The Potential for a

Ka-band Worldwide VLBI Network

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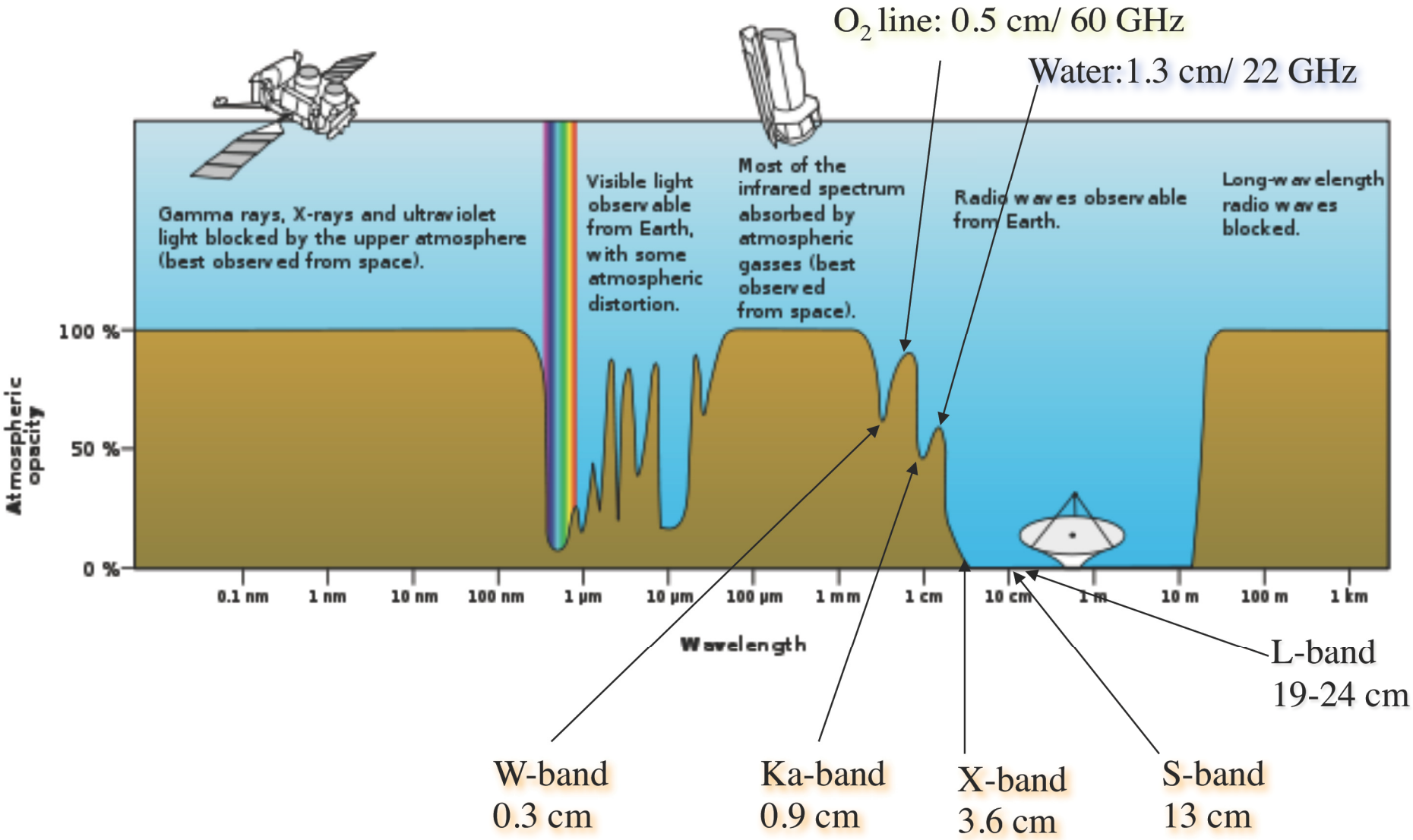
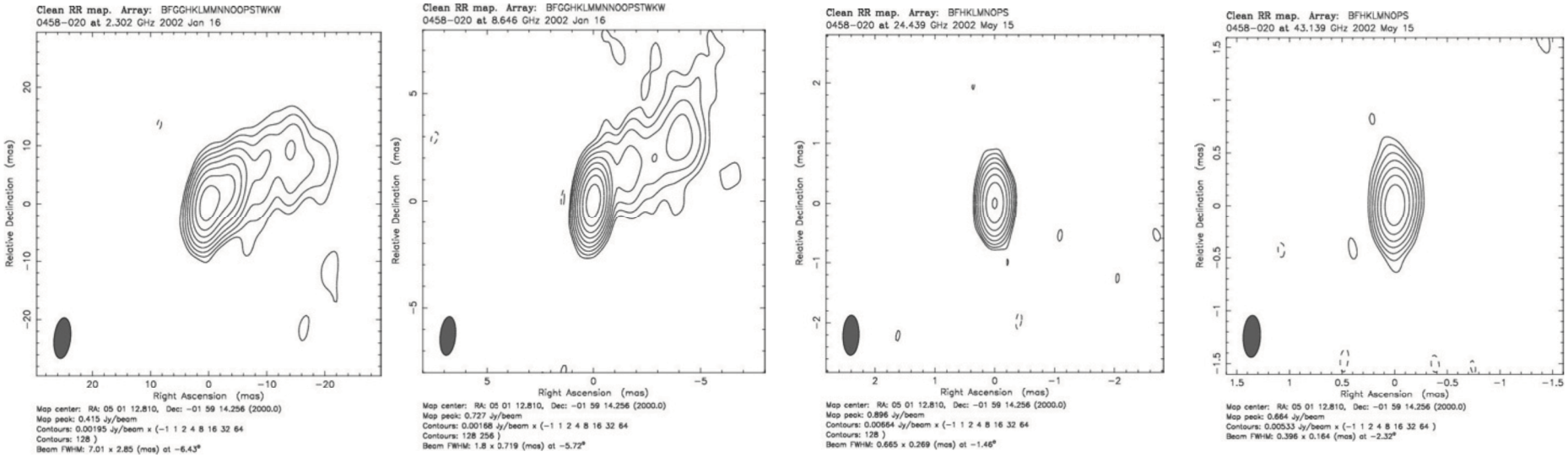
Overview

- Pros & Cons of Ka-band (32 GHz, 9mm)
- Ka-band antennas
  - Status of existing Ka-band antennas
  - potential future Ka-band antennas
- UV coverage simulations
- Feeds: S/X/Ka and X/Ka

Ka-band: on the edge of the Radio Window



Source Structure vs. Wavelength

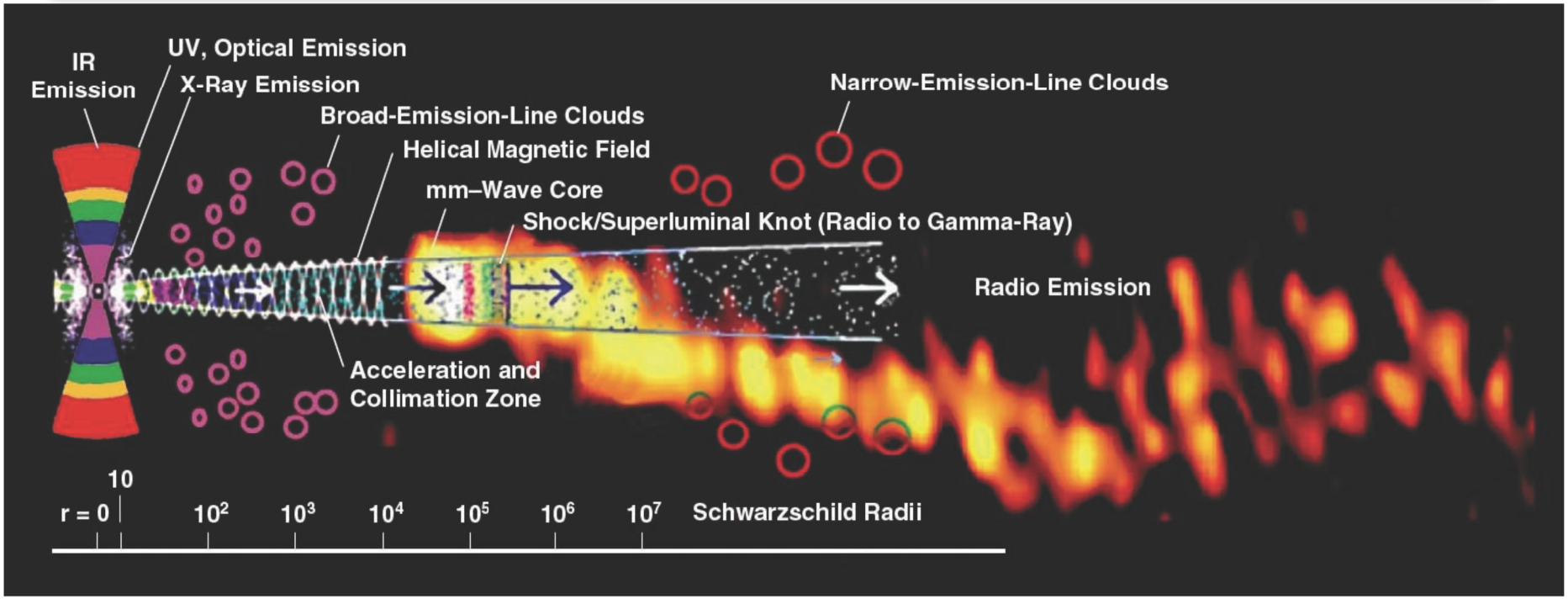


S-band	X-band	K-band	Q-band
2.3 GHz	8.6 GHz	24 GHz	43 GHz
13.6cm	3.6cm	1.2cm	0.7cm

The sources become more compact -----> Ka-band 32 GHz 0.9cm

Image credit: P. Charlot et al, AJ, 139, 5, 2010

9mm vs. 3.6cm? Core shift & structure



Credit: Marscher, Proc. Sci., Italy, 2006
Krichbaum et al, IRAM, 1999
Wehrle et al, ASTRO-2010

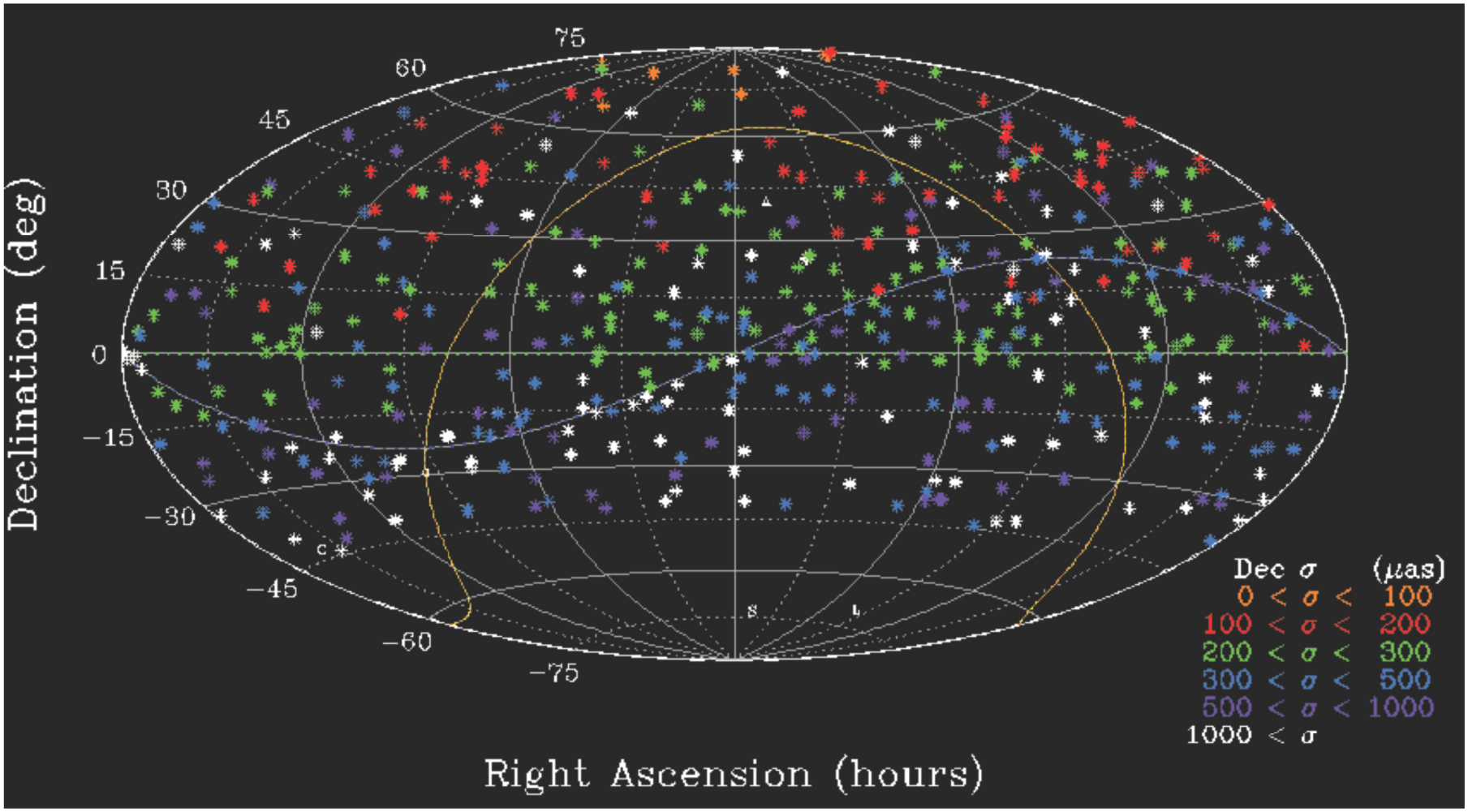
Positions differences from 'core shift'

- wavelength dependent shift in radio centroid.
- *3.6cm to 9mm core shift:*

  100 μas in phase delay centroid?

  <<100 μas in group delay centroid? (*Porcas, AA, 505, 1, 2009*)
- shorter wavelength closer to Black hole and Optical: Ka better than X-band

X/Ka source catalog exists: 464 sources



DSN data, 200-300 μas accuracy. Weakens southward, No south cap.

Credit: Jacobs et al, EVGA, Bonn, Germany, 2011
and Jacobs et al, poster, this meeting

Potential Ka-band VLBI Network

Map credit: maps.google.com

Overview: Ka European VLBI Network

Robledo,	Spain	34-m	S/X/Ka	now
Cebreros,	Spain	35-m	X/Ka	now
Effelsberg,	Germany	100-m	Ka	now lin-pol
Wettzell,	Germany	13-m	S/X/Ka	2011/12

RAEGE sub-net

Yebes,	Spain	13-m	S/X/Ka	2012
Canaries,	Spain	13-m	S/X/Ka	2013
Santa Maria,	Azores	13-m	S/X/Ka	2014
Flores,	Azores	13-m	S/X/Ka	2014

Kazan,	Russia	12-m	S/X/Ka	TBD
Kislovodsk,	Russia	12-m	S/X/Ka	TBD

Overview: Ka PacificVLBI Network

South Pacific sub-Net

Tidbinbilla,	Australia	34-m	X/Ka	now
Narrabri,	Australia	6x22-m	Ka	now
Mopra,	Australia	22-m	Ka	now
Auscope+				
Hobart,	Australia	12-m	S/X/Ka	now/TBD
Katherine,	Australia	12-m	S/X/Ka	now/TBD
Yaragadee,	Australia	12-m	S/X/Ka	now/TBD
Warkworth,	New Zealand	12-m	S/X/Ka	now/TBD

North Pacific Outriggers

Kashima,	Japan	34-m	Ka	now
Usuda,	Japan	45-m	S?/X/Ka	2018

East Pacific outrigger (not in uv simulation)

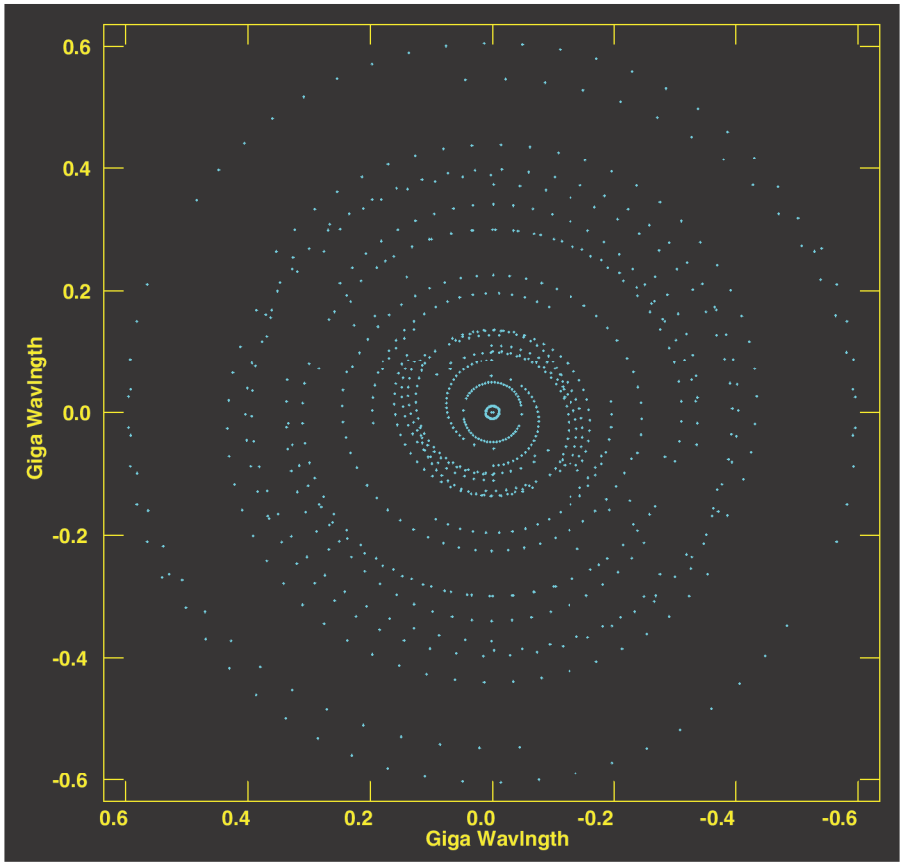
Goldstone,	CA, USA	34-m	X/Ka	now

Potential Ka-band VLBI Network

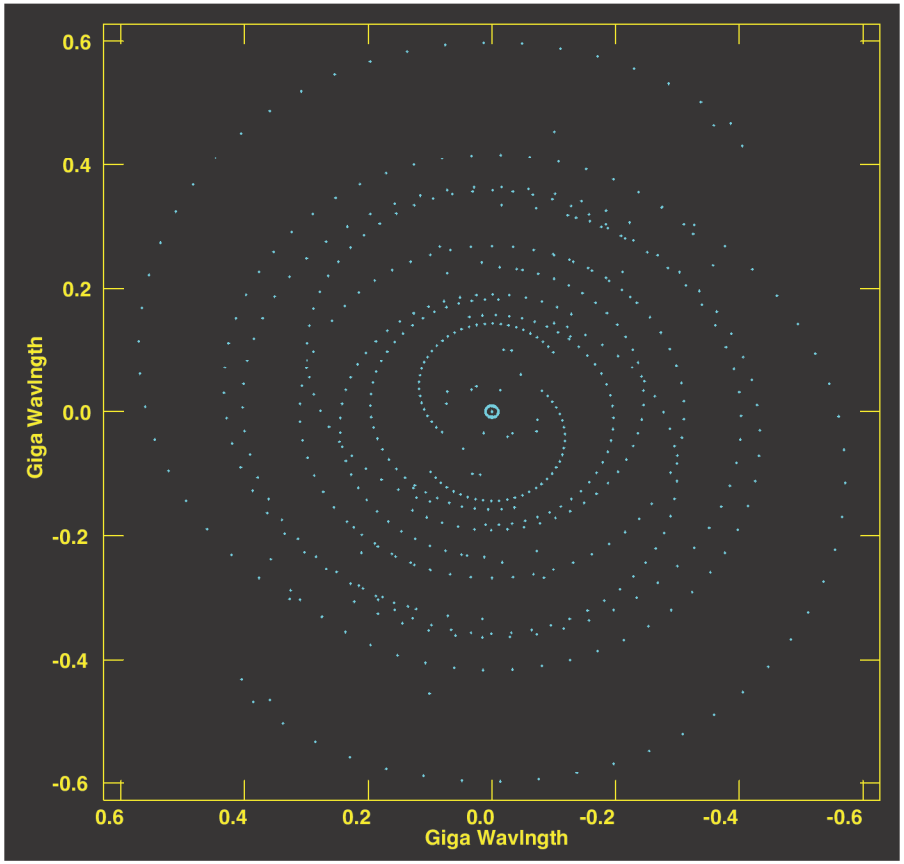
Map credit: maps.google.com

AIPS simulated UV Coverage for European Sub-net

AIPS version 31Dec10, ©Associated Universities, http://www.aips.nrao.edu/
Snapshot Tint=1min, interval=30min, Bandwidth=500 MHz

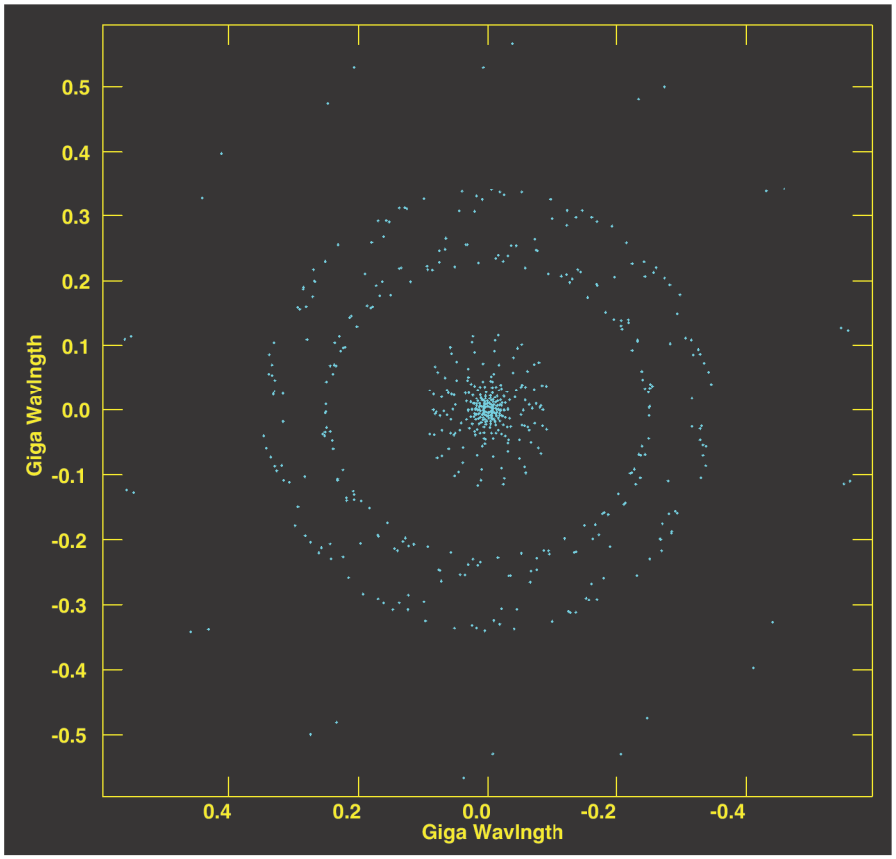


Declination +75 deg

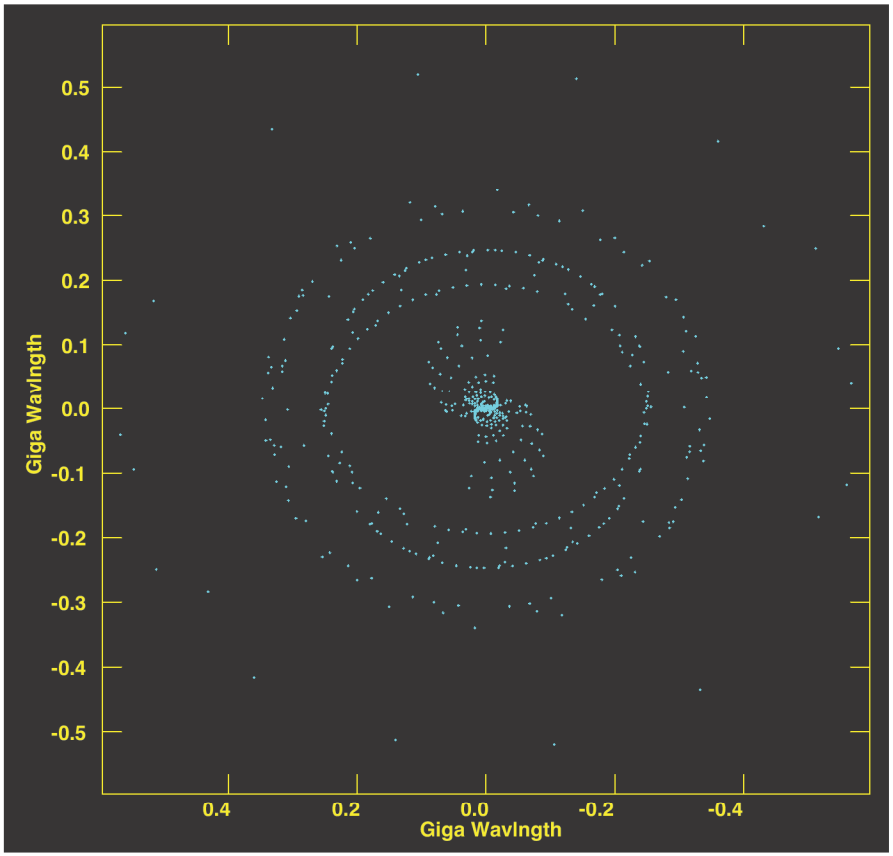


Declination +60 deg

AIPS simulated UV Coverage: South Pacific sub-net



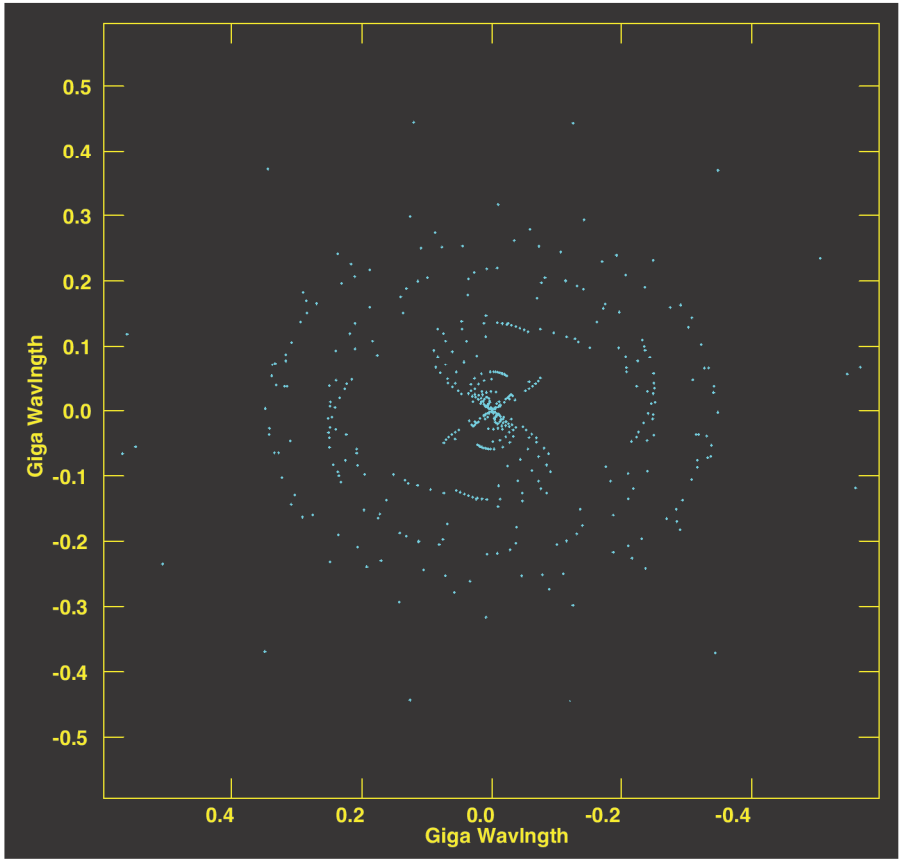
Declination -75 deg



Declination -60 deg

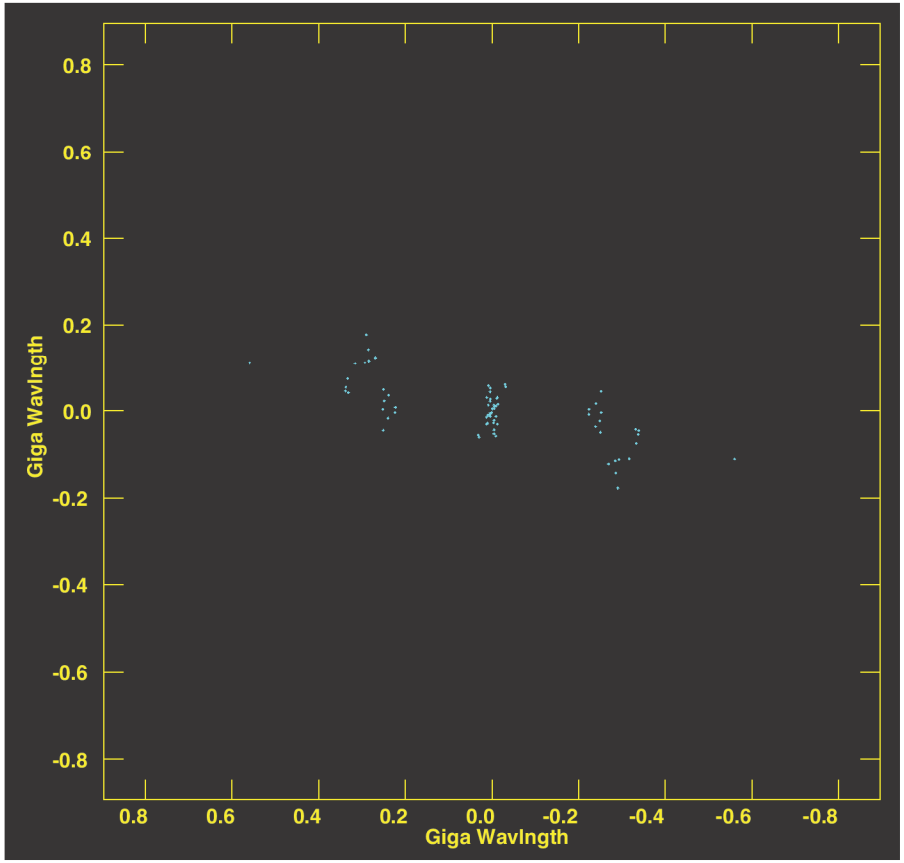
AIPS simulated UV Coverage: Pacific

South Pacific sub-net



Declination -45 deg

South Pacific sub-net + Japan



Declination -30 deg