

## TECHNOLOGICAL OFFER - CELLS

### VARIABLE SPEED UHV CHOPPER

**A team of ALBA Synchrotron engineers have developed a new variable speed system for in-vacuum beam chopping**

The ALBA synchrotron managed by the Consortium for the Construction, Equipping and Exploitation of the Synchrotron Light Source (CELLS) is aiming at contributing to improve the industry competitiveness by offering the technological solutions developed in-house. In this case the ALBA Synchrotron engineers have developed a **new beam chopper compatible with ultra-high vacuum (UHV) that allows variable frequency and high speed operation.**

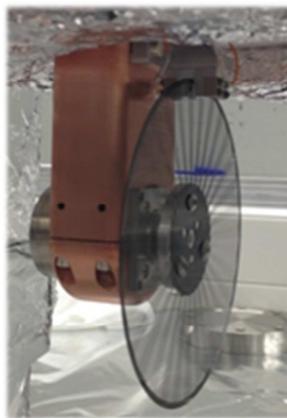
In some soft X-ray absorption experiments, when performing electrochemical characterization of electrode-electrolytes systems under extreme working conditions for instance, the big currents prevent from effectively collecting the tiny electron yield currents that permit the understanding of these reactions. In order to separate these weak currents induced by the X-Ray absorption process from the noise the incoming X-Ray beam must be chopped at certain high frequencies and then, the signal corresponding to the  $\omega$  frequency is extracted and measured. To modulate the TEY (Total Electron Yield) current, ALBA developed an in vacuum chopper with a variable frequency (up to 2KHz) that if inserted in the X-ray incoming beam, produces pulses with frequency  $\omega$  and therefore modulates the TEY.

The chopper consists of a slotted disk that spins driven by an UHV stepper motor. The main requirements of the mechanical chopper are the following:

- High and stable rotation speed (up to 2kHz).
- Controlled and variable frequency.
- UHV compatible.
- Allow the synchronization with the electron yield current by means of a lock-in amplifier.

The selection of **the stepper motor is a key issue** taken into account the high speeds required and the fact that it is placed at UHV, thus without air convection cooling at all. This problem is solved with the internally water cooled copper support that holds the motor.

In general terms, the chopper could be used to filter low frequency electrical noise whose origin are mechanical vibrations, network noise or accelerator feedback (150 Hz). Operating at slightly higher frequencies than noise sources (2 or 3 times), noise could be filtered thanks to a lock in amplifier so as to have cleaner signals with a better signal/noise ratio. This is useful when measuring weak signals or in general where signal's intensity is comparable to the noise level.



**CELLS (ALBA Synchrotron) is the owner of the present invention and is offering it to the technological industries for its commercialization. Those companies interested, please, do not hesitate to contact the ALBA Industrial Liaison Office in the below email:**

<b>Patent Status</b>	Spanish utility model
<b>Contact</b>	Industrial Liaison Office- ALBA Synchrotron <a href="mailto:industrialoffice@cells.es">industrialoffice@cells.es</a>