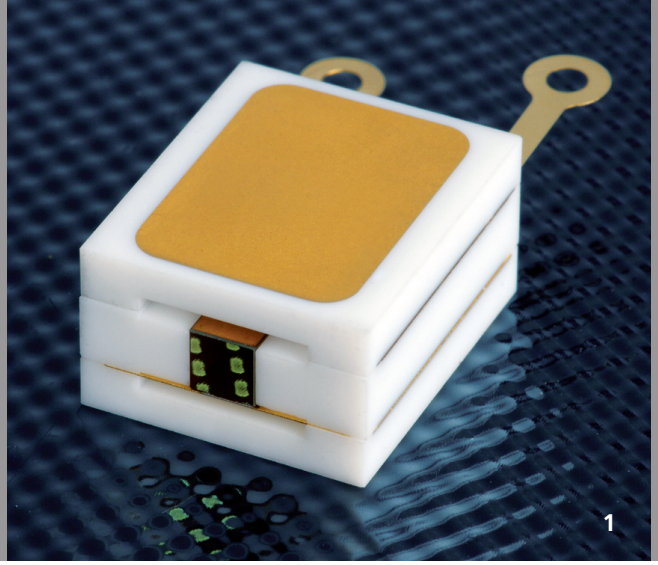
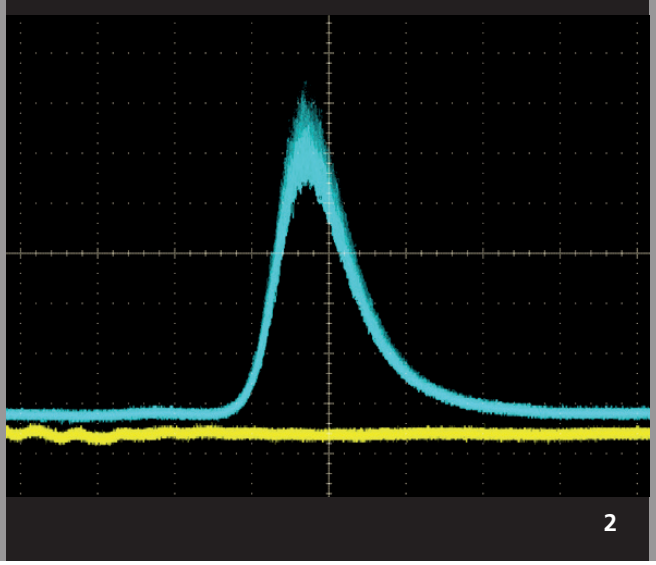


1



2

THERMOMECHANICALLY ROBUST POCKELS CELL

Task

Mechanically and thermally stable laser components are required for use in LIDAR systems for atmospheric research. The assembly of Pockels cell crystals poses major challenges due to the optical, electrical and thermomechanical conditions. The research aims to investigate how a Pockels cell module can be assembled using a soldering process. Varying coefficients of thermal expansion along the crystal layers (α_{11}/α_{33} = 1/9) pose a particular challenge. The assembly concept needs to support alternating temperatures of -30 °C to +50 °C.

Method

The elastic design of the supporting structures reduces the load on the BBO crystal during soldering and the temperature cycle. The BBO crystal is soldered between two metal sheets which are themselves soldered to the ceramic housing. The metal sheets are designed to prevent an electrical sparkover. The entire Pockels cell module is soldered simultaneously, eliminating the need for any further steps to mount the module in the housing. The module thus mounted can be aligned in the laser and joined as a whole.

Result

The assembly method developed at Fraunhofer ILT for Pockels cells ensures that thermomechanically stable modules can be manufactured. Following the completed temperature cycle test, the quarter-wave voltage at 3.85 kV was achieved with a crystal measuring 4 x 4 x 20 mm³. The Pockels cell was successfully tested in Q-switched mode.

Applications

The range of applications of the process described for assembling Pockels cells goes well beyond aerospace applications. The concept presented can also be used in laser beam sources for laser material processing, for metrology and medical technology applications.

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Contacts

Dipl.-Ing. Heinrich Faidel
Phone +49 241 8906-592
heinrich.faidel@ilt.fraunhofer.de

Dipl.-Ing. Michael Leers
Phone +49 241 8906-343
michael.leers@ilt.fraunhofer.de

1 Pockels cell in ceramic housing assembled using solder.

2 Oscilloscope image of the laser pulses in Q-switched mode.

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
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