Centro Nacional de Aceleradores-CNA
Applications, research, collaborations

Some studies, which are carried out at CNA, are shown below:

-Cultural Heritage: Carambolo Treasure composition study.

-Materials Science: Implantation of layers of different elements into new materials and determination of concentration profiles.

-Aerospace Technology: Electronic circuit behavior under irradiation.

-Instrumentation Development: Testing of detection systems for their use in large scientific facilities such as CERN, GSI, GANIL and ITER.

-Nuclear Physics: Half-life precise determination of ^{8}Li nuclei.

-Environment: ^{129}I distribution in marine environment.

-Environmental Impact: Plutonium determination in environmental samples.

-^{14}C Dating: Study of University of Seville Library Incunabula.

-Medicine: Radiopharmaceuticals production for PET imaging (Positron Emission Tomography)

-Preclinical Research: Determination of tumors evolution in animal models.

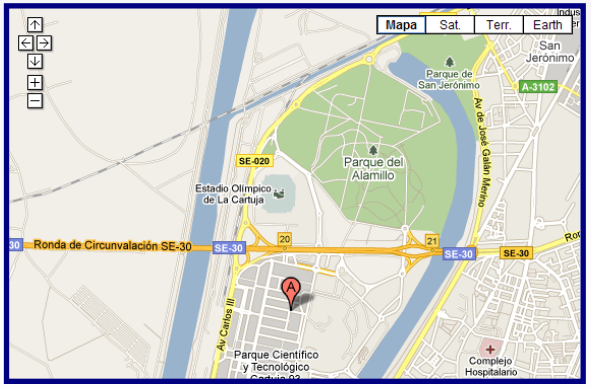
CNA has collaboration agreements with International Atomic Energy Agency (IAEA), Servicio Andaluz de Salud (SAS), CIEMAT (Public Research Agency for excellence in energy and environment) , as well as companies such as IBA Molecular and Enresa (Public entity responsible for the management of all the radioactive wastes generated in Spain).

Centro Nacional de Aceleradores-CNA
Presentation

Centro Nacional de Aceleradores, CNA, is a joint centre, Universidad de Sevilla, Junta de Andalucía and CSIC. It is a Singular Scientific and Technological Installation , ICTS, dedicated to interdisciplinary research with ion accelerators.

There are 3 accelerators: a 3 MV Tandem van der Graaff accelerator, a Cyclotron which provides protons of 18 MeV and deuterons of 9 MeV and a Tandem Cockcroft-Walton accelerator, so called 1 MV Tandetron, which is used as mass spectrometer. Recently, 3 new facilities have arrived at CNA, a human PET/CT scanner, a ^{60}Co irradiator and an ultracompact radiocarbon dating system, MiCaDaS.

The applications of CNA accelerators covers fields such as material sciences, environmental sciences, nuclear and particle physics and instrumentation and medical images treatment, biomedical research, among others.



Google Maps image

Centro Nacional de Aceleradores

Centro Nacional de Aceleradores
CNA

New Facilities

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Infraestructura cofinanciada por el Fondo Europeo de Desarrollo Regional
"Una manera de hacer Europa"

Centro Nacional de Aceleradores-CNA
Human PET/CT Scanner

Since late 2011, the National Accelerator Centre has a PET/CT for humans, which allows receiving patients at CNA facilities.

It allows the preparation of very flexible studies from (i) standard full body PET and CT scans to (ii) dynamic PET scans with field of view longer than one detector ring down to 3 s per bed, (iii) dynamic CT scans of up to 67 mm field of view and down to 1 s resolution, (iv) respiratory gated PET or CT scans, (v) cardiac gated PET or CT scans and (vi) flexible list mode acquisition in PET.

Human scanner shares control room with small animal scanner, both installed a few meters from radiopharmacy allowing studies with ^{11}C based radiopharmaceuticals of short half-life.

Presently, hospital patients of research interest are scanned in CNA three days a week, and for the remaining two days the Service provides the qualified personnel (radiologists and nurses) for the human studies designed by non-Hospital scientific personnel. Also, the scanner is used for the examination of large art objects with the CT and for the studies of animals with size or mass not allowed in the scanner for small animals.

Centro Nacional de Aceleradores-CNA
MiCaDaS

MiCaDaS system (2012) is an instrument to perform AMS analysis specifically designed for ^{14}C measurements.

Its design and functioning follow the basic scheme

of other AMS facilities, like the SARA system at CNA. Samples can be either solid or gaseous, and in any case they are sputtered by Cs^+ ions in the ion source, producing a negative ion beam. This beam is analyzed by a magnetic field before entering the accelerating part, with 200 kV.

In the accelerating stage ions interact with the stripper gas, changing from negative to neutral or positive charge, so that positive ions are accelerated a second time until ground potential, and finally analyzed with magnetic and electric field depending on the charge and mass.

AMS systems determine in a precise way the $^{14}C/^{12}C$ ratio in the samples, measuring different isotopes in different parts of the system.

At the low energy side the ^{12}C beam intensity is measured. At the high energy side beam intensity for ^{12}C, ^{13}C and ^{13}C coming from the breakup of ^{13}CH molecules is measured. ^{14}C counts are also measured.

Centro Nacional de Aceleradores-CNA
^{60}Co Irradiator

At the end of 2012 the CNA received the ^{60}Co Irradiator, devoted to perform photon irradiation studies, complementary to the research undergone with protons at the irradiation line of the 3 MV Tandem and the 18 MeV cyclotron (Cyclone 18/9).

It is one of the most versatile irradiators available nowadays for research. The Gammabeam ®X200 (GBX200) has a cobalt-60 (^{60}Co) source of 357 TBq (9651 Ci) on December, 2nd 2013, being the maximun air kerma-rate at 100cm 103Gy/h.

The initial purpose of this facility is the performance of reliability studies of electronic components used in aerospace technology by irradiating them with gamma radiation from the disintegration of the ^{60}Co. The facility fulfills the European Spatial Agency ESA/SCC Basic Specification Nº 22900 (Total Dose Steady-State Irradiation Test Method), as well as MIL-STD-740 and MIL-STD-883 regulations of the Defense Logistic Agency-DLA Land and Maritime.

Applications:
-studies about the change in the mechanical, electrical or thermic properties of materials exposed to radiations
-ionizing radiation metrology
-irradiation of biological tissues or samples under research.