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Advanced features of ALEPH2 depletion code applied to radioprotection of nuclear facilities

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The SCK CEN in-house ALEPH2 depletion code is designed to combine the Monte Carlo codes (MCNP or PHITS) for spectral calculations with the advanced depletion module realizing RADAU5 implicit Runge-Kutta algorithm for evolution calculations. The versatility of the code allows using it for time behavior simulation of various systems ranging from one single pin model to full-scale models of conventional reactors, accelerator driven systems and high energy proton accelerators. The radiation protection calculations of two world-renowned projects of SCK CEN (MYRRHA and RECUMO) rely on the ALEPH2 code. Besides that, in several running projects ALEPH2 is a key code for characterization of nuclear waste (CHANCE project), decommissioning calculations of end-of-life projects for nuclear plants (e.g., BR3 reactor), cyclotrons (e.g, 40 MeV Medical Cyclotron of VUB in Brussel), hot cells, laboratories and etc.
ALEPH2 has several advanced features making it attractive and user-friendly among other depletion codes. An important feature in terms of user's convenience is automatic generation of MCNP input files with the delayed particle spectra from previous irradiation or decay steps. The delayed particle spectra are used as new source distributions for subsequent delayed radiation transport calculations to obtain biological dose due to alpha, beta and gamma radiation in most accurate way.
This work summarizes the features and example applications of ALEPH2 code.

Scientific Topic 1

Scientific Topic 2

Code status, development and model converters

Scientific Topic 3

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