# CONTINUOUS WAVE HOLOGRAPHIC LASER RESONATORS USING DEGENERATE FOUR-WAVE MIXING IN A DIODE BAR SIDE-PUMPED $Nd:YVO_4$ AMPLIFIER

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**Abstract**

Degenerate four-wave mixing techniques used to produce self-adaptive laser resonators based on diffraction from a gain grating have shown considerable promise for correction of distortion in high-average-power solid-state laser systems, as well as for spectral and temporal control of the laser radiation [1-4]. In these systems, the gain grating is formed by spatial hole burning caused by interference of coherent beams in the laser amplifier and modulation of the population inversion. The gain grating formation can be used for phase conjugation by using the amplifier in a four-wave mixing geometry [2], for self-pumped phase conjugation by using an input beam in a self-intersecting loop geometry [3] and for formation of a self-starting adaptive oscillator by providing additional feedback from an output coupler and requiring no external optical input. Experimental demonstrations have been performed successfully in several laser systems including flashlamp-pumped and quasi-c.w. pumped neodymium-doped amplifiers [1,2], in laser-pumped titanium-doped sapphire [4] and $CO_2$ lasers. We present for the first time, demonstration of a continuous-wave self-adaptive holographic laser resonator. The operation is based on the very high reflectivities (>800%) [5] and more recently (>10,000%) of a gain grating formed in a diode-bar side-pumped Nd:YVO4 amplifier. We have subsequently modelled the FWM interactions and have found good agreement with experimental results. This resonator has been shown to correct for severe phase distortions introduced inside the loop. An output of ~1 W has so far been achieved, future steps include an additional power amplifier incorporated into the resonator loop geometry to give an expected multi-watt operation with a midterm goal of 10 W.

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**Biography**

Jason Hendricks was born in Maidstone, England in 1975. He received a first class B.Sc. (Hons) degree in Physics with Optoelectronics from the University of Kent at Canterbury in 1998. He is currently working toward the Ph.D. degree at the Optoelectronics Research Centre, University of Southampton, England, where he carries out research into Four-wave mixing methods to correct for intra-cavity distortions. He is a member of the Optical Society of America.