**Purpose:**
We developed a cone-beam CT phantom for bone, metal, and beam hardening artifact evaluation. The two measures that can be tested are resolution and soft tissue discrimination.  We will use this phantom to investigate beam filtrations for artifact reduction, resolution, and soft tissue discrimination.

**Method and Materials:**
The cylindrical PMMA phantom designed for cone-beam CT (radius 12 cm, height 19 cm) is non-uniform in the z-direction. The phantom incorporates several different structures to test for bone and metal artifacts, as well as small object discrimination.  A human skull fragment placed at the center of the cylinder tests for bone artifacts.  Metal wires were placed horizontally and vertically through the cylinder.  BBs were inserted on-top of the skull fragment which were used for automatic object alignment.  Both of these metal components were also used to generate metal artifacts.  The phantom includes a soft tissue discrimination block with five different densities.  Two additional blocks are used to test for small object discrimination in the horizontal and vertical directions. 24 BBs were inserted into the rims of the PMMA cylinder (top and bottom of phantom) and were used for the geometric reconstruction of the image acquisition trajectory.

**Results:**
The phantom was scanned on a bench-top cone-beam CT system with three different k-edge filters, Er (0.127 mm), Er (0.254 mm), and Yb (0.254 mm).  The resulting artifacts in the reconstructed images were assessed qualitatively. The data were reconstructed, and artifacts from the bone, wires, and BBs were observed to vary depending on the specific beam filtration used.

**Conclusion:**
We have developed a cone beam CT phantom for artifact evaluation and imaging technique optimization. The potential imaging techniques that can benefit are breast, brain, and extremity cone beam CT. Future work: develop a task specific figure of merit for artifact evaluation.