Implementation of a relativistic intensity laser as a multi-user scientific infrastructure in Brazil

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FINEP, Brazil's federal innovation funding agency, has approved a project to implement a relativistic laser system as a multiuser research infrastructure. The system will be installed at IPEN in São Paulo, and is expected to begin operation in late 2026, becoming the first laser of this class in the Southern Hemisphere. The laser, operating at 10 Hz, will deliver 35 fs, 0.5 J pulses at 800 nm, achieving a peak power of 15 TW and intensities above 10^{19} W/cm². Under such extreme electromagnetic fields, laser–matter interactions enable particle acceleration in highly compact geometries, generating longitudinal accelerating electric fields that can reach TV/m, and producing relativistic electron beams on a tabletop scale. Our team has previously participated in the LaserNetUS user program, supported by a FAPESP's SPRINT project, which granted the use of a 700 TW laser, in which electrons were accelerated for the first time by a Brazilian group. This experience highlighted the strategic need for a domestic facility to support research in this emerging field. The 15 TW laser will initially operate as a compact accelerator for electrons and protons, enabling a range of applications that use such beams. It will also generate extreme conditions similar to those found in stars, providing opportunities for micro-fusion studies for nuclear studies. This will open new horizons in nuclear photonics and expand the spectrum of high-energy electromagnetic radiation available to the scientific community in Brazil and the Southern Hemisphere. The facility will operate under an open proposal model, serving researchers from multiple institutions.

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