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Calculation of kinetic parameters of the RECH–1 research nuclear reactor using MCNP and Serpent 2

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In this work we calculated two kinetic parameters of the RECH-1 research nuclear reactor: the effective delayed neutrons fraction, β_{eff}, and the mean neutron generation time Λ using the Monte Carlo codes MCNP6 [1] and Serpent 2 [2] and the neutron cross section library ENDFV.VII.1.
To calculate β_{eff} we used the method proposed by Meulekamp and van der Marck[3]. In this method the effective delayed neutron fraction is estimated as

$\beta_{eff} \sim 1 - \frac{k_p}{k}$,

where k_p is the prompt effective neutron multiplication factor and k is the total effective neutron multiplication factor. To calculate the effective neutron generation time we used the pulsed neutron source method[4]. In this technique a burst of neutrons is injected in a subcritical system and then the decay of the neutron population is observed as a function of time. After the system thermalization and decay of higher flux modes, the fundamental-mode decay constant, α_0 can be measured using the point kinetic approximation. The relation between α_0 and the reactivity, ρ, is obtained from the point kinetics equations:

$\alpha_0 = \frac{\rho - \beta_{eff}}{\Lambda}$.

These calculations will be contrasted with reactor operation experimental campaign results during next year.

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Primary authors: ROMERO BARRIENTOS, Jaime Alfonso (CCHEN Comision Chilena de Energia Nuclear, Chile.); Dr MOLINA PALACIOS, Francisco (CCHEN Comision Chilena de Energia Nuclear, Chile.); AGUILERA, Pablo (Universidad de Chile, Chile.); Dr ARELLANO SEPULVEDA, Hugo (Universidad de Chile, Chile.)

Presenter: ROMERO BARRIENTOS, Jaime Alfonso (CCHEN Comision Chilena de Energia Nuclear, Chile.)

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