

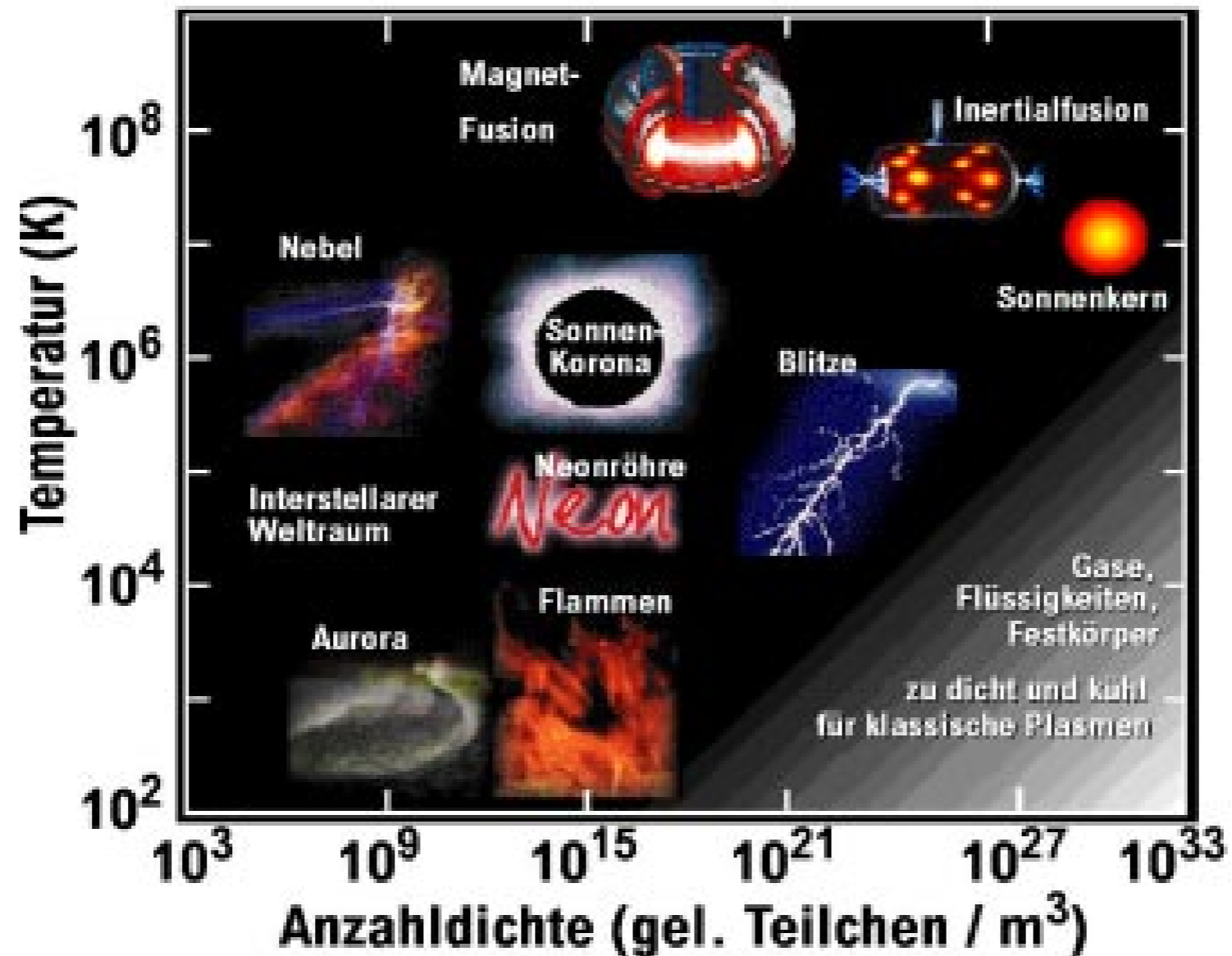
Seminar/Proseminar Plasma Physics Winter Semester 2016/17

http://www2.ipp.mpg.de/~pwl/tum/2016_WS.html

possible topics:

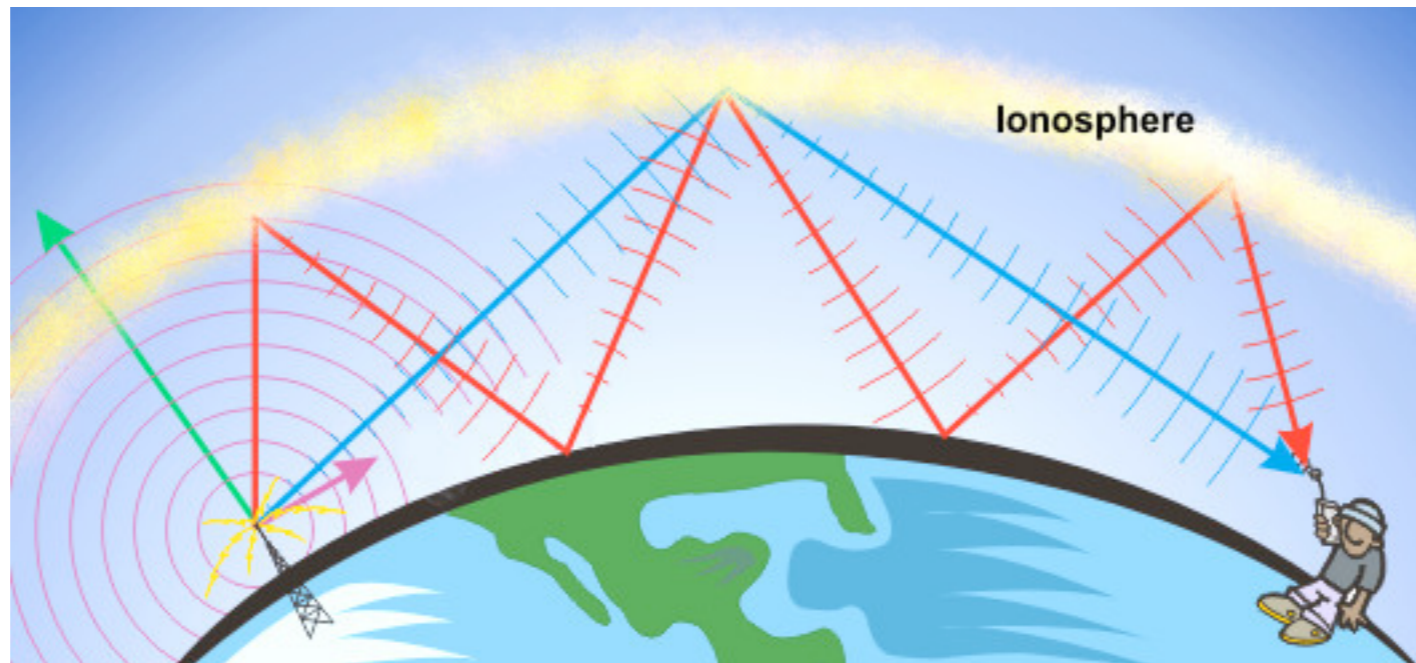
1. Classification of plasmas, plasma properties, plasma frequency
2. Coulomb Collisions
3. Charged particle motion and drifts
4. Low temperature discharges, plasma TV
5. MHD
6. Plasma thrusters
7. Fusion processes
8. The sun
9. The corona, solar wind
10. Electron-Positron Plasmas
11. Confinement concepts
12. Tokamaks
13. Runaway Electrons
14. Stellarators

Plasma Properties



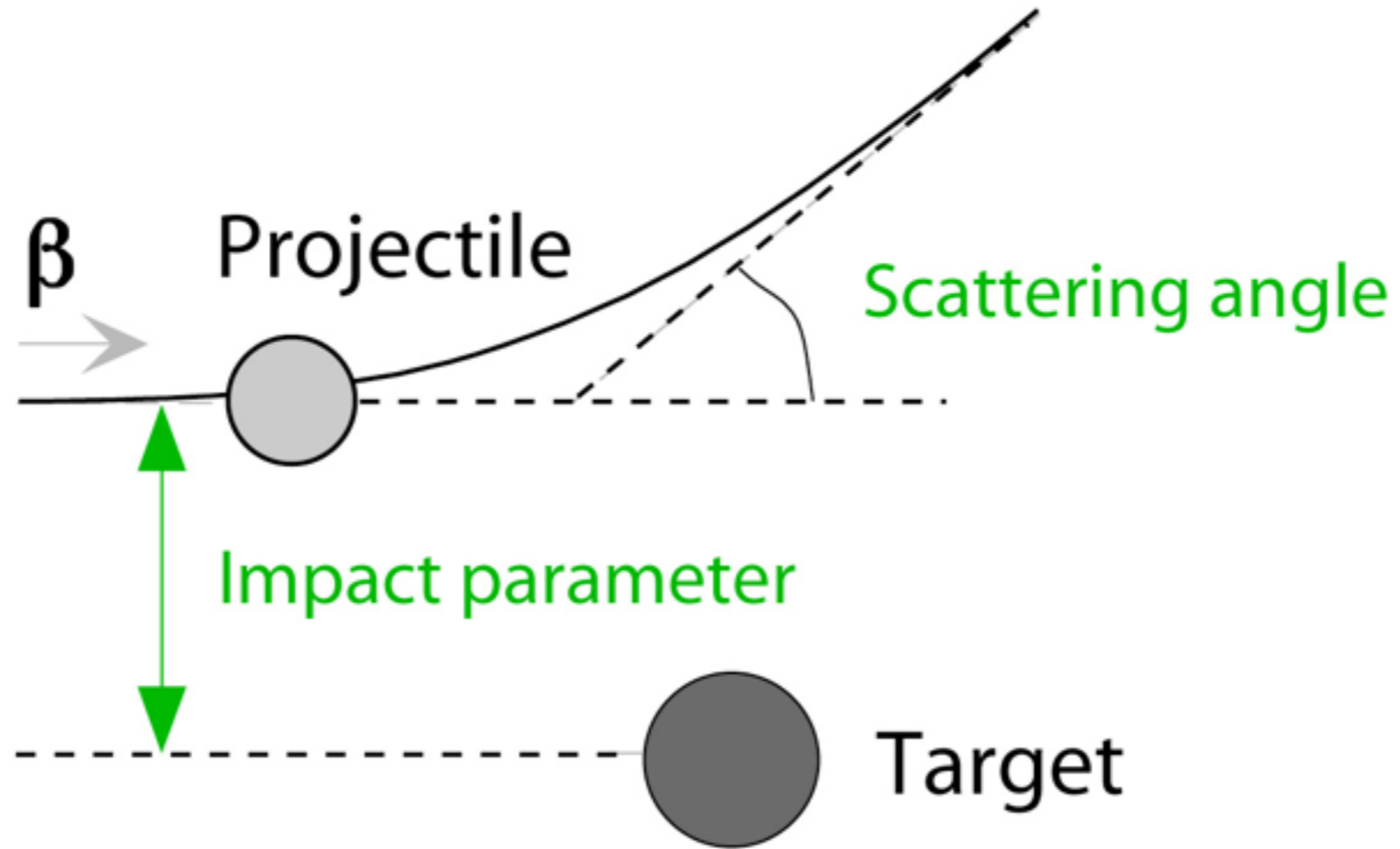
classification of plasmas,
Debye theory

Plasma frequency



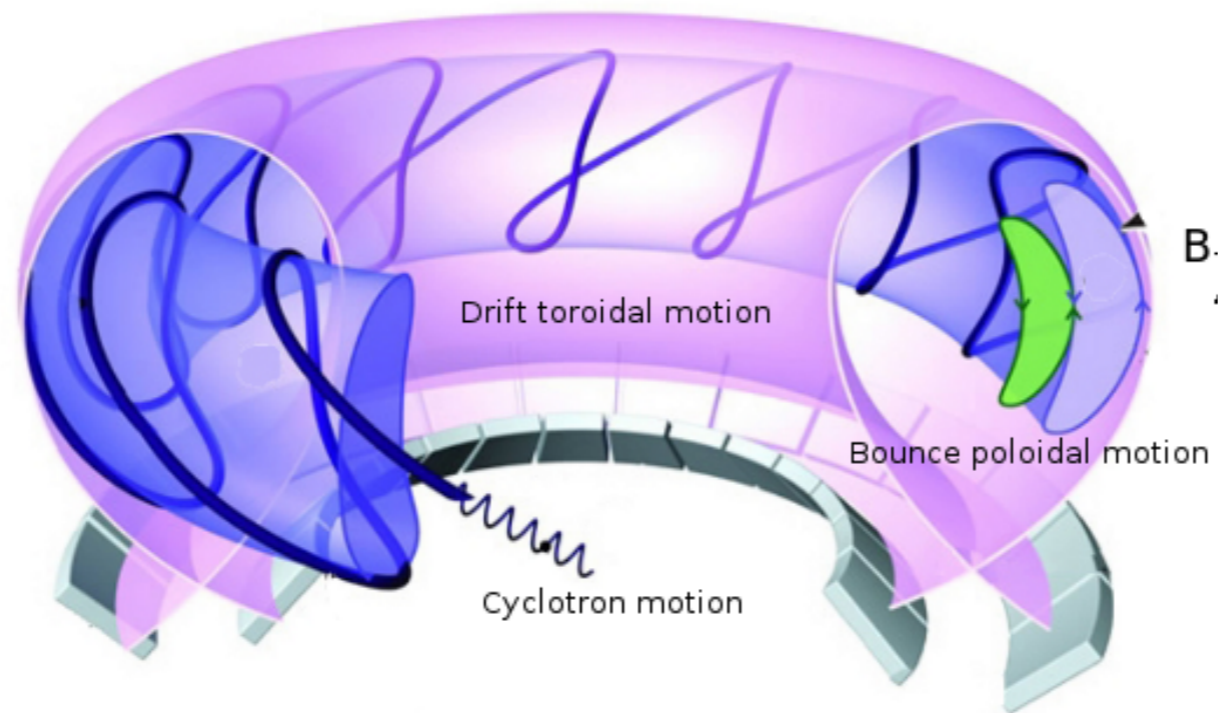
derivation, consequences,
application to ionosphere/
plasma diagnostics

Coulomb collisions



cross section, Coulomb logarithm, friction force

Charged particle motion in inhomogeneous magnetic fields



drifts, guiding centre description
(numerical approaches: implicit, explicit, symplectic)

Magnetohydrodynamics (MHD)

$$\frac{d\rho}{dt} + \rho \nabla \cdot \mathbf{V} = 0,$$

$$\rho \frac{d\mathbf{V}}{dt} + \nabla p - \frac{(\nabla \times \mathbf{B}) \times \mathbf{B}}{\mu_0} = 0,$$

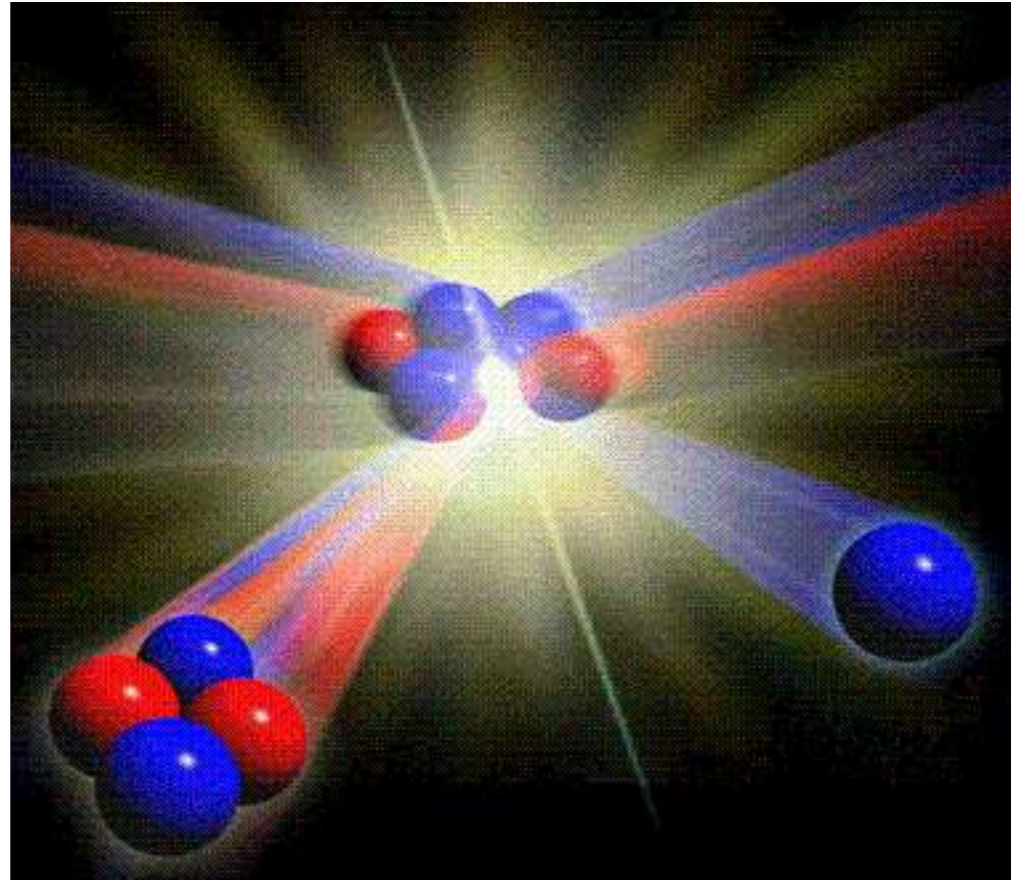
$$-\frac{\partial \mathbf{B}}{\partial t} + \nabla \times (\mathbf{V} \times \mathbf{B}) = 0,$$

$$\frac{d}{dt} \left(\frac{p}{\rho^\Gamma} \right) = 0,$$

Plasma Thrusters

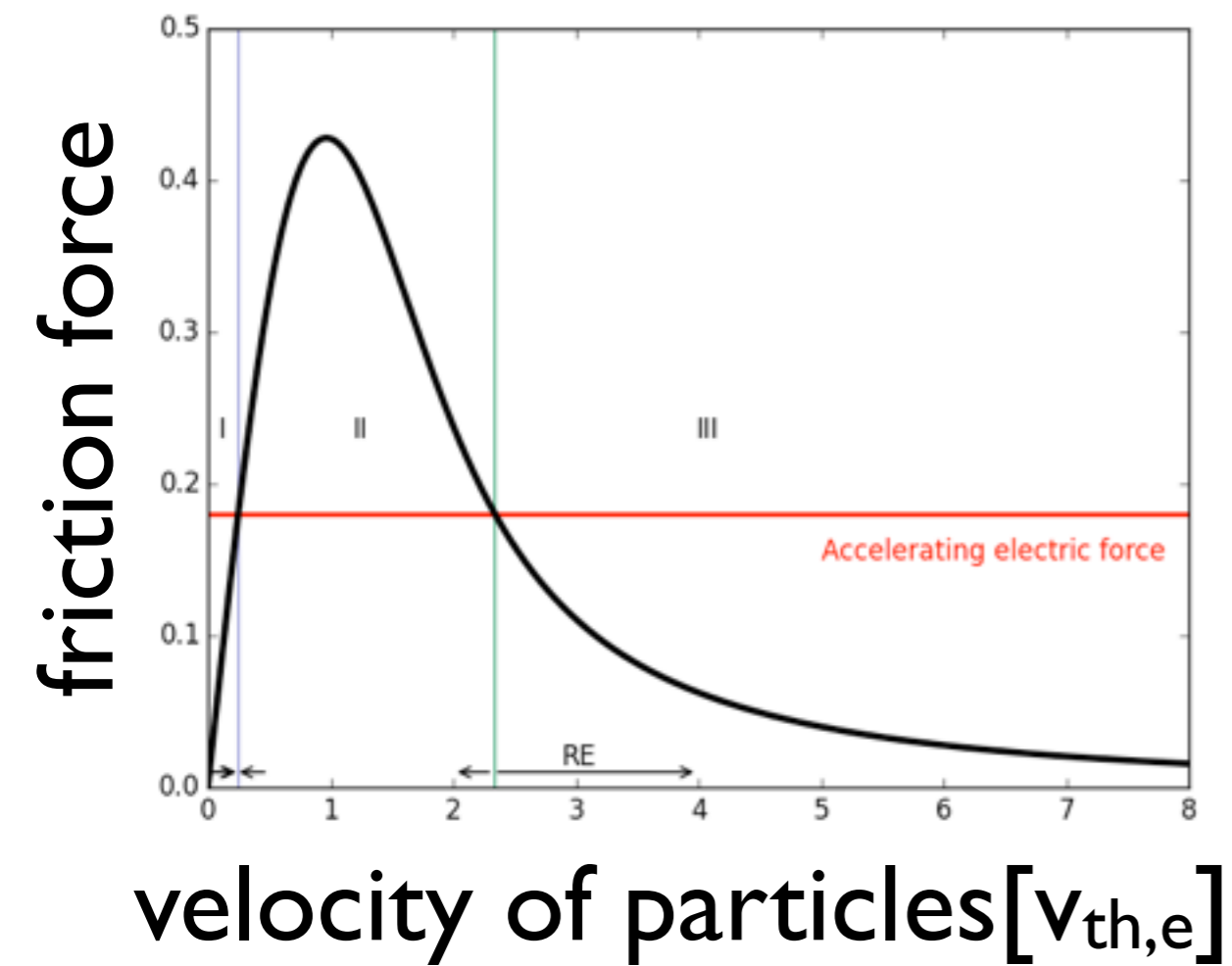
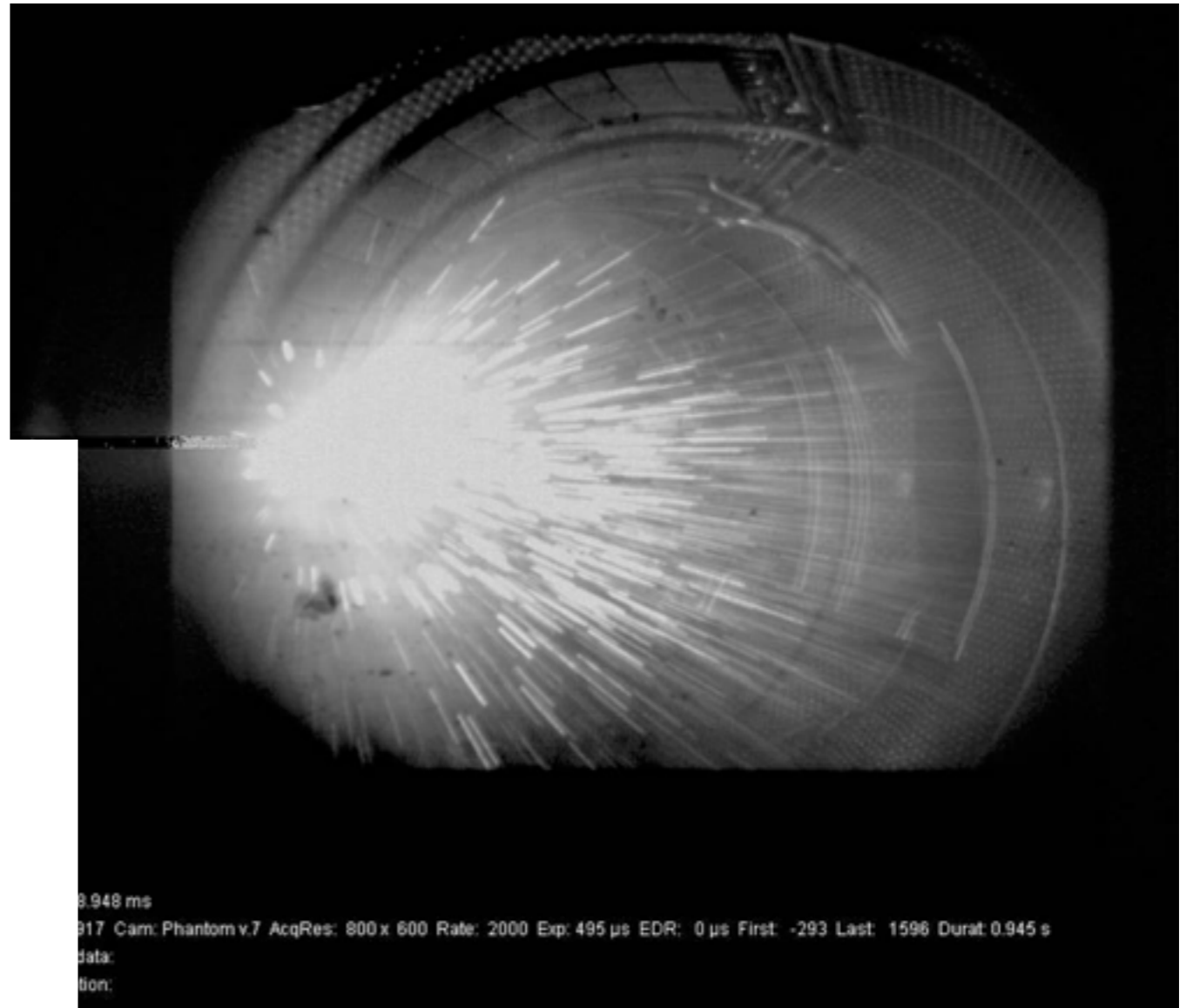


fusion processes

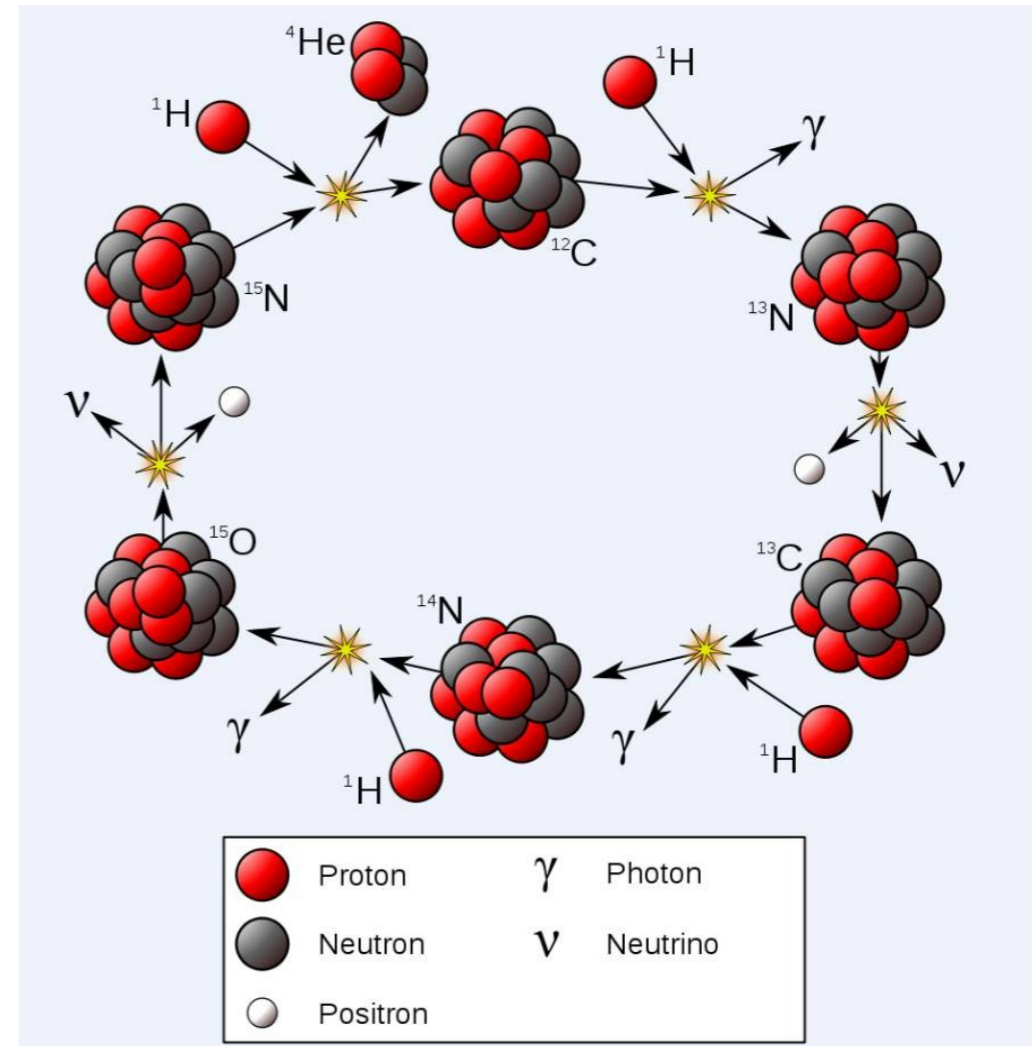
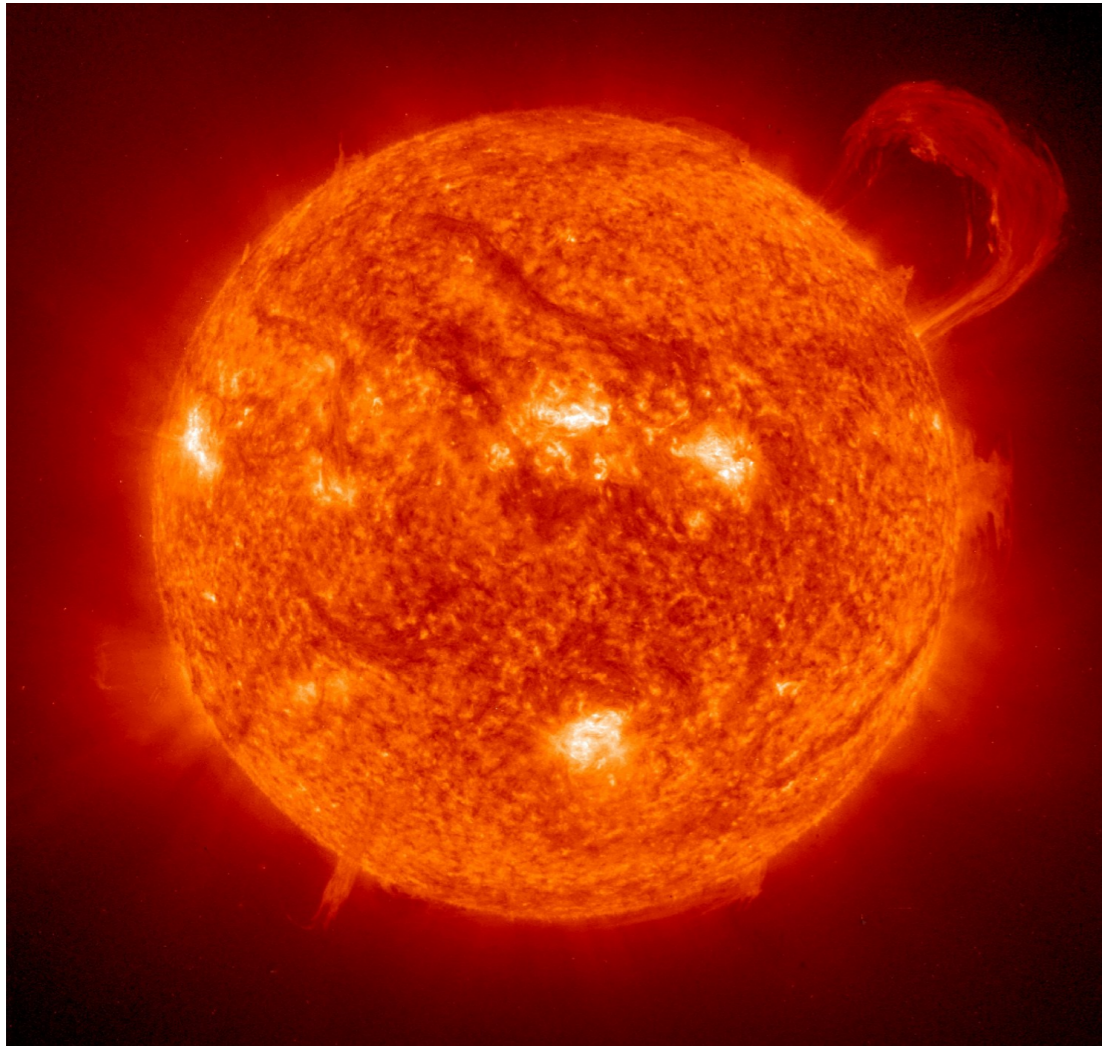


cross sections, reaction
rates, applications

Runaway electrons

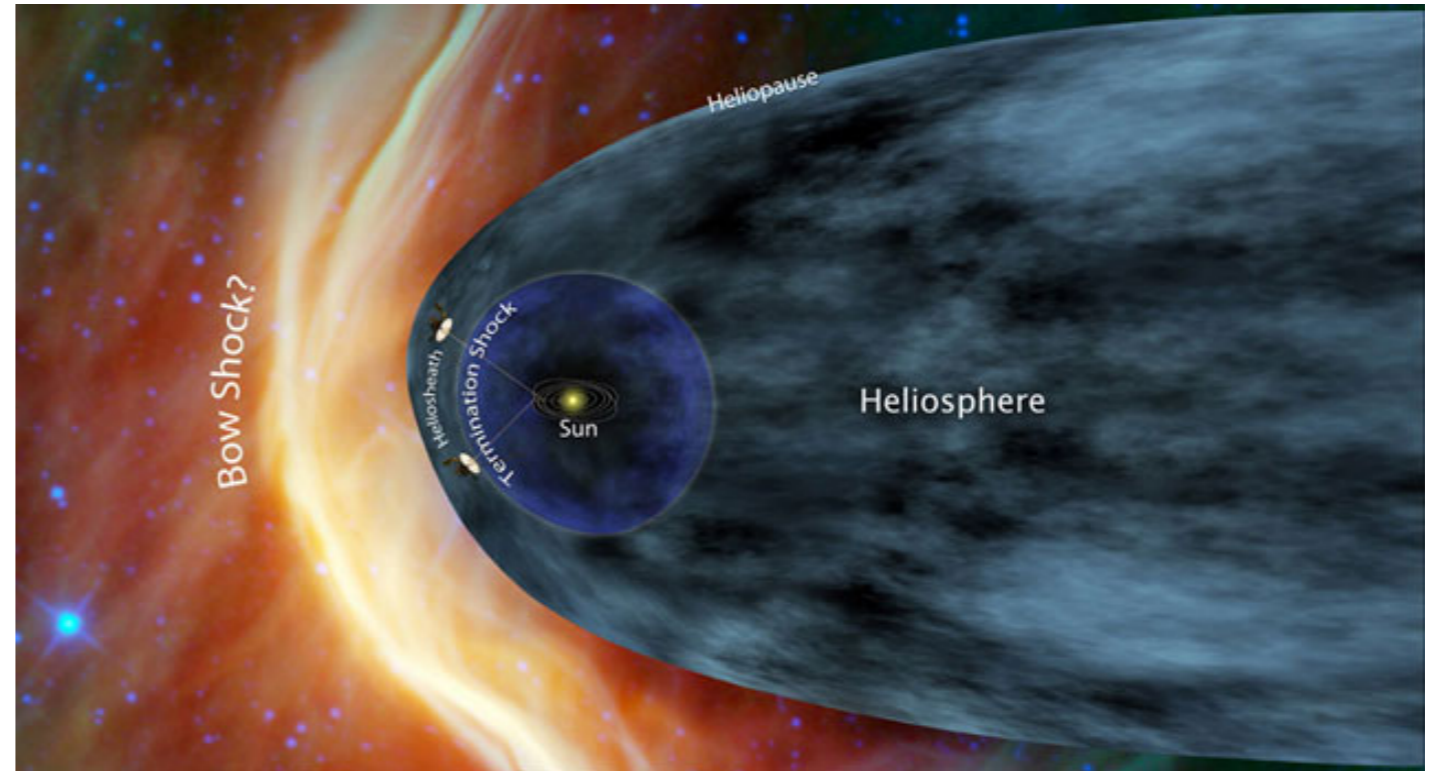
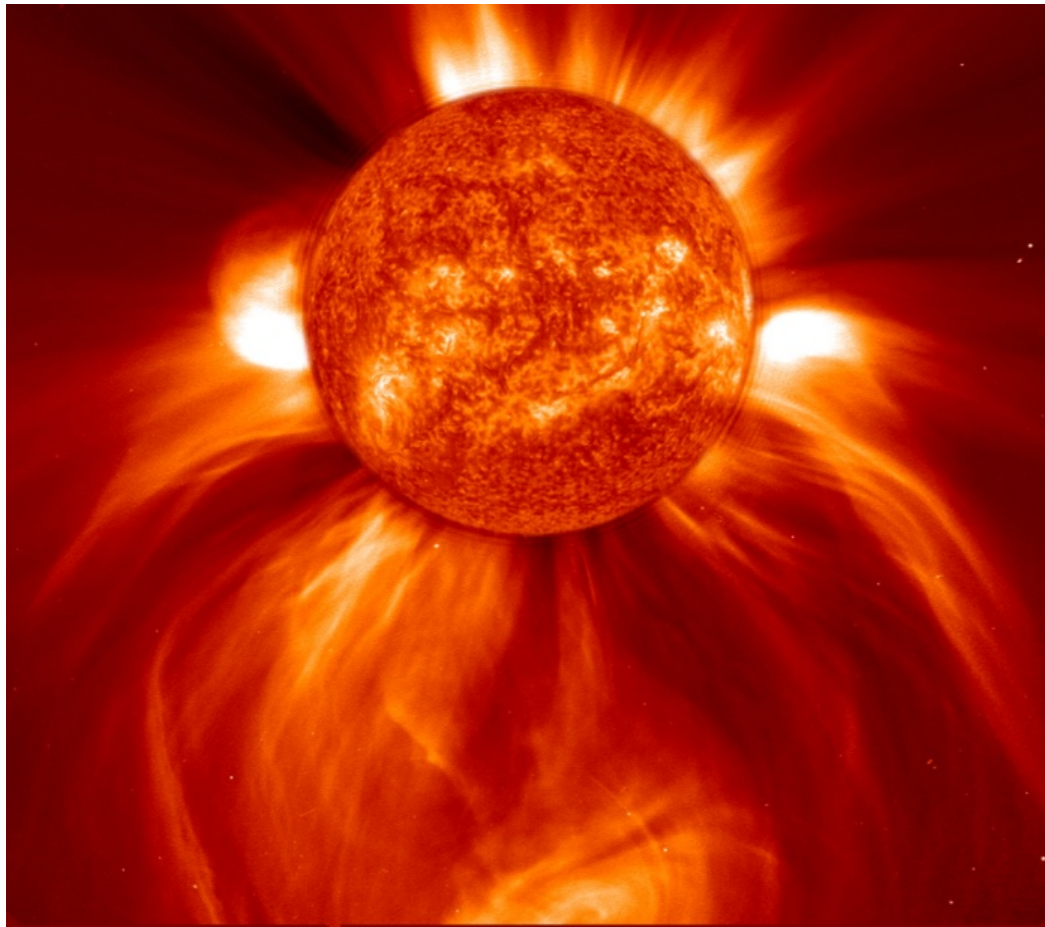


The Sun



nuclear processes, solar structure, solar equilibrium and equations of state, life cycle of the sun and stars in general

Corona and the solar wind

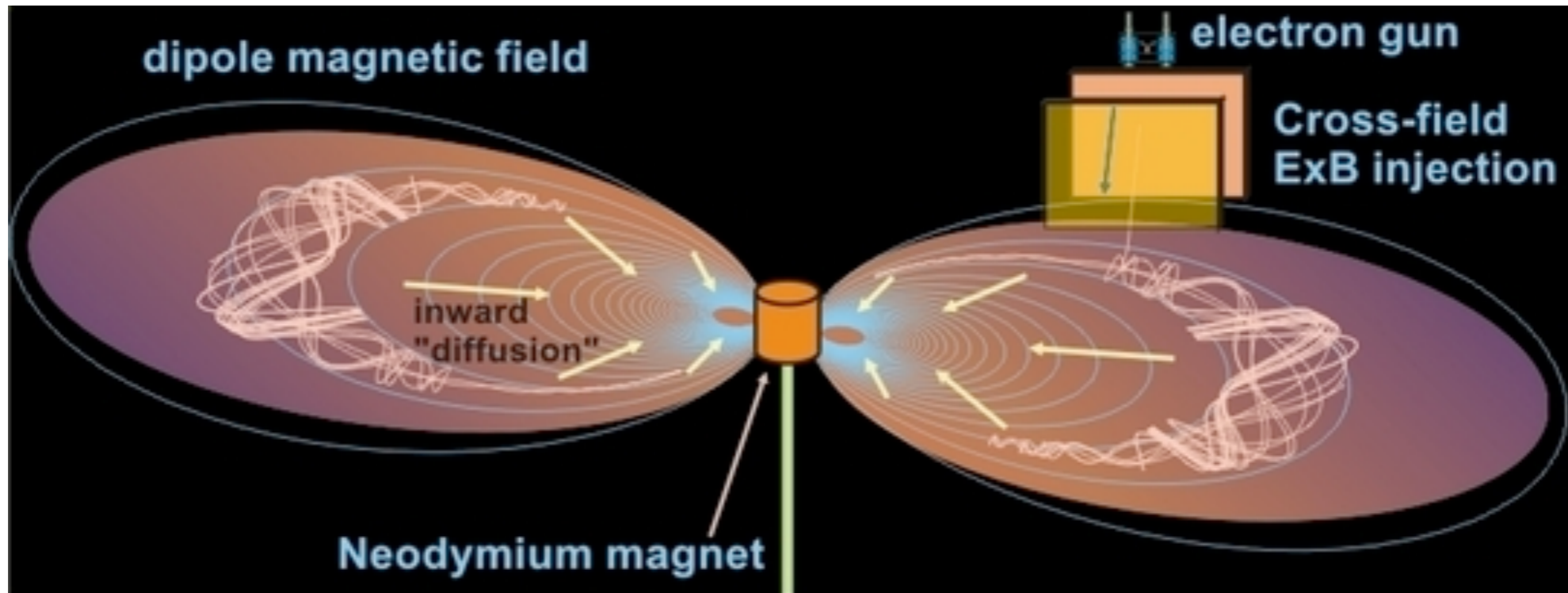


NASA, easa/SOHO

solar structure, magnetic fields in the sun(dynamo),
solar spots, the corona heating problem

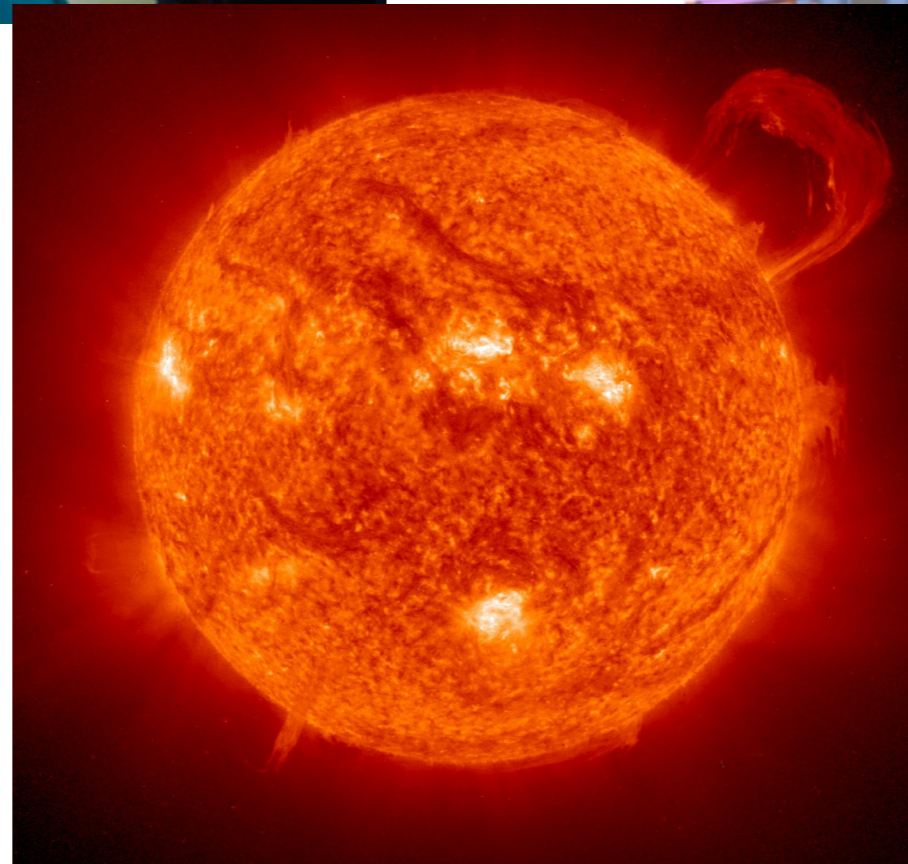
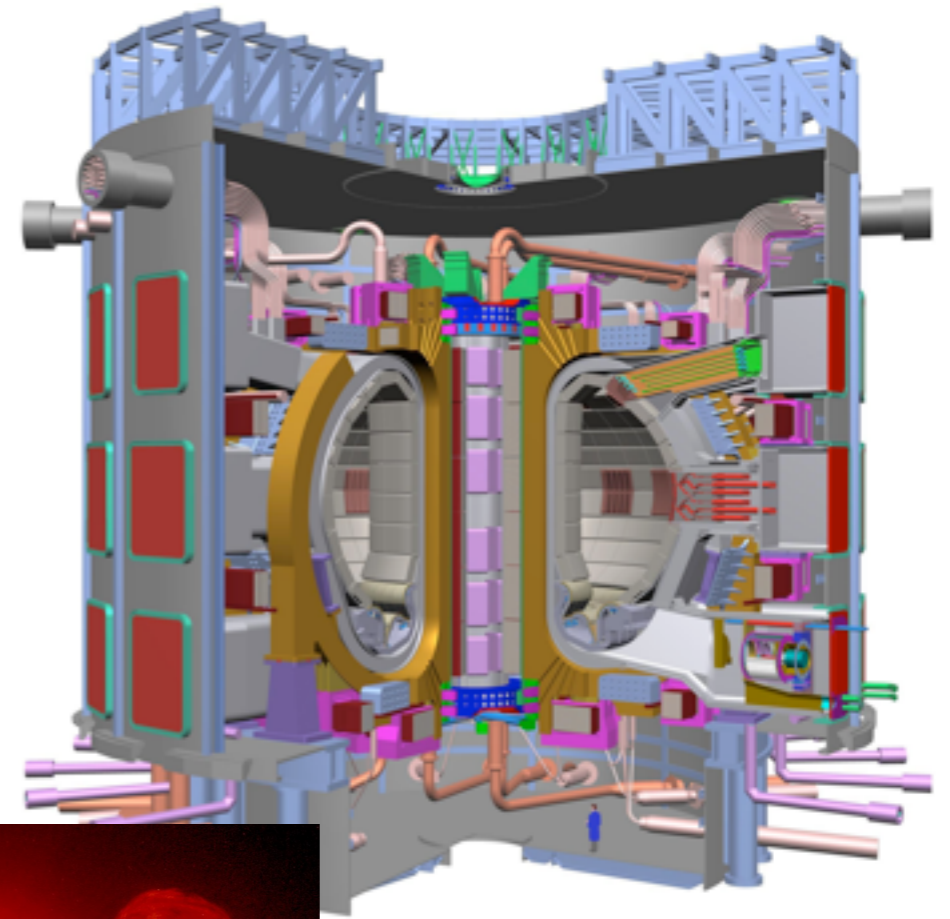
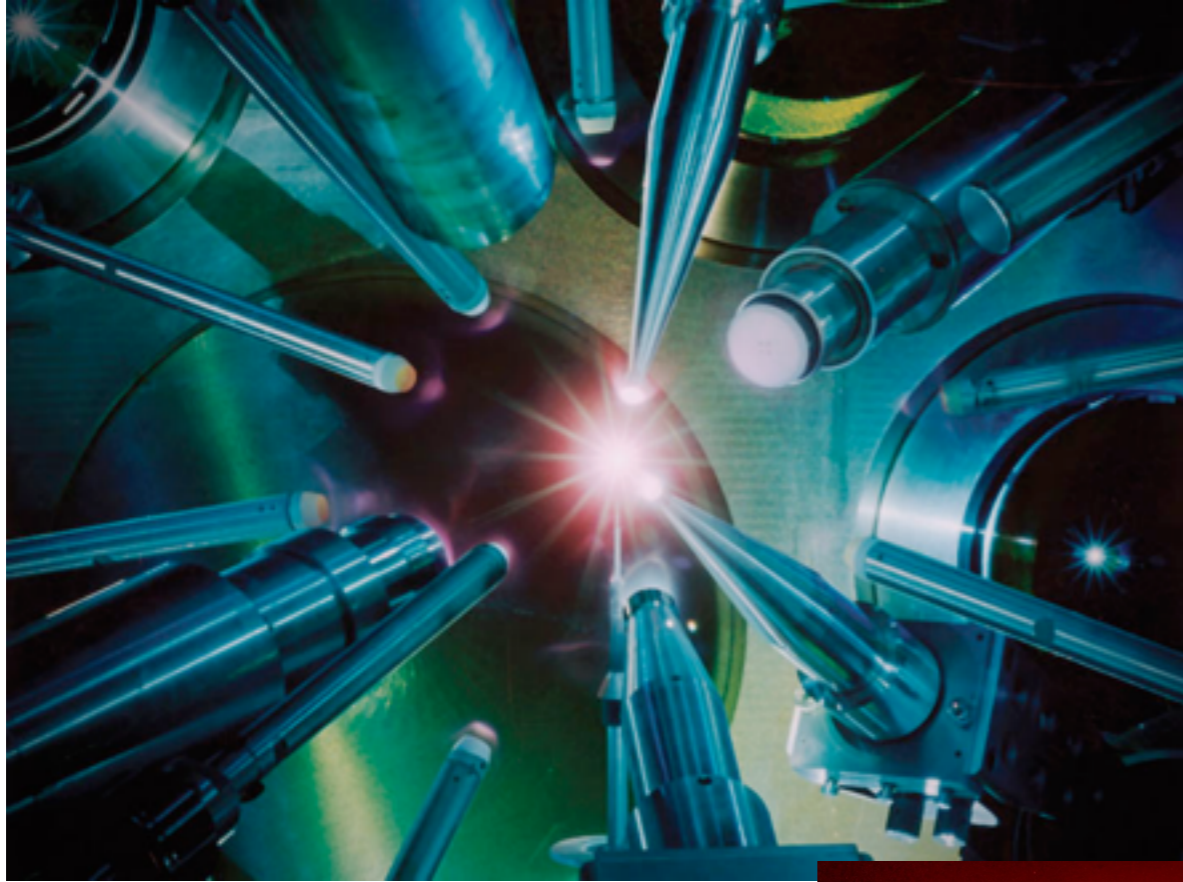
history, origin, Chapman model (static), Parker Model,
interaction with earth magnetic field

Electron-Positron Plasmas



theoretical properties, experimental setup

Confinement concepts



Tokamaks (ITER/DEMO)/ Stellarators (W7-X)

