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10:30 AM
Physics and Astronomy Building, Room 4-330

PSTI UCLA
Plasma Science and Technology Institute

# PSTI Seminar

## Small, modular & economically attractive fusion enabled by high-field superconductors

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The origin, development and new opportunities of an accelerated strategy for magnetic fusion energy based on the high-field approach are developed. This approach confinement devices are designed at the maximum possible value of vacuum magnetic field strength, B. The integrated electrical, mechanical and cooling engineering challenges of high-field large-bore electromagnets are described. These engineering challenges are confronted because of the profound science advantages provided by high-B: high fusion power density, ~B4, in compact devices, thermonuclear plasmas with significant stability margin, and, in tokamaks, access to higher plasma density. Two distinct magnetic fusion strategies were previously allowed: either compact, cryogenically-cooled copper devices with $B_{coil}$>20 T, orlarge-volume, Nb3Sn superconductor device with $B_{coil}$ < 12 T. The second path was exclusively chosen ca. 2000 with the ITER construction decision. Yet since that decision, a new opportunity has arisen: compact, Rare Earth Barium Copper Oxide (REBCO) superconductor-based devices with $B_{coil}$ > 20 T; a strategy that essentially combines the best components of the two previous strategies. This new strategy is materialized in the recently announced SPARC project, which looks to build a highly compact net energy magnetic fusion device, solely funded by the private sector.The science and fusion energy development mission of SPARC will be described.