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Diagnostics of beam losses at the Novosibirsk Free Electron Laser

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The article describes the BLM system of the Novosibirsk Free Electron (NovoFEL) microtron. Cherenkov radiation detectors are used to monitor beam losses. When beam of electrons hit the wall of the vacuum chamber, they create a shower of secondary electrons that fly out of the chamber and pass through the detector material, creating Cherenkov radiation in the process. The facility uses two types of Cherenkov detectors: optic fibers and quartz rods. Optic fibers are applied for the localization of the source of beam losses due to short duration of Cherenkov flashes. Quartz rods, on the other hand, measure the average beam loss at their location. In both cases, photomultiplier tubes (PMTs) are used to detect the Cherenkov radiation, and the voltage from the PMTs is digitized using an analog-to-digital converter (ADC) and displayed on a computer screen. This allows operators to monitor beam losses and tune the system accordingly. The article provides an overview of the basic principles of the BLS system of NFEL and describes in detail its operation. It also discusses the choice of detectors and the experience gained from applying diagnostics to tune the NovoFEL.

Footnotes

Funding Agency

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