UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Nuclear and Subnuclear Measurements Laboratory II

2122-1-F1701Q123

Aims

The laboratory course provides an introduction at graduate level of the experimental techniques employed in particle and nuclear physics, including applications to medical, environmental physics, and quantum computing.

Contents

In this II part, the students deepen the experimental techniques developed in the I part of this Laboratory. The experimental apparatus assembled in the previous course is now employed to perform more sophisticated measurements; here the assessment of systematic bias plays a leading role in data taking and analysis. Advanced experimental techniques for quantum computing may also be addressed.

Detailed program

Each student placed in a group of three or four people, will carry out an experiment (just one) in the field of particle

physics, based on the achievements obtained in the first semester. Experiments are the following:

1) Compton scattering of polarized photons,

2) Measurement of the muon precession in a magnetic field at rest,

3) Measurement of the lifetime of a metastable state of 57-Co,

4) PET techniques

5) Experimental techniques for quantum computing

Prerequisites

Laboratory of nuclear and particle physics, I part

Teaching form

The experiments are performed in the labs of the Department of Physics and the activities are supervised by the teacher. The results are summarized in a final report written in English.

Textbook and teaching resource

The final reports from the previous years. We also suggest the reading of a few chapter (depending on the

experiment) from

G. F. Knoll, “Radiation Detection and Measurement”, 4th ed., Wiley & Sons

K. Grupen, “Particle Detectors”, 2nd ed., Cambridge University Press

G. Gilmore, “Practical gamma ray spectroscopy”, 2nd ed., Wiley & Sons

F. Terranova, "A modern primer in particle and nuclear physics", 1st ed., Oxford Univ. Press

Semester

II semester

Assessment method

The team that performed the experiment presents the final report and discuss it with the teacher. During the discussion, we detail the techniques that were implemented, the issues encountered during the run of the apparatus and possible sources of systematics in the measurements.

Office hours

Under request by the team.