The Kerr nonlinearity of the beta-barium borate crystal

A popular crystal for ultrafast cascading experiments is beta-barium-borate (β-BaB\(_2\)O\(_4\), BBO). It has a decent quadratic nonlinear coefficient, and because the crystal is anisotropic it can be birefringence phase-matched for type I (oo → e) second-harmonic generation (SHG). For femtosecond experiments BBO is popular because of low dispersion and a high damage threshold. The main attractive property of ultrafast cascading is that the induced cascading nonlinearity \( n_{II} \), casc can be negative, i.e. generate a self-defocusing Kerr-like nonlinearity. However, the material Kerr nonlinearity \( n_{II} \), Kerr is self-focusing and competes with the cascading nonlinearity. Therefore, precise knowledge of its strength is crucial. We perform an experiment measuring the main \( c_{uu} \) tensor component, and together with literature experimental data [1], we propose a \( c_u \) value composed of 14 different data points.