

# Beam Emission Spectroscopy (BES)

## Physical principles

When neutral particles enter in a plasma, they are subject to inelastic collisions with plasma's ions and electrons. The neutrals' electrons, which initially are in their ground state, can reach a higher energy level,  $E_2$  and, when they decay to a lower energy state  $E_1$ , they emit a photon with energy  $E_\gamma = E_2 - E_1$ , and wavelength  $\lambda = \frac{hc}{E_\gamma}$ .

In particular, of specific interest is the Balmer- $\alpha$  emission of the deuterium atom  $D_\alpha$ , which corresponds to the transition between  $n = 3$  and  $n = 2$ , and is characterized by an energy  $E_{D_\alpha} = 1.89$  eV and a wavelength  $\lambda_{D_\alpha} = 656.279$  nm.