MVSS Motorised Slits
User notes

Overview

The bandwidth of a monochromator has an impact upon the resolving power of the system, the ability to discriminate adjacent spectral features. Bandwidth is defined by the dimensions of the entrance and exit slits, or, where asymmetric slits are used, is defined by the largest of the two.

Where multiple diffraction gratings are installed in a monochromator, as one migrates between gratings of different line density, the dispersion and therefore the system bandwidth changes where the slits fixed. To preserve the desired bandwidth, or to permit the change of bandwidth within a measurement, motorised slits are employed.

Mechanical

The motorised slit is based on stepping motor-driven bi-lateral slits, where the drive electronics are situated in a separate PMC MAC unit. The motorised slits are installed as part of the monochromator and should not be tampered with. Care should be taken no to subject the slits or their housing to physical shock.

PMC MAC

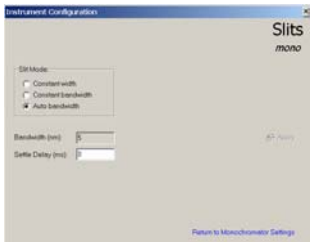
The stepping motor drives are situated in the MAC electronics bin, cables are supplied to connect the labelled ports to the labelled MVSS. The cables should be firmly attached.

Never connect or disconnect slit cables whilst MAC electronics powered on!

Software control

Within Benwin+, the properties page of the motorised slits is as follows showing three modes of operation:-

•constant width, input required dimension
•constant bandwidth, input required bandwidth
•auto, sets the bandwidth to the step size defined in the scan setup page



It should be noted that having calibrated a system in auto mode at a given step size, to change the step size would invalidate the calibration.

A settle delay of 100ms is sufficient.

Monochromator Bandwidth

The monochromator bandwidth, defined in nm, is the range of wavelengths seen by the detector at one time, and is directly linked to the monochromator slits in use.

The effect of monochromator entrance and exit slits on monochromator bandwidth can be viewed in two manners.

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In the first instance, the monochromator is an imaging system; the input port is imaged at the exit port; the dimension of the monochromator entrance slit defines the image size at the exit port.

Furthermore, at the exit of the monochromator, since the light incident thereupon is dispersed, one can imagine the wavelength axis running along parallel to the wall of the exit slit, the size of this slit determining how many wavelengths can be seen at one time. What results is an infinite number of images of the entrance slit, of incrementally differing wavelength, presented parallel to the exit slit; whichever of the two are the largest, defines the bandwidth of the system.

In a double monochromator, a further slit is included, the middle slit (in the case of a system having additive dispersion). The purpose of this slit is to reduce the amount of stray light going from the first to second monochromators and should at all times be set to at least 20% larger than the largest slit in the system, else tracking problems between the component monochromators shall result.

The slit function of a monochromator provides interesting information with regards the device performance and the system bandwidth and may be determined by the measurement of a source of narrow spectral width, such as a laser.

One should perform a measurement at smaller steps than the system bandwidth (for example 0.1nm), over a spectral range of around four times the expected bandwidth, centred on the expected wavelength of the emission line, for example 632.8nm for the HeNe laser.

The full width half maximum (FWHM) of this spectrum provides the bandwidth of the system. Inspecting the signal at one bandwidth, two bandwidths etc. relative to the peak, provides information of the stray light performance of the system. Where the entrance and exit slits are of the same dimension, the slit function shall have a triangular profile, otherwise, the function shall be flat-topped.

It is worthy to note that care should be made in making this measurement- it is not sufficient merely to shine a laser in the entrance slit of the monochromator. This measurement should ideally be performed by filling the entrance slit, for example with the use of an integrating sphere, and illuminating the sphere with the source.

Finally, it follows of course that slit dimension has an impact of the light throughput of the monochromator, and in certain instances where a reduction in signal is required, either the entrance or exit slit is reduced, whilst maintaining the same system bandwidth.

It is preferable that the slit to be reduced be the exit slit to avoid any conflict with the input optic.

It is important to remember that to perform a scan with a step size lower than the bandwidth obtained is satisfactory, on the contrary to step larger than the bandwidth results effectively in the loss of information.

WEEE statement:

Bentham are fully WEEE compliant, registration number is WEE/CB0003ZR.
Should you need to dispose of our equipment please telephone 0113 385 4352 or 4356, quoting account number 135419.

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