THE AFRICAN LIGHT SOURCE

Towards a Light Source for the African Continent

NEWSLETTER

January 20, 2020

Cover Image (above) is a photo of the National Synchrotron Light Source (NSLS II) located at Brookhaven National Laboratory in Upton, NY, U.S.A.
Photo is courtesy of Brookhaven National Laboratory.

Inside This Issue:

AfLS Steering Committee Chair's Comment

Written by Simon Connell

Welcome to the first edition of the African Light Source Newsletter, keeping you in touch with the AfLS related activities, supplementing our web-pages, blog and social media pages.

The AfLS is a home for all individuals and organizations whose vision includes a light source for Africa. It brings coherence and a common unified voice to the AfLS project. It enables the inclusivity beyond an African base, bringing in all global players, while still establishing a primary Africa-lead and Africa-inspired energy towards the vision.

What then is a light source ?

It's a mega-science, massively multi-disciplinary, large scale, research infrastructure [1], a mega-training infrastructure, a font of innovation, whose context is Africa entering the first world in a sustainable way. Its context is the banishment of disease and poverty. Africa must have a light source as its presence feeds so much progress, and implies so much progress. Africa is the last habitable continent without such a device, while other continents together have tens of them, which they continually upgrade. The current upgrades have a figure of merit in accelerator-detector development bringing up to four orders of magnitude in research potential. We have yet to discover how best to deploy such vast research potential. Africa is barely on the starting blocks, while other continents are implementing a ten-thousand fold upgrade to their capacity. Our sister continent, South America, is a recognized lead-contributor to light source technology and light source enabled science. They, and their youth, are one of our tremendous inspirations. Each year we delay, condemns Africa to a greater gap in catching up. The AfLS project belongs to the basket of the few most urgent projects the Africa Union could possibly take up.

Achieving a light source is a quintessential goal. It includes the idea of Science for Socio-economic Development, as enabled by capacity building, science, innovation and sustainable competitive industry. As Africa is a large continent of many nations, we also have the idea of Science for Peace and Science for Diplomacy. The AfLS is an African-passion lead foundation conducting a mega-project uniting many stakeholders and partners in a common vision. All of these partners can retain their branding as we all build together the African Light Source. Achieving this vision will mean an Africa with its own industry and innovations, a massively broadened base of scientists, engineers and technologists and significant other local and regional research infrastructure. We fully anticipate it will mean cures for diseases like HIV-AIDS, Malaria, Ebola and Tuberculosis. It will ultimately mean decolonization, the sustainable beneficiation of African resources within Africa, a massively enhanced African GDP, the end of war in Africa and Africa as a scientific and recreational mecca for the rest of the world.

Can we afford it – Yes. Can we afford to not have it - No.

Who are African researchers and are they ready for the AfLS ?

Firstly, we have the African passport carrying compatriots, who may even be in the great African Diaspora. Focusing now on research: If we can include all African light source users, from within Africa and also the Diaspora, then we long ago passed the accepted threshold for a user base of sufficient extent to moot an Africa Light Source. In addition, we have many African researchers and institutions where light (or electromagnetic radiation) is a premier research tool. These are ripe for an upgrade to that golden chalice - that large scale research infrastructure with its mega-science and industry park attached – the African Light Source. Our conclusion is: Africa is ready, in terms of its science capacity, to populate an excellent light source based research and innovation program.

(continue on Page 7)

SA-ESRF-2019

Written by Simon Connell

The **SA-ESRF-2019 Conference** took place on **11-13 November 2019 : Johannesburg**.

The meeting builds on more than a decade of deep commitment to develop the ESRF User Base in South Africa. The broadness of the current user base already reflects the global nature of science and the ESRF as a leading international facility. The SA-ESRF relationship forms part of a wider context of the full Light Source User Base of South Africa, which accessed many Light Sources available around the world. The ESRF had been selected by the SA Community for Scientific Associateship as it was an International Facility, which has some premier and unique features, and which is especially heavily used by South Africa, to a level comparable to other smaller European nations. It also plays the role of supplying central innovation for other Light Sources, and extended capacity for special training as its staff complement is about a factor of two more than for other light sources. All light sources accessed by South Africans remain important to our User Base, either because of a niche competence, special collaborative networks, or efficiencies of access.

In the meeting, delegates explored the enhanced capacity of the ESRF following the upgrade of the ESRF to an Extremely Brilliant Source (EBS). The ESRF was represented by the top leadership, including the Director Dr Francesco Sette, the two Research Directors Harald Reichert (Physical Sciences) and Jean Susini (Life Science), as well as four leading beamline scientists. The latter represented all major areas of research for South Africa. The ESRF-EBS represents an impressive increase in the performance of both the source and the detectors: 100 fold improved emittance and 10 to 1000 times better detector performance depending on the context. In addition to dramatic enhancement the usual spectroscopies and imaging techniques, novel techniques and opportunities emerge. The dramatic improvement and novelty analytical and imaging modalities means there is not really an established user-experience yet and so the exploitation of the new capacity requires partnerships with beamline scientists. This meeting extended the possibility for all SA Users and also potential new users to grow their connections with the ESRF or launch new ones. This should lead to the development of proposals ready for March 2020.

AfLS at NSBP

Written by Tabbetha Dobbins

The AfLS project was well represent at the **National Society of Black Physicist (NSBP) conference** in **Providence, RI held from Nov 14 to 17**. The theme of the conference was "Promoting Professional Connections and Persistence in Physics". The NSBP conference program is 30% professional development workshops and 70%technical. The professional development workshops aim to help students and faculty to make the various transitions to becoming active scientists. The NSBP technical program includes presentations in parallel sessions on Astronomy, Condensed Matter and Materials Physics, Cosmology, Gravitation, and Relativity, Chemical and Biological Physics, Medical Physics, Nuclear and Particle Physics, Photonics and Optical Physics, and Physics Education Research.

Next year, in 2020, the NSBP conference will be held from Nov 5-8 at Brookhaven National Laboratory (BNL) in Upton, NY. BNL is home to the National Synchrotron Light Source II (NSLSII)—which is the newest third generation light source constructed in the U.S. A little known fact: AfLS Executive Steering Committee Member and LAAAMP Executive Director, Sekazi Mtingwa, is one of the founders (1977) and a past President of NSBP.

Read more about the history of NSBP here: https://www.nsbp.org/nsbp-information/nsbp-history

"PROMOTING PROFESSIONAL CONNECTIONS AND PERSISTENCE IN PHYSICS"

Benson Frimpong (L) and Joseph DaFuor (R) presented together and won best graduate student poster award in the category of "Photonics and Optical Physics". The award was presented by Donnell Walton Ph.D. (Center), a representative of Corning, Inc. Corning, Inc was one of the major sponsors of the conference.

2ND INTERDISCIPLINARY GRADUATE SCHOOL IN LASER-BASED MANUFACTURING

On March 9-13, 2020, the Interdisciplinary Graduate School in Laser-based Manufacturing Technologies (IGSLbMT) will take place. This is a 5-day summer course aimed at providing post-graduate students with a strong tutoring from the commencement of postgraduate programs with a view to defining an optimized path throughout their research activities. The 10 lectures and practical sessions are:

- Lasers and optics and their use in materials processing
- Industrial hazards associated with laser processing and the international standards which need to be adhered to
- Laser-based Manufacturing Entrepreneurship in Africa - Fundamental principles of laser-materials interactions, laser cladding, laser welding, and laser additive/subtractive manufacturing
- How process, materials, and design parameters influence the quality characteristics of the laser processed components
- Characterization and quality control issues in laser processed samples
- Modeling and simulations in laser materials processing
- LbM practicals in laser cladding, laser welding and laser metal deposition.

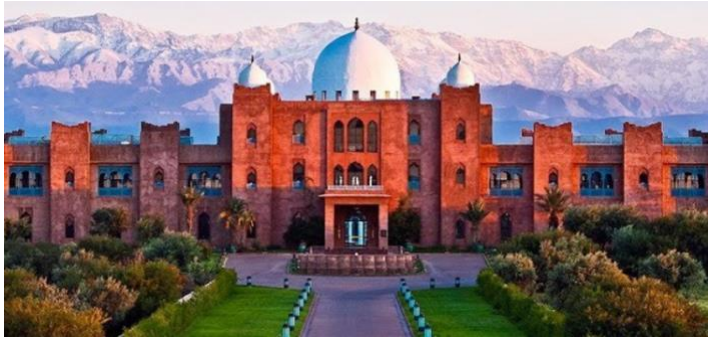
The conferences is organized by the Education for Laser-based Manufacturing (ElbM) Partner Institutions. For further information, contact: Prof. E.O. Olakanmi (+267)74276012 (olakanmie@biust.ac.bw). Funding application deadline is January 31, 2020.

AFRICAN SCHOOL AND AFRICAN CONFERENCE ON FUNDAMENTAL PHYSICS AND APPLICATIONS (ASP2020 & ACP2020)

Physicists let's get ready to go to Morocco! ! ! The African School on Fundamental Physics (ASP2020) and African Conference on Fundamental Physics (ACP2020) are coming up in July. Topics include:

1. Nuclear and Particle Physics
2. Astrophysics and Cosmology
3. Accelerators, Radiation, and Medical Physics
4. Materials Physics
5. High Performance Computing
6. Physics Education
7. Physics Communication
8. Renewable Energies and Energy Efficiency
9. Quantum Information

This will be the 6th biennial ASP. Student applications are open until January 15, 2020. This will be the 2nd biennial ACP. Abstracts are open until February 29, 2020. Instructions for applying to the APS2020 and submitting a contributed talk to ACP2020 are located here: https://www.africanschoolofphysics.org/



UPCOMING EVENTS

SCHOOL ON ADVANCED LIGHT SOURCES: PRINCIPLES, METHODS AND MULTIDISCIPLINARY APPLICATIONS (SMR 3439)

April 20 to May 1, 2020, ICTP will hold a School in Advanced Light Sources in Trieste, ITALY. The School aims to introduce young scientists to research at synchrotron and free electron laser (FEL) facilities. Content will cover an overview and characteristic of radiation produced by these facilities, interaction of radiation with matter, and other topics in basic and applied research. A list of topics include:

- Production of Synchrotron and FEL Radiation
- Properties of Synchrotron and FEL Light
- Photo-Matter Interactions
- Photon Transport and Beamline Instrumentation
- X-ray Absorption and Fluorescence Spectroscopy
- Photoelectron Spectroscopy Methods
- X-ray Diffraction Methods
- X-ray Scattering Techniques – SAXS, WAXS, XPCS, RIXS
- Imaging Techniques using Synchrotron and FEL Light
- X-ray and IR Spectromicroscopy
- Time-resolved Approaches and non-linear X-ray Optics

Apply online at: http://indico.itcp.it/event/9080/

A limited number of grants are available to support the attendance of selected participants, with priority giving to participants from developing countries. There is no registration fee. ***Deadline of January 15th for Applicants needing financial support; General application deadline is March 1st.***

Download the event poster for more information at: indico.ictp.it/event/9080/material/poster/0.pdf.

Elettra Sincrotrone Trieste | IAEA | ICTP The Abdus Salam International Centre for Theoretical Physics www.ictp.it Trieste, Italy | UNESCO United Nations Educational, Scientific and Cultural Organization

CCP4 CRYSTALLOGRAPHIC SCHOOL IN SOUTH AFRICA

On March 30 to April 8, 2020, the University of Cape Town, SA will host the first **CCP4 Crystallographic School in South Africa:** ***Data Collection to Structure Refinement and Beyond***. Organized by Trevor Sewell (University of Cape Town, SA), Carmien Tolmie (University of the Free State, SA), Gwyndaf Evans (Diamond Light Source, UK), and Ronan Keegan (CCP4, STFC Rutherford Appleton Laboratory, UK) with help from Ruslan Sanishvili (Argonne National Lab, USA), the workshop will provide instruction on protein structure solved by X-ray crystallography.

Don't miss this opportunity to have data from your crystals collected at the Diamond Light Source (remotely). Software to be covered includes: iMosflm, XDS, DIALS, BLEND, PHASER, SHELX, MrBUMP, SIMBAD, ARP/wARP, Coot, REFMAC, Isolde, Crank2, PISA, etc. Postgraduate students, postdoctoral researchers, and early career scientist in structural biology are encouraged to apply.

There is no registration fee and accommodations will be provided for participants not in Cape Town. Twenty-five applicants will be selected. Apply at: biophysicsworkshop.co.za/ccp4-2020-workshop/application/ (Deadline is January 25th).

CCP4 | SYNCHROTRON TECHNIQUES FOR AFRICAN RESEARCH AND TECHNOLOGY START | diamond | GCRF Global Challenges Research Fund

ESRF TO HOST "CULTURAL & NATURAL HERITAGE" WORKSHOP by LEE BERGER

Don't miss out on the opportunity to participate in the workshop offered by Lee Berger. The workshop will be livestreamed on YouTube on January 22nd and 23rd. Visit: https://www.youtube.com/user/LightforScience for more information.

3rd African Synchrotron Light Source Conference
AfLS3 : towards a brighter future

AfLS3 CONFERENCE

Save-the-date for the 3rd African Light Source Conference Nov 16th-21st, 2020. The conference will be held in Kigali, Rwanda and hosted by the International Centre for Theoretical Physics (ICTP)/ East Africa Institute for Fundamental Research (EAIFR) located at the University of Rwanda (UR), College of Science and Technology. Abstracts can be uploaded at: **http://afls3.africanlightsource.org/**

The conference program will feature sessions on:

- News from Light Sources around the world
- Heritage Sciences (Archeo- and Paleo-)
- Environmental Sciences
- Energy Sciences
- Pan-African Initiatives in Science and Technology
- Strategy and Vision for the African Light Source
- Capacity Building

Don' t miss out on this historical event! During the first AfLS conference, a steering committee was elected and mandated. As well, a set of resolutions (the Grenoble Resolutions) were adopted and a Roadmap towards implementation was developed. Since then, actions to move the roadmap forward have always been operationalized during sessions at the conferences. Come and be a part of this wonderful endeavor!

Additionally, Biostruct-Africa will organize a workshop at AfLS3. More details coming on this workshop and another at the 11th African Congress of Immunology, Lilongwe-Malawi (November 2020)! Visit http://biostructafrica.org/upcoming-worksops for updates.

MEET THE AfLS EXECUTIVE STEERING COMMITTEE 2020

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AfLS Steering Committee Chair's Message
(Cont'd from page 2)

Once again, who are Africans ?

Science is an intrinsically global endeavor, teaching us through evidenced-based-reasoning that there is no place for our ancient outdated prejudices, and that our diversity is our strength and salvation. We know that the best paleontological and archaeological evidence indicates we are all ultimately African. The African Union has said through one of its one-time ambassadors, Dr Arikana Chihombori-Quao, that "to be an African, you do not need to born in Africa, but Africa must be in borne in your heart". The AfLS says to all its partners, you are African!

Let us then welcome the entire world to the African Light Source project.

The AfLS Roadmap

Progress on the Roadmap towards the AfLS is indeed one of the sources of strong, well-founded Afro-optimism. This Roadmap [2] is progressed by the AfLS and its committees and all partners and stakeholders. The Roadmap has a base platform of human capacity development, light source user-base development, local (feeder) infrastructure development and global networking development. Some of this progress is tracked on the website.

Indeed, it's not an easy task to do this auditing. However, you will see an increasing record of schools, research outputs, training and research opportunities, conferences, meetings, stakeholder involvement programs and a growth of African local and regional research infrastructures.

In parallel with the bottom-up activities, the Roadmap also includes top-down activities. These are political and strategic activities, building the involvement of African National, and Pan African institutions, including governments. There is an ongoing call to all governments and all Pan African institutions to participate in the AfLS vision via endorsements (see our web-site [3]). Already we have a sequence of writings from the Africa Union and its structures that build consensus towards this vision. This is backed up by new programs and communications from some governments and academies as they develop activities towards the AfLS. On the international scene, there is a long list of national and international large scale research infrastructures globally who have already supported for many years the activities of the AfLS Roadmap. These are either developing or well established conversations extending to the domain of major international bodies, including those who have been involved in similar developments, such as the SESAME international light source in the Middle East.

Of particular note is that a start has been made on the Conceptual Design Report. This is a major comprehensive document that is the first of a sequence common to most large scale research infrastructure projects. It includes expositions on: Political, Economic Development and Management Concepts (Science Case, Economic Development Case, Political and Economic Strategic Roadmap, Education Infrastructure and HCD Roadmap, Project Management); Financial Considerations and models; Machine Design Concepts; Site Selection Criteria and Procedures; Experimental Capabilities and Beamlines Concepts with volumes by discipline and technique.

The AfLS story started two decades ago, but it was first crystallized into a document at the founding of the African Laser Centre in 2002. The AfLS Structures were prepared for and then established via an African-mandate obtained by harvesting all participants in the AfLS conversation at the First African Light Source Conference in 2015. This full story and the subsequent developments are laid out in several papers [4-6] as referenced below. In addition, the AfLS website [3], is an important resource.

[1] "***Advanced Light Sources and Crystallography - Tools of Discovery and Innovation***", (2018), Published by LAAAMP, Light sources for Africa, Asia, the Americas and Middle East Project - an IUPAP) and IUCr project funded by the International Science Council (ISC), Ed: E Malamud (2019). Available https://laaamp.iucr.org

[2] The African Light Source Steering Committee, "***The African Light Source Manifesto***"(includes the Roadmap), African Light Source Website, https://wp.me/a5gqfo-38 accessed 16 Jan 2020.

[3] African Light Source Website, http://www.africanlightsource.org accessed 16 Jan 2020.

[4] S.K. Mtingwa, H. Winick, "***Synchrotron light sources in developing countries***" Mod Phys Lett A **33/9** (2018) 1830003.

[5] S.H. Connell, S.K. Mtingwa, T. Dobbins, B. Masara, E.P. Mitchell, L. Norris, P. Ngabonziza, T. Ntsoane, M. Sekota, A. Wague, H. Winick, M. Yousef, "***The African Light Source Project***", The African Review of Physics 13 (2018) 0019.

[6] S.H. Connell, S.K. Mtingwa, T. Dobbins, N Kumbah, B. Masara, E.P. Mitchell, L. Norris, P. Ngabonziza, T. Ntsoane, H. Winick, "***Towards an African Light Source***", Biophysical Reviews 11 (2019) 499.

An IUPAP-IUCr project within the 2016-2019 ICSU Grants Programme

LAAAMP

Lightsources for Africa, the Americas, Asia and Middle East Project

LAAAMP Enters Year Four

Michele Zema, Sekazi K. Mtingwa, Sandro Scandolo
***LAAAMP* Executive Committee**

Light sources for Africa, the Americas, Asia and Middle East Project (*LAAAMP*) just closed out its third year of operations and is off to a fast start in Year 4. *LAAAMP*'s targeted regions are Africa, Mexico, the Caribbean, Southeast Asia, and Middle East. At conception, *LAAAMP* identified five tasks to pursue, namely (1) conduct a survey of crystallography and advanced light source (AdLS) users in the targeted regions and develop a **Strategic Plan** for each; (2) send seasoned AdLS users to the targeted regions under the **Colloquium Program** to enhance researchers' knowledge of crystallography and AdLSs and how they can be of benefit in their research and training of students, and become a partner in the launch of IUCr-UNESCO-*LAAAMP* OpenLabs, which is a network of operational crystallography laboratories in developing countries; (3) develop and disseminate an informational, nontechnical brochure that explains the tremendous dividends derived from crystallography and AdLS research and training; (4) send **FAculty-STudent (FAST) Teams** to any of the sixteen AdLS partners around the world for two months of training, mainly on the beamlines, and when possible, allow them to continue the training for another two months the following year; and finally (5) convene a meeting at the end of the year 2019 to present the *Strategic Plans* and launch more detailed *Business Plans* that include feasibility studies of constructing AdLSs in regions where they do not currently exist.

Year 3 began with a major push on concluding the survey, which is posted on the *LAAAMP* Website at https://laaamp.iucr.org/. To assist in this effort, Dorian Bohler, a staff physicist at the SLAC National Accelerator Laboratory, joined the *LAAAMP* team to identify those researchers in the targeted regions who should submit responses to the survey and assist with the development of the *Strategic Plans* in the regions.

(Cont'd on page 10)
(*LAAAMP* Enters Year 4 Cont'd)

IUCr IUPAP INTERNATIONAL COUNCIL FOR SCIENCE

X-TechLab

A huge success of the Colloquium Program stems from Thierry d'Almeida's visit to his home country of Benin. A member of the *LAAAMP* Steering Committee and currently employed as a senior research engineer at France's Commissariat à l'Energie Atomique, d'Almeida traveled to Benin during 30 April to 7 May 2018 to deliver a series of lectures on AdLSs, related techniques and their relevance to specific issues of interest in Africa, and his own synchrotron-based research. Jean-Pierre Ezin, a member of *LAAAMP*'s Regional Committee for Africa and former African Union Commissioner for Human Resources, Science and Technology, arranged for the venues of the lectures to be the Institut de Mathématiques et Sciences Physiques (IMSP) in Porto-Novo and the Université de Abomey-Calavi (UAC) in Cotonou.

While in Benin, d'Almeida met Claude Borna, who is Scientific Advisor to Benin's President Patrice Talon. She arranged for d'Almeida to return to Benin for a one-hour meeting on 12 September 2018 with President Talon and his Cabinet. She also arranged for d'Almeida to meet with President Talon two days prior to that meeting, during which time he acquainted President Talon with various initiatives, including *LAAAMP*, the African Light Source, and his own idea to establish a crystallography training program in Benin to benefit students from Benin and neighboring countries. The latter idea, which d'Almeida dubbed X-TechLab, highly impressed President Talon, who indicated that that is precisely the kind of initiative that he has been seeking, and hence pledged his government's support for the project. Subsequently, X-TechLab was allocated space in Sèmè City, which is between Cotonou and Porto-Novo and is being established as a high-tech hub for Benin.

According to d'Almeida, the mission of X-TechLab is to create a center of training for a new generation of crystallographers. Students participating in X-TechLab will train for 2 weeks, twice per year. Approximately 50 IMSP students will train, with an additional 60 students from UAC and other institutions both from inside Benin and neighboring countries, such as Nigeria, Togo, Niger and Burkina Faso, for a total of approximately 110 Masters and Ph.D. students per year. With support from *LAAAMP*, the government of Benin, and the World Bank's *Africa Higher Education Centres of Excellence (ACE)* program, d'Almeida; Marielle Agbahoungbata, XTech-SD Co-Leader; Ezin; and one of the authors (MZ) have worked with many others to offer the first training school in 18-29 May 2019 and the second in 18-30 November 2019 that covered crystallography/X-ray diffraction and tomography/mathematical engineering.

Thierry d'Almeida Addresses Benin President Patrice Talon's Cabinet (Photo Courtesy of Government of Benin)

***LAAAMP* Brochure**

The brochure, with Ernie Malamud serving as Editor, is entitled *Advanced Light Sources and Crystallography: Tools of Discovery and Innovation*, and is available on the *LAAAMP* Website in English, Spanish, French and Arabic, with the International Atomic Energy Agency (IAEA) donating the latter three translations. Hardcopies of the brochure have been in great demand at conferences. Indeed, the brochure has been extremely helpful in educating the public and governmental officials about the tremendous benefits derived from crystallography and AdLSs.

FAST Teams

Perhaps the most high-profile LAAAMP initiative is its (FAculty-STudent) FAST Team program. For this, LAAAMP disseminates a solicitation each year calling for faculty with less than a year's experience with AdLSs to apply with a Ph.D. student to spend two months at one of the 16 LAAAMP AdLS partners. LAAAMP provides airline tickets and partial meal expenses, while the AdLSs provide housing and additional partial meal expenses. One of the authors (SS) oversees the travel arrangements through the Travel Office of the Abdus Salam International Centre for Theoretical Physics. During 2019, LAAAMP and the AdLSs awarded 14 FAST Teams, and they anticipate supporting at least 10 FAST Teams in 2020. Where possible, LAAAMP allows previous awardees to participate for another two months during the year following the first award.

Kirsi Lorentz and her research team (left to right: Yuko Miyauchi, Grigoria Ioannou, Kirsi Lorentz and Iosif Hafez) at the XAFS/XRF beamline control hutch (© Kirsi Lorentz, The Cyprus Institute)

THE AFRICAN LIGHT SOURCE CONFERENCE

16 - 21 Nov 2020, Kigali, Rwanda

Conference Venue

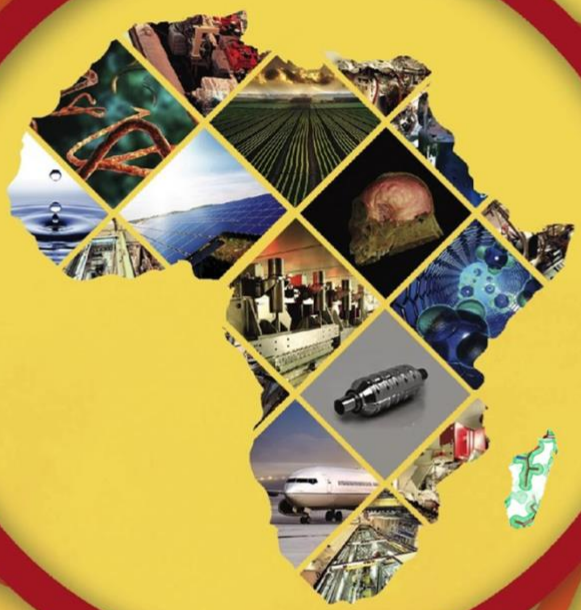
Hosted by ICTP-East African Institute for Fundamental Research (EAIFR)

Web Pages

AfLS3 Conference: http://afls3.africanlightsource.org

ICTP - East African Institute for Fundamental Research under the auspices of UNESCO

Download the Conference Poster at:
https://eaifr.ictp.it/media/2853/conferenceposter_afls3-01.pdf



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THE AFRICAN LIGHT SOURCE CONFERENCE IS OPEN TO AFRICAN SCIENTISTS, COLLEAGUES, STUDENTS WHO HAVE UTILISED LIGHT SOURCES, AND FRIENDS OF AFRICA WHO SUPPORT THE VISION FOR AN AFRICAN LIGHT SOURCE.

CONFERENCE TOPICS

Medical Sciences, Heritage Sciences, Geosciences, Environmental sciences, Energy Sciences, Nano Sciences, Materials Sciences, Mineral Sciences, Accelerator and Detector Sciences, Competitive Industry, Capacity Building, Infrastructures, Strategy and Vision for the AfLS.

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