# FOCK'S QUASI-STATIONARY STATES THEOREM FOR A BINOMIAL DISTRIBUTION DERIVATION TO DESCRIBE REACTOR CORE NUCLEI RADIOACTIVE DECAY

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Classical experimental nuclear physics determines radioactive decay for a close to infinite number of nuclei as process described with a continuous differential function. Such an assumption is valid until one meets a finite amount of a radioactive nuclei in a system. In that case a binomial distribution must be applied instead of Poisson as well as the intensity of radioactive decay must depend on number of particles in a system.

Started in [1,2] the research direction in field of nuclear reactor physics aims to achieve common mathematical apparatus for simple analytic description of reactor's breeding medium parameters. These studies are based primarily on the theory of Markov processes [3] having a well-developed mathematical apparatus. The description of the reactor operation within the framework of this theory makes it possible to consider it as an analog of an oscillatory system with events of nuclei-emitters emergence and decay occur in time.

Current work is aimed at deriving mathematical apparatus for binomial distribution by the means of Fock's quasi-stationary states theorem. First implementation of such a mathematical apparatus was made in development of sub-Poisson distribution in [4,5]. Present work includes description of reactor core nuclei radioactive decay in terms of binomial distribution. Nuclei radioactive decay kinetics equations and asymptotical function form for an average nuclei number in a system has been have been derived by the means of probability analysis [6]. Main result of the work is to be an Eq. (1) for an average number of radioactive nuclei by moment of time *t*.

$$n(t)_{\mathrm{b}} = n \cdot \mathrm{e}^{n \cdot \ln(1 - \lambda t / n)} \qquad (1)$$

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