29.05 (Dissertation)

Quasars in Galaxy Cluster Environments
E. Ellingson (University of Arizona)

The environments of quasars with 0.2 < z < 0.7 are investigated in order to draw conclusions concerning the dependence of quasar activity on environment. It has been found (Vee and Green, 1986) that the preferred site of bright, radio-loud quasars has evolved in recent epochs; quasars with z < 0.5 are situated in regions of enhanced galaxy density, though rarely in rich clusters, while higher redshift quasars are often found in clusters of galaxies as rich as Abell richness class 1. This result may imply that quasars in rich clusters have faded since z = 0.5. Two-color CCD images of a sample of 70 radio-loud and quiet quasars with 0.3 < z < 0.7 have been obtained with the Steward Observatory 90" telescope. These observations are sufficient to determine the statistical quasar fading time to within approximately 0.6 billion years.

Multiband spectra of galaxies in rich clusters associated with quasars have also been obtained, confirming the association. Spectra of twelve members of the Abell class 1 cluster associated with the quasar 3C 296 (z = 0.20) yield a core velocity dispersion of 600 km/sec, somewhat low for a cluster of this richness. The extremely high galaxy density in the cluster core and existence of several blue galaxies in the cluster core are consistent with a model of quasar activity which requires high frequency of interaction between the quasar host galaxy at low relative velocity, and a low intra-cluster gas pressure. Photometry and spectra of galaxies associated with the quasars 3C 246 (z = 0.34) and PKS 0412+02 (z = 0.40) are also presented.

Absorption in the profile of C IV emission in quasars has been interpreted by Foltz et al. (1986) as indication of clusters of galaxies associated with quasars at z ≈ 1.5. IUE observations were obtained for quasars with z ≈ 0.6 that are observed to be in rich clusters of galaxies. In a small, preliminary sample, no absorptions in the C IV profile were detected, though the low resolution and S/N of the IUE spectra severely limit the equivalent width of absorption that is detectable.

29.07

Induced Scattering Constraints on Models of Active Galactic Nuclei
R. D. Blandford (CfA, Caltech), M. J. Rees (Cambridge)

The discovery of rapid variability in compact extragalactic radio sources inspired several theoretical studies of induced Compton scattering. This process can cause distortion of the emergent radiation spectrum (and heating of the scattering electrons) when the brightness temperature exceeds ~ 5 x 10^10 T_e, where T_e is the Thomson optical depth of the source. Two recent observational developments have prompted a re-examination of this mechanism. Firstly, successful trials of orbiting VLBI using the TDRSS satellite and high resolution mm observations have shown that radio structure with brightness temperature in excess of ~ 10^10 K is quite common. Secondly, far-infrared observations suggest that the spectra of radio-quiet quasars turn-over abruptly at frequencies ~ 300 GHz, an effect which might be attributable to induced Compton scattering.

The observational signatures of induced Compton scattering include rising spectra, halos around high brightness emission peaks and strong frequency-dependence in source structure especially its variation with time. All of these effects can be sought. Conversely, if they are not found, then useful constraints on the presence of very high brightness sources, the juxtaposition of the radio and broad-line emitting regions and the confinement of small scale jets can be imposed.

We tentatively conclude that the far infra-red emission from radio-quiet quasars does not originate from compact self-absorbed synchrotron sources.

Session 30: HEAD II
10:00–11:30 am, Salon F

30.01

X-ray Emission from Stellar Coronae
R. Roemer
(Enrico Fermi Institute and Dept. of Astronomy and Astrophysics, The Univ. of Chicago)

With the end of the discovery phase of stellar coronal emission, initiated by the Einstein Observatory and EXOSAT, and the next phase of detailed studies well in sight, as ROSAT and other new missions come on line over the next few years, it is time to step back and summarize where we are: In rough outline, we have a firm grasp of the range of possible soft x-ray emission levels of normal stars, and of the likely determinants of these emission levels; but we know very little in detail. I will briefly discuss the present status, and then focus on the outstanding problems, and how observations yet to be done can address them.

30.02

New Observations of Hard X-Ray and Gamma-Ray Emission From the Galactic Center Region
C. MacCallum (Sandia Labs.)