

# Current Status and Wideband Upgrade of the KVN

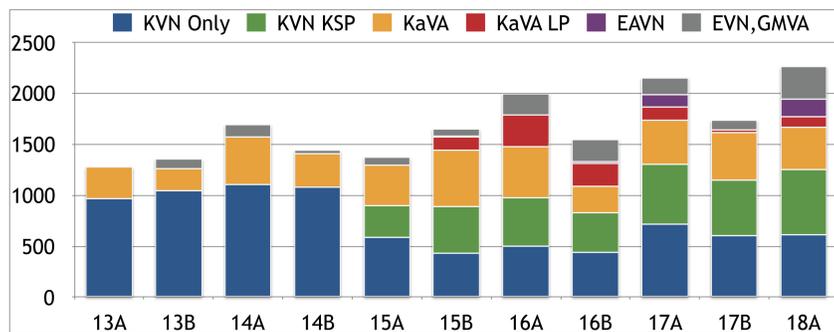
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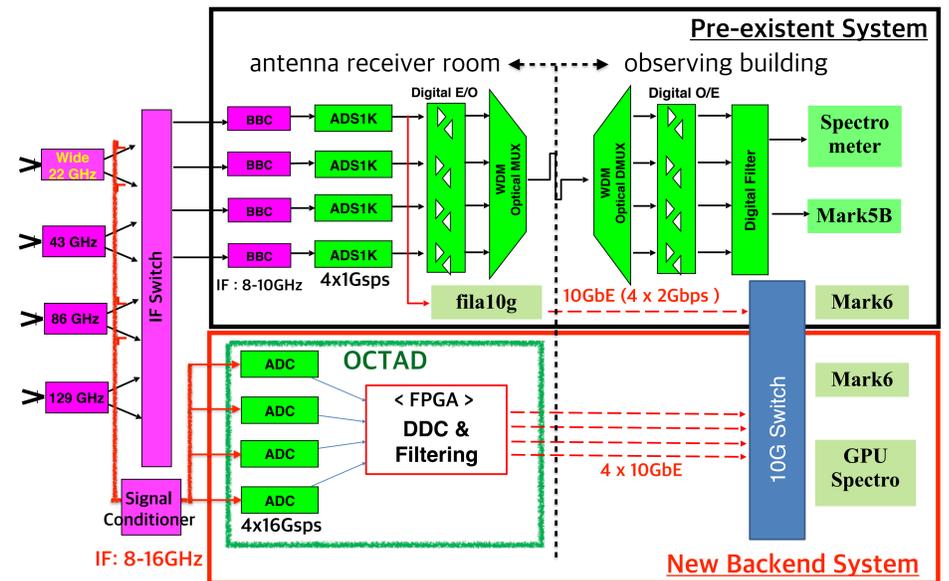
## Abstract

Upgrade of KVN four bands receivers to widen observing frequency ranges is on-going. As a first step, K-band receivers were upgraded to support observing frequency range from 18 to 26 GHz and upgrade of 86GHz receiver for 85-116 GHz frequency range is following. Each KVN station is equipped with a broadband sampler OCTAD of which the maximum aggregated data rate is 32Gbps. It consists of four high-speed A/D converters and digital down-converters. Simultaneous four frequency bands full polarization observation mode will be available from 2019 by using the new and preexisting VLBI backend together.

## Current Status



- \* Keeping steady VLBI operation ( > 3500h / yr)
- \* KVN Key Science Projects, KaVA Large Program from 2015
- \* EAVN, EVN 22/43GHz + GMVA 86GHz > 300h / yr
- \* Global Open Use ( KVN-only 600h/yr, KaVA 500h / yr)
- \* 8Gbps (4x512MHz BW) operation from 2017 using 4 ADS1K , fila10g and Mark6



## Receiver Upgrade for Wideband

- \* Upgrade current receivers to cover wide frequency ranges
- \* Low receiver noise temperatures using new LNA, compact feed horns
- \* Compact feed horns and polarizers were developed

	Frequency Range (GHz)		Trx(K)	Installation
	Before	After		
K	21.2-23.2	16-26	< 40	2017 - 18
Q	42.1-44.1	35-50	< 50	2019 - 20
W	85-95	84-116	< 80	2018 - 19
D	125-142	125-172	< 60	2020 - 21

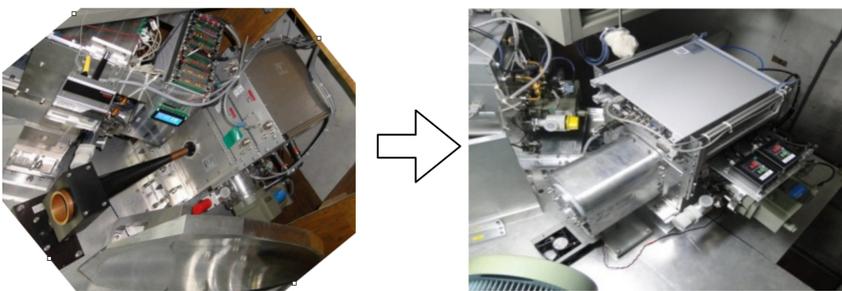
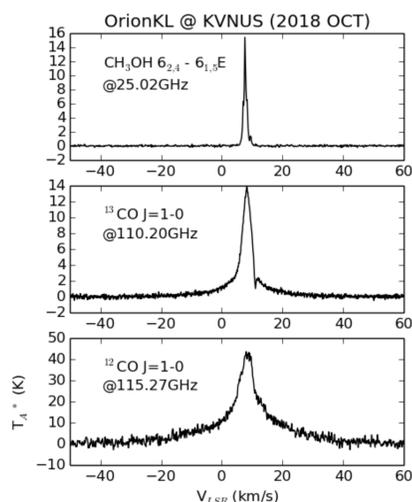


Fig. K-band Receivers before and after wideband upgrade

### Wide K-band Receiver

- \* All KVN Stations
- \* RF 18 - 26.5GHz
- \* IF 8 - 16GHz
- \* Compact feed horn inside the extended dewar
- \* Trx < 40K at 22GHz
- \* Aperture Efficiency ~ 70%



### Wide W-band Receiver

- \* W-band receiver of Ulsan station was upgraded in summer
- \* Upgrade of W-band Rx at Yonsei and Tamna in 2019 summer

## Broadband Samplers



Fig. OCTAD developed by Elecs.co.(Japan)

- \* 4 ADC (4 x 16Gbps)
- \* Digital Down Conversion
- \* Digital Filtering
- \* 4 x 10GbE output
- \* VDIF format
- \* Installation : 2017
- \* Commissioning : ~2018

Bandwidth (MHz)	Max Num of Channels	Max Data Rate (Gbps)
8092	1	32
4096	2	32
2048	4	32
1024	8	32
512	16	32
256	16	16
128	16	8
64	16	4
32	16	2
16	16	1

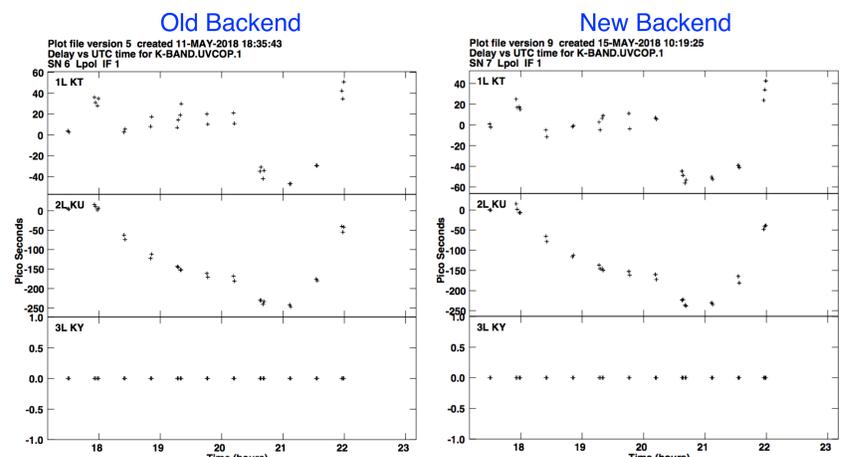


Fig. Comparison of VLBI results in 32MHz mode

- \* Consistent results in 32MHz BW mode
- \* Further VLBI tests for various modes are on going
- \* New amplitude calibration scheme for OCTAD is under development
- \* Simultaneous four frequency bands full polarization observing mode will available in 2019 by using pre-existent and new backend system together