Abstracts
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Development of the NRC "Kurchatov Institute" Reactor Experimental Basis: Starting with Commissioning of F-1 Reactor up to the 60-th Anniversary of IR-8 Reactor.

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The article presents the current state and perspective development of the NRC "Kurchatov Institute" reactor experimental basis, including research nuclear reactors and critical facilities. Individual stages of work for developing nuclear facilities at NRC "Kurchatov Institute" are reviewed.
Key Words: Research Nuclear Reactors, IR-8 Reactor, Critical Facilities, Experimental Researches.

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Evolution of Nuclear Physical Research at IR-8 Reactor.

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The article presents basic trends of evolution of nuclear and physical research carried out at the Kurchatov Institute. This research became possible after commissioning in 1957 of the first in the USSR pool type water-water research reactor.
Key Words: IR-8 Reactor, Nuclear Physical Researches.

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Beginning and Continuation: History of Neutron Research in the Field of Solid State Physics at IR-8 Reactor

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The article presents the history of the first experiments in the field of solid state physics at IR-8 reactor, as well as further experimental work in the soviet period. The article is written by one of the participants. Presented are the examples of key important experiments that became the basis for development of the new research areas in this field. The article summarizes the results of scientific and research activities for the whole period of the reactor operation.
Key Words: Reactor IR-8, Cold Neutrons, Experimental Researches.

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Neutron Center of NRC "Kurchatov Institute": Current Status and Perspectives

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Perspectives for development of the Kurchatov neutron center with the cold hydrogen source, neutron guides and new experimental facilities in the neutron guide and reactor halls on the basis of IR-8 reactor are

being discussed. Such center will be equipped with the wide variety of devices allowing research with the help of new techniques both in traditional areas, and in the areas of nano-technologies, surface physics, study of the matter in extreme conditions.
Key Words: Reactor IR-8, Cold Neutrons, Experimental Researches.

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New Challenges: From Physics to Medicine

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The article reviews the current state of neutronic research at IR-8 reactor; it is shown that research is mainly concentrated in two basic trends – comprehensive radiation diagnostics for the areas it has never been used before, as well as study of the matter in extreme conditions (at high pressure, in intense magnetic fields, and under irradiation). The article gives examples of research carried out in the areas of material science, geology, paleontology, archeology, and medicine, as well as study of the matter in case of thermobaric impact and self-irradiation. The article also discusses the capabilities, which become available with the combination of different experimental techniques.
Key Words: Reactor IR-8, Experimental Researches.

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Technique and Methods for Research of the Experimental Fuel Elements with Different Fuel Compositions at IR-8 Reactor

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Experimental basis for radiation material science, which allows the in-core testing of different fuel compositions at given parameters, was established at IR-8 research reactor. Possibility of such tests is justified in the article based on the analysis of neutronic, thermophysical, and strength calculation results. Results of the carried out in-core tests of some pilot fuel compositions confirm to the correctness of design solutions for development of techniques and methods allowing carry out of experiments at given parameters.
Key Words: Reactor IR-8, Fuel Elements, Experimental Researches.

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Technique and Methods of Structural Materials Testing at the IR-8 Research Reactor

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The article presents information about irradiation basis for radiation material science at IR-8 research reactor. It is shown that result analysis of neutronic, thermophysical, and strength calculations allowed justifying the possibility of testing structural materials in IR-8 reactor at given parameters, as well as developing the technique and methods for testing pilot specimens of nuclear power facility structural materials in the conditions close to real. The article also presents examples of design and engineering solutions.
Key Words: Reactor IR-8, Structural Materials, Testing.

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Neutron Spectra in the IR-8 Reactor Experimental Channels

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The article describes irradiation characteristics for equilibrium core loadings of IR-8 reactor, which allow selecting the channels for experimental research at the required neutron flux density and assessing the irradiation time. Computational analysis to determine neutron flux densities and spectra in the reactor experimental channels was carried out using the certified MCU-PTR Monte-Carlo code. Maximum density of thermal neutron flux in the experimental channel of the core is ≈ $1{,}6\cdot10^{14}$ $с^{-1}$ $см^{-2}$, of the reflector ≈ $2{,}0\cdot10^{14}$ $с^{-1}$ $см^{-2}$, and in the blind end of the horizontal experimental channel ≈ $1{,}3\cdot10^{14}$ $с^{-1}$ $см^{-2}$.

Key Words: Reactor IR-8, Neutron Spectrum, Experimental Channel.

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Computational Justification of the Possibility of the IR-8 Operation Cycle Duration Increasing

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Computational analysis for the possibility of increasing fuel burnup in IRT-3M fuel assemblies, as well as of the reactor fuel cycle duration was carried out through the example of IR-8 reactor equilibrium fuel cycles. Computational analysis was carried out using the certified MCU-PTR Monte-Carlo code. Computational analysis indicated the possibility for increasing fuel burnup in the unloaded FAs up to 70%. Analytical dependence for assessing reactivity margin changes in case of different options of FAs refueling was obtained. Generated power losses were determined for the events of early unload of FAs. It was shown that transition to the equilibrium core loading with the standard refueling of two FAs leads to the sufficient increase of the fuel cycle duration.

Key Words: Reactor IR-8, Fuel Reloading, Fuel Cycle Duration.