

MARA recoil-mass separator at JYFL – status, instrumentation and performance modelling

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The recoil-mass spectrometer MARA at the Accelerator Laboratory of the University of Jyväskylä (JYFL) will be a compact recoil mass spectrometer for studies of fusion-evaporation residues at the $N \approx Z$ line. It has an unique ion-optical configuration – a quadrupole triplet followed by an electrostatic and a magnetic sector field. At the focal plane, a typical first order mass-resolving power of 300 is achieved according to ion-optical calculations.

The aperture and mass slits, vacuum gate valves, power and high-voltage supplies of the magnets and electrostatic deflector are controlled from the same industrial automation system which is used for K130 cyclotron and beam lines in JYFL. An overview of the control system will be given. The mechanical focal plane construction is highly modular which allows an optimized detector setup to suit the varying experimental requirements. The preamplifiers of the silicon detectors are optimized to give a wide energy range when used with digital ADC units. Tests with the preamplifiers and ADC's have shown that the conversion electron, alpha emission and fission fragment energies can be fitted in the same linear energy spectrum with a reasonable electron resolution. The preamplifiers allows an easy gain selection between predefined set of gains.

The mass spectrum of a fusion-evaporation reaction is often very complicated due to many open fusion channels in the reactions producing $N \approx Z$ nuclei. A user-friendly program has been developed for calculation and optimization of ion-optical properties of fusion-evaporation reactions. In addition to the focal plane setup, auxiliary detectors at the target position will be used. For example, feasibility studies of MARA combined with a prompt charge-particle veto detector will be presented for different kinds of reaction kinematics. An overall status report of the MARA construction will be given.