GE Site Yearly Performance Evaluation GE Open Speed - 0.7T 31-Aug-08

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Site Name:	GE Site			MRAP # _	04342-01
Address				Survey Date:	8/31/08
City, State, Zip				Report Date: _	9/4/08
MRI Mfg:	GE	Model:	OpenSpeed	Field:	0.7T
MRI Scientist	Moriel NessAiver, Ph.D.	Signature:	Monel 1	Ventiver, P.	h.O.
	Equipment Evalua	ation Tests		Pass Fail * N/A	
1.	Magnetic field homogeneity	/:			
2.	Slice position accuracy:				
3.	Table positioning reproduci	bility:			
4.	Slice thickness accuracy:				
5.	RF coils' performance:				
	a. Volume QD Coils				
	b. Phase Array Coils				
	c. Surface Coils				
6.	Inter-slice RF interference (Crosstalk):			
7.	Soft Copy Display				
	Evaluation of Site's Techno	logist OC Pro	oram	ass ail * VA	
1	Set up and positioning accur	racy: (daily)	51 am		
1. 2	Center frequency: (daily)	racy. (duriy)			
2.	Transmitter attenuation or g	ain: (daily)			
4	Geometric accuracy measur	ments: (daily)			
5	Spatial resolution measurem	nents: (daily)			
6	Low contrast detectability.	(daily)			
7	Head Coil SNR (daily)	(4411))			
8	Body Coil SNR (weekly)				
9	Fast Spin Echo (FSE/TSE)	phosting levels	s [.] (daily)		
10	Film quality control: (week	v)	······································		
11	Visual checklist: (weekly)	57			
	······································				

Specific Comments and Recommendations
1. The head coil has significantly lower SNR due to channel #1 being effectively dead.
2. All of the other coils are functioning properly.
3. <u>Magnet homogeneity is fair</u> . Comparable or a little worse than other OpenSpeed systems.
4
5. Overall system status is pretty good.
6
7
8
9.
10.
11.
12.
13.
NOTE: Please be sure to read appendix D for an explanation of the new format of this document.

Site Na Contac Equipment Inf MRI Manufact Camera Manufact PACS Manufact 1. Table Positi Table	tet formation turer:A turer:A Curer:A Curer:	<u>Ti</u>	tle Model: Model: Model: Model:	OpenSp Drystar 3	Phone eed		T105	eMail	
Contac Equipment Inf MRI Manufact Camera Manufact PACS Manufact 1. Table Positi Table	formation turer:A turer:A turer:ACR	GE DGFA Phantom Nut	Model: Model: Model: Model: nber used:	OpenSp Drystar 3	Phone		T105	eMail	
Equipment Inf MRI Manufact Camera Manufact PACS Manufact 1. Table Positi Table	formation curer:A curer:A curer:A Curer:A CR	GE DGFA Phantom Nui	Model: Model: Model: nber used:	OpenSp Drystar 3	eed	SN:	T105	C - C-	
Camera Manufact PACS Manufact 1. Table Positi Table	turer: <u>A</u> turer: <u>A</u> ACR	DGFA Phantom Nui	Model: Model: nber used:	Drystar 3	000			Software:	3.0320.a
PACS Manufact 1. Table Positi Table	ACR	Phantom Nu	Model: mber used:	15602		SN:		Software:	
1. Table Positi Table	ACK	Phantom Nul	nber used:	156117		SN:		Software:	
	e motion out/in	ducibility: : IsoCenter	Out/In	Out/In	Out/Ir	1			Pass
Measured P	hantom Center	0.97	0.64	0.65	0.7				
2. Magnetic F Las Axial: 1. Coronal: 0.;	ield Homoge st Year CF:2 cm 20 cm 14 2.24 37 0.86	neity 19,801,500 25 cm 4.22 1.85	See append Thi GRE 5 mm Comn <u>Opens</u>	lix A for fie s Year CF: TR: 500, T skip 5 mm nents: <u>The s</u> Speeds that 1	29,79 29,79 E: 10 & 1 , BW: 10. him is con	28,100 5 Flip A 4KHz, 2 problebl	CF Ch ngle: 45, F 56x128, 4nd to a little we	ange: <u>-340</u> OV: 40 ex orse than other	PASS 0
Sagittal: 2. 4	43 4.11	6.93				11001401	y within GE	Spec.	
Sagittal: 2.4 3. Slice Thickn FOV:	43 4.11 ness Accurac 250mm	6.93 y Matrix: 256x2		(Slic	e #1 fron	n ACR P	y within GE	Spec.	im
Sagittal: 2.4 3. Slice Thickn FOV:	43 4.11 ness Accurac 250mm 3 Sequence	6.93 y Matrix: 256x TR	256 TE	(Slic Flip	e #1 fron	n ACR P Calc	within GE hantom) A Target	Spec. Il values in m % Error	nm
Sagittal: 2. 3. Slice Thick FOV:	43 4.11 ness Accurac 250mm 1 Sequence SE (ACR) 1	6.93 y Matrix: 256x2 TR 500	256 TE 20	(Slic Flip 90	e #1 from NSA	n ACR P Calc 5.43	hantom) A Target	Spec. Il values in m % Error 8.6%	ım
Sagittal: 2.4 3. Slice Thick FOV:	43 4.11 ness Accurac 250mm 1 Sequence SE (ACR) SE (Site T1)	6.93 y Matrix: 256x2 TR 500 500	256 TE 20 20	(Slic Flip 90 90	e #1 from NSA 1 1	n ACR P Calc 5.43 5.25	hantom) A Target 5 5	Spec. Il values in m % Error 8.6% 5.0%	ım
Sagittal: 2.4 3. Slice Thick FOV:	43 4.11 ness Accurac 250mm 1 Sequence SE (ACR) SE (Site T1) SE (20/80) SE (20/80)	6.93 y Matrix: 256x2 TR 500 500 2000 2000	256 TE 20 20 20 20	(Slic Flip 90 90 90	e #1 from NSA 1 1 1	n ACR P Calc 5.43 5.25 5.43	hantom) A Target 5 5 5 5	Spec. Il values in m % Error 8.6% 5.0% 8.6% 4.2%	nm
Sagittal: 2.4 3. Slice Thick FOV:	43 4.11 ness Accurac 250mm 2 Sequence SE (ACR) SE (Site T1) SE (20/80) SE (20/80) ESE(14)	6.93 y Matrix: 256x TR 500 2000 2000 2000 3000	256 TE 20 20 20 80 80	(Slic Flip 90 90 90 90	e #1 from NSA 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	n ACR P Calc 5.43 5.25 5.43 5.21 4.58	hantom) A Target 5 5 5 5 5 5	Spec. Il values in m % Error 8.6% 5.0% 8.6% 4.2% -8.4%	ım
Sagittal: 2. 3. Slice Thick FOV:	43 4.11 ness Accurac 250mm 1 Sequence SE (ACR) SE (Site T1) SE (20/80) ESE (20/80) FSE(14) FSE(2)	6.93 Matrix: 256x2 TR 500 2000 2000 2000 3000 516	256 TE 20 20 20 20 80 80 16	(Slic Flip 90 90 90 90 90 90	e #1 from NSA 1 1 1 1 1 1 2	n ACR P Calc 5.43 5.25 5.43 5.21 4.58 4 78	hantom) A Target 5 5 5 5 5 5 5 5 5	Spec. Il values in m % Error 8.6% 5.0% 8.6% 4.2% -8.4% -4.4%	ım

4. Slice Crosstalk (RF interference)

The following data were obtained using the ACR phantom slice thickness wedges to measure the slice profile of a three T1 weighted sequences when the slice gap varies from 200% down to 0% (contiguous) As the slices get closer together it is expected that the edges of the slices will overlap causing a deterioration of the slice profile. The data shown below clearly demonstrates this effect. Once the slice gap drops below 40% of the slice thickness, the measured slice profiles begin to drop. The tailing off at very small slice gaps is strange, normally one would expect to see a steady drop, not a levelling off. The slice profile with TRF is very poor - it reduces the ghosting but it also reduces the SNR by about 8-12%.

All of the slice profiles can be seen in Appendix B.slice crosstalk.

Sequence Type	TR	TE	FOV (cm ²)	Matrix	NSA	Thickness	# of slices	Slice Measured
SE	450	19	25	256x256	1	5	11	6
FSE(2)	516	16	25	256x256	2	5	11	6
FSE(2) TRF	516	16	25	256x256	2	5	11	6

Skip	SE	FSE(2)	FSE(2) TRF
0.0	4.61	4.43	3.87
0.2	4.61	4.42	3.94
0.5	4.72	4.39	3.93
1.0	4.88	4.66	4.05
1.5	4.92	4.72	4.11
2.0	5	4.74	4.15
2.5	5.02	4.71	4.11
5.0	5.02	4.71	4.15
10.0	5.05	4.78	4.20



5. Soft & Hard Copy Displays

Luminance Meter Make/Model: Tektronix J16 Digital Photometer Cal Expires:

Monitor Description: NEC Multisync LCD 1850X

Luminance Measured: Ft. lamberts

Measured Data							
Which Monitor	Center of Image Display	Top Left Corner	Top Right Corner	Bottom Left Corner	Bottom Right Corner		
Console	34.9	31.8	24	36.1	27.5		

	Uniformity				
	MAX	MIN	Percent Delta		
	36.1	24	40%		
ľ					

4/6	/06
	SMDTE
	SNIFIE
	OK?
	Y

% delta =200% x (max-min)/(max+center) (>30% is action limit)



The center of the monitor is 'ok'. The right side of the monitor is noticebly dim and fails ACR spec for signal

uniformity. This is a common problem with these monitors. The agreement between the monitor and the film is fair.



Coil and Other Hardware Inventory List

Site Name GE Site

ACR Magnet # 1 Nickname GE HFO

Activ	e Coil Description	Manufacturer	Model	Rev.	Mfg. Date	SN	Channe	s
	Body Flex - Large	GE	2273180-2		Oct, 2002	897591M4	1	
	Body Flex - Medium	GE	2273181-2		Oct, 2002	897679YM7	1	
	Body - Integrated	GE					1	
⊠	Body Flex - Large	GE	2273180-2		Apr, 2006	3844YR8	1	
	Body Flex - Medium	GE	2273181-3		Mar, 2006	966351YM9	1	
⊠	CTL Phased Array	USA Instr.	Magna 5000		Jun, 2003	505	6	
	Head PA	MRI Devices	101463	1	Jun, 2002	U7284	4	
⊠	Knee - Large	USA Instr.	Legend 5000	В	Sep, 2002	421	2	
	Knee - Medium	USA Instr.	Legend 5000	В	Sep, 2002	427	2	
⊠	Knee/Foot - Standard	USA Instr.	Legend 5000		Sep, 2002	427	3	
	Shoulder - Phased Array	USA Instr.	Mark 5000	С	May, 2003	464	2	
	Wrist Coil	MRI Devices		0	Sep, 2002	U8469	3	
								•

RF Coil Performance Evaluation Coil: Body - Integrated Mfg.: GE Mfg. Date: Coil ID: 662 Phantom: Shim sphere Sequence TR TE Plane FOV SE 300 20 T 40	Nx Ny 256 256	Test Date: 8/31/2008 Model:			
Analysis of Test Image					
Back	Noise <u>N</u> oise	Mean Normal- Max Uni-			
LabelMeanMaxMingroundN139236620.0	SD Type 20.06 NEMA	SNR ized SNR formity 4.9 1.2 8.3 41.6%			
A 139 236 58 35.8	19.86 Air	4.6 1.1 7.8 39.5%			
Mean: 139 Role Role Role Bole Role	• -0.00 • 20.00 • 20.0				

RF Coil Performance Evaluation Coil: Body Flex - Large Mfg.: GE Mfg. Date: 4/1/2006 Coil ID: 1151 Phantom: Body phantom sphere (27cm) Sequence TR TE Plane FOV SE 300 20 T 40	Nx Ny 256 256	Test Date: 8/31/2008 Model: 2273180-2 Revision:				
Coil Mode: BODYFLEXL TX gain: 159 R1: 11 R2: 28						
Analysis of Test Image						
Measured Data	isa Noisa —	Calculated Results				
Label Mean Max Min ground S		SNR ized SNR formity				
N 720 849 580 0.6 8. A 720 852 577 13.0 7.	34 NEMA 00 Air	61.1 34.3 72.0 81.2% 67.4 37.9 79.8 80.8%				
SNR.is.up.by.88%	60 34 9 9 ROI Area: 507.	Air M: 13.03 Airsd: 7.00 0				

RF Coil Performance EvaluationCoil:Body Flex - MediumMfg.:GEMfg. Date:3/1/2006Coil ID:1152Phantom:Body phantom sphere (27cm)SequenceTRTEPlaneFOVNxNySE30020T40Coil Mode:BODYFLEXMT	Test Date: 8/31/2008 Model: 2273181-3 Revision:
Analysis of Test Image	
Measured Data	Calculated Results
Back Noise Noise Label Mean Max Min ground SD Type	Mean Normal- Max Uni- SNR ized SNR formity
N 818 1,001 660 3.7 8.20 NEMA	70.5 39.7 86.3 79.5%
A 814 1,002 657 12.7 6.87 Air SNR is identical to last year.	77.6 43.7 95.6 79.2%
Mean: 818 ROI M: 3.73 ROIsd: 8.20 0 1001 0 1002 ROI Area: 507.48 ROI Area: 507	Air M: 12.74 Airsd: 6.87

RF Coil Performance Evaluation Test Date: 8/31/2008 Coil: CTL Phased Array Model: Magna 5000 Mfg.: USA Instr. Revision:					
SequenceTRTEPlaneFOVNxNyBWNSAThicknessGapSE30020T3025625615.613-					
Coil Mode: a Cervical CTL TX gain: 159 R1: 11 R2: 29 Analysis of Composite Image	-				
Measured Data Calculated Results					
Back Noise Noise Mean Normal- Max Uni-	-				
Label Mean Max Min ground SD Type SNR ized SNR formity	-				
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	-				
Analysis of Uncombined Images	_				
Measured Data Calculated Results	_				
Noise Noise Mean % of Max % of Ch Mean Max SD Type SNP Mean SNP Mean					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1				
2 737 966 7.24 Air 66.7 100% 87.4 100%					
SNR is up by 80% (back to where it should be.)					
Mean: 739 ROI M: 0.99 Mean: 738 Air M: 18.17 Mean: 293 Air M: 10.31 Mean: 737 Air M: 13 Image: Mean: 739 Image: Mean: 738 Image: Mean: 738 Image: Mean: 6.86 Image: Mean: 737 Image: Mean	54 4 6				
ROI Area: 163.82 ROI Area: 163.82 ROI Area: 163.82 ROI Area: 163.82					
Composites Channel 1 Channel 2					

RF Coil Performance Coil: CTL Phased Arr Mfg.: USA Instr. Mfg. Date: 6/18/2003 Phantom: CTL Phantoms Sequence TR TE SE 300 20 Coil Mode: b Thoracic CTL	ce Evaluat	ion 40	Vx Ny 56 256		BW 15.6	Fest Date: Model: Revision: SN: NSA T 1 [8/31 Mag 5 4 of Char hickness 3 [: 11 R2	/2008 na 5000 505 nnels <u>6</u> Gap 100 2: <u>30</u>
	Ana	alysis of C	omposite	Imag	le			
Me	asured Dat	a 👘		-	C	alculate	d Result	5
Label Mean Max	Bac Min grou	k Noise nd SD	Noise Type		Mean SNR	Normal- ized	Max SNR	Uni- formity
N 214 446	115 -0.4	4.40	NEMA	Γ	34.4	19.3	71.7	41.0%
N 307 514	248 0.1	5.27	NEMA		41.2	23.2	69.0	65.1%
N 286 559	212 -0.4	4.63	NEMA		43.7	24.6	85.4	55.0%
	Anal	sis of Un	combined	Imag	ges			
Measured	Data				Ca	culated	Results	
Ch Mean Max 1 91 343 2 223 319 3 146 366 4 188 575	Noise SD Noise 3.46 3.46 - 3.89 - 2.76 - 4.51 -	oise ype Air Air Air Air		Me SN 17 37 34 27	$\begin{array}{c c} \text{pan} & \text{pan} \\ \text{NR} & \text{M} \\ \hline 7.2 & 2 \\ \hline 7.6 & 1 \\ \hline 1.7 & 2 \\ \hline 7.3 & 7 \\ \hline \end{array}$	% of <u>Mean</u> 46% 00% 02% 73%	Max SNR 65.0 53.7 86.9 83.5	% of Max 75% 62% 100% 96%
The uncombined images came fr documents. The SNR values are Composites Channels	Mean: 214 Mean: 214 Mean: 214 F ROI Area: 385.21 Mean: 91 08 032 ROI Area: 385.21 Channe	7, 13, and 9, ar or better, than 101 M: -0.42 Noi M: -0.42 Near 101 M: -0.42 Mean Roi J Roi J Roi J Nir M: 6.48 Mean Roi J Roi J	ad.correspond.d last.year. a: 307 ROI M ROISd O 2448 O 514 Area: 393.81 Area: 393.81 Channel 2	to.elem 1: 0.14 1: 5.27 3.89 8 8 9 9 9 19 19 19 19 19 19 19 1	lean: 286 0212 01 Area: 401.4 Mean: 146 050 AOI Area: 401.4 Channe	ROI M: -0.37 ROIsd: 4.63	fined by USA Mean: 188 6777 ROI Area: 393. Chan	Air M: 8.43 Airsd: 4.51

RF Coil Performan	ce Evaluati	on	-		-	Test Date [.]	8/31/2008
Coil: CTL Phased Ar	ray		11-	m		Model:	Magna 5000
Mfg.: USA Instr.						Revision:	
Mfg. Date: <u>6/18/2003</u>	Coil ID: 640)				SN:	505
Phantom: <u>CTL Phantoms</u>							# of Channels <u>6</u>
SequenceTRTESE30020	E Plane F	OV N 40 25	1x Ny 56 25	56	BW 15.6	NSA T	hickness Gap 3 100
Coil Mode: <u>c Lumbar CTL</u>				т	X gain:	<u>163</u> R1:	: <u>11</u> R2: <u>30</u>
	Ana	ysis of C	omposit	e Ima	ge		
Me	easured Data			-	C	alculate	d Results
Label Mean Max	Min groun	d SD	Noise Type	1	SNR	ized	SNR formity
N 161 356	<u>64</u> 0.3	4.25	NEMA		26.8	15.1	<u>59.2</u> <u>30.5%</u>
N 278 488	199 0.6 194 0.6	4.00	NEMA NEMA		45.8	27.4	80.4 56.9%
	Analy	sis of Un	combine	d Ima	aes		
Measured	Data				Ca	culated	Results
Ch Moan Max	Noise No	vise		M	ean ⁽	% of	Max % of
3 82 261] 2.54 A	vir		2	1.2	57%	67.3 67%
4 207 256	3.64 A	<u>vir</u>		3	7.3 1	00%	46.1 46%
$\begin{array}{ c c c c c }\hline 7 & 113 & 419 \\\hline 8 & 139 & 482 \\\hline \end{array}$	2.74 A 5.23 A	Air Air			7.0	73% 47%	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
		7.0.14	1	11		7.0.0.1.0	
documents. The SNR values are	e better than last y	7, 8 and 4 an rear.	a correspond	1 to elen	nents 5, 4,	/ & 8 as del	
	Moon 161 PC	M.O.30 Moon	DZC ROI	M: 0.56	Maan 078	ROI M: 0 59	n
	RC	llsd: 4.25	ROI	sd: 4.00	Mean: 276	ROIsd: 4.29	
			0199			0194	
Composites	G4 0356		0 644			D488	
	ROI Area: 404.80	ROLA	rea: 390.48		ROI Area: 395.3	37	
	Mean: 82 Air Air	M: 4.71 Mean sd: 2.54	: 207 Air Airs	M: 6.76 d: 3.64	Mean: 113	Air M: 5.12 Airsd: 2.74	Mean: 139 Air M: 9.80 Airsd: 5.23
		015		0256	0 24		
Channels				011			
	ROI Area: 395.37	ROLA	vrea: 390.48		ROI Area: 390.	48	ROI Area: 404.80
	Channel	1	Channel 2		Chann	el 3	Channel 4

RF Coil Performance Evaluation	Test Date: 8/31/2008
Coil: Head PA	Model: 101463
Mfg.: MRI Devices	Revision: 1
Mfg. Date: 6/01/2002 Coil ID: 636	SN: U7284
Phantom: ACR Phantom	# of Channels4
SequenceTRTEPlaneFOVNxNySE30020T40256256	BWNSAThicknessGap15.613-
Coil Mode: <u>a Head</u>	TX gain: <u>91</u> R1: <u>11</u> R2: <u>29</u>
Measured Data	Calculated Results
Back Noise Noise	Mean Normal- Max Uni-
Label Mean Max Min ground SD Type N 606 682 556 6.5 8.74 NEMA	49.0 27.6 55.2 89.8%
A 599 674 548 20.2 5.86 Air	67.0 37.7 75.4 89.7%
Analysis of Uncombined	Images
Measured Data	Calculated Results
Noise Noise Ch Mean Max SD Type	Mean % of Max % of SNR Mean SNR Mean
1 10 12 0.82 Air	8.0 14% 9.6 14%
2 232 307 6.05 Air	25.1 45% 33.3 48%
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	46.4 82% 68.2 99% 56.5 100% 68.7 100%
The SNR is 30% lower than last year due to channel #1 being effectively dea	ıd
	Channel 1 Channel 2
Mean: 606 ROI M: 6.47 Mean: 599 Air M: 20.19	Mean: 10 Air M: 1.42 Mean: 232 Air M: 11.39
HUISU. 0.74 AllSU. 5.00	
	9 9
O 882 O 8748	012
	ROI Area: 235.12 ROI Area: 235.12 Mean: 406 Air M: 10.76 Mean: 647 Air M: 14.13
ROI Area: 235.12 ROI Area: 235.12	Airsd: 5.74 Airsd: 7.51
Composites	BOI Area; 235,12 BOI Area; 235,12
	Channel 3 Channel 4

RF Coil Performance Evaluation	Test Deter 8/31/2008
Coil: Head PA	Model: 101463
Mfg.: MRI Devices	Revision: 1
Mfg. Date: 6/01/2002 Coil ID: 636	SN: U7284
Phantom: Head Sphere	# of Channels4
SequenceTRTEPlaneFOVNxSE30020T40256	NyBWNSAThicknessGap25615.613-
Coil Mode: Head	TX gain: <u>86</u> R1: <u>11</u> R2: <u>29</u>
Measured Data	Calculated Results
Back Noise Noise	ie Mean Normal- Nax Uni-
Label Mean Max Min ground SD Typ N 681 853 587 -2.6 7.44 NEM	A 64.7 36.4 81.1 81.5%
A 684 859 590 23.7 7.04 Air	63.7 35.8 80.0 81.4%
Analysis of Uncombi	ned Images
Measured Data	Calculated Results
Noise Noise Ch Mean Max SD Type	Mean % of Max % of SNR Mean SNR Max
1 23 34 0.85 Air	17.7 30% 26.2 34%
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
4 703 842 7.81 Air	59.0 100% 70.6 92%
The SNR is 43% lower than last year due to channel #1 being effective	v dead
······································	у. Талан а
Mean: 681 ROI M: -2.63 Mean: 684 Air M: 23.72	Channel 1 Channel 2
ROIsd: 7.44 Airsd: 7.04	Airsd: 0.85 Airsd: 5.92
0587	9114
OB53 OB59	9 34
	0297
	ROI Area: 347.05 ROI Area: 347.05
ROI Area: 347.05 ROI Area: 347.05	Mean: 501 Air M: 11.32 Mean: 703 Air M: 14.60 Airsd: 6.03 Airsd: 7.81
Composites	0472 0520
	O 703 O 842
	ROI Area: 347.05 ROI Area: 347.05
L	Channel 3 Channel 4

RF Coil Performance Evaluation Test Date: 8/31/200	8
Coil: Head PA Model: 101463	
Mfg.: MRI Devices Revision: 1	
Mfg. Date: 6/01/2002 Coil ID: 636 SN: U7284	
Phantom: Head Sphere # of Channels	s <u>4</u>
SequenceTRTEPlaneFOVNxNyBWNSAThicknessGaSE30020S4025625615.613-	ıp
Coil Mode: Head TX gain: 85 R1: 11 R2:	29
Analysis of Composite Image	
Measured Data Calculated Results	
Label Mean Max Min ground SD Type SNR ized SNR for	mity
N 586 698 225 1.2 7.63 NEMA 54.3 30.6 64.7 48. A 585 696 223 23.6 7.03 Air 54.5 30.7 64.9 48.	8% 5%
	570
Analysis of Uncombined Images	
Noise Noise Mean % of Max %	of
Ch Mean Max SD Type SNR Mean SNR M 1 16 21 0.84 Air 0.592 0.592 0.64 0.592	ax
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	3%
3 394 488 6.05 Air 42.7 85% 52.9 86 4 595 52.9	5%
4 595 /31 /./6 Air 50.2 100% 61./ 10	0%
The SNR is 36% lower than last year due to channel #1 being effectively dead.	
Channel 1 Channel 2	
Mean: 586 ROI M: 1.24 Mean: 585 Air M: 23.57 Mean: 16 Air M: 1.48 Mean: 287 Air M: 40.57	11.14
Airsa: 7.03 Airsa: 7.03 Airsa: 0.84 Airsa: 0.84	5.97
ROLAroo: 247.20 Mean: 394 Air M: 11.26 Mean: 595 Air M:	14.52
Composites	7.76
	51
9 159 9 238	
ROI Area: 347.20ROI Area: 347.20Channel 3Channel 4	

RF Coil Performance Evaluation	Tast Data: 8/31/2008
Coil: Head PA	Model: 101463
Mfg.: MRI Devices	Revision: 1
Mfg. Date: 6/01/2002 Coil ID: 636	SN: U7284
Phantom: Head Sphere	# of Channels
SequenceTRTEPlaneFOVNxNySE30020C4025625	BWNSAThicknessGap615.613-
Coil Mode: <u>Head</u>	TX gain: <u>96</u> R1: <u>11</u> R2: <u>29</u>
Analysis of Composite Measured Data	e image Calculated Results
Back Noise Noise	
LabelMeanMaxMingroundSDTypeN6609202900.86.96NEMA	67.1 37.7 93.5 47.9%
A 659 916 290 23.7 6.97 Air	62.0 34.9 86.1 48.1%
Analysis of Uncombine	d Images
Measured Data	Calculated Results
Noise Noise Ch Mean Max SD Type	Mean % of Max % of SNR Mean SNR Max
1 19 35 0.85 Air	14.6 27% 27.0 29%
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$
3 434 641 6.05 An 4 660 1,115 7.84 Air	40.7 07.0 70.3 71.0 55.2 100% 93.2 100%
The SNR is 37% lower than last year due to channel #1 being effectively de	ead
Mean: 660 BOI M: 0.77 Mean: 659 Air M: 23.68	Channel 1 Channel 2
ROIsd: 6.96 Airsd: 6.97	Airsd: 0.85 Airsd: 5.97
	O PR
O 920 O 916	035
	ROI Area: 324.48 ROI Area: 324.48
ROI Area: 324.48 ROI Area: 324.48	Mean: 454 Air M: 11.35 Mean: 660 Air M: 14.64 Airsd: 6.09 Airsd: 7.84
Composites	01115
	Q 3:41 Q 179 Q 294
	ROI Area: 324.48 ROI Area: 324.48
	Channel 3 Channel 4

RF Coil Performance Evaluation Coil: Knee - Large Mfg.: USA Instr. Mfg. Date: 9/20/2002 Coil ID: 633 Phantom: Knee Phantom (bottle) - Site is missing phantom holder Test Date: 8/31/2008 Model: Legend 5000 Revision: B Sequence TR TE Plane FOV Nx Ny BW ISE 300 20 T 25 256 256 15.6 1 3 Coil Mode: LargeKnee TX gain: 167
Analysis of Composite Image
Mean Max Min Back ground Noise SD Noise Type Mean Normal- ized Max Uni- formity N 1,888 2,028 1,773 -5.6 15.29 NEMA 87.3 125.7 93.8 93.3% 93.3% A 1,893 2,036 1,763 33.2 12.70 Air 97.7 140.7 105.1 92.8%
Analysis of Uncombined Images
Measured Data Calculated Results Ch Mean Max SD Type Mean % of Max % of 1 1,587 1,725 11.27 Air 92.3 100% 100.3 100% 2 750 830 11.95 Air 41.1 45% 45.5 45%
Mean: 1888 ROI M: -5.60 Mean: 1893 Air M: 33.22 Mean: 1587 Air M: 21.11 Mean: 750 Air M: 22.44 02028, 1773 01763 01763 2036 01474 01474 0711 0711 ROI Area: 90.92 Composites Channel 1 Channel 2

RF Coil Performance Evaluation		Test Date: 8/31/2008
Coil: Knee - Large		Model: Legend 5000
Mfg.: USA Instr.		Revision: B
Mfg. Date: <u>9/20/2002</u> Coil ID: <u>633</u>	and the second	SN: 421
Phantom: Knee Phantom (bottle) - Site is missing phanto	m holder	# of Channels 2
SequenceTRTEPlaneFOVSE30020S361	Nx Ny BW 256 256 15.6	NSA Thickness Gap
Coil Mode: LargeKnee	TX gain:	<u>167</u> R1: <u>11</u> R2: <u>29</u>
Analysis of	Composite Image	
Measured Data		Calculated Results
Back Noise Label Mean Max Min ground SD	e Noise Mean Type SNR	Normal- Max Uni- ized SNR formity
N 1,487 1,981 871 3.9 8.20	NEMA 128.2	89.1 170.9 61.1%
A 1,483 1,970 867 16.0 6.28	Air 154.7	107.5 205.6 61.1%
Analysis of U	ncombined Images	
Measured Data	0	Calculated Results
Noise Noise Ch Mean Max SD Type	Mean SNR	% of Max % of Mean SNR Max
1 1,170 1,549 5.43 Air	141.2	100% 186.9 100%
2 580 791 5.70 Air	66. 7	47% 90.9 49%
The SNR is up roughly 14%		
Mean: 1487 ROI M: 3.94 Mean: 1483 Air M: 16.0 ROIsd: 8.20 Airsd: 6.28 871 1981 0 1981 1970 ROI Area: 192.42 ROI Area: 192.42	1 Mean: 1170 Air M Airso 684 0 1549 ROI Area: 192.42	A: 10.11 d: 5.43 Mean: 580 Air M: 10.62 Airsd: 5.70 791 801 Area: 192.42
Composites	Channel 1	Channel 2

RF Coil Performance Evaluation	Test Date: 8/31/2008
Coil: Knee - Medium	Model: Legend 5000
Mfg.: USA Instr.	Revision: B
Mfg. Date: 9/13/2002 Coil ID: 637	SN: 427
Phantom: Knee Bottle phantom	# of Channels 2
SequenceTRTEPlaneFOVNxSE30020T25256	NyBWNSAThicknessGap25615.613-
Coil Mode: Small Knee	TX gain: <u>163</u> R1: <u>11</u> R2: <u>29</u>
Analysis of Com	posite Image
Measured Data	Calculated Results
Back Noise Label Mean Max Min ground SD	Noise Mean Normal- Max Uni- Type SNR ized SNR formity
N 1,628 1,807 1,491 -3.1 10.92 N	EMA 105.4 151.8 117.0 90.4%
A 1,631 1,814 1,502 26.1 9.98	Air 107.1 154.2 119.1 90.6%
Analysis of Uncon	nbined Images
Measured Data	Calculated Results
ChMeanMaxNoise SDNoise Type11,6151,8649.59Air	Mean % of Max % of SNR Mean SNR Max 110.4 100% 127.4 100%
2 691 776 8.53 Air	53.1 48% 59.6 47%
The SNR is up roughly 5%	
Mean: 1628 ROI M: -3.14 Mean: 1631 Air M: 26.08 ROIsd: 10.92 Airsd: 9.98	Mean: 1615 Air M: 18.01 Mean: 691 Air M: 16.03 Airsd: 9.59 Airsd: 8.53
	0776
01807 01814	○ 145 2 01864
01491 01502	0644
ROI Area: 89.96 ROI Area: 89.96	ROI Area: 89.96 ROI Area: 89.96
Composites	Channel 1 Channel 2

RF Coil Performance Evaluation	Test Date: 8/31/2008			
Coil: Knee - Medium	Model: Legend 5000			
Mfg.: USA Instr.	Revision: B			
Mfg. Date: <u>9/13/2002</u> Coil ID: <u>637</u>	SN: 427			
Phantom: Knee Bottle phantom	# of Channels 2			
SequenceTRTEPlaneFOVNxNSE30020S362562	byBWNSAThicknessGap5615.613-			
Coil Mode: Small Knee	TX gain: <u>163</u> R1: <u>11</u> R2: <u>29</u>			
Analysis of Composi	te Image			
Measured Data	Calculated Results			
Back Noise Noise Label Mean Max Min ground SD Type	Mean Normal- Max Uni- SNR ized SNR formity			
N 1,148 1,732 525 0.5 4.80 NEMA	<u>169.1</u> <u>117.5</u> <u>255.2</u> <u>46.5%</u>			
A 1,148 1,735 525 12.4 4.76 Air	158.0 109.8 238.9 46.5%			
Analysis of Uncombine	ed Images			
Measured Data	Calculated Results			
Noise Noise Ch Mean Max SD Type	Mean % of Max % of SNR Mean SNR Max			
1 1,070 1,663 4.60 Air	152.4 100% 236.9 100% 22.4 55% 116.5 40%			
	<u>83.4</u> <u>55%</u> <u>110.5</u> <u>49%</u>			
The SNR is up roughly 18%				
Mean: 1148ROI M: 0.50 ROIsd: 4.80 0 1792 525 ROI Area: 191.94Mean: 1148 Air M: 12.36 Airsd: 4.76 0 1795 525 ROI Area: 191.94Mean: 1070 Air M: 8.62 Airsd: 4.60 0 1993 				

RF Coil Performance Evaluation	Tost Dato: 8/31/2008								
Coil: Knee/Foot - Standard	Model: Legend 5000								
Mfg.: USA Instr.	Revision:								
Mfg. Date: 9/13/2002 Coil ID: 663	SN: 427								
Phantom: Foot phantom	# of Channels 3								
SequenceTRTEPlaneFOVSE30020S40	NxNyBWNSAThicknessGap25625615.623-								
Coil Mode: Foot TX gain: 161 R1: 11 R2: 29									
Analysis o	f Composite Image								
Measured Data	Calculated Results								
Label Mean Max Min ground Si	se Noise Mean Normal- Max Uni- D Type SNR ized SNR formity								
N 991 1,456 223 -0.4 3.6	51 NEMA 194.1 77.2 285.2 26.6% 0 11 200.5 200.2 26.6%								
A 991 1,458 223 10.1 3.1	0 Air 209.5 83.3 308.2 26.5%								
Analysis of I	Jncombined Images								
Measured Data	Calculated Results								
Ch Mean Max SD Type	Mean % of Max % of SNR Mean SNR Max								
1 320 840 2.14 Air 2 673 1850 374 Air	98.0 82% 257.2 79% 117.9 99% 324.1 100%								
2 075 1,050 5.74 All 3 441 817 2.43 Air	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$								
The values are comparable to or just a futue lower than last	year								
Mean: 991 ROI M: -0.36 Mean: 991 Air M: 10.10 Channel 1 Channel 2 ROIsd; 3.61 Airsd; 3.10 Mean: 320 Air M: 3.99 Mean: 673 Air M: 7.06 Airsd; 3.10 O 840 0 840 0 15									
0:1458 B02288a: 287.56 B02288a: 287.56	Rol Area: 287.56 Rol Area: 287.56								
Composites	Mean: 441 Air M: 4.55 Airso: 2.43 0817 Rol Area: 287.56								
	Channel 3								

RF Coil Performance Evaluation Test Date: \$\frac{8/31/2008}{Model: Mark 5000} Coil: Shoulder - Phased Array Model: Mark 5000 Mfg.: USA Instr. Model: \$\frac{1}{1000}\$ Mfg. Date: \$\frac{5/15/2003}{5/15/2003}\$ Coil ID: \$\frac{638}{638}\$ Phantom: Shoulder sphere Coil ID: \$\frac{638}{638}\$ Sequence TR TE Plane SE 300 20 C 36 256 256 15.6 1 3 - Coil Mode: Shoulder Tx gain: 164 R1: \$11 R2: \$30								
Analysis of Composite Image								
Measured Data Calculated Results								
Back Noise Noise Mean Normal- Max Uni- Label Mean Max Min ground SD Type SNR ized SNR formity								
N 653 1,113 340 -0.8 4.54 NEMA 101.7 70.6 173.4 46.8%								
A 654 1,114 348 7.2 2.76 Air 155.3 107.8 264.5 47.6%								
Analysis of Uncombined Images								
Measured Data Calculated Results								
Noise Noise Mean % of Max % of								
ChMeanMaxSDTypeSNRMeanSNRMax11<								
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$								
The values are comparable to or just a little lower than last year.								
Mean: 653 ROI M: -0.80 ROIsd: 4.54 Mean: 654 Air M: 7.19 Airsd: 2.76 Mean: 470 Air M: 4.65 Airsd: 2.50 Mean: 416 Air M: 4.86 Airsd: 2.62 Image: Composites Image: Channel 1 Image: Channel 2 Image: Channel 2								

RF Coil Performance Evaluation Test Date: 8/31/2008								
Coil: Shoulder - Phased Array Model: Mark 5000								
Mfg.: USA Instr. Revision: C								
Mfg. Date: 5/15/2003 Coil ID: 638 SN: 464								
Phantom: Shoulder sphere # of Channels 2								
SequenceTRTEPlaneFOVNxNyBWNSAThicknessGapSE30020T3625625615.613-								
Coil Mode: Shoulder TX gain: 160 R1: 11 R2: 30								
Analysis of Composite Image								
Measured Data Calculated Results								
Back Noise Noise Mean Normal- Max Uni- Label Mean Max Min ground SD Type SNR ized SNR formity								
N 566 690 427 -0.1 3.13 NEMA 127.9 88.8 155.9 76.5%								
A 566 689 428 7.1 2.73 Air 135.9 94.3 165.4 76.6%								
Analysis of Uncombined Images								
Measured Data Calculated Results								
Noise Moise Mean % of Max % of Ch Mean Max SD Type SNR Mean SNR Max								
1 456 640 2.48 Air 120.5 100% 169.1 100% 2 200 200 200 500								
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$								
Mean: 566 ROI M: -0.05 Mean: 566 Air M: 7.12 Mean: 456 Air M: 4.61 Mean: 320 Air M: 4.84 ROIsd: 3.13 Airsd: 2.73 Airsd: 2.73 Mean: 456 Air M: 4.61 Mean: 320 Air M: 4.84								
0427 0428 0263 0388								
ROI Area: 184.94 ROI Area: 184.94 ROI Area: 184.94 ROI Area: 184.94								
Composites Channel 1 Channel 2								

RF Coil Performance Evaluation Test Date: 8/31/2008
Coil: Wrist Coil Model:
Mfg.: MRI Devices Revision: 0
Mfg. Date: 9/01/2002 Coil ID: 639 SN: U8469
Phantom: Wrist coil phantom # of Channels 3
SequenceTRTEPlaneFOVNxNyBWNSAThicknessGapSE30020S2025625615.613-
Coil Mode: Wrist - Horizontal TX gain: 137 R1: 11 R2: 29
Analysis of Composite Image
Measured Data Calculated Results
Back Noise Noise Mean Normal- Max Uni- Label Mean Max Min ground SD Type SNR ized SNR formity
N 3,037 3,942 2,048 15.3 25.30 NEMA 84.9 191.0 110.2 68.4%
A 3,022 3,941 2,037 49.5 18.71 Air 105.8 238.1 138.0 68.1%
Analysis of Uncombined Images
Measured Data Calculated Results
Noise Noise Mean % of Max % of Ch Mean Max SD Type SNR Mean SNR Max
1 1,960 3,301 14.83 Air 86.6 100% 145.9 100%
2 2,012 3,631 19.70 Air 66.9 77% 120.8 83%
When choosing the horizontal mode, the system seems to only use two channels.
Mean: 3037 ROI M: 15.2s Mean: 3022 Air M: 49.47 Mean: 1960 Air M: 27.98 Mean: 2012 Air M: 37.15 ROIsd: 25.30 Airsd: 18.71 Airsd: 18.71 Airsd: 14.83 Airsd: 14.83 Airsd: 19.70 Ai
BOLArea: 66.93 BOLArea: 66.93 BOLArea: 66.93 BOLArea: 66.93 BOLArea: 66.93
Composites Channel 1 Channel 2

RF Coil Performance Evaluation Test Date: 8/3	1/2008
Coil: Wrist Coil Model:	
Mfg.: MRI Devices Revision:	0
Mfg. Date: 9/01/2002 Coil ID: 639 SN: U	8469
Phantom: Wrist coil phantom # of Cha	nnels <u>3</u>
SequenceTRTEPlaneFOVNxNyBWNSAThicknessSE30020C2025625615.613	Gap _
Coil Mode: Wrist - Horizontal TX gain: 138 R1: 10 R	2: 29
Analysis of Composite Image	
Measured Data Calculated Result	s
Back Noise Noise Mean Normal- Max Label Mean Max Min ground SD Type SNR ized SNR	Uni- formity
N 3,254 4,102 2,013 7.9 22.86 NEMA 100.7 226.5 126.9	65.8%
A 3,246 4,091 2,011 49.2 18.94 Air 112.3 252.7 141.5	65.9%
Analysis of Uncombined Images	
Measured Data Calculated Results	
Noise Noise Mean % of Max Ch Mean Max SD Type SNR Mean SNR	% of Max
1 2,158 3,353 14.90 Air 94.9 100% 147.5 2 2.754 2.754 10.25 10.25 12.41	100%
<u>2</u> 2,0/4 3,784 19.98 Air 68.0 72% 124.1	84%
When choosing the horizontal mode, the system seems to only use two channels.	
Mean: 3254 ROI M: 7.89 Mean: 3246 Air M: 49.19 Airsd: 18.94 Airsd: 18.94 Airsd: 14.90 Orgoni	Air M: 37.19 Airsd: 19.98
O 3323	0171
EQ13 BOLArea: 107.91 BOLArea: 107.91 BOLArea: 107.91 BOLArea: 107.91 BOLArea: 107.91 BOLArea: 107.91 BOLArea: 107.91	
Composites Channel 1 Chann	el 2

RF Coil Performance Evaluation	Test Date: 8/31/2008								
Coil: Wrist Coil	Model:								
Mfg.: MRI Devices	Revision: 0								
Mfg. Date: <u>9/01/2002</u> Coil ID: <u>639</u>	SN: U8469								
Phantom: Wrist coil phantom	# of Channels _ 3_								
SequenceTRTEPlaneFOVNxSE30020S20256	NyBWNSAThicknessGap25615.613-								
Coil Mode: Wrist - Vertical TX gain: 139 R1: 11 R2: 28									
Analysis of Co	mposite Image								
Measured Data	Calculated Results								
Label Mean Max Min ground SD	Type SNR ized SNR formity								
N 3,836 5,107 2,281 -0.7 27.20 A 3,836 5,110 2,293 63.9 20.96	NEMA 99.7 224.4 132.8 61.7% Air 119.9 269.8 159.8 61.9%								
Measured Data	Calculated Results								
Noise Noise Ch Maan Max SD Type	Mean % of Max % of								
Cn Mean Max SD Type 1 2,215 3,759 15.64 Air	SNR Mean SNR Max 92.8 100% 157.5 100%								
2 2,022 3,835 20.49 Air	64.7 70% 122.7 78% (2.2) (2.2) (2.2) (2.2) (2.2)								
<u>3</u> 1,587 2,578 17.33 Air	60.0 65% 97.5 62%								
· · · · · · · · · · · · · · · · · · ·									
Moon: 2926 BOLM: -0.68 Moon: 2926 Air M: 63.87	Channel 1 Channel 2								
2281 - ROISd: 27.20 2293 - Airsd: 20.96	Mean: 2215 Air M: 28.98 Mean: 2022 Air M: 38.40								
	0 3835								
O <u>5</u> 107 O <u>5</u> 110	0 2759 0 160								
	685 9								
ROI Area: 101.65 ROI Area: 101.65	ROI Area: 101.65 ROI Area: 101.65								
Composites	Airsd: 17.33								
	Q 2578								
	ROI Area: 101.65								
	Channel 3								

RF Coil Performance Evaluation	Test Date: 8/31/2008								
Coil: Wrist Coil	Model:								
Mfg.: MRI Devices	Revision: 0								
Mfg. Date: 9/01/2002 Coil ID: 639	SN: U8469								
Phantom: Wrist coil phantom	# of Channels								
SequenceTRTEPlaneFOVSE30020C20	NxNyBWNSAThicknessGap25625615.613-								
Coil Mode: Wrist - Vertical TX gain: 140 R1: 11 R2: 29									
Analysis of Macourod Data	Coloulated Results								
Back Nois	e Noise Mean Normal- Max Uni-								
Label Mean Max Min ground SD	Type SNR ized SNR formity NEMA 130.0 204.6 175.7 59.09/								
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	S INELVIA 130.9 294.0 175.7 58.970 5 Air 131.2 295.2 175.9 59.0%								
Analysis of II									
Measured Data	Calculated Results								
Noise Noise Ch Moon May SD Type	Mean % of Max % of								
$\begin{bmatrix} 1 \\ 2,231 \\ 3,573 \\ 15.56 \\ \text{Air} \end{bmatrix}$	94.0 100% 150.5 100%								
2 2,427 4,158 20.65 Air	77.0 82% 132.0 88%								
<u>3</u> 1,999 3,189 17.55 Air									
The values are comparable to last year									
Mean: 4143 ROI M: 8.55 Mean: 4134 Air M: 64. ROIsd: 22.38 Airsd: 20.	12 Channel 1 Channel 2 65 Mean: 2231 Air M: 29.21 Mean: 2427 Air M: 38.75								
	Airsd: 15.56 Airsd: 20.65								
O 5581	Q4158								
	03573 0254								
02217	837								
BOI Area: 66.34 BOI Area: 66.34	ROI Area: 66.34 ROI Area: 66.34								
Composites	Mean: 1999 Air M: 32.83								
Composites	456011100								
	0 3189								
	ROI Area: 66.34								
	Unanner 5								

Appendix A: Magnet Homogeneity - Measured August 31, 2008

GE OpenSpeed 0.7T - 3 central planes



Axial										
MIN	MAX	RANGE	PPM	MEAN	STDEV					
-9.1	6.8	15.9	0.54	-0.04	3.0					
-20.5	13.3	33.8	1.14	-1.56	5.4					
-40.2	26.2	66.5	2.24	-3.99	9.7					
-75.1	50.0	125.1	4.22	-7.67	17.4					
-109.3	71.6	180.9	6.09	-10.78	24.6					
-138.5	90.1	228.6	7.70	-13.17	30.4					
	MIN -9.1 -20.5 -40.2 -75.1 -109.3 -138.5	A MIN MAX -9.1 6.8 -20.5 13.3 -40.2 26.2 -75.1 50.0 -109.3 71.6 -138.5 90.1	Axial MIN MAX RANGE -9.1 6.8 15.9 -20.5 13.3 33.8 -40.2 26.2 66.5 -75.1 50.0 125.1 -109.3 71.6 180.9 -138.5 90.1 228.6	Axial MIN MAX RANGE PPM -9.1 6.8 15.9 0.54 -20.5 13.3 33.8 1.14 -40.2 26.2 66.5 2.24 -75.1 50.0 125.1 4.22 -109.3 71.6 180.9 6.09 -138.5 90.1 228.6 7.70	AX1CLMINMAXRANGEPPMMEAN-9.16.815.90.54-0.04-20.513.333.81.14-1.56-40.226.266.52.24-3.99-75.150.0125.14.22-7.67-109.371.6180.96.09-10.78-138.590.1228.67.70-13.17					

Coronal									
DIAMETER	MIN	MAX	RANGE	PPM	MEAN	STDEV			
10	-5.2	2.7	7.9	0.27	-0.16	1.8			
15	-8.4	2.8	11.1	0.37	-1.21	2.5			
20	-19.4	6.2	25.7	0.86	-3.25	4.6			
25	-42.7	12.1	54.8	1.85	-6.50	9.5			
28	-61.4	19.2	80.7	2.72	-8.98	14.0			
30	-74.9	29.5	104.4	3.52	-10.60	17.6			

Sagittal										
DIAMETER	MIN	MAX	RANGE	PPM	MEAN	STDEV				
10	-19.6	17.9	37.5	1.26	-1.76	7.3				
15	-38.4	33.7	72.1	2.43	-4.30	13.4				
20	-65.2	56.9	122.1	4.11	-8.12	22.2				
25	-114.8	90.9	205.7	6.93	-13.50	34.7				
28	-165.3	117.2	282.5	9.52	-17.79	44.6				
30	-210.3	137.3	347.5	11.71	-20.95	52.5				

GE OpenSpeed 0.7T - Graph of PPM within ± 9cm from Isocenter









Axial Field Plots



Coronal Field Plots



Sagittal Field Plots

Appendix B: RF Slice Profiles and Crosstalk

Spin Echo : Minimum Full TR/TE = 450/19BW = 10.4 KHz nex = 1Scan time: 1:55



Appendix B: RF Slice Profiles and Crosstalk

Fast Spin Echo ETL = 2 TR/TE = 516/16BW = 15.6 KHz nex = 3 Scan time: 3:20



Appendix B: RF Slice Profiles and Crosstalk

Fast Spin Echo - Tailored RF ETL = 2 TR/TE = 516/16BW = 15.6 KHz nex = 2 Scan time: 3:20



GE Site

Coil Used: Head PA

	Sagittal Locator								
1	Length of phantom, end to en	d (mn 148± 2)	14	6.0	=	calculated field			
		(SE 500/20)	(SE 2000/20)	(SE 2000/80)	(Site T1)	(Site T2)			
	Slice Location #1	ACR T1	ACR PD	ACR T2	Site T1	Site T2			
2	Resolution	1.0	1.0	1.0	0.9	1.0			
3	(1.10, 1.00, 0.90 mm)	1.0	1.0	1.0	0.9	1.0			
4	Slice Thickness Top	62.1	62.4	57.0	60.5	51.5			
5	(fwhm in mm) Bottom	48.3	48.1	47.9	46.3	41.3			
6	Calculated value 5.0±0.7	5.43	5.43	5.21	5.25	4.58			
7	Wedge (mm) = + = -	0.6	0.5	0.4	1.5	2.0			
8	\square	190.8	190.7	190.7	190.7	190.4			
9	Diameter (mm) (190 \pm 2) \ominus	188.7	188.8	188.7	188.8	189.2			
	Slice Location #5								
10	Φ	189.7	189.8	189.7	189.7	189.9			
11	Diameter (mm) (190+2) Θ	188.0	188.1	187.9	188.0	188.5			
12	Ø	188.8	188.8	188.7	188.8	189.1			
13	Ø	188.7	188.8 188.6		188.8	189.2			
	Slice Location #7]							
14	Signal Big ROI	764	799	481	754	382			
15	(mean only) High	881	925	558	864	449			
16	Low	712	741	440	699	355			
17	Uniformity (>87.5%)	89.4%	89.0%	88.2%	89.4%	88.3%			
18	Background Noise Top	33.0 ± 8.57	36.0 ± 9.28	29.8 ± 7.28	26.1 ± 6.82	27.4 ± 7.10			
19	Bottom	33.0 ± 8.66	36.0 ± 9.28	29.2 ± 7.28	25.5 ± 7.23	26.8 ± 6.79			
20	(mean ±std dev) Left	27.8 ± 7.28	31.7 ± 7.99	24.6 ± 6.22	26.0 ± 6.62	24.7 ± 6.39			
21	Right	27.7 ± 6.92	30.7 ± 8.03	24.1 ± 6.25	26.6 ± 6.99	$24.6~\pm~6.45$			
22	Ghosting Ratio (<2.5%)	0.7%	0.6%	1.1%	0.1%	0.6%			
23	SNR (no spec)	108	100	77	111	60			
	Low Con Detectability								
24	Slice Location #8 1.4%	0	0	0	0	0			
25	Slice Location #9 2.5%	0	0	0	6	0			
26	Slice Location #10 3.6%	4	6	0	8	0			
27	Slice Location #11 5.1%	8	8	8	8	8			
28	Total # of Spokes (>=9)	12	14	8	22	8			
	Slice Location #11]							
29	Wedge (mm) = + = -	-6.1	-6.1	-5.9	-5.2	-5.0			
30	Slice Position Error	-6.7	-6.6	-6.3	-6.7	-7.0			

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GE HFO

Test Date:

8/31/2008

GE Site

Sequence parameters

Coil Used:Head PA

GE HFO

Test Date: 8/31/2008

Test ID 337

Study Descrip tion	Pulse Sequence (ETL)	TR (ms)	TE (ms)	FOV (cm)	Phase Sample Ratio	Number of Slices	Thick- ness (mm)	Slice Gap	NSA (Nex)	Freq Matrix	Phase Matrix	Band Width (kHz)	Scan Time (min:sec)
ACR T1	SE	500	20	25	1	11	5	5	1	256	256	10.4	2:09
ACR PD	Dual Echo SE	2000	20	25	1	11	5	5	1	256	256	12.4	8:32
										r			
ACR T2	Dual Echo SE	2000	80	25	1	11	5	5	1	256	256	8.92	8:32
Site T1	SE	450	14	24	1	11	5	5	2	256	256	10.4	3:51
										r			
Site T2	FSE(14)	3000	98	24	2	11	5	5	1.5	256	224	20.7	2:24

Magnet ID: 37

Coil ID: 636

TestID: 337



ACR PD



High Contrast Resolution

Slice Thickness

1200 100 ۲Ľ 1000 80 800 60 600 400 200 0 50 100 150 200 10 20 30 40 0 Upper=56.96 Lower=47.86 Slice Thickness=5.20 Diff.= 0.36 Uniformity & Ghosting - #7 Axial Diameters - #1 Axial Diameters - #5 **Slice Position - Superior** 196 Mean:481 194 19 192 190 188 186 184 0 10 20 30 40 5 135 184 Max:558 Min:440 PIU: 88.2% 45 90 180 0 180 0.7 190.2 188.9 逐 Mean 29.8 S.D. 7.28 Mean 24.6 Mean 24.1 S.D. 6.22 S.D. 6.25 /lean 29.2 D. 7.28 Diff.= -5.92 D. 08/31/08 TR:2000 TE: 80.0 Low Contrast - #10 Low Contrast - #11 Low Contrast - #8 Low Contrast - #9

41

ACR T2

50

Slice Position - Inferior





Appendix D: Explanation of RF Coil Testing Report

Introduction

The primary goal of RF coil testing is to establish some sort of base line for tracking coil performance over time. The most common measure is the Signal to Noise Ratio or SNR. In addition, we can look at overall signal uniformity, ghosting level (or better - lack of ghosting) and in the case of phased array coils we look at the SNR of each and every channel and at symmetry between channels. Unfortunately, there is no single best method for measuring SNR. Below I explain the different methods used and the rationale for each.

<u>SNR</u>

One needs to measure the signal in the phantom (either mean or peak or both) and then divide that by the background noise. Measuring the signal is fairly straightforward, the noise can be more problematic. The simplest method is to measure the standard deviation (SD) in the background 'air'. However, MRI images are the magnitude of complex data. The noise in the underlying complex data is Gaussian but it follows a Rician distribution when the magnitude is used. The true noise can be estimated by multiplying the measured SD by 1.526.

During the reconstruction process, most manufacturers perform various additional operations on the images, This could include geometric distortion correction, low pass filtering of the k-space data resulting in low signal at the edge of the images, RF coil intensity correction (PURE, CLEAR, SCIC, etc), and other processing during the combination of phased array data and parallel imaging techniques. All of these methods distort the background noise making it impossible to obtain an accurate (and reproducible) estimate of the image noise in the air region. The alternative is to use a method which I shall refer to as the NEMA (National Electrical Manufacturers Association) method. The signal in the phantom area is a sum of the proton signal and noise. Once the signal to noise ratio exceeds 5:1, the noise in the magnitude image is effectively Gaussian. To eliminate the proton signal, you acquire an image twice and subtract them. The measured SD in the phantom region should now be the true SD times the square root of 2. When determining the SNR using the NEMA method, calculate the mean signal of the average of the two source images then divide by .7071 x the SD measured in the same area as the mean signal.

Unfortunately, this doesn't always work. It is absolutely imperative that the RF channel scalings, both transmit and receive, be identical with both scans. Any ghosting in the system is not likely to repeat exactly for both scans and will cause a much higher SD. Finally, the phantom needs to be resting in place prior to the scan long enough for motion of the fluid to have died down. Depending on the size and shape of the phantom, this could take any where from 5 to 20 minutes.

One of the most common causes of ghosting is vibration from the helium cold-head. The best way to eliminate this artifact is to turn off the cold head, which will increase helium consumption. Because this vibration is periodic, the ghosting is usually of an N over 2 (N/2) nature. The affect inside the signal region of the phantom can be minimized by using a FOV that is twice the diameter of the phantom (measured in the PE direction.) If the noise is to be measured in the air, then be sure to NOT make measurements to either side of the phantom in the PE direction.

Scan parameters also significantly affect measured SNR. For most of the testing performed in this document I used a simple Spin Echo with a TR of 300, a TE of 20 and a slice thickness of 3mm and a receiver BW of 15.6 KHz. The FOV was varied depending on the size of the coil and the phantom used. All of the parameters used for each test can be found on each page immediately below the coil description.

Report Layout

Each page of this report lists the data from a single test. The top third of the page describes the coil and phantom information, followed by the scan parameters used. The middle third contains the numbers measured and calculated results. This section will contain one table if the coil being tested is a single channel coil (i.e. quadrature or surface coils) and two tables if it is a multi-channel phased array coil. The entries in the table will be described further below. The bottom section contains a few lines of comments (if necessary), a picture of the coil with the phantom as used for the testing and one or more of the images that were used for the measurements.

There is usually one image for each composite image measurement and one image for each separate channel measurement. Each image shows the ROI (red line) where the mean signal was measured and two smaller ROIs (green lines) where the signal minimum and maximum was found. In the top left corner of each image is the mean signal in the large ROI. The bottom left corner contains the large ROI's area (in mm²). The top right corner contains two numbers a mean and a standard deviation. If the NEMA method was used, then the top right corner will list the mean and SD of the large ROI (labeled ROI M and ROIsd) applied to the subtraction image. If the noise was measured in the background air the the numbers are labeled Air M and AirSD.

Data Tables

The meaning of most of the entries in the data table are should be self evident with a few exceptions. The first column in each table is labeled "Label". In the composite analysis, this field may be empty or contain some sort of abbreviation to identify some aspect of the testing. Some possibilities are the letter N for NEMA, A for Air, L for Left, R for Right, C for CLEAR, NoC for No CLEAR. In the Uncombined Image table, the label usually contains the channel number or similar descriptor. The column labeled "Noise Type" will be either Air or SubSig which stands for Subtracted Signal, *i.e.* the NEMA method. Both tables contain a column for Mean SNR and Max SNR which are the Mean or Max signal divided by the SD of the noise scaled by either 1.526 (Air) or 0.7071 (NEMA).

Composite Image Table: The final two columns in this table are "Normalized" and "Uniformity". It can be rather difficult to compare the performance of different coils particularly if different scan parameters are used. (Of course, it's even more difficult from one scanner to another.) I have standardized most of my testing to use a spin echo with a TR/TE of 300/20msec and a thickness of 3 mm. The FOV changes to depending on the size of the phantom used although I try to use a FOV that is at least twice the diameter of the phantom as measured in the PE direction. For one reason or another, a change may be made in the scan parameters (either accidentally or intentionally such as turning on No Phase Wrap to eliminate aliasing, etc.). In order to make it easier to compare SNR values I calculate a "Normalized" SNR value. This value is theoretically what the SNR would be if a FOV of 30cm, 256x256 matrix, 1 average, receiver BW of 15.6 KHz and slice thickness of 3mm had been used. Obviously, the final number is affected by the T1/T2 values of the phantoms used as well as details of the coil and magnet field strength but it can be useful in certain situations.

The "Uniformity" value is defined by the ACR as 1 - (max-min)/(max+min). This is most important when looking at volume coils or for evaluating the effectiveness of surface coil intensity correction algorithms (such as PURE, CLEAR or SCIC).

Uncombined Image Table: This table has two columns labeled "% of Mean" and "% of Max". When analyzing multi-channel coils it is important to understand the relationship between the different channels, the inherent symmetry that usually exists between channels. In a 8 channel head or 4 channel torso phased array coil, all of the channels are usually have about the same SNR. These two columns list how the SNR (either Mean or Max) of each channel compares to the SNR of the channel with the maximum value.