Workshop – 2004 RHIC & AGS Annual User's Meeting

Hadronic Physics with Hadronic Beams at AGS:
Baryons, Hyperons, and Pentaquarks

11 May 2004

AGS Fixed Target Future Plans

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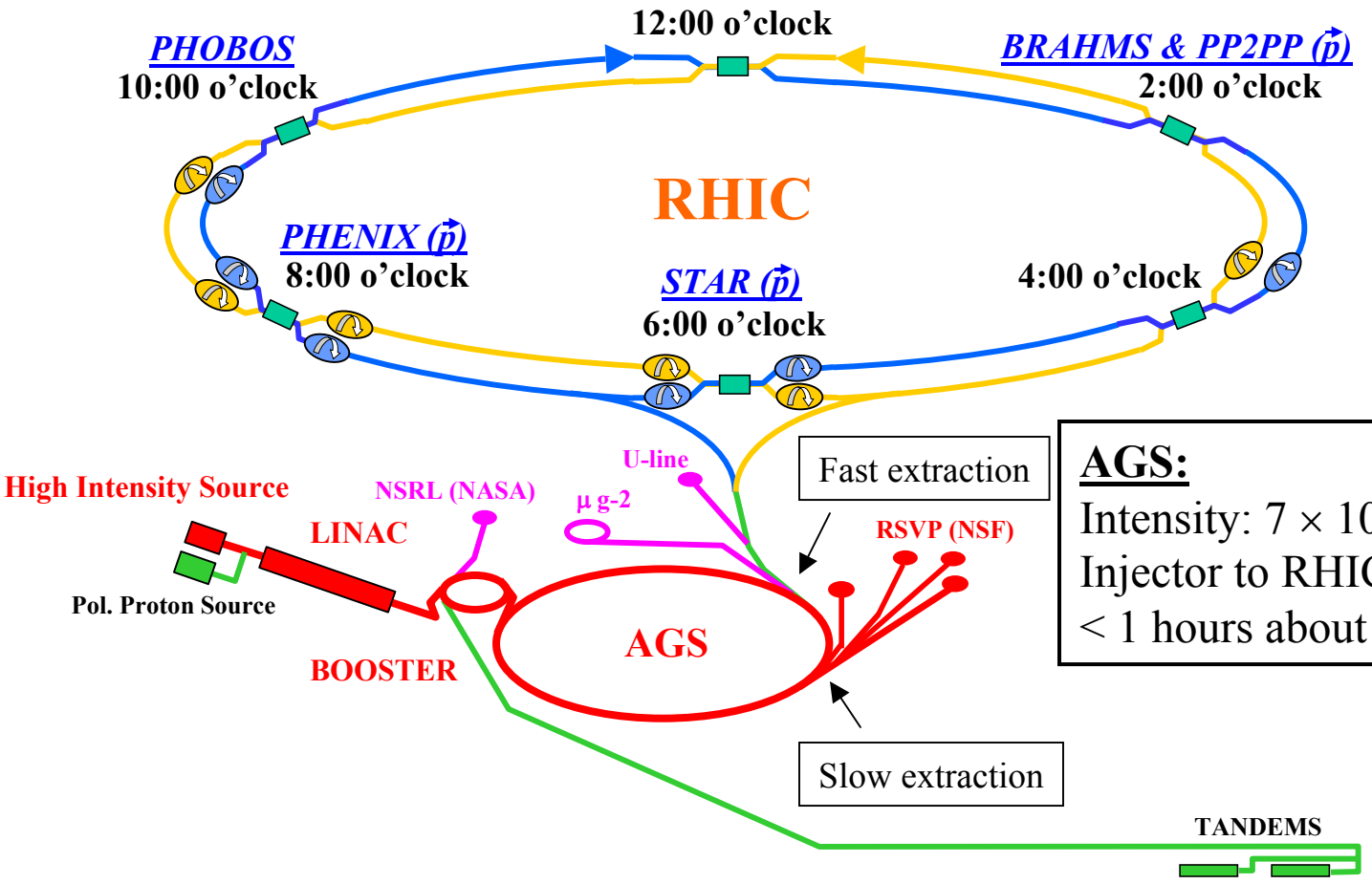
Office of Science
U.S. DEPARTMENT OF ENERGY

BROOKHAVEN
NATIONAL LABORATORY

C-AD Accelerator Complex



AGS:

Intensity: 7×10^{13} protons/pulse

Injector to RHIC:

< 1 hours about every 4 hours

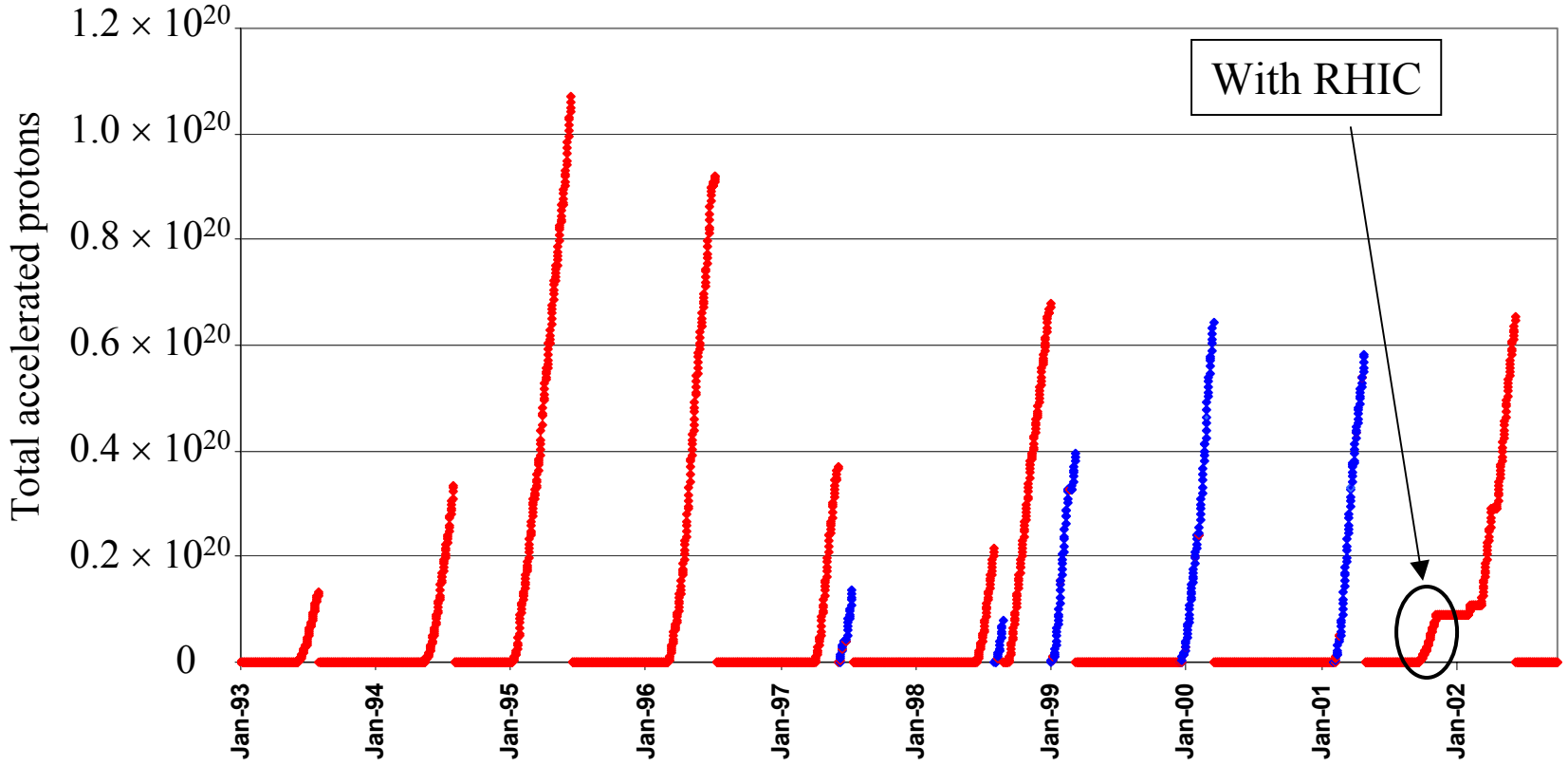
AGS Performance

T. Roser

PROTON BEAM	FY96 SEB	FY97 SEB	FY97 FEB (g-2)	FY98/99 SEB	FY98/99 FEB (g-2)	FY2000 FEB (g-2)	FY2001 FEB (g-2)	FY2002 SEB
Beam Energy	24 GeV	24 GeV	24 GeV	24 GeV	24 GeV	24 GeV	24 GeV*	22 GeV*
Peak Beam Intensity	62 x 10^{12} ppp	62 x 10^{12} ppp	46 x 10^{12} ppp	72 x 10^{12} ppp	58 x 10^{12} ppp	61 x 10^{12} ppp	63 x 10^{12} ppp	76 x 10^{12} ppp
Total protons accelerated	0.9 x 10^{20}	0.4 x 10^{20}	0.1 x 10^{20}	0.9 x 10^{20}	0.4 x 10^{20}	0.5 x 10^{20}	0.6 x 10^{20}	0.7 x 10^{20}
Spill Length/Cycle Time	1.6 sec/3.6 sec	1.6 sec/3.6 sec		2.8 sec/5.1 sec				2.4 sec/5.4 sec
-> Duty Cycle	44%	44%		55%				44%
Spill Structure Modulation (peak-average) /average	20%	20%		20%				20%
Average Availability /Best Week	76% / 92%	71% / 79%	58 % / 67 %	71% / 88%	55 % / 83 %	74 % / 87 %	83 % / 88 %	85 % / 97 %
HEAVY ION BEAM	**Au**	**Au**	**Fe (NASA)**	**Au**	**Fe (NASA)**	**Fe (NASA)**	**Fe (NASA)**	**Fe (NASA)**
Beam Energy /nucleon	11 / 4 / 2 GeV	11 / 8 / 6 GeV	1.0 / 0.6 GeV	11 GeV	1.0 / 0.6 GeV	1.0 GeV	1.0 GeV	1.0 GeV
Peak Beam Intensity	4 x 10^{8} Au/p	17 x 10^{8} Au/p	20 x 10^{8} Fe/p	9 x 10^{8} Au/bunch	36 x 10^{8} Fe/p	17 x 10^{8} Fe/p	80 x 10^{8} Fe/p	49 x 10^{8} Fe/p
Spill Length/Cycle Time	1.4 sec/3.6 sec	1.5 sec/4.0 sec		1.2 sec/3.0 sec		0.9 sec/3.3 sec	0.9 sec/3.3 sec	0.9 sec/3.3 sec
-> Duty Cycle	39%	38%		40 %		27%	27%	27%
Spill Structure Modulation (peak-average) /average	<20%	<20%		<20%		<20%	<20%	<20%
Average Availability	80%	82 %	96 %	81 %	90 %	90 %	97 %	84 %

* Westinghouse Motor Generator

Total Accelerated Protons at the

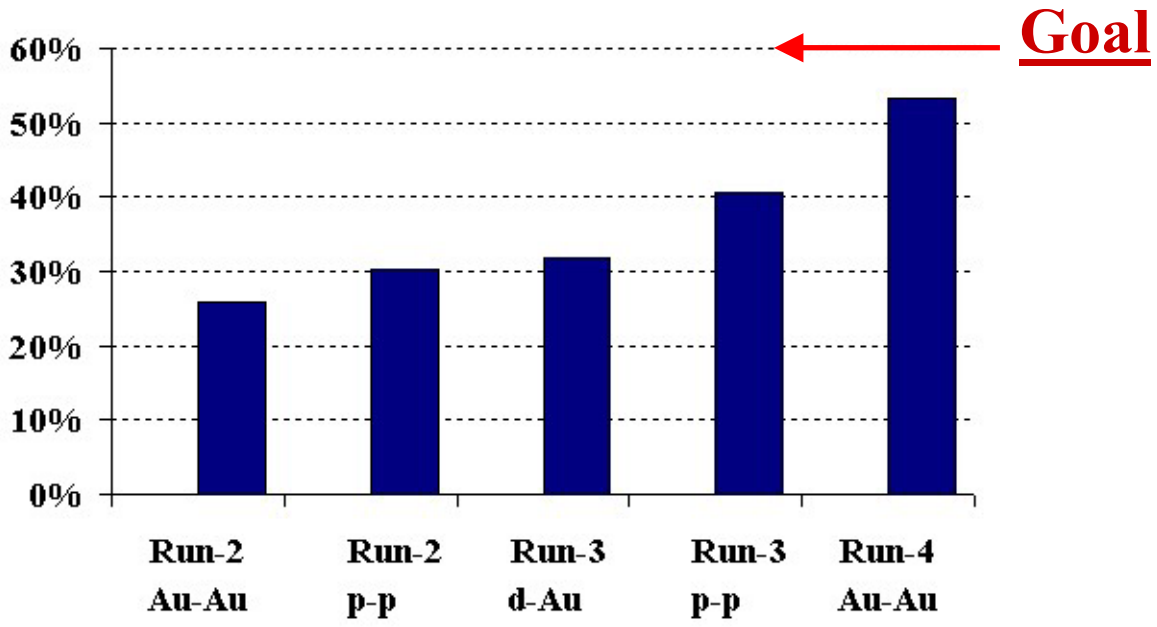


Slow extracted beam (Kaon decay)

Fast extracted beam (g-2)

Note: Lower total accelerated protons in later years due to much shorter running time

RHIC Time in Store



AGS Fixed Target Operations in RHIC Era –

The Present Situation

- ***AGS Fixed target experiments are no longer supported concurrent with RHIC operations since HEP base support was terminated at the end of 2002.***

- Two major HEP experiments submitted proposals to the NSF for construction and operations funds. These experiments, E926-K0PI0 and E940-MECO, collectively referred to as RSVP, were identified by the NSF for support and were included in the FY 2004 Presidents Budget request for a 2006 construction start.

- A third experiment, E949 (K^+ rare decay) has submitted a proposal to the NSF with no action taken to date. A fourth experiment, E962 (μ g-2) is reviewing options and may submit a new proposal to the laboratory and subsequently to the DOE and/or NSF.

- Seven other approved experiments await beam time with no clear path to success. In addition, three proposals and three LOI's are on the books with more to come.

AGS Fixed Target Operations in RHIC Era –

The Present Situation (cont')

- AGS fixed target experiments are still supported but are only scheduled outside RHIC operations and only if this can be done with minimal impact to RHIC activities. Full operations costs are recovered (roughly 0.5M$/week). Two AGS experiments ran in this mode in FY2003 – Radiobiology (NASA-E966) and Proton Radiography (NNSA-E963), one is planned in 2004, K0PI0 (NSF-E926) test.

AGS Fixed Target Operations in RHIC Era – The Future - RSVP Expectation

- The NSF plans to provide base support ($'s for personnel and materials) for AGS operations for the RSVP experiments. With this support, concurrent operation with RHIC is planned as well as limited running outside RHIC operations.

- The present plan for the future is to simplify the AGS switchyard to help insure efficient running of the RSVP experiments. This will result in a more robust, low beam loss switchyard ***at the expense of beam sharing***. The RSVP experiments are not impacted since they cannot share the beam due to different beam conditions required by each. Furthermore, the RSVP experiments are designed to accept the full AGS beam intensity so beam sharing is not planned.

RSVP requirements

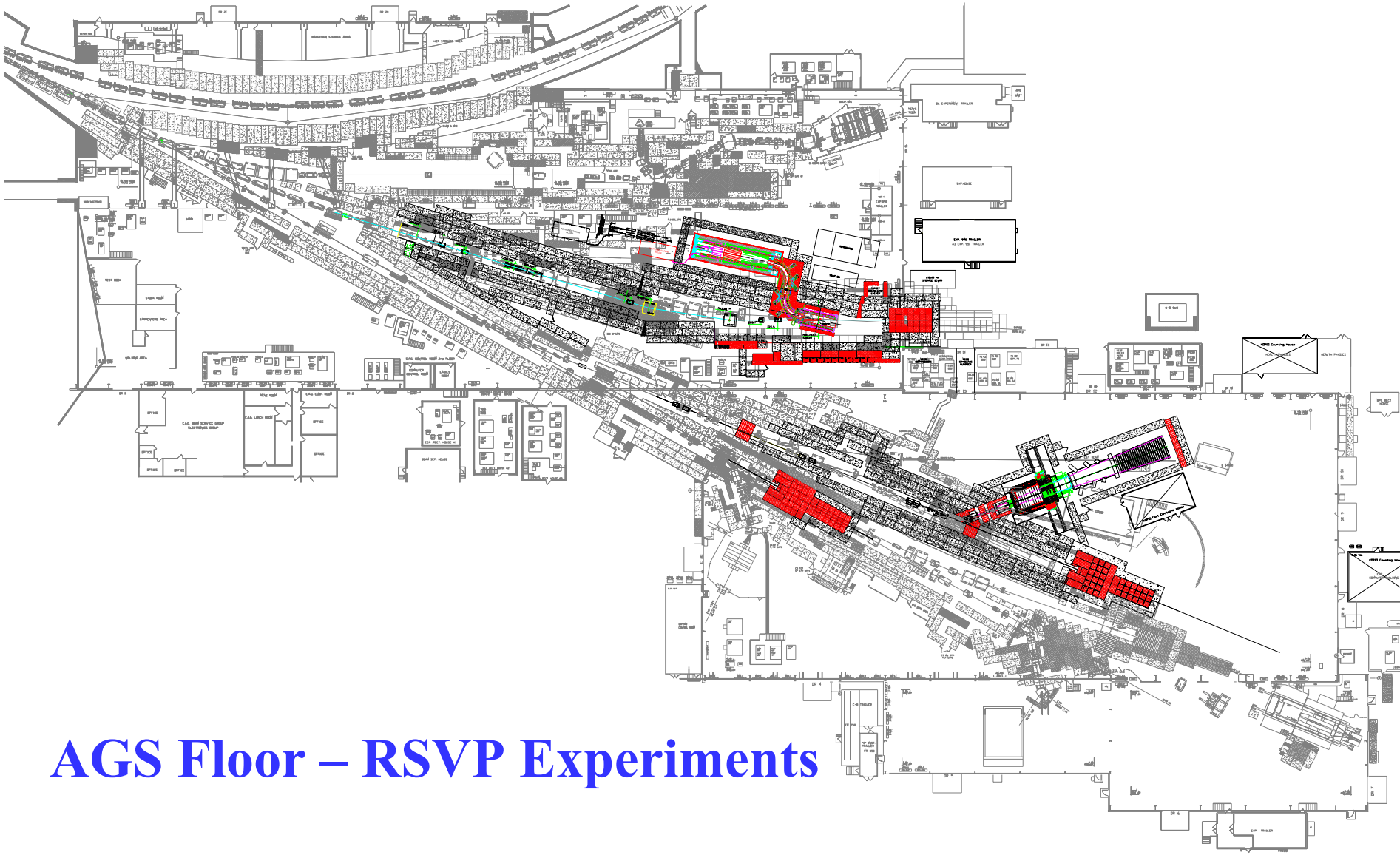
KOPIO:

- 100×10^{12} ppp; 5 s cycle; extraction @ 24 GeV [20×10^{12} p/s]
  - Proton throughput achieved
  - AGS injection energy upgrade to 2 GeV to reach 100×10^{12} ppp (R&D)
- Slow extraction with micro-bunching (200ps (σ) every 40 ns)
  - Extraction with high frequency cavity (25 MHz, 100 MHz) (R&D)
    < 250 ps every 10 ns demonstrated; no change in losses
  - Extinction of 10^{-3} (R&D)

MECO:

- 40×10^{12} ppp; 1 s cycle; extraction @ 8 GeV [40×10^{12} p/s]
  - No transition losses and reduced AGS injection losses (R&D)
- Slow extraction of 2 bunches with 10^{-9} extinction during 1.35 μs gap.
  - h=2 Booster operation; achieved 22×10^{12} protons per Booster cycle
  - Two Booster cycles per AGS cycle
  - Bunch merging to 2 bunches or develop h=1 Booster ops. (R&D)
  - Gap cleaning with resonant transverse kicker plus rf kicker in beam line (R&D)

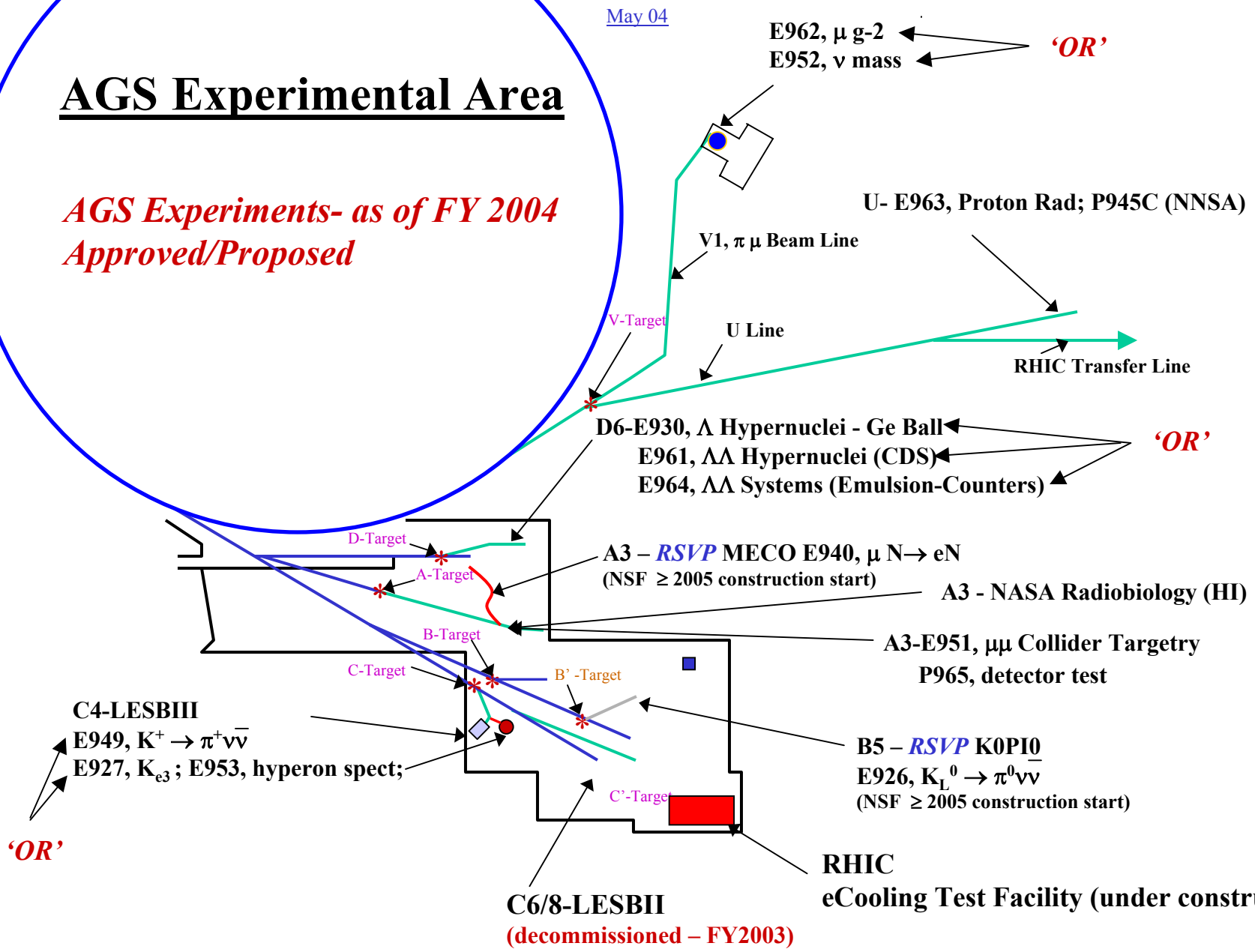
⇒ No protons left to share with other experiments



AGS Floor – RSVP Experiments

AGS Experimental Area

AGS Experiments- as of FY 2004
Approved/Proposed

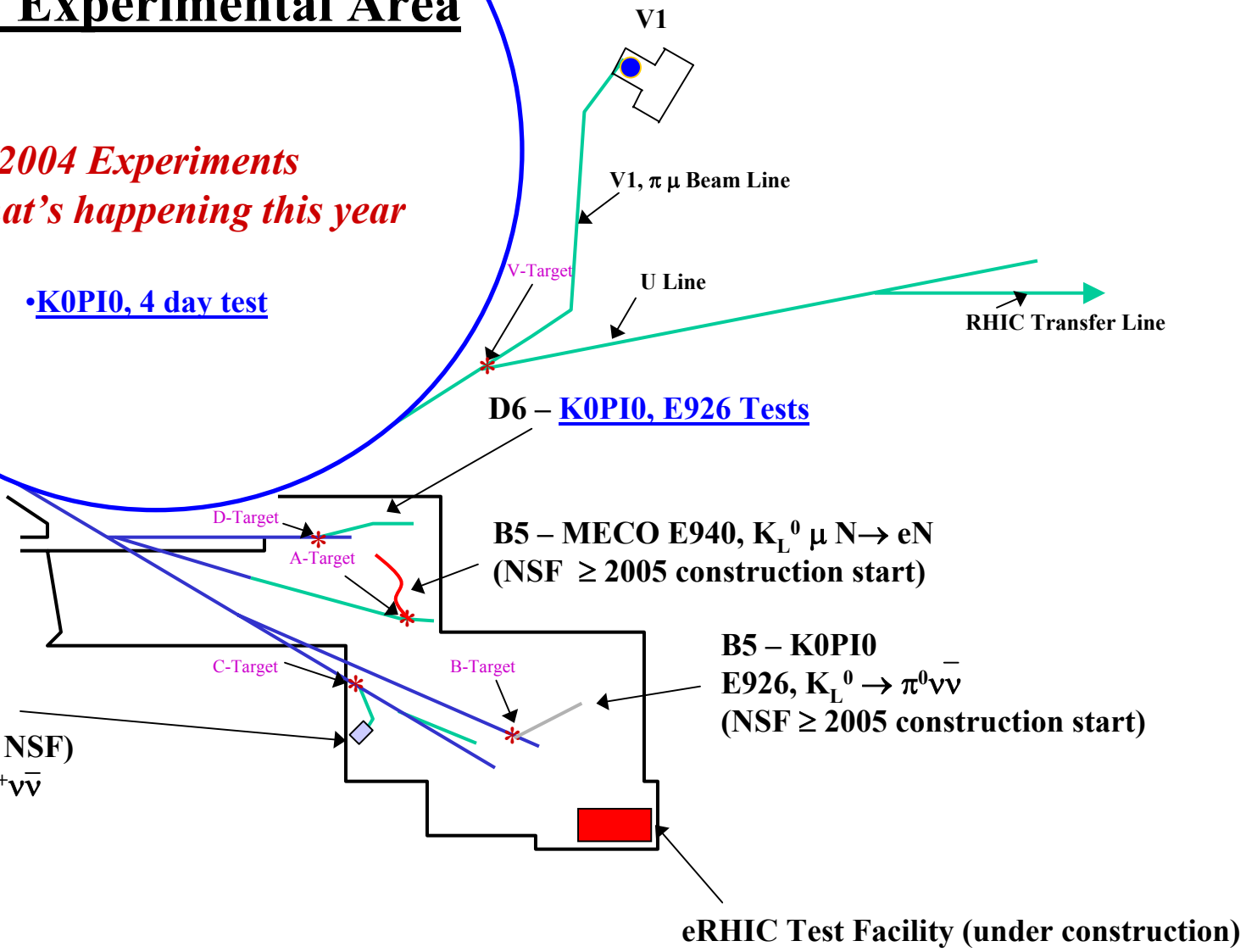


7 May 04

AGS Experimental Area

FY2004 Experiments
What's happening this year

•K0PI0, 4 day test



AGS Experimental Area

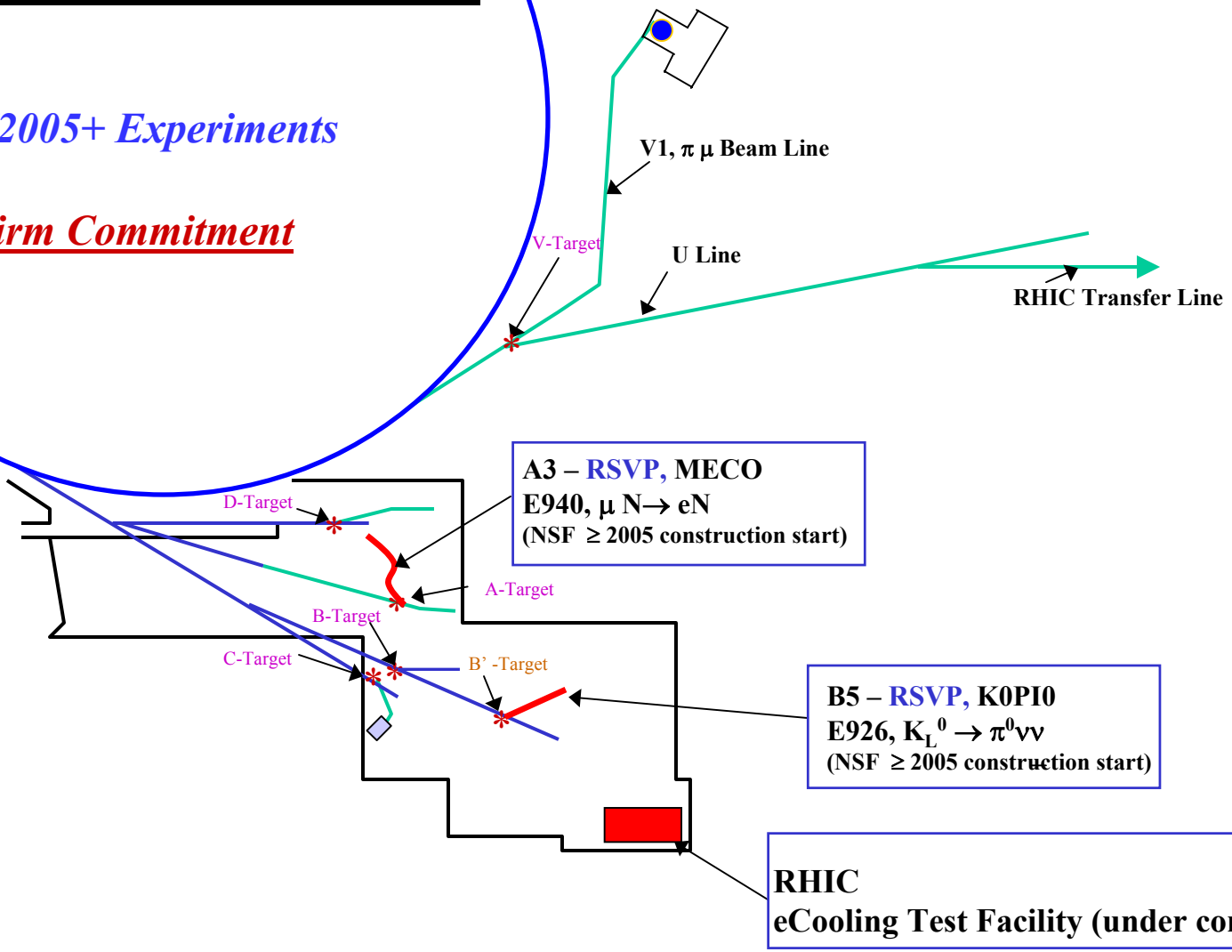
May 04

The Plan

- D-Line Decommissioned
- A,B,C Lines run as "OR's"

FY2005+ Experiments

~Firm Commitment



AGS Fixed Target Operations in RHIC Era – The Future – RSVP Impact on other AGS Experiments, an example

- RSVP construction is expected to take about 5 years. Beam development for these experiments is planned between now and the end of construction.

- Once RSVP begins operation there will be no beam time available for other experiments for ~5-10 years.

- E949 has proposed to run in the C-line for about 3 years during RSVP construction.

- An example schedule follows – assumes we follow the PHENIX RHIC beam use proposal and maintain a B-C beam splitting capability during this period.

RSVP and E949 Example Run Plan

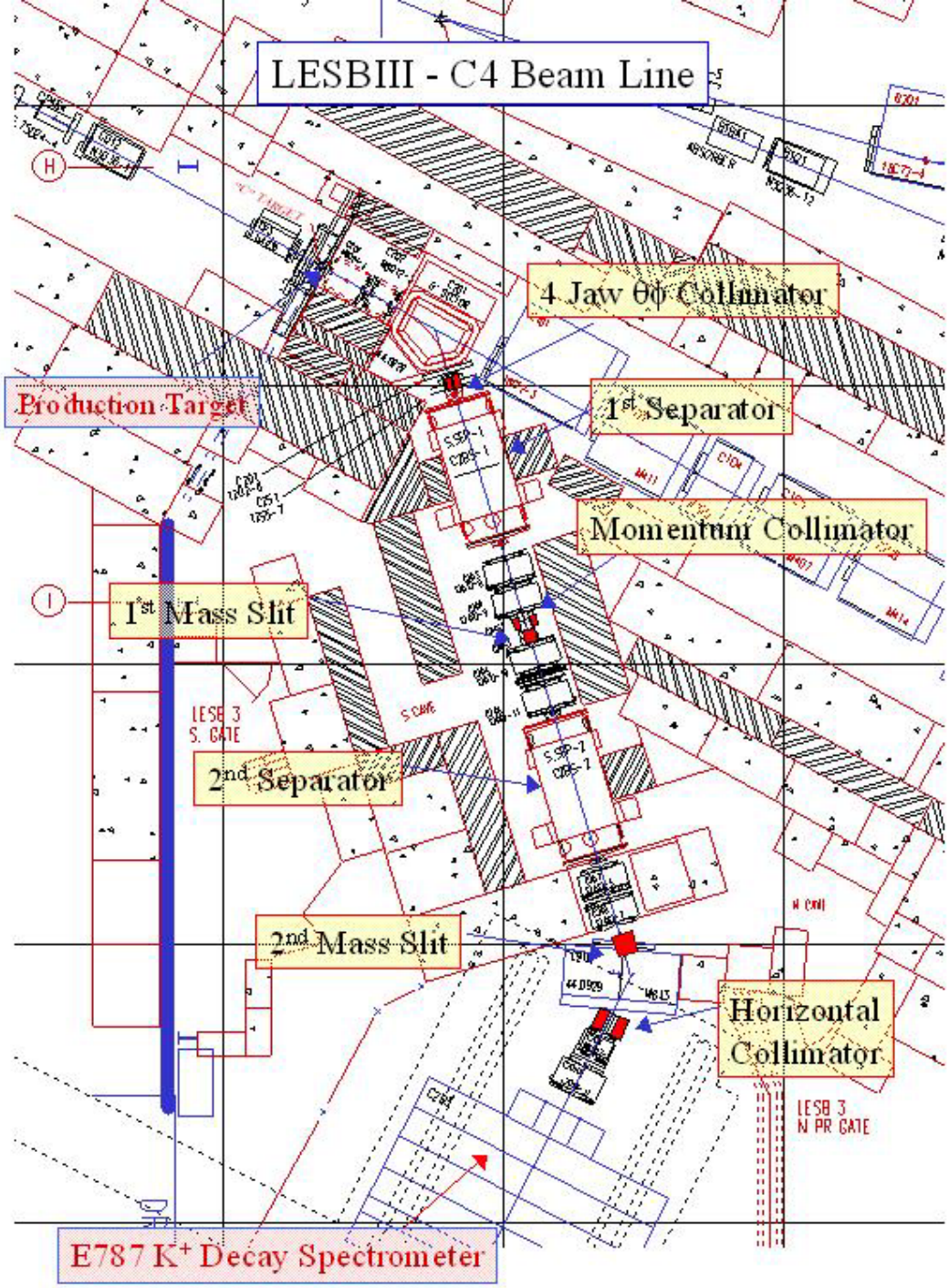
Assumptions	1/26/2004	ppile										
FY 2003 Dollars, full NSF Indirects												
K0Pi0 total hours	8000	80	weeks	Beginning in 5th year of construction (last year)								
MECO total hours	4000	40	weeks	Beginning in 5th year of construction (last year)								
Power cost	$ 85.00	per MWhr	FY 2006 and beyond									

	FY04	FY05	FY06#	FY07#	FY08#	FY09	FY10	FY11	FY12	FY13	FY14
RHIC Weeks Total	27	27	27	27	27	27	27	27	27	27	27
Available with pp*	0	5	0	19	0	19	0	19	0	19	0
Available with HI*	14	9	19	0	19	0	19	0	19	0	19
			← MRE Construction Years →								
With RHIC HI											
K0Pi0	0	0	7	0	6	0	9.5	0	9.5	0	19
MECO	0	0	4	0	7	0	9.5	0	9.5	0	0
E949 with K0Pi0	0	0	6	0	5	0	0	0	0	0	0
E949 alone	0	0	8	0	6	0	0	0	0	0	0
With RHIC pp											
K0Pi0	0	0	0	9	0	7	0	9.5	0	19	0
MECO	0	0	0	6	0	7	0	9.5	0	0	0
E949 with K0Pi0	0	0	0	8	0	0	0	0	0	0	0
E949 alone	0	0	0	4	0	0	0	0	0	0	0
Without RHIC											
K0Pi0	1.4	4.3	0	0	0	0	0	4	5.5	8	8
MECO	1.2	2.6	0	0	0	0	0	4	2.5	0	0
E949 with K0Pi0	0	0	0	0	0	0	0	0	0	0	0
E949 alone	0	0	0	3	1	0	0	0	0	0	0
Fixed Costs (labor)											
RSVP			$2,421,818	$2,421,818	$2,421,818	$2,421,818	$2,421,818	$ 2,421,818	$ 2,421,818	$ 2,421,818	$ 2,421,818
K0Pi0			$ 379,875	$ 379,875	$ 379,875	$ 379,875	$ 455,850	$ 455,850	$ 455,850	$ 759,751	$ 759,751
MECO			$ 379,875	$ 379,875	$ 379,875	$ 379,875	$ 683,776	$ 683,776	$ 683,776	0	0
Other Costs (scales)			RSVP Commissioning				RSVP Running Years				
RSVP			$1,530,772	$1,496,388	$1,809,094	$1,396,629	$2,644,061	$ 3,748,838	$ 4,497,475	$ 3,748,838	$ 4,497,475
K0Pi0	$ 820,558	$2,520,284	$ 992,997	$1,011,960	$ 851,140	$ 787,080	$1,347,639	$ 2,018,025	$ 2,653,676	$ 4,036,050	$ 4,594,969
MECO	$ 646,232	$1,400,169	$ 486,053	$ 552,579	$ 850,594	$ 644,676	$1,154,377	$ 1,690,439	$ 1,664,078	$ -	$ -
TOTAL RSVP Operations Cost	**$1,466,789**	**$3,920,453**	**$6,191,391**	**$6,242,495**	**$6,692,397**	**$6,009,952**	**$8,707,521**	**$ 11,018,745**	**$12,376,673**	**$10,966,456**	**$12,274,012**
E949 Operations Cost			E949 Running Years								
Fixed (labor)			$ 190,255	$ 190,255	$ 190,255						
Other (scales)			$2,871,960	$3,016,385	$2,686,467						
Total E949 Operations Cost			**$3,062,215**	**$3,206,640**	**$2,876,722**						
Weeks per year											
K0Pi0	1.4	4.3	7	9	6	7	9.5	13.5	15	27	27
MECO	1.2	2.6	4	6	7	7	9.5	13.5	12	0	0
E949	0	0	14	15	12						
Total Weeks of Physics Running			E949 Integrated Weeks				RSVP Integrated Weeks				
K0Pi0							9.5	23	38	65	92
MECO							9.5	23	35		
E949	0	0	14	29	41						

K0Pi0 Plan	12000 hrs	150	80 hr weeks
MECO Plan	2777 hrs	35	80 hr weeks

*Based on PHENIX Decadal plan and constant effort scenario through FY10

assmes experiments pay for 12 FTE base manpower plus an additional 4 FTE (shared) during first 3 years of beam development

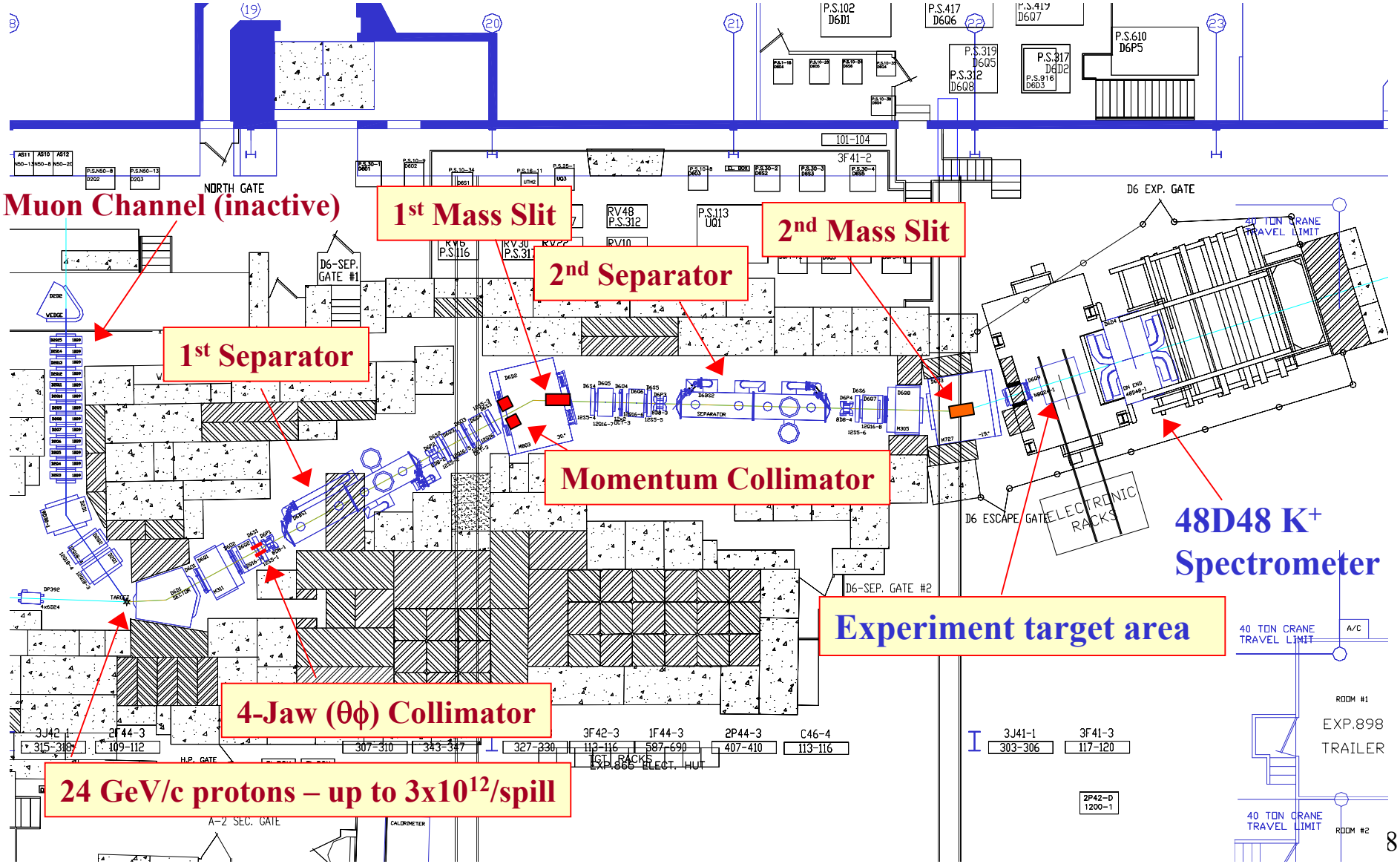

LESBIII - C4 Beam Line
4 Jaw θϕ Collimator
Production Target
1st Separator
Momentum Collimator
1st Mass Slit
LESB 3
S. GATE
2nd Separator
2nd Mass Slit
Horizontal
Collimator
LESB 3
N PR GATE
E787 K+ Decay Spectrometer

Properties of C4 LESB-III Beam Line

- Maximum Momentum: 820 MeV/c
- 2 Stage Separation, 3rd order optics, special collimators
- Length: 19.6 meters
- ~ 30 TP/sec target limit
- Particle flux* per 1 x 10^{13}, 25 GeV/c protons on 9 cm Pt target

Particle	Momentum	Flux	Beam Purity
K^+	800 MeV/c	4.8 x 10^6	71%
K^+	Stopped	1.0 x 10^6	

D6 Beam Line and Experimental Area



Properties of D6 2GeV Beam Line

- Maximum Momentum:1900 MeV/c
- 2 Stage Separation, 3rd order optics, special collimators
- Length: 31.6 meters
- Particle flux* per 3 x 10^{13}, 25 GeV/c protons on 9 cm Pt target

Particle	Momentum	Flux	Beam Purity
K^-	1800 MeV/c	8.0 x 10^6	36%
K^-	1800 MeV/c	3.0 x 10^6	70%
K^-	1200 MeV/c	1.1 x 10^6	94%
K^-	930 MeV/c	3.8 x 10^5	97%
p	1800 MeV/c	3.6 x 10^6	47%
p	1400 MeV/c	1.2 x 10^6	99%

* Proton flux in D-line limited by beam loss considerations, up to 7.6 x 10^{13} protons/AGS cycle have been extracted.

AGS High Energy Physics Experiments - FY 2005+

- **E949 – Rare K decay** (2338/6000 hrs)
  - Was approved (DOE) to run through FY 2003, however no funds for AGS HEP operations were identified in the FY2003 presidential budget request
  - Experiment needs two more long running years to complete goals
  - Proposal to NSF to run concurrent with RSVP beam studies

- **E951 - Muon Collider Target Studies**
  - Will continue subject to MCOG guidance and restoration of DOE HEP funding – However, once E940 beam line construction begins (2006?) the A3 beam will no longer be available

- **E952 - Muon Neutrino Mass (g-2 storage ring)**
  - Scientific approval from BNL, submitted to DOE for approval to run, will not be considered unless if DOE HEP funding for the AGS is restored. Could possibly run parasitic to E949 once E962 is complete.

- **E962 – muon g-2** (Continuation of E821) (0/2000 hrs)
  - A request has been submitted to DOE to run this experiment, however the FY 2003 funding problem lead to no action at the DOE level. Planning to submit new proposal (upgraded from E962) to BNL and if again judged "Must Do" seek funding from DOE and/or NSF.

- **RSVP** - ***Rare Symmetry Violating Processes***
  - ***NSF Major Research Equipment (MRE) proposal ($100M+); ≥ FY 2005 construction start***
  - MECO, E940, $\mu^- \rightarrow e^-$ conversion
  - K0PI0, E926, Rare K decay $K_L^0 \rightarrow \pi^0 \nu\bar{\nu}$

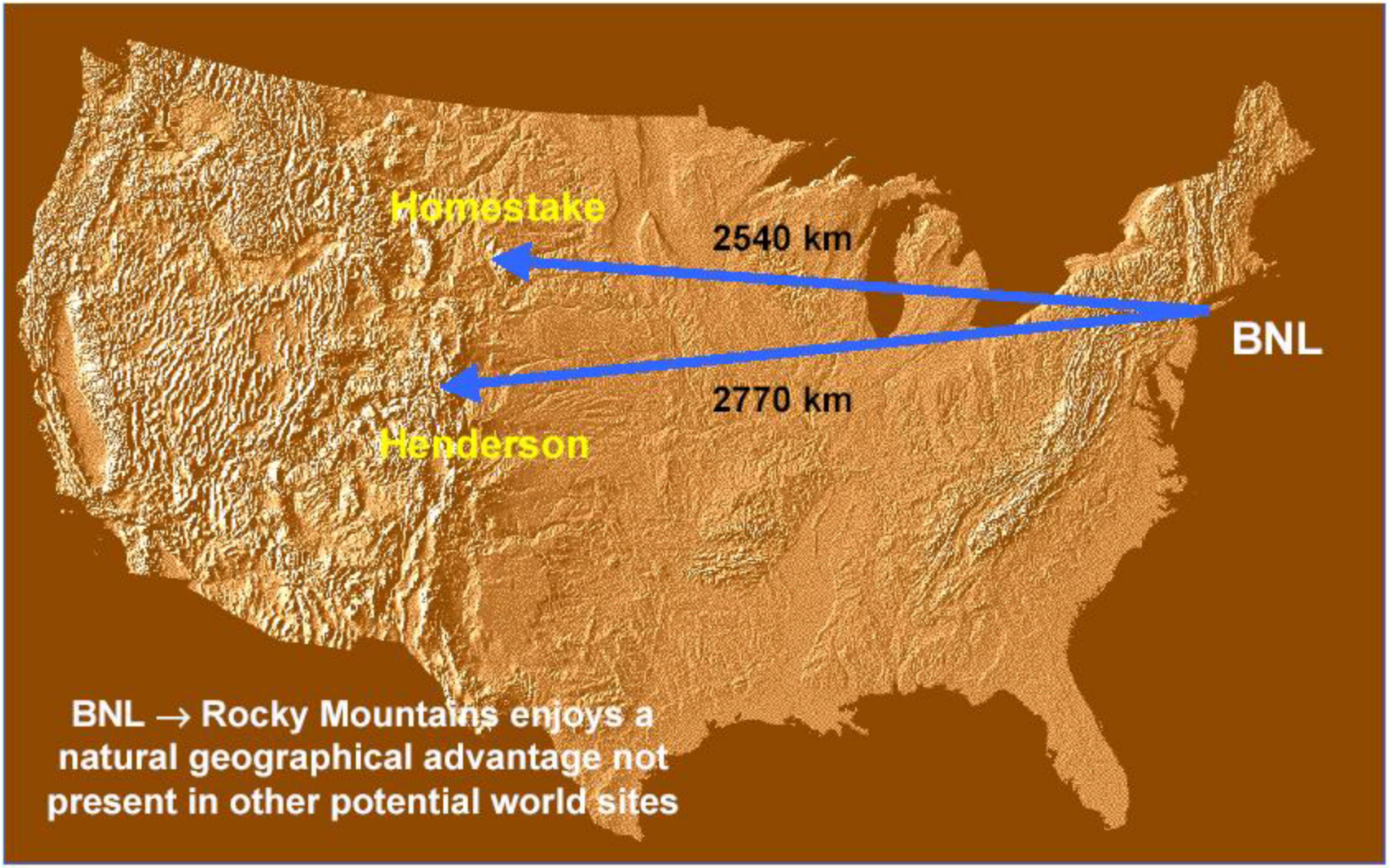
AGS High Energy Experiments - FY 2005+

- **P965 – A3,** [1 week detector test (Submitted Aug 2002, deferred)]: ***Proposal to Measure the Efficiency of Electron Charge Sign Determination up to 10 GeV in a Magnetized Liquid Argon Detector (μLANNDD)***
  BNL, UCLA, Texas, Zurich, Hawaii, Napoli, Pisa, Princeton
  McDonald (Princeton)

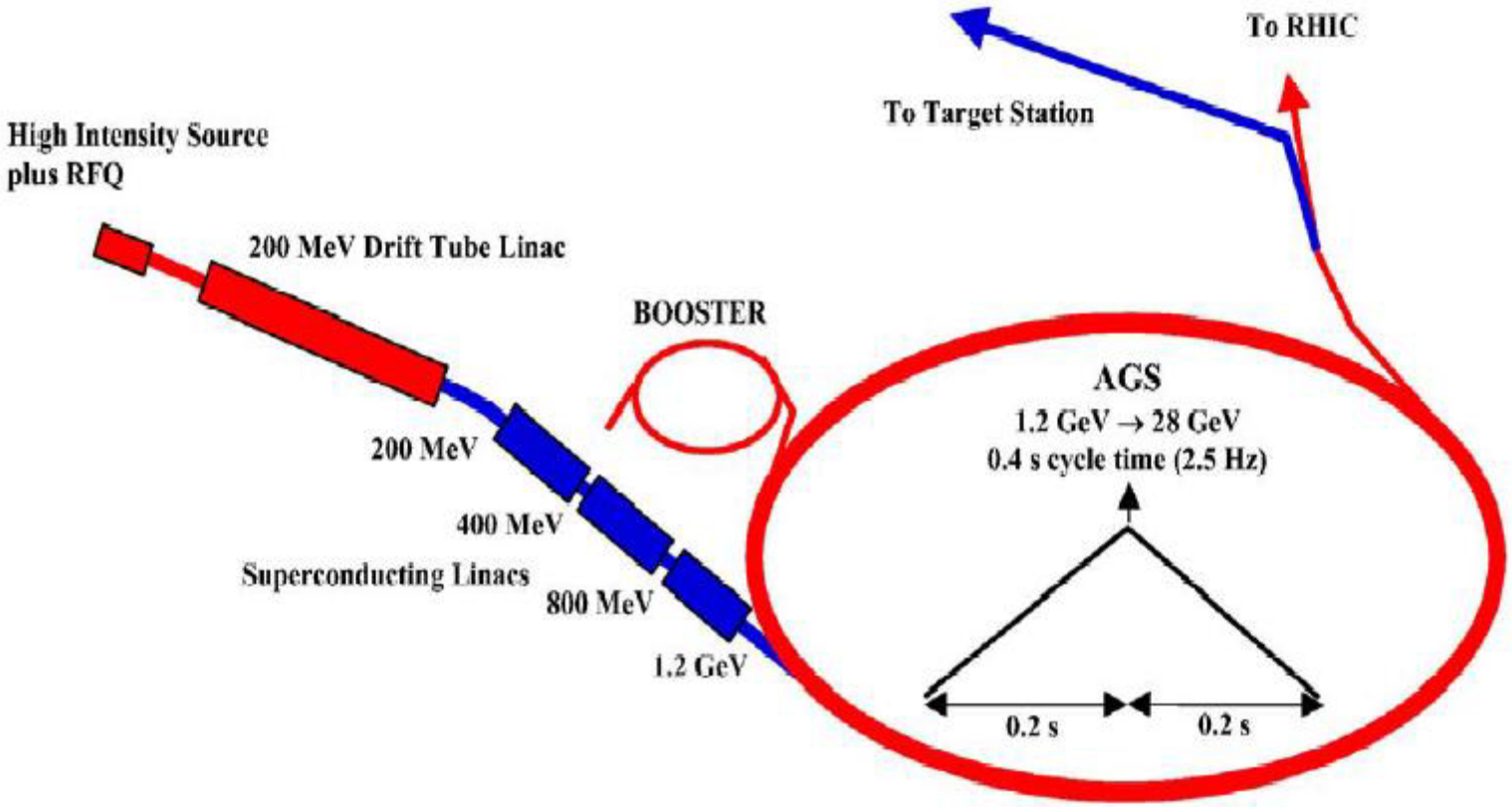
- **LOI** – V1, (g-2 storage ring) ***Muon Electric Dipole Moment Experiment,*** Boston, BNL, BINP, Cornell, Heidelberg, Illinois, Indiana, Yale
  Semertzidis (BNL), Miller (Boston)

- **LOI – New Beam,** [neutrino oscillation experiment]: ***Neutrino Physics with Detectors at Baselines of 100-1000 km from BNL,*** BNL, UCLA, Texas, Zurich, Hawaii, Napoli, SUNY-SB, Pisa, Princeton
  Diwan (BNL)

BNL → Rocky Mountains Super Neutrino Beam

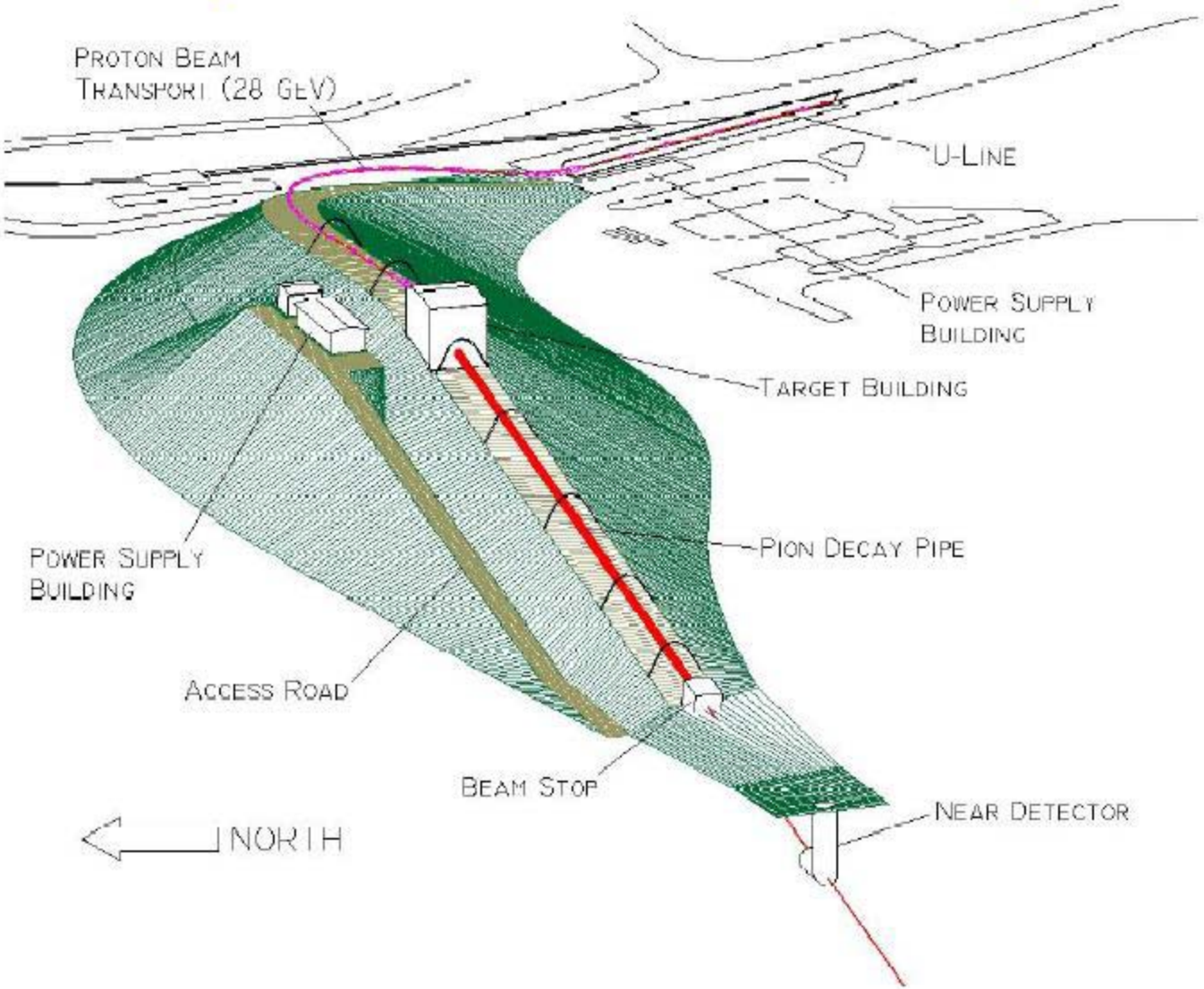


1-2 MW Super Neutrino Beam at AGS

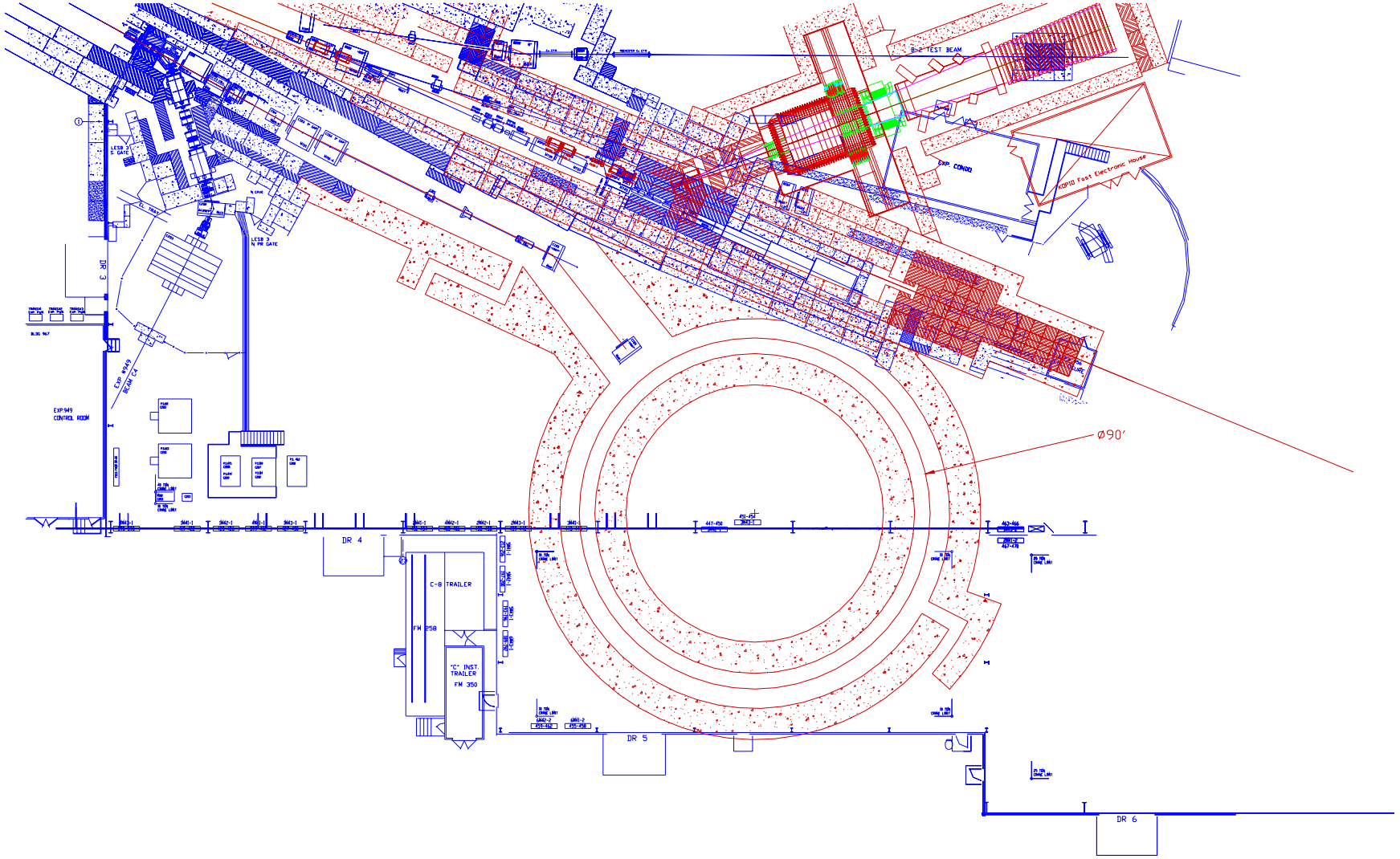


- BNL will complete in June 2004, a Conceptual Design in preparation for a proposal to DOE to upgrade the AGS to 1-2 MW target power and construct the wide-band ***Super Neutrino Beam*** as listed in the DOE's "Facilities for the Future of Science" plan of November 2003

3-D Super Neutrino Beam Perspective



deuteron EDM experiment (Semertzidis proposal in preparation) – C3 Beam Location



AGS Medium Energy Experiments - FY 2005+

Crystal Ball (shipped to Mainz in 2003, possible return to BNL in 3-4 years)

- **E927 - C2/D6,** [233 (tests)/2280 hrs]: ***Measurement of the K^+_{e3} decay rate and spectrum,*** UCLA, JINR, ACU, ANL, Az.U, Boskov, U.Colo, GWU, U.Karlsruhe, Kent, PNPI, Regina, Valparaiso – **(subject to final approval - technical issues)**
  Nefkens (UCLA),Comfort (Arizona)

- **E953 - C2/D6**, [0/450 hrs]: ***Neutral Hyperon Spectroscopy with the Crystal Ball,*** UCLA, JINR, ACU, ANL, Az.U, Rudjer Boskovic, U.Colo, GWU, Karlsruhe, Kent State, PNPI, Regina, Maryland, Uppsala, Valparaiso

  Manley (Kent State), Spinka (ANL), Nefkens (UCLA)

- **EOI – D6**, (Xstal Ball in D6) ***Search for Lambda Radial Trajectory 1 (1/2-,3/2-),***
  Peaslee (Maryland)

AGS Medium Energy Experiments - FY 2005+

D6 (2GeV) Beam Line

- * **E930 – D6,** [1002/1428 hrs]: ***High resolution spectroscopy of hypernuclei using large acceptance germanium detector,*** Tokyo, Tohoku, Osaka, BNL, CMU, China Inst. Of Atomic Energy,Kyoto, Hampton,North Carolina A&T, Freiburg

  Tamura (Tohoku)

- * **E961 – D6**, (continuation of E906 - CDS) [1200 hrs] ***Search for Double-Λ Hypernuclei by Sequential Pionic Decays***, Osaka Electro-Communication U, KEK,Tokyo, BNL, CMU, Freiburg, Hampton, INR-Moscow, Kyoto, TRIUMF, Manitoba, New Mexico, Osaka, Pusan National, Temple

  Fukuda (Osaka Electro-Communications), Rusek (BNL), Chrien (BNL)

- * **E964 – D6**, [0/1400 hrs] Hybrid Emulsion, **:** ***Systematic Study of Double Strangeness System by an Emulsion-Counter Hybrid Method*** , BNL,CMU,Gifu,China Inst. Of Atomic Energy,Kyoto,UNM,Osaka City,Pusan,Tokoyu,Tokyo

  Imai (Kyoto), Tamura (Tokoyu), Nakazawa (Gifu)

- **LOI – D6**, (LANL MRS spectrometer for D6) ***Double Strange Nuclei,*** BNL, CMU, Houston, KEK, Tohoku

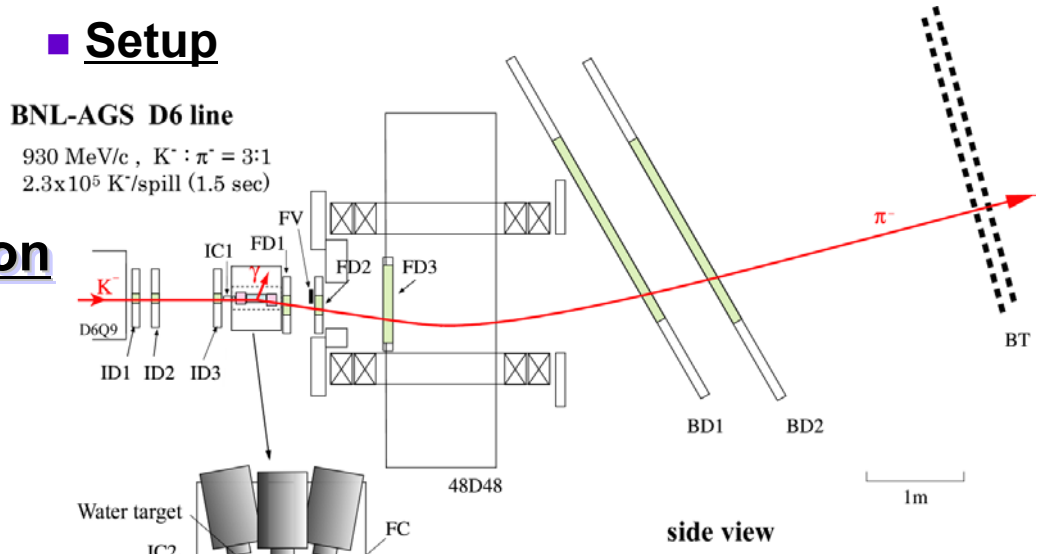
  May (BNL)

*** These experiments were proposed by physicists from Japan interested in bridging the gap between now and the time the Japanese Hadron Facility (a.k.a. JKJ) comes on line. Equipment funds for these experiments come from Japanese sources.**

E930 ('98,'01)

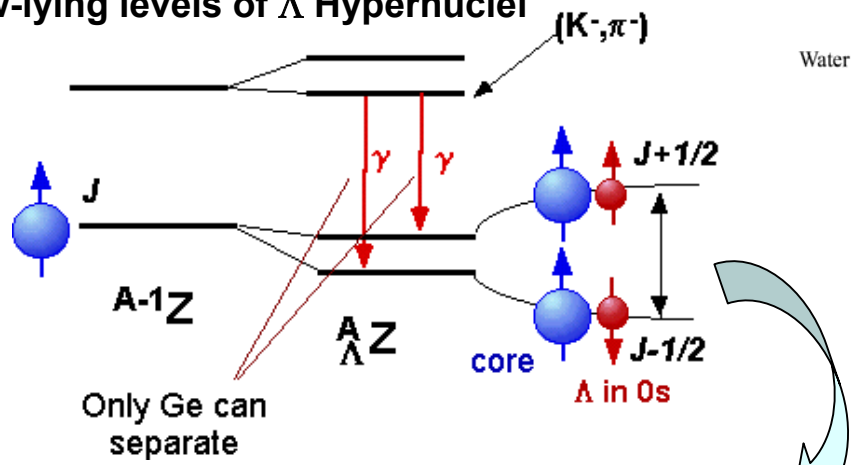
Precision γ Spectroscopy of Λ Hypernuclei for ΛN Interaction

■ Setup



■ Motivation

Low-lying levels of Λ Hypernuclei

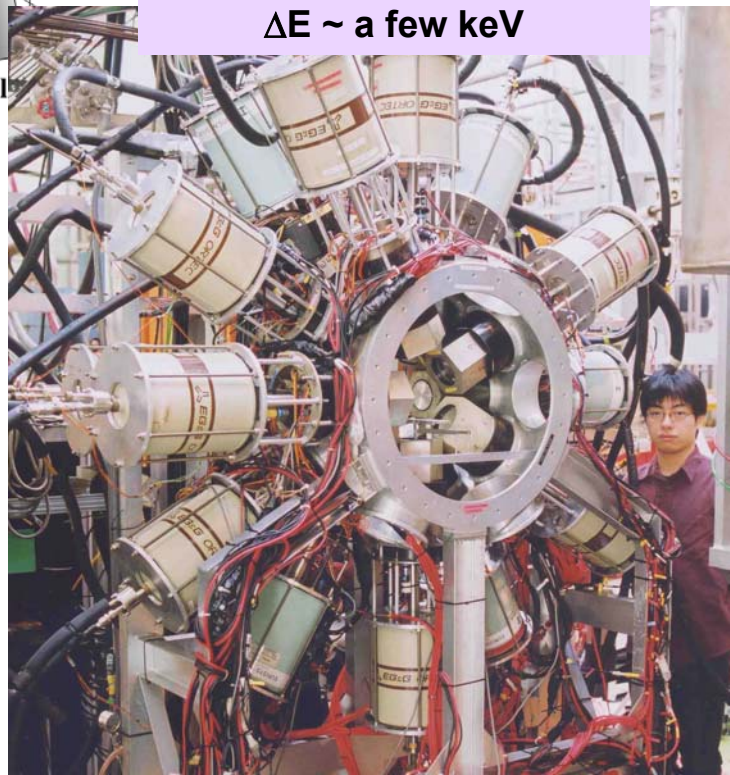


2-body ΛN effective interaction

$$V_{\Lambda N}^{eff} = V_0(r) + \underbrace{V_\sigma(r)\,\vec{s}_\Lambda\vec{s}_N}_{\Delta} + \underbrace{V_\Lambda(r)\,\vec{l}_{\Lambda N}\vec{s}_\Lambda}_{S_\Lambda} + \underbrace{V_N(r)\,\vec{l}_{\Lambda N}\vec{s}_N}_{S_N} + \underbrace{V_T(r)\,S_{12}}_{T}$$

ΛN spin-dependent interaction strengths

Hyperball (Ge array)
ΔE ~ a few keV

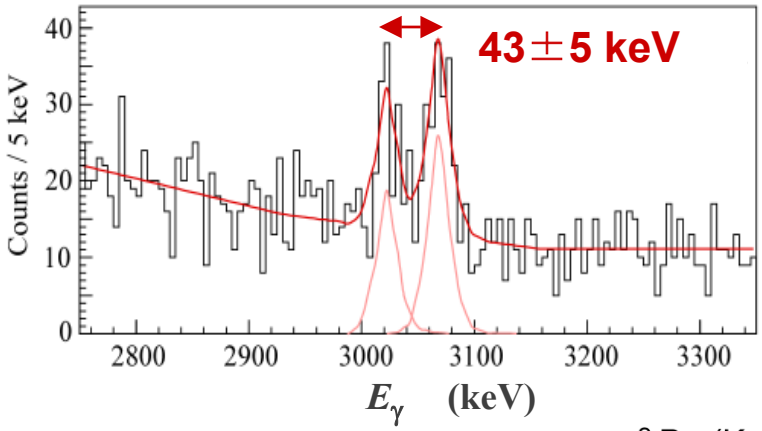


■ Results

γ rays from $^{9}_{\Lambda}$Be, $^{16}_{\Lambda}$O, $^{15}_{\Lambda}$N, $^{7}_{\Lambda}$Li (8 new γ rays) were observed.
-> All of Δ, S_Λ, S_N, T were determined and cross-checked.

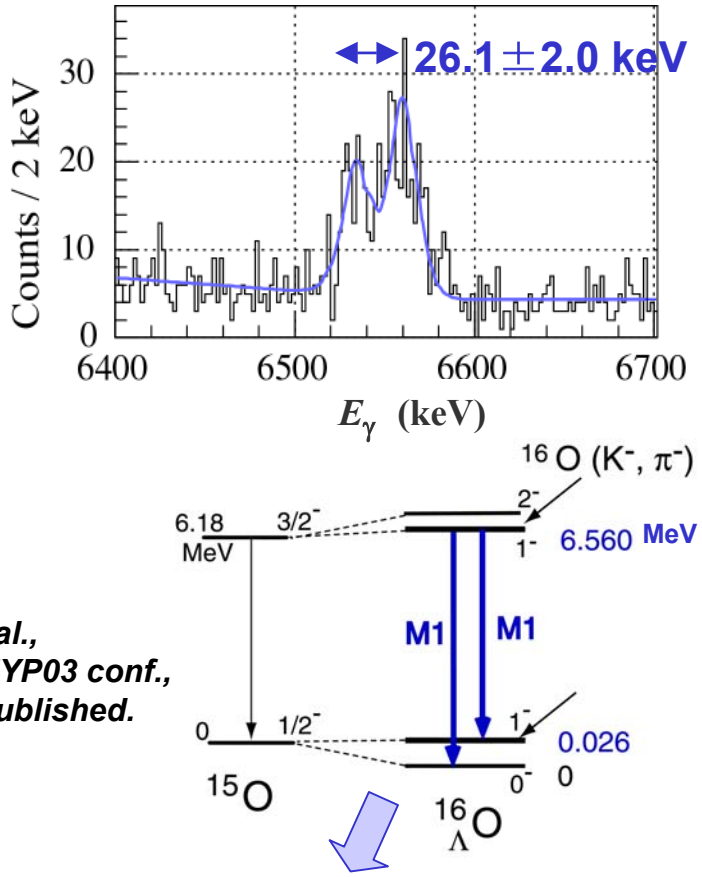
Highlights of E930 results:
Observation of "Hypernuclear Fine Structure"

^{9}Be (K^-, $\pi^-\gamma$) $^{9}_{\Lambda}$Be



Akikawa et al., PRL 88 (2002) 082501; Tamura et al., proc. HYP03 conf.

^{16}O (K^-, $\pi^-\gamma$) $^{16}_{\Lambda}$O



Ukai et al., proc. HYP03 conf., to be published.

ΛN spin-orbit force: S_Λ = -0.01 MeV
= Consistent with a quark model

ΛN tensor force: T = 0.03 MeV
= Consistent with meson-exchange models

Poster by M.Ukai tomorrow

BNL-E964: (Approved by AGS-PAC Oct. '01)

International collaboration
AGS-E964(BNL)

Systematic Study of Double Strangeness System with an Emulsion-Counter Hybrid Method

AGS-E964 collaborators (now)

USA: BNL R. E. Chrien, M. May, P. Pile, A. Rusek
CMU G. B. Franklin
Houston Ed. Hungerfold, K. J. Lan, Y. Cui, Song
New Mexico B. Bassalleck

CHINA: CIAE H. Guo, Z. Liu, S. Lu, J. Zhou

INDIA: AMU R. Hasan

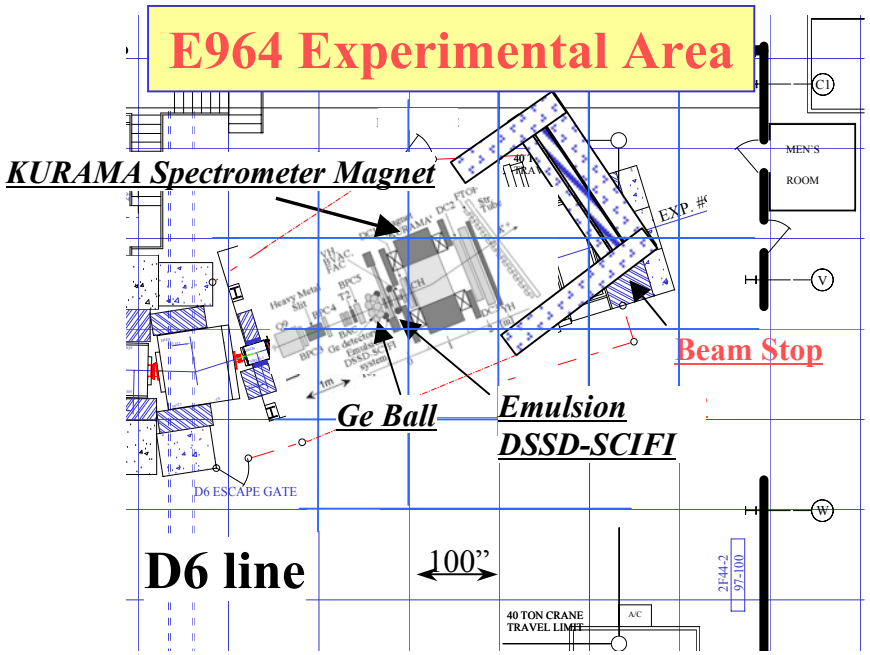
JPN: Gifu K. Nakazawa
Kyoto H. Funahashi, K. Imai, N. Saito, M. Yosoi
OCU K. Yamamoto, T. Yoshida
Osaka E-C H. Hotchi
Riken K. Tanida
Toho S. Ogawa, H. Shibuya
Tohoku Y. Miura, H. Tamura, M. Ukai

KOREA: GNU J. S. Song, C. S. Yoon
PUSAN J. K. Ahn, S. J. Kim

MM: MANDALAY M. Thein, K. S. Myint

UK: UCL D. H. Davis, D. Tovee

+ Graduate students



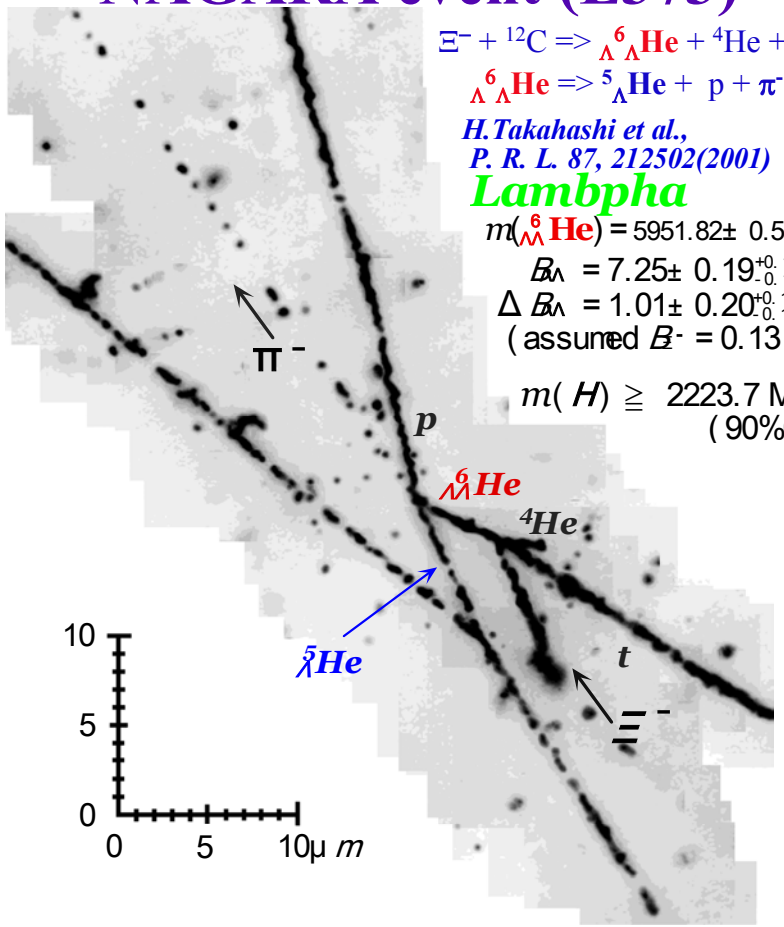
Beam : K^- (1.7GeV/c),
2×10^5 K^-/spill (4.1sec) with $K^-/\pi > 9$
Time requested : **100 hours** for detector tune
100 hours for beam tune
1100 hours for beam exposure

Beam time in **FY2006** is required.

Nuclear Physics with double strangeness *(S=−2)*

KEK-E373 => AGS-E964 ·····> J-PARC

NAGARA event (E373)



$\Xi^- + {}^{12}C \Rightarrow {}^{6}_{\Lambda\Lambda}He + {}^{4}He + t$

${}^{6}_{\Lambda\Lambda}He \Rightarrow {}^{5}_{\Lambda}He + p + \pi^-$

H.Takahashi et al., P. R. L. 87, 212502(2001)

Lambpha

$m({}^{6}_{\Lambda\Lambda}He) = 5951.82 \pm 0.54$ MeV

$B_{\Lambda\Lambda} = 7.25 \pm 0.19^{+0.18}_{-0.11}$ MeV

$\Delta B_{\Lambda\Lambda} = 1.01 \pm 0.20^{+0.18}_{-0.11}$ MeV

(assumed $B_{\Xi^-} = 0.13$ MeV)

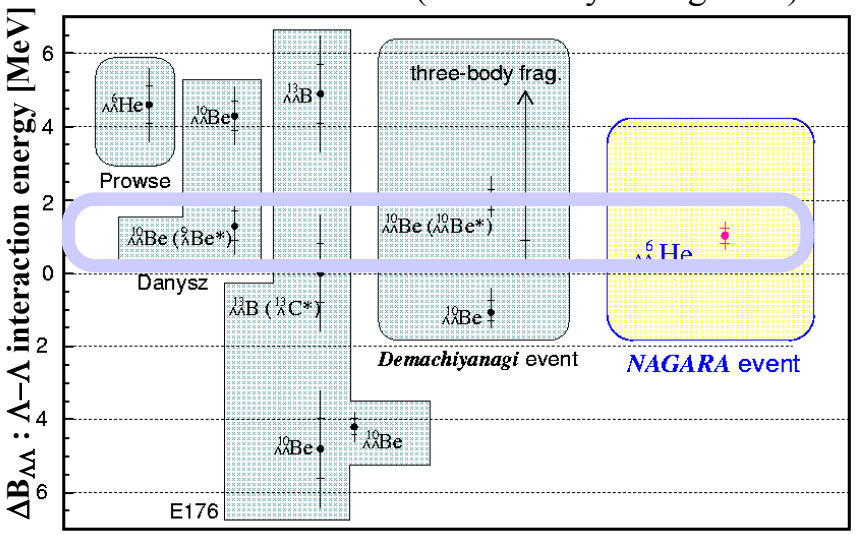
$m(H) \geqq 2223.7$ MeVc^2 (90%CL.)

KEK-E373 (Preliminary results)

*) **~10^3** Ξ^- stopping events in nuclear emulsion.

*) Observation of several double-Λ hypernuclei

=> **NAGARA event** (without any ambiguities).



ΛΛ interaction is attractive but weak

AGS-E964 (statistics X 10)

*) **~10^4** Ξ^- **stopping events** in nuclear emulsion.

*) **~10** double-Λ hypernuclei (**without any ambiguities**).

=> making nuclear chart with S=-2.

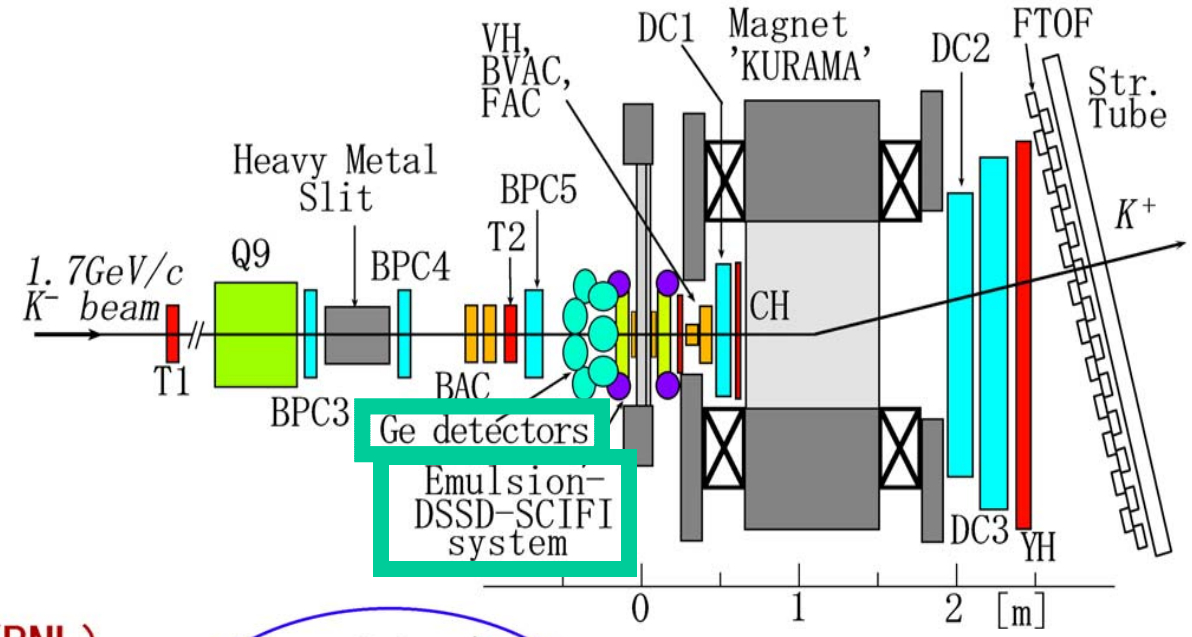
A-dependence of **$\Delta B_{\Lambda\Lambda}$** in several nuclides.

*) **X-ray measurement** from Ξ^--atom, for the first time.

=> information of Ξ-N interaction.

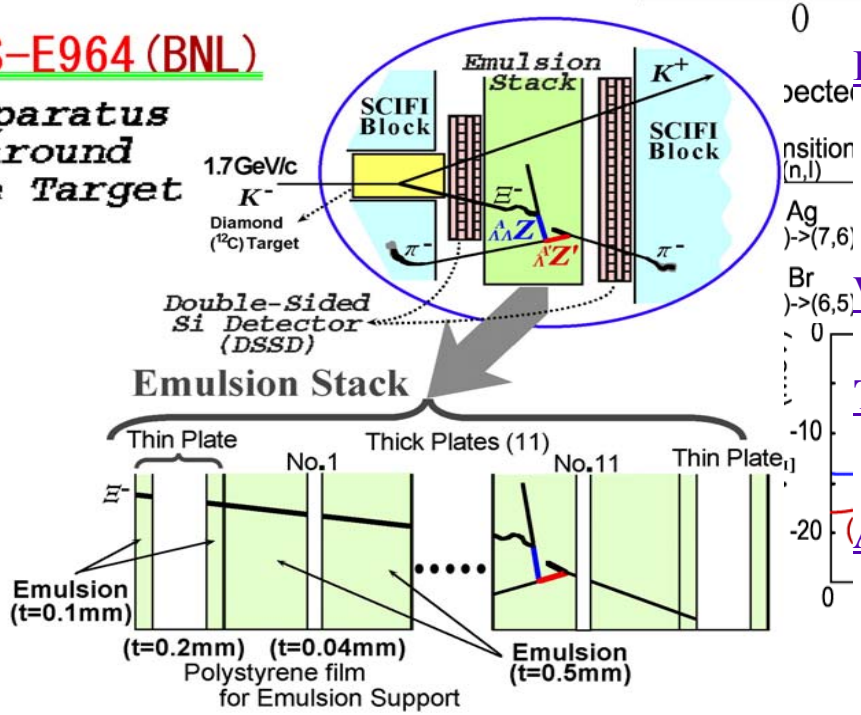
*) **funded $2.5M** by JPN. Gov., already. (2003~2007)

Setup around the target *(E964)*



AGS-E964 (BNL)

Apparatus around the Target



DSSD(Double-Sided Si Detector)

Precise prediction of Ξ^- tracks on the first emulsion plate.

=> Reduction in background tracks which are picked up in the first plate.

Volume of nuclear emulsion

70 *liters* (E373) => **210 *liters***

Track scanning method

Automated + Interactive (E373)
=> **Fully Automated (speed x10)**

As for X-ray measurement

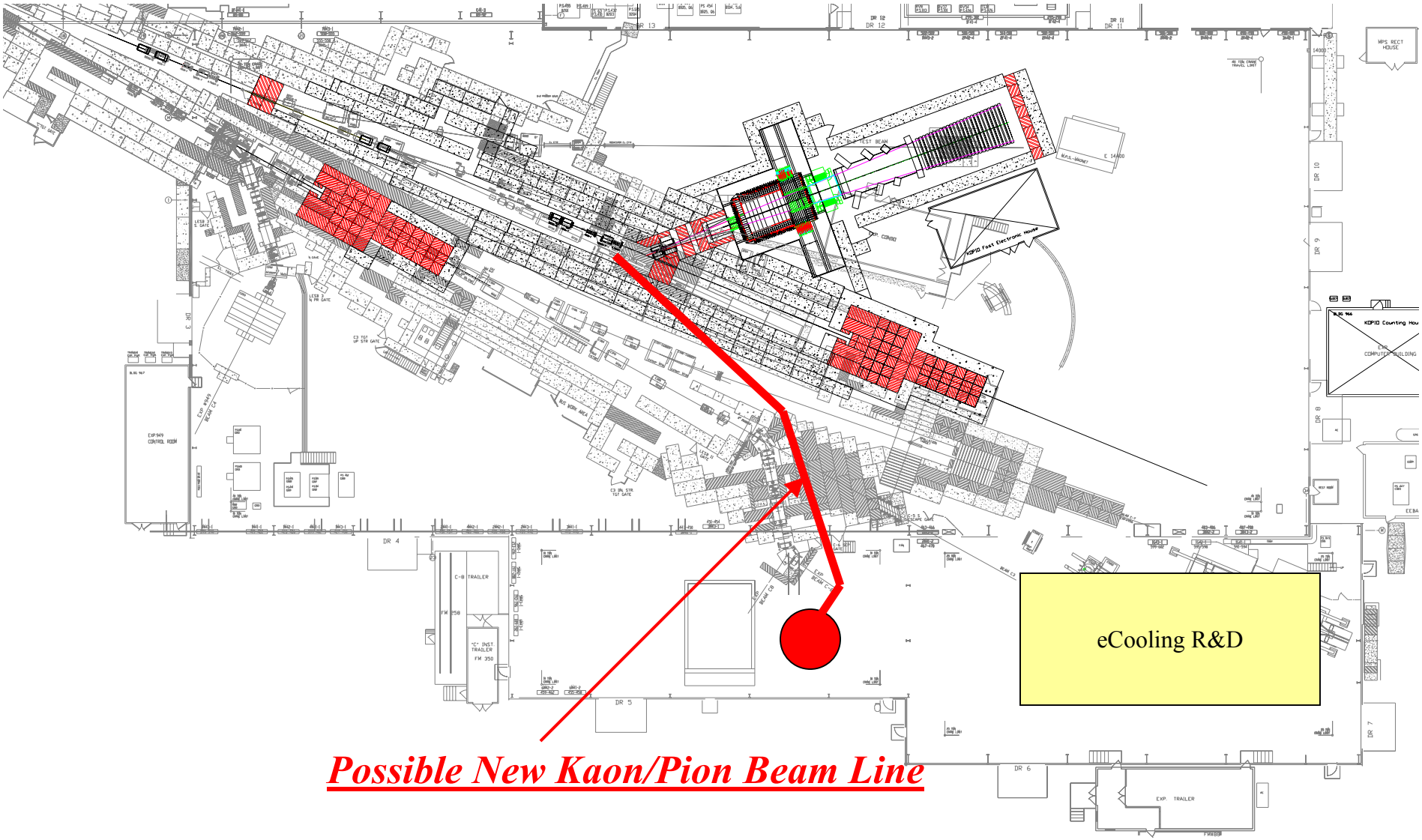
X-ray data are only analyzed for **clear Ξ^- stopping events** which are identified by nuclear emulsion.

=> **quite low background**

Other AGS Experiments - FY2005+

- **AGS Radiobiology** *(NASA)*
  - Completed last run in Nov 2002
  - Expect limited AGS use since NSRL is now operational
  - Facility will be displaced (move to Switchyard?) by E940 (≥ 2005)

- **P963 – Proton Radiography** *(National Nuclear Security Administration - NNSA)*
  - Multiple bunch extraction studies in FY 2002-3 (successful)
  - Proposal for dynamic testing under discussion with BNL management


eCooling R&D
Possible New Kaon/Pion Beam Line

Final Comments

- The BNL priority for AGS Fixed target experiments is:

  1) RSVP (and finish E949 and E962 if possible)
  2) Long base line neutrino experiment to follow RSVP

- Experiments must make their case (again!) and devise a strategy to secure operations funds to be considered.

- Once RSVP construction plans are set (towards the end of this year) they will be difficult to make changes to accommodate other experiments.