Concept Note

Expanding African Access to Synchrotron Light Source; *Unlocking Scientific Innovation and Sustainable Development in Africa*

1. Context and Rationale

Africa remains the **only continent without a synchrotron facility**, placing its scientists at a significant disadvantage in accessing **cutting-edge research infrastructure**.

A synchrotron is a type of particle accelerator that generates extremely bright X-rays, allowing scientists to analyze materials at the atomic and molecular levels with unparalleled precision. This powerful technology is used across multiple scientific fields, enabling breakthroughs in medicine, materials science, energy, and agriculture.

Synchrotrons have played a crucial role in **breakthrough discoveries in medicine, materials science, energy, and agriculture**. They were instrumental in **characterizing COVID-19, developing vaccines, and advancing renewable energy technologies**.

While more than **50 synchrotron facilities exist globally**, African researchers face **severe barriers** to accessing them due to **limited funding, travel constraints, and highly competitive time allocations** at foreign facilities. This limits Africa's ability to **develop homegrown solutions for pressing challenges**, from climate resilience to food security.

Building a **new synchrotron in Africa** is an ambitious yet critical goal. However, such an undertaking requires **a long-term commitment and significant investment**, often exceeding **$500 million USD** and spanning over a decade for design, construction, and operational readiness. While such a project remains an aspiration, an **immediate, high-impact solution is within reach**.

2. A Pragmatic Approach: Establishing an African Beamline at SESAME

To **accelerate access to synchrotron technology** while working toward the long-term goal of establishing an African synchrotron facility based in Africa, African Member States can pursue a **cost-effective and timely alternative**: **establishing a dedicated African beamline at SESAME (Synchrotron-Light for Experimental Science and Applications in the Middle East)**.

Why SESAME?

Geographic and Political Accessibility; Located in **Jordan**, SESAME is the **closest synchrotron to Africa**, making it easier and more affordable for African researchers to travel and conduct experiments.

Proven Model of International Cooperation; SESAME was established as a **UNESCO Initiative**, bringing together countries from the Middle East and beyond, despite political differences. It serves as a **diplomatic and scientific success story**, demonstrating that regional collaboration in synchrotron science is achievable.

Existing Infrastructure and Expansion Capacity; SESAME is a **world-class synchrotron** with **beamlines already in operation**, and **space available for additional beamlines**. This makes it an ideal host for an **African-dedicated beamline**, ensuring faster implementation compared to building a new facility.

Cost-Effective and Faster Deployment; Constructing a beamline at SESAME would cost approximately **$6-10 million USD,** a fraction of the **$500 million USD** required for a full synchrotron facility and could be operational in **3-5 years**.

Capacity Building for African Scientists; SESAME already has established training programmes and would provide **African researchers hands-on experience** in beamline operation and data analysis. This knowledge transfer is crucial for **building African expertise** in synchrotron science.

3. A Call for Collective Action

Establishing an African beamline requires **political commitment and financial backing** from African Member States. This initiative aligns with **Agenda 2063, the African Union's Science, Technology, and Innovation Strategy for Africa (STISA-2024), and the UN Sustainable Development Goals (SDGs)**.

How Member States Can Support This Initiative:

🔷 **Political Endorsement** – Formally support the initiative through regional organizations such as the **African Union and UNESCO**.

🔷 **Financial Contributions** – A coordinated, multi-country funding approach can **pool resources** to support the beamline's construction and operation.

🔷 **Scientific Collaboration** – Engage national research institutions, universities, and industry to ensure **widespread utilization** of the facility.

🔷 **Capacity Development** – Invest in **training programmes** to develop African expertise in synchrotron science and its applications.

4. Next Steps: Advancing Africa's Role in Synchrotron Science

UNESCO stands ready to support Member States in this endeavor. The next steps include:

🔷 **Formalizing African Member States' endorsement of SESAME as the host synchrotron.**

🔷 **Developing a financial roadmap** for joint investment by Member States.

🔷 **Launching an African Synchrotron Users Network** to connect researchers and identify priority research areas.

🔷 **Establishing a governance framework** to ensure equitable access and long-term sustainability of the beamline.

This initiative represents a **transformational leap for African science and innovation**. By joining forces, African nations can **ensure that their researchers have the tools they need to drive scientific discovery, strengthen industrial innovation, and develop local solutions to global challenges**. **It will secure Africa's rightful place in the global scientific landscape.**

If the Member States agree, the initiative would be announced during the Global Ministerial Dialogue on Science Diplomacy which will take place on 26 March 2025 at UNESCO HQ in Paris in the presence of a number of African Ministers (so far 18 Ministers from Africa confirmed their presence). A visit to a synchrotron facility outside Paris could also be organized on 27 March 2025 for those Ministers and experts who would like to join.