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Design and development of the Power Supply Board within the Digital Optical Module in KM3NeT

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KM3NeT is a deep-sea neutrino telescope of very large scale (several km³) to be deployed and operated in the Mediterranean Sea. Neutrino-induced charged particles are detected by measuring their Cherenkov light in sea-water, using photomultiplier tubes (PMTs) inside transparent and pressure resistant spherical enclosures. The aim is to instrument several km³ of sea volume with tens of thousands of optical sensors, connected to the shore through electro-optical cables up to 100km. The KM3NeT collaboration has successfully developed an optical sensor, the Digital Optical Module (DOM), by placing 31, 3-inch PMTs in a 17-inch glass sphere along with the readout electronics.

Each DOM is supplied power through a high voltage (400 VDC) line from the shore, converted to low voltage (12 VDC) before entering the DOM. The Power Supply Board (PB), situated inside the DOM, is used to produce seven voltage rails as required by the DOM electronic modules. This paper summarizes the design considerations of the PB and the results of the trial runs so far. Efficiency, testing, manufacturing and reliability issues are also addressed in connection to the project overall objectives.

Primary author: Dr BELIAS, Anastasios (NCSR Demokritos)

Co-author: Dr MANOLOPOULOS, Konstantinos (NCSR Demokritos)

Presenters: Dr BELIAS, Anastasios (NCSR Demokritos); Dr MANOLOPOULOS, Konstantinos (NCSR Demokritos)

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