmartStep adds programmable stepping capability to SmartPrep to plan and optimize your contrast enhancements in the peripheral vascular run-offs.

### **VCG Gating**

Allows more robust trigger detection.

### **IVI**

IVI is an interactive user interface that allows operators to remove background from MR angiography images. The result: angiographic and maximum intensity (MIP) projections in multiple scan planes. The processed images are saved automatically as a distinct series for quick recall.

# Neuro Imaging applications

Following NEURO applications are standard with our Optima MR360 ScanTools.

- Ready Brain
- Diffusion Weighted EPI
- EPI 2D GRE for BOLD acquisitions
- EPI FLAIR
- 2D STIR
- 2D MERGE
- MR Pasting
- 2D/3D TOF
- 2D/3D Phase Contrast Angio
- Magnetization Transfer Contrast

## Optional Advanced Neuro applications

### **PROPELLER 2.0**

PROPELLER 2.0 is a technique derived from fast spin echo (FSE) for brain imaging and named for its unique k-space acquisition, in which data are acquired in radial “blades” that rotate similar to the propeller on an airplane until the acquisition is completed. Since each blade passes through the center of k-space, PROPELLER 2.0 has unusually low sensitivity to motion artifacts and exceptionally high contrast-to-noise properties. This makes it well-suited for producing high-resolution image quality even under challenging circumstances. Available in all-imaging planes, PROPELLER 2.0 provides the contrast and resolution that helps to deliver real clinical impact. T2 FSE PROPELLER 2.0 creates T2-weighted images that are degraded much less by head motion than conventional FSE, with a 25-75% increase in contrast to noise without any time penalty. Imagine acquiring a motion-free scan, virtually every time, and even on the most difficult of patients.

T2 FLAIR PROPELLER 2.0 combines T2 FLAIR image contrast with the tolerance of motion and superb contrast-to-noise characteristic of PROPELLER 2.0. Diffusion-weighted PROPELLER 2.0 is an alternative to the more conventional technique based on echoplanar imaging, which tends to be compromised in the presence of large changes in magnetic susceptibility. Diffusion-weighted PROPELLER 2.0 can produce high quality images in the skull base even in the presence of dental work, craniotomies or other abnormalities that cause a magnetic field disturbance.

### **3D Cube**

Cube utilizes eXtended Echo Train Acquisition (XETA) technology to acquire a single-slab 3D FSE imaging sequence that applies modulated flip angle refocusing RF pulses that enables very long echo trains to generate T2-weighted soft tissue images with reduced blurring.

### **SWAN**

SWAN lets you visualize and clearly delineate small vessels and microbleeds, as well as large vascular structures, and iron or calcium deposits in the brain. SWAN captures a broad spectrum of contrast characteristics specific to a wide range of tissue components using a multi-TE acquisition technique. The multi-TE approach is inherently less affected by chemical shift, leading to clear images. The end result is a sub-millimeter-resolution 3D dataset, which integrates a broad range of distinct tissue contrasts with excellent susceptibility information and high SNR.

### **3D FIESTA-C**

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

### **3D FIESTA**

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

### **IDEAL**

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



# Body Imaging software

## ***Diffusion Tensor Imaging with Fiber Tracking***

This package expands EPI capability to include diffusion tensor imaging, a technique that acquires diffusion information in up to 150 different diffusion directions. It generates image contrast based on the degree of diffusion anisotropy in cerebral tissues such as white matter. FuncTool capabilities on the console (included with ScanTools) create Fractional Anisotropy (FA), Apparent Diffusion Weighted (ADC) and T2-Weighted TRACE maps. The optional FiberTrak post-processing utility generates eigen-vector information from the diffusion tensor acquisition and processing. Using a robust and efficient seeding process, three-dimensional renderings of the diffusion along white matter tracts are generated.

## ***3D COSMIC***

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

## ***PROBE PRESS single voxel spectroscopy***

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

## ***PROBE – 2D CSI***

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

Following BODY applications are standard with our Optima MR360 ScanTools.

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

## **Optional Advanced Body and Breast applications**

### ***2D FatSat FIESTA***

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

### ***3D Cube***

Cube utilizes eXtended Echo Train Acquisition (XETA) technology to acquire a single-slab 3D FSE imaging sequence that applies modulated flip angle refocusing RF pulses that enables very long echo trains to generate T2-weighted soft tissue images with reduced blurring.

### ***StarMap***

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

# Orthopedic imaging

## **VIBRANT**

VIBRANT (Volume Imaging for Breast Assessment) permits high definition bilateral imaging of both breasts in the time that it normally takes to image a single breast. VIBRANT integrates ASSET technology with unique bilateral shimming and a patented fat-suppression technique developed specifically for breast imaging. This enhanced version of VIBRANT for Optima MR360 allows the slices to be acquired in either the sagittal or axial orientation. It also provides for the automatic subtraction of pre-contrast images from post-contrast images to highlight abnormalities.

## **BREASE**

BREASE is a TE averaged PRESS spectroscopy acquisition that provides the necessary biochemical information to help characterize breast anatomy.

## **CADStream Breast Analysis**

CADStream includes hardware and post-processing software that facilitates analysis and management of breast image data. Image processing is performed automatically, using predefined templates for non-rigid image registration, subtraction, parametric maps, maximum intensity projection and multi-planar reformat. CADStream also generates reports that include images and graphic reports that can be exported in PDF or DICOM formats.

CADStream includes SureLoc – a tool that helps radiologists to more efficiently calculate coordinates for MR-guided interventions at the point of procedure. SureLoc reports needle position in real time and displays images and needle position in the patient's orientation

Following ortho applications are standard with our Optima MR360 ScanTools.

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

## **Optional Advanced Ortho applications**

### **3D FIESTA**

3D FIESTA (Fast Imaging Employing Steady-state Acquisition) inherent sensitivity to fluids makes this an excellent sequence for orthopedic applications. In knee imaging, 3D FIESTA uses an extremely short repetition time (TR) between RF pulses such that high-resolution 3D volume images can be acquired rapidly. The 3D FIESTA technique is especially useful for the rapid acquisition of high-spatial-resolution images of static structures such as cochlea, internal auditory canal, or joints.

### **IDEAL**

Areas such as the foot/ankle, shoulder, and off-isocenter wrist make fat saturation a challenge. With IDEAL, water, fat, in-phase, and out-of-phase images can be generated even in the presence of large static field variations. This sequence can produce consistent and reliable images in challenging anatomical areas.

### **CartiGram**

CartiGram is a non-invasive T2 mapping package that provides high-resolution maps of the T2 values in cartilage and other tissues. The imaging results are color coded to highlight those structures with increased water-content yielding elevated T2 values.



# Cardio-vascular Imaging

Following Cardiac applications are standard with our Optima MR360 ScanTools.

- VCG Gating
- VCG Gated GRE and Fast SPGR
- Double and Triple IR
- Fast Cine
- iDRIVE Pro realtime imaging
- SmartPrep for vascular runoffs
- SmartStep for vascular runoffs
- MR Pasting
- 2D/3D Phase contrast Angio
- 2D/3D TOF
- 3D Fast TOF with GRE/SPGR for ce-MRA
- IVI
- Elliptic centric k-space re-ordered

## Optional Advanced Cardio-vascular applications

### *Inhance Application Suite*

The Inhance application suite consists of several new sequences designed to provide high-resolution images of the vasculature with short-acquisition times and excellent vessel detail. These new sequences include:

### *Inhance 3D Velocity*

Inhance 3D Velocity is designed to acquire angiographic images in brain and renal arteries with excellent background suppression in a short scan time. By combining a volumetric 3D phase contrast acquisition with parallel imaging, efficient k-space sampling, and pulse sequence optimization, Inhance 3D Velocity is faster than previous generations and is capable of obtaining the whole neurovascular anatomy in approximately 5~6 minutes. Furthermore, background suppression is improved by the optimized pulse sequence design, resulting in better visualization of small branches. Respiratory triggering is also compatible with Inhance 3D Velocity to enable abdominal angiography, specifically renal arteries. The results are improved productivity and image quality.

### *Inhance 2D Inflow*

The Inhance 2D Inflow pulse sequence is designed to acquire angiographic images of arteries that follow almost a straight path (i.e. femoral, popliteal and carotid arteries). Arterial blood flow is faster during the systolic phase and slows down during the diastolic phase. Therefore, Inhance 2D Inflow is designed to acquire data during systolic phase and offers the following:

- Optimized spatial saturation gap to improve fat suppression and background suppression. With this saturation gap optimization, higher views per segment (vps up to 48) can be used, resulting in significant scan time reduction.
- Peripheral Gating that reduces the pulsatile artifacts.
- Optimized view ordering to help improve arterial signal.
- ASSET acceleration compatibility to reduce scan time.

### *Inhance Inflow IR*

Inhance Inflow IR is a new angiographic method, which has been developed to image renal arteries. It has an ability to suppress static background tissue and venous flow. This sequence is based on 3D FIESTA, which improves SNR as well as produces bright blood images. A selective inversion pulse is applied over the region of interest, which inverts arterial, venous, and static tissue. At the null point of the venous blood, an excitation pulse is applied to generate signal. The net result is an angiographic image with excellent background suppression that is free of venous contamination. Uniform fat suppression is achieved using a spectrally selective chemical saturation (SPECIAL) technique to provide uniform fat suppression while respiratory gating compatibility reduces respiratory motion artifacts during free-breathing renal exams.

### *iDrive Pro Plus*

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

- Geometric changes to image plane location, obliquity, rotation, center FOV and FOV size
- Contrast parameters such as spatial pre-saturation on/off, special sat pulses, flow comp and RF spoiling
- Application of a non-selective IR pulse
- Swapping phase and frequency

It starts with an intuitive point-and-click user interface and live, on-image navigation icons. It continues with click-of-the-mouse image book-marking and a suite of localization and drawing tools, and includes capabilities from 10-level undo/redo, built-in time, autoNEX and click-of-the-mouse display/review/save, all to streamline even the most complex exams and manipulations.

### **TRICKS**

Time Resolved Imaging of Contrast KineticS (TRICKS) technology uses intricate temporal sampling with complex data recombination to accelerate the temporal resolution of 3D dynamic imaging – without compromising spatial resolution. This technology is now with Elliptical- Centric data sampling to create the innovative imaging technique for contrast enhanced MRA of the lower extremities in even the most challenging circumstances. Easy to set up and easy to use, TRICKS rapidly generates time-resolved 3D images of blood vessels to meet the challenge of capturing peak arterial phases with minimal venous contamination. With TRICKS, the different vascular phases can be extracted, quickly and easily, after image acquisition.

### **2D FIESTA CINE**

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

### **StarMap**

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

### **QuickSTEP**

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

### **3D FatSat FIESTA**

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

### **Navigators**

This software package is designed for use in conjunction with 3D IR Prepared FGRE or 3D FatSat FIESTA for Cardiac Imaging. It consists of navigators that make it possible to track the diaphragm and use the information to acquire crisp 3D gradient-echo images of the heart even while the patient breathes.

### **Cardiac Tagging**

Used to improve visualization of contractile function, this tagging application combines cardiac-gated FastCINE gradient-recalled echo to acquire data throughout the cardiac cycle, with spatial SAT pulses applied throughout the FOV. Using the operator's choice of diagonal stripes or a grid pattern, tagging is applied once per R-R interval immediately following the R-wave ECG trigger, just before the start of data acquisition.

# Pediatric Applications\*

## ***2D Delayed Enhancement***

Vital to MRI myocardial assessments, this technique can help distinguish living tissue from the irreversible infarction.

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

## ***3D Delayed Enhancement***

3D Delayed Enhancement is an outstanding tool for myocardial assessment. It uses VAST (Variable Sampling in Time) technology to acquire extensive volumes of data, rather than merely single slices, during breath-holds, with acquisitions gated to the cardiac cycle. The software applies a non-selective inversion-recovery magnetization preparation step to create T1-weighted tissue contrast and suppress the signal from certain tissues.

## ***Fluoro-Triggered MRA***

Fluoro-Triggered MRA images the anatomy continuously, enabling the user to manually trigger each angiographic acquisition as soon as he or she is satisfied with the level of vessel enhancement. This switch-over occurs almost instantly, in less than one second. The result is an interactive, ASSET compatible and extremely accurate approach to contrast-enhanced MRA.

## ***PROPELLER 2.0***

PROPELLER 2.0's ability to compensate for patient motion makes it an excellent sequence for pediatric imaging where motion often plagues the exams. Since each blade passes through the center of k-space, PROPELLER 2.0 has unusually low sensitivity to motion artifacts and exceptionally high contrast-to-noise properties. This makes it well-suited for producing high-resolution image quality, even under challenging circumstances. Available in all-imaging planes, PROPELLER 2.0 provides the contrast and resolution that delivers real clinical impact. T2 FSE PROPELLER 2.0 creates T2-weighted images that are degraded much less by head motion than conventional FSE, with a 25-75% increase in contrast to noise without any time penalty. Imagine acquiring a motion-free scan, virtually every time, and even on the most difficult of patients.

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## ***Inhance Application Suite***

Inhance 3D Velocity, Inhance 2D Inflow, and Inhance Inflow IR are applications designed to provide high-resolution images of the vasculature with short-acquisition times and excellent vessel detail.

\* MR Scanning has not been established as safe for imaging fetuses or infants. Carefully compare the benefits of MR versus alternative procedures before scanning to control risk to the patient. A physician needs to decide to scan pregnant or infant patients.

# Site Planning and power consumption

## InSite Remote Diagnostics

GE unique remote service and applications support including magnet monitoring. Also allows downloading of applications software such as eFlex trials program.

## Accessory Package

The scanner comes with the Unified coil phantom set, customer diagnostic software, operator manuals, and patient log books. Optional storage-cart also available.

## GE Regulatory compliance

The 1.5T Optima MR360 system is a CE-compliant device that satisfies Electro-Magnetic Compatibility (EMC) and Electro-Magnetic Interface (EMI) regulations, pursuant to IEC 60601-1-2.

## InSite™ Remote Diagnostics

GE-unique 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 Optima MR360 1.5T MR System is a CE-complaint device that satisfies Electro-Magnetic Compatibility (EMC) and Electro-Magnetic Interface (EMI) regulations, pursuant to IEC-601. Laser alignment devices contained within this product are appropriately labeled according to the requirements of the Center for Devices and Radiological Health.

## Fringe Field

	Axial	Radial
0.5 mT	4.00 m	2.48 m
0.1 mT	5.70 m	3.28 m

## Weight of the key system components

Magnet with enclosures and cryogen	5375 kg
Electronics Cabinet	900 kg
Patient Table	150 kg
Patient table detachable Liberty	286 kg
Patient table detachable Signa Lite	150 kg
Vibroacoustic Mat	231 kg

## Electrical Power Supply

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

## Temperature and Humidity

	Temperature in degreez 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

### Power management technology

Due to multiple power supplies and amplifiers employed in a modern day MRI, power surges are common. Optima MR360 offers robust power management technology to reduce the peak instantaneous power demand.

### Power Consumption

	50 Hz	60 Hz
Average Power	13.3 kW	14.0 kW
Standby (no scan)	4.6 kW	5.0 kW
Overnight sleep mode	2.8 kW	2.7 kW
Peak Instantaneous power < 5s	24 kW	27 kW
Continuous sustained power > 5s	17.2 kW	17.4 kW

### Cryocooler power consumption

	50 Hz	60 Hz
Cryo-cooler (Shield cooler)	6.5 kW	7.5 kW

### Recommended Room dimensions

	With Equip Room	No Equip Room
Magnet Room	3.3m x 5.7m	3.3m x 5.7m
Control Console Room	1.5m x 2.1m	3.33m x 1.9m
Electronics Equipment Room	2.7m x 2.5m	
Total room requirement	29 sq meter	25.3 sq meter

### DICOM Compliance

Images generated by the Optima MR360 scanner adhere to the 2004 version of the DICOM conformance standard.

Objects created by the system include:

- MR images
- Secondary-capture images, both grayscale and color
- Grayscale Softcopy Presentation State (GSPS)
- Structured reports
- In addition to supporting MOD, CD-R and DVD-R for

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 Technical Profiles. Scheduled workflow with the following options:

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

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GE Healthcare, a division of General Electric Company

## About GE Healthcare

GE Healthcare provides transformational medical technologies and services that are shaping a new age of patient care. Our broad expertise in medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, biopharmaceutical manufacturing technologies, performance improvement and performance solutions services help our customers to deliver better care to more people around the world at a lower cost. In addition, we partner with healthcare leaders, striving to leverage the global policy change necessary to implement a successful shift to sustainable healthcare systems.

Our “healthymagination” vision for the future invites the world to join us on our journey as we continuously develop innovations focused on reducing costs, increasing access and improving quality and efficiency around the world.

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imagination at work