Los Alamos NATIONAL LABORATORY

Status of the LANL ^{15}N System Analysis

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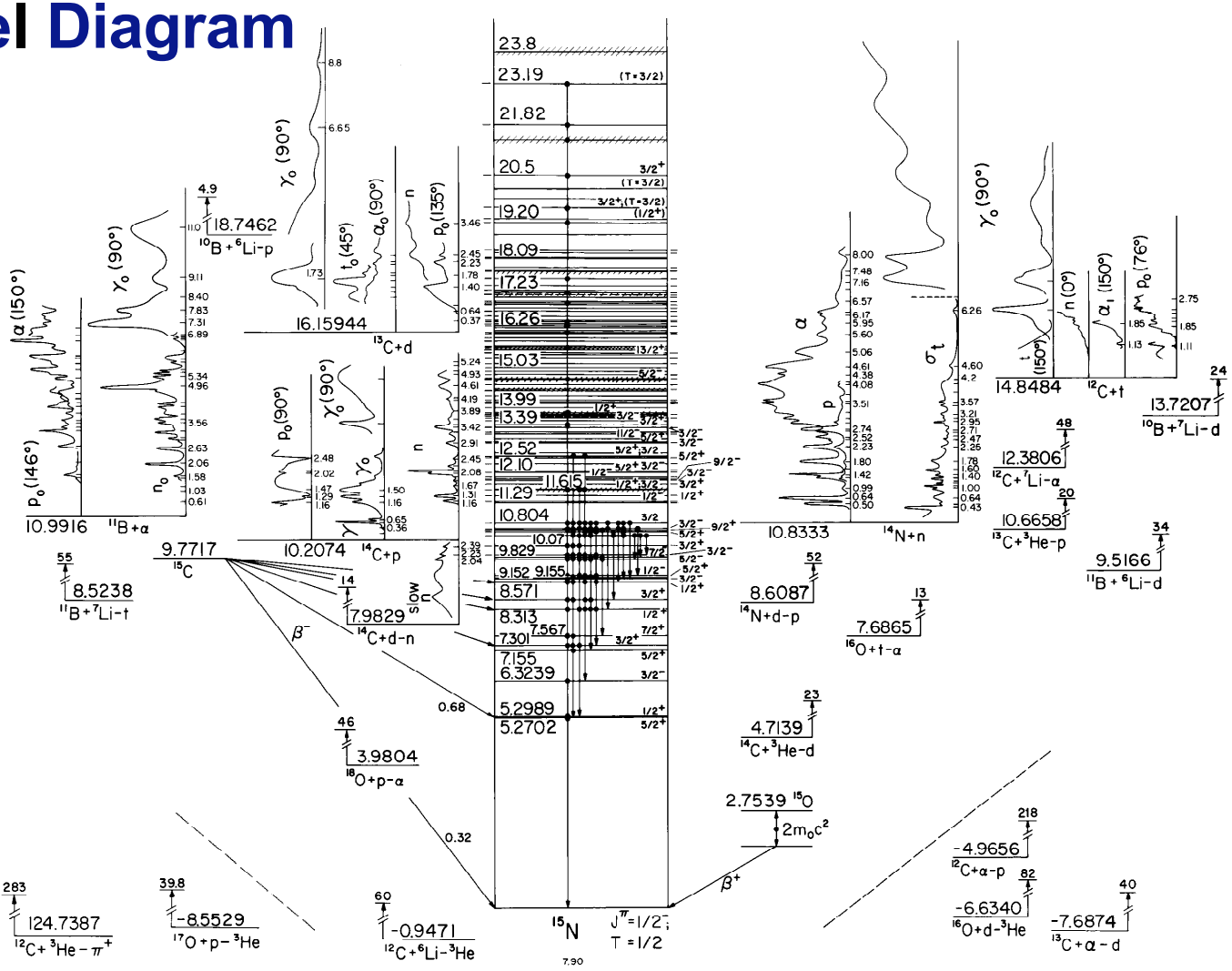
LA-UR-23-29902

^{15}N Level Diagram

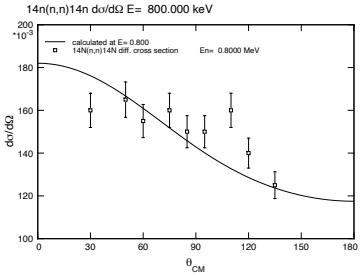


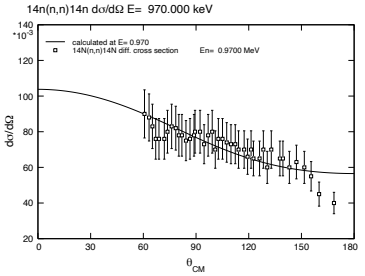
Summary of ^{15}N Analysis

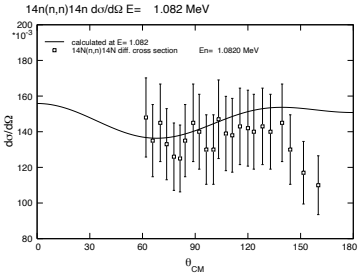
channel	a_c (fm)	l_{max}
n+^{14}N	2.5	2
p+^{14}C	4.3	3
α+^{11}B	5.1	3

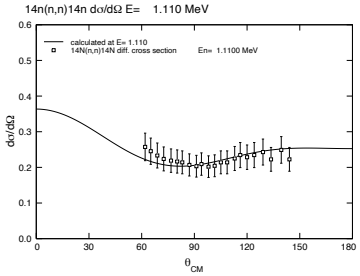
Reaction	Energies (MeV)	# data points	Types of data	χ^2
^{14}N(n,n)^{14}N	E_n = 0 – 2.5	931	σ_T, $\sigma(\theta)$	889
^{14}N(n,p)^{14}C	E_n = 0 – 3.0	362	σ_{int}	766
^{14}N(n,α)^{11}B	E_n=1.33 – 2.32	104	σ_{int}	304
^{14}C(p,n)^{14}N	E_p=1.17 – 3.1	407	σ_{int}, $\sigma(\theta)$, $A_y(\theta)$	1163
^{11}B(α,n)^{14}N	E_α=0.33 - 2.39	190	σ_{int}	626
^{11}B(α,p)^{14}C	E_α=1.45 - 2.94	145	σ_{int},$\sigma(\theta)$	564
	Total	2139		4312

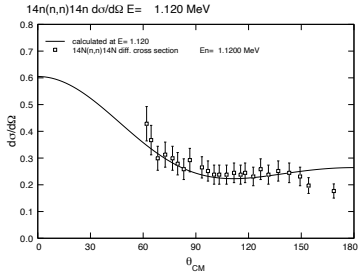
$^{14}N(n,n)^{14}N$ Differential Cross Section

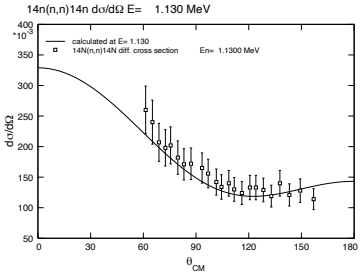


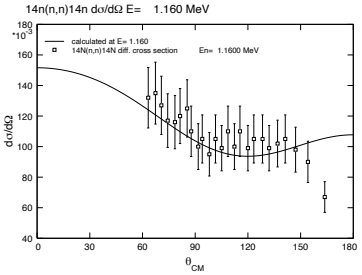


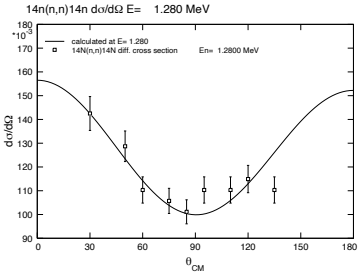


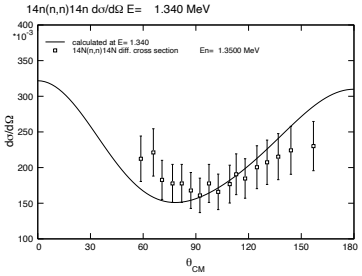


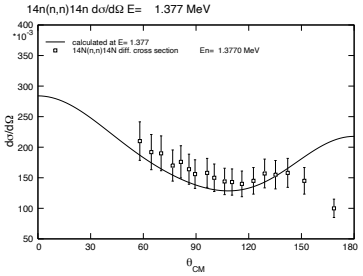


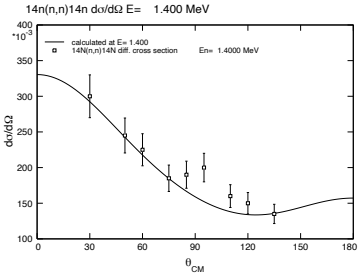


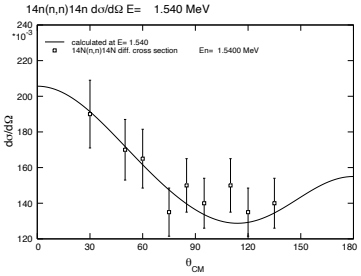




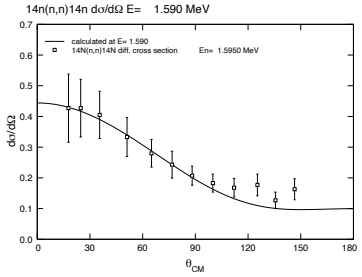


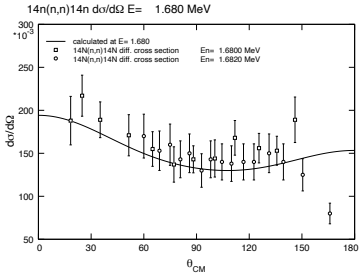


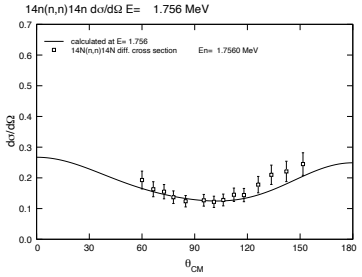


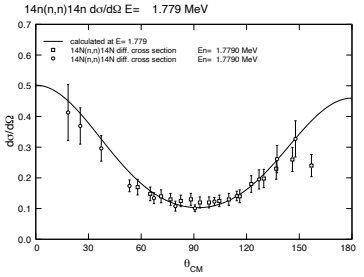


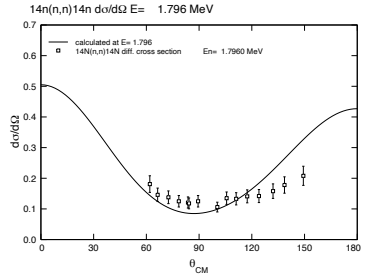
$^{14}N(n,n)^{14}N$ Differential Cross Section, cont.

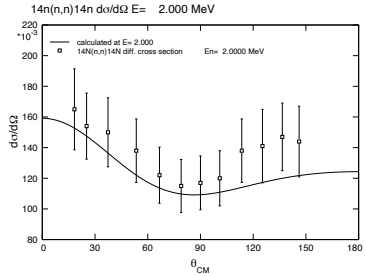


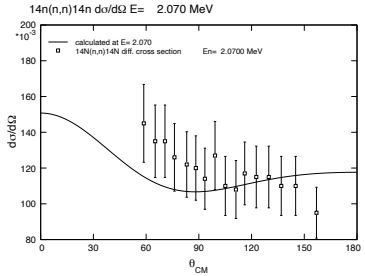


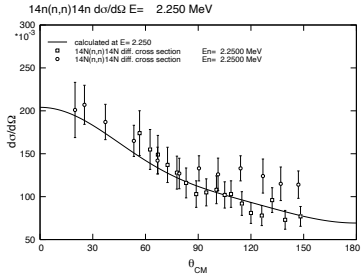




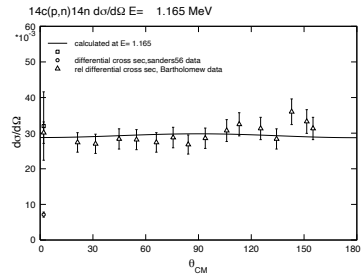


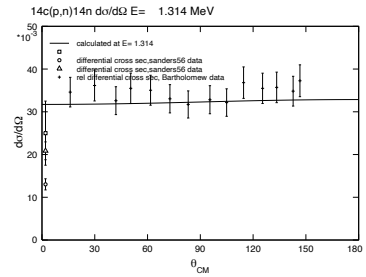


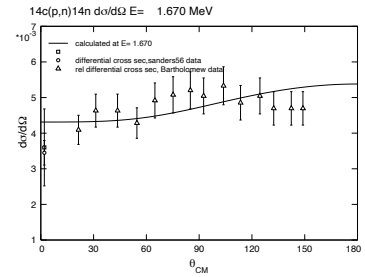


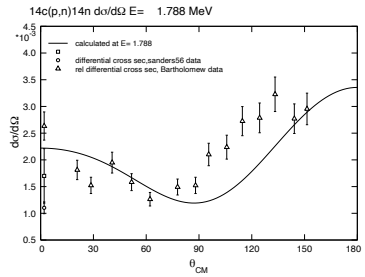


$^{14}C(p,n)^{14}N$ Differential Cross Section

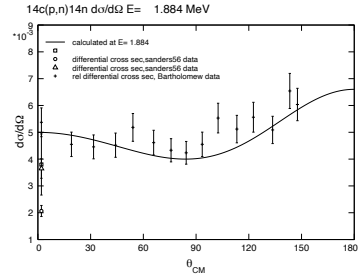


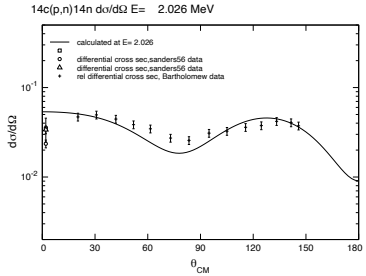


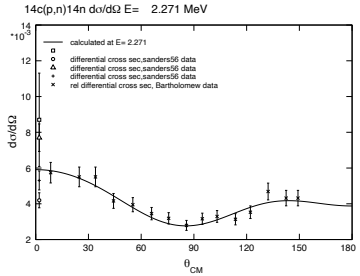


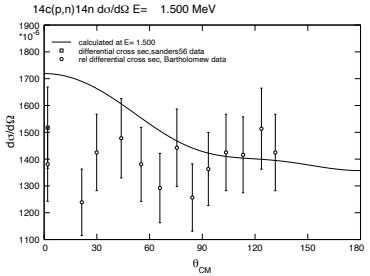


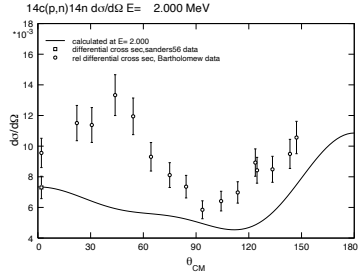
$^{14}C(p,n)^{14}N$ Differential Cross Section, cont.

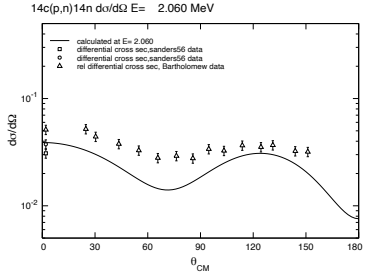


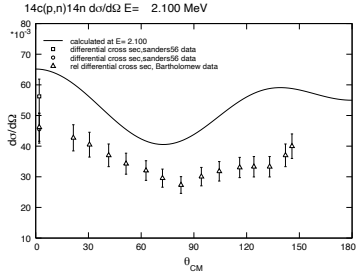


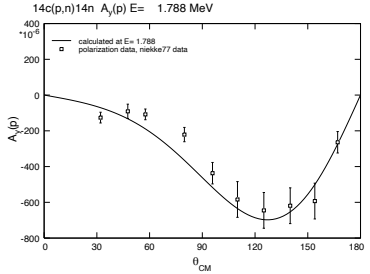


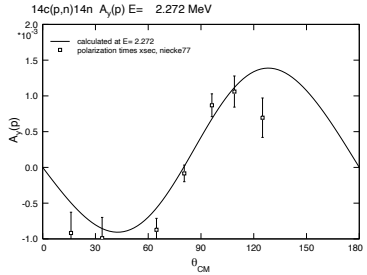


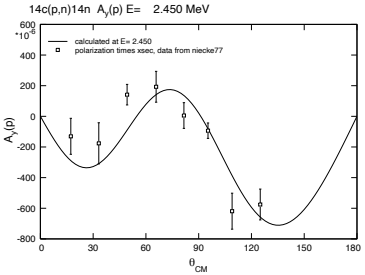




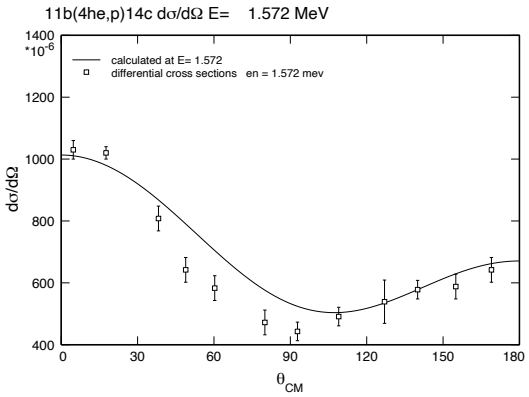


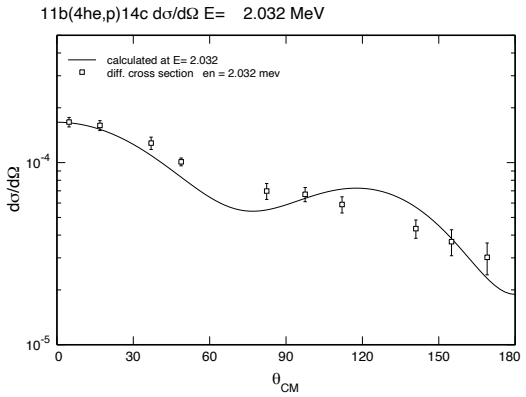


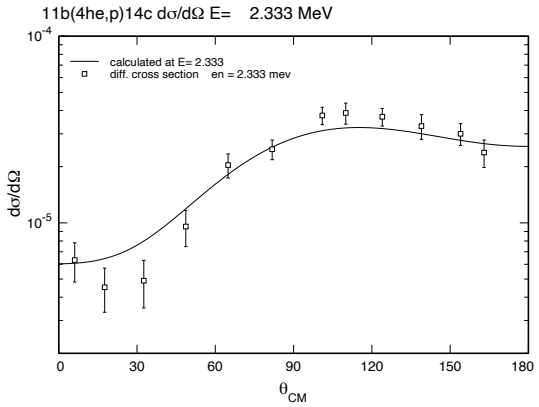


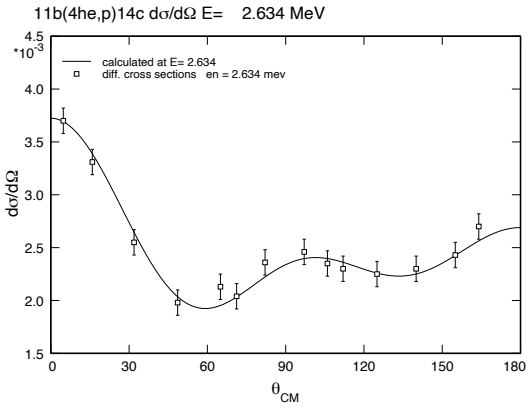


$^{11}B(\alpha,p)^{14}C$ Differential Cross Section

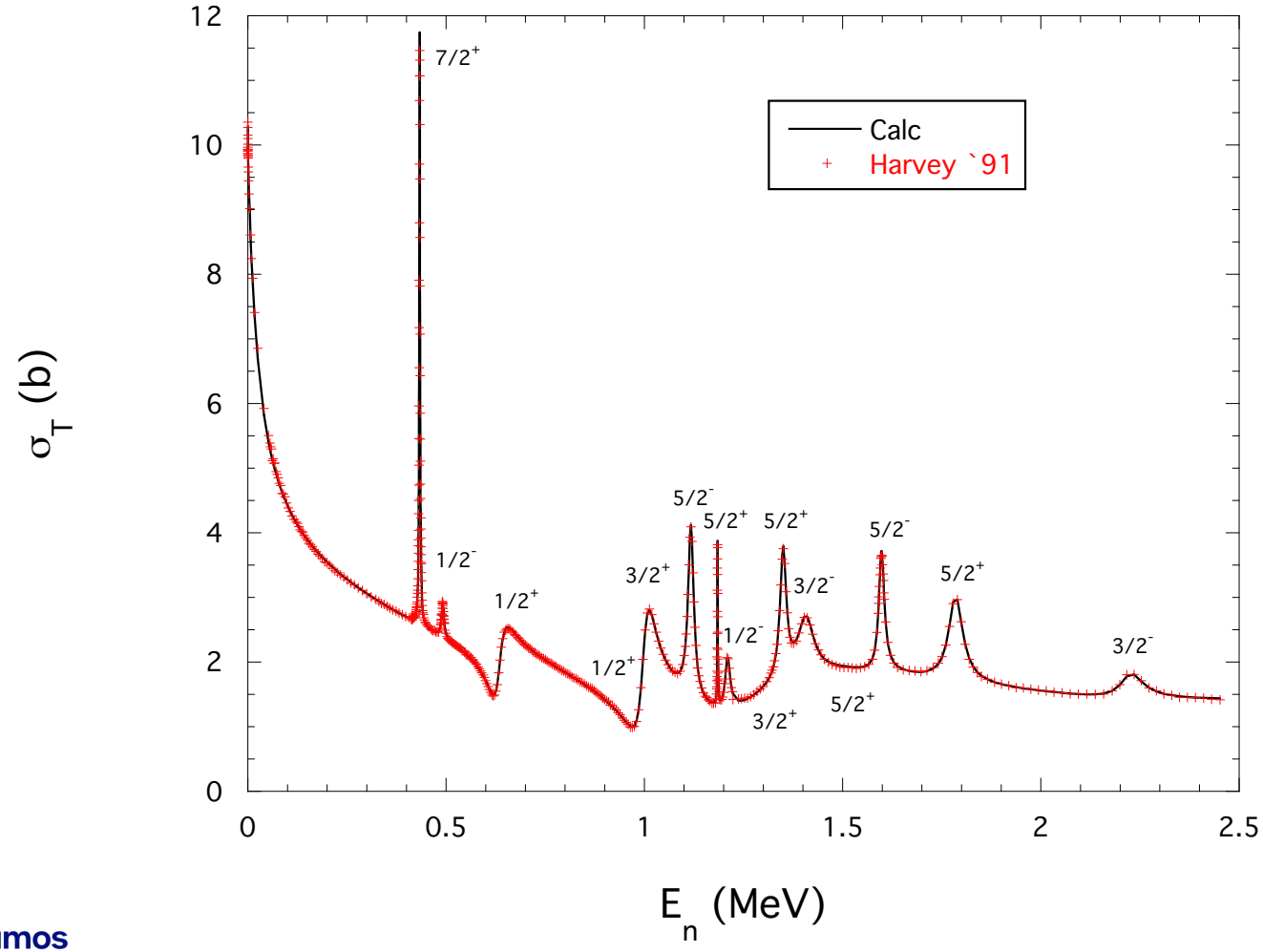




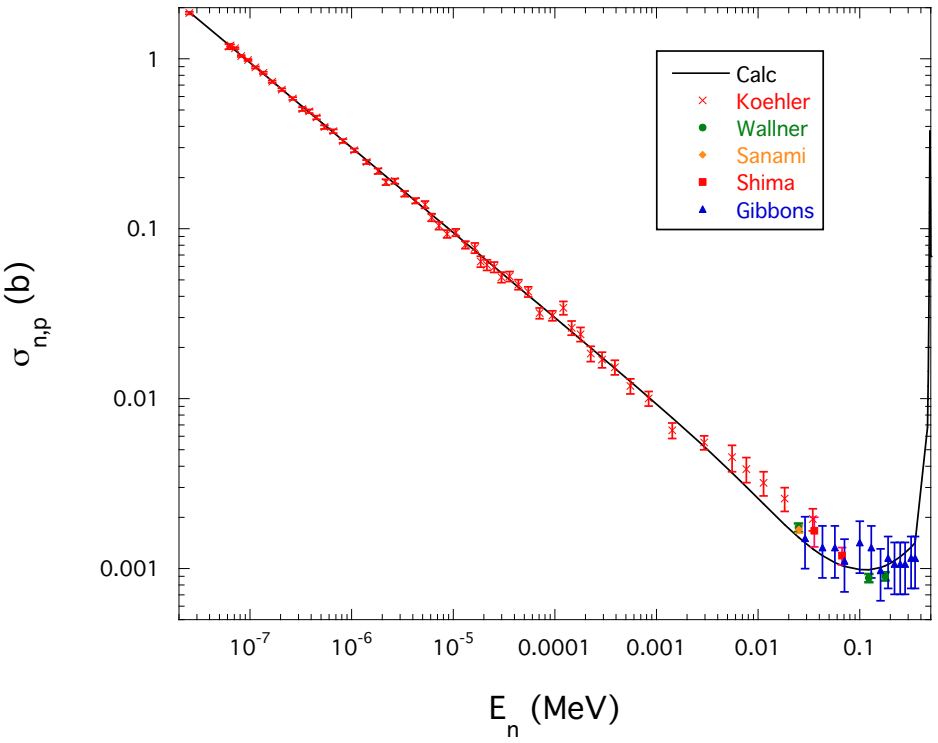


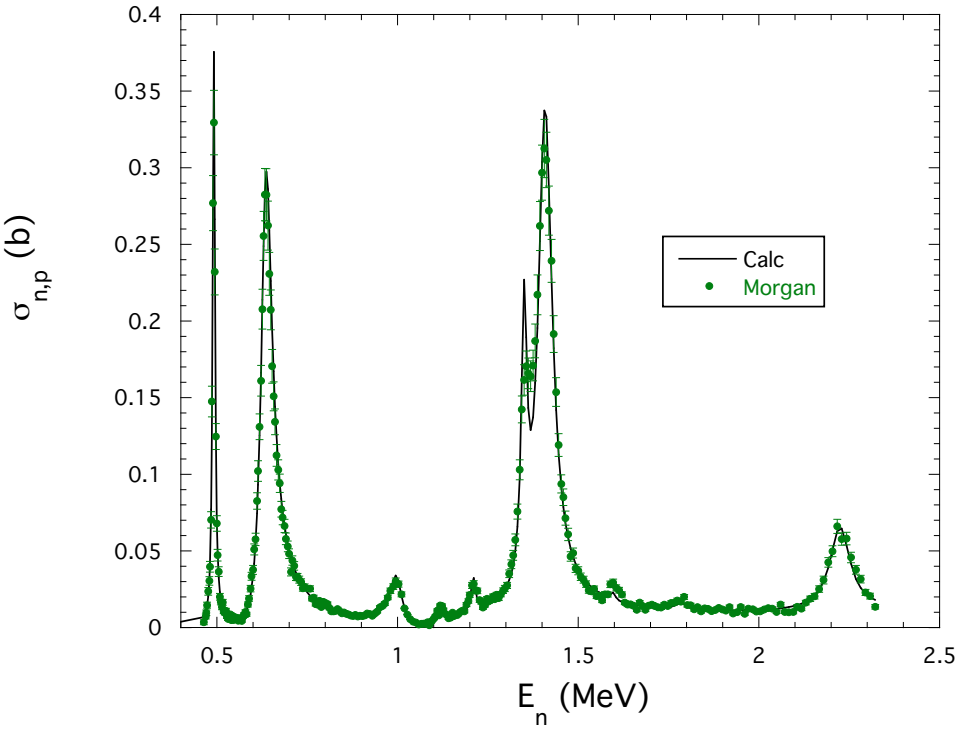


n+^{14}N Total Cross Section

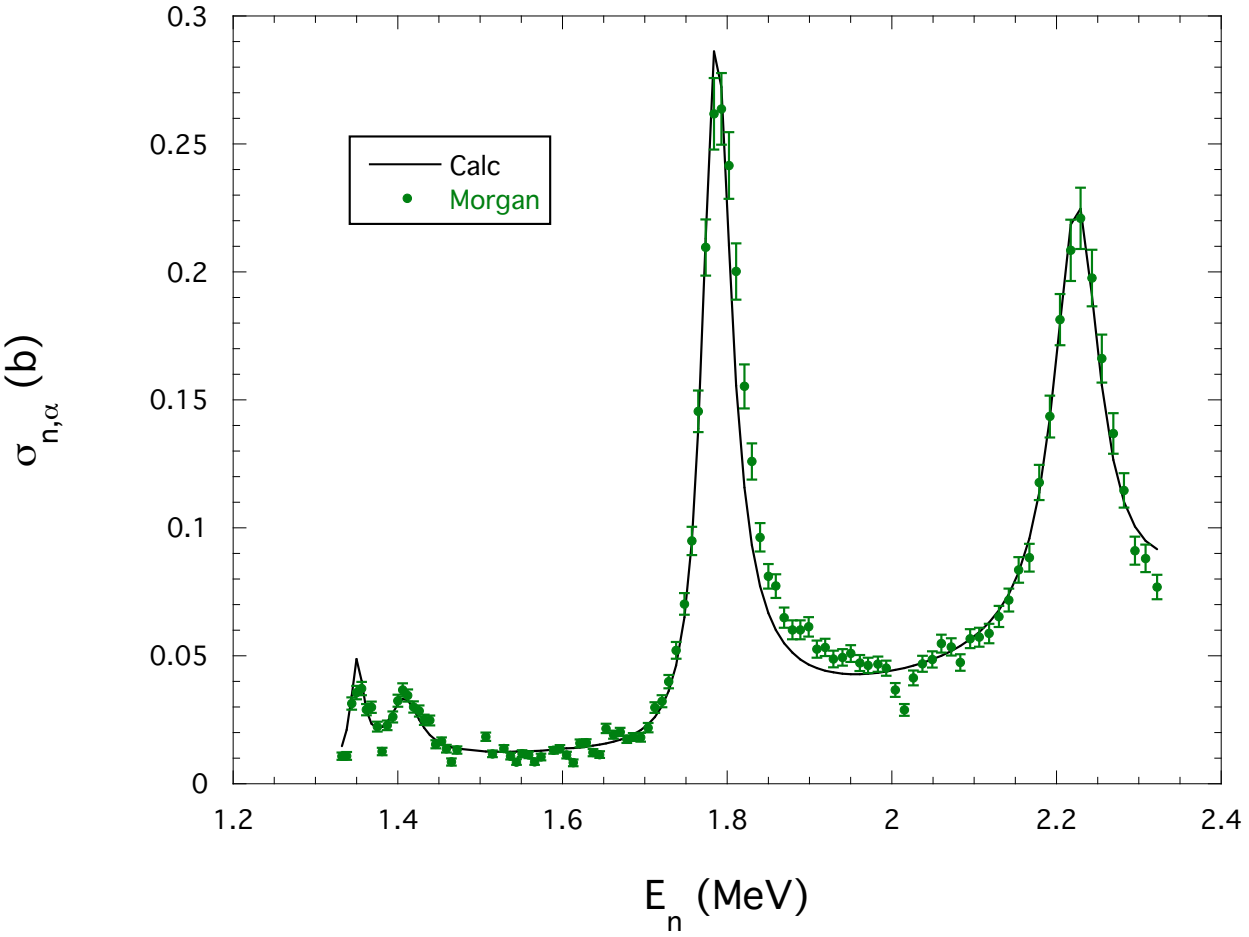


$^{14}N(n,p)^{14}C$ Integrated Cross Section

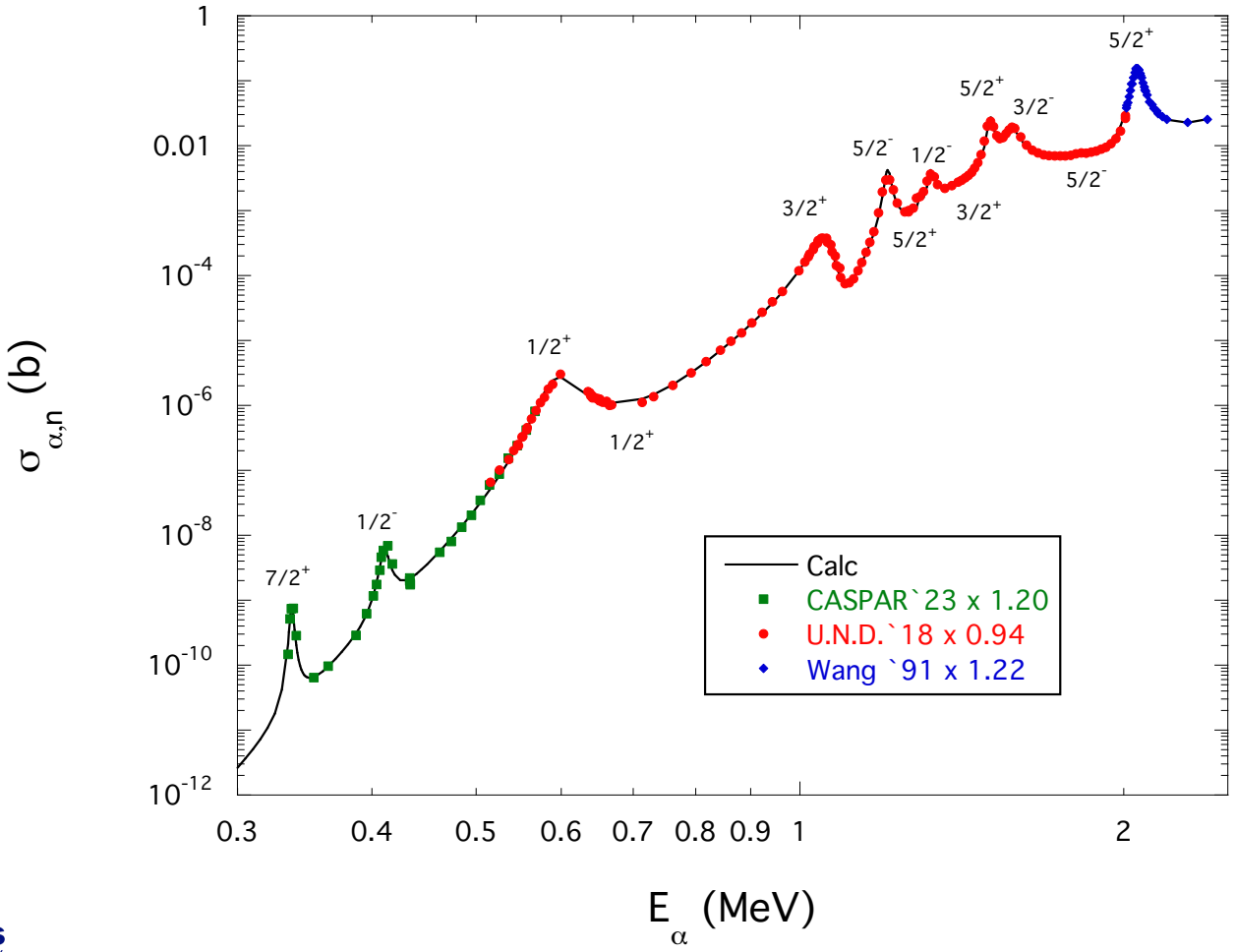




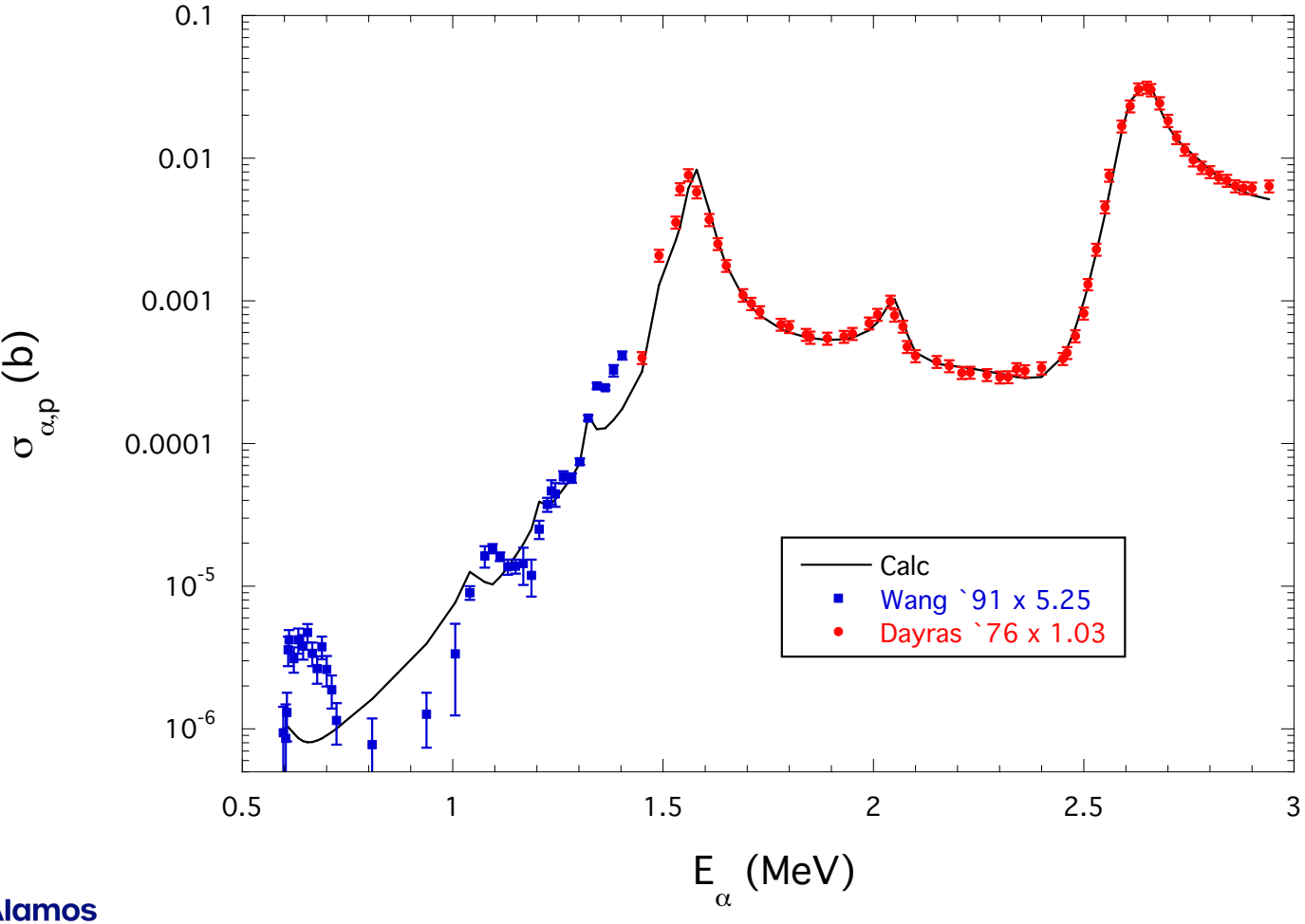
$^{14}N(n,\alpha)^{11}B$ Integrated Cross Section



$^{11}B(\alpha,n)^{14}C$ Integrated Cross Section



$^{11}B(\alpha,p)^{14}C$ Integrated Cross Section



Summary/Conclusions

- The current EDA analysis of the n+^{14}N (^{15}N system) reactions does a rather good job of describing most of the low-energy data. A notable exception is the low-energy ^{11}B(α,p)^{12}C cross section measured by Wang.
- Different J$^{\pi}$ values were found for some of the levels. In addition to the narrow resonances, underlying broad structure is important for most of the reactions.
- An extension to higher energies is needed. Do we have enough experimental data?
- Charged particle evaluations for p+^{12}C and α+^{11}B could be produced from a higher-energy extension of this analysis, in addition to the one for n+^{14}N.