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Highlight

3D laser beam manipulation prototype with adapted wavelength for polymer welding



Figure 1:
ARGES' "Elephant" F-theta-less scanner, mounted at roboter arm. Laser radiation enters scanner via QBH connector, internally mounted fixed collimating lens and shiftable focussing lens

Task 3.2 within PolyBright's Work Package WP3 is the setup of a 3D beam manipulation prototype system. Project partners ARGES and IPG realise this goal by combining a F-theta-less "Elephant" scanner with "ELS500" Erbium fiber laser.

A Fast 3D F-theta-less scan system was designed for a fiber laser wavelength of 1567nm with plano-convex collimating lens $f=40\text{mm}$, $d=20\text{mm}$ and focus translator lens at scanner's entrance. Scanning mirrors are equipped with highly reflective silicon carbide. The laser is build up as a combination of several single-mode fiber laser beams into one combining 200 μm fiber. Laser's output connector is HLC-8 (QBH compatible).

Machine Specifications:

- 3D scan system for wavelength 1567nm,
- Laser output power max. 500W
- Laser's Beam Parameter Product BPP = 7,0 mm mrad
- Core diameter of combining fiber 200 μm
- Tophat-shaped intensity distribution, advantageous for polymer welding purposes
- Focussed laser beam diameter 2 mm, suited for typical weld seam widths
- Working field 400 x 400 mm

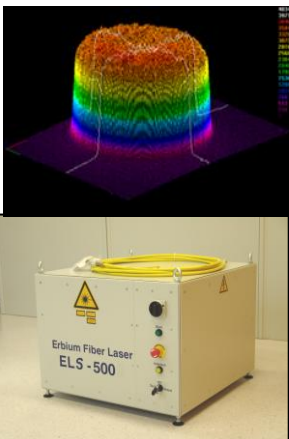


Figure 2:
500 W Erbium fiber laser system ELS-500, emitting at $\lambda=1567\text{nm}$, multimode fiber $d=200\mu\text{m}$:
Top hat intensity distribution and housing

Prototype system is set up at Fraunhofer ILT and planned to be used for welding white-white and grey-grey polymer (PC-ABS) combinations which is favourable with 1567nm compared to welding with regular 1070nm Ytterbium fiber laser.



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