

Experimental Setup for Optical Property Measurement in the VUV Region

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The study of optical properties in the vacuum ultraviolet (VUV) region plays an important role in various scientific fields and in particle physics this is enhanced by the growing utilization of cryogenic noble gasses as scintillating material, mainly in dark matter and neutrino experiments. Indeed their high light yield, good purity and the possibility to perform pulse shape discrimination make Argon and Xenon excellent choices to meet specific requirements; this comes at the cost, also, of their emission spectra, centered at 128 and 178 nm respectively.

Here, we present a detailed description of an experimental setup designed for the precise measurement of optical properties in the VUV region.

The setup described here comprises several components that enable accurate characterization of materials and surfaces. The core component is a VUV spectrometer equipped with a photomultiplier tube (PMT) as the sensitive photodetector. The spectrometer covers a broad spectral range from 120 to 200 nanometers. The entire system can operate at a pressure of 10^{-6} mbar in order to preserve VUV light along its path. For VUV light generation, a deuterium lamp serves as the light source. To determine absolute measurements, a calibrated photodiode is incorporated in the setup enabling the measurement of VUV flux. To further enhance the versatility of our setup, a goniometric sample chamber has been included. This commercial chamber allows for measurements of transmission and reflectivity of a given sample as a function of the angles involved.

In the first application, our experimental setup was employed to measure the efficiency of p-terphenyl as a wavelength shifter as a function of its thickness (of the order of 1 mg/cm^2) for 128 nm primary light. The obtained results will be presented in this poster.

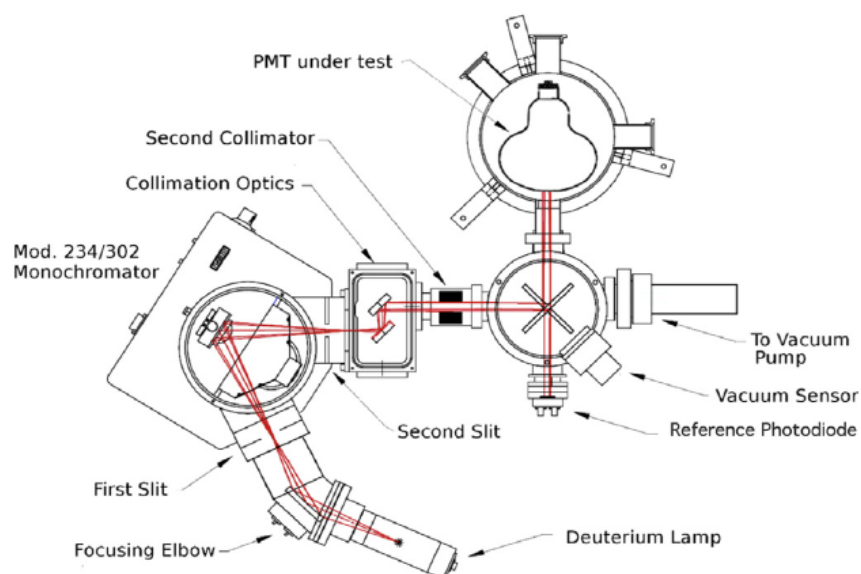


Fig: a scheme of the setup in the configuration used to characterize a photomultiplier tube.