

Section 5. New and ongoing projects

Research Project: Aurora (Autonomous Mobile Unit for Renewable Energy Generation)

PI: J. M. Andújar

Aurora is a project granted by the CDTI Feder-Interconecta call. At a business level, it is led by Sacyr, a multinational construction company.

The Aurora project also includes companies such as Ariema Enerxia, and Kemtecnia, a Huelva technological SME specializing in the field of renewable energies. The construction of Aurora is being carried out in San Juan del Puerto, at the installations of the Huelva company contracted for the project.

Under the name of Aurora, this project has developed and implemented a mobile autonomous unit of Auto Depletable Generation of Renewable Electric Power, integrated by various systems: photovoltaic, wind and hydrogen.

A fundamental characteristic of the Aurora project is its ability to be deployed in situ, an action that requires two operators to do it in about five hours, thus being able to meet almost immediately the energy needs in the context of humanitarian catastrophes or natural disasters.

This is achieved by Aurora thanks to a robotic arm that is folded in the container. This arm reaches a length of 18 meters when automatically and fully deployed and becomes the mast of the wind turbine itself at the end of its deployment. The total installed power of this first prototype is 32.5 kWp of one hundred percent renewable energy, although for the systems that are beginning to be commercialized through the companies, it is

expected to reach up to 100 kWp with the same container configuration.

The project was presented by Prof. Andújar and Kemtecnia at the International Conference on Power Engineering and Renewable Energy in Indonesia. This has facilitated the generation of business contacts in the aforementioned country. Interest in the project has been very high, since Indonesia, with more than 18,000 islands, sees in Aurora a possible solution for its electrification problems.

Prof. Andújar is very satisfied that the central axis of the Project is becoming a reality. In his own words, Aurora "is able to take energy to remote places of any part of the world, to cover the needs of catastrophes, humanitarian aid operations, infrastructures, etc. in a fast and independent way of fuel supplies".



Aurora presentation in ICPERE-Indonesia.

Tecnolivo

PI: J. M. Ándújar

Tecnolivo is a Interreg V-A Spain Portugal Program (POCTEP 2014-2020) and is co-financed with FEDER funds.

The TECNOLIVO Project was approved in the first call for projects of the EU Program (POCTEP 2014-2020).

The University of Huelva (UHU) through the European research project 'Technologies for the management and supervision of olive cultivation', will promote the research, technological development and innovation in this fruit, based on innovative techniques of precision agriculture through the use of drones. The UHU is part of the consortium making up the CEIA3, together with the universities of América, Cádiz, Córdoba and Jaén.

Participants in Tecnolivo include the research group TEP 192-Control and Robotics, the National Institute of Aerospace Technology (INTA, Spain); the National Institute of Agricultural and Veterinary Investigation (Portugal); Ubiwhere Lda. (Portugal); the Sociedad Cooperativa Andaluza Nuestra Señora de la Oliva (Spain) and the Murtigao - Sociedade Agrícola, S.A. (Portugal).

This project, financed with 2.5 million euros, pursues the development of a marketable technological solution (Tecnolivo) that is easy to use by farmers. It allows for an integrated, ecological and optimized management of the olive grove through the non-invasive monitoring of agronomic parameters of interest. The objective of this project is to modernize a traditional sector such as olive growing, by creating a pioneering technological product that opens up new business opportunities and places the

industry in Huelva and southern Portugal at the forefront of international innovation and, by extension, that in the rest of Andalusia and the centre of Portugal. With 'Tecnolivo', this project also seeks to improve the sustainability of olive cultivation, favouring an optimal use of resources.

The project presents an integral solution, in the sense that it is not just about flying with drones to obtain crop data through cameras or other sensors. 'Tecnolivo' has a dynamic configuration, as it allows for the identification of different areas of the olive grove in terms of interests. Once such areas have been established from the air, the network is installed in them. It allows for the monitoring, in real time and georeferenced, of the key parameters of the olive grove. These parameters are known in real time from the hydric status and individualized nutrients of each tree, up to an estimate of the amount of harvest.

This also permits an evaluation of the existence of pests and diseases, the treatments to be applied, in what areas of the olive grove and the extent to which action in this regard is needed.

'Tecnolivo' aims to contribute to the technological development in the olive sector in the province of Huelva, promoting the transfer of technology from the university, so that greater business opportunities and quality of employment can be generated.



Tecnolivo: detail of a drone to be used in the project.

Research Projects at CERN: Effects of the neutron halo in ^{15}C scattering at energies around the Coulomb barrier (INTC-P-468)

PI: I. Martel

INTC-P-468 is a research project approved by the International Scientific Committee of CERN (INTC). The activity is partially funded by the projects “FINURA” (Government of Spain) and “ENSAR2” (European Union H2020).

Nuclear systems, such as ^6He or ^{11}Li are known to have an extended neutron distribution, the so-called neutron halo [1].

This structure can be formed in systems where the separation energy of the valence neutrons is small, and the wave function can tunnel out the nuclear potential leading to an extended density distribution.

At energies around the Coulomb barrier, the reaction is dominated by neutron transfer and breakup. These processes are reflected in the shape of the angular distributions of the elastic cross sections and the fragments, and our team have investigated the dynamics of a number of halo systems like ^{11}Be , ^{11}Li and ^6He [2] scattered from heavy targets.

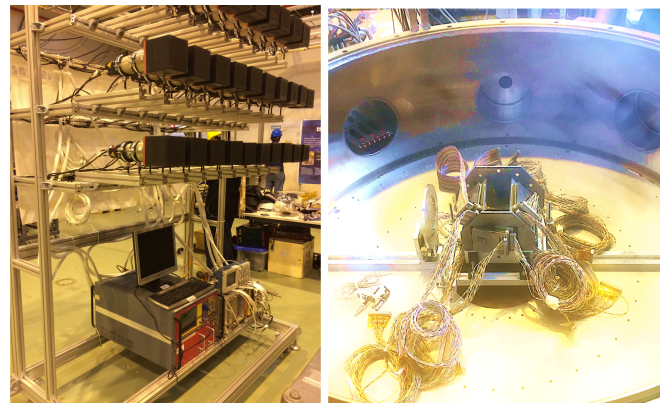
The neutron-rich carbon isotope ^{15}C has a half-life of 2.45 s, and the binding energy for one-neutron removal is only 1218 keV, suggesting the formation of a one-neutron halo structure. More interestingly, in the ground state the ^{14}C core is coupled to an $s_{1/2}$ neutron with a spectroscopic factor very close to unity [4], thus being a unique nuclear system exhibiting almost a pure $2s_{1/2}$ single neutron configuration.

A team of researchers of the Science and Technology Research Centre lead by Prof. I.

Martel is investigating the structure and dynamics of ^{15}C by a research project approved by the Scientific Committee INTC at the European Centre for Nuclear Research (CERN) in Geneva, Switzerland (INTC-P-468).

The measurements are carried out using the nuclear physics detector systems *SAND* and *GLORIA* [5] that the research group FQM318 “Structure of Matter” of the University of Huelva has installed at the beam line XT03 of the linear accelerator HIE-ISOLDE at CERN. *GLORIA* is a multichannel particle detector array called, and *SAND* a 30 units-modular neutron detector.

The complete setup at the experimental hall of HIE-ISOLDE is shown in the figure. Besides the basic nuclear structure interest of ^{15}C , the results will shed some light to the astrophysical relevant reactions of neutron capture over $^{13,14}\text{C}$.



Experimental setup of the University of Huelva at the XT02 beam line of HIE-ISOLDE at CERN (Geneva, Switzerland). Left: *SAND* neutron detector. Right: *GLORIA* particle (ion) detector.

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