FCC Crystals Channeling Rainbows - Determination of Crystal Structure

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Abstract. Ion channeling through thin single crystals produces characteristic angular distributions depending on the crystal lattice orientation. Analysis of these distributions enables identification of an unknown crystal's orientation and differentiation between crystallographic structures. The rainbow effect - manifested as distinct features in the angular distribution of channeled ions - offers efficient tool for probing crystallographic structures. Theoretical calculations were performed to analyze rainbow lines, specifically probing proton scattering patterns in Face-Centered Cubic (FCC) crystals in (111) orientations. Using a numerical approach, we obtained distinct scattering patterns for different FCC crystals across (111) crystallographic orientations enabling their characterization.