NEW BNL-325 EVALUATIONS

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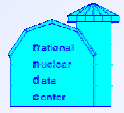

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Motivation

- Since the publication of the 4th edition of BNL325, (Neutron Cross Sections and Resonance Parametets, Vol. 1 parts A and B (1981-1984), a significant amount of data of resonance parameters and thermal cross sections appeared in the literature.

- Because of ongoing plans for ENDF/B-VII, and since 65% of the FP evaluations in ENDF/B-VI (release 8) are more than 20-25 years old, and because of man power and financial resources, the adoption of the BNL325 evaluations for these nuclei becomes desirable.

Evaluation Methodology

- Review recent measurements of thermal cross sections and resonance integrals. Normalize to standard cross sections (^{1}H, ^{14}N, ^{35}Cl, ^{55}Mn, ^{59}Co, ^{197}Au, ^{235}U),half-lives, branching ratios, conversion coefficients.

  - Review recent measurements of neutron resonance parameters to incorporate into computer files in BNL format, calculate quantities from capture kernels, and then compute weighted average values from the various measurements.

  - Run Physics codes , applying Porter-Thomas and Bayasian analysis to determine average parameters, S_0, S_1, D_0, D_1, $\langle \Gamma_0 \rangle$, $\langle \Gamma_1 \rangle$.

Methodology (continued)

- Run physics code PSY325 to compute the contribution of positive energy resonances to the thermal capture cross sections, coherent scattering amplitudes and resonance integrals.
- Achieve consistency between the thermal constants and resonance integrals by making adjustments to the resonance parameters and/or invoking one or two bound levels.

Evaluated Nuclei for BNL325

ENDF/B formatted files available

Nuclei in red indicate major revisions; in yellow, new.

50-Sn-112 114, 115, 116, 117, 118, 119, 120, 122, 124
51-Sb-121, 123
52-Te- 122, 123, 124, 125, 126, 128, 130
53-I - 127, 129
54-Xe- 124, 126, 128, 129, 130, 131, 132, 134, 135
55-Cs-133, 134
56-Ba-130, 132, 133, 134, 135, 136, 137, 138
57-La-138, 139
58-Ce-136,140,142
59-Pr- 141, 143
60-Nd-142, 144 143, 145, 146, 147, 148, 150
61-Pm-147, 148,
62-Sm-144, 147, 148, 149, 150, 152, 154
63-Eu-151, 152, 153, 154, 155
64-Gd-152, 154, 155, 156, 157, 158, 160
65-Tb-159, 160
66-Dy- 156,158, 160, 161, 162, 163, **164**
67-Ho-165, 166m
68-Er- 162, 164, 166, 167, 168, 170

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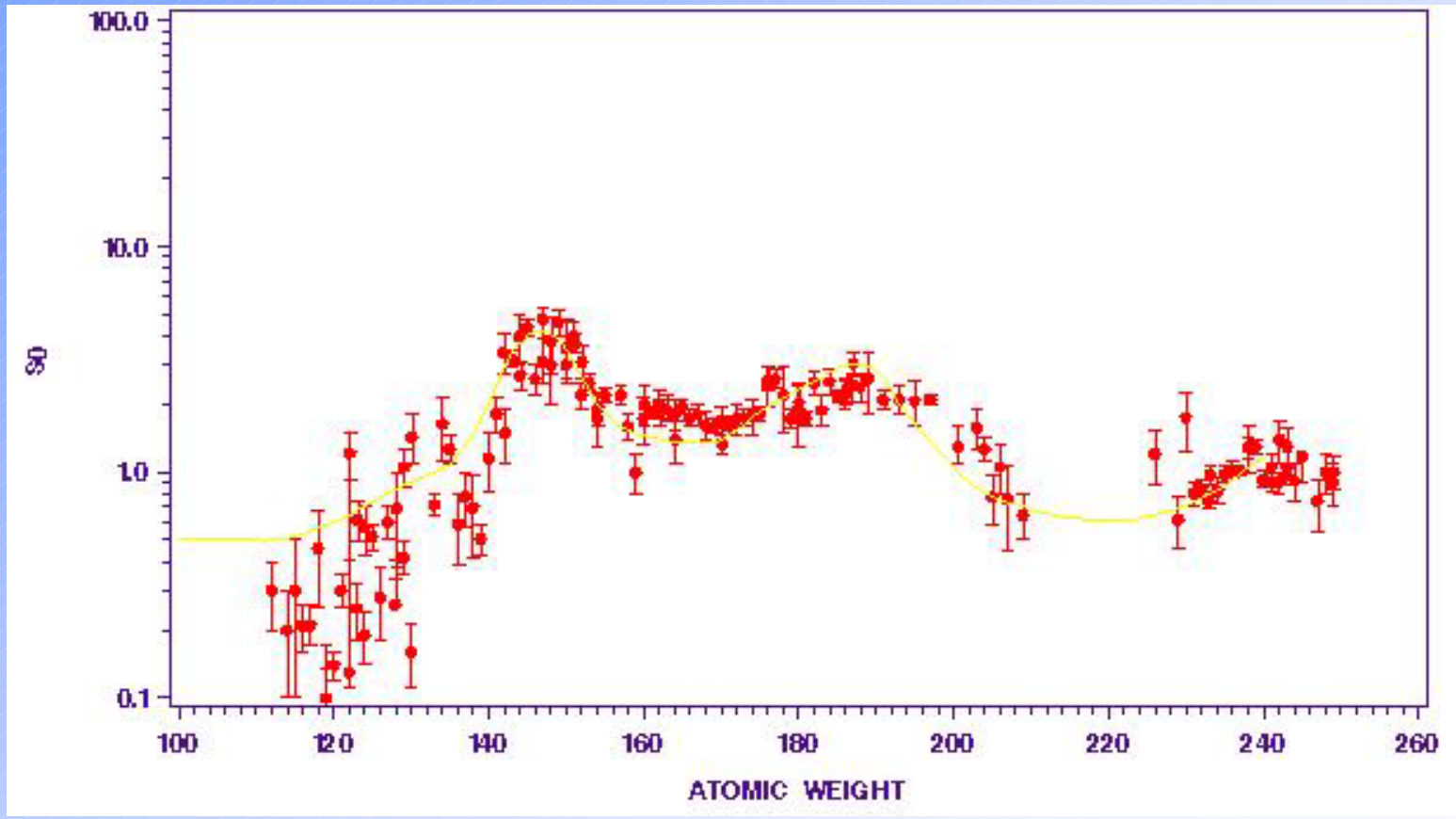
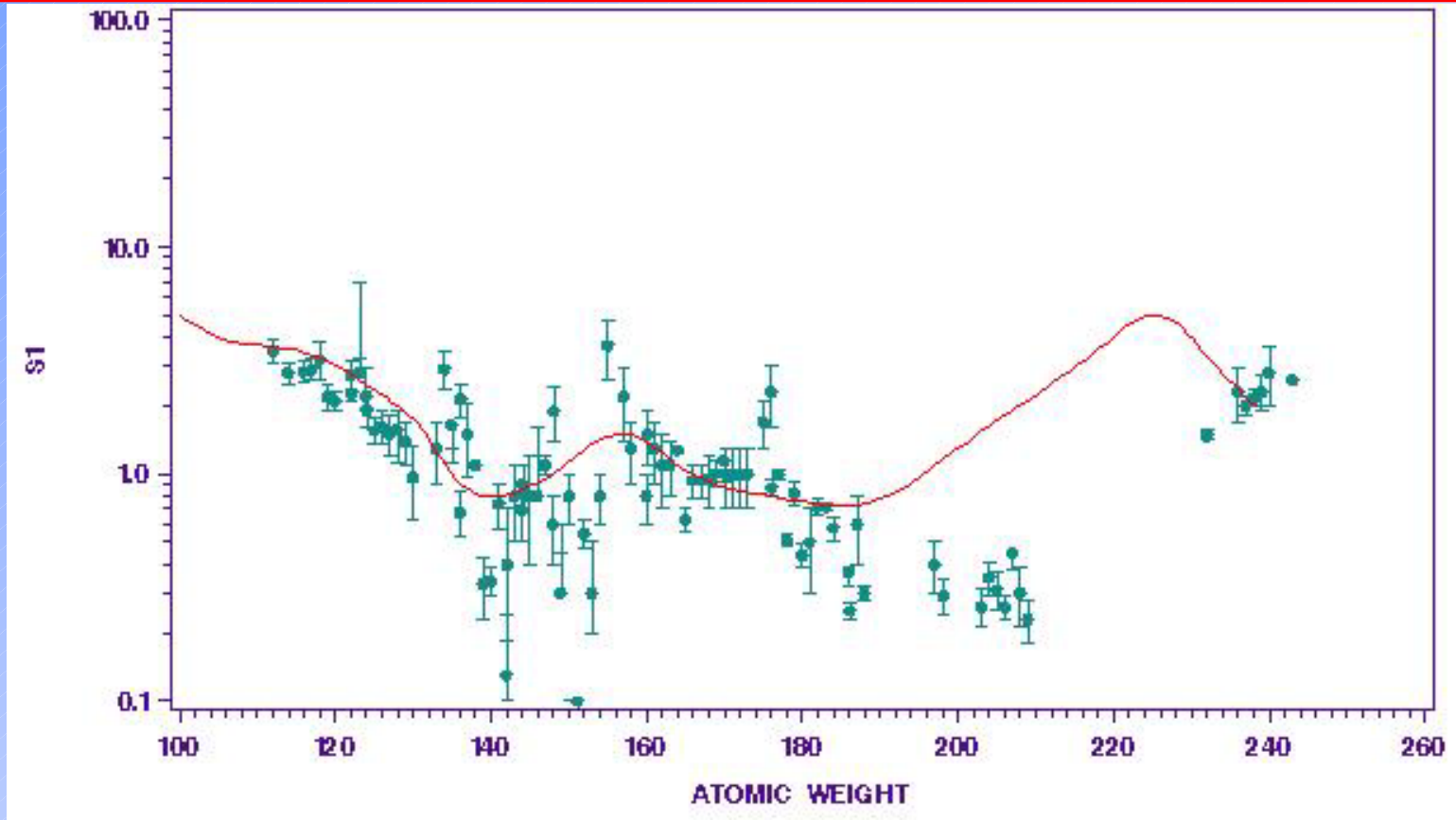
69-Tm-169, 171g, 171m
70-Yb-168, 169, 170, 171, 172, 173, 174, 176
71-Lu-175, 176
72-Hf-174, 176, 177, 178, 178m2, 179, 180
73-Ta-180, 181, 182
74-W -180, 182, 183, 184, 185g, 186
75-Re-185, 187
76-Os-186, 187, 188, 189, 190, 192
77-Ir-191, 193
78-Pt-190, 192, 194, 195,196, 198
79-Au-197
80-Hg-196, 198, 199, 200, 201, 202
81-Tl-203, 204, 205
82-Pb-204, 206, 207, 208
83-Bi-209
88-Ra-226
90-Th-228, 229, 230, 232
91-Pa-231, 232, 233
92-U –232, 233, 234, 235, 236, 237, 238

Systematics of Average Properties

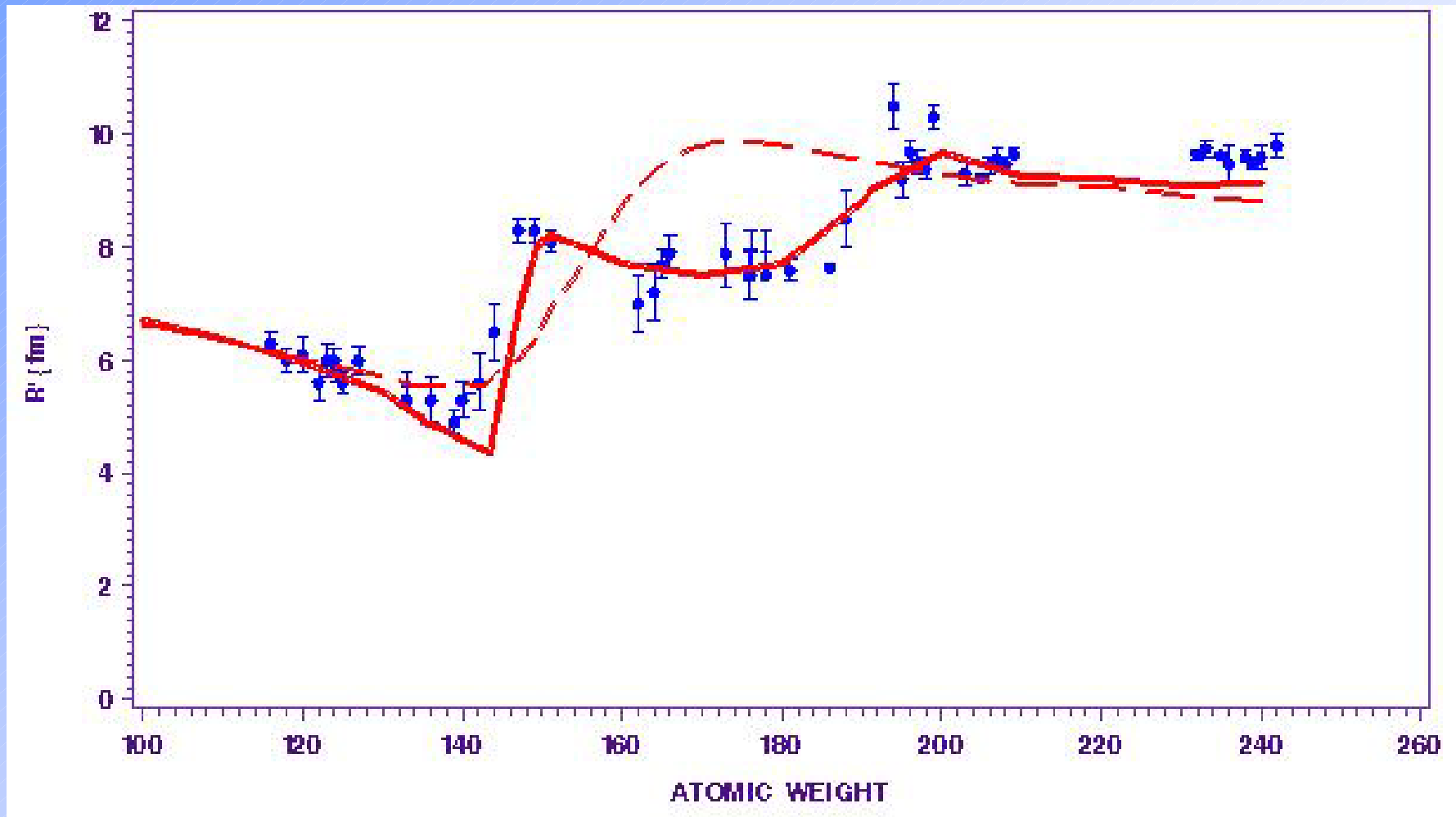
- S-wave Strength Functions (OM Results)



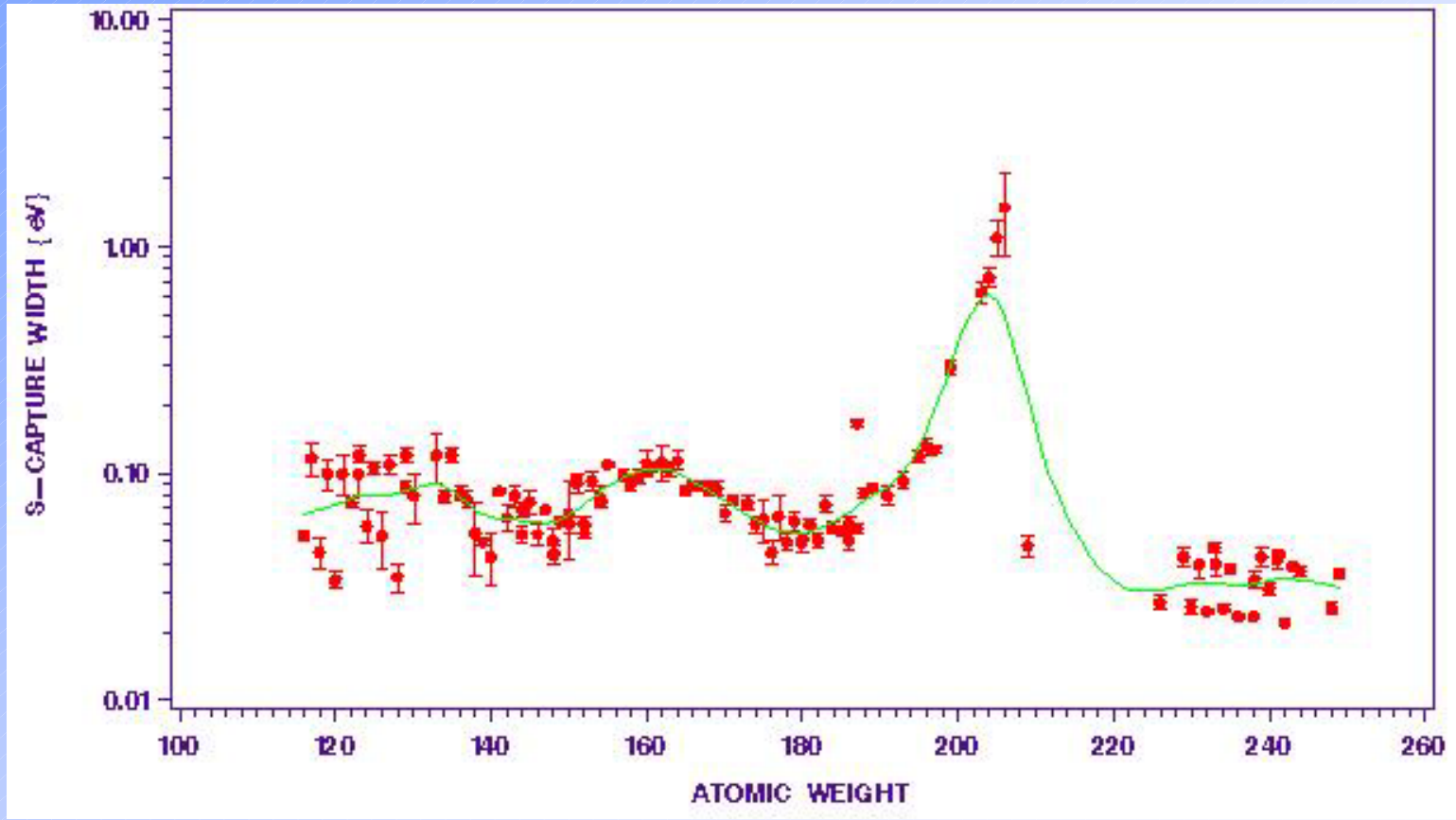
P-wave Strength Functions
Deformed Optical model calculations)



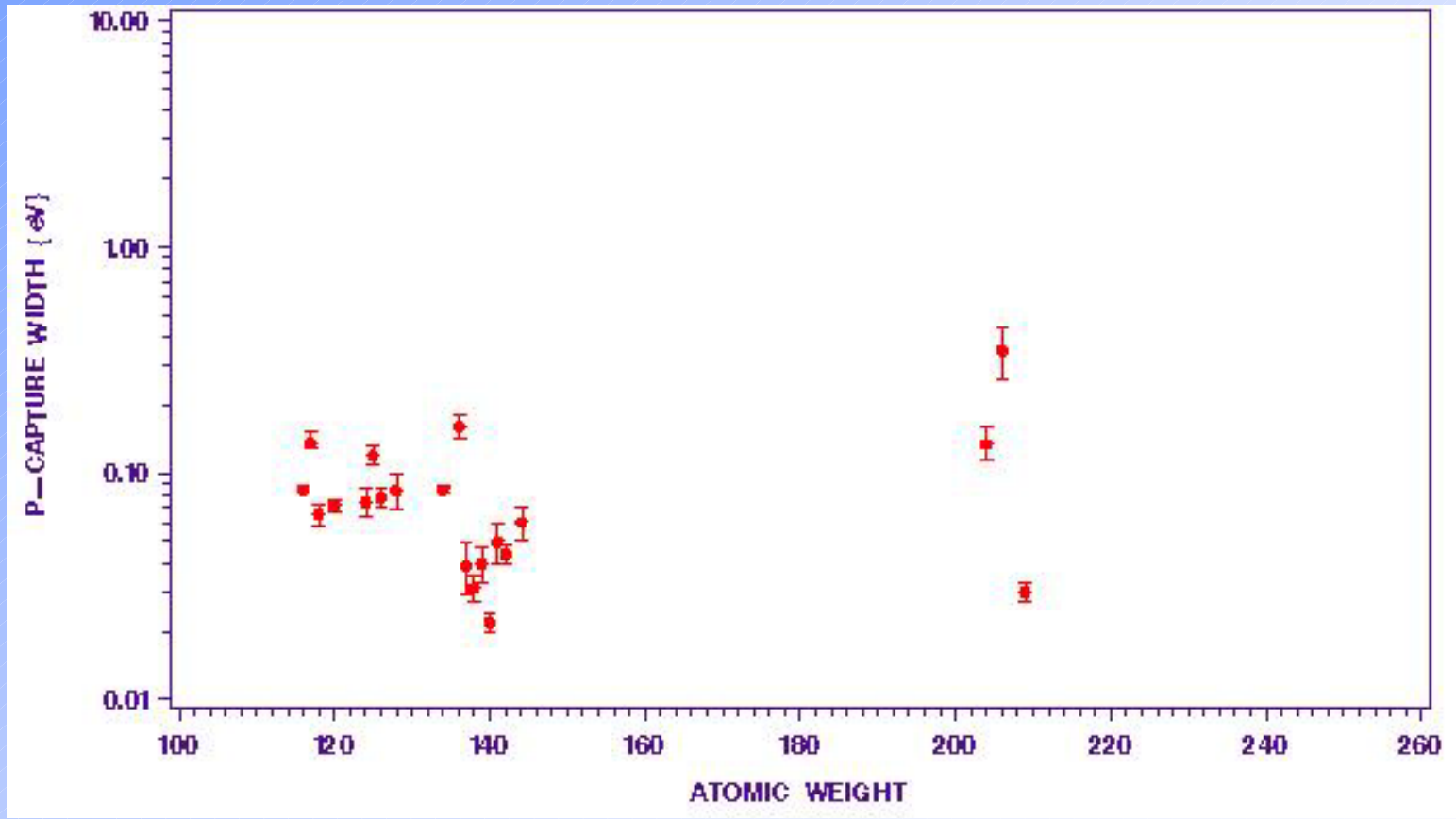
S-Wave Scattering Radii
Deformed Optical Model Calculations



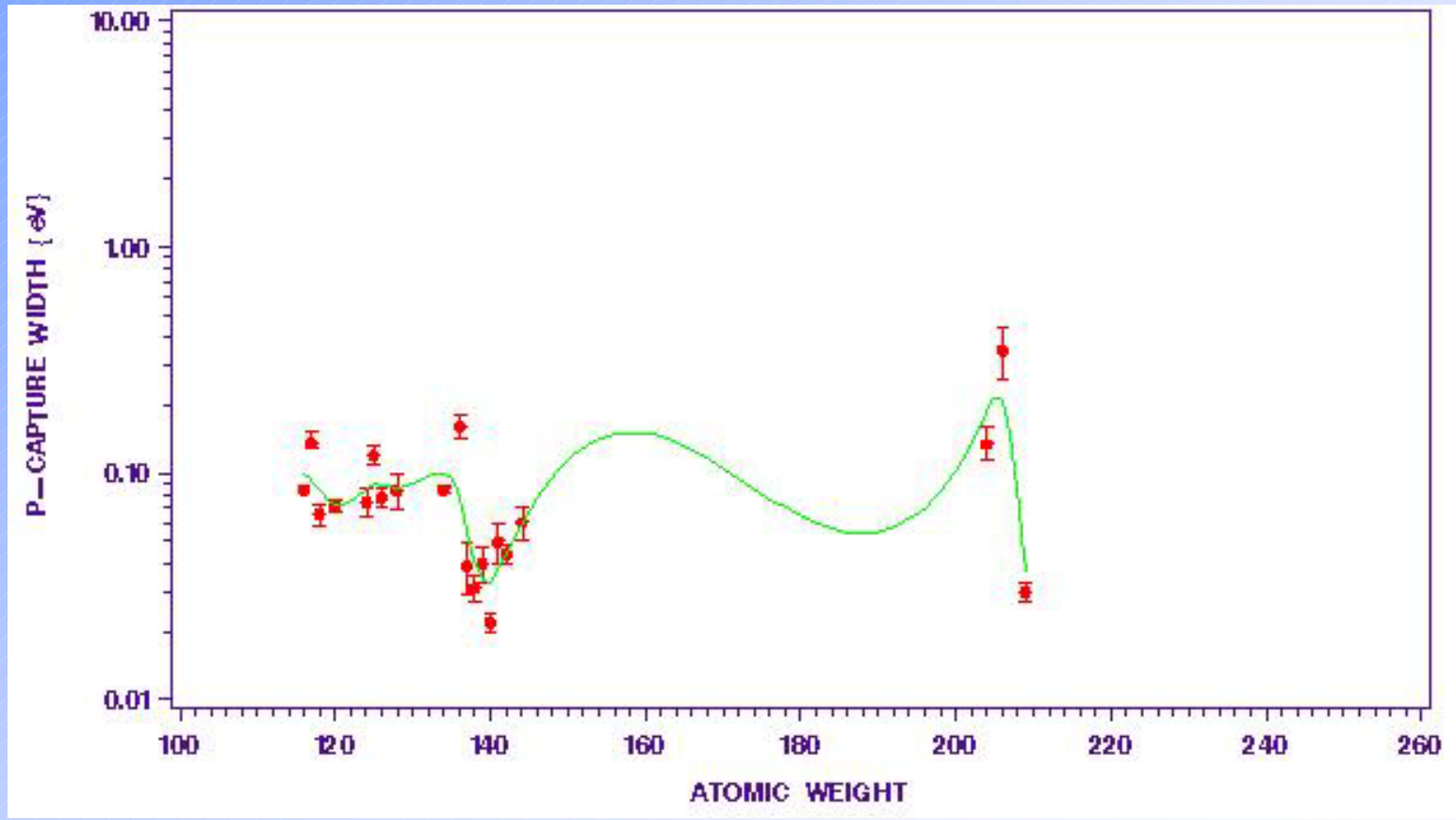
S-wave Average Radiative Widths
Spline Fit



P-Wave Radiative Widths
Data Only



P-wave Capture Widths
Spline Fit



New Features of BNL-325

- Energy range extended for a few isotopes.
- New nuclei with resonance parameter data.
- Improved systematics, as well as model calculations, of average neutron parameters is achieved.
- Bayasian and Porter-Thomas analyses extensively applied.
- Single parameters from combined quantities, capture kernels) derived.
- Expand the Introduction to include the following:

- Derived nuclear level density parameters (from present D_0)
- Computed average capture widths (nuclei with no such data) (Mughabghab+Dunford, PL/B,487,155,2000)
- Section on parity non-conservation (TRIPLE results),
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Conclusions and Future Work

- Evaluated thermal cross sections, average properties, and resonance parameters for Z=50-92 completed (166 nuclei).
- New isotopes with resonance parameters (9 nuclei).
- ENDF/B formatted files for Z=50-83 available.
- Future work
  - Complete the evaluation for Z=1-49, 93-100
  - Rewrite and expand the INTRODUCTION
  - Send manuscript to a publisher (December, 2004 Academic Press?)