

## AbstractID: 11698 Title: Improving noise uniformity in volumetric CT via ROI-based weighting scheme in cone beam image reconstruction

**Purpose:** To present an ROI-based weighting scheme for cone beam image reconstruction to improve noise uniformity.

**Method and Materials:** In CT imaging, the noise in near-iso area is significantly larger than outer area. The root cause of this phenomenon is that the system transfer function of backprojection is reversely proportional to the iso-distance of pixels to be reconstructed. Though this phenomenon is intrinsic and has been observing since the advent of CT imaging, we address this undesired noise non-uniformity by extending the 3D weighted cone beam filtered backprojection (CB-FBP) algorithm that has been previously published by us. As demonstrated previously, the noise level of images reconstructed by the 3D weighted CB-FBP algorithm monotonically increases with the strength of 3D weighting. In addition to its dependence on view angle, orthogonal iso-distance and cone angle, the extended 3D weighting scheme integrates a dependence on the iso-distance of pixels to be reconstructed, i.e., the larger the iso-distance, the stronger the weighting. Consequently, the noise at near-iso area is reduced while that at outer area is increased.

**Results:** The helical body phantom (HBP) simulated by computer is employed to evaluate the performance of the extended 3D weighting scheme to improve noise uniformity, in which 128 detector rows corresponding to 8.46 degree cone angle is assumed. The results shows that, with the integration of dependence on the iso-distance of pixels to be reconstructed, the extended weighting scheme can improve noise uniformity by more than 30%, while its efficacy in suppressing artifacts caused by longitudinal truncation can be retained.

**Conclusion:** The intrinsic noise non-uniformity in CT images can be improved significantly using the ROI-based 3D weighting scheme proposed in this study. It is believed that, the extended 3D weighting scheme can find its applications in the pursuit of clinical excellence using volumetric CT as the modality.