Abstract Submitted
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Physics design of the NSTX Upgrade[1] JONATHAN MENARD, PPPL, FOR THE NSTX RESEARCH TEAM — Access to low collisionality is important to more fully understand transport, stability, and non-inductive start-up and sustainment in the ST. For example, NSTX and MAST observe a strong (nearly inverse) scaling of normalized confinement with collisionality, and if this trend holds at low collisionality, high fusion neutron fluences could be achievable in very compact ST devices. Such considerations motivate the proposed upgrade of NSTX to higher field, current, and heating power. To enable engineering design of the upgrade, systematic free-boundary equilibrium calculations have been performed to determine the upgrade poloidal field requirements as a function of plasma shape, magnetic balance, internal inductance, and beta. Additional poloidal field coils in the divertor region are proposed to provide very high flux expansion for reduction of high predicted divertor heat flux. TRANSP simulations indicate that more tangential neutral beam injection (NBI) can increase NBI current drive efficiency by up to a factor of two, enable control of the core q profile, and ramp-up the plasma current to near mega-ampere levels. These and other physics design activities will be discussed.

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