

iThemba LABS (Laboratory for Accelerator Based Sciences)



Makondelele Victor Tshivhase
Managing Director: iThemba LABS



iThemba LABS: The largest facility of its kind in the Southern Hemisphere and one of the largest in the world



science & innovation

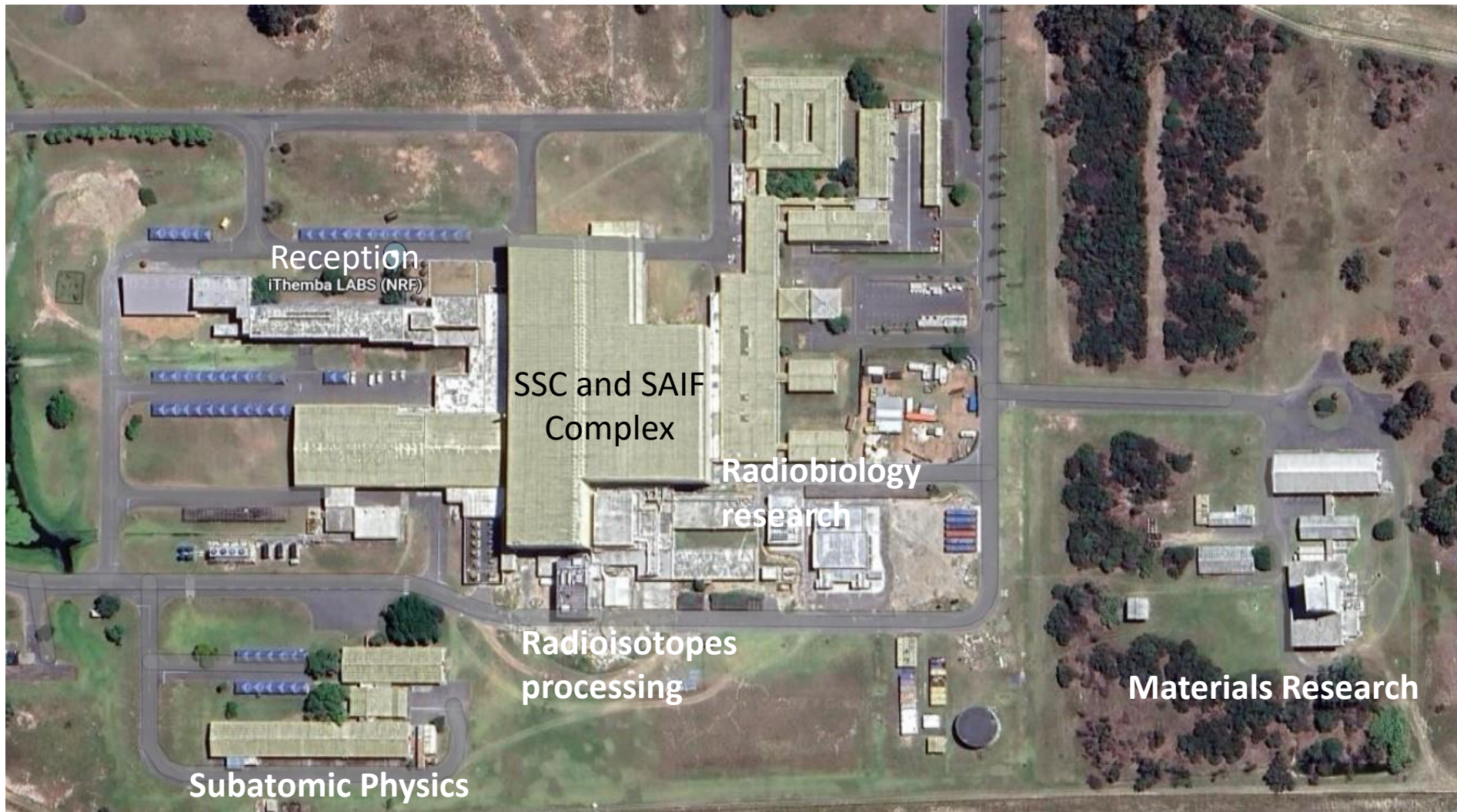
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Science and Innovation
REPUBLIC OF SOUTH AFRICA

Research the Bridge to Technology and Innovation

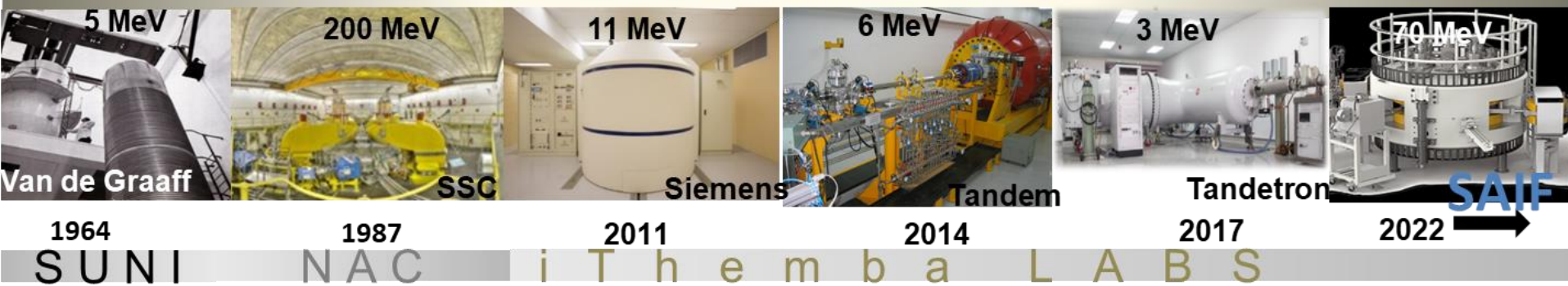


**iThemba
LABS**
Laboratory for Accelerator
Based Sciences

iThemba LABS: National Facility for Research, Development and Training



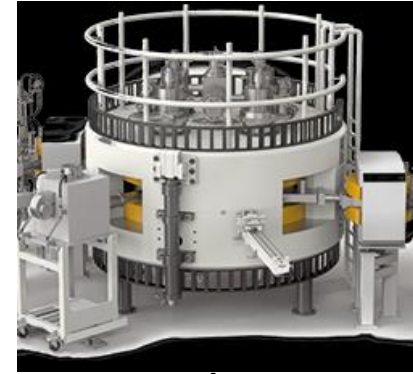
iThemba LABS: International African Hub of Expertise in Accelerator Based Sciences



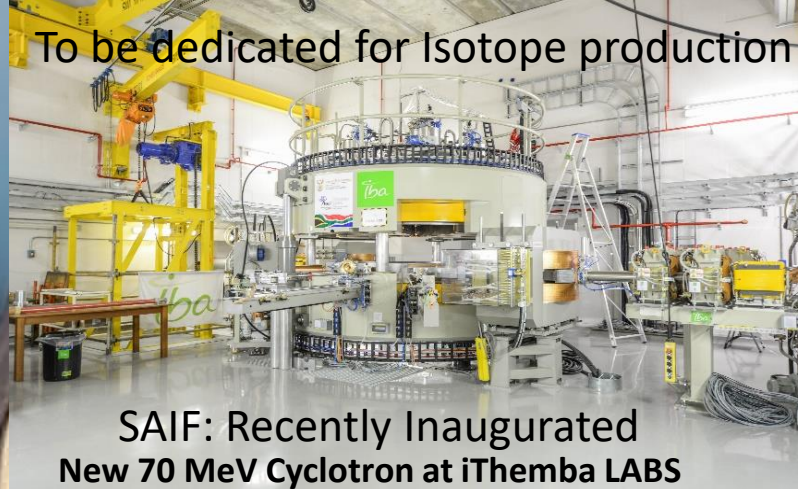
iThemba LABS is a research platform for pure and applied research, development and training in Accelerator Based Sciences

- fundamental studies of nuclear phenomena,
- applications of ion beams and associated techniques in materials and nanoscience research,
- accelerator mass spectrometry
- the production of radionuclides,
- radiation biology and medical physics

iThemba LABS: National Facility for Research, Development and Training



C70 Cyclotron



6MV Tandem

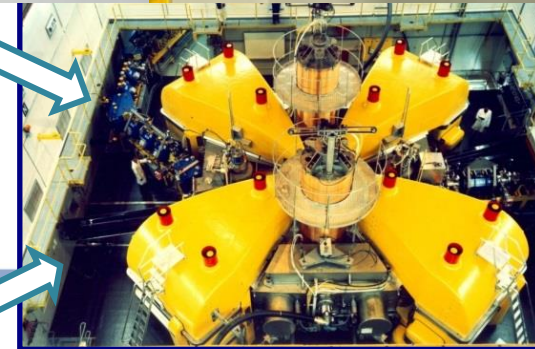


3MV Tandatron



Injector cyclotron 1

Injector cyclotron 2



K200 Separated Sector Cyclotron



iThemba LABS: Laboratories for Accelerator Based Science

K8 Injector Cyclotron 2



K8 Injector Cyclotron 1



K200 Separated Sector Cyclotron



K11 Cyclotron

Radioisotope
Production



IBA C70 Cyclotron

Subatomic Physics and Applications, Nuclear Medicine



3 MV Tandetron

Materials Research and
Nanoscience

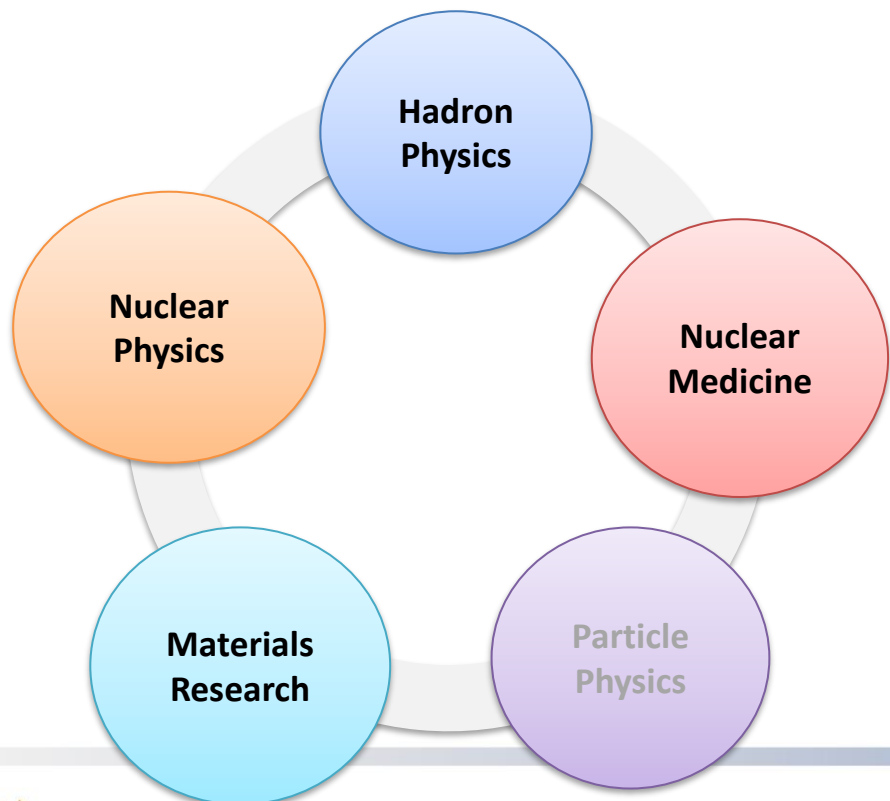


6 MV Tandem

Materials Research and Accelerator
Mass Spectrometry (AMS)

Research and Collaboration: iThemba LABS

The transdisciplinary research agenda of iThemba LABS brings together scientists working in the physical, medical and biological sciences to solve real world problems while still considering the origin and evolution of the universe.



Collaborators and Users of the Platforms

University of the Western Cape

University of Cape Town

University of Stellenbosch

Cape Peninsula University of Science and Technology

University of the Witwatersrand

University of Pretoria

North-West University

University of Fort Hare

University of KwaZulu Natal

University of Zululand

Nelson Mandela University

University of Limpopo

University of Venda

University of Johannesburg

Europe, Asia and America

iThemba LABS: Accelerator Based Isotope Production Infrastructure



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Nuclear Medicine

Production activities and infrastructure

1



Target irradiation -
SSC

2



Chemical processing in hotcells

3



Preparation of final dosage forms
in Clean Rooms

4



Quality Control

5



Packaging and distribution

Nuclear Medicine

Products supplied globally for clinical and research application

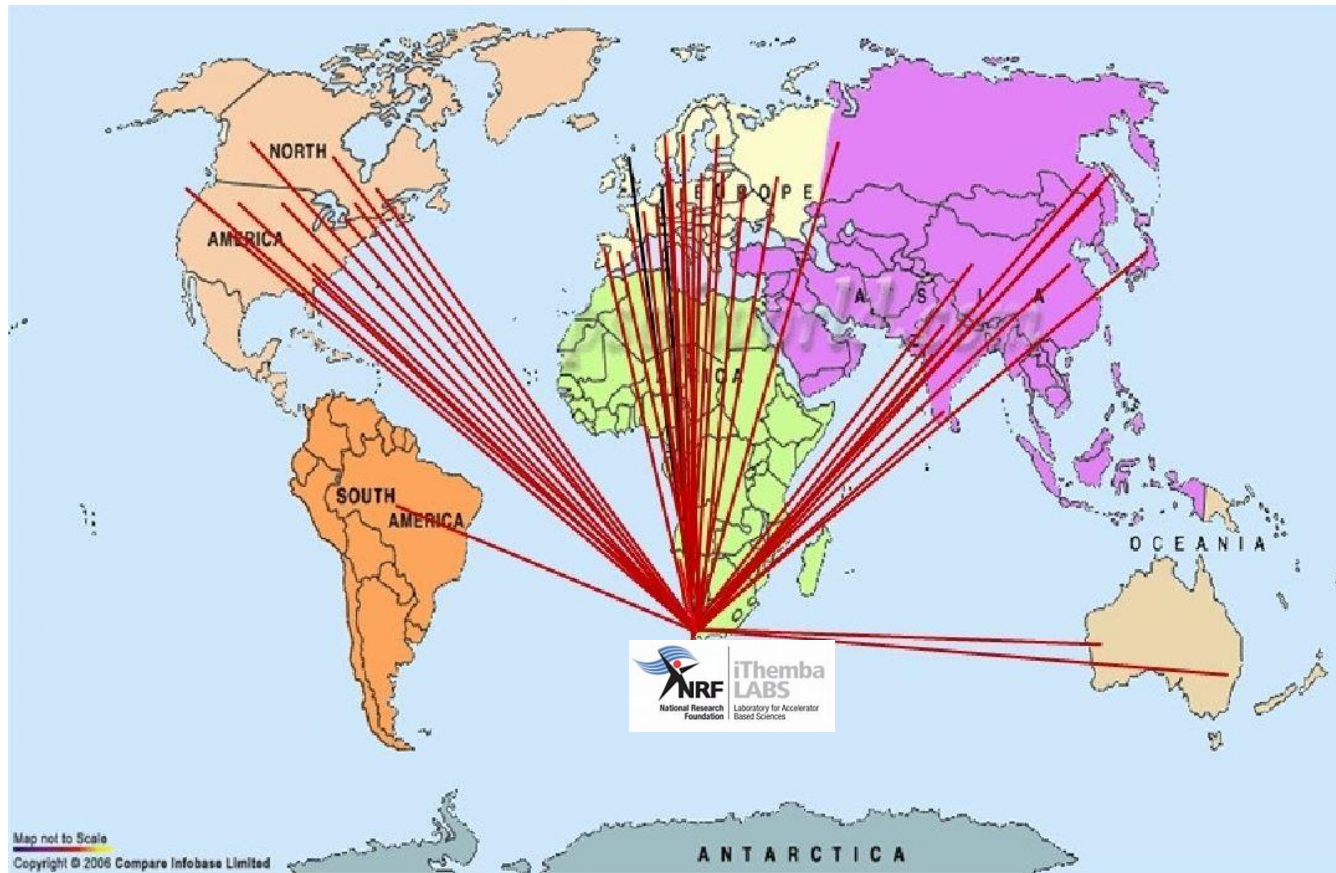
Product	Application	T _{1/2}
⁶⁸ Ge/ ⁶⁸ Ga generator	⁶⁸ Ge/ ⁶⁸ Ga generators used for the PET diagnosis of neuroendocrine tumours (NET's).	⁶⁸ Ge: 271 days ⁶⁸ Ga: 68 min
¹²³ I products	¹²³ I API, capsules, solution and mIBG injection. SPECT tracers used for tumour localisation and for observing heart, kidney, thyroid and brain function.	13.2 h
¹⁸ F-FDG	PET radiopharmaceutical used for oncology, cardiac and neurological applications	1.83 h
⁸² Sr	Irradiated Rb targets (unprocessed) used to prepare ⁸² Sr API. ⁸² Sr/ ⁸² Rb generators used for myocardial perfusion PET imaging.	25.6 days
²² Na solution & source	²² Na ultra-high vacuum positron sources used for scientific research purposes (positron annihilation studies).	2.6 years

New product development

- Alpha Emitters for Targeted Alpha Therapy for cancer treatment
- Theranostics

Nuclear Medicine

Local and global impact



75

local nuclear
medicine depts. &
academic
institutions

100

international
clients and
collaborators

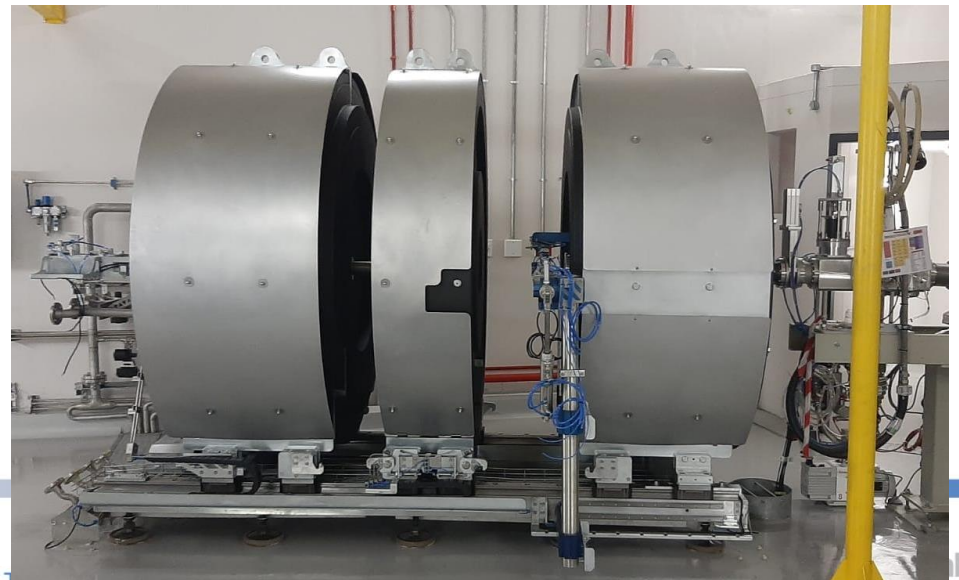
165 000

Patients in the last
Financial Year

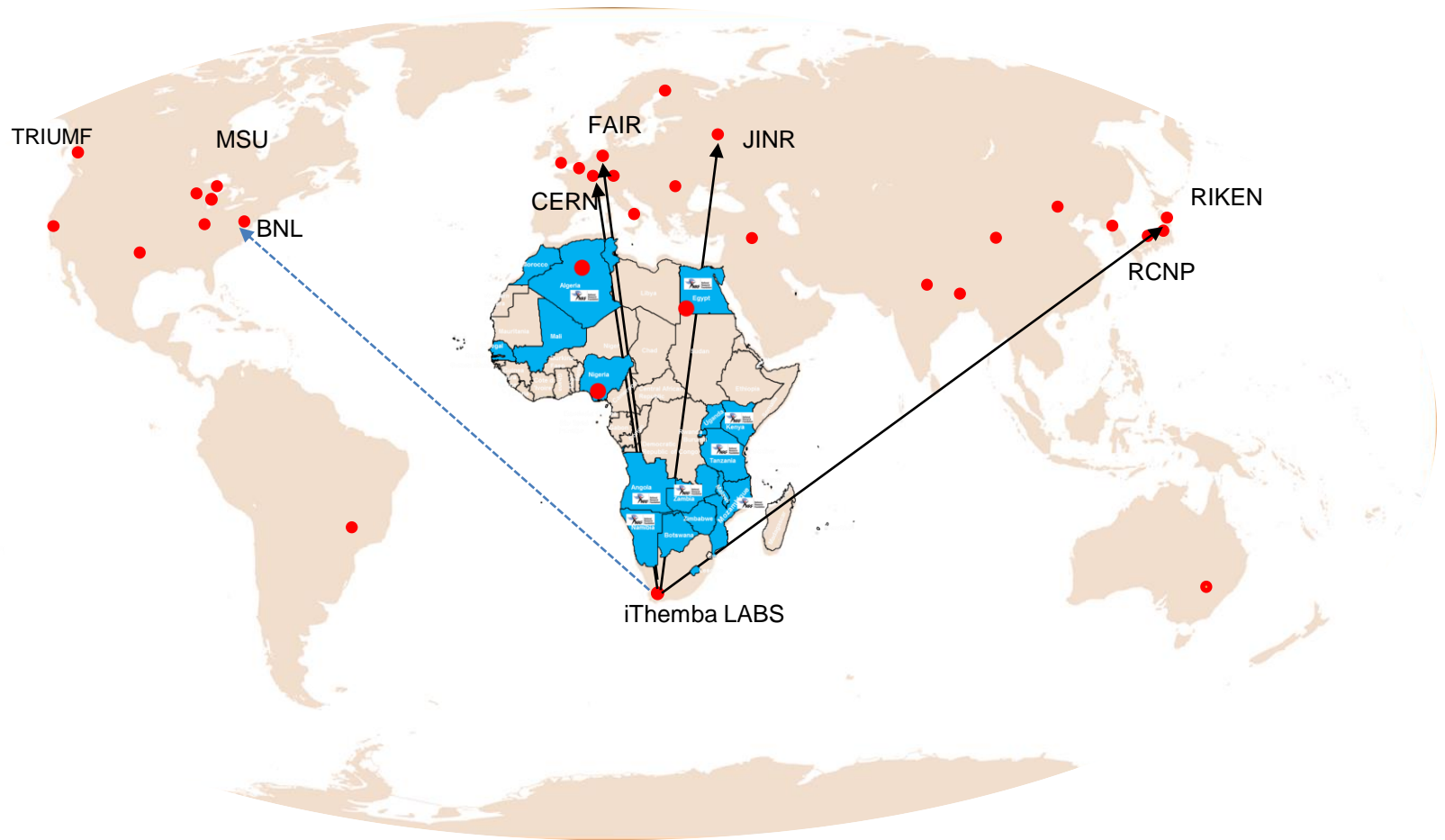


Accelerator Physics and Technology

The South African Isotope Facility



IRI- Gateway (International Research Infrastructure Gateway)



The African gateway to International Large Scale Research Infrastructures



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IAEA Collaborating Centre 2021 - 2025



IAEA
International Atomic Energy Agency

iThemba Laboratory for Accelerator-Based Sciences
(iThemba LABS)

IAEA Collaborating Centre

for
Accelerator-Based Scientific Research and Applications

2021 – 2025



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Collaborating Centre Activities

- Capacity building:
 - ✓ Hosting visits of young researchers and scientists from Africa and other continents.
 - ✓ Organizing post-graduate training courses in fields relevant to Accelerator Based Sciences extended to IAEA member states across the African continent.
- Organization and/or hosting regional and/or international scientific/technical events (workshops, conferences, collaboration meetings, etc.)
- Providing expert services for expert and other missions on request



IAEA
International Atomic Energy Agency

Training Workshop on the Operation and Maintenance of Electrostatic Accelerators and Associated Instrumentation

Hosted by the
Government of South Africa

through the
iThemba LABS

Johannesburg, South Africa

5 to 9 December 2022

Ref. No.: EVT2104016



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Advancing knowledge



**AFRICAN REGIONAL CO-OPERATIVE AGREEMENT FOR
RESEARCH, DEVELOPMENT AND TRAINING RELATED TO
NUCLEAR SCIENCE AND TECHNOLOGY (AFRA)**

MEMORANDUM OF UNDERSTANDING BETWEEN

iThemba Laboratory for Accelerator Based Sciences
selected as AFRA Regional Designated centre in the field of
Nuclear Instrumentation

Herein represented by Rudolph Nchodu
Deputy Director: Research
(hereinafter referred to as “iThemba LABS”)

And the

AFRA Management

Herein represented by Fidele Ndahayo,
CEO, Rwanda Atomic Energy Board
Chairperson of AFRA
(hereinafter referred to as “AFRA”)



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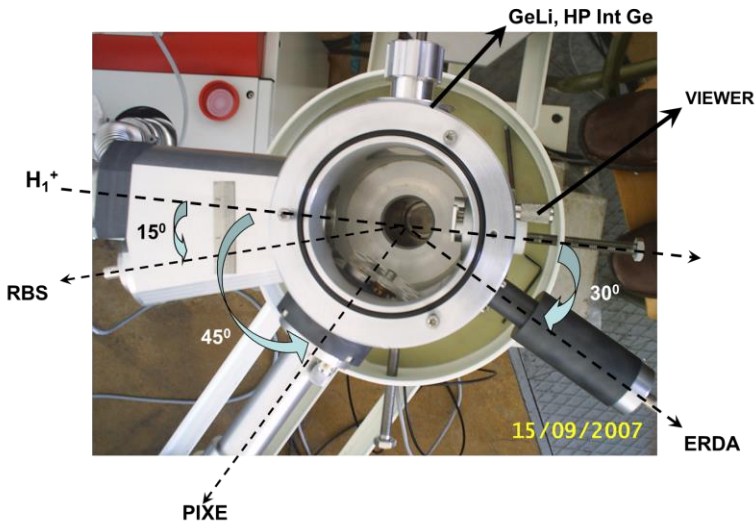


CONSTRUCTION AND INSTALLATION OF END-STATION FOR ION BEAM ANALYSIS FOR THE CERD 1,7 MV TANDEM ACCELERATOR



MEMORANDUM OF UNDERSTANDING

END STATION SCATTETRING CHAMBER



BETWEEN

ITHEMBA LABORATORY FOR ACCELERATOR BASED SCIENCES

(Herein referred to as iThemba LABS)

a national facility of the National Research Foundation operating under the NRF Act, No. 23 of 1998, and represented by Dr Zebon Vilakazi in his capacity as Director at iThemba LABS

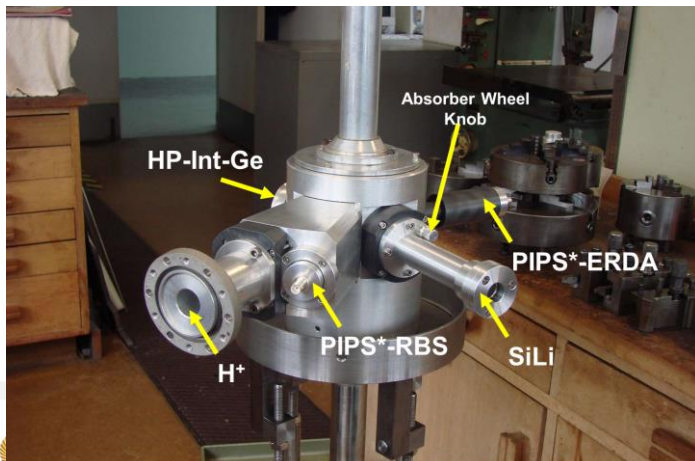
AND

**THE CENTRE FOR ENERGY RESEARCH AND DEVELOPMENT AT
OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA**

a tertiary educational institution, duly established under the applicable Laws of Nigeria, herein represented by Prof Gabriel A. Osinkulo in his capacity as Director of the Centre for Energy Research and Development and he being duly authorised thereto

(herein referred to as CERD)

RELATING TO:



CONSTRUCTION AND INSTALLATION OF END-STATION FOR THE CERD 1,7 MV TANDEM ACCELERATOR, referred to a "the Field

CONSTRUCTION AND INSTALLATION OF END-STATION FOR ION BEAM ANALYSIS FOR THE CERD 1,7 MV TANDEM ACCELERATOR



Equipment Donation to Center for Nuclear Research (CRNA) Algeria



- Vacuum chambers for diagnostic equipment.
- Faraday cup chamber.
- Beam viewing screen
- Design drawings for steering magnets and faraday cup

Donation Agreement

between

**THE NATIONAL RESEARCH FOUNDATION
ACTING THROUGH ITS NATIONAL FACILITY ITHEMBA LABORATORY FOR ACCELERATOR
BASED SCIENCES**

Old Faure Road, Faure 7131, South Africa

-hereinafter referred to as "iThemba LABS"-

and

**THE ALGERIAN ATOMIC ENERGY COMMISSION
ACTING THROUGH ITS NUCLEAR RESEARCH CENTER OF ALGIERS**

02, Boulevard Frantz Fanon, B.P. 399, Alger RP, Alger

Hereinafter referred to as "CRNA"

-herein jointly referred to as the "Parties"-

African Particle Accelerators Collaboration Committee (APACC)

1st Meeting: 8 February 2022

- International Atomic Energy Agency (**IAEA**)
- iThemba LABS (**South Africa**)
- **AFCONE**: African Commission on Nuclear Energy
- Egyptian Atomic Energy Authority, Nuclear Research Center (**Egypt**)
- Centre for Energy Research & Development (**Nigeria**).
- Nuclear Research Center of Algiers (**Algeria**)
- National Nuclear Research Institute (**Ghana**)

Resolution

Establishment of a technical forum between all facilities for seeking advices and help in a prompt and swift manner

Workshops, Conferences and Schools

- Advanced Analytical Techniques
- Radiation Protection
- SAINTS Short Course: *Introduction to Accelerator Physics*:
17 – 19 July 2023

Workshops, Conferences and Schools

Low-Energy Nuclear Astrophysics

26-27 November 2023

Auditorium

Africa/Johannesburg timezone

Overview

Call for Abstracts

Important Dates

Registration

Participant List

Workshop Program



iThemba LABS is organising a workshop on Low-Energy Nuclear Astrophysics at Tandem Accelerator Mass Spectrometer (TAMS) Laboratory in **Johannesburg** from **26-27 November 2023**. There has been many years of nuclear investigations pursued at the EN Tandem Accelerator since the commissioning of the Tandem in 1973 (as part of the Schonland Institute) and the subsequent transfer of the Institute to the NRF in 2005 through running of the laboratory as a National Facility by iThemba LABS.

Workshops, Conferences and Schools

ANPC 2023

AFRICAN NUCLEAR PHYSICS CONFERENCE

Combining a topical nuclear physics conference with a workshop on select open questions in **nuclear physics**

29 November - 3 December 2023

Topics

Nuclear Astrophysics
Nuclear Structure, Reactions
& Dynamics
Neutron Physics
Applied Nuclear Physics
New Facilities & Instrumentation

Workshop Topic

Opportunities for knockout
reaction studies

International Advisory Committee



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Enkosi, Thank you, Re a leboga, Siyabonga, Dankie Ri a livhuwa, Nza khensa



SARAO

South African Radio
Astronomy Observatory



SAAO

South African
Astronomical Observatory



SAEON

South African Environmental
Observation Network



SAIAB

South African Institute
for Aquatic Biodiversity



**iThemba
LABS**

Laboratory for Accelerator
Based Sciences



SAASTA

South African Agency for Science
and Technology Advancement



RISA

Research and Innovation
Support and Advancement