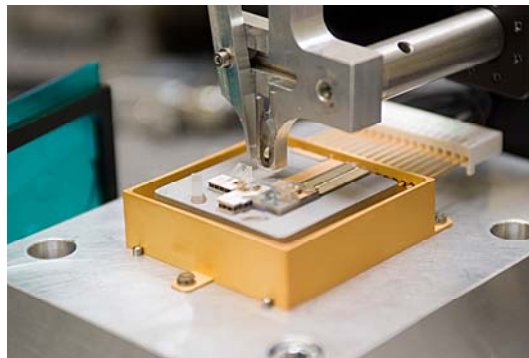


## Cobolt introduces HTCure™ Technology – and redefines the concept of robust solid–state lasers

Anyone with experience from the use, design or manufacture of lasers is familiar with the challenges involved in meeting the extremely tight tolerances for all the components that build up the laser cavity. A laser is a very delicate and sensitive device, and its performance may severely degrade as a result of a mechanical displacement of a cavity component on the order of sub- $\mu\text{m}$  or sub- $\mu\text{rad}$ , or as a result of very small levels of contamination on optical surfaces. This sets extremely high demands on the method for fixation of cavity components in the manufacturing process, as well as on the choice of materials.

Solid–state lasers are known to offer much extended lifetime as compared to gas lasers thanks to the lack of problems associated with the nature of a gaseous lasing medium. However, this advantage can not be realised in practice if the laser assembly in itself is neither extremely stable over time nor insensitive to thermal and mechanical shocks or vibrations.

The introduction of High Temperature Curing or HTCure™ Technology, a new proprietary method for fixation of cavity components developed by Cobolt, provides a solution to this problem and appears to have established a new level of reliability for advanced solid–state lasers.



*Fig.1 Active alignment of optical components with sub- $\mu\text{m}$  precision on the Cobolt 04–01 laser platform, prior to permanent fixation using HTCure™ Technology*

The HTCure™ Technology is based on building the lasers into a hermetically sealed sub–package in a planar configuration. The material and design of each component in the architecture has been carefully chosen for extremely high overall thermo–mechanical stability. As a result, the design is so thermo–mechanically stable that the whole laser can be baked at  $>100\text{ }^{\circ}\text{C}$  for several hours and at multiple phases as part of the manufacturing process without the laser going out of alignment or any damage being caused.

This extra–ordinary capability of the design has enabled the use of a new advanced type of adhesive for the fixation of cavity components that cures at high temperatures, instead of the traditional UV curing fixation methods. Thermal curing yields a very stiff and reliable fixation joint, free from outgassing and the long–term drifts sometimes associated with aftercuring using UV light.

First introduced on the 04–01 series of Cobolt lasers, the HTCure™ Technology manufacturing technique has provided outstanding performance, in all aspects, and especially in terms of the robustness of the laser. The lasers' sensitivity to varying environmental and transport/storage conditions is dramatically improved. As an additional advantage, the 04–01 lasers can be delivered in an ultimately compact package suitable for OEM integration.



*Fig.2 a) Cobolt 04-01 laser package*



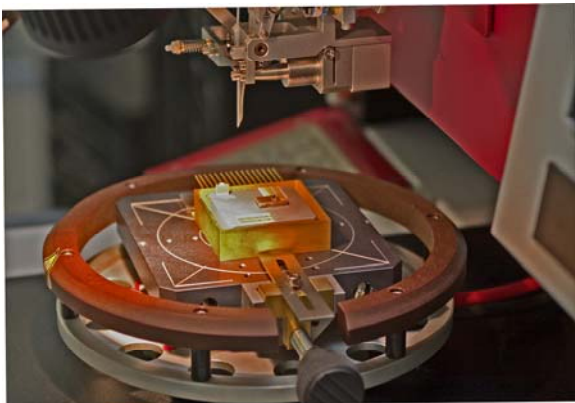
*b) CDRH Outer housing to Cobolt 04-01 lasers (optional)*

Lasers built using HTCure™ Technology have shown to withstand multiple 60G mechanical shocks in operation (limited by equipment capacity) without any sign of degraded performance. They can be exposed to extreme temperatures ( $>100\text{ }^{\circ}\text{C}$ ), and are insensitive to pressure and humidity (in one example the laser was cooked in boiling water before operation).

The new design has also proven to result in outstanding DC power and beam pointing stability with varying ambient temperatures ( $<3\%$  pk-pk and  $<6\mu\text{rad}/^{\circ}\text{C}$  respectively over  $20\text{--}50\text{ }^{\circ}\text{C}$ ) and has virtually eliminated laser failure in the field during the warranty period (standard 18 months, unlimited numbers of operation).

The results show that HTCure™ Technology is an advanced manufacturing technique which can provide reliability and performance for today's demanding applications.

The Cobolt 04-01 series of lasers are manufactured in a modern  $400\text{ m}^2$  clean-room facility using qualified processes and each unit is taken through an extensive verification test program before shipping. All laser models in the visible range are true single-mode CW lasers providing low noise ( $<0.3\%$  rms and  $<3\%$  pk-pk) and excellent beam quality ( $M^2 < 1.1$  and  $>95\%$  circularity) at high power levels (up to 300 mW). Available wavelengths include 473, 491, 491+532, 515, 532, 561 and 594 nm



*Fig. 3 a) Pre-assembly of Cobolt 04-01 lasers*



*b) Clean-room facility for high quality manufacturing*

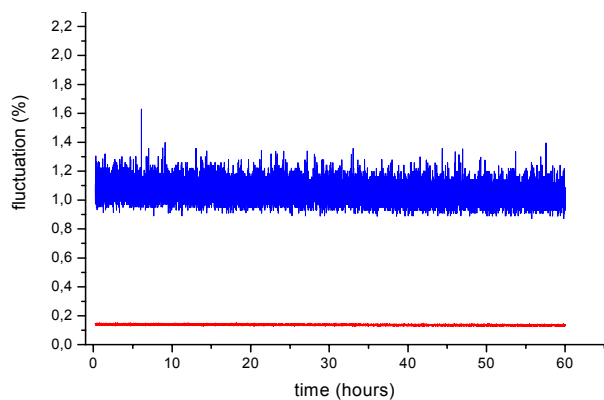
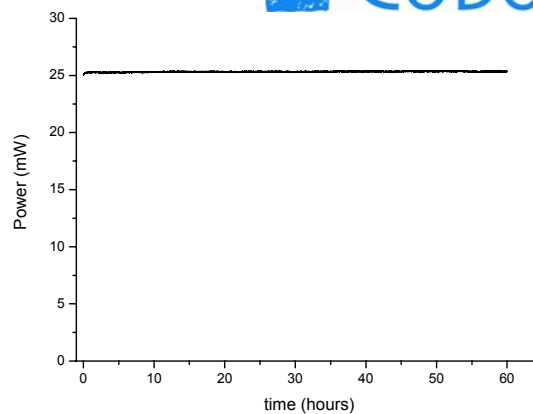


Fig. 4 a) Typical noise (rms/pk-pk) performance of Cobolt 04-01 lasers



b) Typical power stability of Cobolt 04-01 lasers

#### About Cobolt AB

Cobolt supplies compact and efficient diode-pumped solid-state lasers in the visible and near IR regions, for stand-alone use or OEM integration in equipment for bio-analysis, imaging, range finding and displays. Cobolt lasers are built on proprietary PPKTP technology and combine top-class wall-plug efficiency with low noise and compact size.

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