

## **vGeN/GEMMA**

### **Questionnaire**

for Joint session of the PAC for Particle Physics and the PAC for Nuclear Physics for the assessment of the JINR Neutrino Projects

#### **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

The vGeN experiment is performed practically almost by JINR with small participation by ITEP. So all hardware including detectors, electronics, and materials is mostly purchased and developed by JINR. Also, all software development and physics analysis is performed and managed by the JINR group. We execute all installation and maintenance of the experimental setup at KNPP.

-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.

As long as the JINR group is responsible for all operations, it has to manage all the works with the project. Therefore, all managing positions are belong to JINR.

##### 2. Publications:

-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.

[1] V. Belov et al., "The vGeN experiment at the Kalinin Nuclear Power Plant", 2015 JINST 10 P12011.

[2] nuGeN collaboration, "The vGeN spectrometer at Kalinin Nuclear Power Plant" in preparation.

##### 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.

M. Shirchenko, "Investigation of the neutrino properties: helicity and magnetic moment", 2019

D. Medvedev, "Research of neutrino electromagnetic properties in GEMMA experiment: magnetic moment and electric charge", 2021

#### 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.

1. A. Lubashevskiy, "Experimental search for the coherent neutrino scattering with the vGEN experiment.", ISSP 2017, Erice, Italy, 2017
2. A. Lubashevskiy, "Status of investigations of neutrino properties with the vGEN spectrometer at Kalinin Nuclear Power Plant", WIN 2019, Bari, Italy, 2019

-Give a similar list for parallel talks.

1. V. Belov, "Reactor experiments on Kalinin Nuclear Power Plant", ISAAP, Arenzano, Italy, 2017
2. A. Lubashevskiy, "Status of nuGEN project", ICSSNP 2017, Nalchik, Russia, 2017
3. D. Medvedev, "Investigation of neutrino properties with Ge detectors on KNPP", ICSSNP 2017, Nalchik, Russia, 2017
4. A. Lubashevskiy, "Investigation of neutrino properties with the nuGEN spectrometer", VLVnT 2018, Dubna, Russia, 2018

### **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.

The JINR group recently started an installation of the experimental setup at Kalinin nuclear power station. The data taking with a first detector is been started. Our efforts at the moment are concentrated on the optimization of the data taking in order to maximize the sensitivity of the experiment. The reactor stoppage for the maintenance is scheduled for March 2020, so before this time we plan to finalize the structure of the experimental setup and finish the optimization of data taking. After that, we will continue data taking for the search for CEvNS and neutrino magnetic moment. We plan to use four detectors with a total mass of 5.5 kg. Energy threshold and background level are one of the most important parameters of data taking. Therefore, in parallel to data taking, we plan to improve these parameters by the usage of new electronics and optimization of data taking. In addition to these, we plan to use a new detector with more advanced performance to upgrade our experimental setup.

#### 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.

Detail information about JINR group human resources:

Name	Category	Responsibilities	Time that each participant will give to the work under the Project in relation to its Full Time Equivalent(FTE)
V.V.Belov	Junior researcher	Muon veto, MC, data taking	0.2
V.B.Brudanin	Head of department	Administrative work, project management	0.1
V.A.Evsenkin	Engineer	Constructions, detector building	0.5
S.A.Evseev	Engineer	Constructions, detector building	0.4
D.V.Filosofov	Head of sector	Calibration sources	0.1
M.V.Fomina	Junior researcher	Muon veto, MC	0.1
L.Grubchin	Leading researcher	Detector development	0.1
U.B.Gurov	Senior engineer	Detector development	0.2
A.Kh.Inoyatov	Head of sector	Spectroscopy measurements	0.1
S.L.Katulina	Senior engineer	Administrative work, materials preparations	0.1
S.V.Kazarcev	Junior researcher	Electronics, data taking	0.1
S.P.Kiyanov	Senior engineer	Data taking at KNPP	0.3
A.S.Kuznecov	Engineer	Data taking, MC	0.1

A.V.Lubashevskiy	Senior Researcher	Data analysis, MC, commissioning and administrative work	0.5
D.V.Medvedev	Researcher	Data analysis, MC	0.7
D.V.Ponomarev	Engineer	Constructions, detectors building, testing. Experiment running.	0.7
D.S.Pushkov	Senior engineer	3D modeling and design of experimental setup	0.2
A.V.Salamatin	Senior reseacher	Electronics	0.1
K.V.Shakhov	Engineer	3D printing, construction	0.1
Z.Kh.Khukhvatov	Junior researcher	MC	0.2
V.G.Sandukovsky	Head of sector	Detector configuration, constructions	0.5
E.A.Shevchik	Senior engineer	Mu-veto, constructions	0.1
M.V.Shirchenko	Senior researcher	Data taking, analysis	0.1
S.V.Rozov	Engineer	Detector building, testing, calibration, running.	0.3
I.E.Rozova	Engineer	Data analysis, constructions	0.5
V.P.Volnikn	Engineer	Computer support	0.1
I.V.Zhitnikov	Junior researcher	Experiment running, data analysis	0.1
E.A.Yakushev	Head of sector	Building, commissioning, running, data analysis	0.2
<b>Total FTE (Engineers): 3.5, Total FTE (Scientific staff): 3.2, Total FTE: 6.7</b>			

The total number people in the collaboration is 30 people, 28 of them are from JINR.

-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...)

**Estimated expenditures for the Project vGeN, Investigations of neutrino properties with the low-background germanium spectrometer vGeN**

#	Designation for outlays	Total cost	1 year	2 year	3 year
<b>Direct expenses for the project</b>					
1.	Networking	6.0K US\$	2.0	2.0	2.0
2.	DLNP workshop	600 norm-hours	200	200	200
3.	Materials	45.0K US\$	35.0	10.0	0.0
4.	Equipment	350.0K US\$	130.0	20.0	200.0
5.	Expenses for R&D on a contract base	6.0K US\$	2.0	2.0	2.0
6.	Travel expenses, including	60.0K US\$	20.0	20.0	20.0
	a) to non-rouble zone countries		5.0	5	5
	b) to cities of rouble zone countries		15.0	15.0	15.0

**Total 467.0K US\$ 189.0KUS\$ 54.0KUS\$ 224.0K US\$**

Salaries: 113900 US\$ per year.

Estimation based on 2020 data and includes spending on technical personnel not listed in the project. 1US\$ equal to 64RUB assumed in the estimation.

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

Our existing local computing resources are enough for analysis of data taking at the moment. However, with the increasing amount of data, the JINR computer resources will be needed to store and analyze data.