

Improving the design process of a MEMS-IR-Emitter

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Motivation

Developing a new MEMS chip is time-consuming, often taking over a year to determine optimal operational conditions and delaying dependent components like control electronics.

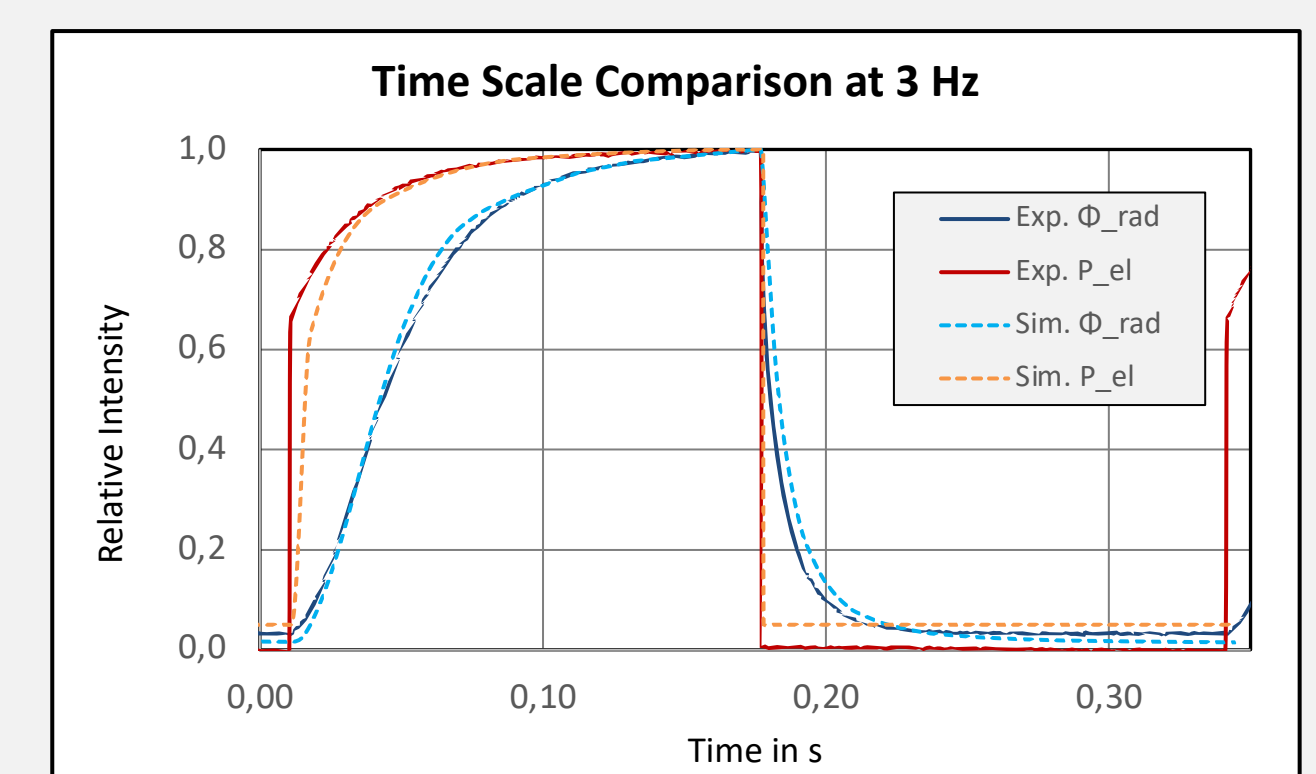
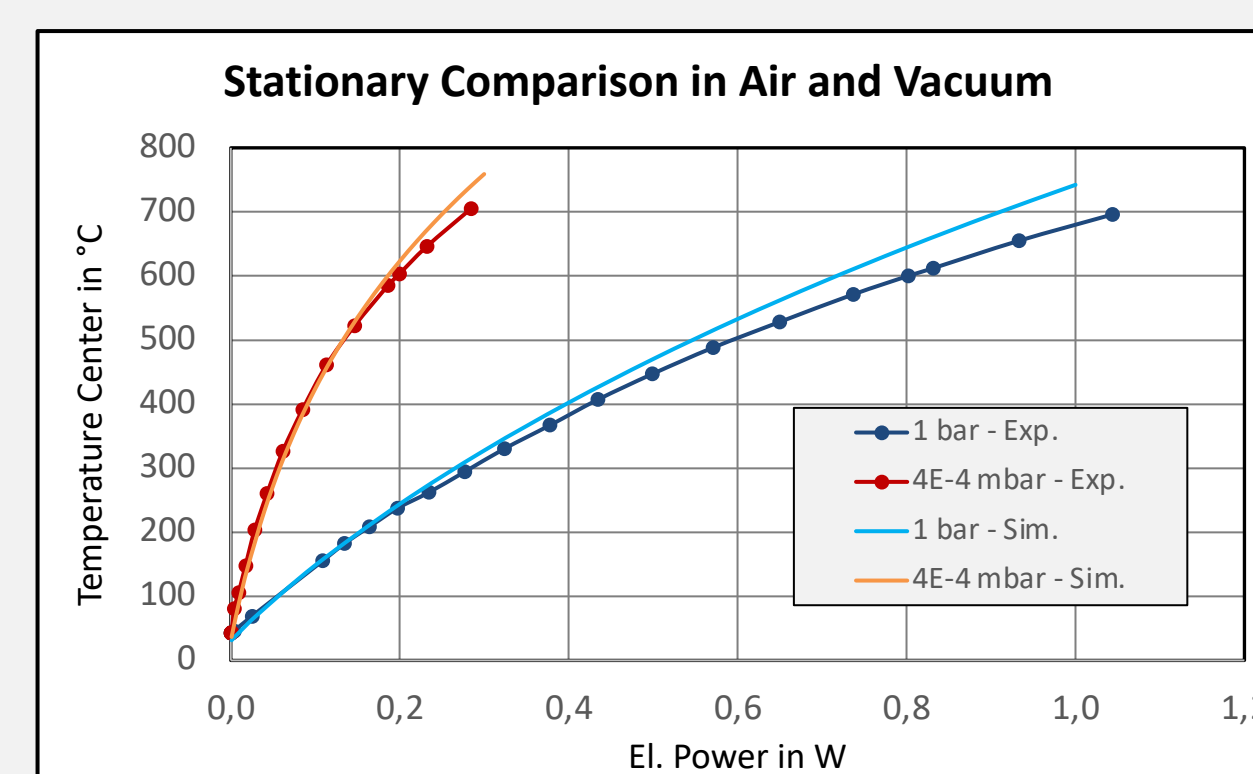
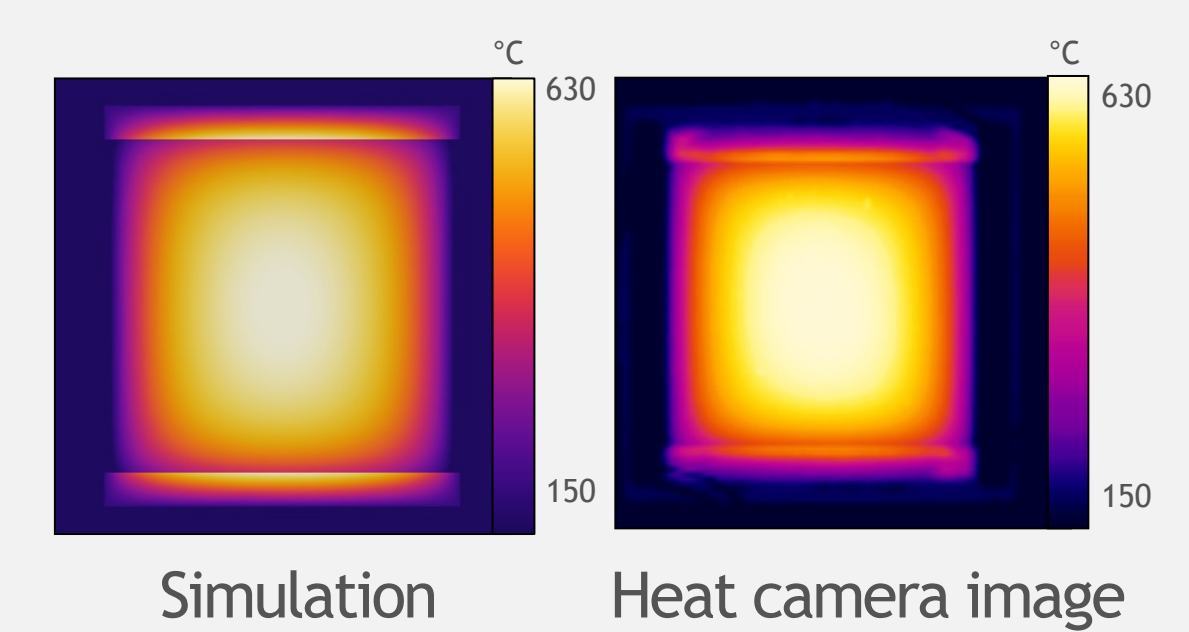
By integrating advanced modelling with a neural network and experimental data we created a validated digital twin of a MEMS-IR emitter chip. This model enables accurate simulation of design variations and prediction of operational conditions. Using a surrogate model, we can efficiently explore adjustable parameters and better understand the design-function relationship.

Model Building

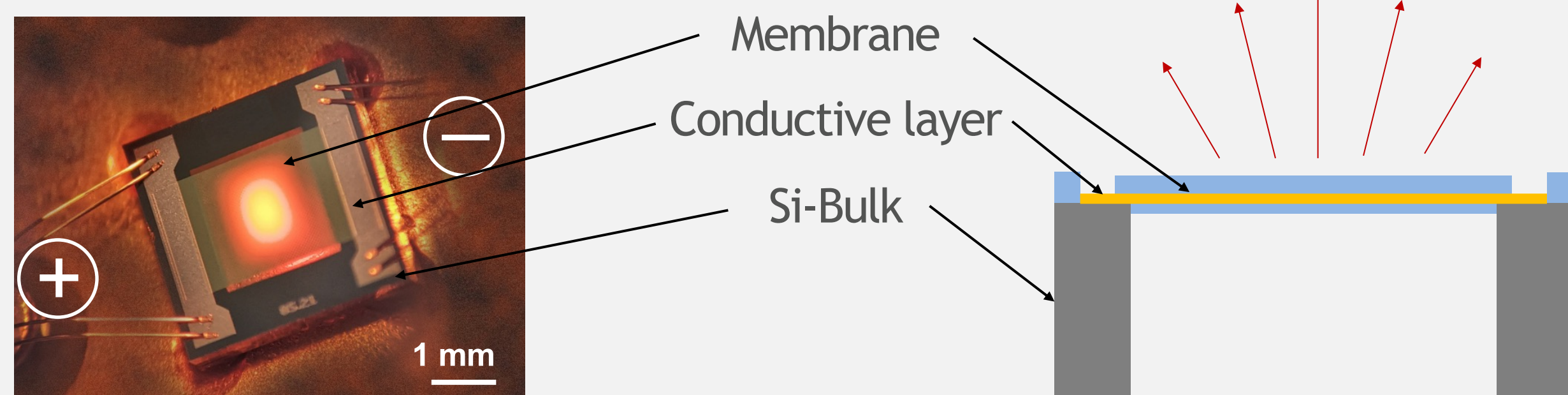


Unknown material parameters of our own layers at high temperatures.

Using a Neural Network and measurement data to deduce parameters

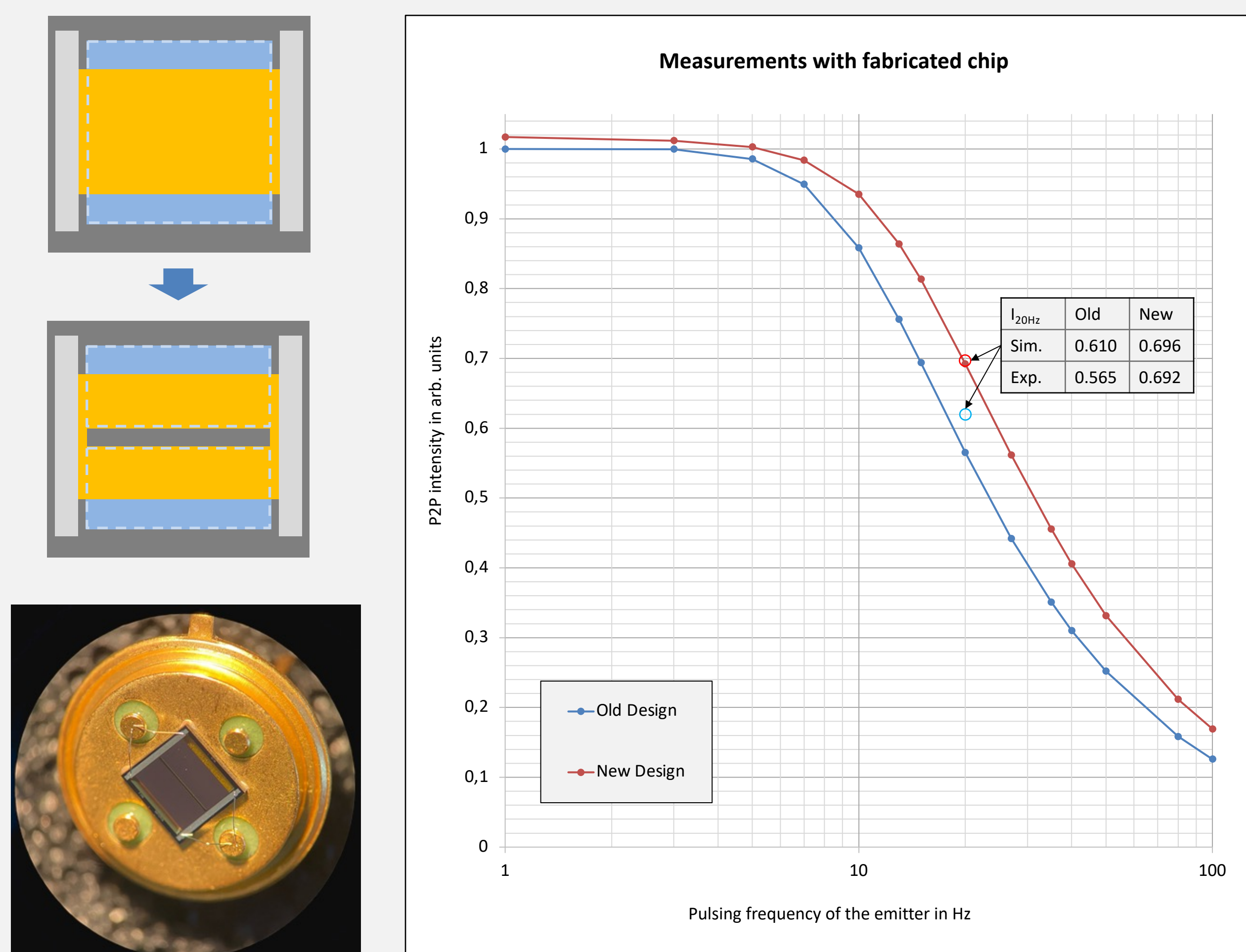


Emitter Concept



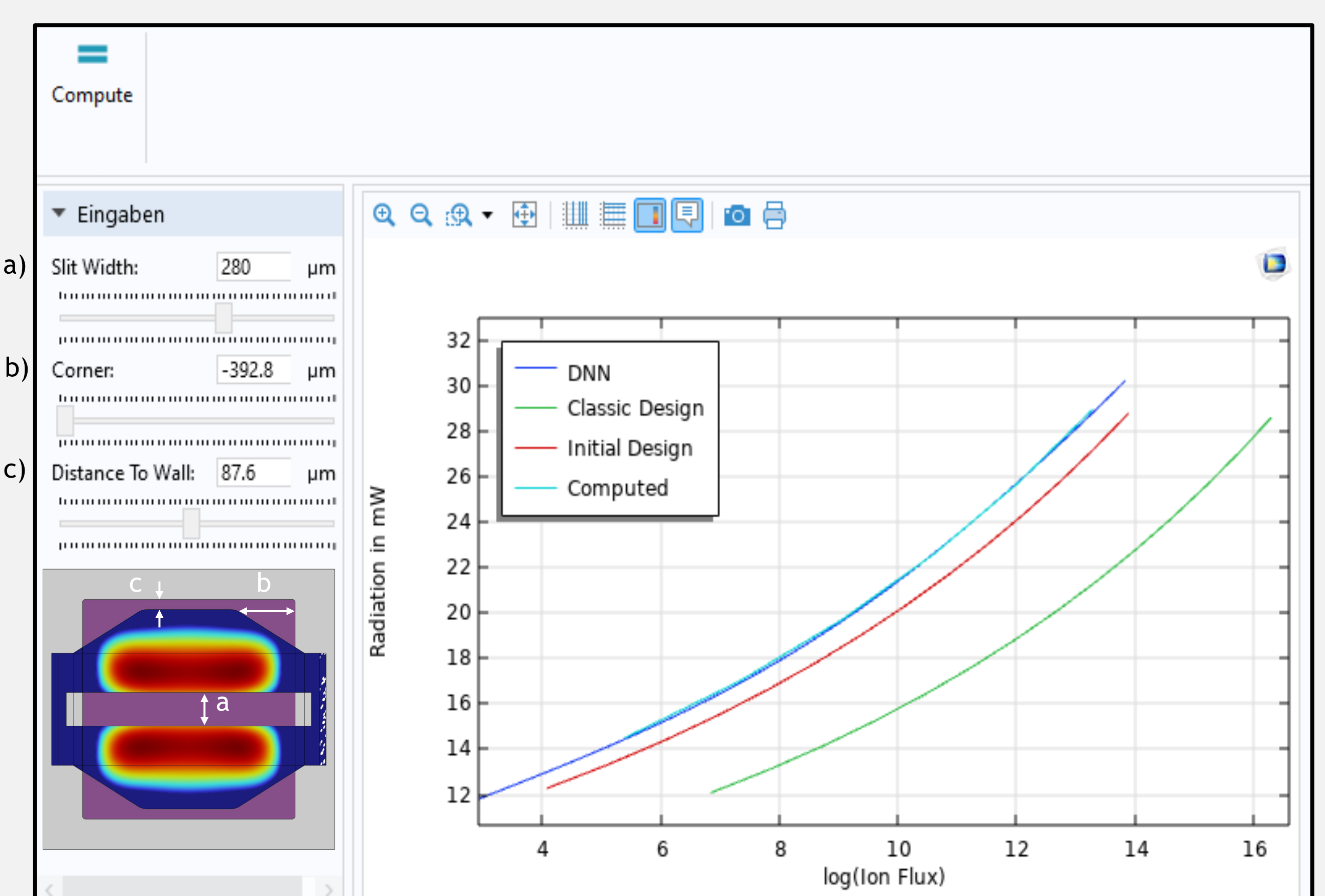
First Optimization Task

Optimizing membrane splitting bar for faster response time



Surrogate Modelling

Surrogate Modelling allows continuously adjustable parameters while the application illustrates the results. Influence of the different parameters on the functional properties becomes visible. Suitable for simple optimization tasks.



Conclusion

Most promising chip design from simulation exceeded expectation after manufacturing. Adding "Surrogate Modelling" gives more freedom for simple optimization tasks. Time-consuming microfabrication processes and life time analysis were minimized.

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