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NEW TRIPLE-JUNCTION SOLAR CELL ASSEMBLY PROCESS FOR CONCENTRATOR PHOTOVOLTAÏC (CPV) APPLICATIONS.

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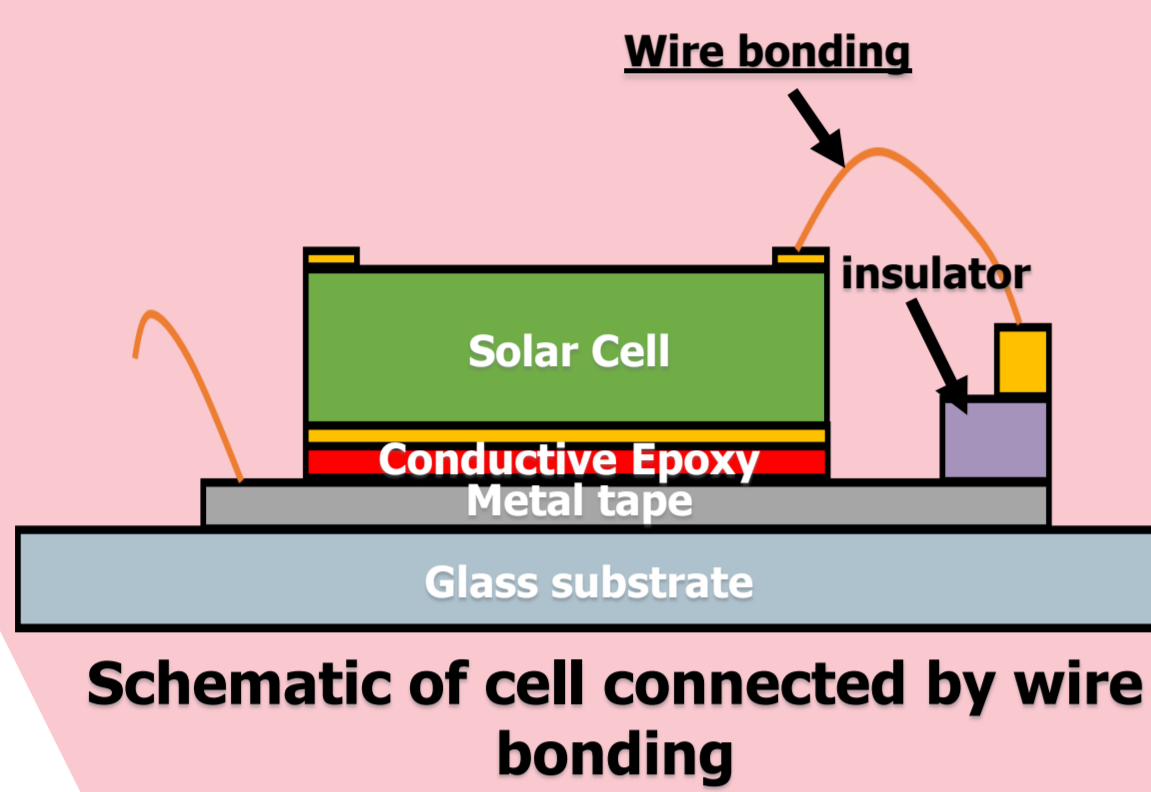
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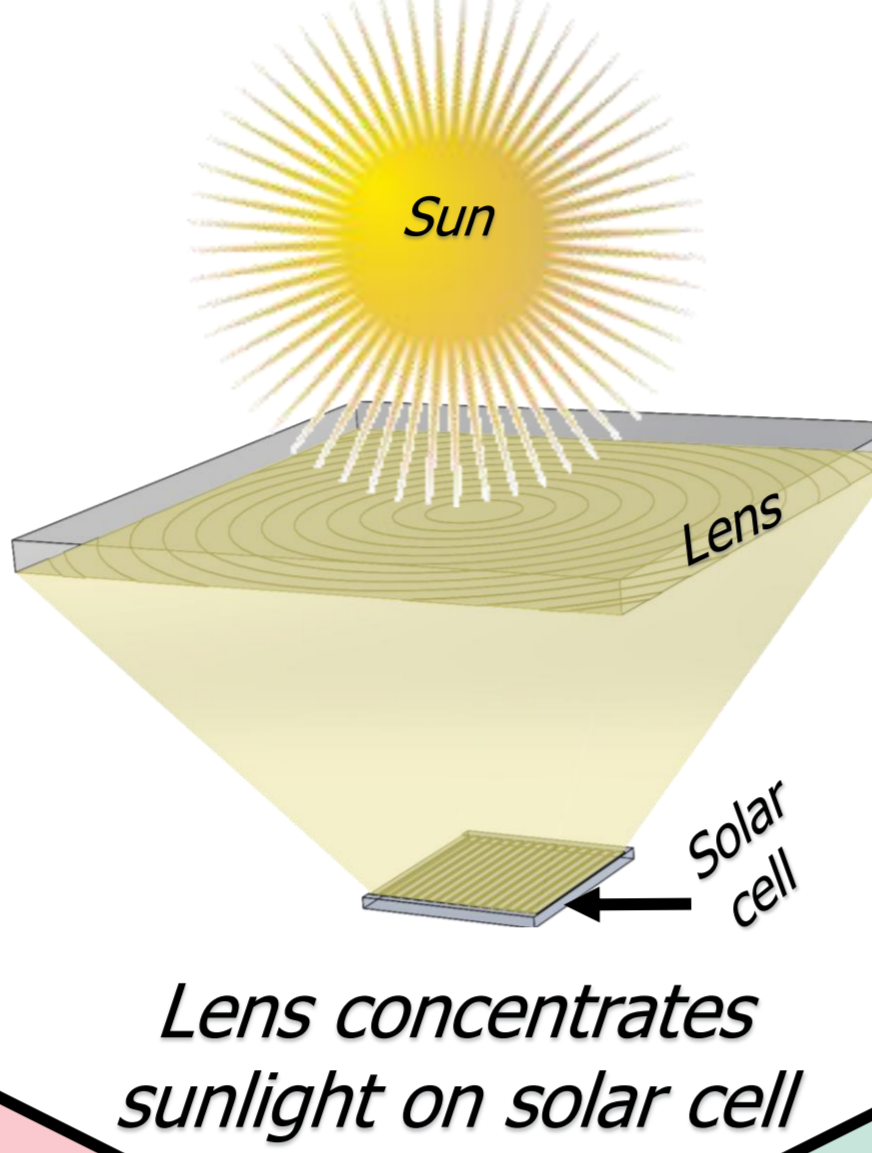
Context

Standard approach: Cell connected by wire bonding

- Advantage**
 - Mature technology
- Challenges**
 - Misalignment
 - Complex and long assembly time
 - High cell Temperature

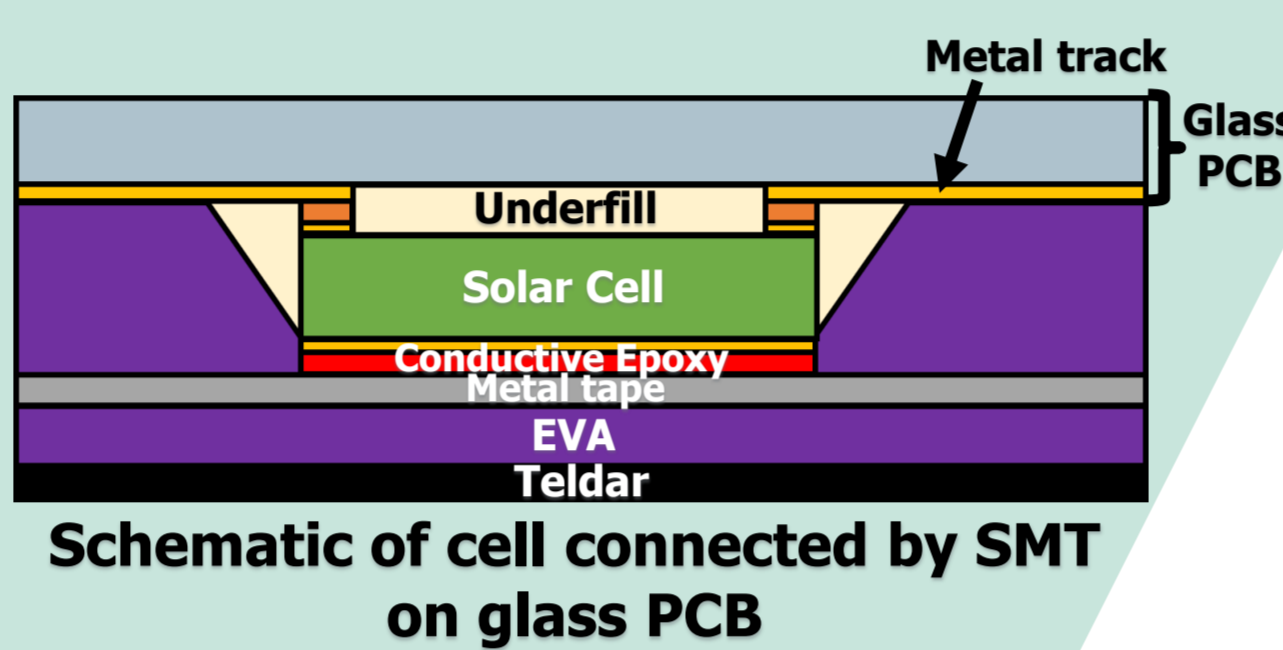


Concentrated photovoltaic principle:



Surface Mount (SMT) approach: Cell connected by solder joints on PCB

- Advantages**
 - Standard assembly method
 - Parallel solar cell alignment and interconnection
 - Reduce interconnection time
- Challenges**
 - Solar cell performance after assembly
 - High cell Temperature



Highlights

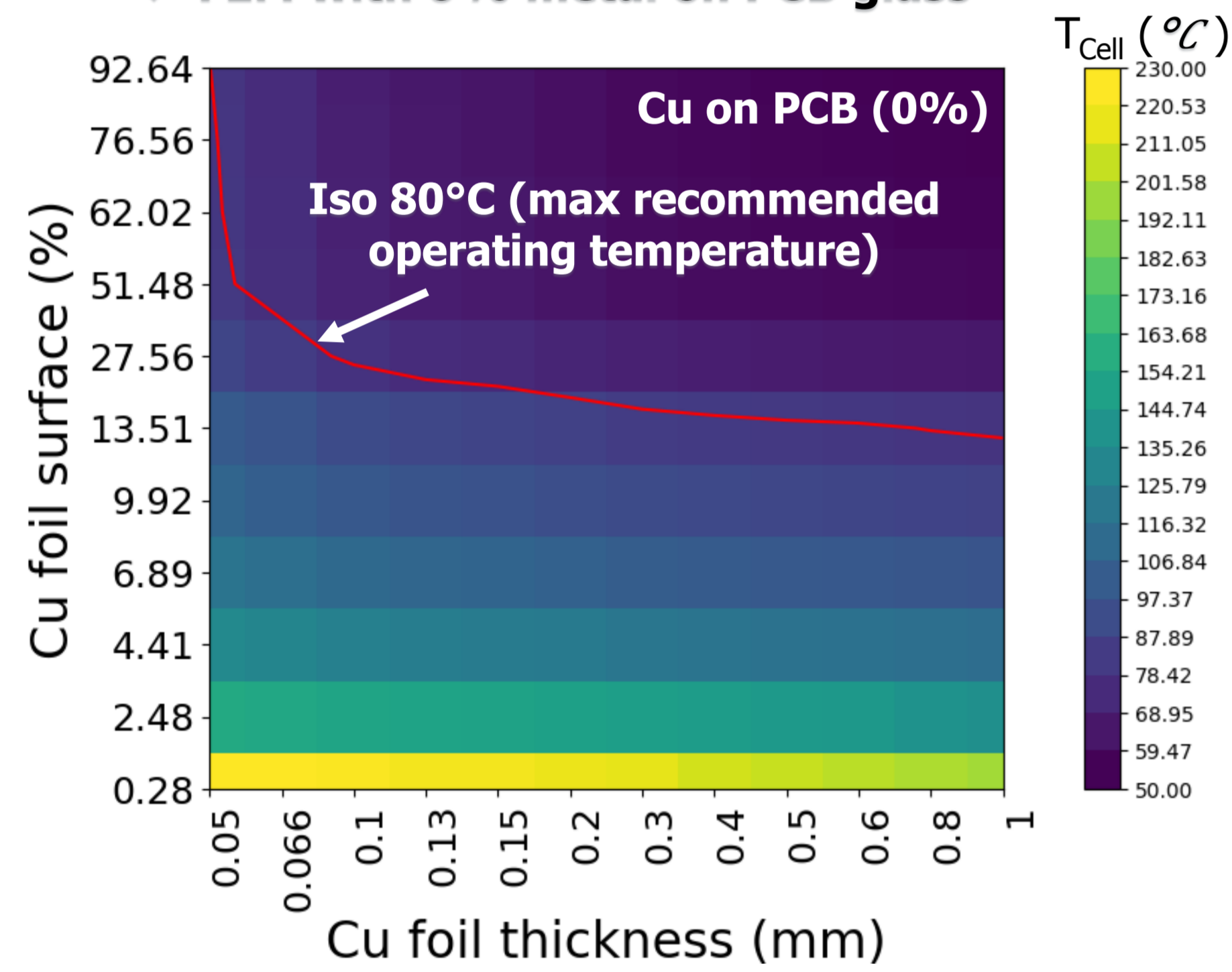
- Standard microelectronic method to assemble the solar cells in a CPV module
- Efficient heat dissipation with SMT assembly

Objectives

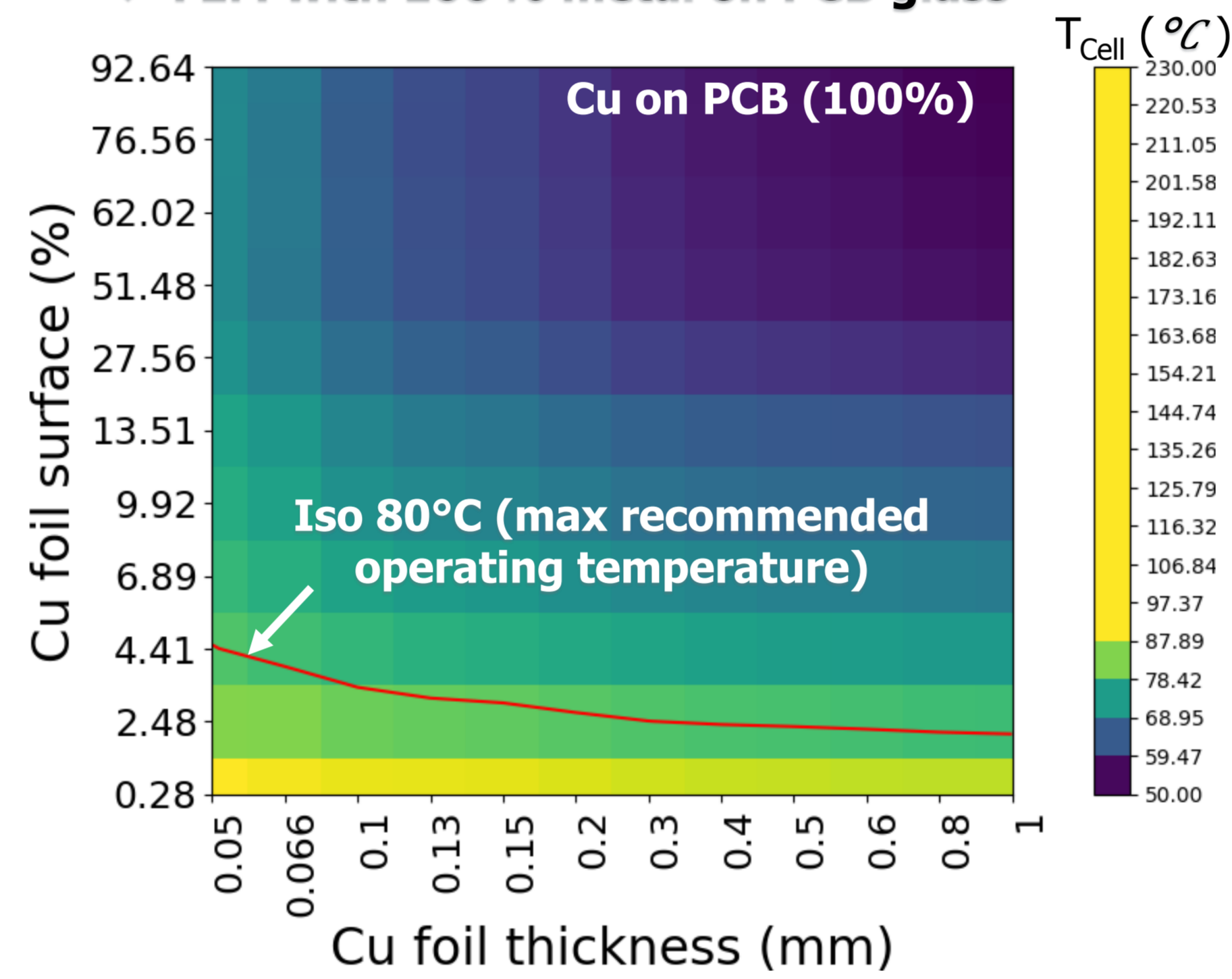
- Manufacture a functional CPV module based on the SMT
- Guide the design of the CPV module by Finite Element Modeling (FEM)

Analysis of temperature variation by finite element modeling (FEM): a parametric study

FEM with 0% metal on PCB glass



FEM with 100% metal on PCB glass



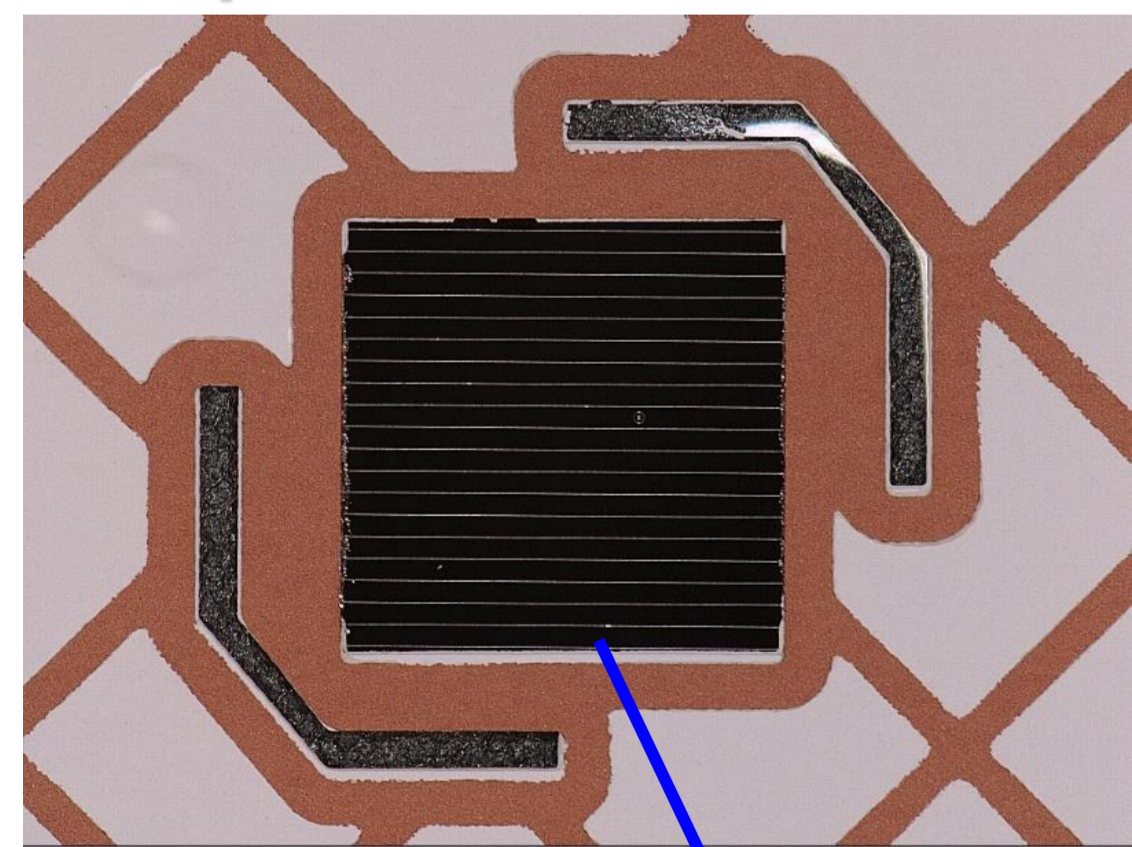
- $T_{Cell} \searrow$ when Cu tape thickness and/or surface \nearrow
- Iso 80°C: $T_{Cell} \searrow$ when the metal coverage on PCB \nearrow

SMT assembly

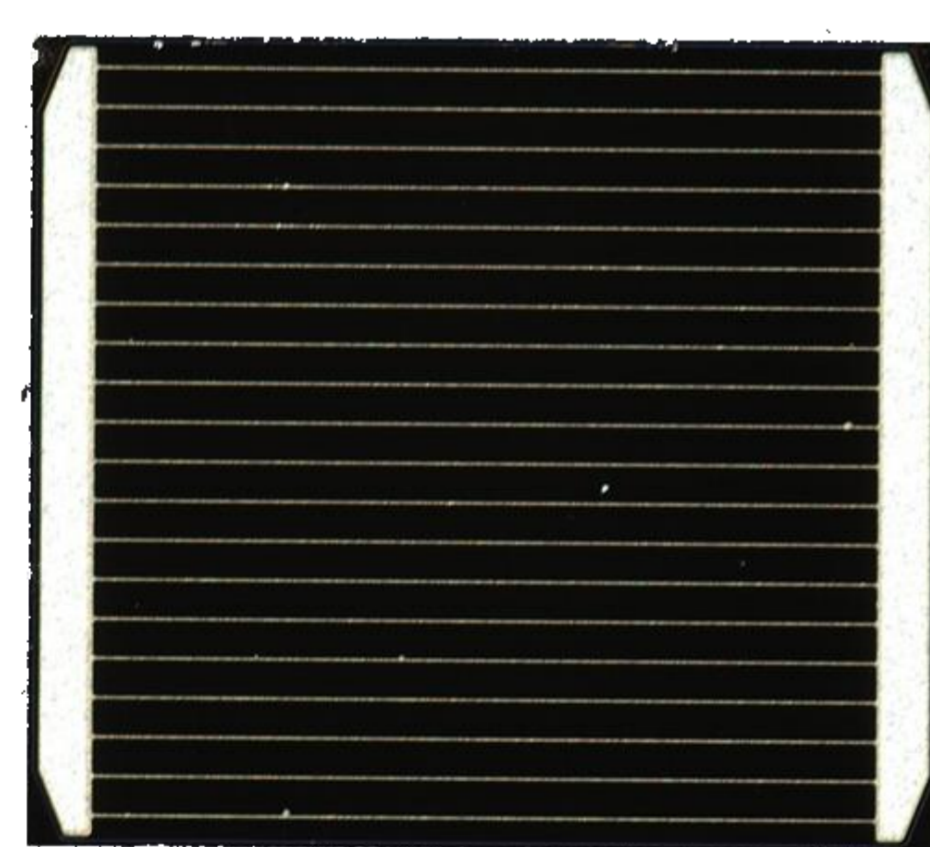
- Front and back sides heat dissipation
- Low T_{cell}

Process development and proof of SMT concept

Encapsulated solar cell on PCB

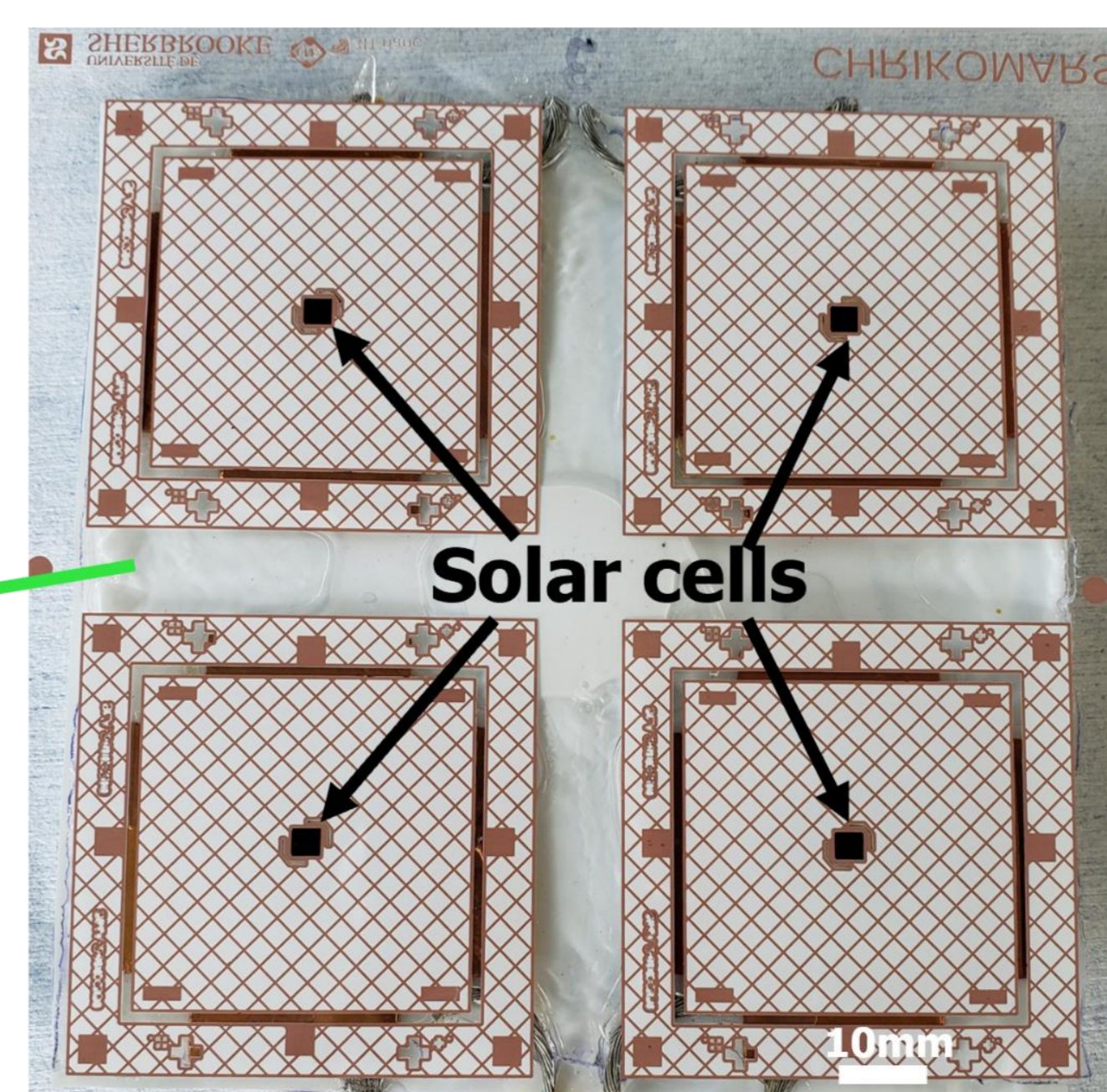
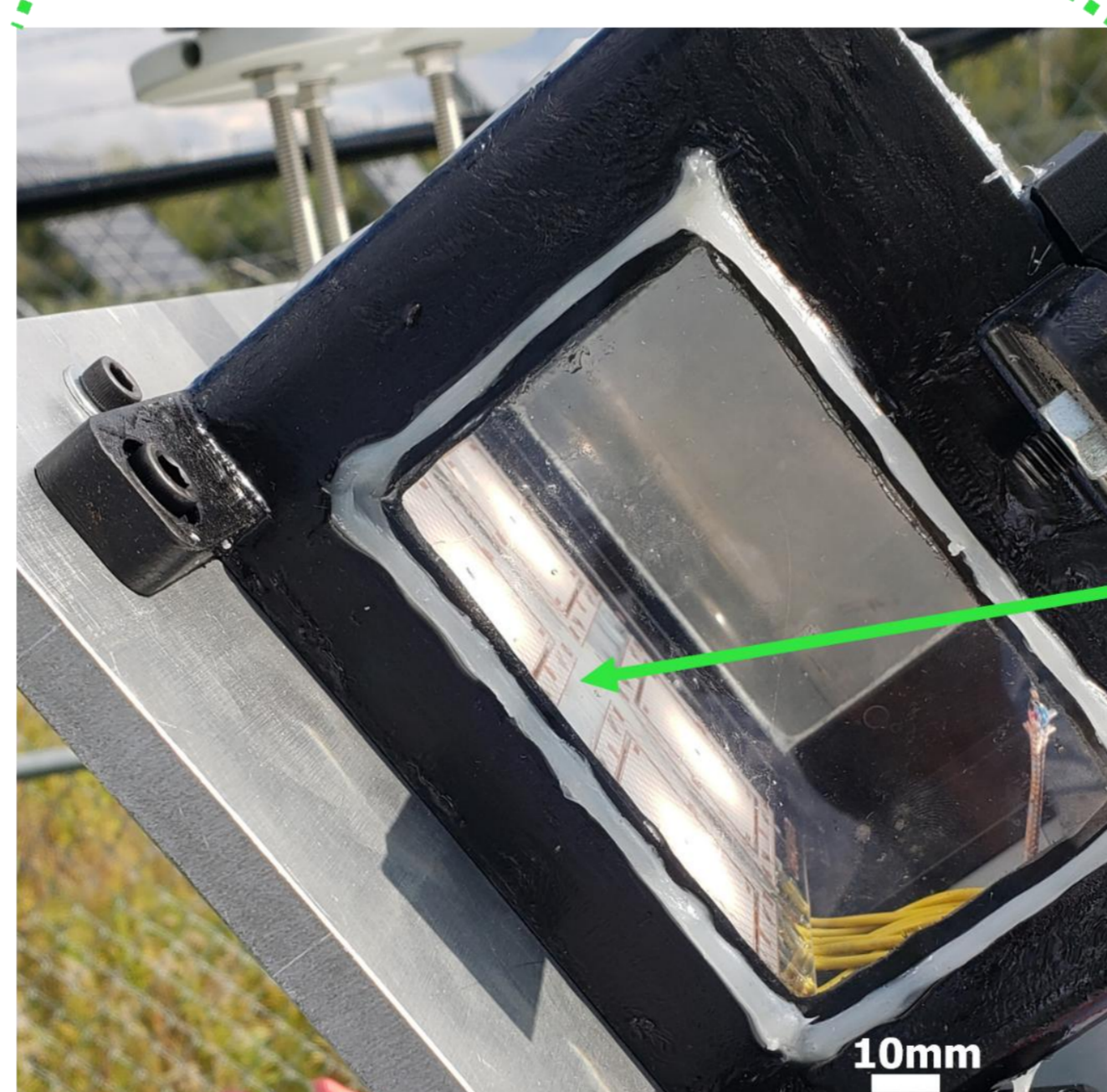
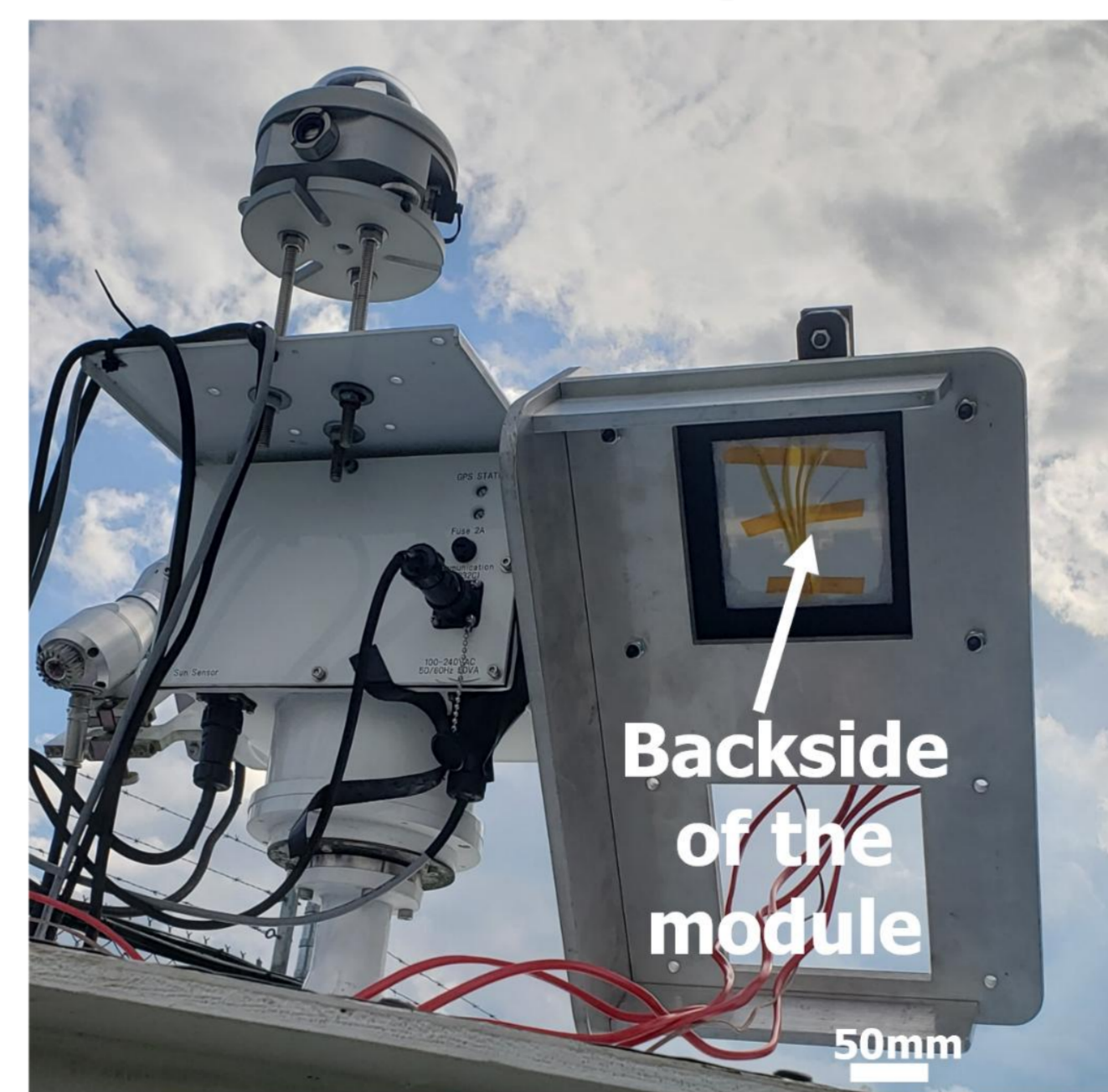
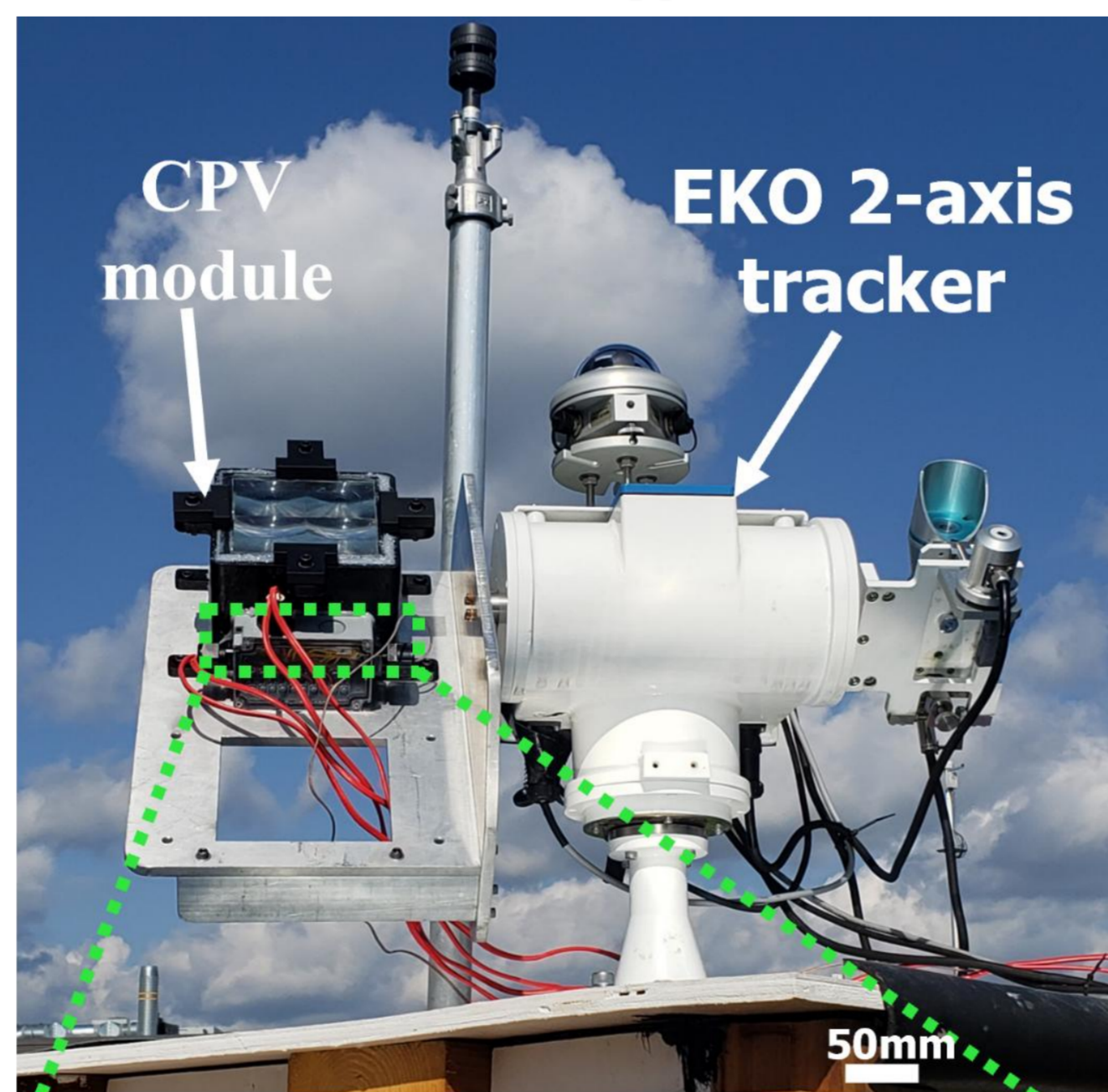


Bare solar cell



External Quantum Efficiency (EQE) of solar cells

Prototype of CPV module based on SMT assembly



Conclusion

- First functional macro CPV module using SMT assembly
- Efficient heat dissipation at front and back side
- No cell performance degradation

Perspective

- Higher concentration CPV module

Contacts

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Slight decrease of the EQE after solar cell encapsulation due to reflection and absorption
 → can be improve

Acknowledgements

