Osservatorio Astronomico di Brera

Searching for absorbed-AGN in the 2XMM-Newton Source Catalogue

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in collaboration with
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Part of an extended evaluation of the 2XMM Catalogue in the context of the Survey Science Centre work

Scientific Goals

Obscured AGN should numerically dominate the AGN population
→ 85% of the accretion power in the Universe could be absorbed (Fabian et al. 1998, MNRAS, 297, L11)

★ To select rare and interesting (e.g. Absorbed AGN, Type 2 QSOs) populations of X-ray sources to increase the current statistics.

★ Here we present a pilot-project with the aim of assembling a larger (about hundred) sample of obscured AGN

Absorbed AGN

To **efficiently** select absorbed AGN is not an easy task !

Nuclear properties affected by absorption in optical & soft X
→ optical and soft X-ray surveys not efficient to select them

Hard X-ray data (2-10 keV) are needed
→ Problem of absorption less severe

However at bright fluxes, even in the 4.5-7.5 keV band,
the majority of sources are 'unabsorbed' AGN
(75% - Della Ceca et al. 2006 from the Bright Survey)

Therefore efficient seletion criteria are needed !

Selected results from the Hard Bright Sample

Selection Band = 4.5 – 7.5 keV, Fx >7 *10^{14} cgs

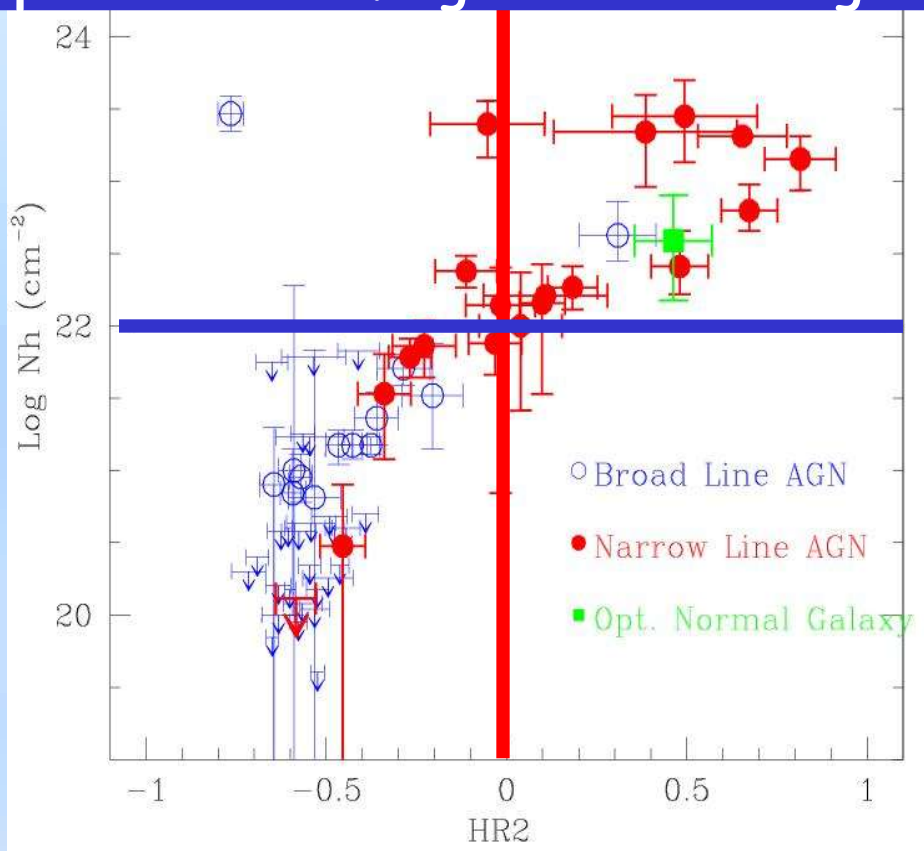
The nice correlation between the instrinsic absorption and HR2 found out for the HBS is very useful to exploit the incoming 2XMM catalogue

HR2 extremely efficient to select absorbed sources

100% of the sources with HR2>0 (up to z≈0.8) are absorbed and 4/13 are Type 2 QSOs

Energy bands:
2) 0.5 - 2.0 keV
3) 2.0 - 4.5 keV

$$HR2 = \frac{CR3 - CR2}{CR3 + CR2}$$



Caccianiga et al., 2004, A&A, 416, 901
Della Ceca et al., 2004, A&A, 428, 383
Della Ceca et al., 2005, astro-ph/0510845

Searching "with high efficiency" for absorbed AGN in the 2XMM catalogue (Watson et al., 2006, in preparation)

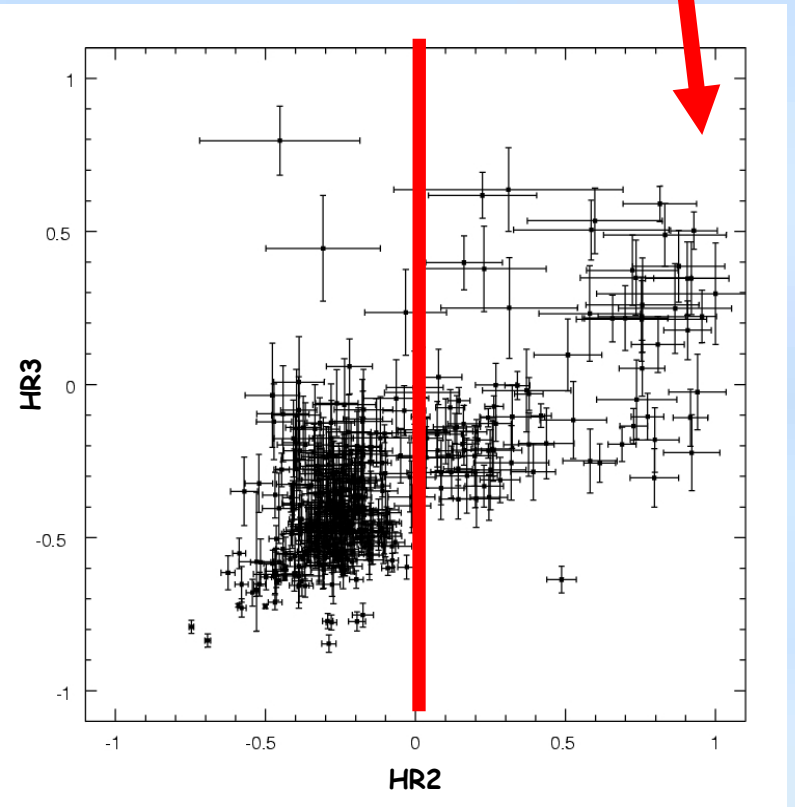
★ OABrera is a member of the XMM-Newton Survey Science Centre ★

Preliminary version (100.000 Sources)

Selections:
|b|>20 deg
Exposure>20 Ksec
Flux (4.5-12 keV)>10^{-13} cgs
Likelihood (4.5-12 keV)>20
Target excluded

389 Sources

91 X-ray sources with HR2>0



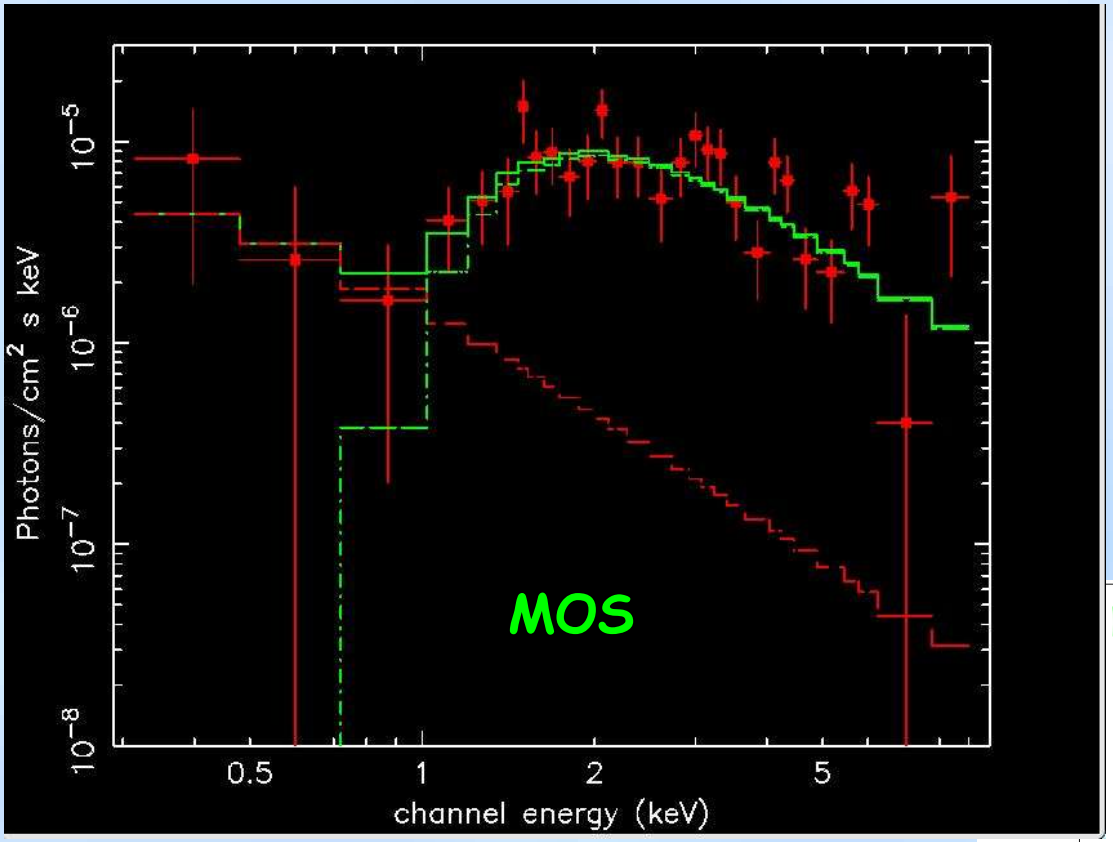
Work in progress @OABrera

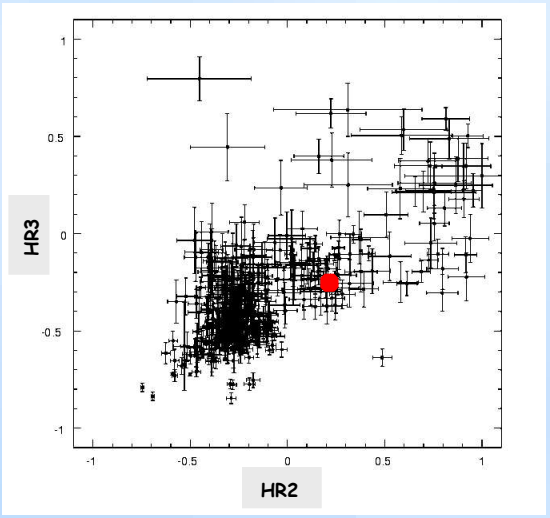
Energy bands:
2) 0.5 - 2.0 keV
3) 2.0 - 4.5 keV
4) 4.5 - 7.5 keV

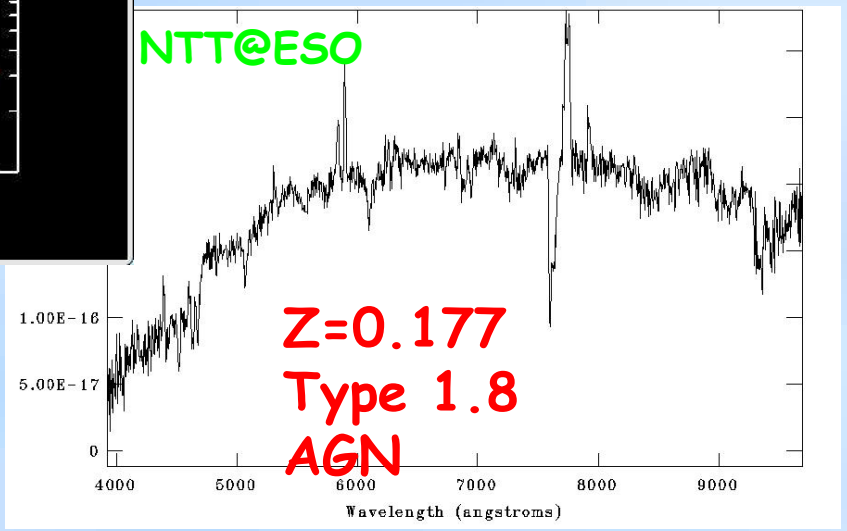
$$HR2 = \frac{CR3 - CR2}{CR3 + CR2}$$

$$HR3 = \frac{CR4 - CR3}{CR4 + CR3}$$

Newly identified absorbed AGN @OABrera







XMM X-ray spectrum

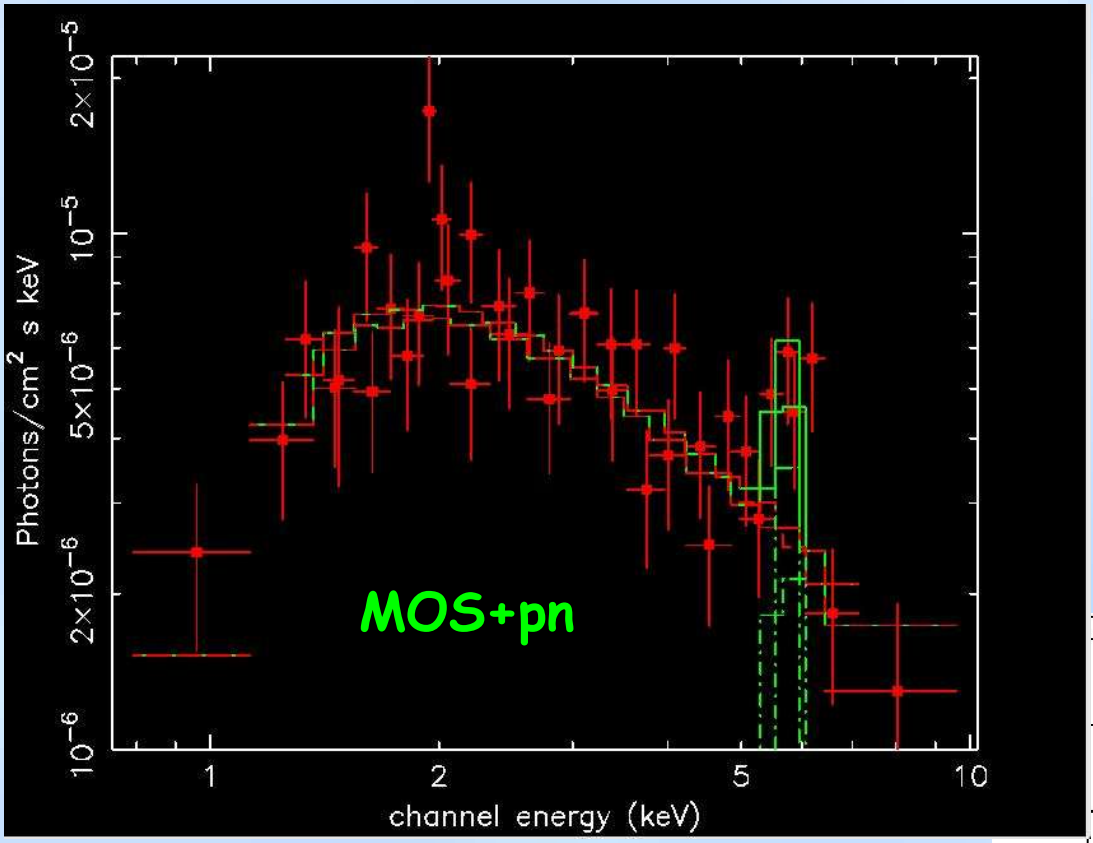
$\Gamma \approx 1.9 \pm 0.5$

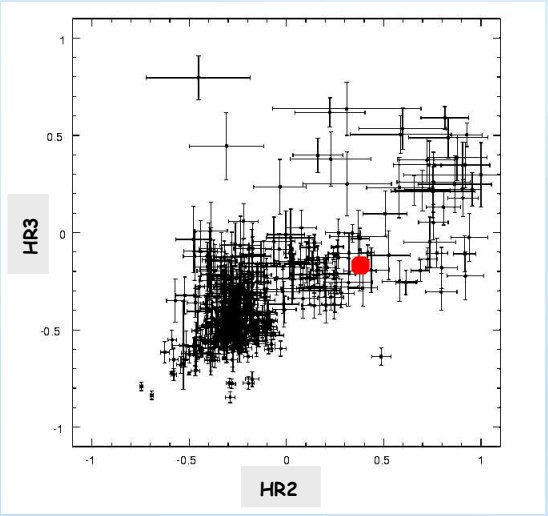
$N_H \approx 2.5 \pm 1.5 \times 10^{22}$ cm^{-2}

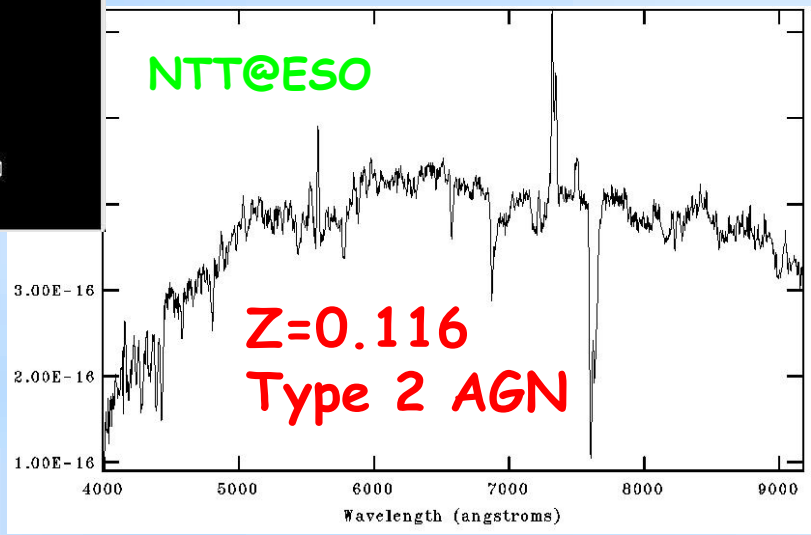
$L_{Intr(2-10\ keV)} \approx 2 \times 10^{43}$ cgs

Memola et al. 2006, in preparation

Newly identified absorbed AGN @OABrera







XMM X-ray spectrum

$\Gamma \approx 1.4 \pm 0.3$

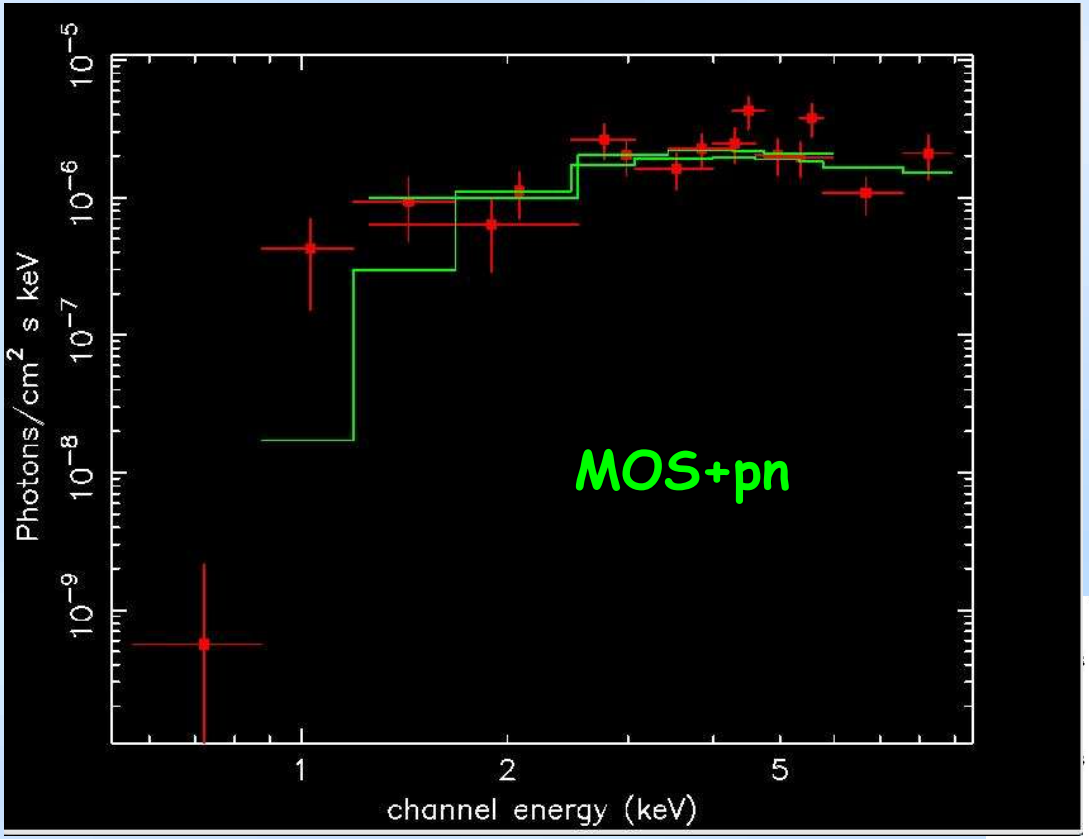
$N_H \approx 1.5 \pm 0.5 \times 10^{22}$ cm^{-2}

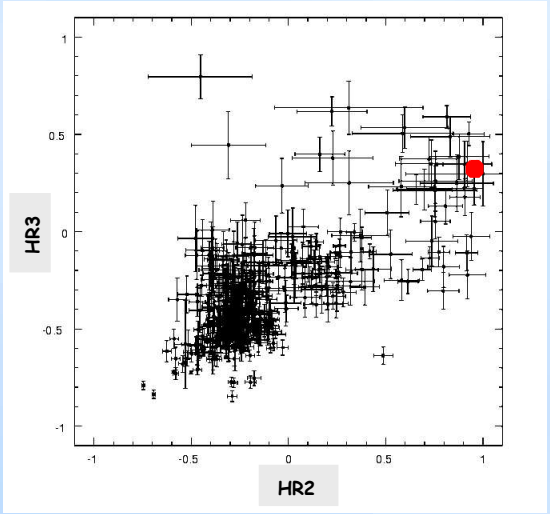
$Fe_{line} \approx 6.34^{+0.43}_{-0.11}$ EW$\approx$700eV

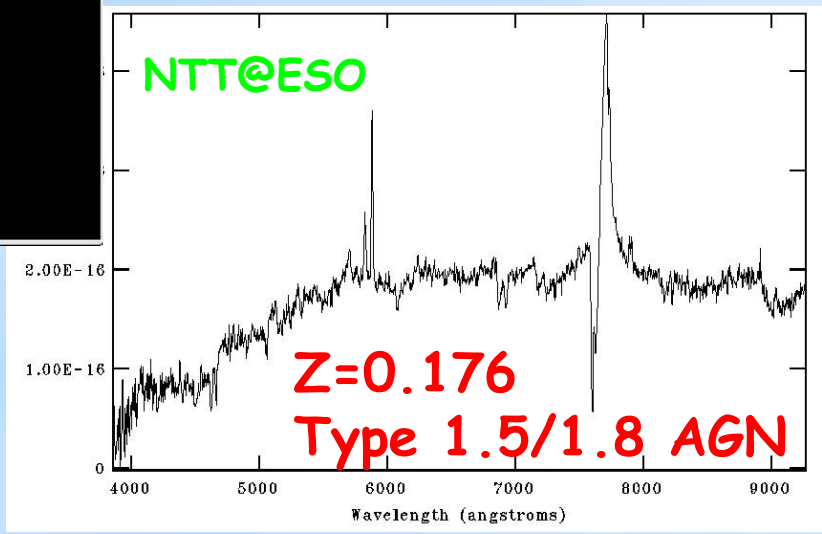
$L_{Intr(2-10\ keV)} \approx 8 \times 10^{42}$ cgs

Memola et al. 2006, in preparation

Newly identified absorbed AGN @OABrera







XMM X-ray spectrum

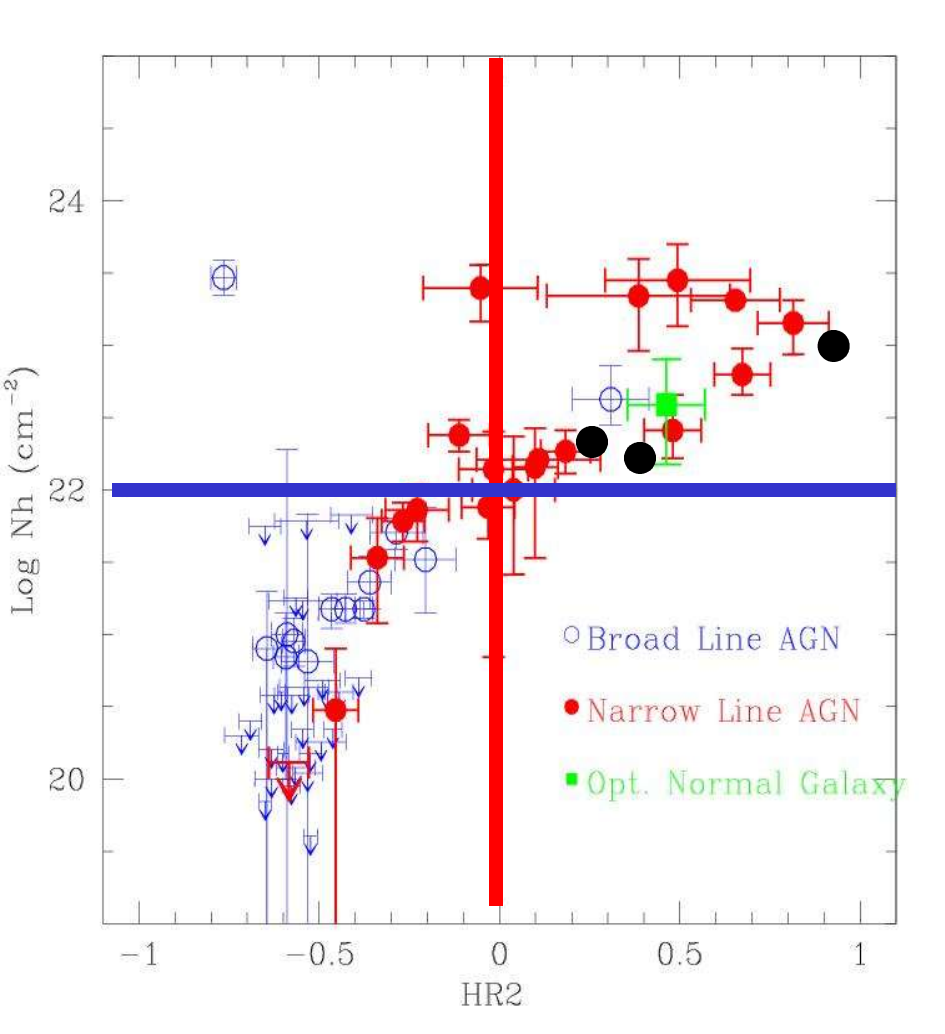
$\Gamma \approx 1.9$ (frozen)

$N_H \approx 1.1^{+0.45}_{-0.27} \times 10^{23} cm^{-2}$

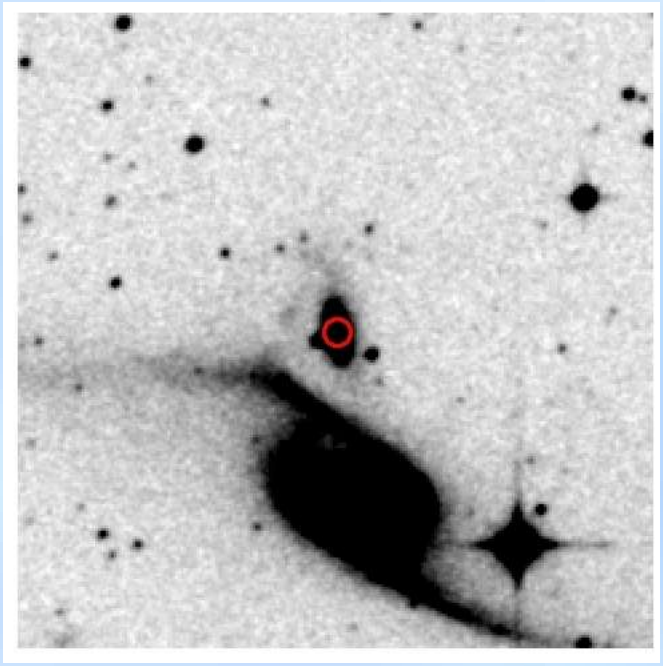
$L_{Intr(2-10\ keV)} \approx 2 \times 10^{43}$ cgs

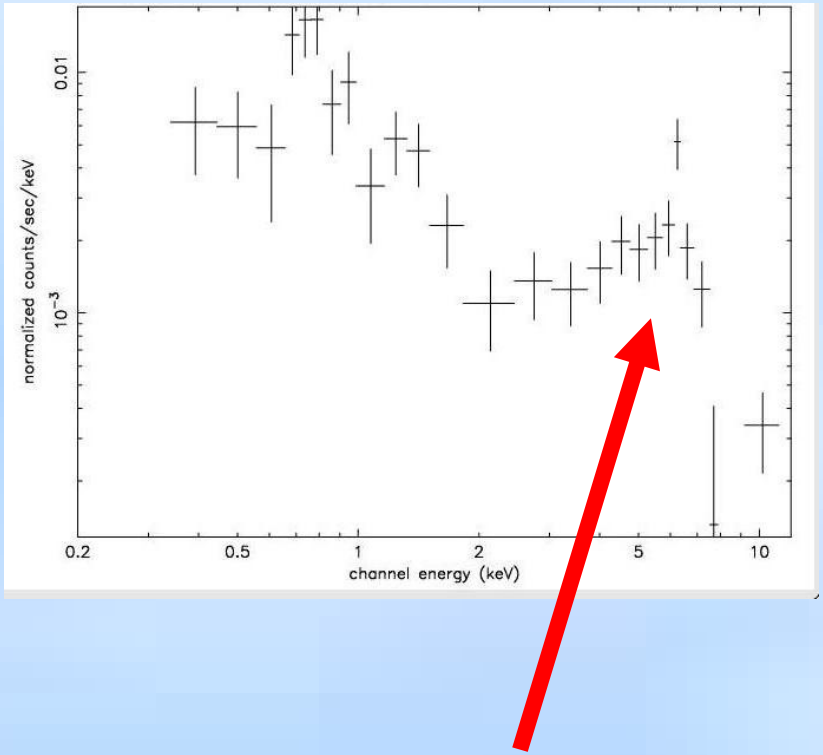
Memola et al. 2006, in preparation

A confirmation of the criteria efficiency



An interesting example

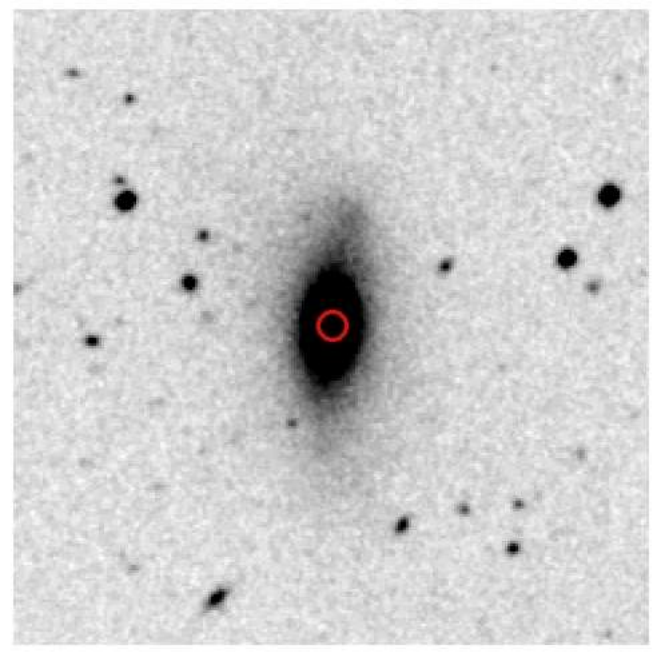


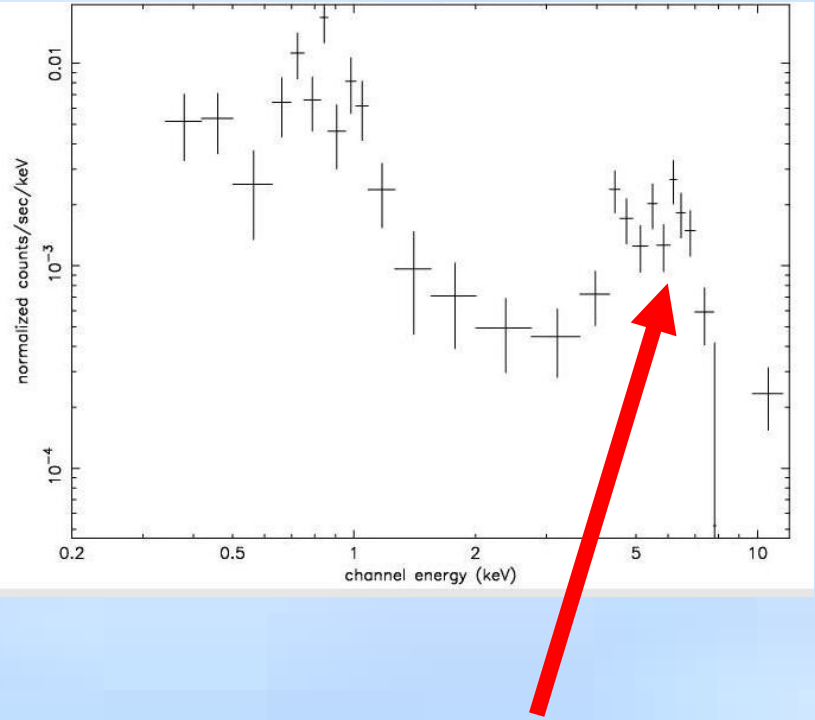


Z=0.016

This close source shows in X-rays the typical cutoff of absorbed AGN

Another interesting example





Z=0.021

This close source also shows in X-rays the typical cutoff of absorbed AGN

Summary and Future

2XMM-Pilot-Sample of 54 sources

14 ID (10 literature + 4 NTT):
10 Ty2 AGN (Sy 1.8,1.9,2), 1 Sy 1.5 (?), 2 Ty2 QSOs, 1cluster

Efficient criteria to select optically absorbed sources !!!

3 X-ray spectra analyzed: $N_H > 10^{22}$ cm^{-2}

TNG proposal (submitted) - 17 sources

Final Goals

- Discover about hundred absorbed AGN to trace the accretion history of the Universe

- Where are the high Luminosity AGN with narrow lines and how many are them? ~30% of the HBS are QSO2!

We thank ASI and INAF for partial financial support