Abstract ID: 17254 Title: The Need for Speed: A Technical and Clinical Primer for Parallel MR Imaging

Parallel imaging in magnetic resonance imaging (or "pMRI") is a family of techniques that uses the position of multiple RF coil elements to assist in spatial localization of signal, as opposed to phase-encoding techniques. Effectively, by reducing the number of required phase encodings to produce an image, pMRI can directly reduce the time for acquiring enough signal to produce an image in many circumstances, for a small penalty in the signal-to-noise ratio. This characteristic can be used in a variety of ways, including the reduction image acquisition time; the increase in image matrix for a given acquisition time; the mitigation of geometric distortion via quicker readout; or the reduction of SAR over the duration of a scan. Furthermore, pMRI can be implemented in virtually all existing sequences. The current use of pMRI is widespread as a result of these advantages, with a tendency toward increased utilization as the technology matures. In particular, the general increase in SAR associated with higher field strength scanners is an ongoing problem for abdominal imaging, and pMRI will continue to play a critical role in alleviating this problem.

To take advantage of all of benefits available through pMRI, the Medical Physicist must invest some energy to grasp the added complexity of this technique. pMRI is implemented in multiple "flavors", all of vary between vendors and scanner vintage. Although pMRI is frequently useful, it can cause problems within some imaging contexts (e.g., low SNR imaging, patients prone to movement). The Physicist and Technologist must appreciate a new set of artifacts particular to pMRI. Finally, an MR system that passes quality assurance tests for non parallel imaging on a given day may not have the necessary performance for pMRI. In 2005, the AAPM MRI subcommittee created Task Group #118 in order to provide guidelines to the Medical Physics community that address these concerns.

This presentation will provide a comprehensive overview of pMRI, introducing the theoretical framework behind the technique as well as practical usage strategies and other clinically-relevant information.

Educational Objectives:

1) To understand the basis of the pMRI technique, including the technical background and the required technology for implementation.
2) To gain insight into what clinical scenarios may gain benefit from the use of pMRI.
3) To recognize how pMRI may induce new artifacts or modify traditional artifacts.
4) To observe new directions of pMRI development and how this may change clinical practice in the next few years.