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The Dark Box instrument for fast automatic testing of the photomultipliers for KM3NeT

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Since the early days of experimental particles physics photomultipliers have played an important role in detector design. Also in astroparticle physics research, photomultipliers are largely used, in particular in experiments employing the technique of the detection of Cherenkov photons. Currently, the KM3NeT Collaboration is building a water Cherenkov neutrino telescope in the Mediterranean Sea based on the next generation optical modules with multiple low price 3-inch photomultiplier tubes. In its final layout, the KM3NeT neutrino telescope will host several hundred thousand photomultipliers, which must be tested and calibrated during the production of the optical modules. To overcome a possible bottleneck in the production process of testing and calibration of the massive amount of photomultipliers for KM3NeT, we developed the Dark Box instrument to accelerate the process.

The Dark Box setup is designed to provide fast simultaneous automatic testing of 62 photomultipliers to verify their compliance to requirements for timing and ToT resolution and the occurrence of spurious pulses. In addition, the Dark Box can be easily converted into a general instrument for testing and calibrating large amounts of photomultipliers other than those for KM3NeT.

We report on the design and performance of the Dark Box instrument for the high-statistics measurement of the characteristics of photomultipliers and of their calibration.

Collaboration

KM3NeT

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