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# Product Proposal

## SuperMark 1.5T Superconducting MRI System



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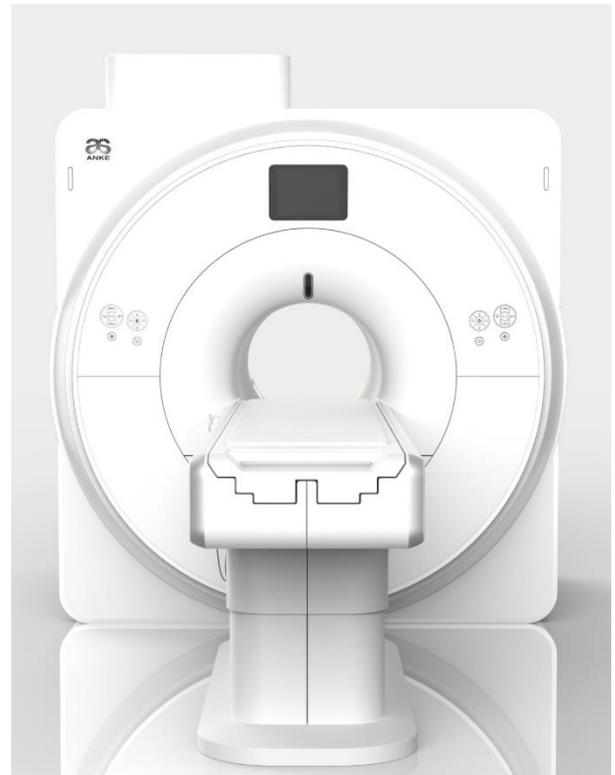
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## Introduction of SuperMark 1.5T

SuperMark 1.5T is a new generation superconducting MRI system designed focused on user concerns, based on over 30 years of experience in research and development. This system is equipped with a new generation of hardware and software platforms to benefit users a lot and provide patients with more comfortable experiences. It features new user-friendly design, faster imaging speed, higher image quality, greatly improved work efficiency.

SuperMark 1.5T provides not only conventional pulse sequences and basic clinical applications, but also advanced functional applications. It adopts brand new ANKE's APEX operating system which ensures easy operation and fast diagnosis.



### Technical Advantages

- Reliable short bore superconducting magnet system with zero liquid helium consumption;
- New generation of fully digitalized and extensible multichannel spectrometer;
- Powerful high efficiency and high fidelity gradient system;
- Multi-channel phased array (PA) RF receiving coil with intelligent identification;
- High resolution conventional clinical images;
- Practical advanced functional imaging.

# Hardware specification

## 1. Magnet system

SuperMark 1.5T system is equipped with a optimally designed short bore superconducting magnet. High magnetic field uniformity, which ensure a superior performance, large FOV rapid imaging and high-quality fat suppression imaging is easily to achieved.

- High cost-effective magnet equipped with “4K” cold head and utilizes "zero" boil-off technology, which ensure stably running for more than 3 years without liquid helium supplement.

No.	Technical and performance names	Specific parameters
1.1	Magnet type	Superconducting type
1.2	Magnetic field strength	1.5T
1.3	Shielding method	Active shielding
1.4	Shimming methods and types	Active Shimming + Passive Shimming +Dynamic Shimming
1.5	Number of superconducting shim coils	10
1.6	The longest time of 3D automatic dynamic shimming	30 seconds
1.7	Magnetic field stability	≤ 0.1ppm/h
1.8	Magnetic field homogeneity (VRMS measurement method)	
1.8.1	50 cm DSV (VRMS)	≤ 0.800 ppm
1.8.2	45cm DSV (VRMS)	≤ 0.450 ppm
1.8.3	40cm DSV (VRMS)	≤ 0.170 ppm
1.8.4	30cm DSV (VRMS)	≤ 0.058 ppm
1.8.5	20cm DSV (VRMS)	≤ 0.020 ppm
1.8.6	10cm DSV (VRMS)	≤ 0.002 ppm
1.9	Magnet net weight (including 100% liquid helium)	3800kg
1.10	Magnet length	
1.10.1	Magnet length (without housing)	157cm
1.10.2	Magnet length (with housing)	170cm
1.11	Magnet bore diameter	605mm±5mm
1.12	Magnet scan bore length	120cm
1.13	Maximum open aperture of magnet (open of magnet at both ends)	160cm
1.14	Patient table to bore top distance	46cm
1.15	5 Gaussian fringe field (X, Y, Z)	≤ 2.5 m × 2.5 m × 4.0m
1.16	Liquid helium volume (100% liquid helium filling)	700L
1.17	Liquid refilling interval	≥ 3 years

1.18	Liquid helium "zero" boil-off technology	provided
1.19	4K cold head technology	provided

## 2. Gradient system

As well-known, in MRI systems, gradient system provides the location information, generates the space coding and provides diffusion sensitive gradient field, etc., it is the foundation of resolution in MRI systems. The gradient amplitude directly determines the spatial coding ability, gradient amplitude is also the root of getting large FOV high resolution images. Another important parameter, the gradient slew rate, is influencing MRI scanning speed. High gradient amplitude and high gradient slew rate can premise the quickly obtain of high resolution large FOV images.

- SuperMark 1.5 T provides gradient amplitude as high as 40mT/m, slew rate as high as 150T/m/s, this extremely strong gradient system can create infinity possibility.
- Water cooler unit supplies a stable water loop of gradient amplifier and gradient coil, which helps gradient system dissipate heat in time, the whole system will works in the best state and show you the best performance.

No.	Technical and performance names	Specific parameters
2.1	Max. amplitude (single axis, non-effective value)	40mT/m
2.2	Max. slew rate (single axis, non-effective value)	150T/m/s
2.3	Min. rise time	0.27ms
2.4	Maximum gradient field strength and maximum gradient switching rate arrive at the same time	provided
2.5	Gradient coil cooling	Water cooling
2.6	Gradient control system	Digital & real-time transmitting and receiving

## 3. Radio Frequency system

- Powerful RF amplifier, provides outstanding quality, compact structure, reliable operation and low noise characteristics, it not only enhance the stability of the equipment, but also good for the future system upgrades provide reliable hardware foundation.
- High efficiency and low SAR transmitter coil, can provide a shorter RF pulse, and optimize the scanning parameters, thus greatly improve the quality of the image.

No.	Technical and performance names	Specific parameters
3.1	RF amplifier maximum power	20kW
3.2	Center frequency	63.85 MHz
3.3	Real-time digital RF energy monitoring	provided
3.4	Real-time digital RF short-term accumulation monitoring	provided
3.5	Real-time digital RF long-term accumulation	provided

	monitoring	
3.6	Radio frequency and concurrent terminal receiving channel	16
3.7	Parallel A/D working converters	16
3.8	Each coil unit has corresponding pre-amplifier	provided
3.9	Parallel acquisition technology platform	provided
3.10	Maximum bandwidth of each parallel acquisition receive channels	1.6MHz
3.11	Transmission bandwidth	550kHz
3.12	Receive dynamic range	120dB/Hz
3.13	Maximum received signal resolution	16bit
3.14	Sampling resolution	100ns
3.15	Fully digital radio frequency system	provided
3.16	RF receiver amplifier noise level	≤ 0.45dB

● Precise focus design PA receiving coil

New designed efficient Multi-channels phased array receiving coil with intelligent identification and the automatic tuning function, combined with “Dull-engine parallel acquisition technology”, the operator can quickly and easily get high resolution clinical images.

3.17 Multi-channel phased array receiver coil			
	Coil name	Description	Picture
3.17.1	Head & Neck phased array coil	16 channels Head & Neck coil is used for head and neck scanning, you can get high quality images of brain, neuro, angio, ear, thyroid, C-spine, etc.	
3.17.2	Body phased array coil	16 channels Body coil is used for body scanning, include T-spine, L-spine, abdomen, Hip, etc. Flat part on the backside of patient and flexible part on the anterior, which is best designed for a widespread use.	
3.17.3	Knee phased array coil	8 channels Knee coil is used for knee scanning, and sometimes, you can also use it for ankle, leg, wrist, hand, etc. 8 channels design will provide a high SNR level.	

3.17.4	Shoulder phased array coil	4 channels Shoulder coil is used for shoulder scanning, friendly design with soft mattress will keep the patients feel comfortable.	
3.17.5	Wrist phased array coil (optional)	8 channels Wrist coil is used for wrist and hand scanning.	
3.17.6	Ankle phased array coil (optional)	8 channels Ankle coil is used for ankle and foot scanning.	
3.17.7	Breast phased array coil (optional)	8 channels Breast coil is used for breast scanning.	

#### 4. Patient environment

In the new generation of SuperMark 1.5T MRI system, We have redesigned the patient table system, More stable and comfortable patient table, easier operation of the control panel, Full-HD LED screen, will bring you a new experience. Lighting, Ventilation and Calling system are all available, so the patients will be relaxed when scanning.

No.	Technical and performance names	Specific parameters
4.1	Patient table	electric
4.2	Position horizontal accuracy	≤ 1mm
4.3	Patient table length	260cm
4.4	Patient table horizontal movement range	185cm
4.5	Patient table minimum height	63cm
4.6	Patient table vertical movement range	28cm
4.7	Patient table maximum weight load	200kg
4.8	Patient table horizontal movement maximum speed	≥ 20cm/s
4.9	Feet-first entry scanning mode	provided

4.10	Patient table can be controlled by machine panel in case of emergency	provided
4.11	Patient table control system on both side of gantry	provided
4.12	Lighting, ventilation, calling system	Adjustable

## 5. Computer system

High performance workstation: 3.6GHz, 8cores CPU / 16GB memory / 1TB×2 hard disk capacity, can easily and quickly finish all the work flow such as patient registration, scan controlling, image browsing and advanced post-processing applications (MIP and MPR, 3D, etc.) and the controls of external equipment (workstation, laser camera, etc.).

No.	Technical and performance names	Specific parameters
5.1	Computer operating system	Windows 7 (64-bit)
5.2	CPU	3.6GHz (i7, 8 cores)
5.3	RAM	16 GB
5.4	H disk	1TB × 2
5.5	Number of image storage (256 x 256 matrix)	≥ 2,750,000 (256 × 256)
5.6	Image reconstruction speed (256x256, 100% FOV)	≥ 3,300 fps
5.7	Display size	24"
5.8	Display resolution	1920×1080
5.9	External storage of image data	DVD/USB
5.10	DICOM3.0 interface	provided

# Software specification

## 6. Sequence and scanning technology

No.	Technical and performance names	Specific parameters
6.1	Spin echo (SE) sequence	
6.1.1	SE 2D/3D	provided
6.1.2	FSE 2D/3D	provided
6.1.3	FSE echo sharing	provided
6.1.4	Single shot FSE	provided
6.1.5	SE fat suppression	provided
6.1.6	SE frequency fat suppression	provided
6.1.7	SE water suppression	provided
6.1.8	SE muting sequence	provided
6.1.9	FSE shortest TE (256 x 256 matrix)	≤ 4ms
6.1.10	FSE shortest TR (256 x 256 matrix)	≤ 8ms
6.1.11	FSE shortest TE (128 x 128 matrix)	≤ 3ms
6.1.12	FSE shortest TR (128 x 128 matrix)	≤ 6ms
6.2	Gradient echo (GRE) sequence	
6.2.1	GRE 2D/3D	provided
6.2.2	3D GRE shortest TE (128 x 128 Matrix)	≤ 0.4ms
6.2.3	3D GRE shortest TR (128 x 128 matrix)	≤ 1ms
6.2.4	3D GRE shortest TE (256 x 256 matrix)	≤ 0.8ms
6.2.5	3D GRE Shortest TR (256 x256 Matrix)	≤ 1.5ms
6.3	EPI sequence	
6.3.1	Single shot EPI	provided
6.3.2	Multi shot EPI	provided
6.3.3	SE-EPI	provided
6.3.4	GRE-EPI	provided
6.3.5	EPI shortest TR (256 x256 matrix)	≤ 8ms
6.3.6	EPI shortest TE (256 x256 matrix)	≤ 3ms
6.3.7	EPI shortest echo spacing time (128 x 128 Matrix)	≤ 0.4ms
6.3.8	EPI maximum scan slice	≥ 128
6.3.9	EPI maximum echo chain length	≥ 512
6.3.10	Diffusion weighted imaging maximum b value	10000
6.4	Inversion recovery (IR) sequence	
6.4.1	IR	provided
6.4.2	FIR (water / fat suppression)	provided
6.4.3	Water suppression (FLAIR)	provided
6.4.4	Single shot FIR sequence	provided

6.4.5	Fat suppression technology	provided
6.4.6	Chemical saturation	provided
6.4.7	Separation of water and fat	provided
6.4.8	IR muting sequence	provided
6.5	Gating	
6.5.1	Respiratory gating	provided
6.5.2	ECG gating	optional
6.5.3	Peripheral gating	optional
6.6	2D, 3D, multi-slice scan technology	provided
6.7	Noise reduction pulse sequence	provided
6.8	Various accelerated scan sequences	provided
6.9	Special k- space filling and data processing methods	
6.9.1	“Propeller” motion artifact free technology	provided
6.9.2	Propeller T2 FSE imaging	provided
6.9.3	Propeller T2 FLAIR imaging	provided
6.9.4	Propeller DWI imaging	provided
6.9.5	Key-hole fast imaging	provided
6.10	256×256 max reconstruction speed (FFT)	≥ 3300 frames / s
6.11	Min. 2D thickness	0.1mm
6.12	Min. 3D thickness	0.05mm
6.13	Max. FOV	50cm
6.14	Min. FOV	1cm

## 7. Advanced imaging application technology

No.	Technical and performance names	Specific parameters
7.1	Body imaging	
7.1.1	In-phase / Out-phase imaging technology	provided
7.1.2	Magnetic resonance cholangiopancreatography (MRCP)	provided
7.1.3	Magnetic resonance urography (MRU)	provided
7.1.4	Magnetic resonance myelography (MRM)	provided
7.1.5	Volume interpolation for rapid body acquisition	provided
7.2	Neuroimaging	
7.2.1	High resolution cervical spinal cord imaging	provided
7.2.2	High-resolution inner ear 3D imaging	provided
7.2.3	Whole spine imaging	provided
7.3	Diffusion weighted imaging	
7.3.1	Isotropic acquisition	provided
7.3.2	ADC value measurement	provided
7.3.3	ADC-map	provided

7.3.4	Diffusion tensor imaging (DTI)	optional
7.4	Angiography	
7.4.1	2D/3D TOF	provided
7.4.2	Continuous multi-slice 3D Time-of-Flight (TOF) technology	provided
7.4.3	Contrast enhanced MRA (CE-MRA)	provided
7.4.4	Magnetization transfer contrast (MTC)	provided
7.4.5	Maximum intensity projection (MIP)	provided
7.4.6	Multi-slice reconstruction	provided
7.4.7	Cardiac cine	optional
7.4.8	FAST 3D dynamic enhancement, FAST 4D dynamic enhancement	optional
7.5	Susceptibility weighted imaging (SWI)	
7.5.1	Compatible with parallel acquisition	provided
7.5.2	Intensity map of SWI	provided
7.5.3	Phase map of SWI	provided
7.6	Amide proton transfer imaging (APT)	optional
7.7	Parallel acquisition technology	
7.7.1	Image-based algorithm	provided
7.7.2	K- space algorithm	provided
7.7.3	Parallel acquisition acceleration factor	4
7.7.4	Compatible RF coils	provided
7.7.5	Compatible scan sequences	provided
7.7.6	Automatic calibration technology	provided
7.7.7	Parallel acquisition factor application direction	X, Y, Z
7.8	Artifact correction	
7.8.1	Flow compensation	provided
7.8.2	Respiratory compensation	provided
7.8.3	Head motion artifact correction	provided
7.8.4	Eliminate magnetic susceptibility artifacts	provided
7.8.5	Eddy current adaptive correction	provided
7.8.6	Gradient linearity correction	provided
7.8.7	Multiple echo phase correction	provided

# System Configurations

No.	Descriptions	
<b>SuperMark 1.5T standard hardware configurations</b>		
MRSM15-H01	Superconducting magnet system	
	Short bore superconducting magnet	1 set
	Magnet condition monitoring system	1 set
	Magnet emergency handling device	1 set
	Helium exhausting system	1 set
	Standard magnet housing	1 set
MRSM15-H02	Digital radio frequency system	
	RF transmission system	
	20kW RF Power Amplifier	1 set
	RF transmission coil	1 set
	BC control unit	1 set
	Radio frequency receiving system	
	16-channel spectrometer system	1 set
	Pulse sequence generator	1 set
	Signal receiving system	1 set
	Data collection system	1 set
	RF receiver coil	
	16-channel head & neck phased array coil	1 set
	16-channel body phased array coil	1 set
	8-channel knee phased array coil	1 set
	4-channel shoulder phased array coil	1 set
	8-channel wrist phased array coil (optional)	1 set
8-channel ankle phased array coil (optional)	1 set	
8-channel breast phased array coil (optional)	1 set	
MRSM15-H03	Gradient system	
	Gradient power amplifier	1 set
	Gradient power	1 set
	Active shielded water-cooled gradient coil	1 set
MRSM15-H04	Gradient coil temperature protection system	1 set
	Cooling System	
	Helium liquid cooling system	
	Superconducting magnet refrigeration system	1 set
	Helium Compressor cooling system	1 set
	Water cooling system	
	RF power amplifier cooling system	1 set
	Gradient power amplifier cooling system	1 set
Gradient coil cooling system	1 set	
MRSM15-H05	Doctor operating system	

	Magnetic resonance system professional workstation	1 set
	24-inch dedicated LCD display	1 set
	1000M / 100M network card	1 set
	DVD burning system	1 set
	USB standard keyboard & mouse	1 set
	Windows7 operation system	1 set
	CV image post-processing set	1 set
	Operator's desk and seat	1 set
MRSM15-H 06	Patient environment system	
	Electric control patient table	1 set
	Patient communication system (without magnetic, noise-proof headphones)	1 set
	Laser positioning system	1 set
	Patient table covers	1 set
MRSM15-H07	Power system	
	Dedicated isolated regulation power supply	1 set
	1KVA uninterrupt power supply for workstation	1 set
MRSM15-H08	Standard PDU	1 set
MRSM15-H09	Accessories	
	Mattress and pillows	1 set
	Phantom, maintenance and commissioning accessories	1 set
	Non-magnetic tools, other tools, etc.	1 set
	Spare fuse	1 set
	Safety warning sign	1 set
MRSM15-H10	User manual	
	Operation guide	1 set
	Software operation guide	1 set
	Operation application guide	1 set
<b>SuperMark 1.5T standard software configurations</b>		
MRSM15-S01	Data Management Software	
MRSM15-S02	Scanning & imaging software	
	Spin echo (SE)	
	SE T1-weighted image, SE proton density (PD)-weighted image, Double-contrast SE, 3D SE, SE muting sequence	
	Fast spin echo (FSE)	
	FSE T2- weighted image, FSE T2- weighted image, FSE proton density weighted image, 3D FSE, and FSE muting sequence	
	Inversion recovery (IR)	
	IR fat suppression, IR water suppression, IR muting sequence	
	Fast inversion recovery (FIR)	
	FIR fat suppression, FIR water suppression, STIR fat suppression, FIR muting sequence	
	Gradient echo (GRE)	

	GRE T1 weighted image, GRE T2* weighted image, fast refocused GRE, breath-holding spoiled GRE	
	3D fast spoiled GRE, 3D fast refocused GRE, in-phase/opposed phase GRE	
	Balanced steady-state free-precess (B-SSFP) GRE	
	Magnetic Resonance Angiography (MRA)	
	TOF 2D& 3D, PC, CE-MRA	
MRSM15-S03	Advanced imaging software	
	Diffusion weighted imaging (DWI)	
	Head DWI, abdominal DWI, breast DWI, prostate DWI	
	Water imaging technology	
	Cholangiopancreatography (MRCP), Magnetic resonance urography (MRU), Magnetic resonance myelography (MRM)	
	Fast imaging technology	
	Dual-engine parallel acquisition technology, SSFSE ultra-fast imaging technology, key-hole imaging technology, half-fourier acquisition imaging technology, rectangular acquisition technology	
	Artifact suppression technology	
	Pre-saturation technology, flow compensation technology, propeller scanning technology, gating technology	
Magnetic susceptibility imaging (SWI)		
MRSM15-S04	Image evaluation software	
MRSM15-S05	Image processing software	
	MPR multi-planar reconstruction , MIP reconstruction, MinIP reconstruction	
MRSM15-S06	System management software	
	Management software, calibration software, diagnostic software	
<b>SuperMark 1.5T third-party hardware</b>		
MRSM15-T01	Physiological gating items	
	Respiratory gating	1 set
	Peripheral gating (Optional)	1 set
	ECG gating (Optional)	1 set
MRSM15-T02	Patient monitoring system (Optional)	1 set
MRSM15-T03	Room shielding materials	1 set
<b>SuperMark 1.5T advanced applications (optional)</b>		
MRSM15-S01	Amide proton transfer (APT) imaging	
MRSM15-S02	Diffusion tensor imaging (DTI)	
MRSM15-S03	Cardiac cine	
MRSM15-S04	Dynamic imaging technology	
	FAST 3D dynamic enhancement, FAST 4D dynamic enhancement	

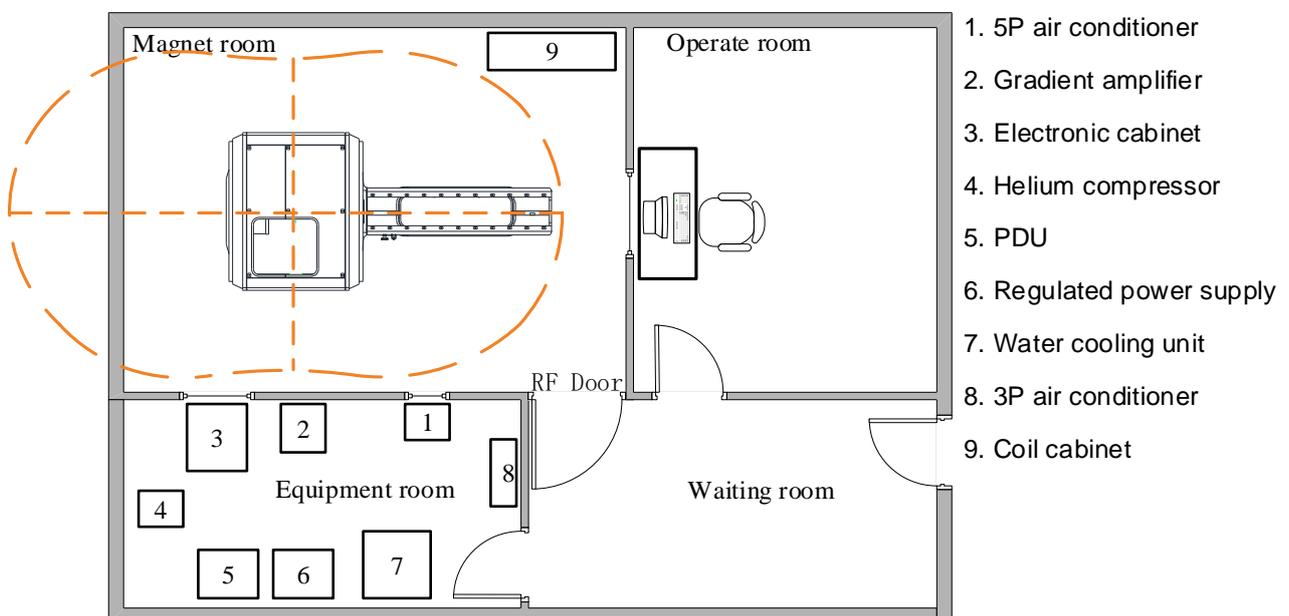
# Site Requirements

## Environment Requirement

- Metal Parts Safety Distance(Vehicle、Elevator、Electric Car、Water Pipe、Oil Pipe etc.)

Metal Parts Weight	≤200Kg	≤900Kg	≤4500Kg	Train
Safety Distance (m)	5	6	15	100

## Recommended site drawing



## Room Size Requirement

Room name	Standard Dimension L×W×H (m)	Smallest Dimension, L×W×H (m), Need ANKE engineer review first.
Scanning Room	6.5×5.5×3.3	6.2×4.8×3.2
Equipment Room	3.0×5.5×3.3	2.3×4.5×2.8
Operation Room	4.0×4.5×3.2	3.0×4.5×3.2

- Magnet weight: 6T

## Power supply

Voltage: 3-Phase & 4-wire, 380V±10%, 50/60Hz±1Hz,  
 Power Consumption: ≥100KW.

# Warranty

Shenzhen Anke High-tech Co., Ltd. is a professional enterprise which integrates research, development, manufacture, sales and marketing of products such as Magnetic Resonance Imaging (MRI), computed tomography (CT), and Digital Radiology (DR). We are the leading manufacturer of medical equipment in China and our products are the first choice of most Chinese hospitals, also have exported to more than 30 countries around the world.

SuperMark 1.5T supplied by ANKE will be, under normal and proper use and care, free from all defects or deficiency in design, material and workmanship for the Warranty Period as specified below:

- Warranty Period (from acceptance date): 12 months.
- The warranty shall not extend to:
  - (1) any Products that are misused or that have malfunction attributable to negligence or accidents;
  - (2) any Products where ANKE's original serial number tag or product identification markings have been altered or removed;
  - (3) any Products repaired by anyone unauthorized by ANKE.

The guarantee covers all the materials, main accessories that will be shipped directly from the factory and we offer the service technically by the Internet of 7 x 24 hours.