

Obsidian Analysis
for Seppi at UCLA
of analysis done in Turkey

The analysis was done using a variety of analysis codes and the calibration from the Smithsonian instrument. It matched very closely the response of the UCLA instrument. That calibration was done by Jeff Speakman.

The samples fell into 2 major groups and then a bunch of other sources. A quick review of the data was done to assure quantification was done only on the samples that were "thick" enough. This was done by looking at the backscatter from 20 to 40 keV. Not all samples were analyzed.

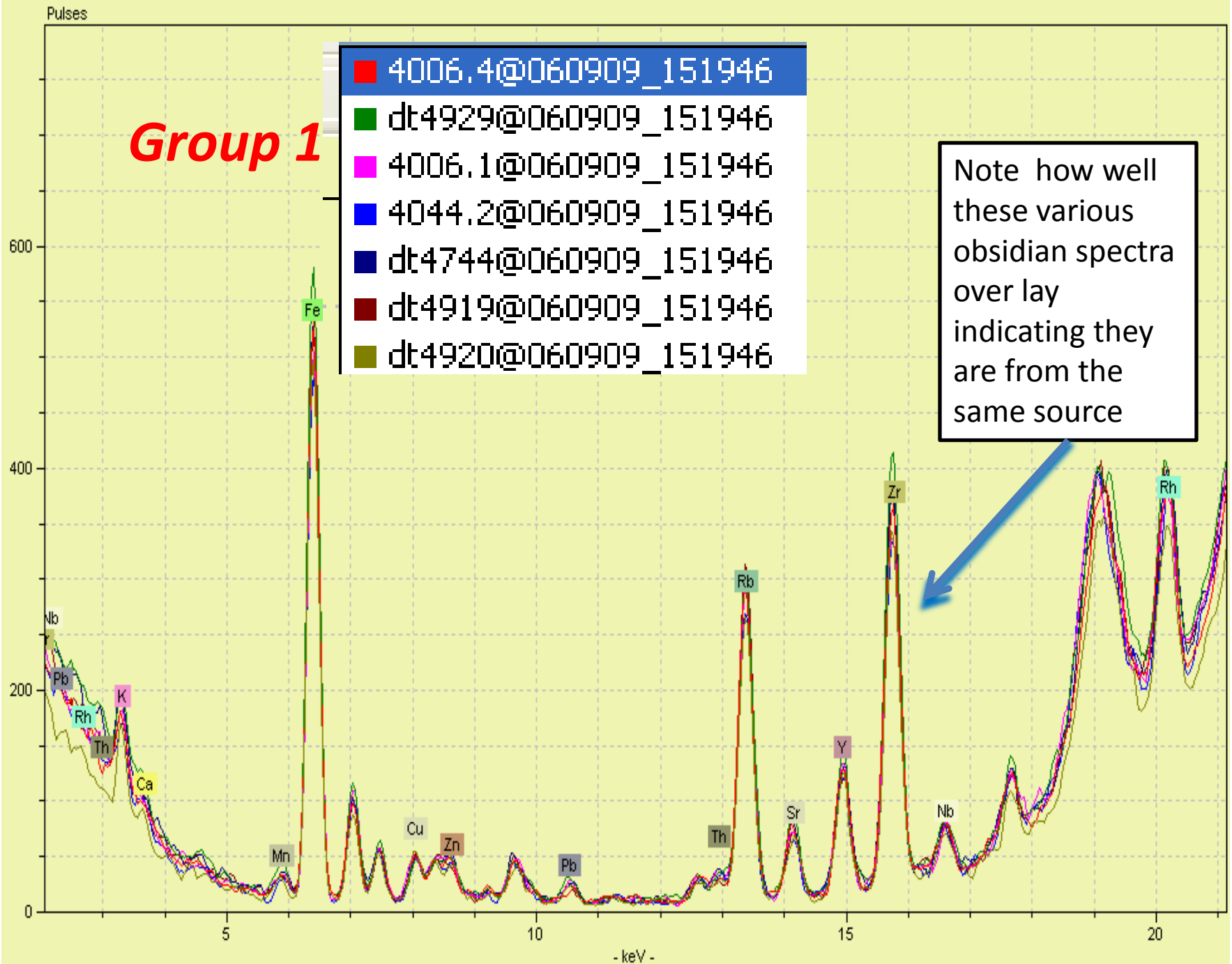
The overlaid plots and the numeric data is given below. Note that the group overlaid plots lie on top of each other, while the differences in the spectra that fall into no group are clearly apparent in the overlay of that data.

The lower backscatter "small" samples can be sourced by overlaying them with the spectra of the thicker samples and just looking at the Rb to Nb relative peak intensities. Care must be exercised to do Quantitative analysis of these with xrf.

Group 1

- 4006.4@060909_151946
- dt4929@060909_151946
- 4006.1@060909_151946
- 4044.2@060909_151946
- dt4744@060909_151946
- dt4919@060909_151946
- dt4920@060909_151946

Note how well these various obsidian spectra overlay indicating they are from the same source



NOTE all values are in PPM

Group 1

Element	dt4929	dt4919	dt4920	s4044.2	dt4744	s4006.4	s4006.1	Average	StDev
K Ka1	37,509.3	38,362.1	39,883.3	40,355.0	37,762.7	38,616.8	39,592.8	38,868.9	1,091.9
MnKa1	453.3	212.1	252.4	108.0	297.3	270.0	268.9	266.0	103.4
FeKa1	6,272.7	5,777.9	6,461.4	5,571.3	5,780.7	6,183.1	5,556.2	5,943.3	359.7
ZnKa1	46.8	34.0	38.7	22.0	51.1	45.6	36.0	39.2	9.8
GaKa1	13.7	12.2	12.9	10.7	14.4	14.3	11.8	12.9	1.4
ThLa1	10.5	7.7	11.7	7.4	12.8	10.5	8.6	9.9	2.0
RbKa1	125.2	130.5	129.3	116.1	126.0	130.7	122.4	125.7	5.3
SrKa1	20.8	16.7	19.2	13.8	18.0	18.8	15.9	17.6	2.3
Y Ka1	23.7	22.8	24.5	21.7	24.3	24.7	23.3	23.6	1.1
ZrKa1	103.5	94.4	96.6	85.0	96.7	99.0	83.3	94.1	7.4
NbKa1	9.6	9.0	9.4	8.5	8.4	9.4	7.0	8.8	0.9

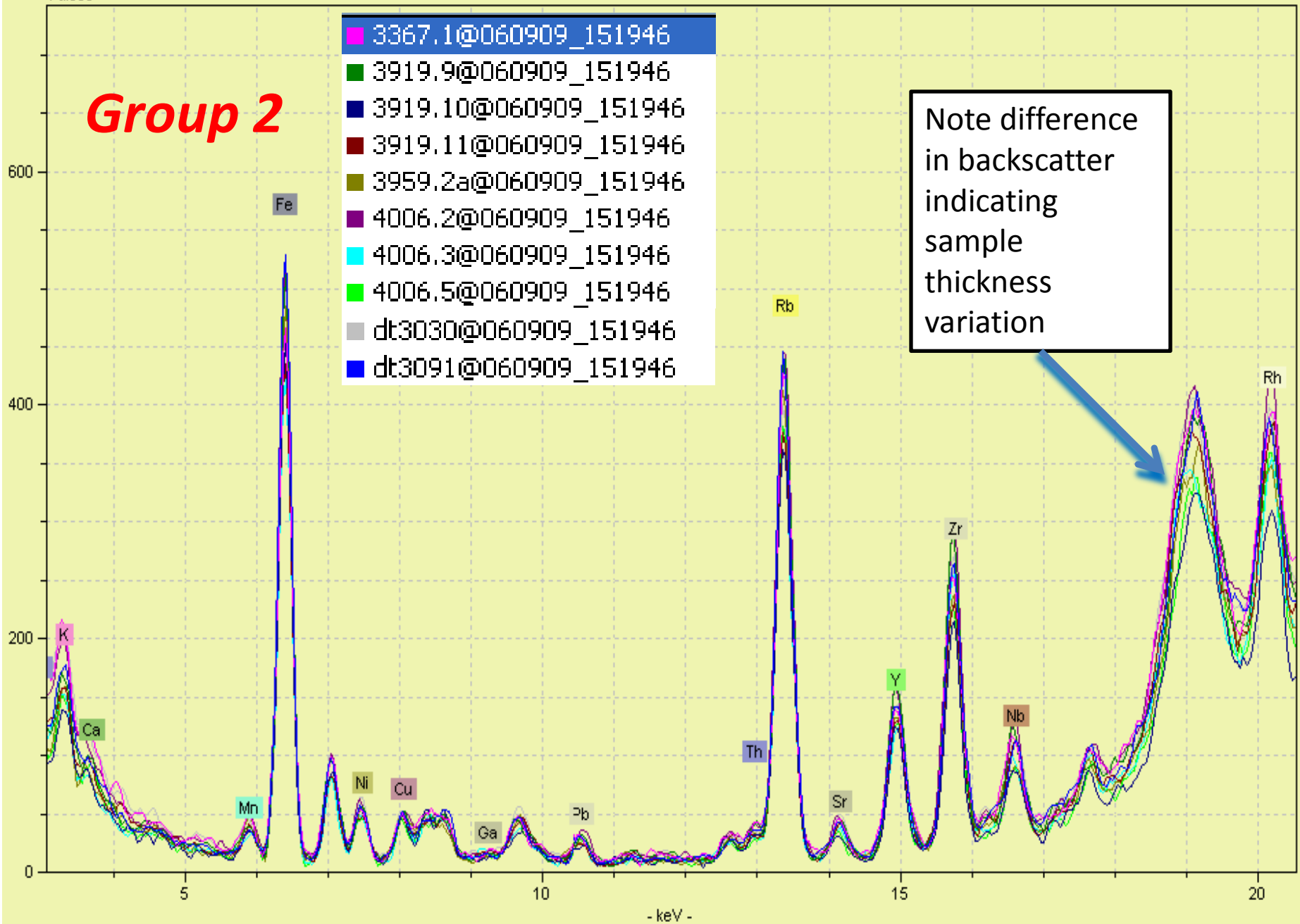
Note how small the ppm variation is within a group

Pulses

Group 2

- 3367.1@060909_151946
- 3919.9@060909_151946
- 3919.10@060909_151946
- 3919.11@060909_151946
- 3959.2a@060909_151946
- 4006.2@060909_151946
- 4006.3@060909_151946
- 4006.5@060909_151946
- dt3030@060909_151946
- dt3091@060909_151946

Note difference in backscatter indicating sample thickness variation



600

400

200

0

5

10

15

20

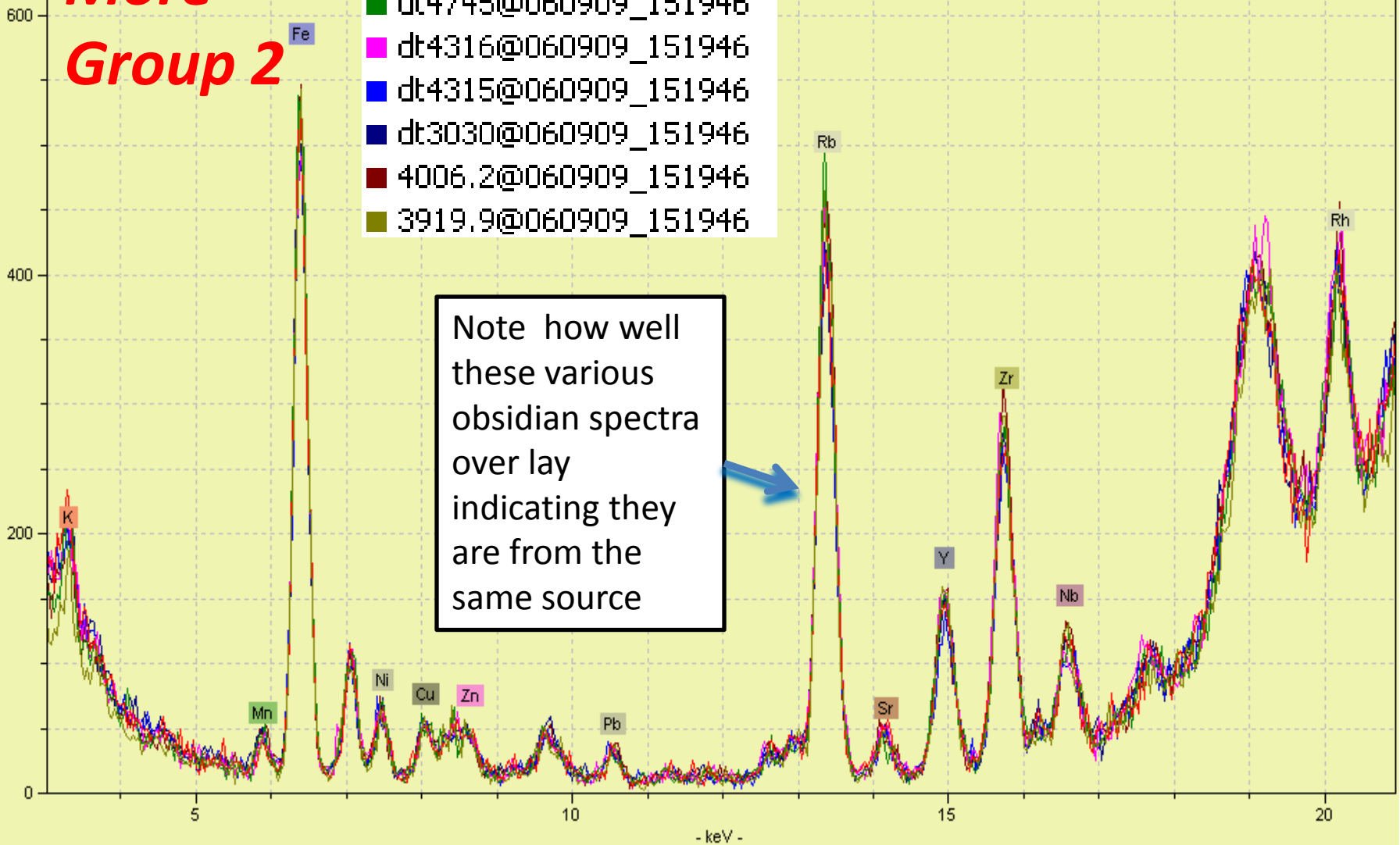
- keV -

Pulses

More Group 2

- dt5875@060909_151946
- dt4745@060909_151946
- dt4316@060909_151946
- dt4315@060909_151946
- dt3030@060909_151946
- 4006.2@060909_151946
- 3919.9@060909_151946

Note how well these various obsidian spectra over lay indicating they are from the same source



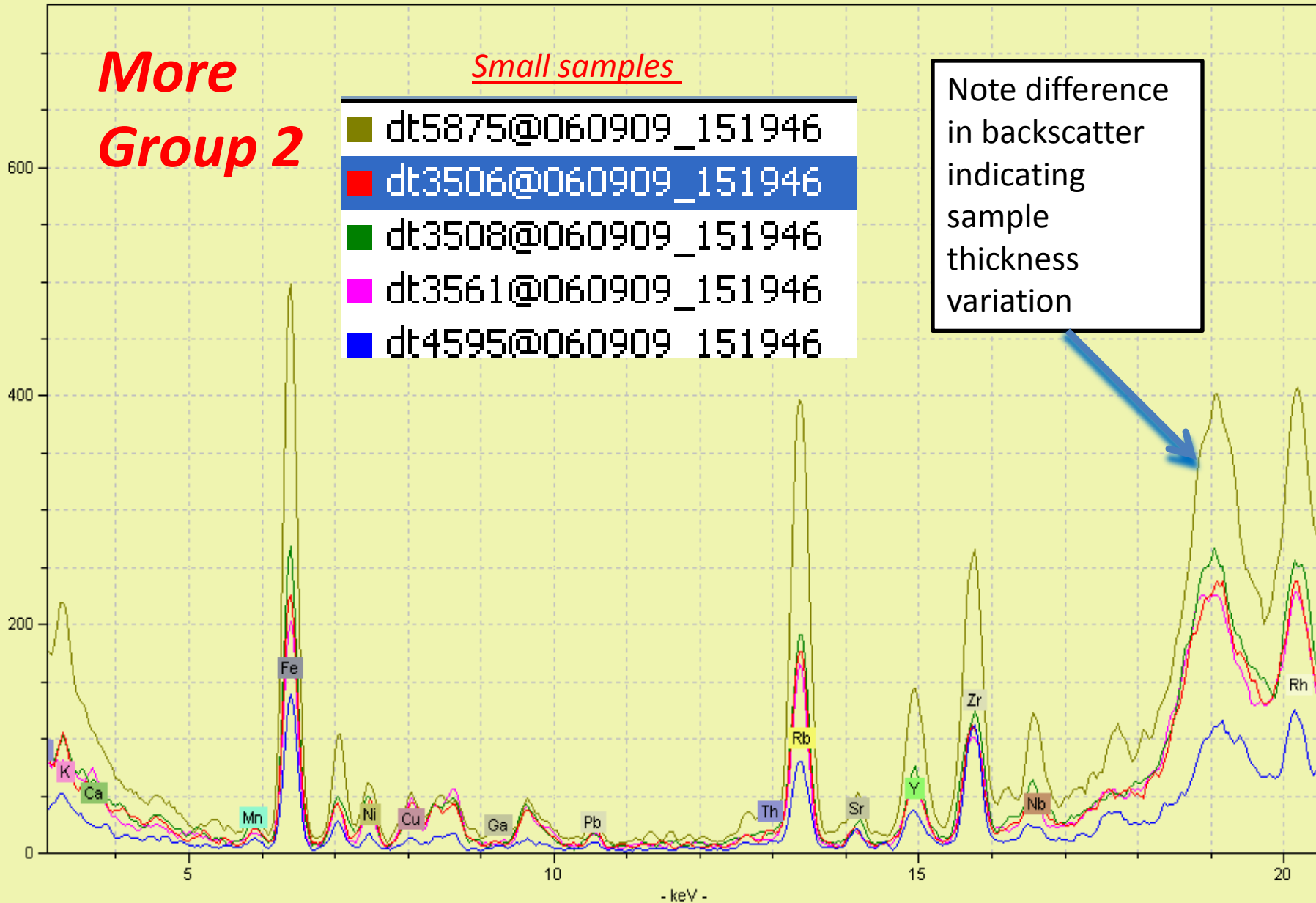
Pulses

More Group 2

Small samples

- dt5875@060909_151946
- dt3506@060909_151946
- dt3508@060909_151946
- dt3561@060909_151946
- dt4595@060909_151946

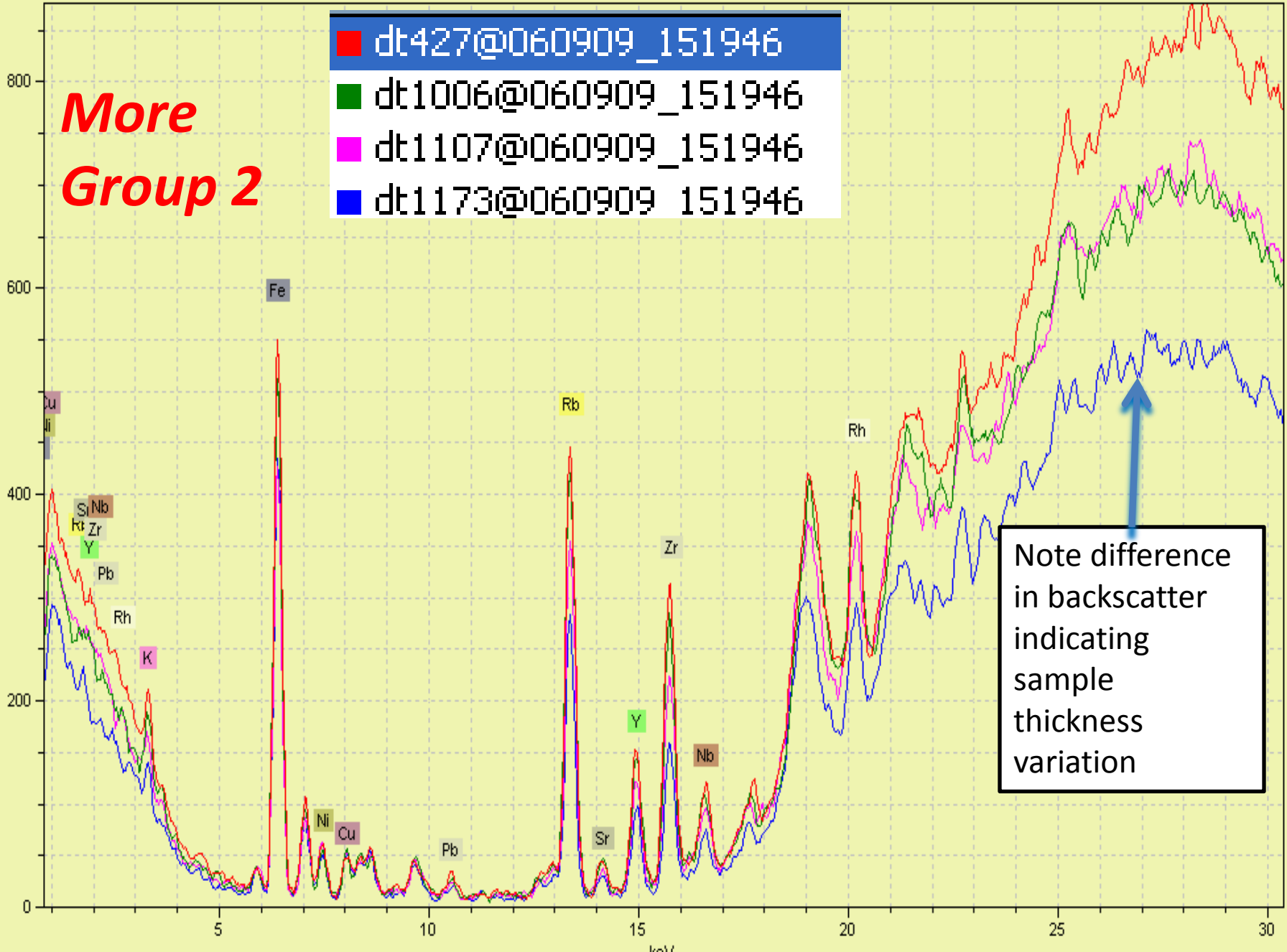
Note difference in backscatter indicating sample thickness variation



Pulses

More Group 2

- dt427@060909_151946
- dt1006@060909_151946
- dt1107@060909_151946
- dt1173@060909_151946

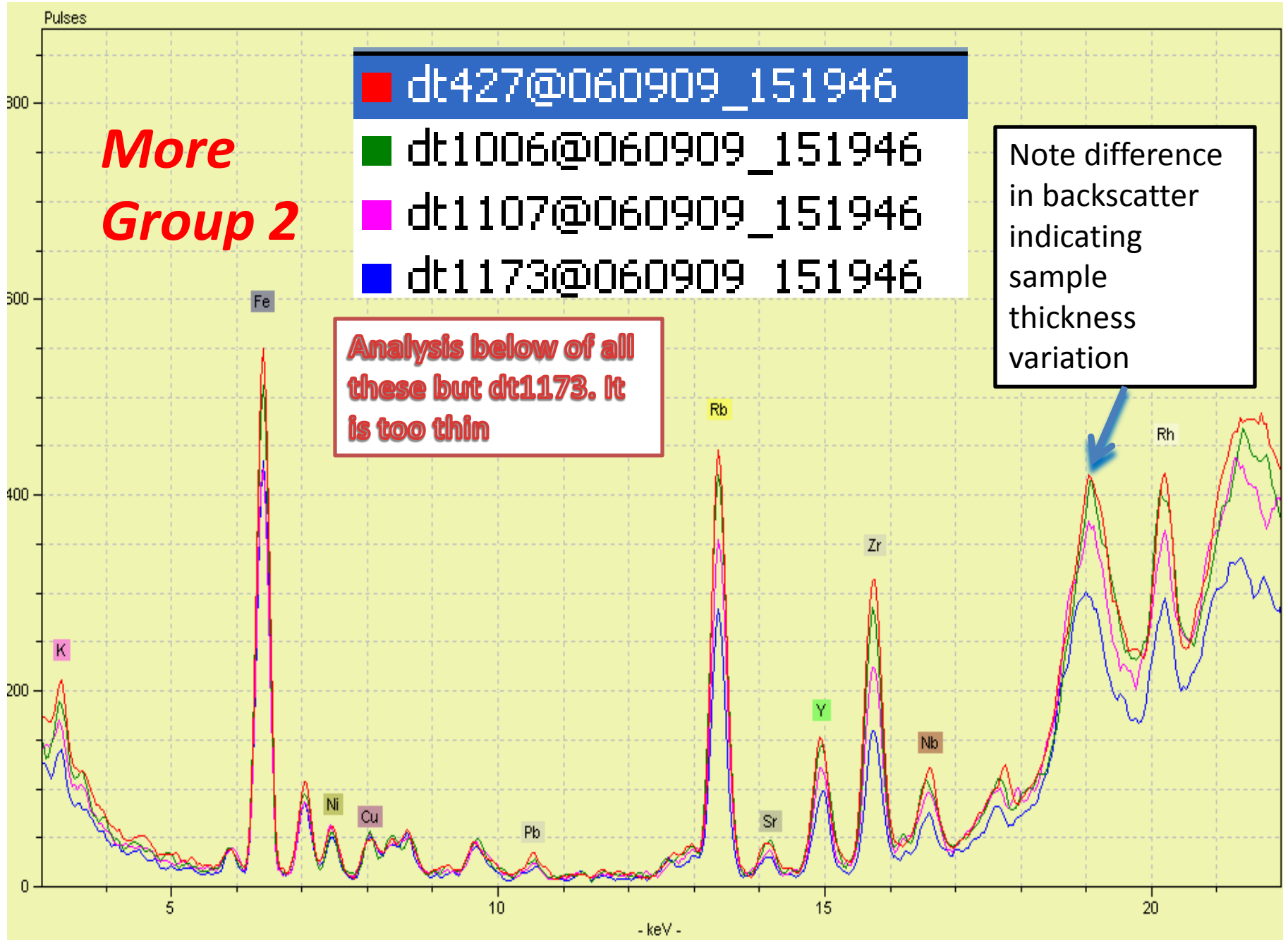


Note difference in backscatter indicating sample thickness variation

NOTE all values are in PPM

Group 2

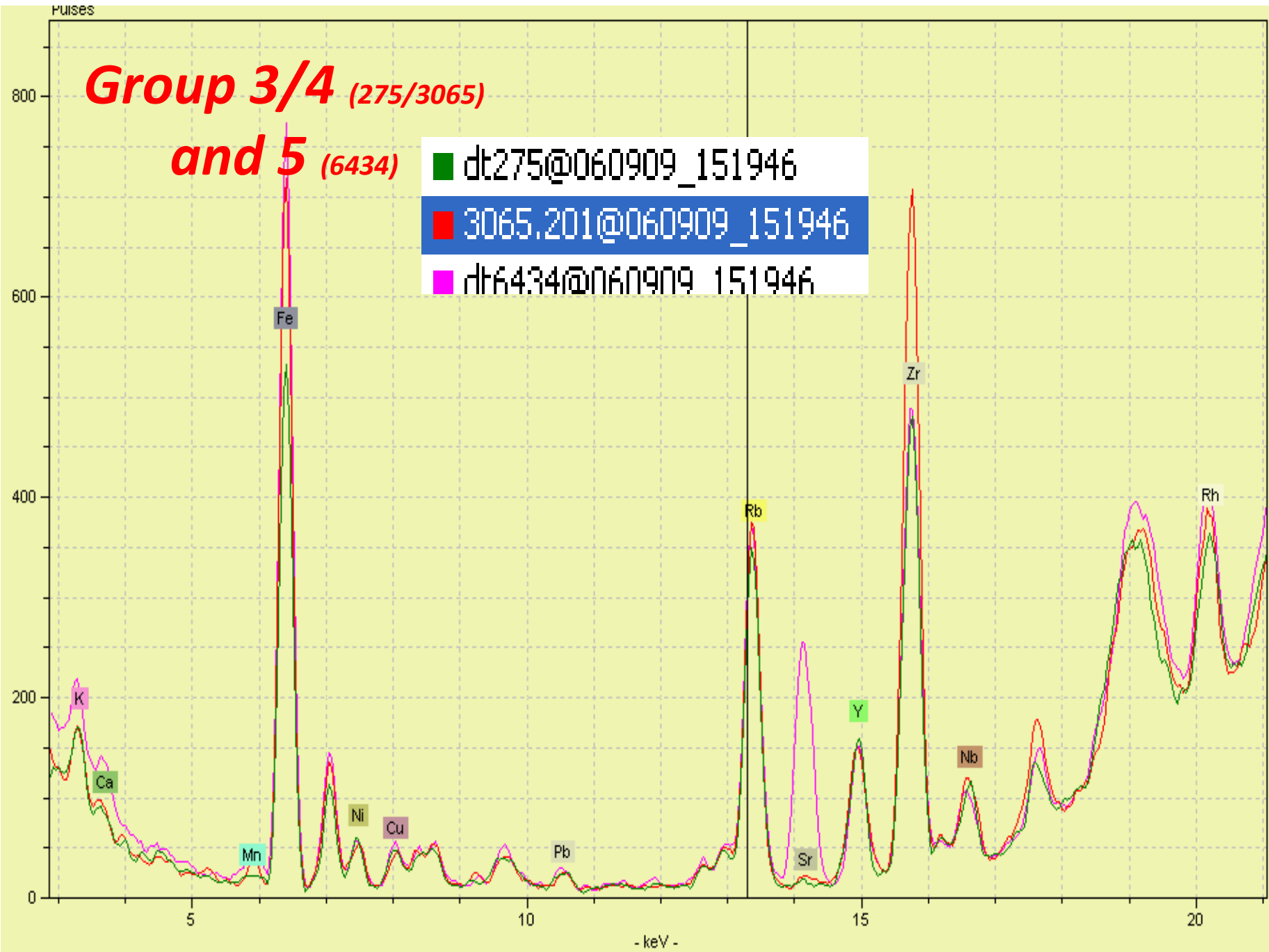
Elements	dt5875	dt4745	dt4316	dt4315	dt3115	dt3030	s4006.2	s3919.9	AVERAGE	SDEV
K Ka1	36,062.9	37,777.4	37,666.2	37,126.5	37,095.0	36,361.5	37,708.0	40,250.2	37,506.0	1,274.8
MnKa1	197.5	350.2	277.8	312.9	387.5	412.7	411.9	369.9	340.1	74.3
FeKa1	5,299.8	5,768.6	5,348.0	5,318.7	5,296.9	5,277.6	5,453.8	5,909.9	5,459.2	243.7
ZnKa1	38.9	37.6	38.0	38.0	34.0	37.6	37.1	36.0	37.1	1.5
GaKa1	14.1	12.8	13.7	13.2	13.7	13.8	13.3	11.6	13.3	0.8
ThLa1	14.5	11.4	17.6	11.7	16.0	12.8	14.3	13.1	13.9	2.1
RbKa1	177.5	197.2	188.1	176.7	182.3	168.8	191.0	196.0	184.7	10.1
SrKa1	8.2	5.7	7.8	5.8	5.0	7.5	7.6	7.3	6.9	1.2
Y Ka1	25.0	27.1	26.3	22.0	24.2	25.4	26.4	28.6	25.6	2.0
ZrKa1	56.3	58.6	61.3	55.1	57.7	55.2	64.0	65.2	59.2	3.9
NbKa1	15.7	16.9	14.3	15.4	17.3	16.6	17.3	18.0	16.5	1.2

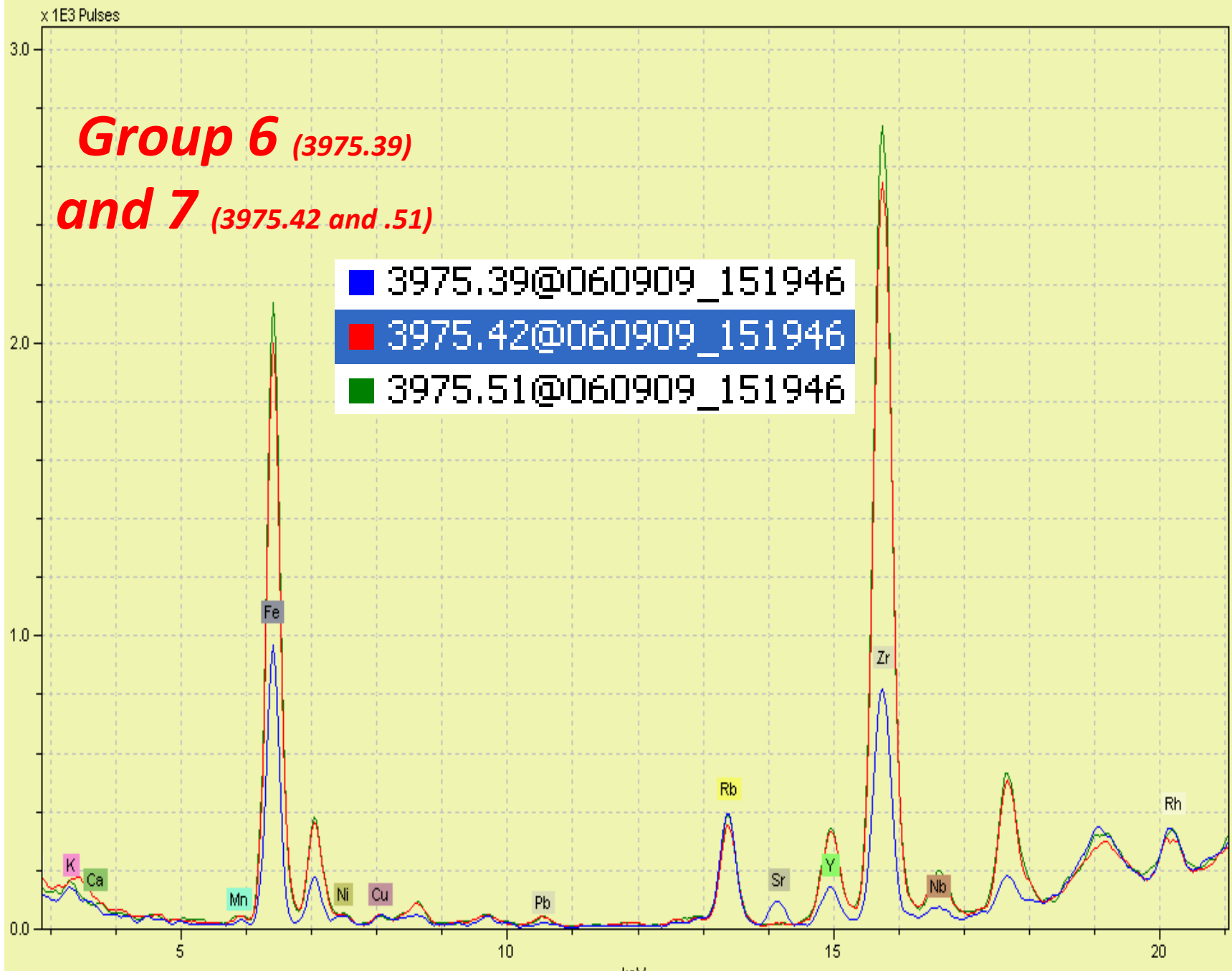


NOTE all values are in PPM

**More
Group 2**

Element	dt427	dt1006	dt1107	Average	St Dev
K Ka1	37,501.84	38,482.02	39,864.33	38,616.06	1186.939
MnKa1	263.0106	294.3459	324.8247	294.06	30.90806
FeKa1	5,663.73	5,888.50	4,934.44	5,495.56	498.7693
ZnKa1	45.09627	42.78412	39.75737	42.55	2.677408
GaKa1	15.05834	14.41313	12.8166	14.10	1.154025
ThLa1	14.14737	17.83787	10.73502	14.24	3.552334
RbKa1	181.5139	193.833	155.5241	176.96	19.55674
SrKa1	6.976923	7.862961	4.658051	6.50	1.654976
Y Ka1	25.41877	26.86877	21.43204	24.57	2.815273
ZrKa1	71.90384	65.70407	48.41796	62.01	12.17123
NbKa1	16.74503	16.53043	14.86414	16.05	1.02959





Group 6 (3975.39)
and 7 (3975.42 and .51)

- 3975.39@060909_151946
- 3975.42@060909_151946
- 3975.51@060909_151946

x 1E3 Pulses

3.0

2.0

1.0

0.0

5 10 15 20

keV

Fe

Zr

Rb

Rh

K

Ca

Mn

Ni

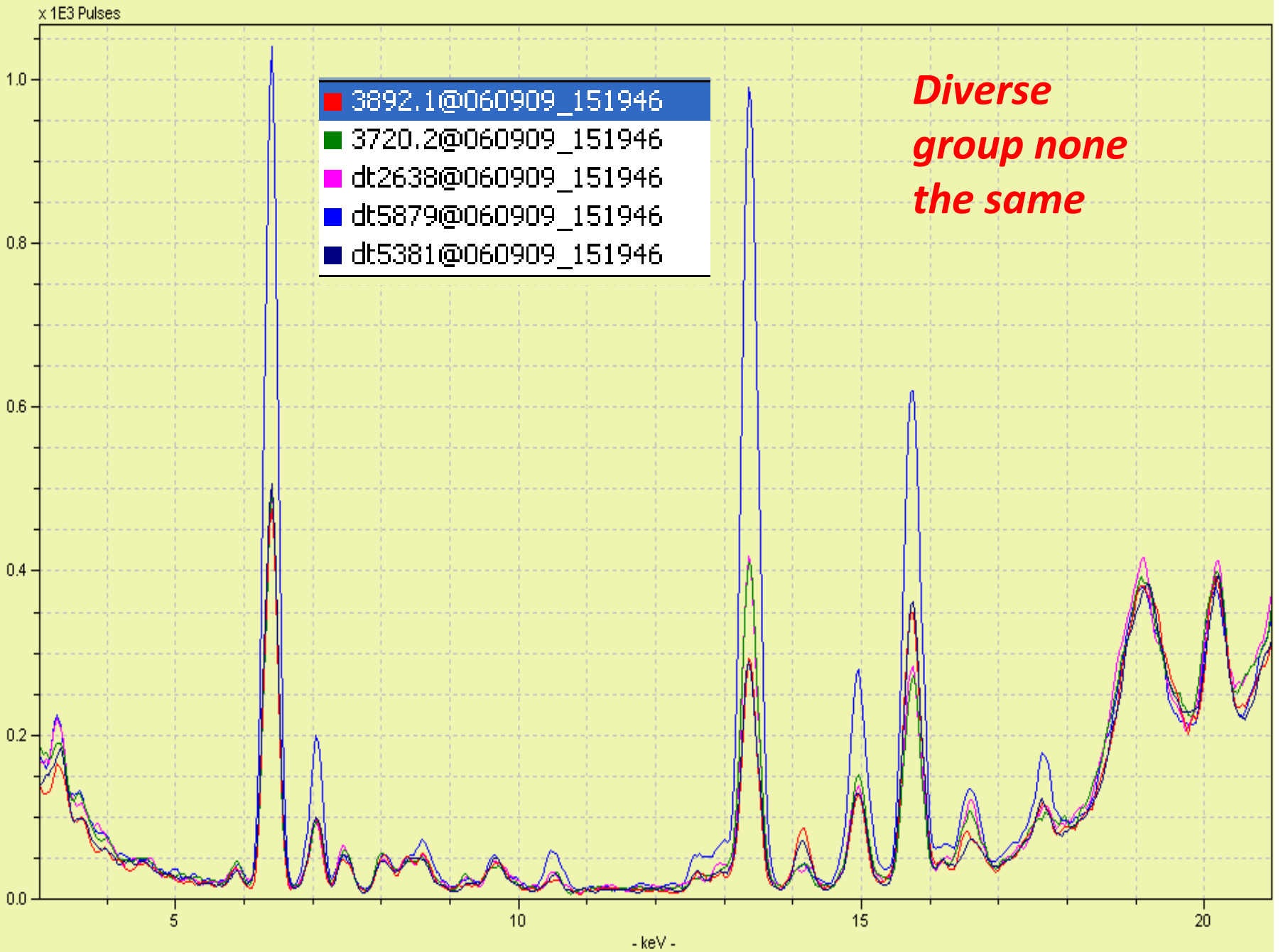
Cu

Pb

Sr

Y

Nb



NOTE all values are in PPM

Various samples all very different

Element	s3065.201	dt275	dt6434	s3975.39	s3975.51	s3975.42	s3720.2	dt5879	dt5381
K Ka1	39,593.5	40,139.6	34,676.4	41,310.8	36,209.9	32,568.7	37,145.4	35,151.8	37,773.6
MnKa1	300.7	101.7	586.1	272.3	555.4	549.1	394.4	387.0	231.9
FeKa1	8,396.7	6,412.8	8,186.7	12,627.7	28,183.4	27,574.0	5,292.3	11,117.2	5,984.5
ZnKa1	58.3	34.4	51.8	55.6	190.0	205.9	50.6	85.2	38.3
GaKa1	18.1	13.9	15.1	16.2	25.3	24.7	16.0	22.7	12.0
ThLa1	26.9	19.7	24.7	18.5	37.8	28.1	15.1	81.3	12.0
RbKa1	177.9	159.1	163.3	216.8	239.2	236.3	182.3	479.5	133.8
SrKa1	0.2	-1.2	90.9	31.9	2.8	3.3	7.0	8.0	16.2
Y Ka1	32.3	30.8	26.4	32.9	132.6	141.9	26.7	65.4	25.2
ZrKa1	214.0	138.7	135.6	293.4	1,102.4	1,123.2	60.1	188.0	98.9
NbKa1	20.4	16.5	15.7	10.3	41.6	42.7	14.9	18.1	8.1