

NERO

Neutron Emission Ratio Observer



**Polyethylene Matrix
To Thermalize Neutrons**

**3 Rings Of ^3He
And BF_3 Counters**



**Large, Constant Efficiency
For Neutrons Below 1 MeV**



**Energy Information From Count
Rate Ratio Of Counter Rings**



**Large Cavity To Accommodate
Particle Detectors for Neutron-
Particle Coincidences**

NERO

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April 2002: Calibration

NSCL at MSU

June 2002: Exp 01028 Commissioning

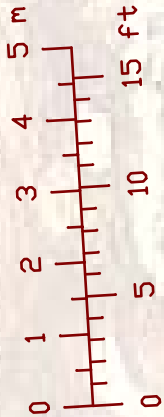
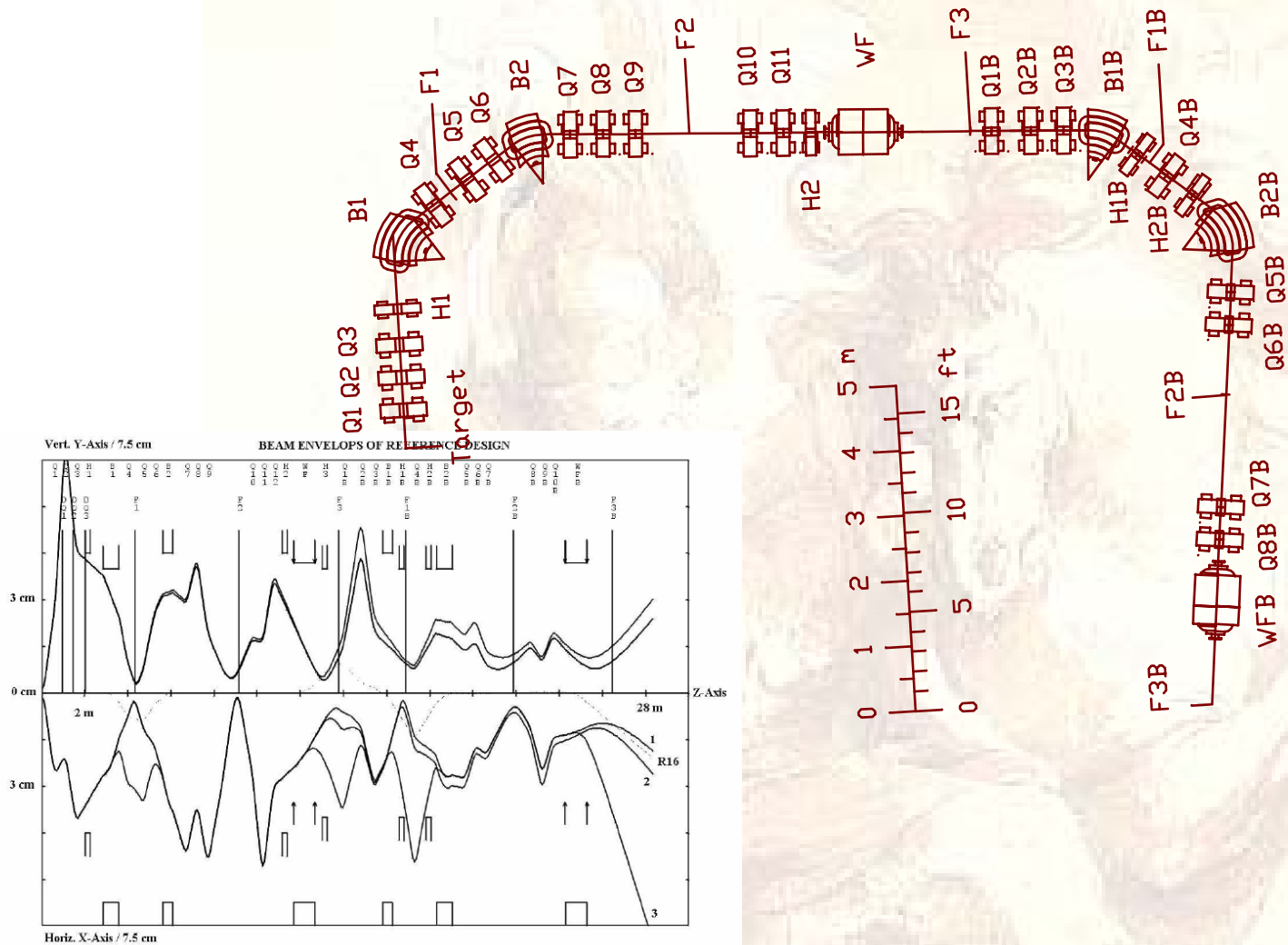
March 2003: Exp 02028 ^{78}Ni

April 2003: Exp 02032 Near $N = 82$ Shell



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The Future: Recoil Separator



The Design Goal

Alpha and Proton Capture Reactions on sd-Shell Nuclei

Realistic Evaluation
of Eight Reactions

Discussion/Visit
of Existing
Recoil Separators

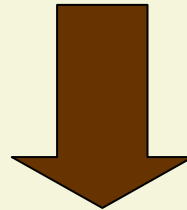
Stable Beam

Assumptions:

100 microA Beam Intensity

1/h Minimum Count Rate

33 % Efficiency

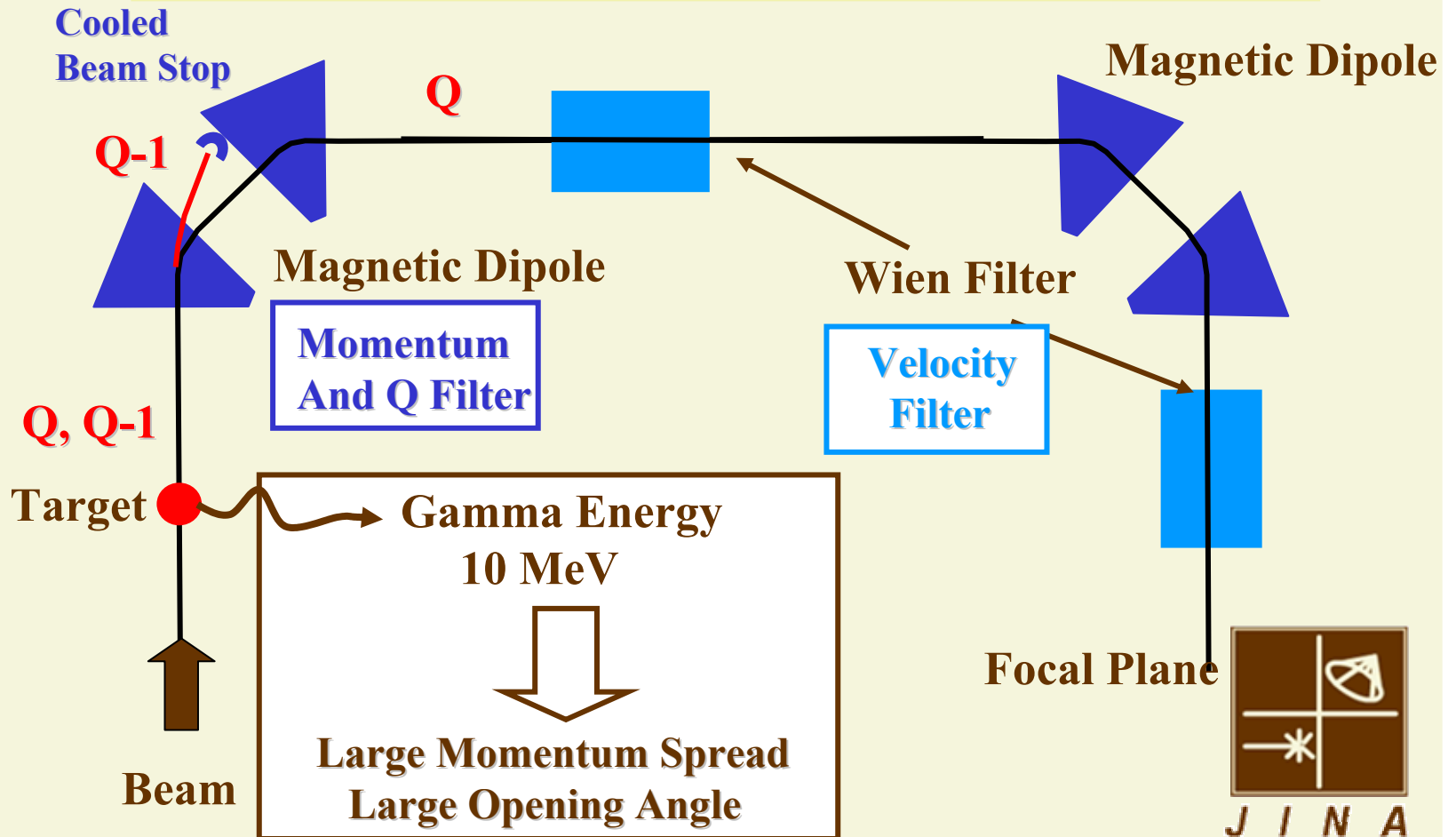


Design Parameters	Brho(min)	=	0.1 Tm	
	Brho(max)	=	0.45 Tm	
	Momentum accept	= +/-	3.7 %	
		= +/-	2.3 deg	40 mrad



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The Concept



The Schedule

Fall 2004 : Final Design
Late 2004 : Quote Request
Early 2005 : Order
Summer 2005 : Parts Arrive
Spring 2006 : Commissioning

Georg Berg: Design Fall 2003
Ed Stech: Infrastructure and Gas Target Fall 2003
Manoel Couder: Development and Simulation Fall 2004
Dave Hutcheon: Consultant
Cary Davis: Consultant
Brad Sherrill: Consultant



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The Future Prospects

**Improved Reaction Rates
For Nova and He-Burning
Environments**

**Prototype Facility For
Future Underground
Laboratory**

**Test Facility For Recoil Separator
At Rare Isotope Accelerator RIA**

St. George



*S*trong

*G*radient

*E*lectro-magnetic

*O*n-line

*R*ecoil separator for capture

*G*amma ray

*E*xperiments



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St. George

Strong

Gradient

Electro-magnetic

On-line

Recoil separator for capture

Gamma ray

Experiments



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Xavier Cortada, "Estampita de St. George," 2000