Cyclotron (cyclone 18/9, IBA)	**Category:** **B. Particle Labelling** **Institute: CIC biomaGUNE** **Location:** Paseo Miramón Parque Tecnológico de San Sebastian 20009 San Sebastian Guipúzcoa, SPAIN **Contact Details of Technology Expert:** **Jordi Llop Roig** **+34 943 00 53 33** **jllop@cicbiomagune.es**

Short technology description/Overview:

Particle accelerator IBA Cyclone 18/9 cyclotron (dual particle, H- and D-). A cyclotron is a particle accelerator in which an electric field is used to accelerate ions, such as H- or D-, and a magnetic field is applied to "guide" them. The electric field is generated by the application of an electric potential difference to two electrodes (called dees and counter-dees), which are connected to the alternating current source (radiofrequency generator). Negative ions are generated in the ion source (placed in the center of the cyclotron) by applying a high voltage to hydrogen (or deuterium) gas. Negative ions are extracted from the center of the cyclotron by applying an electrical field. When the dee is positively charged, the counter dee is negatively charged. Thus, the ion is accelerated towards the dee by the electric field. Once the ion enters the hole of the dee it experiences only the magnetic field. When the ion leaves the dee, the polarity on the dees is reversed, so that the ion is accelerated again to the counter dee. The same process is repeated in the other dee, but the orbit radius is higher as the speed of the ion is higher. This process continues and the ion is spiraling outward towards the border of the magnetic field. The ion gets an energy which is equal to the sum of all individual accelerations in the gaps between the dees and the counter dees. The final kinetic energy is determined by the nature of the ion and the size of the magnet. The particles are directed toward targets, loaded with specific substances. As a result of the high energy impact, a radioactive atom (which can be further used for the production of labelled species to be applied in imaging studies) is produced.

Main Features (Equipment Capabilities):

Seven targets for the production of:

- $[^{18}F]F^-$ (large volume, 2 units, able to produce 7.5 Ci in 2 hour beam)
- $[^{18}F]F_2$ (by irradiation of $^{18}O_2$ with protons, able to produce 800 mCi in 1 hour beam)
- $[^{13}N]NH_4^+$ and $[^{15}O]O_2$
- $[^{11}C]CO_2$ (to produce 2.5 Ci in 45 minutes beam)
- $[^{11}C]CH_4$ (to produce 1 Ci in 45 minutes beam)
- A solid target suitable for the production of other positron emitters is also available, although manual recovery of the irradiated material is required (no automated transfer of irradiated materials into hot cells).

Typical Samples & Images:

Any further Information: