

## A scintillator detector for beam tuning of low energy single electron accelerator

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In general, the weak-current beam of accelerator can be measured by picoammeter, the Faraday cup and other devices. However, when the beam intensity is lower than picoampere, the methods above are not suitable. For some applications and researches, the quasi-single charged particle beam is a key and essential facility. Therefore, it is required to find a new solution to reach single particle sensitivity for beam tuning. In this paper, nine single particle sensitive beam detectors based on plastic scintillator and photomultiplier tube (PMT) were developed to measure the 100Hz pulsed electron beam in the range of 0.1 to 50 MeV. The beam was tuned from about 107 to quasi-single electron for each bunch by these detectors installed after slits along the beam pipe. In order to determine the number of electrons in a bunch, the gains of each PMT were calibrated by a precise single photon gain measurement system for PMTs; the signal response of each detector was calibrated with <sup>207</sup>Bi radioactive source; the deposited energy in the plastic scintillator, and the electron detection efficiency and light collection efficiency of the probe, as a function of electron incident energy were also simulated in detail by Geant4. The commissioning result shows that the detector is an effective method to measure the weak-current beam lower than picoampere, instead of the Picoammeter and Faraday cup for beam tuning.

### Has accepted

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