

Technical Description

i_Open 0.36T

Veterinary MRI System



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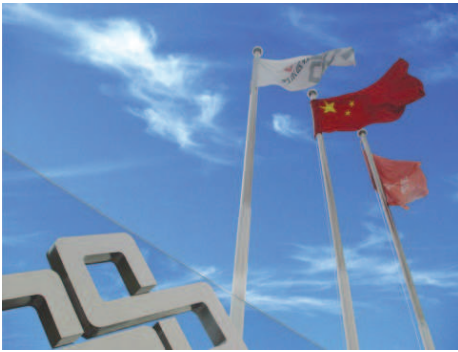
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WDM: A successful journey of more than 60 years



Beijing Wandong Medical Technology Co., Ltd. (WANDONG, originally Beijing Wandong Medical Equipment Co., Ltd.) was established in 1955, and has been listed on the Shanghai Stock Exchange since 1997. Headquartering in High-Tech industrial park in Beijing, Wandong occupies an area of more than 100,000 square meters as its modern production base and R&D center, and has 30+ branches in China and a wide sales and service network in about 70 countries all over the world. With the 60 years dedication to the medical imaging, Wandong has made brand name of “WDM”, a well-known brand in the world.

As one of the largest radiology imaging equipment

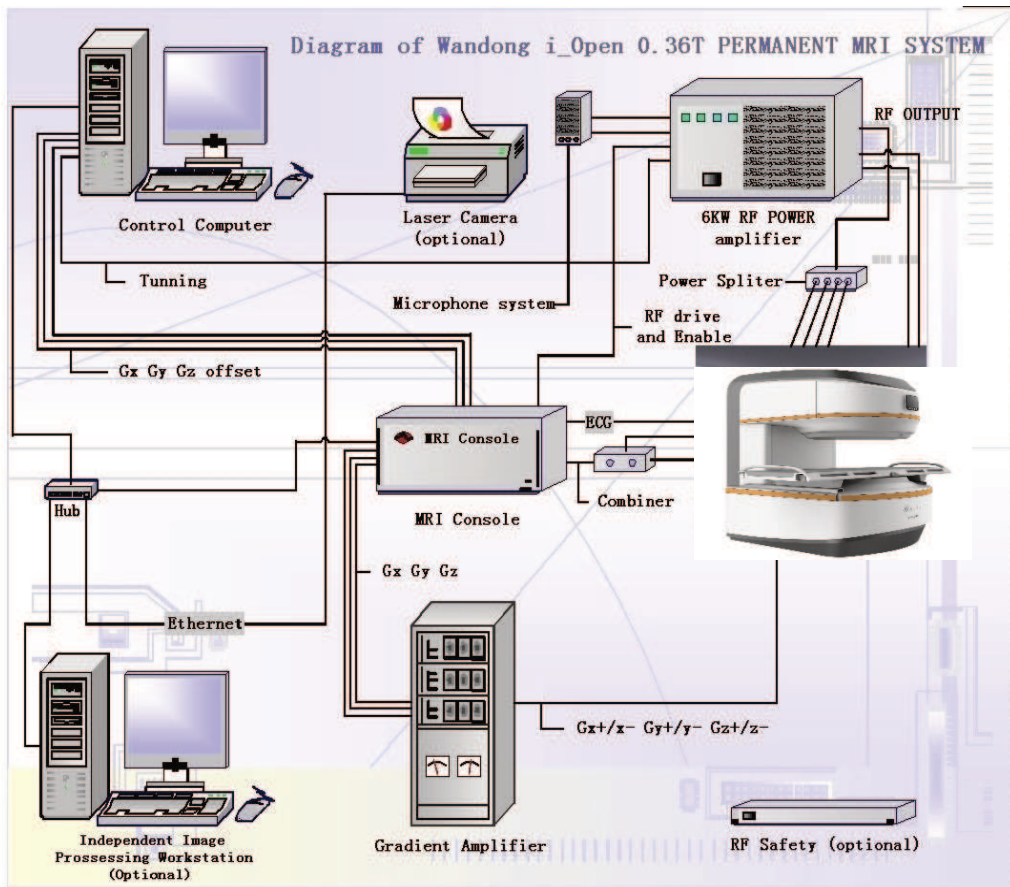
manufacturers in the world, Wandong has wide range of product lines including General Radiography, Mobile X-ray & C-arm, Digital Radiography (DR), Digital Fluoroscopy (DRF), Digital Mammography, Cath-Lab, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) machine, and the annual production capability is more than 6,000 units.



Milestones for Wandong MRI:

- 1995 *Cooperated with SHIMADZU in 0.5T Super-Con. MRI*
 - 2000 *R&D work redirected to Open Permanent MRI*
 - 2002 *Established R&D center with experts and subject elites*
 - 2003 *Established research Lab. in Peking University*
 - 2004 *i_ Open 0.36T MRI launched into market*
 - 2005 *i_ Open 0.36T CE & FDA approved and entered into US market*
 - 2006 *Development of 0.4T MRI*
 - 2007 *Development of 0.5T MRI*
 - 2008 *0.4T MRI launched into market with CE & FDA approval*
Started development of Super-Con 1.5T MRI
 - 2009 *0.5T MRI launched into market with CE & FDA approval*
 - 2012 *1.5T MRI released in CMEF Shenzhen on 17th April 2012*
0.36T MRI got ACR accreditation in the US
 - 2013 *0.3T MRI got CE approved*
 - 2015 *Permanent MRI for veterinary use launched into market*
 - 2017 *i_Space 1.5T got CE approval*
 - Today *WANDONG installed up to 400 MRI machine in Chinese and overseas market, and we are confident to serve customer with quality product and excellent services all over the world*
- Total overseas installation more than 100 sets.***

General description of the product



The i_Open 0.36T system is a medical diagnostic magnetic resonance system. The main magnet of the system adopts the “C” type, single pole structure. The structure has large open degree (the opening angle is larger than 270 degree), which provides the patient much comfort and acceptance. The main magnet has the advantage of compact structure, small size (1.7m×1.1m×1.7m) and light weight (15T) with the static magnetic field strength up to 0.36T.

Hardware Description

Magnet

The i_Open 0.36T features an Open C-shape magnet with active shielding. The stability of the magnetic field is ensured via patent design of magnet and a specialized magnet constant temperature system. Magnet constant temperature system is consisted of magnet temperature isolation coat and automatic temperature regulator, which makes magnet working at the stable temperature higher than the magnet room, greatly improved the system stability by cancelling influence from room temperature fluctuation. The magnet's fringe field is small; the 5-G field is contained within 2.5 m or less in all directions allowing the system to be sited in a small space. The complete system can be installed in a space of 22.5 m². The excellent magnetic field homogeneity is to ensure superior image quality with a 40 cm field of view.

The open, C-arm magnet design is based on the research and clinical feedback in the area of full body imaging. The result is a high resolution, wide field of view magnet optimized to image of different part of body scan.

- Field Strength: 0.36T ±5%
- Type: Permanent
- Field Orientation: Vertical
- Weight: 15000 Kg
- Homogeneity 35cm DSV 2.06ppm
- Gradient Strength: 28.5 mT/m
- Slew Rate: 95 mT/m/ms
- Gap: 37±1 cm
- Horizontal Open Angle: 300°
- Environmental: Internal Thermostatic Control System

Patient table

The patient table is used for positioning the patient with corresponding RF receiving coils to the iso-center of the magnet for the scanning of MR.

The patient table unit includes two parts: patient table and positioning system. The patient table includes tabletop, tabletop carrier, cushion, etc.

The positioning system includes laser positioning and LED display screen. LED screens display the coordinates of the table simultaneously.

- Support Width: 60 cm
- Max. Patient Weight: 240kg

Spectrometer

The spectrometer is a key part of the whole MRI system. Its function is to generate the pulse sequences, to RF and gradient amplifiers, collect and analyze pre-amplified data from receiving channels, and send data to workstation for image reconstruction.

- Structure: Network Communication Module (NCM)
Multi-Channel Data Acquisition Module (DAM)
Digital Control Module (DCM)
Gradient Calculation Module (GCM)
Gradient Output Module (GOM)
RF Output Module (ROM)
Gain Adjustment Amplifier Module (GAM)

Gradient System

The i_Open 0.36T gradient system is state-of-the-art, capable of running at 28.5 mT/m with a slew rate of 95 mT/m/ms.

- Maximum Voltage: 150V
- Maximum Current: 150A

More gradient power will support more gradient strength, enable system to provide less slice thickness and smaller minimum FOV, and allows fast (single-shot) TSE sequences with high turbo-factor and heavy T2-weighting.

Digital RF system

The flat quadrature transmitter coil is integrated in the pole pieces providing a strong uniform field. The 6 kW RF power amplifier allows short pulses to be used, ensuring the execution of fast imaging sequences available now and those of the future.

Receive platform

The system is equipped with a fully digital four-channel hardware platform. The technology allows the use of phase array coil. These coils provide image acquisition with higher signal to noise ratio and image quality.

RF receiving system adapts quantum optical fiber transmitting technology. The A/D conversion and quantum laser modulation are placed inside the magnet room, that helps to significantly reduce signal loss and avoid interference during transmission. As a result, the image quality is effectively improved.

RF Receiving Coils

The i_Open 0.36T RF coils provide excellent signal to noise ratio, due to presence of pre-amplifiers in all elements of the coils and other receiver coils, ensuring proper enhancement of the signal. The i_Open 0.36T comes with a comprehensive set of RF receive coils supporting a wide range of clinical applications from head to toe. Dedicated preset procedures are available for all coils.

- Coil Design: Phase Array coil
- RF Receiving Coils: Head
Cervical
Knee
Body (Large)
Body (Medium)
Small Joint
- Max. RF Power: 6 kW
- Preamplifiers: All digital Fixed inside magnet
- Positioning: Padding set included providing comfortable patient positioning and restricting movement.

Phase Array Head Coil

The Phase array Head Coil is optimized for imaging head and upper C-spine. The coil can be opened for fast and easy positioning.

Features:

- 4 channel phase array coil with high signal to noise ratio
- External dimension: 310×265×320 mm
- Large coverage for easy positioning.
- Split design for easy positioning

Phase Array Neck Coil

The coverage of the Neck coil is uniform from cerebellum to the upper thoracic spine region. The upper part of the coil can be removed for fast and easy positioning.

Features:

- 4 channel phase array Coil with high signal to noise ratio
- External dimension: 420×330×330 mm
- High uniformity from cerebellum to the upper thoracic spine region.
- Split design for easy positioning

Phase Array Body Coil (Large)

The Phase array Body/Spine Coil Large has four phased array elements suitable for imaging chest, abdomen, pelvis, thoracic and lumbar spine in large sized patients. The upper part of the coil can be

removed for fast and easy positioning. In addition the coil also slides under the patient for easy positioning.

Features:

- 4 channel phase array Coil with high signal to noise ratio
- External dimension: 460×300×285 mm
- Split design and sliding support for easy positioning.

Phase Array Body Coil (Medium)

The Phase array Body/Spine Coil Medium has four phased array elements suitable for imaging chest, abdomen, pelvis, thoracic and lumbar spine in large sized patients. The upper part of the coil can be removed for fast and easy positioning. In addition the coil also slides under the patient for easy positioning.

Features:

- 4 channel phase array Coil with high signal to noise ratio
- External dimension: 440×300×255 mm
- Split design and sliding support for easy positioning.

Phase Array Knee Coil

The Phase Array Knee Coil is used for knee. The coil can be opened for fast and easy positioning.

Features:

- 4 channel phase array Coil with high signal to noise ratio
- External dimension: 280×220×255 mm

Small Joint Coil

Single channel coil, dedicated for wrist application.

Computer Control System

Host Computer

Host computer with Intel CORE 2 DUO 3.2G or higher CPU and at least 4 GB RAM for overall system control and processing, allowing simultaneous operation of Patient registration/pre-registration, MR scanning and imaging, Image reconstruction, Image review, print and etc. greatly enhanced patient throughput. 500 GB hard disc is used for system software and data storage. CD/DVD RW for data archive, backup and transfer.

- CPU: INTEL CORE DUO 3.2GHz or higher
- Memory (RAM): 4 G byte or higher
- Hard Disk: 500 GB or higher - stores up to 3 million 256x256 uncompressed images
- Image Archiving: CD/DVD-RW
- Operating System: Windows 7
- Graphical Interface: Windows based
- Networking: DICOM 3.0 Storage, Media Exchange, Send, Print and Worklist

NOTE: Customer will be required to provide cabling, appropriate interface devices, and network connection from the operator console to the viewing location. Customer is also responsible for all telephone, network and/or internet service provider charges. Contact WDM for specific requirements and recommendations.

Operator's console

The i_Open 0.36T is designed for operation by a single operator. Patient administration and scan control, image data viewing and transfer, image processing and printing, system control can be performed with user-friendly, intuitive controls. Simple mouse clicks enable routine actions, allowing high patient throughput and operator comfort. The Operator's Console comprises:

- Microsoft Windows 7 operating system for efficiency and ease of operation.
- A desktop with space for equipment and paperwork
- 24" TFT-LCD monitor for professional image quality

Patient Environment

The i_Open 0.36T is the most patient friendly of open scanners; even the most anxious and claustrophobic patients will feel at ease. The C-arm magnet has a spacious 40cm opening to allow maximum access to the patient. The magnet poles are small, providing the patient with a full view to the outside of the system in virtually all examinations.

- Patient communication system for bi-directional patient communication.
- A set of soft mattresses ensure patient comfort.
- Low noise system makes patient feel ease during the whole scanning procedure.
- A hand-held nurse call button allows the patient to attract the operator's attention without talking (Optional)
- Patient music system will effectively relieve anxiety and emotional distress (Optional).

Gating Package (Optional)

Respiratory Gating

Respiratory gating can be utilized to reduce artifacts caused during respiratory motion by acquisition of data on the basis of the phase in the respiratory cycle. The device relies on the relative humidity differences between inspired and expired air.

The respiratory gating package contains:

- an air ball fixed on the abdomen for pressure sensor
- a convertor from pressure to digital signal
- Software display the respiration wave shape
- Trigger position can be selected by the customer

Pulse Gating

The use of Pulse Triggering and Gating is to monitoring the pulsating

Features:

- a pressure sensor fixed on the wrist
- a convertor from pressure to digital signal
- Software display the pulse wave shape

Software Description

The software package is intended for use with Magnetic Resonance Diagnostic Imaging Systems – i_Open 0.36T. The main software, which called To-Station, will help operators and physicians to step patient registering, system adjusting, 2D & 3D image acquisition, processing, analyzing and storage, it also integrates image enhancement, DICOM printing, etc.

Software Package

- Scanning control software
- Image reconstruction software
- Image processing software
- Image analyzing software
- Image format conversion software (JPEG, BMP, etc.)
- Image view software
- System inspecting software
- Real-time printing software (Standard DICOM 3.0)
- Remote Service Software

Advanced Features

Patient Pre-registration

Support patient pre-registering when scanning, without limitation to amount of pre-registered patients, improves work efficiency.

9 Slices of Scout Images

9 slices of scout images in three dimensions by one pilot scan in 25 seconds, provides you 3 choices in each dimension, greatly enhance precision of the scan positioning, and enable a high patient flow.

Scout Line

Scout image can be displayed at the lower right corner and the side bar. It makes very simple to know exact slice position, which is significant improved the convenience of clinical diagnosis.

Image Comparison

Provide multi-slices comparison on one screen.

Intelligent Icon Management

Enhance operator's efficiency by customizing interface icons, re-arranging the position of each icon, grouping your icons.

Non-film Capability

A smart image reviewer software called "to viewer" has been integrated into the archive VCD/DVD automatically, which enable to review the archive images in any other PC.

Abundant Sequence Database

Provides Sequences upgrade free of charge.

Sequence database can be customized and categorized by operator. System provides operator with reference information and will inspect the validity of parameters automatically.

Parameters can be reset to default

Standard DICOM 3.0 Interface

- DICOM Modality Worklist (RIS interface)

The Radiology Information System Interface option enables automatic transfer of patient information from the hospital's DICOM RIS to the MR Console Operator's Console, thereby eliminating retyping and possible errors.

Correct data transfer in the first stage setup of the MR scan ensures data-integrity and provides the correct association between images and other patient data in the departmental information system or PACS. The functionality is according to the DICOM definitions.

It provides work lists for predefined time-windows, sorted by time slot and automatic transfer of:

- Accession number
- Scheduled procedure step
- Patient name
- Patient identification
- Patient sex
- Patient weight (if known on RIS)
- Referring physician's name

- DICOM Query/Retrieve Service Class as a Provider

Supports database browsing from a DICOM workstation and sends a copy of requested images in DICOM format

The i_Open 0.36T DICOM conformance statement provides full details on the implementation of the DICOM standard.

Remote Service Software

Customer is required to perform a phantom scanning program before first patient scanning every day, system status and parameters will be sent via internet to Service Center at WDM headquarter. Malfunction will be detected automatically meanwhile a message will be sent to service manager, and service center will be able to observe the curves of system running, that will be valuable for engineer to do slight adjustment of each system.

Acquisition Matrix: 2-D: from 128 x 128 to 256 x 256
3-D: from 128 x 128 x 24 to 256 x 256 x 128
Field of View: 40 mm to 350 mm, 1 mm increments
Number of Slices: 2-D: 1 – 256
3-D: 1 - 500 (maximum 50 slices x 10 slabs)

Imaging Processing and Manipulation

WDM 'ToStation' provides powerful and easy to use image manipulation tools.

Help: Tutorial off-line

Multi-tasking:

- All operations can be performed in parallel.
- Support patient pre-registering when scanning, without limitation to amount of pre-registered patients, improves work efficiency.
- Indicator of background task

Exam Queue:

- Management and planning of scan queue for a complete examination
- Customization of protocols with archiving

Positioning:

- Visualize current image with geometrical references on the scout image
- Graphic positioning by using the mouse

Image Tools (On single image or complete series):

- Window width/level
- Zoom
- Pan
- Rotate
- Mirror
- Measurements
- Distances
- ROI (manual, rectangular, oval), size, media, standard deviation
- Annotation on images
- Comparison of multi-slices on one screen

Database Functions:

- Search (alphabetic, chronological, patient ID, Body part, Sex, Age, etc.)
- Sort
- Archiving and export functions for CD/DVD-ROM

Archiving in CD/DVD: To enable the images archived in CD/DVD can be reviewed in any windows PC, 'ToViewer' – a smart image browser will be automatically burned into each disk

System Siting Requirements

Power Voltage Regulator will be supplied for the system by WDM.

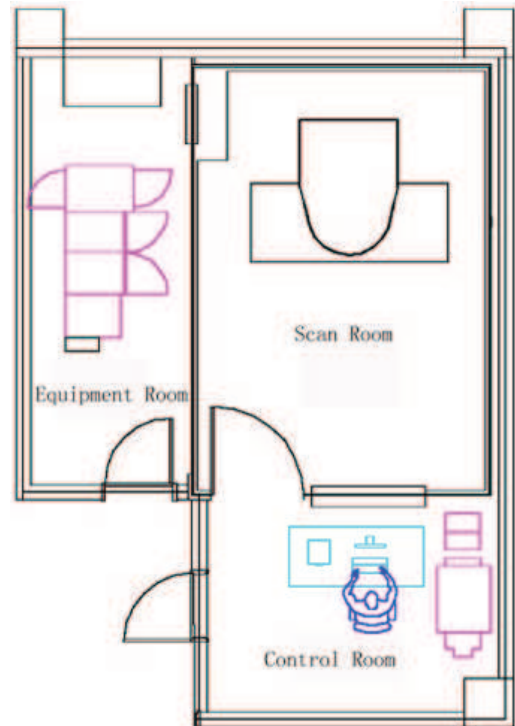
RF shielding solutions and site planning support is provided through WDM.

Magnet room requires 24hr isolate Air Conditioning to stabilize the room temperature at 23 centi-degree with deviation of ± 1 centi-degree per hour. Humidity: 40 – 60%.

Electronics room requires air-conditioning, room temperature: 15 - 30 centi-degree with deviation less than 3 centi-degree per hour. Humidity: 40 ~ 80%.

Air Conditioning Machines are to be provided by customer, and WDM is available to supply Air Conditioning Machines upon customers request at additional cost to the customer. Specifications of Air Conditioning Machines depend on size of magnet room. Normally it is suggested for the magnet room to have refrigerating capacity no less than 3KW and able to work 24 hrs x 7 days

- Magnet & table weight: 15000 kg.
- Electronics Cabinet Weight: 500 kg.
- Recommended Magnet Room Dimensions: 4m x 5m x 3m
- Recommended Room Space for electronics: 6 sqm
- RF Shielding: Required
- Power Requirement: 220 VAC single phase, $\pm 10\%$, 10 Amp Service
- Power Consumption: 15 KVA (Not including consumption of Air Conditioning Machine)
- Internet: A customer supplied and maintained dedicated high speed internet connection (ADSL or cable modem) is required for Remote Assistance.



Modular RF Cage (Not included in this offer)

The RF cage is a modular enclosure assembled on-site. This “room within a room” features a galvanized steel frame and filter panels with observation window and access door. The RF cage materials weighs approximately 3000 Kg completed and provides 80 dB of RF attenuation. It is appropriate for sites with ample space (standard cage 4m X 5 m X 3m) and low RF profiles (maximum RF 80 dB $\mu\text{V}/\text{m}$). The floor holding the pavilion should be finished to a flatness of 5mm over 5 m.

The RF cage includes also internal light.

The RF cage may be customized to accommodate your specific space needs.

Includes installation and delivery.

Buyer accepts responsibility for all site modifications, permits and approvals.

WDM will provide complete details to your architect or builder.

Patents & Publications of WDM MRI

Patents

- Invention Patent: Permanent Magnate for Open MRI
Patent No.: ZL 200610114716.X
- Invention Patent: Flat active shield gradient coil
Patent No.: ZL 200610144180.6
- Invention Patent: Flat-Panel RF coils
Patent No.: ZL 200610144181.0
- Invention Patent: Gate control device for respiration/ECG in MRI
Patent No.: ZL 200610144179.3
- Practical New Patent: Permanent Magnate for Open MRI
Patent No.: ZL 2006 2 0158534.8
- Practical New Patent: Flat-Panel RF coils
Patent No.: ZL 2006 2 0158617.7
- Practical New Patent: Gate control device for respiration/ECG in MRI
Patent No.: ZL 2006 2 0158618.1
- Design Patent: MRI system
Patent No.: ZL 2006 3 0189763.1

Publications

- A New Method for Shimming a Magnetic Field in NMR System Zhe Jin, Xin Tang, Feng Qi, Donglin Zu, and Weimin Wang Progress In Electromagnetics Research Symposium 2007, Beijing, China, March 26-30 1903-1907
- A New Target Field Method for Optimizing Longitudinal Gradient Coils' Property Feng Qi, Xin Tang, Zhe Jin, Le Wang, Donglin Zu, and Weimin Wang Progress In Electromagnetics Research Symposium 2007, Beijing, China, March 26-30 1898-1902
- Optimization Method for Passive Pole Pieces Design Le Wang, Zhe Jin, Xin Tang, and Weiming Wang Progress In Electromagnetics Research Symposium 2007, Beijing, China, March 26-30 228-233
- A simulated annealing method of designing NMR biplanar shim coils. Qi Feng, Tang Xin, Wang Weimin etc. Progress in Natural Science. 16 (2006) 747-752 (SCI EI Index)
- A hybrid optimization method for biplanar transverse gradient coil design Feng Qi, Xin Tang etc.. Journal of Physics D: Applied Physics. 40 (2007) 2988-2993. (SCI EI Index)

System Configuration

Number	Description		Quantity
HARDWARE			
1	C shape super open permanent magnet		1
2	Magnet constant temperature system		1
3	X, Y, Z gradient coil set		1
4	Gradient amplifier modules for X, Y and Z axes Gradient amplifier power module		1
5	QD Flat transmitting coil		2
6	RF power amplifier		1
7	RF power splitter		1
8	Four channel digital optical spectrometer	Network Communication Module(NCM)	1
		Data Acquisition Module (MC-DAM)	1
		Digital Control Module(DCM)	1
		Gradient Calculation Module(GCM)	1
		Gradient Output Module(GOM)	1
		RF Output Module(ROM)	1
		Gain-Adjust RF Amplifier Module(GAAM)	4
		Power Module	1
9	Receiving coil	Four channel phase array head coil	1
		Four channel phase array neck coil	1
		Four channel phase array knee coil	1
		Four channel phase array body coil (Large)	1
		Four channel phase array body coil (Medium)	1
		Single channel small joint coil	1
		Pre amplifier	4

10	Workstation	CPU: Intel® Core™2 Duo≥3.2GHz	1
		Memory:≥4GB	
		Hard disk: ≥500GB	
		DVD+/-RW	
		USB Keyboard, USB optical mouse	
		High performance graphic card	
		Windows 7 Business	
11	TFT-LCD monitor ≥ 24 inch		1
12	10/100M Switch		1
13	15KVA Stabilizer		1
14	Electric cabinet		1
15	Magnet cover		1
16	Patient table		1
17	Laser position system		1
18	Dual-way communication system		1
19	Patient cushion		1
20	Operating table		1
21	Receiving coils interface		1
22	Phantom	Cube(Large)	1
		Cube(Small)	1
		Cylinder	1
		Hemisphere(Optional with breast coil)	1
23	Supporting system	Filter panel	1
		Filter set	1
		Connecting cable set	1
		Other auxiliary parts set	1

24	User manual		1
SOFTWARE			
1	System software	Patient register software	1
		Scanning control software	
		Sequence management software	
		Image reconstruction software	
		Image viewing software	
		Image processing software	
		Image analyzing software	
		Image format conversion software(BMP,JPG)	
		Multi function image searching software	
		Image DVD archive software	
		DICOM 3.0 printing software	
System quality assurance software			
2	Pulse sequence		
Spin Echo And Fast Spin Echo	Scout image with Spin Echo	1	
	T1 weighted image with Spin Echo		
	Proton density weighted image with Spin Echo		
	T2 weighted image with Fast Spin Echo		
	Heave T2 weighted image with Fast Spin Echo		
	Proton density weighted image with Fast Spin Echo		
	3D Fast Spin Echo		
Inversion Recovery	Fat suppress with Inversion Recovery	1	
	Water suppress with Inversion Recovery		
	Fat suppress with Fast Inversion Recovery(STIR)		
	Water suppress with Fast Inversion Recovery(FLAIR)		
	Heave T1 weighted image with Inversion Recovery		
Gradient Echo	Scout image with Gradient Echo	1	
	T1 weighted image with Gradient Echo		
	T2* weighted image with Gradient Echo		
	Fast dephase Gradient Echo		
	Fast rephase Gradient Echo		
	Fast dephase Gradient Echo with breath hold		
	3D Fast dephase Gradient Echo		
3	TOF for Angiography	2D TOF	1
		3D TOF	1
		MRCP	1
4	Water imaging	MRU	1
		MRM	1
5	LSDWI		1

6	MTC		1
7	Movement compensation		1
8	Flow compensation		1
9	Multi slice multi angle imaging technology		1
10	Track pre-saturation band		1
11	Image filter software		1
12	Advanced 3D MRI	MIP	1
		MPR	1
13	DICOM 3.0	DICOM Storage	1
		DICOM Transfer (to PACS)	1

Warranty

12 months warranty from the date of system acceptance.

Standard warranty includes:

- Technical support through internet and telephone
- Remote system diagnosis and service
- Overall system examination by end of warranty period
- If necessary to deliver spare parts at free of charge and to dispatch WDM engineer to the site at free of charge.
- Service terms after warranty: Service will be provided to customer after Warranty ends on comprehensive service contract or by Paid visit and spares, as desired by Hospital. However, comprehensive service contract can only be signed before expiry of warranty, or customer may need to pay for a visit of WDM engineer to check the system on-site.

Customer is obligated to provide necessary support including:

- To keep the system console connected to internet;
- To report and describe system malfunction to WDM service engineer;
- To cooperate remote system diagnosis and service;
- To send replaced defective components back to WDM factory in China
- To provide necessary assistance to WDM engineer during on-site service, if necessary to provide tools, labors, technicians and volunteers.