Long Live Solar Technology

Measuring the Dynamic Response of Solar Panels with Scanning Vibrometers Supports Service Time Simulations

Computer modeling and simulation can help to determine load/strain scenarios and processes for materials and parts prior to actual deployment. In this way, they can be further developed and improved based on the results and customized to their future applications and environments. Combining simulated results with real experimental data allows a highly precise calculation of mechanical properties and can be used to predict service times for newly designed materials.

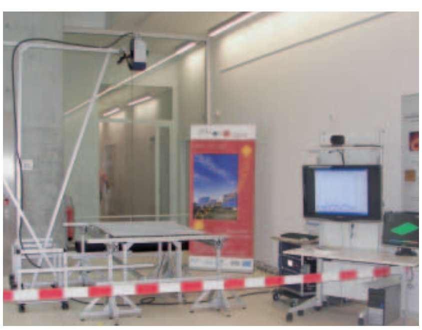

Fig. 1: Vibration measurement test setup for solar panel characterization using the Scanning Vibrometer.

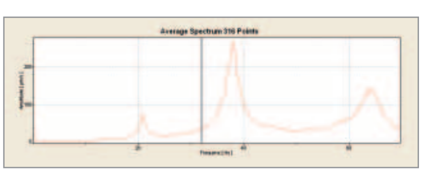

Fig. 2: Frequency spectrum averaged over all 316 measurement points.

For instance, researchers at the Fraunhofer Center for Silicon Photovoltaics CSP in Halle, Germany, investigate the mechanical vibrations on solar panels. Using this data, they are able to engineer appropriate design improvements to achieve the best possible stability and service time.

Unlike traditional contact transducer measurement techniques, the Scanning Vibrometer measurement of solar panel dynamic properties is a non-destructive, non-contact, remote method (See Fig. 1 and notice the distance from the measurement head at the top of the tower to the panel at the bottom) that enables the determination of resonance frequencies, operational deflection shapes as well as material parameters like stiffness and damping without mass loading. In Fig. 2, three of the panel's measured resonance frequencies are shown. The operational deflection shapes (ODS) for two of the resonance frequencies are compared to the respective simulation results (See Fig. 3 and 4). The frequencies and shapes confirm the basic simulation model that has been used. To optimize mechanical strength, thus increasing the service time, variable parameters such as panel dimensions or mounting/installation techniques can now be confidently simulated, measured, and adjusted to match the expected application.

More Info · Contact
Dr.-Ing. Matthias Ebert
Fraunhofer Center for Silicon Photovoltaics CSP
Matthias.Ebert@csp.fraunhofer.de

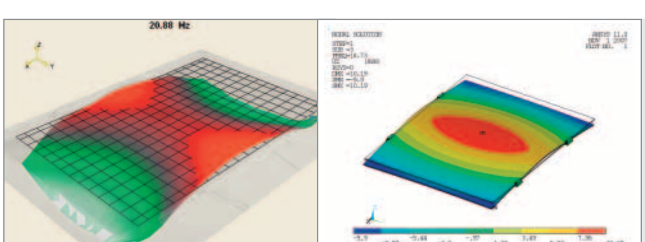

Fig. 3: First ODS measured at 20.9 Hz (left) corresponding to the simulated mode at 18.7 Hz (right).

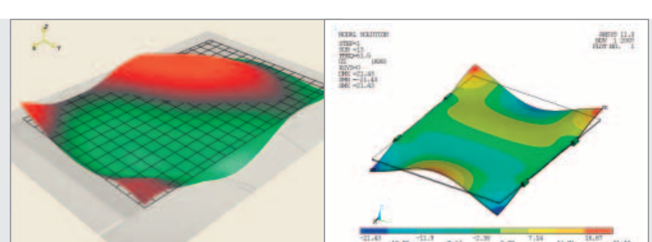

Fig. 4: Third ODS measured at 63.8 Hz (left) corresponding to the simulated mode at 61.5 Hz (right).