

## Technical Assistance Request

Beyond Silicon is seeking technical assistance on the following areas: (1) finding solutions to accurately measuring perovskite/silicon tandem cells at a working pace of 5000 wafers/hour, and full-size tandem modules at corresponding production speed (< 20 seconds per module), (2) predicting module lifetime based on accelerated testing and outdoor field testing.

In laboratories, perovskite solar cells and their tandems are primarily measured under continuous-light solar simulators with illumination time of several seconds or even minutes, if at accredited PV performance certification laboratory. In contrast, in production environment, current-voltage measurements were performed primarily under flash tester with tens of milliseconds illumination or hundreds of milliseconds for high-capacitance cells such as heterojunction cells—intended as bottom cells for Beyond Silicon’s tandem product. Besides this timescale challenge, the spectrum mismatch is another challenge that is more critical in tandem cell measurement than single junctions. To reduce the spectrum mismatch, continuous-light solar simulators usually incorporate extra halogen lamps and optical filters to produce illumination spectrum closely matched to AM1.5G. Although continuous-light solar simulator has been introduced into PV industry (with multiple light sources plus automation to reach the throughput), it is less feasible to do so on the module testing with an illumination area of approximately 2.4 m x 1.2 m. Therefore, Beyond Silicon is seeking technical assistance on finding solutions, preferably flash tester based, to measure perovskite/silicon tandems accurately and quickly on both the cell and module scale.