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A Precision Optical Calibration Module for IceCube-Gen2

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We present here a new idea of an in-situ self-calibrated isotropic light source for the future IceCube-Gen2 neutrino detector called the Precision Optical CALibration Module (POCAM). IceCube-Gen2 will be a matrix of light sensors buried deep in the ice at the geographical South Pole. The timing, the location and the amount of Cherenkov light deposited by the secondary charged particles are used to reconstruct the properties of the incident neutrinos. This calculation relies on a detailed detector model that includes the response of optical modules to the Cherenkov light, as well as the optical properties of the detector medium - the natural Antarctic ice. To understand these properties, both natural and artificial light sources are already used for calibration. New calibration devices are being developed in order to improve the precision of these measurements and reduce systematic errors for the determination of the neutrino mass ordering with the Precision IceCube Next Generation Upgrade (PINGU). The POCAM's concept is based on the principle of an inverted integrating sphere. The main components are LEDs emitting light at several wavelengths and solid-state light sensors e.g. calibrated photodiode or silicon photomultipliers to control the emitted light intensity. We will report on the current status of the POCAM R&D.

Primary author: JURKOVIC, Martin (TUM)

Co-authors: Prof. RESCONI, Elisa (TUM); Mr VEENKAMP, Joost (TUM); Mr KRINGS, Kai (TUM); Mr ABRAHAM, Kevin (TUM); Mr HOLZAPFEL, Kilian (TUM)

Presenter: JURKOVIC, Martin (TUM)

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