

## 5.8. Mr Burkhard Schillinger (Germany)

### Introduction

The ANTARES facility for neutron imaging is currently completely refurbished and will restart operation in summer 2012. ANTARES will again provide the combination of highest flux and highest resolution worldwide in neutron imaging. Additional methods include energy-dependent measurements (Bragg edges) for the identification of different elements and phases as well as (soon) phase gratings for linear phase contrast.

With the collaboration partners The University of Queens (Canada), The Archäologisches Landesamt für Denkmalpflege in Esslingen, Germany, and Archäologische Staatssammlung of Bavaria, Germany, research at ANTARES will focus on the examination of organic materials in combination with metal artefacts.

- The University of Queens (Canada) possesses a huge collection of Roman and other coins that need to be identified and restored, often to give contextual information about their place of discovery. Research at ANTARES will include radiographical and tomographical examination of a large part of this collection.
- The Archäologisches Landesamt für Denkmalpflege in Esslingen will provide artifacts of cloth stuck to metal objects for further examination with Neutron computed tomography to analyse different organic materials out of early medieval burials in Southern Germany. The measurements will help to get some very new detailed information about their usage and ancient manufacturing techniques. The results will also be important for investigation of original functions, reconstruction of early medieval clothes and for studies of ancient funeral rites.
- Archäologische Staatssammlung of Bavaria is involved in many bronze or iron age excavations in South Germany that lie underwater, in swamps or moist soil. Artifacts found there often contain small remains of textile cloth attached to leather or metal artifacts. Neutron computed tomography will be used to examine artifacts made of composed anorganic and organic materials, like corroded swords in scabbards. Another aspect is the shifting of the contrast by impregnating the objects with different organic substances e.g. resins during the conservation process. This phenomenon should be observed as a side effect of the study.

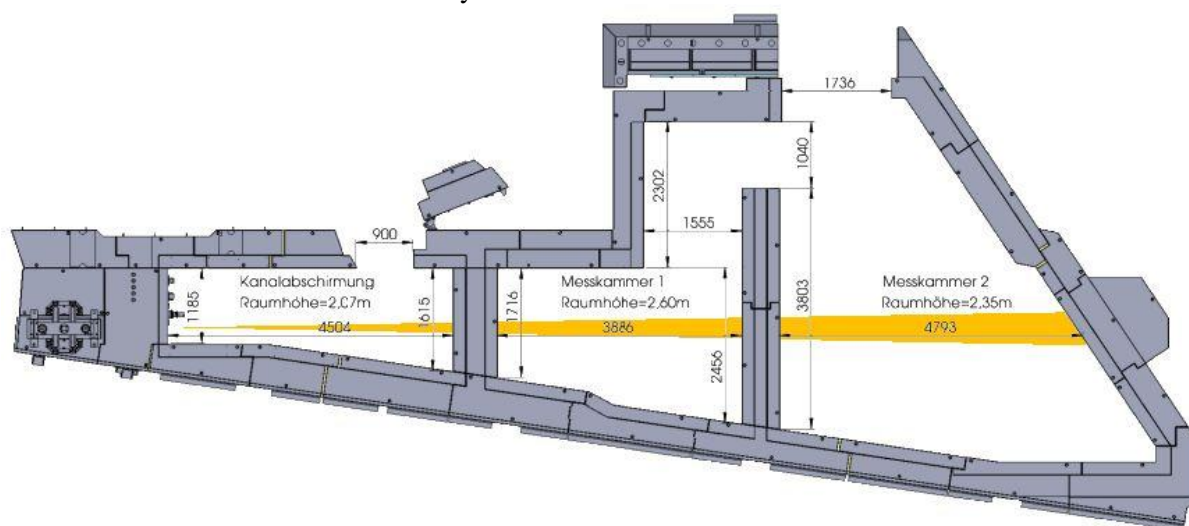


Figure 1 - The ANTARES facility:

Experimental facility:

Chamber 2:

- Large & heavy samples (manipulator load capacity: 500kg)
- Beam size: 350 x 350mm
- Same beam properties as old ANTARES
- L/D ratio 200 ... 7100
- All components movable on rail system

#### Chamber 1:

- L/D ratio 100 ... 3600
- $1.6 * 10^9$  n/cm<sup>2</sup>s (@L/D=100)
- Smaller beam size / small samples (<15cm)
- Low background
- Higher initial intensity (closer to reactor) for low count rate measurements:
- Polarized Imaging
- Monochromatic Imaging
- Grating Interferometry
- Roof elevation for cryostats

#### Beam formation area:

- Separately accessible
- 6 collimators in a drum
- Fast shutter
- Filters
- Double Crystal Monochromator
- Velocity Selector
- Polarizer
- Periscopes
- All flight tubes are He-filled, Non-magnetic

Detection systems: 2k x 2k cooled CCD, 4k x 4k cooled scientific CMOS, 1k x 1k CCD with gated image intensifier, 30 fps video camera with image intensifier

#### *Workplan year 1:*

- Re-establishment of the ANTARES facility and its control and work parameters, as control software, tomographic reconstruction software and 3D raytracing software.
- Radiography and tomography measurements of first batch of coins and textiles.
- Standardization of measurement parameters.
- Exchange with other international groups.
- Grant access for other groups.
- Also: Provide hardware and software information, especially free software, for beginners about to install tomography setups at their reactors.