AbstractID: 5188 Title: Normalized Absolute Average Deviation: A New Method for Computing MR Image Uniformity

Purpose: To evaluate the new Normalized Absolute Average deviation (NAAD) MR image uniformity metric that is in the new IEC MRI performance standard. NAAD is SNR insensitive and applicable to volume, surface and phased array coils, unlike the current standard peak difference (PD) NEMA uniformity method (formerly called the integral uniformity measure).

Method and Materials: NAAD computes the average absolute deviation of each pixel within the measurement region of interest (MROI) from the mean of the MROI, normalized with respect to the MROI average. Data collected on a Philips Infinion 1.5T scanner (Highland Heights, OH) using a body coil transmitter, a quadrature head coil and a surface coil. Both NAAD and NEMA PD method uniformity computed. The head coil data was collected over a range of slice thicknesses and receiver bandwidths to vary the image SNR significantly and demonstrate NAAD SNR robustness. NAAD is demonstrated to work with a highly non-uniform surface coil by measuring a series of nested MROI, starting at the intense signal region near the coil and growing away to less intense signal regions.

Results: By using all pixels within the MROI NAAD is less SNR sensitive than the PD NEMA method. As SNR varies within the MROI, NAAD results are essentially constant while PD results vary significantly. NAAD produces surface coil uniformity measurements that are more realistic than PD uniformity measurements.

Conclusion: Our evaluation shows that NAAD is almost completely insensitive to SNR levels and can be used with all coils. This increased flexibility and robustness should be useful for the evaluating the new generation of surface coils optimized for MRI parallel imaging where coil spatial non-uniformities are used as a spatial encoding mechanism.

Conflict of Interest (only if applicable):
This work was supported by the authors' employers.