Chandra Science Highlights

PKS 1127-145: A Quasar with an Extended X-ray Jet and an Intervening Absorber

The X-ray image of the quasar PKS 1127-145, a highly luminous source of X-rays and visible light about 10 billion light years from Earth (redshift \(z = 1.187\)), shows an enormous X-ray jet that extends approximately a million light years from the quasar.

(Credit: NASA/A.Siemiginowska (CfA)/J. Bechtold (U.Arizona))


Scale: Image is 60 arc seconds on a side
Chandra X-ray Observatory ACIS image.

• The jet from the quasar extends \(~30”\) from the quasar core, corresponding to a projected linear size \(~1,000,000\) light years. The jet is thought to be produced by intense electromagnetic fields generated in gas swirling around a supermassive black hole. The length of the jet and the bright knots of X-ray emission suggest that this activity has been long-lived and intermittent.

• Compton scattering of cosmic microwave background photons off relativistic electrons in a jet moving with bulk relativistic velocities \((v=0.95c)\) is the most probable emission mechanism.

• This observation demonstrates that X-ray jets may be detectable at large distances (redshifts) because the intensity of cosmic microwave background radiation increases strongly with redshift \((\text{fourth power of } 1+z)\).

• X-ray absorption associated with a foreground galaxy at a distance of 4 billion light years (redshift \(z=0.312\)) was also detected. An analysis of this absorption indicates that the oxygen abundance is about 20% of the value measured in our Galaxy.

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