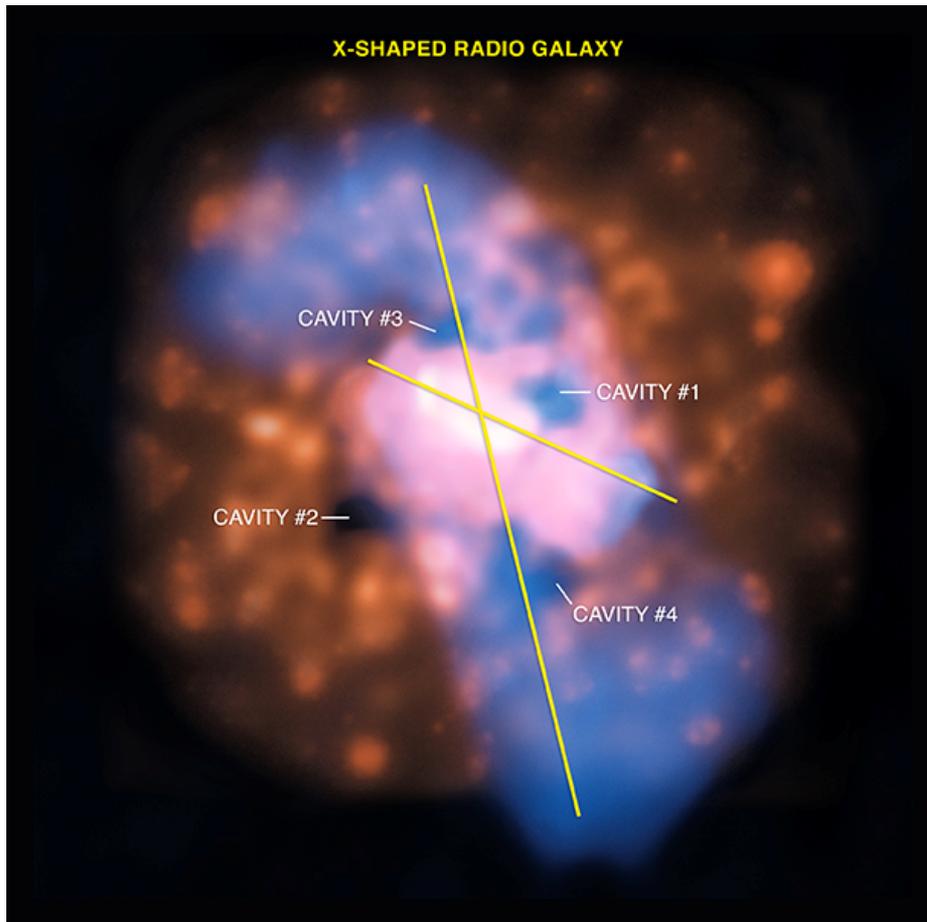




# Chandra Science Highlight

## 4C +00.58: A Candidate for Merger-induced Reorientation of a Black Hole

Chandra X-ray Observatory ACIS image



Distance Estimate: About 780 million light years ( $z=0.059$ )

This composite image of the radio galaxy 4C +00.58, which shows a view of this galaxy in X-rays (in gold) from the Chandra X-ray Observatory, and radio waves (in blue) from the Very Large Array. The X-ray image of hot gas in and around 4C +00.58 reveals four different cavities – regions of lower than average X-ray emission – around the black hole.

The combined radio and X-ray data provide evidence that the spin axis of a supermassive black hole in the galaxy has undergone two dramatic shifts in orientation, according to the following scenario:

- First, a merger of a small galaxy with 4C +00.58 produced an inflow of gas into the black hole, generating a jet of energetic particles aligned with the spin axis of the black hole and creating Cavities 1 and 2.
- The misalignment of the infalling gas with the spin axis torqued the spin axis counterclockwise, creating Cavities 3 and 4 and the radio plume.
- A subsequent merger or ongoing accretion torques then rotated the axis again to its present position as shown by the line with a 10 o'clock to 4 o'clock orientation.

Credits: X-ray: (NASA/CXC/UM/Hodges-Kluck et al); Radio (NSF/NRAO/VLA/UMD/Hodges-Kluck et al)

References: E. Hodges-Kluck et al. 2010 ApJL, 717:L37-L41