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High Sensitivity Electro-Optic Field Sensors ANTHONY GARZARELLA, DONG HO WU, TERENCE WIETING, SYED QADRI, Naval Research Lab, RANDAL HINTON, Temple University — The use of electro-optic (EO) crystals for electric field detection has recently gained considerable interest, due to their nonperturbative method of detecting both field amplitude and phase over a wide range of frequencies. One of the technical challenges facing this detection technique is to improve the detection sensitivity. Since the sensor responsivity is proportional to the EO coefficient of the crystal (r_{33}), utilizing materials with a large r_{33} values, such as $Sr_{0.75}Ba_{0.25}Nb_2O_6$ (SBN-75), is the most straightforward approach. However, it was found that in spite of its large EO coefficient, sensors utilizing SBN-75 ($r_{33}^{\exp t}$ ~700 pm/V) showed similar or weaker responsivities than sensors utilizing $LiNbO_3$ ($r_{33}^{\exp t}$ ~30 pm/V). The detailed data indicate that the responsivity losses in SBN-75 are produced by optically-induced incoherence in the birefringence of the crystal. In this report, we measure this incoherence, and demonstrate its direct impact on the sensitivity and stability of the EO sensor.

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