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PHYSICS

ELECTRON SURFERS

If the Superconducting Super Collider (SSC) is ever completed, it will be the most powerful atom smasher ever built. But at a cost of \$8.2 billion, it will also be the largest and most expensive physics experiment in history.

Chan Joshi, a physicist at the University of California in Los Angeles, has demonstrated a potentially less expensive and more compact way of simulating the primordial conditions that existed immediately after the big bang. If the technology can be scaled up to larger sizes (no easy feat), it could accelerate subatomic particles to the same ultrahigh energies that the SSC does—but in 50 meters, not 87 kilometers. "It's a significant advance," says Andrew Sessler, a physicist at Lawrence Berkeley National Laboratory in California.

Instead of using magnets to speed up particles, as conventional accelerators do, Joshi shoots electrons into a hot plasma illuminated by extremely powerful laser beams. The laser beams excite the plasma, creating a wave that the injected electrons ride like surfers, rapidly gaining incredible amounts of kinetic energy. This method was first proposed more than a decade ago, but until now the technology was not available to do it.

To translate the concept into a practical achievement, however, Joshi's team still will have to overcome a "tremendous list of problems," says Sessler. Most important, they will have to figure out how to hold elusive plasmas in place over long distances—the same obstacle that, for decades, has stymied scientists trying to build a fusion reactor.—Robert Langreth