LASA - Accelerators and Applied Superconductivity Laboratory
Universita’ degli Studi di Milano & National Institute of Nuclear Physics
INFN, Segrate (Milano), Italy

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Infrastructure and people

Founded in 1982 for the Superconducting Cyclotron K800 construction, presently in operation at LNS-INFN, Catania, Italy

People: about 40 persons (18 researchers, 22 technicians) plus students in nuclear/applied physics and radiochemistry

Infrastructure: Experimental area 2000 m², with a 50 ton crane
- Helium liquefier: 40 l/h, LN distribution (10 m³)
- Installed electrical power: 1.6 MVA
- 100 mbit/s LAN
- Machine workshop, Electronics facility, others

Nuclear and Radiochemistry Facilities:
“cold”, “warm” and “hot” radiochemistry laboratories, target preparation, nuclear physics measurements
Components and System for Superconducting Accelerator

- RF components
  - Cavities
  - Cryostats
- Photoinjectors
  - Photocatodes
- DC components
  - Magnets and cables
- Accelerator R&D
  - TRASCO-ADS and PDS-XADS
  - LIBO
- Radiochemistry
  - Cu64
  - ASTATO
- Neutron dosimetry
Neutron Dosimetry

Rem Counters and Spectrometers, for neutron dosimetry in thermal – GeV energy range, were developed starting from Superconducting Cyclotron project. A facility, with 1 Ci Am-Be neutron source, operates at LASA for test and calibration purposes. The developed instruments are, at present, used at high energy accelerator facilities, for medical accelerators and for crew cosmic rays neutron dosimetry in commercial flights.
Main uses of No Carrier Added Radiotracers

- Metallo-biochemistry: behaviour of different chemical forms of trace elements
- Environmental toxicology: Low Level and Long Term Exposure (LLE) to ultra-trace elements
- Nuclear medicine: radiodiagnostics (SPECT, PET) systemic radionuclide tumour therapy

Some NCA radiotracers applications
Production of a N.C.A. radionuclide

MAIN STEPS

Nuclear Reaction Studies
- thin-target excitation functions
- thick-target yields
- irradiation conditions optimisation

N.C.A. radiochemical processing
- Ultra-high purity chemicals
- Ultra-high purity targets
- ultra-high purity equipments

Quality Control
- Radionuclidic Purity
- Radiochemical Purity
- Specific Activity

Chemical Purity

N.C.A. Labelled compound

Radionuclidic Purity
Recent Projects co-funded by INFN

- **RAME-64** (2001-2002): study of cyclotron production, radiochemical separation and QC of high specific activity copper-64 (copper-61) by deuteron irradiation on natural Zn target.

- **ASTATO** (2003-200x): study of cyclotron production of astatine-211 (internally spiked by astatine-210) by alpha irradiation on Bi target. Radiochemical separation and QC. Targetry improvement. Polonium-210 dosimetry!
Recent Project co-funded by Regione Lombardia and MIUR, Italy

- **RATERMET** (2003-200x): assessment of commercial radiopharmaceuticals labelled with rhenium-186g, samarium-153 and rhenium-188 (from tungsten-188 “generator”) for **bone metastases pain palliation** by **metabolic radionuclide therapy**.
  
  Biokinetics studies onto humans, dosimetry studies, **QC** of commercial radiopharmaceuticals (**di- and tetraphosphonates**). Treatment plan optimisation.
Nuclear & Radiochemistry Group at LASA

- Universita’ degli Studi and INFN, Segrate, Milano
  Mauro L. Bonardi
  Flavia Groppi
  Claudio Birattari
  Luigi Gini

- ENEA, Bologna
  Enzo Menapace

- Student training in Nuclear Chemistry and Physics:
  undergraduate, graduate, PhD, Specialization School in Health Physics, Specialization School in Nuclear Medicine
Nuclear Physics Laboratory: $\alpha \beta \gamma$

4 HPGe connected to 4 MCAs
Target measurement assembly

HPGe cup with the target in 10 cm Pb shielding well
Nuclear Physics Laboratory: $\alpha$ $\beta$ $\gamma$

$\text{NaI(Tl), } \alpha \text{ spectrometer, Geiger-Müller}$ $\text{Liquid Scintillation Counting}$
Cold Chemistry Laboratory for trace analysis

UV-VIS spectrophotometry, polarography-SV, ET-AAS
radio-TLC, radio-PC
radio-HPLC, radio-GC
Warm Radiochemistry Laboratory: Class II
Warm Radiochemistry Laboratory: Class II
Hot Radiochemistry Laboratory: Class II
Student Training Laboratory
Radon Measurements Laboratory
**Targetry Laboratory:**
cyclotron target preparation