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# **CESR Positronium Continuum Analysis: Sky Distribution**

by

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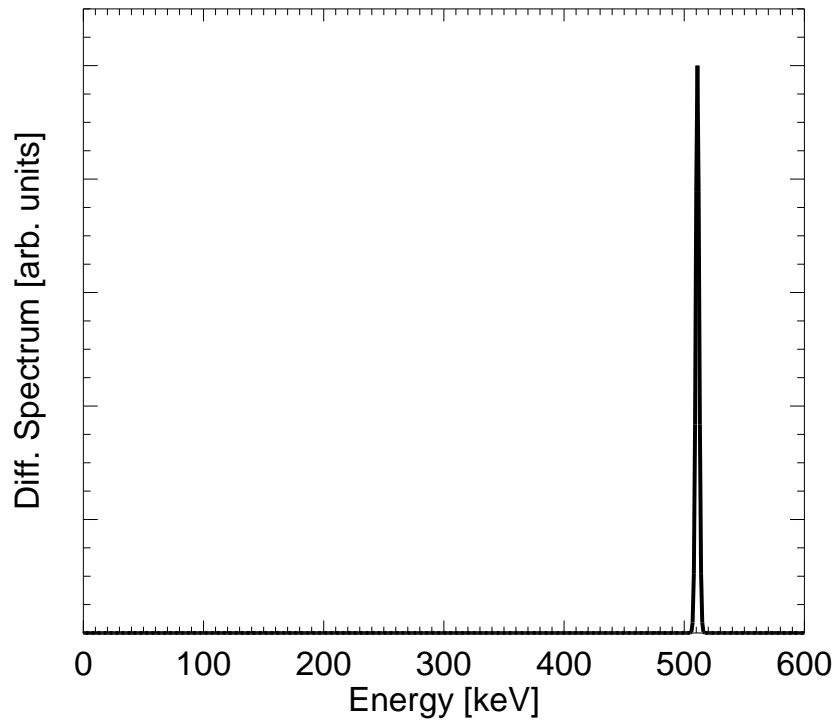
**CESR**

on Behalf of the CESR SPI Team

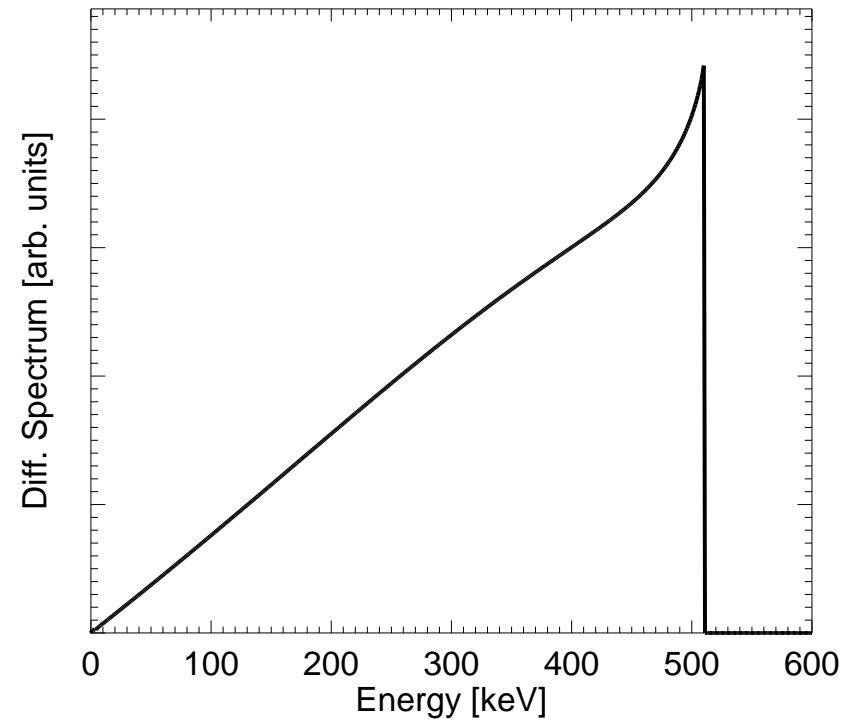
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# Motivation

- For  $f_P \sim 0.92$ :  $F_{3\gamma}/F_{2\gamma} \sim 3.5$   
 $\implies$  most of the  $\gamma$ -ray signal due to positron annihilation is in  $P_s$ !



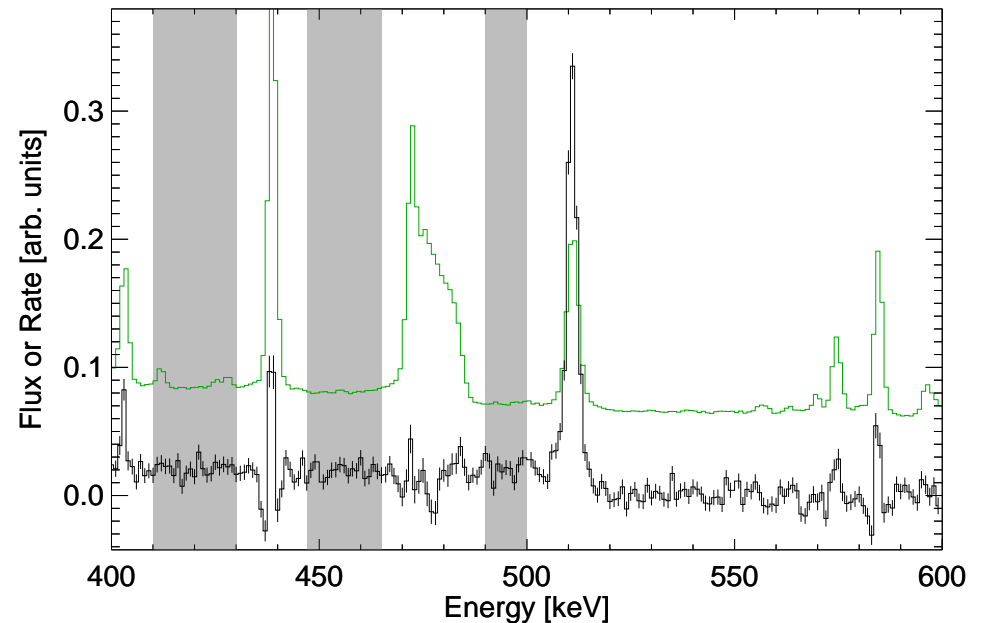
**511 keV Line**



**Positronium Continuum**

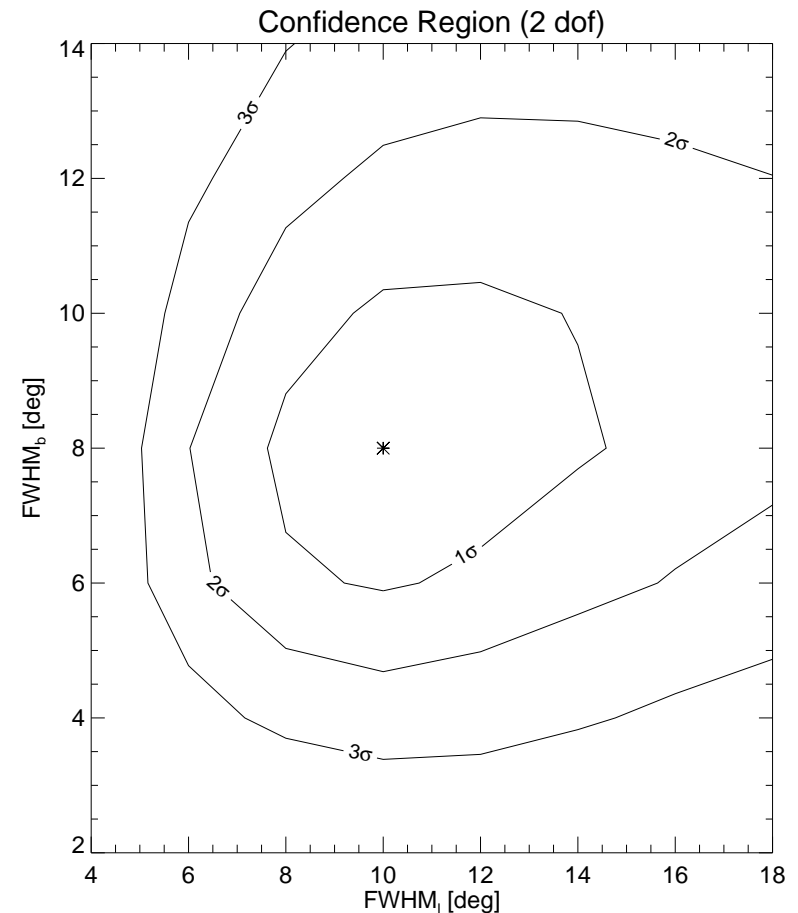
# Background Model / Data Analysis

- As usual, the background modelling is crucial...
- So far: used 511 keV line background model, which has 4 components (all relative to 523-545 keV interval  $\implies$  galactic continuum suppressed):
  - Continuum under 511 keV line
  - 511 keV line: GeDsat
  - 511 keV line:  $^{65}\text{Zn}$  convolved with GeDsat
  - 511 keV line: constant
- Application to 400-600 keV, public data release from Dec. 10, 04 by J. Knödlseher:
  - Works well in general
  - A few strong residuals
  - For Positronium continuum: 410-430, 447-465, 490-500 keV



# Model Fitting / Imaging

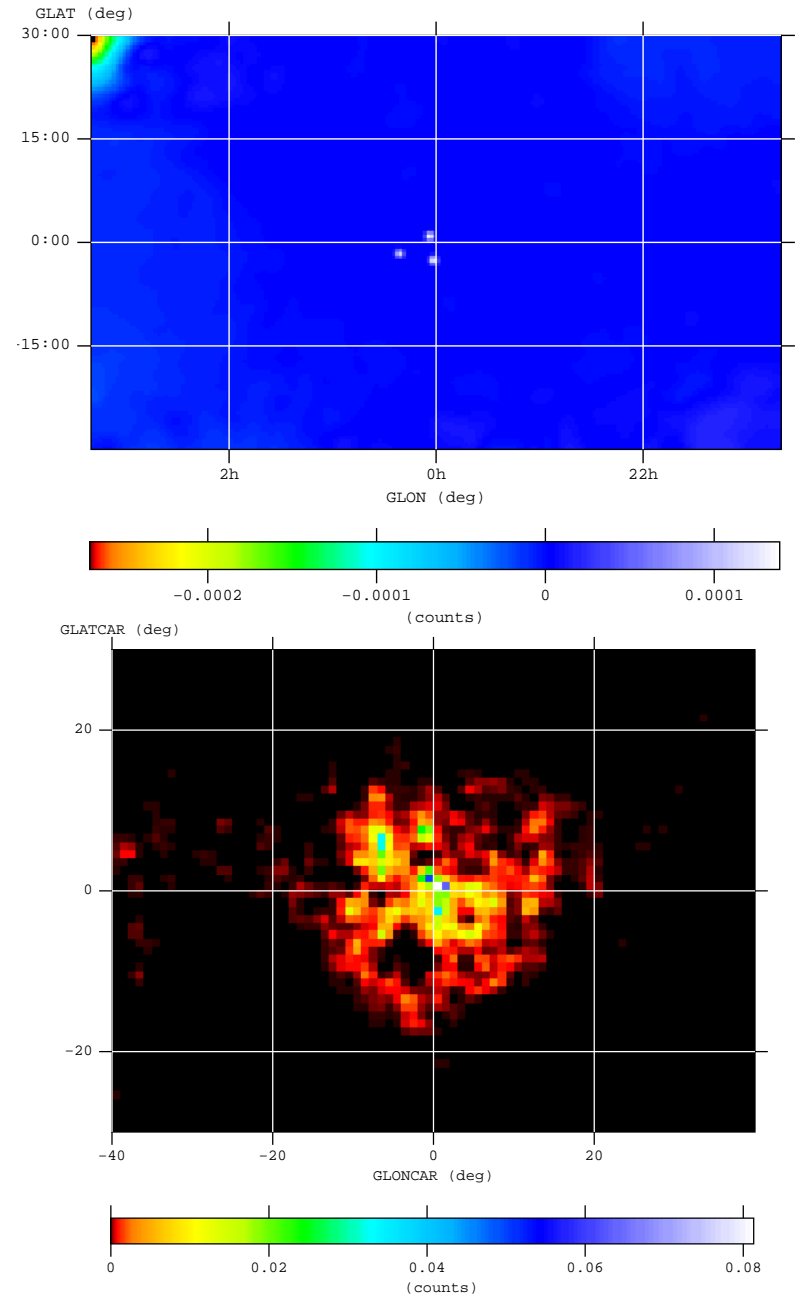
- First step: ellipsoidal distributions with Gaussian radial profile (“2D Gaussians”) in combined energy bands  
⇒  $\text{FWHM}_l \sim 10^\circ$ ,  $\text{FWHM}_b \sim 8^\circ$   
consistent with 511 keV line
- 490-500 keV and 447-465 keV bands are consistent
- **But:** 410-430 keV band is inconsistent!  
 $\text{FWHM}_l \sim 8^\circ$ ,  $\text{FWHM}_b \sim 4^\circ$
- **However:** All bands consistent in LR images!
- Point sources?  
Galactic continuum emission?  
Yet unidentified bias in background model?



# Point Sources

- **SPIROS analysis in 410-430 keV:**  
none of the sources corresponds to known objects...

- **RL imaging:** no obvious point sources in any of the energy bands...



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## Galactic Continuum Emission

- Seems unlikely to cause different behaviour in 410–430 keV  
FWHM<sub>l</sub> should increase, not decrease  
FWHM<sub>b</sub> does decrease, as expected
- Fits including a galactic continuum emission component are running ...

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## Next steps

- Understand biases in the 3 energy bands under study
- Once resolved: use best spatial model to determine  $f_P$
- Full-blown XSPEC analysis  
(requires new background model to extract  $P_s$  and galactic continuum)