Threshold for strong thermal dephasing in periodically poled KTP in external cavity frequency doubling

We present a measurement series of the efficiency of periodically poled KTP used for second-harmonic generation in an external phase-locked cavity. Due to the high absorption (0.01 cm⁻¹) in the PPKTP crystal at the pump wavelength a strong thermal dephasing of the periodically poled grating is observed for high pump powers. For four different resonator setups, it was experimentally found that a threshold parameter could be defined as the ratio between the focal intensity in the crystal and the single-pass conversion efficiency. The value of this threshold for the onset of strong thermal dephasing was found to be 1.41×10^10 W²m⁻² in our 30-mm long PPKTP sample. This threshold parameter marks the onset of thermally induced instability that leads to a degradation of the SHG conversion efficiency. Above the threshold the shape of the resonance peaks of the resonator changed from symmetrical into triangular making phase locking difficult.