GRB 030406:
off-axis detection, localization and spectral analysis

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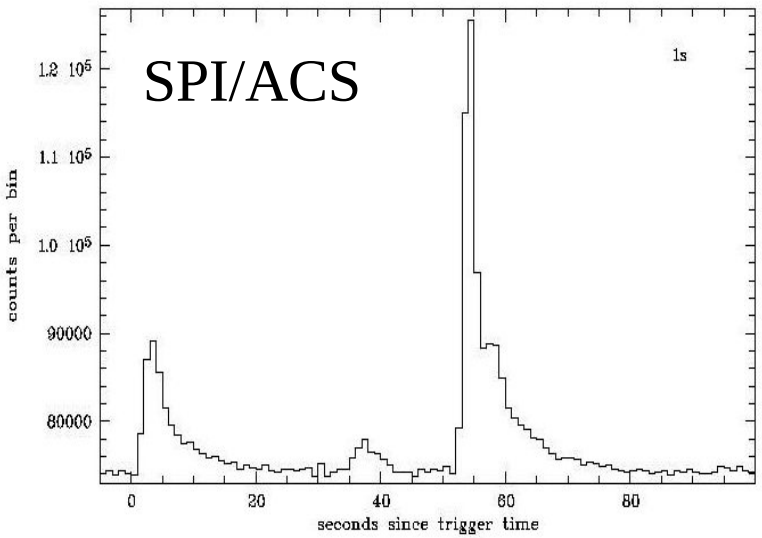
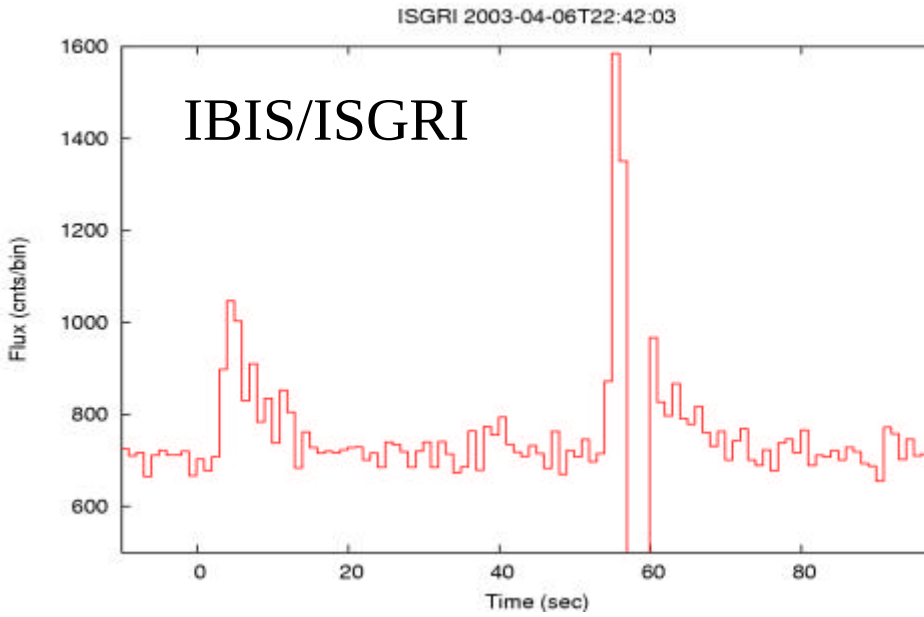
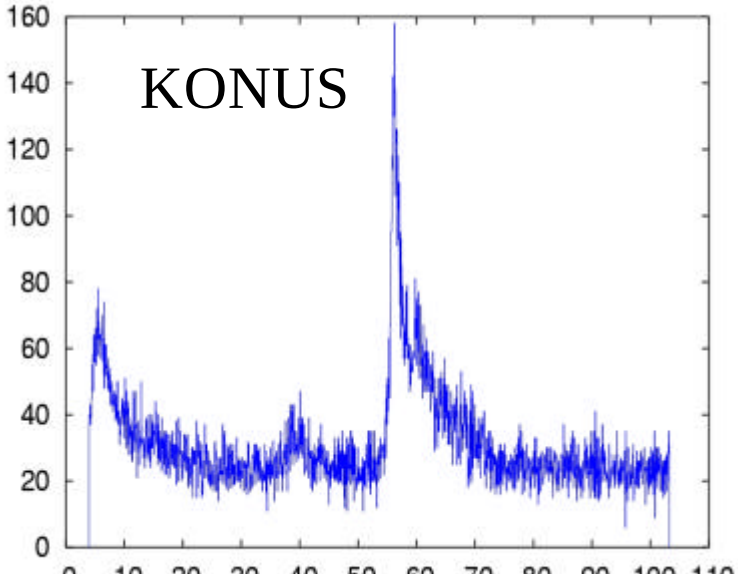
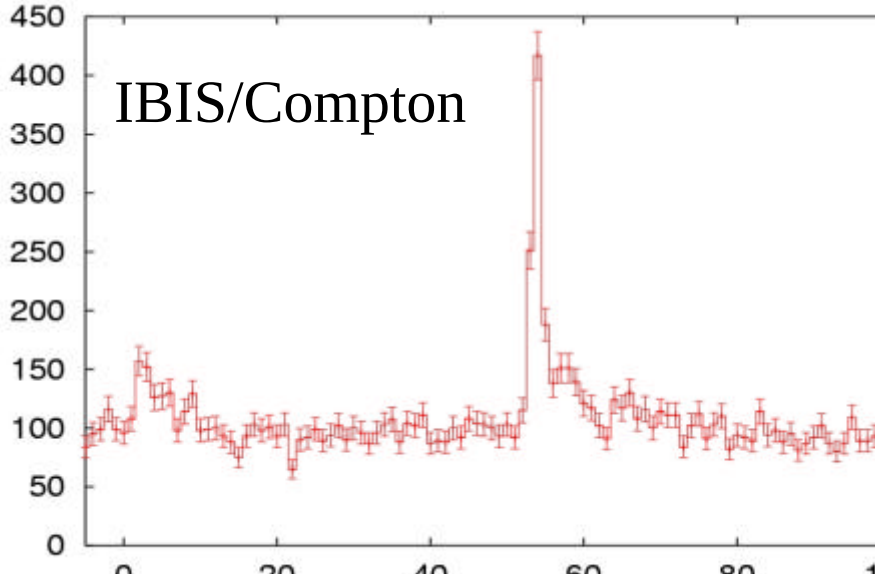
- GRB detection (light curves, different instruments)
- Compton image (position, accuracy)
- Spectral analysis (response, model fitting)
- Other GRBs

GRB034006 detection – light curves



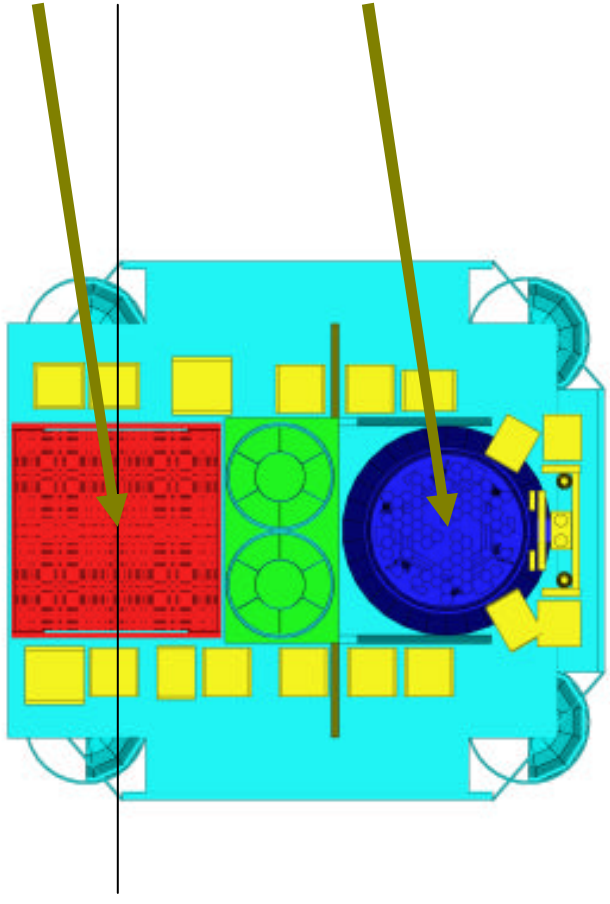




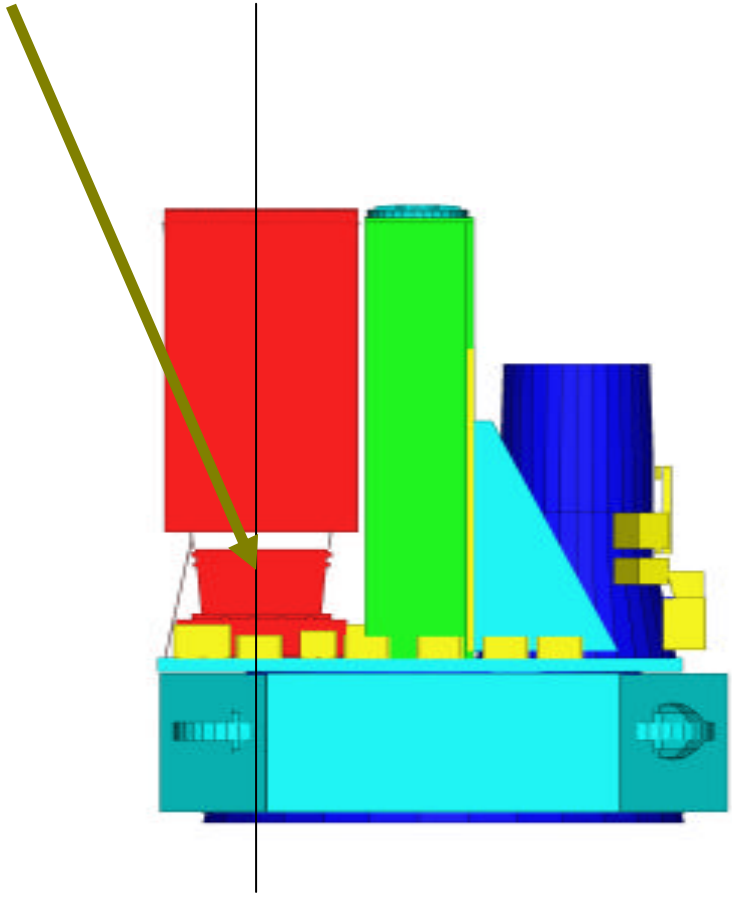


GRB034006 detection – direction

$\phi = 11.036^{o}$

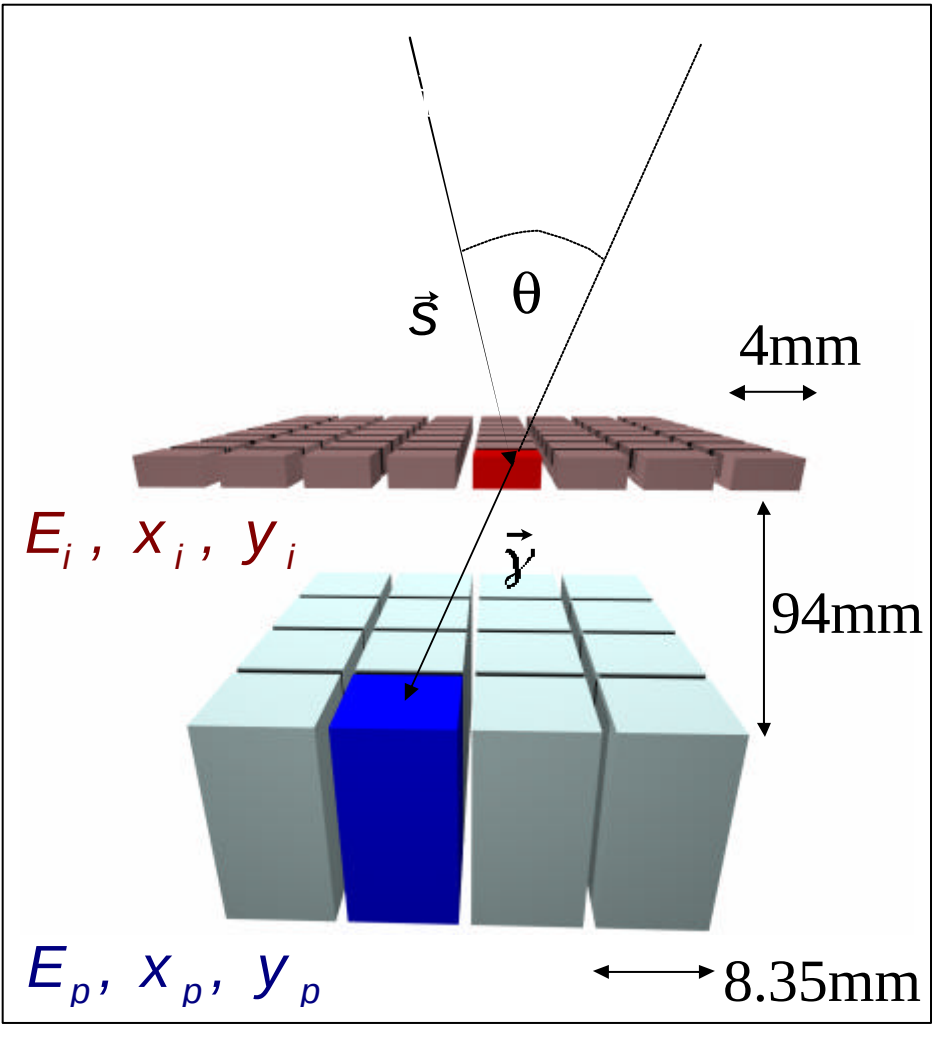


$\psi = 36.827^{o}$



totally out off coded field of view !

Compton kinematics



$$\vec{s}(\alpha,\ \delta) \qquad \vec{\gamma}(x_i\ ,\ y_i\ ,\ x_p\ ,\ y_p)$$

$$\cos(\theta_g)=\frac{\vec{s}\,\vec{\gamma}}{s\,\gamma}$$

$$\cos(\theta_c)=1-\frac{511}{E_i}+\frac{511}{E_i+E_p}$$

for every $\alpha,\ \delta$

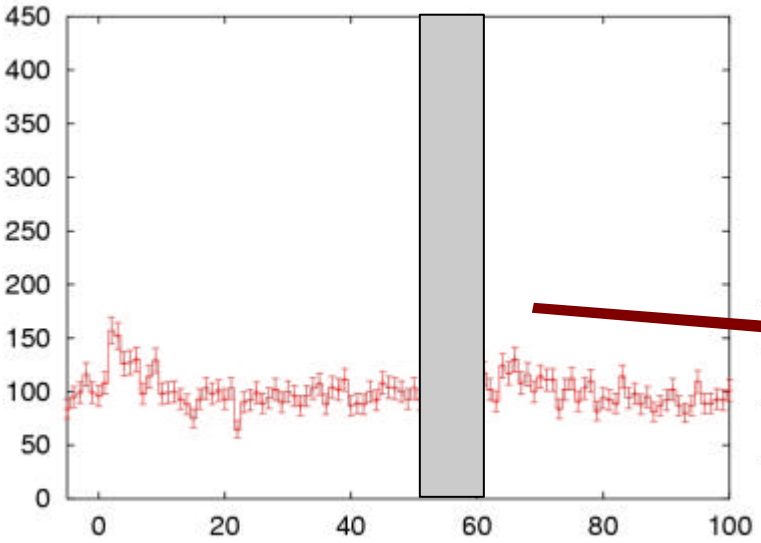
for every event

if $\left|\theta_g-\theta_c\right| < \epsilon$

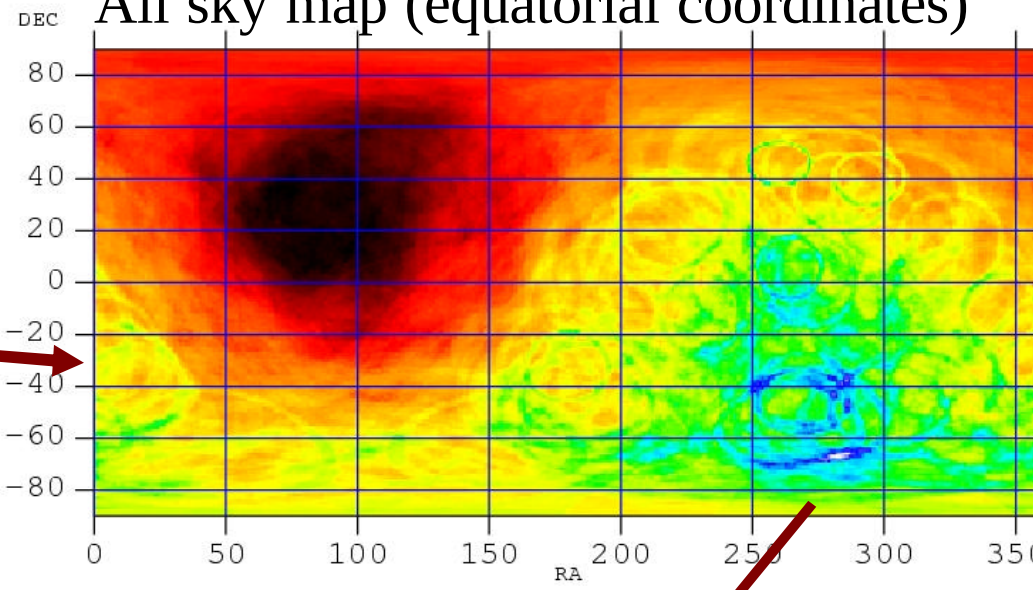
$map(\alpha,\ \delta)+1$

GRB030406 - direct Compton imaging

10 s

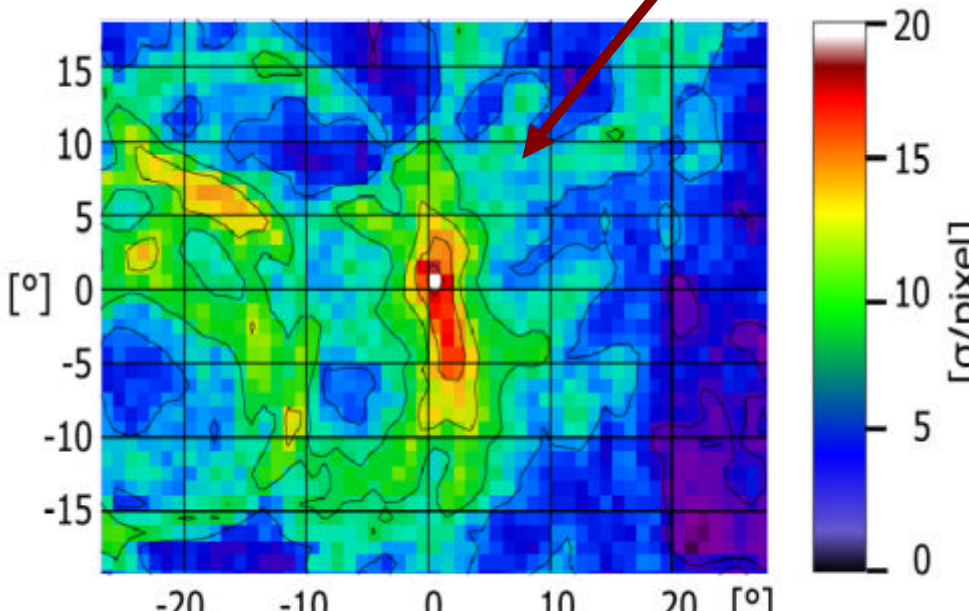


All sky map (equatorial coordinates)

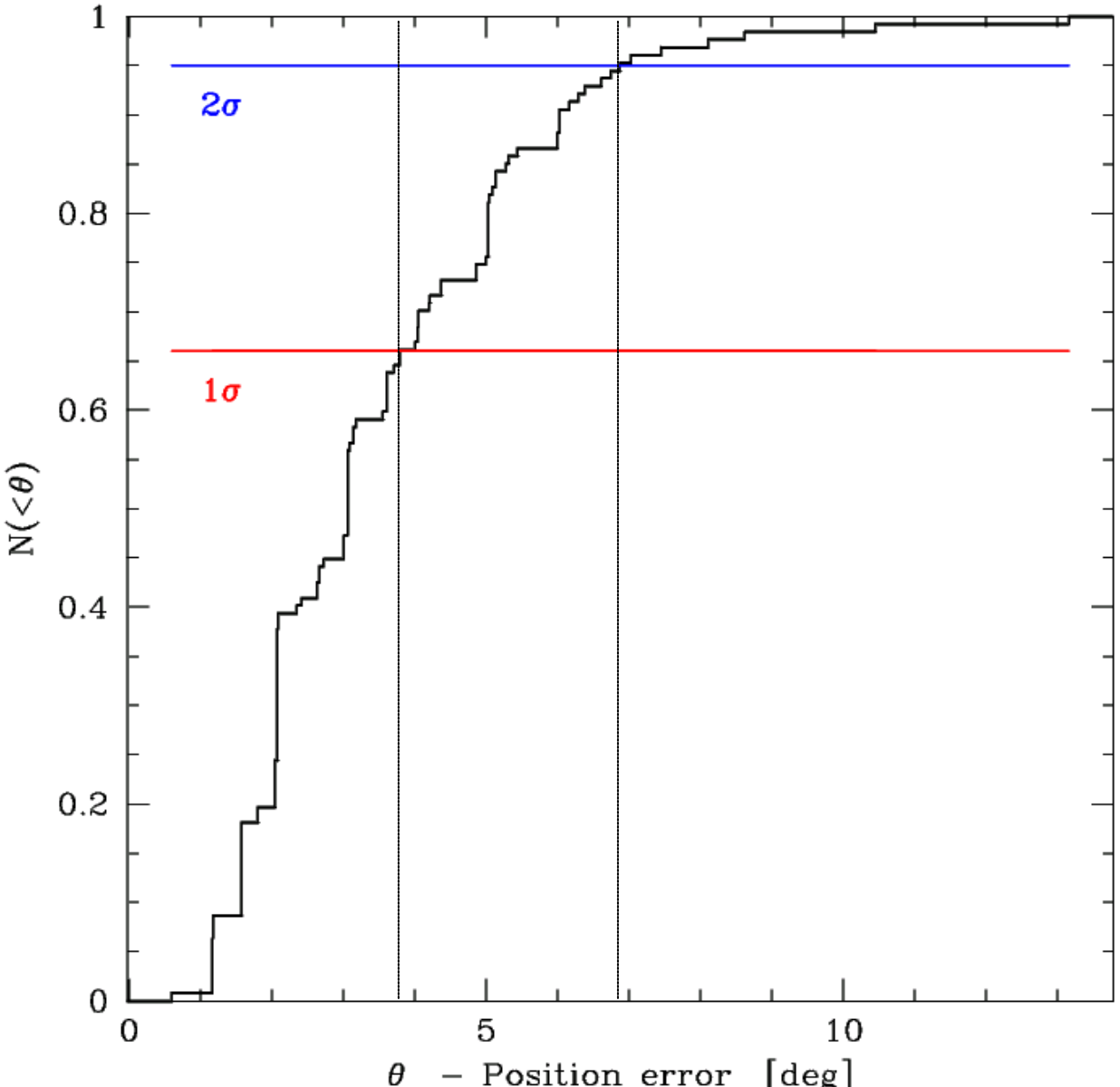


Map centered on the best IPN position (0,0)

Compton kinematics gives the position with 2 deg offset



Compton imaging – positioning accuracy

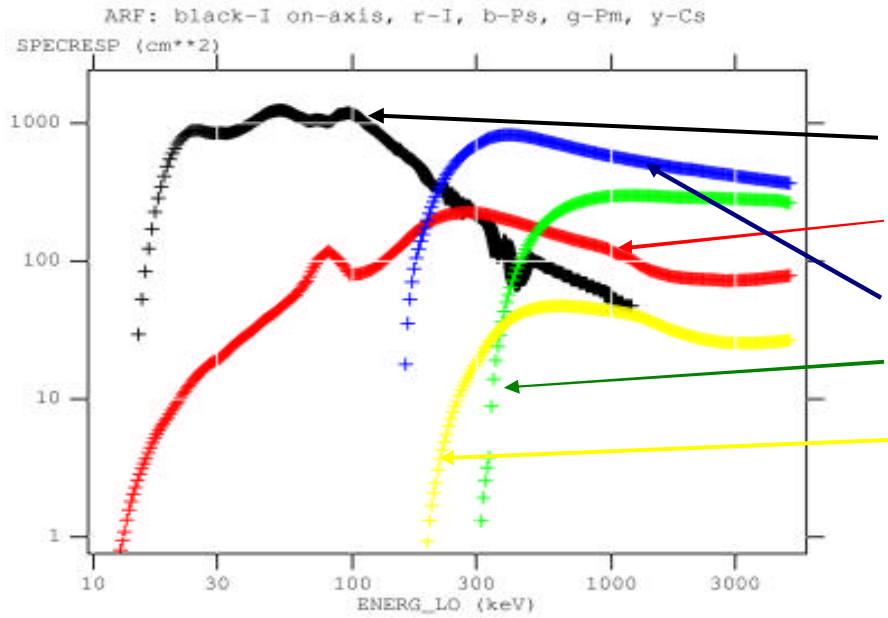


> 100 simulation ru
of the GRB

cumulative distributi
of the position offset

1σ < 4 deg
2σ < 7 deg

Spectral analysis – response



IBIS effective area:

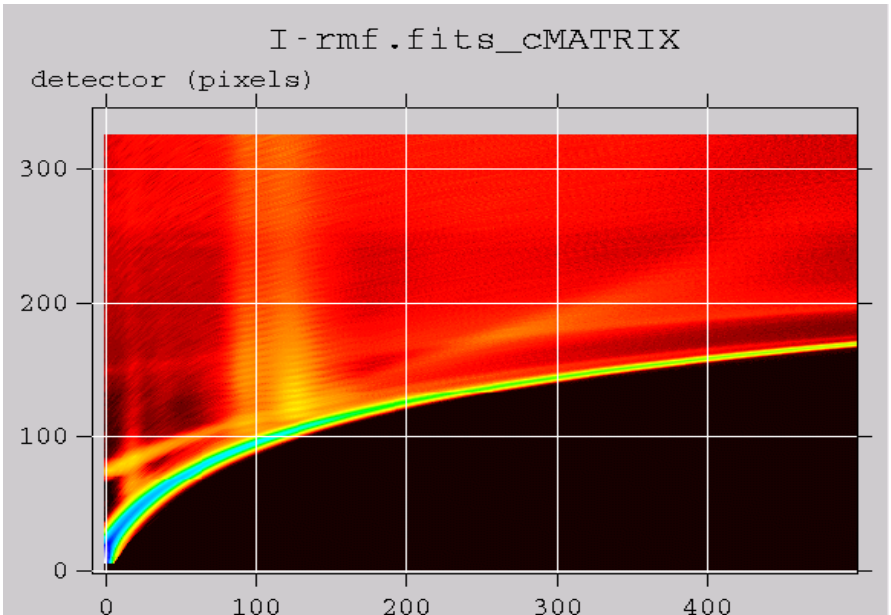
ISGRI on-axis

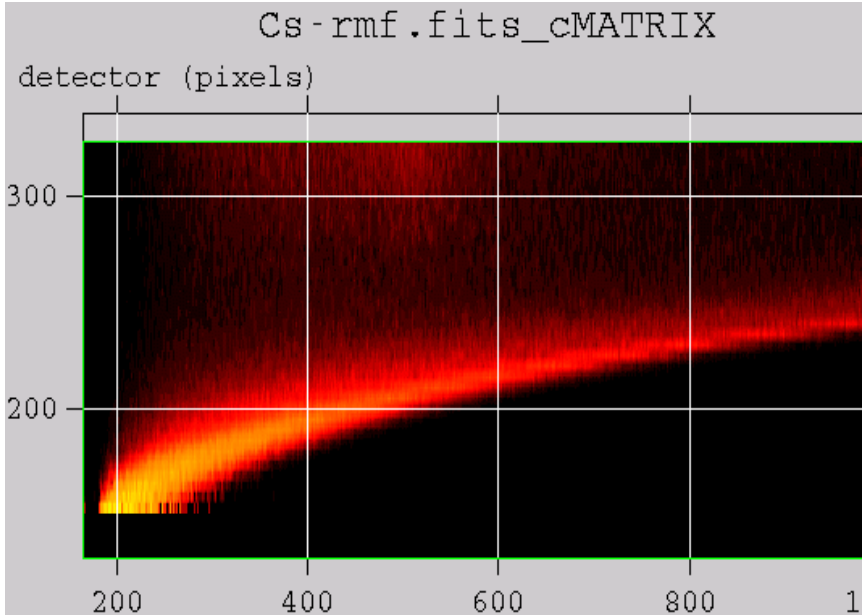
ISGRI

PICSIT single

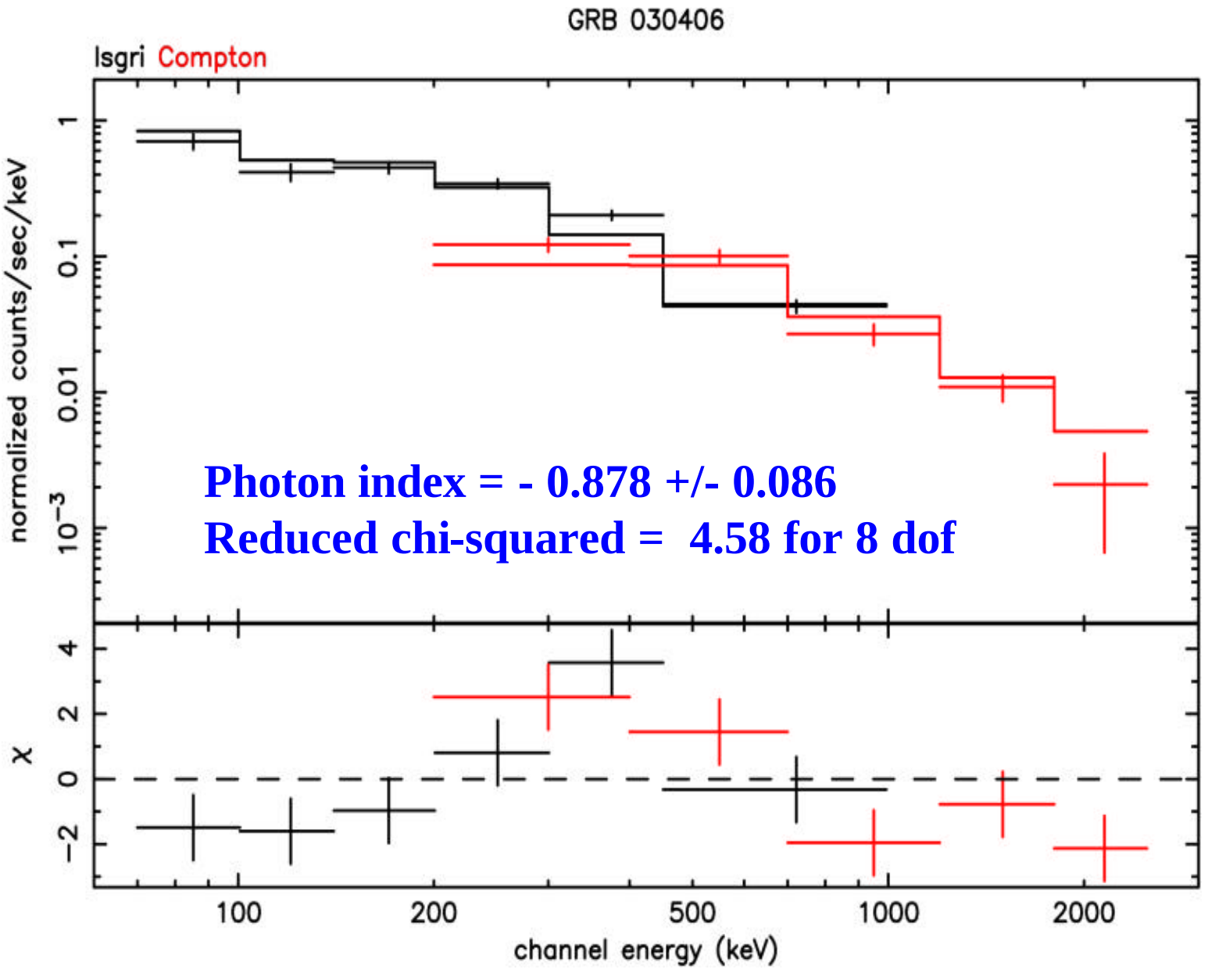
PICSIT multiple

Compton single

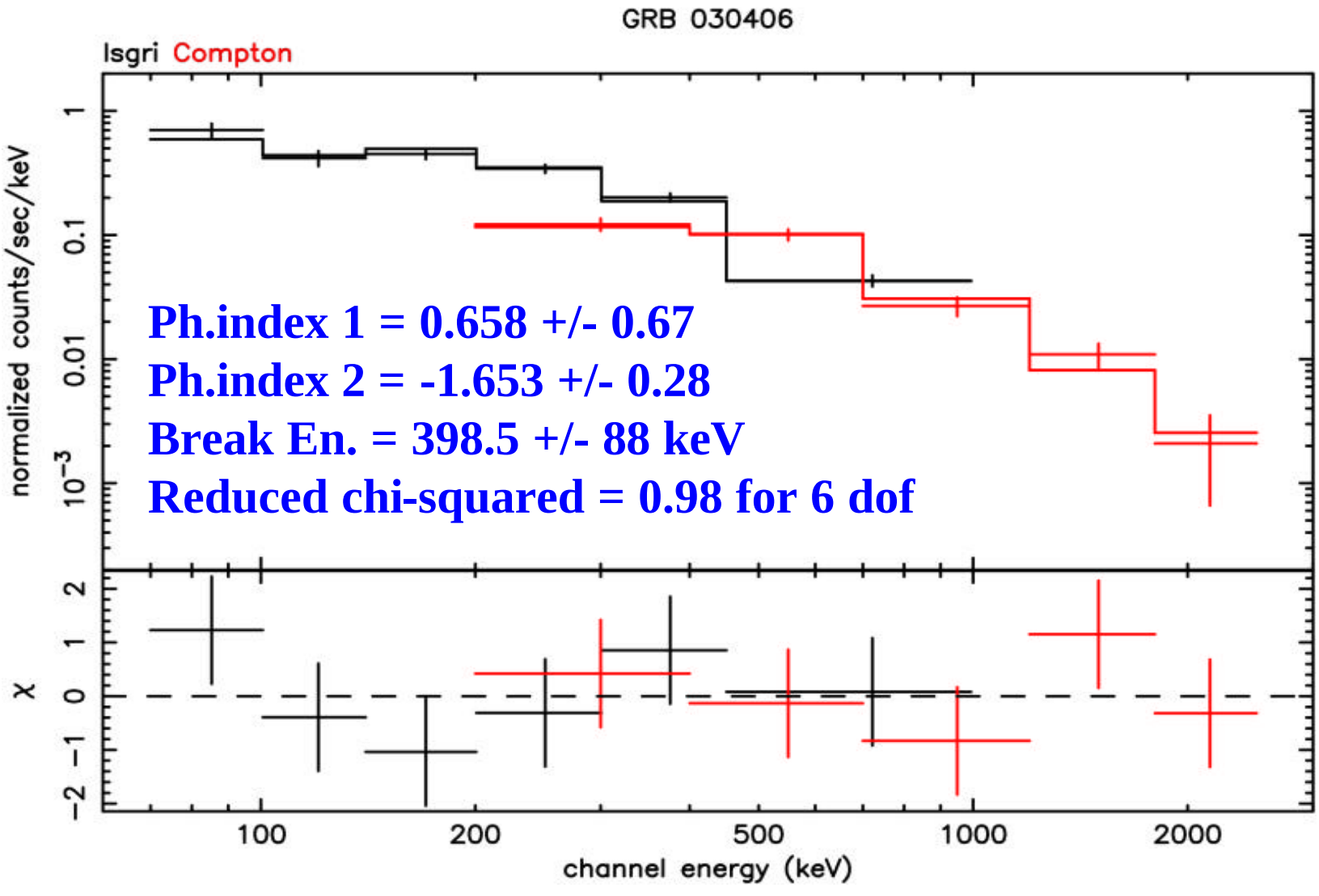




Spectral analysis – single power law



Spectral analysis – broken power law

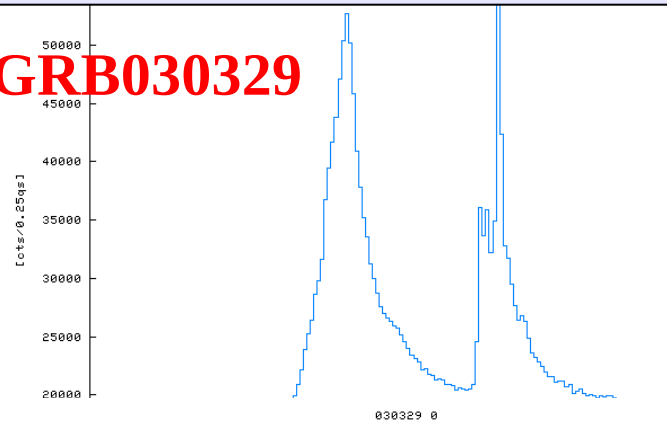


GRBs seen with INTEGRAL -light curves

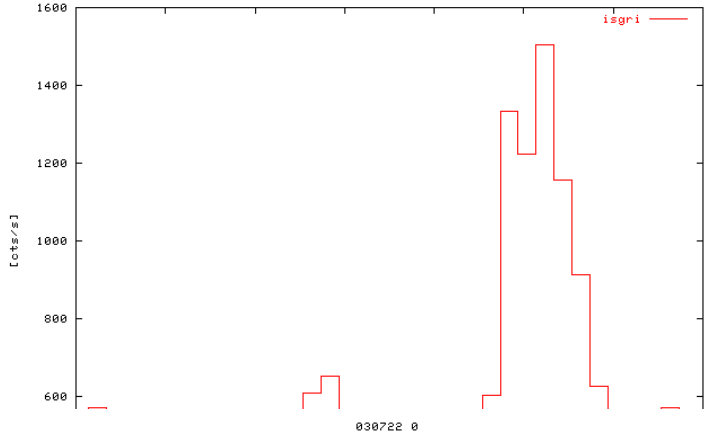
GRB030722

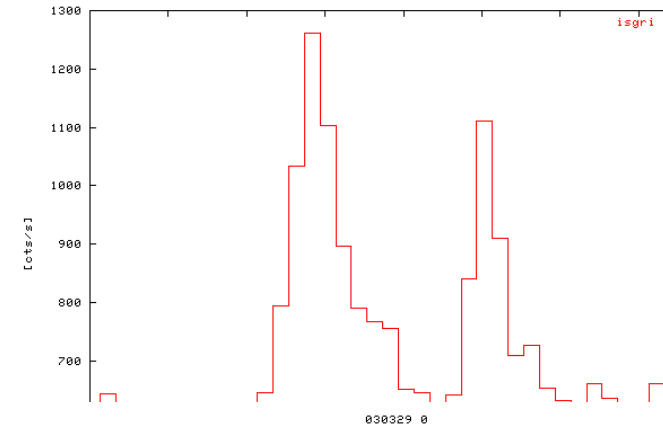
SPI/ACS

GRB030329

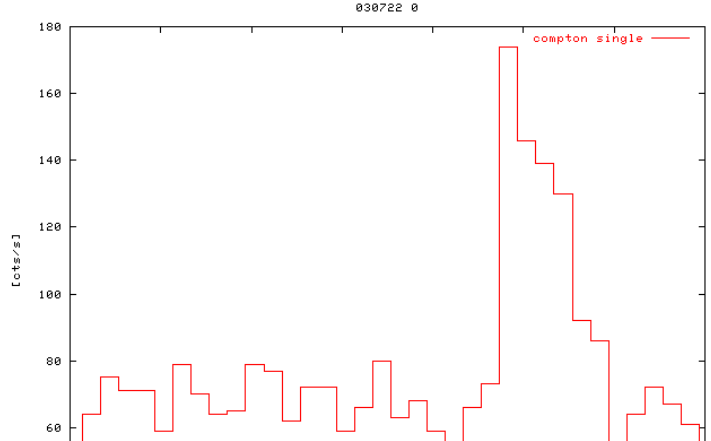


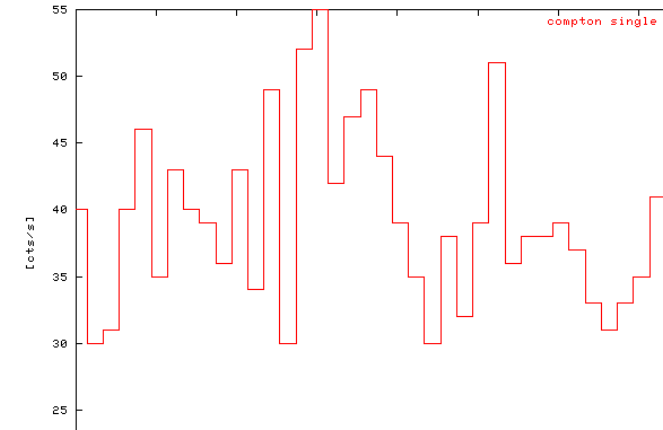
IBIS/ISGRI





IBIS/Compton





SUMMARY

- Off-axis GRBs can be detected by IBIS: ISGRI, PICSIT, Compton
- Compton imaging is possible in the case of hard & strong GRBs
- Spectral analysis ~70 keV – 2 MeV
- GRB 030406 spectrum compatible with a broken power law, index 0 & -1.6, break energy ~ 400 keV
- IBAS will be complemented by the Compton imaging software
- GRBs position with accuracy of ~ 3-4 deg