



## Optics and high-energy imaging systems

*ATTRACT-NL - Trends, Wishes and Dreams in Detection and Imaging Technologies*

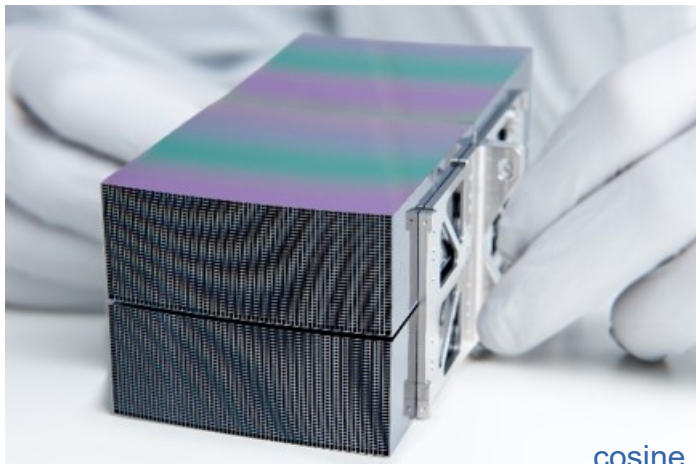
Prof. Dr Marco Beijersbergen  
cosine measurement systems



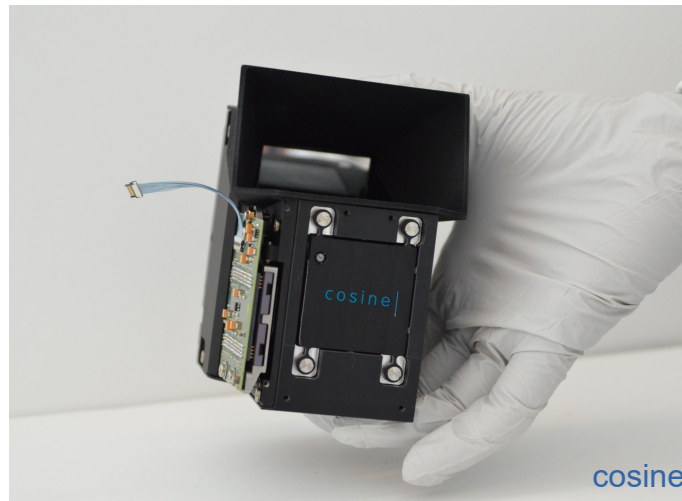
- ▶ Development and supply of measurement systems
- ▶ Founded in 1998
- ▶ 40 scientists and engineers
  - Advise
  - Design
  - Develop
  - Build
- ▶ Office and labs in Warmond
  - clean rooms
  - laboratories
  - integration and test facilities
- ▶ Management
  - Prof. Dr Marco Beijersbergen
  - Dipl.-Ing. Max Collon



# Business lines



**High-energy optics**  
X-ray and gamma-ray optics  
for  
Astronomy, Material Analysis and Health



**Remote sensing systems**  
Space and air-borne spectral cameras  
for  
Science, Agriculture, Environment and  
Disaster Management



**Inspection systems**  
for  
Medical, Oil/Gas, Food & Pharma







NightPod Large  
Lens Support  
←

ATTENTION  
Remove batteries  
before stowage

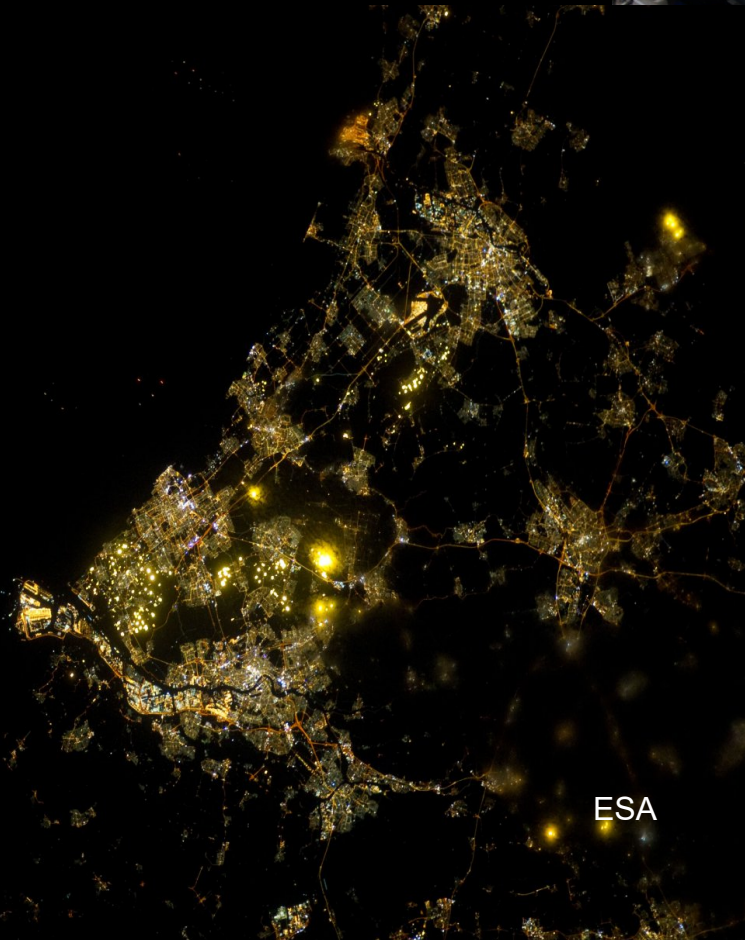
NightPod Left Leg ↑

NightPod Right Leg ↓





ESA



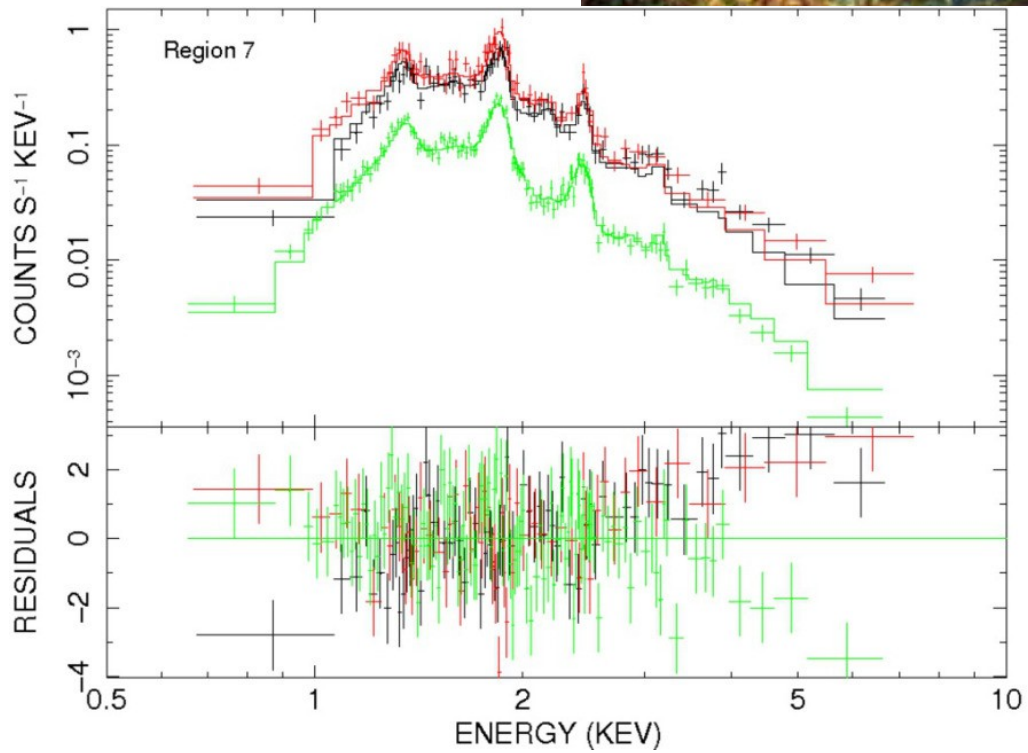
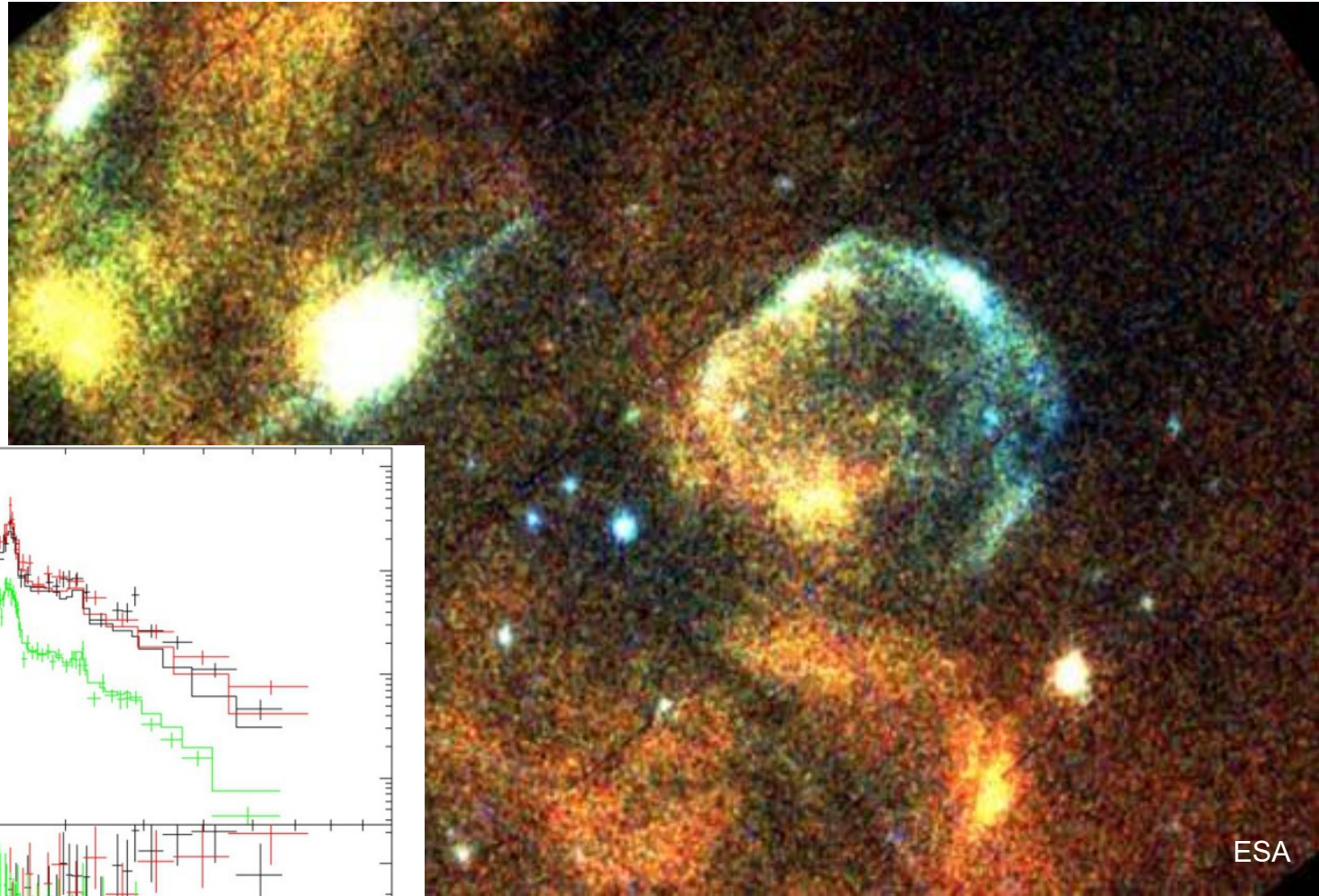
ESA



ESA



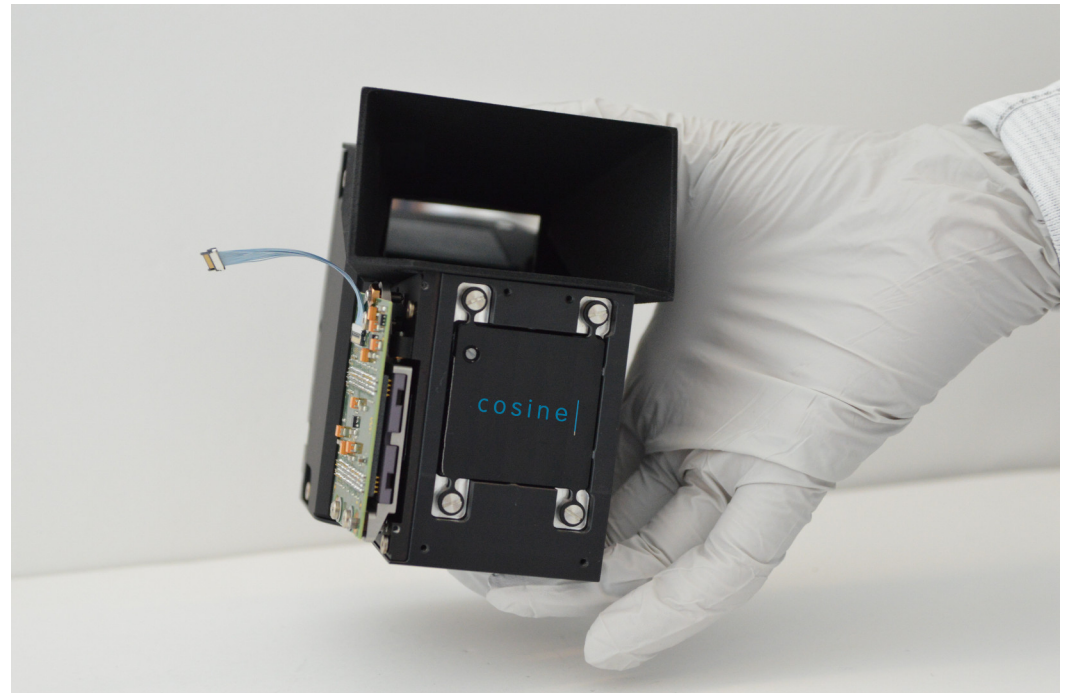
## XMM-Newton 1999-





## HyperScout

- ▶ Hyperspectral imager vis-NIR
- ▶ Nanosat and add-on for larger satellites
- ▶ State of the art technology
  - Free-form optics
  - Lithographic filters
  - On-board processing
- ▶ 20 m ground resolution
- ▶ Up to 200 bands
- ▶ First launch Feb 2018



# CONDI® continuous optical non-destructive inspection



## condi fo





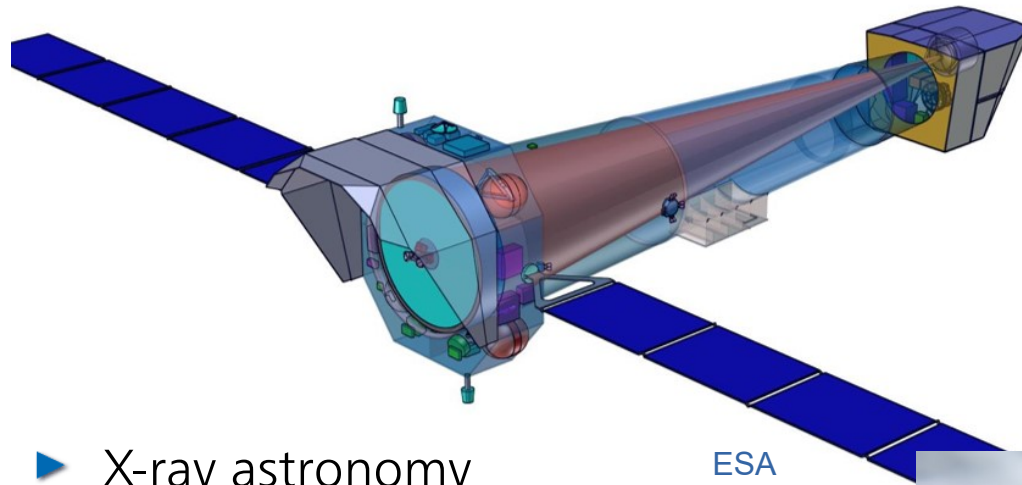
## Precision farming



- ▶ Irrigation
- ▶ Fertilisation
- ▶ Pest control

Doel: duurzaam hogere opbrengst per m<sup>2</sup>

# Silicon pore optics



## ▶ X-ray astronomy

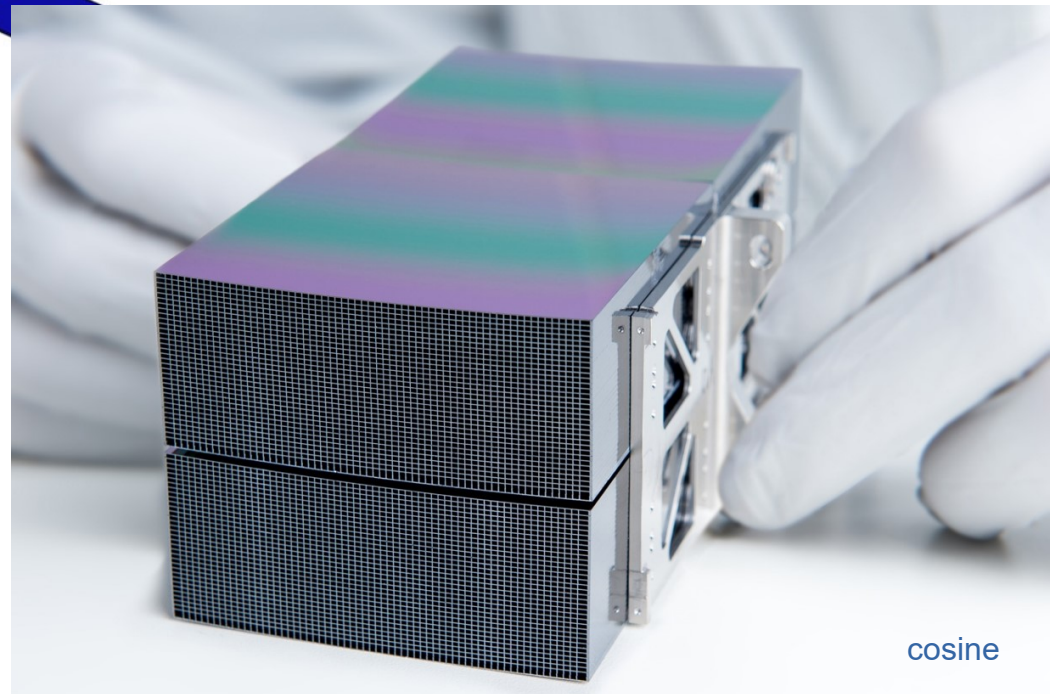
- Athena, Arcus, ...

## ▶ Other applications

- Beam lines
- Material analysis
- Medical

## ▶ Other types of optics

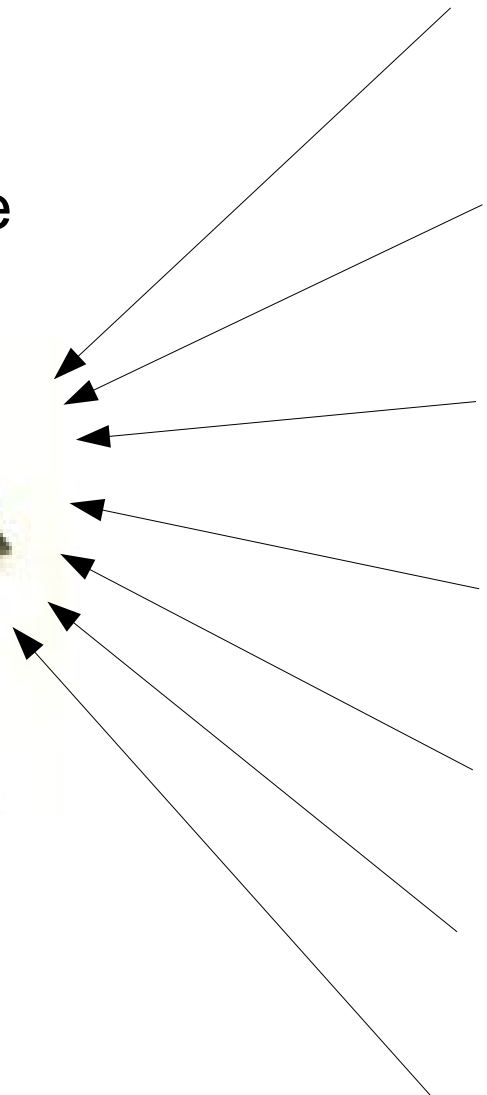
- Curved gratings
- Curved crystals
- Gamma-ray optics





# Multifunctional spectral imaging platform

Multicamera  
spectral image  
processor



thermal



IR



vis

UV

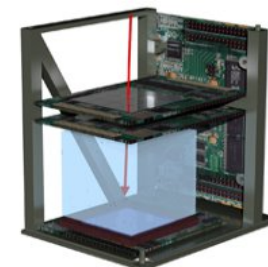
X-ray



ASI

gamma-ray

ionizing particles



## Wishes and dreams

- ▶ Large format X-ray spectral imaging sensor
- ▶ Extend to other radiation
- ▶ Simple low-power sources with variable spectrum
- ▶ Combination of sources, optics and detectors into systems
- ▶ Application of silicon pore optics in high-energy imaging systems
- ▶ Co-development of dispersive and gamma-ray optics
- ▶ Integration of high-energy detectors into our multisensor imaging platform
- ▶ Co-development of high-energy imaging systems



cosine |



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