A I P S L E T T E R

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A newsletter for users of the NRAO
Astronomical Image Processing System

Written by a cast of *AIPS*

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General developments in *AIPS*

Reduction of EVLA and ALMA data in *AIPS*

This *AIPSLetter* and those beginning in 2010 documents numerous improvements to *AIPS* that enable full calibration of EVLA data and most imaging operations as well. The one exception is the wide-band (bandwidth synthesis) deconvolution algorithm ("MSMFS") being developed in CASA by Urvashi Rao Venkata, for which there is no comparable function in *AIPS*. Calibrated *uv* data may be exported from *AIPS* in "UVFITS" format for use in that program. ALMA data may also be reduced in *AIPS*, although the package is not fully qualified to calibrate data from linearly-polarized feeds. See Appendix E of the *AIPS* Cookbook, available via the *AIPS* web site, for details.

AIPSLetter publication

We have discontinued paper copies of the *AIPSLetter* other than for libraries and NRAO staff. The *AIPSLetter* will be available in PostScript and pdf forms as always from the web site listed above. It will be announced in the NRAO e-News mailing and on the bananas list server.

Current and future releases

We have formal *AIPS* releases on an annual basis. We recommend a full binary installation method for both the frozen and development versions for MacIntosh OS/X (PPC and Intel chips), Solaris, and Linux (32- and 64-bit) systems, but all architectures can do a full installation from the source files. If you develop *AIPS* code locally *or have system managers that forbid the use of* `rsync`, you will need to do a source-level installation. The current release is called `31DEC12` and is now "frozen." If you took a development copy of this version at some earlier date, you should use the "Midnight Job" (MNJ) to bring it up to date. You need to run a MNJ only once in 2013 to convert your copy of `31DEC12` into the frozen version. However, when patches to `31DEC12` are announced, you may apply them with the MNJ. This *AIPSLetter* is intended to advise you of corrections and improvements in this release.

We have begun a new version, called `31DEC13`, which is now under development by the *AIPS* Group. You may fetch and install a complete copy of this version at any time. Having fetched `31DEC13`, you may update your installation whenever you want by running the MNJ. This uses `cvs`, `rsync`, and/or transaction files to copy all changed text files and then to copy the binary files or to compile the code selectively based on the code changes and compilations we have done. We expect users to take their source-only or binary version of 31DEC13 *AIPS* over the Internet (via *anonymous* ftp). Both versions require you to copy the installation procedure install.pl via ftp; the source-only version also requires you to ftp the 115-Mbyte 31DEC13.tar.gz compressed tar file. Linux sites will almost certainly have cvs installed; other sites may have installed it along with other GNU tools. Secondary MNJs will still be possible using ssh or rcp or NFS as with previous releases. We have found that cvs works very well, although it has one quirk. If a site modifies a file locally but in an *AIPS*-standard directory, cvs will detect the modification and attempt to reconcile the local version with the NRAO-supplied version. This usually produces a file that will not compile or run as intended. Use a new name for the task or put a copy of the task and its help file in a private disk area instead.

AIPS is now copyright © 1995 through 2012 by Associated Universities, Inc., NRAO's parent corporation, but may be made freely available under the terms of the Free Software Foundation's General Public License (GPL). This means that User Agreements are no longer required, that *AIPS* may be obtained via anonymous ftp without contacting NRAO, and that the software may be redistributed (and/or modified), under certain conditions. The full text of the GPL can be found in the 15JUL95 *AIPSLetter* and is included with every distribution in file $AIPS_ROOT/*release-name*/COPYING.

Installing a new version

If compiling locally, new releases must be installed from the tar ball for that release. If using the binary installation, a full new installation must also be done with rsync. The cvs system requires this. When installing a new *AIPS* release in a system that already has a previous release, we recommend that install.pl be used and that the previous release be left in place, at least until the new installation has been verified. If you do this, then you will not have to re-edit the disk, printer, and tape lists and can simply skip all those pages in the install.pl menus. The old $HOME/.AIPSRC file may be left in place, but it will need to be edited. The lines giving the DOWNLOADED and UNPACKED parameters should be cleared and the CCOMOPT line should be changed to point to the current release rather than the previous one. If you have made a special version of do_daily.*host*, you should preserve it under a new name and restore it after the install. If you have an odd set of *AIPS* versions, the $AIPS_ROOT/AIPSPATH.*SH files may need to be edited after the install to set the desired versions.

31DEC09 contains a change in the format of antenna files. Previous releases will not understand the antenna coordinates for arrays that were traditionally left-handed (VLBI primarily). The format change occurs automatically when any 31DEC09 or later antenna-file specific code reads the file, after which older releases will have difficulties. Note that the only version which we patch for major errors is 31DEC12; even 31DEC11 is no longer changed.

Preview of coming attractions

The 31DEC13 release already contains a few changes that we decided were a bit risky or not needed in 31DEC12. SNPLT was changed to allow the plotting of multiple parameters from the same extension table (such as Psum, Pdif, and Psys from the SY table). SETJY was changed to avoid setting CALCODE and the velocity parameters on OPTYPEs intended for other purposes. It will soon have a complete set of spectral parameters as a function of epoch for the primary calibration sources. RFLAG offers the option of finding and then using separate amplitude scaling factors for each IF, baseline, and source. This will help when the RFI is so bad that the recommended pre-calibration is not feasible. TVFLG and SPFLG were changed to display the status line in the same graphics plane as the axis labeling (to enable later displays) and to offer the option of plotting the data as far to the right as possible, reducing overlap with the menu.

Improvements of interest to users in 31DEC12

We expect to continue publishing the *AIPSLetter* every six months along with the annual releases. There are a few new tasks released in the last six months. New tasks in the last six months include BSCAN to find the "best" scan on a calibration source to use for fringe finding and the like, GCPLT to plot gain versus elevation from the input text files used by INDXR, CC2IM to make images from Clean Component files, MODIM to construct model image cubes including polarization, spectral index, and rotation measure, QUXTR to extract text files from Q/U cubes for input to TARS (Faraday rotation measure synthesis test task), and TARPL to plot the output of TARS. New verbs include CHARMULT to intruct the TV display (XAS) to use larger character sizes, CODECIMAL to switch coordinates between decimal and sexagesimal forms, GETVERS and QGETVERS to return the maximum version number of a specified extension file type, and M2CAT, M3CAT, M4CAT, MOCAT, U2CAT, U3CAT, U4CAT, and UOCAT to do quick catalog listings of images or *uv* files for IN2DISK, IN3DISK, IN4DISK, and OUTDISK, respectively.

In the first six months of 31DEC12 the new tasks were MORIF to break up a data set into a greater number of spectral windows, SNREF to determine which reference antenna would minimize the right minus left phase difference, PRTSY to print statistics of the values in SysPower (SY) tables from the EVLA, FIXAN to correct errors or change the array center in antenna tables, SPCOR to correct an image cube for spectral index and/or primary beam, FIXRL to fix data for mislabeled polarizations in some antennas, and TARS to check the Faraday Rotation Synthesis algorithm (task FARS) with simple user input data. New verbs include NAMEGET to fill in the file naming adverbs completely to aid in writing procedures and IM2HEAD, IM3HEAD, IM4HEAD, IMOHEAD, Q2HEADER, Q3HEADER, Q4HEADER, and QOHEADER to display headers selected by the second, third, and fourth input and the output name adverbs, respectively. New RUN files include OOCAL to enable full self-calibration with the spectral-index and other options of the OOSUB task and LINIMAGE to build a FLATNed spectral cube while separating spectral windows to improve performance in the IMAGR portion.

Normally, bugs which are created in an *AIPS* TST version and then fixed in that same version before its release get little or no discussion in the *AIPSLetter*. Since a rather large number of sites now install the TST version of *AIPS* during its development, this is somewhat of an oversight. We urge you to run the "Midnight Job" at least once after 31DEC12 is frozen to bring it up to date and to fix all bugs of this sort. We urge active sites to use the MNJ and, when something odd occurs, to examine CHANGE.DOC using the cgi tool available from the *AIPS* web page under documentation. Please do not hesitate to e-mail daip@nrao.edu with any questions or suspicions that there are problems.

UV data

FRING was given the DOAPPLY adverb to control whether single-source data sets would be copied, correcting for the calibration parameters found. The writing of the output files now includes automatic generation of an NX table. An option to break the input IFs into N groups (of equal size) was added, replacing the limit that $N = 1, 2$, or 4. Handling of the case $N = 1$ with multi-band delays was corrected. Adverbs BIF and EIF were added but only for the case $N > 0$ and $N \neq N_{\mathrm{if}}$.

LISTR was given the option in DPARM(10) to control the data scaling in LIST, GAIN, and MATX modes.

Flag application is now limited to no more than 60000 flags applying to a single time in most tasks and 600000 in UVCOP and TYAPL.

TYAPL was given the option to apply the post-detection gain from the SY table rather than the gains determined from P_{dif}. EVLA 3-bit data benefit from this, while the P_{dif} values are found to have non-linear scaling issues.

UVCOP copies tables for a time range beginning a little before that used for the *uv* data and ending a little after so that enough table values will be available for any interpolation. User control over the size of "little" was added. The copying of PD tables (spectral polarization calibration) was corrected.

RFLAG was changed to handle FG table versions more carefully to achieve the apparent user-requested pattern. Since this task uses the flag table to read the data multiple times, but also can write it at the same time, great care is required.

CLCOR was changed to re-compute the apparent coordinates before using them in source and antenna position corrections. FITLD was changed to re-compute the apparent coordinates in all cases, not just those in which they were very obviously wrong.

Ka-band models for the primary flux calibration sources were released.

EVAUV was changed to plot the real versus imaginary values of the data-model and data/model-1 files as logarithmic contours in 2-dimensional images. Adverbs to control these plots (size of images, range of values, smoothing) were added. The option of saving the data-model and data/model *uv* data sets was also added.

UVFIX was made fault tolerant when it fails to find a particular source, time, and antenna in the CL table or FO table. It used to turn off all time-dependent frequency shifts in case of error, but now reports the error and keeps trying.

ATLOD was corrected to handle files larger than 2 Giga-bytes.

CLCOP was given an AVER option to average values from a list of IFs and then replace the values of another list of IFs with the average. This should help deal with IFs adversely affected by RFI, line emission, and the like.

SETJY was corrected for errors in OPTYPE 'VCAL' in computing LSR and radio-convention velocities. The transfer of velocity at one pixel to that at the reference pixel in the optical convention was replaced by the more accurate, fully non-linear formula. Perley-Butler fluxes for 2013 were added for 3C286 and 3C295 (only) and the reporting of the "previous" values was improved.

TVFLG and SPFLG had addressing problems after the MAXCHA increase which could cause the master grid to be damaged on CLIP INTERACTIVE, while LIST FLAGS needed modernizing to report them correctly and NEXT IF/ST assumed 2 Stokes without checking which made for addressing problems.

BSCAN is a new task which checks the data in each scan of a user-specified calibrator source to see if any have all antennas and, if so, which has the most data. It returns time ranges of the recommended scans. This should be most useful in pipelines searching for fringe finder scans and the like.

GAINS for the EVLA antennas as functions of elevation are given in a text file determined by Perley and Butler. The file was corrected and currently only has one set of values for each band although it retains the ability to be more finely divided in frequency.

Baseline dependent calibration may be determined with BLCAL and then applied through adverb BLVER. The calibration routines failed to initialize its use properly which caused confusion in tasks like IMAGR that read different *uv* files through the calibration routines.

Edit class methods used in EDITA, EDITR, SNEDT and others were changed the make the SWITCH ALL IF operation have 3 possibilities: 1 IF, a range of IFs, and all IFs. The second one is new and appropriate for EVLA data in some cases.

KEYIN is a routine used to parse free-format inputs for tasks including PCLOD, SETAN, USUBA, M3TAR, DTSIM, ANCAL, FETCH, ANTAB, VLBIN, UVFLG, and MK3IN. Its handling of character strings owes more to Fortran 2 than 77 and required a variety of fixes to handle strings of varying lengths.

Imaging

Compared to some years, IMAGR has received only modest attention. It was changed to compute the actual average frequency found in the data used to make a bandwidth-synthesis image and to put that frequency in the header. Editing can cause this to be somewhat different from the nominal frequency. The findings of this computation are reported to the user. Errors in frequency-dependent imaging were found: the value of FQTOL could get lost causing the task to do way too much work and too low a value for the number of channels could get used, causing the model to be damaged. When IMAGR was told to include all subarrays but also given other adverb values (such as time range) that caused there to be no data in one or more of the subarrays, the task would die. It was corrected to handle the "no data" return with grace, dying only if all subarrays lack data. Subtle errors affecting multi-facet imaging with ONEBEAM true and cases in which baseline-dependent calibration is to be applied were also corrected.

Faraday rotation analysis

The subject of Faraday rotation measure synthesis is receiving a great deal of attention these days. *AIPS* task `FARS` performs this analysis and was corrected to subtract the contribution of the last Clean component from the residuals before they are used for output or for restoration of the components. The output file naming adverbs were simplified and the header coordinates corrected to drop the incorrect `STOKES` axis. Task `AFARS` examines the image cubes from `FARS` to extract images of the rotation measure at the peak amplitude and the amplitude and phase or real and imaginary at that peak (along the RM axis). The methods of determining that maximum were changed, with the new default being an exact cubic fit, and with obviously wrong answers trapped and corrected. `AFARS` now writes out all 3 images with a simplified control of the output names and with corrected header coordinates.

To study the methods used in `FARS`, another task `TARS` was written. It computes a single rotation measure spectrum, taking its data from an input text file which can include model components and a spectrum of Q and U values and writing an output text file. It had the same error as `FARS` in handling the last Clean component. `TARS` was changed to use the sum of the Q/U spectrum and any model. Previously, it ignored the Q/U values if there was a model and used the spectrum only for its list of frequencies. An experimental method of doing a complex Clean was added. This pattern match scheme is rather slow and so will not be added to `FARS` unless it is found to be worth the wait. the width of the real part of the RM transfer function (dirty beam really) is now used as the default restoring beam width. `TARS` may now write repeatedly to the same output text file, allowing comparison of RM spectra made with different input parameters.

To assist in these studies, three new tasks were also written. `MODIM` will construct model I, Q, and U cubes. Each model component has I, Q, U fluxes at 1 GHz plus a spectral index and rotation measure as well as the usual position, width, and type parameters. Up to 9999 components may be read from a text file and, optionally, added to pre-existing images. New task `QUXTR` reads Q and U cubes to extract a spectrum in the form expected by `TARS`. Finally, new task `TARPL` plots the RM spectrum from one or more `TARS` output spectra contained in a single text file.

Other analysis

SLICE was given the option to avoid interpolation when the slice is directly along the X or Y axis. It already did that along the Z axis. It now allows non-integer end points when interpolating. All slice plots and `SLFIT` now detect the old format slice files and handle them correctly. The format was changed quite some time ago without properly insuring backward compatibility.

CODECIMAL is a new verb to switch between decimal coordinate (`X`, `Y`) and sexagesimal coordinate (`COORDINA`) representations.

IMVAL was changed to let the user choose between returning the value at the nearest integer pixel and doing a cubic fit to determine the value.

MAXFIT was changed to return the shift necessary to move the peak found to the nearest integer pixel.

CC2IM is a new task to convert point and Gaussian components in Clean Component extension files into images without any convolution. Some software expects model images rather than `CC` files.

FITLD and `IMLOD` now trap the modern coordinate description used for East-West interferometers and change it into the description recognized by *AIPS* (`-NCP`).

Display

SNPLT was given the option to color the plot based on source number. This is very helpful when examining calibration tables.

IMEAN now uses `BLC`, `TRC`, and `DOINVERS` when it does the initial robust estimate of the rms prior to the fitting. `DOMODEL` was added to control the plotting of the fit Gaussian. The `TRIANGLE` adverb was added to output the flux level exceeded by only i percent of the pixels. This may be used in scripts to select intensity ranges, contour levels, and the like.

POSSM was changed to avoid plot labels below panels that are not the bottom of a column of panels. Overlaps were occurring in LWPLA outputs. Labeling of IF numbers and polarization was improved. The flux scaling (milli, kilo, *et al.* will now be fixed on each plot page, being set by the first panel. Previously, when panels were separately scaled, the prefix portion was ambiguous.

GREYS was corrected to handle 3-color images correctly and was given additional options controlling the transfer function type and intensity ranges separately in each color. KNTR and PCNTR were also corrected to implement DOCOLOR correctly.

TVHUI was changed to allow transfer functions in the hue image and to allow the output of an image of a two-dimensional, hue-intensity step wedge.

LWPLA was changed to guess the size of characters in a string (some are narrow) and adjust the string positioning accordingly. Plot tasks will now use upper and lower case lettering where appropriate. Plots now can have ticks separated by as little as 1 micro unit (previously 10 micro units was the lower limit).

PRTAB was changed to use F format by default for printing real and double precision values. It tries to represent both the smallest and largest values present.

GCPLT is a new task to plot the gain curve text files used by INDXR and BDF2AIPS.

TAPLT was given more adverbs to limit which rows are selected for inclusion in the plot.

EXTLIST was brought up to date systematically for all plot tasks already supported and support for CCNTR, SERCH, EVAUV, DELZN, ELINT, FGPLT, GAL, SNIFS, SOUSP, and WETHR was added. These tasks were modified to insure that defaults were filled in before the plot files are created. Verb PLGET was also updated to support these tasks.

CHARMULT is a new verb to instruct the XAS TV display to use the standard character font scaled by a specified integer. Very large TV displays will choose the default scaling but may need user direction.

General and system matters

MAXCHA is the maximum number of spectral channels which *AIPS* can handle. It was increased from 65536 to 132096 (a factor of 2 plus 1024). An overflow in the calibration application at 65536 was corrected.

TAB characters in input text files are invisible to users and catastrophic to incautious software. All software was changed to check input text for TABs and change them to an equal number of blanks.

CookBook was updated generally including Appendix E specifically addressed to EVLA users. The control files that enable TAB completion, ABOUT, and APROPOS were also updated.

U2CAT, U3CAT, U4CAT, and UOCAT are new verbs like UCAT except that the disk examined is controlled by the IN2DISK, IN3DISK, IN4DISK, and OUTDISK adverbs, respectively.

M2CAT, M3CAT, M4CAT, and MOCAT are new verbs like MCAT except that the disk examined is controlled by the IN2DISK, IN3DISK, IN4DISK, and OUTDISK adverbs, respectively.

GETVERS is a new verb to return the maximum version number of the extension file type specified with messages; QGETVERS does the same, but quietly. The output is stored in the MAXVERS adverb.

Patch Distribution for 31DEC11

Because of the extensive use of binary installations, we now patch the master copy of the most recently frozen version. Older versions are not corrected even for egregious errors. Thus, 31DEC11 was patched during 2012 and 31DEC12 will be patched as needed during 2013. Your copy of them may be corrected simply by running a Midnight Job. Information about patches and the code may be found using links from the main *AIPS* web page or by *anonymous* ftp to the NRAO server ftp.aoc.nrao.edu. Documentation about patches to a release is placed on this site at pub/software/aips/*release-name* and the code is placed in suitable sub-directories below this. Patches to older releases are kept here as well, but they will require local compilation.

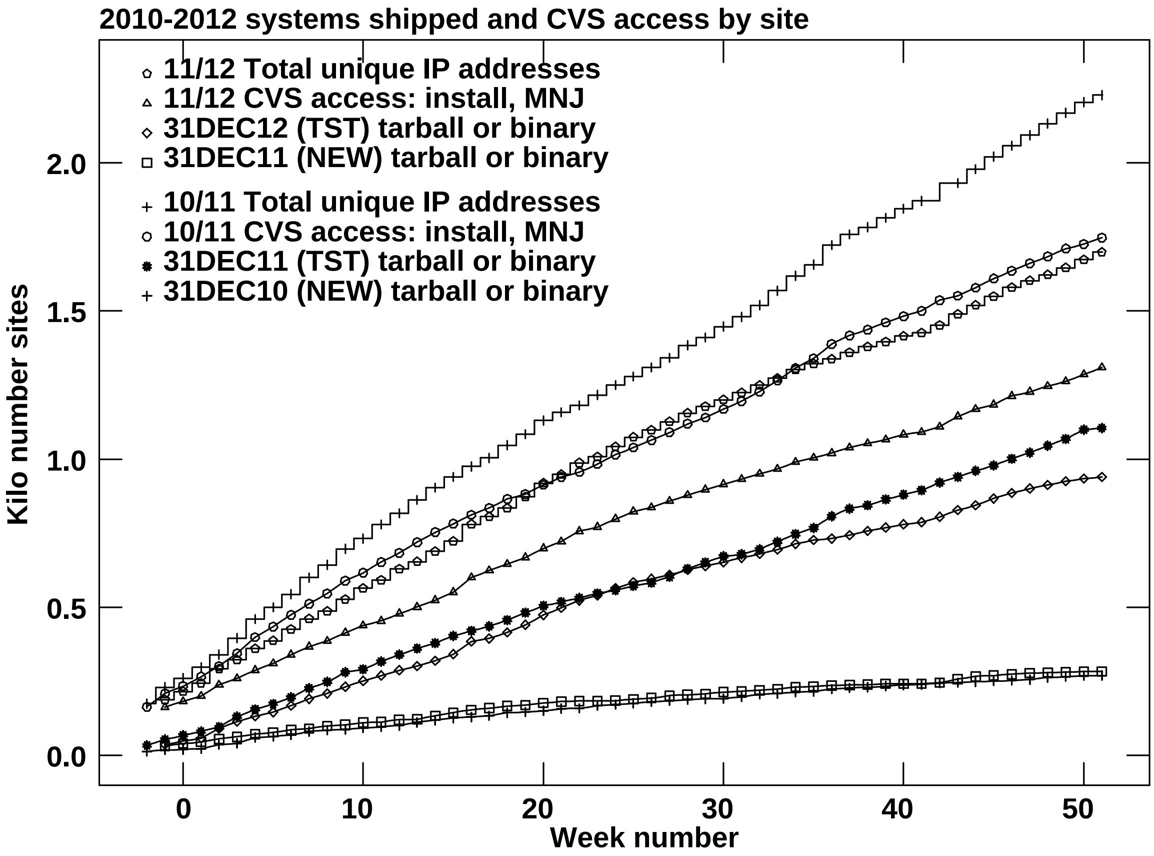
The 31DEC11 release is no longer available for installation and will no longer receive patches even for egregious errors. It had a number of important patches during 2012. They are

1. Imaging code had problems with large gridded modeling. *2012-01-16*
2. UVFIT had many areas dimensioned for the old limit of 4 components, rather than the new limit of 20. *2012-01-16*
3. FARS did not shift residuals back to the original λ^2 correctly and did not add residuals into amplitude/phase outputs correctly. *2012-01-16*
4. AFARS did not handle BLC correctly, producing wrong rotation measure images. It also stated incorrect information in the history. *2012-01-16*
5. SQASH had an error in history writing that led to aborts. *2012-01-16*
6. FITAB omitted an essential keyword for compressed UV data. *2012-01-16*
7. CLCOR ignored the fact that the GMRT uses an opposite phase convention. *2012-01-16*
8. VLANT did not correct EVLA data properly. *2012-03-01*
9. SCMAP and SCIMG did not apply the flag table to the data entering the self-cal step *2012-03-07*
10. Mac OS/X version Mountain Lion changed ps to issue an error message when there is a library path; procedures needed defenses against this. *2012-11-19*

AIPS Distribution

From the NRAO system logs, we count apparent MNJ accesses, downloads of the tar balls, and rsync accesses by unique IP address. Since DSL and some university and other connections may be assigned different IP addresses at different times, this will be a bit of an over-estimate of actual sites. However, a single IP address is often used to provide AIPS to a number of computers, so these numbers are at the same time an under-estimate of the number of computers running current versions of AIPS. In 2012, a total of 284 different IP addresses downloaded the frozen form of 31DEC11 and 940 IP addresses downloaded 31DEC12 in tarball or binary form. Fully 1309 IP addresses accessed the NRAO cvs master. Each of these has at least installed some version of AIPS and 422 appear to have run the MNJ at least occasionally. The total number of unique IP addresses in these three lists was 1698. The table below shows these numbers as a function of year since we began recording them. The attached figure shows the cumulative number of unique sites, cvs access sites, and tar-ball/binary download sites known to us as a function of week in 2012. The numbers for 2011 are also plotted and show a drop in the shipping of TST. The cvs access numbers have dropped in a way that suggests some change in the manner of counting in addition to the decrease in the numbers for the TST version.

year	TST name	NEW name	TST	NEW	TST binary	NEW binary	cvs	Total unique
2004	31DEC04	31DEC03	808	196			797	1276
2005	31DEC05	31DEC04	832	246	299	48	982	1460
2006	31DEC06	31DEC05	806	191	402	94	1050	1398
2007	31DEC07	31DEC06	965	277	669	161	1385	1811
2008	31DEC08	31DEC07	1058	246	986	303	1667	2107
2009	31DEC09	31DEC08	1228	307	1082	478	1855	2399
2010	31DEC10	31DEC09	1228	307	1203	477	1914	2416
2011	31DEC11	31DEC10	1105	270	1064	424	1747	2228
2012	31DEC12	31DEC11	940	284	1028	396	1309	1698



Recent *AIPS* and related Memoranda

All *AIPS* Memoranda are available from the *AIPS* home page. *AIPS* Memo 117 describing *AIPS*' usage of the FITS format was modified slightly on several occasions in 2012. In addition, there are two new EVLA memorandum from the *AIPS* group in the last six months. Obtain them via

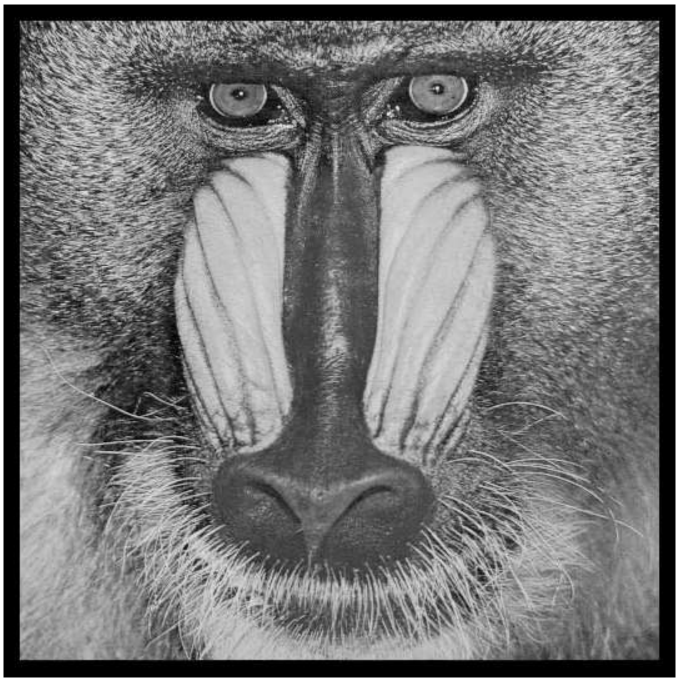
`http://www.aoc.nrao.edu/evla/memolist.shtml`

162 Comparison of E and D configuration sensitivity when D configuration is tapered
L. Kogan & F. Owen, NRAO
July 6, 2012
The latest design of the new most compact E-configuration of VLA has been finished. So the array dimensions are approximately 3 times less than the existed most compact VLA configuration: D. Therefore the sensitivity of E-configuration to the brightness temperature of an expanded source might be expected to be 9 times better in comparison with D configuration. However using tapering with D-configuration data can diminish this advantage. In this memo, we estimate the actual possible advantage of E configuration when tapering is used with the D configuration data.

164 Some comments on the W-projection algorithm
Leonid Kogan, NRAO (ret.)
October 8 2012
The algorithm W-projection implemented in CASA has been successfully tested using some data. But still the restrictions of this algorithm are not clear. In this memo we point out to the possible problems at the case of poor UV coverage for some W layers. We have evaluated analytically the convolution function which is used at the W-projection algorithm to project (recalculate) the measured visibilities (corrupted by the W term) to the visibilities corresponded to the ideal observations (W=0). The found analytical equation for the convolution function allows to find a simple expression for its width for arbitrary field of view and W. The width is much wider in some cases than the upper limit (70x70 pixels) cited and therefore the computation time may not be as small as cited. We suggest multiplication by $\exp(j\pi W l^2)$ at the image plane (instead of the convolution at the UV plane). Such a way to correct the W-term may give the gain in the computation time.

Personal note

Leonia Kogan has retired from NRAO and the *AIPS* group although he still pays attention to our progress and will help us if needed with programs for which he was responsible; note the EVLA Memo cited above. Leonia worked for NRAO for nearly 20 years, most of that assisting the *AIPS* project. His first `CHANGE.DOC` entry was May 21, 1993. He is a mathematician by training and temperament and solved many of our most difficult, mathematically-based issues. Most recently he worked on `FARS`, implementing NRAO's first Faraday Rotation Synthesis algorithm. But he is also well known for `UVFIX` which computes u, v, w from antenna locations and time with much trusted accuracy and for several correction functions in `CLCOR`, most notably that for the position of the Earth's pole. He is widely known for his work on array configurations, represented in *AIPS* by tasks `CONFI` (array optimization) and `UVCON` (array simulation). VLBI data calibration received a lot of his attention through tasks such as `FRMAP`, `PCCOR`, `PCLOD`, `ACCOR`, `COHER`, `DELZN`, and `ATMCA` as well as work on handling orbiting antennæ. He developed `UVRFI` to excise RFI from EVLA data and did substantial work on tasks `VPLOT`, `SPLAT`, `FGPLT`, `ELINT`, and `RMSD`. Leonia's name appears on very many entries in `CHANGE.DOC` encompassing a much wider range of matters than the list given above would suggest and reflecting his ready willingness to help wherever he was needed. Leonia will be missed and we wish him the very best in his future endeavors.



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