

Fields of Competence

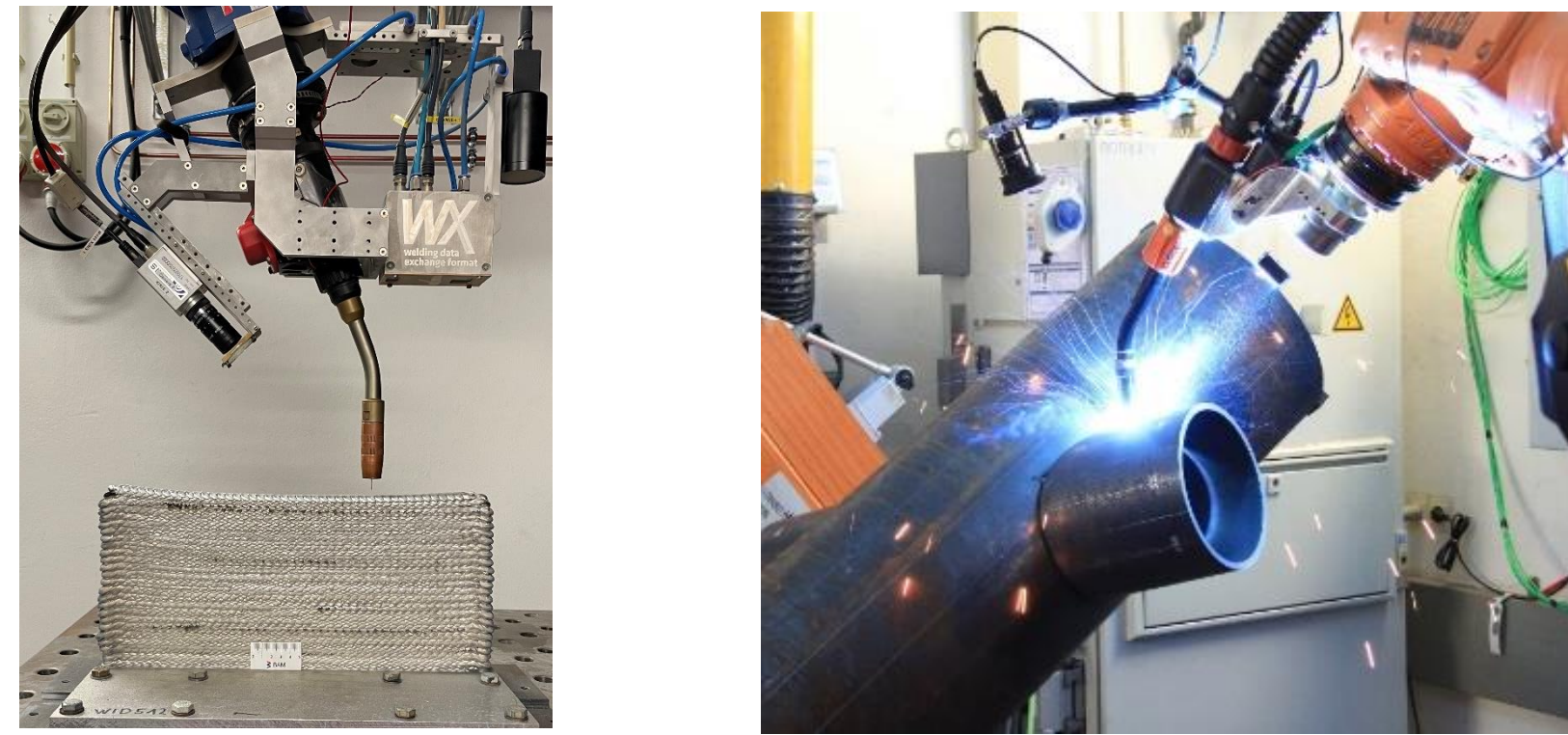
Laserbeam and Hybrid Welding

(Dr.-Ing. Andrey Gumenyuk @ BAM)



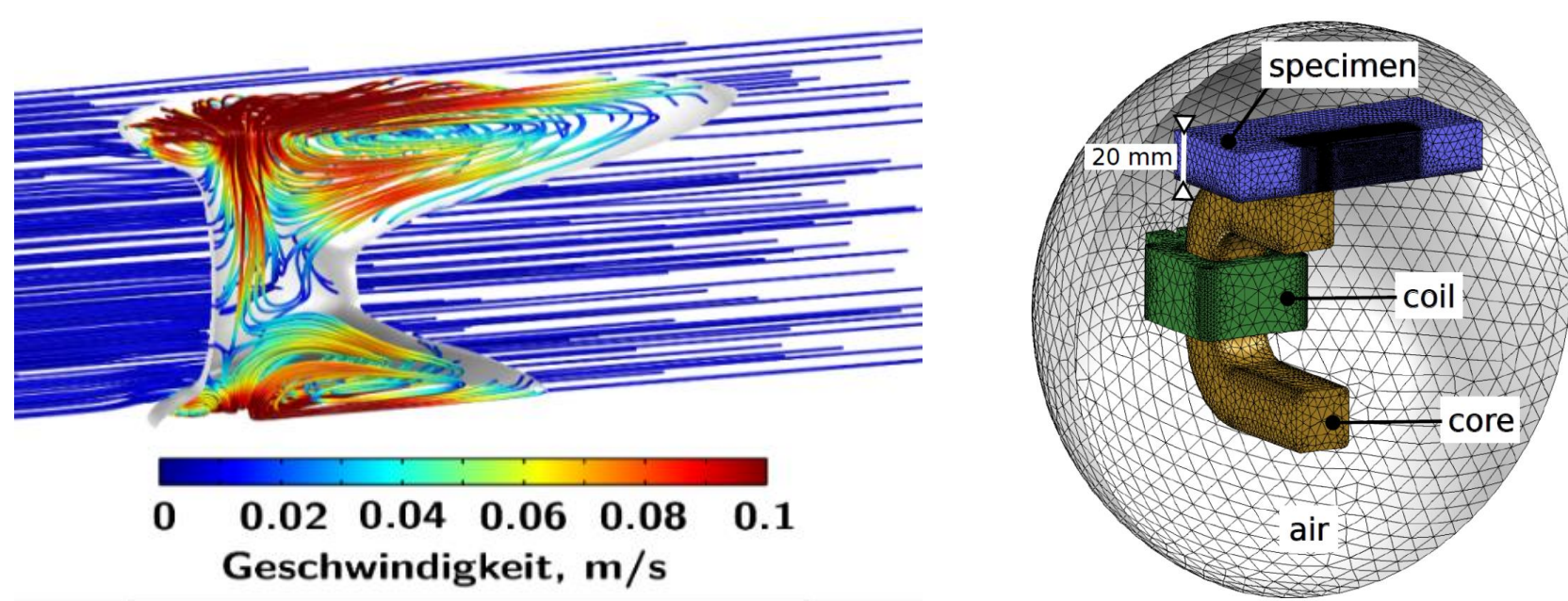
Arc Welding and DED-Arc

(Dr.-Ing. Andreas Pittner @ BAM)



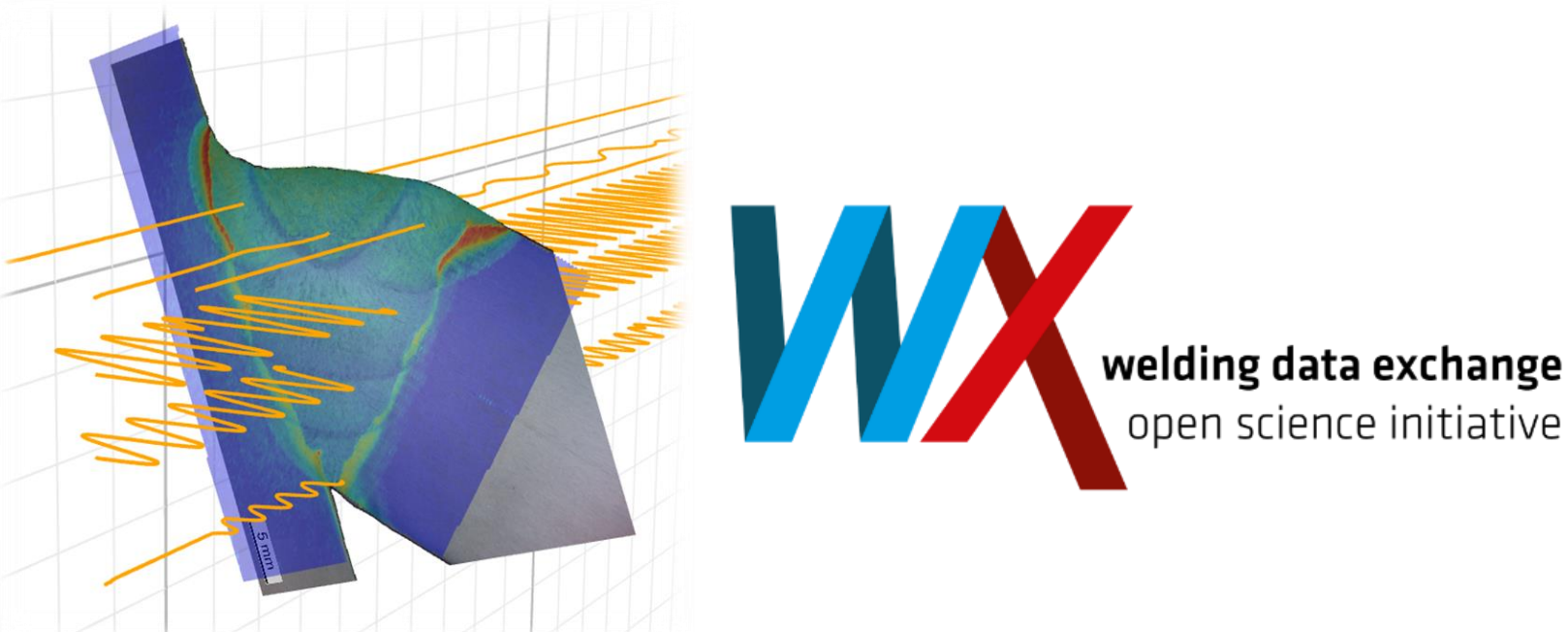
Welding Simulation

(Dr.-Ing. Marcel Bachmann @ BAM)



Digitalisation and Reference Data

(Dr.-Ing. Cagtay Fabry @ BAM)

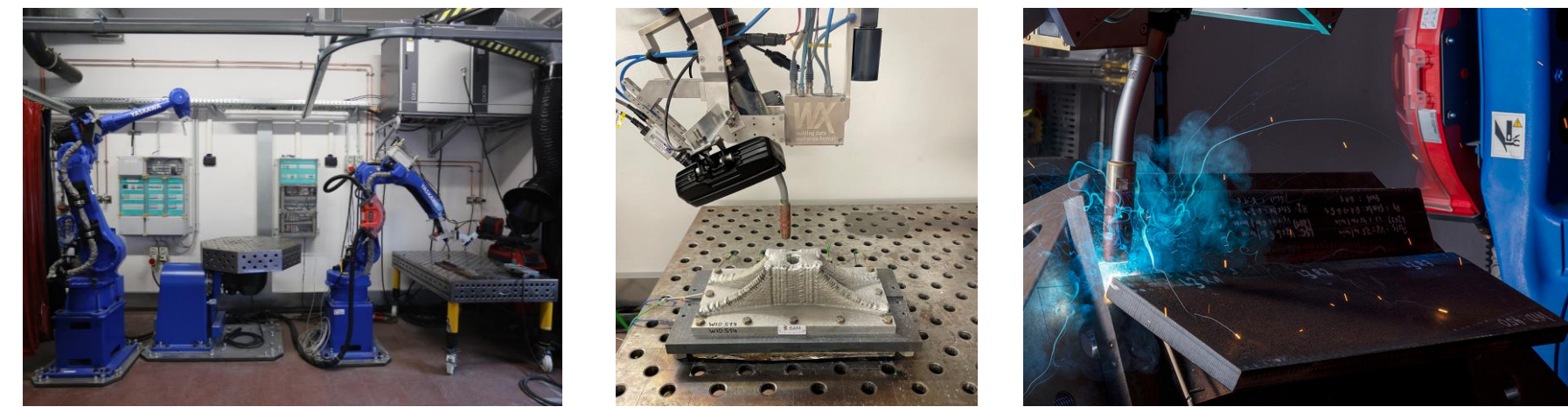


RSW and DED-LB @ Fraunhofer IPK

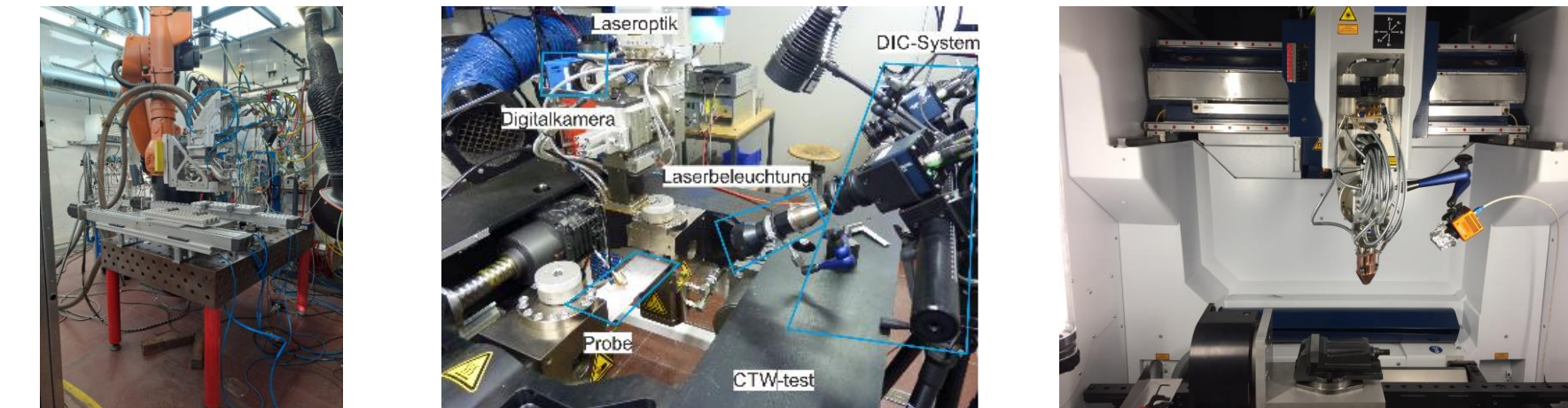
Equipment

GMA welding power sources (TIG, SA, Plasma)

Welding robots with turn tilt table



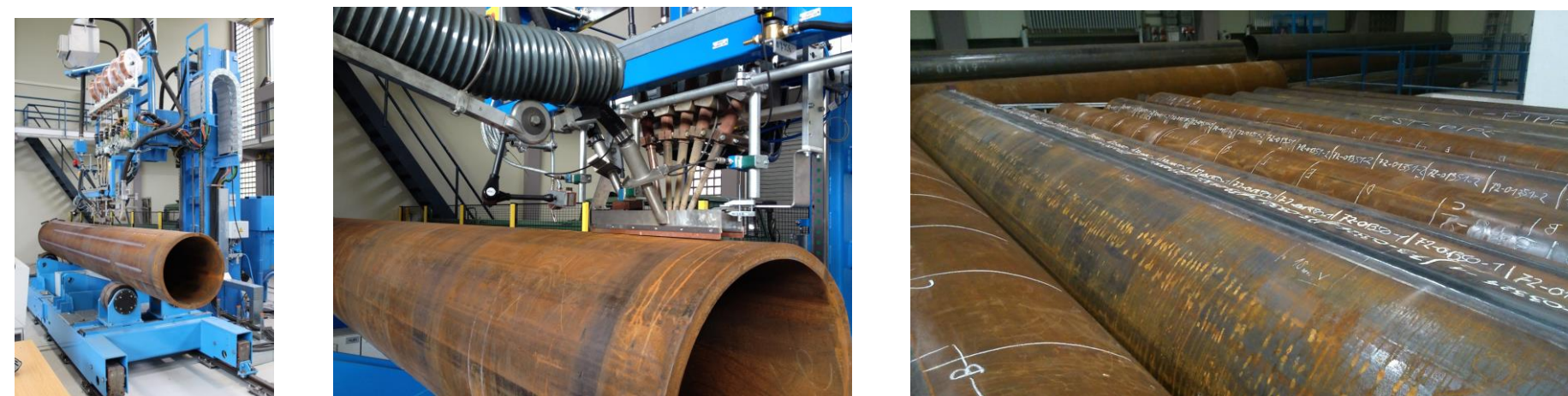
Laser Beam Welding and AM Machines (16 kW – 60 kW)



Electron Beam Welding Machine (60 kW)



5-wire SAW pipe-welding station



Resistance Welding Machines for all industrially used current forms



Kontakt

Univ.-Prof. Dr.-Ing. Michael Rethmeier
Fachgebietsleiter Fügetechnik (am IWF)
Technische Universität Berlin

Pascalstraße 8 - 9
10587 Berlin
Deutschland
Mobil: +49-173-2716078
mailto:michael.rethmeier@tu-berlin.de
http://www.fuegetechnik.tu-berlin.de

Key Aspects of Research

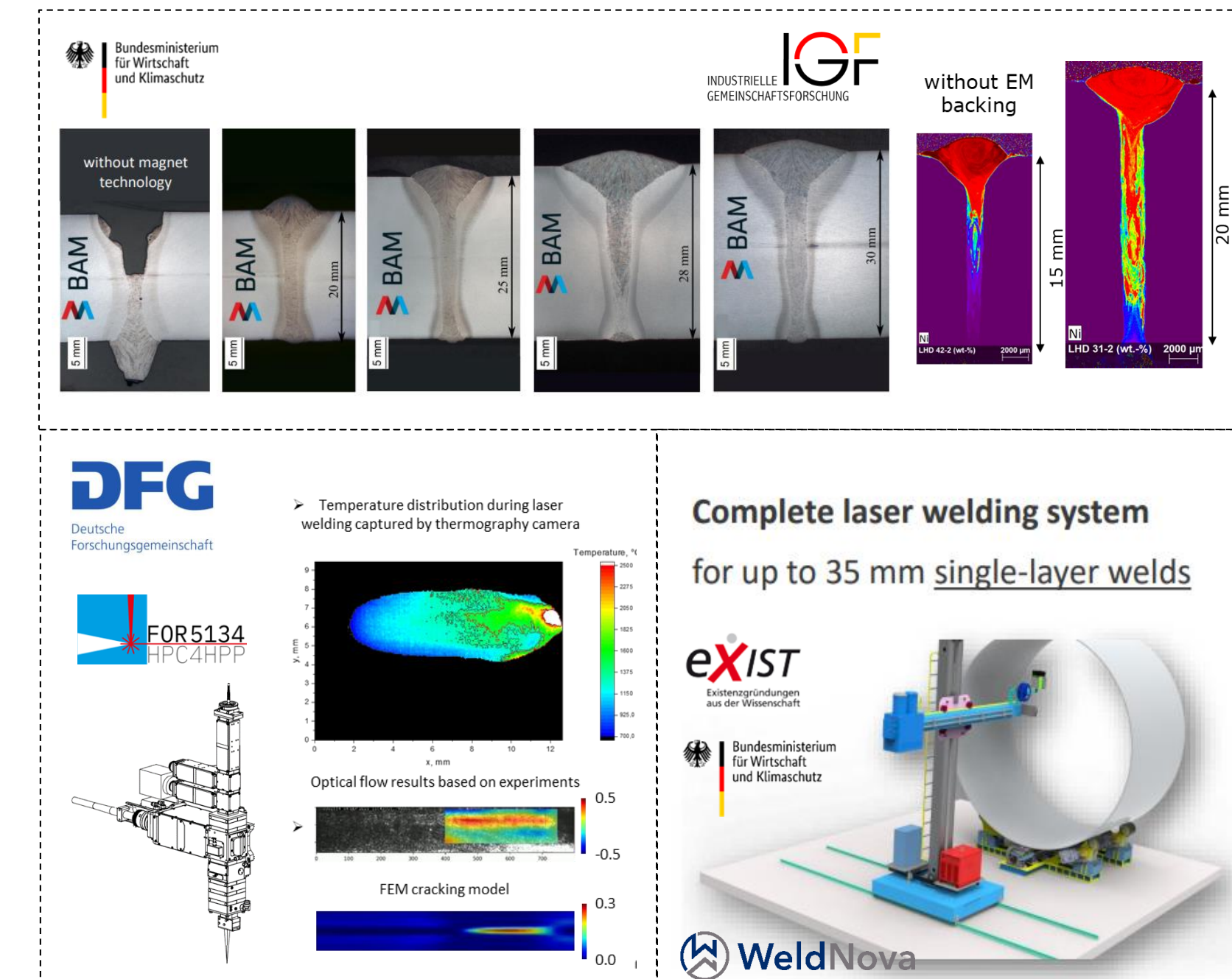
High-power laser hybrid welding of thick sections / Hot cracking

Motivation

- Application of high-power laser systems in shipbuilding and off-shore industries bring economical profit for our customers
- Understanding and remedial of welding defects (cracks, pores etc.) increases confidence in laser technology

Approach to Solution and Results

- Application of electromagnetic weld pool support system shifts limits of high-power laser welding for high thickness materials
- Novel in-situ strain measurement techniques and special AI-algorithms enable process monitoring for crack detection



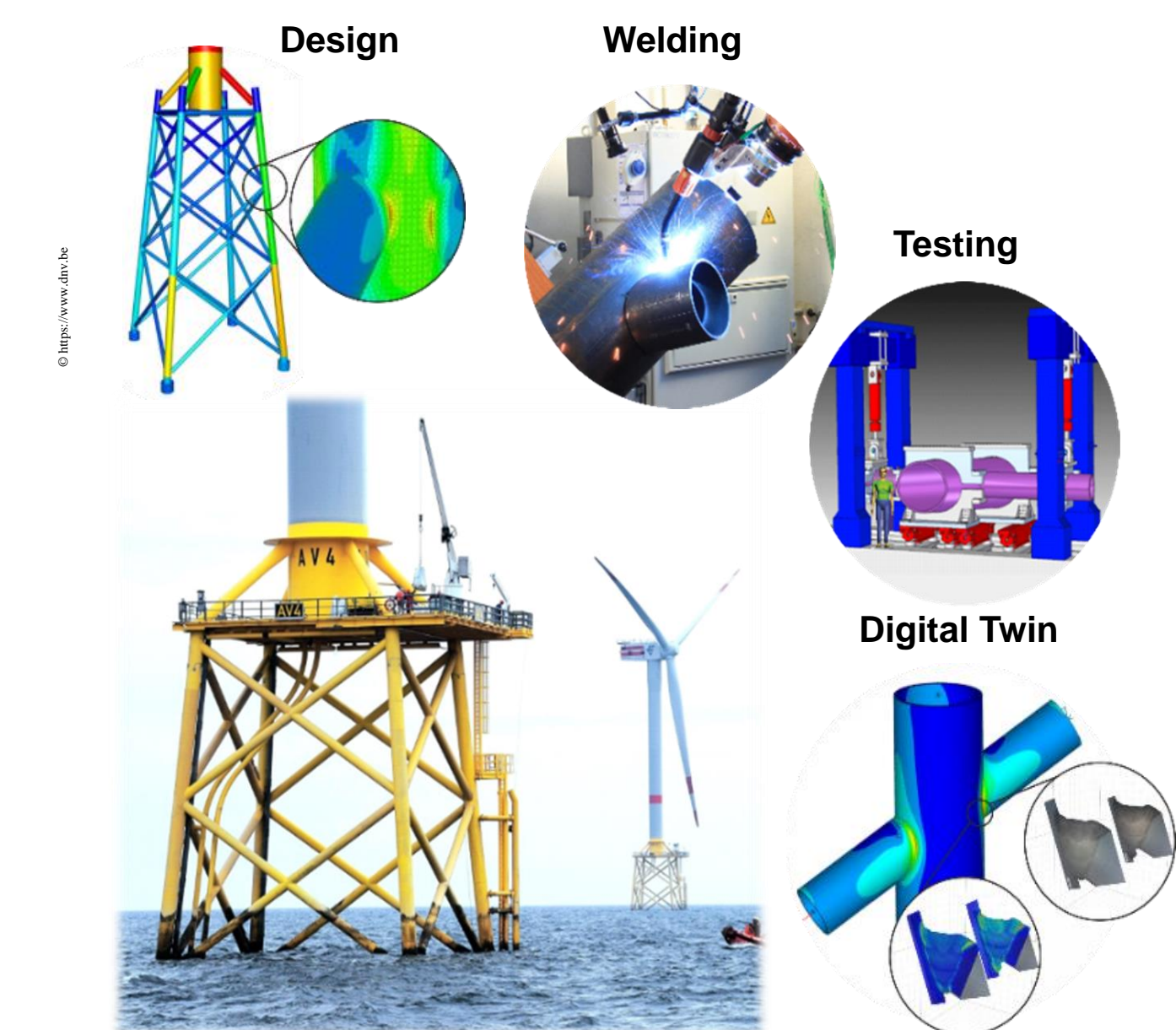
Automated arc welding and quality assessment of large scale support structures for offshore wind turbines

Motivation

- Nodal sections are most demanding components of foundation structures since the resulting seam geometry directly effects the fatigue strength
- The dimensional tolerances influence the local groove geometry that needs to be compensated by the welding process

Approach to Solution and Results

- Capturing of the local groove geometry for large scales nodal section and derivation of an adaptive process control optimizing the local seam geometry
- Tracing of varying process parameters for quality control of adaptive welding processes



Process simulation of laser beam welding

Motivation

- Mechanisms of defect formation cannot be observed in welding experiments.
- Unknown correlation of different physical factors on liquid metal flow.

Approach and Results

- Reveal fundamental mechanisms of the evolution of weld defects in laser beam welding by physics effect decoupling in a combination of multi-physics modelling and welding experiments
- Derivation of strategies to avoid defects
- Mechanism analysis of the effect of external EM forces in the melt pool
- Coupling AI methods with CFD analysis

