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Novel 1.5' Size PMTs of Outstanding Parameters for the CTA Project

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Content

Photomultiplier Tubes (PMT) are the most wide spread light detectors for measuring fast and faint signals. About six years ago we started an improvement program for the PMT candidates for the Cherenkov Telescope Array (CTA) project with the companies Hamamatsu Photonics K.K. (Japan) and Electron Tubes Enterprises Ltd. (England). CTA is the next major Imaging Atmospheric Cherenkov Telescopes array for high energy gamma-ray astrophysics, about 100 telescopes of sizes of 23m, 12m and 4m will be built in Northern and Southern hemispheres. For CTA we need PMTs with the highest quantum efficiency, maximized photo electron collection efficiency, short pulse width of a few ns, very low after-pulsing and transit time spread. The manufacturers were able to produce 1.5 ' PMTs of enhanced peak quantum efficiency of ˜ 40%. These can collect up to 95-98% of photo electrons onto the first dynode for the wavelengths $\geq$ 400nm. A pulse width of $\leq$ 3ns has been achieved at the selected operational gain of 40k. The after-pulsing for a threshold of $\geq$ 4 photo electrons is reduced down to the level of 0.02%. We will report on the measurements of PMT R-12292-100 from Hamamatsu and the PMT D573KFLSB as the latest iteration from Electron Tubes Enterprises as candidate PMTs for the CTA project.

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