

PPPL Calculation Form

Calculation # CSU-CALC-131-01-0 Revision # 0 WP #, 1540 (ENG-032)

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

This memo documents an analysis of poloidal magnetic fields and fluxes in the National Spherical Torus eXperiment Center Stack Upgrade (NSTX CSU).

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

Reference 1: R. Woolley, Excel file NSTX_CSU_AssumedPFSystem_090617.xls, issued with this memo 26 June 2009

Reference 2: R. Woolley, Excel file NSTX_CSU_Poloidal_Field_Flux-5cm-plots.xls, issued with this memo 26 June 2009

Reference 3: J. Menard, Excel file NSTX_CSU_PF1ABC_geometry_Menard_20090616.xls, issued by email 17 June 2009

Reference 4: J. Menard, Excel file NSTX_CSU_PFcurrents_OHswing_versionE_20090616.xls, issued by email 17 June 2009

Reference 5 C. Neumeyer, Excel file NSTX_CS_Upgrade_090217.xls, issued 17 February 2009

Reference 6: J. Menard, Excel file NSTX_CSUv3_IPF_20081023.xls, issued 23 October 2008

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

It states the numerical calculation methods, describes the assumed PF and OH coil set (Ref.1), and details approximations made in representing plasma current. Analysis results have been used to create a useful tool, an Excel spreadsheet (Ref.2) which dynamically calculates poloidal magnetic field components and poloidal magnetic flux on a grid of NSTX CSU locations, given operator-input adjustable values of currents in each of the PF coil circuits, in the OH coil, and in the plasma. In addition to stating the computed numerical poloidal magnetic field and flux results for any set of currents the spreadsheet also summarizes the overall spatial pattern of those results via dynamically updated contour plots of magnetic flux, radial magnetic field and vertical magnetic field.

Calculation (Calculation is either documented here or attached) -_Attached (Memo: 13-260609)

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

Poloidal magnetic quantities have been calculated for the 16 June 2009 version of the NSTX CSU PF coil system and for an approximate representation of expected plasmas. Its accuracy is expected to be sufficient for engineering evaluations of TF and PF coil system design changes. The results have been used to create an Excel-based tool (Ref.2) which evaluates poloidal magnetic field and flux at all PF and TF coil system conductors for all static CS upgrade current scenarios.

Cognizant Engineer's printed name, signature, and date

Bob Woolley _____

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

Checker's printed name, signature, and date
