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**Quench and stress coupled analysis of high temperature superconducting coils** JESSICA LI, Columbia Univ, YUHU ZHAI, Princeton Plasma Phys Lab — High-temperature superconductors (HTS) are promising candidates for compact next step fusion reactor designs due to their low power loss, higher margin and ability to carry extremely high current densities at high magnetic fields. However, unlike their low-temperature counterparts, HTS coils are much more vulnerable to damage during quench events under severe mechanical loading at high field magnet operation. It has been shown that the intensity of quench events may be mitigated by installing inductively coupled inserts around the superconducting coils. To this end, some previously explored designs of force-balanced coils which minimize stress in coil winding packs are reviewed for better stress management in HTS coils for quench mitigation. We use analytic models in FORTRAN and MATLAB to calculate the magnetic fields and resultant forces for various solenoid-like configurations of both high- and low-temperature superconducting coils. We then simulate their thermal, electric, and magnetic behaviors during quench-like events to identify optimal designs for both stability and quench protection.

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