ECSV Discussion
9 October 2012, 10am in room 317

Attendees:

Barry Clark, Vivek Dhawan, Miller Goss, Eric Greisen, Jeff Kern, Ann Mao, Minni Mao, Susan Neff, Kristina Nyland, Juergen Ott, Rick Perley, Dave Roberts, Deb Shepherd, Lorant Sjouwerman, Ken Sowinski, Ravi Subrahmanyan, Hsi-Wei Yen,

Minutes:

News:

- ***See last item in these minutes – first 3-bit imaging science is VERY impressive.***
- Ann Mao is back for the month, this will be her 3rd and final month as RSRO.
- The AIPS cookbook is being updated.
- Jamie Stevens, senior system scientist at the CSIRO ATCA, is visiting this week. He will be giving the Wednesday lunch talk.

Correlator and general system health (Ken, Vivek)

- Power at the site is off most of the day. James Robnet is doing work in the correlator room (rewiring to get full data flow throughput in a switch, giving a hopefully 20% improvement in the data flow). James is also putting in infrastructure to support infiniband addition to the luster to improve bandwidth (to 10 GB).
- 3-bit testing (use WebTEST OPT followed by M2Stest) status:
    - 3-bit calibration: we will run with set-n-remember but we will not be able to apply the switched power corrections. Requantizer gains must be reset with every scan.
        - We cannot calibrate 3-bit data in CASA until the can apply the changing requantizer gains however this was added to AIPS recently so 3-bit data can be calibrated in AIPS (see Rick's report of the first 3-bit imaging below).
    - The largest 'blocker' in 3-bit development is still that the Correlator BackEnd (CBE) often fails when 3-bit scripts are run back to back. This is being worked on by Martin at high priority.
        - Note that 8-bit scripts using a large fraction of the correlator resources also causes failures, like in 3-bit.
    - Miller has been working on testing the 3-bit bandpass. He observed 3c454.3 using 3 correlator setups, 4, 2, and 1-Stokes, with the same LO-IF setup in a 2 hr SB. There were 64 sub-bands, each with 256 channels. This SB was run on two successive days to examine bandpass stability.
        - Miller has been looking at the data, determining the bandpass on day 1 and applying to day 2. The bandpass stability is

extremely good: to about 0.1%. Phase difference is only a few degrees.
    - Moving antennas bothers the 3-bit system. There are two main areas of concern:
        - The DTS system doesn't stay in sync when the move occurs. It takes a while but eventually it settles down after a while. Perhaps low-optical power affecting the lock circuitry?
        - Some 3-bit samplers also misbehavior during moves. In the move to A configuration, samplers 10A2C2 and 28B2D2 failed outright and several more needed re-booting. Given that we have no spares, it takes time to get the system in good working order.
    - Mark Claussen also submitted a 3-bit test and this was run but there are no test results available yet.
- Low-band
    - The 4-band dipoles were on the array for basic testing for several weeks starting during the move to A config. After many tests, they came down last Friday. The test data is being evaluated by Huib & Frazer. Ravi also did a test with the first use of 'box dipoles' on ea05. Initial indications of the box-dipoles showed that signal was obtained from the dipoles and now the issue remains as to how to calibrate the data.
    - Nirupam tried a test with 100msec output integration with 512 channels, single sub-band, on a long-period pulsar at P-band. It worked, with little or no data lost (i.e. zeros) from CBE.
- Other observing mode testing:
    - Michael Busch tested a mode designed for asteroid radar with 30KHz bandwidth, 1 sub-band, 32,000 channels and a 1 sec dump time. This works with no data loss (Only 3 antennas used, at the ends of arms). It was a useful test because it used all station boards in the correlator although only a relatively small fraction of each board was actually in use since only 3 antennas were in the array. Michael was interested in autocorrelations only. It was found that turning off the frequency shift (f_shift) cleans up spikes in the autocorrelations at harmonics of f_shift. This mode may be ready for ECSO/RSRO use in early November perhaps.
    - Robert Mutel and Christine Lynch observed their RSRO science project with 2-subarrays. This appeared to work well in CBE – the data still need to be evaluated to determine if it is good science data.
        - Note: the use of 3 sub-arrays still fails in the correlator. Martin is working on the problem.
- Phased array test status
    - Project TY018 with the phased VLA and VLBA was recorded on 20sep12. The disks are finally all here and were run through DifX this past weekend. This tests repeatability of delays for Y27 across

different days and bandwidths. The source was 3C273 so we might get another usable image out of this.
    - Project TY020 is a demo/test to make a nice image with as much end-to-end software/hardware working as possible. The observations appeared to have been successful as far as we could tell from the phased VLA side. Amy gave vex2OPT its first test flight, and found a number of features and bugs for improvement.

Software status (Bryan):

- The OPT is being modified to include changes in requantizer gains
- Vex2opt is being worked on. This is software that takes a SCHED output file and creates an OPT file to run the VLA phased array. Thus, the user should only have to create a single SCHED file specifying that they want the VLA phased array and this Vex2opt convertor will be run to create the VLA phased array OPT run file.

CASA (Jeff, Juergen):

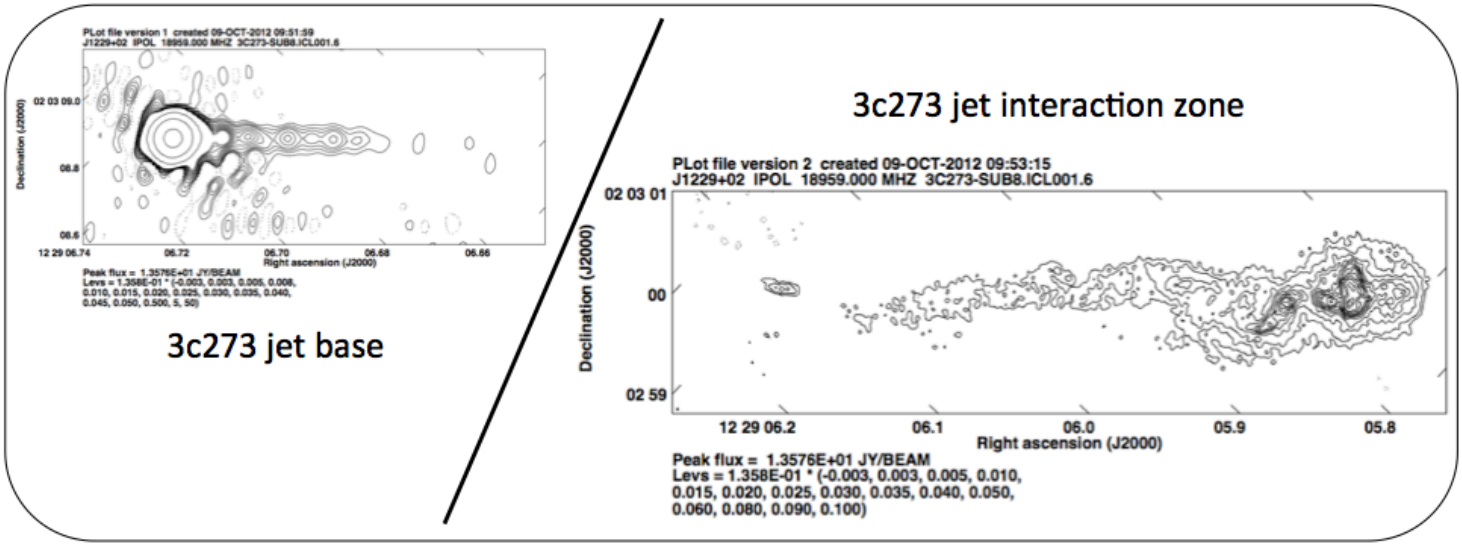
- We have a new casapy-stable CASA 4.0 pre-release. It is r21422 and it is available on the NRAO computers. We also have a Mac OS 10.6 for download on casa.nrao.edu/casa_obtaining.shtml. A Mac 10.7 version is in the works. All CASA testers: please use the new stable version for your tests.
- Testing is on-going by Kristina, Josh, Frazer, Juergen, Claire and Steve.
- Comments from testerss are due by Monday for the release. Hoping to release the following week.
    - ***Please use CASA stable and report on bugs this week.***
- CASA 4.1 planning is also on-going.
- The final Perley-Butler 2013 flux standards are finalized. This will go in the CASA release.

Rick's fun results

- Rick had a test using the 3-bit samplers in a 3-hour K band polarization observation. The data had some missing BDF's but appeared to be otherwise OK. Highlights of his observations and initial results are given below.
    - The sources observations were of 3c273, located 8deg from the Sun plus 2 calibrators. 3c273 has a 20" jet.
    - K-band reference pointing was done but it appears that the pointing did not work well at all times and this may be the cause of errors in the map.
    - Both Bill Cotton and Rick are calibrating the data. Rick has some initial results:
        - Work on imaging with 1 sub-band (90 MHz bandwidth) is very promising. Rick is now working on full images with all sub-bands.
        - Rick has achieved a 200,000:1 dynamic range.

- 3c273 appears to be 7% polarized. We are closure-limited in Q and U now and we need to self-cal in Q and U. It appears that what is limiting us in I is also limiting us in Q and U.

- Rick has some old-VLA data on 3c273 made with many configurations and many hours on source. In comparison, this new image with only 80min on source is much better than the old VLA data, even with the many configurations and many hours. Amazing and very impressive. Rick's initial images are given below. Note the side-lobe emission in a N-S direction centered on the jet source (left) – likely due to the fact that this source is only at 2 deg declination and there are K-band pointing errors. Note also that the extended emission in the jet (right) is only detected on about 6 baselines and is not well-recovered in this A configuration observation.



Rick's procedure for calibrating this 3-bit data in AIPS is:

1. Generate a 2-second CL table (matches the integration time) to permit precise atmospheric phase removal.
2. Determine and remove delay error, based on a single solution for a short time span. This solution was applied uniformly over all observations.
3. Do a phase solution, on 2-second basis, on all sources using the central 10 channels. Apply, using 2-point interpolation.
4. Solve for bandpass, using 3C286 only, and 1 minute average. (There were two observations only of this source).
5. Solve and remove cross-hand delay, using 3C286. (These were very small -- much less than 1 nsec).
6. Amp and Phase calibration, with a solution every 2 seconds, using good models for 3C273 and 3C286. Apply with 2-point interpolation.
7. Polarization calibration, using 3C286 and 3C273.
8. R-L phase rotation calibration, using 3C286.

9. The data were then split out, source by source, and self-calibration applied to each. Baseline-based calibration was done using the best model for 3C273.