

Highlight

Aachen,
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21th LASER World of PHOTONICS: Machine prototype exhibit for welding of transparent PC polymer using 1640 nm diode laser

The POLYBRIGHT research project focuses on laser polymer welding using high brilliance lasers with new wavelengths between 1,5 μm and 1,9 μm , high speed scanning systems and wavelength adapted polymer additives. Many project aspects are realized in a machine prototype, welding two transparent PC samples using 1640 nm diode laser radiation.

Figure 1 :
Top: High-NA diode laser focusing; focal diameter 0,26mm, focal depth 0,3mm.
Bottom: Laser welded contour on flat PC sample, dimension 40 x 20 x 2 mm.

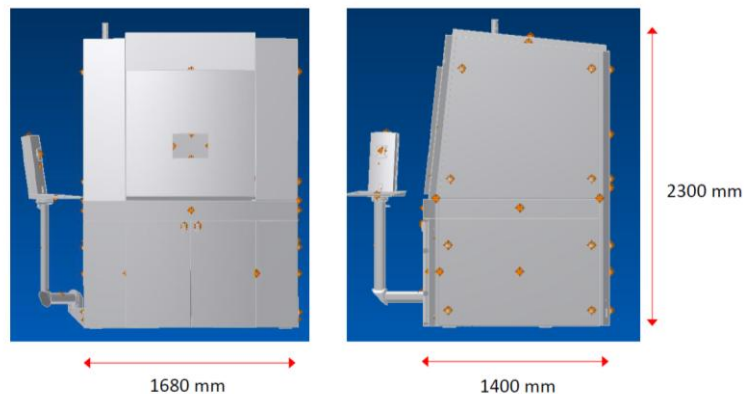
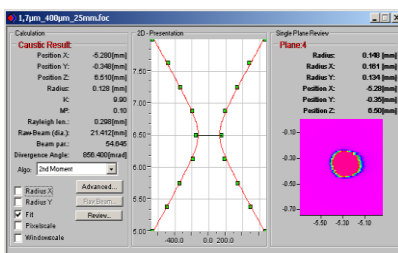


Figure 2 : Sketch of laser welding machine prototype extracted from CAD data, front + side view.

The machine prototype consists of:

- Diode laser module, 1640 nm, 20W, Fiber 400 μm (LIMO)
- High-NA focussing: $D_{\text{foc}}=0,26\text{mm}$, $z_{\text{R}}=0,3\text{mm}$ (ILT)
- xyz linear axes 400mm on granite base (Rexroth)
- Machine housing and clamping device (Intro, ILT)
- Axes' motion controller (Rexroth)



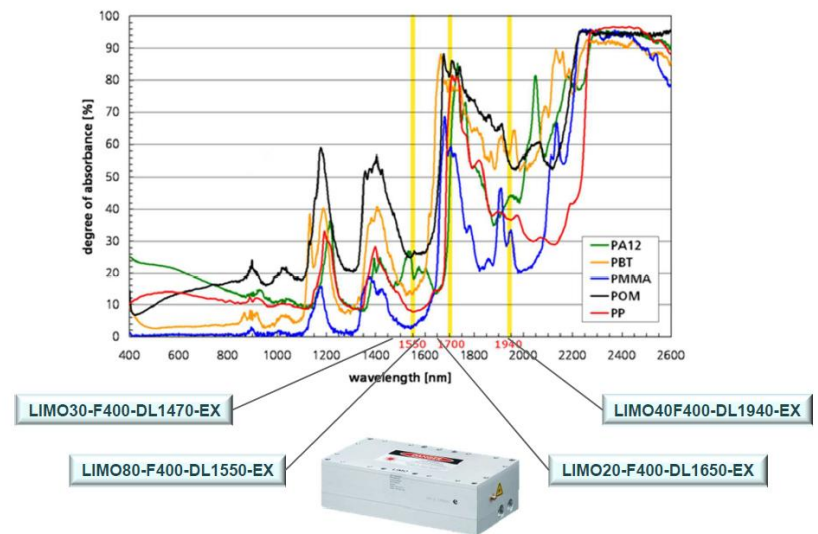


Figure 3: Wavelength dependence of different polymer absorbance in the VIS and NIR range.

Figure 3 shows the wavelength dependence of PA12, PBT, PMMA, POM, PP polymer absorbance in the VIS and NIR range. Yellow bars indicate 1500/1700/1900nm regions, as well as LIMO's available diode lasers, suited to weld polymers in overlap or butt joint geometry without using polymer radiation absorbers.

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