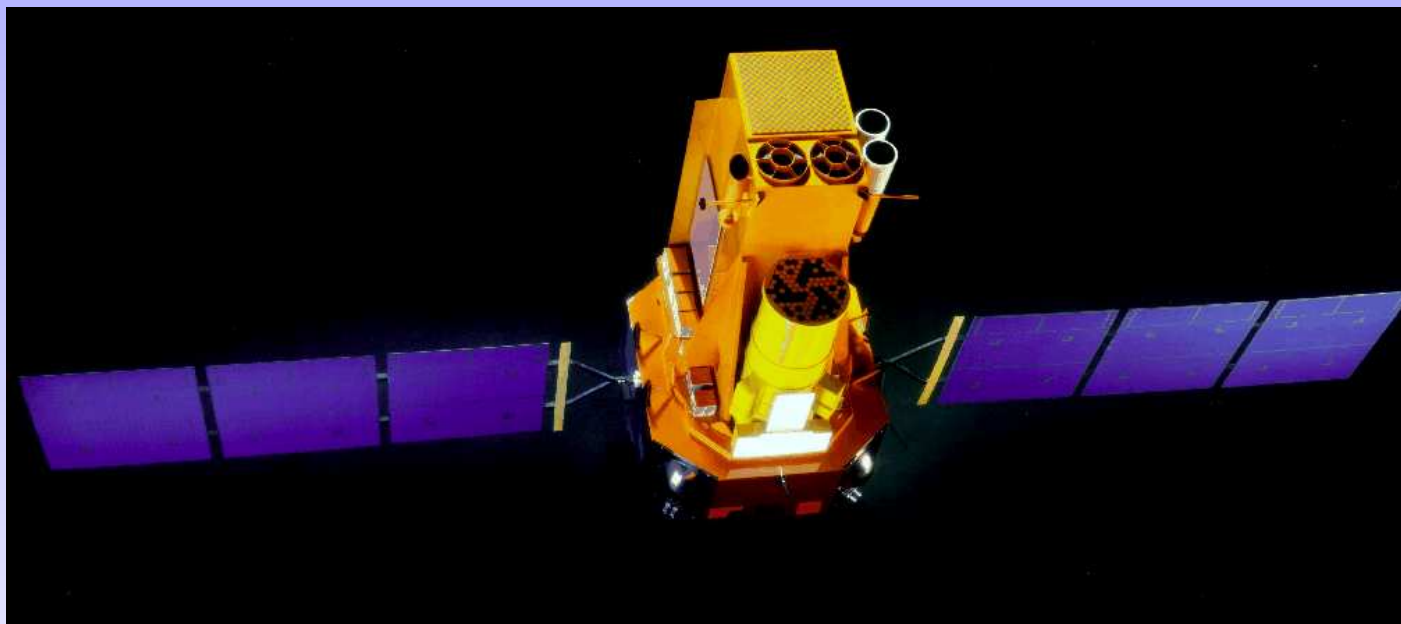


# The Integral mission



seminary talk by F. Hroch  
(co-authors: R. Hudec, J. Polcar)



# The Integral mission

- ★ *International Gamma-Ray Astrophysics Laboratory*
- ★ Gamma-ray observatory with concurrent X-ray and optical monitoring.
- ★ ESA's second gamma-ray mission (COS-B, 1975)
- ★ ESA led mission in collaboration with Russia, US, Czech Republic and Poland
- ★ Highly eccentric 72 hour orbit
- ★ Observing programme includes 65-75% open time.



# Integral spacecraft

Lunch date:

- ★ 17 Oct. 2002

Launch mass:

- ★ 4 tonnes

Dimensions:

- ★  $5 \times 3.7$  m,
- ★ 16 m panels



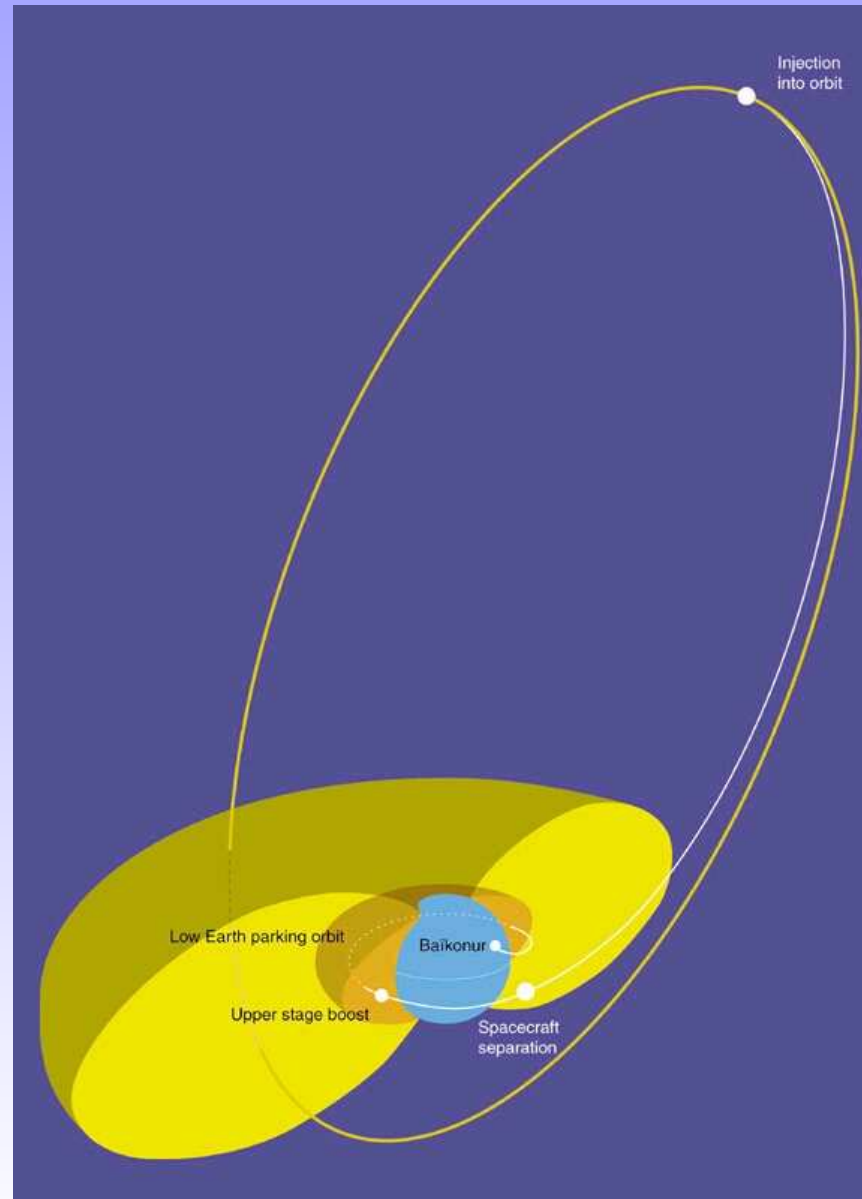
# Orbit

Launcher:

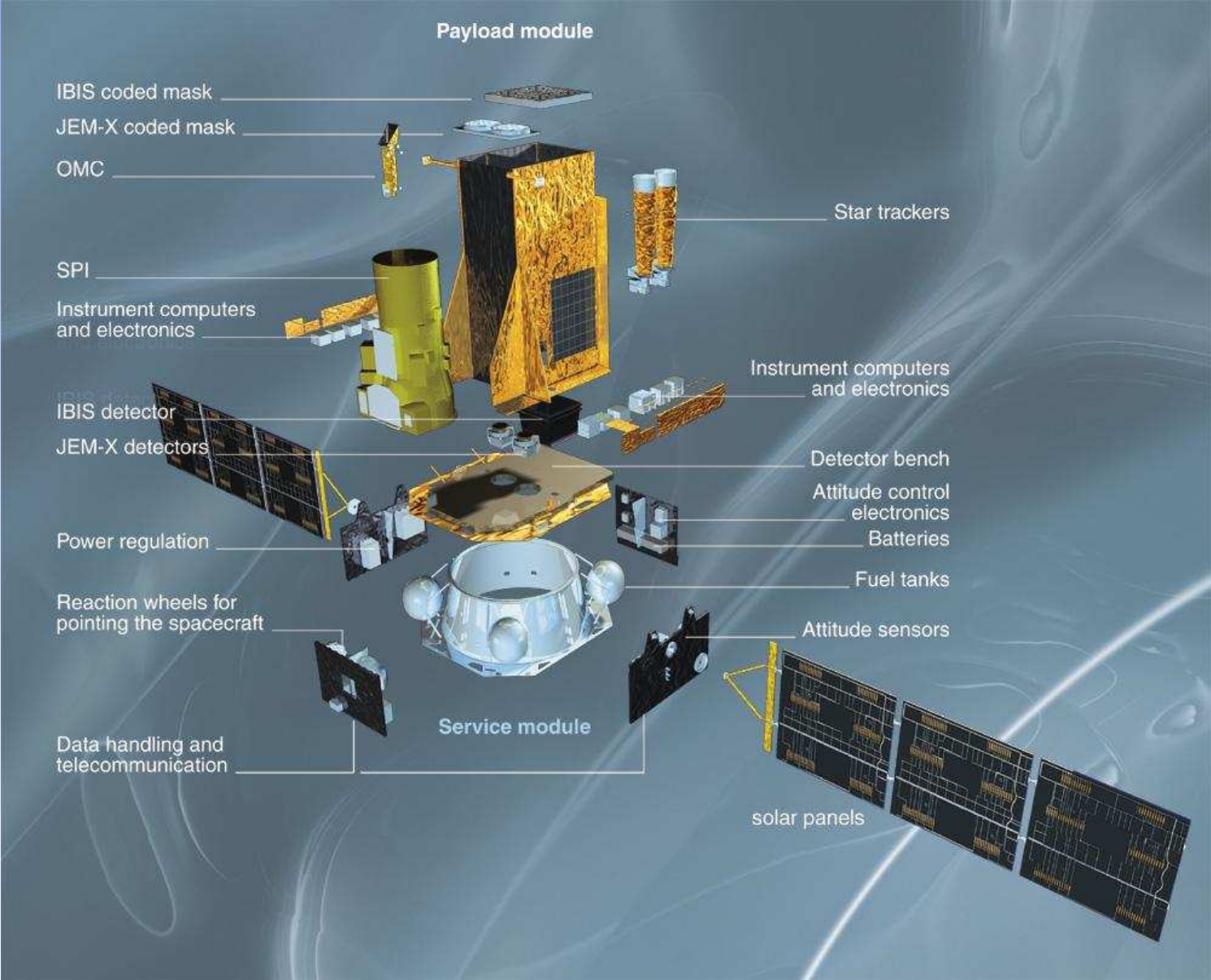
- ★ Proton

Elements:

- ★ period: 72 hour
- ★ apogee: 153000 km
- ★ perigee: 9000 km
- ★ inclination:  $51.6^\circ$



# Description



# Summary of instruments

**IBIS** (15keV-10MeV,  $\sim 9^\circ$ ,  $\sim 12'$ )

- ★ main imaging telescope
- ★ detectors: ISGRI, PICSIT

**SPI** (10keV-8MeV,  $\sim 16^\circ$ ,  $\sim 1.3^\circ$ )

- ★ spectrograph

**JEMX-1, JEMX-2** (3keV-35keV,  $\sim 5^\circ$ ,  $\sim 3^\circ$ )

- ★ X-ray imaging telescopes

**OMC** (V filter,  $\sim 5^\circ$ ,  $\sim 25''$ )

- ★ optical camera

All high energy instruments are on base of coded mask technique.



# Principle of coded mask technique

Source:

I

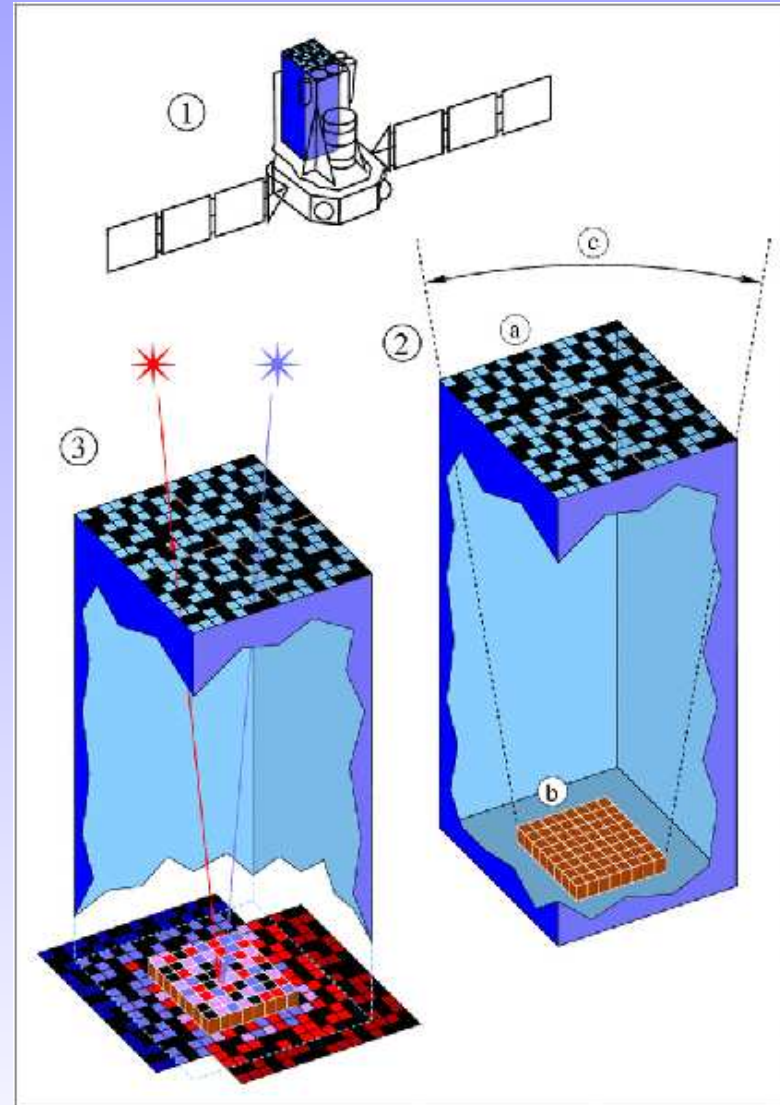
Coded mask:

M

Shadowgram:

S

$$S = M * I$$



# Benefits from coded masks

- + resolution ( $\sim 1'$ )
- + field of view ( $\sim 10^\circ$  - fully coded)
- reduced sensitivity ( $< 50\%$ )
- indirect imaging





# Participation

- ★ Ja (MU) - Centering algorithm, OMC simulator, blazars
- ★ V. Hudcova (ASU) & J. Polcar (MU) - OMC Pointing Software
- ★ M. Bernas (CVUT) & P. Pata (CVUT) - compression
- ★ J. Soldan (ASU) - software support in ISDC
- ★ R. Hudec (ASU) - head of Cataclysmic Variable programme



# Scientific objectives - I.

**Compact Objects** White Dwarfs, Neutron Stars, Black Hole Candidates, High Energy Transients and Gamma-Ray Bursts

**Extragalactic Astronomy** Galaxies, Clusters, AGN, Seyferts, Blazars, Cosmic Diffuse Background

**Stellar Nucleosynthesis** Hydrostatic Nucleosynthesis (AGB, WR Stars), Explosive Nucleosynthesis (Supernovae, Novae)



# Scientific objectives - II.

Galactic Structure Cloud Complex Regions, Mapping  
of continuum and line emission, ISM, CR distribution

The Galactic Centre

Particle Processes and Acceleration Transrelativistic  
Pair Plasmas, Beams, Jets

Identification of High Energy Sources Unidentified  
Gamma-Ray Objects as a Class



# Core program

- ★ Galactic centre deep exposure (GCDE)
- ★ Weekly galactic plane scans (GPS)
- ★ Transient events (TOO)
- ★ Vela region deep exposure



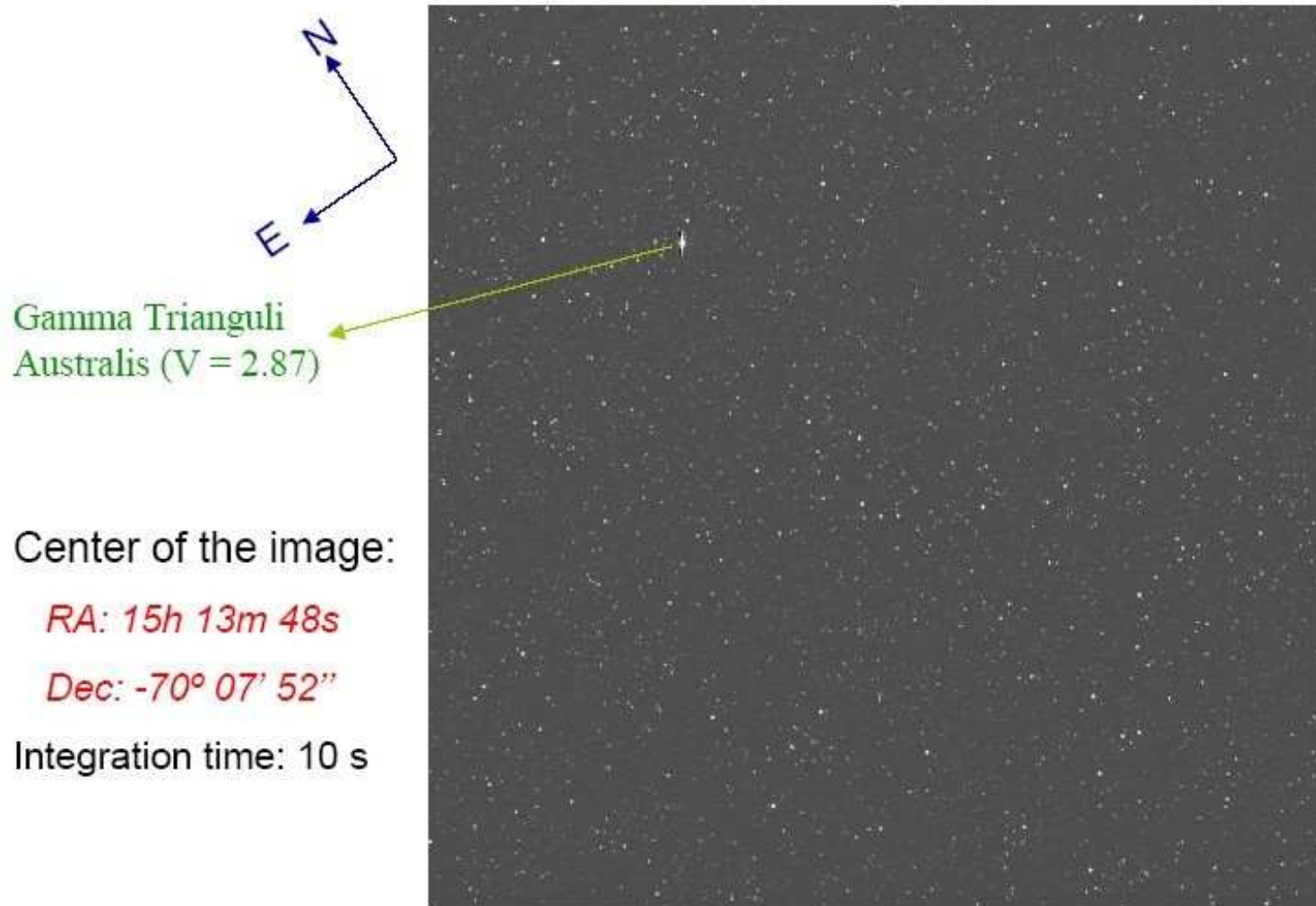
# Open time program

- ★ Compact objects (Galaxy and Mageellanic Clouds)
- ★ Active galactic nucleus
- ★ Diffuse emission
- ★ Supernova nucleosynthesis



# Results - OMC

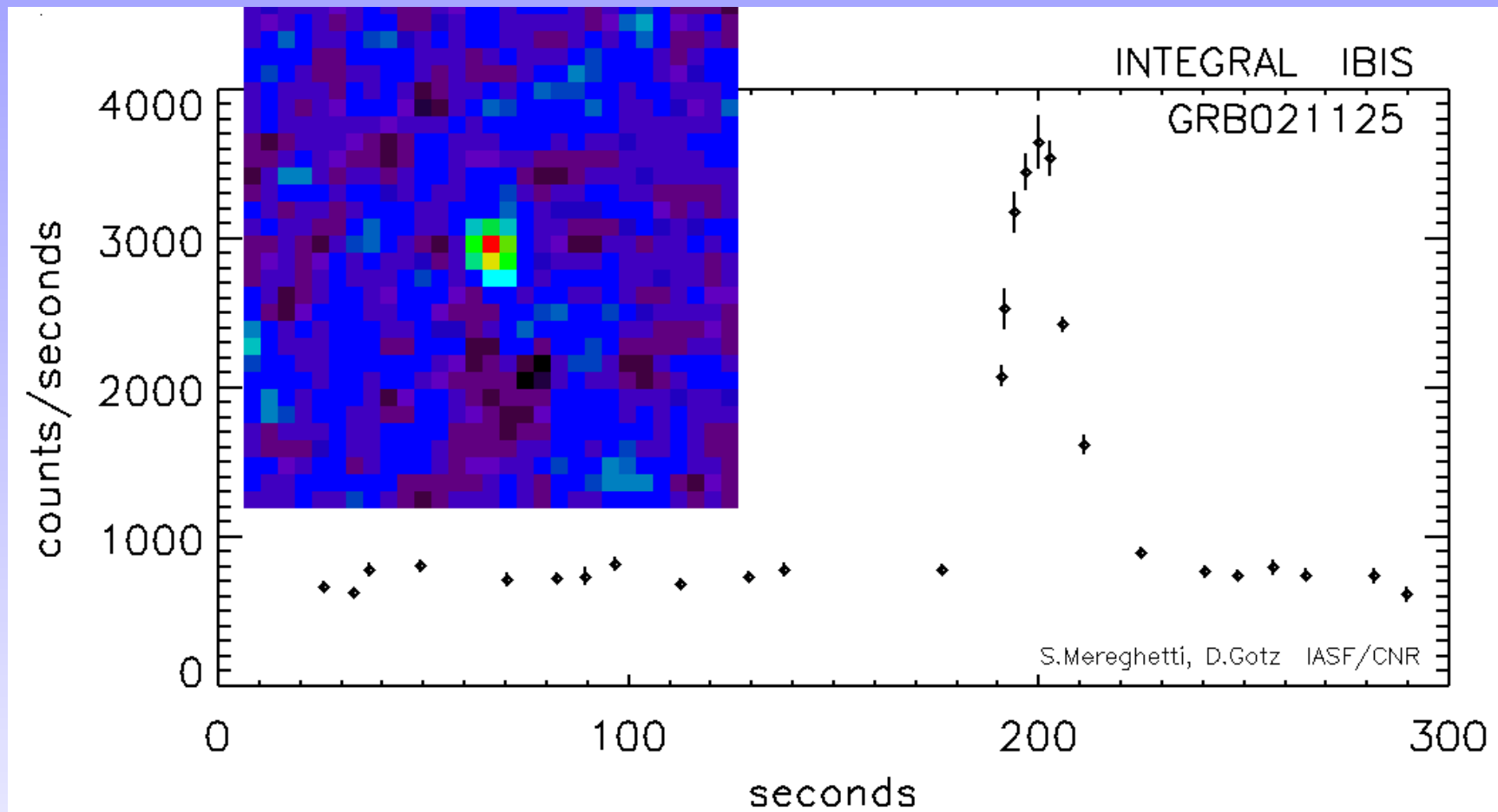
OMC First Light *Oct 21<sup>st</sup>, 2002*



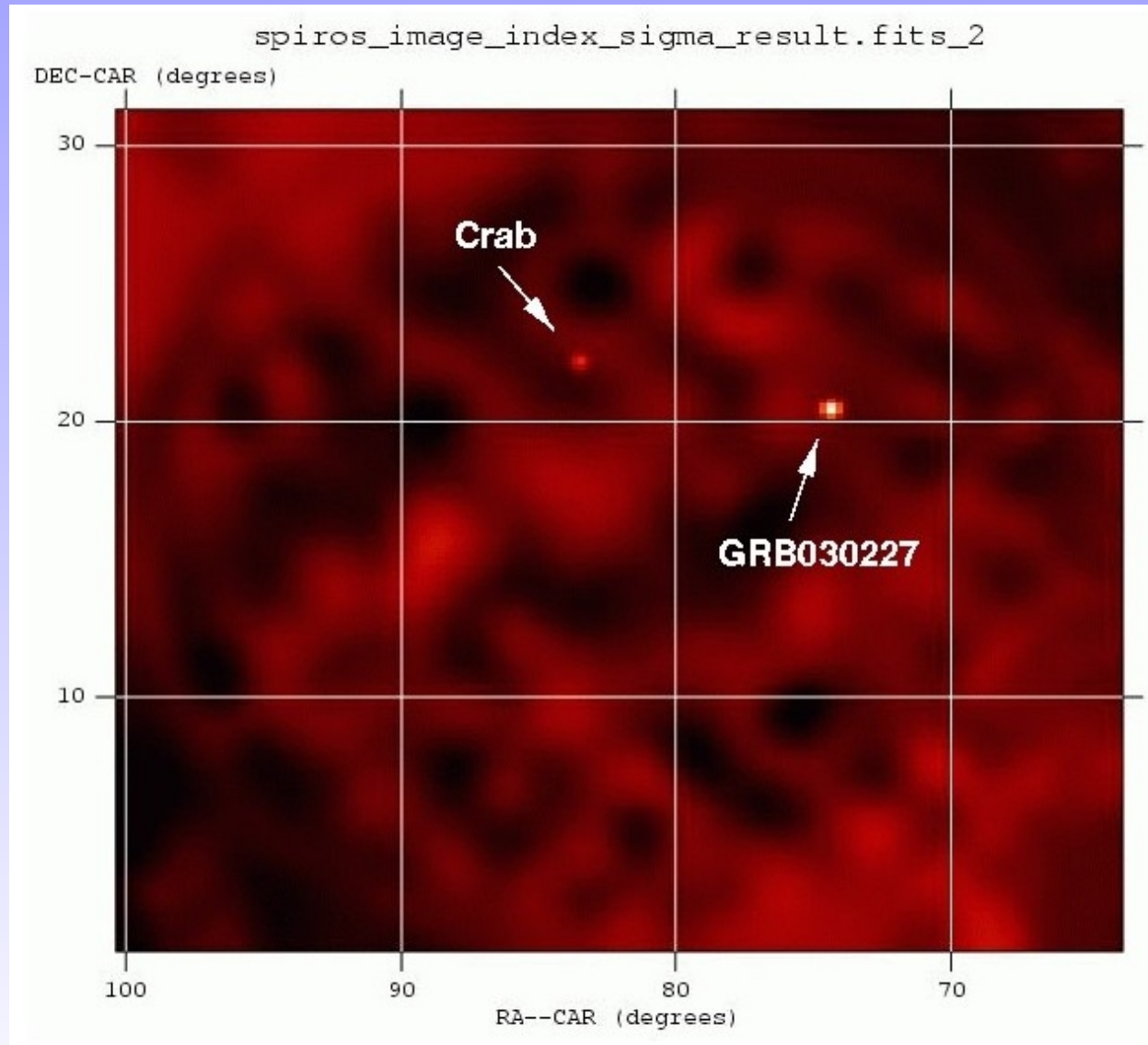
The OMC team



# Results - first GRB



# SPI Image of GRB 030227 in 20-200 keV band

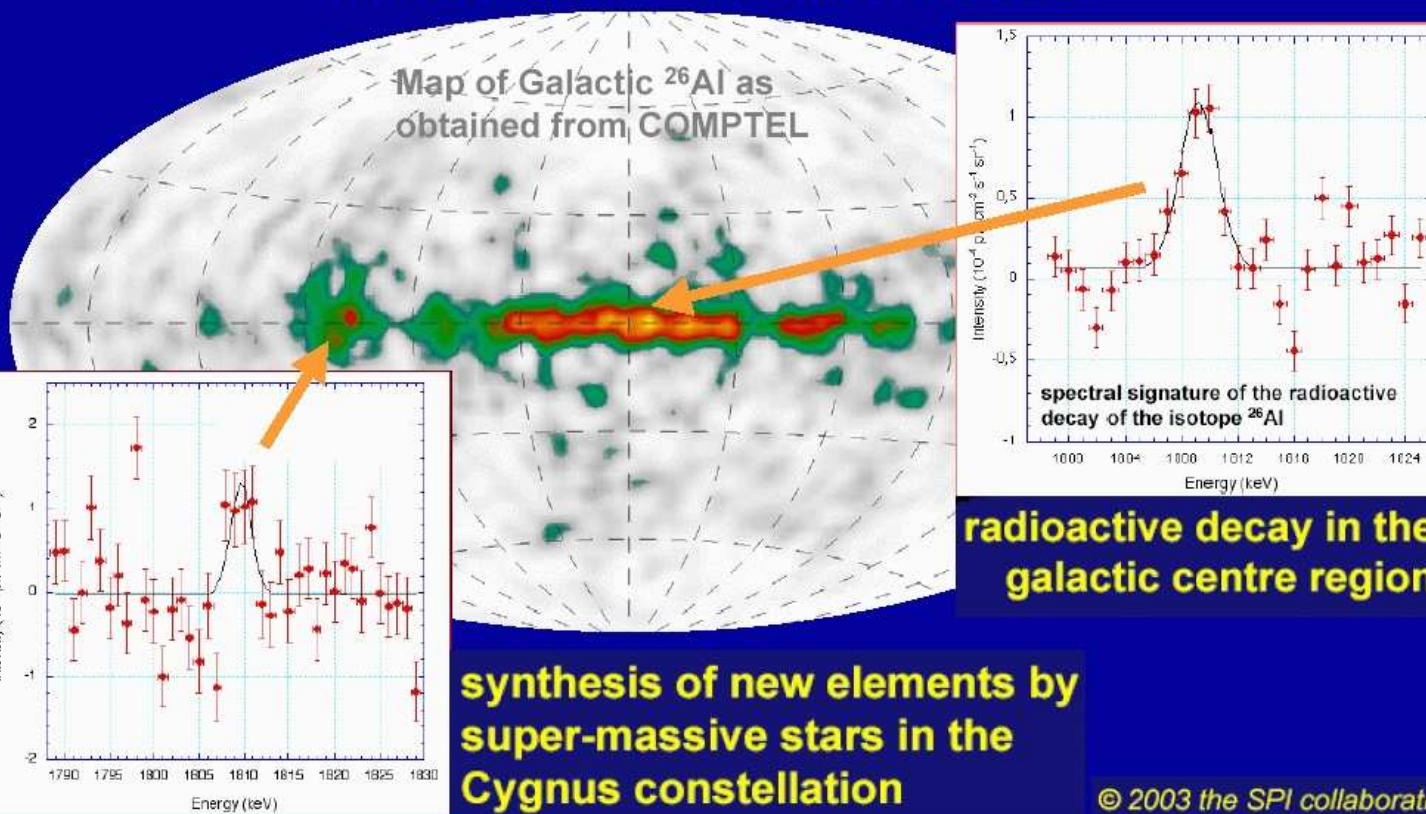




# 1.809 MeV Emission from $^{26}\text{Al}$ in the galaxy

## Radioactive $^{26}\text{Al}$ in the Galaxy

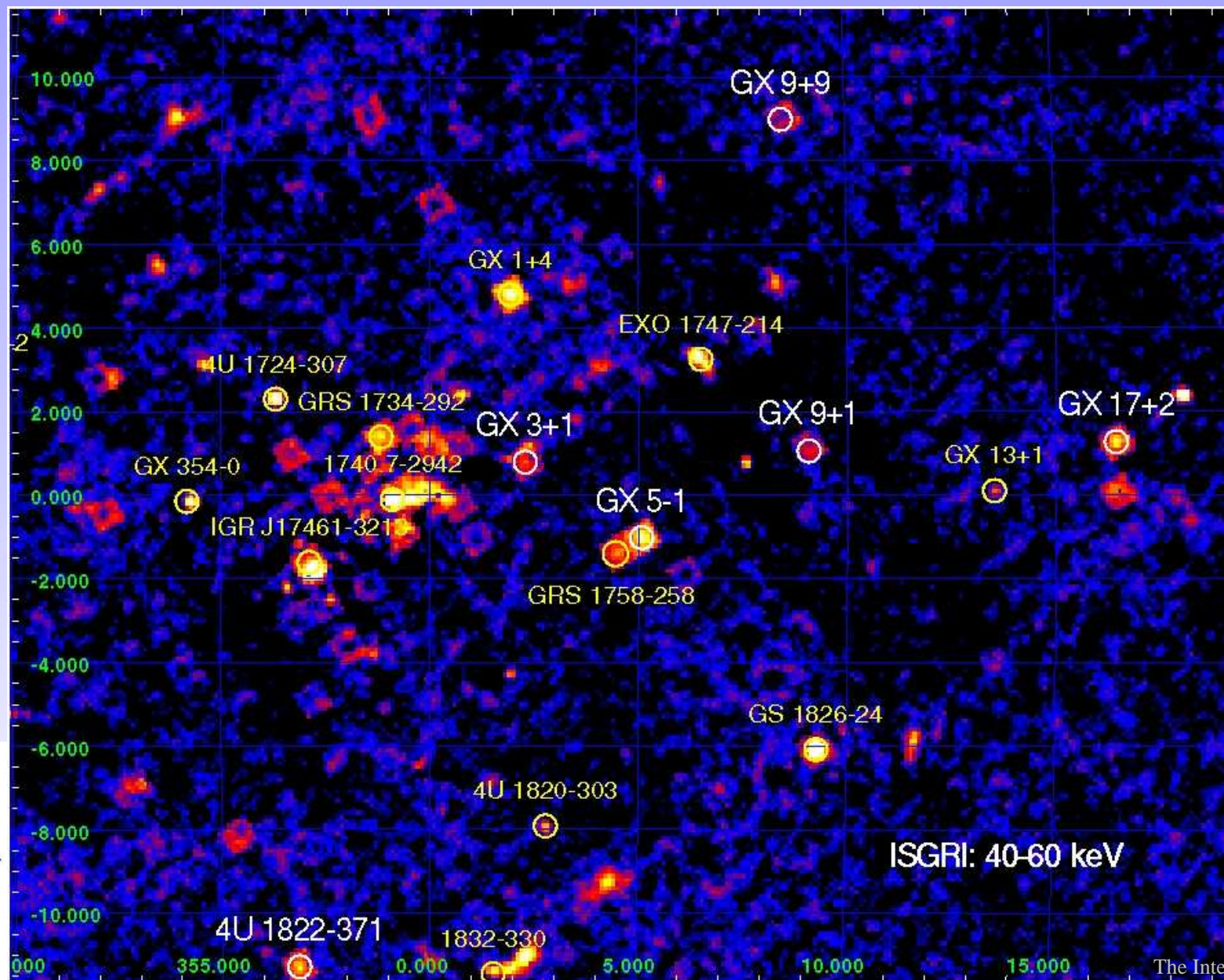
- first results from SPI/INTEGRAL -



© 2003 the SPI collaboration



# Galactic Centre at 40-60 keV



# References

## **ESA Integral**

<http://sci.esa.int>

## **ISOC**

<http://www.rssd.esa.int/Integral/>

## **ISDC**

<http://isdc.unige.ch/>

