

Area 7: Performance and Reliability of PV Modules.

MEAN SURFACE-PRESSURE PATTERN ON PHOTOVOLTAIC MODULE FOR NON-UNIFORM DYNAMIC MECHANICAL LOAD TEST

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Taiwan is centrally situated in the main path of typhoons generated in the Western North Pacific Ocean (19-28° N, 117-125° E). On average in last one hundred years, three or four typhoons approach or make landfall in Taiwan yearly. The associated strong winds generally affect the photovoltaic (PV) modules and cause severe damage. But little attention had been paid so far to certify PV module how to withstand strong wind loads, especially addressed on the simulated non-uniform wind-loads on PV module. The purpose of this article is to develop a new test method including test requirements to simulate the different wind actions on PV module. Result of this study revealed that the mean surface-pressure pattern (MSPP), e.g. composed of eighteen mean pressure loads ($p_1 \sim p_{18}$), made at specific wind velocity (V) and distributed on the surface of PV module. Based on the flow similarity at high Reynolds number ($>10^4$), MSPP (Fig. 1 (b)) at higher wind velocity (V_2) can be transferred from the mean net-pressure coefficients ($\Delta C_p = C_{p \text{ upper}} - C_{p \text{ lower}}$, Fig. 1 (a)) at lower wind velocity (V_1), which were measured by wind-tunnel experiment or computational fluid dynamics (CFD) simulation. All MSPPs data strongly rely on the multi-environmental factors such as wind velocity (V), wind direction angle (β) and inclined angle (α) of PV platform. In addition, the work also design a non-uniform dynamic mechanical load (NUDML) test to operate this severity test (Fig. 1 (c)(d)) including test condition of MSPP@($p_1 \sim p_{18}$) for PV module due to wind actions.

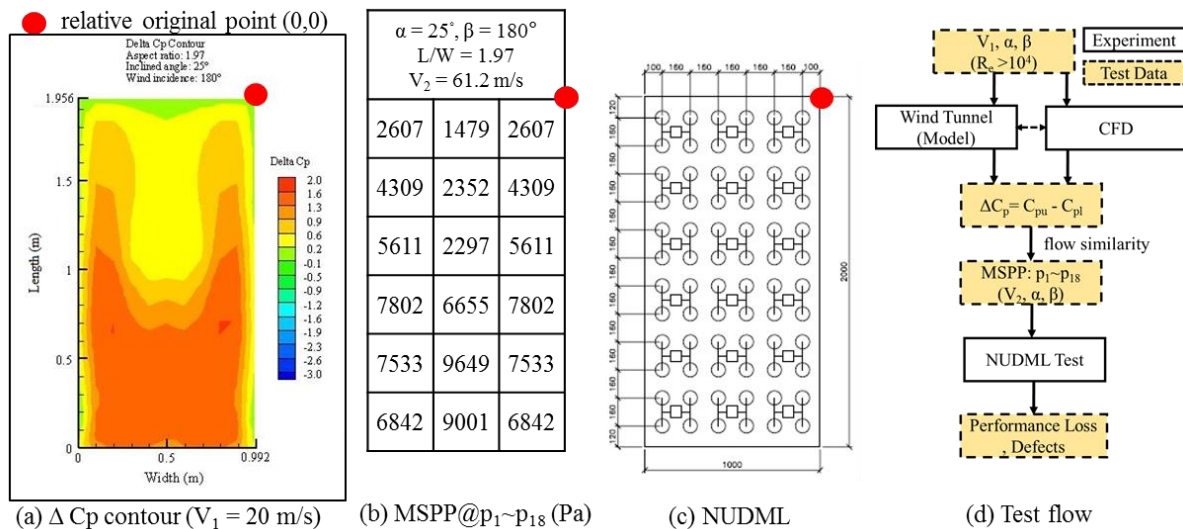


Figure 1: Example of MSPP@($p_1 \sim p_{18}$) and test flow

Key words: Mean Surface-Pressure Pattern, Non-Uniform Dynamic Mechanical Load

Reference:

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