Ferroelectric nanoparticles, in particular barium titanate (BTO), exhibit bewildering behavior at the nanoscale. In sintered, fully dense devices, their permittivity drops off with decreasing grain size from a maximum at $\mu$m and larger grain diameters. However, when BTO particles remain unsintered and are studied in solution or some other matrix material, their permittivity has been shown (although these results remain controversial) to increase dramatically as a critical diameter is approached, after which the particles’ permittivity falls precipitously with further decreases in size. Even below this critical size where measured permittivity values of BTO nanoparticles are extremely low and approach zero, some BTO samples have been shown to have tetragonal crystallographic distortions at the local level. However, these tetragonal distortions are not maintained coherently across the entire width of the particle, resulting in a macroscopic crystal structure that resembles a distorted cubic lattice. To date, little is known about how synthesis methods, passivating ligands, and other physical properties of BTO nanoparticles affect their behavior at the nanoscale. We will present a study of several different sets of BTO nanoparticles including commercially available particles produced using hydrothermal routes and solution synthesized BTO produced in our laboratories. The particles cover a range of diameters from 10 to 500 nm and were studied using synchrotron based XRD analyzed using the PDF method, XAFS, and Raman spectroscopy. The results from high energy X-ray and Raman experiments will be compared to permittivity and other measured physical properties of these particles.