

Guidelines and Blank for the Interim Report

For research projects which are funded for two or more years the Foundation expects yearly interim reports to be submitted both electronically (.doc or .pdf-file) **and** as a paper copy. Reports should be written in English, including an abstract in German, if the proposals were submitted in English.

The systematic evaluation of projects is of high importance for the development of the Foundation's funding initiatives; therefore, it is essential for the Foundation to receive comparable reports. Scientific publications are welcome but cannot replace a report. Please make use of the following blank. Some of the aspects listed may not be applicable to certain funding initiatives and may be omitted in those cases.

Front page	
Funding initiative	Between Europe and the Orient - A Focus on Research and Higher Education in/on Central Asia and the Caucasus
Reference number	AZ 93562
Title of the project	Regional Doctoral Program in Theoretical and Experimental Particle Physics
Project investigators and cooperation partners	Ulf-G. Meißner Akaki Rusetsky Thomas Mannel Andro Kacharava Mirian Tabidze Armen Nersessian

Narrative part of the report (which should not exceed 6 pages)

Report on scientific results and the progress achieved (approx. 2 - 4 pages)

As expected, the global pandemic affected the implementation of the program. As everywhere else, the peer to peer contacts were drastically reduced, and the lectures went online. In this unusual situation, our strategy was to keep important parts of the program alive, the end of pandemic in sight. In our opinion, this goal was largely achieved.

1. Main achievement of 2020 was that the pool of PhD and master students in Georgia, Armenia and Germany, which are involved in the program, has grown and consolidated even more. Our strategy to start the selection and affiliation to the program already at the level of the master students is starting to bring fruit. Moreover, with the end of pandemic, one might seriously think about the internationalization of this pool, attracting students from the neighboring countries.

Moreover, this success already brings us to the necessity of starting to think about designing a next step of the program. The next step would imply assisting

those, who have defended their PhD theses, to continue a successful academic career and, eventually, get high-rank academic positions in the country of their origin. This will be a key to the sustainability of the whole program in the long run.

At this moment, our students are:

YerPhI + YSU node:

Maneh Avetisyan, PhD Student, YSU, **Asatiani Stipend (since March 2018)**
Arman Stepanian, PhD Student, YerPhI, **ICTP Stipend (since August 2017)**
Hamid Arian Zad, PhD Student, YerPhI, **ICTP Stipend (since September 2018)**
Erik Khastyan, PhD Student, YSU, **RDP Stipend (since September 2018)**
Mher Davtyan, PhD Student, YerPhI
Melik Karapetyan, Master Student, YSU
Seda Vardanyan, Master Student, YSU, **RDP Stipend (since January 2020)**
Sergey Tumasyan, Master Student, YerPhI, **RDP Stipend (since January 2020)**
Samvel Mouradian, Master Student, YSU
Zhirair Adamyan, Master student, YSU

One PhD and two master theses were defended by the students enrolled in the program:

Arman Derstepanians (Stepanian),
PhD thesis: ["Studies on modified gravity theory"](#),
Supervisor: Vahagn Gurzadyan (YerPhI),
Defended at Yerevan Physics Institute 30.06.2020.

Sergey Tumasyan.
Master thesis: ["Higher order QCD corrections for neutral B-meson oscillations"](#),
Supervisor Hrachia Asatryan (YerPhI)
Defended at YSU in 2020

Melik Karapetyan,
Master thesis: ["Manifestly covariant form of the cubic interaction in the higher spin fields on \$AdS_{d+1}\$ "](#),
Supervisor Ruben Manvelyan (YerPhI)
Defended at YSU in 2020

TSU node:

Tamar Zakareishvili, PhD student, TSU, **Asatiani Stipend (since April 2018)**
Gogita Papaplashvili, PhD student, TSU, **RDP Stipend (since April 2018)**
Archil Durglishvili, PhD student, TSU, **RDP Stipend (since July 2019)**
Dito Shergelashvili, PhD student, TSU
Revaz Beradze, PhD Student, TSU, **RDP Stipend (since February 2019)**
Alexander Gurchumelia, PhD Student, TSU, **RDP Stipend (since February 2019)**
Lasha Pantskhava, PhD Student, TSU, **RDP Stipend (Since April 2020)**
Irakli Lomidze, Master Student, Agriuni
Dachi Okropiridze, Master Student, GTS

Nino Turkadze, PhD Student, TSU
Levan Cheishvili, PhD Student, TSU
Mariam Chitishvili, PhD Student, TSU

One PhD and one master theses were defended by the students enrolled in the program:

Archil Durglishvili,

PhD thesis: ["Search for Flavour-Changing Neutral Current Top-Quark Decays and Optimization of the Hadronic Tile Calorimeter Performance at the ATLAS Experiment"](#).

Supervisors: Tamar Djobava (HEPI TSU) and Ana Maria Henriques Correia (CERN), defended at Tbilisi State University on 22.07.2020.

Lasha Pantskhava,

Master thesis: ["Grand Unification of fermion masses"](#),

Supervisor: Zurab Berezhiani (L'Aquila Uni.)

Defended at TSU in 2020

Georgian and Armenian students at the University of Bonn:

Vakhtang Ananiashvili, Master student from Georgia, ***RDP stipend (since October 2018)***

Giorgi Chanturia, Master student from Georgia, ***DAAD stipend***

Lado Razmadze, Master student from Georgia, ***RDP stipend (since October 2018)***

Archil Suladze, PhD student from Georgia, ***RDP stipend (since December 2020)***

Gor Nikogosian, PhD student from Armenia, ***RDP stipend (January 2020)***

The master thesis defended at the University of Bonn:

Archil Suladze (Georgia), thesis defence in July 2020

"Bounds on supersymmetric operators from experiments."

Supervisor: Prof. Dr. H. Dreiner

2. We continue organizing advanced lecture courses, albeit pandemic took toll on these as well. Most of the courses, as elsewhere in the world, were moved to the online platforms. The list of the lecture courses, organized in 2020, is given below:

YerPhI + YSU node:

Spring Semester 2020:

"Integrability in 2D Statistical Systems and in (1+1)-Dimensional Quantum Field Theory" by Hrachya Babujyan (YerPhI).

"Geometric Methods in Mathematical Physics" by Hovhannes Shmavonyan (YerPhI).

"Integrable Systems - From Generalities to the Thermodynamic Bethe Ansatz" by Gleb Arutyunov(Hamburg Uni.).

TSU node:

Spring Semester 2019:

"Modern Trends in Mathematical Physics I" by Gia Giorgadze (TSU).

"An Introduction of Elementary Particle Physics" by Hans Stroeher and Irakli Keshelashvili (IKP, FZJ)

Autumn Semester 2019:

"Modern Trends in Mathematical Physics II" by Gia Giorgadze (TSU).

In addition, at TSU, in May 2020 we have organized three online lectures

E-learning methodology and pedagogies by George Dafoulas (University of Middlesex), in order to get our lecturers acquainted with the methods of online lecturing and evaluation. We would also like to stress that these lectures were offered not only within a group of the lecturers involved in the program, but were open and attended by lecturers from the whole University and members of the University scientific management. This serves as a nice example of the cooperation between our program and the TSU administration.

3. A traditional RDP PhD school and workshop had to be canceled due to pandemic, first time since 2013. The Caucasian-German School and Workshop: Health as a Global Challenge: Contributions by GGSB SMART|Labs. [7-12 September, 2020, Tbilisi, Georgia](#) , which was organized by the members of the TSU and FZ Jülich nodes of our program, was canceled as well.

In order to keep our activities alive, we had organized a

RDP Online Workshop on Mathematical Physics [5-6 December, 2020](#)

The participants were mainly the members of the Georgian and Armenian Nodes. The colleagues from Germany and Russia were also invited. It should be mentioned especially that the students, participating our program, could report in this workshop about their work. This was very important for them in order to

keep visibility in the times of the pandemic and global lockdown. Moreover, for the first time, we have decided to publish the *proceedings* of the workshop, which will appear soon in the Proceedings of Science series. These proceedings, apart from original contributions (including the contributions from our students), contains a short PhD course on integrable systems, written by Gleb Arutyunov (University of Hamburg).

We hope that it will be possible to revive our traditional school and workshop in 2021. This is already an established event in the region that greatly contributes to the internationalization efforts in our field.

4. As in the previous years, our program was actively promoting the young female scientists in the field. The recipients of Tina Asatiani Stipend in 2020 were the same: Maneh Avetisian (PhD student since 2019, Armenia) and Tamar Zakareihvili (PhD student, Georgia).

5. The purchases of the equipment for the laboratory at TSU were ongoing in 2020.

6. Attracting additional external funding remained an important part of our strategy. In 2020, some of our students received funding from ICTP and DAAD.

Self-evaluation in comparison with the original objectives and working plan (e.g. unexpected results, other deviating developments in terms of contents/methodology)

Despite many problems, brought in by global pandemic, the project survived and in many aspects, moved further. We are confident that we are on a right path.

Added value gained through interdisciplinary and international cooperation

The interdisciplinary and international cooperation laid at the core of our project from the beginning. Moreover, the collaboration of the Georgian and Armenian physicists is a nice example of mutually profitable cross-border cooperation in a volatile region where such examples are still rare. Therefore, besides a pure scientific value, our project makes social impact as well. Furthermore, the present pandemic has demonstrated that one has to actively look for alternative forms of the international cooperation, which starts to shift to the online platforms. We have been consistently promoting such forms since 2013 and, hence, a lockdown in 2020 did not catch us completely offguard. Furthermore, we believe that, in the future, the extensive use of online communication tools has no alternative for maintaining a regular international cooperation between partners.

Public relation activities and resonance in the media

Unfortunately, due to the global lockdown, there has been a lull in the relation with media which, at a large part, was caused by the suspension of most of the activities (workshops, PhD schools, etc.) There is no mention of the project this year.

<i>Further aspects</i> (e.g. particularly beneficial or obstructive circumstances, experiences with cooperation)

Tabular part of the report			
<i>Participating researchers and students, separated by institution and funding source</i>	Given on a separate sheet		
<i>Additional cooperation partners in the project</i> (not applicants)			
<i>Publications and abstracts directly related to the project</i> (Please include reprints.)	Given on a separate sheet. The reprints of the papers, co-authored by students, are sent separately on a DVD disc (Only those of them, which are absent in the open-source repositories).		
<i>Specific events, e.g. workshops and PhD schools</i> (Program, list of participants, abstracts and other details may be appended in a separate file.)	RDP Online Workshop on Mathematical Physics 5-6 December, 2020		
<i>Patents directly related to the project</i>			