ECSV Discussion
30 October 2012, 10am in room 317

Attendees:

Bryan Butler, Vivek Dhawan, Feng Gao, Miller Goss, Eric Greisen, Huib Intema, Judith Irwin, Christene Lynch, Minni Mao, Drew Medlin, Heidi Medlin, Emmanuel Momjian, Robert Mutel, Steve Myers, Susan Neff, Juergen Ott, Rick Perley, Urvashi Rau, Dave Roberts, Michael Rupen, Deb Shepherd, Lorant Sjouwerman, Gustaaf Van Moorsel, Hsi-Wei Yen

Minutes:

News:

- Visitors: Judith Irwin is visiting Socorro until Friday.

Correlator and general system health (Ken, Vivek, Michael)

- There was a CMIB (Correlator Module Interface Board) software update last week that should have taken care of the bad baseline boards in the correlator.
- We have had problems in which we loose about 30% of the binary data files (BDFs) when significant fractions of the correlator are in use (e.g., when doing 3-bit science and some complicated 8-bit science programs). To address this, a new version of the CBE (Correlator Back End) was installed and we have been running with the new CBE for about a week. This has significantly decreased the number of missing BDFs: we are loosing only about 1% of the data now; this includes 3-bit data. So we are making good progress.
    - The remaining problem with the missing BDFs might be due to the MPD (multi-processor in the correlator). Martin is working on replacing this with what some have called the hydra++ code.
- We tried switching to a rubidium maser as backup for the VLA maser and this worked well. A second test will be planned to actually observe a science target using the rubidium standard.
- There are still occasional timing errors in which we see errors on the timing chip every few hours. It is not clear how or if this affects the data. The problem is being investigated.
- At the moment we are running with the old WIDAR correlator hardware. We have new CBE hardware nodes in house but there are problems with the power supplies and they have to be fixed. So we will wait a bit longer.
- There will be a new version of the Configuration Mapper (CM) later this week.
- Sub-arrays are still a problem. More tests are required to troubleshoot the issue.

- Phased array testing is stalled for the moment, waiting for progress on the VLBA Digital Down Converter (DDC) issues. In the mean time, there have been discussions on the best way to calibrate VLBA+phased VLA data:
    - Amplitude instabilities exist on some stations on the VLBA still (using the DDCs, but not with the polyphase filter banks or PFBs). The phased VLA is more stable in amplitude at this time.
    - Bryan is interested in making changes to the SDM (Science Data Model) to help with the VLBA+phased array calibration and he is talking with Jeff Kern to look into this option. If we can't do this, we can make a separate table or put the information into the Annotation Table that already exists in the SDM.
    - We have found that the Tsys and gains between the VLA and VLBA are good so the correction factor between the two is ~1.
    - Bottom line on these discussions: we are in pretty good shape for phased VLA+VLBA calibration but we still need to tie up a few loose ends and verify the procedure works (once we get data to work with).
- Reminder: For all 3-bit tests, please remember to use the WebTEST OPT followed by M2S.

Software status:

- OPT
    - There will be an upgrade of webtest to production for the OPT in a week or so. This will make it possible to make 3-bit scripts in the production OPT (e.g. we won't have to run model to script). Holography modes are also ready in the OPT and Rick will start testing when he can.
    - OPT has shown some 'slow-down' issues and this needs to be addressed also.
    - Working on user interface and m2s to support holography
- RCT
    - Daniel, Dave, Emmanuel, & Lorant met to discuss implementation of the new user interface that will allow entry and display of spectral line info. The plan is to have the new user interface ready for testing by December 3 in WEBTEST. This is a problem for testing. Juergen will talk to Lorant and Emmanuel.
- PST
    - Started GOST Wideband integration

CASA (Steve, Juergen):

- CASA 4.0 is not released, hopefully Monday it will be released. Build testing machines are in CV so we need to wait for them to be powered back up after hurricane Sandy. Steve is also working on final.

- Last time: Frazer will give Steve a Linear polarization P-band dataset so he can calibrate the data in CASA and see if this works and we can start to create a regression script and then a 'casa-guide' for our users on how to do this.

Note from Rick:

- Next Thursday, there will be a VLA technical issues meeting at 10am. Rick will send around an agenda in a couple of days. This is a meeting for the testers to communicate issues they see in the data with the engineers. All are invited.

Urvashi's report on CASA processing of the 3c273 3-bit dataset:

- Urvashi has been imaging the 3c273 data taken with the 3-bit sampler system. The first results on this data set were presented by Rick a few weeks ago and Rick showed an image created in AIPS using a single spectral window (not all 64) because he could only get the noise correct with one spectral window. Here, Urvashi shows results in CASA using a single spectral window and all 64 spectral windows.
- Consider the images below. Fig 1. shows images with 1 SPW and 64 SPWs respectively. Noise levels are 132uJy and 17uJy in the top right corner (dyn ranges of ~ 110000 and 837000 respectively). Artifacts around the bright core are at the 0.5mJy level (still very high !).
    - Note: the theoretical RMS noise as predicted by the exposure calculator is ~ 4 microJy. This is probably very optimistic because the exposure calculator doesn't know about the opacity in these K-band observations or the contribution the sun made to increased Tsys (this observation was done 8 deg away from the sun).
- Figs 2 & 3 show the core (continuum and spectral index).
- Figs 4 & 5 show zooms of the lobe. Reasonable extended emission was recovered with multi-scale deconvolution.
- To make these images, Urvashi started with data from Rick that he had calibrated and averaged in time and frequency. These images were made after several (~5) rounds of standard bandpass self-cal per integration on this averaged dataset, followed by one global frequency-dependent baseline-self-cal. Bandpass solutions gave amplitudes in the few % range, and phase solutions of about 1 deg. Baseline-solutions were of a similar order. The image-coordinates were chosen to place the bright core at the middle of a pixel. Imaging was done with 6 scales and 3 Taylor-terms.
- **Bottom line:** RMS improvement from narrowband to wideband is as expected (so far). But, images are still artifact-dominated. (With 'cheating' - i.e. baseline-self-cal with time-variable solutions, the off-source noise goes down to 6 uJy (2.2 million dyn-range) - but this is not justifiable. There is no obvious correlation of these solutions with polarization.)
    - Note on why baseline-based self-calibration can be considered "cheating": Consider the following: if you applied a baseline self-cal on a per integration basis, then you will force the image to be exactly like

the model because there will be no constraints on the solutions. But we know there are closure errors at the 10^-4 level, e.g. due to leakage of the polarization, due to pointing, and possibly other things. If you do this on a time range that is long (the length of the track if possible), then this provides more constraints on the baseline self-cal. If this longer time range doesn't improve the image, then the standard methodology is to start shortening the time range until you can get improvement. The trick is to know when to stop shortening the time range – now you are in black-belt regime

- It is probably worth a try to use this model and start from the original un-averaged data.

Urvashi's Figures discussed above:

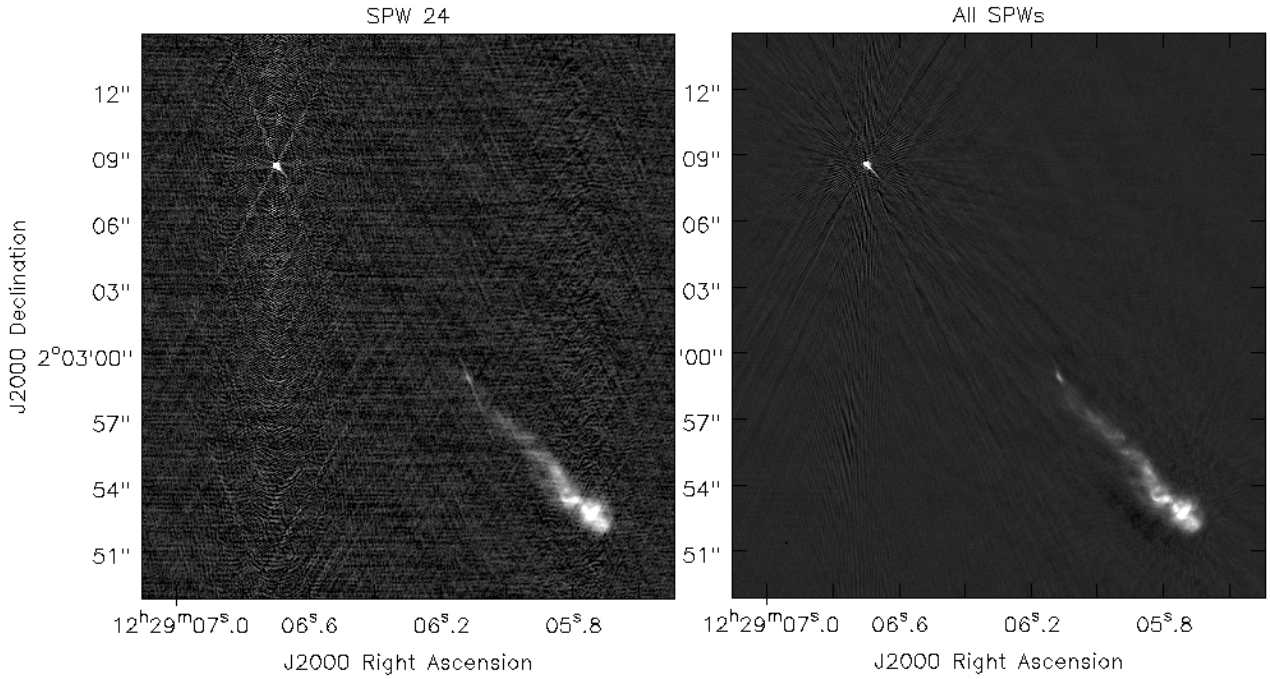

Fig 1. 3c273 images.
Left: using a single spectral window. RMS = 132uJy. The dynamic range is ~ 1.1 x 10^5.
Right: using all spectral windows. RMS = 17uJy. The dynamic range is ~ 8.3 x 10^5.

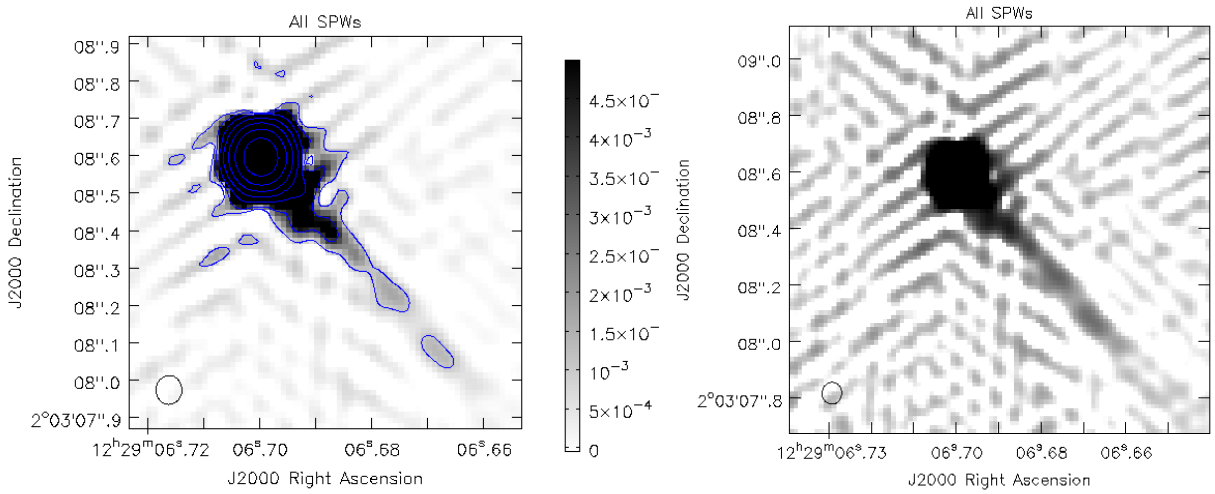

Fig 2. 3c273 Core continuum emission using different stretches to show the structure in the 'tail'.

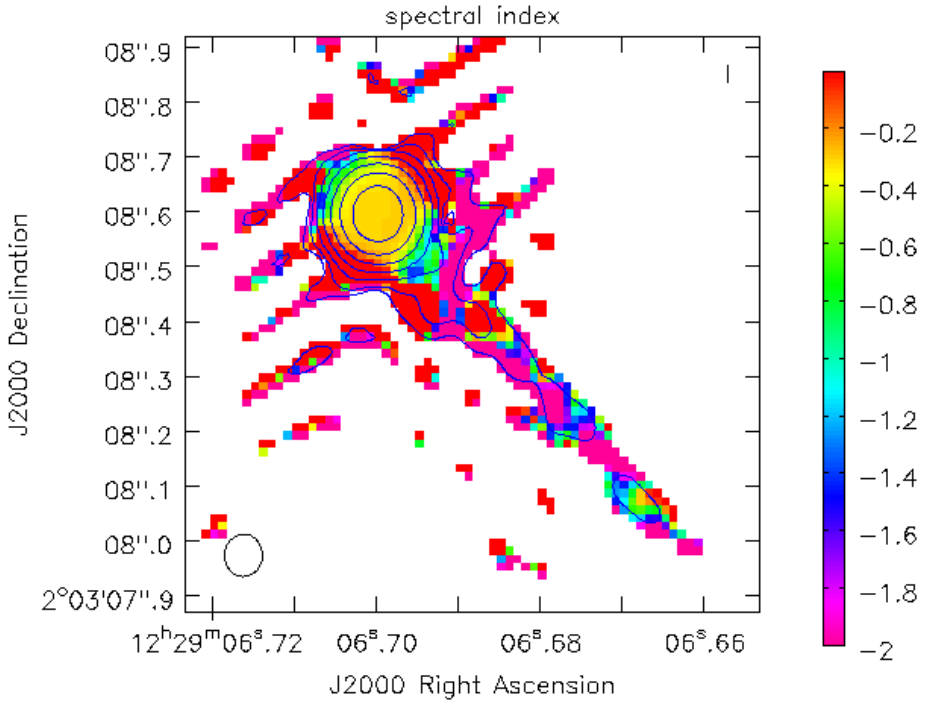

Fig 3. 3c273 core spectral index image.

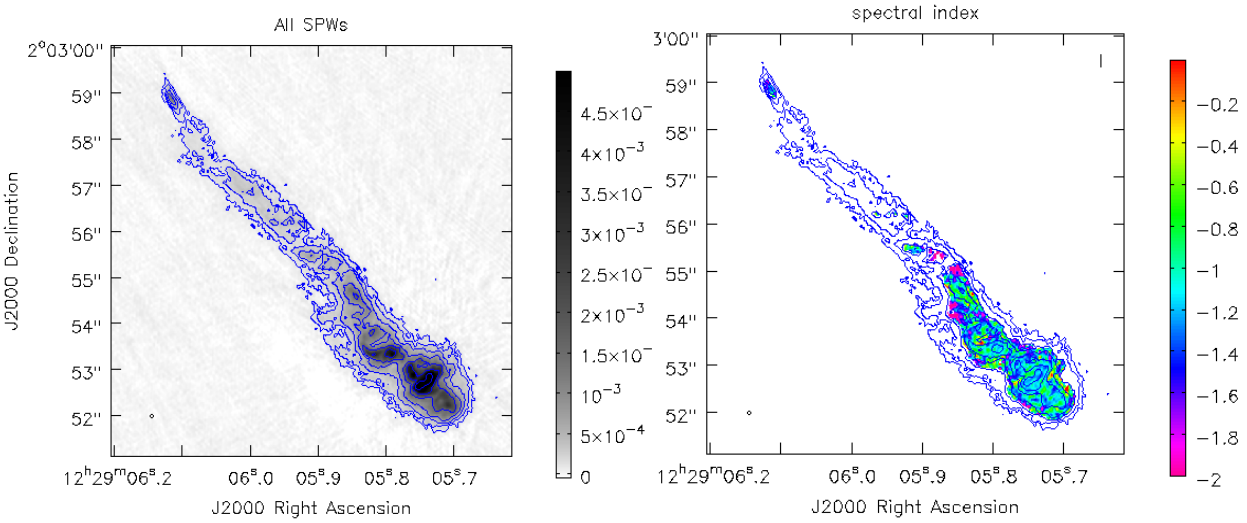

Fig 4. Left: 3c273 continuum emission in the extended jet lobe. Right: 3c273 emission lobe spectral index map.

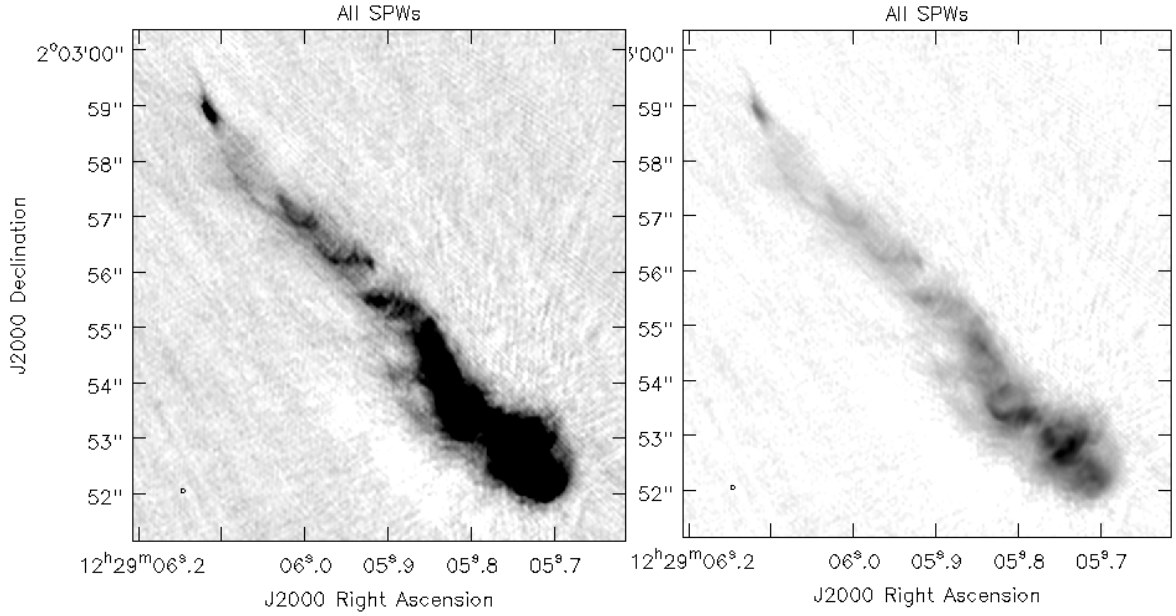

Fig 5. Two different stretches on the jet lobe showing the helical structure very nicely.