VARIABLE POLARIZATION MEASURED IN THE PROMPT EMISSION OF GRB 041219A USING IBIS ON BOARD *INTEGRAL*

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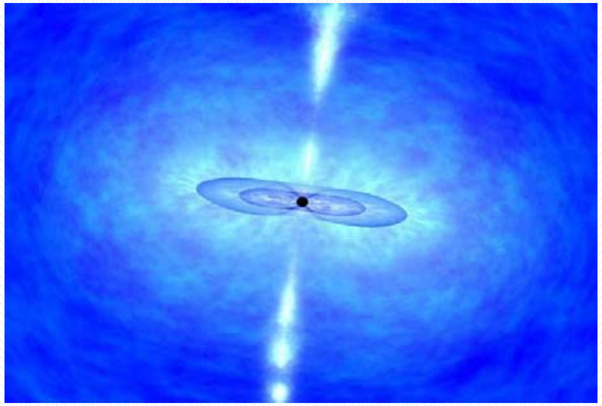
- On December 19, 2004, the Imager on Board the European Space Agency's (ESA) Integral satellite (IBIS) measure the polarization of the prompt γ -ray emission of GRB 041219A.

- IBIS is composed of two position sensitive detector layers ： 1. ISGRI (CdTe, 15–1000 keV), and
  2. PICsIT(CsI, 200 keV–10 MeV)

- As the data were collected, astronomers saw the 500-second-long burst rise to extraordinary brilliance.

- It is in the top 1 percent of the brightest GRBs we have seen.

- Polarization measurements provide a direct insight into the nature of astrophysical processes.
- The blast from a GRB is thought to be produced by a jet of fast-moving gas bursting from near the central engine, probably a black hole created by the collapse of the massive star. The polarization is directly related to the structure of the magnetic field in the jet.



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- We find a variable degree of polarization ranging from less than 4% over the first peak to 43%±25% for the whole second peak.

$\Pi = a_0/a_{100}$, *where* a_{100} *is the* amplitude expected for a 100% polarized source

Table 1
Polarization Results for the Different Time Intervals

Name	T_{start} (UT)	T_{stop} (UT)	Π %	P.A. (deg)	Image (SNR)
First peak	01:46:22	01:47:40	<4	...	32.0
Second peak	01:48:12	01:48:52	43 ± 25	38 ± 16	20.0
P6	01:46:47	01:46:57	22 ± 13	121 ± 17	21.5
P8	01:46:57	01:27:07	65 ± 26	88 ± 12	15.9
P9	01:47:02	01:47:12	61 ± 25	105 ± 18	18.2
P28	01:48:37	01:48:47	42 ± 42	106 ± 37	9.9
P30	01:48:47	01:48:57	90 ± 36	54 ± 11	11.8

Notes. Errors are given at 1σ c.l. for one parameter of interest.

P.A. = $\varphi_0 - \pi/2 + n\pi$

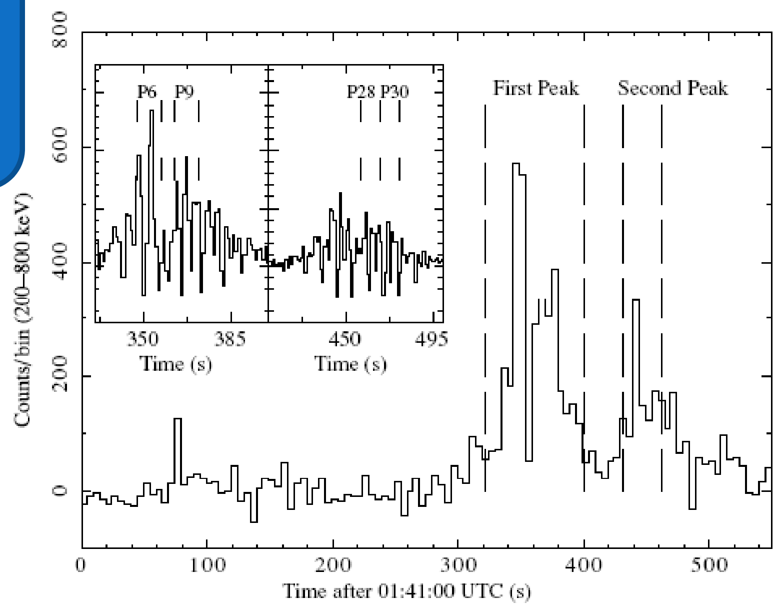

Figure 1. Compton light curve of GRB 041219A. Bin size is 5 s. The two insets show a magnified view of the two peaks, binned at 1 s. The analyzed intervals are shown with dashed lines. P8 is omitted for clarity.

- In the first scenario, the jet carries a portion of the central engine's magnetic field into space.
- A second involves the jet generating the magnetic field far from the central engine.
- A third concerns the extreme case in which the jet contains no gas, just magnetic energy.
- The fourth scenario entails the jet moving through an existing field of radiation.

Götz believes that the Integral results favor a synchrotron model and, of those three, the most likely scenario is the first.

Thank you

- Reference:
- VARIABLE POLARIZATION MEASURED IN THE PROMPT EMISSION OF GRB 041219A USING IBIS ON BOARD *INTEGRAL*
  *(*The Apj, V 695, Issue 2, pp. L208-L212)

- Astronomers dissect a giant stellar explosion
  (http://www.astronomy.com/asy/default.aspx?c=a&id=8086)