IBIS/ISGRI STATUS

Philippe Laurent, Jérome Rodriguez, Floriane Cangemi, Christian Gouiffès, Aymeric Sauvageon, Geoffrey Daniel, Alexis Coleiro

CEA/DRF/IRFU/DAp & APC

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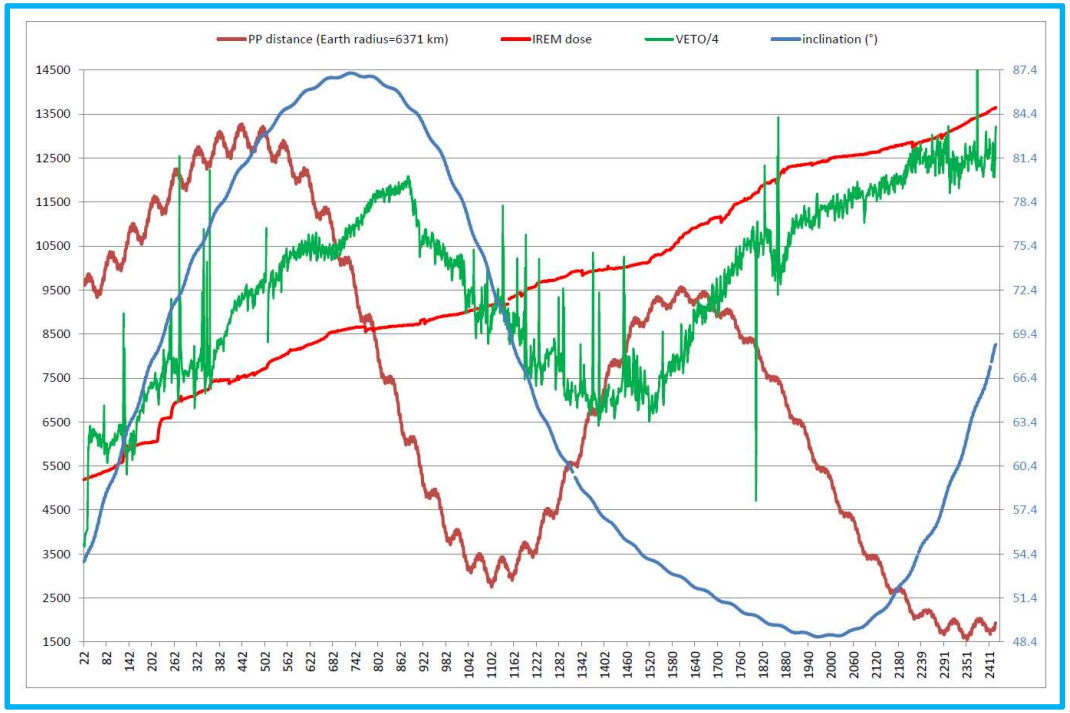
ISGRI OPERATION

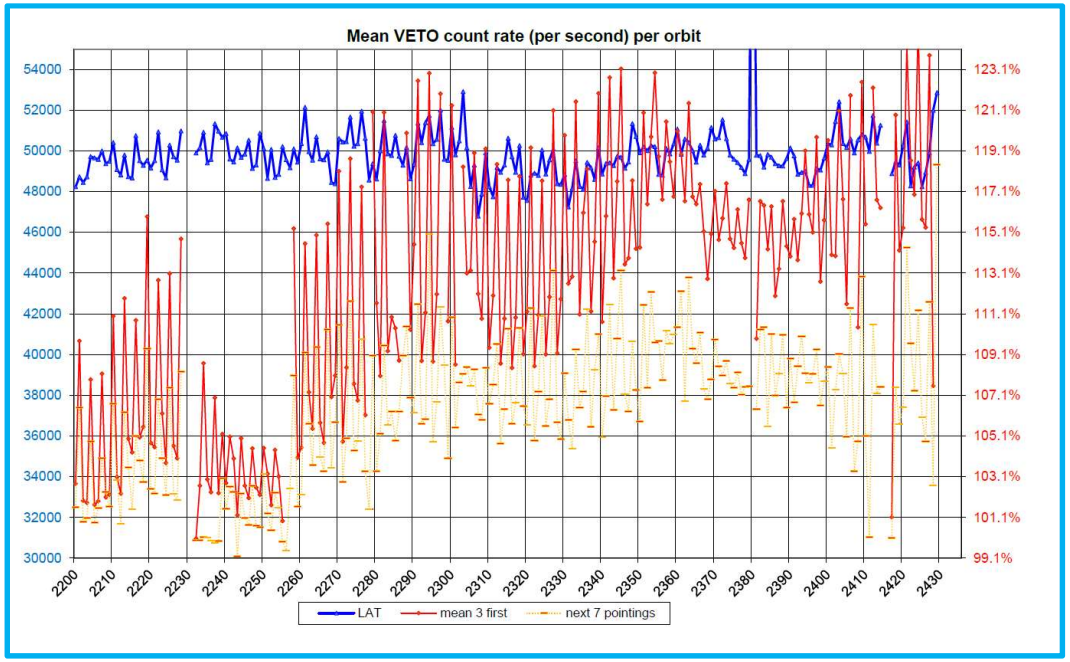
ISGRI/Veto Background

As solar activity is minimum, ISGRI and Veto count rate increases. Also, perigee decreases and IBIS spend more time in the radiation belt.



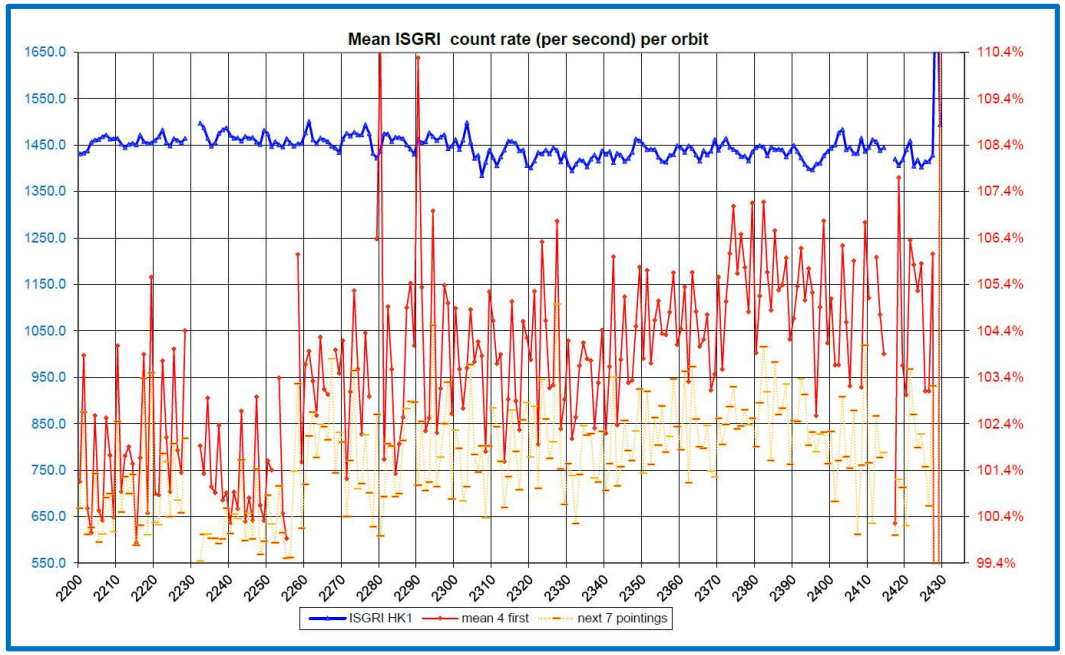
Veto count rate at the beginning of orbit.

Strong increase of Veto count-rate just after the IBIS switch-on, as we switch-on IBIS too early => origin of the recent Veto problems ?



ISGRI count rate at the beginning of orbit.

Same for ISGRI. Count rate increases in rev. 2428 due to the strong solar flare of October 28th. Also, IBIS may be switched-on too early after this on rev. 2429 (high Veto rate).



COMPTON SOFTWARE

ISGRI/Compton mode data analysis

- **Compton :**

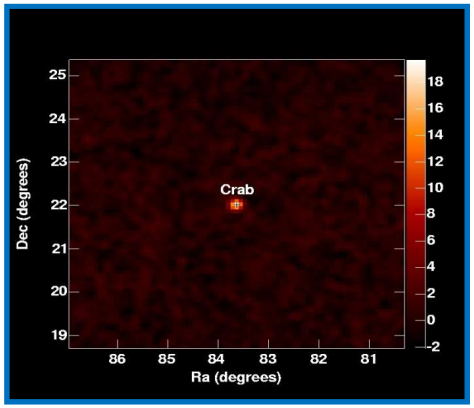
- Ic_MosaIma developed with OSA 11.1. Some small bugs found in dal3ibis at that occasion.

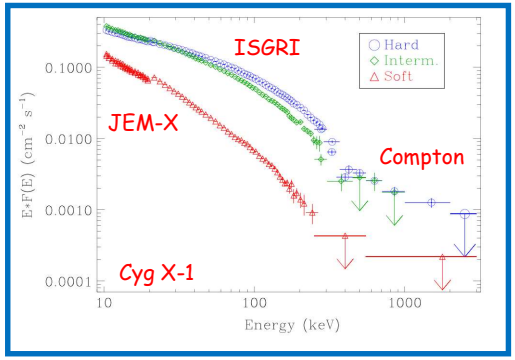
- Delivery to ISDC underway. Last tests with bright sources (MAXI J1820+070) on going …

- **OSA11.2 : Very nice work !**

- Tests of the new platform developed at ISDC (MMODA) in Saclay on going with Crab, Cygnus X-1, MAXI sources. No big issues, just some small remarks which will be sent to ISDC (“don’t know if a request has been sent or not …”).

- OSA 11.2 is a “black box” for us. It is complicated to verify it completely and validate it. Is software similar to OSA 11.1 ? What changes have been done ? We should have also a look to the new calibration files.





Compton mode window analysis

(preliminary)

Small window : less Compton events
High window : more background/spurious events

⇒ Window size determined during In-Flight Calibrations just after the launch

window size µs	Rev.	Time (s)	S/N (300 – 600 keV)	S/N (300 – 750 keV)
1,666	2347	164227	6,88	7,33
1,904	2349/2351	164179	8,19	6,98
2,142	2425	132358	6,91	7,32

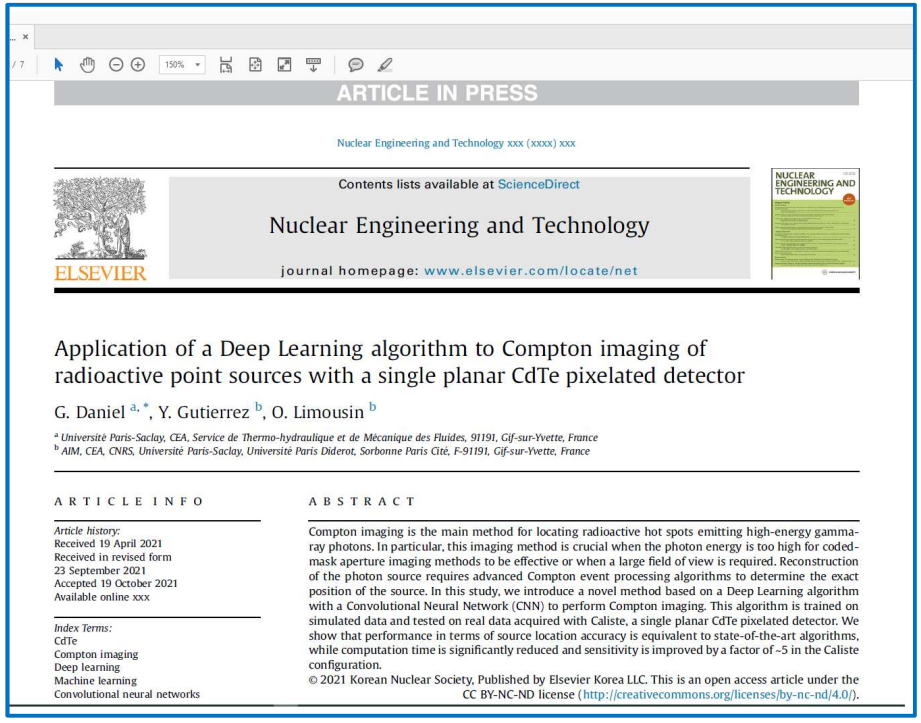
Crab S/N : seems that the window size is still good, even after CdTe aging.

SCIENCE

Multi-messengers, polarization, compact objects

- On-going multi-messenger activity at Paris/Saclay
  - Participation to the MM team shift (A. Coleiro).
  - Development of a true Compton wide FOV imaging software (G. Daniel).
  - Study of GRB/magnetars (Götz, D.)
  - Participation to the maintenance of IBAS (Götz, D.)
- Several polarization studies are on-going :
  - Cygnus X-1, MAXI sources (Cangémi, F., Laurent P. & Rodriguez, J.)
  - Crab total and phase-resolved, comparison to optical GASP measures (Gouiffès, C.)
- Multi-wavelength study of FRB (Gouiffès, C.), GRS1915+105 (Rodriguez, J.), X-ray binaries in outburst (Cangemi, F.)

Deep Learning algorithm for Compton reconstruction



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Application of a Deep Learning algorithm to Compton imaging of radioactive point sources with a single planar CdTe pixelated detector

G. Daniel [a, *], Y. Gutierrez [b], O. Limousin [b]

[a] Université Paris-Saclay, CEA, Service de Thermo-hydraulique et de Mécanique des Fluides, 91191, Gif-sur-Yvette, France
[b] AIM, CEA, CNRS, Université Paris-Saclay, Université Paris Diderot, Sorbonne Paris Cité, F-91191, Gif-sur-Yvette, France

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ABSTRACT

Compton imaging is the main method for locating radioactive hot spots emitting high-energy gamma-ray photons. In particular, this imaging method is crucial when the photon energy is too high for coded-mask aperture imaging methods to be effective or when a large field of view is required. Reconstruction of the photon source requires advanced Compton event processing algorithms to determine the exact position of the source. In this study, we introduce a novel method based on a Deep Learning algorithm with a Convolutional Neural Network (CNN) to perform Compton imaging. This algorithm is trained on simulated data and tested on real data acquired with Caliste, a single planar CdTe pixelated detector. We show that performance in terms of source location accuracy is equivalent to state-of-the-art algorithms, while computation time is significantly reduced and sensitivity is improved by a factor of ~5 in the Caliste configuration.

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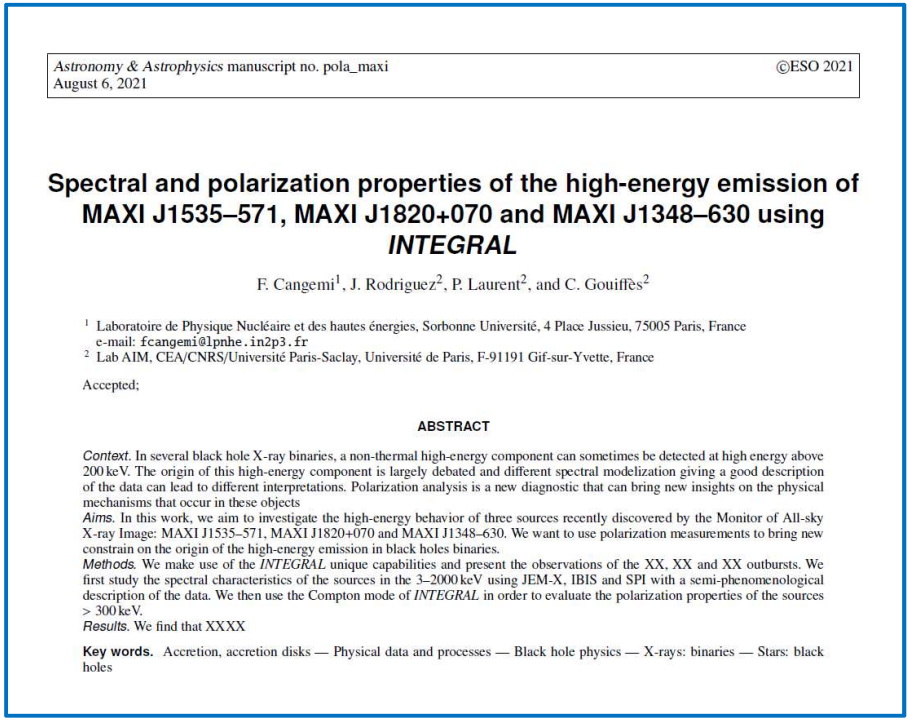
- Paper published by G. Daniel on Compton imaging.
- Hackathon on INTEGRAL data next week !

(more infos : https://astroinfo2021.sciencesconf.org/)

Study of MAXI sources with Compton mode data



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Spectral and polarization properties of the high-energy emission of MAXI J1535–571, MAXI J1820+070 and MAXI J1348–630 using *INTEGRAL*

F. Cangemi[1], J. Rodriguez[2], P. Laurent[2], and C. Gouiffès[2]

[1] Laboratoire de Physique Nucléaire et des hautes énergies, Sorbonne Université, 4 Place Jussieu, 75005 Paris, France
e-mail: fcangemi@lpnhe.in2p3.fr
[2] Lab AIM, CEA/CNRS/Université Paris-Saclay, Université de Paris, F-91191 Gif-sur-Yvette, France

Accepted;

ABSTRACT

Context. In several black hole X-ray binaries, a non-thermal high-energy component can sometimes be detected at high energy above 200 keV. The origin of this high-energy component is largely debated and different spectral modelization giving a good description of the data can lead to different interpretations. Polarization analysis is a new diagnostic that can bring new insights on the physical mechanisms that occur in these objects
Aims. In this work, we aim to investigate the high-energy behavior of three sources recently discovered by the Monitor of All-sky X-ray Image: MAXI J1535–571, MAXI J1820+070 and MAXI J1348–630. We want to use polarization measurements to bring new constrain on the origin of the high-energy emission in black holes binaries.
Methods. We make use of the *INTEGRAL* unique capabilities and present the observations of the XX, XX and XX outbursts. We first study the spectral characteristics of the sources in the 3–2000 keV using JEM-X, IBIS and SPI with a semi-phenomenological description of the data. We then use the Compton mode of *INTEGRAL* in order to evaluate the polarization properties of the sources > 300 keV.
Results. We find that XXXX

Key words. Accretion, accretion disks — Physical data and processes — Black hole physics — X-rays: binaries — Stars: black holes

Paper on the polarization of MAXI sources (Cangemi et al.) in preparation.

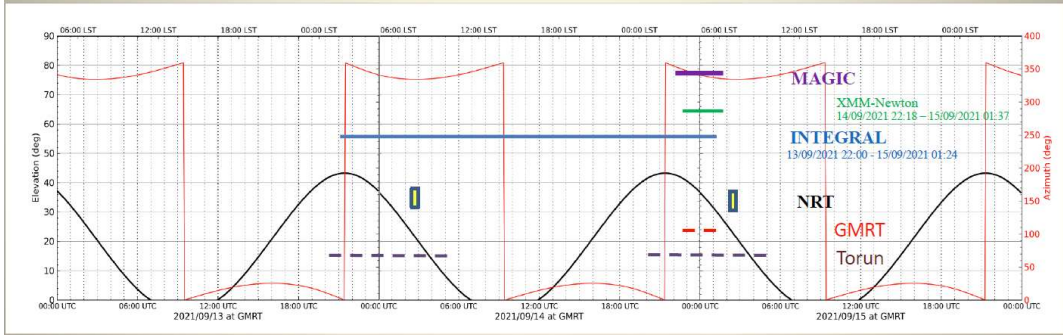
FRB : Workshop during « les Journées de la SF2A »

FRB : TOO observation of FRB 180916

A multiwavelenth of FRB 180916.J0158+65

(PI C. Kilpatrick Northwestern University)

- Repeating FRB discovered with CHIME in 2018
- Relatively close source z=0.03
- Activity with a 16 day period
- Special target for multiwavelength searches
- International campaign in September 2021: radio (HF,LF), Optical, X-rays, gamma-rays, VHE



Our contribution in the campaign : INTEGRAL (ToO), NRT, VHE (Magic)

One radio burst seen by GMRT during INTEGRAL observation.
Analysis of IBIS data on-going.