**Facilities and Other Resources**

**University of Wisconsin Medical Radiation Research Center (UWMRRC)**

The UWMRRC includes the Radiation Calibration Laboratory (UWRCL) and is a leader in the field of ionizing radiation dosimetry. It operates as a research and outreach service laboratory with the capability of determining reference standards and dosimetry parameters relevant to diagnostic and therapeutic ionizing radiation-based medicine.

The UWMRRC was established in 1977 within the Section of Medical Physics, Department of Radiology of the School of Medicine, University of Wisconsin-Madison. The laboratory was approved as a secondary standards laboratory by the National Institutes of Standards and Technology (NIST) and as an Accredited Dosimetry Calibration Laboratory (ADCL) by the American Association of Physicists in Medicine (AAPM), in 1981. In addition to its AAPM accreditation, the UWMRRC has been accredited by the American Association for Laboratory Accreditation (A2LA) to ISO/IEC 17025:2005 and ANSI Z540-1-1994 standards since 2001. The mission of the UWMRRC is to educate the next generation of Medical Physicists, conduct metrological research for medically relevant ionizing radiation used in both therapeutic and diagnostic modalities, and provide service to the national and international Medical Physics, Health Physics, and Radiation Protection communities.

The UWMRRC is a Medical Physics Department facility which occupies approximately 8,000 square feet in the basement level of the Wisconsin Institutes for Medical Research (WIMR). The Center is completely self-funded through its accredited calibration services, with private industry-funded research contracts supplementing our research program. The UWMRRC employs 12 professional staff and 12-15 research assistants. Our reputation for advanced, comprehensive technical support and service is recognized worldwide.

**Major Equipment**

The UWMRRC maintains a large inventory of equipment and other facilities available to support the laboratory and departmental research programs. This includes investments in machine shop and computational hardware upgrades in the department. The UWMRRC maintains a number of NIST-traceable external beam irradiators, including Cobalt-60, Cs-137, constant potential x-ray and high frequency diagnostic radiographic units, Cs-137 and cabinet x-ray irradiators, as well as access to radiobiology irradiators and clinical linear accelerators at the UW Hospitals and Clinics. The UWMRRC is in the process of installing a clinical state-of-the-art teaching and research linear accelerator within the laboratory facility in WIMR. The UWMRRC maintains a full range of brachytherapy sources and well-type ionization chambers for calibration, including some primary calibration equipment, such as the variable aperture free air chamber (VAFAC), the Attix Variable Length Free-air Chamber, and a cryogenic calorimeter. The UWMRRC has developed a parallel processing computer cluster to provide mathematical modeling for the laboratory’s research projects. The UWMRRC has, since its inception, maintained a complete and extensive Thermoluminescent Dosimetry laboratory. The UWMRRC has radiochromic film technology utilizing a wide variety of scanners for use with virtually any clinical application, or to characterize and commission unique irradiator geometries including cabinet and small animal irradiators.

**Linac Laboratory**

The UWMRRC has recently installed a Varian 21EX linac with cone beam CT, RapidArc, with direct access to an eclipse treatment planning system. This facility will be used for research, graduate student and outreach training, and classroom laboratories.

**Research**

The UWMRRC research effort spans the fields of medical physics, radiation therapy, diagnostic radiology, health physics, and radiation protection. The research encompasses both basic and applied areas of investigation. Although the core research group is primarily focused on radiation metrology, one area of ongoing research has involved the investigation of small animal irradiator dosimetry. Due to the phase-out of Cs-137 irradiators and their replacement with filtered x-ray units, the impact on current radiobiology research can be a significant source of uncertainty. A variety of experimental methods and computational techniques are currently under investigation to accurately quantify the dosimetrically relevant output parameters of these units to maintain historical consistency with past radiobiology research outcomes.

**Calibration Laboratory**

As the largest and most comprehensive of the three Accredited Dosimetry Calibration Laboratories (ADCL’s) in the United States, the UWRCL currently calibrates approximately 75% of clinical brachytherapy instrumentation, and 50% of other clinical therapy instrumentation. The laboratory has been accredited by the AAPM since 1984, and was accredited by the American Association for Laboratory Accreditation (A2LA) to ISO/IEC 17025-1999 and ANSI Z540-1-1994 standards in 2001. Our reputation for detailed technical support and service is recognized worldwide.

**Developing Standards**

The UWMRRC’s impact on radiation metrology is well documented. The instrumentation for the national mammography standard (the Attix Free-Air Chamber) was developed at the UWMRRC and transferred to NIST in 1996. An Attix Free-Air Chamber unit is installed in the UWMRRC, and it serves as an active and important research tool. The UWMRRC’s brachytherapy calibration protocol is recognized as the interim national standard for both high dose rate (HDR) and pulse dose rate (PDR) 192Ir sources. The UWMRRC was instrumental in development of the air kerma calibration and dosimetry standard for electronic brachytherapy sources (eBT). The UWRCL is the only accredited laboratory for calibration of well-type ionization chambers using eBT sources.

**Existing Remote Dosimetry Services**

The Radiation Monitoring by Mail (RMM) program within the UWMRRC is the first and only accredited TLD dosimetry service in the USA. The RMM was started by John Cameron, Ph.D. in 1977, and has been providing a wide range of diagnostic and therapeutic dosimetry services since its inception. The RMM also has extensive experience with radiation protection dosimetry, and was previously accredited by NVLAP.

**Clinical Resources**

The UWMRRC has a strong relationship with the University of Wisconsin Medical School and the University of Wisconsin Radiation Therapy Center. Access to clinical facilities, faculty, and staff permits validation of research-derived protocols to clinical treatment modalities.