IMPROVEMENT OF DYNAMICAL CHARACTERISTICS OF RHODIUM-BASED SELF- POWERED NEUTRON DETECTOR

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A new solution has been suggested for the problem of improvement of dynamical characteristics of a rhodium-based self-powered neutron detector (SPND), which is the commonly used device for measuring neutron fluxes inside the core of the reactor of VVER type [1]. A quantity to be measured in a new registration scheme is supposed to be not a standard electrical current but the so-called generalized current, which is a linear combination of the standard current and its time derivative [2].

The theory of the response of the standard and modified SPND to fastly changing neutron fields has been developed. The time-dependent SPND response for the standard and generalized currents has been investigated for various variants of fast generation of neutron fields described by the point reactor neutron kinetics equations.

The investigations show that the modified SPND allows not only to measure neutron fluxes under stationary mode of reactor operation but also to react promptly to fast changes of neutron flux (around a second and less). Such fast changes take place not only under normal operation of a nuclear power station at maneuvering of its power, but also at various deviations from normal operation, and also in various emergency situations.

Enhancement of dynamic characteristics of a signal in various conditions of fast introduction of reactance in a reactor is of high importance for signal interpretation of an SPND signal in a working reactor. Using a modified SPND, which measures the generalized current, can provide reliable control of neutron flux inside the core of VVER type reactor in the most problematic and nuclear-dangerous moments of its operation.

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2. A.A.Khrutchinsky, S.A.Kuten, L.F.Babichev // Nonlinear Dynamics and Applications. 2012. V.19. P.12.