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Poling Protocols: Order Makes a Difference JOHN ZETTS, Air Force Research Laboratory, JOSHUA HAGEN, University of Cincinnati, JAMES GROTE, Air Force Research Laboratory — The electric field poling process used to create noncentrosymmetric order in an amorphous polymer, thus creating an electro-optic (EO) material, is accomplished by heating the material to its glass transition temperature T_g , applying a large voltage V_p across it, and then holding the sample under these conditions for several minutes. Afterward, the sample is cooled to room temperature with the applied voltage still on. Previously, it was generally believed that it made no difference in the final EO activity produced in the sample as to how the material was taken from room temperature and zero applied voltage to its poling state at V_p , T_g . Recent studies in our labs now strongly suggest that greater EO activity can be realized by adopting the V-T poling protocol: i.e. raising the sample's voltage in increments to its final value V_p , while keeping it at room temperature, and then increasing its temperature in increments until T_g is reached. Compared to the opposite T-V protocol, EO coefficients some 40% greater have been observed with this method. We will present data which establishes this effect and then present some elementary conduction models as to why the V-T procedure works much better than the T-V one.

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