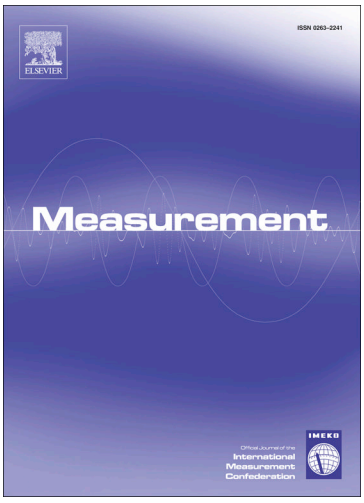

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Investigation of the potential induced degradation of on-site aged polycrystalline PV modules operating in Malaysia

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Abstract:

On-site investigation of PID behavior of PV module has been carried out under typical Malaysian climate. A quantitative degradation measurement process of PV module through EL imaging has been introduced. PID has been observed only for the negative voltage stress in this p-type polycrystalline Si PV module. The negative end PV module degrades 42% due to 9 years field aging under a negative voltage stress from the 240V string size. While positive end PV module is degraded near about 17% over the same period due to normal field aging. Shunt resistance of negative-end module has been found 75% lower than that of the positive-end module. Module crack propagation is found to be accelerated due to onsite cyclic high voltage stress. PID at higher string size has been estimated from the leakage current of brand new same PV module. The estimated PID of PV module under 600 V stress is 72.84%.

Keywords: On-site PID; EL imaging; Aging effect; Shunt resistance; Leakage current

Abbreviation:

A_{cell}	Area of solar cell (m^2)
E_{ab}	Total energy (W) absorbed by module top surface
E_b	Total energy (W) transferred by conduction and convection from top surface to bottom surface
E_{ctop}	Total energy lost (W) by convection from top surface to ambient
E_e	Electrical energy (W) produced by module
E_{mean}	Mean EL intensity
E_{mean0}	Mean EL intensity at non degradation condition
EL	Electroluminescence
G	Incident irradiation (W/m^2)

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