PAUL SCHERRER INSTITUT

PSI

Wir schaffen Wissen – heute für morgen

ECFA meeting at PSI, July 19, 2012

Overview about PSI

Martin Jermann

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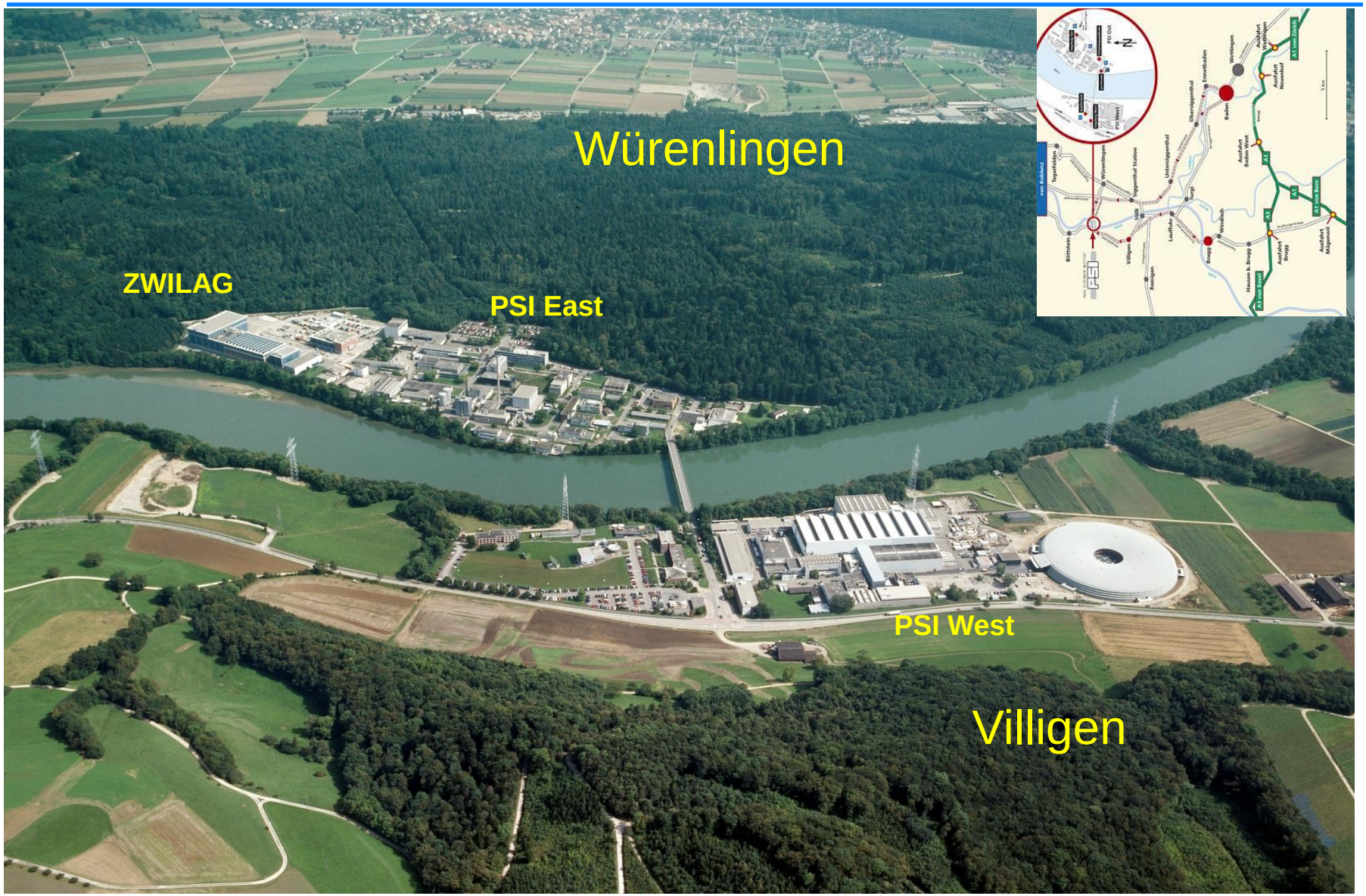
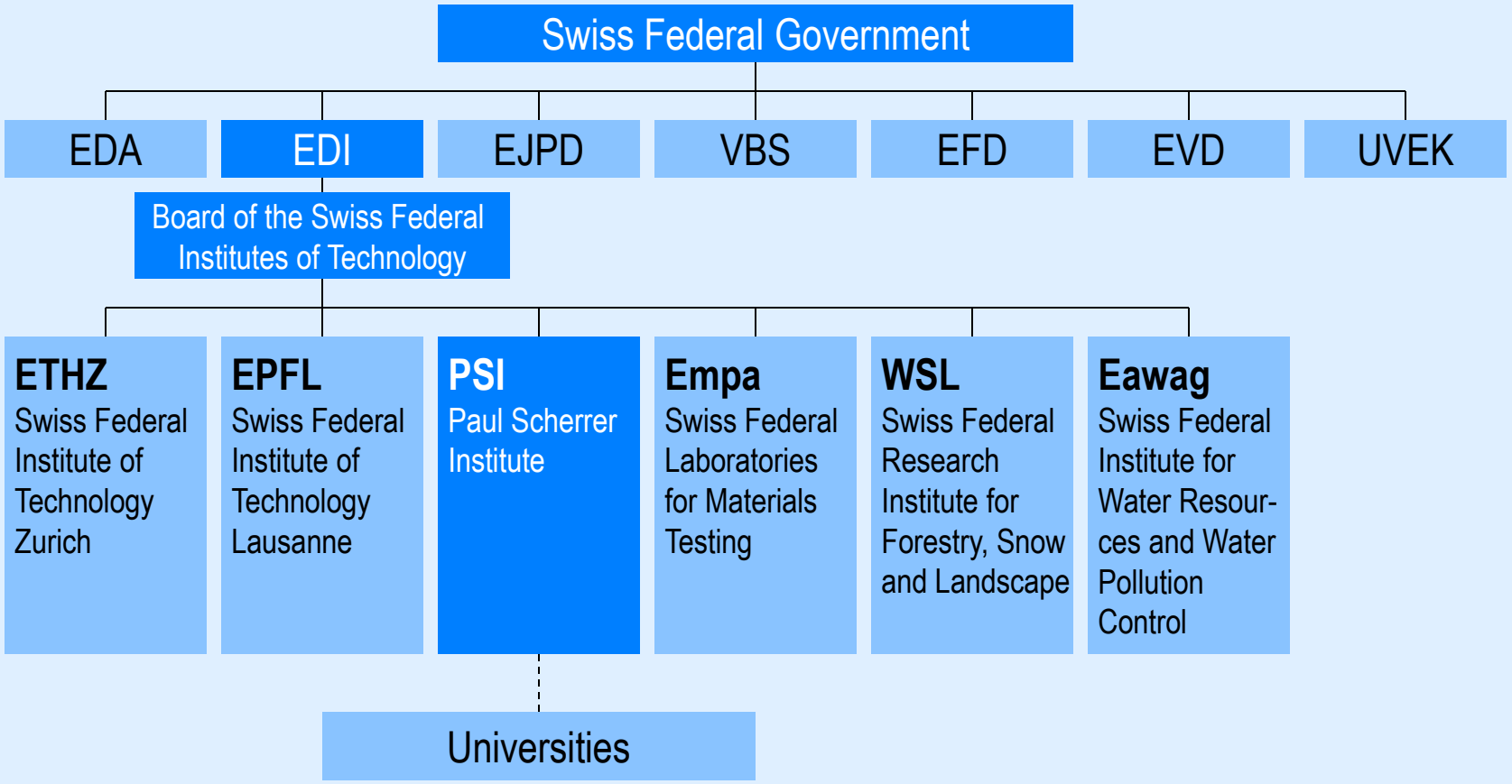


Embedding


Swiss Federal Government
EDA
EDI
EJPD
VBS
EFD
EVD
UVEK
Board of the Swiss Federal Institutes of Technology
ETHZ
Swiss Federal Institute of Technology Zurich
EPFL
Swiss Federal Institute of Technology Lausanne
PSI
Paul Scherrer Institute
Empa
Swiss Federal Laboratories for Materials Testing
WSL
Swiss Federal Research Institute for Forestry, Snow and Landscape
Eawag
Swiss Federal Institute for Water Resources and Water Pollution Control
Universities

PAUL SCHERRER INSTITUT

Mission

- **To play a leading role on an international level in**
  – physics of condensed matter and materials sciences
  – structural biology
  – radiochemistry, radiopharmacy and proton radiation therapy
  – particle and accelerator physics

  with use of our large-scale facilities
  (SLS, SINQ, SμS, particle beams)

- **To be a UserLab for the external science community**

- **Energy research, primarily using complex facilities, towards an efficient, environmentally friendly and reliable energy supply**

- **Education, training, knowledge and technology transfer**

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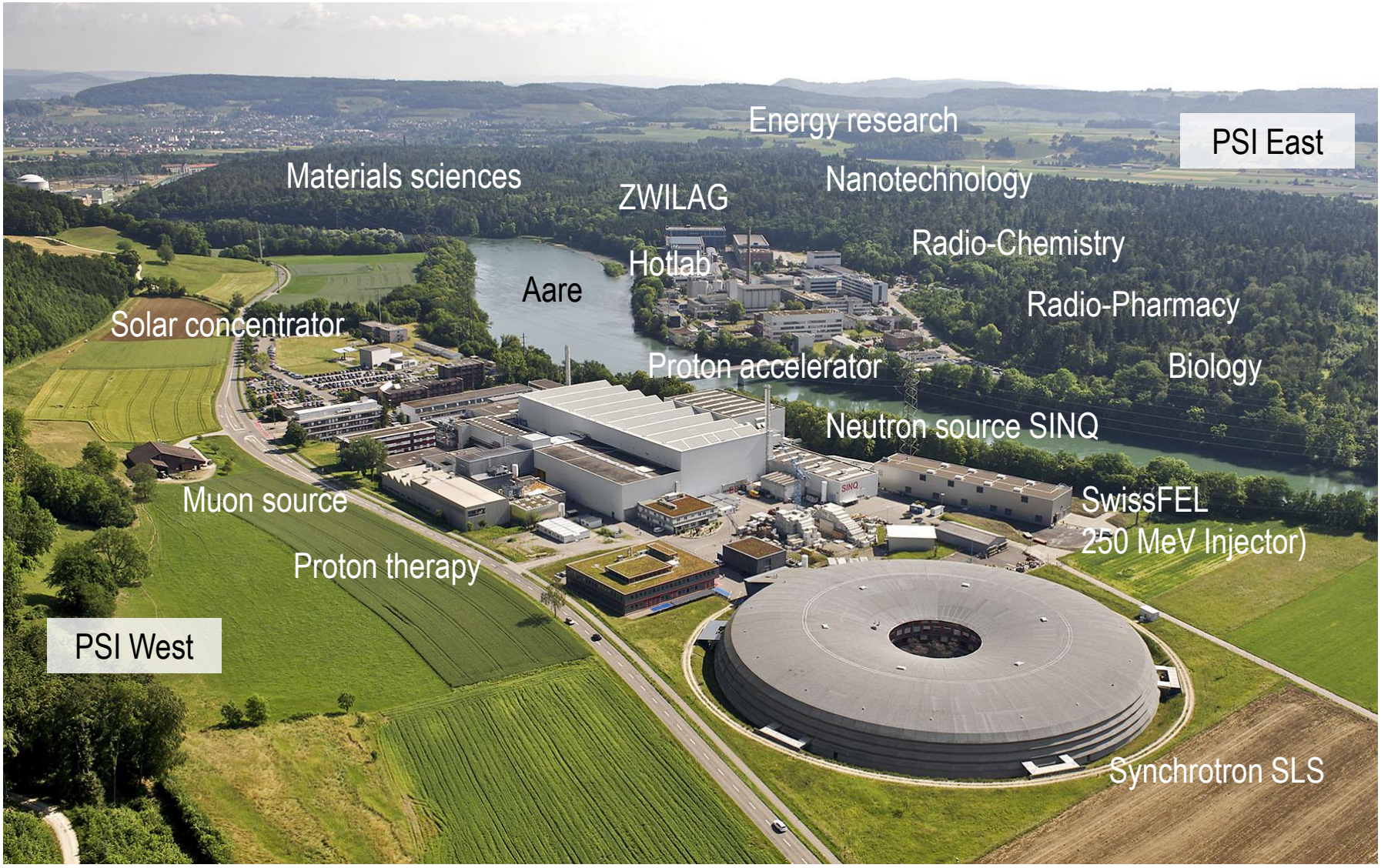

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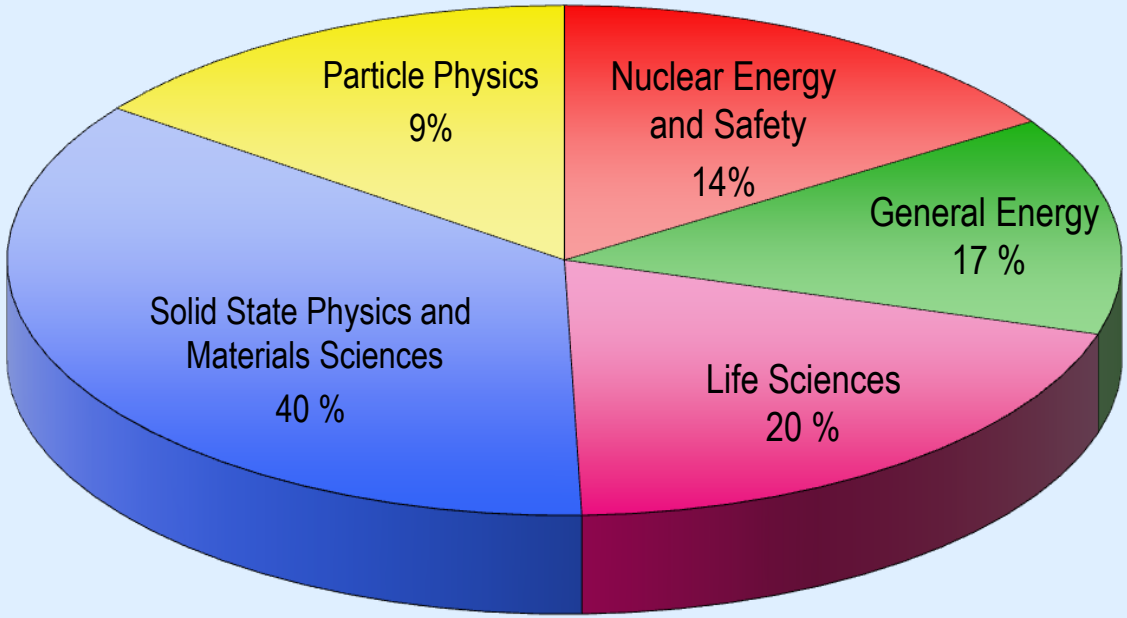
Key Figures 2012

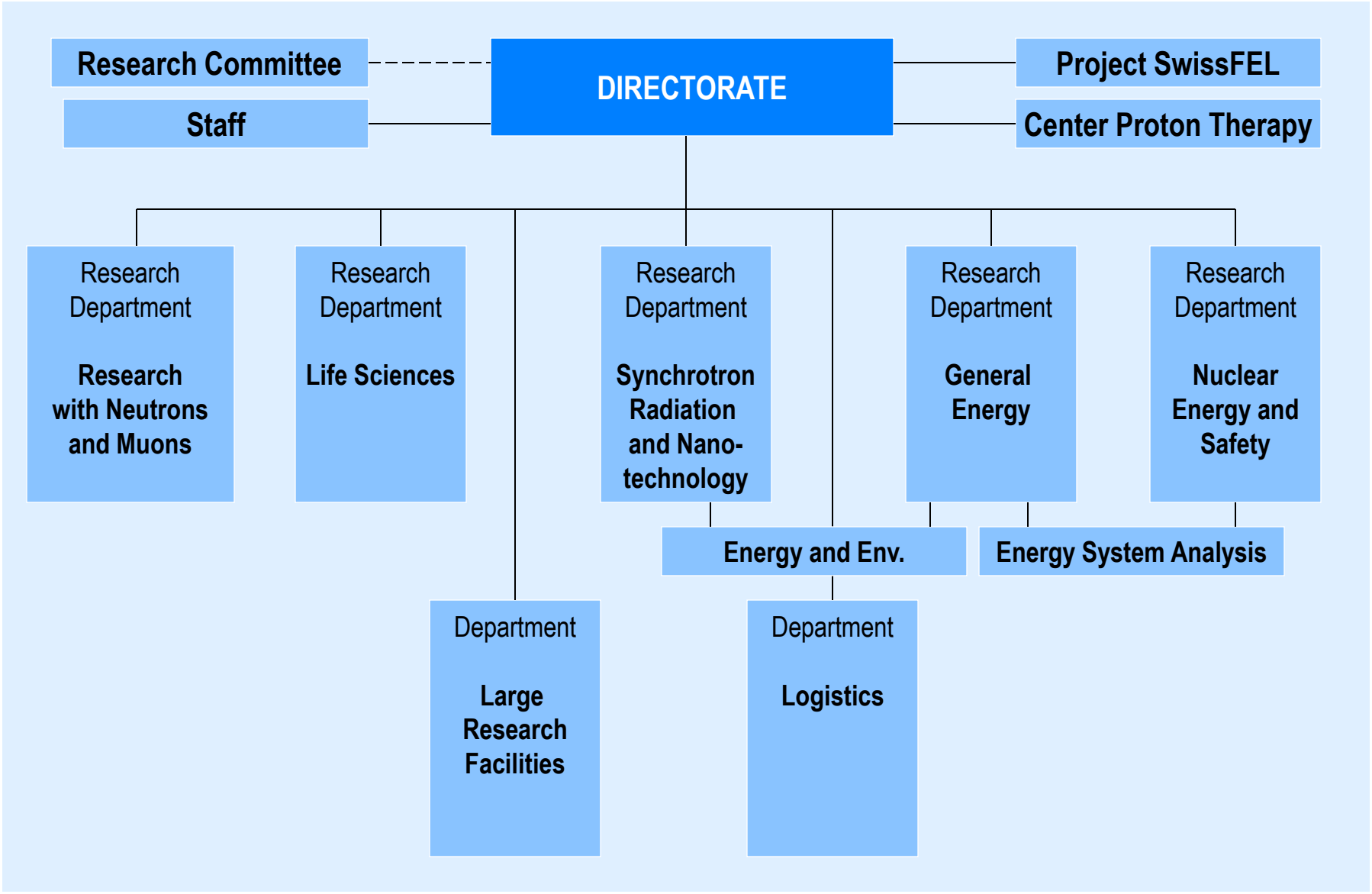
PSI funds (global budget)	**~**	**250**	**MCHF**
External funding	**~**	**80**	**MCHF**
Staff / FTE	~	1500	PJ
Of which externally financed	~	400	PJ
Doctoral students	~	320	
Apprentices		85	
External users	~	2000	
Number of scientific publications	~	1000	
PSI-employees with teaching duties at ETH and universities	~	100	

Budget Distribution 2012

ca. 330 MCHF (incl. external funding)



Organisation chart of PSI



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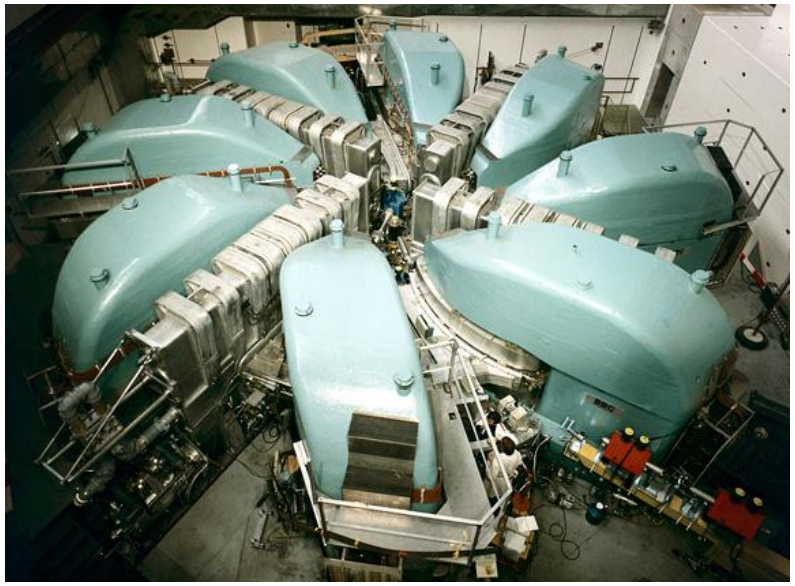
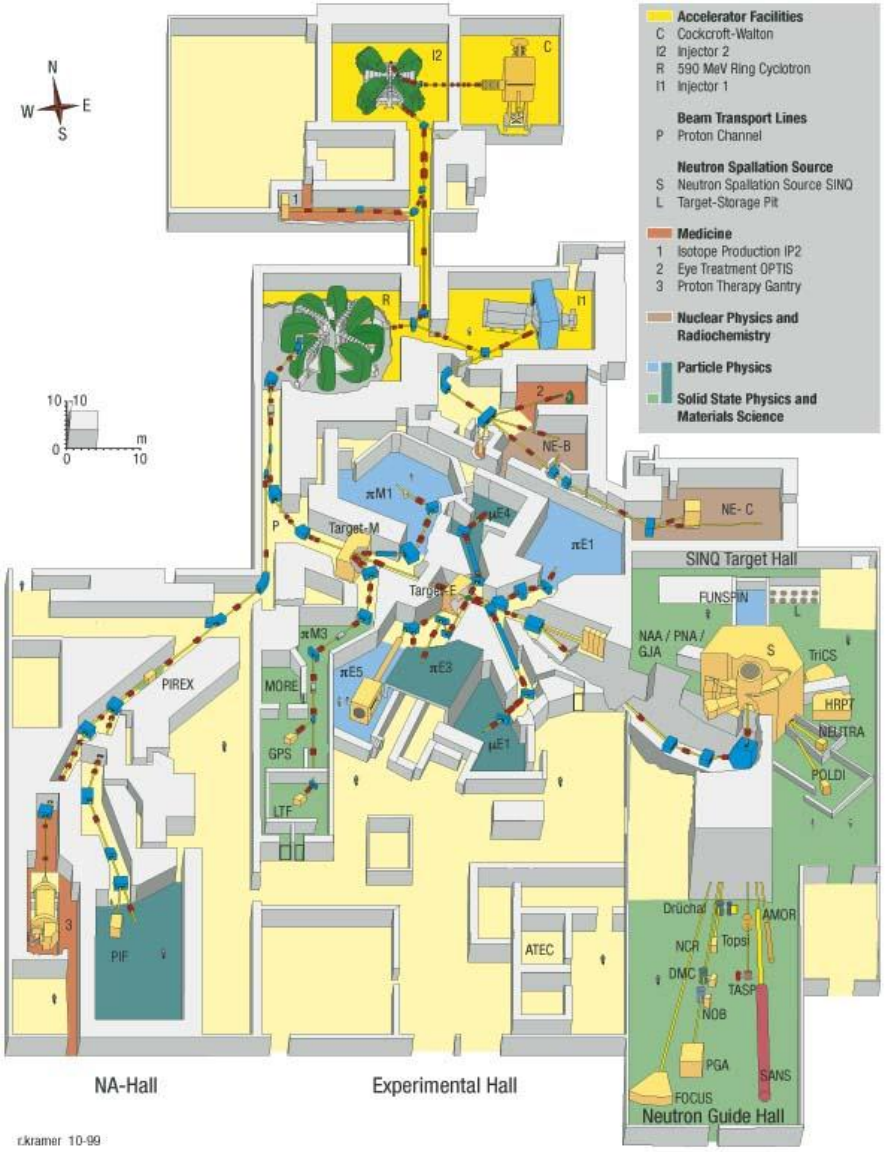
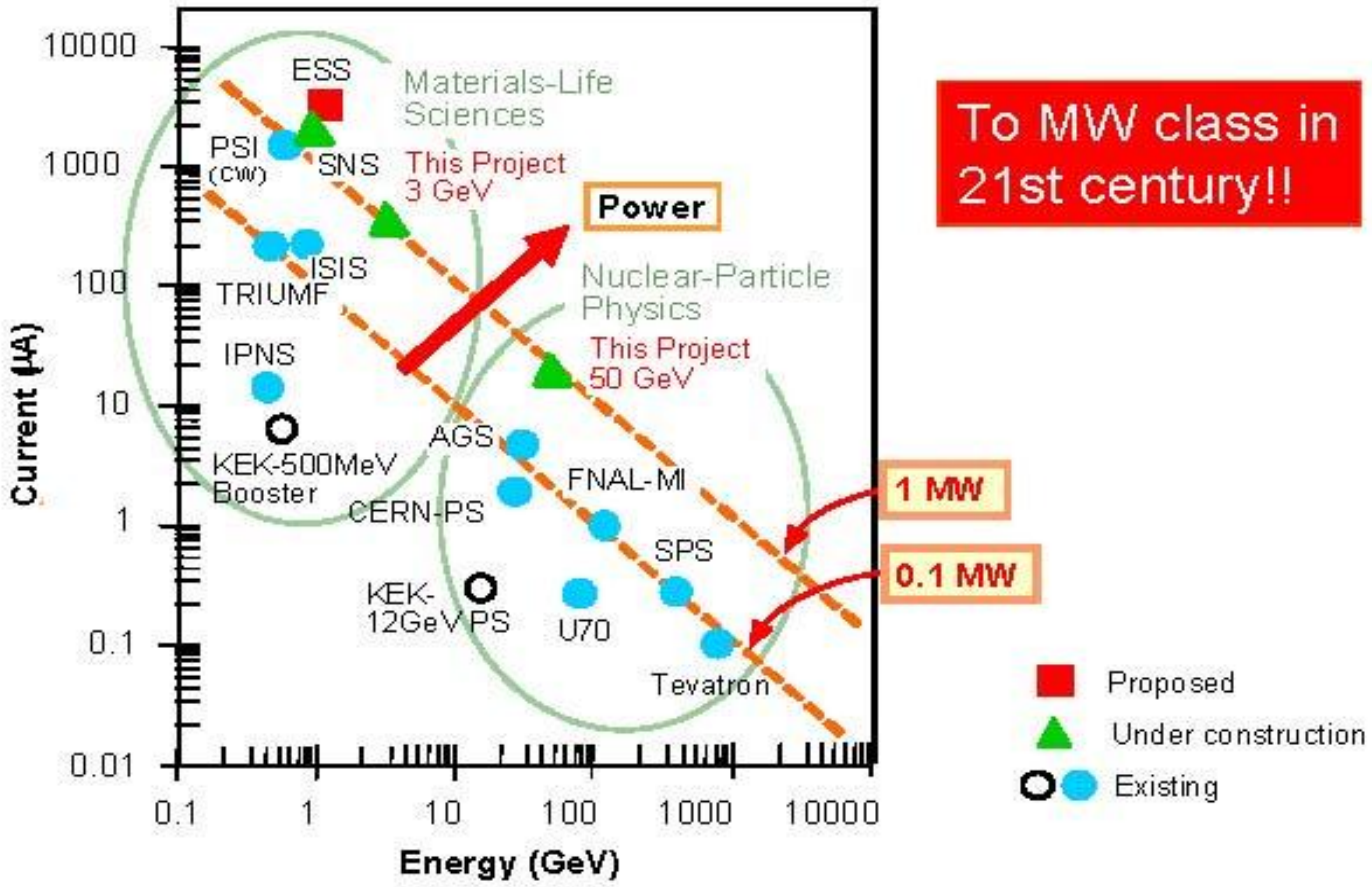
Proton accelerator facility



Most powerful accelerator of this type
(590 MeV, 2.0-2.3 mA)



World's Proton Accelerators



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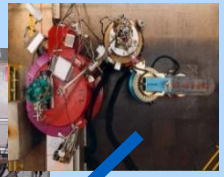
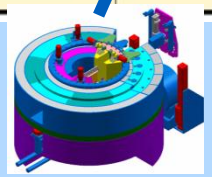
Spallation Neutron Source SINQ & Instrumentation





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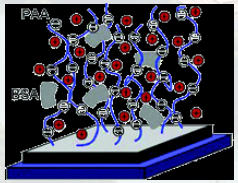
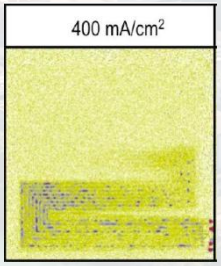
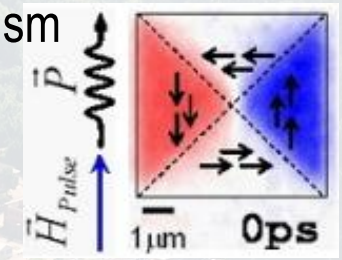
Use of Muon-, Neutron- and Photon-Beams at PSI

Fuel cells

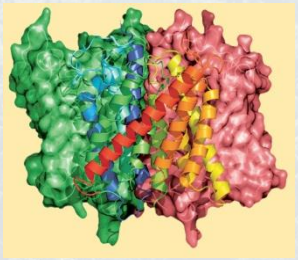




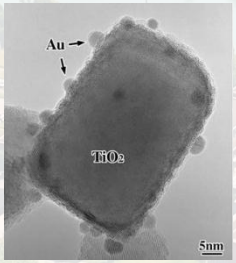
Magnetism



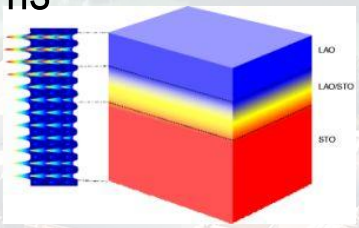
Proteins



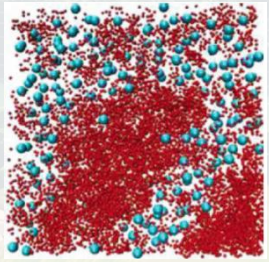
Catalysts



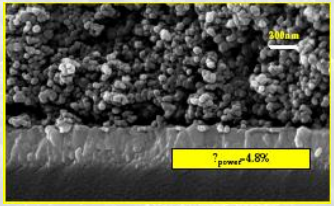
Thin films



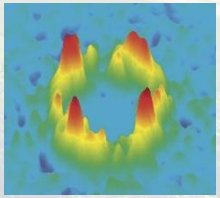
Cataract

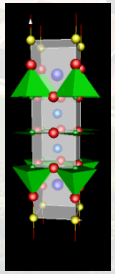


Nano-Photovoltaics



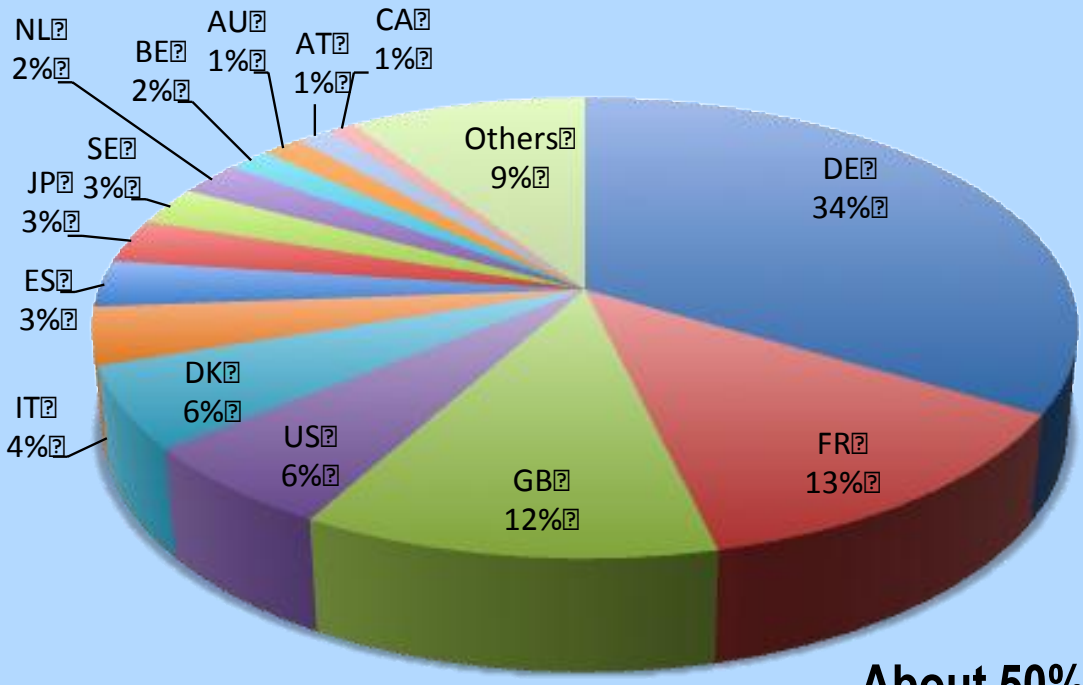
Superconductors





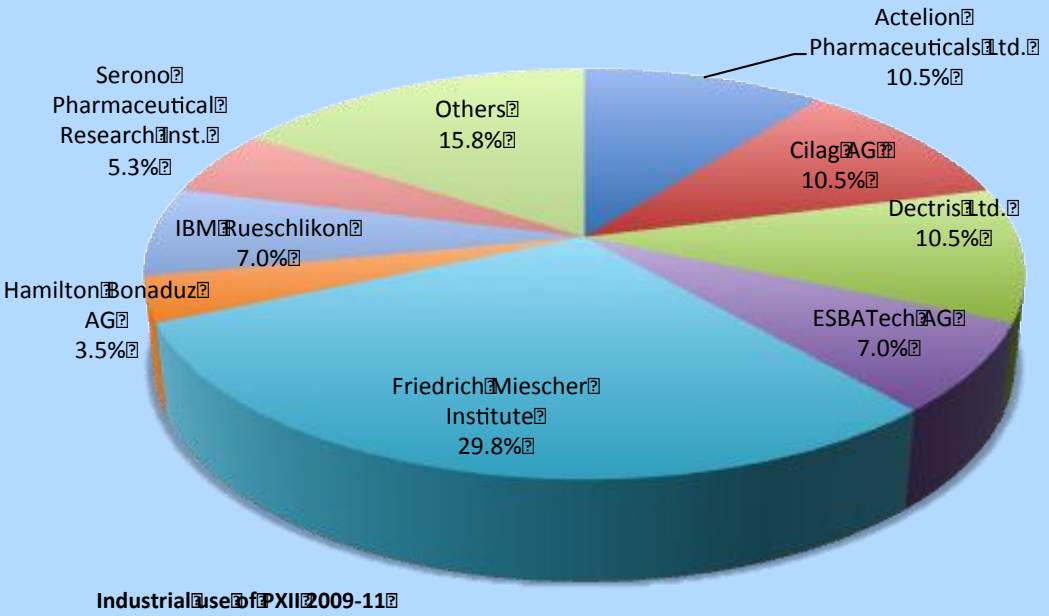
Disc of Nebra Landes-Museum Halle

International Academic Users, 2006-2011

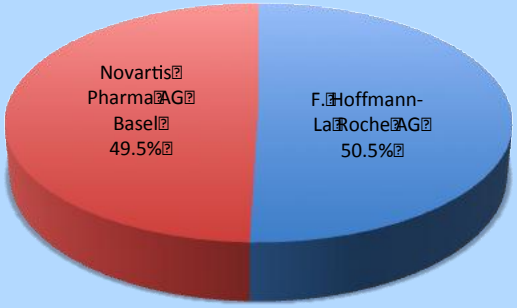


About 50% from total users are international users
(> 80% from EU countries)

Use of SLS by Industry



Industrial use of PXII 2009-11



SLS TechnoTrans AG

(industry services at SLS)

NOVARTIS

SULZER

mps

n|w Fachhochschule Nordwestschweiz

VONTOBEL

BRUGG

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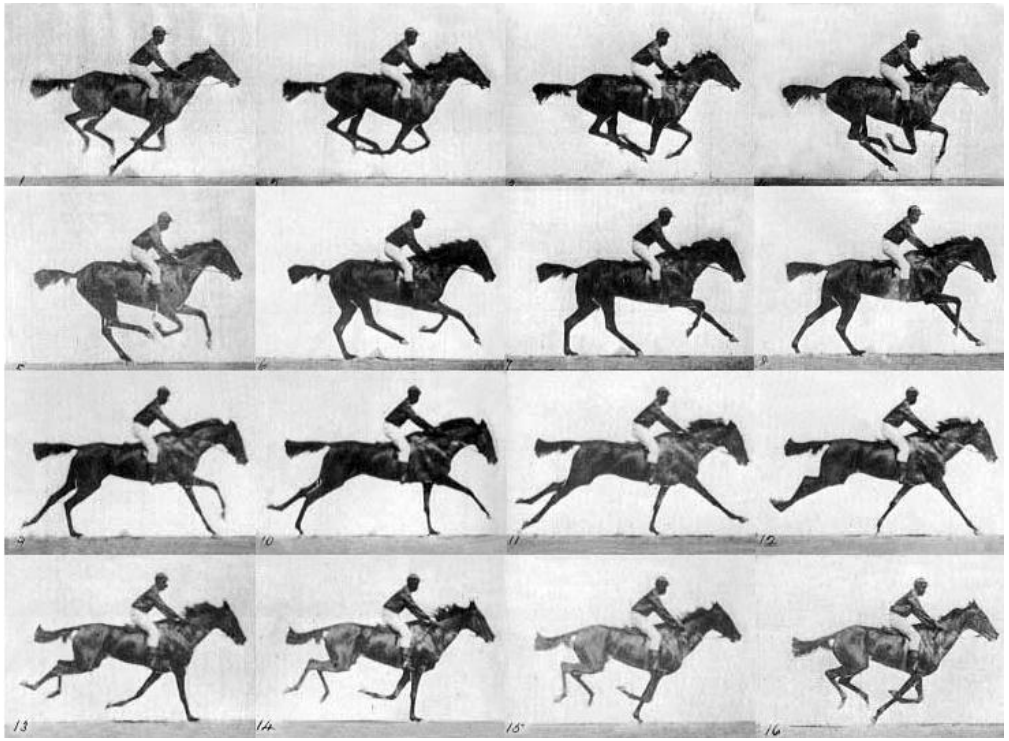
Louis Jacques Mandé Daguerre
Portrait of Jean-Baptiste Sabatier-Blot, 1844
Exposure time: few minutes



Eadweard Muybridge
The Horse in Motion, 1872
Exposure time: few milli-seconds

Louis Jacques Mandé Daguerre
Portrait of Jean-Baptiste Sabatier-Blot, 1844
Exposure time: few minutes

Eadweard Muybridge
The Horse in Motion, 1872
Exposure time: few milli-seconds

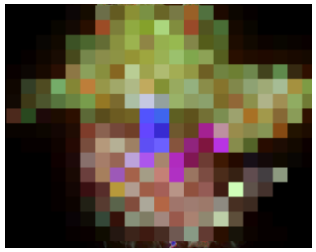
SwissFEL – a forefront research infrastructure for CH

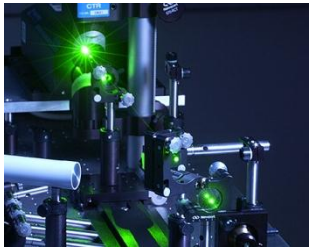
3rd gen. synchrotron

fine, too slow

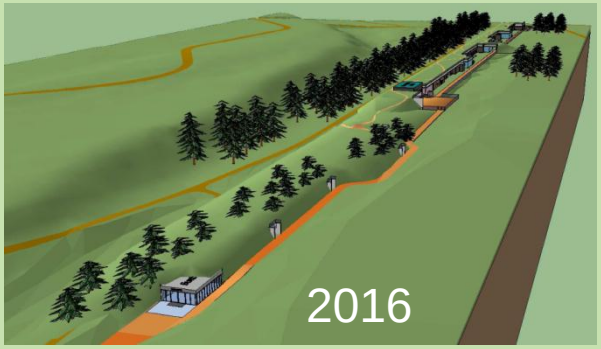
optical lasers

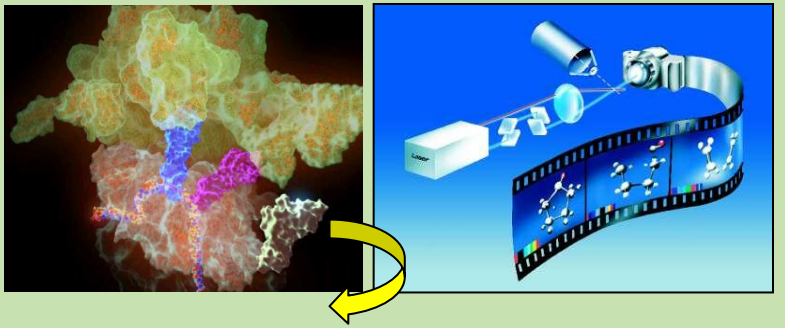
fast, too coarse





SwissFEL fine **and** fast at extreme high intensity

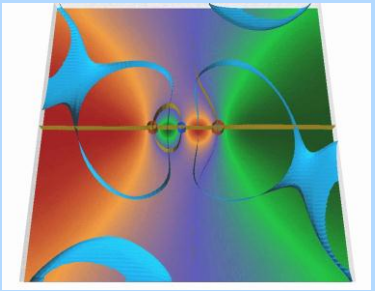


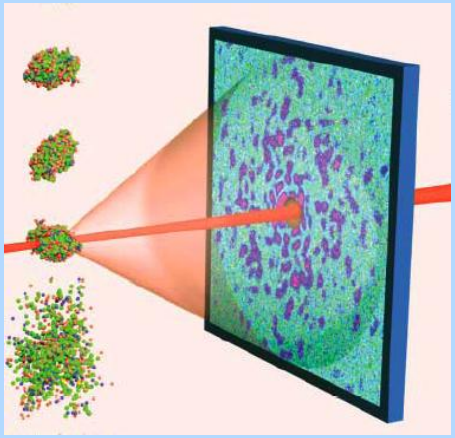


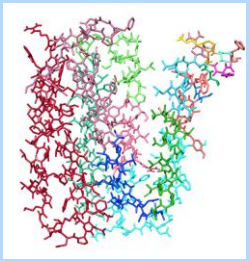
new direct insights into chemical, physical, biological mechanisms governing our daily-life

SwissFEL: for new sciences

Functions and processes in magnetic and electronic switching

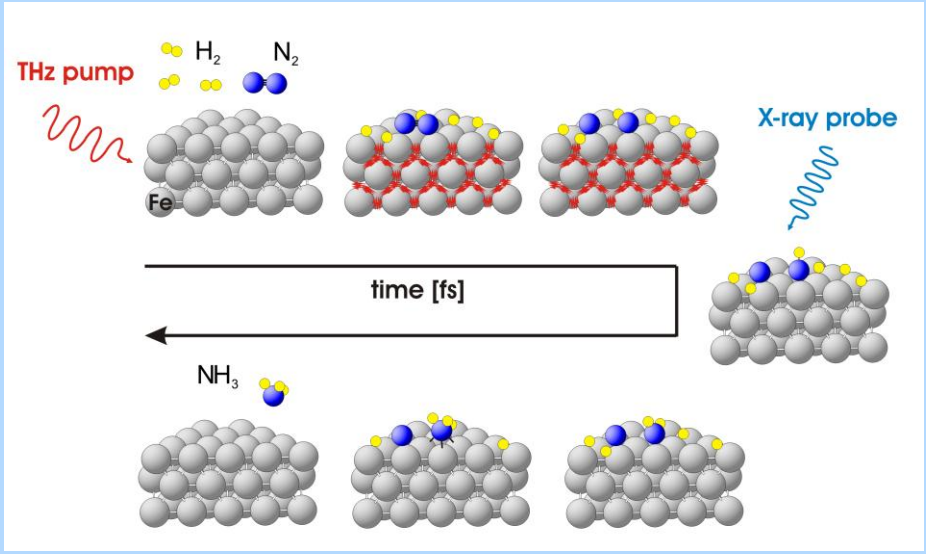




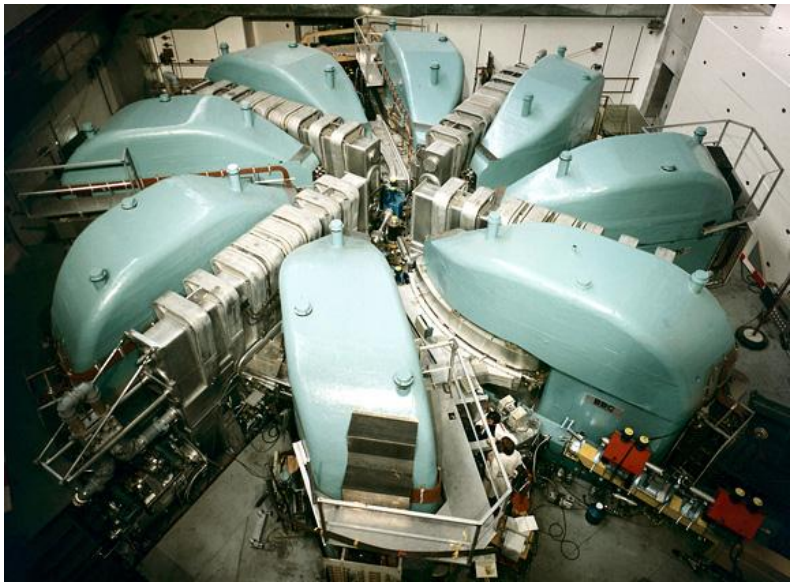


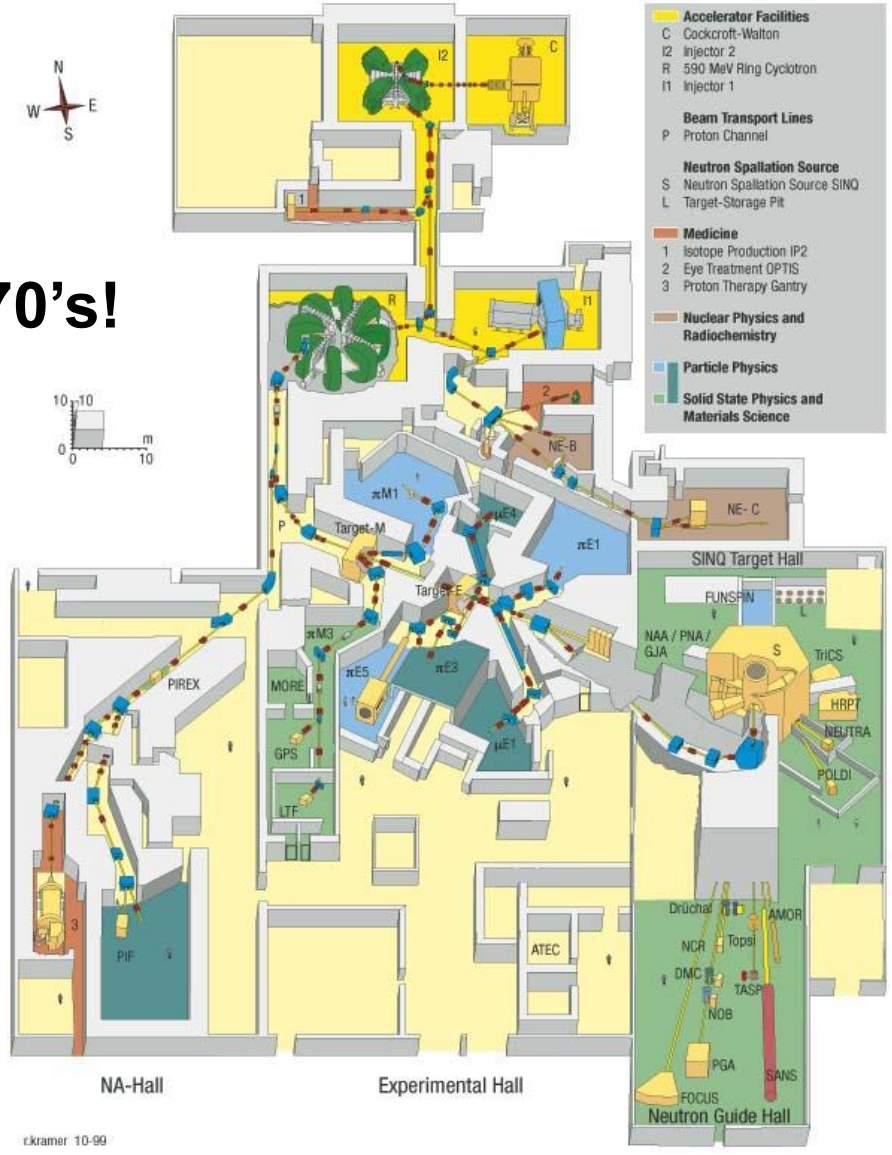
Determination of protein structures and interactions → functionality of drugs

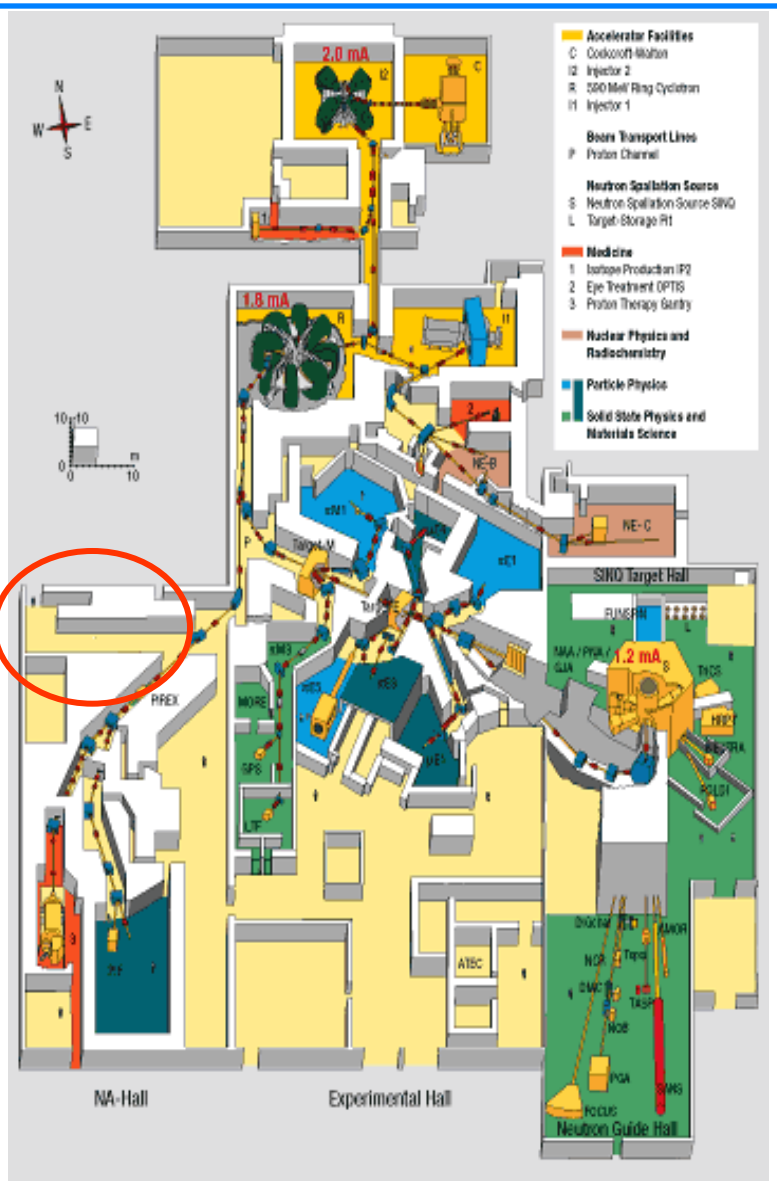
Catalytic reactions (time)



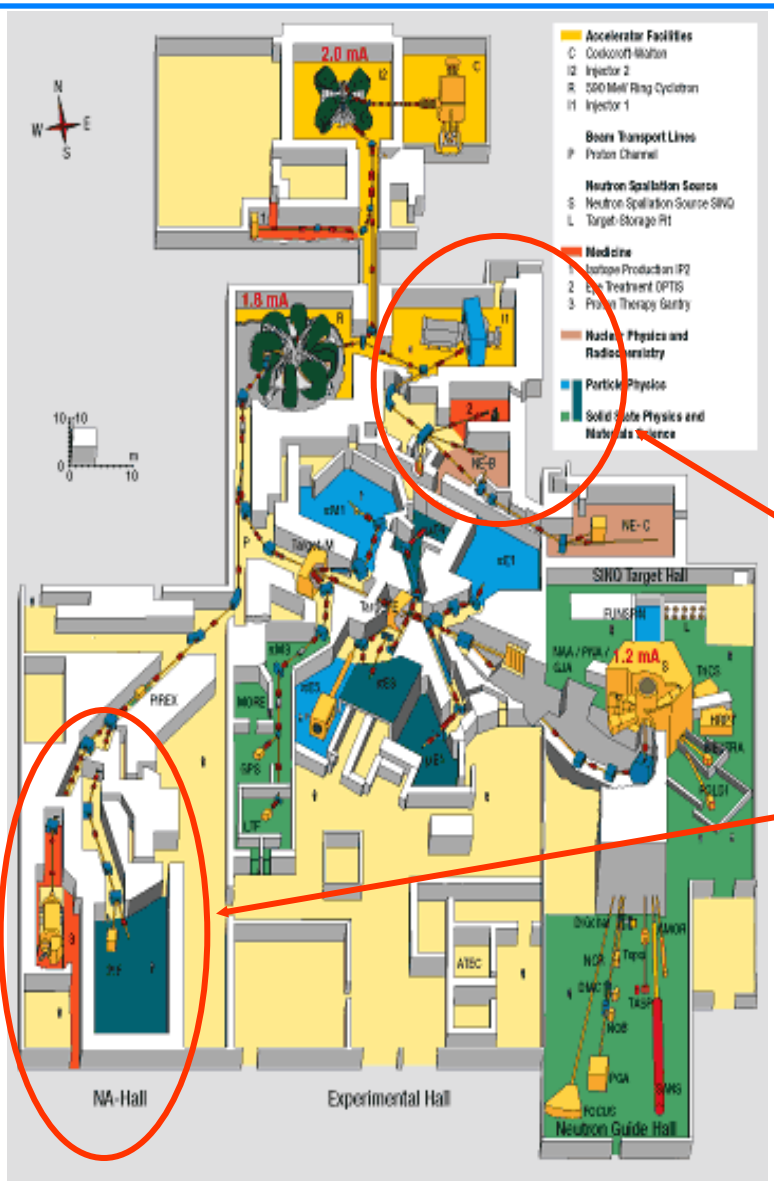
Particle therapy -- clinical use of accelerator technology at PSI (SIN) started in the 70's!







PIOTRON
Pion Therapy
503 Patients
1980-1993



Proton Therapy
using the proton
accelerators
of the particle physics
research programme

OPTIS since 1984

GANTRY 1 since 1996

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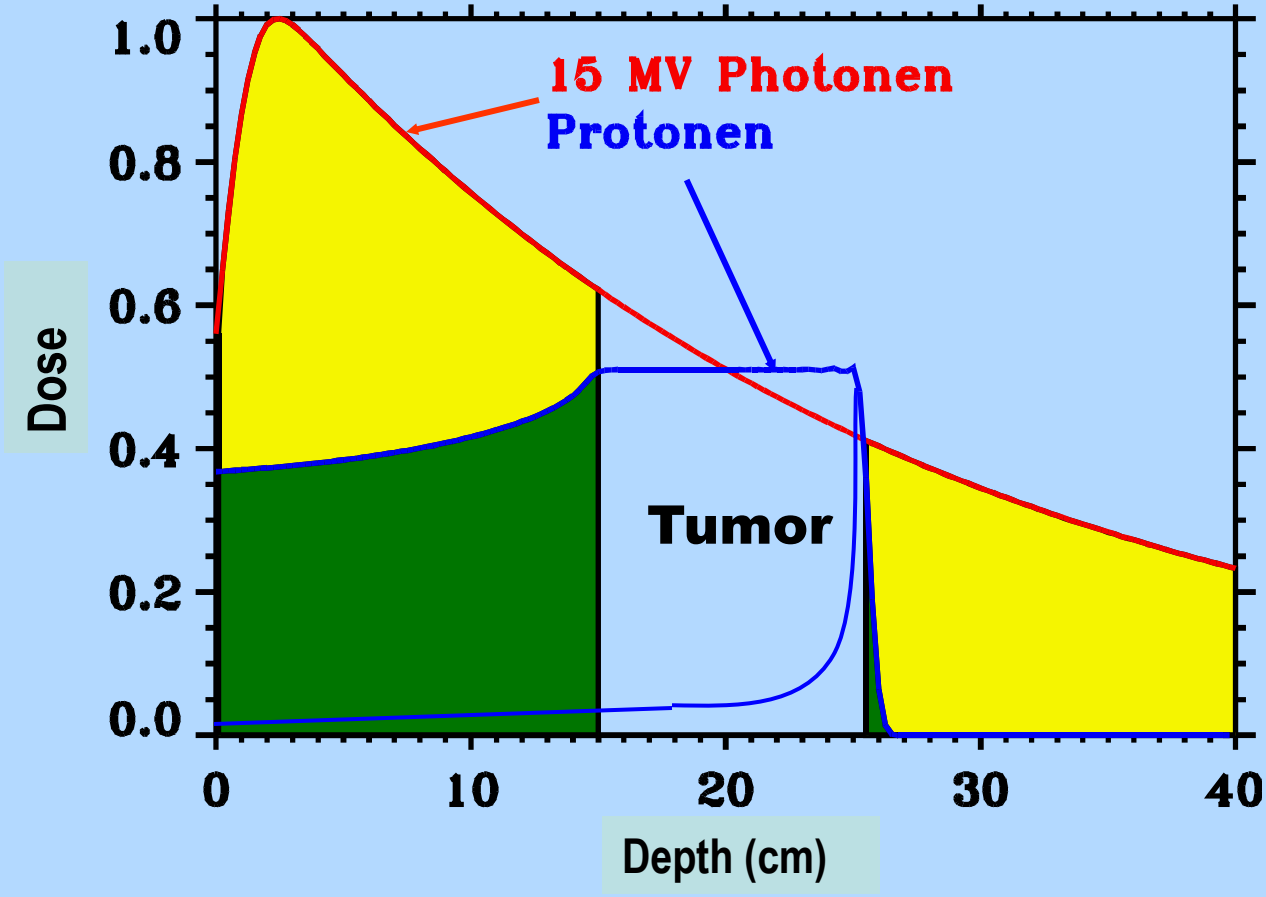
Comparison of Characteristics of Photons und Protons for Radiation Therapy



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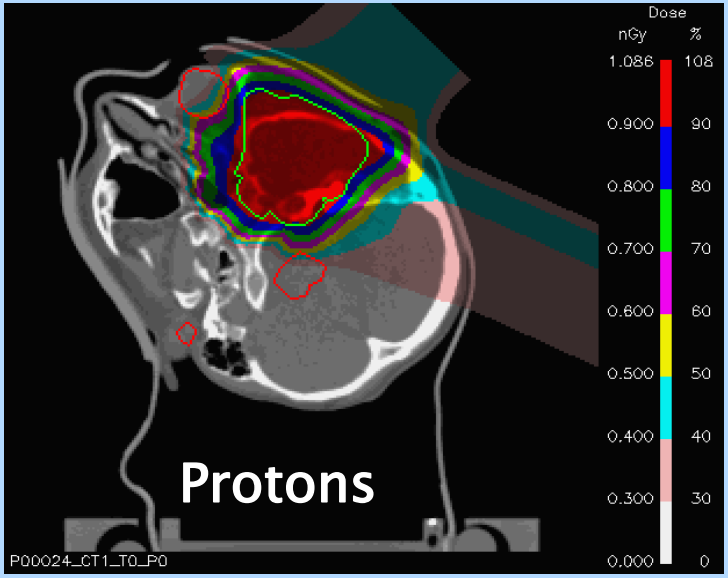
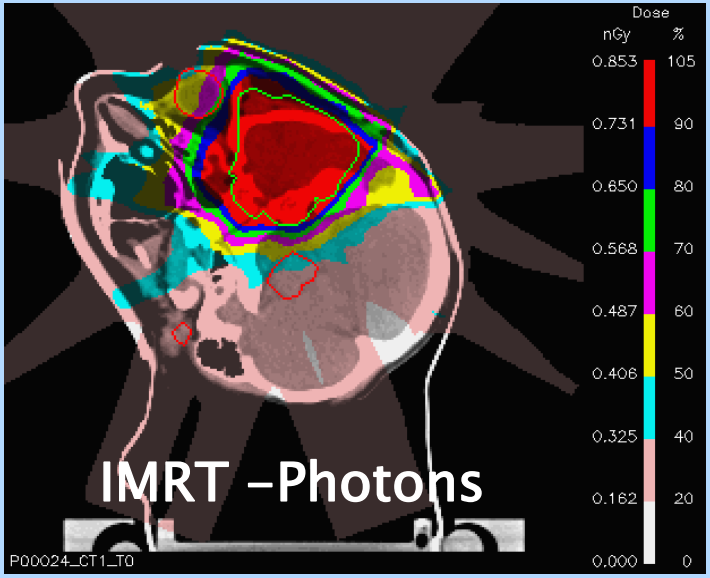
Medical Proton Accelerator

Superconducting coils
Proton beam with energy of 250 MeV (about 180’000 km/sec)
3.5 m diameter, 90 tonnes

Aim of proton therapy:
Dose concentrated in the tumor volume, low dose or no dose to healthy tissues

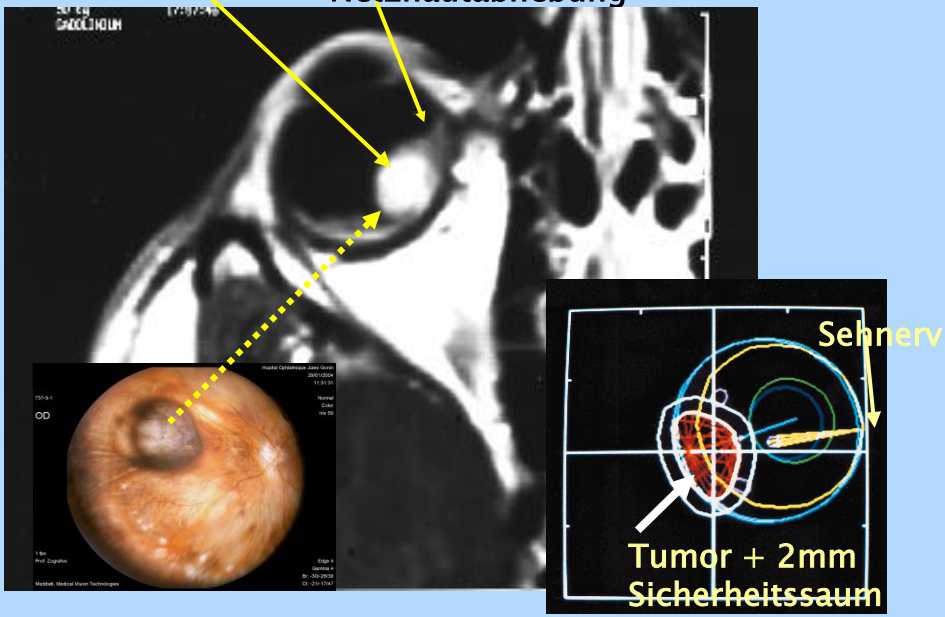


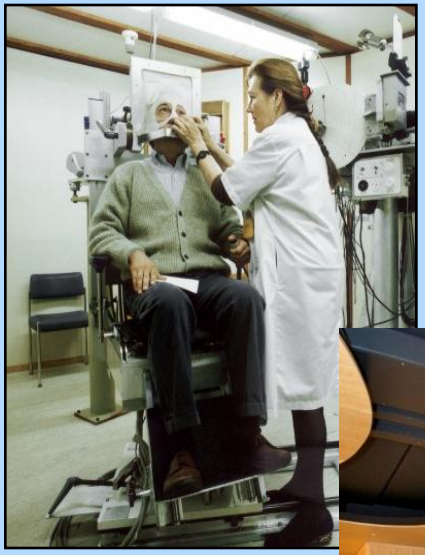


OPTIS: Proton therapy of tumors in the eye

Co-operation with UniL, Hôpital Ophtalmique Jules Gonin (Prof. Zografos)

MRI of the eyes:
Grosses Aderhautmelanom mit sichtbarer Netzhautabhebung





OPTIS
1984 –
2010

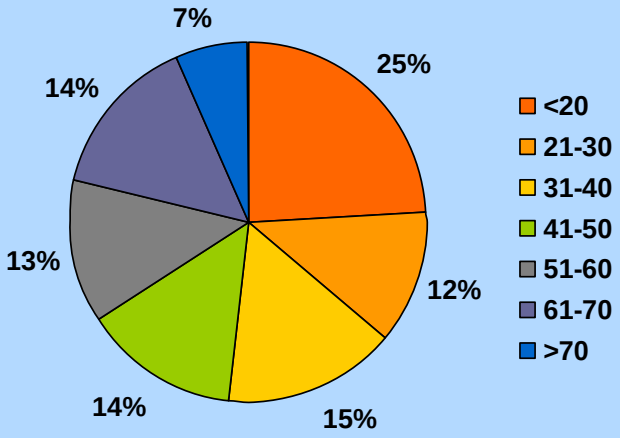
Since 1984 more than 5800 patients treated (vein skin melanoma),
>97 % tumor control
>90 % preserve vision

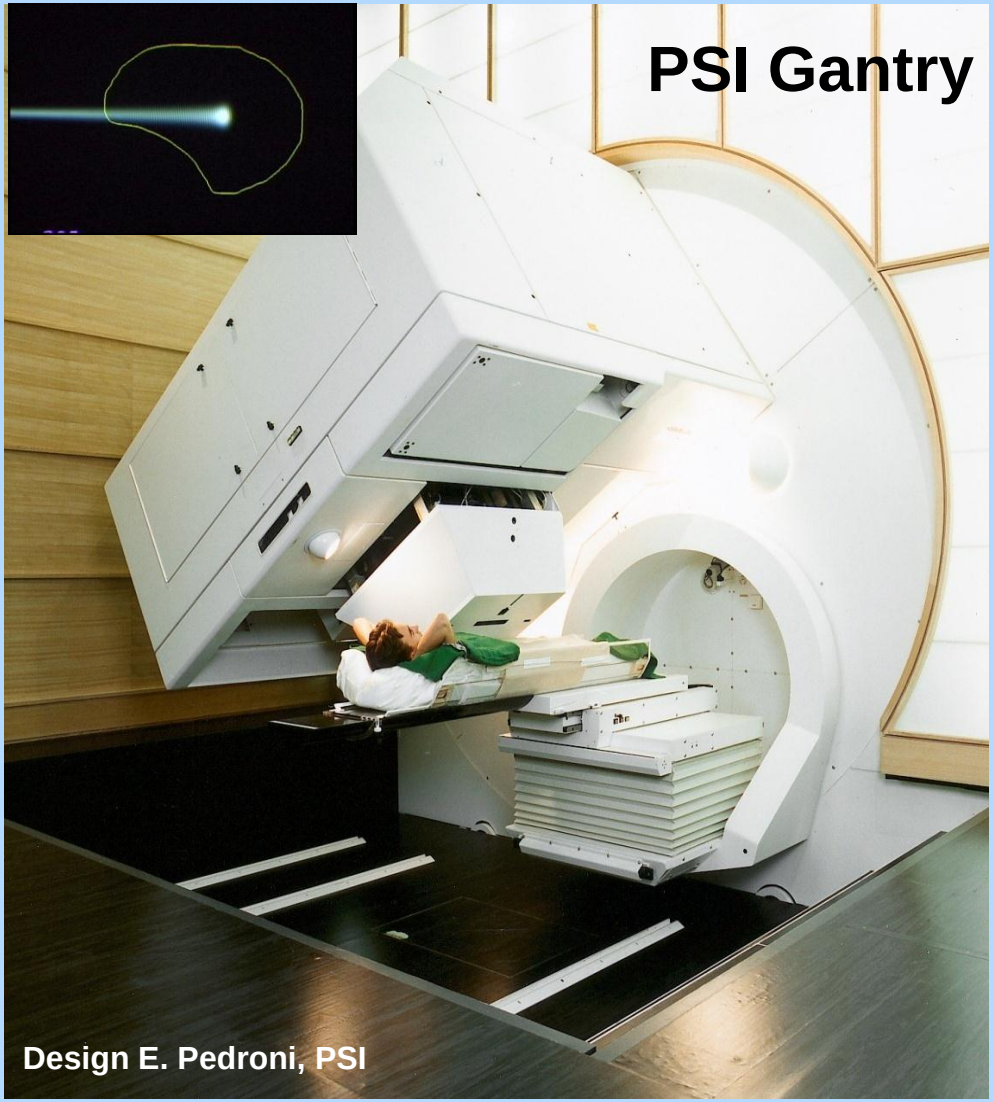
OPTIS 2
Start 2010

Proton Therapy

> 800 patients treated with deep-seated tumors
> 5800 patients treated with eye tumors

> 50 % of patients are below 40 years old





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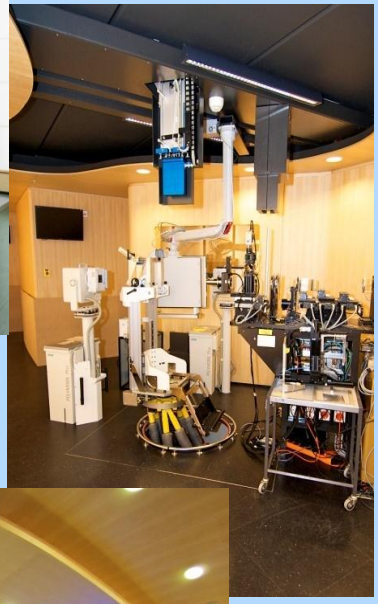
Cyclotron (COMET)

Degrader and
Proton
Beamlines

2 Gantries

Fixed Beam



Proton Therapy Facility at PSI

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Thank you for your attention