A POSSIBLE CONNECTION BETWEEN THE DIFFUSE X-RAY BACKGROUND AND LARGE SCALE STRUCTURES IN THE UNIVERSE

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The diffuse x-ray background extends from about five to 200 keV. The spectrum is very well fit by a thermal bremsstrahlung emission spectrum characterized by a temperature of about (25-40)(1+z) keV, where z is the redshift at which the emission is produced.

Let us suppose that the matter within a spherical volume with radius R = R(z=0)/(1+z) gravitationally collapses to form a virialized object. The virial temperature of the hydrogen in this potential well may be calculated using conservation of energy and the virial theorem. An object which forms at a redshift z_f, when the density parameter of the universe is O_f, from a comoving volume with radius R(z=0) is about $26(1+z_f)(O_f/1.0)(R(z=0)/12.5h^{-1}\ \mathrm{Mpc})^2$ keV. The typical radius of a void at a redshift of zero is about $12.5h^{-1}$ Mpc. Therefore, if the matter within the comoving volume corresponding to that of a void gravitationally collapses to form a virialized object, the virial temperature of the hydrogen in this potential well is quite close to that necessary to produce the diffuse x-ray background.

Suppose that the matter within the comoving volumes corresponding to the voids gravitationally collapses to form virialized objects. The hydrogen in these potentials could produce the five to 200 keV diffuse x-ray background. In this case the emitters responsible for the background are large (about eight arc minutes), discrete sources and therefore these sources must evolve so that the background is not dominated by low redshift objects. There are three possible paths along which these sources may evolve (each of which is discussed in detail by Daly, 1987, Ph.D. Thesis, Boston University). The sources may simply evolve into low luminosity x-ray emitters; galaxies would form directly from the gravitational growth of primordial perturbations. Alternatively, the sources could disrupt due to either dark matter annihilation or decay, in which case the gas released by the potential expands out to the edge of the region from which it originally collapsed, collides with the ambient medium and triggers galaxy formation.

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