



SARAO
South African Radio
Astronomy Observatory



The Path Less Travelled

The adventures of building the African VLBI Network

Nkululeko Qwabe
AVN Software Engineer

AVN Training School
07 March 2018

Outline

- Myself
- AVN
- Why do this?
- What's been going on?
- What's next?

Myself



Background

- Basic Education
 - Indukebandla Primary School
 - Uphaphazi Higher Primary School
 - Ikusasaletu High School
- University
 - University of KwaZulu-Natal ((UKZN)
 - University of South Africa (UNISA)*

Background

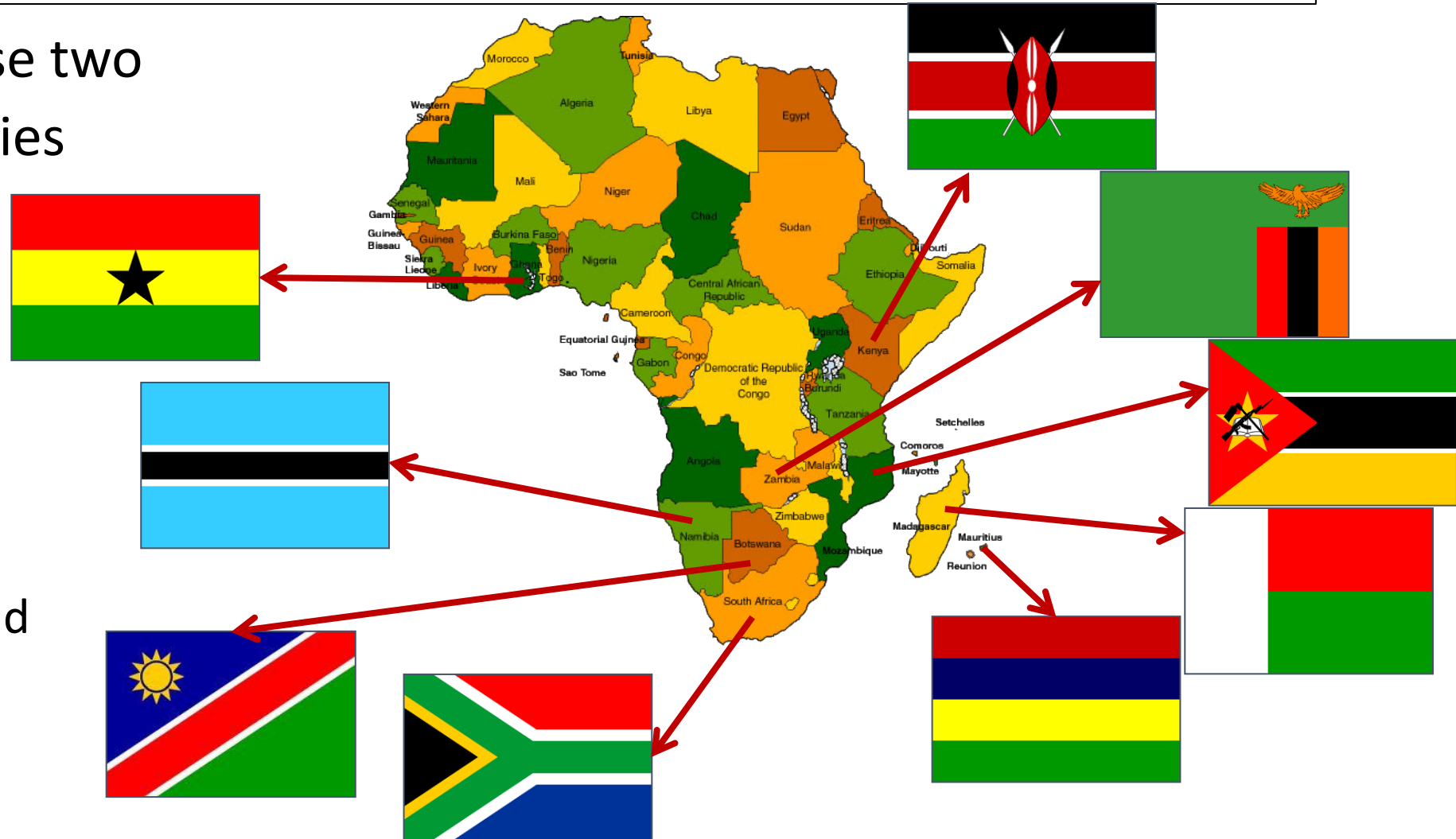
- Intern Developer (CSIR)
- Intern Systems Administrator (DUT)
- Junior Software Engineer (SKA SA – AVN)
- Software Engineer (SKA SA – AVN)

The African VLBI Network (AVN)

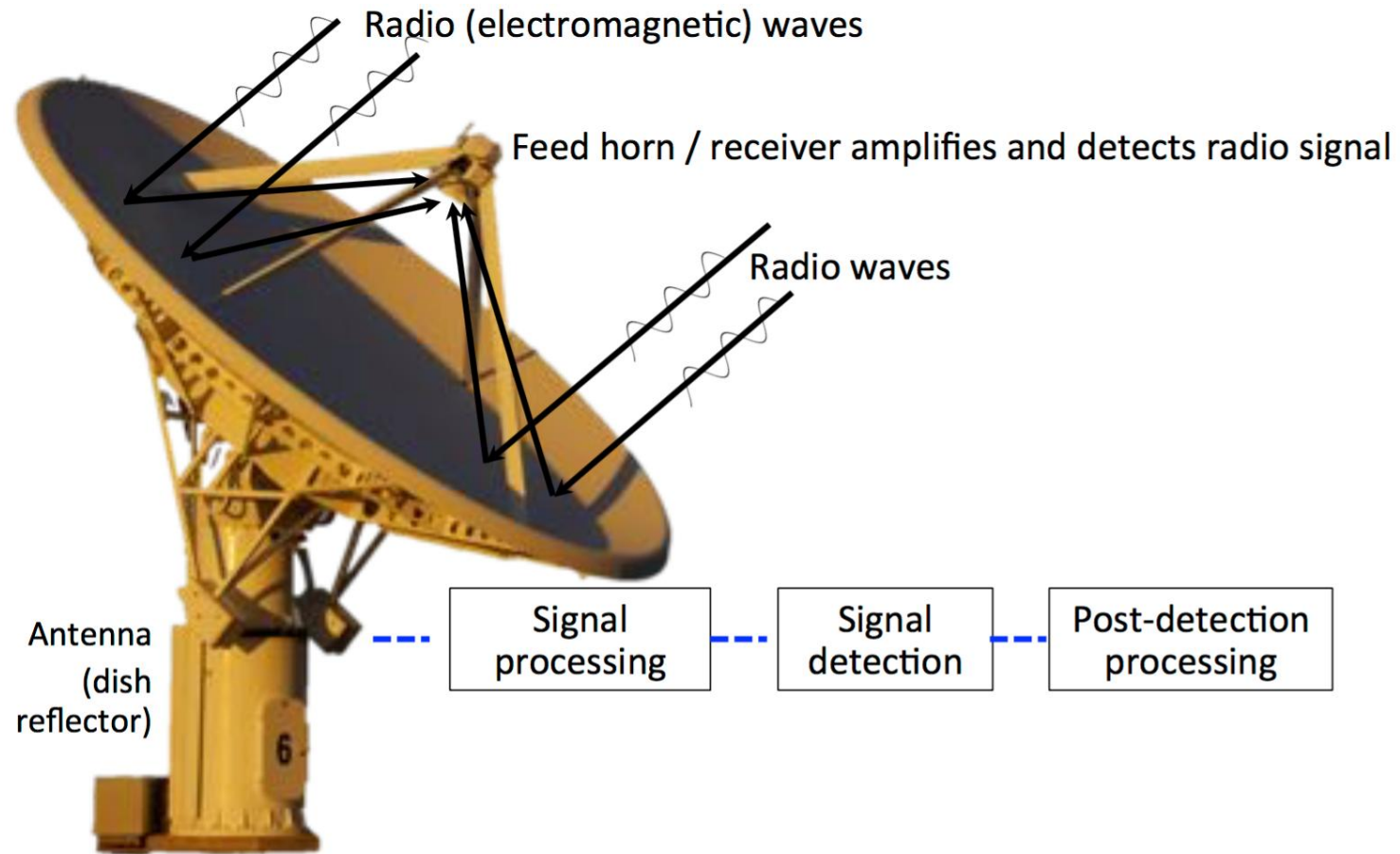
- A network of VLBI-capable radio telescopes on the African continent
- A project to develop the skills, regulations and institutional capacity
- Skills and knowledge transfer
- A mechanism through which to bring (develop) new science and opportunities to Africa

The African VLBI Network

- Part of SKA Phase two
- 9 African countries
 - Botswana,
 - Ghana,
 - Kenya,
 - Namibia,
 - Madagascar,
 - Mauritius,
 - Mozambique,
 - South Africa and
 - Zambia



The African VLBI Network (AVN): Skills



The African VLBI Network (AVN)

- Structural Mechanical Engineering
- Analog and Digital Electronic Engineering
- Electrical Engineering
- Civil Engineering
- Software Engineering
- Science (Astronomy, Astrophysics, Cosmology, Geodesy, etc)
- Mathematics
- Computer Sciences (Machine Learning, Big Data, Algorithms, etc)
- Communications
- HR
- ...

Projects

- ASTT
 - AVN Scale Training telescope
 - Learn engineering principles
 - Train partner country engineers
 - Community outreach



Projects

- HHARC
 - Hand-Held Antenna Remote Control
 - Learning experience



Projects

- Ghana Radio Astronomy Observatory (GRAO)
 - Field System software
 - VLBI Backend
 - DBBC
 - Mark 5B+



Ghana Radio Astronomy Observatory (GRAO)



Why do this?

- Some statistics (UNESCO)

Country	Literacy Rate	Male Literacy	Female Literacy	Gender Difference
Botswana	88.5%	88.0%	88.9%	-0.9%
Namibia	81.9%	79.2%	84.5%	-5.3%
South Africa	94.3%	95.5%	93.1%	2.4%
Zambia	63.4%	70.9%	56.0%	14.9%
Korea	100.0%	100.0%	100.0%	0.0%

What's been going on?

- Training
 - HartRAO
 - 2015 IVS TOW (MIT Haystack - USA)
 - 2nd IVS Training School on VLBI (HartRAO)
 - 13th EVN Symposium and Users' Meeting (St. Petersburg – Russia)
 - Public Benefits Programme (SKA SA)
 - SciFest Africa (Grahamstown – South Africa)
 - 2017 Astana World Expo (Astana - Kazakhstan)
 - AVN Training School (HartRAO)

Ghana



Ghana

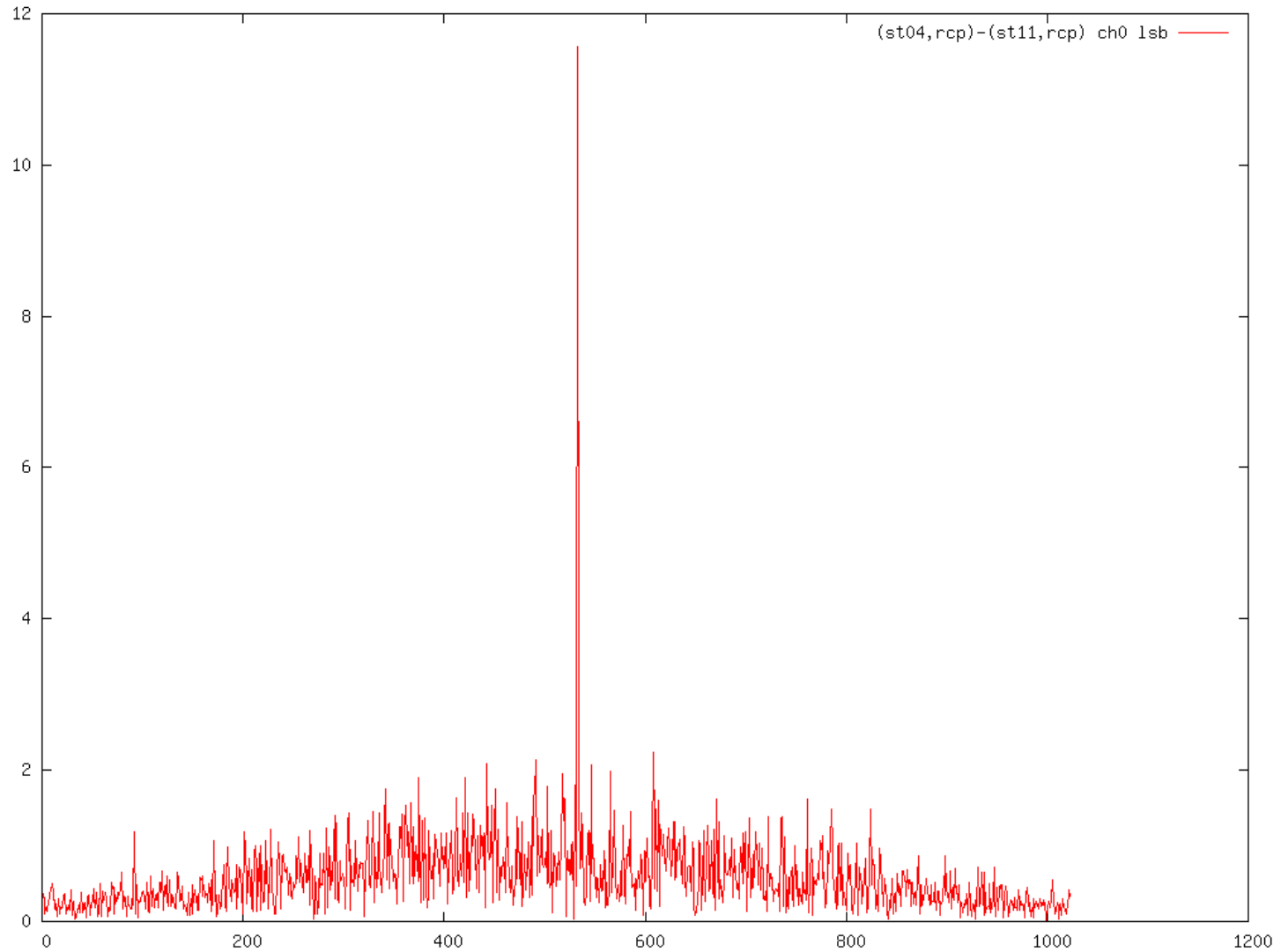


Ghana

Effelsberg - Kuntunse

**4966.49MHz,
LSB,
Rcp-Rcp**

05/03/2018



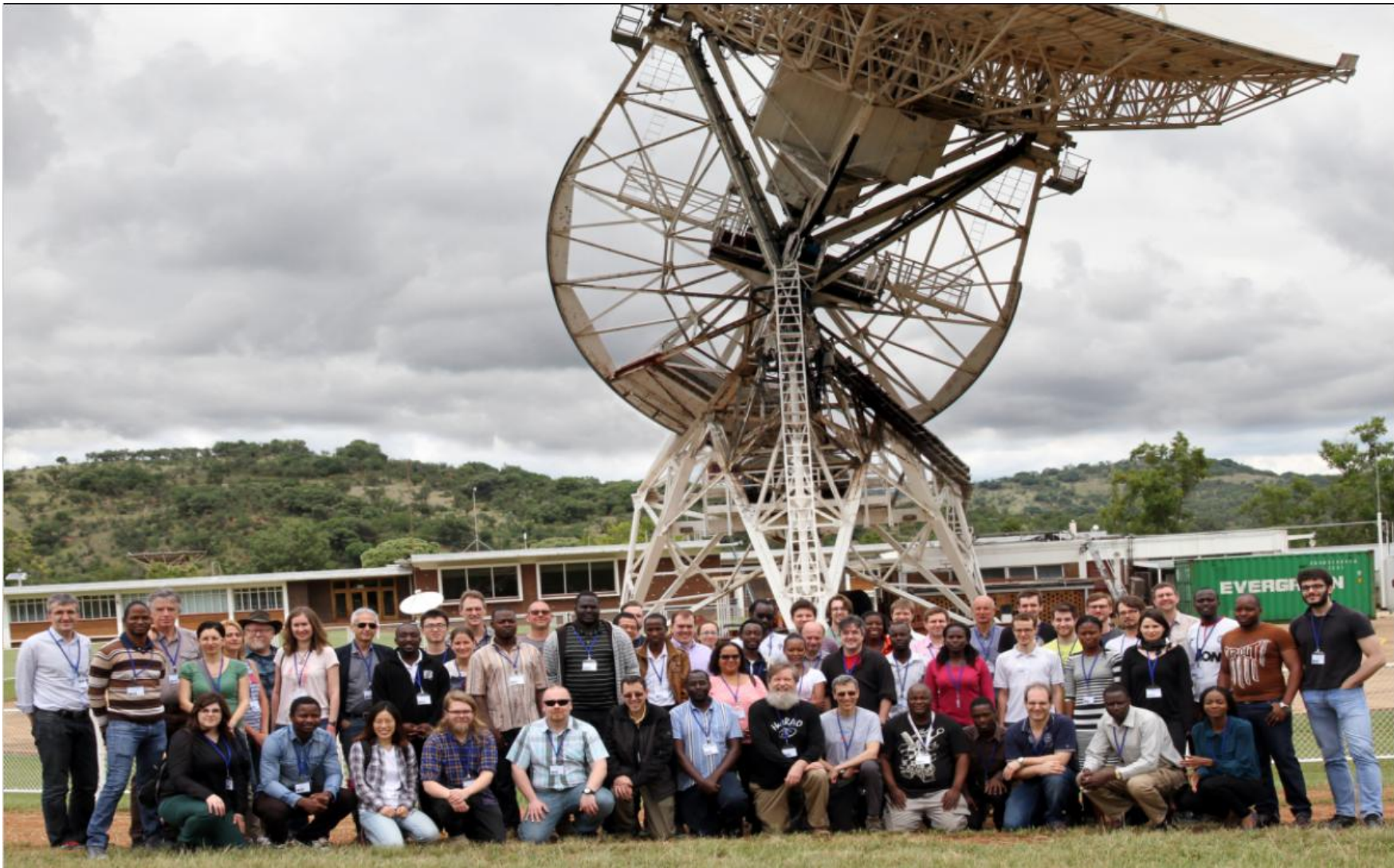
2015 IVS TOW (MIT Haystack - USA)



2015 IVS TOW (MIT Haystack - USA)



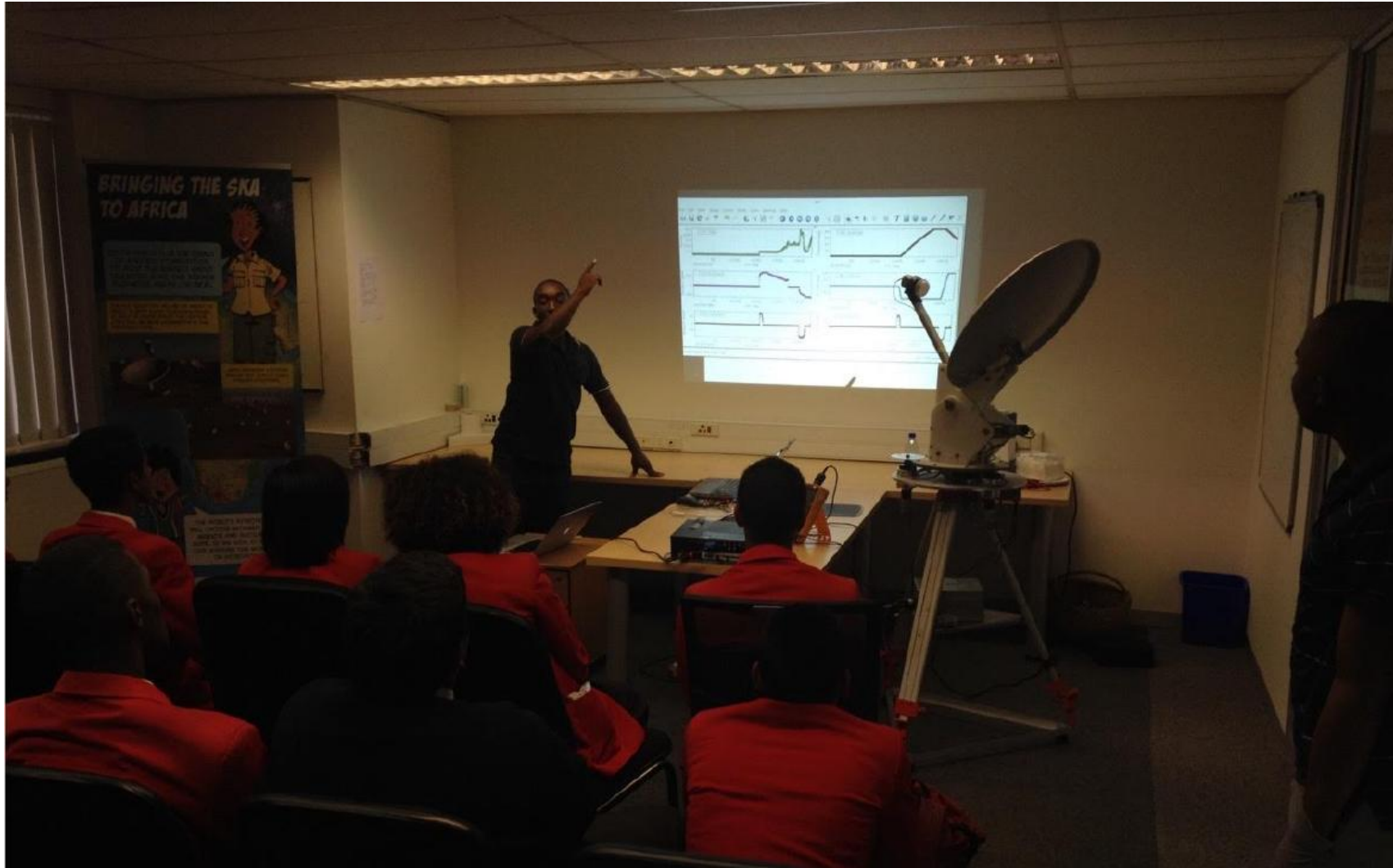
2nd IVS Training School on VLBI (HartRAO)



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2017 Astana World Expo (Astana - Kazakhstan)



2017 Astana World Expo (Astana - Kazakhstan)



2017 Astana World Expo (Astana - Kazakhstan)



AVN Training School (HartRAO)



Mivuyo Creche (Gugulethu Township)



Other News



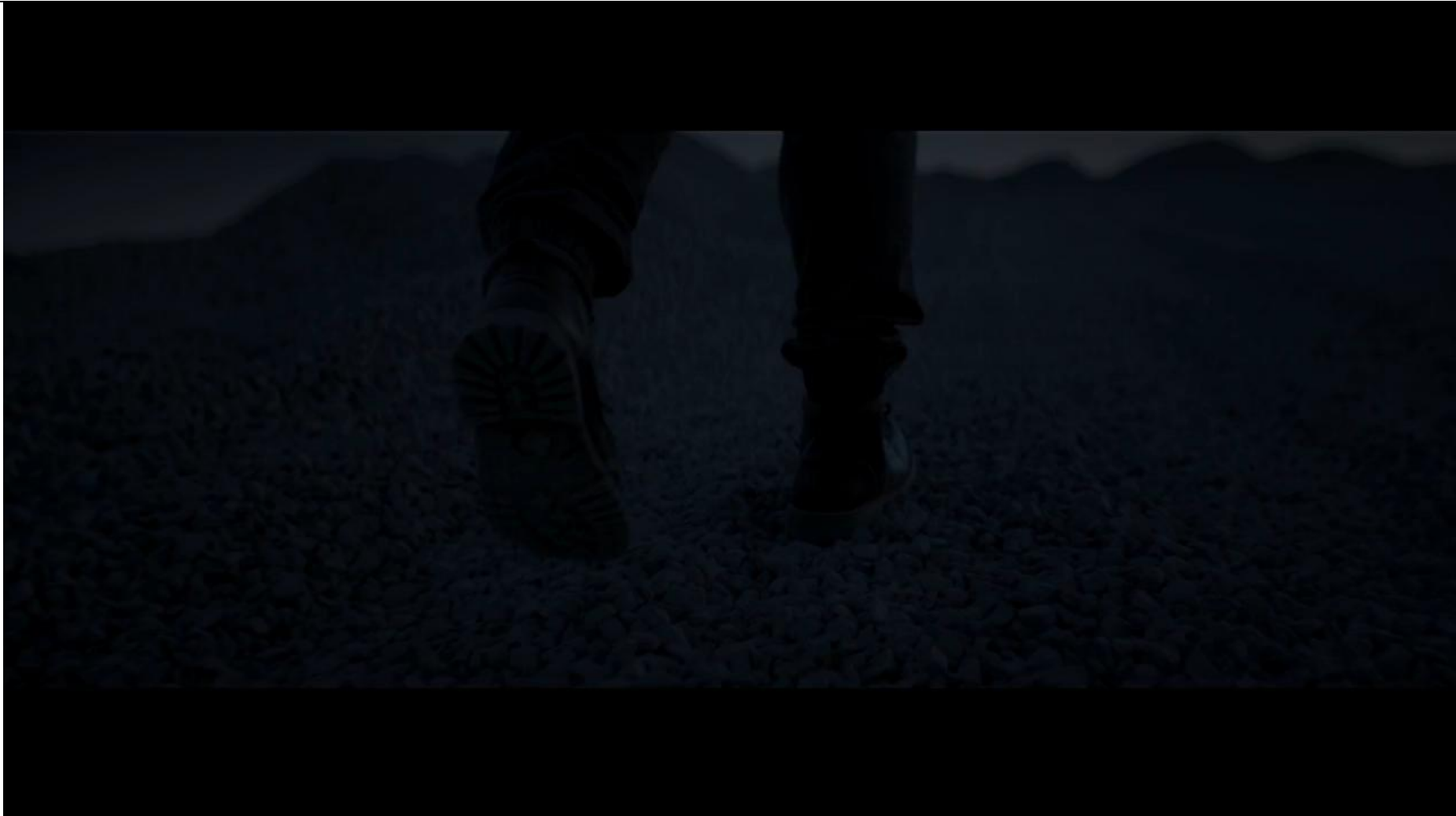
Other News



What's Next?

- More conversions
- More outreach
- Further studies

The path Less Travelled



Thank you!



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