Internal Standard Correction in iTEVA

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Before You Begin

Abbreviations Used:

IS – Internal Standard

Why use an Internal Standard?

- The use of an internal standard (IS) is the most efficient way of correcting for the presence of non-spectral interferences
- Interferences occur when the Physical and/or Chemical composition of the sample is different from the composition of the calibration standards
- This type of interference will manifest itself as either an ***enhancement*** or a *suppression* of the analyte signal

How does an Internal Standard work?

- An internal standard (IS) gives the instrument a point of reference enabling the software to detect an enhancement or suppression and correct the sample results accordingly
- Analyte Signal ÷ IS Recovery = IS Referenced Results

What are the requirements of an internal standard?

- The IS element of choice MUST NOT be present in your samples
- The IS element MUST be added precisely and accurately to ALL solutions. This can be done by manually adding the internal standard element into each standard, QC and sample OR by using the online Internal Standard Mixing Kit (P/N 842312051551) as demonstrated in Figure 1.

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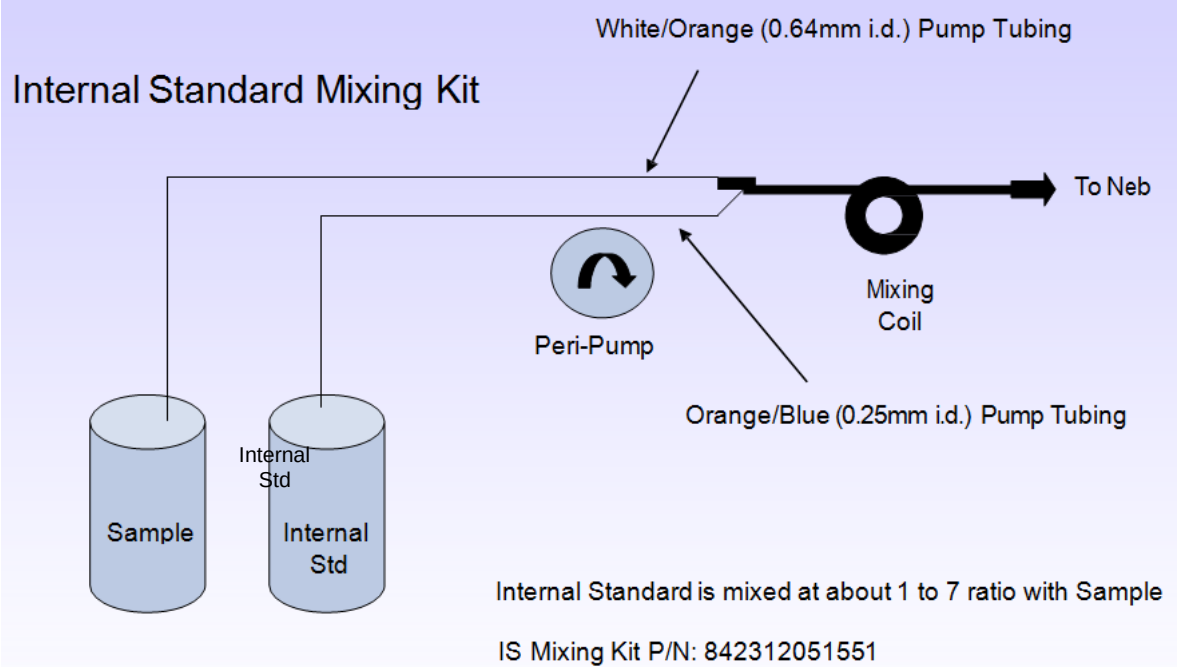

Figure 1: How the Internal Mixing Kit is plumbed

- The chosen IS wavelength should be interference free
- For true simultaneous IS correction, the plasma view and slit combination of your IS wavelength should be matched to that of your target wavelength.

Plasma View and Slit Combinations	
Duo View Instrument	**Radial Instrument**
Radial High	Radial High
Radial Low	Radial Low
Axial High	
Axial Low	

Table 1: Plasma View and Slit Combinations

Implementing Internal Standard Correction in iTEVA

1) Add the internal standard element(s) to the method in the same manner as you would target wavelengths.

   Note: Ensure simultaneous internal standard correction during your analysis by selecting an internal standard wavelength which represents the same plasma view and slit combination as your target wavelengths which have been referenced to it.

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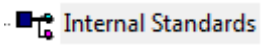
2) Internal Standard Wavelength selection

a) Click on 

b) Click

c) From the periodic table, select the wavelengths which will be used as Internal Standards

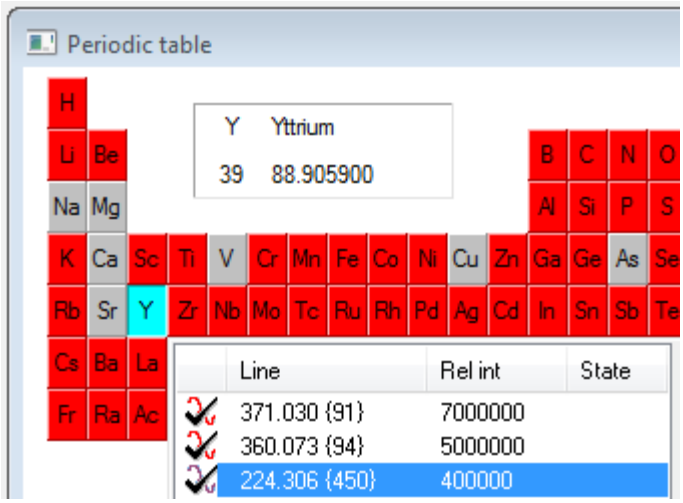


Figure 2: Internal Standard wavelength selection

3) Reference your target wavelengths to an internal standard

a) With your first internal standard wavelength selected, select the wavelengths (Lines) you would like to reference to this internal standard.
Note: you can Left-click to select multiple lines

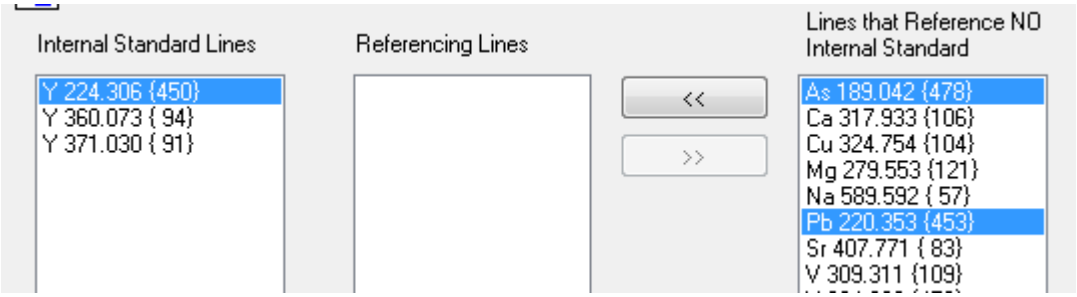


Figure 3: Referencing Lines selection

b) Click

to move the wavelengths you selected into the Referencing Lines column

c) Repeat steps a & b for each Internal Standard wavelength

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d) When you are finished, the only wavelengths which should be left in the **Lines that Reference No Internal Standard** column are the internal standard wavelengths themselves.

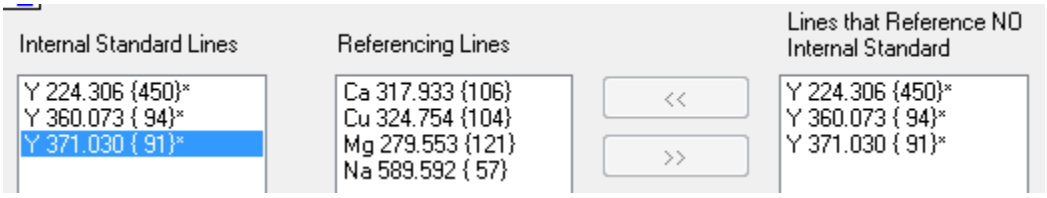
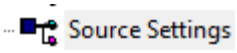


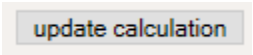
Figure 4: All target wavelengths have been referenced.

4) Click on 

5) Determining the Pump Speed

a) If you are using a glass concentric nebulizer, manually adding your internal standard, and using the default Orange/White sample pump tubing, the Flush Pump rate will be 45rpm
b) If you are using a glass concentric nebulizer and automatically adding your internal standard using the Thermo Scientific internal standard mixing kit (P/N 842312051551), the Flush Pump Rate will be 24rpm.
c) If you are adding the internal standard automatically online but using different sizes of pump tubing than that which comes in the Internal Standard Mixing Kit (Sample = Orange/White and Internal Standard = Orange/Blue) in order to for instance achieve a different dilution factor then you will need to calculate the Flush Pump Rate.

An easy way to do this is by using the Glass Expansion Pump Speed and Sample Uptake Calculator found here:
http://www.geicp.com/cgi-bin/site/wrapper.pl?c1=Pumpflow_calculator

i) Select Thermo iCAP 6000 Series from the drop down menu in Step 1
ii) Add up the size (i.d.) of your sample and internal standard pump tubing (i.e. using the tubing which comes in the internal standard mixing kit this would equate to: 0.25mm (Orange/Blue) + 0.64mm (Orange/White) = 0.89mm. Select the Sum (0.89mm in previous example) from the drop down menu in Step 2.
iii) Change the Sample Uptake rate the value you are wishing to achieve for your application. For a standard aqueous application, this will equate to 1800 ul/min.
iv) Click 

v) Whatever value is calculated for Pump Speed will be the value you want to enter for **Flush Pump Rate** in iTEVA
Note: Round to the nearest whole number

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6) Input the **Analysis Pump Rate** determined in Step 5

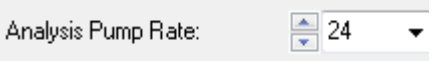

Figure 5: Analysis Pump Rate in iTEVA software

7) Save the method

Setting Up to Run

Prepare the Internal Standard

The table below lists guidelines for the concentration of the three most common internal standards which you can use to prepare your internal standard solution when using the Internal Standard Mixing kit.

	Duo View Instrument	Radial Instrument
Yttrium	5ppm	10ppm
Scandium	5ppm	10ppm
Indium	50ppm	

Table 3: Typical concentrations for IS elements

When manually adding the internal standard elements into your samples, you can use 1/5 the values listed in **Table 3** because the internal standard is not being diluted as it is when added using the mixing kit.

Optimize the Peristaltic Pump Tension

Optimize the pump tension for both the sample and the internal standard (if being used) pump tubing in such a way that a smooth flow is attained.

Note: The internal standard solution will flow much more slowly than the sample since the inner diameter of the pump tubing is much smaller.

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