Relativistic Iron K line in the X-ray spectra of AGN

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X-ray Emission

To observer

"Reflection spectrum"

Direct Power-law
X-ray emission

The X-ray analysis is a fundamental key to probe the innermost regions of the AGNs.

- **Continuum**: power law
- **Fluorescence**: emission lines
- **Reflection**: Compton Hump

Reynolds et al. 1995
Motivations

Broad iron lines are expected to be a widespread feature in the bright AGN

Guainazzi et al. (2006), Nandra et al. (2007), de La Calle Pérez et al. (2010)

Bhayani & Nandra 2011: Strong relativistic Effects

Still in some sources relativistic component is missing
**Sources and Data**

<table>
<thead>
<tr>
<th>Object</th>
<th>Flux 5-7 keV</th>
<th>#Suzaku Obs</th>
<th>Exposure (ks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGC 2110</td>
<td>3.4</td>
<td>2</td>
<td>205.300</td>
</tr>
<tr>
<td>NGC 5506</td>
<td>2.7</td>
<td>3</td>
<td>158.455</td>
</tr>
<tr>
<td>IC 4329A</td>
<td>2.6</td>
<td>6</td>
<td>248.820</td>
</tr>
<tr>
<td>MCG +8-11-11</td>
<td>1.6</td>
<td>1</td>
<td>98.750</td>
</tr>
<tr>
<td>NGC 7213</td>
<td>0.57</td>
<td>1</td>
<td>90.750</td>
</tr>
<tr>
<td>MRK 110</td>
<td>0.48</td>
<td>1</td>
<td>90.900</td>
</tr>
<tr>
<td>NGC 7469</td>
<td>0.49</td>
<td>1</td>
<td>112.100</td>
</tr>
<tr>
<td>NGC 5548</td>
<td>0.46</td>
<td>7</td>
<td>209.435</td>
</tr>
<tr>
<td>MRK 590</td>
<td>0.18</td>
<td>2</td>
<td>102.520</td>
</tr>
</tbody>
</table>

We used Suzaku data in order to have better constraints on the high energies spectra.

We applied the same fitting process of Nandra et al. (2007)
IC 4329A

Significance between 2-4σ for single observation

Model:
zwabs*(pexrav+zgauss)

Mantovani et al. 2014
Relativistic emission detected in IC 4329A
(>5.5σ significance)

Model: zwabs*(pexrav+zgauss+Laor)  
Mantovani et al. 2014
Relativistic Iron Ka line common feature in AGN

Model: pexrav+zgauss+Laor

Mantovani et al. 2015, submitted
Relativistic Pexmon

Fe Kα (6.4 keV), Fe Kβ (7.06 keV) flux 11.3% of Kα, Ni Kα (7.47 keV) flux 5% of Kα

Compton Reflection (pexrav)

Fe Kα Compton shoulder

Nandra et al. 2007
Relativistic Pexmon

Model: cutoffpl+pexmon+kdblur*pexmon
Relativistic Pexmon

In general, the Pexmon model gives similar fit to the data compared to the phenomenological one.

MCG+8-11-11 $\Delta \chi^2/\Delta$ d.o.f. > 123/1

IC 4329A $\Delta \chi^2/\Delta$ d.o.f. > 57/1

Mantovani et al. 2015, submitted
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Relativistic Pexmon

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IC 4329A \( \Delta \chi^2 / \Delta \text{d.o.f.} > 57/1 \)

Mantovani et al. 2015, submitted
Conclusions

- Detection of broad iron line in IC 4329A when the data are combined

- We do not detect the relativistic line only when the statistics is low $< 2 \times 10^4$

- Data consistent with a correlation between the emission of the Reflection and the Iron Kα emission line