

## SHORT COURSES

### **MAGNETRONS - CASE STUDY OF MAGNETIZED PLASMAS**

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Magnetized plasmas are of high interest for improving the electron confinement and hence increasing the plasma density. They are widely used for space thrusters, thin film deposition, surface treatment and coatings, charged particles sources for accelerators, beams, etc.

This lecture will firstly introduce the necessity to operate these plasmas at low pressure and explain the effectiveness of the magnetic confinement. Several hints will be given to evaluate the magnetic field configurations and different topologies will be discussed.

Further, the core of the lecture will focus on the modeling of the magnetron discharge, as a valuable example of the magnetized plasmas. Indeed, the magnetic field is complex, presenting strong curvature and gradients, and the local electric field in front of the target can easily achieve huge values, exceeding 100 V/mm. Moreover, magnetrons can be direct current (dc) driven, as well as radiofrequency (rf) or pulsed and even high power pulsed, usually known as HiPIMS (High Power Impulse Magnetron Sputtering). The particular modeling approach will be presented and specificities for each type of plasma will be discussed, aiming to give a large overview of a broad range of magnetized plasmas, but also on the numerical methods used to address them.