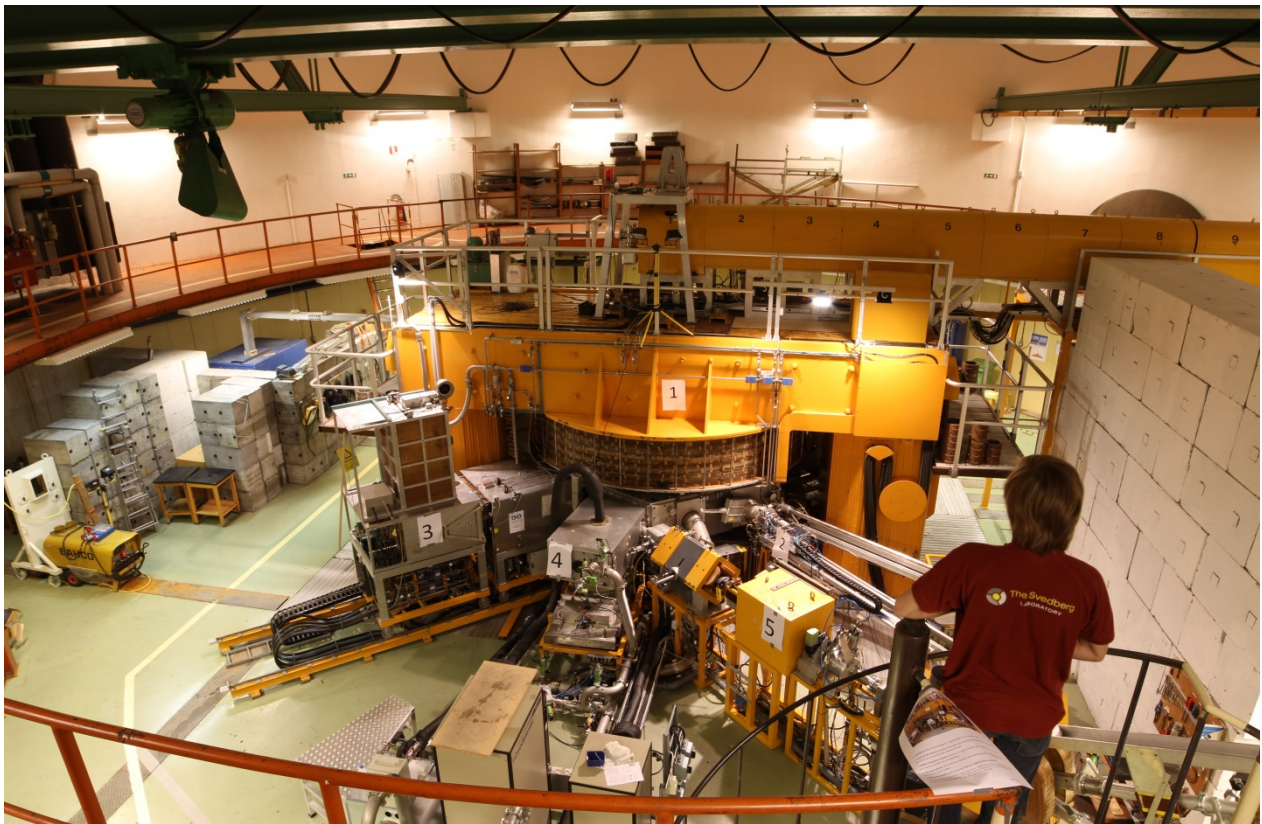


The Svedberg Laboratory (TSL)



Picture 1. The Gustaf Werner Cyclotron at TSL

TSL is an accelerator laboratory at Uppsala University. It has been used for research in basic and applied nuclear physics and for proton therapy of cancer patients.

Currently TSL is being decommissioned. A large part of this work concerns the determination of the type and amount of radioactivity of the objects and areas in the laboratory.

Methods are being developed and used to measure both gamma and beta radiation.

The measurements are complemented by Monte Carlo simulations.

Master Thesis Project 1

Measurements of Radioactive Samples using Liquid Scintillator Counting

The task of the project is to commission a liquid scintillator counter to be used for measurements of samples taken from the buildings and objects that have been activated during the period of operation of TSL. Nuclides of interest are for example ^3H and ^{63}Ni . The work can be divided into the following parts:

1. Learn the basics of liquid scintillator counting
2. Commission, test and calibrate the counter
3. Sample preparation
4. Measurements of some real samples
5. Evaluation of the results and recommendations for further use

Start date: August - September 2017

Contacts:

- Elke Passoth <elke.passoth@physics.uu.se>
- Johan Nyberg, johan.nyberg@physics.uu.se



Picture 2. Liquid scintillator counter

Master Thesis Project 2

Determination of Nuclide Vectors for TSL

The decommissioning of the laboratory includes a radiological characterization of the rooms and the equipment that shall be decommissioned. In this context, many measurements of gamma and beta radiation have to be done. A powerful instrument in this connection is to use so-called nuclide vectors.

By measurements of a key nuclide (for example ^{60}Co), it is possible to calculate the activity for other nuclides in the sample. For this method, an extensive analysis of existing measurements is needed to define one or more nuclide vectors for the buildings and equipment in the facility.

The main part of the project is to use existing measurements of concrete samples and identify other places where additional measurements must be done.

Start date: August - September 2017.

Contacts:

- Elke Passoth <elke.passoth@physics.uu.se>
- Johan Nyberg, <johan.nyberg@physics.uu.se>

Nuclide	Specific activity (Bq/(gW))	
	[Silari, 2004]	[Fasso, 1999]
H-3	0.08	0.039
Na-22	0.05	0.088
Sc-46	0.32	0.39
Mn-54	6.2	10.3
Co-56	1.2	1.4
Co-57	5.1	8.3
Co-58	6.6	7.7
Co-60	0.2	0.58
Sr-85	0.26	0.3
Y-88	0.03	0.034
Zr-88	0.03	0.031

Typical nuclide vector for steel per W of beam loss, applicable for CERN [Silari, 2004] och SLAC [Fasso, 1999]

Picture 3. Nuclide vector table for steel