IAEA 60 Years
Atoms for Peace and Development

Coordinated Research Project: Updating the Photonuclear Data Library and Generating a Reference Database for Photon Strength Functions

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Nuclear Data Section
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Coordinated Research Project: 2016-2019

- Update the Photonuclear Data Library
- Generate a Reference Database for Photon Strength Functions

- 14 participants from 12 countries + 3 advisors
- 3 Research Coordination Meetings + 2 CMs

- 8 Research Contracts
- 6 Research Agreements

Participants

T. Belgya (HAS)
Y-S. Cho (KAERI)
D. Filipescu (IFIN-HH)
R. Firestone (UCB)
S. Goriely (ULB)
N. Iwamoto (JAEA)
T. Kawano (LANL)
M. Krticka (Charles Univ. Prague)
V. Plujko (Kiev)
R. Schwengner (Dresden)
S. Siem (Oslo)
H. Utsunomiya (Kobe)
V. Varlamov (Moscow)
M. Wiedeking (iThemba)
R. Xu (CNDC)
J. Kopecky (Netherlands)
P. Oblozinsky (Slovakia)

Scope of the project

Reference Input Parameter Library (RIPL-3)

R. Capote, M. Herman, P. Oblozinsky, P.G. Young, S. Goriely, T. Belgya, A.V. Ignatyuk, A.J. Koning, S. Hilaire, V.A. Plujko, M. Avrigeanu, O. Bersillon, M.B. Chadwick, T. Fukahori, Zhigang Ge, Yinlu Han, S. Kailas, J. Kopecky, V.M. Maslov, G. Reffo, M. Sin, E.Sh. Soukhovitskii and P. Talou

Nuclear Data Sheets - Volume 110, Issue 12, December 2009, Pages 3107-3214

10 entries of the Optical Model database corrected in December 2010.

Introduction | MASSES | LEVELS | RESONANCES | OPTICAL | DENSITIES | GAMMA | FISSION | CODES | Contacts

Gamma-ray Segment

Experimental Giant Dipole Resonance (GDR) Parameters

The values and errors of giant dipole resonance (GDR) parameters are presented which were obtained by a fit of the theoretical photoabsorption cross sections to the experimental data for 121 nuclides from 12-C through 239-Pu. The values and errors of the shape parameters of the Lorentzian-like curves corresponding to the giant dipole resonance excitation are presented.[1-8]

References

[1] J. Kopecky, in Handbook for calculations of nuclear reaction data. Reference Input Parameter Library (RIPL), IAEA-TEDOC-1034, 1998, Ch.6
[2] T. Belgya, O. Bersillon, R. Capote, T. Fukahori, G. Zhigang, S. Goriely, M. Herman, A.V. Ignatyuk, S. Kailas. A. Koning, P. Oblozinsky, V. Plujko, P. Young. Handbook for calculations of nuclear reaction data: Reference Input Parameter Library-2, IAEA-TECDOC-1506, Vienna, 2006, Ch.7.
[3] V.A. Plujko, I.M. Kadenko, E.V. Kulich, S. Goriely, O.I. Davidovskaya, O.M. Gorbachenko, in Proceeding of Workshop on Photon Strength Functions and Related Topics, Prague, Czech Republic, June 17-20, 2007, Proceedings of Science, PSF07, 2008
[4] S.S.Dietrich, B.L.Berman; At. Data Nucl. Data Tables., 199, 38(1988).
[5] M.B. Chadwick, P. Oblozinsky, P.E. Hodgson, G. Reffo. Phys.Rev. C44(1991)814.
[6] M.B.Chadwick, P.Oblozinsky, A.I.Blokhin, T.Fukahori, Y.Han, Y. O.Lee, M.N.Martins, S.F.Mughabghab, V.V.Varlamov, B.Yu, J.Zhang. Handbook on photonuclear data for application. Cross sections and spectra. IAEA TECDOC 1178, Vienna, 2000
[7] Experimental Nuclear Reaction Data Library EXFOR
[8] CERN Program Library, MINUIT (D506), Function Minimization and Error Analysis

README File (16kB)
Standard Lorentzian model (SLO) (22,3kB)   Modified Lorentzian model (MLO) (22,0kB)

Theoretical GDR Parameters

Predictions of the GDR energies and widths using Goldhaber-Teller model for about 6000 nuclei with 14<=Z<=110 lying between the proton and the neutron driplines.

Data File (281kB)   README File (3.5kB)

Retrieval of GDR Parameters

Atomic number (Z)
Mass number (A)
(blank for all mass numbers)
retrieve   reset

Microscopic E1 Photoabsorption Strength-Functions

Predictions of the E1-strength functions for 3317 nuclei with 8<=Z<=84 lying between the proton and the neutron driplines. The E1-strength functions are determined within the QRPA model based on the SLy4 Skyrme force[1,2].

References

[1] S. Goriely, E. Khan, Nucl. Phys. A706, 217 (2002).
[2] E. Khan et al., Nucl. Phys. A694 (2001) 103.

README File (2.8kB)

Retrieval of Microscopic E1 Photoabsorption Strength-Functions

Atomic number (Z)
Mass number (A)
retrieve   reset

Giant Dipole Resonance Parameters

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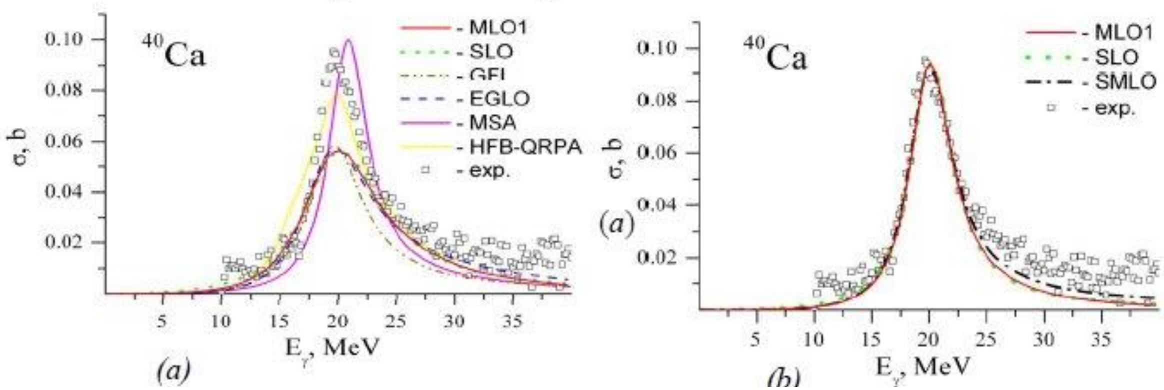
Data for 18 new isotopes are included in the tables. Data are revised for 87 isotopes. 102 new values are added from 23 sources. 12 values were omitted

Impact of using renewed values of the GDR parameters on photoabsorption cross section



Atom. Data Nucl. Data Tables 123-124 (2018) 1-85
(Plujko, Gorbachenko, Capote, Dimitriou,);
arXiv e-Print – 2018: https://arxiv.org/abs/1804.04445

Atomic Data and Nuclear Data Tables 123–124 (2018) 1–85

Contents lists available at ScienceDirect

Atomic Data and Nuclear Data Tables

journal homepage: www.elsevier.com/locate/adt

ELSEVIER

Giant dipole resonance parameters of ground-state photoabsorption: Experimental values with uncertainties

V.A. Plujko [a], O.M. Gorbachenko [a], R. Capote [b,*], P. Dimitriou [b]

[a] Nuclear Physics Department, Taras Shevchenko National University, Kyiv, Ukraine
[b] NAPC–Nuclear Data Section, International Atomic Energy Agency, Vienna, Austria

Photon Strength Functions database

New measurements

Group	Nuclides	Technique
S. Siem (Oslo)	^{111,112,113}Sn, ^{92}Mo (12/2016) ^{152,153}Sm (12/2018), ^{186}W (12/2017) ^{144,145,148,149,150,151}Nd (12/2017) ^{234}U, ^{240}Pu (12/2016) ^{203,205}Tl (12/2016); ^{192}Os (12/2017), ^{185}Re (12/2017); ^{182,183,184}W (12/2018); ^{89}Y (12/2016); ^{64}Zn (2019), ^{66,68}Zn (12/2018)	Oslo charged-particles (γ,n)
M. Wiedeking (iThemba)	^{74}Ge (12/2017), ^{180,181,182}Ta (12/2016) ^{154,155}Sm (05/2018)	Ge (ratio method) ; Ta (Oslo method)
R. Schwengner (HZDR)	^{80}Se (12/2016); ^{54}Fe (12/2017); A~60 (^{62}Ni, ^{64}Zn tbc) (03/2019)	At Elbe and/or Higs (^{54}Fe)
T. Belgya (HAS)	^{233}Th, ^{239}U (12/2017)	thermal n-capture
H.Utsunomiya (Konan)	^{156,157,158,160}Gd (2019) ^{58,60,64}Ni (12/2017)	(γ,n)

PSF Database 2019

- NRF measurements for 23 nuclei with Z=32-78
- Oslo method data for 72 nuclei with Z=21-94
- ARC/DRC measurements for 88 nuclei with Z=9-94
- (p,γ) measurements for 22 nuclei with Z=22-40
- Ratio method measurement for 1 nucleus, 95Mo
- (p,p’) measurements for 3 nuclei, 96Mo, 120Sn and 208Pb
- E1 photodata for 159 nuclei with Z=3-94

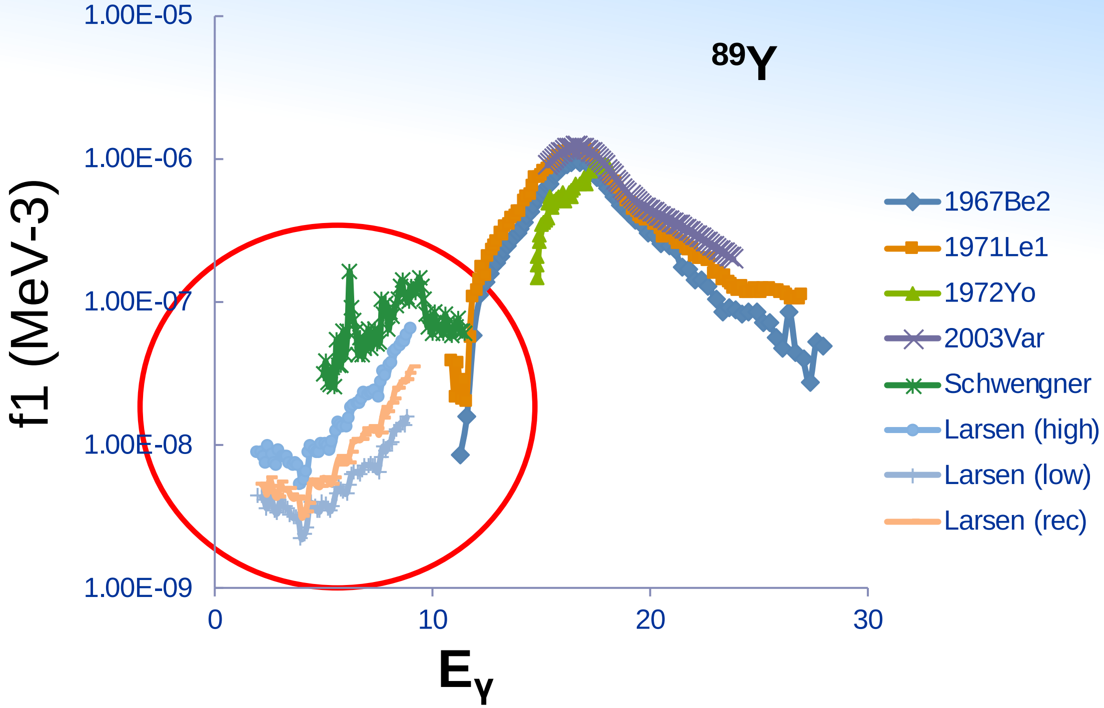
- *NEW - [19 Sep 2022] Thermal Capture (THC) measurements (incl. EGAF) for 55 nuclei with Z=9-90*

PSF database

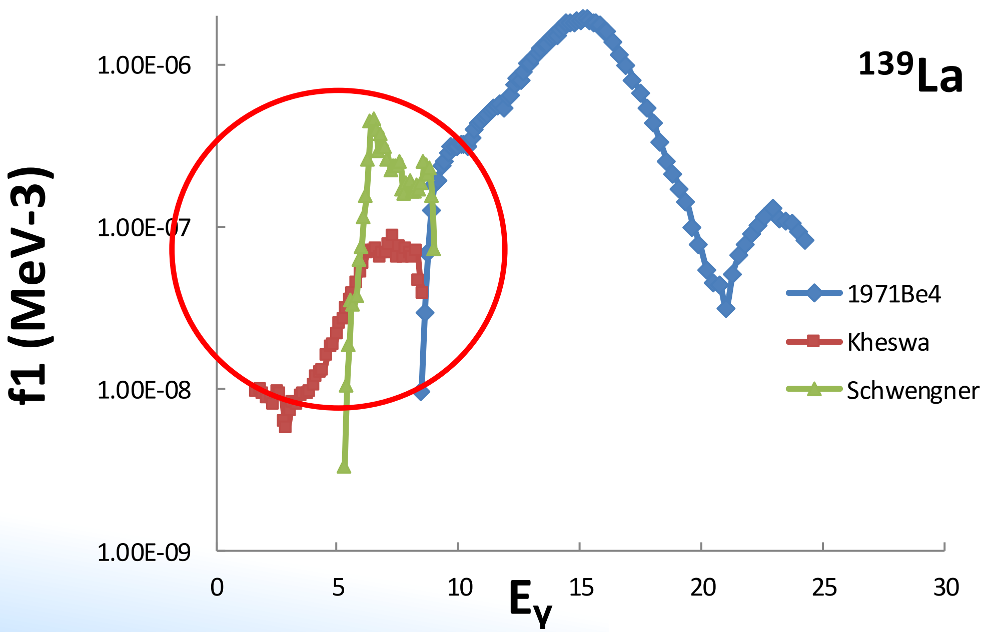
- Each data set entry contains 2 files:
  1. Readme file: how PSF is extracted from raw data -references
  2. PSF file: X Y dY
  3. Oslo method: NLD data files provided

```
# f1_exp_034_080_NRF.dat
#
# Z = 34, A = 80
# No. of entries: 20
# Col 1: photon energy E in MeV
# Col 2: bin width dE in MeV
# Col 3: dipole strength f1 in MeV^-3
# Col 4: uncertainty df1 in MeV^-3
# Format: 2f10.3, 2e12.3
# Author: R. Schwengner HZDR
#     E          dE        f1          df1
    6.200      0.200    7.151E-08    4.695E-08
    6.400      0.200    8.213E-08    3.981E-08
    6.600      0.200    9.827E-08    3.488E-08
    6.800      0.200    1.292E-07    3.013E-08
    7.000      0.200    1.493E-07    2.642E-08
    7.200      0.200    7.954E-08    2.507E-08
    7.400      0.200    1.007E-07    2.227E-08
    7.600      0.200    1.216E-07    2.184E-08
    7.800      0.200    1.397E-07    2.022E-08
    8.000      0.200    1.567E-07    1.961E-08
    8.200      0.200    1.365E-07    1.727E-08
    8.400      0.200    1.322E-07    1.553E-08
    8.600      0.200    1.386E-07    1.422E-08
    8.800      0.200    1.153E-07    1.274E-08
    9.000      0.200    1.511E-07    1.345E-08
    9.200      0.200    1.484E-07    1.106E-08
    9.400      0.200    1.572E-07    9.428E-09
    9.600      0.200    1.530E-07    7.450E-09
```

```
# f1_exp_034_080_NRF.readme
#
# Data were published by A. Makinaga et al., Phys. Rev. C 94, 044304 (2016).
#
# Reaction 80Se(gamma,gamma') using bremsstrahlung produced with
# 11.5 MeV electrons at the ELBE accelerator of HZDR.
#
# Gamma rays were measured with two shielded HPGe detectors at 90 deg to the
# beam and two at 127 deg to the beam.
# Spectra were response and efficiency corrected.
#
# The photon flux was determined by using known level widths in 11B.
# Background due to atomic processes in the target was determined in GEANT4
# simulations and subtracted from the spectra. Subtracted spectra contain
# resolved peaks and nuclear quasicontinuum.
#
# Spectra were corrected for feeding and branching intensities obtained from
# simulations of statistical gamma-ray cascades using the code gDEX.
#
# Input for the simulations:
# (i)  E1 strength function: three-Lorentz function (TLO)
#      [A.R. Junghans et al., Phys. Lett. B 670, 200 (2008)] with a
#      quadrupole deformation of 0.23 and a triaxiality of 22 degrees.
#      M1 and E2 strength functions: parametrizations given in RIPL
#      [R. Capote et al., Nucl. Data Sheets 110, 3107 (2009)].
#      Partial level widths were varied using the Porter-Thomas distribution.
# (ii) Level density: constant-temperature model with parameters from
#      [T. von Egidy and D. Bucurescu, Phys. Rev. C 80, 054310 (2009)].
#      Parameters were randomly varied within the given uncertainties.
#
# Simulations were performed iteratively. The strength function obtained from
# an iteration step was used as the input for the next step. The iteration was
# stopped when input and output were in agreemant within their uncertainties.
#
# The absorption cross sections were obtained from scattering cross sections by
# using average branching ratios of ground-state transitions obtained from
# the simulations.
#
```



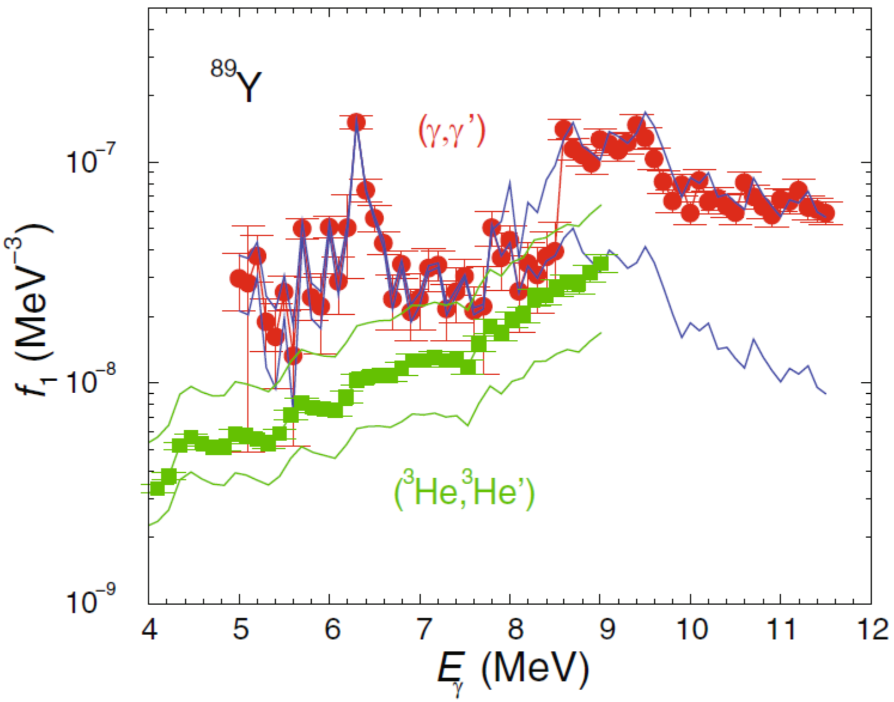
89Y
f1 (MeV-3)
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
10
20
30
Eγ
1967Be2
1971Le1
1972Yo
2003Var
Schwengner
Larsen (high)
Larsen (low)
Larsen (rec)

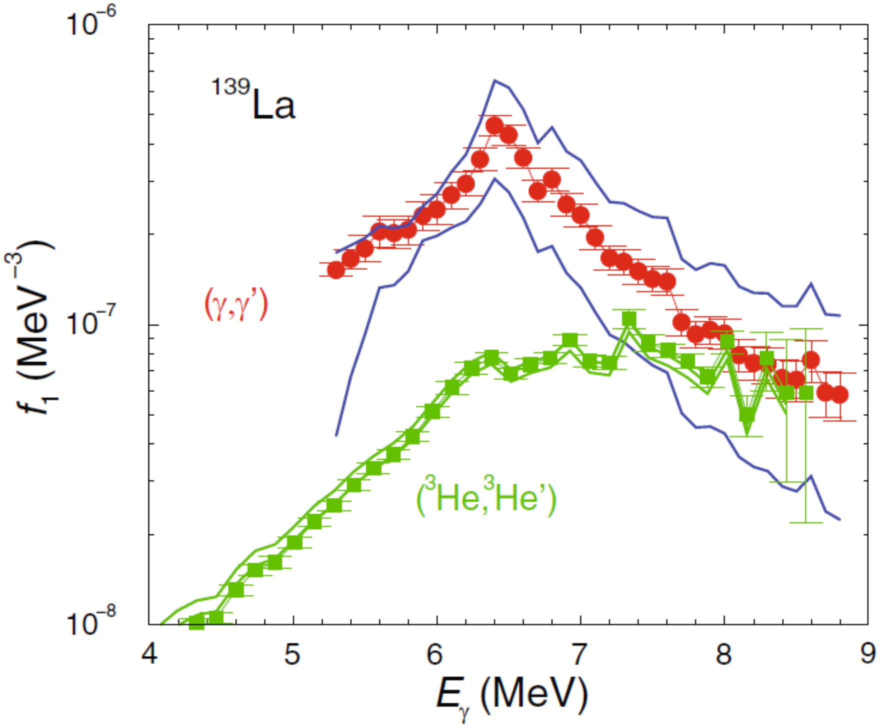


139La
f1 (MeV-3)
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
5
10
15
20
25
30
Eγ
1971Be4
Kheswa
Schwengner

Assessment of exp. PSF

- Assessment of data/techniques considering all uncertainties (model dependent)





Models

- Global models for E1 and M1:
  - D1M+QRPA+0lim: 7380 nuclei with 8 ≤ Z ≤ 110, Goriely et al., Phys. Rev. C 98, 014327 (2018)
  - new Simple Modified Lorentzian (SMLO): 8980 nuclei with 8 ≤ Z ≤ 124, Goriely and Plujko, PRC 99, 014303 (2019)

Others presented:

- *TLO, Junghans*
- *Empirical M1, Kawano*
- *Shell model calculations (Schwengner)*

Validation

Conditions for recommending global models: validation by means of other "integral" data (depending on other parameters, i.e. NLD)

- Two-step cascade spectra MSC: E1+M1 for ~15 nuclei
- Thermal (n,γ) spectra: E1+M1 for 5 nuclei
- <Γγ>: E1+M1 for ~230 nuclei
- MACS: 30 keV (n,γ) E1+M1 for ~240 nuclei

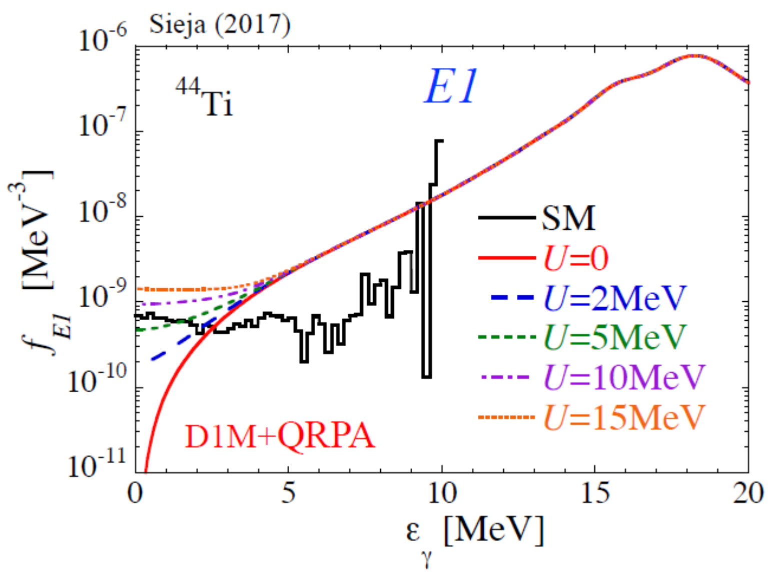
D1M+QRPA+0lim model

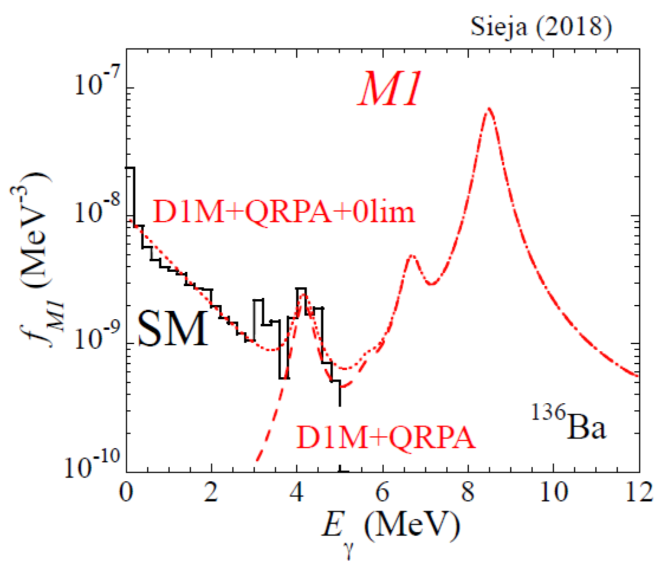
SM-inspired low-energy correction of the de-excitation strength

$$f_{E1} = f_{E1}^{QRPA} + f_{E1}(\varepsilon_\gamma \to 0)$$ Non-zero limit of the *E1* strength at $\varepsilon_\gamma \to 0$

$$f_{M1} = f_{M1}^{QRPA} + f_{M1}(\varepsilon_\gamma \to 0)$$ Upbend of the *M1* strength at $\varepsilon_\gamma \to 0$

D1M+QRPA+0lim model





Slide: S. Goriely, CM on PSF evaluation, Nov. 2022

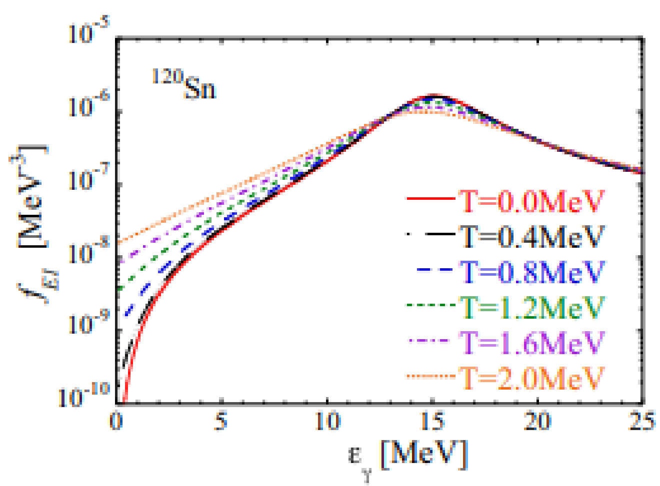
SMLO – Simplified modified LO (E1+M1)

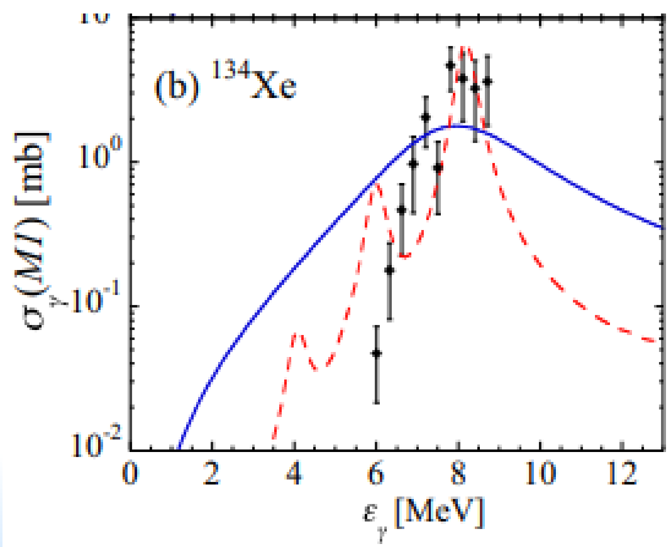
- E1: SMLO model describing GDR (Plujko, Gorbachenko, et al., ADNDT 123, 1, 2018) – extended to low energies (T dependence):

$$\Gamma_j(\varepsilon_\gamma, T) = \frac{\Gamma_{r,j}}{E_{r,j}}\left(\varepsilon_\gamma + \frac{4\pi^2}{E_{r,j}}T^2\right)$$

- M1 (spin-flip +scissors): $f^{sc}_{SLO} + f^{sf}_{SLO}$

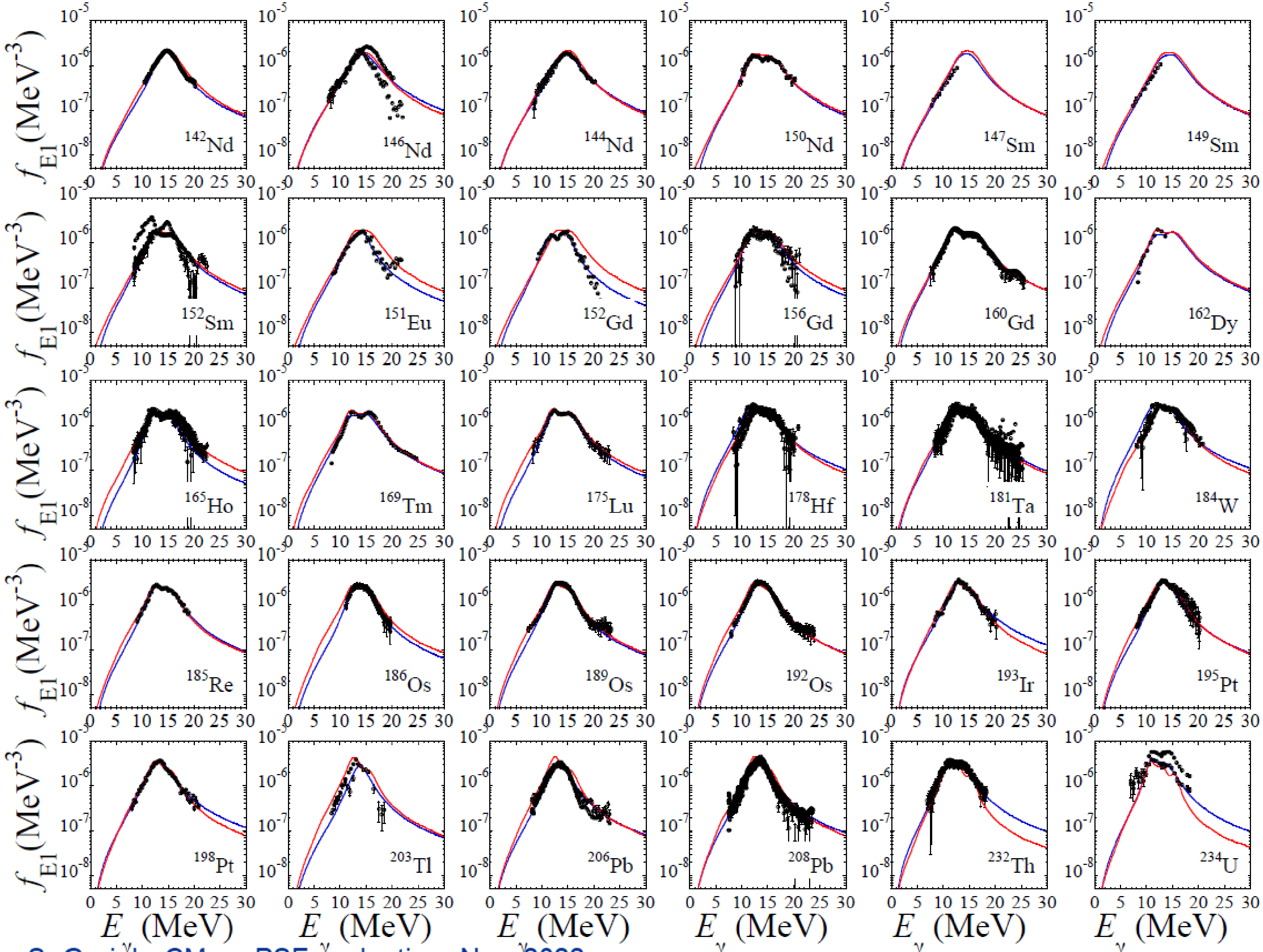
incl. upbend: $\overleftarrow{f_{M1}}(\varepsilon_\gamma) = \overrightarrow{f_{M1}}(\varepsilon_\gamma) + C\ \exp(-\eta\varepsilon_\gamma)$





Comparison of D1M+QRPA and SMLO with Photodata

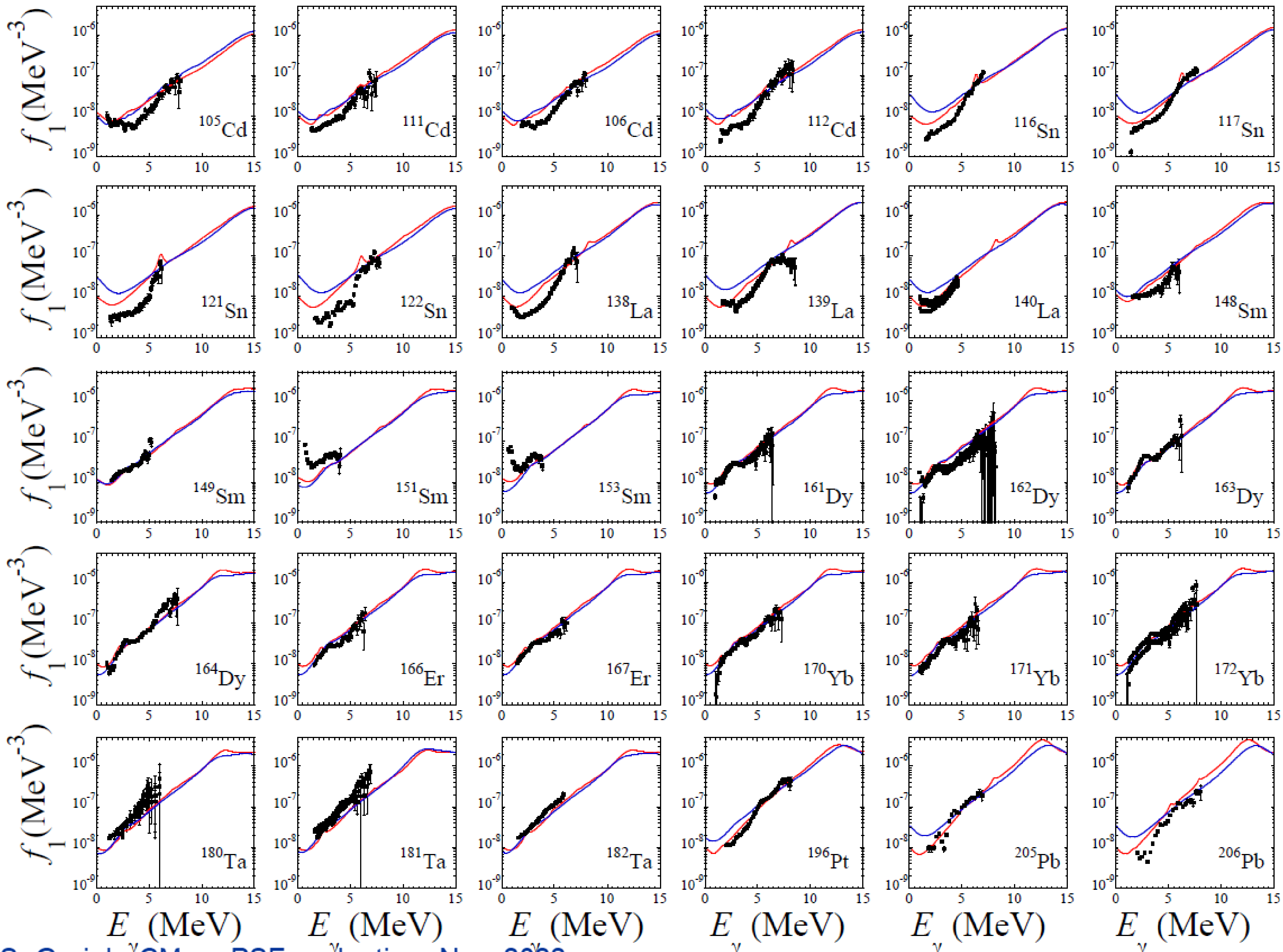
30 nuclei out of 159



Slide: S. Goriely, CM on PSF evaluation, Nov. 2022

Comparison of D1M+QRPA+0lim and SMLO with Oslo data

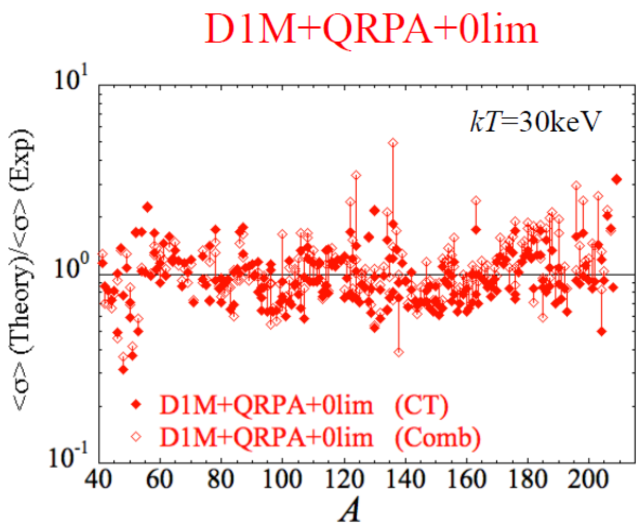
30 nuclei out of 72

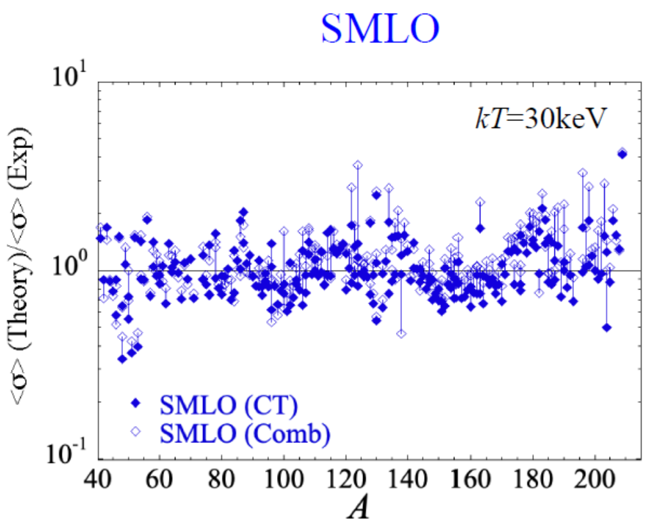


Slide: S. Goriely, CM on PSF evaluation, Nov. 2022

Validation

Comparison of D1M+QRPA+0lim and SMLO with MACS

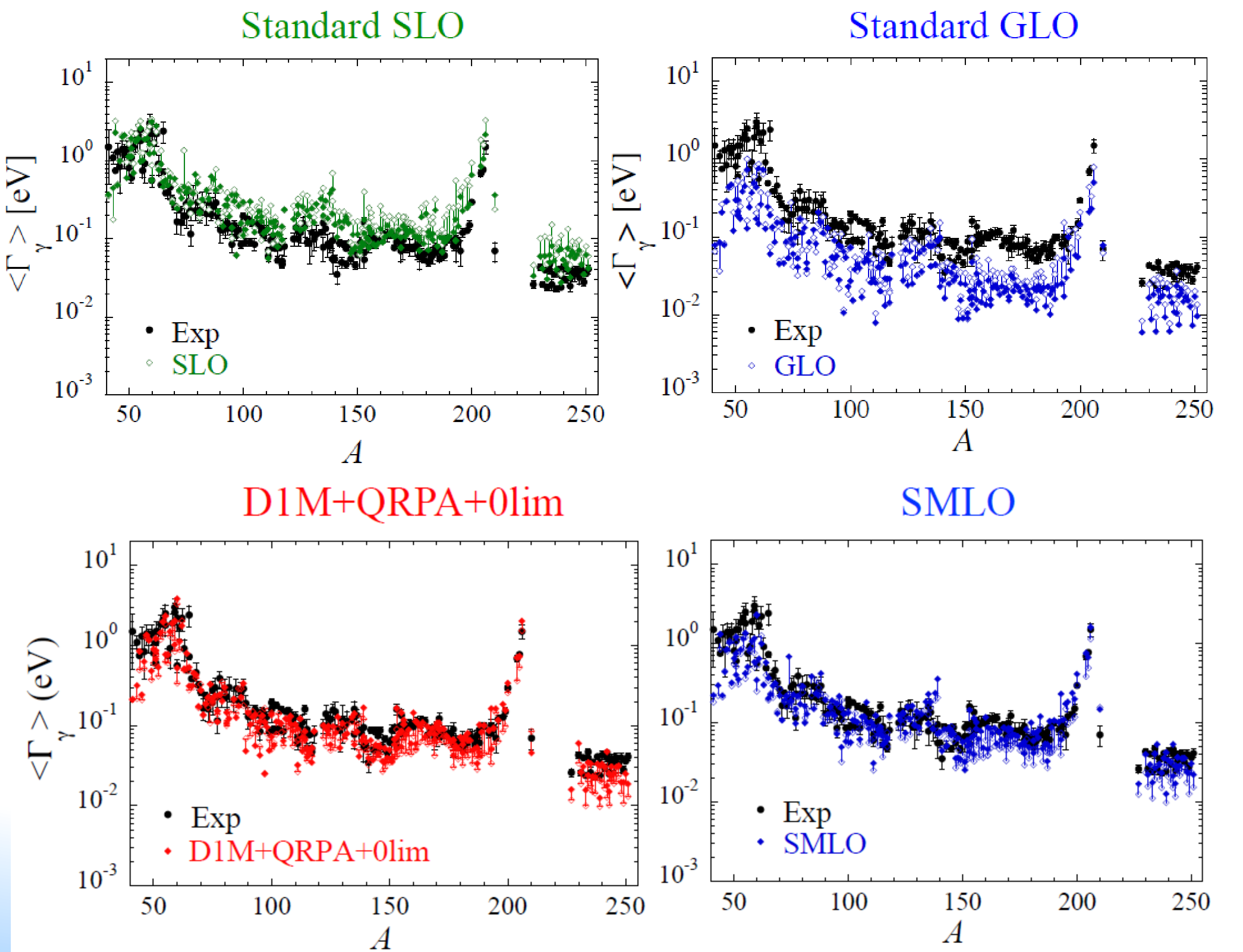




Both PSF models reproduce ~240 MACS within ~ 40-50%

Slide: S. Goriely, CM on PSF evaluation, Nov. 2022

Validation cont'd



Slide: S. Goriely, CM on PSF evaluation, Nov. 2022

Recommendations

- Measurements: no recommendations → full model-dependent uncertainty analysis required - evaluation is needed (ongoing)
- Models:
  - D1M+QRPA + upbend, S. Goriely, S. Hilaire, S. Péru, K. Sieja, Phys. Rev. C 98, 014327 (2018)
  - SMLO, S. Goriely, V. Plujko, Phys. Rev. C 99, 014303 (2018)
- Giant Dipole Resonance Parameters, V. Plujko, O. Gorbachenko, R. Capote, P. Dimitriou, At. Data Nucl. Data Tables 123, 1 (2018)

PSFdatabse

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Atlas
- Atlas GDR
- Atlas ARC
- Atlas DRC
- Atlas THC

Related Documents
- INDC(NDS)-0777
- INDC(NDS)-0745
- INDC(NDS)-0712
- INDC(NDS)-0649
- IAEA TECDOC-1178

Codes
- DICEBOX
- Empire-3.2 (Malta)
- TALYS

Databases
- RIPL
- Photonuclear Data Library
- Oslo Compilation
- Evaluated Gamma-ray Activation File (EGAF)
- Center for Photonuclear Experiments Data (CDFE)

Links
- PSF CRP webpage
- IAEA Nuclear Data Services

Photon Strength Function Database

Experimental data

The PSF database contains all the experimental PSF data that were compiled by the IAEA CRP on Generating a Reference Database for Photon Strength Functions [CRP-photonuclear]. The methods that have been used to extract experimental PSF data are extensively described and assessed in the CRP technical report that is published in [1], and in the recent IAEA reports [2,3,4].

The data files naming convention is self-explanatory and includes: the type and multipolarity of the PSF XL={E1|E2|M1|1} (1 stands for E1+M1), if it is experimental or theoretical data, nuclide (Z,A), method used (NRF, OM, ARC/DRC, pg, pp, RM, photonuclear), NSR keynumber is added for photonuclear data.

f{XL}_{exp|the}_Z_A_method[_NSRKeyNo].dat, e.g. fe1_exp_012_024_photoabs_1966Dol.dat, f1_exp_042_097_OM_3he_2.dat

Each data file is accompanied by a README file with the same naming convention but with the extension 'readme'. The README file contains all the information about the measurement, the experimental method, the model dependent analysis and parameters as well as the reference.

An interface that would allow the user to plot and compare the measured PSFs is under construction.

Here you download the data files for each method:

- UPDATED [1 May 2023] NRF measurements for 23 nuclei with Z=32-78: [download]
- UPDATED [1 May 2023] charged-particle reaction data with the Oslo method for 72 nuclei with Z=21-94: [download]
- UPDATED-corrected [19 Sep 2022] ARC/DRC measurements for 71 nuclei with Z=9-94: [download]
- (p,g) measurements for 22 nuclei with Z=22-40: [download]
- ratio method measurement for 1 nucleus, ^{95}Mo (1 file): [download]
- UPDATED [1 May 2023] (p,p$_0$) measurements for 3 nuclei, ^{96}Mo, ^{120}Sn and ^{208}Pb: [download]
- E1 photodata for 159 nuclei with Z=3-94: [download]
- NEW - corrected [19 Sep 2022] Thermal Capture (THC) measurements (incl. EGAF) for 55 nuclei with Z=9-90: [download]
- The entire experimental database can be downloaded here: [download]

Theoretical data

Theoretical PSF data recommended by the IAEA CRP on Reference Database for Photon Strength Functions are also available for downloading. These theoretical PSFs were validated according to the CRP prescription [1].

Two global models have been used to perform global calculations of E1 and M1 PSFs for all nuclides across the nuclear chart: the D1M-QRPA and SMLO. Details about the models and calculations are available in [1,5,6,7].

The files contain PSFs in units of [MeV-3] at various excitation energies U (QRPA files) or temperature T (SMLO files) so that they can be used for de-excitation processes. Note that for photoabsorption, U=0 or T=0, while for de-excitation the user needs to use the relation: $U=aT^2$ with a=A/10.

- D1M-QRPA data files [2]: [download]
- SMLO data files [3]: [E1], [M1]

Triple Lorentzian model

Theoretical PSF data generated by the triple Lorentzian model (TLO) [8] are now also available for dowloading. The folder contains the source files for generating the PSF data as well as the data files themselves. These PSFs have not been validated according to the CRP prescription [1].

- TLO data files: [download]

The entire experimental and theoretical database can be downloaded [here].

References:

https://www-nds.iaea.org/PSFdatabase/

Publications

[1] S. Goriely et al., The European Physical Journal A 55, 172 (2019).
[2] J. Kopecky, Photon Strength Functions in Thermal Capture, INDC(NDS)-0799.
[3] J. Kopecky, Photon Strength Functions in Thermal Capture II, INDC(NDS)-0815.
[4] J. Kopecky, S. Goriely, Strength Functions Derived from The Discrete And Average Neutron Resonance Capture, INDC(NDS)-0790.
[5] S. Goriely, S. Hilaire, S. Péru, K. Sieja, Phys. Rev. C 98, 014327 (2018).
[6] V. Plujko, O. Gorbachenko, R. Capote, P. Dimitriou, At. Data Nucl. Data Tables 123, 1 (2018).
[7] S. Goriely, V. Plujko, Phys. Rev. C 99, 014303 (2018).

Eur. Phys. J. A (2019) **55**: 172
DOI 10.1140/epja/i2019-12840-1

THE EUROPEAN PHYSICAL JOURNAL A

Review

Reference database for photon strength functions

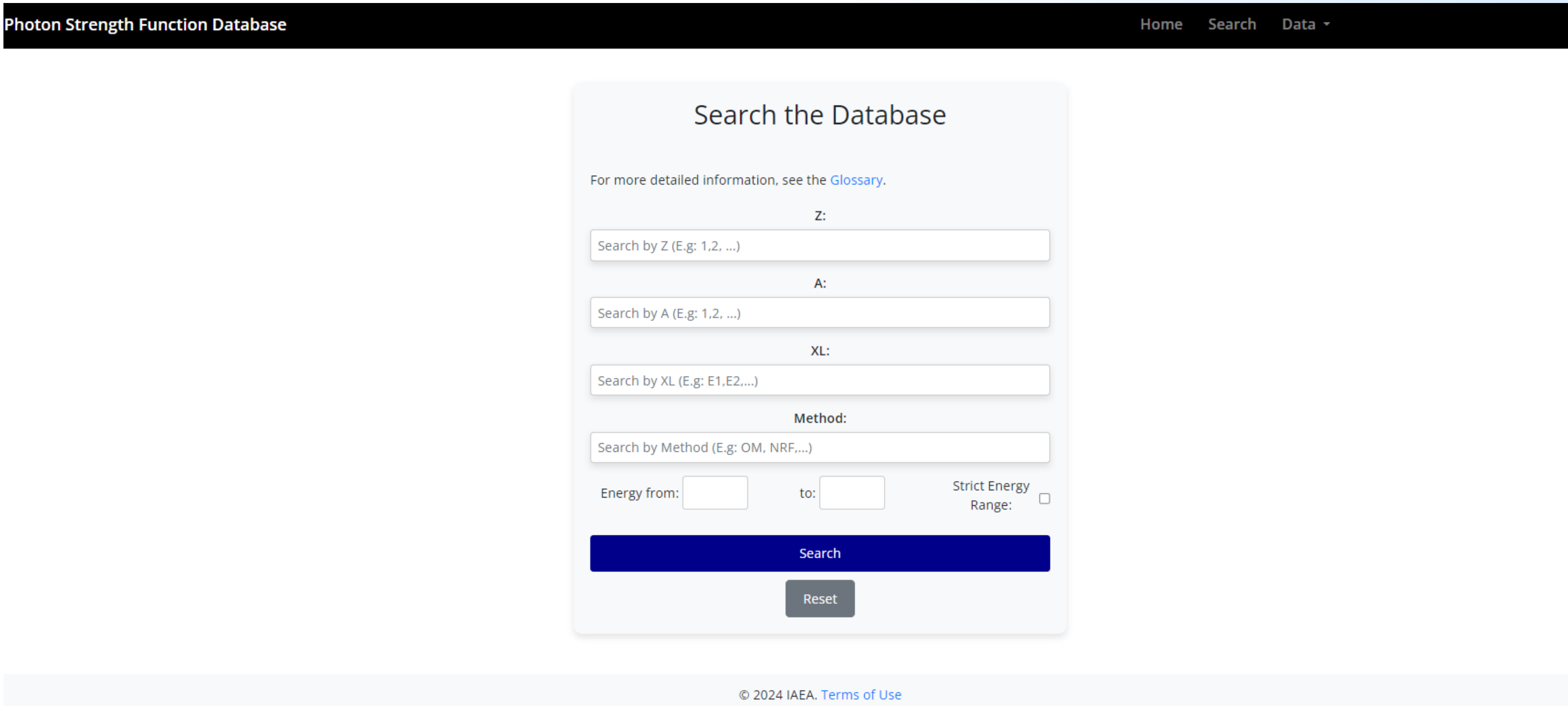
S. Goriely[1], P. Dimitriou[2,a], M. Wiedeking[3], T. Belgya[4], R. Firestone[5], J. Kopecky[6], M. Krtička[7], V. Plujko[8], R. Schwengner[9], S. Siem[10], H. Utsunomiya[11], S. Hilaire[12], S. Péru[12], Y.S. Cho[13], D.M. Filipescu[14], N. Iwamoto[15], T. Kawano[16], V. Varlamov[17], and R. Xu[18]

Follow-up

- Data Development Project on Evaluation of PSF data, 2022+
  - PSF systematics
  - Evaluation of PSF data
  - PSF database interface

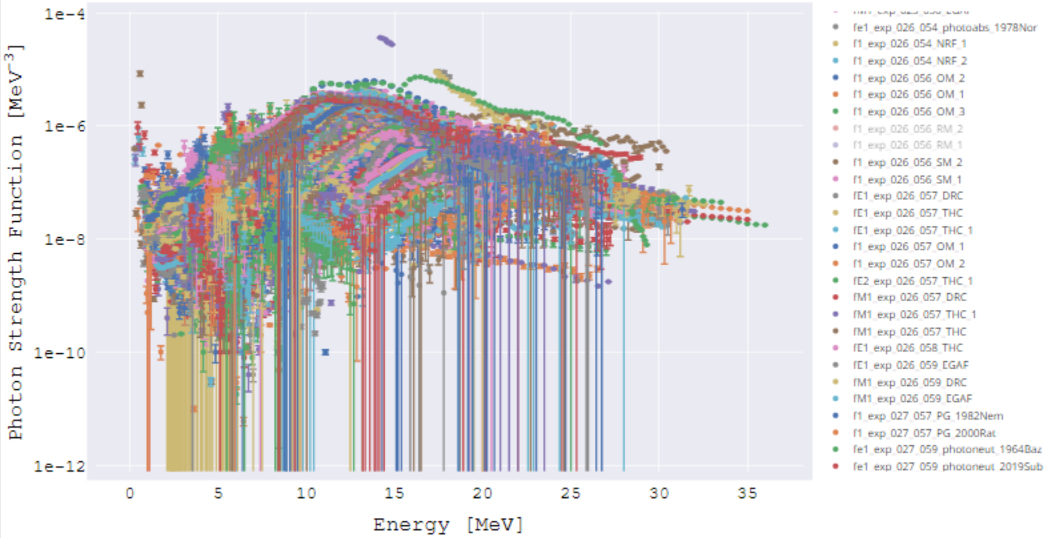
Participants: Goriely, Ingeberg, Kopecky, Krticka, Schwengner, Siem, Wiedeking, Gorbachenko, Plujko

New interface + APIs



Photon Strength Function Database

Home Search Data



X-Axis Scale: Linear Y-Axis Scale: Log Update Graph

Download All Download CSV

Show 10 entries

Search:

Z	A	Method	XL	No. Data	Min E [MeV]	Max E [MeV]	Author	Year	View Readme	Plot
3	7	PHOTOABS	E1	40	7.500	27.000	V.V.Varlamov et al.	1986	fe1_exp_003_007_photoabs_1986Var	
3	6	PHOTOABS	E1	40	6.000	26.500	V.V.Varlamov et al.	1986	fe1_exp_003_006_photoabs_1986Var	
3	6	PHOTONEUT	E1	96	5.680	26.500	B.L.Berman et al.	1965	fe1_exp_003_006_photoneut_1965Be1	
3	7	PHOTOABS	E1	44	7.340	27.100	J Ahrens	1985	fe1_exp_003_007_photoabs_1985Ahr	
3	7	PHOTONEUT	E1	52	7.350	27.130	R.L.Bramblett et al.	1973	fe1_exp_003_007_photoneut_1973Bra	
4	9	PHOTONEUT	E1	59	2.110	6.110	H. Utsunomiya et al.	2000	fe1_exp_004_009_photoneut_2000Uts	
4	9	PHOTONEUT	E1	1	2.060	2.060	K. Sumiyoshi et al.	2002	fe1_exp_004_009_photoneut_2002Sum_K2004003	
4	9	PHOTOABS	E1	37	10.500	28.500	J.Ahrens et al.	1975	fe1_exp_004_009_photoabs_1975Ahr	
4	9	PHOTONEUT	E1	59	2.110	6.110	H. Utsunomiya et al.	2001	fe1_exp_004_009_photoneut_2001Uts	
5	10	PHOTONEUT	E1	113	8.592	25.260	M.H.Ahsan et al.	1987	fe1_exp_005_010_photoneut_1987Ahs	

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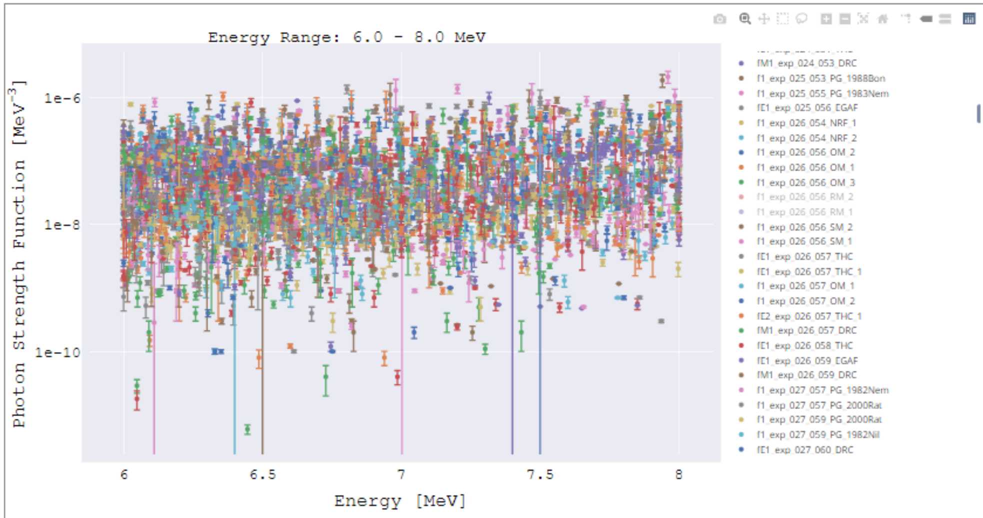

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3	7	PHOTOABS	E1	40	7.500	27.000	V.V.Varlamov et al.	1986	fe1_exp_003_007_photoabs_1986Var	
3	6	PHOTOABS	E1	40	6.000	26.500	V.V.Varlamov et al.	1986	fe1_exp_003_006_photoabs_1986Var	
3	6	PHOTONEUT	E1	96	5.680	26.500	B.L.Berman et al.	1965	fe1_exp_003_006_photoneut_1965Be1	
3	7	PHOTOABS	E1	44	7.340	27.100	J Ahrens	1985	fe1_exp_003_007_photoabs_1985Ahr	
3	7	PHOTONEUT	E1	52	7.350	27.130	R.L.Bramblett et al.	1973	fe1_exp_003_007_photoneut_1973Bra	
4	9	PHOTONEUT	E1	59	2.110	6.110	H. Utsunomiya et al.	2000	fe1_exp_004_009_photoneut_2000Uts	
4	9	PHOTONEUT	E1	59	2.110	6.110	H. Utsunomiya et al.	2001	fe1_exp_004_009_photoneut_2001Uts	
6	13	PHOTOABS	E1	46	7.500	30.000	B.S.Ishkhanov et al.	2002	fe1_exp_006_013_photoabs_2002Ish	
8	17	PHOTOABS	E1	49	5.000	29.000	B.S.Ishkhanov et al.	2002	fe1_exp_008_017_photoabs_2002Ish	
9	20	DRC	E1	7	2.518	6.601	M.J.Kenny et al.	1974	fE1_exp_009_020_DRC	

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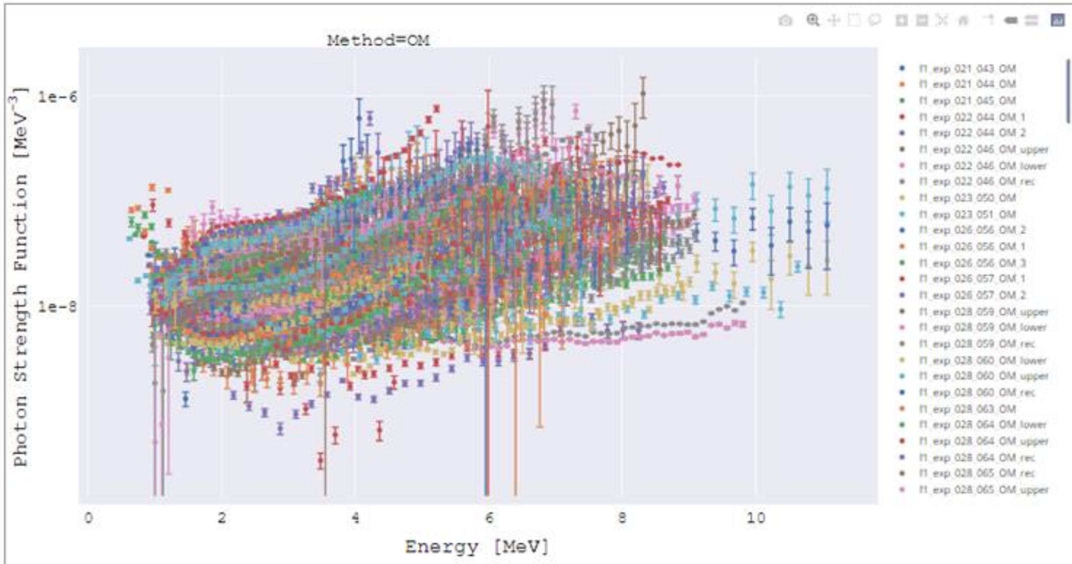

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Search:

Z	A	Method	XL	No. Data	Min E [MeV]	Max E [MeV]	Author	Year	View Readme	Plot
21	44	OM	E1+M1	28	1.434	7.914	A. C. Larsen et al.	2007	f1_exp_021_044_OM	
21	45	OM	E1+M1	29	1.580	8.300	A. C. Larsen et al.	2007	f1_exp_021_045_OM	
21	43	OM	E1+M1	25	1.920	7.680	A. Burger et al.	2012	f1_exp_021_043_OM	
22	44	OM	E1+M1	27	2.173	8.241	A. C. Larsen et al.	2012	f1_exp_022_044_OM_1	
22	44	OM	E1+M1	27	2.173	8.241	A. C. Larsen et al.	2012	f1_exp_022_044_OM_2	
22	46	OM	E1+M1	69	1.790	9.800	M. Guttormsen et al.	2011	f1_exp_022_046_OM_upper	
22	46	OM	E1+M1	69	1.790	9.800	M. Guttormsen et al.	2011	f1_exp_022_046_OM_lower	
22	46	OM	E1+M1	69	1.790	9.800	M. Guttormsen et al.	2011	f1_exp_022_046_OM_rec	
23	51	OM	E1+M1	34	2.194	10.622	A. C. Larsen et al.	2006	f1_exp_023_051_OM	
23	50	OM	E1+M1	28	2.010	8.906	A. C. Larsen et al.	2006	f1_exp_023_050_OM	

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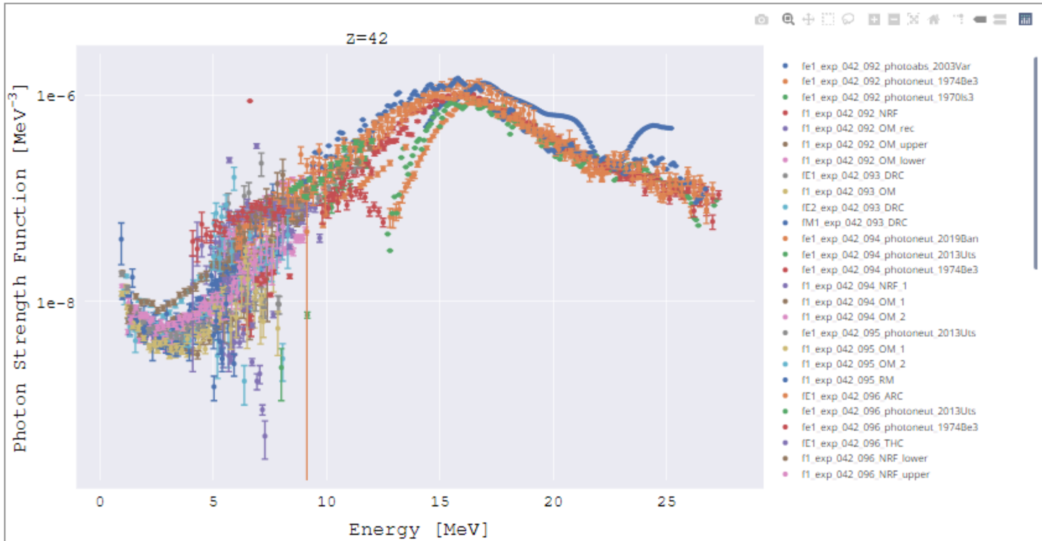

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Z	A	Method	XL	No. Data	Min E [MeV]	Max E [MeV]	Author	Year	View Readme	Plot
42	94	NRF	E1+M1	24	5.100	9.700	G. Rusev et al.	2009	f1_exp_042_094_NRF_1	
42	96	NRF	E1+M1	19	5.300	8.900	G. Rusev et al.	2009	f1_exp_042_096_NRF_lower	
42	92	NRF	E1+M1	33	6.100	12.500	G. Rusev et al.	2009	f1_exp_042_092_NRF	
42	96	NRF	E1+M1	19	5.300	8.900	G. Rusev et al.	2009	f1_exp_042_096_NRF_upper	
42	96	NRF	E1+M1	19	5.300	8.900	G. Rusev et al.	2009	f1_exp_042_096_NRF_rec	
42	98	NRF	E1+M1	23	4.100	8.500	G. Rusev et al.	2008	f1_exp_042_098_NRF	
42	100	NRF	E1+M1	21	4.100	8.100	G. Rusev et al.	2008	f1_exp_042_100_NRF	
42	93	DRC	E1	12	5.189	8.067	A. Wasson et al.	1973	fE1_exp_042_093_DRC	
42	98	ARC	M1	8	6.418	7.910	A.F. Gamalli et al.	1972	fM1_exp_042_098_ARC	
42	96	ARC	E2	2	8.007	9.155	BNL/ECN database	1988	fE2_exp_042_096_ARC	

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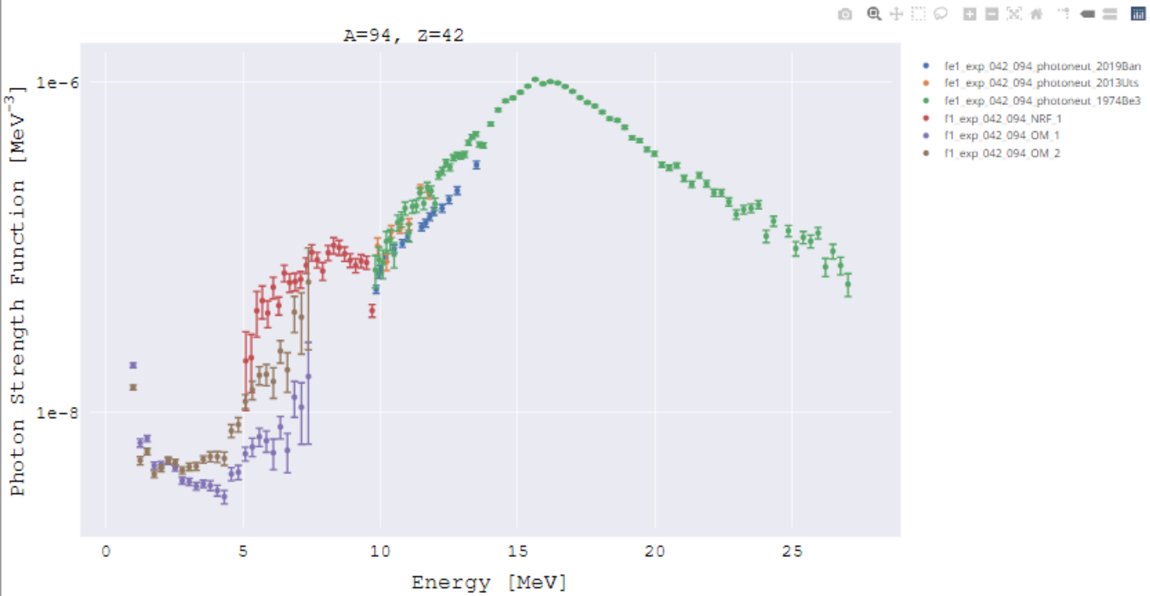

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Search:

Z	A	Method	XL	No. Data	Min E [MeV]	Max E [MeV]	Author	Year	View Readme	Plot
42	94	NRF	E1+M1	24	5.100	9.700	G. Rusev et al.	2009	f1_exp_042_094_NRF_1	
42	94	OM	E1+M1	26	0.998	7.381	M. Guttormsen et al.	2005	f1_exp_042_094_OM_1	
42	94	OM	E1+M1	26	0.998	7.381	H. Utsunomiya et al.	2013	f1_exp_042_094_OM_2	
42	94	PHOTONEUT	E1	15	9.850	13.500	A. Banu et al.	2019	fe1_exp_042_094_photoneut_2019Ban	
42	94	PHOTONEUT	E1	7	9.900	11.780	H. Utsunomiya et al.	2013	fe1_exp_042_094_photoneut_2013Uts	
42	94	PHOTONEUT	E1	78	9.820	27.030	H.Beil et al.	1974	fe1_exp_042_094_photoneut_1974Be3	

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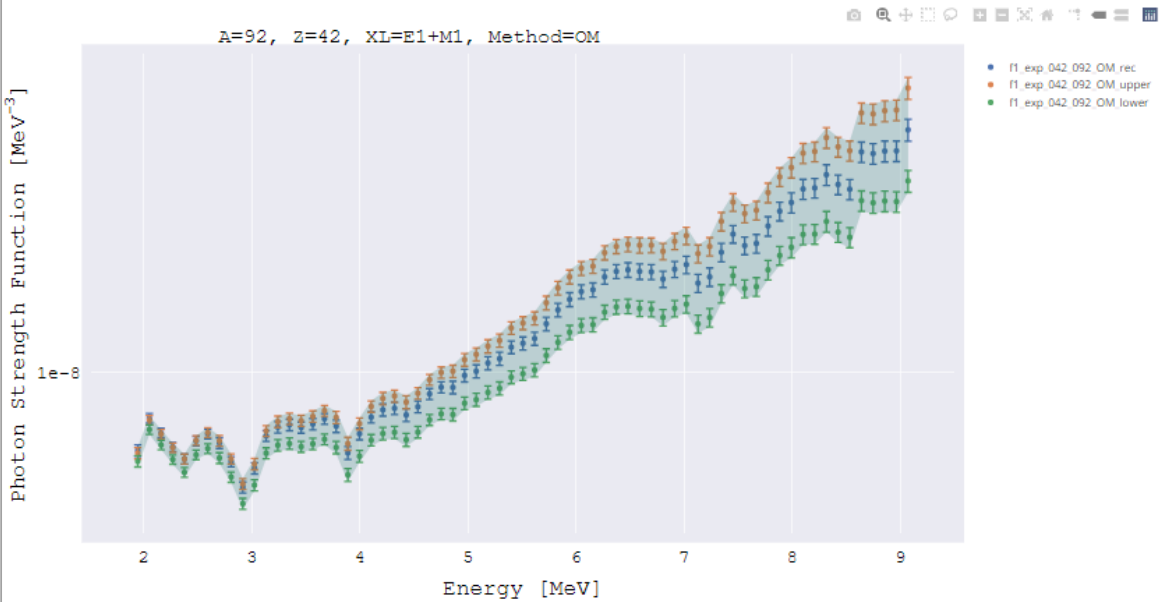

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Compiler	Year	Publication	View Readme	Download All	
M. Wiedeking and V.W. Ingeberg	2016	G. M. Tveten et al., Phys. Rev. C 94, 025804 (2016)	f1_exp_042_092_OM_rec	[data]	[readme]
M. Wiedeking and V.W. Ingeberg	2016	G. M. Tveten et al., Phys. Rev. C 94, 025804 (2016)	f1_exp_042_092_OM_upper	[data]	[readme]
M. Wiedeking and V.W. Ingeberg	2016	G. M. Tveten et al., Phys. Rev. C 94, 025804 (2016)	f1_exp_042_092_OM_lower	[data]	[readme]

PSF database: to do list

- Update photonuclear PSF data
- Include model curves to interface
- Include photonuclear PSF from IAEA/PD-2019 library
- Include links to Atlas (GDR, ARC, DRC, THC)
- Make APIs available

Thank you!