PRELIMINARY RESULTS FROM THE XMM MEDIUM DEEP SURVEY

L. MARASCHI, M. TAJER, G. TRINCHIERI
INAF Osservatorio Astronomico di Brera, via Brera 28, Milano, Italy

L. CHIAPPETTI, L. PAIORO, D. MACCAGNI
IASF via Bassini 15, Milano, Italy

M. PIERRE
CEA/DSM/DAPNIA Sérvice d'Astrophysique, Saclay, France

J. SURDEJ
Institut d'Astrophysique et Géophysique, Université de Liège, Belgium

O. LE FÈVRE
LAM, Marseille, France

The XMM Medium Deep Survey (XMDS) is a joint program that involves three XMM hardware institutes (in Milan, Italy; Saclay, France; Liège, Belgium) and the VLT Deep Survey consortium (VVDS). The project aims at obtaining deep multiwavelength coverage of a $\sim$ 2 deg^2 area: U, B, V, R and I images have already been obtained at a depth equivalent to $I_{AB} = 25.3$ (Le Fèvre et al., 2004, A&A 417, 839; McCracken et al., 2003, A&A 410, 17; Radovich et al., 2004, A&A 417, 51), a radio survey has been completed at VLA (Bondi et al., 2003, A&A 403,857), and a spectroscopic survey is in progress (Le Fèvre et al., 2004). The X-ray band is covered by 19 XMM-Newton pointings, with a nominal exposure of 20 ksec each. In the 18 useful fields analyzed with a pipeline adapted from Baldi et al. (2002, ApJ 564, 190) we detect 1322 sources (including multiple detections in overlapping fields) with a probability that they are a background fluctation P$< 2 \times 10^{-4}$ in at least one of the energy bands considered and flux in the range $\sim 10^{-12} - 10^{-17}$ erg cm^{-2} s^{-1}.

We have started a systematic investigation of the properties of the X-

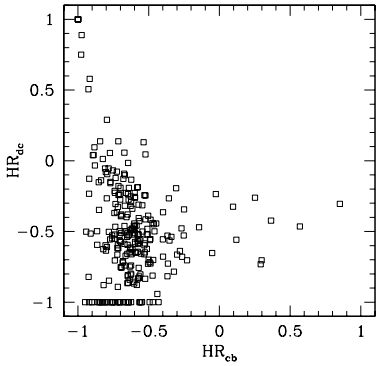

Figure 1. Distribution of Hardness Ratios for the "4σ" sample. Energy bands are defined as: b:0.5-2, c:2-4.5, d:4.5-10 keV.

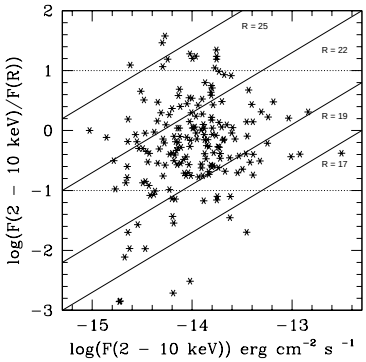

Figure 2. $F_{(2--10keV)}/F_{R-band}$ ratio vs f_x for the "identified" sources. Horizontal lines at ± 1 enclose the region of classical AGNs, starbursts are at < -1, candidate obscured AGNs at > 1.

ray optical counterparts. We have selected a "4σ" sample (ie, 4σ detection in at least one band, in the flux range $2 \times 10^{-16} - 5 \times 10^{-13}$ erg cm^{-2} s^{-1}) in the area already covered by the VVDS: of the 338 detection, or 294 unique sources, 97% are detected in the 0.5 – 2 keV band, and a mere $\sim 2\%$ is detected in the harder band **only** (and *none* above 4.5 keV), indicating a peculiar or highly absorbed spectrum for a very few sources. This is confirmed by the distribution of Hardness Ratios (Fig. 1), that shows only a few deviant sources from the bulk. A more quantitative study of the HR distribution is in progress.

A search in the optical images in a $6''$ radius from the X-ray sources gives a likely identification for over $\sim$ 50% of the sources, either with a single counterpart or with the brightest (Δmag $> 3-4$) *and* closest object, often ($\sim 1/5$) also coincident with a compact radio source. Without proper spectroscopic data some ambiguity remains in associating the X-ray emission to a single object or to a group/cluster, since a significant fraction of sources appears in relatively crowded fields ($\sim 1/4$).

F_x/F_0 ratios are plotted in Fig. 2 for the "identified" sources. The vast majority $\sim$82% lies in the region of the AGN population, a smaller percentage $\sim$ 11% is in the starburst - normal galaxies range, and $\sim$ 6% are candidate obscured AGNs.

At the time of writing we are completing the X-ray/optical association and checking on the robustness of the X-ray products (positions, fluxes and HR) before releasing the catalog to the community.