Toshiba Site Yearly Performance Evaluation Toshiba Vantage 1.5T 24-Feb-08

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Site Name:	Toshiba Site			MRAP # _	
Address:				Survey Date:	2/24/08
City, State, Zip				Report Date:	4/6/08
MRI Mfg:	Toshiba	Model:	Vantage	Field:	1.5T
			m in	1	2/ 0
MRI Scientist:	Moriel NessAiver, Ph.D.	Signature:	Moriel,	Vessewer, 8	h.D.
	Faninmant Evolu	ation Tests		ass ail * //A	
1	Equipment Evalu	ation rests			
1. ว	Slice position accuracy:	у.			
2.	Table positioning reproduci	hility			
Э. Л	Slice thickness accuracy:	onity.			
4. 5	RE coils' performance:				
5.	a Volume OD Coils				
	h Phase Array Coils				
	c. Surface Coils				
6	Inter-slice RF interference ((Crosstalk):			
0. 7	Soft Conv Display	CIUSSIAIK).			
	15 1 5			<u> </u>	
]	Evaluation of Site's Techno	logist QC Pro	gram	Pass Fail N/A	
1.	Set up and positioning accu	racy: (daily)			
2.	Center frequency: (daily)				
3.	Transmitter attenuation or g	gain: (daily)			
4.	Geometric accuracy measure	rments: (daily)			
5.	Spatial resolution measurem	nents: (daily)			
6.	Low contrast detectability:	(daily)			
7.	Head Coil SNR (daily)				
8.	Body Coil SNR (weekly)				
9.	Fast Spin Echo (FSE/TSE)	ghosting levels	: (daily)		
10.	Film quality control: (week	ly)			
11.	Visual checklist: (weekly)				

Specific Comments and Recommendations

1.	Magnet homogeneity is 'fair' but sub-optimal. The magnet 'sweet spot' should be at iso-center but instead
	is located roughly 5-6 cm towards the head. Overall homogeneity is reasonable but I think it could be better

2.	The LCD display is good. There is a slight divergence in the film response curve and the display response curve.
	This may make it difficult to obtain 'wysiwyg' on the films.

3. There are two coil ports, labeled L1 and L2. I tested both ports using the GP Flex coil and the wrist coil. With both coils, port L2 had roughly 50% better SNR! This is VERY unusual.

4. The wrist coil has two areas of very low signal in the lower/outer regions. This coil should always be used with adequate padding to keep the patient's wrist away from the surface of the coil.

S. All other cons appear to be working property

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NOTE: Please be sure to read appendix D for an explanation of the format of this document.

Contact	 •	Title	·	Phor		-	-	Fax		eMail
uipment Information ARI Manufacturer: mera Manufacturer:	 on 	niba	Model: Model:	Vanta Drystar 1	ge	-	SN: _ SN:	V5818	_ Software: _	8.01 R242
CS Manufacturer:			Model:				SN:		Software:	
	ACR Pl	hantom Nur	mber used:	J6959	_					
Tabla Dasitianing F) on word-									Deer
rable rositioning F	veproat	IsoCenter	Out/In	Out/In	Out	/In				Pass
			III	0 44 111						
Massurad Dhantom	Contor	-0.2	01	0	1 0	1				
Measured Phantom Comment:	Center mogene	-0.2	0.1 See append	0 lix A for fi	0.	ts.				PASS
Measured Phantom Comment: Magnetic Field Ho	Center mogene	-0.2 eity N/A	0.1 See append Thi FE fo	U lix A for fi s Year CF: c TR: 600, 7	0. eld plo <u>63</u> FE: 10	1 ts. 85217 & 15	7 <u>2</u> Flip A	CF Cł ngle: 45, 1	nange: <u>N</u> . FOV: 40	PASS
Measured Phantom (Comment: Magnetic Field Ho Last Year C 15 cm 2	Center mogene F: 20 cm	-0.2 eity N/A 25 cm	0.1 See append Thi FE fo 5 mm	U lix A for fi s Year CF: c TR: 600, 7 skip 5 mm	0. eld plo : <u>63</u> FE: 10	1 ts. 85217 & 15 1 ces, BV	72 Flip Ai W: 15.0	CF Cł ngle: 45, 1 5 KHz, 25	nange: <u>N</u> . FOV: 40 66x128, 2nex	PASS
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Measured Phantom Comment: Magnetic Field Ho Last Year C Axial: 0.3 oronal: 0.1	Center mogene F: 20 cm 0.6 0.2	-0.2 eity N/A 25 cm 0.9 0.3	0.1 See append Thi FE fo 5 mm Comm you ca	U lix A for fi s Year CF: c TR: 600, 7 skip 5 mm nents: <u>The r</u> an see that t	0. eld plo : <u>63</u> FE: 10 a, 19 slid magnet here is s	1 ts. 85217 & 15 ces, BV shim is signific	72 Flip A W: 15.0 s fair. cant as:	CF Cł ngle: 45, 1 5 KHz, 25 By examin symetry in	nange: <u>N.</u> FOV: 40 66x128, 2nex ting page 2 of the magnet sh	PASS A appendix A,
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4. Slice Crosstalk (RF interference)

The following data were obtained using the ACR phantom slice thickness wedges to measure the slice profile of a two common 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 reaches 40% (SE 15) or 20% (ACR) of the slice thickness, the measured slice profile begins to drop. As the echo time drops, most systems trade off slice profile for echo time. This behaviour is common and expected. All slice profiles can be viewed in Appendix B.

Sequence Type	TR	TE	FOV (cm ²)	Matrix	NSA	Thickness	# of slices	Slice Measured
SE	500	20	25	256x256	1	5	11	6
SE	500	12	25	256x256	1	5	11	6

Skip	ACR T1	SE 15
0	4.73	4.62
0.2	4.78	4.67
0.5	4.91	4.76
1	5.02	4.88
1.5	5.01	4.93
2	5.05	4.96
2.5	5.03	4.99
5	5.06	4.96
10	5.04	4.98



5. Soft & Hard Copy Displays Luminance Meter Make/Model: Tektronix J16 Digital Photometer Cal Expires: 4/6/06 Monitor Description: LCD Luminance Measured: Ft. lamberts Uniformity **Measured Data** SMPTE Bottom Тор Bottom Center of Which Top Left Percent Image Right Left Right MAX MIN OK? Monitor Delta Corner Display Corner Corner Corner Console Υ % delta =200% x (max-min)/(max+center) (>30% is action limit) Minimum Brightness must be > 26.24 Ft. Lamberts

The LCD looks good. The film response matches the display well at the low end but rises a little too fast from 50%

to 80% making it a little hard to match what is seen on the screen to what comes out on the film.



Coil and Other Hardware Inventory List

Site Name Toshiba Site

ACR Magnet # _____

Nickname Vantage

Activ	e Coil Description	Manufacturer	Model	Rev	. Mfg. Date	SN C	Channels
	Body Integrated	Toshiba					1
	CTL Spine PA QD	USA Instruments	MJAS-127A	1	May, 2005	S3A0562181	4
	GP Flex	Toshiba	MJCC-147A			A4592130	4
	Head Coil QD	Toshiba	MJQH-127A			A3532050	1
	Head Speeder w/ NV attch.	Toshiba	MJAH-117A	1	May, 2005	K2A0572001	8
	Knee QD	Toshiba	MJQJ-107A			SIB0562286	4
	Shoulder Array	Toshiba	MJCC-167A			S2A0562135	4
	Torso Speeder QD	Toshiba	MJAB-137A			SIA0562254	8
	Wrist - Quadrature	Toshiba	Alpha 7000	2	Sep, 2004		4
]						
							7 🗸

RF Coil Per	formance Eva	luation			Test Date	: 2/2	4/2008
Coil: Body I	ntegrated				Model	:	
Mfg.: Toshiba				F	Revision	:	
Mfg. Date:	Coil ID:	1550		-	SN	:	
Phantom: <u>32 cm sp</u>	phere				_	# of Cha	annels <u>1</u>
Sequence T SE 3	RTEPlane0020T	e FOV 48	Nx Ny 256 256	BW 15.6	NSA 1	Thickness 3	Gap _
Coil Mode: Body	y QD						
		Analysis	of Test Ima	age			
	Measured	l Data		_	Calculate	ed Result	ts
Label Mean	Max Min	Back No ground S	se Noise D Type	Mea SNF	n Normal- R ized	Max SNR	Uni- formity
A 7,177	8,042 6,496	-8.6 294	76 NEMA	17.2	2 6.7	19.3	89.4%
N 7,186	8,052 6,499	512.0 267	.79 Air	17.0	6.9	19.7	89.3%
F	Mean: 7177 0:3042 0:042 0:042 0:042 0:042 0:042 0:042 0:042 0:042 0:042 0:042 0:042 0:042 0:042	ROI M: -8.55 ROIsd: 294.7	ROI Area:	6 152 2649 714.46	Air M: 511.9 Airsd: 267.7	7 9	
		Tes	Images				

RF Coil Performance Evaluation Test Date:	2/24/2008 MJAS-127A 1 S3A0562181 Channels 4 ss Gap -
Analysis of Composite Image	
Measured Data Calculated Res	sults
Back Noise Noise Mean Normal- Max Label Mean Max Min ground SD Type SNR ized SNR	x Uni- R formity
N 3.071 5.967 1.159 3.7 11.91 NEMA 182.4 65.6 354.	.3 32.5%
A 3,067 5,964 1,156 25.1 9.64 Air 208.5 75.1 405.	.4 32.5%
Analysis of Uncombined Images	
Measured Data Calculated Resu	ulte
Noise Noise Mean % of Max	x % of
Ch Mean Max SD Type SNR Mean SNR	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\frac{9}{5}$ 100%
Mean: 3071 ROI M: 3.70 Mean: 3067 Air M: 25.14 Mean: 3665 Air M: 25.36 Mean: 1221	Air M: 16.20
ROIsd: 11.91 Airsd: 9.64 Airsd: 13.75	Airsd: 8.77
0 7278	
9 5967 9 5964 9 769	<mark>0</mark> 6818
	· ·
ROI Area: 326.80 - ROI AREA - R	26.80-
Composites Channel 1 Cha	annel 2

RF Coil Per Coil: CTL S Mfg.: USA Ins Mfg. Date: 5/1/2005 Phantom: Bottle in Sequence T SE 30 Coil Mode: CTL	formany pine PA (truments Neck, and R TE 20 2(234	Ce Eval	<u>uation</u> 1543 4 FOV 50	Ny 256	BW 15.6	Test Date: Model: Revision: SN: 	2/24/2008 MJAS-127A 1 S3A0562181 # of Channels 4 hickness Gap 3 -		
Analysis of Composite Image									
	IN	easured	Back	Noise	Noise	Mea		Max Uni-	
Label Mean	Max	Min	ground	SD	Туре	SN	R ized	SNR formity	
A 2,150	6,330	488	4.4	47.14	Air	32.	$\frac{3}{9}$ 39.9	<u>95.0</u> <u>14.3%</u> <u>321.6</u> <u>14.7%</u>	
	Analysis of Uncombined Images								
IV	leasureu	Noise	Noise	-		Mean	% of	Max % of	
Ch Mean	Max	SD	Type	1		SNR	Mean	SNR Max	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	6,214	13.03	Air			62.8 68.6	92%	<u>312.5</u> 100% 305.0 98%	
4 855	6,022	13.09	Air]		42.8	62%	301.5 96%	
Mean: 2150 488 ROI Area: 369.18	ROI M: 4 POIsd: 4 Oc330	.37 Mean 7.14 ROI A	: 2146 049 area: 369.1	Air M: 3 Airsd: 1 05222 3	2	Cha Mean: 1249 ROI Area: 36 Mean: 855 ROI Area: 36 ROI Area: 36	annel 1 Air M: 24.75 Airsd: 13.03 0 3214 0 25 9.18 Air M: 24.23 Airsd: 13.09 0 35 0 3022 9.18 annel 3	Channel 2 Di Area: 369.18	

RF Coil Performance Evaluation Coil Coil PA QD Mfg. USA Instruments Mfg. Date: 5/1/2005 Coil ID: 1543 Phantom: Jug for 456 Sequence TR TE Plane FOV SE 300 20 S 50 Coil Mode: LS456 Analysis	Nx Ny BW 256 256 15.6	Test Date: 2/24/2008 Model: MJAS-127A Revision: 1 SN: S3A0562181 # of Channels 4 NSA Thickness Gap 1 3 -						
Measured Data		Calculated Results						
Back Label Mean Max Min ground	Noise Noise Mear SD Type SNR	Normal- Max Uni- ized SNR formity						
N 2,481 6,960 650 -5.7	36.82 NEMA 47.7	17.2 133.7 17.1%						
A 2,487 6,973 666 44.7	14.67 Air 111.1	40.0 311.5 17.4%						
Analysis of Uncombined Images								
Measured Data		Calculated Results						
Noise Noise ChMeanMaxSDType	Mean SNR	% of Max % of <u>Mean SNR Max</u>						
1 1,261 7,051 16.88 Air	49.0	72% 273.7 76%						
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	52.3	100% 290.4 81% 77% 359.6 100%						
Mean: 2481 ROI M: -5.70 ROIsd: 36.80 Mean: 2487 Gogo Gogo Gogo Gogo Gogo Gogo Gogo Gogo	Air M: 44.67 Airsd: 14.67 06973 06973 Mean: 961 Mean: 961 Rol Area: 370 Rol Area: 370 Char	nnel 1 Air M: 31.43 irsd: 16.88 0 0 0 0 Air M: 22.55 Air M: 22.55 0 0 0 0 0 0 0 0 0 0 0 0 0						

RF Coil Performance Evaluation Coil: <u>GP Flex</u> Mfg.: Toshiba Mfg. Date: Coil ID: Phantom: Bottle Sequence TR TE Plane Fe SE 300 20 T 3 Coil Mode: <u>GP flex Ports L1 & L2</u>	ON Nx 0 256	Ny 256	BW 15.6	Test Date: Model: Revision: SN: NSA Tr 1	2/24/2008 MJCC-147A A4592130 # of Channels 4 hickness Gap 3 -				
Analysis of Test Image									
Measured Data Calculated Results									
Bac Label Mean Max Min Grout	k Noise	Noise	Mean	Normal-	Max Uni- SNR formity				
Label Mean Max Mini ground L1N 4,349 6,571 905 -27.1	1 51.00	NEMA	60.3	60.3	91.1 24.2%				
L1A 4,376 6,613 909 82.0	5 43.47	Air	66.0	66.0	99.7 24.2%				
L2N 4,367 6,570 891 0.2	33.61	NEMA	91.9	91.9	138.2 23.9%				
L2A 4,367 6,553 895 51.2	2 24.73	Air	115.7	115.7	173.6 24.0%				
Fort#122.nas.30-7.5%.more.sixk.mail.port.L1110	Test Ir ROI M: -27.09 ROIsd: 51.00 5 06571 ROI M: 0.17	nages Mean: 4376 ROI Area: 88.94 Mean: 4367	Air M: 8 Airsd: 4 909 66	32.57 13.47 13					
ROI Area: 88.96	ROIsd: 33.61	ROI Area: 88.96	Airsd: 2 895 085	24.73 53					

\int	RF C	oil Per	forman	ce Eva	luation			Y	-	Lost Dato:	2/2	24/2008
	Coil:	Head (Coil QD			Ð				Model:	MJ	QH-127A
	Mfg.:	Toshiba					N B	The	F	Revision:		
M	fg. Date:			Coil ID:	1544			-		SN:	A3	3532050
P	Phantom: ACR Phantom # of Channels 1									annels <u>1</u>		
SequenceTRTEPlaneFOVNxNyBWNSAThickneSE30020T4025625615.613									hickness 3	Gap _		
Coil Mode: Head QD												
	Analysis of Test Image											
			М	easured	Data				С	alculate	d Resul	ts
	Label	Mean	Max	Min	Back ground	Noise SD	Noise Type		Mean SNR	Normal- ized	Max SNR	Uni- formity
	N	7,874	8,604	7,344	0.8	34.59	NEMA		161.0	90.6	175.9	92.1%
	A	/,0/4	0,009	/,331	40./	20.58			194.1	109.2	212.2	92.0%
		N	/lean: 787	4	ROI M: 0 ROIsd: 3).82 	Mean: 7874	4	Air Airs	M: 48.66 d: 26.58		
									-			
									L/L			
							7/6/6/-1					
				07944								
			4	19-1-1	03604				936	09		
		F	ROI Area:	235.40			ROI Area: 2	235.4	40			
						Test Im	ages					

RF Coil Per Coil: Head S Mfg.: Toshiba Mfg. Date: 5/1/2005 Phantom: Large B Sequence 1 SE 3 Coil Mode: NVA	formance Speeder w/ N ottle R TE 00 20	Evali NV attcl Coil ID: Plane	uation n. 1548 FOV 50	Nx 256	Ny 256		BW 15.6	Test Dat Mode Revisio S - NSA	e: 2/2 el: MJ2 on: N: K22 # of Ch Thickness 3	24/2008 AH-117A 1 A0572001 annels <u>8</u> Gap -
			Analysis	s of Con	nposite	Imag	е			
	Меа	asured	Data		•			Calculat	ted Resu	lts
label Mean	Мах	Min	Back	Noise	Noise		Mean SNR	Normal ized	- Max SNR	Uni- formity
N 1,390	4,134	453	-1.7	14.11	NEMA	1 [69.7	25.1	207.2	19.8%
A 1,392	4,107	454	30.5	8.22	Air		111.0	39.9	327.4	19.9%
		Α	nalysis d	of Unco	mbined	Imag	es			
N	leasured D	ata		_			С	alculate	d Results	;
Ch Mean	Мах	Noise SD	Noise Type			Mea SN	an R	% of Mean	Max SNR	% of Max
1 1,928	6,907	27.98	Air			45	.2	61%	161.8	47%
2 2,144 3 909	7,204	36.99	Air			38	.0	52%	127.6	37%
4 955	3,986	9.62	Air			65	.1	88%	271.5	79%
Mean: 1390 453 ROI Area: 348.62	ROI M: -1.72 ROIsd: 14.11 04134 Comp	Mean: ROI Are	1392 454 ea: 348.62	Air M: 30 Airsd: 8.2 04107	54 22	Mean: 192 ROI Area: Mean: 909 ROI Area:	Chann 8 0 8907 348.62 0 66 0 348.62 Chann	el 1 hir M: 53.06 hirsd: 27.98 454 FRC Also: 8.08 Also: 8.08 Also: 8.08 RC el 3	Channe pan: 2144 A 0 7204 DI Area: 348.62 DI Area: 348.62 Channe	2 ir M: 70.37 irgd: 36.39 if M: 18.17 irsd: 9.62 3986

RF C Coil Mfg. Date Phantom Sequ S Coil Mo	oil Perf : Head Sp : Toshiba : 5/1/2005 : Large Bo ence TF E 30 ode: NVA	ormand peeder w/ ttle R TE 0 20 4ch Neck	Coil ID:	uation h. 1548 FOV 50	Nx 256	Ny 256		BW 15.6	Test Date Mode Revision St NSA 1	e: 2/2 I: MJ2 n: K2A # of Ch Thickness 3	24/2008 AH-117A 1 A0572001 annels 8 Gap -
		8.4			s of Con	nposite	Ima	ge	2010-104		4-
		IVI	easured	Back	Noiso	Noiso	-	Mean		ed Resul	
Label	Mean	Max	Min	ground	SD	Туре	1	SNR	ized	SNR	formity
N	5,283	7,519	2,702	-1.6	65.46	NEMA		57.1	20.5	81.2	52.9%
A	5,285	7,447	2,697	179.9	48.27	Air		71.7	25.8][101.1	53.2%
			Д	nalysis	of Unco	mbined	Ima	ges			
_	M	easured	Data					Ca	lculated	d Results	;
Ch	Mean	Max	Noise SD	Noise Type			M	ean	% of	Max	% of
	4,217	6,774	84.64	Air	1		3	2.6	56%	52.4	45%
2	4,937	9,525	97.17	Air			3	3.3	57%	64.2	56%
3	4,399	8,690	49.35	Air	-		5	8.4	100%	115.4	100%
4	3,711	7,802	60.00	Air			4	0.5	69%	85.2	74%
Mean: 5	283 27 07519 a: 375.03	ROI M: -1.6 Polsd: 65.4	3 Mean: 16 ROI Ar nposites	5285 07447 ea: 375.03	Air M: 17 269 Sd: 48	9.93 .27	Mean: 4 ROI Are Mean: 4	Channe 217 Air 1788 0 377 a: 375.03 399 Air 700 700 700 700 700 700 700 700 700 70	I 1 M: 160.70 sd: 84.64 r4 ROI M: 93.17 sd: 49.35 5 5 8690 ROI ROI	Channe an: 4937 A 0 9525 Area: 375.03 an: 3711 A 0 7602 Area: 375.03 Channe	I 2 r M: 194.31 Fod: 97.17 r M: 113.94 r M: 113.94

Nx Ny	Test Date: 2/24/2008 Model: MJAH-117A Revision: 1 SN: K2A0572001 # of Channels 8 BW NSA								
256 256									
Coil Mode: <u>NVA 5ch Head</u> Analysis of Composite Image									
	Calculated Results								
Noise Noise	Mean Normal- Max Uni- SNR ized SNR formity								
17.66 NEMA	125.1 70.3 274.1 19.8%								
14.83 Air	137.9 77.5 301.3 19.8%								
Analysis of Uncombined Images									
	Calculated Results								
	Mean % of Max % of SNR Mean SNR Max								
	41.5 50% 88.4 30%								
	82.5 100% 291.6 100%								
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$								
	$\begin{array}{c c c c c c c c c c c c c c c c c c c $								
Channel 1	Channel 2 Channel 3								
	Nx Ny 256 256 of Composite I Noise Noise SD Type 17.66 NEMA 14.83 Air f Uncombined								



RF Coil Per	RF Coil Performance Evaluation						Test D	ate: 2	/24/2008
Coil: Head S	Speeder w	/ NV atto	ch.			4	Mo	odel: MJ	JAH-117A
Mfg.: <u>Toshiba</u>	l						Revis	sion:	1
Mfg. Date: <u>5/1/2005</u>	5	Coil ID	1548			-		SN: <u>K2</u>	A0572001
Phantom: Large E							# of C	hannels <u>8</u>	
Sequence T SE 3	E Plane	e FOV 40	Nx 256	Ny 256	E	8W NSA 5.6 1	Thickness	Gap _	
Coil Mode: <u>NVA 7ch Head</u>									
	М	easured	Data		iiposite	inage	Calcul	ated Resu	ults
			Back	Noise	Noise	- <u> </u>	lean Norn	nal- Max	Uni-
Label Mean	Max	Min 743	ground	SD 22.11	I ype NEMA		08.8 55.	$\frac{d}{6} \qquad \frac{5NR}{225.1}$	19.1%
A 3,087	7,018	743	77.5	15.50	Air	1	30.5 73.	4 296.7	19.1%
		Δ	nalvsis	of Unco	mbined	Image	s		
N	leasured	Data					Calculat	ted Result	S
Ch Moan	May	Noise	Noise	-		Mean	% of	Max	% of
1 1,389	6,318	14.51	Air	1		62.7	98%	285.3	91%
2 1,422	6,979	14.57	Air]		64.0	100%	313.9	100%
3 5,064	9,509	81.35	Air	_		40.8	64%	76.6	24%
4 4,467	0 208	147.51	Air			19.8		34./	11%
6 1.543	6.139	22.06	Air	-		45.8	72%	182.4	58%
7 1,615	7,231	25.15	Air			42.1	66%	188.4	60%
]			0%		0%
				Cha	nnol 1	Channa		nol 2 Ch	annal 4
				Mean: 1389	Air M: 27.28 Me	aan: 1422 A	M: 27.30 Mean: 5064	Air M: 152.39 Mean: 44	67 Ar M: 275.97
Mean: 3088 ROI M: 1.59 Mean: 3087 Air M: 77.47 ROIsd: 22.11 07038 07018 07018 To 7038 743 ROI Area: 359.28 ROI Area: 359.28 Composites					Ared: 14.51 0 5318 9 54 18 RC	0 1979 Di Area: 359.28	ed: 14.57 0169 ROI Area: 359.2	And: 81.35 01509 8 ROI Area	And: 147.51 974 0.750× : 359.28
					Ar M: 288.51 And: 153.94 5537 1539 1539 1539 1539 1539 153.94 RC	Di Area: 359.28 Channe	PUI-20.98 PUI-22.06 POI Aves: 359.2 POI Aves: 359.2 I 6 Chan	Ar M. 47.03 Apre: 25.15 52 8 nel 7 Cha	annel 8
l								511	

RF Coil Performance Evaluation Coil: Knee QD Mfg.: Toshiba Mfg. Date: Coil ID: Phantom: Large Bottle Sequence TR TE SE 300 20 T Coil Mode: Knee							N3 25	c Ny 6 256		BW 15.6	Test Date: Model: Revision: SN: NSA T 1	= 2/2 MJC = SIB # of Cha hickness 3	24/2008 QJ-107A 0562286 annels 4 Gap 12		
	Analysis of Test Image														
				Μ	leasured	l Data				C	alculate	d Resul	Results		
Labe	əl	Mea	ın	Max	Min	Back ground	Noise SD	Noise Type		Mean SNR	Normal- ized	Max SNR	Uni- formity		
		7,77	0	8,289	7,199	24.9	57.63	NEMA		95.4	53.6	101.7	93.0%		
		7,74	5	8,283	7,155	58.5	31.56	Air		160.8	90.5	172.0	92.7%		
	Mean: 7770 ROI M: 24.92 ROIsd: 57.63						24.92	Mean: 774	5	Air Airs 0 8288 55	M: 58.47 sd: 31.56				
							Test In	nages							

RF Coil Performance Evaluation Coil: Shoulder Array Image <	Test Date: 2/24/2008 Model: MJCC-167A Revision:
Analysis of Composite I	Image
Measured Data	Calculated Results
Back Noise Noise Label Mean Max Min ground SD Type	Mean Normal- Max Uni- SNR ized SNR formity
N 3,202 6,132 1,152 -2.0 27.46 NEMA	82.5 46.4 157.9 31.6%
A 3,204 6,166 1,152 78.3 21.18 Air	99.1 55.8 190.8 31.5%
Analysis of Uncombined	Images
Measured Data	Calculated Results
Noise Noise Ch Mean Max SD Type	Mean % of Max % of SNP Mean SNP Max
1 2,633 6,469 34.40 Air	50.2 83% 123.2 70%
2 1,993 5,475 28.18 Air	46.3 77% 127.3 72% 58.3 96% 135.2 77%
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Mean: 3202 ROI M: -1.98 ROIsd: 27.46 Mean: 3204 Air M: 78.26 Airsd: 21.18 Airsd: 21.18 Image: Composites ROI Area: 184.79	Channel 1Channel 2Mean: 2633Air M: 65.39 Airsd: 34.40Mean: 1993Air M: 53.06 Airsd: 28.18Image: Second Area: 184.79Mean: 1993Air M: 53.06 Airsd: 28.18ROI Area: 184.79Mean: 1993Air M: 62.75 Airsd: 33.11Mean: 2946Air M: 62.75 Airsd: 33.11Mean: 1962Air M: 62.75 Airsd: 33.11Mean: 1962Air M: 40.24 Airsd: 21.24Image: Second Area: 186.33Mean: 1962Air M: 40.24 Airsd: 21.24Image: Second Area: 186.33Mean: 1962Air M: 40.24 Airsd: 21.24Image: Second Area: 186.33Mean: 1962Air M: 40.24 Airsd: 21.24Image: Second Area: 186.33Air Area: 186.33Channel 3Channel 4

RF Coil Performance Evaluation Coil: Shoulder Array Mfg.: Toshiba Mfg. Date: Coil ID: Phantom: Large Bottle Sequence TR TE Plane FOV SE 300 20 S 40 Coil Mode: Shoulder	Test Date: 2/24/2008 Model: MJCC-167A Revision:
Analysis of	Composite Image
Measured Data	Calculated Results
Back No	ise Noise Mean Normal- Max Uni-
Label Mean Max Min ground Si N 1.935 5.665 469 3.8 17.	Sink ized Sink formity 16 NEMA 79.7 44.9 233.5 15.3%
A 1,932 5,643 481 50.2 13.	68 Air 92.5 52.1 270.3 15.7%
	ncombined Images
Measured Data	Calculated Results
Noise Noise Ch Maan Max SD Type	Mean % of Max % of
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	SNR Mean SNR Max 55.7 100% 271.5 100%
2 2,147 7,535 29.25 Air	48.1 86% 168.8 62%
3 2,577 8,331 38.89 Air 4 1.933 7.403 31.39 Air	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$
Mean: 1935 ROI M: 3.75 ROIsd: 17.16 Mean: 1932 Airs José Airs ROI Area: 359.20 EOI Area: 359.20	Storage Channel 1 Channel 2 N: 50.22 (1 13.68) Mean: 1086 Air M: 24.10 Airsd: 12.77 Mean: 2147 Air M: 54.93 Airsd: 29.26 N: 50.22 (1 13.68) Mean: 217 Air M: 54.93 Airsd: 29.20 Mean: 217 Air M: 54.93 Airsd: 29.20 Mean: 2577 Air M: 72.85 Airsd: 38.89 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.89 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.89 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.89 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.89 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.89 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.89 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.90 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.90 Mean: 1933 Air M: 58.86 Airsd: 31.39 Mean: 2577 Air M: 72.85 Airsd: 38.90 Mean: 1933 Air M: 58.86 Airsd: 31.90 Mean: 2577

RF Coil Performance Evaluation	Test Date: 2/24/2008							
Coil: Torso Speeder QD	Model: MJAB-137A							
Mfg.: Toshiba	Revision:							
Mfg. Date: Coil ID: 1545	SN: SIA0562254							
Phantom: <u>'Gas Can'</u>	# of Channels 8							
SequenceTRTEPlaneFOVSE30020T50	NxNyBWNSAThicknessGap25625615.613-							
Coil Mode: Torso Speeder 8ch								
Analysis o	of Composite Image							
Measured Data	Calculated Results							
Label Mean Max Min ground	SD Type SNR ized SNR formity							
N 2,699 4,088 1,726 3.3	17.68 NEMA 108.0 38.9 163.5 59.4% 0.05 Air 177.6 63.0 268.2 50.5%							
A 2,090 4,075 1,724 49.1	9.95 Air 1//.0 03.9 208.2 39.5%							
Analysis of Uncombined Images								
Measured Data	Calculated Results							
Ch Mean Max SD Type	SNR Mean SNR Max							
1 1,039 3,976 10.39 Air	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							
2 1,554 5,000 15.09 Air 3 1.671 5.712 15.56 Air	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							
4 1,338 5,005 13.23 Air	66.3 94% 247.9 99%							
5 1,113 4,032 12.81 Air	56.9 81% 206.3 82%							
6 1,531 5,012 15.73 Air	63.8 91% 208.8 83%							
7 2,108 6,005 29.37 Air	47.0 67% 134.0 53%							
8 2,678 7,204 36.00 Air	48.7 69% 131.1 52%							
	Channel 1 Channel 2 Channel 3 Channel 4							
	Mean: 1039 Air M: 19.58 Mean: 1354 Air M: 24.69 Mean: 1671 Air M: 29.70 Mean: 1338 Air M: 24.87 Aired: 10.39 Aired: 13.09 Aired: 15.56 Aired: 15.26 Aired: 13.23							
Mean: 2699 ROI M: 3.28 Mean: 2696 Air M: 49.05 ROIsd: 17.68 Airsd: 9.95								
01028	ROI Area: 366.07 ROI Area: 366.07 ROI Area: 366.07 ROI Area: 366.07							
	Mean: 1113 Ar M: 24.01 Aired: 12.81 Mean: 1531 Air M: 29.73 Aired: 15.73 Mean: 2108 Air M: 55.57 Aired: 29.37 Mean: 2678 Ark M: 67.58 Aired: 36.00							
ROI Area: 366.07 ROI Area: 366.07	87 0.146 0.869 0.004							
Composites	ROLArea: 366.07 ROLArea: 366.07 ROLArea: 366.07 ROLArea: 366.07							
	Channel 5 Channel 6 Channel 7 Channel 8							

RF Coil Performance Evaluation	Test Date: 2/24/2008									
Coil: Torso Speeder QD	Model: MJAB-137A									
Mfg.: Toshiba Revision:										
Mfg. Date: Coil ID: 1545 SN: SIA0562254										
Phantom: 'Gas Can' # of Channels 8										
SequenceTRTEPlaneFOVNxNyBWNSAThicknessGapSE30020S5025625615.613-										
Coil Mode: Torso Speeder 8ch										
Analysis of Composite Image										
Measured Data	Calculated Results									
Back Label Mean Max Min ground	Noise Noise Mean Normal- Max Uni- SD Type SNR ized SNR formity									
N 1,770 2,943 902 4.6	10.45 NEMA 119.8 43.1 199.2 46.9%									
A 1,766 2,929 897 40.2	8.04 Air 143.9 51.8 238.7 46.9%									
Analysis of Uncombined Images										
Measured Data	Calculated Results									
Noise Noise Ch Mean Max SD Type	Mean % of Max % of SNR Mean SNR Max									
1 1,271 3,932 14.87 Air	56.0 99% 173.3 86%									
2 1,409 3,820 19.20 Air	48.1 85% 130.4 65%									
3 955 2,864 11.11 Air	$\begin{array}{c c c c c c c c c c c c c c c c c c c $									
5 1.375 4.611 17.82 Air	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$									
6 1,590 4,771 25.84 Air	40.3 72% 121.0 60%									
7 934 3,969 15.36 Air	39.8 71% 169.3 84%									
8 1,232 4,181 17.77 Air	45.4 81% 154.2 77%									
	Channel 1 Channel 2 Channel 3 Channel 4									
Macri 1770 DOLM: 4.59 Macri 1766 Air M: 40.17	Mean: 1271 Air M: 28.21 Mean: 1409 Air M: 36.21 Mean: 955 Air M: 21.04 Mean: 776 Air M: 17.76 Airsd: 14.87 Airsd: 19.20 Airsd: 11.11 Airsd: 9.50									
Mean: 1770 ROI M: 4.58 Mean: 1766 Air M: 40.17 Airsd: 8.04 09920										
	ROI Area: 314.98 ROI Area: 314.98 ROI Area: 314.98 ROI Area: 314.98 Magaz: 1275 Air M: 33.80 Magaz: 1590 Air M: 48.77 Magaz: 127 Air M: 29.80 Magaz: 1290 Air M: 43.60									
ROI Area: 314.98 Composites	Mean: 1375 Air M: 33.80 Mean: 1590 Air M: 45.77 Mean: 934 Air M: 28.89 Mean: 1232 Air M: 33.62 Airsd: 17.82 Airsd: 15.36 Airsd: 15.36 Airsd: 15.36 Airsd: 15.36 Oct 15.36 Airsd: 15.36 Airs									
	ROLArea: 314.98ROLArea: 314.98ROLArea: 314.98Channel 5Channel 6Channel 7Channel 8									

RF Coil Performance Evaluation	Test Date: 2/24/2008									
Coil: Torso Speeder QD	Model: MJAB-137A									
Mfg.: Toshiba	Revision:									
Mfg. Date: Coil ID: 1545 SN: SIA0562254										
Phantom: 'Gas Can' # of Channels 8										
SequenceTRTEPlaneFOVNxNyBWNSAThicknessGapSE30020C5025625615.613-										
Coil Mode: Torso Speeder 8ch										
Analysis Massured Date	is of Composite Image									
Measured Data	Noise Noise Mean Normal- Max Uni-									
Label Mean Max Min ground	SD Type SNR ized SNR formity									
N 7,187 9,794 4,019 19.2	59.88 NEMA 84.9 30.6 115.7 58.2% 36, 12 Air 120.0 46.8 176.0 57.2%									
A 7,106 9,749 3,904 178.0	30.12 Air 130.0 40.0 170.9 37.270									
Analysis of Uncombined Images										
Measured Data	Calculated Results									
Noise Noise Ch Mean Max SD Type	Mean % of Max % of SNR Mean SNR Max									
1 2,718 9,205 41.09 Air	43.3 90% 146.8 84%									
2 2,574 9,657 36.32 Air	46.4 96% 174.2 100%									
3 3,147 9,826 45.04 Air	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$									
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$									
6 2.765 9.565 37.57 Air	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$									
7 2,674 8,765 46.47 Air	<u> </u>									
8 3,091 9,711 47.25 Air	42.9 89% 134.7 77%									
	Channel 1 Channel 2 Channel 3 Channel 4									
Mean: 7187 ROI M: 19.1 t ROIsd: 59.8 t Mean: 7168 Air M: 178.6 t Airsd: 36.12 Mean: 2718 Air M: 77.0 t Airsd: 41.0 t Mean: 2574 Air M: 67.8 t Airsd: 36.3 t Mean: 3147 Air M: 84.5 t Mean: 3029 Air M: 94.9 t 0 97/94 0 97/49 0 97/49 0 97/49 0 97/49 0 97/49 0 97/49 0 97/49 0 97/49 0 97/49 0 1 Area: 761.03 Mean: 2765 Air M: 70.8 t Mean: 2674 Air M: 67.3 t Mean: 3029 Air M: 88.68 ROI Area: 761.03 ROI Area: 761.03 Rol Area: 761.03 Mean: 2765 Air M: 70.8 t Mean: 2674 Air M: 67.3 t Mean: 3091 Air M: 88.68 Airsd: 40.47 0 95 <t< td=""></t<>										
Composites	ROI Area: 761.03 ROI Area: 761.03 ROI Area: 761.03 ROI Area: 761.03									
	Channel 5 Channel 6 Channel 7 Channel 8									

Analysis of Test Image Measured Data Calculated Results Label Mean Max Min Back ground Noise SD Noise Type Mean Normal- ized Max SNR N1 6,852 7,591 5,137 -14.2 35.51 NEMA 136.5 307.0 151.2 A1 6,866 7,595 5,131 53.4 28.37 Air 136.5 307.0 151.2 N2 6,574 7,278 5,119 1.4 27.29 NEMA 170.4 383.3 188.6 A2 6,572 7,269 5,096 33.9 18.27 Air 235.7 530.4 260.7	ha 7000 2 annels <u>4</u> Gap -	2/2 Alpl # of Cha nickness 3	est Date: Model: Revision: SN: NSA Th 1	Tes R 	BW 15.6		Ny 256	Nx 256	 	Ure Coil ID: Plane T	Quadrat	Wrist - Toshiba 9/1/2004 Small Bo ence TF 30 de: Wrist	Coil: Mfg.: fg. Date: hantom: Seque SE
Label Mean Max Min Back ground Noise SD Noise Type Mean SNR Normal- ized Max SNR N1 6,852 7,591 5,137 -14.2 35.51 NEMA 136.5 307.0 151.2 A1 6,866 7,595 5,131 53.4 28.37 Air 136.5 307.0 151.2 N2 6,574 7,278 5,119 1.4 27.29 NEMA 170.4 383.3 188.6 A2 6,572 7,269 5,096 33.9 18.27 Air 235.7 530.4 260.7	Coil Mode: Wrist - cable ports 1 # 2 Analysis of Test Image Messeured Data												
N1 6,852 7,591 5,137 -14.2 35.51 NEMA 136.5 307.0 151.2 A1 6,866 7,595 5,131 53.4 28.37 Air 136.5 307.0 151.2 N2 6,574 7,278 5,119 1.4 27.29 NEMA 170.4 383.3 188.6 A2 6,572 7,269 5,096 33.9 18.27 Air 235.7 530.4 260.7 ort L2 has 50% better SNR than port L1. When using the GP coil there was an almost 75% difference. 6,570 100 the lower/outer sides are rather worrisome. This coil should always be used with adeq	Uni- formity	Max	Normal- ized		Mean SNR		Noise Type	Noise SD	Back	Min	Max	Mean	Label
A1 6,866 7,595 5,131 53.4 28.37 Air 158.6 356.8 175.4 N2 6,574 7,278 5,119 1.4 27.29 NEMA 170.4 383.3 188.6 A2 6,572 7,269 5,096 33.9 18.27 Air 235.7 530.4 260.7 ort L2 has 50% better SNR than port L1. When using the GP coil there was an almost 75% difference. 16 source of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequation of low signal on the lower/outer sides are rather worrisome. This coil should always be used with adequating the section of low sign	80.7%	151.2	307.0	5	136.5		NEMA	35.51	-14.2	5,137	7,591	6,852	N1
N2 6,574 7,278 5,119 1.4 27.29 NEMA 170.4 383.3 188.6 A2 6,572 7,269 5,096 33.9 18.27 Air 235.7 530.4 260.7 ort L2 has 50% better SNR than port L1. When using the GP coil there was an almost 75% difference. 16 min port L1. When using the GP coil there was an almost 75% difference.	80.6%	175.4	356.8		158.6		Air	28.37	53.4	5,131	7,595	6,866	A1
A2 6,572 7,269 5,096 33.9 18.27 Air 235.7 530.4 260.7 ort L2 has 50% better SNR than port L1. When using the GP coil there was an almost 75% difference. and the lower/outer sides are rather worrisome. This coil should always be used with adeq addies to be noticed for the noticed formula to the surface of the notice	82.6%	188.6	383.3	4	170.4		NEMA	27.29	1.4	5,119	7,278	6,574	N2
ort L2 has 50% better SNR than port L1. When using the GP coil there was an almost 75% difference.	82.4%	260.7	530.4		235.7		Air	18.27	33.9	5,096	7,269	6,572	A2
Test Images	quate	d with ade	ifference vays be used	5% diff Id alwa	most 75% il should	an alı his.co	il there was rrisome. T oil.	the GP cc e rather wo ce of the c	When using iter sides ar im the surfa	n port L1 he lower/ou ist away fro	er SNR tha signal on t atient's wr	as 50% bett reas of low heep the p	ort L2 ha he two a adding to



Appendix A: Magnet Homogeneity Field Maps Toshiba Vantage 1.5T - 3 central planes Measured February 25, 2008



Axial											
MIN	MAX	RANGE	PPM	MEAN	STDEV						
-4	8	12	0.2	0.5	2.5						
-5	16	21	0.3	1.3	4.5						
-10	26	36	0.6	2.4	7.1						
-15	40	55	0.9	3.8	10.7						
-19	52	72	1.1	4.9	13.5						
-23	62	86	1.4	5.7	15.6						
	MIN -4 -5 -10 -15 -19 -23	Ax MIN MAX -4 8 -5 16 -10 26 -15 40 -19 52 -23 62	AX10LMINMAXRANGE-4812-51621-102636-154055-195272-236286	AX1CLMINMAXRANGEPPM-48120.2-516210.3-1026360.6-1540550.9-1952721.1-2362861.4	AX1CL MIN MAX RANGE PPM MEAN -4 8 12 0.2 0.5 -5 16 21 0.3 1.3 -10 26 36 0.6 2.4 -15 40 55 0.9 3.8 -19 52 72 1.1 4.9 -23 62 86 1.4 5.7						

Superior







Inferior

Sagittal										
DIAMETER	MIN	MAX	RANGE	PPM	MEAN	STDEV				
10	-2	8	11	0.2	1.2	2.0				
15	-4	13	18	0.3	1.6	3.2				
20	-10	22	33	0.5	2.1	5.1				
25	-21	34	56	0.9	2.8	7.8				
28	-31	44	76	1.2	3.2	9.9				
30	-40	53	93	1.5	3.6	11.5				

Appendix A: Magnet Homogeneity Field Maps Toshiba Vantage 1.5T Measured February 25, 2008







Axial Field Plots



Coronal Field Plots





Appendix B: RF Slice Profiles and Crosstalk

Spin Echo : ACR T1 TR/TE = 500/20BW = 15.6 KHz nex = 1.0Scan time: 2:09



Appendix B: RF Slice Profiles and Crosstalk

Spin Echo TR/TE = 500/15 BW = ? KHz nex = 1.0 Scan time: 2:09



Toshiba Site

Coil Used: Head Coil QD

	Sagittal Locator					
1	Length of phantom, end to en	d (mn 148± 2)	14	8.2	=	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	0.9	0.9	0.9	0.9	0.9
3	(1.10, 1.00, 0.90 mm)	0.9	0.9	0.9	0.9	0.9
4	Slice Thickness Top	47.1	44.4	42.3	48.0	47.8
5	(fwhm in mm) Bottom	52.2	48.1	46.3	51.8	49.4
6	Calculated value 5.0±0.7	4.95	4.62	4.42	4.98	4.86
7	Wedge (mm) = + = -	2.0	2.9	2.9	2.0	2.0
8	Diameter (mm) (190+2) \oplus	190.8	190.8	190.9	190.6	190.6
9	$\Theta = \Theta = \Theta = \Theta$	189.8	189.9	189.9 189.8		189.9
	Slice Location #5					
10	Φ	191.1	191.1	191.1	190.9	190.8
11	Diameter (mm) (190+2) Θ	189.9	189.9	189.9	189.9	190.1
12	Ø	189.8	190.1	190.1	189.9	190.0
13	Ø	190.2	190.5	190.5	190.3	190.4
	Slice Location #7					
14	Signal Big ROI	7109	7303	4055	7171	7077
15	(mean only) High	7670	7803	4413	7655	7585
16	Low	6485	6574	3584	6594	6505
17	Uniformity (>87.5%)	91.6%	91.5%	89.6%	92.6%	92.3%
18	Background Noise Top	64.2 ± 41.0	$98.0~\pm~54.6$	92.1 ± 49.4	73.3 ± 41.0	56.3 ± 40.9
19	Bottom	76.4 ± 47.9	94.6 ± 52.8	90.6 ± 49.9	75.4 ± 45.6	60.4 ± 43.0
20	(mean ±std dev) Left	80.4 ± 53.0	112 ± 90.8	164 ± 69.0	89.5 ± 47.7	113 ± 61.3
21	Right	71.3 ± 42.9	122 ± 63.8	167 ± 71.9	86.4 ± 48.1	102 ± 66.0
22	Ghosting Ratio (<2.5%)	0.1%	0.3%	1.8%	0.2%	0.7%
23	SNR (no spec)	160	136	82	166	169
	Low Con Detectability					
24	Slice Location #8 1.4%	7	7	0	8	8
25	Slice Location #9 2.5%	10	9	5	9	9
26	Slice Location #10 3.6%	10	9	6	10	9
27	Slice Location #11 5.1%	10	10	8	10	10
28	Total # of Spokes (>=9)	37	35	19	37	36
	Slice Location #11					
29	Wedge (mm) = + = -	0.4	1.3	1.2	0.4	0.4
30	Slice Position Error	-1.6	-1.7	-1.7	-1.6	-1.6

Vantage

2/27/2008

Test Date:

33

Toshiba Site

Sequence parameters

Coil Used:Head Coil QD

Test Date: 2/27/2008

Test ID **253**

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	15.6	2:09
	r									r			(
ACR PD	Dual Echo SE	2000	20	25	1	11	5	5	1	256	256	63	8:32
-					-								
ACR T2	Dual Echo SE	2000	80	25	1	11	5	5	1	256	256	63	8:32
Site T1	SE	560	12	24	1	11	5	5	1.3	256	256	17.92	3:03
										·			
Site T2	FSE(20)	4800	100	24	1	11	5	5	2	256	256	11.4	2:01

Magnet ID: 196

Coil ID: 1544

TestID: 253

Vantage

ACR T1



ACR PD



ACR T2



Site T1



Site T2



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, SPEEDER, 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 31.2 KHz (a 1 pixel fat/water chemical shift). 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 NEMA. 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, SCIC or SPEEDER).

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.