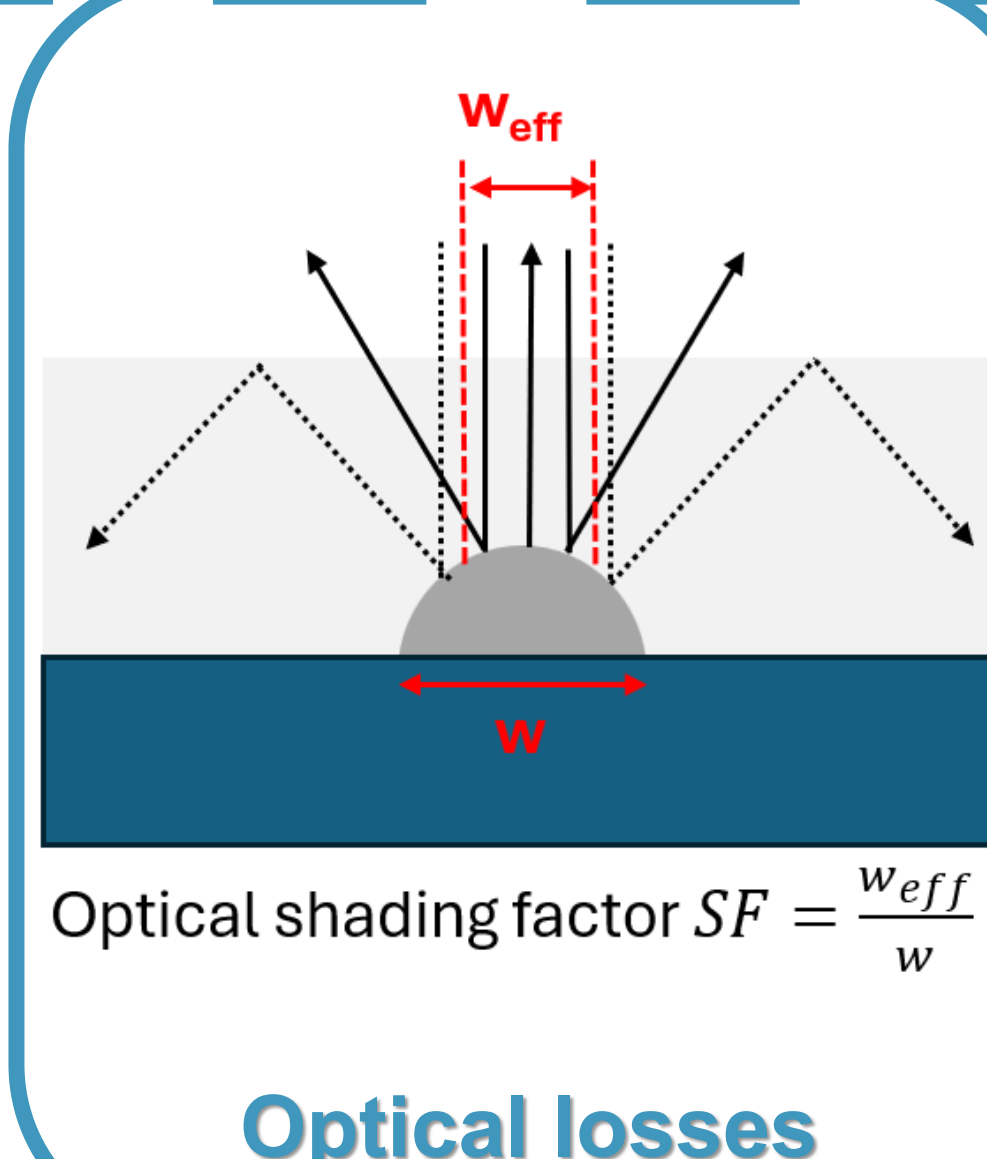
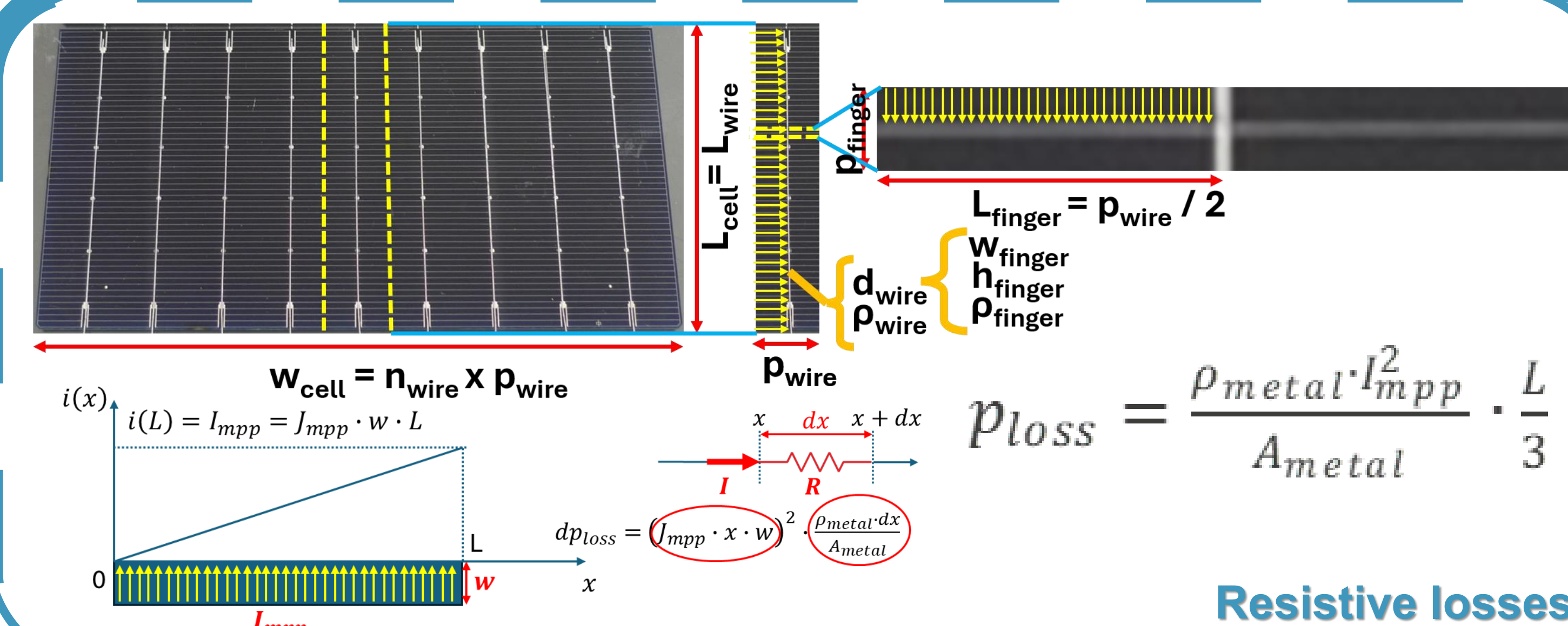


MULTI-WIRE MODULE MODELING, MEASURING AND MORE

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►► **Objective** understanding impacts of **Ag finger metallization** and **Cu interconnect wire layout** on performance and materials

►► **Methodology** spreadsheet-based calculations of losses and costs

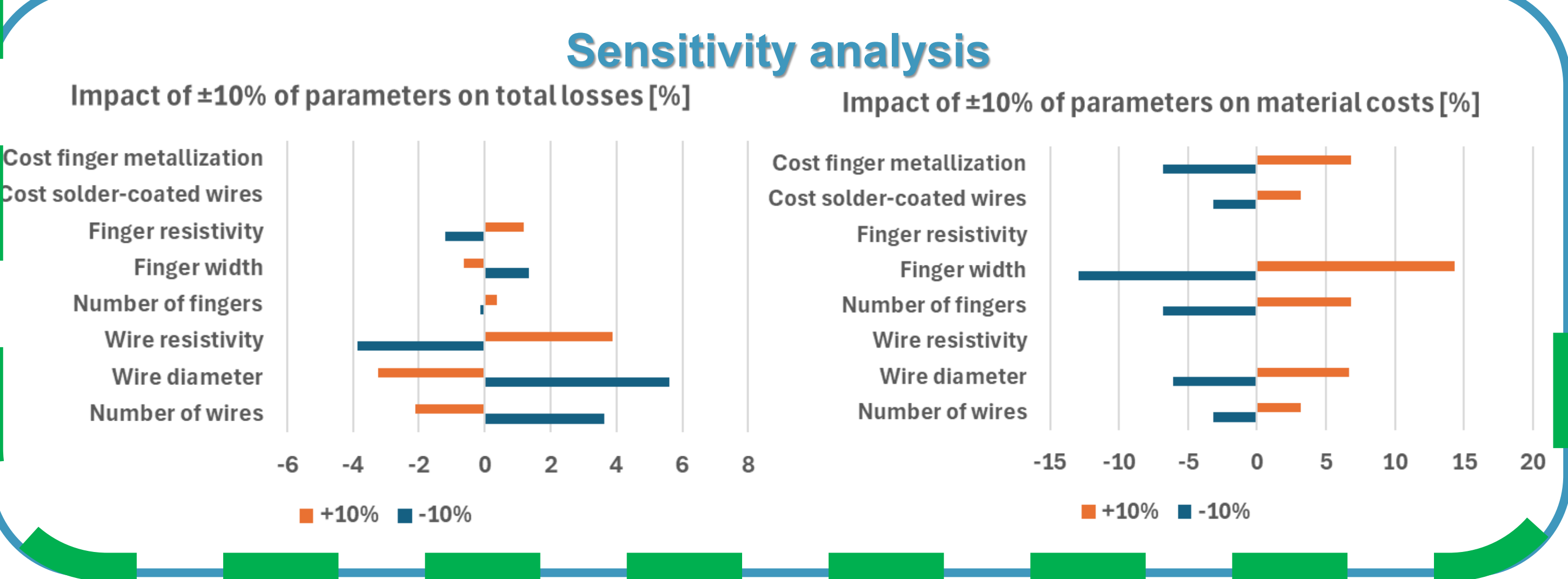
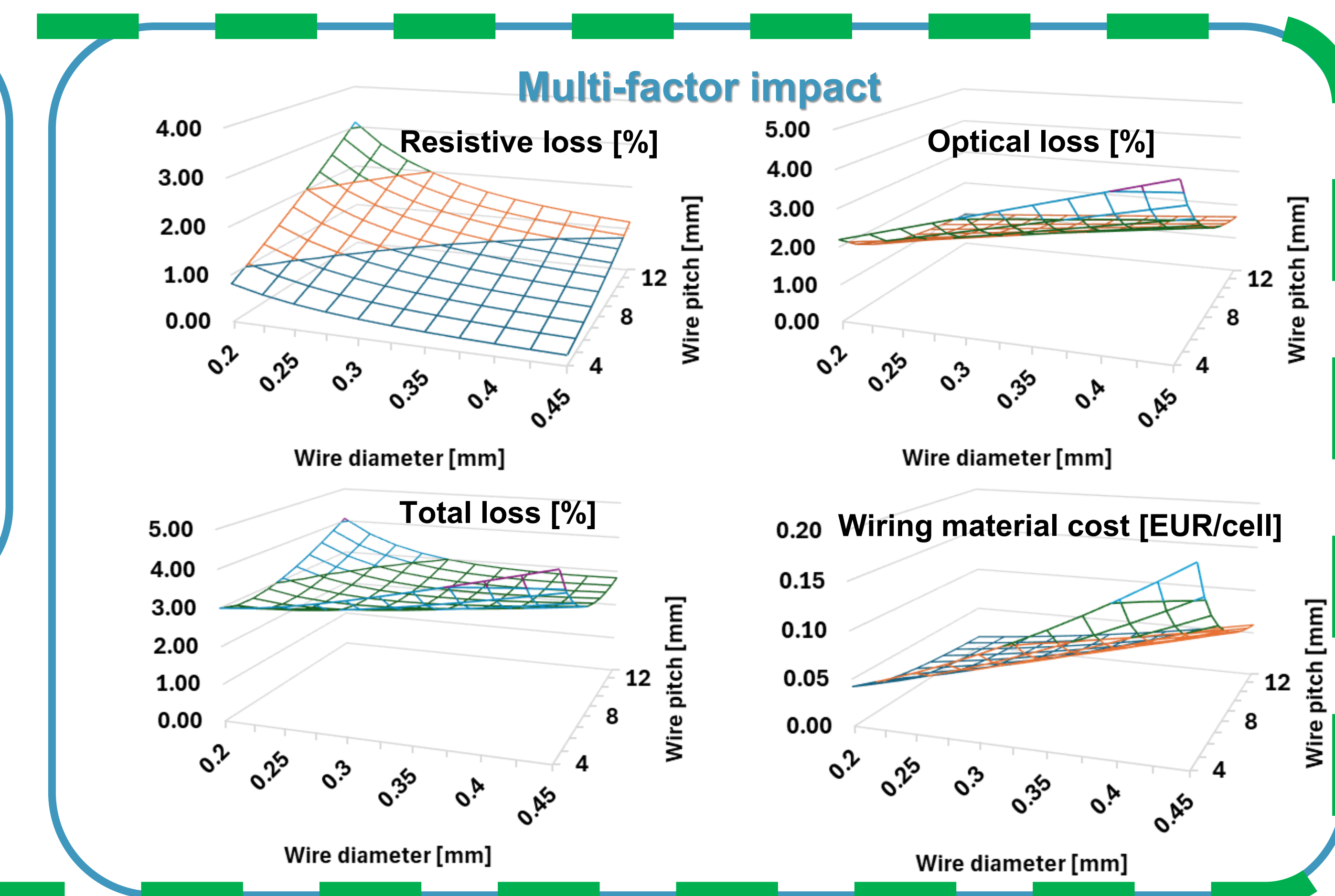
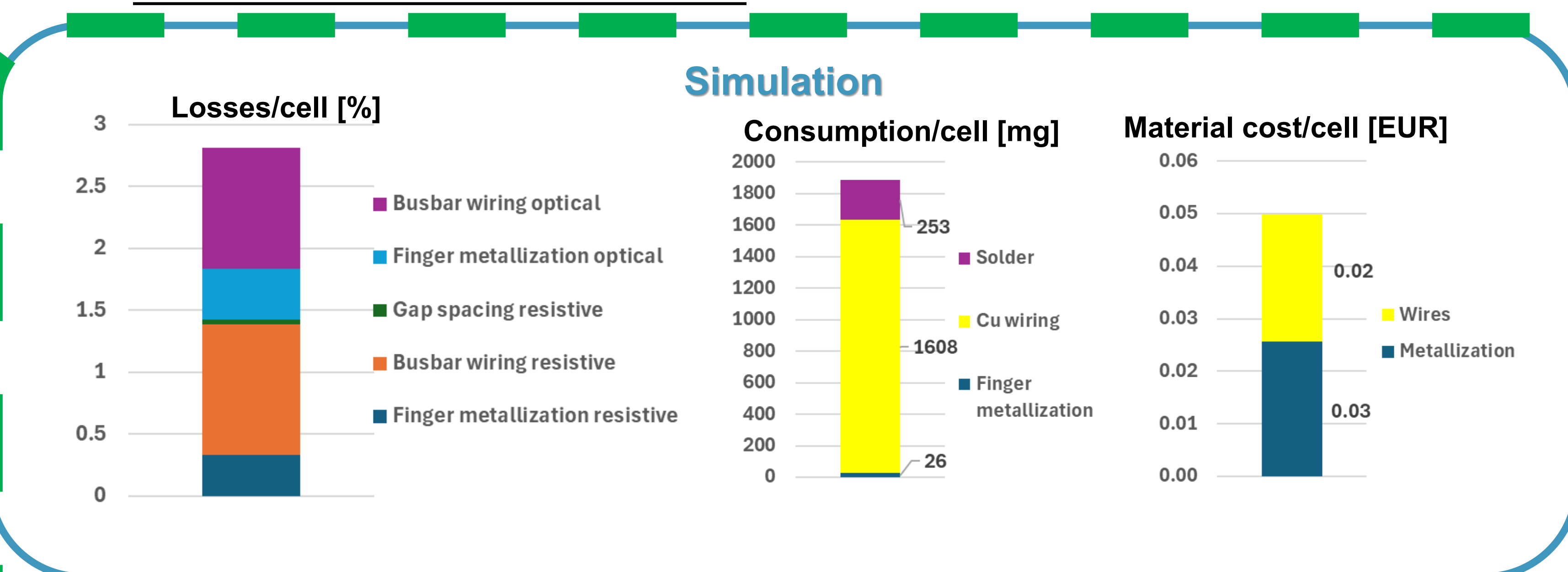


Explanation	Standard value
w_{cell}	Cell width 182 mm
L_{cell}	Cell length 91 mm
n_{wire}	Number of wires 20
p_{wire}	Wire pitch 9.1 mm
d_{wire}	Wire diameter 0.250 mm
ρ_{wire}	Wire resistivity 0.017 mΩ · mm
n_{finger}	Number of fingers 50
p_{finger}	Finger pitch 1.82 mm
L_{finger}	Finger length 4.55 mm
w_{finger}	Finger width 0.020 mm
h_{finger}	Finger height 0.020 mm
ρ_{finger}	Finger resistivity 0.035 mΩ · mm
w_{gap}	Cell spacing 2 mm

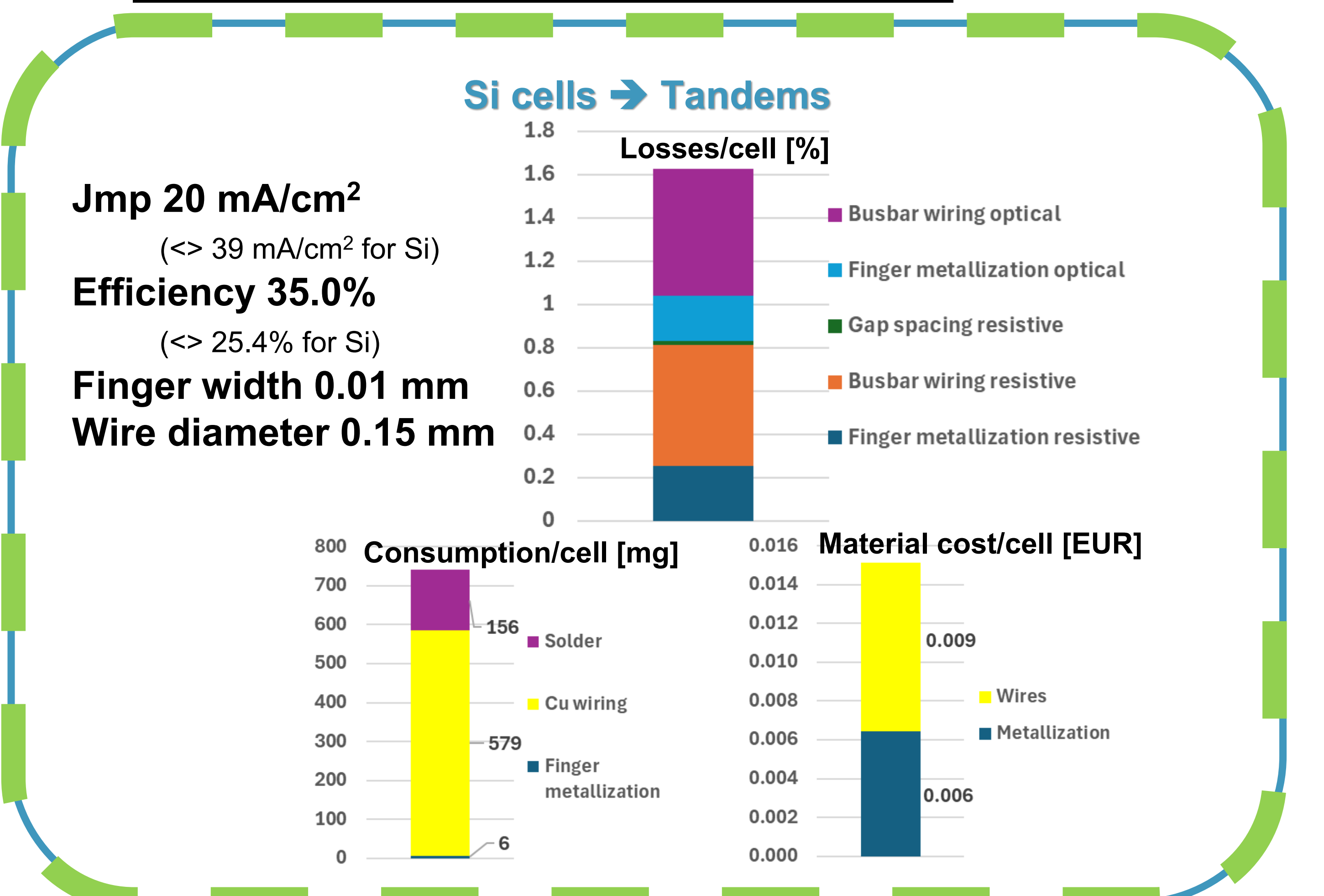
Explanation	Standard value
D_{Ag}	Density of Ag paste 0.009 g/mm ³
D_{Cu}	Density of Cu 0.009 g/mm ³
D_{solder}	Density of Solder 0.0085 g/mm ³
t_{solder}	Solder thickness 0.01 mm
C_{wire}	Cost of (coated) wire 15 EUR/kg
C_{finger}	Cost of Ag paste 1000 EUR/kg

Parameters and assumptions

►► Results for Si cells



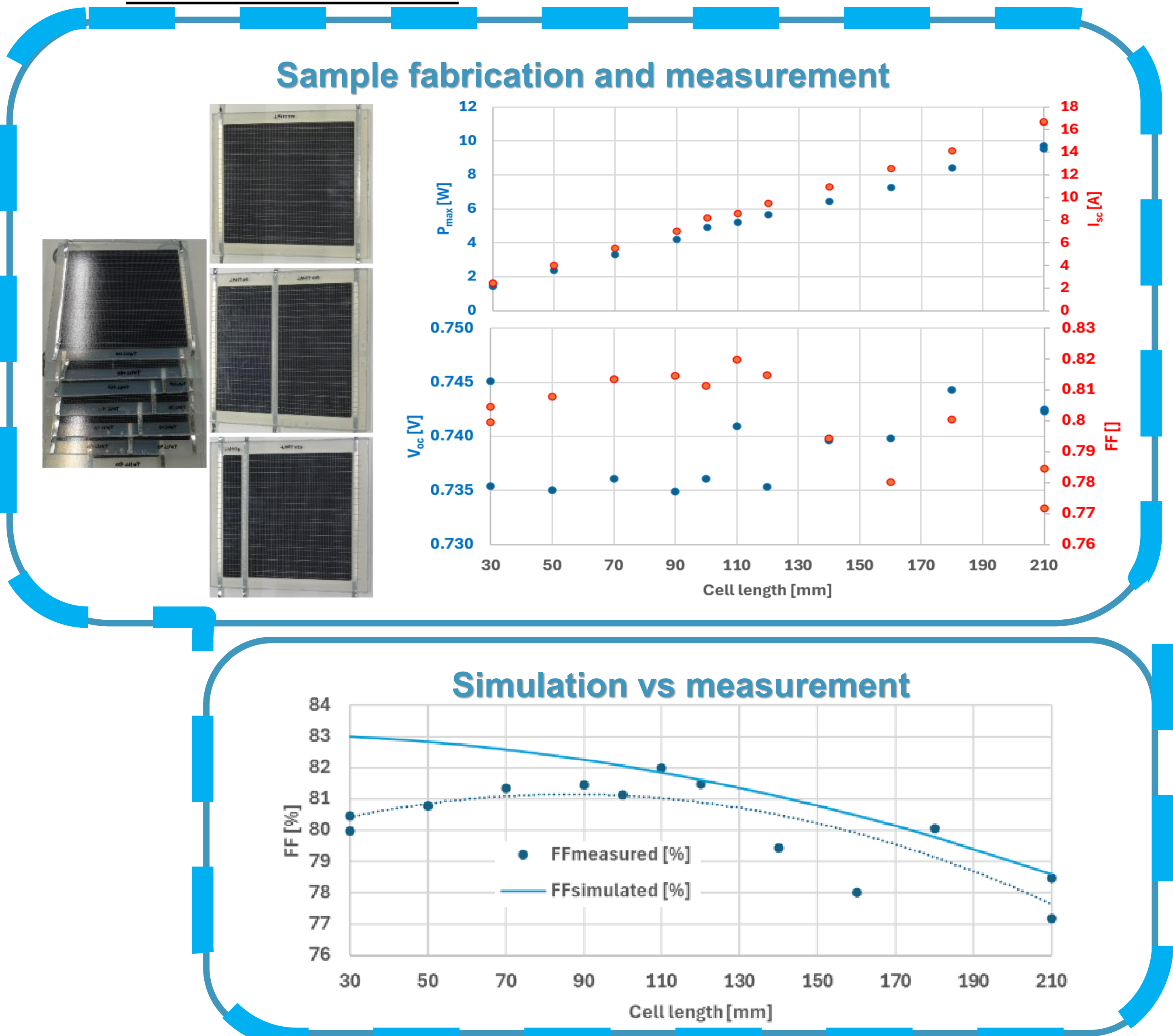
►► Extension to tandem cells



►► Conclusions

Validated basic model available for optimizations
Losses most sensitive to wiring
Costs most sensitive to finger metallization
Losses and material costs drastically reduced in tandems

►► Validation



►► Acknowledgment



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