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## Título puesto: Operation and development of the LLRF system

## Curso: 2026/27

## División: Aceleradores

## Descripción del proyecto:

ALBA is a 3rd generation synchrotron light source located in Cerdanyola del Vallès, Spain. It consists of a complex of accelerators dedicated to speed up and accumulate electrons in a circular ring, where they generate light for several experiments dedicated to material and life science.

The accelerators division is responsible of operating and maintaining the machine and specifically, the radiofrequency group is in charge of the high-power amplifiers and the resonant cavities that provide energy to the electrons by means of longitudinal electric field generated in the path of the particles.

In order to provide a stable and in phase electric field to the particles, an FPGA based system named LLRF reads the amplitude and phase of the voltage inside the cavity and by means of a PID generates the needed low power signal that is fed to the amplifier and ultimately reaches the cavities.

The student would be in charge of develop and test new routines for the LLRF in form of VHDL code. These new developments shall we tested first in the Laboratory and finally in the ALBA machine itself. A non-exhaustive list of the possible routines to be implemented is:

- Digital reference generation of revolution frequency signal.
- Automatic switch OFF of the cavity
- Internal communication of primary and secondary board.
- General frequency modulation for rise/damp measurements.

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## Perfil del estudiante:

- The student must be enrolled to Physics, Electronic engineering or similar degree.

He/She shall also have

- Knowledge in hardware programming such a VHDL or Verilog.
- Knowledge in electromagnetic and high frequency theory such as impedance matching and resonators.
- Knowledge in analogue electronics such as filters or simple PCB design.
- Knowledge in control theory such as PID loops.

Tutor: Pol Solans

Responsable División: Francis Pérez