



**Chandra X-ray  
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**Iron Spectra from Supermassive Black Holes:** X-rays from iron atoms near distant supermassive black holes in the North and South Chandra Deep Fields.  
(Credit: X-ray spectra/NASA/CXC/MPI/M.Brusa et al.; Illustration: CXC/M.Weiss)

**Caption:** A team of astronomers has been able to determine the amount of iron near supermassive black holes (light blue in illustration on the right) in the centers of distant galaxies. The graphic on the left shows portions of X-ray spectra from a subset of 50 black holes about 9 billion light years away (upper panel), and another group of 22 black holes that are about 11 billion light years away (lower panel). The peaks in the spectra are produced by X-ray emission from iron atoms, and indicate that approximately the same amount of iron was present around black holes 9 billion years and 11 billion years in the past. Similar results from other groups of black holes show that the amount of iron around black holes has not changed significantly over the past 11 billion years. This implies that most of the iron in the galaxies that contain these supermassive black holes was created before the universe was about 2 billion years old, when galaxies were very young.

*Chandra X-ray Observatory ACIS Spectra*

*CXC operated for NASA by the Smithsonian Astrophysical Observatory*