

ISO-ASYMMETRIC 3-NUCLEON NLO CALCULATIONS
&
THE ENGINEERING DECK OF 4-NUCLEONS.

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Thank You,

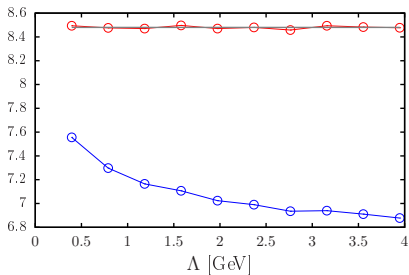
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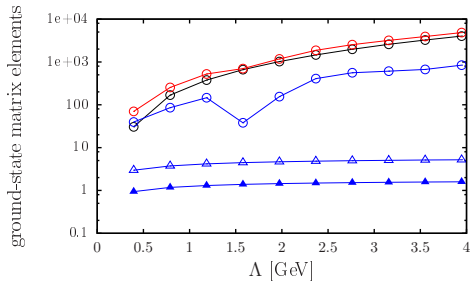


3 ISOSPIN-SYMMETRIC NUCLEONS.

$B(^3\text{H})$ RRGM \circ $B(^3\text{H})$ exp. —
 $B(^3\text{He})$ $r_{np} = r_{pp}$ \circ



$\langle V_{\text{Coul}} \rangle_3$ \blacktriangle $\langle \hat{C}_{10} \rangle_3$ \circ $\langle \hat{D}_{10} \rangle_3$ \circ
 $\langle V_{\text{Coul}}^* \rangle_3$ \blacktriangle $\langle \hat{C}_{12} \rangle_3$ \circ



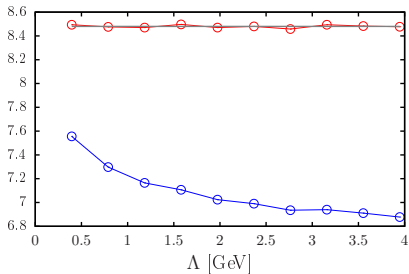
• Last time on Emmy:

1. $\lim_{k \rightarrow 0} A_{\text{NLO}} \stackrel{!}{=} -a$ via **non-perturbative** p-independent NLO counter term.
2. $\Lambda \lesssim 2.4$ GeV
3. Spin and isospin **independent** 3NI.

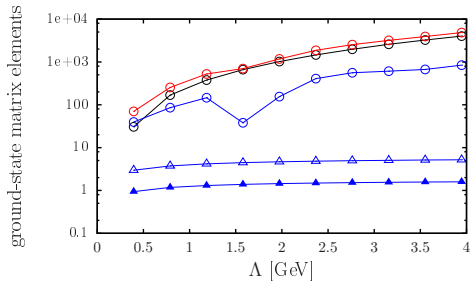


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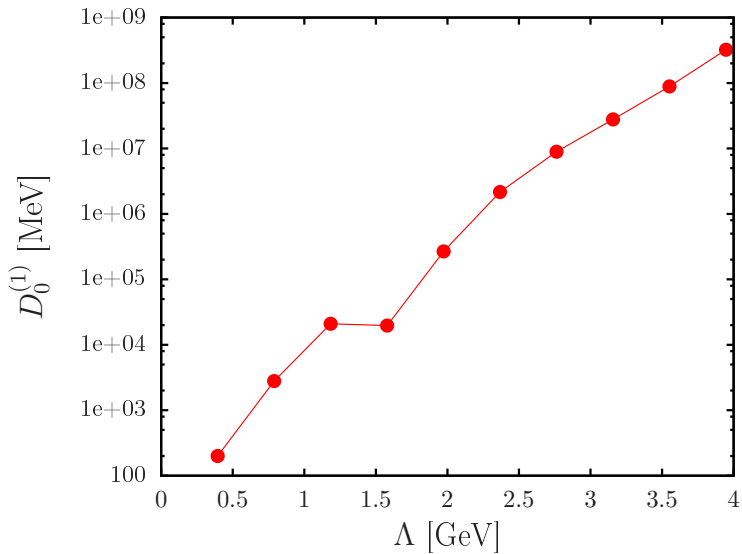


• Converging to *text-book* EFT(π):

1. $\lim_{k \rightarrow 0} A_{\text{NLO}} \stackrel{!}{=} -a$ via **perturbative** p-independent NLO counter term.
2. $\Lambda \lesssim 4$ GeV
3. 3NI projected into the 3-nucleon $J = \frac{1}{2}^+$ channel.



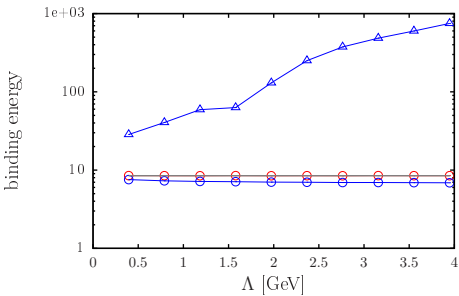
3 ISOSPIN-SYMMETRIC NUCLEONS (P-INDEP. NLO TNI CORRECTION).



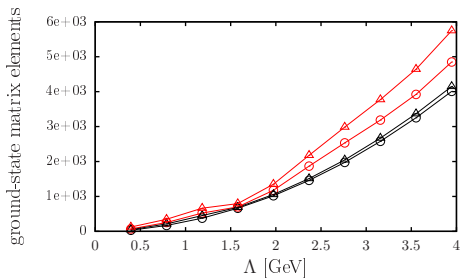


3 ISOSPIN-ASYMMETRIC NUCLEONS.

$B(^3\text{He})$ $r_{nn} = 2.75$ fm $r_{pp} = 6.05$ fm \blacktriangle



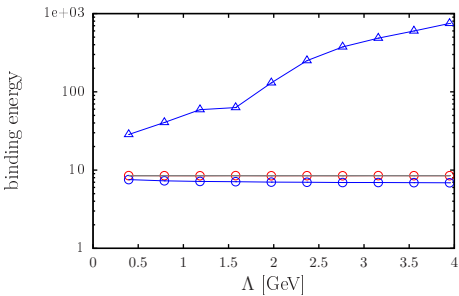
$\langle \hat{C}_{10} \rangle_t$ \circ $\langle \hat{C}_{10} \rangle_{\text{he}}$ \blacktriangle
 $\langle \hat{C}_{12} \rangle_t$ \circ $\langle \hat{C}_{12} \rangle_{\text{he}}$ \blacktriangle



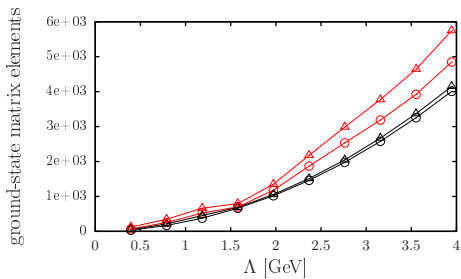


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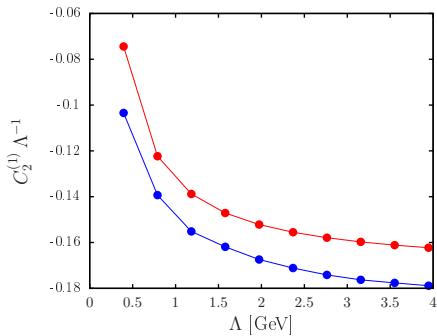
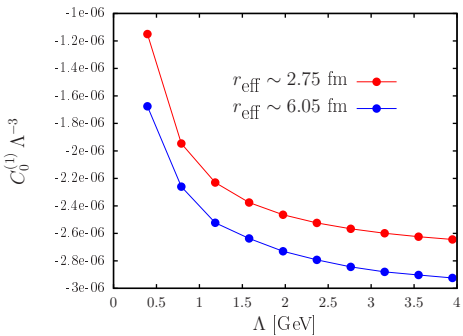


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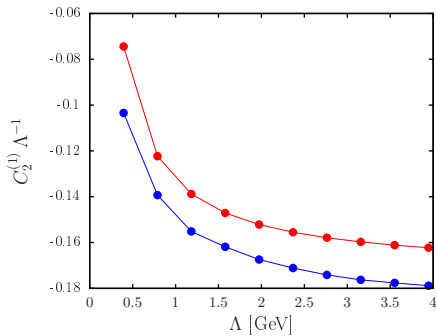
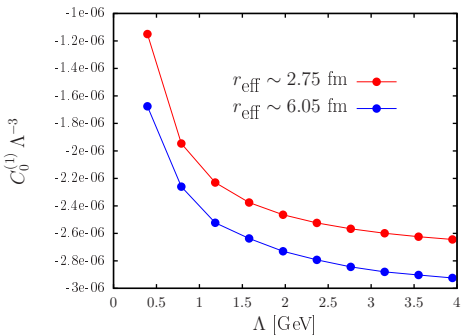


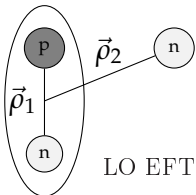
3 ISOSPIN-ASYMMETRIC NUCLEONS (2-BODY LOW-ENERGY CONSTANTS).





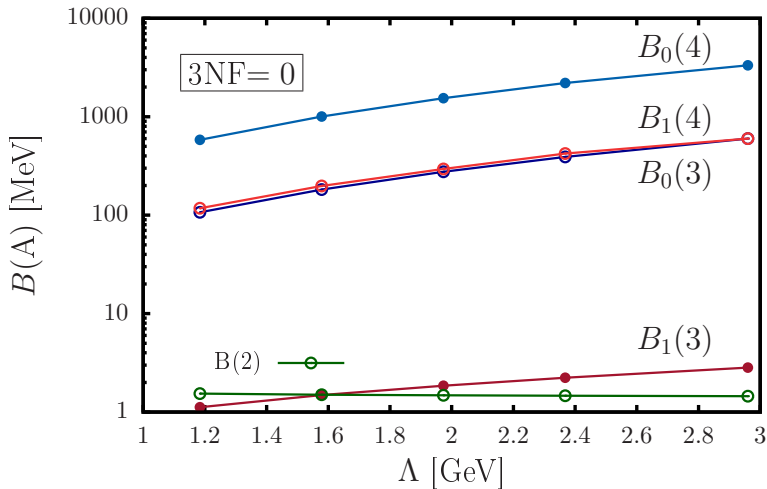
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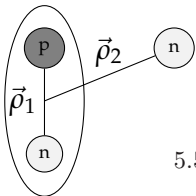




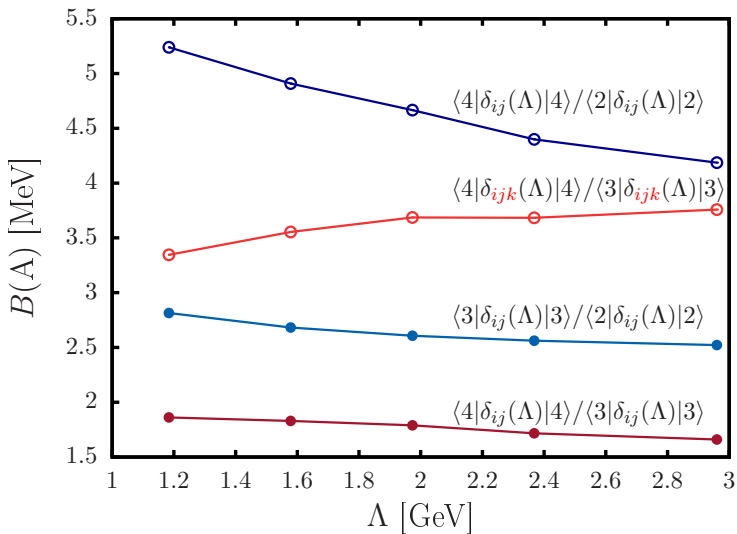
4-NUCLEON LEADING-ORDER DETAILS.

LO EFT($\vec{\pi}$, $\alpha = 0$): $m_\pi = 140$ MeV, $a(^3S_1) = 5.4$ fm, $a(^1S_0) = -23.7$ fm

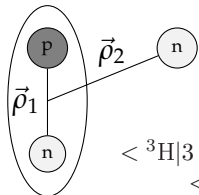




4-NUCLEON LEADING-ORDER DETAILS.



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$$\langle {}^3\text{H} | 3\text{-body int.} | {}^3\text{H} \rangle$$



$$\langle {}^3\text{H} | \text{kinetic} | {}^3\text{H} \rangle$$



$$\langle {}^3\text{H} | 2\text{-body int.} | {}^3\text{H} \rangle$$



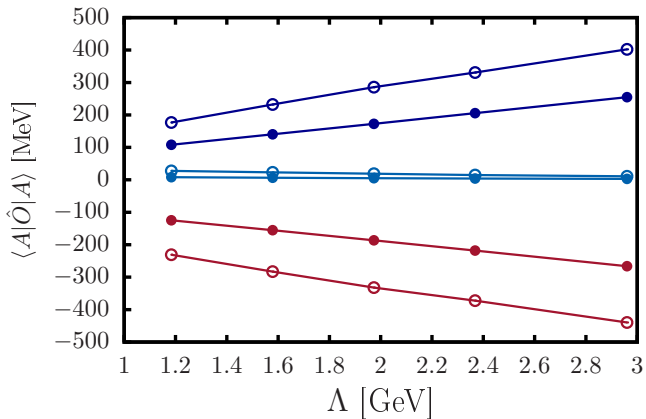
$$\langle \alpha | 3\text{-body int.} | \alpha \rangle$$



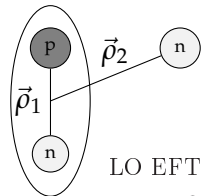
$$\langle \alpha | \text{kinetic} | \alpha \rangle$$



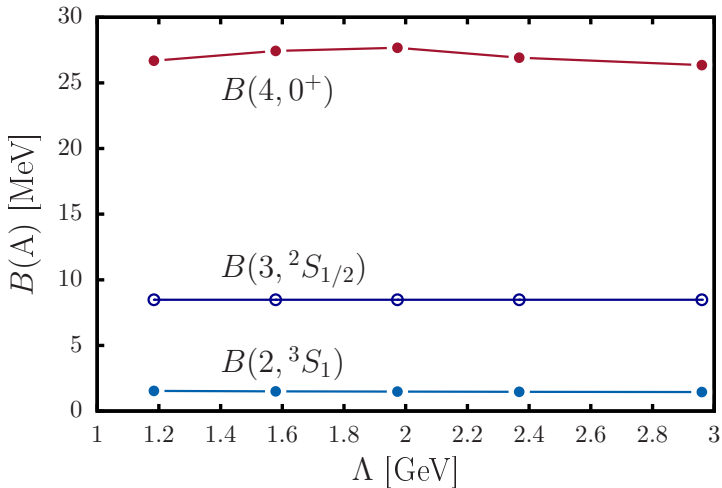
$$\langle \alpha | 2\text{-body int.} | \alpha \rangle$$



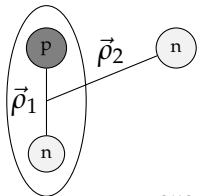
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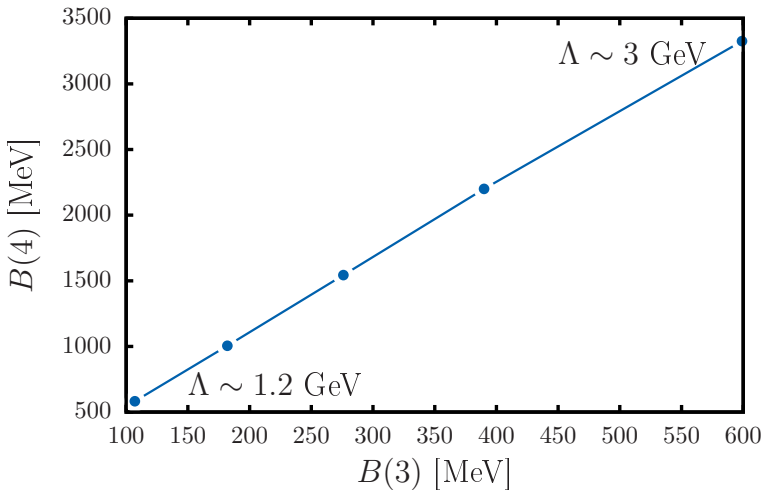
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4-NUCLEON LEADING-ORDER DETAILS.



LO EFT(π , $\alpha = 0$): Tjon correlation





4-NUCLEON LEADING-ORDER DETAILS.



4-NUCLEON LEADING-ORDER DETAILS.



PROBLEMS.