The Oslo Cyclotron Laboratory and the Nuclear Physics Program

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From 2005, the Oslo Cyclotron Laboratory (OCL) at the University of Oslo has been a part of the SAFE centre, which combines nuclear physics, nuclear chemistry and nuclear medicine research. The MC-35 Scanditronix cyclotron was installed in 1979 at the Department of Physics and has been operative since then. The University funds the operational costs, while the Norwegian research council finances research projects and instrumentations.

The nuclear physics group has developed a method for measuring nuclear level densities (NLD) and radiative strength functions (RSF) in the continuum, with energies up to the neutron separation energy. These functions are important for many aspects of fundamental and applied nuclear physics, including calculations of nuclear cross sections for nucleosyntheses.

Previously, the majority of data for NLD are obtained from two energy regions. At low excitation energy, the level density is obtained directly from counting of low-lying levels. Nuclear resonances at or above the nucleon binding energy provide another source of NLD data. The Oslo method bridges the excitation energy gap between these two regions. The RSF describes the average electromagnetic properties of nuclei, and is important for decay studies as well as gamma-absorption phenomena.

Apart from the cyclotron, the most important instrumentation is the CACTUS multi-detector system utilized for recording gamma-particle coincidences. The experiments are usually carried out with 45 MeV 3He-ions, where the charged ejectiles are detected with eight particle telescopes placed at an angle of 45 degrees relative to the beam direction. An array of 28 NaI gamma-ray detectors with a total efficiency of 15 % surrounds the target and particle detectors. The experiments are run with beam currents of 2 ns for 1-2 weeks.

We are now building a new set of particle telescopes, called SiRi. The system contains 64 silicon telescopes and gives much better efficiency and energy resolution than the previous system. We also plan to replace the NaI detectors with the BrilLanCe 380 crystals to obtain better efficiency and resolution, also for the gamma-ray measurements.

Today, the nuclear physics group uses about 20 % of the available beam time for fundamental research. We would therefore like to invite new collaborators from other labs as users of our facilities.