COMPARISON CHART

Wide Bore MRI Systems, 1.0T or higher

October 2012 Comparison Chart Compiled by Imaging Technology News
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N/A = Not applicable N/S = Not specified

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Company	Hitachi Medical Systems America	Philips Healthcare		Siemens Medical Solutions					Toshiba America Medical Systems	
Model	Echelon Oval	Ingenia 1.5T	Ingenia 3.0T	Magnetom Skyra	Magnetom Aera	Magnetom Verio	Magnetom Espree	Magnetom Espree-Pink	Vantage Titan	Vantage Titan
FDA Cleared (Year)	2012	2011	2011	2010	2010	2007	2004	2004	2012	2010
Clinical Application	Whole body	Whole body	Whole body	Whole body	Whole body	Whole body	Whole body	Dedicated breast MRI / optional whole body	Whole body	Whole body
MAGNET										
Configuration	Wide-oval bore	Wide-bore	Wide-bore	Open-bore	Open-bore	Open-bore	Open-bore	Open-bore	Ultra-short bore	Ultra-short bore
Type	Superconducting	Superconducting	Superconducting	Superconducting	Superconducting	Superconducting	Superconducting	Superconducting	Superconducting	Superconducting
Field Strength, Tesla (T)	1.5	1.5	3.0	3.0	1.5	3.0	1.5	1.5	1.5	3.0
Homogeneity (35 or 40 cm DSV), Vrms (Guaranteed)	0.75 ppm Vrms @ 40 cm DSV	< 0.5 ppm @ 40 cm DSV	< 0.4 ppm @ 40 cm DSV	1.4 ppm @ 40 cm DSV, Vrms	1.4 ppm @ 40 cm DSV, Vrms	1.4 ppm @ 40 cm DSV, Vrms	< 5 ppm @ 40 cm DSV	< 5 ppm @ 40 cm DSV	1 ppm or less @ 40 cm DSV	1.4 ppm or less @ 40 cm DSV
Homogeneity (35 or 40 cm DSV), Vrms (Typical)	0.2 ppm Vrms @ 40 cm DSV	N/S	N/S	1.2 ppm @ 40 cm DSV, Vrms	1.2 ppm @ 40 cm DSV, Vrms	1.2 ppm @ 40 cm DSV, Vrms	N/S	N/S	N/A	N/A
5-Gauss Fringe Field, Radial/Axial, m	4 / 2.5	2.4 / 3.8	3.05 / 4.95	2.6 / 4.6	2.5 / 4	2.6 / 4.6	2.5 / 4	2.5 / 4	3 / 5	2.6 / 4.6
Per-patient Active Shimming Features	High order active shim technology	3 x linear	3 x linear, 5 x HOS	3 linear with 20 coils, 5 nonlinear 2nd-order	3 linear with 20 coils, 5 nonlinear 2nd-order	Passive, active; 1st-order standard / 2nd-order standard	Passive, active; 1st-order standard / 2nd-order standard	Passive, active; 1st-order standard / 2nd-order standard	Active, auto active	Active, auto active
Cryogen Refill Interval, Year	1 time per 6 years with 4k He refrigerator	Zero boil off, not applicable	Zero boil off, not applicable	Zero boil, approx .10 years	Zero boil, approx. 10 years	Zero boil, approx. 10 years	Zero boil, approx .10 years	Zero boil, approx. 10 years	24-36 months	Zero boil off, > 36 months
Finished (Covered) Gantry Weight, kg	5,200	3,060	4,600	5,768	3,121	8,200 in operation	5,100 in operation	5,100 in operation	5,400	7,800
Finished (Covered) Gantry Dimension (L x W x H), cm	Short-bore length 160 x 220 x 220	1.5 x 1.88 x 2.29	1.64 x 1.88 x 2.29	173 x 231 x 219	145 x 231 x 219	173 x 230 x 222	125 x 230 x 225	125 x 230 x 225	149.5 x 201.5 x 241	181.8 x 201.5 x 241
PATIENT MANAGEMENT/COMFORT										
Minimum Finished Bore L-R Diameter, cm (Closed Magnet), Measured at Isocenter	74	70	70	70	70	70	70	70	71 aperture, 69 at middle of bore	71 aperture, 69 at middle of bore
Minimum A-P Dimension With Table Inserted, cm, Measured at Isocenter, Including Spine Coil, But Not Mat	48	N/S	N/S	55	55	55	55	55	52.9	52.9
Dockable Table (Standard or Option)	Standard	Option	Option	Option	Option	N/A	N/A	N/A	N/A	N/A
Table Width (Moving Portion), cm	63	64	64	N/S	N/S	N/S	N/S	N/S	52	52
Table Capacity, lbs	550	550	550	550	550	550	550	550	440 standard, 550 optional	440
Table Vertical Travel (Min Height - Scanning Height), cm	50 - 84	59 - 82	59 - 82	52 minimum H	52 minimum H	50 minimum H	47 minimum H	47 minimum H	43 - 84.5	43 - 84.5
Table Longitudinal Movement Range, cm	279	200	200	Max. scan 140, optional 205	Max. scan 140, optional 205	Max. scan 140, optional 196	Max. scan 154, optional 205	Max. scan 205	205	205
Table Lateral Movement Range (Extreme L - Extreme R), cm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Feet-First Imaging for all Regions (Yes/No)	Yes	Yes	Yes	Yes, except for head/neck coil	Yes, except for head/neck coil	Yes, except for head/neck coil	Yes, except for head/neck coil	Yes, except for head/neck coil	Yes, shoulders to feet	Yes, shoulders to feet
Gantry-Mounted Operator-Controlled LCD (Yes/No)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Patient Cooling Features	Yes	In-bore ventilation (5 settings)	In-bore ventilation (5 settings)	In-bore ventilation (3 levels)	In-bore ventilation (3 levels)	In-bore ventilation (3 levels)	In-bore ventilation (3 levels)	In-bore ventilation (3 levels)	Yes	Yes
Operator Call	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Patient - Operator Intercom	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Patient illumination Features	Yes	Yes, plus Ambient ring	Yes, plus Ambient ring	In-bore lighting (3 levels)	In-bore lighting (3 levels)	In-bore lighting (3 levels)	In-bore lighting (3 levels)	In-bore lighting (3 levels)	Yes	Yes
GRADIENT										
Maximum Amplitude, Single Axis, mT/m (X, Y and Z)	34	45	45	45	33 or 45	45	57 effective	57 effective	34	30
Maximum Slew Rate, Single Axis, T/m/s (X, Y and Z)	150	200	200	200	200	200	170	100	148	203
Cooling System Type	Water	Liquid	Liquid	Water	Water	Water	Water	Water	Water	Water
COMPUTER SYSTEM										
CPU Type	Core i5 3.33 GHz	Quad Core Intel 2.8 GHz	Quad Core Intel 2.8 GHz	Intel Xeon ≥ W3520 Quad Core	Intel Xeon ≥ W3520 Quad Core	2x Pent. IV / Intel Xeon	2x Dual Core Intel Xeon	2x Dual Core Intel Xeon	Intel Xeon 6-Core Dual	Intel Xeon 6-Core Dual
CPU Memory Size, MB	8,000	8 GB	8 GB	4 GB RAM	4 GB RAM	4 GB RAM	4 GB RAM	4 GB RAM	12 GB Main Memory	12 GB Main Memory
Reconstruction Hardware	Core i5 3.33 GHz	Quad Core Intel 3.6 GHz	Quad Core Intel 3.6 GHz	Intel ≥ E5540 Quad Core	Intel ≥ E5540 Quad Core	2x AMD Opt. (Linux 64-Bit)	2x AMD Opt. (Linux 64-Bit)	2x MD Opt. 248 CPU	8,800 images per second	4,400 images per second
Reconstruction Memory Size, MB	8,000	36 GB	36 GB	48 GB RAM	48 GB RAM	≥ 8 GB RAM	8 GB RAM	16 GB RAM	12 GB	12 GB
Image Storage Media Type	HDD, DVD, CD-R	DVD+RW	DVD+RW	CD ROM / DVD-R, USB Drive	CD ROM / DVD-R, USB Drive	CD ROM / DVD-R, USB Drive	CD ROM / DVD-R, USB Drive	CD ROM / DVD-R, USB Drive	DVD 9.4 GB	DVD 9.4 GB
Image Storage Media Image Capacity	HDD 320 GB; DVD 4.7 GB, CD-R for an exam	300,000 images local	300,000 images local	25,000 images 256^2	25,000 images 256^2	25,000 images 256^2	25,000 images 256^2	25,000 images 256^2	44,000 DVD image capacity	44,000 DVD image capacity
DICOM 3.0 Classes Supported (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Display Monitor Displayable Area (L x W), cm	24-in. diagonal	23-in. 1,900 x 1,200 resolution	23-in. 1,900 x 1,200 resolution	1,280 x 1,024 full screen	1,280 x 1,024 full screen	1,280 x 1,024 full screen	1,280 x 1,024 full screen	1,280 x 1,024 full screen	24-in. LCD (1,920 x 1,200)	24-in. LCD (1,920 x 1,200)
Simultaneous Scan and Reconstruction, (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RF SYSTEM										
Channels (Minimum, Maximum Configuration)	16	Channel independent	Channel independent	48, 64, 128	48, 64	8, 18, 32	8, 18, 32	18, 32	8, 16 or 32	16 or 32
Parallel Imaging Features (Name, Image/K-Space)	RAPID, Image	dS-SENSE, ktBLAST (k-space, image)	dS-SENSE, ktBLAST (k-space, image)	iPAT, mSENSE and GRAPPA (image, k-space)	iPAT, mSENSE and GRAPPA (image, k-space)	iPAT, mSENSE and GRAPPA (image, k-space)	iPAT, mSENSE and GRAPPA (image, k-space)	iPAT, mSENSE and GRAPPA (image, k-space)	SPEEDER	SPEEDER
Analog-to-Digital Conversion at Gantry (Yes/No)	Yes	Inside the RF coils	Inside the RF coils	Yes	Yes	No	No	No	No	No
Optical Transmission	Yes	Digital broadband signal transfer	Digital broadband signal transfer	Yes	Yes	No	No	No	No	No
COILS (STANDARD/OPTIONAL, # OF ELEMENTS, RF CHANNELS, PARALLEL IMAGING SUPPORT)										
Brain	Standard, 19, 15, yes	Standard, 15 ch, channel independent, dS-SENSE	Optional, 32 ch, channel independent, dS-SENSE	With head coil	With head coil	With head coil	With head coil	N/A	Atlas SPEEDER head, standard, 14 elements, parallel imaging capable	Atlas SPEEDER head, standard, 16 elements, parallel imaging capable
Head	Standard, 19, 15, yes	Standard, 15 ch, channel independent, dS-SENSE	Standard, 15 ch, channel independent, dS-SENSE	Standard, 16 e, 20 e with neck; 48 ch, 64 ch (opt); iPAT	Standard, 16 e, 20 e with neck; 48 ch, 64 ch (opt); iPAT	Standard,12 e, 32 e (opt); 8 ch, 18 ch, 32 ch (opt); iPAT	Standard,12 e, 32 e (opt); 8 ch, 18 ch, 32 ch (opt); iPAT	N/A	Atlas SPEEDER head, standard, 14 elements, parallel imaging capable	Atlas SPEEDER head, standard, 16 elements, parallel imaging capable
Spine	Standard, 20, 16, yes	Standard, 44 ch, channel independent, dS-SENSE	Standard, 44 ch, channel independent, dS-SENSE	Standard, 32 e; 48 ch, 64 ch / 128 ch (opt); iPAT	Standard, 32 e; 48 ch, 64 ch (opt); iPAT	Standard, 24 e; 8 ch, 18 ch, 32 ch (opt); iPAT	Standard, 24 e; 8 ch, 18 ch, 32 ch (opt); iPAT	N/A	Atlas SPEEDER spine, standard, 32 elements, parallel imaging capable	Atlas SPEEDER spine, standard, 40 elements, parallel imaging capable
Neck	Standard, 18, 12 to 16, yes	Standard, 20 ch, channel independent, dS-SENSE	Standard, 20 ch, channel independent, dS-SENSE	Optional, 4 e, 20 e with head coil; 48 ch, 64 ch / 128 ch (opt); iPAT	Optional, 4 e, 20 e with head coil; 48 ch, 64 ch (opt); iPAT	Optional, 4 e,16 e (opt); 8 ch,18 ch, 32 ch (opt); iPAT	Optional 4 e; 8 ch,18 ch, 32 ch (opt); iPAT	N/A	Atlas SPEEDER head-cervical, standard, 17 elements, parallel imaging capable	Atlas SPEEDER head-cervical, standard, 16 elements, parallel imaging capable
Shoulder	Standard, 5, 5, yes	Optional, 8 ch, channel independent, dS-SENSE	Optional 8 ch, channel independent, dS-SENSE	Optional, 16 e, 16 ch; iPAT	Optional, 16 e, 16 ch; iPAT	Optional, 4e; 4 ch; iPAT	Optional, 4 e; 4 ch; iPAT	N/A	Shoulder SPEEDER, optional, 6 elements, parallel imaging capable	Shoulder SPEEDER, optional, 6 elements, parallel imaging capable
Body/Torso	Standard 8, up to 16 ch with spine coil, yes	Optional, 32 ch, channel independent, dS-SENSE	Optional, 32 ch, channel independent, dS-SENSE	Standard, 18 e / 30 e combined with spine; 48 ch, 64 ch / 128 ch (opt); iPAT	Standard, 18 e / 30 e combined with spine; 48 ch, 64 ch / 128 ch (opt); iPAT	Standard, 6 e / 12 e combined with spine; 8 ch, 18 ch, 32 ch (opt); iPAT	Standard, 6 e / 12 e combined with spine; 8 ch, 18 ch, 32 ch (opt); iPAT	N/A	Atlas body SPEEDER, standard, 16 elements, parallel imaging capable	Atlas body SPEEDER, standard, 16 elements, parallel imaging capable
Knee	Standard, 12, 12, yes	Optional, 8 ch or 16 ch, channel independent, dS-SENSE	Optional, 8 ch or 16 ch, channel independent, dS-SENSE	Optional, 15 ch; iPAT	Optional, 15 ch; iPAT	Optional, 8 ch or 15 ch; iPAT	Optional, 8 ch or 15 ch; iPAT	N/A	Knee SPEEDER, optional, 8 elements, parallel imaging capable	Knee SPEEDER R/T, optional, 7 elements, parallel imaging capable
Cardiac	Optional, 6, up to 16 with P-head and spine coil, yes	Optional, 32 ch, channel independent, dS-SENSE	Optional, 32 ch, channel independent, dS-SENSE	Standard, 18 e / 30 e combined with spine; 48 ch, 64 ch / 128 ch (opt); iPAT	Standard, 18 e / 30 e combined with spine; 48 ch, 64 ch / 128 ch (opt); iPAT	Standard, 6 e / 12 e combined with spine; 8 ch, 18 ch, 32 ch (opt); iPAT	Standard, 6 e / 12 e combined with spine; 8 ch, 18 ch, 32 ch (opt); iPAT	N/A	Atlas body SPEEDER + Atlas SPEEDER spine, standard, 16 elements + 32 elements, parallel imaging capable	Atlas body SPEEDER, standard, 16 elements, parallel imaging capable
Breast	Optional, 7, 7, yes	Optional, 7 ch or 16 ch, channel independent, dS-SENSE	Optional, 7 ch or 16 ch, channel independent, dS-SENSE	Optional, 4 e, 8 e, 16 e; 4 ch, 8 ch, 16 ch; iPAT	Optional, 4 e, 8 e, 16 e; 4 ch, 8 ch, 16 ch; iPAT	Optional, 4 e, 7 e, 16 e; 4 ch, 7 ch, 16 ch; iPAT	Optional, 4 e, 7 e, 16 e; 4 ch, 7 ch, 16 ch; iPAT	Standard 2 e, 4 e, 8 e; 18 ch; iPAT	Sentinelle SPEEDER or Invivo SPEEDER, optional, 8 or 7 elements (respectively), parallel imaging capable	Sentinelle SPEEDER or Invivo SPEEDER, optional, 8 elements, 8 RF, parallel imaging capable
Wrist	Optional, 7, 7, yes	Optional, 8 ch, channel independent, dS-SENSE	Optional, 8 ch, channel independent, dS-SENSE	Optional, 16 ch; iPAT	Optional, 16 ch; iPAT	Optional, 8 e; 8 ch; iPAT	Optional, 8 e; 8 ch; iPAT	N/A	Wrist SPEEDER, optional, 6 elements, parallel imaging capable	Wrist SPEEDER, optional, 6 elements, parallel imaging capable
Neurovascular	Optional, 22, 15, yes	Standard, 20 ch, channel independent, dS-SENSE	Standard, 20 ch, channel independent, dS-SENSE	Standard, up to 30 e in combination with TIM 4G coils; iPAT	Standard, up to 30 e in combination with TIM 4G coils; iPAT	Standard, up to 28 e in combination with TIM coils; iPAT	Standard, up to 28 e in combination with TIM coils; iPAT	N/A	Atlas SPEEDER head-cervical, standard, 17 elements, parallel imaging capable	Atlas SPEEDER head-cervical, standard, 16 elements, parallel imaging capable
Peripheral Vascular	Optional 16, 8 to 12 with torso and spine coil, yes	Standard, 60 ch, channel independent, dS-SENSE	Standard, 60 ch, channel independent, dS-SENSE	Optional, 36 e; up to 40 e in combination with TIM 4G; iPAT	Optional, 36 e; up to 40 e in combination with TIM 4G; iPAT	Optional, 36 e; 8 ch, 18 ch, 32 ch (opt); iPAT	Optional, 36 e; 8 ch, 18 ch, 32 ch (opt); iPAT	N/A	Atlas body SPEEDER + Atlas SPEEDER spine, standard, 16 elements + 32 elements, parallel imaging capable	Atlas body SPEEDER + Atlas SPEEDER spine, standard, 16 elements + 40 elements, parallel imaging capable
Foot / Ankle	Optional 8, 8, yes	Optional, 8 ch, channel independent, dS-SENSE	Optional, 8 ch, channel independent, dS-SENSE	Optional,16 e, 16 ch pending; iPAT	Optional,16 e, 16 ch pending; iPAT	Optional, 8 e, 8 ch; iPAT	Optional, 8 e, 8 ch; iPAT	N/A	QD knee-foot SPEEDER, optional, 4 elements, parallel imaging capable	Flex SPEEDER coil, 4 elements, parallel imaging capable (WIP)
Others	Flex Extremity standard 4, 4 yes; MP standard 2, 2 yes; Micro optional 1, 1, no	N/S	N/S	Multi-purpose flex coils (4 ch, iPAT)	Multi-purpose flex coils (4 ch, iPAT)	Multi-purpose flex coils (4 ch, iPAT)	Multi-purpose flex coils (4 ch, iPAT)	N/A	Flex SPEEDER coil (medium and large), 16 elements, parallel imaging capable	32 channel SPEEDER head, 32 elements, parallel imaging capable
IMAGING FEATURES										
Noncontrast Angiography	VASC-ASL; VASC-FSE; BeamSat	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Fresh blood imaging (FBI), contrast-free improved angiography (CIA), time-SLIP: spatial labeling inversion pulse, time space angiography (TSA)	Fresh blood imaging (FBI), contrast-free improved angiography (CIA), time-SLIP: spatial labeling inversion pulse, time space angiography (TSA)
Plaque Imaging and Color Analysis	SIR map with RADAR-SE T1WI	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A
Selective MRA with Cylindrical-Shaped Saturation	BeamSat TOF	Yes	Yes	No	No	No	No	N/A	Yes	Yes
Spectroscopy	MRS / CSI	2-D, 3-D SENSE spectro	2-D, 3-D SENSE spectro	Yes	Yes	Yes	Yes	Yes	Single and multi-voxel	Single and multi-voxel
Motion Compensating Radial Techniques	RADAR	Yes, MultiVane	Yes, MultiVane	Yes, standard	Yes, standard	Yes, standard	Yes, standard	Yes, standard	JET	JET
Motion Compensating Radial Techniques with Parallel Imaging for all Regions	RAPID RADAR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	JET	JET
Brain Volume Imaging	isoFSE / 3DGEIR	3-D BrainView	3-D BrainView	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Ultra-Short TE (TE < 1 ms, Multi-Slice)	uTE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minimum Repetition Time (3-D T1 Spoiled Gradient Echo), msec	1.4	3-D FFE 0.95 (256 matrix)	3-D FFE 0.95 (256 matrix)	3-D GRE 0.95 (256 matrix)	3-D GRE: 0.95 (256 matrix)	3-D GRE: 1.5 (256 matrix)	3-D GRE: 1.6 (256 matrix)	3-D GRE: 1.93 (256 matrix)	1.4	1.4
Minimum Echo Time, (3-D T1 Spoiled Gradient Echo), msec	0.6	3-D FFE 0.34 (256 matrix)	3-D FFE 0.34 (256 matrix)	3-D GRE:0.22 ms (256 matrix)	3-D GRE: 0.22 (256 matrix)	3-D GRE: 0.63 (256 matrix)	3-D GRE: 0.66 (256 matrix)	3-D GRE: 0.82 (256 matrix)	0.4	0.4
FOV (AP, RL, HF, Min to Max), cm	50, 50, 50, 0.5 - 50	55 x 55 x 50 (0.05 - 55)	55 x 55 x 50 (0.05 - 55)	0.5 - 50	0.5 - 50	0.5 - 50	0.5 - 45	0.5 - 45	0.5 - 50	0.5 - 50
POWER REQUIREMENTS										
Voltage (Line Voltage, Phases)	460 / 480 3-phase	400 / 480 3-phase	400 / 480 3-phase	380 / 400 / 420 / 440 / 460 / 480 V, 3-phase + ground	380 / 400 / 420 / 440 / 460 / 480 V, 3-phase + ground	380 / 400 / 420 / 440 / 460 / 480 V, 3-phase + ground	380 / 400 / 420 / 440 / 460 / 480 V, 3-phase + ground	380 / 400 / 420 / 440 / 460 / 480 V, 3-phase + ground	200 V; 3-phase, 400 V, 3-phase	200 V; 3-phase, 400V , 3-phase
kVA	100	80	86	110	85	110	85	85	20, 42	20, 90
A/C, BTU / Hour (for Entire System)	63,438	N/A	N/A	</= 20,473	</= 20,473	</= 61,418	</= 34,121	</= 34,121	Approx. 92,000	Approx. 92,000

Scranton Gillette Communications obtained the model specifications from the manufacturers.