

Ultra-Trace Forensic Science Center

Description

The Ultra-trace Forensic Science Center (UFSC) at Oak Ridge National Laboratory is a multi-directorate center focused on strengthening the nation's forensic science capability by providing state-of-the-art analysis and research facilities in a clean, legacy-free building. The center was conceived to provide basic research expertise and support to multiple high-impact national security and basic science missions that rely on ultra-trace analysis and high-precision measurements.

The UFSC was established in 2011 to provide a legacy-free facility to house ORNL's world-renowned high precision chemical and isotope mass spectrometry expertise and instruments, which form the backbone of ORNL's trace nuclear forensic analytical capabilities. In 2017 ORNL took delivery of a CAMECA® NanoSIMS 50L nanoscale secondary ion mass spectrometer dedicated to the missions executed in the UFSC. The center also houses ORNL's forensic science efforts in collection science and specialty sampling system development. The location of collection and analysis expertise and instrumentation within class 100 and 10,000 clean space in the UFSC allows for a high-fidelity, cradle-to-grave research program in forensic science that relies on collection and analysis of samples and materials.

Applications

- High-precision mass spectrometry development
- Detection limit enhancement for chemical and isotopic analysis methods
- Forensic analysis of materials
- Development and application of aerosol sampling systems for nonproliferation R&D
 - Design and fabrication of field deployable collection systems
 - Clean assembly and qualification
 - Deployment and return of sampling and support systems
- Training "Boots on the Ground" personnel in forensics methods

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Specifications	
Clean Space	<ul style="list-style-type: none">• Class 100 and 1000 hard-wall, low-return, metal-free chemistry and isolated sampler development laboratories• Class 10,000 instrument laboratories
Instruments	<ul style="list-style-type: none">• High-resolution inductively coupled plasma mass spectrometers (3)• CAMECA NanoSIMS 50L secondary ion mass spectrometer• Thermal ionization mass spectrometer• Quadrupole mass spectrometers• Time-of-flight mass spectrometer• Scanning electron microscopy• X-ray diffraction analysis• X-ray fluorescence instrumentation• Raman spectroscopy• Laminar flow hoods for sample handling• Separate sample and spike storage facility
Sampler development	<ul style="list-style-type: none">• Multiple class 1000 to class 10,000 laboratories dedicated to system development and deployment• Unmanned Vehicle Development Laboratory• Meteorology research and development instrumentation
Total space	>13,000 ft ² of renovated laboratory space



Left: Class 100 (ISO 5) metal-free clean room for trace uranium and plutonium chemistry and preparation; **Center:** Researcher operating thermal ionization mass spectrometer in the mass spectrometry wing; **Right:** Installation of a new CAMECA® NanoSIMS 50L in the NanoSIMS Suite.