

# High power diode lasers from NIR to blue wavelength for advanced material processing

S. Britten<sup>1</sup>, A. Eltze<sup>1</sup>, Chris Ogden<sup>2</sup>

*1 Laserline GmbH, Fraunhofer Straße, D - 56218 Mülheim-Kärlich.*

*2 Laser Lines Ltd, Beaumont Close, Banbury, Oxon OX16 1TH, UK*

[Simon.britten@laserline.com](mailto:Simon.britten@laserline.com)

In the last years NIR high power diode lasers with multiple of 10kw of laser power were developed, which expand the processing capabilities for thick steel plates regarding a high process speed and low distortion in comparison to conventional process approaches. High power diode laser in the NIR are now available as customized solutions by component tailored intensity profiles, which solve processing issues for ferrous metals.

The high absorption of NIR wavelength in steel is however not comparable to copper material, in which the absorption of the near-infrared (NIR) wavelength is below 5%. Still, NIR continuous wave (cw) powered laser systems with 1µm have been widely used over the last decades for the welding of copper material. This approach was mainly driven by the lack of availability of cw sources with a material customized wavelength, which would be below 500 nm. In order to address this limitation, the company Laserline is developing a new high power diode laser with a wavelength of 450 nm. With this blue wavelength, an increase of processing efficiency of the factor 20x is expected for copper material compared to a wavelength around 1 µm. The availability of a high power blue diode laser enables for the first time a melting of copper material in the heat conduction mode, allowing the precise adjustment of the melt pool geometry also for thin copper materials. The stable energy deposition and heat conduction process regime is especially important for applications, where the high pressure of a keyhole welding mode with conventional NIR lasers would lead to a cutting of the material or an undesirable spatter occurrence. In this presentation the state of the technology and first applications with a high power blue laser system are presented.