substrate of small molecular clouds similar to those found in the solar vicinity.

Session 40: QSO’s and AGN’s
10:30–12:00 (South Meeting Room)

40.01
Rapid X-ray Variability in NGC 3031 (MB1)

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W. Wamsteker, R. Gilmozzi (IUE Observatory/Vilspa)
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In addition, we find repeated rapid variability in the 1–6 keV EXOSAT data, the intensity changing by a factor of 2 in 600s, thus providing direct evidence for a single supermassive object as the X-ray source. NGC 3031 has the lowest X-ray luminosity (3 x 1040 erg s^-1) of any AGN yet discovered. The 1–10 keV spectrum is substantially steeper than the ‘canonical’ Seyfert/QSO X-ray spectrum of Rothschild et al. (Ap.J., 299, 423, 1985). Comparison with contemporaneous UV and optical observations are made to determine the position of NGC 3031 in the AGN hierarchy.

40.02
X-ray and Optical Observations of Four X-ray Selected BL Lac Objects

P. Giommi, P. Barr (EXOSAT Observatory)
D. Maccagni, B. Garilli (Istituto di Fisica Cosmica)
I.M. Gioia, T. Maccacaro, R. Schild (Center for Astrophysics)
J. Stocke (Steward Observatory)

All four BL Lac objects discovered in the Einstein Observatory Medium Sensitivity Survey have recently been observed with the EXOSAT satellite. Whenever possible contemporaneous or near-contemporaneous optical observations were also performed. All objects have been detected in the EXOSAT low energy telescope and in one case (HE2140+3404) a factor of two decrease in flux in less than six hours has been observed.

We present here results from a preliminary analysis of the X-ray and optical data and we discuss the time variability of these objects on timescales ranging from a few hours to years.

40.03
H0323+022: A Remarkably Variable BL Lac Object


H0323+022 is a variable X-ray source associated with a red 16th stellar object. Margon and Jacoby (1984, Ap.J. 286, L31) recently found nebulosity in the optical image and suggest it is a BL Lac object. We have conducted a multi-band, multi-epoch study of H0323+022 and unequivocally confirm its BL Lac nature. Some of our findings are: (1) The active nucleus is embedded in a 17.5" nebulosity that can be interpreted as an elliptical galaxy at z ~ 0.13 or D ~ 600 Mpc; (2) The source exhibits optical linear polarization ranging from 2% to 9% varying night-to-night and, on one occasion, showing a large change within one hour and possibly faster; (3) Optical photometry shows variations of ~ 1 m in time-scales of days on some occasions, and constancy on other occasions; (4) It is an unresolved radio source with moderate flux variations at all frequencies on timescales of days; (5) The HEAO-2 X-ray data are reanalyzed and show a secular drop in flux on timescales of hours and a single event where the hard (E > 0.5 keV) X-ray flux dropped several fold on a timescale of 30 seconds. No instrumental or environmental causes of the X-ray event are found.

We conclude that the H0323+022 is one of the most rapidly variable active galactic nuclei known. The X-ray and polarized optical emission must come from a region 10^12-10^13 cm in size, where δ is an unknown Doppler factor. With L ~ 10^45 erg/s, a variability timescale of ~ 30s is marginally compatible with emission from a maximally efficient accreting black hole. The rapid X-ray variations preclude the model where the X-rays are produced by synchrotron self-Compton scattering in the radio emitting region. The radio emission must come from a region considerably larger than the X-ray emission.

40.04
Newly Discovered BL Lacertae Objects Identified as Bright X-ray Source Counterparts by the HEAO-1 Scanning Modulation Collimator


We have discovered two new, probable BL Lacertae objects which we identify with bright, hard X-ray sources (flux greater than 10^{-11} erg cm^{-2} s^{-1}) in the 2-10 keV band. The source 4U1057-21 ~ 2A1058-22 is identified with a V=16.6 object at 1101-232. The object has a slight fuzz around a stellar image. A radio flux of 83 mJy at 1.4 GHz was measured in a VLA snapshot. A featureless spectrum measured with the AAT and polarization of a few percent confirms its BL Lac identification. Einstein observations show that the Abell cluster 1146 is not the X-ray source observed by HEAO-1. The source 4U16444+43 ~ 3A2622+425 is associated with a V=16.2 object which clearly shows an extended size. We measured a radio flux of 33 mJy at 1.4 GHz in a 10 minute VLA snapshot. An IRTF spectrum with the faint object grating spectrometer gave a continuous distribution, with the lack of either emission lines or galaxy absorption features indicating a probable BL Lac nature.

For both of these objects, many other galaxies of similar brightness can be found within a 10 arcmin radius. If we speculate that these galaxies are physically associated with the BL Lac objects, then the same BL Lac objects tenths further away would masquerade as a group of galaxies in the Einstein Medium Survey within the 1 arcmin IPC location circle. This may contribute to the dearth of BL Lac objects found to be emitting at 10^{-13} ergs cm^{-2} s^{-1} in the Einstein Medium Survey.

40.05
18 cm VLBI Observations of the Quasar NRAO 140 During and After a Low-Frequency Outburst

A.P. Marscher (Boston U.), J.J. Broderick (VPI&SU), N. Bartel (CPA), L. Padrielli (Bologna), J.D. Romney (NRAO)

We have obtained an 18 cm VLBI map of the z=1.258 quasar NRAO 140 at epochs 1984.4. We compare this map with a similar one obtained at epoch 1981.7 by Marscher and Broderick at the peak of a low-frequency outburst, which had an amplitude of about 25% at 34 cm (Altschuler et al. 1984, A.J., 99, 1784). A significant decrease in brightness at the end of the compact jet was observed between the two epochs. Since the component at the end of the jet has a spectrum which peaks at low frequencies, we identify it as the likely site of the low-frequency event. The more compact jet components did not vary significantly, contrary to the expectations of the refractive scintillation model for low-frequency variability. A.P.M. and J.J.B. are partially supported by NSF. NRAO is operated by AUI, under contract with the NSF.