The unique experimental research facility in MENA and neighboring region

Open Science – The Way Forward
Movenpick Du Lac Hotel in Tunis, Tunisia
19-20 July 2022

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www.sesame.org.jo

SESAME stand for: Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME)

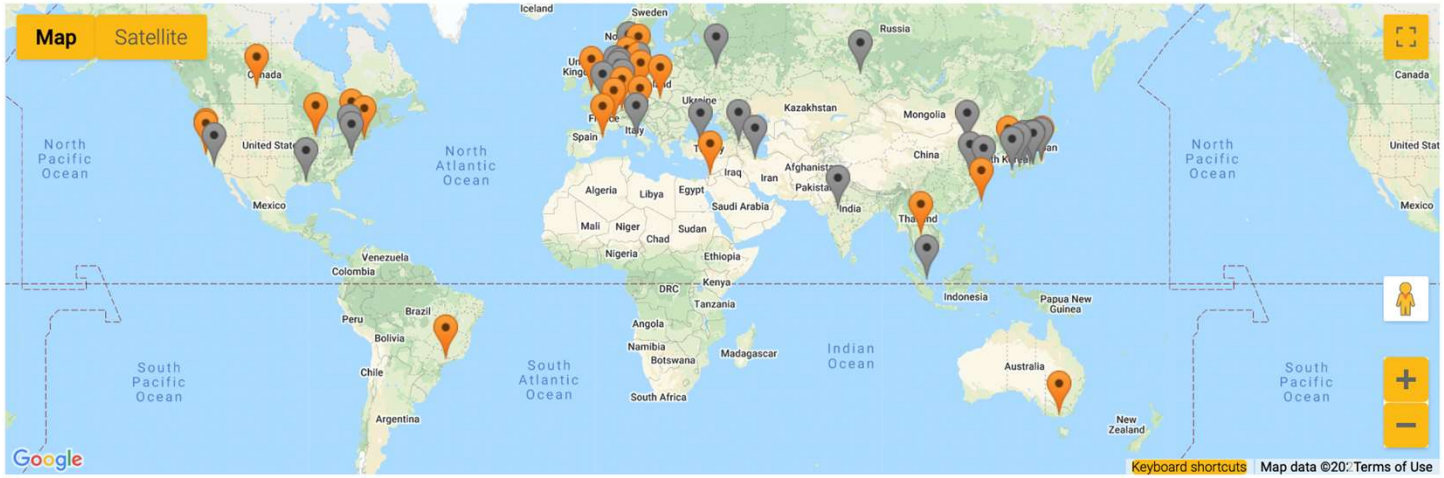
A 3rd Generation Light Source, SESAME has state-of-the-art infrastructure which designed to enable the Scientific Research in the region for designated users communities

lightsources.org

Home | About Lightsources.org | International Day of Light | For Users | Careers | Light sources of the world

Light sources of the world

There are more than 50 light sources in the world (operational, or under construction). This page lists all the members of the lightsources.org collaboration.



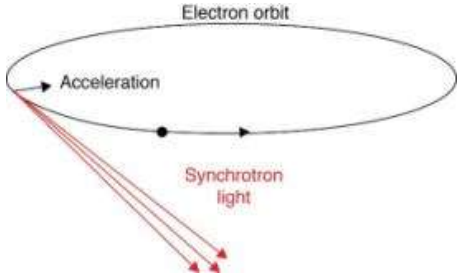
50.000 users, the largest scientific community in the world

Over 50 light sources world wide, SESAME is the only one on MEAN and ME

History and Milestones

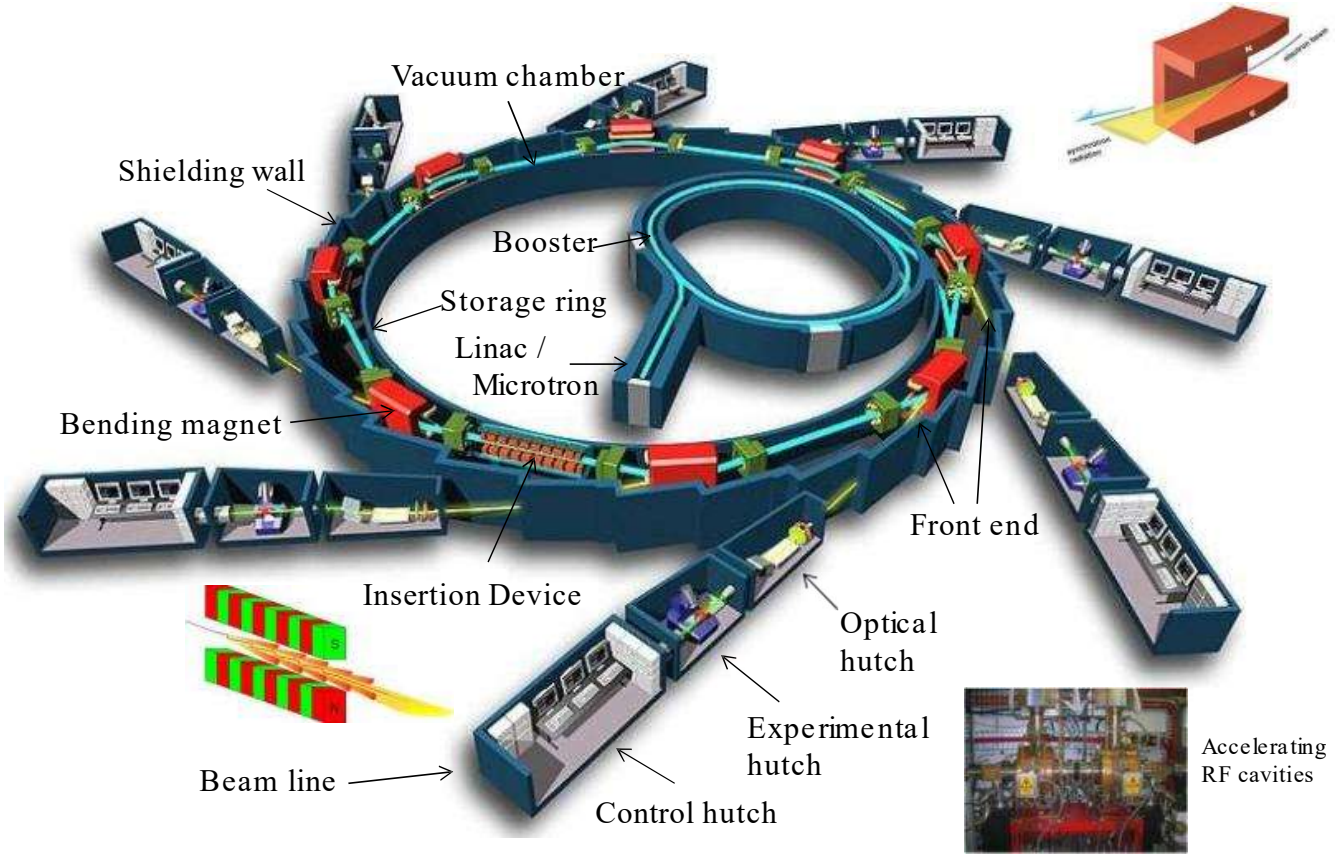
How is Synchrotron Radiation Produced?

- When electrons are accelerated (e.g. in a radio transmitter antenna), part of the energy in the electromagnetic force field that surrounds them is 'shaken off' and emitted as electromagnetic radiation (e.g. radio waves).
- As their trajectories are deflected, electrons in circular motion in a synchrotron also undergo acceleration, directed towards the centre of the circle, and emit radiation.

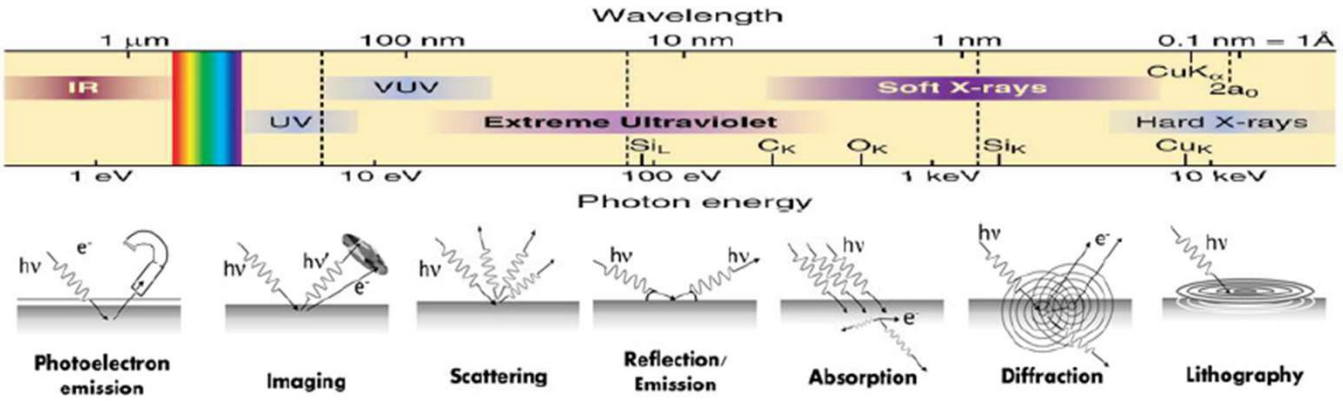


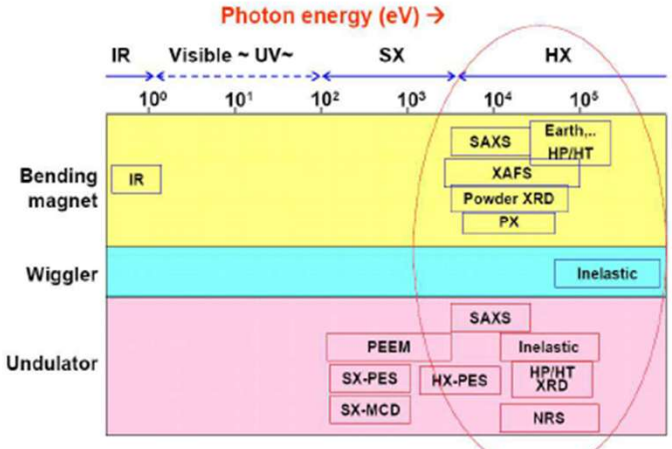
The electromagnetic field surrounding the electrons is unable to respond instantaneously when the electrons are deflected; some of the energy in the field keeps going, producing a tangential cone of synchrotron radiation. As the electrons' energy increases, the cone of radiation narrows, and the radiated power goes up dramatically.

General Structure of a Synchrotron Light Source

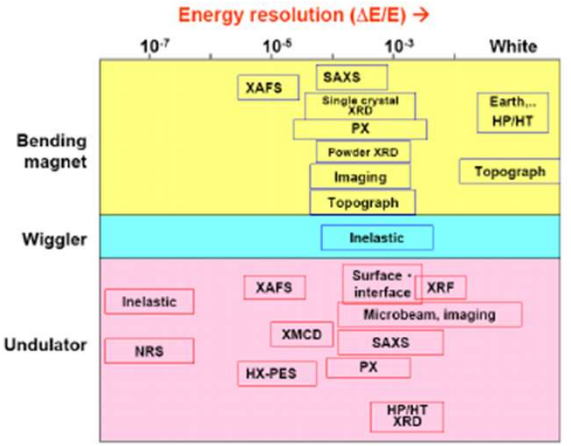


Typical Synchrotron Researches





Different techniques need different photon energy



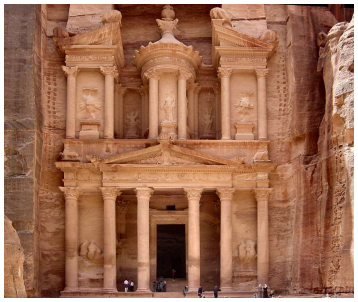
Most of the techniques need good energy resolution

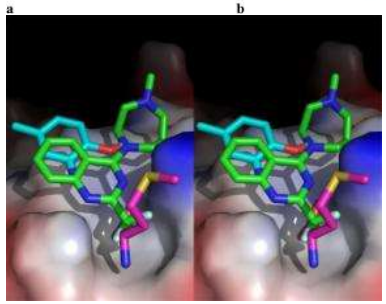
Very wide energy and wide required energy resolution

SESAME

Research Scientific areas

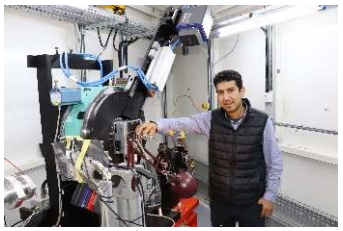
- Life Sciences
- Material Science & Physics
- Chemical Sciences
- Cultural Heritage & Archeology Applications



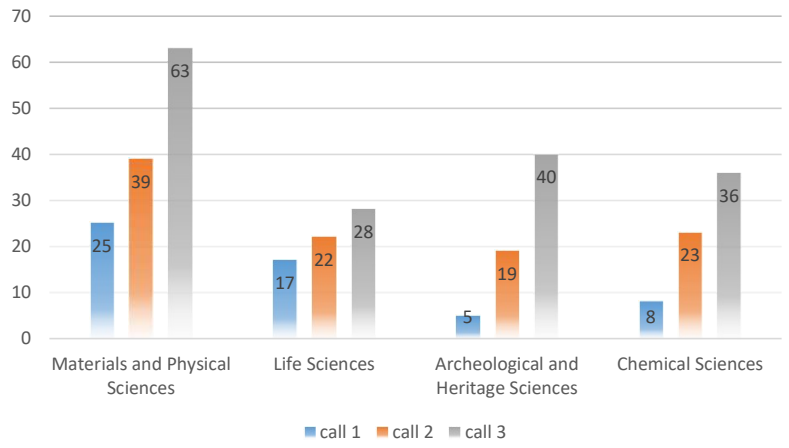


2018 **2018** **2020**

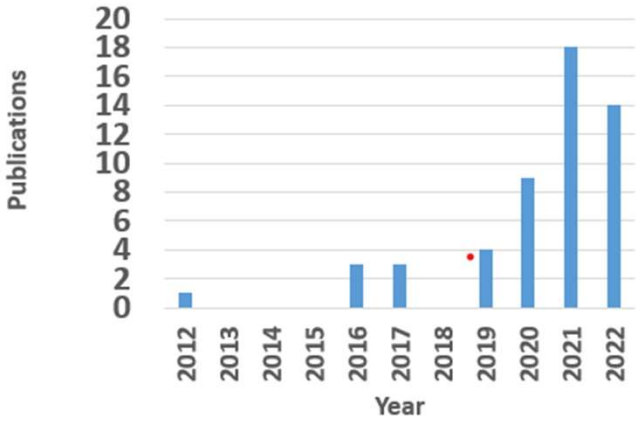


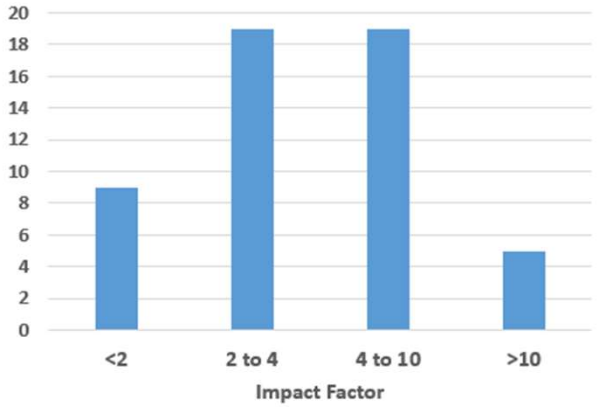


BM02 IR **BM08 XAFS/XRF** **ID09 MS**



Call 4, CFP Just closed on 30 June 2022
Now it is under scientific and technical evaluation process
https://sup.sesame.org.jo

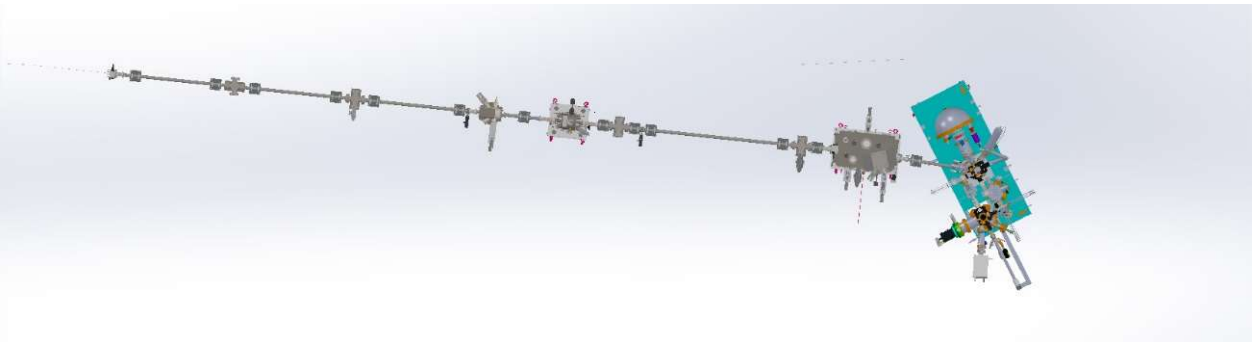




CFP 1,2 and 3: 461 proposals from 27 coun

ID10 - BEATS
BEAmline for Tomoghraphy at SESAME (2022)

ID11 left – HESEB
Helmholtz-SESAME Beamline (2022)
Inaugurated on June 12, 2022



ID11 right – TXPES
Türkiye X-ray PhotoEmission Spectroscopy Beamline (2023)

Computing Services to the community (open-source)

use, distribute, modify, or contribute back to a project

- Computing infrastructure for Machine, Beamlines and Offices (DNS, DHCP, Hosting, LADP, Nagios, Elog, EPICS, …)
- SESAME Users Office portal(Call for proposals CFP, Beam-time)
  - https://sup.sesame.org.jo
- SESAME Experimental Data (SED) management (Next slide)
- Community code for:
  - Data Acquisition system, in-house python development
  - Data analysis, community-driven repo per research filed
- HPC clusters (CPU/GPU)
  - OpenHPC is a set of community-driven tools for Linux based HPC
- Data transfer, high-end storage and remote access
  - Private cloud, SSL tunneling, X2Go/NX, ssh gateway, and many…

X2Go

SESAME Datacentre is Powered by many open-source software apps

Computing Services to the community(cont.)

ICAT and SESAME Experimental Data (SED)

under implementation and adaptation to cover the following:

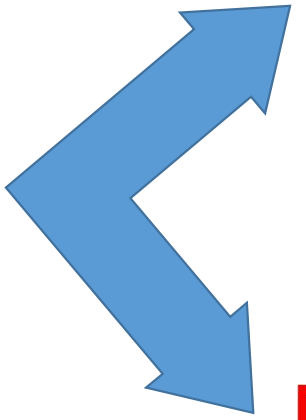
1. **Meta Data: All Data Comes from SUP (SESAME USER PORTAL) contain the user names, Emails, User group, Proposal Number…. ETC.**
2. **Scientific Data: All Data comes from the beamlines: XSAFS, IR, MS, HESEB, and BEATS**
3. **Enable the web-based access to SESAME Experimental Data (SED)**

IT challenges on research environment

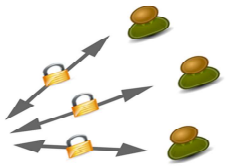
- Computing is playing a vital role on enabling research operations and experimental data production. So we use High-end HW for availability, and lot of man-power effort to adapt legacy/custom-made Scientific tools on the IT infra
- Connectivity become essential and like the nerve to the body
- HPC operation for remote users (CPU/GPU) for data analysis
- Linux distribution and open-source repo maintainer : define and apply global plan for the institute
- COVID - new trigger and community-driven: global requirements to enable and deliver free remote control and access to the experiments + Video conferencing tool

SESAME is enabling the Remote experiment and experimental data management

- ✓ External User register at (SUP)
- ✓ SUP=SESAME User Portal
- ✓ https://sup.sesame.org.jo
- ✓ User submit a proposal
- ✓ Proposal Granted a Beamtime



ICAT: web service interface



Users get their SED Data via ICAT, with the applied Data Policy

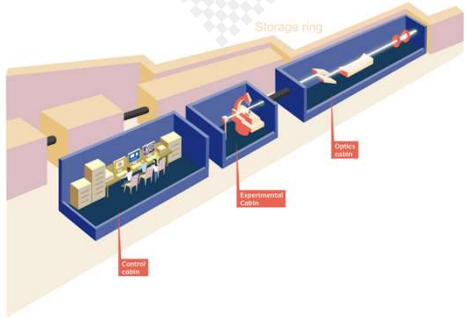
SED Storage

SED server

Beamlines

Data acquisition system
Detectors output…

Users execute remote experiment. via NoMachine

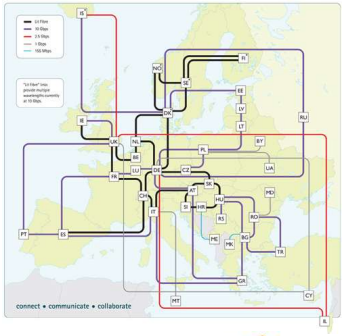


Data Connectivity
International Access to Education & Research Networks

World wide Education & Research Networks

International circuit to
GÉANT(pan-European data network for the research and education) via ASREN.
Connectivity service contract:

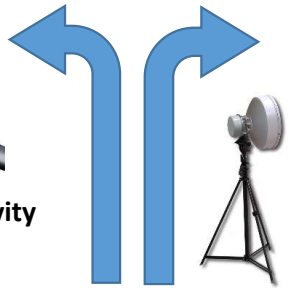
- 1000 Mbps Circuit over fiber connectivity
- 250 ++ Mbps Internet (shared with ASREN clients)
- Operational since: July 2016

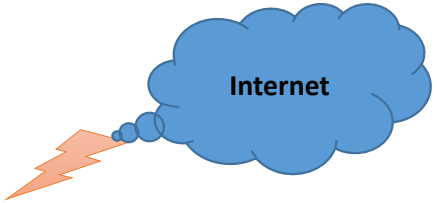


ASREN
Arab States Research and Education Network

GÉANT
Networks • Services • People

Data Connectivity to GÉANT via ASREN
(Fiber optics link)



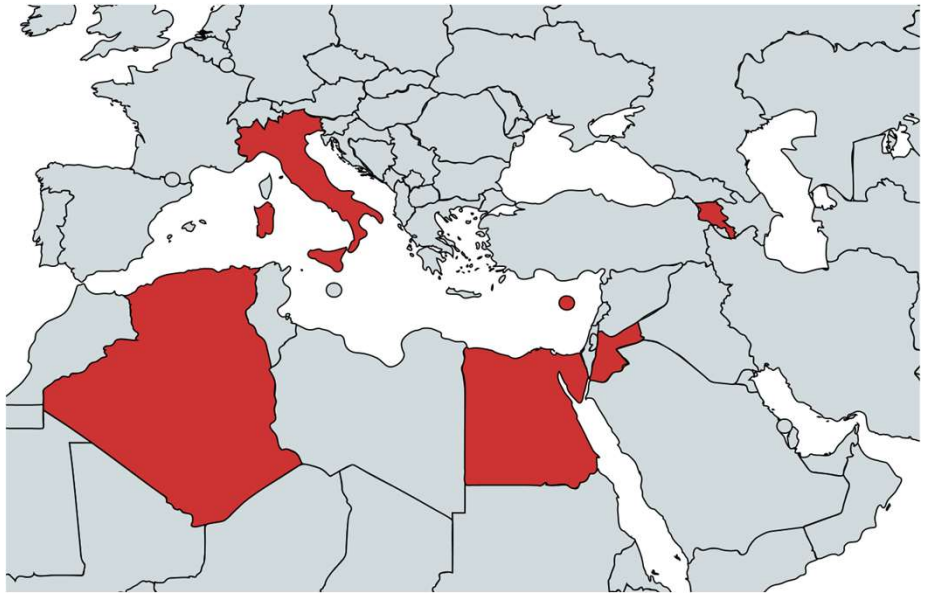


Internet Connectivity
(Microwave Link)

SESAME

Access to HPC systems and Scientific Computing Research @SESAME [Regional]

- Jordan university of science and technology, JUST, Jordan
- The University of Jordan, Jordan
- Jerash University, Jordan
- National Academy of Sciences of the Republic of Armenia NAS RA, Armenia
- The Cyprus Institute, CyI, Cyprus
- International Centre for Theoretical Physics, ICTP, Italy
- Supreme Council of Universities-Egypt, Egypt
- University of Laghouat, Algeria

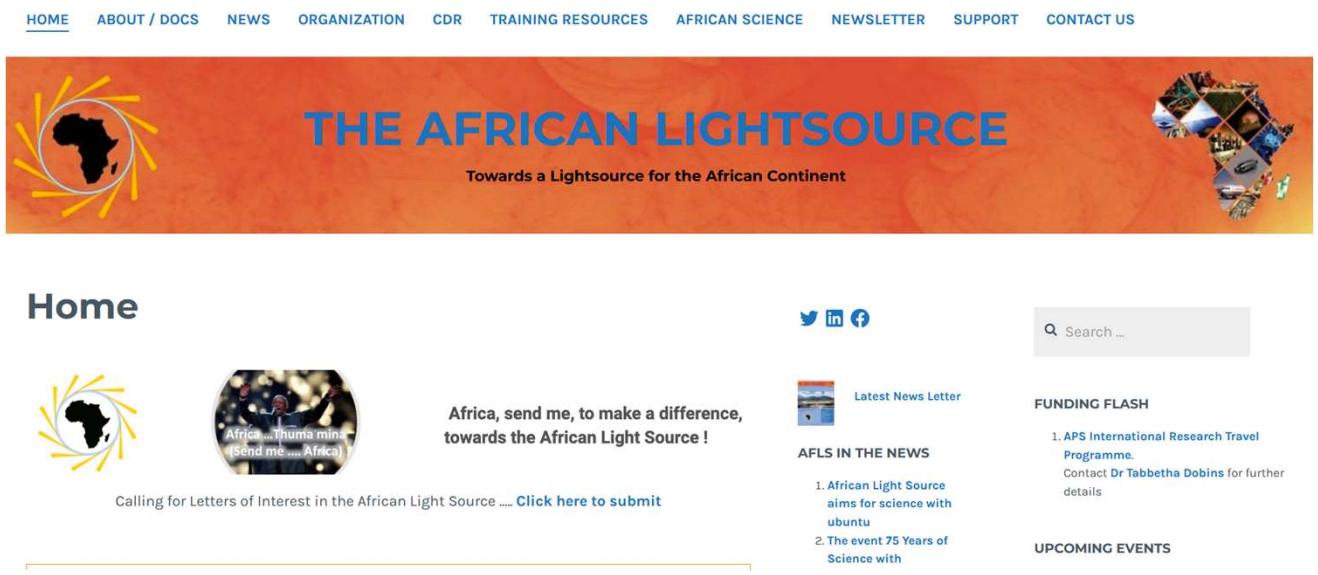


Why Build a Synchrotron Facility?

- International collaboration is obvious way for countries with relatively small scientific communities and/or limited science budgets to build a synchrotron-light source.
- Broad programs make synchrotron-light sources ideal facilities for building scientific capacity.
- SESAME is a user facility: scientists will typically go to SESAME two or three times a year for a week or two to carry out experiments, in collaboration with scientists from other institutions/countries.

African Synchrotron light

- African synchrotron light https://www.africanlightsource.org/



Thank you

www.sesame.org.jo