**TASCA** – **T**rans**A**ctinide **S**eparator and **C**hemistry **A**pparatus

1st Workshop on Recoil Separator for Superheavy Element Chemistry, March 2002, GSI

- community formed (> 70 participants, 10 countries, > 20 institutes)
- discussion of possible schemes for a technical realization
- discussion of possible / desired experiments

2nd Workshop on Recoil Separator for Superheavy Element Chemistry, Nov. 2003, LBNL

- BGS continues operation at LBL's 88-inch; start TASCA with NASE components
- planning for TASCA at X8/9 starts early in 2004

GSI establishes an official collaboration with TU Munich (Institut für Radiochemie) to build a dedicated physical recoil separator for coupling of chemistry experiments with superheavy elements, 2004-2006

3rd Workshop on Recoil Separator for Superheavy Element Chemistry, August 2004, GSI, TASCA04: [http://www.gsi.de/tasca04/](http://www.gsi.de/tasca04/) working groups started on specific tasks for TASCA; advisory committee
Recoil separator
with maximized transmission (efficiency)
for transactinides (SHE)
from hot-fusion reactions with actinide targets,
in particular for:

* Chemical investigations of elements 104 -- 116

* Nuclear structure and nuclear reaction investigations
  of the most n-rich nuclides

* "Chemistry" in the separator – probe the influence of the gas

* Basic studies to design the next generation "best" TASCA
Chemistry Experiments with TASCA

**New techniques:**
- **Aqueous phase:**
  - miniaturized µ-SISAK: Bh
  - potential controlled electrodeposition: 112
- **Gas-phase:**
  - volatile/gaseous organic compounds: Rf-Bh
  - ultra-fast vacuum thermo-chromatography: 116

**Proven techniques:**
- **Aqueous phase:**
  - fast centrifuge system SISAK: Rf-Sg
  - quasi-continuous, fast column chromatography
- **Gas-phase:**
  - gas-chromatography (volatile compounds): Rf-Bh
  - thermo-chromatography (volatile elements) 112-114

All technical developments are ongoing programs at other institutes.
TASCA – Status - I

* TASCA ion optical calculations, design studies, .. progress (A. Semchenkov)

* TASCA magnet calculations, design studies, .. (Efremov Inst., St. Petersburg)

* NASE and UNILAC components were secured (magnets: dipole, 3 quads; 2 power supplies, vacuum chambers, stands, ...)

* The best (and only possible) UNILAC beam line (X8/9) was selected; close to chemistry laboratory

* Ion optical/beam transport calculations for beam to TASCA at X8 performed

# Accelerator group starts building a new beam line to (new) Z7 on Dec. 16; it should be finished by Feb. 03, 2005.

# Moving the existing X8/9 experiment to a new beam line will begin in Feb. '05

# Setting up TASCA is envisioned to begin in March '05
TASCA Dipole Magnet

former "NASE" or "HECK" dipole
TASCA Quadrupole Magnets

former "NASE" or "HECK" quadrupoles
DQ$_h$Q$_v$ - configuration

A. Semchenkov
TASCA04
August 2004
TASCA – Status - II

* Detailed **floor plan** (drawing) for the **TASCA cave** was made including the beam line, the TASCA separator, infrastructure, shielding, ...

* **Shielding** material secured (concrete, paraffin)

* Major reconstruction of the **shielding** along the X-branch initiated

* Evaluation of the statics situation in X8/9 started

* First (preliminary) information was given to the **state authorities** issuing the operation permit; GSI's health physics / **radiation safety group** is involved

* Detailed **calculations** for the necessary shielding were performed and approved drawings are ready

* Estimate of total **cost** for **TASCA** and the **infrastructure** (including shielding) was made -- and was submitted to the GSI directorate after a **recommendation from the Scientific Council of GSI to build TASCA** and a positive response from the GSI directorate to do so.
WE HAVE:

- Beam line with diagnosis
- 2 vacuum pumps
- 1 dipole magnet
- 3 quadrupole magnets
- 2 power supplies
- Most stands
- Quadrupole mass spectrometer
- Vacuum chambers, beam dump
- Some preliminary detectors
- Some data acquisition
- Detector chambers
- Concrete and paraffin shielding
- Some infrastructure
- Enthusiastic colleagues...

WE NEED:

- Experiment beam diagnosis
- Wobbler
- 1 vacuum pump
- Vac. chambers - diff. pumping - target
- 2 power supplies
- Some stands
- Gas supply and control system
- New vacuum chambers, beam dump
- Focal plane detectors
- Data acquisition
- RTC
- More concrete and paraffin shielding
- Crane, water, electr., exhaust line, ...
- More enthusiastic colleagues...
Tasks / Working Packages – I – TASCA

A: Differential pumping, gas control (pressure, purity, exhaust, recycling,...)
   A. Türler et al.

B: Target (preparation, rotation, safety, control, cooling,...), window, collimator
   K. Eberhardt et al.

C: Separator: A. Semchenkov et al. (1), M. Schädel et al. (2)
   1. Ion optics, magnets, power supplies
   2. Mechanics (support structures, vacuum chambers, beam dump, ...)

D: Focal plane D. Ackermann et al. (1), A. Yakushev et al. (2)
   1. Detectors, data acquisition
   2. RTC, transport

→ http://www.gsi.de/tasca

Convener
TASCA (DQQ) – with Target Area
ARTESIA
GSI Target Wheel

For experiments at X1 with 25% duty cycle and 5 ms pulse length

2000 rpm:
120° → 10 ms
Sequence: 1-3-2-1-...