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Depolarization factors in electro-optic crystals and their effects in sensing applications ANTHONY GARZARELLA, Naval Research Laboratory — Many applications involving electric field measurements require sensors that are compact and non-intrusive. This is especially true for tests inside small cavities, where conventional antennas and metallic probes are not only too bulky, but will also perturb the very fields they measure. Electro-optic (EO) sensors are ideal in such situations, because they are small and all-dielectric. Despite this, antennas are still predominantly used due to their higher sensitivity (2-3 orders of magnitude). Therefore to make EO sensors viable, sensitivity must be improved. The customary figure of merit (FOM) is the ratio of the EO coefficient to the dielectric constant. $LiNbO_3$ and similar crystals are preferred because of their large FOMs. In these crystals, the EO tensor is such that a transverse configuration must be used where the E-field and laser path are orthogonal. In this report, we demonstrate that sensors based on longitudinal crystals (E-field and laser collinear) can have greater sensitivities, even though their FOMs are substantially lower due to depolarization effects that enhance internal fields. Explicit examples are shown, and the practical limits in making EO sensors more competitive with conventional antennas will be discussed.

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