www.superheavies.de
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Search for element 119

Christoph E. Düllmann
for the *TASCA E119* collaboration

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SHE Chemistry, GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt
SHE Chemistry, Helmholtz Institute Mainz

TASCA 12

11th Workshop on Recoil Separator for Superheavy Element Chemistry
GSI Darmstadt, Germany, September 14, 2012

The *TASCA* Element 119 Collaboration

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HIM Mainz (D)	L.-L. Andersson, X. Derkx, J. Even, J. Khuyagbaatar, V. Yakusheva
ORNL / UT Knoxville (USA)	R. Grzywacz, D. Miller, J. Roberto, K. Rykaczewski
Vanderbilt U (USA)	J.H. Hamilton
LBNL / UC Berkeley (USA)	N. Esker, J.M. Gates, K.E. Gregorich, H. Nitsche, G.K. Pang
LLNL (USA)	N. Gharybian, J.M. Gostic, R.A. Henderson, K.J. Moody, D.A. Shaughnessy, E.E. Tereshatov
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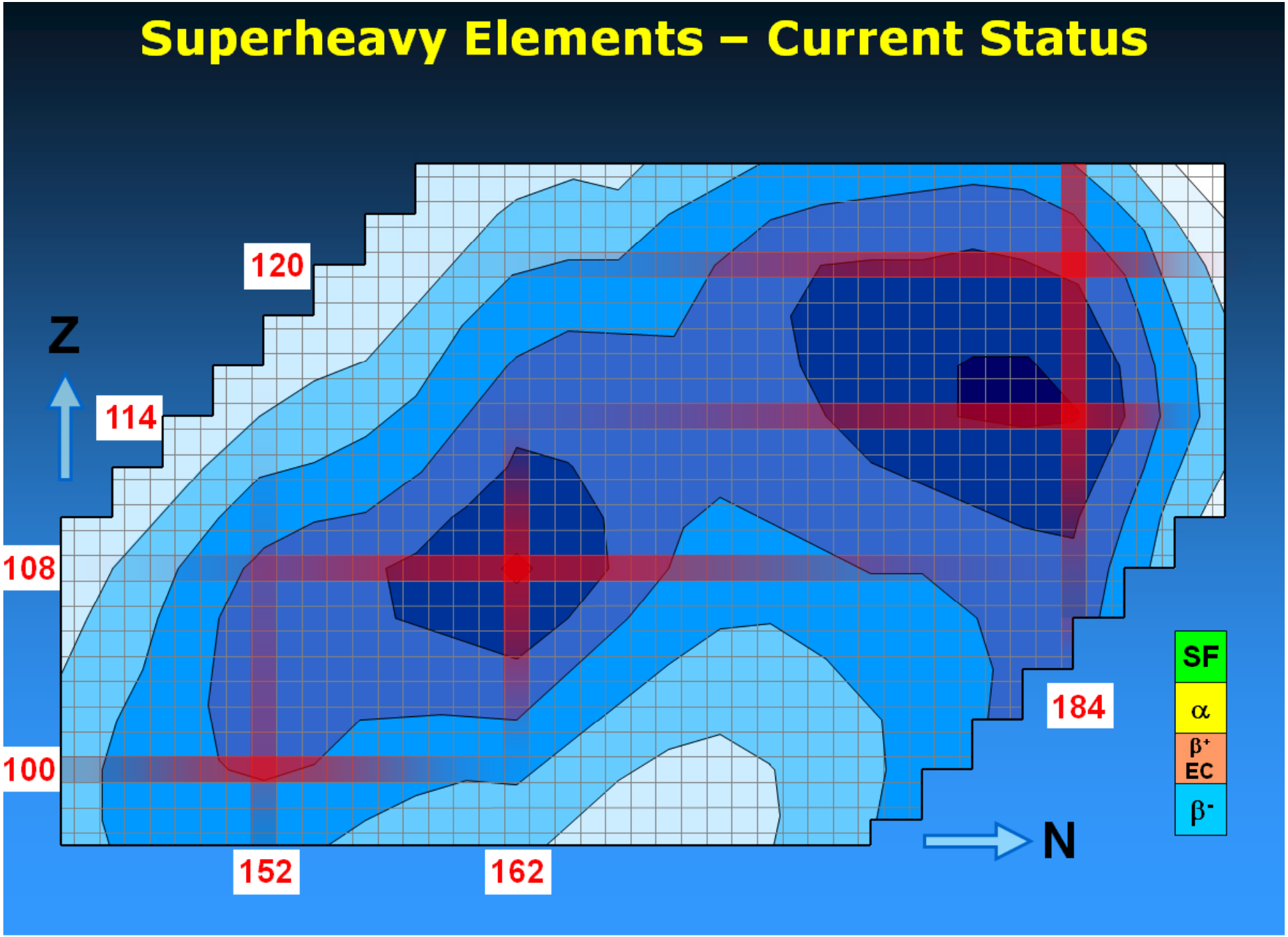
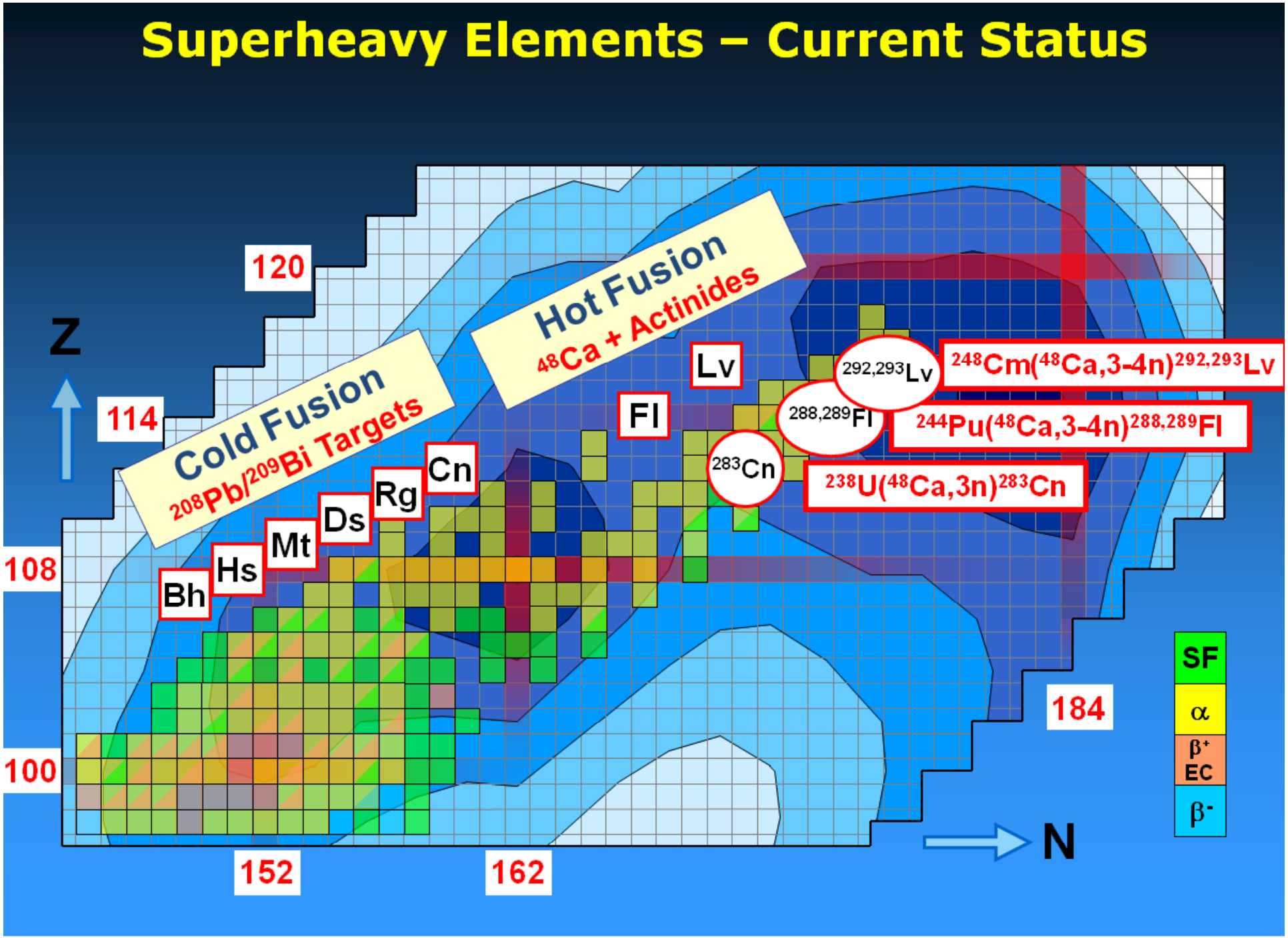
Univ. Liverpool (UK)	D.M. Cox, R.-D. Herzberg, A. Mistry
SINP Kolkata (IND)	S. Lahiri, M. Maiti
JAEA Tokai (J)	M. Asai, M. Schädel
Univ. Oslo (N)	J.P. Omtvedt, A. Semchenkov
U Jyväskylä	J. Uusitalo
PSI / Univ. Berne (CH)	A. Türler, P. Steinegger
ITE Warsaw (PL)	M. Wegrzecki
ANU Canberra (AUS)	M. Evers, D. Hinde

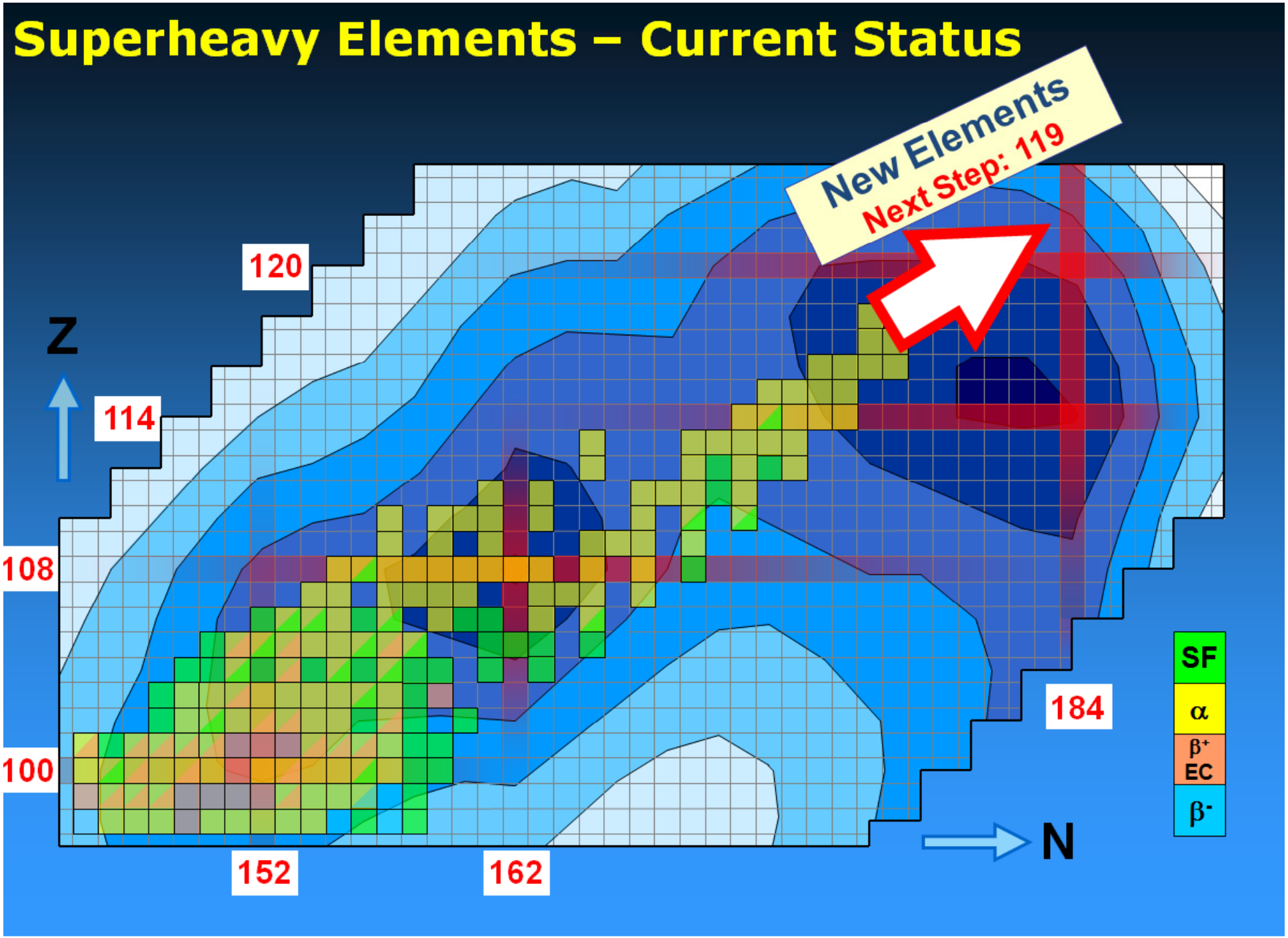
Superheavy Elements – Current Status



Superheavy Elements – Current Status

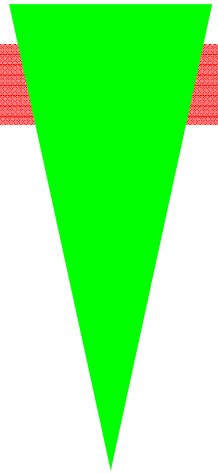


Superheavy Elements – Current Status

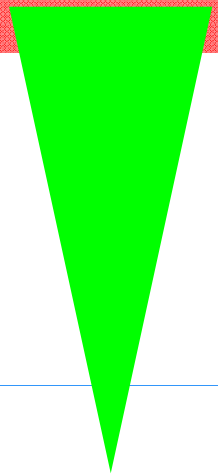


Making elements 119 and 120

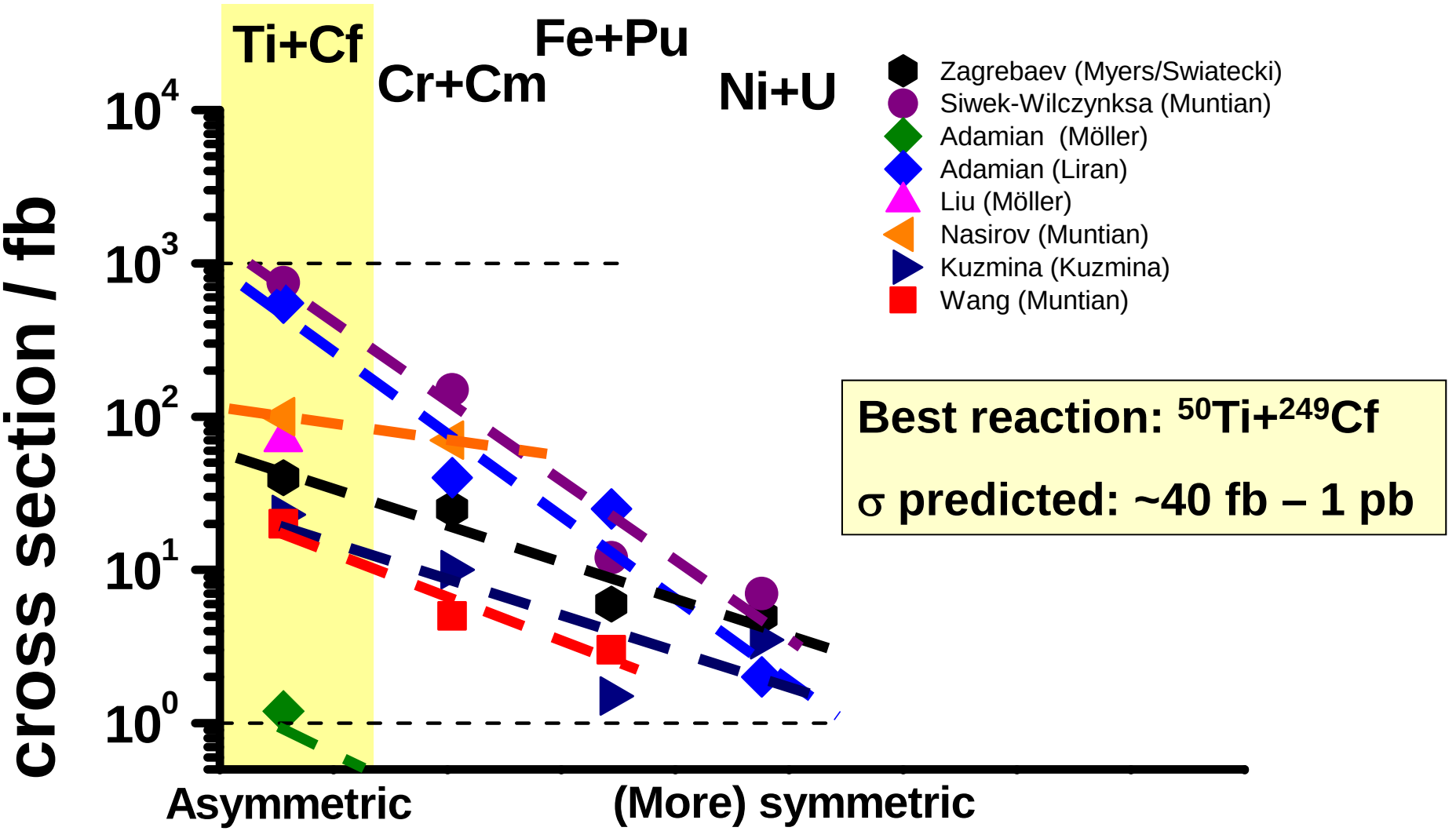
E119

Z_{Beam}	Beam	Target	Asymmetry	$E^*@B_{Bass}$
21	^{45}Sc	^{249}Cf		41.7
22	^{50}Ti	^{249}Bk		32.4
23	^{51}V	^{248}Cm		36.8
24	^{54}Cr	^{243}Am		31.5
25	^{55}Mn	^{244}Pu		37.7
26	^{58}Fe	^{237}Np		29.9
27	^{59}Co	^{238}U		36.7

E120

Z_{Beam}	Beam	Target	Asymmetry	$E^*@B_{Bass}$
22	^{50}Ti	^{249}Cf		31.7
23	^{51}V	^{249}Bk		35.9
24	^{54}Cr	^{248}Cm		33.0
25	^{55}Mn	^{243}Am		34.5
26	^{58}Fe	^{244}Pu		33.9
27	^{59}Co	^{237}Np		32.9
28	^{64}Ni	^{238}U		27.3

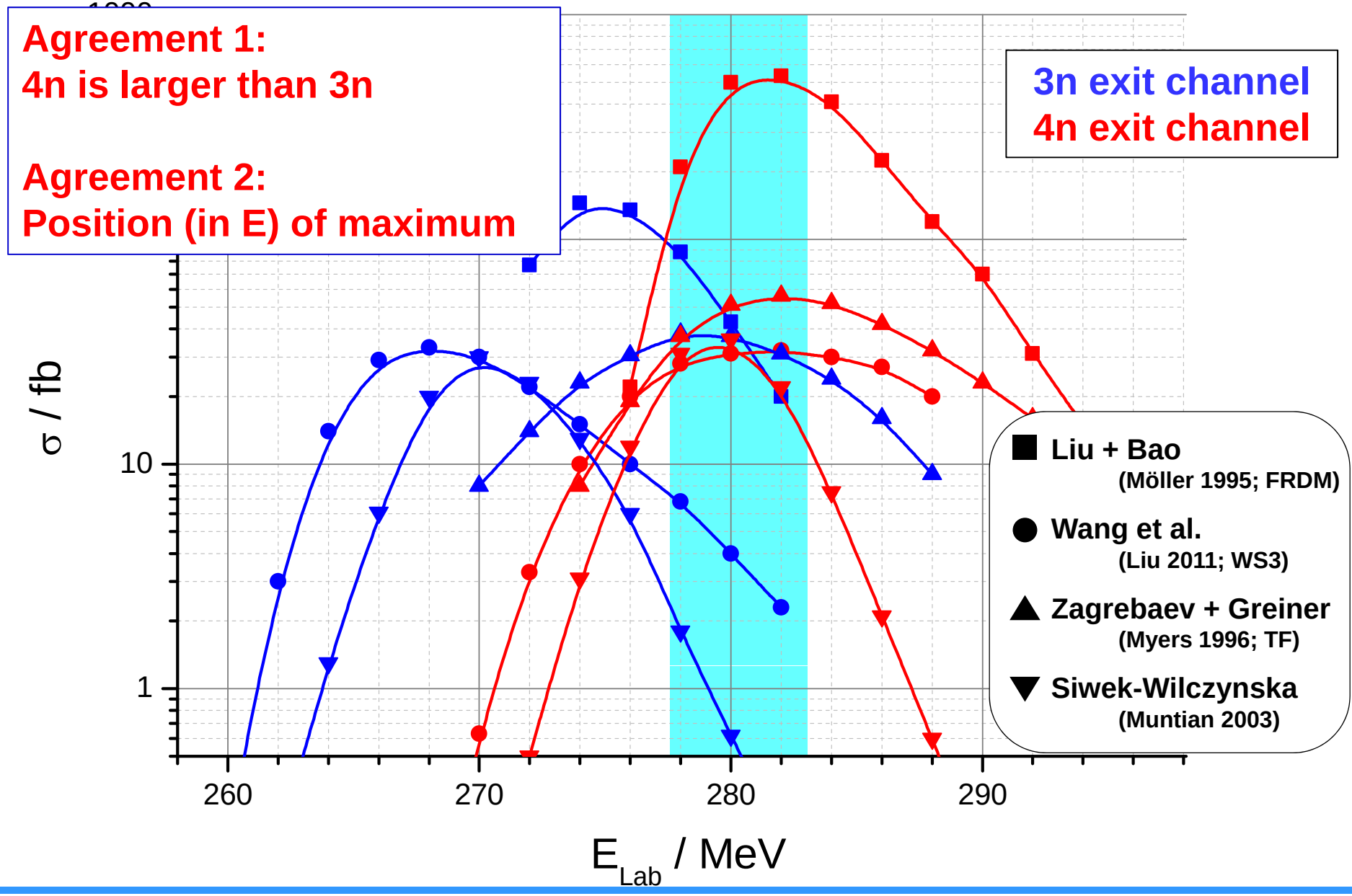
Cross sections: current predictions from theory



Best reaction: ^{50}Ti+^{249}Cf

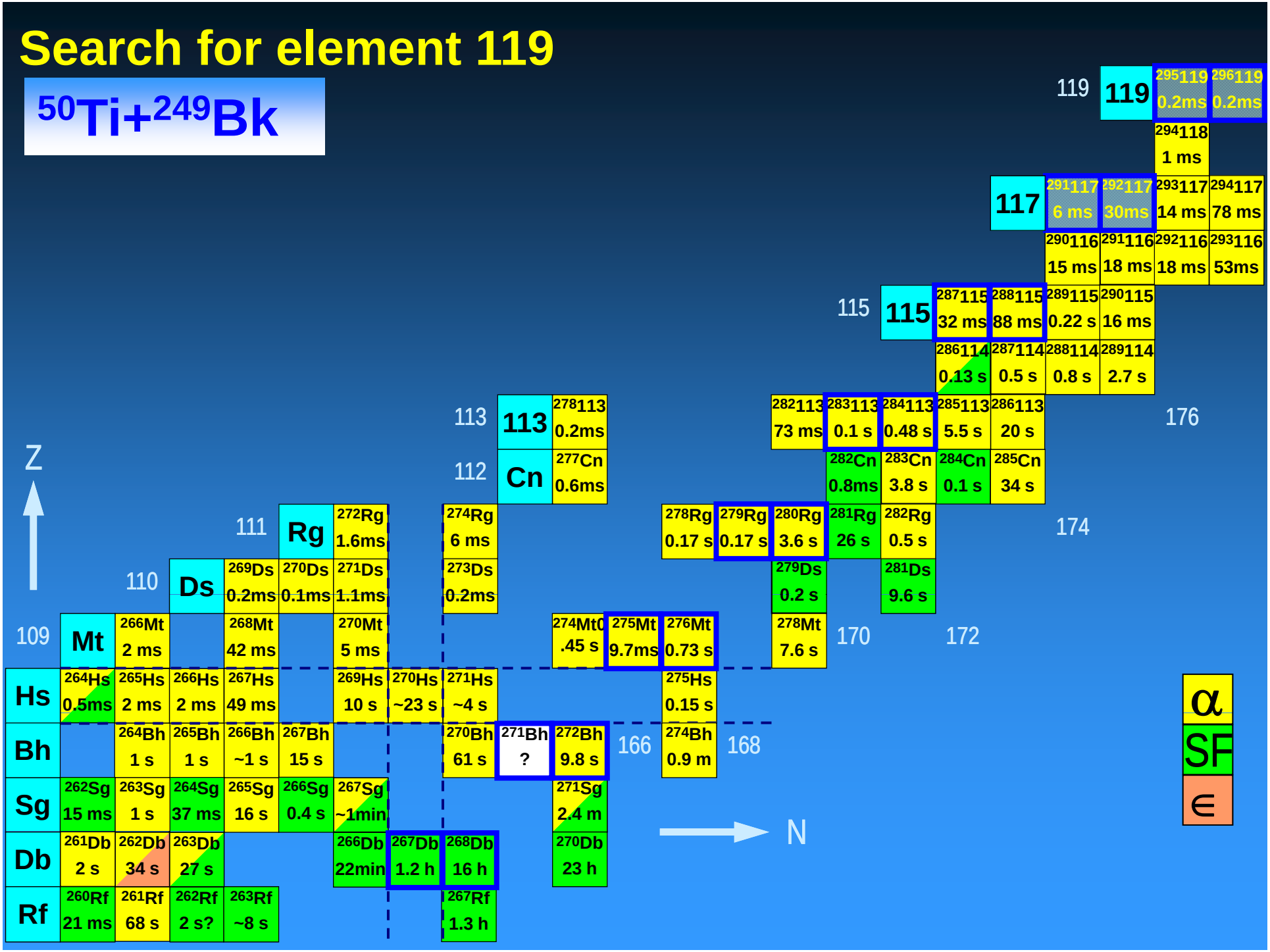
σ predicted: ~40 fb – 1 pb

$^{50}Ti+^{249}Bk$ Excitation Function

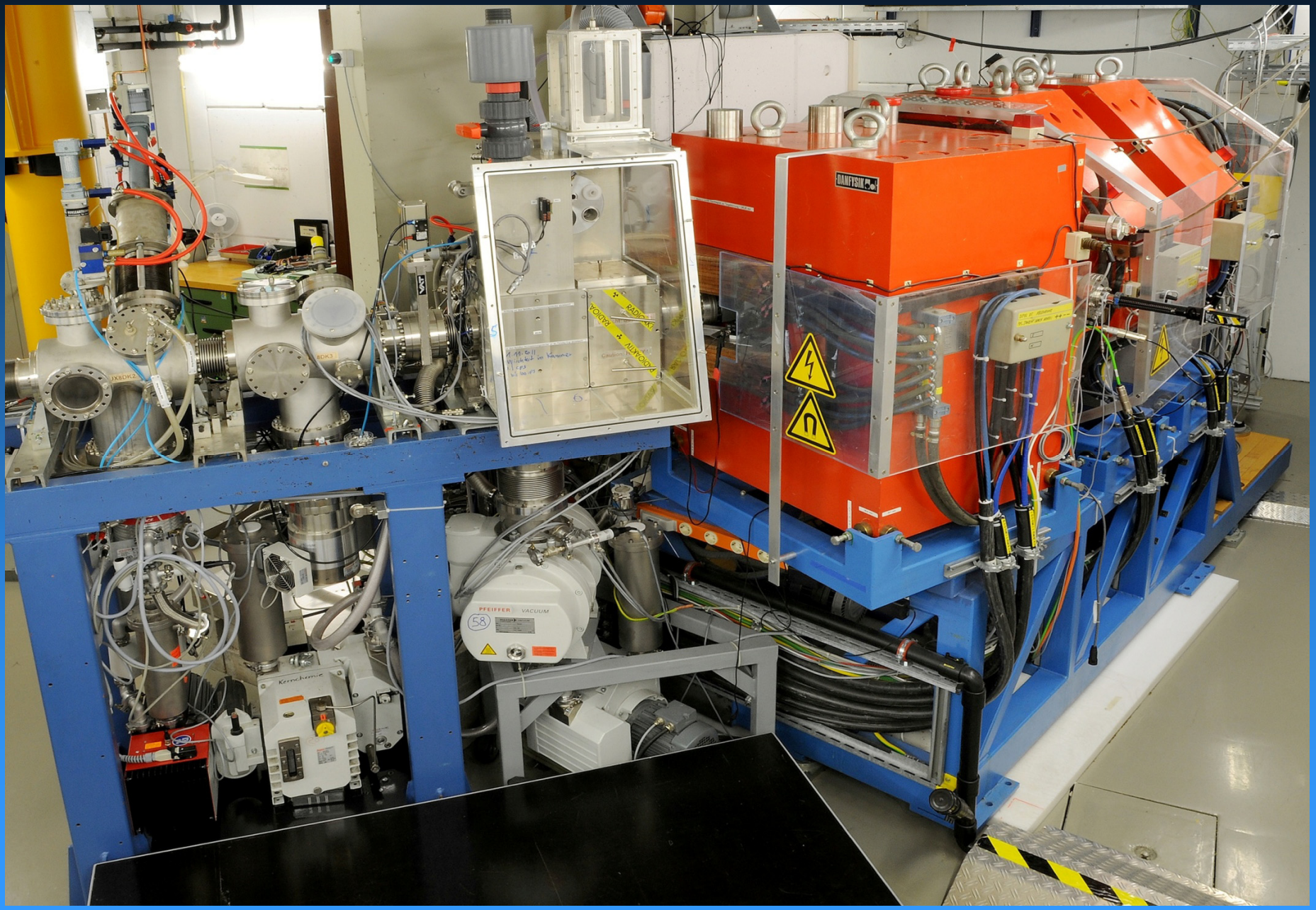


Search for element 119

$^{50}Ti+^{249}Bk$



TransActinide Separator and Chemistry Apparatus (*TASCA*)



TASCA High Power Target Wheel used for E119 at GSI

Ø Target Wheel: 100 mm
Ø Beam Spot: 8 mm

Target wheel with Gd tested up to 2500 particle·nA

Wheel system: E. Jäger, T. Torres, J. Krier

March 6:
^{249}Bk arrives in Mainz

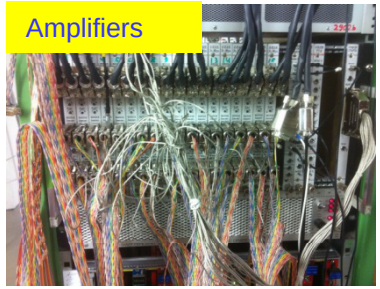
March 23:
Targets arrive at GSI

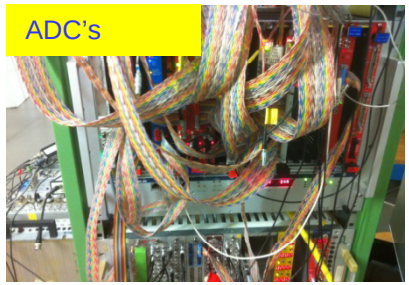
April 12:
Targets mounted in TASCA

April 14:
Begin Element 119 search

....still going on

A new ANalog/DIgital (ANDI) DAQ system for μs-isotopes





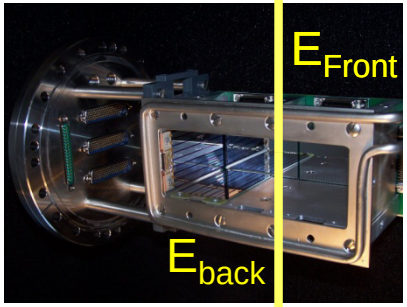
ADC

PreAmp

SpecAmp

Analog

Energy, X: Deadtime <50 μs



$E_{FrontX}=E_{backY}$

Comp
MBS 1

Digital

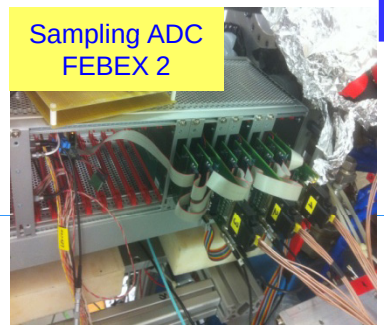
Energy, Y: Trace length 50 μs

Event Builder

PreAmp

ADC

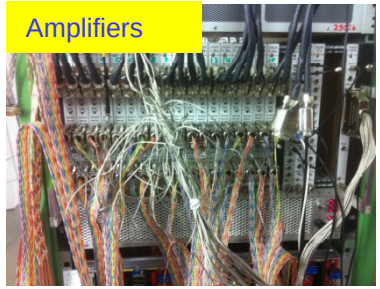
Comp
MBS 2

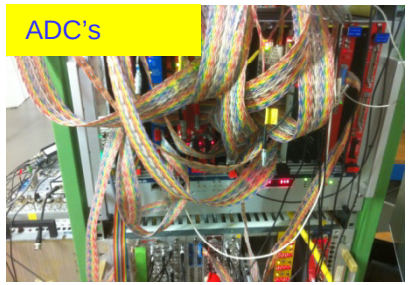


GSI EE

J. Khuyagbaatar

A new ANalog/DIgital (ANDI) DAQ system for μs-isotopes





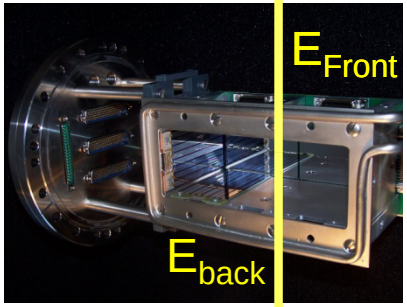
ADC

PreAmp

SpecAmp

Analog

Energy, X: Deadtime <50 μs

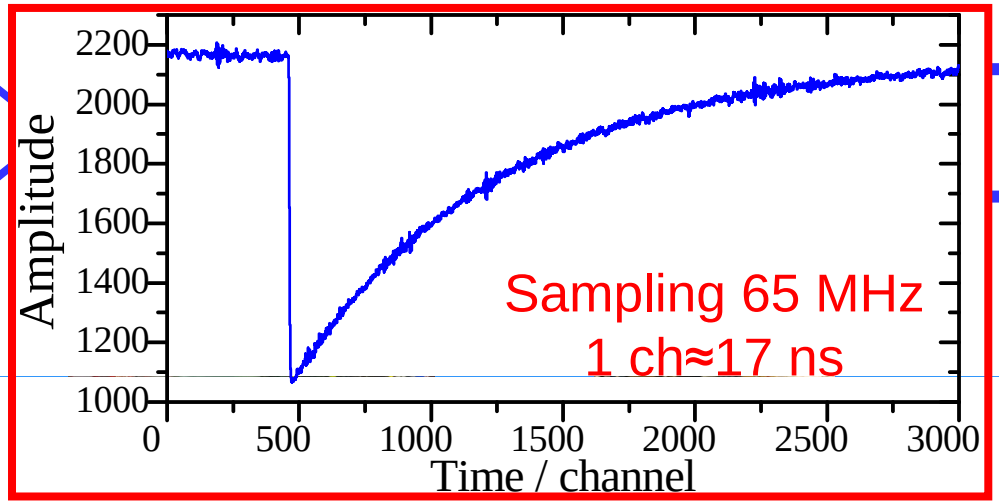


$E_{FrontX}=E_{backY}$

Comp
MBS 1

Digital

Energy, Y: Trace length 50 μs



Event
Builder

HELMHOLTZ ASSOCIATION
Helmholtz Institute Mainz

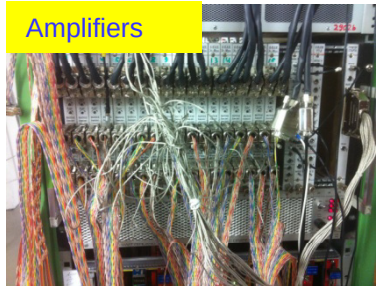
GSI

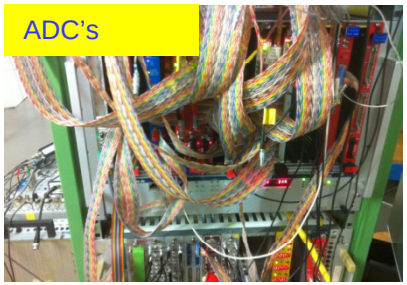
LUND UNIVERSITY

GSI EE

J. Khuyagbaatar

A new ANalog/DIgital (ANDI) DAQ system for μs-isotopes

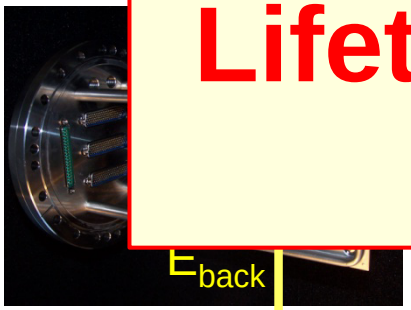


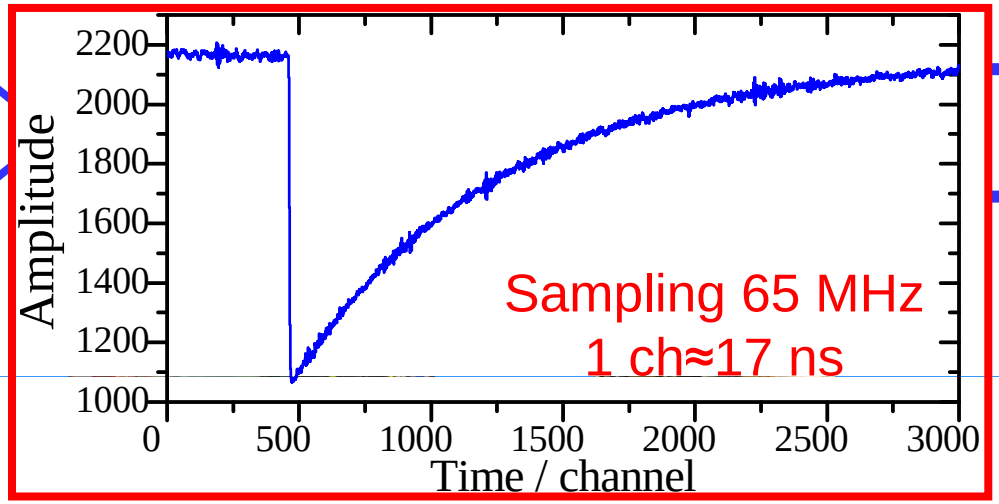


ADC

Dead-time free!

Lifetimes down to about 100 ns can be measured





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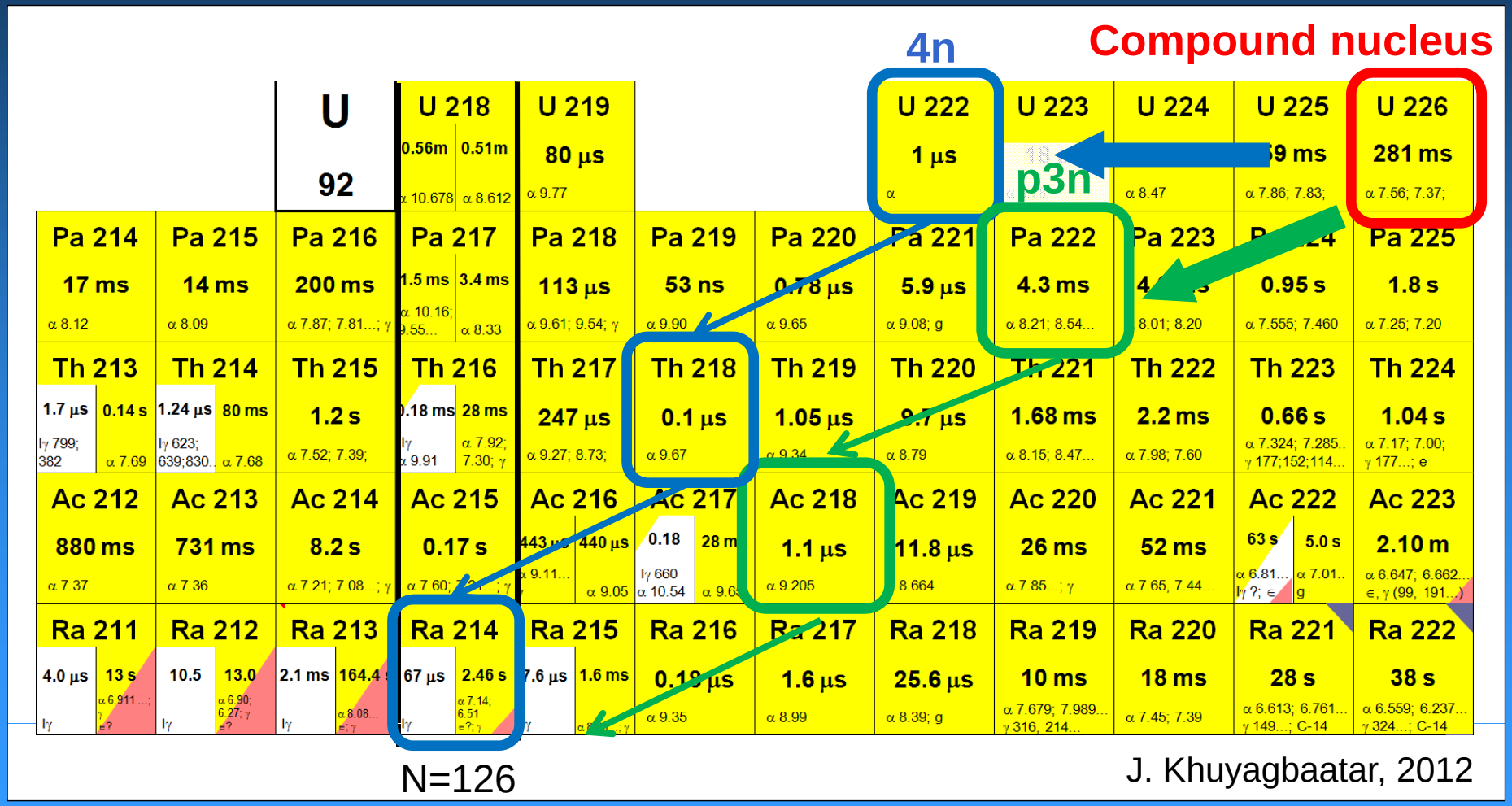
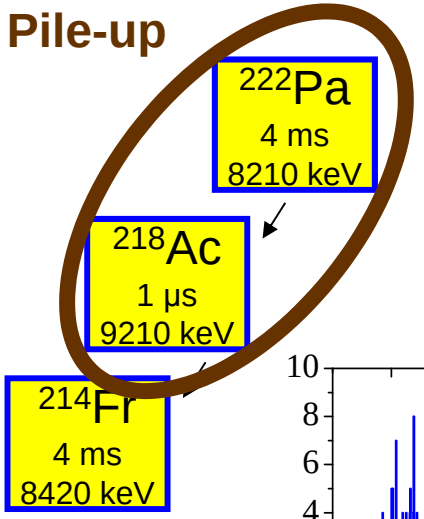
Measuring microsecond activities produced with a ^{50}Ti beam:

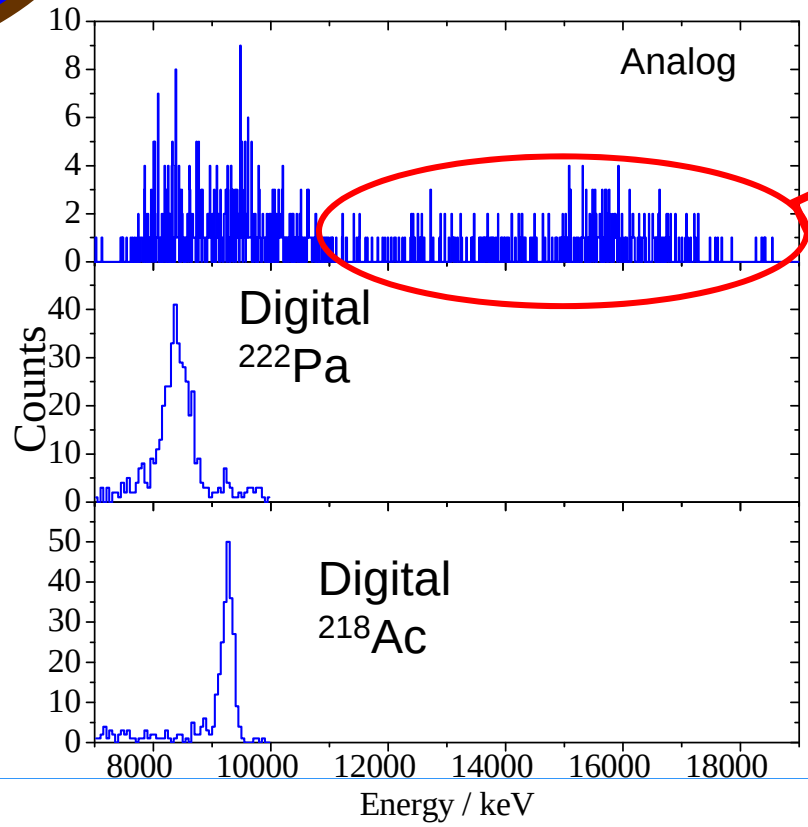
$$^{50}\mathrm{Ti} + {}^{176}\mathrm{Yb} \rightarrow {}^{226}\mathrm{U}^{*}$$



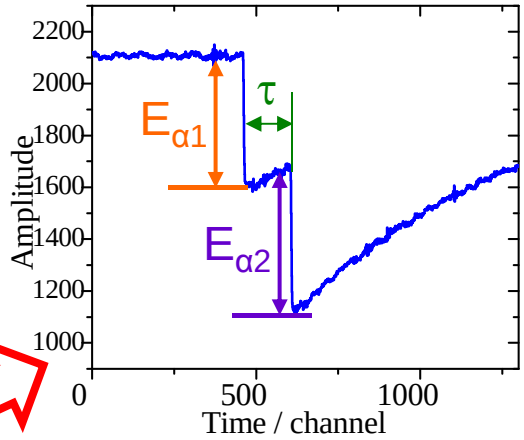
With digital part of the data: access to μs-isotopes

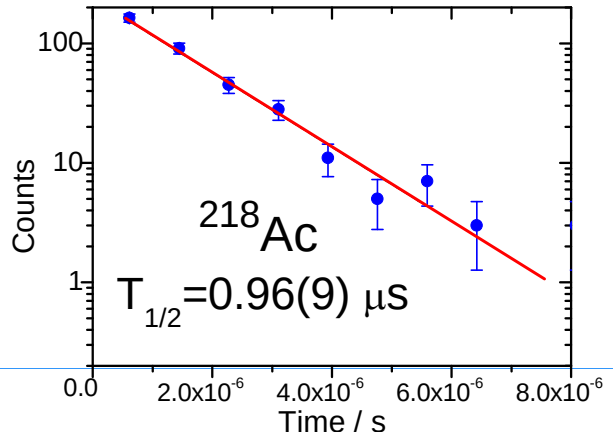


ER: p3n



Digital part of pile-up events





J. Khuyagbaatar, 2012

Conclusion

Search for element 119 with ^{50}Ti + ^{249}Bk ongoing at *TASCA*

Experiment running smoothly, good beams, good target

$\Rightarrow$ Good sensitivity

Will continue into November 2012