Fit method rethink

Shift or Transition energy ?

There are two methods to obtain the energy of 3d->2p X-ray.
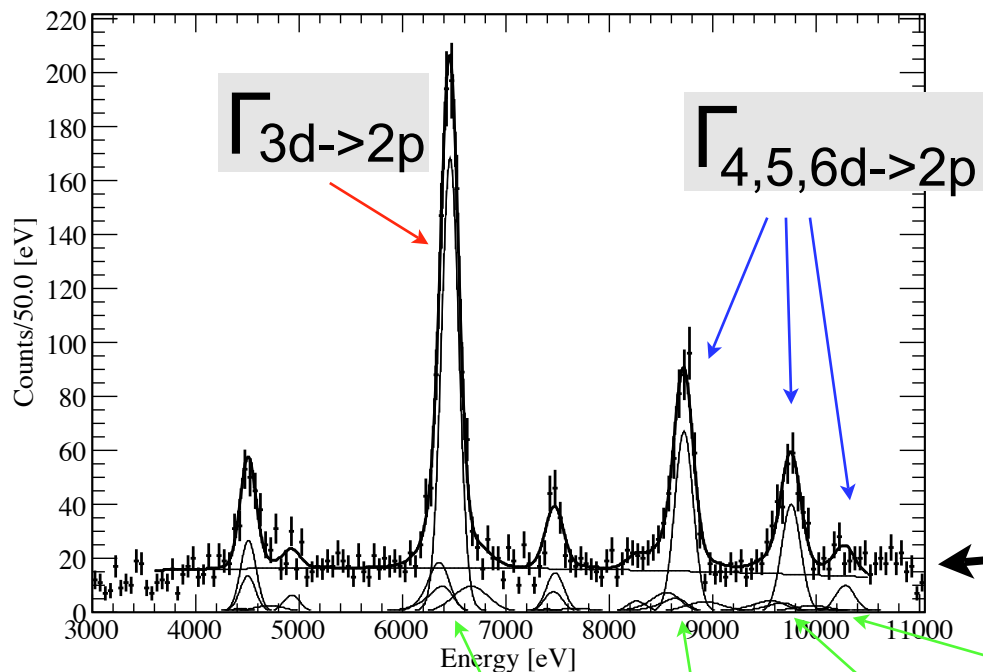
1. Coulomb + $\Delta E_{2p} \pm \sigma(\Delta E_{2p})$,   [common shift]
2. $E_{3d->2p} \pm \sigma(E_{3d->2p})$ [no common parameter]

In the first method, the parameter ΔE_{2p} is common with that of other transitions, so the statistical error $\sigma(\Delta E_{2p})$ is *smaller than* the $\sigma(E_{3d->2p})$.
But the systematic error of Coulomb must be added !

(I think) The definition of "transition energy" is the second one.
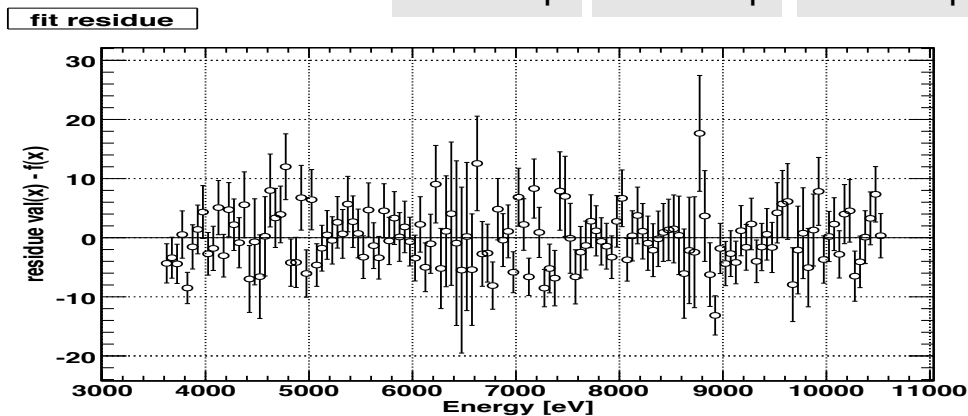Here, I checked the second method.

2007 May 20, Hideyuki Tatsuno

1st cycle transition-energy fit

$\Gamma_{3d->2p}$

$\Gamma_{4,5,6d->2p}$

$E_{3d->2p}$ $E_{4d->2p}$ $E_{5d->2p}$ $E_{6d->2p}$

four positions and two Gammas

Fit range was changed to avoid the structure around 10.7 keV (KHeX-Lε / πHeX-Kα ?)

fit residue

Chisqr/NDF = 138.4/123

		center	1σ error
15	KHeXLa mean [eV]	6.46206e+03	4.07355e+00
49	KHeXLb mean [eV]	8.72440e+03	7.11973e+00
50	KHeXLg mean [eV]	9.76040e+03	1.18737e+01
51	KHeXLd mean [eV]	1.02831e+04	5.23604e+01
14	GammaLa [eV]	5.81939e+00	1.01862e+01
52	GammaLb-Ld [eV]	3.60822e-13	9.31996e+00

c.f Theoretical calculations in Baird (1983)

transition	energy (eV)
3d->2p	6464
4d->2p	8723
5d->2p	9768
6d->2p	10331

$\Gamma_{3d\rightarrow2p}$
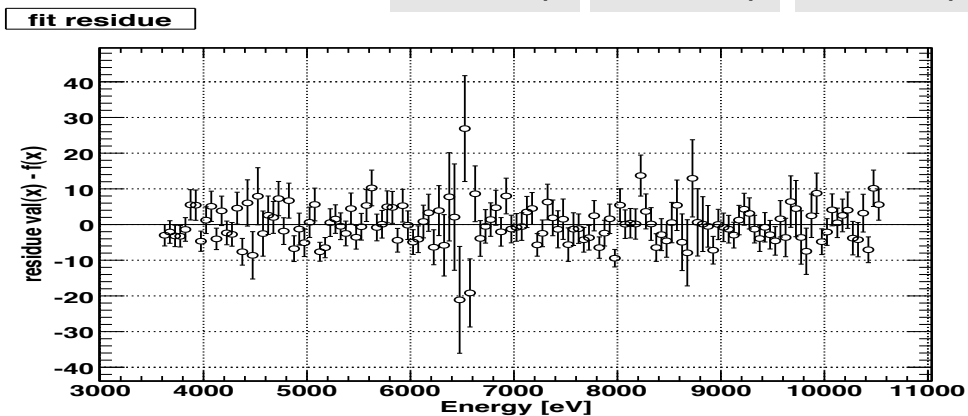
$\Gamma_{4,5,6d\rightarrow2p}$

2nd cycle transition-energy fit

four positions and two Gammas
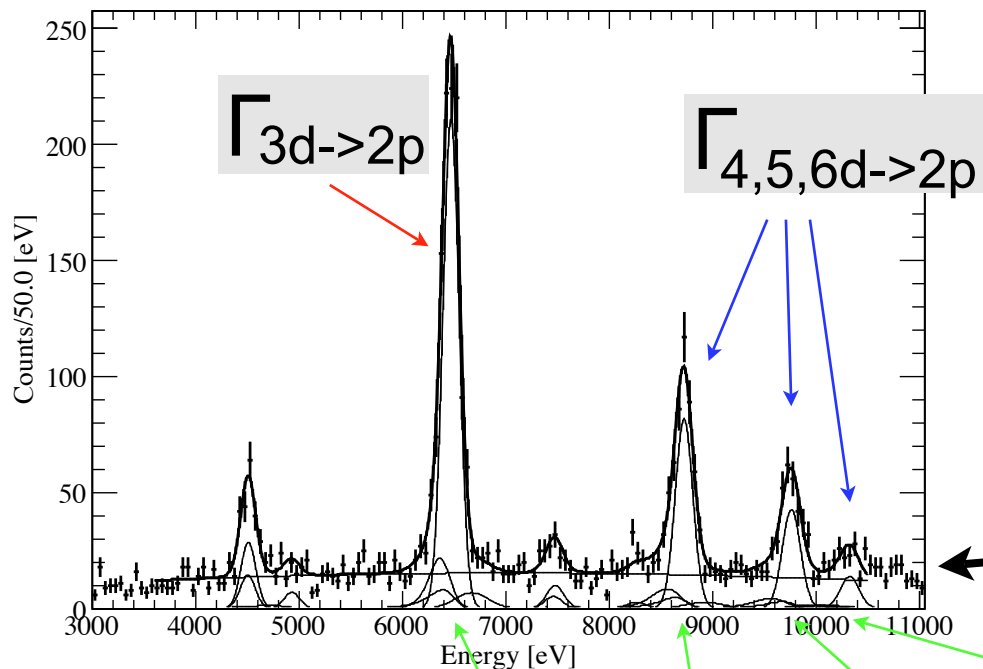
Fit range was changed to avoid the structure around 10.7 keV (KHeX-Lε / πHeX-Kα ?)

$E_{3d\rightarrow2p}$ $E_{4d\rightarrow2p}$ $E_{5d\rightarrow2p}$ $E_{6d\rightarrow2p}$

fit residue

Chisqr/NDF = 161.3/123

		center	1σ error
15	KHeXLa mean [eV]	6.47057e+03	3.37153e+00
49	KHeXLb mean [eV]	8.72468e+03	6.27304e+00
50	KHeXLg mean [eV]	9.76276e+03	1.01762e+01
51	KHeXLd mean [eV]	1.03260e+04	3.19444e+01
14	GammaLa [eV]	1.89848e-10	1.14407e+01
52	KHeXLb-d Gamma [eV]	1.49297e-10	7.59515e+00

c.f Theoretical calculations in Baird (1983)

transition	energy (eV)
3d->2p	6464
4d->2p	8723
5d->2p	9768
6d->2p	10331

Weighted average and the shift (exp - theory)

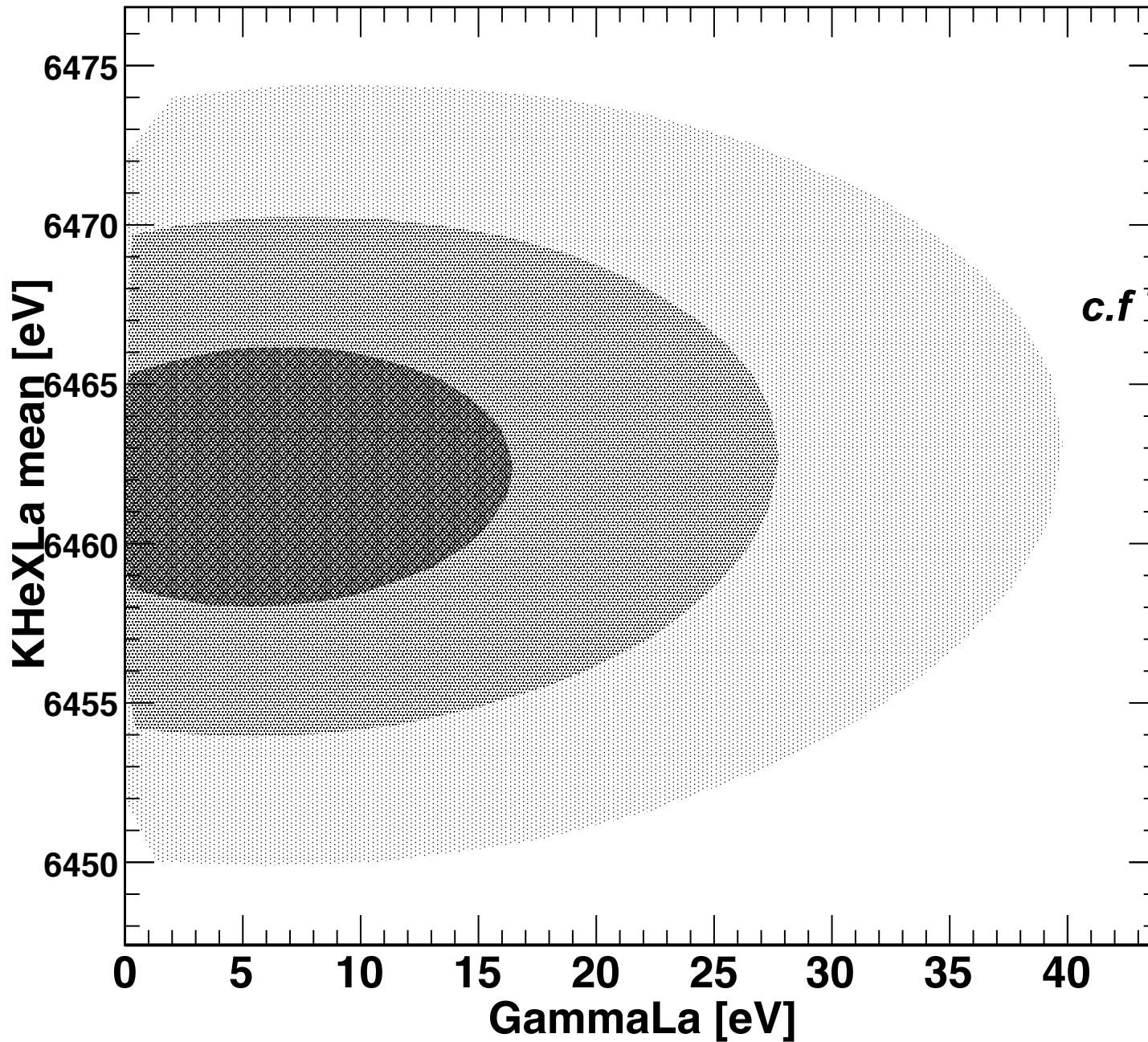| Transition	E570 (eV)	Theory (eV)	Shift (eV)
3d->2p	6467±3	6464	3±3
4d->2p	8725±5	8723	2±5
5d->2p	9762±8	9768	-6±8
6d->2p	10314±27	10331	-17±27
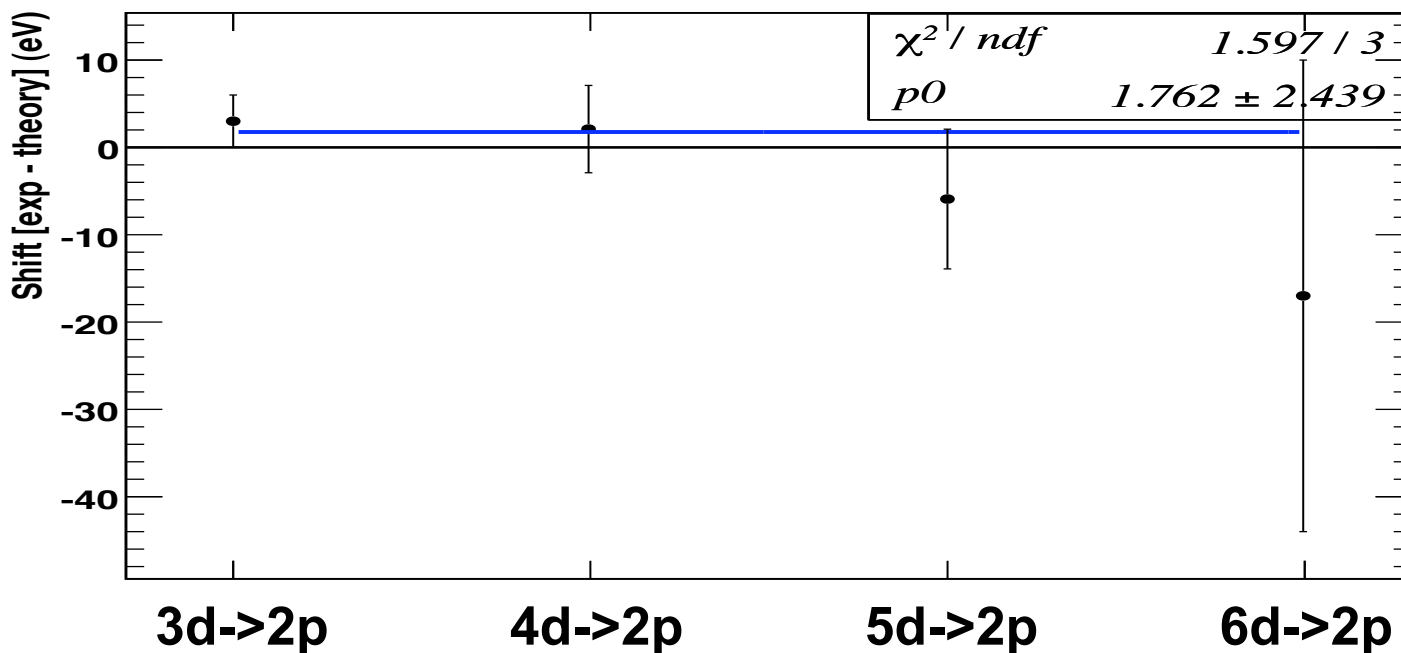
least-squares

2±2(stat.) eV

Is this correct ?

Spare

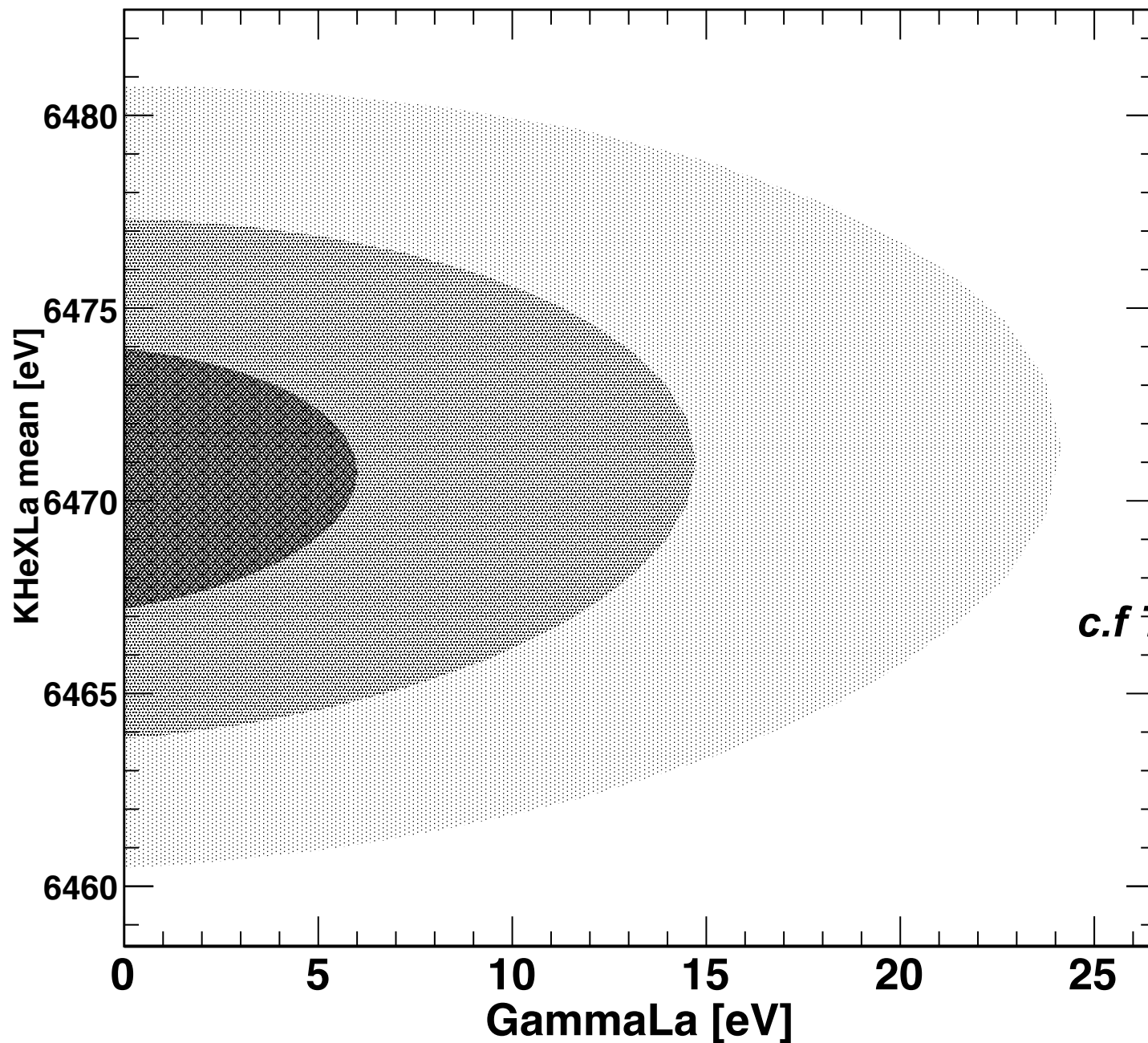**1st cycle transition-energy fit contour of the 3d->2p X-ray energy and Γ**

c.f Theoretical calculation in Baird (1983)

KHeXLa mean [eV]

GammaLa [eV]

2nd cycle transition-energy fit contour of the 3d->2p X-ray energy and Γ