

INSPCT-s Tool

Alireza Haghghat (haghghat@vt.edu)

Nuclear Science and Engineering Lab (<http://nse.ncr.vt.edu>), Virginia Tech, Arlington, VA

Prof. Alireza Haghghat and Dr. William Walters (postdoctoral fellow) from the Nuclear Science and Engineering Lab (NSEL) at Virginia Tech have developed^{1,2} an accurate and fast software tool (INSPCT-s, Inspection of Nuclear Spent fuel-Pool Calculation Tool ver. spreadsheet.) for identification of suspicious regions of the pool that may have missing or substitute assemblies. INSPCT-s uses a MRT methodology³ that is benchmarked against the Monte Carlo calculations.

INSPCT-s is implemented in an Excel 2003 spreadsheet using the Visual Basic for Applications (VBA) code to perform input and output processing. While the major portion of the calculations is performed using FORTRAN 95, the spreadsheet interface of the program makes the software user-friendly and allows for easy input, output, and visualization. Fig. 1 below gives a screen capture of the INSPCT-s software.

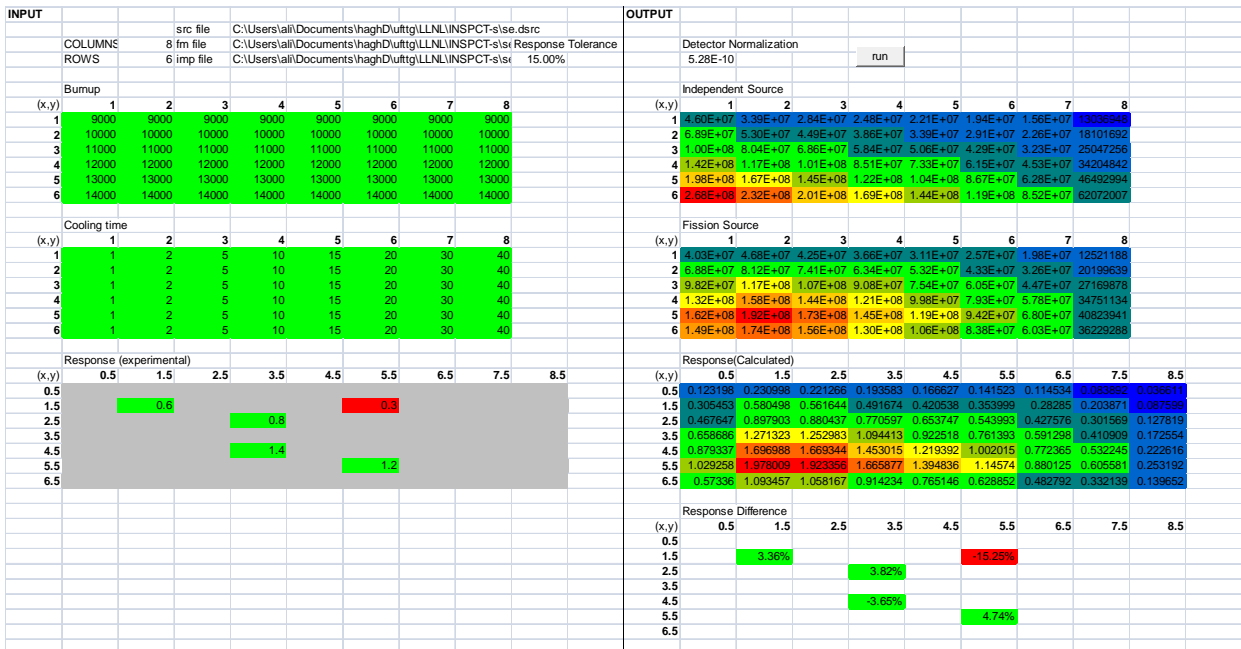


Fig. 1 – Screen capture of the INSPCT-s software simple spreadsheet interface

The INSPCT-s system is unique in that it can calculate a real-time response to fuel movement. Recently a simplified version of INSPCT-s was successfully demonstrated by Sitaraman et al. at the Atucha-1 SNF pool⁴. Fig. 2 presents a sample result of this demonstration. The red points indicate measurements at the lower level of the pool, while the blue points indicate measurements at higher level of the pool. These results are in excellent agreement; 95% of the calculated responses are within $\pm 10\%$.

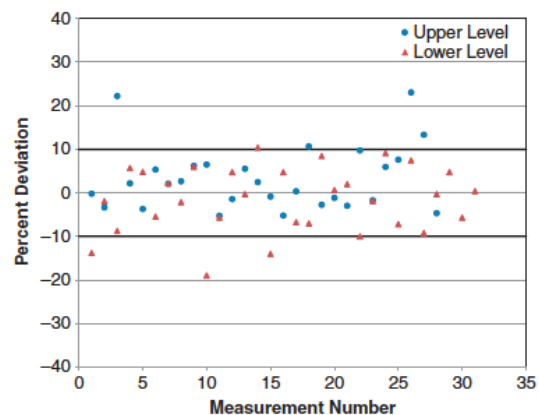


Fig. 2. Comparison of measured and predicted responses in ATUCHA-I SNF pool 1

References:

1. W. Walters, A. Haghghat, S. Sitaraman, and Y. Ham, "A Methodology for Determination of Detector Response for Inspection of a Spent Fuel Pool," *Proceedings of PHYSOR 2010, Advances in Reactor Physics to Power the Nuclear Renaissance*, Pittsburgh, Pennsylvania, USA, May 9-14, 2010.
2. W. Walters, A. Haghghat, S. Sitaraman and Y. Ham, "Development of INSPCT-s for Inspection of Spent Fuel Pool," *Journal of ASTM International, American Institute of Physics*, 2012.
3. A. Haghghat, K. Royston and W. Walters, "MRT Methodologies for real-time simulation of nonproliferation and safeguards problems," *Annals of Nuclear Energy*, June 2015 (in press).
4. S. Sitaraman, Y. S. Ham, N. Gharibyan, O. J. M. Peixoto, G. Diaz, "Methodology and Software for Gross Defect Detection of Spent Nuclear Fuel at the Atucha-I Reactor," *Nuclear Technology*, 192 (1), pp. 74-83, 2015.