Brief Description:
Trans-Atlantic Radioactive Beam Facilities
RIA and ISAC II
Brief Description: Trans-Atlantic Radioactive Beam Facilities RIA and ISAC II

Image of RIA

- Overview
- Comparison
- History
- Experimental Areas
- Working Groups

ISAC II

Dr. Laird’s talk

Picture from Argonne National Laboratory
Similar picture from MSU not shown
Brief Overview: RIA

From: http://www.orau.org/ria/
Brief Overview: RIA comparison

RIA: Driver Accelerator
Beam Energy > 400 MeVA for U
Beam Power > 100 kW

Competing In-Flight Facilities
Radioactive Ion Beam Factory at RIKEN
FAIR at GSI

1) RIA design has post-acceleration
   Allows astrophysical energies to be explored
   Super-heavy elements to be explored

2) RIA’s Primary Beam Linac is planned to be
   20x more efficient than either

Competing ISOL Facility
ISAC II at TRIUMF

RIA has higher primary-beam power
More flexible combination of ion sources

Result: Higher Beam Intensities
Wider Variety of Rare Isotopes

SPIRAL II now on roadmap
- no comparison
Brief Overview: Road to RIA

1991
The IsoSpin Laboratory (ISL)

1995
TUNL Town Meeting Report, January 19-21, 1995
Research Opportunities with Radioactive Nuclear Beams (updated IsoSpin Lab Report)
Argonne Yellow Book

1996
NSAC Long Range Plan

1997
Columbus White Paper Scientific Opportunities with an Advanced ISOL Facility

1998
OECD Megascience Forum: Report of the Study Group on Radioactive Nuclear Beams
NRC Report "Core of Matter, Fuel of Stars"

1999
"Report to the Users of ATLAS"
Opportunities in Astrophysics with Radioactive Beams
ISOL Task Force Report

2000
Opportunities with Fast Rare Isotope Beams
Durham Workshop White Paper
RIA Applications Workshop Summary
Oakland Town Meeting Report

2002
NSAC Long-Range Plan
"The Intellectual Challenges of RIA" A White Paper from the RIA Users Community
"Why RIA" handout

Dr. CJ Barton Department of Physics
Brief Overview: Road to RIA

2002  (DOE/NSF NSAC) recommended RIA as the “highest priority for major new construction in Nuclear Physics
2002 Long Range Plan for Nuclear Science

2003  U.S. Energy Secretary and the Department of Energy Office of Science
20-year Facilities for the Future of Science plan
RIA was ranked 3rd among 28 major science projects deemed necessary

2004  DOE designated RIA’s status as CD-0
Critical Decision Zero – develop the engineering and conceptual design studies

The DOE's Office of Nuclear Physics plans to build RIA during the next decade at a site yet to be determined.

Proposals to design, build, and operate RIA expected from Argonne National Laboratory and Michigan State University

Dr. CJ Barton  Department of Physics  THE UNIVERSITY OF YORK
RIA – Experiment Areas

1. Stopped Beams
2. Beam < 1 MeV
3. Beam < 10 MeV
4. Beam > 100 MeV
5. Neutron Facility
RIA - stopped beam

Experimental Stations currently planned:
- Nuclear Orientation
- Beta-NMR
- Laser Polarization
- Collinear Laser Spectroscopy

- Solid State Physics
- Nuclear Spectroscopy
- Atomic traps
- Precision decay studies
- Penning trap MS

MSU, February 2004
RIA < 1 MeV

Experimental Stations currently planned:
- Recoil Separator
- Silicon Detector Array
- Gamma Array
RIA < 10 MeV

Experimental Stations currently planned:
- Gamma Spectroscopy
- Mass separators
- Magnetic Spectrograph
- Solenoid Charged Particle Spectrometer
- Large Scattering Chamber
- General Purpose Beamline(s)
RIA > 100 MeV/u

Experimental Stations currently planned:
- Large Neutron Array
- Spectrometer
- Beta-Decay End Station
- TCP
- Gamma spectroscopy
Experimental Stations currently planned:
- DANCE at RIA
- Low Energy Activation -- $^7$Li$(p,n)$
- D(d,n) -- 4-12 MeV
- High Energy with deuteron breakup 12-20 MeV
RIA Experiment Working Groups

All will identify physics goals, specify facility infrastructure, and advocate the design toward RIA

1. ARIA (Astrophysics at RIA)
2. DARITI (Decay spectroscopy At RIA: Into Terra Incognita) promote the universal and modular design of detector systems
3. GRETINA/GRETA Users Group
4. RIA Separator Working Group for the E/A=10MeV Experimental Area Recoil mass separator, Gas filled device, RF-driven separator, Large acceptance spectrograph.
5. RIA Spectrograph Working Group
6. SHIRIA (Studies of Heavy-Ion Reactions at RIA) isospin-related reaction dynamics and nuclear decay
7. RIATG (RIA Theory Group)
Summary

1. Initial user working groups defined
2. Facility now CD-0
3. Cost ~ $1 \times 10^9 \text{ (similar to FAIR at GSI)}
4. Site decision ~ 1 year
5. Facility to be built ~ 10 years
6. Funding uncertainties and US Budget Deficit implications?