Detectors in Nuclear Physics (40 hours)

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Material for the course can be found at the web page: http://www.mi.infn.it/~sleoni/

After an introduction on the interaction mechanisms of charge particles, γ-rays and neutrons with matter, the general properties of radiation detectors are presented. Modern and future detection systems based on different kind of materials are discussed in connection with specific experiments at the frontiers of the nuclear physics research. In the last part of the course techniques for production, acceleration and studies of unstable (exotic) beams are presented.

The course is organized as follows:

1 – Radiation interactions:
   a) charged particles;
   b) γ-rays;
   c) neutrons.

2 – General properties of radiation detectors:
   a) gas detectors;
   b) scintillator detectors;
   c) semiconductor detectors;
   c) neutron detectors.

3- Modern detector systems:
   a) large volume composite Ge detectors;
   b) Ge arrays: the European project EUROBALL;
   c) Si arrays;
   d) scintillators arrays;
   e) electron conversion spectrometers;
   f) neutron arrays;
   g) heavy ions detectors;
   h) magnetic spectrometers.

4- Future developments in γ-detection:
   a) segmented Ge detectors: pulse shape analysis and tacking techniques;
   b) the ultimate array for γ-spectroscopy: the European project AGATA.

5- Production and acceleration of radioactive beams:
   a) fragmentation;
   b) isotopic separation on line;
   c) overview of present and future facilities in Europe.