A Liquid Scintillator Transparency Monitoring Laser System for JUNO
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**The JUNO Experiment & Motivation**

- **Main Goals of the JUNO Experiment**
  - Determination of the neutrino mass hierarchy (sign of $[\Delta m_{21}^2]$)
  - Precision measurement of solar oscillation parameters $\theta_{13}$, $\Delta m_{21}^2$ and atmospheric oscillation parameter $\Delta m_{31}^2$ to better than 1%  
- **How to measure the Mass Hierarchy?**
  - JUNO uses interference effects of $\Delta m_{21}^2$ and $\Delta m_{31}^2$ in oscillation probabilities of $\nu_s$ emitted by nuclear reactors

**General Design of the JUNO Detector**

![Schematic of the Jinpingex Underground Neutrino Observatory (JUNO)](image)

**Design of the Laser System & Characterization of single Components**

**A Unit for Researching Online the lScTransparency**

**The Laser Diode**

We will use the light of a laser diode to illuminate the detector in order to determine the optical parameters of the scintillator.

- **Requirements:**
  - Stability
  - Linearity
  - Doping spectrum
  - Resolution

**Specifications:**

- **Bozitmeter Laser Technik**
  - $\lambda_{FB} = 445$ nm
  - $P_{FB} = 50$ mW

**The Fiber Switch Module**

The Fiber Switch module has twelve different outlets through which the laser can be guided via optical fibers into the detector. Only one outlet is open at a time.

- **Requirements:**
  - Stable intensity ratio between outlets
  - No channel-channel-communication

**Specifications:**

- **Performance stability $\leq 0.01$ dB**

**The Fiber Termination**

Here, the laser couples out of the fiber being collimated by a GRIN lens. The beam direction is adjustable by a piezo-electric device – the Fiber Termination Holder (FTH).

- **Fiber Termination Holder:**
  - Beam tilt to the p- and B-direction
  - Beam is tunable even after filling

**Designation:**

![Designation](image)