KM3NeT

Opens a new window on our universe

www.km3net.org, kt@km3net.de

Multiple photomultiplier testing facility

INNOVATIVE TECHNOLOGICAL SOLUTIONS FROM KM3NeT

KM3NeT is a research infrastructure housing the next generation neutrino detectors, located at some of the greatest depths of the Mediterranean sea. Each detector comprises a three dimensional array of optical modules. Large scale Cerenkov detectors such as KM3NeT require tens of thousands of photomultipliers (PMTs). Developing a method for simultaneous multiple PMT characterization is of fundamental importance for KM3NeT.

Credit: Italiana d-Arte

The DarkBox

A "DarkBox" system has been developed which is capable of measuring the characteristics of 62 PMTs simultaneously twice a day. It allows the characterization of all PMTs of experiments demanding large numbers of PMTs.

The DarkBox design allows easy, fast and safe loading and unloading of the PMTs, thus optimizing the operation time. The PMTs are maintained in a vertical position using PVC collars and elastic bands. Dark tightness is reinforced by means of light-tight supports for each PMT.

KM3NeT

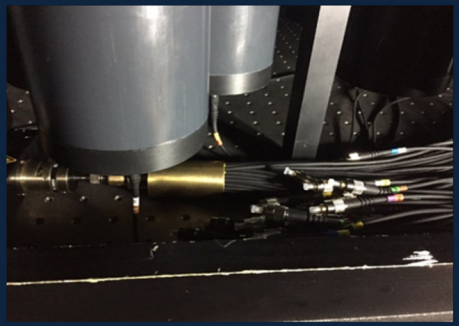
Opens a new window on our universe

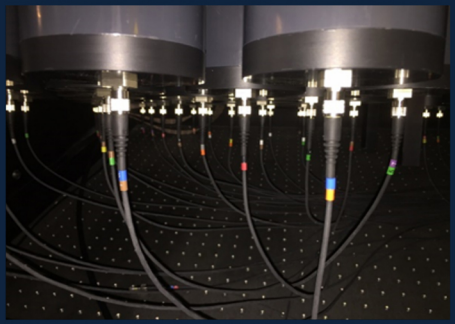
www.km3net.org, kt@km3net.de

Multiple photomultiplier testing facility

Optical System

A time-calibrated electrical cabling system was realized to connect PMTs to the DAQ system placed outside the box, maintaining for all PMTs an equal time delay from the base to the DAQ. A picosecond accuracy laser and a calibrated optical 1x70 splitter are used to distribute single photon signal to all PMTs. Tunable optical attenuators are used to provide single photon condition.





Multi-PMT testing facility

The DarkBox is used to measure the PMT dark rate, equalize gain, determine spurious pulses and timing characteristics such as transit time and transit time spread. A complete calibration takes about 10 hours of which 9 hours are used for PMT conditioning in darkness. 7000 3-inch PMTs have been tested at Naples using the «DarkBox» facility.

The DarkBox system and the developed calibration procedure is extremely flexible and can be adapted to other PMT types or data acquisition electronics with minimal changes.

The DarkBox system has been developed by INFN (Instituto Nationale di Fisica Nucleare) Napoli.