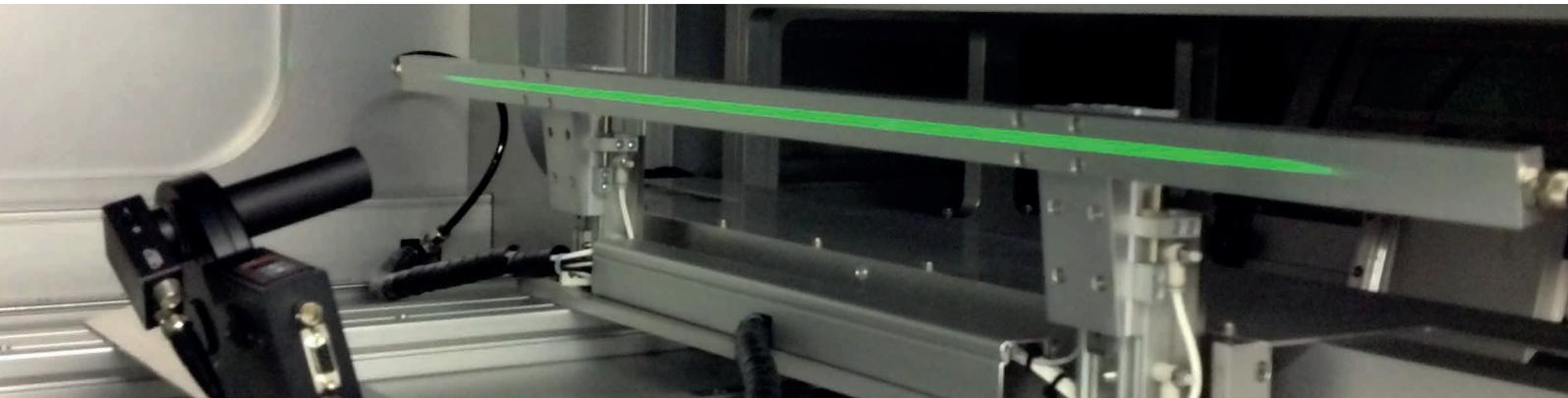


## Green Laser Line Beam VOLCANO LB 750G



Line beam in intermediate image plane

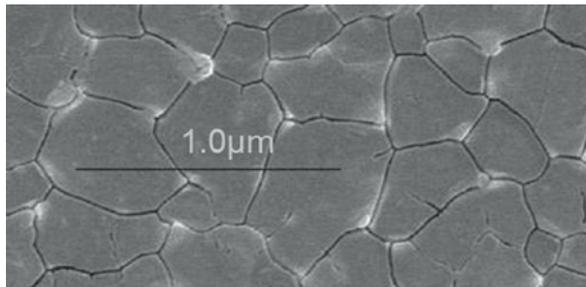
# Green Laser Line Beam VOLCANO LB 750G

## Green Laser Annealing - GLA

A new alternative to near complete melt ELA (Excimer Laser Annealing) of thin Si-films is GLA (Green Laser Annealing). A Gaussian line beam of 750mm length and longer is created by using fiber coupled 532nm diode pumped solid state lasers (DPSSL) of typically 60-100ns pulse length. This method allows to prepare equivalent ELA type LTPS (low temperature p-Si) films at dramatically reduced cost of ownership.

## GLA process

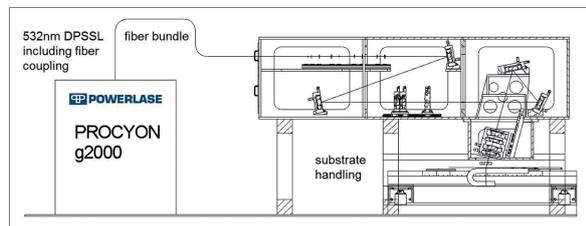
The GLA process for near complete melt a-Si annealing is applying a 30 $\mu$ m FWHM quasi Gaussian beam scanned at 10-15mm/s with 10 kHz laser repetition rate. While the beam is scanned in the small 30 $\mu$ m axis a-Si material is converted into p-Si. The green wavelength absorption in p-Si is weak (~5,000 – 10,000 cm<sup>-1</sup>), however high absorption in the 50-70nm a-Si (200,000cm<sup>-1</sup>) is heating the film to the melting temperature @ 400-500 mJ/cm<sup>2</sup>.



Typical p-Si GLA grain structure in a 60nm film: 430mJ/cm<sup>2</sup>, 84ns, pitch 1.5 $\mu$ m (15mm/s @ 10kHz)

## VOLCANO LB 750G Laser Optics

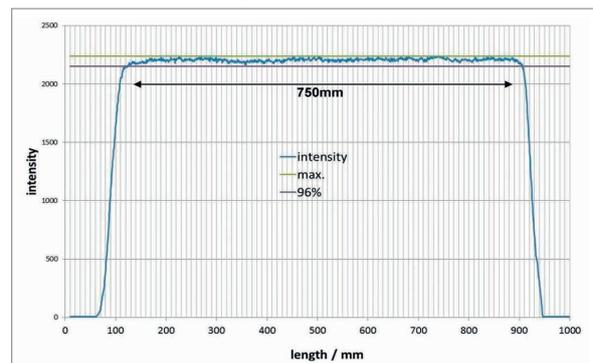
The VOLCANO<sup>®</sup> LB (Line Beam) Laser Optics consists of a fiber coupled laser module and a separate optics module.



VOLCANO LB 750G sketch shown with Procyon g2000 laser and fiber bundle

The laser beam emitted by an array of fibers is processed by cylindrical collimation optics to provide the optimal illumination of the homogenizer cylinder lens arrays.

The VOLCANO<sup>®</sup> LB Laser Optics is equipped with a FALCON<sup>®</sup> XXL cylinder projection lens. This projection lens provides a working distance of ~200mm at a demagnification of 10x (NA=0.25). The 10x FALCON<sup>®</sup> XXL cylinder p-lens demagnifies the intermediate image in the small axis to 30  $\mu$ m FWHM on the substrate. The line length can be arranged up to 750mm. The optics is operated with the Procyon g2000, 532 nm, 2000W laser (Powerlase Photonics Ltd., UK). The laser light is coupled into fibers and provided to the optics module over a distance of up to 30 m. This multiplexing of laser oscillators provides an outstanding p2p stability of <2.0%, a line homogeneity of p2p<4% and a convenient and reliable decoupling of laser and Gaussian line beam optics.



750mm beam profile showing a uniformity of p2p<4%



View into the VOLCANO LB 750G

	VOLCANO LB 750G	LB 200G
line size	750mm x 30 $\mu$ m	200mm x 30 $\mu$ m
wavelength	532nm	
laser power	2000W	600W
pulse length	80-85ns	
energy density	max. 500mJ/cm <sup>2</sup>	

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