



This 3D image was generated from a Monte Carlo Ray Trace simulation for an enclosed cylinder with black walls, no participating medium, and an aspect ratio of 5. The cylinder has been discretized into surface cells and control volumes using 6 radial divisions, 75 angular divisions, and 119 axial divisions. The photon bundles are traced through each control volume until they reach a bounding wall. Tracing through the control volumes is necessary when a participating medium is considered, which, can introduce scattering and absorption events in the control volumes. The left end plate of the cylinder is hot while the tube wall and right end plate are cold. The blue lines represent the trajectories of photon bundles and the red lines represent the cylinder walls. Only 450 photon bundles total were emitted (all from the hot left end plate) for the visualization; generally more than 10,000 photon bundles from each surface cell would be used to achieve highly accurate results.

The shape factor for the 2 end plates can be found analytically as 0.00980<sup>1</sup>. From inspection of the 3D image it can be seen that 4 photon bundles have reached the right end plate. The ratio of the number of photon bundles that are absorbed by the right end plate to the number of photon bundles that are emitted from the left end plate gives the shape factor from the simulation as 0.00889 (this value would be must closer to the analytical value if more photon bundles were used).

<sup>1</sup>Siegal, R., and Howell, J. R., 1992, *Thermal Radiation Heat Transfer*, 3rd Ed., Taylor and Francis, Washington, DC.