

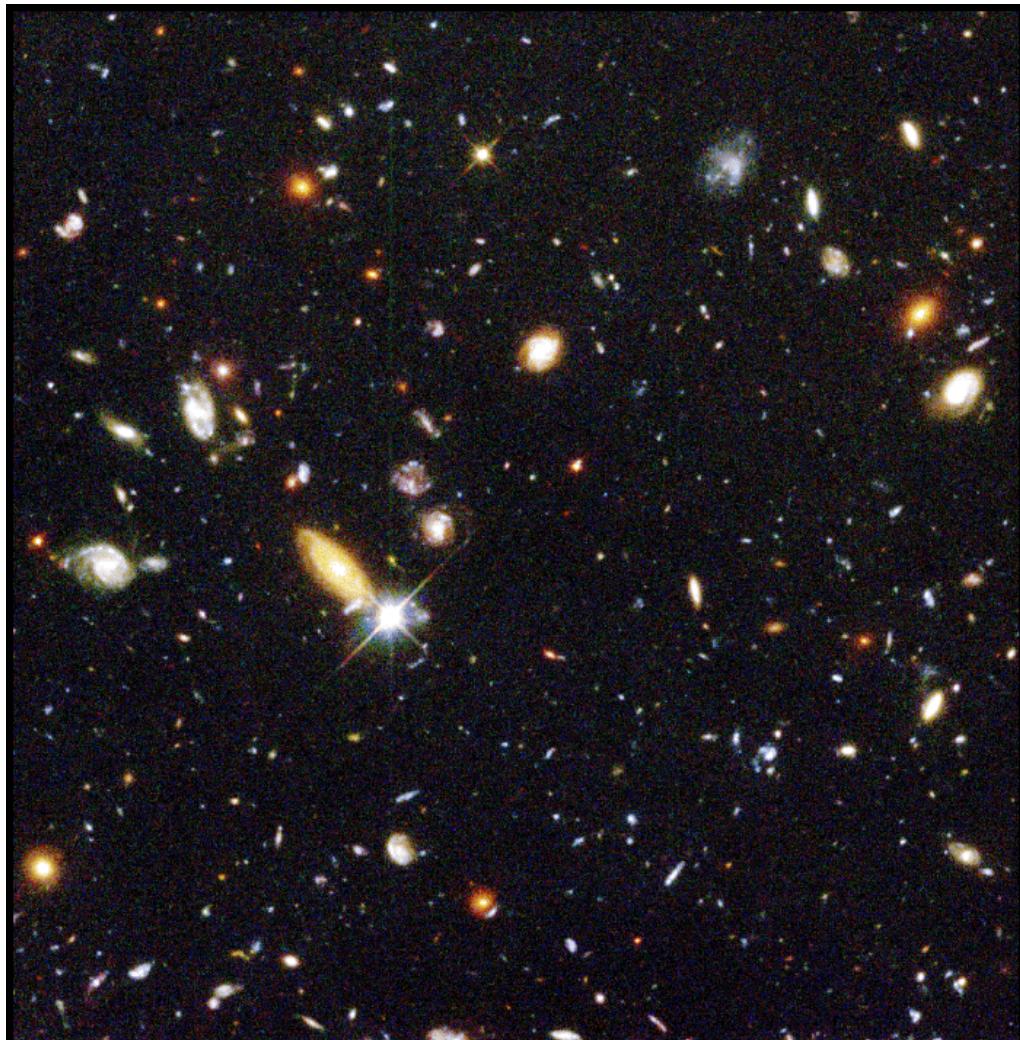


The Square Kilometre Array

A Global Science Enterprise

Russ Taylor
Institute for Space Imaging Science
University of Calgary

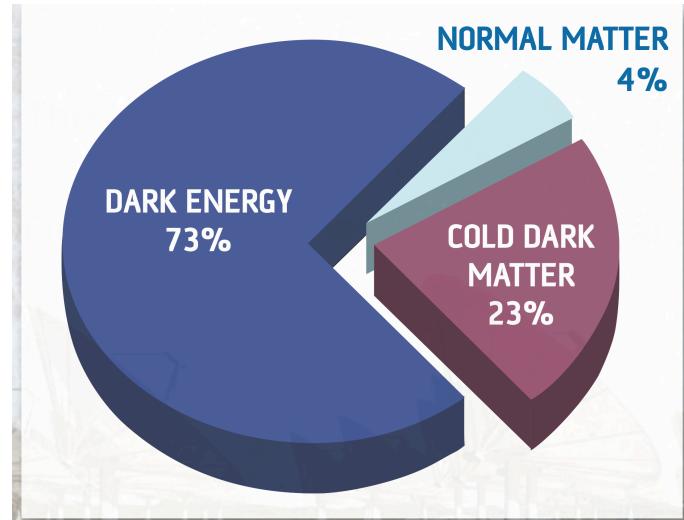
The Hubble Deep Field: Probing Deep Space



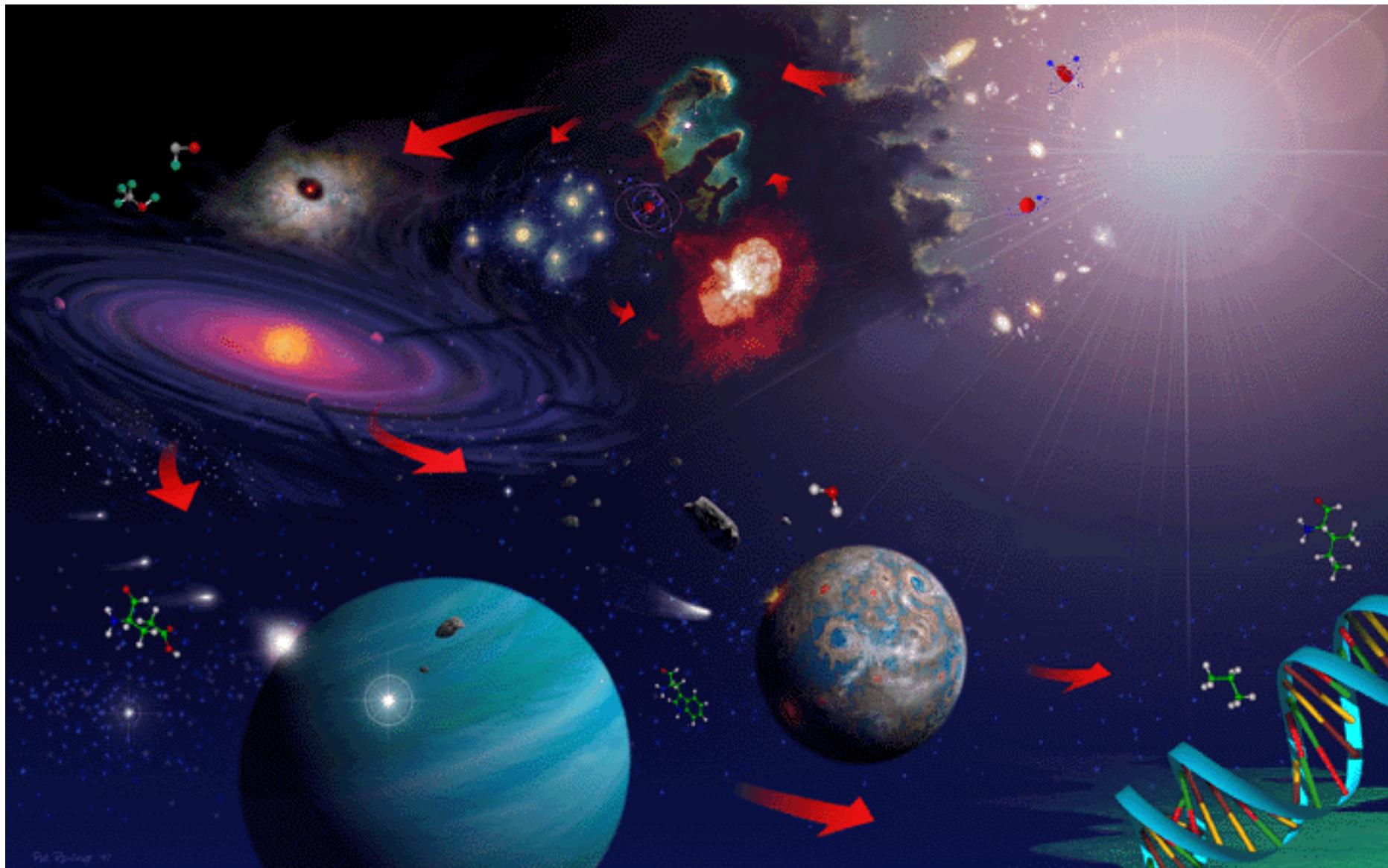
Hubble Deep Field

PRC96-01a · ST Scl OPO · January 15, 1996 · R. Williams (ST Scl), NASA

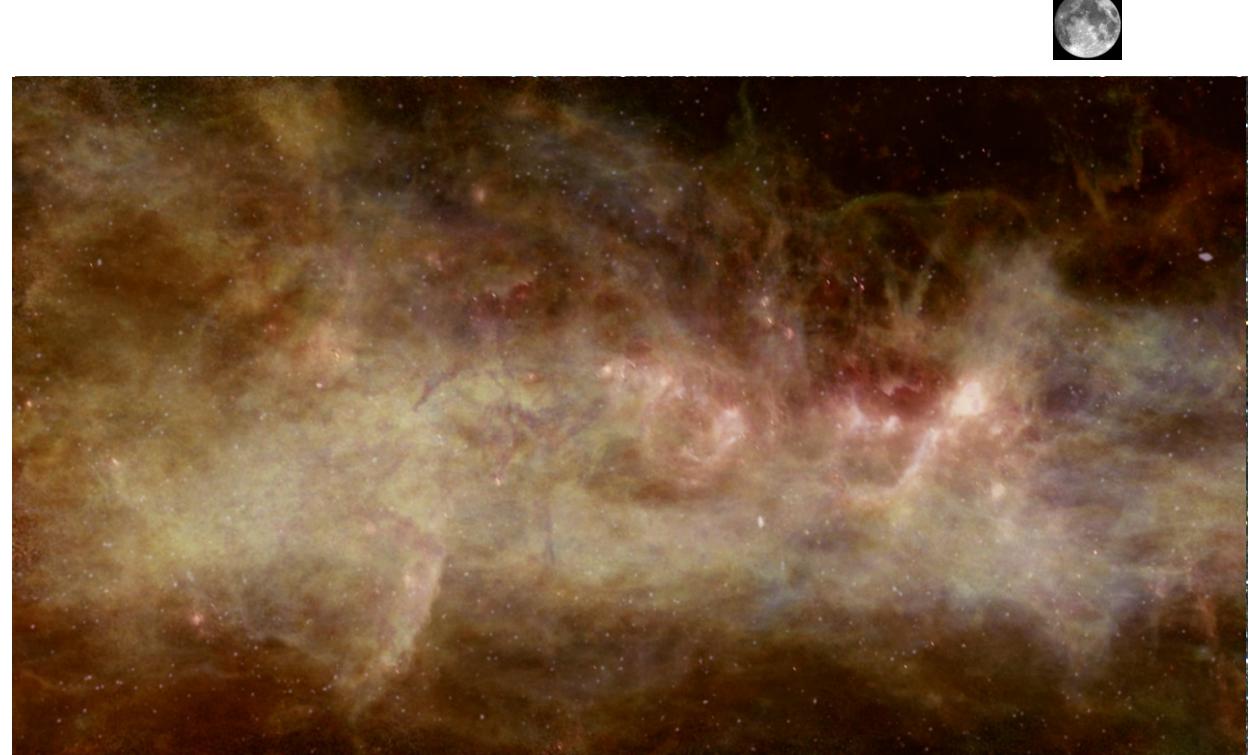
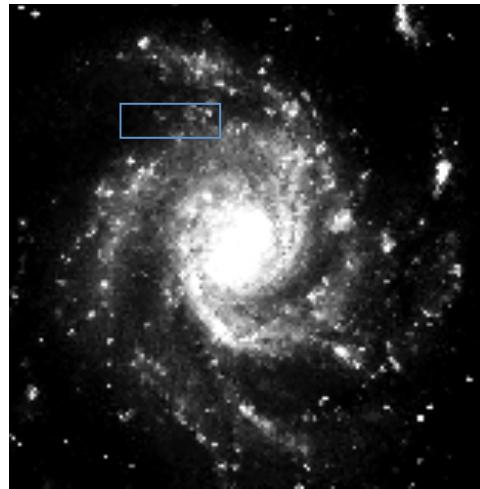
HST · WFPC2



A complete History of time

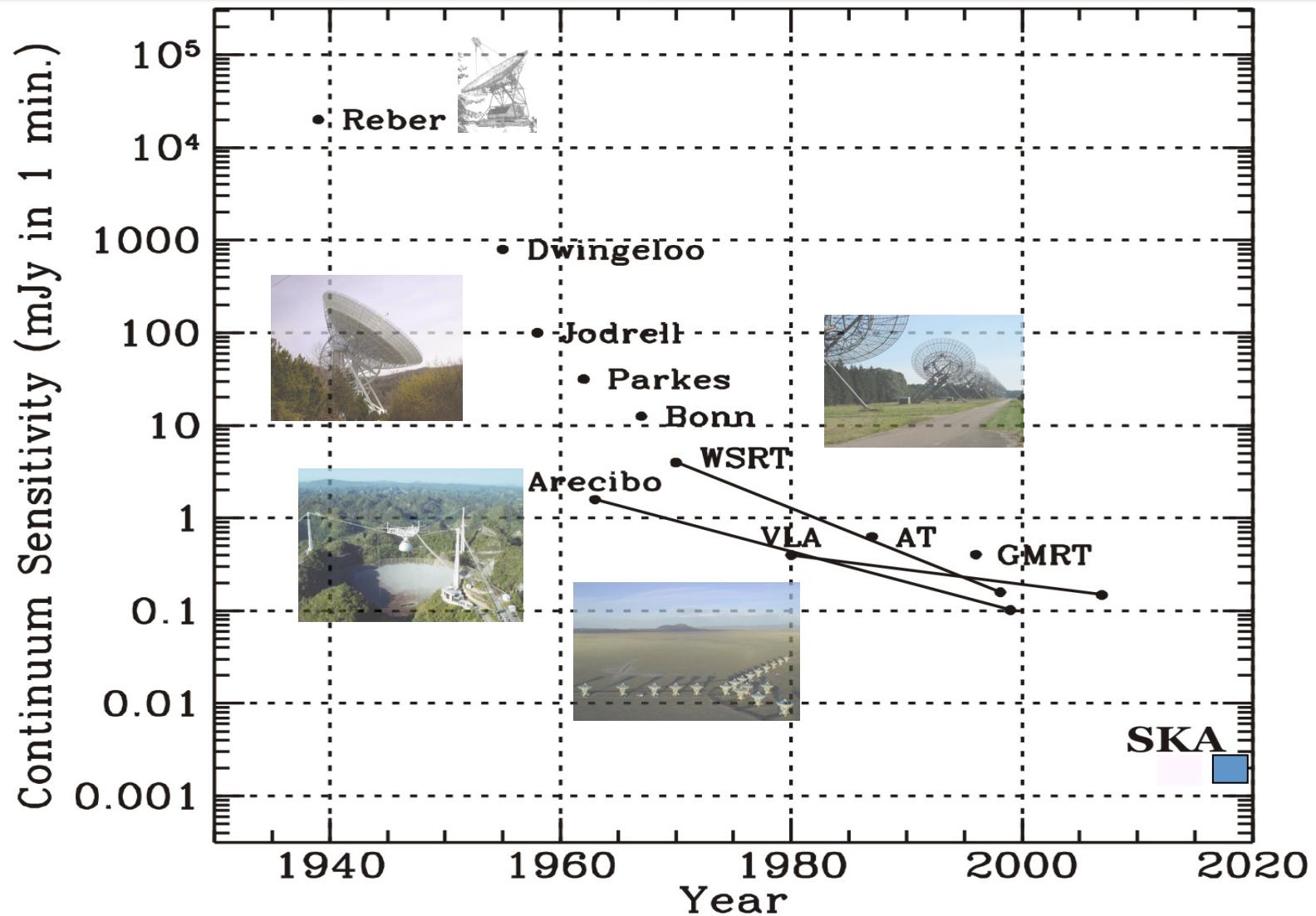


Optical and Radio Pictures in the Milky Way



Radio image Canadian Galactic Plane Survey

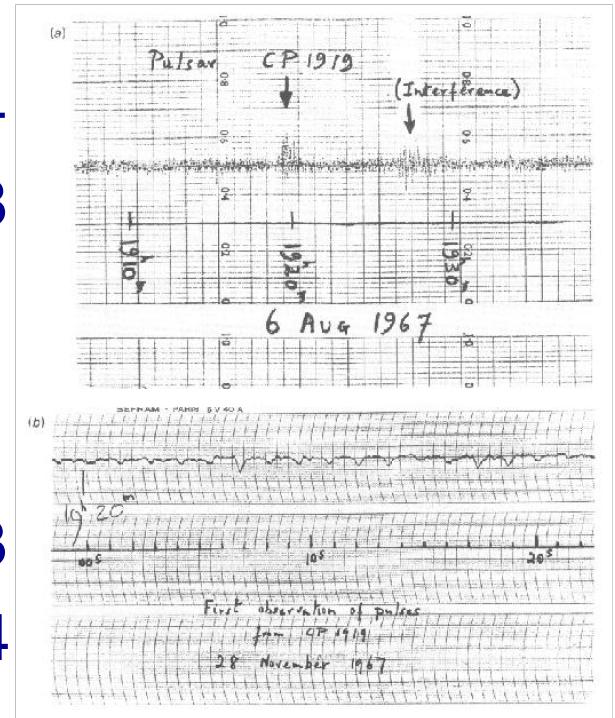
Sensitivity in Radio Astronomy Versus Time



Radio waves: A Rich History of Discovery

Many Discoveries over the past 50 years

- pulsars  1974
- microwave background radiation  1978
- Dark Matter
- Quasars
- Jet & superluminal motion
- effect of gravity radiation  1993
- aperture synthesis  1974



A photograph of a large array of radio telescopes, likely the Very Large Array in New Mexico, set against a vibrant orange and yellow sunset sky. The telescopes are large parabolic dishes mounted on tall metal towers. In the foreground, several smaller dish antennas are visible. The ground is a flat, dry landscape.

“I need a bigger telescope”

Jodi Foster

SKA: The Movie

Movie removed for this pdf version



SKA International Partnership



SKA Born Global: 22 countries participate in SKA planning



Canadian now a partner with 7 countries for pre-construction detailed design

- Australia, China, Italy, New Zealand, Netherlands, South Africa, and the UK.

Canadian SKA Consortium

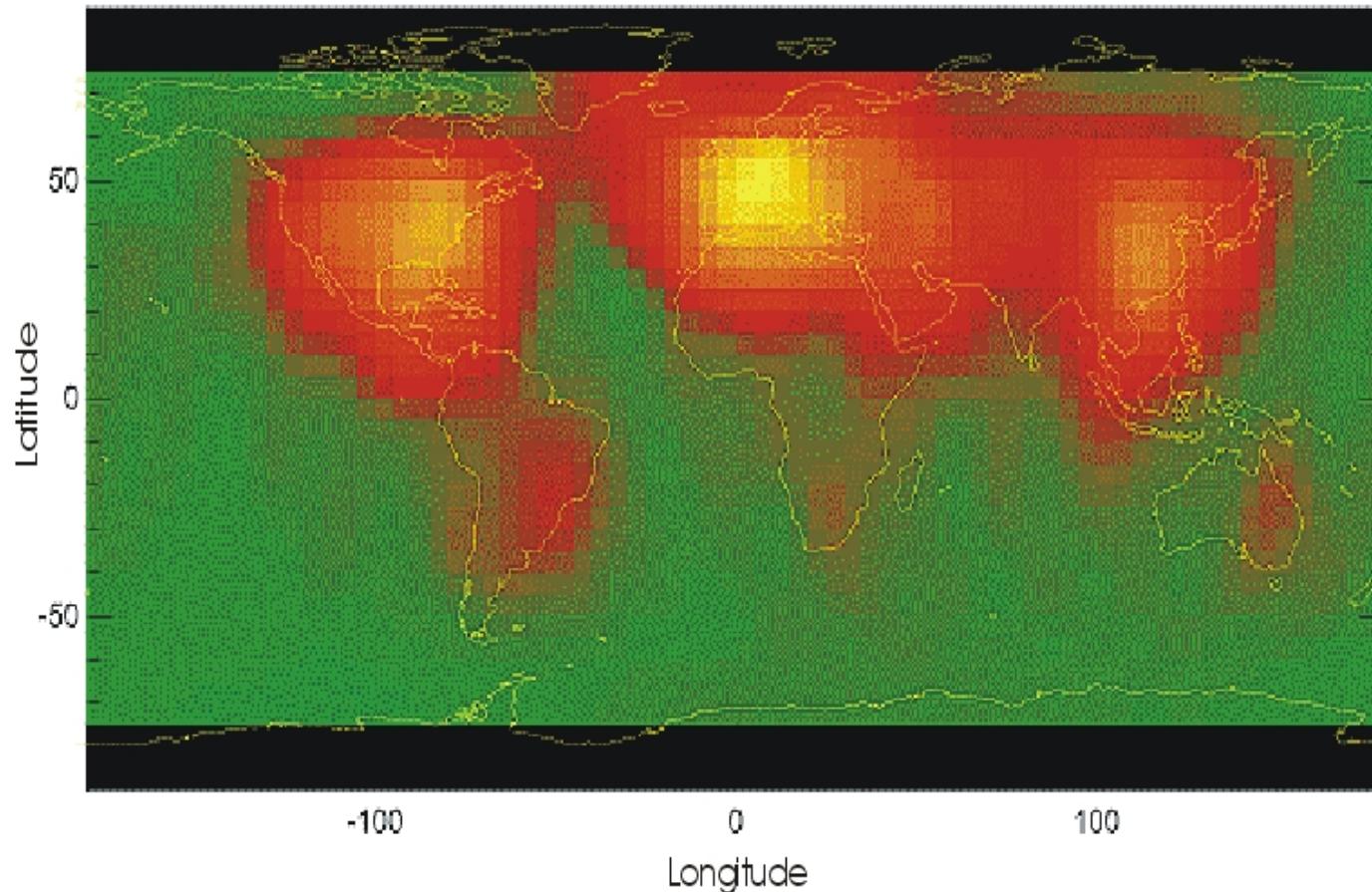
- partnership between government Universities and industry
- Canadian National Astronomy plan recommends 10% partnership

Examining a hole

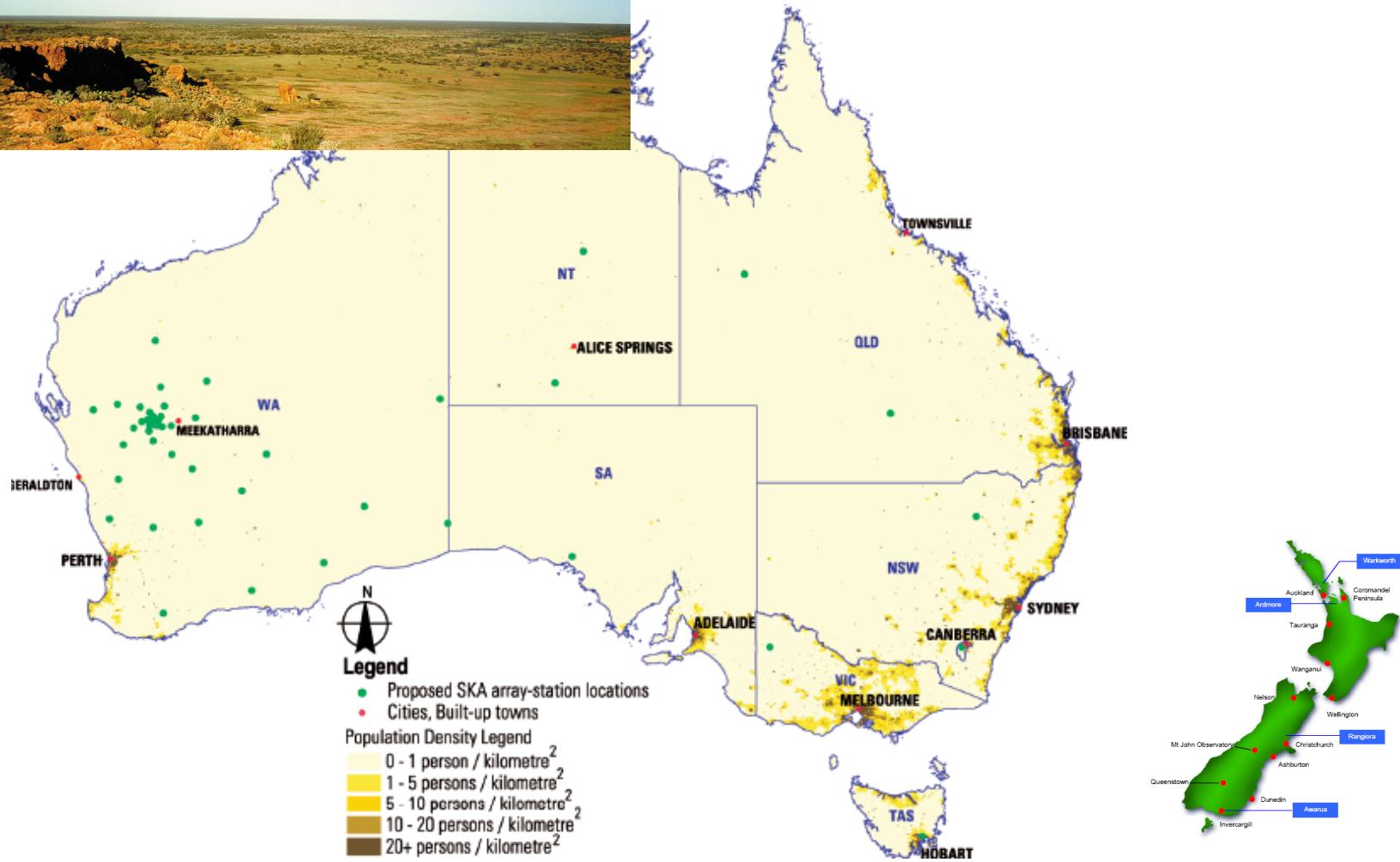


SKA Location

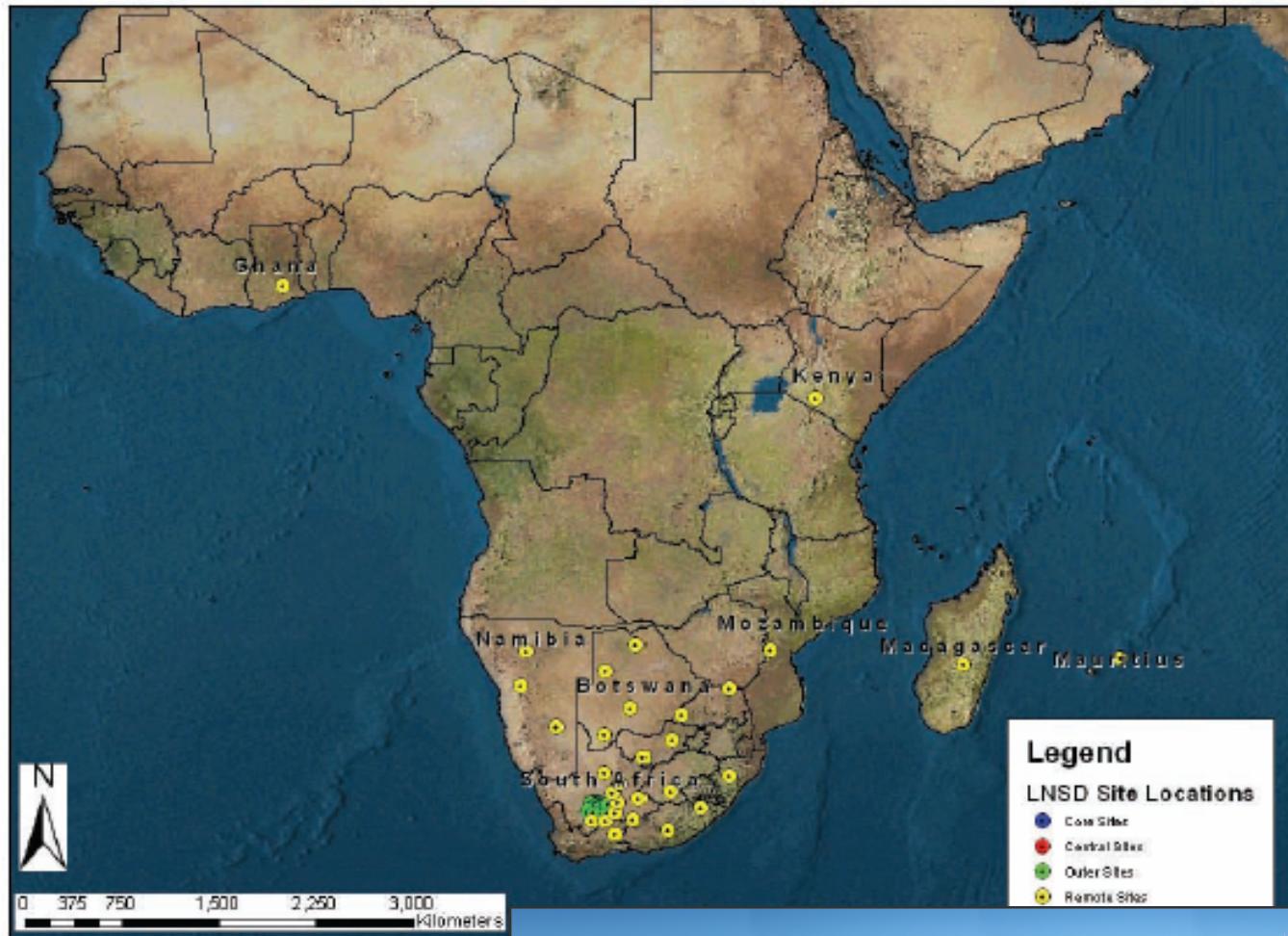
TERRESTRIAL INTERFERENCE



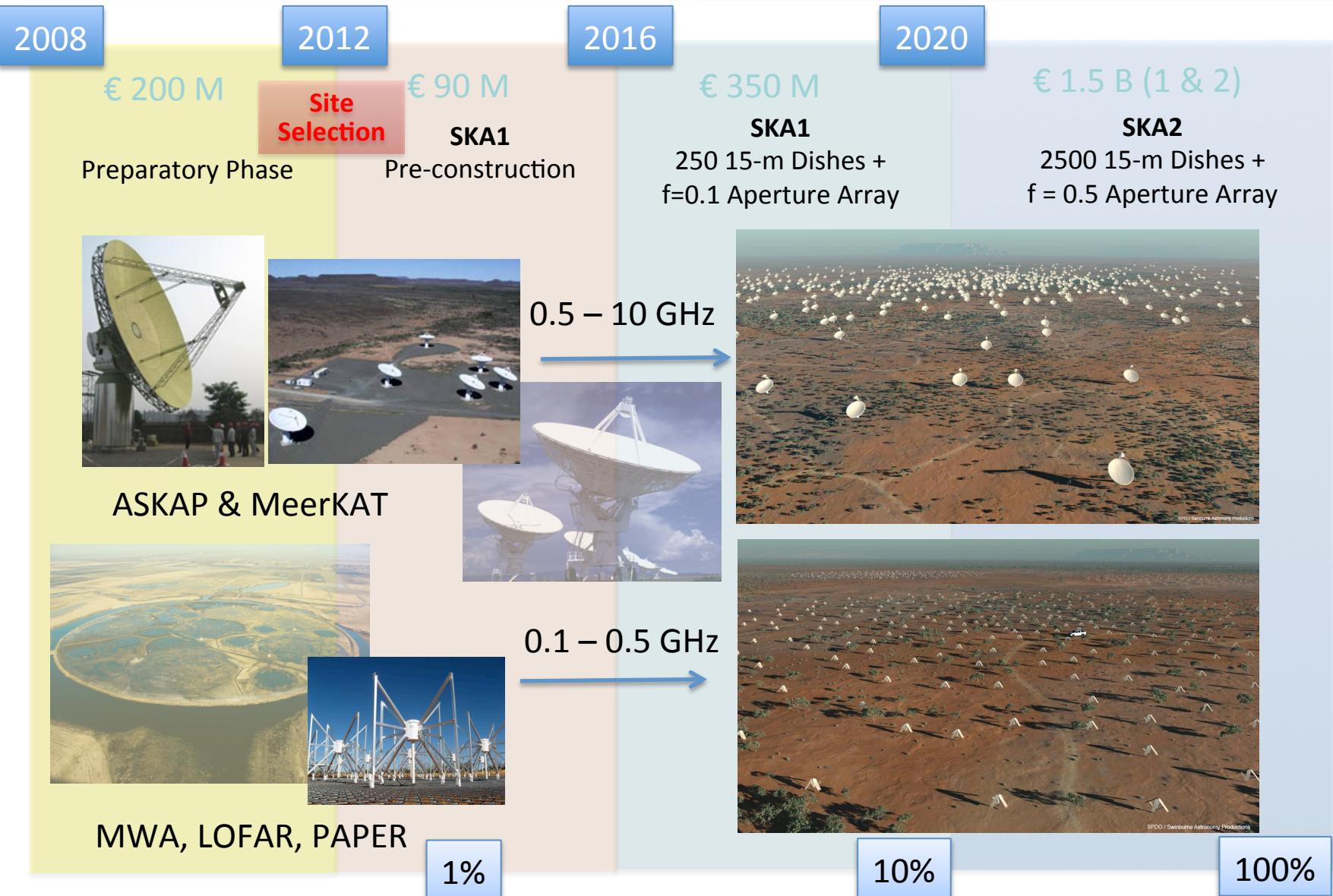
Australia + NZ



South Africa + 7 countries

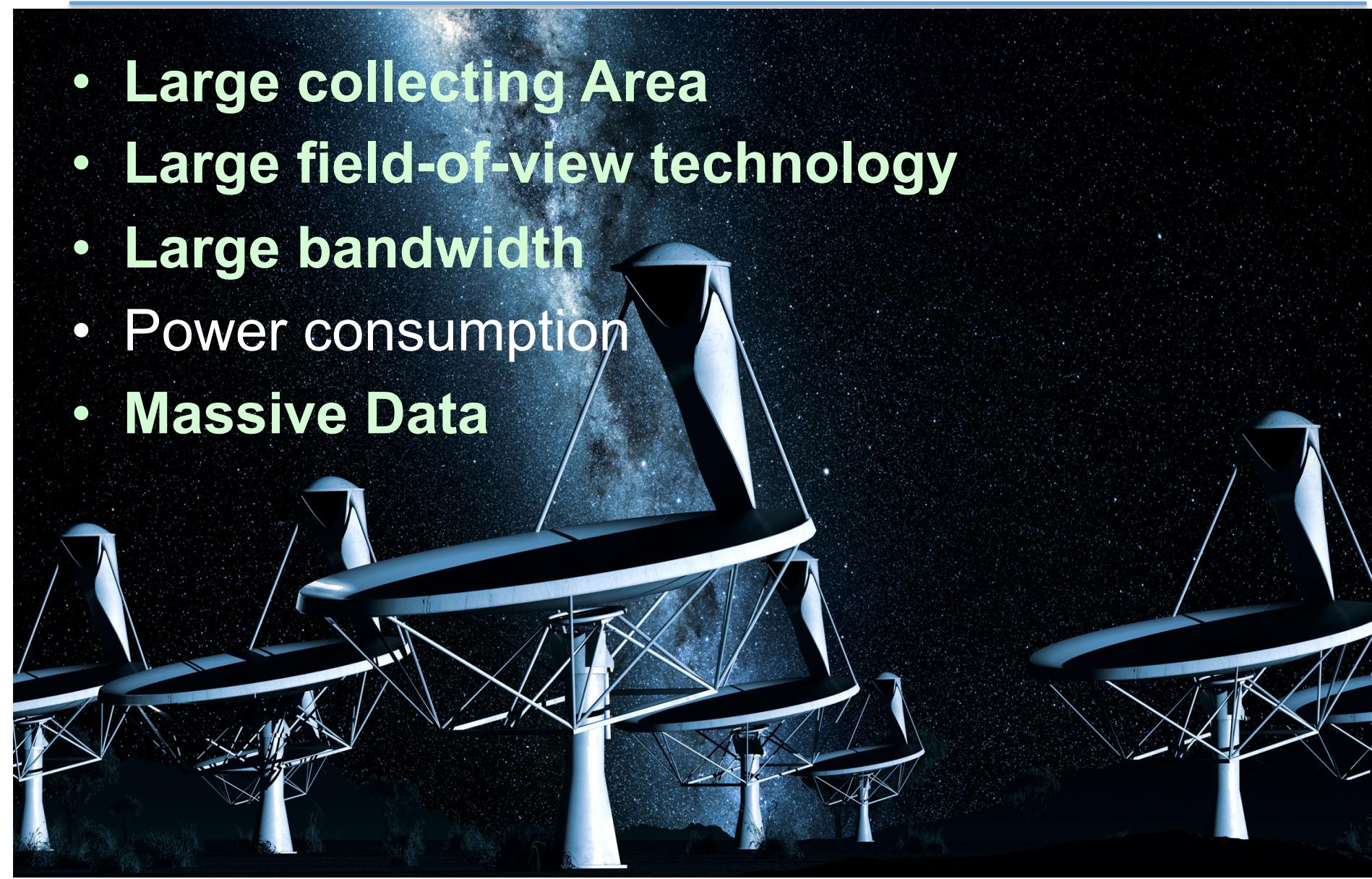


SKA Timeline



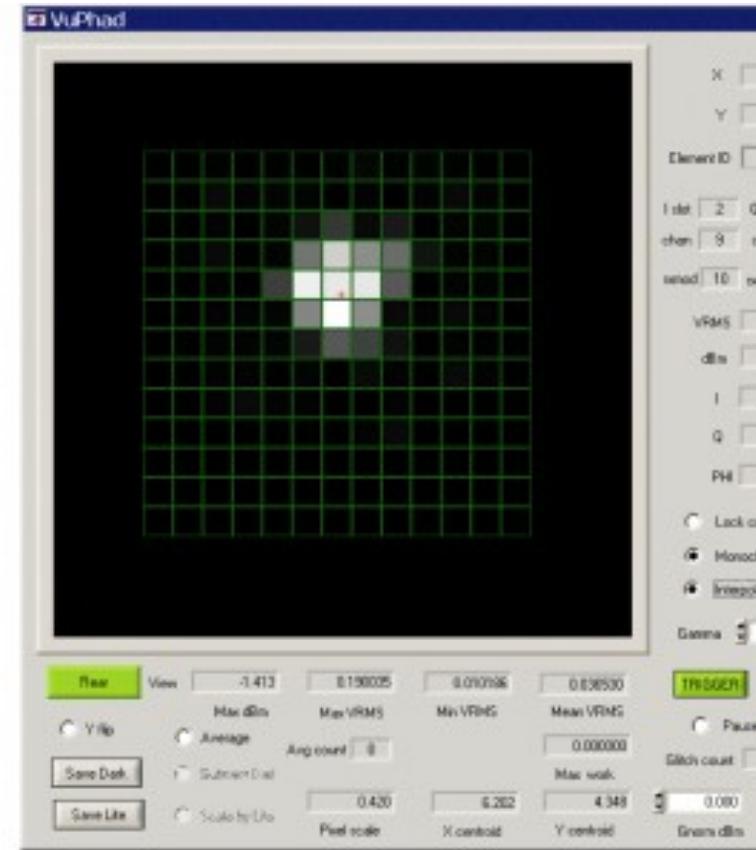
SKA Technology Innovations

- Large collecting Area
- Large field-of-view technology
- Large bandwidth
- Power consumption
- Massive Data



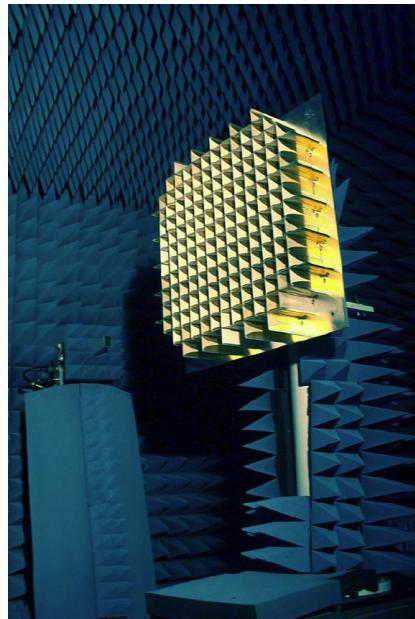
Wide field-of-view technology

Focal-Plane Phase-Array Systems: A Radio Camera



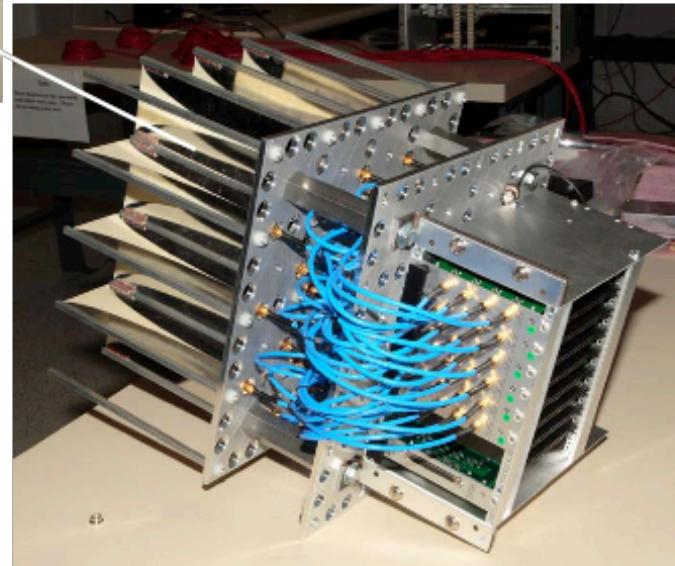
Wide field-of-view technology

National Research Council of Canada – Herzberg Institute of Astrophysics



Vivaldi
Antennas

Phased Array Feed Prototype

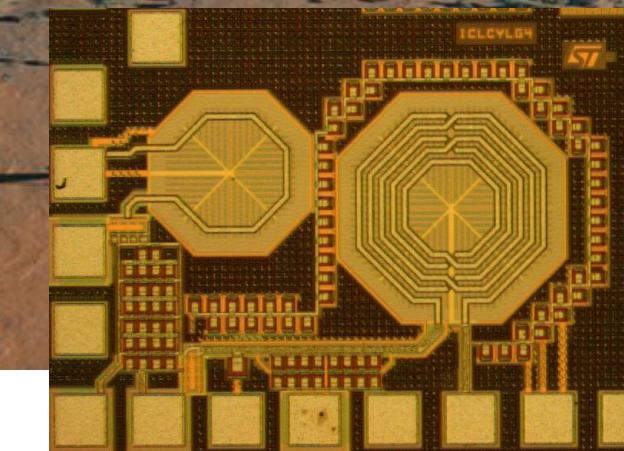
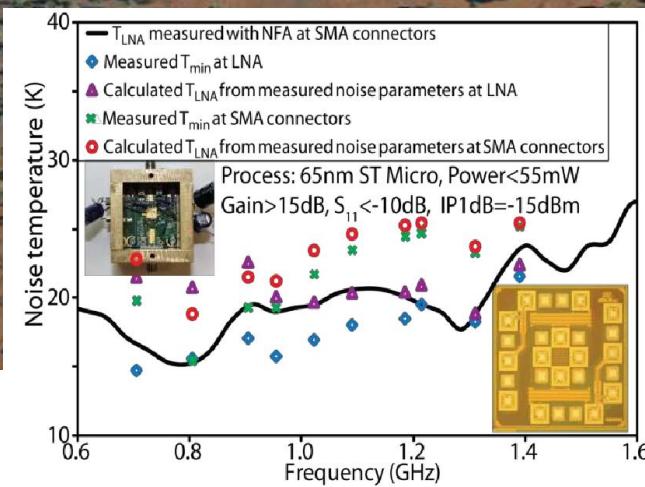
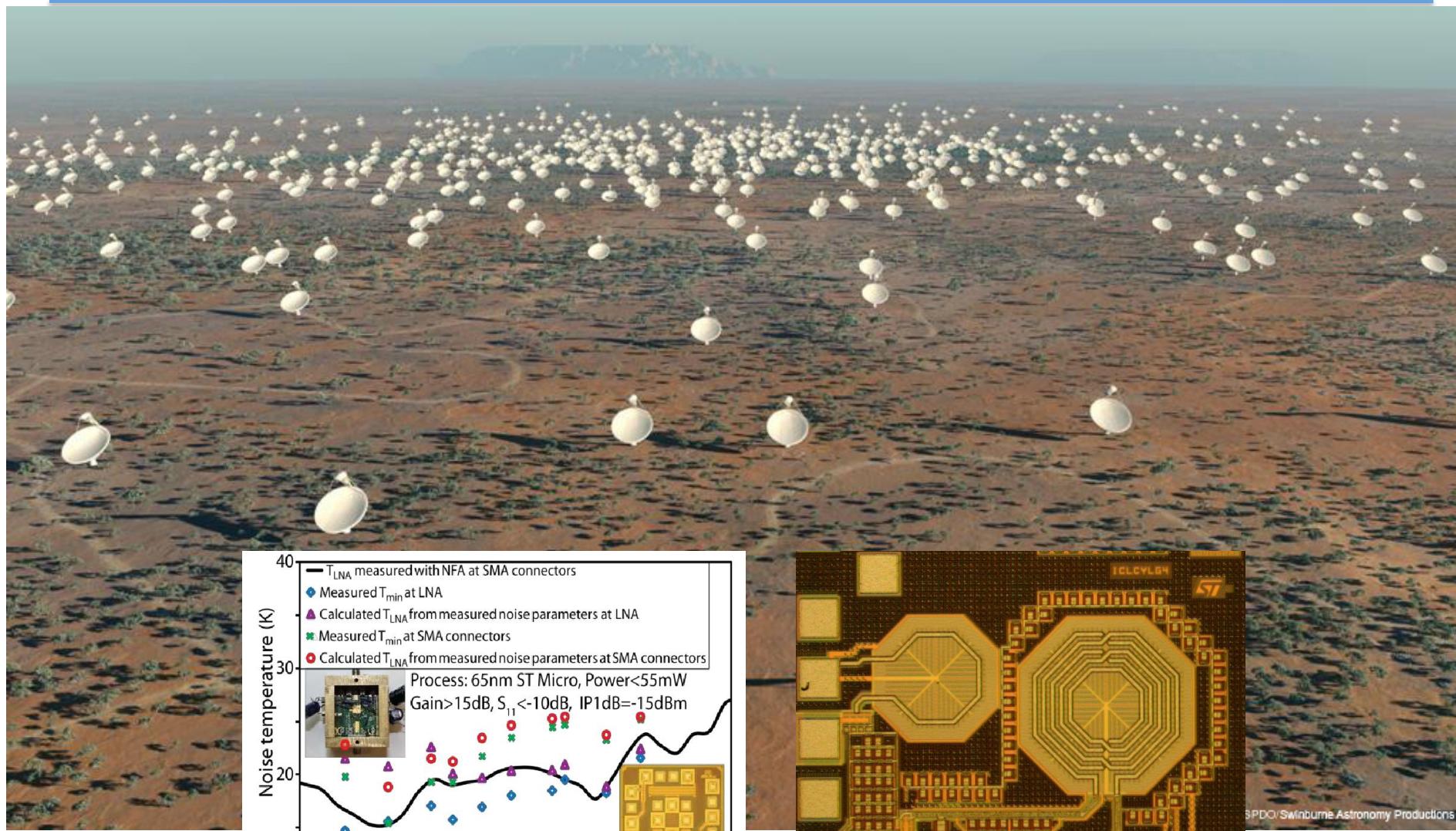


Front End



Digital
Back End

Low-power, low-noise, broad-band signal detection

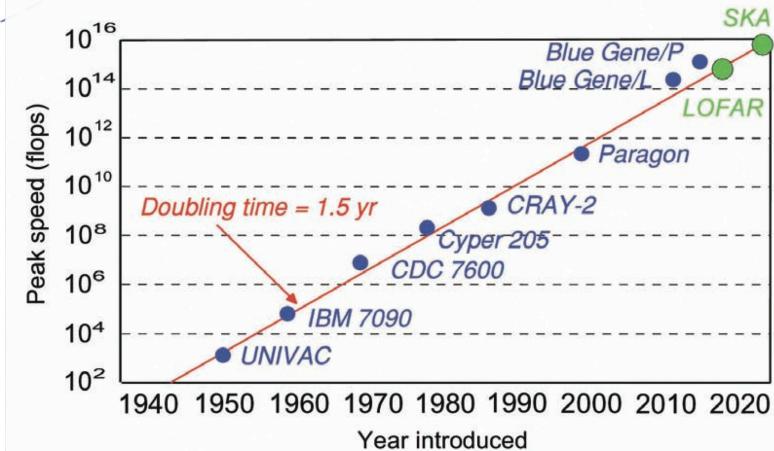
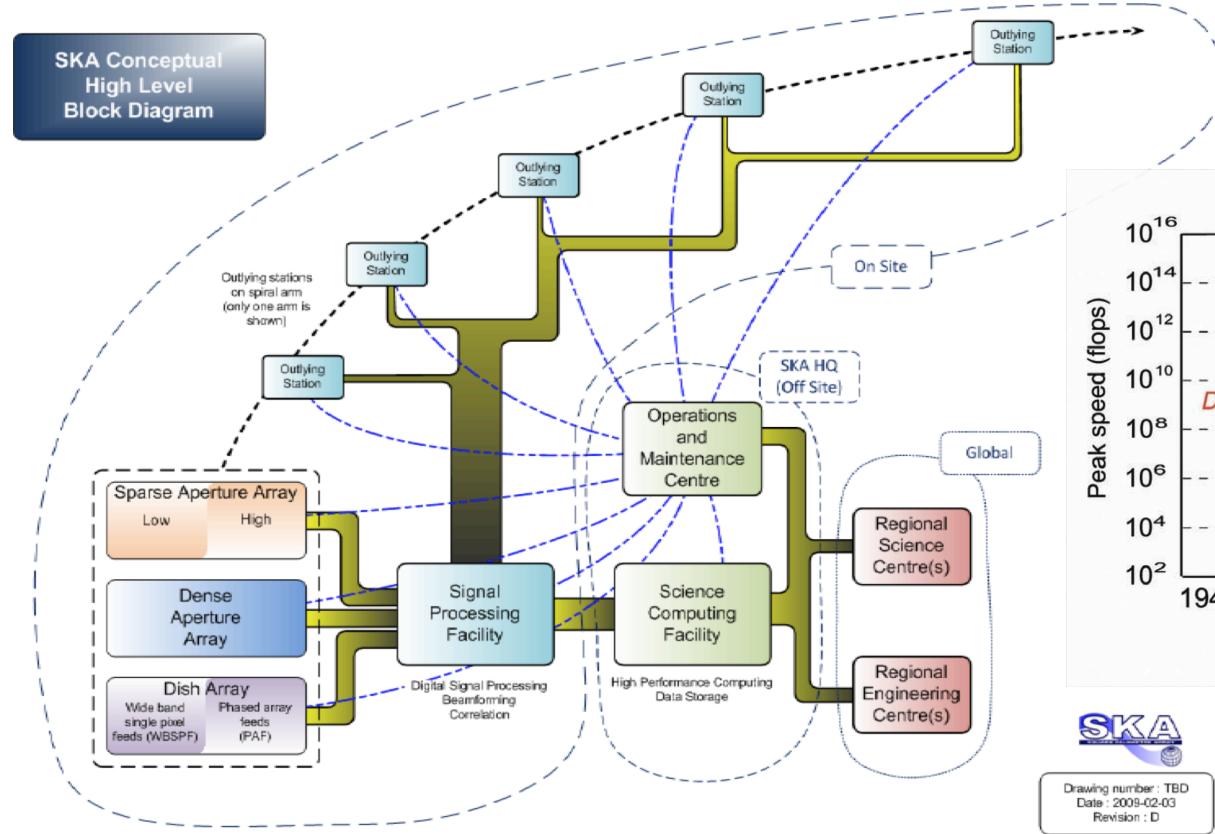


SPDO/Swinburne Astronomy Productions

BIG DATA

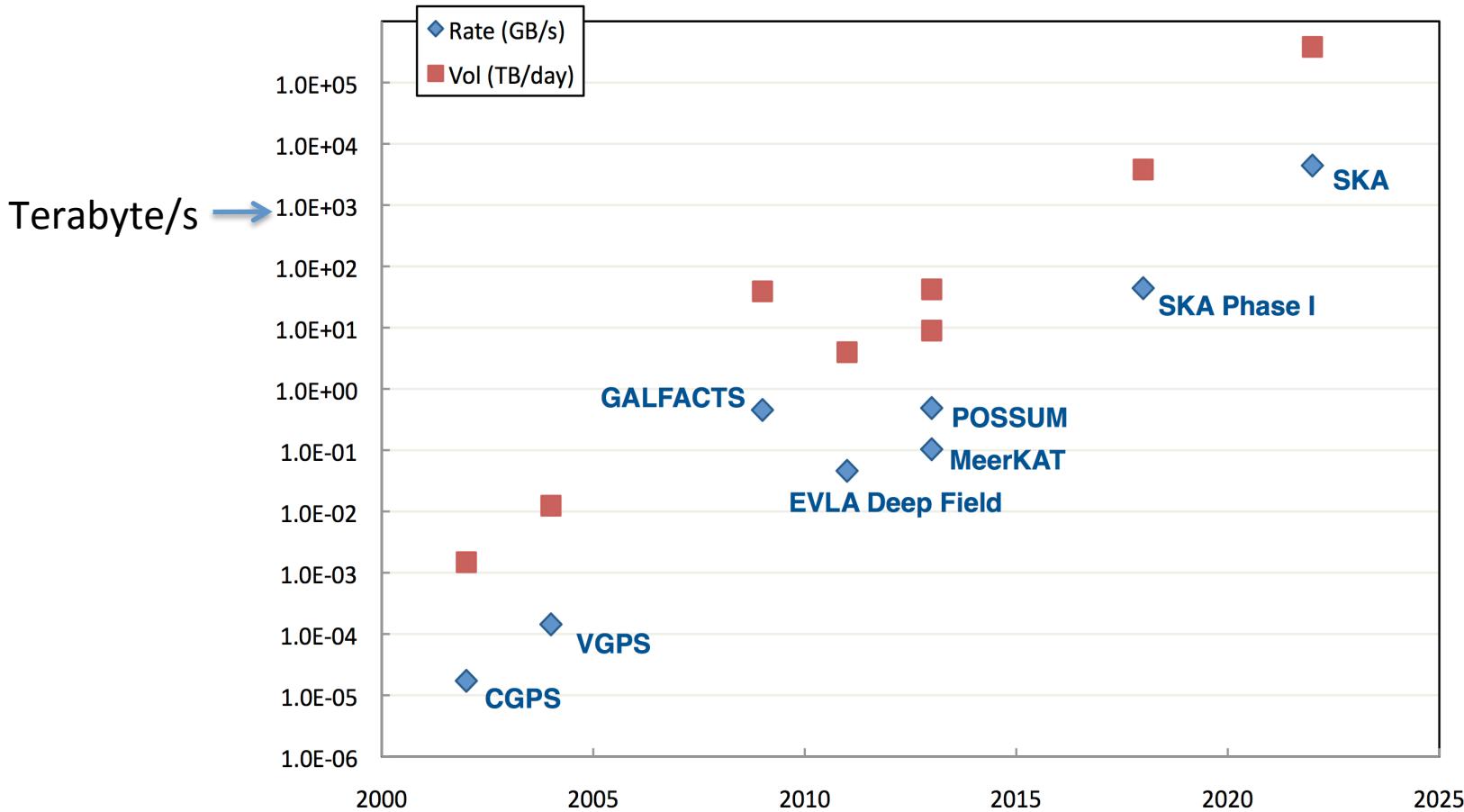
Data, data, data, information.....(gulp).

SKA Conceptual High Level Block Diagram



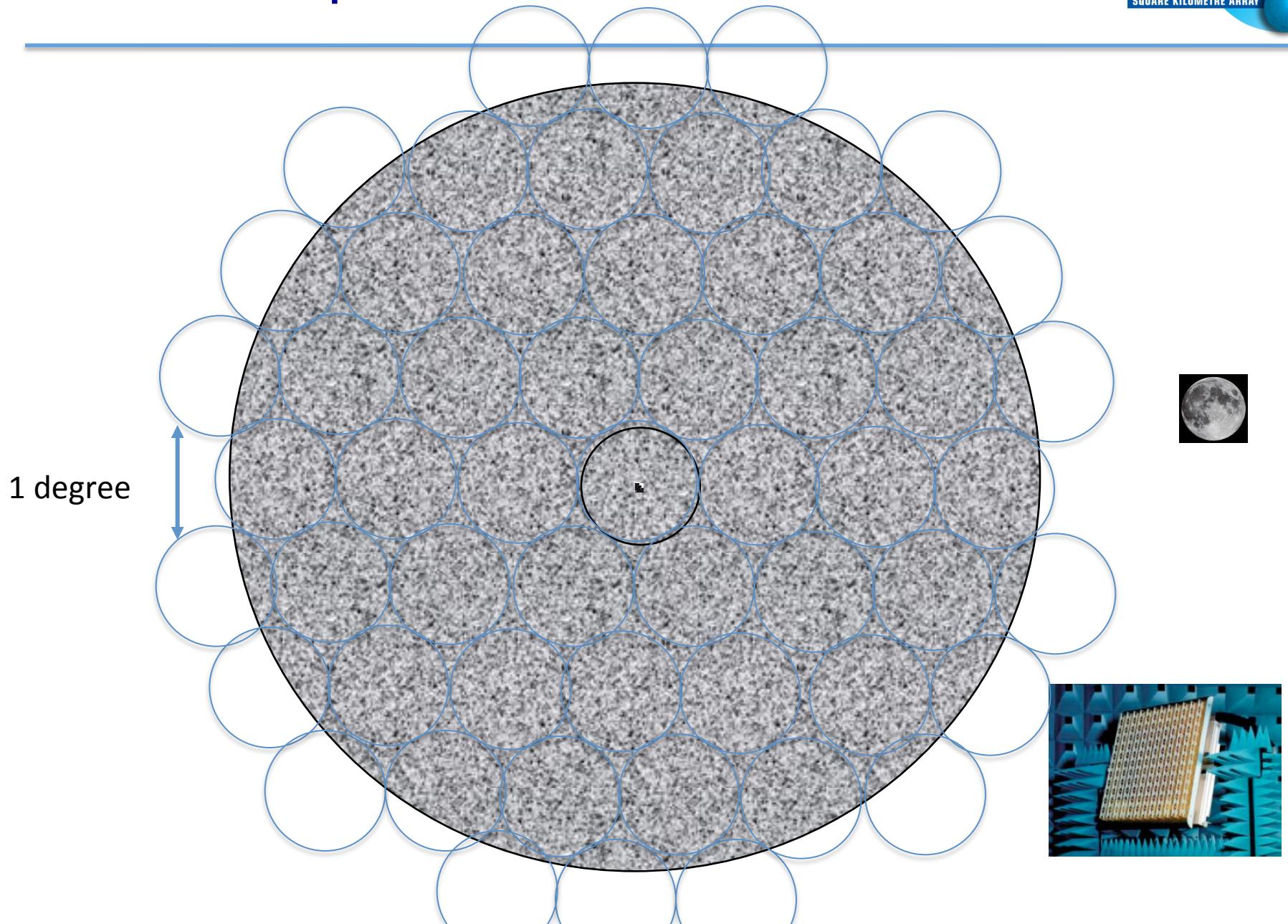
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Date : 2009-02-03
Revision : D

Radio Imaging Survey Data Rates

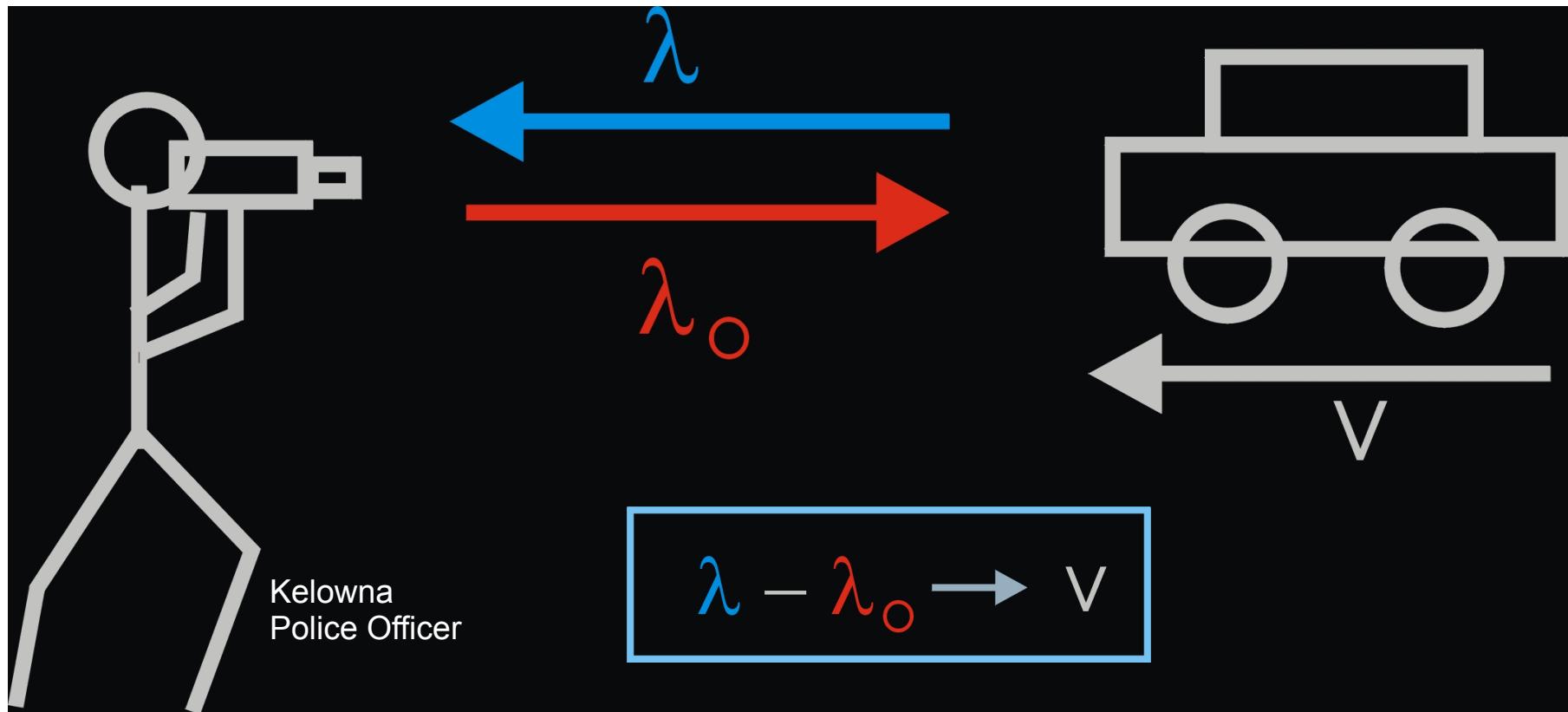


Current projects operate as partnership between observatories and university consortia to execute and manage large survey projects

Data Outputs

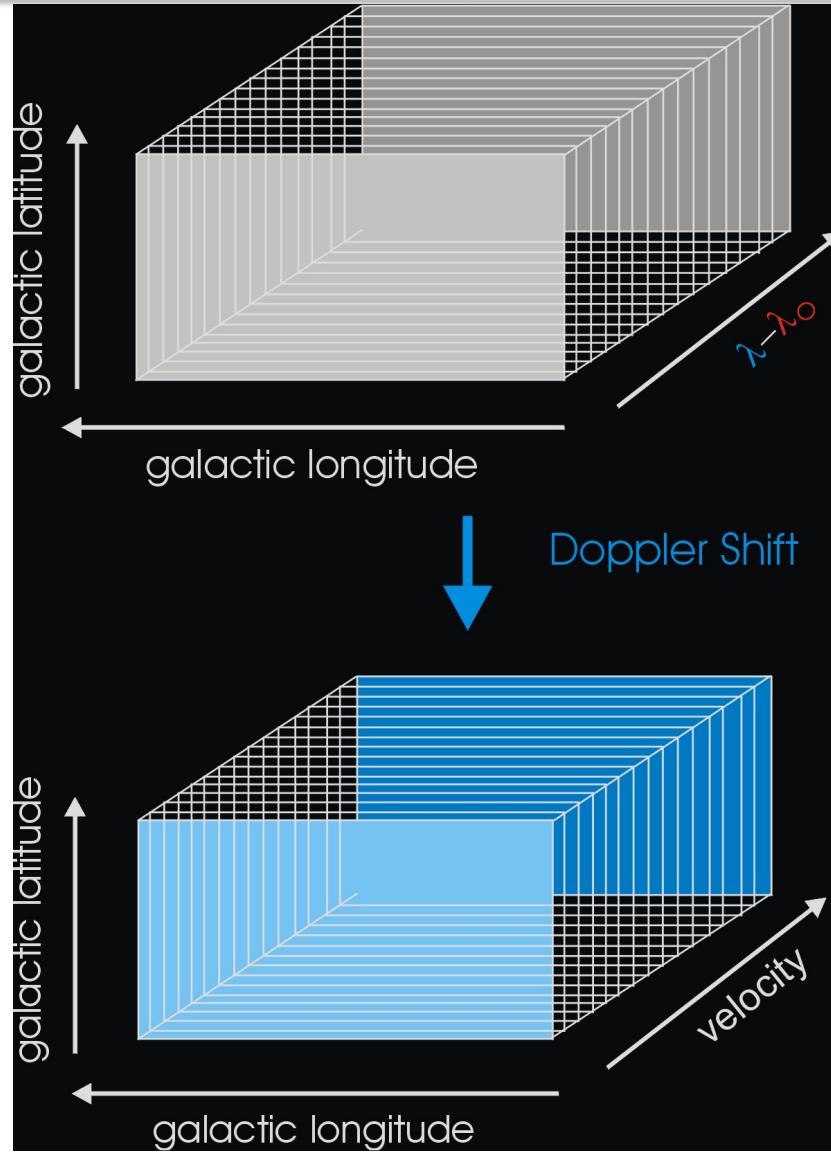


The Third Dimension: wavelength



Expansion of the universe: wavelength $\rightarrow v \rightarrow$ distance \rightarrow time

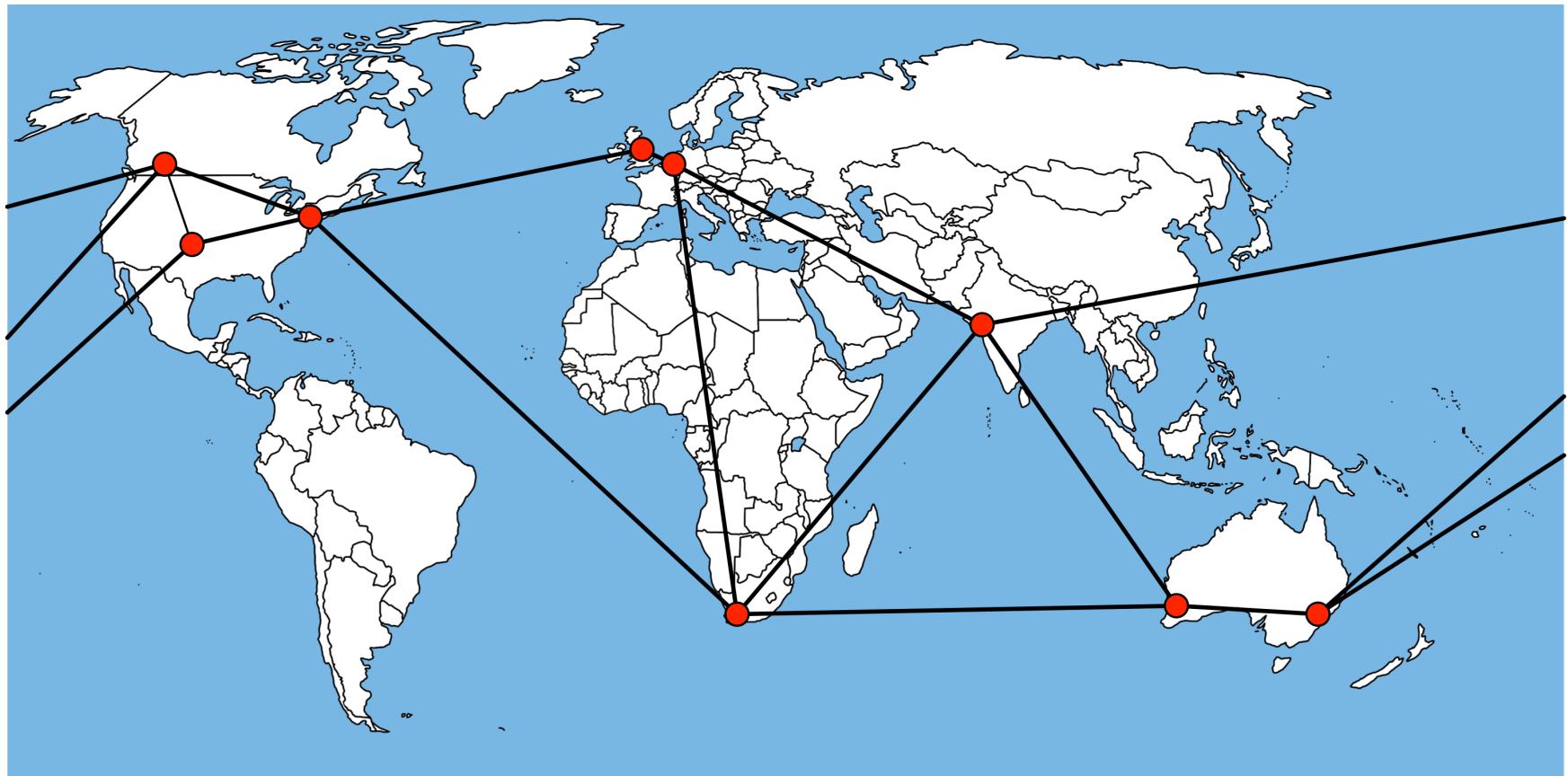
Radio data cube



CyberSKA

The beginning of a distributed global SKA big data network

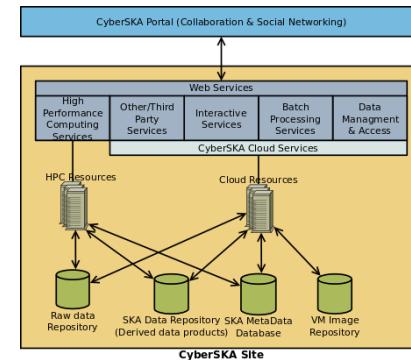
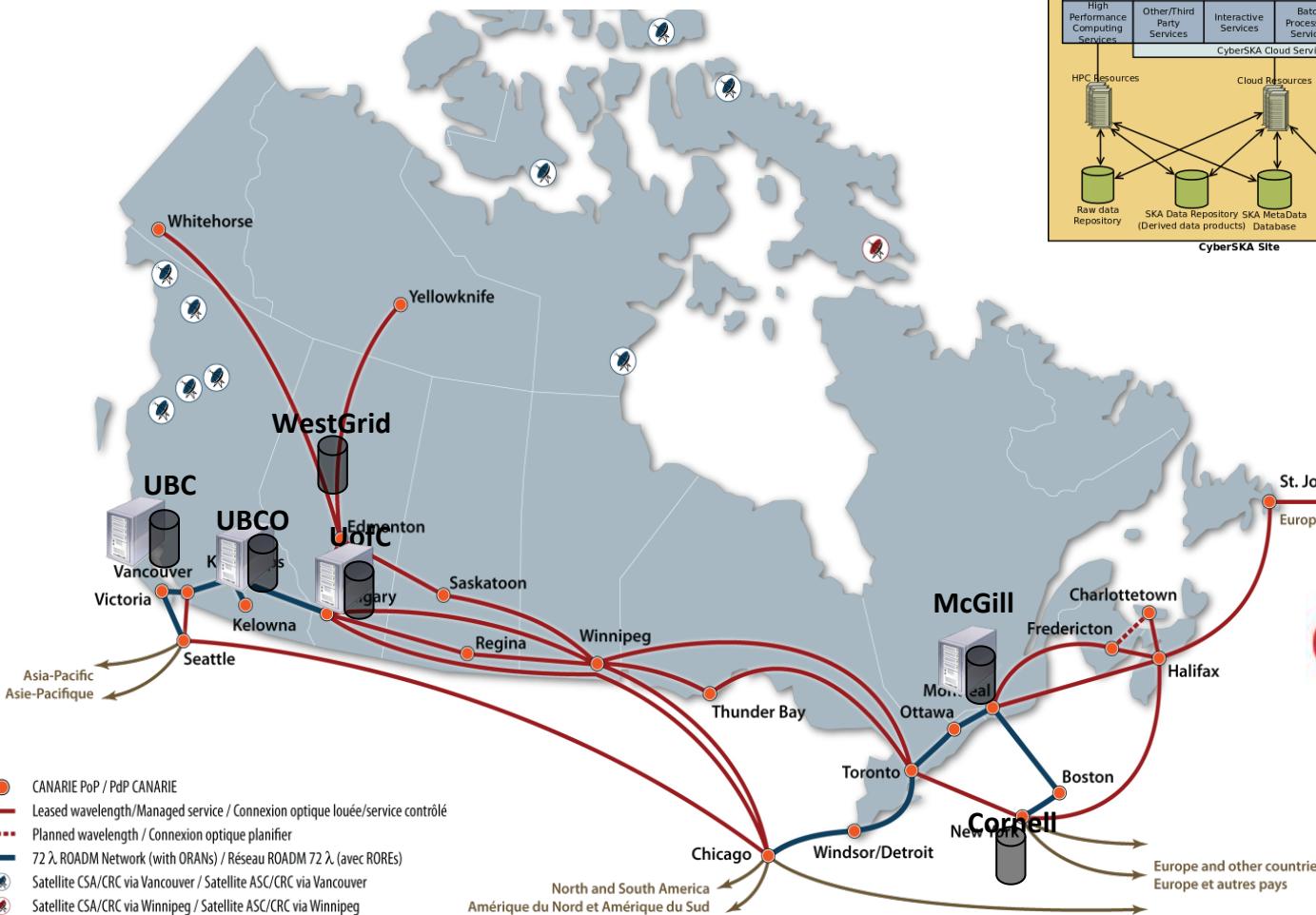
- data management and processing
- data mining, visualization and analytics



CyberSKA

canarie

Canada's Advanced Research and Innovation Network
Le réseau évolué de recherche et d'innovation du Canada



IBM



calgary SCIENTIFIC

2020 Square Kilometre Array



www.skatelescope.ca