From the first European commercial introduction of multileaf collimation in the late 1980s and the eventual commercial entry in the United States, much analysis has taken place. Multileaf collimator (MLC) systems are either tertiary or a collimating jaw(s) replacement. Common to all systems are the tungsten leaves with fitted divergent sides minimizing interleaf leakage. The leaves have a finite width yielding a stair-stepping effect in the beam's-eye-view plane. The leaves move either perpendicular to the central axis with idealized curved-end design or are flat-ended and move in an arc following beam divergence.

The current systems are designed to efficiently replace blocks and for dynamic conformal therapy. The former is limited by stair stepping and field size limitations. The latter is limited by leaf speed and range and transmission properties. Each clinic must analyze the stair-step effects with the clinical impact in mind. Most commercial systems designed for fixed static field therapy have also been investigated for intensity modulated radiotherapy (IMRT). A new breed of systems has hit the market, with narrower leaf widths; they are even suitable for stereotactic radiosurgery or specific IMRT treatments. These micro or mini MLCs are being analyzed in great detail.

Attenuation and leaf transmissions have been analyzed for the various systems. Attenuation values range from 1% to 2%. Interleaf transmission has been reported to be as high as 3%. The abutted leaf transmission (10-28%) outside the treatment field is not a problem as long as the collimating jaws or backup diaphragms are properly configured. Manufacturers provide various control features to move and check the leaves at their designated positions. Leaf calibration is either simple, where the leaves are calibrated at central axis, or elaborate, with multiple calibration positions. Leaf settings for a particular field are assigned by files that are generated after conforming the MLC shape to a smooth field. This is carried out by manual digitization, raster film digitization, or within treatment planning. In all cases the system generates the MLC files, which are then transferred to an MLC workstation or record and verify system. These devices then communicate with a control system connected to the MLC.

In 1995, the AAPM's Radiation Therapy Committee (RTC) assigned Task Group 50 to provide basic information to implement an MLC in a conventional clinic. This report is forthcoming. In addition, the AAPM RTC formed the Assessment of Technology Subcommittee (ATS). The ATS chose to first assess MLCs. A survey was sent to North American users this year. Results of this survey will be presented during this course.

Learning Objectives for this course:

1. To obtain an overview of the general and specific aspects of MLC systems.
2. To understand the limitations of the MLC systems and how related systems (treatment planning, accelerator, etc.) interact with the MLC.
3. To assess multileaf collimation as a new technology.