Background
National security concerns arise when terrorist and rogue states pursue nuclear weapon development. The United States Departments of Defense (DoD), Energy (DOE), and Homeland Security (DHS) must identify security barriers, and develop new technologies to detect and mitigate these threats. National strategic research must include improved nuclear detectors and sensor systems for safeguard programs. Establishment of a center dedicated to development of radiation sensors and radiation measurement techniques is a direct response to national security needs.

In addition to faculty who are leaders in several areas relevant to nuclear detection, Kansas State University (K-State) has nuclear capabilities unique to the Midwestern region of the United States. The Semiconductor Materials and Radiological Technologies (SMART) Laboratory at K-State, one of the largest and most diverse university-based, radiation- detector development laboratories in the United States, is dedicated to research and development of new, innovative radiation-detector technologies. Over the past 14 years, the SMART Lab has benefited from numerous government and corporate sponsors, including the DoD, NSF, U.S. DOE Nuclear Engineering Educational Research program (NEER), and U.S. DOE NNSA office, totaling more than $23 million in extramural research support. A recently installed class-100 clean room is dedicated to fabrication of innovative radiation detectors.

The radiation-detector development group at K-State is involved in groundbreaking projects that emphasize development, design, and fabrication of innovative nuclear-radiation-detector materials and devices for applications such as nuclear materials monitoring, radiation imaging, radiation dosimetry, and remote radiation sensing. The SMART Lab has extensive materials purification and crystal-growth facilities, semiconductor detector processing fabrication equipment, electronics design and testing equipment, and radioactive calibration sources and detection calibration facilities, allowing the lab to be a fully operable facility for radiation-detector design and development. SMART Lab detectors have been featured in local and national news, and 16 U.S. patents have been awarded to SMART Lab researchers for novel detector designs, in addition to four Research & Development (R&D) 100 awards for innovative detector designs. The K-State nuclear program has conducted seminal civil defense research and maintains a world-class reputation in radiation shielding research. U.S. DOE, DHS, and DoD laboratories are currently testing detectors from the SMART Lab. K-State operates the only university research nuclear reactor in an 11-contiguous-state region within the Great Plains. The K-State nuclear reactor is used extensively to test and characterize detector technologies developed in the SMART Lab. Additional support is provided by the K-State Electronics Design Laboratory (EDL), staffed with professional electronics engineers with combined experience exceeding 80 years. Proximity to the Fort Riley military installation offers potential dual-use development and testing in a secure environment.

Description
The mechanical and nuclear engineering (MNE) and chemical engineering (CHE) departments at K-State are renowned for innovative radiation-detector research. In addition to the K-State TRIGA Mark II nuclear reactor and the EDL, K-State seeks to combine and exploit these resources to establish a National Center for Strategic Applications of Nuclear Sensors (SANS). This interdisciplinary center will have four primary missions: (1) explore new radiation-detector materials, (2) design and fabricate novel radiation detectors with unprecedented performance, (3) develop integrated detector systems and arrays vital to national security, and (4) train the next generation of leaders in detector technology needed to replace the first generation of nuclear-trained scientists and engineers whose ranks are rapidly dwindling due to retirements.

Relevance
A combination of faculty, expertise, and facilities will make the SANS center foremost in nationwide university- and government-based radiation-detector research, complete with materials research, neutron and gamma-ray detector development, electronics design, wireless detection technologies, and radiation monitoring and imaging devices. Establishment of the SANS center is a direct response to national security needs for development of new radiation detectors to mitigate nuclear materials. Detector development is highly relevant to a variety of radiation-detection applications such as stockpile stewardship, homeland security, astrophysics and space satellites, medical imaging, oil-well logging, active personnel dosimetry, high-resolution gamma-ray spectroscopy, and alternative methods for neutron detection.

Agency Contact Information
Defense Threat-Reduction Agency
(505) 853 – 0854 or (703) 767 - 6555