

Internally consistent ^{181}Ta evaluation



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Managed by Triad National Security, LLC for the U.S. Department of Energy's NNSA

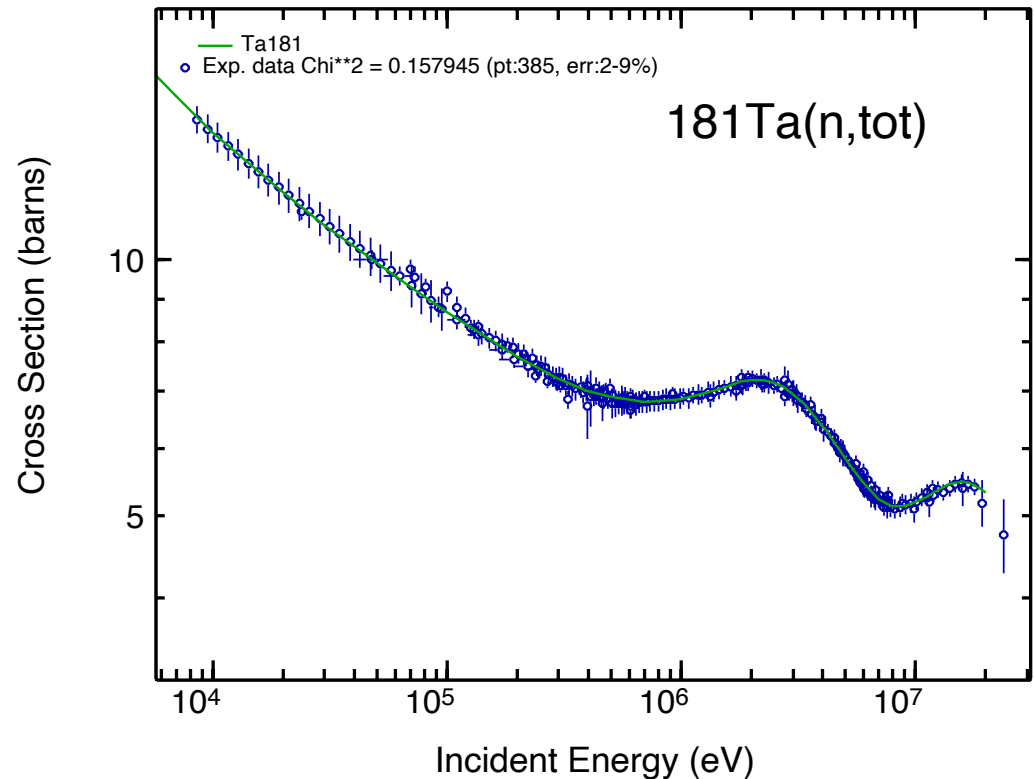
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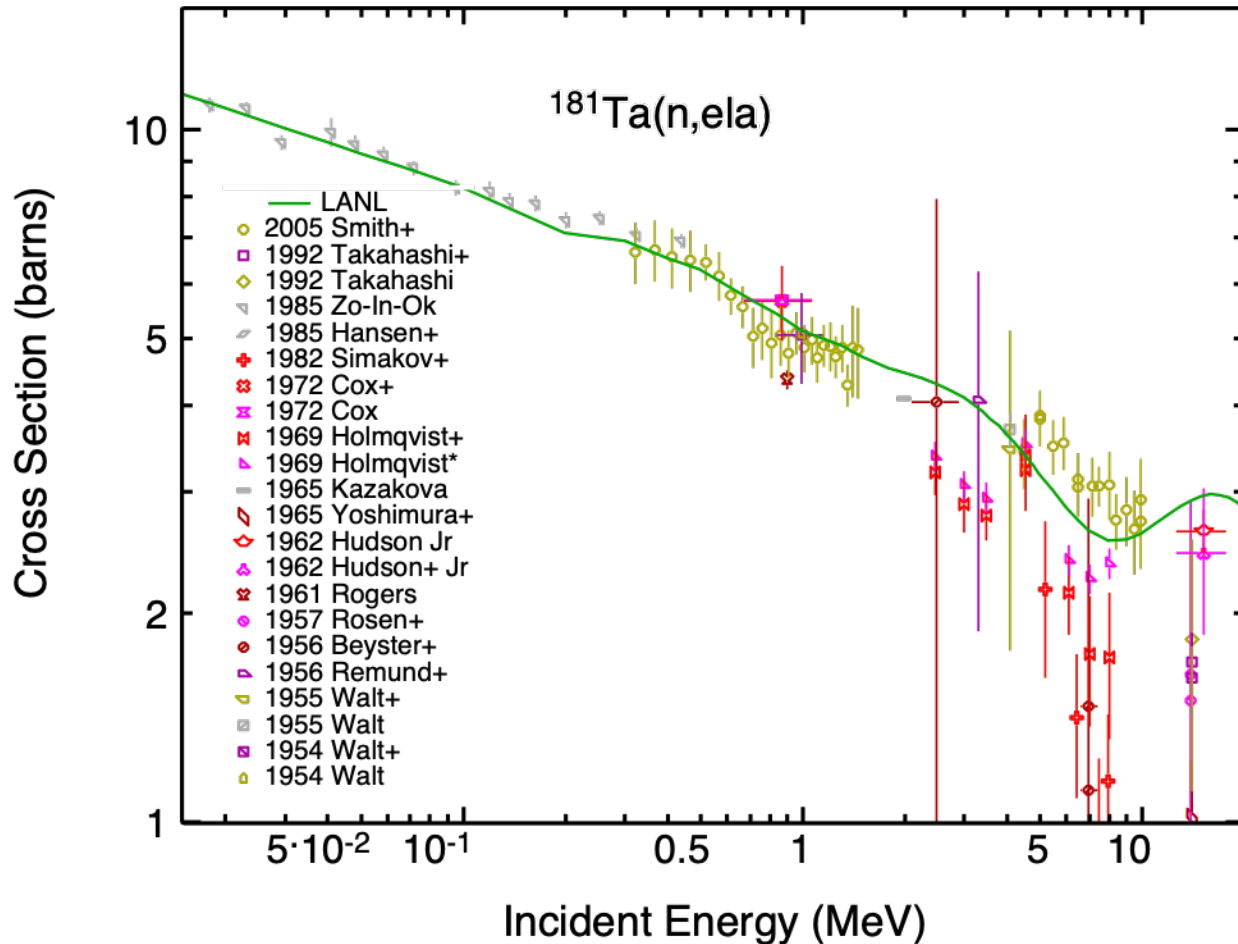
$^{181}\text{Ta}(n, \text{tot})$ - corner stone of every evaluation

- **Consistent** set of experimental data
- Excellent fit with dispersive CC potential using Kalman

	Factor
T.Y.Byoun (73)	0.96
I.Tsubone, et.al. (84)	1
W.P.Poenitz, et.al. (81)	1
A.B.Smith, et.al. (68)	1
R.Hannaske, (13)	0
M.J.Rapp, et.al. (19)	1
W.P.Poenitz, et.al. (83)	1
D.G.Foster Jr, et.al. (71)	1.015
A.D.Carlson, et.al. (67)	1
R.W.Finlay, et.al. (93)	0

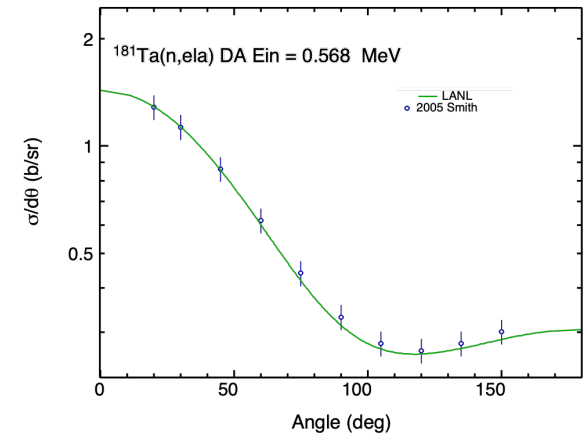


CC model - elastic x-sec & angular distributions



Elastic cross sections after adding the 1-st and the 2-nd inelastic.

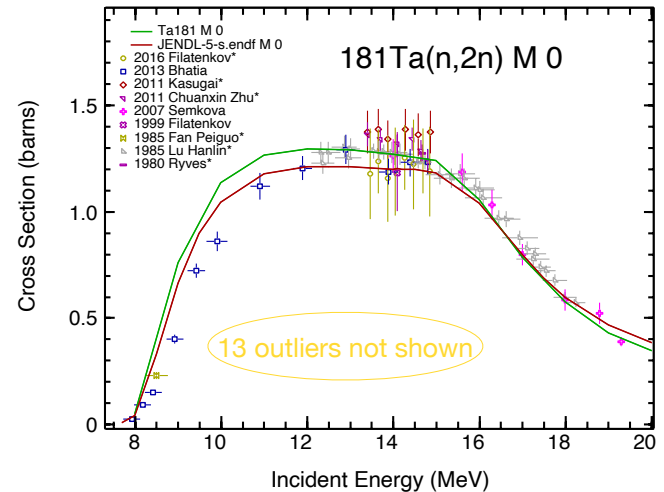
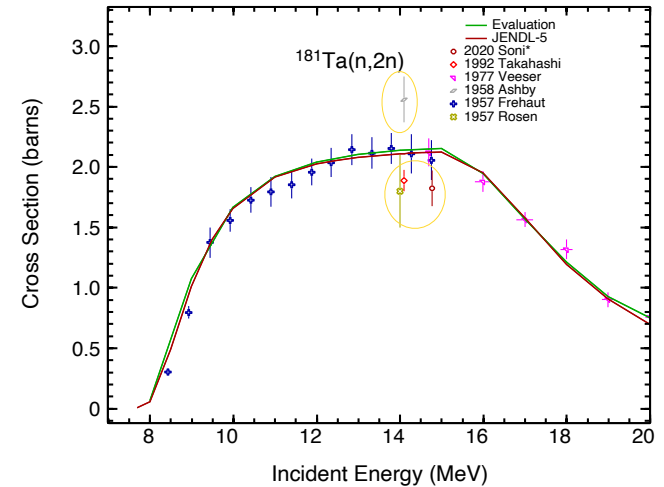
Here - in model we trust!



(n,2n)

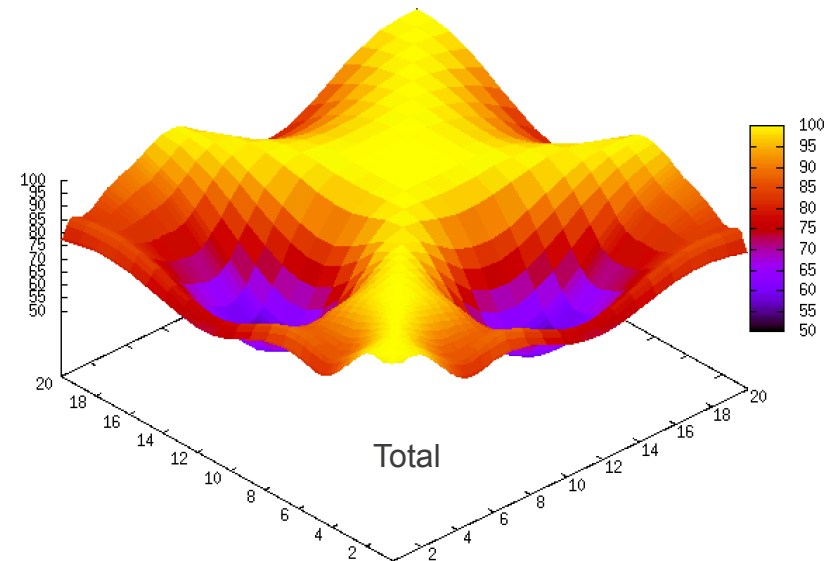
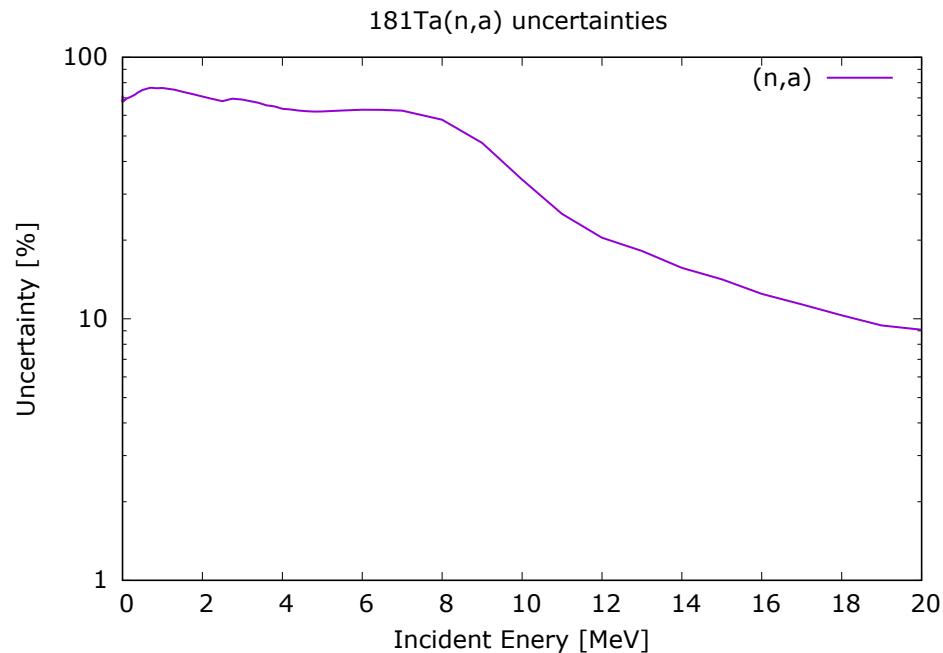
Model adjusted to experimental data

- 10% increase of the a-parameter in target lev. densities to reproduce consistent set of data.
- **Note:** out of 22 datasets for ground state cross sections **13(!)** are outliers, for total (n,2n) these are **4** out of 6.

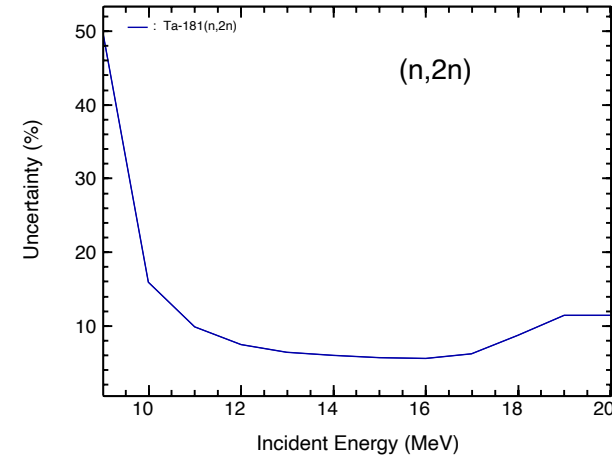
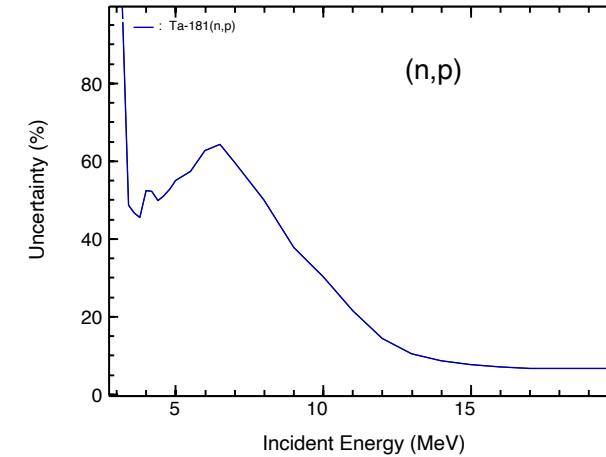
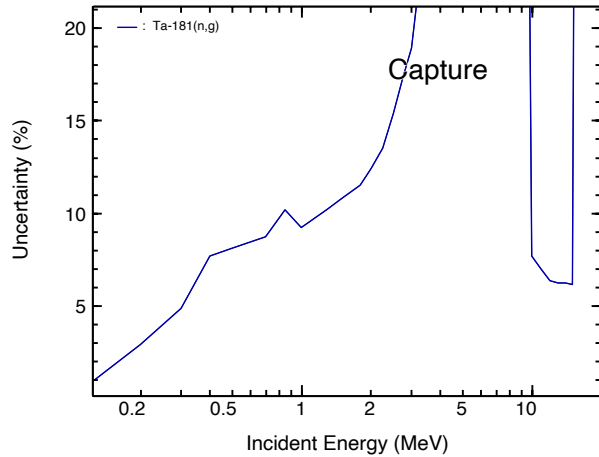
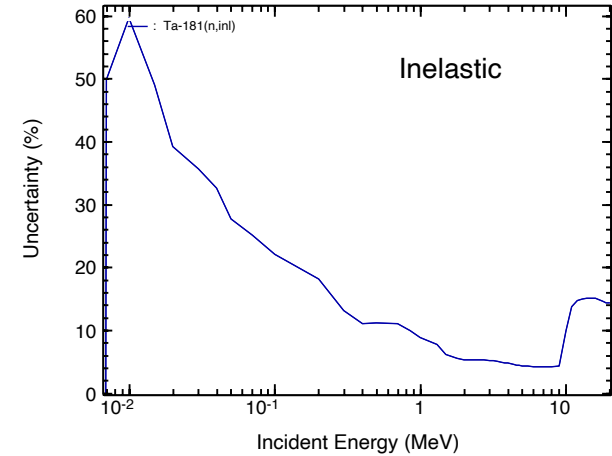
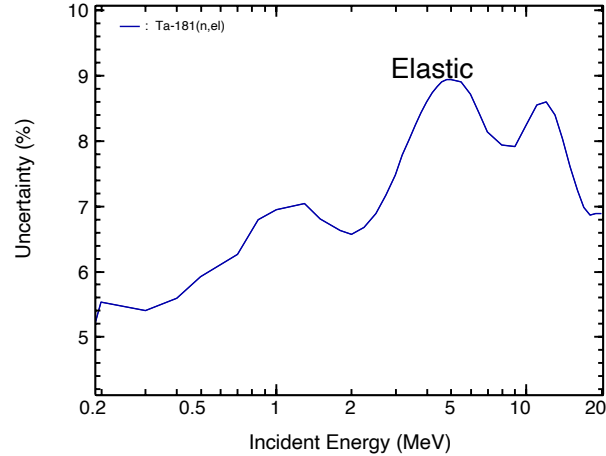
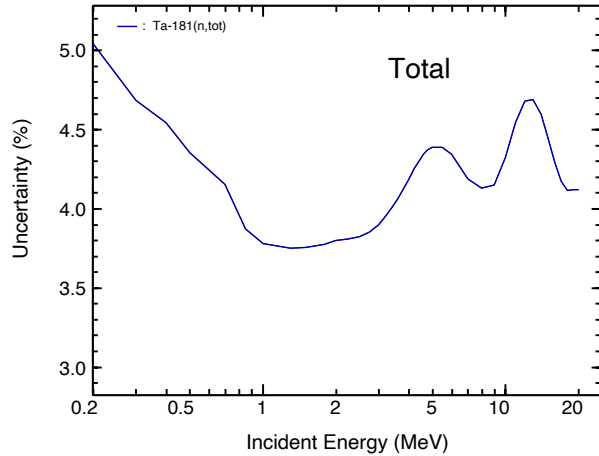


Covariances

- NNL/ORNL (SAMMY RR MF32 & UR MF33) merged with LANL (KALMAN fast MF33).
- Unusual combination of covariances and cross sections in UR.
- Cross-reaction correlations to be formatted.



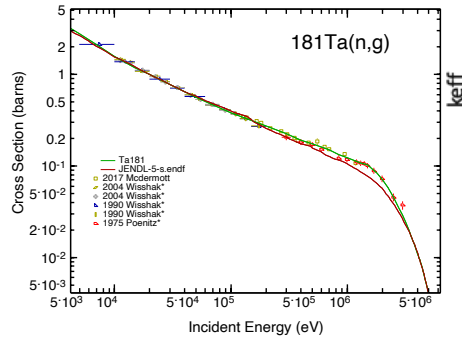
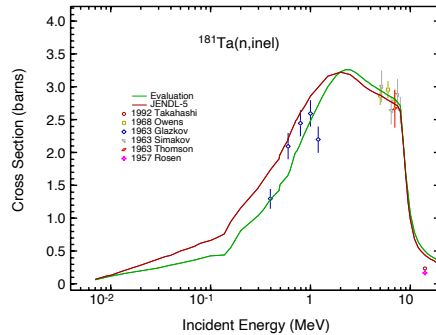
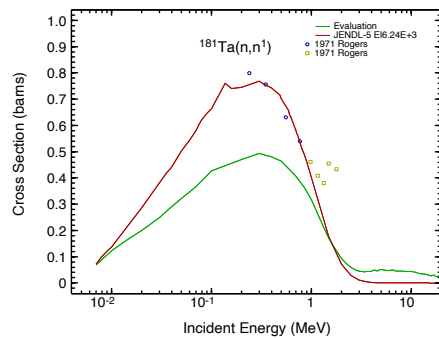
Uncertainties in the fast neutron region



Integral testing in Tex experiment

PMF45 - late 50's, water moderator, can't be fixed with ^{181}Ta .
Limited confidence!

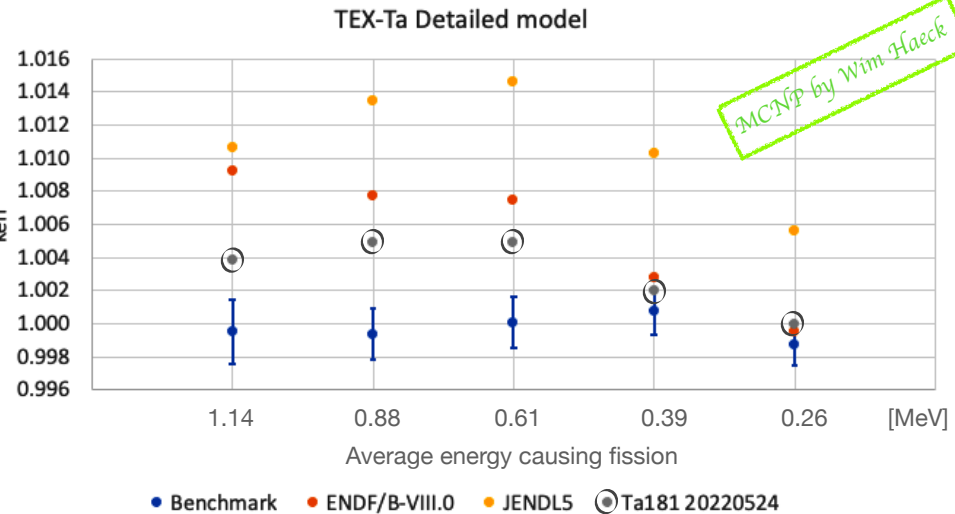
Consistent, model based (EMPIRE) evaluation reproducing selected differential data and well performing in integral testing



- 1st inelastic - major difference to JENDL5 driven by modeling consistency
- Capture - model forced to follow selected experimental data

Tex (new experiment) - essential improvement compared to ENDF/B-VIII.0 and JENDL-5.0

Further amelioration possible with the new ^{239}Pu



Internal consistency of the new Ta181 evaluation

- Consistency between resonance and fast neutron range.
 - new NNL/ORNL evaluation in resonance range.
 - URR consistently derived from RR parameters (cross sections including inelastic).
 - URR matching with fast neutron evaluation within fraction of % for total, elastic, inelastic & capture.
- Consistency with reaction modeling.
 - fast neutron evaluation given by model and its parameters (physics constraints observed!).
- Consistency with differential data.
 - good agreement of evaluation with differential data (after imposing consistency).
- Covariances consistent with the methodology.
 - derived from resonance parameters in RR and URR and using Kalman filter, model sensitivities and consistent experimental data in fast neutron region.
- Successful validation in integral benchmarks.
 - not perfect but significantly improved.

Conclusions

- Evaluation based on concepts of:
 - “limited confidence”
 - “seeking consistency”.
- No integral experiment influence (so far).
- This work and JENDL-5 are very similar, but different choices were made for total, inelastic and capture. Ours were more fortunate (in validation).
- Tex validation with ENDF/B-VIII.0 shows decisive improvement but new ^{239}Pu evaluation should be taken into account.

Status

- File merged with the new NNL/ORNL Resonance Region including covariances.
- Merged file submitted to the NNDC Git repository, reviewed and pushed to Phase 2.