Design and Status of the MPE Fast Timing Photo-Polarimeter OPTIMA

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Cosmic high-energy sources are often characterized by extremely fast variations in wide spectral bands. Relativistic particle populations in strong electro-magnetic fields and high temperature plasmas generate primarily X- and γ-ray photons. Optical radiation from these sources can be closely related to the high energy processes and is readily observed from the ground. For this multiwavelength extension of our studies of high energy sources into the optical range we have built a sensitive, portable high-speed photometer called OPTIMA ("Optical Pulsar Timing Analyzer").

OPTIMA is based on a set of single photon sensitive counters (avalanche photodiodes, APD) which are coupled to astronomical targets with an array of optical fibers embedded in the focal plane of large telescopes. APDs have quantum efficiencies exceeding 50% in the range 450-950 nm. A GPS timing receiver, a CCD camera for target acquisition and stand-alone PC control units complete the instrument. Single photons can be recorded with an absolute timing accuracy of $\sim 2\mu s$. Recently a rotating polarisation filter and a prism spectrograph that allows to simultaneously record photons in 4-color bands, have been added as optional equipment. The polarimeter has been verified in Crab pulsar observations; the spectrograph has been tested in May 2002 on selected sources. OPTIMA has so far been used on the 1.3m telescope (Skinakas), on the 3.5m telescope (CAHA) and in the southern hemisphere (74in. Mt. Stromlo, 2.2m La Silla).