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**High efficiency III-V/Si tandem photovoltaics**

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Silicon photovoltaics are rapidly approaching their practical efficiency limit of 29%. However, multi-junction geometries have the potential to reach significantly higher conversion efficiencies. While III-V multi-junctions have already demonstrated efficiencies exceeding 40%, approaches based on lower cost technologies have only recently surpassed 30% efficiency. In this talk, we will discuss 4-terminal, mechanically stacked III-V//Si dual- and triple-junction solar cells that reach record one-sun efficiencies of 32.8% and 35.9%, respectively. These efficiencies exceed both the theoretical efficiency limit for single-junction Si and also the record III-V dual-junction efficiency (32.6%). We will also discuss a new approach to mechanically stacked solar cell fabrication, which relies on the use of a transparent conductive adhesive (TCA) to interconnect the cells. The TCA conforms to textured Si surfaces, providing optical and electronic coupling between any top and bottom cell, enabling two-terminal and three-terminal devices. Three-terminal devices are based on an interdigitated back contact bottom cell with a conductive top surface. This design, in particular, is a compelling platform for tandem solar cell integration because it includes the best features of both two- and four-terminal operation. It enables low sensitivity to band gap matching and spectral fluctuations, similar to a four-terminal device, but does not require the intermediate grids and lateral current transport. We will discuss both modeling and experimental work on TCA-bonded three-terminal tandem solar cells.