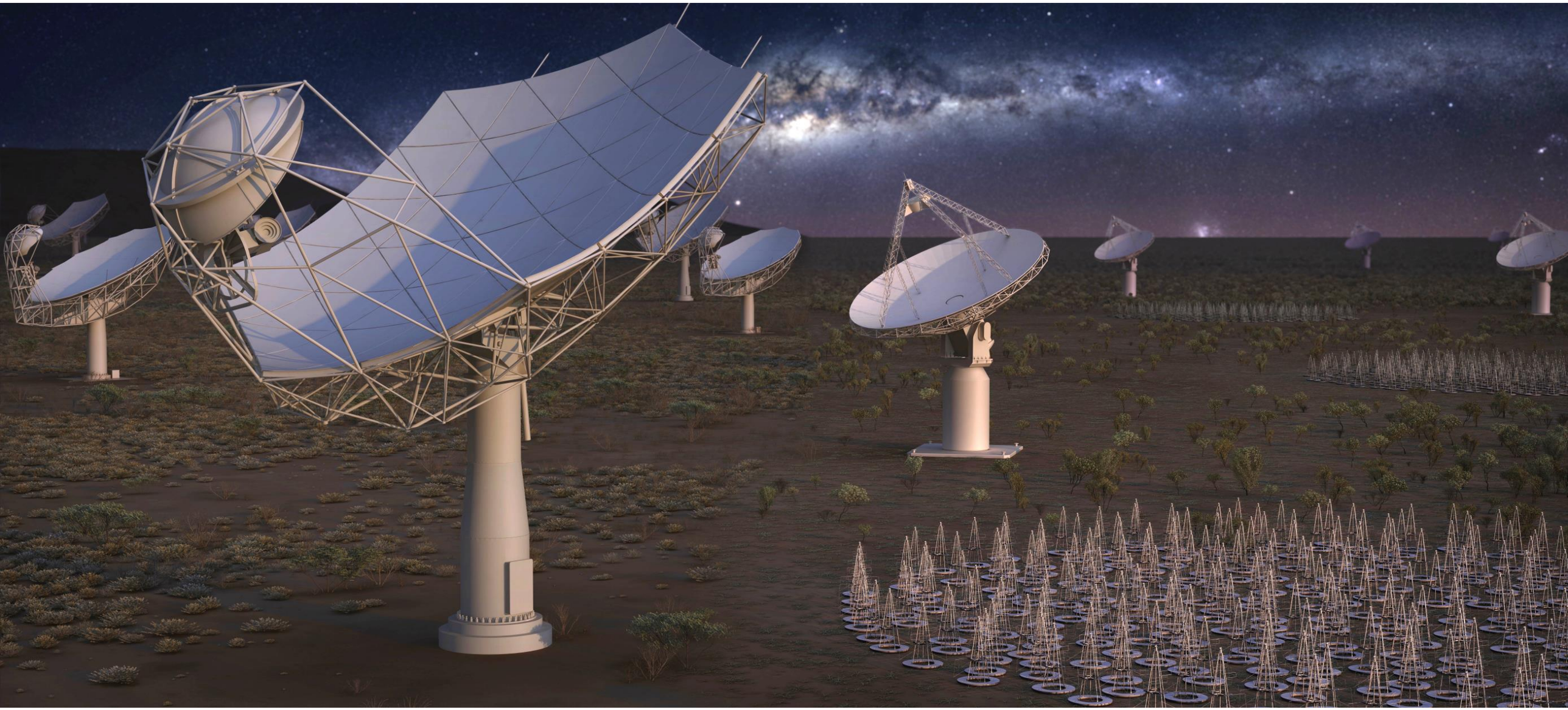
The Square Kilometre Array

An example of international cooperation



SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

Antonio Chrysostomou

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SKA– Key Science Drivers: The history of the Universe

Cosmic Dawn

Testing General Relativity

Galaxy Evolution

Cradle of Life

Cosmology

Cosmic Magnetism

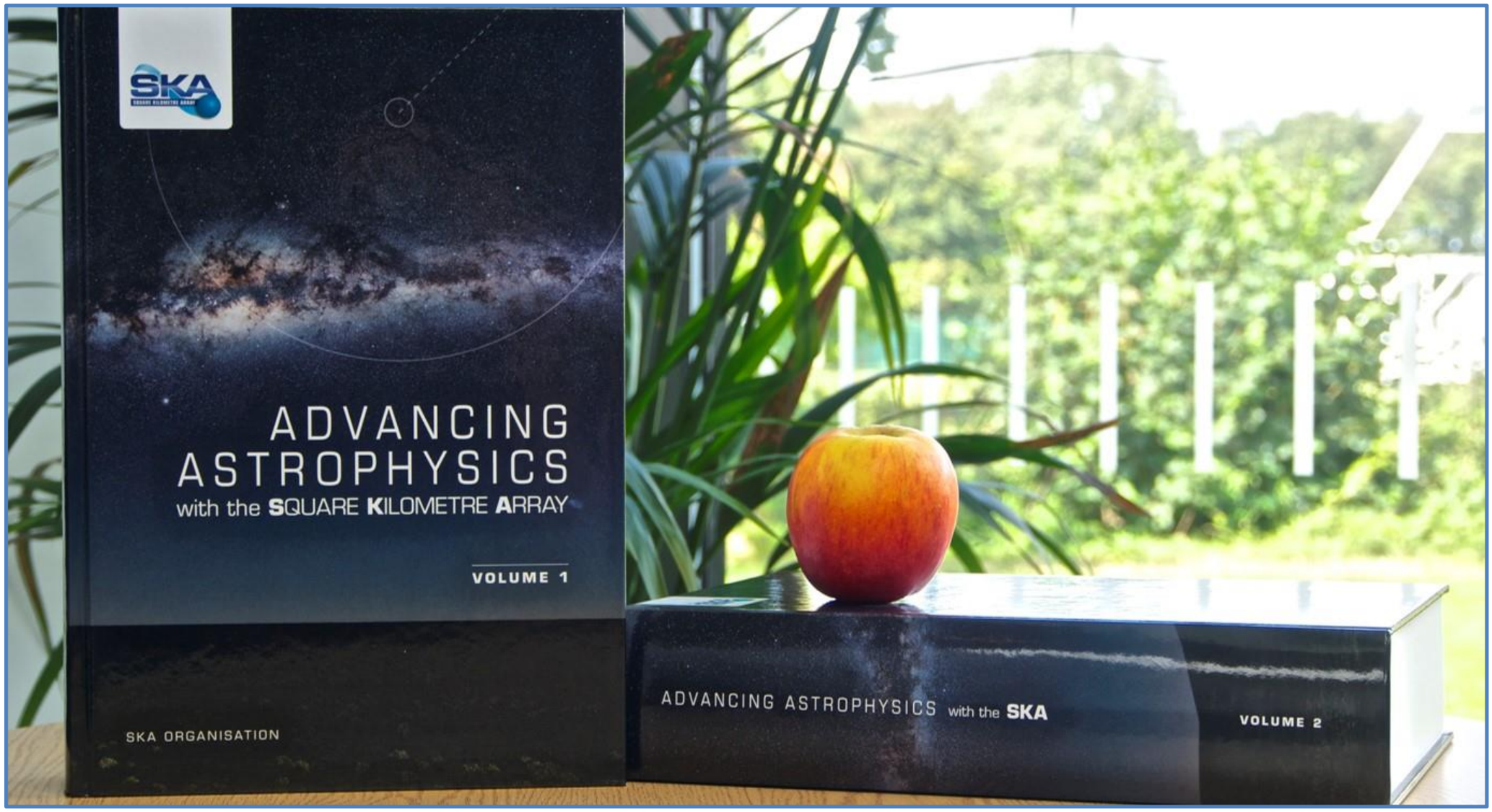
Exploration of the Unknown

Broadest range of science of any facility, worldwide

Science Driven Design

SKA Science Case

- 135 Chapters
- more than 1200 authors
- 31 countries
- 9-kg of science



Challenges

To achieve these science goals we must overcome the challenges that emerge

operational

technical

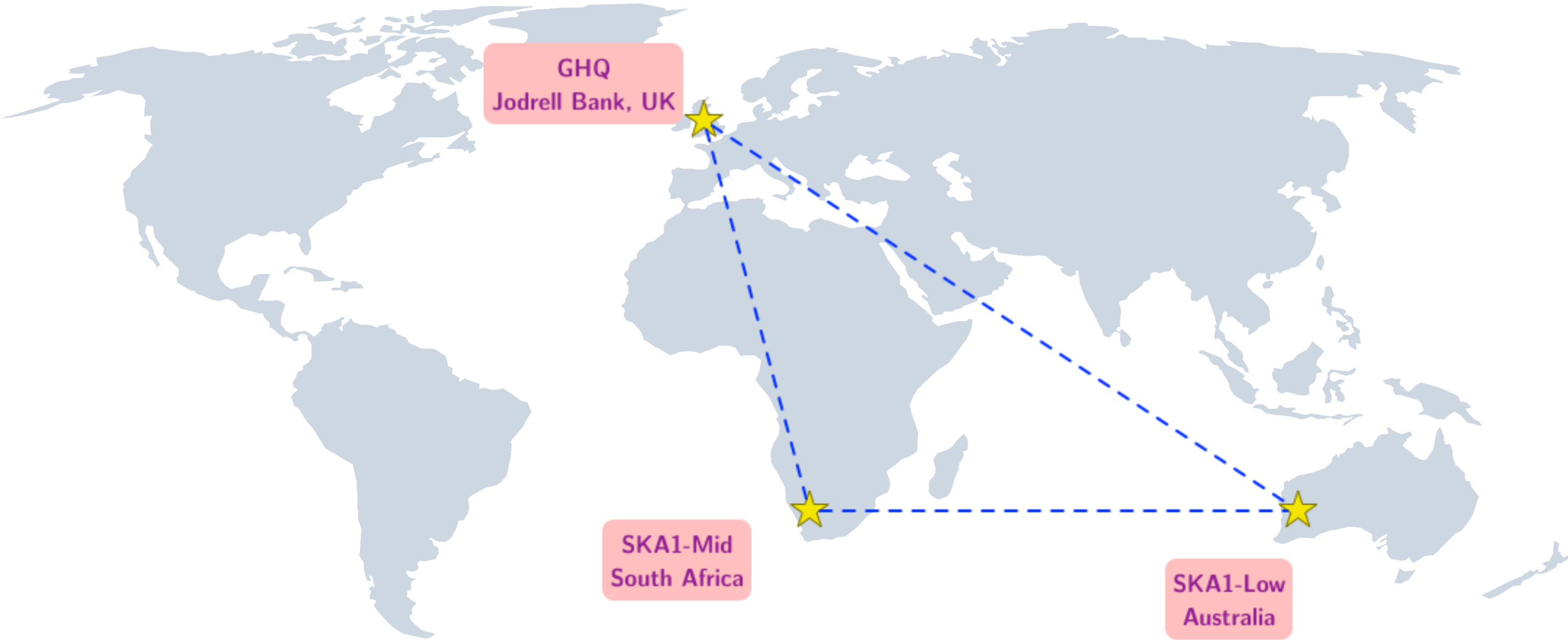
scientific exploitation

societal impact

governance

These challenges can only be faced by a dedicated and international collaboration

Challenge of distributed operations



3 Continents
2 Telescopes
1 Observatory

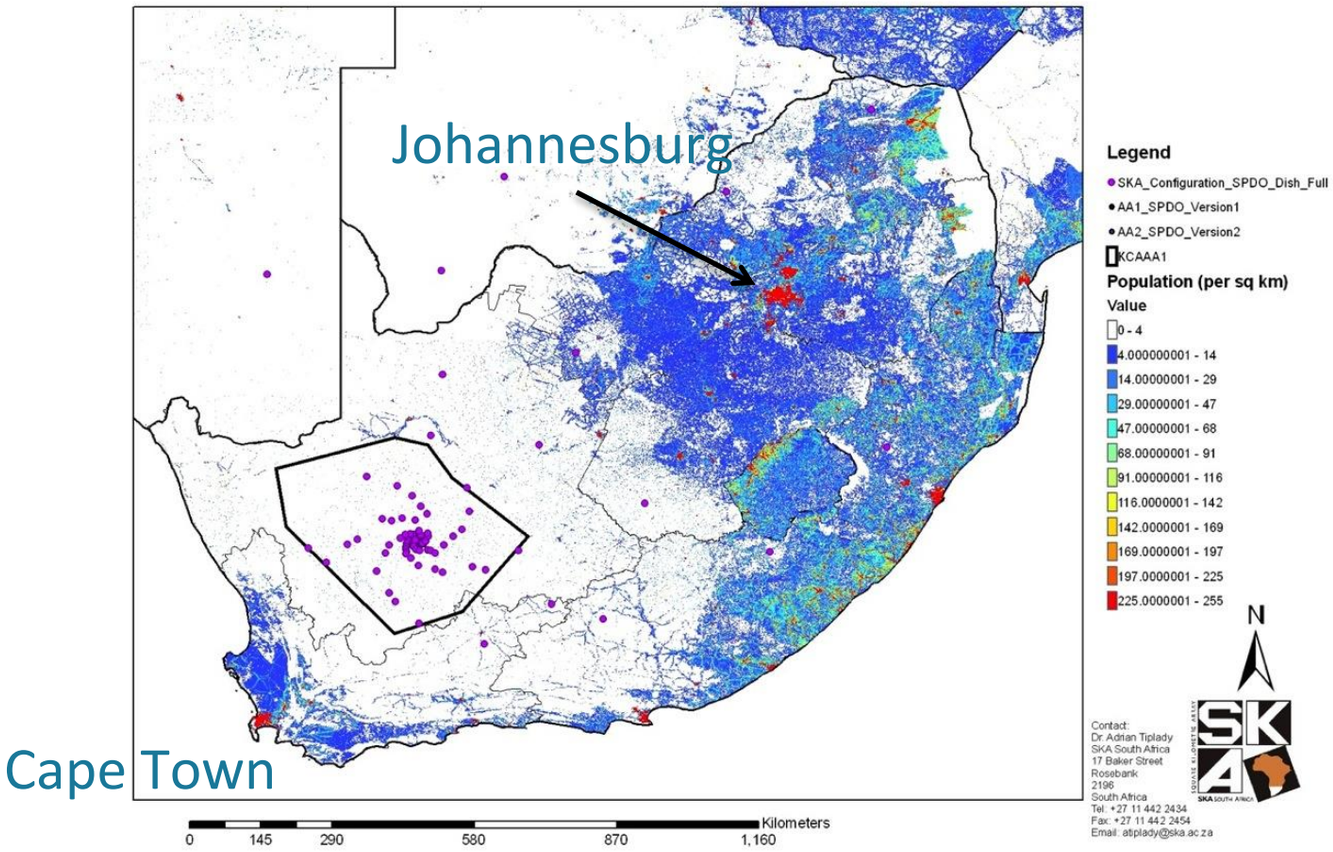
Challenge of distributed operations

Telescope Operator controls and operates the telescope from 600–800 km away at Science Operations Centre

Signal processing at the telescope sites

Data transferred to SOC for Science Processing

Karoo Radio Astronomy Reserve

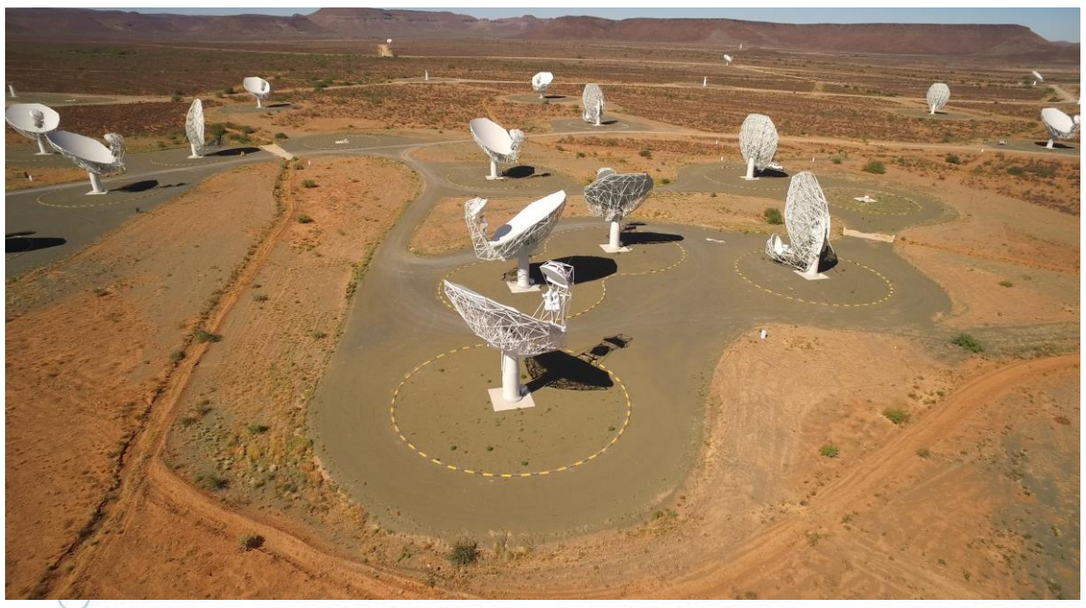


197 dishes =
133 (15-m SKA1 dishes) +
64 (13.5-m MeerKAT dishes)

150-km baselines

3 spiral arms

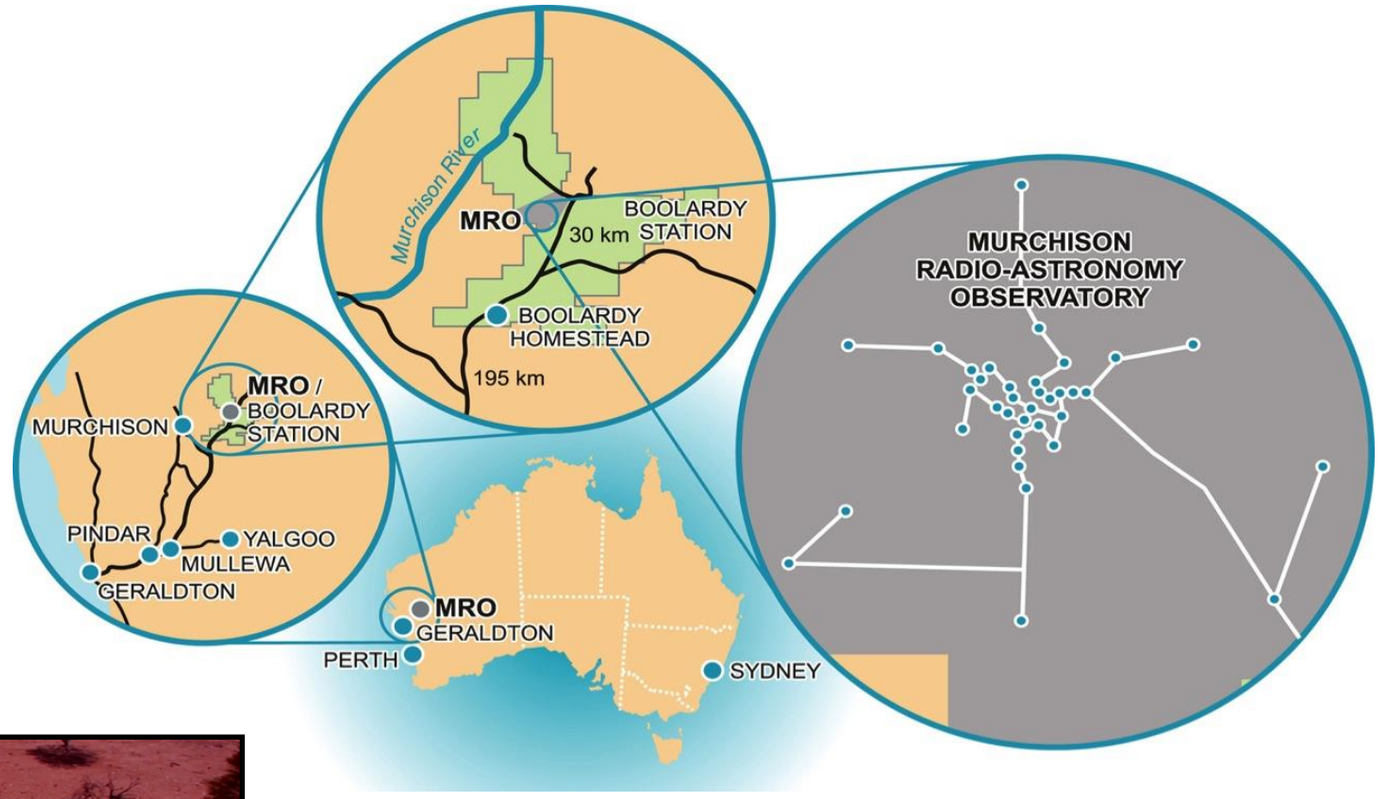
frequency range = 0.35 – 15 GHz



Murchison Radio-Astronomy Observatory

Shire of Murchison

- 50,000 km^2 (~ NY State)
- no towns
- 29 sheep & cattle stations
- population 110



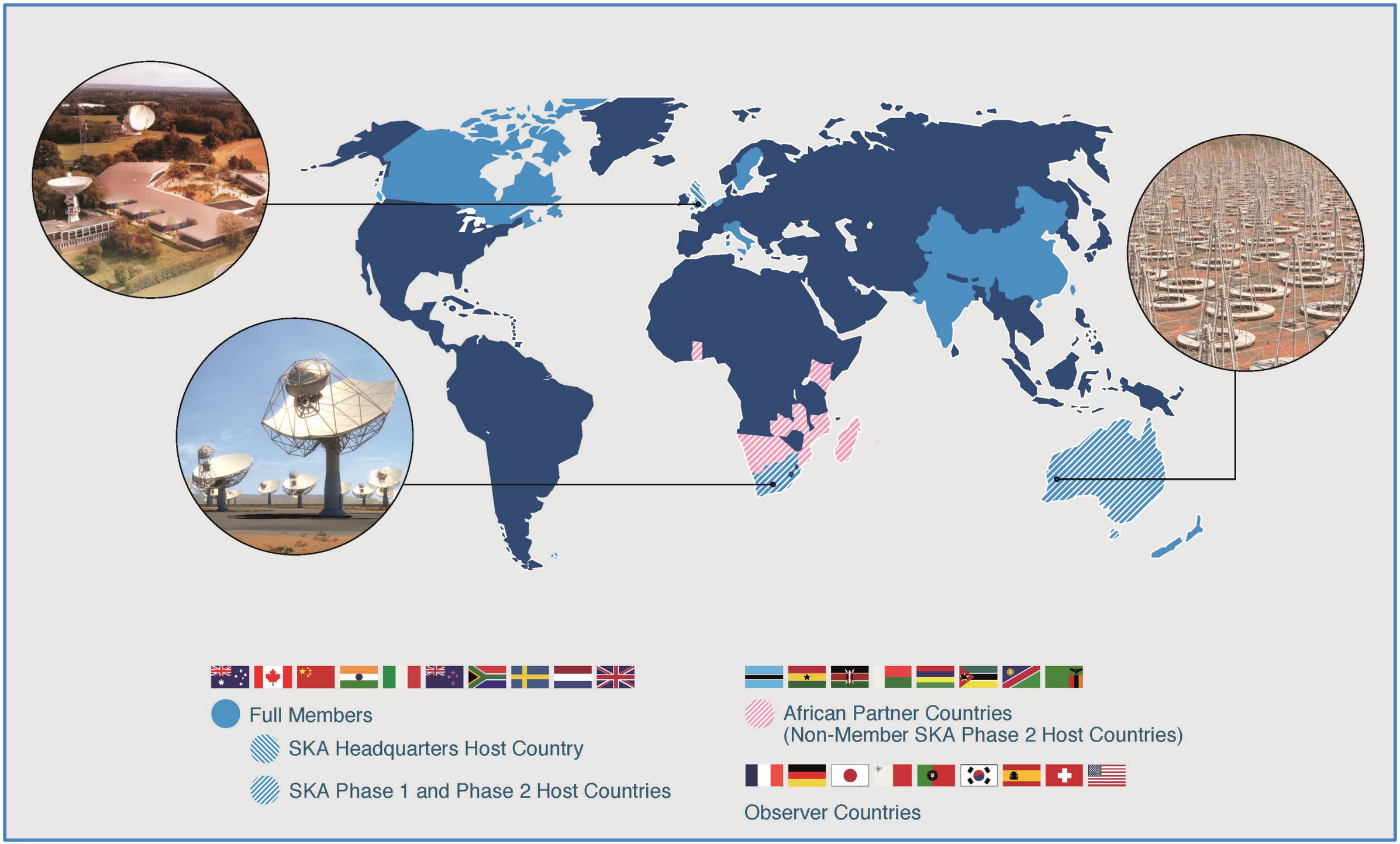
131,072 antenna =
512 stations × 256 antenna

60-km baselines

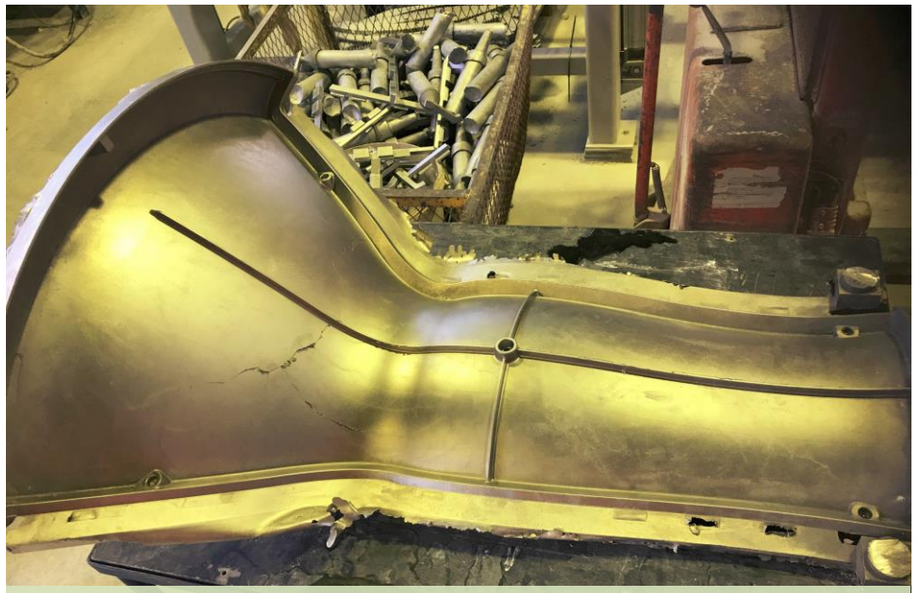
3 spiral arms

frequency range = 50 – 350 MHz

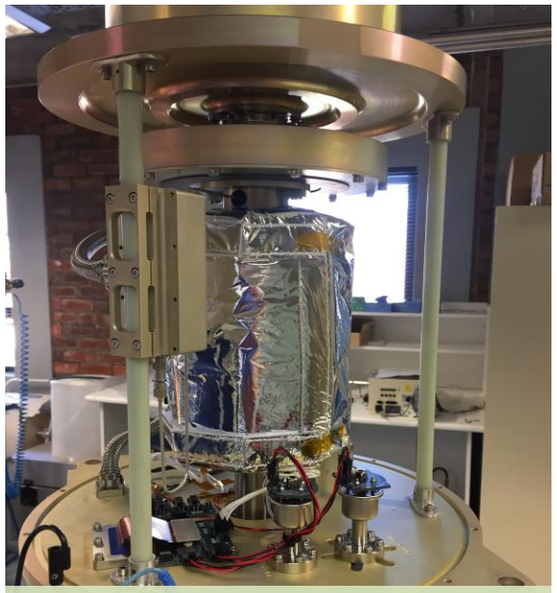
The SKA's global footprint



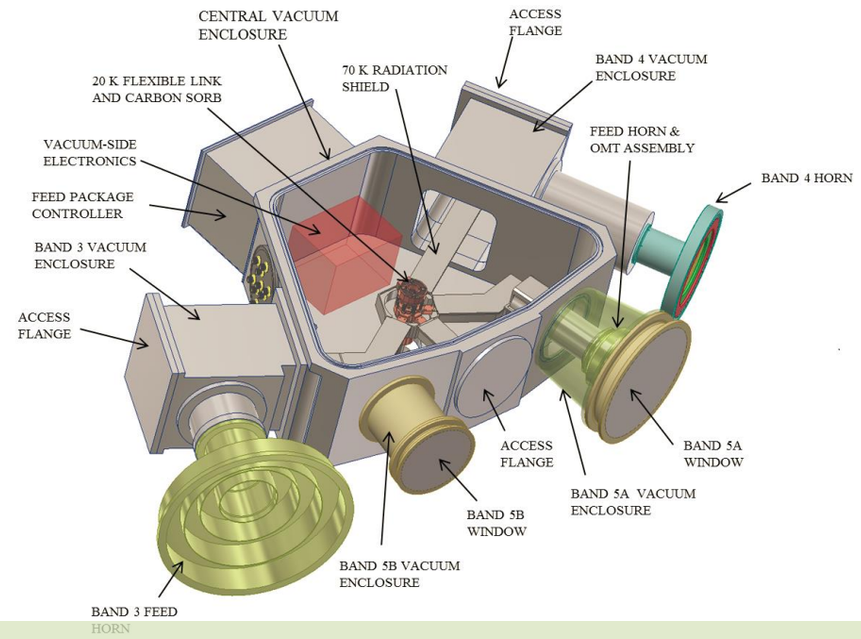
Technical challenges with an international solution



Sweden: Band 1

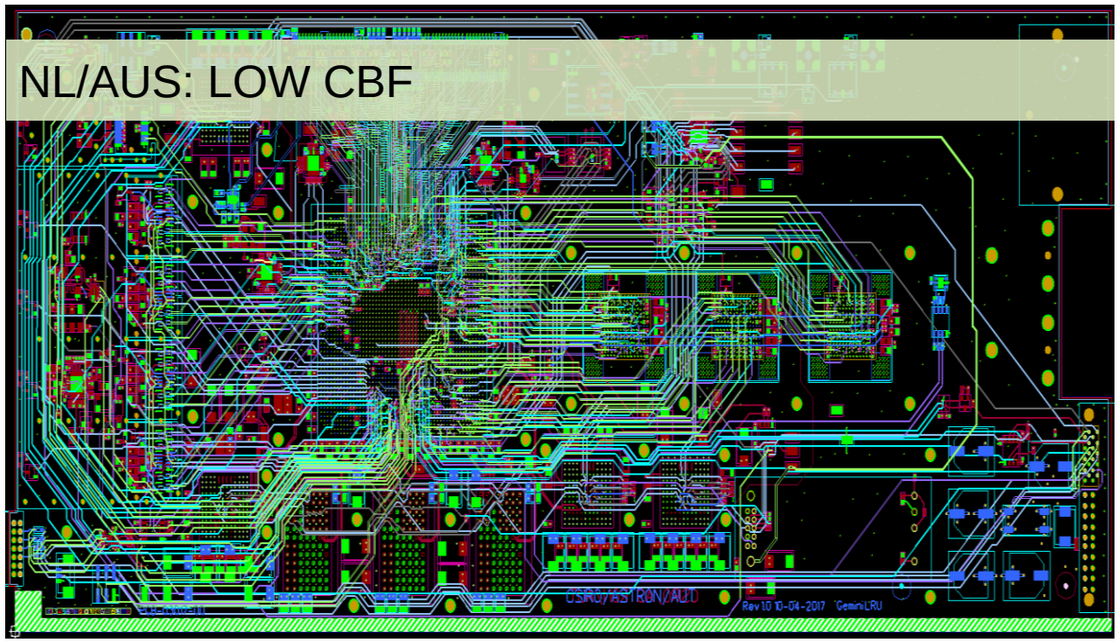


RSA/Canada: Band 2



UK: Band 5

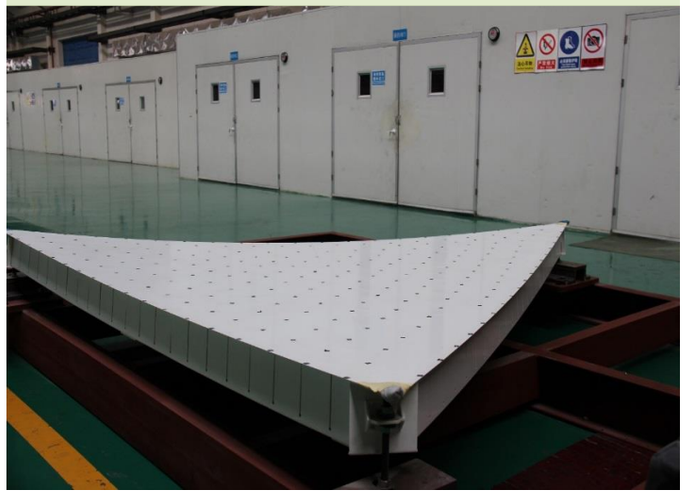
UK/AUS: Prototype NIP



NL/AUS: LOW CBF

Technical challenges with an international solution

Chinese (CETC54)/German (MTM) Dish Design



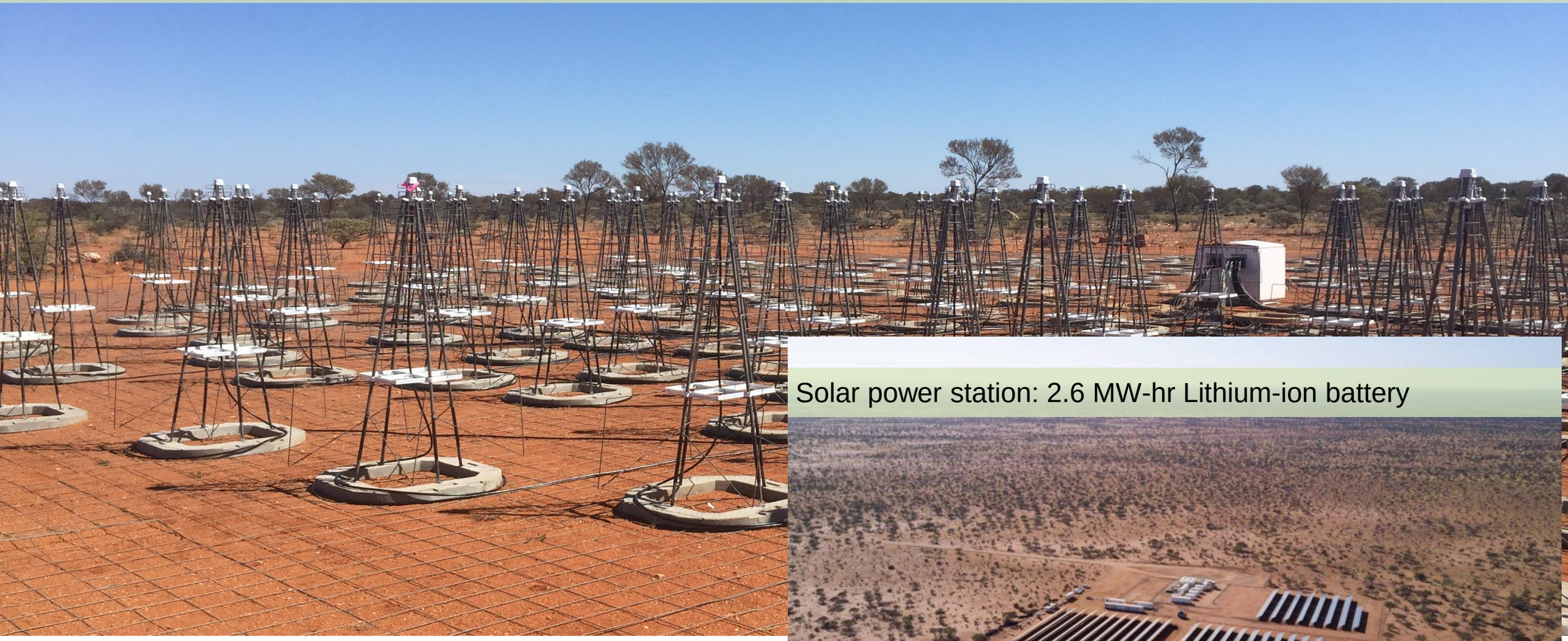
South Africa: DSH test foundation

China : Subreflector

Italy: Feed indexer

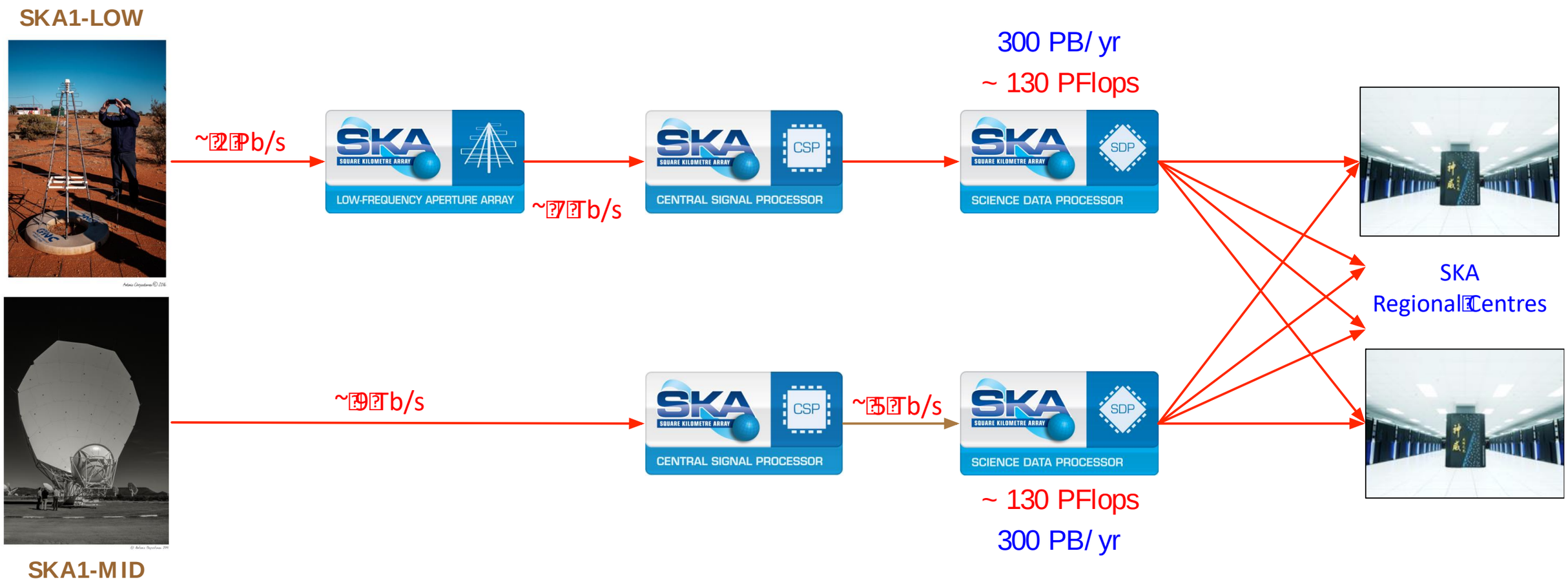
Technical challenges with a **green** solution

SKA-LOW prototype antenna station deployed



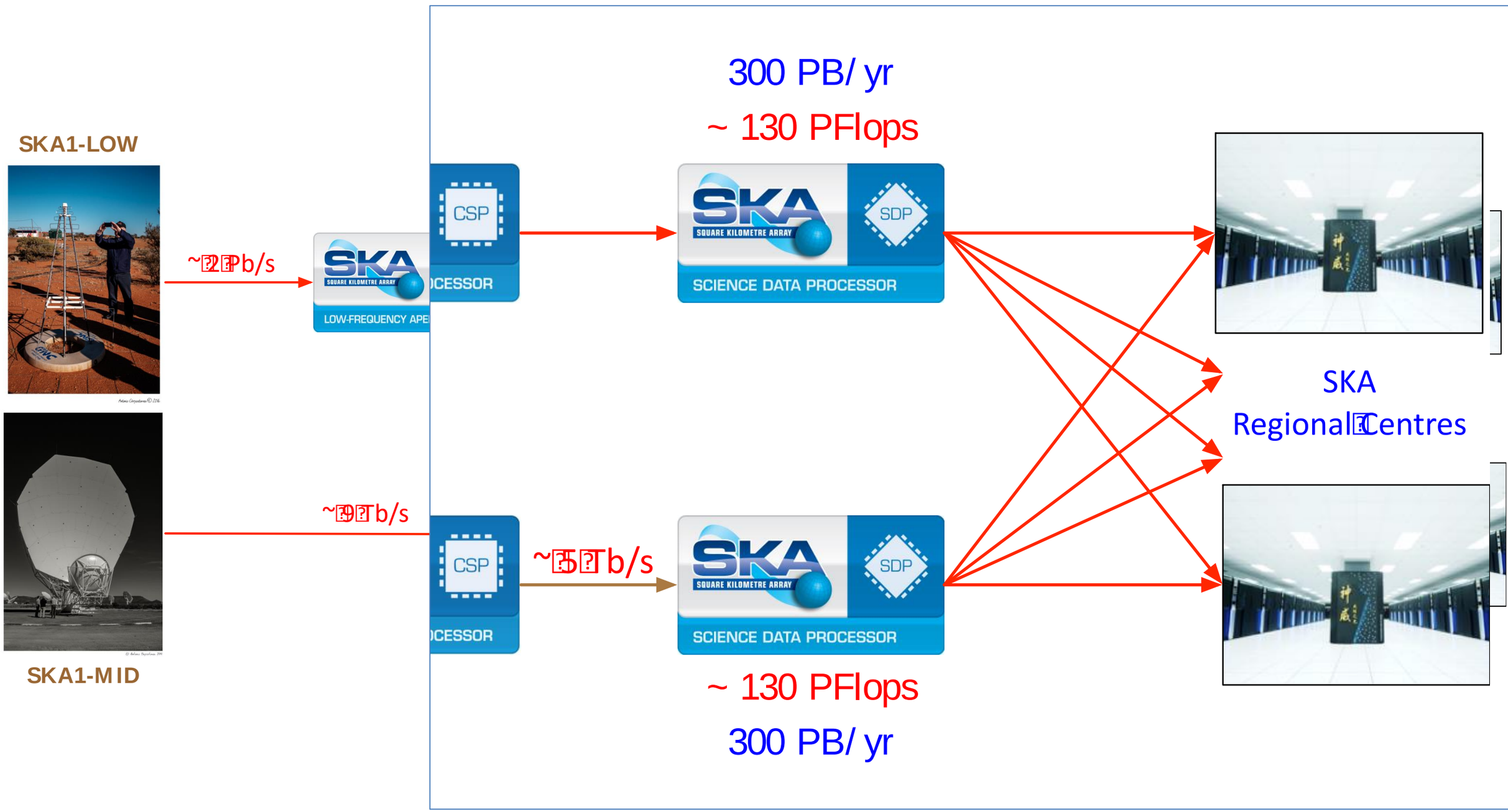
Solar power station: 2.6 MW-hr Lithium-ion battery

Technical and scientific challenge



Technical and scientific challenge

Technical and scientific challenge



Memory bandwidth ~ 200 PB/s

A collaborative model for SKA Regional Centres

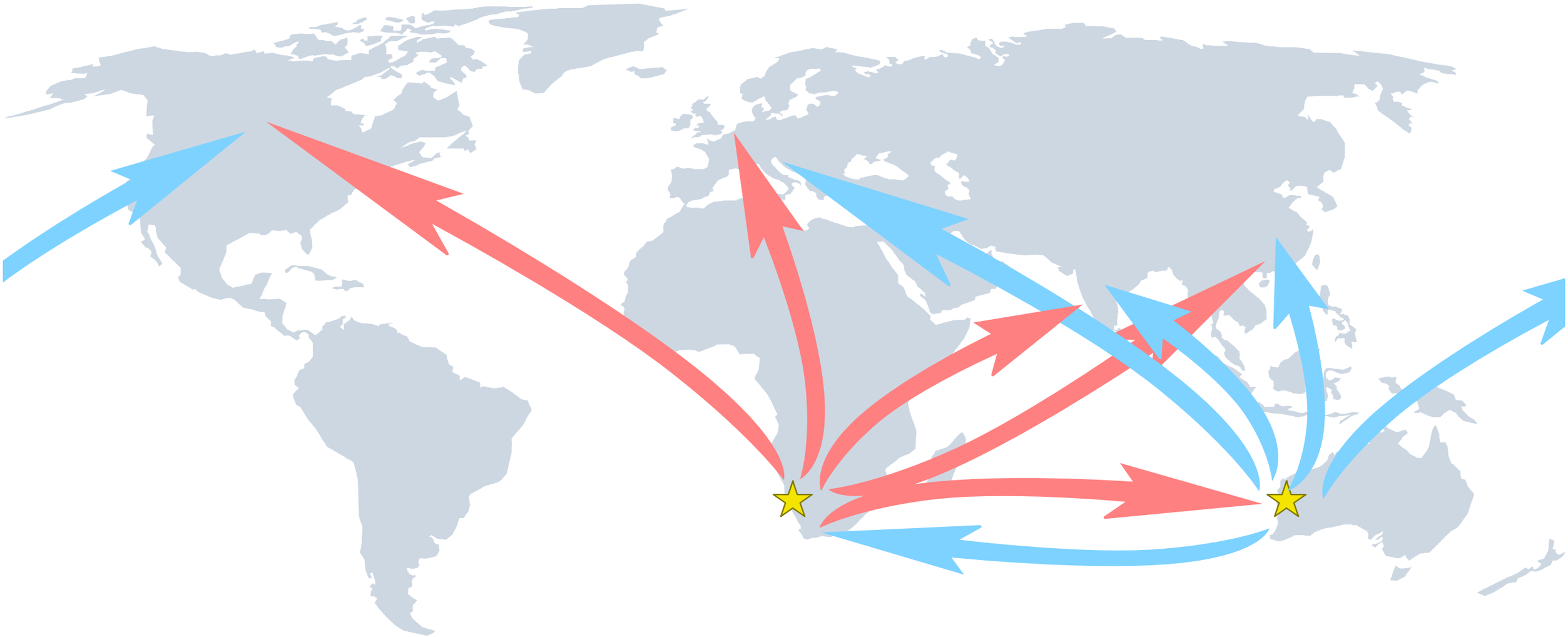
There are three main factors that lead to a model of a global collaborative alliance of SKA Regional Centres (SRCs)

(1) The science data products that emerge from the SKA observatory are not in the final state required for science analysis and publication

(2) The data volumes are so large that direct delivery to end users is unfeasible

(3) The community of scientists working on SKA science data products will be geographically distributed

SKA Distributed Science Operations



Observatory Data Products flow from the Science Data Processors in Perth and Cape Town to SKA Regional Centres around the globe.

Establishing the SKA Intergovernmental Organisation

Establishing the SKA Intergovernmental Organisation

An initial membership of 10 countries to start construction of SKA Phase 1

Developing and growing membership towards SKA Phase 2

The SKA IGO will:

- recognise that socio-economic impact is core to its aims
- recognise that all partners require return in various forms
- partnership with hosting nations – not “landlord-tenant” relationship
- promote positive environment: local and global outreach, scientific creativity, positive IP regulations

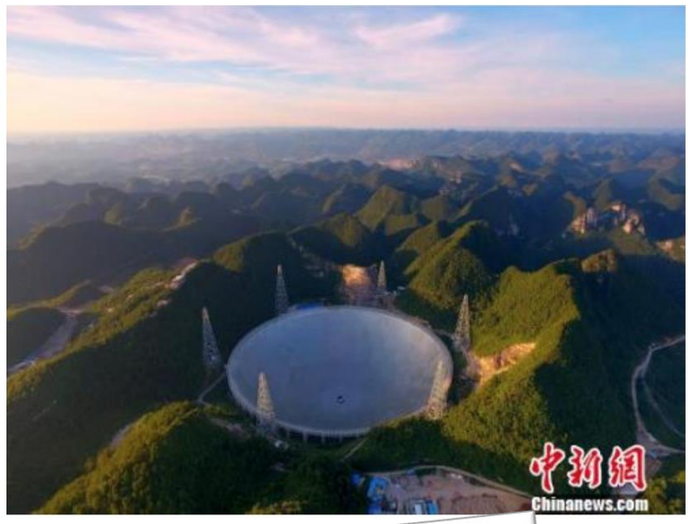
Societal impact

Support

- 125k Euro work package within the Jumping JIVE H2020 project
- Funds trainers from EU radio observatories to help with the DARA basic training
- Funds a seminar series to advertise DARA programme
- Funds African students to attend EU radio astronomy training events
- Funds staff exchanges between EU and AVN countries

FAST项目是中国重大科技项目，系目前世界上口径最大的单天线射电望远镜，是人类直接观测遥远星系行星、寻找类似太阳系或地球的宇宙环境，以及潜在智慧生命的重要设施。其科学目标主要是巡视宇宙中的中性氢、发现新脉冲星、主导国际甚长基线网、探测星际分子、寻找地外文明等，在航天工程及其他领域具有广泛用途。

平塘县旅游事业管理中心负责人介绍，目前造访“天眼”的游客以周末、节假日来的占大多数，2016年国庆黄金周期间，每天造访“中国天眼”景区的游客最高达万人。由于要保障“天眼”的正常运行，平塘县在旅游开发中，将观景台址5公里范围设为“静默区”，不得使用任何电子设备，每天控制2000人次的最大承载量。尽管如此，“天眼”还是吸引了越来越多远道而来的游客。



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