

Highlights of the recent developments of Astronomy in Botswana

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Abstract

In this poster, we present highlights of the recent developments of Astronomy in Botswana. Today, African countries have made very significant progress in Astronomy and Space Sciences with involvement in a variety of the most advanced survey and monitoring projects as well as the Square Kilometre Array (SKA) project that is expected to become operational in the near future. Botswana is one of the eight partner countries around the African continent in the SKA project. Botswana's role in the build-up to SKA is incredibly important for being the precursor (African Very long Baseline Interferometry Network-AVN) to this project. Botswana has been tasked to lead the implementation of the part of the SKA project to build human capacity and international network by providing local and regional training which would be the main goal for successful completion of the mission. We also present plans in the next five-year to be carried out in Botswana that will enable research activities to be recognized by the leading authorities in Astronomy.

INTRODUCTION

Africa is becoming the focus of the world of radio astronomy. It will host the mid-frequency Square Kilometre Array (SKA) – the next generation global radio astronomy facility that will be built initially in South Africa, and then rolled out across eight African partner countries, including Botswana.

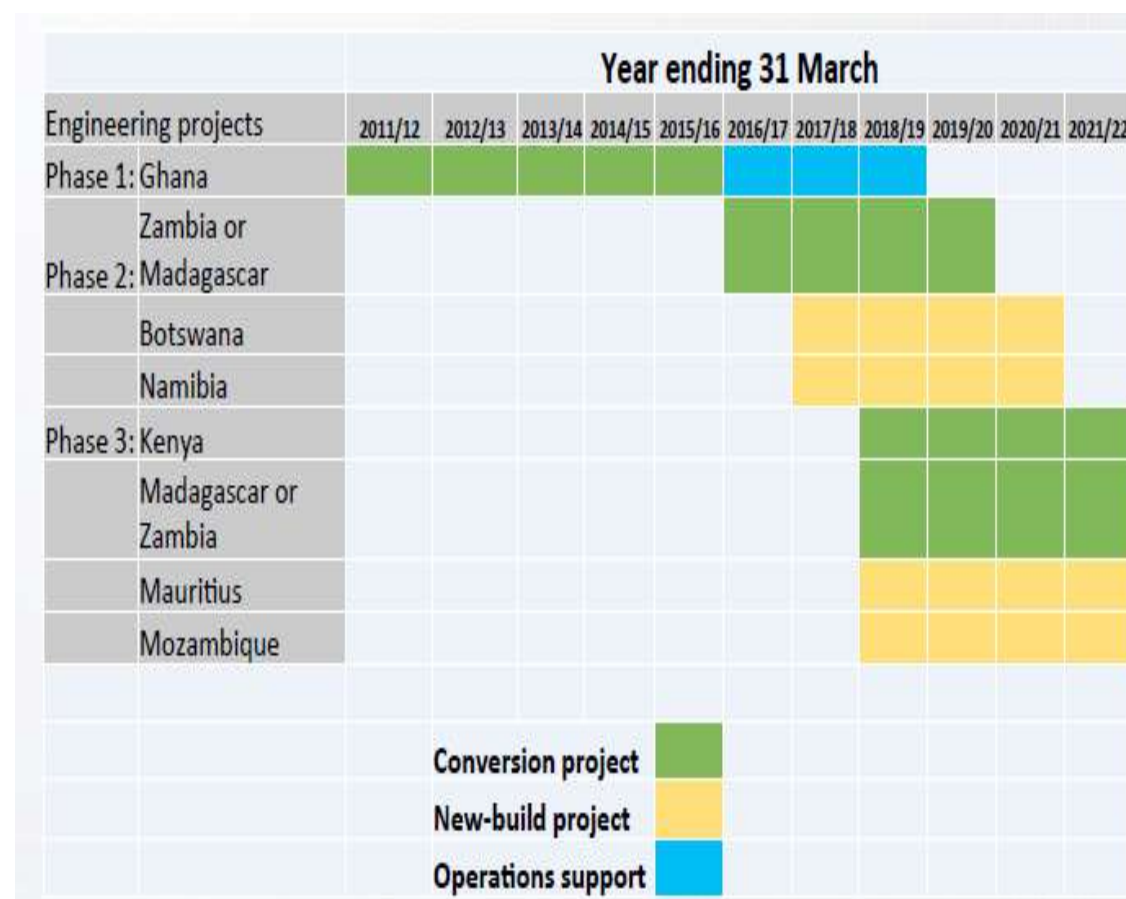


The SKA-MPI prototype dish on the South African site. SKA MPI is funded by the Max Planck Institute for Radioastronomy (MPIfR), and is the first SKA prototype dish to be assembled on site. (Credit: SKAO)

Prior to the SKA, a network of radio telescopes called the African Very Long Baseline Interferometry Network (AVN) is being built in the African partner countries. Botswana has the ambition to become a leader among African nations in Space Science and Technology over the coming decade.

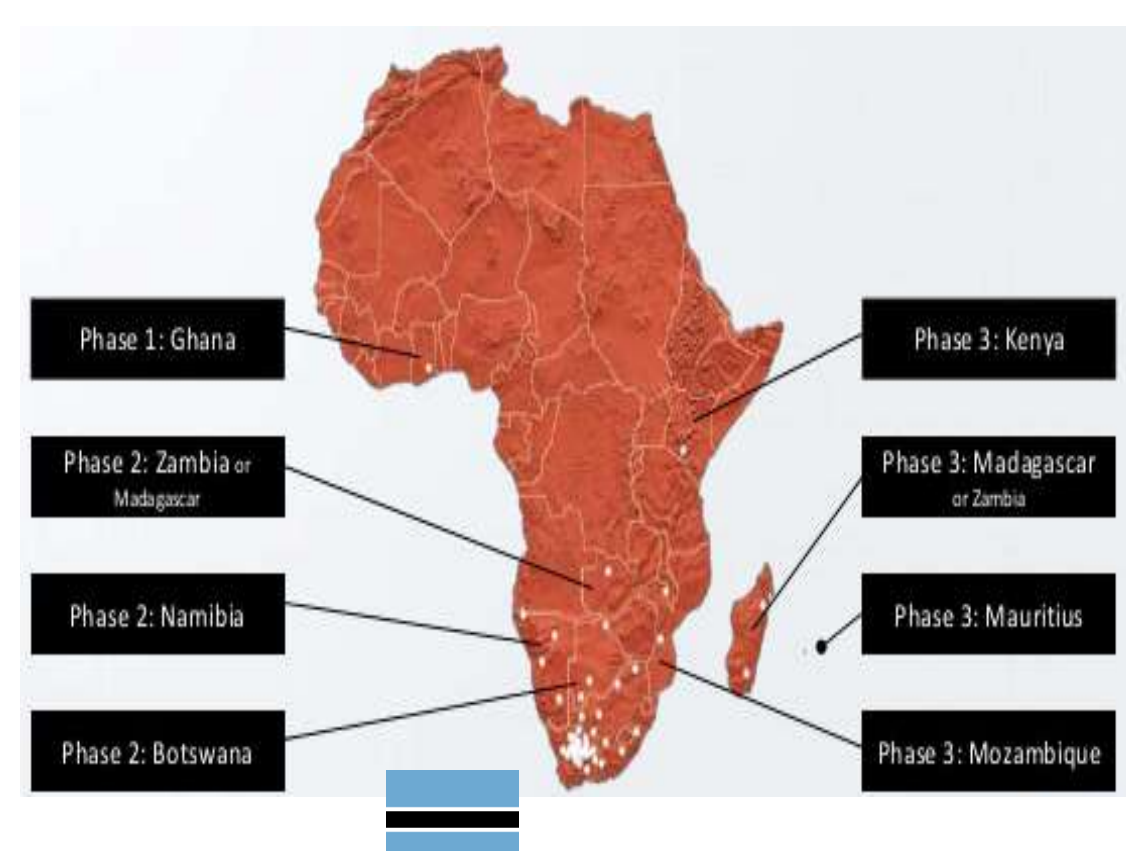
AVN / SKA SCIENCE

The Botswana International University of Science and Technology (BIUST) will lead the way in this development and has been designated as the Host Institution in Botswana for the African Very Long Baseline Interferometry Network (AVN) and Square Kilometre Array (SKA) projects.



The African Very Long Baseline Interferometry Network (AVN) is an initiative to fill the existing gap of radio telescopes on the African continent via a combination of new build as well as conversion of large redundant telecommunications antennas: precursor to Square Kilometre Array (SKA).

The SKA-AVN partners of South Africa are Botswana, Ghana, Kenya, Madagascar, Mauritius, Mozambique, Namibia, and Zambia.



BOTSWANA'S ADVANTAGE

Botswana has a geographical and meteorological advantage for astronomy due to its relatively clear skies, low humidity and high, flat and very extensive plateaux. In terms of radio astronomy, and particularly the development of the SKA, Botswana is important because of the geographical development of the array configuration from its "core" in South Africa.



The precursor AVN radio-astronomy facility proposed for Botswana nicely fills in AVN baselines for interferometry involving existing dishes at HartRAO near Pretoria and the refurbished telecommunications dish recently opened in Ghana. Botswana is seen as a stable/reliable partner in major international undertakings.

DARA PROGRAMME



Credit:DARA:<https://www.daraproject.org/2018meeting>

The DARA project (funded through the Newton-Fund, UK) aims to develop high tech skills using radio astronomy. The DARA project provides training in science, technology, and engineering, to develop, maintain and run radio telescopes and instrumentation. DARA currently runs a basic training programme in radio astronomy in Botswana, Kenya, Madagascar, Mozambique, Namibia and Zambia. Botswana has acquired a two Dish Radio-Interferometer and 10 PC Lab (from AVN South Africa), and we have participated in DARA Training Programmes (2016+): facilities hosted at BIUST.

DARA PROGRAMME



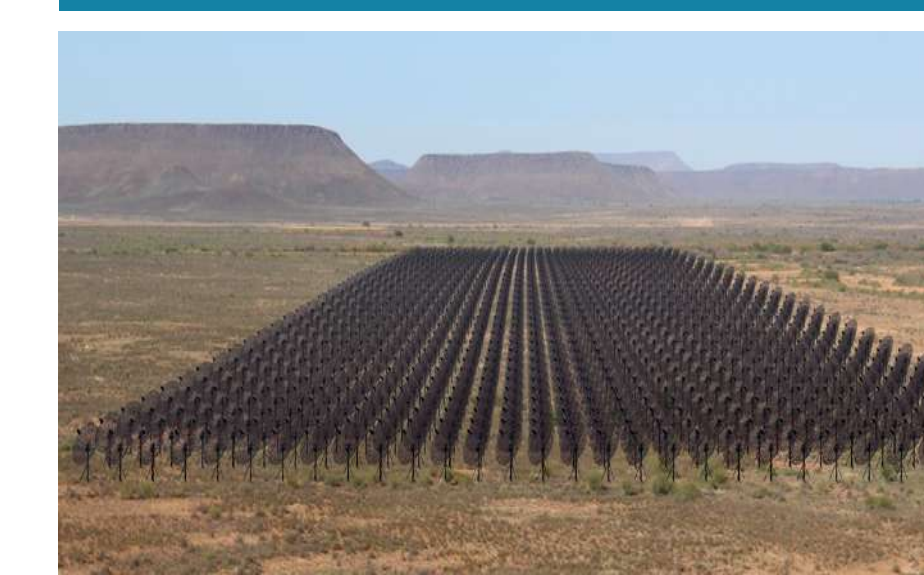
From 2016 – 2020, 4 training units were held annually for 5 students from Botswana and 5 students from Namibia. In July 2016, BIUST and University of Leeds signed an MOU to develop Radio Astronomy in Botswana (DARA project funded through the Newton Fund).

Astronomical Society of Botswana

Astronomical Society of Botswana (ASB) established by BIUST (2018) as a registered non-profit organization; the ASB is made up of inspired Professionals, Researchers, Educators and Amateur Astronomers and has organized several outreach and public awareness events; the ASB secretariat is at BIUST.



HIRAX



Credit: <https://quantumleapfrica.org/project/hirax/>

BIUST is part of the HIRAX (The Hydrogen Intensity and Real-time Analysis eXperiment) project which involves an international consortium, led from the University of Kwa-Zulu Natal (UKZN) in South Africa. Array of 1000 x 6 m dishes in Karoo; 400 - 800 MHz. Science priorities of HIRAX is to probe Dark Matter; Fast Radio Bursts (FRB). BIUST to provide site infrastructure.

Public Awareness and Outreach



BIUST students won a bid through the Office of Astronomy for Development for an outreach project entitled "Women in STEM" (WiS). The aim of WiS is to capacitate women for the development of Space Science in Botswana with a focus on the AVN and SKA projects.



BIUST Physics and Astronomy Club established in 2018: pilot project focusses on Indigenous Astronomy in Botswana: stargazing evenings held with university and high school students.

RECENT COLLABORATIONS



Recent collaboration with Thailand brings technical assistance and Botswana will become part of a global network of remotely operated telescopes for the general public (including tourists), students on degree courses, and with international research capability.