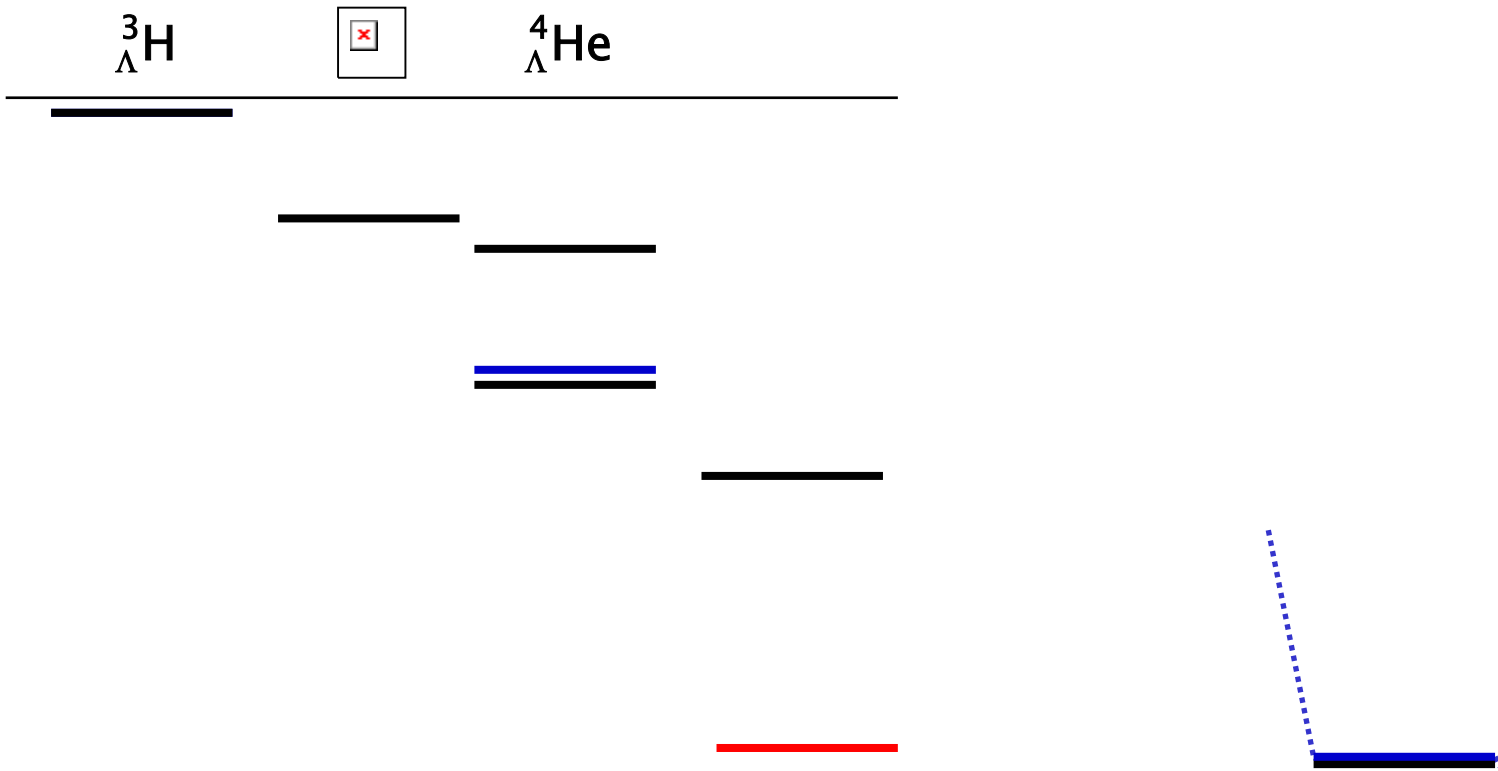
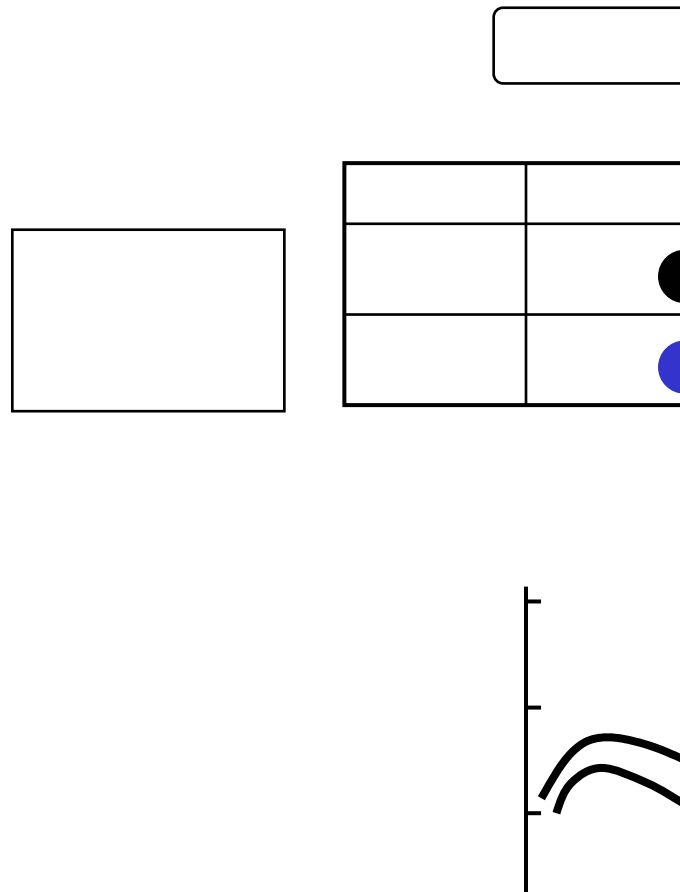
HYP03

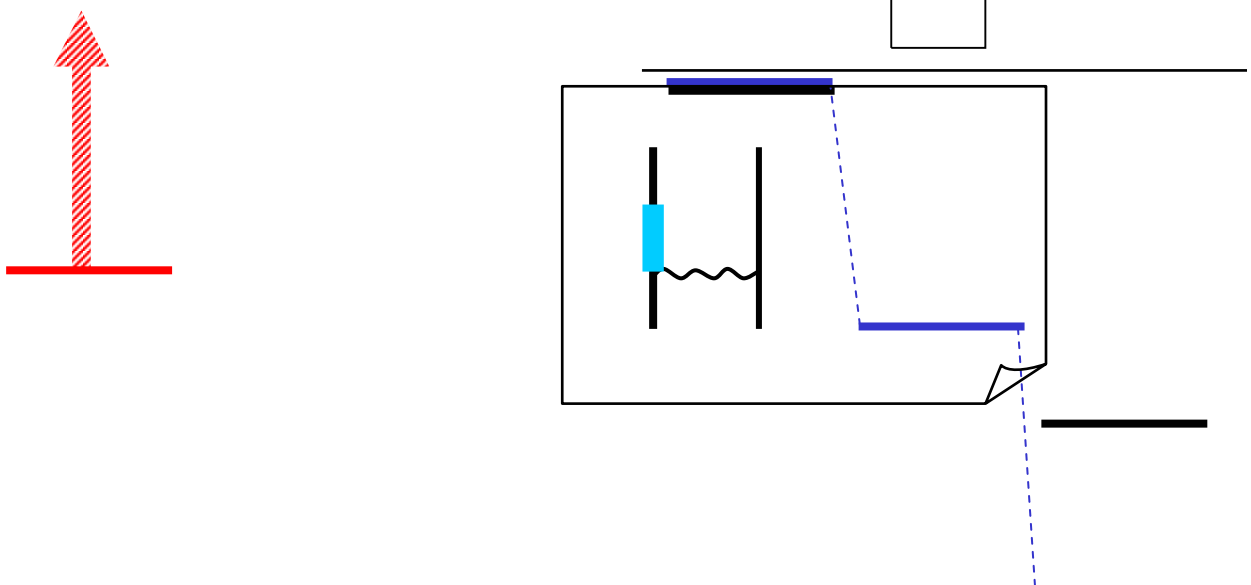
The Coherent Λ-Σ Coupling in Light Hypernuclei

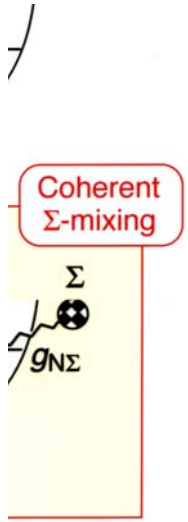
Yoshinori AKAISHI
Institute of Particle and Nuclear Studies, KEK

The Overbinding Problem

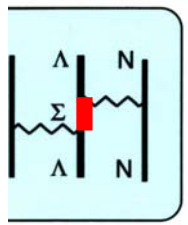


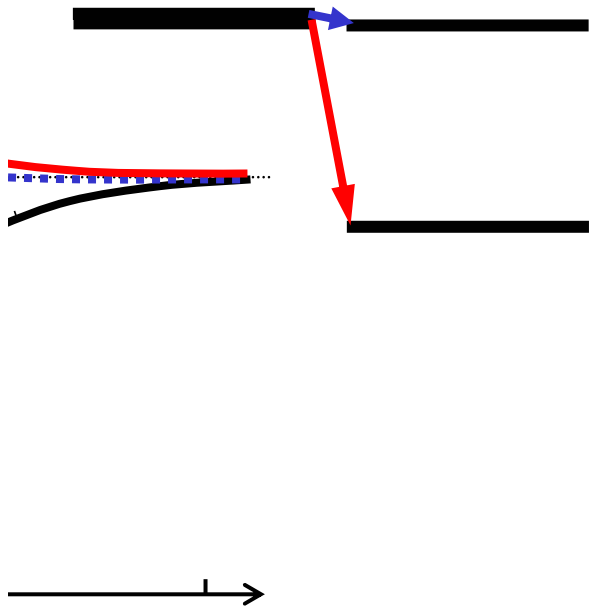


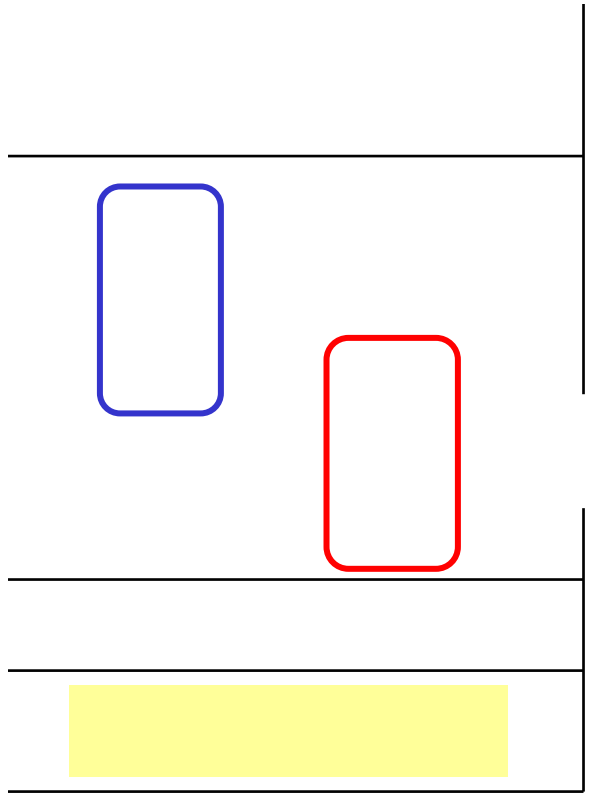




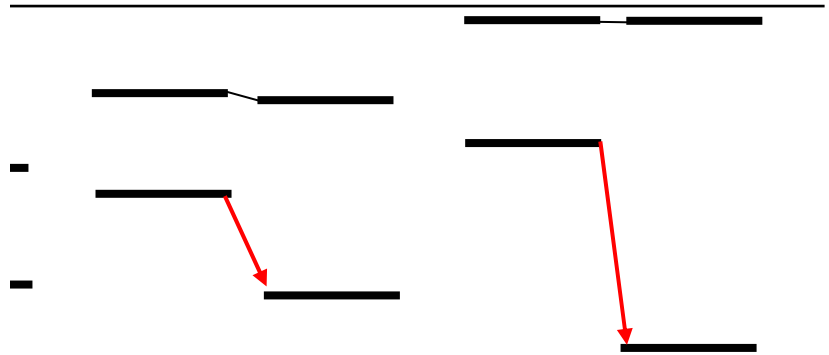
$i \neq 0 \rightarrow B_0$

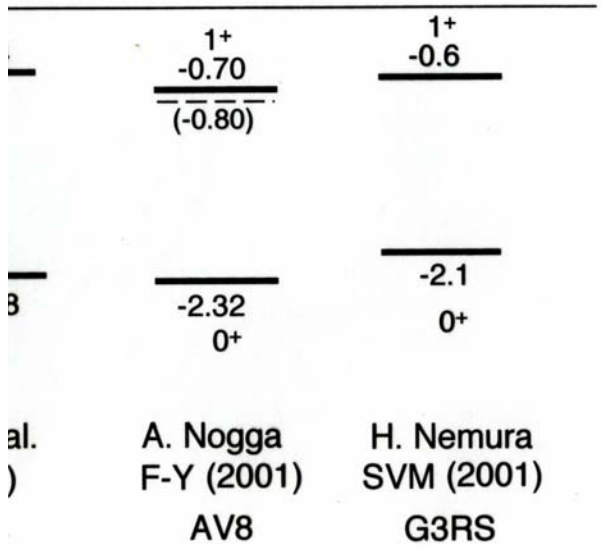




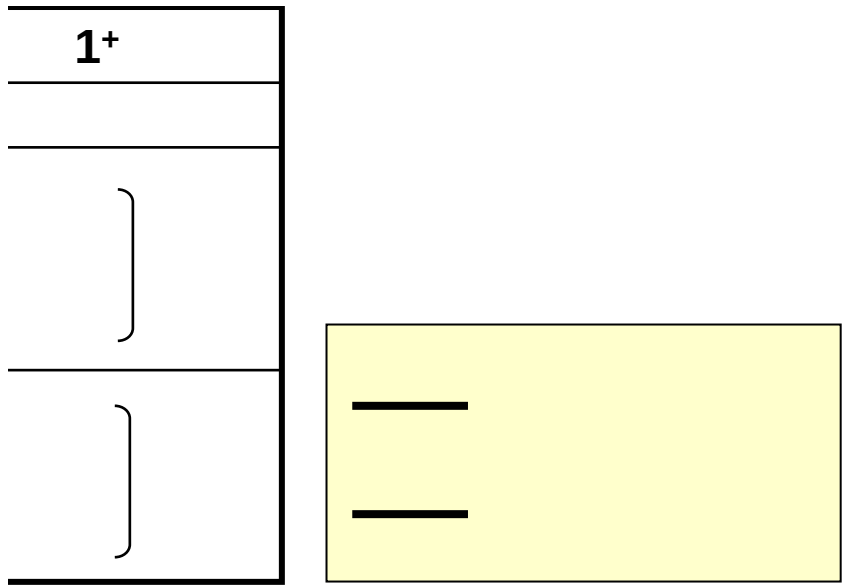


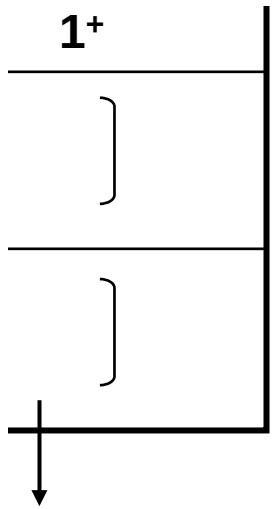
He





. Y. Yamamoto, Phys. Rev. C**65** (2001) 011301(R).


1+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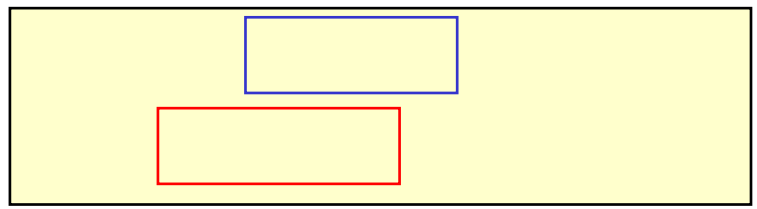
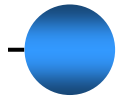
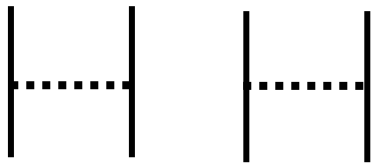
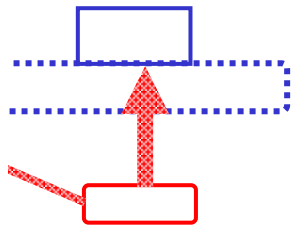


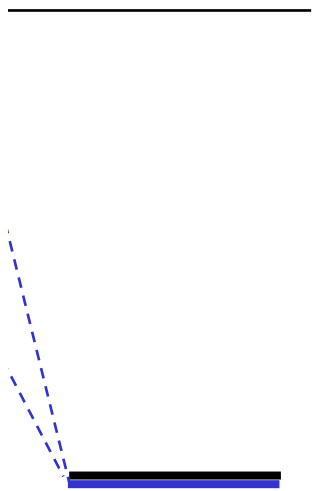
body calculation

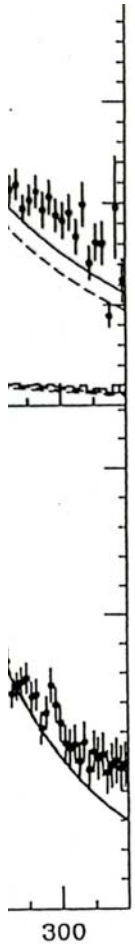
degrees of freedom









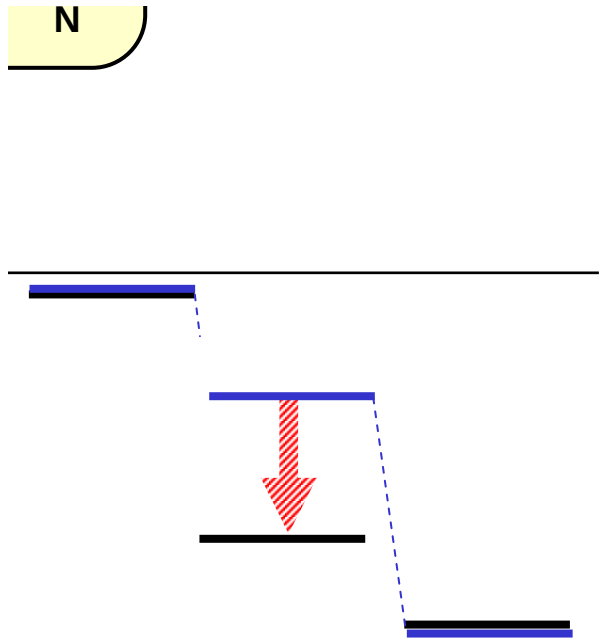


BNL : (1998)

T. Nagae, R.E. Chrien et al.,
Phys. Rev. Lett. **80** (1998) 1605.

KEK : (1989)

R. Hayano et al.,
Phys. Lett. **231** (1989) 355.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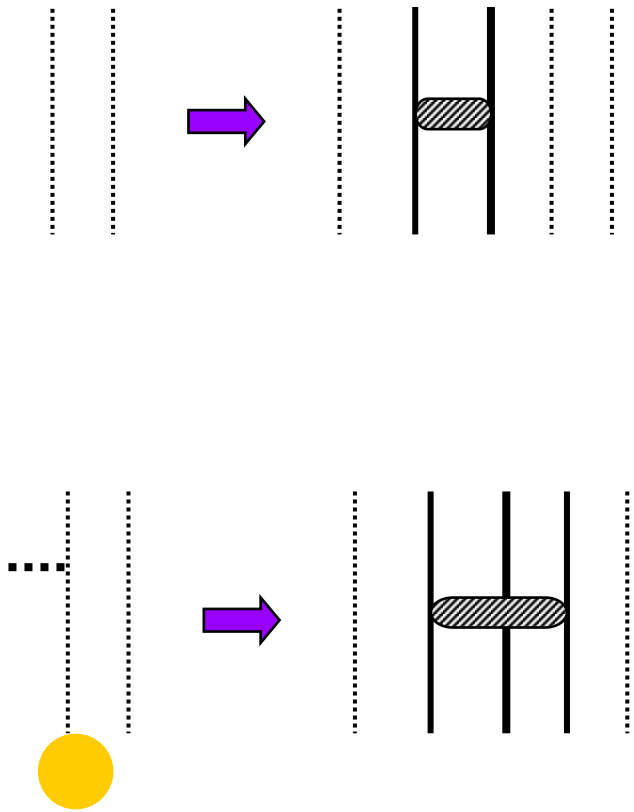
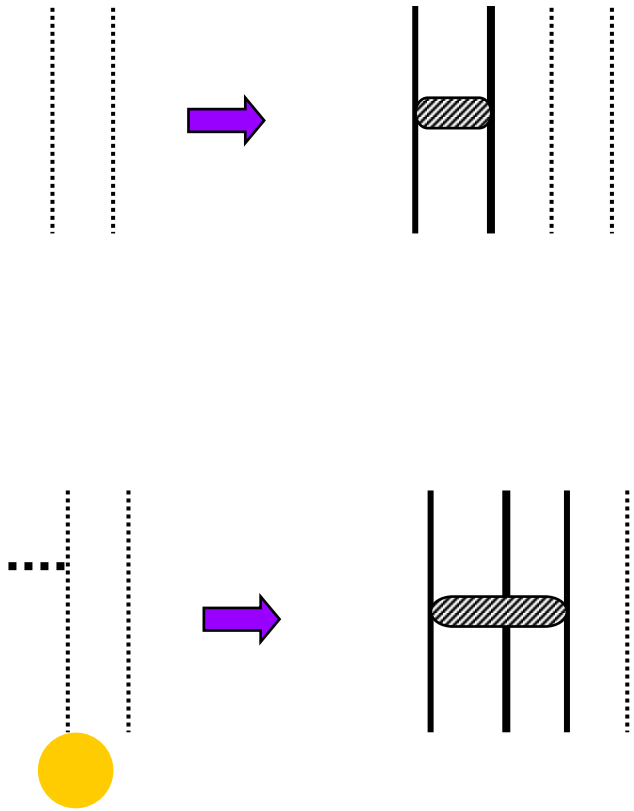
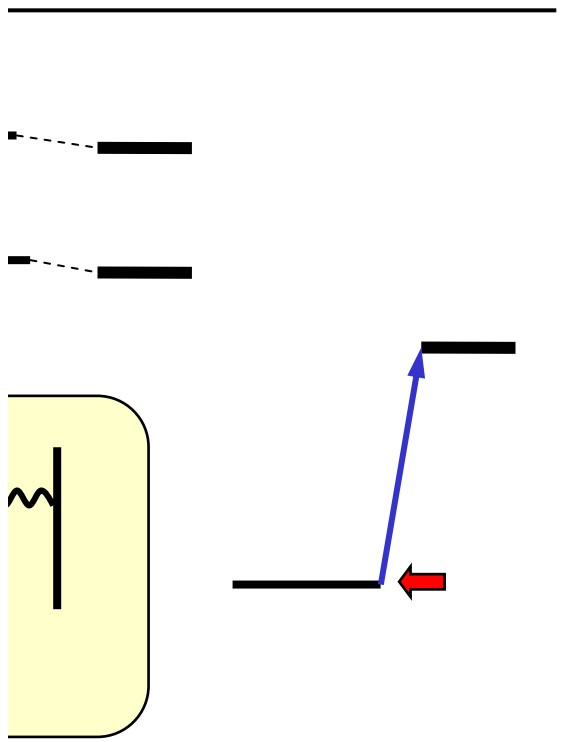
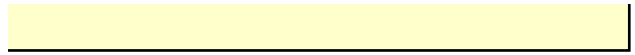
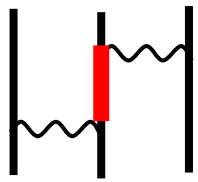
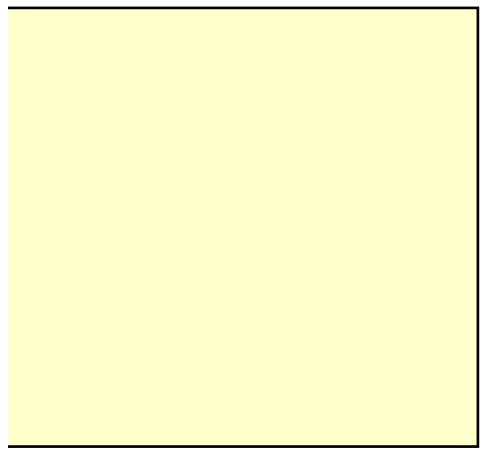


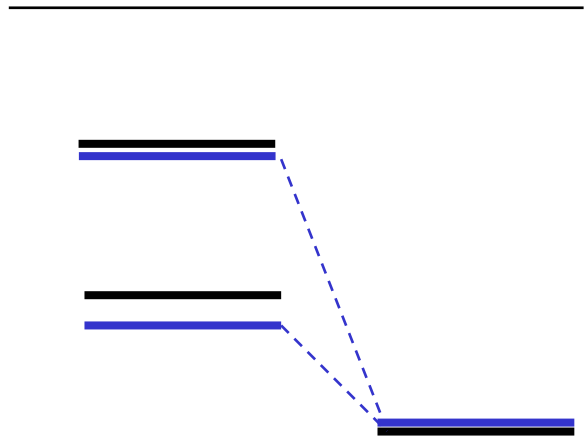


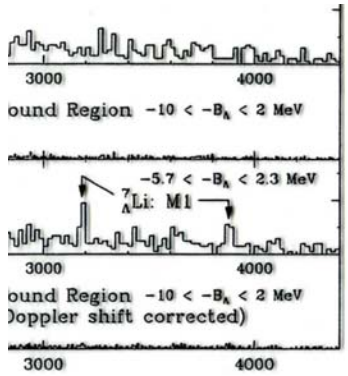


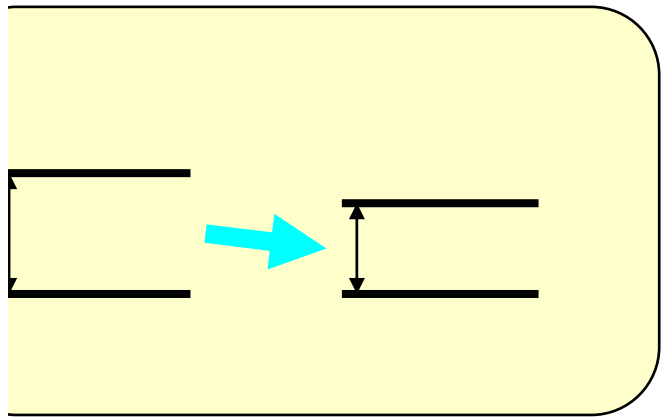




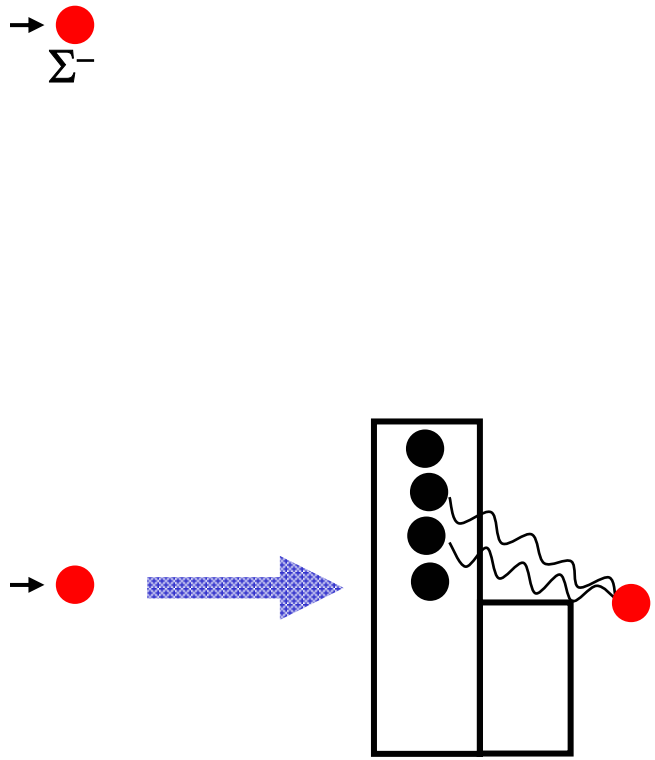





3000
4000
ound Region −10 < −B_Λ < 2 MeV
−5.7 < −B_Λ < 2.3 MeV
7ΛLi: M1
3000
4000
ound Region −10 < −B_Λ < 2 MeV
Doppler shift corrected)
3000
4000

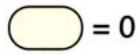


Cancellation
due to isospin

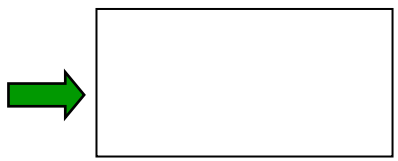

Σ^-

N.K. Glendenning, Astrophys. J. 293 (1985) 470.

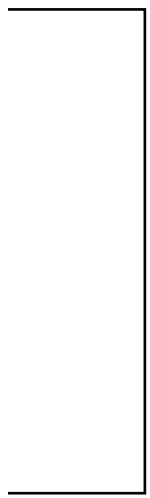
aryons in the medium carry the same Q.N.'s as in vacuum.

 = 0

Phys. Rev.



$= {}^{6}_{\Lambda}\mathrm{H} +$

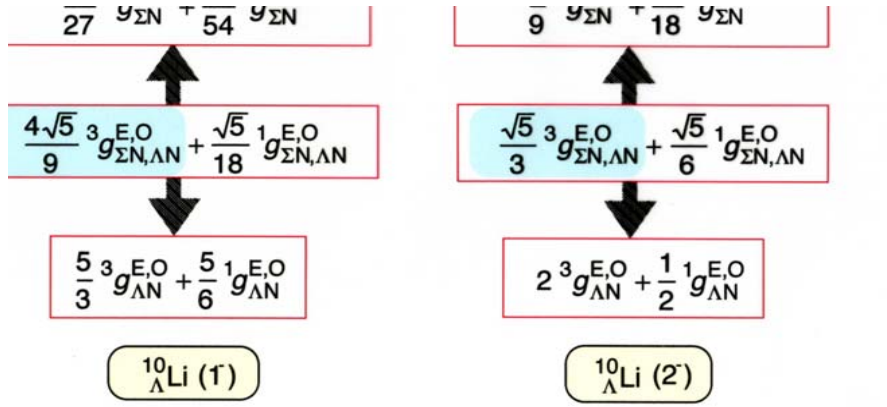


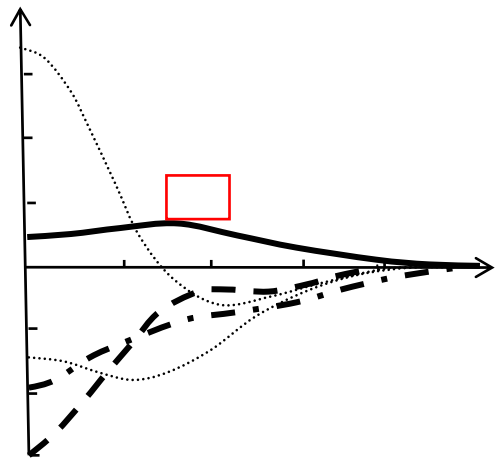
$\pi^- p \to K^0 \Lambda$ & $K^0 p \to K^+ n$

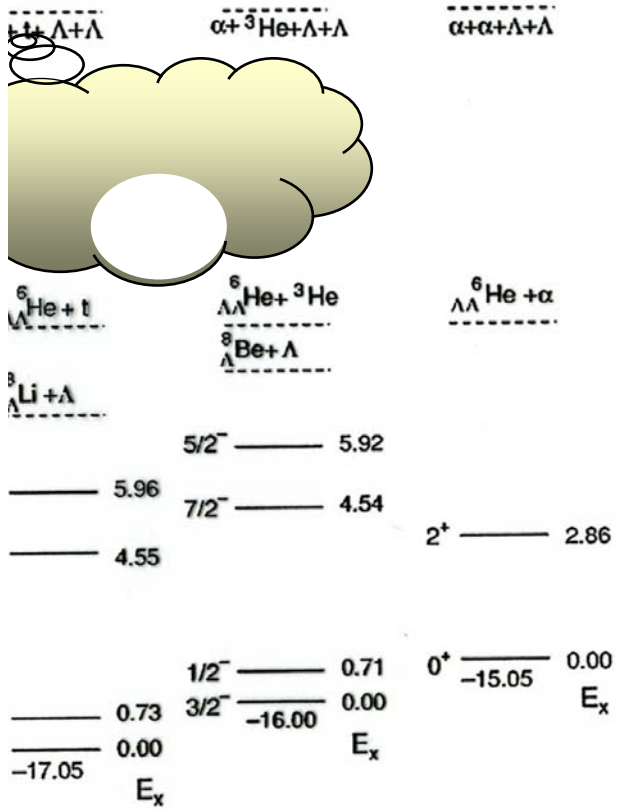
$\left.\frac{d\sigma}{d\Omega}\right|_{\theta=0}$ (nb/sr) at $p_\pi = 1.05\,\mathrm{GeV}/c$

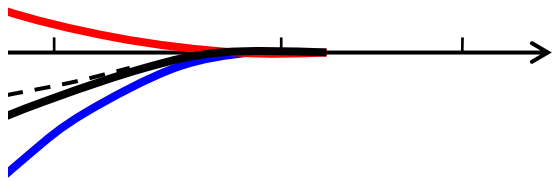
Final nucleus		One-step	Two-step
	2^-		66.8
	1^-		3.2
${}^{12}_{\Lambda}\mathrm{Be}$	1^-	1.4	6.5
	0^+	0.1	2.1
${}^{16}_{\Lambda}\mathrm{C}$	2^+	0.3	0.4
	0^+	0.01	0.1

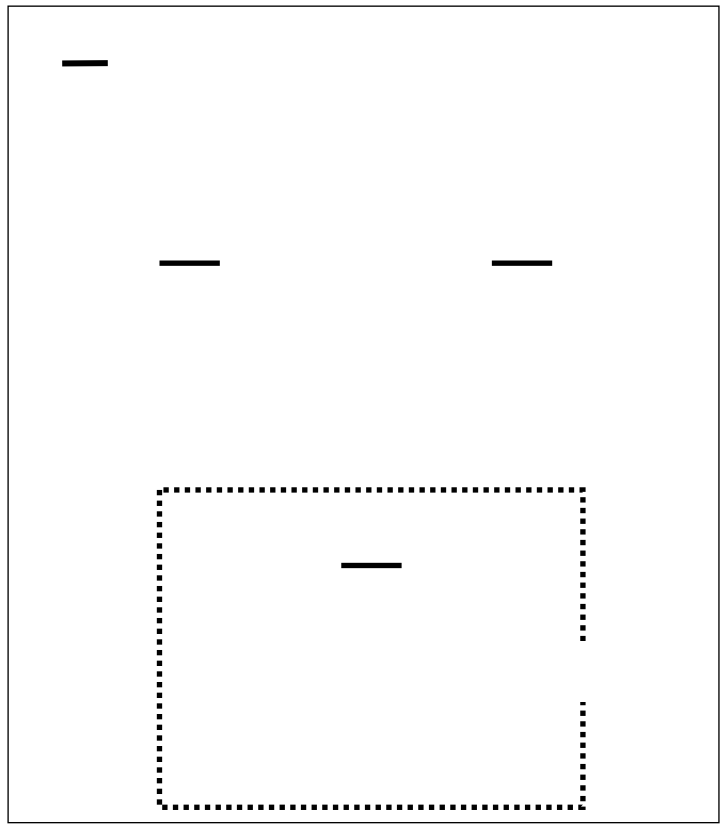
Exceptionally large!

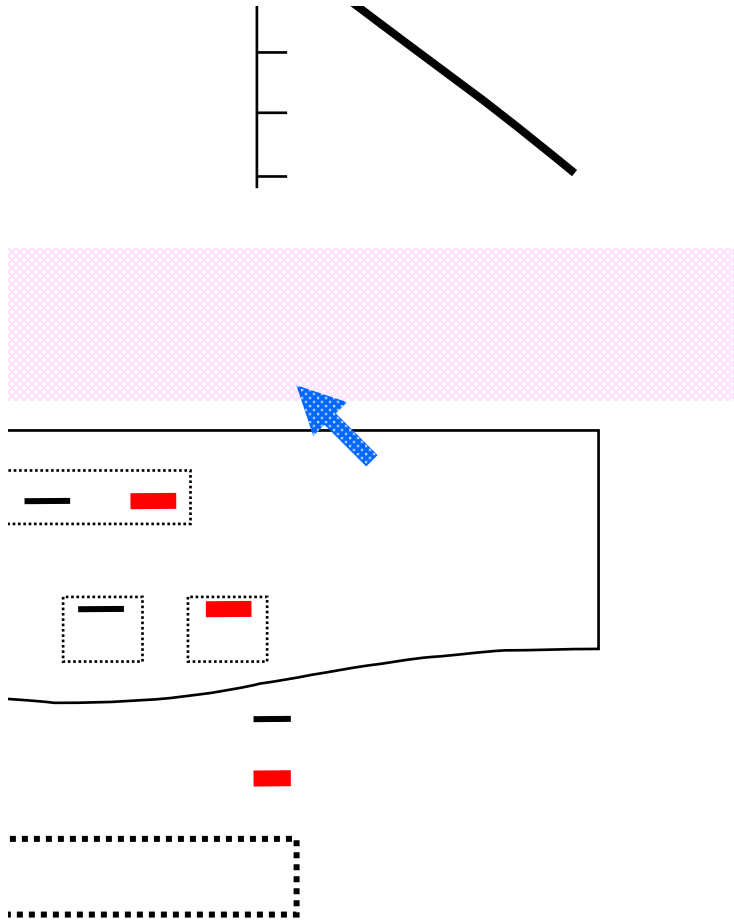

$\frac{4\sqrt{5}}{9}\,{}^{3}g^{E,O}_{\Sigma N,\Lambda N} + \frac{\sqrt{5}}{18}\,{}^{1}g^{E,O}_{\Sigma N,\Lambda N}$
$\frac{5}{3}\,{}^{3}g^{E,O}_{\Lambda N} + \frac{5}{6}\,{}^{1}g^{E,O}_{\Lambda N}$
${}^{10}_{\Lambda}\mathrm{Li}\,(1^-)$
$\frac{\sqrt{5}}{3}\,{}^{3}g^{E,O}_{\Sigma N,\Lambda N} + \frac{\sqrt{5}}{6}\,{}^{1}g^{E,O}_{\Sigma N,\Lambda N}$
$2\,{}^{3}g^{E,O}_{\Lambda N} + \frac{1}{2}\,{}^{1}g^{E,O}_{\Lambda N}$
${}^{10}_{\Lambda}\mathrm{Li}\,(2^-)$



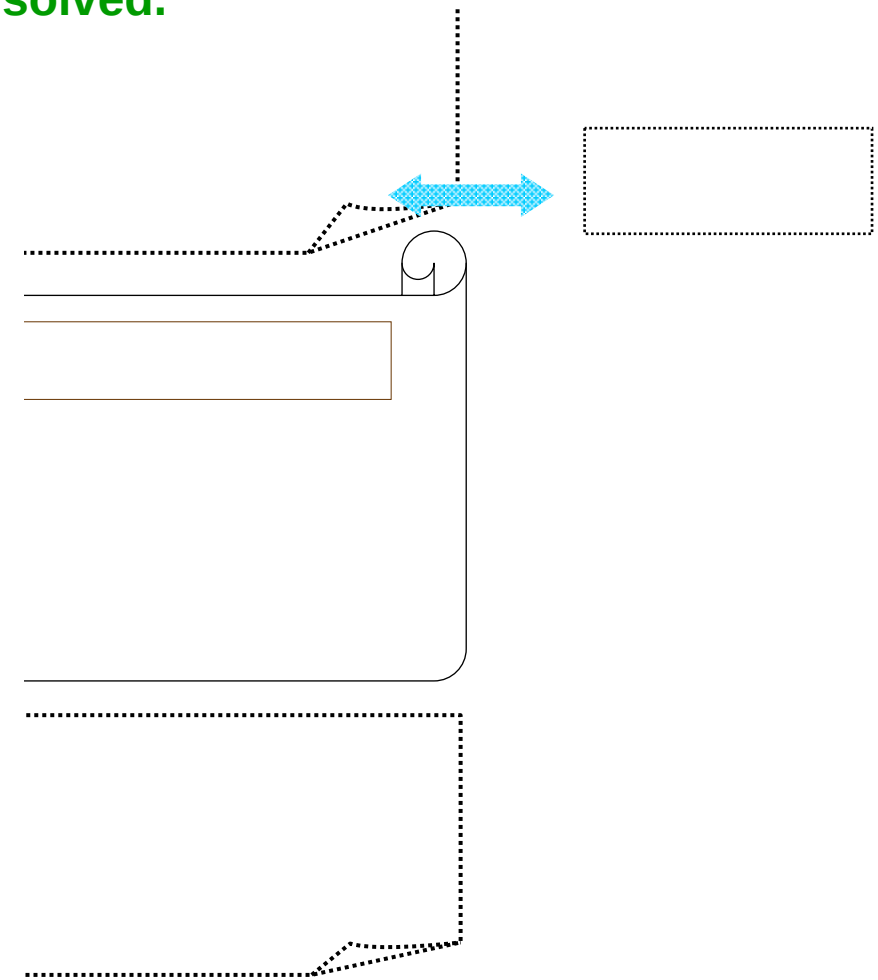

α+ ³He+Λ+Λ
α+α+Λ+Λ
⁶ΛΛHe+ ³He
⁸ΛBe+Λ
⁶ΛΛHe +α
5/2⁻ 5.92
7/2⁻ 4.54
5.96
4.55
2⁺ 2.86
1/2⁻ 0.71
3/2⁻ 0.00
–16.00
0.73
0.00
–17.05
0⁺ 0.00
–15.05
Eₓ

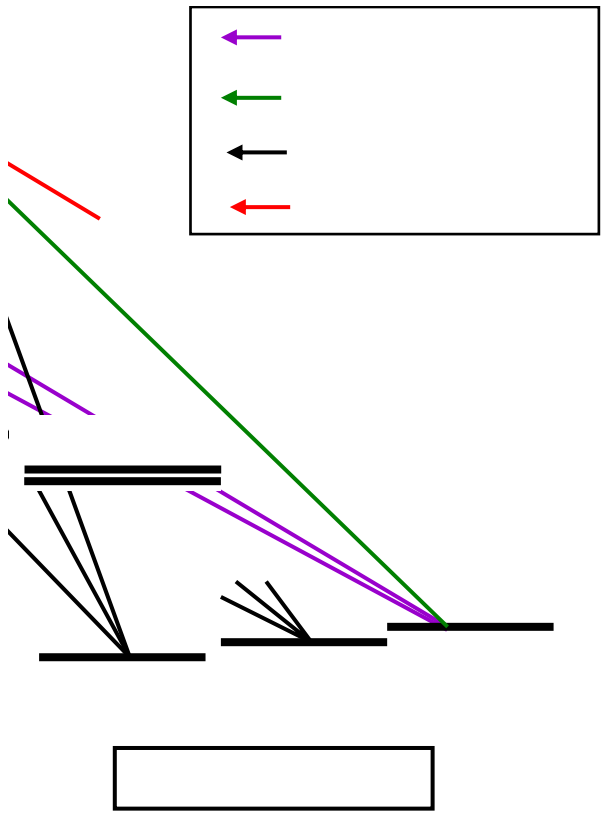


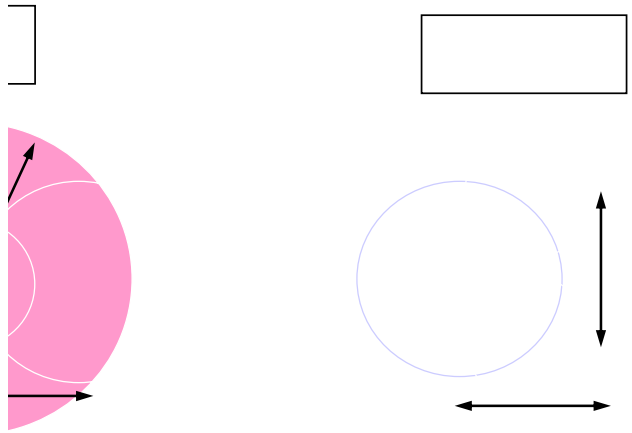


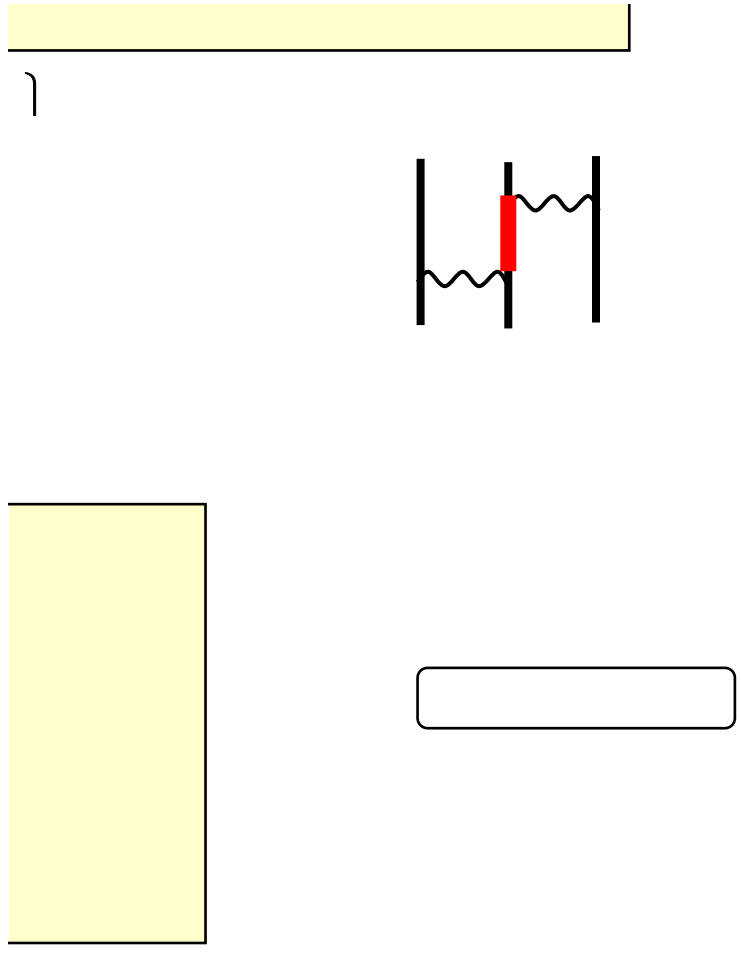


solved.







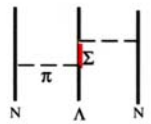


$$U_{03} = \frac{1}{4}U_0^t + \frac{3}{4}U_0^s$$
$$U_{04} = \frac{1}{2}U_0^t + \frac{1}{2}U_0^s$$
$$U_{05} = \frac{3}{4}U_0^t + \frac{1}{4}U_0^s$$

$$\rightarrow \quad \frac{1}{2}(U_{03} + U_{05}) - U_{04} = 0 \quad .03\,W_3$$

$W_3 \approx 480$ MeV

$W_3 = 1.43$ MeV



Nogami's 3BF

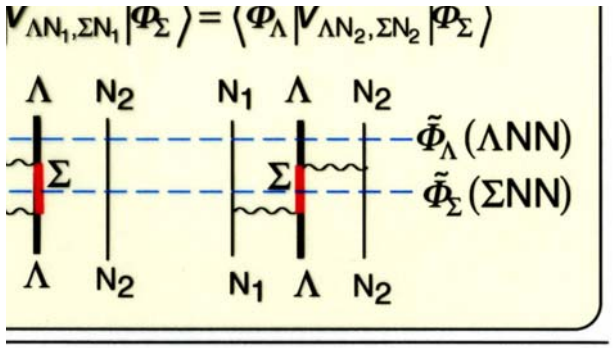
$$V_{\Lambda NN} = -\frac{1}{3}W_3(\vec{\sigma}_1\vec{\sigma}_2)(\vec{\tau}_1\vec{\tau}_2)\frac{\exp(-\mu r_{1\Lambda})}{\mu r_{1\Lambda}}\frac{\exp(-\mu r_{2\Lambda})}{\mu r_{2\Lambda}}$$

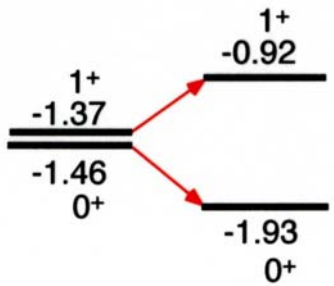
$$+\langle\psi_\Lambda V_{\Lambda\Sigma}\psi_\Sigma\rangle$$
$$-\langle\psi_\Sigma V_{\Sigma\Lambda}\psi_\Lambda\rangle+\langle\psi_\Sigma\psi_\Sigma\rangle\Delta M$$

$$P_\Sigma\Delta M$$

$$\Sigma,\Sigma\Lambda\rangle_{sc}$$

$$\overline{\quad}V_{\Sigma\Lambda}\Psi_\Lambda=E\Psi_\Lambda$$
$$V_\Sigma$$





E. Hiyama et al.
GVM (2001)

$$\Delta\tilde{E}_{2BF} = \begin{cases} -\frac{1}{12}x_t^{\,2} - \frac{1}{12}x_s^{\,2} - \frac{1}{6}x_t x_s : 1^+ \\ -\frac{3}{4}x_t^{\,2} - \frac{1}{12}x_s^{\,2} + \frac{1}{2}x_t x_s : 0^+ \end{cases}$$

$$\Delta\tilde{E}_{3BF} = \begin{cases} -\frac{1}{6}x_t^{\,2} - \frac{1}{6}x_s^{\,2} - \frac{1}{3}x_t x_s : 1^+ \\ -\frac{3}{2}x_t^{\,2} - \frac{1}{6}x_s^{\,2} + x_t x_s : 0^+ \end{cases}$$

Akaishi et al.

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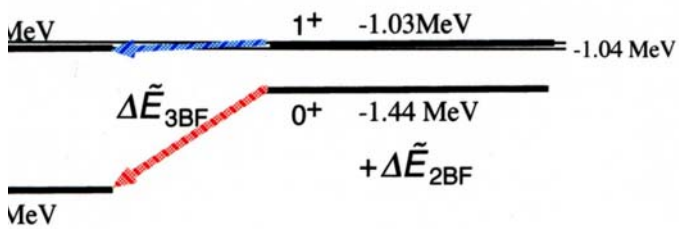

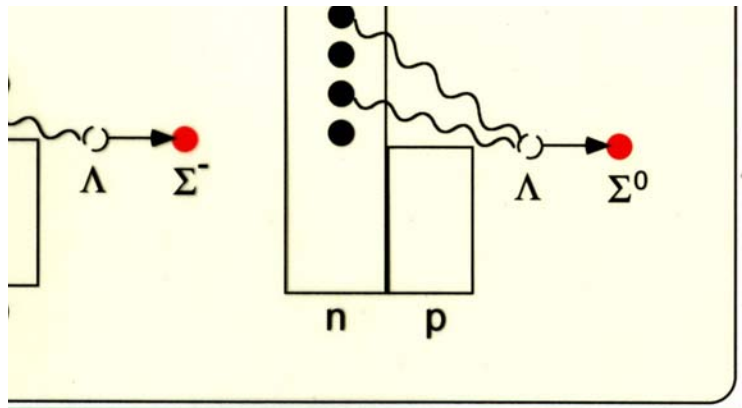
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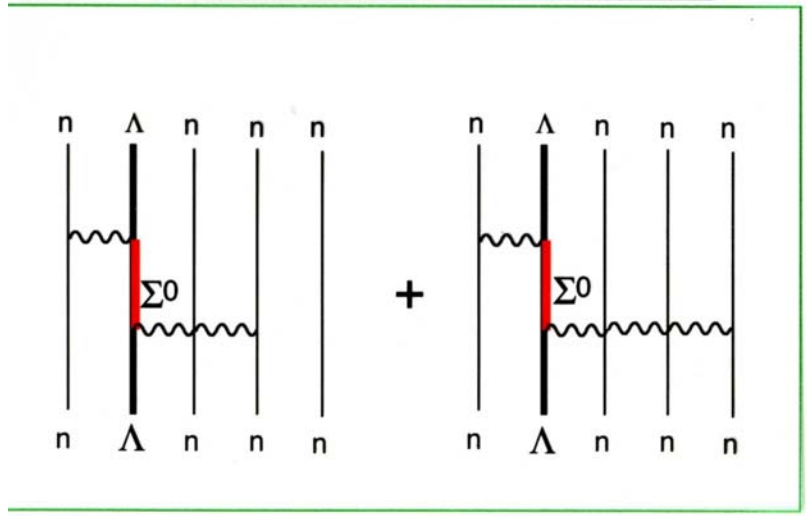
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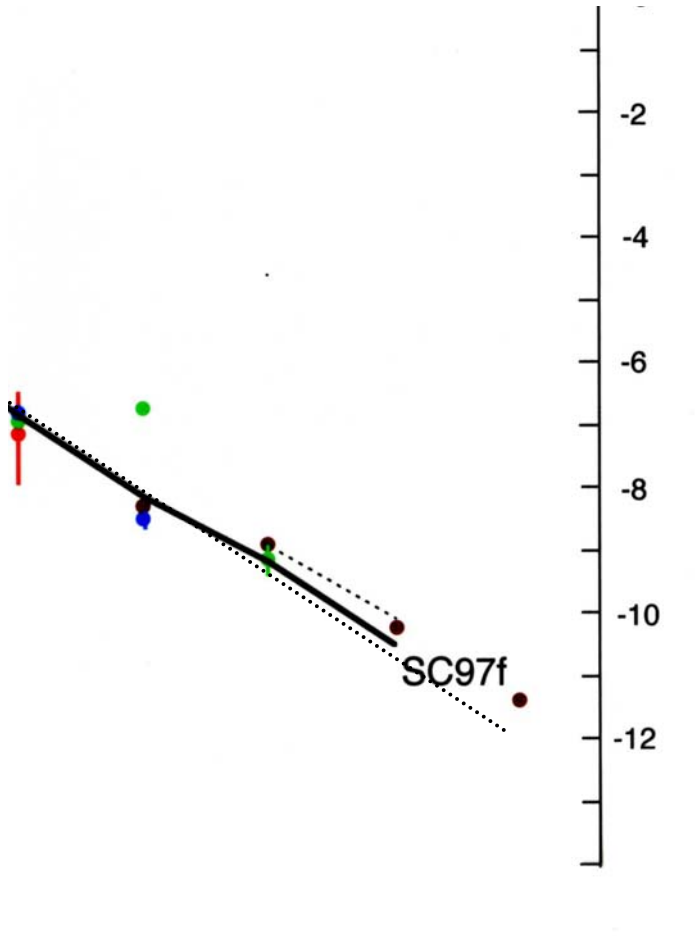
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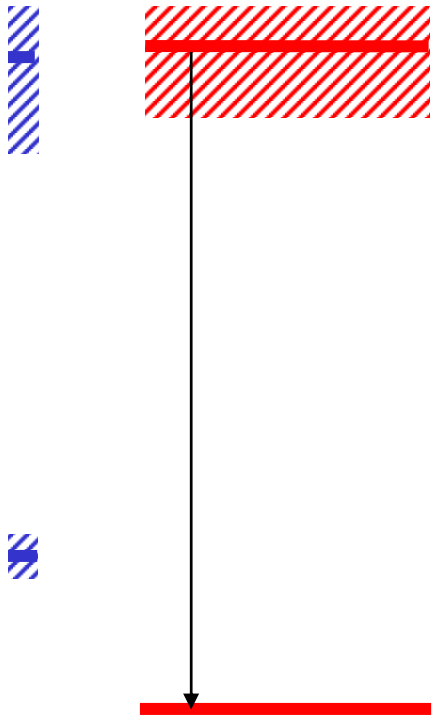
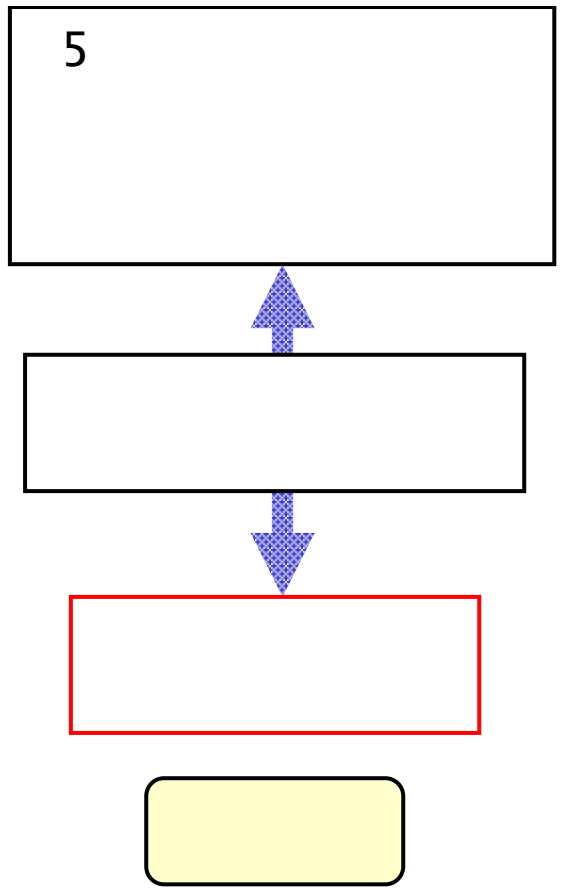
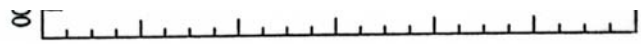
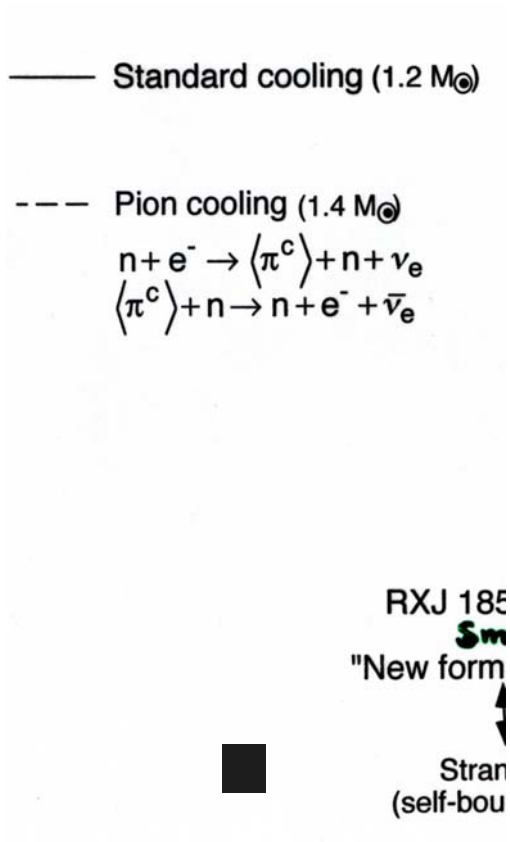



5




Standard cooling (1.2 M⊙)
Pion cooling (1.4 M⊙)
$n + e^- \rightarrow \langle \pi^c \rangle + n + \nu_e$
$\langle \pi^c \rangle + n \rightarrow n + e^- + \bar{\nu}_e$
RXJ 185
Sm
"New form
Stran
(self-bou