The Future: Fiber Accelerators

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High intensity lasers drive frontiers of contemporary science. IZEST (International Center for Zetta- Exawatt Science and Technology) has aspiration to make an ascent toward the highest energy frontier (beyond TeV) based on high-energy lasers. The relativistic optics is the high intensity frontier in which particles are driven at relativistic optical fields, as opposed to cold atom studies via quantum optics. Laser-driven accelerators open new applications both for fundamental physics purposes such as colliders and for industrial and societal applications. We are launching a project of kJ laser driver toward 100GeV stage acceleration as a proof-of-principle experiment. High field lasers can also explore the texture of vacuum fields such as Dark Matter.

At the same time recently we at IZEST advance a revolutionary laser architecture concept composed of several thousands phased high-efficiency coherent fibers CAN (Coherent Amplification Network). This laser embodiment is fully diode-pumped and provides a way to dramatically augment efficiency and cooling area. CAN lasers can be regarded as the first digital laser coherent amplifiers since it is possible to adjust individually the phase and amplitude of each fiber. This laser efficaciously addresses scientific, industrial, and societal grand challenge: future colliders as already mentioned, high flux neutron sources, applications such as nuclear transmutation (Laser-Driven Transmutators—LDT), energy-specific gamma beams with high fluence as well as nuclear medicine / pharmacology and proton therapy. In this sense CAN is the laser response to grand scientific and societal challenges.