To: Files
From: Douglas Wood
Date: Friday, July 20, 1990
Subject: SMA Technical Memo #22

Using SDE for SMA Imaging Simulations

Abstract

This memo is a practical guide to the Software Development Environment (SDE) developed by the NRAO. SDE can be used to simulate SMA observations and image reconstruction with mosaics. Because SDE is continuously being updated by NRAO, I first describe how to use FTP over Internet to copy the latest version of SDE to CX1 and how to install the new programs. Next I provide samples of SDE runs to show how a mosaicing image simulation is performed and how to read the resulting images in AIPS. Some helpful hints on using SDE are given at the end of this memo.

Introduction

The software development environment (SDE) was written by Tim Cornwell, Mark Holdaway and others at the National Radio Astronomy Observatory. SDE has been used for the simulations performed by Cornwell, Braun and Holdaway for the NRAO Millimeter Array. It has many features and is a platform for NRAO algorithm development for both the MMA and the VLBA. NRAO plans to use SDE to test new imaging techniques before they are implemented in AIPS. The primary advantage of SDE over AIPS is that it is easy to test imaging algorithms without a great deal of programming overhead. I have left a three-ring binder in the SMA office which describes SDE in more detail and presents a programmer's guide.

The SDE account

SDE is presently kept in my account (DWOOD) on CFACX1. I will give the password to her and Colin. SDE in located in the directory

`/cx1/disk2/dwood`

The simulations I have performed are kept in

`/cx1/disk2/dwood/sma`

If you run SDE from an account other than DWOOD, you should first type

```
% source /cx1/disk2/dwood/sdeini
```

to set-up path names, etc. This C-shell is executed in the .login of DWOOD.

Using FTP to Install Updates

SDE is constantly being updated by NRAO, so from time to time one should get the latest version. In addition, the current version that I have been using has some bugs (see below), which may be fixed with future updates. The following steps should allow you to use the network to copy the latest version of SDE over to our CONVEXes.

1) Copy the new version to CX1 over Internet

```
% cd /cx1/disk2/dwood
% ftp yucca
~~~~~
FTP> Username: sde
FTP> Password: notaips
~~~~~~
FTP> cd /yucca/sde/tarfiles
FTP> type binary
FTP> get sdetar.d.Z
  (sdetar.d.Z should be the latest version.
   Call Cornwell or Holdaway at NRAO to see if it is updated.)
~~~~~~
```

At this point the transfer should take place. If you have trouble completing the transfer, try again at an off time (evenings are best). It should take only 15 or 20 minutes. If it takes longer, there are too many network errors.

```
FTP> quit
```

2) Uncompress the tar file

The utility 'uncompress' is not available on CX1 or CX2. Ask Mark Birkenshaw to uncompress the file

```
/cx1/disk2/dwood/sdetar.d.Z
```

using his SUN. Put the output file `sdetar.d` in the `/cx1/disk2/dwood` directory.

3) Backup current configuration files

Before you 'untar' the tar file, you should first make copies of two files that have been specially configured for our system

```
% cd /cx1/disk2/dwood
% cp sdeini.csh sdeini.csh.save
% cd bin/unix
% cp comopt comopt.save
```

4) Run tar to install the new code

```
% cd /cx1/disk2/dwood
% tar -xf sdetar.d
```

5) Copy the saved files back

```
% cd /cx1/disk2/dwood
% cp sdeini.csh.save sdeini.csh
```

```
% cd bin/unix
% cp comopt.save comopt
```

6) Build

```
% cd /cx1/disk2/dwood
% build
```

Using SDE

The user interface to SDE is similar to the old DEC-10 programs. You invoke SDE modules by typing their name in the operating system rather than in a central command interpreter (as in AIPS). Each program has a set of inputs that are saved in a file named ____.cur where _____ is the program name. You can write a unix script to execute several SDE tasks from a command file if you want to run things overnight or in the background.

Here is a current list of SDE task that is printed when you type `sdetasks`.

% sdetasks

```
The following tasks exist in SDE as of 5/29/90:

      Task          Purpose
      ----          -------
      ant           I allow interactive array building
      calsf         I calculate the antenna gain correlation
      clean         I perform Clark or Hogbom CLEAN deconvolution
      closure       I use closure phase information
      cohtst        I perform a coherence test
      corrupt       I corrupt data
      cyclic        I
      dump          I dump files
      fft           I test FFTS
      fftx          I time FFTs
      fix           Special fixer
      fly           I perform wide-field imaging
      gsp           I perform GSP deconvolution
      hdr           I manipulate headers
      hgeom         I change the geometry
      Img2sun       I display images on the Sun
      imgclip       I clip images
      imgcollap     I collapse cubes
      imgcopy       I copy images
      imgdesph      I project spheres
```

imgdump	I dump Images
imglc	I add images
imgmodel	I insert a model into an image
imgpb	I apply or correct primary beams
imgplot	I contour an image
imgprt	I print images
imgres	I find residuals
imgsph	I expand images into spheres
imgstat	I calculate statistics of images
imgsub	I sub-section images
imgtvd	I put an image on the TV
imgxfr	I make a transfer function
ldecs	I do linear deconvolution and smoothing
lmosaic	I perform linear mosaicing
lucy	I perform Lucy deconvolution
magtape	I handle magnetic tapes
makmos	I assemble u,v data into mosaic data bases
makepb	I make primary beams
mapper	I make and clean images from visibility data
mosaic	I perform maximum entropy mosaicing
moscat	I concatenate mosaic data bases
moslist	I list mosaic visibility data
mosobs	I assist in scheduling mosaic observations
mosscal	I self-calibrate mosaics
npamsim	I make simulated mosaic array data, with errors
oisim	I make simulated OI array data
padim	I pad images to a larger size
photons	I add photon noise to images
rvres	I plot normalized radially averaged residual vis
selfcal	I self-calibrate
smooth	I smooth images with an elliptical Gaussian
stalin	I remove history cards
tblstat	I calculate table statistics
template	I am a template task
triple	I solve for visibilities from triple product
trp	I triple-produce
trplist	I list triple product data
trptst	I test TRP routines
uvcov	I display uv coverage on the tv
uvmap	I make images from visibility data
uvplt	I plot uv data
vislist	I list visibility data
vismodel	I insert a model into a visibility data set
visres	I find residuals
vlba	I find mosaic data from VLBA mosaic data
vm	I perform maximum entropy deconvolution
wiener	I do Wiener filtering and smoothing
world	Archetypal Hello, world program

Of course many of these routines are applicable to SMA simulations. I have used the routines NPAMSIM and MOSAIC to simulate SMA observations and create mosaic images. At the back of this memo I have included a sample run that illustrates how the a simulation was performed.

To date I have not tried to produce any plots directly with SDE, although this should be possible. I have obtained a copy of the PGPLOT library for our non-IEEE standard CONVEXes, so the the routines in SDE that generate graphics should work. This will take a little fiddling to generate graphic output, but since NRAO has the same equipment we do there should be no major snags.

I have not tried to generate any SDE images directly on the IIS in the image processing lab. It is possible that this will work since NRAO uses IIS as well. SDE appears to be integrated with SAOIMAGE so it may be possible to have SDE display image on an X-window system directly. Currently I read the SDE FITS files into AIPS and use the IIS for display.

Antennae stations

The ANT file used by SDE is a list of the antennae stations. The format of this file is the same at for the task UVSIM in AIPS. I have written some Excel spread sheets that calculate antennae station positions in the X,Y,Z coordinate system that UVSIM and SDE use. The spread sheets can be found on the Mac file server in the folder SMA Array SE/SMA/SDE. SDE also has an option for reading the stations in simply x,y coordinates on the ground. I have not tried this. You will find the in the SDE area on CX1 some of these antennae files. They have extentions .DAT. The two I have used the most are MK12.DAT (inner two stations of Y array on Mauna Kea) and MKCRY6.DAT (a 6 station on Mauna Kea).

Tips and Hints

- Use the predefined prefix `SMA/` in front of a file name (e.g. `*Mos = SMA/MK12#4.mos`) to direct SDE to look in the directory `/cx1/disk2/dwood`

- Use the prefix `D1/` in front of image names to direct output to a large scratch area accessible to AIPS (e.g. `*VM = D1/MK12#4.FTS`). Use .FTS as the extension to image files to cause SDE to generate a FITS image for AIPS. With no extension SDE generates a binary file that only it can read by SDE, but which is smaller and faster to read than FITS format.

• You can easily read SDE FITS images into AIPS using IMLOD:

```
AIPS 2: IMLOD:  Task to store an image from a FITS or IBM-CV tape
AIPS 2: Adverbs          Values              Comments
AIPS 2: ------------------------------------------------------------
AIPS 2: INTAPE         1                     Input tape drive # (0 => 1)
AIPS 2: OUTNAME     'MKCRY6#8VM  '           Image name (name)
AIPS 2: OUTCLASS    '      '                 Image name (class)
AIPS 2: OUTSEQ         0                     Image name (seq. #)
AIPS 2:                                        0 => highest unique number
AIPS 2:                                       -1 => FITS tape value
AIPS 2: OUTDISK        1                     Disk drive # (0 => any)
AIPS 2: NCOUNT         1                     Number of files to load.
AIPS 2: DOTABLE        0                     True (1.0) means load tables
AIPS 2: NFILES         0                     # of files to advance on tape
AIPS 2: NMAPS          0                     # IBM maps to advance on tape
AIPS 2: INFILE      'D1:MKCRY6#8VM.FTS                                  '
>go
IMLOD2: Task IMLOD  (release of 15JAN90) begins
IMLOD2: Reading from disk file: D1:MKCRY6#8VM.FTS
IMLOD2: ZTPOPD: using translated file name =
IMLOD2: ZTPOPD: /cx1/disk1/SDE/MKCRY6#8VM.FTS
AIPS 2: Resumes
IMLOD2: Create IMLOD        .TEMP  .    1 (MA)  on disk 1 cno   39
IMLOD2: End of file read as expected
IMLOD2: RENAME MKCRY6#8VM  .ICLN  .    1 (MA)  ON DISK 1 CNO   39
IMLOD2: Image=TEST       (MA)          Filename=MKCRY6#8VM  .ICLN  .   1
IMLOD2: Telescope=MMA                  Receiver=?
IMLOD2: Observer=?                     User #= 1207
IMLOD2: Observ. date=BAD DATE          Map date=24-JUL-1990
IMLOD2: Minimum= 1.22097242E-03        Maximum= 2.69469023E-03 JY/PIXEL
IMLOD2: ------------------------------------------------------------
IMLOD2: Type    Pixels   Coord value  at Pixel    Coord incr   Rotat
IMLOD2: RA---SIN   128    00 00 00.000   64.00        -1.000    0.00
IMLOD2: DEC--SIN   128    30 00 00.000   64.00         1.000    0.00
IMLOD2: FREQ         1   3.4499999E+11    1.00 3.4500000E+10    0.00
IMLOD2: ------------------------------------------------------------
IMLOD2: Map type=NORMAL                Number of iterations=      15
IMLOD2: Conv size= 0.00000 X 0.00000   Position angle=   0.00
IMLOD2: Observed RA   00 00 02.761    DEC  30 00 35.87
IMLOD2: There are   1 extension files of type HI
IMLOD2: Appears to have ended successfully
IMLOD2: Account: Cpu=    2.61  Real=    10.0  IOcount=        47
```

• After you run a program you can copy (cp) the .cur file into a file of your own choosing if you want to save the exact inputs that were used. You can then copy this file back to the .cur file to run the program with those inputs.

Bugs

1) AIRY and AIRYB work in NPAMSIM, but when I try to run MOSAIC it bombs with a floating point error when databases generated with AIRY or AIRYB are input.

2) I could not get MOSAIC to generate a CVM map. Perhaps these is some parameter that should be set to get this to work

3) Large image mosaics bomb in MOSAIC with the message:

```
"No memory available in routine DAIMAKAR, Requested
item:M/PC37/XFR/ARRAY/DATA
```

This happens to me when I try to create images with IMSIZE = 256,256,1

4) Automatic stopping of the image restoration in MOSAIC does not work (or at least I never go it to stop automatically for me).

5) I have been using Mos = ____.mos in NPAMSIM and getting good results. Mark Holdaway tells me (see attached E-mail) that I should use .SDE for the extension on visibility. This is undocumented and since I had no previous runs to study when I began my work I chose .mos as the extension. Probably NPAMSIM should be run with .SDE for the visibility file extensions in the future.

OBSERVATORY: D. Wood

LAT: 19.82667 ° .3460 (radians)
ALT: 4066 m

		East (m) E	North (m) N	Alt (m) AL	Dist D (m)	Azimuth A (radians)	Azimuth A (degrees)	Elevation EL (radians)	Elevation EL (degrees)	POSITIONS for UVSIM input file X (m)	Y (m)	Z (m)	Dia
BASIC Y ARRAY:		2.911	7.545	4066	8.087	.368	21.10	.00	.00	-2.56	2.91	7.10	6
		5.997	15.542	4066	16.659	.368	21.10	.00	.00	-5.27	6.00	14.62	6
		12.354	32.017	4066	34.318	.368	21.10	.00	.00	-10.86	12.35	30.12	6
		25.450	65.955	4066	70.695	.368	21.10	.00	.00	-22.37	25.45	62.05	6
		52.427	135.867	4054	146.125	.368	21.10	-.08	-4.71	-57.37	52.43	123.74	6
		107.999	279.886	4043	300.880	.368	21.10	-.08	-4.38	-116.57	108.00	255.49	6
		5.078	-6.294	4066	8.087	2.463	141.10	.00	.00	2.13	5.08	-5.92	6
		10.461	-12.965	4066	16.659	2.463	141.10	.00	.00	4.40	10.46	-12.20	6
		21.550	-26.708	4066	34.318	2.463	141.10	.00	.00	9.06	21.55	-25.12	6
		44.394	-55.018	4066	70.695	2.463	141.10	.00	.00	18.66	44.39	-51.76	6
		91.451	-113.336	4066	145.631	2.463	141.10	.00	.00	38.44	91.45	-106.62	6
		188.389	-233.473	4066	300.000	2.463	141.10	.00	.00	79.19	188.39	-219.63	6
		-7.990	-1.251	4066	8.087	-1.726	-98.90	.00	.00	.42	-7.99	-1.18	6
		-16.459	-2.577	4066	16.659	-1.726	-98.90	.00	.00	.87	-16.46	-2.42	6
		-33.905	-5.309	4066	34.318	-1.726	-98.90	.00	.00	1.80	-33.90	-4.99	6
		-69.844	-10.937	4054	71.706	-1.726	-98.90	-.17	-9.63	-7.58	-69.84	-14.36	6
		-143.878	-22.531	4043	147.436	-1.726	-98.90	-.16	-8.97	-13.99	-143.88	-29.00	6
		-296.388	-46.413	4043	300.880	-1.726	-98.90	-.08	-4.38	-5.89	-296.39	-51.46	6
OUTRIGGERS	1	-32.335	616.983	4013	620.099	-.052	-3.00	-.09	-4.90	-259.12	-32.33	562.43	6
	2	444.430	-429.181	4066	617.830	2.339	134.00	.00	.00	145.57	444.43	-403.74	6
	3	-590.834	180.636	4005	620.834	-1.274	-73.00	-.10	-5.64	-118.65	-590.83	149.24	6
CRY-6 ARRAY													
with same max.	1	8.788482	10.827	4066	13.945	.682	39.07	.00	.00	-3.67	8.79	10.19	6
baseline as MK12	2	-13.76777	2.211	4066	13.944	-1.412	-80.88	.00	.00	-.75	-13.77	2.08	6
	3	-9.041495	10.617	4066	13.945	-.705	-40.42	.00	.00	-3.60	-9.04	9.99	6
	4	5.006651	-13.015	4066	13.945	2.774	158.96	.00	.00	4.41	5.01	-12.24	6
	5	-4.648432	-13.147	4066	13.945	-2.802	-160.53	.00	.00	4.46	-4.65	-12.37	6
	6	13.70946	2.552	4066	13.945	1.387	79.45	.00	.00	-.87	13.71	2.40	6

Spread sheet for calculating a basic 6 element O array.
See Cornwell MMA Memo #38

D. Wood

Scale = 27.9 diameter of circle in meters

If Y arm = 16.1 then use scale = 27.89 meters
in order for the O array to have the same maximum baseline as Y array

		X
Cornwell	CRY6-1	0.3151123
MMA	CRY6-2	-0.4936455
Memo #38:	CRY6-3	-0.3241841
	CRY6-4	0.1795142
	CRY6-5	-0.1666702
	CRY6-6	0.4915545

Station	X	Y	E(m)	N(m)
1	0.31511	0.3882064	8.788482047	10.827
2	-0.4936	0.079260695	-13.767773	2.211
3	-0.3242	0.3806634	-9.041494549	10.617
4	0.17951	-0.4666631	5.006651038	-13.015
5	-0.1667	-0.471403	-4.648431878	-13.147
6	0.49155	0.091509384	13.70945501	2.552

Y
0.38821
0.07926
0.38066
-0.4667
-0.4714
0.09151

Y array pos calculator

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Nstations=	6	per arm		
MaxLen=	300	m	Max Baseline:	519.6
scale=	12.25	1 mm = scale ft		0.2678204
gfactor=	2.06			
a=	8.086957			

AZ_ARM1=	21.1	0.37
AZ_ARM2=	141.1	2.46
AZ_ARM3=	261.1	4.56

	D		Arm 1		Arm2		Arm3	
			E	N	E	N	E	N
Station	m	ft						
1	8.1	26.5	2.911	7.545	5.078	-6.294	-7.990	-1.251
2	16.7	54.7	5.997	15.542	10.461	-12.965	-16.459	-2.577
3	34.3	112.6	12.354	32.017	21.550	-26.708	-33.905	-5.309
4	70.7	231.9	25.450	65.955	44.394	-55.018	-69.844	-10.937
5	145.6	477.8	52.427	135.867	91.451	-113.336	-143.878	-22.531
6	300.0	984.3	107.999	279.886	188.389	-233.473	-296.388	-46.413

```
6
19.82667
1 1
-2.56 2.91 7.10 6
-5.27 6.00 14.62 6
2.13 5.08 -5.92 6
4.40 10.46 -12.20 6
.42 -7.99 -1.18 6
.87 -16.46 -2.42 6
```

MK12.DAT

Inner 2 stations of MK Y

```
6
19.82667
 1
-3.67     8.79    10.19    6
-.75     -13.77    2.08    6
-3.60     -9.04    9.99    6
4.41       5.01   -12.24   6
4.46      -4.65   -12.37   6
-.87      13.71     2.40    6
```

MKCRY6.DAT

Crystaline 6 for MK

```
39
  35.0000
  1.00000     1.00000
 -6.81000    -1.79000     9.72000     7.50000
 -3.44000   -10.39000     4.91000     7.50000
  2.51000    -11.1700    -3.59000     7.50000
  6.58000    -3.54000    -9.39000     7.50000
  5.69000     6.76000    -8.12000     7.50000
 0.510000     11.9700   -0.740000     7.50000
 -5.05000     8.16000     7.21000     7.50000
 -12.5900    -1.35000     17.9900     7.50000
 -11.4600    -9.20000     16.3700     7.50000
 -8.78000    -15.7900     12.5500     7.50000
 -4.92000    -20.2600     7.02000     7.50000
-0.390000    -21.9900    0.550000     7.50000
  4.19000    -20.7500    -5.99000     7.50000
  8.21000    -16.7100    -11.7300     7.50000
  11.1200   -10.41000    -15.8800     7.50000
  12.5200    -2.70000    -17.8800     7.50000
  12.2400     5.37000    -17.4800     7.50000
 10.30000     12.7100    -14.7100     7.50000
  6.97000     18.3400    -9.95000     7.50000
  2.70000     21.4900    -3.86000     7.50000
 -1.94000     21.7400     2.76000     7.50000
 -6.31000     19.0500     9.01000     7.50000
 -9.83000     13.7900     14.0400     7.50000
 -12.0200     6.67000     17.1700     7.50000
 -19.2100    -5.90000     27.4300     7.50000
 -16.1700    -19.0100     23.0900     7.50000
-10.33000    -28.3285     14.8353     7.50000
 -2.71000    -33.6700     3.88000     7.50000
  5.38000    -32.6800    -7.68000     7.50000
  12.5400    -26.0500    -17.9000     7.50000
  17.5300    -14.9000    -25.0300     7.50000
  19.4900    -1.19000    -27.8300     7.50000
  18.0800     12.7400    -25.8200     7.50000
  13.5500     24.4600    -19.3500     7.50000
  6.67000     31.9500    -9.53000     7.50000
 -1.36000     33.9200     1.94000     7.50000
 -9.16000     30.0200     13.0800     7.50000
 -15.3700     20.9300     21.9500     7.50000
 -18.9200     8.23000     27.0200     7.50000
```

MMA_D.DAT

D configuration of MMA

SDE run example

An Example of an SDE run to simulate an SMA Observation
After Loggin in....

```
cd /cx1/disk2/dwood/sma
% npamsim
npamsim I:
npamsim I: I make simulated mosaic array data
npamsim I:
npamsim I: Compiled : Tue Jul 10 15:35:05 EDT 1990
npamsim I:
npamsim I: *inp
npamsim I: Name of ASCII file specifying array : Antfile = MK12.DAT
npamsim I: Name of ASCII file giving model comps. : Model = testd.mod
npamsim I: Size of model image : Imsize = 256, 256, 1
npamsim I: Cellsize in model image : Cellsize = 1.000000, 1.000000,
)00000
npamsim I: Name of output or input model image : Map =
npamsim I: Hour angle limits [hours] : HAlimits = -5.00000000000000,
)00000000
00000
npamsim I: Declination of source in Model [deg.] : Dec =
0000000000000
npamsim I: Frequency of radiation [Hz] : Freq = 344999985152.000
npamsim I: Minimum elevation for unflagged data [deg.] : ELmin =
000000000000
0
npamsim I: Primary beam application? : PB = T
npamsim I: Integration time [seconds] : INTtime = 180.000000000000
npamsim I: Add noise to visibility data? : ADDN = F
npamsim I: rms phase noise per telescope per integration time : PHRMS
..000000
npamsim I: rms fractional complex gain deviation : GRMS = 5.0000000E-

npamsim I: fractional gain drift for TOTAL POWER : GDRIFT =
)000000E-02
npamsim I: rms noise per correlator per integration time : NRMS =
.000000
npamsim I: global pointing error,      AZ, EL [arcsec] : GLPNT = 0.,

npamsim I: original (random) pnt err,  AZ, EL [arcsec] : ORPNT = 0.,

npamsim I: drift in pointing over obs, AZ, EL [arcsec] : DRPNT = 0.,

npamsim I: random pointing error,      AZ, EL [arcsec] : RANPNT = 0.,

npamsim I: Name of telescope for header and PB : Telescope = MMA
npamsim I: Telescope diameter for type AIRY or AIRYB [meters] :
.diam = 7.5000
00
npamsim I: Do we use uniform grid on SIN PROJECTION? : Sinproj = F
npamsim I: Use DFT for no pointing error case? [T|F] : DFT = F
npamsim I: Generate autocorrelations? : AutoC = T
    npamsim I: Weighting for autocorrelations : AutoW = 0.4000000
    npamsim I: Number of extra pointings in each direction : NED = 4
    npamsim I: Name of output mosaic database : Mosaic = MK12#10.SDE
    npamsim I: Name of output Visibility database (first pointing only)
Vis =
    npamsim I: *imsi = 128,128
    npamsim I: *mod = teste.mod
    npamsim I: *Int = 600
    npamsim I: *Ned = 3
    npamsim I: *Mosaic = SMA/MK12#10.SDE
    npamsim I: *ranPnt = 3,3
    npamsim I: *inp
    npamsim I: Name of ASCII file specifying array : Antfile = MK12.DAT
    npamsim I: Name of ASCII file giving model comps. : Model = teste.mc
    npamsim I: Size of model image : Imsize = 128, 128, 1
    npamsim I: Cellsize in model image : Cellsize = 1.000000, 1.000000,
1.000000
    npamsim I: Name of output or input model image : Map =
    npamsim I: Hour angle limits [hours] : HAlimits = -5.00000000000000,
5.000000000
    00000
    npamsim I: Declination of source in Model [deg.] : Dec =
30.0000000000000
    npamsim I: Frequency of radiation [Hz] : Freq = 344999985152.000
    npamsim I: Minimum elevation for unflagged data [deg.] : ELmin =
20.000000000000
    0
    npamsim I: Primary beam application? : PB = T
    npamsim I: Integration time [seconds] : INTtime = 600.000000000000
    npamsim I: Add noise to visibility data? : ADDN = F
    npamsim I: rms phase noise per telescope per integration time : PHRM
= 1.000000
    npamsim I: rms fractional complex gain deviation : GRMS = 5.0000000E
02
    npamsim I: fractional gain drift for TOTAL POWER : GDRIFT =
5.0000000E-02
    npamsim I: rms noise per correlator per integration time : NRMS =
0.1000000
    npamsim I: global pointing error,      AZ, EL [arcsec] : GLPNT = 0.,
0.
    npamsim I: original (random) pnt err,  AZ, EL [arcsec] : ORPNT = 0.,
0.
    npamsim I: drift in pointing over obs, AZ, EL [arcsec] : DRPNT = 0.,
0.
    npamsim I: random pointing error,      AZ, EL [arcsec] : RANPNT =
3.000000,
    npamsim I:  3.000000
    npamsim I: Name of telescope for header and PB : Telescope = MMA
    npamsim I: Telescope diameter for type AIRY or AIRYB [meters] :
Teldiam = 7.5000
    00
    npamsim I: Do we use uniform grid on SIN PROJECTION? : Sinproj = F
```

```
npamsim I: Use DFT for no pointing error case? [T|F] : DFT = F
npamsim I: Generate autocorrelations? : AutoC = T
npamsim I: Weighting for autocorrelations : AutoW = 0.4000000
npamsim I: Number of extra pointings in each direction : NED = 3
npamsim I: Name of output mosaic database : Mosaic = SMA/MK12#10.SDE
npamsim I: Name of output Visibility database (first pointing only) :
; =
npamsim I: *go
npamsim I: POINTING ERROR MODEL (ARCSECONDS)
npamsim I: GLOBAL POINTING ERRORS : AZ  0.0        EL  0.0
npamsim I: INITIAL POINTING SPREAD: AZ  0.0        EL  0.0
npamsim I: DRIFT IN POINTING      : AZ  0.0        EL  0.0
npamsim I: RANDOM POINTING ERRORS : AZ  3.0        EL  3.0
npamsim I: There were      6 shadowed points out of      21
npamsim I: Found      1 components
npamsim I: Read model
npamsim I: Pointings seperated by        11.9573811616 arcseconds
npamsim I: We will make 1      integration intervals
npamsim I: Integration number 1
npamsim I: Data go to Temp/PC1I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = -1.16
npamsim I: DEC ERROR AVE, arcseconds = 0.33
npamsim I:  RA ERROR SPREAD, arcseconds = 2.14
npamsim I: DEC ERROR SPREAD, arcseconds = 1.87
npamsim I:    .
npamsim I: Creating pointing ( -3, -3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC2I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = 1.14
npamsim I: DEC ERROR AVE, arcseconds = -0.123
npamsim I:  RA ERROR SPREAD, arcseconds = 2.18
npamsim I: DEC ERROR SPREAD, arcseconds = 3.54
npamsim I:    .
npamsim I: Creating pointing ( -2, -3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC3I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = -1.48
npamsim I: DEC ERROR AVE, arcseconds = 1.35
npamsim I:  RA ERROR SPREAD, arcseconds = 1.96
npamsim I: DEC ERROR SPREAD, arcseconds = 1.6
npamsim I:    .
npamsim I: Creating pointing ( -1, -3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC4I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = 0.0918
npamsim I: DEC ERROR AVE, arcseconds = -0.561
npamsim I:  RA ERROR SPREAD, arcseconds = 2.23
npamsim I: DEC ERROR SPREAD, arcseconds = 1.76
npamsim I:    .
npamsim I: Creating pointing (  0, -3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC5I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = -0.677
npamsim I: DEC ERROR AVE, arcseconds = 0.185
npamsim I:  RA ERROR SPREAD, arcseconds = 5.3
npamsim I: DEC ERROR SPREAD, arcseconds = 3.17
npamsim I:    .
npamsim I: Creating pointing (  1, -3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC6I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = 1.26
npamsim I: DEC ERROR AVE, arcseconds = -0.961
npamsim I:  RA ERROR SPREAD, arcseconds = 2.55
npamsim I: DEC ERROR SPREAD, arcseconds = 2.41
npamsim I:    .
npamsim I: Creating pointing (  2, -3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC7I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = 0.52
npamsim I: DEC ERROR AVE, arcseconds = 0.868
npamsim I:  RA ERROR SPREAD, arcseconds = 3.17
npamsim I: DEC ERROR SPREAD, arcseconds = 1.93
npamsim I:    .
npamsim I: Creating pointing (  3, -3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC8I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = -0.283
npamsim I: DEC ERROR AVE, arcseconds = -0.297
npamsim I:  RA ERROR SPREAD, arcseconds = 2.28
npamsim I: DEC ERROR SPREAD, arcseconds = 1.88
npamsim I:    .
npamsim I: Creating pointing ( -3, -2)
```

```
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC9I1
npamsim I:  RA ERROR AVE, arcseconds = -1.75
npamsim I: DEC ERROR AVE, arcseconds = 1.53
npamsim I:  RA ERROR SPREAD, arcseconds = 3.89
npamsim I: DEC ERROR SPREAD, arcseconds = 2.56
npamsim I:    .
npamsim I: Creating pointing ( -2, -2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC10I1
npamsim I:  RA ERROR AVE, arcseconds = -1.78
npamsim I: DEC ERROR AVE, arcseconds = 0.214
npamsim I:  RA ERROR SPREAD, arcseconds = 2.22
npamsim I: DEC ERROR SPREAD, arcseconds = 2.21
npamsim I:    .
npamsim I: Creating pointing ( -1, -2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC11I1
npamsim I:  RA ERROR AVE, arcseconds = -1.17
npamsim I: DEC ERROR AVE, arcseconds = -0.476
npamsim I:  RA ERROR SPREAD, arcseconds = 1.52
npamsim I: DEC ERROR SPREAD, arcseconds = 1.99
npamsim I:    .
npamsim I: Creating pointing (  0, -2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC12I1
npamsim I:  RA ERROR AVE, arcséconds = -1.13
npamsim I: DEC ERROR AVE, arcseconds = -0.427
npamsim I:  RA ERROR SPREAD, arcseconds = 4.61
npamsim I: DEC ERROR SPREAD, arcseconds = 2.45
npamsim I:    .
npamsim I: Creating pointing (  1, -2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC13I1
npamsim I:  RA ERROR AVE, arcseconds = -1.03
npamsim I: DEC ERROR AVE, arcseconds = 1.71
npamsim I:  RA ERROR SPREAD, arcseconds = 1.66
npamsim I: DEC ERROR SPREAD, arcseconds = 1.92
npamsim I:    .
npamsim I: Creating pointing (  2, -2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC14I1
npamsim I:  RA ERROR AVE, arcseconds = -0.598
npamsim I: DEC ERROR AVE, arcseconds = 0.368
npamsim I:  RA ERROR SPREAD, arcseconds = 5.74
npamsim I: DEC ERROR SPREAD, arcseconds = 2.26
npamsim I:    .
npamsim I: Creating pointing (  3, -2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC15I1
npamsim I:  RA ERROR AVE, arcseconds = -0.177
npamsim I: DEC ERROR AVE, arcseconds = -0.783
npamsim I:  RA ERROR SPREAD, arcseconds = 2.95
npamsim I: DEC ERROR SPREAD, arcseconds = 2.35
npamsim I:    .
npamsim I: Creating pointing ( -3, -1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC16I1
npamsim I:  RA ERROR AVE, arcseconds = -0.062
npamsim I: DEC ERROR AVE, arcseconds = -0.529
npamsim I:  RA ERROR SPREAD, arcseconds = 1.98
npamsim I: DEC ERROR SPREAD, arcseconds = 1.82
npamsim I:    .
npamsim I: Creating pointing ( -2, -1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC17I1
npamsim I:  RA ERROR AVE, arcseconds = 0.124
npamsim I: DEC ERROR AVE, arcseconds = -0.976
npamsim I:  RA ERROR SPREAD, arcseconds = 1.24
npamsim I: DEC ERROR SPREAD, arcseconds = 3.59
npamsim I:    .
npamsim I: Creating pointing ( -1, -1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC18I1
npamsim I:  RA ERROR AVE, arcseconds = 1.06
npamsim I: DEC ERROR AVE, arcseconds = -0.224
npamsim I:  RA ERROR SPREAD, arcseconds = 3.08
npamsim I: DEC ERROR SPREAD, arcseconds = 2.43
npamsim I:    .
npamsim I: Creating pointing (  0, -1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC19I1
```

```
npamsim I:  RA ERROR AVE, arcseconds = -1.3
npamsim I: DEC ERROR AVE, arcseconds = -1.41
npamsim I:  RA ERROR SPREAD, arcseconds = 3.26
npamsim I: DEC ERROR SPREAD, arcseconds = 4.89
npamsim I:    .
npamsim I: Creating pointing (  1, -1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC20I1
npamsim I:  RA ERROR AVE, arcseconds = -0.0111
npamsim I: DEC ERROR AVE, arcseconds = 0.158
npamsim I:  RA ERROR SPREAD, arcseconds = 3.32
npamsim I: DEC ERROR SPREAD, arcseconds = 4.3
npamsim I:    .
npamsim I: Creating pointing (  2, -1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC21I1
npamsim I:  RA ERROR AVE, arcseconds = 2.18
npamsim I: DEC ERROR AVE, arcseconds = 0.835
npamsim I:  RA ERROR SPREAD, arcseconds = 2.13
npamsim I: DEC ERROR SPREAD, arcseconds = 1.98
npamsim I:    .
npamsim I: Creating pointing (  3, -1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC22I1
npamsim I:  RA ERROR AVE, arcseconds = 1.4
npamsim I: DEC ERROR AVE, arcseconds = -1.39
npamsim I:  RA ERROR SPREAD, arcseconds = 2.78
npamsim I: DEC ERROR SPREAD, arcseconds = 3.45
npamsim I:    .
npamsim I: Creating pointing ( -3,  0)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC23I1
npamsim I:  RA ERROR AVE, arcseconds = -0.886
npamsim I: DEC ERROR AVE, arcseconds = 0.903
npamsim I:  RA ERROR SPREAD, arcseconds = 2.07
npamsim I: DEC ERROR SPREAD, arcseconds = 1.39
npamsim I:    .
npamsim I: Creating pointing ( -2,  0)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC24I1
npamsim I:  RA ERROR AVE, arcseconds = -0.167
npamsim I: DEC ERROR AVE, arcseconds = 0.582
npamsim I:  RA ERROR SPREAD, arcseconds = 3.37
npamsim I: DEC ERROR SPREAD, arcseconds = 0.652
npamsim I:    .
npamsim I: Creating pointing ( -1,  0)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC25I1
npamsim I:  RA ERROR AVE, arcseconds = 0.343
npamsim I: DEC ERROR AVE, arcseconds = 0.97
npamsim I:  RA ERROR SPREAD, arcseconds = 4.31
npamsim I: DEC ERROR SPREAD, arcseconds = 0.924
npamsim I:    .
npamsim I: Creating pointing (  0,  0)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC26I1
npamsim I:  RA ERROR AVE, arcseconds = 0.486
npamsim I: DEC ERROR AVE, arcseconds = -0.887
npamsim I:  RA ERROR SPREAD, arcseconds = 2.4
npamsim I: DEC ERROR SPREAD, arcseconds = 2.83
npamsim I:    .
npamsim I: Creating pointing (  1,  0)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC27I1
npamsim I:  RA ERROR AVE, arcseconds = 0.254
npamsim I: DEC ERROR AVE, arcseconds = -0.913
npamsim I:  RA ERROR SPREAD, arcseconds = 3.33
npamsim I: DEC ERROR SPREAD, arcseconds = 3.17
npamsim I:    .
npamsim I: Creating pointing (  2,  0)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC28I1
npamsim I:  RA ERROR AVE, arcseconds = 0.805
npamsim I: DEC ERROR AVE, arcseconds = 1.47
npamsim I:  RA ERROR SPREAD, arcseconds = 2.76
npamsim I: DEC ERROR SPREAD, arcseconds = 4.43
npamsim I:    .
npamsim I: Creating pointing (  3,  0)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC29I1
npamsim I:  RA ERROR AVE, arcseconds = 1.2
npamsim I: DEC ERROR AVE, arcseconds = -0.0381
npamsim I:  RA ERROR SPREAD, arcseconds = 2.8
npamsim I: DEC ERROR SPREAD, arcseconds = 3.02
```

SDE run example

```
npamsim I:    .
npamsim I: Creating pointing ( -3,  1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC30I1
npamsim I:  RA ERROR AVE, arcseconds = -1.11
npamsim I: DEC ERROR AVE, arcseconds = -0.27
npamsim I:  RA ERROR SPREAD, arcseconds = 2.74
npamsim I: DEC ERROR SPREAD, arcseconds = 3.13
npamsim I:    .
npamsim I: Creating pointing ( -2,  1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC31I1
npamsim I:  RA ERROR AVE, arcseconds = 1.03
npamsim I: DEC ERROR AVE, arcseconds = 0.0415
npamsim I:  RA ERROR SPREAD, arcseconds = 3.37
npamsim I: DEC ERROR SPREAD, arcseconds = 1.24
npamsim I:    .
npamsim I: Creating pointing ( -1,  1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC32I1
npamsim I:  RA ERROR AVE, arcseconds = -0.302
npamsim I: DEC ERROR AVE, arcseconds = 0.743
npamsim I:  RA ERROR SPREAD, arcseconds = 2.62
npamsim I: DEC ERROR SPREAD, arcseconds = 2.72
npamsim I:    .
npamsim I: Creating pointing (  0,  1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC33I1
npamsim I:  RA ERROR AVE, arcseconds = 0.792
npamsim I: DEC ERROR AVE, arcseconds = 2.84
npamsim I:  RA ERROR SPREAD, arcseconds = 4.41
npamsim I: DEC ERROR SPREAD, arcseconds = 1.59
npamsim I:    .
npamsim I: Creating pointing (  1,  1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC34I1
npamsim I:  RA ERROR AVE, arcseconds = 0.166
npamsim I: DEC ERROR AVE, arcseconds = -0.88
npamsim I:  RA ERROR SPREAD, arcseconds = 1.05
npamsim I: DEC ERROR SPREAD, arcseconds = 3.48
npamsim I:    .
npamsim I: Creating pointing (  2,  1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC35I1
npamsim I:  RA ERROR AVE, arcseconds = 0.943
npamsim I: DEC ERROR AVE, arcseconds = -1.25
npamsim I:  RA ERROR SPREAD, arcseconds = 1.45
npamsim I: DEC ERROR SPREAD, arcseconds = 1.17
npamsim I:    .
npamsim I: Creating pointing (  3,  1)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC36I1
npamsim I:  RA ERROR AVE, arcseconds = 0.681
npamsim I: DEC ERROR AVE, arcseconds = -1.7
npamsim I:  RA ERROR SPREAD, arcseconds = 1.75
npamsim I: DEC ERROR SPREAD, arcseconds = 2.28
npamsim I:    .
npamsim I: Creating pointing ( -3,  2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC37I1
npamsim I:  RA ERROR AVE, arcseconds = -0.588
npamsim I: DEC ERROR AVE, arcseconds = -4.61
npamsim I:  RA ERROR SPREAD, arcseconds = 2.57
npamsim I: DEC ERROR SPREAD, arcseconds = 2.0
npamsim I:    .
npamsim I: Creating pointing ( -2,  2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC38I1
npamsim I:  RA ERROR AVE, arcseconds = -1.13
npamsim I: DEC ERROR AVE, arcseconds = 0.179
npamsim I:  RA ERROR SPREAD, arcseconds = 2.12
npamsim I: DEC ERROR SPREAD, arcseconds = 3.58
npamsim I:    .
npamsim I: Creating pointing ( -1,  2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC39I1
npamsim I:  RA ERROR AVE, arcseconds = -0.0739
npamsim I: DEC ERROR AVE, arcseconds = 0.564
npamsim I:  RA ERROR SPREAD, arcseconds = 2.22
npamsim I: DEC ERROR SPREAD, arcseconds = 1.76
npamsim I:    .
npamsim I: Creating pointing (  0,  2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
```

```
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC40I1
npamsim I:  RA ERROR AVE, arcseconds = 0.112
npamsim I: DEC ERROR AVE, arcseconds = -0.112
npamsim I:  RA ERROR SPREAD, arcseconds = 4.87
npamsim I: DEC ERROR SPREAD, arcseconds = 2.41
npamsim I:    .
npamsim I: Creating pointing (  1,  2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC41I1
npamsim I:  RA ERROR AVE, arcseconds = -0.85
npamsim I: DEC ERROR AVE, arcseconds = 1.57
npamsim I:  RA ERROR SPREAD, arcseconds = 3.04
npamsim I: DEC ERROR SPREAD, arcseconds = 4.07
npamsim I:    .
npamsim I: Creating pointing (  2,  2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC42I1
npamsim I:  RA ERROR AVE, arcseconds = -0.881
npamsim I: DEC ERROR AVE, arcseconds = -2.16
npamsim I:  RA ERROR SPREAD, arcseconds = 2.08
npamsim I: DEC ERROR SPREAD, arcseconds = 2.03
npamsim I:    .
npamsim I: Creating pointing (  3,  2)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC43I1
npamsim I:  RA ERROR AVE, arcseconds = -0.0883
npamsim I: DEC ERROR AVE, arcseconds = -0.891
npamsim I:  RA ERROR SPREAD, arcseconds = 1.08
npamsim I: DEC ERROR SPREAD, arcseconds = 3.48
npamsim I:    .
npamsim I: Creating pointing ( -3,  3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC44I1
npamsim I:  RA ERROR AVE, arcseconds = 1.61
npamsim I: DEC ERROR AVE, arcseconds = 0.489
npamsim I:  RA ERROR SPREAD, arcseconds = 3.99
npamsim I: DEC ERROR SPREAD, arcseconds = 3.37
npamsim I:    .
npamsim I: Creating pointing ( -2,  3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC45I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = 0.909
npamsim I: DEC ERROR AVE, arcseconds = -0.78
npamsim I:  RA ERROR SPREAD, arcseconds = 3.35
npamsim I: DEC ERROR SPREAD, arcseconds = 2.39
npamsim I:    .
npamsim I: Creating pointing ( -1,  3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC46I1
npamsim I: There were      6 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = -0.619
npamsim I: DEC ERROR AVE, arcseconds = -0.309
npamsim I:  RA ERROR SPREAD, arcseconds = 1.71
npamsim I: DEC ERROR SPREAD, arcseconds = 1.14
npamsim I:    .
npamsim I: Creating pointing (  0,  3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC47I1
npamsim I: There were     11 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = -0.625
npamsim I: DEC ERROR AVE, arcseconds = -2.13
npamsim I:  RA ERROR SPREAD, arcseconds = 2.29
npamsim I: DEC ERROR SPREAD, arcseconds = 2.23
npamsim I:    .
npamsim I: Creating pointing (  1,  3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC48I1
npamsim I: There were     11 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = 0.886
npamsim I: DEC ERROR AVE, arcseconds = -0.522
npamsim I:  RA ERROR SPREAD, arcseconds = 2.93
npamsim I: DEC ERROR SPREAD, arcseconds = 2.07
npamsim I:    .
npamsim I: Creating pointing (  2,  3)
npamsim I: Transforming model, DFT
npamsim I:  IMGDFTPE found     1 integration intervals
npamsim I:  IMGDFTPE found     6 ANTENNAS
npamsim I: Data go to Temp/PC49I1
npamsim I: There were     15 shadowed points out of      21
npamsim I:  RA ERROR AVE, arcseconds = -0.128
npamsim I: DEC ERROR AVE, arcseconds = 0.0934
npamsim I:  RA ERROR SPREAD, arcseconds = 4.98
npamsim I: DEC ERROR SPREAD, arcseconds = 2.17
npamsim I:    .
npamsim I: Creating pointing (  3,  3)
npamsim I: Transforming model, DFT
```

SDE run example

```
 npamsim I:  IMGDFTPE found     1 integration intervals
 npamsim I:  IMGDFTPE found     6 ANTENNAS
 npamsim I: Writing new mosaic file as SDE file
 npamsim I: Writing Vis to SDE format file SMA/MK12#10.SDE
 npamsim I:
 npamsim I: Started  : Wed Jul 25 18:28:59 1990
 npamsim I: Finished : Wed Jul 25 18:41:22 1990
 npamsim I: User:   142.65 System:     5.23
 npamsim I: Run on cfacx1
 % mosaic
 mosaic I:
 mosaic I: I perform maximum entropy mosaicing
 mosaic I:
 mosaic I: Compiled : Tue Jul 10 15:35:05 EDT 1990
 mosaic I:
 Mos = SMA/MK12#10.SDmosaic I: *E
 mosaic I: *VM = D1/MK12#10VM.FTS
 mosaic I: *CVM = D1/MK12#10CVM.FTS
 mosaic I: *Res = D1/MK12#10RVM.FTS
 mosaic I: *Imsi = 128,128
 mosaic I: *inp
 mosaic I: Mosaic visibility file (must be specified if Vis is not) :
saic = SM
 A/MK12#10.SDE
 mosaic I: Default  (can be left blank) : Default =
 mosaic I: VM  (can already exist, can be left blank) : VM =
'MK12#10VM.FTS
 mosaic I: Convolved VM plus residuals (can be left blank) : CVM =
'MK12#10CVM.
 FTS
 mosaic I: Residual image (can be left blank) : Residual =
'MK12#10RVM.FTS
 mosaic I: Number of Iterations (<0 for automatic stopping) : Niter =

 mosaic I: Required total flux (<0 for a guess) : Tflux = 20.00000
 mosaic I: Required final fit in Jy/beam or Jy : Sigma = 4.9999995E-03
 mosaic I: Telescopes with specific sigma : Telnames =
 mosaic I: Sigma for specific telescope : Sigtel = 1.0000001E-03,
)000001E-03,
 mosaic I:  1.0000001E-03, 1.0000001E-03, 1.0000001E-03, 1.0000001E-03,
)000001
 E-03,
 mosaic I:  1.0000001E-03, 1.0000001E-03, 1.0000001E-03, 1.0000001E-03,
)000001
 E-03,
 mosaic I:  1.0000001E-03, 1.0000001E-03, 1.0000001E-03, 1.0000001E-03,
)000001
 E-03,
 mosaic I:  1.0000001E-03, 1.0000001E
 mosaic I: Form to optimize, Entropy or emptiness [H|E] : Entropy = H
 mosaic I: Smoothing beam, BMAJ, BMIN, BPA, BZ : Beam = 1.000000,
)00000,
    mosaic I:  0., 0.
    mosaic I: Image size : Imsize = 128, 128, 1
    mosaic I: Cellsizes in arc-seconds : Cellsize = 1.000000, 1.000000,
1.000000
    mosaic I: UV limits in wavelengths : Uvlimits = 0., 1.0000000E+10
    mosaic I: Filter for sources of this size: BMAJ, BMIN, BPA (asec) :
Filter = 0.,
    mosaic I:  0., 0.
    mosaic I: Shift in arcseconds : Shift = 0., 0., 0.
    mosaic I: Stokes type [I|Q|U|V|R|L] : Stokes = I
    mosaic I: FOV for weighting : FOV = 0.
    mosaic I: Minimum level in Primary beam to include (fraction] : MinB
= 0.100000
    0
    mosaic I: Timerange (d,h,m,s) : Timerange = 0, 0, 0, 0, 0, 0, 0, 0
    mosaic I: Reweight to get nice PSF [T|F] : NicePSF = F
    mosaic I: List of telescopes for which a DFT is to be used : DFT =
    mosaic I: Convolution function SF, SZE or BOX : Convtype = SF
    mosaic I: Write iterations to TV file ? : Dotv = F
    mosaic I: *go
    mosaic I: Maximising entropy -I*logI
    mosaic I: Working on Stokes type I
    mosaic I: Reading Mosaic visibility file
    mosaic I: Reading IM from SDE format file SMA/MK12#10.SDE
    mosaic I: There are   49 pointings in all
    mosaic I: Pointing    1 : selected      15 visibilities
    mosaic I: Pointing    2 : selected      15 visibilities
    mosaic I: Pointing    3 : selected      15 visibilities
    mosaic I: Pointing    4 : selected      15 visibilities
    mosaic I: Pointing    5 : selected      15 visibilities
    mosaic I: Pointing    6 : selected      15 visibilities
    mosaic I: Pointing    7 : selected      15 visibilities
    mosaic I: Pointing    8 : selected      15 visibilities
    mosaic I: Pointing    9 : selected      21 visibilities
    mosaic I: Pointing   10 : selected      21 visibilities
    mosaic I: Pointing   11 : selected      21 visibilities
    mosaic I: Pointing   12 : selected      21 visibilities
    mosaic I: Pointing   13 : selected      21 visibilities
    mosaic I: Pointing   14 : selected      21 visibilities
    mosaic I: Pointing   15 : selected      21 visibilities
    mosaic I: Pointing   16 : selected      21 visibilities
    mosaic I: Pointing   17 : selected      21 visibilities
    mosaic I: Pointing   18 : selected      21 visibilities
    mosaic I: Pointing   19 : selected      21 visibilities
    mosaic I: Pointing   20 : selected      21 visibilities
    mosaic I: Pointing   21 : selected      21 visibilities
    mosaic I: Pointing   22 : selected      21 visibilities
    mosaic I: Pointing   23 : selected      21 visibilities
    mosaic I: Pointing   24 : selected      21 visibilities
    mosaic I: Pointing   25 : selected      21 visibilities
    mosaic I: Pointing   26 : selected      21 visibilities
    mosaic I: Pointing   27 : selected      21 visibilities
```

SDE run example

```
 mosaic I: Pointing   28 : selected      21 visibilities
 mosaic I: Pointing   29 : selected      21 visibilities
 mosaic I: Pointing   30 : selected      21 visibilities
 mosaic I: Pointing   31 : selected      21 visibilities
 mosaic I: Pointing   32 : selected      21 visibilities
 mosaic I: Pointing   33 : selected      21 visibilities
 mosaic I: Pointing   34 : selected      21 visibilities
 mosaic I: Pointing   35 : selected      21 visibilities
 mosaic I: Pointing   36 : selected      21 visibilities
 mosaic I: Pointing   37 : selected      21 visibilities
 mosaic I: Pointing   38 : selected      21 visibilities
 mosaic I: Pointing   39 : selected      21 visibilities
 mosaic I: Pointing   40 : selected      21 visibilities
 mosaic I: Pointing   41 : selected      21 visibilities
 mosaic I: Pointing   42 : selected      21 visibilities
 mosaic I: Pointing   43 : selected      21 visibilities
 mosaic I: Pointing   44 : selected      21 visibilities
 mosaic I: Pointing   45 : selected      15 visibilities
 mosaic I: Pointing   46 : selected      15 visibilities
 mosaic I: Pointing   47 : selected      10 visibilities
 mosaic I: Pointing   48 : selected      10 visibilities
 mosaic I: Pointing   49 : selected       6 visibilities
 mosaic I: Got data: User:    23.56 System:     1.01
 mosaic I: Creating new VM image
 mosaic I: Coordinates for VM:
 mosaic I: Axis    Name   Pixels  Ref. Pix  Ref. Value  Increment
:ation
 mosaic I:    1   RA---SIN  128      64.00    0.000E+00  -2.778E-04
)0
 mosaic I:    2   DEC--SIN  128      64.00    3.000E+01   2.778E-04
)0
 mosaic I:    3   FREQ        1       1.00    3.450E+11   3.450E+10
)0
 mosaic I: Coordinates for transform of VM:
 mosaic I: Axis    Name   Pixels  Ref. Pix  Ref. Value  Increment
:ation
 mosaic I:    1   UU---SIN  129      1.00    0.000E+00  -8.057E+02
)0
 mosaic I:    2   VV---SIN  256    128.00    0.000E+00   8.057E+02
)0
 mosaic I:    3   FREQ        1       1.00    3.450E+11   3.450E+10
)0
 mosaic I:    4   RA---SIN    1    128.00    0.000E+00  -2.778E-04
)0
 mosaic I:    5   DEC--SIN    1    128.00    3.000E+01   2.778E-04
)0
 mosaic I: Using flat default
 mosaic I: Initial guess is a flat image
 mosaic I: Initialized dirty images
 mosaic I: Initial fit =   1001.432, Sum of weights =    3.063E+07
 mosaic I: Iteration         Entropy        Flux        Fit
idient
```

```
mosaic I:      1              9.687     20.336    998.891      0.(
mosaic I:      2              9.687     20.336    998.891      0.(
mosaic I:      3              9.684     20.390    998.476      0.(
mosaic I:      4              9.681     20.453    997.985      0.(
mosaic I:      5              9.677     20.527    997.405      0.(
mosaic I:      6              9.673     20.615    996.717      0.(
mosaic I:      7              9.667     20.719    995.897      0.(
mosaic I:      8              9.661     20.843    994.915      0.(
mosaic I:      9              9.653     20.991    993.732      0.(
mosaic I:     10              9.643     21.170    992.295      0.(
mosaic I: Opening FITS file D1/MK12#10VM.FTS for WRITE as VM
mosaic I: Writing 32-bit scaled-integer format
mosaic I: Writing 2-dimensional image VM
mosaic I:     11              9.631     21.386    990.535      0.(
mosaic I:     12              9.617     21.651    988.358      0.(
mosaic I:     13              9.598     21.978    985.633      0.(
mosaic I:     14              9.575     22.388    982.171      0.(
mosaic I:     15              9.545     22.907    977.702      0.(
mosaic I: Opening FITS file D1/MK12#10VM.FTS for WRITE as VM
mosaic I: Writing 32-bit scaled-integer format
mosaic I: Writing 2-dimensional image VM
mosaic I: Pointing:    1 Fit =    1.504E-01 sigma
mosaic I: Pointing:    2 Fit =    4.980E-01 sigma
mosaic I: Pointing:    3 Fit =    1.032E+00 sigma
mosaic I: Pointing:    4 Fit =    9.683E-01 sigma
mosaic I: Pointing:    5 Fit =    8.171E-01 sigma
mosaic I: Pointing:    6 Fit =    2.240E-01 sigma
mosaic I: Pointing:    7 Fit =    1.142E-01 sigma
mosaic I: Pointing:    8 Fit =    3.097E-01 sigma
mosaic I: Pointing:    9 Fit =    1.389E+00 sigma
mosaic I: Pointing:   10 Fit =    3.335E+00 sigma
mosaic I: Pointing:   11 Fit =    4.408E+00 sigma
mosaic I: Pointing:   12 Fit =    3.620E+00 sigma
mosaic I: Pointing:   13 Fit =    1.918E+00 sigma
mosaic I: Pointing:   14 Fit =    5.198E-01 sigma
mosaic I: Pointing:   15 Fit =    8.259E-01 sigma
mosaic I: Pointing:   16 Fit =    3.330E+00 sigma
mosaic I: Pointing:   17 Fit =    7.713E+00 sigma
mosaic I: Pointing:   18 Fit =    1.038E+01 sigma
mosaic I: Pointing:   19 Fit =    7.986E+00 sigma
mosaic I: Pointing:   20 Fit =    3.943E+00 sigma
mosaic I: Pointing:   21 Fit =    5.792E-01 sigma
mosaic I: Pointing:   22 Fit =    1.361E+00 sigma
mosaic I: Pointing:   23 Fit =    4.194E+00 sigma
mosaic I: Pointing:   24 Fit =    1.062E+01 sigma
mosaic I: Pointing:   25 Fit =    1.366E+01 sigma
mosaic I: Pointing:   26 Fit =    1.026E+01 sigma
mosaic I: Pointing:   27 Fit =    4.632E+00 sigma
mosaic I: Pointing:   28 Fit =    9.868E-01 sigma
mosaic I: Pointing:   29 Fit =    9.761E-01 sigma
mosaic I: Pointing:   30 Fit =    3.323E+00 sigma
mosaic I: Pointing:   31 Fit =    8.381E+00 sigma
```

```
mosaic I: Pointing:    32 Fit =    1.020E+01 sigma
mosaic I: Pointing:    33 Fit =    6.634E+00 sigma
mosaic I: Pointing:    34 Fit =    3.400E+00 sigma
mosaic I: Pointing:    35 Fit =    6.922E-01 sigma
mosaic I: Pointing:    36 Fit =    4.150E-01 sigma
mosaic I: Pointing:    37 Fit =    2.046E+00 sigma
mosaic I: Pointing:    38 Fit =    3.470E+00 sigma
mosaic I: Pointing:    39 Fit =    4.313E+00 sigma
mosaic I: Pointing:    40 Fit =    3.415E+00 sigma
mosaic I: Pointing:    41 Fit =    1.688E+00 sigma
mosaic I: Pointing:    42 Fit =    4.812E-01 sigma
mosaic I: Pointing:    43 Fit =    1.244E-01 sigma
mosaic I: Pointing:    44 Fit =    3.745E-01 sigma
mosaic I: Pointing:    45 Fit =    8.829E-01 sigma
mosaic I: Pointing:    46 Fit =    1.179E+00 sigma
mosaic I: Pointing:    47 Fit =    1.555E+00 sigma
mosaic I: Pointing:    48 Fit =    2.546E-01 sigma
mosaic I: Pointing:    49 Fit =    1.496E-01 sigma
mosaic I: Opening FITS file D1/MK12#10RVM.FTS for WRITE as Residual
mosaic I: Writing 32-bit scaled-integer format
mosaic I: Writing 2-dimensional image Residual
mosaic I:
mosaic I: Started  : Wed Jul 25 18:43:37 1990
mosaic I: Finished : Wed Jul 25 19:28:11 1990
mosaic I: User:  1110.72 System:    15.89
mosaic I: Run on cfacx1
```