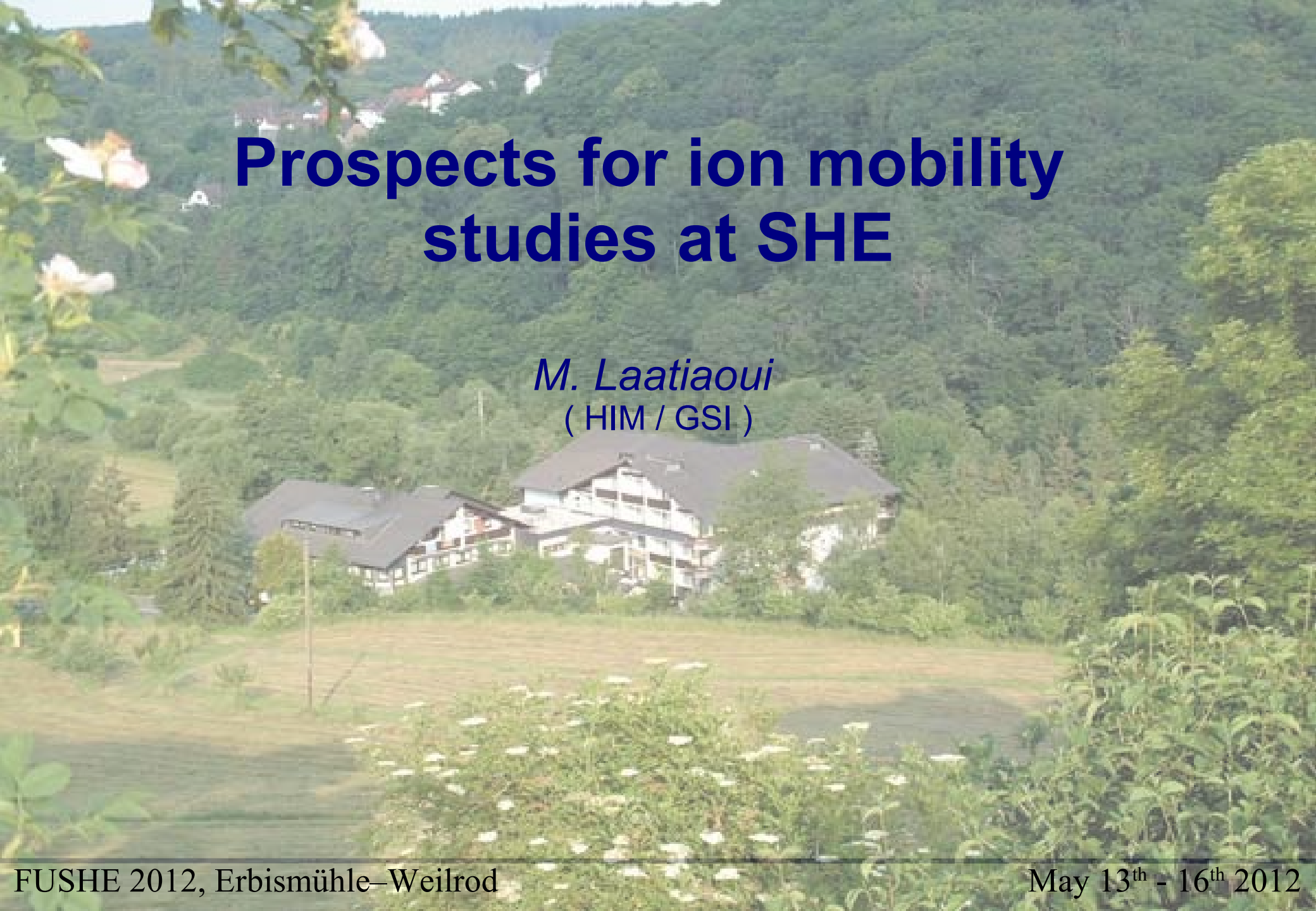
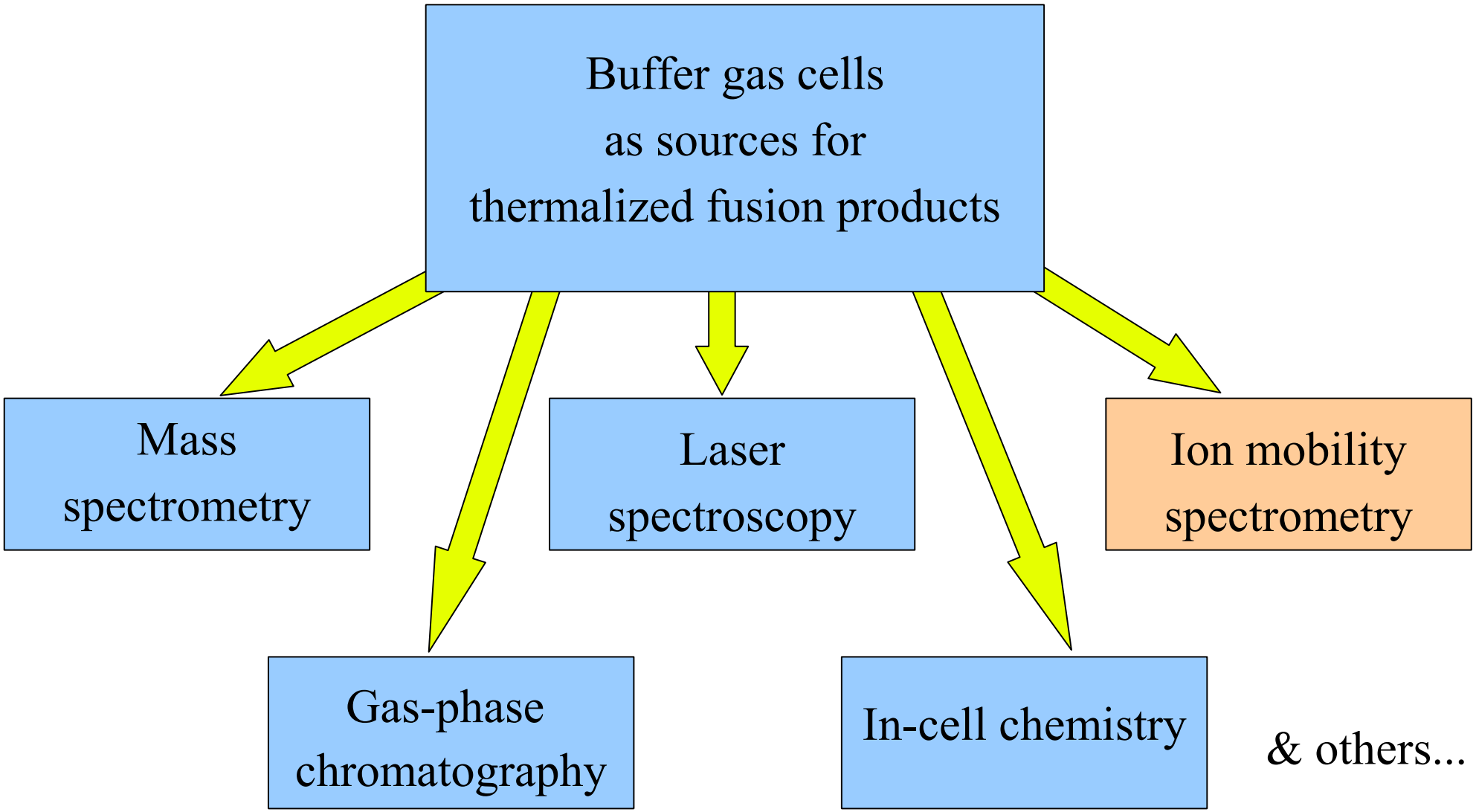


Prospects for ion mobility studies at SHE

M. Laatiaoui
(HIM / GSI)

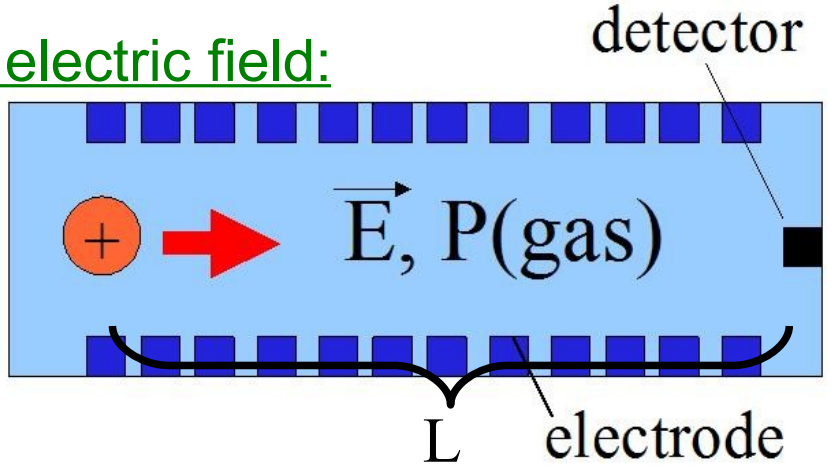
Scientific methods



Ion Mobility Spectrometry (IMS)

Ion drift motion in gas & homogeneous electric field:

Mobility: $K = L / (E * t_{drift})$



IMS in chemistry:

- State selected ion chemistry ...

C. Iceman, et al., J. Am. Soc. Mass Spectrom. 18 (2007) 1196
P. Kemper, et al., J. Am. Chem. Soc. 112 (1990) 3231

- Study of molecule-molecule interaction potentials / polarizabilities
- Study of molecular bond lengths
- Study of reaction rate constants (via ATD or Ion-Rate analysis)

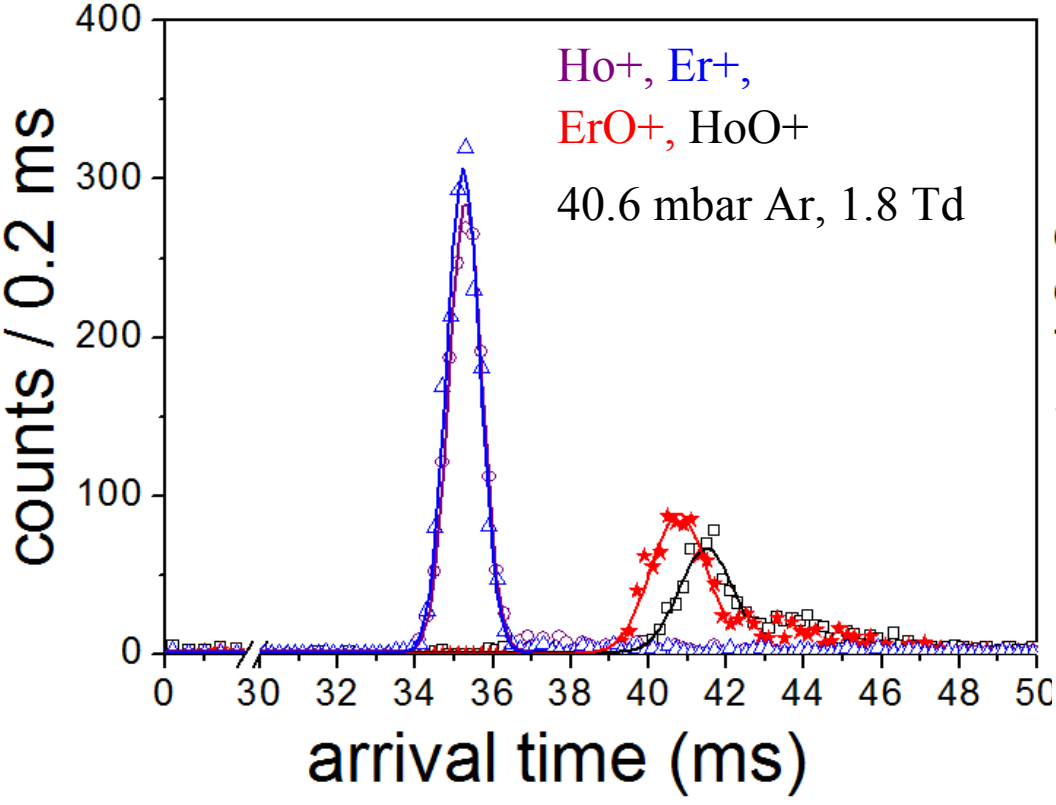
IMS in physics:

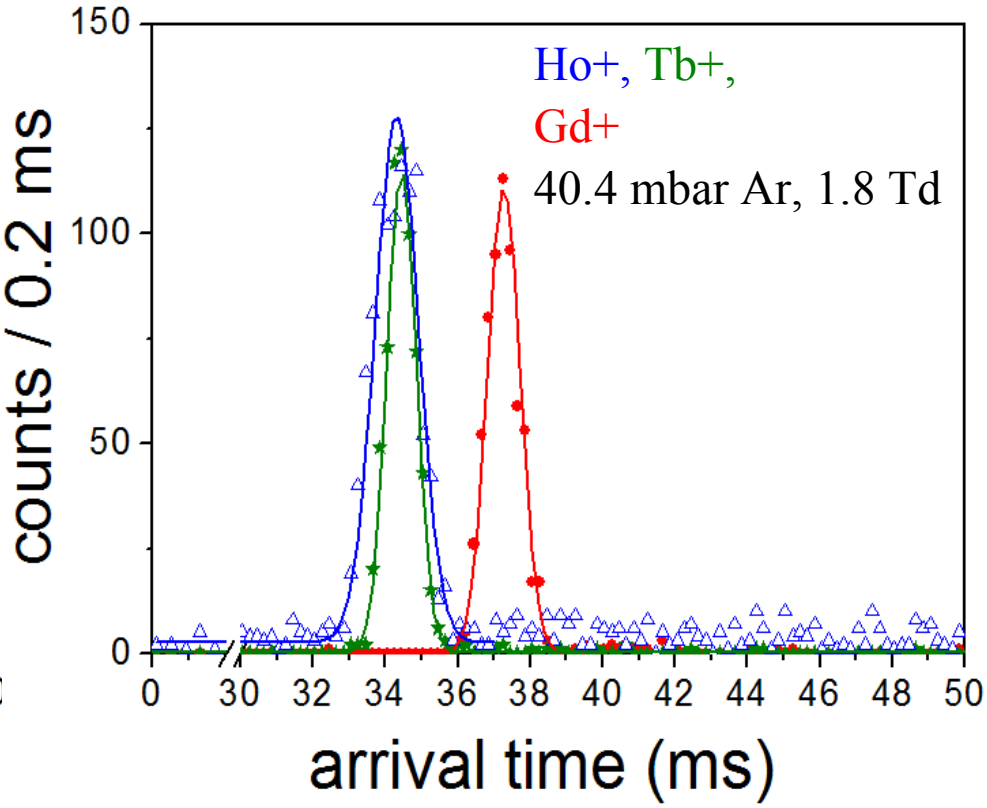
- Access to ion-atom interaction potential of short-lived isotopes ($t_{1/2}$<1s)
- Assignment/verification of valence electron configurations also @SHE

Systematic studies @ rare earth metals

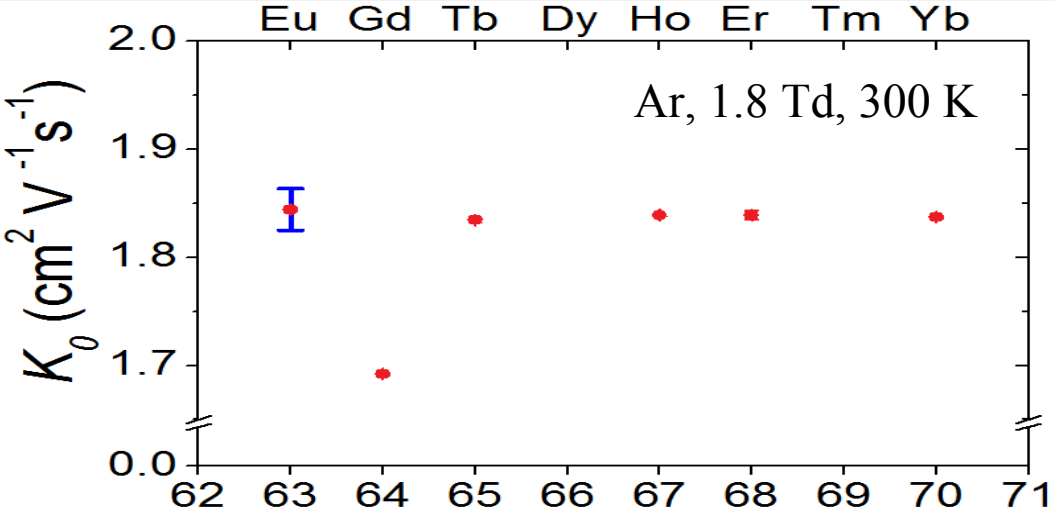
* Lanthanide oxides could be discriminated in time due to lanthanide contraction.

* All lanthanide ions in GS exhibited nearly the same drift time except Gd+.





Valence Electron Configuration (singly charged ions)



M. Laatiaoui et al.,
Eur. Phys. J. D,
submitted

Rare earth metals:

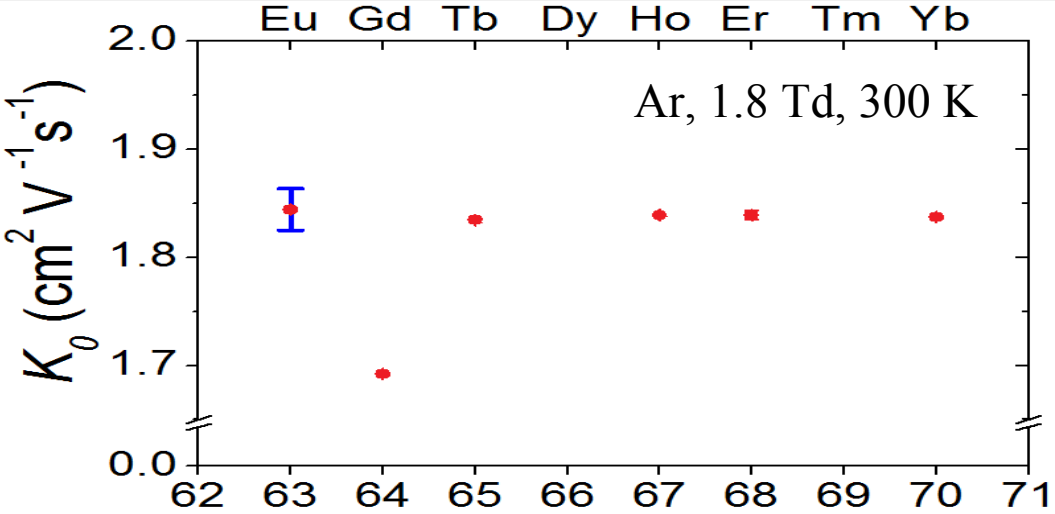
58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
$4f5d^2$	$4f^46s$	$4f^56s$	$4f^66s$	$4f^75d6s$	$4f^{10}6s$	$4f^{11}6s$	$4f^{12}6s$	$4f^{13}6s$	$4f^{14}6s$	$4f^{14}6d^2$			

P. Indelicato et al.,
Eur. Phys. J. D **45**, 155 (2007)

5f-shell elements:

90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	104 Rf	105 Du	106 Sg	107 Bh	108 Hs
$5f^26d$	$5f^36d7s$	$5f^46d7s$	$5f^56d7s$	$5f^67s^2$	$5f^{10}7s$	$5f^{11}7s$	$5f^{12}7s$	$5f^{13}7s$	$5f^{14}7s$	$5f^{14}6d7s^2$	$5f^{14}6d^27s^2$	$5f^{14}6d^37s^2$	$5f^{14}6d^47s^2$	$5f^{14}6d^57s^2$				

Valence Electron Configuration (singly charged ions)



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