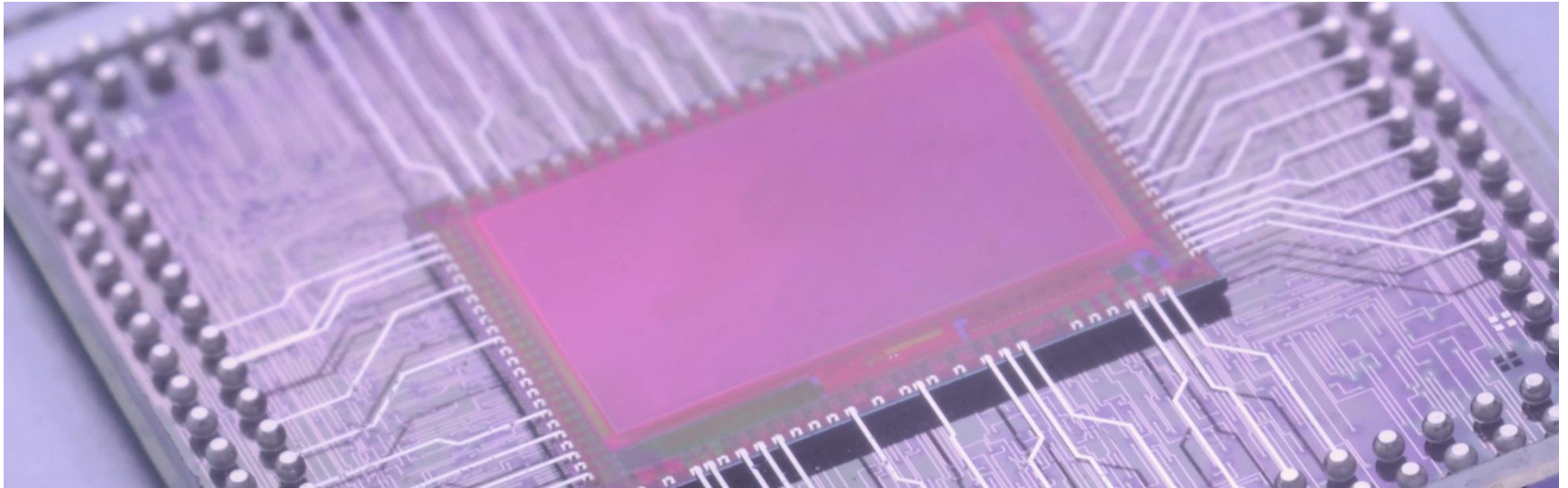

FRAUNHOFER EAS

ADVANCED SYSTEM INTEGRATION

Efficient Parameter Sweeps of a Transmission Line for Advanced Integrated Systems by Weighted Step-Width Approach



Alexander Steinhardt
Advanced System Integration

Fraunhofer IIS

Design Automation Division EAS



| | |
|------------------|----------------------------------------------------------------------------------------|
| Founded | 1992 |
| Location | Dresden |
| Employees | approx. 90 |
| Budget | € 8,3 Mio. approx. 20 % basic governmental funding approx. 80 % project financed |
| Director | Dr. Peter Schneider |

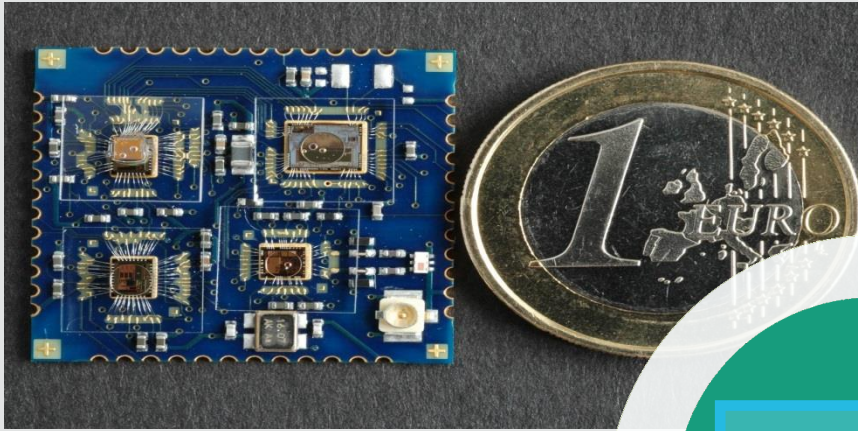
Advanced System Integration

Different examples



Advanced System Integration

Different examples

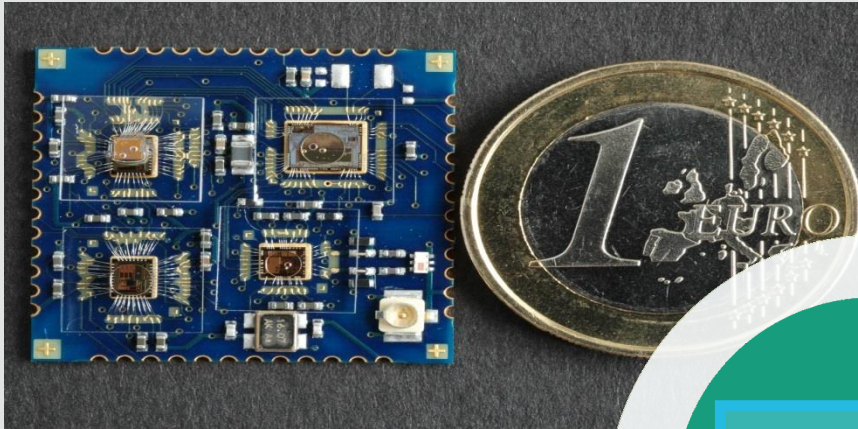


Wireless ECG-Sensor

**Advanced
System
Integration**

Advanced System Integration

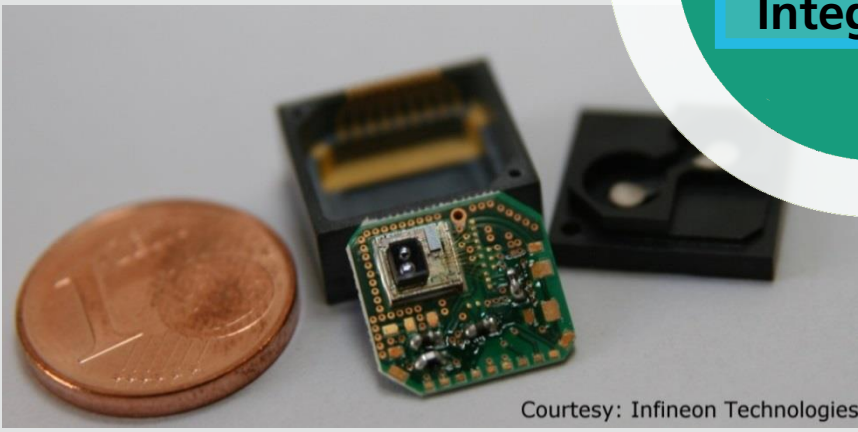
Different examples



Wireless ECG-Sensor

Tire pressure monitor

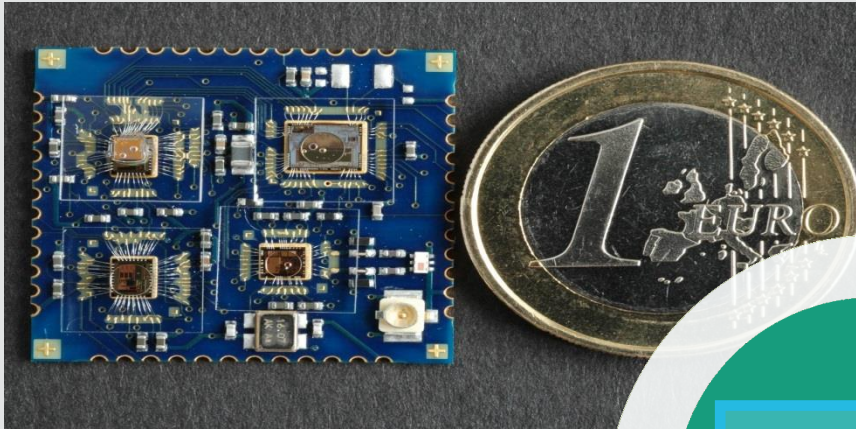
Advanced
System
Integration



Courtesy: Infineon Technologies

Advanced System Integration

Different examples



Wireless ECG-Sensor
Tire pressure monitor

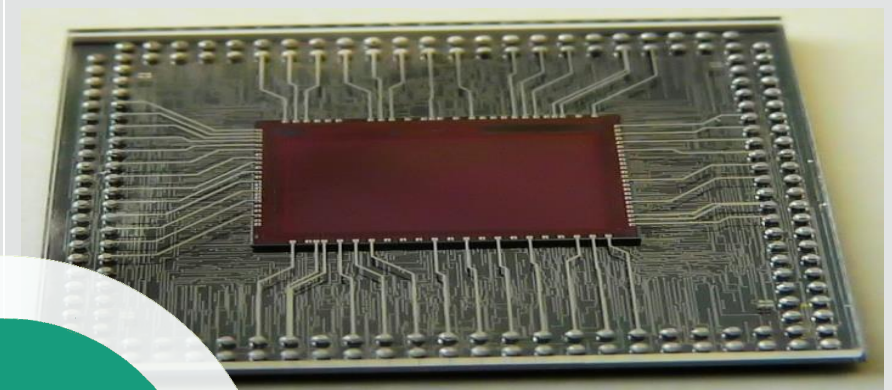
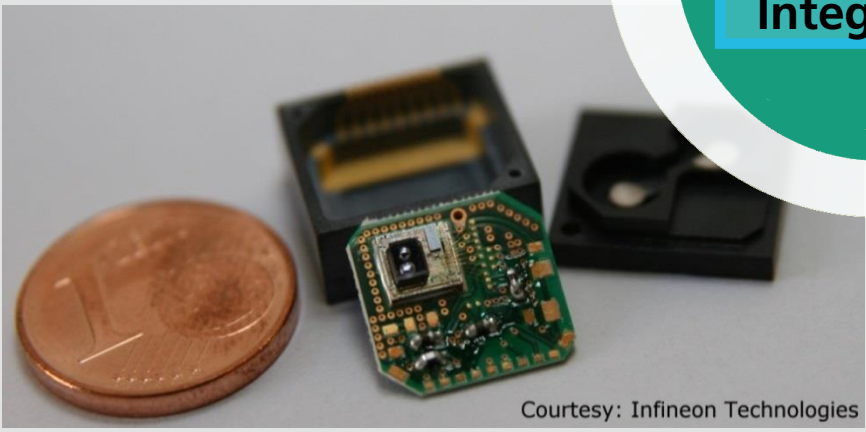


Image sensor / processor
integration

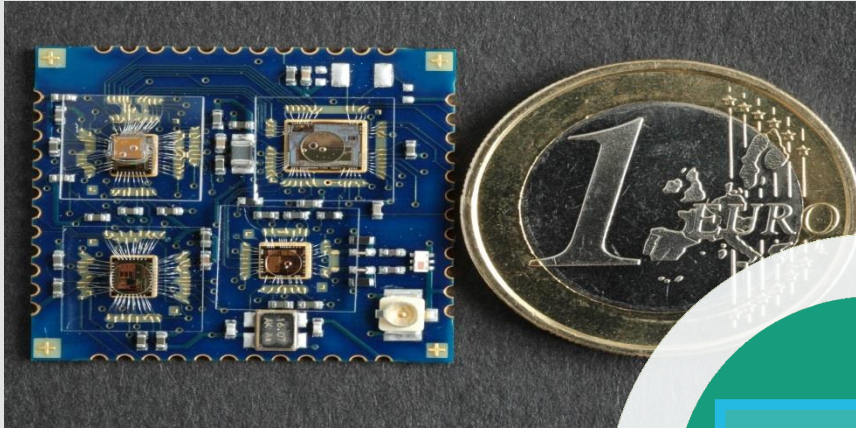
**Advanced
System
Integration**



Courtesy: Infineon Technologies

Advanced System Integration

Different examples



Wireless ECG-Sensor
Tire pressure monitor

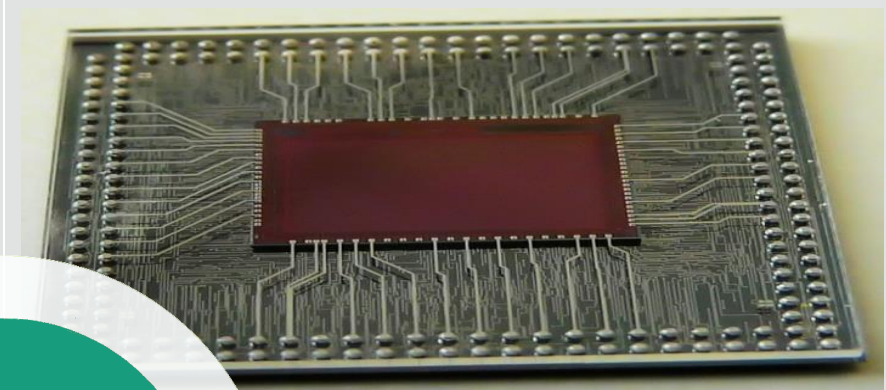
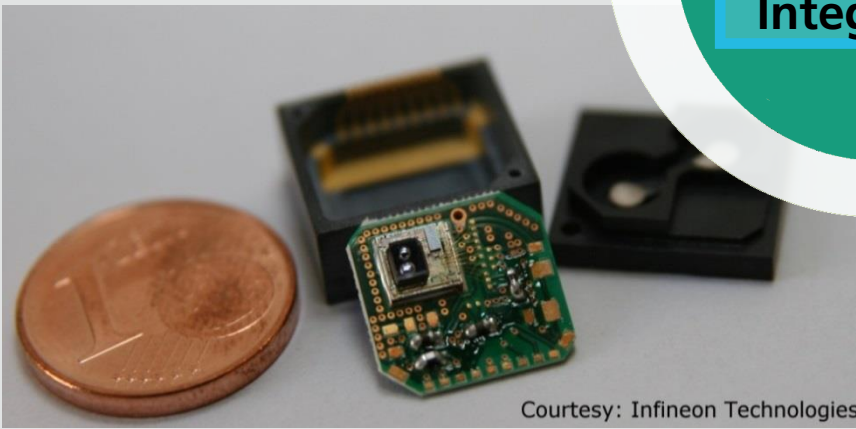
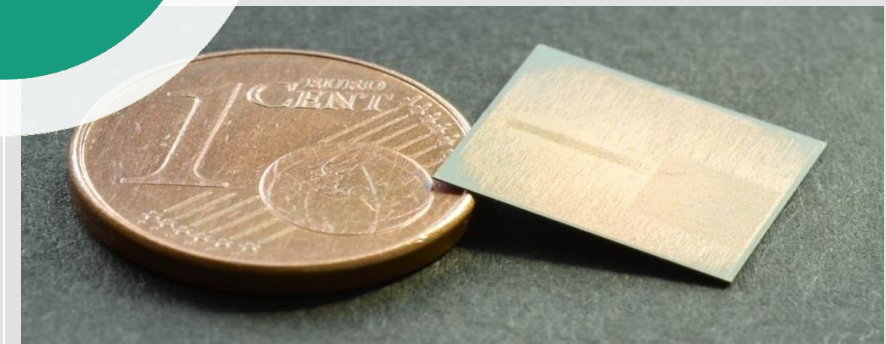


Image sensor / processor
integration



Courtesy: Infineon Technologies



Interposer for JEDEC
WideIO/Processor

**Advanced
System
Integration**

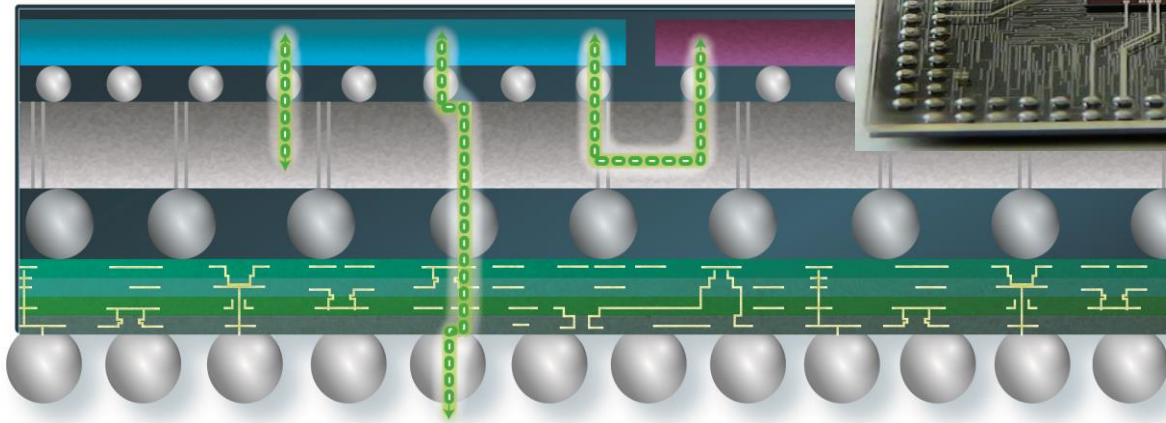
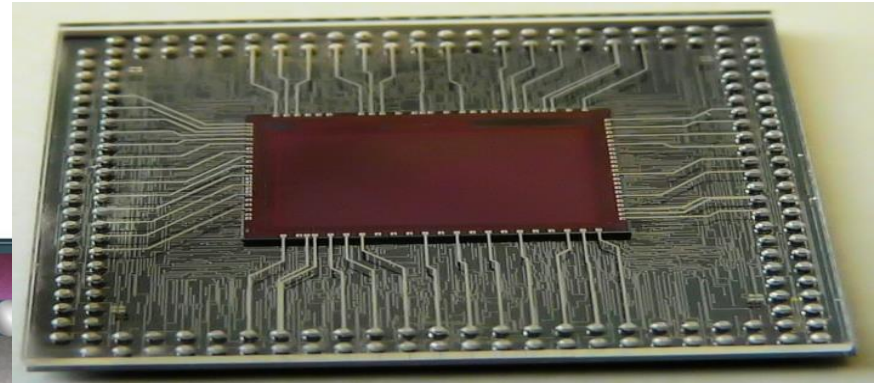
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Plan

- Motivation
- Decision making
- Simulation
- Sampling for behavior trend
- Summary

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Motivation



■ Packaging

- Expensive prototyping
- New knowledge required
- Simulations for better first try

■ Simulation

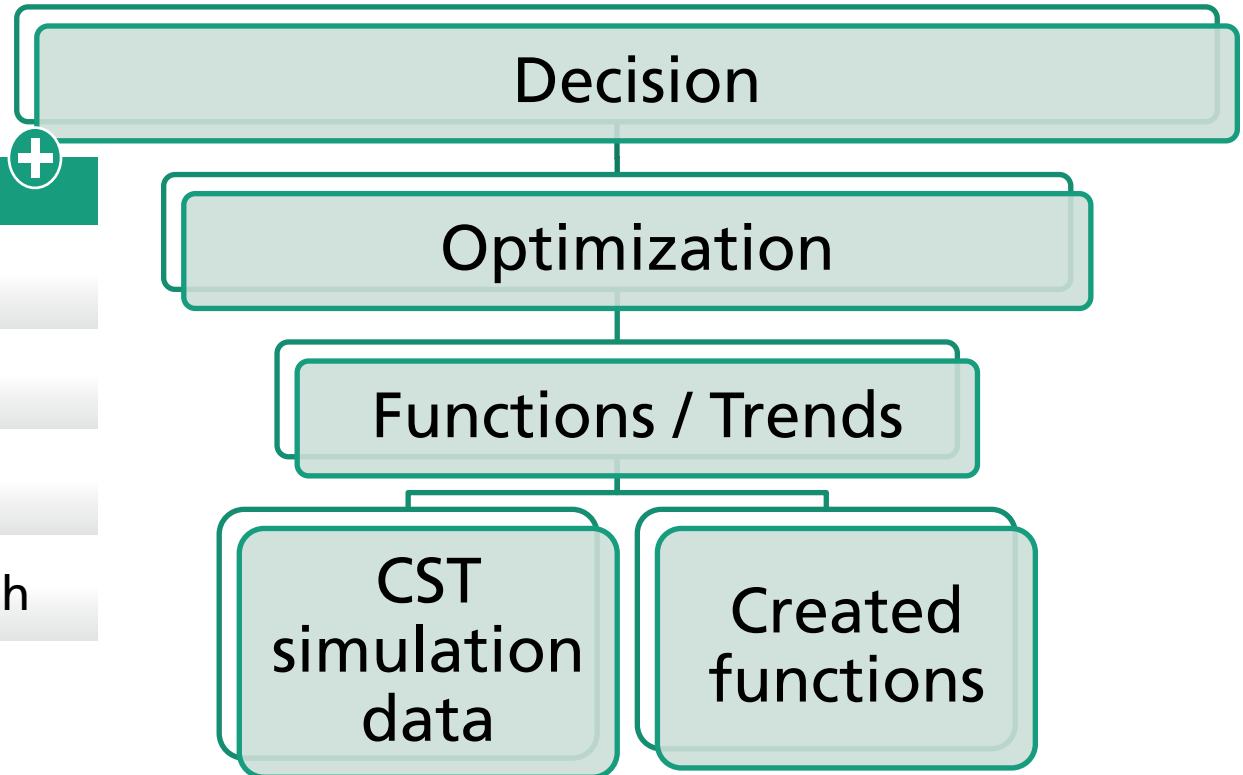
- Easy to find the impact of the model parameters (e.g., geometry parameters, material data, ...) onto the behavior by parameter sweeps

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Decision making

Pro Decision making

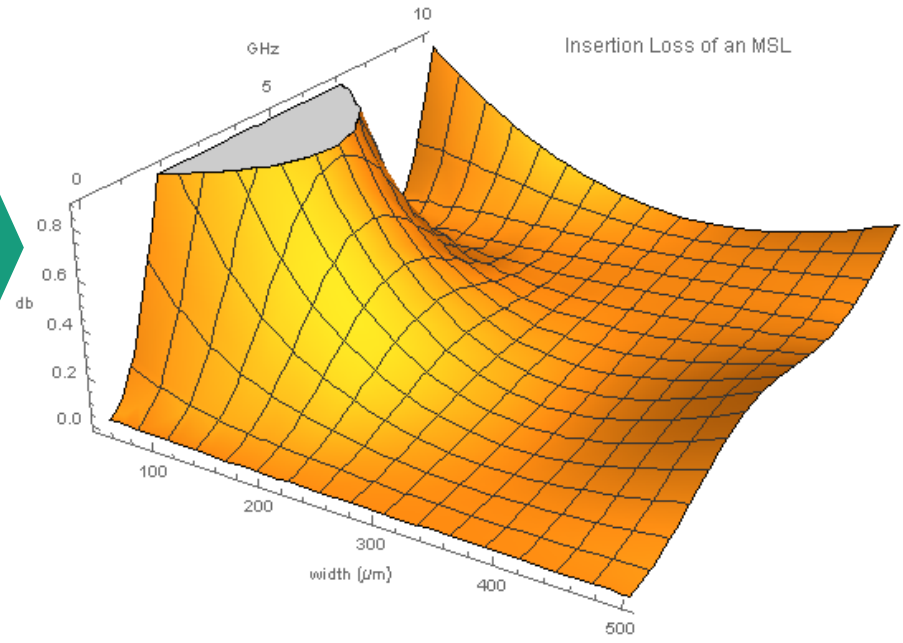
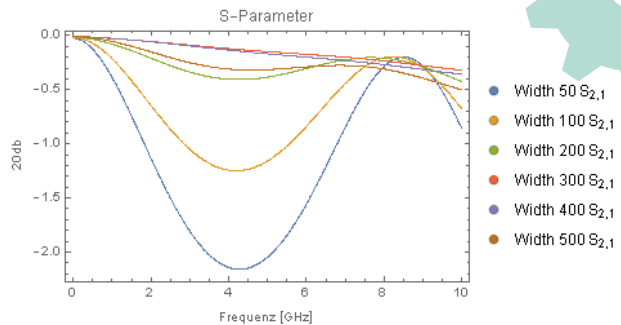
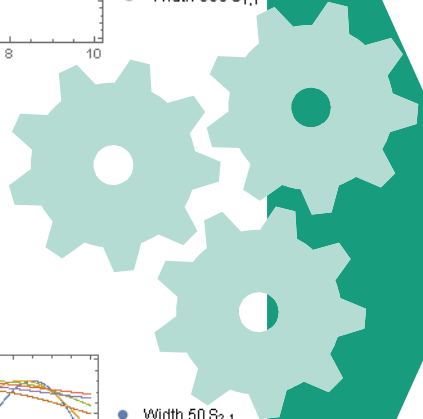
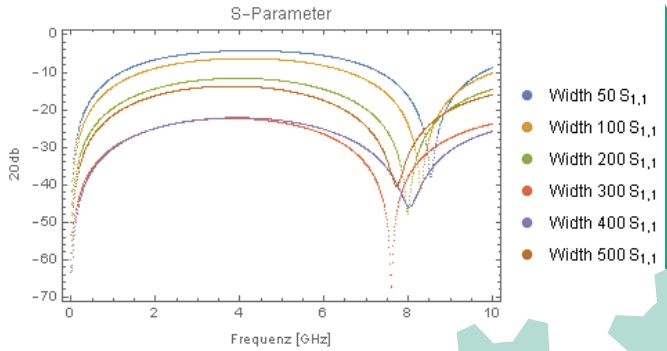
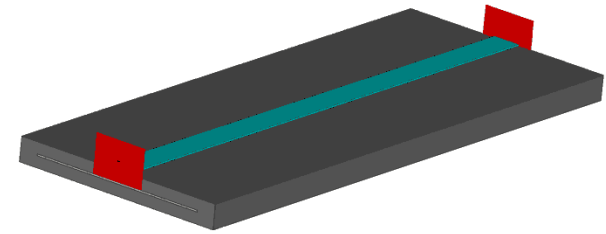
- IP – Control
- Trend generation
- Optimization
- Step-by-Step approach



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Decision making – trend generation

■ Width sweep of a MSL of 28.937 μm height



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Decision making – Decision Making Manager (DMM)

Data

- CST parameter sweeps

Create Function

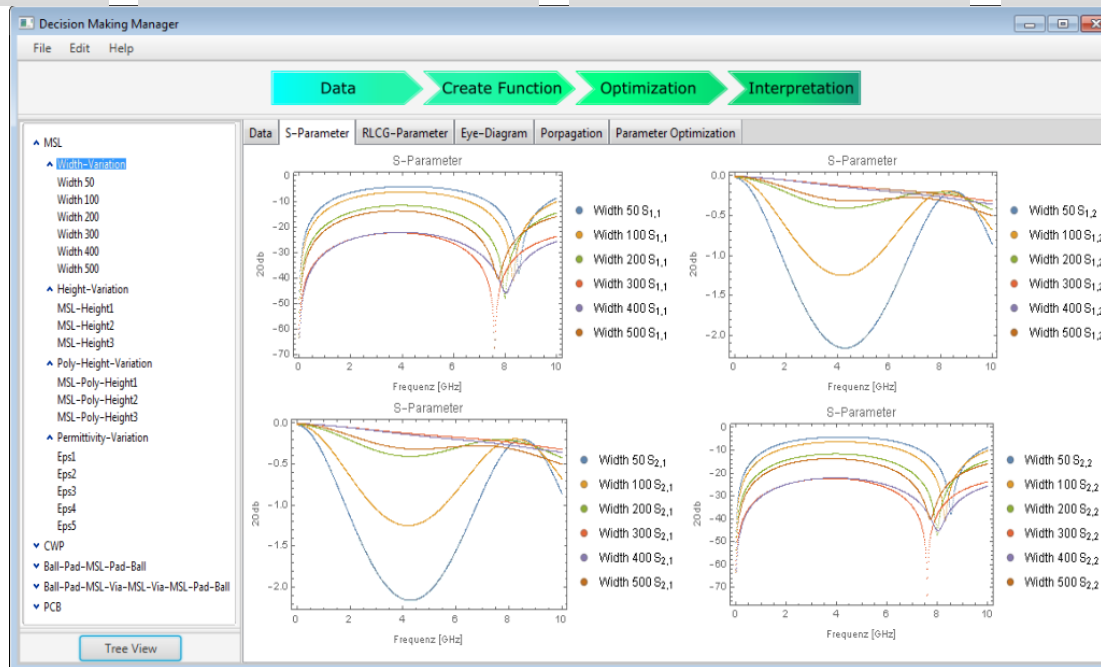
- Interpolation w.r.t. the parameters

Optimization

- Find an optimum w.r.t. the functions

Interpretation

- Results of the optimum and the functions

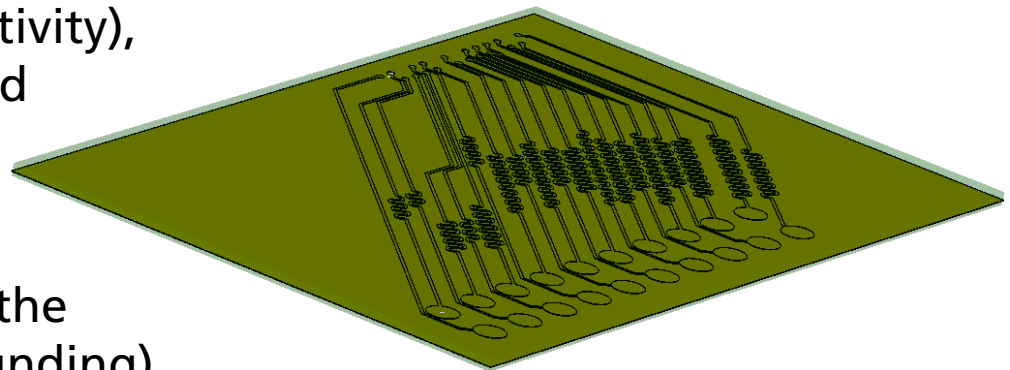
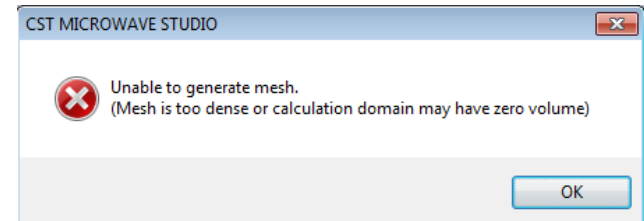
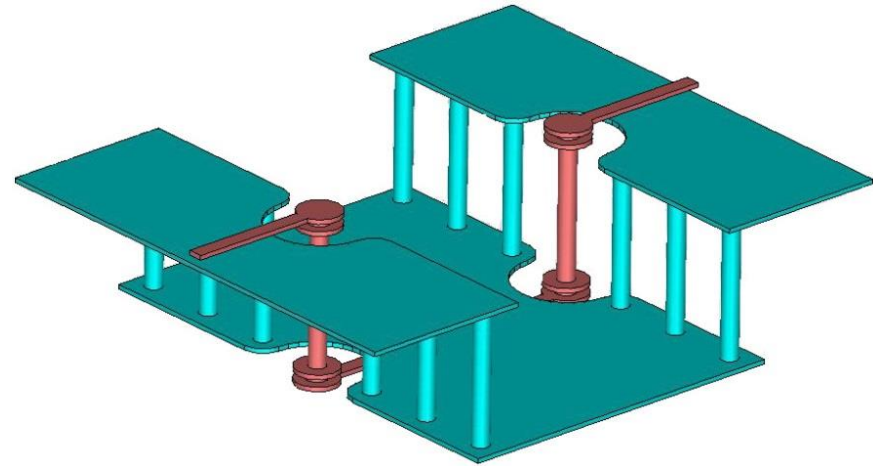


12

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Simulation

- GDSII
 - Easy to import
 - No editing of the model
 - One by one import
- Accuracy
 - Good for a single simulation with respect to the settings
 - Depends strongly on the parameter (e.g., permittivity), especially for broadband characterization
- History list
 - Automation of editing the model (substrate surrounding)



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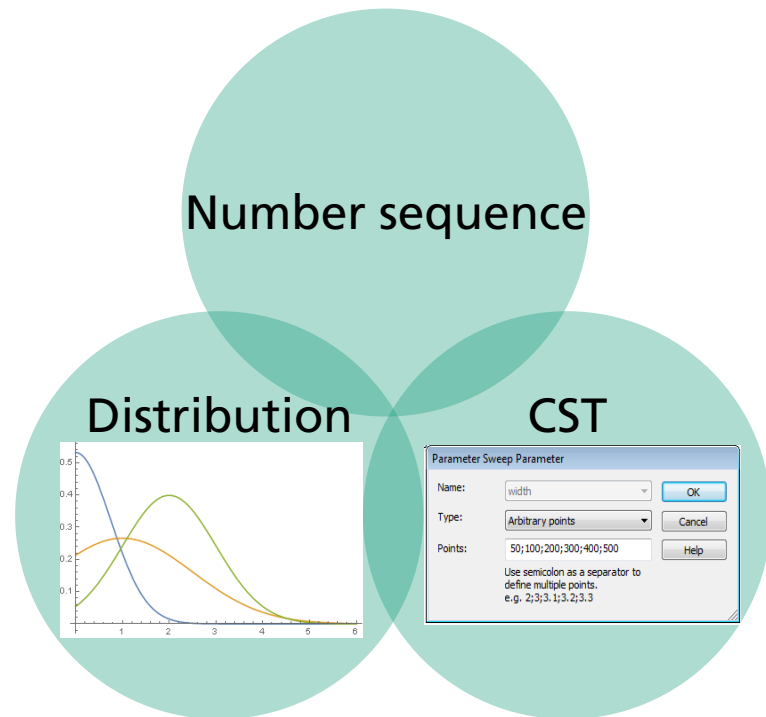
Simulation provided by trends

| | Contra Simulation  | Pro Trend  |
|--------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Accuracy | <ul style="list-style-type: none">■ Depends strongly on the model parameter. | <ul style="list-style-type: none">■ Assume that the trend of the simulation is the physical trend of the system. |
| Measurements | <ul style="list-style-type: none">■ No impact on the simulation results. | <ul style="list-style-type: none">■ Can be used as input for the trend generation. |
| Significance | <ul style="list-style-type: none">■ Local. | <ul style="list-style-type: none">■ More global. |

Nyquist-Shannon Sampling Theorem (simplified)_[1]

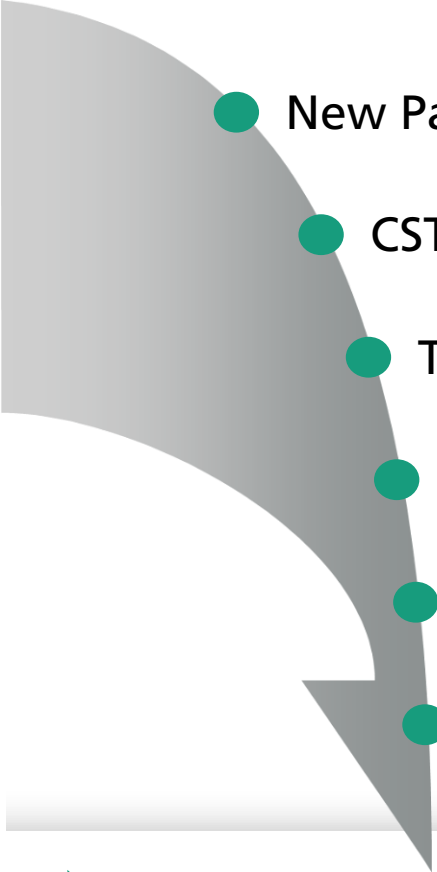
The sampling frequency should be at least twice the highest frequency contained in the signal.

- Linear sampling
- Logarithmic sampling
- Random sampling
- Normal distributed
- ...



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Summary

- 
- New Packages require new knowledge and simulations
 - CST parameter sweeps and schematic
 - Trend based approach
 - Optimization of the model for lower risk by prototyping
 - Decision making support
 - Best solution

▶ **Result: CST and DMM provide low risk but high quality solutions.**

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Acknowledgment / References

- CST
- Mathematica

- [1]: <http://redwood.berkeley.edu/bruno/psc129/handouts/aliasing.pdf>

Thank you

for your attention

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