



# Highest solar cell efficiency

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Researchers at the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) created a solar cell with a record 39.5% efficiency under 1-sun global illumination. This is the highest efficiency solar...

LONGi, a Chinese solar module manufacturer, recently announced it has achieved a remarkable power conversion efficiency of 34.6% in two-terminal tandem perovskite solar cell prototype devices.

The announcement was made during the publication of a scientific paper in Nature that detailed the perovskite-silicon tandem solar cell, which was unveiled last December. This newly achieved power conversion efficiency is currently the highest ever recorded for this type of cell.

The US Department of Energy's National Renewable Energy Laboratory (NREL) has confirmed the results, which represent a world record for this cell typology. Previously, Saudi Arabia's King Abdullah University of Science and Technology (KAUST) held this record.

KAUST achieved 33.7% efficiency with a device featuring a similar configuration. According to LONGi's research team, their cell was based on a bilayer interface passivation strategy.

This bilayer interface passivation strategy reportedly maximizes both electron transport and hole blocking. LONGi's tandem team developed the two-terminal prototype devices, which have been certified with a record efficiency of 34.6%.

Although they did not provide more technical details, LONGi stated, "The commercial-sized two-terminal tandem cells developed for mass production (M6) and the world's first square meter four-terminal tandem modules have been authoritatively certified with efficiencies of 30.1% and 25.8%, respectively. These results demonstrate a significant efficiency advantage over single junction silicon cell technology."

LONGi's result is also reported as the first certified efficiency to exceed the Shockley-Queisser limit of 33.7% for single-junction cells in a double-junction tandem solar cell.

A LONGi blog highlights the company's pragmatic and innovative research approach, focusing on generating independent certifications from leading institutions such as the US National Renewable Energy Laboratory (NREL), Germany's Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE), and the European Solar Test Installation (ESTI) over the years.

According to the blog, the silicon-perovskite tandem solar cell is considered the mainstream technology for next-generation ultra-efficient solar cells, with a theoretical maximum efficiency of up to 43%, greatly surpassing the Shockley-Queisser limit of 33.7% for single-junction cells.

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In November 2023, the LONGi tandem solar cell team achieved an efficiency of 33.9% for tandem cells, and less than a year later, they broke the record once again, showcasing their strong R& D capabilities and relentless pursuit of exploration.

The team aimed to achieve significant breakthroughs by optimizing the deposition process of the electron transport layer film. They introduced high-efficiency defect passivation materials and designed and developed high-quality interface passivation structures.

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