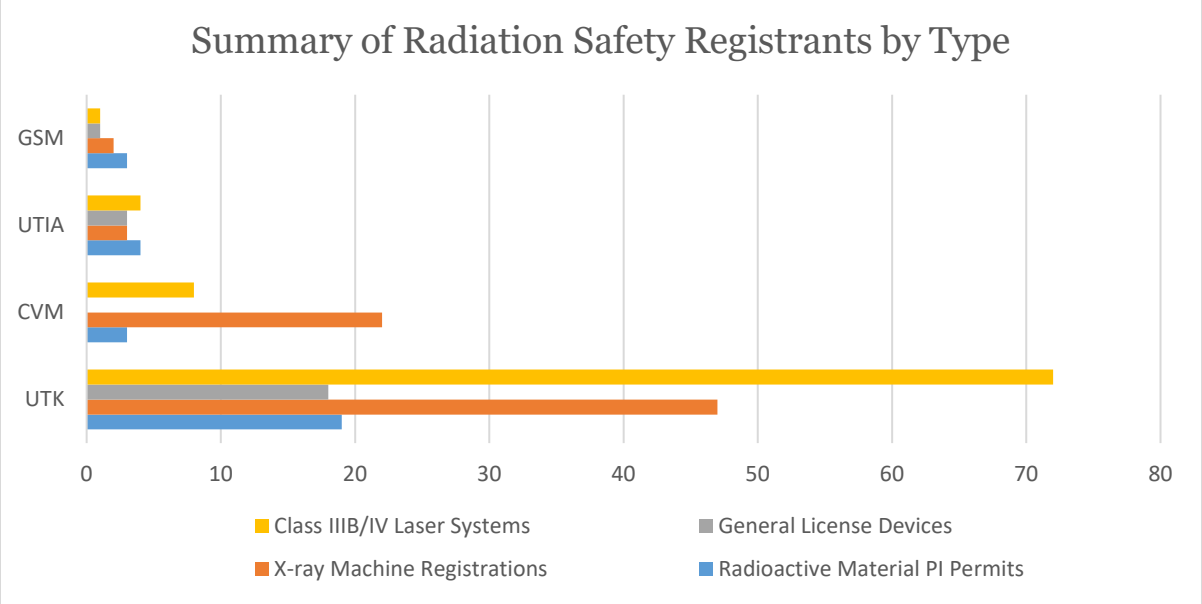
University of Tennessee-Knoxville
Radiation Safety
Annual Services Report 2022

Radiation Safety is responsible for overseeing ionizing radiation safety for the Knoxville area campuses which include Knoxville, Institute of Agriculture, College of Veterinary Medicine, Graduate School of Medicine, and UT Space Institute in Tullahoma. We manage the safe use of these sources for faculty, staff, students, and the general public. We provide safety training, regulatory permit management, occupational radiation exposure monitoring, lab protocol and safe use reviews, facility inspections, waste management, and monitoring of environmental releases. Radiation Safety also oversees non-ionizing radiation which includes high-powered laser generating equipment.

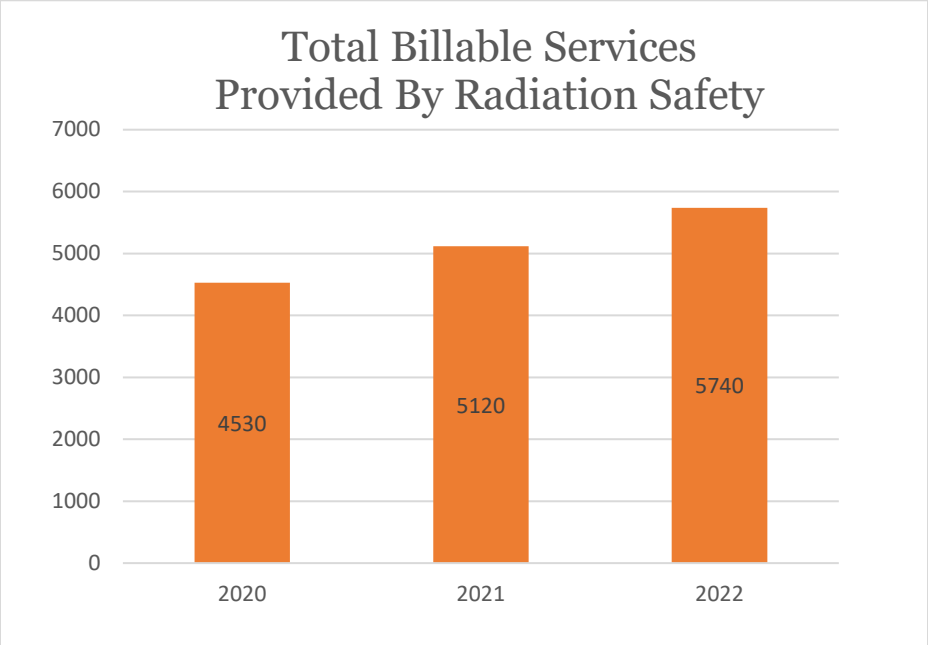
Currently, the Knoxville area campuses hold four radioactive materials licenses with the Tennessee Division of Radiological Health. We manage the registration and inspection of 74 x-ray or machine generated ionizing radiation devices, including three particle accelerators, and oversee the safe utilization of 85 Class IIIb and IV laser systems on the campuses.



Safety and Compliance Services

Radiation Safety tracks services provided to the Knoxville area campuses for billing purposes. The chart below details the billable service time by activity for 2022. Billable service time for the radiation safety programs does not include other tasks or efforts executed by the team to support the university including team member training and supervision, committee meetings, or other administrative tasks related to supporting the EH&S unit.

The graph below shows the total billable services to the Knoxville Area Campuses by calendar year since 2020. Growth in our programs has occurred as we incorporate additional training and hazard assessments for non-ionizing radiation sources and the increase of research activities on the Knoxville campus.



Description of Billed Service Hours by Category

Radiation Safety Program Administration	1260
Laboratory or X-ray Generating Device Inspections	510
Safety Training	970
Special Services and P.I. Requests	525
Occupational Radiation Exposure Monitoring	1090
Radioactive Waste Management	330
Contamination Assessments of Rooms or Equipment	100
Radioactive Material Packages Receipt and Inventory Management	210
Radiation Detection Instruments Calibrated/Fume Hood Flow Tests	250
Radioactive Sealed Source Leak Tests/Inventories	380
Non-Ionizing Hazard Assessments and Device Registrations	115
Total Billed Hours of Services	5,740

We count miscellaneous services in units of time under our Special Services and P.I. Requests. These types of activities include research protocol or experiment safety reviews, requested surveys or

assessments of compliance, transport of radioactive sources, and any other non-routine task executed to assist our customers. A more detailed explanation of our other work activities is provided below.

Radiation Safety Program Administration

There are many tasks necessary to execute the radiation safety programs. Tasks in this category include managing regulatory permits and compliance documentation, managing the Radiation Safety Committee, communicating with our customer base to answer questions and provide guidance, managing the program budget and campus billing, and all the tasks not specifically described in the chart that are necessary for operating the radiation safety programs for the campuses.

Occupational Radiation Exposure Monitoring

The Radiation Safety Program actively monitors the radiation exposure through radiation dosimetry or internal radiation dose assessments for approximately 900 individuals at the university. In addition, radiation monitoring exemptions are issued for certain x-ray generating devices that are engineered with shielding and safety interlocks that prevent user exposure to ionizing radiation. We track and maintain the records of radiation exposure for all individuals who are exposed to ionizing radiation through academic, research, or service pursuits at the university.

Laboratory and X-ray Generating Device Inspections:

Laboratories using liquid or solid forms of radioactive materials are inspected at least once every quarter of the calendar year based on the requirements in the university's broad scope radioactive materials license. On average, we inspected 48 open-source usage or storage laboratories per quarter in 2022. We reviewed shielding, security, and source integrity on approximately 200 sealed radioactive sources every six months. These sources are used for academic teaching laboratories, research operations, and as reference sources to maintain instrumentation. The frequency of safety inspections for equipment that generates x-ray radiation or other forms of ionizing radiation vary each year based on the type of machines, type of use, and safety risks. In 2022, we inspected for safety and compliance purposes 31 of the 74 total x-ray generating devices possessed.

Training:

Our unit provided over 18 different ionizing radiation safety or laser safety training modules developed in-house. Most of the training modules are hosted online and cover a wide range of safety and hazard instruction for varied uses of ionizing radiation sources and lasers on our campuses. We track training completion for our initial and refresher trainings, and we are pleased that we achieved a 99% completion rate for the radiation safety training modules that were due during the 2022 calendar year.

Waste Management:

Radioactive waste is removed from laboratories on an as needed basis. Our laboratories will collect their waste in bags or in 55-gallon drums. The university is allowed to store radioactive waste that has a short radioactive half-life on campus until the materials decay and are no longer considered radioactive. Once the waste is considered non-radioactive, it can be disposed of as regular trash. Most of the radioactive waste generated are materials that we can hold for radioactive decay. We collected enough radioactive waste in 2022 to fill 26 55-gallon steel drums. We shipped 13 drums of radioactive waste for off-site disposal.