**REPORT ON** **THE PROJECT ACTIVITY IN 2021 (SINCE JANUARY TILL PRESENR TIME) AND DETAILS FOR PROJECT PLAN**

The project "Energy and Transmutation" was approved at the PAC in 2020. for 2021.

Due to objective reasons, it was impossible to carry out irradiation neither in 2020, nor during the first half of the 2021 year.

At present, JINR has developed and accepted for execution the Technical Design of the Specialized Zone: “Station“ SIYaET ”for research in the field of nuclear power on the extracted beams of the NICA accelerator complex”. The project was accepted for implementation in 2021 and will be implemented at the end of 2022.

Now the phasotron is working and this opportunity has appeared.

In 2020 and in 2021, our colleagues together with IFTP (Rosatom) took part in the design of an experimental installation for the applied research area at the NICA complex for the accelerator-driven theme. Now the main components are being manufactured.

The yield of 238U fission fragments at the electron accelerator of DLNP was studied in terms of the identification of neutrons from the reaction ( , n) and for the subsequent identification of the fission neutron energy in the Large uranium target.

Theoretical calculations of the efficiency of fission of 238U by various ions and the energy yield were carried out. These calculations continued the work of A. Baldin, M. Paraypan and others on the analyzing the use of ions up to Ar. Based on these calculations, the new accelerator-driven system is being designed for the applied research area at the NICA complex.

Radiation materials science is one of the project directions (the study of HTSC cable behavior in the fields of neutron and proton irradiation). Samples of HTSС cables at the reactor with fluxes from 1018 n/cm to 1016 were irradiated. Now they are "cooling down".

**WORK PLAN OF THE 1107 PROJECT FOR 2021-2022**

1. Energy and transmutation

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| Work period | Work title | Financial costs | Notes |
| ~1 month | Routine activities on the spectrometric complex | Acquisition  sources,  neutron source 20000 $ | ~20000 $ |
| ~2 months | Theoretical calculation of a new critical assembly on NICA | ~5000 $ |  |
| ~1 month | Installation of a large target on the phasotron and associated target equipment | ~15000 $ |  |
| ~2-3 weeks | Conducting of the radiation on protons Ep=660 MeV (2 sessions of 4 hours) | ~5000 $ | On agreement with the management of DLNP and RSD |
| ~1 month | Conducting measurements | ~5000 $ |  |
| ~6 months | Purchase and commissioning of detectors and beam diagnostics systems | ~210000 $ |  |
| ~8 months | Research and development with GIHT RAS, ITEP “Kurchatov Institute” , etc | 110000 $ |  |
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1. The work in the field of radiation testing of HTSC cables and other materials used in the creation of detectors at the NICA complex.

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| Work period | Work title | Financial costs | Notes |
| ~1 month | Testing of HTSP cable at the IBR-2 reactor (fission spectrum) | ~10000 $ |  |
| ~2 months | Investigation of the effect of monochromatic neutrons En-2.6 MeV, En -14 MeV on the electrophysical characteristics of the cable | ~100 k$ -acquisition of a neutron generator  ~50 k$ instrumentation and control equipment | A neutron generator at intensity of 10 9 n / cm will be the basic device of LHEP |
| ~1 month | Studies of the effect of protons with an energy of Ep> 20 MeV on the electrophysical characteristics | ~50 k$ business trips  ~10 k$  ~40 k$ purchase of equipment  ~150 к$ | It is necessary to conclude contracts for the study of the characteristics of HTS cables |
| ~2 months | Radiation materials of structural materials for MPD installations (organic adhesives, thermal adhesives, etc. on IBR-2 and neutron generator) | ~100 k$ reconstruction of measuring equipment:  1. Raman microscope  2. Purchase measuring equipment 20 k$ |  |
| ~2 months | Conducting radiation resistance on a neutron generator. Measuring electronics. |  |  |
| ~2- 3 months | Theoretical calculations of radiation defects in HTS materials exposed to protons and neutrons | 10 k$ (business trips) |  |

New collegues for participating in the project

1. Mikhail Novikov and his colleagues
2. Uzbekistan, Tashkent, INP - S. Artemov, B. Yuldashev
3. JINR DLNP 1. V. I. Stegaylov 2. N. Shakun
4. JINR LHEP - Y. S. Kovalev, V. V. Efimov
5. JINR FLNP 1. M. Bulavin 2. M. Belova 3. G. Arzumanian