

PRESS RELEASE

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Pilot production line for solar roof tiles with matrix shingle technology established

As part of the "SPHINX" research project, the Fraunhofer Institute for Solar Energy Systems ISE has set up a pilot line for PV roof tiles at Module-TEC in Freiburg. The flexible, automated production allows the project partner Freesuns, a Swiss solar roof manufacturer, to produce its newly developed matrix shingle roof tiles on a pilot scale before moving into mass production. The flexible, industry-oriented production line will manufacture a total of 4,000 solar roof tiles using the matrix shingle technology. Since March 2025 the first 800 modules have been produced. Freesuns is currently installing the first roof systems into 5 existing buildings in Switzerland. The new solar roof tiles are on exhibit from May 7 - 9 at Smarter E Europe / Intersolar at the Fraunhofer ISE booth in Hall A1.

"By manufacturing the first matrix shingling Freesuns solar roof tiles in Fraunhofer ISE's [Module TEC](#), we can collaborate on the production development and demonstrate the great advantage of matrix technology," explains John Morello, Founder and CTO of Freesuns. The 450x510mm solar roof tile consists of a glass-glass module with TOPCon solar cells connected in a [shingle matrix](#). Various color options are available. "Our focus in developing this product is on applications for existing buildings, especially those listed as historic structures, says Morello.

In shingle technology, the solar cell strips are connected to strings using electrically conductive, lead-free adhesives and arranged in an overlapping pattern, like roof shingles. The photovoltaic modules produced in this way are more efficient because the currents of the solar cell strips are smaller than in half-cell modules, the collector bars of the solar cells are covered with active cell surface, and there are no gaps between the solar cells of a string. The matrix shingle concept developed by Fraunhofer ISE goes one step further: the shingled solar cells are also arranged in a staggered pattern. This enables complete, homogeneous coverage of the entire module surface, making matrix shingle modules around 4 percent (relative) more efficient than conventional half-cell modules with wire interconnection.

"Matrix shingle modules are predestined for integrated applications, especially in building facades and, as here, as photovoltaic tiles on roofs," says Torsten Rößler, project manager at Fraunhofer ISE. "This is precisely where maximum space utilization, shading tolerance, and attractive aesthetics are important." The matrix shingle technology is characterized by a very high tolerance to partial shading. The matrix arrangement allows

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the electricity to flow around the shaded areas, so that, depending on the partial shading, twice the power can be generated compared to conventionally interconnected PV modules.

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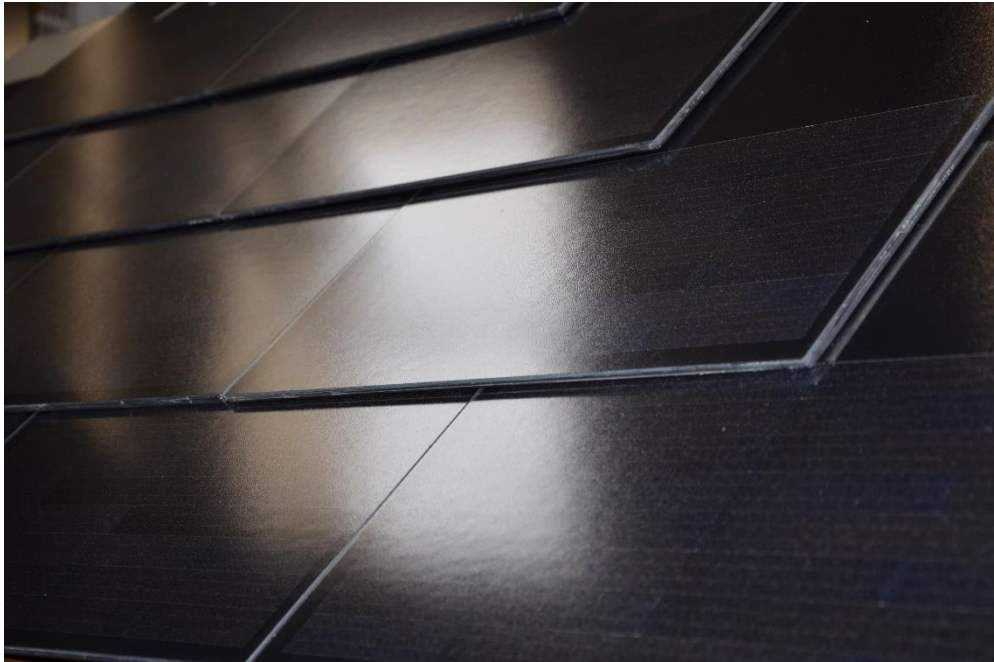
In the SPHINX (Sustainable Photovoltaics Integration in buildings and Infrastructure for multiple applications) project, a consortium of European PV manufacturers and research institutions has set itself the goal of developing cost-effective, rapidly deployable building-integrated photovoltaic (BIPV) elements using innovative matrix shingle technology. These modular, prefabricated elements will vary in size and functionality and will be available as lightweight construction, semi-transparent and PV tiles. Thanks to its flexible configuration, the pilot production line at Fraunhofer ISE's Module-TEC can implement the various prototypes and produce initial small series in an industry-oriented manner. The project is funded by the European Union.

Further Information:

Project page of SPHINX: <https://sphinxproject.eu/>

Website of Freesuns Sàrl: <https://freesuns.com/en/>

Matrix-Shingle Technology at Fraunhofer ISE: <https://www.ise.fraunhofer.de/en/business-areas/photovoltaics-production-technology-and-transfer/interconnection-and-encapsulation-technologies/matrix-shingle-technology.html>



The 450x510mm Freesuns matrix shingle solar roof tile consists of a glass-glass module with TOPCon solar cells © Fraunhofer ISE / photo: Sophia Baechle