INSTITUTE OF EXPERIMENTAL
AND APPLIED PHYSICS
Doc. Ing. IVAN ŠTEKL, CSc.
DIRECTOR

JINR Dubna
Joliot-Curie 6
141980 Moscow region
Russian federation

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REVIEW

"Study of deep subcritical electronuclear systems and possibilities of their application for energy production, transmutation of radioactive waste and research in the field of radiation material science"

(Topic number 02-1-1107/2020-2021)

The report is an evaluation of the proposal of the E&T&RM project, reflects conclusions of the meeting of Scientific-Technical Committee of LHEP (17.11.2020) and two reviews prepared by Yu. E. Titarenko and M.G.Sapozhnikov. The proposal of project (leader S.I. Tyutyunnikov, deputy leader A.A.Solnyshkin) includes information about the present situation in the field of research, previous phases of the project and obtained results (articles, these, conference papers, patents), and activities in year 2021, composition of the team and budget.

The tasks, which should be performed in 2021, are defined as follows:
i) Study of energy release in a quasi-infinite target, spatial and energy spectra of neutrons (LNP accelerator Phazotron).
ii) R&D and construction of beam diagnostic equipment.
iii) R&D of diamond detectors for detecting charged particles and neutrons.
iv) R&D of radiation resistance of electronic elements under the neutrons irradiation at the "BURAN" setup in LNP.
v) R&D and construction the channels for experimental research in the field of radiation materials science, ADS energy, radiobiology at the NICA facility.
vi) Preparation of a research project in the field of ADS power engineering on nuclei Li, C, Ar with neutron-forming targets with different ratios U235/U238.
vii) Study of the radiation resistance of HTSC materials.
Viii] Further research of the effect of high-power laser radiation on the radioactive decay of minor actinides.

HUSOVA 240/5
111 00 PRAHA 1
CZECH REPUBLIC

+420 244 105 101
IVAN.STEKL@CVUT.CZ
WWW.UTEF.CVUT.CZ

VAT CZ68407700
KB PRAHA 6
IBAN BIC

The budget is 195 kUSD for year 2021. 50 kUSD is devoted to buy material, 75 kUSD for equipment (diagnostics of an ion beam; detectors of neutrons; thermometry system; oscilloscopes; power supplies; neutron generator), 50 kUSD for contracts outside JINR and 20 kUSD for travel expenditures. Project plans 300 hours in 2021 on accelerator Nuclotron. Team consists of 23 members.

Both referees provided positive review. Scientific-Technical Committee LHEP recommended to support the project for year 2021 with the first priority.

The different phases of the project were already discussed during previous sessions of PAC for nuclear physics (46th, 47th, and 50th). As a result of this review, I suggest the PAC committee to approve the project **"Study of deep subcritical electronuclear systems and possibilities of their application for energy production, transmutation of radioactive waste and research in the field of radiation material science"** and finance its realization in year 2021.

Important information is given in recommendation of STC LHEP about including the project of E&T&RM into the framework of theme 02-1-1107-2011/2021 „Development and construction of the prototype of a complex for radiotherapy and applied research with heavy-ion beams at the Nuclotron-M". Comparison of the project E&T&RM with MYRRHA project is not reasonable (the financial support of MYRRHA project for phase 1, 2019-2026, exceed substantially 500 MEURO). I see two possibilities for the E&T&RM project: i) continuation in current dimension (relatively small support with decision which tasks are realistic to reach based on priorities) or ii) substantial extension of team and financial support (more institutions from JINR member states or non-member states, possible cooperation with MYRRHA, budget from resources outside of JINR). But such decision, which should be based on new fully defined project proposed by established collaboration, belongs to the management of LHEP, Scientific Council of JINR and directorate of JINR.

Ivan Štekl

HUSOVA 240/5
110 00 PRAHA 1
CZECH REPUBLIC

+420 244 105 101
IVAN.STEKL@UTEF.CVUT.CZ
WWW.UTEF.CVUT.CZ

VAT CZ68407700