Conceptual design of a 900-TW pulsed-power accelerator for high-yield thermonuclear-fusion experiments

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We have developed a conceptual design of a next-generation pulsed-power accelerator that is optimized for high-yield thermonuclear-fusion experiments. The prime-power source of the machine consists of 210 impedance-matched Marx generators. Six water-insulated radial-transmission-line impedance transformers transport the power generated by the IMGs to a six-level vacuum-insulator stack. The stack is connected to six conical outer magnetically insulated vacuum transmission lines (MITLs), which are joined in parallel at a 10-cm radius by a triple-post-hole vacuum convolute. The convolute sums the currents at the outputs of the outer MITLs, and delivers the combined current to a single short inner MITL. The inner MITL transmits the combined current to the physics load. The accelerator is 72 m in diameter, stores 134 MJ of electrical energy, and generates 900 TW of peak electrical power. The accelerator delivers 66 MA and 8.7 MJ in 113 ns to a magnetized-liner inertial-fusion (MagLIF) target. The principal goal of the machine is to achieve a thermonuclear-fusion yield that exceeds the energy initially stored by the accelerator's capacitors.

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