AIPSLETTER

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A newsletter for users of the NRAO
*A*stronomical *I*mage *P*rocessing *S*ystem

Written by a cast of *AIPS*

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IMPORTANT

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General developments in *AIPS*

Staff

In August, 1996 Dave Adler accepted an offer from the Space Telescope Science Institute and left the *AIPS* group. Staff and visitors at the AOC will remember Dave as a very helpful and knowledgeable first point of contact for all *AIPS* related questions. Dave also was responsible for keeping in running order what has to be one of the most complex *AIPS* installations. In May, 1997, Athol Kemball moved to the AIPS# project. In the past years, Athol has greatly contributed to *AIPS*, in particular to VLBA and Space VLBI applications. We are fortunate that Athol will still be available for consulting on *AIPS* matters. We wish both Dave and Athol good luck in their new endeavors.

Current release

The 15APR97 release of Classic *AIPS* is now available. It may be obtained via *anonymous* ftp or by contacting Ernie Allen at the address given in the masthead. *AIPS* is now copyright ©1995, 1996, 1997 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*. Details on how to obtain *AIPS* under the new licensing system appear later in this *AIPSLetter*.

A total of 222 copies of the 15OCT96 release were distributed, of which 114 were in source code form and 108 were distributed as binary executables. The table below shows the breakdown of how these copies were distributed. This includes both source code distributions and binary distributions. The latter method is gaining popularity quickly: 54 % of all distributions include binaries.

ftp	8mm	4mm	QIC	Floppy
198	16	7	1	0

User feedback suggests that the distribution over operating systems for installed versions of 15OCT96 was as follows:

Operating System	No.	15APR97 %	15OCT96 %
Solaris/SunOS 5	228	46	50
PC Linux	92	19	7
SunOS 4	63	13	22
Dec Alpha	48	10	8
SGI	24	5	5
IBM /AIX	22	4	3
HP-UX	18	4	3
Ultrix	1	0	1
Total	496		

The percentage for the previous release is given in the last column. The rapidly rising popularity of PC Linux is obvious. Solaris/SunOS 5 appears to have made significant gains over SunOS 4 since the last release. These figures are affected by the percentage of *AIPS* users that register with NRAO. For 15OCT96, though the number of *AIPS* shipments remained essentially unchanged, we noticed a pronounced drop in the number of sites that registered. We remind serious *AIPS* users that registration is required in order to receive user support.

The next release of *AIPS* will be 15OCT97.

Delay in 15APR97

The 15APR97 version of *AIPS* is focused on space VLBI applications. This arises from NRAO's commitment to fully support, within *AIPS*, the reduction of data taken with the HALCA satellite.

In April, 1997 we decided to delay the official release of 15APR97 to the summer of 1997, to accommodate the shift in the launch schedule and the start of in-orbit checkout (IOC) observations. HALCA was launched on 12 February 1997, and the first scientific data were taken around early April. Although by then almost all Space VLBI related software was already available in *AIPS*, we decided to postpone the release until we had had the chance to use this software at least once on real data. This became possible in May and June as fringes were found, followed by a complete pass of HALCA data through *AIPS*, resulting in a map. Though many aspects of Space VLBI specific software remain untested under real circumstances, these first successful results are very encouraging. In the next release, 15OCT97, we expect to ship Space VLBI application software with additional features and enhanced robustness.

Future plans

The two positions in the *AIPS* group that have been lost will not be filled again. This is partly due to a general trend of trying to cope with leaner budgets, and partly due to the increasing shift of focus of NRAO application development from *AIPS* to AIPS#. For the foreseeable future, however, we intend to continue releasing new versions of *AIPS* on a 6 month time scale.

System Support

printers Users can now change their printer on the fly from within *AIPS*, if you have more than one printer defined in PRDEVS.LIST. If you have multiple versions of *AIPS*, this requires copying the new $SYSUNIX versions of ZLPCL2 and ZLASCL to all older $SYSUNIX areas.

CAD There is a system utility called CAD (a shell script in $SYSUNIX) that may come in useful in the event of data or catalog corruption problems (*e.g.*, if your system crashes and the disk is compromised). It offers what is hopefully good advice on the shape of a given user's catalog in a specific data area.

tapes/Linux The tape drive code for Linux has had a good workout, and now correctly sets block sizes and densities for Exabytes and DAT drives.

AIPS_ROOT $SYSUNIX/TVDEVS.SH and START_AIPS no longer expand the $AIPS_ROOT variable before performing any remote shell command. In a heterogeneous environment with possibly different $AIPS_ROOT values, doing so was causing problems. This requires users to have $AIPS_ROOT defined in their environment when performing a remote shell (**rsh** or **remsh**) command (defined at the remote system), and thus some startup script changes may be needed at your site.

network names Using network service names in upper case letters has been found to precipitate bugs in certain operating systems. In particular, a NIS/YP server running SunOS 5.5 was found to reject connects for service names (in getservbyname) in uppercase. All services are now expected to be in lowercase.

SGI drives Better support for SGI tape drives under Irix 6 has been implemented; the older Z routines that were built for Irix 5 are deprecated but still available.

debuggers A new utility is provided that allows a user to switch debuggers on the fly within an **aips** session. The source for this utility is in **$SYSUNIX /DBGWRAP.C** and documentation in **$SYSUNIX/DBGWRAP.DOC**. It is not built as part of the normal installation procedure.

Improvements for users in 15APR97

Model-fitting — 1 - SLIME

SLIME is an interactive model-fitting program for *AIPS* that allows the user to construct and edit models by manipulating a graphical representation of the model. It is primarily intended for use with VLBI data.

The current version of **SLIME** is Version 2.0.0. If you are running an earlier version then you must switch to the new version for the **15APR97** release of *AIPS*. To obtain **SLIME** you should go to the **SLIME** homepage at **http://www.nrao.edu/~cflatter/slime.html** and download the appropriate distribution package for your workstation (**SLIME** is currently available only for SPARC-based systems running Solaris 2.4 or later and ALPHA/AXP-based systems running Digital UNIX 4.0). Each distribution package contains a precompiled version of **SLIME** and a script that will install it into a pre-existing *AIPS* installation as an *AIPS* task.

Model-fitting — 2 - OMFIT

OMFIT, one of three UV model fitting tasks in AIPS, has been improved considerably in **15APR97**. Several new models have been added including optically thin spheres, rings, and disks with limb darkening. Other improvements include improved convergence criteria, inclusion of the w-term, a rewrite of the HELP file, and better error-bar analysis. Due to limitations of the AIX fortran compiler, **OMFIT** now compiles without optimization on IBM architectures. **OMFIT** is still under development and details of features currently being implemented can be found at **http://www.nrao.edu/~kdesai** or by contacting **kdesai@nrao.edu**.

Elevation interpolation

The elevation interpolation task **ELINT** underwent a series of improvements for this release. New **OPTYPE** options were added to allow fitting for atmospheric opacity (following a law of the form exp(-tau/cos z)) as well as for the gain. This option can be useful in situations of high optical depth (such as at the upper end of Q-band, or a soaking wet day at K-band). The task can also now deal with elevation ranges exceeding 90 degrees, when antennas observe "over-the-top". The fitted polynomial can now take two forms: i) three coefficients of the polynomial; ii) three coefficients which determine position and value of minimum correction (maximum gain).

GPS ionospheric data

We are currently experimenting with the use of dual-frequency measurements to estimate the ionospheric electron content and the ionospheric Faraday rotation at the VLA. The new *AIPS* task **LDGPS** is used to load GPS data and to correct it for known clock offsets. The corrected data is used by the task **GPSDL** (GPS DeLay) to calculate Faraday rotation corrections for polarization data.

It should be emphasized that this is still an experimental system and that GPS data is not automatically available. Anyone who is interested in trying this system should consult with Alan Roy (**aroy@nrao.edu**) to determine the current status of this system and to arrange for the necessary data to be recorded. This should be done before the experiment is observed.

VLBI DDT test

Work on VLBI and Space VLBI testing using simulated data have continued since the last release, and a new VLBI DDT test script is now available. The simulated data are generated using task DTSIM, which can apply pre-fringe fitting calibration errors, including amplitude, phase, polarization and bandpass errors. Source models can also be specified. Test compliance is checked using DTCHK which reads calibration tables or checks the uv-data directly. The DDT script is called VLBDDT, and further information can be obtained by typing EXPLAIN VLBDDT.

Software ported from CVX

Several pieces of software were ported from CVX, the experimental version of AIPS. They include:

EDITA This is a new TV task to edit uv data based on calibration tables.

EDITR This new task allows interactive editing using a display of up to 10 baselines to a single antenna and that allows editing based on a secondary dataset (*e.g.*, residual visibilities).

SCMAP The "Edit Data" menu command was implemented, and APARM(9) was added to give the averaging time for data editing.

Miscellaneous Developments and Improvements

UVPLT UVPLT can now be told to generate UVW coverage plots with uniform limits in the U,V,W directions. If BPARM = x,y,2,0 is selected, where x and y are chosen from 6,7,8 [U,V,W respectively], then the plot is generated with identical limits along the X and Y axes.

SPLIT SPLIT now preserves the values of the rest frequency RESTFQ and the LSR velocity LSRVEL. Previously, they had to be set by hand after running SPLIT.

SNSMO SNSMO now allows smoothing of tables attached to single source files, and the new smoothing option 'DELA' specifies smoothing of delays only. A feature was added to control whether existing flagged solution entries are interpolated, and a bug was fixed that caused phase always to be re-referenced whereas delay and rate were only re-referenced for VLBI and VLMB smoothing modes. This allowed the possibility of partial re-referencing. Another re-referencing bug that was corrected affected multi-IF calibration tables for the second secondary reference antenna and above.

INDXR A bug was fixed in the routine that evaluates delay polynomials in the IM table, and shifts them to the CL table. This fix gets rid of the GETDEL error messages that were seen occasionally due to a small number of VLBA records being more than 2 minutes from an IM entry at the end of correlator jobs.

bandpasses Autocorrelation data can now be corrected by cross-power bandpasses for polynomial bandpass solutions. Previously, this case would be trapped, and the task would halt with an appropriate error message.

PARALLEL A PARALLEL verb was added to AIPS. This verb controls the number of processors that will be used for AIPS tasks that have been compiled with multiprocessor support. In the near future, we hope to add multiprocessor support to a few selected tasks.

IBLED IBLED was modified to allow an overlay plot of model amplitude as derived from an external CLEAN component table. This plot can be selected or de-selected using a new "PLOT MODEL" option of the left-hand menu. The model plotting supports multi-field data, and is useful for editing gravitational lens datasets in particular.

IRING Two options were added: a) plotting the cumulative intensity distribution, and b) specifying a range of azimuthal angles over which to compute the intensity distributions.

VLBI and Space VLBI specific developments

Data Loading — FITLD

Weight-based flagging was added. The implementation method is not totally general in that no FG table is written. Instead, data are not copied from tape to disc if the visibility weight in any IF drops below the specified threshold. FITLD now also writes the new spacecraft orbit (OB) table and writes output data using the new correlation_id random parameter. FITLD now supports reading FITS tables that are split up in 200 Mbyte chunks, as is customary for VLBA data.

Fringe fitting

FRING now implements the ORIGIN keyword for single source data files. When CALIB and BPASS run on single source files, they add the ORIGIN keyword to the output SN table. FRING has now been modified to do this as well.

Exhaustive fringe searching and subset solve were added to FRING. The FFT stage in FRING used to give up too easily when searching for fringes. Now, by setting APARM(9) > 0, FRING will exhaustively search all baselines, beginning with those baselines to the reference antenna specified by REFANT. Optionally a new control adverb called SEARCH can be filled in to specify the order in which to use the remaining antennas to search for fringes to antennas when REFANT was inadequate. The least squares stage now allows specification of a subset of antennas to solve for, *e.g.*, ANTENNAS =1,2,3,4 to include data on all baselines between antennas $1-4$ but also use DOFIT=1,2 to specify that solutions only be computed for antennas 1 and 2 [effectively, baselines 1-2, 1-3, 1-4, 2-3, 2-4 are used to find solutions for antennas 1 and 2]. DOFIT=0 specifies that all antennas are solved for, as before.

Baseline stacking is now supported for multiple integration times, as required by VSOP. Sparse baselines are padded with duplicate values before the initial FFT step. Weights and the SNR calculation are adjusted accordingly.

BLING

A major improvement in this release is that BLING now interpolates using quadratic interpolation in delay, rate and acceleration. This has allowed the default padding to be greatly reduced so that BLING should be much faster than before. The user still has the option of adding extra padding using negative values of APARM(5) and APARM(6) but preliminary tests indicate that this gives little improvement in precision at a large cost in run-time.

DOFIT adverb in CALIB

The antenna subset solve feature as described above for FRING was also implemented in CALIB. As in FRING, the adverb DOFIT specifies for which antennas solutions should be determined. DOFIT = 0 defaults to determining solutions for *all* antennas.

Ground-phasing for Space VLBI fringe-fitting

The task GPHAS, which averages selected baselines into a single effective baseline, and is particularly useful for Space VLBI data, received further development. New options were added for REFANT selection, and fixed model division. Previously the REFANT was created as a new virtual antenna. Now, the REFANT can be specified explicitly, or taken to be the most commonly occurring REFANT in the CL table. APARM(1)=1 works as before creating a new fictitious new antenna. APARM(1)=0 chooses the most commonly occurring reference antenna in the chosen CL table as the new reference antenna. APARM(1)=2 lets the user choose via APARM(2) the reference antenna number. APARM(3) also allows the user the option to normalize the visibilities before stacking them together.

New polarization modes for VLBA

The new polarization correction modes DOPOL=2 and DOPOL=3 were introduced. These modes allow second order polarization corrections when using the linear D-term approximation within AIPS. The mode DOPOL=3 applies more rigorous flagging, removing visibility points with any missing polarization correlation pairs. The mode DOPOL=2 applies the same second-order correction but makes several approximations for any missing polarization correlation pairs when computing the correction matrix. The mode DOPOL=1 makes the same first-order correction as before. The new modes are currently implemented only for VLBI polarization calibration within AIPS, and have no effect on other solution types (*e.g.*, VLA), though a VLA implementation may be added later. The second-order corrections have recently been shown to be important when correcting EVN data which may have individual D-term amplitudes as high as $\sim$ 20% in isolated cases (as reported by K. Leppänen). Note that 2nd order corrections have always been applied for the orientation-ellipticity VLBI polarization model in AIPS.

Improved handling of external calibration files

VLOG is a new task to segment and re-format the external calibration file produced by the VLBA monitor and control system for each project. The resulting output files can be used directly by ANTAB, APCAL, UVFLG and PCLOD and should help to significantly automate a priori calibration for a broad range of VLBA projects. This task is VLBA-specific and makes some assumptions about the format of the input ASCII files.

PCLOD, the task that produces an AIPS PC table based on input data from the VLBA monitor system, was refined in several respects. The calculation of the reference frequency was revised in order to correctly take into account the frequency reference pixel. The new adverb FQTOL sets the tolerance used in the frequency match. The robustness when handling multi-frequency data was enhanced: PCLOD no longer aborts if it encounters a frequency group that does not match an FQ-ID in the uv file but prints a warning message and skips pulse-cal groups until it finds a frequency group that does correspond to an FQ-ID in the data file.

Orbit tables

Orbit (OB) tables were introduced to support Space VLBI data reduction, and three new tasks make use of this new table. OBTAB reads the OB table, and fills in empty columns with additional information such as angular distance to the sun, position angle of the antenna feed, etc. Optionally OBTAB will add the six orbital parameters to the relevant column of the AN table. A second new task, OBEDT, allows flagging of data depending on entries in the OB table. Finally, OBPLT allows various columns of the OB table to be plotted against each other.

New random parameter: correlation_id

For full VSOP support, it was necessary to introduce a new random parameter. The VLBA correlator can change correlation modes with great flexibility, leading to time-variable rate and delay decorrelation corrections which depend on the type of frequency and time filtering performed in the correlator. The most general solution to this problem was to implement a correlation_id random parameter for VLBA datasets which points to the recorded correlation modes stored in the existing CQ table. This change made it possible to allow time variable correlation mode changes in general, although only time variable OVLB filtering is activated at present.

new ALIAS adverb

A new adverb, ALIAS, has been introduced to facilitate the calibration of Space VLBI data. Antennas specified via the ALIAS adverb will be treated as identical for the purposes of certain tasks. This allows HALCA, which appears in AIPS as a conglomerate of tracking stations, to be calibrated as one individual antenna, and to be viewed as such for some plotting tasks.

MSORT

MSORT is a new task that reproduces the functionality of **UVSRT**, but is optimized for large slightly missorted datasets. **MSORT** does an in-memory sort of a UV-data file. At best, **MSORT** should be about 3 times faster than **UVSRT** (in case when the data is only weakly mis-sorted — as is the case for normal VLA and VLBA data). At worst **MSORT** should take no more than 50% longer. In either case, **MSORT** requires no ancillary disk space — making this the preferred sorting method for large data files.

RESEQ

RESEQ is a new task which will, via the **ANTENNAS** input, renumber antennas in a UV file. Space VLBI requires the ability to alias stations together at some points in the data reduction stream. This is the first step for that requirement. **RESEQ** will renumber all antennas specified in the **ANTENNAS** adverb to **ANTENNAS(1)**, or, using **INFILE**, to some desired order.

CLCAL

CLCAL now allows "pass-through" calibration, as well as "proper" **FQID** and **SOURCEID** selection. By choosing **'CALP'**, **CLCAL** can now be made to pass **CL** table records for which no **SN** table record is found. This is dangerous but necessary if **SN** tables are constructed piecemeal as may be necessary for VSOP data. **SN** tables generated by single source data files and by OOP tasks may contain **FQID=-1** and/or **SOURCEID=0**. Such entries should match ALL **CL** table records. This is perfectly obvious for **FQIDs** but a bit ambiguous for **SOURCEIDs**. Furthermore, the new adverb **CUTOFF** specifies a maximum time interval over which interpolation is to be performed.

Documentation, on-line help, and user support

Designated AIP program

We continue the designated AIP program essentially unchanged. *AIPS* user support can be obtained by the following methods:

1. E-mail to **aipsmail@nrao.edu**. This account is checked several times a day, and messages are forwarded within the AIPS group as appropriate.
2. Submit a gripe. This is usually done from within AIPS. Newer versions of *AIPS* (**15JAN96** and later) will automatically send an e-mail message to NRAO. The gripe system should be used for less urgent matters, such as suggestions for improvement.
3. Contact the AIPS group member currently designated to provide user support. This listing is available on the WWW via

http://www.cv.nrao.edu/aips/d_aip.html

The "designated AIP" program covers all aspects of *AIPS* user support, including VLBI. Users may wish to contact individual members of the AIPS group directly if their question is of a specialized nature, and they know who in the AIPS group is the specialist in that area.

AIPS Publications and the World-Wide Web

The *World-Wide Web* (WWW) is a method for sending and receiving hypertext over the Internet network and has been made easy to use by clients such as *NCSA Mosaic, Netscape, Arena,* and *Lynx*. NRAO is among the many institutions which now offer informative Web pages and networks of additional information. The NRAO "home" page is at the Universal Resource Locator (URL) address

http://www.nrao.edu/

The *AIPS* group home page may be found from the NRAO home page or addressed directly at URL

http://www.cv.nrao.edu/aips/

This page points at basic information, news items about *AIPS*, recent *AIPSLetters* in PostScript format, patch information for all releases after **15JAN91**, the latest *AIPS* benchmark data from various computer systems, copies of **CHANGE.DOC** for every release since **15JAN90**, *all* relevant *AIPS* Memos, *every* chapter of the *CookBook*, and all recent quarterly reports to the NSF. There is even a tool to let you browse the **15APR97** versions of all help/explain files. We recommend that you check this URL occasionally since it changes when new software patches, revised *CookBook* chapters, and new *AIPS* Memos are released.

There are two new *AIPS* Memos with this release:

Memo	Date	Title and author
93	97/01/29	Position Angle of the VSOP Antenna Feed L. Kogan, NRAO
94	97/01/29	*AIPS* Benchmarks for the Silicon Graphics Origin 200 A. Kemball & C. Flatters, NRAO

These memos are available through the WWW pages. Since some Memos are not available electronically and others do not yet have computer readable figures, you may wish to write for a paper copy of these. To do so, use an *AIPS* order form or e-mail your request to **aipsmail@nrao.edu**. If you cannot use the Web, you can still use **ftp** to retrieve the Memos, *CookBook* chapters, etc.:

1. **ftp aips.nrao.edu** (currently on **192.33.115.103**)
2. Login under user name **anonymous** and use your e-mail address as a password (*yourname*@ will do; ftp will fill in the machine you are using).
3. **cd pub/aips/TEXT/PUBL**
4. **get AAAREADME** and read it for lots more information.
5. **get AIPSMEMO.LIST** for a full list of *AIPS* Memos.

Patch Distribution

As before, important bug fixes and selected improvements in **15APR97** can be downloaded via the Web at:

http://www.cv.nrao.edu/aips/15APR97/patches.html

Alternatively one can use *anonymous* **ftp** on the NRAO cpu **aips.nrao.edu** (currently located on **baboon** which is **192.33.115.103**). Documentation about patches to a release is placed in the anonymous-ftp area **pub/aips/***release-name* and the code is placed in suitable subdirectories below this. Information on patches and how to fetch and apply them is also available through the World-Wide Web pages for *AIPS*. As bugs in **15APR97** are found, the patches will be placed in the **ftp**/Web area for **15APR97**. No matter when you receive your **15APR97** "tape," you must fetch and install these patches if you require them.

Obtaining *AIPS* under the GNU General Public License

We have decided to make *AIPS* available via anonymous ftp under the GNU General Public License, the meaning of which was spelled out in the 15JUL95 *AIPSLetter*. The installation of *AIPS* will now proceed something like the following example:

We assume that you have created an account for *AIPS* with a root directory called /AIPS. Then do

```
home_prompt<601> cd /AIPS
home_prompt<602> ftp aips.nrao.edu
Connected to baboon.cv.nrao.edu.
220 baboon FTP server (Version wu-2.4(1) Fri Apr 15 12:08:14 EDT 1994) ready.
Name (aips.nrao.cv:johndoe): anonymous
331 Guest login ok, send your complete e-mail address as password.
Password: johndoe@nrao.edu
230- This is the National Radio Astronomy Observatory ftp server for the
230- AIPS, AIPS++, and FIRST projects.  Your access from primate.cv.nrao.edu
230- has been logged, and all file transfers will be recorded.  If you do not
230- like this, type "quit" now.  Counting you there are 1 (max 20) ftp users.
230-
230- Current time in Charlottesville, Virginia is Mon Jan 18 10:18:46 1996.
230-
230-
230-Please read the file README
230-  it was last modified on Wed Mar  8 14:01:24 1995 - 316 days ago
230 Guest login ok, access restrictions apply.
ftp> cd aips/15APR97
250 CWD command successful.
ftp> get README
200 PORT command successful.
150 Opening ASCII mode data connection for README (nnnn bytes).
226 Transfer complete.
local: README remote: README
nnnn bytes received in T seconds (5 Kbytes/s)
ftp> get INSTALL.PS
200 PORT command successful.
150 Opening ASCII mode data connection for INSTALL.PS (mmmmm bytes).
226 Transfer complete.
local: INSTALL.PS remote: INSTALL.PS
mmmmm bytes received in TT seconds (5 Kbytes/s)
ftp> binary
200 Type set to I.
ftp> hash
Hash mark printing on (8192 bytes/hash mark).
ftp> get 15APR97.tar.gz
200 PORT command successful.
150 Opening ASCII mode data connection for 15APR97.tar.gz ( bytes).
226 Transfer complete.
local: 15APR97.tar.gz remote: 15APR97.tar.gz
mmmmm bytes received in TTTTT seconds (5 Kbytes/s)
ftp> quit
221 Goodbye.
```

You should type in your full e-mail address (not johndoe@nrao.edu) at the password prompt. The hash command is optional and may be inappropriate in some versions of ftp; it does give a useful indication of progress in the long get in most versions. If you do not have the GNU file compression code (gzip), you should get 15APR97.tar. Our ftp server will uncompress the gzipped file automatically. (It would be around 3 times faster if you had gzip.)

At this point you should read the README file to review the latest changes, if any, affecting your installation of *AIPS*. You should print out the INSTALL.PS PostScript document and read at least its overview section.

To create the rest of the /AIPS directory tree, and fill it with the *AIPS* source code

```
cd /AIPS
zcat 15APR97.tar.gz | tar xvf -
                or
tar xvf 15APR97.tar
```

depending on whether you fetched the source file with compression or without.

If you want to get the binary version(s) of *AIPS*, you should read the README file for further directions. They will tell you about a procedure to run from the INSTEP1 installation procedure and/or at a later time which will initiate a second ftp session to fetch the appropriate contents from the $LOAD, $LIBR, MEMORY, BIN, and DA00 areas. You may run this procedure more than once if you need to fetch binaries for more than one architecture. You may also have to run portions of this procedure "by hand" if you encounter reliability problems with the network.

You will then have to run the INSTEP1 procedure, as usual, to tell your *AIPS* about your computer environment. A new part of INSTEP1 is its offer to assist you in "registering" your copy of *AIPS*. It will help you complete a registration form and will even e-mail it to us if you want. When we get a registration request, we will enter your information in our user data base and reply with instructions and registration numeric "keys" which you may use to complete the registration process (using SETPAR and SETSP). This may seem cumbersome and onerous, but we have two reasons for doing this. The first reason is to provide us with information about the use of *AIPS*. This information is useful to us to justify, to management and funding agencies, our existence and our need for more employees or computers or disk or whatever. The second reason is a concern about excessive demands on our employees' limited time to provide assistance to sites in installing and running the software. If an excessive demand should arise, information from the registration process will allow us to set priorities among the different sites. This registration is entirely optional. We will use transaction logging in ftp and, hence, know which sites have fetched the code. We will assume that sites which do not register are not "serious" in their use of *AIPS* and we will be unable to provide any assistance to unregistered sites (except, of course, to help them register). This means that unregistered sites will receive no assistance in installing *AIPS* and users at those sites will receive no assistance in using *AIPS*, including no printed literature. All serious sites are strongly encouraged to register since registration statistics are used to determine the level of effort that NRAO can provide for the Classic *AIPS* project. The statistics are also used to obtain assistance from computer vendors.

As of the 15JUL95 release, *AIPS* is available under the GNU General Public License. The short statement of this license is in every *AIPS* file, is available on-line via HELP GNU, and was given (once) in the 15JUL95 *AIPSLetter*. You should have received the GNU General Public License from several sources, most notably GNU themselves with their emacs, gcc, and numerous other software products. Since *AIPS* now applies that license to itself — and intends to import and use other GNU-licensed routines — we also include the full license text on-line via EXPLAIN GNU and, once, in the 15JUL95 *AIPSLetter*.

CookBook errata

If you are reducing polarization data, please note that the phase offset corrections given on Page 4-32 are in error. The correct values for the R-L phase difference (twice the position angle of the electric vector) are as follows.

Calibrator	angle	band
3C286	66 degrees	all wavelengths
3C138	-18 degrees	L-band
	-24 degrees	all other bands
3C48	do not use	L-band
	-150 degrees	C-band
	-131 degrees	shorter wavelengths

AIPS Order Form for `15APR97` *(Unix, "tar" format)*

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☐ Dec Alpha/OSF-1 4.0 ☐ HP 9000/7xx HP/UX B.10.01

4. Computer(s) make, model and OS version: _____

Include hardware/software/quantity info, e.g. _____

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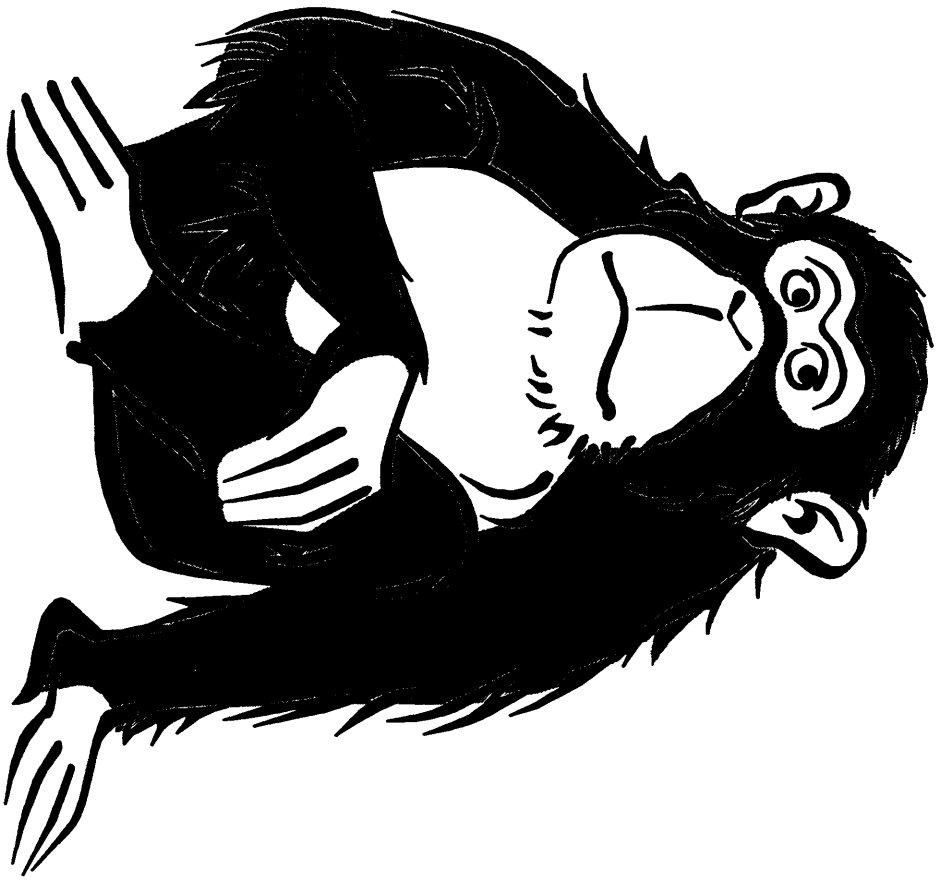

AIPSLETTER

April 15, 1997

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AIPSLETTER

Volume XVII, Number 2: October 15 1997

A newsletter for users of the NRAO
*A*stronomical *I*mage *P*rocessing *S*ystem

Written by a cast of *AIPS*

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General Developments in *AIPS*

Current Release

The **15OCT97** release of Classic *AIPS* is now available. It may be obtained via *anonymous* ftp or by contacting Ernie Allen at the address given in the masthead. *AIPS* is now copyright ©1995, 1996, 1997 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*. Details on how to obtain *AIPS* under the new licensing system appear later in this *AIPSLetter*.

The next release of *AIPS* will be **15APR98**. It is possible to get early access to this release by running a "midnight job"; see the *AIPS* home page for further details.

Space VLBI Support

The **15OCT97** release of *AIPS* incorporates a number of revisions and enhancements arising from our experiences in processing observations made during the in-orbit checkout (IOC) of the HALCA spacecraft. Several Space VLBI enhancements are summarized in the next section of this newsletter. We recommend that **15OCT97** be installed at all *AIPS* sites that will be used to reduce HALCA observations.

Staff Changes

In September Gustaaf van Moorsel left the *AIPS* group to concentrate on AOC computing issues, and Tony Beasley took over as head of the *AIPS* group. Eric Greisen returned to the *AIPS* group after 18 months of work on his experimental version, CVX. Eric's CVX version of *AIPS* has been successfully merged with **15OCT97** *AIPS* and the combined version will form the basis of **15APR98**.

AIPS Distribution

A total of 148 copies of the **15APR97** release were distributed, of which 79 were in source code form and 69 were distributed as binary executables. The table below shows the breakdown of how these copies were distributed. This includes both source code distributions and binary distributions.

ftp	8mm	4mm	ZIP	Floppy
137	6	3	2	0

User feedback suggests that the distribution over operating systems for installed versions of **15APR97** was as follows.

Operating System	No.	**15APR97** %	**15OCT96** %
Solaris/SunOS 5	255	66	46
PC Linux	61	16	19
HP-UX	23	6	4
Dec Alpha	23	6	10
SunOS 4	19	5	13
SGI	2	1	5
IBM /AIX	1	0	4
Total	384		

The distribution of **15APR97** has been rather lower than that for **15OCT96**, perhaps reflecting the fact that **15OCT96** had a longer lifetime than normal as **15APR97** was delayed by several months. These figures are affected by the percentage of *AIPS* users that register with NRAO. We remind serious *AIPS* users that registration is required in order to receive user support.

Improvements for Users in 15OCT97

This release includes several improvements over **15APR97**. The most significant of these are described below. See the **CHANGE.DOC** file for more details.

General Improvements

Support for Large Files

Unix file systems have traditionally limited file sizes to a maximum of 2 Gbytes (2 097 152 bytes). Several of the more modern varieties of Unix have removed this restriction but *AIPS* has continued to assume that

addresses in files can be stored in a standard 32-bit signed integer and has, therefore, been unable to take advantage of this change. This size restriction has proved awkward for some types of data reduction that require large volumes of data (eg. spectral-line mapping and space VLBI).

Starting with the **15OCT97** release of *AIPS* we have removed this limit so that *AIPS* can take advantage of large file facilities if they are made available by the host operating system. We have been able to use files larger than 2 Gbytes under IRIX 6 (SGI) and Digital UNIX 4 (DEC); this should also be possible under other operating systems. You should note, however, that filesystems may need to be set up in a particular manner before they can be used to store these large files: consult your system documentation to see what needs to be done.

Model Fitting

The **JMFIT** task, which fits model components to *AIPS* images now has a stricter convergence criteria so that it is less likely to position components at integer cell coordinates. It has also been modified to give better error estimates (see *AIPS* Memo 97 for more details).

Van Vleck correction in FILLM

The correlation coefficient produced by a digital correlator such as used by the VLA differs in a non-linear way from that produced by a perfect analog correlator. The VLA online system does not correct the visibilities for this difference. In most cases, measured correlation coefficients are too small for the effect to produce noticeable artifacts, but in cases of uncommonly high flux densities a correction — the so-called *Van Vleck correction* — may be needed. Fig. 1 shows the correction factor as a function of the correlation coefficient. In order to apply this correction, several quantities are required which are recorded on the archive tape but are not copied to the AIPS headers. Therefore, the latest stage at which this correction still can be applied is when the data are being read from tape to *AIPS* using the *AIPS* task **FILLM**.

This has now been implemented in **FILLM**; the Van Vleck correction will be applied when the third bit in parameter **CPARM(6)** is *on*. This is done by adding 8 to whatever value of **CPARM(6)** the user wants. Fig. 2 shows an example of a strong continuum source (Cygnus A) without (top panel) and with (bottom panel) the Van Vleck correction applied.

The Van Vleck correction in **FILLM** currently only works on continuum data. Results should always be inspected carefully. There are cases (strong masers) where spectral line observations could benefit from a Van Vleck correction as well, and we may implement this at some future stage.

Improvements for VLBI (Including Space VLBI)

VLBA Correlator

FITLD and **INDXR** will now transfer clock offsets and atmospheric delay from VLBA **MC** tables to the initial calibration table of a uv data set. This improves the tracking of the data reduction process for astrometry.

Mk 3 Correlators

New tasks, **M3TAR** and **TFILE** have been added to the system that will load data from Mk 3 VLBI correlators which has been encoded in tar archive files. Thanks go to M. Wunderlich for contributing this code.

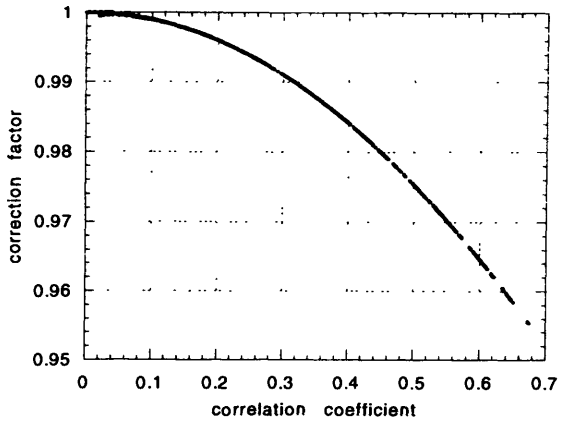

Figure 1: The Van Vleck correction factor applied to the visibilities as a function of the correlation coefficient. This graph refers to the actual Cygnus A data shown in Fig. 2. Note the unusually high correlation coefficients present in these data.

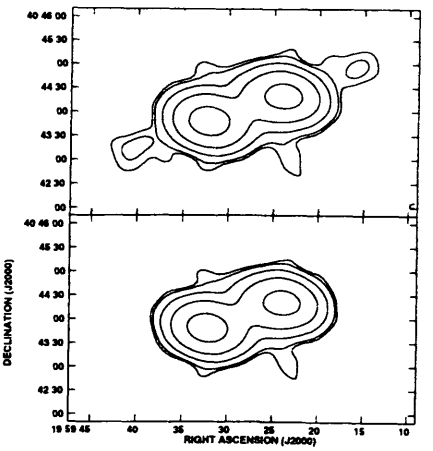

Figure 2: Cygnus A observations without (top) and with (bottom) the Van Vleck correction applied. Observations with other synthesis arrays confirm the spurious nature of the lobes at both ends in the top panel.

Forced Scan Breaks in INDXR

INDXR will now accept a list of times in a text file and will ensure that scans do not cross these times. This is primarily intended for Space VLBI, where scans should not span times at which clocks are reset at the ground stations since resetting the clock introduces discontinuous changes in residual delay.

Phase Calibration Data

VLBA antennas as well as some other VLBI antennas are equiped with pulse calibration system which provides the information necessary to align the phases of different IFs and polarizations as a function of time, removing the effects of any differences and fluctuations in the instrumentation. The instrumental delay can can be as large as 1 microsecond and can therefore cause several turns across typical VLBA band. With at least two tones in each band, it is possible to measure and remove the instrumental delay. The main problem is the existence of 2π ambiguities in the measured phase.

The *AIPS* task **PCCOR** uses pulse calibration data stored in an *AIPS* PC table to remove instrumental delays from UV data. Phase ambiguities are removed using the fact that phase of a calibrator's visibilities as a function of frequency should coincide with a straight line corresponding to a common delay for all IFs and polarizations.

PCCOR uses only the two tones with the lowest and highest freqquency within each IF Tests of **PCCOR** have shown that it produces a good alignment of phases in IFs separated by as much as 500 MHz.

Pulse calibration (PC) tables may be loaded from text files extracted from VLBA log files using **PCLOD** or directly from FITS data files; the Calagary S2 correlator already incorporates pulse calibration data in its data sets and the VLBA correlator will begin adding them to data files in 1998.

Coherence Times

COHER will now produce estimates of the coherence time for data that has not yet been fringe-fitted. These estimates may be used to set an upper bound for **SOLINT** in **FRING** or **BLING**.

Astrometry

Most tasks that support astrometry have been updated in this release, as has the **ASTROMET.HLP** file which describes the recommended process for reducing astrometic data in *AIPS*.

A new POPS procedure **REFREQ** allows the reference frequency to be changed within a band and may be used to change the reference frequency for fringe-fitting to the centre of the band to improve the isolation of delay and rate errors.

Baseline-Oriented Fringe-Fitting

The size of the delay-rate region search by **BLING** is no longer limited by the size of the *AIPS* pseudo-AP. The full ambiguity range may be now be searched for arbitrarily long solution intervals and arbitrarily large numbers of channels — subject to machine limitations, of course.

BLING has also be tuned for greater speed and should now be significantly faster than **FRING** in most circumstances (much of this tuning was done prior to the release of **15APR97** but was not mentioned in the *AIPSLetter*).

UVFIX and Space VLBI

UVFIX has been revised to caluculate correct (u, v, w) coordinates for baselines to an orbiting antenna. This assumes that the orbital elements are encoded in the antenna (**AN**) table and are referenced to the J2000 equinox.

Corrections for differential aberration have also been added to **UVFIX**.

Recent AIPS Memoranda

The following memoranda are available from the AIPS home page.

95 AIPS/AIPS++ Interoperability
A.J. Kemball
August 29 1997
This note discusses the question of interoperability between AIPS and AIPS++ during the transition period between the two systems. The objectives of such an effort and the technical means by which it might be achieved are considered. A distributed object design, which has already been investigated as a prototype, is presented as a solution.

96 AIPS on an Alpha/AXP Clone
Robert L. Millner, Patrick P. Murphy and Jeffrey A. Uphoff
October 14 1997
There has been some interest, both within NRAO and in the general Radio Astronomy Community, in the possibility of running AIPS on one of the many "clone" systems based on the Digital ALPHA AXP 21164 processor. Recently, NRAO/Charlottesville acquired such a system and proceeded to install the Linux operating system thereon. We have also started the process of porting AIPS to this 64-bit system, though the results reported herein are based solely on the use of binaries generated on an OSF/1 (Digital Unix) ALPHA processor and copied to the Linux system. We have successfully run the "DDT" suite of programs on this Linux/Alpha system and have achieved an AIPSMark$^{(93)}$ of 9.0.

97 Test of Errors of the Fitting Parameters at Gaussian Fitting Task JMFIT
L. Kogan
October 14 1997
Two-dimensional elliptical Gaussian fits are used in astronomy for accurate measurements of source parameters such as central position, peak flux density and angular size. The revised error analysis based on *con* and *kog* is implemented at the AIPS task JMFIT. A test of the errors of six parameters of fitted Gaussian into an image provided by JMFIT has been carried out. The test demonstrates a good agreement with the error predicted by JMFIT.

98 AIPSTerminal for Linux PCs
Robert L. Millner and Patrick P. Murphy
November 19 1997
There has been some interest in accessing AIPS on a home Linux PC. Many home machines lack the resources to run AIPS well and people may not wish to move large amounts of data to and from home. A small install package was created for Red Hat Linux which contains a minimal subset of AIPS to run the TV, Message and Tek servers. With this package, a user may run the servers from home, dial into the network and access AIPS on their workstation in an efficient manner.

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☐ **QIC 150 (150MB)** ☐ **9-track 6250 bpi**

☐ **100 MB "Zip" disk (includes Linux binaries)**

☐ Check here for BINARY TAPE (load and go), exabyte or DAT only, and indicate OS/hardware

☐ Sparc/Solaris 2.5 (SC4) ☐ Sparc Ultra (SUL) ☐ Sparc/SunOS 4.1.2 (SC2.0.1)

☐ Linux 2.0 (ELF format) ☐ Silicon Graphics IRIX 6.4 ☐ IBM RS6000/AIX 3.2

☐ Dec Alpha/OSF-1 4.0 ☐ HP 9000/7xx HP/UX (not yet available)

4. Computer(s) make, model and OS version: _____

Include hardware/software/quantity info, e.g. _____

Sparc Ultra 2/SunOS 5.5/21, etc. _____

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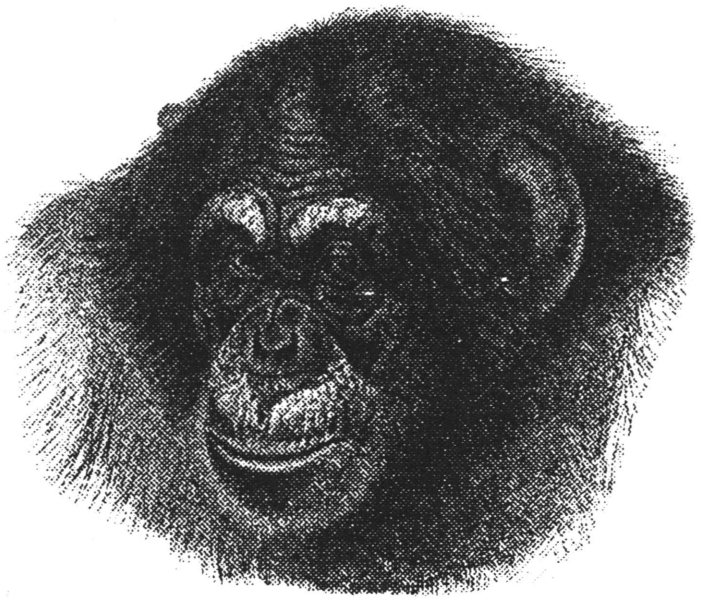

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