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Universities meets Laboratories

The situation in Sweden

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Kingdom of Sweden

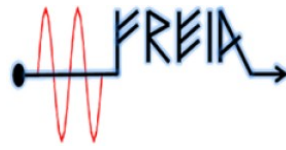


- Pop: 9.6 million (1/8 x Germany)
- Area: ~450 000 km² (1.2 x Germany)
- BNP: 430 GEuro (1/6 x Germany)
- Three cities with accelerator history
 - **Uppsala:**
 - TSL, FREIA
 - **Stockholm:**
 - MSL
 - **Lund:**
 - Maxlab
 - European Spallation Source

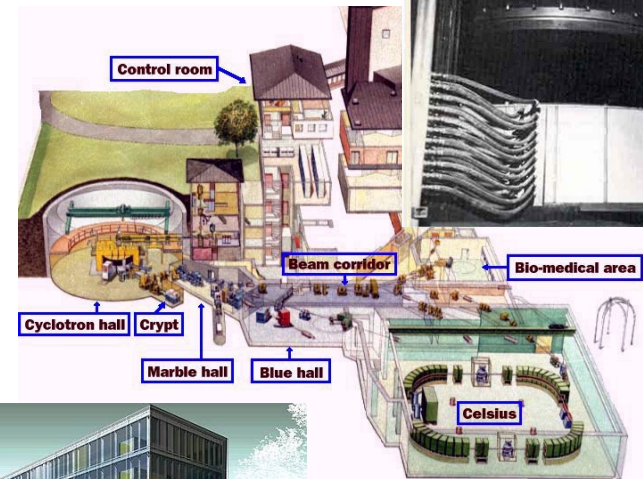
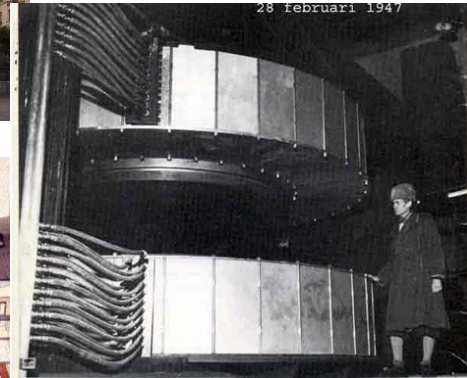


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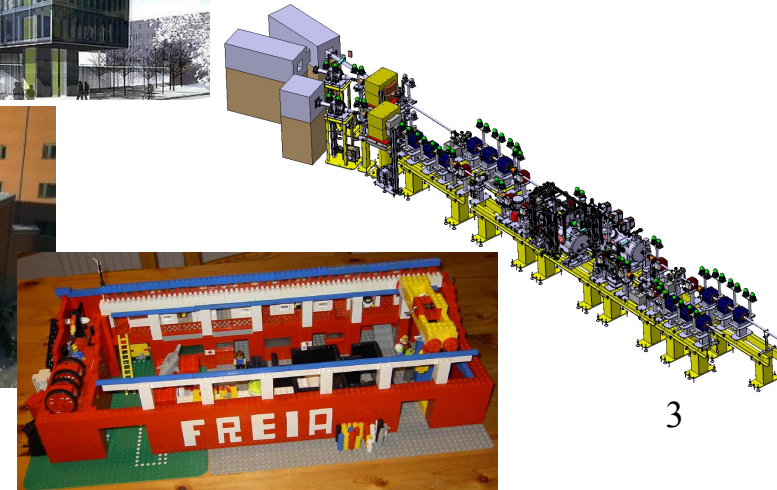
Uppsala History



- Uppsala University (1477-today)
 - ~30k students, 6k staff,
 - 430 MEuro annual budget
- Synchro-Cyclotron (1947-today)
 - Nuclear physics
 - Cancer treatment (1957!)
- CELSIUS cooler ring (1984-2005)
 - Nuclear physics
- Skandion proton-therapy clinic (2015)
- CTF3, FLASH, XFEL (2005-today)
- FREIA (2010-today)
 - RF@ESS
 - THz-FEL

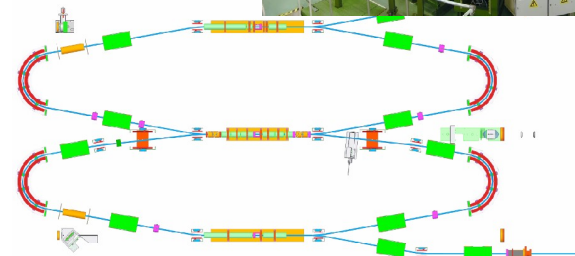
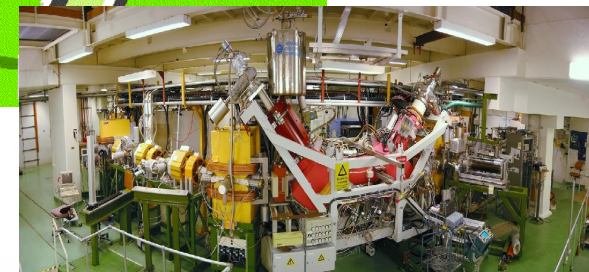
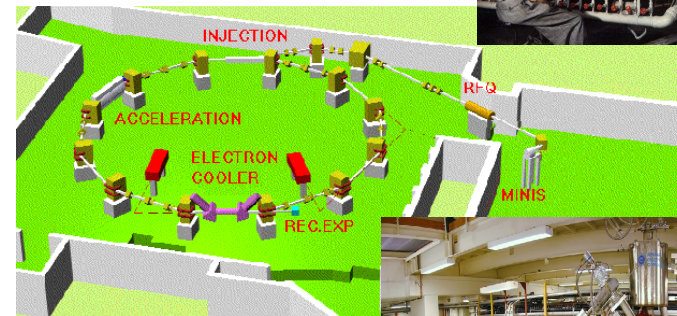
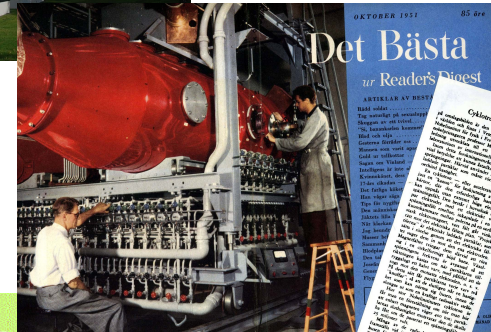


Situation in Sweden



Stockholm History

- Stockholm University (1878-today)
 - 30k students, 5k staff
- 80 cm cyclotron (1939)
- 225 cm cyclotron (1950-1986)
- Cryring (1986-2010)
 - atomic and molecular physics
 - moved to FAIR
- DESIREE (2010-today)
 - electro-static double ring





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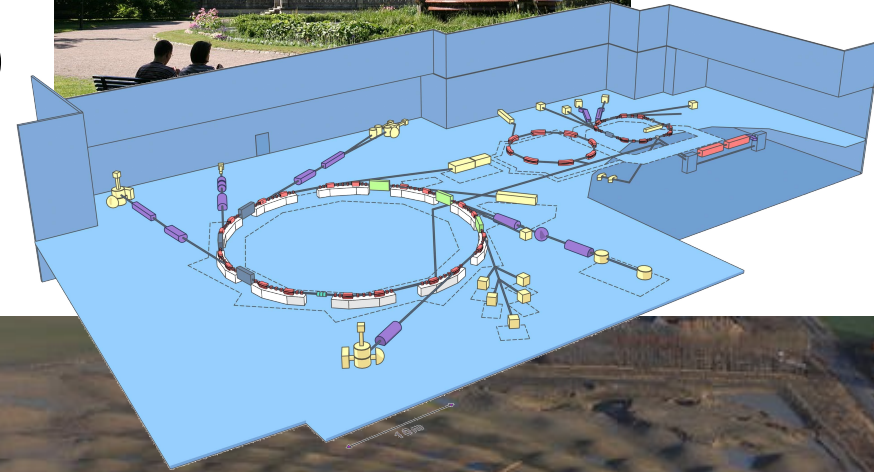
Lund: Maxlab History

MAX IV



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- Lund University (1666-today)
 - ~30k students, 7k staff, 844 MEuro
- National Laboratory (1982- today)
 - hosted by Lund University
- MAX (1986-today)
- MAX II (1995-today)
- MAX III (2007-today)
- MAX IV (2015-today)
 - 3 GeV, 528 m
 - 1.5 GeV, 96 m





Lund: ESS History

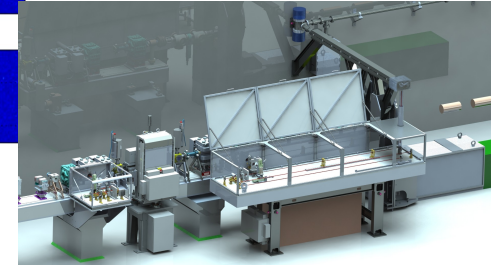
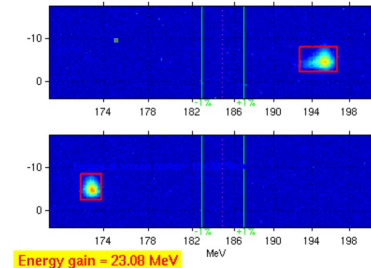
- 2009 Lund was selected as the site for the European Spallation Source on the European ministerial level.
- Budget: ~1.8 GEuro, 250 staff today
- Socio-economic reasoning
- Photons and Neutrons
- 5 MW protons on target
- ESS accelerator physicists looked for collaboration partner in Sweden
 - Lund University
 - Uppsala University → FREIA



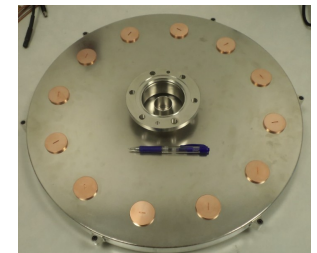
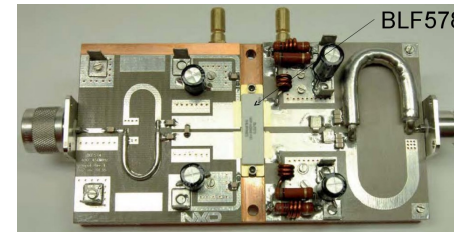
Some Political Background

- Initially the accelerators were 'large research apparatus' operated by the Universities.
- For a while there were three 'National Accelerator Laboratories' hosted by their respective Universities.
 - Maxlab in Lund: (1983-today)
 - Manne Siegbahn Laboratory in Stockholm (1995-2003)
 - The Svedberg Laboratory in Uppsala (1994-2003)
- Closing two of the Nat'l facilities caused some pain and reorientation (e.g. Stockholm-Uppsala FEL center)
- 2009 the European Spallation Source came to town...

So, what do we do today? Uppsala



- Science: (Staff: 3+2 in HEP, ~12 FREIA)
 - Two-beam test stand and XBOX in CTF3@CERN
 - XFEL laser heater, Swedish in-kind contribution
 - FREIA: Develop and test RF system for spoke-cavities (90-220 MeV) in the ESS.
 - RF-power generation+distribution, cryogenics
 - Solid -state amplifier development
 - High-power tests of spoke cavities
 - THz FEL studies.



- Education:
 - Accelerator physics and technology (10 ECTS, ~10 students/year incl 5 doctoral students, many Erasmus)
 - Accelerators and Detectors (5 ECTS, ~15/year, hands-on in tandem lab quad scan plus D-D scattering)
 - 3 current doctoral students: (1 CERN, 1 CLIC, 1 FREIA) + 2 incoming + 2 completed 2013;
 - home base for CERN doctoral students: one today, 2 more earlier.
 - 2 recent master degrees, about one undergraduate project work per year.

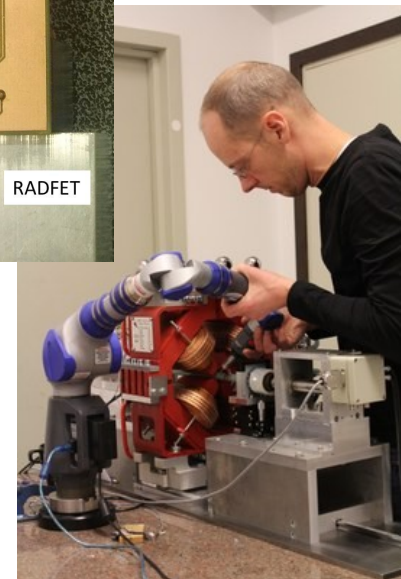
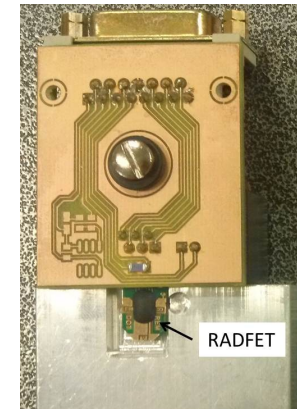
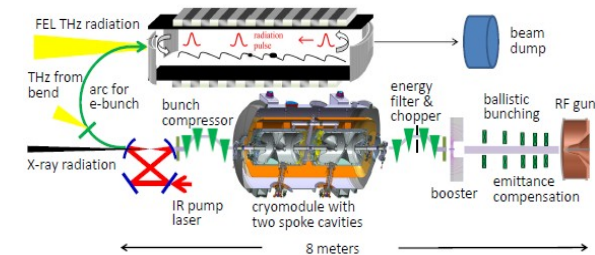
So...today? Stockholm

- Science:

- Stockholm-Uppsala FEL center with planning of THz FEL in FREIA
- Commissioning and operating DESIREE and Ion traps
- Several Swedish in-kind projects for XFEL: Magnet fiducialization, Investigate hybrid magnets, radiation monitor for undulators, Fresnel zone-plates.

- Education:

- Course in accelerator physics, every other year (7.5 ECTS, ~8 students)
- Diploma students





So...today? Lund



- Science:
 - operating MAX I, II, III
 - building MAX IV and injector linac
 - planning for X-ray FEL
- Education: (shared dept NFac)
 - Accelerators and FELs (7.5 ECTS, ~ 10 students incl 5 doctoral students)
 - Production of photons and neutrons(7.5 ECTS, ~ 15 students incl 5 doctoral students)
 - Synchrotron radiation user courses (Introduction to accelerators and FEL, introduction to synchrotron radiation science, Experimental methods of s.r.s, Frontiers of science)
 - Master program on “Synchrotron radiation based science”
 - 6 (acc)+2(sr) current doctoral students
 - 2 or 3 master degrees/year and 2-3 other undergraduate project work/year.





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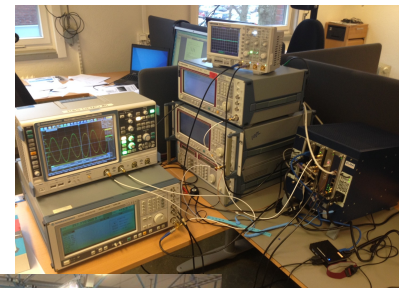


So...today? ESS

- Science:
 - building the spallation source
- Education:
 - Host for external students for PhD and master studies (about 25-35 total).
 - Collaboration with Universities in Europe for in-kind contributions to ESS.
 - Interaction with **Uppsala University** resulting in FREIA and 1+2 doctoral students.
 - Interaction with **Lund University** for LLRF, cavity development for n.c. accelerator, klystron modulators, 3 master thesis, 1 PhD student in 2015
 - Initiative for a Baltic Accelerator School



Ground breaking Oct 2



- Nuclear physics department
- Home institution for CERN doctoral students
- Development of components for radioactive ion-beams, such as ion sources, polarized beams and data acquisition (CERN-ISOLDE, and GSI-FAIR)
- Laboratories important to attract students and for inspiring visits during undergraduate education.



Summing up

- Collaboration of the accelerator-universities in Uppsala, Stockholm and Lund with ESS, XFEL, CERN, FAIR.
- ESS and other labs turn this around and collaborate with academia (which is not a 'bad' word, by the way).
- Synergies exist! (Maxlab, FREIA, Chalmers, SU)
- Accelerators got too expensive, which caused closing some (painful!). Concentration towards 'Big Labs'.
- Universities with accelerator courses should be a recruitment base; with limited success in Uppsala but better in Lund.