

INVESTIGATION OF THE PROPERTIES OF DIFFERENT CONSTRUCTION DKDP POCKELS CELLS

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Pockels effect is applied in electrooptic modulators which are used in laser systems, pulse pickers and production of lasers [1, 2]. One of the most commonly used and cheapest Pockels cell crystals is DKDP. Its half-wave voltage is low compared with other materials. However, piezoelectric oscillations in Pockels cell crystals tend to depolarize the passing beam and reduce the efficiency of the device. Therefore, these oscillations need to be suppressed or the Pockels cell has to be operated at conditions with minimum piezoelectric oscillations.

In this study we investigated piezoelectric oscillations in different DKDP Pockels cells of a prototype pulse picker created by UAB „Optolita“ which uses a novel regenerative control signal sequence technique to pick pulse trains up to 1 ms duration. The main parameter for piezoelectric oscillation estimation was measurement of pulse picker contrast ratio. This was performed using an optical setup consisting of femtosecond Yb:KGW laser oscillator generating 1033 nm wavelength, 76 MHz repetition rate and 110 fs duration pulses, two crossed Glan-Taylor polarizers, the aforementioned pulse picker and photodiode. During the first measurement we tested how the contrast ratio of pulse picker with different DKDP crystals depends on Pockels cell high voltage control signal frequency while control signal duration is fixed (Fig. 1). Further on, we measured how the contrast ratio of pulse picker with different DKDP crystals depends on Pockels cell control signal regenerative sequence duration while the control signal frequency is fixed.

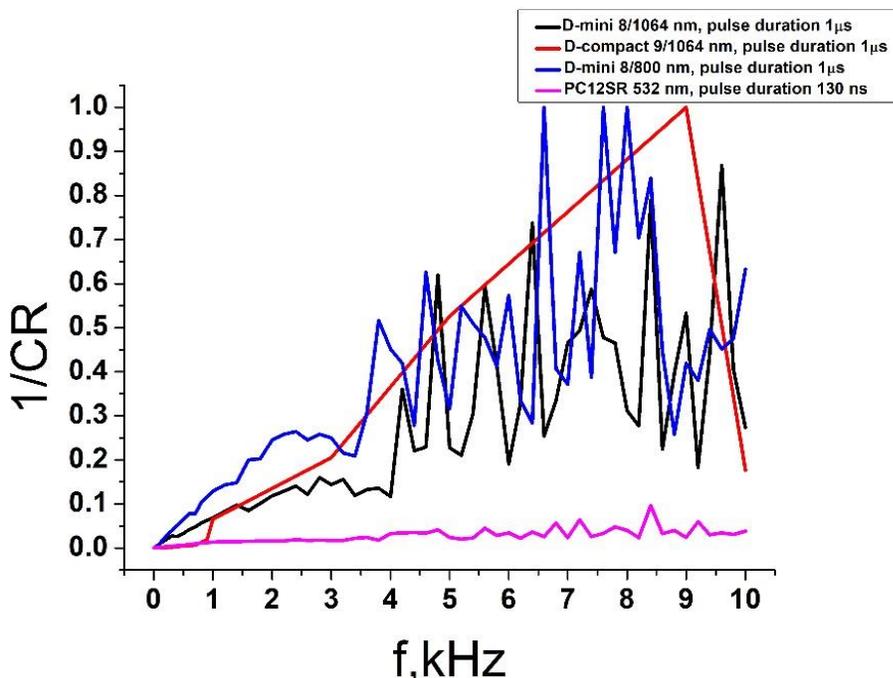


Fig. 1. Inverse contrast ratio dependence on high voltage control signal frequency.

Results showed obvious differences between different construction DKDP Pockels cells. Furthermore, in all investigated Pockels cell we determined control signal duration when piezoelectric oscillations are suppressed: it ranged from 6.6 μs to 9.9 μs.

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[1] <https://www.alphalas.com>.

[2] Akiko Kumada, Kunihiko Hidaka, Directly High-Voltage Measuring System Based on Pockels Effect, IEEE Trans. Power Del. 28(3), 2013.