Siemens Site Yearly Performance Evaluation Siemens Verio 3T 6-May-08

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| Site Name: | Siemens Site | | | MRAP # _ | 00532-02 |
|------------------|-------------------------------|-----------------|---------|-----------------------|----------|
| Address | | | | Survey Date: | 5/6/08 |
| City, State, Zip | | | | Report Date: _ | 5/22/08 |
| MRI Mfg: | Siemens | Model: | Verio | Field: | 3T |
| MRI Scientist: | Moriel NessAiver, Ph.D. | Signature: | Monel | Ventiver, 6 | h.O. |
| | Equipment Evalu | ation Tests | | Pass Fail * N/A | |
| 1. | Magnetic field homogeneity | v: | | | |
| 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 | | | | |
| | | | | ass ail * /A | |
| | Evaluation of Site's Techno | logist QC Prog | gram | й й Ž | |
| l. | Set up and positioning accu | racy: (daily) | | | |
| 2. | Center frequency: (daily) | • (1 • 1) | | | |
| 3. | Transmitter attenuation or g | ain: (daily) | | | |
| 4. | Geometric accuracy measur | ments: (daily) | | | |
| 5. | Spatial resolution measuren | nents: (daily) | | | |
| 6. | Low contrast detectability: | (daily) | | | |
| 7. | Head Coil SNR (daily) | | | | |
| 8. | Body Coll SNK (weekly) | -1 | (1-1) | | |
| 9. | Fast Spin Ecno (FSE/TSE) | gnosting levels | (daily) | | |
| 10. | riim quality control: (week | iy) | | | |
| 11. | visual checklist: (weekly) | | | | |

Specific Comments and Recommendations

- 1. Large Flex coil has bad channel.
- The large oil sphere has a defect where the bottom support bracket attaches to the sphere which causes a large susceptibility artifact which makes it difficult to measure homogeneity.
- 3. The LCD display console is very good.
- 4. The SMPTE pattern printed from the Fuji camera's internal stored patterns lightens up too fast and peaks out at 80% (See page 6, red graph.) The signal sent from the scanner tries to compensate for this to some extent but it still doesn't match what is seen on the screen. The GE CT does a little better job than the MRI.
- 5. Shim in the axial plane is very good.
- 6. It is hard to run the auto-shim in the sagittal and coronal planes due to the limits of the magnet homogeneity and gradient linearity in the S/I direction combined with RF penetration difficulties. Shimming in the axial plane seems to work best.
- 7. <u>The BW and profiles of a standard 1 echo SE is fine in terms of range of thickness, however there is a large difference between the types of RF pulses. All other profiles (dual echo SE, FLASH, TSE and BLADE) all have problems, usually too large. This is typical with Siemens systems. All profiles can be seen in Appendix C.</u>
- 8. It is difficult to evaluate RF penetration on 3T systems but a visual comparison of the RF Field map obtained
 on your Verio DOES look better than I typically see on Trio systems.

| 9 | The 5 gauss line is well restricted inside of the scan room. |
|-----|--|
| 10. | |
| 11. | |
| 12. | |
| 13. | |
| _ | |
| _ | |
| _ | |
| | |

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

| S | ite Name: | Siemens S | bite | | | | | | | |
|---|--|---|--|---|---|---|---|---|--|--------------------------|
| (| Contact | | Title | | Phone | e | | | eMail | |
| | | | Chief Tch. | Off. | | | | | | |
| | | | Technolo | gist | | | | | | |
| | | | Chief Te | ch. | | | | | | |
| Fauinma | nt Inform | ation | | | | | | | | |
| MDIM | nufaaturar: | ation | | Modal | Varia | | SNI | 40116 | Softwara | D150 |
| amera Ma | mufacturer | | | Model: | veno | | SN. | 40110 | Software: | B13 v |
| PACS Ma | mufacturer. | 11 | i)i | Model: | | | SN. | | Software: | |
| 11100 111 | inunuoturor. | ACR P | hantom Nu | mber used: | J5909 | | 511. | | | |
| | | | | into er ubeu. | 00707 | - | | | | |
| 1. Table | Positionin | g Reprod | ucibility: | | | | | | | Pass |
| | Table mot | ion out/in: | IsoCenter | Out/In | Out/In | Out | t/In | | | |
| Meas | ured Phanto | m Center | -1.7 | -1.7 | -1.8 | -1 | .8 | | | |
| | | I | | | | | | | | |
| 2. Magn | etic Field | Homogen | eity | See append | lix A for fie | eld plo | ts. | | | PASS |
| | Last Yea | r CF: | N/A | Thi | is Year CF: | 123 | 3244356 | CF Cł | ange: N | A |
| | | 32 cm Wate | er Phantom | | 1 | | | 24 cm Oi | 1 Phantom | |
| | 10 cm | 15 cm | 20 cm | 25 cm | | | 10 cm | 15 cm | 20 cm | 23 cm |
| | | | | | | | 0.00 | 0.04 | 0 17 | 0 48 |
| Axial: | 0.03 | 0.06 | 0.09 | 0.13 | A | Axial: | 0.02 | 0.04 | 0.17 | 0.10 |
| Axial: Coronal: | 0.03 0.13 | 0.06 0.26 | 0.09 0.51 | 0.13 0.93 | A Coi | Axial: ronal: | 0.02 | 0.04 | 0.17 | 0.50 |
| Axial: Coronal: Sagittal: Comments: | 0.03 0.13 0.10 Used Siemen The shim in | 0.06 0.26 0.22 ns FieldPlot : the Axial pla | 0.09 0.51 0.45 sequence with ane is excelle | 0.13 0.93 1.07 th TR 500, Fl ent out to abo | 2 Cor Sag lip 45°, 5 ski ut ± 10 cm o | Axial: ronal: ittal: p 5, Fo of isoco | 0.02 0.03 0.04 OV of 40 (H | 0.04 0.06 0.12 (20) and 30 (ing the autos | 0.17 0.29 0.46 oil) | 0.50 0.69 |
| Axial: Coronal: Sagittal: Comments: 3. Slice | 0.03 0.13 0.10 Used Siemen The shim in e sagittal and Thickness | 0.06 0.26 0.22 ns FieldPlot : the Axial pla d coronal pla Accuracy | 0.09 0.51 0.45 sequence with ane is excelled nes due to the | 0.13 0.93 1.07 th TR 500, Fl ent out to abo ne limited S/I | f Con Sag iip 45°, 5 ski ut ± 10 cm o range of ma | Axial: ronal: ittal: p 5, F(of isoco gnet/gi | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. | 0.04 0.06 0.12 20) and 30 (ing the autos | 0.17 0.29 0.46 oil) him is difficu | 0.50 0.69 |
| Axial: Coronal: Sagittal: Comments: 3. Slice | 0.03 0.13 0.10 Used Siemer The shim in e sagittal and Fhickness | 0.06 0.26 0.22 ns FieldPlot s the Axial pla d coronal pla Accuracy m M | 0.09 0.51 0.45 sequence with the is excelled nes due to the atrix: 256x | 0.13 0.93 1.07 th TR 500, Fl ent out to abo ne limited S/I 256 | f Cor Sag ip 45°, 5 ski ut ± 10 cm o range of ma (Slice | Axial: ronal: ittal: p 5, F(of isoco gnet/gr e #1 fr | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. | 0.04 0.06 0.12 (20) and 30 (ing the autos | 0.17 0.29 0.46 oil) him is difficu | 0.50 0.69 |
| Axial: Coronal: Sagittal: Comments: 3. Slice | 0.03 0.13 0.10 Used Siemen The shim in e sagittal and FoV: 250m Sequen | 0.06 0.26 0.22 ns FieldPlot : the Axial pla d coronal pla Accuracy m M ce | 0.09 0.51 0.45 sequence with ane is excelled nes due to the atrix: 256x TR | 0.13 0.93 1.07 th TR 500, FI ent out to abo ne limited S/I 256 TE | f Con Sag $iip 45^\circ, 5 ski$ $ut \pm 10 \text{ cm of}$ range of ma (Slice Flip | Axial: ronal: ittal: p 5, Fe of isoce gnet/gr e #1 fr NSA | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. | 0.04 0.06 0.12 (20) and 30 (ing the autos (20) and 30 (hantom) A Target | 0.17 0.29 0.46 oil) him is difficu Il values in 1 % Error | 0.50 0.69 |
| Axial: Coronal: Sagittal: Comments: 3. Slice | 0.03 0.13 0.10 Used Siemen The shim in e sagittal and Fhickness FOV: 250m Sequen SE (AC | 0.06 0.26 0.22 ns FieldPlot : the Axial pla d coronal pla Accuracy um M ce R) | 0.09 0.51 0.45 sequence with the is excelled nes due to the atrix: 256x TR 500 | 0.13 0.93 1.07 th TR 500, Fl ent out to abo ne limited S/I 256 TE 20 | f Cor Sag ip 45°, 5 ski ut ± 10 cm o range of ma (Slice Flip 90 | Axial: ronal: ittal: p 5, F(of isoco gnet/gr e #1 fr NSA 1 | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. rom ACR F Calc 4.87 | 0.04 0.06 0.12 (20) and 30 (ing the autos (hantom) A Target 5 | 0.17 0.29 0.46 oil) him is difficu .ll values in 1 % Error -2.6% | 0.50 0.69 |
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| Axial: Coronal: Sagittal: Comments: 3. Slice 7 | 0.03 0.13 0.10 Used Siemer The shim in e sagittal and FOV: 250m Sequen SE (AC SE (20/80) L SE (20/80) L | 0.06 0.26 0.22 ns FieldPlot : the Axial pla d coronal pla d coronal pla d coronal pla Mccuracy m M ce R) .0 SAR .0 SAR | 0.09 0.51 0.45 sequence with the is excellent nes due to the atrix: 256x TR 500 2000 2000 | 0.13 0.93 1.07 th TR 500, Fl ent out to abo ne limited S/I 256 TE 20 20 80 | f Con Sag ip 45°, 5 ski ut ± 10 cm o range of ma (Slico Flip 90 90 90 90 | Axial: ronal: ittal: p 5, F0 of isoce gnet/gr e #1 fr NSA 1 1 1 | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. com ACR F Calc 4.87 5.66 4.59 | 0.04 0.06 0.12 20) and 30 (ing the autos Phantom) A Target 5 5 5 5 5 | 0.17 0.29 0.46 oil) him is difficu .ll values in 1 % Error -2.6% 13.2% -8.2% | 0.50 0.69 |
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| Axial: Coronal: Sagittal: Comments: 3. Slice 7 | 0.03 0.13 0.10 Used Siemen The shim in e sagittal and FoV: 250m Sequen SE (AC SE (20/80) L E (20/80) L E (20/80) No E (20/80) No | 0.06 0.26 0.22 Ins FieldPlot : the Axial plated d coronal plated d coronal plated Accuracy m M ce R) o SAR o SAR ormal RF ormal RF ormal RF ormal RF ormal RF SAR AR 1 RF RF SAR | 0.09 0.51 0.45 sequence with the is excelled nes due to the atrix: 256x TR 500 20 | 0.13 0.93 1.07 th TR 500, Fl ent out to abo ne limited S/I 256 TE 20 20 80 80 80 80 80 80 80 80 80 8 | f Con Sag ip 45°, 5 ski ut ± 10 cm of range of ma (Slico Flip 90 90 90 90 90 90 90 90 90 90 | Axial: ronal: ittal: p 5, F0 of isoco gnet/gn e #1 fr NSA 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. om ACR F Calc 4.87 5.66 4.59 4.85 3.64 5.48 4.67 6.39 5.52 4.80 5.28 6.92 | 0.04 0.06 0.12 20) and 30 (ing the autos ing the autos Phantom) A Target 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | 0.17 0.29 0.46 oil) him is difficu | 0.50 0.69 |
| Axial: Coronal: Sagittal: Comments: 3. Slice 1 | 0.03 0.13 0.10 Used Siemer The shim in e sagittal and Fhickness FOV: 250m Sequen SE (AC SE (20/80) L E (20/80) No SE (20/80) No SE (20/80) P T1-FLAS SE Lo S SE Norma SE Fast TSE(19) Lo SE(10) Nor | 0.06 0.26 0.22 Ins FieldPlot : the Axial pla d coronal pla Accuracy m M ce R) o SAR o SAR o SAR ormal RF ormal RF ormal RF SH AR 1 RF RF o SAR o SAR o SAR mal RF | 0.09 0.51 0.45 sequence with the is excellence with atrix: 256x TR 500 2000 | 0.13 0.93 1.07 th TR 500, FI ent out to abo he limited S/I 256 TE 20 20 80 20 10 10 10 10 10 10 10 10 10 1 | f Cor Sag $ip 45^{\circ}, 5 skij$ $ut \pm 10 cm of range of ma (Slice Flip 90 90 90 90 90 90 90 90 90 90$ | Axial: ronal: ittal: p 5, F0 of isoco gnet/gr e #1 fr NSA 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. om ACR F Calc 4.87 5.66 4.59 4.85 3.64 5.48 4.67 6.39 5.52 4.80 5.28 6.93 6.72 | 0.04 0.06 0.12 20) and 30 (ing the autos ing the autos Phantom) A Target 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | 0.17 0.29 0.46 oil) him is difficu | 0.50 0.69 |
| Axial: Coronal: Sagittal: Comments: 3. Slice 7 | 0.03 0.13 0.10 Used Siemen The shim in e sagittal and FOV: 250m Sequen SE (AC SE (20/80) L E (20/80) No E (20/80) No E (20/80) No E (20/80) No E (20/80) F SE (20/80) F | 0.06 0.26 0.22 Ins FieldPlot : the Axial plated d coronal plated d coronal plated Accuracy Mm M ce R) 0 SAR 0 SAR 0 SAR 0 SAR 0 SAR 0 SAR 1 RF SH AR 1 RF 0 SAR 1 RF 0 SAR mal RF 0 SAR 1 RF 0 SAR | 0.09 0.51 0.45 sequence with the is excelled the is | 0.13 0.93 1.07 th TR 500, FI ent out to abo ne limited S/I 256 TE 20 20 80 20 98 100 97 98 100 97 97 97 97 100 97 97 97 97 97 97 97 97 97 97 | $\begin{array}{c} $ | Axial: ronal: ittal: p 5, F0 of isoc gnet/gn e #1 fr NSA 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. om ACR F Calc 4.87 5.66 4.59 4.85 3.64 5.48 4.67 6.39 5.52 4.80 5.28 6.93 6.72 6.67 | 0.04 0.06 0.12 20) and 30 (ing the autos ing the autos Phantom) A Target 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | 0.17 0.29 0.46 oil) him is difficu Ill values in n % Error -2.6% 13.2% -8.2% -3.0% -27.2% 9.6% -6.6% 27.8% 10.4% -4.0% 5.6% 38.6% 34.4% 33.4% | 0.50 0.69 |
| Axial: Coronal: Sagittal: Comments: 3. Slice 7 | 0.03 0.13 0.10 Used Siemer The shim in e sagittal and FoV: 250m Sequen SE (AC SE (20/80) L E (20/80) L E (20/80) No E (20/80) No E (20/80) No E (20/80) F SE (20/80) F S | 0.06 0.26 0.22 Ins FieldPlot : the Axial plated d coronal plated d coronal plated Accuracy mm M ce R) o SAR o SAR ormal RF ormal RF ormal RF SH AR 1 RF RF SH AR 1 RF RF SAR mal RF of SAR mal RF of SAR F(35) | 0.09 0.51 0.45 sequence with the is excelled nes due to the atrix: 256x TR 500 20 | 0.13 0.93 1.07 th TR 500, Fl ent out to abo ne limited S/I 256 TE 20 20 80 21 12 12 12 12 12 12 13 10 10 11 11 11 11 11 11 11 11 | f Cor Sag $iip 45^{\circ}, 5 skii$ $ut \pm 10 cm of range of ma (Slico Flip 90 90 90 90 90 90 90 90 90 90$ | Axial: ronal: ittal: p 5, F0 of isoco gnet/gn e #1 fr NSA 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 1 | 0.02 0.03 0.04 OV of 40 (H enter. Runn radients. om ACR F Calc 4.87 5.66 4.59 4.85 3.64 5.48 4.67 6.39 5.52 4.80 5.52 4.80 5.28 6.93 6.72 6.67 6.30 | 0.04 0.06 0.12 20) and 30 (ing the autos ing the autos Phantom) A Target 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | 0.11 0.29 0.46 oil) him is difficu ''' | 0.50 0.69 |

4. Slice Crosstalk (RF interference)

The following data were obtained using the ACR phantom slice thickness wedges to measure the slice profile of a four 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 gap drops below 40-50%. What's interesting is how large the variation is in the starting slice thickness for each type of RF pulse. All of the slice profiles can be seen in Appendix B. There you can see that the Fast RF pulse has the squarest profile (and the most accurate) while the Normal is almost rectangular. The T1 FLASH sequence's profile is almost gaussian. This is expected for a short TE gradient echo. What is not expected is that the Full Width Half Maximum value should be 6.5 mm when 5.0 was requested.

| Sequence Type | TR | TE | FOV (cm ²) | Matrix | NSA | Thickness | # of slices |
|------------------|-----|------|---------------------------|---------|-----|-----------|-------------|
| SE Lo SAR | 500 | 12 | 25 | 256x256 | 1 | 5 | 11 |
| SE Normal | 500 | 12 | 25 | 256x256 | 1 | 5 | 11 |
| SE Fast RF | 500 | 12 | 25 | 256x256 | 1 | 5 | 11 |
| T1 FLASH | 350 | 2.58 | 25 | 256x256 | 2 | 5 | 11 |

| Skip | SE Low SAR | SE Normal | SE Fast | T1 FLASH |
|------|---------------|-----------|---------|-------------|
| 0 | 5.06 | 4.51 | 4.86 | 6.07 |
| 0.2 | 4.96 | 4.39 | 4.85 | 6.13 |
| 0.5 | 4.96 | 4.53 | 4.89 | 6.18 |
| 1 | 5.16 | 4.68 | 4.99 | 6.27 |
| 1.5 | 5.31 | 4.63 | 5.12 | 6.35 |
| 2 | 5.33 | 4.73 | 5.21 | 6.39 |
| 2.5 | 5.46 | 4.82 | 5.25 | 6.46 |
| 5 | 5.52 | 4.8 | 5.28 | 6.49 |
| 10 | 5.49 | 4.86 | 5.27 | 6.47 |



5. Soft & Hard Copy Displays

Luminance Meter Make/Model: Tektronix J16 Digital Photometer

Monitor Description: Siemens LCD

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 | 38.3 | 34.1 | 36.8 | 34.2 | 37.2 | |
| | | | | | | |

| Uniformity | | | | |
|------------|------|------------------|--|--|
| MAX | MIN | Percent Delta | | |
| 38.3 | 34.1 | 12% | | |
| | | | | |

Cal Expires:

| SMPTE |
|-------|
| OK? |
| Y |
| |

4/6/06

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

Minimum Brightness must be > 26.24 Ft. Lamberts

The LCD display console is very good. The SMPTE pattern printed from the Fuji camera's internal stored patterns

lightens up too fast and peaks out at 80% (red graph). The signal sent from the scanner tries to compensate for this

to some extent but it still doesn't match what is seen on the screen. The GE CT does a little better job than the MRI.

| Donaity | Ft- | MRI | Fuji | GE CT |
|---------|--------|---------|---------|---------|
| Density | Lamber | Density | Density | Density |
| 0 | 0.10 | -2.89 | -2.93 | -2.88 |
| 5 | 0.26 | -2.34 | -2.39 | -2.4 |
| 10 | 0.41 | -2.07 | -2.04 | -2.1 |
| 20 | 1.14 | -1.65 | -1.59 | -1.71 |
| 30 | 2.44 | -1.32 | -1.23 | -1.38 |
| 40 | 4.38 | -1.09 | -0.97 | -1.17 |
| 50 | 7.23 | -0.84 | -0.72 | -0.94 |
| 60 | 11.16 | -0.63 | -0.50 | -0.75 |
| 70 | 16.1 | -0.44 | -0.30 | -0.56 |
| 80 | 22.3 | -0.31 | -0.15 | -0.43 |
| 90 | 29.9 | -0.24 | -0.15 | -0.34 |
| 95 | 35.1 | -0.2 | -0.15 | -0.33 |
| 100 | 37.7 | -0.19 | -0.15 | -0.31 |



Coil and Other Hardware Inventory List

Site Name Siemens Site

ACR Magnet # 02 Nickname Verio

| Activ | e Coil Description | Manufacturer | Model | Rev. | Mfg. Date | SN | Channels |
|-------|------------------------|--------------|----------|------|-----------|---------|----------|
| | Body Integrated | | | | | | 1 |
| | Body Matrix | Siemens | 08622651 | | | 1649 | 6 |
| | Breast Array | Invivo | | | Mar, 2007 | U23005 | 7 |
| | Extremity - 8 Ch. | Invivo | 8622693 | | Jan, 2008 | 001185 | 8 |
| | Flex Coil - Large | Siemens | 08625761 | | | 1143 | 4 |
| | Flex Coil - Small | Siemens | 08625779 | | | 1143 | 4 |
| | Head Matrix | Siemens | 08622644 | | | 1362 | 12 |
| | Neck Matrix | Siemens | 08622677 | | | 1358 | 4 |
| | Shoulder Array - Large | Invivo | 8623626 | | Jan, 2008 | S001221 | 4 |
| | Shoulder Array - Small | Invivo | 8622719 | | Jan, 2008 | S001210 | 4 |
| | Spine Matrix | Siemens | 08622743 | | | 1351 | 24 |
| | Wrist Coil | Invivo | 8625621 | | Sep, 2007 | S1056 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | 7 |

| RF Coil Performance Evaluation Coil: Body Integrated Mfg.: | Ny 56 256 | Test Date: Model: Revision: SN: | 5/6/2008 |
|--|-----------------------------|---|-------------------------|
| Analysis | of Test Image | | |
| Measured Data | | Calculate | ed Results |
| Back Nois Label Mean Max Min ground SD | e Noise Type | Mean Normal- SNR ized | Max Uni- SNR formity |
| N 1,980 2,089 1,917 1.4 17.9' | 7 NEMA | 77.9 35.9 | 82.2 95.7% |
| A 1,979 2,088 1,916 37.9 16.8 | 9 Air | 76.8 35.4 | 81.0 95.7% |
| Mean: 1980 ROI M: 1.37 ROIsd: 17.97 Google ROI Area: 385.67 | Mean: 1979 | Air M: 37.8 Airsd: 16.8 0.2088 5.67 | 79 |
| lest | Images | | |

| <u> </u> | <u>) Il Pert</u> | orman | | uation | | 1051 | | | Test Date: | 5/ | 6/2008 |
|--|-------------------------|---|----------------------------|---|-------------------------------------|--|--------------|---------------------------------------|---|-------------------------------|--|
| Coil: | Body In | tegrated | | | | 140 | | | Model: | | |
| Mfg.: | | | | | | | A | | Revision: | | |
| ig. Date: | | | Coil ID: | 1657 | 0 | The second | | | SN: | | |
| hantom: | <u>32 cm wa</u> | ter sphere | | | | | | | | # of Cha | annels <u>1</u> |
| Sequence TR TE Plane FOV Nx Ny BW NSA Thickness Gap SE 300 20 T 50 256 256 1 3 - | | | | | | | | | | | |
| Seque SE Coil Mod | te: Body | | | FOV 50 | Nx 256 | Ny 256 | | BW 25.6 | NSA Th | 3 | Gap _ |
| Seque SE Coil Moo | de: <u>Body</u> | <u>te</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> | Plane T T Pasured | FOV 50 Analy | Nx 256 /sis of | Ny 256 Test Ima | ge | BW 25.6 | NSA TH | aickness 3 d Resul | Gap - |
| Seque SE Coil Moo | de: Body | <u>TE</u> 0 20 20 Max | easured | FOV 50 Analy Data Back ground | Nx 256 /sis of ' | Ny 256 Test Ima Noise Type | [ge | BW 25.6 | NSA Th 1 | d Resul | Gap - - ts Uni- formity |
| Coil Mod | de: <u>Body</u> Mean | <u>те</u> 0 20 20 Мах 413 | easured Min 65 | FOV 50 Analy Data Back ground 0.1 | Nx 256 /sis of SD 16.66 | Ny 256 Test Ima Noise Type NEMA | nge | BW 25.6 (Mean SNR 7.5 | NSA Tr 1 Calculated Normal- ized 3.5 | d Resul Max SNR 17.5 | Gap - ts Uni- formity 27.2% |



Test Images

| RF Coil Performance Evaluation | Tost Date: 5/6/2008 | | | | | | | | | |
|---|---|--|--|--|--|--|--|--|--|--|
| Coil: Body Matrix | Model: 08622651 | | | | | | | | | |
| Mfg.: Siemens | Revision: | | | | | | | | | |
| Mfg. Date: Coil ID: 1649 | SN: 1649 | | | | | | | | | |
| Phantom: 2 cylinders | # of Channels 6 | | | | | | | | | |
| SequenceTRTEPlaneFOVNxNyBWNSAThicknessGapSE30020T5025625625.613- | | | | | | | | | | |
| SE 300 20 T 50 256 256 25.6 1 3 - | | | | | | | | | | |
| Coil Mode: B0,1 | | | | | | | | | | |
| Analysis of Composit | te Image | | | | | | | | | |
| Measured Data | Calculated Results | | | | | | | | | |
| Back Noise Noise Label Mean Max Min ground SD Type | e Mean Normal- Max Uni- SNR ized SNR formity | | | | | | | | | |
| N 786 1,323 388 0.2 2.45 NEMA | A 226.9 104.6 381.9 45.4% | | | | | | | | | |
| A 786 1,321 388 5.8 2.24 Air | | | | | | | | | | |
| Analysis of Uncombine | ed Images | | | | | | | | | |
| Measured Data | Calculated Results | | | | | | | | | |
| Ch Mean Max SD Type | SNR Mean SNR Max | | | | | | | | | |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | | | | | | |
| 3 565 865 2.15 Air | 172.2 100% 263.6 97% | | | | | | | | | |
| 4 590 852 2.45 Air | 157.8 92% 227.9 84% | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | Channel 1 Channel 2 | | | | | | | | | |
| | Mean: 465 Air M: 3.58 Mean: 595 Air M: 4.12 Airsd: 2.15 Airsd: 2.45 | | | | | | | | | |
| Mean: 786 ROT M: 0.24 Mean: 786 Air M: 5.83 ROIsd: 2.45 Airsd: 2.24 | | | | | | | | | | |
| | 236 | | | | | | | | | |
| | | | | | | | | | | |
| | ROI Area: 155.40 ROI Area: 155.40 Macan: 565 Air M: 2.58 Macan: 500 Air M: 4.12 | | | | | | | | | |
| | Airsd: 2.15 Airsd: 2.45 | | | | | | | | | |
| | Q368 Q368 Q368 Q368 Q368 Q368 Q368 Q368 | | | | | | | | | |
| ROI Area: 150.86 ROI Area: 150.86 C 535 C 535 | | | | | | | | | | |
| Composites | ROI Area: 150.86 ROI Area: 150.86 | | | | | | | | | |
| | Channel 3 Channel 4 | | | | | | | | | |

| RF Coil Performance Evaluation | Test Date: 5/6/2008 |
|---|--|
| Coil: Body Matrix | Model: 08622651 |
| Mfg.: Siemens | Revision: |
| Mfg. Date: Coil ID: 1649 | SN: 1649 |
| Phantom: 2 cylinders | # of Channels |
| SequenceTRTEPlaneFOVNxSE30020C50256 | NyBWNSAThicknessGap25625.613- |
| Coil Mode: B0,1 | |
| Analysis of Com | posite Image |
| Measured Data | Calculated Results |
| Label Mean Max Min ground SD | Noise Mean Normal- Max Uni- Type SNR ized SNR formity |
| N 753 1,384 255 0.5 2.44 A 753 1,383 256 5.8 2.19 | NEMA 218.3 100.7 401.1 31.1% Air 225.3 103.9 413.8 31.2% |
| | AII 103.9 413.8 |
| Analysis of Uncom Measured Data | Iblined Images |
| | Mean % of Max % of |
| Ch Mean Max SD Type | SNR Mean SNR Max 132.6 100% 327.1 01% |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ |
| 3 397 1,139 2.20 Air | 118.3 89% 339.3 95% 120.8 088/ 258.6 1008/ |
| 4 495 1,308 2.50 Air | |
| | |
| | |
| | Channel 1 Channel 2 |
| | Mean: 445 Air M: 3.67 Mean: 488 Air M: 4.26 Airsd: 2.20 Airsd: 2.50 |
| Mean: 753 ROI M: 0.50 Mean: 753 Air M: 5.7 ROled: 2.44 Aired: 2.1 | |
| BUSU. 2.44 | |
| 0 1984 | ○ 1098 |
| | ROI Area: 470.95 ROI Area: 470.95 |
| | Mean: 397 Air M: 3.67 Mean: 495 Air M: 4.28 Airsd: 2.20 Airsd: 2.50 |
| 255 | ⊂19 O 1288 |
| ROI Area: 455.82 ROI Area: 455.82 | |
| Composites | 0 1169 |
| Compositor | ROI Area: 455.82 ROI Area: 455.82 |
| | Channel 5 Channel 4 |

| RF Coil Performance Evaluation | | Test Date: | 5/6/2008 |
|---|--|-------------------|--------------------|
| Coil: Breast Array | | Model: | |
| Mfg.: Invivo | | Revision : | |
| Mfg. Date: <u>3/1/2007</u> Coil ID: <u>1654</u> | | SN: | U23005 |
| Phantom: Two Small Bottles | | | # of Channels |
| SequenceTRTEPlaneFOVSE30020T50 | Nx Ny BW 256 256 25.73 | NSA Th | ickness Gap 3 - |

Coil Mode: a LBR;RBR

Analysis of Composite Image

| | Measured Data | | | | | | | | Calculated Results | | | | |
|-------|---------------|-------|-----|----------------|-------------|---------------|--|-------------|--------------------|------------|-----------------|--|--|
| Label | Mean | Max | Min | Back ground | Noise SD | Noise Type | | Mean SNR | Normal- ized | Max SNR | Uni- formity | | |
| NR | 1,131 | 1,762 | 472 | 0.2 | 1.54 | NEMA | | 519.4 | 240.1 | 809.2 | 42.3% | | |
| NL | 957 | 1,479 | 475 | 0.5 | 1.25 | NEMA | | 541.4 | 250.3 | 836.8 | 48.6% | | |
| AR | 1,132 | 1,763 | 472 | 4.2 | 1.63 | Air | | 455.1 | 210.4 | 708.8 | 42.2% | | |
| AL | 957 | 1,481 | 476 | 4.2 | 1.64 | Air | | 382.4 | 176.8 | 591.8 | 48.6% | | |

Analysis of Uncombined Images

| | M | easured | Data | | | Calculated | | | | |
|-----|------|---------|-------------|---------------|-------------|--------------|------------|-------------|--|--|
| Ch | Mean | Max | Noise SD | Noise Type | Mean SNR | % of Mean | Max SNR | % of Max | | |
| RB1 | 665 | 1,335 | 1.43 | Air | 304.7 | 72% | 611.8 | 91% | | |
| RB2 | 504 | 677 | 0.78 | Air | 423.4 | 100% | 568.8 | 84% | | |
| RB3 | 446 | 764 | 0.76 | Air | 384.6 | 91% | 658.8 | 98% | | |
| MBR | 447 | 974 | 1.28 | Air | 228.8 | 54% | 498.6 | 74% | | |
| LB1 | 377 | 609 | 0.74 | Air | 333.9 | 79% | 539.3 | 80% | | |
| LB2 | 478 | 1,164 | 1.13 | Air | 277.2 | 65% | 675.0 | 100% | | |
| LB3 | 492 | 659 | 0.78 | Air | 413.3 | 98% | 553.7 | 82% | | |
| MBR | 330 | 891 | 1.28 | Air | 168.9 | 40% | 456.2 | 68% | | |

When using both sides simultaneously, the left side has roughly 16% lower signal overall than the right side (Air SNR) but slightly better SNR when looking at the subtracted images (NEMA method).





| RF Coil Performance Evaluation | | Test Date: | 5/6/2008 |
|---|--|-------------------|--------------------|
| Coil: Breast Array | | Model: | |
| Mfg.: Invivo | | Revision : | |
| Mfg. Date: <u>3/1/2007</u> Coil ID: <u>1654</u> | | SN: | U23005 |
| Phantom: Two Small Bottles | | | # of Channels7 |
| SequenceTRTEPlaneFOVSE30020C40 | Nx Ny BW 256 256 25.73 | NSA Th | ickness Gap 3 - |

Coil Mode: b LBR;RBR

Analysis of Composite Image

| | | М | easured | Calculated Results | | | | | | |
|-------|-------|-------|---------|--------------------|-------------|---------------|-------------|-----------------|------------|-----------------|
| Label | Mean | Max | Min | Back ground | Noise SD | Noise Type | Mean SNR | Normal- ized | Max SNR | Uni- formity |
| NR | 1,290 | 1,692 | 1,069 | -0.4 | 2.69 | NEMA | 339.1 | 245.0 | 444.8 | 77.4% |
| NL | 1,008 | 1,071 | 904 | -0.3 | 2.40 | NEMA | 297.0 | 214.6 | 315.6 | 91.5% |
| AR | 1,290 | 1,693 | 1,071 | 7.2 | 2.22 | Air | 380.8 | 275.1 | 499.7 | 77.5% |
| AL | 1,009 | 1,072 | 906 | 7.2 | 2.22 | Air | 297.8 | 215.2 | 316.4 | 91.6% |

Analysis of Uncombined Images

| | Me | easured | Data | | | Calculat | ed Results |
|-----|------|---------|-------------|---------------|-------------|--------------|------------|
| Ch | Mean | Max | Noise SD | Noise Type | Mean SNR | % of Mean | Max SNR |
| RB2 | 575 | 620 | 1.13 | Air | 333.5 | 100% | 359.5 |
| RB3 | 494 | 606 | 1.08 | Air | 299.7 | 90% | 367.7 |
| RB1 | 768 | 1,069 | 2.18 | Air | 230.9 | 69% | 321.3 |
| MBR | 585 | 970 | 1.91 | Air | 200.7 | 60% | 332.8 |
| LB2 | 528 | 597 | 1.69 | Air | 204.7 | 61% | 231.5 |
| LB3 | 572 | 652 | 1.12 | Air | 334.7 | 100% | 381.5 |
| LB1 | 410 | 546 | 1.04 | Air | 258.3 | 77% | 344.0 |
| MBR | 364 | 536 | 1.91 | Air | 124.9 | 37% | 183.9 |

There appears to be significant assymetry in the MBR (middle breast) channel. The right side has substantially higher signal. This results in a 22% difference in the composite image left to right. However, this type of asymmetry is common on Trio systems with this coil.



| Chan | nel 1 | Chanr | nel 2 | Channe | el 3 | Channel 4 | | |
|-----------------|----------------------------|-----------------|----------------------------|-----------------|----------------------------|-----------------|----------------------------|--|
| Mean: 575 | Air M: 1.59 Airsd: 1.13 | Mean: 494 | Air M: 1.50 Airsd: 1.08 | Mean: 768 | Air M: 3.62 Airsd: 2.18 | Mean: 585 | Air M: 3.10 Airsd: 1.91 | |
| 2308 820 | | 0 895, 364 | | 0 1069 0 585 | | C 770 | | |
| ROI Area: 79.71 | | ROI Area: 79.71 | | ROI Area: 79.71 | | ROI Area: 79.71 | | |
| Mean: 528 | Air M: 2.67 Airsd: 1.69 | Mean: 572 | Air M: 1.56 Airsd: 1.12 | Mean: 410 | Air M: 1.42 Airsd: 1.04 | Mean: 364 | Air M: 3.10 Airsd: 1.91 | |
| | D 47 P 597 | | 0 852 517 | | 0546 | | 0 555 | |
| ROI Area: 75.92 | | ROI Area: 75.92 | | ROI Area: 75.92 | | ROI Area: 75.92 | | |
| Chan | nel 5 | Chanr | nel 6 | Channe | el 7 | | | |

% of Max 94% 96% 84% 87% 61% 100% 90% 48%

| F Mfç Ph | Coil: Mfg.: g. Date: antom: Seque | Dil Perf Breast 2 Invivo 3/1/2007 Two Sma ence TF 2 30 | Orman Array All Bottles R TE 0 20 | Coil ID: | uation 1654 FOV 50 | Nx 256 | Ny 256 | | BW 25.73 | Test Dat Mode Revisio S NSA | e: | /6/2008 U23005 hannels 7 Gap - |
|----------------|---|--|---|----------------------|--|---------------------|-----------|--|-----------------------------|---|---|--|
| (| Coil Mo | de: <u>c LB</u> F | R (Left Bro | east) | Analysis | s of Cor | nposite | Imag | le | | | |
| | | | М | easured | Data | | | | (| Calculat | ted Resu | lts |
| | Label | Moon | Mox | Min | Back | Noise | Noise | | Mean | Normal | - Max | Uni- |
| I | Label | Mean | 1 244 | 455 | | | | Γ | 542.0 | 250.6 | 778.6 | 53.6% |
| | A | 866 | 1,244 | 456 | 2.7 | 1.13 | Air | - | 472.9 | 218.6 | 679.3 | 53.6% |
| | | | | 100 | | 1120 | | L | | | | |
| _ | | | | A | nalysis | of Unco | mbined | Imag | ges | | | |
| | | M | easured | Data | | | | | Ca | Iculate | d Results | 5 |
| | | | | Noise | Noise | - | | Me | an | % of | Max | % of |
| | | Mean | Max | | | 1 | | SNR Mean | | | SNR | Max |
| | LB1 | 420 | 1.014 | 1.02 | Air | - | | <u>327.7</u> 79% 5 269.8 65% | | | 651.5 | 100% |
| | LB3 | 493 | 683 | 0.78 | Air | | | 414 | 4.2 | 100% | 573.8 | 88% |
| | MBR | 307 | 844 | 1.12 | Air | 1 | | 179 | 9.6 | 43% | 493.8 | 76% |
| | | | | | | | | | | | | |
| | ean: 866 | ide has 13% | 6 better SNI R01 M: -0.2 R01sd: 1.1 | Rol Area Roj Area | ight.when.u | Air M: 2 Air SD: | de.only | Mean: 370 R0I Area: 19 Mean: 493 R0I Area: 19 | Channel (51))1.8 | 1 Ir M: 0.85 IrSD: 0.74 Roll Ir M: 0.94 Mea 623 Roll Roll | Channe n: 420 Area: 191.8 n: 307 | AIR M: 1.38 AIRSD: 1.02 01014 112 AIR M: 1.55 AIRSD: 1.12 3214 0 24 |
| | | | | | | | | ROI Area: 15 | Channel | 3 | Channe | 4 |

| RF C Coil Mfg. Mfg. Date Phantom Sequ S Coil Mo | oil Perf E Breast 4 Invivo 3/1/2007 Two Sma ence TF 30 ode: d RB | Orman Array All Bottles R TE 10 20 R (Right E) | Ce Eval | uation 1654 FOV 50 | Nx 256 | Ny 256 | | BW 25.73 | Test Date Mode Revision SM - NSA 1 | e: 5/ | 6/2008 23005 annels 7 Gap - | |
|--|---|--|-------------|--|------------------|---------------|------|-------------|--|--------------|---|--|
| | | | | Analysis | s of Cor | nposite | Imag | ge | | | | |
| | | Μ | easured | Data | | | _ | | Calculat | ed Resul | ts | |
| Label | Mean | Max | Min | Back ground | Noise SD | Noise Type | | Mean SNR | Normal- ized | - Max SNR | Uni- formity | |
| Ν | 1,082 | 1,694 | 433 | -0.7 | 1.96 | NEMA | | 390.4 | 180.5 | 611.2 | 40.7% | |
| Α | 1,081 | 1,693 | 433 | 3.7 | 1.70 | Air | | 416.7 | 192.7 | 652.6 | 40.7% | |
| | | | А | nalysis | of Unco | mbined | Ima | ges | | | | |
| | M | easured | Data | | | | | С | alculated | d Results | | |
| Ch | Mean | Max | Noise SD | Noise | - | | Me | ean | % of | Max | % of | |
| RB1 | 613 | 1,305 | 1.52 | Air |] | | 26 | 4.3 | 66% | 562.6 | 88% | |
| RB2 | 534 | 737 | 0.88 | Air | | | 39 | 7.7 | 100% | 548.8 | 86% | |
| RB3 | 477 | 787 | 0.81 | Air | - | | 38 | 5.9 | 97% | 636.7 | 100% | |
| | 433 | 909 | 1.30 | | J | | 20 | 5.0 | 3270 | 409.0 | /4/0 | |
| The right | $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | | | | | | | | |

| RF Coil Performance Evaluation Coil: Extremity - 8 Ch. Mfg.: Invivo Mfg. Date: 1/1/2008 Coil ID: 1652 Phantom: Small Bottle Sequence TR TE Plane FOV SE 300 20 T 25 Coil Mode: Knee | | | | | | Ny 256 | B 25 | W .6 | Test Date Model Revision SN | : : : : # of Ch <u>Thickness</u> 3 | /6/2008 622693 001185 annels <u>8</u> Gap - |
|---|---------------------------------|--------------------------------------|--|-----------------------------|--|---|--|---|--|---|---|
| | | | | Analysis | s of Con | nposite | mage | | | | |
| | | M | easured | Data | | | | C | Calculate | ed Resul | ts |
| Label | Mean | Max | Min | Back ground | Noise SD | Noise Type | M S | ean NR | Normal- ized | Max SNR | Uni- formity |
| N | 1,302 | 1,733 | 936 | 0.3 | 1.97 | NEMA | 40 | 7.4 | 862.2 | 622.1 | 70.1% |
| Α | 1,302 | 1,733 | 935 | 11.4 | 2.33 | Air | 30 | 6.2 | 675.5 | 487.4 | 70.1% |
| | Me | easured | A Data | nalysis | of Unco | mbined | Images | Ca | Iculated | Results | |
| | | | Noise | Noise | | | Mean | | % of | Мах | % of |
| Ch 1 | Mean 450 | Max | | Type Air | 1 | | SNR 129.3 | | Mean | SNR 413.3 | Max |
| 2 | 323 | 1,430 | 2.00 | Air | 1 | | 105.8 | | 82% | 330.9 | 80% |
| 3 | 396 | 1,142 | 2.11 | Air | | | 123.0 | | 95% | 354.7 | 86% |
| 4 | 308 | 1,027 | 1.92 | Air | | | 105.1 | | 81% | 350.5 | 85% |
| 5 | 394 | 1,163 | 2.03 | Air | | | 127.2 | | 98% | 375.4 | 91% |
| 6 | 410 | 1,227 | 2.17 | Air | - | | 123.8 | | 96% | 370.5 | 90% |
| 7 | 328 | 885 | 1.97 | Air | - | | 109.1 | | 84% | 294.4 | 71% |
| 8 | 3/3 | 1,221 | 2.13 | | J | | 114.8 | | 89% | 3/5.0 | 91% |
| Mean: 13 ROI Area | 02 ROI 1 ROIs 1733 936 | M: 0.33 Mear d: 1.97 ROI. ROI. | n: 1302 0 1733 99 Area: 88.57 S | Air M: 11.37 Airsd: 2.33 | Cha Mean: 450 O 14: ROI Area: 88.9 Mean: 394 53 ROI Area: 88.9 | Air M: 3.84 Me Airsd: 2.28 Me 39 142 57 RO Airsd: 2.23 Me 57 RO 57 RO 57 RO | Channel an: 323 Air 106 C I Area: 88.57 an: 410 Air 0: 1227 C I Area: 88.57 Channel | 2 M: 3.27 1010 M: 3.60 1010 M: 3.60 118 | Channel Mean: 398 Air An C98 C98 C98 C98 C98 C98 C98 C98 C98 C98 | 3 Cha M: 3.48 sd: 2.11 Mean: 308 rd: 2.11 Mean: 308 ROI Area: M: 3.20 ROI Area: ROI Area: 7 Cha | nnel 4 Air M: 3.11 Airsd: 1.92 47 68.57 86.57 0 Air M: 3.54 Airsd: 2.13 40 104 104 104 104 104 105 104 105 104 105 105 105 105 105 105 105 105 |

| RF Coil Performance Evaluation Coil: Flex Coil - Large Mfg.: Siemens Mfg. Date: Coil ID: 1650 Phantom: Large Cylinder Sequence TR TE SE 300 20 T 36 256 2: Coil Mode: FL Port 1 | Test Date: 5/6/2008 Model: 08625761 Revision: | | | | | | | |
|---|--|--|--|--|--|--|--|--|
| Analysis of Composit | e Image | | | | | | | |
| Measured Data | Calculated Results | | | | | | | |
| Label Mean Max Min ground SD Type | Mean Normal- Max Uni- SNR ized SNR formity | | | | | | | |
| N 818 1,349 376 0.2 2.86 NEM/ A 818 1.349 371 9.3 2.37 Air | A 202.3 205.2 333.6 43.6% 226.2 229.4 373.0 43.1% | | | | | | | |
| | | | | | | | | |
| Measured Data | Calculated Results | | | | | | | |
| Ch Mean Max Noise SD Noise Type 1 84 195 2.44 Air 2 511 1,065 2.47 Air 3 362 1,021 2.49 Air 4 424 844 2.26 Air | Mean SNR % of Mean Max SNR % of Max 22.6 17% 52.4 19% 135.6 100% 282.6 100% 95.3 70% 268.7 95% 122.9 91% 244.7 87% | | | | | | | |
| Channel #1. is. dead. Channel #1. is. dead. Mean: 818 ROI M: 0.15 ROIsd: 2.86 376 376 376 Channel 1 Channel 2 Mean: 818 Air M: 9.29 Airsd: 2.37 Airsd: 2.37 Airsd: 2.37 Airsd: 2.37 Airsd: 2.37 Airsd: 2.37 Airsd: 2.37 Airsd: 2.37 Channel 1 Channel 2 Mean: 84 Airsd: 2.44 Airsd: 2.44 Airsd: 2.44 Airsd: 2.47 Airsd: 2.47 Air | | | | | | | | |
| O:1349 O:1349 ROI Area: 160.85 ROI Area: 160.85 Composites | Mean: 362 Air M: 4.26 Airsd: 2.49 Air M: 3.77 Airsd: 2.49 Airsd: 2.26 0107 0145 0107 0344 ROI Area: 160.85 ROI Area: 160.85 Channel 3 Channel 4 | | | | | | | |

| RF Coil Performance Evaluation Coil: Flex Coil - Large Mfg.: Siemens Mfg. Date: Coil ID: Phantom: Large Cylinder | Test Date: 5/6/2008 Model: 08625761 Revision: |
|--|---|
| SE 300 20 T 36 256 2 Coil Mode: FL Port 4 Analysis of Composit | |
| Measured Data | Calculated Results |
| Interstitled DataLabelMeanMaxMinBack groundNoise SDNoise TypeN8191,346369-0.03.03NEM.A8191,3453699.42.41Air | Mean SNR Normal- ized Max SNR Uni- formity A 191.2 193.9 314.2 43.0% 222.7 225.9 365.7 43.1% |
| Analysis of Uncombine | ed Images |
| Measured Data | Calculated Results |
| Ch Mean Max Noise SD Noise Type 1 80 184 2.42 Air 2 503 1,057 2.48 Air 3 364 1,039 2.56 Air 4 436 849 2.33 Air | Mean SNR % of Mean Max SNR % of Max 21.7 16% 49.8 18% 132.9 100% 279.3 100% 93.2 70% 266.0 95% 122.6 92% 238.8 85% |
| Channel #1 is dead. | |
| Mean: 819 ROI M: -0.04 ROIsd: 3.03 Mean: 819 Air M: 9.42 Joing Jacobia Airsd: 2.41 Joing Jacobia Joing Jacobia ROI Area: 161.27 ROI Area: 161.27 | Channel 1Channel 2Mean: 80Air M: 4.07 Airsd: 2.42Mean: 503Air M: 4.20 Airsd: 2.48Image: Image: |

| RF Coil Performance Evaluatio | <u>n</u> | | | Test Date: | 5/6/2008 | | | |
|--|--|---------------|--|--|---|--|--|--|
| Coil: Flex Coil - Small | A. | | Model: | 08625779 | | | | |
| Mfg.: Siemens | | | 2 | Revision : | | | | |
| Mfg. Date: Coil ID: 1651 | | | SN: | 1143 | | | | |
| Phantom: Small Bottle | | | | | # of Channels | | | |
| SequenceTRTEPlaneFOVNxNyBWNSAThicknessGapSE30020T2525625625613- | | | | | | | | |
| Coil Mode: FS Port 1 | | | | | | | | |
| Analy | sis of Com | posite l | mage | | | | | |
| Measured Data | | | | Calculated | d Results | | | |
| Back Label Mean Max Min groun | Noise d SD | Noise Type | Mean SNR | Normal- ized | Max Uni- SNR formity | | | |
| N 1,518 2,132 805 0.4 | 3.43 | NEMA | 313.0 | 577.4 | 439.6 54.8% | | | |
| A 1,518 2,131 805 14.3 | 3.56 | Air | 279.4 | 515.5 | 392.3 54.8% | | | |
| Analysi | s of Uncon | nbined I | mages | | | | | |
| Measured Data | | - | Ca | alculated F | Results | | | |
| Noise Nois Ch Mean Max SD Type | e e | | Mean SNR | % of Mean | Max % of SNR Max | | | |
| 1 673 1,705 3.53 Ain | • | | 124.9 | 98% | 316.5 100% | | | |
| 2 713 1,725 3.65 Ain | · | | 128.0 | 100% | <u>309.7</u> <u>98%</u> | | | |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | · | | 108.7 | <u>85%</u> 94% | <u>307.7</u> <u>97%</u> | | | |
| | | | | J | | | | |
| Mean: 1518 ROI M: 0.38 ROIsd: 3.43 02162 ROI Area: 84.68 ROI Area: 84.68 ROI Area: 84.68 | Air M: 14 Airsd: 3.5 02:61 68 | .27 56 | Channe lean: 673 Ai Ai 0 1705 100 Area: 84.68 lean: 599 Ai Ai 0 175 0 1 | el 1 r M: 6.21 rsd: 3.53 e 205 ROI Arr r M: 6.33 rsd: 3.61 ROI Arr ROI Arr | Channel 2 713 Air M: 6.46 Airsd: 3.65 0226 01725 ea: 84.68 651 Air M: 6.26 Airsd: 3.54 0220 0662 ea: 84.68 Channel 4 | | | |

| RF Coil Performance Evaluation Coil: Flex Coil - Small Mfg.: Siemens Mfg. Date: Coil ID: Phantom: Small Bottle Sequence TR TE Plane SE 300 20 T 25 256 | Test Date: 5/6/2008 Model: 08625779 Revision: | | | | | | |
|---|---|--|--|--|--|--|--|
| Coil Mode: FS Port 3 Analysis of Composite Image Calculated Results Measured Data Calculated Results Measured Data Calculated Results Label Mean Max Min ground SD Type Noise Type Mean Normal- Max Uni-formity N 1.503 2.131 802 0.2 3.09 NEMA 344.0 634.6 487.7 54.7% | | | | | | | |
| A 1,503 2,131 801 14.0 3.53 A A A A A A A A A A B A A A A A A B B A A B A A B | Air 279.0 514.7 395.6 54.6% nbined Images | | | | | | |
| Ch Mean Max SD Noise Type 1 672 1,685 3.50 Air 2 698 1,688 3.56 Air 3 583 1,565 3.48 Air 4 658 1,656 3.59 Air | Mean % of SNR Max Mean % of SNR Max Max % of Max 125.8 98% 315.5 100% 310.7 98% 109.8 85% 294.7 93% 302.3 96% | | | | | | |
| Mean: 1503 ROI M: 0.23 ROIsd: 3.09 Mean: 1503 Air M: 14. Airsd: 3.5 Airsd: 3.5 Image: Composites ROI Area: 84.69 | O3Channel 1Channel 2Mean: 672Air M: 6.16 Airsd: 3.50Mean: 698Air M: 6.28 Airsd: 3.50Image: Construction of the structure o | | | | | | |

| RF Coil Performance Evaluation Coil: Flex Coil - Small Mfg.: Siemens Mfg. Date: Coil ID: Phantom: Small Bottle Sequence TR TE SE 300 20 T 25 26 2 Coil Mode: FS Port 4 | Test Date: 5/6/2008 Model: 08625779 Revision: |
|--|--|
| Analysis of Composi | te Image |
| Measured Data | Calculated Results |
| Back Noise Nois Label Mean Max Min ground SD Type | e Mean Normal- Max Uni- e SNR ized SNR formity |
| N 1,514 2,175 805 1.1 3.80 NEM A 1,513 2,171 806 14.2 3,57 Air | A 281.8 519.8 404.8 54.0% 277.7 512.3 208.5 54.1% |
| | |
| Analysis of Uncombine Measured Data | Ed Images Calculated Results |
| Mean Max SD Noise Type 1 656 1,655 3.44 Air 2 705 1,696 3.60 Air 3 604 1,615 3.63 Air 4 667 1,692 3.62 Air | Mean % of SNR Max Mean % of SNR Max Max % of Max 125.0 97% 315.3 100% 128.3 100% 308.7 98% 109.0 85% 291.5 92% 120.7 94% 306.3 97% |
| Mean: 1514 ROI M: 1.05 ROIsd: 3.80 Bos OLArea: 84.70 Mean: 1513 Air M: 14.20 Airsd: 3.57 Bos Airsd: 3.5 | Channel 1Channel 2Mean: 656Air M: 6.07 Airsd: 3.44Mean: 705Air M: 6.33 Airsd: 3.600 16550 16550 16500 16500 Area: 84.70Mean: 607Air M: 6.42 Airsd: 3.62Mean: 667Mean: 604Air M: 6.42 Airsd: 3.63Mean: 667Air M: 6.39 Airsd: 3.620 Area: 84.70Mean: 667Air M: 6.29 Airsd: 3.62Mean: 6670 Area: 84.70Mean: 667Air M: 6.39 Airsd: 3.620 Area: 84.70Mean: 667Air M: 6.42 Airsd: 3.620 Area: 84.70Air M: 6.42 Airsd: 3.62Air M: 6.42 Airsd: 3.620 Area: 84.70Air M: 6.42 Airsd: 3.62Air M: 6.42 Air M: 6.42 Air M: 6.42 Air M: 6.420 Area: 84.70Air M: 6.42 Air M: 6.42 |

| RF Coil Performance Evaluation Coil: Flex Coil - Small Mfg.: Siemens Mfg. Date: Coil ID: Phantom: Small Bottle Sequence TR TE Plane FOV SE 300 20 Coil Mode: FS Port 6 | Test Date: 5/6/2008 Model: 08625779 Revision: |
|---|--|
| Analysis of | Composite Image |
| Measured Data | Calculated Results |
| Back No | se Noise Mean Normal- Max Uni- |
| Label Mean Max Min ground S N 1.763 2.454 941 0.9 3 | Type SNR ized SNR formity 9 NEMA 357.3 659.0 497.3 55.4% |
| A 1,762 2,452 939 16.7 4. | 6 Air 277.6 512.0 386.3 55.4% |
| Analysis of U | combined Images |
| Measured Data | Calculated Results |
| Ch Mean Max Noise SD Noise Type 1 780 1,959 4.11 Air 2 829 1,986 4.22 Air 3 681 1,795 4.11 Air 4 777 1,948 4.20 Air | Mean SNR% of MeanMax SNR% of Max124.497%312.3100%128.7100%308.499%108.684%286.292%121.294%303.997% |
| Mean: 1763 ROI M: 0.94 ROIsd: 3.49 02454 ROI Area: 84.70 ROI Area: 84.70 ROI Area: 84.70 Composites | Standard Channel 1 Channel 2 Main: 780 Air M: 7.34 Mean: 829 Air M: 7.54 Joint 1 Joint 1 Joint 1 Joint 1 Joint 2 Joint 2 Joint 2 Joint 2 Joint 2 |

| RF Coil Performance Evaluation Coil: Head Matrix Mfg.: Siemens | Test Date: 5/6/2008 Model: 08622644 Revision: | | | | | | | |
|--|---|--|--|--|--|--|--|--|
| Mfg. Date: Coil ID: 1646 | SN: 1362 | | | | | | | |
| Phantom: ACR Phantom | # of Channels 12 | | | | | | | |
| SequenceTRTEPlaneFOVNxSE30020T40256 | NyBWNSAThicknessGap25625.613- | | | | | | | |
| Coil Mode: HEA,HEP | | | | | | | | |
| Analysis of Con | nposite Image | | | | | | | |
| Measured Data | Calculated Results | | | | | | | |
| Back Noise Label Mean Max Min ground SD | Noise Mean Normal- Max Uni- Type SNR ized SNR formity | | | | | | | |
| N 2,050 2,485 1,780 0.2 2.65 | NEMA 547.1 394.2 663.2 83.5% | | | | | | | |
| A 2,050 2,485 1,778 11.9 2.92 | Air 460.1 331.5 557.7 83.4% | | | | | | | |
| Analysis of Unco | mbined Images | | | | | | | |
| Measured Data | | | | | | | | |
| Ch Mean Max SD Type | Mean % of Max % of SNR Mean SNR Max | | | | | | | |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | | | | | | | |
| 3 970 2,083 3.06 Air | 207.7 100% 446.1 95% | | | | | | | |
| 4 887 1,880 2.87 Air | 202.5 97% 429.3 91% | | | | | | | |
| $\frac{3}{4} \frac{370}{887} \frac{2,083}{1,880} \frac{3.06}{2.87} \frac{A1r}{Air} \frac{207,7}{202,5} \frac{100\%}{97\%} \frac{440,1}{429,3} \frac{95\%}{91\%}$ | | | | | | | | |

| RF Coil Performance Evaluation Coil: Neck Matrix Image: Neck Matrix </th <th>Test Date: 5/6/2008 Model: 08622677 Revision: </th> | Test Date: 5/6/2008 Model: 08622677 Revision: | | | | | | | |
|--|---|--|--|--|--|--|--|--|
| Analysis of Compos | ite Image | | | | | | | |
| Measured Data | Calculated Results | | | | | | | |
| Back Noise Nois Label Mean Max Min ground SD Typ | se Mean Normal- Max Uni- e SNR ized SNR formity | | | | | | | |
| N 1,529 3,495 616 0.2 2.45 NEM | IA 441.4 203.5 1008.9 30.0% | | | | | | | |
| A 1,529 3,493 616 9.5 2.27 Air | r 441.4 203.6 1008.4 30.0% | | | | | | | |
| | | | | | | | | |
| Analysis of Uncombin | ed Images | | | | | | | |
| Measured Data | Calculated Results | | | | | | | |
| Ch Mean Max SD Noise Type 1 630 2,056 2.22 Air 2 520 1,827 2.29 Air 3 492 1,832 2.20 Air 4 439 1,477 1.52 Air 5 343 1,319 1.42 Air 6 585 1,866 2.12 Air | Mean % of Max % of SNR Mean SNR Max 186.0 98% 606.9 95% 148.8 79% 522.8 82% 146.6 77% 545.7 86% 189.3 100% 636.8 100% 158.3 84% 608.7 96% 180.8 96% 576.8 91% | | | | | | | |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | | | | | |

| RF Coil Performan Coil: Neck Ma Mfg.: Siemens Mfg. Date: | ormanc atrix inder TE 20 HEP; NE1, | e Eval | 1647 FOV 50 | Nx 256 | Ny 256 | BW 25.6 | Test Date: Model: Revision: SN: | 5/6/2008 08622677 1358 # of Channels 4 hickness Gap 3 - |
|---|---|---|---|-------------|---------------|---|---|--|
| | Mo | asurad | Data | | iiposite | innage | Calculate | d Rosults |
| Label Mean | Max | Min | Back | Noise SD | Noise Type | Mean SNR | Normal- ized | Max Uni- SNR formity |
| N 1,562 | 3,031 | 622 | -0.5 | 4.86 | NEMA | 227.3 | 104.8 | 441.1 34.1% |
| A 1,562 | 3,036 | 623 | 9.4 | 2.26 | Air | 452.9 | 208.9 | 880.3 34.1% |
| | | Δ | nalvsis (| of Unco | mhined | Images | | |
| Me | asured I | Data | | | | C | alculated | Results |
| Ch Mean 1 590 2 495 3 554 4 415 5 377 6 671 | Max 1,794 1,377 1,755 1,281 1,165 2,361 | Noise SD 2.20 2.11 2.20 1.54 1.44 2.29 | Noise Type Air Air Air Air Air Air | | | Mean SNR 175.7 153.7 165.0 176.6 171.6 192.0 | % of Mean 92% 80% 86% 92% 89% 100% | Max % of Max 534.4 79% 427.7 63% 522.8 77% 545.1 81% 530.2 78% 675.6 100% |
| 0 0/1 2,301 2.23 AIP 10076 073.0 10076 Image: 10076 073.0 10076 073.0 10076 Image: 10076 Image: 10076 Image: 10076 | | | | | | | | |

| RF Coil Performane Coil: Neck Matrix Mfg.: Siemens Mfg. Date: | uation 1647 FOV 36 | Nx 256 | Ny 256 | BW 25.6 | Test Date: Model: Revision: SN: | 5/6/2008 08622677 1358 # of Channels 4 Thickness Gap 3 | |
|---|---|--|-------------|---------------|---|--|---|
| | | Analysis | s of Con | nposite | Image | | |
| M | easured | Data | | | - | Calculate | ed Results |
| Label Mean Max | Min | Back ground | Noise SD | Noise Type | Mear SNR | n Normal- ized | Max Uni- SNR formity |
| N 1,912 2,356 | 1,410 | 0.0 | 5.37 | NEMA | 251.8 | 3 224.0 | 310.3 74.9% |
| A 1,912 2,359 | 1,415 | 18.5 | 4.00 | Air | 313.2 | 2 278.7 | 386.5 75.0% |
| | A | nalysis | of Unco | mbined | Images | | |
| Measured | Data | _ | | | (| Calculated | Results |
| ChMeanMaxH1P8241,541H2P8531,683H3P9501,722H4P9401,813NE14575NE24572 | Noise SD 3.98 4.15 4.16 4.33 2.64 2.87 | Noise Type Air Air Air Air Air Air Air | | | Mean SNR 135.7 134.7 149.6 142.3 11.2 10.3 | % of Mean 91% 90% 100% 95% 7% 7% | Max % of SNR Max 253.7 92% 265.8 97% 271.3 99% 274.4 100% 18.6 7% 16.4 6% |
| NE2 45 72 2.87 Air 10.3 7% 16.4 6% The low signal in channels NE 1 & 2 is normal for this slice acquired in the superior portion of the head coil | | | | | | | |

| RF Coil Performance Evaluation Coil: Neck Matrix Test I Mfg.: Siemens Image: Siemens Image | Date: 5/6/2008 odel: 08622677 sion: | | | | | | |
|---|---|--|--|--|--|--|--|
| Analysis of Composite Image | | | | | | | |
| Measured Data Calcu | lated Results | | | | | | |
| Back Noise Noise Mean Norr Label Mean Max Min ground SD Type SNR ize | nal- Max Uni- ed SNR formitv | | | | | | |
| N 1,165 1,427 805 0.9 5.56 NEMA 148.2 131 | .8 181.5 72.1% | | | | | | |
| A 1,165 1,426 801 18.4 4.00 Air 190.9 169 | 0.8 233.6 71.9% | | | | | | |
| | | | | | | | |
| Analysis of Uncombined Images | | | | | | | |
| Measured Data Calcula | ted Results | | | | | | |
| Noise Noise Mean % of | Max % of | | | | | | |
| Ch Mean Max SD Type SNR Mean | | | | | | | |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - 140.7 78% | | | | | | |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | 144.3 77% | | | | | | |
| H4P 469 1,010 4.34 Air 70.8 68% | 152.5 81% | | | | | | |
| NE1 285 466 2.68 Air 69.7 67% | 113.9 61% | | | | | | |
| NE2 462 832 2.90 Air 104.4 100% | 188.0 100% | | | | | | |
| | | | | | | | |
| $\underbrace{NE2}_{V} \underbrace{V2}_{V} \underbrace{V2} \underbrace{V2}_{V} \underbrace{V2}_{V} \underbrace{V2}_{V} $ | | | | | | | |

| RF Coil Performar | nce Evaluation | | | | | | |
|--|--|----------------------------|---------------|---|---|--|-------------|
| Coile Shouldon Annoy Longo | | | | | Test Date: | 5/6/2008 | |
| Mfg.: Invivo | | | | | Model: <u>8023020</u> | | 0 |
| Mig. <u>11/1/2008</u> Coil ID: 1655 | | | | | SN: | | 1 |
| Phantom: Small Bottle | | | | | • | # of Channels | s 4 |
| Sequence TR | E Plane FOV | Nv | Nv | BW | NSA TH | nicknoss Ga | |
| SE 300 | $\begin{array}{c c} \hline \\ \hline $ | 256 | 256 | 25.6 | | 3 - | |
| | | | | | | | |
| | | | | | | | |
| | Analysis | s of Comp | osite Im | age | | | |
| | Aleasured Data | N! | N - ! | Maan | | d Results | ni |
| Label Mean Max | Min ground | SD | Noise Type | SNR | ized | SNR for | ni- mity |
| N 1,314 1,868 | <u>583</u> -0.3 | 2.14 N | | 434.2 | 556.3 | 617.3 47. 637.9 47 | 6% |
| A 1,514 1,007 | | 1.72 | | 440.3 | 374.3 | 037.3 47. | 0 /0 |
| | Analysis | of Uncom | bined Im | ages | -11-41 | D | |
| Measure | | - | <u> </u> | Gi Mean | % of | Results Max % | of |
| Ch Mean Max | SD Type | 1 | | SNR | Mean | SNR M | ax |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | 1.75 Air 1.87 Air | - | | 296.5 | 40% | $ 181.6 34 \\ 533.7 10 $ | 0% |
| 3 584 985 | 2.00 Air | | | 191.3 | 65% | 322.7 60 |)% |
| 4 719 892 | 1.69 Air | J | | 278.8 | 94% | 345.9 65 | 5% |
| Mean: 1314 ROI M: - ROIsd: 2 583 668 ROI Area: 87.05 | 0.28 Mean: 1314 .14 583 | Air M: 6.76 Airsd: 1.92 | ROI ROI | Channe n: 313 Ai 163 163 Area: 87.05 n: 584 Ai 242 Area: 87.05 Channe | el 1 r M: 2.80 rsd: 1.75 S5 ROI A rsd: 2.00 ROI A ROI A ROI A | Channel 2 846 Air M: 3.05 Airsd: 1.87 0320 01523 (1523 rea: 87.05 719 Air M: 2.68 Airsd: 1.69 0392 (1523 | |

| RF Coil Performance Evaluation | | | | | | | |
|--|---|--|--|--|--|--|--|
| | Test Date: <u>5/6/2008</u> | | | | | | |
| Coil: Shoulder Array - Large | Model: <u>8623626</u> | | | | | | |
| Mfg.: Invivo | Revision: | | | | | | |
| Mrg. Date: 1/1/2008 Coil ID: 1655 | SN: <u>S001221</u> | | | | | | |
| Phantom: Small Bottle | # of Channels | | | | | | |
| SequenceTRTEPlaneFOVNxNyBWNSAThicknessGapSE30020C3625625625613- | | | | | | | |
| Coil Mode: <u>SHL</u> | | | | | | | |
| Analysis of Composi | te Image | | | | | | |
| Measured Data | Calculated Results | | | | | | |
| Back Noise N | e Mean Normal- Max Uni- SNR ized SNR formity | | | | | | |
| N 935 2,145 357 0.1 1.17 NEM | A 565.2 502.8 1296.6 28.5% | | | | | | |
| A 935 2,146 357 3.9 1.13 Air | 542.2 482.4 1244.5 28.5% | | | | | | |
| Analysis of Uncombine | ed Images | | | | | | |
| Measured Data | Calculated Results | | | | | | |
| Noise Noise Ch Mean Max SD Type | Mean % of Max % of | | | | | | |
| 1 390 947 0.95 Air | Sink Mean Sink Max 269.0 78% 653.2 56% | | | | | | |
| 2 521 1,760 0.99 Air | 344.9 100% 1165.0 100% 252.1 70% 441.0 20% | | | | | | |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | Channel 1 Channel 2 | | | | | | |
| | Mean: 390 Air M: 1.63 Mean: 521 Air M: 1.74 Airsd: 0.95 Airsd: 0.99 | | | | | | |
| Mean: 935 ROI M: 0.11 Mean: 935 Air M: 3.93 | 760 | | | | | | |
| ROISa: 1.17 Airsa: 1.13 | 9947 | | | | | | |
| O2145 O2146 | | | | | | | |
| | ROI Area: 104.03 ROI Area: 104.03 | | | | | | |
| O357 O357 Mean: 436 Air M: 1.91 Mean: 424 Air M: 1.54 Airsd: 1.05 Airsd: 0.92 | | | | | | | |
| Airsa: 1.05 Airsa: 0.92 | | | | | | | |
| BOLArea: 104.03 | | | | | | | |
| ROI Area: 104.03 ROI Area: 104.03 | | | | | | | |
| Composites | ROI Area: 104.03 ROI Area: 104.03 | | | | | | |
| | Channel 3 Channel 4 | | | | | | |
| | | | | | | | |

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| <u>RF Coll Performance Evaluation</u> | Test Date: 5/6/2008 |
|---|--|
| Coil: Shoulder Array - Small | Model: 8622719 |
| Mfg.: Invivo | Revision: |
| Mfg. Date: 1/1/2008 Coil ID: 1656 | SN: S001210 |
| Phantom: Small Bottle | # of Channels |
| Sequence TR TE Plane FOV Ny I | Av BW NSA Thickness Gan |
| $\begin{bmatrix} SE & 300 & 20 & T & 30 & 256 \end{bmatrix}$ | 1 3 - |
| | |
| Coil Mode: SHS | |
| Analysis of Composi | te Image |
| Measured Data | Calculated Results |
| Back Noise Nois Label Mean Max Min ground SD Typ | e Mean Normal- Max Uni- e SNR ized SNR formity |
| N 1,430 2,131 554 -0.1 2.09 NEM | IA 483.9 613.3 721.1 41.3% |
| A 1,430 2,131 554 7.4 2.09 Air | 448.4 568.3 668.2 41.3% |
| Analysis of Uncombin | ed Images |
| Measured Data | Calculated Results |
| Noise Noise Ch Moan Max SD Type | Mean % of Max % of |
| $\begin{bmatrix} 1 \\ 412 \\ 737 \\ 1.82 \\ \hline \text{Air} \end{bmatrix}$ | SNR Mean SNR Max 148.3 56% 265.4 51% |
| 2 798 1,559 1.98 Air | 264.1 100% 516.0 100% |
| 3 725 1,173 2.08 Air | 228.4 86% 369.6 72% |
| 4 800 1,057 2.03 Air | |
| | |
| | |
| | |
| | Channel 1 Channel 2 Mean: 412 Air M: 2.92 Mean: 798 Air M: 3.27 |
| Mean: 1430 ROI M: -0.09 Mean: 1430 Air M: 7.35 | Airsd: 1.82 Airsd: 1.98 |
| ROIsd: 2.09 Airsd: 2.09 | |
| | 172 9-37 285 9 559 |
| | |
| 0554 02131 0554 02131 | ROI Area: 86.61 ROI Area: 86.61 |
| | Mean: 725 Air M: 3.42 Mean: 800 Air M: 3.33 Airsd: 2.08 Airsd: 2.03 |
| | |
| | 216 01 957 |
| HOTATEA: 60.61 HOTATEA: 66.61 | |
| Composites | |
| | Channel 3 Channel 4 |
| | |

| PE Coil Porformanco Evaluation | | | | | | | |
|---|--|--|--|--|--|--|--|
| <u>RF Coll Fertormance Evaluation</u> | Test Date: 5/6/2008 | | | | | | |
| Coil: Shoulder Array - Small | Model: 8622719 | | | | | | |
| Mfg.: Invivo | Revision: | | | | | | |
| Mfg. Date: 1/1/2008 Coil ID: 1656 | SN: S001210 | | | | | | |
| Phantom: Small Bottle # of Channels 4 | | | | | | | |
| SequenceTRTEPlaneFOVNxSE30020C36256 | NyBWNSAThicknessGap25625.0613- | | | | | | |
| Coil Mode: SHS | | | | | | | |
| Analysis of Comp | osite Image | | | | | | |
| Measured Data | Calculated Results | | | | | | |
| Back Noise I Label Mean Max Min ground SD | Noise Mean Normal- Max Uni- Type SNR ized SNR formity | | | | | | |
| N 1,138 2,805 429 -0.5 1.29 N | KEMA 623.9 549.1 1537.8 26.5% | | | | | | |
| A 1,139 2,806 430 4.4 1.25 | Air 597.1 525.6 1471.0 26.6% | | | | | | |
| Analysis of Uncom | bined Images | | | | | | |
| Measured Data | Calculated Results | | | | | | |
| Noise Noise Ch Mean May SD Type | Mean % of Max % of | | | | | | |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | SNR Mean SNR Max 292.2 78% 689.4 55% | | | | | | |
| 2 617 2,080 1.08 Air | 374.4 100% 1262.1 100% | | | | | | |
| 3 505 965 1.09 Air 4 593 1.714 1.07 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 $ | | | | | | | |

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| RF Coil Performance Evaluation Coil: Spine Matrix Image: Spine Matrix <th< th=""><th>Test Date: 5/6/2008 Model: 08622743 Revision: </th></th<> | Test Date: 5/6/2008 Model: 08622743 Revision: |
|---|--|
| | oito Imogo |
| Analysis of Compo | Site image |
| Back Noise No | Dise Mean Normal- Max Uni- |
| Label Mean Max Min ground SD Ty | /pe SNR ized SNR formity |
| N 607 1,130 182 -0.1 1.94 NE A 667 1,132 182 4.1 1.71 A | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ |
| Analysis of Uncombi | ned Images |
| Measured Data | Calculated Results |
| Noise Noise | Mean % of Max % of |
| $\begin{bmatrix} 1 \\ 421 \\ 1,129 \\ 1.65 \\ \text{Air} \end{bmatrix}$ | SNR Mean SNR Max 167.2 100% 448.4 100% |
| 2 394 1,059 1.72 Air | 150.1 90% 403.5 90% |
| Mean: 667 ROI M: -0.07 ROIsd: 1.94 01130 01132 | ean: 421 Air M: 2.58 Mean: 394 Air M: 2.73 Airsd: 1.65 20 01129 01059 |
| O182 O182 ROI Area: 428.31 ROI Area: 428.31 ROI Area: 428.31 | 014rea: 428.31 ROI Area: 428.31 |
| Composites | Channel 1 Channel 2 |
| | |

| RF Coil Performance Evaluation Coil: Spine Matrix Mfg.: Siemens Mfg. Date: Coil ID: Phantom: Long Cylinder Sequence TR TE SE 300 20 S 50 256 Coil Mode: SP34 | Test Date: 5/6/2008 Model: 08622743 Revision: |
|--|---|
| Analysis of Compos | ite Image |
| Measured Data | Calculated Results |
| Back Noise No Labol Moan Max Min ground SD Ty | se Mean Normal- Max Uni- |
| N 688 1,190 186 0.0 1.69 NEI | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ |
| A 688 1,190 186 4.3 1.75 A | ir 257.6 118.8 445.6 27.0% |
| Analysis of Uncombin | ned Images |
| Measured Data | Calculated Results |
| Ch Mean Max Noise SD Noise Type 3 438 1,183 1.72 Air 4 404 1,069 1.75 Air | Mean % of Mean Max % of SNR Max 166.9 100% 450.7 100% 151.3 91% 400.3 89% |
| Mean: 688 ROI M: 0.03 ROIsd: 1.69 Mean: 688 Air M: 4.28 Airsd: 1.75 Ø 1190 Ø 1190 Ø 1190 Ø 1190 Ø 100 Area: 428.33 Ø 100 Ø 100 Scomposites B 100 B 100 B 100 | m: 438Air M: 2.75Airsd: 1.72Mean: 404Airsd: 1.72Jone: 428.33Channel 1Channel 2 |
| | |

| RF Coil Performance Evaluation Test Date: 5/6/2008 | • |
|---|----------------|
| Coil: Spine Matrix Model: 0862274 | 3 |
| Mfg.: <u>Siemens</u> Revision: | |
| Mfg. Date: Coil ID: 1648 SN: 1351 | |
| Phantom: Long Cylinder # of Channels | |
| SequenceTRTEPlaneFOVNxNyBWNSAThicknessGaSE30020S5025625625613- | р |
| Coil Mode: SP56 | |
| Analysis of Composite Image | |
| Measured Data Calculated Results | |
| Back Noise Noise Mean Normal- Max Ur Label Mean Max Min ground SD Type SNR ized SNR forr | ni- nity |
| N 737 1,233 199 0.5 1.84 NEMA 283.3 130.6 473.9 27.4 | 8% |
| A 736 1,232 199 4.5 1.80 Air 267.9 123.6 448.5 27.3 | 8% |
| Analysis of Uncombined Images | |
| Measured Data Calculated Results | |
| Ch Mean Max SD Noise Type Mean % of SNR Max % 5 450 1,226 1.73 Air 170.5 100% 464.4 100 6 451 1.195 1.88 Air 157.2 92% 416.5 90 | of ax)% |
| | 70 |
| | |
| | |
| | |
| Mean: 737 BOI M: 0.47 Mean: 736 Air M: 4.50 Mean: 450 Air M: 2.76 Mean: 451 Air M | .3.04 |
| ROIsd: 1.84 Airsd: 1.80 Airsd: 1.73 Airsd: 1.73 | : 1.88 |
| 01232 01232 | |
| | |
| | 5 |
| | |
| ROI Area: 427.42 ROI Area: 427.42 ROI Area: 427.42 ROI Area: 427.42 | |
| Composites Channel 1 Channel 2 | |
| | |
| | |
| | |

| RF Coil Performance Evaluation Coil: Spine Matrix Test Date: 5/6/20 Mfg.: Siemens Model: 08622 Mfg. Date: Coil ID: 1648 SN: 135 Phantom: Long Cylinder # of Channel | 108 743 1 els 24 |
|---|----------------------------|
| SequenceTRTEPlaneFOVNxNyBWNSAThicknessOSE 300 20 S 50 256 256 25.6 1 3 | <u>-</u> |
| Coil Mode: SP78 | |
| Analysis of Composite Image | |
| Measured Data Calculated Results | |
| Back Noise Noise Mean Normal- Max Label Mean Max Min ground SD Type SNR ized SNR fo | Uni- ormity |
| N 726 1,257 197 0.2 2.14 NEMA 239.9 110.6 415.4 2 | 7.1% |
| A 726 1,255 197 4.5 1.80 Air 264.3 121.9 456.9 2 | 7.1% |
| Analysis of Uncombined Images | |
| Measured Data Calculated Results | |
| Ch Mean Max SD Noise Type Mean % of SNR Max Max 7 456 1,250 1.81 Air 165.1 100% 452.6 1 8 426 1.153 1.70 Air 156.0 94% 422.1 1 | % of <u>Max</u> 100% |
| 0 420 1,155 1.79 Air 150.0 94% 422.1 | 9370 |
| Mean: 726 ROI M: 0.22 Mean: 726 Air M: 4.48 Mean: 456 Air M: 2.92 Mean: 426 Air M: 4.48 ROIsd: 2.14 Airsd: 1.80 Airsd: 1.81 Airsd: 1.81 Airsd: 1.81 Airsd: 1.81 | r M: 2.87 rsd: 1.79 |
| Image: Note of the second s | 153 |
| | |

| RF Coil P | erforman | ce Eval | uation | | 157 | | Test Date | : 5/0 | 5/2008 | |
|---|------------------|-------------|--------------|---------------|-------------------------------|---------------------|-------------------------------------|------------------------|----------------------------|--|
| Coil: Wrist Coil | | | | | | | | : 86 | 8625621 | |
| Mfg.: Invivo Revision: | | | | | | | | | | |
| Mfg. Date: 9/1/2007 Coil ID: 1653 SN: \$1056 | | | | | | | | 1056 | | |
| Phantom: Wrist Phantom # of Channels 8 | | | | | | | | | | |
| Sequence TR TE Plane FOV Nx Ny BW NSA Thickness Gap | | | | | | | | | | |
| SE 300 20 T 12 256 256 1 3 - | | | | | | | | | | |
| Coil Mode: W | 'R8 | | | | | | | | | |
| _ | | | Analysis | — s of Con | nposite | Image | | | | |
| | М | easured | Data | | - | | Calculate | ed Result | S | |
| Label Moa | n May | Min | Back | Noise | Noise | - Me | ean Normal- | Max | Uni- formity | |
| N 1,78 | 3 2,208 | 1,467 | 0.5 | 4.04 | NEMA | 31 | 2.1 2499.0 | 386.5 | 79.8% | |
| A 1,78 | 3 2,208 | 1,467 | 22.0 | 4.36 | Air | 26 | 68.0 2145.6 | 331.9 | 79.8% | |
| | | Δ | nalvsis | of Unco | mbined | Images | | | | |
| | Measured | Data | y | | | <u>g</u> | Calculated | Results | | |
| Ch Maa | n May | Noise | Noise | - | | Mean | % of | Max | % of | |
| | n Max 5 1,535 | 3.95 | Air | 1 | | 105.3 | <u>Mean</u> 99% | 254.7 | Max 96% | |
| 2 705 | 1,562 | 4.34 | Air | | | 106.4 | 100% | 235.9 | 89% | |
| 3 501 | 1,422 | 3.75 | Air | | | 87.5 | 82% | 248.5 | 93% | |
| 4 680 | 1,378 | 4.44 | Air | | | 100.4 | 94% | 203.4 | 76% | |
| 5 410 | 1,562 | 3.96 | Air | | | 68.8 | 65% | 258.5 | 97% | |
| 6 491 | 1,495 | 3.68 | Air | | | 87.4 | 82% | 266.2 | 100% | |
| 7 450 | 1,220 | 3.45 | Air | - | | 86.6 | 81% | 231.7 | 87% | |
| | 1,154 | 3.29 | | | | 81.9 | //% | 229.9 | 86% | |
| Channel # 5 (phy | sical channel # | 8) seems to | be about 20 | 1% lower th | an compar | able chanr | els. Not signific | ant enough t | o require | |
| service. | | | | | | | | | | |
| | | | | Cha | nnel 1 | Channel | 2 Channel | 3 Chan | nel 1 | |
| | | | | Mean: 635 | Air M: 7.00 M | ean: 705 Air | M: 7.73 Mean: 501 Ai | M: 6.64 Mean: 680 | Air M: 7.93 | |
| Mean: 1783 | ROI M: 0.53 Mea | an: 1783 | Air M: 22.03 | | Airsd: 3.95 | Air | sd: 4.34 Ai | rsd: 3.75 | Airsd: 4.44 | |
| | NOISU. 4.04 | | Allsu. 4.30 | O 1555 | 221 | | 278 | 22 | 01575 | |
| | | | | | | 0.1552 | 0166 | 346 | | |
| O1467 O1467 ROLArea: 24.61 ROLArea: 24.61 ROLArea: 24.61 ROLArea: 24.61 | | | | | | | | | | |
| 02208 | | 02208 | | Mean: 416 | Air M: 7.03 Me Airsd: 3.96 | ean: 491 Air Air | M: 6.51 Mean: 456 Ai sd: 3.68 Ai | Mean: 411 rsd: 3.45 | Air M: 5.76 Airsd: 3.29 | |
| | | | | | 70 | | | | | |
| ROI Area: 24.61 | RO | Area: 24.61 | | OTER | | B171 | 9 185 | 01220 D1154 | 138 | |
| Composites BOLAres: 24.61 BOLAres: 24.61 BOLAres: 24.61 BOLAres: 24.61 | | | | | | | | | | |
| | | | | Cha | nnel 5 | Channel | 6 Channel | 7 Chan | inel 8 | |
| RF Coil Performance Evaluation Coil Wrist Coil Mfg.: Invivo Mfg. Date: 9/1/2007 Coil ID: 1653 Phantom: Wrist Phantom Sequence TR TE Plane FOV | Nx Ny | Test Date: 5/6/2008 Model: 8625621 Revision: | | | | | | | | |
|---|---|--|--|--|--|--|--|--|--|--|
| SE 300 20 S 20 | 256 256 | 5 25.6 1 3 - | | | | | | | | |
| Coil Mode: <u>WR8</u> Analysis of Composite Image | | | | | | | | | | |
| Measured Data Calculated Results | | | | | | | | | | |
| Back Label Mean Max Min ground | Noise Noise SD Type | Mean Normal- Max Uni- SNR ized SNR formity | | | | | | | | |
| N 1,198 1,726 306 -0.1 | 1.27 NEMA | <u>667.1</u> <u>1922.8</u> <u>961.1</u> <u>30.1%</u> | | | | | | | | |
| A 1,198 1,727 306 4.7 | 1.26 Air | 623.1 1795.9 898.2 30.1% | | | | | | | | |
| Analysis of Uncombined Images | | | | | | | | | | |
| | - | Calculated Results | | | | | | | | |
| Ch Mean Max SD Type | | SNR Mean SNR Max | | | | | | | | |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | | | | |
| 3 283 437 0.91 Air | | 203.8 60% 314.7 42% | | | | | | | | |
| 4 347 648 0.95 Air | | 239.4 70% 447.0 60% | | | | | | | | |
| 5 433 757 1.03 Air | | 275.5 80% 481.6 64% 224.5 224.5 224.5 224.5 | | | | | | | | |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | | | | |
| 7 240 360 0.87 Air 8 323 605 0.98 Air | | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | | | | |
| | | | | | | | | | | |
| | Channel 1 | Channel 2 Channel 3 Channel 4 | | | | | | | | |
| Mean: 1198 ROI M: -0.13 Mean: 1198 Air M: 4.70 ROIsd: 1.27 Airsd: 1.26 | Airsd: 1.12 Airsd: 1.12 1282 E.49 ROI Area: 44.37 | Airsd: 1.03 Airsd: 1.03 Airsd: 0.91 Airsd: 0.91 Airsd: 0.91 Airsd: 0.95 Airsd: 0.95 B48 B01 Area: 44.37 R01 Area: 44.37 R01 Area: 44.37 | | | | | | | | |
| ROI Area: 44.37 ROI Scomposites | Mean: 433 Air M: 1.39 Aired: 1.03 Aired: 1.03 07/57 07/57 107 ROI Area: 44.37 I | Mean: 587 Air M: 1.62 Mean: 246 Air M: 1.07 Mean: 323 Air M: 1.28 Airsd: 1.15 Airsd: 0.87 Airsd: 0.87 Airsd: 0.98 Airsd: 0.98 C1250 C360 C360 C360 C360 C360 ROI Area: 44.37 ROI Area: 44.37 ROI Area: 44.37 ROI Area: 44.37 ROI Area: 44.37 | | | | | | | | |
| | Channel 5 | Channel 6 Channel 7 Channel 8 | | | | | | | | |

| RF Co | oil Perf | orman | ce Eval | <u>uation</u> | | 15 | | | Toot Doto | 5/ | 6/2008 |
|----------------------------------|----------------|-------------|-------------|----------------------------|-------------------------|------------------------------|--------------|-------------------------|------------------------|------------------------------|----------------------------|
| Coil: | Wrist (| Coil | | | | (0) | | | Model: | 80 | 525621 |
| Mfg.: | Invivo | | | | | | × | - | Revision | : | |
| Mfg. Date: | 9/1/2007 | | Coil ID: | 1653 | | | - | | SN | : | 51056 |
| Phantom: | Wrist Ph | antom | | | | | | | | # of Cha | annels <u>8</u> |
| Seque | nce TF | | Plane | FOV | Nx | Ny | | BW | NSA T | hickness | Gap |
| SE | 30 | 0 20 | C | 20 | 256 | 256 | | 25.6 | 1 | 3 | - |
| Coil Mod | de: WR8 | | | | | | | | | | |
| Analysis of Composite Image | | | | | | | | | | | |
| Measured Data Calculated Results | | | | | | | | | | | |
| Label | Mean | Max | Min | Back ground | Noise SD | Noise Type | | Mean SNR | Normal- ized | Max SNR | Uni- formity |
| N | 1,214 | 1,896 | 362 | 0.0 | 0.96 | NEMA | [| 894.3 | 2577.7 | 1396.7 | 32.1% |
| A | 1,214 | 1,895 | 362 | 4.8 | 1.26 | Air | | 631.4 | 1819.8 | 985.6 | 32.1% |
| Analysis of Uncombined Images | | | | | | | | | | | |
| | M | easured | Data | | _ | | | Са | lculated | Results | |
| Ch | Mean | Max | Noise SD | Noise Type | | | Me Sl | an NR M | % of Mean | Max SNR | % of Max |
| 1 | 327 | 775 | 0.98 | Air |] | | 21 | 8.7 | 74% | 518.2 | 62% |
| 2 | 475 | 1,086 | 1.05 | Air | | | 29 | 6.4 1 | 00% | 677.8 | 82% |
| 3 | 415 | 790 | 1.12 | Air | | | 24 | 2.8 | 82% | 462.2 | 56% |
| 4 | 343 | 1,070 | 0.09 | Air | | | 25 | 7.8 | 0370 | /0/.0 830.5 | 95% |
| 6 | 286 | 890 | 1.04 | | - | | 18 | 0.2 | 61% | 560.8 | 68% |
| 7 | 388 | 1.066 | 0.99 | Air | | | 25 | 6.8 | 87% | 705.6 | 85% |
| 8 | 436 | 794 | 1.14 | Air | | | 25 | 0.6 | 85% | 456.4 | 55% |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | 0 | | ~ | | 0 | | |
| | | | | | Cha Mean: 327 | Air M: 1.29 M | Char | Air M: 1.43 | Mean: 415 Air | 3 Chai M: 1.56 Mean: 343 | Air M: 1.13 |
| Mean: 121 | I4 ROI BOIs | M: 0.01 Mea | n: 1214 | Air M: 4.76 Airsd: 1.26 | | Airso: 0.98 | | Airsd: 1.05 | Airs | 6:1.12 | Airsa: 0.89 |
| | | | | | | 07/75 | 010 | 36 | 0790 | | 01070 |
| | | | | | | 12 | | | 270 | | 41 |
| | O 1898 | | 0 1895 | | ROI Area: 92. | 70 R0 | DI Area: 92. | 70 F | ROI Area: 92.70 | ROI Area: S | 92.70 |
| | | | | | Meán: 376 | Air M: 1.20 M Airsd: 0.92 | an: 286 | Air M: 1.42 Airsd: 1.04 | viean: 388 Air Airs | m: 1.32 Mean: 436 d: 0.99 | Air M: 1.60 Airsd: 1.14 |
| | 0362 | | L3 | 32 | $\langle \cdot \rangle$ | | 0 88 | •) | 9 | 066 | 0784 |
| ROI Area: | 92.70 | ROI | Area: 92.70 | | | 01166 | | | | | |
| | (| Composite | s | | ROI Area: 92 | 15 70 B(| DI Area; 92 | 37 70 | ROI Area: 92.70 | ROI Area: 5 | 92.70 |
| | | | | | Cha | nnel 5 | Char | nnel 6 | Channel | 7 Chai | nnel 8 |

Appendix A: Magnet Homogeneity Field Maps Siemens Site Siemens Verio 3T - 3 central planes Measured May 6, 2008 wih 32 cm water filled sphere



| Axial | | | | | | | | | |
|----------|-------|-----|-------|------|--------|-------|--|--|--|
| DIAMETER | R MIN | MAX | RANGE | PPM | MEAN | STDEV | | | |
| 10 | .1 | 6.9 | 6.7 | 0.05 | 0.43 | 1.43 | | | |
| 15 | -5.4 | 6.9 | 12.3 | 0.10 | 2.03 | 2.81 | | | |
| 20 | -14.0 | 6.9 | 20.9 | 0.16 | -1.16 | 4.86 | | | |
| 25 | -27.2 | 6.9 | 34.1 | 0.27 | -5.32 | 7.64 | | | |
| 28 | -36.0 | 6.9 | 42.9 | 0.34 | -8.35 | 9.72 | | | |
| 30 | -42.6 | 6.9 | 49.5 | 0.39 | -10.53 | 11.20 | | | |
| | | | | | | | | | |

Superior





| Coronal | | | | | | | | |
|---------|-------|-------|-------|------|-------|-------|--|--|
| DIAMETE | R MIN | MAX | RANGE | PPM | MEAN | STDEV | | |
| 10 | -11.6 | 8.4 | 20.1 | 0.16 | -2.31 | 3.99 | | |
| 15 | -22.1 | 20.8 | 42.9 | 0.34 | -1.41 | 8.99 | | |
| 20 | -39.7 | 40.7 | 80.5 | 0.63 | -0.45 | 15.62 | | |
| 25 | -60.8 | 86.9 | 147.7 | 1.16 | 0.17 | 24.68 | | |
| 28 | -76.6 | 126.8 | 203.5 | 1.59 | -0.82 | 31.16 | | |
| 30 | -86.6 | 127.1 | 213.7 | 1.67 | -2.95 | 32.90 | | |

| Sagittal | | | | | | | | | | |
|----------|-------|-------|-------|------|-------|-------|--|--|--|--|
| DIAMETER | MIN | MAX | RANGE | PPM | MEAN | STDEV | | | | |
| 10 | -7.7 | 5.5 | 13.3 | 0.10 | -4.03 | 2.82 | | | | |
| 15 | -8.5 | 19.7 | 28.3 | 0.22 | -0.98 | 5.91 | | | | |
| 20 | -10.2 | 47.7 | 58.0 | 0.45 | 2.98 | 10.11 | | | | |
| 25 | -34.1 | 103.1 | 137.2 | 1.07 | 7.19 | 17.09 | | | | |
| 28 | -34.1 | 138.6 | 172.7 | 1.35 | 9.19 | 20.76 | | | | |
| 30 | -34.1 | 138.6 | 172.7 | 1.35 | 9.06 | 20.70 | | | | |

Appendix A: Magnet Homogeneity Field Maps Siemens Site Siemens Verio 3T - 3 central planes Measured May 6, 2008 wih 24 cm oil filled sphere



| Axial | | | | | | | | | |
|----------|-------|-----|-------|------|-------|-------|--|--|--|
| DIAMETER | MIN | MAX | RANGE | PPM | MEAN | STDEV | | | |
| 10 | -1.4 | 1.7 | 3.1 | 0.02 | 0.17 | 0.57 | | | |
| 15 | -1.7 | 3.5 | 5.2 | 0.04 | 0.23 | 0.66 | | | |
| 20 - | -14.2 | 7.2 | 21.5 | 0.17 | 0.07 | 1.80 | | | |
| 23 - | -53.5 | 7.6 | 61.1 | 0.48 | -0.76 | 4.50 | | | |







| Coronal | | | | | | | | | |
|----------|-------|------|-------|------|-------|-------|--|--|--|
| DIAMETER | MIN | MAX | RANGE | PPM | MEAN | STDEV | | | |
| 10 | -2.2 | 1.6 | 3.8 | 0.03 | 0.13 | 0.59 | | | |
| 15 | -5.7 | 2.5 | 8.2 | 0.06 | -0.14 | 1.13 | | | |
| 20 | -26.9 | 9.8 | 36.7 | 0.29 | -0.66 | 3.88 | | | |
| 23 | -49.0 | 15.2 | 64.2 | 0.50 | -2.00 | 7.67 | | | |

| Sagittal | | | | | | | | |
|----------|-------|------|-------|------|-------|-------|--|--|
| DIAMETER | MIN | MAX | RANGE | PPM | MEAN | STDEV | | |
| 10 | -2.6 | 2.7 | 5.3 | 0.04 | 0.10 | 0.83 | | |
| 15 | -10.0 | 5.7 | 15.8 | 0.12 | -0.06 | 2.02 | | |
| 20 | -38.9 | 20.4 | 59.3 | 0.46 | -0.67 | 5.75 | | |
| 23 | -58.4 | 29.7 | 88.2 | 0.69 | -2.02 | 10.08 | | |

Appendix A: Magnet Homogeneity Field Maps Siemens Site Siemens Verio 3T Measured May 6, 2008 wih 32 cm water filled sphere







Appendix A: Magnet Homogeneity Field Maps Siemens Site Siemens Verio 3T Measured May 6, 2008 wih 24 cm oil filled sphere This sphere has susceptibility defect.







Appendix A: Magnet Homogeneity Field Maps Siemens Site Siemens Verio 3T Measured May 12, 2008 wih 32 cm water filled sphere







Appendix A: Magnet Homogeneity Field Maps Siemens Site Siemens Verio 3T Measured May 12, 2008 wih borrowed 24 cm oil filled sphere







Water Phantom

Axial Field Plots







Oil Phantom

Axial Field Plots







Spin Echo : Lo SAR TR/TE = 500/12BW = 25.6 KHz nex = 1 Scan time: 2:09





Spin Echo : Fast RF TR/TE = 500/12BW = 25.6 KHz nex = 1 Scan time: 2:09



T1 FLASH Flip angle = 70° TR/TE = 100/3.3BW = 40.96 KHz nex = 4Scan time: 1:43



Coil Used: Head Matrix

| | Sagittal Locator | | | | | |
|----|---|-----------------|-----------------|-----------------|------------------|--------------------|
| 1 | Length of phantom, end to en | nd (mn 148± 2) | 14 | 7.5 | = | calculated field |
| | | (SE 500/20) | (SE 2000/20) | (SE 2000/80) | (Site T1) | (Site T2) |
| | Slice Location #1 | ACR T1 #7 | ACR PD #8 | ACR T2 #8 | Site T1 Flash 19 | Site T2 17 |
| 2 | Resolution | 0.9 | 1.0 | 1.0 | 0.9 | 0.9 |
| 3 | (1.10, 1.00, 0.90 mm) | 0.9 | 1.0 | 1.0 | 0.9 | 0.9 |
| 4 | Slice Thickness Top | 47.7 | 49.2 | 38.6 | 60.4 | 67.9 |
| 5 | (fwhm in mm) Bottom | 49.8 | 48.8 | 37.8 | 67.9 | 69.1 |
| 6 | Calculated value 5.0±0.7 | 4.87 | 4.90 | 3.82 | 6.39 | 6.85 |
| 7 | Wedge (mm) = + = - | -0.4 | -0.4 | -0.4 | 0.1 | -1.0 |
| 8 | Diamator (mm) $(100 2)$ | 190.5 | 190.0 | 190.0 | 190.2 | 189.9 |
| 9 | $\Theta = \Theta_{11} \Theta_{12} \Theta_{$ | 188.4 | 188.3 | 188.3 | 188.4 | 188.5 |
| | Slice Location #5 |] | | | | |
| 10 | \square | 190.7 | 190.2 | 190.1 | 190.3 | 190.0 |
| 11 | Diameter (mm) (190+2) Θ | 188.4 | 188.3 | 188.3 | 188.5 | 188.5 |
| 12 | | 188.1 | 188.3 | 188.3 | 188.5 | 188.5 |
| 13 | Í Ó | 189.8 | 189.7 | 189.6 | 189.8 | 189.8 |
| | Slice Location #7 | 1 | | • | | |
| 14 | Signal Big ROI | 2499 | 2592 | 1081 | 1963 | 1748 |
| 15 | (mean only) High | 2713 | 2799 | 1177 | 2298 | 1937 |
| 16 | Low | 2066 | 2170 | 884 | 1584 | 1435 |
| 17 | Uniformity (>87.5%) | 86.5% | 87.3% | 85.8% | 81.6% | 85.1% |
| 18 | Background Noise Top | 17.0 ± 6.70 | 10.3 ± 2.83 | 8.8 ± 2.58 | 5.6 ± 3.28 | 12.7 ± 3.76 |
| 19 | Bottom | 18.2 ± 6.21 | 12.5 ± 3.67 | 10.3 ± 2.91 | 6.9 ± 3.77 | 14.2 ± 4.07 |
| 20 | (mean ±std dev) Left | 20.2 ± 7.56 | 13.9 ± 4.27 | 10.8 ± 3.15 | 7.3 ± 5.29 | $0.0 \ \pm \ 0.00$ |
| 21 | Right | 23.6 ± 8.37 | 13.2 ± 3.50 | 11.4 ± 3.21 | 8.8 ± 4.29 | 0.0 ± 0.00 |
| 22 | Ghosting Ratio (<2.5%) | 0.2% | 0.1% | 0.1% | 0.1% | 0.8% |
| 23 | SNR (no spec) | 387 | 798 | 394 | 557 | ? |
| | Low Con Detectability |] | | | | |
| 24 | Slice Location #8 1.4% | 10 | 10 | 10 | 9 | 1 |
| 25 | Slice Location #9 2.5% | 10 | 10 | 10 | 10 | 9 |
| 26 | Slice Location #10 3.6% | 10 | 10 | 10 | 10 | 10 |
| 27 | Slice Location #11 5.1% | 10 | 10 | 10 | 10 | 10 |
| 28 | Total # of Spokes (>=9) | 40 | 40 | 40 | 39 | 30 |
| | Slice Location #11 | | | | | |
| 29 | Wedge (mm) = + = - | -2.0 | -2.1 | -2.1 | -1.8 | -3.2 |
| 30 | Slice Position Error | -1.7 | -1.7 | -1.8 | -1.8 | -2.1 |

This page lists the images obtained using the first pass attempt at ACR submission sequences. The ACR T2 would fail slice thickness (too thin). The reviewer would then look at the Site T2 which would also fail (too thick.) The site T1 would also fail image uniformity (but it would not be measured in a normal submission.)

Verio

Test Date:

5/6/2008

Sequence parameters

Coil Used:Head Matrix

56

| Test Date: | 5/6/2008 |
|------------|----------|
| rest Dute. | 0/0/2000 |

Test ID **272**

| 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 #7 | SE Prescan 2D Dist. | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 19.2 | 2:09 |
| | | | | | | | | | | | | | |
| ACR PD #8 | Dual SE Prescan 2D Dist. | 2000 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 19.2 | 8:32 |
| | | | | | | | | | | | | | |
| ACR T2 #8 | Dual SE Prescan 2D Dist. | 2000 | 80 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 19.2 | 8:32 |
| | | | | | | | | | | | | | |
| Site T1 Flash 19 | FLASH 70° | 350 | 2.58 | 24 | 1 | 11 | 5 | 5 | 1 | 320 | 288 | 51.2 | 1:41 |
| | | | | | _ | | | | | | | | |
| Site T2 17 | TSE(19) | 3800 | 98 | 24 | .8 | 11 | 5 | 5 | 1 | 320 | 288 | 32.0 | 0:46 |

Magnet ID: 212

Coil ID: 1646

TestID: 272

Verio

ACR T17



ACR PD 8



ACR T2 8



Flash 19



Site T2 17



Coil Used: Head Matrix

| | Sagittal Locator | | | | | |
|----|--|-----------------|-----------------|-----------------|-----------------|------------------|
| 1 | Length of phantom, end to er | nd (mn 148± 2) | 14 | 7.5 | = | calculated field |
| | | (SE 500/20) | (SE 2000/20) | (SE 2000/80) | (Site T1) | (Site T2) |
| | Slice Location #1 | No Filters #10 | Prescan Only #9 | Prescan+2D #13 | B1 Only #11 | B1 + 2D #15 |
| 2 | Resolution | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 3 | (1.10, 1.00, 0.90 mm) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 4 | Slice Thickness Top | 49.3 | 48.8 | 49.0 | 49.7 | 50.3 |
| 5 | (fwhm in mm) Bottom | 50.0 | 49.7 | 50.0 | 50.0 | 47.0 |
| 6 | Calculated value 5.0±0.7 | 4.96 | 4.92 | 4.95 | 4.98 | 4.86 |
| 7 | Wedge (mm) = + = - | -0.3 | -0.4 | -0.4 | -0.3 | -0.4 |
| 8 | Diameter (mm) (100+2) \square | 190.6 | 190.6 | 190.0 | 190.6 | 190.0 |
| 9 | $\Theta = \Theta_{1}^{\text{Diameter (IIIII)}} \Theta$ | 188.9 | 188.9 | 188.3 | 188.9 | 188.3 |
| | Slice Location #5 |] | | | | |
| 10 | Φ | 192.0 | 192.0 | 190.1 | 192.0 | 190.1 |
| 11 | Diameter (mm) (190+2) Θ | 190.0 | 190.0 | 188.3 | 190.0 | 188.3 |
| 12 | \oslash | 190.1 | 190.1 | 188.3 | 190.1 | 188.3 |
| 13 | × × | 191.5 | 191.5 | 189.7 | 191.5 | 189.7 |
| | Slice Location #7 | 1 | - | | | |
| 14 | Signal Big ROI | 2332 | 2472 | 2500 | 2235 | 2280 |
| 15 | (mean only) High | 2931 | 2684 | 2710 | 2427 | 2485 |
| 16 | Low | 1950 | 2038 | 2071 | 2041 | 2061 |
| 17 | Uniformity (>87.5%) | 79.9% | 86.3% | 86.6% | 91.4% | 90.7% |
| 18 | Background Noise Top | 14.9 ± 3.73 | 11.3 ± 3.14 | 11.5 ± 3.03 | 17.2 ± 4.41 | 17.9 ± 4.39 |
| 19 | Bottom | 15.7 ± 4.03 | 12.9 ± 3.55 | 13.7 ± 3.59 | 15.8 ± 4.09 | 16.5 ± 4.10 |
| 20 | (mean ±std dev) Left | 16.0 ± 4.00 | 14.5 ± 4.72 | 13.9 ± 4.44 | 14.6 ± 4.06 | 15.1 ± 4.27 |
| 21 | Right | 18.0 ± 4.55 | 15.4 ± 4.63 | 16.6 ± 4.37 | 15.7 ± 4.17 | 15.4 ± 3.64 |
| 22 | Ghosting Ratio (<2.5%) | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| 23 | SNR (no spec) | 601 | 739 | 755 | 543 | 576 |
| | Low Con Detectability |] | | | | |
| 24 | Slice Location #8 1.4% | 10 | 10 | 10 | 10 | 10 |
| 25 | Slice Location #9 2.5% | 10 | 10 | 10 | 10 | 10 |
| 26 | Slice Location #10 3.6% | 10 | 10 | 10 | 10 | 10 |
| 27 | Slice Location #11 5.1% | 10 | 10 | 10 | 10 | 10 |
| 28 | Total # of Spokes (>=9) | 40 | 40 | 40 | 40 | 40 |
| | Slice Location #11 | 1 | | | | |
| 29 | Wedge (mm) = + = - | -2.0 | -2.0 | -2.1 | -2.0 | -2.1 |
| 30 | Slice Position Error | -1.7 | -1.6 | -1.7 | -1.7 | -1.7 |

All of these images were different versions of the ACR T1 sequence with different filter options. The unfiltered image would definitely fail image uniformity. All of the other sequences pass easily. The X gradient (L/R) while within spec is not as well calibrated as the Y gradient. (This is unusual for Siemens systems.)

Verio

Test Date:

5/6/2008

Sequence parameters

Coil Used:Head Matrix

63

| 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) |
|--------------------------|----------------------------|------------|------------|-------------|--------------------------|------------------------|------------------------|--------------|--------------|----------------|-----------------|------------------------|---------------------------|
| No Filters #10 | SE - No filters | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:09 |
| | | | | | | | | | | | | | |
| Prescan Only #9 | SE Prescan No 2D | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:09 |
| | | | | | | | | | | | | | |
| Prescan +2D #13 | SE Prescan w/ 2D | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:09 |
| | | | - | | | | | | - | | | | |
| B1 Only #11 | SE - B1 no 2D | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:09 |
| | | | | | - | | | | | | | | |
| B1 + 2D | SE - B1 | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:09 |

Magnet ID: 212

#15

w/2D

Coil ID: 1646

TestID: 273

Test Date:

Test ID 273

5/6/2008

Verio

ACR T1 10 B1 Filtered No 2D



ACR T1 9 - Prescan - No 2D



ACR T1 13



ACR T1 11 - B1 filtered No 2D



ACR T1 15



Coil Used: Head Matrix

| | Sagittal Locator | | | | | | | | | |
|----|--------------------------------|-----------------|-----------------|-----------------|-----------------|------------------|--|--|--|--|
| 1 | Length of phantom, end to er | d (mn 148± 2) | 14 | 7.7 | = | calculated field | | | | |
| | | (SE 500/20) | (SE 2000/20) | (SE 2000/80) | (Site T1) | (Site T2) | | | | |
| | Slice Location #1 | B1 Weak B3 | B1 Medium B4 | B1 Strong B5 | PD Fast RF B6 | T2 Fast RF B6 | | | | |
| 2 | Resolution | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | | | |
| 3 | (1.10, 1.00, 0.90 mm) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | | | |
| 4 | Slice Thickness Top | 49.6 | 50.3 | 50.0 | 59.5 | 50.1 | | | | |
| 5 | (fwhm in mm) Bottom | 44.8 | 44.9 | 46.0 | 50.8 | 43.8 | | | | |
| 6 | Calculated value 5.0±0.7 | 4.71 | 4.75 | 4.79 | 5.48 | 4.67 | | | | |
| 7 | Wedge (mm) = + = - | -0.1 | -0.1 | -0.0 | 0.2 | 0.2 | | | | |
| 8 | $D_{interactor}(mm)$ (100+2) | 190.5 | 190.5 | 190.5 | 190.0 | 190.0 | | | | |
| 9 | Θ | 188.4 | 188.4 | 188.4 | 188.4 | 188.3 | | | | |
| | Slice Location #5 | | | | | | | | | |
| 10 | Φ | 190.5 | 190.5 | 190.5 | 190.0 | 190.0 | | | | |
| 11 | Diameter (mm) (190+2) Θ | 188.5 | 188.5 | 188.5 | 188.4 | 188.4 | | | | |
| 12 | (1) | 188.1 | 188.1 | 188.1 | 188.3 | 188.3 | | | | |
| 13 | Ő | 189.7 | 189.7 | 189.7 | 189.7 | 189.6 | | | | |
| | Slice Location #7 | | | | | | | | | |
| 14 | Signal Big ROI | 2309 | 2219 | 2128 | 2709 | 1245 | | | | |
| 15 | (mean only) High | 2658 | 2436 | 2239 | 2929 | 1347 | | | | |
| 16 | Low | 1942 | 2010 | 1995 | 2387 | 1066 | | | | |
| 17 | Uniformity (>87.5%) | 84.4% | 90.4% | 94.2% | 89.8% | 88.4% | | | | |
| 18 | Rackground Noise Top | 21.7 ± 7.88 | 22.2 ± 7.93 | 23.4 ± 8.36 | 11.9 ± 3.42 | 10.5 ± 2.92 | | | | |
| 19 | Bottom | 20.4 ± 6.20 | 20.9 ± 6.09 | 20.9 ± 6.20 | 13.8 ± 3.72 | 11.8 ± 3.12 | | | | |
| 20 | (mean ±std dev) Left | 18.7 ± 7.55 | 19.5 ± 8.09 | 21.0 ± 8.64 | 15.8 ± 4.43 | 13.9 ± 3.68 | | | | |
| 21 | Right | 20.9 ± 7.26 | 20.4 ± 7.58 | 18.7 ± 7.17 | 15.8 ± 4.87 | 13.2 ± 3.44 | | | | |
| 22 | Ghosting Ratio (<2.5%) | 0.1% | 0.1% | 0.1% | 0.1% | 0.2% | | | | |
| 23 | SNR (no spec) | 328 | 317 | 292 | 759 | 412 | | | | |
| | Low Con Detectability | | | | | | | | | |
| 24 | Slice Location #8 1 4% | 10 | 10 | 10 | 10 | 0 | | | | |
| 25 | Slice Location #9 2.5% | 10 | 10 | 10 | 10 | 10 | | | | |
| 26 | Slice Location #10 3.6% | 10 | 10 | 10 | 10 | 10 | | | | |
| 27 | Slice Location #11 5.1% | 10 | 10 | 10 | 10 | 10 | | | | |
| 28 | Total # of Spokes (-0) | 40 | 10 | 10 | 10 | 20 | | | | |
| | 10tal # 01 5pokes (~->) | 40 | 40 | 40 | 40 | 33 | | | | |
| | Slice Location #11 | | | | | I | | | | |
| 29 | vveage (mm) = + r = - | -1.9 | -2.0 | -1.9 | -1.3 | -1.3 | | | | |
| 30 | Slice Position Error | -1.9 | -1.9 | -1.9 | -1.5 | -1.5 | | | | |

The first 3 sequences are evaluating the new image normalization feature known as B1 filtering. Using either weak or medium filtering provides adequate results. I wouldn't use Strong.

Verio

5/6/2008

Test Date:

Sequence parameters

Coil Used:Head Matrix

70

| 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) |
|--------------------------|-----------------------------|------------|------------|-------------|--------------------------|------------------------|------------------------|--------------|--------------|----------------|-----------------|------------------------|---------------------------|
| B1 Weak B3 | SE - B1 filter Weak | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:09 |
| B1 Medium B4 | SE - B1 filter Medium | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:09 |
| B1 Strong B5 | SE - B1 filter Strong | 500 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:09 |
| PD Fast RF B6 | Dual SE Fast RF | 2000 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 8:32 |
| T2 Fast RF B6 | Dual SE Fast RF | 2000 | 80 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 15.6 | 8:32 |

Magnet ID: 212

Coil ID: 1646

TestID: 274

Test Date: 5/6/2008

Test ID 274

Verio

ACR T1 Weak



ACR T1 Medium


ACR T1 Strong



ACR PD Fast



ACR T2 Fast



Coil Used: Head Matrix

| | Sagittal Locator | | | | | | |
|----|--|-----------------|-----------------|-----------------|-----------------|-----------|--|
| 1 | Length of phantom, end to en | d (mn 148±2) | 14 | 7.7 | = calculated fi | | |
| | | (SE 500/20) | (SE 2000/20) | (SE 2000/80) | (Site T1) | (Site T2) | |
| | Slice Location #1 | PD Normal B7 | T2 Normal B7 | PD Lo SAR B8 | T2 Lo SAR B8 | | |
| 2 | Resolution | 1.0 | 1.0 | 1.0 | 1.0 | | |
| 3 | (1.10, 1.00, 0.90 mm) | 1.0 | 1.0 | 1.0 | 1.0 | | |
| 4 | Slice Thickness Top | 53.1 | 39.0 | 61.3 | 48.8 | | |
| 5 | (fwhm in mm) Bottom | 44.6 | 34.2 | 52.7 | 43.4 | | |
| 6 | Calculated value 5.0±0.7 | 4.85 | 3.64 | 5.66 | 4.59 | | |
| 7 | Wedge (mm) = + = - | -0.1 | 0.0 | -0.1 | -0.0 | | |
| 8 | Diameter(mm)(100/2) | 190.0 | 190.0 | 190.0 | 190.0 | | |
| 9 | Diameter (iiiii) (190 ± 2) Θ | 188.4 | 188.3 | 188.4 | 188.4 | | |
| | Slice Location #5 | | | | | | |
| 10 | Π | 190.0 | 190.0 | 190.0 | 190.0 | | |
| 11 | Diameter (mm) (190+2) Θ | 188.3 | 188.3 | 188.3 | 188.3 | | |
| 12 | | 188.3 | 188.3 | 188.3 | 188.3 | | |
| 13 | Ŏ | 189.6 | 189.6 | 189.6 | 189.6 | | |
| | Slice Location #7 | 1 | | | | | |
| 14 | Signal Big ROI | 2531 | 1055 | 2743 | 1260 | | |
| 15 | (mean only) High | 2734 | 1148 | 2977 | 1377 | | |
| 16 | Low | 2130 | 861 | 2238 | 956 | | |
| 17 | Uniformity (>87.5%) | 87.6% | 85.7% | 85.8% | 82.0% | | |
| 18 | Background Noise Top | 11.7 ± 3.05 | 10.6 ± 2.93 | 11.7 ± 3.23 | 10.3 ± 2.84 | ± | |
| 19 | Bottom | 13.5 ± 3.72 | 11.5 ± 3.26 | 13.6 ± 3.68 | 11.6 ± 3.15 | ± | |
| 20 | (mean ±std dev) Left | 17.5 ± 4.48 | 12.5 ± 3.30 | 14.2 ± 4.08 | 13.5 ± 3.65 | ± | |
| 21 | Right | 15.5 ± 4.18 | 13.0 ± 3.52 | 16.5 ± 4.46 | 13.5 ± 3.73 | ± | |
| 22 | Ghosting Ratio (<2.5%) | 0.2% | 0.2% | 0.1% | 0.2% | | |
| 23 | SNR (no spec) | 748 | 341 | 794 | 421 | | |
| | Low Con Detectability | | | • | | | |
| 24 | Slice Location #8 1.4% | 10 | 9 | 10 | 10 | | |
| 25 | Slice Location #9 2.5% | 10 | 10 | 10 | 10 | | |
| 26 | Slice Location #10 3.6% | 10 | 10 | 10 | 10 | | |
| 27 | Slice Location #11 5.1% | 10 | 10 | 10 | 10 | | |
| 28 | Total # of Spokes (>=9) | 40 | 39 | 40 | 40 | | |
| | Slice Location #11 |] | | | | | |
| 29 | Wedge (mm) = + = - | -1.9 | -1.8 | -1.9 | -1.8 | | |
| 30 | Slice Position Error | -1.8 | -1.8 | -1.8 | -1.8 | | |

These images represent the use of a Low SAR and Normal RF pulses for the Dual Echo ACR T2 sequence. Note that the Normal RF pulse has a slice thickness of only 3.64 mm (should be 5). (Noticeably lower SNR.). This sequence would definitely fail the ACR submission process while the Lo SAR would fail the image uniformity... Looks like you need to use Fast RF with the ACR T2.

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Verio

Test Date:

5/6/2008

Sequence parameters

Coil Used:Head Matrix

77

| 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) |
|--------------------------|----------------------------|------------|------------|-------------|--------------------------|------------------------|------------------------|--------------|--------------|----------------|-----------------|------------------------|---------------------------|
| PD Normal B7 | Dual SE | 2000 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 8:32 |
| T2 Normal B7 | Dual SE | 2000 | 80 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 8:32 |
| | | | | | | | | | | | | | |
| PD Lo SAR B8 | Dual SE | 2000 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 8:32 |
| | | | | | | | | | | | | | |
| T2 Lo SAR B8 | Dual SE | 2000 | 80 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 8:32 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

Magnet ID: 212

Coil ID: 1646

TestID: 275

Test Date: 5/6/2008

Test ID **275**

Verio

ACR PD Normal



ACR T2 Normal



ACR PD Lo SAR



ACR T2 Lo SAR



Coil Used: Head Matrix

| | Sagittal Locator | | | | | |
|----|---------------------------|--------------------|-----------------|-----------------|-----------------|------------------|
| 1 | Length of phantom, end to | end (mn 148±2) | 14 | 7.7 | = | calculated field |
| | | (SE 500/20) | (SE 2000/20) | (SE 2000/80) | (Site T1) | (Site T2) |
| | Slice Location #1 | PD LoSAR B1 13 | T2 LoSAR B1 13 | Site T1 B11 | Site T1 B14 | |
| 2 | Resolution | 1.0 | 1.0 | 1.1 | 1.0 | |
| 3 | (1.10, 1.00, 0.90 mm) | 1.0 | 1.0 | 1.0 | 1.0 | |
| 4 | Slice Thickness To | p 62.2 | 49.4 | 51.4 | 51.9 | |
| 5 | (fwhm in mm) Botto | n 53.2 | 43.8 | 44.3 | 47.1 | |
| 6 | Calculated value 5.0±0.7 | 5.74 | 4.64 | 4.76 | 4.94 | |
| 7 | Wedge (mm) = + = | -0.1 | -0.0 | -0.0 | 0.1 | |
| 8 | Diamotor (mm) $(190+2)$ |) 190.0 | 190.0 | 190.4 | 190.0 | |
| 9 | |) 188.4 | 188.3 | 188.5 | 188.4 | |
| | Slice Location #5 | | | | | |
| 10 | (| D 190.1 | 190.1 | 190.4 | 190.0 | |
| 11 | Diameter (mm) (190+2) | 188.3 | 188.3 | 188.5 | 188.4 | |
| 12 | (| 188.3 | 188.2 | 188.4 | 188.3 | |
| 13 |] (| 189.7 | 189.6 | 189.6 | 189.6 | |
| | Slice Location #7 | | | | | |
| 14 | Signal Big RC | PI 2445 | 1081 | 2665 | 2569 | |
| 15 | (mean only) Hig | h 2671 | 1174 | 2886 | 2787 | |
| 16 | Lo | v 2217 | 957 | 2200 | 2122 | |
| 17 | Uniformity (>87.5% | 90.7% | 89.8% | 86.5% | 86.5% | |
| 18 | Background Noise To | p 16.7 ± 4.19 | 15.7 ± 3.9 | 14.3 ± 4.70 | $10.3~\pm~2.82$ | ± |
| 19 | Botto | m 17.0 \pm 4.09 | 15.1 ± 3.9 | 16.4 ± 5.16 | 11.9 ± 3.31 | ± |
| 20 | (mean ±std dev) Le | ft 17.7 \pm 4.02 | 13.1 ± 3.56 | 17.3 ± 6.75 | $16.9~\pm~3.97$ | ± |
| 21 | Rig | nt 15.5 ± 3.86 | 13.4 ± 3.5 | 19.4 ± 5.98 | 15.1 ± 4.33 | ± |
| 22 | Ghosting Ratio (<2.5%) | 0.0% | 0.2% | 0.1% | 0.2% | |
| 23 | SNR (no spec) | 621 | 306 | 541 | 838 | |
| | Low Con Detectability | | | | | |
| 24 | Slice Location #8 1.4 | % 10 | 9 | 10 | 10 | |
| 25 | Slice Location #9 2.5 | % 10 | 9 | 10 | 10 | |
| 26 | Slice Location #10 3.6 | 76 10 | 10 | 10 | 10 | |
| 27 | Slice Location #11 5.1 | % 10 | 10 | 10 | 10 | |
| 28 | Total # of Spokes (>=9) | 40 | 38 | 40 | 40 | |
| | Slice Location #11 | | | | | |
| 29 | Wedge (mm) = + = | -1.9 | -1.9 | -1.6 | -1.7 | |
| 30 | Slice Position Error | -1.8 | -1.8 | -1.6 | -1.8 | |

This site T1 sequence failed high contrast resolution. With a 320x256 matrix this should NOT have happened. I can't explain...

Verio

5/6/2008

Test Date:

Sequence parameters

Coil Used:Head Matrix

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| 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) |
|--------------------------|----------------------------|------------|------------|-------------|--------------------------|------------------------|------------------------|--------------|--------------|----------------|-----------------|------------------------|---------------------------|
| PD LoSAR B1 13 | Dual SE | 2000 | 20 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 8:32 |
| T2 LoSAR B1 13 | Dual SE | 2000 | 80 | 25 | 1 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 8:32 |
| Site T1 B11 | SE Prescan & 2D | 500 | 10 | 25 | 1 | 11 | 5 | 5 | 1 | 320 | 256 | 25.6 | 3:12 |
| Site T1 B14 | SE Prescan & 2D | 400 | 10 | 24 | 1.5 | 11 | 5 | 5 | 1 | 256 | 256 | 25.6 | 2:34 |
| | | | | | | | | | | | | | |

Magnet ID: 212

Coil ID: 1646

TestID: 277

Test Date: 5/6/2008

Test ID _____277

ACR PD Lo SAR B1 13



ACR T2 Lo SAR B1 13



Site T1 B11



Site T1 B14



Coil Used: Head Matrix

| | Sagittal Locator | | | | | | |
|----|-----------------------------|-------------------|-----------------|-----------------|-------------------|-----------|--|
| 1 | Length of phantom, end to e | nd (mn 148± 2) | 14 | 7.7 | = calculated fiel | | |
| | | (SE 500/20) | (SE 2000/20) | (SE 2000/80) | (Site T1) | (Site T2) | |
| | Slice Location #1 | TSE(19) LoSAR | TSE(19) Fast | TSE(16) | T2 Blade | | |
| 2 | Resolution | 0.9 | 0.9 | 1.0 | 0.9 | | |
| 3 | (1.10, 1.00, 0.90 mm) | 0.9 | 0.9 | 1.0 | 0.9 | | |
| 4 | Slice Thickness Top | 71.1 | 70.2 | 71.4 | 68.7 | | |
| 5 | (fwhm in mm) Bottom | n 67.5 | 63.5 | 63.4 | 58.1 | | |
| 6 | Calculated value 5.0±0.7 | 6.93 | 6.67 | 6.72 | 6.30 | | |
| 7 | Wedge (mm) = + = - | -0.3 | 0.2 | 0.1 | 0.0 | | |
| 8 | \square | 190.0 | 190.0 | 190.0 | 190.6 | | |
| 9 | \ominus | 188.7 | 188.6 | 188.5 | 188.0 | | |
| | Slice Location #5 | 7 | - | | - | | |
| 10 | ſ |) 190.0 | 190.0 | 190.1 | 190.7 | | |
| 11 | Diamotor (mm) (190+2) | 188.7 | 188.6 | 188.5 | 188.8 | | |
| 12 | | 188.5 | 188.4 | 188.4 | 188.5 | | |
| 13 | 6 | 189.8 | 189.8 | 189.8 | 189.9 | | |
| | Slice Location #7 | 7 | | | | | |
| 14 | Signal Big RO | 1714 | 1666 | 1732 | 1387 | | |
| 15 | (mean only) High | 1904 | 1808 | 1883 | 1522 | | |
| 16 | Low | 1368 | 1431 | 1483 | 1166 | | |
| 17 | Uniformity (>87.5%) | 83.6% | 88.4% | 88.1% | 86.8% | | |
| 18 | Packaround Naiso To | 28.4 ± 2.85 | 8.5 ± 2.84 | 6.9 ± 2.28 | 18.4 ± 12.7 | ± | |
| 19 | Background Noise Botton | 19.3 ± 2.99 | 9.4 ± 2.99 | 7.7 ± 2.73 | 14.5 ± 10.1 | ± | |
| 20 | (mean ±std dev) Lef | t 16.0 ± 5.79 | 21.0 ± 8.02 | 16.8 ± 5.61 | 18.4 ± 10.5 | ± | |
| 21 | Righ | t 21.1 ± 8.76 | 26.4 ± 9.22 | 13.5 ± 6.36 | 20.9 ± 11.9 | ± | |
| 22 | Ghosting Ratio (<2.5%) | 0.6% | 0.9% | 0.5% | 0.2% | | |
| 23 | SNR (no spec) | 587 | 572 | 691 | 124 | | |
| | Low Con Detectobility | 7 | 0,12 | 0,1 | 121 | | |
| 24 | Slice Location #8 1 407 | | 7 | 0 | 2 | | |
| 24 | $\frac{1.4\%}{1.4\%}$ | 5 | / | 9 | 3 | | |
| 20 | Slice Location #9 2.5% | 9 | 10 | 10 | 8 | | |
| 20 | Since Location #10 3.6% | | 10 | 10 | <u> </u> | | |
| 21 | Since Location #11 5.1% | | 10 | 10 | 10 | | |
| 28 | 1 otal # of Spokes (>=9) | 34 | 31 | 39 | 30 | | |
| | Slice Location #11 |] | | | | | |
| 29 | Wedge (mm) = + = - | -2.6 | -1.9 | -1.7 | -1.9 | | |
| 30 | Slice Position Error | -2.3 | -2.1 | -1.9 | -2.0 | | |

Ghosting of the LoSAR version of the TSE(19) sequence made the low contrast detection difficult in slice #8. The measured slice profile is excessive for ALL of these T2 sequences. Fortunately, the ACR T2 will pass ACR requirements so the Site T2 will not be evaluated for slice thickness.

Verio

Test Date:

5/6/2008

Sequence parameters

Coil Used:Head Matrix

Test Date: 5/6/2008

Test ID **278**

| 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) |
|--------------------------|----------------------------|------------|------------|-------------|--------------------------|------------------------|------------------------|--------------|--------------|----------------|-----------------|------------------------|---------------------------|
| TSE(19) LoSAR | TSE(19) Lo SAR | 4000 | 98 | 24 | 1 | 11 | 5 | 5 | 2 | 320 | 288 | 32.0 | 2:09 |
| TSE(19) Fast | TSE(19) Fast RF | 4000 | 100 | 24 | 1 | 11 | 5 | 5 | 2 | 320 | 288 | 32.0 | 2:09 |
| 1 451 | Tustili | | | | | | | | | | | | |
| TSE(16) | TSE(16) Fast RF | 4000 | 97 | 24 | 1 | 11 | 5 | 5 | 2 | 256 | 256 | 25.6 | 2:08 |
| | | | | | I | | | | | | | | 'I |
| T2 Blade | TSE BLADE (35) | 5860 | 118 | 24 | 1 | 11 | 5 | 5 | 1 | 320 | 320 | 58.4 | |
| r | | | 1 | 1 | 1 | | | r | r | | | | 1 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | .[|

Magnet ID: 212

Coil ID: 1646

TestID: 278

Verio

Site T2 Lo SAR



Site T2 Fast



Site T2 TSE(16)



Site T2 Blade



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 25.73KHz (200 Hz/pixel). 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 pre or post Normalization).

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.