

The background of the slide features a vibrant image of a spiral galaxy in deep space. In the foreground, a stylized map of Earth is shown with several white satellite dishes positioned across its surface. Overlaid on the map are several glowing, curved lines in red, yellow, and green, representing the network connections between the dishes. The text 'KVN' is prominently displayed in the upper left corner in a bold, orange font.

KVN

The most Powerful
mm-VLBI Network System

Current Status & Activities of KVN

Taehyun Jung

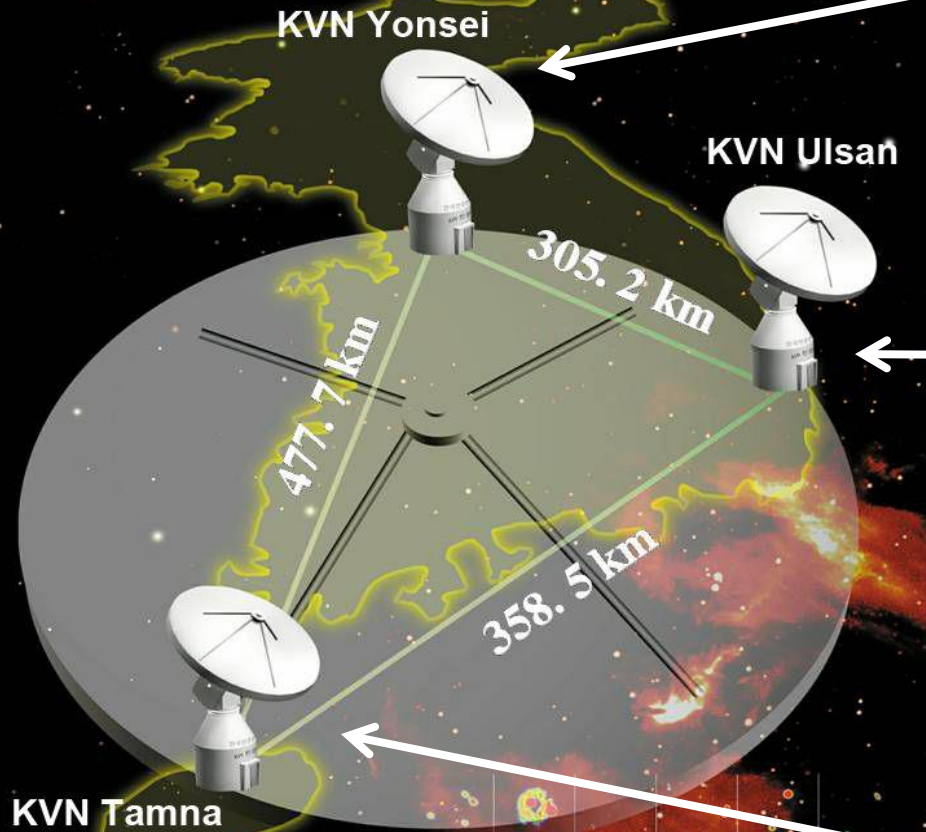
(thjung@kasi.re.kr)

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**Korea Astronomy
& Space Science Institute (KASI)**

KVN 한국우주전파관측망

Korean VLBI Network



KVN Yonsei
Observatory



KVN Ulsan
Observatory



KVN Tamna
Observatory



KVN

The most Powerful
mm-VLBI Network System

Specifications

- **Three 21m antennas**
@ Seoul, Ulsan, Jeju island
- **Alt-Az mount, shaped Cassegrain**
- **Fast slewing speed : 3 deg/sec (AZ/EL)**
- **First simultaneous multi-frequency receiving system @ 22/43/86/129GHz**
- **Dual Polarization**
~ Circular Pol (LCP & RCP)

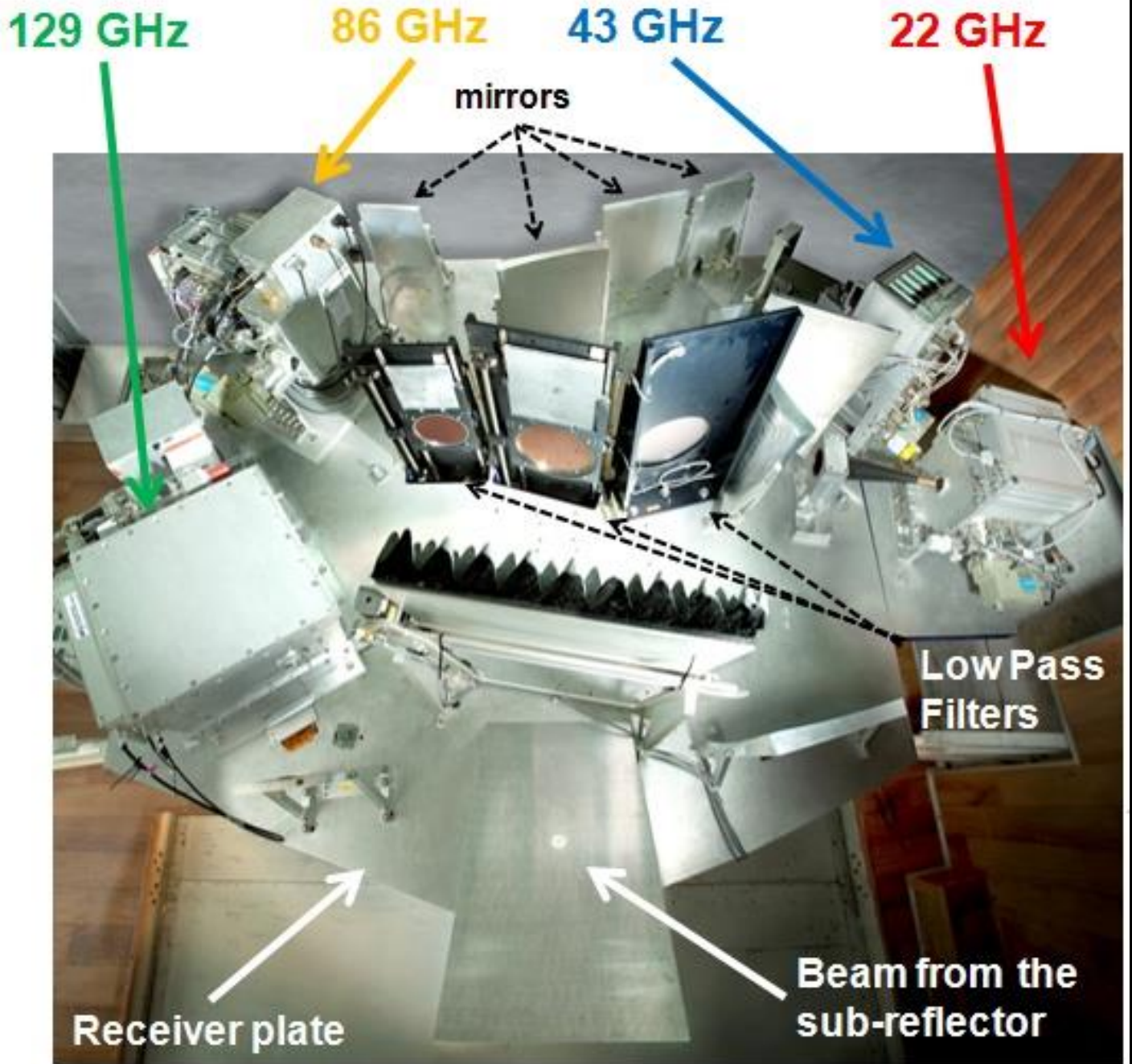
- **High surface accuracy**
~ panel < 65 micron
~ total < 150 micron
- **High pointing accuracy**
~ < 4 arcseconds in RMS
- **High aperture efficiency**
~ 65/60/50/40% @ 22/43/86/129 GHz

Multi-Frequency Receiving System

DUAL -
POLARIZATION

4CH Receivers
@ Yonsei

Han et al. (2008)



Aperture efficiency

	Aperture Efficiency (%)				Date
	22GHz	43GHz	86GHz	129GHz	
Yonsei	55	60	57	37	2012.9
Ulsan	60	56	46	30	2012.10
Tamna	59	62	52	40	2012.5

Beam Alignment

	Alignment Accuracy w.r.t 86GHz			
Band	22GHz	43GHz	86GHz	129GHz
Accuracy	< 5 arcsec	< 3 arcsec	-	< 2 arcsec

KVN Station Coordinate by GPS

- Refinement of antenna position using dual-band GPS
 - Collaboration with KASI GPS group

position	X (m)	Y (m)	Z (m)
Yonsei (2 Sep 2012)	-3042280.9137	4045902.7164	3867374.3544
Ulsan (10 Sep 2012)	-3287268.6186	4023450.1799	3687380.0198
Tamna (20 Sep 2012)	-3171731.5580	4292678.4878	3481038.7252

KVN Station Coordinate by K-band Geodesy

- Two K-band geodesy experiments have been made with VERA (huge contributions from Jike-san, VERA)
- 1st experiment (4 Oct 2011)
 - Only Yonsei solution was obtained
 - Failed to Ulsan & Tamna because of poor initial antenna positions
- 2nd experiment (27 Sep 2012)
 - **Successful solutions were obtained at all stations**

Geodesy (27 Sep 2012)	X (m) errors (m)	Y (m) errors (m)	Z (m) errors (m)
Yonsei	-3042280.8857 0.0033	4045902.6611 0.0041	3867374.3222 0.0035
Ulsan	-3287268.5345 0.0032	4023450.1596 0.0040	3687379.9751 0.0035
Tamna	-3171731.5330 0.0032	4292678.5360 0.0040	3481038.7742 0.0033

KVN Station Coordinate by K-band Geodesy

- 3rd experiment (27 Mar 2013)
 - waiting for results
- Difference btw. GPS and VLBI measurements are about less than 5 cm except Ulsan (X: ~8 cm).
- KVN station coordinates will be measured every 3 months by GPS and K-band geodesy

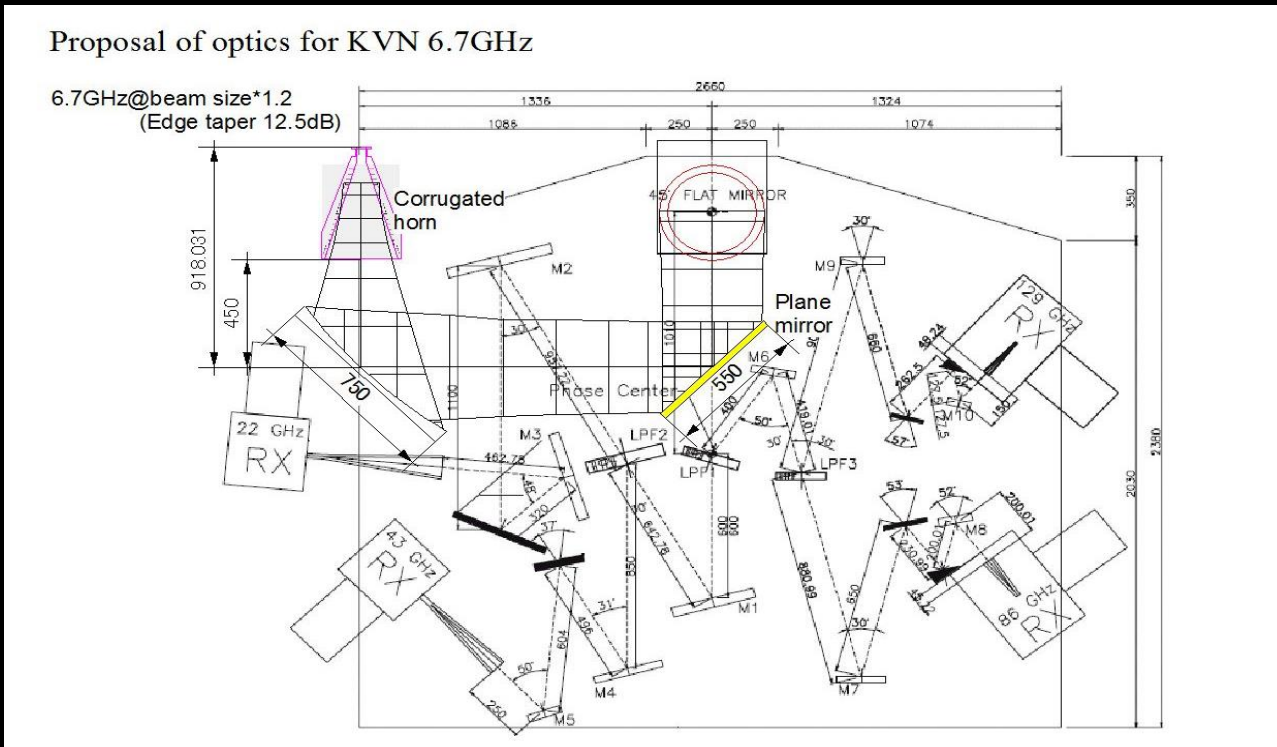
GPS installation

- Trimble GNSS Solution (2EA)
- A GPS system (one of KASI GNSS stations) has already installed at Tamna
- New GPS systems will be installed at Yonsei & Ulsan stations (Apr ~ May)
 - Collaboration with GPS group @ KASI
 - wet-delay & TEC measurement
 - Test observation & check feasibility



6.7 GHz Receiver installation (Ulsan)

- 6.7GHz methanol maser observation with VERA, JVN, CVN
- **Freq. range : 6.7 ± 0.1 , 8.4 ± 0.4 GHz**
- Aperture Efficiency : 0.75
- Time-line: Lab test and installation at Ulsan before this summer, later a fringe test is planned

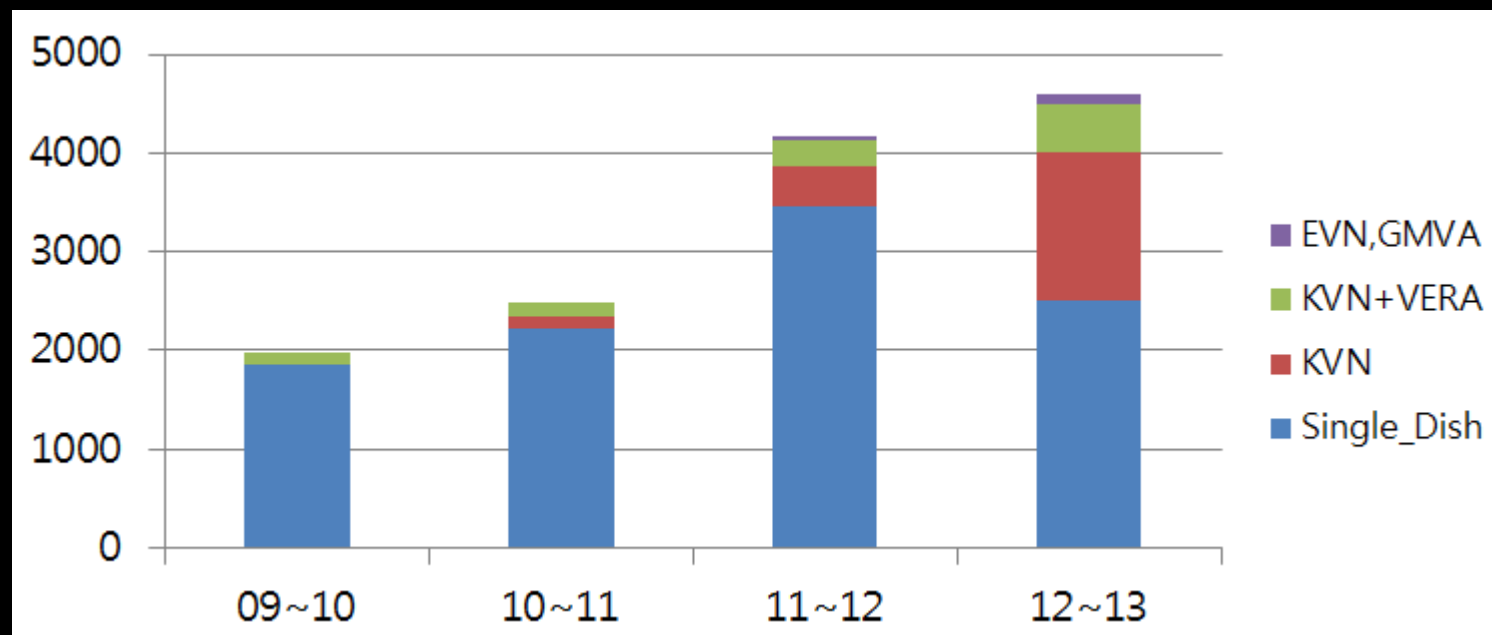


Other Issues

- Preparation of Open Use (Call for Proposal)
 - Oct 2013: for domestic only
 - 2014 ~ : for international
- 2Gbps recording observation & mode test (Apr. 29-30, 2013)
- P-cal development & test (22/43/86/129 GHz) is on going
- H-maser maintenance: April 22 ~ 26

Operation Time (2012 ~ 2013)

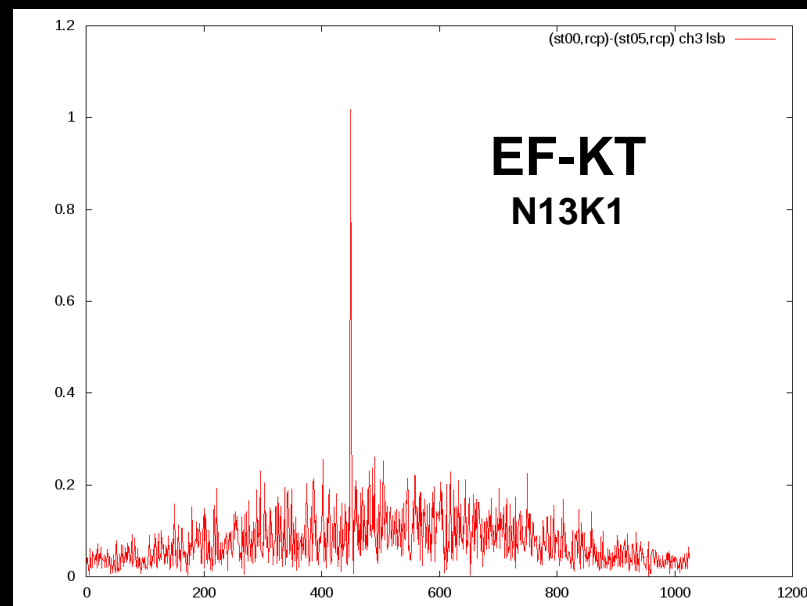
- Plan of 2012-2013 season
 - KVN+VERA : ~500h (= 50h x 10months)
 - KVN alone : 1500h
 - Single-Dish : 2500h



EVN + KVN collaboration ...

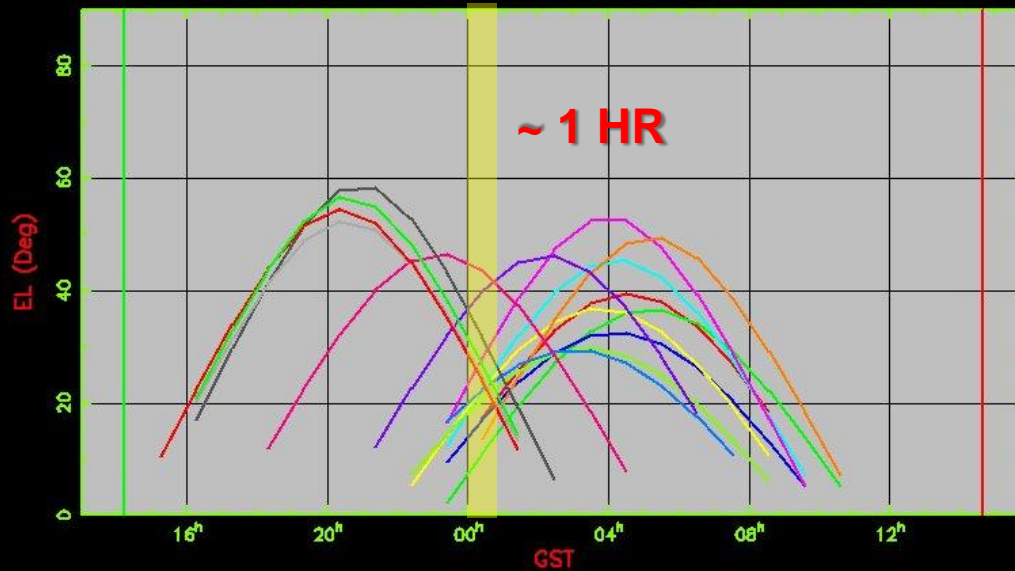
History of EVN + KVN Activities

- 22 Sep 2011: Formatter test for a e-VLBI with JIVE
- 19 Oct 2011: First e-VLBI experiment with JIVE & EVN(On, Mh, Ys)
512Mbps
- 06 Nov 2012 (n12k4) EVN K-band observation
- 27 Feb 2013 (n13k1) EVN K-band observation
- From those experiments, we have ...
 - updated our field system to support FTP fringe test
 - purchased 3xMark5 disk modules (16TB x 3EA) for EVN observation



Common Sky : EVN + KVN (Dec = 0)

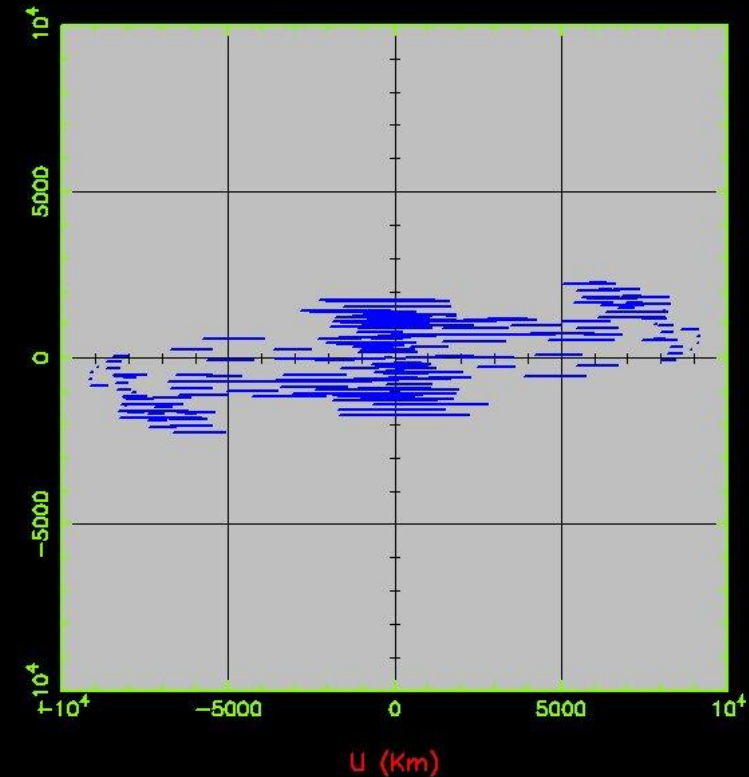
Experiment code: sky_cove



EFLSBERG	TORUN	URUMQI
JODRELL2	YEBES40M	SHANGHAI
ONSALABO	METSAHOV	KVNYS
MEDICINA	SVETLOE	KVNUS
NOTO	ZELENCHK	KVNTN

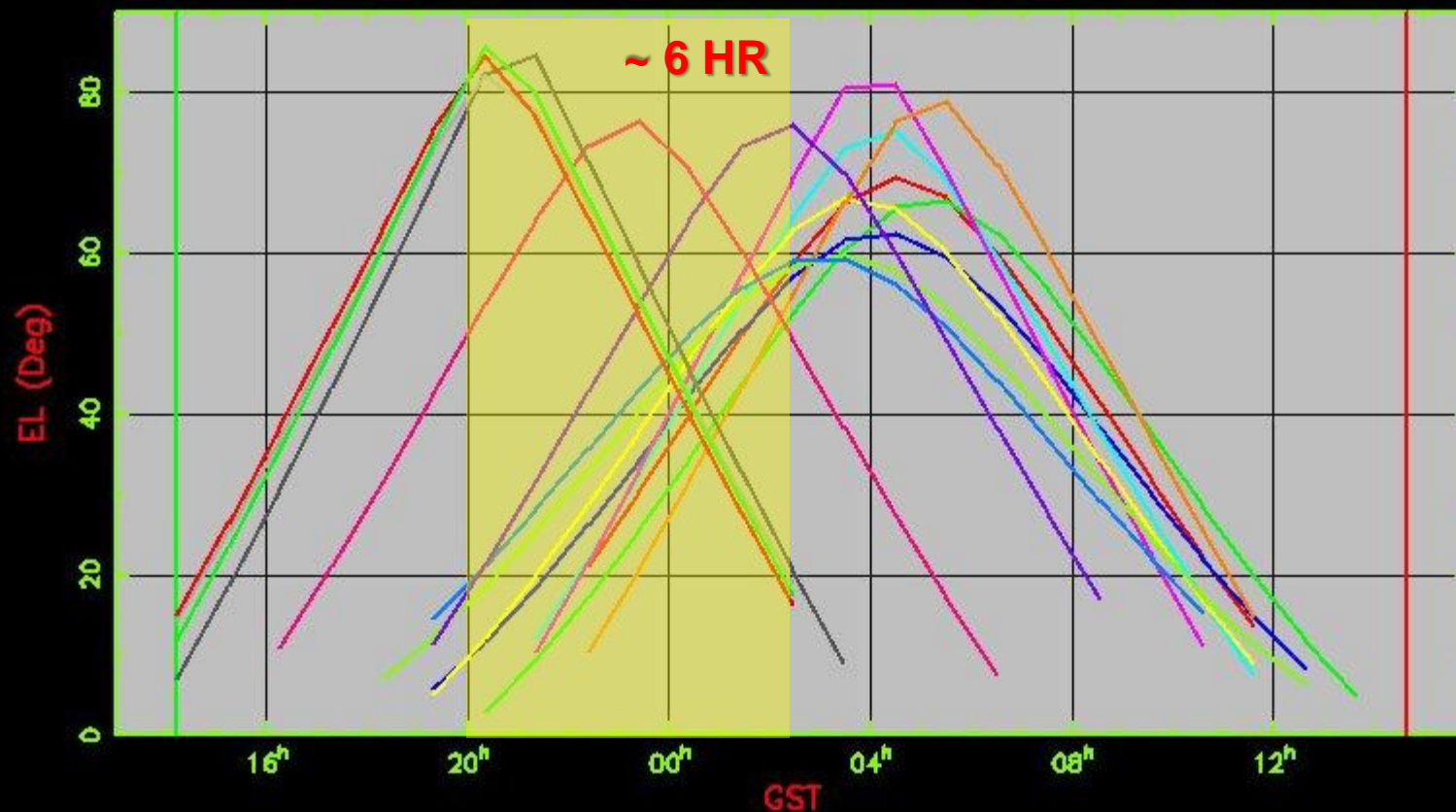
DEC00

UV Coverage for sky_cove



Common Sky : EVN + KVN (Dec = 30)

Experiment code: sky_cove



EFLSBERG
JODRELL2
ONSALA80
MEDICINA
NOTO

TORUN
YEBES40M
METSAHOV
SVETLOE
ZELENCHK

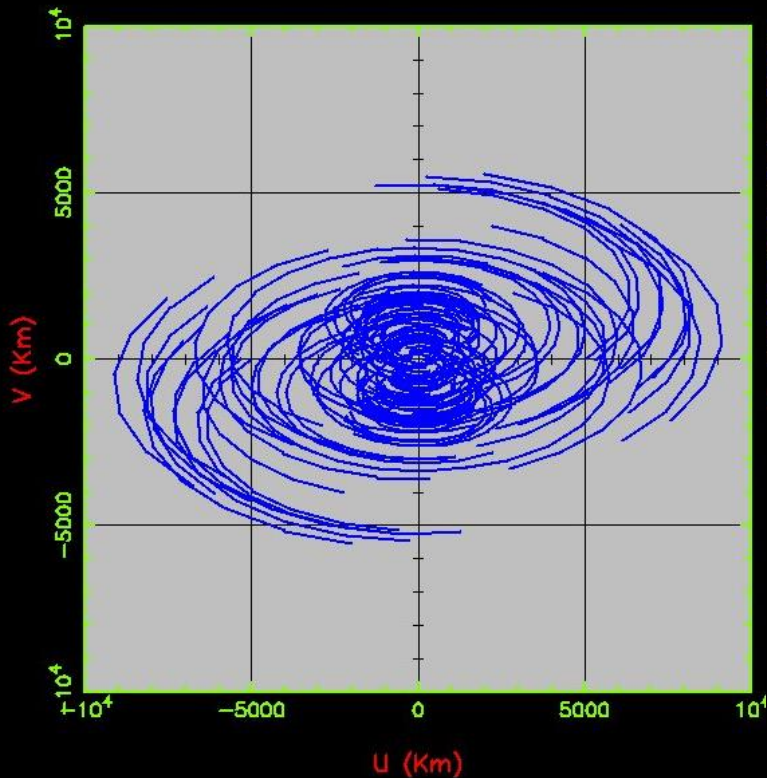
URUMQI
SHANGHAI
KVNYS
KVNUS
KVNTN

DEC30

Common Sky : EVN + KVN (Dec = 30)

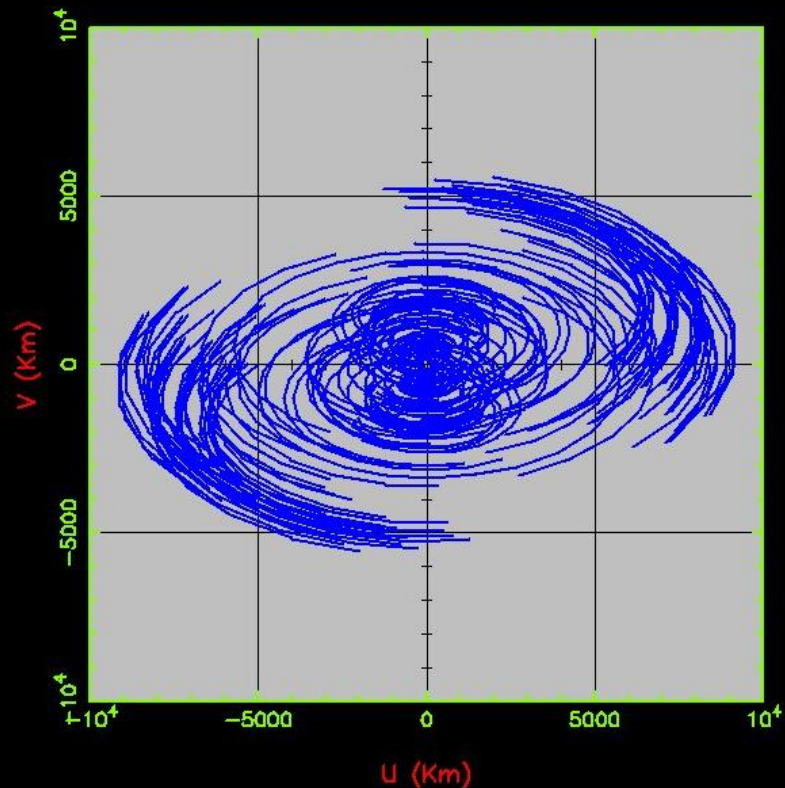
EVN only

UV Coverage for sky_cave



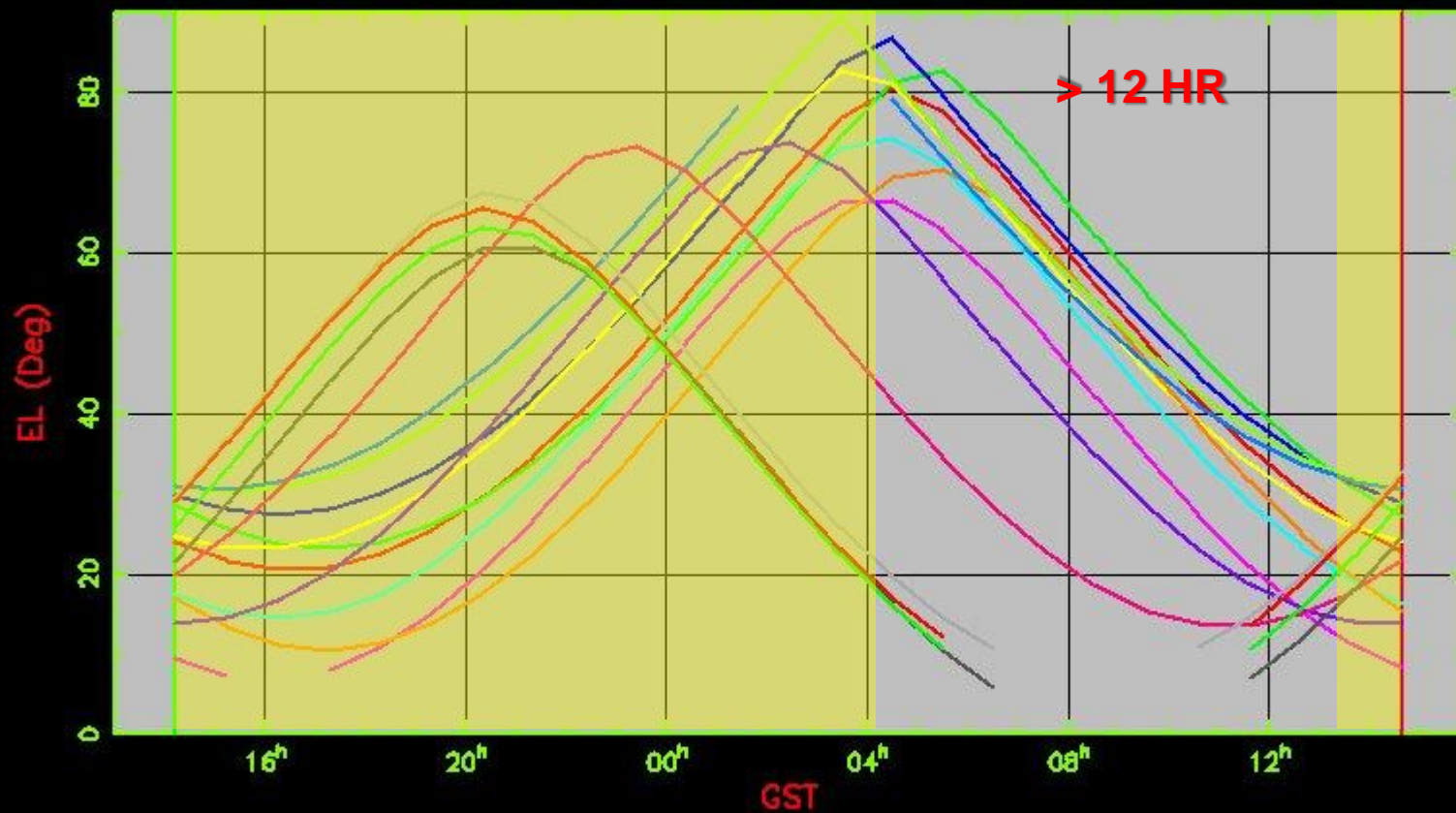
EVN+KVN

UV Coverage for sky_cave



Common Sky : EVN + KVN (Dec = 60)

Experiment code: sky_cove



EFLSBERG

TORUN

URUMQI

JODRELL2

YEBES40M

SHANGHAI

ONSALA80

METSAHOV

KVNYS

MEDICINA

SVETLOE

KVNUS

NOTO

ZELENCHK

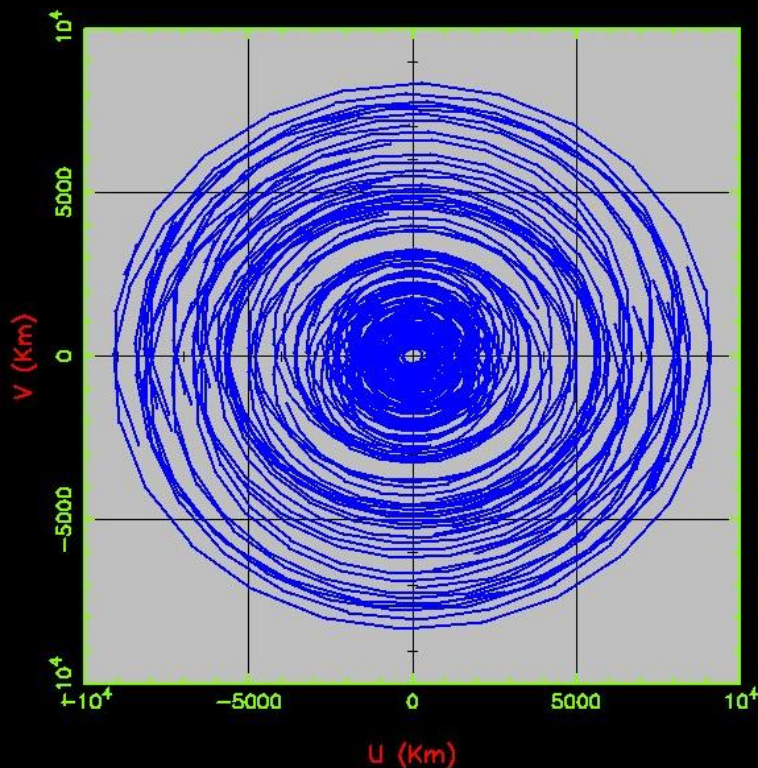
KVNTN

DEC60

Common Sky : EVN + KVN (Dec = 60)

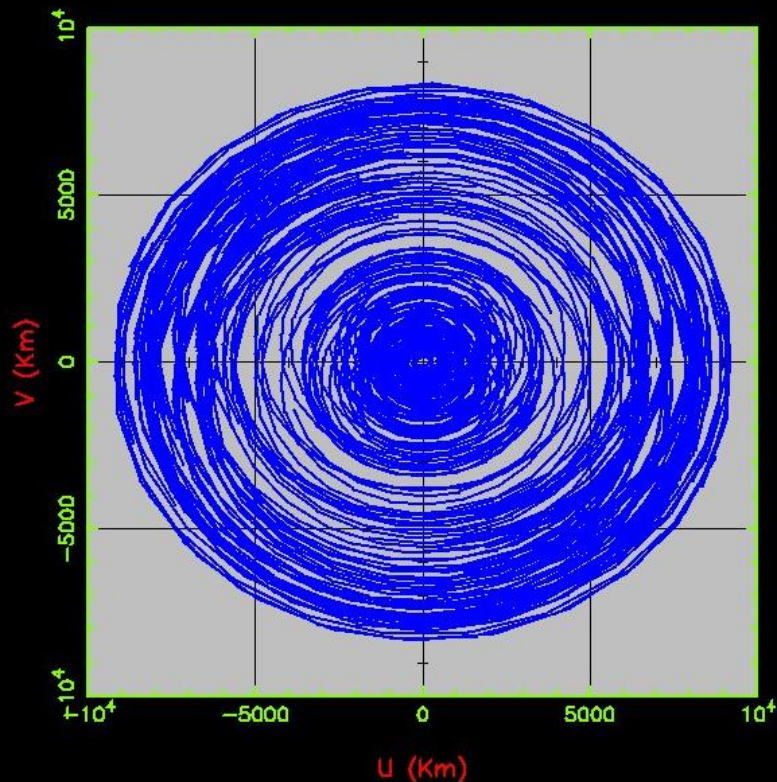
EVN only

UV Coverage for sky_cove



EVN+KVN

UV Coverage for sky_cove



A large satellite dish antenna is the central focus, illuminated from below, set against a dark night sky filled with concentric star trails. The trails are most prominent around the dish, suggesting a long-exposure photograph taken from a location with a high latitude. The dish itself is a complex structure with a large, multi-colored parabolic reflector. The colors transition from yellow at the top to red at the bottom. The sky is a deep blue, and the horizon shows some faint lights and silhouettes of trees or buildings.

Thank you

서울~울산~제주 삼각관측
우주와의 '소통' 한걸음 더

12일 새벽 제주도 서귀포하늘에서 북극성을 중심으로 위치를 그리며 돌고 있는 별들을 향해 지름 21m 크기의 접시 안테나가 우뚝 솟아 있다. 서울 연세대-울산 울산대-제주 문리대를 3각으로 연결하는 한국우주연구기관 연합(KVNO) 사업의 최후의 단계로 서귀포 달리대 별자리천문대의 천리안망경이 지난 1월 상공사를 마치고 시험 가동에 들어갔다. 한과영항중 석대기 관측지원서점에서 제주 할라산의 별 한 톨도 식별할 수 있는 정밀도를 갖게 된다. 한국우주천리관측망들이동하면 우리도 우주의 별빛들을 정밀 계속해 별의 탄생과 사멸을 연구할 수 있고, 한반도 지각변동도 정밀 모니터링할 수 있게 된다. 이 소식은 디지털카메라에 14mm 렌즈를 부착해 1시간 동안 셔터를 열며 찍었다. 서귀포/김동규 기자 bong9@hani.co.kr