A study of gamma-ray selected AGN with INTEGRAL

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INTRODUCTION

- High luminosity AGN (Quasars and Blazars) almost ignored by INTEGRAL.

- Most of them are at the limit of INTEGRAL sensitivity.

- Aim: Measure their spectra to use the results for an INTEGRAL proposal.
Two projects

- PG 1416-129:
  - Highest luminosity Radio Quiet Quasar listed in the 1st INTEGRAL AGN Catalogue.

- MeV Selected Blazars:
  - Study of the small number of blazars emitting in the 1-30 MeV band.
  - Listed in the 1st COMPTEL Source Catalogue.
**PG 1416-129**

- Most of Radio Quiet Quasars are too faint except this one.
- Previous researches ➔ Complex and variable spectrum in 2-10 keV band.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Date</th>
<th>Energy (keV)</th>
<th>$\alpha$ Spectral index</th>
<th>Flux (erg cm$^{-2}$s$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ginga</td>
<td>Feb 1988</td>
<td>2.0-18</td>
<td>0.2 ± 0.1</td>
<td>0.7x10$^{-11}$</td>
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<td>Ginga</td>
<td>Jan 1991</td>
<td>2.0-18</td>
<td>0.5 ± 0.1</td>
<td>0.7x10$^{-11}$</td>
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<tr>
<td>ROSAT</td>
<td>Jan 1992</td>
<td>0.1-2.4</td>
<td>1.2 ± 0.15</td>
<td>1.2x10$^{-11}$</td>
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<tr>
<td>ASCA</td>
<td>Jul 1994</td>
<td>0.5-10</td>
<td>0.78 ± 0.02</td>
<td>1.4x10$^{-11}$</td>
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<tr>
<td>RXTE</td>
<td>Aug 1998</td>
<td>2.5-20.0</td>
<td>0.38 ± 0.06</td>
<td>0.6x10$^{-11}$</td>
</tr>
<tr>
<td>XMM</td>
<td>Jul 2004</td>
<td>2.0-10</td>
<td>0.54 ± 0.02</td>
<td>1.3x10$^{-11}$</td>
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<tr>
<td>INTEGRAL</td>
<td>Jun-Aug 2003</td>
<td>2.0-100</td>
<td>0.77 ± 0.45</td>
<td>14.1x10$^{-11}$</td>
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</tbody>
</table>
Fit of non-contemporary ASCA and RXTE observations
- Fit from XMM data using a combined model.

\[ \chi^2 = 1.0928 \quad \text{dof}=312 \]
\[ \Gamma = 1.89236 \quad \alpha = 0.892 \]
\[ z = 0.129 \]
\[ \text{Eq Width}= 77.86 \text{ eV} \]
Conclusions:

- The absorption Fe line is broadened.
- Bump could be due by reflection.
- PG 1416-129 is one of the most luminosity objects whit this properties.
It's clearly not detected in the INTEGRAL data in this analysis.
Powerlaw
\[ \Gamma = 1.509 \quad \alpha = 0.509 \]
\[ \chi^2 = 1.3651 \quad \text{dof} = 306 \]
MeV Selected Blazars

- Objects very bright on medium energy γ-Ray but unremarkable on X-Ray and unstudied with INTEGRAL (hard X-ray band)

- Scientific aims:
  - Determine if the hard X-ray spectral properties of MeV blazars differ from other AGN.
  - Determine if any of the objects are bright enough for a dedicated INTEGRAL observation.
1st source: PKS0528+134

- It is high variable in the MeV band.
- Brightest observed MeV flux, so remarkable.
- It's near the Crab nebula → Large amount of data
• It's supposed to be seen but We don't do it!
The spectrum ➞ We may use more data.

\[ \Gamma = 1.705 \]
\[ nH = 0.34 \]
Γ = 1.38
nH = 0.53

BeppoSAX

INTEGRAL
- Table fluxes-significances

<table>
<thead>
<tr>
<th>Source</th>
<th>Flux 2-10·10^{-11} erg/cm^2s</th>
<th>Flux 2-10 photons</th>
<th>Flux 20-100 photons</th>
<th>Exposure ks</th>
<th>Significance</th>
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<tbody>
<tr>
<td>PKS0528</td>
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<td>0,00038906</td>
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<td>PKS2230</td>
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<td>PKS1222</td>
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</table>
FUTURE

- Write up X-Ray properties of PG1416-129.
- Study the rest of sources looking at the table to choose the best one to continue.
- Write the proposal if it's possible.
- Lot of work to do.