

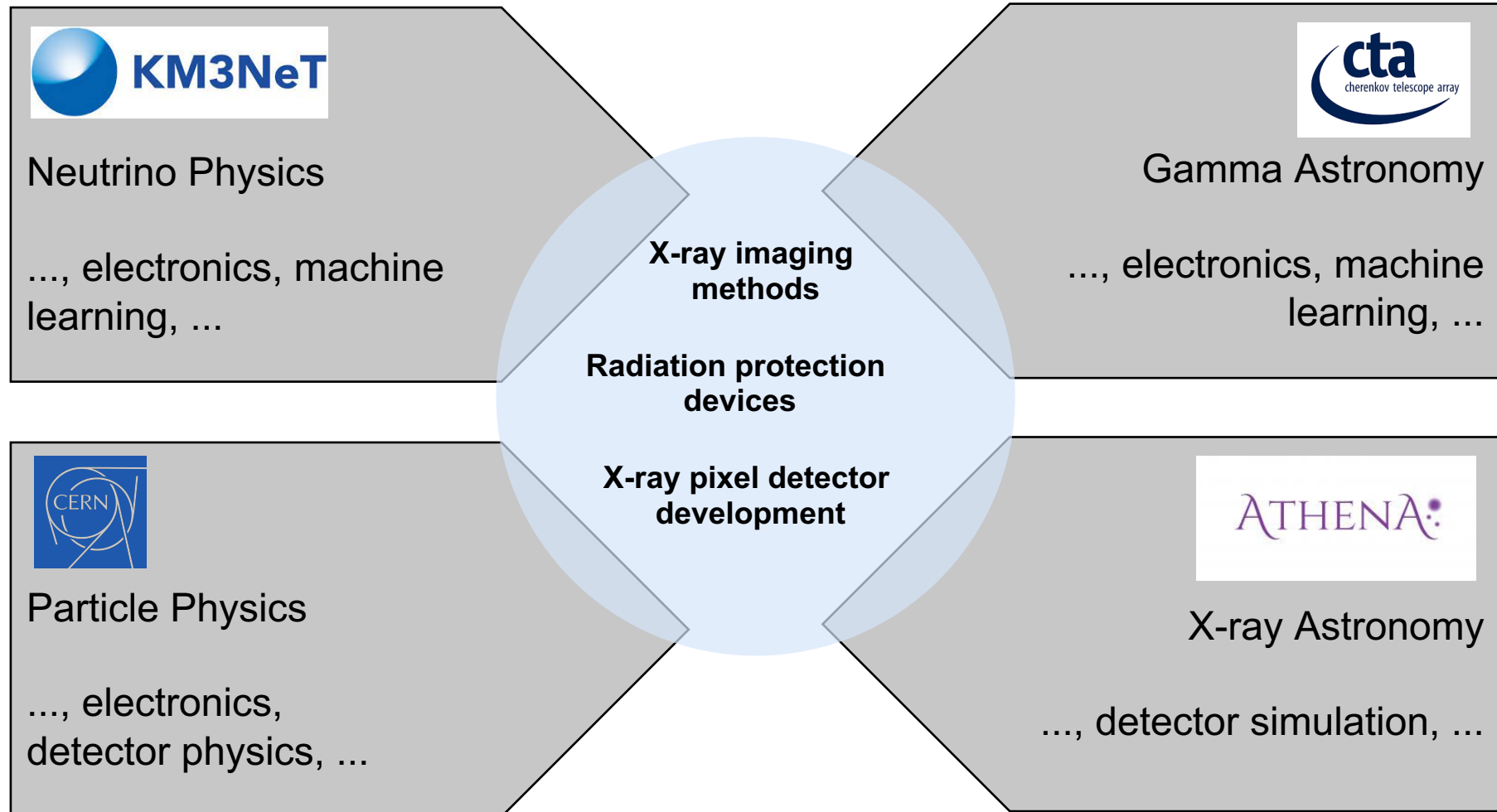


Technology transfer @ ECAP

Thilo Michel
Erlangen, April 4, 2022



ECAP's expertise & environment





Several opportunities for technology transfer:

- Siemens Healthineers
- Fraunhofer EZRT
- iba dosimetry GmbH
- ...



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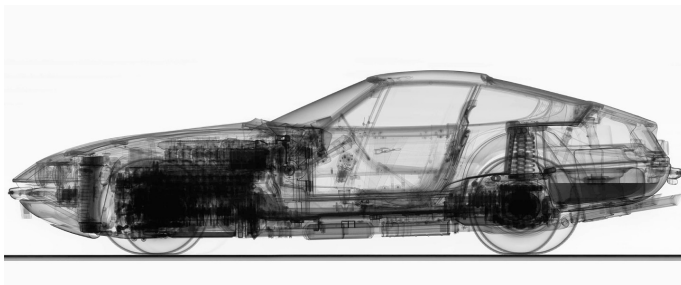


Example: Cooperation with Fraunhofer on food inspection with X-rays



Advanced X-rays for industry

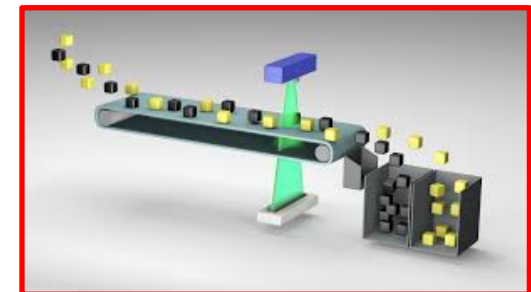
High energy X-ray imaging



Microscopic X-raying

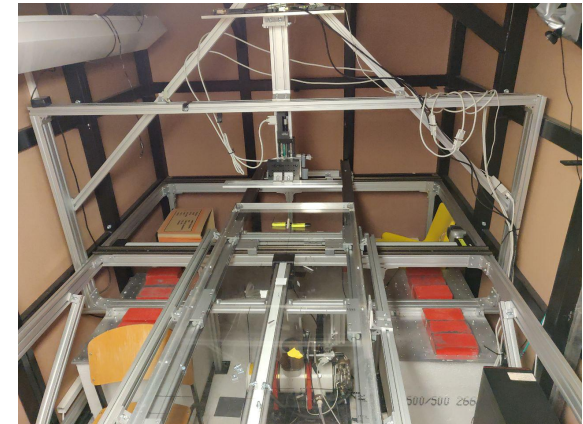
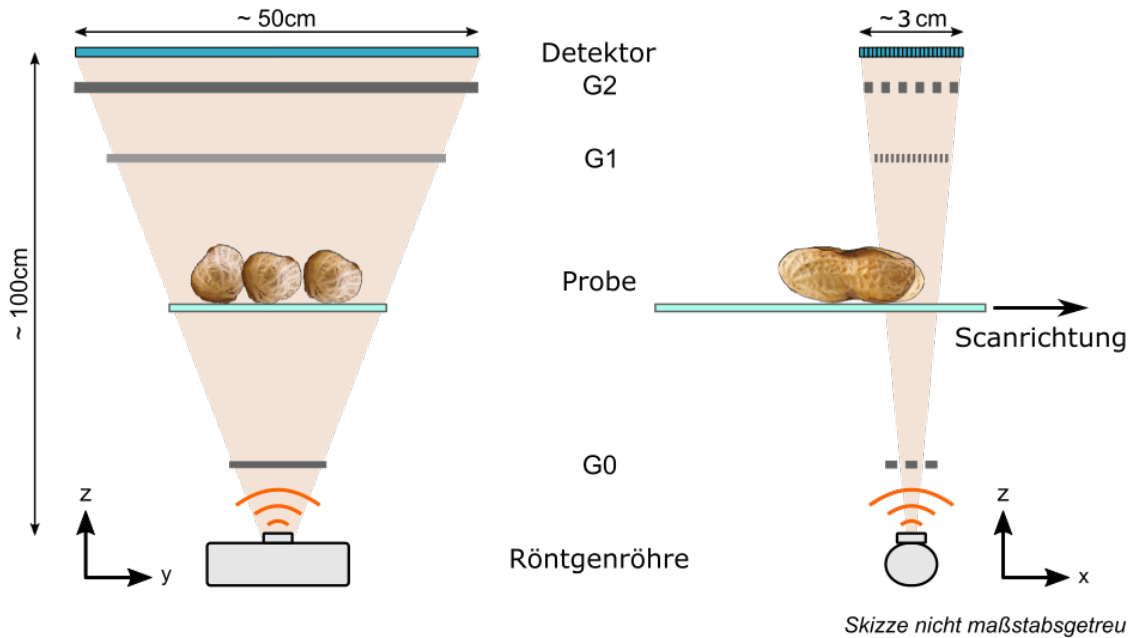


Quality control



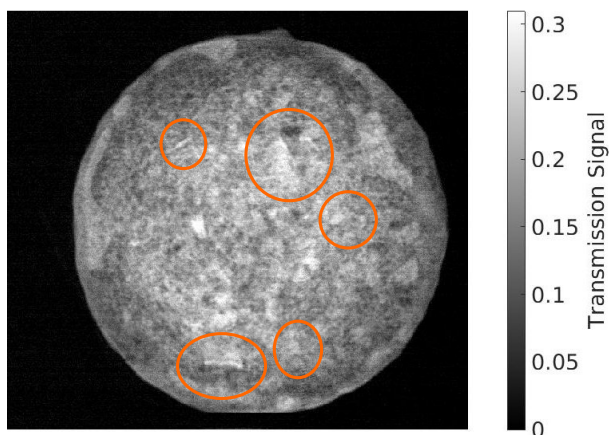
Actual cooperation:
Phase-contrast imaging
in food production

Prototype phase-contrast X-ray scanner for food inspection

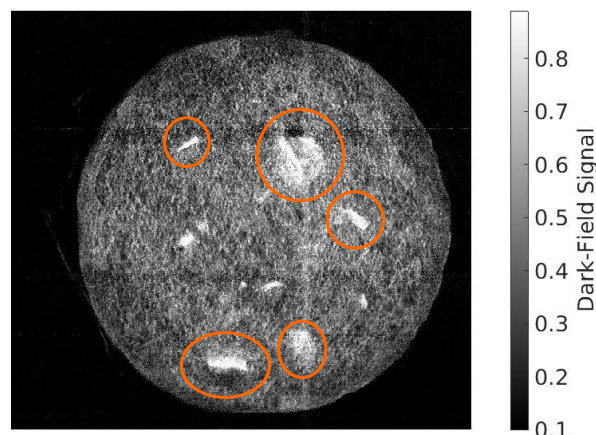


Example: Nuremberg's gingerbread with nutshell contaminations

Conventional (attenuation)



New: darkfield



Fotography



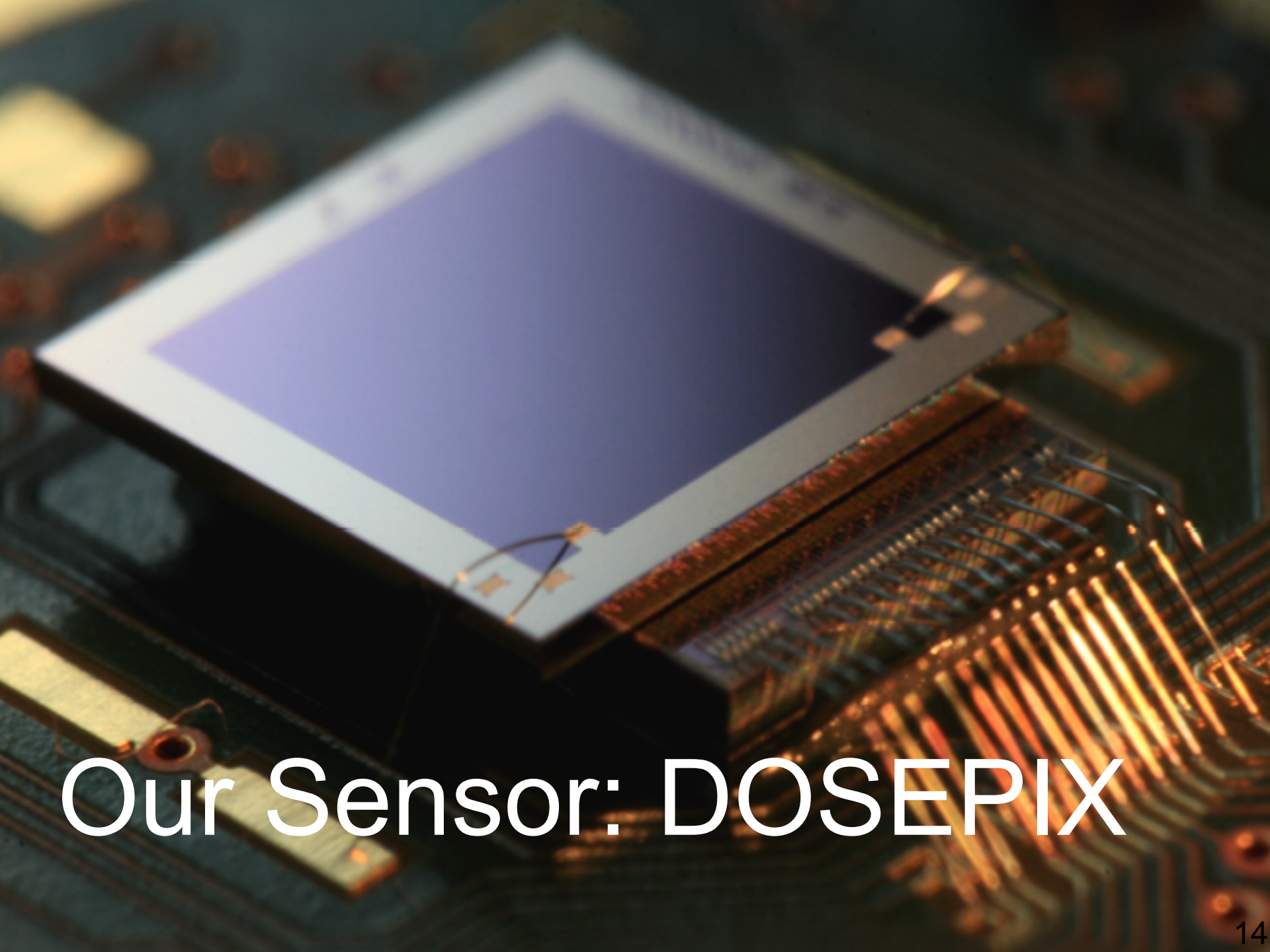


Example: Medical Valley Award (2019-2022)









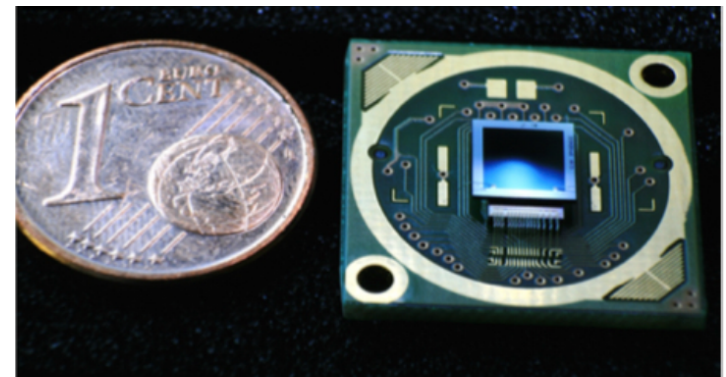
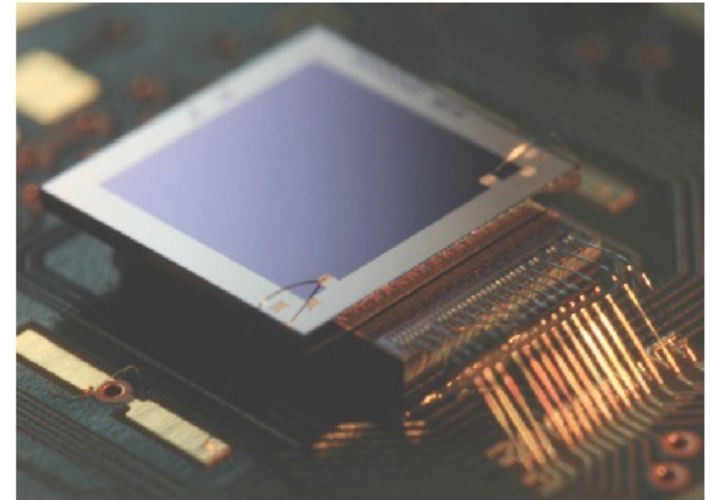
Our Sensor: DOSEPIX



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PHYSICS



- Former industry partner: iba dosimetry GmbH
- Hybrid pixelated X-ray detector
- 16 x 16 quadratic pixels
 - 192 large pixels (220 μm edge length)
 - 64 small pixels (55 μm edge length)
 - Pixel pitch 220 μm
- → Area (3.52×3.52) mm^2
- 300 μm thick p-in-n doped silicon sensor
- Energy threshold about 10 keV

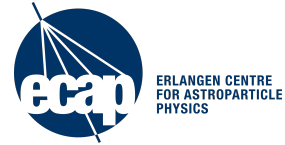
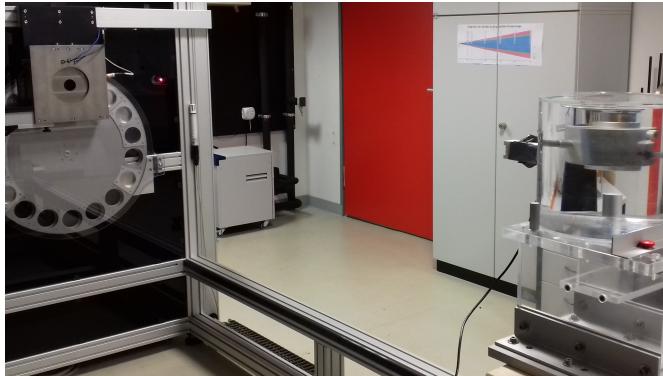


The very first active eye lens dosemeter

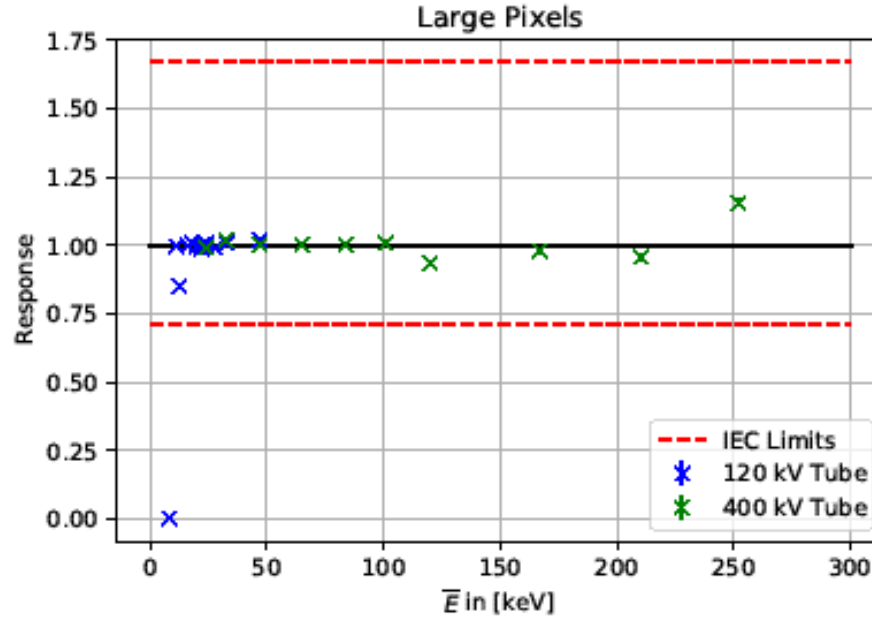
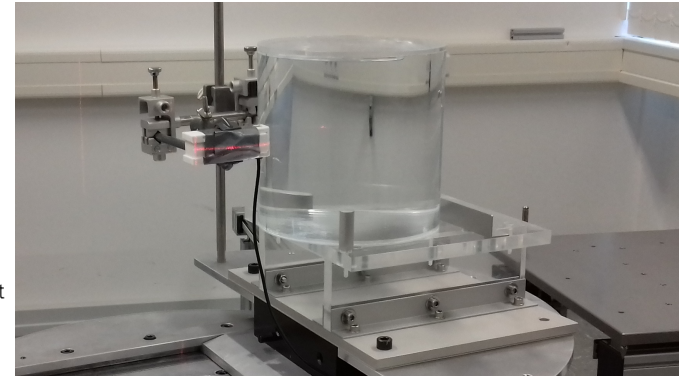




Performance measured at PTB: excellent systematic accuracy



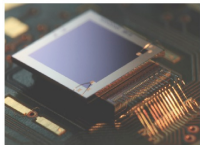
Physikalisch-Technische Bundesanstalt
Nationales Metrologieinstitut



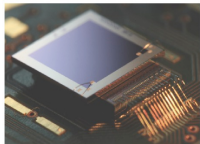


Spin-off activities

- First spin-off „DOSEPIX e.K.“ founded in 2018:
Sales of bare Dosepix-detectors to research institutes



- Spin-Off converted to „Dosimetric Instruments UG&Co. KG“ in 2020:
Sales of detector kits + later eye lens dosimeter commercialization





Thank you very much for your attention

Example: Cooperation with Siemens on medical phase-contrast X-ray imaging



Several opportunities for technology transfer:

- Siemens Healthineers
- Fraunhofer EZRT
- iba dosimetry GmbH
- ...

- More than 66.000 employees worldwide
- Headquarter in Erlangen
- Global health care player:
Projective and CT X-ray imaging,
Radiation therapy



Former cooperation:
Phase-contrast mammography

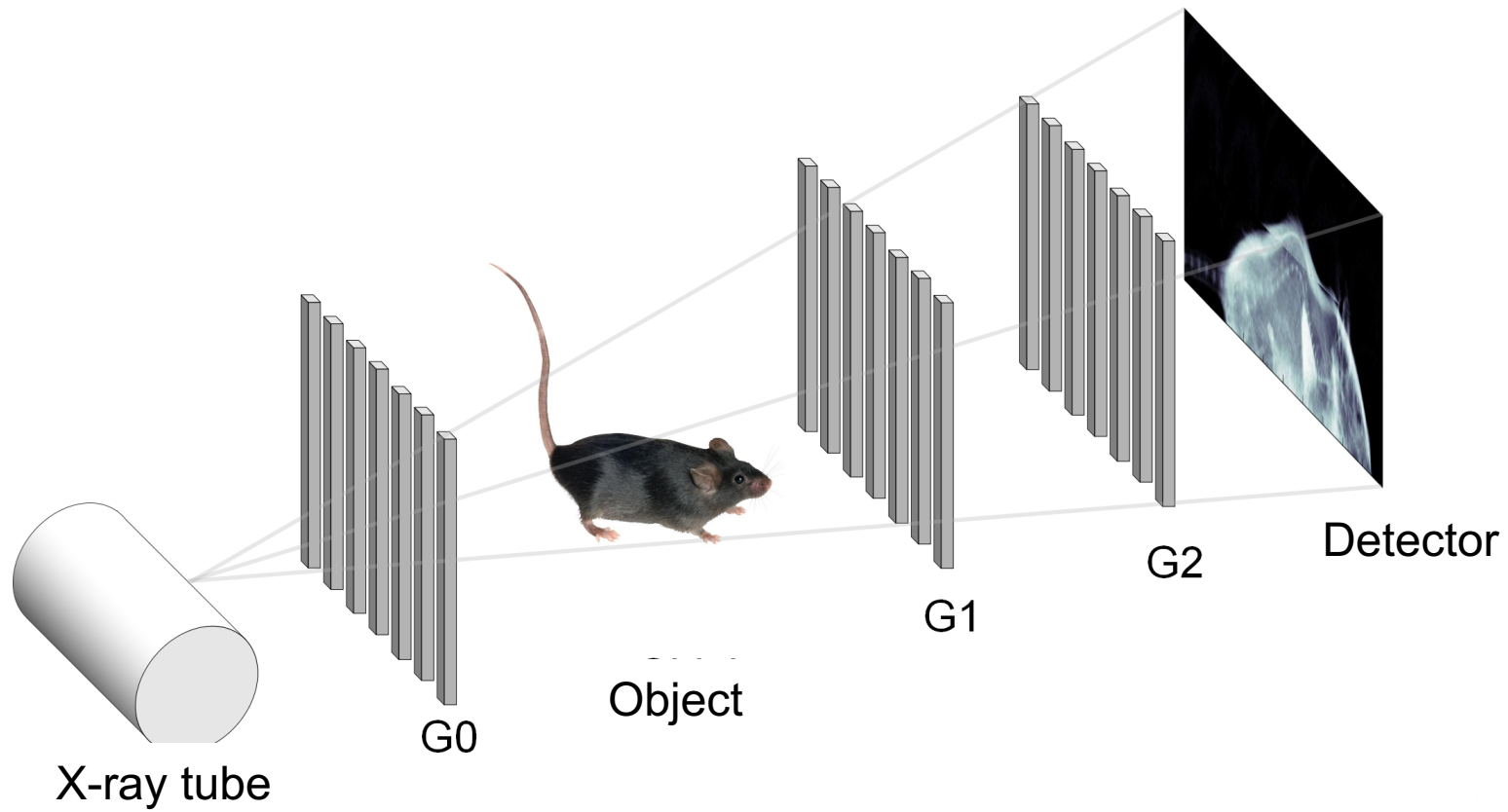


Former cooperation:
Photon counting detectors



Former and future cooperation?
Simulation radiation therapy,
FLASH-dosimetry?

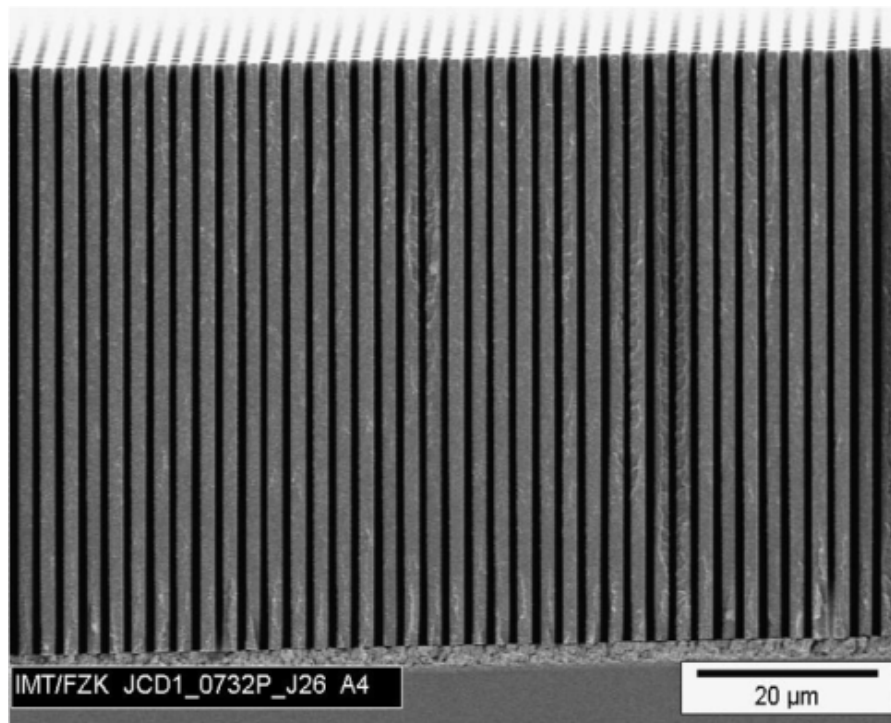
Polychromatic X-ray interferometre with 3 microstructured gratings



High-aspect ratio grating manufactured by

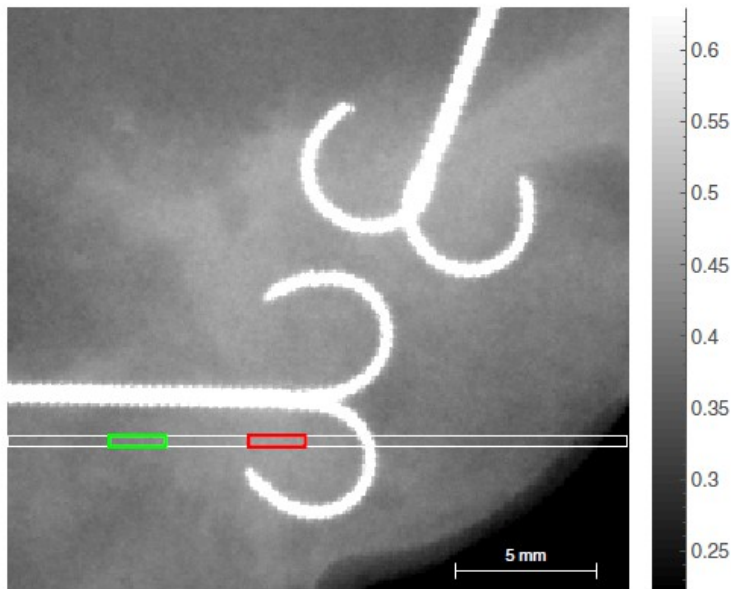


through annual joint scientific proposals between KIT and ECAP

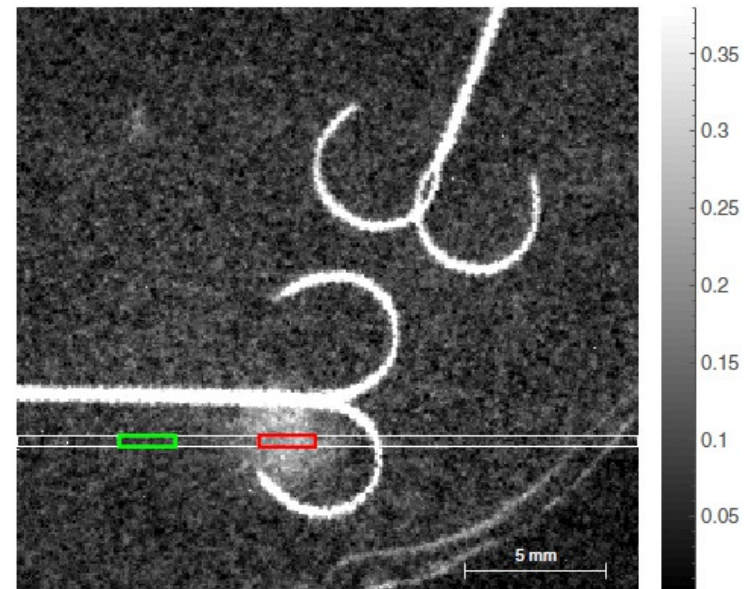


- X-rayed hundreds of breast specimen right after surgery
- Found improved breast cancer detection in dark-field
- BUT: too many false-positive cases; mammography too cost sensitive for this

Conventional (attenuation)



Dark-field



A porcine lung in our X-ray phasen-contrast scanner



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PHYSICS

+



Attenuation



Darkfield



Differential phase



V. Ludwig et al. (2019): "Exploration of different X-ray Talbot-Lau setups for dark-field lung imaging examined in a porcine lung." *Phys. Med. Biol.* 64.6: 065013