

VLB ARRAY MEMO No. 414

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12 December 84

To: VLBA
From: W. D. Cotton
Subject: Data Processing Meeting 11 December 1984

Present: Benson, Burns, Cotton, Fickling, Greisen, Johnston,
Kellermann, Moore, Pearson, Romney, Simon, Walker, Wells

The items discussed on the agenda were the following:

1) Memo from Tim Pearson suggesting a generalized version of the proposed AIPS channel table to handle irregularly spaced axes. This memo is appended to the end of this document.

2) Weights. It has been suggested that the weights used for data be related to the noise in the data. If the weight is actually the inverse of the variance of the data then it becomes poorly behaved as the noise approaches zero. Should we use a floor on the noise in these cases.

3) Autocorrelation data. The autocorrelation data could go into the same data file as the cross correlations; however, the averaging times appropriate for these two types of data are quite different and the data will be put to different uses.

4) Source table. A proposed source descriptor extension table for AIPS is proposed; is anything left out? A proposed extension table for the source information is specified in UMA3:[VLBA.DTATPROC]:SOURTAB.SPC.

Item 1) There was little dissent on this motherpie-and-applehood question. The details of a file to describe the pixel locations along axes with irregular spacing were not worked out but all agreed this was a good idea. D. Wells pointed out that this would not work for all problems and in particular projective geometries could not be dealt with in this manner; AIPS currently recognizes several types of projective geometries by axis label and does the correct transformation to position.

Item 2) There was general agreement that whatever quantity is carried along with the data it should be convertible to an RMS noise. There was some discussion about exactly what noise should be included. P. Moore pointed out that if atmospheric noise were included it would be different for amplitudes and phases. B. Cotton mentioned that the systematic contributions to the noise would presumably be reduced during the processing. The conclusion was that the thermal or sampling noise be used; for a digital correlator this is derivable

directly from the number of bits correlated and does not include atmospheric or other systematic effects.

There was an extended discussion about what form the noise/weight should be kept in, RMS or the inverse of the variance. The advantage of using the RMS is that it has a smaller range than the inverse of the variance. On the other hand, the inverse of the variance is what is wanted most often in processing the data. J. Romney and R. Simon expressed a desire to be able to modify the weights for portions of the processing to be able to include systematic effects. On the whole, using the inverse of the variance seemed somewhat preferable.

Item 3) After some discussion it was generally agreed that the autocorrelation data should go into a separate catalogue entry from the crosscorrelation data but there should be file naming conventions which allow an user to ignore this fact. The advantage of separate files is basically increased flexibility.

Item 4) Two items left out of the SOURCE table were bandwidth and polarized flux densities. The updated specification file for the source table is appended to the end of this memo. C. Walker suggested that the SOURCE table might be the appropriate place to keep a template source spectrum to use for amplitude calibration of spectral line data. After some discussion it was concluded that this was not appropriate.

Other Items:

-K. Johnston again promised to have his memo on the requirements of geometric measurements out by the next meeting.

-Time. The current 1530 EST Tuesday time of the meeting conflicts with the Tuesday Astronomy lunch at Cal Tech. It was decided to try to move the standard time for these meetings to 1600 EST Tuesday.

-C. Walker suggested that at the next meeting we discuss the January VLBA face-to-face meeting in Socorro.

From: PHOBOS::NETCHECK 4-DEC-1984 20:47
To: CVAX::COTTON
Subj: Mail forwarded from _PHOBOS::TJP.

From: TJP 4-DEC-1984 11:41 *
To: NRAO
Subj: VLBA IF table

>CVAX::COTTON
Re: VLBA Memo No. 409
Processing ID: 4.X IF table (CHANTAB)

The CHANTAB table appears to be to a specific case of a much more generally applicable concept, and I would like to see the AIPS group consider a general solution to the general problem rather than a specific solution to a specific problem.

The general problem is that of images (or uv data sets) with irregularly sampled axes. The standard AIPS format copes with regularly spaced axes, where the coordinate is a linear function of pixel number. However, many images have axes along which the coordinate is a non-linear function of the pixel number. The IF frequency is only one specific case of this problem. The solution proposed for IF frequency can easily be generalized to arbitrary non-linear axes: provide an extension table which provides the exact coordinate value at each pixel.

I would like to see a general AIPS mechanism whereby non-linear axes can be accommodated in this way. Any axis of the image could have an associated extension table providing the coordinate values for the center of each pixel along this axis.

The simplest such extension file would contain (a) keywords to identify the AXIS (n) which this table is associated with, and the number of values (-NAXISn) in the table, and (b) a list of NAXISn numbers giving the coordinate values at the center of each pixel along the axis. It might be desirable to extend this structure to be able to specify more than one parameter for each pixel: for example, the proposed CHANTAB table gives both the FOFF and the ISIDE parameters for each pixel (although these could easily be encoded in one number by multiplying them together, assuming all the FOFF's can be made positive). The coordinate value recorded in the extension table could be either an absolute value (eg frequency) or an offset from the reference value recorded in the main header (eg frequency offset).

I should be grateful for your comments on this suggestion. Please forward this note to anyone else on the Data Processing Group who might be interested.

VLBA Post Processing Software Specification

Post Processing ID: 4.X Source table (SOURTAB)

Version: 12/12/84

Type: AIPS table structure

Function: This table will contain information about sources in a raw uv-data file.

Details:

A. Overview

This extension table for a uv data set contains relevant information about the sources in a raw uv data file. This includes positions.

Names: The file name is SUDSSSVV where d is disk number, sss-catalog number and vv = version number.

B. File structure.

Each logical record consists of the position and other information about a source in the raw uv data file. Sources are distinguished in the data file by a source ID number.

The file header record contains no KEYWORDS.

Table entries:

Title	Units	Description
ID. NO.	integer	The source identification number.
SOURCE	char.	Name of the source to be flagged, (8 Char) blank -> all sources
QUAL	integer	Source qualifier
CALCODE	char.	Calibrator code
FLUX(4)	Jy	Flux density at reference frequency in uv file header for I, Q, U, V Stokes' parameters.
FREQOFF	Hz	Frequency offset from reference frequency in catalogue header.
BANDWID	Hz	Bandwidth of channel.
RAEPO	degrees	Right ascension at standard mean epoch
DECEPO	degrees	Declination at standard mean epoch
EPOCH	years	Date in years since year 0.0 of the standard epoch.
RAAPP	degrees	apparent Right ascension at Oh IAT on reference day in uv file header.
DECAPP	degrees	apparent declination at Oh IAT on reference day in uv file header.

C. User notes.

The true frequency of the observations are the signed sums of the reference frequency in the catalogue header, the peculiar source frequency offset from this table and the IF frequency offset from the IF table (CH file).

D. Routines to write SU files:

Chapter 14 of "Going AIPS" given a detailed description of routines to access tables files.

E. Routines to access SU files:

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Special Requirements: none.

Revision:

11/07/84 W. Cotton Original specifications.
12/12/84 W. Cotton Add polarized flux and bandwidth