
Ver 3

1. Copy David's dataset from cedarflat4

```
% scp -r obs@cedarflat4.carma.pvt:/opt/sdp/sciencedata/test.cs017.4.mir .
```

2. Find obs. parameters and sequence

```
% uvlist vis=test.cs017.4.mir options=spec ; check correlator configuration -> Band1 (= Window 1&4):  
500MHz
```

```
% listobs vis=test.cs017.4.mir ; check obs. sequence
```

David's obs.

```
flux cal.(MWC349)-->Pass Cal.(3c279)-->Phase Cal.(1625-254)-->Target(IRS16293)-->Phase Cal.  
(1625-254)-->Target-->Phase Cal.--> ...
```

3. Check data before calibration

```
% smauvspec vis=test.cs017.4.mir device=/xs axis=chan,both "select=-auto>window(4),source(3C279)"  
nxy=3,5 ; bandpass cal. looks coherent/good.
```

```
% smauvspec vis=test.cs017.4.mir device=/xs axis=chan,both "select=-  
auto>window(4),source(IRS16293)" nxy=3,5 interval=9999 ; ah, target is also detected!
```

```
% smauvspec vis=test.cs017.4.mir device=/xs axis=chan,both "select=-  
auto>window(4),source(1625-254)" nxy=3,5 interval=5 ; gain cal. is good, too.
```

```
% smauvplt vis=test.cs017.4.mir device=/xs axis=time,phase "select=-  
auto>window(4),source(1625-254)" nxy=3,5" ; phase is coherent and smooth -> calibratable!!
```

```
% smauvplt vis=test.cs017.4.mir device=/xs axis=time,phase "select=-  
auto>window(5),source(1625-254)" nxy=3,5 ; ok, narrow band (win5 = band2 usb) is noisy; we should  
use wide band (band1) for gain calibration
```

```
% smauvspec vis=test.cs017.4.mir device=/xs axis=chan,both "select=-  
auto>window(5,6),source(3C279)" nxy=3,5 interval=15 ; bandpass data for narrow bands (win5&6) are  
fine.
```

4. line length calibration (calibrate cable length differences btw antennas; cable length varies as a function of ambient temp.)

```
% ls test.cs017.4.mir ; you should not find 'gains' file before linecal
```

```
% linecal vis=test.cs017.4.mir
```

```
% ls test.cs017.4.mir ; now you find 'gains'
```

```
% smauvplt vis=test.cs017.4.mir device=/xs axis=time,phase "select=-  
auto>window(4),source(1625-254)" options=nocal ; no linelength correction
```

```
% smauvplt vis=test.cs017.4.mir device=/xs axis=time,phase "select=-  
auto>window(4),source(1625-254)" ; apply correction (phase became flatter vs time)
```

apply linecal; 'linecal' command makes 'gains' file, but does not apply it to the data. so do this

```
% uvcat vis=test.cs017.4.mir out=test.cs017.4.lc
```

```
% ls test.cs017.4.lc ; 'gains' applied -- disappeared
```

5. Baseline correction (baseline in your data may not be the latest/best; apply the best one)

Go to "<http://cedarflat.mmarray.org/observing/baseline/>"

Download the solution "[antpos.080606](#)"

```
% uvedit vis=test.cs017.4.lc out=test.cs017.4.lc.bl apfile=antpos.080606
```

6. Bandpass calibration

for today, I will reduce only wide band data (window4 = band1 upper-side band)

```
% smauvspec device=/xs vis=test.cs017.4.lc.bl axis=chan,both "select=-auto,source(3C279),window(4)"  
yrange=0,30 interval=16 ; check spectra before passband calibration
```

```
% mfcals vis=test.cs017.4.lc.bl "select=-auto,source(3C279)" refant=8 interval=0.1 ; first trial worked
```

```
% smauvspec device=/xs vis=test.cs017.4.lc.bl axis=chan,both "select=-auto,source(3C279),window(4)"  
yrange=0,30 interval=16 nxy=3,5 ; after bandpass calibration, FLAT!!
```

```
% ls test.cs017.4.lc.bl ; now there are 'bandpass' and 'gains'. apply only 'bandpass' since this 'gains' is  
only for passband calibrator.
```

```
% uvcat vis=test.cs017.4.lc.bl out=test.cs017.4.lc.bl.pb options=nocal ; don't apply gains use,  
"options=nocal". 'bandpass' IS APPLIED
```

7. Save window 4 in separate file

```
% uvcat vis=test.cs017.4.lc.bl.pb out=test.cs017.4.lc.bl.pb.w4 "select=-auto,window(4)" ; separate  
window4, remove auto correlation
```

Note: you can do this at the very beginning of the data reduction -- depends on how you want to reduce data

8. Gain calibration

```
% smauvplt device=/xs vis=test.cs017.4.lc.bl.pb.w4 "select=source(1625-254)" axis=time,phase ; check  
phase vs time before gain cal.
```

```
% smauvplt device=/xs vis=test.cs017.4.lc.bl.pb.w4 "select=source(1625-254)" axis=time,amp ; amp vs  
time before gain cal
```

```
% selfcal vis=test.cs017.4.lc.bl.pb.w4 refant=8 "select=source(1625-254)" interval=20 ; derive gain  
solution.
```

```
% smauvplt device=/xs vis=test.cs017.4.lc.bl.pb.w4 "select=source(1625-254)" axis=time,phase ; phase  
vs time after gain cal.
```

9. Invert (make dirty map and dirty beam)

```
% invert vis=test.cs017.4.lc.bl.pb.w4 map=test.dirty beam=test.beam imsize=257,257 cell=0.5,0.5  
line=chan,1,1,15 options=mosaic,double,sysprep edge=1 "select=source(IRS16293)" robust=-2 ;  
robust=-2 for uniform weighting
```

```
% invert vis=test.cs017.4.lc.bl.pb.w4 map=test.rb+2.dirty beam=test.rb+2.beam imsize=257,257  
cell=0.5,0.5 line=chan,1,1,15 options=mosaic,double,sysprep edge=1 "select=source(IRS16293)"  
robust=+2 ; robust=+2 for natural weighting
```

Note: "cell" should be significantly smaller than the size of synthesized beam. "cell*imsize" should be larger than the 6m FoV. cell [arcsec]. imsize [pixel]

10. Display images

```
% cgdisp in=test.dirty device=/xs
% cgdisp in=test.rb+2.dirty device=/xs
```

11. Synthesized beam size

```
% cgdisp in=test.beam device=/xs ; three synthesized beams = 10m-10m beam, 10m-6m beam, and
6m-6m beam
% mospsf beam=test.beam out=test.combbeam ; combine three-types of beam
% cgdisp in=test.combbeam device=/xs ; ok, now we have only one beam (combined beam)
% imfit in=test.combbeam object=gauss "region=relcenter,boxes(-20,-20,20,20)" ; measure the
synthesized beam size (resolution) --> 5.7" x 3.9"
% imfit in=test.combbeam object=gauss "region=relcenter,boxes(-30,-30,30,30)" ; ok, it's independent
of the size of region
```

12. Deconvolution (mossdi = CLEAN for mosaic)

```
% mossdi map=test.dirty beam=test.beam out=test.clean niters=3000
"region=relcenter,boxes(-50,-50,50,50)"
```

13. Restore (convolve with the gaussian with the synthesized beam size)

```
% restor model=test.clean map=test.dirty beam=test.combbeam out=test.map

% cgdisp in=test.map device=/xs
% cgdisp in=test.map device=/xs beamtyp=b,l,1,3
```

14. Output FITS

```
% fits in=test.map out=test.map.fits op=xyout
```

15 (or before 6) Flagging 1: Shadowing

```
% csflag vis=test.cs017.4.lc.bl.pb.w4 carma=true
% ls test.cs017.4.lc.bl.pb.w4 ; 'flags' and 'wflags' appeared
```

16 (or before 8, but sometimes after 8) Flagging 2

```
% smauvplt vis=test.cs017.4.lc.bl.pb.w4 "select=source(1625-254,IRS16293)" axis=time,phase device=/
xs options=nocal ; found phase jump in bl1-4
% smauvplt vis=test.cs017.4.lc.bl.pb.w4 "select=source(1625-254,IRS16293),ant(1)(4)"
```

```
axis=time,phase device=/xs options=nocal ; plot bl1-4 to find the bad time range --> 7:15 to 7:38 is bad
% uvflag vis=test.cs017.4.lc.bl.pb.w4 flagval=flag "select=ant(1)(4),time(7:15,7:38)"
```

```
% smauvplt vis=test.cs017.4.lc.bl.pb.w4 "select=source(1625-254,IRS16293)" axis=time,phase device=/
xs options=nocal ; phase jump in bl1-5\
```

```
% smauvplt vis=test.cs017.4.lc.bl.pb.w4 "select=source(1625-254,IRS16293),ant(5)" axis=time,phase
device=/xs options=nocal ; plot all bls with ant5. this is antenna-based phase jump. flag all bls with ant 5
% uvflag vis=test.cs017.4.lc.bl.pb.w4 flagval=flag "select=ant(5),time(6:25,7:12)" ; flag all bls with ant 5
```

apply gain calibration before further flagging

```
% uvcat vis=test.cs017.4.lc.bl.pb.w4 out=test.cs017.4.lc.bl.pb.w4.gn
```

```
% smauvplt vis=test.cs017.4.lc.bl.pb.w4.gn "select=source(1625-254,IRS16293)" axis=time,phase
device=/xs options=nocal ; find large phase scatters for bl2-10
```

```
% uvflag vis=test.cs017.4.lc.bl.pb.w4 flagval=flag "select=ant(2)(10),time(8:35,9:05)"
```

17 If you use my program (hkuvplt)

```
mirboss
cd $MIR/borrow/zeno
make install_miriad
cd $MIR/src/spec/hkmiriad
make install_miriad
```

Error 1: -IX11 problem

check where you have libX11.a, and set the path in Makefile

```
-L/usr/X11/lib -IX11
or
-L/usr/X11R6/lib -IX11
```

for Linux

```
scp obs@cedarflat4.carma.pvt:koda/hkmiriad/hkuvplt .
```

for Mac 10.5

I installed gcc&gfortran binaries distributed in <http://hpc.sourceforge.net/>

Blame me (not MIRIAD) if it doesn't work.
