BE BOLD

2022 INORGANIC VENTURES WEBINAR SERIES

UTILIZING INTERFERENCE TABLES FOR

Complex ICP-OES Methods

THURSDAY, FEBRUARY 17
9:00–9:30AM EST

PRESENTED BY:
Mike Booth
Director, Technical

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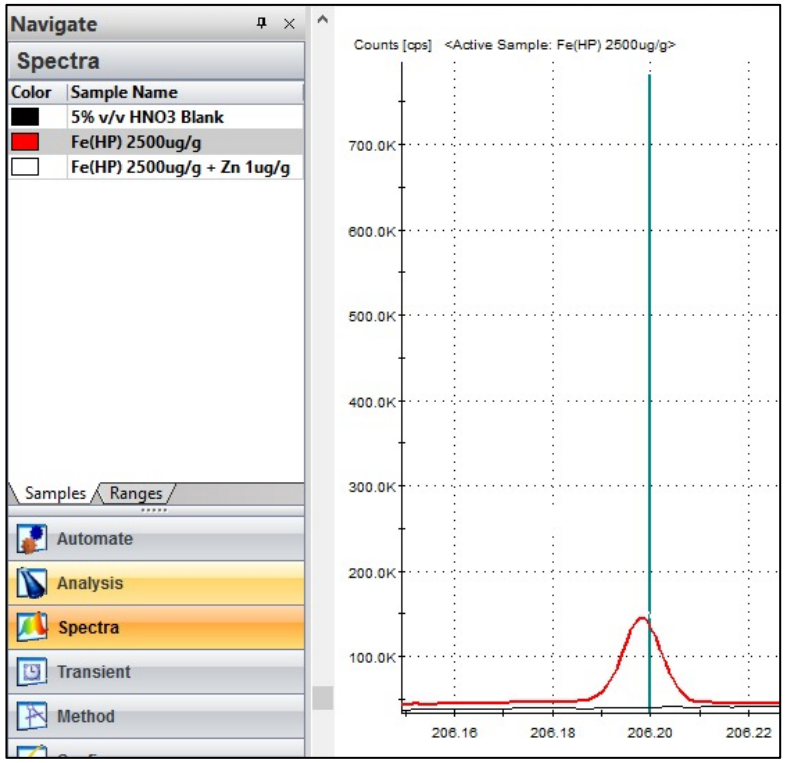
Introduction

- What is a spectral interference?
- What is an interference table?
- What methods should utilize an interference table?
- How do you construct an interference table?

What is a Spectral Interference

A spectral interference occurs when multiple elements share the same or very close emission wavelengths.



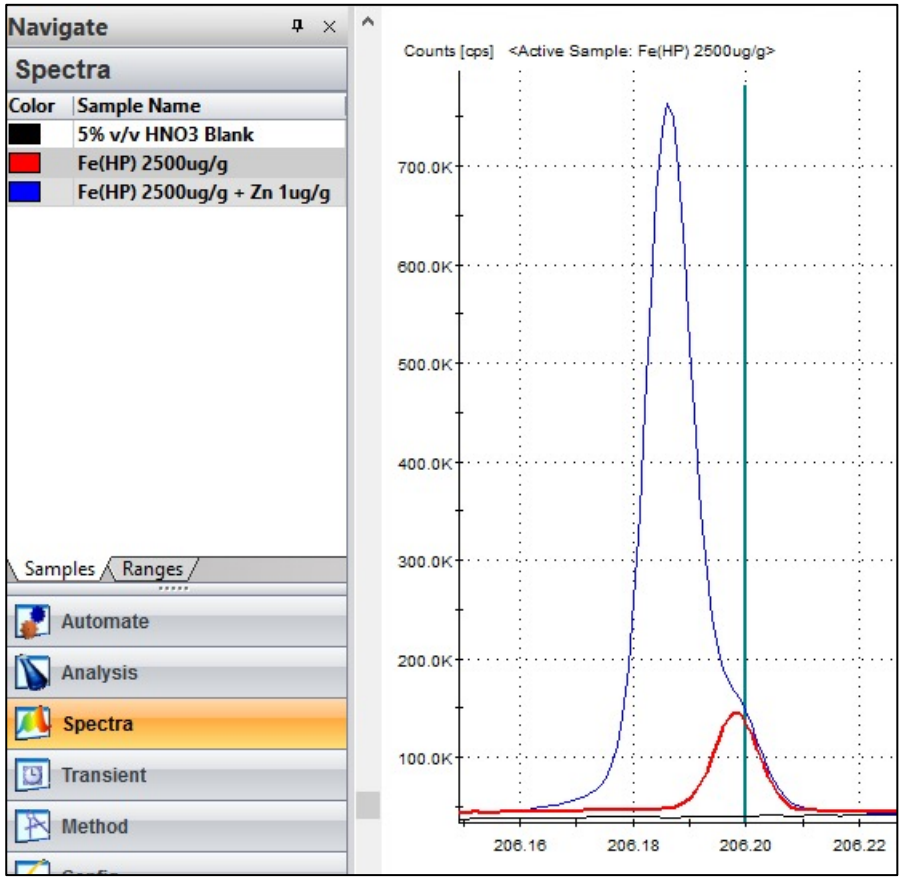
Is this Zn, or is it Fe?

Sample: High Purity Fe at 2,500 µg/g

Software Emission Line: Zn 206.200nm

Does this sample contain a Zn impurity or is it a spectral interference from Fe?

What is a Spectral Interference



Is this Zn, or is it Fe?

Sample:
High Purity Fe at 2,500 µg/g (Red)
High Purity Fe at 2,500 µg/g + Zn at 1 µg/g (Blue)

Software Emission Line: Zn 206.200nm

We can see that the red peak is actually Fe!

<u>This example could have been less of a question with proper peak centering and wavelength calibration.</u>

What’s an interference table?

An interference table is simply a reference tool that can help interpret data by providing information about the spectral interferences that may be present

What Methods would benefit from using an interference table?

- Methods testing extremely high purity samples
- Methods testing a wide variety of samples with widely varying concentrations
- Methods where the sample is a complete or partial unknown
- Methods that collect data that may require further data interpretation at a much later date

Easy Blend Examples

ppm	IV-STOCK-3 (2% v/v HNO_3)	Prep 1 (1000X)
1000	Ca, Mg, K, Na	**1.0µg/g Ca, Mg, K, Na**

ppm	IV-ICPMS-71A (3% v/v HNO_3)	Prep 1 (10X)
10	Ag, Al, As, B, Ba, Be, Ca, Cd, Ce, Co, Cr3, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ho, K, La, Lu, Mg, Mn, Na, Nd, Ni, P, Pb, Pr, Rb, S, Se, Sm, Sr, Th, Tl, Tm, U, V, Yb, Zn	**1.0µg/g Ag, Al, As, B, Ba, Be, Ca, Cd, Ce, Co, Cr3, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ho, K, La, Lu, Mg, Mn, Na, Nd, Ni, P, Pb, Pr, Rb, S, Se, Sm, Sr, Th, Tl, Tm, U, V, Yb, Zn**

Intermediate Blend Example

ppm	WW-LFS-1 (5% v/v HNO_3)	Prep 1 (1000X)	Prep 2 (100X)
1000	K	**1.0µg/g K**	n/a
600	P	**0.6µg/g P**	n/a
300	Fe, Na	**0.3µg/g Fe, Na**	n/a
200	Al, Ce, Mg, Se, Tl	**0.2µg/g Al, Ce, Mg, Se, Tl**	n/a
100	Ca, Pb	**0.1µg/g Ca, Pb**	**1.0µg/g Ca, Pb**
80	As	Too low for reliable results; these will need another prep.	**0.8µg/g As**
70	Hg		**0.7µg/g Hg**
50	Ni		**0.5µg/g Ni**
40	Cr		**0.4µg/g Cr**
30	B, Cu, V		**0.3µg/g B, Cu, V**
20	Ba, Be, Cd, Co, Li, Mn Sr, Zn		**0.2µg/g Ba, Be, Cd, Co, Li, Mn, Sr, Zn**
7.5	Ag		**0.075µg/g Ag**

	MEB4-A	MEB4-B	MEB4-C	MEB4-Os
Zero	5% v/v HNO3	5% v/v HCl	5% v/v HCl 0.2% v/v HF	5% v/v HCl
Low	0.5ppm	0.5ppm	0.5ppm	0.5ppm
Mid	5.0ppm	5.0ppm	5.0ppm	5.0ppm
High	50.0ppm	50.0ppm	50.0ppm	50.0ppm

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca		Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr		Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	*	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	**	Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og

*	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
**	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No

Building an Interference Table

To prepare to build an interference table you will need to first complete two tasks:

<u>Develop your Method & Run High Purity Single Element Standards</u>

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Example

Single Element Standard (80 µg/g)
Al
Ce
Fe
Sm
Th

Building an Interference Table

To prepare to build an interference table you will need to first complete two tasks:

<u>Develop your Method & Run High Purity Single Element Standards</u>

Example

Single Element Standard (80 µg/g)	Ga 417.204 nm Radial
Al	-
Ce	4.5 µg/g
Fe	-
Sm	-
Th	-

Building an Interference Table

To prepare to build an interference table you will need to first complete two tasks:

Develop your Method & Run High Purity Single Element Standards

Example

Single Element Standard (80 µg/g)	Ga 417.204 nm Radial	Gd 335.863 nm Axial
Al	-	-
Ce	4.5 µg/g	-
Fe	-	-
Sm	-	-
Th	-	9.4 µg/g

Building an Interference Table

To prepare to build an interference table you will need to first complete two tasks:

<u>Develop your Method & Run High Purity Single Element Standards</u>

Example

Single Element Standard (80 µg/g)	Ga 417.204 nm Radial	Gd 335.863 nm Axial	Mn 259.372 nm Axial
Al	-	-	-
Ce	4.5 µg/g	-	-
Fe	-	-	0.1 µg/g
Sm	-	-	-
Th	-	9.4 µg/g	-

Building an Interference Table

To prepare to build an interference table you will need to first complete two tasks:

Develop your Method & Run High Purity Single Element Standards

Example

Single Element Standard (80 µg/g)	Ga 417.204 nm Radial	Gd 335.863 nm Axial	Mn 259.372 nm Axial	Pd 360.955 nm Axial
Al	-	-	-	-
Ce	4.5 µg/g	-	-	4.2 µg/g
Fe	-	-	0.1 µg/g	-
Sm	-	-	-	121 µg/g
Th	-	9.4 µg/g	-	20.4 µg/g

Building an Interference Table

To prepare to build an interference table you will need to first complete two tasks:

Develop your Method & Run High Purity Single Element Standards

Example

Single Element Standard (80 µg/g)	Ga 417.204 nm Radial	Gd 335.863 nm Axial	Mn 259.372 nm Axial	Pd 360.955 nm Axial	Pr 422.532 nm Axial	W 220.449 nm Axial
Al	-	-	-	-	-	0.9 µg/g
Ce	4.5 µg/g	-	-	4.2 µg/g	-	-
Fe	-	-	0.1 µg/g	-	-	-
Sm	-	-	-	121 µg/g	30.1 µg/g	-
Th	-	9.4 µg/g	-	20.4 µg/g	-	-

Building an Interference Table

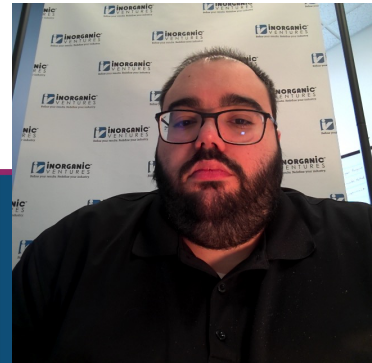
Our Previous Example showed an interference table for 5 single element standards with data from 6 monitored wavelengths.

Our new method uses an interference table for 75 single element standards with data from 396 monitored wavelengths.

Note: To successfully utilize this method you must keep your wavelength calibration up to date and use a validated method to keep your peaks center and plasma conditions set.

Interference Tables – Does it Work?

				Not Accounting for Interferences			
LIMS Analyte	Analyte Conc	Inst Element	Conc (ppm)	P/F?	best % diff	% passed lines	# of lines
Ruthenium	1	Ru	1.000	Pass	0.18	67	6
Samarium	1	Sm	1.000	Pass	3.29	50	6
Scandium	1	Sc	1.000	Pass	0.10	100	6
Selenium	1	Se	1.000	Pass	2.24	50	4
Silicon	1	Si	1.000	Fail	13.64	0	8
Silver	1	Ag	1.000	Pass	0.21	100	4
Sodium	1	Na	1.000	Pass	0.77	50	4
Strontium	1	Sr	1.000	Pass	0.00	100	8
Sulfur	10	S	10.000	Pass	6.74	50	6
Tantalum	1	Ta	1.000	Pass	0.15	100	6
Tellurium	1	Te	1.000	Pass	2.58	83	6
Terbium	1	Tb	1.000	Pass	0.05	100	4

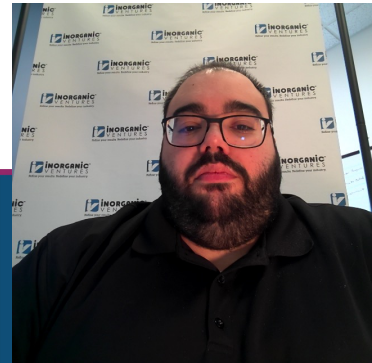


Interference Tables – Does it Work?

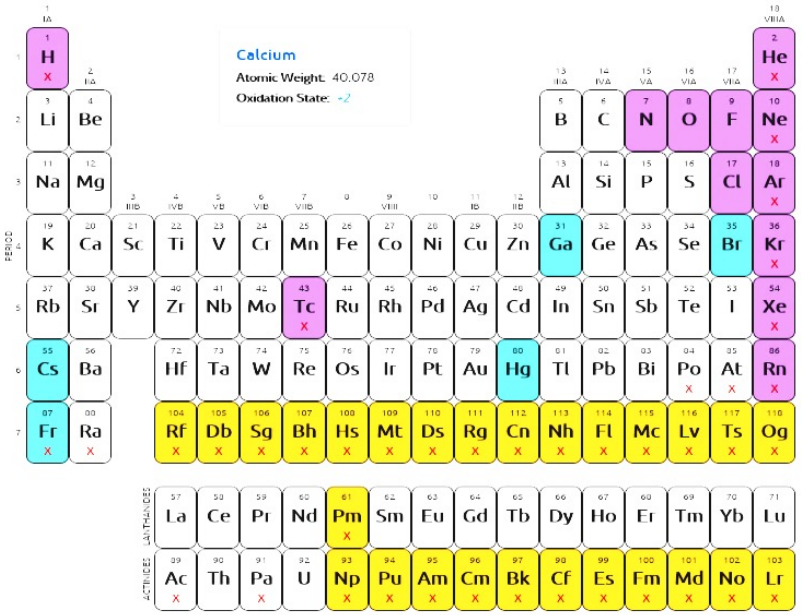
				Not Accounting for Interferences				Accounting for Interferences		
LIMS Analyte	Analyte Conc	Inst Element	Conc (ppm)	P/F?	best % diff	% passed lines	# of lines	P/F?	best % diff	% passed lines
Ruthenium	1	Ru	1.000	Pass	0.18	67	6	Pass	0.18	83
Samarium	1	Sm	1.000	Pass	3.29	50	6	Pass	0.44	67
Scandium	1	Sc	1.000	Pass	0.10	100	6	Pass	0.10	100
Selenium	1	Se	1.000	Pass	2.24	50	4	Pass	0.67	100
Silicon	1	Si	1.000	Fail	13.64	0	8	Pass	6.39	13
Silver	1	Ag	1.000	Pass	0.21	100	4	Pass	0.18	100
Sodium	1	Na	1.000	Pass	0.77	50	4	Pass	0.77	50
Strontium	1	Sr	1.000	Pass	0.00	100	8	Pass	0.00	100
Sulfur	10	S	10.000	Pass	6.74	50	6	Pass	6.71	50
Tantalum	1	Ta	1.000	Pass	0.15	100	6	Pass	0.47	100
Tellurium	1	Te	1.000	Pass	2.58	83	6	Pass	5.47	33
Terbium	1	Tb	1.000	Pass	0.05	100	4	Pass	2.10	100

Summary

- A spectral interference occurs when multiple elements share the same or very close emission wavelengths.
- An interference table is a reference tool that can help interpret data.
- Some methods may benefit from using an interference table while other methods may not.
- Constructing an interference table can be a lengthy process that requires clean single element standards and consistent method settings.

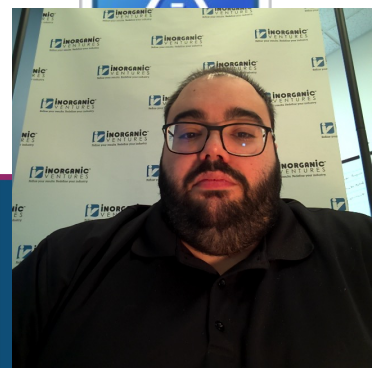


Technical Support – Available to Everyone
Online Resources at inorganicventures.com



Customers can visit our website's Tech Center, which includes:

- Interactive Periodic Table
- Sample Preparation Guide
- Trace Analysis Guide
- ICP Operations Guide
- Expert Advice
- And much, much more.



Thank You!

Please feel free to ask questions!