Development of a large tube outdoor measuring facility for solar modules

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Abstract

Since photovoltaics is a main pillar of Germany's future energy supply, a competence centre for PV metrology is established at PTB for its metrological validation as well as to support industry in the fields of calibration services and PV metrology. With the current PV world market of 30 billion euros for solar modules, each percent of measurement uncertainty leads to a financial uncertainty of 300 million euros per year. The planned reduction of the measurement uncertainty by 0.5% in relation to the currently lowest measurement uncertainties will bring PTB's customers and their clients significantly improved investment security, especially since the profit margins in the PV sector are often in the lower single-digit percentage range.

The developed test site utilizes the perfectly homogeneous radiation field of the natural sun and, at the same time, diffuse radiation from the sky and reflections from the ground are suppressed by means of a large tube. This tube has a total length of 7.2 m with an opening width of 4 m x 4 m at one end. In order to follow the position of the sun during the day, the tube can rotate +/- 45° around the vertical axis (azimuth) and from 0° up to 65° around the horizontal axis (solar altitude). Inside of the tube, up to four conventional solar modules (max. 1250 mm x 2500 mm each) can be mounted to a motor-driven support. Movements of up to +/- 180° around the horizontal axis and up to +/- 90° around the vertical axis are possible in addition to the movement of the tube. By this, also the angular dependence of PV modules can be measured under real sunlight condition. The measurement facility and its peripheral devices are currently being set up.

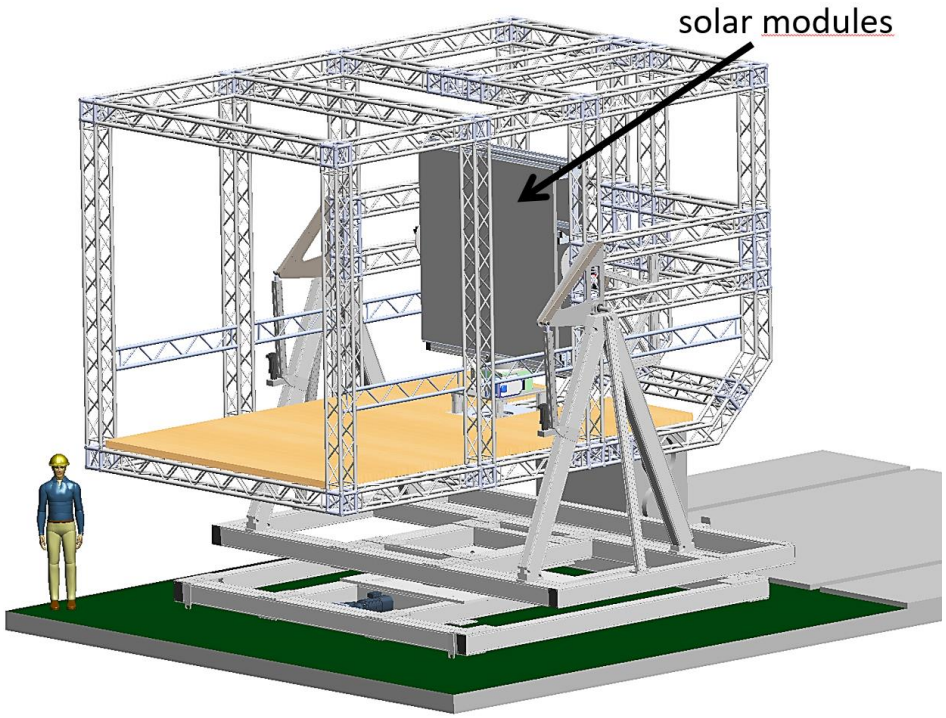

Figure 1: outdoor measurement facility for solar modules (shown without enclosure)

Figure 2: ongoing assembly of the test site, located inside the newly erected building