

Lecture 2

Accelerators

2.1 Cross Section

2.2 Luminosity Definition

2.3 Luminosity Measurements

2.4 Acceleration of Particles

2.5 Accelerator Concepts

2.6 Cyclotron

2.7 Synchrotron

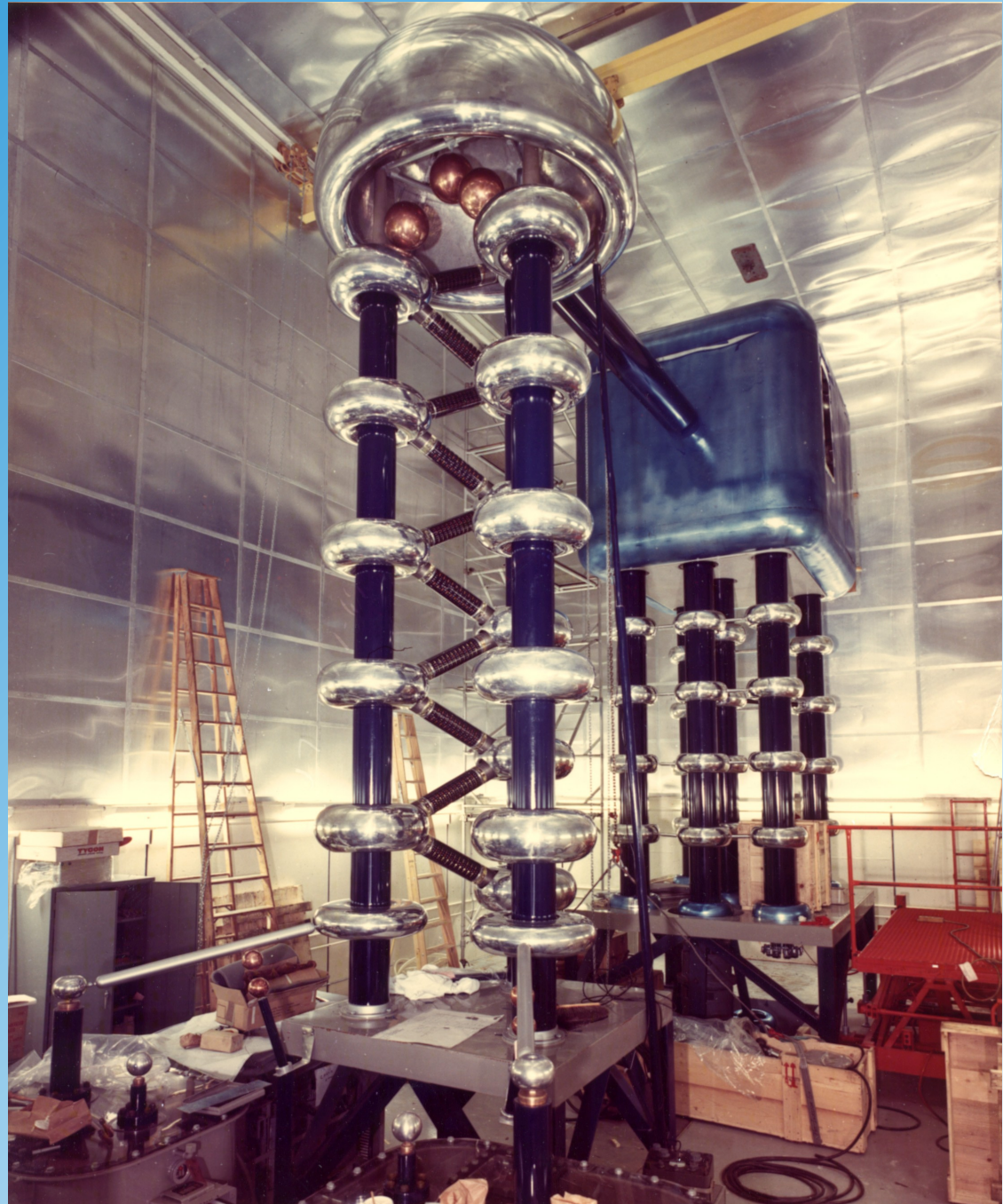
2.8 Magnetic Dipoles + Synchrotron Radiation

2.9 Transverse Beam Stability

2.10 Phase Space and Machine Functions

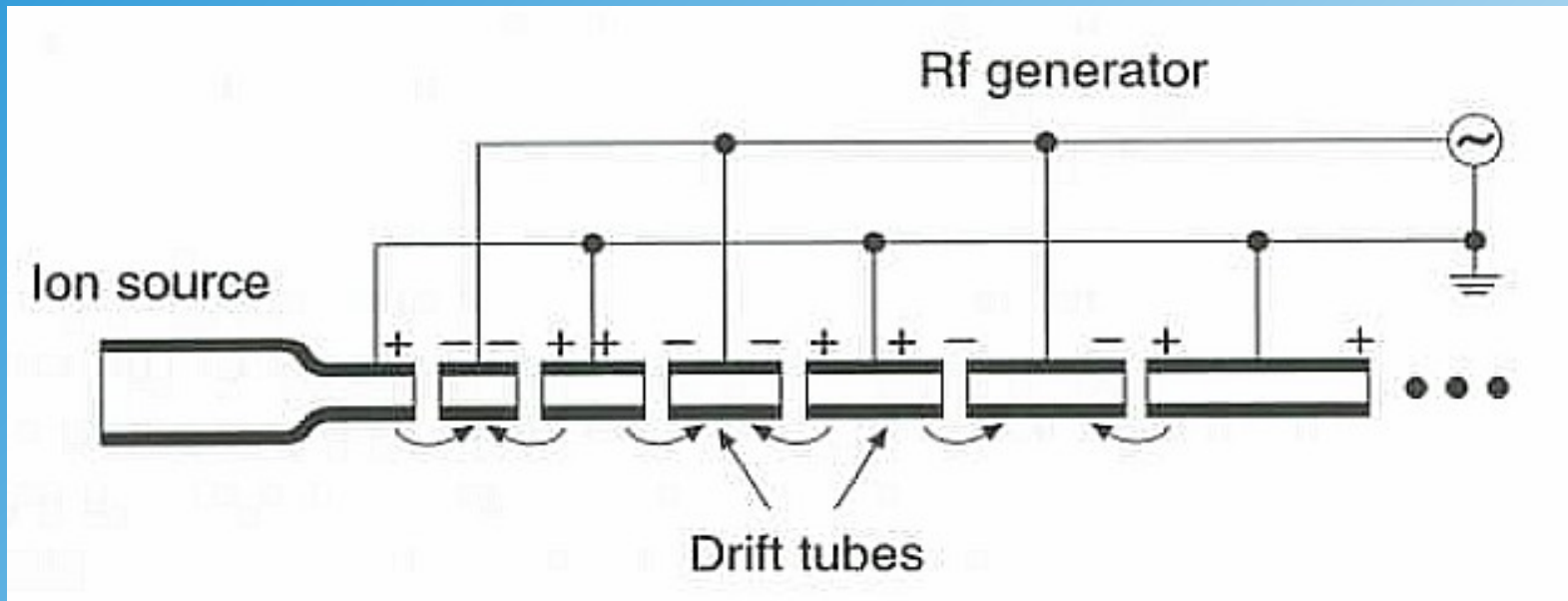
Cockcroft-Walton Generator

(electrostatic accelerator)

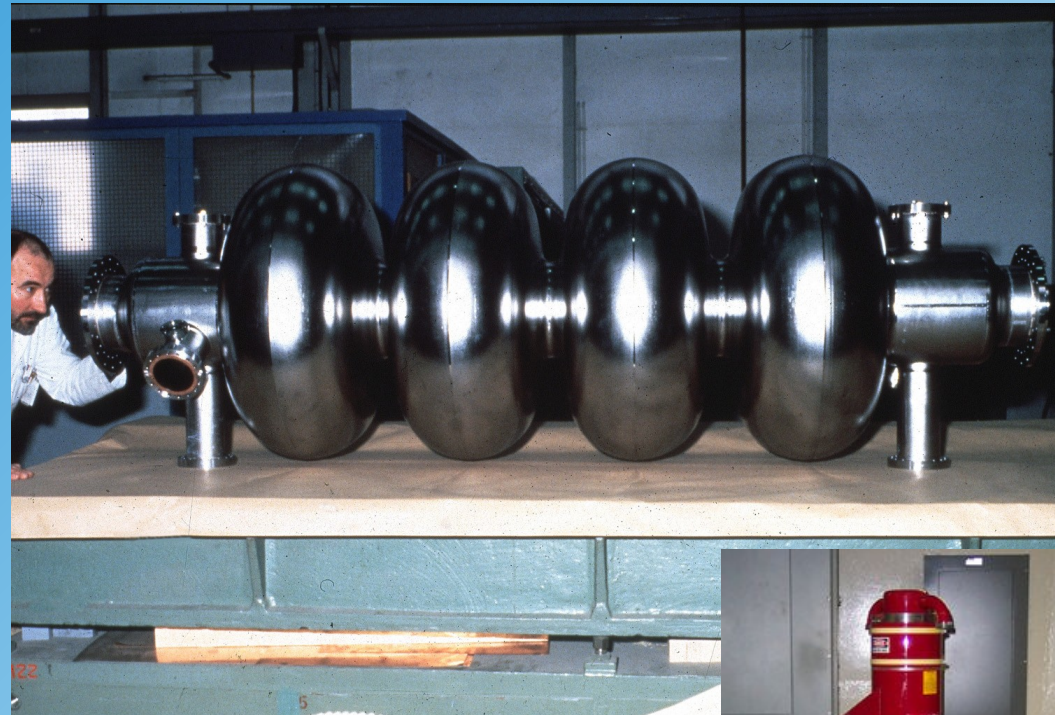
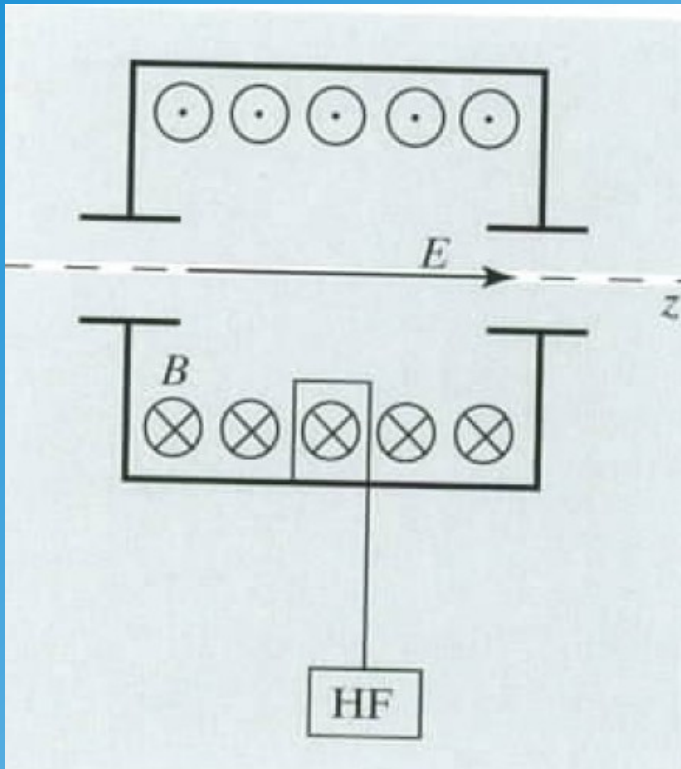


Acceleration of Particles

drift tubes:

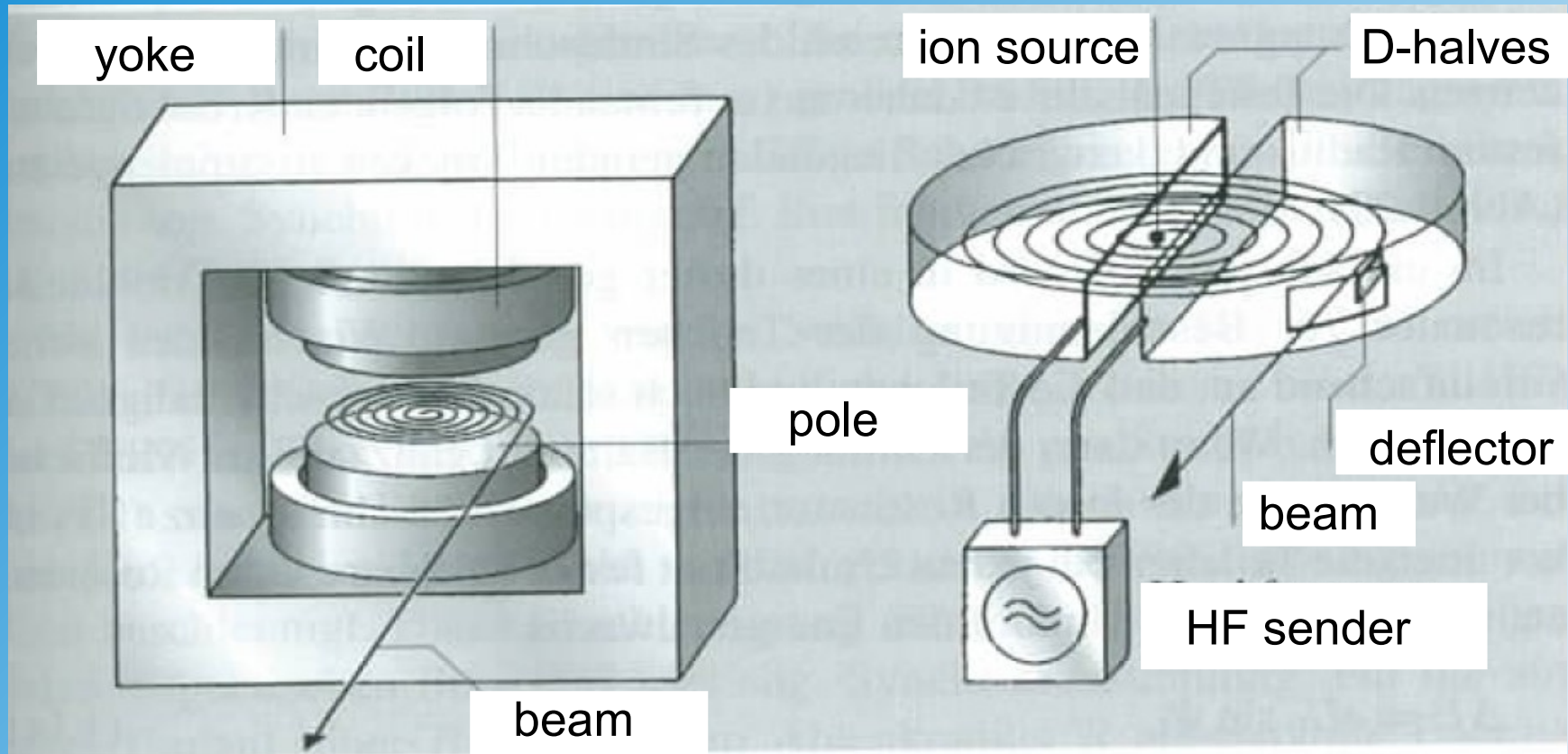


Cavity and Klystrons

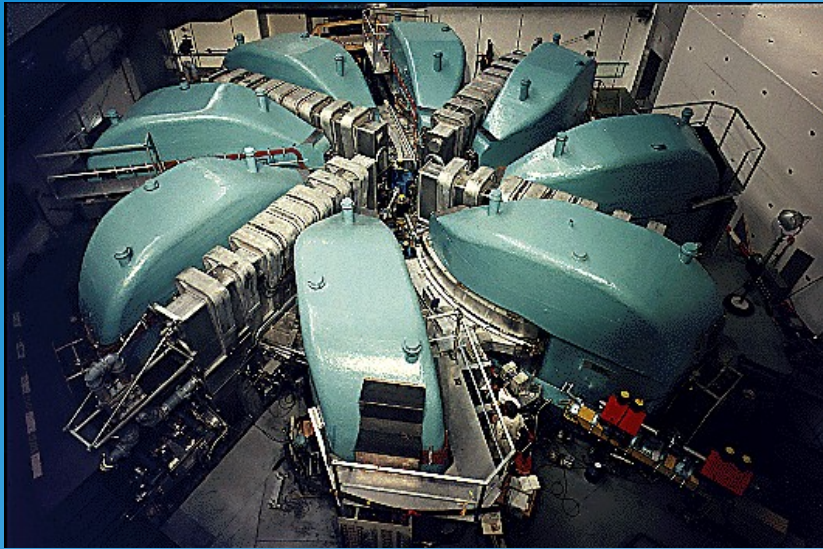


klystron

Cyclotron



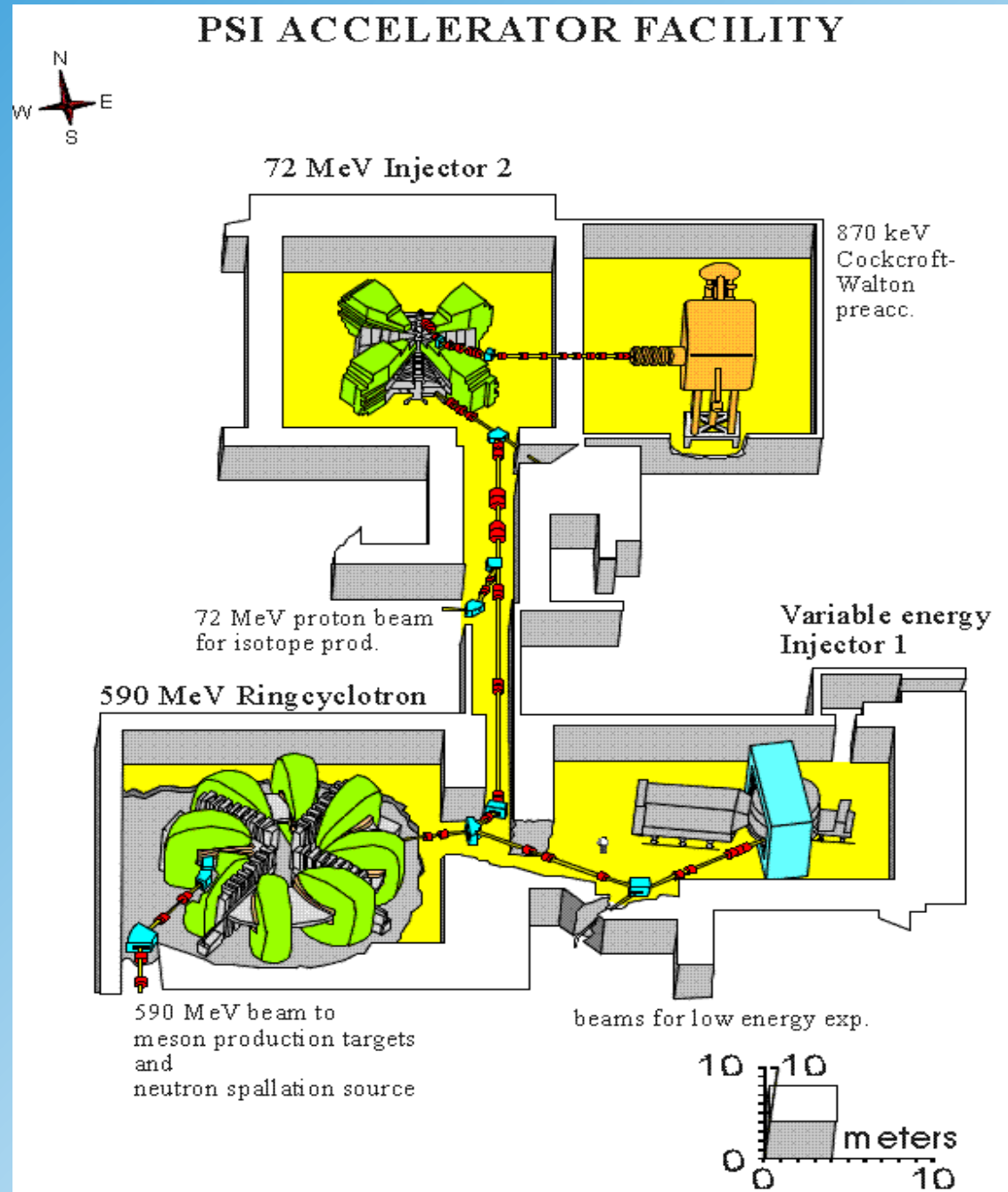
PSI: Proton Cyclotron



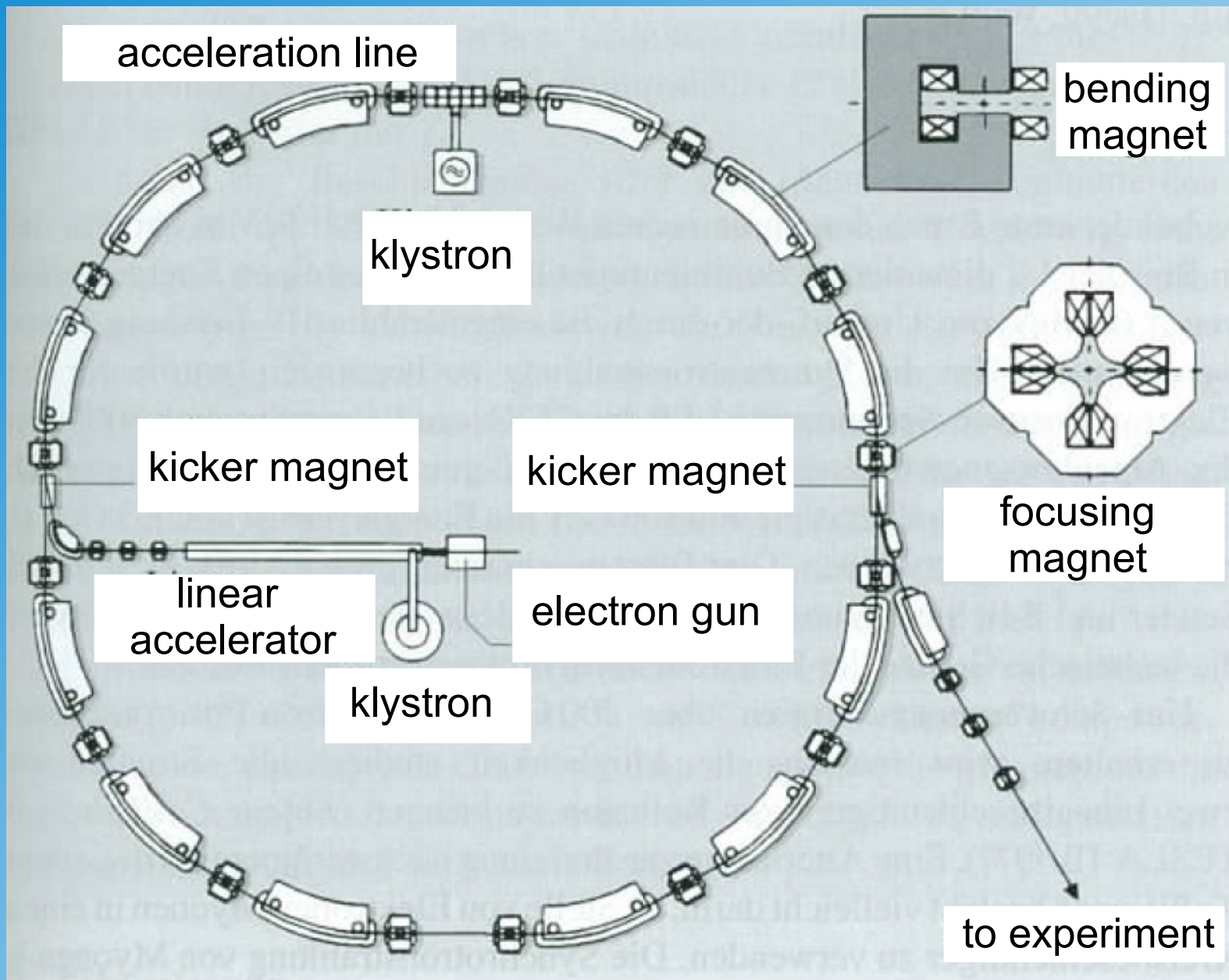
590 MeV cyclotron

$I_p = 2.2\text{-}2.4 \text{ mA (DC)}$

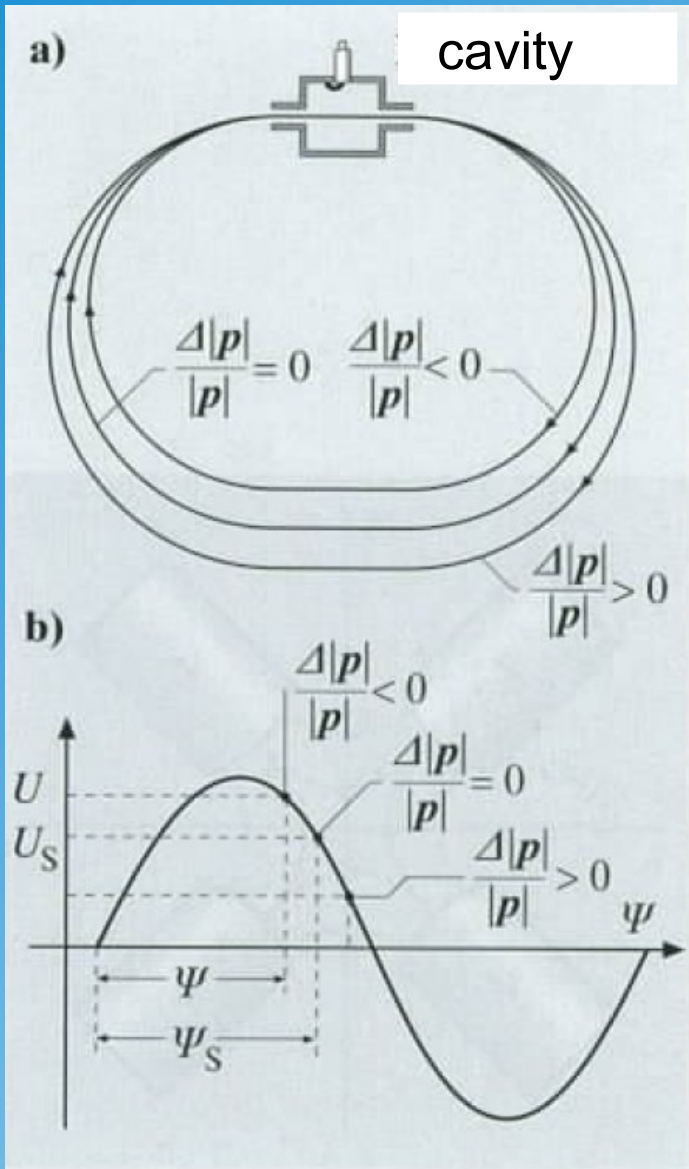
8 magnets instead of two “dees”



Synchrotron



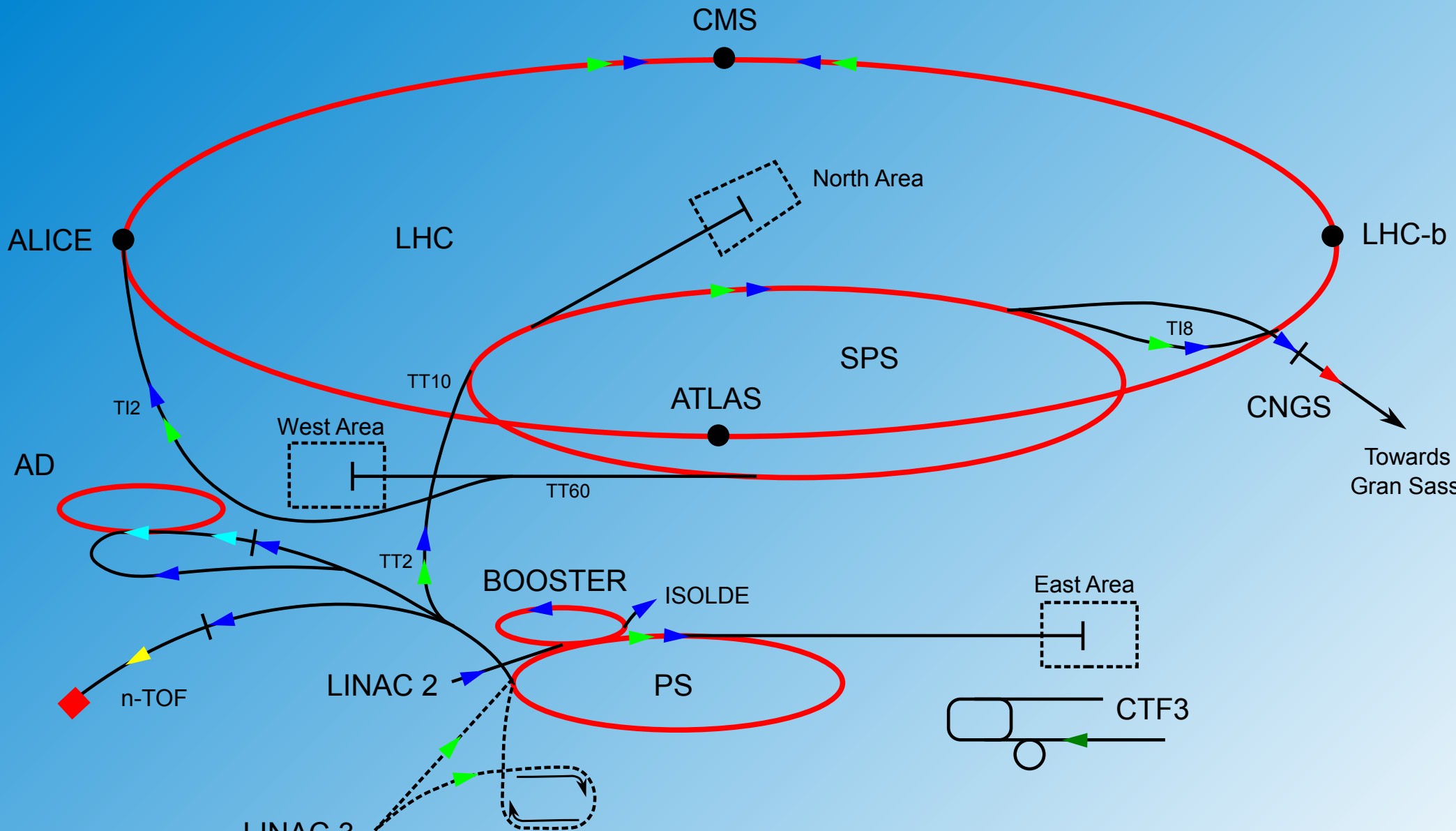
Orbits and Stabilisation



momentum-stabilisation of the beam

nominal phase = Ψ_s

← field in cavity



- ▶ protons
- ▶ ions
- ▶ neutrons
- ▶ antiprotons
- ▶ electrons
- ▶ neutrinos

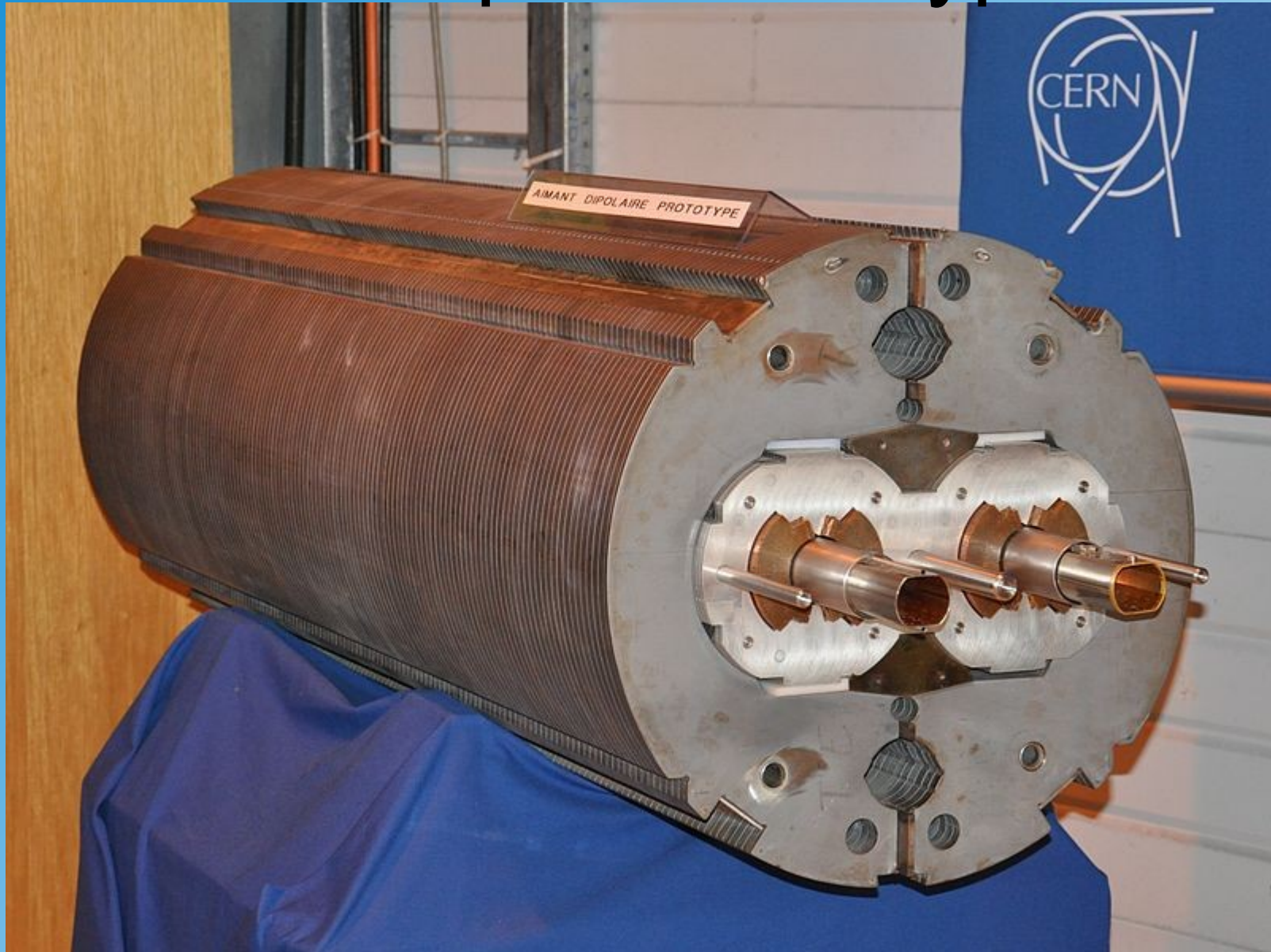
- PS Proton Synchrotron
- SPS Super Proton Synchrotron
- LHC Large Hadron Collider

- AD Antiproton Decelerator
- n-TOF Neutron Time Of Flight
- CNGS CERN Neutrinos Gran Sasso
- CTF3 CLIC TestFacility 3

Superconducting LHC



LHC Dipole Prototype



DESY Accelerator Complex

