HIGH RESOLUTION SPECTROSCOPY OF AGN IN OUTBURST: THE GASEOUS NUCLEAR ENVIRONMENT AND THE WIGM

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This grant is associated to a successful XMM-AO2 proposal to observe blazars in outburst states, to X-ray the intergalactic medium, searching for intervening ionized absorption. The observation was triggered on August 31 2003, on the blazar 1H 0414+009 (z=0.287), when the target was showing a level of activity of about 20 mCrab in the total XTE-ASM band. The observation was performed 1 day later (on September 1, 2003) and lasted for 79 ks (79 % of the requested time). Unfortunately, assuming that the XTE-ASM notification was real, the target had recovered his quiescent level of ~ 0.35 mCrab, when the XMM RGS observed it. This, combined with the lower-than-requested exposure, produced an XMM-RGS spectrum containing only ~ 40 counts per resolution element in the 24.1 < lambda(A) < 30 range, insufficient to detect even the strongest predicted lines from the OVII WHIM. However, we do detect the Local Group WHIM OVII system in the spectrum of this blazar.

The analysis of the detected z=0 ionized absorption lines, as well as the modeling and interpretation work, is currently still on-going. This is partly due to the non exceptional signal to noise of these data, that has forced us to be extremely cautious with the identifications of the detected features, and has required a detailed analysis of the instrumental features of the XMM RGS (the observation was performed before the increase in the temperature of the CCD detector, and so is heavily contaminated by bad columns in the CCD chips). Moreover the data from this observation have been received only more than two months after the observation was effectively performed (on November 2003), so delaying the beginning of our analysis. Finally, due to an oversight, the grant related to this observation was released only on March 1, 2004 (6 months after the observation was performed, and three months after we got the data).

We are currently preparing 2 papers on these data. The first paper is on the OVII z=0 absorption system, which will complement, adding a new line of sight, the three more papers we have already written on this subjects (Nicastro et al., 2002, ApJ, 573, 157; Nicastro et al., 2003, Nature, 421, 719; Williams, Mathur, Nicastro et al., 2005, ApJ, submitted), and will help shed light on the exact location of this absorber (an extended galactic Corona, or a Local Group WHIM filament). We are also using these data as part of a summary paper on the current detections or upper limits of the OVII WHIM at cosmological distance. The XMM RGS data of 1H 0414+009 provides a stringent upper limit at OVII column density larger than logN = 16.25 (cm-2) and so help in comparing the expectations for the cumulative number density of intervening OVII WHIM systems, with the actual data. We anticipate that we will be able to submit the first of these two paper around June 2005, and the second probably toward the end of 2005.