Приложение 2

**Questionnaire**

for the extraordinary session of the PAC for Condensed Matter Physics for the assessment of related JINR projects

**PROJECT:** **Development of an inelastic neutron scattering spectrometer in inverse geometry at the IBR 2 reactor.**

 **PART A: Achievements**

1.   Contributions of the JINR group:

-List the contributions of the JINR group in hardware (including use of JINR computing resources for the project), software development and physics analyses

1. Design project
2. Detector system
3. Electronics system
4. Cryogenic system
5. Software

-List the responsibilities of JINR group members within the management structure of the collaboration, if any, giving the name of the JINR member, the managerial role and the appointment period.

Chudoba D. - FLNP DCMRD DNICM – project manager – 2021-2023

Goremychkin E. - FLNP DCMRD DNICM – deputy project manager – 2021-2023

Belushkin A. - FLNP DCMRD – science advisor – 2021-2023

Klepacka M. - FLNP DCMRD DNICM - responsible for simulations of secondary spectrometer 2020-2021

Bodnarchuk V. - FLNP DCM – coordinator of technical works (Detector, electronic and cryogenic systems, software) – 2021-2023

Kruglov A. – FLNP DCMRD DNICM - responsible for infrastructure modernization and documentations – 2021 -2023

Churakov A. - FLNP DCM Group № 1 - responsible for the manufacture and assembly of the detector system - 2022 -2023

Chernikov A. - FLNP DCM Group № 5 - responsible for the manufacture and assembly of the cryogenic system - 2022 -2023

Altynov A. - FLNP DCM Group № 4 - responsible for the manufacture and assembly of the electronic system - 2022 -2023

Petukhova T. - FLNP DCM Group № 3 - responsible for the manufacture and assembly of the cryogenic system - 2023 -2024

2.   Publications:

1. K. Jóźwiak, A. Jezierska, J. J. Panek, E. A. Goremychkin, P. M. Tolstoy, I. G. Shenderovich, A. Filarowski “Inter- *vs.* intra-molecular hydrogen bond patterns and proton dynamics in phthalic acid associates” Molecules **25**, 4720 (2020)
2. Patrycja Piękoś, Aneta Jezierska, Jarosław Panek, Eugene A. Goremychkin, Alexander Pozharskii, Alexander Antonov, Peter Tolstoy, Aleksander Filarowski “Symmetry/asymmetry of NHN hydrogen bond in protonated 1,8-bis (dimethylamino) naphthalene” Symmetry **12**, 1924 (2020)

The contribution of FLNP JINR consisted in carrying out experiments on inelastic neutron scattering, reduction and analysis of the experimental data.

-List the papers published in the refereed literature (no conference proceedings) in which the JINR group had a major contribution (e.g. author of the analysis, promoter of the experiment, corresponding author, realization of a key equipment etc.). Give title of paper, reference and describe in 1-2 sentences the JINR contribution. Only papers published since the last approval of the project should be listed.

3.   PhD theses:

-List the PhD theses completed within the last 3 years, or expected to be completed within 2021, by JINR students within the project, giving the student name, thesis title and graduation year.

**Master thesis of Marta Klepacka:** Monte-Carlo simulations of inelastic neutron scattering spectrometer

**Defended:** 28th September 2020, Faculty of Chemical Technology, Poznan University of Technology

4.   Talks:

-List the invited plenary talks given by members of the JINR group at international conferences, workshops… since the last approval of the project: give name and date of the conference, title of talk and speaker name.

-Give a similar list for parallel talks.

1. Chudoba D. “New inelastic neutron scattering spectrometer project. Present status” Workshop on the construction of a new inelastic neutron scattering spectrometer FLNP JINR 28.03.2019 , Dubna, Russia (oral presentation)
2. Chudoba D. ” Inelastic neutron scattering at IBR-2 reactor: current state and further prospects” 50th meeting of Advisory Committee for Condensed Matter Physics, Dubna, Russia 17-18.06.2019 (oral presentation)
3. Chudoba D. ”New INS spectrometer at FLNP JINR” The International Conference ECNS'19 30.06-05.07.2019, Sankt-Petersburg, Russia (poster)
4. Klepacka M. “Monte-Carlo simulation of new ToF spectrometer at IBR-2”, 3rd Asia-Oceania Conference for Neutron Scattering, 16-20.11.2019, Kenting, Tajwan (poster)
5. Klepacka M. “Monte-Carlo simulation of inelastic neutron scattering ToF spectrometer”, Bogolubov-Infeld Seminar, 01.12.2019, Physics Faculty, Adam Mickiewicz University (oral presentation)
6. Goremychkin E.A. “Coherent band excitations in intermediate valence compounds: A comparison of neutron scattering and ab initio theory.” 13th International Ural Seminar on Radiation Damage Physics of Metals and Alloys, Ekaterinburg, Russia, 24.02-02.03 2019 (plenary presentation)
7. Chudoba D. “New inelastic neutron scattering spectrometer at the IBR-2 reactor: the status and the prospects of the project” 51st meeting of Advisory Committee for Condensed Matter Physics, Dubna, Russia 20-21.01.2020 (oral presentation)
8. Klepacka M. “Monte-Carlo simulation of inelastic neutron scattering at NERA spectrometer”, Seminar of Inelastic Neutron Scattering Group NERA, FLNP, JINR, 29.05.2020 (oral presentation)
9. Chudoba D. Proposal for opening a new project “Development of inverse geometry inelastic neutron scattering spectrometer at the IBR-2 reactor” 52nd meeting of Advisory Committee for Condensed Matter Physics, Dubna, Russia 02.07.2020 (oral presentation)
10. Chudoba D. “Development of an inelastic neutron scattering spectrometer in inverse geometry at the IBR 2 reactor”; The International Conference on Condensed Matter Research at IBR-2 reactor, 12-16.10.2020, Dubna, Russia (oral presentation)
11. Klepacka M. “Monte-Carlo simulation of inelastic neutron scattering spectrometer “, The International Conference on Condensed Matter Research at IBR-2 reactor, 12-16.10.2020, Dubna, Russia (poster)
12. Klepacka M. “Monte-Carlo simulation of inelastic neutron scattering spectrometer”, Seminar of High Pressure Physics Department, Physics Faculty, Adam Mickiewicz University, 24.11.2020 (oral presentation)
13. Klepacka M. “Application of McStas and iFit software for designing elements of inelastic neutron scattering experiments”, Seminar of Inelastic Neutron Scattering Group NERA, FLNP, JINR, 11.12.2020 (oral presentation)

 **PART B: Plans and requests**

5.   Plans

-Describe the plans of the JINR group within the project, in physics analysis, data taking, software development. detector R&D, detector operation and maintenance, upgrade activities… for the period of time of the requested extension.

|  |  |  |  |
| --- | --- | --- | --- |
| Works description | 2021 | 2022 | 2023 |
| I half-year | II half-year | I half-year | II half-year | I half-year | II half-year |
| Simulations work |  |  |  |  |  |  |
| Development of a draft design of the spectrometer elements - preparation of technical drawings of the spectrometer elements, which include:- HOPG crystal fastening systems- detector mounting systems- Beryl filter mounting systems- cryostat with sample holder- boron carbide block attachment systems to suppress forward scatter from the sampleinto the detector- a vacuum container containing all the elements of the secondary spectrometer |  |  |  |  |  |  |  |
| Purchase of HOPG crystal |  |  |  |  |  |  |
| Purchase of Beryllium |  |  |  |  |  |  |
| Design and manufacturing of detector system |  |  |  |  |  |  |  |
| Design and manufacturing of cryogenic system |  |  |  |  |  |  |  |
| Design and manufacturing of electronic system |  |  |  |  |  |  |  |
| Construction works of spectrometer |  |  |  |  |  |  |
| Neutron guide instalation |  |  |  |  |  |  |
| Instalation of spectrometer |  |  |  |  |  |  |  |

6.   Group size, composition and budget

-List the JINR personnel involved in the project, including name, status (e.g. PI, researcher, post-doc, student, engineer, technician…) and FTE. Mention the total number of people in the collaboration.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| № | Name of Division / Department / Group | Number of persons | Status | Amount of employment |
| 1 | FLNP DCMRD DNICM | Chudoba D. +1 | Head of the NERA Group / scientific secretary of FLNP  | full-time |
| 2 | FLNP DCMRD DNICM | Goremychkin E. | Leading researcher | full-time |
| 3 | FLNP DCMRD DNICM | Klepacka M. | student | full-time |
| 4 | FLNP DCMRD | Belushkin A. | Head of the Division | part-time |
| 5 | FLNP DCM | Bodnarchuk V. | Head of the Department | part-time |
| 6 | FLNP DCMRD DNICM | Kruglov A.+5 | Engineer | part-time |
| 7 | FLNP DCM Group № 1 | Churakov A. + 1 | Head of the Detectors Group | part-time |
| 8 | FLNP DCM Group № 5 | Chernikov A. +1 | Head of the Cryogenic Group | part-time |
| 9 | FLNP DCM Group № 4 | Altynov A. + 1 | Head of the Sample and Choppers enviroment Group | part-time  |
| 10 | FLNP DCM Group № 3 | Petukhova T. + 1 | Engineer-programmer | part-time (by request) |
| 11 | FLNP DB | Kustov А. + 1 | Head of the Design department | part-time (by request) |
| 12 | FLNP workshops | Kuznetsov А. | Head of the workshops | part-time (by request) |

-Present the JINR group budget for the period of time of the requested extension, specifying the main budget items (equipment, computing, salaries, common funds, travel…)

**Proposed time schedule and required resources for realization of first part of the project «Creation of an inelastic neutron scattering spectrometer in inverse geometry at the IBR 2 reactor»**

|  |  |  |
| --- | --- | --- |
| Description of units and systems,resources, funding sources | Cost of units (k$). Resource requirementsfor 1st part of the project | Proposals of the Laboratory for distribution of funds and resources |
| **2021** | **2022** | **2023** |
| **Neutron guide** | **2500** | 600 | 900 | 1000 |
| **Construction design and technical specification** | **250** | 250 | - | - |
| **Highly Orientated Pyrolytic Graphite** | **550** | 150 | 250 | 150 |
| **3He Detectors****and electronics** | **50** | - | - | 50 |
| **Manufacture of vacuum, cryogenic systems and beryllium filters** | **350** | 250 | 50 | 50 |
| **Total** | **3700** | **1250** | **1200** | **1250** |

**Cost estimate of the first part of the project « Creation of an inelastic neutron scattering spectrometer in inverse geometry at the IBR 2 reactor »**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| № | Description of cost items | Total cost | 2021 | 2022 | 2023 |  |
| Direct expenses |  |  |
| 1 | Design | k$ | 250 | - | - | **250** |
| 2 | Materials | k$ | 150 | 250 | 200 | **600** |
| 3 | Equipment | k$ | 850 | 950 | 1050 | **2850** |
| 4 | Payment for research performed under contracts | k$ | 40 | 40 | 40 | **120** |
| 5 | Travel expenses | k$ | 10 | 10 | 10 | **30** |
| **Total** | k$ | **1300** | **1250** | **1300** | **3850** |

-Indicate the use or needs of JINR computing resources for the group and for the project if any.

All simulations works are perform on personal computers.