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A diode pumped high power Nd:YAG laser system for space application

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The poster gives an overview on a diode pumped, fibre coupled Nd:YAG laser for pulses of 50mJ at a wavelength of 1064 nm. The system for space has some additional requirements in comparison to terrestrial application. First the limited resources in mass, power and thermal control restrict the design features. In addition the system has to work under different environmental conditions like high radiation load and vacuum. Third the lifetime aspects are a strong design driver for some applications, for instance for a range finder system to work over some years. Especially possible failures of the 808nm GaAs pump diodes have been identified as a potential operation time limiting factor. Optical pumping will be performed by around 20 diode bars, containing around 40 single diode lasers each. A careful selection of high reliability bars, an extensive qualification program, and an operation plan for conservative use of the performance shall provide high lifetimes. However, failures of single emitters or bars have to be taken into account. Therefore operational and design features as well as some redundancy have to be implemented to overcome these hints. The pump light will be transmitted to the laser head by fibre, mostly for homogenisation of the pump source diodes light. The laser head will be longitudinal pumped. It comprises of a passive switched oscillator and two amplifier stages. The design is made for repetition rates of typical 10Hz. The 50mJ output pulse has a typical width of 3ns with a beam quality M^2 better 1.6. Allocated power and mass are 18W and 4kg. The system is housed by three boxes: laser head, pump diodes unit, and power/control, 1.3kg each. Scientific applications are for instance altimetry at planetary orbiters as well as laser induced breakdown spectroscopy and matrix assisted laser desorption ionisation at planetary landers.