



ASTRONOMICAL CALIBRATION LAMPS

Thorium / Argon (Th/Ar) Hollow Cathode Lamps

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Astronomical spectrographs are used for a variety of high-precision measurements, ranging from the discovery of low-mass exoplanets to the possible variation of fundamental constants, such as the fine structure constant or the proton-electron mass ratio. These works require excellent wavelength calibration sources and a detailed understanding of the associated uncertainties and systematics. In the era of extremely large telescopes, it is often the accuracy of the calibration source, not the intrinsic photon noise, that limits the achievable precision. Furthermore, the science goals of future extremely large telescopes will require very high precision calibration sources.

Below 900 nm, the well-established thorium-argon (Th/Ar) hollow cathode lamps have been a workhorse. Continual improvements in the line list have now enabled Th lamps to be used to calibrate almost the entire optical bandpass with high precision.

Hollow cathode lamps, being significantly less expensive and easier to use, are the preferred wavelength calibration solution for most astrophysical spectrographs. Thorium (^{232}Th), an element often used as the cathode for such lamps, exhibits many of the desired characteristics of an atomic emission calibration source: it has many energy levels (leading to many lines), a heavy nucleus, a very long half-life, and occurs in nature as a single isotope. Other elements such as Uranium can be used as a calibration source.

** Power supply required to run the lamp is P209. Also optional P217, 10m Extension lead cable*