



한국우주전파관측망
KOREAN VLBI NETWORK · KASI

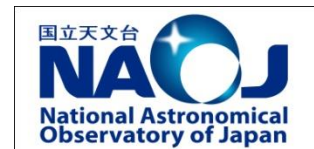


Current Status of KJCC operation and Upgrade



Se-Jin Oh

and staff of Correlator team of KASI/NAOJ



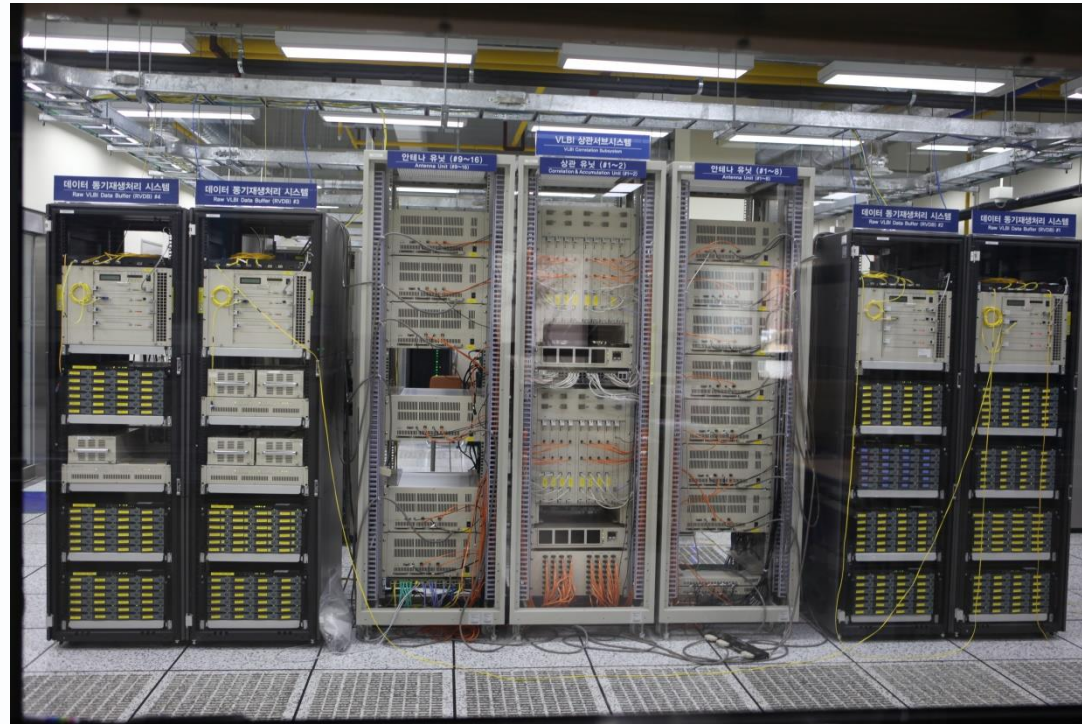


- ❖ **KJCC system status**
 - Problem(known) and others
- ❖ **Correlation Status**
- ❖ **Recent Activities**
- ❖ **Future Work**

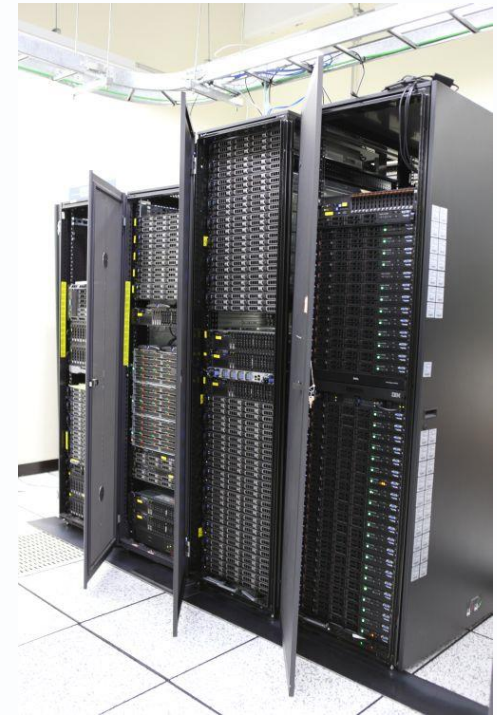
KJCC(Korea-Japan Correlation Center)



Executive Board



Daejeon HW Correlator



DiFX SW Correlator

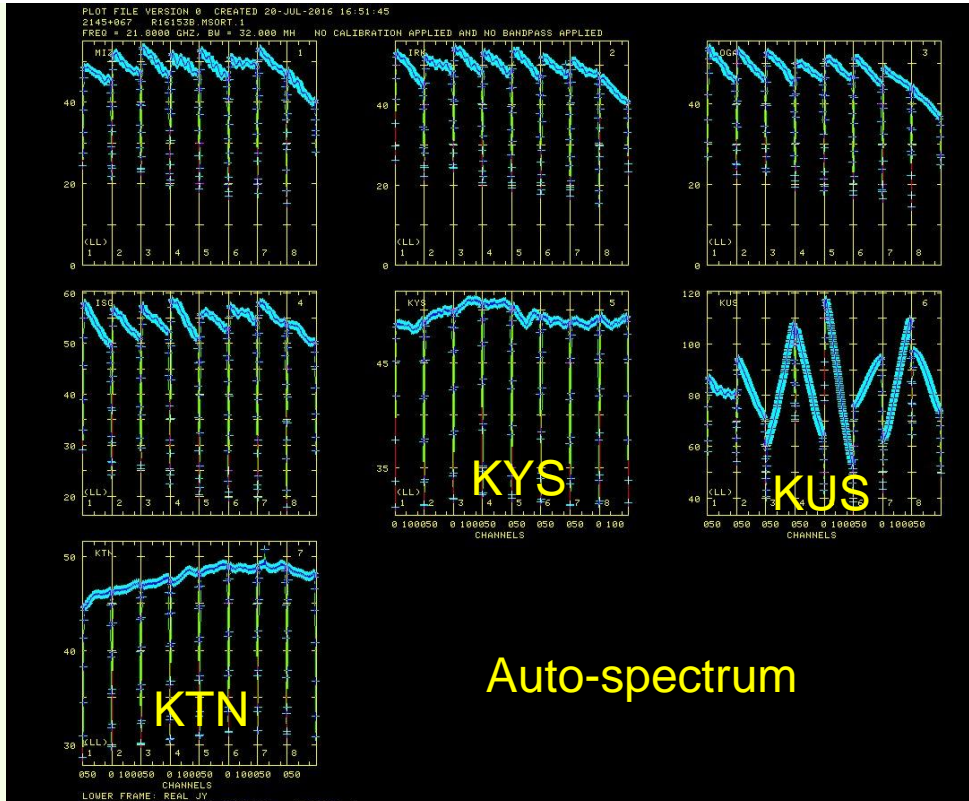
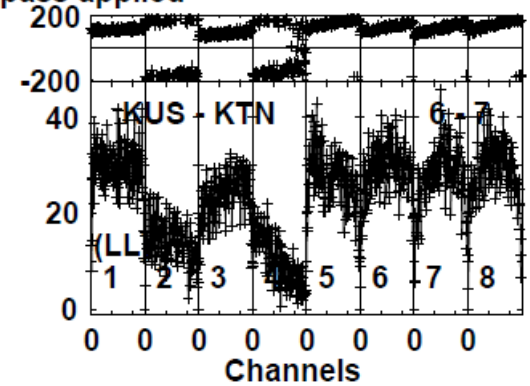
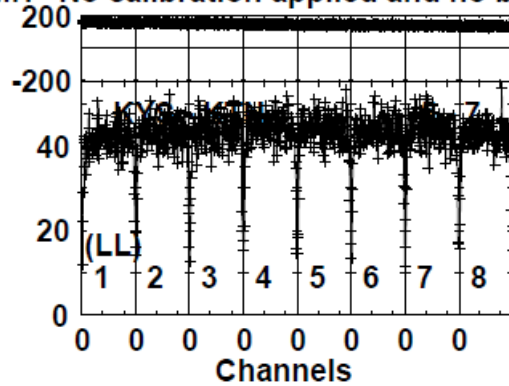
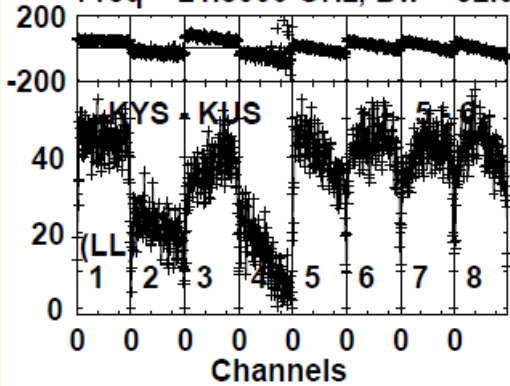
KJCC system status

[Known Problem, k16jm01b(r16153b)(J .Miller-san)]

Plot file version 3 created 04-AUG-2016 17:36:07
 2145+067 R16153B.MSORT.1
 Freq = 21.8000 GHz, Bw = 32.000 MH

Cross-spectrum

No calibration applied and no bandpass applied



Auto-spectrum

- Simultaneous obs(1G/8G) was done.
- When obs was started, DFB of KUS setting was changed from 1G to 8G.
- Then KUS has strange band shape.

VCS firmware upgrade



- ❖ **To support wideband correlation, Daejeon correlator new firmware was installed.**
 - Full output speed of VCS is supported.
 - 2/4/6/8 Gbps correlation is optionally possible for each obs mode.

Correlation Status



Season	Observation	Corr Finished	Remain Corr	FITS release
2016B	21(w/2 geo)	9	10	7
2016A	103(w/5 geo)	97	1	97

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Correlation status : [2016B](#) | [2016A](#) | [2015B](#) | [2015A](#) | [2014B](#) | [2014A](#) | [2013B](#) | [2013A](#)

2016B Correlation List

Season	#Observation	Corr Finished	Remain Corr	Remark	Update
KaVA 2016B	21	9	10	2	2016.09.28

[Finished](#)
[Doing](#)
[Not yet](#)
[Suspend](#)
[KJCC evaluation](#)
[Not related in KJCC](#)

Please click the observation code for more detail procedure!!

Observation Date	Observation Code	PI & SWG	Frequency Band	Corr Mode	Objective	Media POS	Copy Status	Fringe Detection	Correlation Status	FITS release Date
2016.09.26 (a16270b)	a16270b	K. Wajima	Q	VERA4S (C4)	EAVN Q imaging test 2016 Sep	STN	NY	NY	NY	NY
2016.09.26 (16270a)	k16km01f	K. Motogi/ES	K	VERA4S (C4)	Imaging of jet-tracing masers in G357.957	STN	NY	NY	NY	NY
2016.09.26 (a16270a)	a16270a	K. Wajima	K	VERA4S (C4)	EAVN K imaging test 2016 Sep	STN	NY	NY	NY	NY

<http://kjcc.kasi.re.kr>
<http://kava.kasi.re.kr>

Correlation Time Statistics



2016A	EA	Average days for corr completion	remark
Overall	103	52	
ESTEMA(Imai)	14	60	Hybrid (KVN re-corr)
Evolved Star(Hirota)	10	76	Hybrid (KVN re-corr)
ES(Motogi)	4	44	
AGN(Kino)	13	49	
AGN(Liu)	4	43	
AGN(Koyama)	6	47	
AGN(Ro)	13	46	
AGN(Park, Oh)	20	45	
GA-sub	2	51	
ToO(JS Kim)	4	47	
ToO(Miller)	3	58	
Test(IljeCho, Sugiyama)	3		C2 mode(short IP)
Others	2		Dual-pol
Geodesy	5	~30	Only copy & delivery
Diskpack delivery		13	OCTADISK

Period means each session final obs date to fits release date

Recent Activities

[2Gbps test correlation of VSREC recoder]



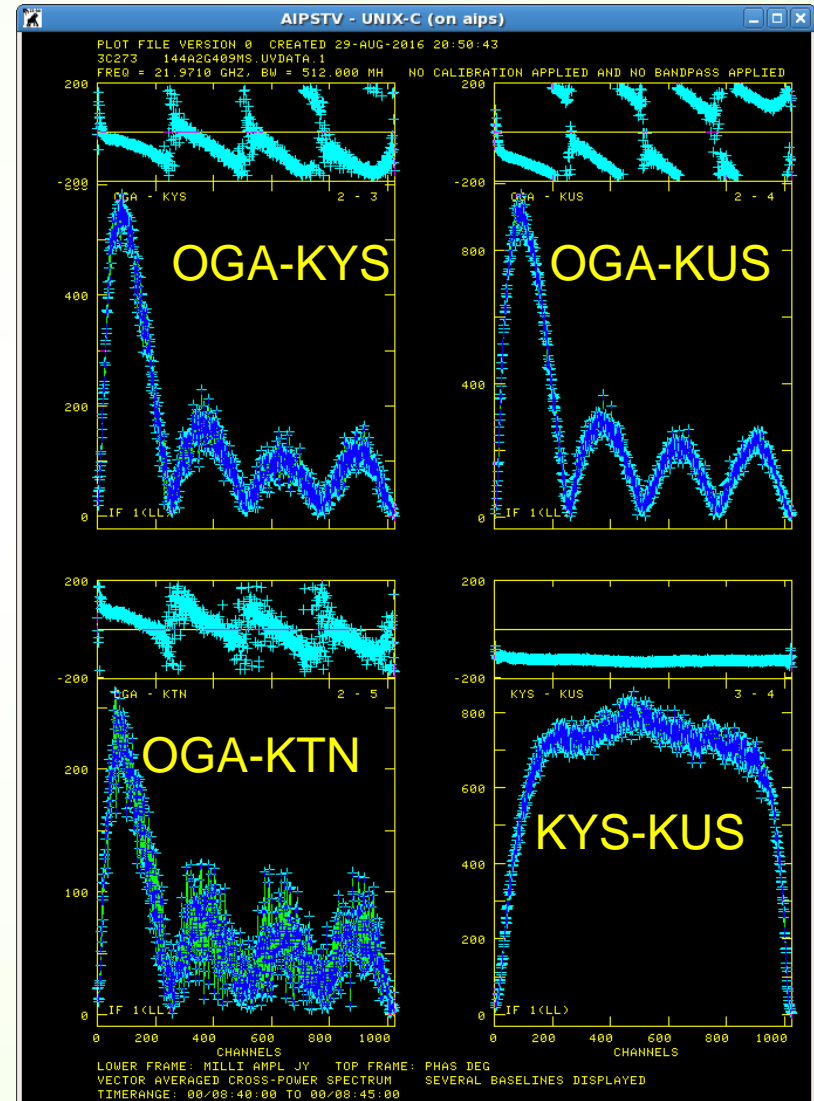
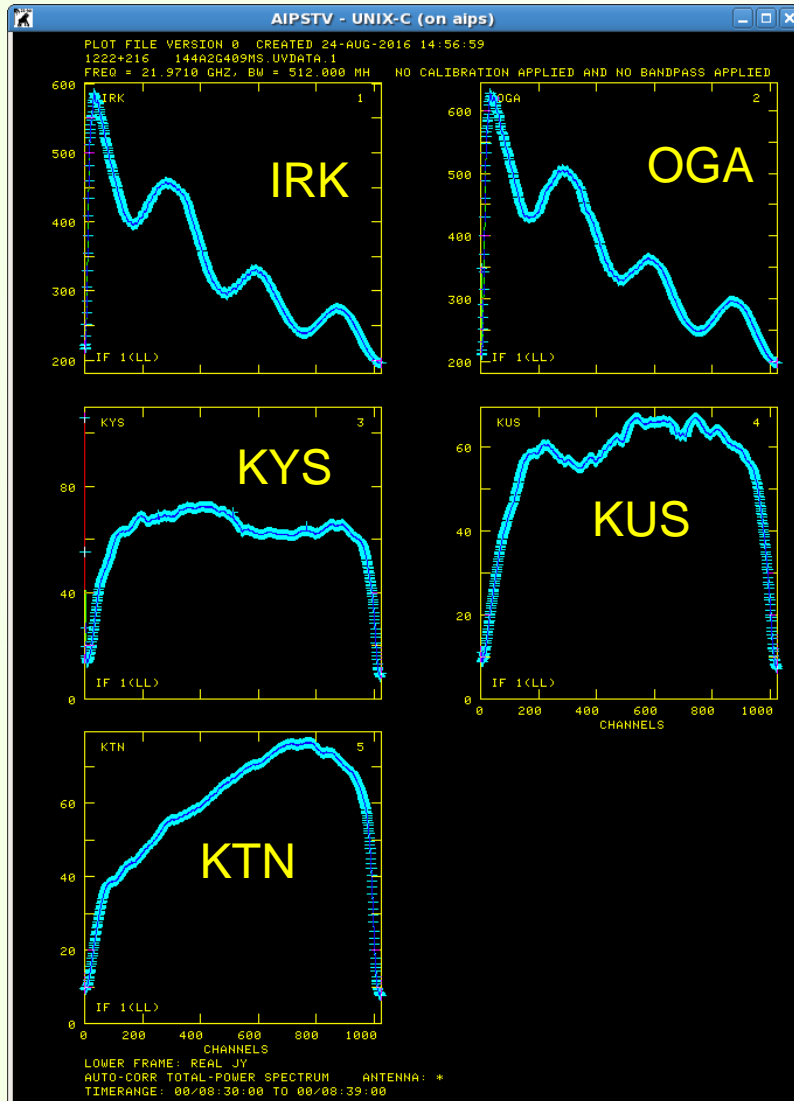
❖ K16mk02m(r16144a)

- 1G/2Gbps simultaneously recorded
- MIZ, ISH of 2Gbps were lost due to diskpack problem.
- 1G : OCTADISK(VERA)/Mark5B(KVN)
 - Normally fits released
- 2G : VSREC(VERA)/Mark6(KVN)

❖ 2Gbps correlation by KJCC

- KJCC had already experienced the 2Gbps correlation, but we found that strange features for correlation result were appeared and surprised.

Strange features of Corr.

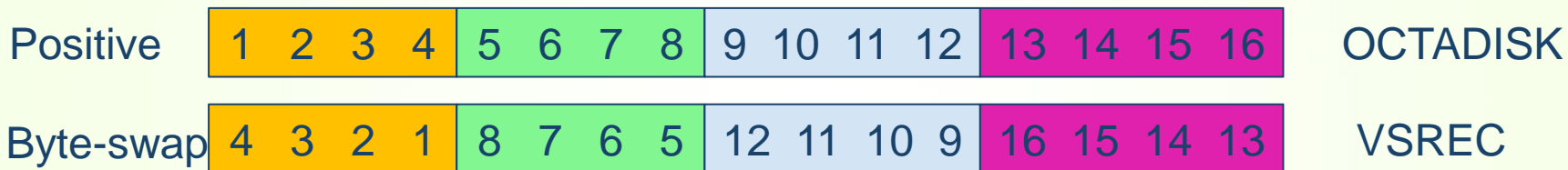


VSREC bit-assign(reversed)

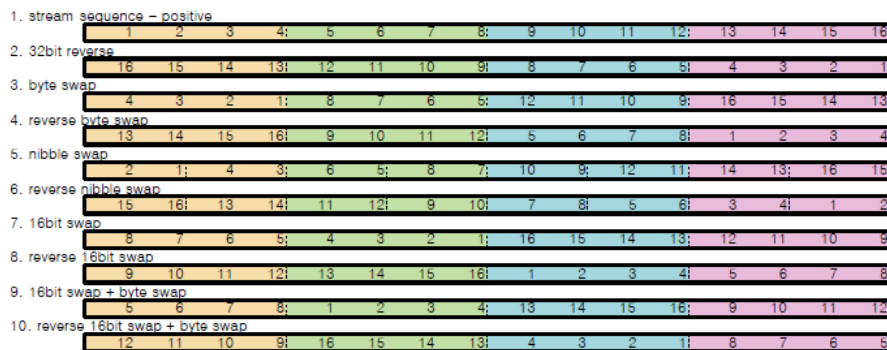


❖ Bit-assign

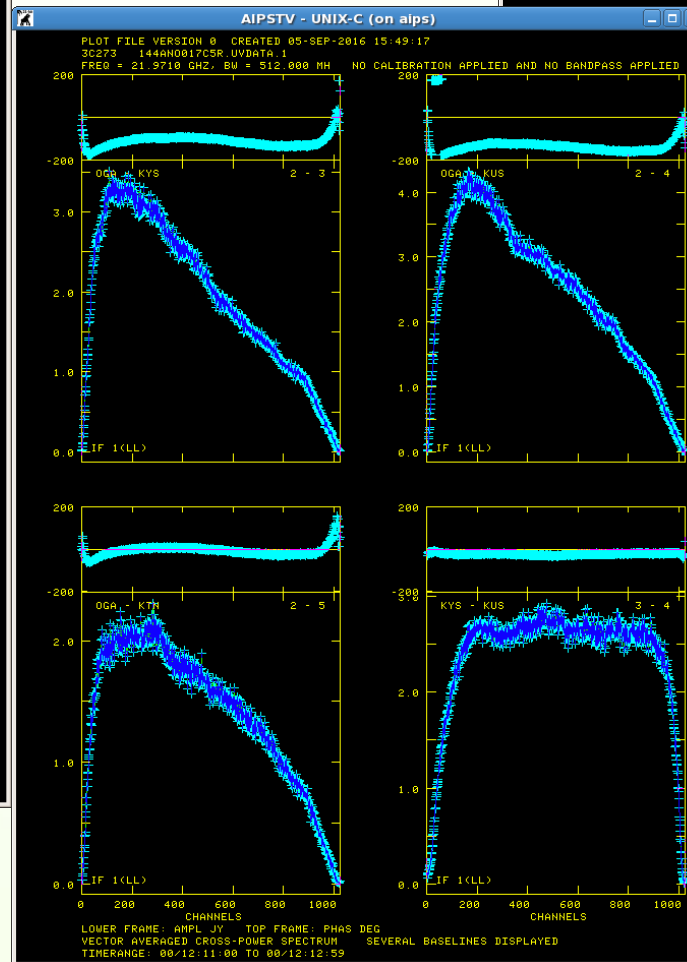
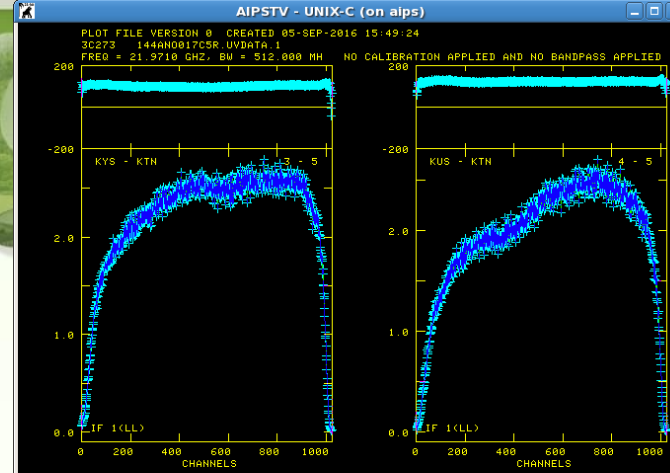
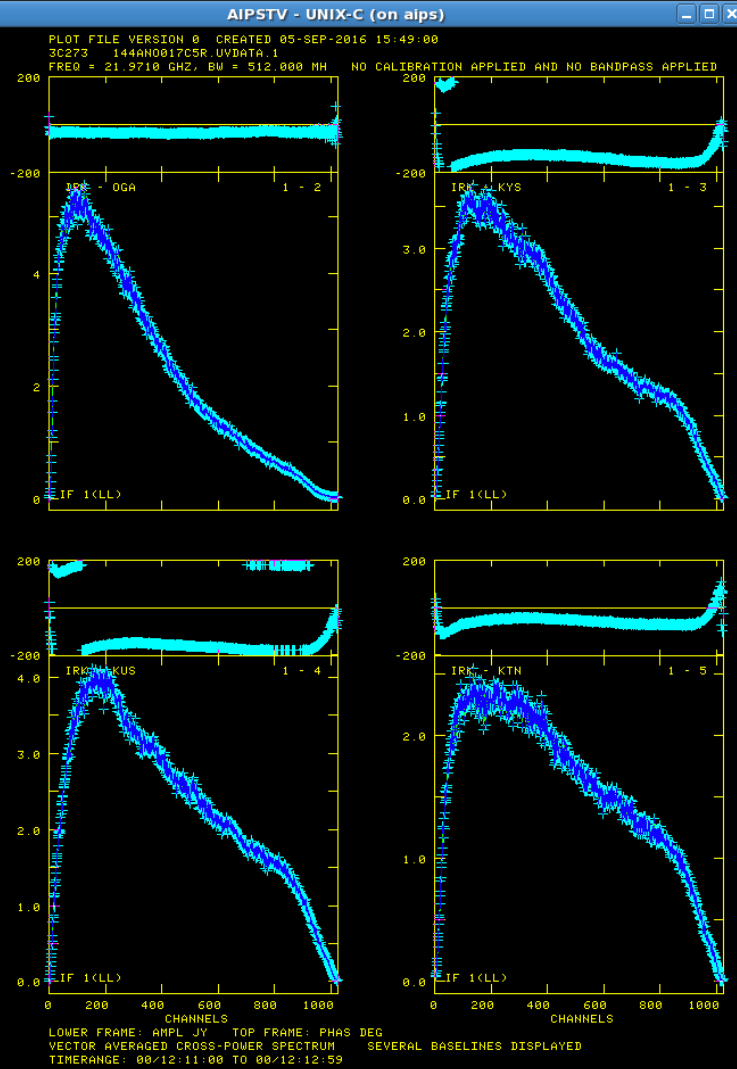
- Bit-assign of VSREC is reversed compared to OCTADISK as bellowing BYTE-SWAP
 - Stream sequence : 1sample=2bit



- No-information from VERA, we did 10-kinds of bit-assign test.
- After correction of bit-assign, we got the fringe.



VSREC 2Gbps corr result



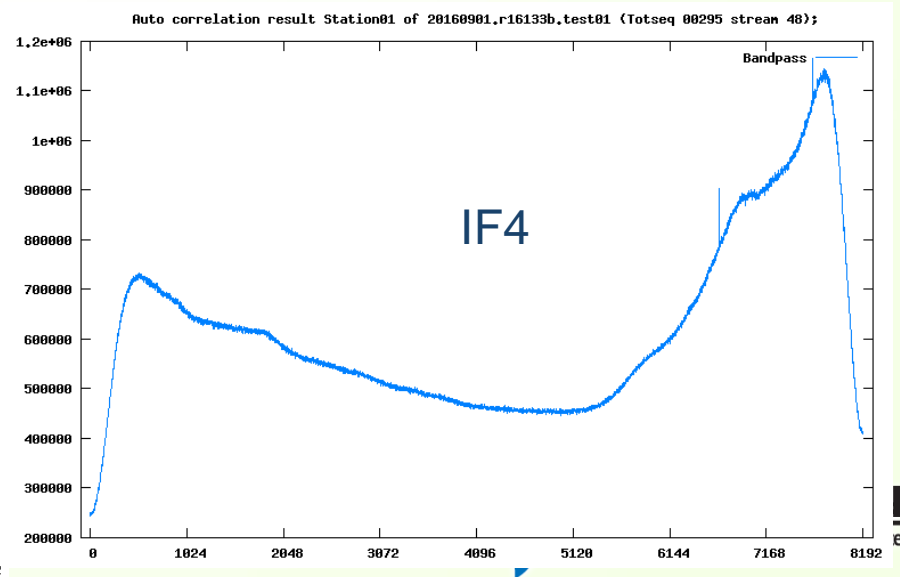
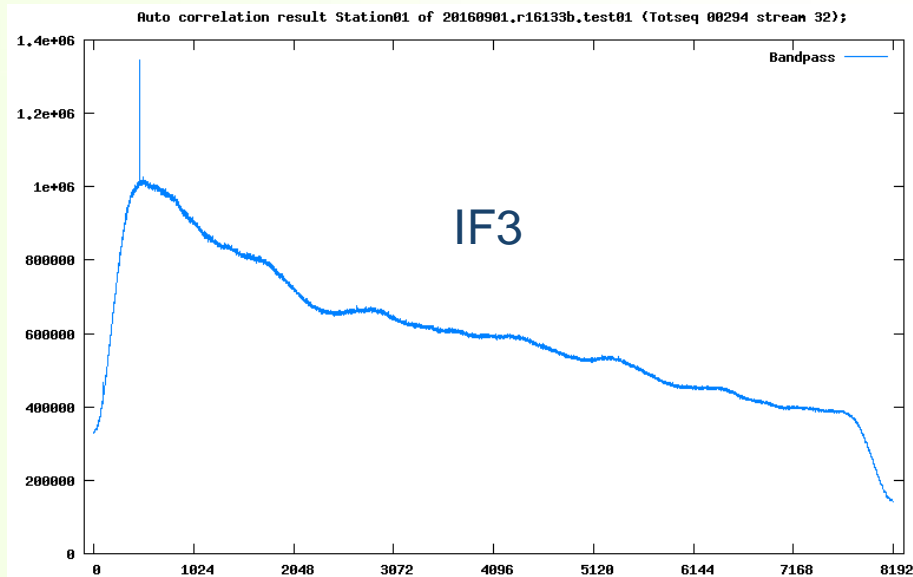
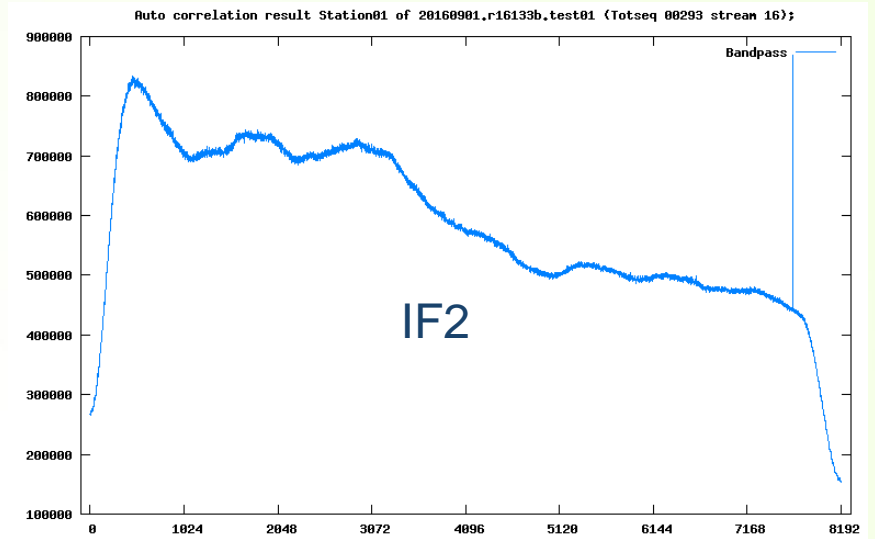
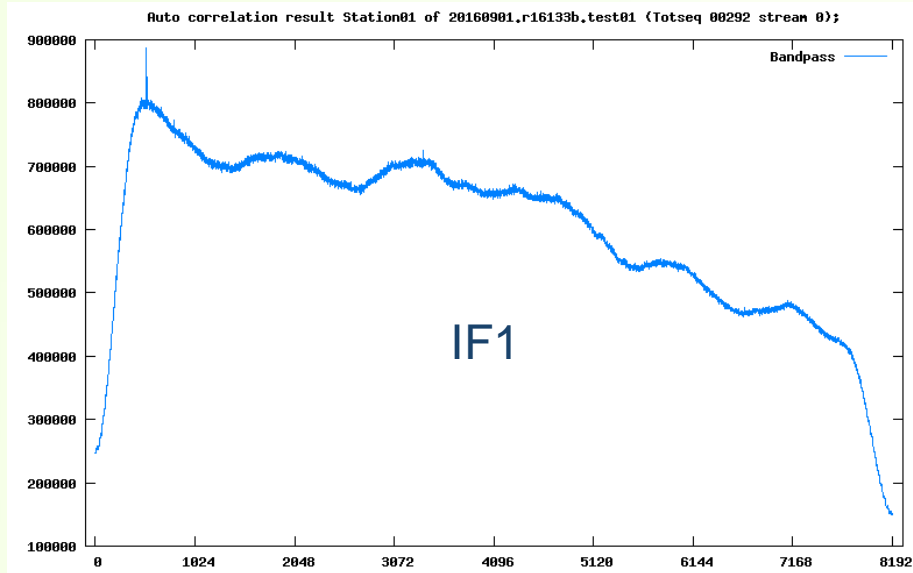
TOP FRAME: PHAS DEG
 3-POWER SPECTRUM SEVERAL BASELINES DISPLAYED
 00 TO 00/12/12:59

8Gbps by Daejeon correlator

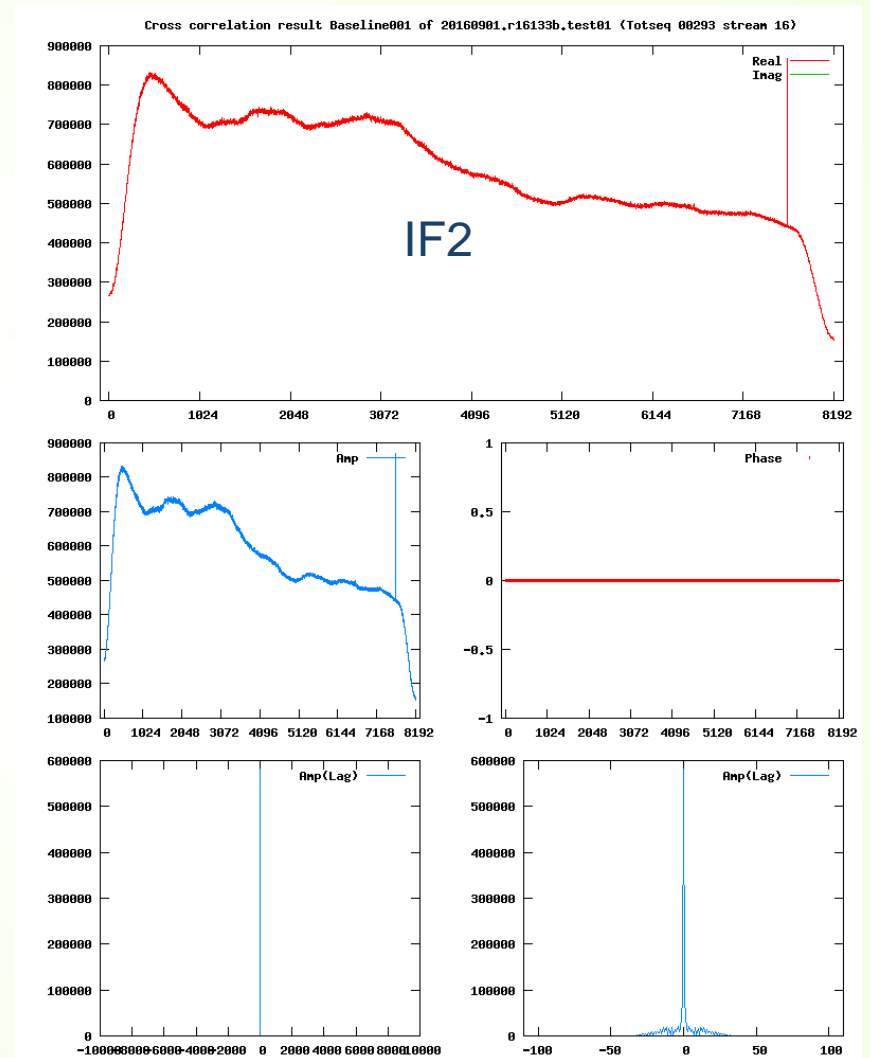
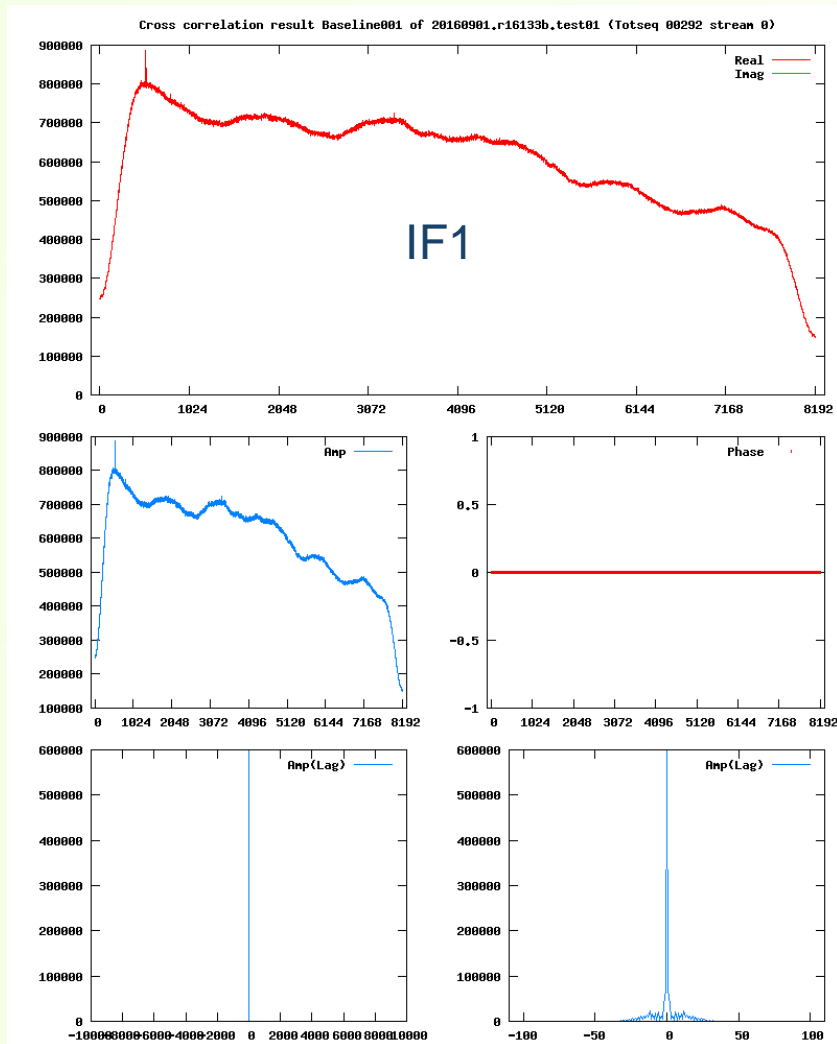


- ❖ OCTAD, OCTADISK2 were installed at KYS with the help of NAOJ(Oyama-san).
- ❖ R16133b : KYS, MIZ, IRK, OGA
- ❖ Source : 3C279 @ 22 GHz
- ❖ 4 wideband(512MHz BW x 4 IFs : 2048 MHz BW)
 - 2Gbps(1Gsps x 2 bits @ 512 MHz BW) x 4 IFs
- ❖ Correlation : After obs, MIZ SW-CORR was used for confirming the result. Then VERA data was deleted unfortunately.
- ❖ KYS data was only used for Daejeon hardware correlator in order to just check the correlation function of 8Gbps.

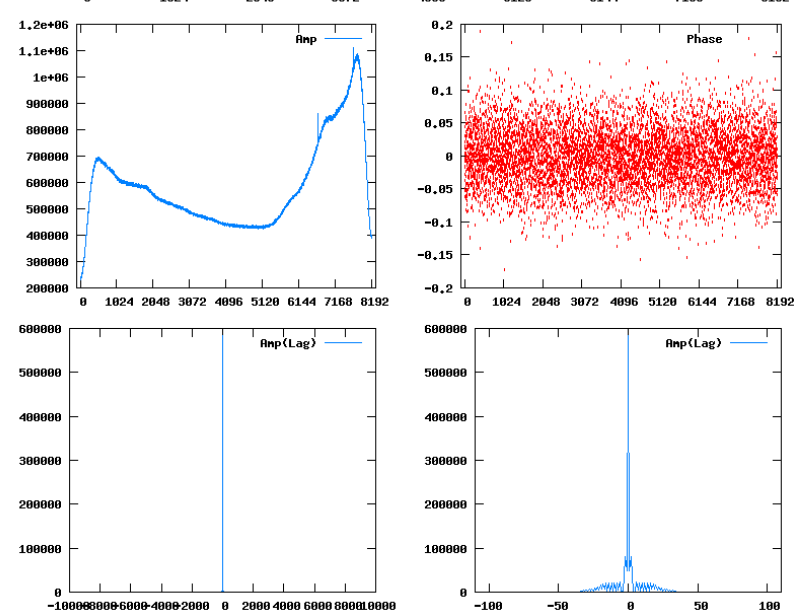
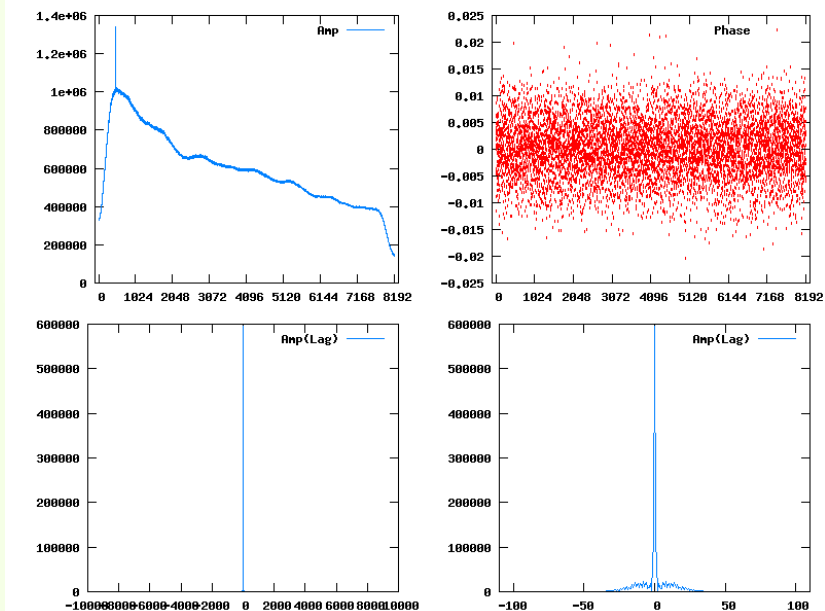
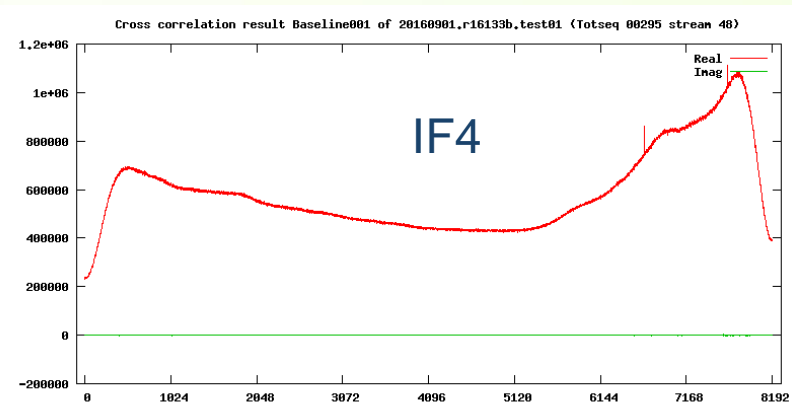
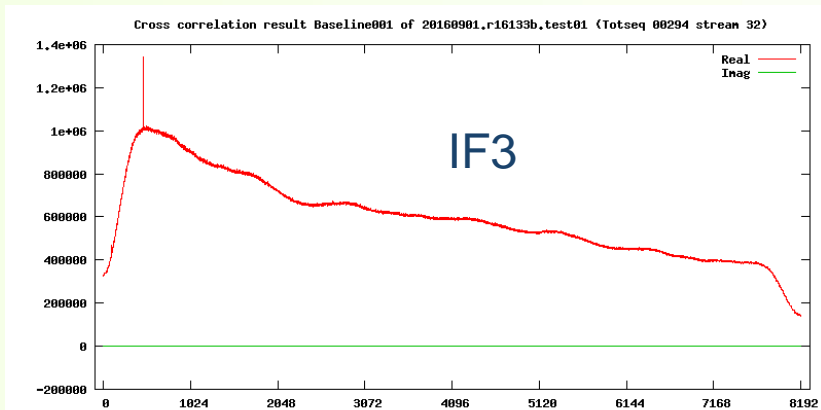
8Gbps Auto-corr



8Gbps Cross-corr(actually Auto)-1



8Gbps Cross-corr(actually Auto)-2

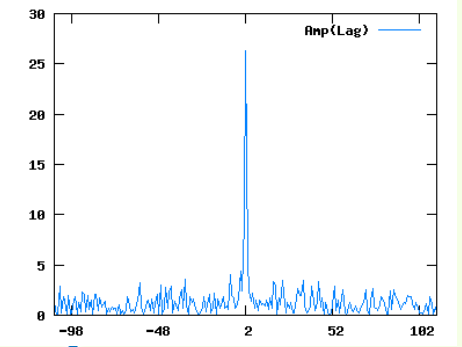
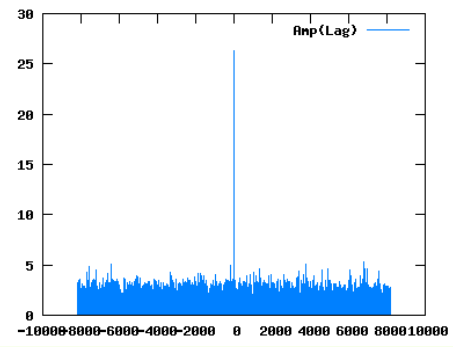
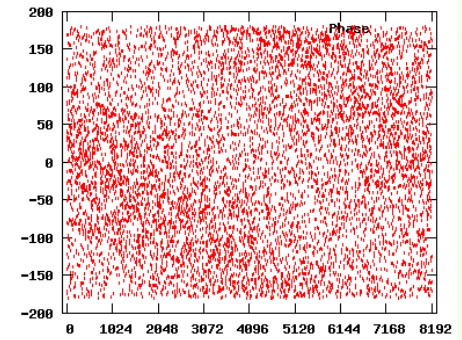
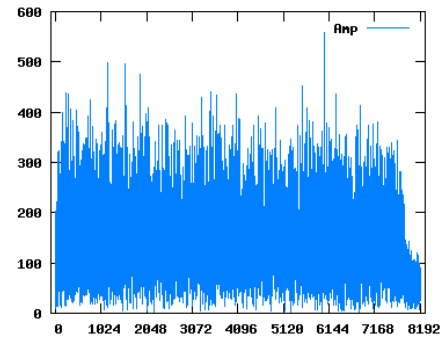
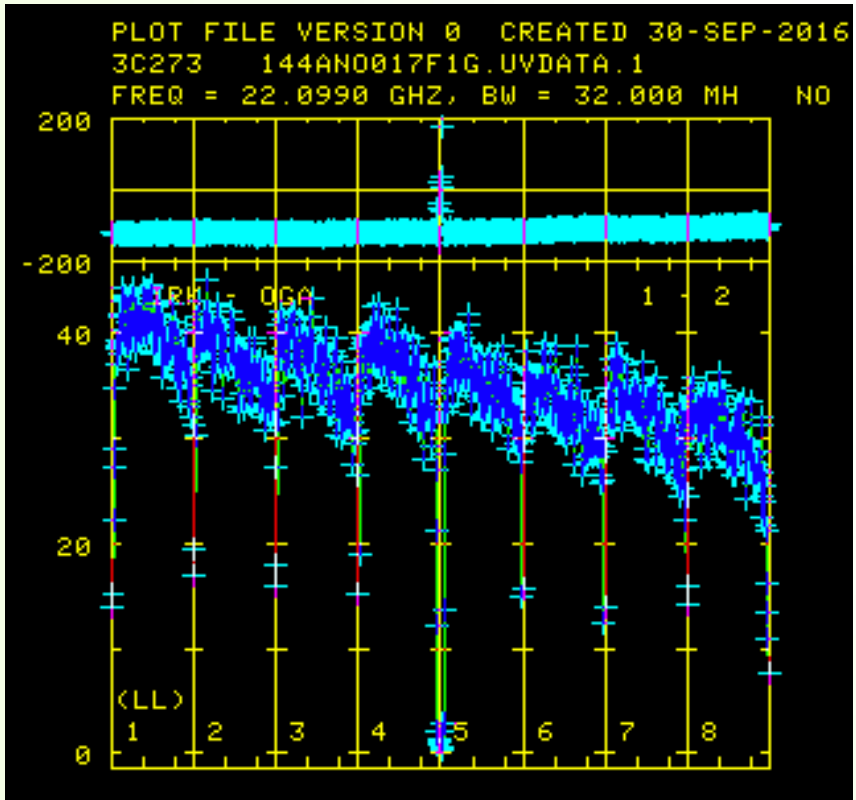
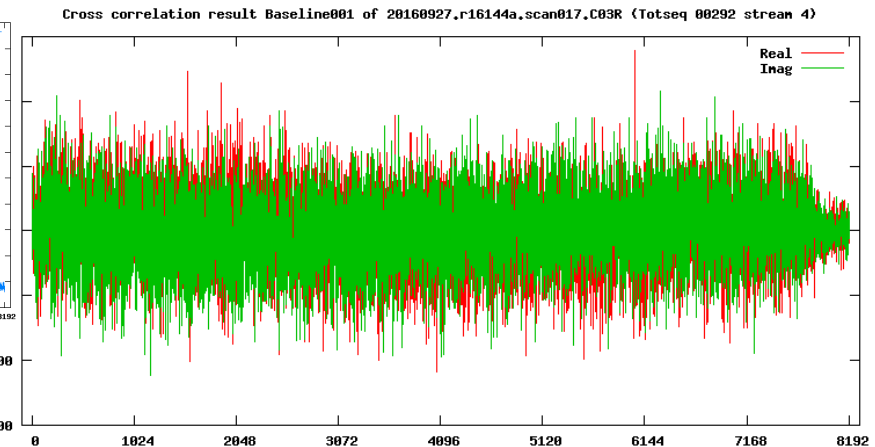
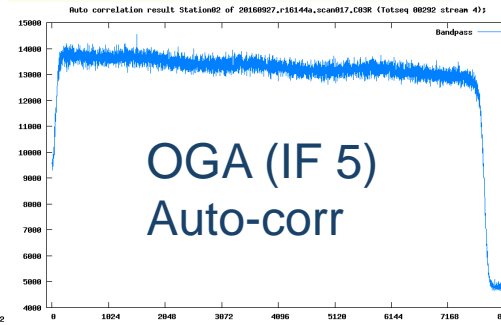
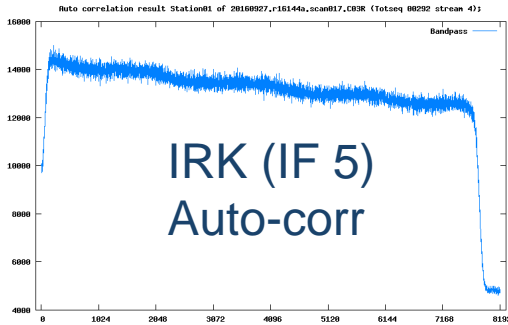


SW Digital Filtering by Yeom-san



- ❖ In order to solve the different observation mode such as 2Gbps(512MHz BW x 1IF) or 1Gbps(32MHz BW x 8IFs), SW Digital Filtering method was considered and developed.
- ❖ Advantage : if VERA HW DFB has problem, it will be helpful to process.
- ❖ Disadvantage
 - Current version is very slow. it needs to be modified the algorithm for speed up.

R16144a(2Gbps → 1Gbps) SW DF



For wideband correlation [Daejeon Correlator?]



❖ VCS specification

- Already designed and implemented for wideband(8Gbps)
 - But the other equipment as playback terminal and output saving system are also needed to be prepared.
1. The software for data splitting and upload to the RVDB are required.
 2. The playing back of the RVDB with 8 Gbps observation data to the VCS is needed.
 3. 8Gbps correlation by the Daejeon correlator is also needed according to the 4 VSI input.
 4. CODA/FITS SW(Post processing SW) for correlated result is also needed and improved.

Data Splitting and transmission SW



❖ KVN 8Gbps observation

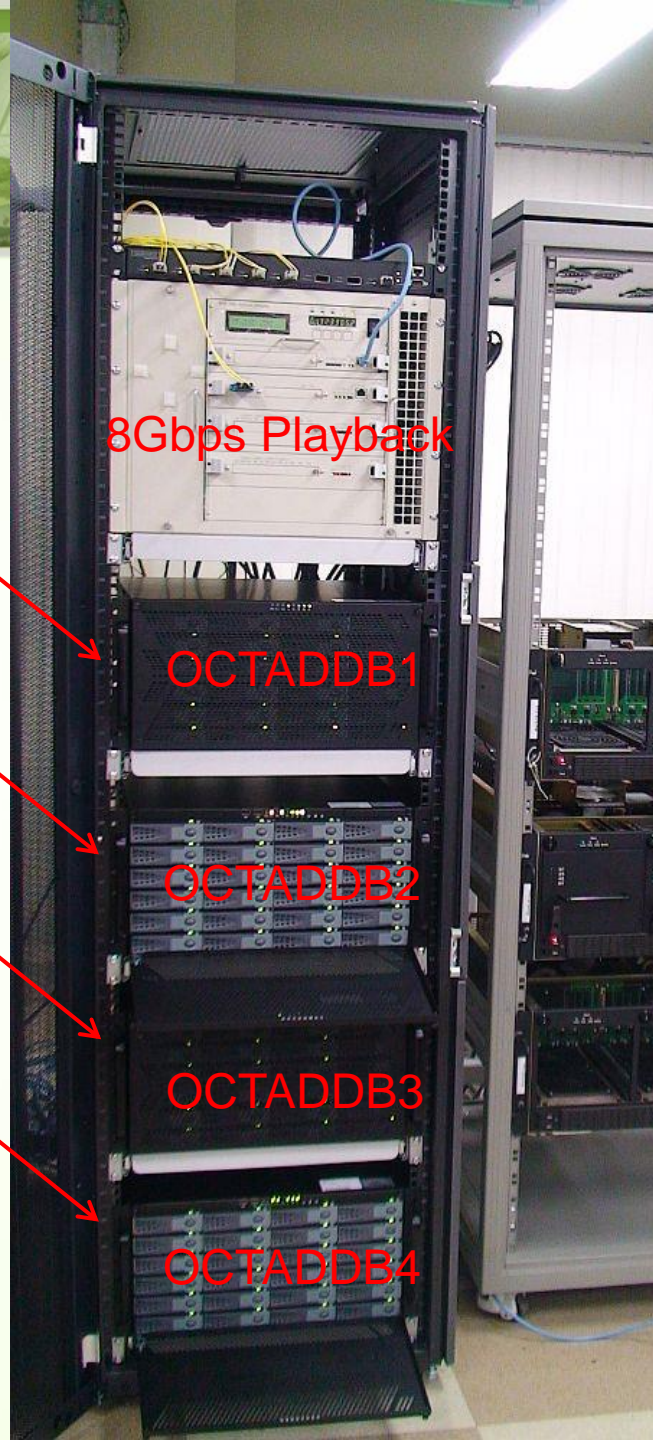
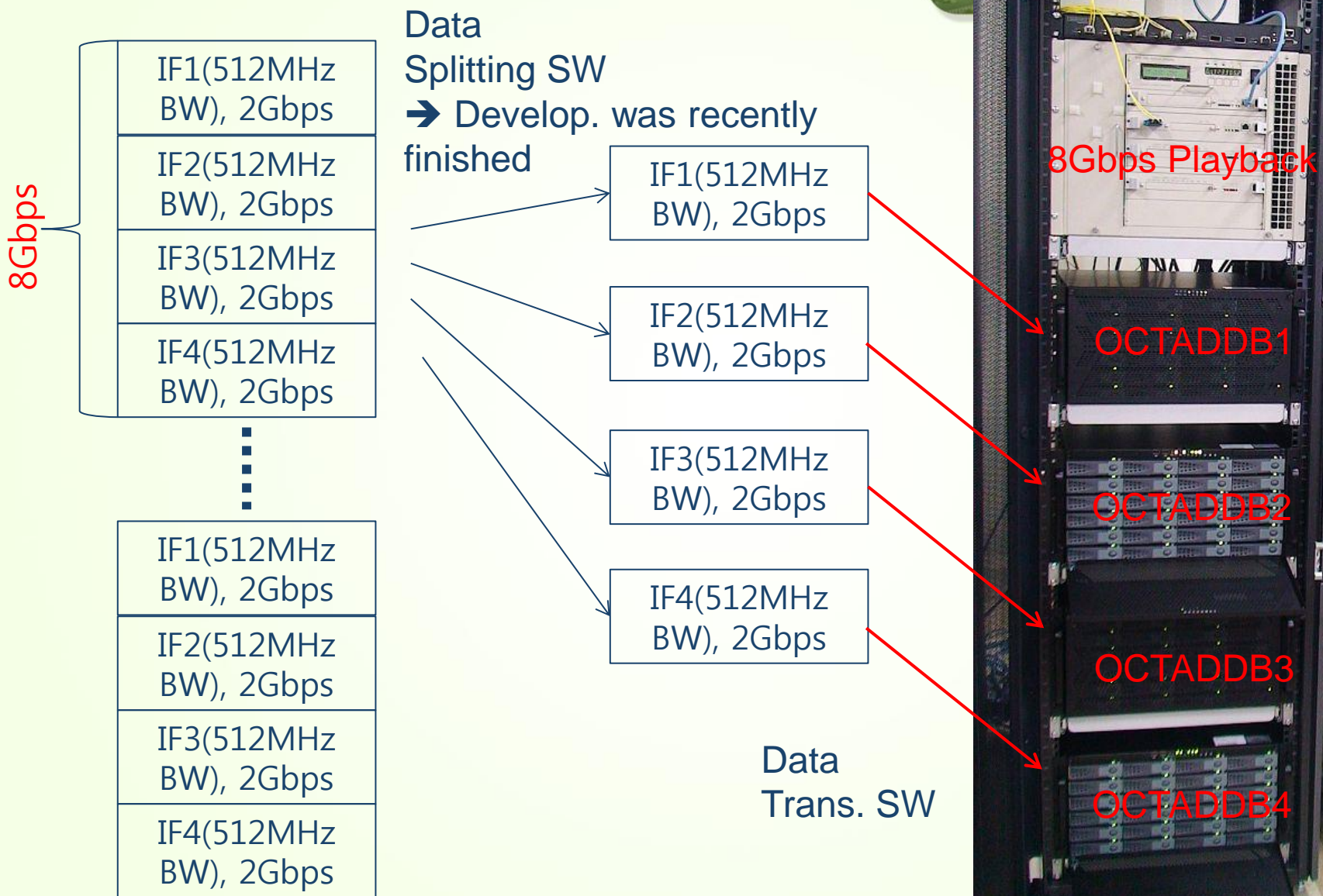
- 1024 Msps x 2bits x 4streams/station
- The obs data of 22, 43, 86 and 129 GHz frequency for the KVN multi-frequency simultaneous observing system is combined with 4 data streams as time-ordered.
- Mark6, file system is combined with 8Gbps → need to split
- Data Splitting SW development was finished and will be tested

❖ VERA 8Gbps observation

- 4 frequency like KVN is not supported, but 2 frequency (22/43, dual-beam) simultaneous obs mode are supported
- In this case, 22/43 LCP/RCP obs for KaVA will be used.
- OCTADISK2, file system is separated with 2Gbps each.

Data Upload to RVDB

Data Splitting & Transmission Basic



New Archive System



- ❖ The maintenance service of current Archive system from Vender will be terminated in this September 2016.
- ❖ For introduce new archive system, KASI searched for some vender(EMC, HP, DELL etc). And we also discussed with Elecs industry for modifying OCTADISK2 to some storage system.
- ❖ Elecs proposed that OCTADISK2 is also some kind of storage and it is able to be modified storage. They could provide receiving SW from VCS. The test performance experiments proposed VCS Data Archive(VDA) is satisfied as VCS maximum output speed.
- ❖ By the Public Procurement Service(PPS), the competition was finished and made a contract with Elecs Industry(Metaspace). It was installed in the end of August 2016.

New Data Archive System

VDA(VCS Data Archive)



- ❖ **CPU : Intel ZEON, 32 cores**
- ❖ **Memory : 32GB**
- ❖ **Storage : 160TB(RAID 5, 6)**
- ❖ **Interface :**
 - 10GbE x 8 ea, SFP+(4 VCS, 4 External)
 - 10GbE x 4ea, 10GBASE-T (Gluster File System)
 - 1GbE x 4ea, 1GBASE-T (Control)
- ❖ **Access speed :**
 - Write : max 1.4GB/sec
 - Read : max 2.2GB/sec
- ❖ **Installed and tested**
 - Full speed(1.4GB/s) of VCS results are saved



❖ Help to data conversion of VERA

- Data bit-assign of VERA is different from standard Mark5B(Italy, KVN)
- KJCC developed many data handling SW such as data conversion (mk5b to vdif, octa-vdif to std-vdif, vdif to mk5b, etc.)
- Test conversion of short VERA data was successful. Now whole VERA data is converting to deliver Italy for make correlation.

STARDOM server



❖ STARDOM server

- Over 2Gbps observation requests are quite frequent and 2/8Gbps observation will be normally conducted soon.
- Data transfer from Mk6(or OCTADISK(2)) is needed to be uploaded to RVDB.
- KJCC now prepared 2 data transfer server.
- 2 more server will be introduced within this month for e-transfer of KaVA



Future Work



- ❖ Full 8Gbps correlation
 - Currently 4 station is possible.
 - For KaVA 7 or 8 stations, 4 RVDBs are needed. For this issue, DM is now discussing for modifying VCS data input part(change VSI to VDIF)
- ❖ CODA/FITS
 - Support 4/6/8Gbps correlation
 - Support for Dual-polarization
- ❖ E-transfer test from VERA