

QESST Year 5: Research Projects, Testbeds and Thrust Alignment

Thrust 1: Terawatt Scale Silicon Manufacturing

- High-mobility Transparent Conductors for Silicon heterojunction and CIGS solar cells (Bertoni, ASU)
- Contact Passivation (Bowden, ASU)
- Defects in high-quality crystalline silicon materials: TCAD modeling and validation using industrially-relevant materials (Buonassisi, MIT)
- Characterization and Reliability in Cell Manufacturing (TamizhMani, ASU)
- High Efficiency Silicon Solar Cells at 1gram/watt (Opila, UDel)

Thrust 2: Tandem Integration with Silicon

- Tandem III-V/Si Integration for > 30% Efficiency (Atwater, Caltech)
- III-Sb on Silicon multi-junction solar cells (Balakrishnan, UNM)
- Terawatt Scale III-Nitride on Si In-situ and Induced Junctions (Doolittle, GaTech)
- Flat-Plate Tandem PV: A Marriage of Silicon and II/VI (Holman, ASU)
- Dilute Nitride Materials and Devices (Freundlich, UH)

Thrust 3: Fundamentals for High Efficiency PV

- Defect creation in epitaxial structures: structural investigations, simulation of defect creation (Faleev, ASU)
- Nano-based enablers for commercial silicon solar cells (Holman, ASU)
- Multi-Scale Modeling of Dilute Nitride Materials and Silicon Heterojunctions (Goodnick, ASU)
- Spectrum Splitting Optics for Micro-Concentrator PV Systems (Kostuk, UofA)
- Cu(InGa)Se₂ Tandem Cell Development (Shafarman, UDel)

Testbeds

- Testbed 1: Student-Led Pilot Line (Bowden, ASU)
- Testbed 2: Advanced Modules and Integration (Kiaei, ASU)
- Testbed 3: Sustainability of TW Scale PV Deployments (Honsberg, ASU)

Cross-Cutting

- Education Research: Common purpose, Shared Goals, and Community - The Learning, Emotional, and Social implications of a shared research vision (Husman, ASU)
- Sustainability: A Systems Dynamics of PV Sustainability at the TeraWatt Scale (Seager, ASU)