Recent Status of KJCC for EAVN

Se-Jin Oh, Duk-Gyoo Roh, Jae-Hwan Yeom, Dong-Kyu Jung, Chungsik Oh, Hyo-Ryoung Kim, Ju-Yeon Hwang and NAOJ Corr. Team

Contents

❖ **KJCC correlation status**

❖ **Development status for wideband**

❖ **Future works**

Korea-Japan Correlation Center(KJCC)

Executive Board

Daejeon HW Correlator

DiFX SW Correlator on HPC

Correlation Mode

Corr. mode	Band width [MHz]	Output streams	#bits	Output data rate [Mbps]	Clock rate [MHz]
[a]C1	256	1	2	1024	32
C2	128	2	2	1024	32
C3	64	4	2	1024	32
C4	32	8	2	1024	32
C5	16	16	2	1024	32
[b]W1	512 x 4band	4	2	8192	64
W2	512 x 4band	1IF[c]x2P[d] 2IFx1P	2	8192	64
W3	512 x 4band	2IFx2P	2	8192	64

a, Narrow band, b. Wideband, c. IF, d. Polarization

KASI 한국천문연구원
Korea Astronomy & Space Science Institute

Correlation Status

Season	Observation	Corr Finished	Remain Corr	FITS release
2018A	88(w/6 geo)	71	11	68

- Data copy for 2018A geodesy data was finished and diskpack was already delivered to MIZ.
- Data transportation for EAVN of SHAO (TIA) is currently conducted via Internet vice versa.
- Each statistics correlation processing period is summarized in next page.

http://kjcc.kasi.re.kr

Radio Astronomy Division Home   LOGIN as : sjoh@kasi.re.kr   AOC | Arch | Profile | Logout |

Korea-Japan Correlation Center

KJCC Main   Correlation Report DiFX Report User Support Contact us

Correlation status : 2018A | 2017B | 2017A | 2016B | 2016A | 2015B | 2015A | 2014B | 2014A | 2013B | 2013A

2018A Correlation List

Season	#Observation	Corr Finished	Remain Corr	Remark	Update
KaVA 2018A	88	71	11	6	2018.08.27

Finished	Doing	Not yet	Suspend	KJCC evaluation	Not related in KJCC

Observation Date	Observation Code	PI & SWG	Frequency Band	Corr Mode	Objective	Media POS	Copy Status	Fringe Detection
2018.06.07 (18158c)	k18hi02b	Hiroshi Imai	K,Q,W,D	VERA7(C5)	ESTEMA	KJC (18.07.03)	KVN Done (18.07.10)	Partially(NG:MIZ)
2018.06.07 (18158b)	k18kf01f	Kazuhiro Fujita/AGN	Q	GEO1S(C5)	J1129 K and Q band	KJC (18.07.03)	KVN Done (18.07.10)	All
2018.06.07 (18158a)	k18hi01d	Hiroshi Imai	K,Q,W,D	VERA7(C5)	ESTEMA	KJC (18.07.03)	KVN Done (18.07.10)	All

한국천문연구원
Korea Astronomy & Space Science Institute

Correlation Status(KaVA overall)

❖ Goal of Correlation Period

- 45days after obs.(which depends on media delivery)

❖ KaVA Overall statistics Corr. period

❖ Obs : 62(8.28)

	FITS release after Obs	FITS release after media arrival	Corr. Processing after Obs	Corr. Processing after media arrival
Average Period(days)	54.4	24.1	49.6	19.3
Within 45days after Obs	28/62(45.2%)		40/62(64.5%)	
Within 30days after media arrival		47/62(75.8%)		54/62(87.1%)

Correlation Status(AGN WG including EAVN)

❖ AGN WG statistics Corr. period
❖ Obs : 45(KaVA)/51(EAVN)(8.28)

	FITS release after Obs	FITS release after media arrival	Corr. Processing after Obs	Corr. Processing after media arrival
Average Period(days)	53.0/60.9	26.1/27.5	48.2/55.4	21.3/22
Within 45days after Obs	18/45(40%) 18/51(35%)		29/45(64.4%) 29/51(57.0%)	
Within 30days after media arrival		31/45(68.9%) 34/51(67%)		37/45(82.2%) 42/51(82%)

Correlation Status(Evolved Star WG)

❖ ES WG statistics Corr. period
❖ Obs : 9(8.28)

	FITS release after Obs	FITS release after media arrival	Corr. Processing after Obs	Corr. Processing after media arrival
Average Period(days)	46.0	17.6	40.6	12.1
Within 45days after Obs	6/9(67%)		8/9(89%)	
Within 30days after media arrival		9/9(100%)		9/9(100%)

Correlation Status(SFR WG)

❖ SFR WG statistics Corr. period
❖ Obs : 6(8.28)

	FITS release after Obs	FITS release after media arrival	Corr. Processing after Obs	Corr. Processing after media arrival
Average Period(days)	55.7	19.7	51.8	15.7
Within 45days after Obs	3/6(50%)		3/6(50%)	
Within 30days after media arrival		6/6(100%)		6/6(100%)

KASI 한국천문연구원
Korea Astronomy & Space Science Institute

Correlation Status(Galactic Astrometry WG)

❖ GA WG statistics Corr. period

❖ Obs : 2(8.28)

	FITS release after Obs	FITS release after media arrival	Corr. Processing after Obs	Corr. Processing after media arrival
Average Period(days)	119.0	22.5	115	18.5
Within 45days after Obs	1/2(50%)		1/2(50%)	
Within 30days after media arrival		2/2(100%)		2/2(100%)

KASI 한국천문연구원
Korea Astronomy & Space Science Institute

KVN KREONET Status

Yonsei Astronomy Observatory

Correlation Center in Daejeon

JIVE

10G

100G

KREONET

KRLight
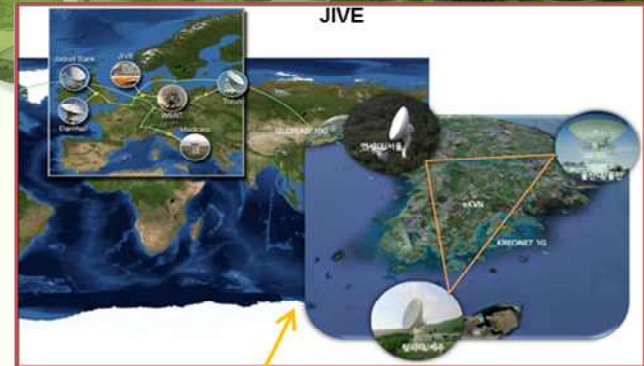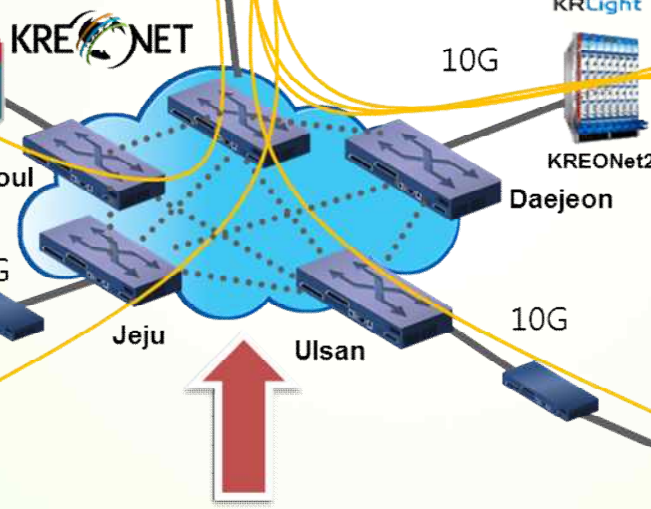
10G

GLORIAD

AARNet (Australia)

JAPAN

Seoul

KREONet2
Daejeon

10G

Jeju   Ulsan

10G

Tamna Astronomy Observatory

To Be: Virtual Dedicate Networks on KREONET-S

Ulsan Astronomy Observatory

KASI 한국천문연구원
Korea Astronomy & Space Science Institute

Data Transmission

❖ **Data transmission from each Obs.**

- 4set STARDOM(RAIDBOX) server were prepared
- KaVA, EAVN observation data is transmitted
  - KVN only observation data(not KaVA, EAVN) is delivered via KREONET
  - From SHAO to KJCC, the EAVN data was transmitted, but speed is very slow < 1Gbps.
  - From MIZ to KJCC, the maximum 1.6Gbps speed is evaluated, which is not connected to KREONET
- Mark5B/Mark6 data for KaVA will be transmitted soon.

KASI 한국천문연구원
Korea Astronomy & Space Science Institute
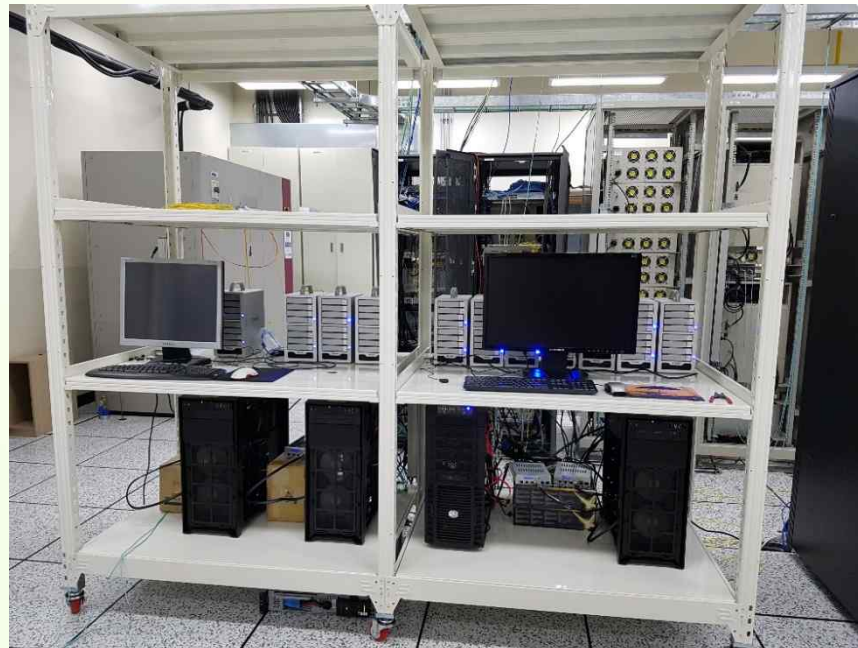
EAVN(a17107a) EHT campaign
➔ EATING VLBI (Italy)

Plot file version 22 created 07-SEP-2017 15:31:46
3C273 A17107A.MSORT.1
Freq = 22.0990 GHz, Bw = 32.000 MH   Calibrated with CL # 3 but no bandpass applied
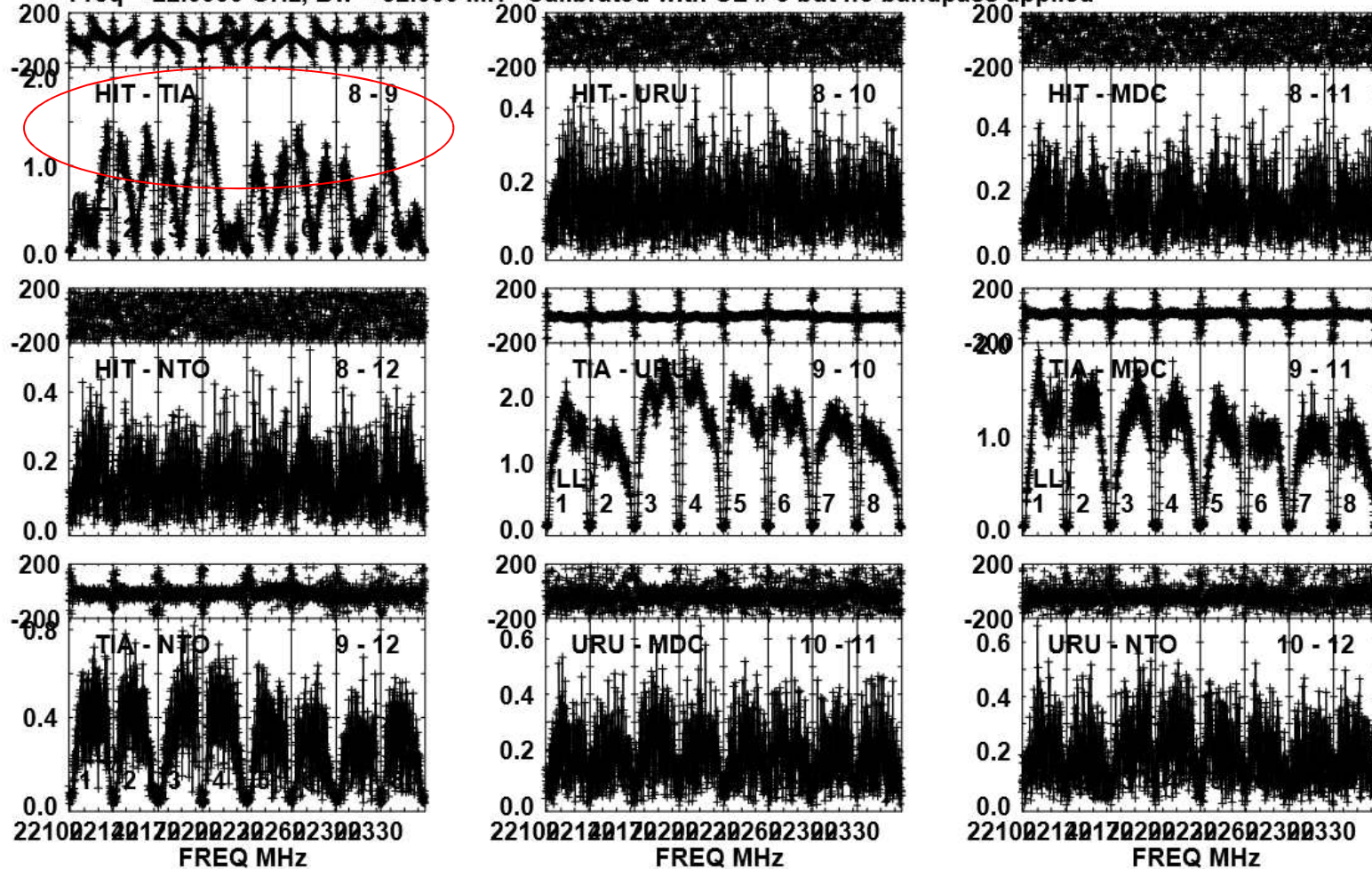
Lower frame: Milli Ampl Jy   Top frame: Phas deg
Vector averaged cross-power spectrum   Several baselines displayed
Timerange: 00/17:43:01 to 00/17:47:59

Bit-assign problem? →a18100a
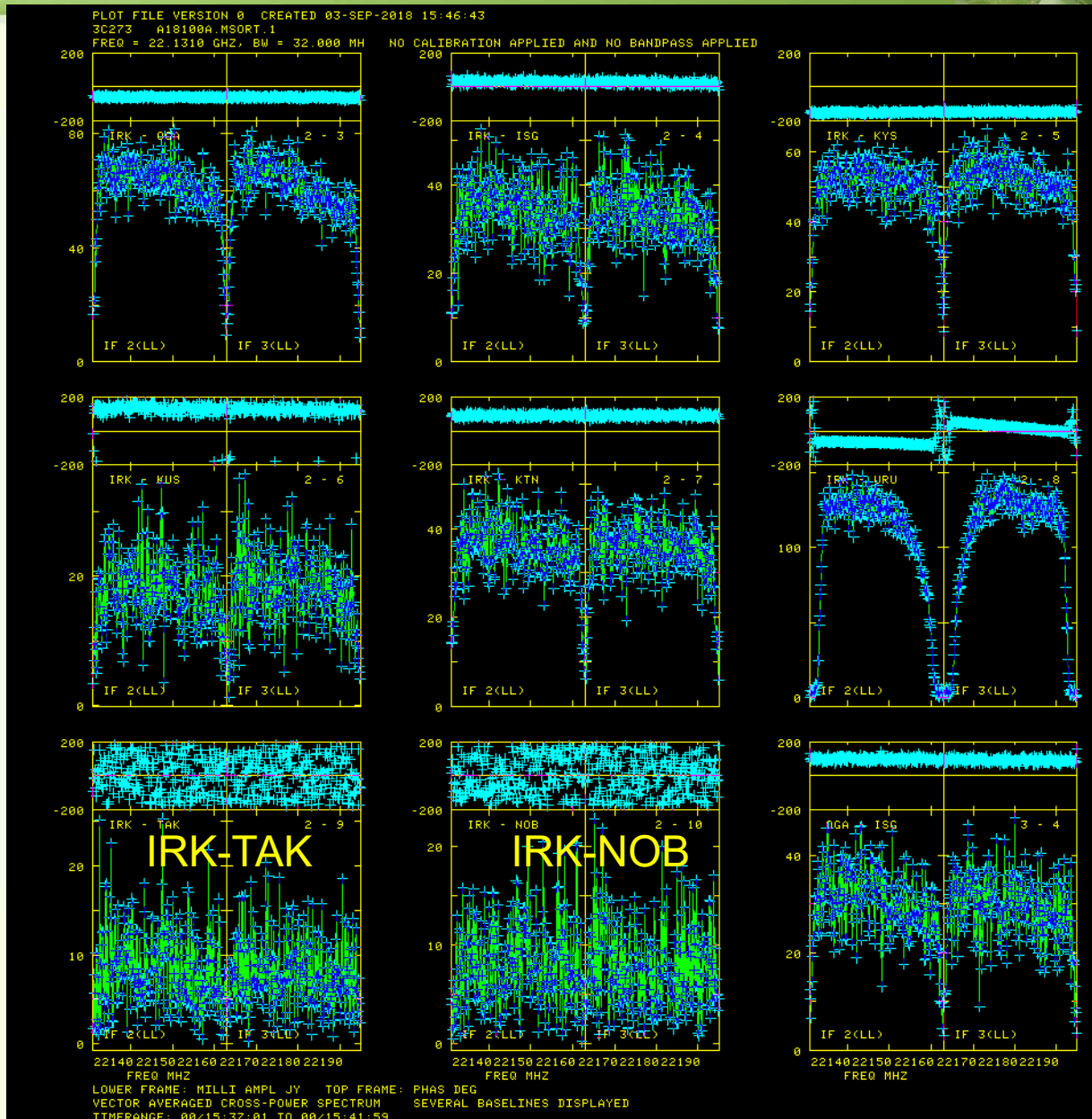
POSSM
Before FRING
Auto-Corr Result

Bit-assign problem? →a18100a
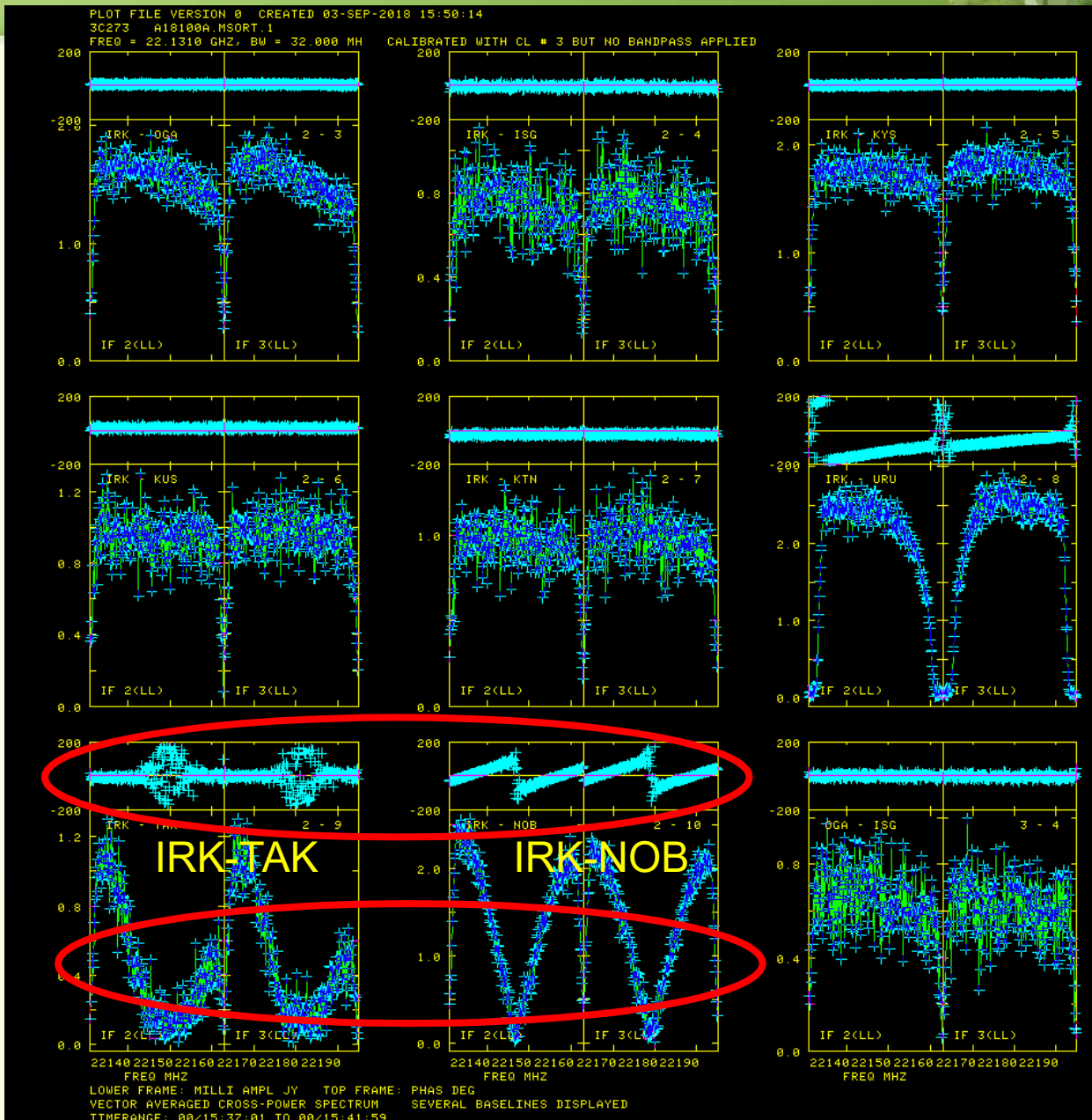
POSSM
After FRING
Cross-Cor Result

Daejeon Correlator Field Maintenance work

❖ Close Maintenance work

- In every year, manufacturer visited KJCC.
- This year : 8/27~8/31
- Field maintenance work was done without any problem.

OCTAD verification test
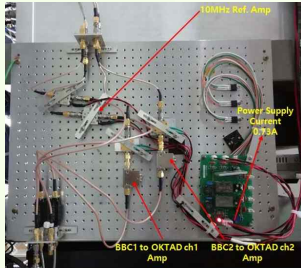
S.D KYS KUS KTN

- ❖ 32 Gbps (8GHz BW) New Digital Backend
- ❖ 2017.08 : installed at KVN 3 stations

- ❖ A18118a : NRAO530(ref), SgrA*, M87 (by Byun-san, Yoon-san)
- ❖ C4 mode (32MHz BW x 8IFs) by OCTAD was simultaneously conducted and verified by comparing with current KVN DAS for compatibility.
- ❖ The obtained delay rate and phase trend rate is mostly consistent with current KVN DAS.
- ❖ In case of SNR, OCTAD obtained 20% higher than current KVN DAS (due to difference sampling bit, OCTAD 3bit, ADS1K 2bit)

KASI 한국천문연구원
Korea Astronomy & Space Science Institute

SNR (NRAO530)
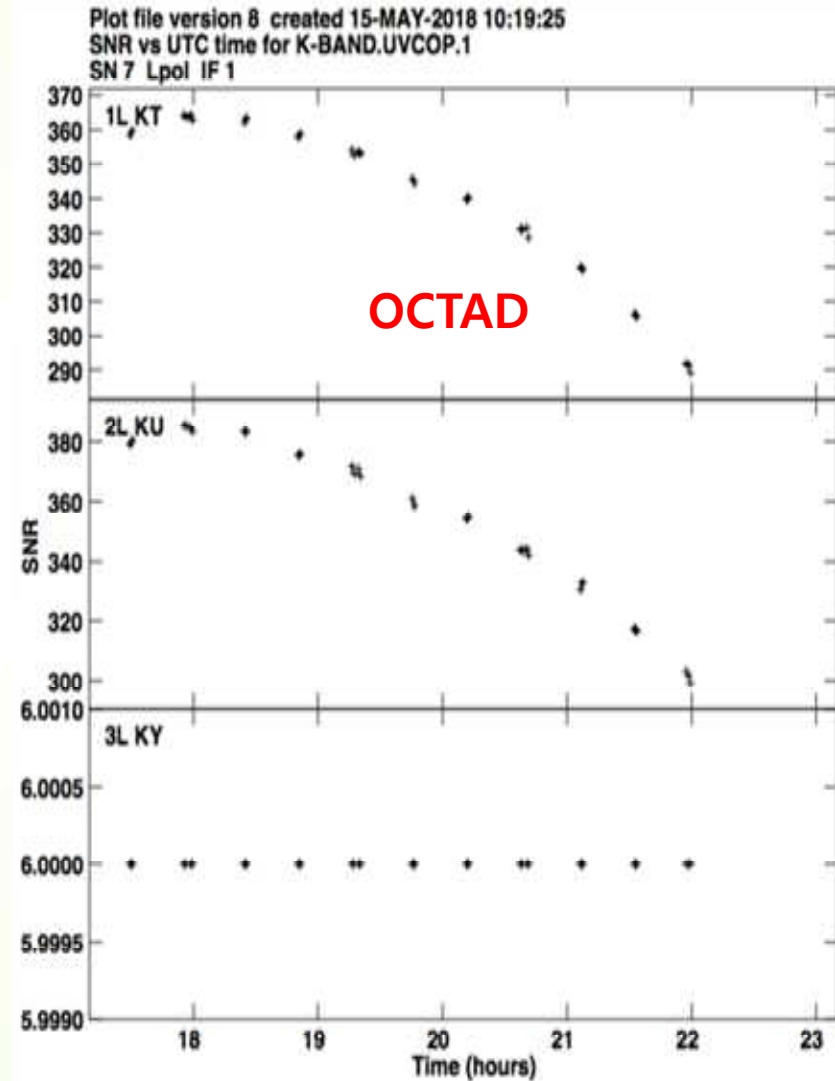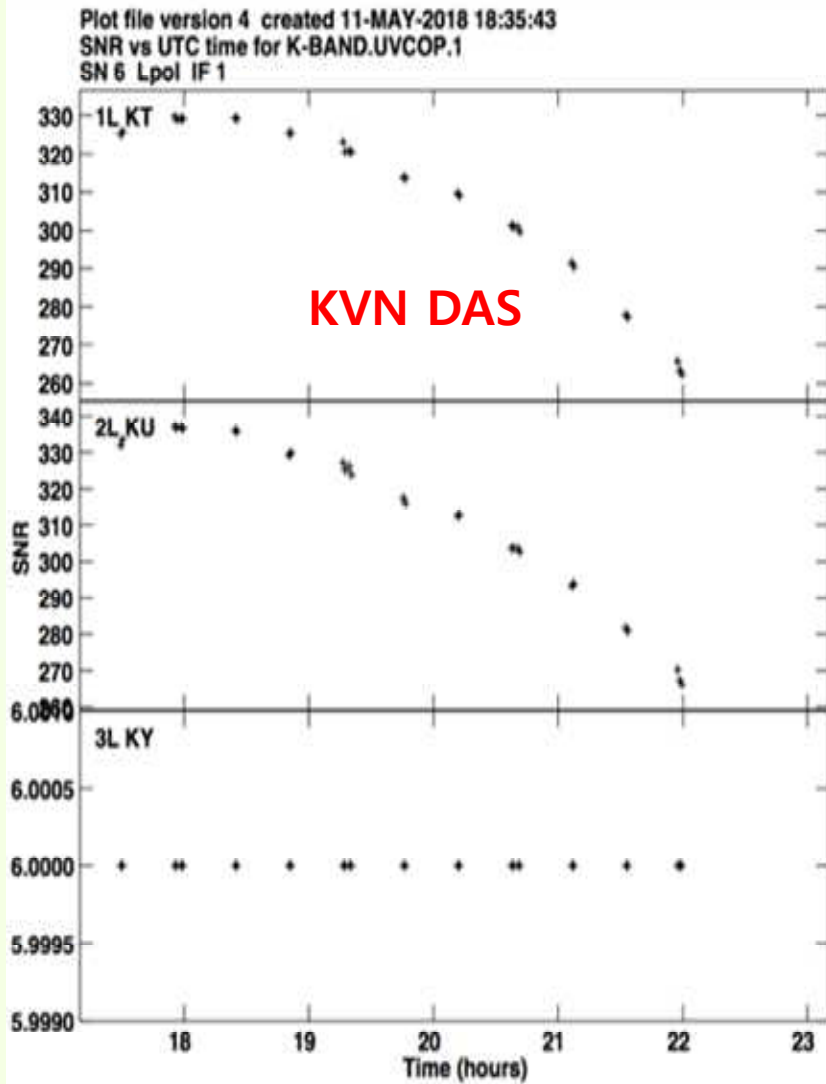
Delay

Plot file version 5 created 11-MAY-2018 18:35:43
Delay vs UTC time for K-BAND.UVCOP.1
SN 6 Lpol IF 1

KVN DAS
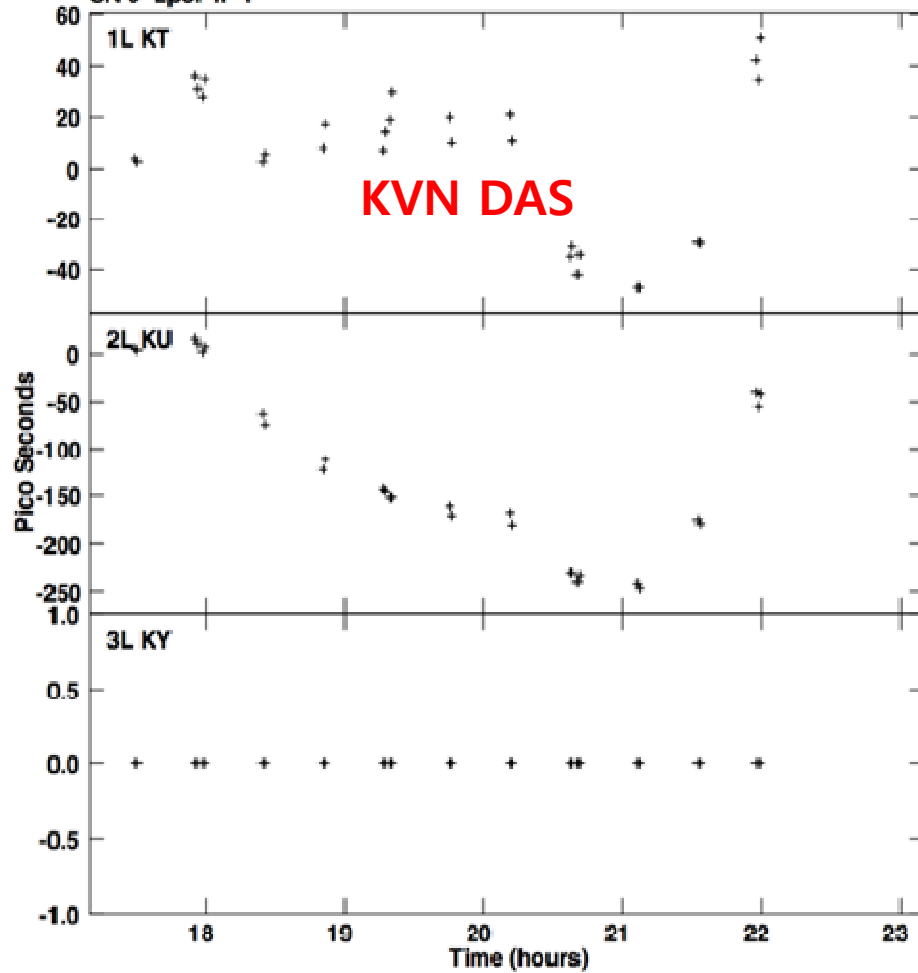
Plot file version 9 created 15-MAY-2018 10:19:25
Delay vs UTC time for K-BAND.UVCOP.1
SN 7 Lpol IF 1

OCTAD
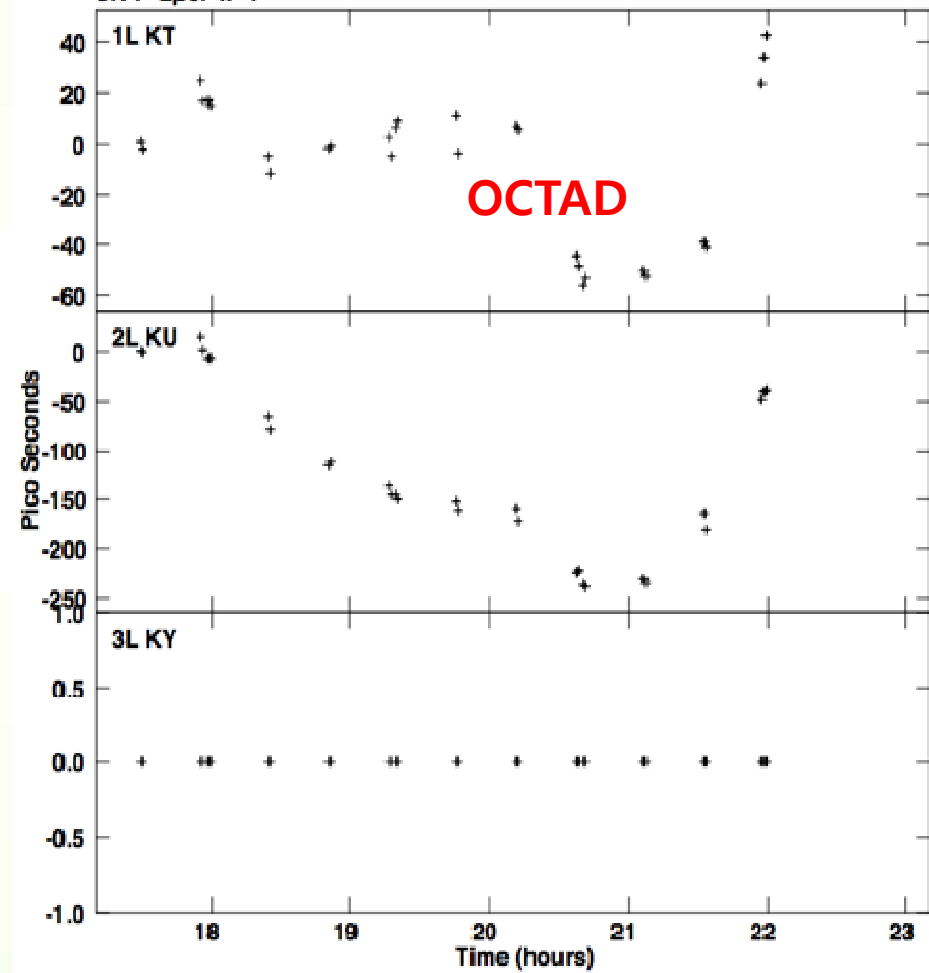
KVN Halcyon Recorder(KHR) (Specification)

- ☐ Target processor : Intel Xeon
- ☐ Target board
  - ▪ Asrock X99 extreme11
  - ▪ DDR4 RAM 32GBytes
  - ▪ Broadcom BCM57711 NIC 10GbE PCIe
- ☐ Operating System : FirmOS(like DOS)
  - ▪ include scheduler
  - ▪ support multi-core
  - ▪ no filesystem
  - ▪ DRAM/NIC/SATA control directly (without device driver)
- ☐ Build environment: gcc, nasm(boot code)
- ☐ **can make full resources and performance**
  - ▪ recording speed 8.224Gbps(VDIF UDP)
  - ▪ recordable capacity 90% of SATA HDD
- ☐ very cheap(Mainboard/CPU/RAM/NIC/Chassis)
  - ▪ around $5,000 without HDDs
- ➢ **Upgraded to support MVMe (SSD)**

Intel Xeon multi-core Processor

10GbE NIC PCIe
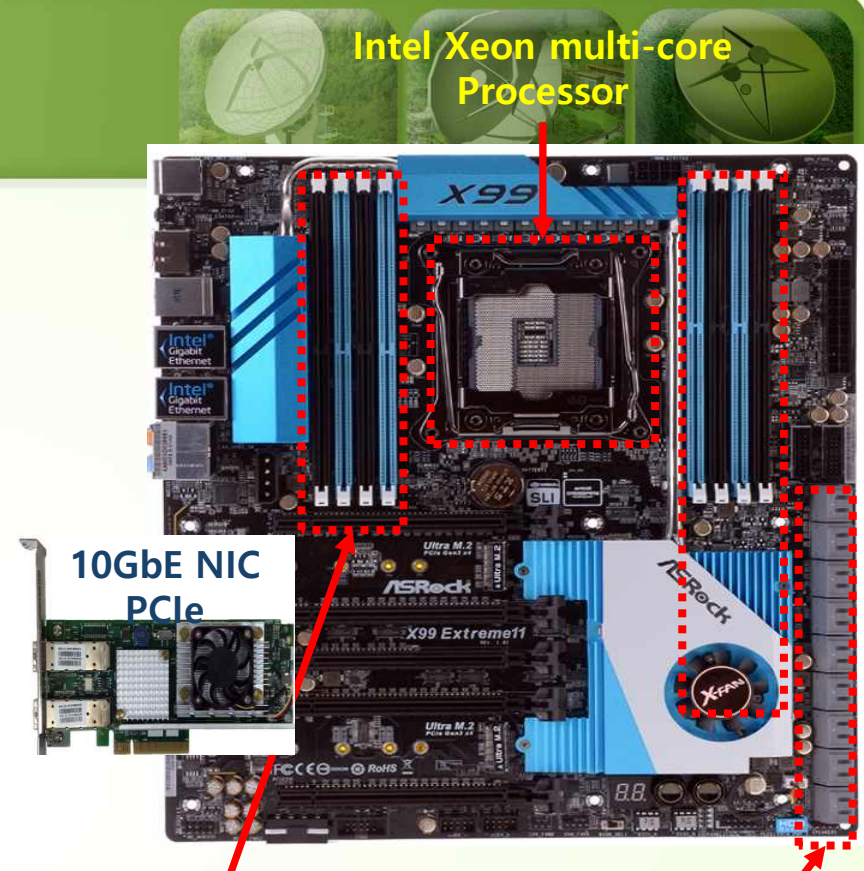
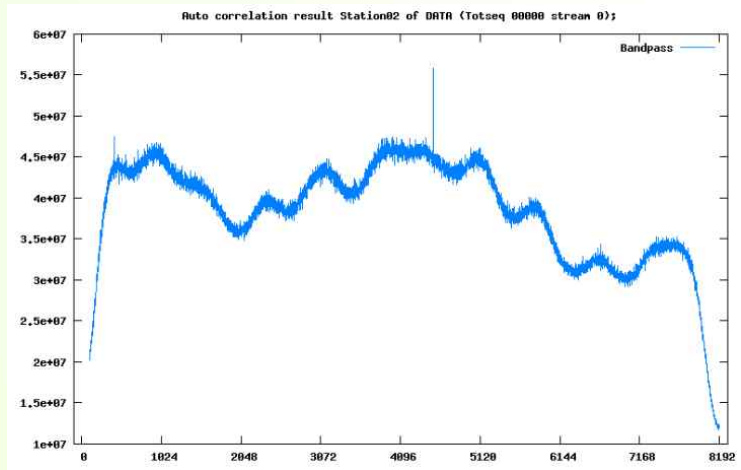DDR4 RAM 3 install (Support M 128GBy

8Gbps recording test

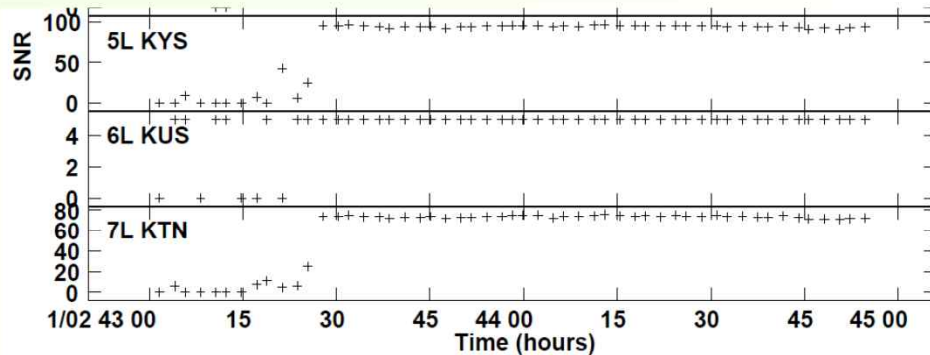❖ 8hrs, no data packet loss
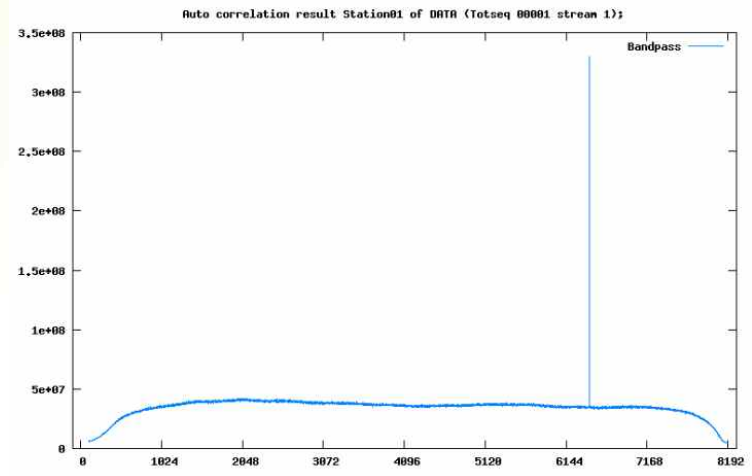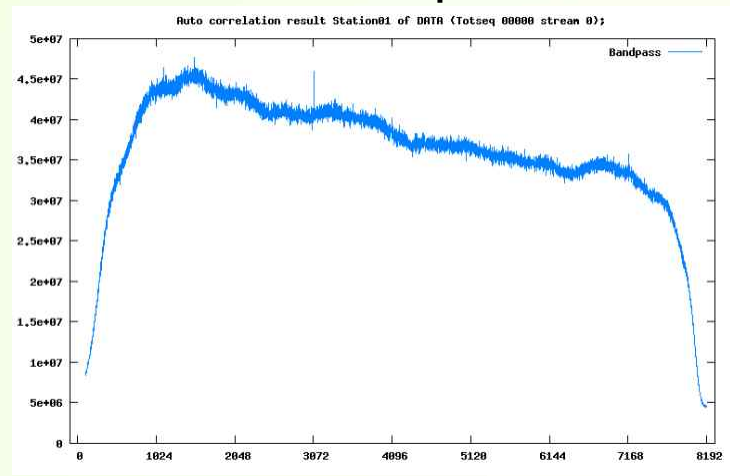
OCTAD→KHR recording
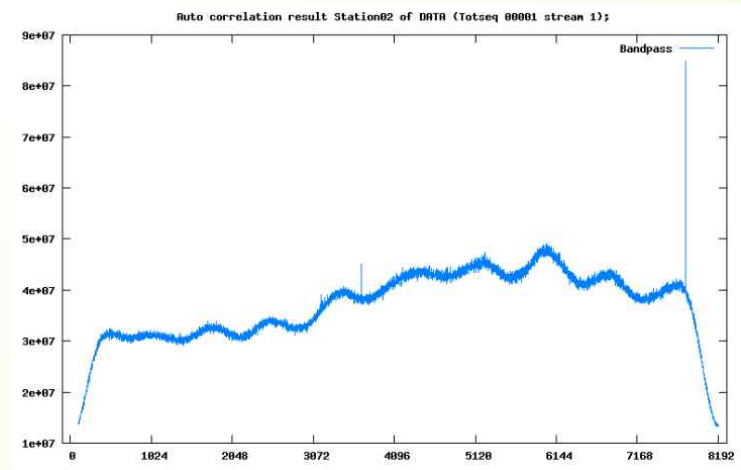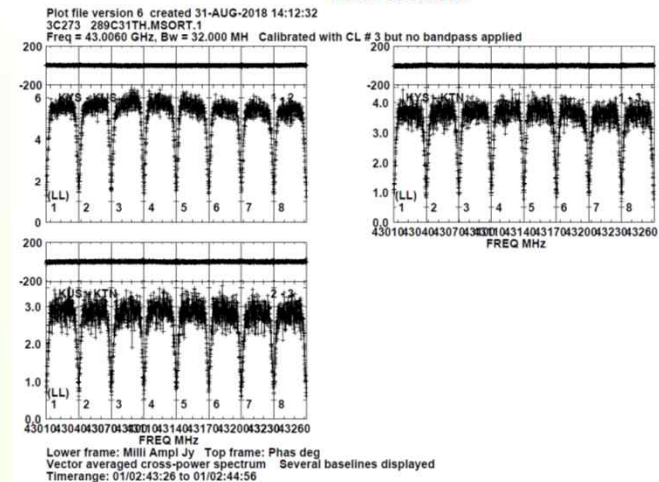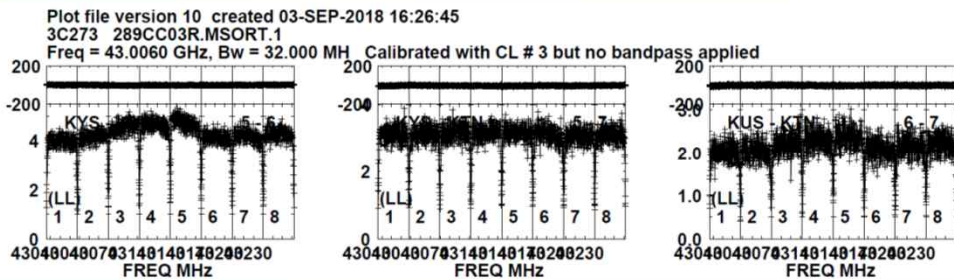

4set ADS1K+FILA10G→KHR recording

SW DFB development
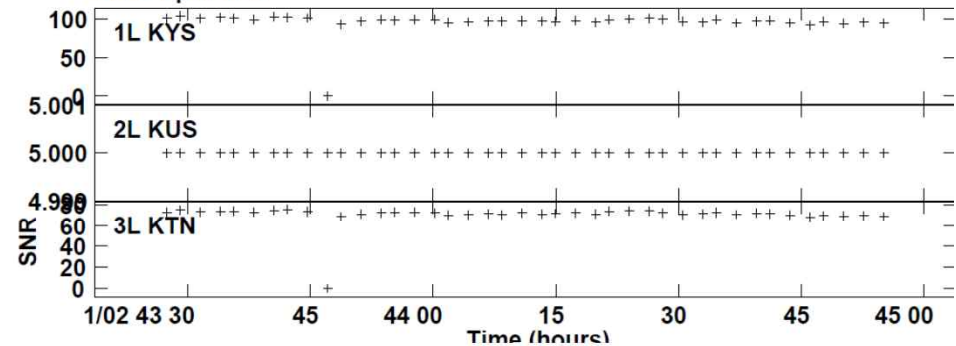
❖ To speed up and support EAVN
❖ We are now developing and optimizing SW DFB based on GPU

R17289c(1Gbps)

SW DFB (r17289c 2Gbps→1Gbps)

Preliminary result

Future works

❖ **Data format alignment**

- VERA : VDIF(octa)
- KVN : VSI, VDIF(general)
- KJCC : current all support ➜ general VDIF

❖ **Support binning-factor for CODA/FITSgen**

- Reduce FITS file size for spectral-line

❖ **SW Digital Filter Development**

- Detail comparison work is expected
- Using Full data with SW DFB, the correlation will be scheduled