

Potential Roles for Sandia National Laboratories within the Integrated Photonics Institute for Manufacturing Innovation (IP-IMI)

Sandia is a National Security Laboratory available to all IP-IMI teams

Sandia is a DOE federally funded research and development center with a broad technical base that supports a wide variety of national security technologies and their transition to fielded applications. The DOE supports our “Strategic Partnership Projects” with industry using both direct contract and cooperative research agreements, with other gov’t agencies through interagency agreements, and by responding to broad agency announcements. We provide unique facilities and expertise that doesn't compete with industry, and we assure fairness of access to these capabilities.

Given our history of national security work and physical infrastructure, Sandia is especially well positioned to support Institute work, including technology transition requiring handling sensitive & proprietary material. Other potential roles include providing materials or devices outside of the main scope of the Institute or providing additional fabrication and test capacity to support Institute load-leveling needs.

How can Sandia fit into your strategy?

Early discussions with Sandia during strategic planning and proposal development offer the highest payoff for our partners. DOE is supporting Sandia involvement in strategy and project development for ALL teams, and we are available for teleconferences and briefings at your team meetings to discuss specific details on how our capabilities might enhance your Institute impact. We are also happy to host visits our Albuquerque facilities. Exemplary roles include:

Trusted technology transition projects

Sandia routinely supports defense contractor partners in technology maturation and transfer activities, and university partners via R&D collaborations and student fellowships/internships within the Laboratories. Our MESA fabrication facility is in a highly secured environment within the Sandia campus on Kirtland air force base and it is operated by cleared technical staff. Sandia’s facility is certified as trusted in its design and fabrication efforts to create and qualify high-reliability products for government programs. Sandia’s current projects utilize heterogeneous integration of III-V and Si photonics with CMOS to realize novel advanced pathfinder products for satellite sensing, exascale computing, next generation alternative energy, chem-bio sensing, and specific radiation hardened and classified applications.

Novel materials, devices, or process integration

Since the Institute will likely need to focus the development of the photonic manufacturing on a fixed process, Sandia’s flexible foundry environment can be applied to support development of novel processing steps and to access novel materials and devices outside the immediate scope of the IMI foundry, prior to transfer to the commercial foundry. Example novel materials currently utilized in Sandia projects include LiNbO₃, AlN, BN, Graphene, MoS₂, and wide-bandgap and ultrawide-bandgap nitride semiconductors. Novel devices include photonic and phononic crystals, optomechanical-force-based opto-acoustic transducers, MEMs-based RF filters and sensors, suspended photonic structures, and chip-scale gas chromatography columns.

Novel reliability/qualification test and failure analysis

Sandia’s high-consequence missions have developed a broad range of failure analysis and qualification metrology and techniques that may be of use to IMI partners in the development of new processes. These capabilities range from detailed material and interface characterization to micro-and macro-scale extreme environment testing. From the Government perspective, Sandia’s rich history of test, evaluation, verification and validation can provide 3rd-party assistance and cross validation of results of the Institute test methodologies and systems.

Extra Institute capacity for fabrication and test

Sandia can support the commercial foundry activities by providing additional capacity for design, fabrication, test, and systems integration while the end-goal commercial foundry ecosystem develops. Sandia’s internal project portfolios have driven the development of a low-volume Silicon Photonics Foundry multi-project wafer (MPW)

system and III-V PIC foundry that IMI partners may utilize (to support continuous capacity or for temporary load-leveling). Extensive design, testing and evaluation capabilities available at Sandia may also help support rapid impact of the IMI on new products by supporting university and industry partners in the development of the complete design, simulation, and test infrastructure needed for rapid, low-cost manufacturing.