window

keys:	**[from]**	*<number>*	source picture
	[to]	*<number>*	output picture
	position	*<x>,<y>*	lattice origin
	width	*<number>*	width in lattice coordinates, of regions retained around each lattice site
	radius	*<number>*	maximum radius of lattice sites that are retained
options:	**verify**		verify results on the console

Use **window** to perform a *window array* Fourier transform filter that retains only components close to a site of a predefined lattice. This command allows you to perform *lattice averaging* of a noisy image of a periodic structure, by filtering out Fourier components that do not have the right periodicity.

Examples

```
u=20,5 v=3,18; window display
```

This command masks the display picture retaining only pixels near sites of the lattice defined by *u, v*. The above command is not in itself useful, but will show you clearly what **window** does.

```
window 50 to 51 width .1 radius 120
```

This command masks picture 50 with windows whose sides are a fraction 0.1 of the corresponding lattice base vectors in length, also setting to zero any pixels that are more than 120 units from the origin.

```
fourier; min=0 max=1e8; ps to display; library lattice
window; image; display
```

This sequence of commands performs a complete filtration process on the current picture (though you may need to adjust the display grey level to suit your data). You indicate the lattice using the display cursor, when prompted by the **library** program.

Description

You can apply **window** to full-plane and half-plane Fourier pictures.

The transform of an image of a periodic structure is localised near an array of peaks arranged in a (*reciprocal*) lattice, while the image noise is spread throughout the transform. You can therefore improve the image substantially by setting to zero all pixels that are not near a lattice site – which can be seen as applying a mask consisting of an array of small windows centred on the lattice sites.

window

The lattice is defined by base vectors *u*, *u2* and *v*, *v2*. You can use the **position** key to move its origin. The generated windows are parallelograms with sides **width** (0.2 in default) multiplied by the corresponding base vector length. Note that smaller windows perform better filtering, but are more likely to cause artefacts if you do not know the base vectors accurately or if the image is imperfectly periodic. In any case, some signal distortion is likely if the windows are smaller than 3 pixels wide. Use the **verify** option to send details of the filtering operation to the console.

You can also see the effect of the filter as a local averaging of unit cells in real space. Transform windows of width *1/n* correspond roughly to averaging the image over regions *n* cells wide. For alternative ways of effecting the average, see the commands **lattice**, **motif**.

If you need to interchange real and reciprocal base vectors, use the program **library reciprocal**.

Notes

multi-layer pictures:	faulted
forms used internally:	complex
variables used:	*u, u2, v, v2* (lattice base vectors)
see also:	**lattice**, **motif**

Defaults and Ranges

keys/options	defaults	range
[from]	current picture, held in the variable *select*	valid picture number
[to]	current picture, held in the variable *from*	valid picture number
position	position 0,0	within bounds of picture (integers)
width	width 0.2	real number
radius	infinite	within bounds of picture (integer)
verify	verification off	