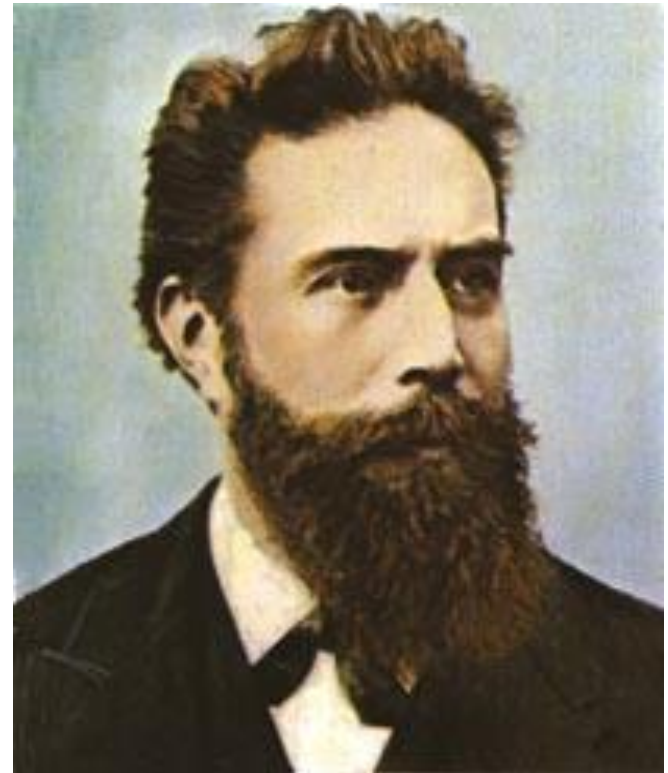


X-Ray analytical tools for industrial quality control

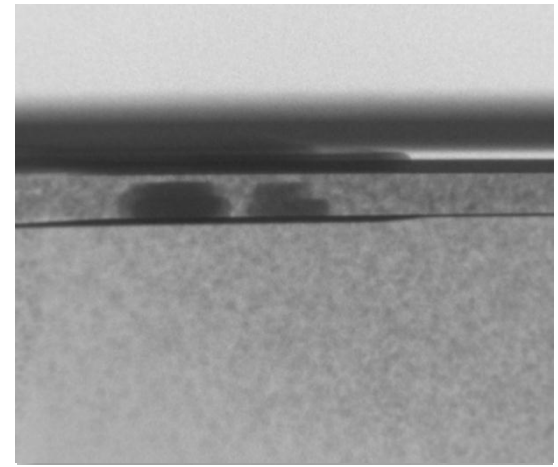
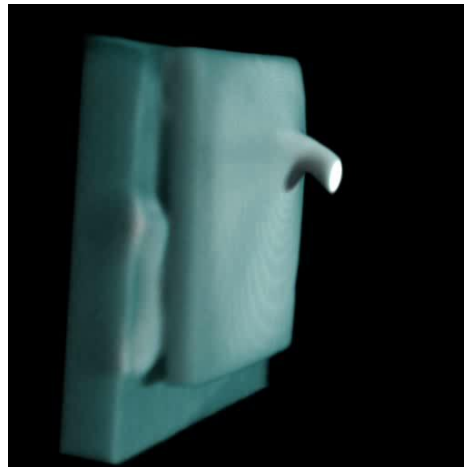
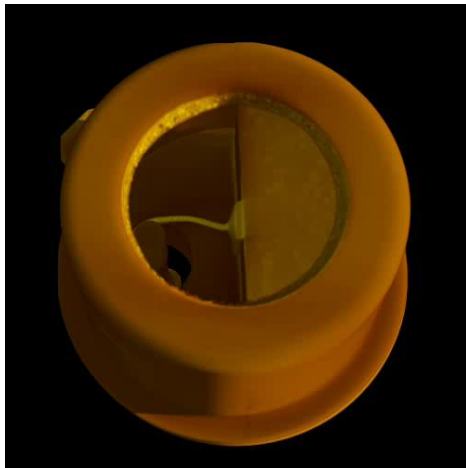
Zürich, October 27, 2011

Alex Dommann



Background: Opportunities in X-Ray imaging

- Quality inspection tool / Non Destructive Testing in Assembly and Packaging

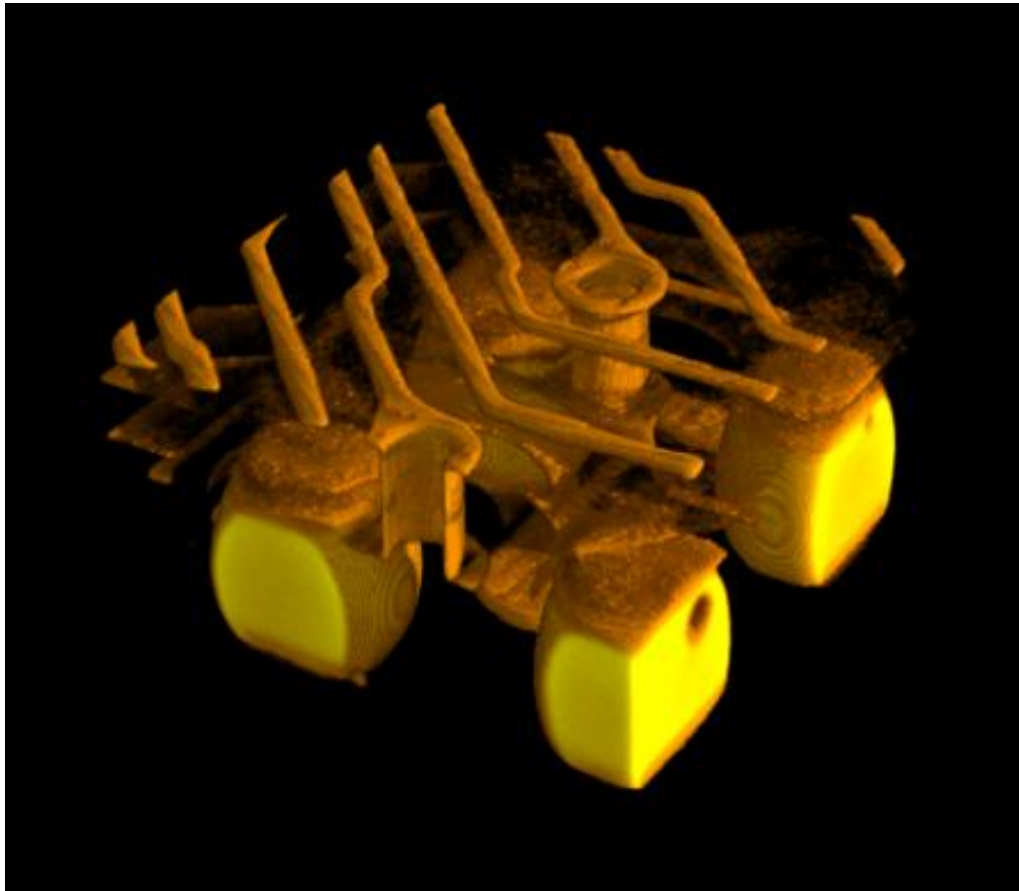


- Medical
- Security

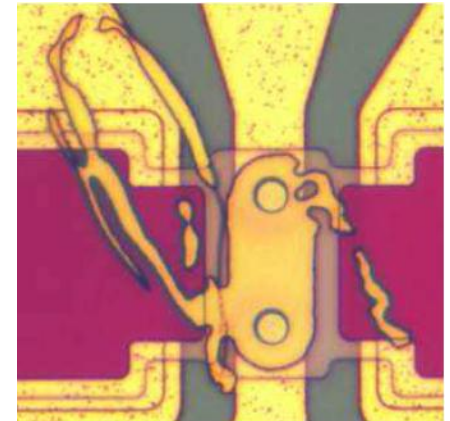
NDT equipments



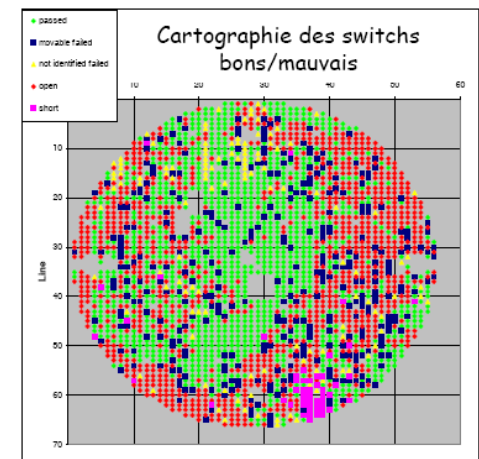
Defect Detection / Failure Mechanisms



Voids in solder inter-connects detected by micro X-ray tomography



Automated wafer inspection by IR-microscopy



Defect mapping on wafer

Analysis Infrastructure

HRXRD



ESEM

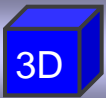


AFM



RBS





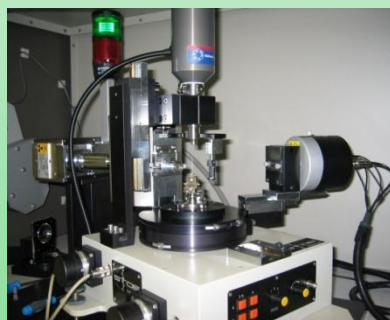
Single Crystal Analysis

3D Structure determination for new materials



STOE IPDS I and II

STOE STADIP



1D

Powder Analysis

- Phase analysis
- Quality control
- 3D Structure determination

2½D

Surface Analysis



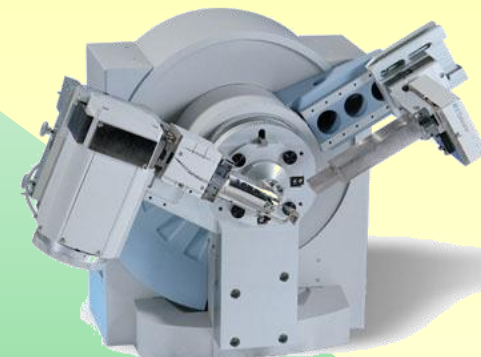
Panalytical X'Pert PRO MRD

- Texture
- Phase analysis
- Density, layer thickness and interface roughness (reflectivity)

HRXRD

Quality control

- Stress analysis
- Defect Analysis

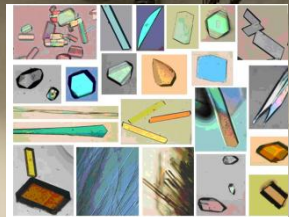


Panalytical X'Pert PRO MPD

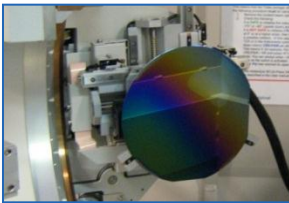
Nanocrystalline
powders

XRD Application LAB

Single crystalline
materials.



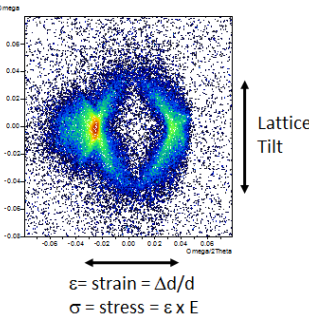
Coatings (metal oxides, nitrides)
Thin films
(molecular self-assembling, organics)



Phase analysis

Quality Control and Reliability in MEMS

- **Defect Analysis, Texture**
(related to processing, fabrication, damage)
- **Stress Analysis**
in SiSC-Microstructures and its correlation with mechanical properties



Transmission Electron Microscope

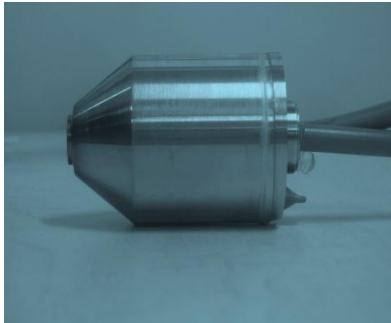
Philips CM200 (Resolution 0.14 nm)

- Energy Dispersive X-Ray Spectrometer (EDS)
- Heating sample holder
- “In-situ” tensile sample holder

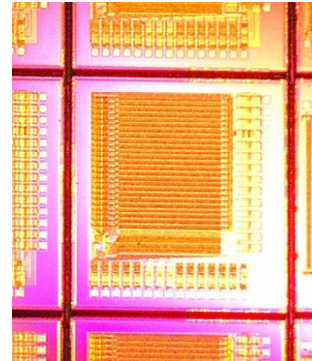


Network of integrated miniaturized X-ray systems operating in complex environments

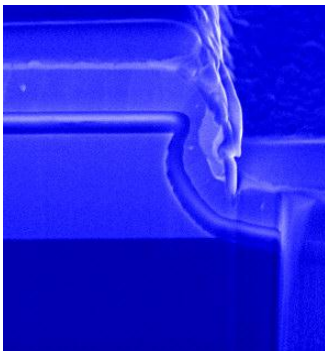
Miniaturized, fast and programmable X-ray sources



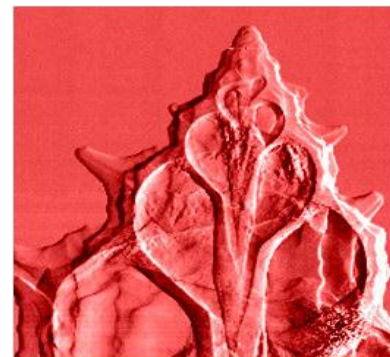
Single-photon solid-state X-ray detection



Si-Ge layers for high-energy X-ray detection

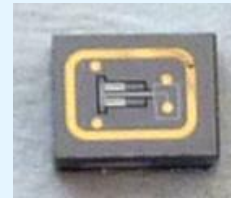
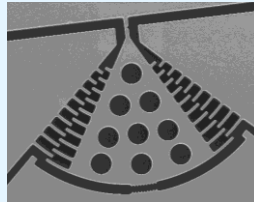
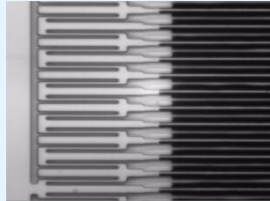
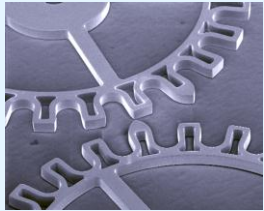


Phase contrast X-ray imaging



Structural testing (HRXRD)

High Resolution X-ray Diffraction in MEMS reliability:



Design:

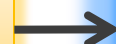
- components
- device
- packaging level



Fabrication



Assembly



MEMS



Product

Thank you for your attention!