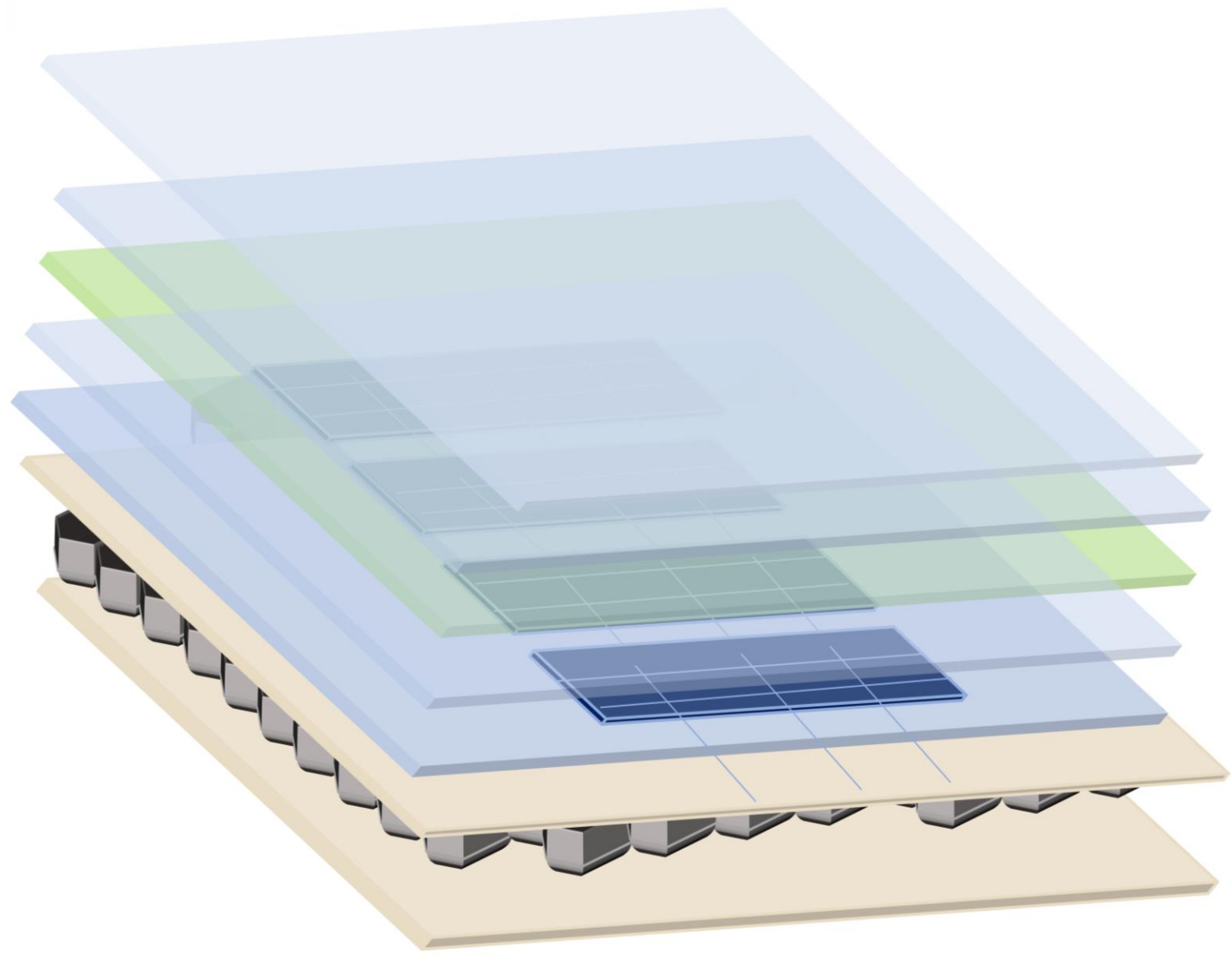


Umang Desai¹, Leïla Mazirt¹, Jean-Paul Callin^{1,2}, Antonin Faes^{1,2}, Christophe Ballif^{1,2}

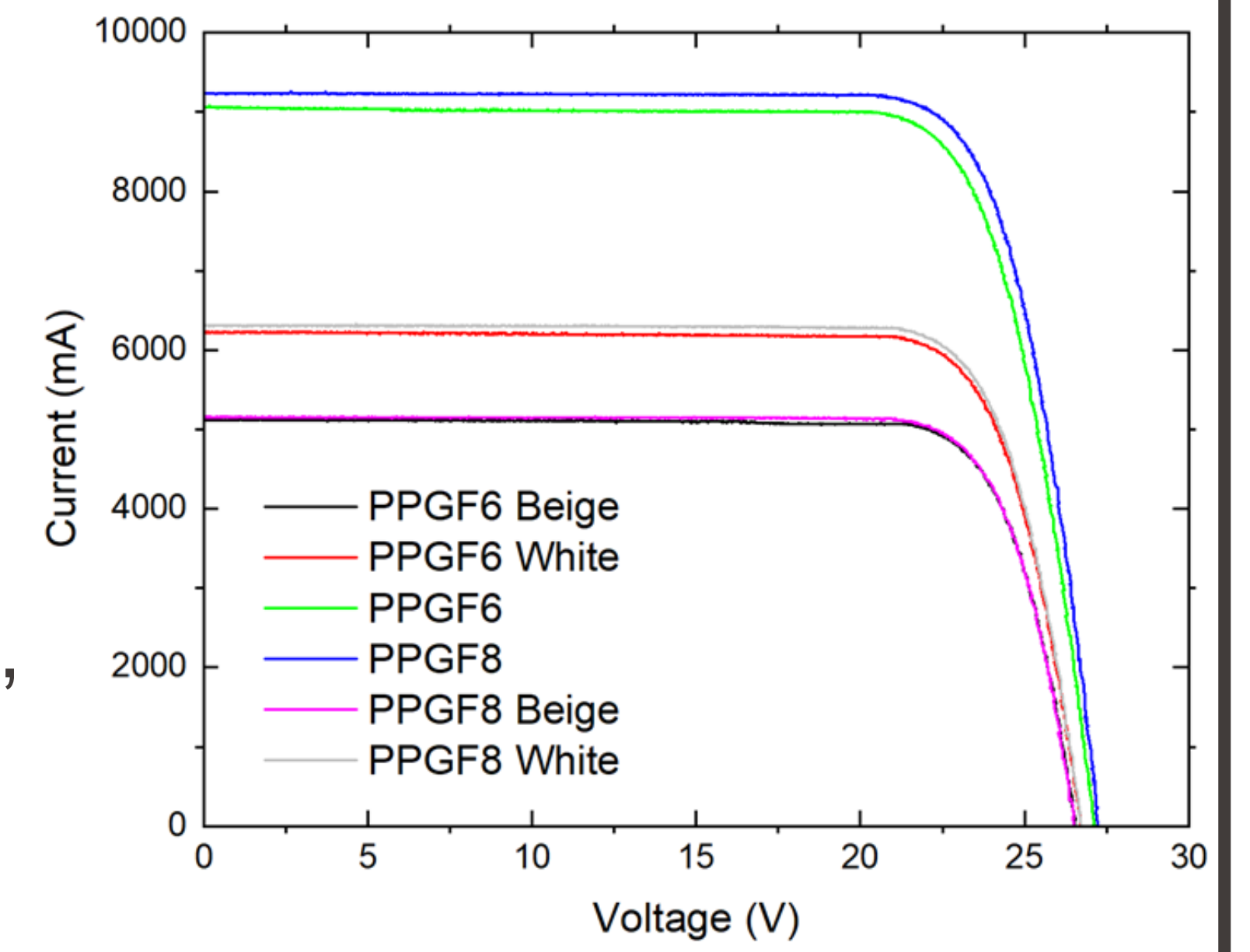
1: EPFL, IEM, PV-Lab, Maladière 71b, CH-2002 Neuchâtel; 2: CSEM, Rue Jaquet-Droz 1, CH-2002 Neuchâtel

Architecture of the novel lightweight coloured PV modules



Polymeric front-sheet
Encapsulant
Coloured foil
Encapsulant
Solar cells
Encapsulant
Skin (GFRP)
Polymeric HC
Skin (GFRP)

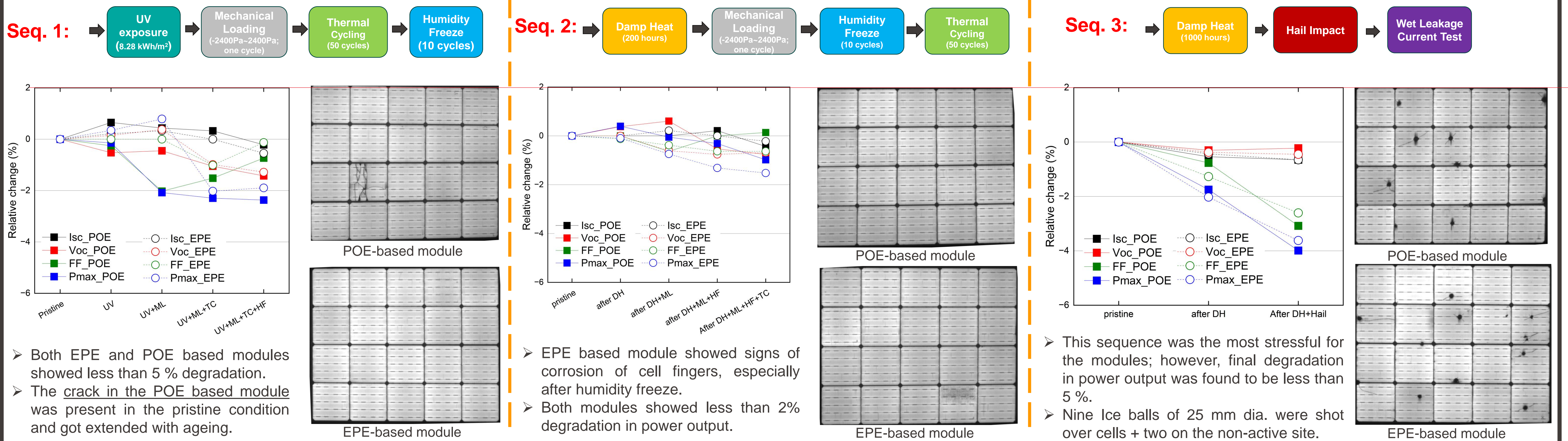
- Glass-free lightweight design,
- PET-based frontsheet,
- Less environmental impact due to polyolefin based backplane,
- Improved aesthetics due to colored modules,
- Frame-less design,
- Total weight less than 6 kg/m²



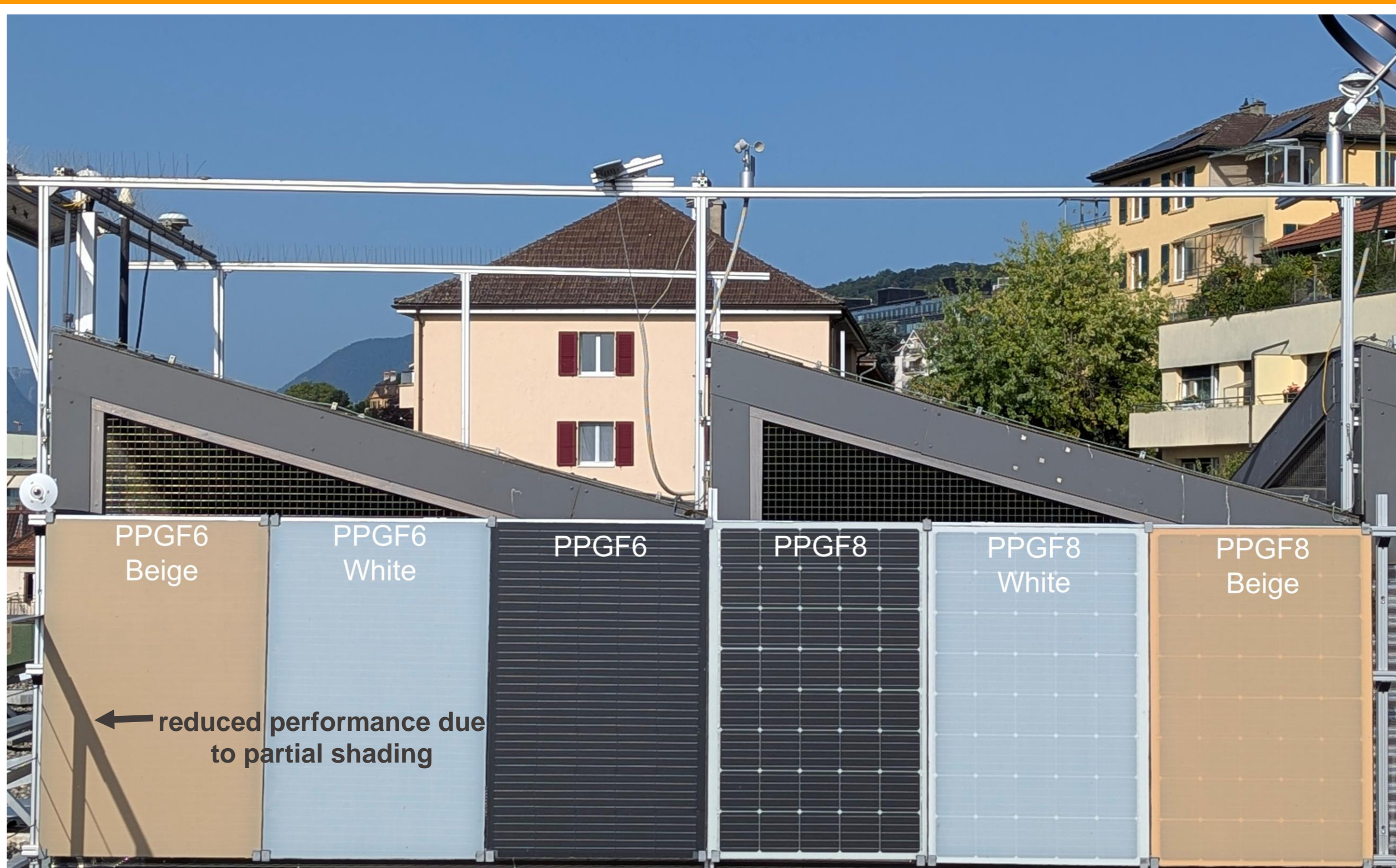
I-V curves for the modules in pristine condition

Bill-of-materials for the lightweight modules

Sequential Accelerated Environmental Tests: POE vs EPE encapsulants



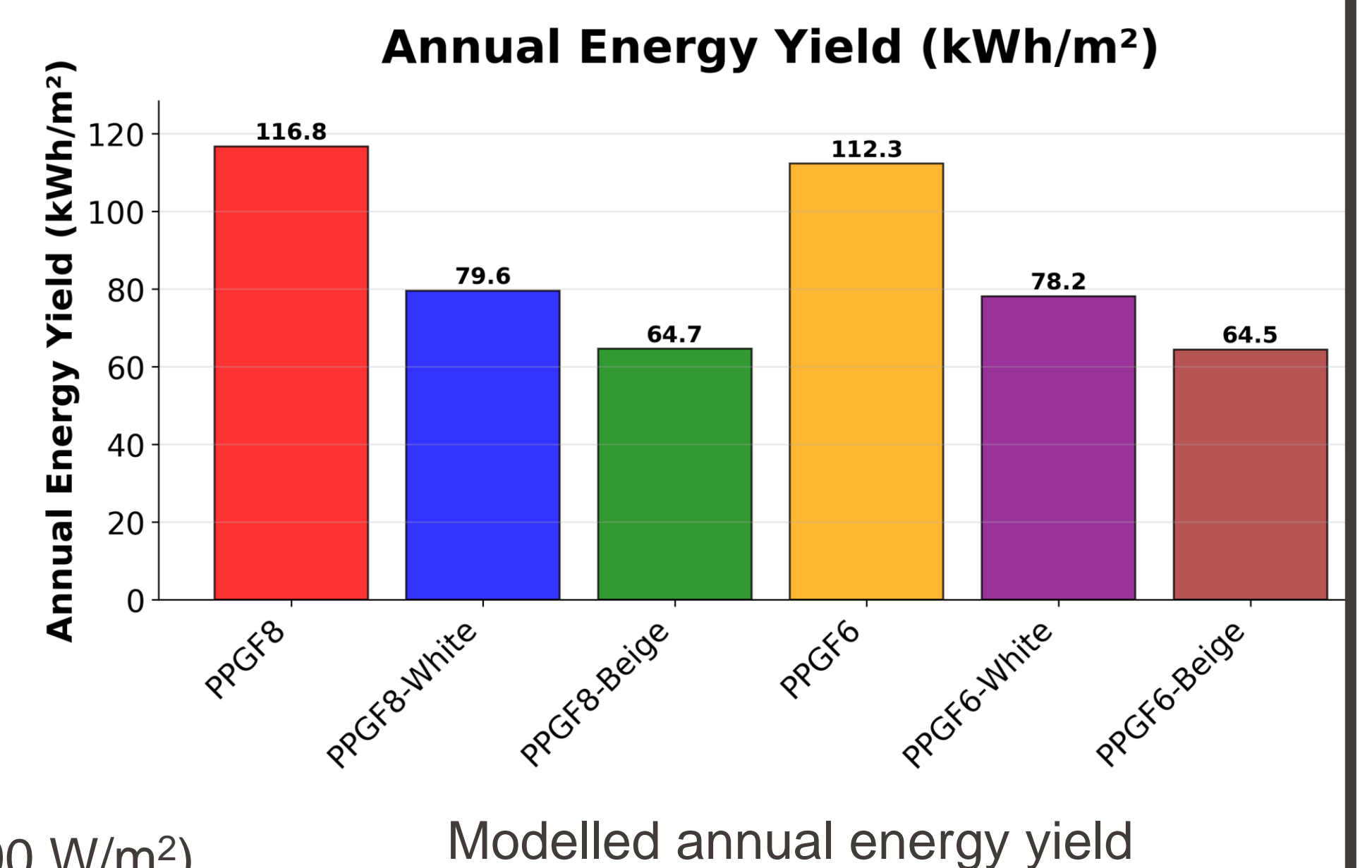
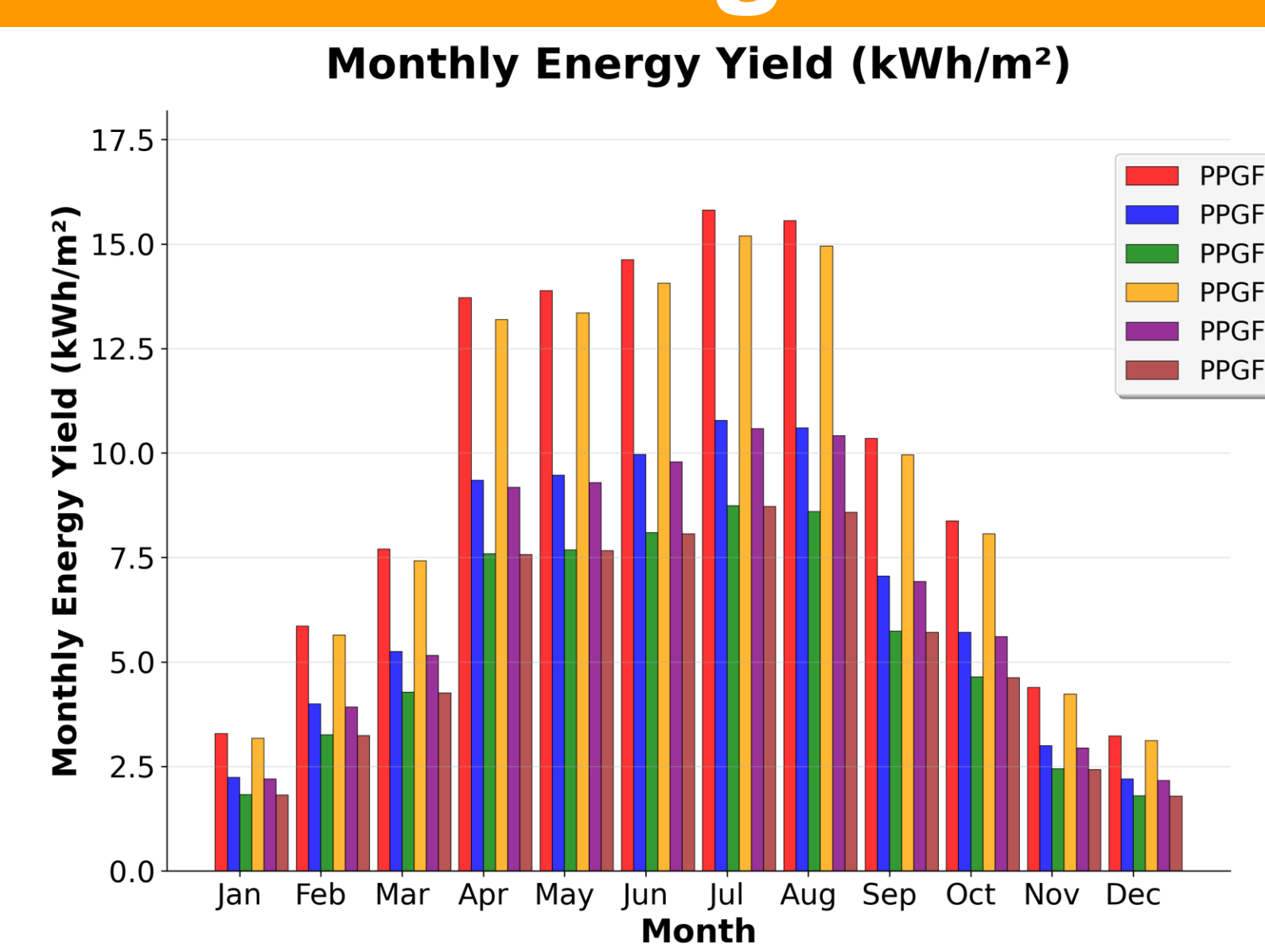
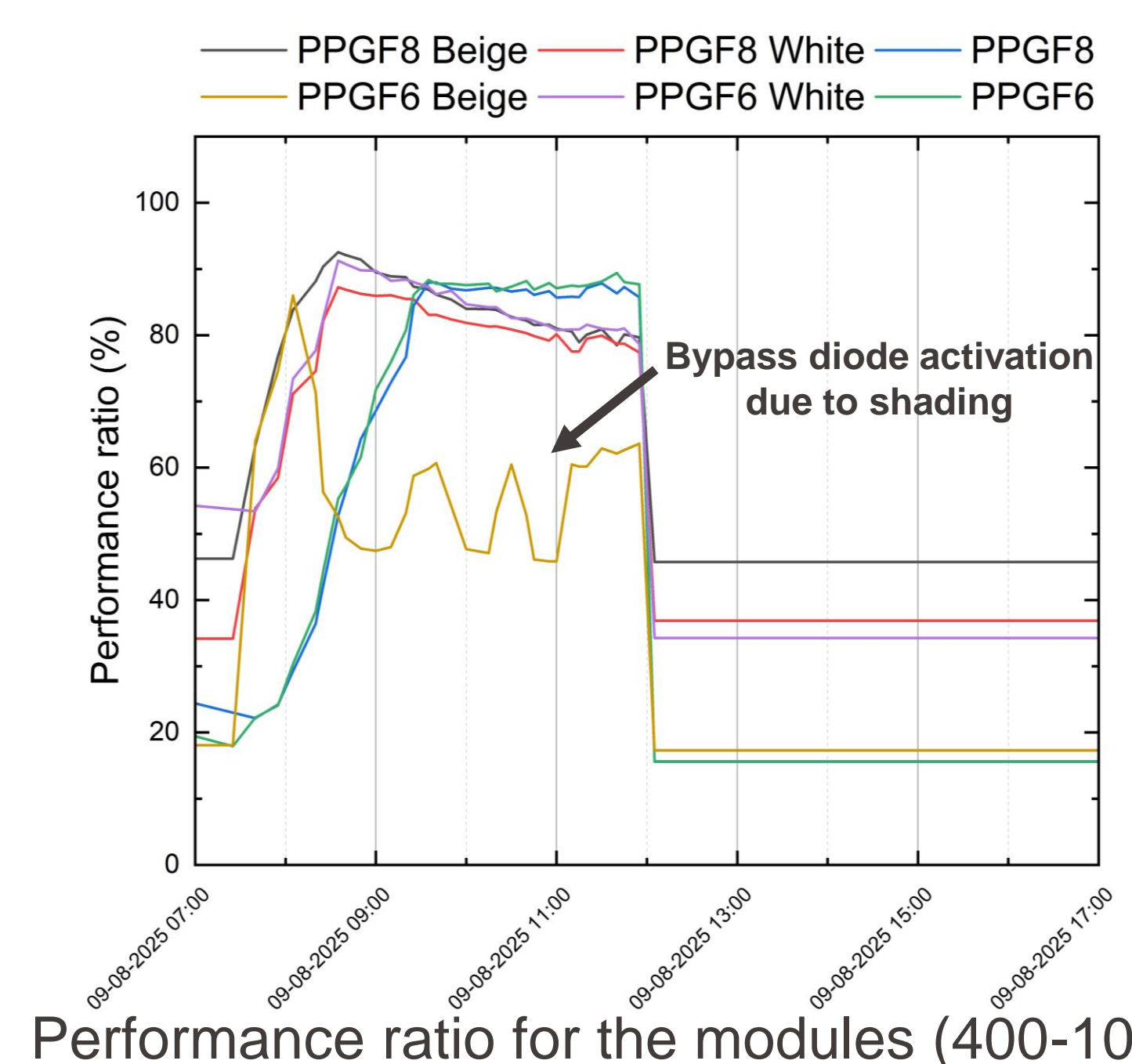
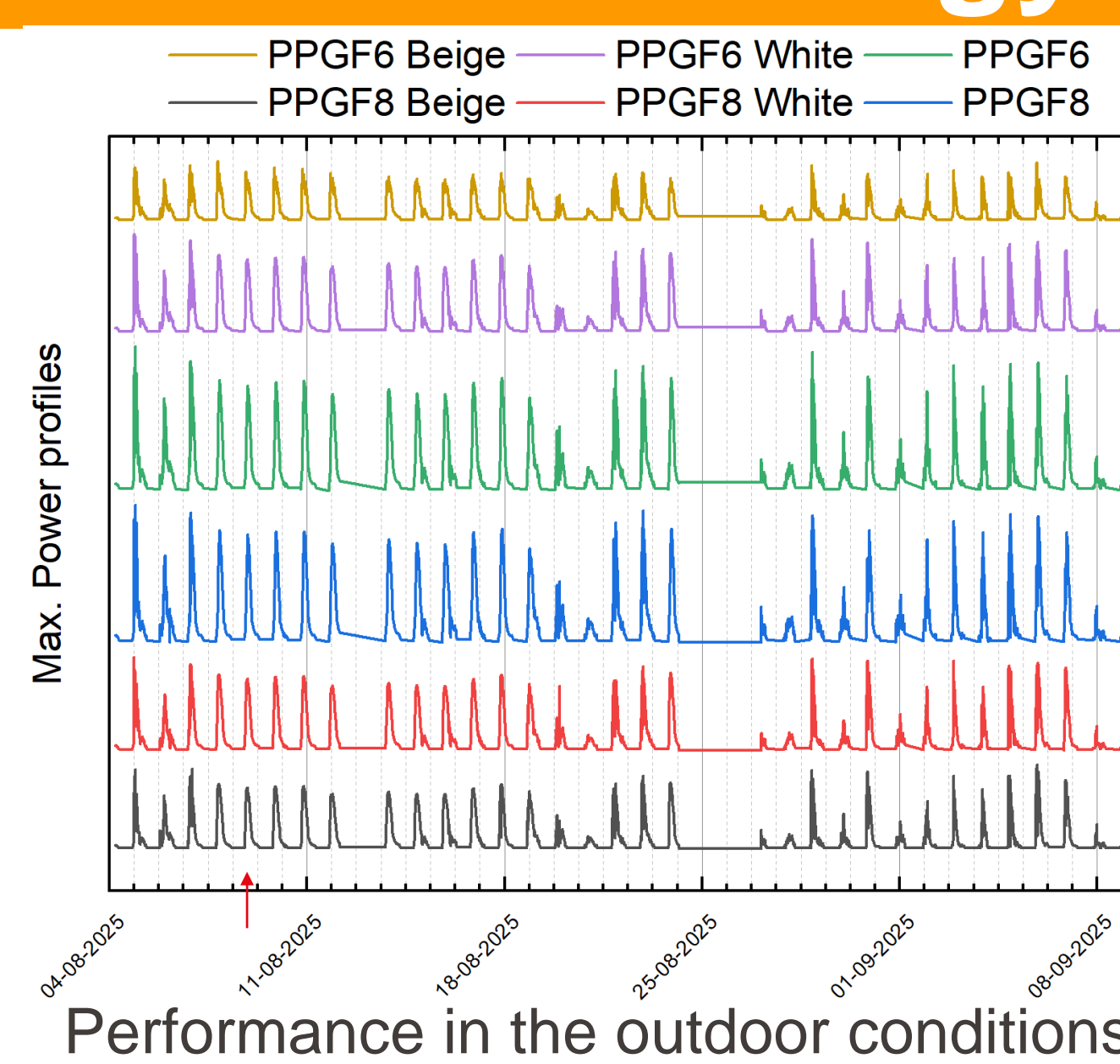
Façade integration: outdoor performance and energy yield modelling



Integration of LW coloured PV modules in the form of East facing façade

Table: electrical characteristics of modules in pristine condition

Module	Isc (mA)	Voc (V)	Max. Power (W)	Efficiency (%)
PPGF8	9122	27.1	195.74	19.57
PPGF8-White	6305	26.7	136.18	13.6
PPGF8-Beige	5220	26.5	112.8	11.19
PPGF6	9065	27.1	193.61	19.36
PPGF6-White	6215	26.7	134.08	13.4
PPGF6-Beige	5112	26.5	110.94	11.09



Conclusions and next steps

- The lightweight modules presented here passed the requirements of IEC 61215:2016 → scan QR:
- Accelerated sequential ageing of 3 different kind involving various stressors showed less than 5% degradation in relative power output.
- Frameless, glass-free coloured modules were installed in the form of façade and operated outdoor for **twelve months**. Modeling showed that East-facing façade in Neuchatel, Switzerland can produce 672 kWh/kWp over a year.



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