

# Visit of the ion-beam facility for proton tumor therapy PT Helmholtzzentrum Berlin (Campus Lise Meitner)

Thursday, February 11, 2010

# Eye tumor therapy with protons (PT) at HZB jointly with the Eye-clinic of Charité - Universitätsmedizin Berlin

protons for eye tumors since 98: > 1200 patients  
<http://www.helmholtz-berlin.de/angebote/pt/>



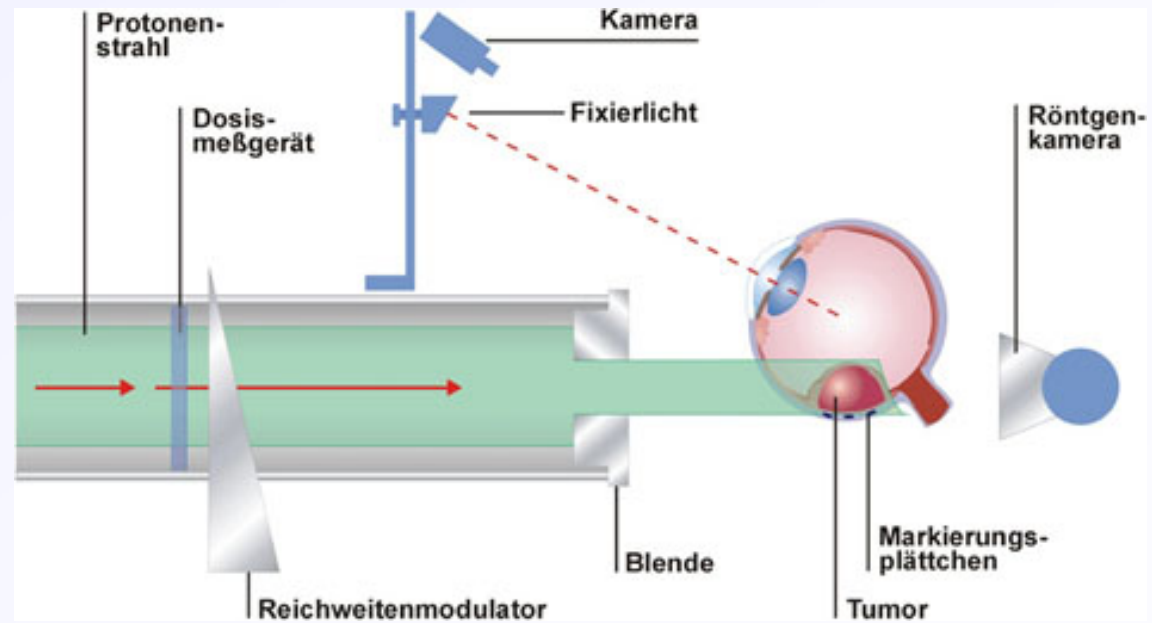
## Pre-accelerator



## Cyclotron



## Principle of irradiation



# Accelerator

## Ion sources

electrostatic accelerator

high-frequency accelerator

- linear accelerator

- circular accelerator

## accelerator facilities

built for

nuclear- and particle physics

solid-state physics

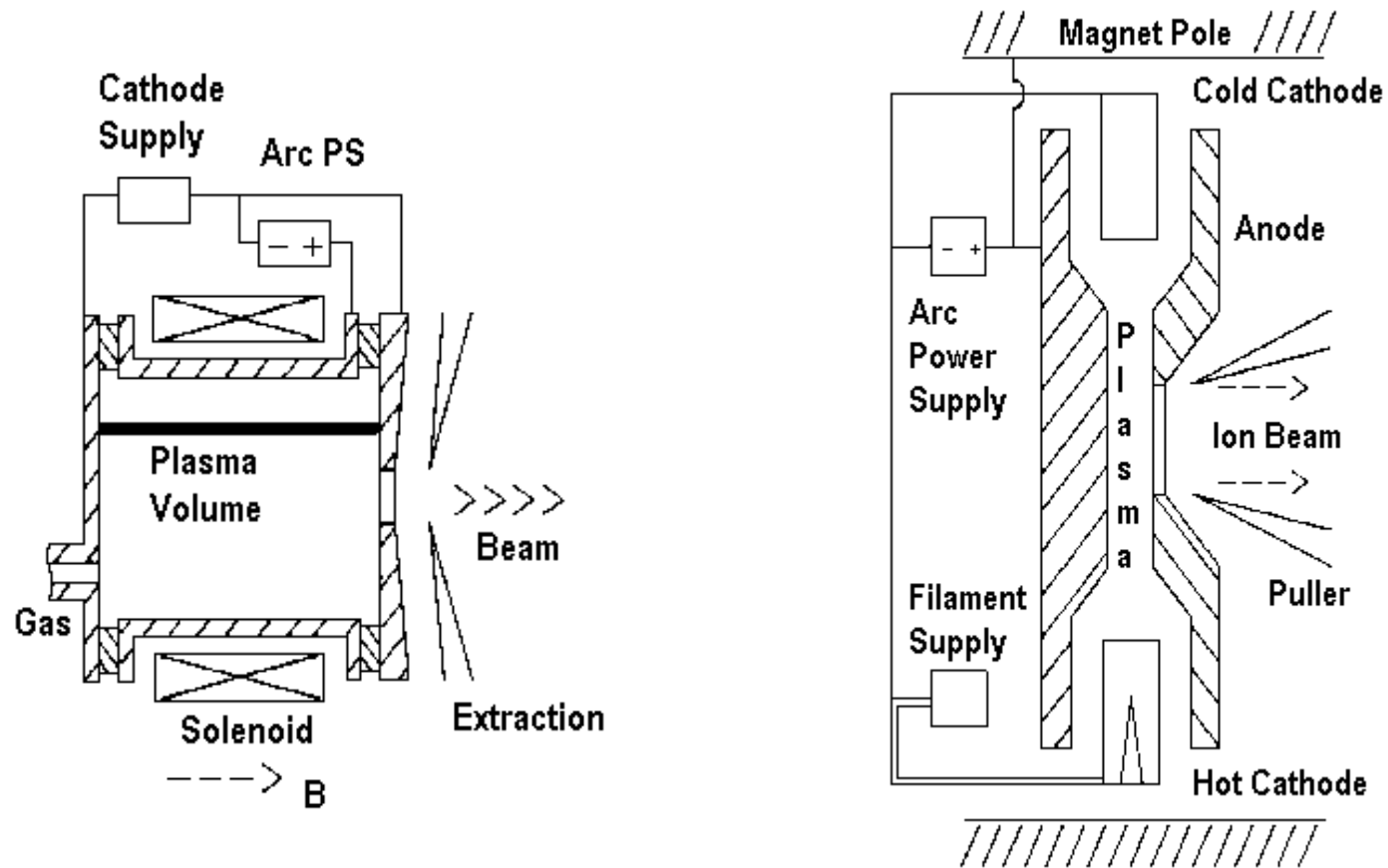
material science

analytics

medical appl. - therapy

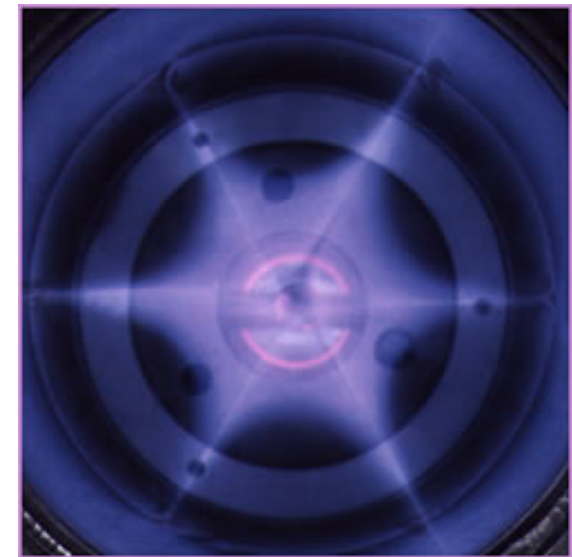
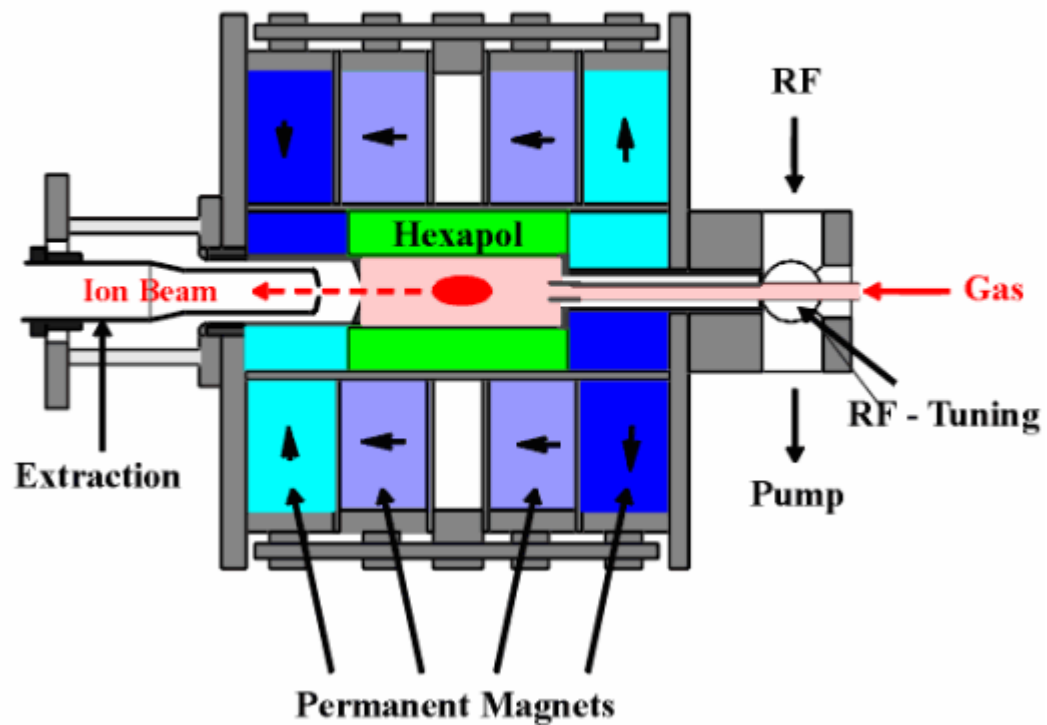
# Ion sources

Gas discharge - electron impact  
energy pickup in E-field, magnetic field for compression  
Penning-arrangement

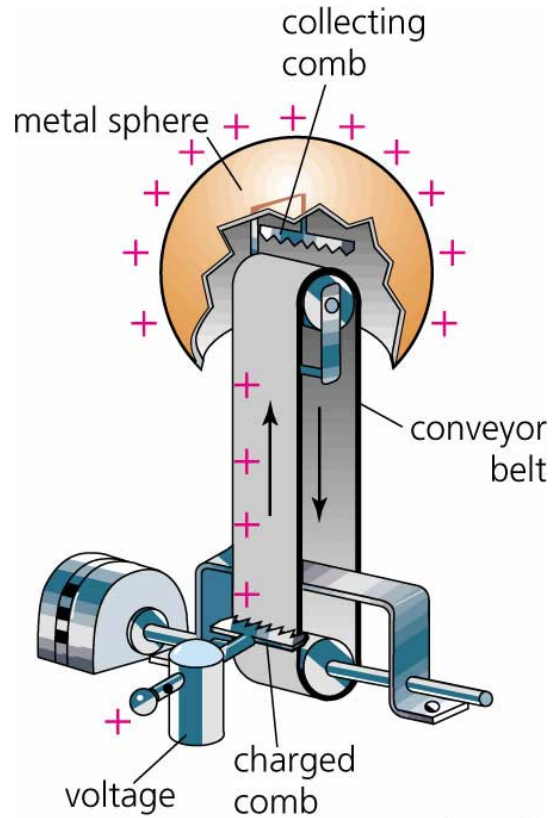


# Micro wave oven for ions: ECR-source

## Electron Cyclotron Resonance Ion Source



# Belt generator - Van de Graaff

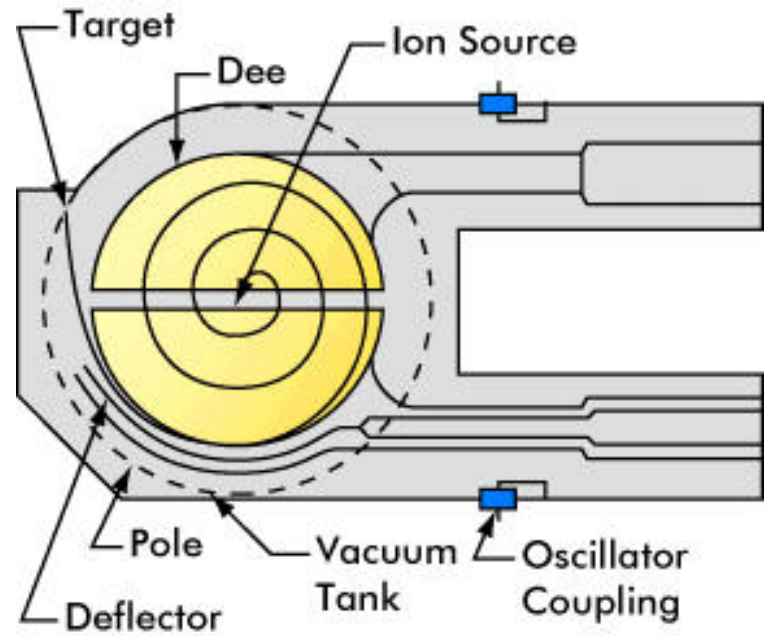


Academy Artworks

$$U = Q/C$$

$$E = qe U$$

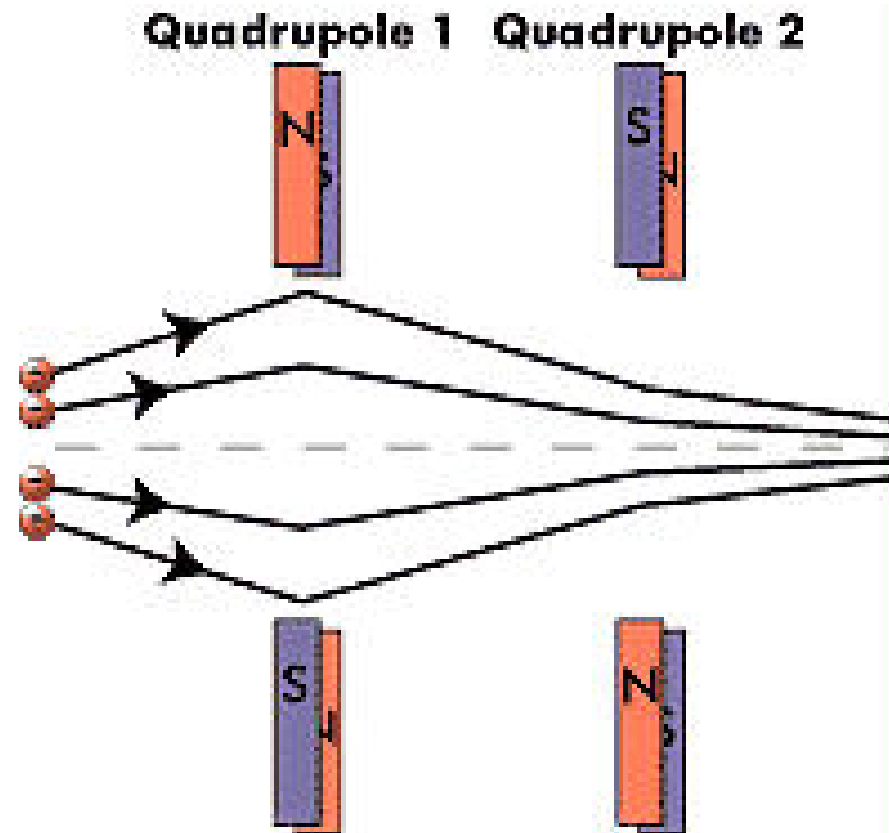
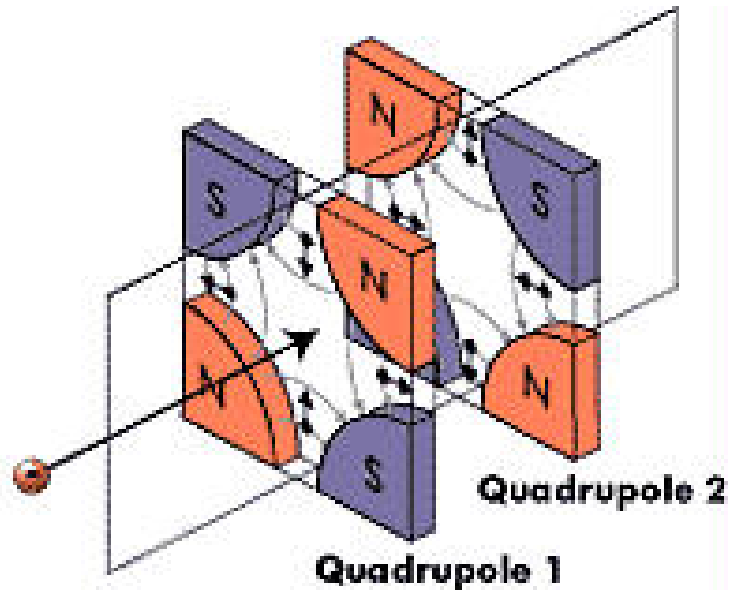
# cyclotron



$$p = qe R B$$

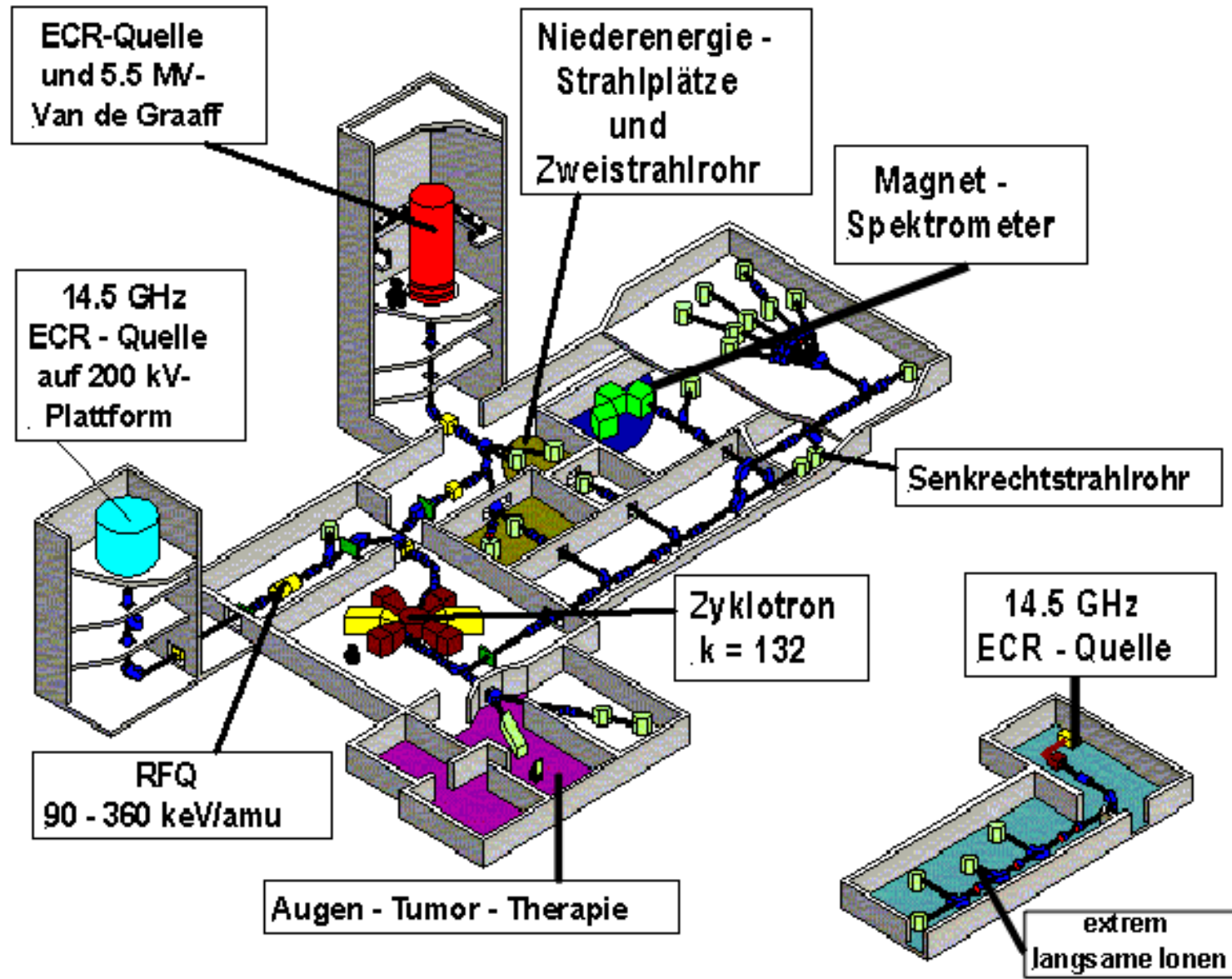
$$\omega = B qe/M$$

# Beam transport - focussing





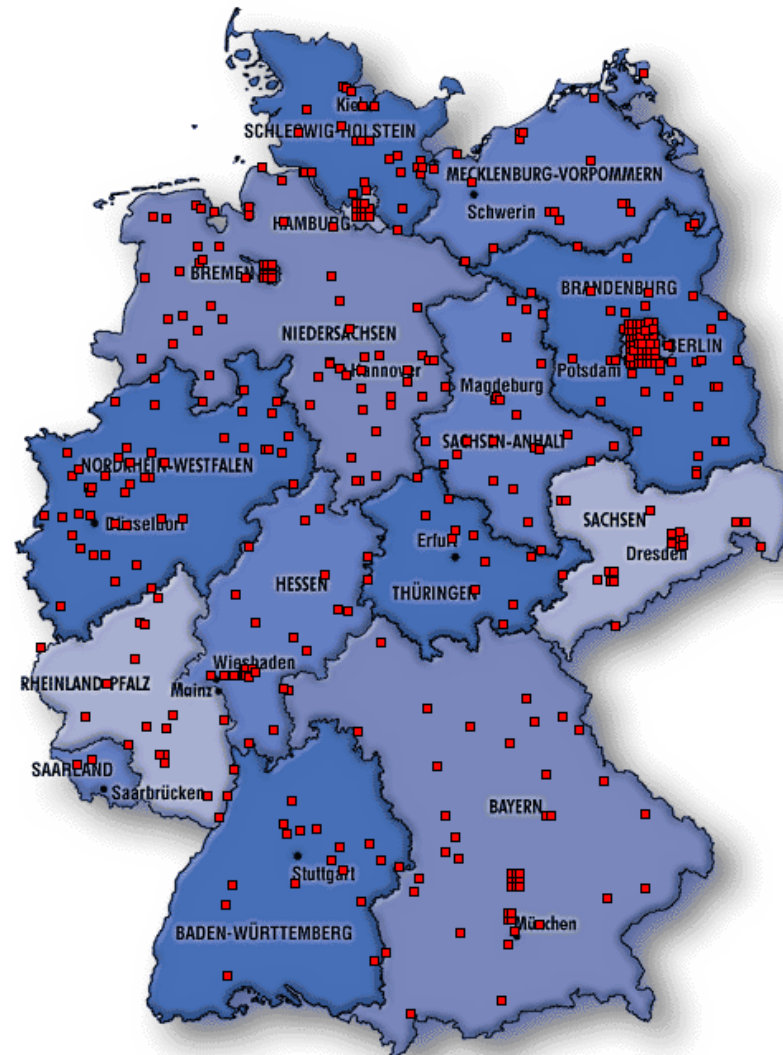
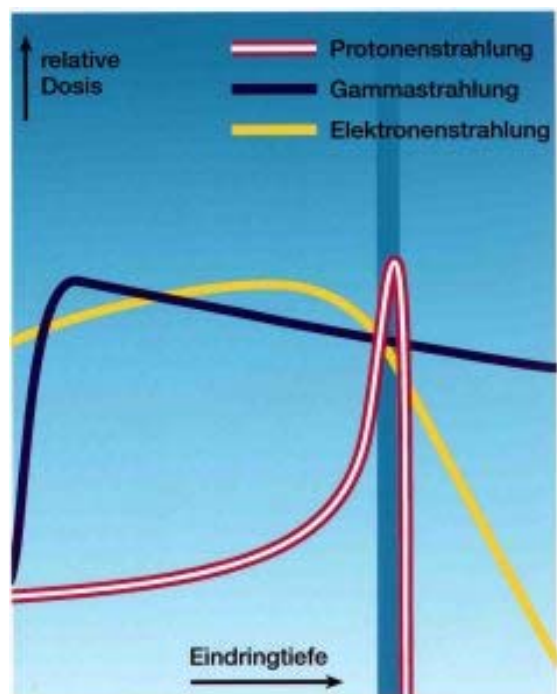
ISL at HMI until 12/2006  
now PT at HZB



# Tumor therapy with ions especially with protons at HMI

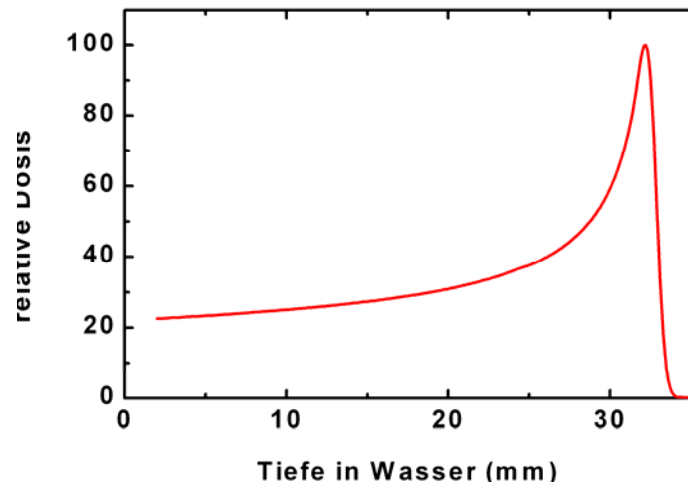
PT (Denker et al.) jointly with Universitätsmedizin Charité - UKBF (Foerster)  
since 1998 over 1200 patients

up to 72 MeV

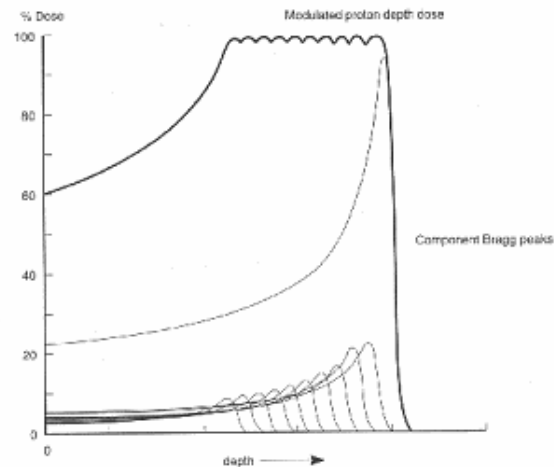
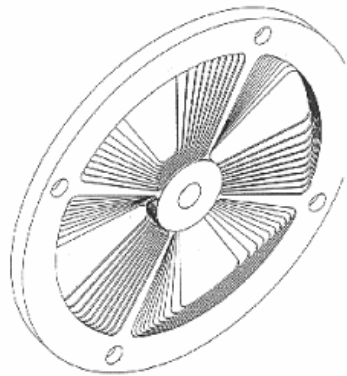
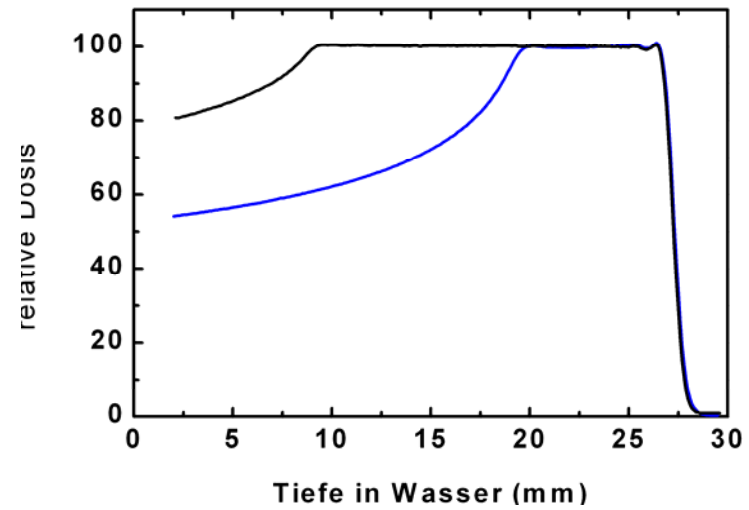


# Principle of Bragg-peaks

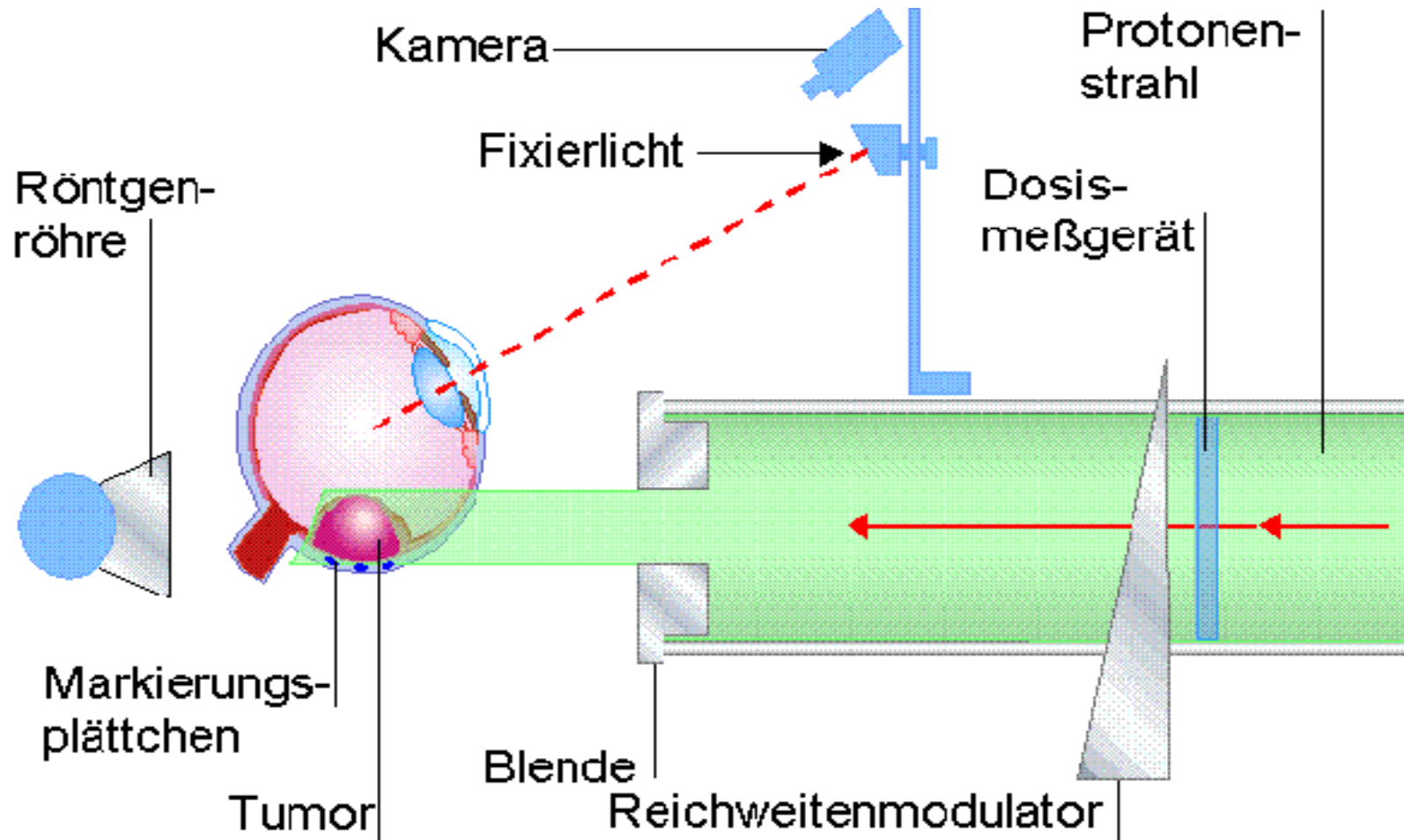
for one energy



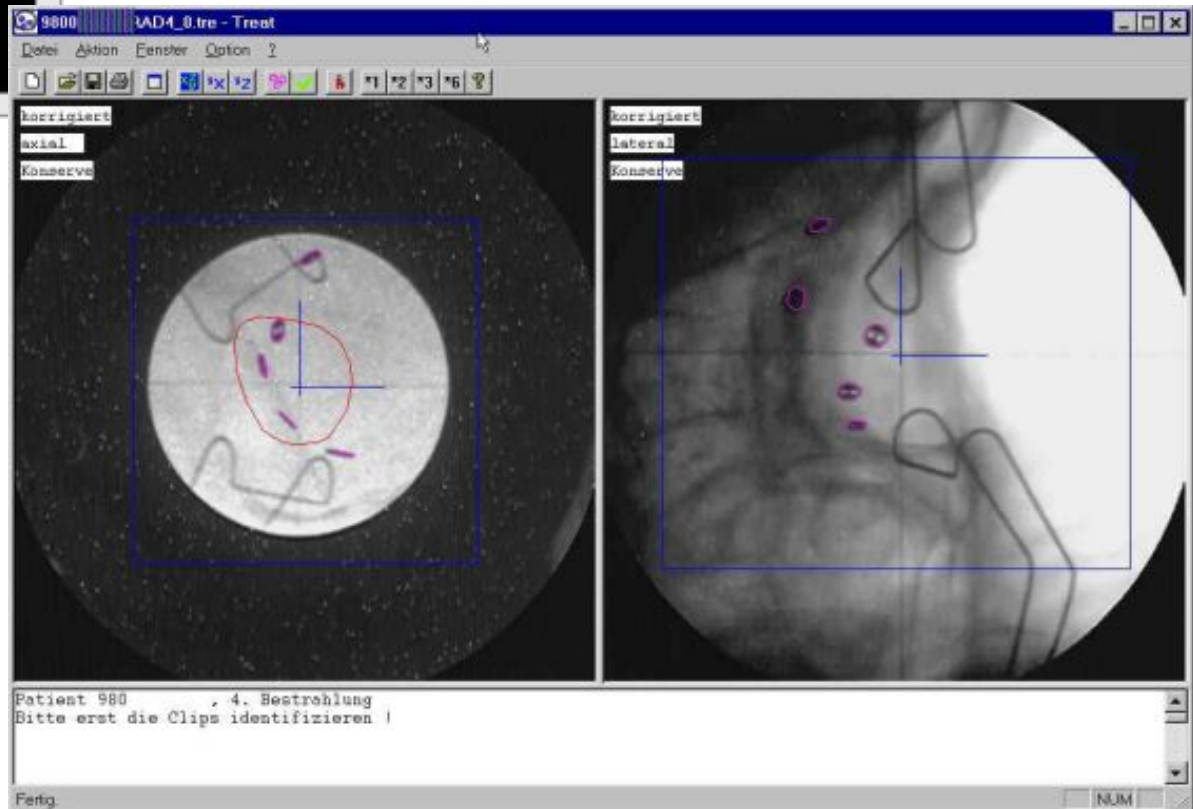
superimposed with different energies



# principal setup



# Diagnosis - planning - markers - positioning



## positioning

