

**Master 2017**

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**Process Monitoring of Laser-Induced Plasma in Dependence of Laser Impact Angle.**

***ABSTRACT - Masterthesis***

In this master thesis work, automation and measurement processes are achieved. The Automation process is achieved in TwinCAT, an PC control Technology for this process. The project comprises of TEA – CO<sub>2</sub> – Laser, PVDF sensor, Beckhoff SPS contains Analog, Digital I/O and Serial Interface, Industrial camera for Plasma detection and charge amplifier to optimal the sensor values. All instruments are interfaced into TwinCAT within Visual Studio IDE platform. Different Fieldbus communication like EtherCAT for SPS, GigE vision for industrial camera are interfaced in Automation Device Specification (TcADS) ActiveX controls. Monitoring and experimental process are proceeded in Bremer Institut für Angewandte Strahltechnik GmbH, Bremen. Controlling language like IEC 61131-3's Structure Text in SPS, Visual Basic for Laser used. In the experimental part, influence of laser pulse energy on laser-induced plasma and influence of laser impact-angle over plasma explained. Evaluation of the plasma characteristics are achieved in Image Processing in MATLAB.

In the Measurement process, Repeatability experiment for plasma height and shock-wave pressure is achieved. Distribution function and Probability density values are defined for repetition values. The measurement uncertainties are evaluated by Confidence Interval and standard error. At the end, 95% confident shockwave pressure and plasma's height is obtained.