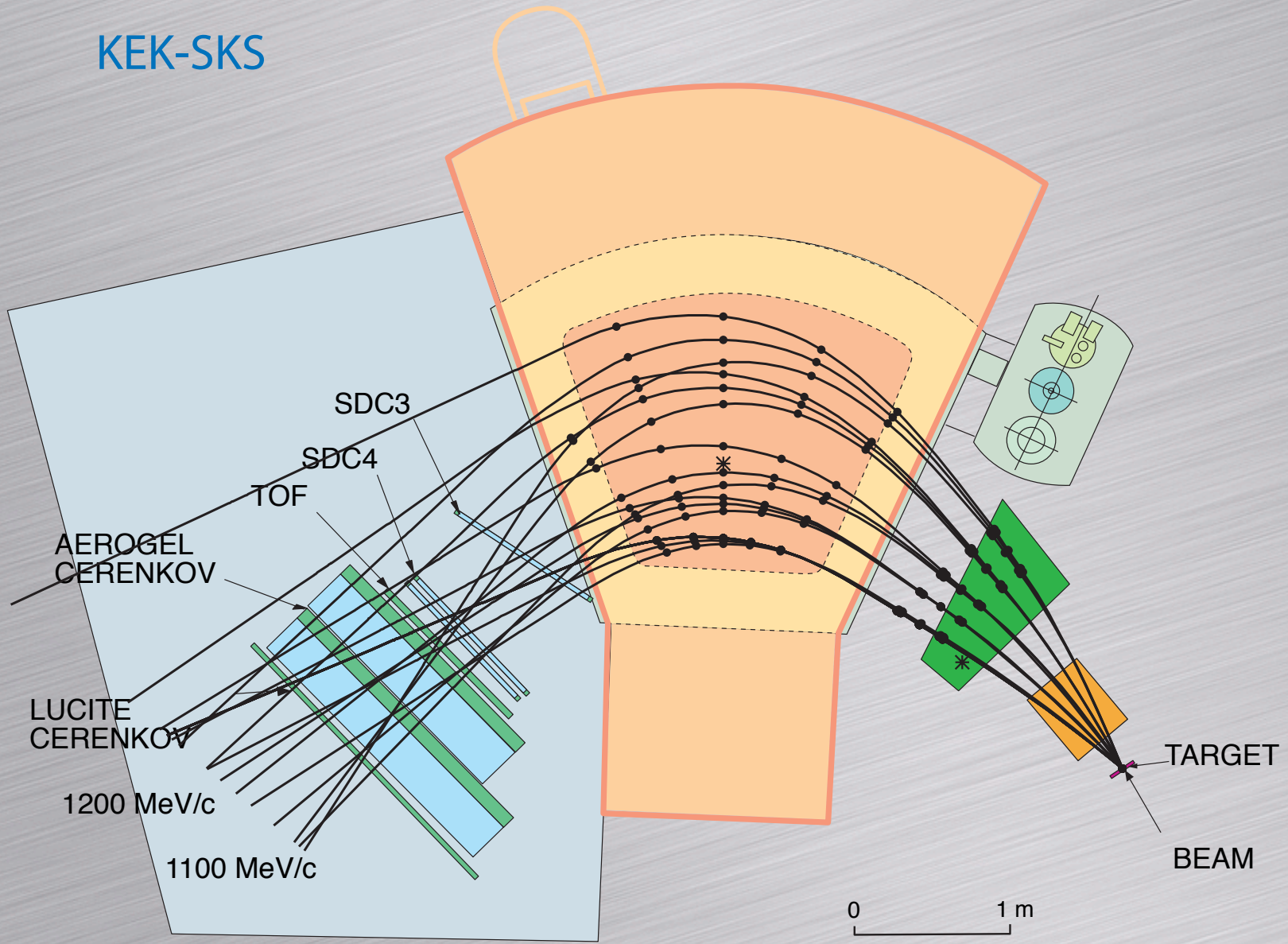
SKS@J-PARC １年の動き

永江知文（J-PARC Project Office）

Day-1実験@J-PARC

- New Generation Spectroscopy of Hadron Many-Body Systems with Strangeness S=-2 and -1
  - (K^-,K^+) for Ξ-hypernuclei
  - $(K^-,\pi^-)\gamma$ with HyperBall-3

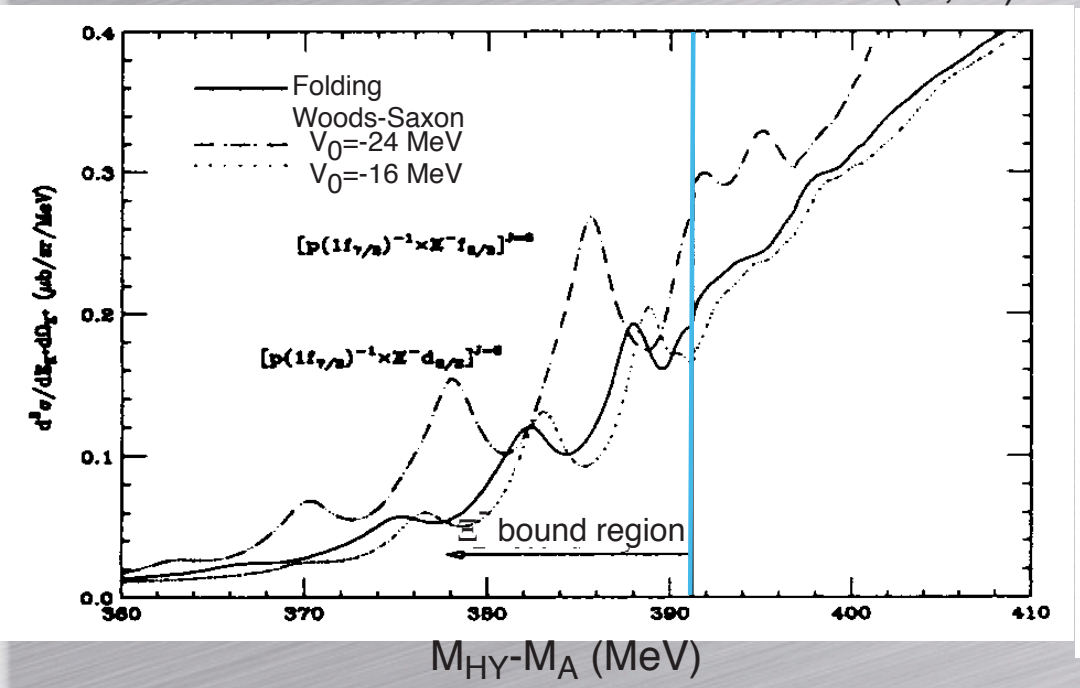
Ξ Hypernuclei with (K^-,K^+)



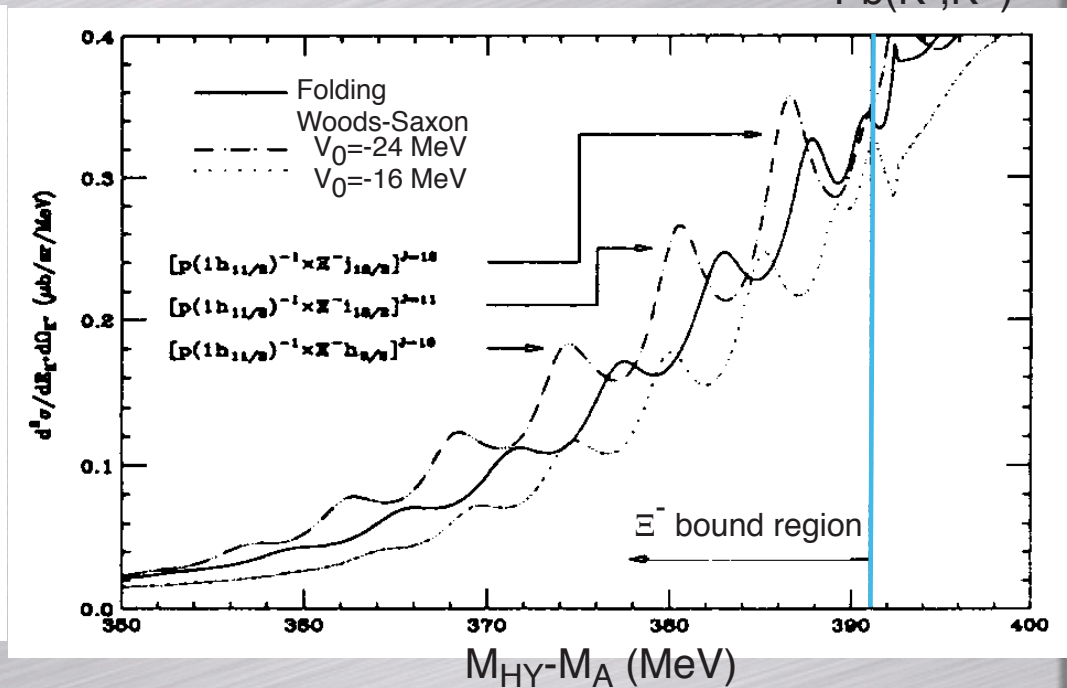
(K^-,K^+) Spectroscopy

- 2 MeV$_{FWHM}$ resolution
- ~6 events/day/MeV for 50 msr, 2g/cm^2 thick Pb ⟶ ~20 days

$^{58}Ni(K^-,K^+)$



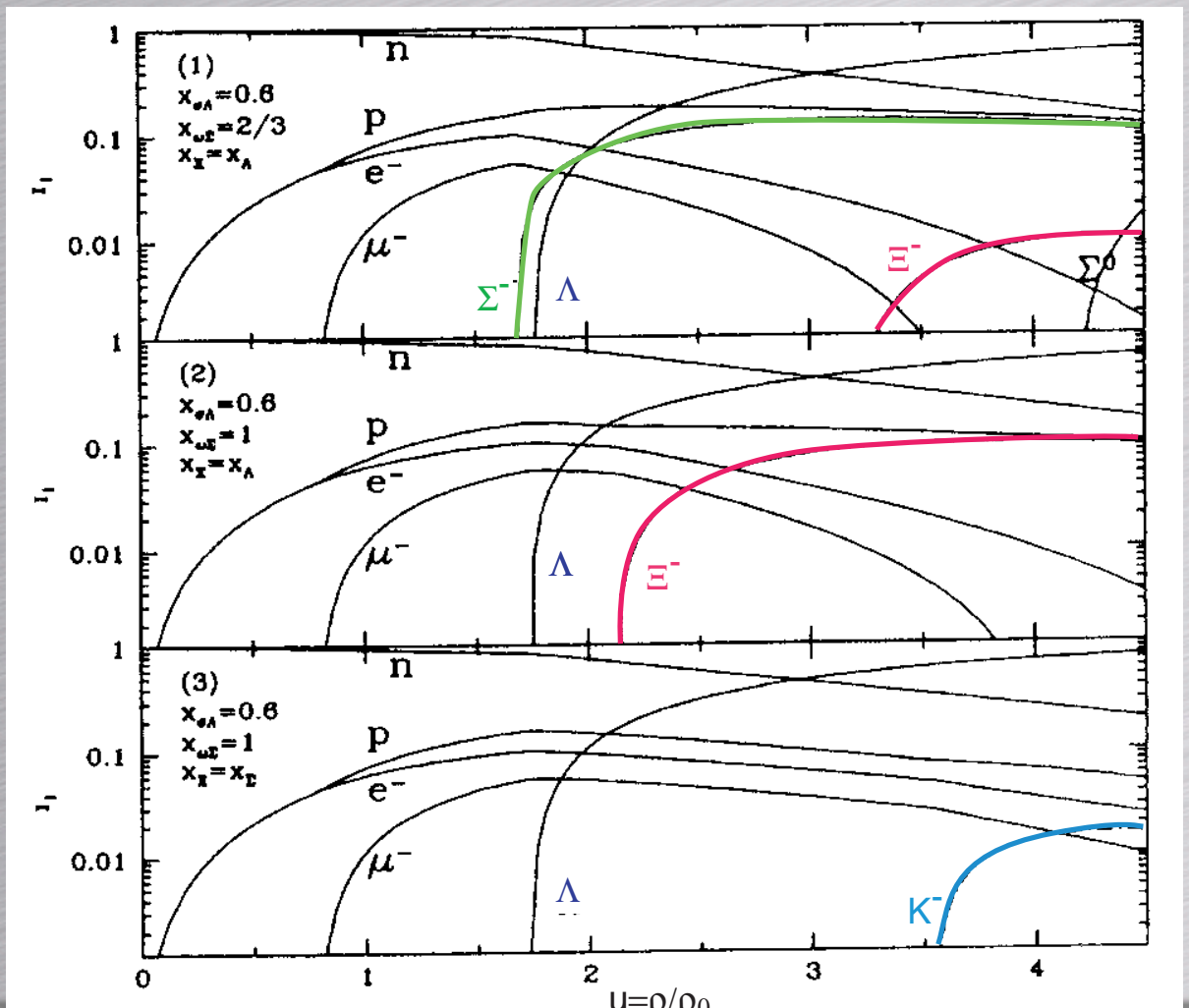
$^{208}Pb(K^-,K^+)$



Ξ hypernuclei potential ?

- Λ, Σ⁻, Ξ⁻, K⁻ in Neutron Star Core ?
  - Chemical Potential:

$$\mu_B = m_B + \frac{k_F^{\,2}}{2m_B} + U(k_F)$$

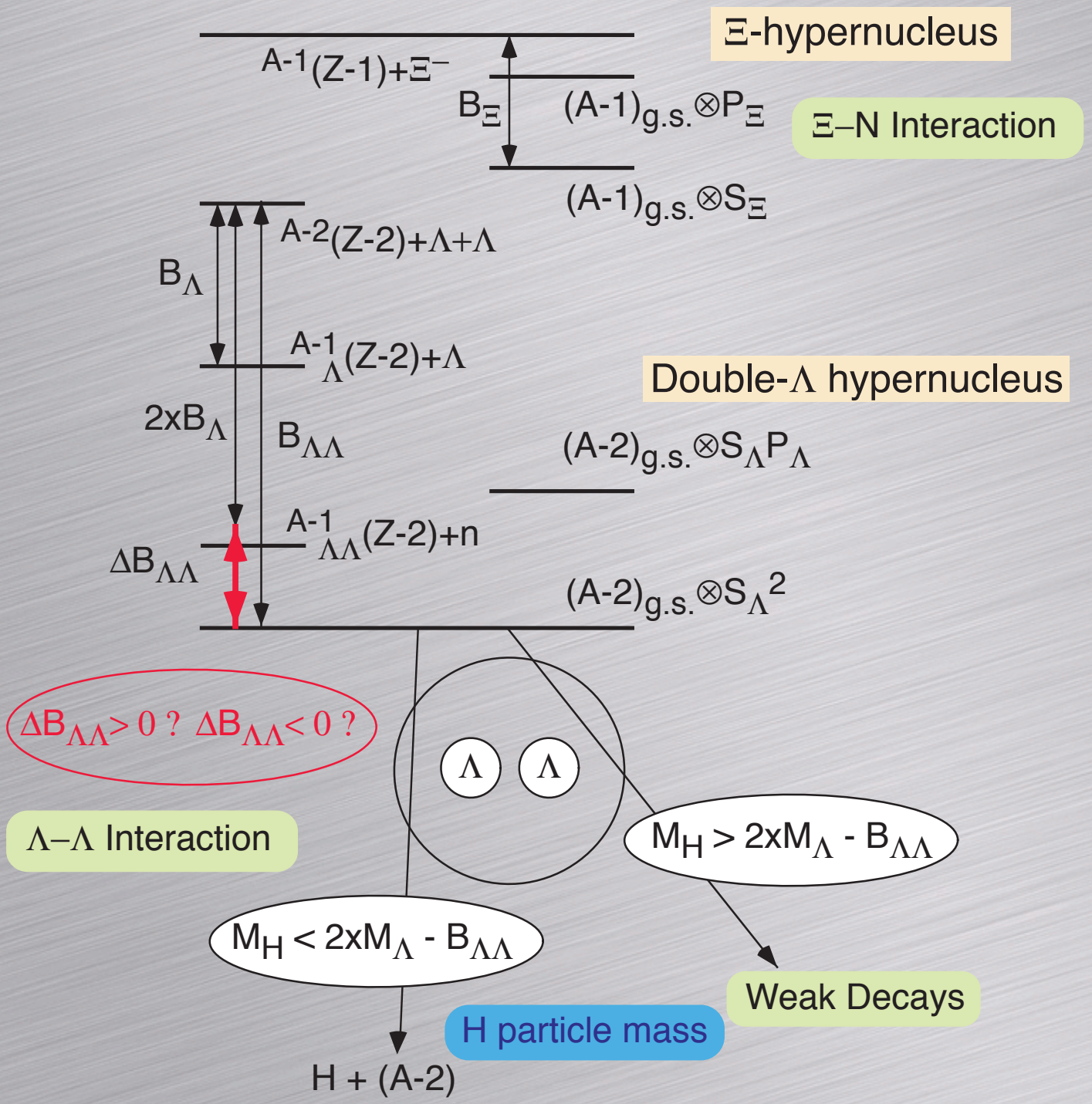


U_Σ<0, U_Ξ<0

U_Σ>0, U_Ξ<0

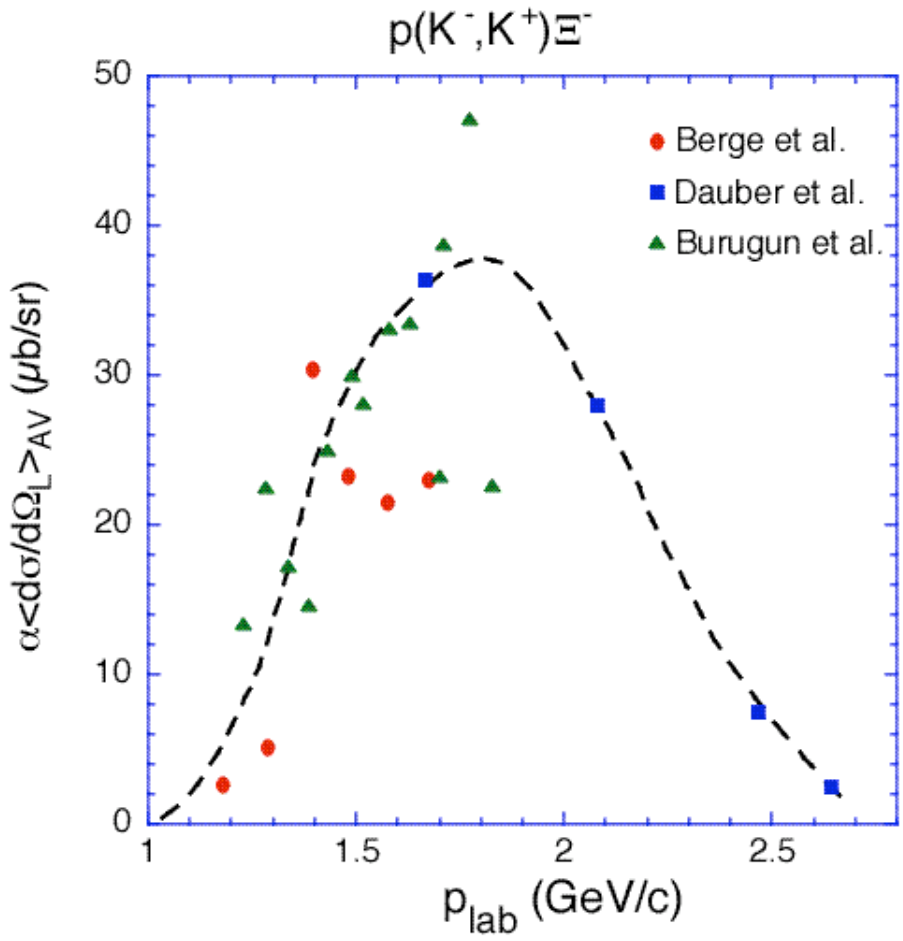
U_Σ>0, U_Ξ>0

Energy Spectrum of S=-2 systems

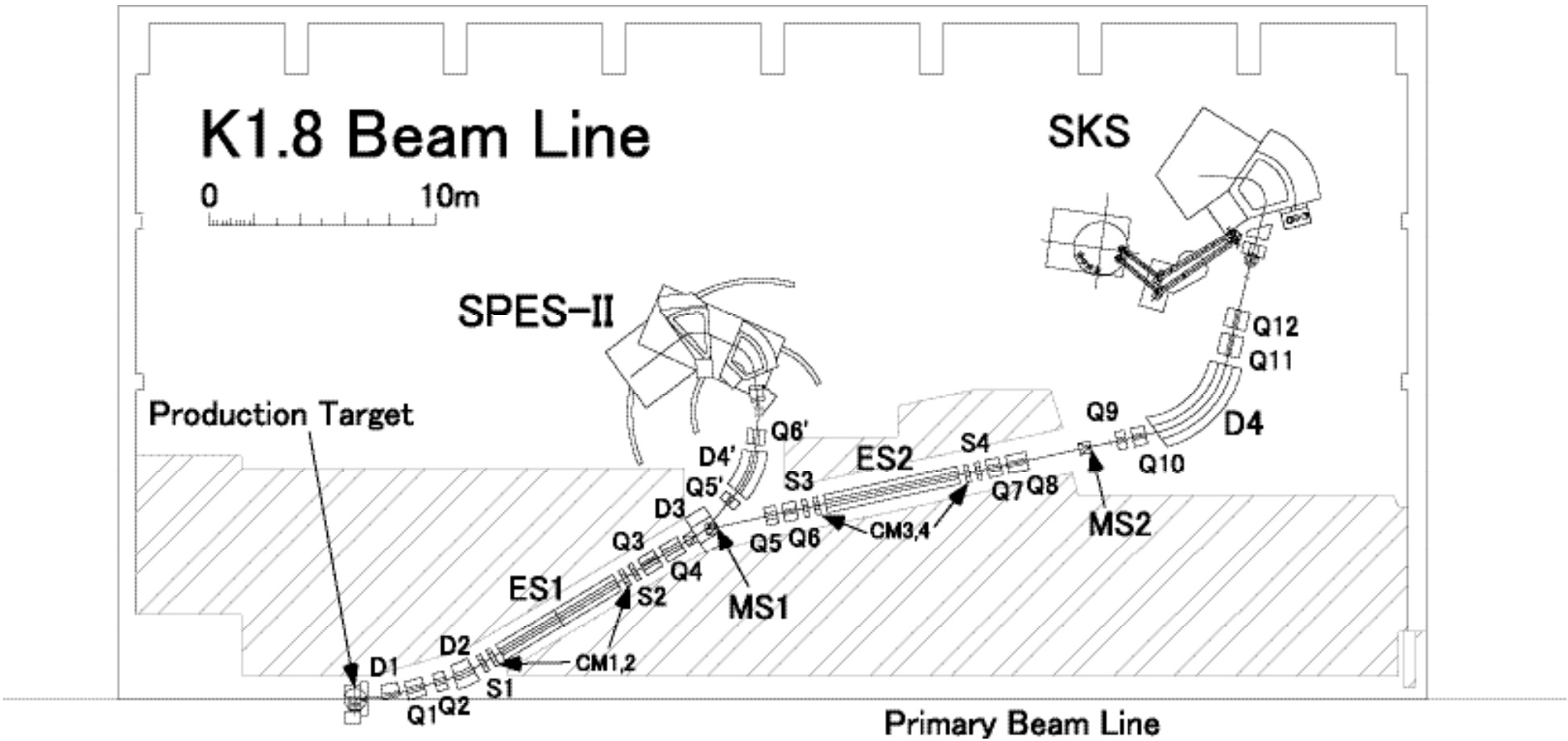


Entrance to the S=-2 World

- Doorway Reaction:
  $K^- + p \rightarrow K^+ + \Xi^-$
  at 1.8 GeV/c



SKS@K1.8


K1.8 Beam Line
0
10m
SKS
SPES-II
Production Target
Q12
Q11
Q9
D4
Q10
Q6'
D4'
Q5'
ES2
S4
S3
Q7
Q8
D3
Q3
Q5
Q6
CM3,4
MS2
Q4
ES1
S2
MS1
D2
D1
CM1,2
S1
Q1
Q2
Primary Beam Line

Energy Resolution

- 2 MeV_{FWHM} resolution

$$\Delta E^2 = \beta_{K^+}^2 \times \Delta p_{K^+}{}^2 + \beta_{K^-}^2 \times \Delta p_{K^-}{}^2 + \Delta E_{straggling}^2$$

$$\Delta p / p_{K^-} = 2 \times 10^{-4}$$

$$\Delta p / p_{K^+} = (0.96 \pm 0.13) \times 10^{-4}\, p_K + (0.092 \pm 0.007)(\%)$$

$$\therefore \Delta E \sim \sqrt{1.89^2 + 0.31^2 + 0.5^2} = 2 MeV_{FWHM}$$

  - Limited by the SKS resolution
- Widths of the Ξ bound state < 1 MeV?

Yield Estimation

- 50 msr, 2g/cm^2-thick Pb

$$Y = I_{Beam} \times 2g/cm^2/208g \times N_A \times \frac{d\sigma}{d\Omega} \times \Delta\Omega \times f_{decay} \times f_{eff}$$

$$= 10^7 \times (2/208) \times 6.02 \times 10^{23} \times 0.1 \times 10^{-30} \times 0.05 \times 0.5 \times 0.5 events/sec$$

$$\cong 6 events/MeV/day$$

Issues in ΞA potential

- A-dependence of ΞA potential depth
  - Strong p-wave attraction
  - $\Xi^{-}{}^{207}\mathrm{Tl} > 2\mathrm{x}\ \Xi^{-}{}^{11}\mathrm{B}$
- Isospin dependence
  - How strong is the Lane term ?
  - $\Xi^{-}\mathrm{p}$-$\Xi^{0}\mathrm{n}$ mixing
- Width and ΞN-ΛΛ coupling

マンパワー

- 応田→理研 (; ;)
- 高橋←J-PARCでのSKSを用いたハイパー核実験担当の助教授 (^^)
- 新たな気持ちで

予算　1

- 特定領域科研費の申請
- 代表者：岡真
- ストレンジネスで探るクォーク多体系
- H16~H21、総額16.6億円

予算　2

- KEKからの来年度概算要求
- PSシャットダウンに伴う予算要求
- SKSの移設費用も含まれる

エネルギー分解能の最適化

- 目標：2 MeV(FWHM)
- SKS入り口部の磁気光学系の設計
  - QDD or QD
  - 立体角を失わないように
- Beam Spectrometerの設計のつめ

測定器系の開発

- 速い飛跡検出器の開発
  - 10^7/sec./cm^2
  - トリガーの強化？
  - 現状：~400 trig./spill
- DAQ

NP04

The 3rd International Workshop on Nuclear and Particle Physics at J-PARC 50-GeV PS

Organizing Institutes: High Energy Accelerator Research Organization (KEK)
Japan Atomic Energy Research Institute (JAERI)

- Strangeness Nuclear Physics Experiments
- Nuclear/ Hadron Physics Experiments
- Neutrino Experiments
- Kaon Rare Decay Experiments
- Muon Rare Decay Experiments
- Physics with Low-Energy Anti-Protons

Aug. 2-4, 2004 at Tokai, Ibaraki, Japan
Aug. 24-26, 2004 at KEK (Neutrino session)

http://j-parc.jp/NP04

Photo: J-PARC site taken in Feb. 2004

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T.Komatsubara (KEK)
T.Nagae (KEK)
K.Nishikawa (Kyoto)
S.Sawada (KEK)
T.Takahashi (KEK; Scientific secretary)
M.Takasaki (KEK)
T.Yamanaka (Osaka)

今年度やるべきこと

- NP04
- Full Proposalの準備
- 科研費申請のstrategy