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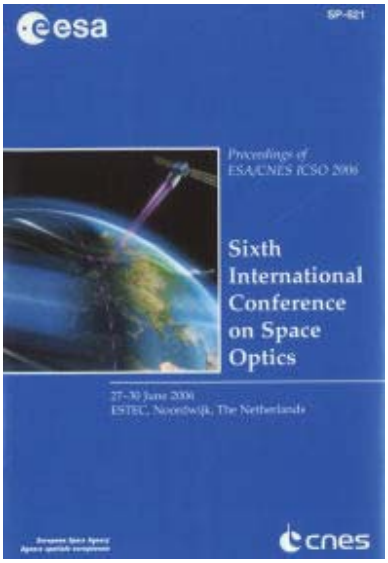

New 808 nm high power laser diode pump module for space applications

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NEW 808 nm HIGH POWER LASER DIODE PUMP MODULE FOR SPACE APPLICATIONS

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ABSTRACT

New pump module concepts had to be developed for space borne applications, because a simple transformation of terrestrial solutions to space requirements was often not useful. A planar approach has been chosen, which prevents inherent draw-backs of stacks.

1. LOW POWER PUMP UNITS

The proven modular concept of Tesat's pump units builds on multiple "Laser Diode Benches", which reduce the test effort and enable maximum flexibility wrt. electrical interfaces, optical output power, reliability requirements, and environmental boundary conditions. Tesat's lower power Pump Modules typically come with two Laser Diode Benches in a 1-out-of-2 cold redundancy. They deliver up to 5W with a 0.9998 reliability over 5 years of continuous operation.

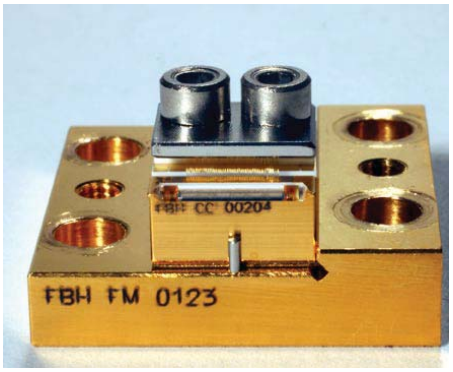

Fig. 1. Laser Diode Bench as used for Tesat low power CW Pump Module Heads

All modules are fiber-coupled and come with robust and really hermetically sealed housings (leak rates are below 5 x 10-9 mbar l/s leading to more than 72% of initial fill gas remaining after 10 years).

Fig. 2. Tesat Pump Laser Head, 45*45*20 mm, 150 gr, truly hermetically sealed

The emission spectrum of the standard low power modules is Bragg stabilized for low noise pump applications with low thermalization effort.

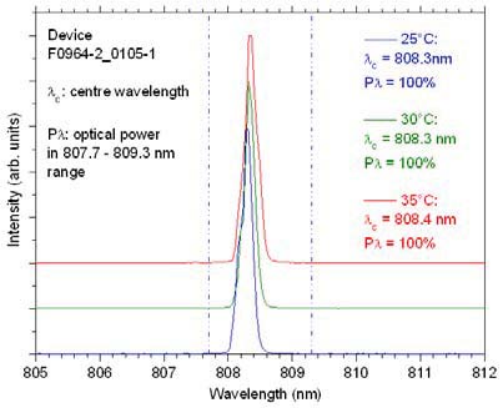

Fig. 3. Bragg stabilized 5W emission spectra for 25°C, 30°C, 35°C,

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2. HIGH POWER QCW PUMP CONCEPT

The high-power end of Tesat's pump module product line is currently marked by a 1.5 kW QCW module, if equipped with 20 high power laser benches and a 800µm output fiber. It builds extremely compact with only 95x35x25mm³. It is based on Tesat's experience of the space qualified low power pump modules, and shows the same key performances as power scalability and truly hermetically sealed housings. A redundant 1-out-of-2 configuration is also possible in the same housing at the expense of output power. Depending on the number of laser benches a big variety of output power and reliability requirements can be met.

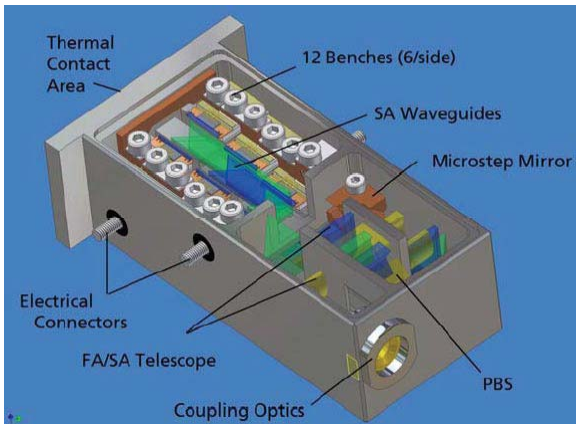

Fig. 4. QCW pump unit concept with 12 laser benches (for 700W peak power)

The concept is based on the combination of individual Laser Diode Benches strictly avoiding the inherent drawbacks of vertical laser diode stacks. Each Laser bench has almost identical operation conditions leading to superior quality and reliability. No interactions are expected between the individual laser benches like catastrophic chain reactions as known from stacks.

High power laser diode benches, containing 35 emitters each on a 4.5mm mini-bar, have already been tested up to 250W QCW peak power without COD. Nominal peak output power is 70W – 100W per bench. Only reliable process technologies as AuSn hard-soldering are applied already known from low poer devices. Power derating has been selected for highest reliable use in space missions.

A demonstrator of the high power QCW module is currently under construction. It shall be used as a pump source in the BepiColombo laser test bed.

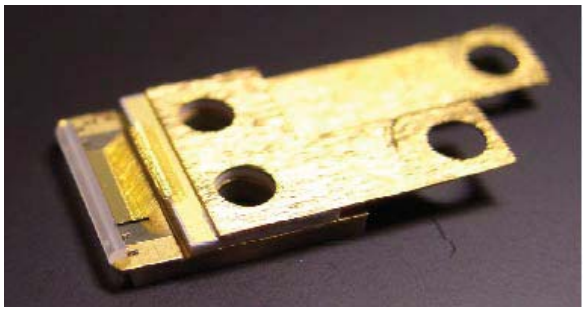

Fig. 5. Preliminary design of QCW high power laser bench

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