

# Control and data acquisition systems for high power laser

What is a control and data acquisition system?

A control and data acquisition system was implemented for the recently developed collinear laser spectroscopy setup. This system is dedicated to data recording, storage, processing, monitoring of the beam intensity and energy, and visualization of various spectra.

Are deterministic control loops necessary for laser countermeasure turret pointing?

Deterministic control loops are necessary for maintaining high accuracy in the pointing of the turret and aiming of the laser countermeasure system. Here, we report on the progress of a beam control system developed at the Institute of Technical Physics of DLR that meets these demands.

What is a control and DAQ system?

In summary, a control and DAQ system was implemented to realize multiple functions for a CLS-experiment, such as data collection, storage and processing, monitoring of the beam intensity and energy, and visualization of the HFS and TOF spectra.

What are the typical laser parameters?

The typical laser parameters are a pulse length of 8 ns and a pulse repetition rate of 1 kHz. The laser is distinguished by its beam quality of  $M^2 \leq 1.4$ . Beam parameters can be monitored continuously in a separated beam line using a sampled beam copy.

How does a high power laser system work?

High power laser systems, such as those at DLR, contain two collinear and collimated laser output options. The laser transmitter emits laser energy of 50 mJ at 1064 nm or 25 mJ at 532 nm. The transmitted wavelength can be changed by a motorized mirror. Typical laser parameters include a pulse length of 8 ns and a pulse repetition rate of 1 kHz.

What is a sub-system in a laser beam control system?

In a laser beam control system, typical sub-systems include the target illumination laser, which functions as an ordinary flash lamp and provides the necessary photons to expose the camera focal plane array within sub-ms.

A control system based on Tango Controls is implemented for both the laser and four experimental areas. ... having a highly dependable and customizable server infrastructure that enables data acquisition and control of the entire experiment can be of great benefit for daily experimental work. ... Control systems and data management for high ...

advanced laser processing with intelligence based on high-brightness and high-efficiency laser technologies (TACMI project), Council for Science, Technology and Innovation (CSTI), Cross ...

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Supervisory Control and Data Acquisition (SCADA) is a computer system that processes and gathers data that exercises high-level operational controls over significant distances. SCADA systems were designed to solve communication issues, particularly data integrity and delay issues stemming from the various communication forms.

Best selection of high performance data acquisition and control systems for machine control, test automation, closed-loop PID or positioning. ... Combined laser and magnet control for MOT's; When designing a data acquisition and control system there are a ...

The computing the laser-fusion project is included. system has been divided into a number of subsystems including power Omega consists of a 24-beam 12 terrawatt (TW) pulsed conditioning, alignment, diagnostic data acquisition, and data reduction. laser system. The 24 beams are focused symmetrically onto These subsystems operate almost autonomously ...

For the design requirements of the miniature spectrometer data acquisition system, the high-resolution data acquisition system was designed by using the FPGA as the controlling core, and 16 bit ...

We compare platforms and approaches to state-of-the-art control systems and data management at high-power laser facilities, and we illustrate these topics with case studies from our ...

High repetition rate lidar is typically equipped with a low-energy, high repetition rate laser, and small aperture telescopes. Therefore, it is small, compact, low-cost, and can be networked for observation. However, its data acquisition and control functions are generally not specially designed, and the data acquisition, storage, and control programs need to be ...

The interaction of relativistically intense lasers with opaque targets represents a highly non-linear, multi-dimensional parameter space. This limits the utility of sequential 1D scanning of experimental parameters for the optimization of secondary radiation, although to-date this has been the accepted methodology due to low data acquisition rates.

We investigated various scenarios for probing the limits of the tracking and pointing accuracy with a target sample mounted on a fast moving linear stage. We present first results of the beam ...

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The data acquisition system collects and analyzes the flow data to monitor and control the flow rates. Acceleration and Vibration Data acquisition systems are also utilized to measure acceleration and vibration in different applications, including structural health monitoring, automotive testing, and aerospace industries.

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Fast solid target delivery and plasma-ion detection systems have been designed and developed to be used in high intensity laser-matter interaction experiments. We report on recent progress in the development and testing of automated systems to refresh solid targets at a high repetition rate during high peak power laser operation (>1 Hz), along with ion diagnostics and corresponding ...

control systems and data management at high-power laser facilities, and we illustrate these topics with case studies from our community. Keywords: big data; community organization; control ...

A user-friendly data acquisition and control system (DACS) for a pulsed chemical oxygen -iodine laser (PCOIL) has been developed. It is implemented by an industrial control computer, a PLC, and a distributed input/output (I/O) module, as well as the valve and transmitter. The system is capable of handling 200 analogue/digital channels for performing various operations such as ...

2.1 DAQ system. As shown in Fig. 1(a) (green shaded area), the collection and processing of the signals from the PMTs and MagneTOF detector are realized through a series of NIM modules, such as a fast timing amplifier (ORTEC FTA 820A) and constant-fraction discriminator (CAEN N605). The bias voltages for the PMTs and MagneTOF detector are provided by high-voltage ...

Figure 1 represents a Wi-Fi interface-based acquisition, analysis, and control system based on master-slave topology developed for the operation of flowing medium lasers. The acquisition and control system is divided into two main parts: master controller and slave unit. Slave unit is an acquisition, analysis, and control unit which performs all the monitoring, ...

As far as directed energy applications are concerned, power scalability from a few hundred to several hundred kilowatts is expected to accomplish the missions of interest [24], [25], [26], [27] these applications, high power laser beam is focused on to the distant target for achieving high power intensity to produce high lethality.

In this paper, a new data acquisition and lidar control system (DALCS) was developed based on System-on-Chip Field-Programmable Gate Array (SoC FPGA) technology. It can be used in lidar systems with high repetition rate and photon-counting mode and has functions such as data storage, laser control, automatic collimation, wireless communication ...

Setup of a Beam Control System for High Power Laser Systems at DLR Ivo Buske, Andreas Walther Deutsches Zentrum f#252;r Luft- und Raumfahrt, Pfaffenwaldring 38-40, 70569 Stuttgart, Germany, ... Synchronized data acquisition using the IEEE 1588 standard is available between the transmitter and receiver station. A time jitter of 120 ns RMS was proved.

results are presented to show that the new control algorithm can improve the pointing performance of the

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system. 2. HIGH ENERGY LASER BEAM CONTROL TESTBED ... power laser to maintain a safe laboratory environment. The testbed is built by Boeing-SVS, and the picture of the testbed ... data acquisition system, and oscilloscope are used for ...

Due to their many advantages, such as high efficiency, small size, light weight, high reliability and direct modulation capability, semiconductor lasers have been widely used in many fields, such as material detection, environmental monitoring, component analysis and optical storage. 1,2 In a high-precision detection system, there are strict requirements for the ...

This system includes a number of laser energy monitoring units at various stages of the laser chain, a data-acquisition unit and a control program to control its operation. Each unit in this ...

3.1.1 NIST Primary Standard for High Power Laser Measurements Scale: 10 cm Absorbing Cavity Calorimeter Case Temp Controlled Jacket Electrical Heater Temperature Sensor Reflector Figure 3.2 Schematic diagram of the cross-sectional view of ...

of data acquisition system for owing laser to the best of our knowledge. e application of a hybrid DAAS for owing medium gas laser and assessing its ecacy by employing methodical approach based on ...

Original manuscripts are sought to the special issue on "Future Control Systems and Machine Learning at High Power Laser Facilities" of High Power Laser Science and Engineering (HPL),. The scope of this special issue is to highlight the cutting-edge engineering, computational and experimental developments supporting the next generation of high power laser facilities and ...

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