REFEREE REPORT

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Manuscript: *High-redshift FR II radio galaxies: X-ray properties of the cores*

Summary

The manuscript presents an X-ray spectral analysis of the nuclear regions of a sample of high-redshift FR II radio galaxies and quasars, with the stated goal of testing AGN unification models and identifying the physical origin of the observed X-ray emission. While the observational data set itself is valuable and the data reduction appears technically competent, the statistical methodology and the physical interpretation are fundamentally flawed.

The conclusions drawn in the manuscript are not supported by the analysis presented.

Major Issues

1. Statistically invalid model selection

The manuscript makes extensive use of the F-test to justify the inclusion of additional spectral components, including intrinsic absorption, multiple power-law continua, and emission lines. This procedure is statistically invalid when parameters are bounded, models are not strictly nested, or line normalizations are constrained to be non-negative.

As a result, multiple claims of statistically significant spectral components are not supported by a valid statistical framework.

2. Systematic bias from pileup and PSF corrections

For sources affected by pileup, spectra are extracted from annular regions and corrected for missing PSF fractions while explicitly neglecting the energy dependence of the PSF. This assumption is not demonstrated and is not justified for hard, core-dominated sources.

The reported photon indices and fluxes for several key objects are therefore subject to systematic bias.

3. Lack of physical model discrimination

The analysis relies almost exclusively on phenomenological power-law fitting to infer physical emission mechanisms. No physically motivated emission models are tested, and no degeneracy analysis is performed. The identification of jet-dominated emission is therefore interpretative rather than demonstrative.

4. Over-interpretation of correlations

The manuscript interprets correlations between X-ray and radio core luminosities as direct evidence for jet-related X-ray emission. Orientation effects and Doppler boosting are not explicitly treated, and the observed correlations do not uniquely identify the underlying emission mechanism.

5. Unsupported physical claims

The statement that steep-spectrum nuclear X-ray emission in radio galaxies must be masked by jet emission is not supported by the data. Non-detection cannot be interpreted as physical absence.

Methodological Implications for the Literature

Beyond the specific results of the present manuscript, the analysis exemplifies a broader methodological issue that affects a significant fraction of the X-ray literature on radio-loud AGN.

In particular, the widespread reliance on phenomenological power-law fitting, combined with statistically invalid model selection criteria and implicit physical assumptions, can lead to systematic misidentification of emission mechanisms. Correlations interpreted as physical diagnostics are often dominated by orientation effects and selection biases, yet are repeatedly cited as evidence for specific physical processes.

If accepted without proper qualification, analyses of this type risk reinforcing a self-consistent but weakly constrained interpretative framework, in which model assumptions are recycled as conclusions. This has direct consequences for the robustness of claims regarding AGN unification, jet dominance, and the physical origin of nuclear X-ray emission.

For this reason, the issues identified in this report should not be regarded as minor technical points, but as indicators of a methodological weakness that warrants particular editorial scrutiny.

Final Recommendation

REJECT

The manuscript does not meet the standards required for publication in a leading physics journal. The statistical methodology is invalid, the physical interpretation is not supported by the data, and the main conclusions are therefore unreliable.

A complete reanalysis using statistically valid model selection and physically motivated models would be required before the results could be reconsidered.