Beam deflection and T.I.R switching in domain-engineered LiNbO$_3$

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We have developed a novel electro-optically addressable deflector and switch in a sample of LiNbO$_3$. Patterning and electric-field poling produce areas of oppositely oriented domain regions separated by a sharp boundary. An external electric field applied to this boundary produces equal magnitude refractive index changes, $\Delta n$, of opposite sign between adjacent domain regions. For increasing $\Delta n$, the incident beam experiences deflection, until a critical value is reached when TIR will occur, thereby leading to complete switching of beam direction.

Such a device provides numerous advantages including ease of fabrication, high contrast ratios (TIR is 100% efficient), relatively low drive voltages, large deflections ($\sim 8^\circ$ for an applied field of 1000V), and a wavelength dependence that is superior to other electro-optic devices such as Pockels cells.

We will discuss results achieved for light of s and p polarisations, for wavelengths in the visible and the near I.R., with initial contrast ratios $>20\text{dB}$. 