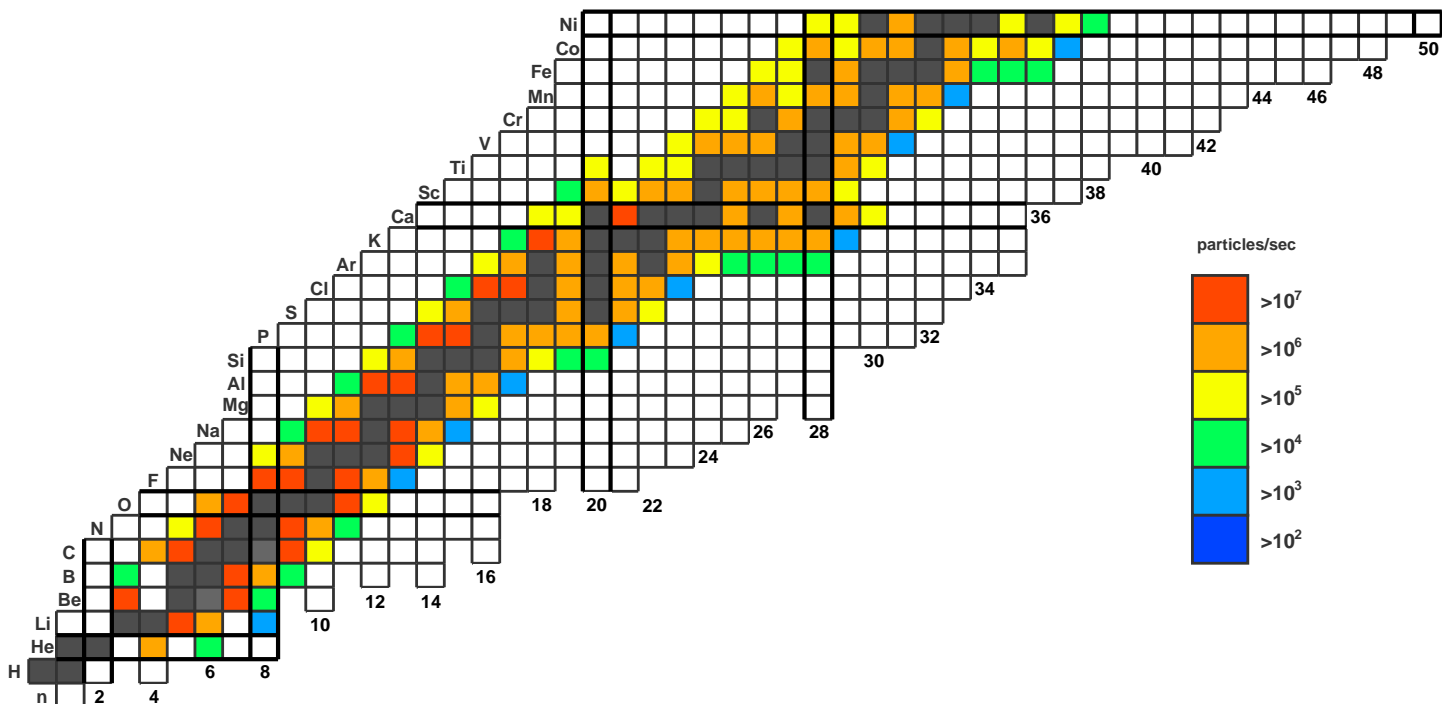


# AIRIS - Argonne In-flight Radioactive Ion Separator

Expansion of the ATLAS in-flight radioactive beam program is underway through the design of a separator comprised of a momentum achromat, a radio-frequency (RF) sweeper, and a bunching/rebunching resonator. The scientific motivation driving AIRIS stems from the increased demand for detailed spectroscopic information in nuclear structure, nuclear reactions, and astrophysics research, on nuclei off the valley of stability. Such studies require rare-isotope beams of adequate intensities and energies coupled with the most advanced experimental equipment.

AIRIS will broaden the scope of rare-isotope research at ATLAS in a number of ways including: i) access to exotic beams further from stability; ii) increased intensity for those which are presently available; iii) extended reach into a higher mass region; iv) the ability to deliver beams to Gammasphere, the FMA, GRETINA, and multi-purpose beam-lines, hitherto inaccessible. The AIRIS design is based on a chicane of four magnetic dipoles placed between pairs of quadrupole focusing elements followed by a downstream RF sweeper. The geometrical acceptance of the device, as defined by the entrance quadrupole, is  $\pm 75$  mrad. Momentum acceptance is defined by variable slits located at the intermediate focal plane where there is a momentum dispersion of 1.2 mm/%. Secondary beams will be available over a range of energies from a few up to nearly 20 MeV/u, depending on the production Q value and the primary beam species. The highest production rates will rely on the most intense beams available from the recent ATLAS upgrades as well as liquid film or rotating production targets.



**Estimated rates for rare-isotope beams at the exit of AIRIS (rates are uncertain by as much as one order of magnitude). They assume primary beam parameters of 10 MeV/u and 1 particle- $\mu$ A, a  $\sim 1$  mg/cm<sup>2</sup> production target, estimated reaction cross sections, the dominant charge state fraction, and transmission through AIRIS.**