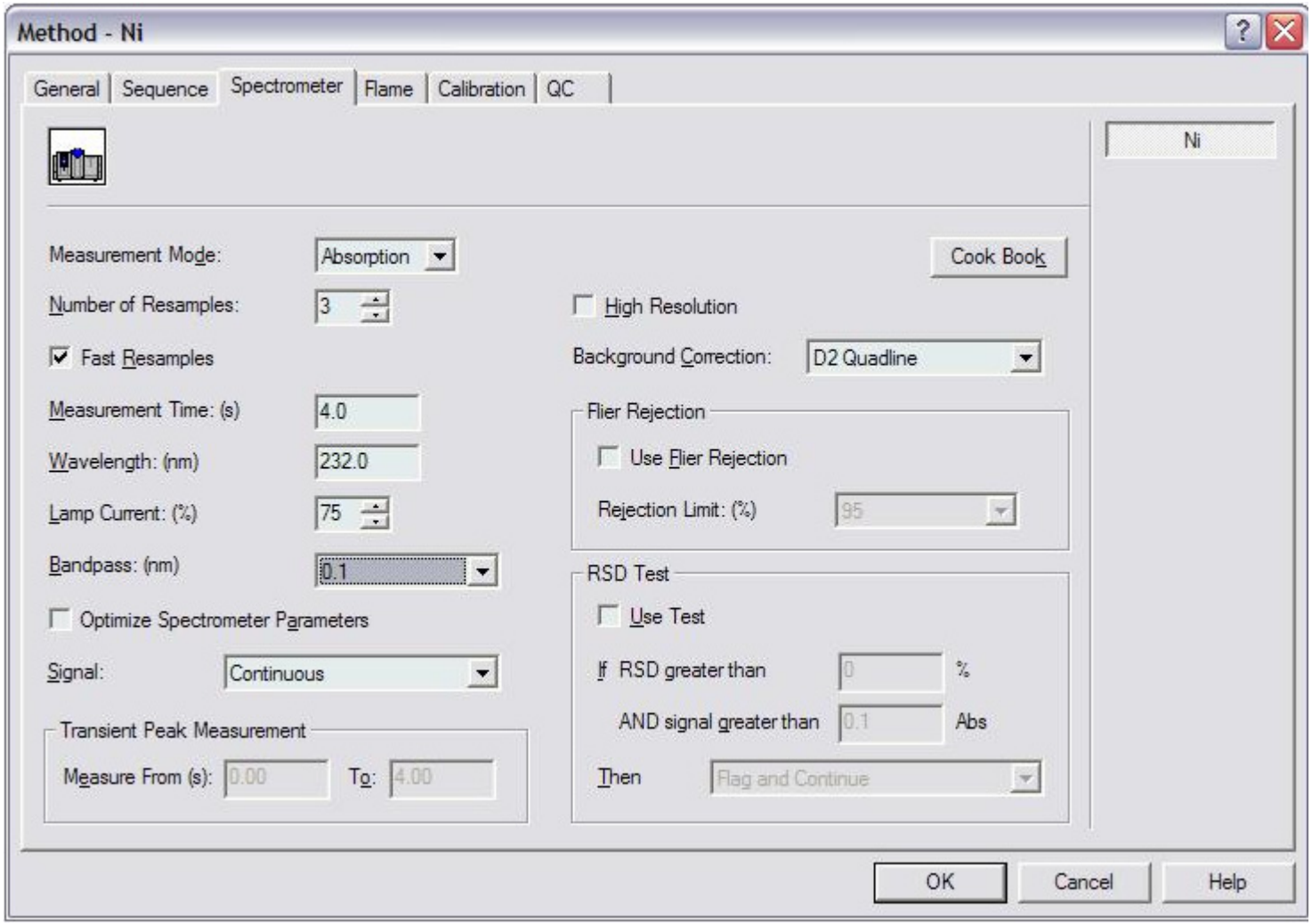
Spectrometer Settings

Spectrometer Settings

Method, Spectrometer tab



Spectrometer Settings

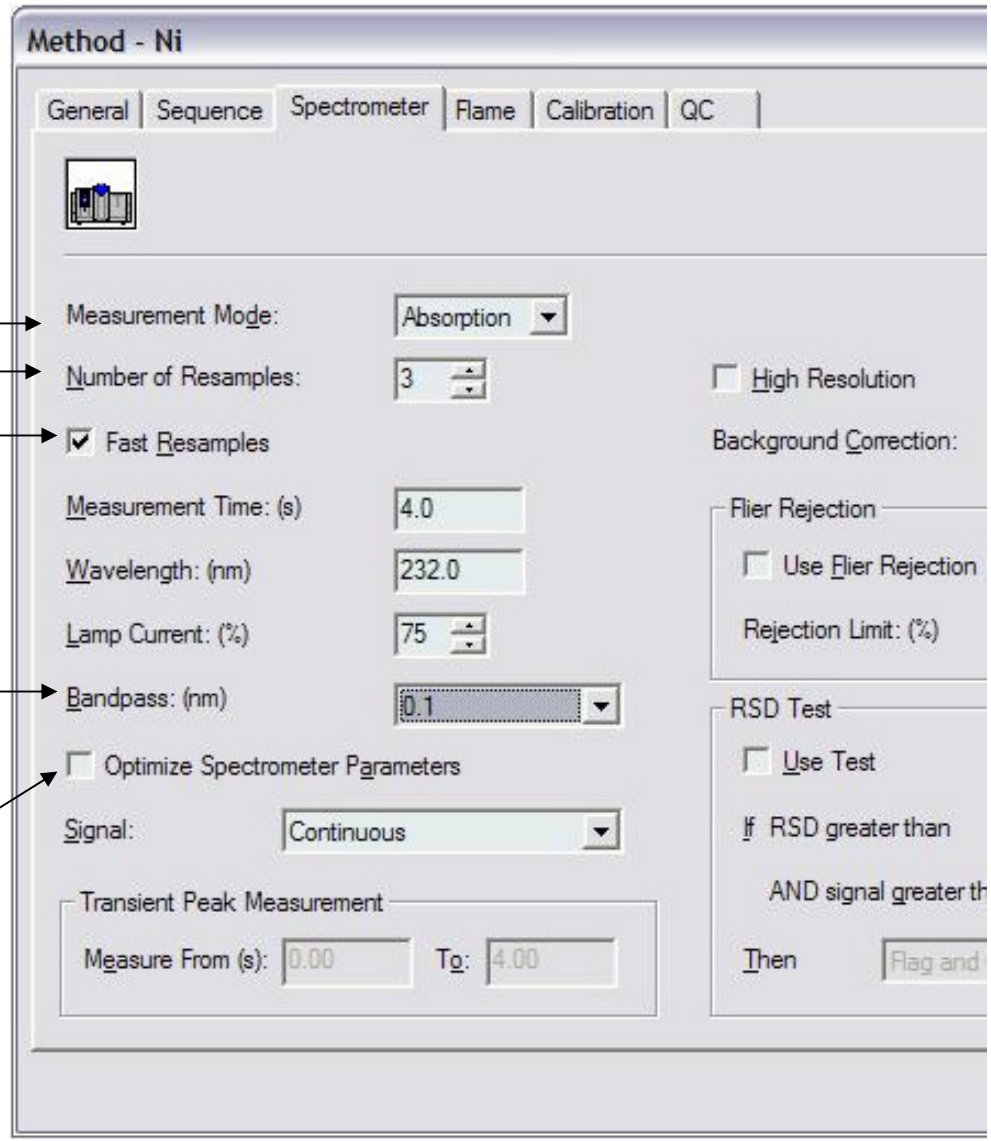
Absorbance or Emission

Number or readings to be averaged

If checked, no reference measurement between readings.

The width of the spectrum that the detector will measure

This feature allows the system to optimize the lamp current, band pass, measurement time and in some cases the wavelength, to obtain the most appropriate conditions for your particular analysis, based on the absorbance signal measured from a typical sample solution .



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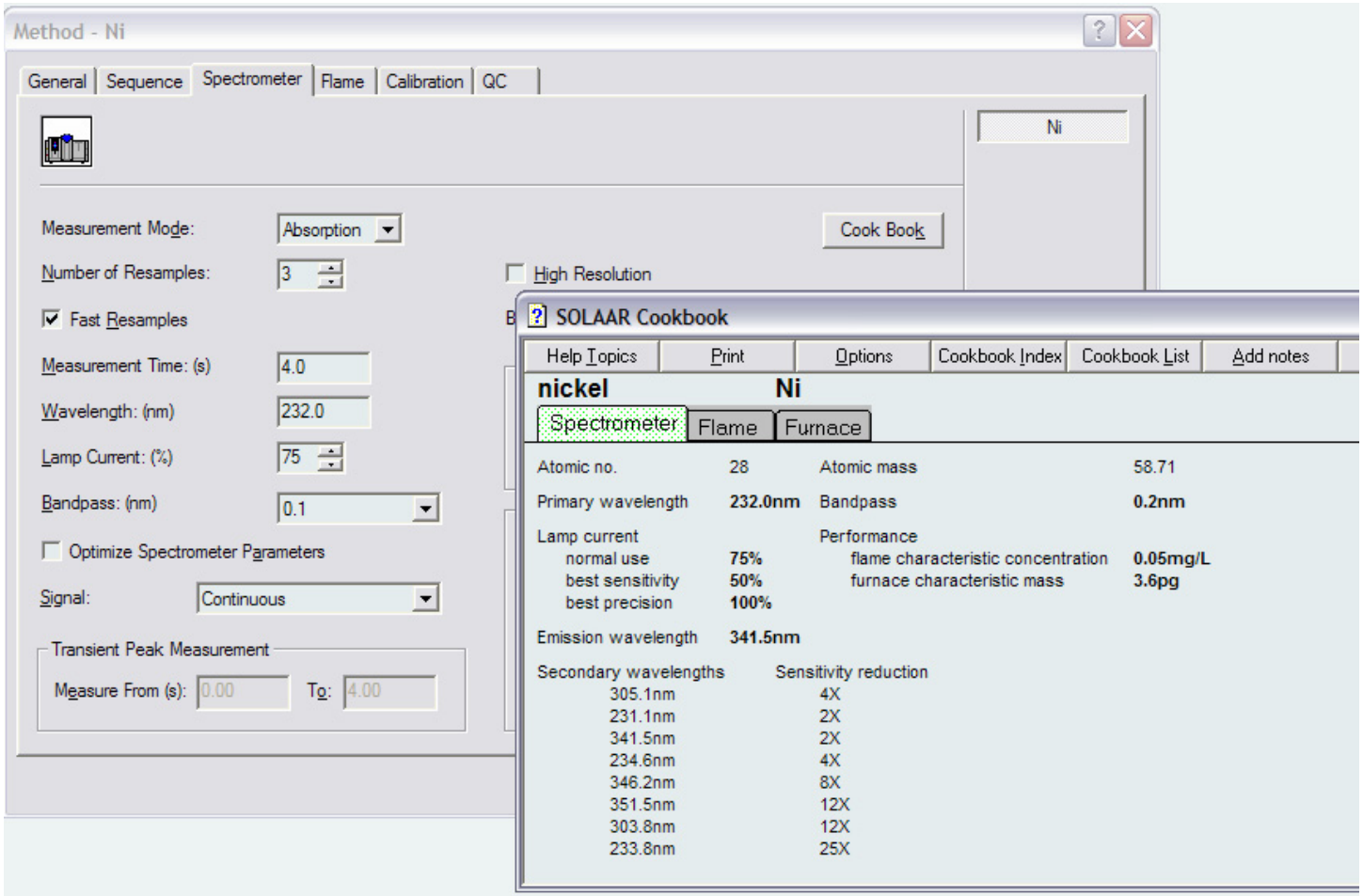


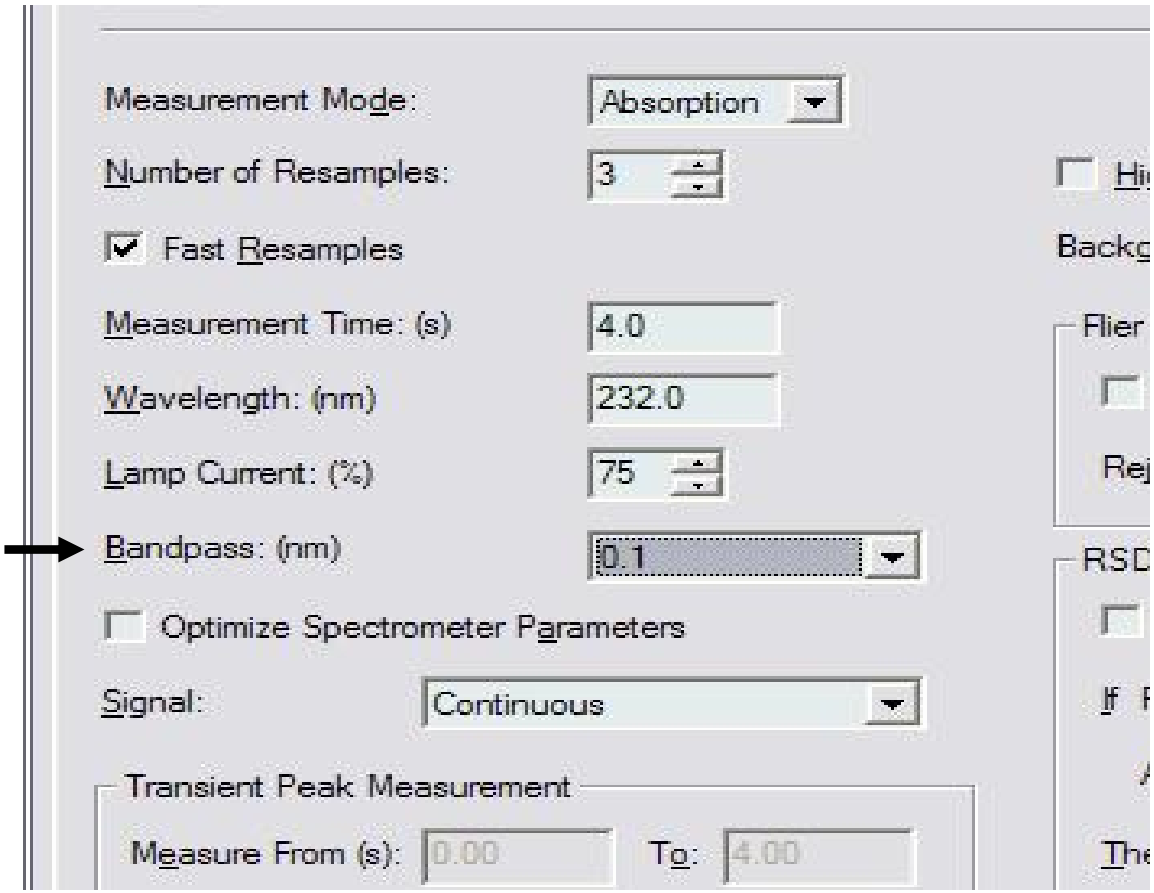
The Cook Book displays helpful information on an element-by-element basis. Other elements are accessed through the Cookbook Index

Spectrometer Settings

There are two main implications regarding changing the bandpass:

1) Opening the bandpass will allow more radiation to reach the detector. This will improve the signal-to-noise ratio. However:

2) Opening the bandpass may let more than one wavelength reach the detector. These additional wavelengths may not be absorbed by the analyte; in this case there will be a reduction in linear range because non-absorbed lines reach the detector unattenuated by the analyte.



The objective, then, is to use a bandpass as wide as possible in order to give the best signal-to-noise ratio; but not so wide that more than the primary wavelength passes to the detector.

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The bandpass is also implicated in performing background correction with the deuterium arc.

Looking at the diagram we can see that the arc will emit radiation over the entire bandpass (a). Not so for the hollow cathode lamp which emits radiation for only a very narrow range of the bandpass. Background will attenuate both the arc and the HCL radiation by the same amount (b). Analyte will effectively only attenuate the HCL radiation (c).

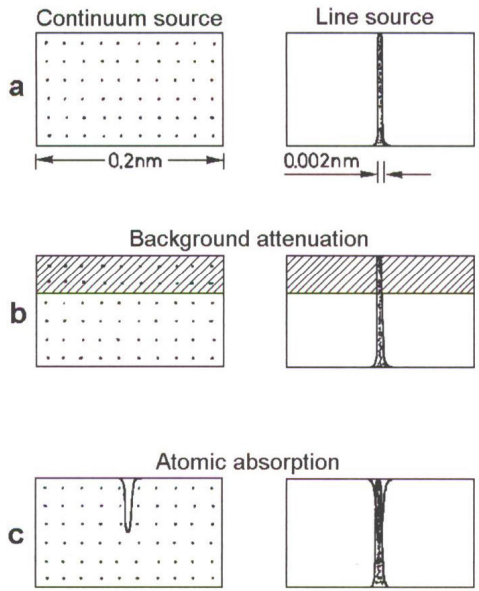

Figure 3-15. Mode of function of continuum source background correction. **a** – The radiant intensity, represented schematically by dots, for the continuum source is distributed over the entire width of the spectral band isolated by the slit (e.g. 0.2–2 nm), while for the line source it is limited to a few picometers. **b** – Broad band background attenuates the radiation emitted by both sources to equal degrees. **c** – Atomic absorption, which again is limited to a few picometers, in the first approximation attenuates only the radiation from the line source.

From Atomic Absorption Spectrometry, B. Welz and M. Sperling, Wiley-VCH

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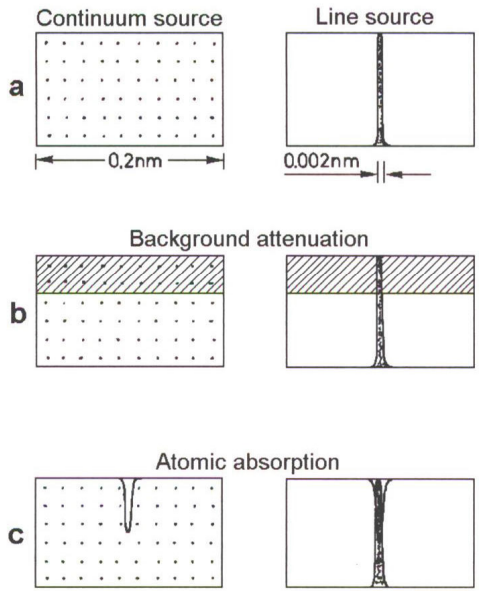
Consider a bandpass of 200 pm (0.200 nm) The emission from the D_2 arc will fill the entire bandpass because it is a broadband emitter. Analyte atoms will not absorb much of this radiation because they only absorb over a very small spectral range ~0.002 nm. The maximum, therefore, that the analyte will change the D_2 emission is only 1 %; i.e. 0.002 nm out of the 0.200 nm. Backgound absorbers on the other hand will absorb the D_2 arc over the entire bandpass. Effectively, then, the D_2 light is only absorbed by backgound and not by the analyte. The HCL light on the other hand is absorbed by both analyte and background



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Spectrometer Settings

Absorbance or Emission

Some elements can easily be run in the emission mode. Group 1A elements –Li, Na, K, Rb, Cs-- emit light at relatively low temperatures and are often run by emission.

•In emission mode, there is no HCL. Emission is made from solutions containing the analyte

•The burner head is rotated 90º yieldlng the shortest path length across the burner.