

Plasma in reactors echoes distribution of galaxies

By *srlinuxx*

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Nuclear fusion reactors could be used to study what the universe was like just after the big bang. So claims a physicist who noticed that the plasma created inside these reactors is distributed in a strikingly similar way to galaxies in today's universe.

Nils Basse of the Massachusetts Institute of Technology does not normally concern himself with events in the early universe. Instead, he studies turbulence in the plasma created in fusion reactors. But when he chanced upon the Sloan Digital Sky Survey (SDSS) - which is mapping a quarter of the sky in detail - he noticed something uncanny. The mathematical equation governing the distribution of voids and galaxies looks remarkably like the one describing the millimetre-sized knots and clots of plasma in the Wendelstein 7-AS "stellarator" fusion reactor in Garching, Germany (Physics Letters A, vol 340, p 456).

Basse argues that the distribution of galaxies today could be the result of variations in the density of plasma after the big bang. "I think it all comes from turbulence in the very early universe," he says. "[The galaxy distribution today] is just a blow-up of what was going on at that point." This suggests that stellarator reactors could serve as models of the early universe.

But cosmologist Daniel Eisenstein of the University of Arizona in Tucson, who works on the SDSS project, disagrees. He points out that the kind of plasma that Basse describes existed only for the first millisecond after the big bang, and that epoch ended too soon to influence the large scale structure of today's universe. Eisenstein calculates that the largest structure that could have arisen because of any such primordial density variations would only stretch a few light years across today.

Eisenstein also says that Basse's claim is difficult to reconcile with the results of the Wilkinson Microwave Anisotropy Probe (WMAP), which has mapped the distribution of the oldest light in the universe dating back to some 380,000 years after the big bang. This "baby picture" of the cosmos yields markedly different density fluctuations to the SDSS map. "I don't see any way to get turbulence into this mix without throwing out all the [WMAP] data," Eisenstein says. "And that's very powerful data."

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