

**Project name:** **Residual Stress Analysis on an Aluminium Metal Sheet Joined by Friction Stir Welding**

## Beamtime Report

**14.03.2014 - 17.03.2014** (Date of the report: 03.04.2014)

### General information

Name of the rapporteur	Name of the rapporteur's organisation
Dr. Henrik Schmidt	HBS Engineering APS
Type of research (nanotechnology/health care/chemistry etc.)	Name of the research facility
Material Science and Engineering	Helmholtz-Zentrum Berlin, Synchrotron Radiation Facility BESSY II, EDDI - Energy Dispersive Diffraction Station
Date of the measurement, duration	Location of the event
14.03.2014, 2.5 days	Berlin
Facility personnel participating in the measurement	
<i>Dr. Manuela Klaus and Dr. Daniel Apel</i>	

### Description of the project

Research description (short summary as written in the application)
<p>Friction stir welding (FSW) is a solid-state welding process where two workpieces are joined using a rotating tool with a pin. Heat is generated by frictional and plastic dissipation – softening the joint region, thereby enabling material to be stirred around the tool.</p> <p>The workpiece "A" consists of FS welding of two aluminum plates. The workpiece is examined using XSA (X-ray Stress Analysis) measurements to obtain the lattice spacing and mapping the residual stress in the workpiece</p>
Summary of activities (experiments performed, beamtime used, preliminary overview of results, next steps and other relevant information)
<p>Several aluminum workpieces were FS welded at HBS Engineering and sent to BESSY II for characterization at the materials science beamline EDDI (Energy Dispersive Diffraction).</p> <p>XSA measurements were performed using symmetrical "psi"-mode (reflection) at a series of different angular orientations, providing energy dispersive spectra. The different energy positions of each diffraction line were subsequently used as basis for calculation of the residual stresses depth profiles</p> <p>Future steps: HBS Engineering ApS will make great use of the result of the one specimen examined,</p>

starting already at the FSW symposium in China.

The ScanStir framework by HBS Engineering could also benefit from the X-ray data which we are now planning to be conducted at DTU facilities as X-ray CT results were not an outcome from the ScienceLink delivery.

**How would you describe cooperation and assistance from industrial liaison officers and national contact points while preparing and carrying out the research at large scale facilities?**

**Other personal remarks**

## **Annexes**

**Annexes**

(list of annexes; meeting minutes, graphical illustrations, tables and other supplementary data)

We refer to the beam time report as supplemented by Dr. Manuela Klaus