

# The African School of Fundamental Physics and Applications

a.k.a. the African School of Physics (ASP)

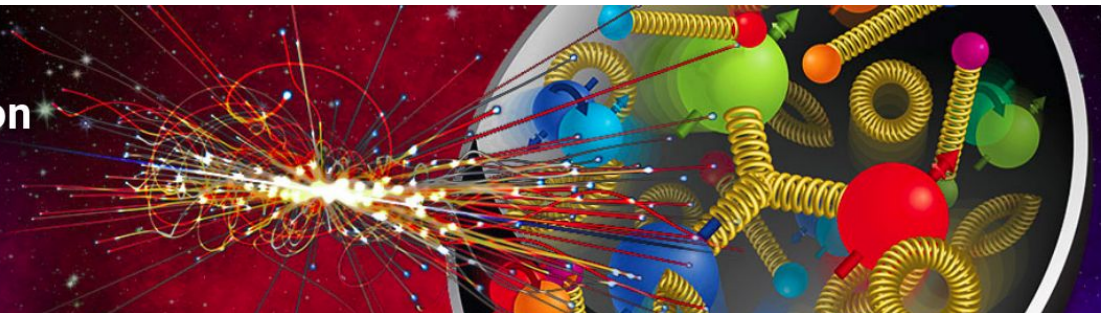


**Mounia Laassiri** (*ASP2016 Alumna*)  
on behalf of the ASP-IOC, IAC and LOC

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[mlaassiri@bnl.gov](mailto:mlaassiri@bnl.gov)

**Workshop on Exploring Collaboration**  
with MSIs in Nuclear and Particle Physics

Hosted by Brookhaven National Laboratory  
July 18-19, 2023



# Outline



**ASP Mission**



**ASP Organisation**



**ASP Editions**



**ASP Activities**



## THE SIXTH BIENNIAL



African School of Fundamental  
Physics and Applications

July 19-30, 2021

Virtual Edition



[www.africanschoolofphysics.org](http://www.africanschoolofphysics.org)

*The African School of Physics is much more than a school. It is a program of actions with directed ethos toward physics as an engine for development in Africa!*



# ASP Mission

ASP as a start-up

A non-profit organization created by a small group of worldwide scientists to stimulate and include more African talented physics students in the world scientific community.

The aim of the school is not to set a strictly one-way effort to bring knowledge and experience to African colleagues and students, but rather to establish a genuinely integrating scientific network between Africa and the rest of the world.



**Contribute to a world w/ equal access to knowledge**



**Support financially up to 85 African students for 3- week classes attendance**



**Establish a biennial educative program to be hosted across Africa**



**Provide high quality classes by international re-known Scientists**



# ASP Mission

Committees to build momentum

Build strategic partnership and collect financial support from Africa, Europe, USA and Asia via universities, laboratories, UN, and other organizations.



Prof. Bobby Acharya (ICTP & King's College London UK)



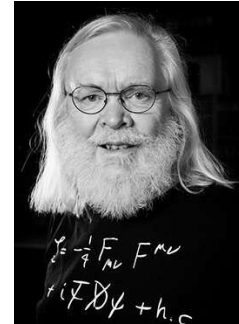
Dr. Kétévi A. Assamagan (BNL)



Dr. Anne E. Dabrowski (CERN)



Dr. Christine Darve (ESS)



Prof. John R. Ellis (CERN & King's College London UK)



Prof. Fernando Ferroni (GSSI-INFN)



Dr. Steve G. Muanza (CNRS-IN2P3)

- Conceptual thinking by *S. Muanza* and *J. Ellis* in 2001 and IN2P3 to trigger.
- International Center for Theoretical Physics (ICTP), *B. Acharya*, as incubator and greatly encouraged by CERN and Fermilab.
- Preparation teams led by *K. A. Assamagan* and *C. Darve* (ASP2010).





# ASP Mission

## Sponsorships for Student Participations

*"If each African country supports its participants, or contributes 2500 Euros every year to the ASP budget, ASP will be entirely financed by African countries. And \*2500 Euros\* is marginal even for the least developed country"*

### ICTP Support major

- Student participation
- Management of application database
- Arrange student travels

### Host Country Support Significant

- In-kind support
- Direct Financial contributions
- Human Resources toward ASP organization

### IOC

- Writes Proposals
- Produces Final Reports of Activities
- Seeking permanent financial backing

### African Contributions (ASP2022)

- SAIP
- Mandela University
- NRF | RISA
- ...

### Fund Management

Funds centralized and managed by the South African Institute of Physics (SAIP)

### Lecturers and Organizers Supported by External Sources - Significant

Support received then used to maximize student participation

### BNL International Engagements

- Contributions to the ASP budget to support African students participation
- Coverage for BNL staff lecturers in the organization, lecturing and mentoring of African students
- Coverage for African students for 3-6 months visits for research at BNL

***We appreciate the DOE support for the ASP!***



# ASP Organization

## Local Organizing Committee (LOC) – in the host country

Local logistics  
Liaise with Education and Research branches of host country government

## Objective

*Increase capacity development in fundamental and applied physics in Africa*

## International Advisory Committee (IAC)

Representatives of funding agencies  
Advise on the program  
Advise of the host country selection

## Assessment of Impact

Survey of students  
Survey of their Professors  
Follow academic developments

## International Organizing Committee (IOC)

Program management  
Fund raising  
Coordination of activities  
Activity reports to Funding agencies

## International Lecturers (IL)

Design the scientific Program  
Help with the student selections  
Mentor and Coach students continuously

## Spin-Offs









ASP Mentorship/ Coaching Program  
Networking and sharing of information  
Align ASP with educational priorities  
Improve future editions of ASP  
Promote research collaborations  
Promote research consortia

## Board of Trustees

Legal Responsibilities  
Fund raising  
Assess Management's



# ASP Editions

ASP	Host Country	Applicants	Students	African Countries	Mentorship	Teachers	Pupils	Conference
2010	South Africa 	125	65	17	Continuously, even when there is no formal school			
2012	Ghana 	138	50	15				
2014	Senegal 	330	70	21				
2016	Rwanda 	429	75	28	Program formalized in 2016. Runs continuously	20	150	
2018	Namibia 	523	85	26		63	> 1200	+60
2020/ 2021	Morocco  Online	N/A	94					+649
2022	South Africa 	>416	~82: In person ~97: Online	40		~80	~230	<a href="#">ACP2023</a> Sep 25-29, 2023 NMU George Campus, SA
2024	Morocco 	Coming up!						



# ASP Activities

Topics of interest

## Particles and related applications

- Nuclear physics,
- Particle physics,
- Medical physics,
- (Particle)astrophysics & cosmology,
- Fluid & plasma physics,
- Complex systems

## Light sources and their applications

- Light sources
- Condensed matter & materials physics
- Atomic & molecular physics
- Optics & photonics
- Earth science

## Cross-cutting fields

- Accelerator physics
- Computing
- Instrumentation & detectors
- Quantum computing & quantum information
- Machine learning & artificial intelligence

## Societal engagement

- Physics education
- Community engagement
- Women in physics
- Early career physicists

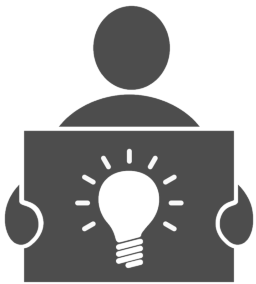
*Emphasis tailored to the physics interests of the host country, e.g. South Africa: Light Sources and Neutron Sources.*





# ASP Activities

## ASP Program Expansion



### **Student Program**

#### **2-week intensive school**

- 3rd year of University to Ph.D.
- Mostly African Students
- 70-85 Students

### **High School Teachers Program**

#### **1-week intensive workshop**

- Train High School Teachers for improved physics teaching

### **High School Learners Program**

#### **1-week learners Outreach**

- 10 – 12th grade learners
- Encourage learners to develop and maintain interests in Physics and Applications

### **ASP Forum**

#### **1-day**

- Involve Regional policy makers
- Promote spin-off activities in Africa
- Introduce students to policy

### **ASP Conference**

#### **Introduced since 2016**

#### **1-week International Conference**

- Participation of ASP Alumni
- Participation of Research Faculties
- Networking and connections

### **Mentorship / Coaching Program**

#### **At all times**

- Connect Students with Researchers
- Place students at Laboratories
- Listen to students and help address their academic needs if possible



# ASP Activities

## World-Class Lecturers

### 2-week intensive school:

- People-oriented lecturers willing to share their experience with African students
- Highly motivated and motivating characters
- Most of ASP lecturers are financially supported by their home institutes
- Provide fruitful interactions with students
- Lecturers typically attend the ASP for 3-7 days



# ASP Activities

## High School Teachers Program



### 1-week intensive workshop:

- ASP2022: ~80 teachers
- ASP2014: 63 teachers

*Teachers program runs in parallel to the students program!*

### Objective

*Support teachers growth in the planning and delivery of physics instructions*





# ASP Activities

## High School learners Program

### Objective

*Motivate high school pupils to develop and maintain interest in Physics.*



### 1-week learners Outreach:

- ASP2022: 10 high schools, 230 pupils
- ASP2018: 39 high schools, 1500 pupils

**Program designed such that the lecturers that are not lecturing to students can help with the learners program.**

*Learners program runs in parallel to the students program!*





# ASP Activities

## ASP Forum

### One day. Objective:

*Align ASP with the research and education priorities of African countries.*

#### ASP2010

Stellenboth,  
South Africa



Dedicated to Knowledge and Transfer of Technologie  
Dr. D. ADAMS, chief director: Emerging Research areas &  
Infrastructure, Human Capital and Knowledge Systems.

#### ASP2012

Kumasi, Ghana



AfLS and compact acc.

Prof. H. WINICK, Prof. Emeritus, SLAC  
and Prof. L. SERAFINI (INFN, IT)

#### ASP2014

Sakar, Senegal



UN support

Dr. H. TOURE, UN ITU Secretary General.  
Prof. A. WAGUE and O. KA. M. NGOM - US  
Embassy rep.

#### ASP2016

Kigali, Rwanda



East Afr. Science and New ICTP Center  
Rwandan Ministry of Education

#### ASP2018

Windhoek,  
Namibia



Education and capacity building in Namibia and Africa in general  
Dr T. TJIVIKUA, Vice-Chancellor, Namibia University of Science and  
Technology (Namibia), Dr. R. ADAM (SKA, SA)

#### ASP2020

marrakech,  
Morocco



Physics education and research roadmap development  
and implementation in Africa

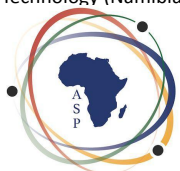
Prof. A. MURONGA (Nelson Mandela University, SA)  
Dr. Raissa Malu (Investing In People (IIP) ASBL)  
Oumar Ka (Cheikh Anta Diop University, Senegal)

#### ASP2022

MU, SA



Sustainability of ASP and capacity development & retention in Africa—with  
the participation of policymaker representatives from Morocco, Senegal, Ivory  
Coast, Burkina Faso, Benin and South Africa (DSI, NRF, SAIP, SANSA, NMU),  
and international delegates from Africa, Europe and the U.S.



# ASP Activities

ASP– Conference (ACP)

## Objectives

- *Attract ASP alumni*
- *Attract African research faculties*
- *Attract international participants not part of ASP*
- *Foster new research collaborations*



Peer-reviewed conference proceedings  
published by the African Review of Physics.

<http://aphysrev.ictp.it/index.php/aphysrev/issue/view/35>

## One week:

The physics topics taught at the school  
form the core of the ASP conference.



## ACP2021

- Participants from Africa: 563 (34/ 54)
- Participants from outside Africa: 86



# ASP Activities

## ASP Mentorship Program

### At all times:

- It runs continuously even when there is no school;
- Open to ASP student alumni in Ph.D. programs;
- Pairing of students to lecturers. Lecturers to mentor and coach them;
  - Not a replacement of academic advisors, rather in addition to / in collaboration with it
- Helps IOC track students after the school;
- Helps answer the questions, "Where are they now?", "What happens to them after they've attended ASP?"
  - These are legitimate questions
  - Mentorship program supplemented by periodic of surveys
- Program formalized soon after ASP2016;
- Through this program, we place ASP alumni in high education programs in South Africa, Asia, Europe and North America.



Participants in the 2018 African School of Physics, which took place in Namibia. Credit: Glibert Tékouté





# Short-Term Visits for Research

## Selected ASP alumni to spend 3-6 month at BNL for research

Assigned to work in research groups according to majors

July-December 2022



From left: Asmaa Aboulhorma (Morocco), Zainab Soumaimi (Morocco), Kétévi A. Assamagan, Antalia Rabarisoa (Madagascar), Xola Mapekula (South Africa), Kayode Dada (Nigeria), Rado Fanantenana (Madagascar)

June-December 2019



From left to right: in front, Christelle Ekosso (Cameroon), Dr. Mounia Laassiri (Morocco); standing, Diallo Boye (Senegal), Dr. Somiealo Azote (Togo), Jesutofunmi Fajemisin (Nigeria), Hassnae El Jarrari (Morocco), Dr. Kétévi A. Assamagan, Raymond Yogo (Kenya), and Yves Kini (Burkina Faso). Heba Sami Abdulrahman (Egypt), not in the figure, arrived in September.

[https://www.symmetrymagazine.org/article/building-up-the-african-physics-community?language\\_content\\_entity=und](https://www.symmetrymagazine.org/article/building-up-the-african-physics-community?language_content_entity=und)





# ASP2016– A Moroccan in Kigali

## ASP Impact

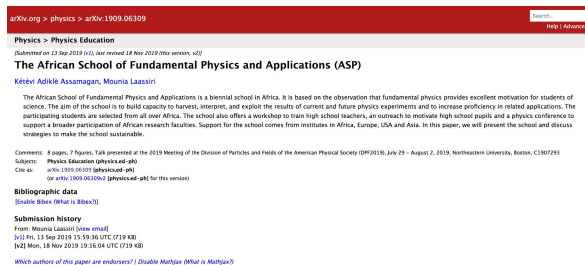
- **ASP2016 (Kigali, Rwanda)**
- **ASP Mentorship Program (Dr. Mario Campanelli & Dr. Kate Shaw)**
- **Ph.D defence**
  - Dr. L. Elouadrhiri (JLab): Thesis president
  - Dr. K. A. Assamagan (BNL): Thesis referee
  - ASP IOC programed a site Visit to Morocco for SP2020
- **Short-term for research to BNL, Jul-Dec 2019**
- **Scientific Activities**
  - **DPF2019**, Northeastern University, Boston, USA
  - **BF2019**, BNL, Upton, NY, USA
  - **NSBP2019**, Providence, Rhode Island, USA
  - ...
- **Lecturer at ASP2022**



Ph.D defence



ASP2022: Event generation & Detector simulation hands-on tutorial



ASP2016 group photo

[HIP Blog](#) [I didn't know a physicist could look like you!](#)



[I didn't know a physicist could look like you!](#)  
by [Mounia Laassiri](#) on April 3, 2023

In July 2016, I had the privilege of participating as a student in the African School of Fundamental Physics and Applications (ASP) held in Kigali, Rwanda. It was there that I had a lot... The post I didn't know a physicist could look like you! [...]



<https://arxiv.org/abs/1909.06309>

# ACP2023– NMU George Campus

September 25-29, 2023

**Coming soon — the 3rd edition of the African Conference on Fundamental Physics and Applications, ACP2023 September 25-29, 2023**

Hosted by the Prof. Azwinndini Muronga (Chair of the LOC) at Nelson Mandela University George Campus

**Registration is still open for the ACP2023**

<https://indico.cern.ch/event/1229551/>





**NELSON MANDELA**  
UNIVERSITY



**SOUTH AFRICAN**  
INSTITUTE OF PHYSICS

**The 3rd African Conference on  
Fundamental and Applied Physics**  
**25-29 September 2023**

**Scientific Program**

**Topics**

- Space Physics, Astrophysics & Cosmology
- Nuclear and Particle Physics
- Medical and Radiation Physics
- Biophysics
- Physics Education, Outreach, & Communication
- Diversity Equity & Inclusion in Physics
- Condensed and Material Physics
- Photonics
- Applied and Industrial Physics
- Theoretical and Computational Physics
- Physics for Sustainable Development
- 100 Years of Physics in Africa and the Future



**100 years of  
Physics in Africa**  
Past, Present, And  
Future



Nelson Mandela University  
(George Campus)



U.S. DEPARTMENT OF  
**ENERGY**  
Office of Science



PAUL SCHERRER INSTITUT  
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SCIENCES SOCIETY



UNIVERSITY OF  
**TEXAS**  
ARLINGTON



**NITheCS**  
National Institute for  
Theoretical and Computational Sciences



UNIVERSITY OF  
**BIRMINGHAM**



**APS**  
physics



science & innovation  
Department of  
Science and Innovation  
REPUBLIC OF SOUTH AFRICA



**CERN**



**DESY**



**INFN**  
Istituto Nazionale



**ICTP**  
International Centre  
for Theoretical Physics



**GSI**  
GRAN SASSO  
SCIENCE INSTITUTE  
DEPARTMENT OF PHYSICS  
UNIVERSITY OF SASSARI



**NRF**  
National Research  
Foundation



**RISA**  
Research and Innovation  
Support and Management



**US ATLAS**



**NELSON MANDELA**  
UNIVERSITY





# ASP2024– Welcome to Morocco



**THE EIGHT BIENNIAL AFRICAN SCHOOL OF FUNDAMENTAL PHYSICS AND APPLICATIONS**

Co-organized by Cadi Ayyad University and Mohammed V University  
at Faculty of Science Semlalia, Marrakesh, Morocco  
**7-21 July 2024**

**ASP**

To increase capacity development in fundamental physics and related applications in Africa. The ASP has evolved to be much more than a school. It is a program of actions with directed ethos toward physics as an engine for development in Africa

**SCIENTIFIC PROGRAM**

► **TOPICS**

- Space physics, Astrophysics & Cosmology
- Nuclear & Particle Physics
- Medical and Radiation Physics
- Condensed and Materials Physics Biophysics
- Applied and Industrial Physics
- Theoretical and Computational Physics
- Physics education, outreach and Communication
- Physics for Sustainable Development

► **ACTIVITIES**

- Workshop for High School Teachers
- Outreach for Secondary Schools
- Physics Lectures & Tutorials for students
- Capacity Development and Retention discussion

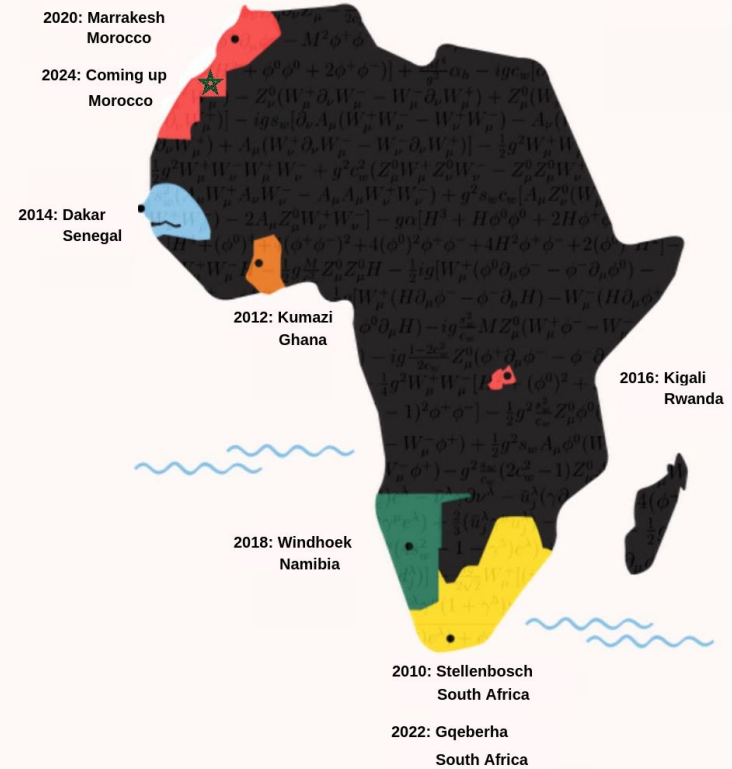
**Logos:** Paul Scherrer Institut, ICTP, International Centre for Theoretical Physics, THE UNIVERSITY OF BIRMINGHAM, INFN, Office of Science, IREE, APS physics, iThemba LABS, NRF, RISA, URPAP, and various African universities.

<https://www.africanschoolofphysics.org/asp2024/>



THANK YOU!

ASP: African School of  
Fundamental Physics  
and Applications



Artwork by Sandbox Studio, Chicago

BACKUP!

# ASP Alumni analyses of COVID-19 data

arXiv.org > q-bio > arXiv:2007.10927

Search...

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Quantitative Biology > Populations and Evolution

COVID-19 e-print

**Important:** e-prints posted on arXiv are not peer-reviewed by arXiv; they should not be relied upon without context to guide clinical practice or health-related behavior and should not be reported in news media as established information without consulting multiple experts in the field.

[Submitted on 21 Jul 2020 (v1), last revised 30 Jul 2020 (this version, v4)]

## A study of COVID-19 data from African countries

Kétévi A. Assamagan, Somiéalo Azote, Simon H. Connell, Cyrille E. Haliya, Toivo S. Mabote, Kondwani C. C. Mwale, Ebode F. Onyie, George Zimba

COVID-19 is a new pandemic disease that is affecting almost every country with a negative impact on social life and economic activities. The number of infected and deceased patients continues to increase globally. Mathematical models can help in developing better strategies to contain a pandemic. Considering multiple measures taken by African governments and challenging socio-economic factors, simple models cannot fit the data. We studied the dynamical evolution of COVID-19 in selected African countries. We derived a time-dependent reproduction number for each country studied to offer further insights into the spread of COVID-19 in Africa.

Subjects: **Populations and Evolution** (q-bio.PE); Physics and Society (physics.soc-ph)

Cite as: arXiv:2007.10927 [q-bio.PE]

(or arXiv:2007.10927v4 [q-bio.PE] for this version)

<https://www.internationalscholarsjournals.org/journal/ijphe/articles>

## APS alumni learned about

- Analysis tools in C++ and Python
- Understanding their data
- Modeling, goodness of fit
- Statistical analysis
- Uncertainties (statistical, systematic)
- Estimation of basic reproduction number  $R_0$
- Giving scientific talks
- Writing a paper and responding referees comments



Scientific African  
Volume 14, November 2021, e00987



## A model of COVID-19 pandemic evolution in African countries

Kossi Amouzouvi<sup>a</sup>, Kétévi A. Assamagan<sup>a,b</sup>, Somiéalo Azote<sup>c</sup>, Simon H. Connell<sup>d</sup>, Jean Baptiste Fankam Fankam<sup>e</sup>, Fenosoa Fanomezana<sup>f</sup>, Aluwani Guga<sup>g</sup>, Cyrille E. Haliya<sup>h</sup>, Toivo S. Mabote<sup>i</sup>, Francisco Fenias Macucule<sup>j</sup>, Dephney Mathebula<sup>k</sup>, Azwinndini Muronga<sup>l</sup>, Kondwani C.C. Mwale<sup>m</sup>, Ann Njeri<sup>n</sup>, Ebode F. Onyie<sup>o</sup>, Laza Rakotondravohitra<sup>p</sup>, George Zimba<sup>q</sup>

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<https://doi.org/10.1016/j.sciaf.2021.e00987>  
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### Abstract

We studied the COVID-19 pandemic evolution in selected African countries. For each country considered, we modeled simultaneously the data of the active, recovered and death cases. In this study, we used a year of data since the first cases were reported. We estimated the time-dependent **basic reproduction numbers**,  $R_0$ ,

## Modelling the impact of vaccination on the COVID-19 pandemic in African countries

Dephney Mathebula<sup>a,\*</sup>, Abigail Amankwah<sup>b</sup>, Kossi Amouzouvi<sup>c</sup>, Kétévi A. Assamagan<sup>d,e</sup>, Somiéalo Azote<sup>f</sup>, Jesutofunmi Ayo Fajemisin<sup>g</sup>, Jean Baptiste Fankam Fankam<sup>h</sup>, Aluwani Guga<sup>i</sup>, Moses Kamwela<sup>j</sup>, Toivo S. Mabote<sup>k</sup>, Mslape M Kanduzi<sup>l</sup>, Francisco Fenias Macucule<sup>m</sup>, Azwinndini Muronga<sup>n</sup>, Ann Njeri<sup>o</sup>, Michael Ohuwole<sup>p</sup>, Cláudio Moisés Paulo<sup>q</sup>

<sup>a</sup>University of South Africa, Department of Decision Sciences, South Africa

<sup>b</sup>African Institute for Mathematical Sciences (AIMS), Ghana

<sup>c</sup>Kwame Nkrumah University of Science and Technology, Ghana

<sup>d</sup>Brookhaven National Laboratory, Physics Department, Upton, New York, USA

<sup>e</sup>Université de Lomé, Département de Physique, Lomé, Togo

<sup>f</sup>University of South Florida, Department of Applied Physics Tampa, Florida, USA

<sup>g</sup>University of Yaounde I, Department of Physics, Yaounde, Cameroon

<sup>h</sup>Nelson Mandela University, South Africa

<sup>i</sup>Lasaka Apex Medical University, Zambia

<sup>j</sup>Universidade Eduardo Mondlane, Grupo de Astrofísica, Ciências Espaciais e Inteligência Artificial, Maputo, Mozambique

<sup>k</sup>Cancer Diseases Hospital, Lusaka, Zambia

<sup>l</sup>University of Manchester, UK

<sup>m</sup>University of Ibadan, Nigeria

### Abstract

The rapid development of vaccines to combat COVID-19 is a great scientific achievement. In addition to non-pharmaceutical measures put in place to contain the pandemic, pharmacological measures have been incorporated in the battle against the SARS-CoV-2, especially with the commencement of vaccination in early December 2020. This study used the SIDARTHE-V model, i.e. an extension of the SIDARTHE model with the impact of vaccination roll outs. We assessed the potential impact of vaccination in reducing the severity (deadly nature) of the virus in African countries. Model parameters were extracted by fitting simultaneously the COVID-19 cumulative data of active cases, recoveries, deaths and full vaccinations reported by the governments of Ghana, Kenya,

arXiv:2209.08694v1 [q-bio.PE] 19 Sep 2022


<https://doi.org/10.1016/j.sciaf.2021.e00987>

<https://arxiv.org/abs/2209.08694>





# ASP Alumnus Yves Kini publication based on study done during his Short-Term Visit at BNL

 Cornell University

We gratefully acknowledge support from the Simons Foundation and member institutions.

arXiv.org > astro-ph > arXiv:2007.10334

Search... All fields Search

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Astrophysics > High Energy Astrophysical Phenomena

[Submitted on 20 Jul 2020]

**Ultra-High-Energy Tau Neutrino Cross Sections with GRAND and POEMMA**

Peter B. Denton, Yves Kini

Next generation neutrino experiments will push the limits in our understanding of astroparticle physics in the neutrino sector to energies orders of magnitude higher than the current state-of-the-art high-energy neutrino experiment, IceCube. These experiments will use neutrinos to tell us about the most extreme environments in the universe, while simultaneously leveraging these extreme environments as probes of neutrino properties at the highest energies accessible in the foreseeable future:  $E \sim 10^9$  GeV. At these energies neutrinos are readily absorbed in the Earth. Assuming an isotropic distribution, by looking at how the flux varies as a function of angle through the Earth, we show that it is possible to extract the  $\nu_\tau$ - $N$  cross section with precision at the  $\sim 20\%$  level ( $1\sigma$  assuming Wilks' theorem) given  $N_{\text{events}} \sim 100$  events.

Comments: 7 pages, 5 figures, comments welcome

Subjects: **High Energy Astrophysical Phenomena (astro-ph.HE)**; High Energy Physics - Experiment (hep-ex); High Energy Physics - Phenomenology (hep-ph)

Cite as: arXiv:2007.10334 [astro-ph.HE]  
(or arXiv:2007.10334v1 [astro-ph.HE] for this version)

**Bibliographic data**  
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**Submission history**  
From: Peter Denton [view email]  
[v1] Mon, 20 Jul 2020 18:00:00 UTC (1,379 KB)

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**References & Citations**

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BNL Advisor during short-term visit: Dr. Peter Denton (Theorist, neutrino physics)

**Yves Kini (ASP2018), Ph.D. student at Anton Pannekoek  
Institute for Astronomy, University of Amsterdam  
2021, Yves won the Inaugural Gus Prince Scholard Award**



# Assisting Alumni in higher education opportunities



## THE AFRICAN SCHOOL OF PHYSICS: A SPRINGBOARD FOR THE FUTURE

A biennial African School of Physics (ASP) on fundamental physics and its applications was established in 2010 in order to promote international cooperation in the field of fundamental physics among African countries and between them and western countries.

An ASP has taken place every second year from 2010 to 2016 ...

[more >](#)

<http://bulletinserv.cern.ch/emails/archive/353/>



Top: Dr. Chilufya Mwewa, (Zambia, ASP2010), Postdoctoral Researcher at BNL  
bottom: Dr. Diallo Boye (Senegal, ASP2012), Postdoctoral Researcher at BNL



# Serving on Thesis Committees / External Examiners / External Reviewers

## Files status determination in a Large Scale Data Center

Aulan Lucrèce ZAHOUNDO (aulan@aims.ac.za)  
African Institute for Mathematical Sciences (AIMS)

Supervised by: Dr Kétévi Adiklè ASSAMAGAN  
Brookhaven National Laboratory, USA

02 May 2020

*Submitted in partial fulfillment of a structured masters degree at AIMS South Africa*



### The search for a dark vector boson and a new scalar with the ATLAS detector

Boye, Diallo

URI: <http://hdl.handle.net/10500/26696>

Date: 2020-06

Type: Thesis

#### Abstract:

Hidden sector or dark sector states appear in many extensions to the Standard Model (SM), to provide particle mediators for dark matter in the universe or to explain astrophysical observations such as the positron excess in the cosmic microwave background radiation flux. A hidden or dark sector can be introduced with an additional U(1) dark gauge symmetry. The discovery of the Higgs boson in 2012 during Run 1 by the Large Hadron Collider (ATLAS and CMS) opens a new and rich experimental program for Beyond Standard Model physics (BSM) based on the Higgs Portal. This exotic discovery route uses couplings to the dark sector at the Higgs level, which were not experimentally accessible before. This thesis presents the searches of possible exotic decays:  $H \rightarrow Z\tilde{Z}(d) \rightarrow 4^*$  where  $Z\tilde{Z}(d)$  is a dark vector boson. It had been initiated in the Run 1 period of the LHC using the ATLAS detector at CERN. The results showed (tantalizingly) two signal events where none were expected, so that in the strict criteria of High Energy Physics, the result was not yet statistically significant. The Run 1 analysis for a 8 TeV collision energy is further developed in Run 2 with a 13 TeV collision energy, to expand the search area, take advantage of higher statistics, a higher Higgs production cross section, and substantially better performance of the ATLAS detector. In this work, the search is further broadened and includes allowing the mass of the originating boson (the dark Higgs  $S$ ) to vary from the SM value. This allows the search for the dark vector boson to also explore higher or lighter masses than the SM Higgs boson. This extended search is efficient and could include a more general class of models, with the mass constraint of the SM Higgs portal lifted. This thesis reviews the analysis results from Run 1 and Run 2, and presents its iteration in the full Run 2 search by focusing on its new channel where the additional scalar  $S$  (with  $m_S \approx m_H$ ) decays to  $4^*$  via two dark vector boson states  $Z\tilde{Z}$ . The case where the Higgs decays to  $4^*$  via two  $Z\tilde{Z}$  ( $H \rightarrow Z\tilde{Z}(d) \rightarrow 4^*$ ) and also called high mass channel, has been just unblinded. Nineteen data events are observed where 14 were predicted. In overall, the data are consistent with the Monte Carlo prediction. No evidence of deviation from the Standard Model expectations are observed.

Dr. Assamagan and Prof. Connell were co-advising  
Diallo Boye (alumnus ASP2012) in his PhD on ATLAS Experiment



## Abstract

Being able to manage the space allocated to the ATLAS dCache despite the large amount of data that comes into it is a great challenge for analysts at the Brookhaven National Laboratory. The main goal of our work is to classify these data according to their importance for physics. To do this, we have, at first glance simulating data in the ideal case, discussing experiences which in reality have made it possible to obtain them. And we then apply a Machine Learning algorithm to our simulated data in order to find solve the storage issue.

Lucrèce Zahoundo (Bénin), alumnus ASP2018  
MSc thesis study done using Deep Learning Tools

### Search for invisible decays of the Higgs Boson, with interpretation for dark matter, using the ATLAS Detector at the LHC

Presented to obtain the degree of **PhD** in physics by:

Mohamed Zaazoua

Supervisors: Pr. Farida Fassi  
Dr. Kétévi Adiklè Assamagan

Mohammed V University, Faculty of Sciences of Rabat



Mohamed ZAAZOUA (FSR)

Invisible Higgs searches

October 29, 2022

1 / 37

Dr. Assamagan was a co-advising  
Mohamed Zaazoua (alumnus ASP2020) in his PhD on ATLAS Experiment