APECS

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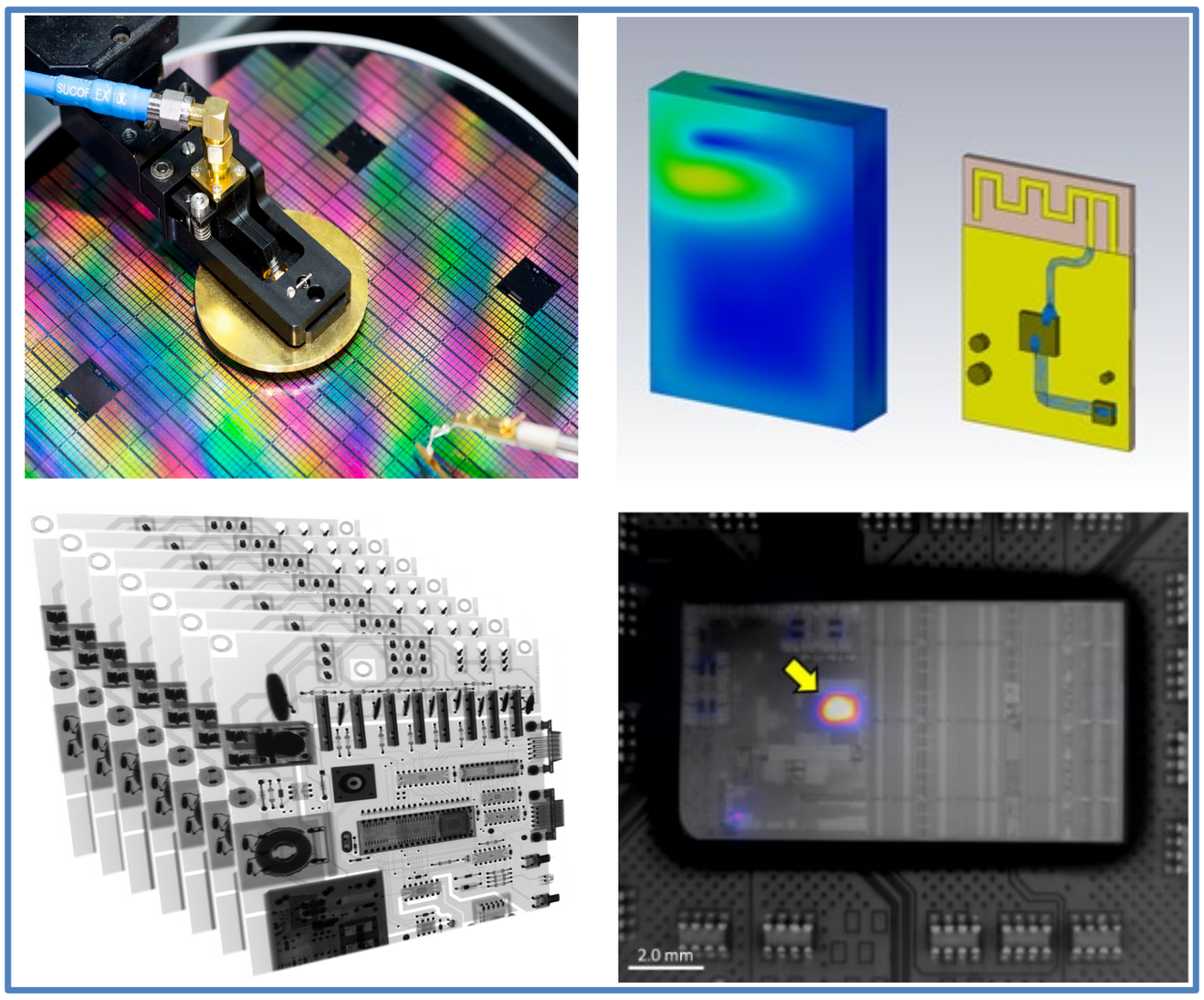
Forschungsfabrik Mikroelektronik Deutschland

Characterization, test, reliability and security analysis for advanced heterogeneous integrated systems (CTR)



Advanced CTR capabilities

- Characterization of high-speed transmitter and detector chiplets up to sub-THz bandwidth
- Efficient electrical characterization tools (high accurate, low noise, pA...A, nV...120V, ...200 GHz)
- Electro-optical characterization with backend optics, characterization of high-performance optical interconnects (VIS... 1.6 µm wavelength)
- Antenna and RF characterization (mm-wave to THz)
- Burn-in tests, ESD and EMC reliability testing
- Defect localization by advanced thermal, acoustic, X-ray imaging in high density and complex packages
- Physical failure analysis, micromechanical testing and numerical simulation to understand reliability risks and degradation mechanisms
- Holistic failure and lifetime modeling based on material parameter characterization
- Side-Channel Evaluation (electromagnetic fault injection, laser fault injection, localized electromagnetic side-channel analysis)

Targets and challenges

Provision of unique functional and reliability test capabilities and cutting-edge failure analysis and strategies to support industrial technology ramp up, series production and market introduction by addressing:

- High complex 3-D functional structures and ultra-high dense interconnects
- Large variety of functional features and technologies for hetero-integration
- Combination of very different electrical and optical signal types in one SoC
- Significant treats by hardware-based attacks (optical, side channel, failure).

Part of the APECS pilot line

Comprehensive characterization, test and reliability platform to support manufacturing of advanced packages

Enhanced defect metrology and process characterization

"100% Known Good Die" approach before chiplet integration, test of complex modules as part of pilot fabrication

Reliability and hardware resilience testing, robustness validation, failure root cause analysis and lifetime modelling

Possible points of contact

- Development of tailored solutions for characterization, testing and failure analysis adapted to specific applications / technologies
- Enable virtual qualification by innovative material characterization, failure mode detection and complex multi-physics simulation approaches
- Test service (volume test)
- Knowledge transfer (test hardware and methods, training)

Key questions to be discussed

1. Which aspects are particularly relevant for characterization and testing, like: high-speed data processing, large-volume data transfer, sensor-specific parameter test, high voltage / high power handling or other aspects with application specific requirements?
2. Are there specific device / application specific failure modes which need to be understood up to life-time modelling approaches
3. Is there a need to implement and test hardware security features in your products?
4. What level of importance have the lifetime estimation, digital twin, robustness validation?

APECS European Chiplet Innovation

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