SUBMIT TO : Photonics West' 99 Kigre Er:Glass Selected Publication #75
CONFERENCE : LASER ' 99
High-Power Lasers and applications
Solid State Lasers VIII (LA03)
CONFERENCE CHAIR : Ernest A. Dorko

Diode Pumped Erbium Glass Eye-Safe laser Transmitter at 50Hz

Ruikun Wu, J.D. Myers, Michael J Myers

Kigre, Inc.,100 Marshland Road, Hilton Head Island, SC 29926
Phone: 843-681-5800 Fax: 843-681-4559
E-mail: kigre@aol.com kigre@rhsnet.com kigre@compuserve.com

Tom Wisnewski

Tracor Flight Systems, Inc., Electronic Systems Division,
557 Mary Esther Cut-Off, Fort Walton Beach, FL 32548
Phone# 850-664-1386 Fax# 850-664-1365
E-mail: twisnewski@tracorservices.com

Presentation : Prefer 'Oral Presentation'
' Poster Presentation' Acceptable

ABSTRACT

Diode pumping technology has opened up many new possibilities for Erbium glass lasers for use in eye-safe radar and rangefinding applications. For most radar applications high pulse repetition rates are required. The low thermal conductivity of Erbium glass is a key limiting factor for laser operation at high repetition rates. When compared with traditional flashlamp pumping, the diode pump is more efficient and produces less heat. Diode pumping allows the Er:glass laser to operate at higher repetition rates. In this paper we report on a 50Hz Erbium glass laser radar transmitter.

The Diode pump head was made by Cutting Edge Optronics, Inc. Three 1 cm diode bars are aligned in a single line to provide a 3.3cm pump length. Three such linear 3 bar units pump the rod from side in a "Y" configuration. A 2.5mm diameter and 33mm long Er:glass rod was liquid cooled in the diode pump head.

Each 1cm long diode bar is rated at 20W for cw output. Test data shows that each bars output reached ~25 W at 35A pump current. The 9 bar pumphead was pulsed at up to a 5msec pump width and 35 A current at 50 Hz. In another test, the same set-up was operated at up to 70 A and 3msec at 50 Hz. The peak output power of each bar doubled and reach 50 W at the shorter pulse width and higher current. Bar life testing at these pump levels has yet to be completed.

Erbium glass is low gain laser material that operates under a quasi-three level working principle. It is very important to having no unpumped gain length in the laser head design as even a few millimetre of unpumped region will introduce absorption to the oscillation beam. In order to deal with this problem three different rod designs were tested. These were thermal fused and chemical fused (glued), doped and undoped rod regions and metal tube collar extensions.

With Maximum pumping energy, 5msec pump width and 35 A current, 1.8 double pass gain was measured in 2.5X33mm Erbium rod. With the FTIR Q-switch the final laser output reached 10mj energy and 40nsec pulse width at 50 Hz repetition rate.