Deconvolution of fiber spectra in IFU spectrographs

SIFS data reduction package

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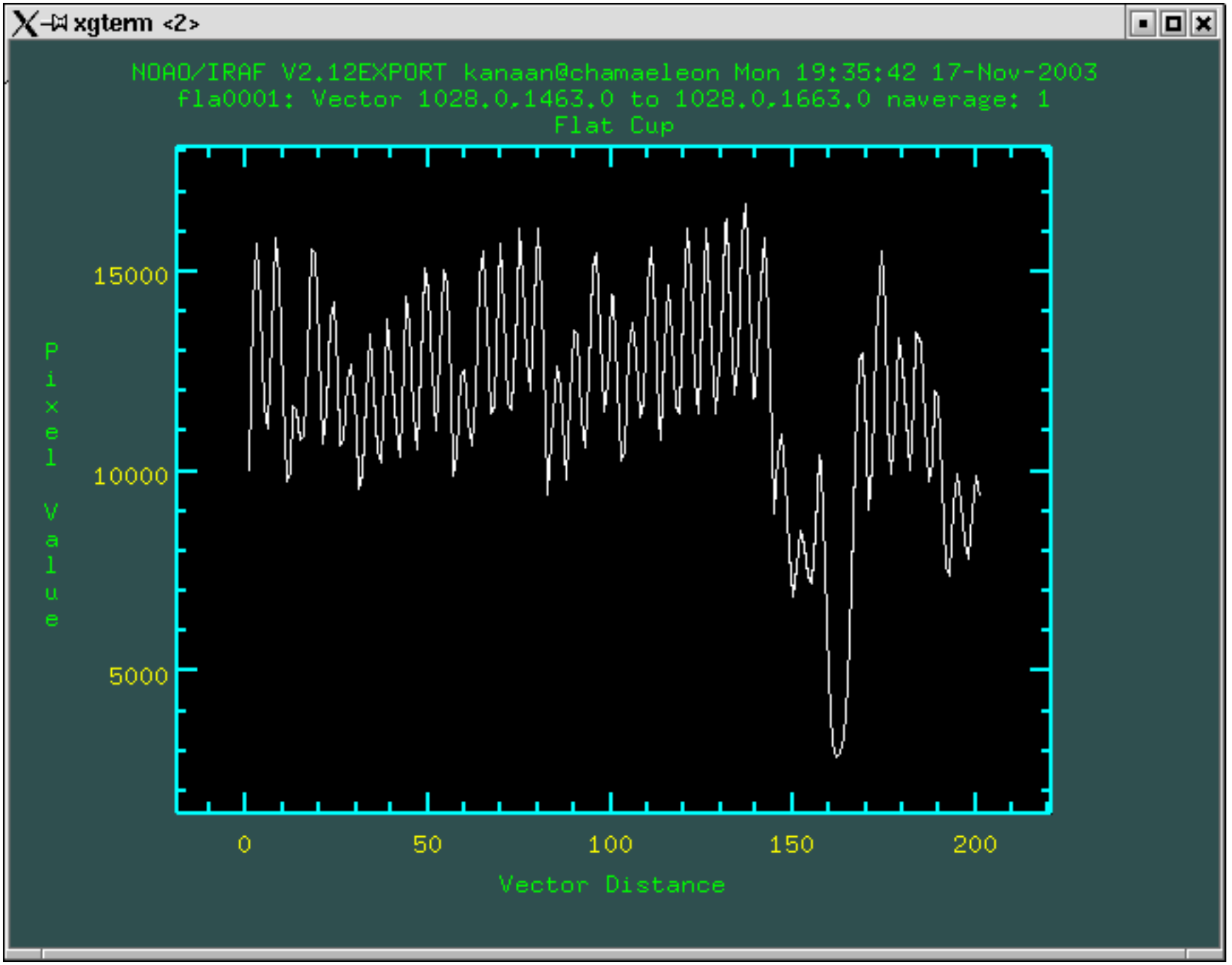
The problem

Fibers are very packed and the spectrum of one superposes to the other in the spatial direction.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Flat Cup
15000
10000
5000
Pixel Value
0
50
100
150
200
Vector Distance

The Solution

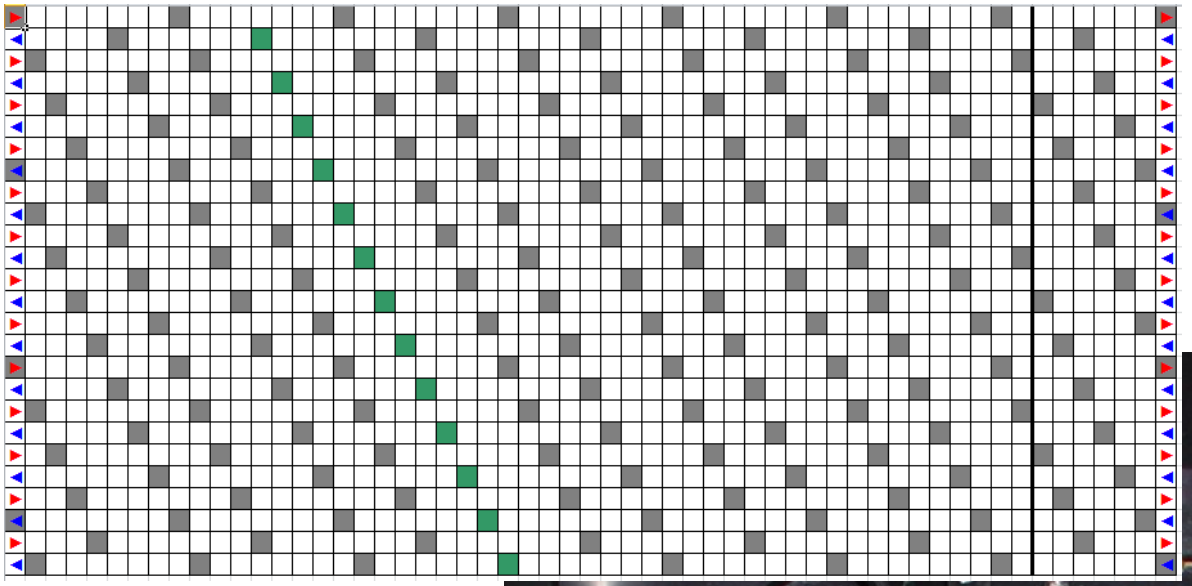
If (and only if), we know the position and width of the spectrum, of each fiber for all wavelengths on the CCD, then it is possible to determine the amount of light incident upon each fiber.

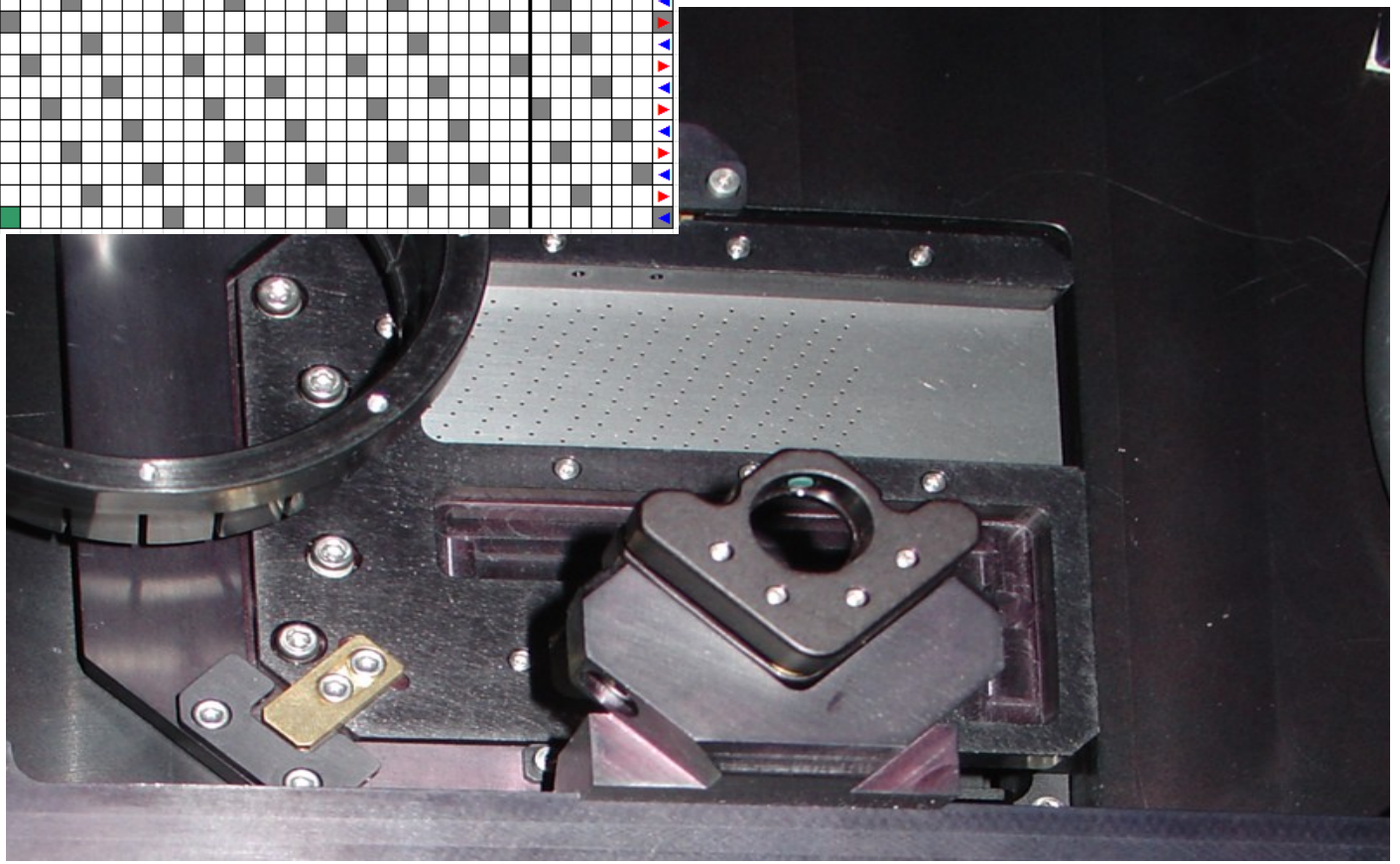
We can do that by fitting the amplitude of Gaussian profiles to column cuts (perpendicular to dispersion) across the detector. The number of Gaussians in the fit equals the number of fibers.

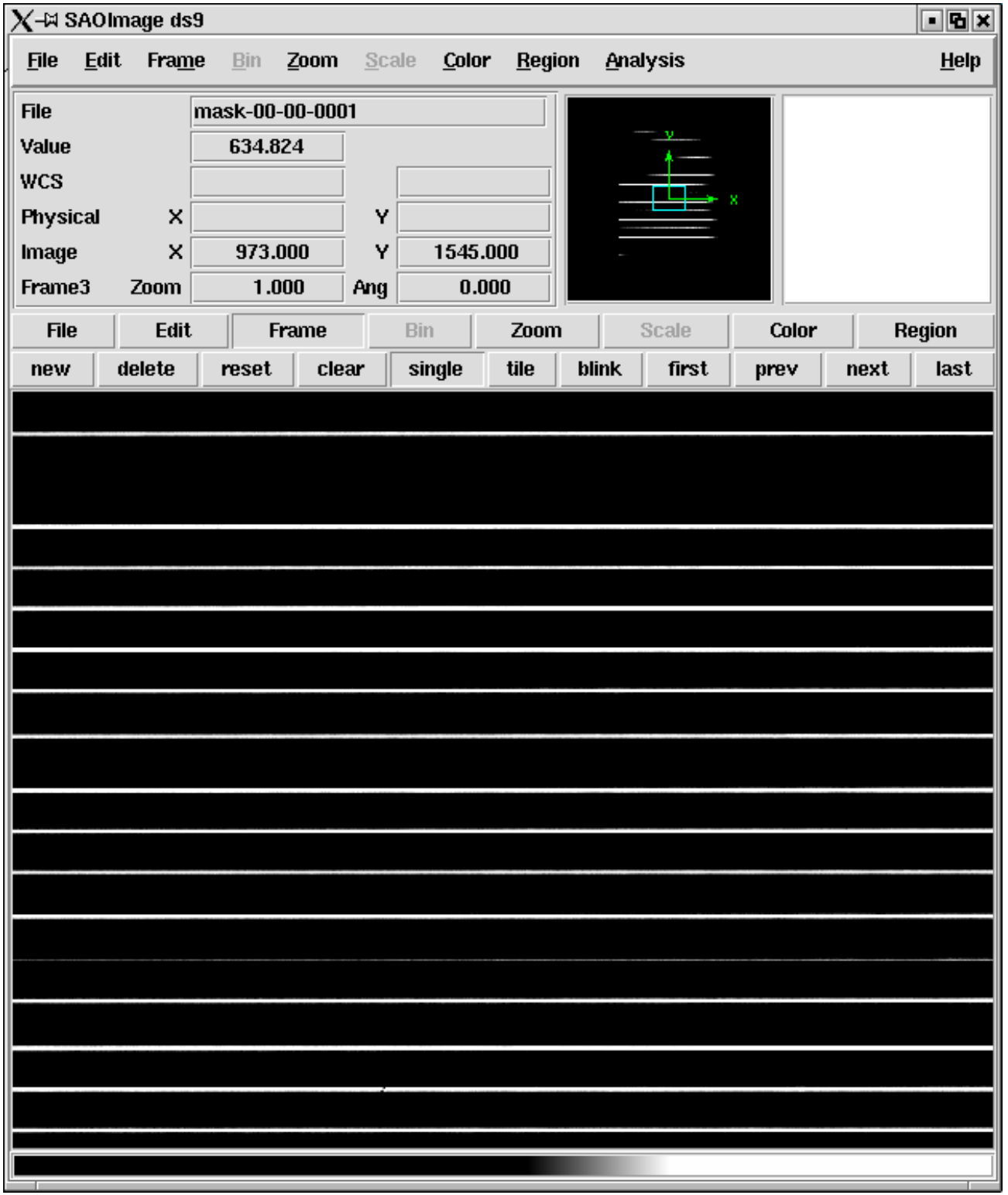
As the amplitude is the only free parameter the fit is linear (fast and with a unique solution).

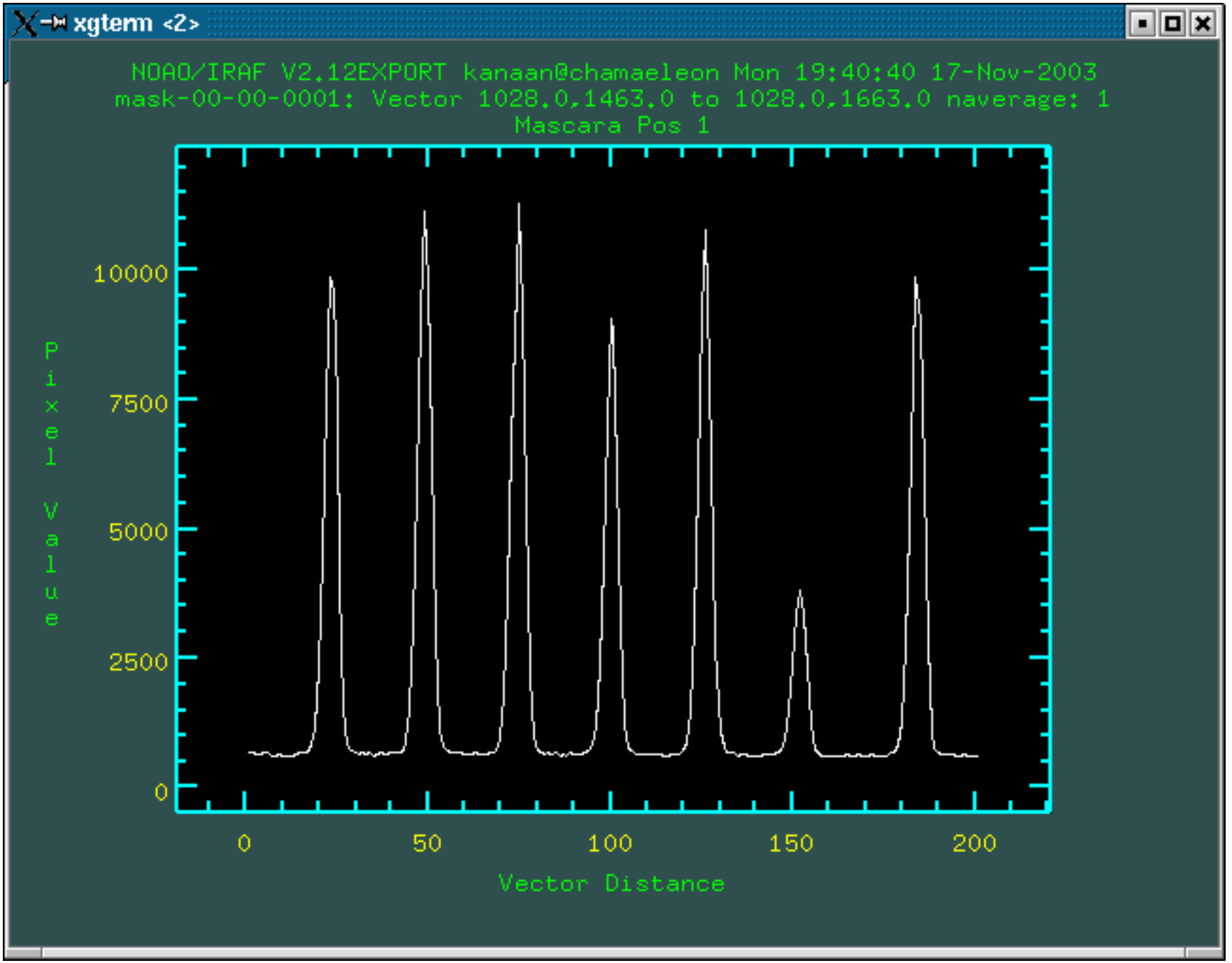
SIFS fore-optics mask

* masked flat as an extra calibration step






SAOImage ds9
File Edit Frame Bin Zoom Scale Color Region Analysis Help
File mask-00-00-0001
Value 634.824
WCS
Physical X Y
Image X 973.000 Y 1545.000
Frame3 Zoom 1.000 Ang 0.000
File Edit Frame Bin Zoom Scale Color Region
new delete reset clear single tile blink first prev next last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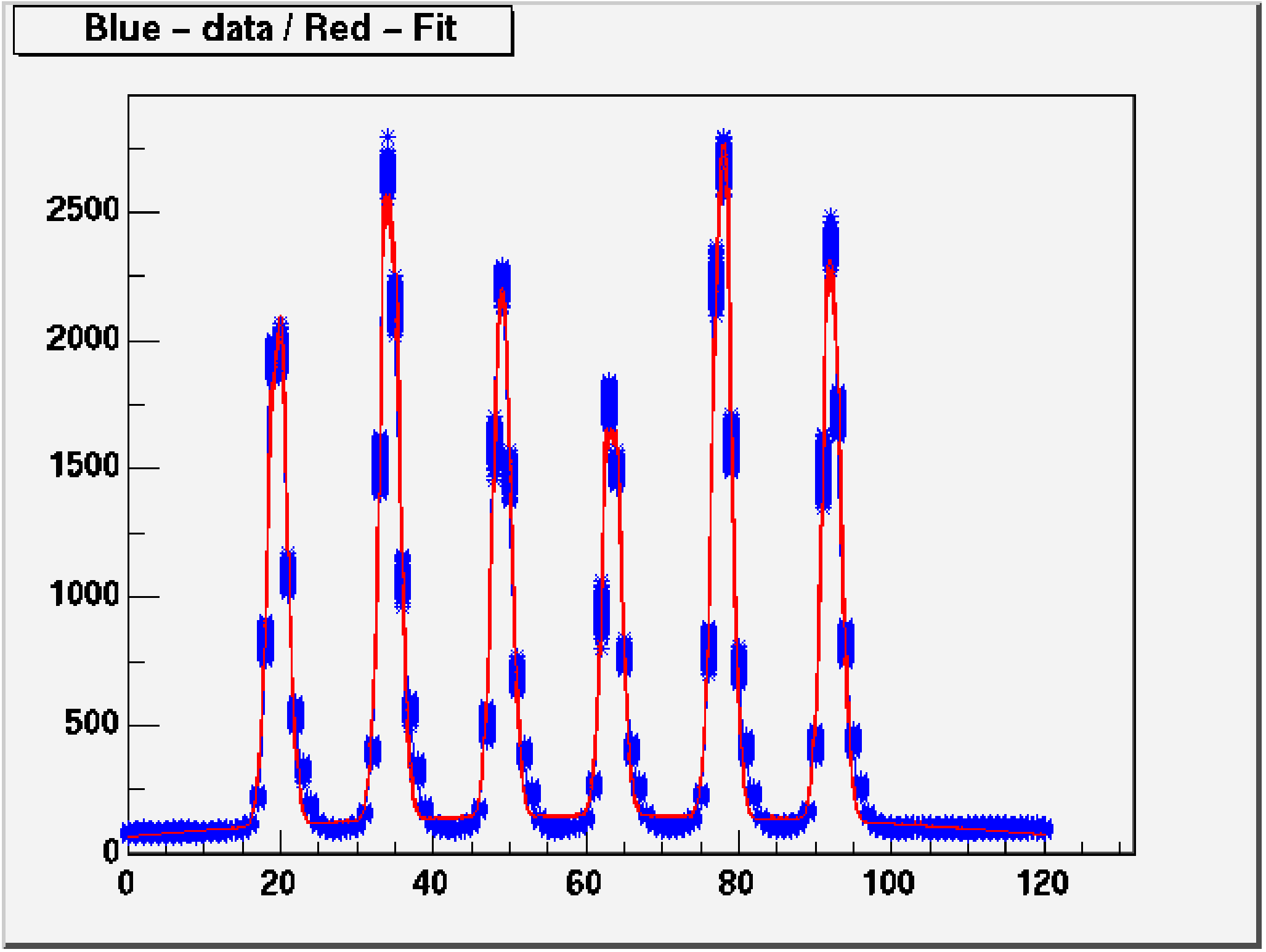
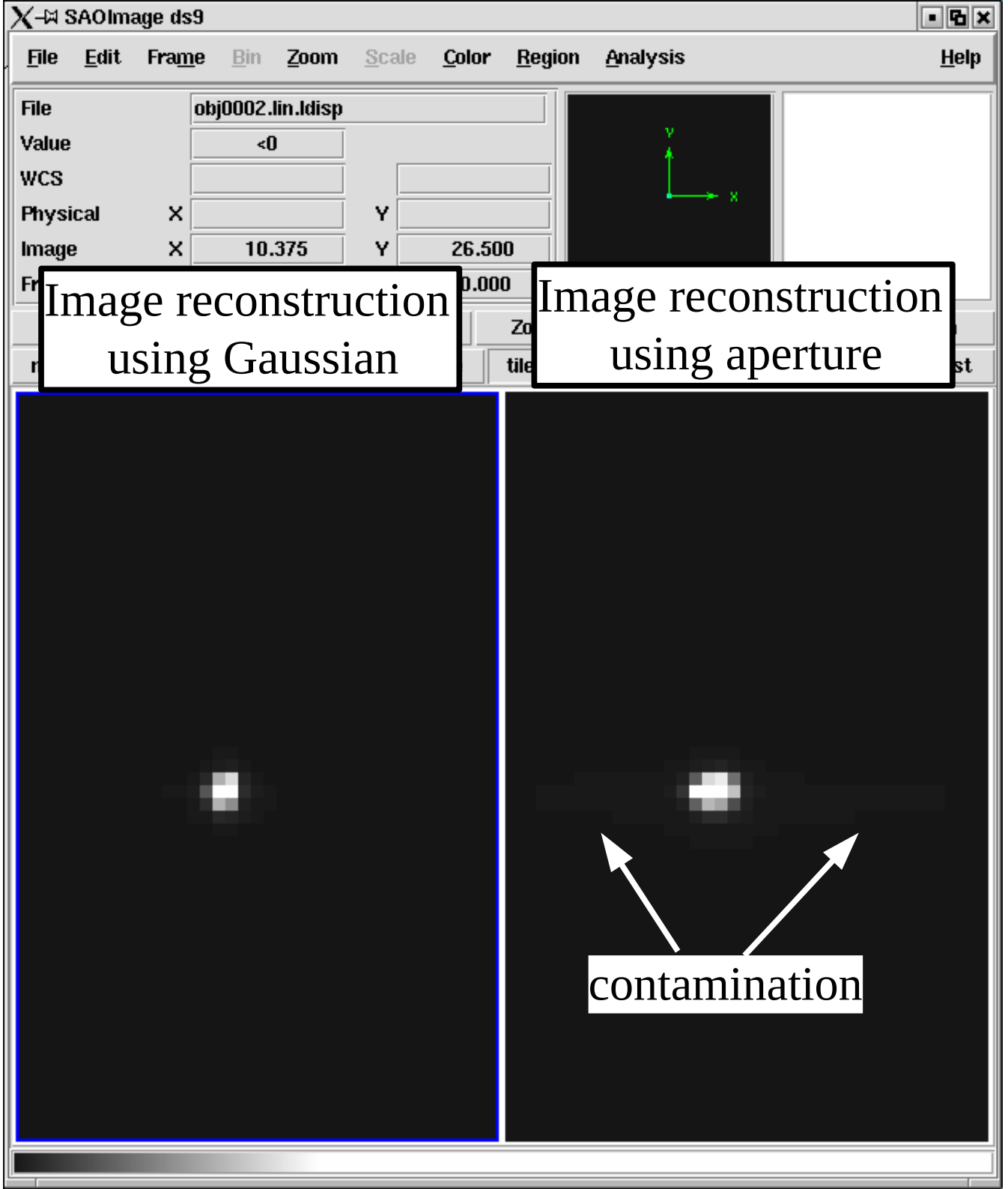
Mascara Pos 1
Pixel Value
10000
7500
5000
2500
0
0
50
100
150
200
Vector Distance


Blue – data / Red – Fit
2500
2000
1500
1000
500
0
0
20
40
60
80
100
120


SAOImage ds9
File Edit Frame Bin Zoom Scale Color Region Analysis Help
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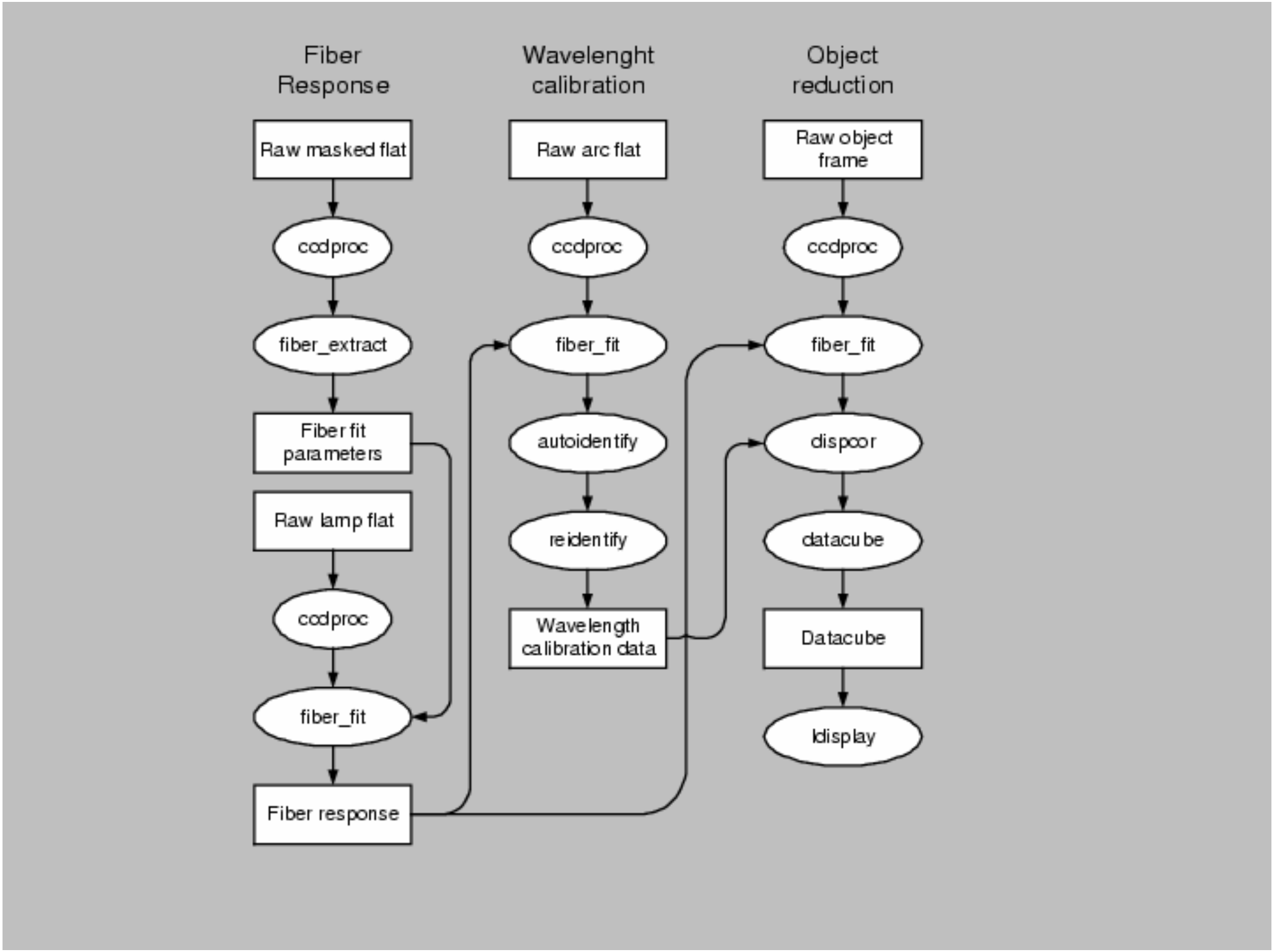
Value <0
WCS
Physical X Y
Image X 10.375 Y 26.500
Image reconstruction using Gaussian
Image reconstruction using aperture
contamination


Fiber Response
Wavelenght calibration
Object reduction
Raw masked flat
codproc
fiber_extract
Fiber fit parameters
Raw lamp flat
codproc
fiber_fit
Fiber response
Raw arc flat
ccdproc
fiber_fit
autoidentify
reidentify
Wavelength calibration data
Raw object frame
ccdproc
fiber_fit
dispcor
datacube
Datacube
idisplay

A complete IRAF package is currently in use for EUCALYPTUS data reduction.

http://www.astro.ufsc.br/~kanaan/ifu

The software will need some adaptations to run smoothly on SOAR, but it is **modular** enough that most fundamental differences can simply be reconfigured by changing configuration files.