New tools in the Ionizing Radiation Standards laboratories allow researchers to meet the needs of Canadian users of radiation—in industry, academia and the health sector.

New Cobalt-60 source

The use of Cobalt-60 for cancer treatment was pioneered in Canada in the late 1950s by Harold Johns and co-workers. Today the majority of radiotherapy treatments are carried out using linear accelerators (linacs) but Co-60 remains a very useful reference source for ionizing radiation standards work and forms the basis for dosimetry protocols worldwide.

In March 2004, technicians from MDS Nordion in Kanata, Ontario installed a new Cobalt-60 source in one of the primary IRS irradiators. This equipment is used to calibrate the ionization chambers that determine the doses delivered in radiotherapy treatments in hospitals across Canada. Cobalt-60 has a half-life of about 5 years and the previous source, installed in 1998, was nearing the end of its useful life. After a series of commissioning measurements the new source was available for customer calibrations in May 2004.

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Brad Downton carries out commissioning measurements on the Co-60 irradiator after the replacement of the source.

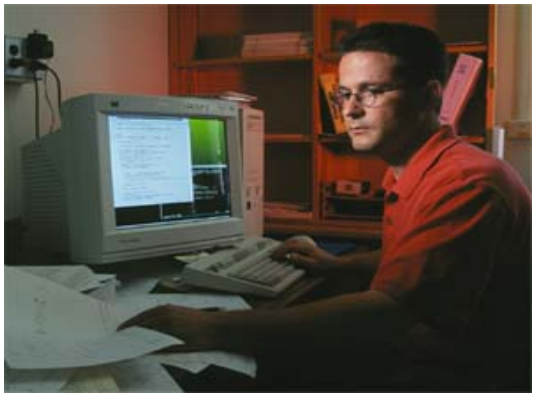
Elekta Clinical Linac

The most significant addition arrived in 2002 when an Elekta clinical linac was installed in the accelerator hall alongside the existing Vickers linac. The old accelerator has been in operation since 1968 and the new machine is intended to complement its older roommate rather than replace it. The new accelerator is identical to those found in cancer centers and provides a powerful tool for investigating dosimetry issues in the clinic.

Matt Kosaki and Malcolm McEwen assist in the installation of the new linac

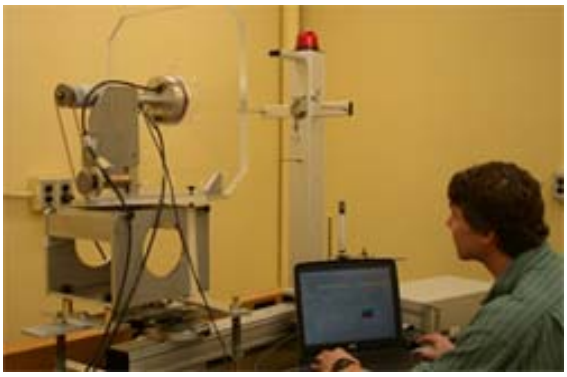
Elekta specialist John Joyce demonstrates the operation of the new linac to Dr. McEwen

Work is currently focused on the investigation of ion chamber response in high-energy X-ray beams. This will not only provide essential data for medical physicists worldwide but could also result in a new calibration service offering lower uncertainties than presently available. Currently, hospitals use the calibration factor obtained in the Co-60 beam and apply calculated correction factors for using the chamber in a linac beam. The new service would provide direct calibrations in X-ray beams similar to those being used for the treatment of cancer.



Dr Iwan Kawrako, a theorist in the IRS group, is also keen to make use of data obtained using the new linac. Dr Kawrakow has been at the forefront of developing Monte-Carlo radiation transport codes, which are increasingly used in clinics to simulate linac radiation beams and plan treatments. The Elekta linac provides the ideal test bed to investigate and validate these codes

New Beta-Ray Irradiation System



Also located in M-35 is the laboratory of Dr Patrick Saull. Patrick joined the IRS group in April 2002, reversing the Canadian “brain drain” by returning to Canada after several years at the *Deutsches Elektronen-Synchrotron* (DESY) high-energy physics laboratory in Germany. Since then he has been working on establishing dosimetry standards for beta particles. Beta sources such as Strontium-90 are a concern in radiation protection but are typically only found in nuclear facilities. However, in recent months there has been increased awareness around the world of the possibility of terrorist groups exploding a “dirty” bomb contaminated with radioactive material such as Strontium-90. In reaction to such threats the Canadian government launched a program—the Chemical, Biological, Radiological and Nuclear Research and Technology Initiative (CRTI)—to develop the necessary techniques and procedures to detect and/or cope with such an incident. In late December 2003, Dr Saull took possession of a new $100k irradiation system funded through CRTI. The new system provides a wider range of beta ray energies and doserates than was available from a previous system and will be used for the characterization of beta detectors employed by emergency response teams. More benignly, it will also be used to improve the monitoring of Canadian radiation workers in nuclear power plants and other such facilities.