

This study focuses on the design and use of a laser diode scanner to examine steep dose gradients and MD-55 film characteristics. The scanner consists of a 670 nm laser diode, polarizer, beam splitter, wavelength sensitive diode detectors, and a computer controlled translational stage. The large absorption peak of MD-55 at a wavelength of 670 nm allows the use of inexpensive, standard laser diode sources for light absorption measurements. The incident and transmitted light power is recorded with calibrated detectors and stored in a computer controlled data acquisition program. The film position along a transverse axis relative to the light beam is also controlled by the computer program.

There has been much research on the temperature, humidity, dose rate effects and the response of MD-55 but there is no data on the effect of laser input power. This research has discovered a large variation in absorption of MD-55 for light powers in excess of 0.8 mW exhibiting increased, irreversible absorption with longer laser-irradiation time. Studies using a He-Ne laser and a filtered white light densitometer were performed to identify similar effects in these systems.

This project has also examined the steep dose gradients at the edge of small stereotactic collimators and in the near zone of brachytherapy sources. The tissue equivalence of MD-55, high resolution and precision movements of the scanning system are well suited for measuring dose distributions in these complex areas.