

ECSV Discussion

11 September 2012, 10am in room 317

Attendees:

Bryan Butler, Claire Chandler, Barry Clark, Mark Claussen, Vivek Dhawan, Eric Greisen, Huib Intema, Jeff Kern, Kristine Lynch, Josh Marvil, Minnie Mao, Drew Medlin, Amy Mioduszewski, Robert Mutel, Steve Myers, Susan Neff, Kristina Nyland, Frazer Owen, Nurur Rahman, Dave Roberts, Nirupam Roy, Michael Rupen, Bob Sault, Deb Shepherd, Lorant Sjouwerman, Ravi Subrahmanyam, Gustaaf Van Moorsel, Joan Wrobel, Hsi-Wei Yen

Minutes:

News:

- Bob Mutel has arrived. He will be staying through Oct & Nov working on phased array commissioning with Vivek, Jon, Amy and Walter. Amy will be his primary contact for commissioning work. Bob will be working 2/3 RSRO and 1/3 visiting scientist.
 - Bob's grad student, Kristine Lynch, is here working for 2 months (until 10 Nov). She will be in room 200B.
- Dave Roberts came 26 August (sitting in the office next to Ravi). He will be here until 20 December.
- Soon-to-be-here RSROs:
 - Nissim Kanekar may be here in mid- to late-October to work with Frazer on low-band. His visit is still under discussion. He is dealing with visa issues.
- Joe Lazio will be here 24-28 September. Working on science and pulsar commissioning.

Correlator and general system health (Vivek, Michael)

- Things are working pretty well after the move to BnA configuration. We have not been able to get a pointing run done because of the weather so K and Q band observations are on hold until we get the pointing model updated.
- The only real problem that occurred as a result of the move is that the digital transmission system stopped working for about 1/2 of the 3-bit samplers that were moved. Engineers are going to the site today to fix this problem. The root cause is still being investigated. This is the first move since we have had the 3-bit samplers installed so finding a problem is just part of the commissioning.
- A power outage was scheduled today to work on the West Arm. This is being delayed due to weather, maybe it will happen later today.
- The highest priority issue to work on has been the performance of the 3-bit samplers that enable 8 GHz bandwidth observing. The 3-bit testing that has happened in the past week includes:

- A bug was fixed in the executor software to allow 3-bit observations to setup more easily and faster (only 2-3 minutes versus 10 or more minutes before). This seems to be working well.
- Michael Rupen has been working with Dave Harland to get the model2script (m2s) software to employ new functions that invoke 3-bit seamlessly. M2s is the underlying software that takes the inputs from the user defined in OPT (schedule blocks, SBs) and translates them into files that control the antennas and the correlator configuration. The changes seems to be working although it needs more testing by Vivek and Michael. This change may be ready to test by RSRO types next week.
 - Note: it is still necessary to run m2s manually on a submitted SB rather than being run by the automatic scheduler. However no hand editing should be required now.
 - Bryan needs to consider how to go the next step in which a user submits an SB in the OPT and this is automatically available to be scheduled by the operator.
- There are still some one-off issues with the Correlator Back End (CBE) during 3-bit testing. These will be pursued as they come up.
- ***Next Tue we will have a summary about how to do a 3-bit setup in the OPT. This will be in preparation for RSRO testing.***
- Martin coded a new version of the CBE that should have included some modifications that make it possible to submit parallel SBs for sub-arrays. However, a test yesterday revealed that this update caused the correlator to drop binary data files (BDFs). So there are still some issues that need to be trouble-shooted.
- Claire has reported intermittent phase jumps on EA 14 and 23 (before the move) – no one else reported seeing this problem in their data.

Software status (Bryan):

- We have been plagued with a problem in which the user cannot create a uvfits based on archive data. Older versions of the CASA/archive interface could do this but not the current version. We are getting about 10 requests per week for uvfits and Drew Medlin is having to create these by hand. The current workaround is being defined by Jeff, Dave Harland and Bryan. The plan is to put a layer of coordination between the archive and CASA versions so if someone requests a uvfits, the request will be directed to a version of CASA that works correctly. The basic problem of the uvfits conversion is being addressed by Honglin.

CASA (Jeff & Steve) -

- We are coming into the end of the development cycle for CASA 4.0. We are currently struggling to get the next test version out that will be the pre-release version. Hopefully this will happen next week.

- Juergen is back Monday and will be coordinating testing of the new features in this test version.
- We will soon be deciding the process of what we will do in the next cycle. ALMA and EVLA pipelines will take up most of the available CASA effort. This next cycle starts development on 15 October 2012.
- A few weeks ago Betsy Mills made the casaguides more organized and user-friendly.
 - She created a new front page: <http://casaguides.nrao.edu/index.php?title=NewPage>
 - She also made slight organizational changes to the following pages: <http://casaguides.nrao.edu/index.php?title=HTT2> (hints tips and tricks)
 - <http://casaguides.nrao.edu/index.php?title=UST2> (User scripts and tasks)
 - And created: <http://casaguides.nrao.edu/index.php?title=List of All Tutorials>
- Steve and Gustaaf looked at this – they said it looked OK; no comments sent to Betsy yet.
 - **Action:** Deb will review Betsy's new casaguides organization and content and decide how to move forward.

Project updates:

- **Ravi Subrahmanyan** gave a status of the low-band system and what we are doing with the new 4-band feed design project. First some background:
 - Currently we have about 14 P-band (270-480 MHz bandwidth) feeds mounted just below the sub-reflectors. There are issues with a few as they are being installed and commissioned but most are working as expected.
 - The low-band system includes 4-band feeds (60-90 MHz) that are dipoles that mount in front of the sub-reflector with hanging cables. For a description of the low-band system, see: <http://www.aoc.nrao.edu/~pharden/LBR/lbr.htm>
 - The 4-band dipoles must be mounted on the antenna for the observations and taken off when not observing so we do not interfere with L band observations. The goal of this project is to design a feed that doesn't interfere with L-band observations so the dipoles can be left on the antennas at all times, allowing more flexibility and access for our users. Ravi is looking at a design in which the dipoles do not interfere with other bands – where the dipole elements are not located in front of the sub-reflector. Two of these have been designed and installed on 2 antennas. Initial tests are promising with good response between 60 and 90 MHz.
 - One test that was recently performed was to determine if the hanging cable attached to the 4-band dipole caused the observed loss in efficiency at L-band. The cable was run along the feed legs on the

antenna and then test observations were made at L-band when our standard dipoles were installed (across the sub-reflector) and not installed. The L-band gains drop between 4.5 and 5%. The old 4-band receivers with the hanging cables lost about 6% also so these measurements show that the hanging cable does not dramatically affect the observed loss in gain at L-band. It must be the dipoles themselves.

- The next step is to put four of the newly designed 4-band receivers (that do not interfere with the sub-reflector) on the array and test to see what the gain will be and whether there is any gain or polarization interference at L-band.
- Now, the P and 4-band feeds are separate at this point with the receiver located in a common area behind the sub-reflector. The next possible upgrade is to design a unified feed for both P and 4-bands and replace the current feeds on all antennas. This is a longer-term research project to determine if it is feasible for such a feed design to work. Ravi notes that since the system temperature on the 4-band receivers are so high (~ 1000 K), having poor efficiency at 4-band is not likely to be a limiting factor.
- **Vivek & Hsi-Wei Yun** gave a status of the performance and commissioning of the 3-bit sampling system in the correlator and the switched power application to the 3-bit system. Vivek's status summary of the system is given below:
 - All antennas have been outfitted with the 3-bit samplers, 224 samplers in all plus (112 8-bit samplers).
 - The sampler health can be done with a Quick-look quality check using the telcal plot – this takes about 2 minutes.
 - Fixing bad ones takes 30-60 minutes per antenna depending on how many samplers in an antenna are bad.
 - There are 4-6 samplers that cannot be fixed in the field and they simply need to come home for fixing, but the replacement of those samplers awaits spares -- maybe late October??
 - When observing with 3-bit samplers, we now need a setup time of 2 to 3 min at start to set the requantizer gains and equalizers. This is much better than the previous setup time of 10 min or more.
 - The current overheads are (may go down):
 - Dummy scan for each LO tuning: 3min at the beginning of the script
 - This may have to be repeated as the input signal changes, most notably due to elevation changes, especially at high frequency.
 - Requantizer setting scan at the beginning of each LO block: 1min (cannot be combined with dummy scan above)
 - If a single LO block is very long this may have to be repeated – we don't know yet.
 - The sampler characteristics are generally good after they are properly tuned (massaged). Phase, delay and band-pass performance are

generally acceptable (nearly the same as 8-bit). Polarization cross-talk also seems to be reasonable but this needs more careful evaluation.

- This could use some careful checking now that we have all the samplers
- Amplitude stability: 0.3%, sometimes 1% deviations.
- Previously we had been having problems with the correlator backend and correlator configuration mapper (CM) software when running 3-bit programs. When we changed the configuration in the correlator or used a large percent of the resources, we would get crashes, missing data and subsequent data corruption even with the 8-bit samplers. Most if not all of this appears to be fixed now. We can now do referenced pointing at X-band with the 8-bit samplers and switch back to 3-bit samplers, seamlessly and beautifully.
 - We still should watch out for very large configuration files as this may push the boundaries of what is currently possible. This should be OK for the next several months so the priority on this is not as high.
- One problem we have found is that antenna moves cause problems in the digital transmission system.
- How we calibrate 3-bit data is in testing, Hsi-Wei is focusing on various aspects of this.
- Changes to the OPT are being made so we can set up for 3-bit observing without having to hand edit scripts. An updated OPT (in the webtest arena) should be ready to test general 3-bit schedules. The full SBs should be built in the OPT-webtest software, then these will have to have model2script run on them and submit the SBs by hand. If this works, we will get it to be more automated so the OST can schedule the 3-bit SBs automatically.
- Hsi-Wei has been working on the following:
 - Hsi-Wei has mainly worked on 2 datasets:
Kac3bd8.56155.54123957176 & Kac8bd3.56155.57043540509.
These data can be found in the data archive. The observing date is around 8/16.
 - Summary:
 - Making images of each spectral window of data from 3 bit and 8 bit samplers to compare their noise levels. This part did not apply the switched power and just did normal calibration (setjy, initial phase, delay, bandpass, initial gain, and gain calibration). Hsi-Wei designed a script to do that (given to Dave Roberts and Vivek). It needs some input parameters and "plotweather".
 - Developed a script to find bad samplers that used gain tables to find bad samplers. The idea is that, at each frequency, to get

median value of gain factors and to compare all gain factors with the median. If there are some gain factors deviating from the median by a certain value, those are data from bad samplers. The script is used before splitting data. The script was given to Dave and Vivek.

- For switched power application, Hsi-Wei wrote a script to read a raw switched-power table and to calculate T_{sys} and SW gain. He compared his results with those from gencal in CASA, and they are consistent. He compared T_{sys} in CASA and in AIPS, and they are consistent. In these testing observations, re-quantization gain was changed in the middle of the observations. He did the calibration with and without applying the switched-power table and compared the results. The bottom line is that changes in the requantizer levels produces the appropriate changes in gain.
 - The next thing Hsi-Wei will look at is to understand "statwt" in CASA, which calculates the weighting of each visibility data. He will compare this with REWAY in AIPS. Hsi-Wei has talked to Vivek about this. He will compare the weight calculated by statwt with T_{sys} of the visibility data and the RMS of each ant.
 - It will be good to develop a pipeline script based on Hsi-Wei's script development to process the 3-bit continuum data.
- Things to note:
 - There is a missing antenna efficiency number and a combo of coefficients to go from K to T_{sys} . This should be something that we provide as an EVLA service.
 - The SDM knows the data is 3 or 8 bit. But AIPS and CASA do not know this and this information is needed to understand the antenna efficiency.
 - Image RMS in 3-bit images is ~15-25% worse than matched 8-bit data (can be improved depending on how strict you apply flagging) It would be interesting to try setting weights correctly, e.g., with REWAY, to see how that affects the image fidelity.