

THE HARD X-RAY REFLECTION ON COLD MATTER

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1. INTRODUCTION

We have simulated the reflection on cold matter (1,2,3&5) in a variety of situations to determine which informations can actually be inferred from observations. We modelled a semi-infinite plane parallel medium of solar abundance matter (4), semi-isotropically illuminated by a X/ γ ray source. The spectra are calculated from a Monte-Carlo method without any approximation in the cross-sections. Θ is the angle over which the reflecting matter is seen (90° =face-on), Θ =all means a spatially integrated spectrum. Fref is the ratio of the reflected over direct component.

2. DISCUSSION

The presence of a reflected component introduces a hump between 10 and 500 keV (1,2,3). More precisely, our study has shown that:

- * small values of Θ , Fref or Nh (10^{-24} cm $^{-2}$) can explain the no detection of this phenomenon even when cold matter is present in the vicinity of the source.
- * we can obtain rather identical spectra for several couples (Fref, Θ) (fig.1).
- * the 2 breaks occur at 10 keV and 30 keV almost independently of the parameter values. However, the 2nd slope change is smooth and can mimic a thermal law. Moreover, a comptonized primary spectrum may hide this feature.
- * between 30 and 60 keV, the composite (direct+reflected) spectrum seems to have a slope close to that of the primary one. A deficit of photons occurs below and above this energy range.
- * above 30 keV, the reflection effect is hard to interpret due to the curved shape of the spectrum. A broken power law fit will give results depending on the energy band chosen.

3. CONCLUSION

It is very likely that cold matter and reflection exist in AGNs central regions. It is thus crucial to get data from 2 to ~ 60 keV with the same instrument and a good sensitivity to determine how the spectrum is affected and deduce informations on the source environment. However, as Fref and Θ act similarly, their values will be generally model dependent. The primary spectrum must also be investigated.

References:

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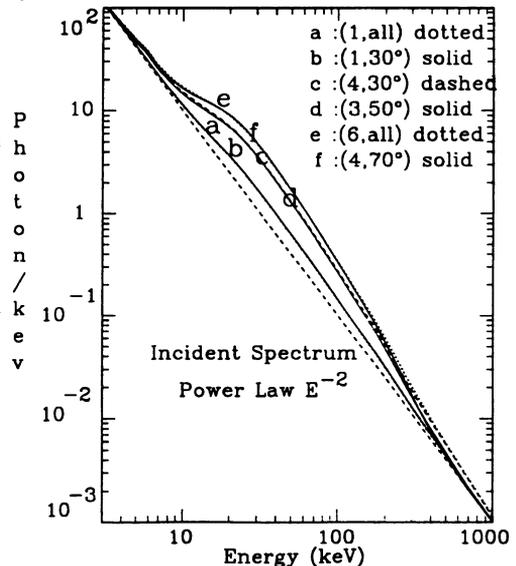


Fig.1: Spectra obtained for different couples (Fref, Θ) as indicated for each label