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News from *TASCA*

Christoph E. Düllmann

for the *TASCA E120* collaboration

Johannes Gutenberg University Mainz

GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt

Helmholtz Institute Mainz

TASCA 11

10th Workshop on Recoil Separator for Superheavy Element Chemistry

GSI Darmstadt, Germany, October 14, 2011

TASCA



DQQ-configuration
 $B\rho_{\max} \approx 2.4 \text{ Tm}$

www.gsi.de/tasca

TASCA



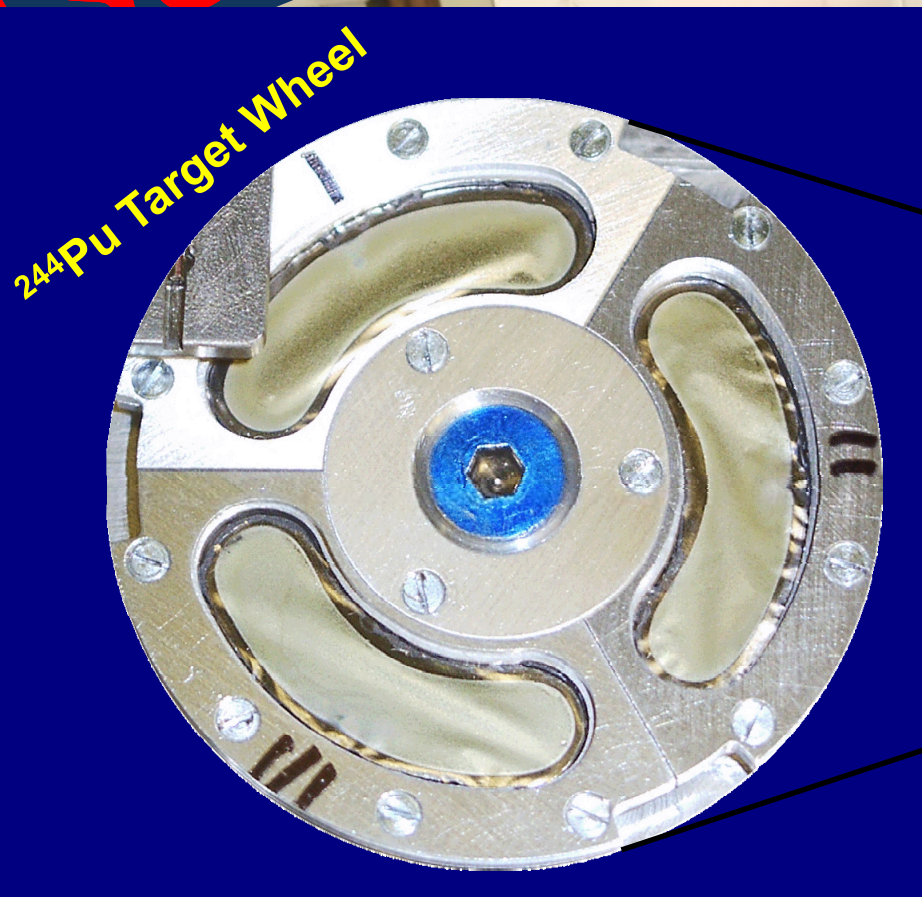
Target Chamber
side view

^{48}Ca beam

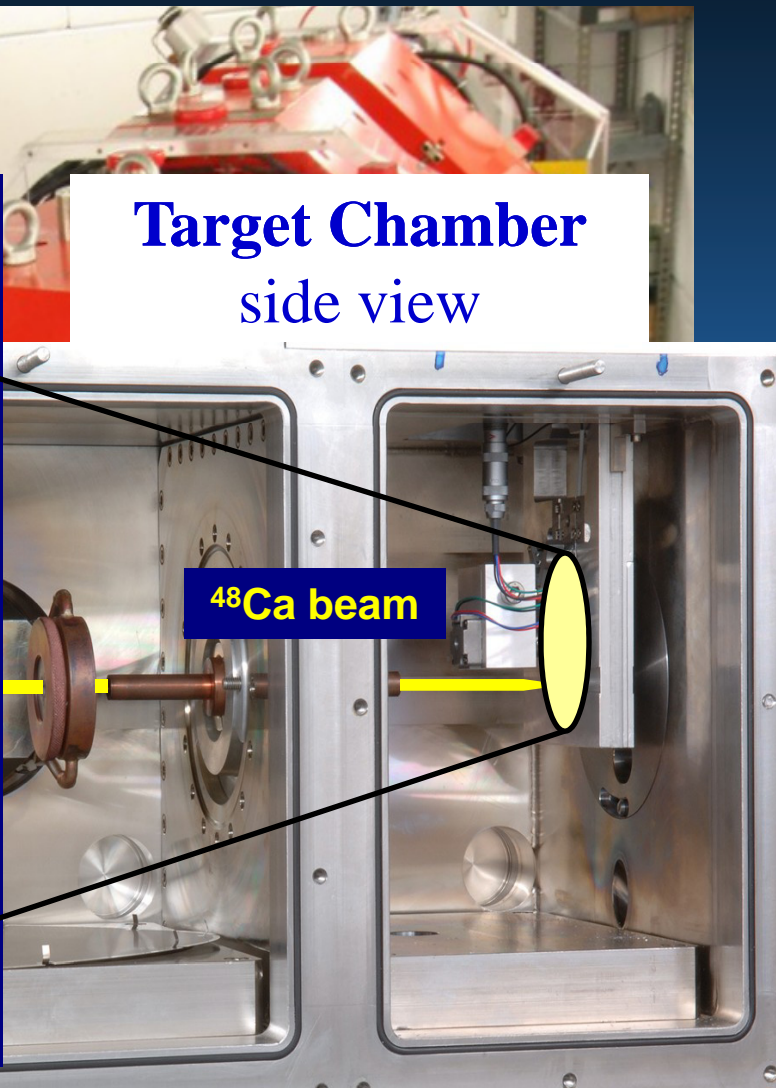
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TASCA

^{244}Pu Target Wheel



**Target Chamber
side view**

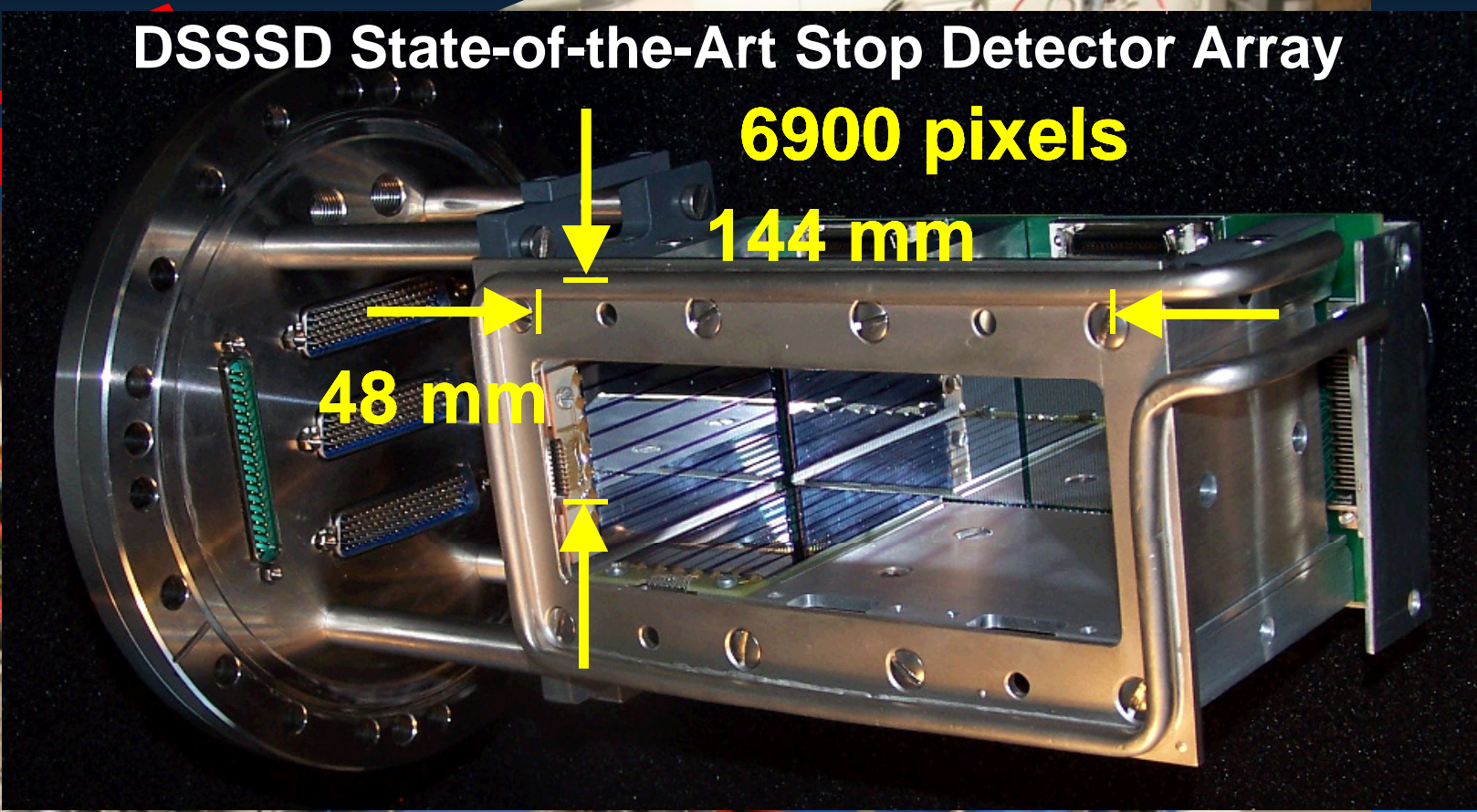


^{48}Ca beam

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DSSSD State-of-the-Art Stop Detector Array

TAS



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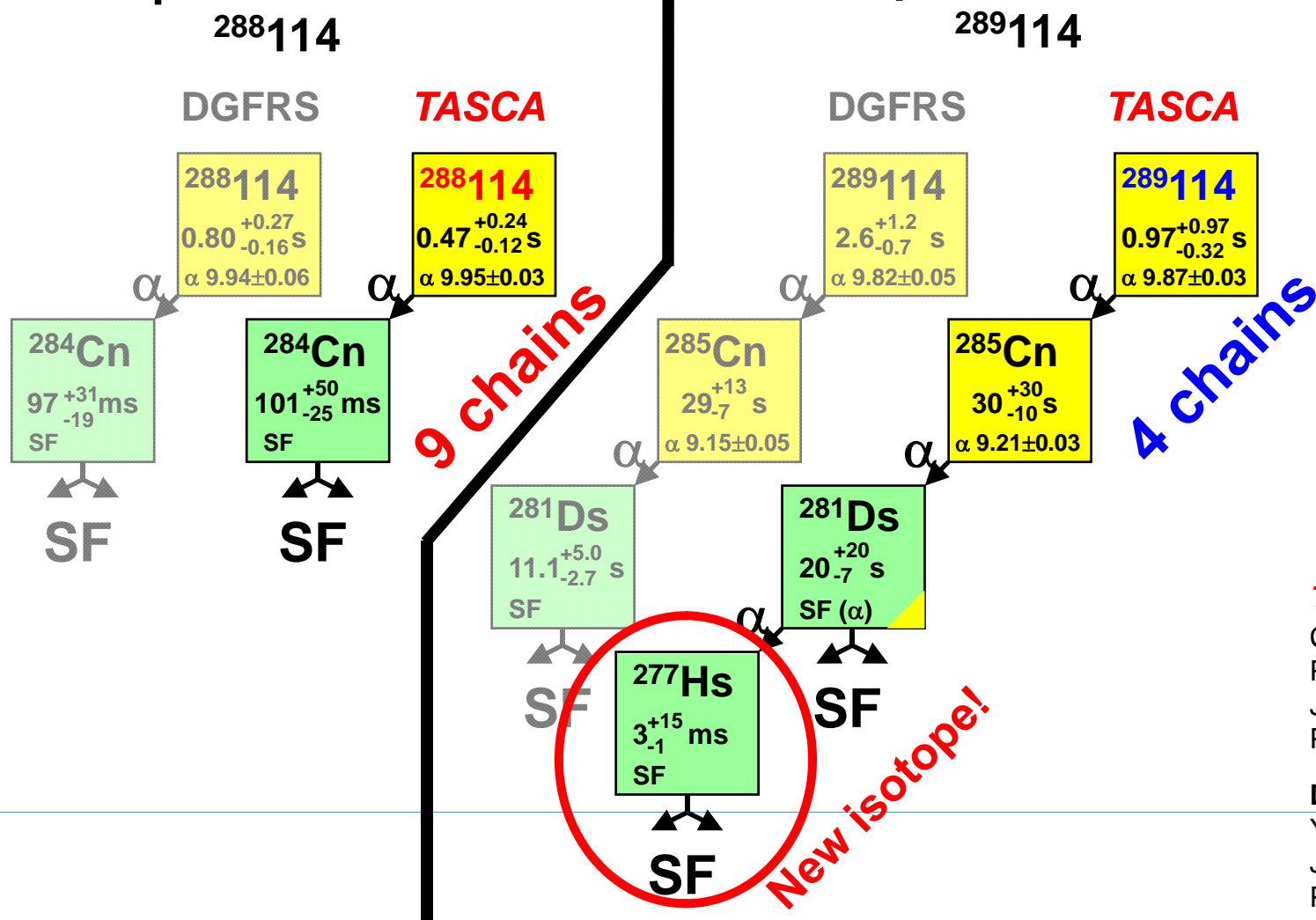
The Element 114 **TASCA** Experiment

13 Decay Chains in 22 Days → Highest SHE Detection Rate



4n Evaporation Channel:

3n Evaporation Channel:



TASCA data:

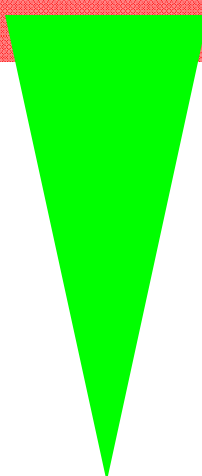
Ch.E.Düllmann *et al.*,
PRL 104 (2010) 252701
J.M. Gates *et al.*
PRC 83 (2011) 054618

DGFRS Data

Yu.Ts. Oganessian *et al.*,
JPG 34 (2007) R165
PRC 69 (2004) 054607

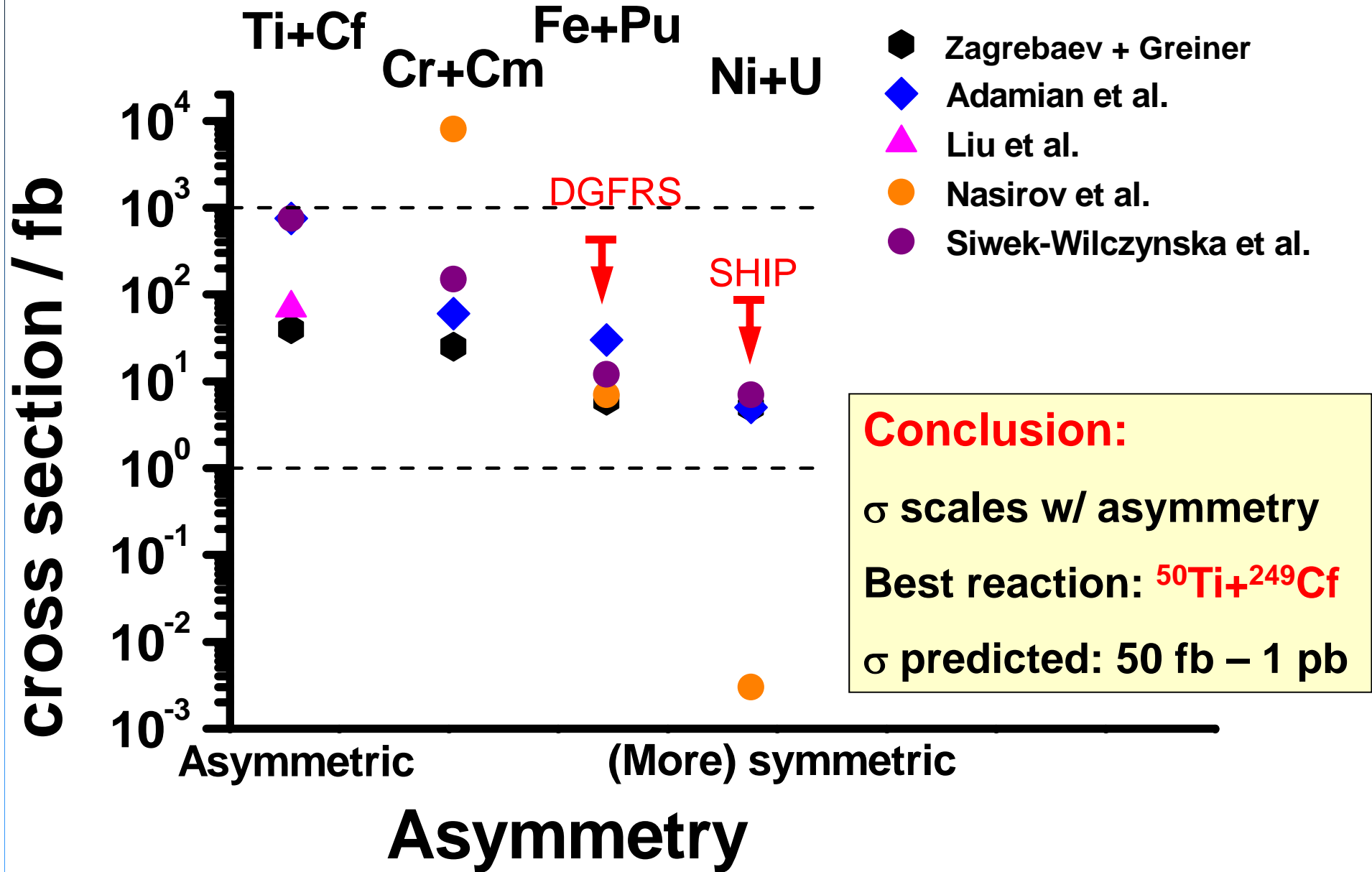
Making new elements

E120

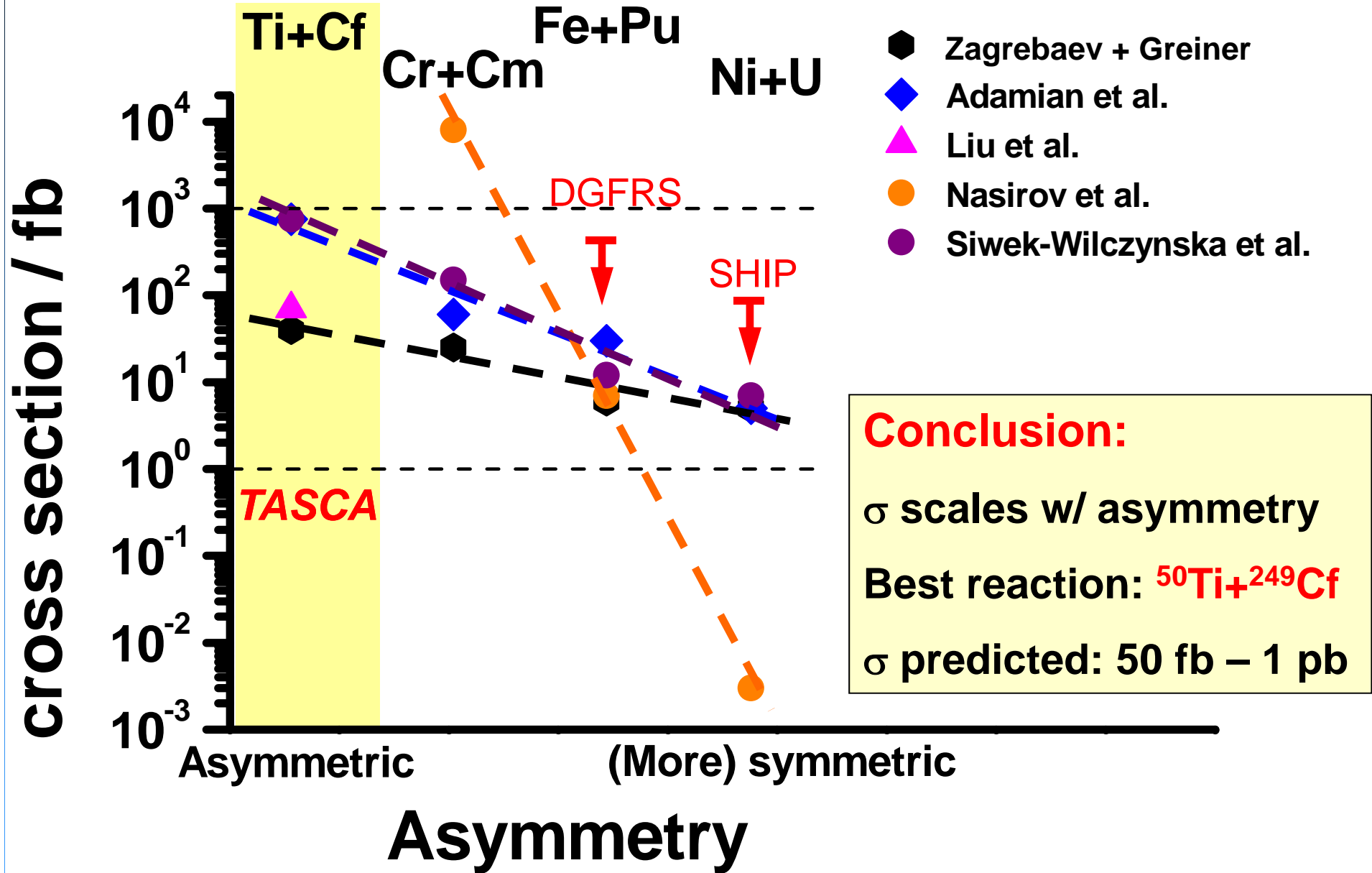
Z_{Beam}	Beam	Target	Asymmetry	$E^* @ B_{\text{Bass}}$
22	^{50}Ti	^{249}Cf		31.7
23	^{51}V	^{249}Bk		35.9
24	^{54}Cr	^{248}Cm		33.0
25	^{55}Mn	^{243}Am		34.5
26	^{58}Fe	^{244}Pu		33.9
27	^{59}Co	^{237}Np		32.9
28	^{64}Ni	^{238}U		27.3

Similar arguments for E119 hint at $^{50}\text{Ti} + ^{249}\text{Bk}$ as the preferred reaction

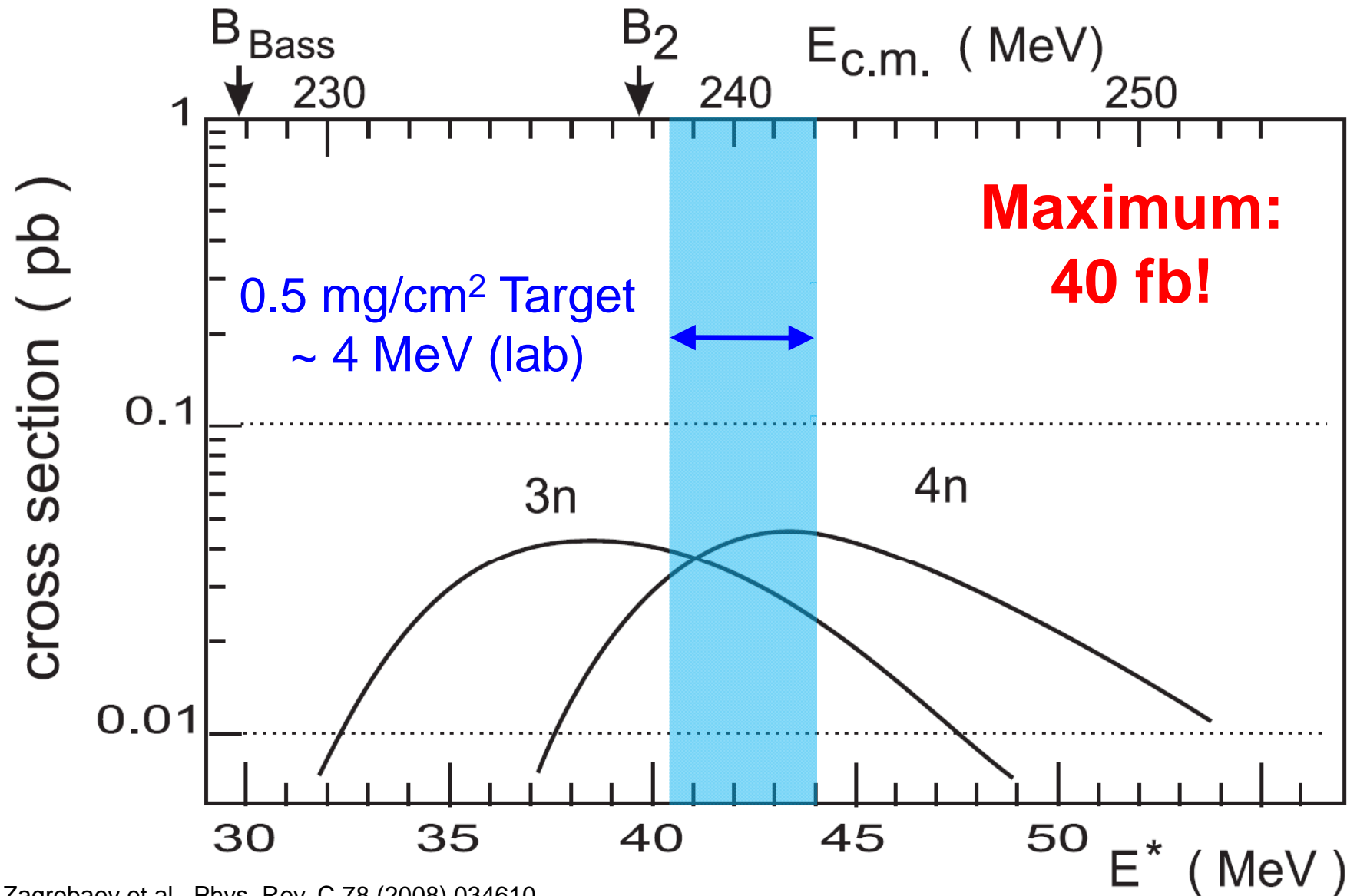
Choice of the optimum reaction: example E120



Choice of the optimum reaction: example E120



$^{50}\text{Ti} + ^{249}\text{Cf}$ Excitation Function

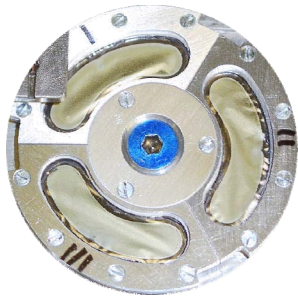


V. Zagrebaev et al., Phys. Rev. C 78 (2008) 034610

A new high-intensity transuranium target wheel for **TASCA**

Used for E114 (2009):

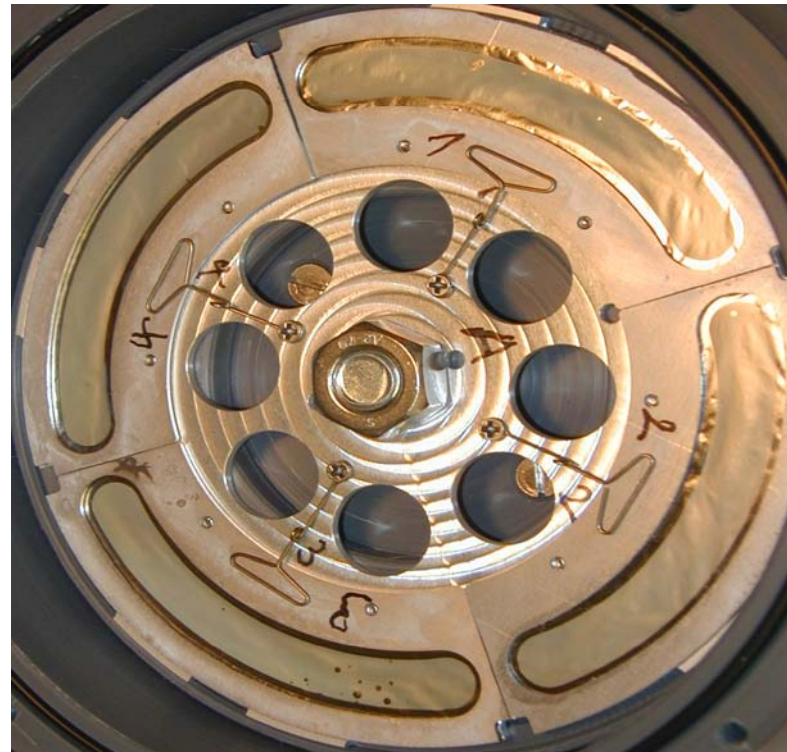
Ø Target Wheel: 32.5 mm
Ø Beam Spot: 6 mm



400 particle-nA

Used for E120 (2011):

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

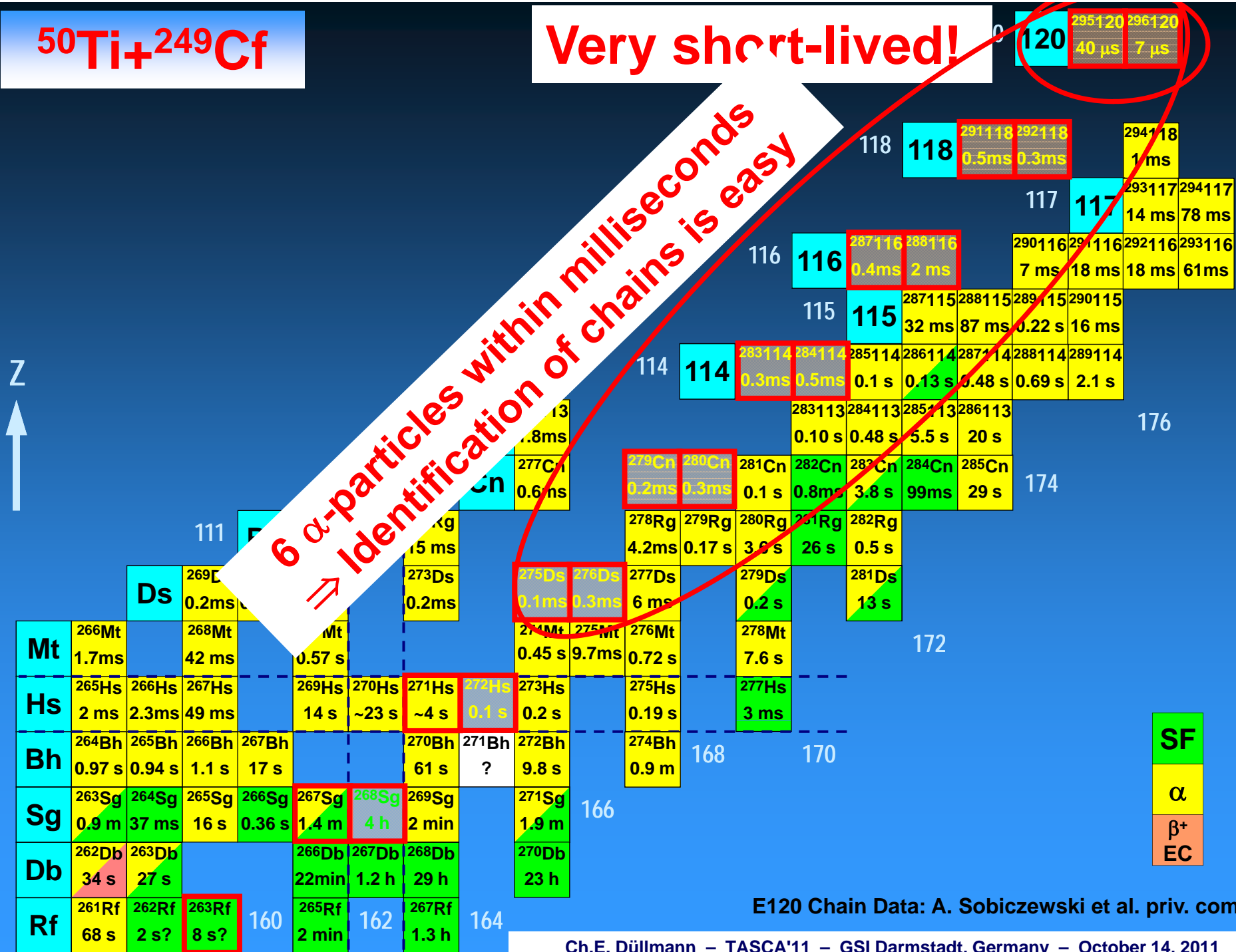


Target wheel tested up to
2500 particle-nA



Very short-lived!

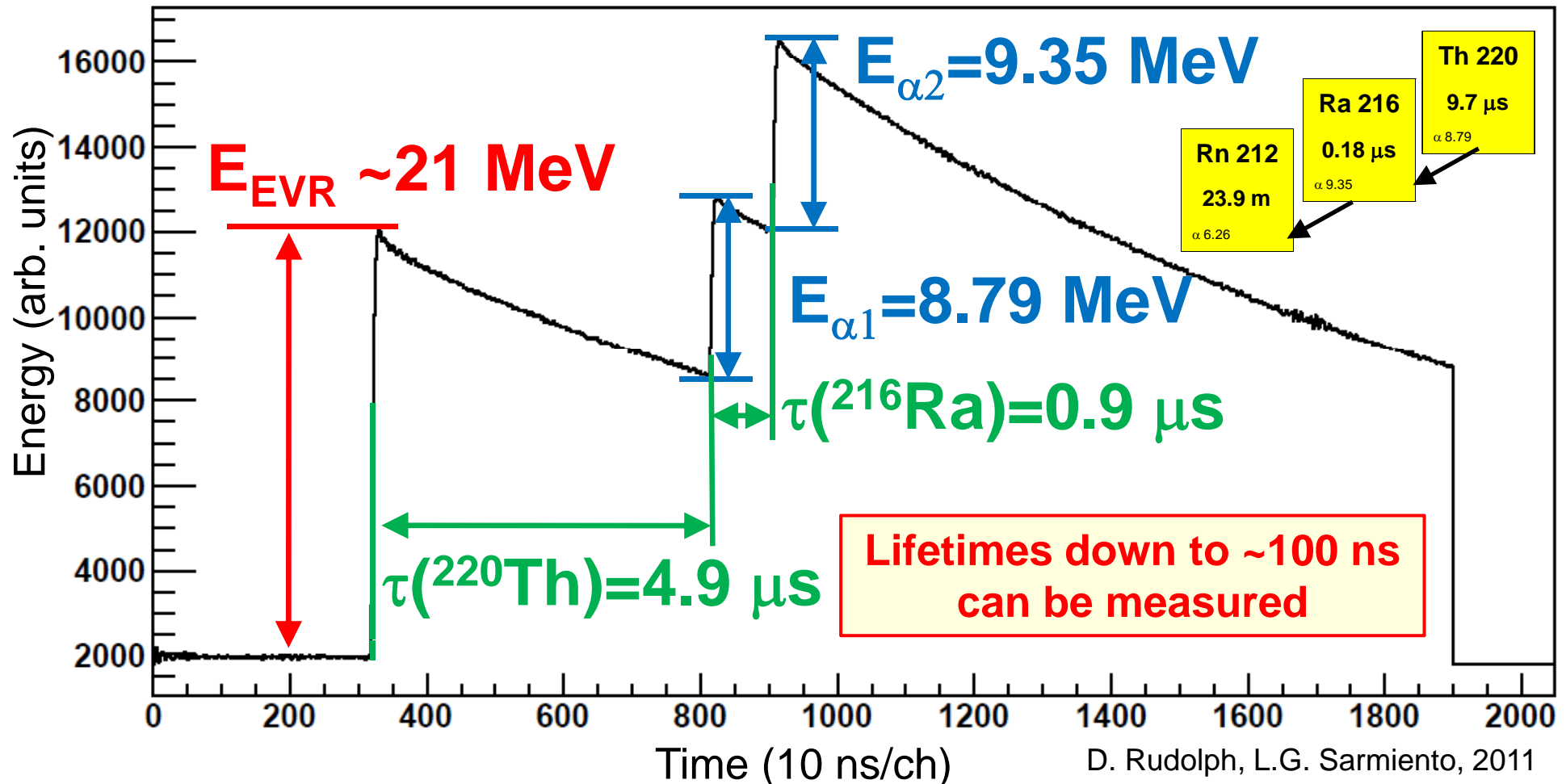
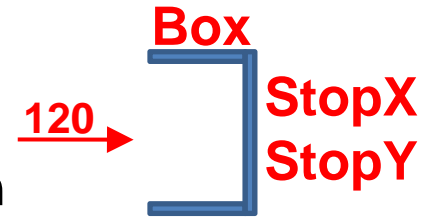
6 α -particles within milliseconds
 Identification of chains is easy



E120 Chain Data: A. Sobiczewski et al. priv. comm.

Detector / Data acquisition system

Fast digital electronics for StopY (48 Ch)
 "Analog" electronics for StopX + Box (272 Ch)
 Next step (ready to go): digital electronics for all Ch
 In-house development, GSI Experimental Electronics Department



NEWSFOCUS

9 September 2011 | \$10

Science

SUPERHEAVY ELEMENTS

Which Way to the Island

Last month at the Helmholtz Centre for Ion Research (GSI) in Darmstadt, Germany, a team of physicists and chemists from around the globe began firing an intense beam of titanium ions at a thin foil made of gold. The collision produced a few atoms of element 118, which scientists believe may be the start of a new island of stability. The discovery could lead to the synthesis of new elements and the development of new materials.

Publicity so far...

The image shows a YouTube video player interface. At the top, the YouTube logo is on the left, and a search bar with the text 'element 120 youtube' and a 'Search' button is on the right. Below the search bar, the video title 'Element 120 - Periodic Table of Videos' is displayed. Underneath the title, it says 'PERIODIC VIDEOS' followed by '359 videos' and a dropdown arrow, and a 'Subscribe' button. The video player itself shows a man with white curly hair and glasses, wearing a white shirt and a patterned tie, holding two blue and green spheres. Below the video player, there are 'Share' and 'Comment' buttons, a view count of '18,685', and a date of '17, 2011'. At the bottom, there is a partial sentence: '0 raise the issue of the so-called "island of' and a like/dislike bar showing '464 likes, 2 dislikes'.

You @ TASCA 11

Status of Bk-249 Target Material

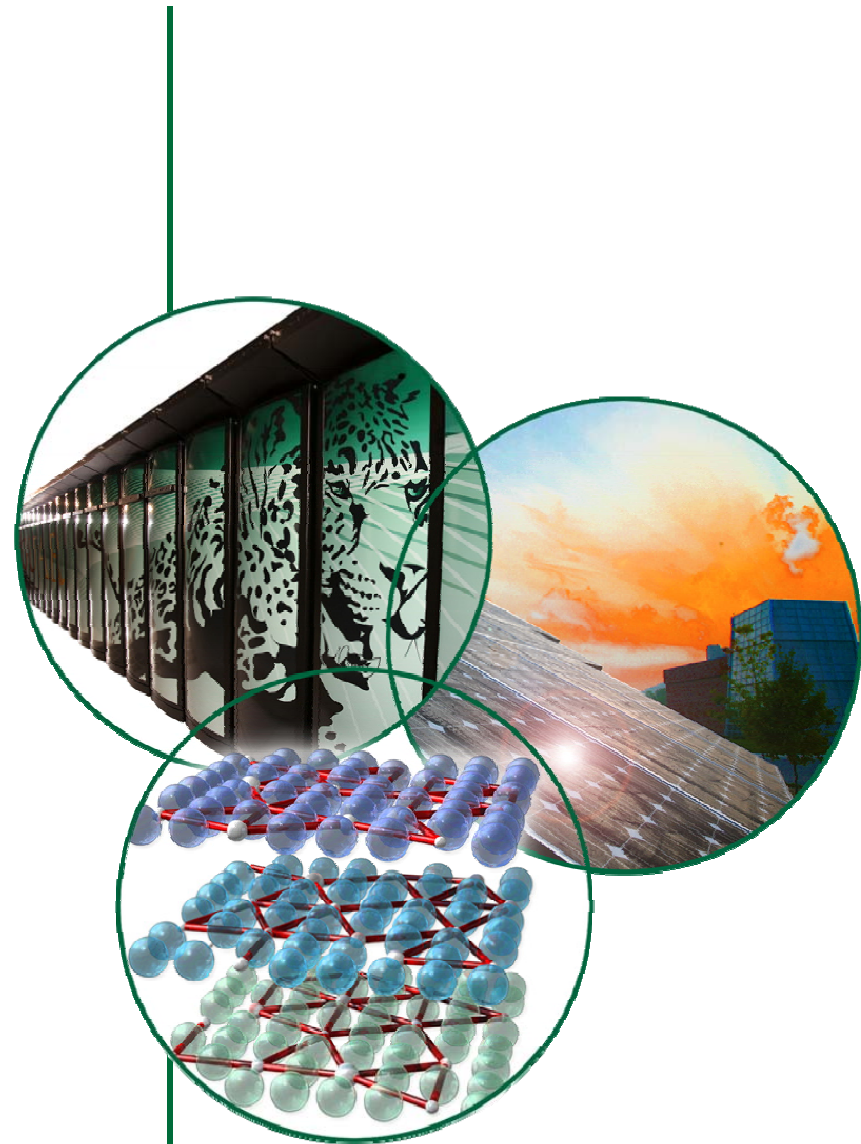
Julie G. Ezold and Jeff L. Binder
Fuel Cycle and Isotope Division
Oak Ridge National Laboratory

Meeting on Super Heavy Nuclei

TASCA 2011

GSI Darmstadt

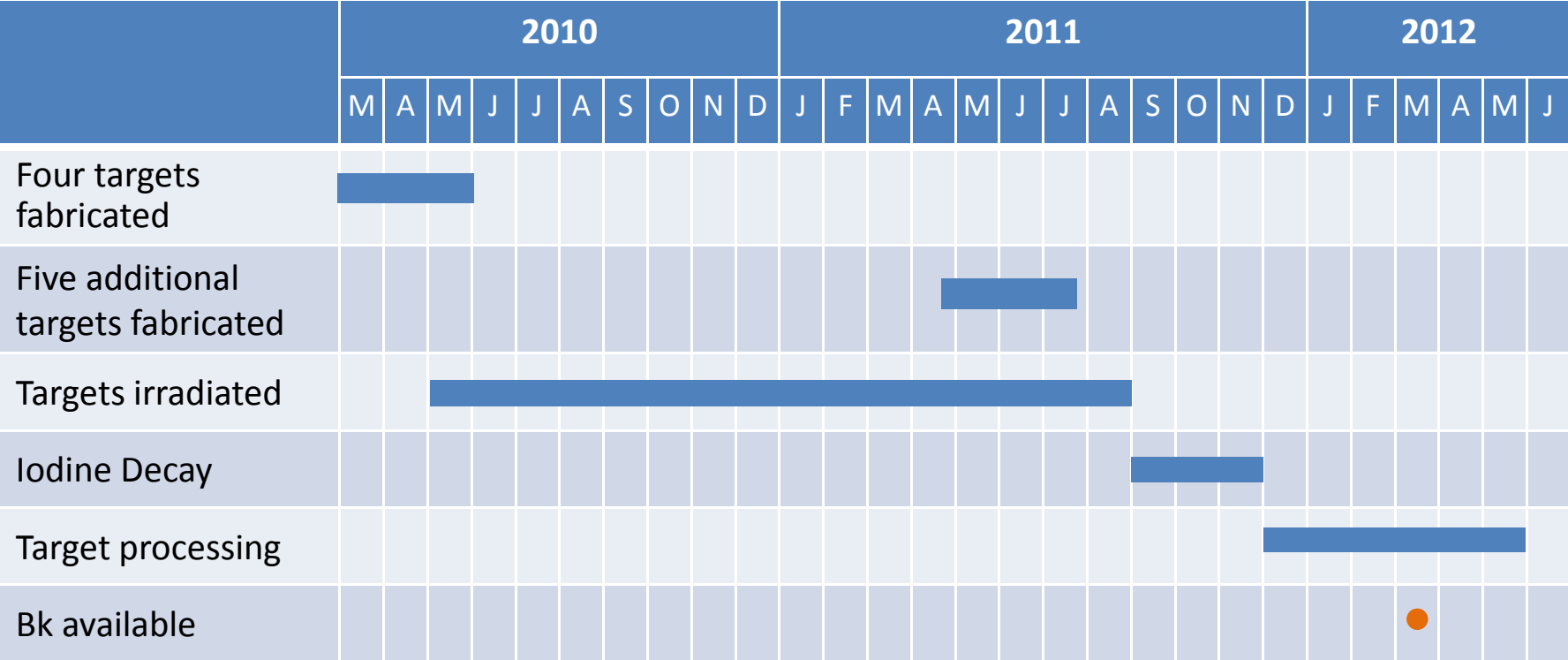
October 14, 2011



Bk-249 Target Material Status

- Nine Cm/Am targets have been irradiated at High Flux Isotope Reactor (ORNL, Oak Ridge) and are “cooling” in the reactor pool to allow for iodine decay
- Total Bk-249 estimated at 20+ mg for full campaign
- Radiochemical processing to begin early December 2011
- Bk-249 to be shipped the first week of March 2012

Timeline of Berkelium-249 Production



Summary: News from **TASCA**

Work at TASCA (and many more @ GSI and abroad) in 2011 focused on:

Development of:

- Beam
- Target
- Background reduction
- Implementation of digital electronics

-for the search of element 120

-and on readiness status of TASISpec for element 115

A first experiment with the reaction $^{50}\text{Ti}+^{249}\text{Cf}$ was performed and ended two days ago

Data are under evaluation

It was (and still is) an exciting **TASCA year!**

Outlook 2012: Finding E119 and E120