The X/Gamma-ray Imaging Spectrometer

XGIS

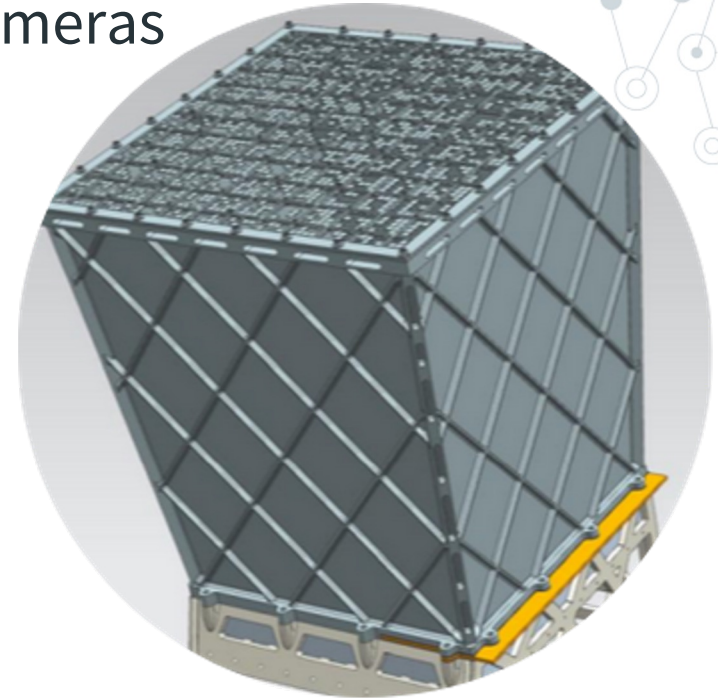
Unveiling a high-energy broadband

1.
Design

Design

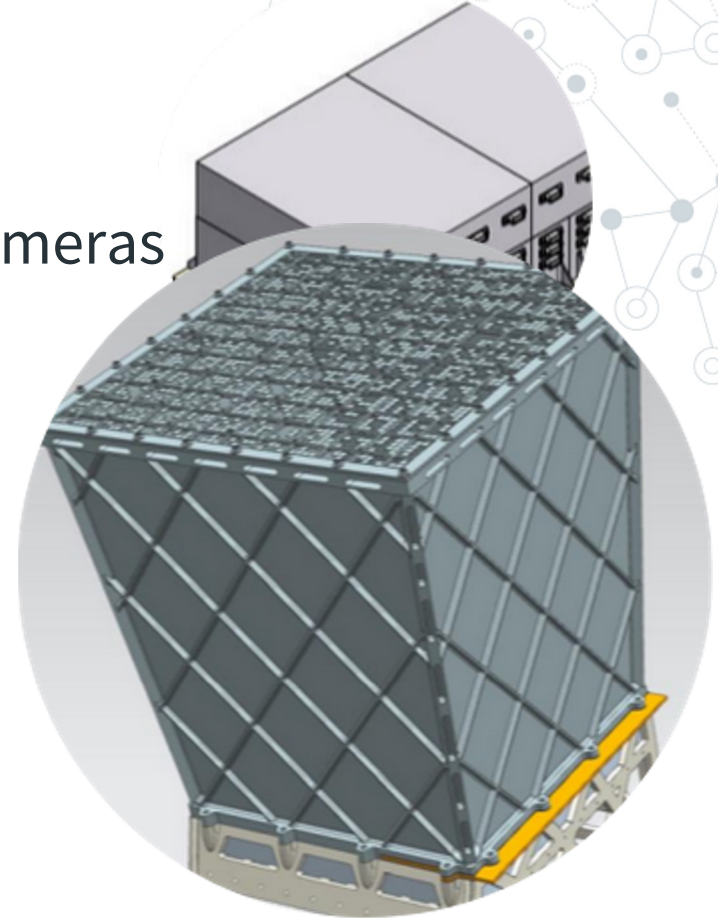
Design

- Two coded-mask X/gamma-ray cameras



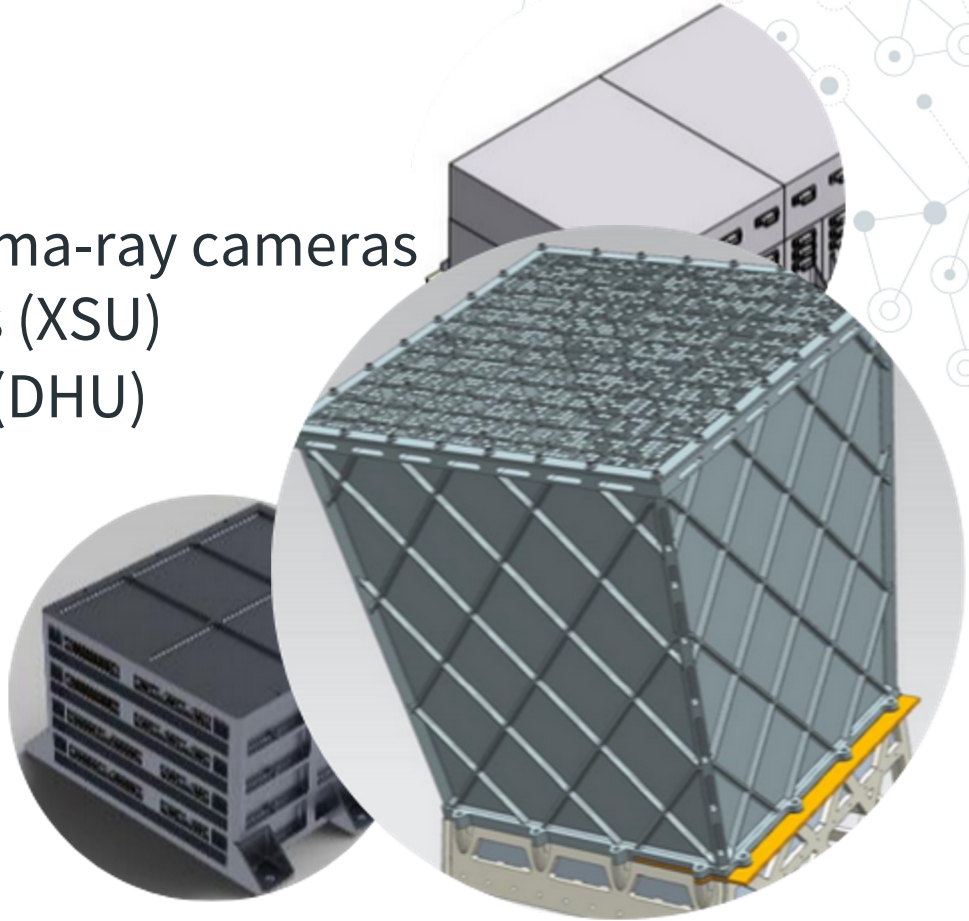
Design

- Two coded-mask X/gamma-ray cameras
- Two power supply boxes (XSU)



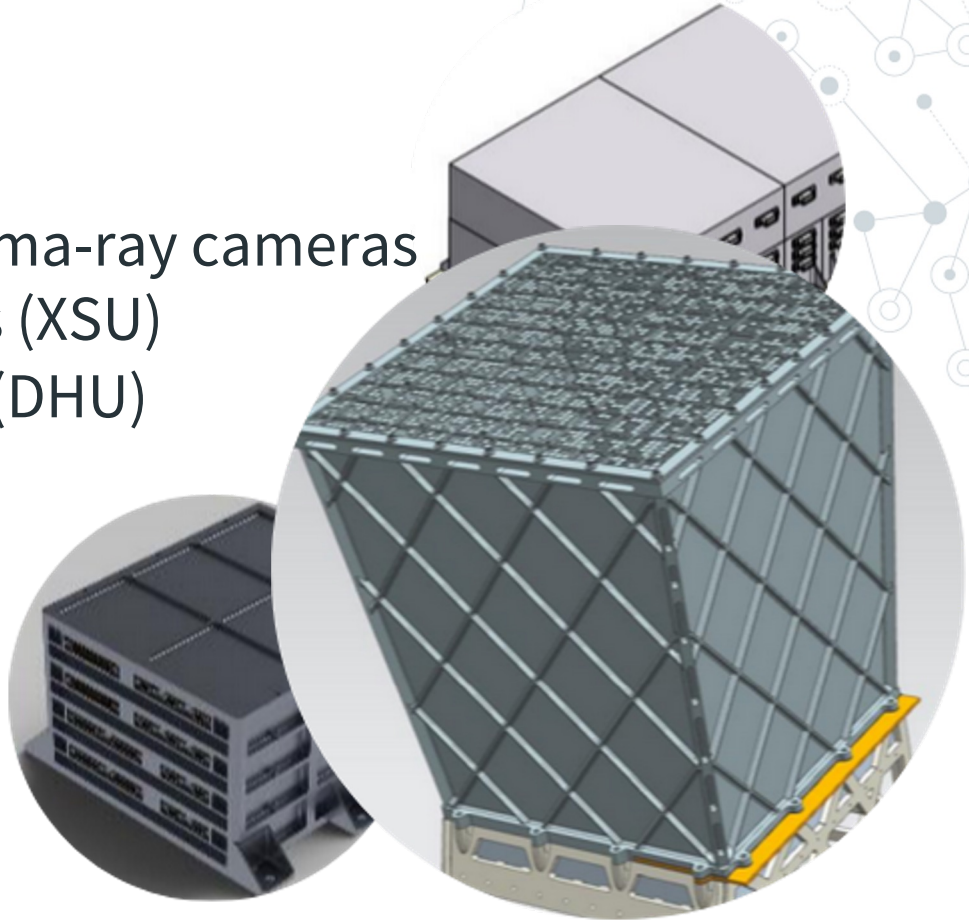
Design

- Two coded-mask X/gamma-ray cameras
- Two power supply boxes (XSU)
- One Data Handling Unit (DHU)



Design

- Two coded-mask X/gamma-ray cameras
- Two power supply boxes (XSU)
- One Data Handling Unit (DHU)
- Harness



Design

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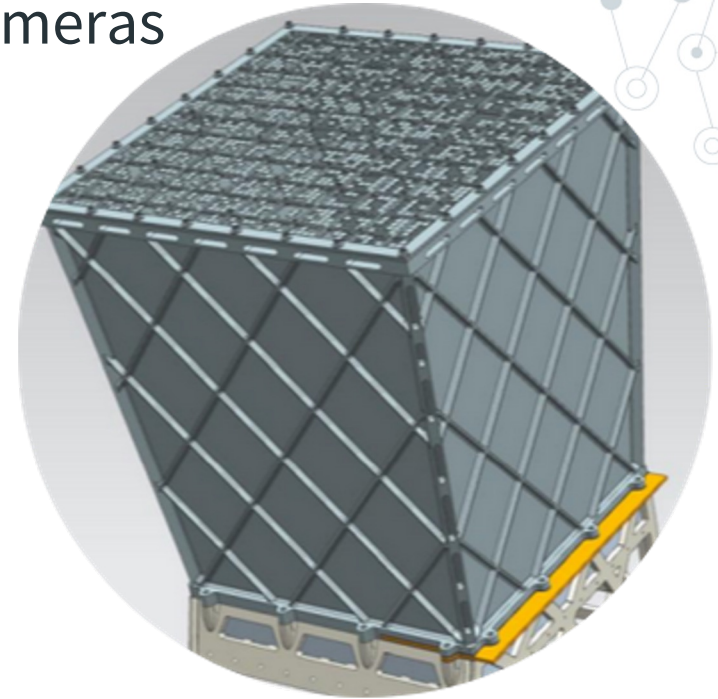
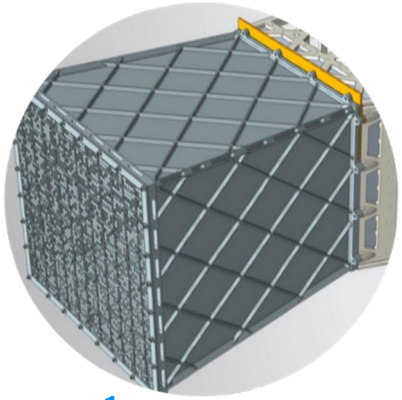
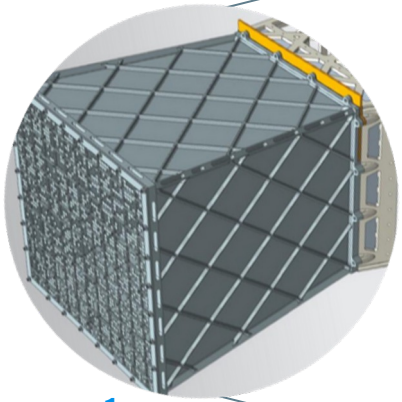


Design:
X/gamma-ray cameras

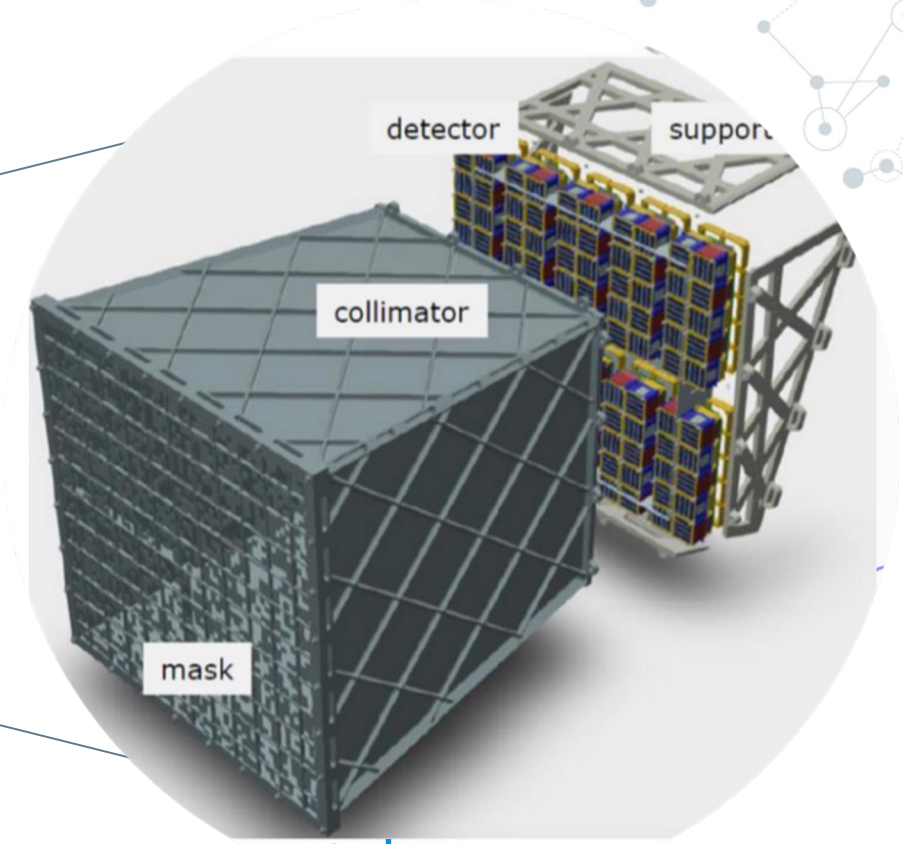


1 camera

Design:
X/gamma-ray cameras

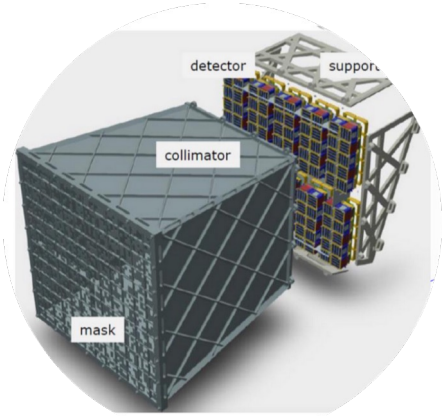


1 camera



1 detector

Design:
X/gamma-ray cameras



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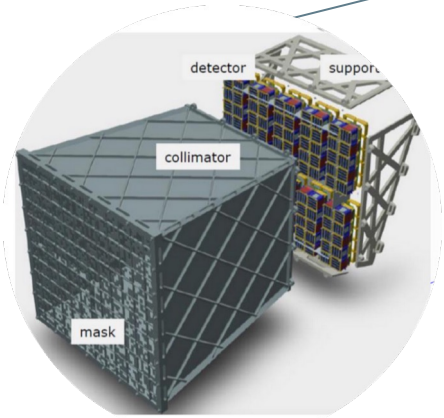
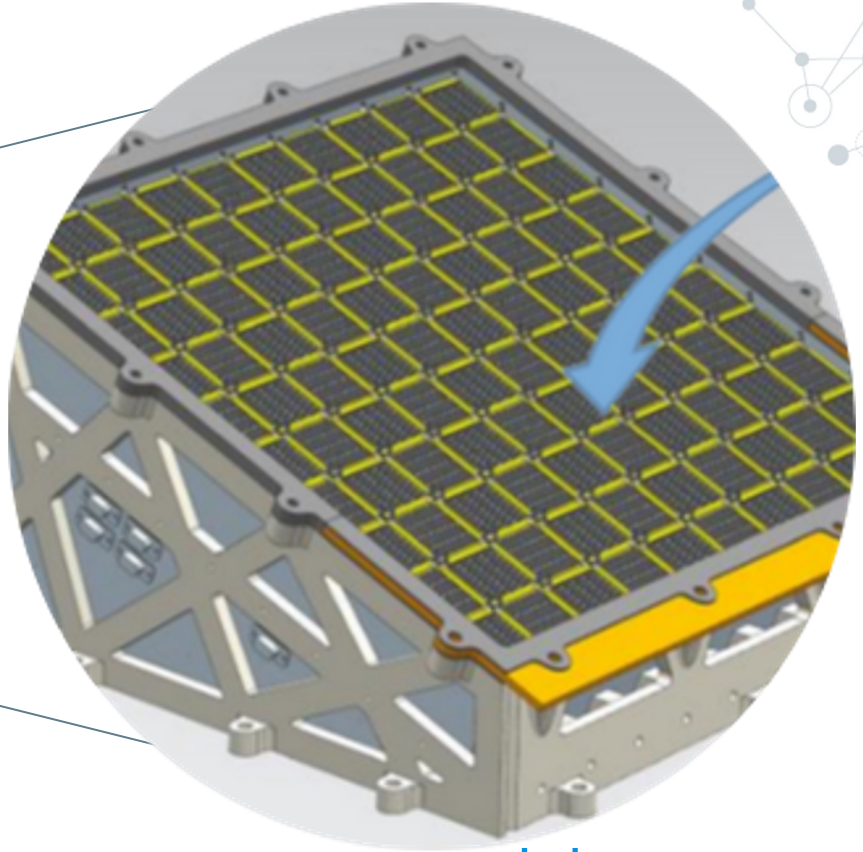
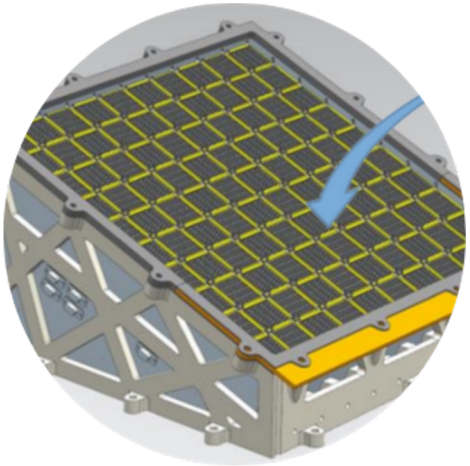


1 detector



100 modules

Design:
X/gamma-ray cameras



100 modules

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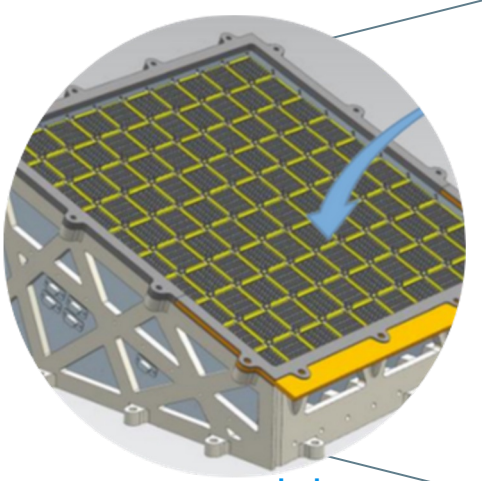
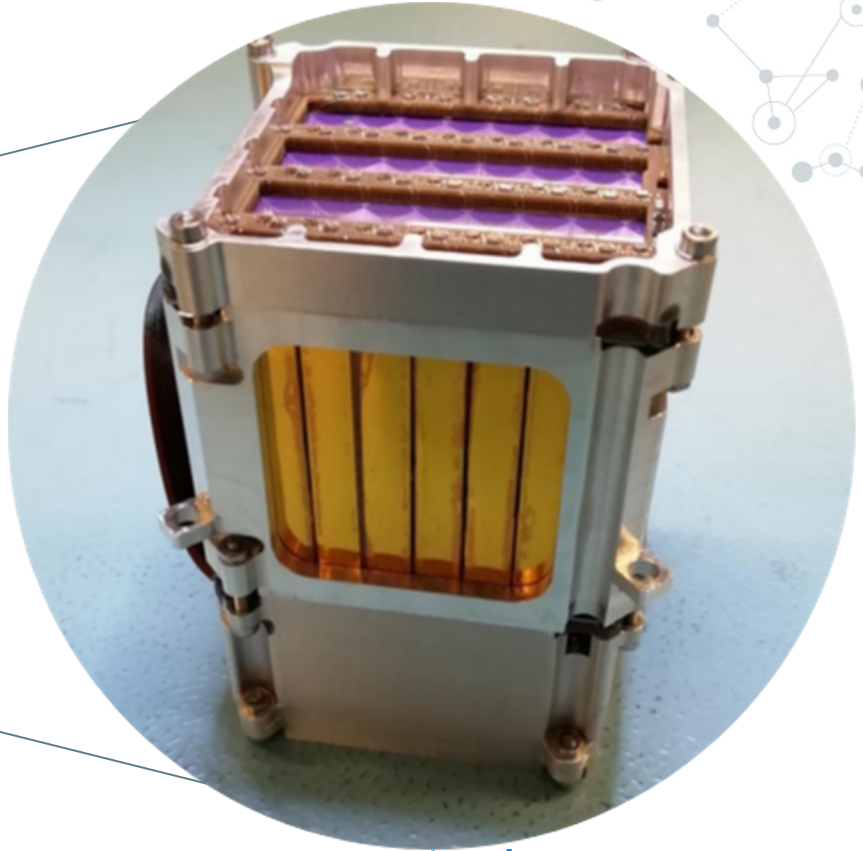
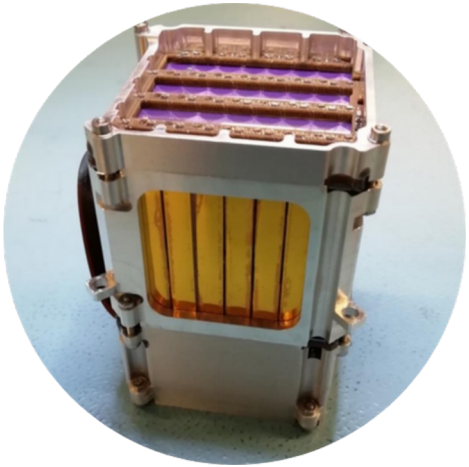


100 modules



64 pixels

Design:
X/gamma-ray cameras



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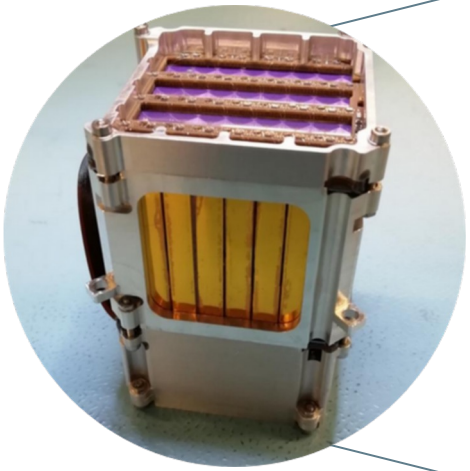

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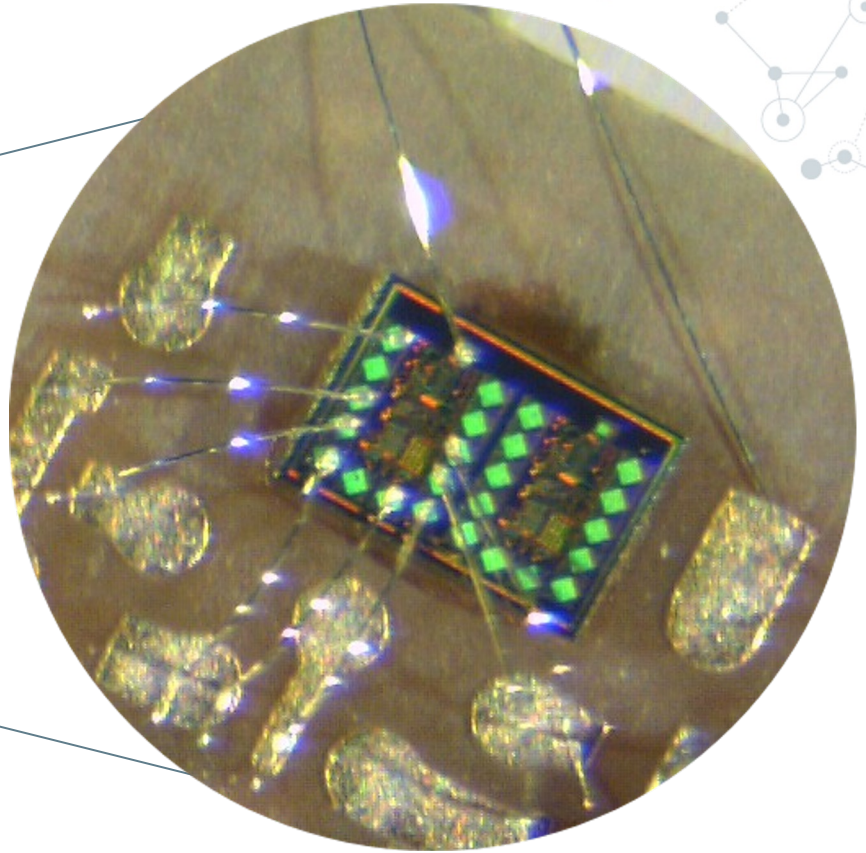
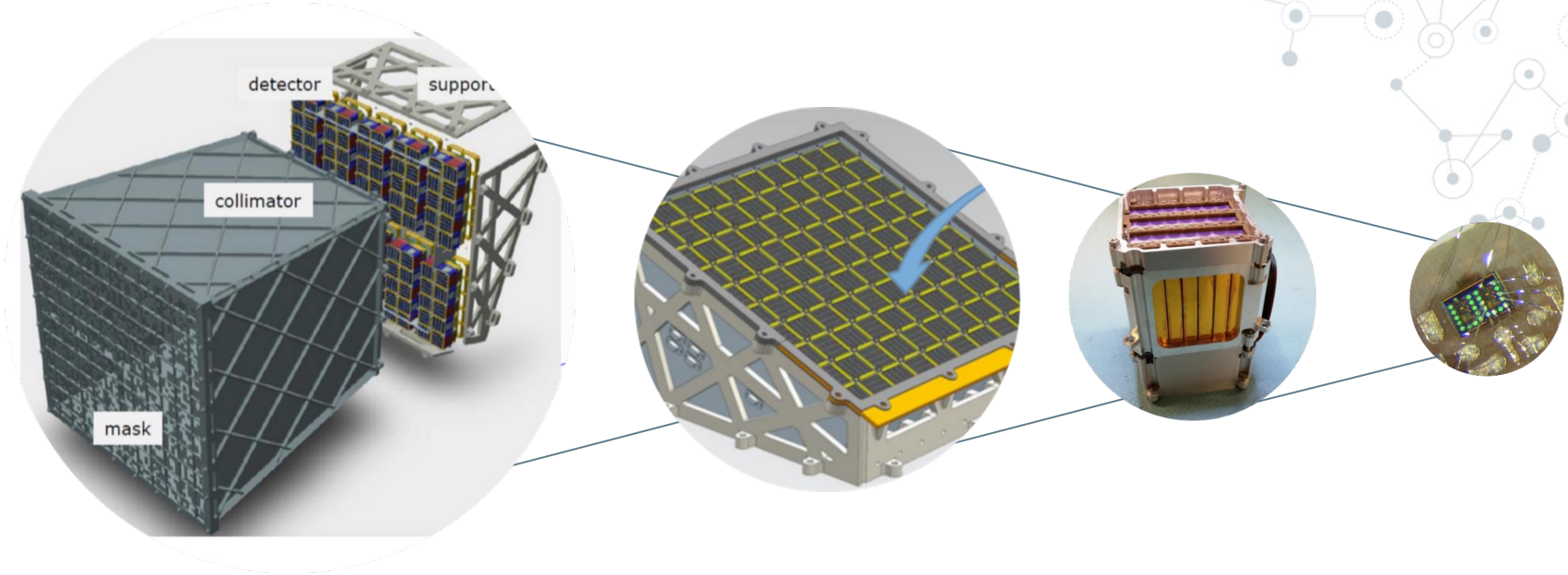
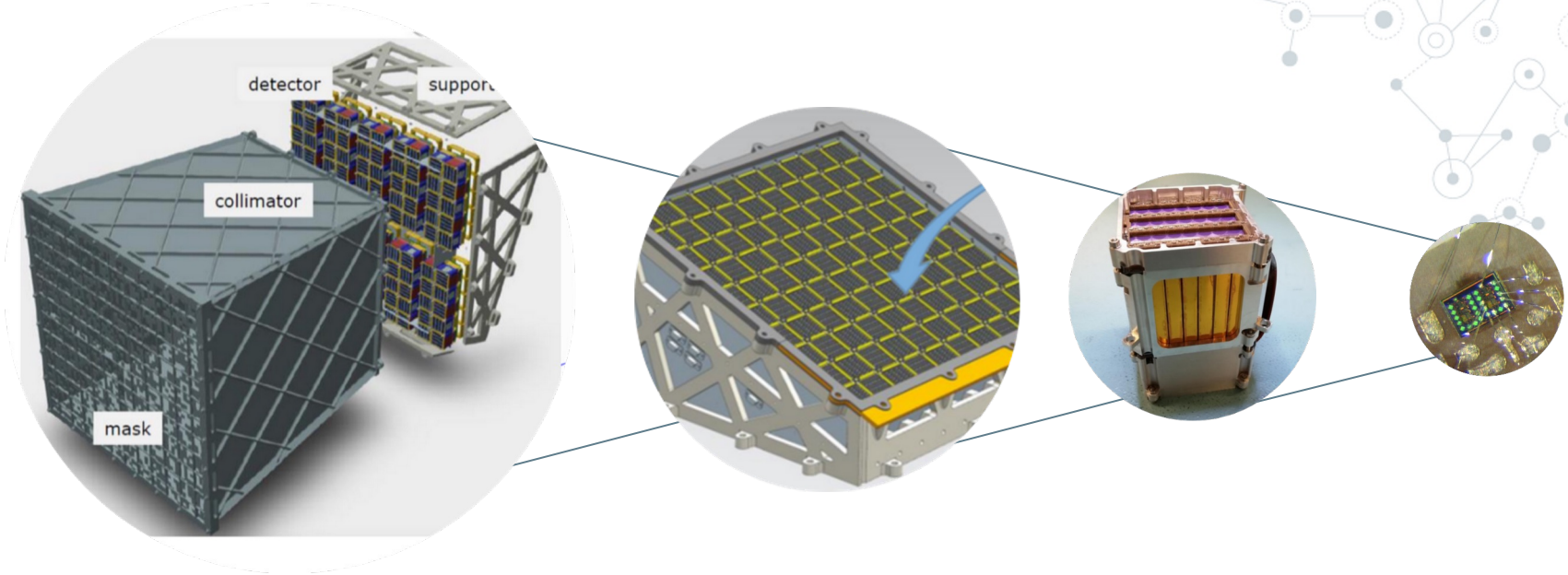


>2 ASICs


detector
collimator
mask



~ 28800 ASICs!

Siswich

Each pixel can simultaneously and *independently* detect X-rays and Gamma-rays

Design:
Siswich detectors

SDD

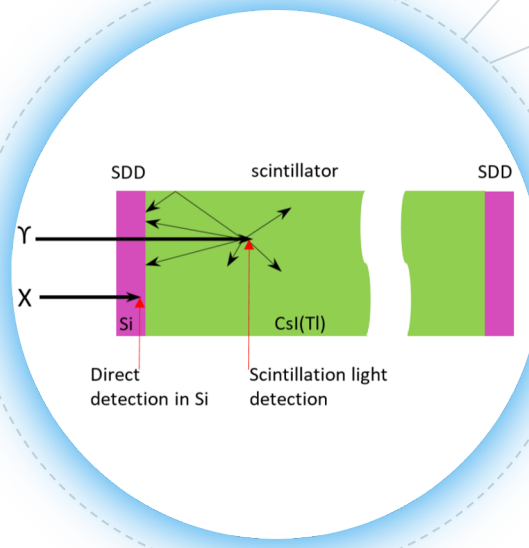
Directly detects X-rays

Scintillator

Generates X-ray light by interacting with incoming γ-rays

ASIC

Ad-hoc low noise electronics



2.
Capabilities

2 keV - 10 MeV

Capabilities

	2–150 keV	150 keV - 10 MeV
Peak eff. area		
Sensitivity		
Energy resolution (EoL)		
Timing accuracy		

Capabilities

	2–150 keV	150 keV - 10 MeV
Peak eff. area	**~500 cm^2**	**~1000 cm^2**
Sensitivity		
Energy resolution (EoL)		
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Capabilities

	2–150 keV	150 keV - 10 MeV
Peak eff. area	**~500 cm^2**	**~1000 cm^2**
Sensitivity	**EoL >10^{-8} cgs (2–30 keV in 1 s)** **EoL > 3x10^{-8} cgs (30–150 keV in 1 s)**	**> 3x10^{-7} cgs (150 keV –1 MeV in 1 s)**
Energy resolution (EoL)		
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Energy resolution (EoL)	**≤ 1200 eV FWHM @ 6 keV**	**≤ 6 % FWHM @ 500 keV**
Timing accuracy		

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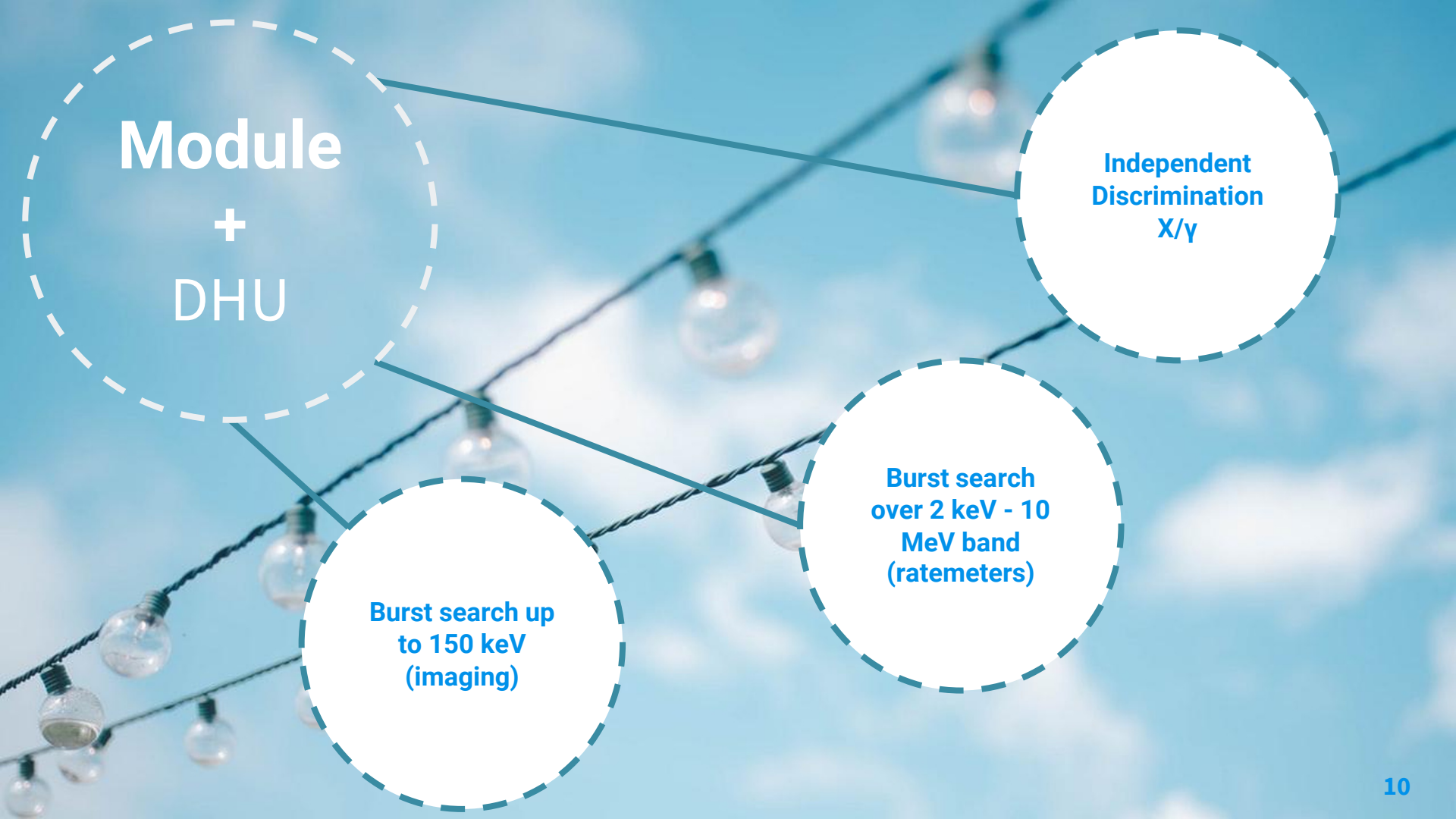
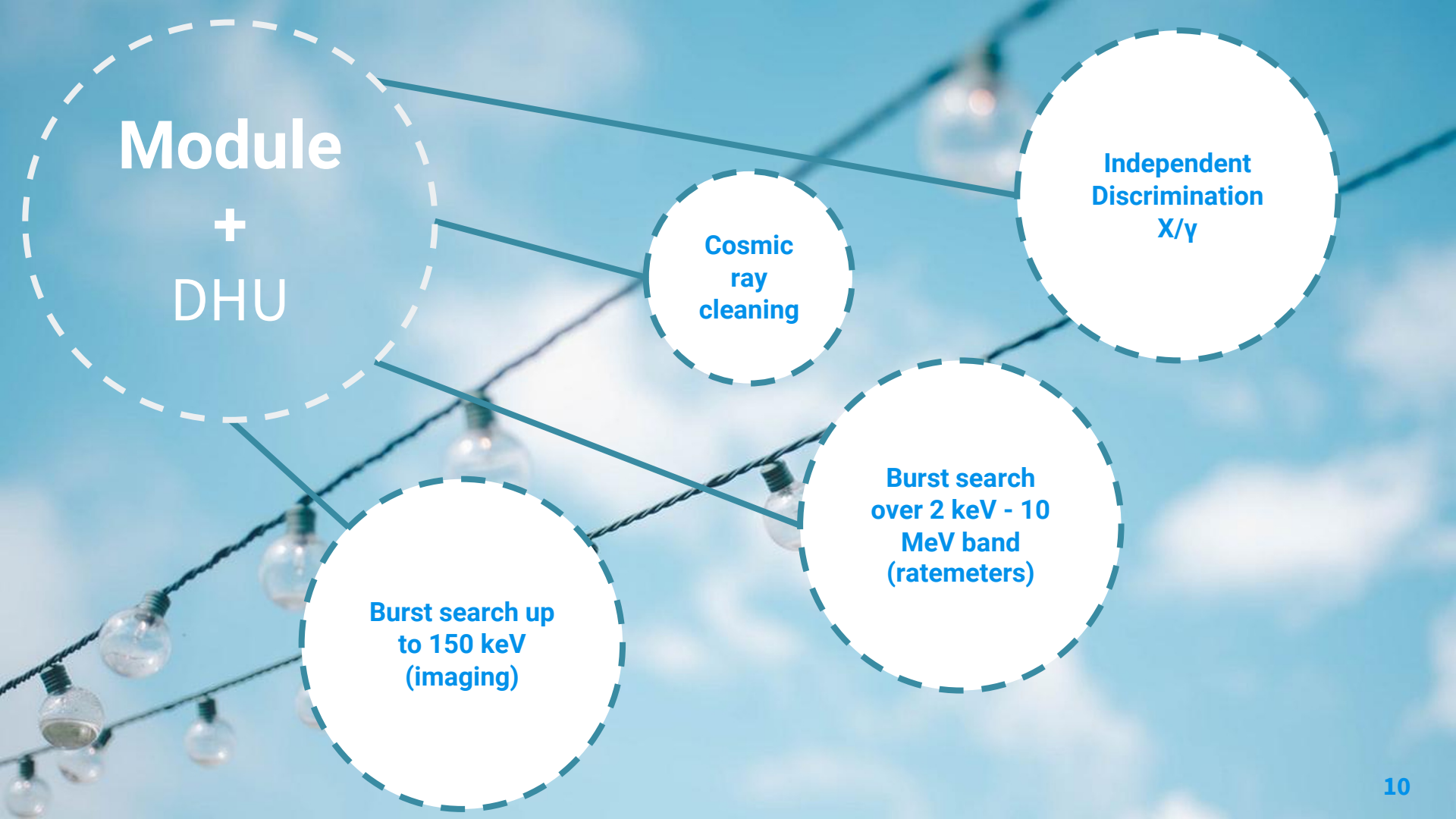
	2–150 keV	150 keV - 10 MeV
Peak eff. area	**~500 cm^2**	**~1000 cm^2**
Sensitivity	**EoL >10^{-8} cgs (2–30 keV in 1 s)** **EoL > 3x10^{-8} cgs (30–150 keV in 1 s)**	**> 3x10^{-7} cgs (150 keV –1 MeV in 1 s)**
Energy resolution (EoL)	**≤ 1200 eV FWHM @ 6 keV**	**≤ 6 % FWHM @ 500 keV**
Timing accuracy	**7 µs**	


Module
+
DHU


Module
+
DHU
Independent
Discrimination
X/γ


Module
+
DHU
Independent
Discrimination
X/γ
Burst search
over 2 keV - 10
MeV band
(ratemeters)


Module
+
DHU
Independent Discrimination X/γ
Burst search over 2 keV - 10 MeV band (ratemeters)
Burst search up to 150 keV (imaging)


Module
+
DHU
Cosmic ray cleaning
Independent Discrimination X/γ
Burst search over 2 keV - 10 MeV band (ratemeters)
Burst search up to 150 keV (imaging)

3.
Expectations

Scientific

Expected scientific output

Technological

Technological achievements

Scientific

Expected scientific output

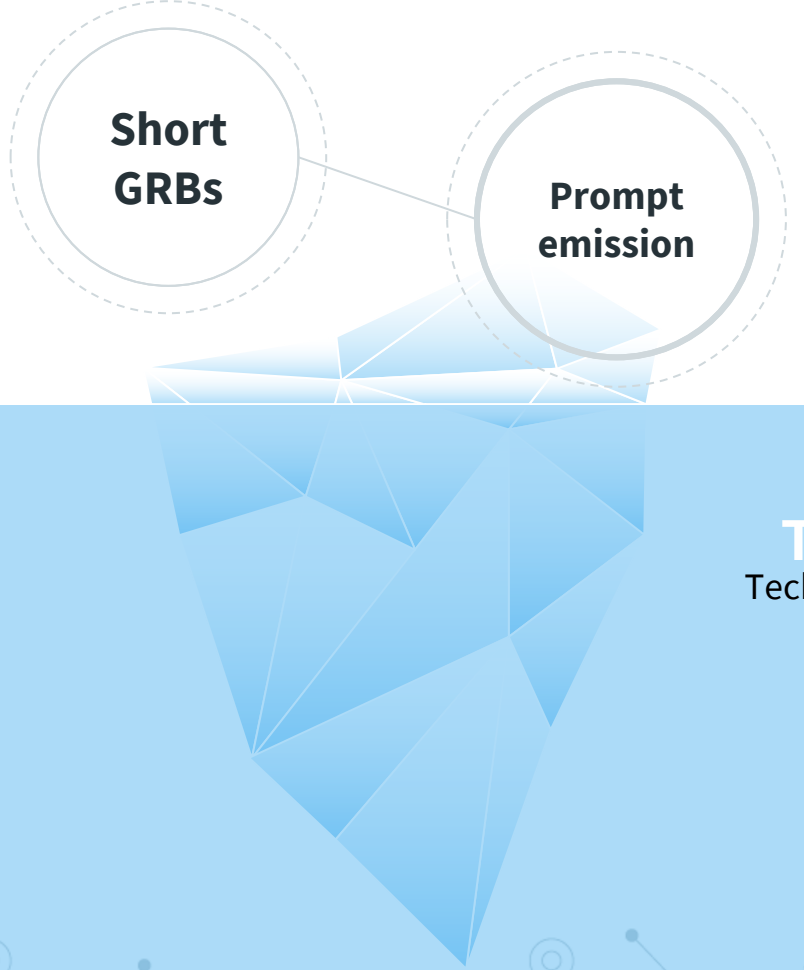
Short GRBs

Technological

Technological achievements

Scientific

Expected scientific output

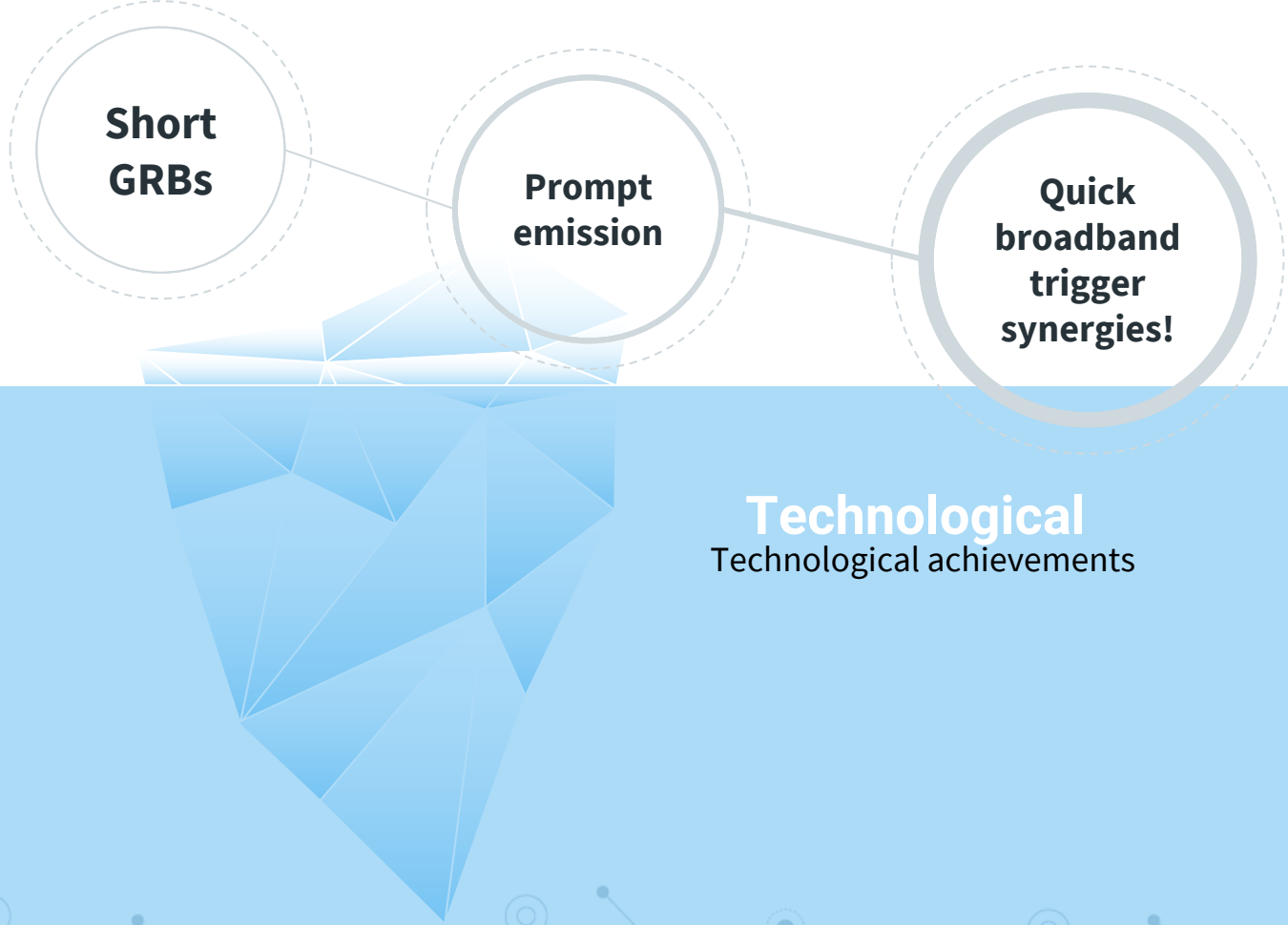


Technological

Technological achievements

Scientific

Expected scientific output



Technological

Technological achievements

Scientific

Expected scientific output

Short GRBs

Prompt emission

Quick broadband trigger synergies!

ASIC with internal ADCs

Technological

Technological achievements

Scientific

Expected scientific output

Short GRBs

Prompt emission

Quick broadband trigger synergies!

Technological

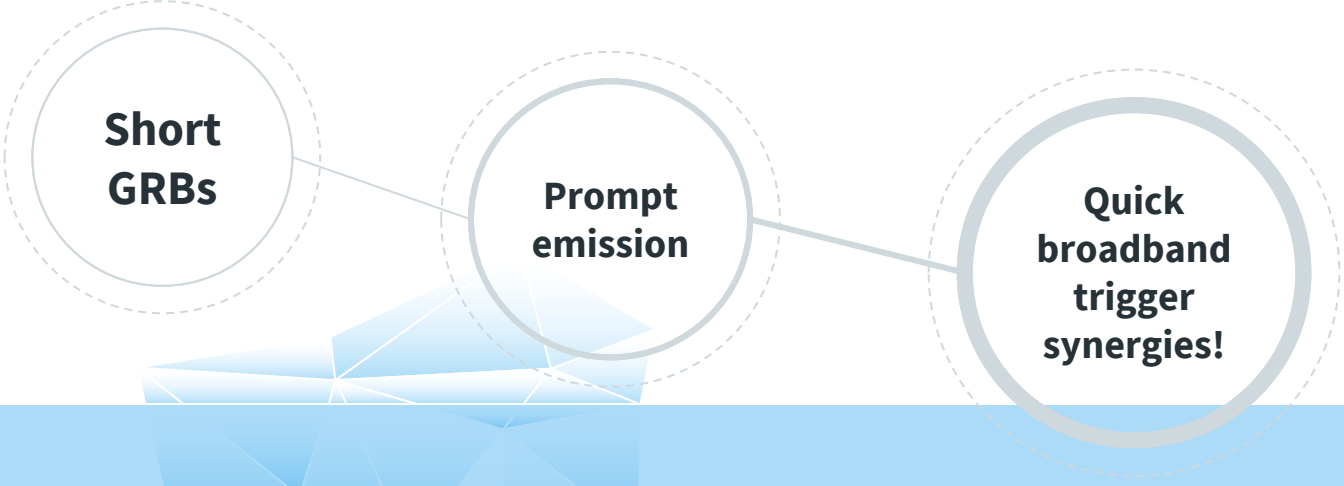
Technological achievements

ASIC with internal ADCs

Two shapings (X & γ)

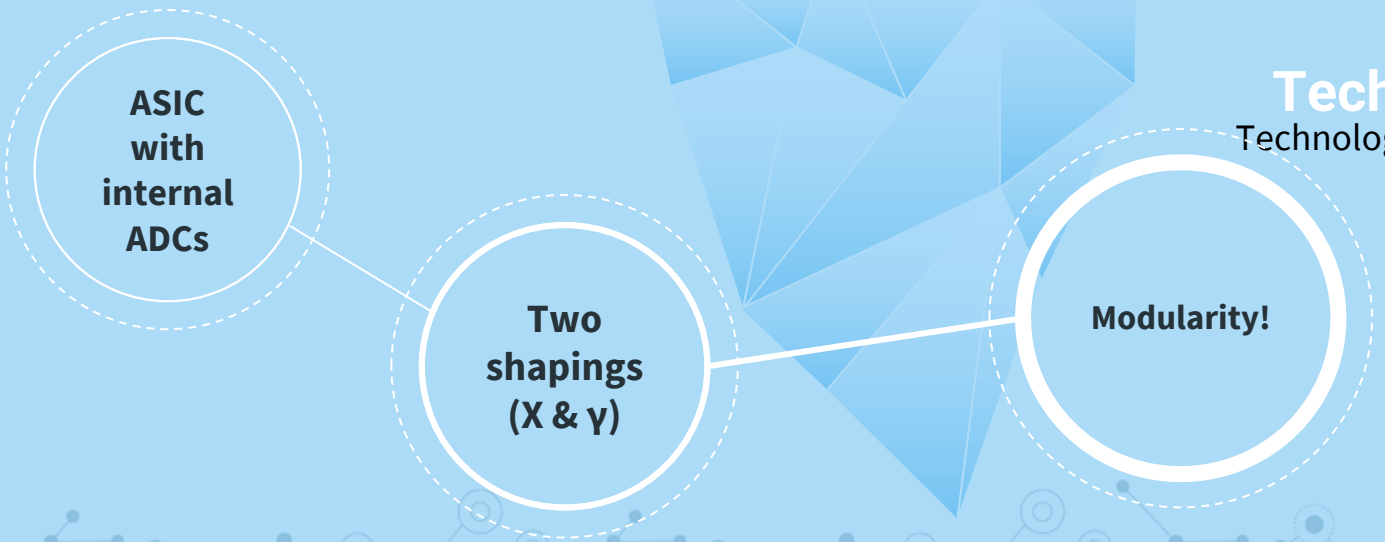
Scientific

Expected scientific output

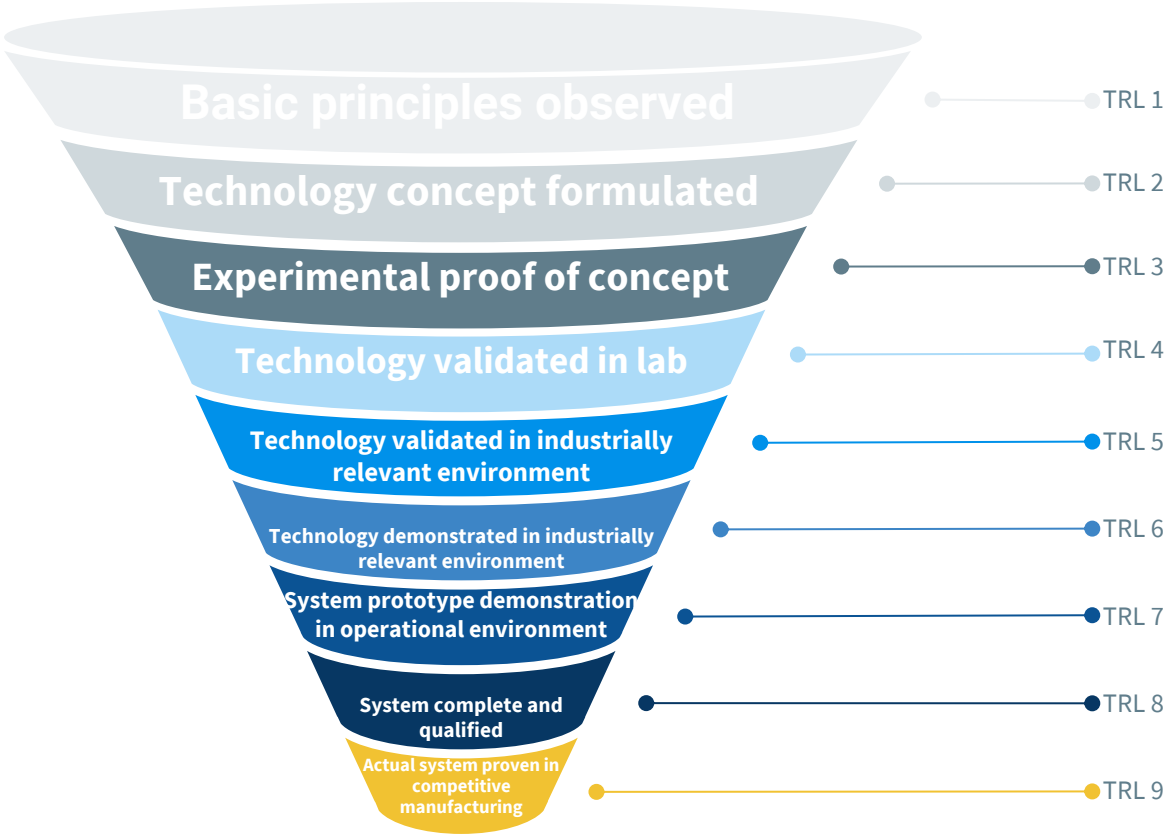


Technological

Technological achievements



Technological Readiness Level



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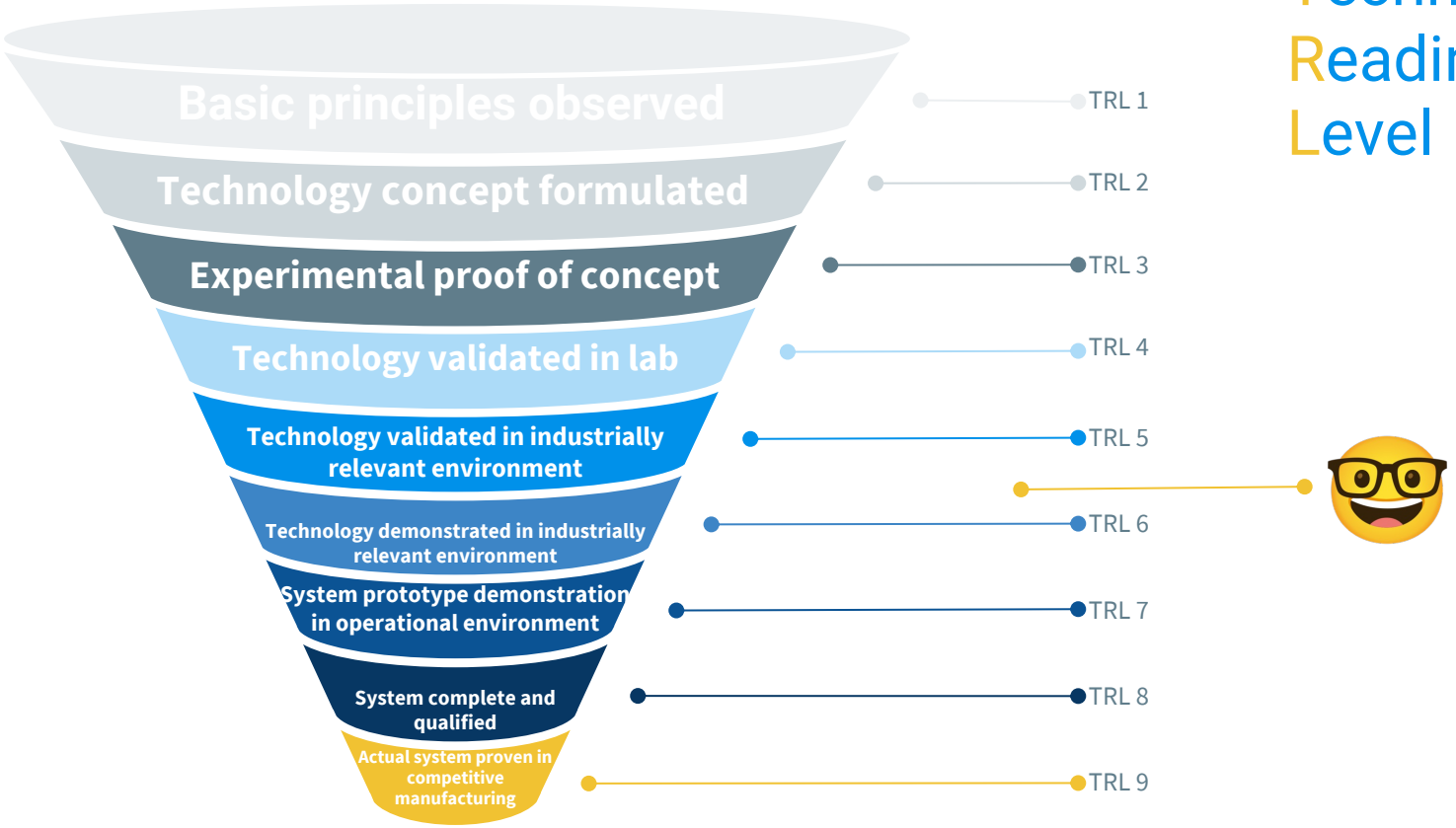

4.
Acknowledgements

THESEUS Yellow Book

Amati L. 2022 (ASI-RF)

Labanti C. 2022 (ASI-RF)

Vacchi A. 2022 (ASI-RF)

Thanks!

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