Synopsis
type()

Description
A mandatory function required by the toolmanager. The type of any dish tool is 'dish'.

Example

Returns
Bool

1.1.3 msr - Tool
Package dish
Module dish

dish spectral line measure tool

Constructors

Functions

areape	Derives profile characteristic values.
areapf	Derives profile characteristic values.
mean	Derives characteristic values based on the mean.
peak	Derives characteristic values based on the peak.
twopeak	Derives characteristic values based on the peaks.

Description
The **dish** msr tool duplicates the functionality of the GMEASURE methods in Unipops (modes 1-5). Each method derives three characteristic values for the flux over the range of channels:

- flux integral (i.e. flux*dv)
- characteristic velocity (i.e. estimate of systemic velocity)

• velocity width

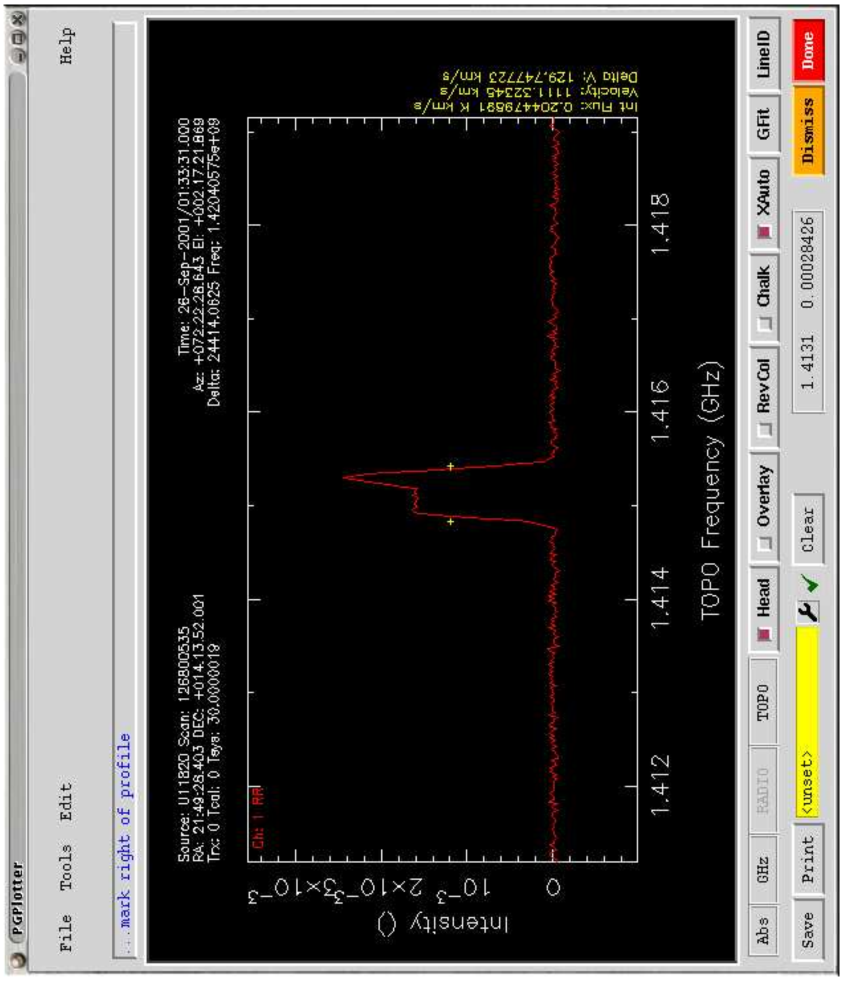

Figure 1.1: View of plotter after msr mean fit

msr.areape - Function

Package	**dish**
Module	**dish**
Tool	**msr**

Derives profile characteristic values.

Synopsis
areape(lv, first, last, levs, rms, usecurs, norder)

Description
This function calculates the width and average velocity of a galaxy spectrum. The two halves of the double horned profile are treated separately. For each half, the peak is determined (it is assumed that the two peaks are on either side of the center of the user specified limits first and LAST). Then on each side of the profile a polynomial (by default 1st order) is fit to a user specified portion of the profile. If the fit is poor, (i.e. (chisqr - deg.of.freedom) ¿ 3 times sqrt(2*deg.of.freedom)), the user is given the option of fitting a 2nd degree polynomial and/or changing the levels between which to fit. The FR points (where FR is a user specified fraction of the peak flux) on either side of the profile are located by interpolation between the two data points that bracket the FR point. The interpolaton is done by channel number and then the velocity corresponding to the interpolated channel number is computed. The average velocity is taken to be the mean of these two velocities and the width is taken to be the difference between these two velocities. The uncertainity in the velocity measurment is then calculated from the rms in the baseline and the coefficients of the fitted polynomial. Finally the area between the channels first and last is computed as in the other methods.

Example

```
- d.msr().areape(rms=0.005,levs=[0.8,0.2,0.4],usecurs=T)
Upper and lower profile points of left peak coincide!
Poor fit to profile: the normalized chisqr are nan14.2039694
Number of points used to fit left and right halves are 23
[type=areape, lchans=[329 328 329] , rchans=[351 353 351] , badfit=T,
vwidth=116.518171, vel=1111.61462, vrms=0.109011172, badpeak=F,
limits=[320.401001 358.420601] , fluxint=98.4090931]
```

Arguments

lv	an SDRecord Allowed:SDRecord - Not enabled Default: F
first	first channel number in range to integrate Allowed:integer Default: F
last	last channel number in range to integrate Allowed:integer Default: F
levs	define levels relative to each peak flux Allowed:vector Default: [0.8,0.2,0.4]
rms	rms of the spectrum (non-line) Allowed:float Default: 0.0
usecurs	optionally set ranges with cursor Allowed:boolean Default: F
norder	order of the fit Allowed:integer Default: 1

Returns
Record (fluxint, vel, vwidth, level, limits, type, mean)

---

msr.areapf - Function

Package	**dish**
Module	**dish**
Tool	**msr**

Derives profile characteristic values.

Synopsis
areapf(lv, first, last, levs, rms, usecurs, norder)

Description
This subroutine calculates the width and average velocity of a galaxy spectrum. The two halves of the double horned profile are treated separately. For each half, the peak is determined (it is assumed that the two peaks are on either side of the center of the user specified limits first and LAST). Then each

on each side of the profile a polynomial (by default 1st order) is fit to a user specified portion of the profile. If the fit is poor, (i.e. (chisqr - deg.of.freedom) ¿ 3 times sqrt(2*deg.of.freedom)), the user is given the option of fitting a 2nd degree polynomial and/or changing the levels between which to fit. Finaly using the fitted polynomial, the fr points (where fr is a user specified fraction of the peak flux) on either side of the profile is located. The interpolaton is done by channel number and then the velocity corresponding to the interpolated channel number is computed. The average velocity is taken to be the mean of these two velocities and the width is taken to be the difference bewteen these two velocities. The uncertainity in the velocity measurment is then calculated from the covariance matrix of the coefficients of the fitted polynomial. Finally the area of the profile between the limits first and last is computed as summation (x(i)*dv(i)), where dv(i) is the velocity difference between channels i and i-1.

Example

```
- d.msr().areapf(rms=0.005,levs=[0.8,0.2,0.4],usecurs=T)
Upper and lower profile points of left peak coincide!
Poor fit to profile: the normalized chisqr are nan 14.2039694
Number of points used to fit left and right halves are 23
[type=areapf, lchans=[323.402033 322.402033 322] , rchans=[351 353 351] ,
badfit=T, vwidth=150.814539, vel=1094.01721, vrms=0.184532409, badpeak=F,
limits=[322.402033 356.419569] , fluxint=99.7206675]
```

Arguments

lv	an SDRecord Allowed:SDRecord - Not enabled Default: F
first	first channel number in range to integrate Allowed:integer Default: F
last	last channel number in range to integrate Allowed:integer Default: F
levs	define levels relative to each peak flux Allowed:vector Default: [0.8,0.2,0.4]
rms	rms of the spectrum (non-line) Allowed:float Default: 0.0
usecurs	optionally set ranges with cursor Allowed:boolean Default: F
norder	order of the fit Allowed:integer Default: 1

Returns
Record (fluxint, vel, vwidth, level, limits, type, mean)

---

msr.mean - Function

Package	**dish**
Module	**dish**
Tool	**msr**

Derives characteristic values based on the mean.

Synopsis
mean(lv, first, last, flevel, usecurs)

Description
The flevel (flux level) is multiplied by the mean over the channel range. Starting at the edges of the range, channels are found where the flux first rises above the derived level. The integrated flux is taken between these channels. A linear interpolation is done to find the velocity corresponding to where the

flux equals that level. These two velocities (one at each end) are used to determine the characteristic velocity (the average of the two). The velocity width is the absolute value of their difference.

Example

```
- d.msr().mean(first=324,last=360,flevel=0.2)
[fluxint=99.0127912, vel=1109.67758, vwidth=130.143466, level=0.103916899,
limits=[328 352] , type=mean, mean=0.519584496]
- d.msr().mean(flevel=0.3,usecurs=T)
[fluxint=0.204479891, vel=1111.32345, vwidth=129.747723, level=0.000357433806,
limits=[329.167913 353.229436] , type=mean, mean=0.00119144602]
```

Arguments

lv	an SDRecord Allowed:SDRecord - Not enabled Default: F
first	first channel number in range to integrate Allowed:integer Default: F
last	last channel number in range to integrate Allowed:integer Default: F
flevel	fractional flux level Allowed:float Default: 0.3
usecurs	optionally set ranges with cursor Allowed:boolean Default: F

Returns

Record (fluxint, vel, vwidth, level, limits, type, mean)

---

msr.peak - Function

Package	**dish**
Module	**dish**
Tool	**msr**

Derives characteristic values based on the peak.

Synopsis
peak(lv, first, last, flevel, rms, usecurs)

Description
Identical to mean except that the cutoff level is the peak value times flevel. Also, you can optionally supply a noise estimation (the rms argument). This is subtracted from the peak value before it is multiplied by flevel. The returned fields here are nearly identical to those in mean. The only difference is that there is a peak field here instead of mean. That is the actual peak, not the value reduced by rms.

Example

```
- d.msr().peak(flevel=0.5,usecurs=T)
[fluxint=91.9571165, vel=1108.78946, vwidth=105.650325, level=0.610705972,
limits=[330.404096 350.418538] , type=peak, peak=1.22141194]
```

Arguments

lv	an SDRecord Allowed:SDRecord - Not enabled Default: F
first	first channel number in range to integrate Allowed:integer Default: F
last	last channel number in range to integrate Allowed:integer Default: F
flevel	fractional flux level Allowed:float Default: 0.3
rms	rms of spectrum Allowed:float Default: 0.
usecurs	optionally set ranges with cursor Allowed:boolean Default: F

Returns
Record (fluxint, vel, vwidth, level, limits, type, peak)

---

msr.twopeak - Function

Package **dish**
Module **dish**
Tool **msr**

Derives characteristic values based on the peaks.

Synopsis

twopeak(lv, first, last, peak1, peak2, flevel, rms, usecurs)

Description

Similar to peak except that there are two cutoff levels determined for the data. Peaks are found within 10 channels from each guessed peak location (peak1 and peak2), the cuttoff levels are then set to be flevel times each peak. The value from the peak near first is used to set the lower channel limit and the value from the peak near last is used to set the upper channel limit in the same way that peak and mean set those channel limits. As with peak, you optionally supply a noise estimate (the rms argument) which is subtracted from the peak values before they are multiplied by flevel. The return value fields are nearly the same as in peak. Here, the level and peak fields have 2 elements. There is also a peakchan field which contains the refined locations of the two peaks.

Example

```
- d.msr().twopeak(flevel=0.5,usecurs=T)
[fluxint=94.6122732, vel=1110.71511, vwidth=109.501611, level=[0.610705972
0.489752263] , limits=[330 351] , type=twopeak, peak=[1.22141194 0.979504526] ,
peakchan=[334 336] ]
```

Arguments