

Modern radiation therapy is built on a technological foundation of volumetric soft-tissue imaging, computer-aided treatment planning, and multi-leaf collimators (MLC) with enhanced computer-control. Constant advances in these three basic elements have led to the development of Intensity Modulated Radiation Therapy (IMRT), which provides the ability to specify and deliver dose distributions that conform definitively to targeted volumes, which in turn, reduces toxicity and facilitates dose escalation.

IMRT is similar to conventional practice in the sense that it requires a comprehensive approach to commissioning and quality control to assure an effective and safe clinical implementation. However, IMRT is different because it involves the superposition of several beam segments, with the potential for very short beam-on times and vary small beam areas. To assure that the dose delivered with IMRT meets accepted standards for accuracy and precision, accelerator commissioning and quality assurance procedures must be extended to evaluate machine performance under these conditions. Thus, MLC calibration; leaf transmission; small field dosimetry; and beam stability for short irradiations are special considerations when commissioning a linear accelerator for IMRT treatment.

Educational Objectives

1. To demonstrate principles of commissioning and quality assurance for step-and-shoot IMRT delivery.
2. To explain the implications and pitfalls of small field dosimetry
3. To show how beam startup characteristics influence IMRT delivery.
4. To illustrate the benefits and limitations of and integrated MLC design.