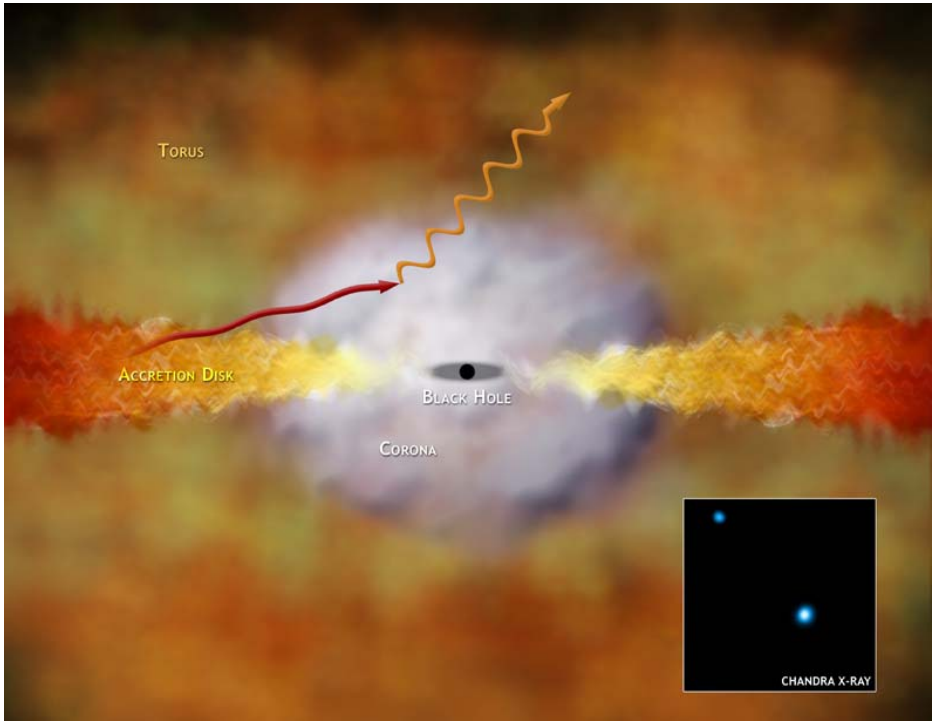
Chandra Science Highlight

SDSSpj130608.26+035626.3: A quasar at redshift z = 5.99

Chandra X-ray Observatory ACIS Image



Credit: Image: NASA/CXC/D. Schwartz & S. Virani: Illustration: CXC/M. Weiss

This distant quasar (inset) is observed as it was only a billion years after the Big Bang. The accompanying illustration shows how these high-energy X-rays might be produced as material from a large torus of gas and dust in the center of a galaxy swirls toward a black hole. Collisions of low-energy optical, ultraviolet and X-ray photons from the accretion disk with the hot electrons in the corona boost the energy of the photons up to the high-energy X-ray range. (The object in the upper left is a foreground galaxy.)

- The observed X-ray spectrum of SDSSpJ1306, seen as it was at an early epoch, is indistinguishable from that of relatively nearby quasars seen as they were several billion years after the Big Bang.
- The similarity in spectra are evidence that the supermassive black hole that powers this quasar is fully grown and must have formed surprisingly quickly after the Big Bang.
- This rapid growth of a supermassive black hole is difficult to explain using most current models. One possibility is that millions of 100 solar mass black holes formed from the collapse of massive stars in the young galaxy, and subsequently built up a billion-solar mass black hole in the center of the galaxy through mergers and accretion of gas.

Reference: D. Schwartz and S. Virani, Astrophys. J. 615, L21, 2004