PPPL Calculation Form

Calculation # CSU-CALC-132-01-00 WP #, if any

(ENG-032)

Purpose of Calculation: (Define why the calculation is being performed.)

Determine if current diffusion at the corner of the extended hub might cause excessive heating.
Benchmark Project heat-up/GFUN calculations for normal and faulted TF current profiles
Quantify Current Densities in the extended hub
Determine Stress of Cantilevered portion of the extended hub

References (List any source of design information including computer program titles and revision levels.)

[1] http://www.pppl.gov/~neumeyer/NSTX_CSU/Design_Point.html, Dated 2 -17- 2009
[2] Properties of Copper and Copper Alloys at Cryogenic Temperatures, NIST Simon, Drexler, and Reed NIST Monograph 177
[3] ANSYS Structural Analysis Program, Revision 10.0 Swanson Analysis Systems, Houston Pa.

Assumptions (Identify all assumptions made as part of this calculation.)

The geometry of the flex loop had not been detailed prior to the preparation of the calculation and was assumed. Flexibility of the loop was not properly accounted for.

Inner leg dimensions were based on an early model and are slightly different than the baseline. The inner leg conduction properties were corrected with a packing fraction adjustment to match baseline conductor cross section.

Calculation (Calculation is either documented here or attached)

Memo to: Charles Neumeyer, Phil Heitzenroeder, NSTX Distribution From: Peter Titus April 7, 2009
Subject:Coupled Electromagnic-Thermal Analysis

Conclusion (Specify whether or not the purpose of the calculation was accomplished.)

Current Densities and temperatures have been quantified for the normal and faulted TF current profiles. Stresses in the extended hub are low, but the effects of the flex stiffness need to be better modeled.

Cognizant Engineer's printed name, signature, and date

Peter Titus_____  April 7 2009

I have reviewed this calculation and, to my professional satisfaction, it is properly performed and correct.

Checker's printed name, signature, and date