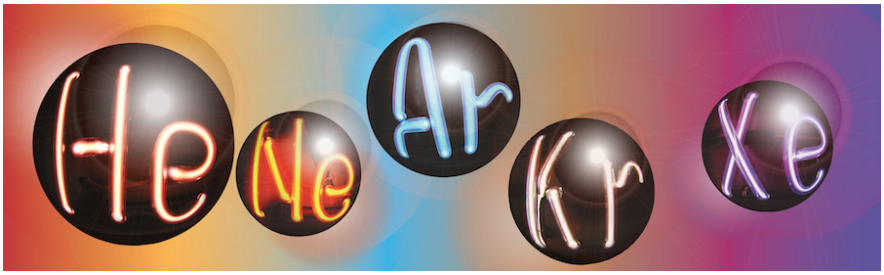

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Portable LAr Scintillation Analyser

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A portable analyser of the Liquid Argon (LAr) scintillation light (Scintillation Analyser) has been built. It allows to perform fast analysis of the lifetime of the argon triplet excitation state. The system was originally used to monitor the quality of LAr after its purification during filling of the LEGEND-200 cryostat. High purity of the argon (0.1 ppm for water, nitrogen and oxygen) was needed to achieve a very good light yield, and thus increase the efficiency of the LAr veto in the experiment.
The Scintillation Analyser is based on two 2-inch Hamamatsu photomultipliers (PMTs) capable to work in LAr. They are covered with Tetraphenylbutadiene (TPB) to shift the UV light to the visible range and are equipped with dedicated bias high voltage (HV) dividers. PMTs were installed face-to-face on a special support structure attached to a CF-150 flange. The latter has appropriate liquid/gas feedthroughs for the LAr filling/draining and electrical feedthroughs to pass the PMTs high voltage and signals. The flange is mounted on a dedicated portable wide-neck cryogenic vessel with 90 L capacity. The fill level of the vessel is controlled by a set of PT-100 sensors installed on the PMT support structure.
A dedicated electronic unit has been built to provide HV to both PMTs and amplify their signals. Each channel has two electronic paths: one for fast linear amplification of the pulses (fast), and the second for linear amplification but with a "semi gaussian shaper" to allow for operation with slower digitizers. A sum of "slow" pulses from both PMTs is also available and sum signal can be used as an acquisition trigger. In the recent upgrade of the system the older digitizer, which worked with the slow pulses (250 MHz sampling rate), was replaced by a new 2-channel FADC card providing 16-bit precision and 500 MHz sampling rate. It allows to use the fast track and record signals from both PMTs simultaneously. New acquisition and analysis software has also been prepared. It allows for fast analysis of the acquired data including fitting of the triplet lifetime. Filling of the vessel with LAr to be analysed takes about 40 min. The analysis of the triplet lifetime with a decent statistics should not take longer than 15-20 min depending on the radioactive source activity. Including draining of the vessel the entire measurement should closed in 90 min. This allows for quasi-real-time analysis. The system is planned to be used to monitor LAr purity during filling of the LEGEND-1000 cryostat. Details of the system, its operation principles, and analysis will be presented.

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