Jefferson Science Associates, LLC
Managing and Operating the Thomas Jefferson National Accelerator Facility
for the U.S. Department of Energy

FY2018 JSA Initiatives Fund Proposal Summary Sheet

Proposal title

Participation in Biennial African School on Fundamental Physics and Its Applications

Project Start Date (month/year) 1/18

Project End Date (month/year) 10/18

○ New proposal ◉ Renewal

Total funds requested $10,620

Total leveraged support / matching funds. Details of funds must be included in budget proposal. $125,000 JLab

To be completed by JSA: Total funds awarded **$3,000**

Principal Investigator (PI) Latifa Elouadrhiri

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Co-PI (if more than 1, add pages with information) David Lawrence

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Check one category: If PI is a Lab employee, your identification of the appropriate Associate Director below represents the acknowledgement of that AD with your submittal of proposal. No signature required.

◉ Lab employee: Identify Associate Director (email / phone)

○ Lab user: Identify University affiliation (email / phone)
Joint appointee: identify University and Lab division association (email / phone)

○ Other: Identify Institutional affiliation (email / phone)

Proposal: Attach file with

(1) Executive summary and technical proposal

(2) Synopsis of scientific, educational, technical, and/or business merits, and alignment with and significance to Lab's current program

(3) Proposed evaluation plan to measure success. If this is a request for renewal of funds, assessment of prior year performance,

Your proposal may include letters of endorsement and other supporting information (maximum of 12 pages including this summary sheet and budget sheet)

Budget Proposal

Proposal Title Participation in Biennial African School on Fundamental Physics and Its Applications

Principal Investigator (PI) Latifa Elouadrhiri

Total funds requested $10,620 **To be completed by JSA: Total funds awarded** $3,000

Item Description		Amount
Equipment. Lab users submitting proposals that include equipment to be used at the Lab must review with the appropriate Lab Associate Director. The provision of the name of the AD below represents the AD's acknowledgement. **No signature required.**		
Associate Director: Rolf Ent		
Subtotal Equipment		0
Travel Support. Provide break-out of estimates for registration fees, lodging and transportation, catering, and facility charges (room rentals, AV equipment; etc.)		
Subtotal Travel		0
Supplies		
Subtotal Supplies		0
Consultants/Subcontracts		
Subtotal Consultants/Subcontracts		0
Other Expenses. Examples include stipends and honoraria, prizes, awards.		
These funds will be used exclusively to support the school including lodging for 3 lecturers	$4,620	
3 local students to attend	$6,000	
Subtotal Other Expenses		$10,620
Total Budget Proposal		**$10,620**

Budget Justification: Include narrative to explain need for each line item in the budget, showing breakdown of calculations used to arrive at the amount in each line of the budget. Note that the JSA Initiatives Fund Program does not support salaries and salary-related expenses, or indirect expenses.

Leveraged Support/Matching Funds information. Identify the source, type and amount of dollar funds from each institution. Include **separately** estimated value of in-kind support. Your identification of the authorized representative who has committed institutional support for your proposal represents the acknowledgement of that individual. If support or funds are provided by the Lab, identify the associate director (or equivalent) as the authorized representative. Information may be included on separate page.

Budget Justification

The African school for Physics will apply these funds as necessary to support the school's operation. For $10,620 we can provide for 3 lectures for all the students and support for 3 local students to attend.

Leverage Support/Matching Funds

>$120k from other labs (US and European)
$5k from JLab Director's fund.

Executive Summary

The request is to support the 5th Biennial school of Fundamental Physics and its Applications. This is a 3-week long event scheduled to take place in Namibia for three weeks in summer 2018.

The school's goals are to continue to foster the growth of research and academic opportunities in Nuclear and Particle physics, encourage international cooperation and exchange of students and scientists, enable African research teams to work with major research Centers such as Jefferson Lab, Fermilab and CERN not only in fundamental physics and related applications, such as medicine, but also in forefront accelerator technologies.

The first school ASP2010 took place in Stellenbosch, South Africa on 1-21 August 2010. The ASP2010 was a very successful. Jefferson Lab/JSA supported the initiative of the first biennial school on fundamental physics and its applications. This support was extremely important to the success of the school. The funds were fully used to support student travel fees.

The school has subsequently been held in Ghana, Senegal, and Rwanda. A report of the previous schools can be found at :

http://www.africanschoolofphysics.org/

The proposal for the 5th Biennial School that we propose to support is attached.

These funds will be used exclusively to support travel and lodging expenses for three students and three lecturers to participate in the school.

Figure 1: Students participating in the 2016 ASP in Rwanda

Synopsis of scientific, educational, technical, and/or business merits, and alignment with and significance to Lab's current program

International participation has been an essential and necessary feature of research in Nuclear and Particle Physics as well as Accelerator Physics due to the size of these enterprises. This proposal extends the cooperation to the largely untapped talents of the African continent in these fields. Participation of Jefferson Lab in this school along side of other major laboratories from around the world allows us to present our lab's scientific and technological achievements and future plans. This in turn will reap the benefit of participation of existing African research teams in JLab research. This fits well with the Jefferson Lab and JSA goals. In addition this will enhance the international profile of JSA and Jefferson Lab, particularly in the Third World where so much untapped talent resides.

Proposed evaluation plan to measure success

By participating (teaching) in the school adds to the labs's research pool, that would be a measure of the success of this proposal.

As a direct result of JLab's participation in the 2016 ASP, Ph.D. Student Ebode Onyie Fabien from The University of Yaounde' I in Cameroon came to JLab for one month during the summer of 2017 to work on analysis of GlueX data for his thesis project. A photo of Ebode with advisor David Lawrence during his visit can be seen below.

August 15, 2017

THE BIENNIAL AFRICAN SCHOOL

ON FUNDAMENTAL PHYSICS AND APPLICATIONS

Proposal for a School of Physics in Africa

We have established a biennial school of physics in Africa, on fundamental subatomic physics and its applications. The aim of the school is to build capacity to harvest, interpret, and exploit the results of current and future physics experiments with particle accelerators, and to increase proficiency in related applications, such as medicine, Grid computing and information technologies. The school is based on a close interplay between theoretical, experimental, applied physics, and Grid computing. The previous schools took place in South Africa, Ghana, Senegal and Rwanda in 2010, 2012, 2014 and 2016 respectively. The fifth edition of the school will take place in 2018 in Namibia. We propose a partnership with the Namibian the National Commission on Research, Science and Technology (NCRST) and the University of Namibia to host the fifth edition of the school in Namibia and to develop the project further.

Authors of the Proposal

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The International Organizing Committee (IOC) of the African School of Physics (ASP) can be reached at the following email: ASP-IOC@CERN.CH.

1 Introduction

Schools of fundamental physics and applications (ASP) took place in Stellenbosch, South Africa, on August 1–21, 2010 [1, 2] (ASP2010), in Kumasi, Ghana, on July 15 – August 8, 2012 [3, 4] (ASP2012), in Dakar, Senegal on 3–23 August 2014 [5] (ASP2014), and in Kigali, Rwanda on August 1–19 2016 [6] (ASP2016). The schools are based on a close interplay between theoretical, experimental, applied physics, and Grid computing. They cover a wide range of topics: particle physics, particle detectors, astro-particle physics and cosmology, computing, accelerator technologies, medical physics, condensed matter, light sources and their applications. The participating students are selected from all over Africa and beyond. The selection of lecture topics is in theoretical, experimental, and applied physics. Scientists from Africa, Europe, Asia and the USA are invited to prepare and deliver lectures according to the proposed topics taking into account the diverse levels of the students. The duration of the school allows for networking — interactions among students and between students and lecturers. The schools are funded by institutes in Africa, Asia, Europe and the USA.

By all accounts, ASP2010–2016 were very successful schools as can be seen from the final reports and the numerous press releases [1–5]. The success of the school is due to the financial support from institutes in the USA, in Europe, in Asia and in Africa, to the dedication of the organizing committee, to the devotion of the lecturers, and to the interests of the students themselves. Many students in Africa face challenges in terms of the logistical support, the quality of education and the opportunity for higher education abroad. It is often the case in Africa that even the best students do not have the needed support to succeed or to acquire the necessary skills to be competitive at an international level. It is particularly important for the organizing committee to help resolve some of the challenges that students from Africa face. It is not to suggest that this particular school has solved all the issues, not at all. However, it is hoped that this school is useful in terms of networking, which in turn will help prepare the students to find practical answers to many issues that they may need to resolve.

Looking at the long term objectives (to help improve high training and education in Africa) that motivated the organization of ASP2010–2016, the success of the school is encouraging and provides motivation to review the ASP goals and consider mechanisms to make it sustainable, and in doing so, truly contribute in a significant way to development in Africa. To build up on the success of ASP2010–2014, and exceed the expectation of ASP2016, the organizing committee proposes to establish a longer partnership with African governments and policy makers on capacity development for the component of funding, and to develop the project goals and the key performance indexes further. These developments are timely given the progress made by the ASP series and the synergy that can be established with the African policy makers on education. There is a strong alignment between the mission and the vision of African governments and policy makers on education and capacity building and their programs with the goals of the ASP. The ASP is committed to include African governments in the planning going forward, in order to take advantage of aspects such as consolidating bilateral agreements and their goals, building on synergy with other programs, improving the sustainability and impact

of the capacity development and improving the measurement and visibility of the impact.

1.1 Topics

Four main topics will form the backbone of the school: 1) Theoretical Physics, 2) Experimental Physics, 3) Accelerators and Technologies, and 4) high performance Grid computing. In addition to lecture courses, each topic will include hands-on exercises on computing-related aspects, including Grid and high-performance computing.

Further, each main topic will contain a number of additional exercises for student projects. These will be completed in groups, with a single lecturer (mentor) assigned to each group. These groups will also provide opportunities for discussing questions arising from the lecture material. The groups will be assigned on arrival, and time will be reserved for this activity each working day during the school. These daily discussion sessions will provide a framework for mentoring students from different backgrounds. Each group will deliver a short presentation at the end of the program.

1.2 Venue and Scope

The school moves around Africa taking advantage of local support and considering a uniform exposure for Africa. The proposed duration of the school is three weeks, in 2018 in Namibia. The exact dates will be determined later. Our target is to have 65 selected students from various African countries. Full bursaries will be provided to the selected students.

2 Relevance to Scientific Development in Africa

International cooperation is a large common denominator of the culture of scientific activities. However, in many scientific disciplines and especially in our field of Fundamental Physics, the cooperation among African countries and between them and Northern countries is not sufficiently developed. This is especially the case for sub-Saharan Africa. We therefore want to extend the usual international scientific ties in our field to this geographical zone.

With this project it is therefore our aim to initiate and support academic and research cooperation in Fundamental Physics with countries in sub-Saharan Africa.

It is *not* our aim to set this up as a strictly one-way effort to bring our knowledge and experience to African colleagues and students, but rather to establish a genuine Integrating Global Network.

For this reason, the program we propose includes as an essential aspect mentored group sessions working on projects with discussions, so that each student may draw the maximum individual benefit from the school.

3 Financial Support

The main funding item on the school budget is the student bursaries, covering the travel and board of all the attending students. We strongly believe that being able to provide such bursaries is vital to the success of the project.

3.1 Financial Support Requested

Our typical budget is based on 65 students supported for the full three weeks of the school, 24 lecturers supported for 6 days each, and 5 organizers supported for the full duration of the school (possibly rotating between a larger pool of individual organizers). Note that the total of 25 required lecturers is arrived at by assigning at least two organizers to act as lecturer as well. We do encourage the lecturers and organizers to seek their own support for transportation and accommodation so the school funding is maximally used for the students.
Table 1 contains the detail of the cost estimate for the students, including some overhead for organization and coverage for up to a maximum of 3 lecturers. Assuming 10 local students, and 55 international students, the total budget for 65 students is of the order 175000€ in addition to the in-kind support from Namibia and the external support for most of the lecturers and organizers. In addition to the in-kind support, we request that 20000€ of the 175000€ come from local Namibian sources.

3.2 Potential Sources of Financial Support

The IOC is in the process of seeking support from the following institutes: NCRST, the University of Namibia, ICTP, CERN, International Union of Pure and Applied Physics (IUPAP), Center National de la Recherche Scientifique CNRS-IN2P3 (France), and Paul Scherrer Institute (PSI, Switzerland), National Research Foundation (NRF, South Africa), Department of Science and Technology (DST, South Africa), Brookhaven National Laboratory (BNL, USA), Jefferson Lab (JLAb, USA), Jefferson Science Associate (JSA, USA), American Physical Society (APS, USA), National Science Foundation (NSF, USA), Istituto Nazionale di Fisica Nucleare (INFN, Italy), European Physical Society (EPS), Institute Of Physics (IOP, UK), Shui-Chin Lee Foundation For Basic Science (Taiwan).

These institutes supported the school in 2010-2016. They were particularly pleased with the success of the previous editions of school [2, 6]. These institutes will be approached again for ASP2018 in Namibia. Other potential sources of support will be pursued.

3.3 Local Support from Namibia

Two types of support are expected from the host country of ASP:

- In-kind support. On the behalf of the host country, the local organizing committee (LOC), working together with the IOC and the International Advisory Committee (IAC), will

Common Costs to all students		
Type of Cost	**Per Student per day**	**Per Student for 23 days**
Catering	20	460
Lodging	40	920
Opening Function		10
School Banquet		29
Social Events		55
Stationary		20
Local Transportation	5	115
Filming & Recording		50
Contingencies		150
For international students		
Airfare including visa		900
For local students not from Windhoek		
Transportation to/from Windhoek		200
Organization Costs		
Opening functions (16 lectures)		190
Banquet (assume 25 delegates)		725
Lecturers lunch and coffee	72	1080 (72$\times$ 15 days)
Coverage for 3 lecturers		4620
Organization costs		6615 (or 102 per Student)
Total Cost per Student		
Local Student in Windhoek		1809
Local Student not from Windhoek		2009
International Student		2700
Organization Cost		102

Table 1: Estimated expenses per student attending ASP2018. The full bursary for an international student is estimated to be about 2800€ , 2100€ for a local student not from Windhoek and 1900€ for local student already in Windhoek. All amounts are in € unless otherwise specified. The bursaries include accommodation and catering. Transportation and accommodation for up to 3 lecturers would be covered. All other lecturers and organizers will seek support from external sources.

identify the venue, not too far from a major international airport for easy commute of the international delegates. The usage of lecture halls, discussion rooms, computer labs, internet library and electricity during the school should be free of charge the school organizing committee. The LOC will also negotiate accommodation and catering for the all the students and lecturers at a reduced rate within the budget shown in Table 1.

- Financial support from the government of the host country. The LOC should seek support from withing the host country at the level 20000€ towards the total budget shown in Table 1. This figure of 20000€ will cover the full participation of about 10 Namibian students.

4 Outreach to Secondary Education

During ASP2018, we will organize an outreach event to secondary schools around Windhoek over the course of three days in parallel with the school program for the participating students. We will visit one secondary school a day, and we will aim to accommodate up to fifty pupils in each visit. The purpose of this outreach will be to motivate and encourage high school students to develop and maintain interest in physics and applications. The details of the program during these visits will be worked out later, but for the most part, will consist of scientifc demonstrations, physics experiments, question and answer session and discussions.

5 Workshop for High School Teachers

We also propose to organize a workshop for high school teachers from all over Namibia, in parallel with the baseline ASP2018 program. We will aim to attract of the order of twenty high school teachers for a two-day workshop. The objective of this workshop will be to train high school teachers for good physics teaching skills. The program will constist of materclasses, physics demonstrations and experiments.

6 Outreach Day

An outreach day is organized during ASP. Local and central Namibian government officials will be invited as well as the international delegates present. The objective is to discuss the strategic planning of the Namibian government towards capacity building; to discuss the South African model towards to capacity building and how it might inform the Namibian model and vice versa, to present the CERN model towards outreach in Asia, Latin America and Africa. It will constitute a platform for bilateral discussions and agreement between Namibia and other African countries.

7 Synergy with Other Large Scale Infrastructures

There are well established synergies between High Energy Physics and other areas. For example in astrophysics, there is an overlap in several crucial science questions: theories and experiments in particle physics are part of cosmological and astrophysical models — in particular Dark Matter, Dark Energy, Dense Matter, neutrino physics, the Standard Model and beyond, exotic physics. There is a further overlap in issues of detectors and high throughput electronics, technological advances at CERN, joint R&D with SKA, high performance computing (Grid, GPU, Raspberry computing), training, management and roll-out of local infrastructure. These synergies also exist for remote sensing in industry, big data computing, medicine, and many other areas. Such synergies and spin-offs are already part of ASP, and they can be further integrated with careful planning and partnerships.

Currently, the ASP program does includes lectures and discussions in astronomy, astroparticle physics and cosmology. This will, in time, evolve to formally include dedicated lectures on SKA, CTA, etc. A number of ASP students have become graduate students in large multinational experiments such as ATLAS, CMS or ALICE.

After several discussions with DOSAR (Distributed Organization for Scientific and Academic Research) representatives, the organizing committee of ASP2012 agreed to extend the school by a few days, to August 8, 2012. The period of August 6-8, 2012 was exclusively devoted to an OSG (Open Science Grid) computing school proposed by DOSAR. Both the local and the international organizing committees felt that the Grid computing school proposed by DOSAR will be very beneficial to the local Ghanaian institutes, to help improve the existing Grid infrastructure, to train the local people on its usage and maintenance. The organizing committee of ASP2012 therefore welcome the DOSAR initiative to add the OSG school to ASP2012, and did all that was necessary to accommodate the Grid school and make it a success, not just for DOSAR but as well for the Ghanaian Grid computing efforts. The idea of the OSG Grid was also symbolic for the school, so that Ghana does not just become the venue of the school but will continue to work on developing Science within the region, so either way it was a good idea to look at the possibility of getting the OSG setup as physical connection to interested parties of the school. Since 2012, high performance Grid computing has become a part of the baseline ASP scientific program.

8 Conclusions

We propose to host the fifth edition of the African School of Fundamental Physics and Applications, ASP2018, for a duration of three weeks in 2018 in Namibia. About 65 students will be selected from all over Africa to attend the school for the entire duration. We seek in-kind logistiscal support from the local organizing committee in Namibia. We also seek a total of 20000€ from Namibian education, reseach and government agencies towards the participation of Namibian students. The international organizing committee will carry out a fundraising

compaign to raise the rest of the school budget from external sources (international organizations, foundations, international research institutes and universities abroad). We expect that ASP2018 will foster increased networking between Namibian students/lecturers/researchers and the international community for increased positive impact on capacity development and research in Namibia. We also expect that ASP2018 will serve as a bridge between Namibia and other African countries to share knowledge and experience in eduation, and to work together to address common issues in education and research.

References

[1] Steve Muanza, et al, "African School of Fundamental Physics and its Applications", **http://AfricanSchoolofPhysics.web.cern.ch**, August 2010

[2] Kétévi Adiklè Assamagan, et al, "African School of Fundamental Physics and its Applications, August 1-21, 2010, Stellenbosch, South Africa, **ASP2010 Final Report**" **http://africanschoolofphysics.web.cern.ch/AfricanSchoolofPhysics/asp2010.pdf**, December 2010

[3] Christine Darve, et al, "First African School of Fundamental Physics and its Applications", American Physical Society, Forum on International Physics, **http://www.aps.org/units/fip/newsletters/201103/darve.cfm**, APS April Meeting, 2011. "Fundamental Physics and Accelerator Sciences in Africa, Invited talk; Meeting of the American Physical Society, 27 February 2012, http://meetings.aps.org/Meeting/MAR12/Event/159351

[4] Kétévi Adiklè Assamagan, et al, "African School of Fundamental Physics and its Applications, July 15 - August 8, 2012, Kumasi, Ghana, **ASP2012 Final Report**" **http://africanschoolofphysics.web.cern.ch/AfricanSchoolofPhysics/asp2012/asp2012_final.pdf**, November 2012

[5] Kétévi Adiklè Assamagan, et al, "African School of Fundamental Physics and its Applications, August 3-23 2014, **ASP2014 Final Report**" **http://www.africanschoolofphysics.org/wp-content/uploads/2014/11/asp2014.pdf**, November 2014

[6] Kétévi Adiklè Assamagan, et al, "African School of Fundamental Physics and Applications, August 1-19 2016, **ASP2016 Final Report**" **https://ketevi.web.cern.ch/ketevi/ASP2016/asp2016-FinalReport.pdf**, September 2016

[7] ICTP, "The Abdus Salam International Centre for Theoretical Physics", **http://www.ictp.it/**