

A Step Closer to a Validation Exercise

D. P. Stotler¹, B. LeBlanc¹, S. J. Zweben¹, and R. J. Maqueda²

¹ Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ 08543

² Nova Photonics, Los Alamos, NM

Abstract

The objective of “validation” is to develop enough confidence in the conceptual model underlying a simulation code so that it may be used to predict the results of experiments to be carried out in the future. Building that confidence requires moving beyond the familiar qualitative, graphical code-experiment comparisons (which inevitably result in “good agreement”) towards dedicated validation experiments and quantitative assessments of the quality of code-experiment agreement.

We present as a preliminary example of a validation exercise the DEGAS 2 neutral transport simulations of NSTX Gas Puff Imaging (GPI) experiments [1]. The GPI experiments are an ideal subject for an initial attempt at validation in that the physics involved is greatly simplified relative to other problems and that most of the input data required by the code can be derived directly from experimental measurements. Both of these considerations minimize the uncertainties involved. Executing a validation experiment and setting up the simulation requires a close interaction between modeler and experimentalist. Specific examples from this case will be given.

The quantitative characterization of the code-experiment comparison takes the form of a “validation metric”. A variety of these have been developed in the literature, with differing objectives. We will describe some of these and apply one to the DEGAS 2 GPI simulations as an example.

This work is supported by the U.S. Department of Energy Contract Nos. DE-AC02-76CH03073 and DE-FG02-04ER54520

¹D. P. Stotler, et al., J. Nucl. Mater. (to appear, 2007).