

On Outdoor Testing Procedures of Large Samples of PV Modules

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Abstract

STC power control of PV modules supply requires testing large samples of modules with low uncertainty. This paper analyses the feasibility of outdoor measurements with the modules kept at their operating positions. The classical procedure of recording *I-V* curves and translating them to STC in accordance with IEC 60891 using the cell temperature directly observed at a few points of the rear of the module entails uncertainties larger than 3% ($k=2$), which is too much for this procedure being accepted in quality controls with contractual consequences. A convenient procedure for overcoming this barrier consists in comparing the *I-V* curves of a tested and a reference module of the same type, both working under the same operating conditions. The latter is mostly secured if they are in adjacent positions. However, when the procedure is applied to large samples of PV modules kept in their operating position, the distance between both modules can reach tens of meters and significant inter-module temperature differences can arise. An artifice for counterbalancing these differences consists of estimating the temperature of the tested module and the “true” temperature of the reference module, as deduced from the V OC measurement, by the temperature difference observed at their respective back-sheets in a central position. This allows the measured power values to be corrected and provides clues to estimating the uncertainty of the results. This procedure has been applied in seven testing campaigns, carried out at commercial PV plants. Dedicated instrumentation, based on two radio linked *I-V* tracers, allowing the simultaneous measurement of the *I-V* curves and of the temperature at the centres of the reference and the tested modules, has been developed for that. The resulting uncertainties are slightly larger than those corresponding to high-quality solar simulators, but still low enough for dealing, in practice, with strict quality control requirements.

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