

Implementation of intensity modulated radiation therapy (IMRT) requires extensive quality assurance procedures that differ from those used in conventional conformal therapy. The relatively straightforward connection between monitor units and dose is lost with IMRT, as is the qualitative assessment of dose coverage using portal films or images. Techniques have been developed to evaluate and monitor linear accelerator performance, dose distribution calculation accuracy, patient positioning accuracy, and dose delivery reproducibility. This talk will specifically address system quality assurance, namely the procedures that are conducted on a routine, but not necessarily a patient-by-patient basis.

For the most part system quality assurance techniques have paralleled the techniques commonly used to evaluate linear accelerators for traditional conformal therapy treatments. These include the measurement of geometric accuracy of analog and digital readouts, determination of absolute dose output, and determination of general dosimetric parameters, such as multileaf collimator (MLC) leakage. With IMRT, some of the quantities traditionally associated with beam geometry, such as MLC position accuracy, have a direct influence on the delivered dose within the tumor volume rather than simply affecting the portal boundary. The altered influence of these parameters must be carefully considered when setting up an IMRT QA program. This talk will discuss the linear accelerator parameters that are altered when IMRT is implemented, and discuss methods for their measurement.

Implementation of IMRT also has a profound influence on the use and QA of the treatment planning system. Commissioning no longer involves only the direct dosimetric evaluation of simple and complex radiation portals, but also requires the development and execution of test treatment plans, including model tumor and critical structure contours and prescriptions. Careful selection of the test treatment plans is important to assure that the treatment planning system will operate accurately, and often test plans are customized to a particular treatment site. This talk will describe techniques for making test plans, dosimetry tools and evaluation methods.

After the lecture, the attendee will understand:

The importance of system QA

Methods for determining accuracy of dose calculation and monitor unit determination

Tradeoffs of different measurement techniques

Test treatment plan design.

Methods for determining linear-accelerator IMRT dose delivery accuracy.

Techniques for evaluating dose discrepancies

Calculational alternatives for direct dose measurements