AIPSLETTER

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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*

AIPSLetter publication

We have discontinued most paper copies of the *AIPSLetter* entirely. The *AIPSLetter* will be available in PostScript and pdf formats as always from the web site listed above. New issues will be announced on the `bananas` and `mnj` list servers and sometimes in the NRAO eNews.

Current and future releases

AIPS is now copyright © 1995 through 2025 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`.

We have formal *AIPS* releases on an annual basis. We recommend a full binary installation method for both the "slushy" and "development" versions for MacIntosh OS/X (Intel *and* ARM chips), and Linux (64-bit) systems, but all architectures can do a full installation from the source files. There are no longer binary versions available for 32-bit Linux, Solaris, and Mac PPC chip architectures. 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 `31DEC25` and is now "slushy." 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 2026 to convert your copy of `31DEC25` into the slushy version. However, when patches to `31DEC25` are announced in 2026, 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 `31DEC26`, 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 `31DEC26`, you may update your installation whenever you want by running the MNJ. This uses `rsync` 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 `31DEC26` *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 201-Mbyte `31DEC26.tar.gz` compressed tar file.

If compiling locally, new releases must be installed from the tar ball for that release. 31DEC22 and later versions contain improvements to the code which should make local compilation more reliable. If using the binary installation, a full new installation must also be done with rsync. 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. The file $SYSLOCAL/UPDCONFIG also needs to be edited to correct your e-mail address(es). A new installation will not change your current *AIPS* data files.

31DEC15 contains a change in the headers of *uv* data sets which will not be understood by previous versions. 31DEC20 contains a change to the XAS TV server which will cause problems with older versions. Note that the only version which we will patch for major errors is 31DEC25; even 31DEC24 will no longer be changed.

Improvements of interest to users in 31DEC25

In the latter half of 2025, four new tasks, four new verbs, and 2 new procedures appeared. The tasks are DFTQU to make an image in Q and U polarizations of a point as a function of time, XG2XG to copy an XG or ZE table to a new one with a different number of possible components, RESOU to renumber sources in a data set, and PRPLT to plot image "profiles" which are the average of the image over 2 axes as a function of the third. The new verbs are CAT2LOG through CAT5LOG to do the CATALOG operation with the second through fifth sets of file name adverbs. The new procedures are TV3LOD to load and display on the TV an RGB image cube and a large RUN file called VLBAPIPE to reduce VLBI data with tasks in a different order than that used in VLBARUN.

In the first six months, there were six new user tasks, 2 new verbs, and four new service programs in 31DEC25. The new tasks are SYHIS to analyze the contents of SysPower (SY) tables, IM2TX to write one-dimensional text files from image data, TX2IM to create one-dimensional image files from text files, LISPX to compute spectral indexes from one-dimensional text files, SPXMD to add spectral index models to image cubes, and OFMPL to display on the TV all available OFM tables. The new verbs are OFMCOLOR to choose from 30 pseudo color tables for the current TV image and OFMSTRCH to modify the TV pseudo color table. The new service programs, used mainly by your editor, are COLOR to translate publicly available color tables into OFM files, ADVHLP and ADVCHK to be used by the new script also named ADVCHK to make sure that all verbs, tasks, and procedures are listed in the adverb help files used by them, and ADVCNT to check line lengths in all help files.

Normally, bugs which appear in an *AIPS* TST version and then are 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, not describing temporary bugs in TST is somewhat of an oversight. We urge you to run the "Midnight Job" at least once after 31DEC25 is turned slushy 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* documentation web page (http://www.aips.nrao.edu/aipsdoc.html). Please do not hesitate to contact us via the NRAO science user help desk (https://help.nrao.edu) or via e-mail daip@nrao.edu with any questions or suspicions that there are problems.

System matters

Due to the "end of life" for RedHat 7, we chose to freeze 31DEC23 completely in June 2024. In this way, the binary version for LNX64 could remain as produced by RedHat 7. 31DEC24 for 64-bit Linux was then re-compiled with RedHat 8, producing a binary version incompatible with the older operating system. At the same time, we discontinued any development of the 32-bit Linux binary version. That version is available in binary form but only up to June 20, 2024. 31DEC25 does not contain a binary version for 32-bit Linux.

Old Linux systems left behind by these actions should note that it is relatively easy to compile all of *AIPS* on whatever machine you may have. Versions of `gfortran` at least 4.8, but better 6 or more, are required. The latest `gfortran` versions should also work.

The `MACARM` binary version of `31DEC25` is computed on a machine that was upgraded to "Sequoia" (OS version 15.6.1) with a gfortran upgraded to version 12.2. The load modules should work on any system at OS 13.0 or greater. The `31DEC23` version was frozen at the previous operating system level. The `MACINT` binary version continues to be developed, but if the computer used to produce it dies, our support for that binary version will halt. Again, you should note that compiling *AIPS* locally should go right on working.

`LNX64` now requires two "containers" to support the new task `ALBUS`. They should be copied by rsync either by `install.pl` or in the MNJ even for text (locally-compiled) installations. These files are large, one is 373 Mbytes, the more recent one is almost 410 Mbytes. These containers are not available for Macs.

UV data

Work on the `ALBUS` task revealed that *AIPS* has used a simple geometric computation to compute antenna longitude and latitude from the antenna (X,Y,Z) location parameters. All of *AIPS* was changed to use the "geodetic latitude" instead using a new subroutine. The geometric latitude of the VLA differs from the geodetic latitude by about 11 arc minutes or about 20 km to the South.

The *AIPS* task called `ALBUS` was given further attention. The desired GPS stations may now be specified with a new adverb, sensibly named `STATIONS`. The stations actually used in the solution are listed in the message file and written to the history file. Each station is listed only once unless a new antenna is specified (as in VLBI). The file `$AIPSIONS/ALBUS.stations` provides an enormous list of GPS stations which might be used by the program. That list was upgraded to drop duplicates, correct West longitudes (previously specified without a minus sign!), and to contain a description of the station location. The reading of negative latitudes from this file was corrected to handle the pernicious -00 degrees issue. Note that the `31DEC24` version of `ALBUS` did not receive these changes other than the upgraded stations file. The default `TECRTYPE` was changed to the model called `G01` which seems best for VLA data.

A new VLBI `RUN` file "pipeline" called `VLBAPIPE` was written. It borrows heavily from `VLBARUN` but does some of the steps in a different order. The most important of these is to do the full (every scan) run of `FRING` before doing the `BPASS` step. When the user has more than one scan on the bandpass calibrator this can make quite a difference. Extensive discussion on these pipelines can be found from the VLBA section of the web site listed at the start of this *AIPSLetter*. Both pipelines were changed to use `LISUN` rather than `LISTR` to generate the summary of the data set written to the output message file. The `RUN` files for `VLBAUTIL` and both pipelines were changed to allow the procedures to be run from multiple *AIPS* numbers for a single user number and output data area.

The interactive data display and editing task `EDITR` was given a new `CLIP EVERYTHING` menu option that uses the `FLAG ABOVE` interaction to set a clip level which is then applied to *every* baseline in the IFs, polarizations, and times currently displayed in the edit window. It displays what it is doing while running and automatically updates the display when it finishes. `EDITR` was also changed to display and edit upon a "coherence" parameter defined as the scalar averaged amplitude divided by the vector averaged amplitude minus 1.0. Note that this parameter requires data to be time averaged on the fly. `EDITR` was also corrected to handle the optional second data set properly. The "expert" mode was not changed and probably should be deleted.

The new task `DFTQU` is similar to `DFTPL` and `DFTIM` but writes out an image cube with Stokes Q and U and RGB color as the axes. The image contains the image of the Q and U Stokes of the data at a user selected celestial coordinate. Time is then used to set the color. This task should allow analysis of time-variable polarized sources of small diameter.

VPLOT was corrected to compute amplitude rms properly and plotting of phase rms was added. An option to extend the rms computation over spectral channels as well as time was added. An optional text file output was also added.

LISTR was given a phase rms option in the 'MATX' and 'LIST' operations. The rms options in 'LIST' were corrected to do a proper computation since the "count" parameter in the code was actually a sum of weights. The handling of antenna selection was changed to honor the *AIPS*-standard specification allowing the list to be inclusive or exclusive.

LISUN was enhanced with a listing of the antennas in the array. Antenna number, station name, (X,Y,Z) coordinates, and longitude and latitude are given.

UVFLG was given an option to flag scans too close to the Sun. Changed the code to allow elevation, shadowing, pulse cal, and Sun distance to be done all at once, although in separate passes through the data.

RESOU is a new task to allow the changing of up to 30 source numbers while copying a data set. It is very similar to DSORC and parts of MATCH without some of their complications.

CLPLT was changed to do all of the optional OUTTEXT output before any plotting. This guarantees that all print out is obtained even when DOTV=1 displays are terminated early. A bug was fixed that caused the last tine sample to be lost. The bad computation and plotting of error bars was corrected.

CAPLT was changed to have an OUTTEXT option and its computation and plotting of error bars was corrected.

UVDIF was changed to include or exclude auto-correlation and cross-correlation data.

DIFUV was given a new option to to compute the difference of the two data sets divided by the second. Output displays of mean, rms, max, and min were added along with a control of the writing of an output data set.

UVHGM and UVHIM were given a channel averaging option.

TVFLG, SPFLG and FTFLG were corrected to handle I/O with short rows. TVFLG was corrected to record the upper time properly in the ANTENNA-DT operation.

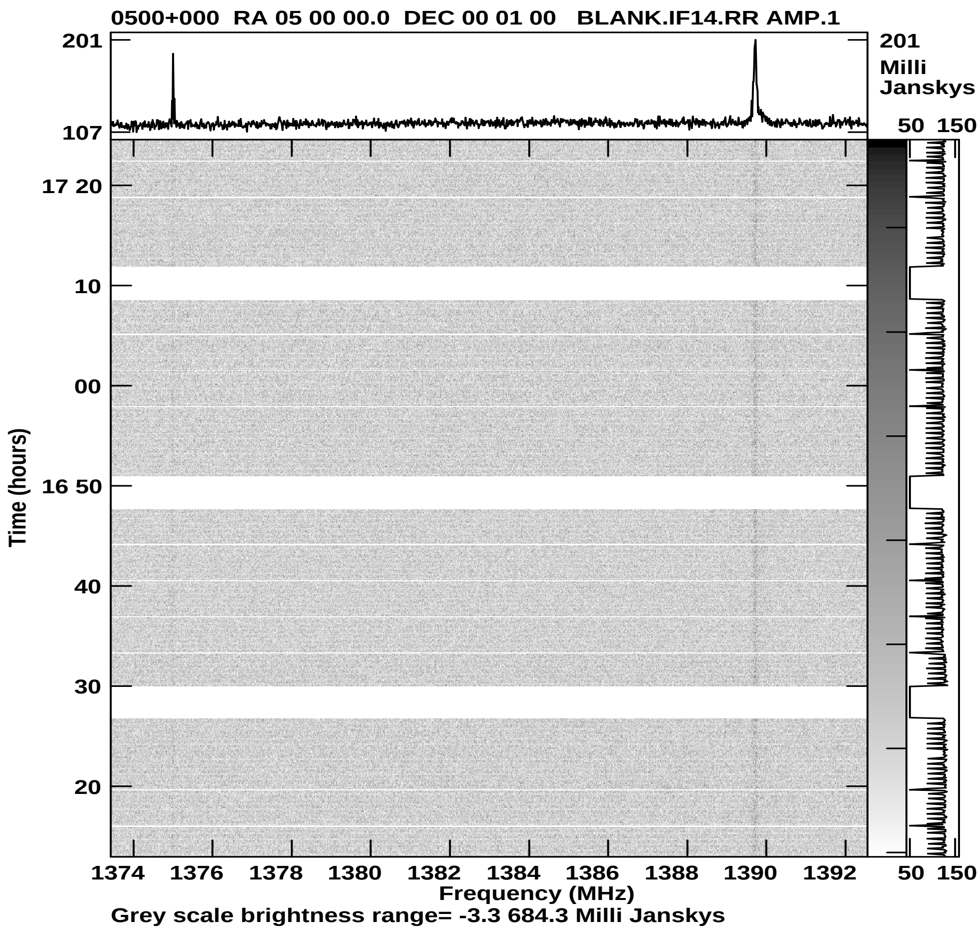
ELINT was corrected to copy the one IF solution to all IFs.

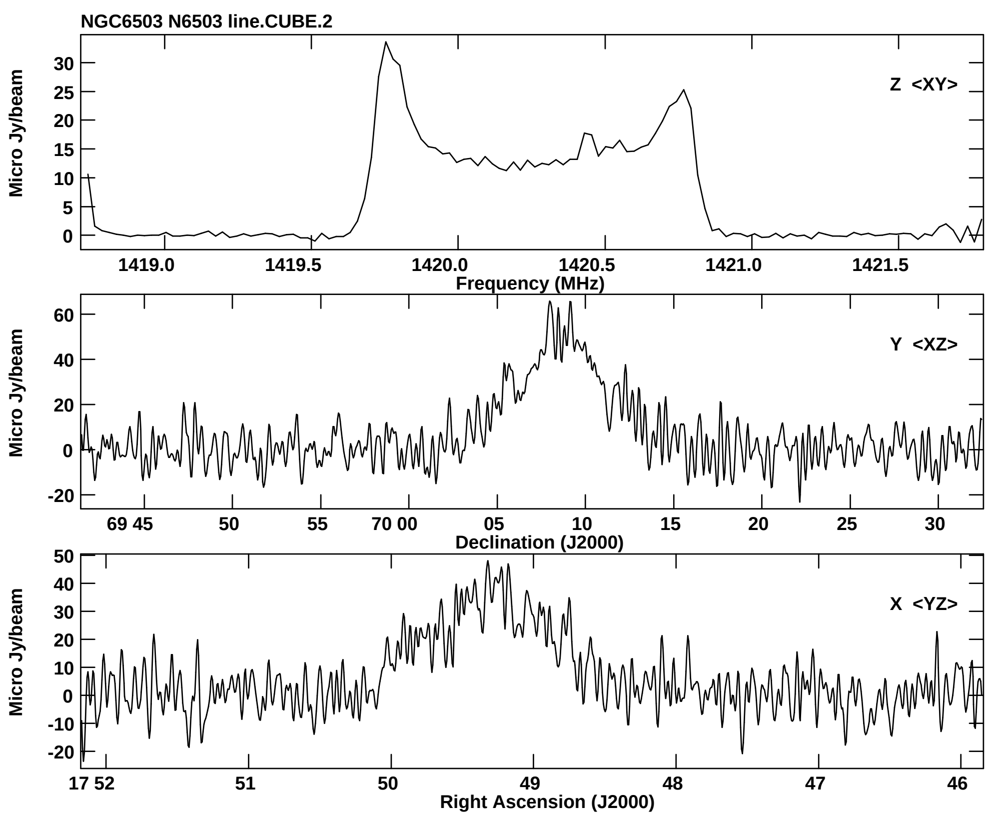
CLCOR was changed when doing the EOPS correction to assume the usual values when the (old) CT tables have all times equal to zero.

Imaging, Analysis, and Display

XGAUS, ZEMAN, AGAUS and ZAMAN are used to fit spectra with Gaussians and measure Zeeman splitting. They received a number of changes reported in the previous *AIPSLetter* and several more in the last six months. XGAUS was changed from always allowing only eight components to allowing up to 32 with the number to be allowed set when the XG table is created. This forced changes to the menu operations when the number of allowed components becomes large. The task now also computes an image of the rms of the residual after fitting which can be used in the editing stage and written to a cataloged file. AGAUS which fits absorption spectra was changed similarly. The Zeeman tasks now respond to the number of Gaussians in the XG table used when OPTYPE = 'GAUS'. Because a user may expend considerable effort on an XG or ZE file, a new task XG2XG was written to copy one of these tables to another with a change to the maximum number of components allowed. The task XG2PL was changed to accommodate the changes in these tables.

The concept of an image "profile" was added to the GREYS task. The profile in GREYS is the average in each column of the image which is then plotted along the top and/or the average in each row which is then plotted to the right. An example is shown in the accompanying figure. This image was produced by DFTIM for a study by Emmanuel Momjian of the new VLA online RFI excision. A new task called PRPLT has also been written to plot any or all three profiles from an image cube. An example plot of an HI galaxy cube is illustrated. The plot from the image x axis being the average over all (y, z), the plot from the image y axis being the average over all (x, z), and the plot along the z axis being the average over all (x, y).


0500+000 RA 05 00 00.0 DEC 00 01 00 BLANK.IF14.RR AMP.1
201
107
201
Milli
Janskys
50 150
Time (hours)
17 20
10
00
16 50
40
30
20
1374
1376
1378
1380
1382
1384
1386
1388
1390
1392
Frequency (MHz)
Grey scale brightness range= -3.3 684.3 Milli Janskys


NGC6503 N6503 line.CUBE.2
Micro Jy/beam
Z <XY>
1419.0
1419.5
1420.0
1420.5
1421.0
1421.5
Frequency (MHz)
Y <XZ>
69 45
50
55
70 00
05
10
15
20
25
30
Declination (J2000)
X <YZ>
17 52
51
50
49
48
47
46
Right Ascension (J2000)

IMAGR was changed to put the version numbers of the tables actually used for calibration and flagging into the history file. The imaging TV display was changed to prevent excess initialization of the look-up tables when the timeout option is used.

IMEAN was corrected to count "overflow" pixels properly and to display the Gaussian fit parameters when that option is selected.

TV3LOD is a new procedure automatically available to load an RGB image to 3 TV planes and turn them on in proper colors.

BLANK was given a simple `'BOX'` option to select or deselect up to 10 circular or rectangular areas.

LEVS contour levels are displayed whenever contours are drawn. The routine to generate the display string did unfortunate things to `LEVS` greater than 1000.

Verbs, general, and documentation

The old verb `CATALOG` was changed to ignore `INTYPE` when displaying all catalog entries matching the other name parameters. New verbs `CAT2LOG`, `CAT3LOG`, `CAT4LOG` and `CAT5LOG` were created to perform the same function with the other sets of name parameters.

Verb `PLGET`, which fills in the adverbs used to create a plot file, was revised as needed to match changes in plot tasks. Another little-known verb `EXTLIST`, which provides information on the contents of extension files, was revised as needed.

The *CookBook* was systematically updated in February, May, July, October, and November. Display problems with the `ABOUT` lists of Chapter 13 in the web-capable pdf and html versions were corrected. The TAB completion, `APROPOS`, and `ABOUT` text files were updated at the same time. The help files for adverbs contain lists of the verbs, procedures, and tasks which use them. These were also updated regularly and were revised so that the same format is used in all such files.

Recent Memoranda

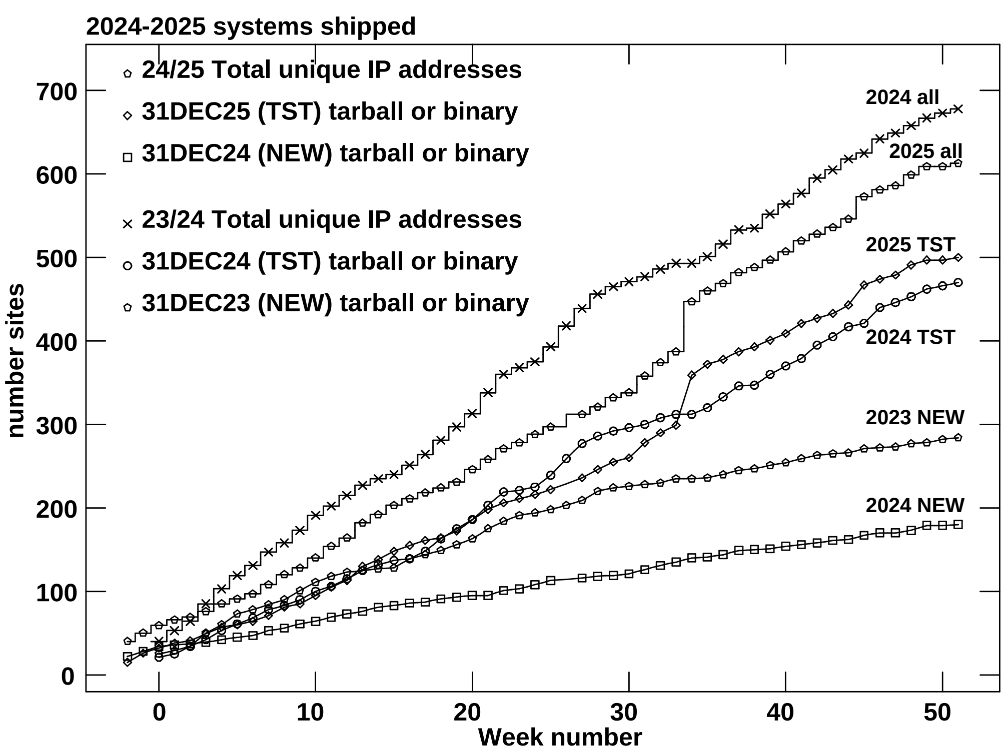
All *AIPS* Memoranda are available from the *AIPS* home page. Memo 117 which details the FITS format used by *AIPS* was updated for changes in the `XG` and `ZE` tables. Memo 118 and 122 which describe the interactive spectral-fitting tasks in *AIPS* were updated substantially to account for the numerous changes in these tasks.

118 Modeling Spectral Cubes in *AIPS*
Eric W. Greisen, NRAO
October 6, 2025 revision
AIPS has done Gaussian fitting along the x-axis of image cubes with task `XGAUS` since the 1980s. That task was overhauled in 2013 to be much easier to use and much more capable. In like fashion, tasks `ZEMAN` and `RMFIT` were developed. The former fits the standard leakage and scaling terms for Stokes V cubes, including a new option to do this for each of the Gaussians found by `XGAUS`. The latter fits polarization models to Stokes Q and U cubes, using the output of Faraday Rotation Measure Synthesis (*AIPS* task `FARS`) to assist with initial guesses. The models can contain multiple components each with a polarization flux, angle, rotation measure, and rotation measure "thickness." The present memo will describe the functions of these tasks in some detail with numerous graphical examples. A revision of this memo discusses changes made for the `31DEC15` release and two new tasks to plot spectra with model fits and a number of tasks which make visibility and image model files. The November 2017 revision includes new display options in `RMFIT`. The April and July 2025 revisions add display and edit options and correct display and pixrange setting. The September 2025 revision contains changes made to allow more than 8 components in `XGAUS` and `ZEMAN`.

122 **Modeling Absorption-line Cubes in *AIPS***
Eric W. Greisen, NRAO
October 6, 2025 revision
AIPS does Gaussian fitting of spectral lines with overhauled task XGAUS and can fit V polarization image cubes for Zeeman splitting with the task ZEMAN. Both of these tasks are designed for emission spectra in which the noise is not a function of spectral channel. In absorption, however, the noise in optical depth becomes high when the optical depth is high. Therefore, new tasks AGAUS and ZAMAN have been written to provide similar functions but with mathematics suitable for absorption lines. This memo describes the new tasks in some detail and includes a description of a new, simplified modeling task MODAB which may also be useful. That task has shown that the results of these four tasks are biased by the presence of the Zeeman splitting and need modest correction if they are meant to describe the actual pre-splitting line widths and magnetic field.

AIPS Distribution

From the NRAO system logs, we count apparent MNJ accesses, downloads of the tar balls, and rsync accesses by unique IP address. In November 2025 one of our counting cron jobs stopped working; recovery of the counts may not be totally accurate. Mysteriously, the number counted for binary is slightly larger than the count intended to represent all. 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 2025, a total of 187 different IP addresses downloaded the slushy form of 31DEC24 and 512 IP addresses downloaded 31DEC25 in tarball or binary form. With the change to the MNJ (rsync only) we are unable even to guess how many sites have run the MNJ. The total number of unique IP addresses in these five lists was 613, about 90 % of last year. The plot of numbers versus time and the table shows that 2025 was a bit ahead of 2024 in the TST version, but rather behind in the NEW version numbers. A new scheme to count rsync uses of $ARCH/LOAD was developed in the hope of learning which architectures are used for *AIPS*, The results were confusing, but clearly show LNX64 as very popular with TST MACARM following rather far behind.



Patch Distribution for 31DEC24

Normally, this section lists the patches that have been released for 31DEC24. This was based on the assumption that users would want to download individual files to compile them locally. However, the "Midnight Job" ($HOME/do_daily.*hostname*) will do this for you on both locally-compiled and binary installations. Therefore there is no reason to continue the old procedure. Major bug corrections were moved to 31DEC24 as they occur and users should use the MNJ on occasion on both the NEW and TST versions of *AIPS*.

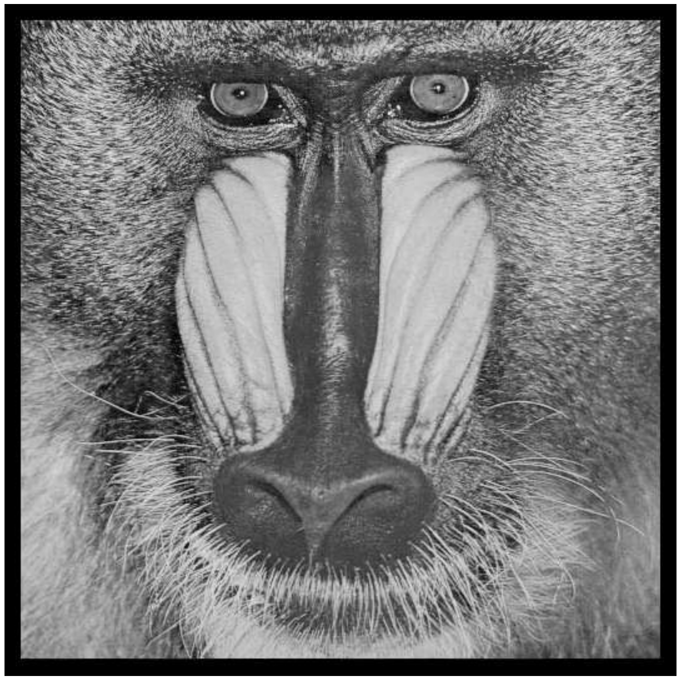
The 31DEC24 release is still available for installation, but is not recommended and will no longer receive patches even for egregious errors. It had a number of important patches during 2025. The patches are

1. TVSPX was given new options and corrected for handling zoom and large images. *2025-01-23*
2. QBEAM was corrected for number of adverbs and its handling of CUTOFF. *2025-01-28*
3. AU8A (EXTLIST verb) was corrected for its handling of 30-value adverbs in PLOTR. *2025-01-28*
4. TECOR was changed to issue a warning about leaving the reliable model behind (date > 2025.0) only once. *2025-01-19*
5. TEPLT was changed to use finer plot range limits on DIFF. *2025-01-19*
6. ZACTV9.C had a C error preventing compilation on the latest compilers. *2025-01-19*
7. FITTP and FITAB were changed to write Slice (SL) files as pseudo-FITS tables. FITLD, UVLOD, and IMLOD were changed to read them back in. *2025-03-06*
8. SYPRT was corrected to handle page size limitations and to loop over IFs, polarizations, and data types properly. *2025-13-11*
9. POSSM had issues with frequency labeling when the IFs were not all contiguous. *2025-03-12*
10. PLRFI, VBRFI, VLBRF did not make plot files properly with more than one subplot per page. *2025-03-18*
11. PRTSY did not sort the SY table correctly. *2025-03-19*
12. SGDESTR left a file open, blocking many functions in AIPS. *2025-03-19*
13. FITAB and FITTP attempted to write the history file as a table making an error message. *2025-03-26*
14. New OFMs have been added for use in OFMGET. *2025-04-03*
15. SPFLG, FTFLG wrote incorrect flags to the flag table when doing clip in sub-images. *2025-04-23*
16. NOIFS output one too many channels and set the reference channel one too high. *2025-05-05*
17. LISTR did not handle arrays with more than 50 antennas well. Fixed both LIST and MATX listings. *2025-05-07*
18. BPEDT did not check times when deleting BP table records. *2025-06-23*
19. IMEAN counted overflow pixels in the highest plotable box rather than one higher.*2025-07-16*
20. ELINT in DOPLOT=3 mode did not copy the solution to all IFs. *2025-07-18*
21. CLCOR died when the CT table times are all zero as in old VLBA data sets. *2025-07-31*
22. BPLOT confused linear polarization V with Stokes V. Labels improved also. *2025-08-06*
23. FITLD passed the wrong array to find the MC table parameters. HANNING tapered data were affected. Added code to detect 256-level antennas and skip the DIGICOR for them. *2025-09-11*
24. VPLOT did not compute amplitude rms correctly. Added phase rms to the possible plot items. *2025-10-14*

AIPS systems shipping

Rather than produce a blank page, we include the chart of systems shipped.

year	TST name	NEW name	TST	NEW	TST binary	NEW binary	Total unique
2004	31DEC04	31DEC03	808	196			1276
2005	31DEC05	31DEC04	832	246	299	48	1460
2006	31DEC06	31DEC05	806	191	402	94	1398
2007	31DEC07	31DEC06	965	277	669	161	1811
2008	31DEC08	31DEC07	1058	246	986	303	2107
2009	31DEC09	31DEC08	1228	307	1082	478	2399
2010	31DEC10	31DEC09	1228	307	1203	477	2416
2011	31DEC11	31DEC10	1105	270	1064	424	2228
2012	31DEC12	31DEC11	940	284	1028	396	1698
2013	31DEC13	31DEC12	1014	307	990	443	1937
2014	31DEC14	31DEC13	1045	333	848	431	1843
2015	31DEC15	31DEC14	1104	309	1001	350	1817
2016	31DEC16	31DEC15	878	222	788	372	1330
2017	31DEC17	31DEC16	874	408	768	386	1383
2018	31DEC18	31DEC17	684	368	603	343	1099
2019	31DEC19	31DEC18	754	406	686	388	1155
2020	31DEC20	31DEC19	796	434	750	470	1230
2021	31DEC21	31DEC20	659	399	604	376	1215
2022	31DEC22	31DEC21	590	226	572	221	965
2023	31DEC23	31DEC22	597	239	596	243	896
2024	31DEC24	31DEC23	470	284	480	272	678
2025	31DEC25	31DEC24	500	180	512	187	613



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