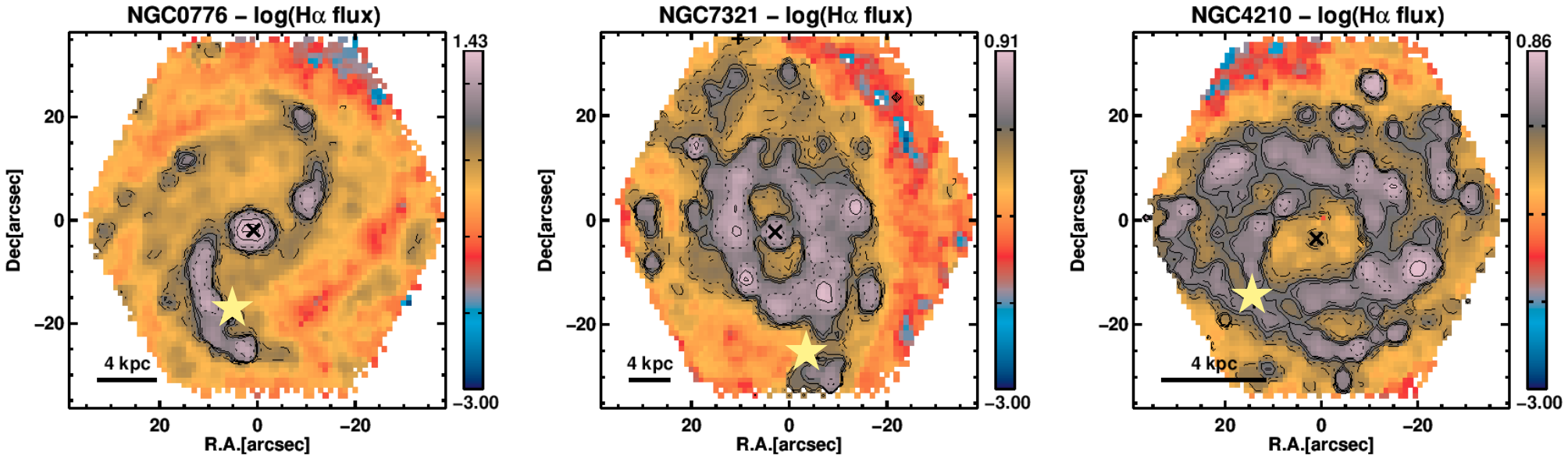
Guillermo Haro 2014: Advanced School on Integral Field Spectroscopy
Techniques and Analysis

HANDS-ON SESSION 6.1:

INTEGRAL FIELD SPECTROSCOPY OF SUPERNOVA HOST GALAXIES



MILLENNIUM INSTITUTE OF ASTROPHYSICS

L.Galbany, MAS - U. Chile

2nd September 2014

Summary

* Get used to work with IFS 3D data cubes

* Study the local environments of 3 SNe of different types in 3 galaxies of the CALIFA Survey

  - Measure the HaplHa EW at the SN position, and study how it varies in the vicinity
  - Extract aperture spectra and annular spectra centered at the SN position
  - Produce a plot of HaEW vs. "distance" from the SN

Procedure

1- Produce v band image: broadbandim,name,redshift,filter

2- correct rotational velocity: zcorr,name,redshift

3- Determine galaxy center:

galcenter,name,boxsize,fitwidth,nterms,/check[,X=,Y=]

4- Determine SN position: ds9 and open v band image

5- Extract aperture spectra:

aper_extract,name,Xpos,Ypos,snname,radius

- Extract "ring" spectra:

ring_extract,name,Xpos,Ypos,snname,limit,step

6- Run STARLIGHT (ALL FILES NEEDED IN THE FOLDER!!)

Starlight < GHSLinput.in

7- Measure Halpha EW: haew,file

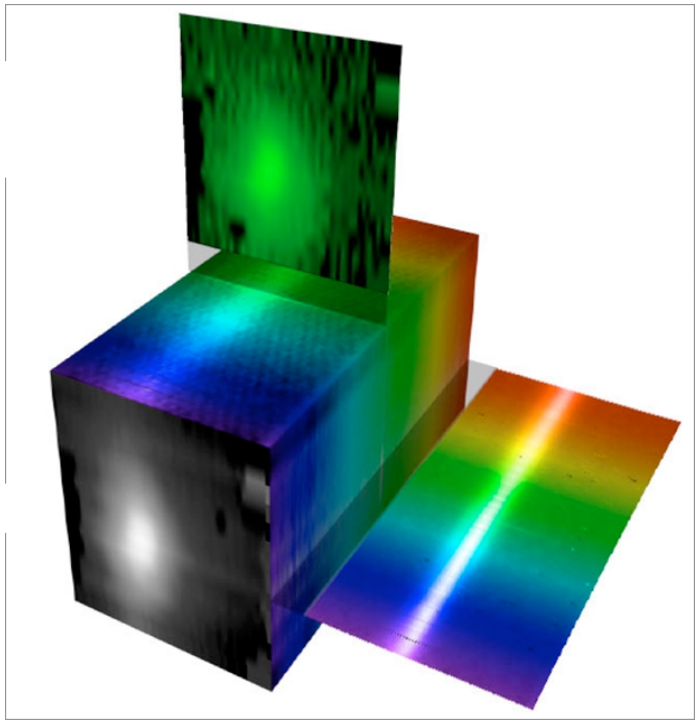
8- Plot HaEW vs. aperture and HaEW vs. distance (ring):

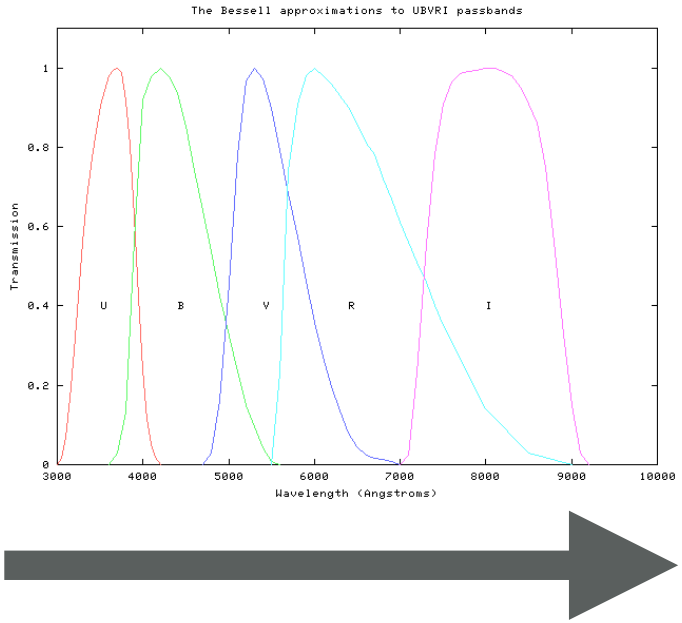
plotfin

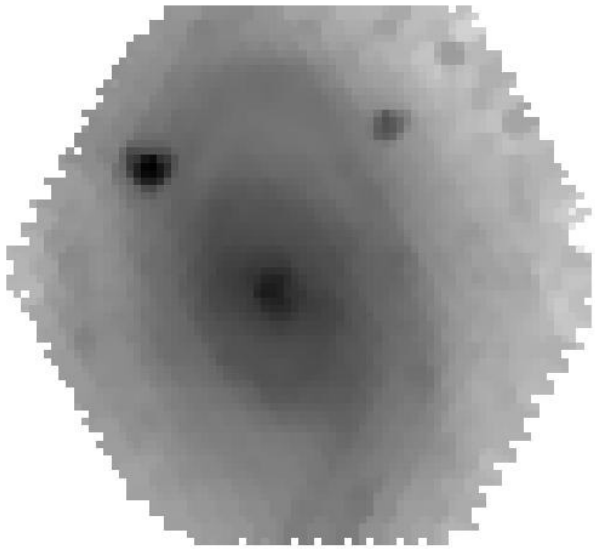
Necessary data

	NGC0776	NGC4210	NGC7321
redshift	0.016415	0.009113	0.023833
SN name	1999di	2002ho	2013di
SN type	Ib	Ic	Ia
offset	5.2 E 17.0S	12.9E 12.2S	7.8W 24.2S

1- Produce v band image



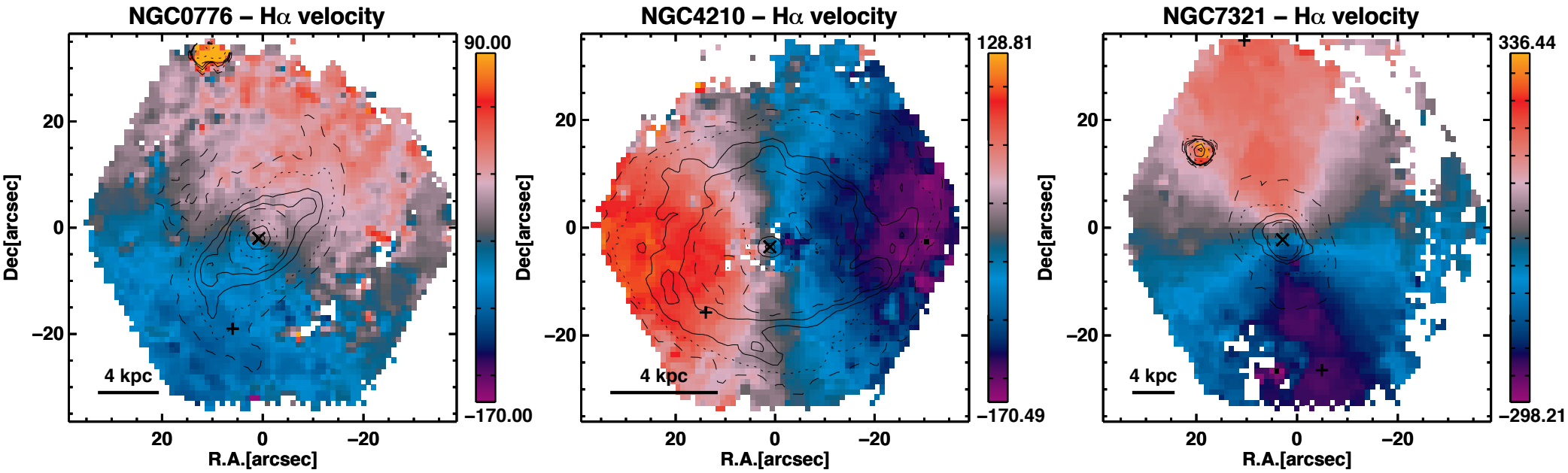




```
broadbandim,'NGC7321',0.023833,'bess_v.dat'
```

Needed to determine the SN location from the galaxy center coordinate and the SN offset

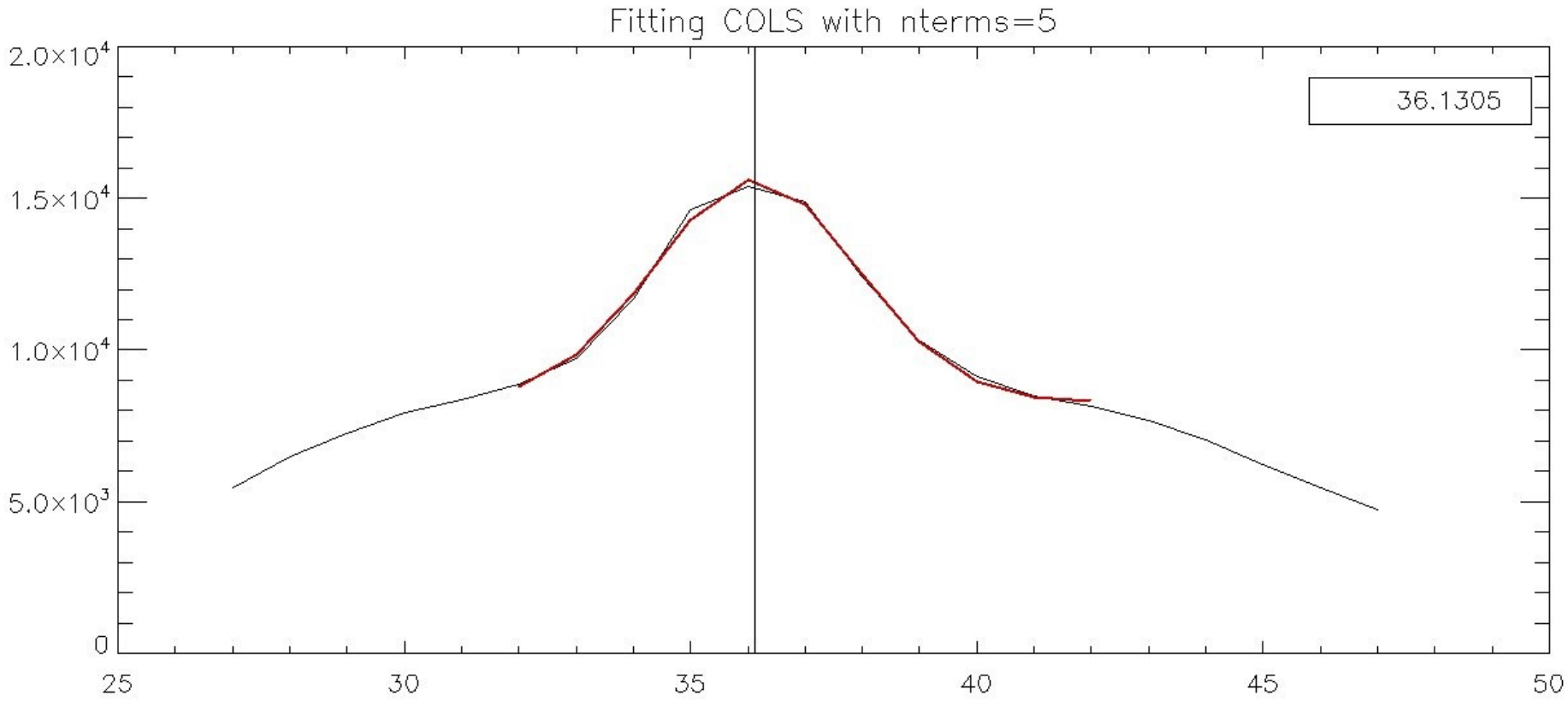
2- correct rotational velocity




```
zcorr,'NGC7321',0.023833
```

Put all the spectra to the rest-frame for STARLIGHT fitting

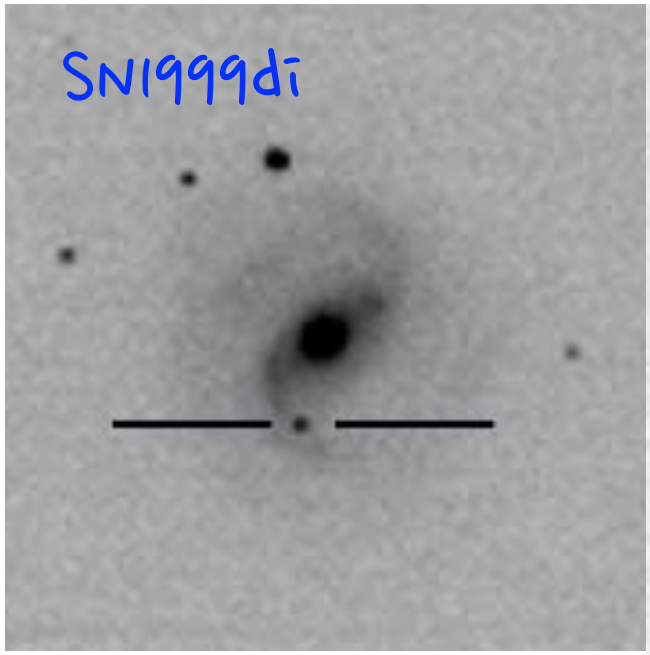
3- Determine galaxy center



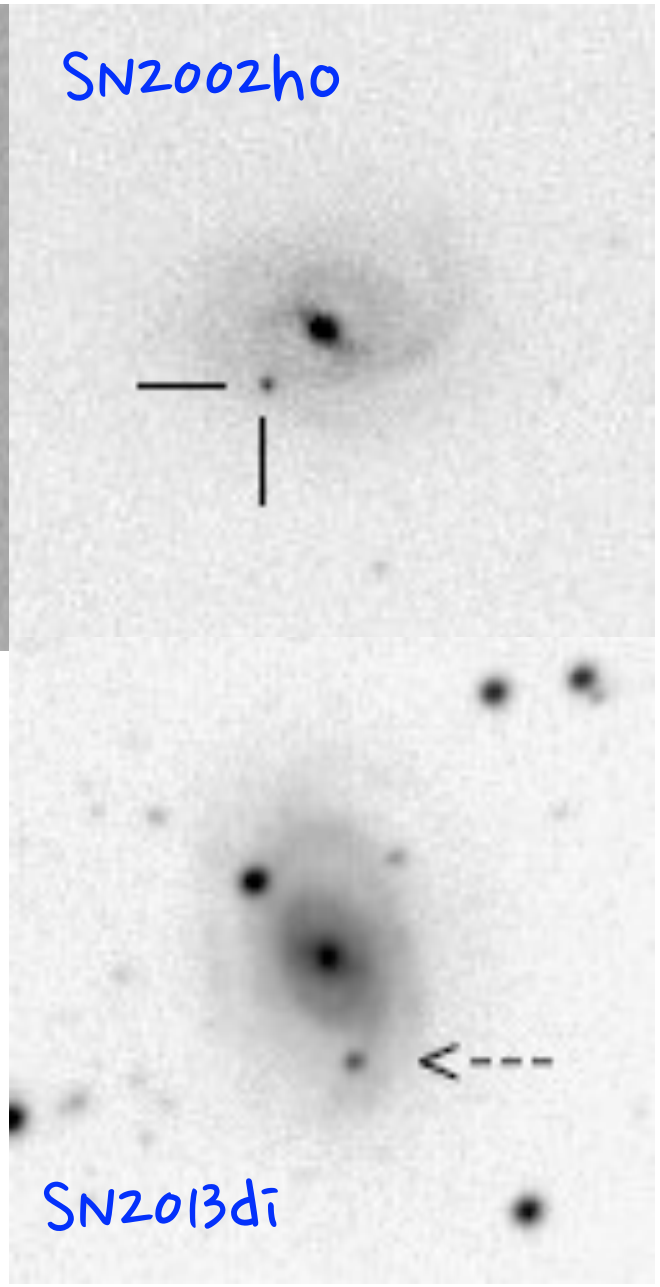

```
galcenter,'NGC7321',10,5,5,/check
```

You probably need different numbers for x and Y axis depending on the morphology of the galaxy

4- Determine SN position



X=33.0194
Y=17.9884

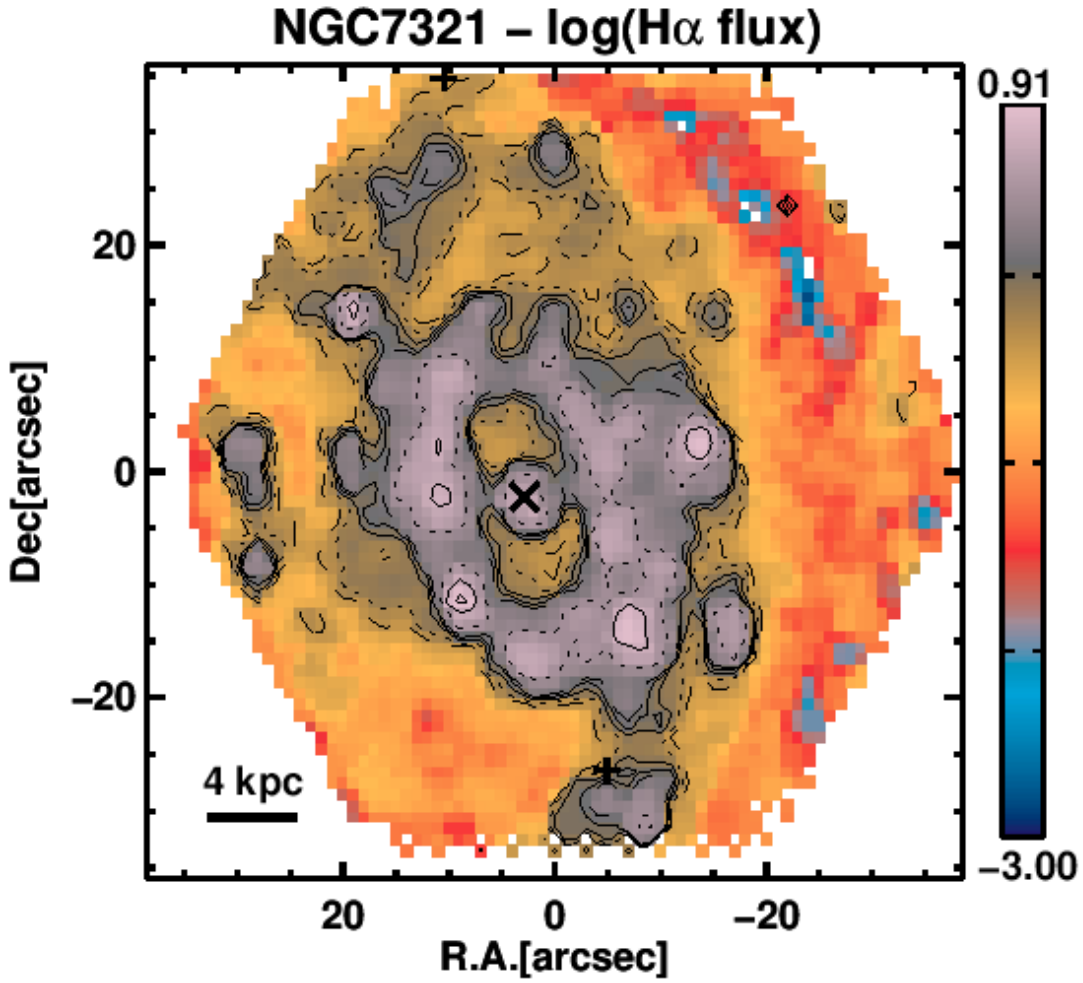


X=25.5620
Y=20.7598

X=43.9331
Y=10.0591

open ds9 and determine the SN coordinates in the cube

5- Extract aperture spectra

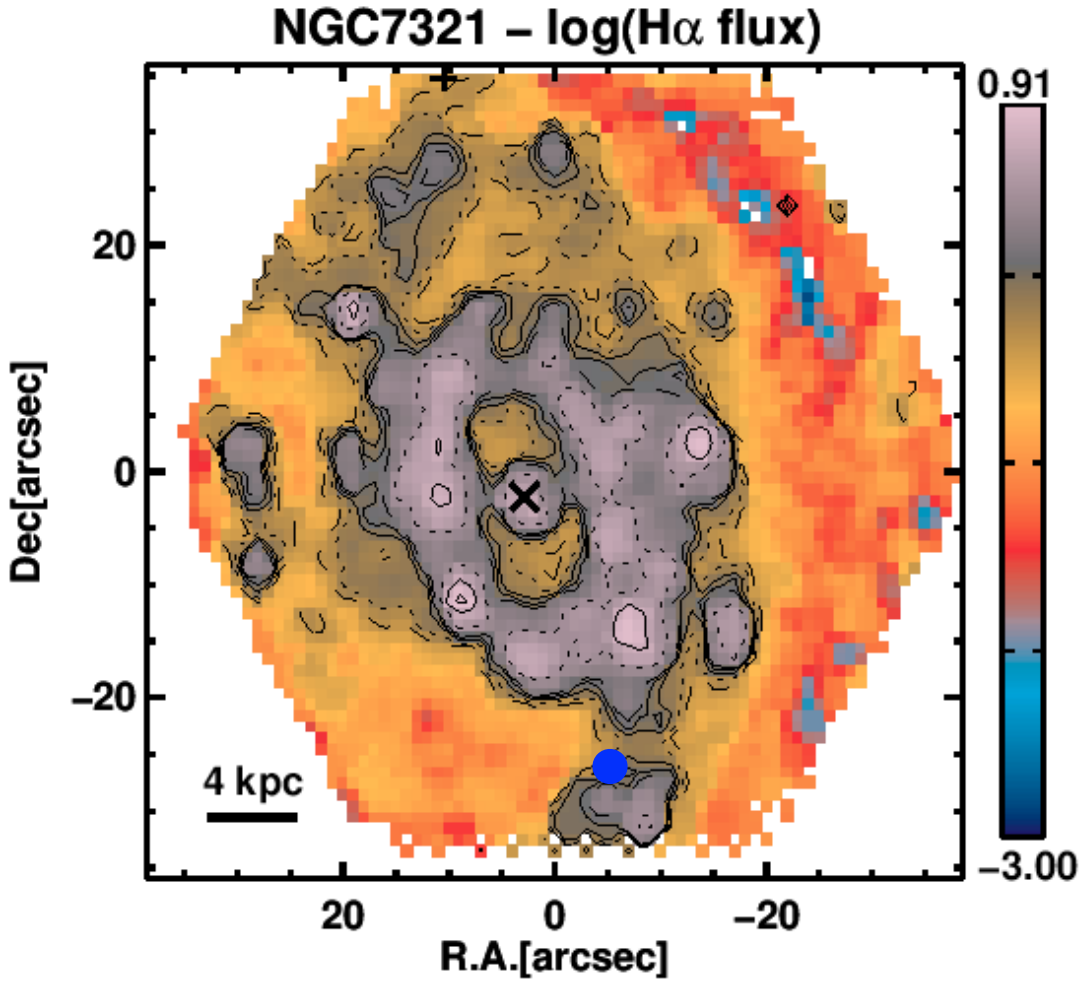


Decide the step you like

It should be contained in the data cube

```
aper_extract,'NGC7321',43.9331,10.0591,'2013di',1.0
```

5- Extract aperture spectra

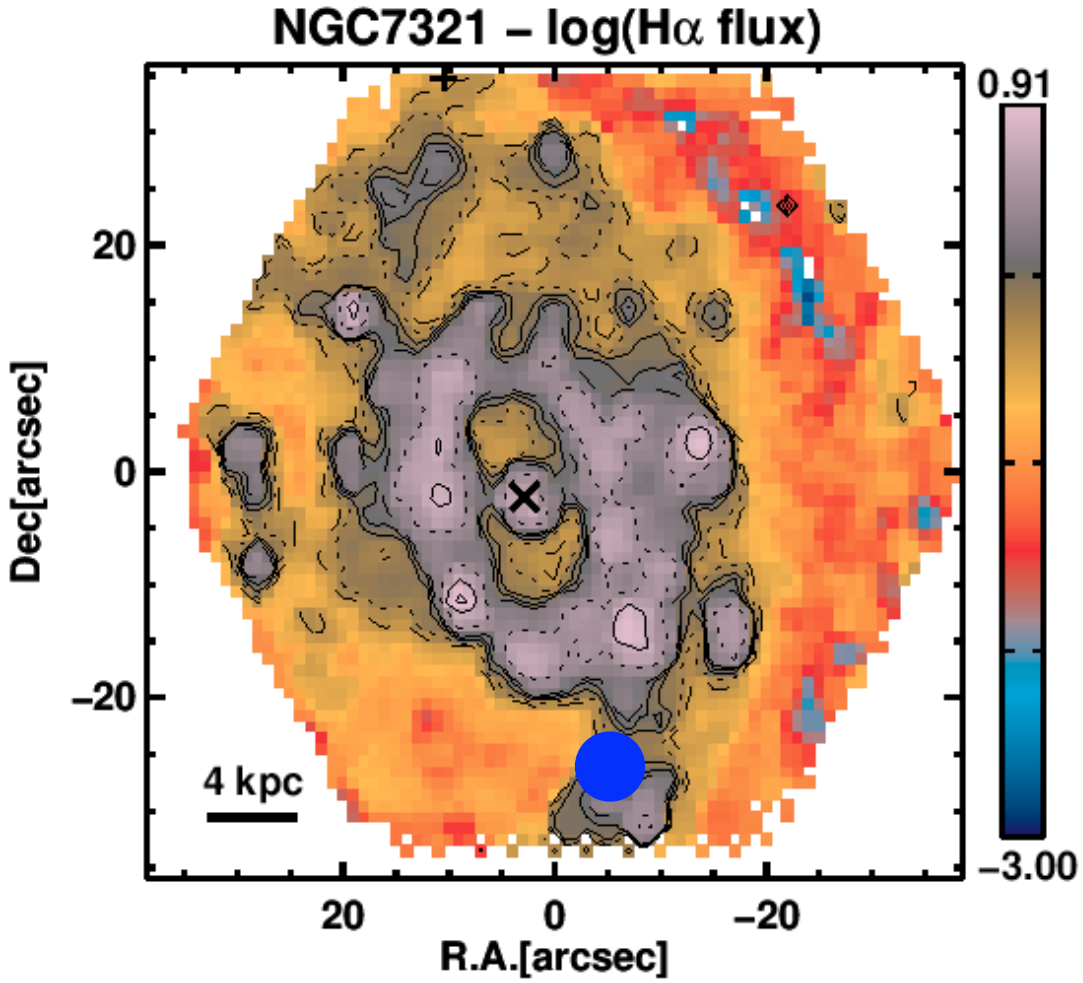


Decide the step you like

It should be contained in the data cube

```
aper_extract,'NGC7321',43.9331,10.0591,'2013di',1.0
```

5- Extract aperture spectra

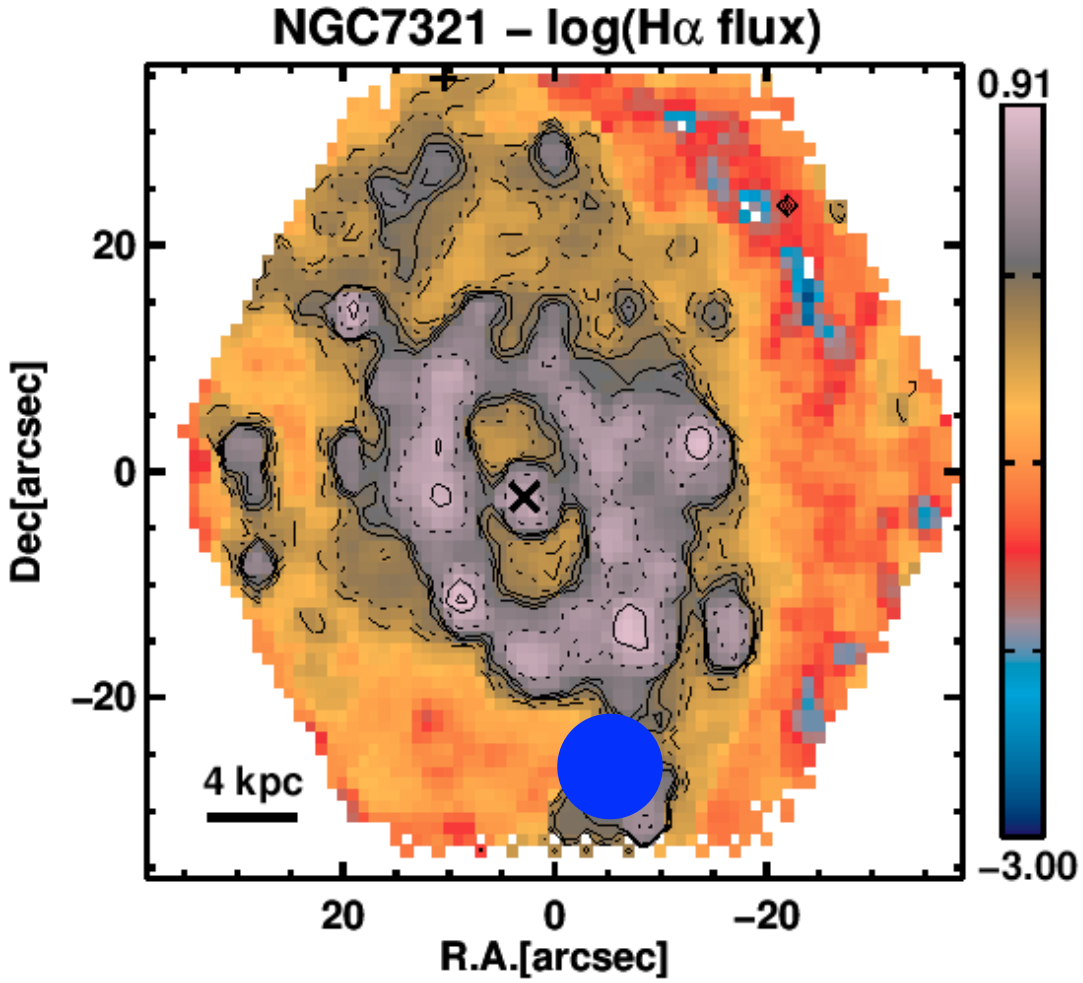


Decide the step you like

It should be contained in the data cube

```
aper_extract,'NGC7321',43.9331,10.0591,'2013di',1.0
```

5- Extract aperture spectra

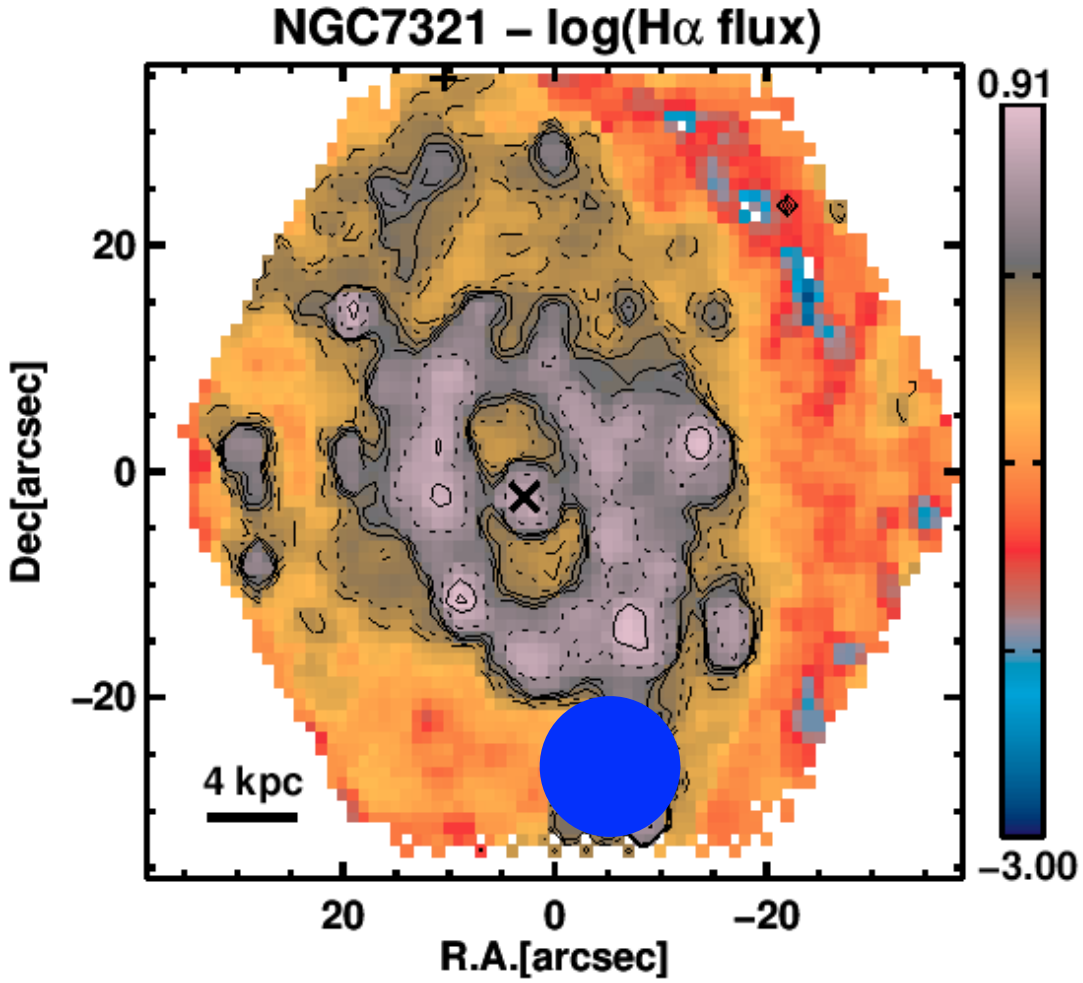


Decide the step you like

It should be contained in the data cube

```
aper_extract,'NGC7321',43.9331,10.0591,'2013di',1.0
```

5- Extract aperture spectra

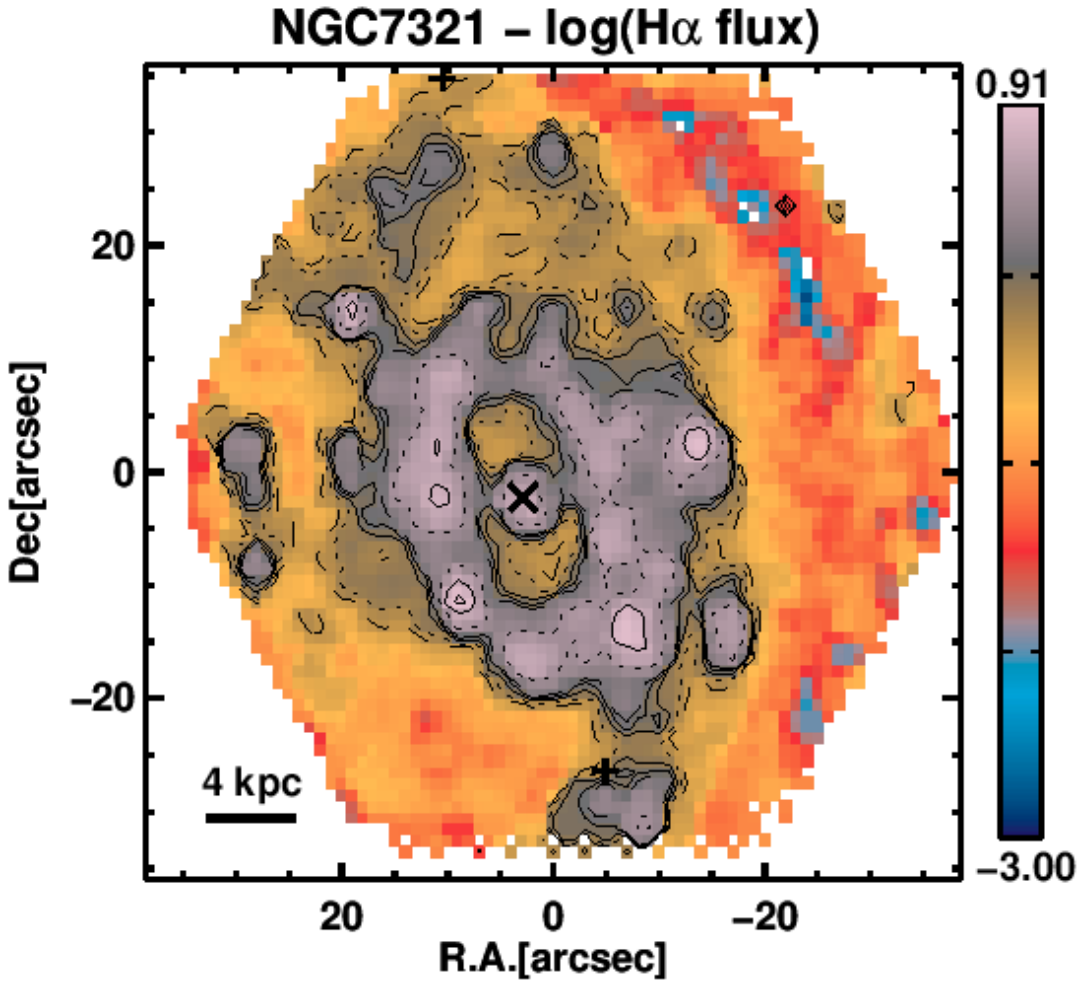


Decide the step you like

It should be contained in the data cube

```
aper_extract,'NGC7321',43.9331,10.0591,'2013di',1.0
```

5b- Obtain "ring" spectra

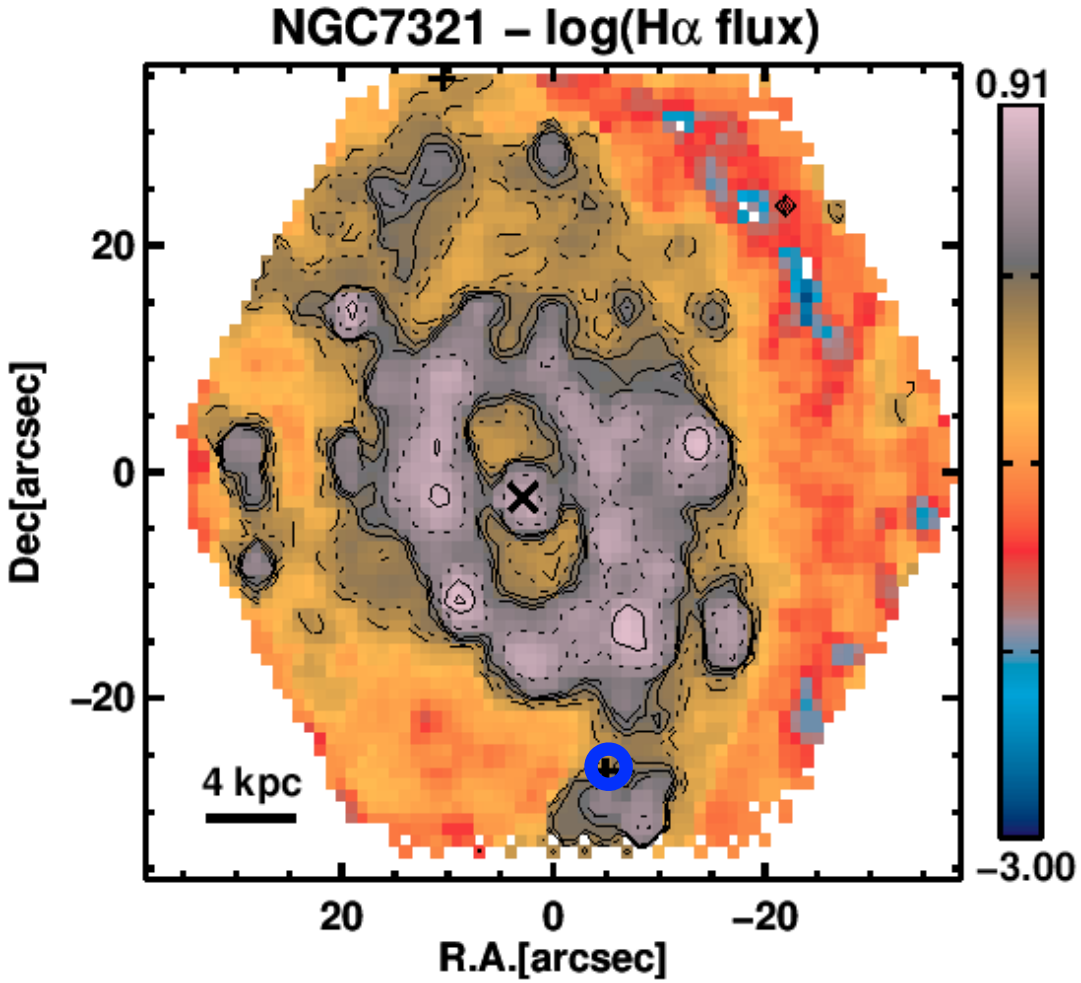


Limit should be the maximum aperture

Put the step you decided

```
ring_extract,'NGC7321',43.9331,10.0591,'2013di',8.5,0.5
```

5b- Obtain "ring" spectra

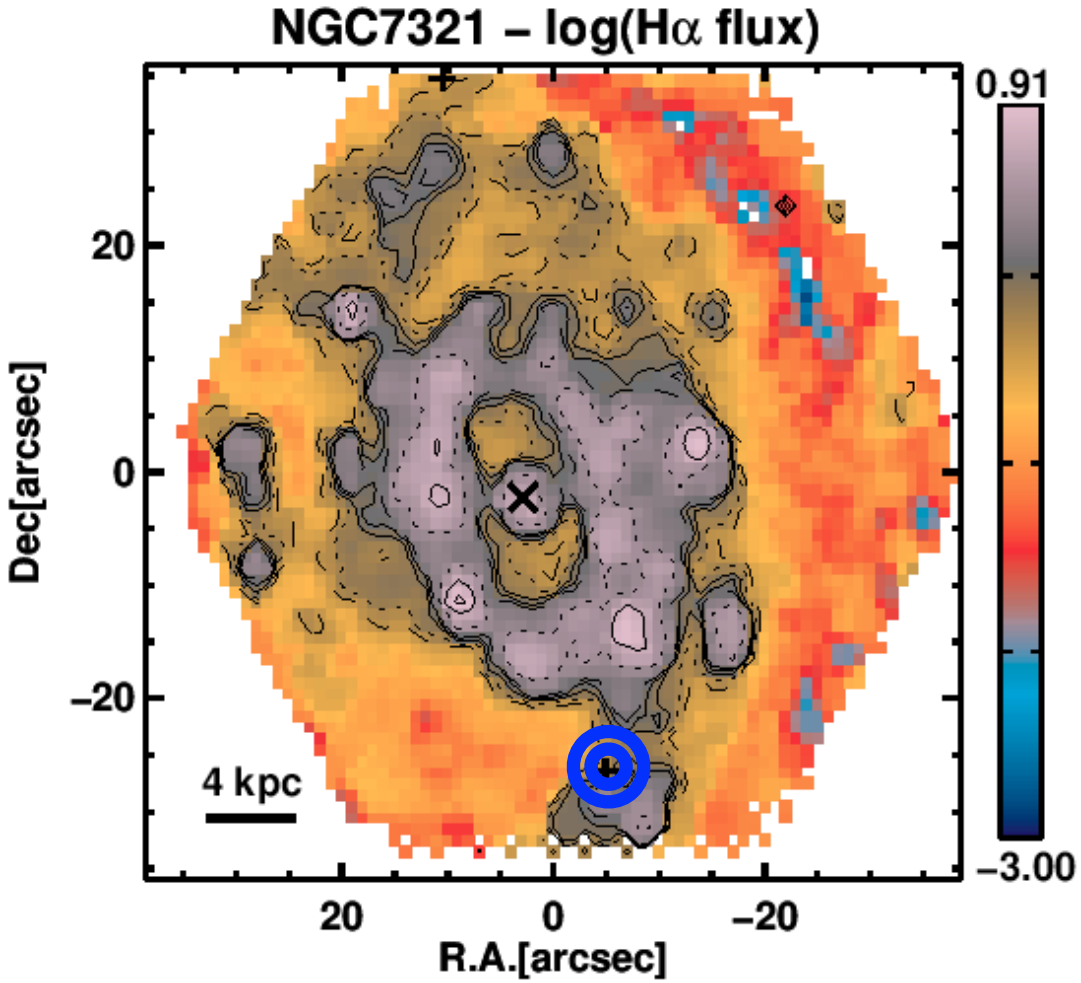


Limit should be the maximum aperture

Put the step you decided

```
ring_extract,'NGC7321',43.9331,10.0591,'2013di',8.5,0.5
```

5b- Obtain "ring" spectra

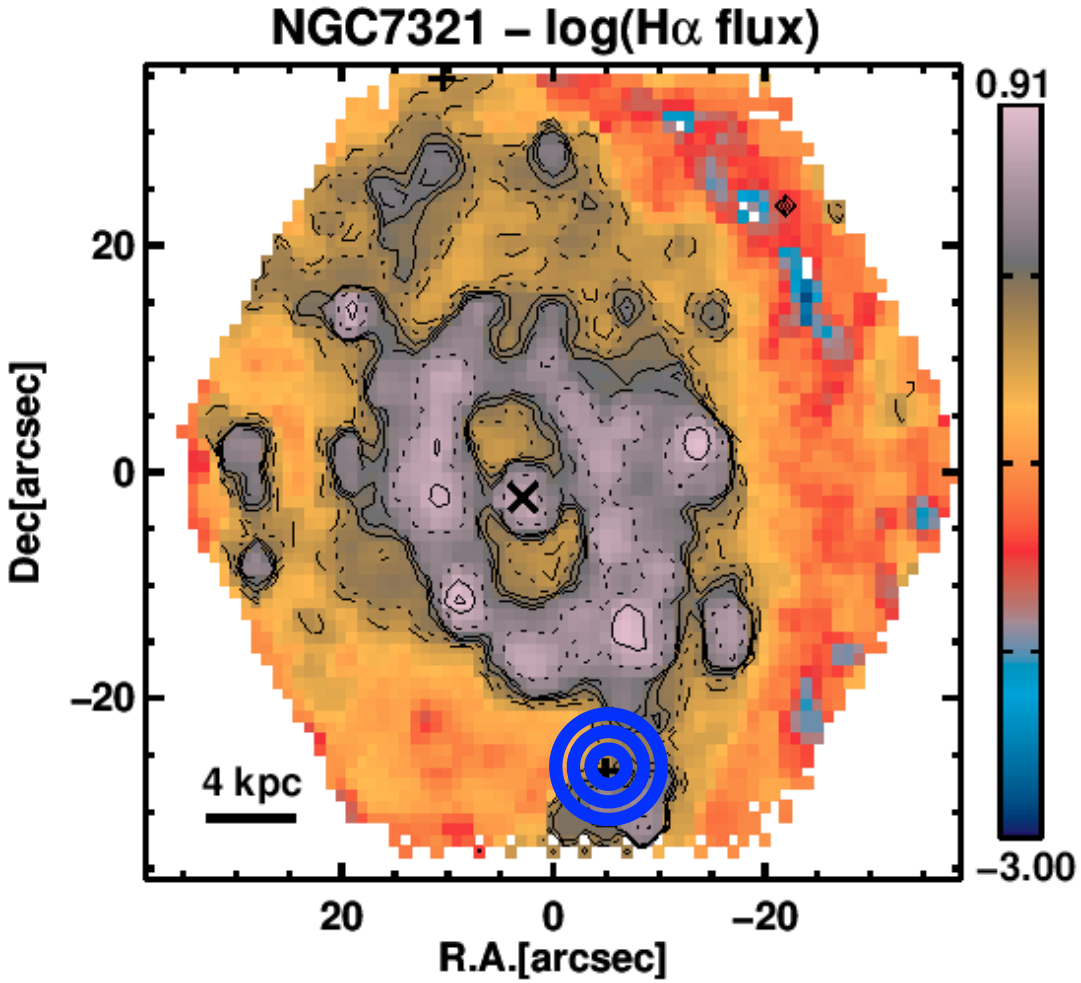


Limit should be the maximum aperture

Put the step you decided

```
ring_extract,'NGC7321',43.9331,10.0591,'2013di',8.5,0.5
```

5b- Obtain "ring" spectra

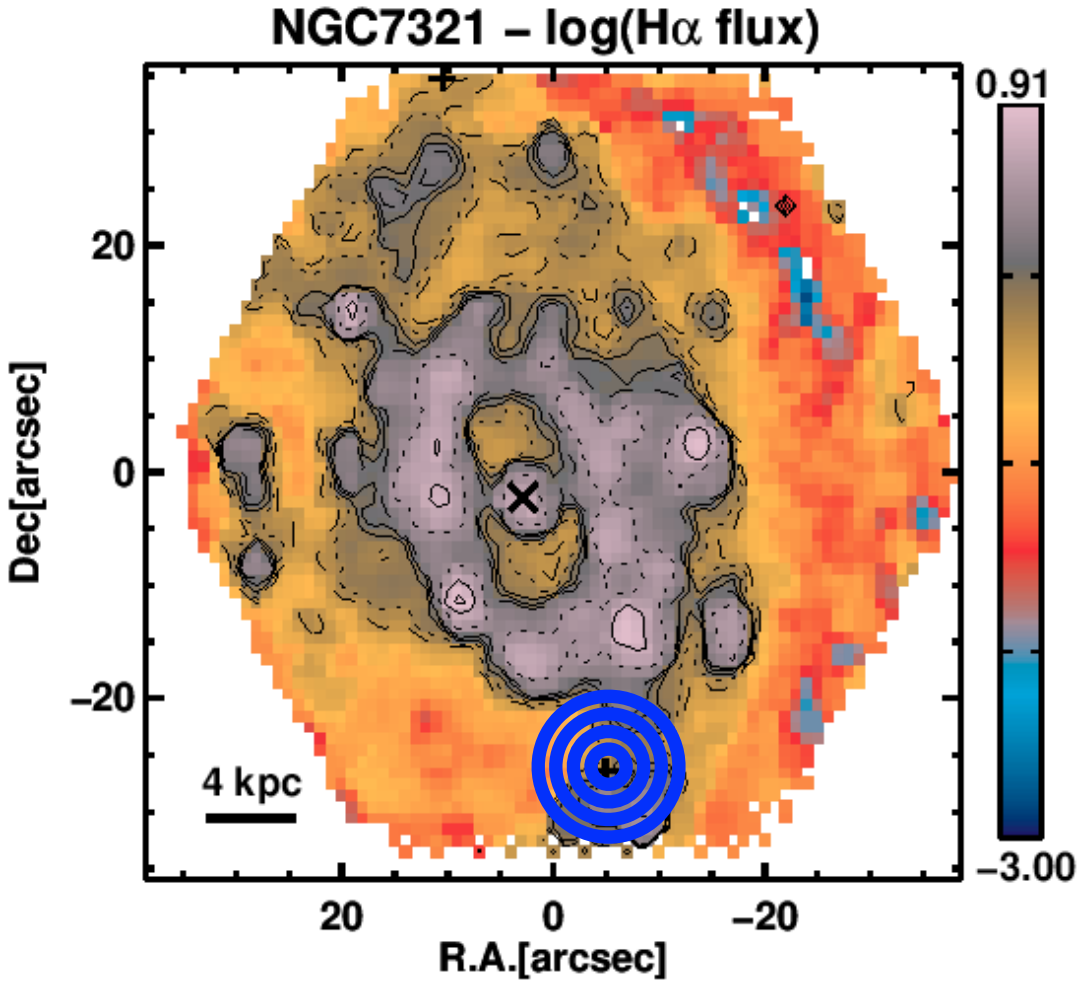


Limit should be the maximum aperture

Put the step you decided

```
ring_extract,'NGC7321',43.9331,10.0591,'2013di',8.5,0.5
```

5b- Obtain "ring" spectra



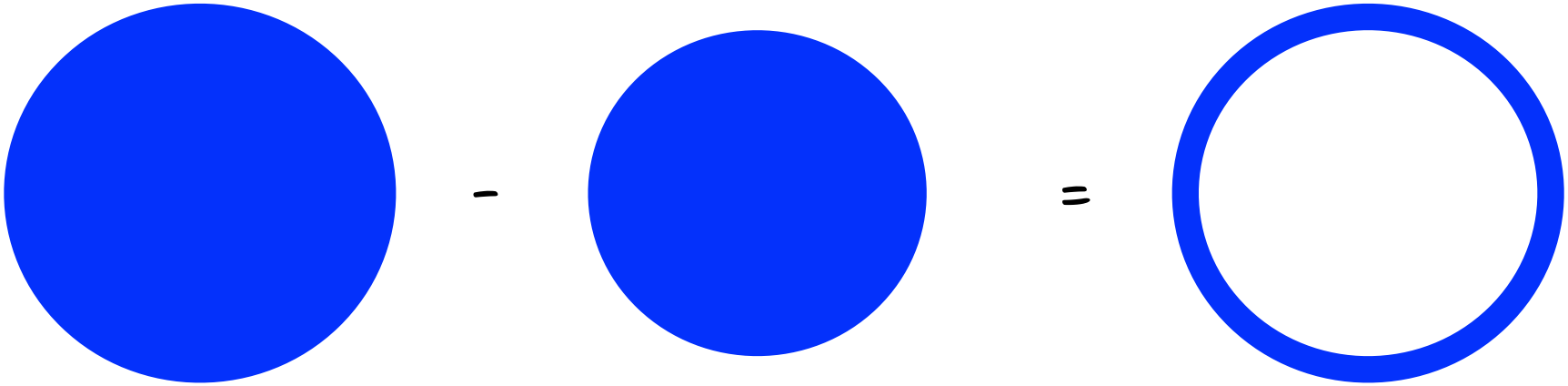
Limit should be the maximum aperture

Put the step you decided

```
ring_extract,'NGC7321',43.9331,10.0591,'2013di',8.5,0.5
```

5b- obtain "ring" spectra (ALTERNATIVE)

Subtract apertures



```
readcol,bigaperture,x,yb,eb,s
readcol,smallaperture,x,ys,es,s
forprint,text=filering,x,yb-ys,eb-es,s,format='f6.1,2e17.7,i',/noco
```

6- Run STARLIGHT

Edit the input file accordingly

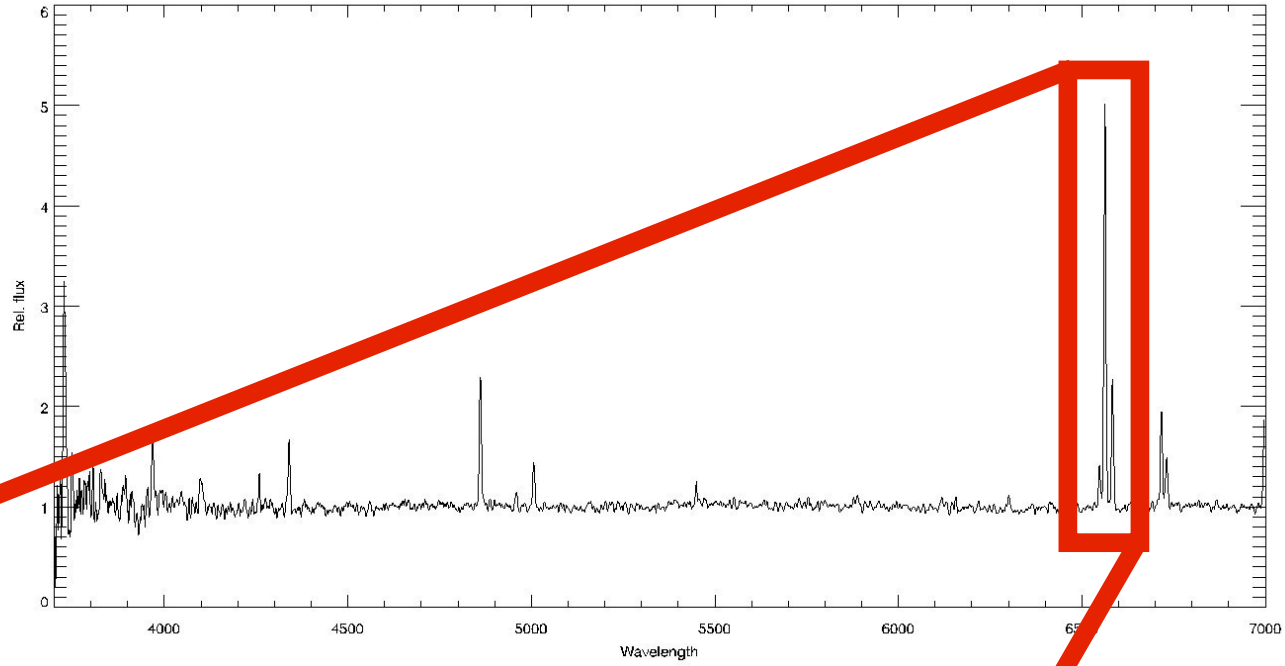
```
20                                                          [Number of fits to run]
./basesdir/                                                 [base_dir]
./                                                          [obs_dir]
./                                                          [mask_dir]
./                                                          [out_dir]
-2007200                                                    [your phone number]
4580.0                                                      [llow_SN]   lower-lambda of S/N window
4640.0                                                      [lupp_SN]   upper-lambda of S/N window
3700                                                        [Olsyn_ini] lower-lambda for fit
6996                                                        [Olsyn_fin] upper-lambda for fit
1.0                                                         [Odlsyn]    delta-lambda for fit
1.0                                                         [fscale_chi2] fudge-factor for chi2
FIT                                                         [FIT/FXK] Fit or Fix kinematics
1                                                           [IsErrSpecAvailable]  1/0 = Yes/No
1                                                           [IsFlagSpecAvailable] 1/0 = Yes/No
2013di_aper_1.0000.dat GHconfig GHbases GHmasks CCM 0.0 150.0 2013di_aper_1.0000.C11.gm.CCM.BN
2013di_aper_1.5000.dat GHconfig GHbases GHmasks CCM 0.0 150.0 2013di_aper_1.5000.C11.gm.CCM.BN
...
2013di_ring_1.0000.dat GHconfig GHbases GHmasks CCM 0.0 150.0 2013di_ring_1.0000.C11.gm.CCM.BN
2013di_ring_1.5000.dat GHconfig GHbases GHmasks CCM 0.0 150.0 2013di_ring_1.5000.C11.gm.CCM.BN
...
```

Run your version of Starlight. Mine is:

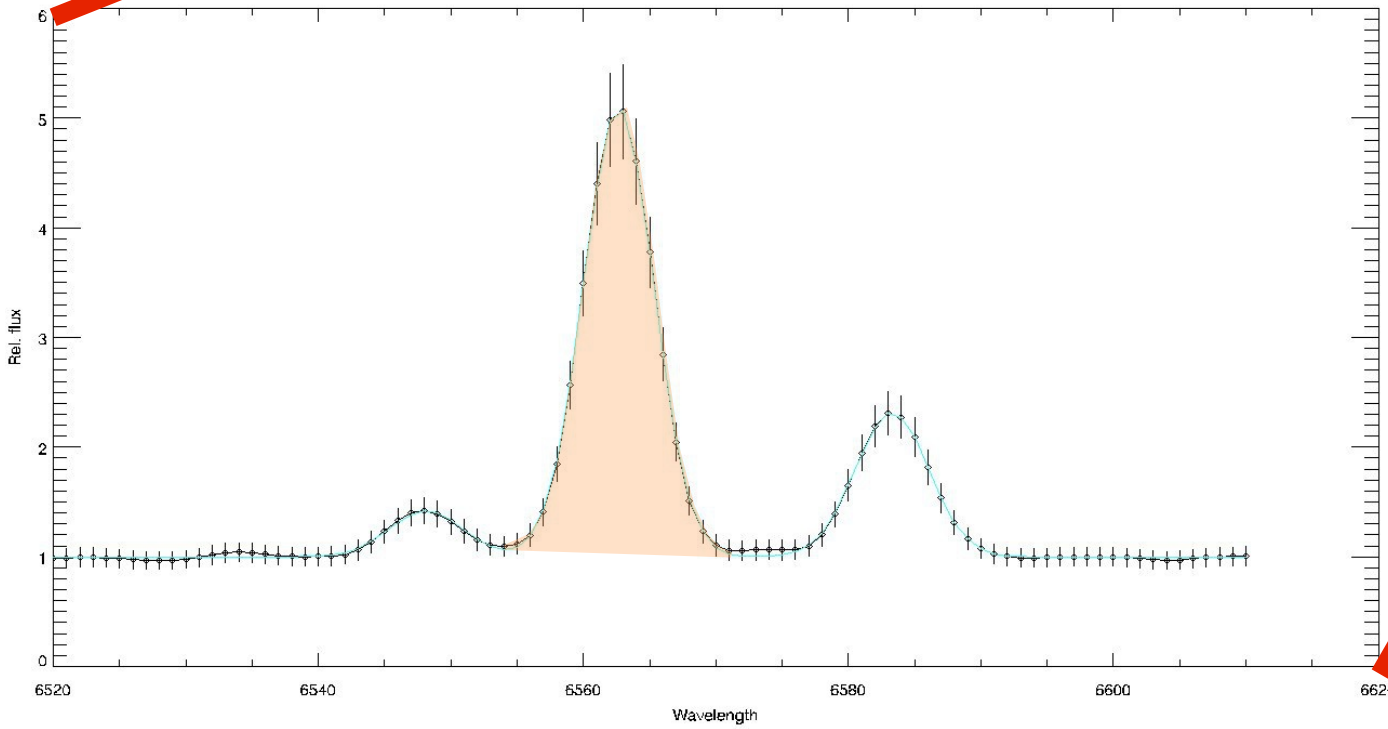
```
./Starlight < GHSLinput.in
```

7- Measure HαEW

Produce a table of all your HαEW values



haew,'2013di_aper_1.0.C11.gm.CCM.BN'



8- Plot H2EW vs. aperture/ring

Palau de la Música, Domènech i Muntaner et al. 1908