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## Invitation to PhD lecture

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Klaus Schütt Hansen will defend his PhD thesis:

### MULTI BEAM FIBER LASER WELDING

WEDNESDAY, 6 APRIL 2016, 13.00 hours, in Auditorium 1.208, Fibigerstræde 16, Aalborg, Denmark

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**Abstract:**

This dissertation presents work and results achieved in the field of multi beam fiber laser welding. The project has had a practical approach, in which simulations and modelling have been kept at a minimum.

Different methods to produce spot patterns with high power single mode fiber lasers have been examined and evaluated. It is found that both diamond turned DOE's in zinc sulphide and multilevel etched DOE's (Diffractive Optical Elements) in fused silica have a good performance.

Welding with multiple beams in a butt joint configuration has been tested. Results are presented, showing it has been possible to control the welding width in incremental steps by adding more beams in a row. The laser power was used to independently control the keyhole and consequently the depth of fusion.

An example of inline repair of a laser weld in butt joint configuration was examined. Zinc powder was placed in the weld causing expulsion of the melt pool. Trailing beams were applied to melt additional material and ensure a melt pool. The method showed good results for increasing tolerances to impurities and reduction of scrapped parts from blowouts during laser welding.

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**The opponents of the PhD lecture are:**

**Benny Ørtoft Endelt, Associate Professor (Chairman)**

*Department of Mechanical and Manufacturing Engineering, Aalborg University, Denmark*

**Alexander Kaplan, Professor of Manufacturing/Laser Materials Processing**

*Produkt- och produktionsutveckling, Institutionen för teknikvetenskap och matematik, Luleå Tekniska Universitet, Sweden*

**Claus Bagger, Project coordinator, Risk Manager, Design Review Leader**

*Novo Nordisk, Denmark*

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The research has been carried out as an Industrial PhD project at IPU.

**Supervisor:**

Ole Madsen, Professor  
*Department of Mechanical and Manufacturing Engineering, Aalborg University, Denmark*

**Company supervisor:**

Flemming Ove Olsen, Senior Engineer  
*IPU, Kgs. Lyngby, Denmark*  
Workplace

**Co-supervisor:**

Morten Kristiansen, Associate Professor  
*Department of Mechanical and Manufacturing Engineering, Aalborg University, Denmark*

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The public PhD lecture will be hosted by **Associate Professor Shaoping Bai**, Department of Mechanical and Manufacturing Engineering, AAU. The lecture constitutes a 45 minutes presentation by **Klaus Schütt Hansen** followed by a short break and a discussion session with questions from the opponents and the auditorium.

**After the lecture, at approx. 16:00 hours, the Department of Mechanical and Manufacturing Engineering will host a reception in Fibigerstræde 14, Common Room.**

*Everybody is very welcome!*