

WELCOME !!!

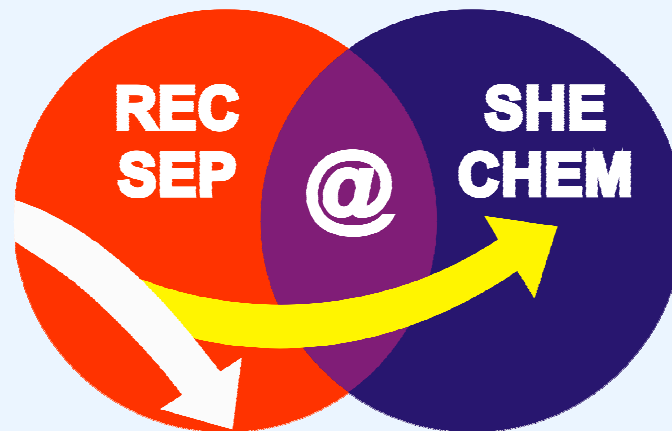
TASCA 08

7th Workshop on

**Recoil Separator
for
Superheavy Element Chemistry**

October 31, 2008

GSI, Darmstadt, Germany



TASCA 08

CHEMSEP 02 Darmstadt

CHEMSEP 03 Berkeley

TASCA 04 Darmstadt

TASCA 05 Oslo

TASCA 06 Garching

TASCA 07 Davos

Goals defined

Community formed

General separator discussions

Decision: Gas-filled separator

Start building *TASCA*

Define commissioning program

TASCA commissioning

TASCA 08 Darmstadt

Conclude commissioning prog.

Define 1st experiments ... ('09/'10)

Discuss long term perspectives

Status of **TASCA** – an overview:

A brief summary of our commissioning experiments

Matthias Schädel
GSI Darmstadt

TASCA 08

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TASCA Collaboration – Building + Commissioning

Major contributions from:



GSI, Darmstadt



TUM, München



LBNL, Berkeley



LMU, München



JYFL, Jyväskylä



Univ. Mainz



SAHA, Kolkata



Univ. Oslo



Efremov Inst., St. Petersburg



Univ. Lund



JAEA, Tokai

.... and many thanks to
"Gitta" for her work in the preparation of TASCA 08
Christoph for organizing the TASCA 08 program
Dieter for the technique,

TASCA Commissioning Program: Parameters Studied

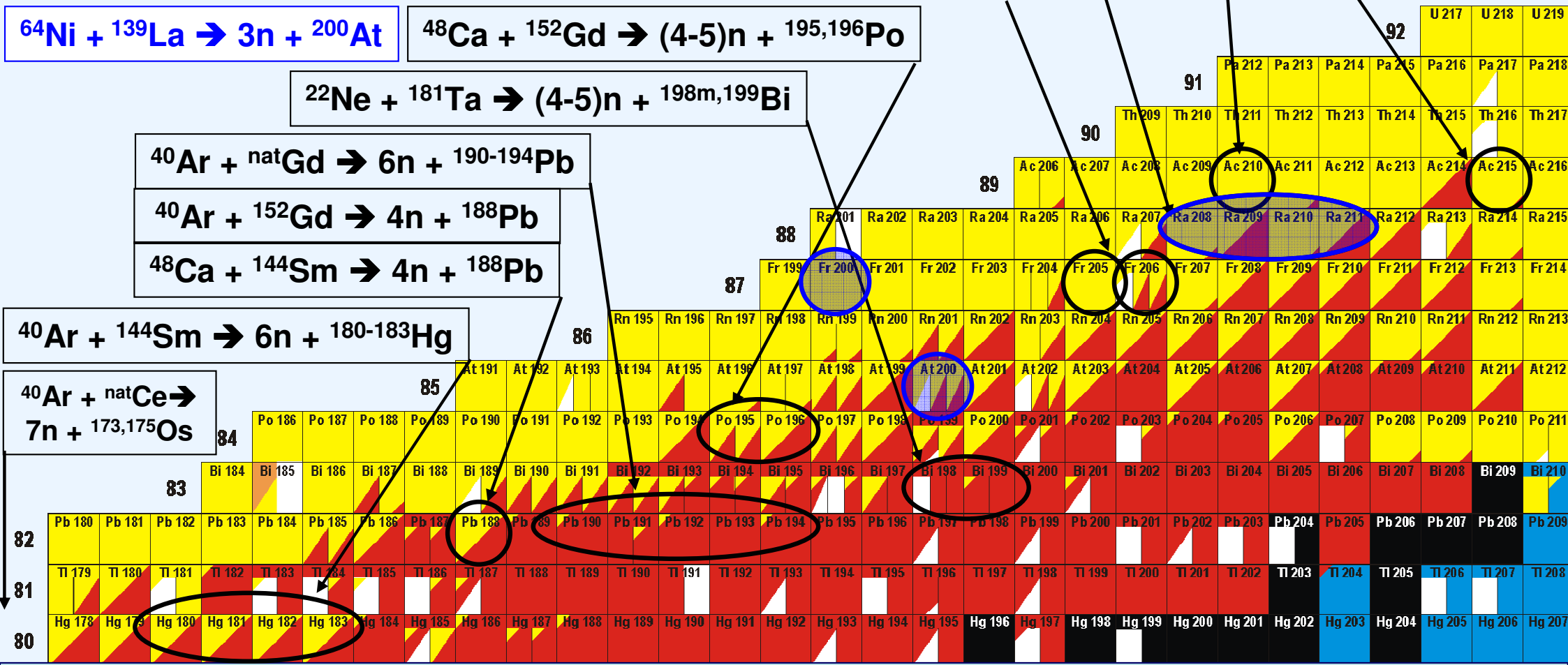
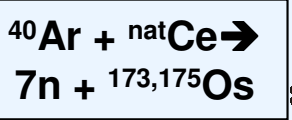
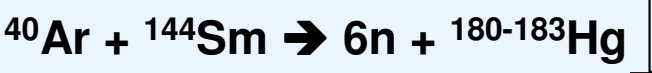
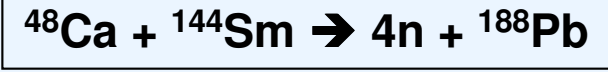
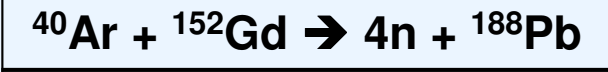
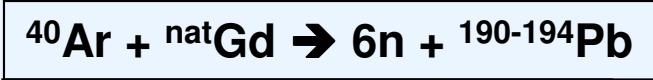
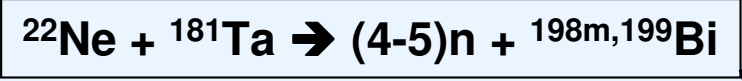
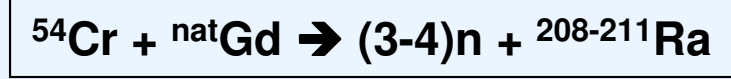
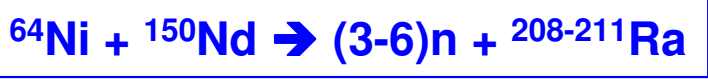
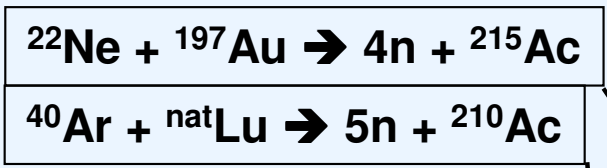
- Nuclear reactions

- Target production technique + target stability
 - Target thickness
 - Gas pressure (HTM, SIM)
 - Gases and mixtures He:H₂ (1:0, 3:1, 2:1, 1:1, 0:1)
 - Charge state, **B_p**; dipole setting, best experimental ↔ theoretical value
 - Transmission (HTM, SIM); (+ scattered, unwanted products)
 - Focus (HTM, SIM)
-
- Detection systems: FPD, TUM-DSSD, Lund-DSSD in *TASISpec*
 - RTC windows (incl. degrader) + chambers (HTM, SIM)
 - He-KCl jet transport → ROMA, → ALOHA + ARCA
 - First aqueous chemistry: Os (Hs-model), Rf (AIX)

TASCA Commissioning Experiments: Nuclear Reactions

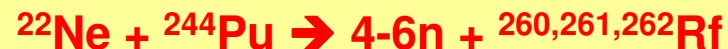
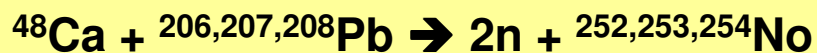
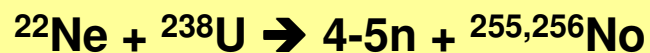
$Z_{CN} < 92$

TASISpec:

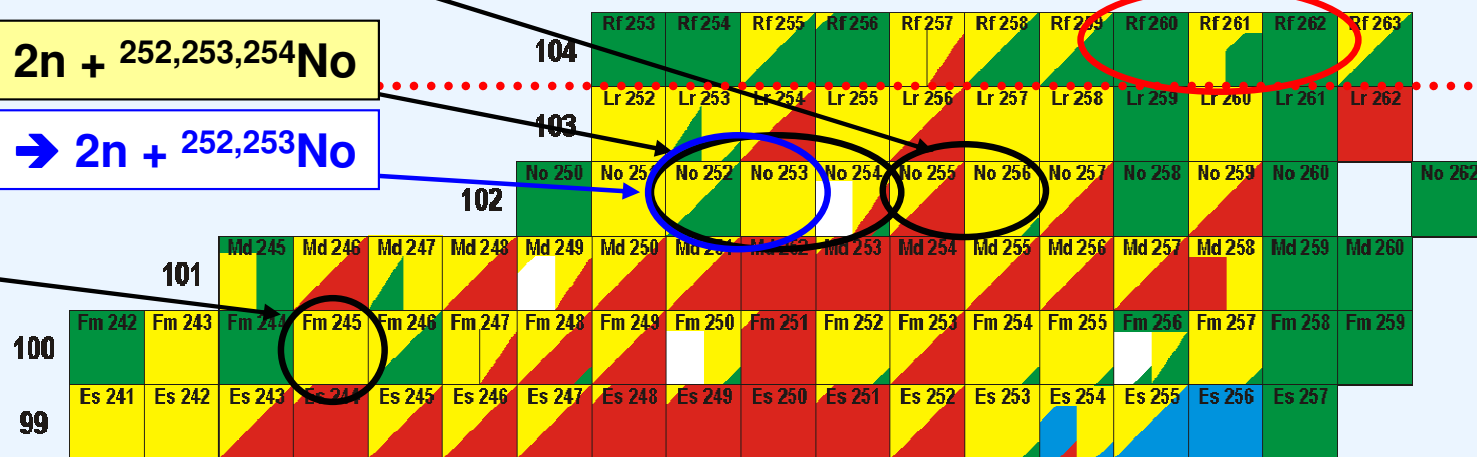


TASCA Commissioning Experiments: Nuclear Reactions

$Z_{CN} > 92$



Trans-actinides

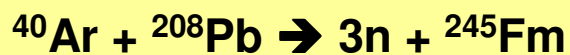
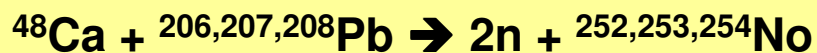
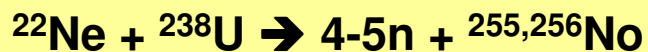


Many, many experiments + parameters studied:
A great success ! Transactinides reached!

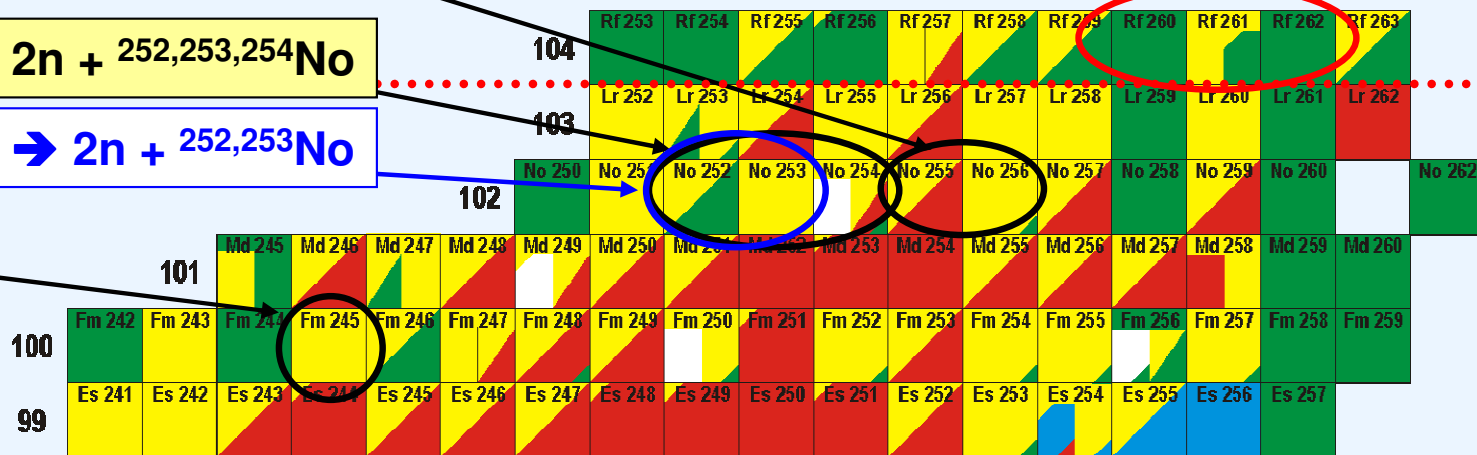
**TASCA – top performance as anticipated !
 Mission Accomplished !**

TASCA Commissioning Experiments: Nuclear Reactions

$Z_{CN} > 92$



Trans-actinides



Many, many experiments + parameters studied:
A great success ! Transactinides reached!

TASCA – top performance as anticipated !

FULLY ? Accomplished !



TASCA – Nuclear Reactions + Parameters Studied

Product	xn	Project.	Target	HTM Dip/Quad	SIM Dip/Quad	Target thick	Gas	Gas press	Det/Electr	RTC	ROMA	Chem
Os-173,175	7n	Ar-40	Ce-nat	x			He			x		AC
Hg-180-183	6n	Ar-40	Sm-144	x	x	x	He	x	G,M	x		GC
Pb-188	4n	Ca-48	Sm-144	x	x	x	He		G,M			
Pb-188	4n	Ar-40	Gd-152	x		x	He		G			
Pb-194-196	4-5n	Ar-40	Gd-nat	x	x	x	He		G	x		
Bi-198m,199	4-5n	Ne-22	Ta-181	x	x		He	x	G CATCH			
Po-195,196	4-5n	Ca-48	Gd-152	x			He		G	x	x	
At-200	3n	Ni-64	La-139		TASISpec		He		TASIS			
Fr-205-206	5-6n	Si-30	Ta-181	x	x		He, VAC	x	G,M			
Fr-200	5n	Ni-64	Pr-141		TASISpec		He		TASIS			
Ra-208-211	3-4n	Cr-54	Gd-nat	x	x		He	x	G			
Ra-208-211	3-6n	Ni-64	Nd-150		TASISpec		He		TASIS			
Ac-210	5n	Ar-40	Lu-nat	x	x		He,N2,mix	x	G,M			
Ac-215	4n	Ne-22	Au-197	x	x	x	He,H2,mix	x	G			
Fm-245	3n	Ar-40	Pb-208	x	x		He	x	G	x	x	
No-252	2n	Ca-48	Pb-206	x	x, TASISpec		He	x	G,TASIS	x	x	
No-253	2n	Ca-48	Pb-207	x	TASISpec		He		G,M,TASIS			
No-254	2n	Ca-48	Pb-208	x	x		He,H2,mix	x	G			
No-255	5n	Ne-22	U-238	x	x		He,H2,mix	x	G,M	x	x	
No-256	4n	Ne-22	U-238	x			He					
Rf-260	6n	Ne-22	Pu-244	x			He,H2,mix		G,M			
Rf-261	5n	Ne-22	Pu-244	x			He			x	x	AC
Rf-262	4n	Ne-22	Pu-244	x			He,H2,mix		G,M			
Background	no	Ca-48	Pu-244	x	TASISpec		He,H2,mix	x	G,M,TASIS			

TASCA Commissioning – Brief Summary I

TASCA is – Operational

- Working \approx as anticipated / calculated
- Ready for TAN / SHE experiments ✓

HTM: - **High efficiency !!!** ✓

- Qualitatively: experim. = calcul.
- Good image size → Competitive

SIM: - **Small spot** in FPD / RTC ✓

- Good efficiency → Unique
- Quad-Focusing qualitatively OK

Gas: - He operation – routinely ✓

- He/H₂-mix + H₂ operation started
- Unique, low background !

HTM: - Efficiency data need evaluation

- B_p-values need compilation and comparison w/ calculations

SIM: - Quad-Focusing +

- efficiency data need evaluation
- Improvements still possible ?

Gas: - More gases to be tested

- Best mixtures to be found
- B_p \approx 2.3 Tm limitation

TASCA Commissioning – Brief Summary II

FPD: - 16-strip GSI-PIPS operational ✓
- TUM-DSSD prototype tested: OK
- SIM Lund-DSSD-box tested: OK

DAQ:- GSI/SHIP-type ≈ operational ✓
- TUM COMPAC-type operational
- GSI-Lund(RISING) operational

TASISpec: ✓
- α - γ -coincidences measured: OK
- **Very high efficiency in SIM**

Data eval: - Huge amount of rough data ✓
- First, exciting prelim. results

FPD:
- Big TUM-DSSD-box under constr.

DAQ: - New preamps/adapters in prep.
- New electronics ordered
- **More electronics needed !!!**

Det: - **TOF missing !** – but: in preparation
- e^- missing – for **TASISpec** in commiss.
- punch-through missing – in preparation
- Rutherford missing – but: TMP sufficient ?!

Data eval: **Need for manpower, coordination, communication, ! – However, we are (seem to be ?) on a good way !!!**

Commissioning Experiments – Brief Summary III

Control: - Fully operational ✓

Target:- ARTESIA running: OK ✓
- PbS, Th, U, **Pu** + Ti tested: **OK**
- Safety-box installed

RTC-windows: HTM + SIM ✓
large + thin + stable: **OK**

HTM-RTC: - Successful tests: **OK** ✓

SIM -RTC: - First successful tests

ROMA: - First successful experiments ✓

ARCA + ALOHA:
- First successful Os + Rf chemistry

Control:- Vacuum/gas remote control +
- safety/interlocks in preparation

Target: - U-target chamber ready
- Pu-, Cm-, Bk-target prod.@MZ

HTM-RTC:- Efficiency may be improved

SIM -RTC: - Potential not fully exploited

ROMA: - Significant improvement
urgently needed

The most important task of this **TASCA 08** workshop

Discuss + define a scientific program at **TASCA**
and
agree on the planned experiments 2009/10
Today !

- Collaboration / participants
- Spokesperson
- PROPOSAL
- Beam time request ('09/10)
- Beam time preparation: who - what – when
- Data evaluation !