

Optical System Design for High-Energy Particle Beam Diagnostics*

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Abstract

Radiation generated by high-energy particle beams is widely used to characterize the beam properties. While the wavelengths of the useful radiation may vary from visible to x-rays, the physics underlying the engineering designs are similar. In this tutorial, we will discuss the basic considerations of the optical system design in the context of beam instrumentation, and the constraints applied by high-radiation environments. We will cover the most commonly used optical diagnostics; fluorescence flags, visible synchrotron radiation imaging, and x-ray radiation imaging. The emphasis will be on how to achieve desired resolution, accuracy, and reproducibility.

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