IBIS/ISGRI STATUS

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ISGRI ENERGY CALIBRATION

Approach in OSA11

Keep the LUT1 with MDU-dependent temperature correction.

ISGRI_PHA, ISGRI_RT→ISGRI_PHA1, ISGRI_PI

Fit the data of each revolution with time-dependent 2D charge loss model,
Generate LUT2 regularly together with the response

ISGRI_PHA1, ISGRI_PI→ISGRI_ENERGY

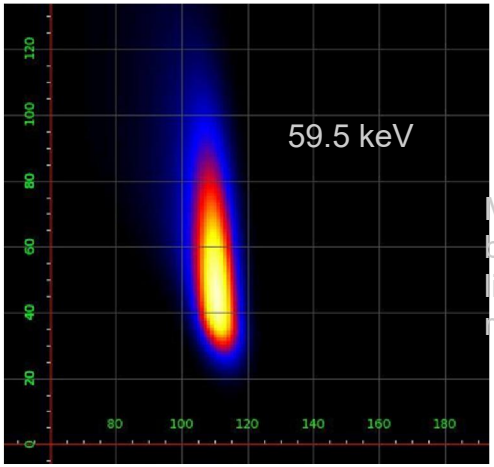
Charge loss model

Charge loss model due to limited charge carrier lifetime: 4 parameters fitted in each revolution.

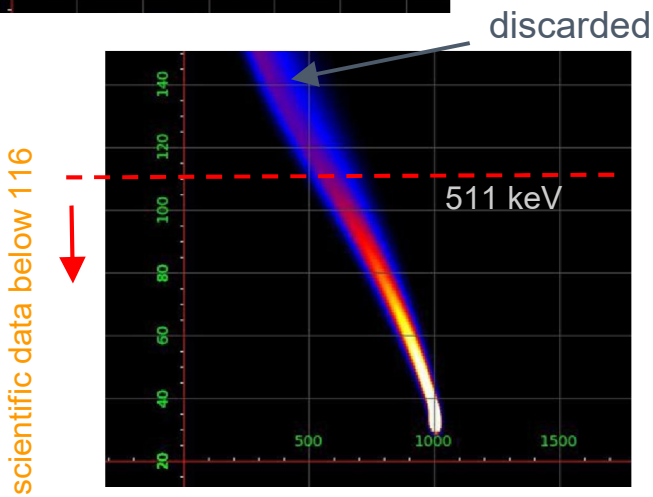
Ballistic losses model related to low charge carrier mobility: Fitted to ground calibration. In S1 data range set by 2 fixed parameters.

Model of electronics: charge to PH conversion with resolution, fixed for each rise time - pulse height pair. Many (~15) parameters are selected.

Offset and width are fitted in a revolution, to account for possible incompleteness of the model.

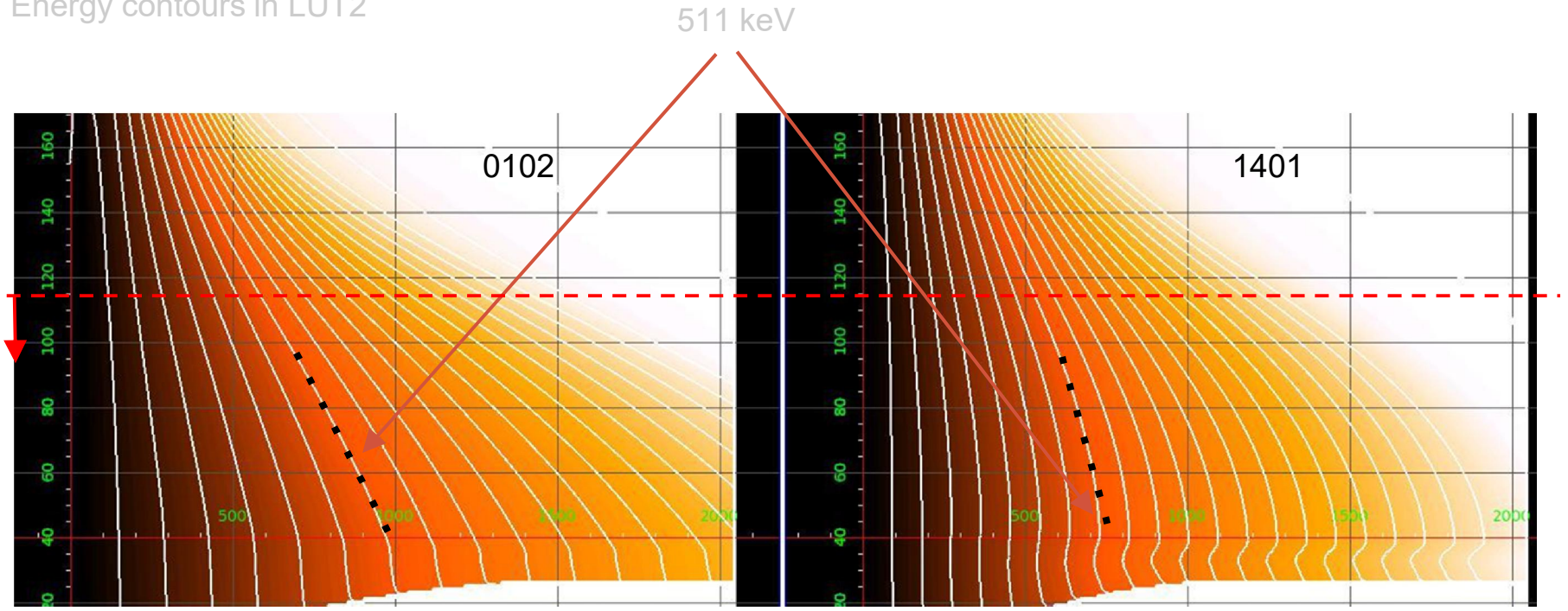


Model for background lines in revolution 0102

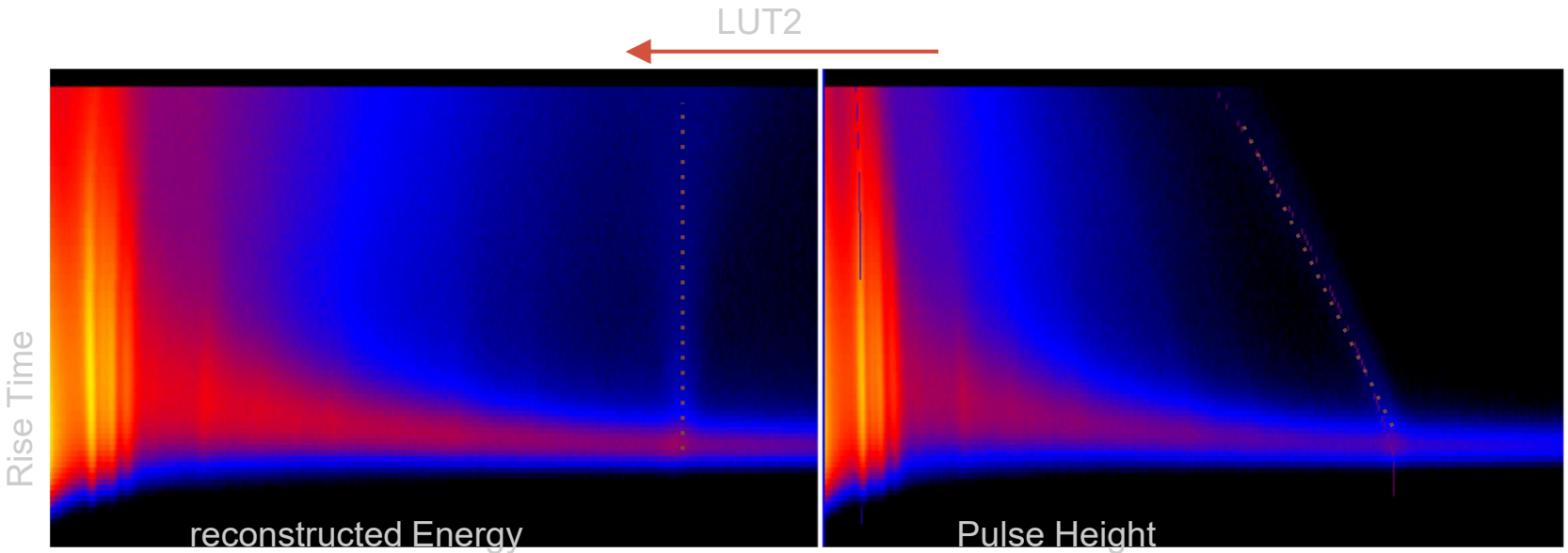


Model of LUT2 evolution

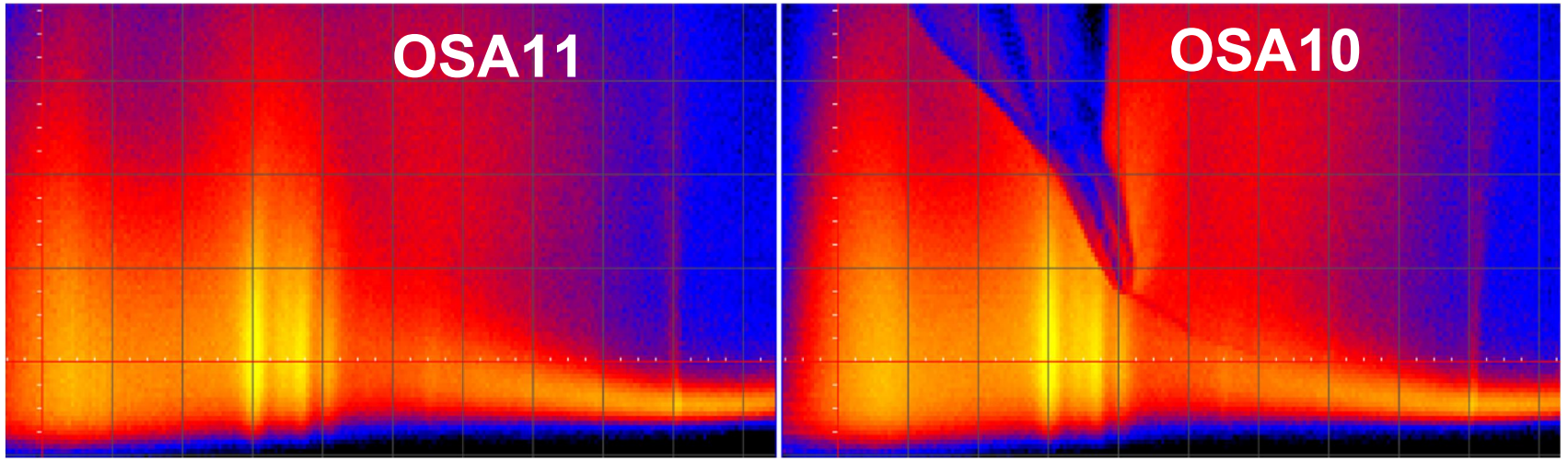
Energy contours in LUT2



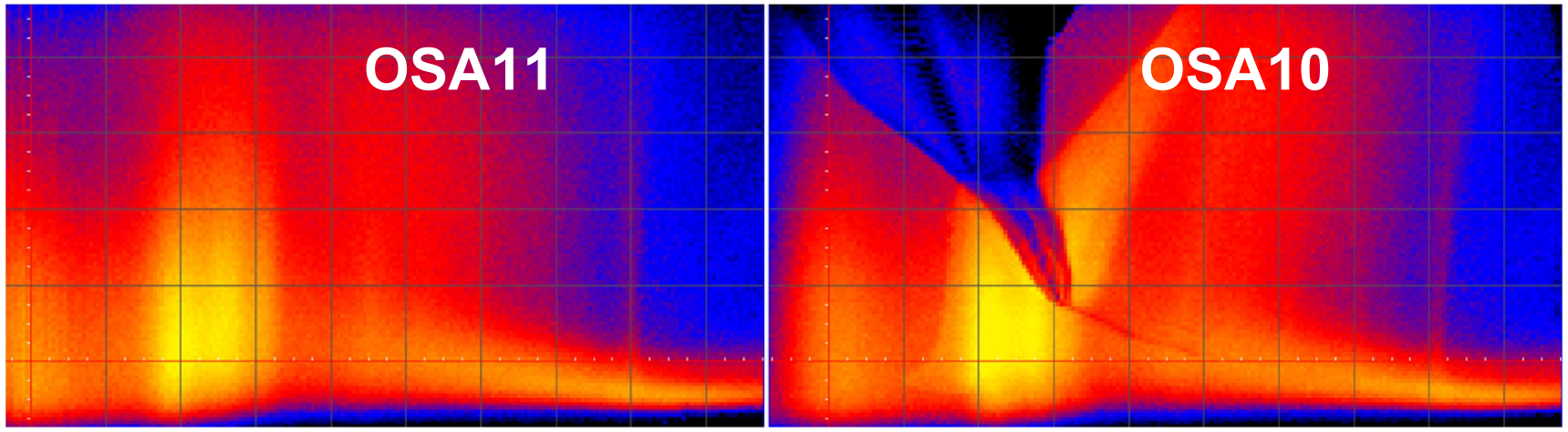
OSA11 reconstruction



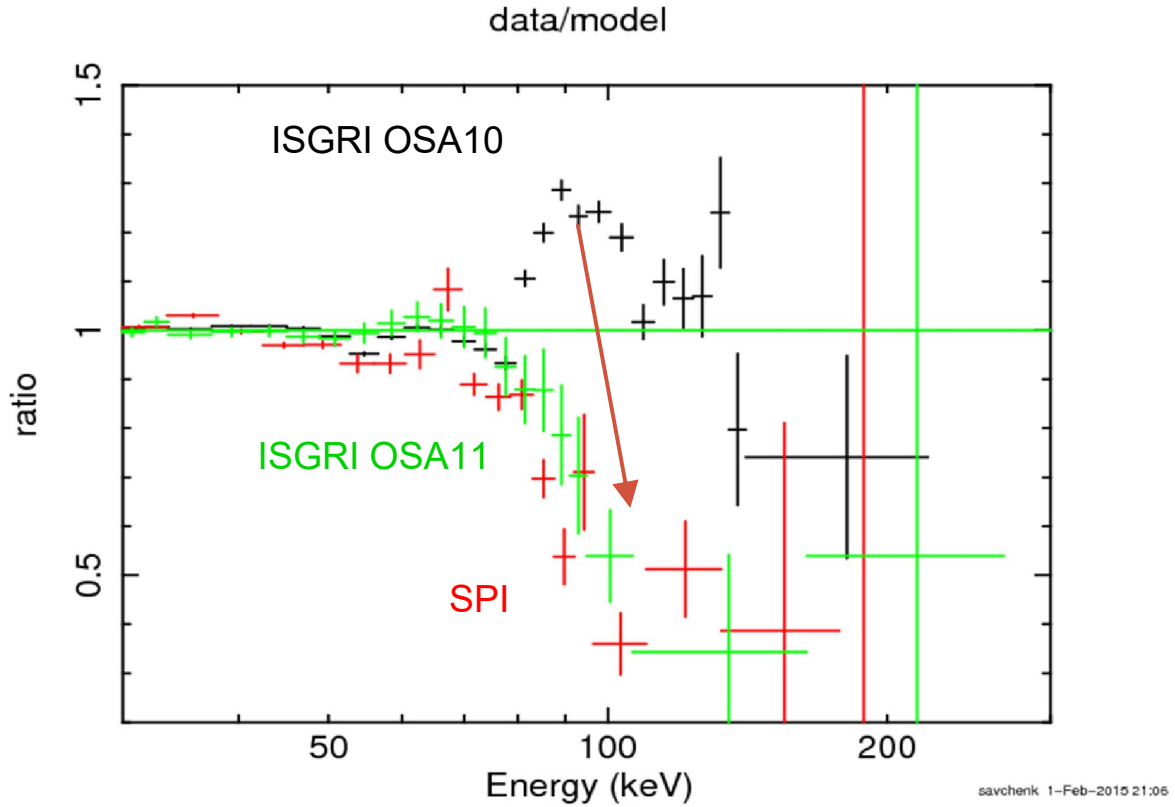
OSA11 vs OSA10



OSA11 vs OSA10



Spectra of 1A 0535+262



50 ks in revolution 1021

2015 issues solved by OSA 11 release

Simulated response does not correctly predict counts in 50-100 keV range. This is connected to the structure between absorption edges and the ARF peak.

Increase of the resolution at early time is compatible with assumptions that the resolution is non-evolving in PH-RT plane. But at later time, the resolution is broader.

Orbital evolution of energy calibration, decrease of gain during the revolution, or after IREM crash. The evolution is connected to IBIS standby, perhaps long-term polarization of detectors.

Changes in OSA11

software

ibis_isgr_energy: disable drift correction (very small change)

ii_shadow_build: to compute LE efficiency, will read current gain information from LUT2, read resolution from current RMF

IC tree

Background maps, LUT2 (+ parameters for LUT1), ARF, RMF every month.

Proposed schedule of OSA11

We shift the schedule due to the work on the GW follow-up.

⇒March 18th : *Report for ISDC on foreseen software and calibration files change.*

⇒ March 31st : *Delivery of the OSA11 subpart (1 rev.) to Roma for testing.*

⇒ April 30th : *Delivery of the OSA11 to ISDC for testing*

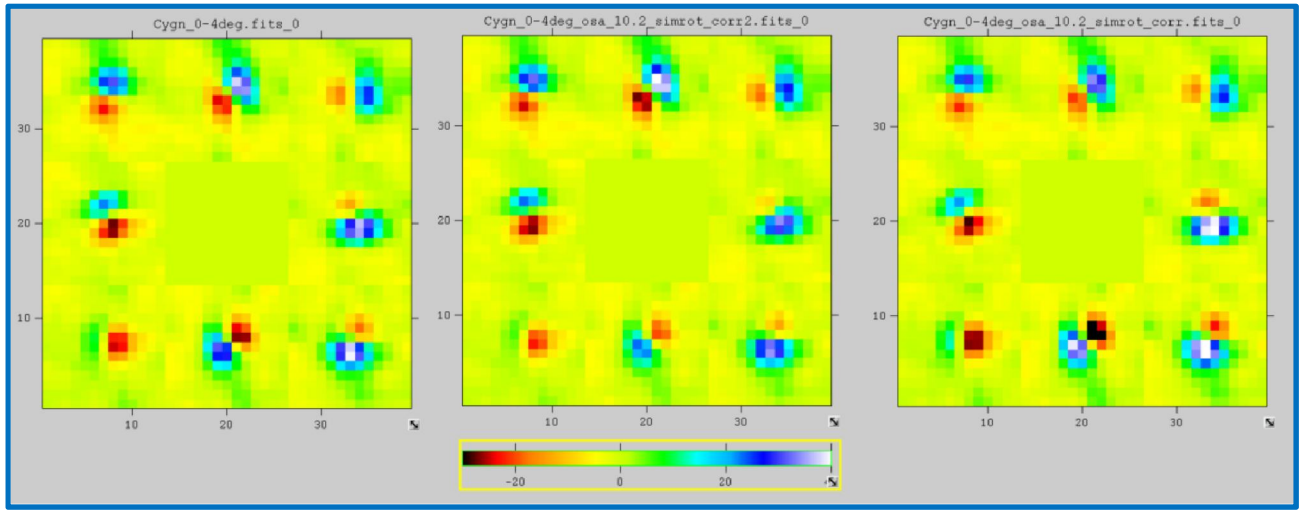
⇒ May 31st : *OSA11 release*

ISGRI IMAGING ACTIVITIES

On-going studies

- Optimization of ghost cleaning (preliminary).

  $\Rightarrow$ due to mask rotation/stretch ?

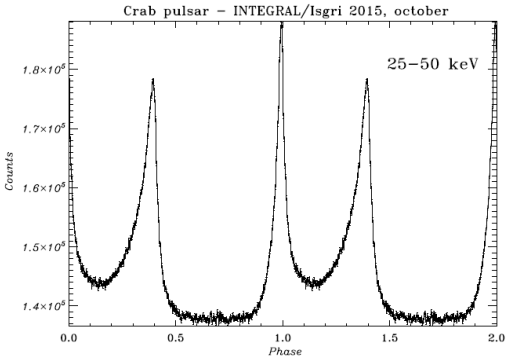


INTEGRAL – ASTROSAT CROSS CALIBRATION

Crab timing studies

We used INTEGRAL/ISGRI observation of the Crab Pulsar, in october 2015, which were made jointly with ASTROSAT

- - The observations were carried out on October 12th – 17th during revolution 1598 and 1599 for a total of 356 ks.
- - We used the Jodrell Bank ephemerides of 2015,Oct 15 at phase 0 (TDB time).
- - Light curve with 330 bins (100 μs time bin resolution) and in 3 spectral bands (25-50, 50-100, >100 keV) were produced
- - Plots and ascii files (with phase , counts and errors), were delivered to ASTROSAT team to cross-check their timing.



TEMPORAL OBSERVATORY

Principles (1/3)

- The idea is to create and maintain database of ISGRI sky images of the whole sky. The goal is to have an image for a given pointing (scw) **each 100s into 16 predefined logarithmically spaced energy bins.**

- All these images will be computed using OSA standard deconvolution tools, but with the new time variable background maps, improved ghost removal algorithm, and improved time-dependent energy calibration.

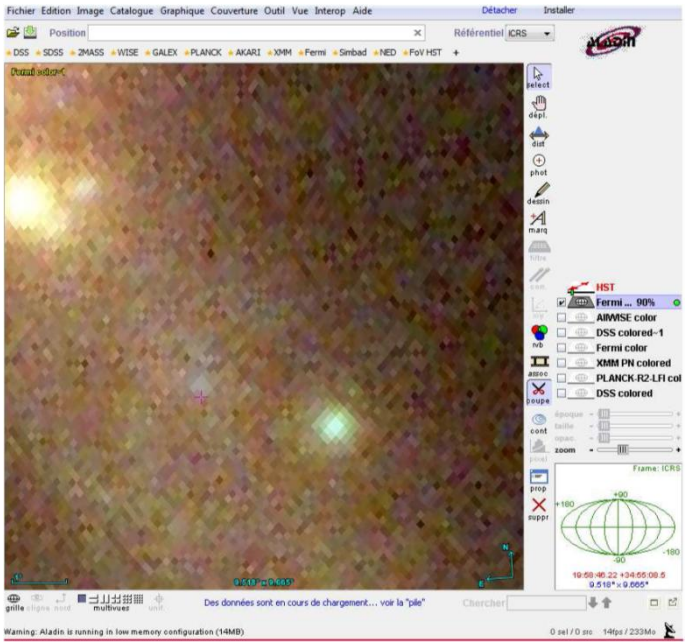
- They will be afterward reorganized to optimize access to the light curves and groups of light curves for neighboring pixels, leading to cubes with the whole sky in the first 2D dimension with an **3.5'x3.5' pixel** dimension and the time in the third dimension.

Principles (2/3)

- Through the Web interface, the user will give the timescale and energy bands he desires, and will point on a given sky position.

⇒ He will get an ISGRI light curve in different TBD formats, which could be used afterward for multi-wavelength/ multi-messenger studies.

⇒ It will be also possible to on-demand compute various characteristics of the temporal properties for extended sky regions: such as maximum flux on a time scales of choice.



Principles (3/3)

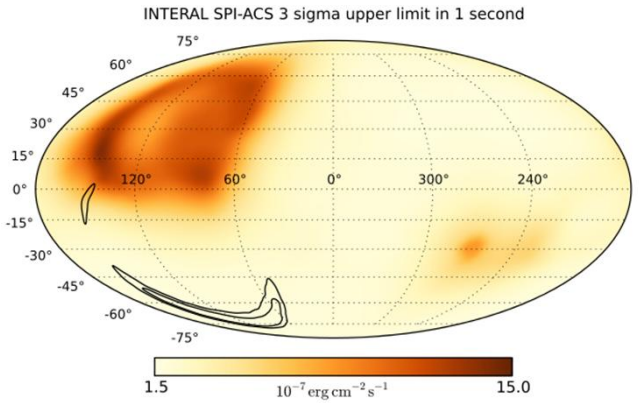
- The observatory will respect the INTEGRAL data right prescription.
- These data will be provided through a dedicated Web interface and a RESTful service.
- The observatory could be also integrated with ESA ESA-sky interface and the Virtual Observatory resources. Collaboration with ESA and other partners will be welcome.

GRAVITATIONNAL WAVES FOLLOW-UP

Main results

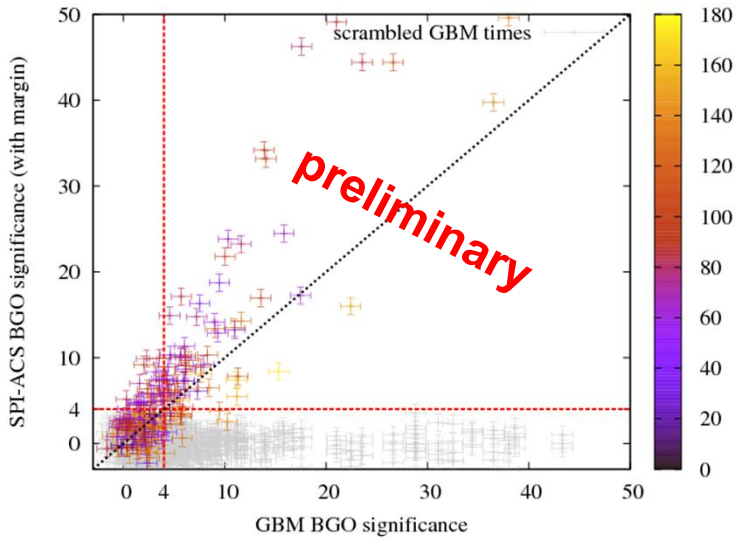
- Gravitational waves detected for the first time on 2015, September 14th.
- Follow-up observations by several electromagnetic observatory (radio to gamma-ray).

- Follow-up in the soft gamma-ray range by GBM and SPI ACS.
- GBM detects an event not confirmed by ACS.
- Publication by Volodymyr Savchenko of INTEGRAL SPI ACS 3σ upper limit accepted for publication in ApJL.



INTEGRAL SPI-ACS vs GBM

- SPI-ACS - GBM intercalibration work has started on Monday March 7th.
- This project will be very useful for future LIGO/Virgo follow-up as well as weak GRB population studies.
- Preliminary results indicate that the SPI-ACS is more sensitive to hard bursts than GBM BGO, providing the right orientation.



THANK YOU !