AbstractID: 6368 Title: Diagnostic Medical Physics Characterization of a High Field MR Scanner using a State of the Art MR Head Coil.

Purpose: To discuss design characteristics of state of the art “multi-element” coil technology and performance testing of 3.0T MR imager.

Method and Materials: All tests were conducted on a Siemens Trio 3.0T imager using a 12 element head coil. ACR accreditation phantom and manufacturer provided phantoms were used. With the development of new imaging techniques such as parallel imaging, manufacturers have developed multi-element coils for advanced imaging capabilities. These receive only coils can be applied independently or subsets of elements can be used for a particular exam. The signals are combined by a hardware called Mode-Matrix. Multi-element coils, however, have associated problems such as drop in signal uniformity across the image. Further image distortion can be more significant with high performance gradients. Various processing filters are available to address these issues.
Our tests included:

a. Operational characterization of MR scanner at the coil element level.
b. Effect of image quality filters available.
c. Image quality in parallel imaging.

Results: ACR tests passed without the application of image quality filters except for uniformity, for which pre-scan normalize was used. Raw filter reduced truncation artifact with loss of spatial resolution. No major impact on SNR or distortion correction when using Elliptical and LargeFOV filters, respectively. With GRAPPA based parallel imaging, low contrast detectibility decreased along with slight reduction in maximum uniformity (around 99%, 98% and 96%) for acceleration factors of 2, 3 and 4, respectively. Number of spokes visible varied as 8, 5, and 0, for acceleration factors of 2, 3 and 4, respectively, in slice number 11 (ACR recommended phantom and slice prescription). Spatial resolution remained unchanged at 0.9 mm. Uncombined images showed individual coil elements with different SNR values while noise remained approximately constant.

Conclusion: System design and application-based testing of magnetic resonance imagers provide valuable insight into scanner capabilities.