An empirical study of the performance of capillary and transmission diffractometers equipped with at least one parallel beam optical component has been completed. Osmic multilayer mirrors were used in the investigation for beam collimation on both the incident beam and diffracted beam sides. In addition, the use of position-sensitive detectors with parallel beam systems was investigated, as well as a preliminary look at the use of coupled parabolic multilayer and channel-cut crystals for powder diffraction.

Data from NIST standards will be presented, including the peak width vs. angle, the accuracy in lattice parameters, and the feasibility of Rietveld analysis using traditional profiles as well as fundamental parameters convolutions. The data will be described in the context of current “standard” instruments and the accuracy compared to that obtained on standard Bragg-Brentano systems with and without incident beam monochromators.

The instrumental geometries reported will focus on six permutations of one parabolic multilayer, two parabolic multilayers, one parabolic and one flat multilayer, and parabolic multilayers with a position-sensitive detector. Both capillary and reflection measurements were performed. Advantages and success with each instrumental configuration will be discussed.