

The delivery of radiation treatments is reaching new pinnacles with continued advancement in accelerator and computer control technology. Computer-controlled linear accelerators (linacs) are increasingly being used clinically in small, as well as big, institutions. There is a complete shift in the paradigm of the treatment delivery process. Historically, linear accelerators have been used to deliver radiation of uniform intensity through field apertures shaped by blocks. Now the emphasis is to shape the field apertures with a multileaf collimator system and vary the radiation intensities with dynamic motion of the collimator system to deliver conformal radiation to the target volume. The fundamental premise is that the high-dose volume is restricted to the shape of the target tissue while excluding as much normal tissue from the high-dose volume as possible. Therefore, the acceptance testing and commissioning of a computer-controlled linac can be quite complex and may vary from institution to institution depending on its anticipated use.

The process of purchase, acceptance testing, and commissioning of a computer-controlled linac is a major undertaking that can take up a considerable amount of time, effort, and expense. Therefore, it is crucial that a great deal of thought and care go into the initial planning. The primary objective is that the accelerator specifications must meet the clearly defined needs of the facility over the projected lifetime of the accelerator, which can be up to 10 years. It is very important that the selection process for the equipment includes input from radiation oncologists, physicists, therapists, and facility engineers. The selection, acceptance testing, and commissioning of a linac involves;

- evaluation of clinical needs
- review of specifications and purchase agreement
- design and construction of the facility to house the new machine
- installation of the machine, safety checks, and initial radiation survey
- acceptance testing of the machine
- commissioning of the machine for clinical use
- final report and documentation
- training of the staff in the safe and efficacious use of the accelerator
- establishment of the baseline quality assurance parameters and schedule

Educational Objectives:

1. Learn to develop equipment specifications, the acceptance testing protocol, and the purchase agreement.
2. Learn the process of bringing a new computer-controlled linear accelerator into clinical use.
3. Data collection for dosimetric commissioning of the accelerator.