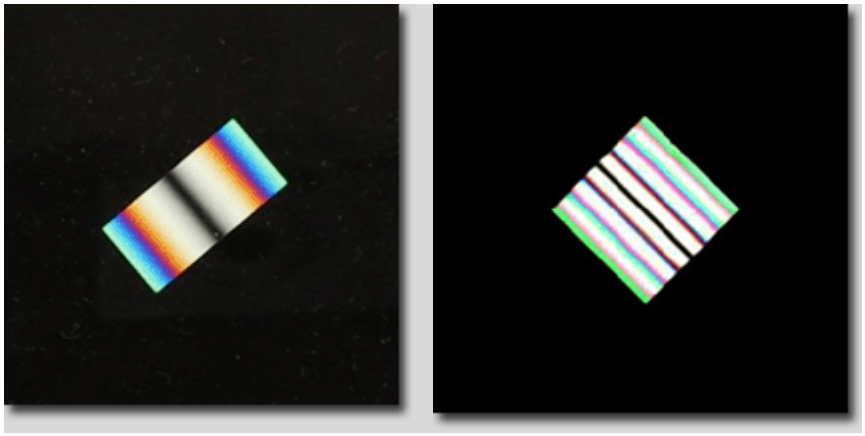
Birefringent Optics

Laser Optics has a long history of manufacturing high quality birefringent optics. Quartz waveplates and rotators are two of the best known components that we manufacture. In every case, manufacturing starts with selection of the highest quality optical-grade crystals available. Key to manufacture is in-process and final inspection Quality Assurance. Starting blanks are in-house x-ray oriented to 6 arc-minutes or better, and proper processing results in the highest quality products.

Birefringent materials exhibit refractive indexes that are direction dependent. In uniaxial crystals, there are two independent values for the refractive index. One refractive index, n_e, is obtained for light polarized along the crystalline optic axis direction and another refractive index, no, applies to light polarized perpendicular to that direction. Such birefringent optical materials include quartz, alpha-BBO, lithium niobate, ammonium dihydrogen phosphate (ADP), and potassium dihydrogen phosphate (KDP). We manufacture parts from all of these materials.

The basis of polarization-dependent components made from birefringent materials is that the different refractive indexes act independently on two polarization components, thereby, changing the properties of a transmitted beam. The change may be a complete separation of the beam into two spatially separate beams or a modification to the polarization state of the beam. These components employ one or more plates that are either plane parallel or wedged. In addition, the angle between the surface normal of the plate and the crystalline optic axis, denoted by the symbol , is an important design variable.

Birefringent optics are building blocks for a rich variety of applications. Components that rely on birefringence for their operation include **beam displacer**, **optical rotators**, **retardation plates** (or **waveplates**), **polarizers**, **depolarizers**, and **birefringent filters**.



Transmission of two different quartz Wollaston prisms, manufactured by Laser Optics, between crossed polarizers. Wedge angle of each of the prisms in the prism pair is 6.1 arcminutes on the left and 48 arcminutes on the right to an accuracy of +/- 6 arcsec. Overall wedge of each Wollaston prism is less than 10 arcseconds. Transmitted wavefront is better than λ/4 @ 633 nm.