Electro-optically controlled beam deflection and switching in domain-engineered $LiNbO_3$

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Abstract.

We report a novel switching method that occurs due to the electro-optic effect under an applied field when a beam incident on an interface between anti-parallel domains in a sample of $LiNbO_3$ subtends an angle greater than that required for total internal reflection (TIR). As the field increases, the induced index change present across the interface region acts to first deflect the beam towards the interface, then when the conditions are reached for TIR, to switch the beam with a contrast ratio that should be extremely high, due to the intrinsic nature of the TIR process.

We show results for wavelengths in the visible and at 1.5μm, where we obtain contrast ratios >20dB, deflection angles of 8° per kV applied, and an effective insensitivity to wavelength when compared to other devices such as Pockels cells. Experimental data is compared to a 2-d theoretical model for an incident Gaussian beam focussed at the interface, and good agreement is shown .