



National Astronomical Institute of Thailand
(Public Organisation)
Ministry of Science and Technology

Updates on the RANGD Project

Phrudth Jaroenjittichai

RANGD Project Manager

3rd AOV, Canberra (telecon)

10/11/18

Radio Astronomy Network and Geodesy for Development (RANGD) 2017-2021

“Capacity Building Through Radio Astronomy”

- Thai National Radio Observatory (**TNRO**)
 - 40m Thai Radio Telescope (**TNRT**)
 - 13m VGOS Telescope
 - Visitor Centre
- Receiver and Electronics Laboratories

Human Expertise

- Workshops & Seminars
- Trainings & Staff exchange

Background of TNRT



- Multipurpose ~40m RT — with flexibility
- (preferably) Existing Design — limited experience
- Frequency ~ UHF - ~115 GHz — determined by Science area, Radio Frequency Interference, Weather conditions

Key attributes

- Extensive observing frequency : 300 MHz - 115 GHz
- Ideal latitude location : +18 N

Single Dish Applications focus on Time Domain astronomy, such as pulsars and radio transients and variability of masers and AGNs.

The 40m Thai National Radio Telescope

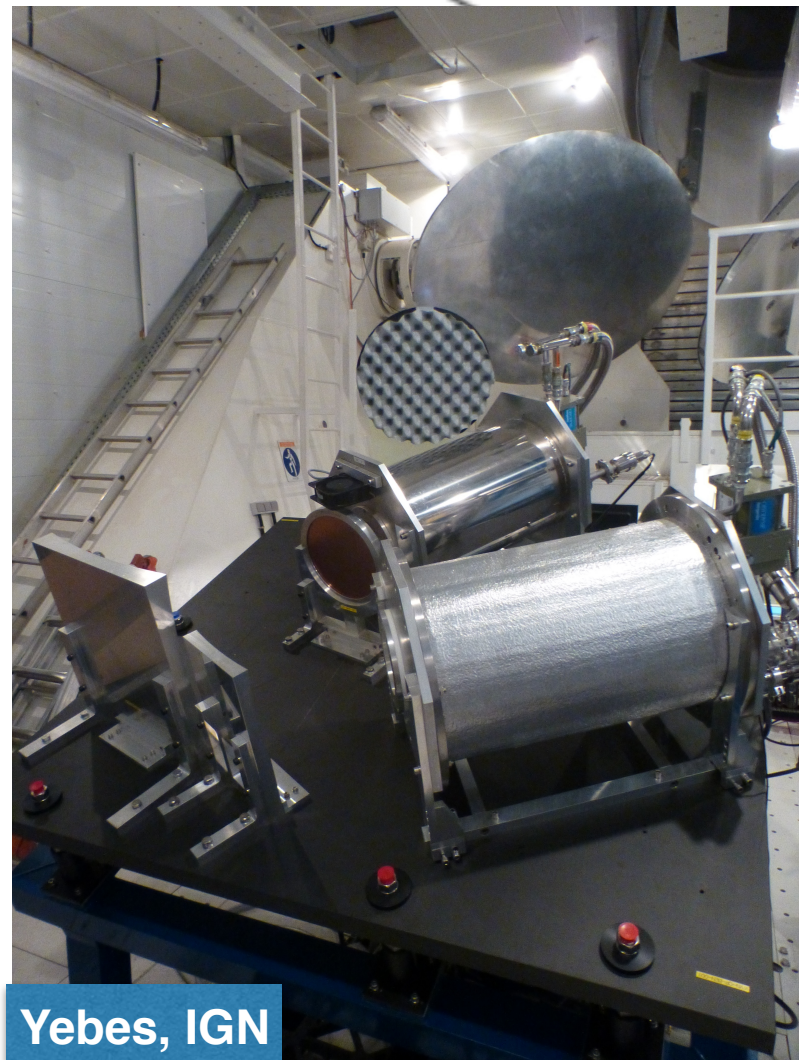
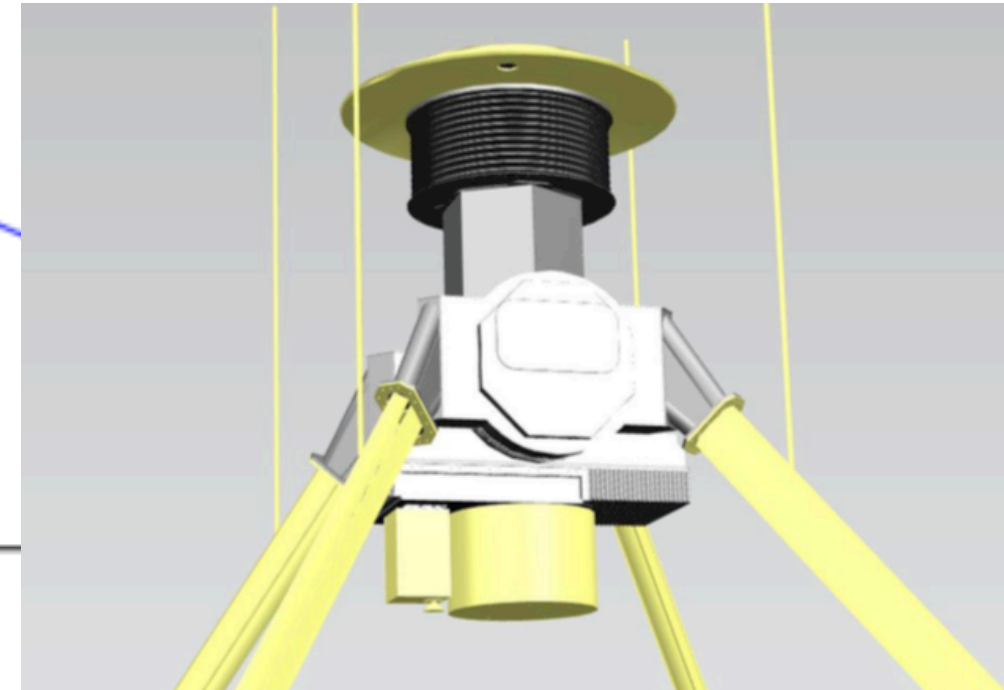
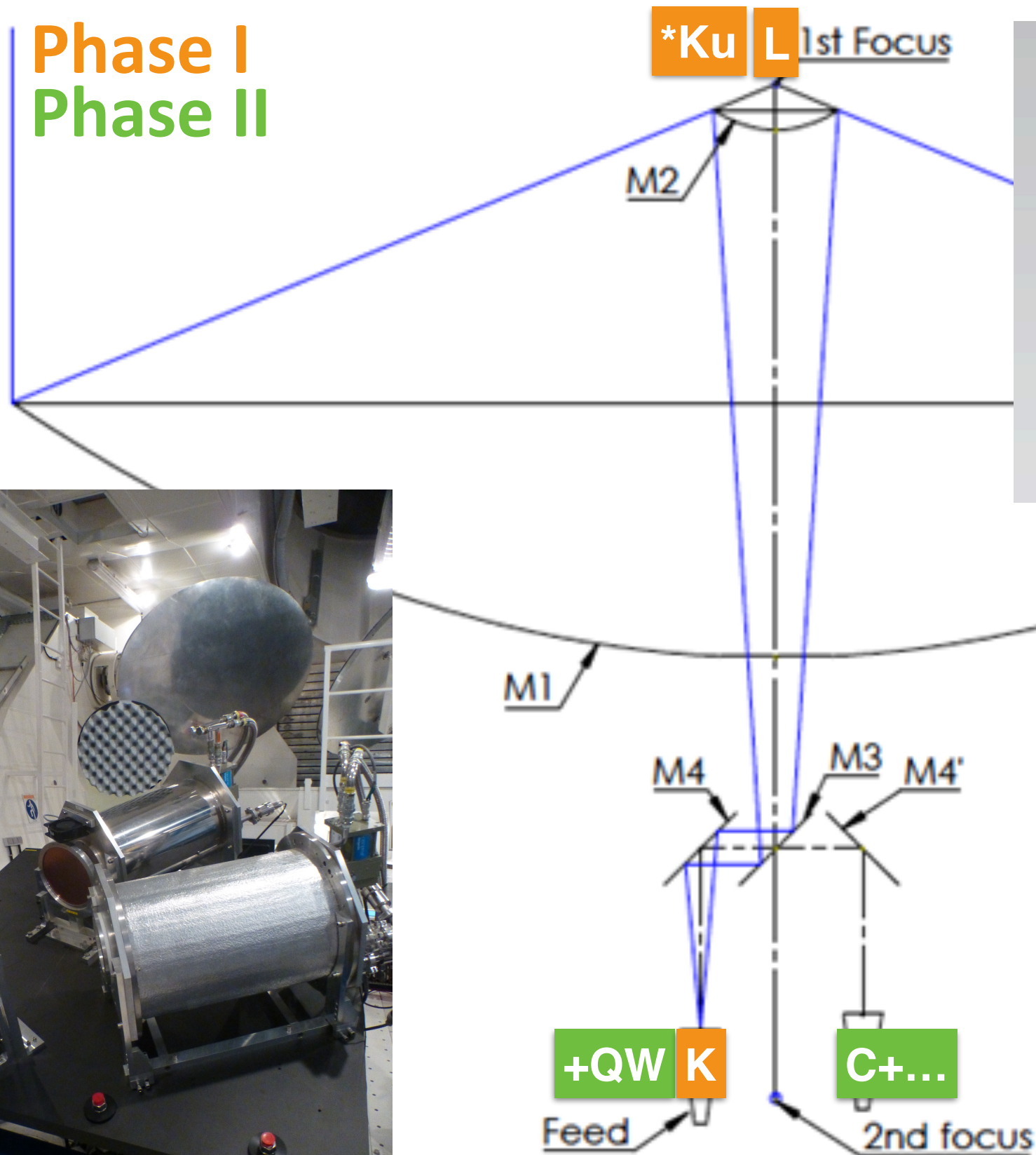
- 'Updated' version of IGN's 40m Yebes Radio Telescope
- 40m Paraboloid Antenna, Cassegrain-Nasmyth optics
- 150 μm (rms) total surface accuracy (@45EL)
- 300 MHz - 115 GHz
- Slew: Az 3 deg/s, EL 1 deg/s
- Pointing: 2" (no wind), 6" (5 m/s wind)
- Tetrapod Head Unit (THU)



40m RT Contract Signing March '17



Phase I
Phase II

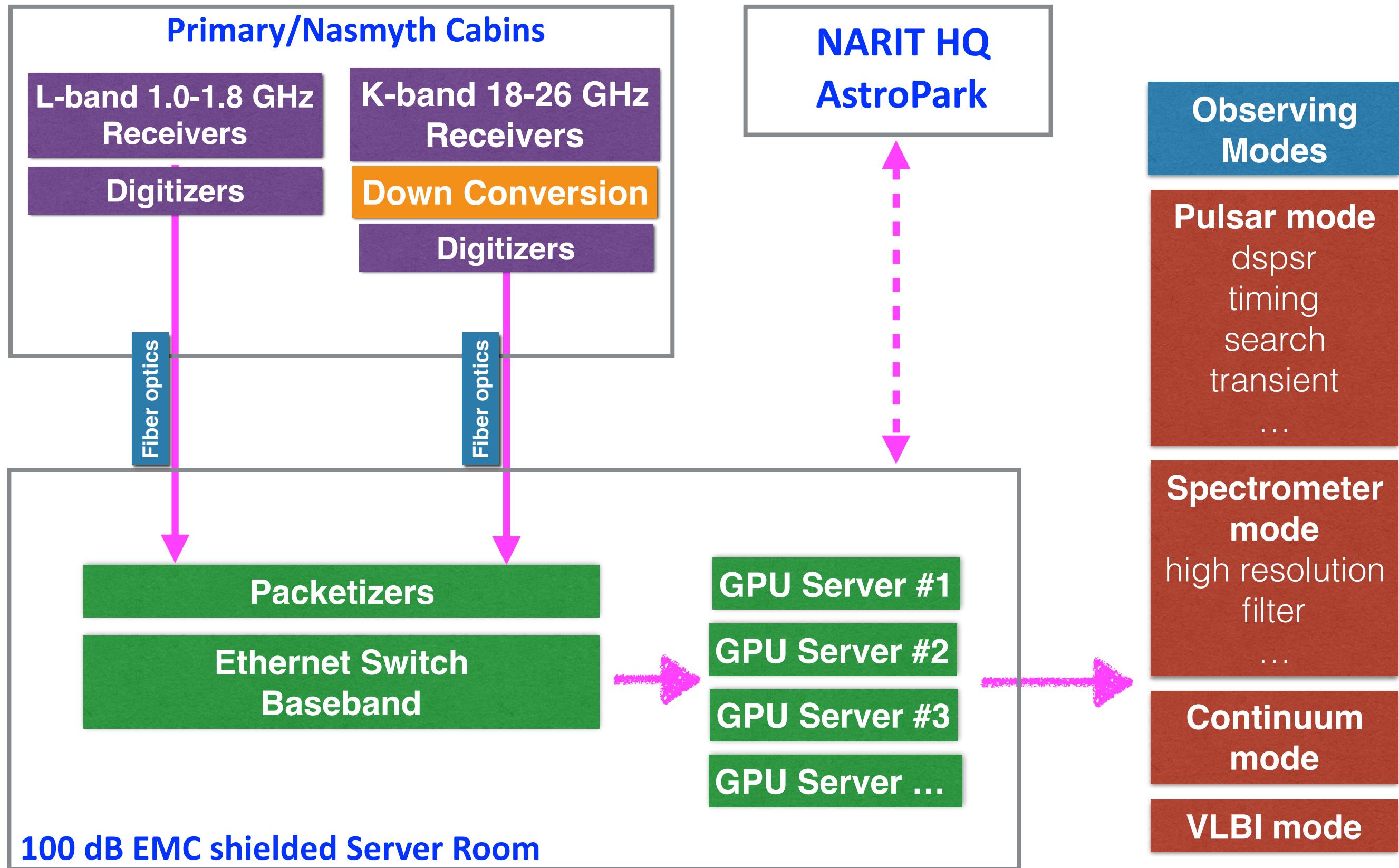


	L-band	K-band
Location	Primary Focus	Nasmyth Focus
Frequency range (GHz)	1.0-1.8	18.0-26.5
Centre wavelength (cm)	21.4	1.36
Beam width (arcmin)	22	1.4
Polarisation	Linear	Circular
Cross polarisation	-25 dB	-25 dB
RF BW	800 MHz	8 GHz
sampler	3 Gsps	>4 Gsps
Packetizer BW	1.5 GHz	>2 GHz
digitisation bits	< 12 bit	< 12 bit
Digitizer Output	2 x 40 Gbps Ethernet, SPEAD	2 x 40 Gbps Ethernet, SPEAD
Total efficiency	0.7	0.5
Gain (K/Jy)	0.32	0.23
Trx	13	20
Tsky (K)	12	50
Tsys (K)	25	70
SEFD (Jy)	78	304



Max-Planck-Institut
für Radioastronomie

Frontend & Universal Backend Concept



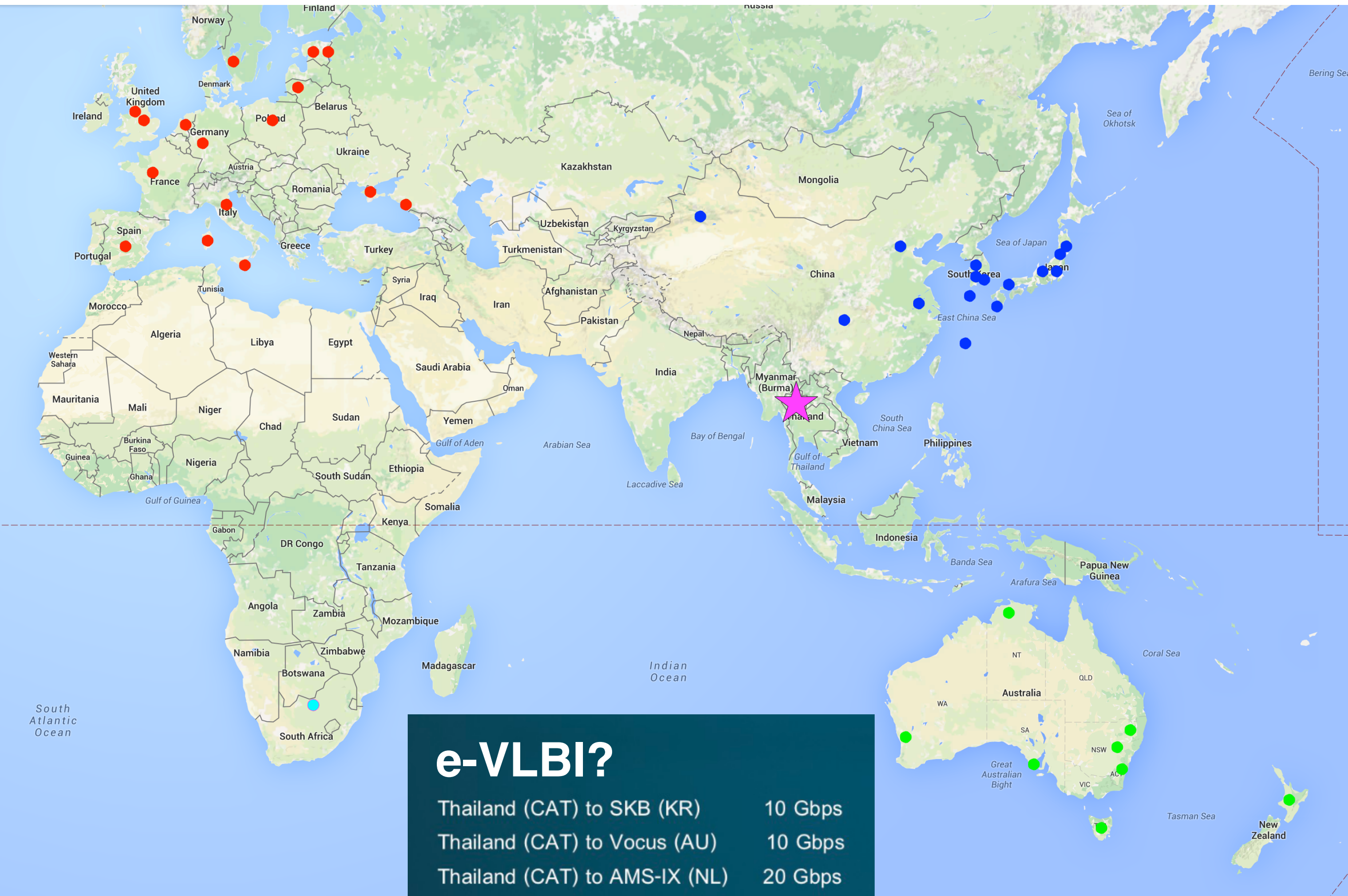
Band	UHF	L	S	C	X	Ku	K	Q	W	PAF	CO
GHZ	0.3-1	1-2	2-4	4-8	8-12	12-18	18-27	36-46	75-110	0.7-2.1	115
Single dish							Simultaneous				
Pulsar	PSR obs	PSR obs/ IPTA	PSR obs				GC/ magnet ars	GC search/ magnetars			
Maser & molecular lines		OH		CH3OH			H2O, NH3	Sio	Sio		
Continuum											
VLBI											
Geodetic VLBI			Legacy system		Legacy system						
			2-14 GHz 13m VGOS Telescope								
EAVN (Wajima et al 2015)											
KaVA											
EVN (evlbi.org)											
Aus LBA											
Global mm VLBA Array											
Space VLBI (radioastron)											

key

phase I Rx 2019

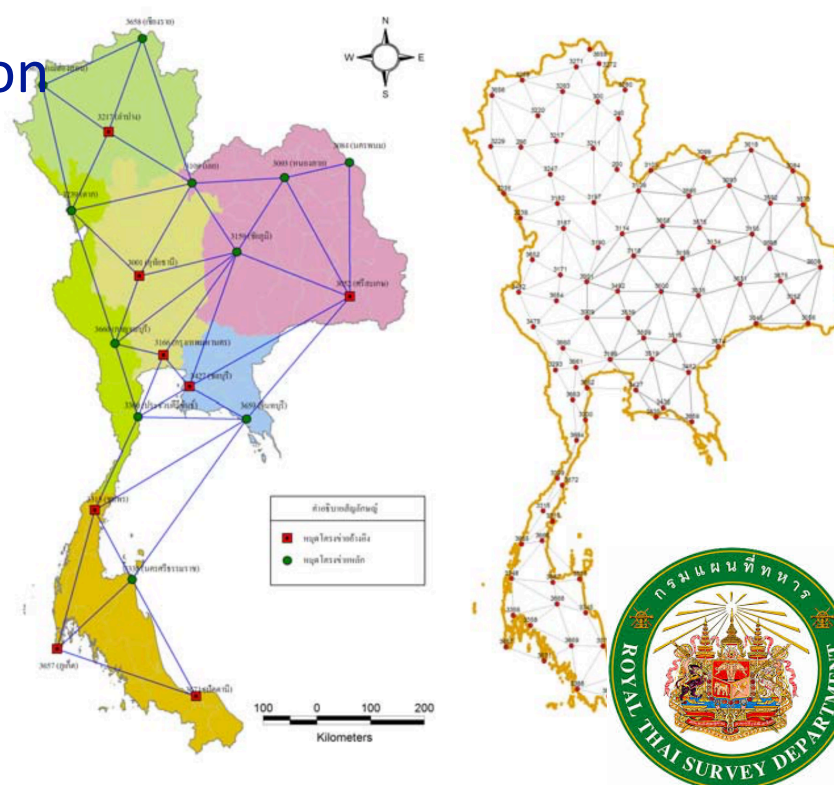
phase II Rx (TBD)

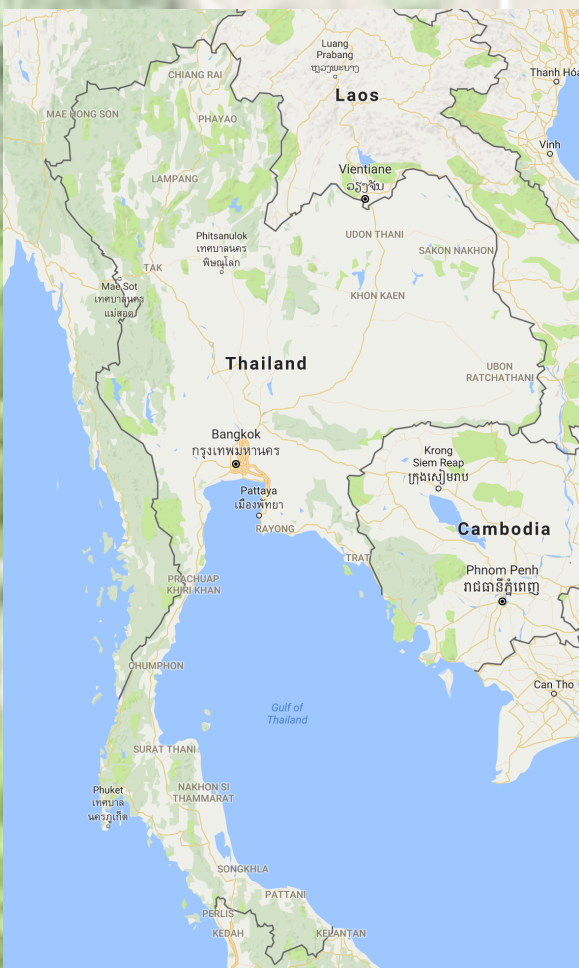
VLBI networks



VGOS station

- First geodetic VLBI station in SEA
- International VLBI Service for Astrometry & Geodesy (IVS) -> CRF, EOP, ITRF
- Tectonic motion/crustal motion
- Thai Continuously Operating Reference Stations (CORS) networks as national infrastructure
- National Institute of Metrology of Thailand (NIMT)
- Co-locating 40m & 13m Science Applications
- Local-tied survey and IRP determination
- **SHAO-NARIT Collaboration on VGOS antenna @TNRO (+X/Ka)**





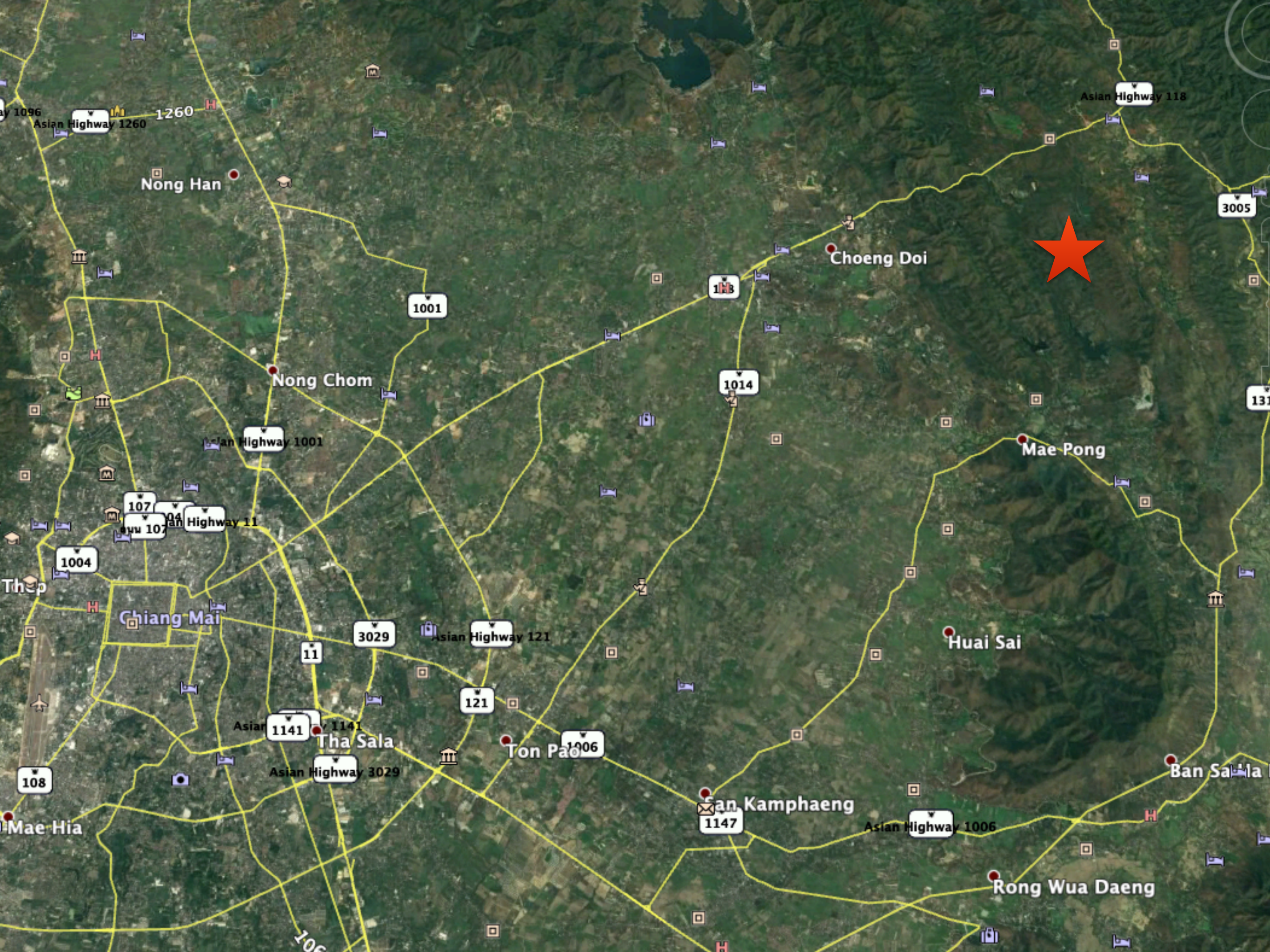
Huai Hongkhrai Royal
Development Study Center

เชียงใหม่



เทศบาลนคร
เชียงใหม่

Radio Quite Zone
National Broadcast and
Telecom Commission (NBTC)





13m telescope

GNSS

Utilities
Building

40m telescope



100 m



