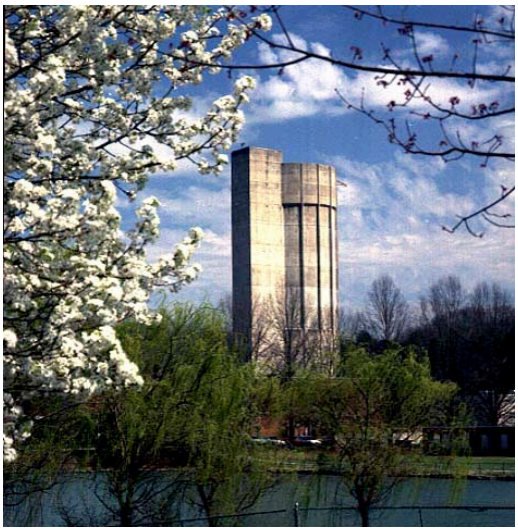
HRIBF Strategic Plan v.23 May 2010

Mission and principles

The principal mission of the Holifield Radioactive Ion Beam Facility (HRIBF), a national user facility at Oak Ridge National Laboratory, is the production of high quality beams of short-lived radioactive isotopes to support research in nuclear science by a broadly-based international user community. HRIBF programmatic goals are aligned with the DOE Office of Science Strategic Plan. Overarching principles of HRIBF programs are to optimally utilize resources, maintain flexibility to adapt to changing scientific opportunities, and to promote and maintain a safe and environmentally responsible work environment.



Major research areas

- Nature of nucleonic matter
  - Limits of nuclear existence and weakly bound systems
  - Effects of proton/neutron asymmetry on nuclear properties
- Origin of elements
  - Nova and X-ray burst nucleosynthesis
  - Supernova and r-process nucleosynthesis
- Synthesis of heavy elements
- Applications of nuclear science to society

Experimental systems goals

- Development of efficient, selective, and flexible detection systems that are specialized for RIB research
- Continuous improvements to end stations and their associated detectors
- Provide computational resources for data acquisition, analysis, simulations, and modeling
- Maintain leadership in applications of digital spectroscopy

Facility goals

- Deliver high quality proton-rich and neutron-rich radioactive ion beams for science
- Continuous improvement of beam quality and purity
- Deliver 3000-4000 radioactive ion beam hours per year with 7-day operations
- Increase existing proton-rich beam intensities by factors of 5-10 and key neutron-rich beams by 100
- Operate HPTL 300-400 hours per year for ISOL R&D
- Continuous improvement of RIB production and experimental system reliability
- Advancement of ISOL technologies

More information may be found on our website

- http://www.phy.ornl.gov/hribf/science/abc/ (public outreach)
- http://www.phy.ornl.gov/hribf/science/ (science highlights)
- http://www.phy.ornl.gov/hribf/app/ (science intersections and applications)

DOE Office of Science Milestones in Relation to HRIBF Science

2010	Reduce uncertainties of the most crucial stellar evolution nuclear reactions by a factor of two, and others (e.g. the MgAl cycle) to limits imposed by accelerators and detectors
2012	Measure masses, lifetimes, spectroscopic strengths and decay properties of neutron-rich nuclei in supernova r-process, and reactions to predict radionuclide production in supernovae
2013	Carry out microscopic calculations for medium-mass nuclei with realistic interactions, develop a realistic nuclear energy density functional for heavy nuclei
2013	Complete initial experiments with the high resolving power tracking array, GRETINA, for sensitive studies of structural evolution and collective modes in nuclei
2013	Perform realistic multi-dimensional calculations of core collapse supernovae
2014	Perform mass measurements and nuclear reactions studies to infer weak interaction rates in nuclei in order to constrain models of supernovae and stellar evolution
2014	Measure or constrain key nuclear reaction rates to improve accuracy of astrophysical models of novae and X-ray bursts and allow astronomical data to be used to infer novae and neutron star properties
2015	Measure properties and production mechanisms of the elements above Z~102 to understand the nature and behavior of these nuclei, and to assist theoretical predictions for the structure and production of superheavy elements.
2018	Measure changes in shell structure and collective modes, from the most proton-rich to the most neutron-rich nuclei accessible, in order to improve our understanding of the nucleus, and to guide theory in every region of the theoretical roadmap (ie., the lightest element region where ab-initio calculations can be performed, the medium-mass region where effective interactions are used, and the region of heavy nuclei, the domain of density functional theory).

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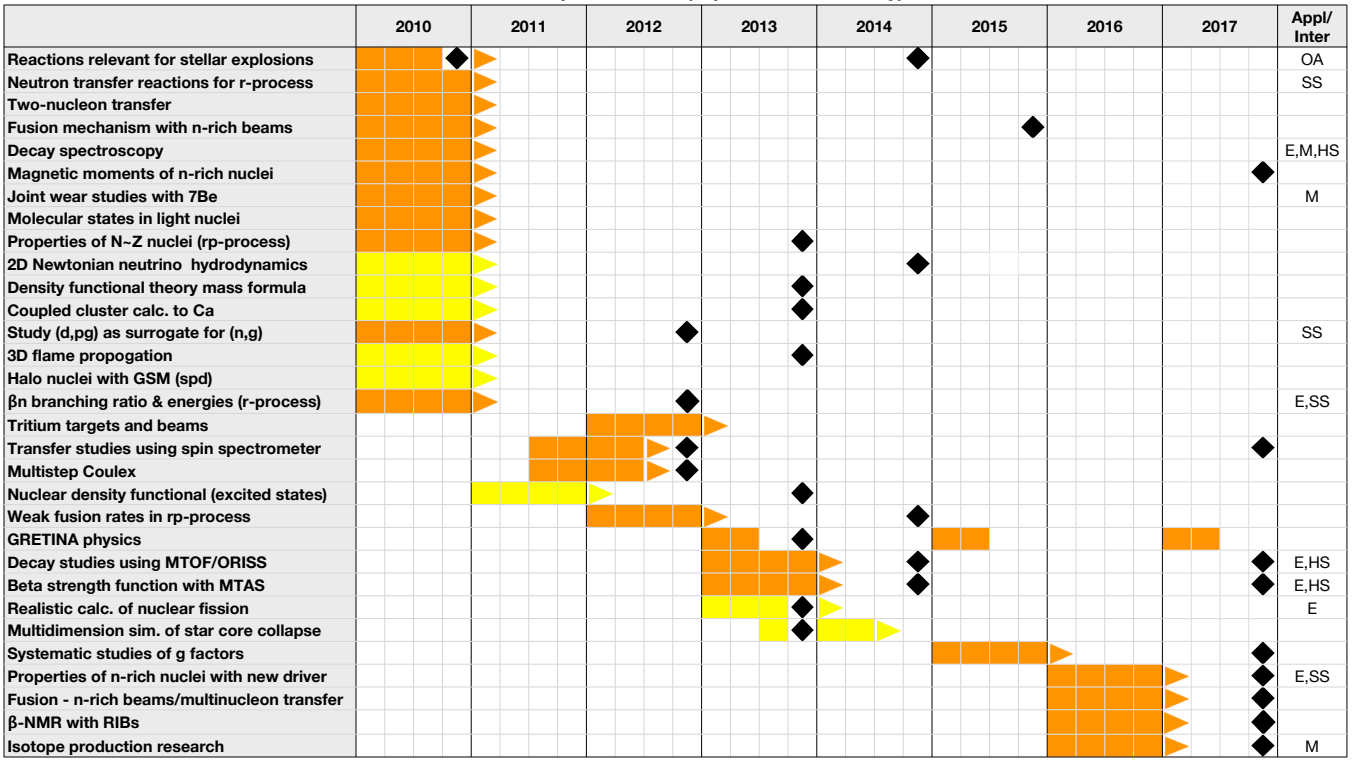
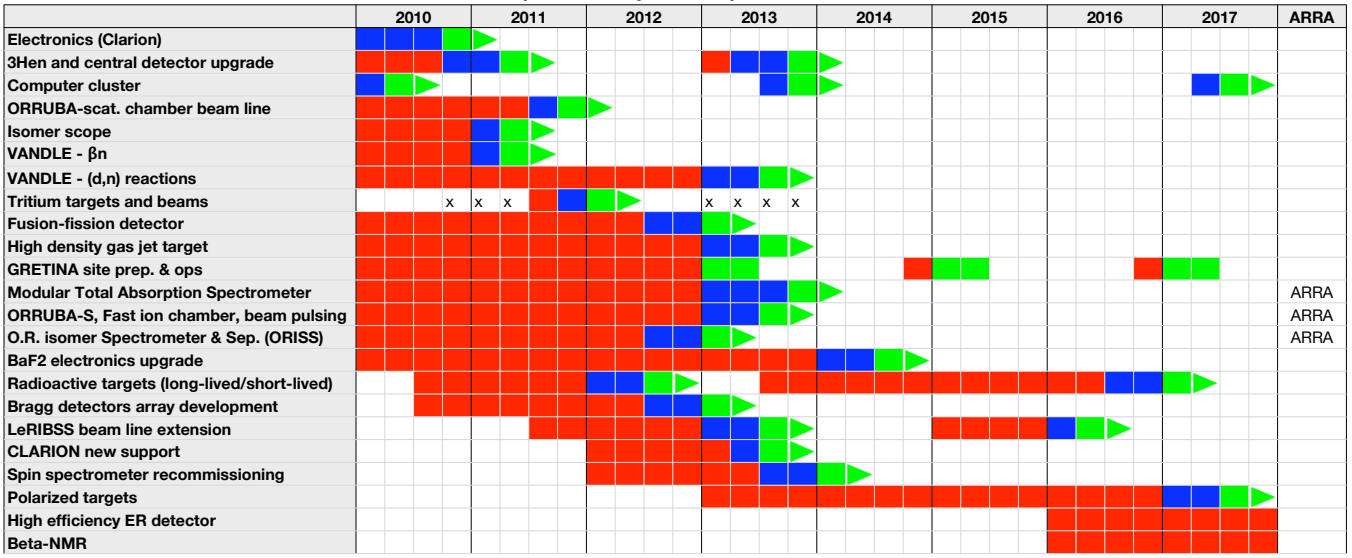
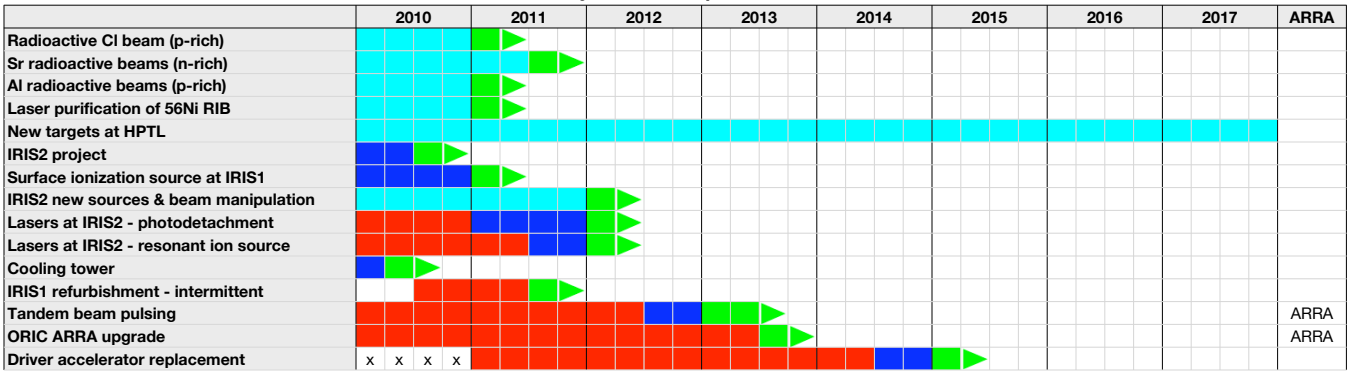
Research implementation (experiment and theory)



Experimental systems implementation



Facility and RIBs implementation



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Research color codes

Experimental program start and continuation	
Theory program start and continuation	
Milestone completion	

Facility & experiment systems color codes

Construction, implementation, or development		
Commissioning or deployment		
Beam development		
Operational or beam available		
Evaluation or design	x	x

Applications/Intersections

Energy	E
Medicine	M
Stockpile stewardship and homeland security	SS
Homeland security	HS
Observational astronomy	OA