S29a   XRISM observation of the broad-line radio galaxy 3C 111

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Some of supermassive black holes exhibit strong relativistic jets, leading to a classification as radio-loud active galactic nuclei (AGN). However, what causes the difference between radio-loud and radio-quiet AGN remains an unresolved question. One potential approach to addressing this jet dichotomy is to investigate and compare the circumnuclear environments of radio-loud and radio-quiet objects. The extremely high spectral resolution of the X-Ray Imaging and Spectroscopy Mission (XRISM) provided detailed insights into environments surrounding AGN, spanning a wide range of spatial scales from the accretion disk to the obscuring torus in a radio-quiet AGN NGC 4151 (XRISM collaboration 2024). This clearly demonstrates XRISM's capability to study the circumnuclear environments of AGN.

To explore the circumnuclear environment of radio-loud AGN, we conducted a XRISM observation of the broad-line radio galaxy (BLRG) 3C 111. This object is a well-studied, nearby ($z = 0.0485$) BLRG, classified as a Fanaroff-Riley type II based on its radio morphology. The XRISM observation of 3C 111 detected a narrow neutral Fe-K line with a width of approximately 20 eV (σ). Additionally, the observed spectrum indicates potentially more complex structures in the Fe-K line. In this presentation, we will report the results of the spectral analysis of the XRISM observation of 3C 111 and discuss the complex structures inferred from the Fe-K line features.