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POCKELS CELLS FOR USE IN HIGH-POWER PULSED FIBER LASERS

Task

Fraunhofer ILT has developed mechanically and thermally stable adhesive-free Pockels cells for use in satellite-based LIDAR systems for atmospheric research; in this system the crystals are soldered into its holder. In contrast to commercially available Pockels cells, this soldering technology does without the elastomeric contacts and adhesives, making this design suitable for high performance applications with average powers in the kilowatt range. Within a project conducted on behalf of Federal Ministry of Education and Research, Fraunhofer ILT is using these Pockels cells as Q-switches in a high-power pulsed fiber lasers.

Method

Due to the fiber resonator's high amplification per pass, the Q-switches must exhibit a high contrast ratio in a repetition rate ranging from 10 to 100 kHz. Since the effective contrast ratio can be influenced by the piezoelectric oscillations of the Pockels cell crystal, an optical measuring station has been built which can test the static contrast ratio and the optical effect of the piezoelectric vibration of different Pockels cells.

Result

An extremely high contrast ratio of about 43 dB (1:20,000) could be measured in the voltage-free state. In the Pockels cells tested, a significant reduction in piezoelectric vibrations could be measured in the range of resonant frequencies as compared to commercially available Pockels cells, thanks to soldered connection of the crystals.

Applications

With the soldered Pockels cells, a Q-switched multimode fiber laser could be demonstrated with an average output power of 500 W and pulse durations of 100 ns.

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- 2 Soldered Pockels cell.
- 3 Active multimode fiber of the pulsed fiber laser.