E-lite 360º neutronics model of the ITER tokamak

G. Pedroche[1], R. Juárez[1], M. J. Loughlin[2], R. Pampin[3], P. Martinez[1], M. De Pietri[1], J. Alguacil[1], F. Ogando[1], P. Sauvan[1], A. J. Lopez-Revelles[1], A. Kolsek[1], E. Polunovskiy[2], M. Fabbri[3] and J. Sanz[1]

[1] *TECF3IR, Universidad Nacional de Educación a Distancia (UNED), Calle Juan del Rosal 12, 28040 Madrid, Spain*

[2] *ITER Organization, Route de Vinon-sur-Verdon, CS 90 046, 13067 St. Paul Lez Durance Cedex, France*

[3] *Fusion for Energy (F4E), Barcelona, Spain*

Email corresponding author: gpedroche@bec.uned.es

Nuclear analysis is a core discipline in support of the design, commissioning and operation of the ITER tokamak. Until recently, ITER nuclear analysis has been conducted with increasingly detailed partial MCNP models, which represented toroidal segments of the tokamak. These models have successfully allowed to address most of the questions regarding ITER nuclear analyses until now. However, the limitations of using partial models became evident as estimates of quantities relevant to design, safety and operation showed unquantifiable uncertainties, which is a risk. Thanks to increasing high-performance computing capabilities and improvements in the memory management by the codes over the years, it is now feasible to overcome such limitations. We have produced a 360° MCNP model of the ITER tokamak, called E-lite. This model reflects the most faithful, realistic and up-to-date MCNP representation of the complete machine configuration ever achieved. E-lite constitutes a milestone in the field of ITER nuclear analysis in terms of realism in the evaluation of key quantities. It has already been adopted as a reference model of the ITER tokamak by the ITER project and, consequently, it has already been used in nuclear analyses of relevance and will be extensively used in the future. The value of E-lite has been highly recognized by the ITER neutronics community. In fact, an article about the model was recently published in the prestigious Nature Energy journal.

We believe E-lite will be useful to support the accurate calibration of ITER neutron detectors. An example of an application of E-lite, relevant to the calibration of ITER neutron detectors, is described. The example highlights the effectivity of E-lite when dealing with calculations for which partial models are not suitable.