NEW X-RAY RESULTS ON RADIO GALAXIES

D.M. WORRALL and M. BIRKINSHAW
Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138, U.S.A.

Abstract.
Prior to ROSAT, separation of X-ray components in radio galaxies has been limited to a few well-known sources, e.g., M 87 and Cen A. Now, from ROSAT PSPC measurements of the first six objects in our study of low-power radio galaxies, we find that both resolved (thermal) and unresolved X-ray emission in a single source is typical (Worrall & Birkinshaw 1993; ApJ, submitted). The angular size of, and fraction of luminosity in, the resolved X-ray emission varies between objects. There is evidence to relate the unresolved X-ray emission with the inner radio jet.

Our joint X-ray spatial fits to unresolved and resolved emission (characterized by a thermal β model) in the six radio galaxies are better than those to either component alone. Spectral fits to two components (a two-temperature gas, or a one-temperature gas plus a power law) are better than those to one component. One source, NGC 326, is anomalous: its X-ray-emitting gas is very extended (of cluster dimension) and asymmetric; more complex models are required here. Two X-ray components characterize each of the other sources adequately, as shown by the self-consistency of our spatial and spectral fits (Table 1).

The X-ray data alone do not determine whether the unresolved component is thermal or non-thermal, although for NGC 6251, where the unresolved component is dominant, we have used gas-confinement properties to argue for a non-thermal origin (Birkinshaw & Worrall 1993; ApJ, 412, 568). A proportionality between the X-ray power-law (from our two-component fit) and radio-core luminosity densities (Fig. 1) further supports an origin for most of the unresolved X-ray emission as non-thermal radiation from the inner regions of a parsec-scale radio jet.

Table 1
% counts in unresolved/total (spatial fit) & power law/total (spectral fit)

Galaxy	Spatial Fit[a]	Spectral Fit[a]
NGC 4261	51 ± 4	52 ± 6
NGC 315[b]	61 ± 7	57 ± 9
...	41 ± 5	54 ± 7
4C 35.03	29 ± 6	52 ± 15
NGC 6251	93 ± 5	78 ± 6
NGC 2484	65 ± 9	76 ± 15
NGC 326	10 ± 2	25 ± 2

a. 1σ statistical errors for best-fit model; systematic errors in model parameters not included.

b. Two PSPC exposures listed separately.

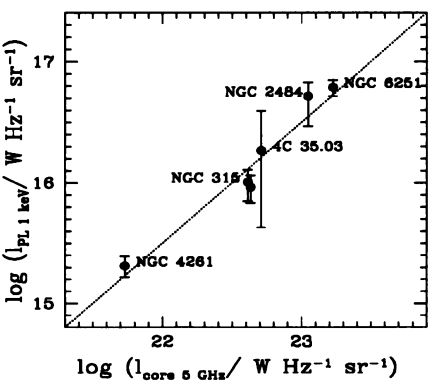

Fig. 1. X-ray power-law and radio core luminosity densities; correlation supports association of the unresolved X-ray component with the inner radio jet. (NGC 326 excluded; see text.)

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