Karlsruhe Institute of Technology

PADF-2. Data for stable isotopes of Ca, Cr, Fe, and Ni

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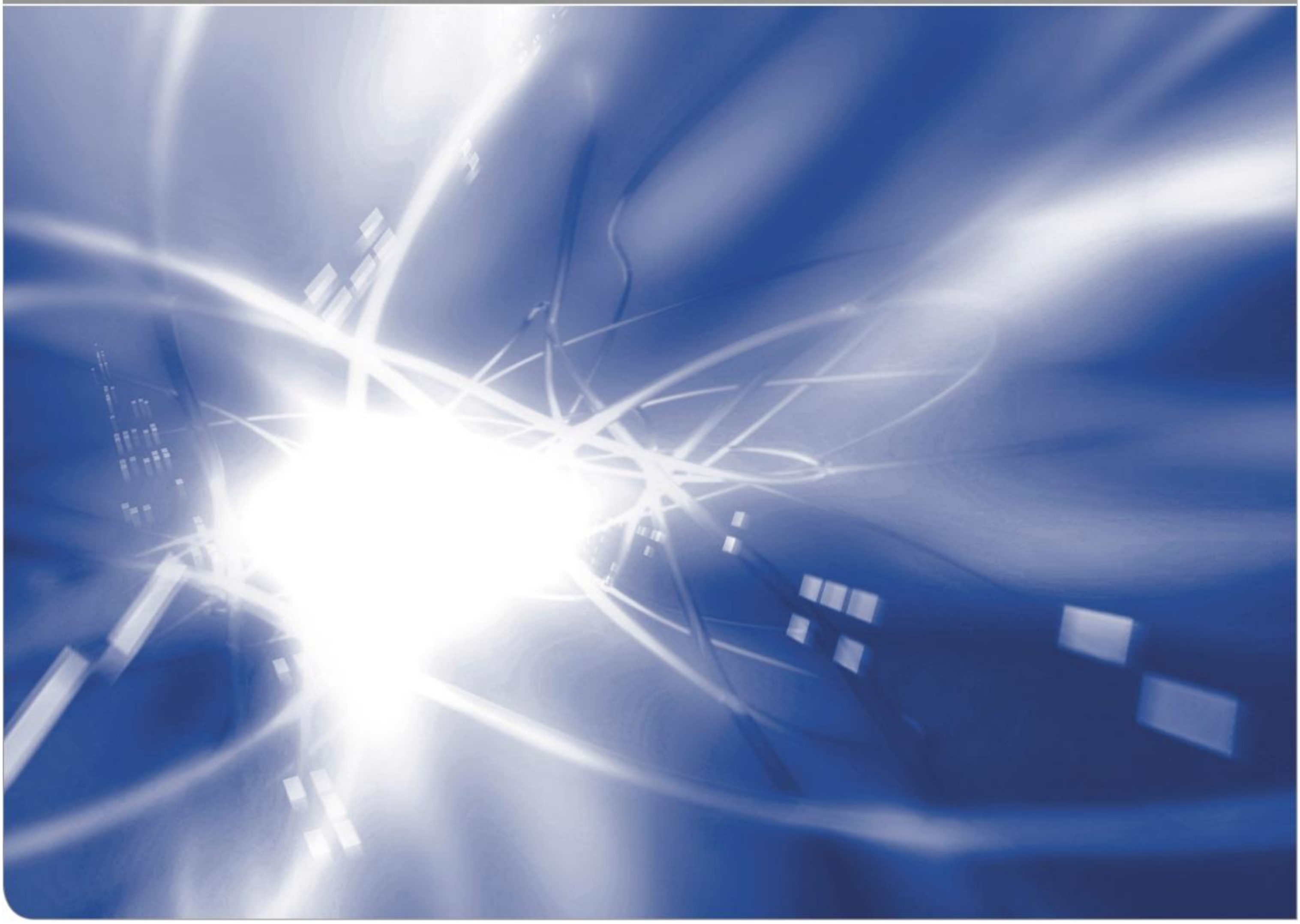

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Abstract

The cross-sections for the interaction of protons with calcium, chromium, iron, and nickel isotopes were obtained at energies from the reaction threshold to 200 MeV. The work included calculations using different models and computer codes, analysis of experimental data, and evaluation of cross sections. For reactions for which no experimental data are available, the cross-sections were estimated by analyzing the calculated data, taking into account the quality and predictive power of various models in different energy ranges.

The resulting files can be downloaded from the https://t1p.de/3vzun website.

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1. Introduction

Data on proton reaction cross-sections are important for a variety of applications. They include astrophysics and environmental sciences, medicine concerning radionuclide production, dosimetry, radiation therapy, accelerator technology relating to detector activation, radiation protection, on-line mass separation, aviation and space technology, accelerator based transmutation of nuclear waste and energy amplification [1]. Proton data play an important role for various emerging energy systems.

In the present work, cross-sections for proton induced reactions were obtained for stable isotopes of Ca, Cr, Fe, and Ni at energies from the reaction threshold to 200 MeV. This work continues the preparation of the PADF-2 files. Previously, the evaluation was performed for isotopes of elements with atomic number from 6 to 15 [2].

The cross-sections were evaluated using the results of theoretical calculations performed with different models and computer codes, and experimental data.

Section 2 briefly describes the computer codes and models used, Section 3 describes the application of experimental data. Cross-section evaluation is discussed in Section 4.

2. Calculation of cross-sections

The cross sections were calculated using the same computer codes as in Ref.[2]: ALICE/ASH (2020) [3-5], CEM03.03 [6,7], PHITS3.27 [8,9], TALYS-1.96 [10,11], and TALYS-G [12-14]. The calculations with TALYS-1.96 were performed using three different models to describe the nuclear level density corresponding to the value of the input parameter *ldmodel* equal to 1, 2, and 3. A brief description of the codes is given in Ref.[2].

The problem of using different codes for calculating cross-sections lies not only in the different “quality” of description of nuclear processes, which leads to the need to introduce unequal statistical weights for different codes. Different codes contain models that are absent in other programs. This concerns, for example, the use of the Fermi breakup model in the CEM code and the models to describe the non-equilibrium and equilibrium emission of heavy clusters in the ALICE/ASH code [2].

The same weights with a certain degree of caution can be attributed only to the calculations using the TALYS-1.96 code and different options for calculating the level densities and the TAYLS-G code. In general, however, the combination of calculated curves obtained using different computer codes should be performed with different weights. The determination of the final theoretical curve for each reaction should be based on an analysis of the possible mechanism of this reaction at different energies. This problem is solved in this work for each particular class of reactions.

Figures 1-3 show a typical spread of data calculated with codes used in this work. In addition, cross-sections from international libraries [15-22] are shown, which were also obtained by the authors using different calculation methods.

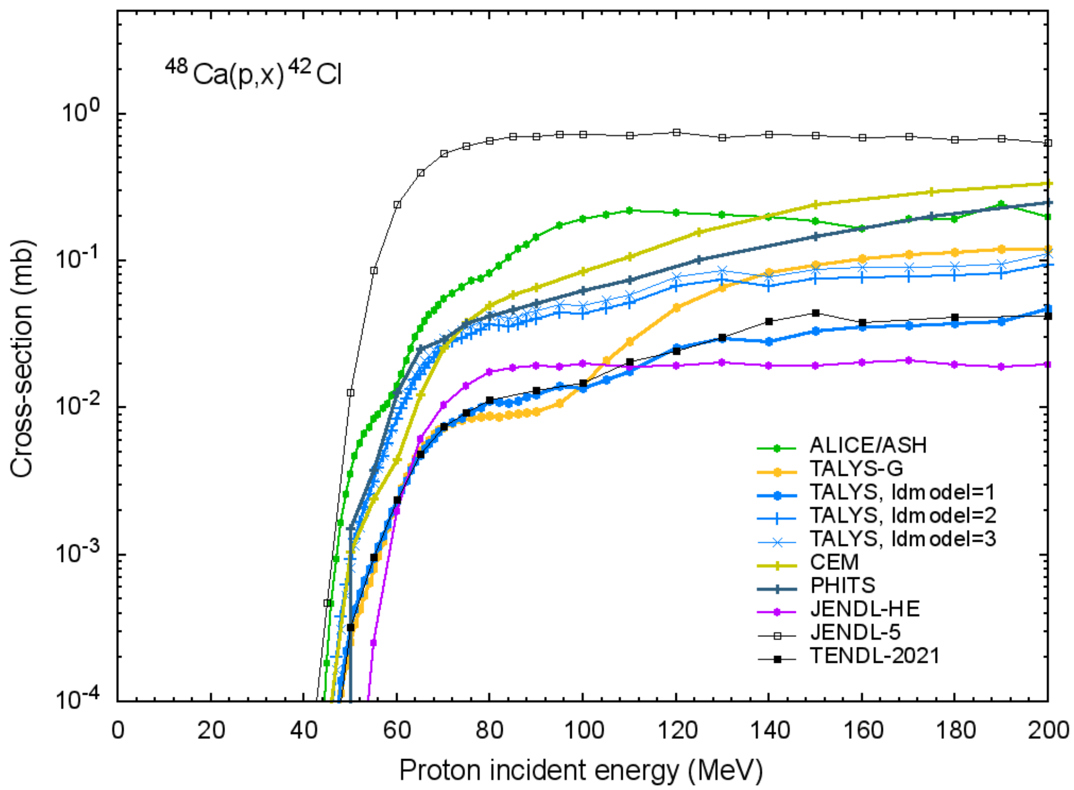

Fig.1 Example of reaction cross-section for p+^{48}Ca interaction calculated using different model and codes, and taken from libraries.

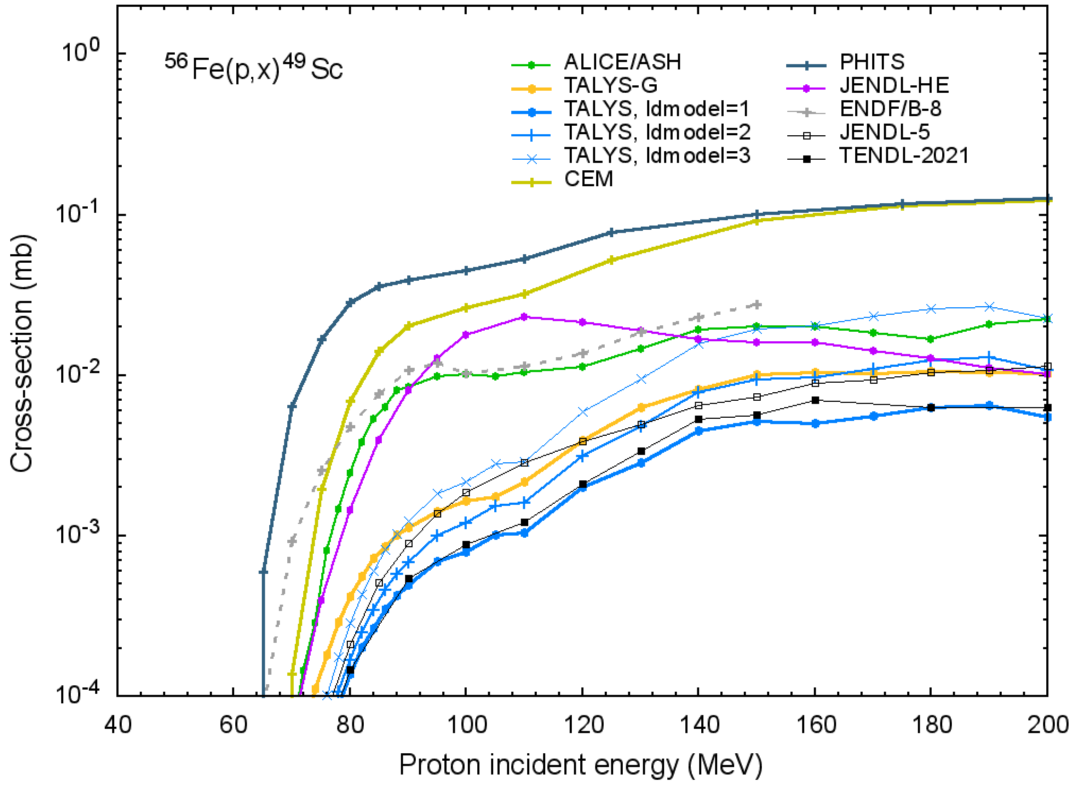

Fig.2 Example of reaction cross-section for p+^{56}Fe interaction calculated using different model and codes, and taken from libraries.

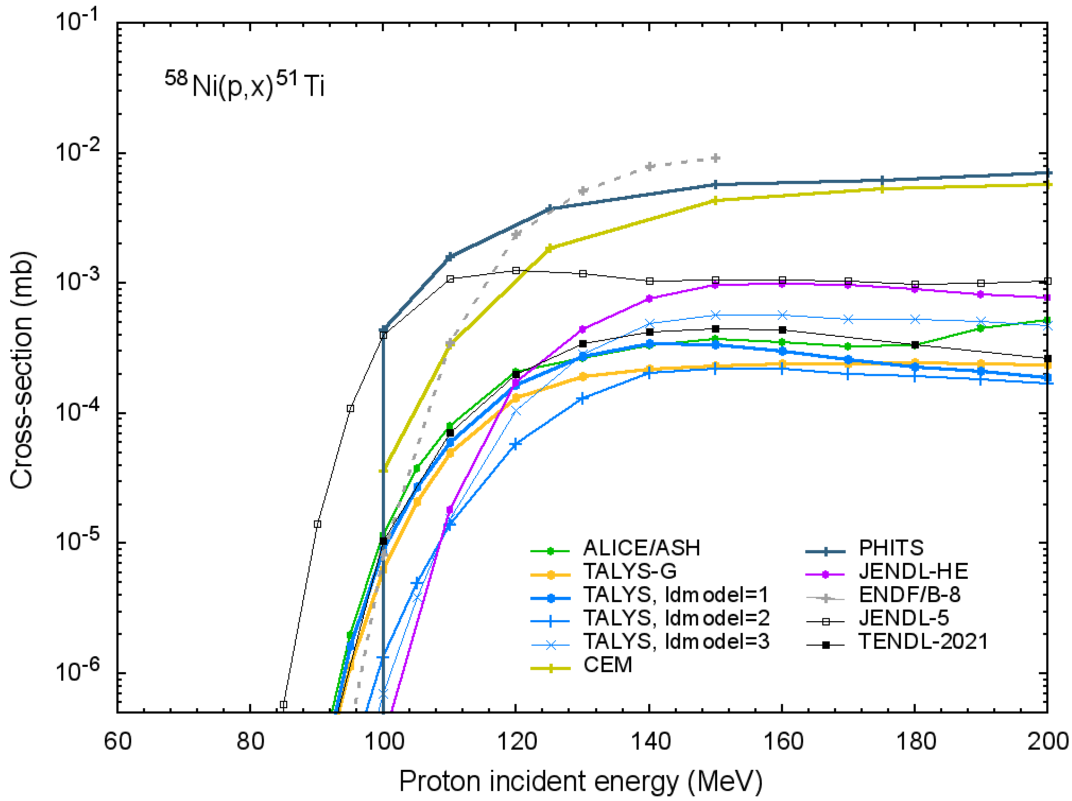

Fig.3 Example of reaction cross-section for p+^{58}Ni interaction calculated using different model and codes, and taken from libraries.

3. Measured cross-sections

Experimental data were taken from EXFOR [23]. In most cases, data from original publications were analysed. The original information together with the calculations often allows to answer the question whether the cross-section compiled in EXFOR and measured by the activation method is cumulative or independent if the corresponding indicator is missing, and to solve other problems, as, for example, the uncertainty of the data recorded with the "*G,M+*" key.

In this work, as in Ref.[2], both independent and cumulative data for specific target-isotopes, and independent and cumulative data for natural mixtures of isotopes were used. The application of data for natural mixtures, especially cumulative cross sections, is challenging if independent and/or cumulative data on specific isotopes exist for the reaction in question. Such a problem is solved in this work for each reaction separately.

Also, as in Ref.[2], the partial data, "*PAR*", are used for those energy ranges where it is possible. The measured relative data, "*REL*" were converted to absolute values if reliable and extensive experimental information was available for this reaction.

For a number of reactions, cross-sections with a certain degree of accuracy can be evaluated using mainly experimental data, while for other reactions the evaluation of the final curve is possible only with the use of calculation results. Examples of such reactions are given in Figs.4.5.

Due to the fact that the experimental data used in this work are quite numerous, references to the measured data are not given in this report, but are presented in a file for each target in the comment section MF=1, MT=451.

4. Cross-section evaluation

Cross-sections were evaluated for all open reaction channels for which experimental data are available and for those where only calculated values obtained using different models and codes are available.

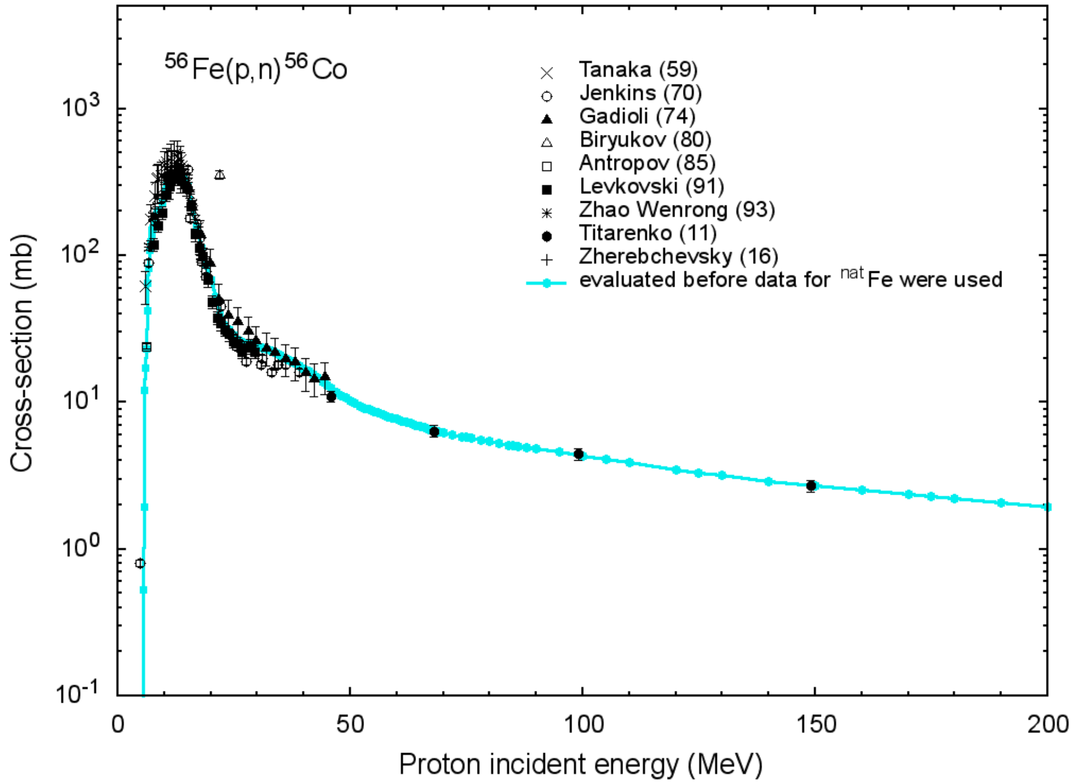

Fig.4. Example of a reaction for which experimental data can serve as a basis for estimating the entire excitation function.

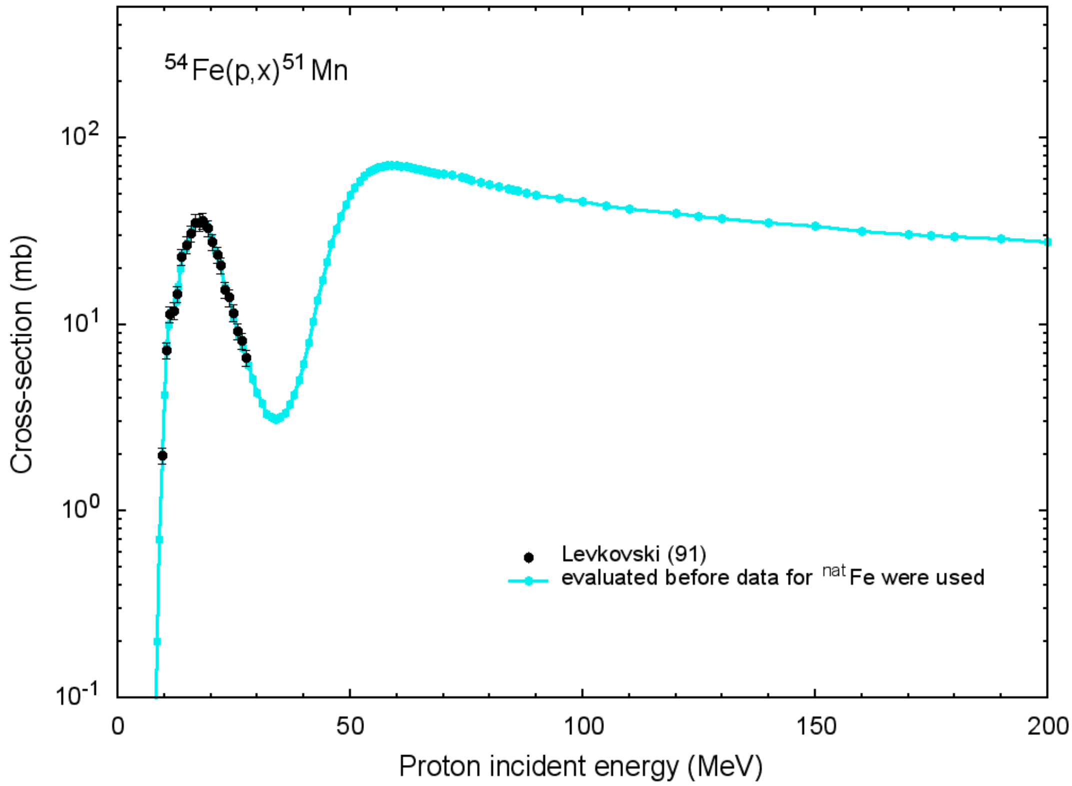

Fig.5. Example of a reaction for which calculated data are essential to evaluate the cross-section.

If experimental data for any reaction were not available, the reaction cross section was estimated on the basis of calculated data obtained with different codes. The “quality” of the models, their ability to describe certain processes, the general applicability of the models, and their predictive power for different classes of reactions and in different energy ranges were taken into account [2]. For example, the cross-sections calculated with TALYS, CEM, PHITS, and ALICE/ASH were generally not included with equal weights in the statistical sum determining the final result. An example of the evaluation is shown in Fig.6.

If experimental data existed for a particular reaction, the cross-section was first estimated based on the results of calculations with different models, and then the final calculated curve was combined with the experimental data. As a rule, the FIT7G code [24] was used. Examples of the evaluation are shown in Fig.7 for ^{54}Mn production by proton irradiation of iron isotopes and natural iron.

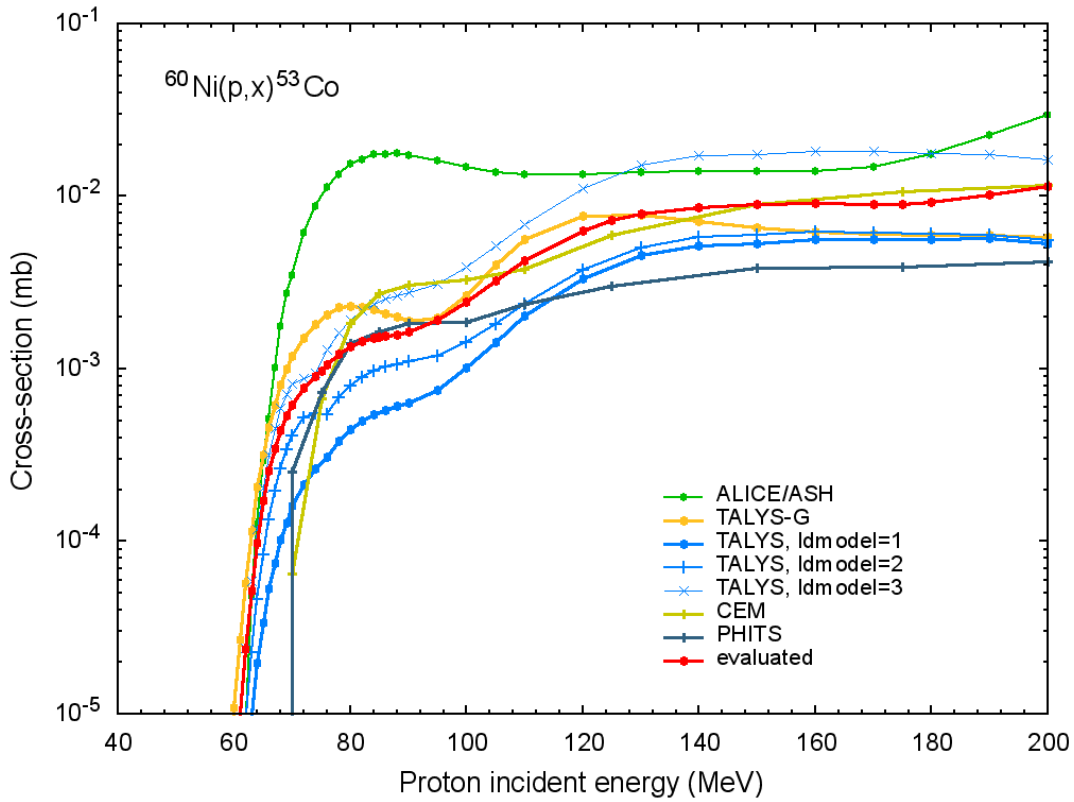

Fig.6. Example of an evaluation for a reaction for which there are no experimental data.

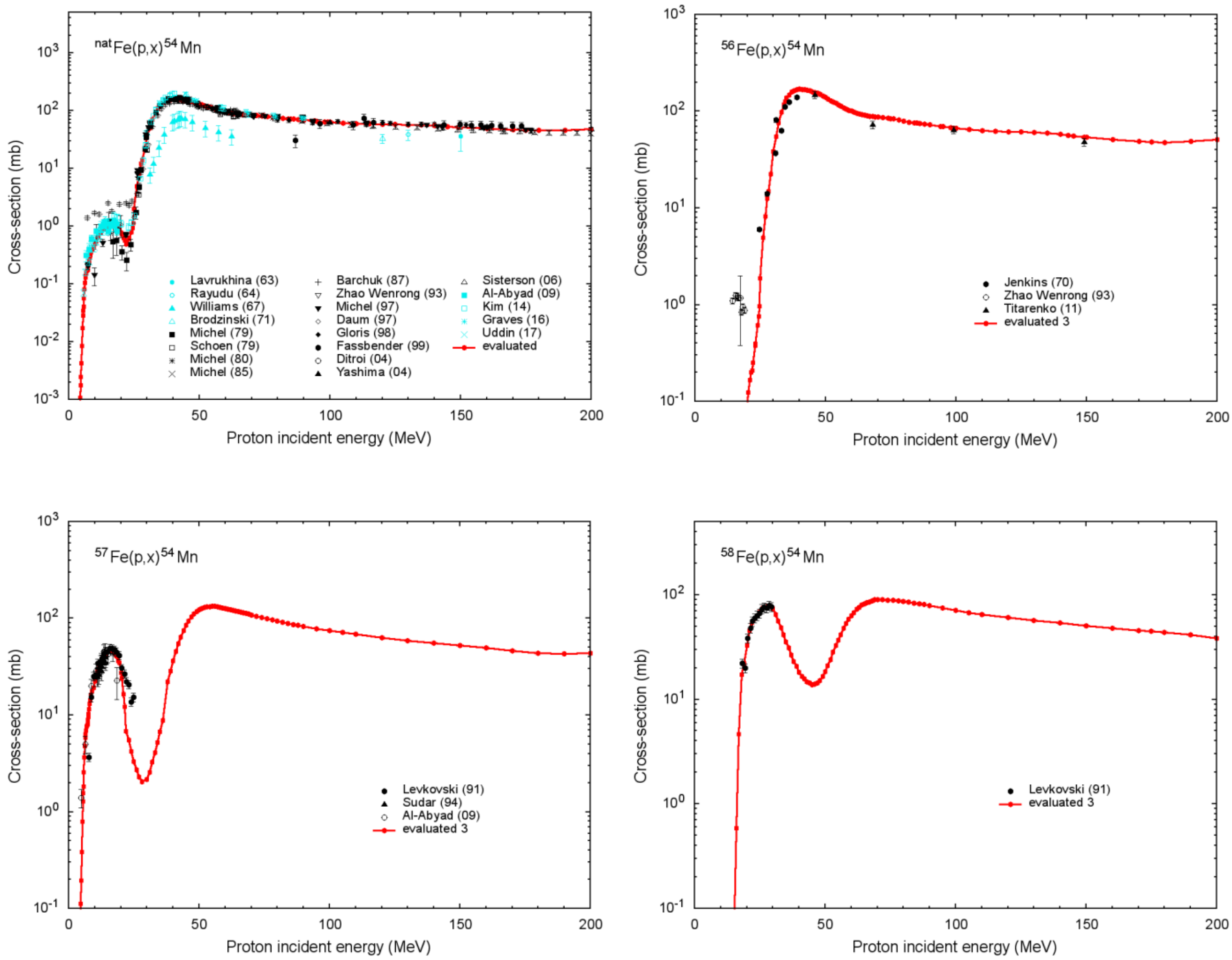

Fig.7. Example of an evaluation of ^{54}Mn production cross-section for natural iron, and iron isotopes with mass number 56, 57, and 58.

5. Results

The cross sections were evaluated for proton induced reactions for calcium, isotopes ^{40}Ca, ^{42}Ca, ^{43}Ca, ^{44}Ca, ^{46}Ca, ^{48}Ca, chromium isotopes ^{50}Cr, ^{52}Cr, ^{53}Cr, ^{54}Cr, iron isotopes ^{54}Fe, ^{56}Fe, ^{57}Fe, ^{58}Fe, and nickel isotopes ^{58}Ni, ^{60}Ni, ^{61}Ni, ^{62}Ni, ^{64}N at energies up to 200 MeV.

The prepared data files also include neutron-, proton-, deuteron-, triton-, ^{3}He-, and α-particle production cross-sections, which may be of interest for some applications.

The obtained files were recorded using ENDF-6 format and MF=10 and MT=5 sections. Details are given in Ref.[2].

As in Ref.[3] the resulting files also include reactions with of π^+ and π^- formation, which are not usually available in libraries. Therefore, it is not surprising that the files contain information about the cross-section, for example, for $^{56}Fe(p,x)^{57}Ni$ reaction.

The data obtained, together with the files prepared in Ref.[2], can be downloaded from Ref.[25].

Plots of cross sections of reactions for which experimental data are exist are given in the Appendix. The data for individual isotopes of each element are given first, followed by data for the natural mixture, including independent and cumulative cross-sections.

6. Conclusion

The cross sections of proton induced reactions for stable isotopes of Ca, Cr, Fe, and Ni at energies up to 200 MeV have been evaluated.

The work included theoretical calculations using various models and computer codes and analysis of experimental data.

The resulting files, combined under the name PADF-2, can be downloaded from the https://t1p.de/3vzun website [25].

Acknowledgement

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References

[1] R. Michel, R. Bodemann, H. Busemann, R. Daunke, M. Gloris, H.-J. Lange, B. Klug, A. Krins, I. Leya, M. Lüpke, S. Neumann, H. Reinhardt, M. Schnatz-Büttgen, U. Herpers, Th. Schiekel, F. Sudbrock, B. Holmqvist, H. Conde, P. Malmborg M. Suter, B. Dittrich-Hannen, P.-W. Kubik, H.-A. Synal, D. Filges. Cross sections for the production of residual nuclides by low- and medium-energy protons from the target elements C, N, 0, Mg, Al, Si, Ca, Ti, V, Mn, Fe, Co, Ni, Cu, Sr, Y, Zr, Nb, Ba and Au, *Nucl. Instr. Meth. Phys. Res.* B129 (1997) 153

[2] A.Yu. Konobeyev, D. Leichtle, Proton activation data file PADF-2. Targets with atomic numbers from 6 to 15, KIT Scientific Working Papers, 204 (2022), https://publikationen.bibliothek.kit.edu/1000152627

[3] C.H.M. Broeders, A.Yu. Konobeyev, Yu.A. Korovin, V.P. Lunev, M. Blann, ALICE/ASH–pre-compound and evaporation model code system for calculation of excitation functions, energy and angular distributions of emitted particles in nuclear reactions at intermediate energies, FZKA 7183, Forschungszentrum Karlsruhe (2006), https://doi.org/10.5445/IR/270064701

[4] A.Yu. Konobeyev, U. Fischer, Simulation of heavy cluster emission in nucleon induced reactions on targets from C to Bi at intermediate energies, KIT Scientific Reports, 7684, 2014, https://doi.org/10.5445/KSP/1000043611

[5] A.Yu. Konobeyev, U. Fischer, P.E. Pereslavtsev, M. Blann, Improved simulation of the pre-equilibrium triton emission in nuclear reactions induced by nucleons, *Nuclear Data Sheets*, 118 (2014) 280

[6] S.G. Mashnik, A.J. Sierk, CEM03.03 User manual, Report LA-UR-12-01364, 2012, https://mcnp.lanl.gov/pdf_files/la-ur-12-01364.pdf

[7] S.G. Mashnik, L.M. Kerby, MCNP6 simulation of light and medium nuclei fragmentation at intermediate energies, *EPJ Web of Conferences*, 117 (2016) 03008, https://doi.org/10.1051/epjconf/201611703008

[8] PHITS, Version 3.27 (2022) https://phits.jaea.go.jp/index.html

[9] T. Sato, Y. Iwamoto, S. Hashimoto, T. Ogawa, T. Furuta, S. Abe, T. Kai, P.-E. Tsai, N. Matsuda, H. Iwase, H. Shigyo, L. Sihver, and K. Niita, Features of Particle and Heavy Ion Transport code System (PHITS), *J. Nucl. Sci. Technol.* 55 (2018) 684, https://doi.org/10.1080/00223131.2017.1419890

[10] A. Koning, S. Hilaire, S. Goriely, TALYS-1.96/2.0 (2021). Simulation of nuclear reactions, https://tendl.web.psi.ch/tendl_2021/talys.html

[11] A.J. Koning, S. Hilaire, M.C. Duijvestijn, TALYS-1.0, Proc. Int. Conf. on Nuclear Data for Science and Technology (ND2007), Nice, France, eds O.Bersillon, F.Gunsing, E.Bauge, R.Jacqmin, S.Leray, *EDP Sciences*, N058, 2008, p.211, https://doi.org/10.1051/ndata:07767

[12] TALYS-G code, https://www.inr.kit.edu/english/940.php

[13] A.Yu. Konobeyev, U. Fischer, P.E. Pereslavtsev, A. Koning, M. Blann, Implementation of GDH model in TALYS-1.7 code, KIT Scientific Working Papers, N45, 2016, https://doi.org/10.5445/IR/1000052543

[14] A.Yu. Konobeyev, U. Fischer, A.J. Koning, P.E. Pereslavtsev, M. Blann, Implementation of the geometry dependent hybrid model in TALYS. J*. Korean Phys. Soc*. 59, 935 (2011), https://doi.org/10.3938/jkps.59.935

[15] ENDF/B-VIII.0, Proton reaction sublibrary, https://www.nndc.bnl.gov/endf-b8.0/download.html

[16] D.A. Brown, M.B. Chadwick, R. Capote, A.C. Kahler, A. Trkov, M.W. Herman, A.A. Sonzogni, Y. Danon, A.D. Carlson, M. Dunn, D.L. Smith, G.M. Hale, G. Arbanas, R. Arcilla, C.R. Bates, B. Beck, B. Becker, F. Brown, R.J. Casperson, J. Conlin, D.E. Cullen, M.-A. Descalle, R. Firestone, T. Gaines, K.H. Guber, A.I. Hawari, J. Holmes, T.D. Johnson, T. Kawano, B.C. Kiedrowski, A.J. Koning, S. Kopecky, L. Leal, J.P. Lestone, C. Lubitz, J.I. Márquez Damián, C.M. Mattoon, E.A. McCutchan, S. Mughabghab, P. Navratil, D. Neudecker, G.P.A. Nobre, G. Noguere, M. Paris, M.T. Pigni, A.J. Plompen, B. Pritychenko, V.G. Pronyaev, D. Roubtsov, D. Rochman, P. Romano, P. Schillebeeckx, S. Simakov, M. Sin, I. Sirakov, B. Sleaford, V. Sobes, E.S. Soukhovitskii, I. Stetcu, P. Talou, I. Thompson, S. van der Marck, L. Welser-Sherrill, D. Wiarda, M. White, J.L. Wormald, R.Q. Wright, M. Zerkle, G. Žerovnik, Y. Zhu, ENDF/B-VIII.0: The 8th major release of the nuclear reaction data library with CIELO-project cross sections, new standards and thermal scattering data, *Nuclear Data Sheets*, 148, (2018) 1

[17] JENDL High Energy File 2007, https://wwwndc.jaea.go.jp/ftpnd/jendl/jendl-he-2007.html

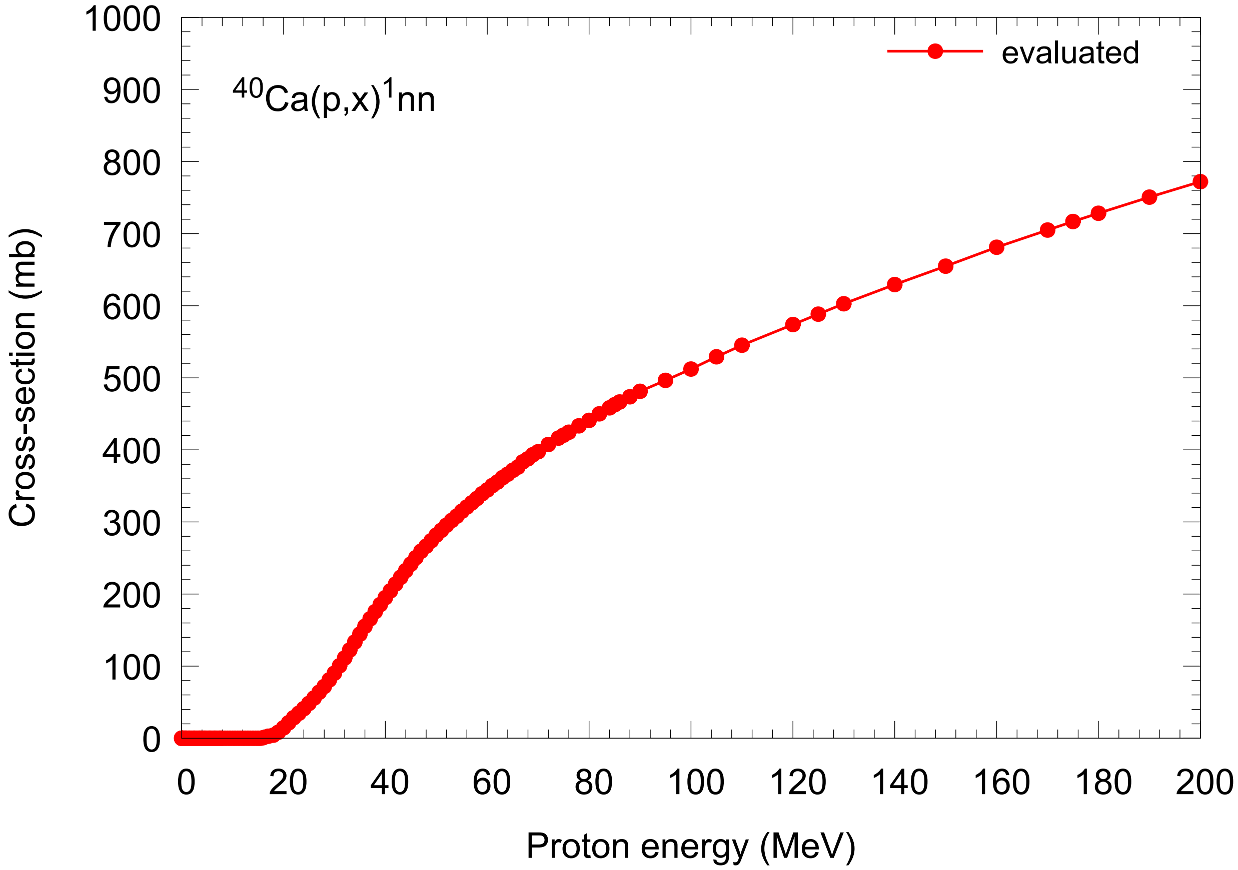
[18] Y. Watanabe, K. Kosako, S. Kunieda, S. Chiba, R. Fujimoto, H. Harada, M. Kawai, F. Maekawa, T. Murata, H. Nakashima, K. Niita, N. Shigyo, S. Shimakawa, N. Yamano, T. Fukahori, Status of JENDL High Energy File, J. of the Korean Physical Society, 59 (2011) 1040, https://doi.org/10.3938/jkps.59.1040
[19] JENDL-5 Proton sublibrary, https://wwwndc.jaea.go.jp/ftpnd/jendl/jendl-5-p.html
[20] O. Iwamoto, N. Iwamoto, K. Shibata, A. Ichihara, S. Kunieda, F. Minato, S. Nakayama, Status of JENDL, *EPJ Web of Conferences*, 239 (2020) 09002, https://doi.org/10.1051/epjconf/202023909002
[21] A.J. Koning, D. Rochman, J. Sublet, N. Dzysiuk, M. Fleming, S. van der Marck, TENDL: Complete nuclear data library for innovative nuclear science and technology, *Nuclear Data Sheets* 155 (2019) 1
[22] TENDL-2021 https://tendl.web.psi.ch/tendl_2021/tendl2021.html
[23] Experimental Nuclear Reaction Data (EXFOR), https://www-nds.iaea.org/exfor/
[24] Fit7G: Fitting calculated values to experimental data, https://t1p.de/91f4h or https://bwsyncandshare.kit.edu/s/SEGa6pitEQLrH4b
[25] PADF-2. Proton activation data files (2023), https://t1p.de/3vzun or https://bwsyncandshare.kit.edu/s/YwCwKH5qSjBPjfx

Calcium

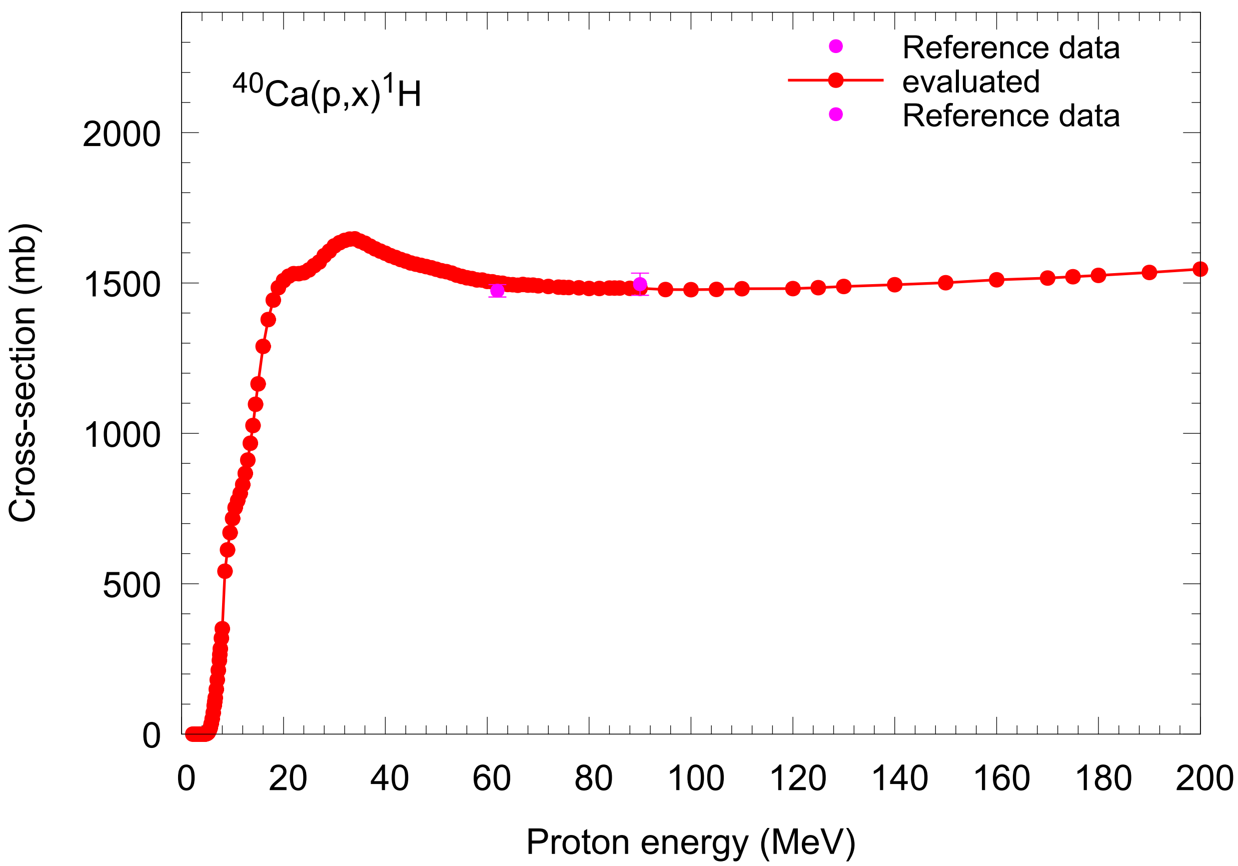
Chromium

Iron

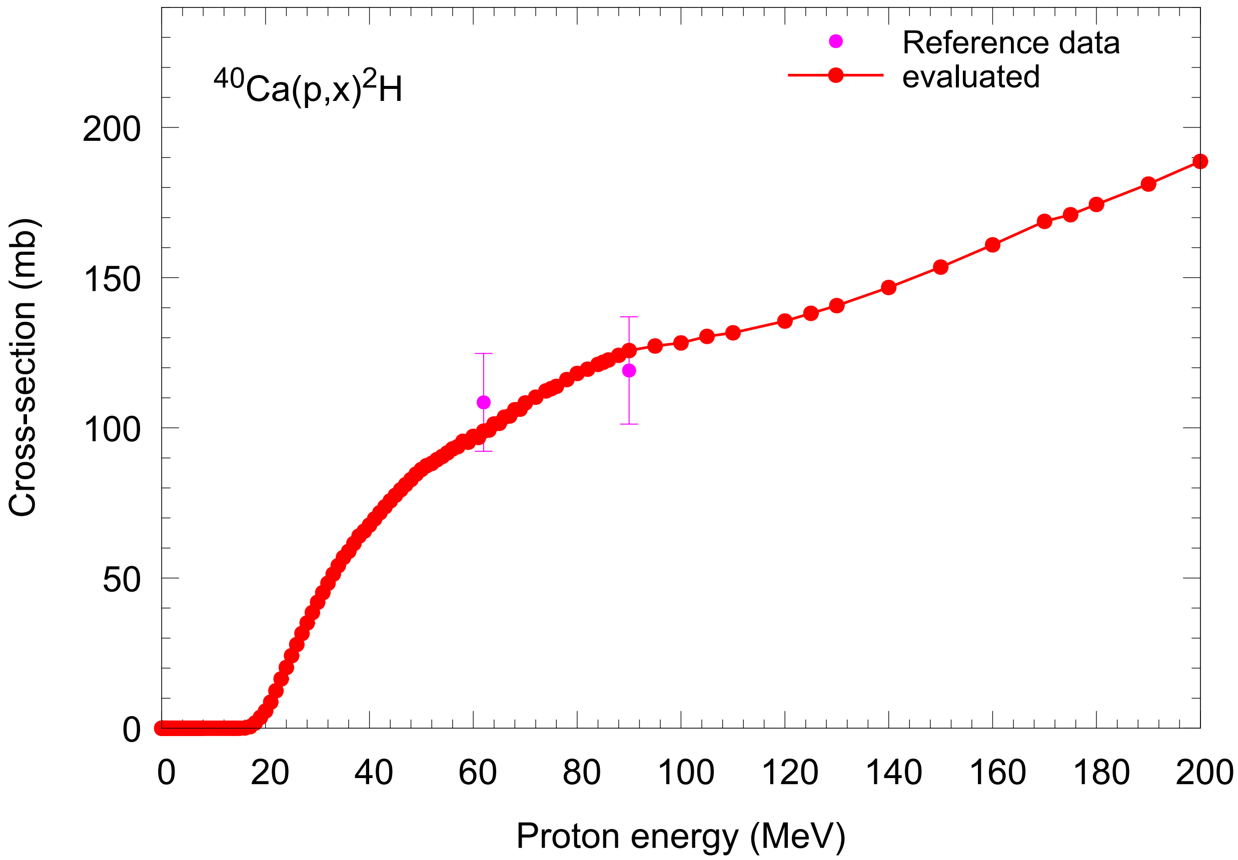
Nickel



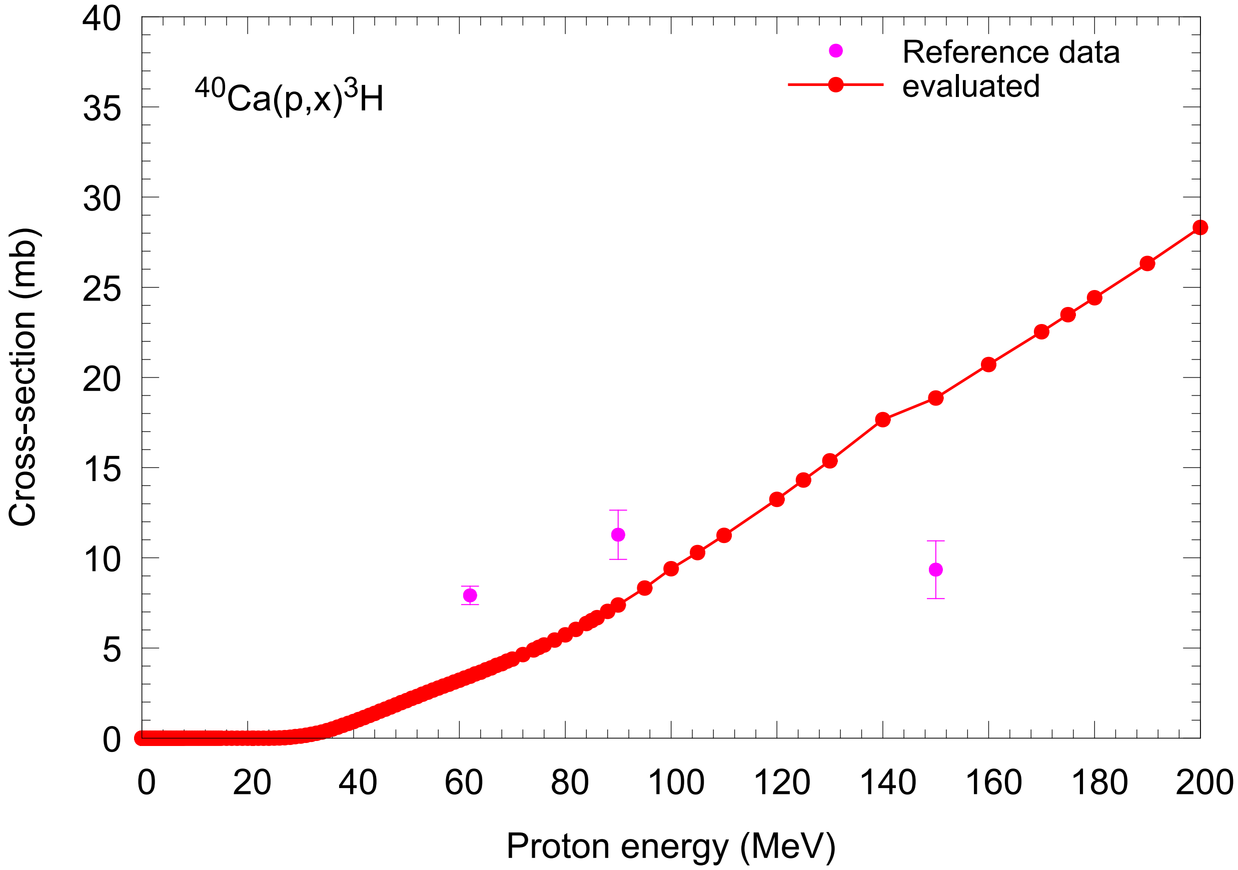
^{40}Ca(p,x)^{1}nn
evaluated
Cross-section (mb)
Proton energy (MeV)



^{40}Ca(p,x)^{1}H
Reference data
evaluated
Reference data
Cross-section (mb)
Proton energy (MeV)



$^{40}Ca(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
0
20
40
60
80
100
120
140
160
180
200



$^{40}Ca(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
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35
40
0
20
40
60
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100
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140
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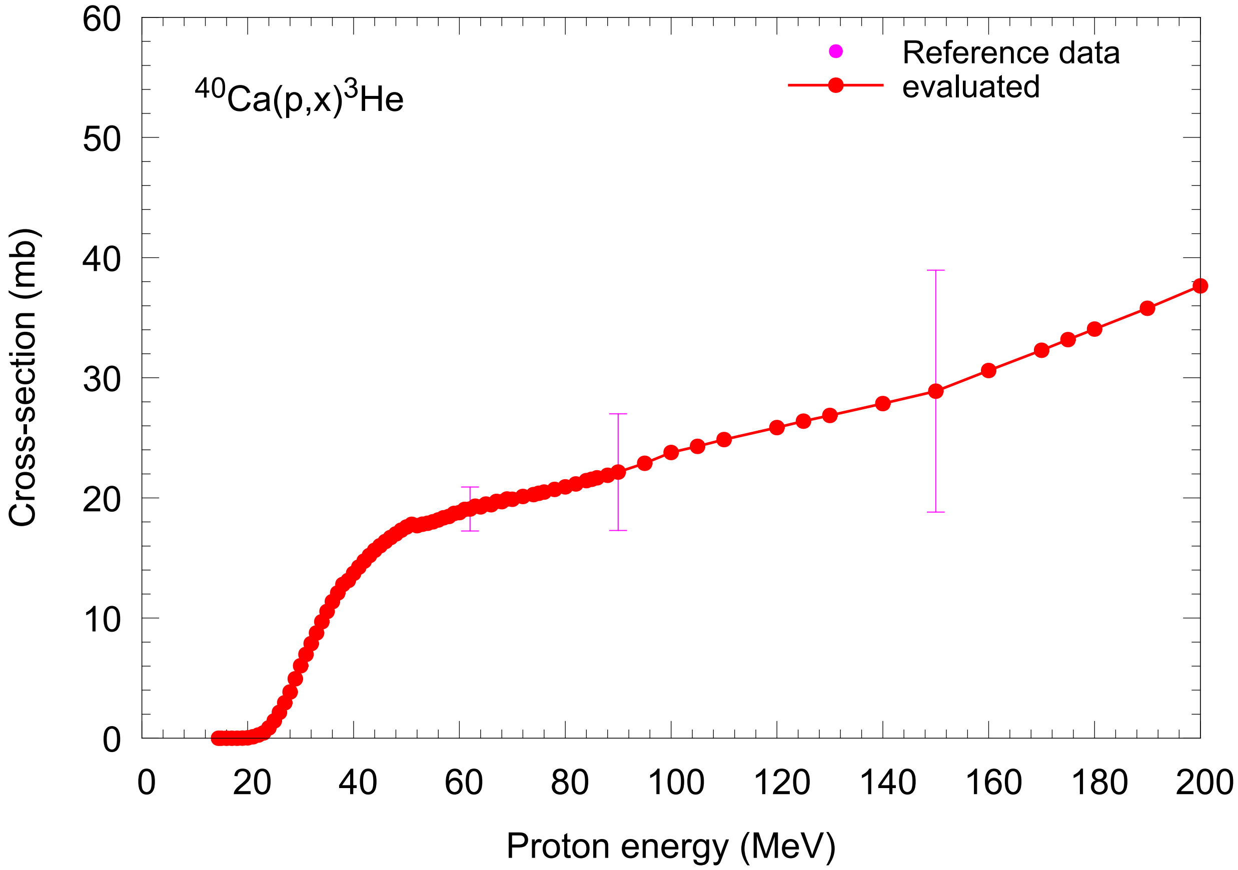
200



$^{40}Ca(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
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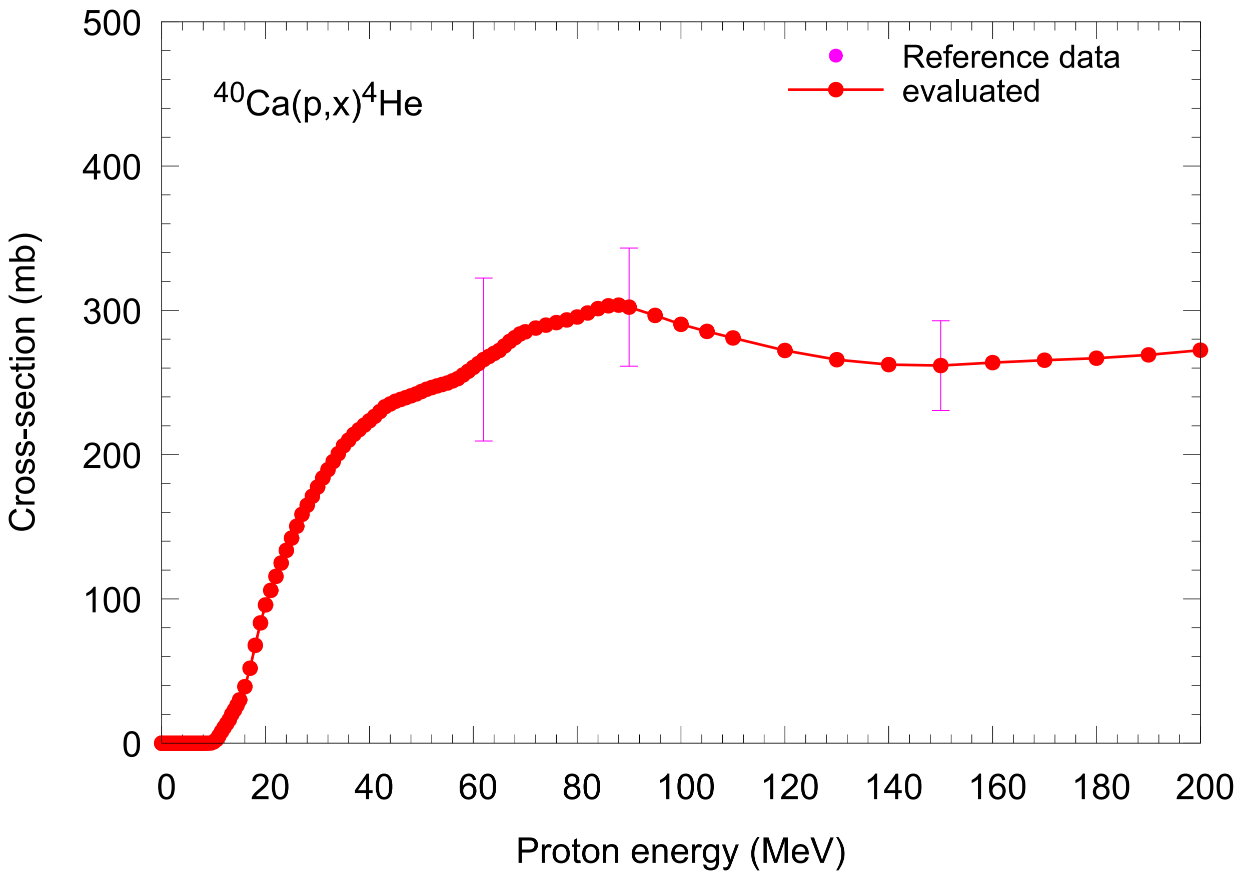
60
0
20
40
60
80
100
120
140
160
180
200



$^{40}Ca(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
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100
200
300
400
500
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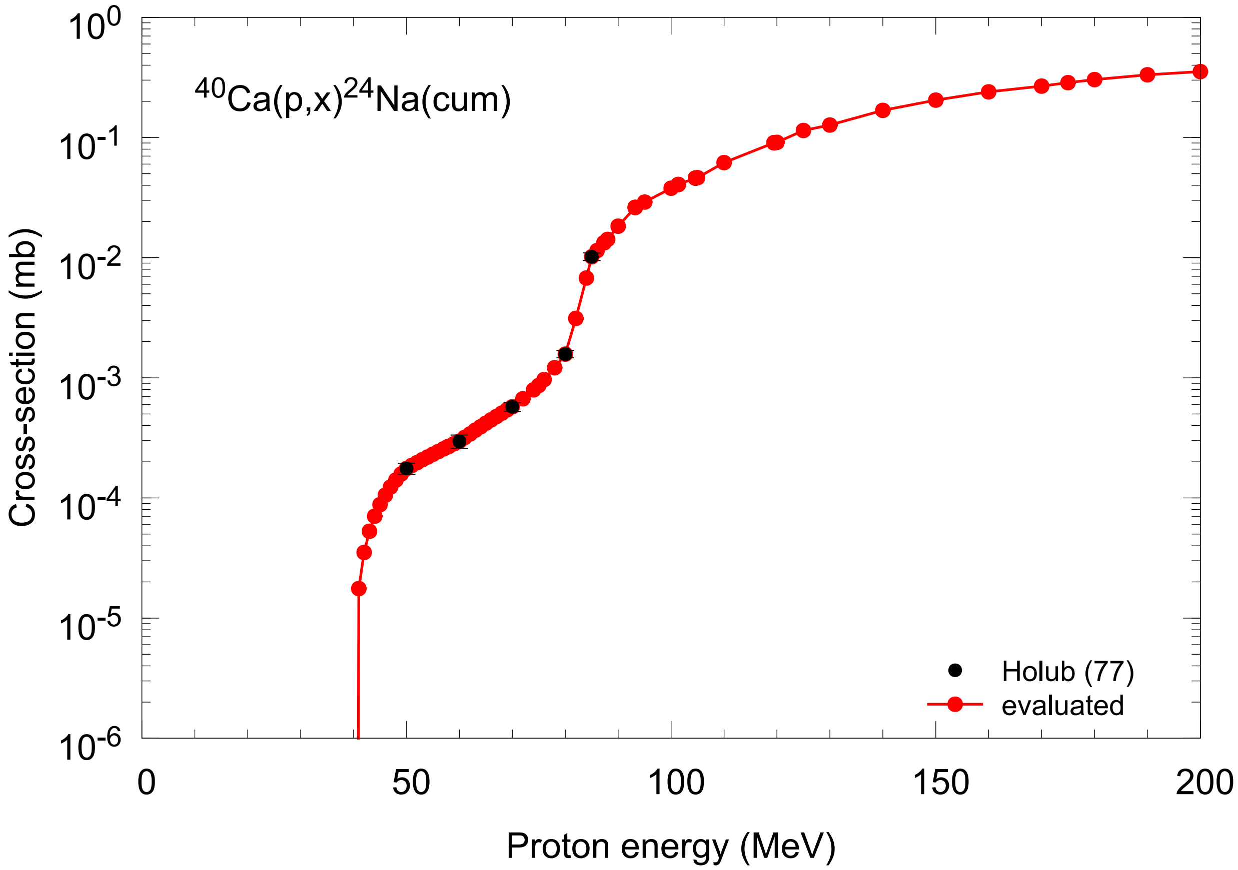
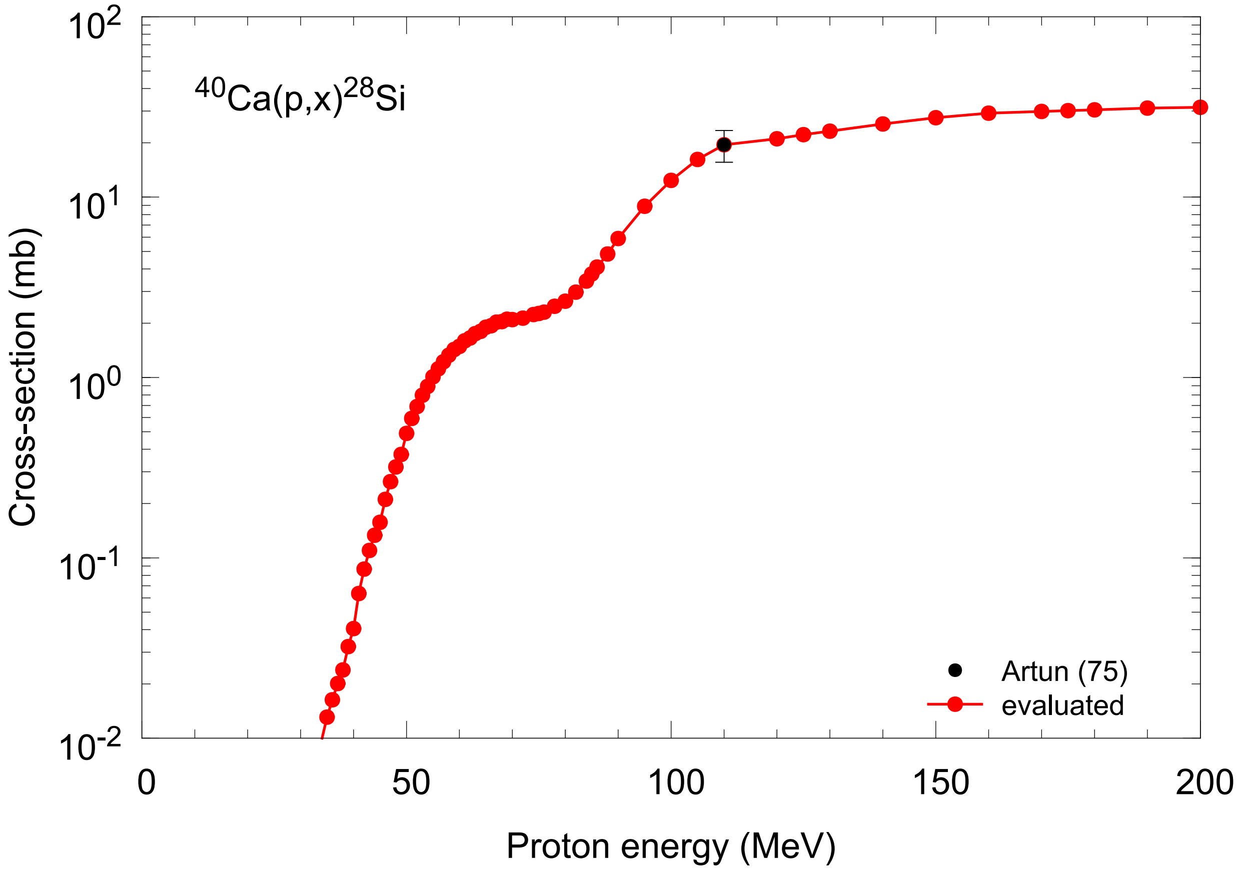
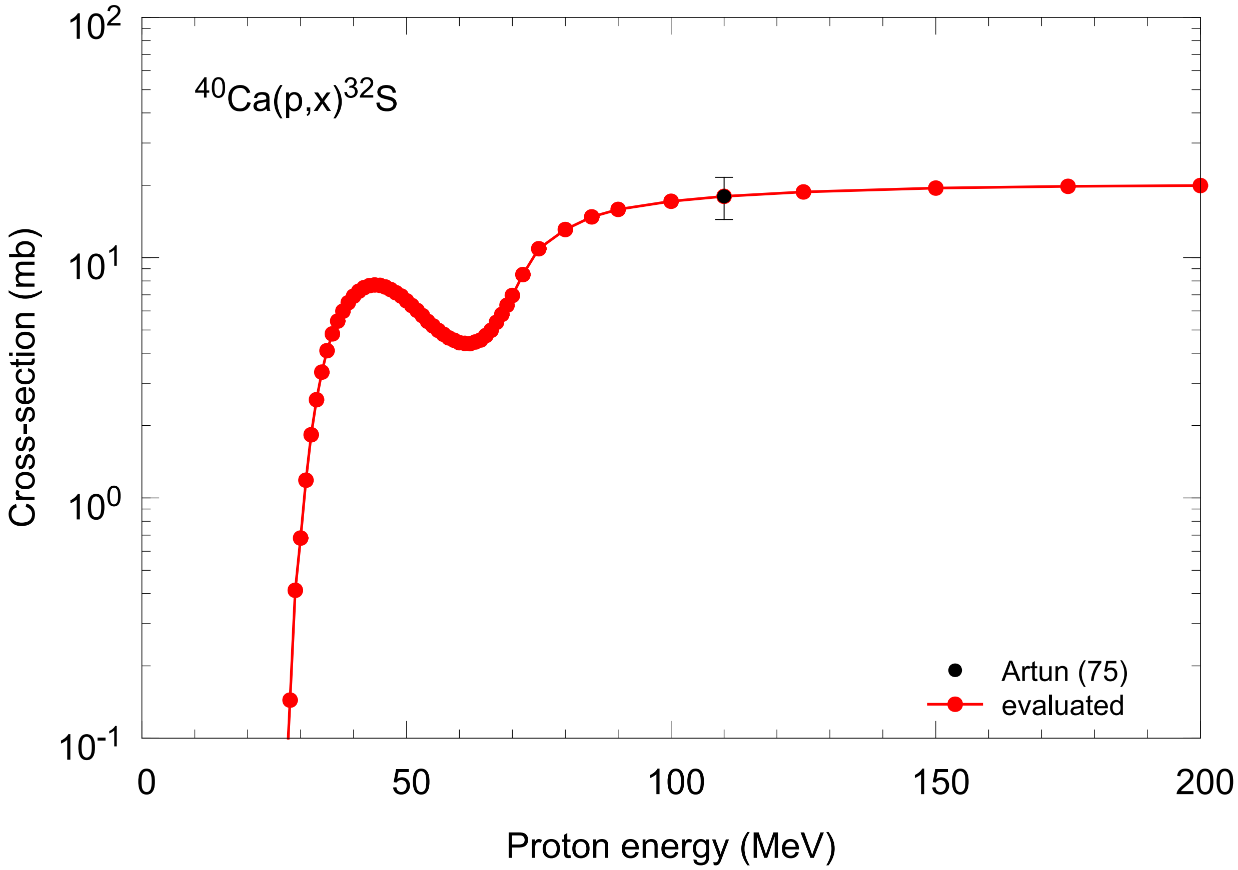
20
40
60
80
100
120
140
160
180
200



$^{40}Ca(p,x)^{24}Na(cum)$
Cross-section (mb)
Proton energy (MeV)
Holub (77)
evaluated



$^{40}Ca(p,x)^{28}Si$
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated



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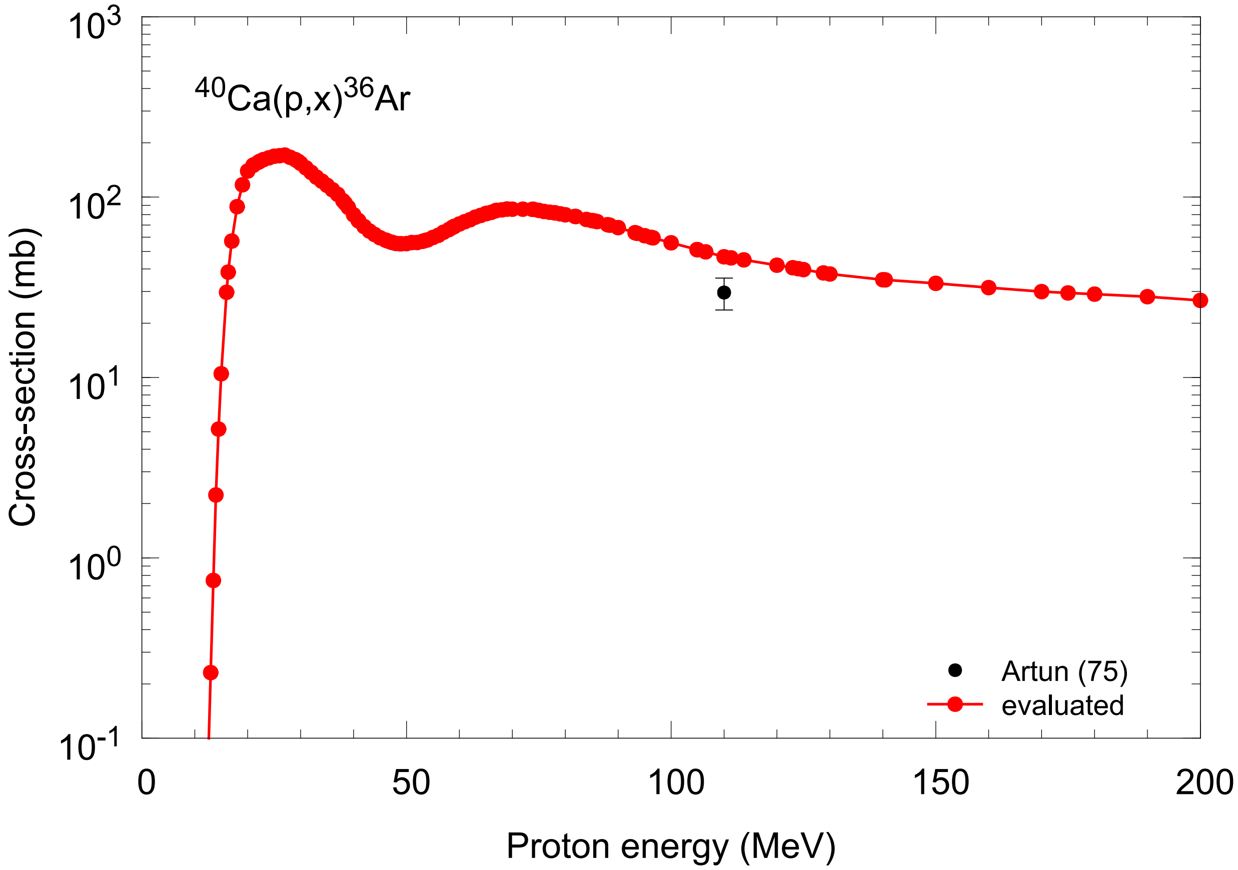
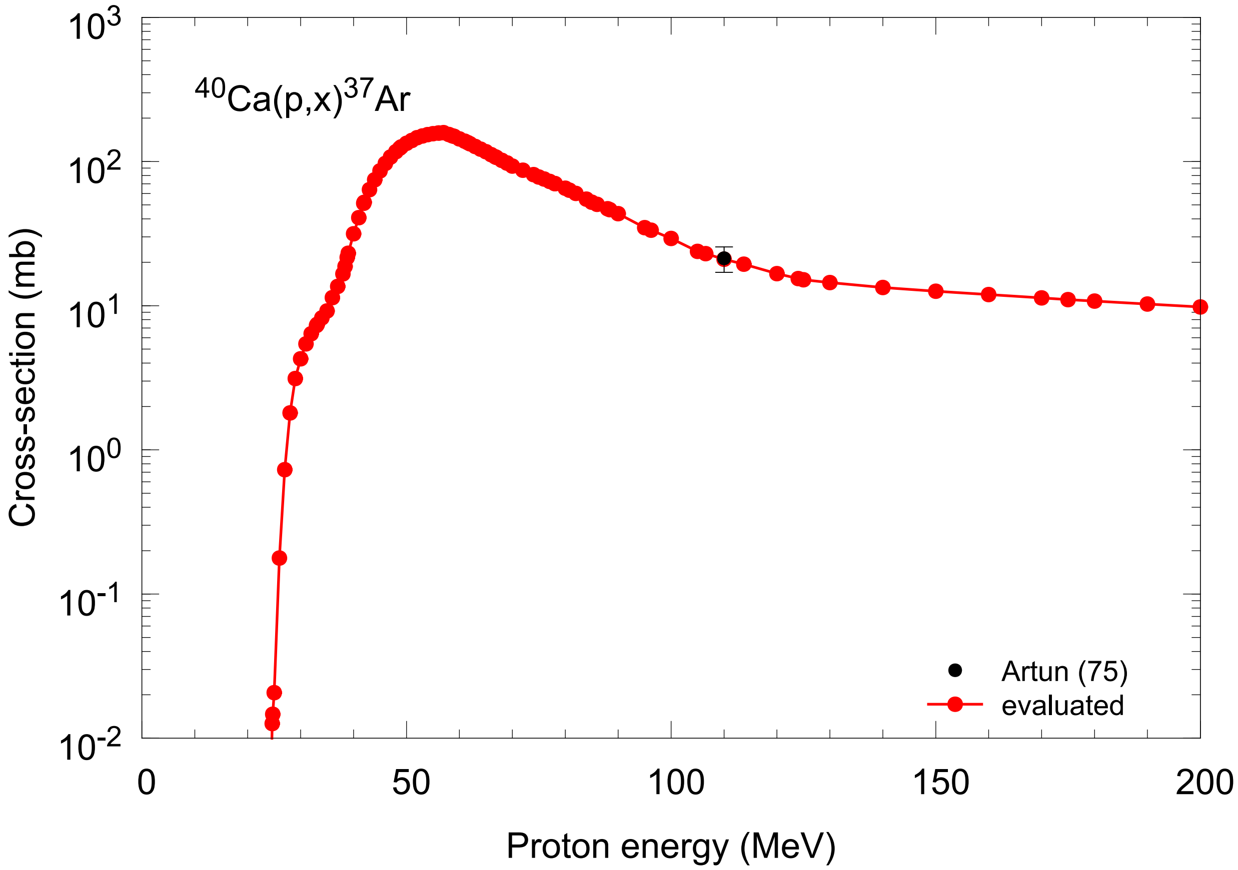
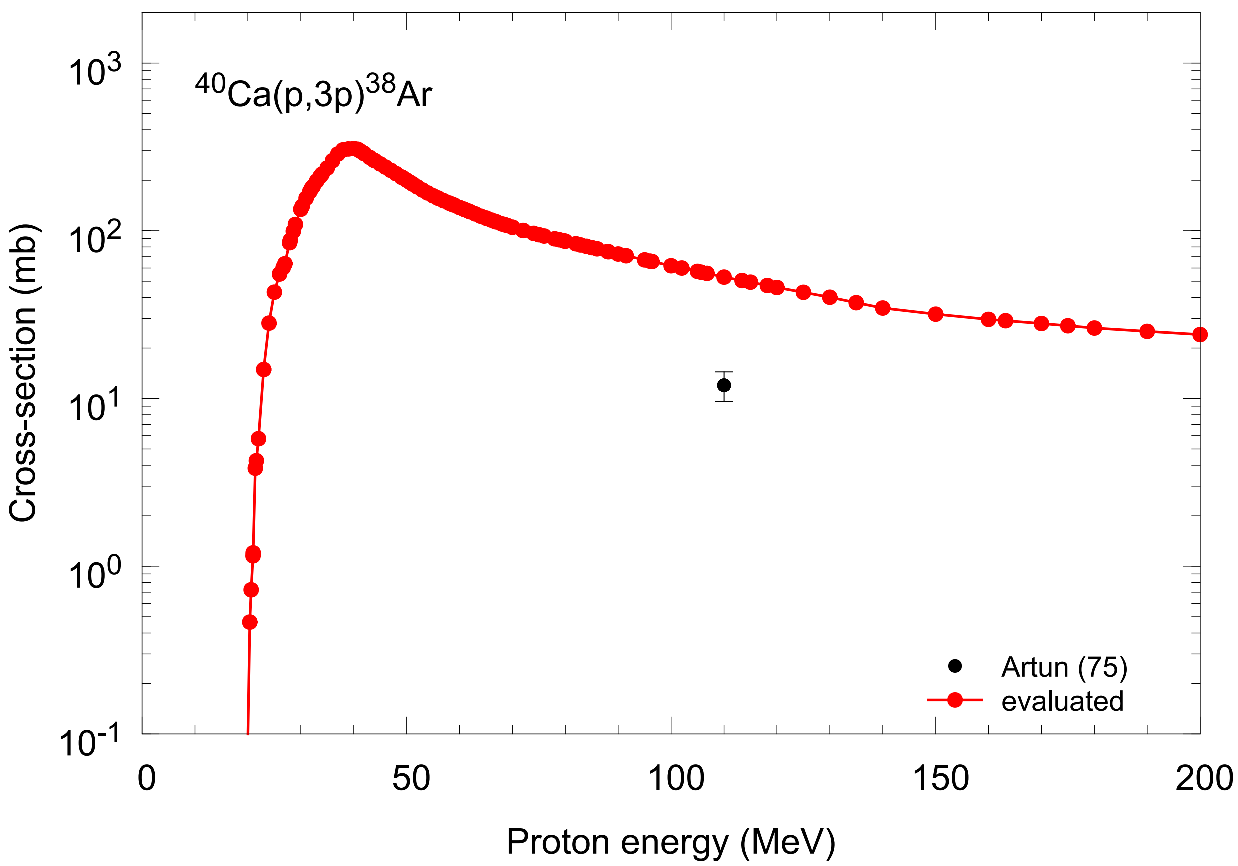
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated



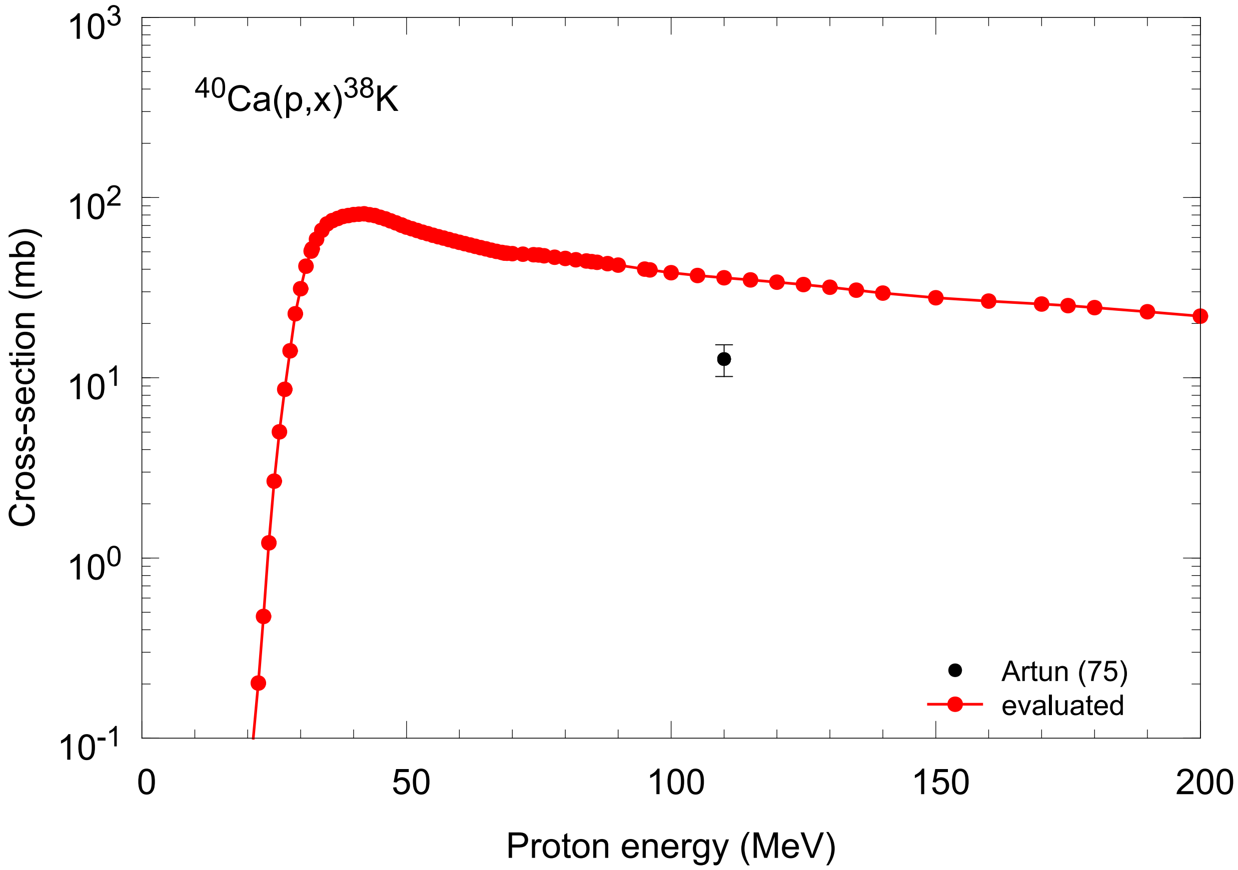
$^{40}Ca(p,x)^{36}Ar$
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated



$^{40}Ca(p,x)^{37}Ar$
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated



$^{40}Ca(p,3p)^{38}Ar$
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated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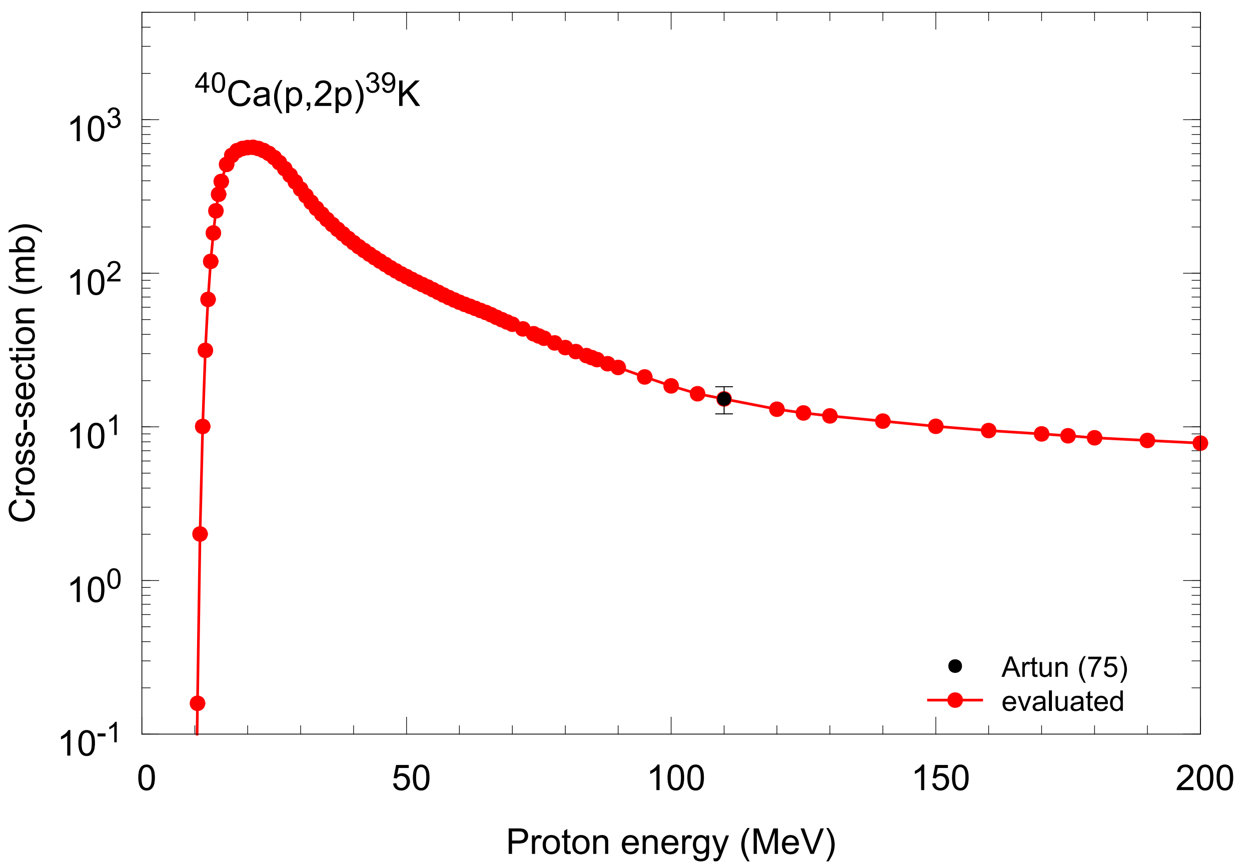
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated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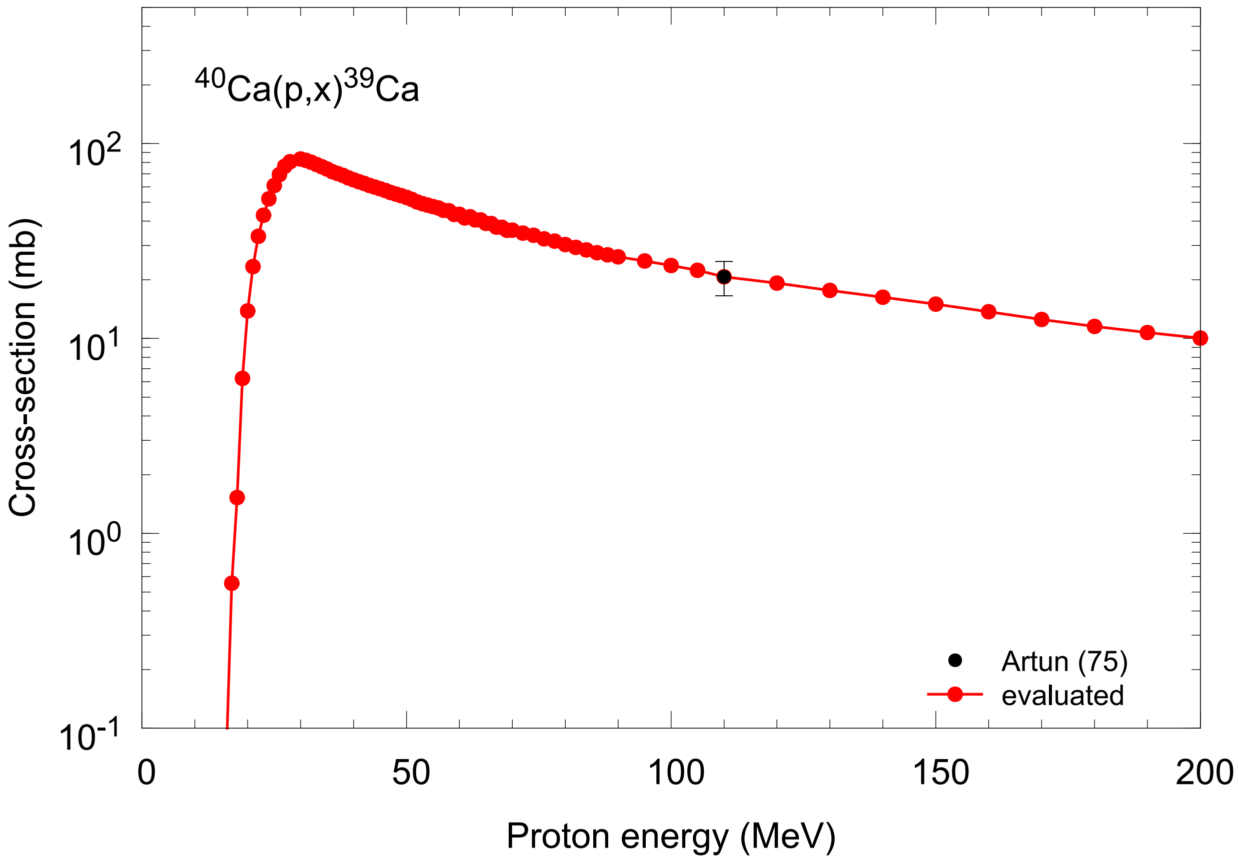
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated



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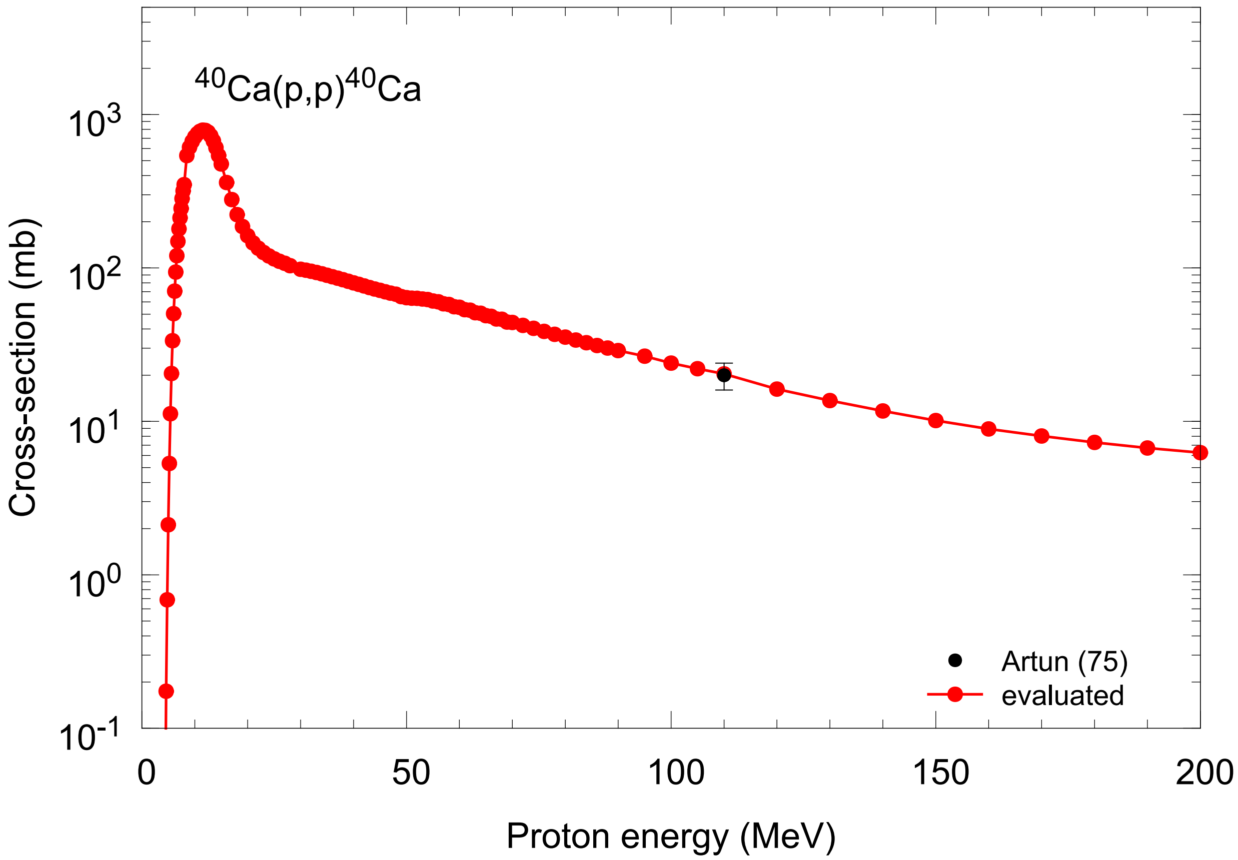
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated



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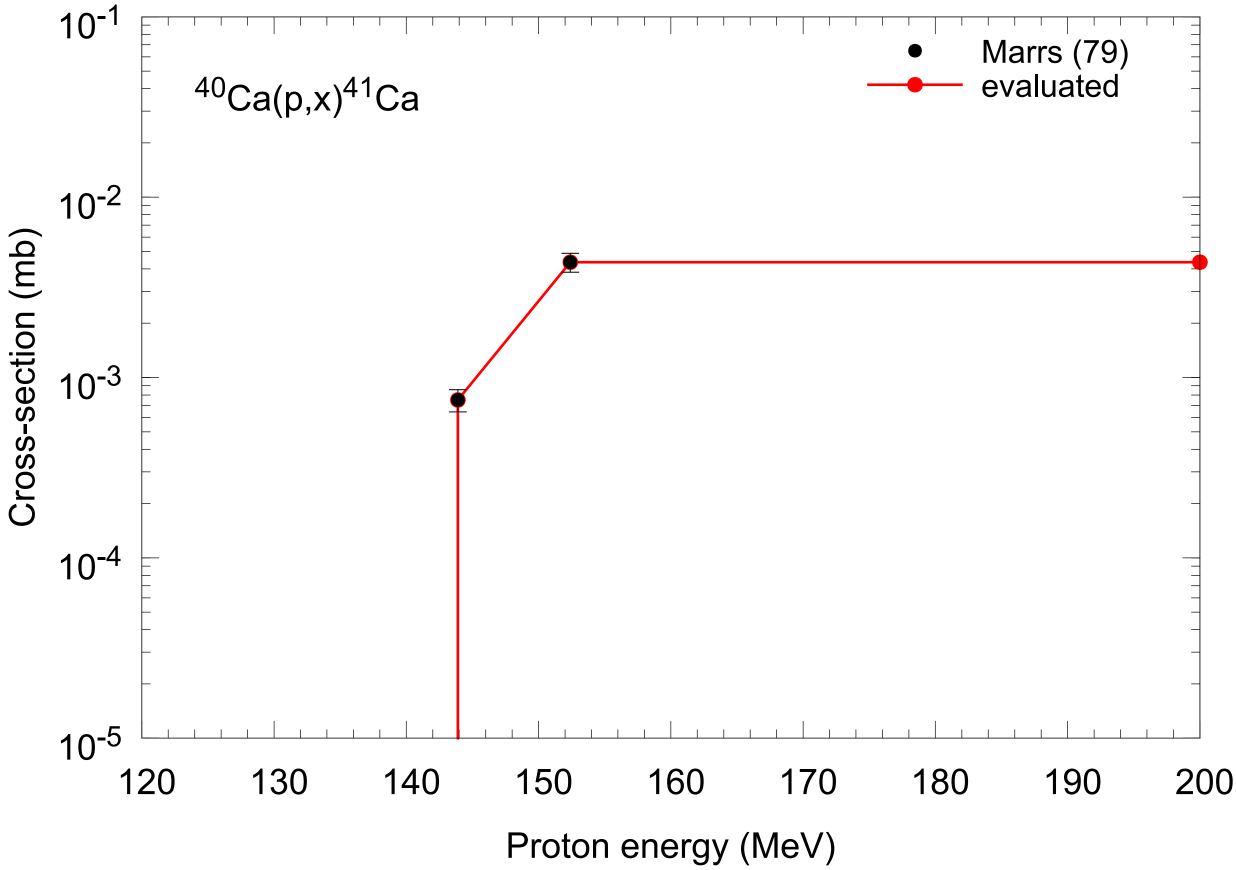
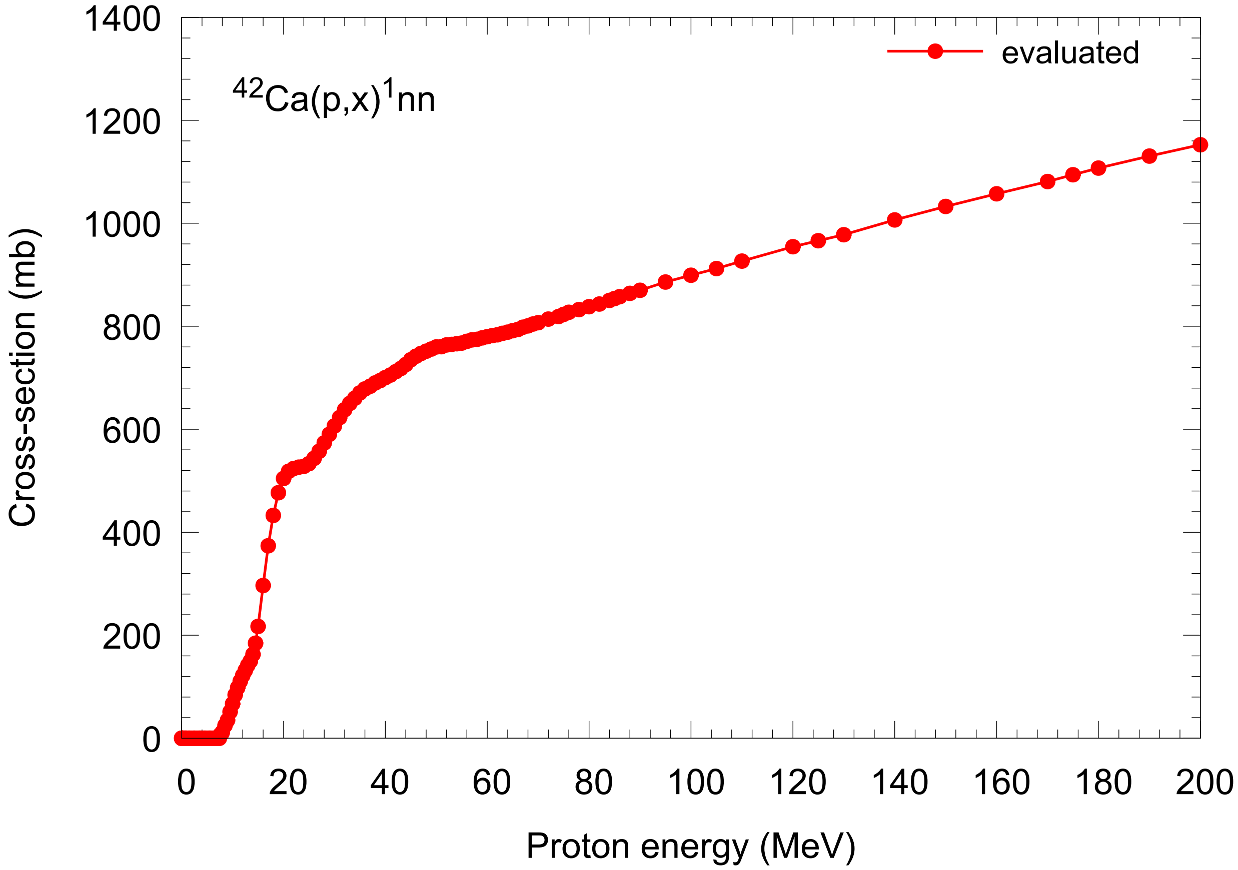
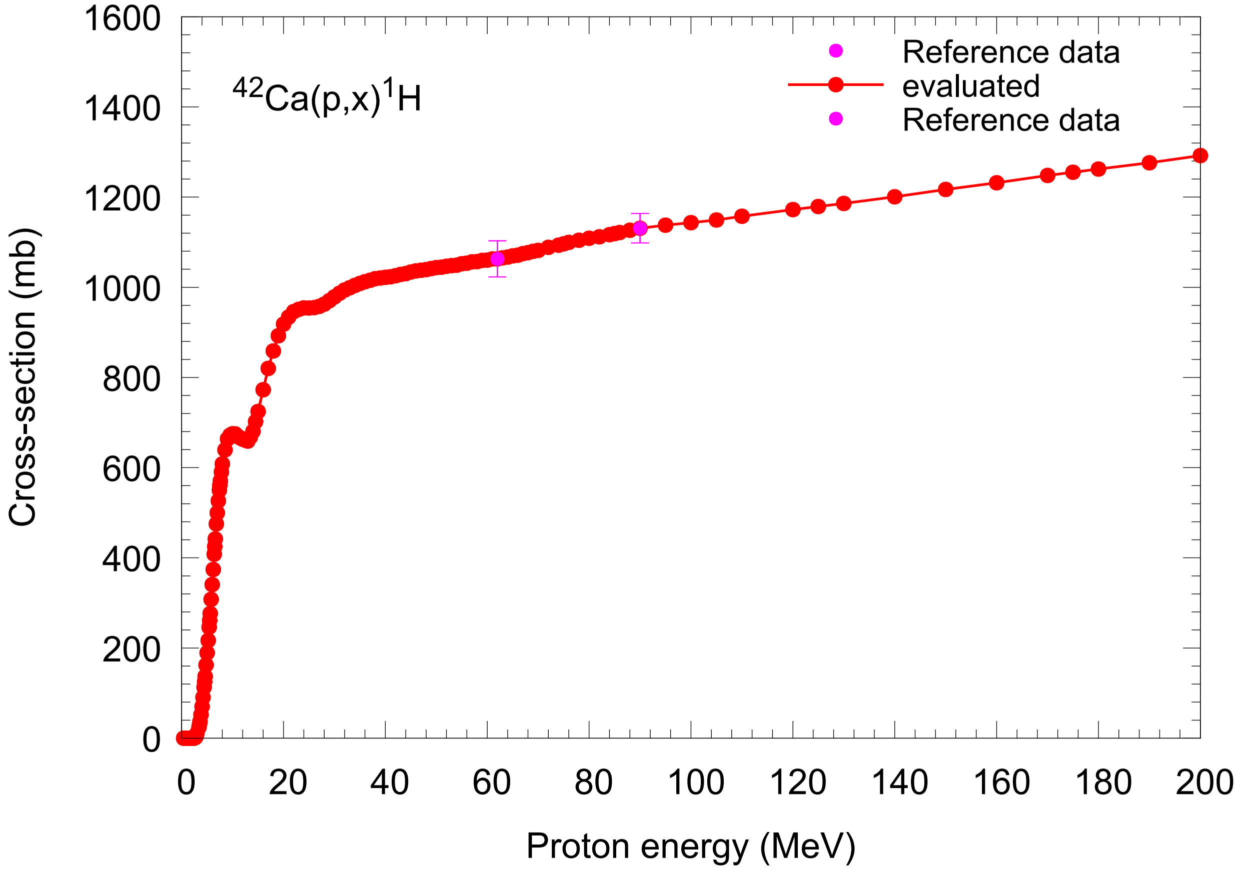
Cross-section (mb)
Proton energy (MeV)
Artun (75)
evaluated



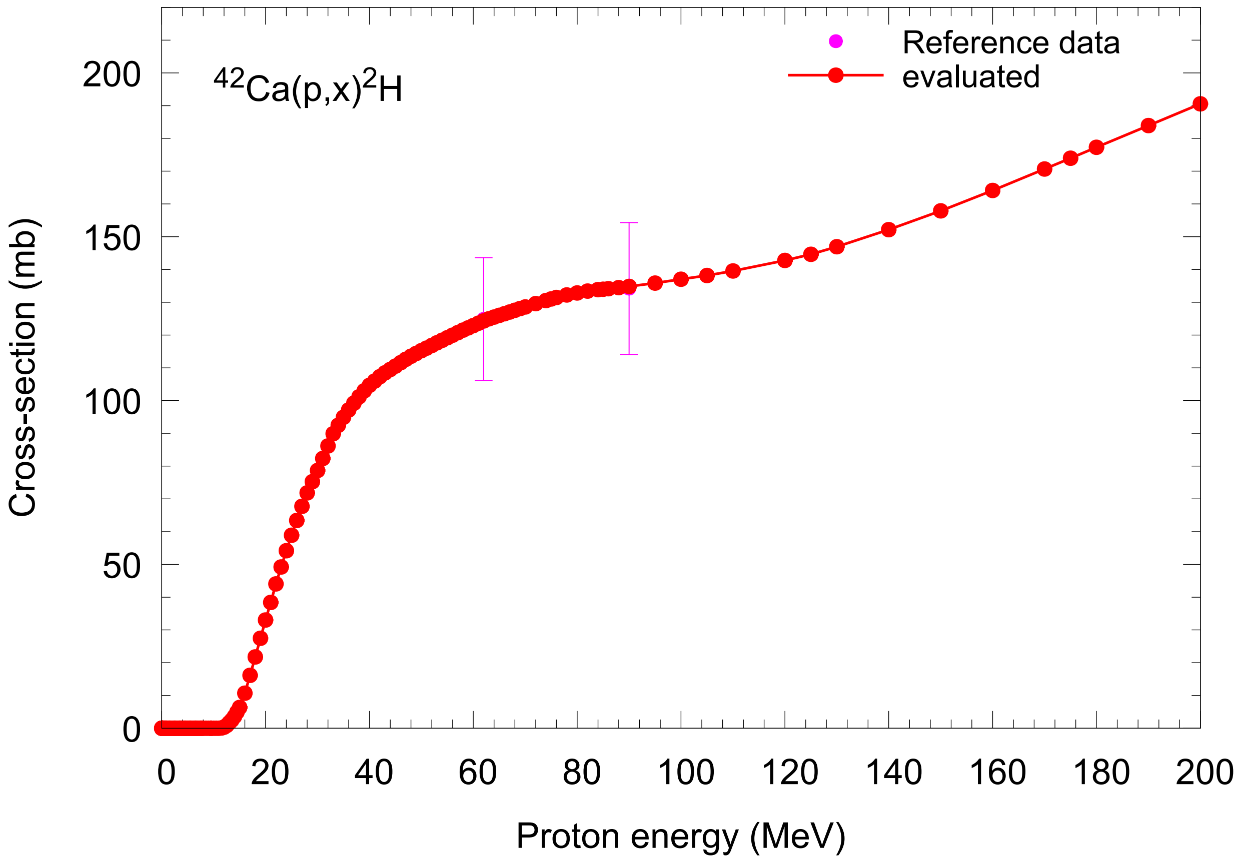
$^{40}Ca(p,x)^{41}Ca$
Marrs (79)
evaluated
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
Cross-section (mb)
120
130
140
150
160
170
180
190
200
Proton energy (MeV)



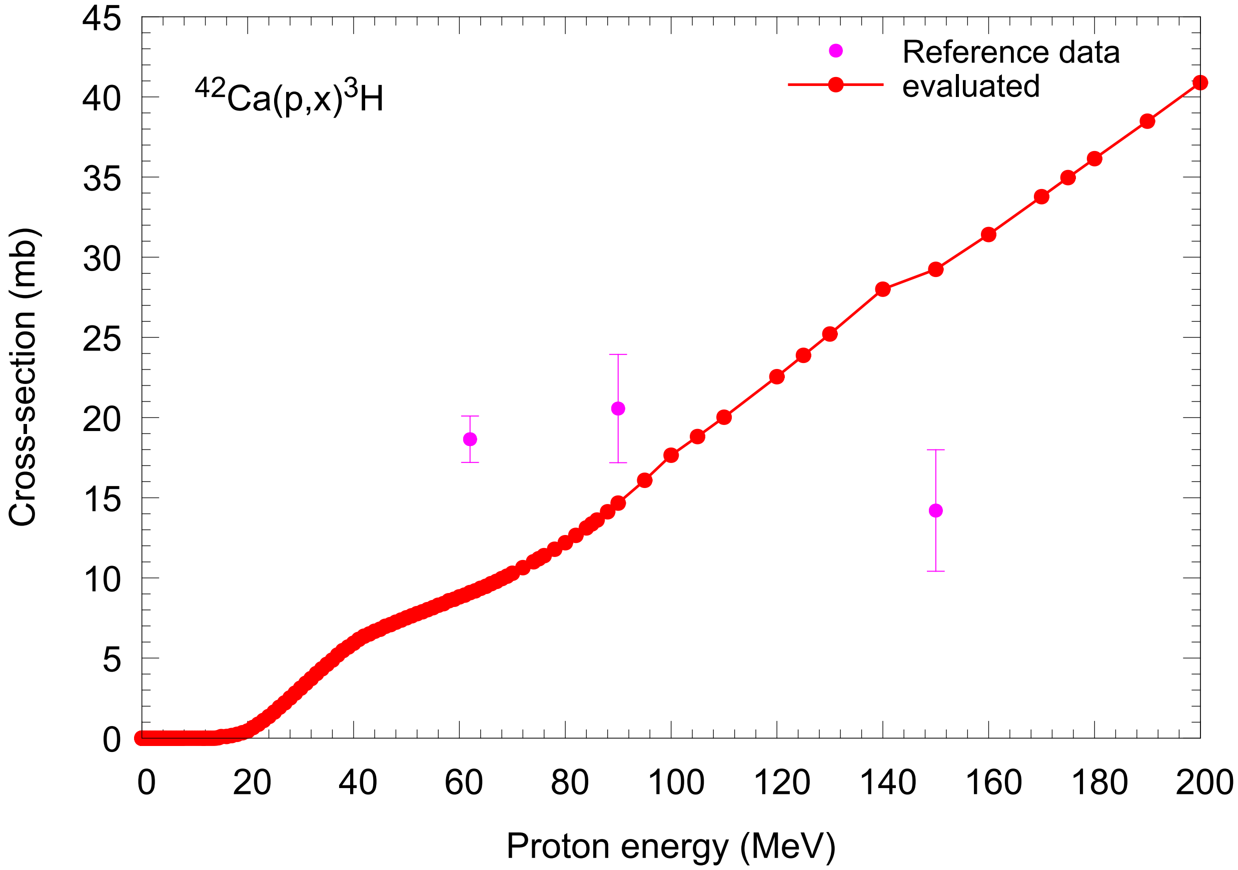
^{42}Ca(p,x)^{1}nn
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
0
20
40
60
80
100
120
140
160
180
200



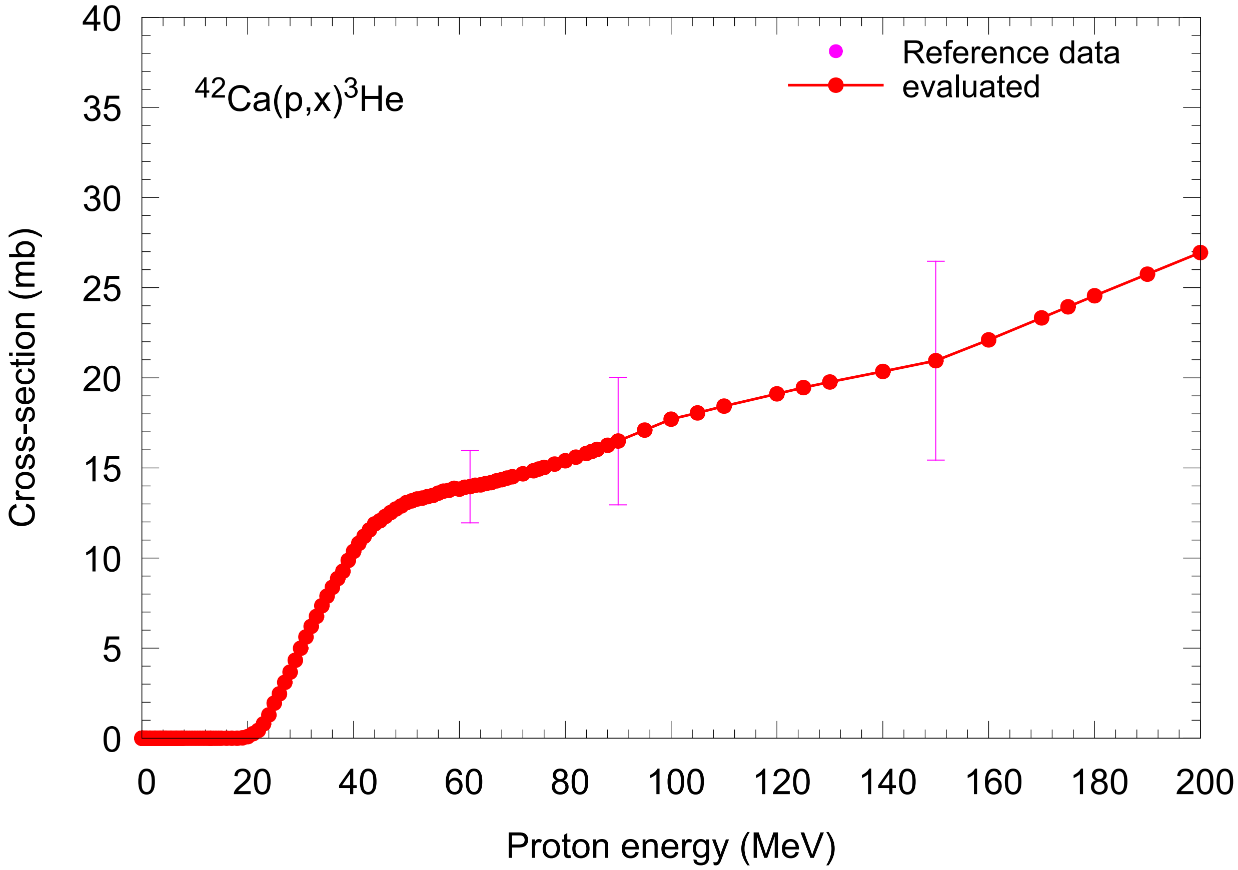
^{42}Ca(p,x)^{1}H
Reference data
evaluated
Reference data
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
0
20
40
60
80
100
120
140
160
180
200



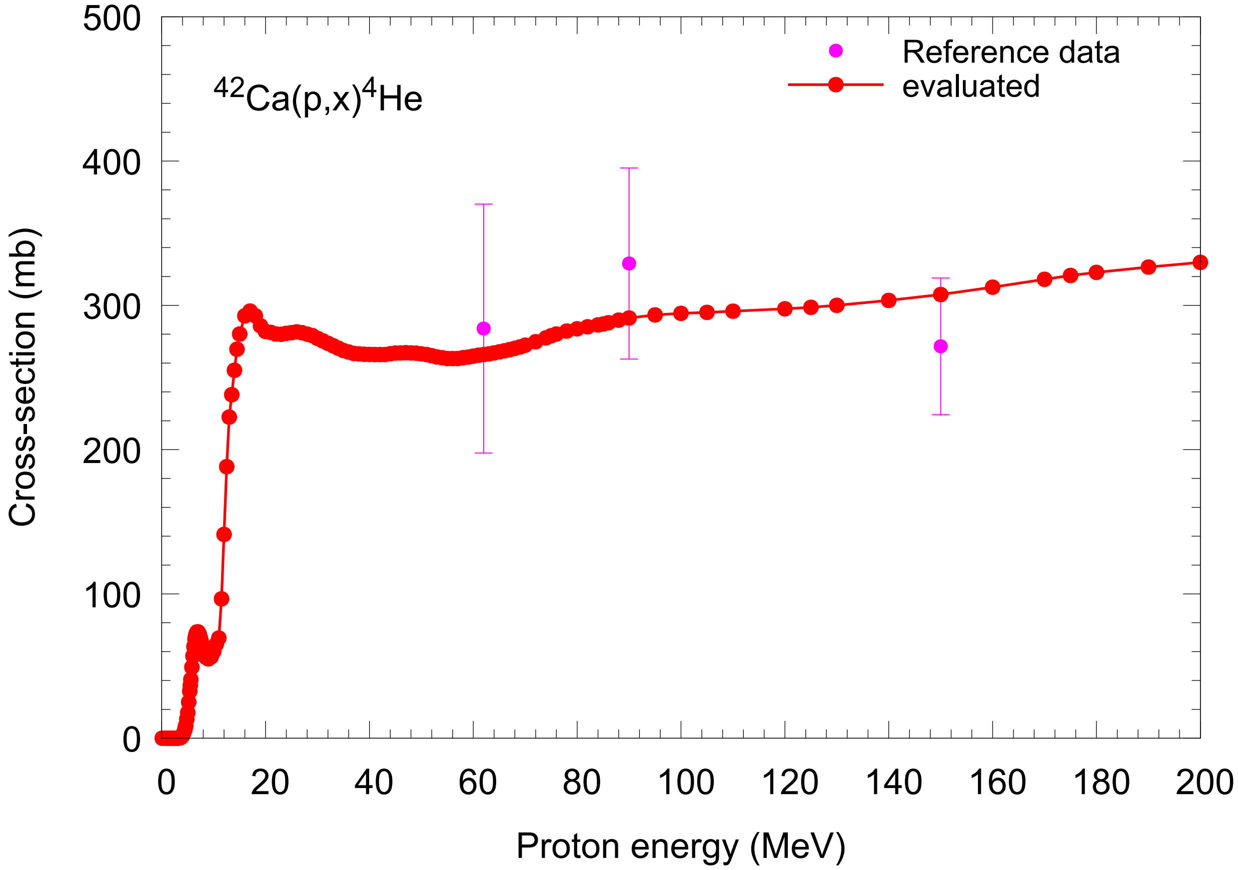
$^{42}Ca(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
0
20
40
60
80
100
120
140
160
180
200



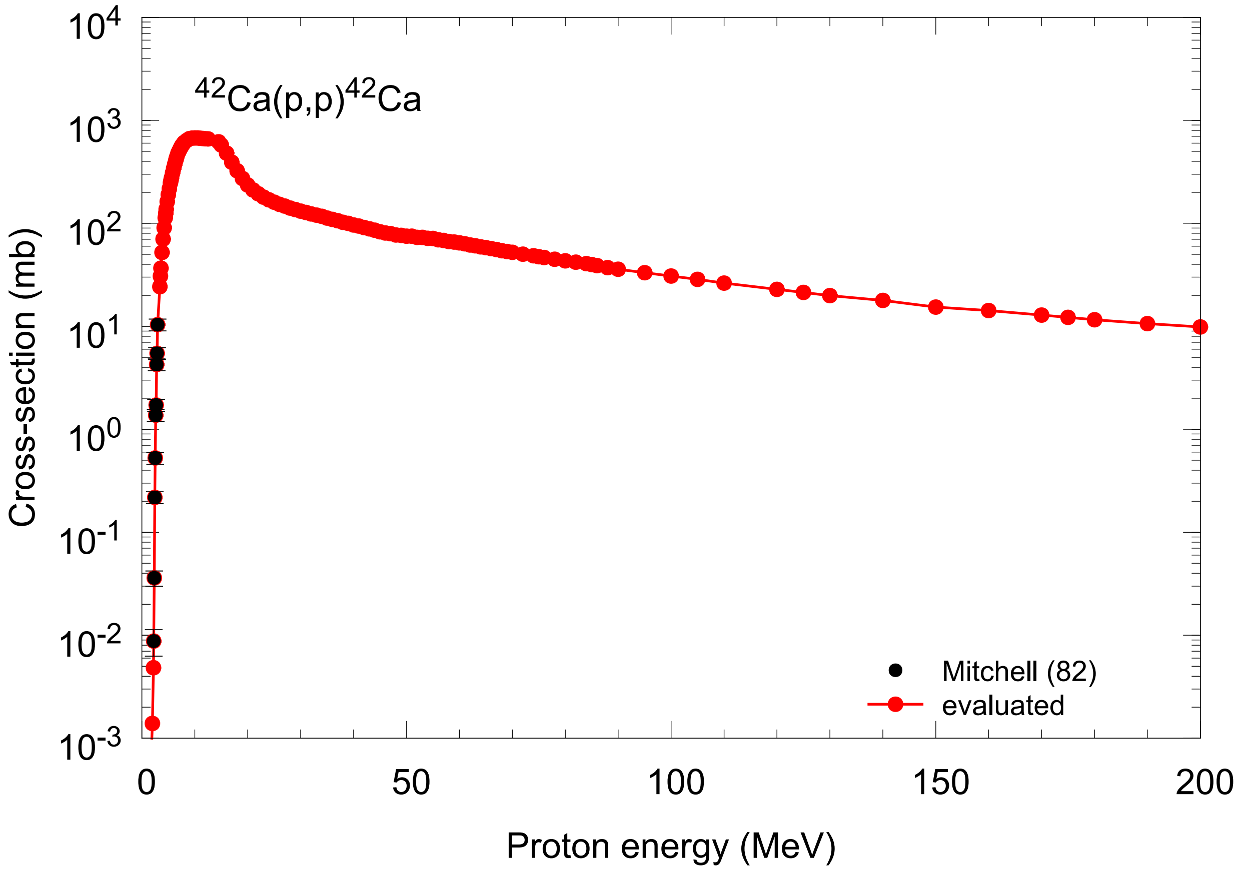
$^{42}Ca(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
40
45
0
20
40
60
80
100
120
140
160
180
200



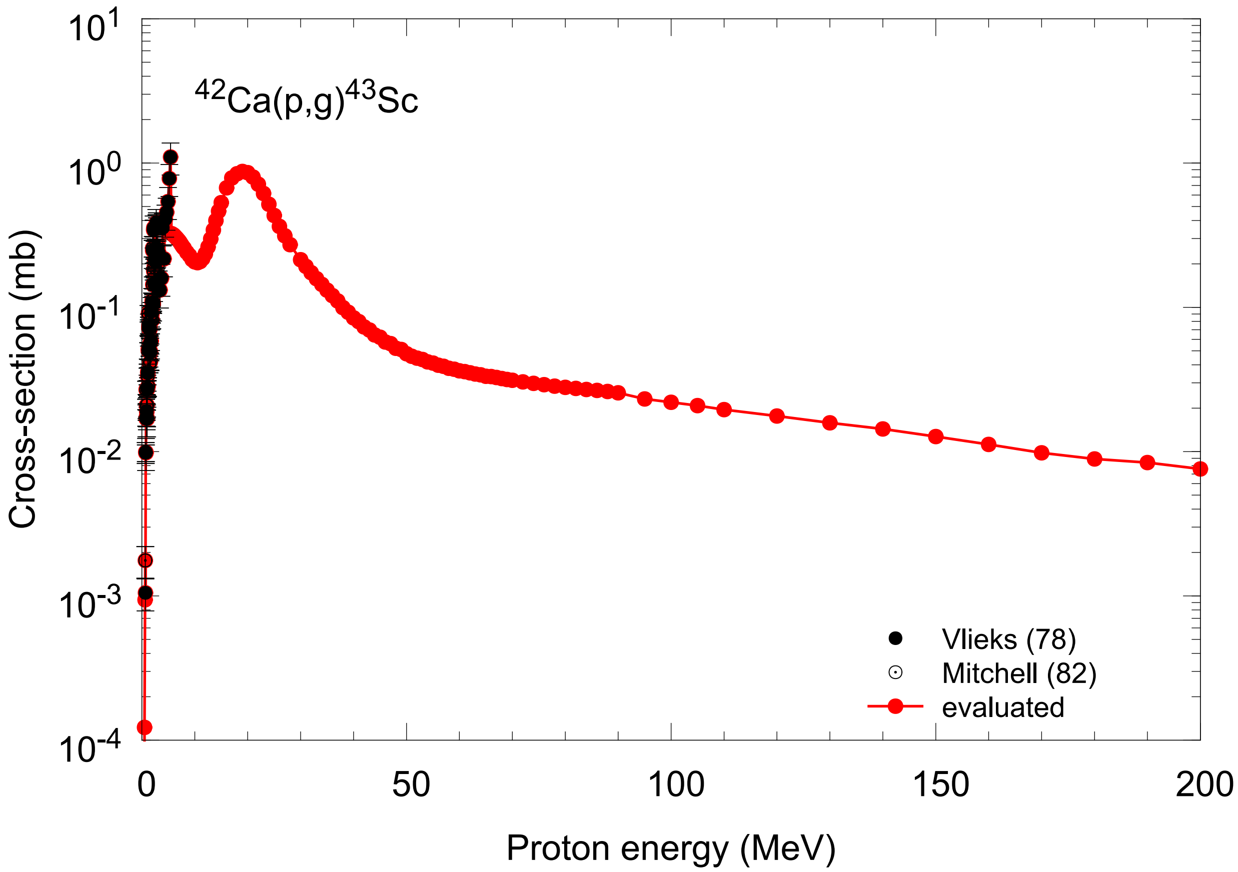
$^{42}Ca(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)



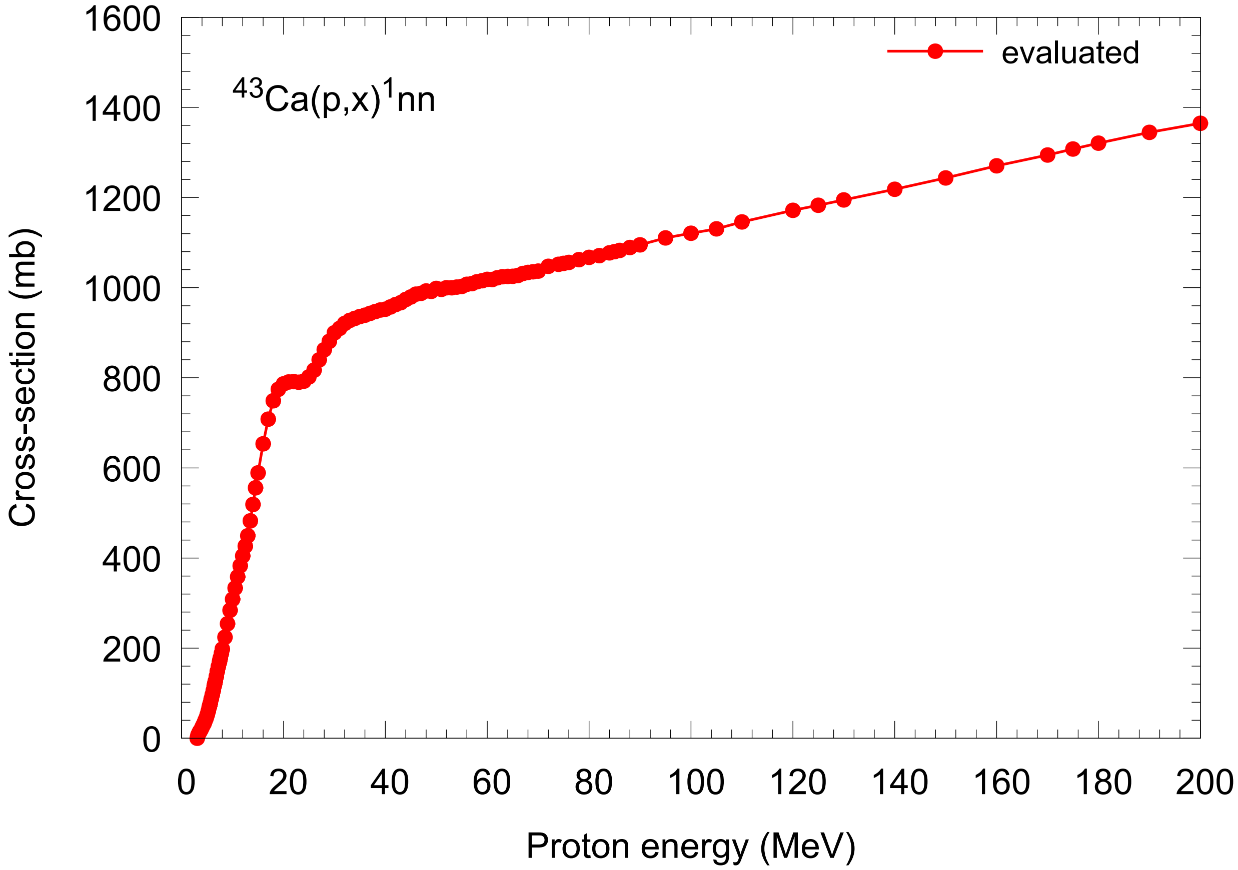
$^{42}Ca(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)



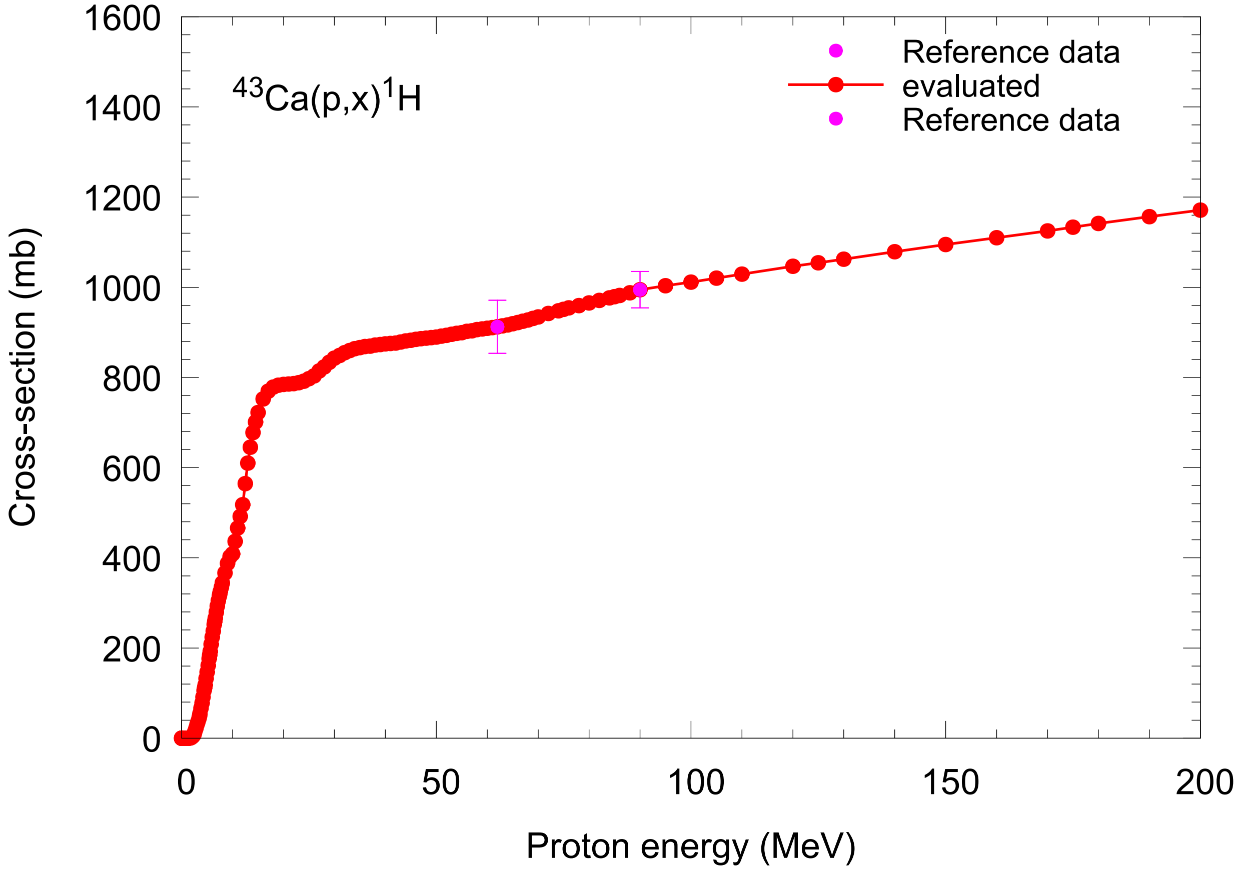
$^{42}Ca(p,p)^{42}Ca$
Cross-section (mb)
Proton energy (MeV)
Mitchell (82)
evaluated



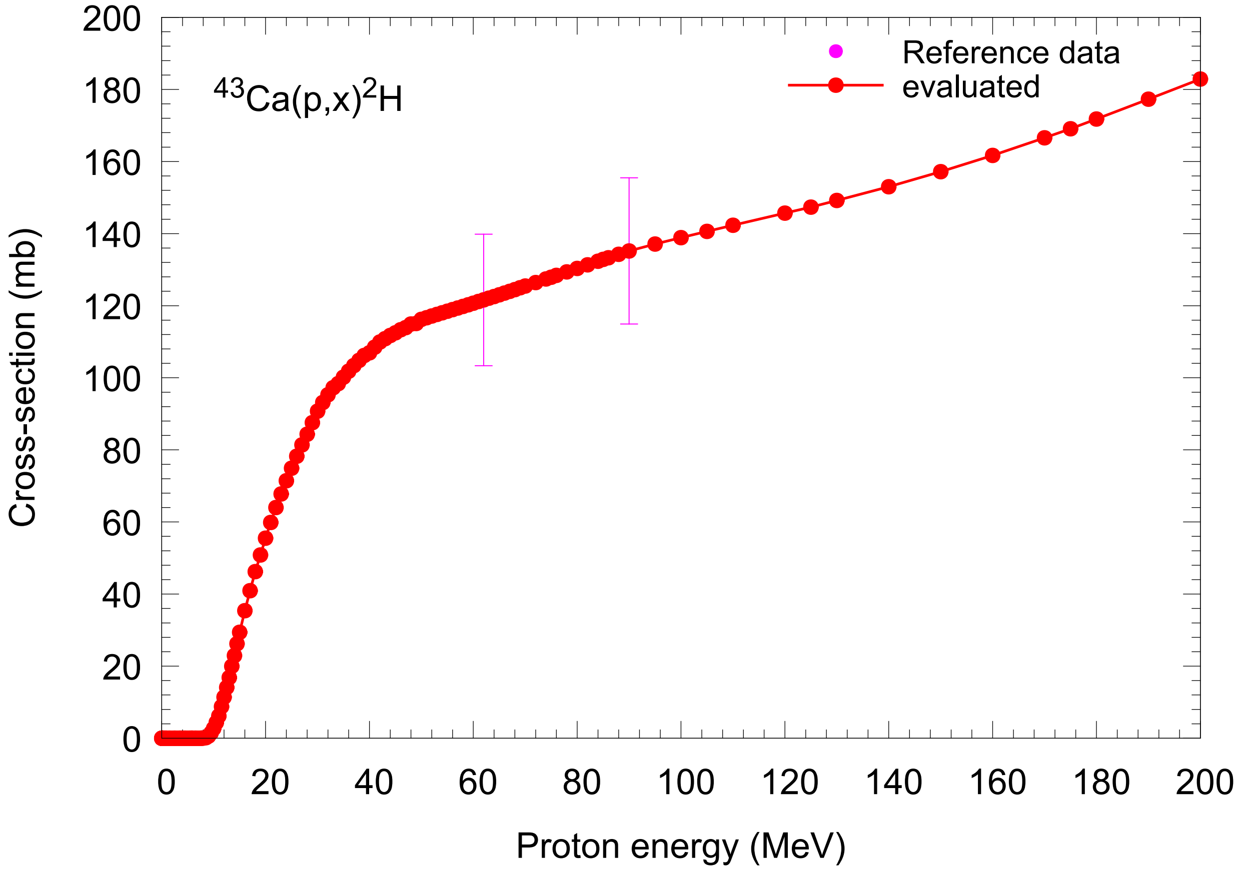
$^{42}Ca(p,g)^{43}Sc$
Cross-section (mb)
Proton energy (MeV)
Vlieks (78)
Mitchell (82)
evaluated



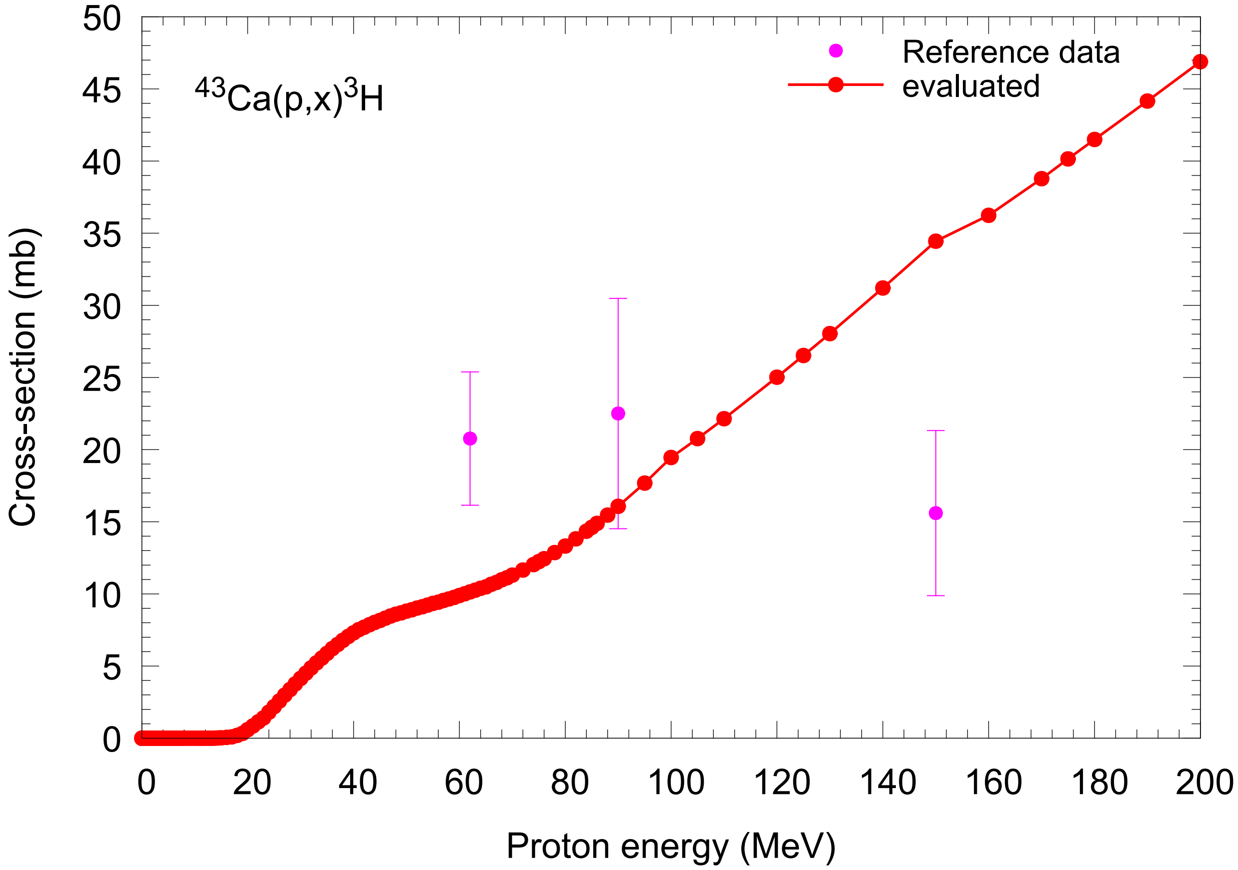
^{43}Ca(p,x)^{1}nn
evaluated
Cross-section (mb)
Proton energy (MeV)



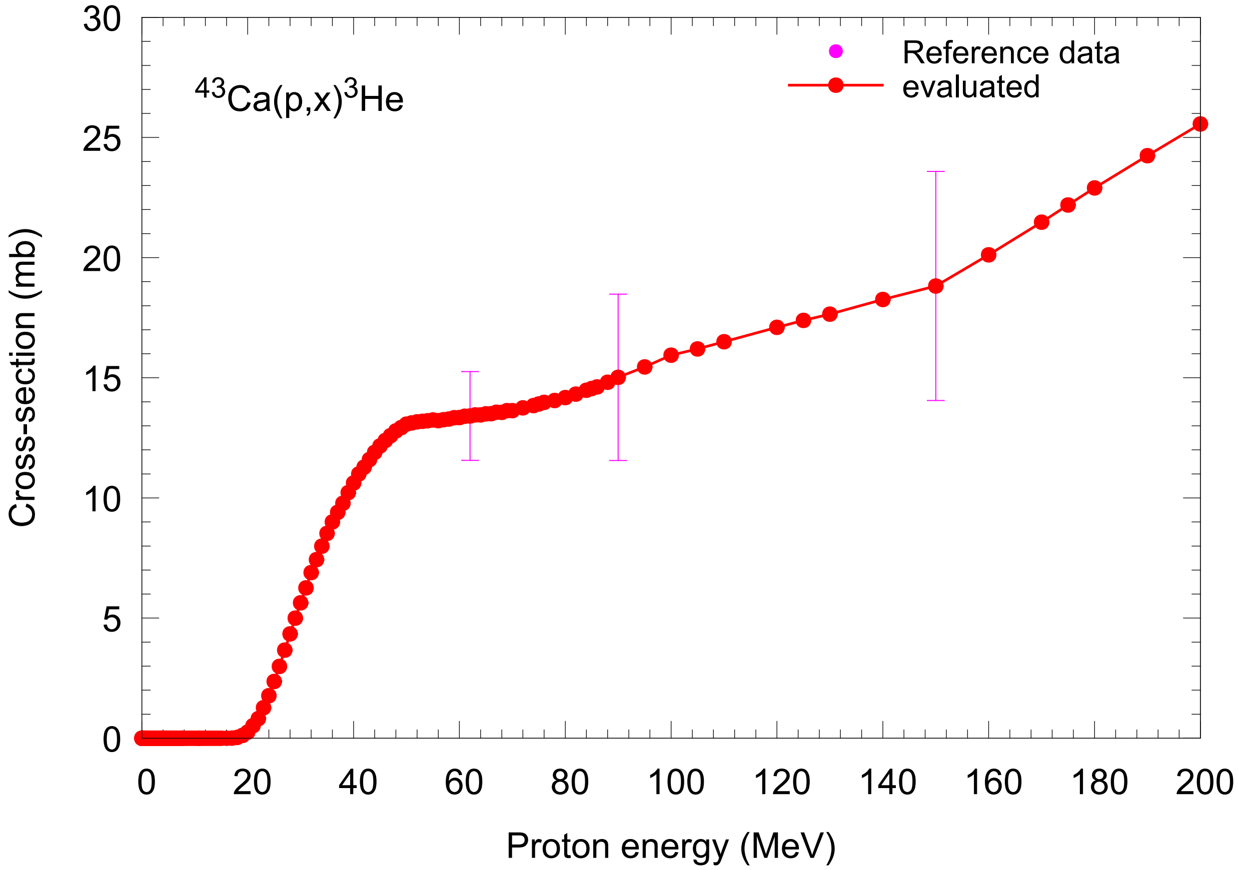
^{43}Ca(p,x)^{1}H
Reference data
evaluated
Reference data
Cross-section (mb)
Proton energy (MeV)



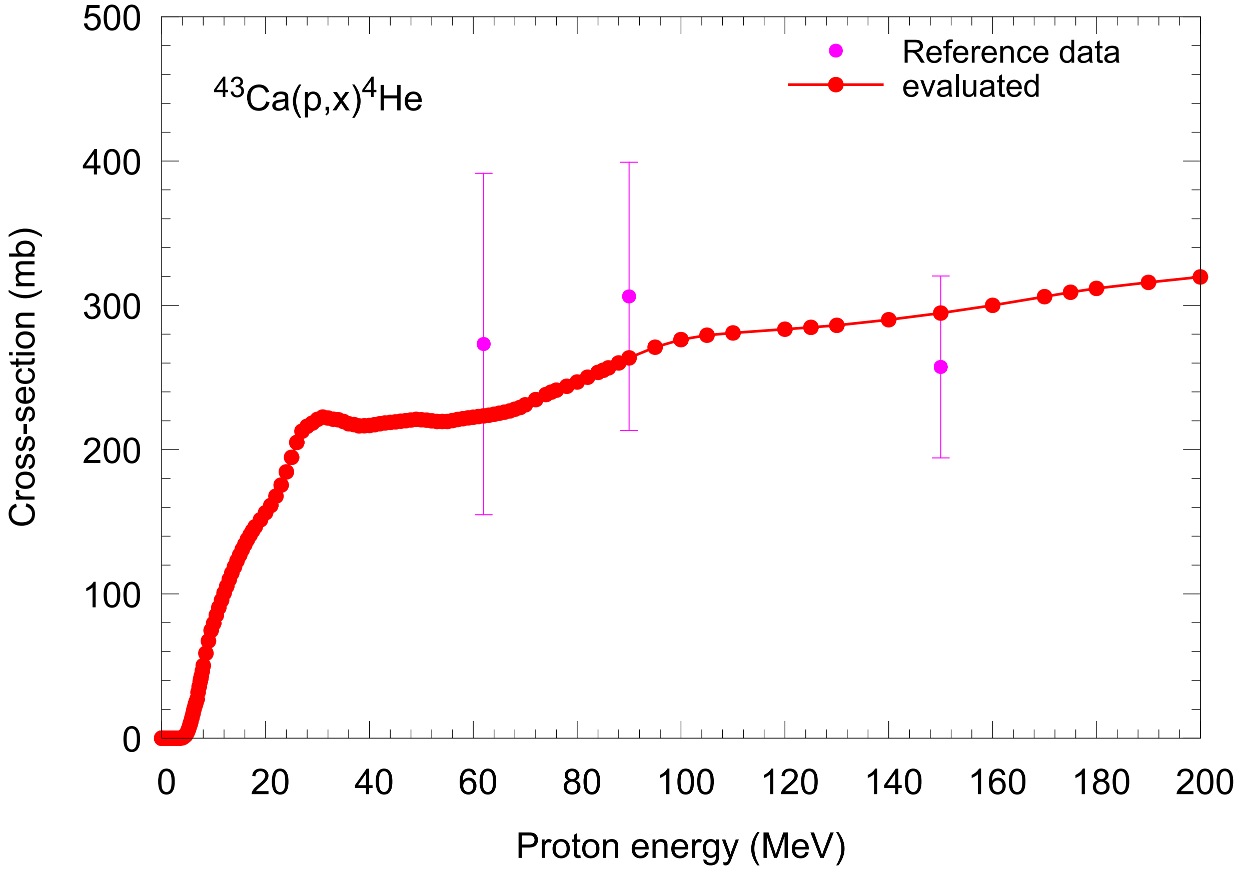
$^{43}Ca(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)



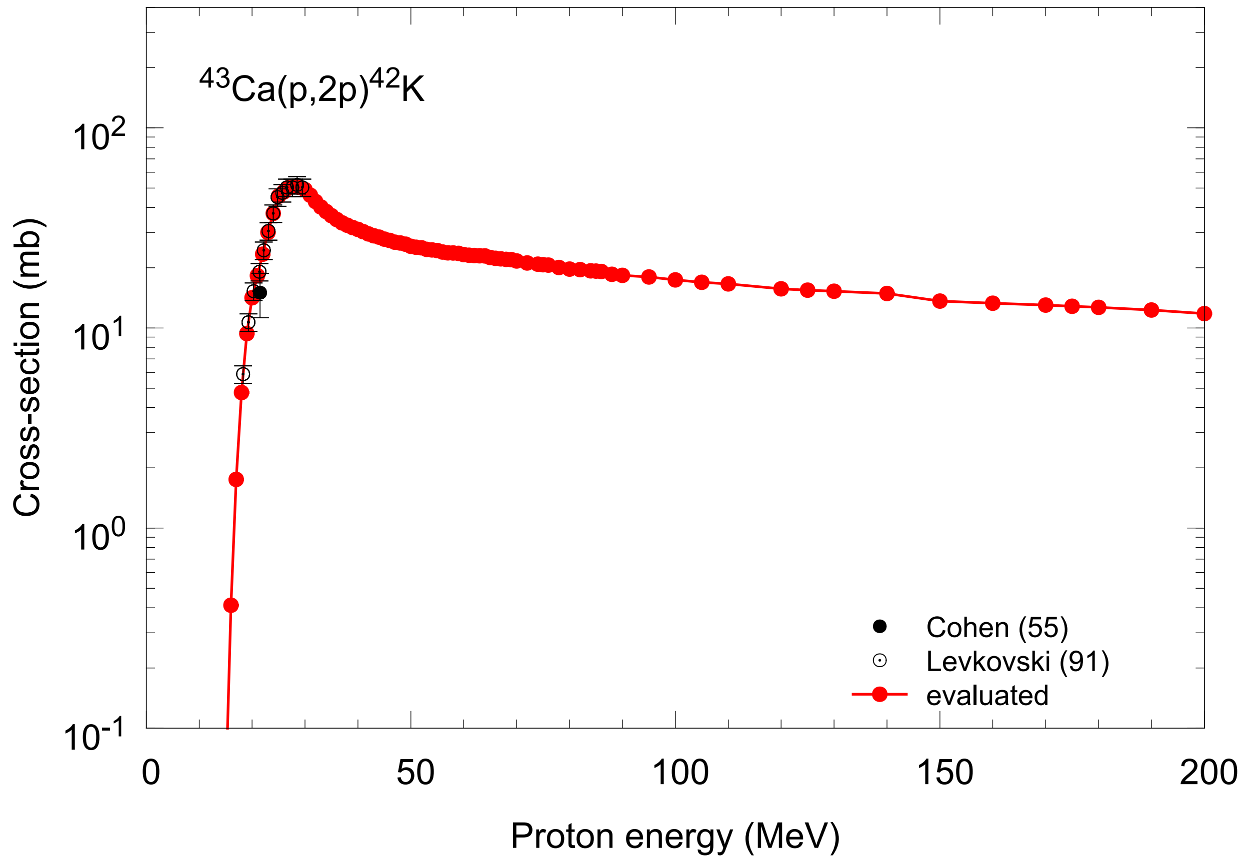
$^{43}Ca(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)



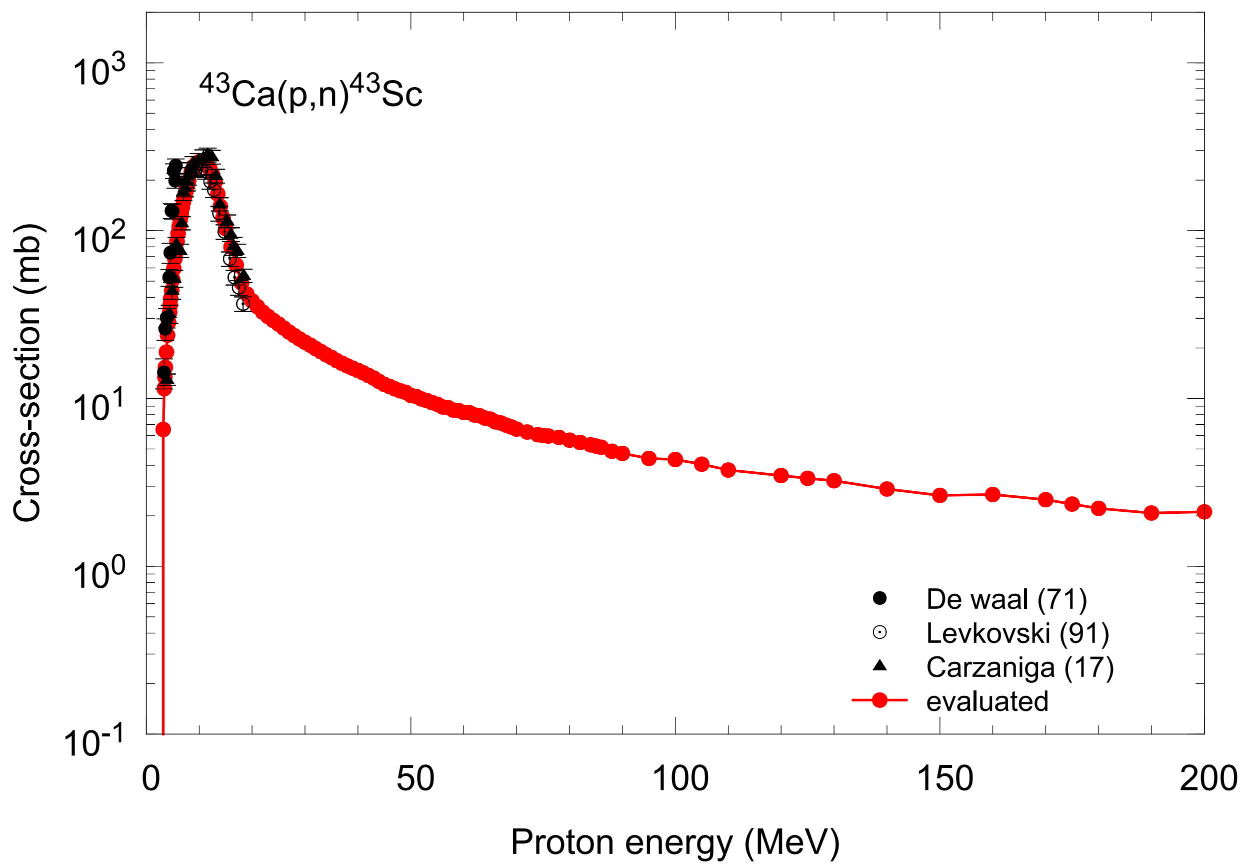
$^{43}Ca(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
0
20
40
60
80
100
120
140
160
180
200



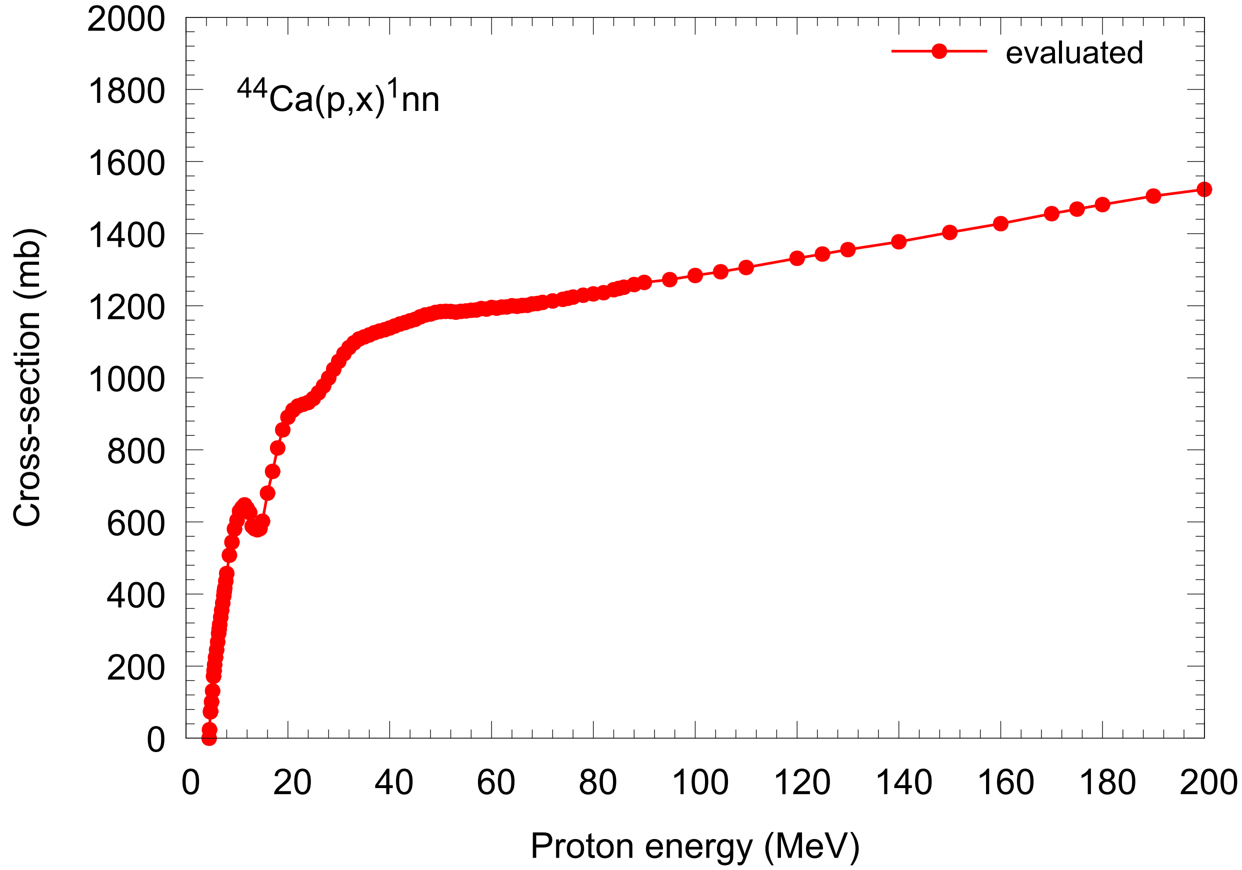
$^{43}Ca(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
100
200
300
400
500
0
20
40
60
80
100
120
140
160
180
200



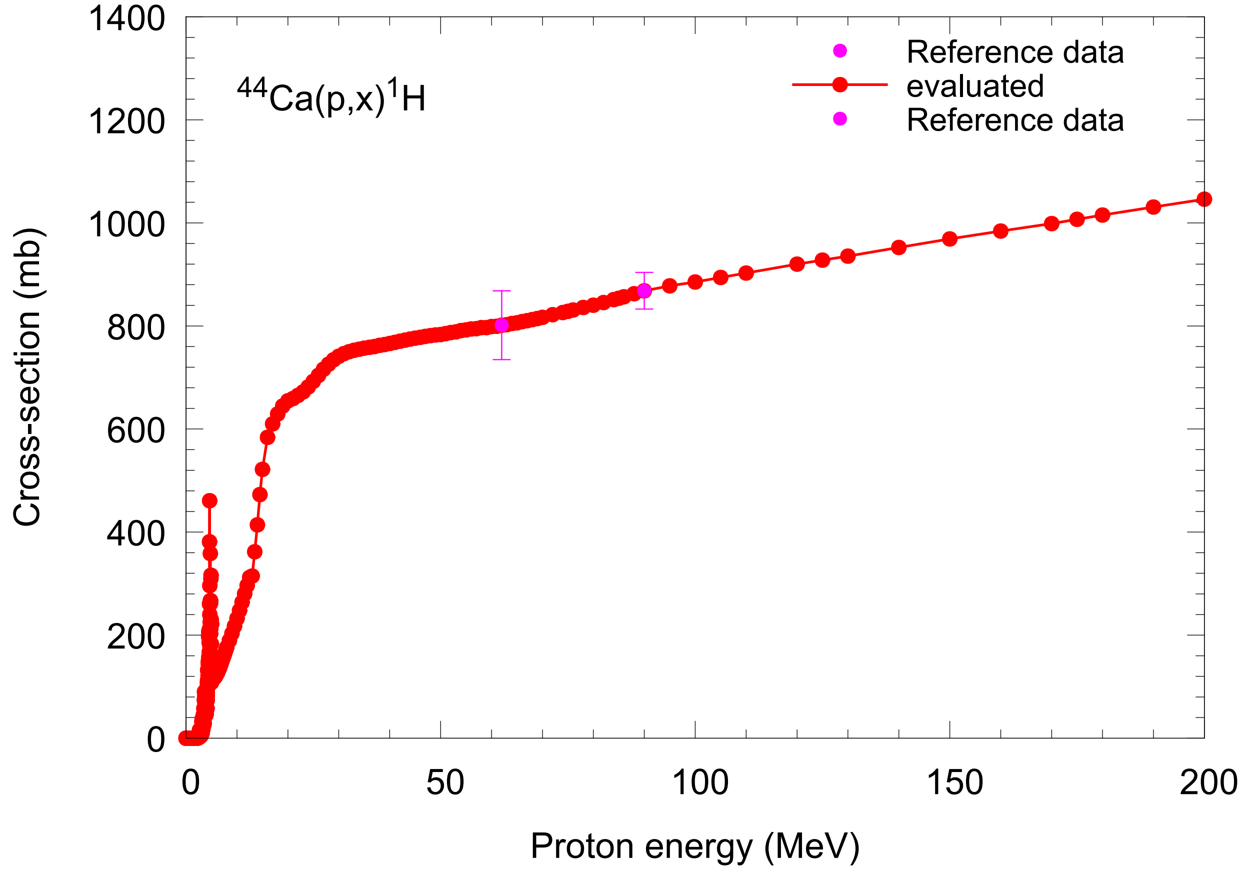
$^{43}Ca(p,2p)^{42}K$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Cohen (55)
Levkovski (91)
evaluated



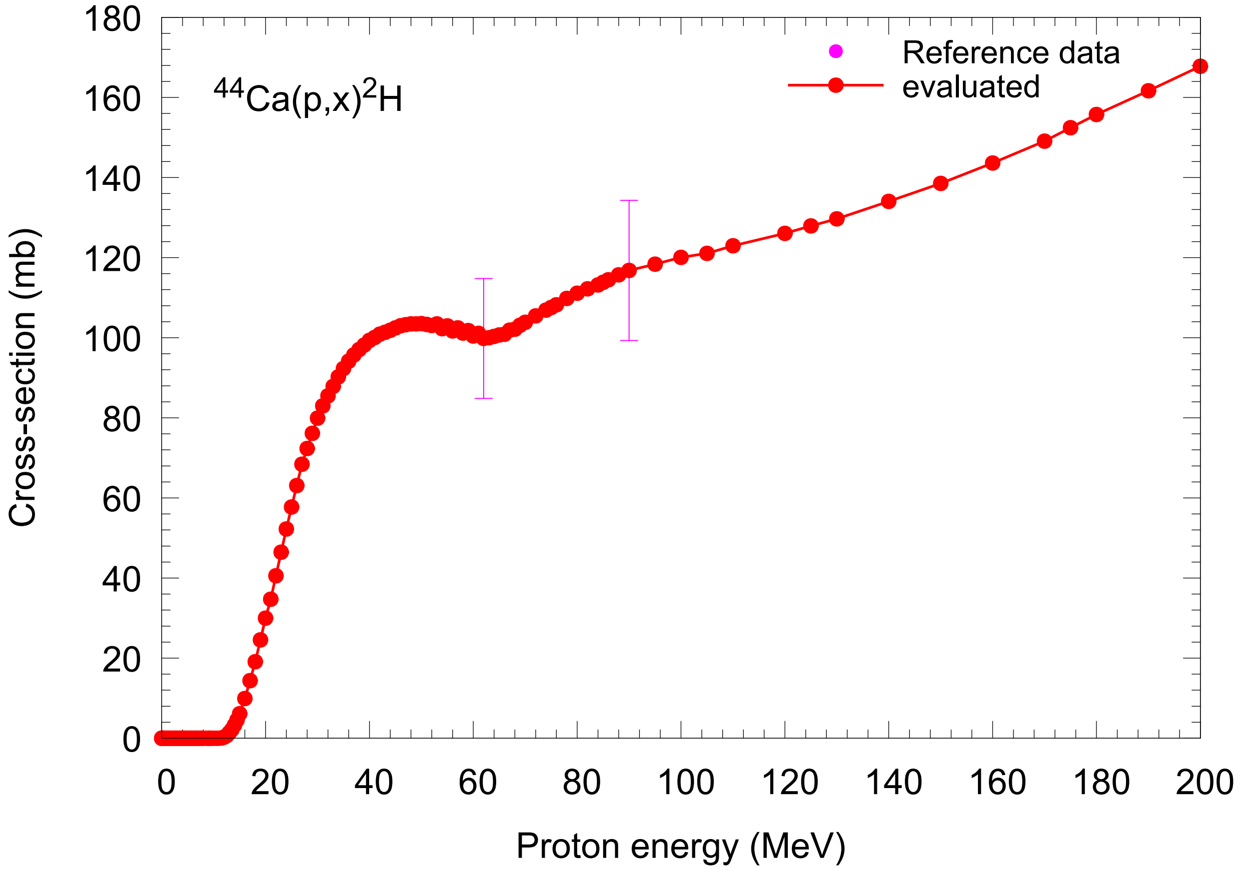
$^{43}Ca(p,n)^{43}Sc$
Cross-section (mb)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
De waal (71)
Levkovski (91)
Carzaniga (17)
evaluated



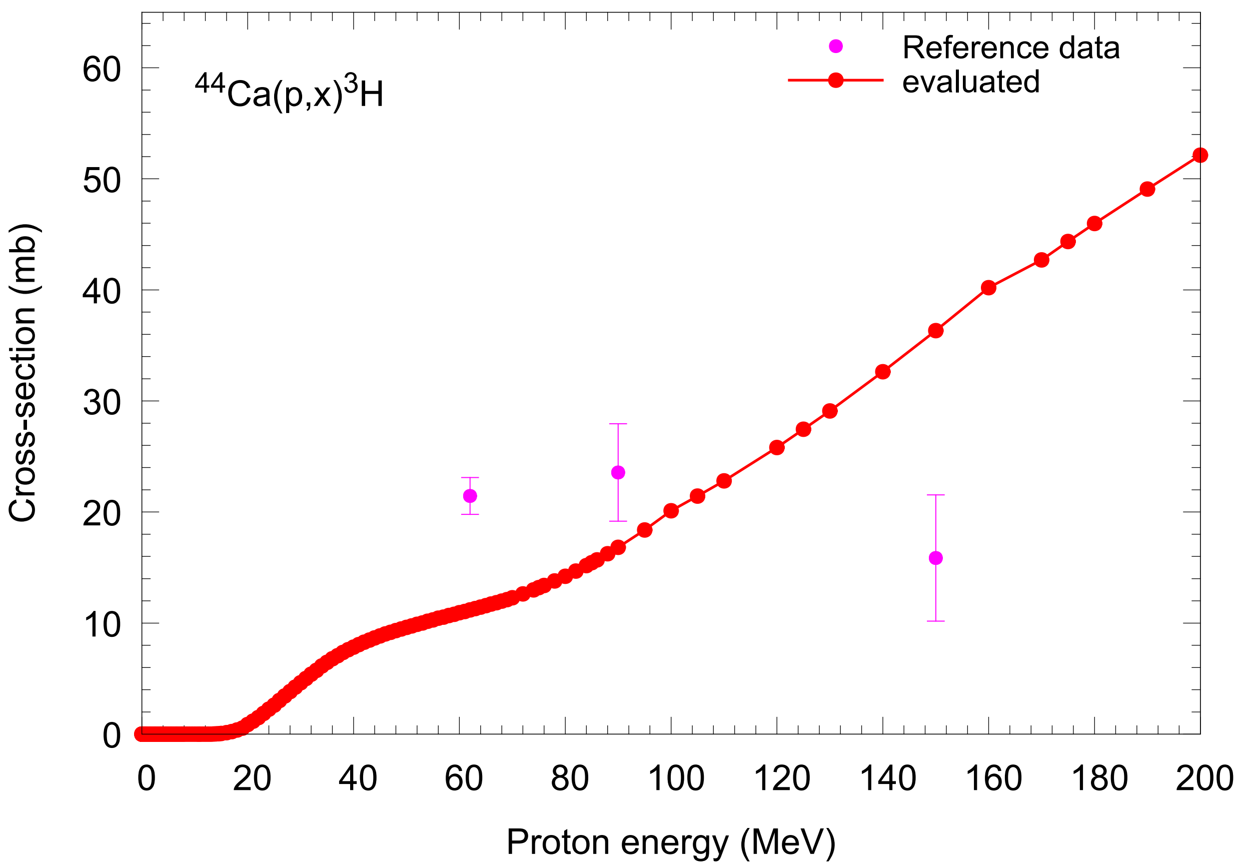
evaluated
$^{44}Ca(p,x)^{1}nn$
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
20
40
60
80
100
120
140
160
180



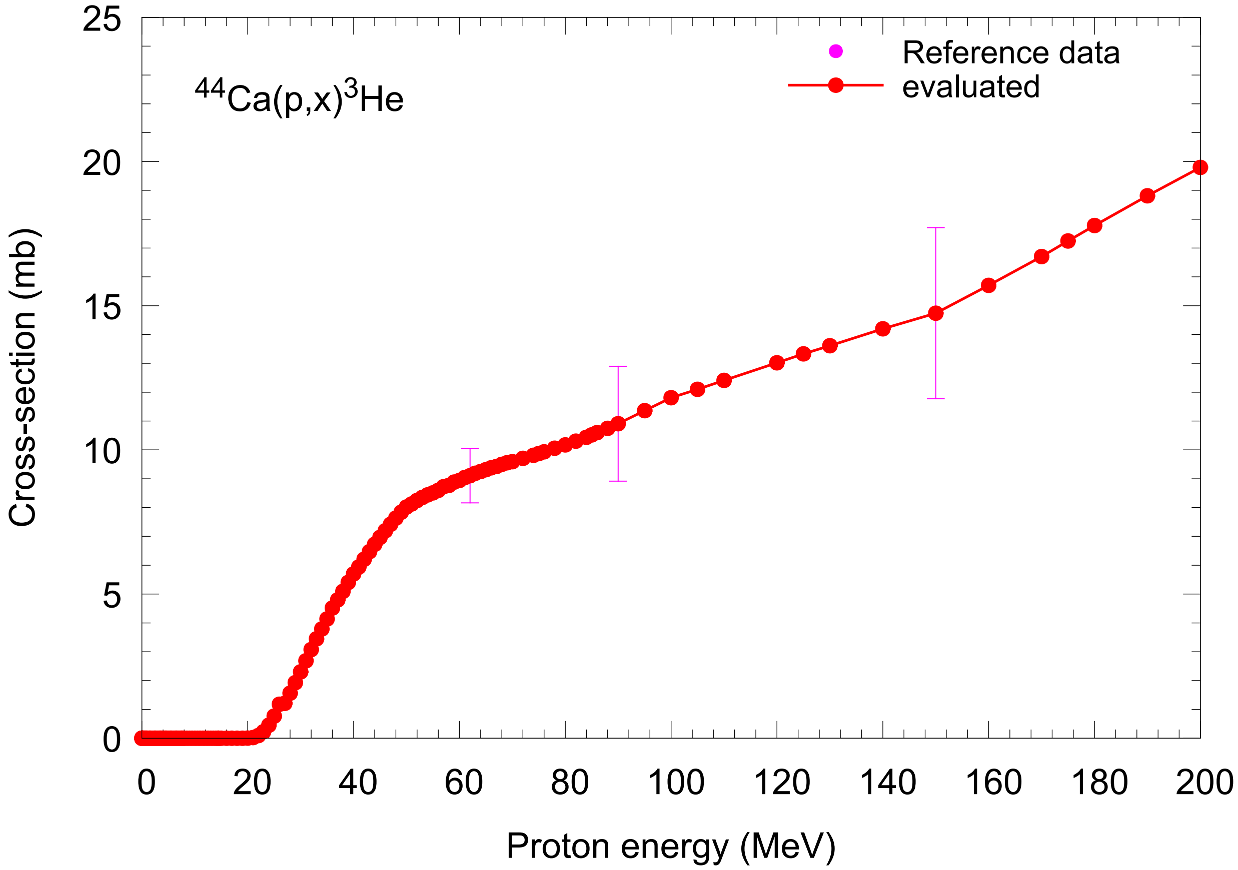
Reference data
evaluated
Reference data
$^{44}Ca(p,x)^{1}H$
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
50
100
150



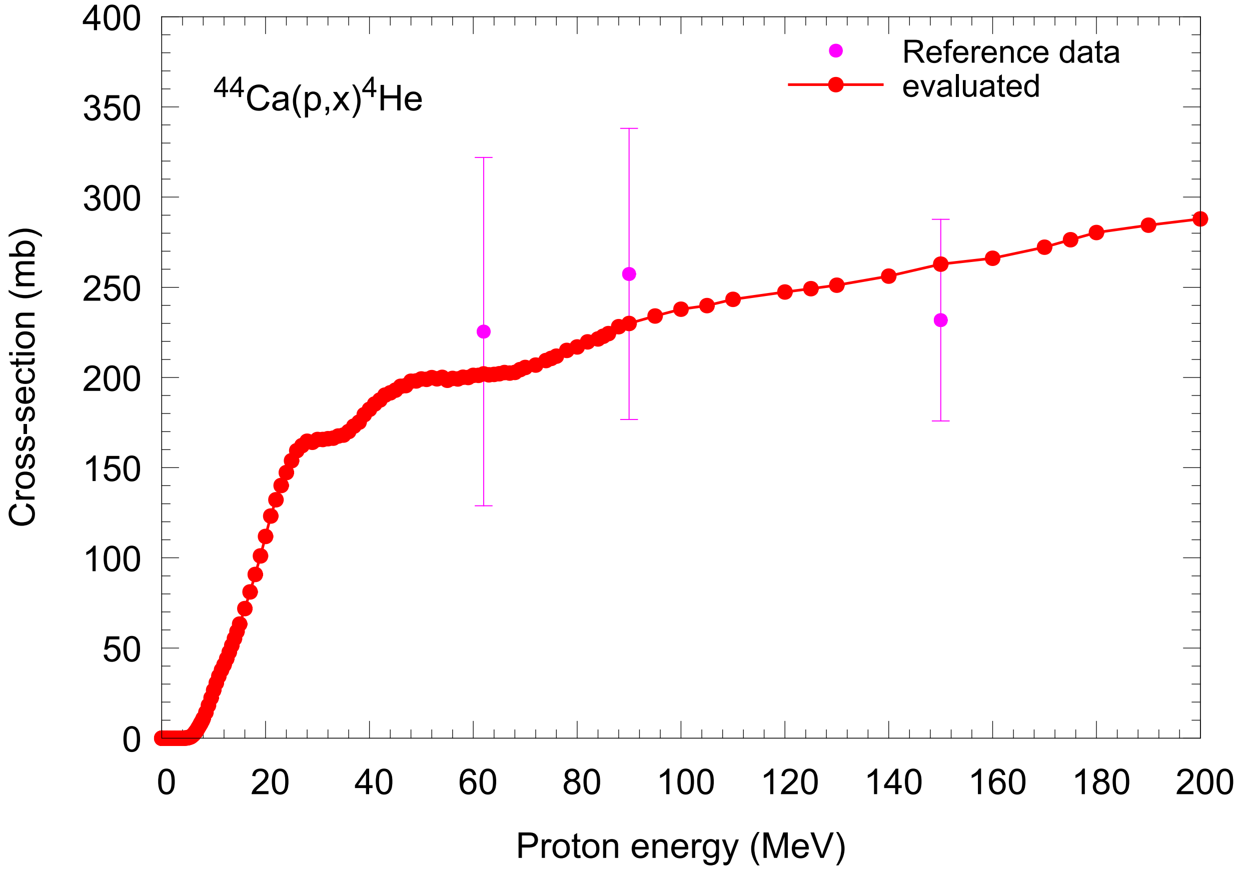
$^{44}Ca(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
200



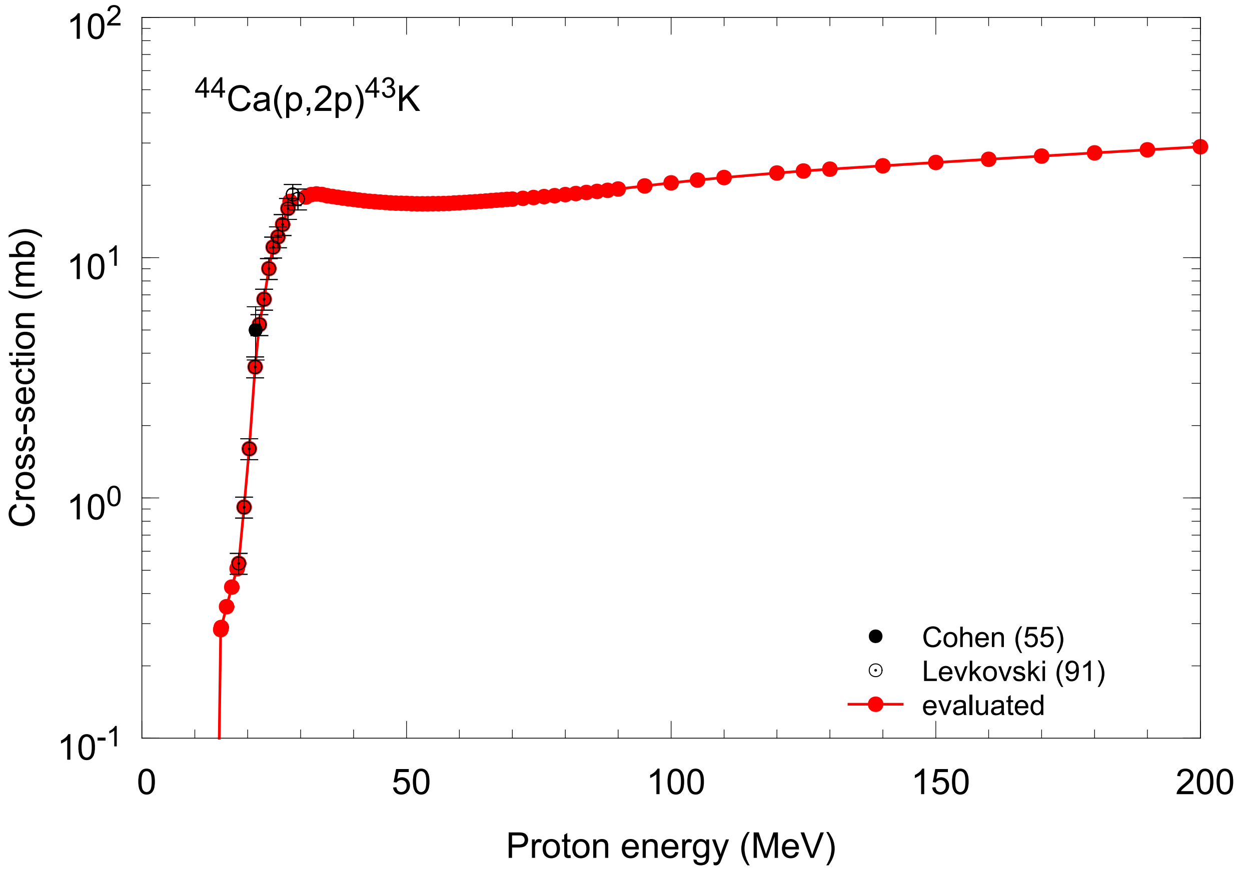
$^{44}Ca(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
10
20
30
40
50
60



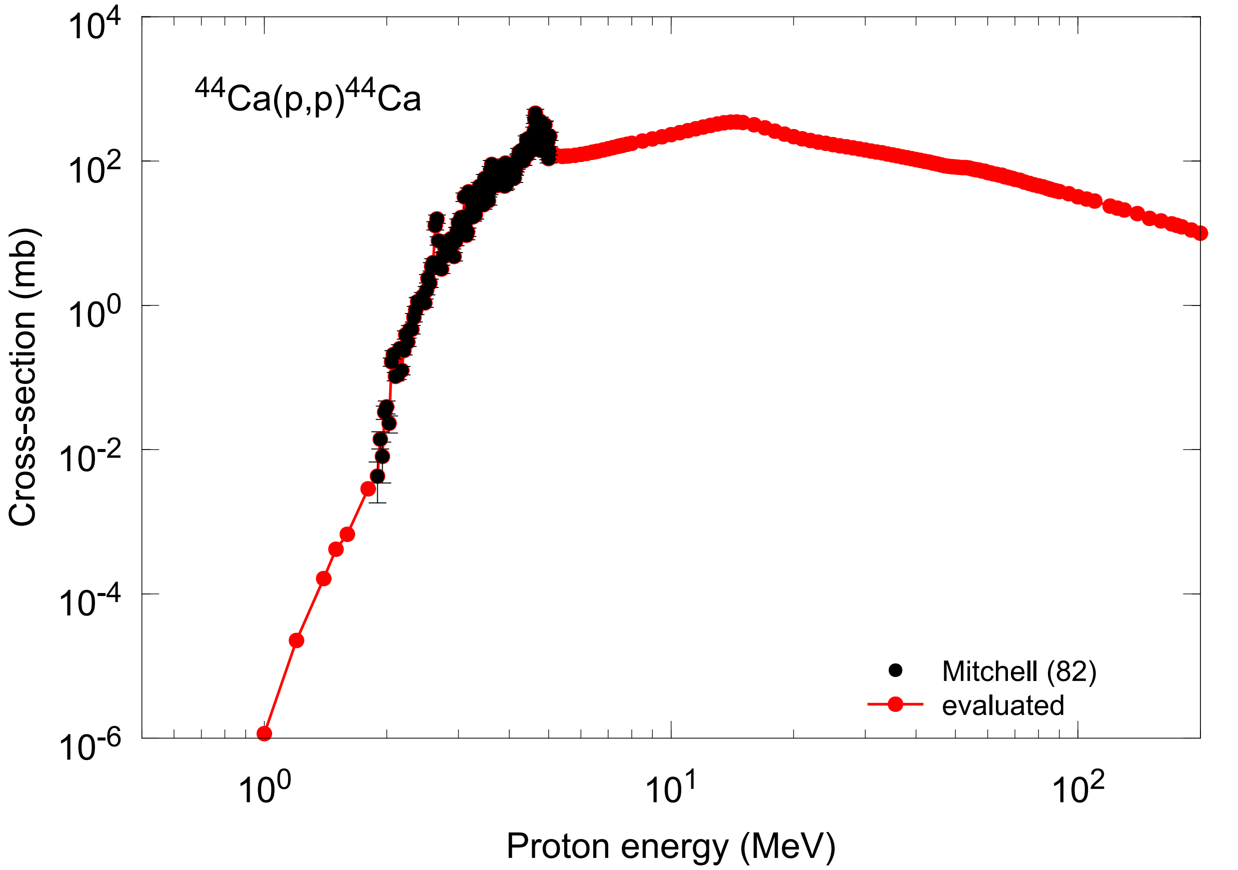
$^{44}Ca(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
0
20
40
60
80
100
120
140
160
180
200



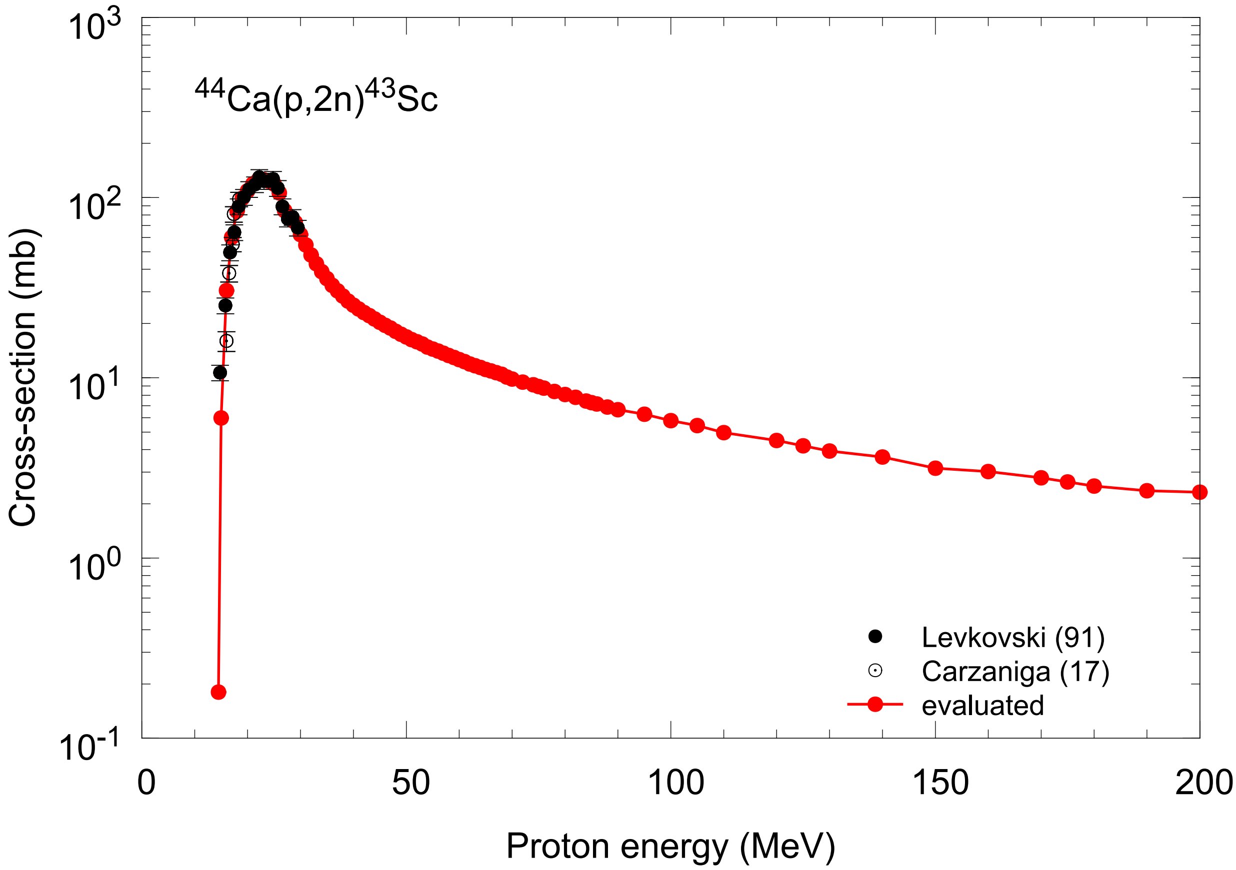
$^{44}Ca(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
300
350
400
0
20
40
60
80
100
120
140
160
180
200



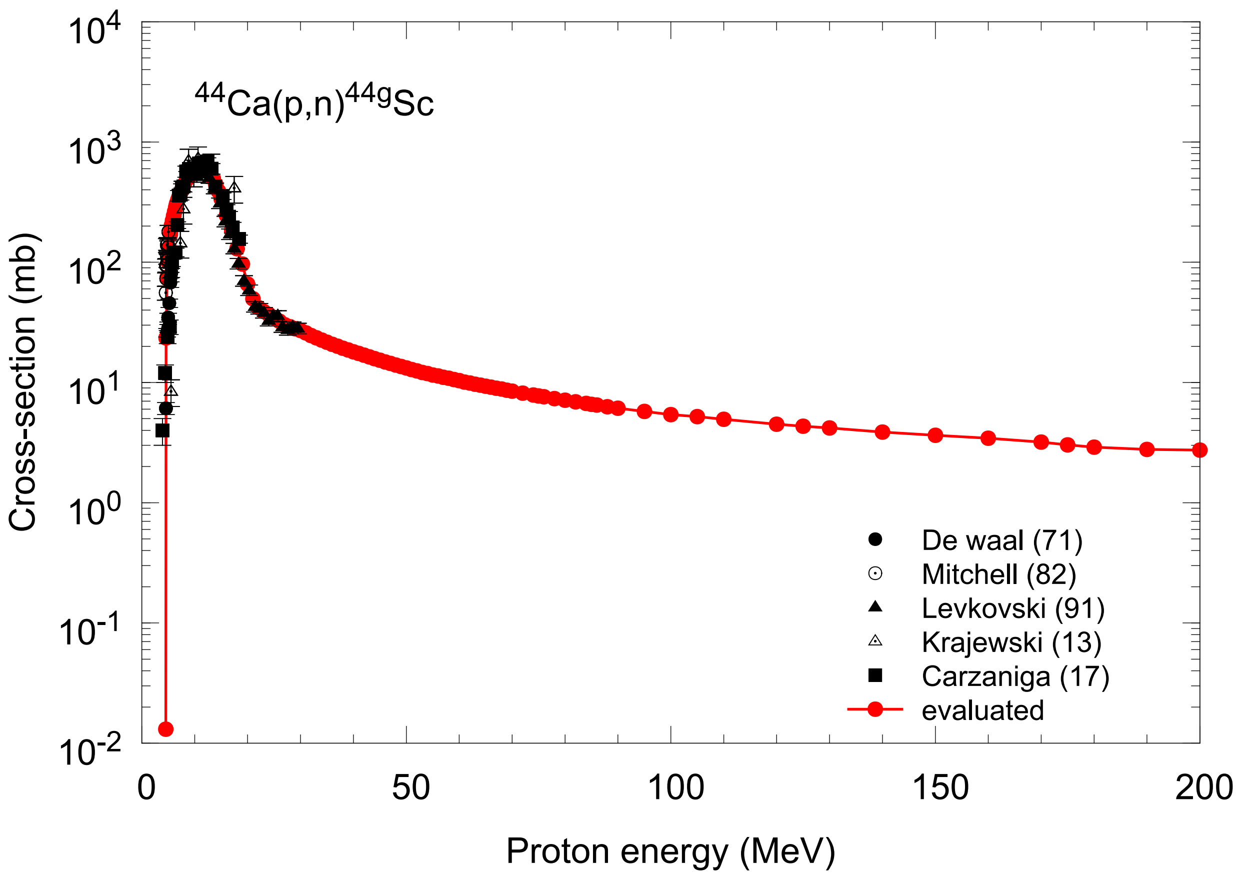
$^{44}Ca(p,2p)^{43}K$
Cross-section (mb)
Proton energy (MeV)
Cohen (55)
Levkovski (91)
evaluated



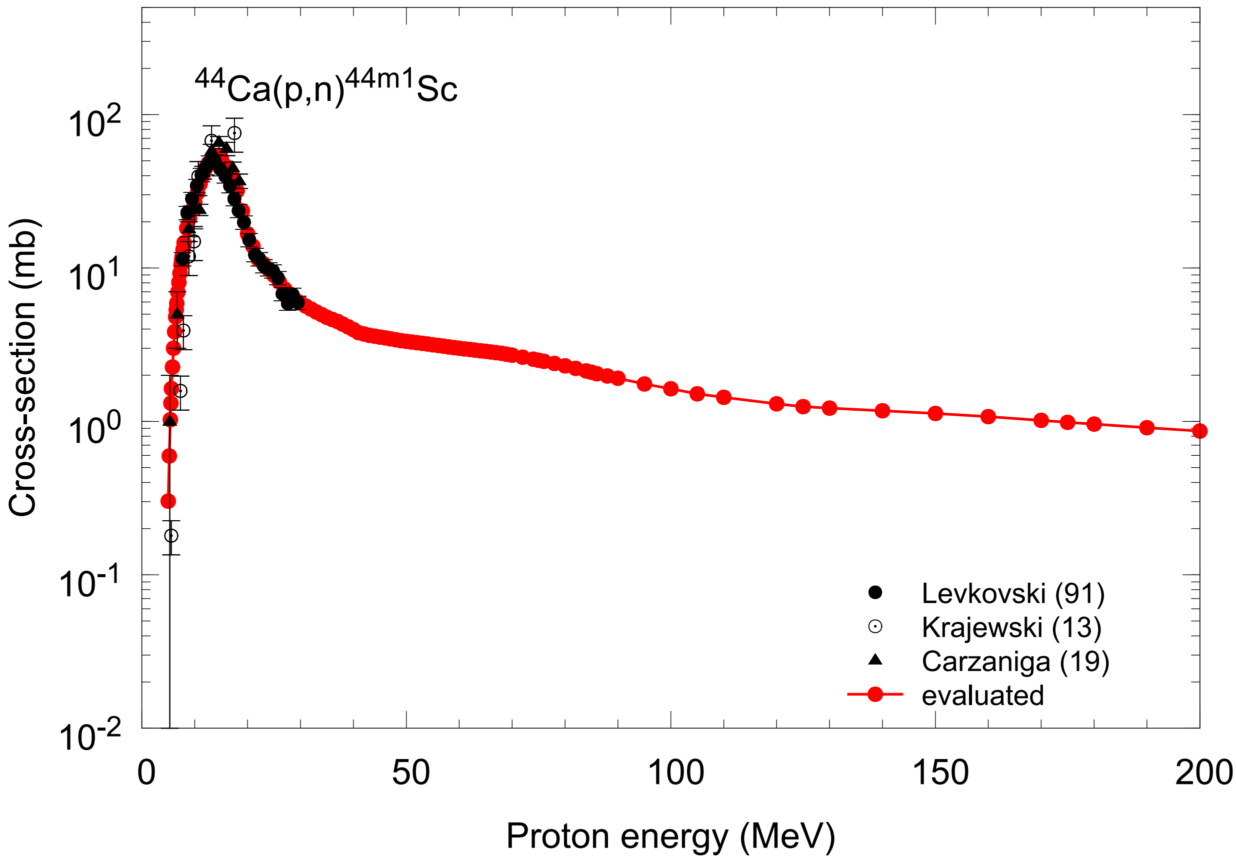
$^{44}Ca(p,p)^{44}Ca$
Cross-section (mb)
Proton energy (MeV)
Mitchell (82)
evaluated



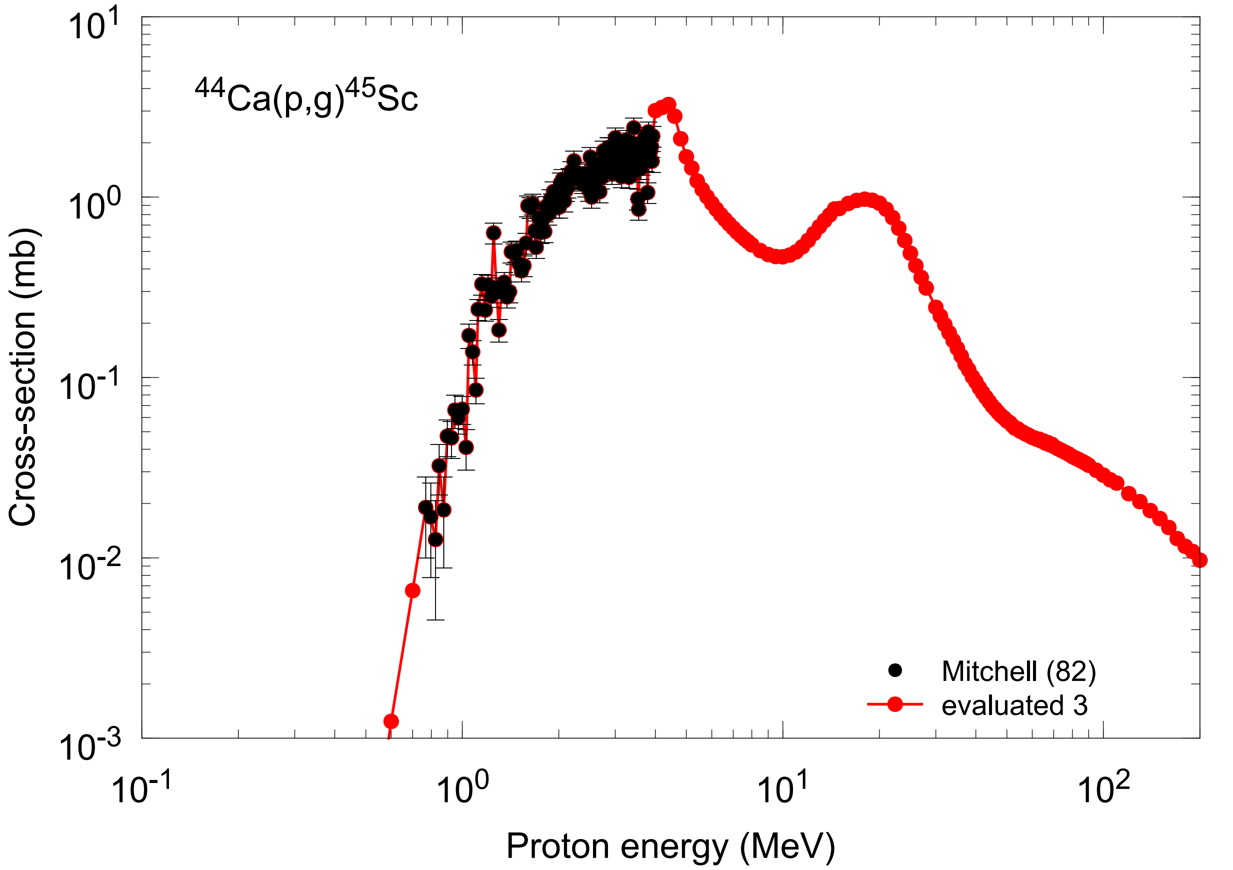
$^{44}Ca(p,2n)^{43}Sc$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
Carzaniga (17)
evaluated



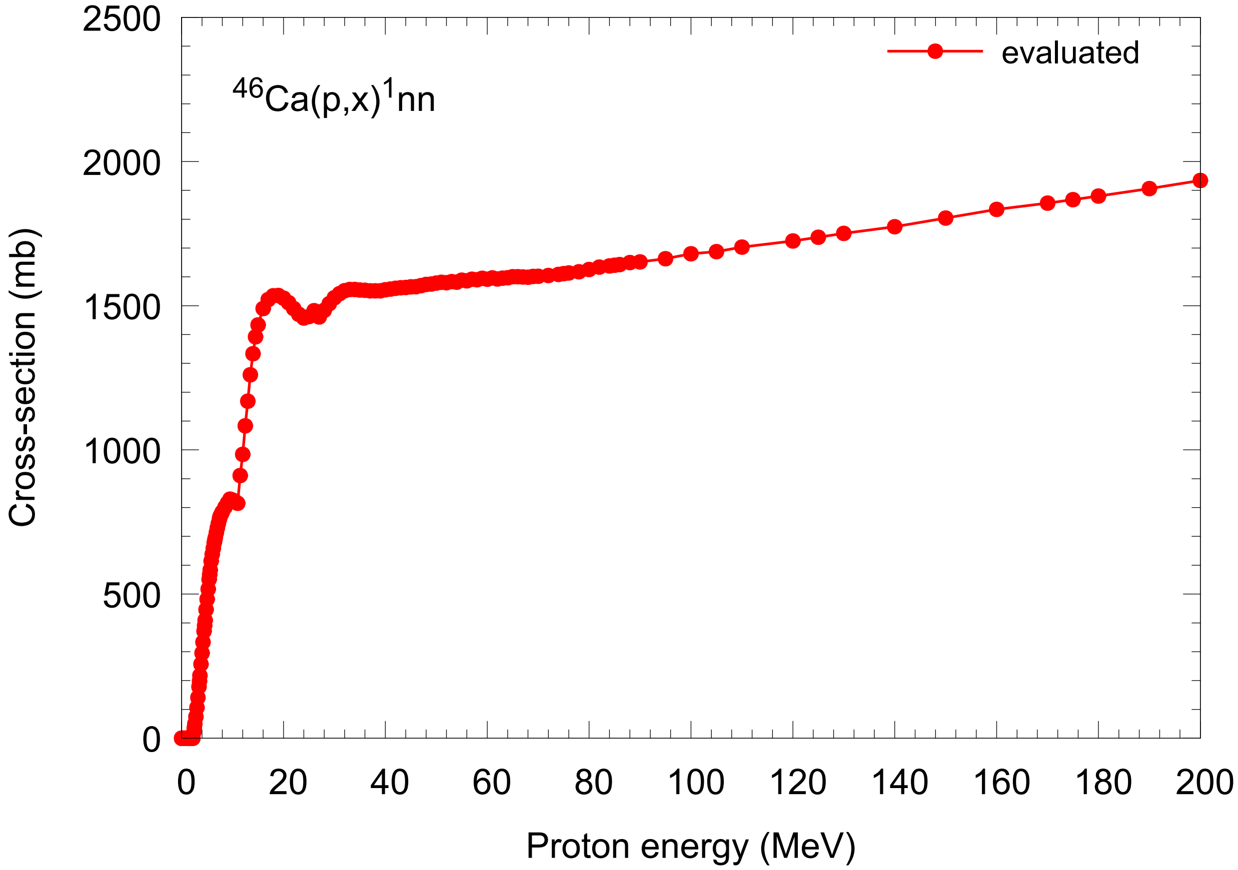
$^{44}Ca(p,n)^{44g}Sc$
Cross-section (mb)
Proton energy (MeV)
De waal (71)
Mitchell (82)
Levkovski (91)
Krajewski (13)
Carzaniga (17)
evaluated



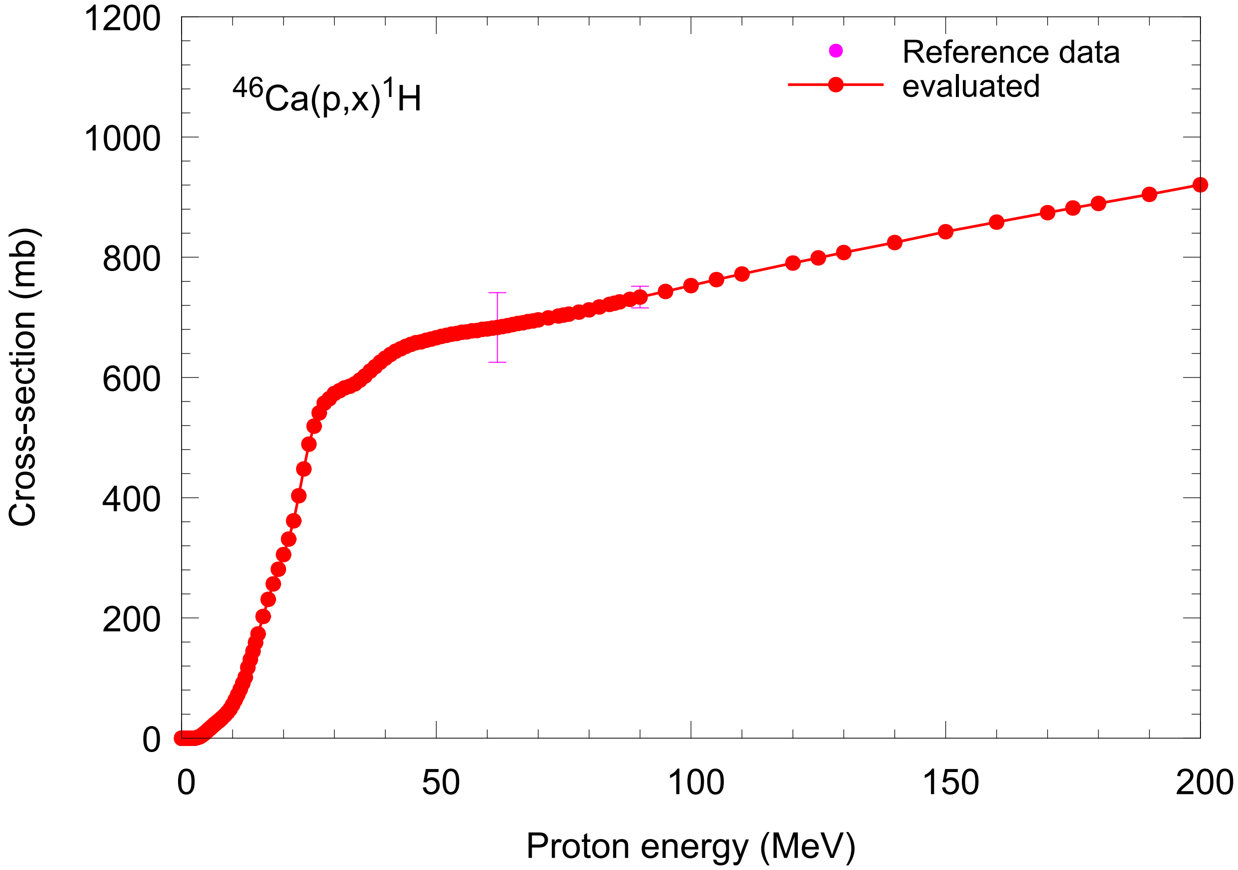
$^{44}Ca(p,n)^{44m1}Sc$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
Krajewski (13)
Carzaniga (19)
evaluated



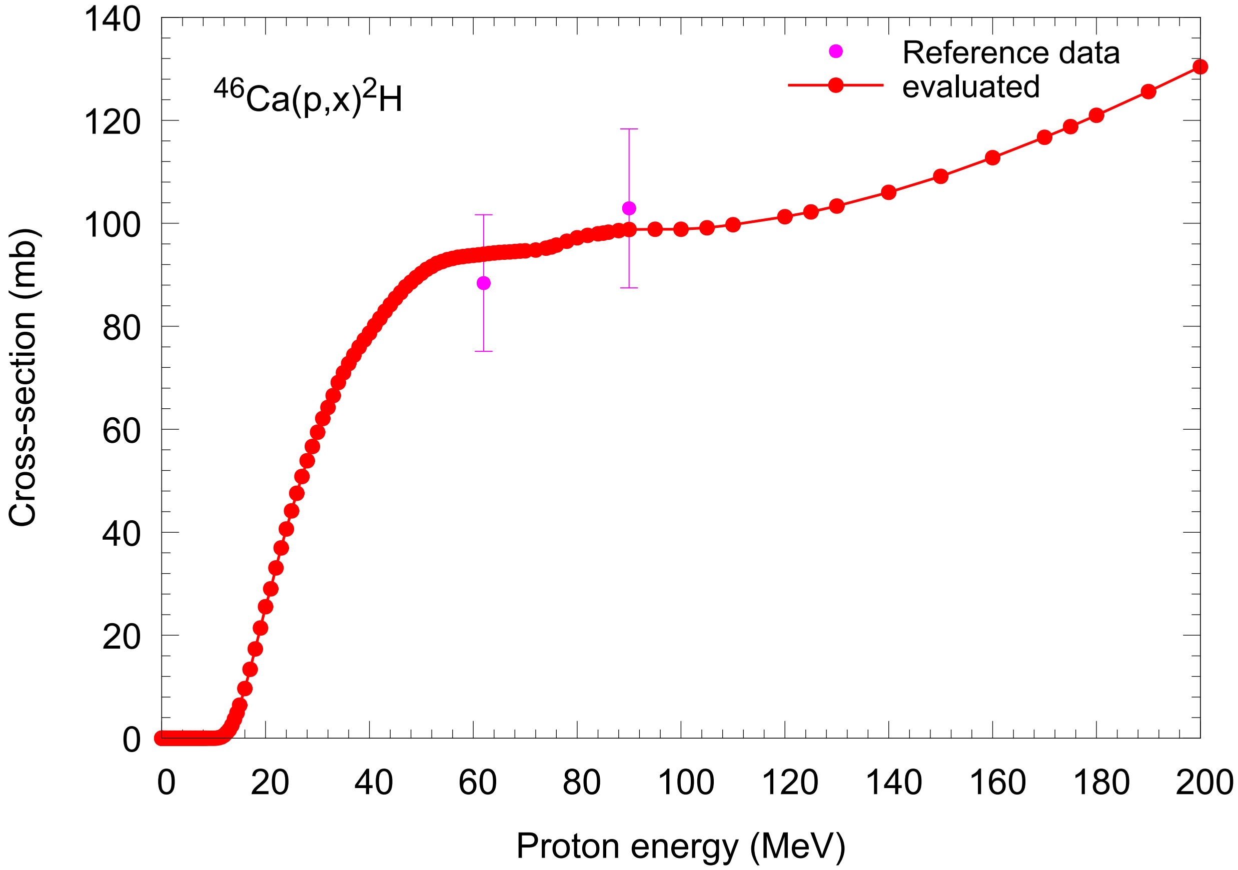
$^{44}Ca(p,g)^{45}Sc$
Cross-section (mb)
Proton energy (MeV)
Mitchell (82)
evaluated 3



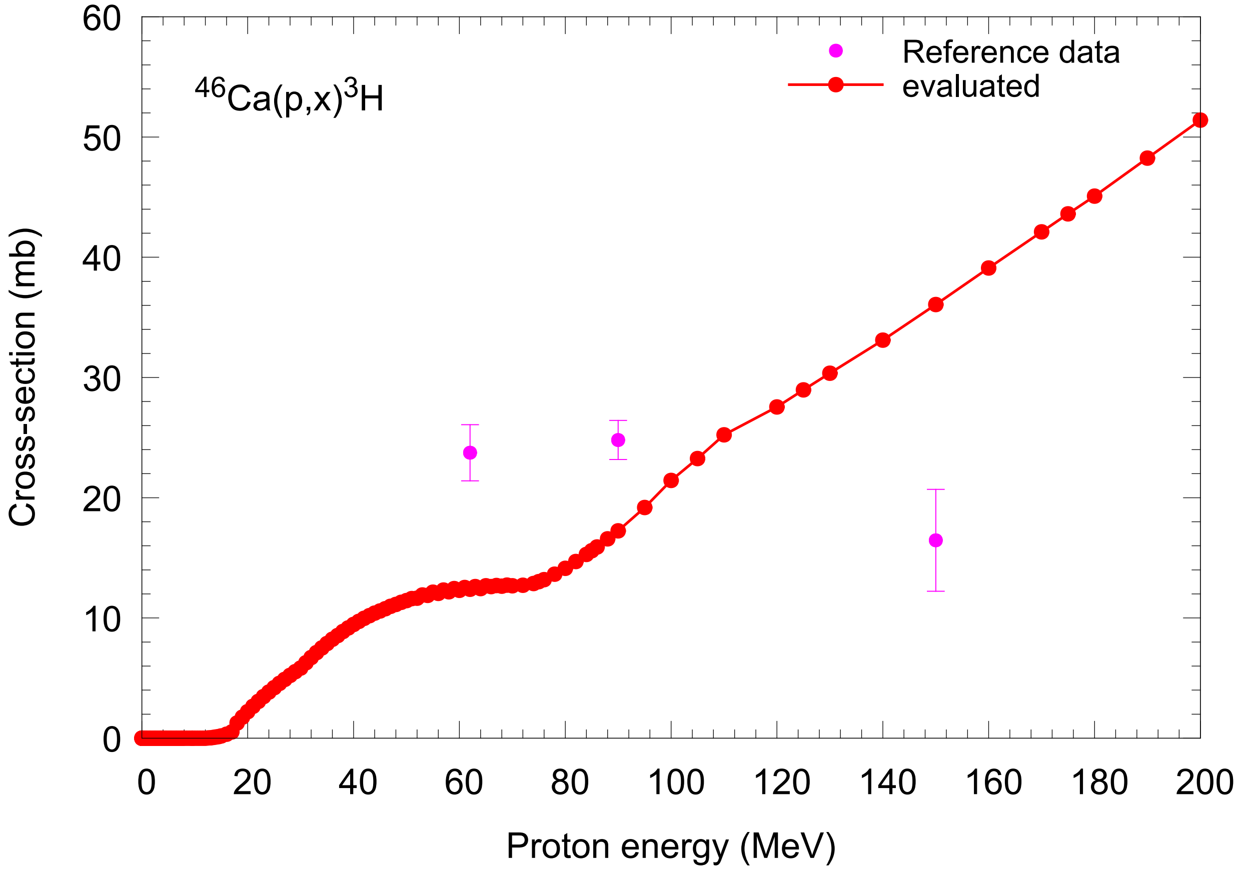
$^{46}Ca(p,x)^{1}nn$
evaluated
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
0
20
40
60
80
100
120
140
160
180
200



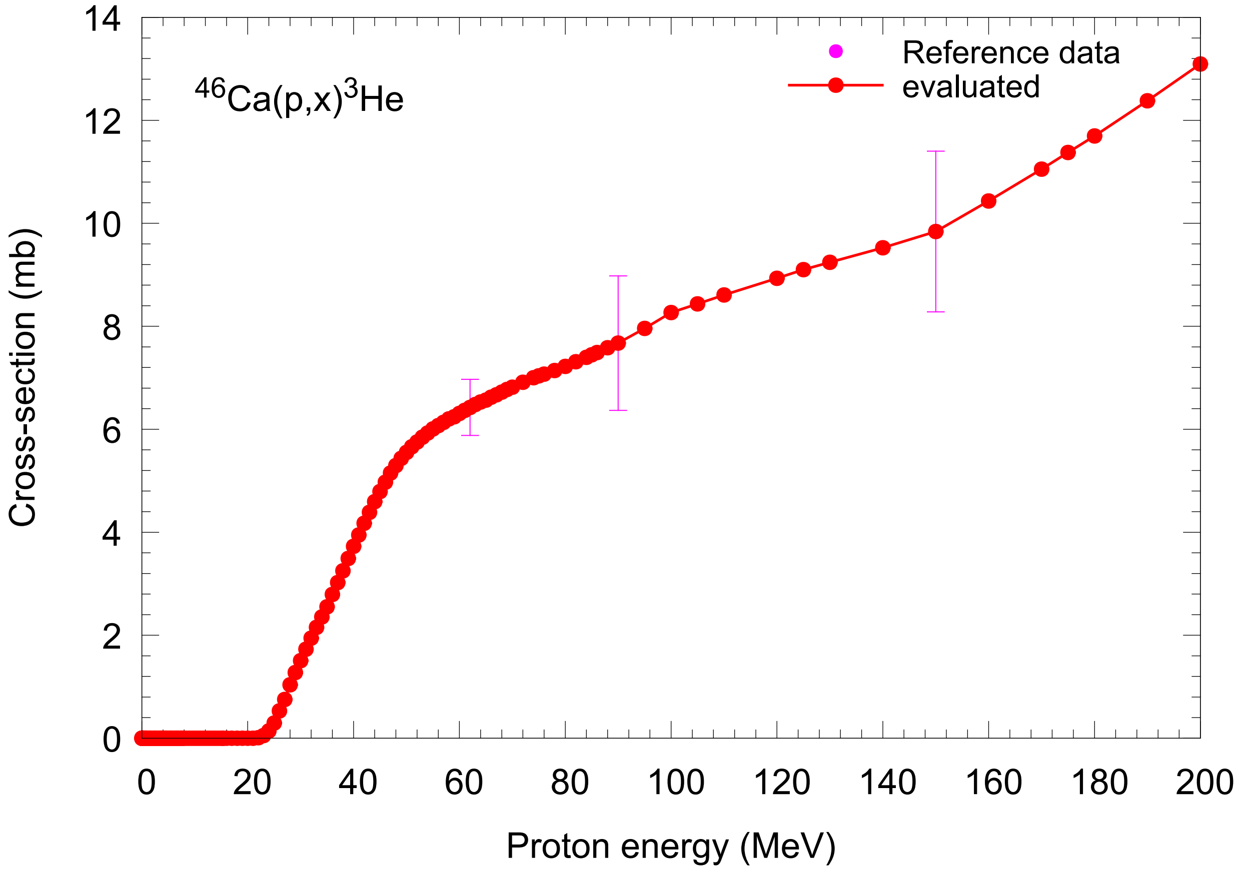
$^{46}Ca(p,x)^{1}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
0
50
100
150
200

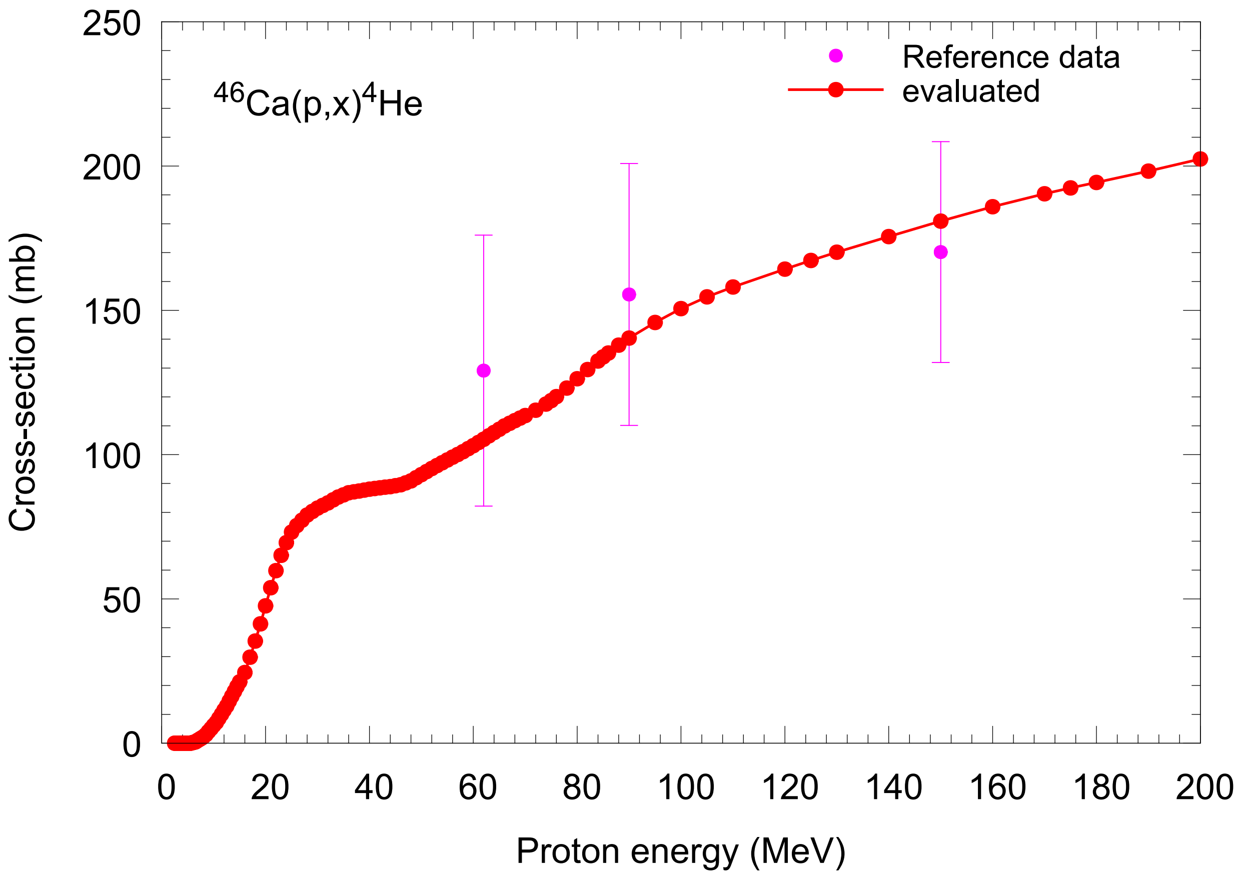


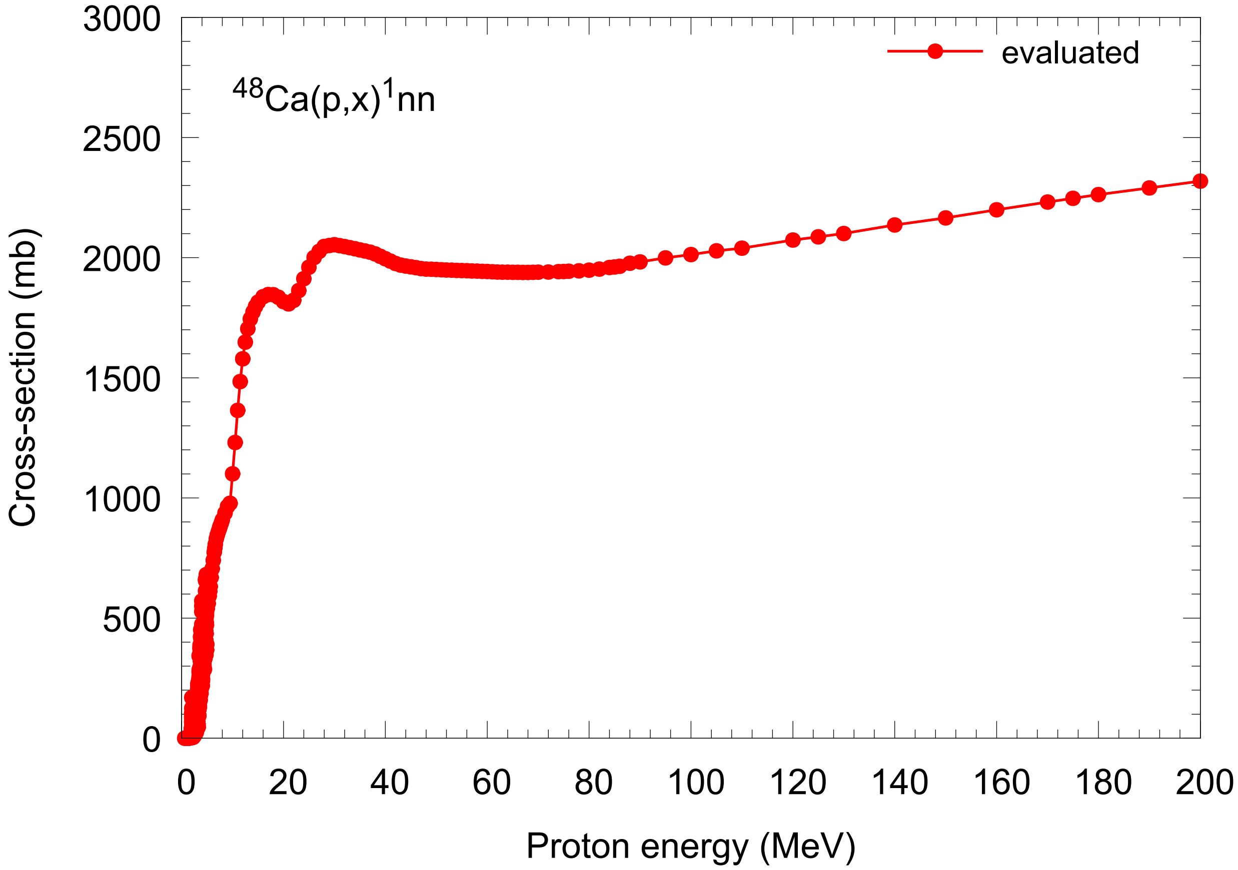
$^{46}Ca(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
0
20
40
60
80
100
120
140
160
180
200



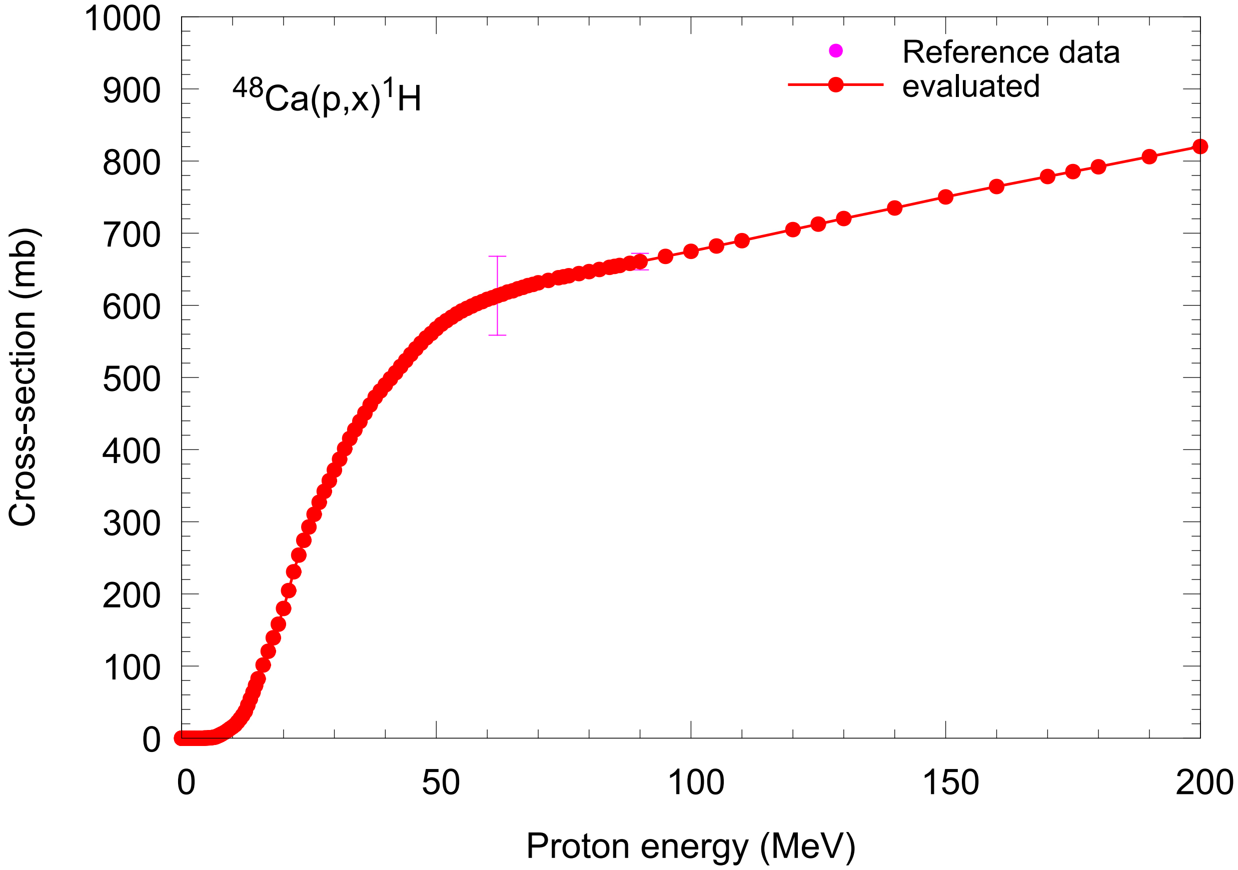
$^{46}Ca(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
10
20
30
40
50
60
0
20
40
60
80
100
120
140
160
180
200


$^{46}Ca(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
2
4
6
8
10
12
14
0
20
40
60
80
100
120
140
160
180
200

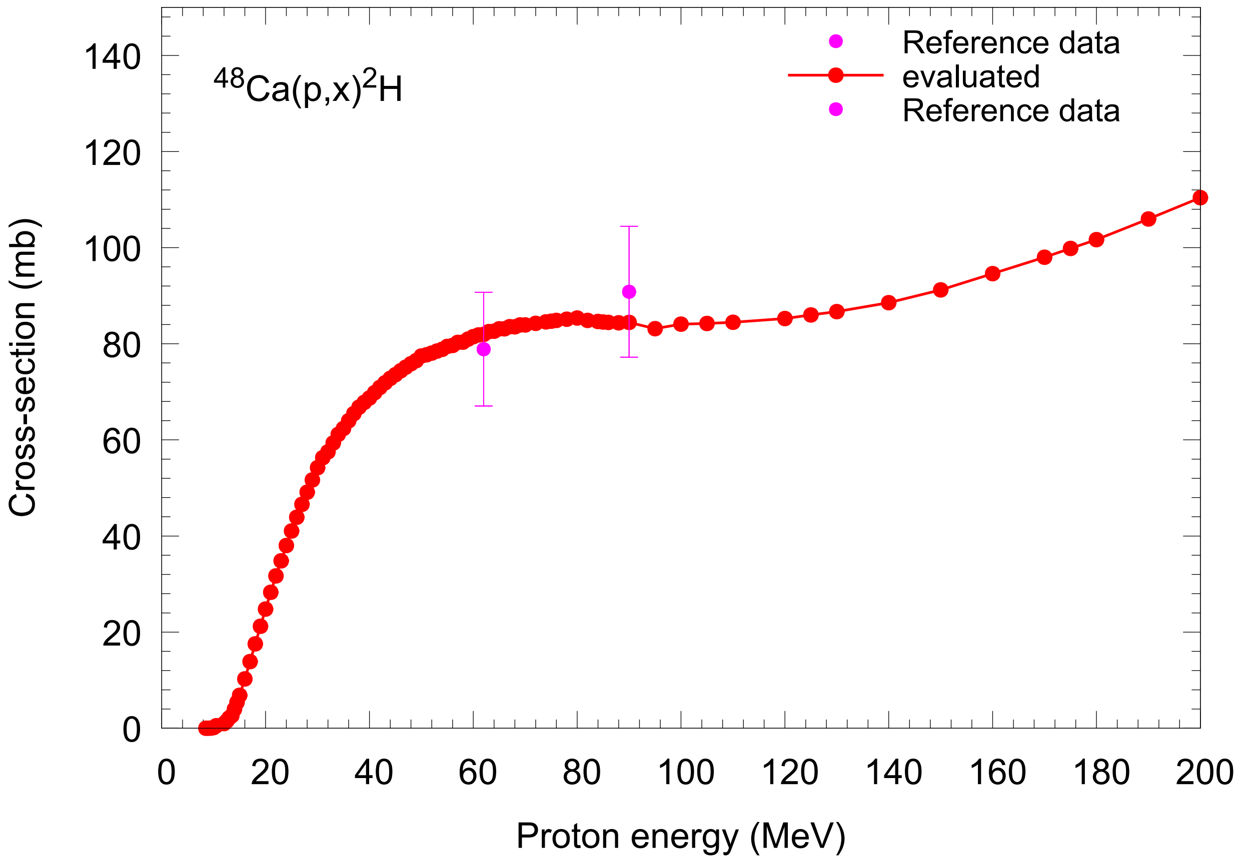

$^{46}Ca(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
0
20
40
60
80
100
120
140
160
180
200



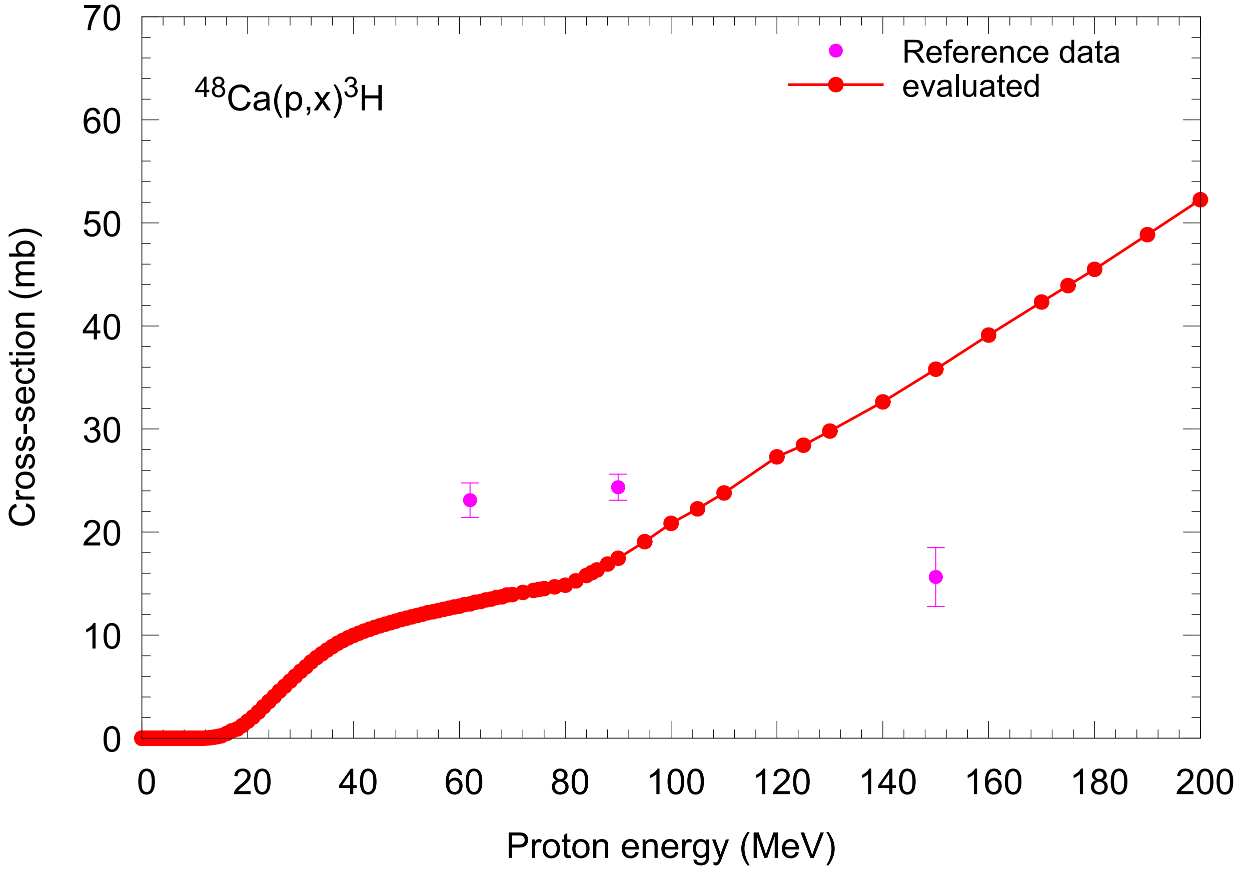
$^{48}Ca(p,x)^{1}nn$
evaluated
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
3000
0
20
40
60
80
100
120
140
160
180
200



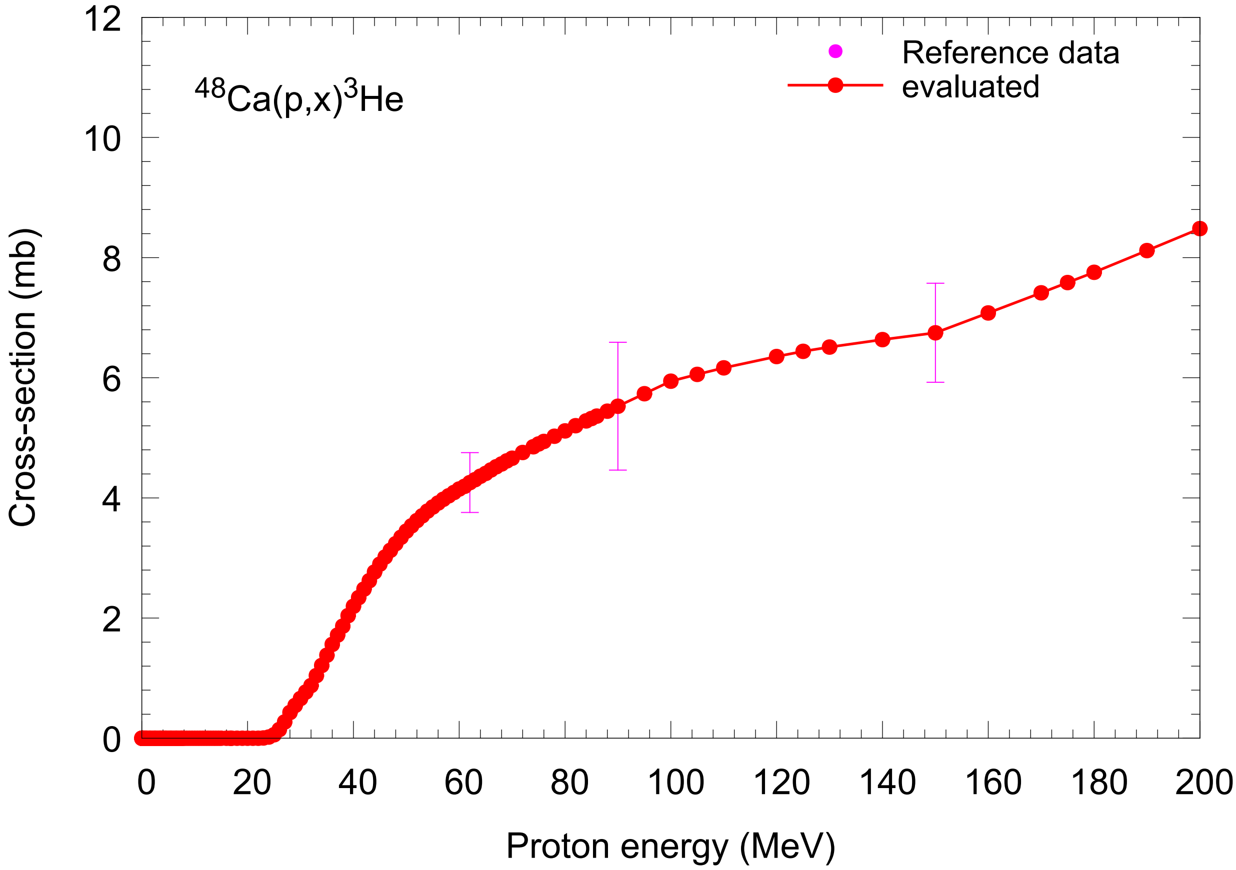
$^{48}Ca(p,x)^{1}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
100
200
300
400
500
600
700
800
900
1000
0
50
100
150
200



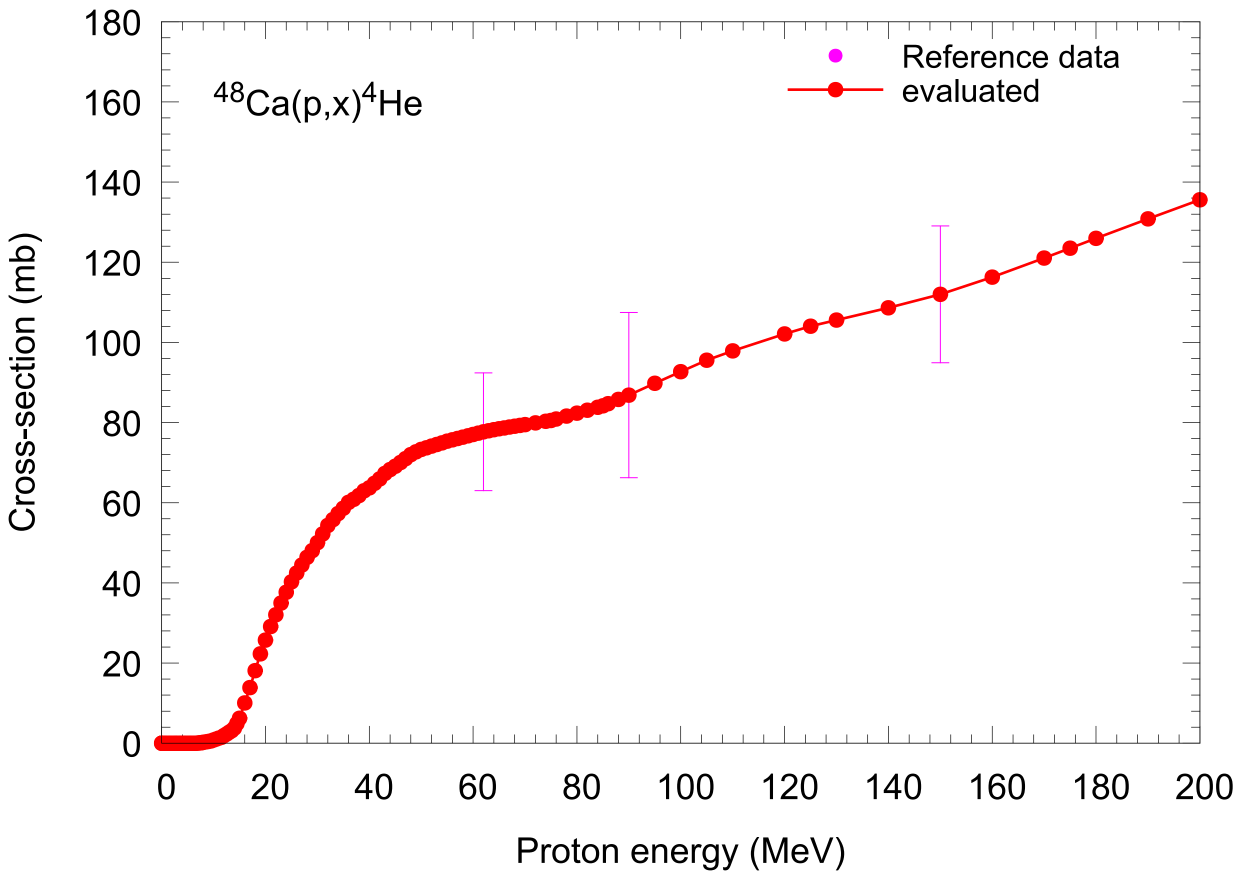
$^{48}Ca(p,x)^{2}H$
Reference data
evaluated
Reference data
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
200



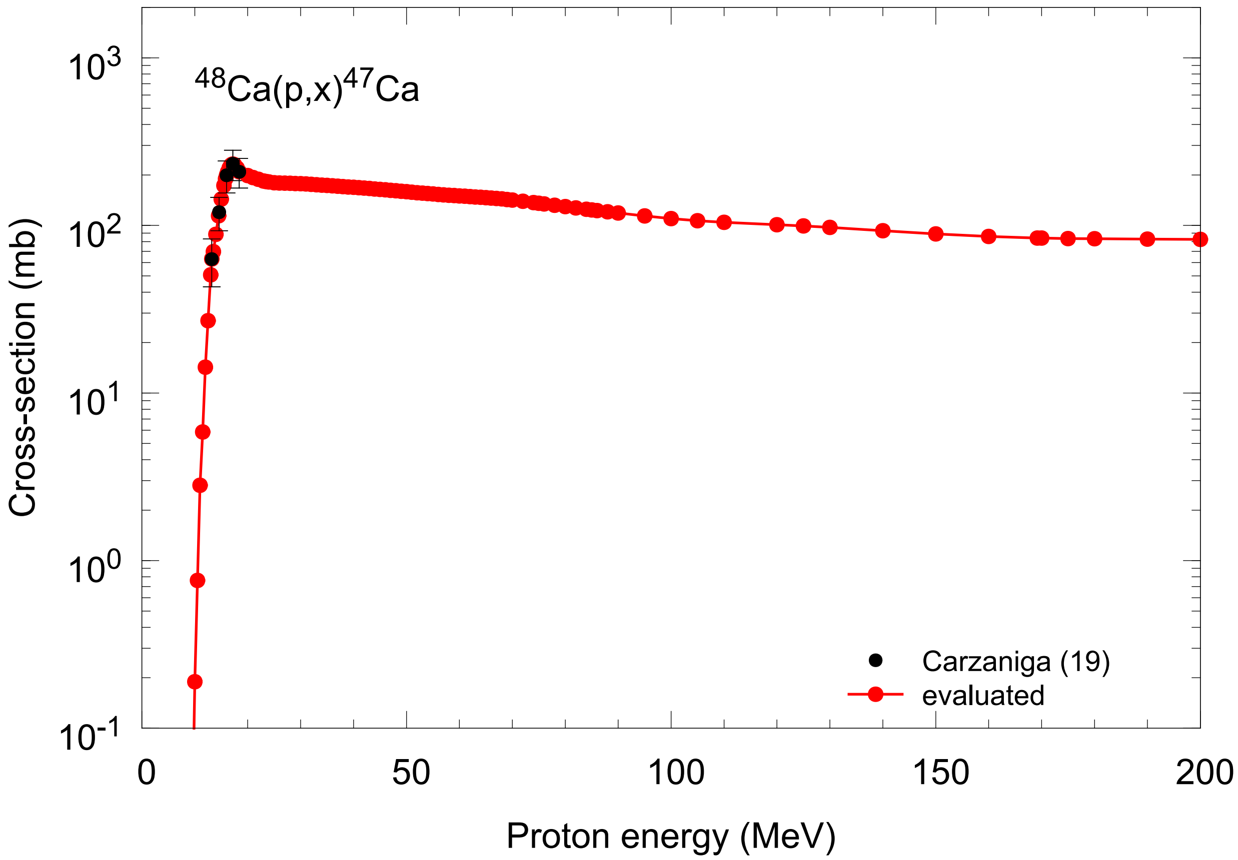
$^{48}Ca(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
10
20
30
40
50
60
70
80
100
120
140
160
180
200



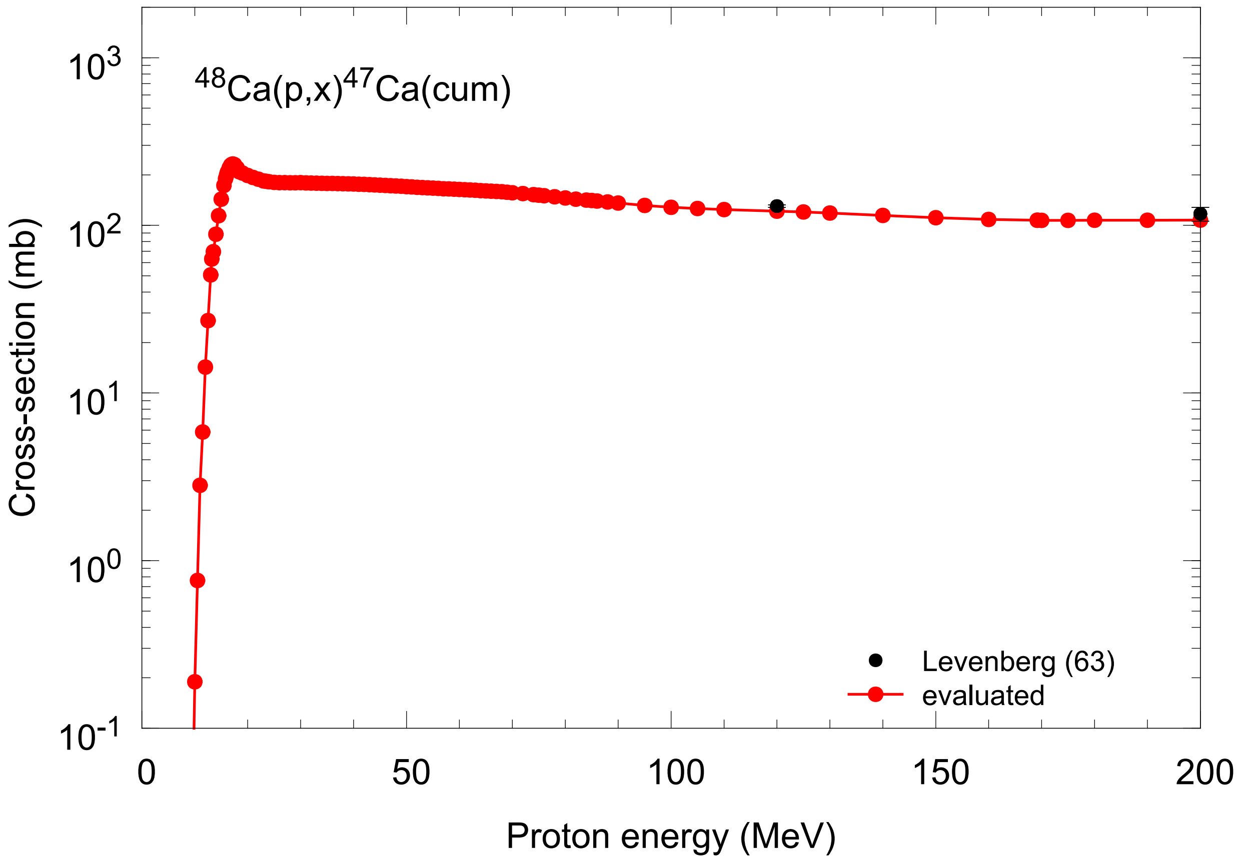
$^{48}Ca(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
2
4
6
8
10
12
0
20
40
60
80
100
120
140
160
180
200



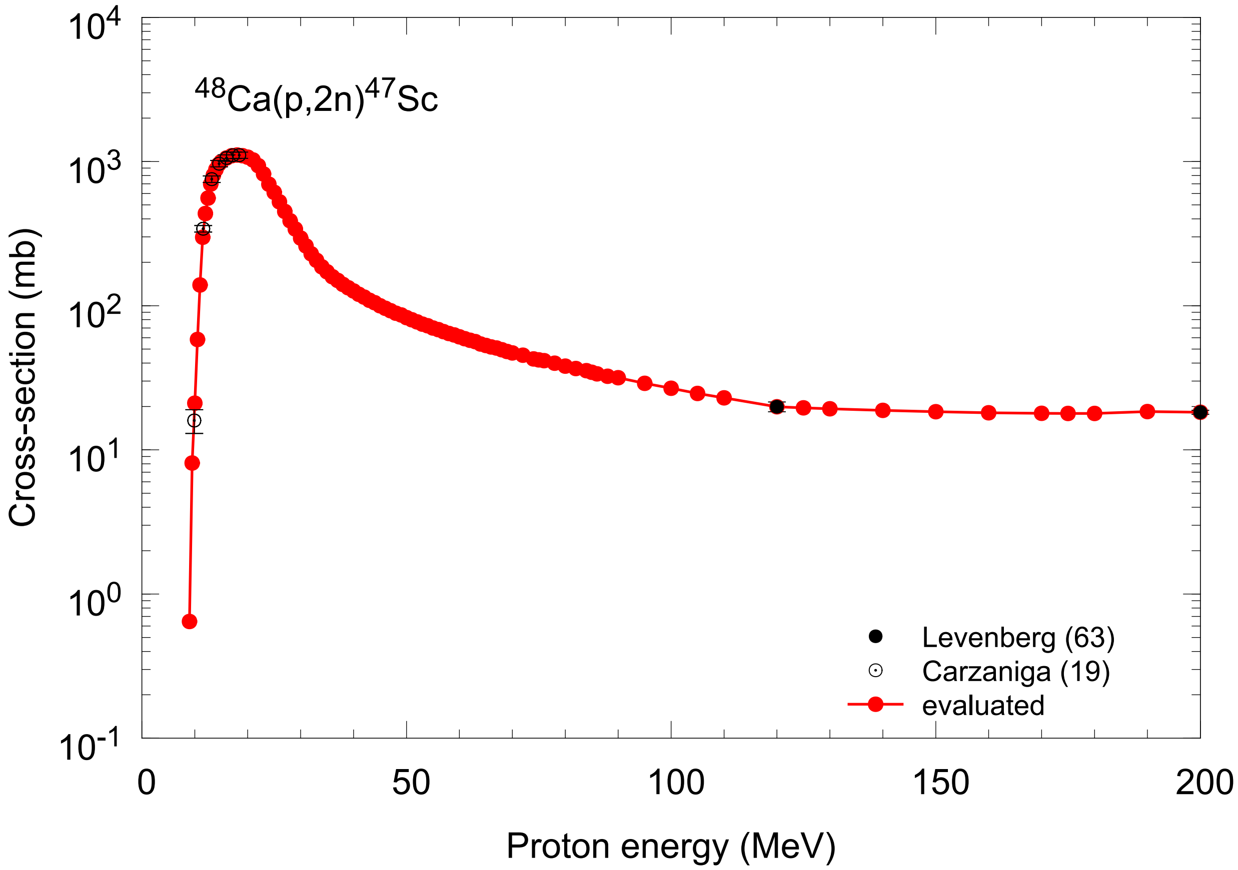
$^{48}Ca(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
0
20
40
60
80
100
120
140
160
180
200



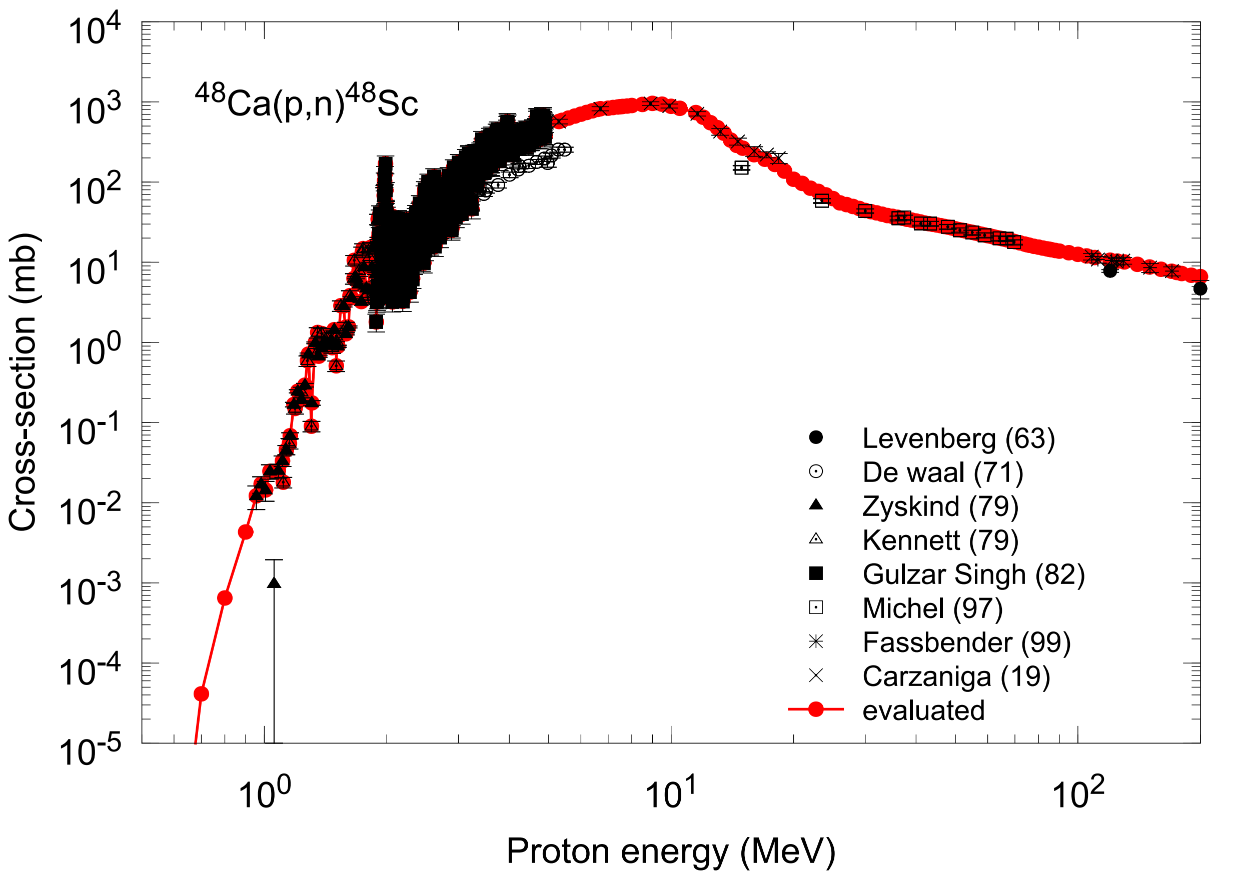
$^{48}Ca(p,x)^{47}Ca$
Cross-section (mb)
Proton energy (MeV)
Carzaniga (19)
evaluated



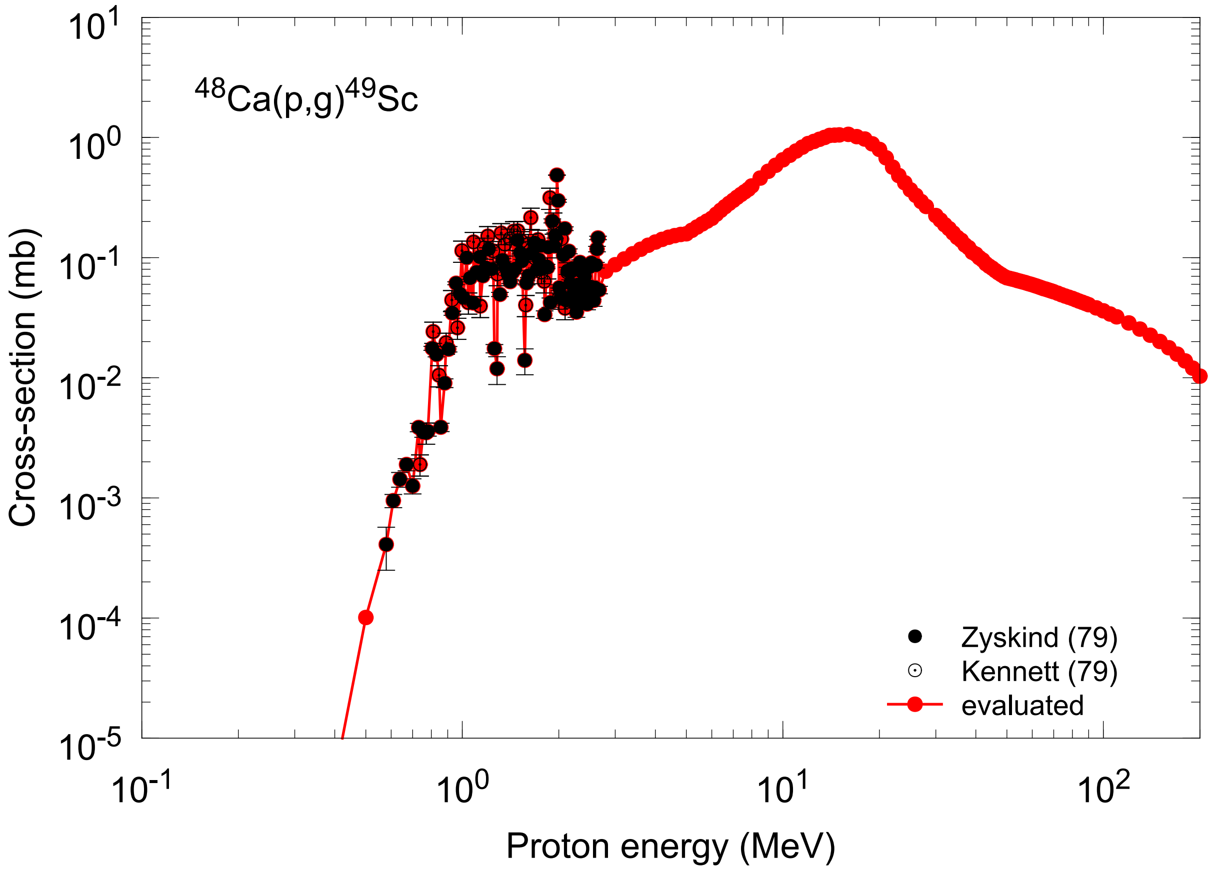
$^{48}Ca(p,x)^{47}Ca(cum)$
Cross-section (mb)
Proton energy (MeV)
Levenberg (63)
evaluated



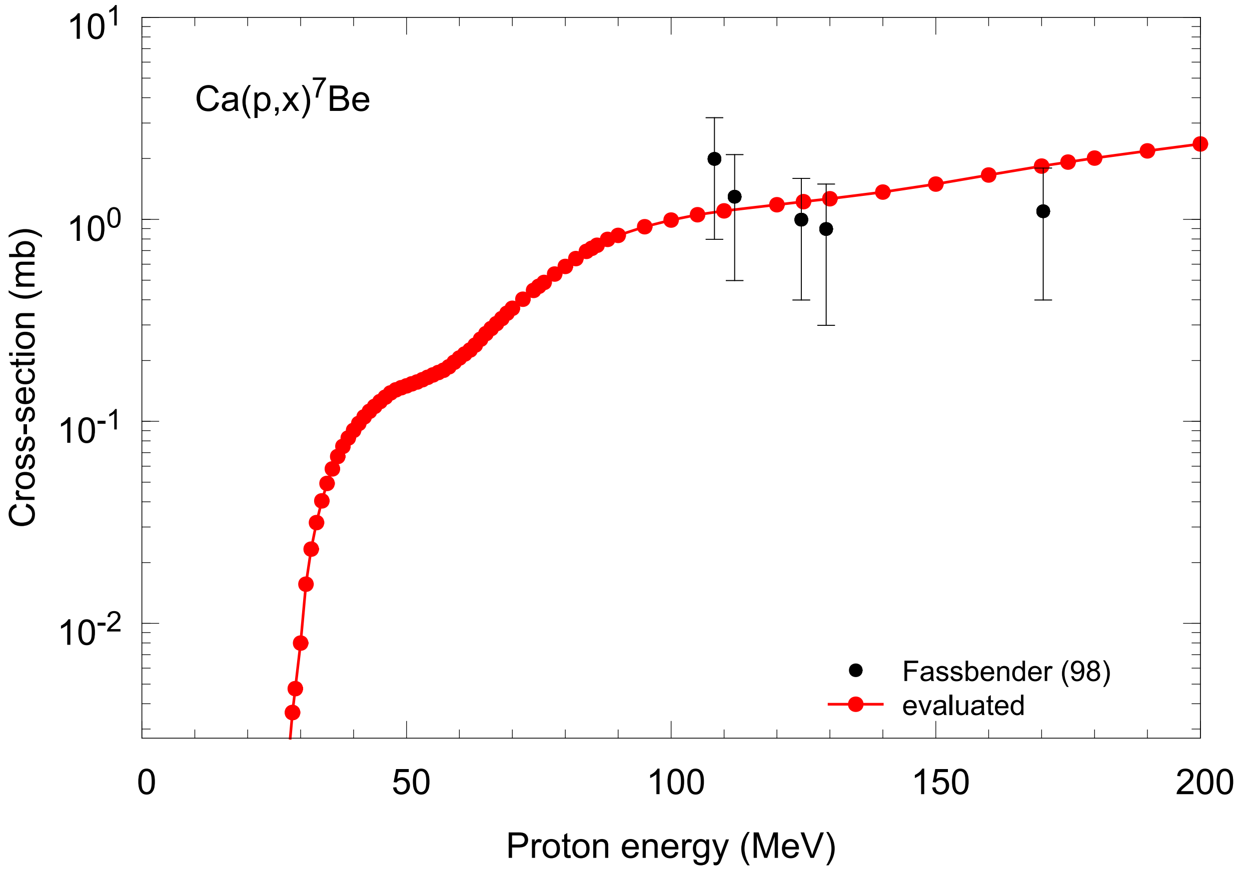
$^{48}Ca(p,2n)^{47}Sc$
Cross-section (mb)
Proton energy (MeV)
Levenberg (63)
Carzaniga (19)
evaluated

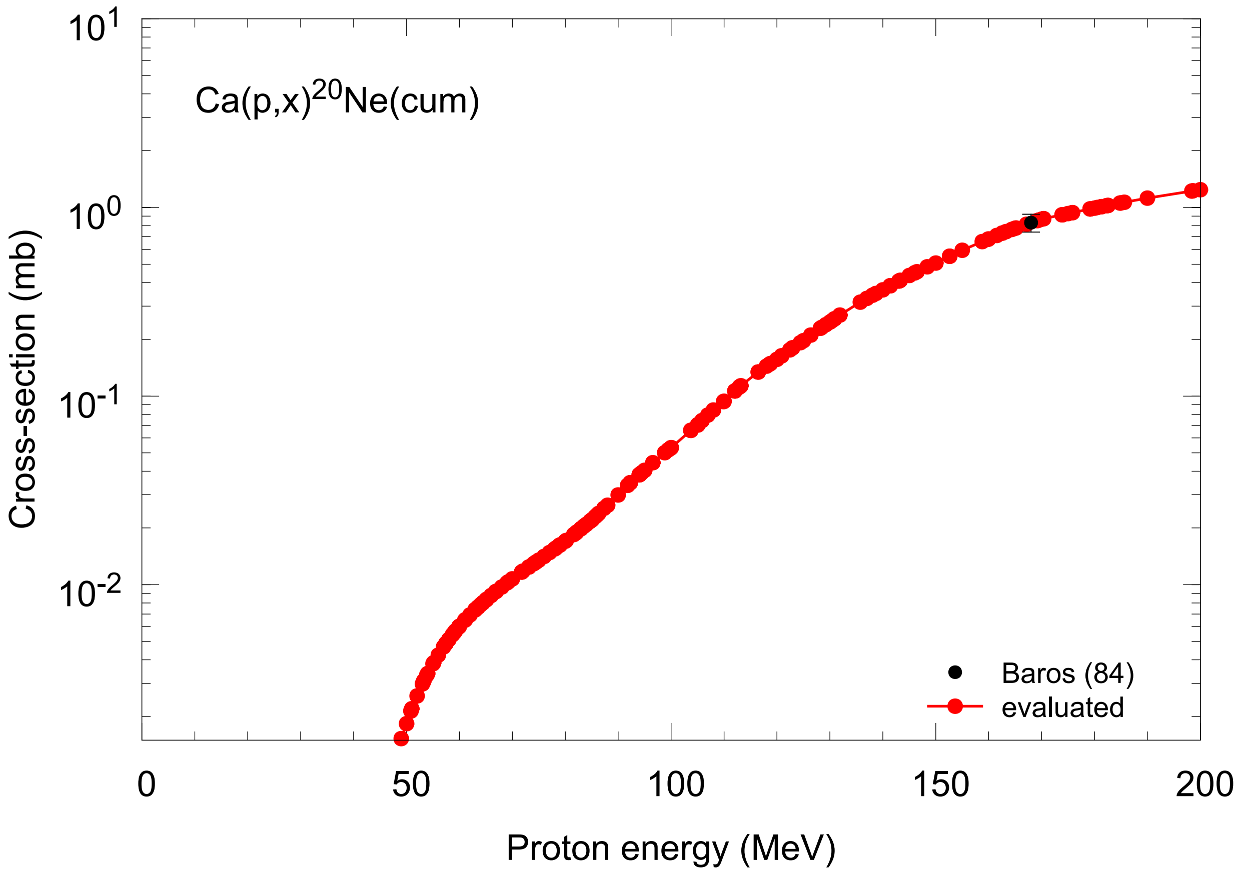


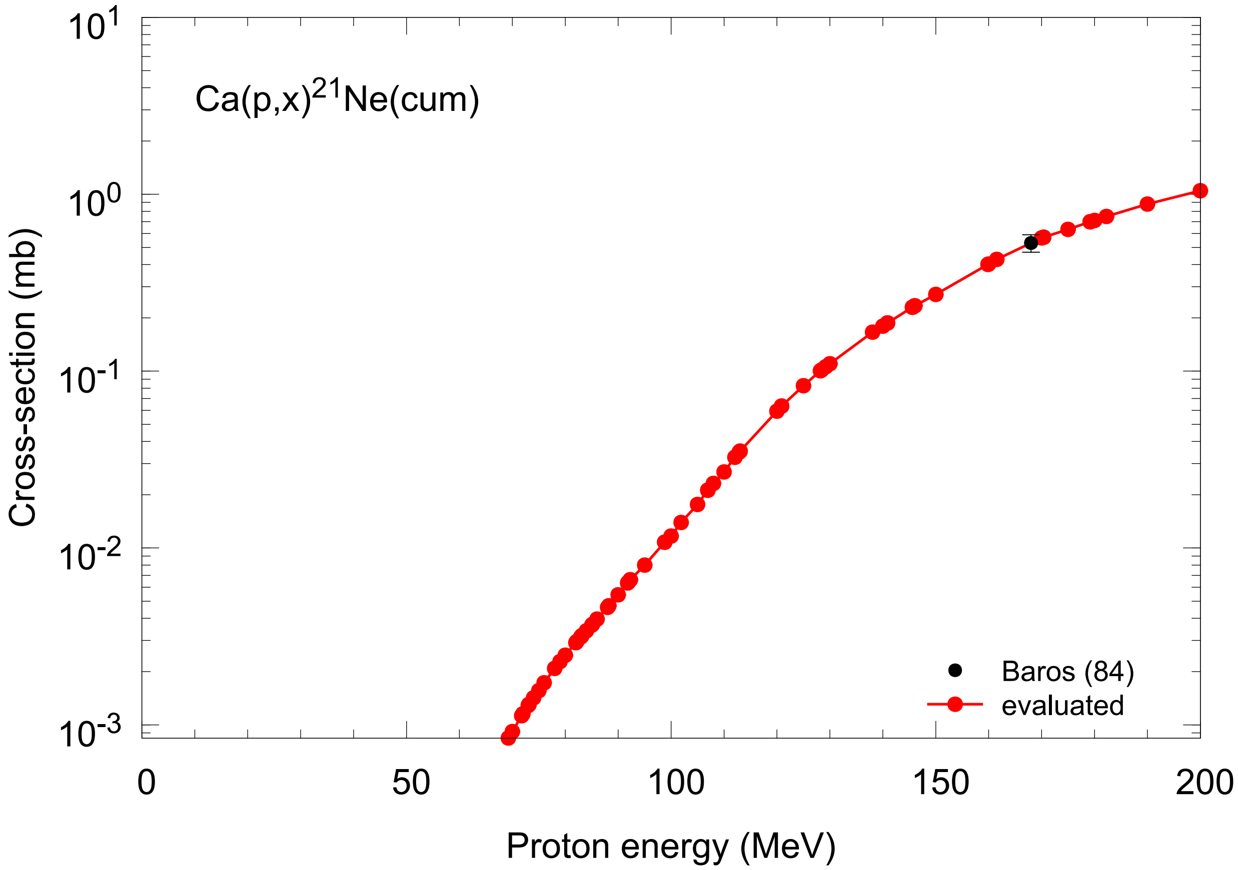
$^{48}Ca(p,n)^{48}Sc$
Cross-section (mb)
Proton energy (MeV)
Levenberg (63)
De waal (71)
Zyskind (79)
Kennett (79)
Gulzar Singh (82)
Michel (97)
Fassbender (99)
Carzaniga (19)
evaluated



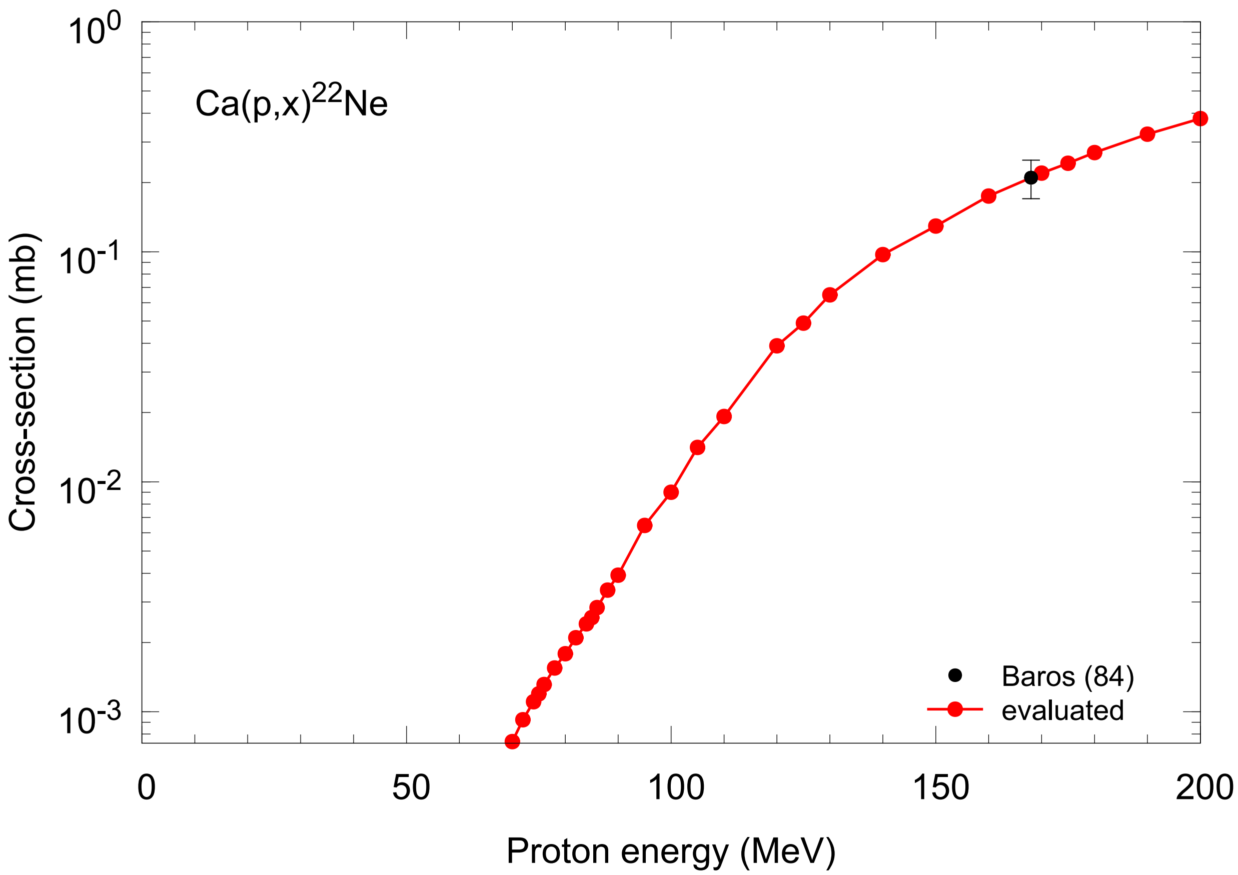
^{48}Ca(p,g)^{49}Sc
Cross-section (mb)
Proton energy (MeV)
Zyskind (79)
Kennett (79)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-1}
10^{0}
10^{1}
10^{2}


Ca(p,x)^{7}Be
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Fassbender (98)
evaluated

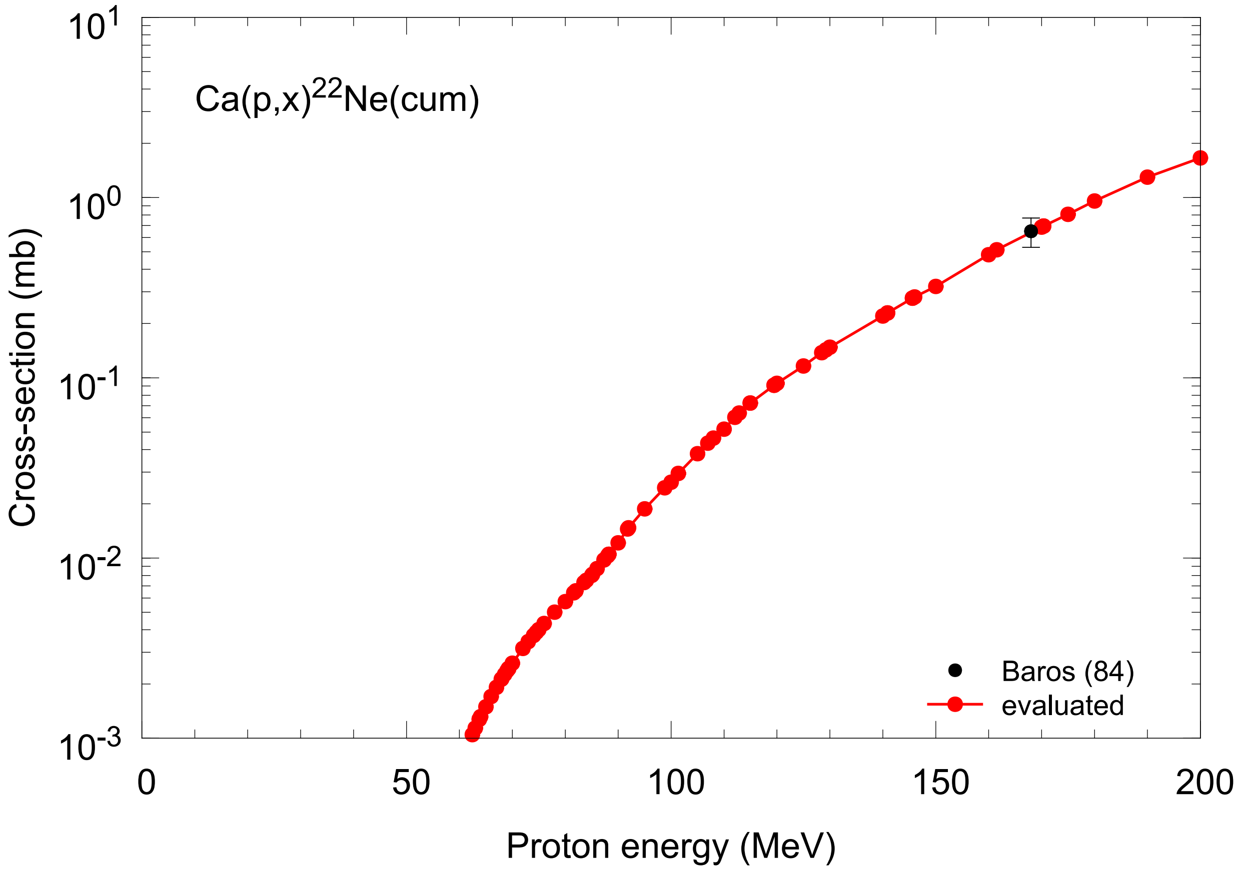

Ca(p,x)^{20}Ne(cum)
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Baros (84)
evaluated

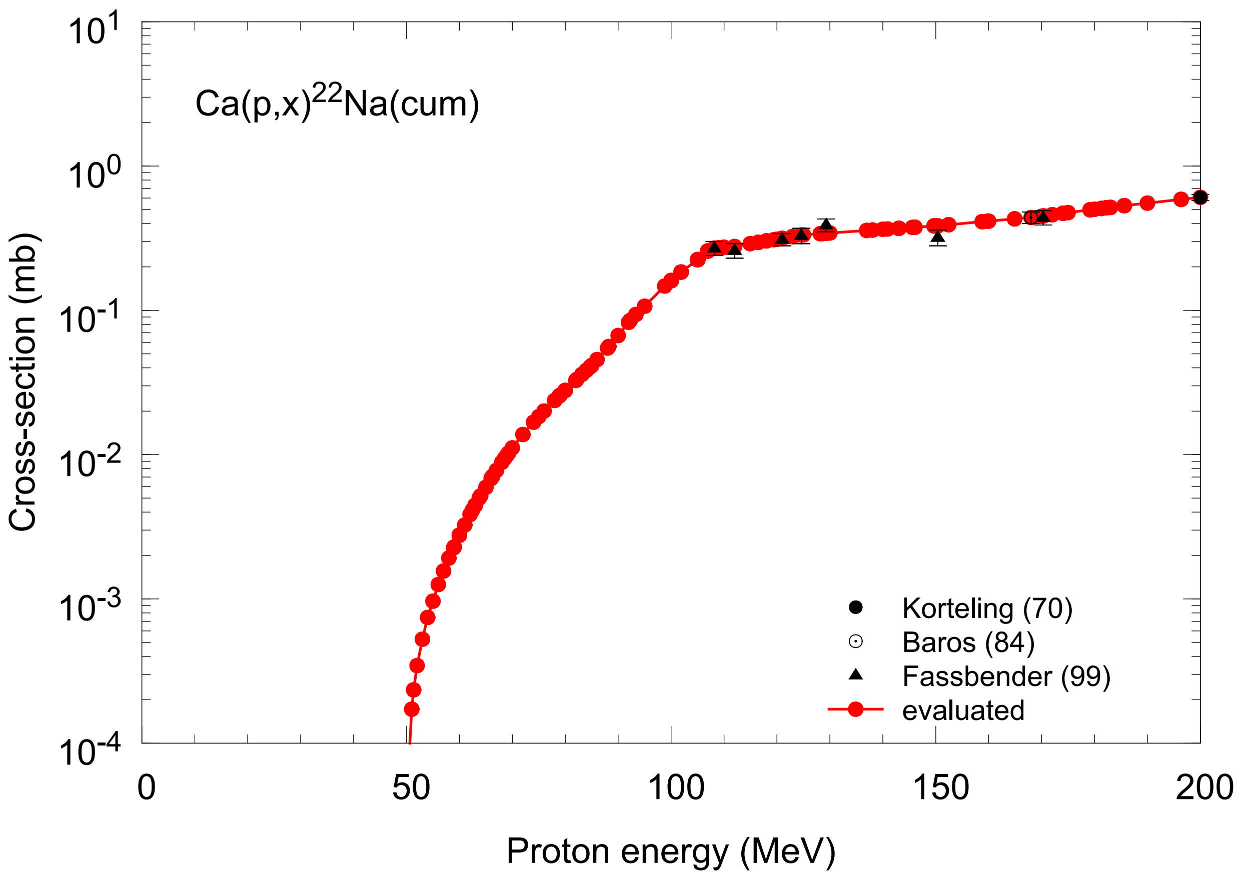


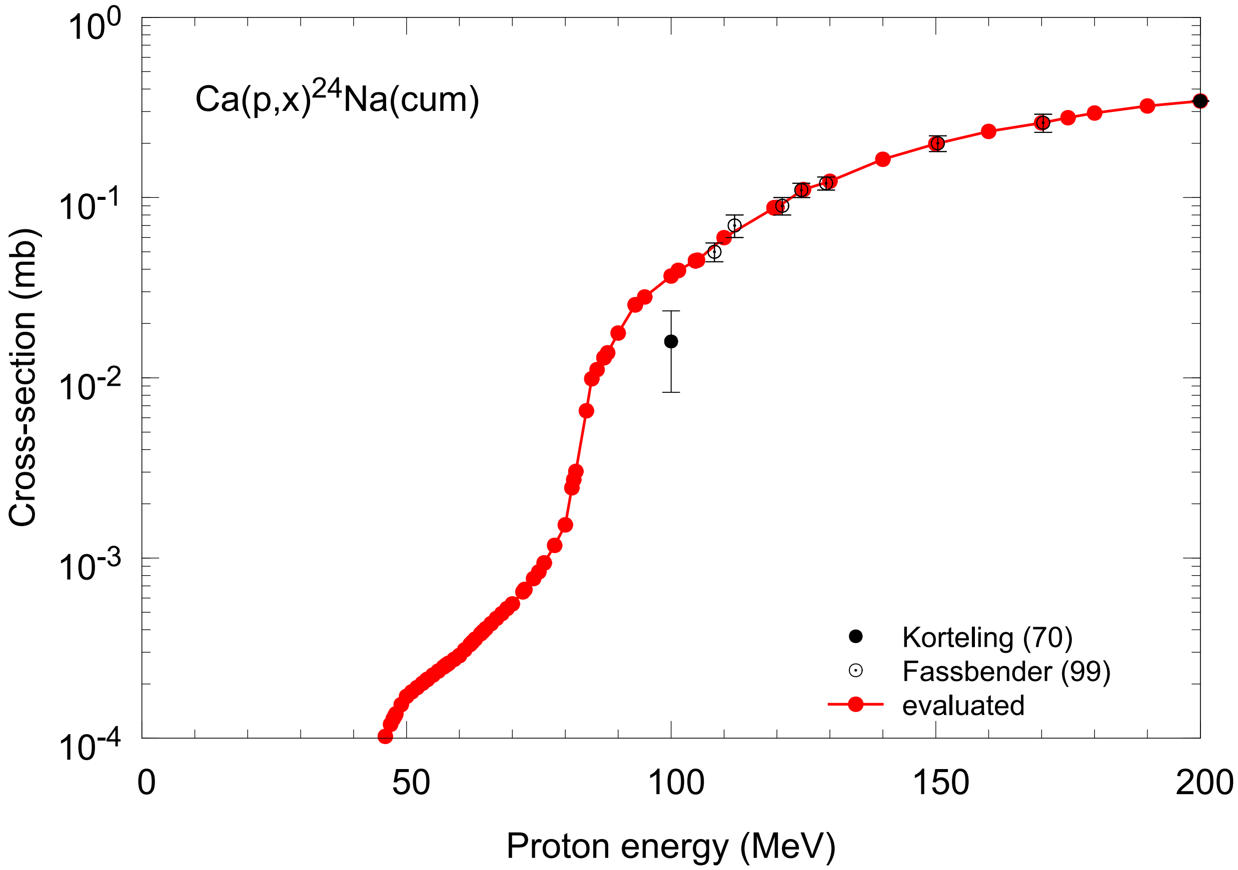
Ca(p,x)^{21}Ne(cum)
Cross-section (mb)
Proton energy (MeV)
Baros (84)
evaluated



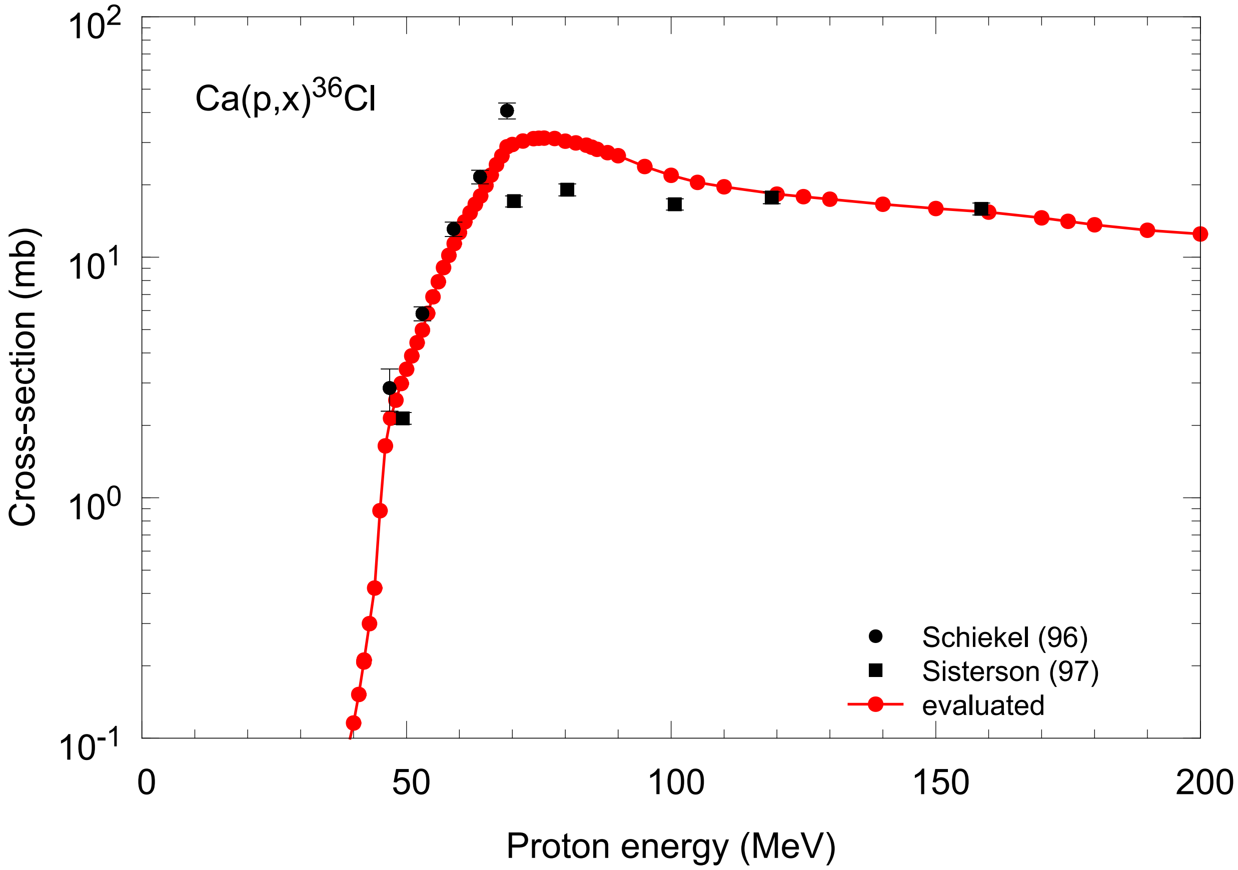
Ca(p,x)^{22}Ne
Cross-section (mb)
Proton energy (MeV)
Baros (84)
evaluated


Ca(p,x)^{22}Ne(cum)
Cross-section (mb)
Proton energy (MeV)
Baros (84)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200

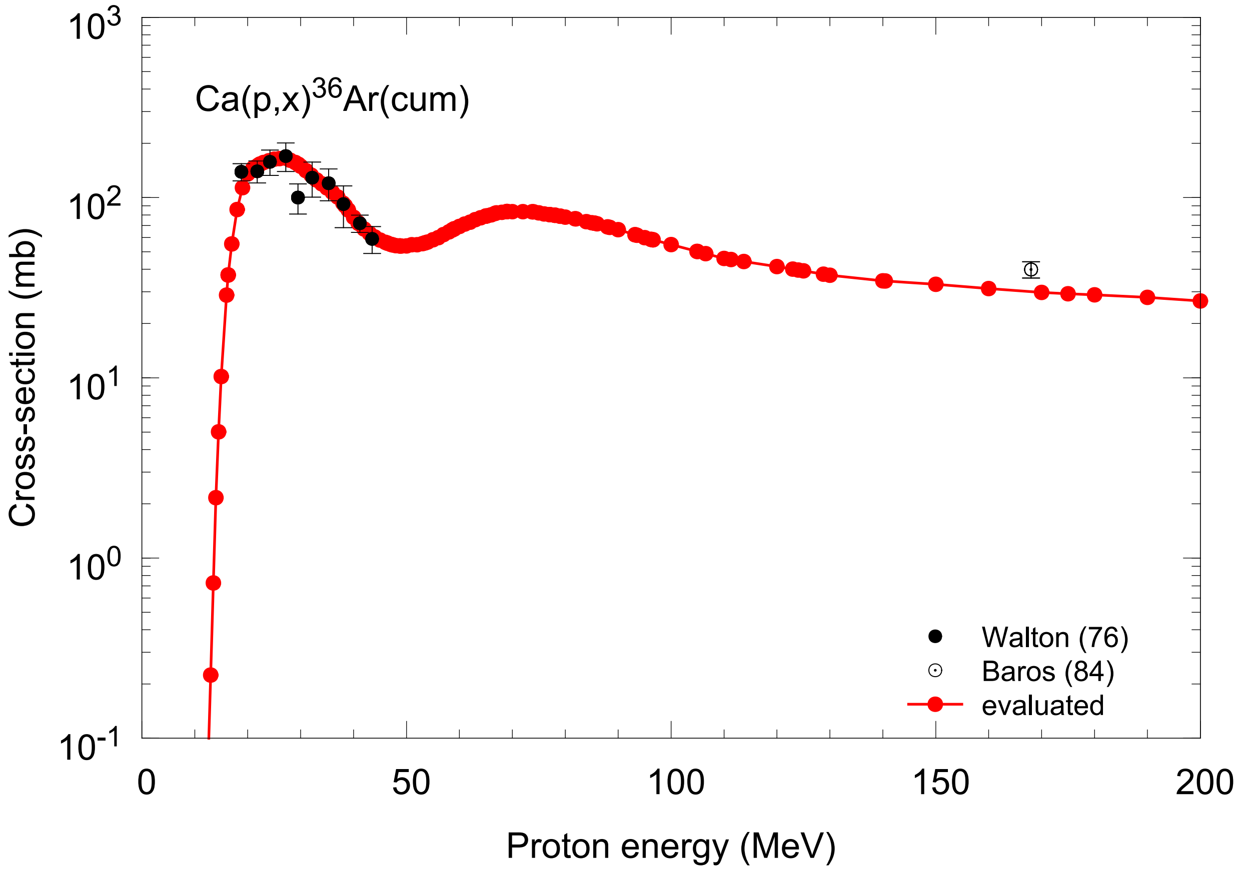

Ca(p,x)^{22}Na(cum)
Cross-section (mb)
Proton energy (MeV)
Korteling (70)
Baros (84)
Fassbender (99)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200



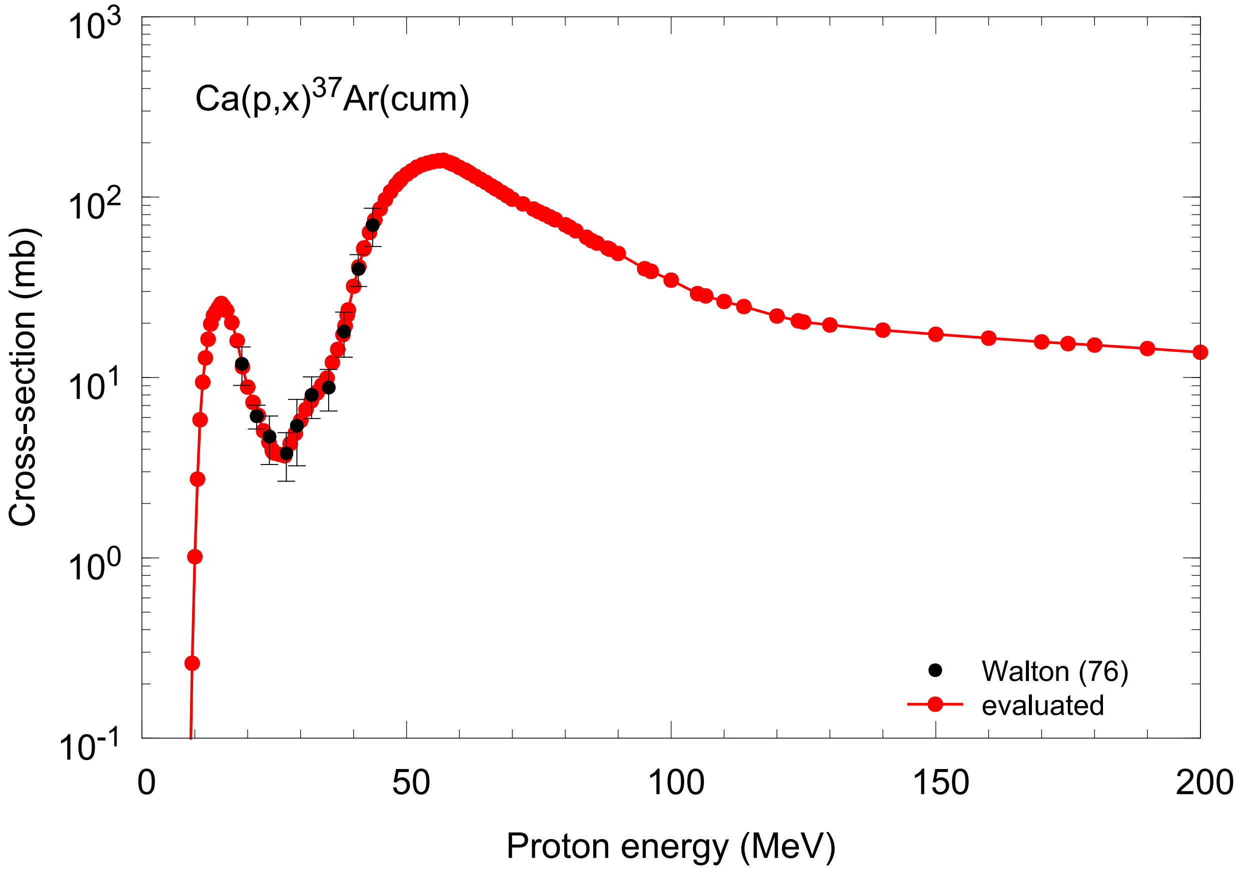
Ca(p,x)^{24}Na(cum)
Cross-section (mb)
Proton energy (MeV)
Korteling (70)
Fassbender (99)
evaluated



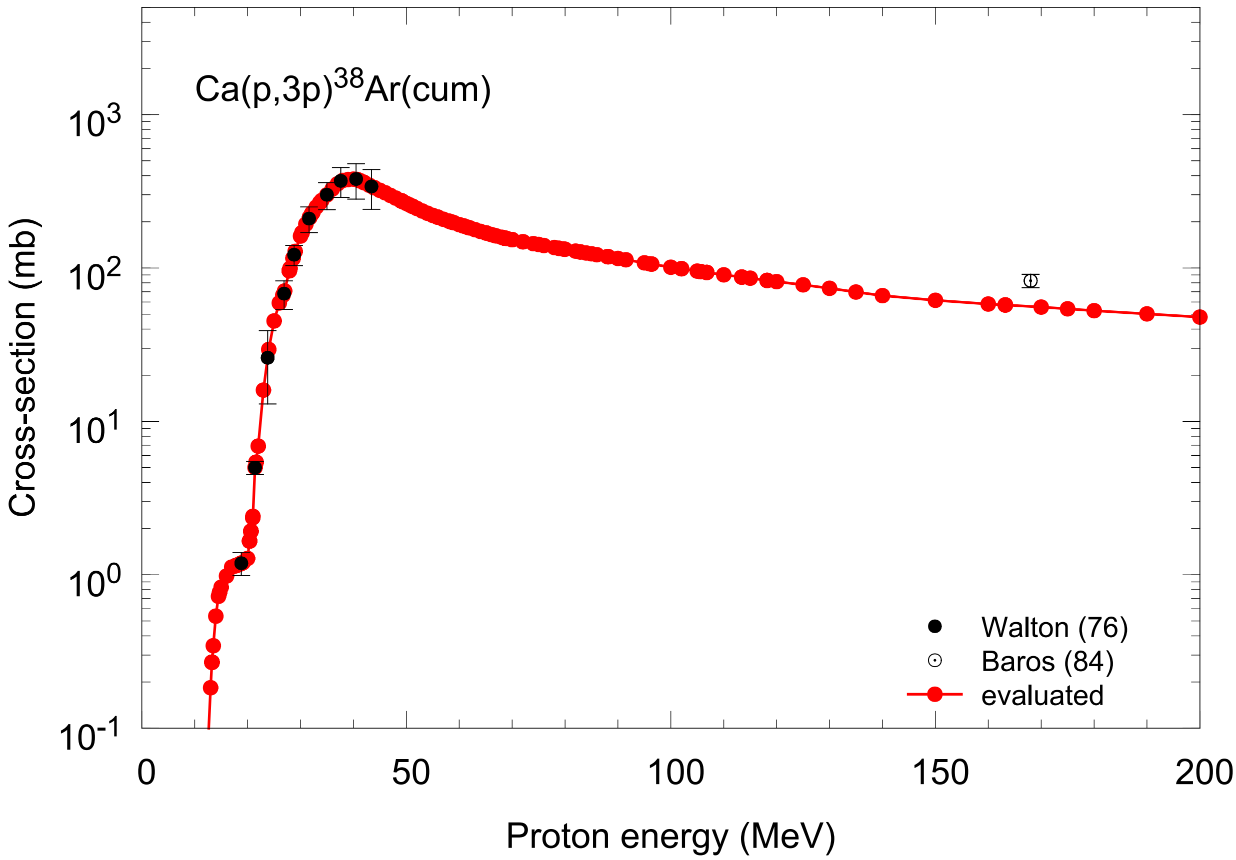
Ca(p,x)^{36}Cl
Cross-section (mb)
Proton energy (MeV)
Schiekel (96)
Sisterson (97)
evaluated



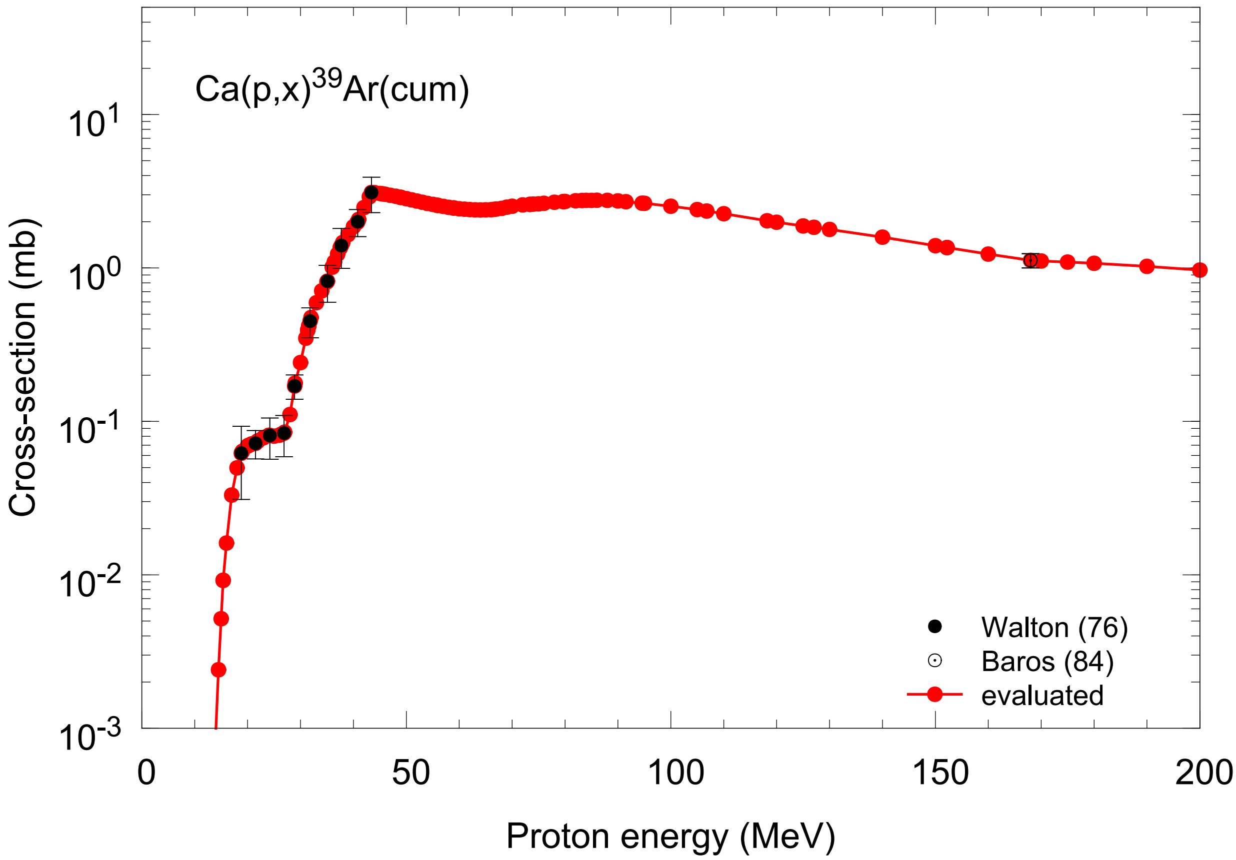
Ca(p,x)^{36}Ar(cum)
Cross-section (mb)
Proton energy (MeV)
Walton (76)
Baros (84)
evaluated



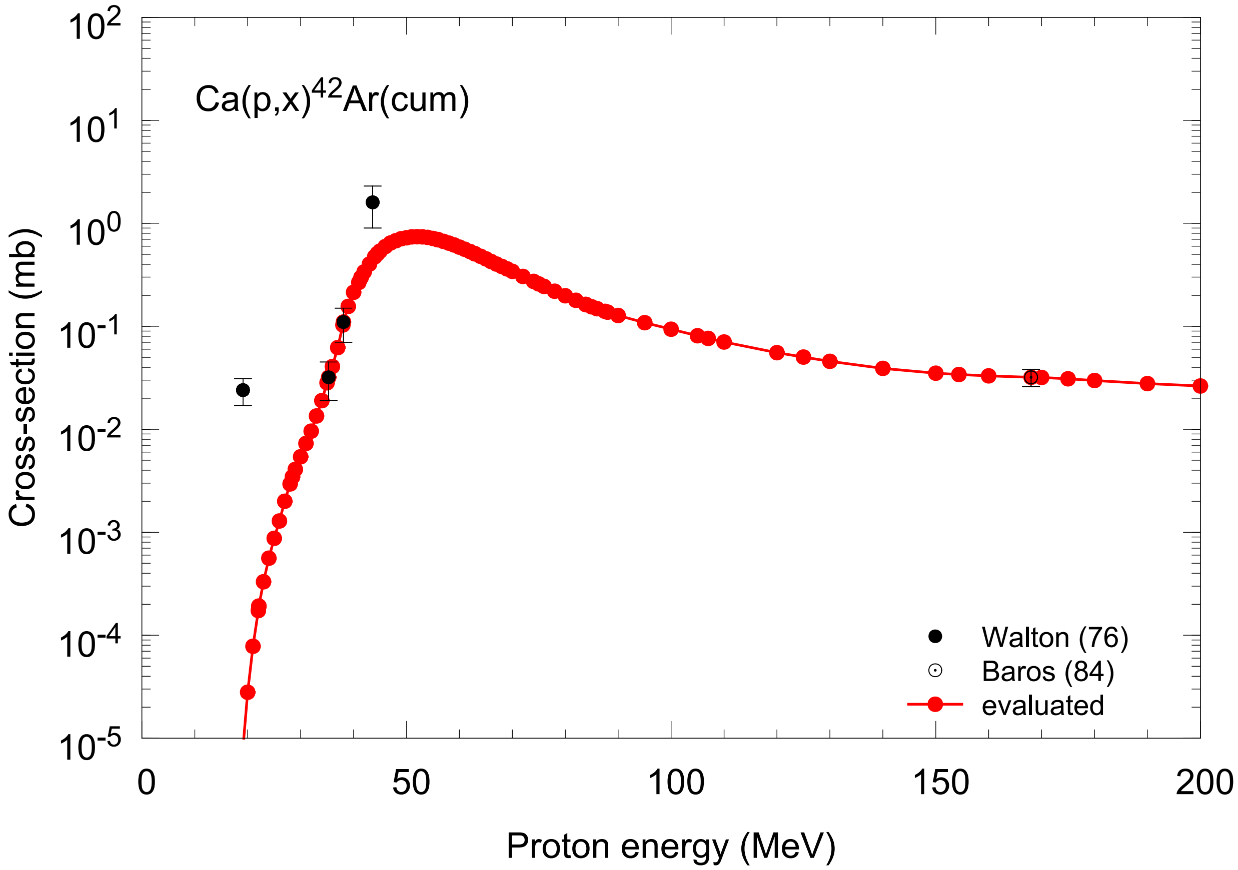
Ca(p,x)^{37}Ar(cum)
Cross-section (mb)
Proton energy (MeV)
Walton (76)
evaluated

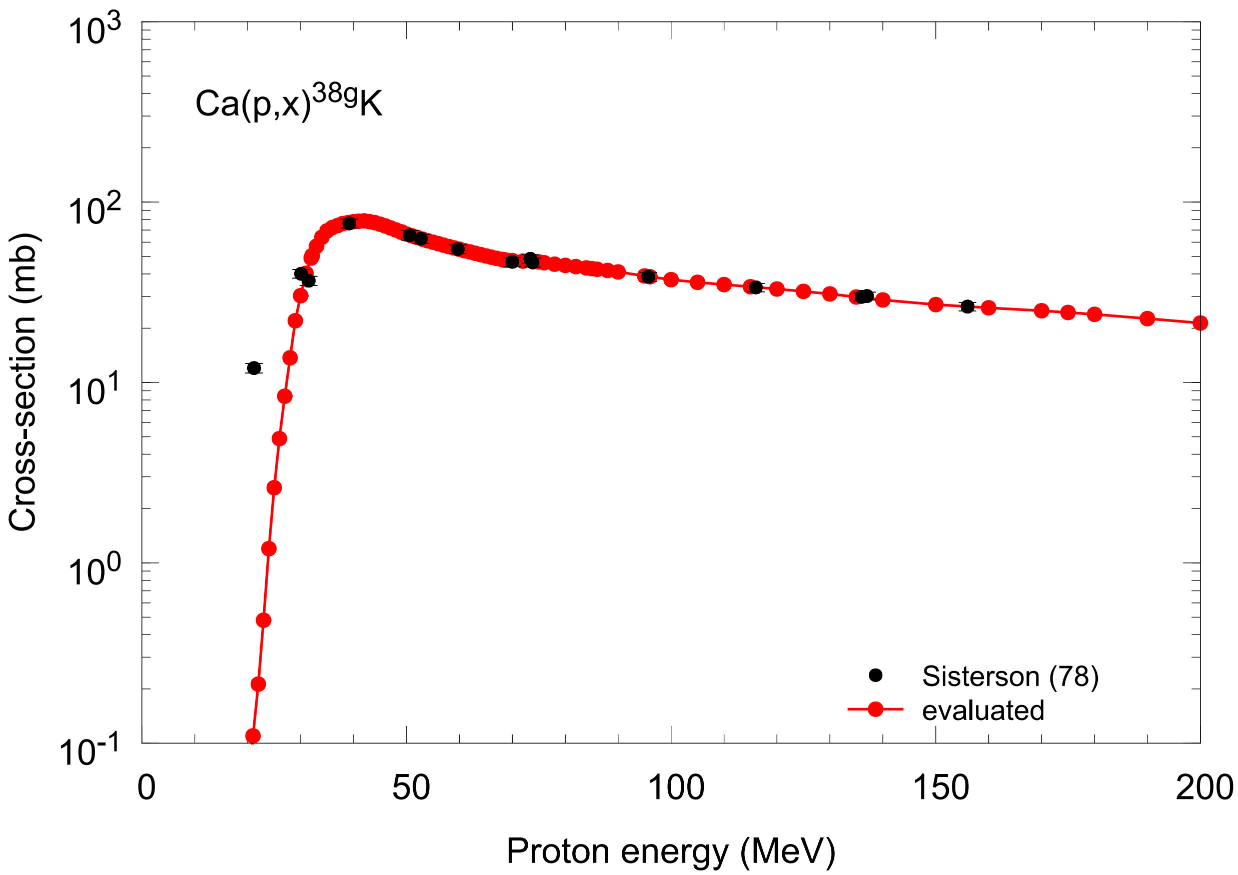


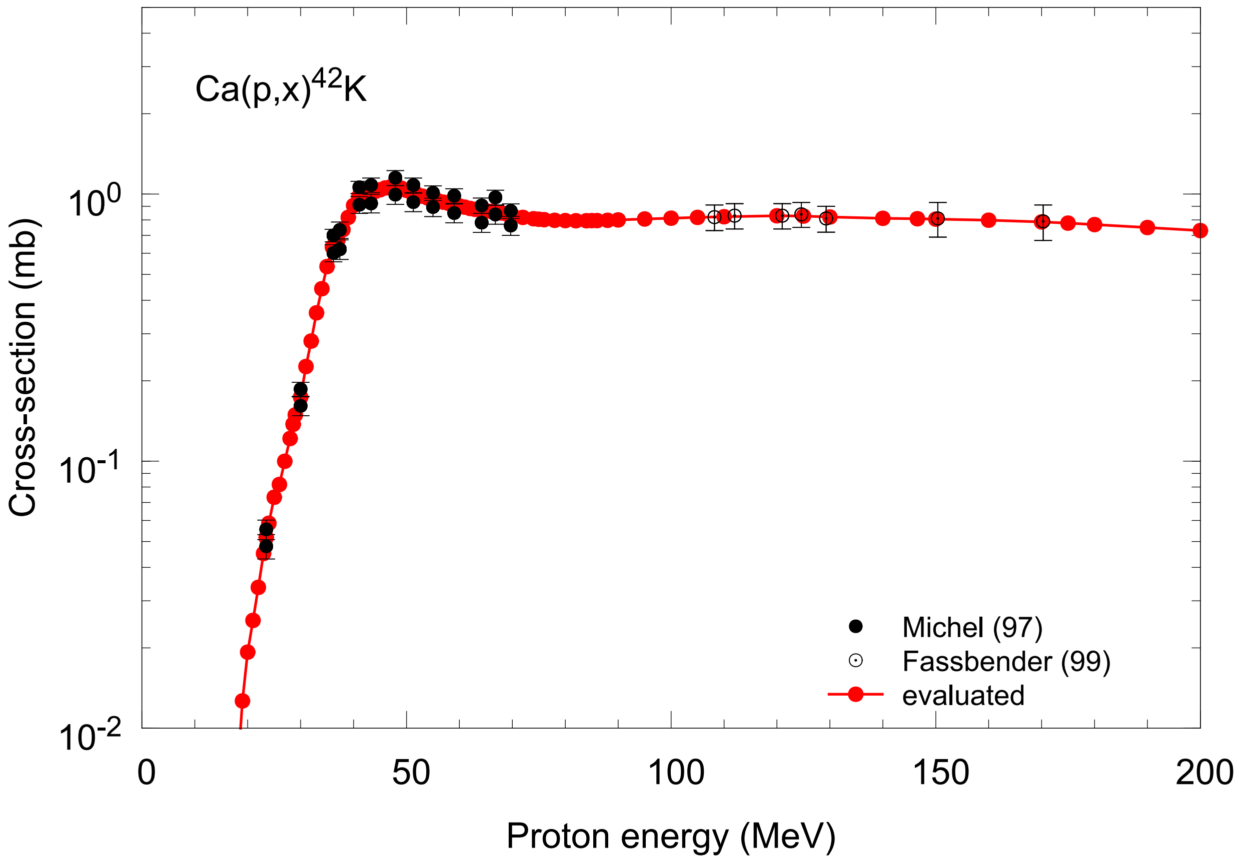
Ca(p,3p)^{38}Ar(cum)
10^3
10^2
10^1
10^0
10^{-1}
Cross-section (mb)
0
50
100
150
200
Proton energy (MeV)
Walton (76)
Baros (84)
evaluated



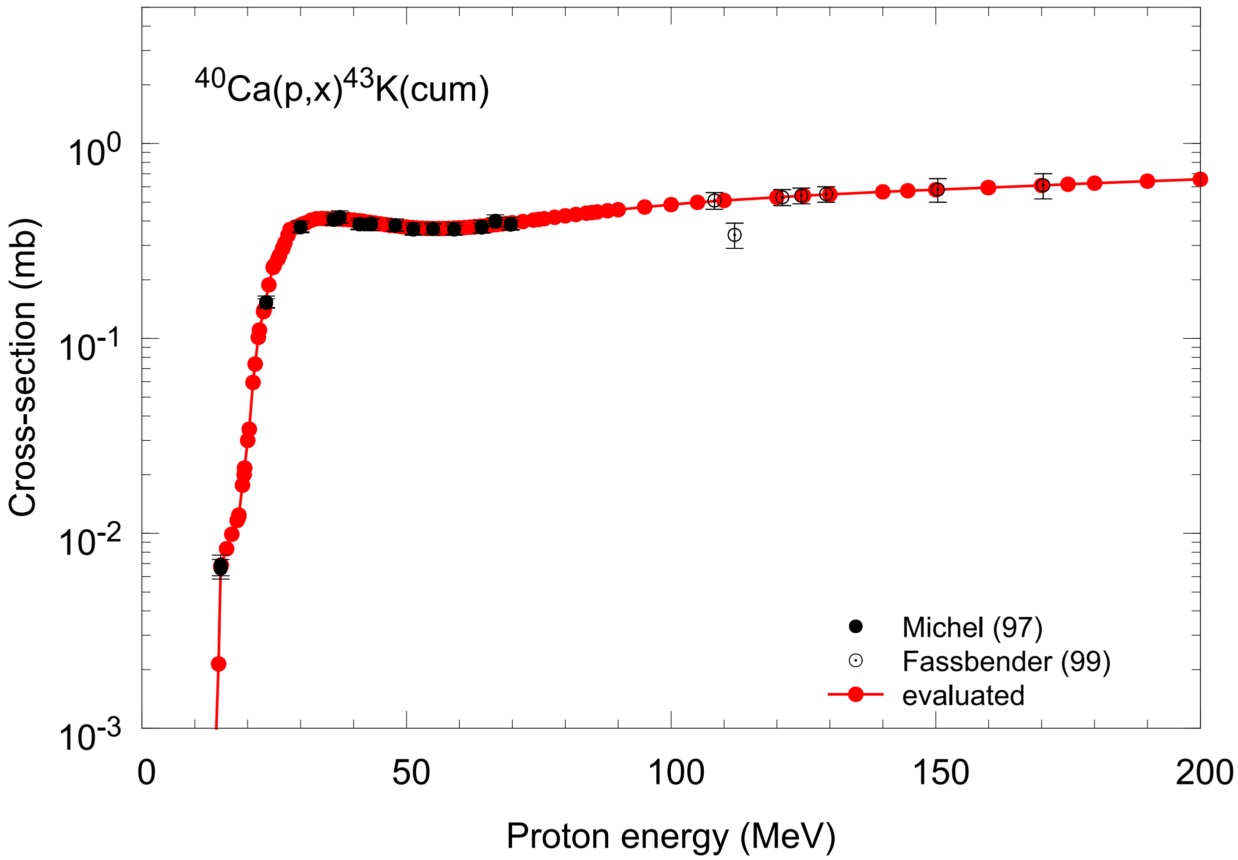
Ca(p,x)^{39}Ar(cum)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Cross-section (mb)
0
50
100
150
200
Proton energy (MeV)
Walton (76)
Baros (84)
evaluated


Ca(p,x)^{42}Ar(cum)
Walton (76)
Baros (84)
evaluated
Cross-section (mb)
Proton energy (MeV)

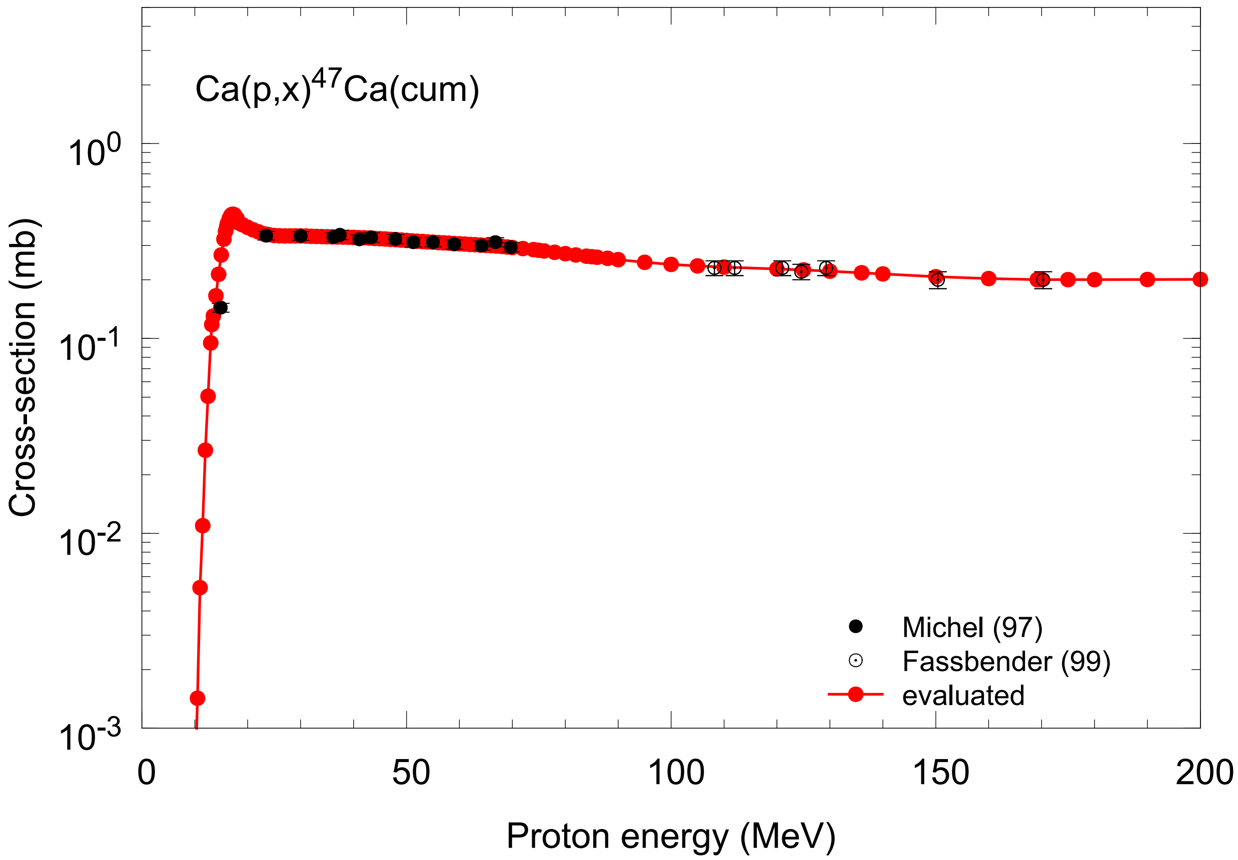

Ca(p,x)^{38g}K
Sisterson (78)
evaluated
Cross-section (mb)
Proton energy (MeV)

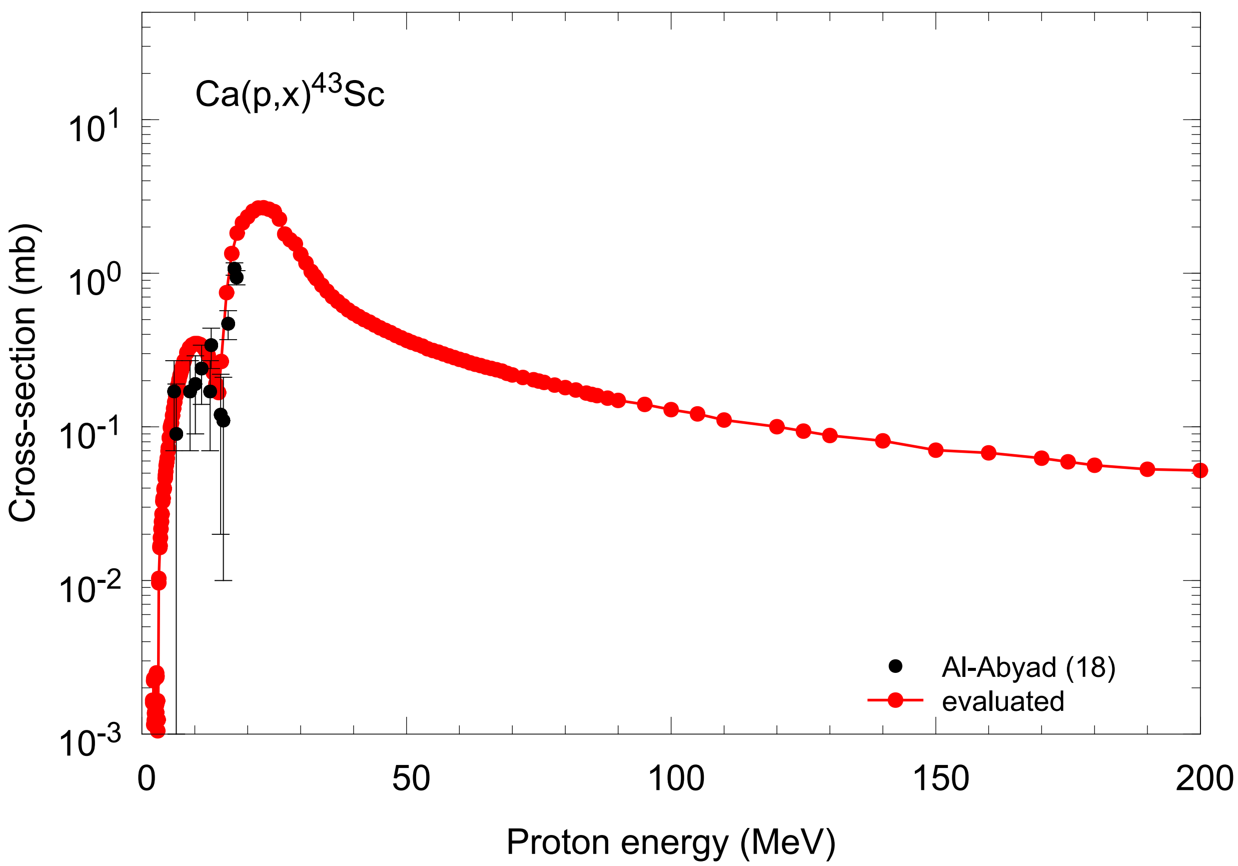


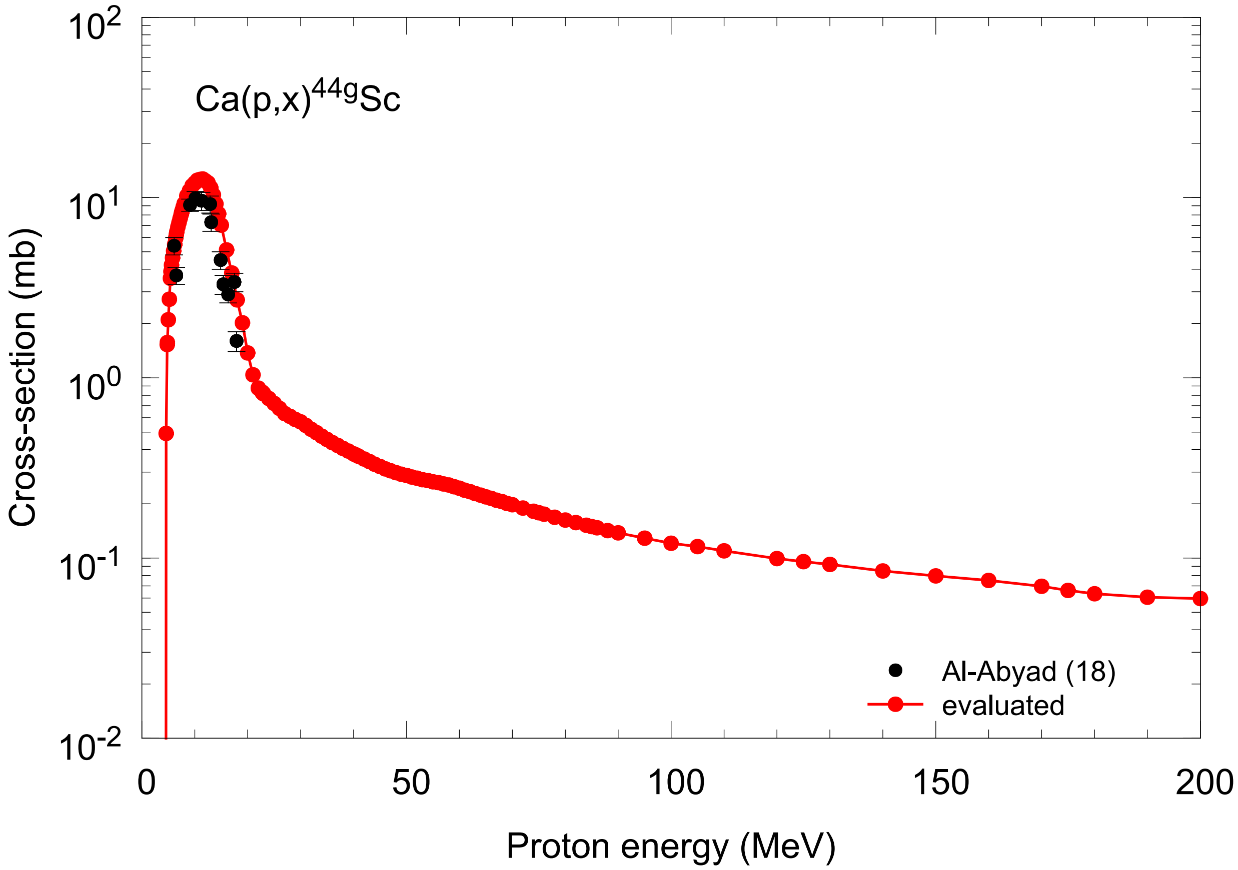
Ca(p,x)^{42}K
Cross-section (mb)
10^0
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Michel (97)
Fassbender (99)
evaluated

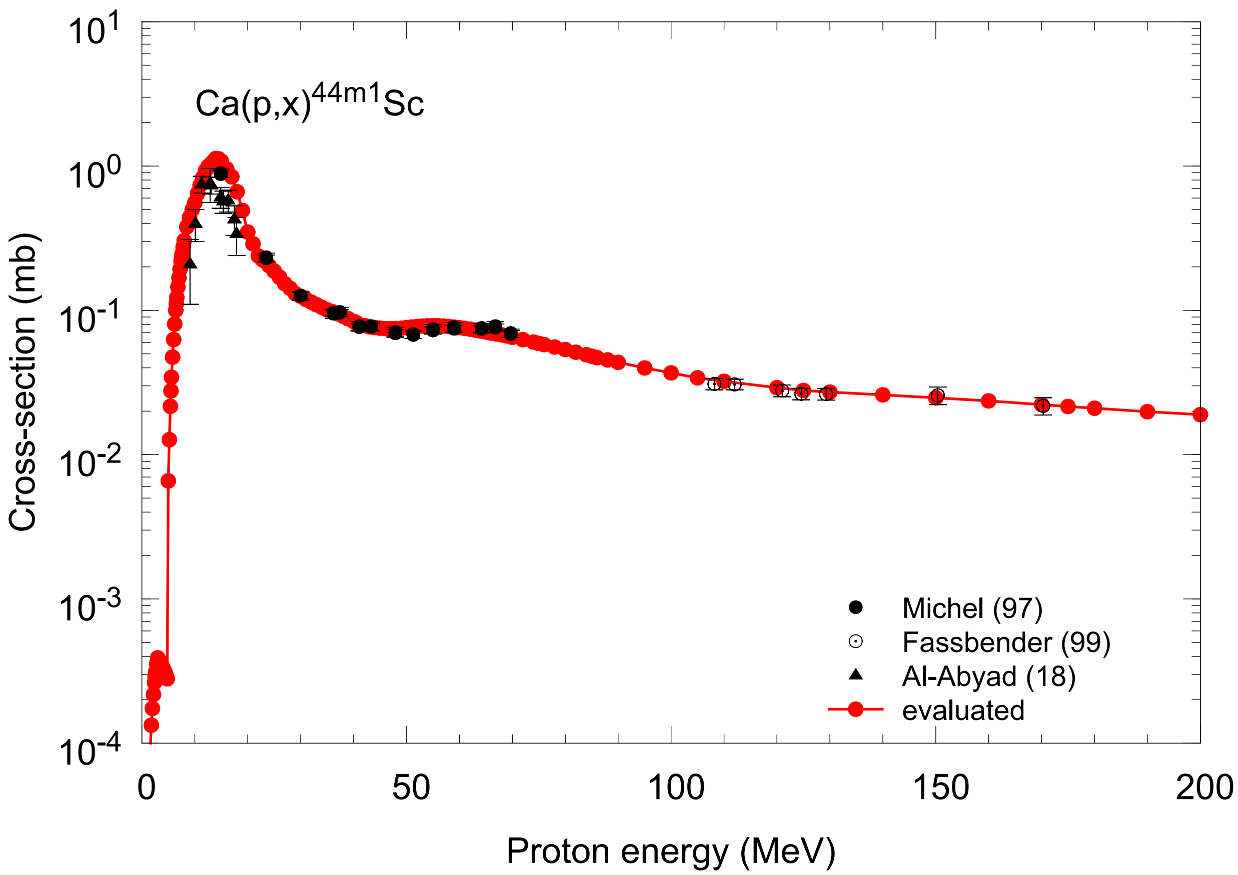


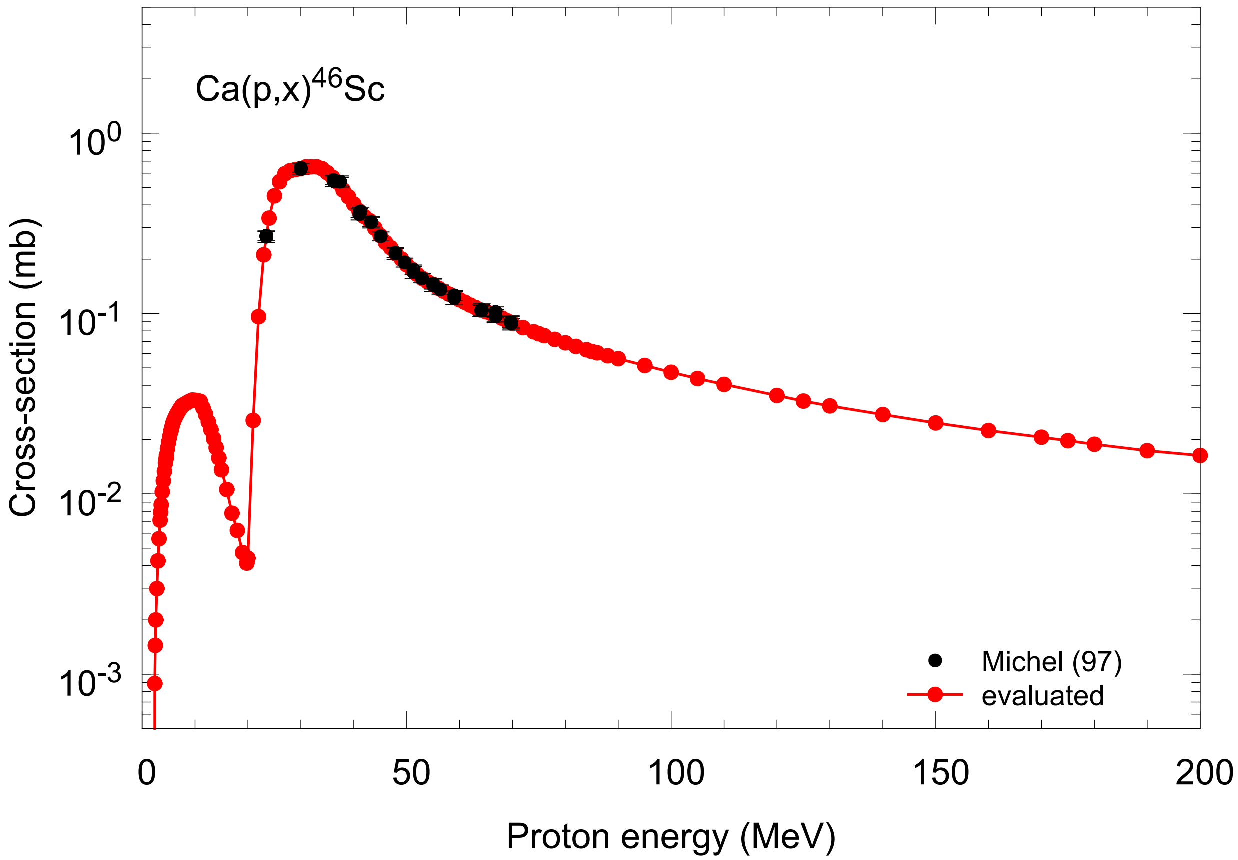
^{40}Ca(p,x)^{43}K(cum)
Cross-section (mb)
10^0
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Michel (97)
Fassbender (99)
evaluated


Ca(p,x)^{47}Ca(cum)
Cross-section (mb)
10^0
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Michel (97)
Fassbender (99)
evaluated

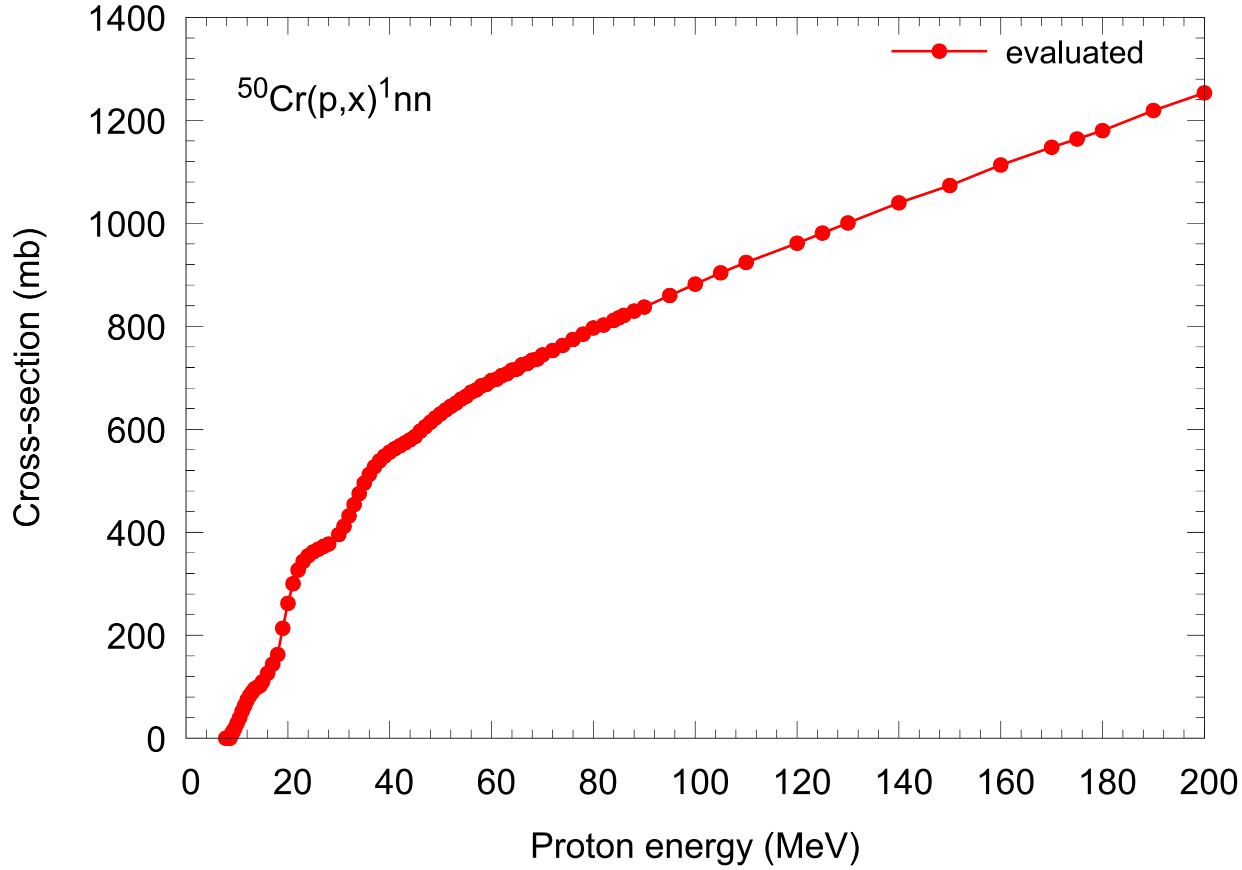

Ca(p,x)^{43}Sc
Cross-section (mb)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Al-Abyad (18)
evaluated


Ca(p,x)^{44g}Sc
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Al-Abyad (18)
evaluated

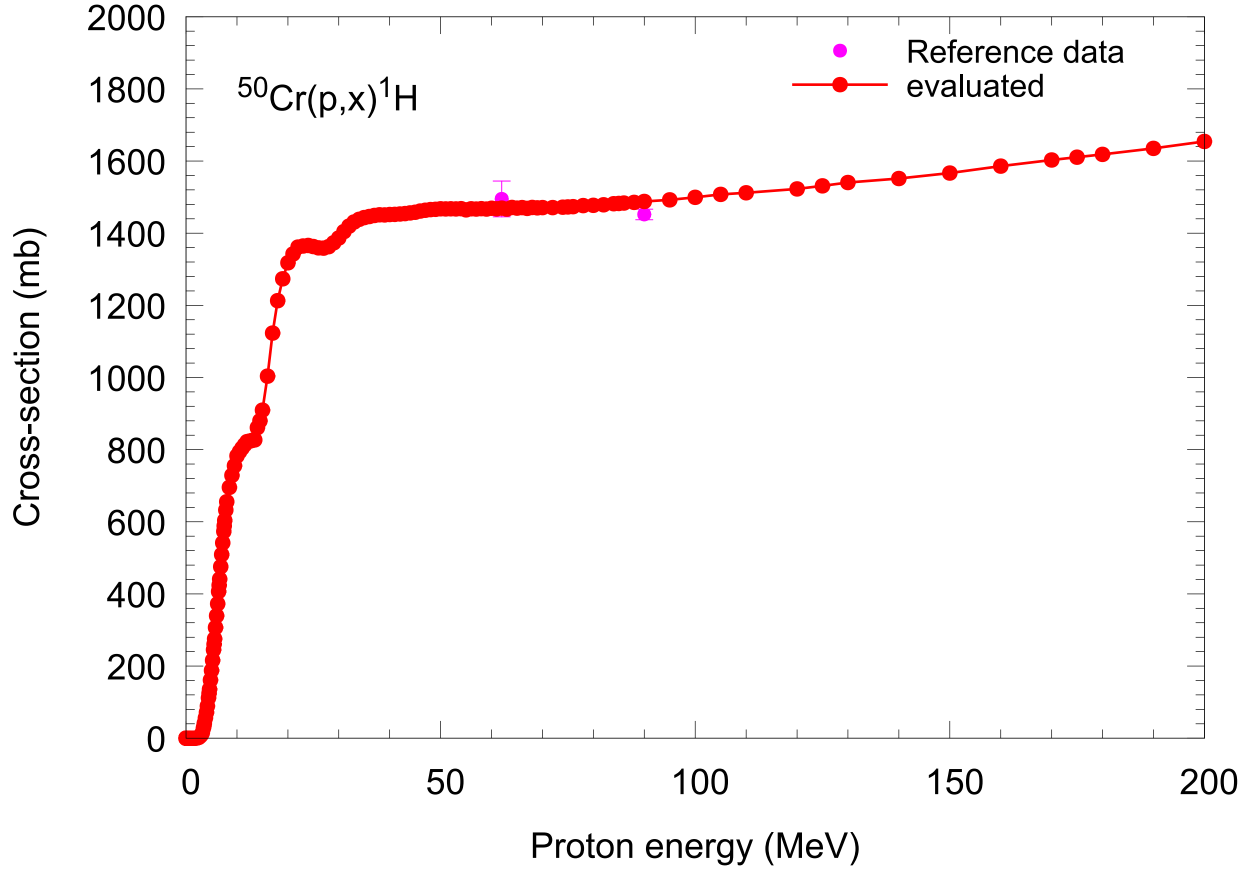

Ca(p,x)^{44m1}Sc
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Proton energy (MeV)
Michel (97)
Fassbender (99)
Al-Abyad (18)
evaluated



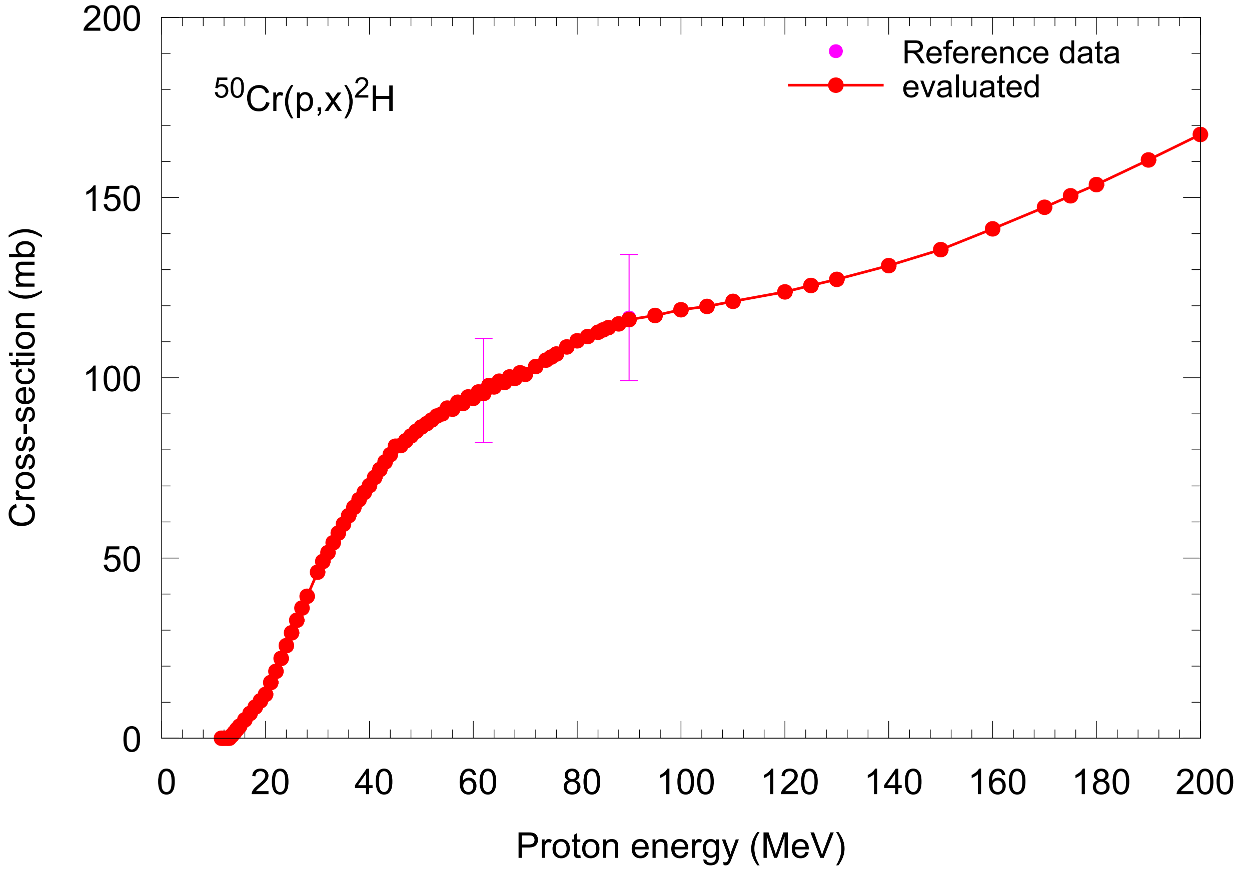
Ca(p,x)^{46}Sc
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Michel (97)
evaluated



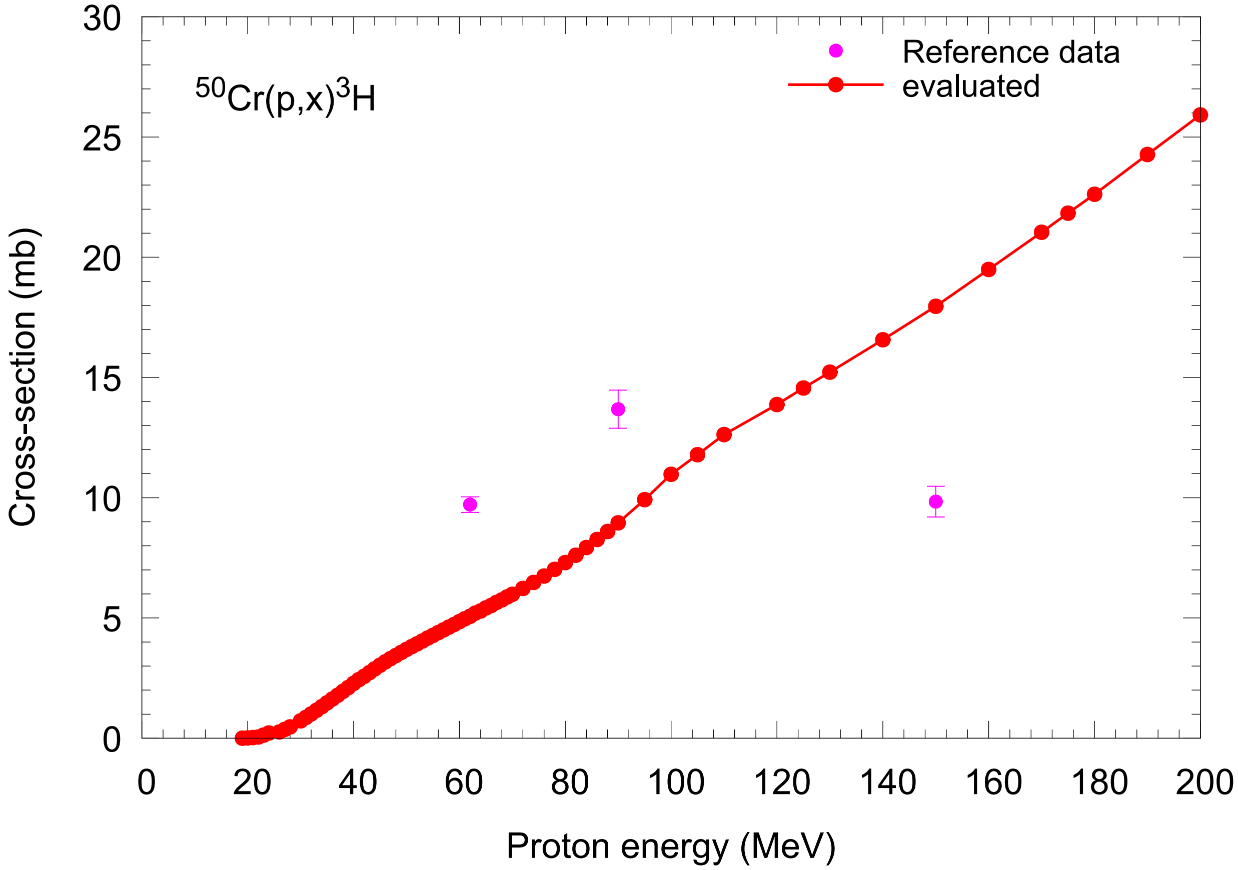
$^{50}Cr(p,x)^{1}nn$
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
0
20
40
60
80
100
120
140
160
180
200



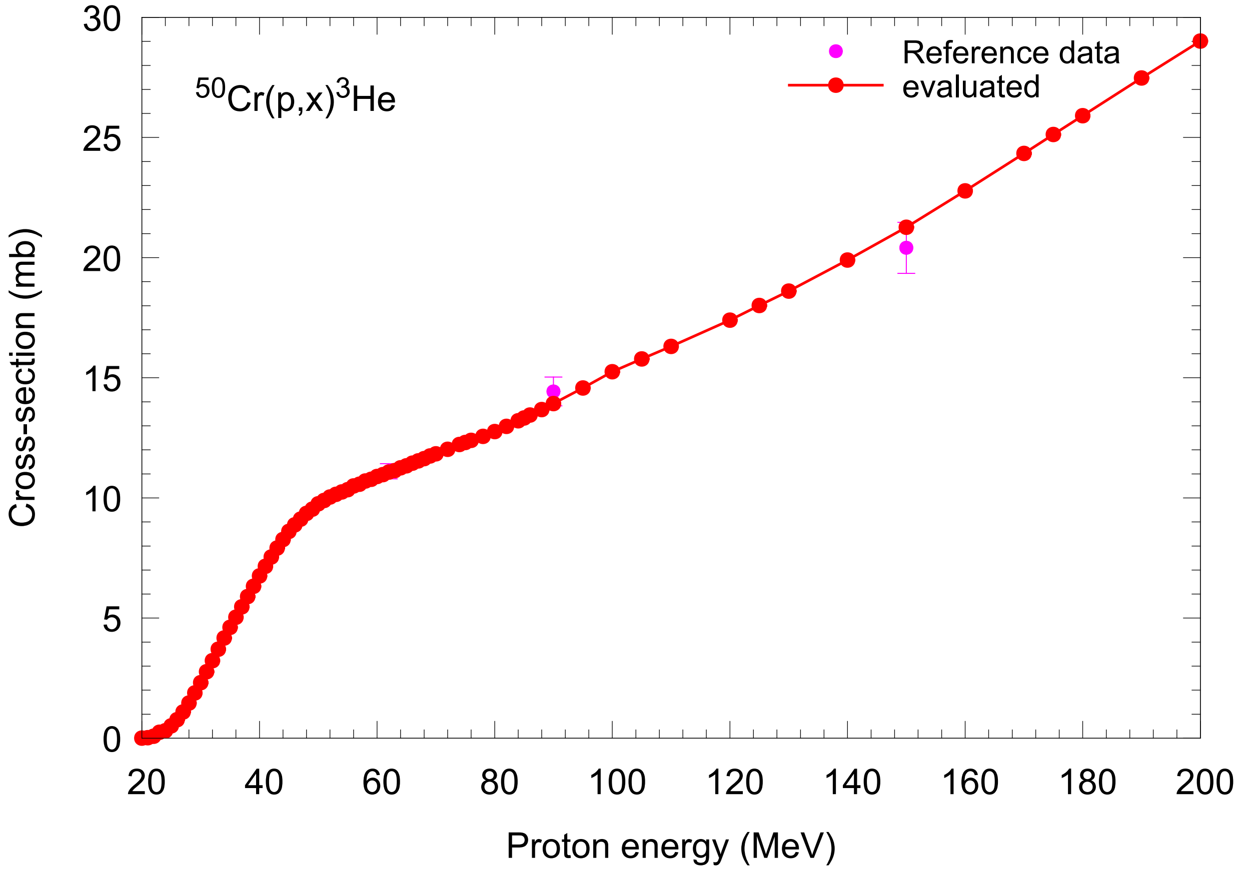
$^{50}Cr(p,x)^{1}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
50
100
150
200



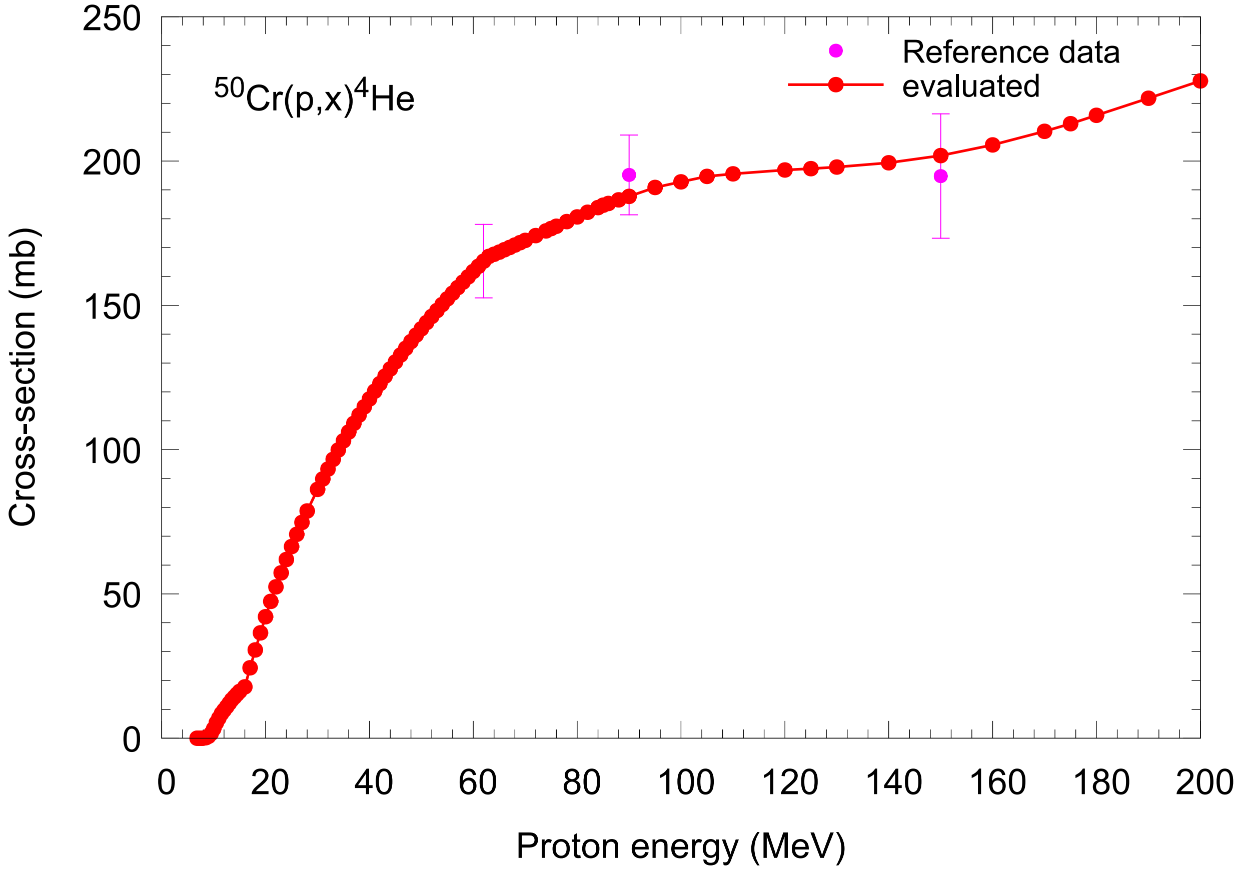
$^{50}Cr(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
0
20
40
60
80
100
120
140
160
180
200



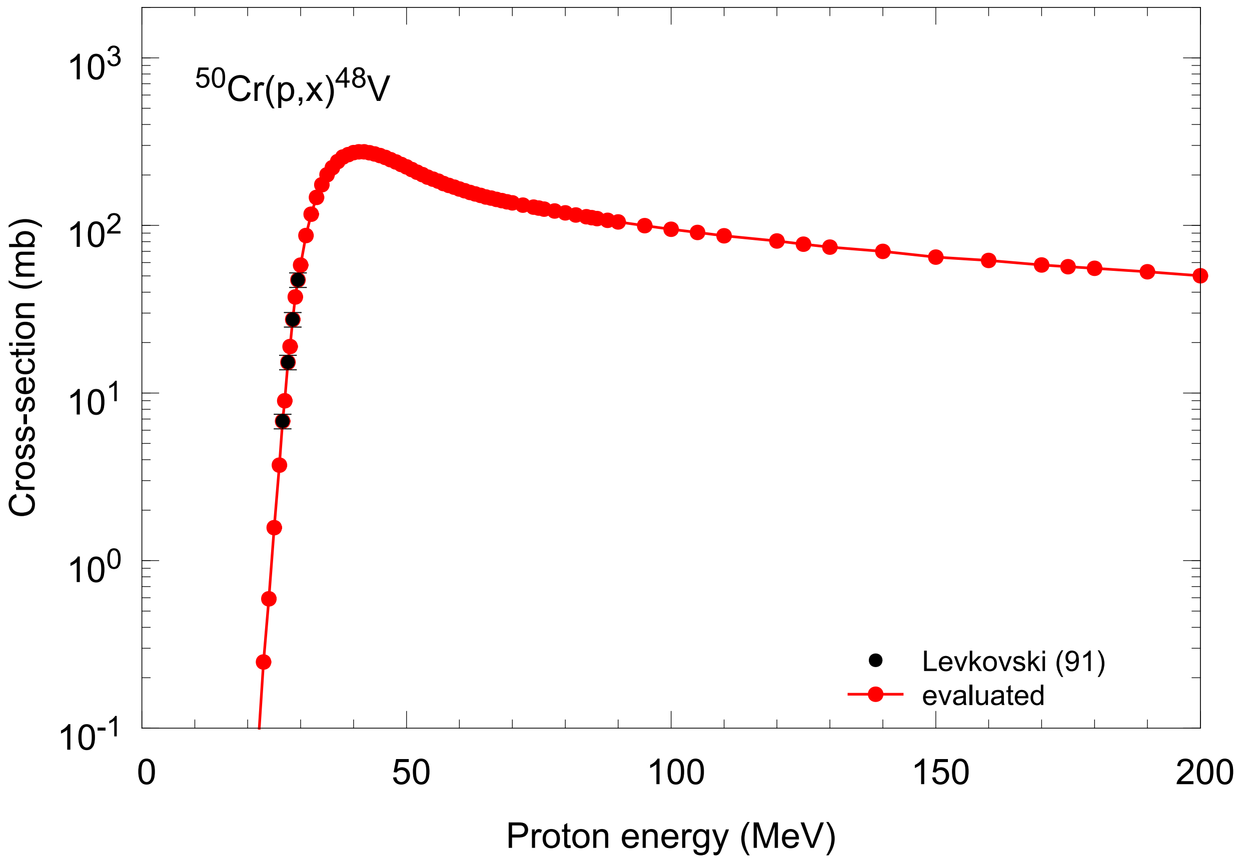
$^{50}Cr(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
0
20
40
60
80
100
120
140
160
180
200



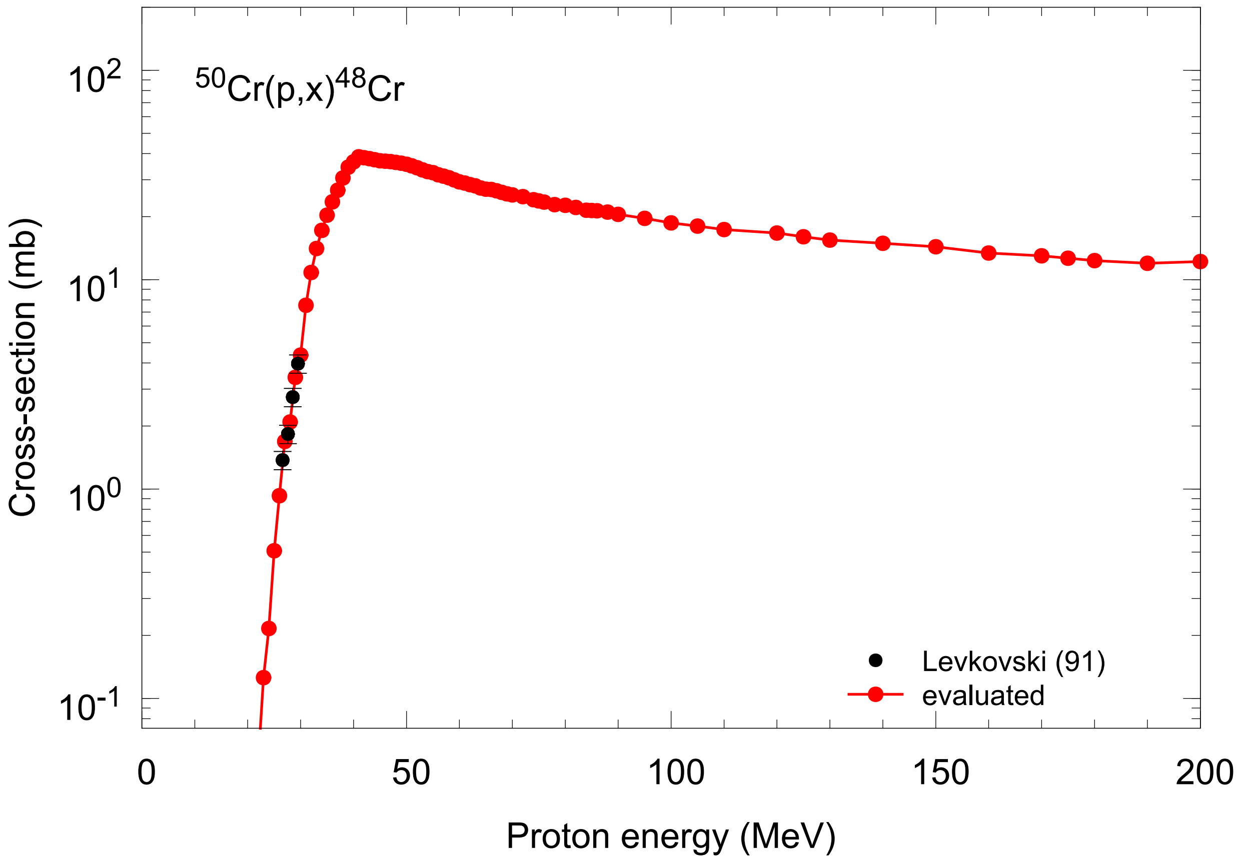
30
25
20
15
10
5
0
Cross-section (mb)
$^{50}Cr(p,x)^{3}He$
Reference data
evaluated
20
40
60
80
100
120
140
160
180
200
Proton energy (MeV)



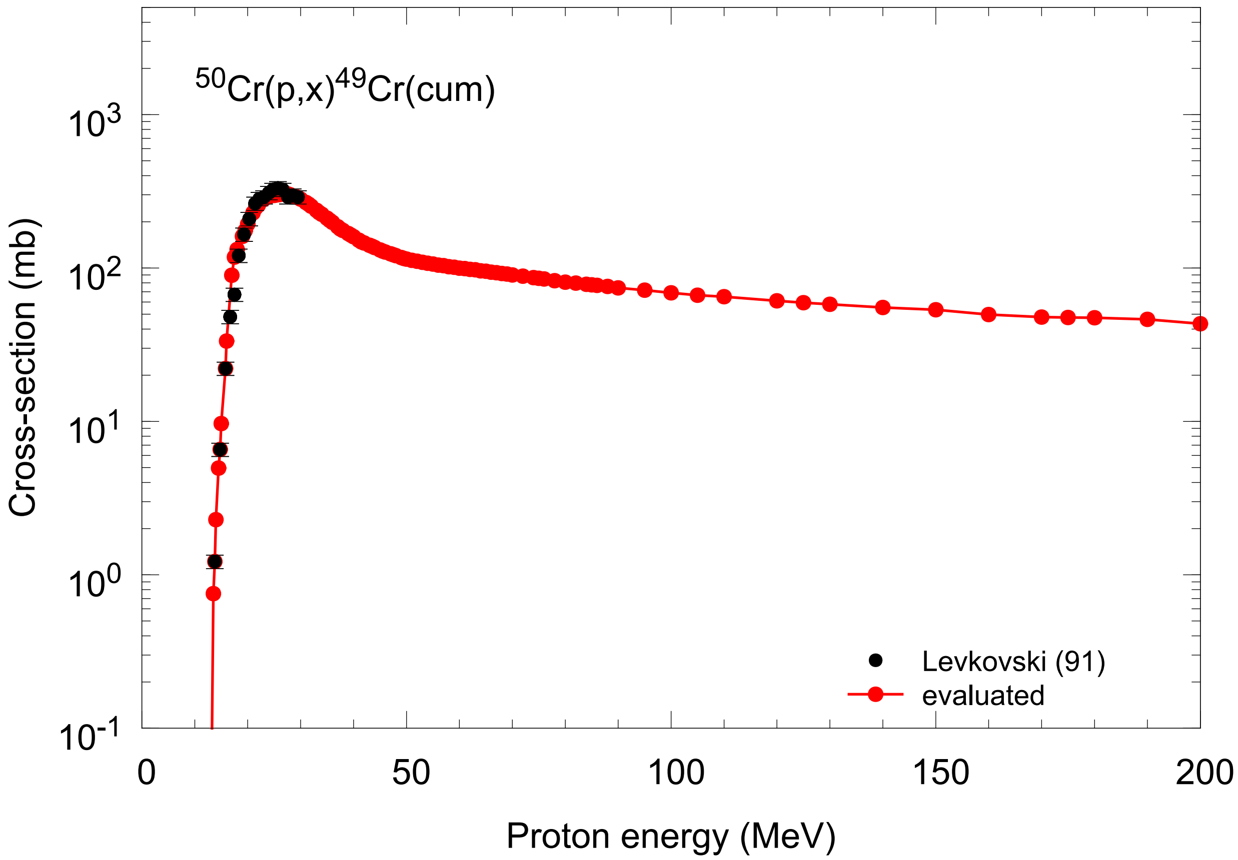
250
200
150
100
50
0
Cross-section (mb)
$^{50}Cr(p,x)^{4}He$
Reference data
evaluated
0
20
40
60
80
100
120
140
160
180
200
Proton energy (MeV)



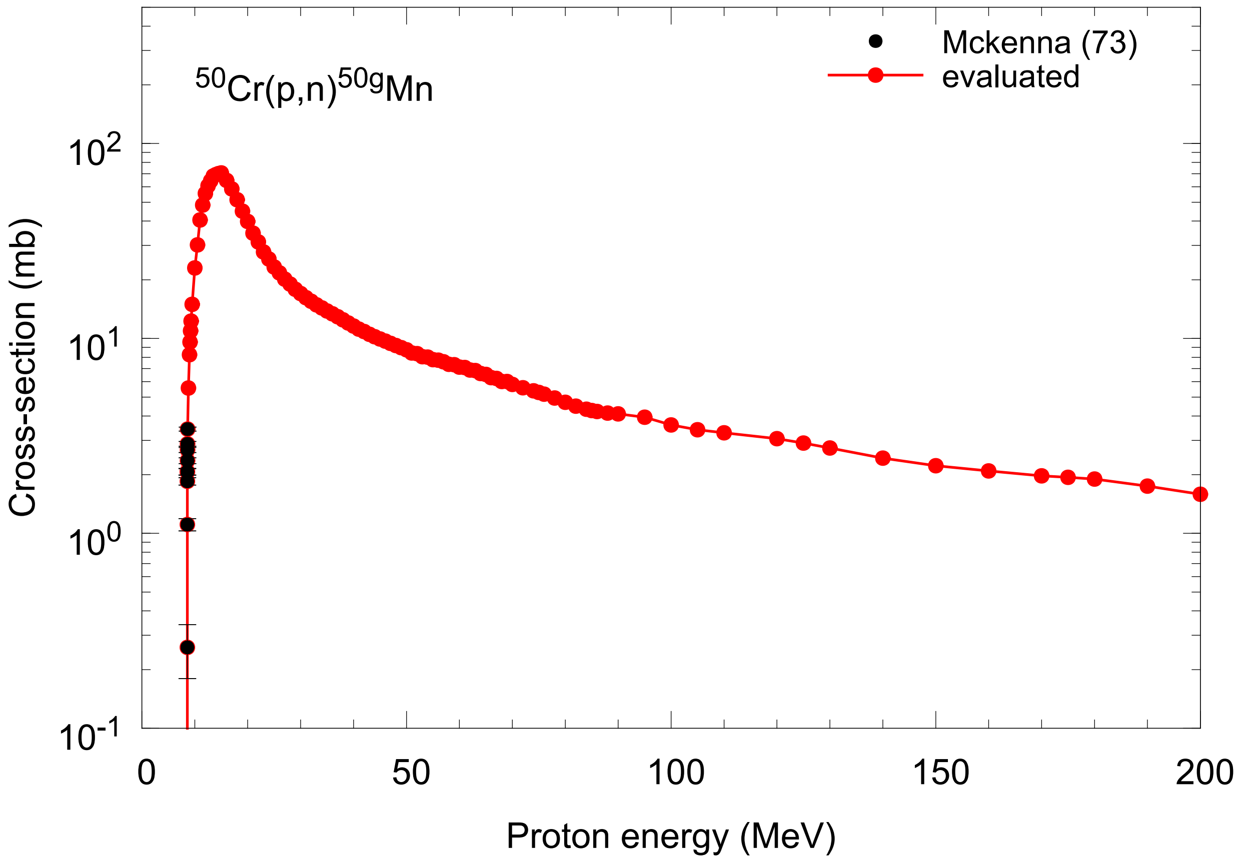
$^{50}Cr(p,x)^{48}V$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
evaluated



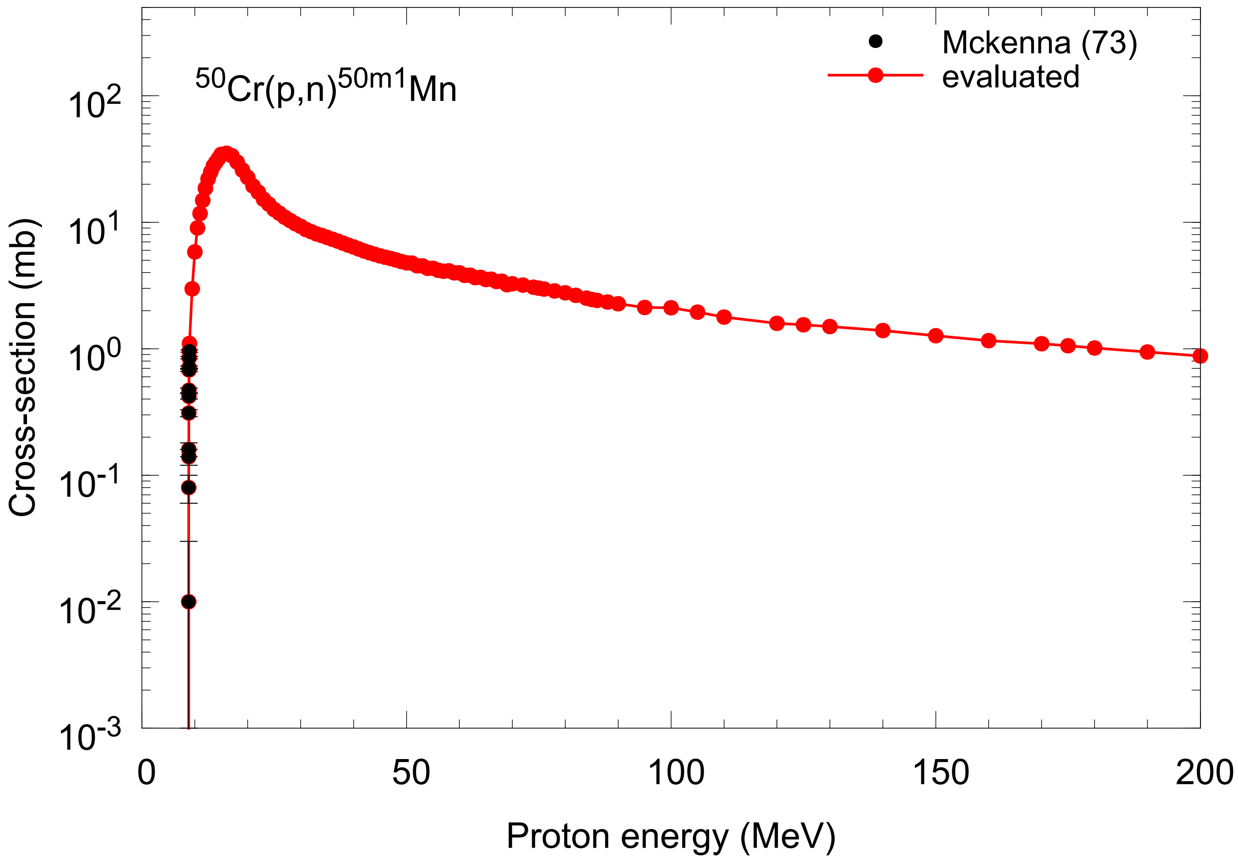
$^{50}Cr(p,x)^{48}Cr$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
evaluated



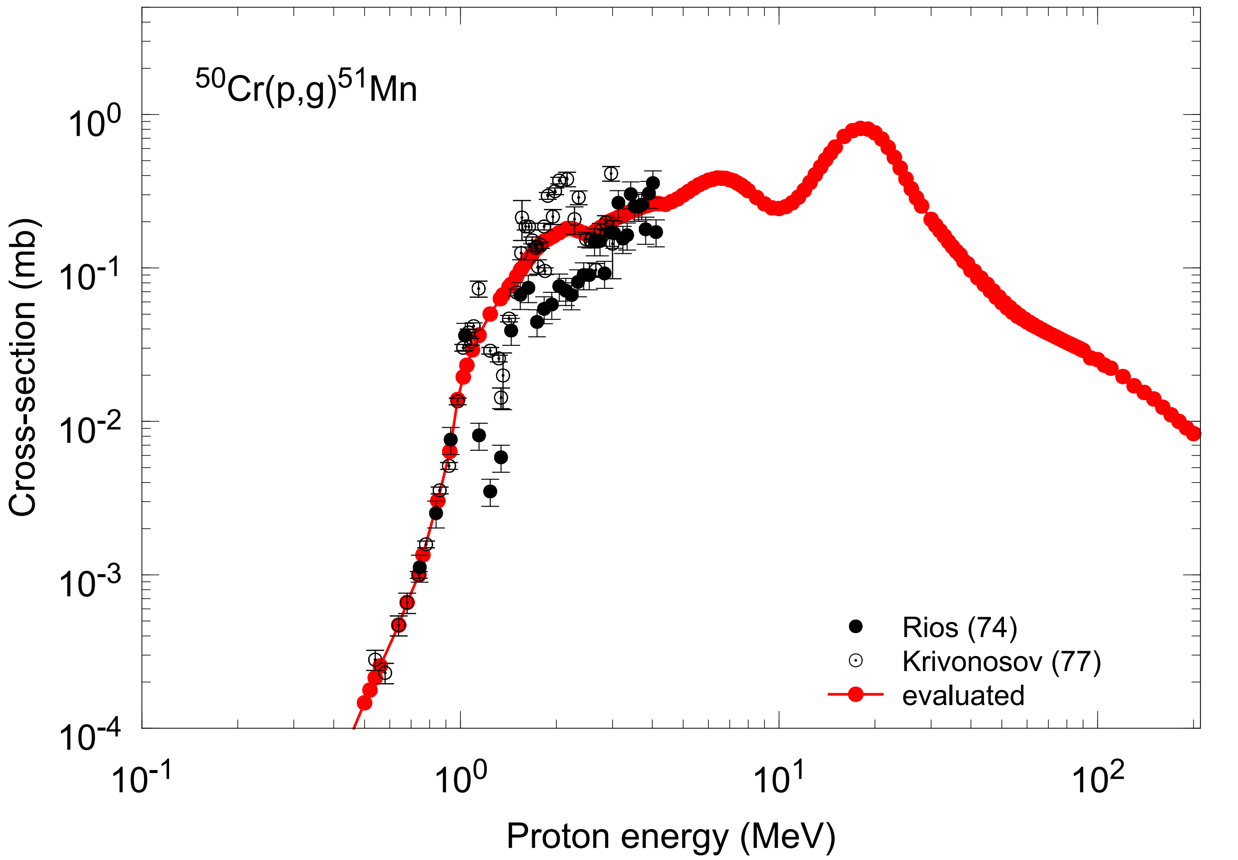
$^{50}Cr(p,x)^{49}Cr(cum)$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
evaluated



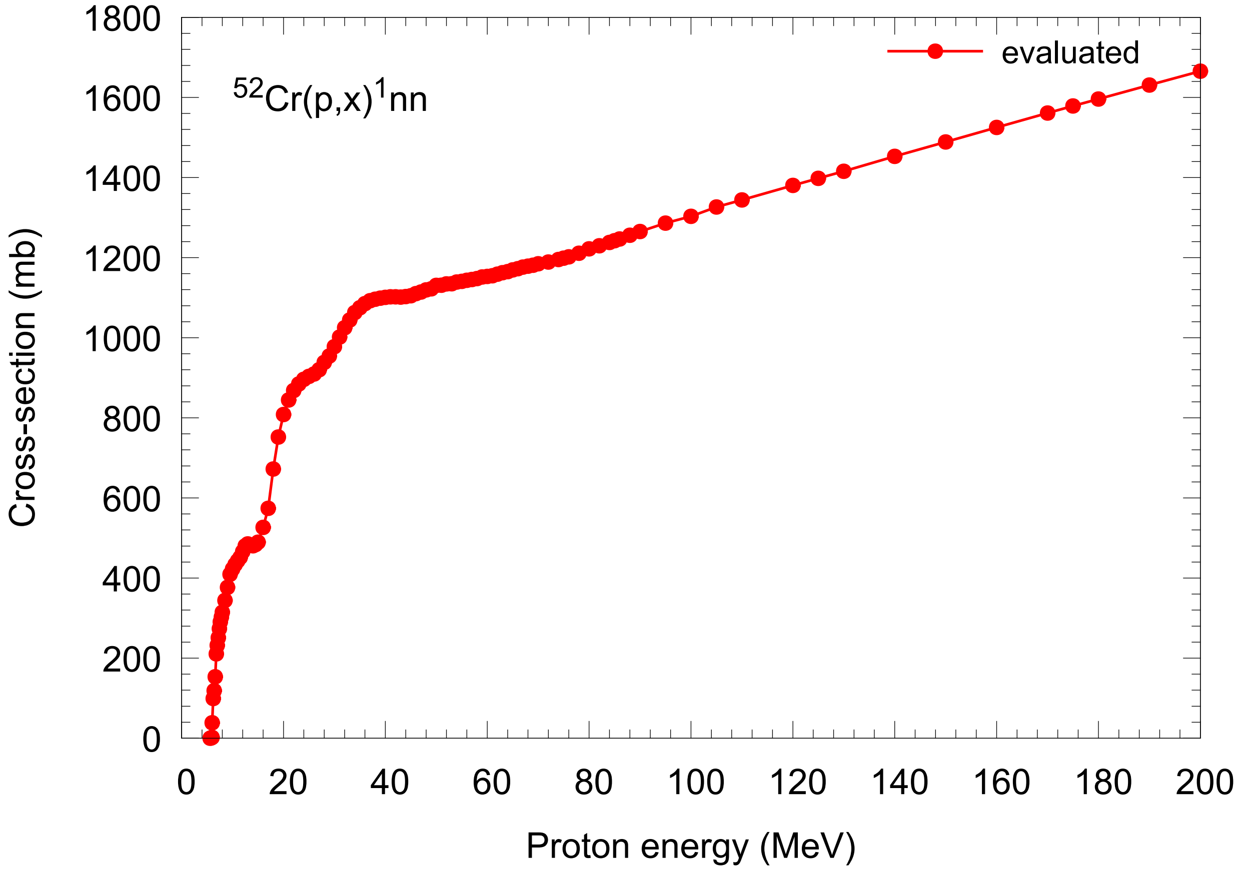
$^{50}Cr(p,n)^{50g}Mn$
Cross-section (mb)
Proton energy (MeV)
Mckenna (73)
evaluated

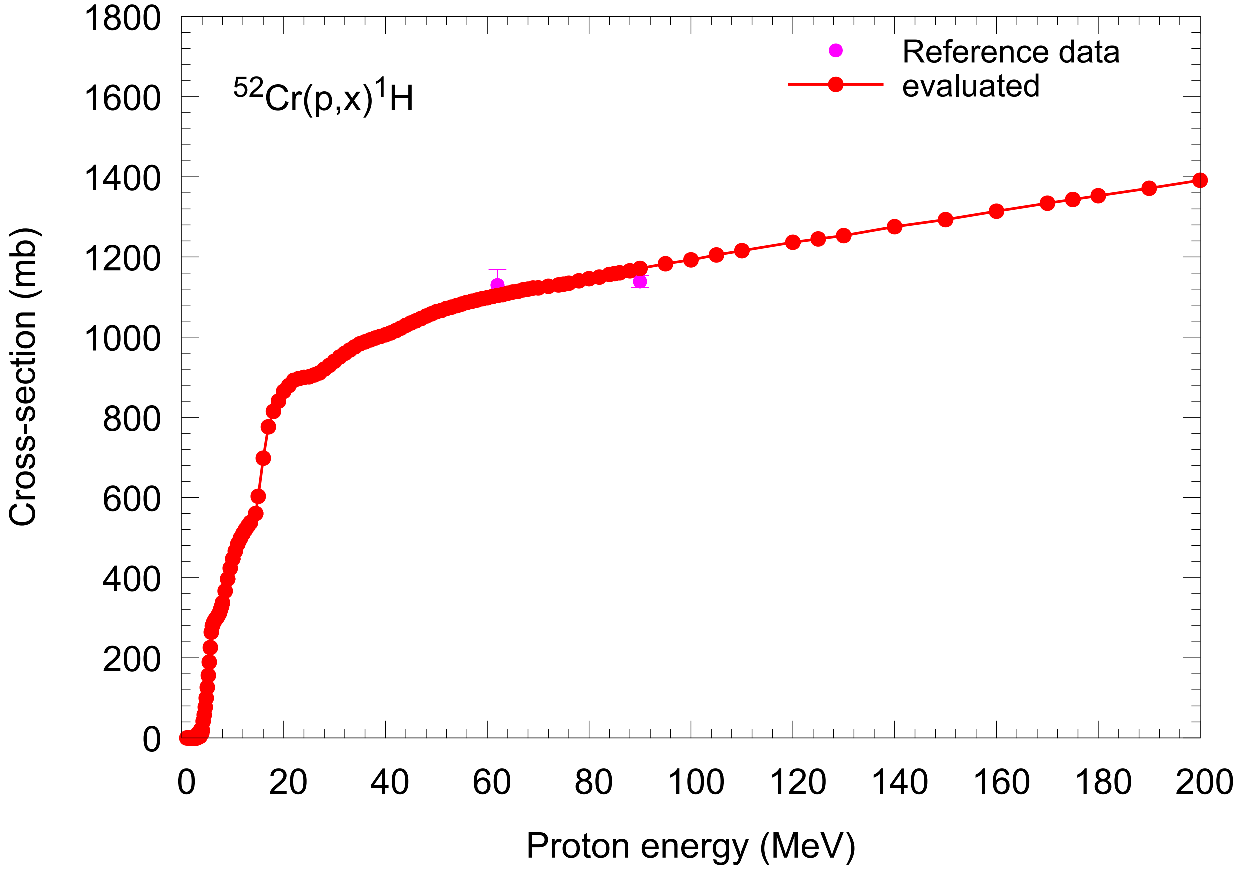


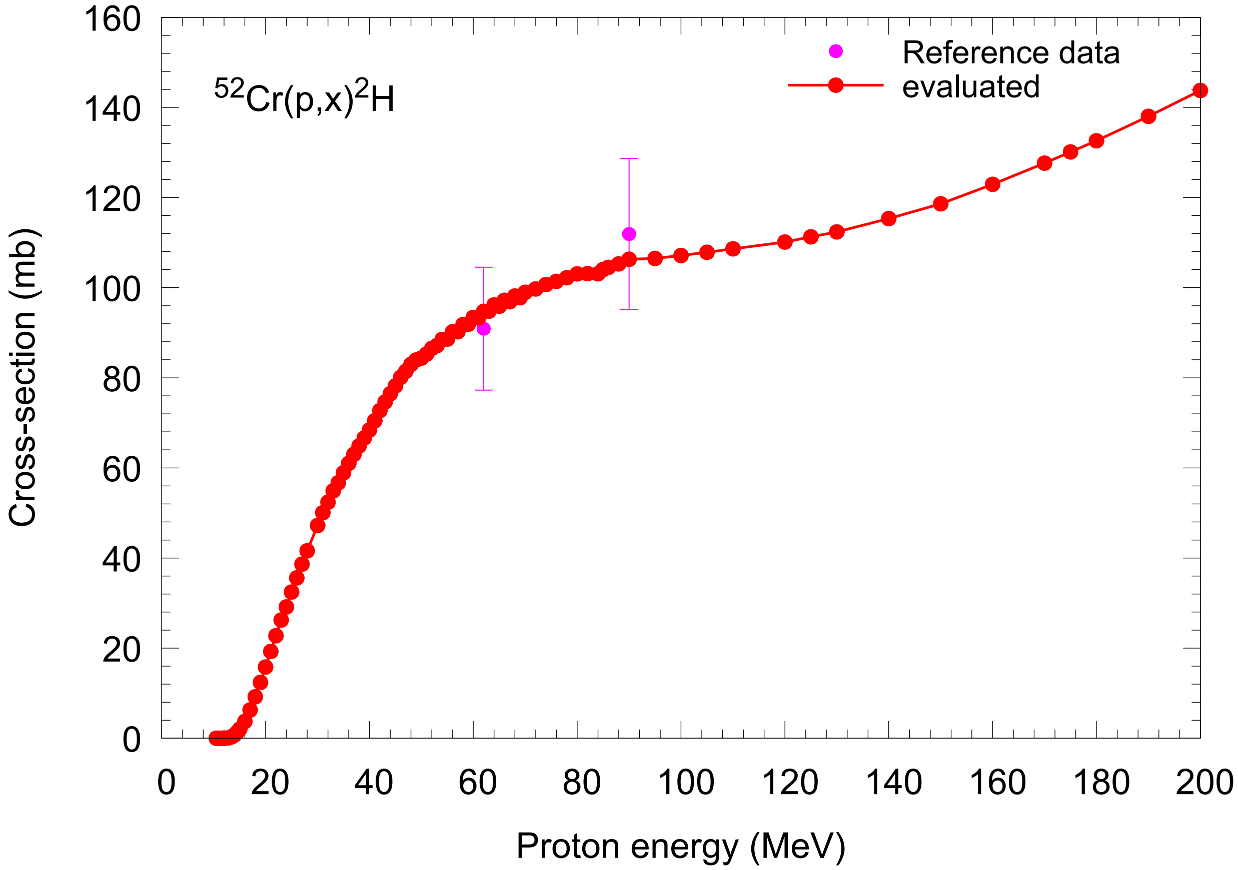
$^{50}Cr(p,n)^{50m1}Mn$
Mckenna (73)
evaluated
Cross-section (mb)
Proton energy (MeV)

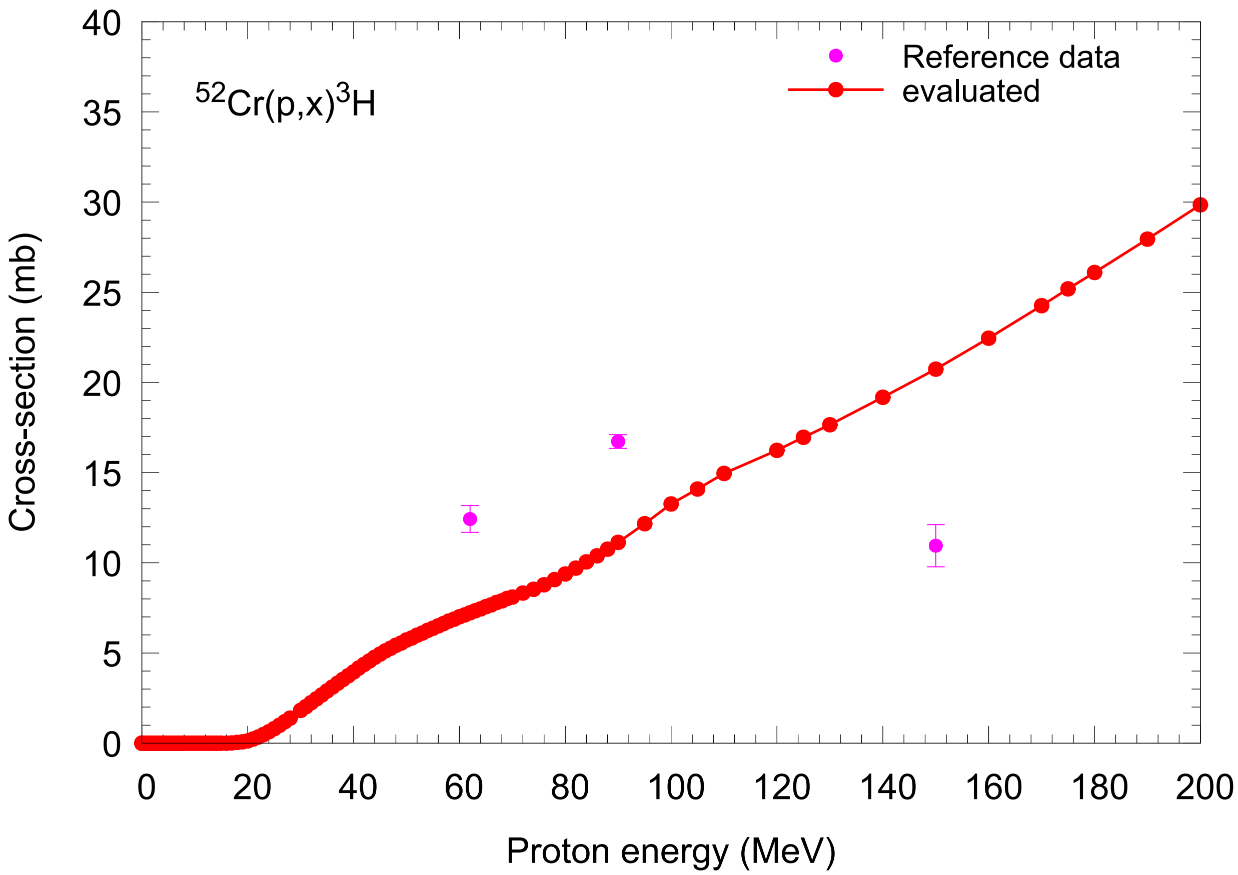


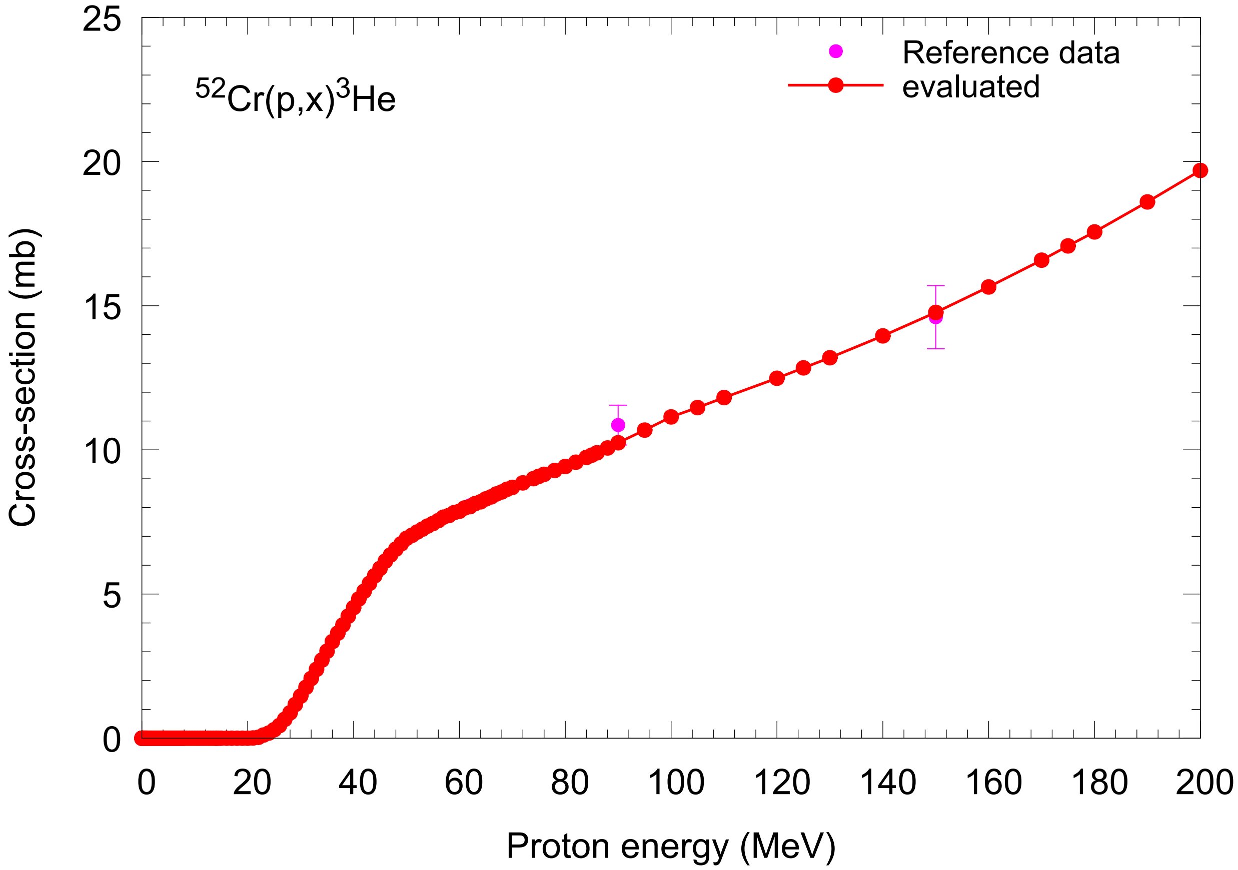
$^{50}Cr(p,g)^{51}Mn$
Rios (74)
Krivonosov (77)
evaluated
Cross-section (mb)
Proton energy (MeV)


$^{52}Cr(p,x)^{1}nn$
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
1800
0
20
40
60
80
100
120
140
160
180
200

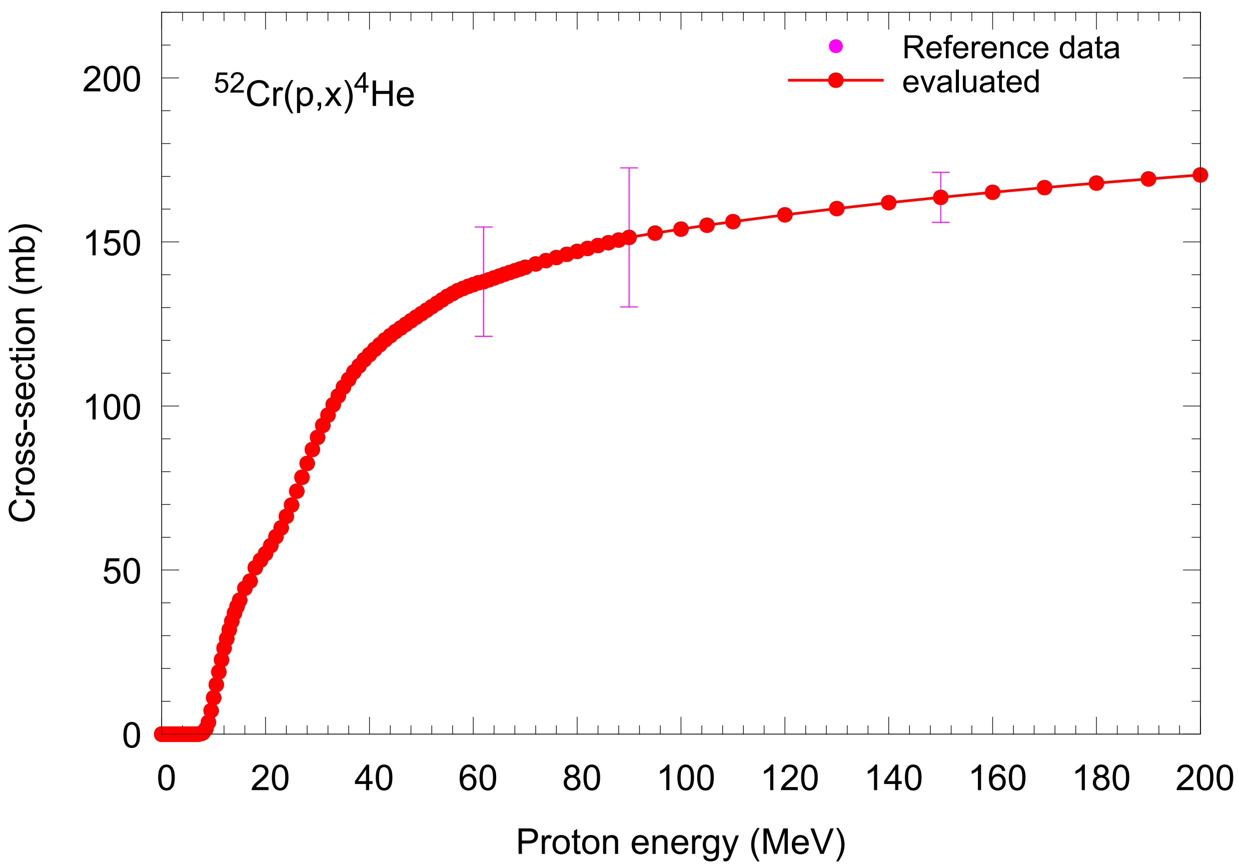

$^{52}Cr(p,x)^{1}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
1800
0
20
40
60
80
100
120
140
160
180
200


Reference data
evaluated
$^{52}Cr(p,x)^{2}H$
Cross-section (mb)
Proton energy (MeV)

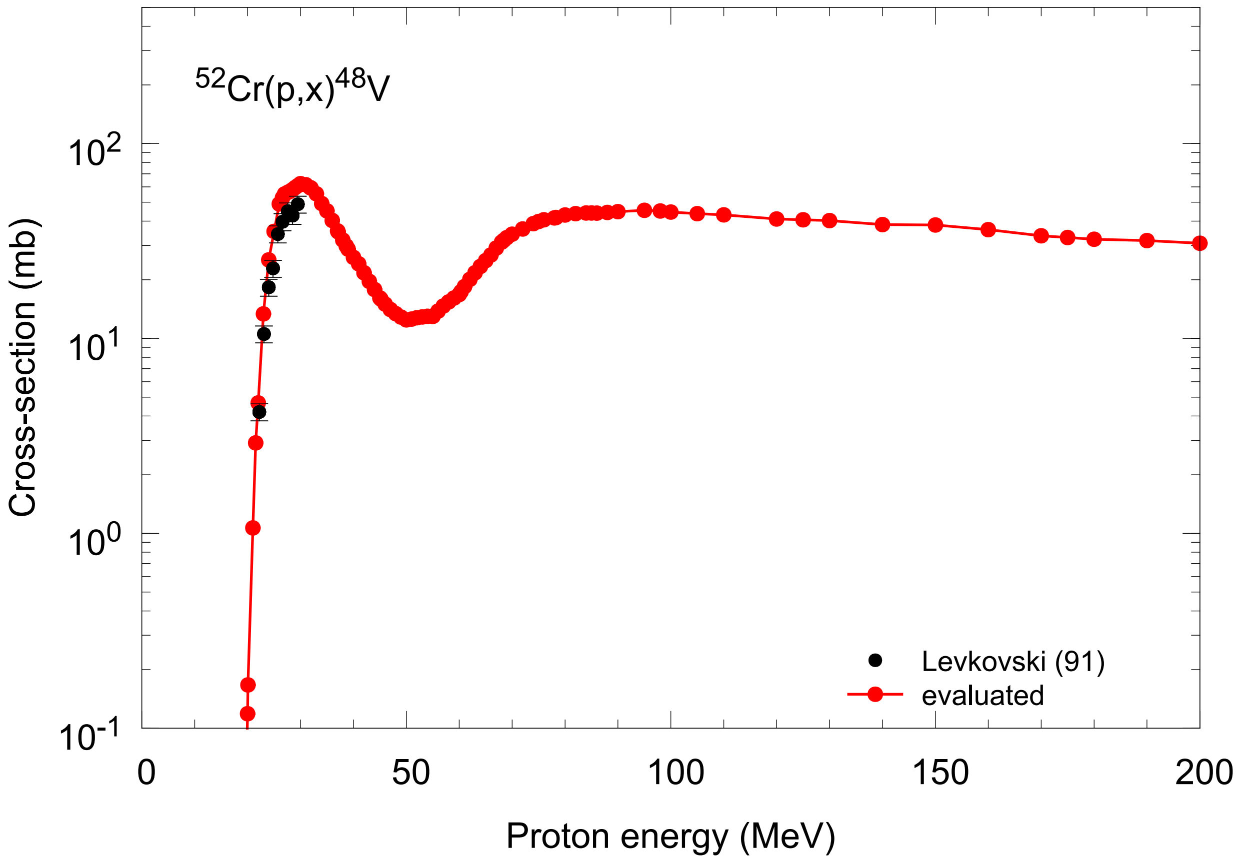

Reference data
evaluated
$^{52}Cr(p,x)^{3}H$
Cross-section (mb)
Proton energy (MeV)

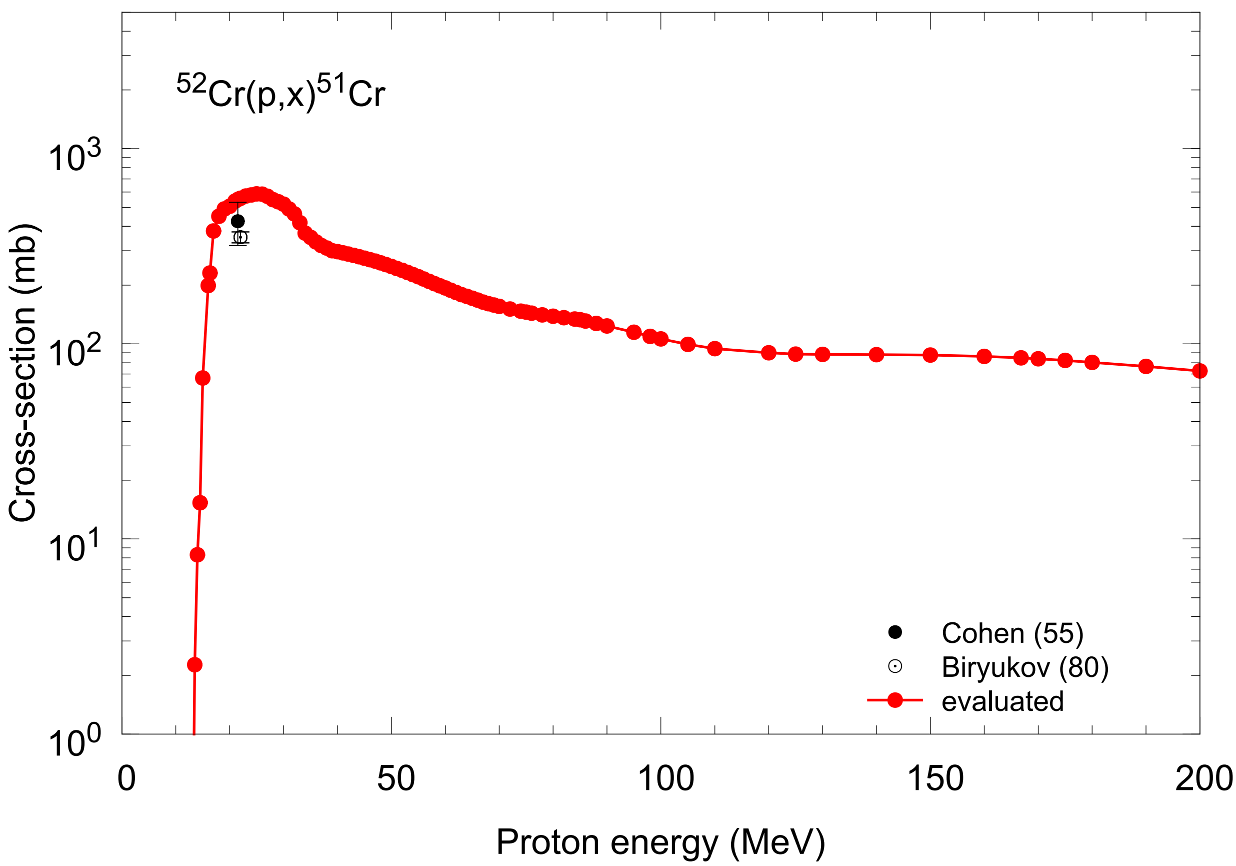


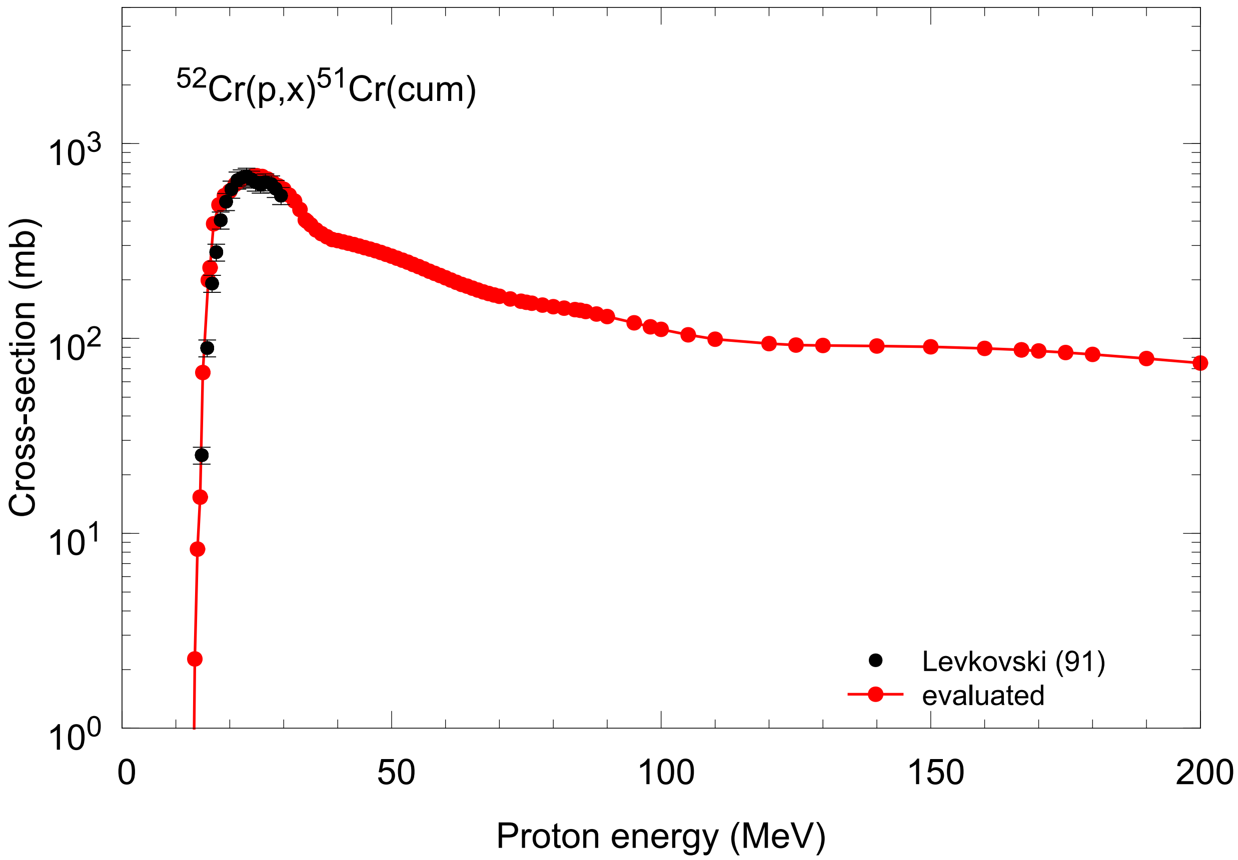
$^{52}Cr(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
0
20
40
60
80
100
120
140
160
180
200



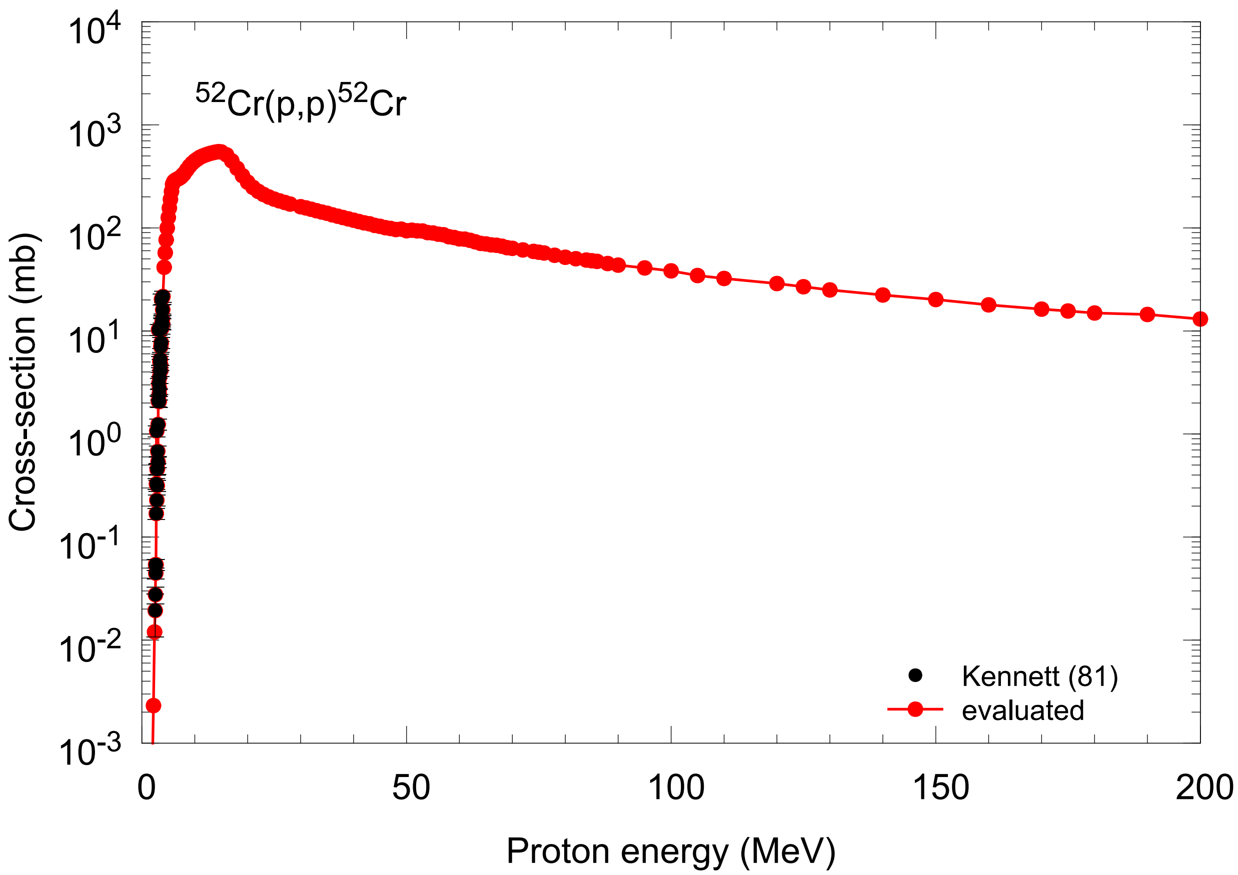
$^{52}Cr(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
0
20
40
60
80
100
120
140
160
180
200


$^{52}Cr(p,x)^{48}V$
Cross-section (mb)
10^{-1}
10^{0}
10^{1}
10^{2}
0
50
100
150
200
Proton energy (MeV)
Levkovski (91)
evaluated

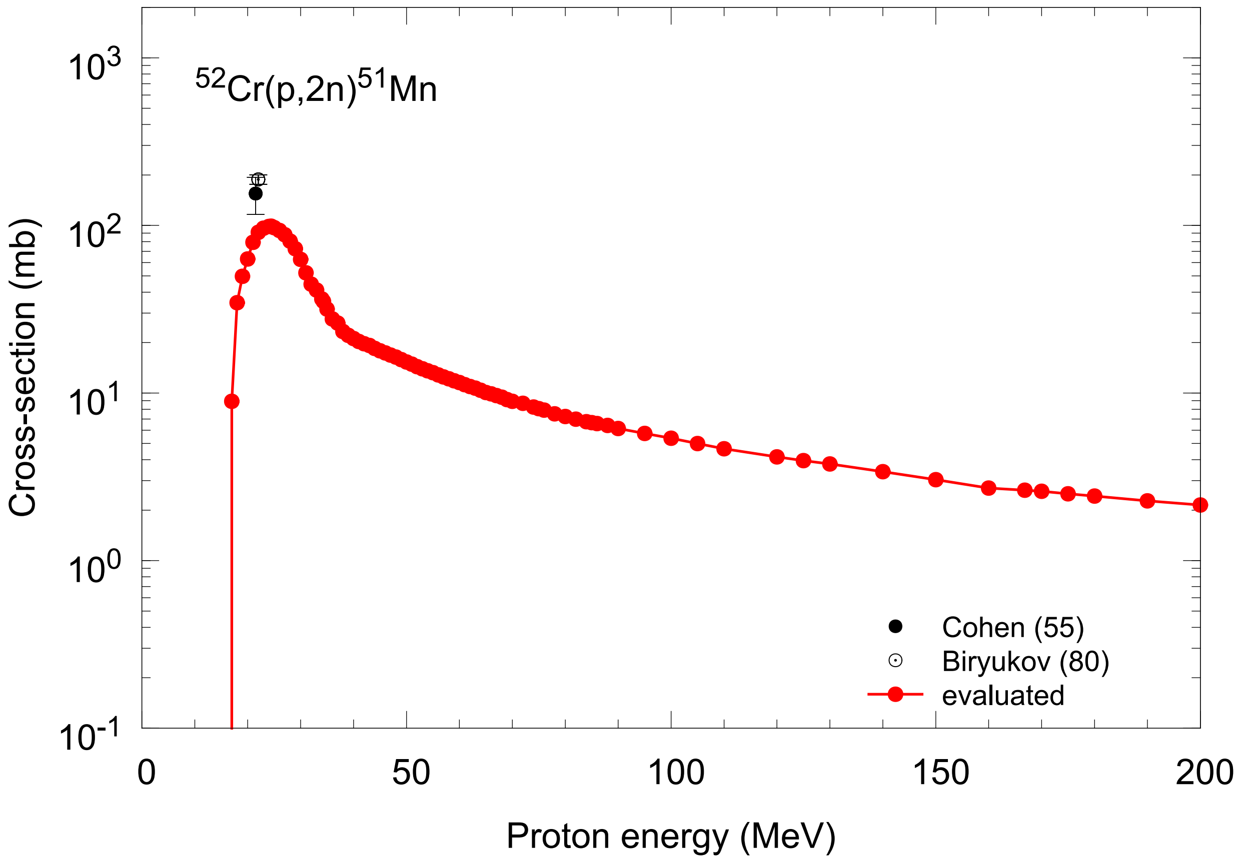

$^{52}Cr(p,x)^{51}Cr$
Cross-section (mb)
10^{0}
10^{1}
10^{2}
10^{3}
0
50
100
150
200
Proton energy (MeV)
Cohen (55)
Biryukov (80)
evaluated



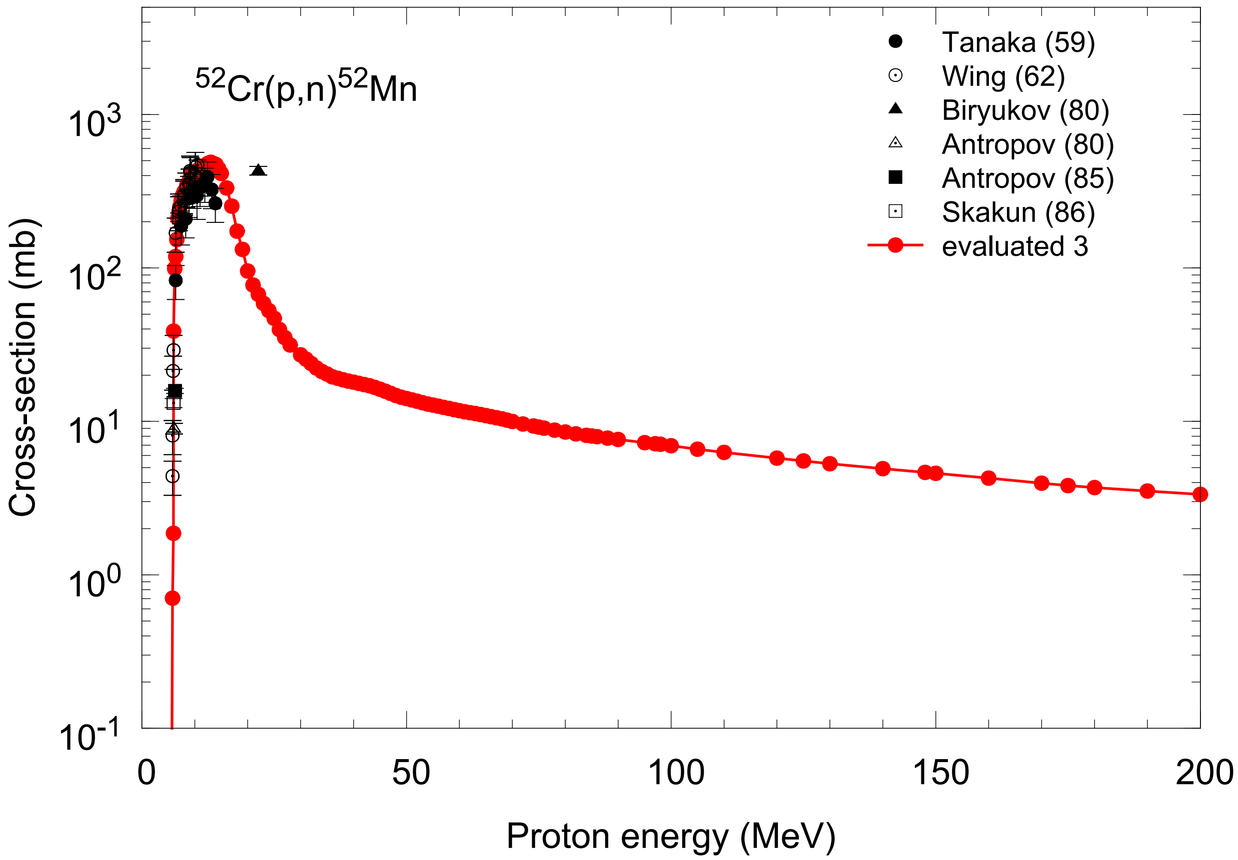
$^{52}Cr(p,x)^{51}Cr(cum)$
Levkovski (91)
evaluated
Cross-section (mb)
Proton energy (MeV)



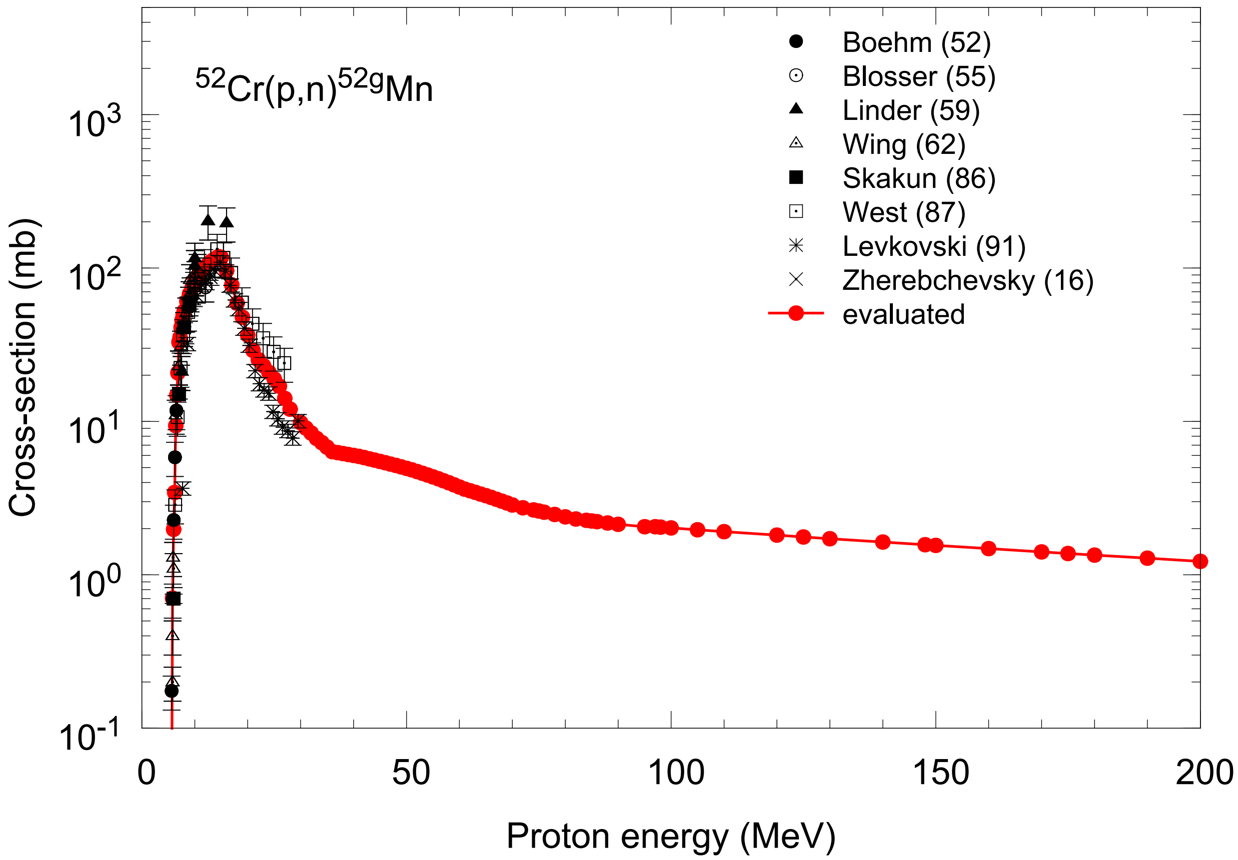
$^{52}Cr(p,p)^{52}Cr$
Kennett (81)
evaluated
Cross-section (mb)
Proton energy (MeV)



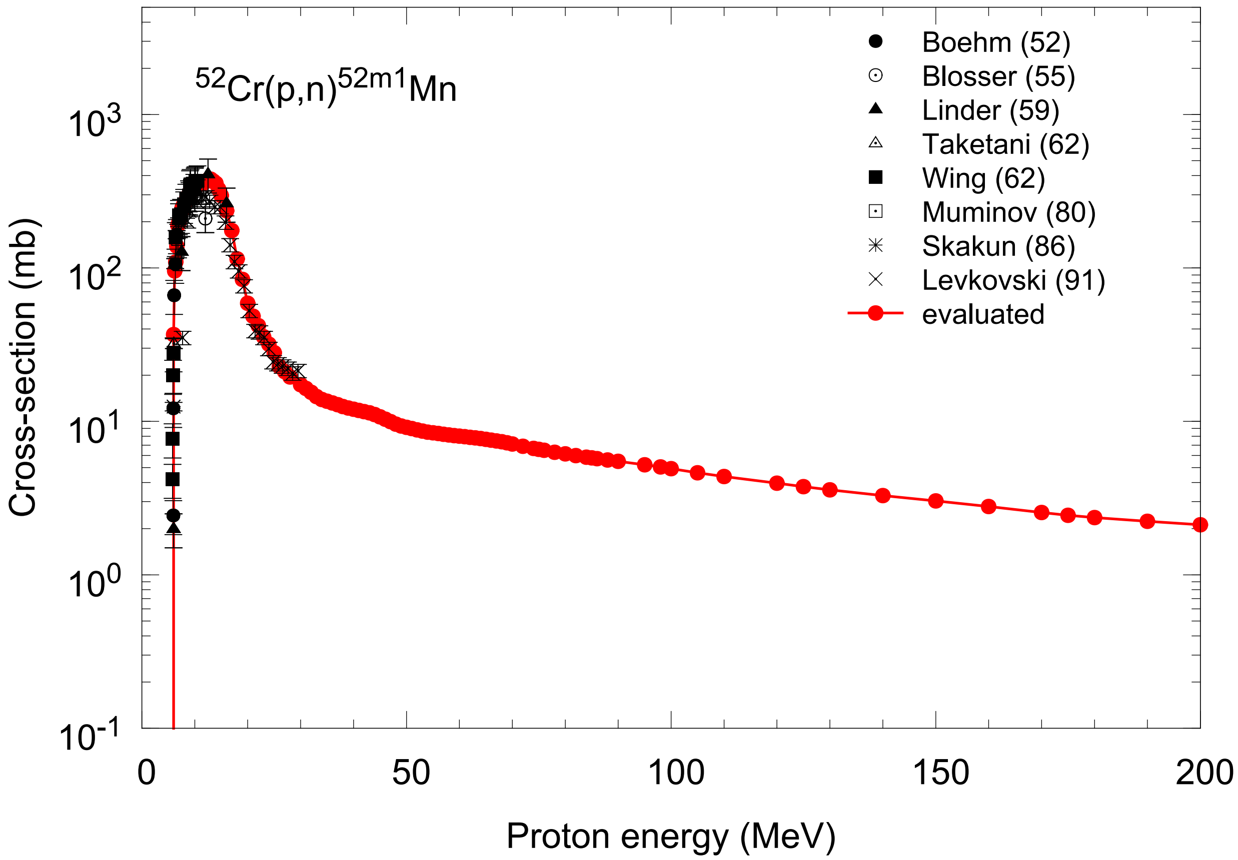
$^{52}Cr(p,2n)^{51}Mn$
Cross-section (mb)
Proton energy (MeV)
Cohen (55)
Biryukov (80)
evaluated



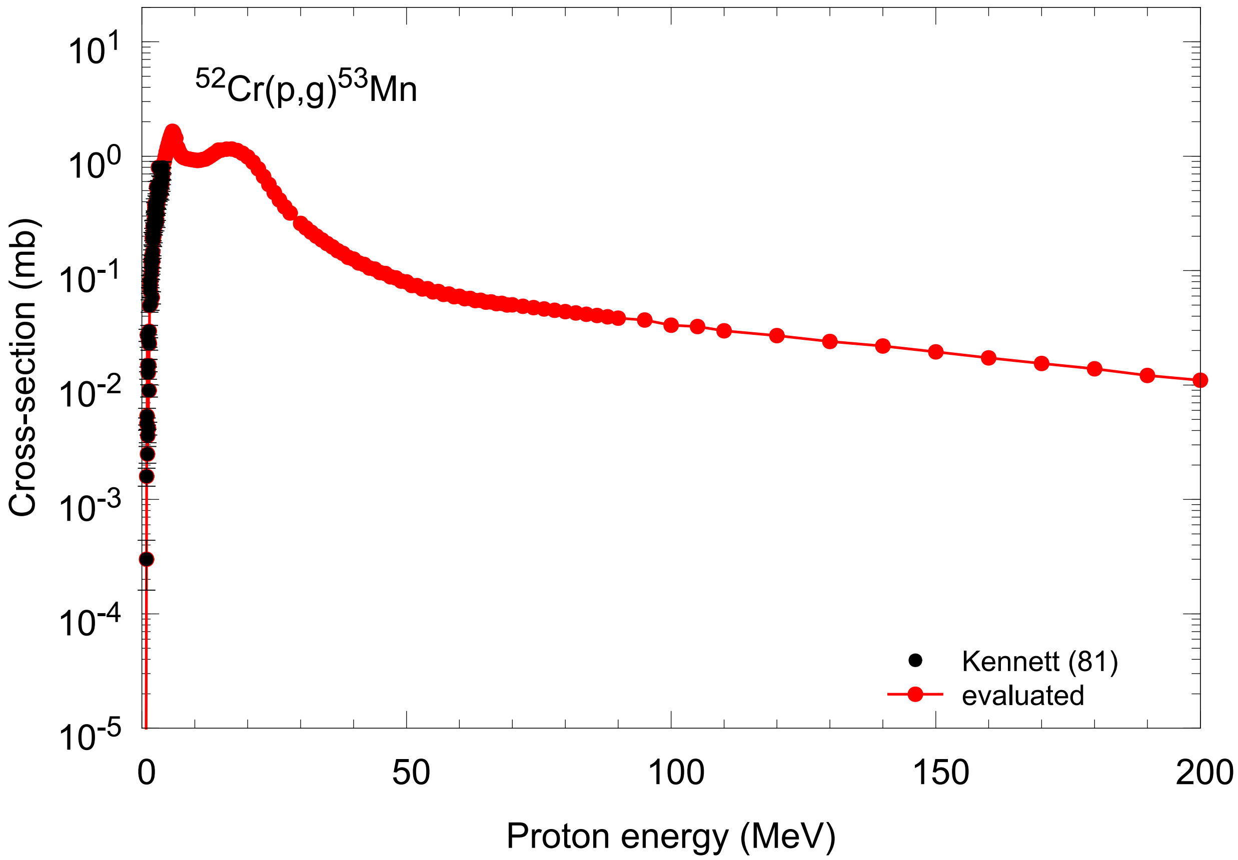
$^{52}Cr(p,n)^{52}Mn$
Cross-section (mb)
Proton energy (MeV)
Tanaka (59)
Wing (62)
Biryukov (80)
Antropov (80)
Antropov (85)
Skakun (86)
evaluated 3



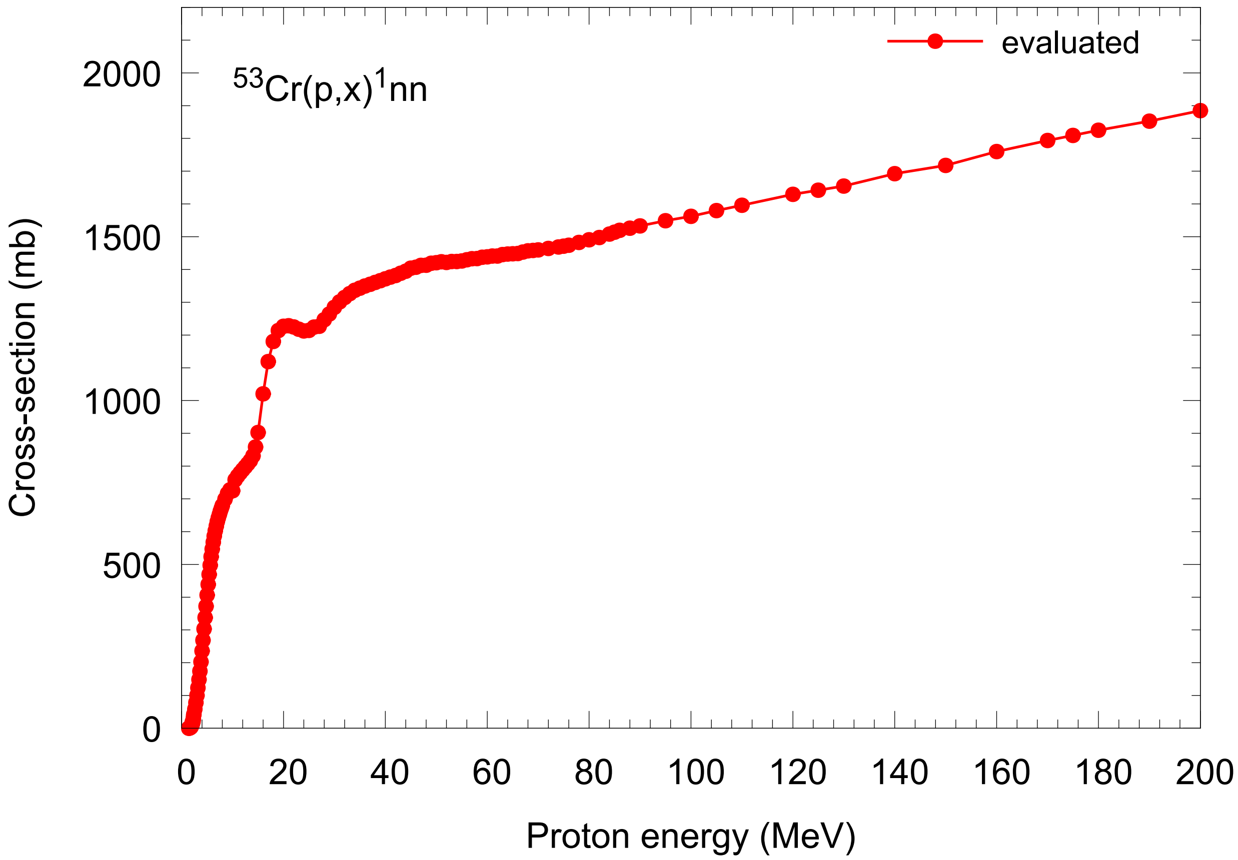
$^{52}Cr(p,n)^{52g}Mn$
Boehm (52)
Blosser (55)
Linder (59)
Wing (62)
Skakun (86)
West (87)
Levkovski (91)
Zherebchevsky (16)
evaluated
Cross-section (mb)
Proton energy (MeV)



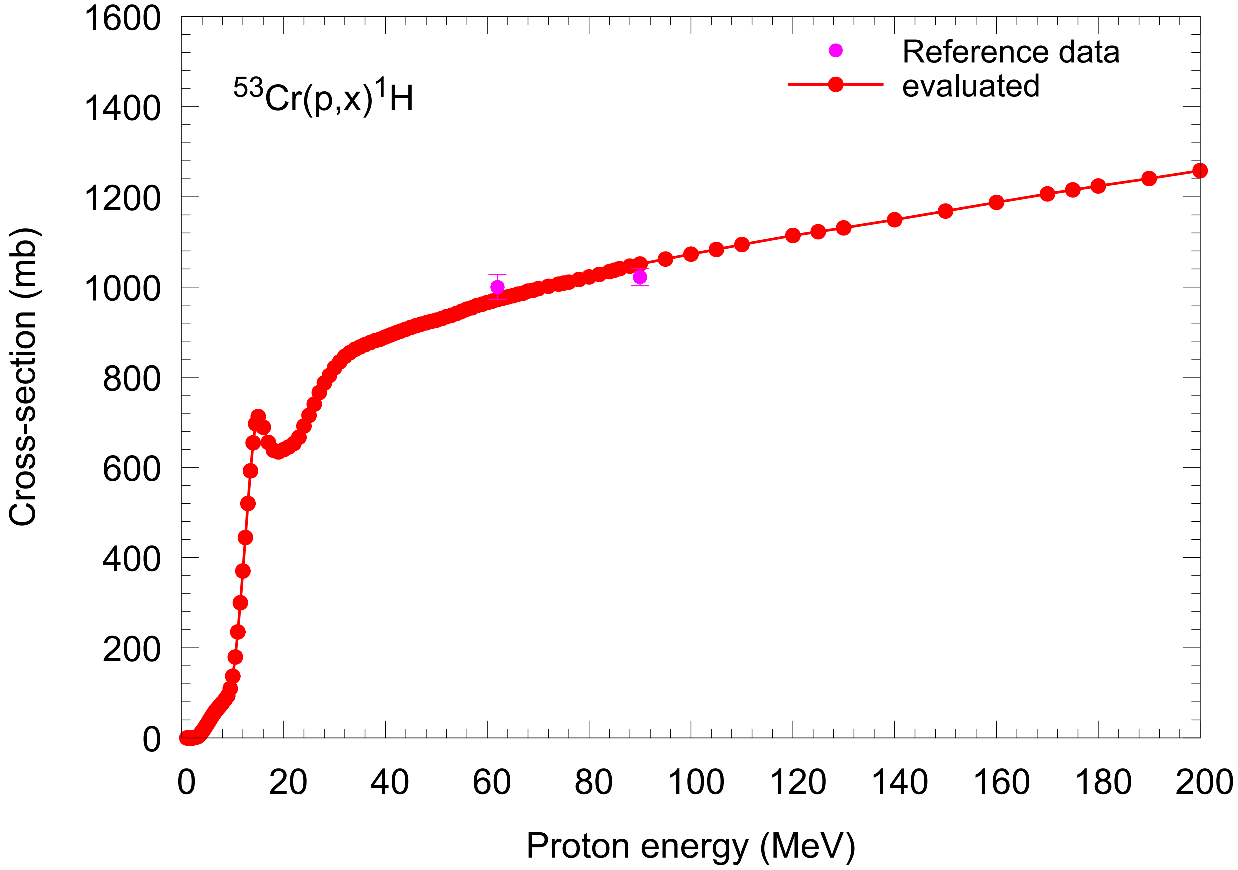
$^{52}Cr(p,n)^{52m1}Mn$
Boehm (52)
Blosser (55)
Linder (59)
Taketani (62)
Wing (62)
Muminov (80)
Skakun (86)
Levkovski (91)
evaluated
Cross-section (mb)
Proton energy (MeV)



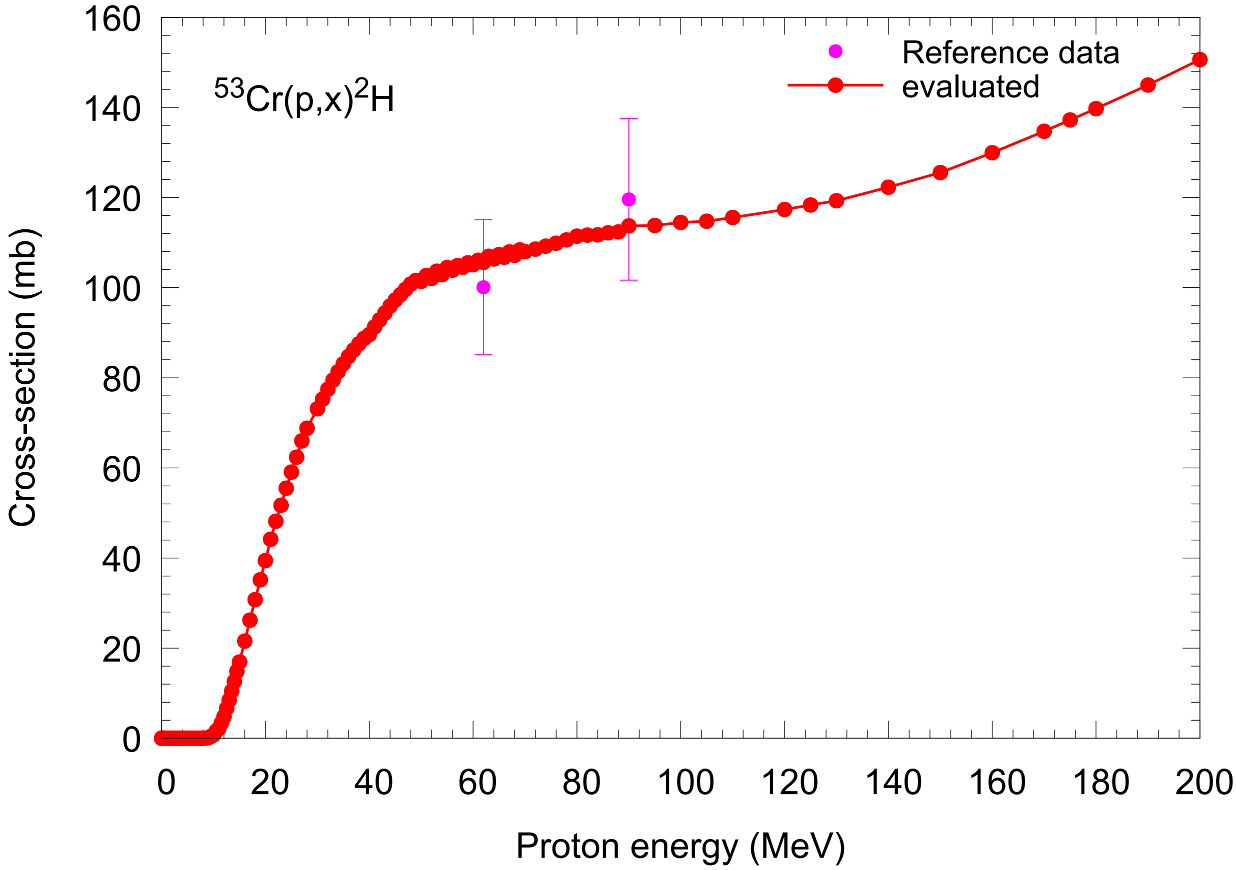
$^{52}Cr(p,g)^{53}Mn$
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200
Proton energy (MeV)
Kennett (81)
evaluated



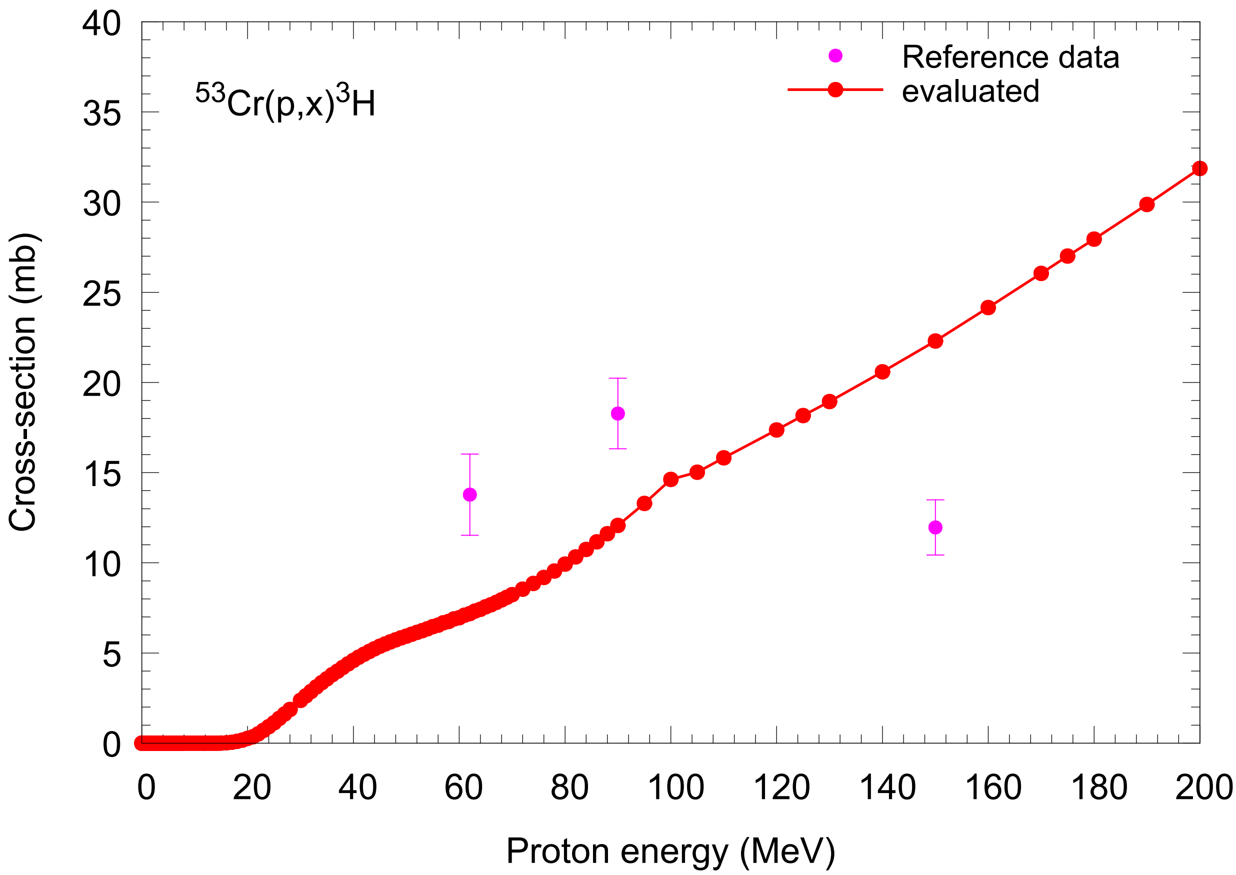
evaluated
$^{53}Cr(p,x)^{1}nn$
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
0
20
40
60
80
100
120
140
160
180
200



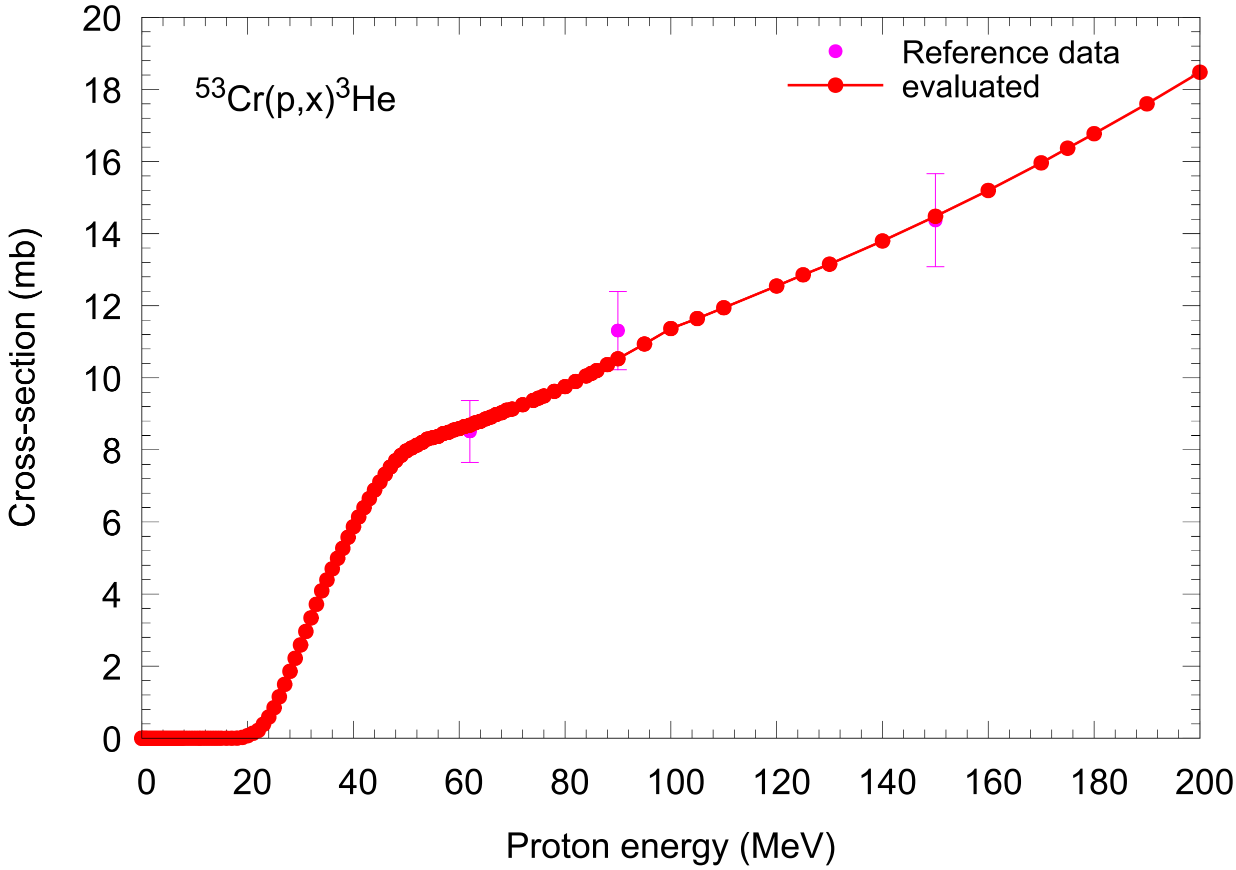
Reference data
evaluated
$^{53}Cr(p,x)^{1}H$
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
0
20
40
60
80
100
120
140
160
180
200



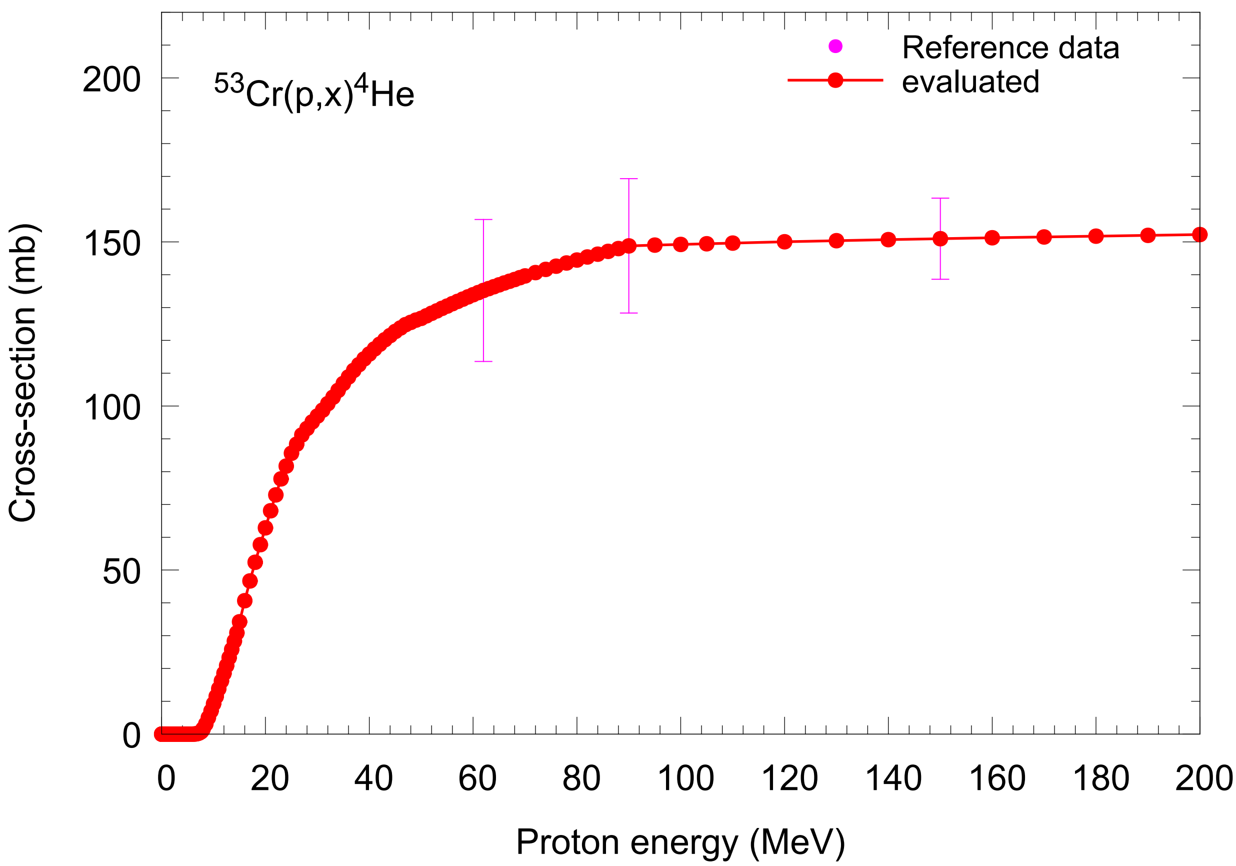
$^{53}Cr(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
200



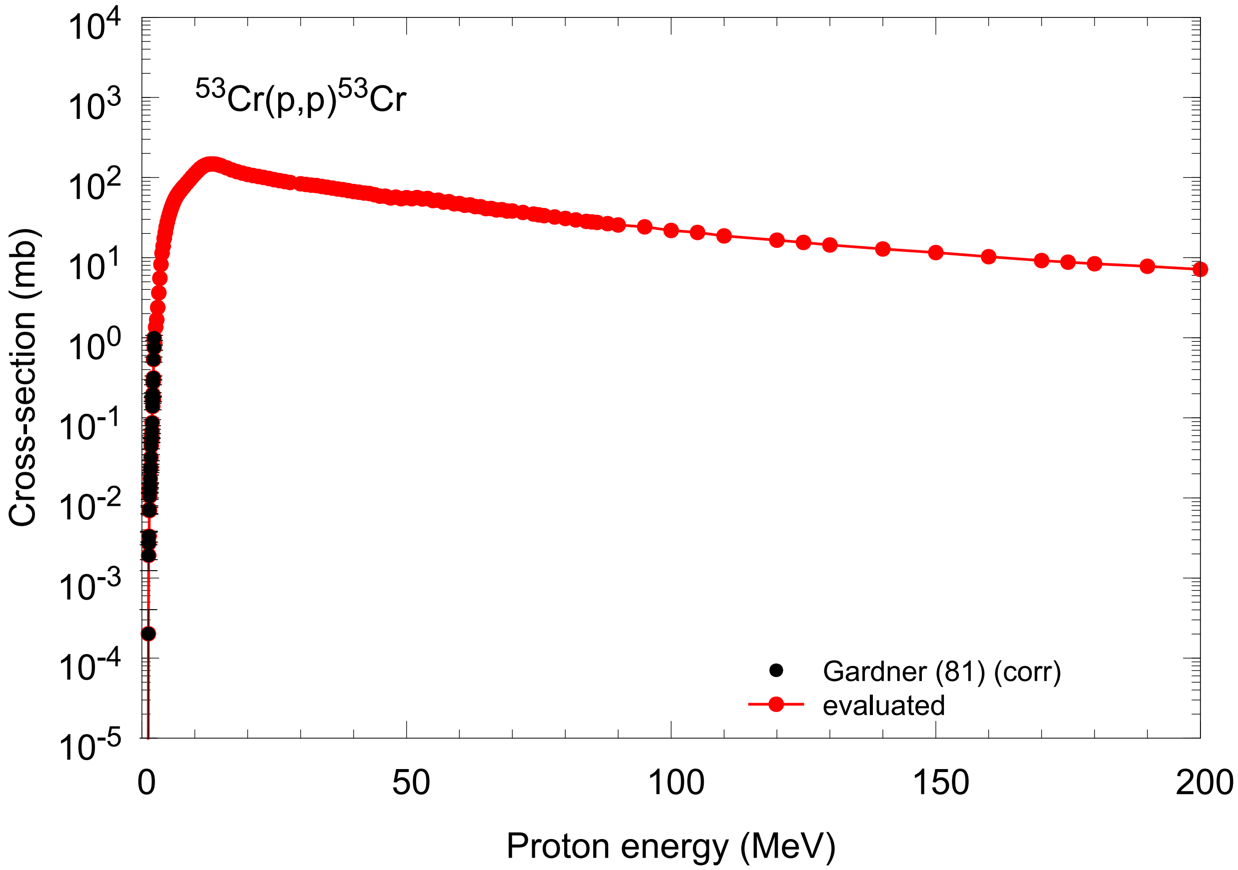
$^{53}Cr(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
40



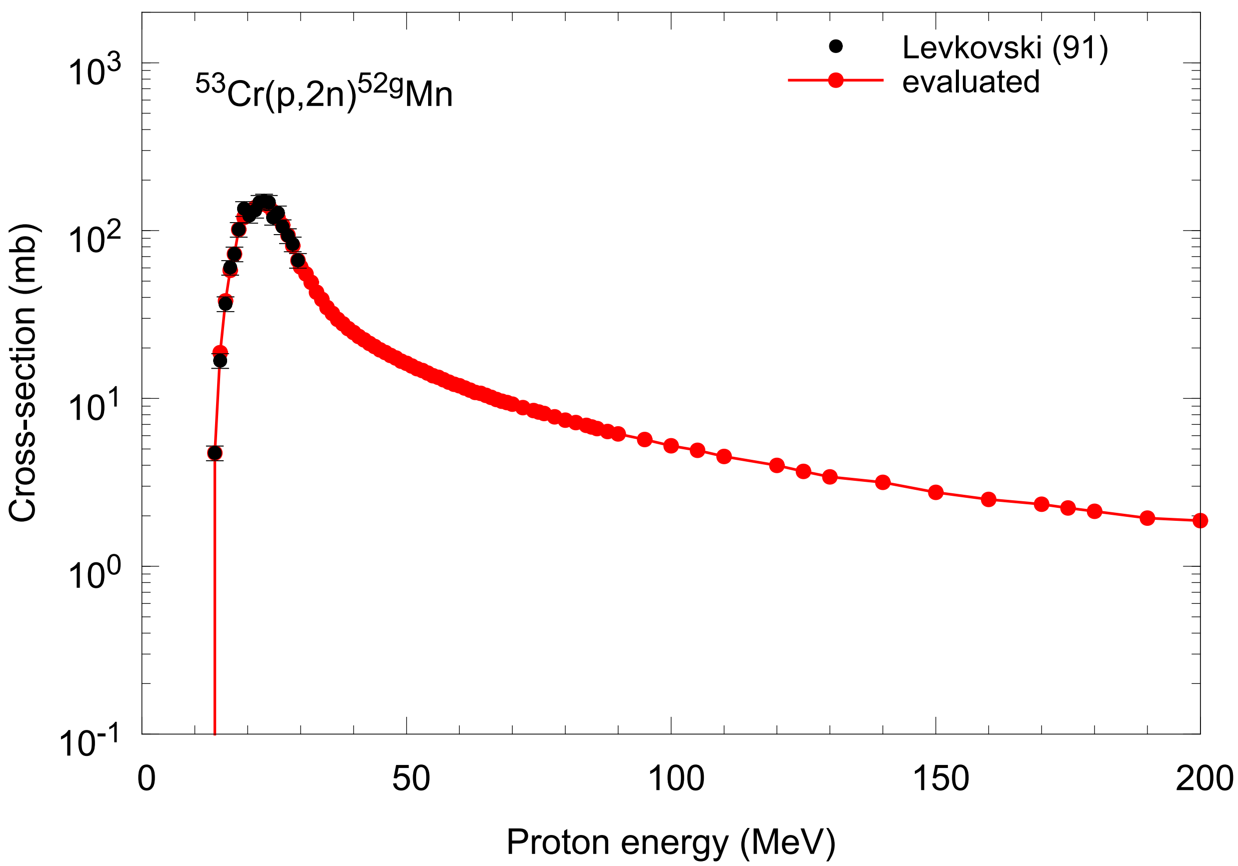
$^{53}Cr(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
2
4
6
8
10
12
14
16
18
20
0
20
40
60
80
100
120
140
160
180
200



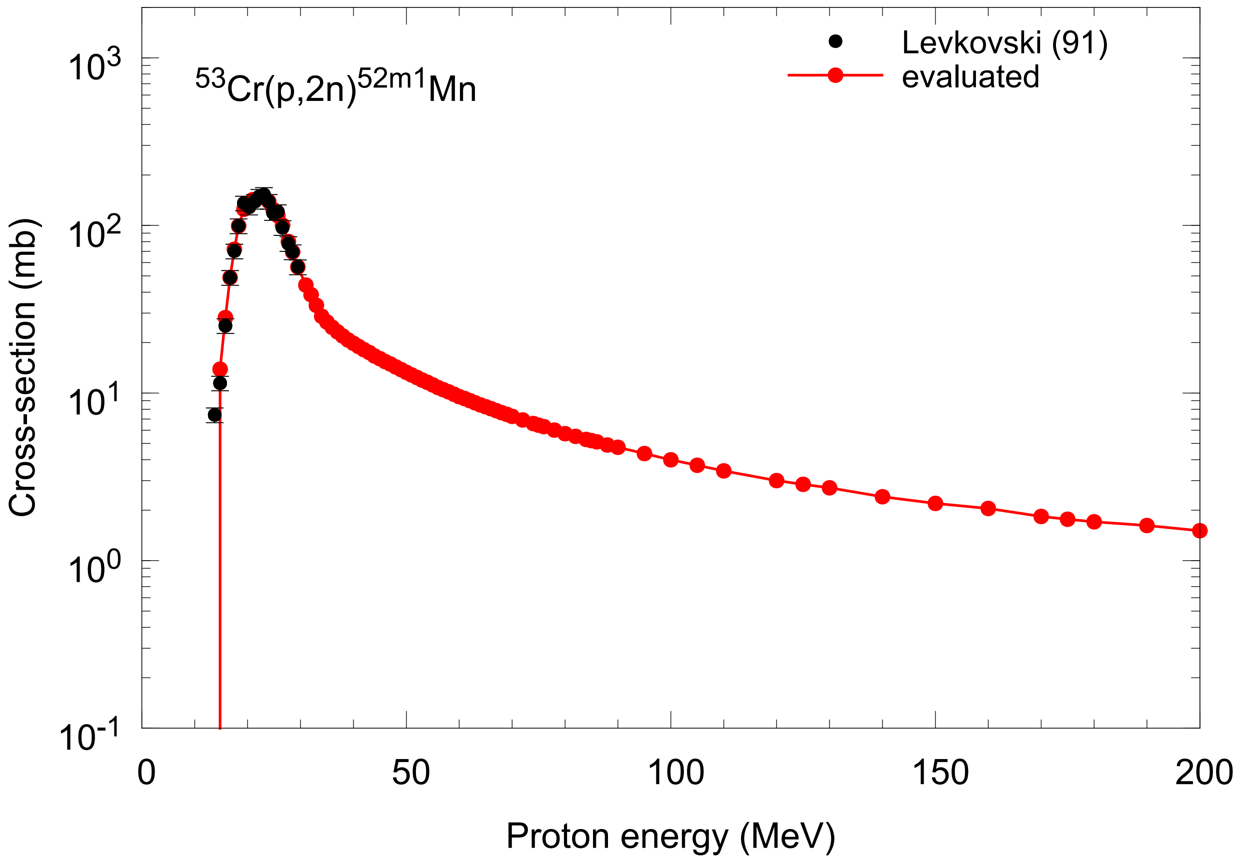
$^{53}Cr(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
0
20
40
60
80
100
120
140
160
180
200



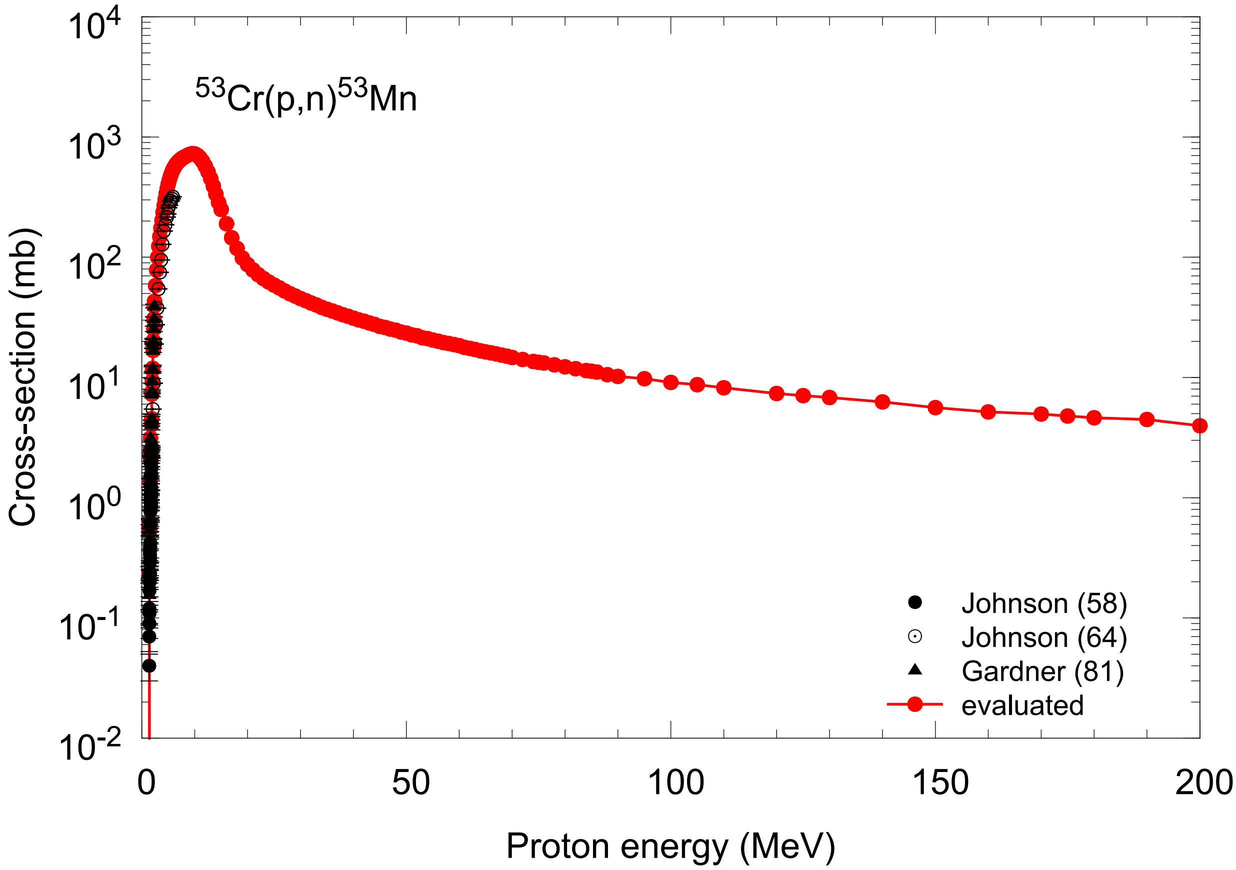
$^{53}Cr(p,p)^{53}Cr$
Gardner (81) (corr)
evaluated
Cross-section (mb)
Proton energy (MeV)



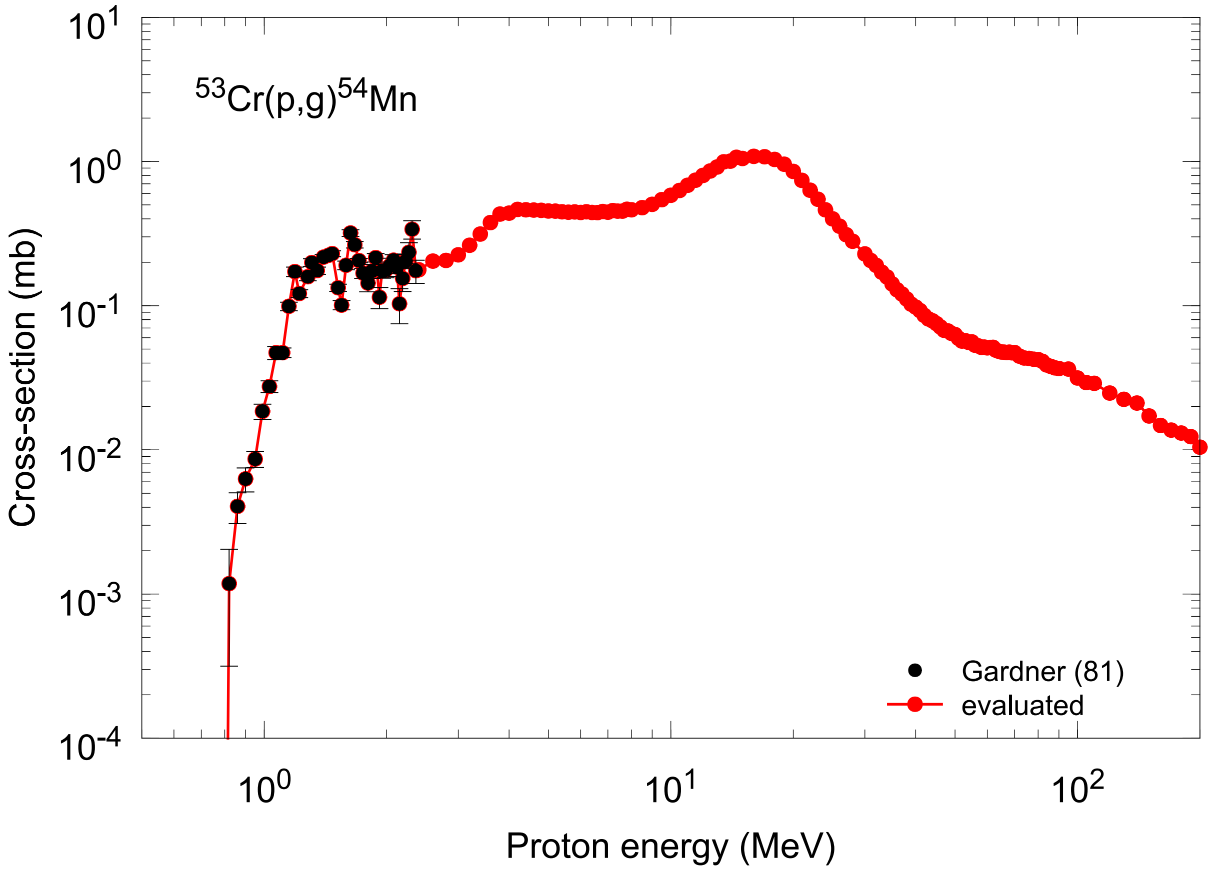
$^{53}Cr(p,2n)^{52g}Mn$
Levkovski (91)
evaluated
Cross-section (mb)
Proton energy (MeV)



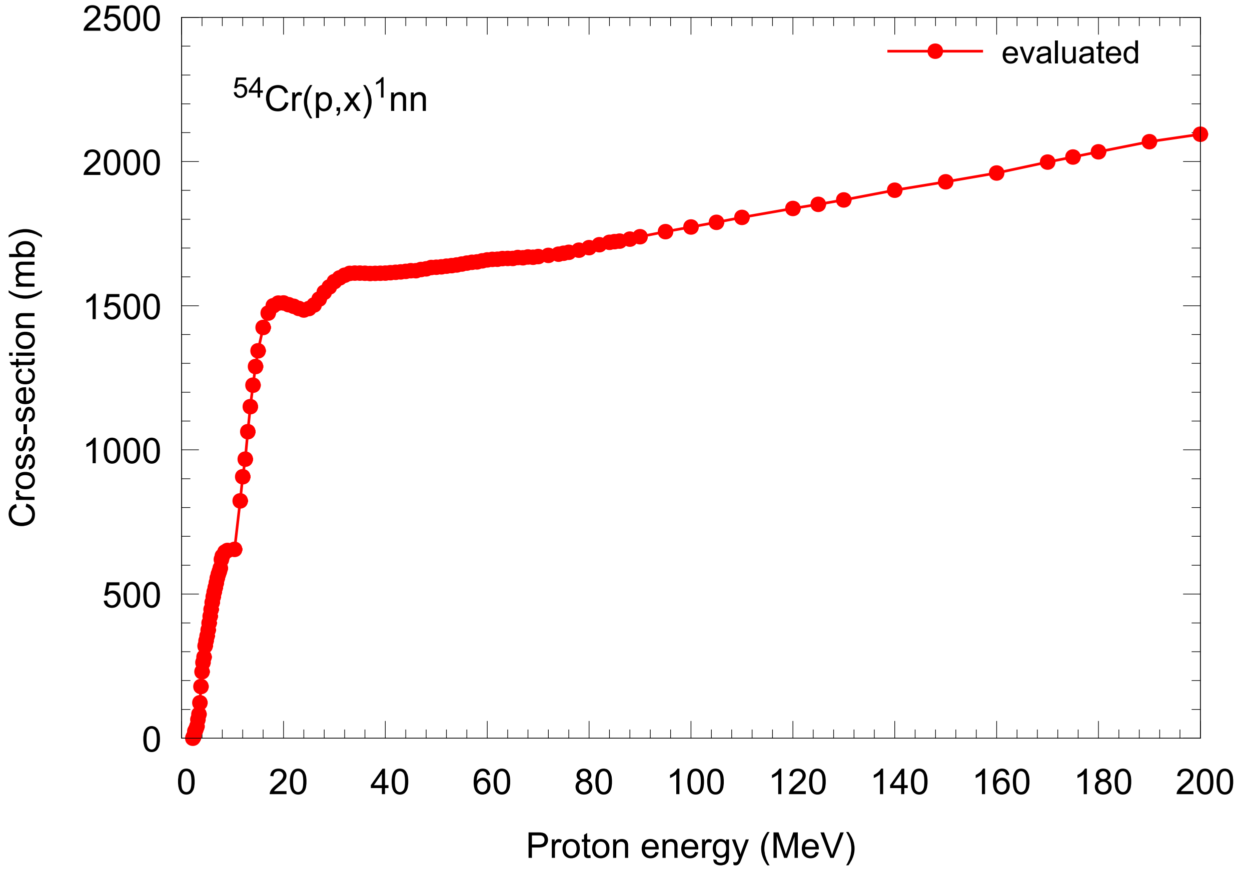
$^{53}Cr(p,2n)^{52m1}Mn$
Levkovski (91)
evaluated
Cross-section (mb)
Proton energy (MeV)



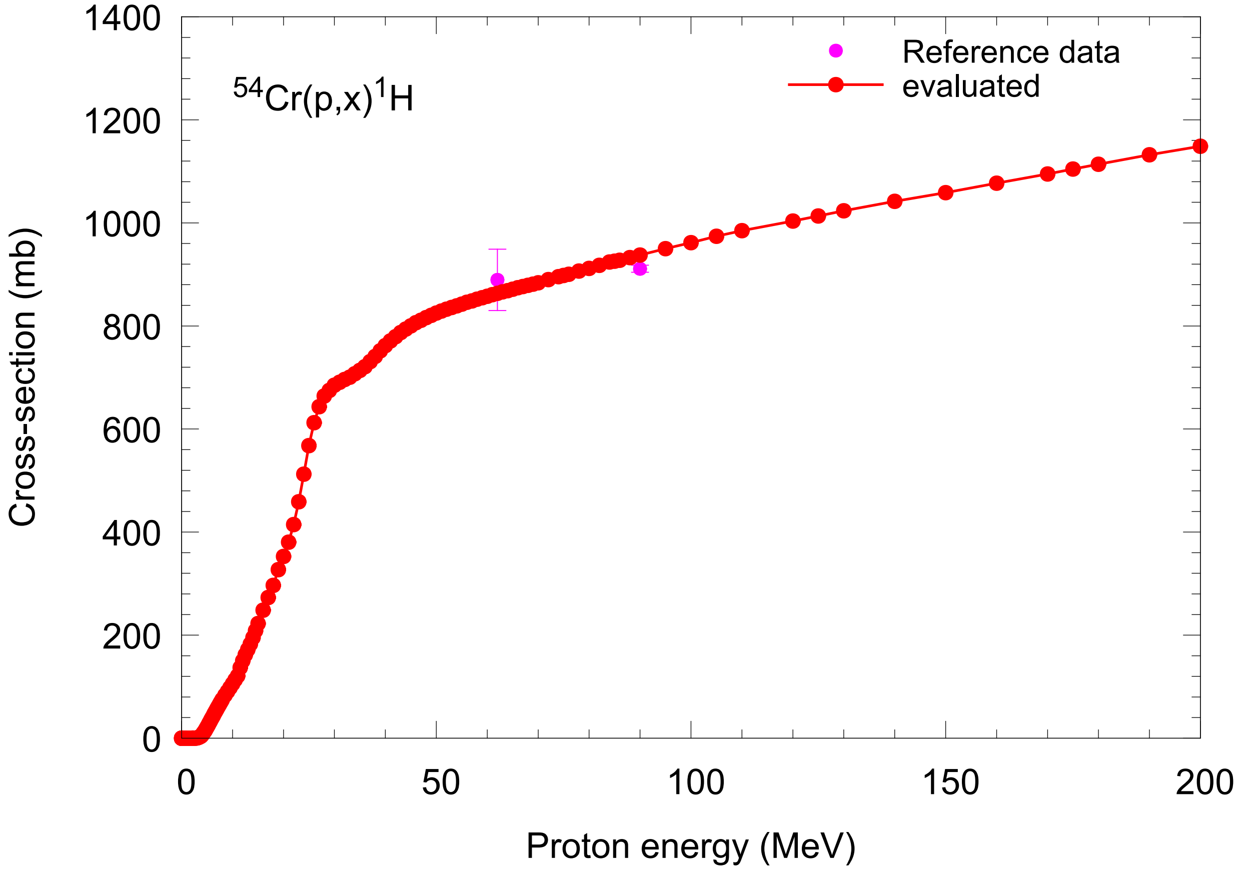
$^{53}Cr(p,n)^{53}Mn$
Johnson (58)
Johnson (64)
Gardner (81)
evaluated
Cross-section (mb)
Proton energy (MeV)



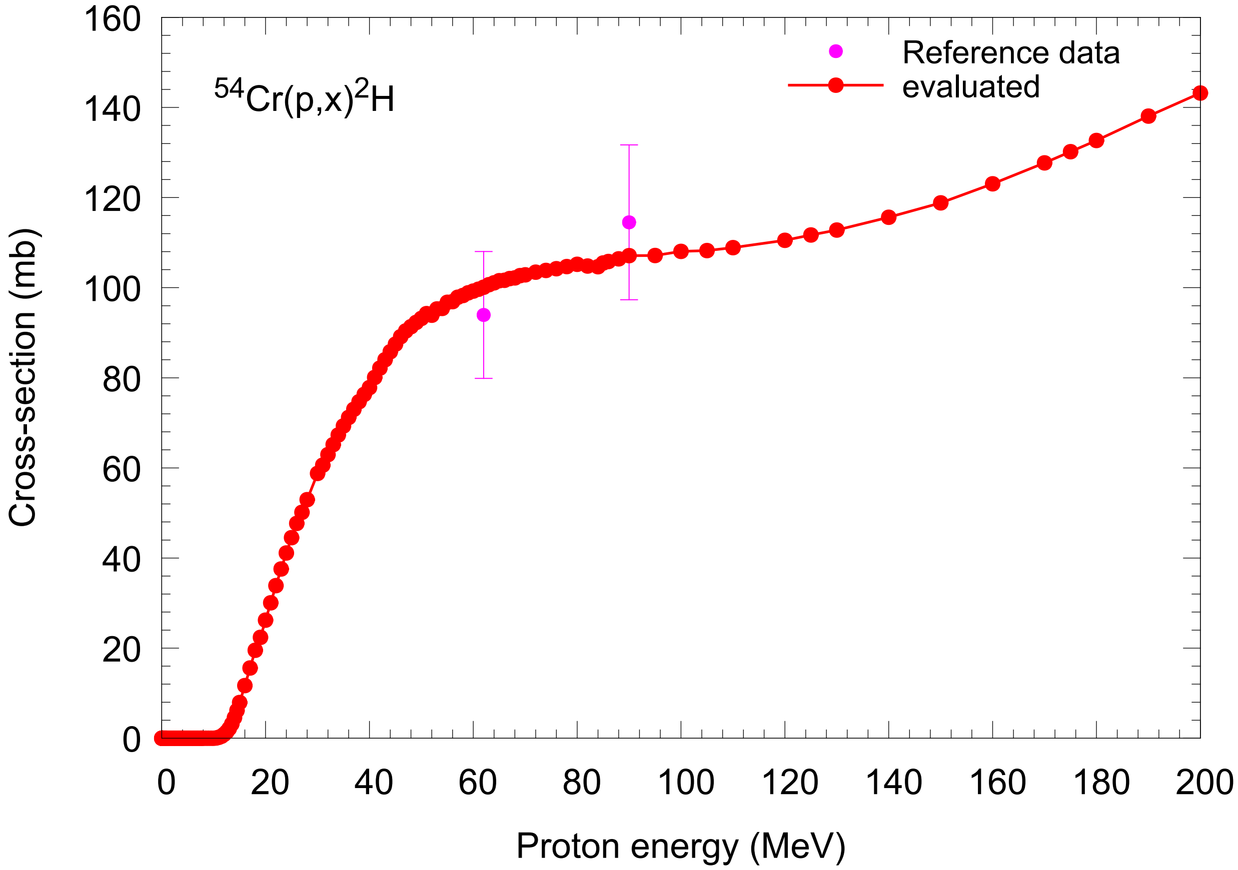
^{53}Cr(p,g)^{54}Mn
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{0}
10^{1}
10^{2}
Proton energy (MeV)
Gardner (81)
evaluated



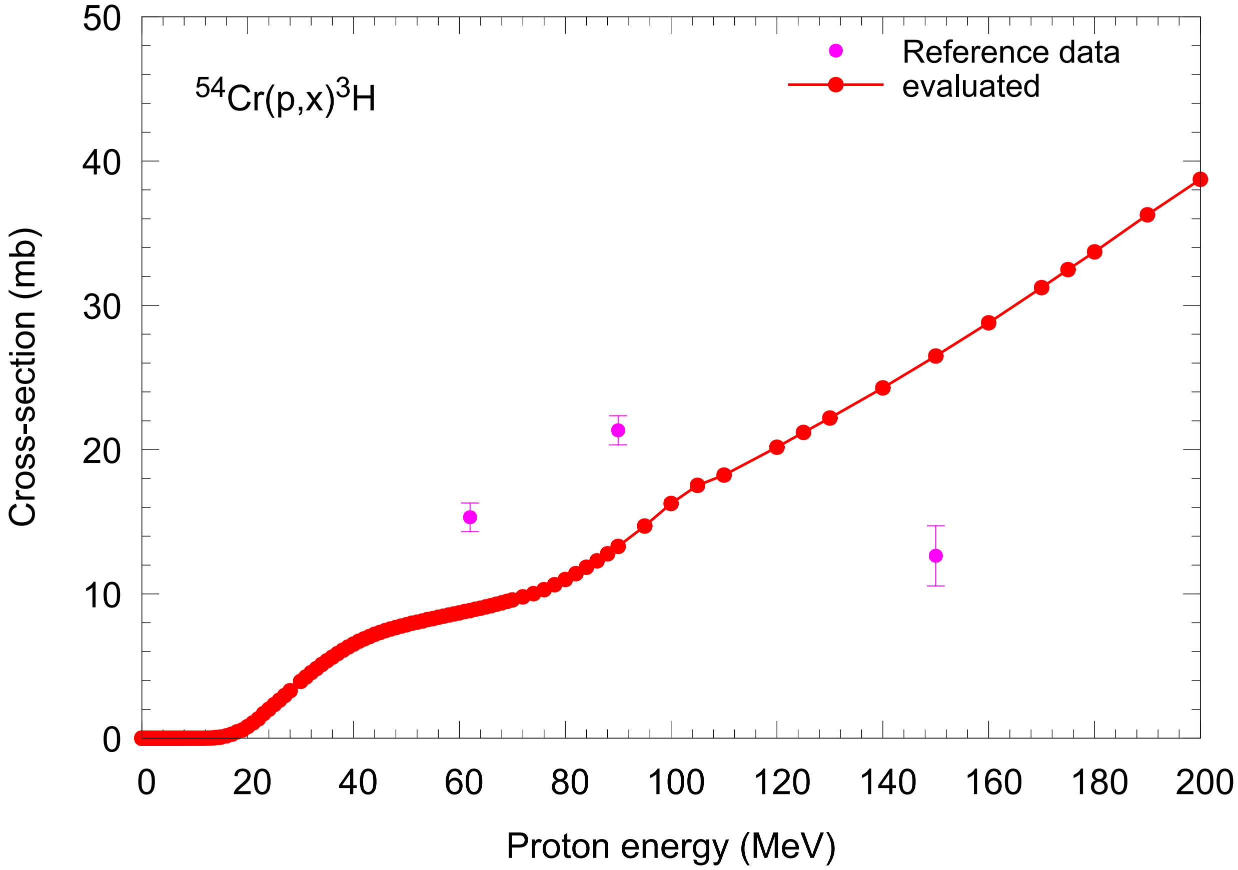
$^{54}Cr(p,x)^{1}nn$
evaluated
Cross-section (mb)
Proton energy (MeV)
2500
2000
1500
1000
500
0
0
20
40
60
80
100
120
140
160
180
200



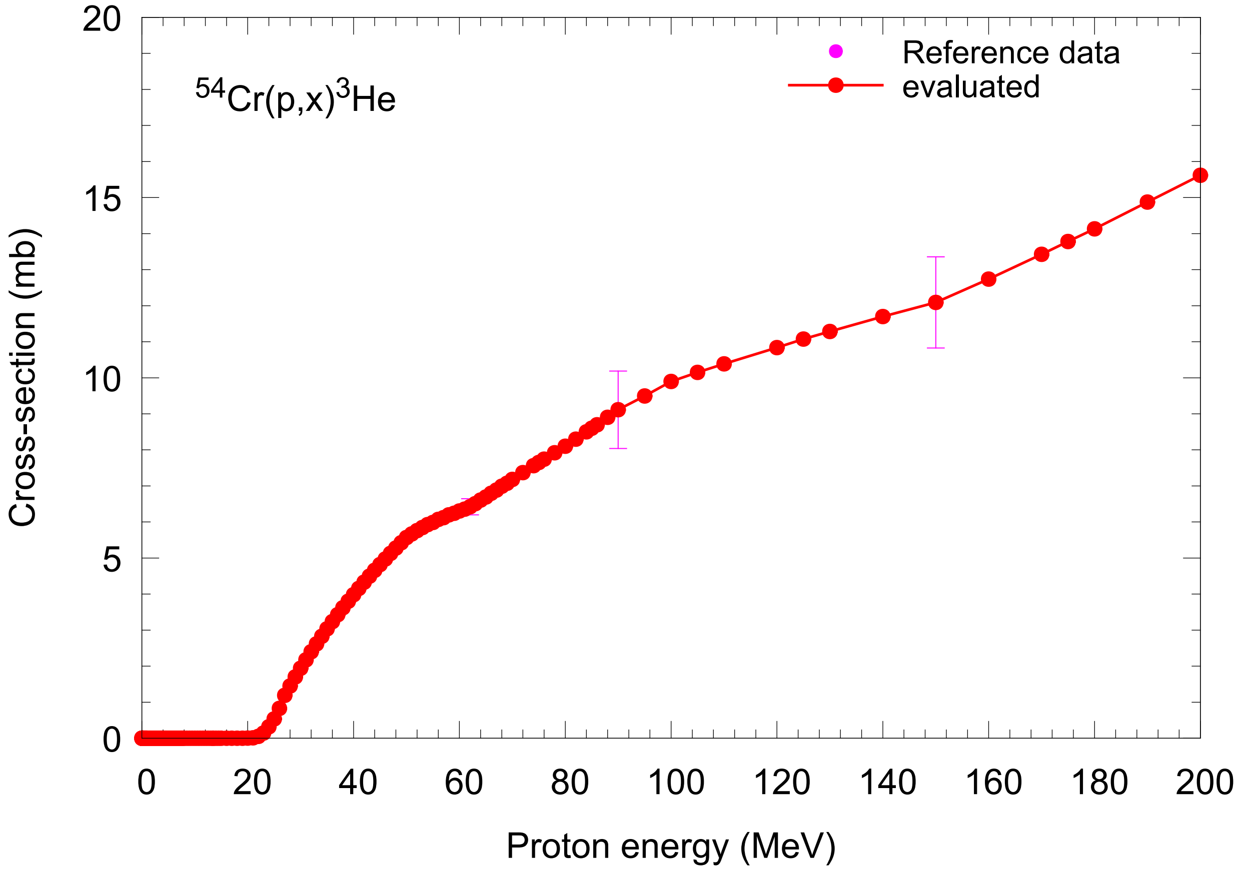
$^{54}Cr(p,x)^{1}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
1400
1200
1000
800
600
400
200
0
0
50
100
150
200



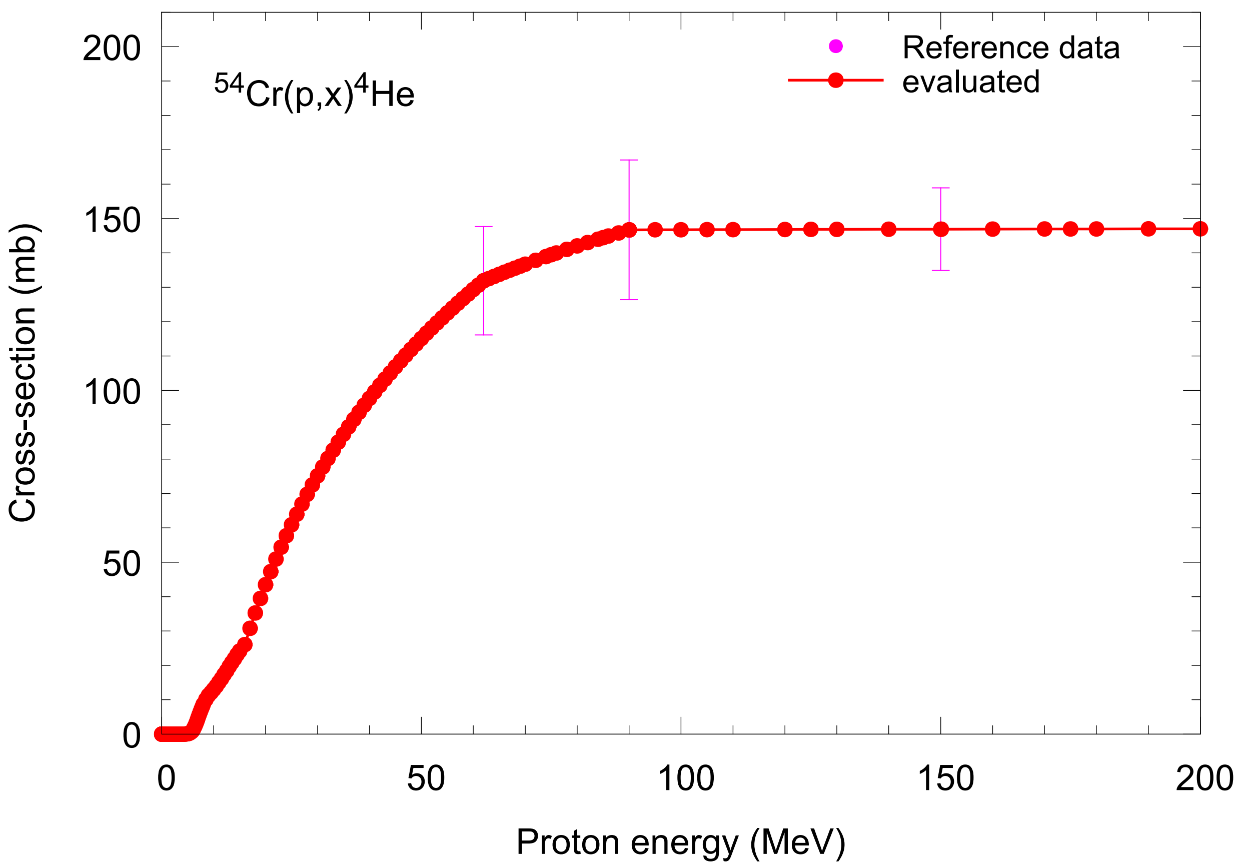
$^{54}Cr(p,x)^2H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
200



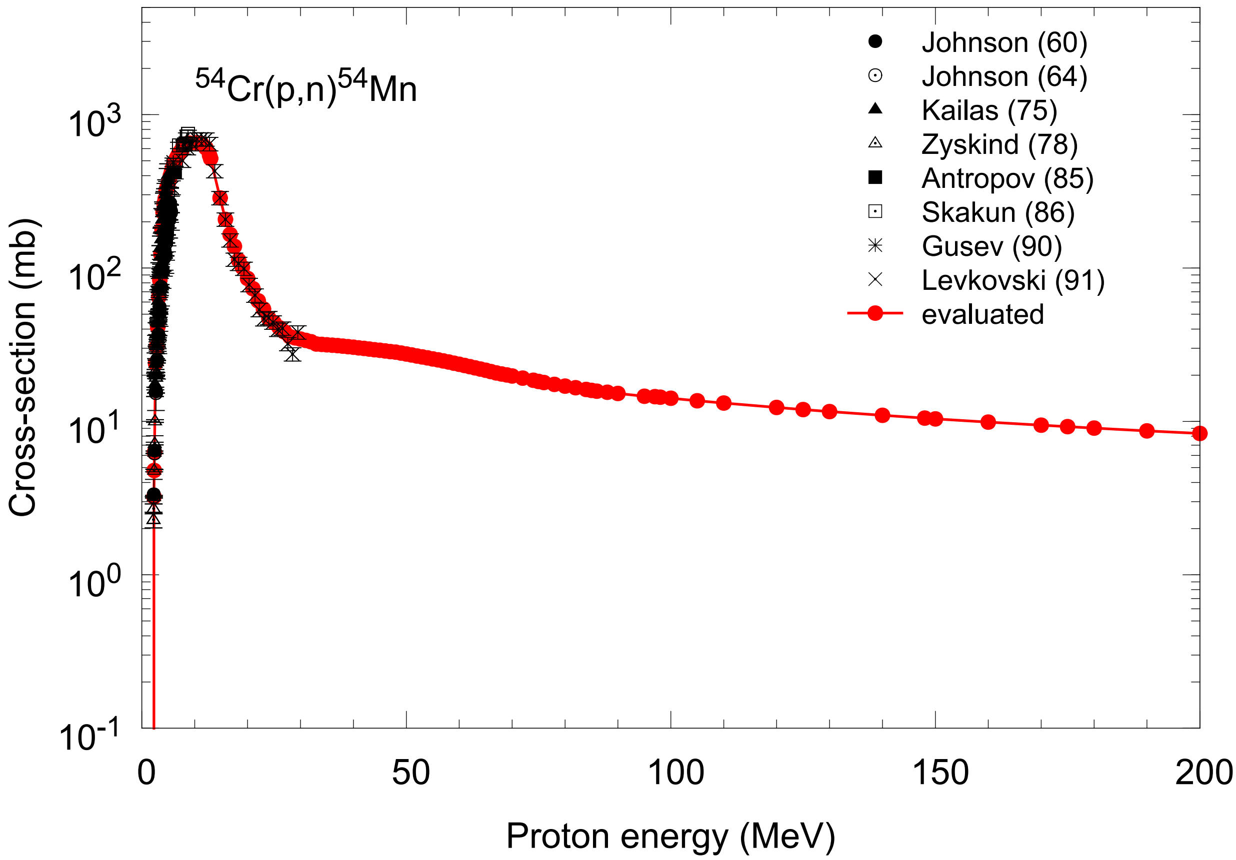
$^{54}Cr(p,x)^3H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
10
20
30
40
50



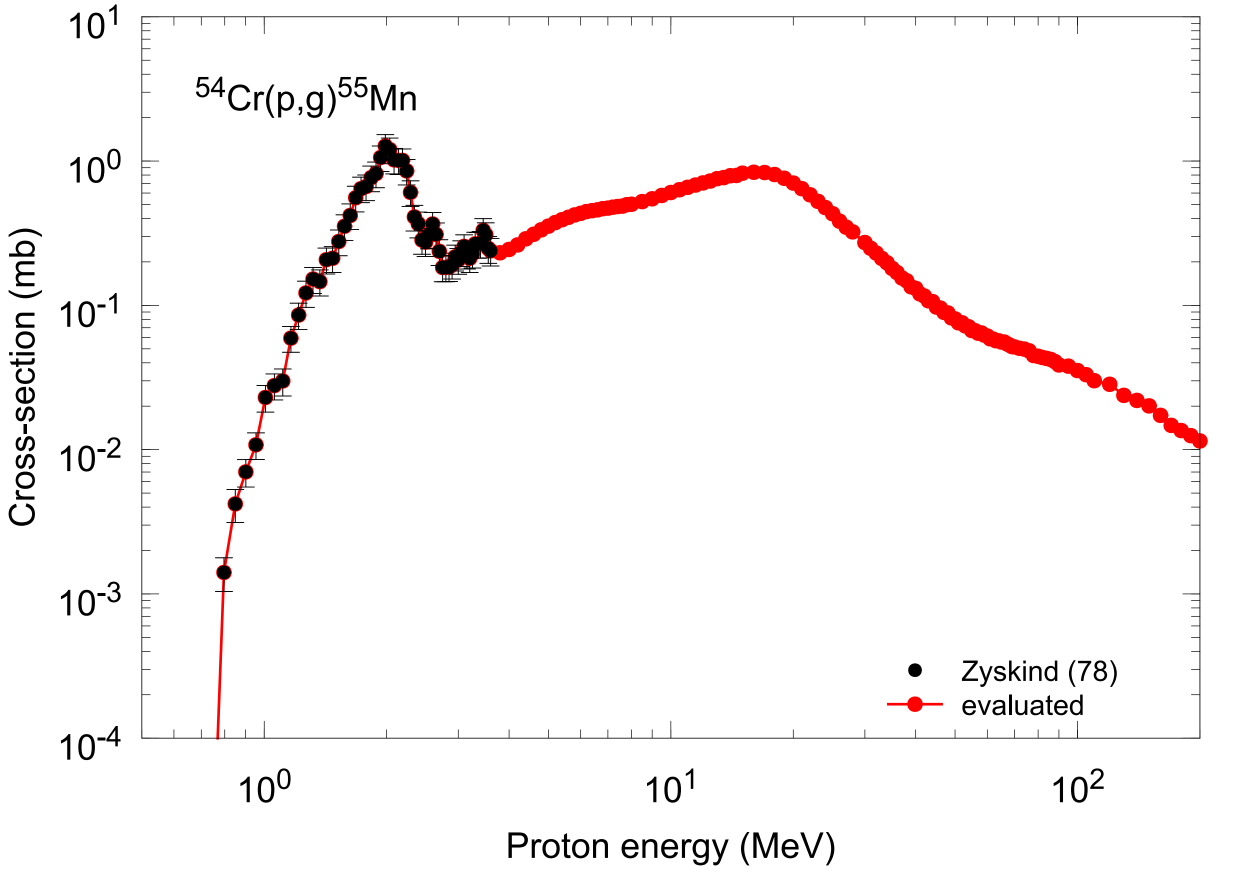
$^{54}Cr(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
0
20
40
60
80
100
120
140
160
180
200



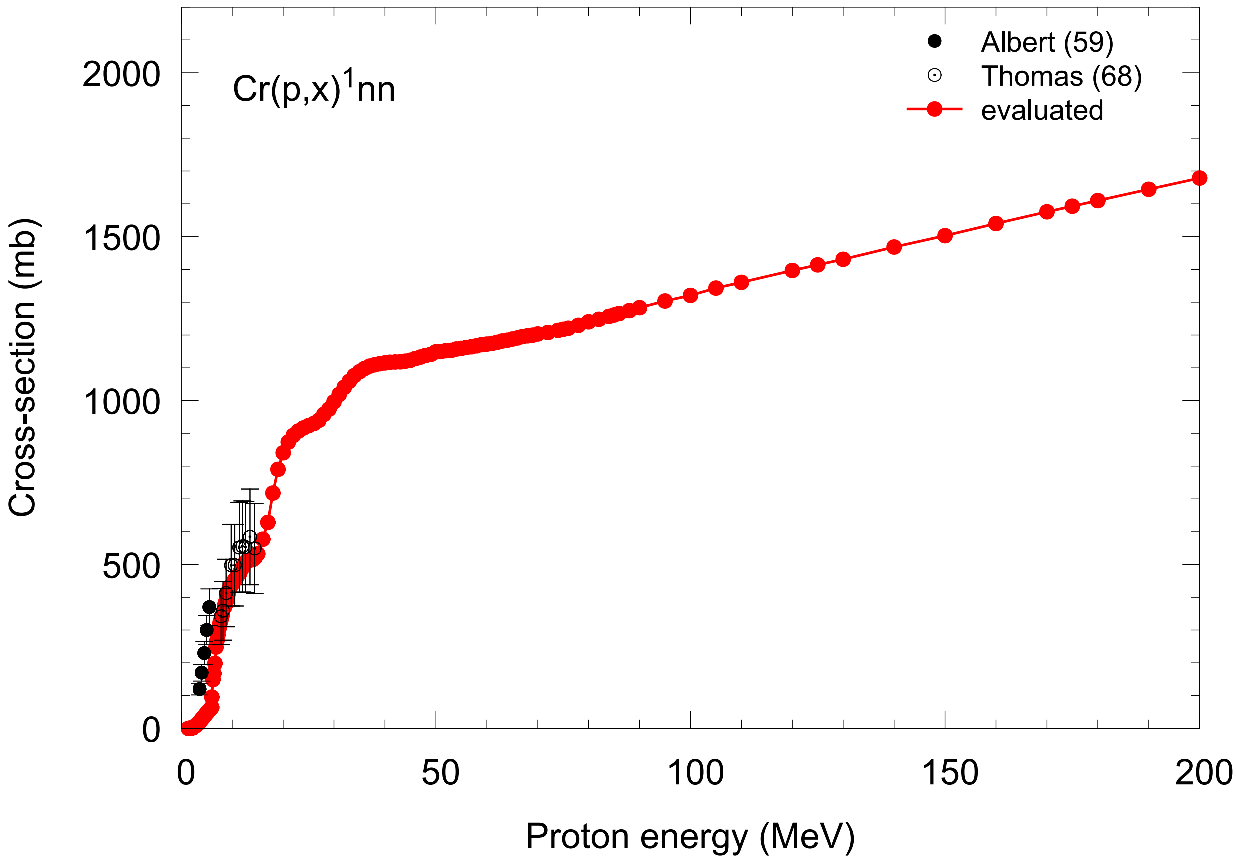
$^{54}Cr(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
0
50
100
150
200



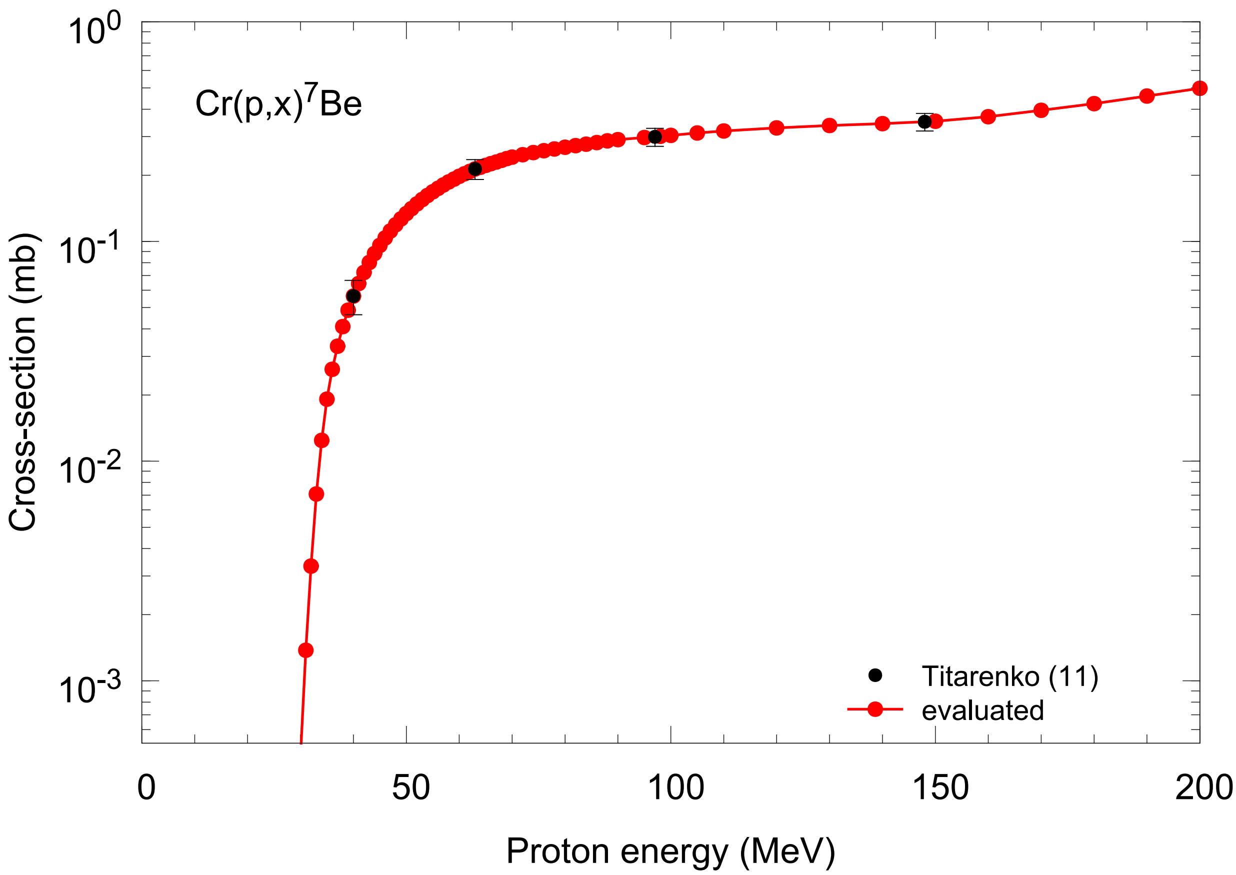
$^{54}Cr(p,n)^{54}Mn$
Johnson (60)
Johnson (64)
Kailas (75)
Zyskind (78)
Antropov (85)
Skakun (86)
Gusev (90)
Levkovski (91)
evaluated
Cross-section (mb)
Proton energy (MeV)



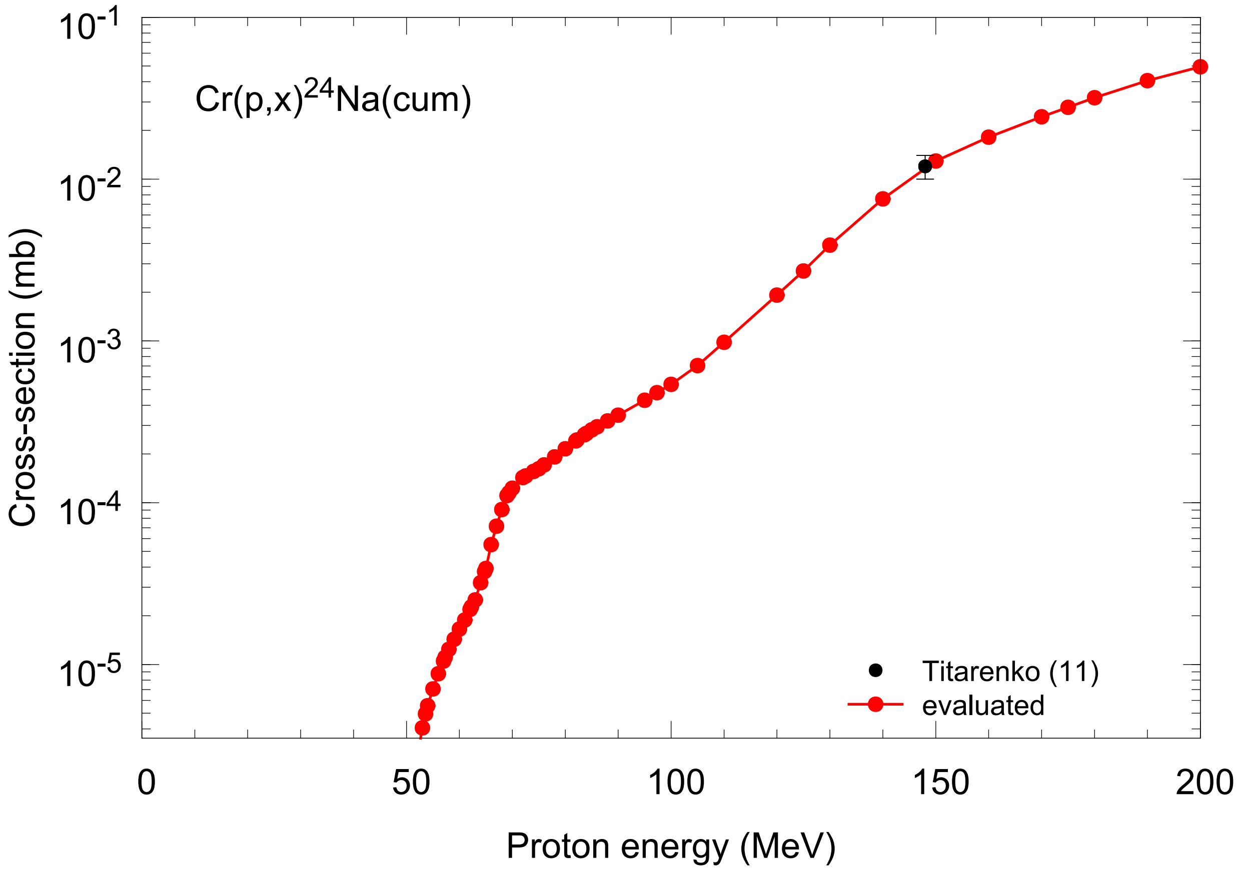
$^{54}Cr(p,g)^{55}Mn$
Zyskind (78)
evaluated
Cross-section (mb)
Proton energy (MeV)



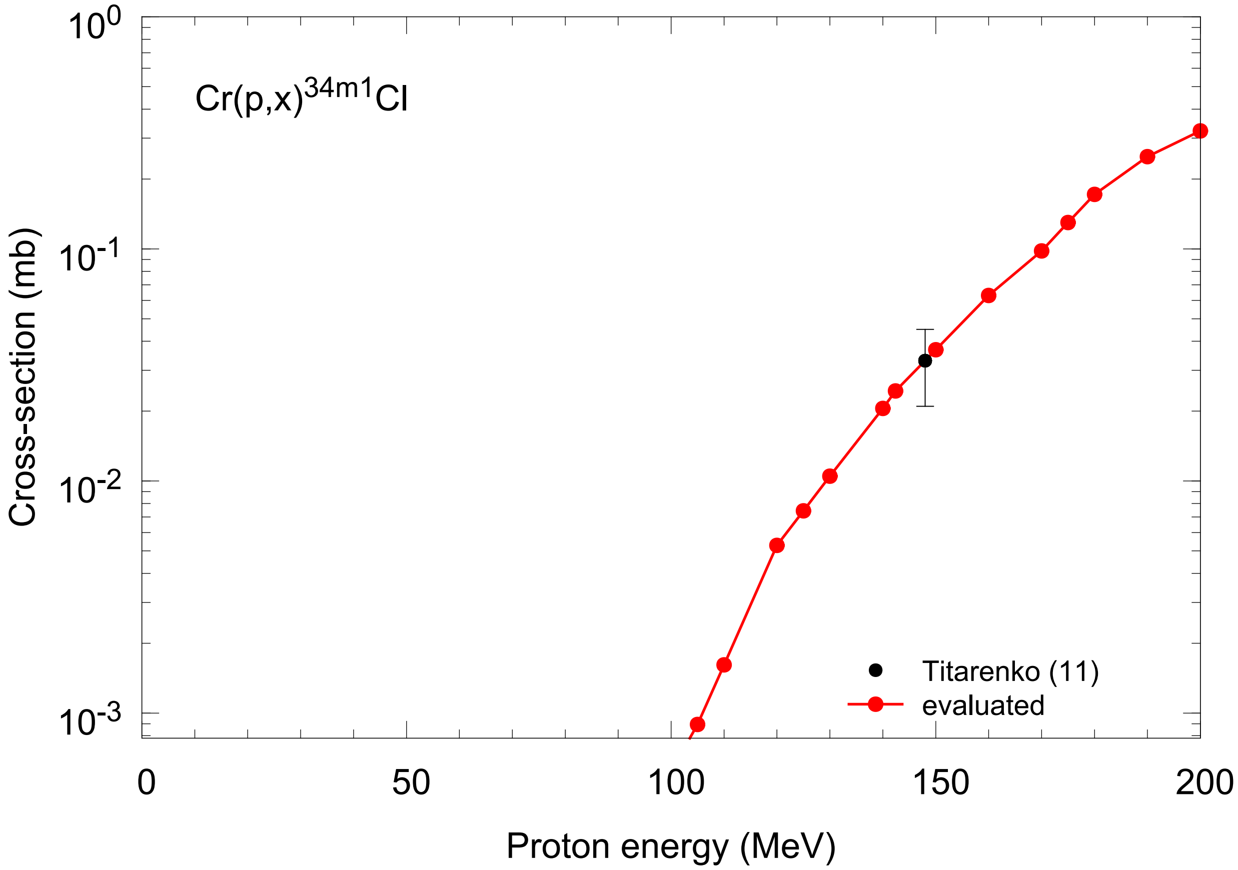
Cr(p,x)^{1}nn
Albert (59)
Thomas (68)
evaluated
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
0
50
100
150
200



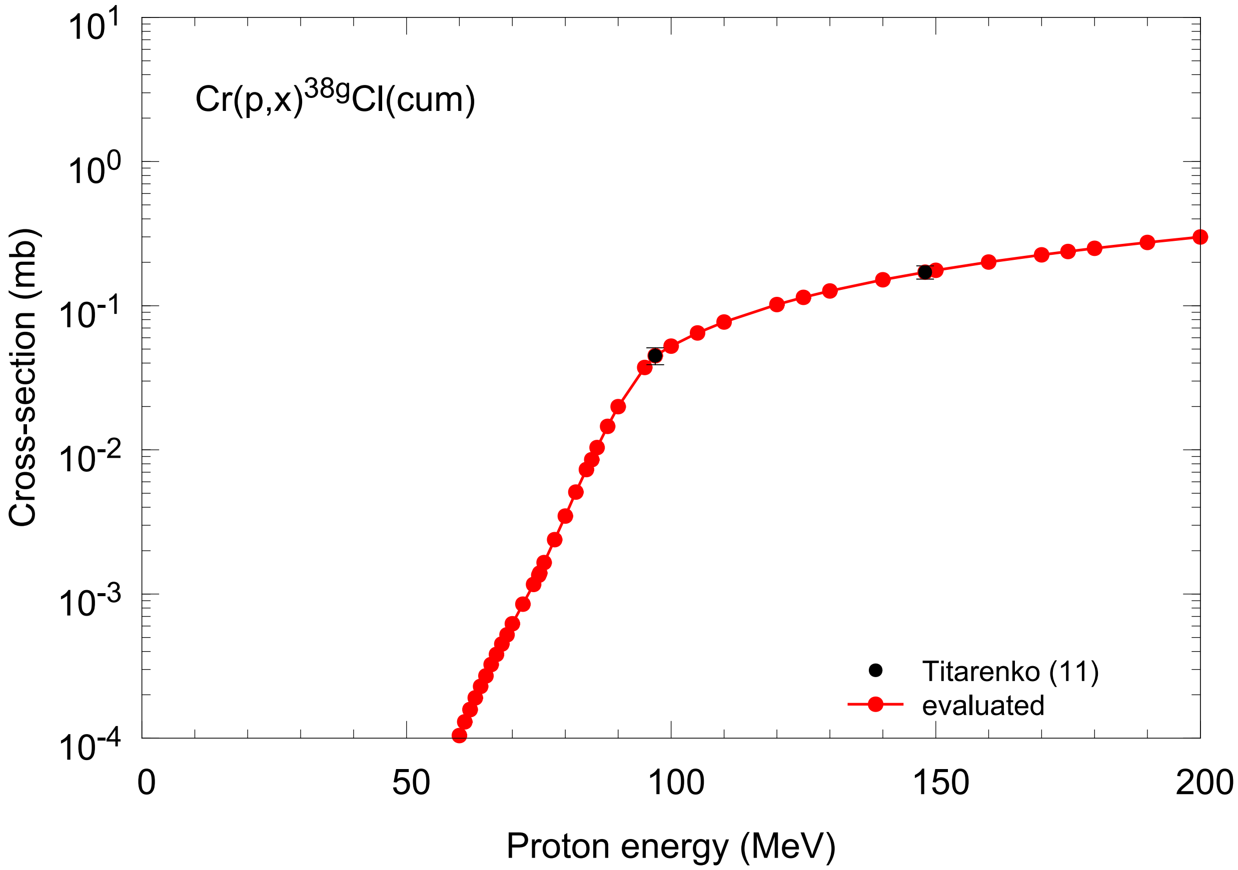
Cr(p,x)^{7}Be
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200

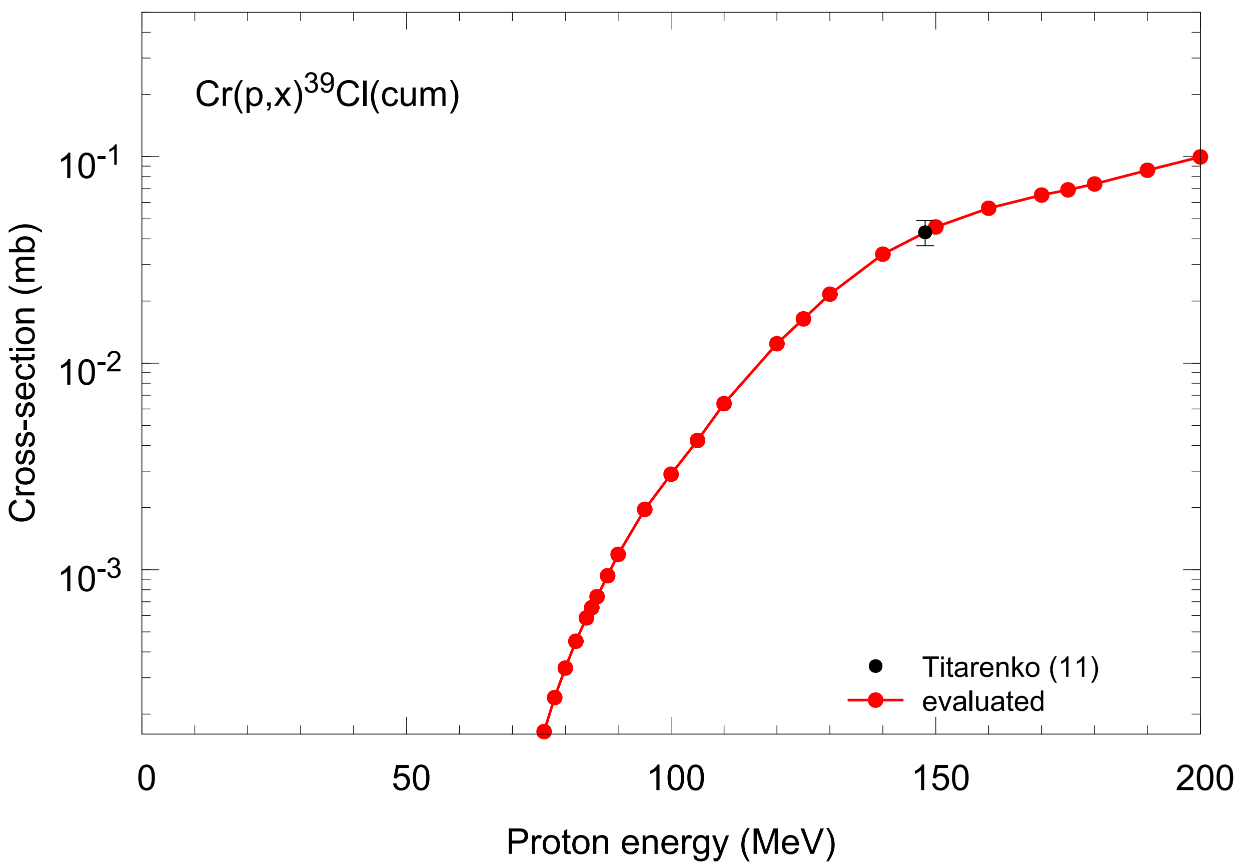


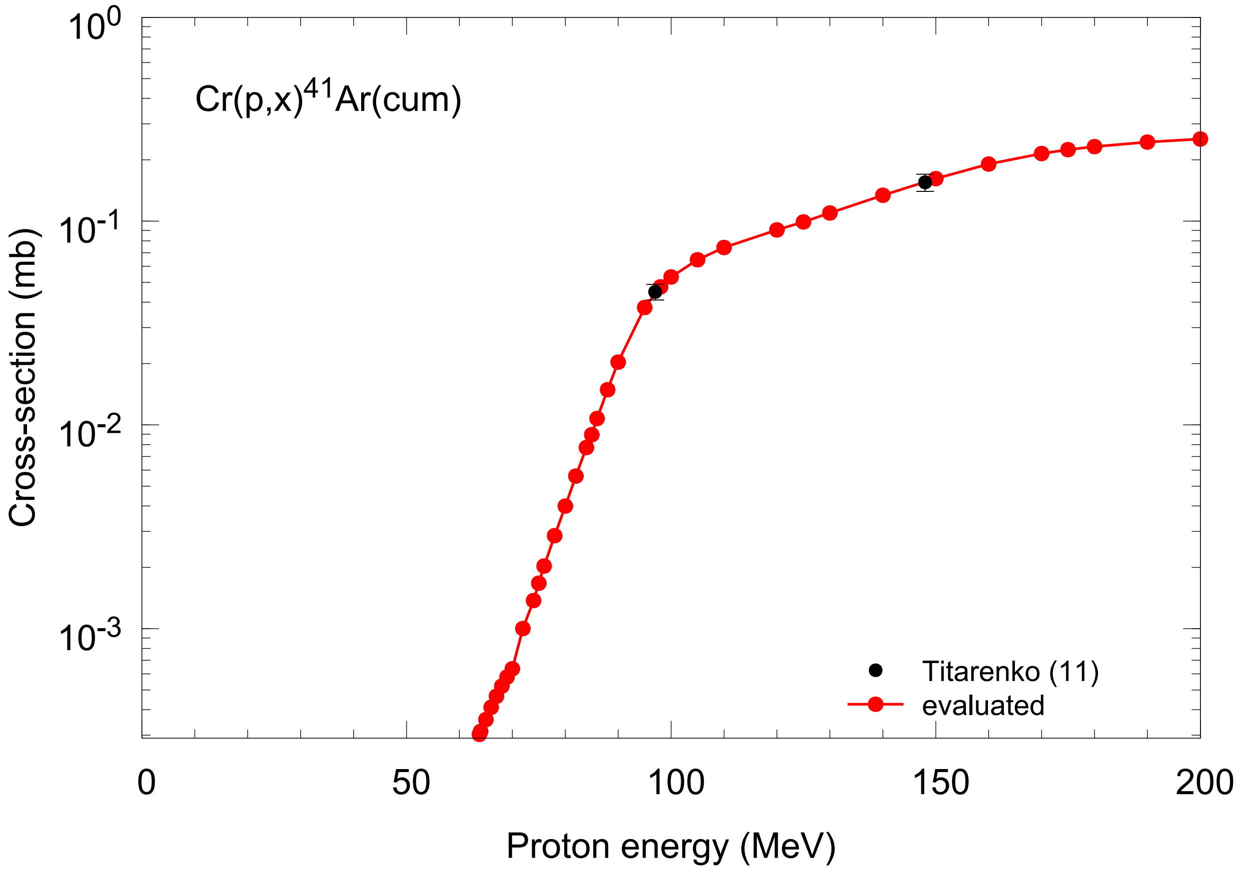
Cr(p,x)^{24}Na(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



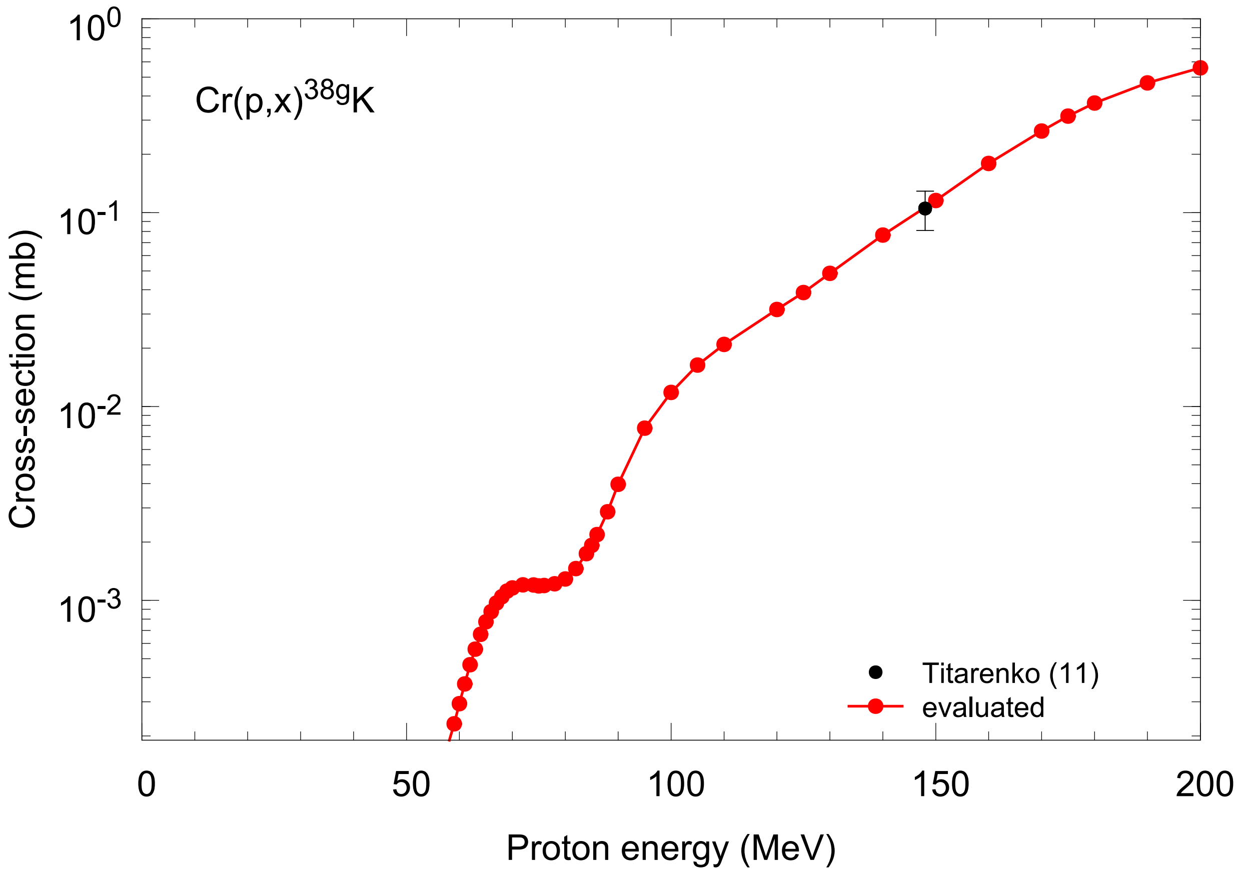
Cr(p,x)^{34m1}Cl
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated


Cr(p,x)^{38g}Cl(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

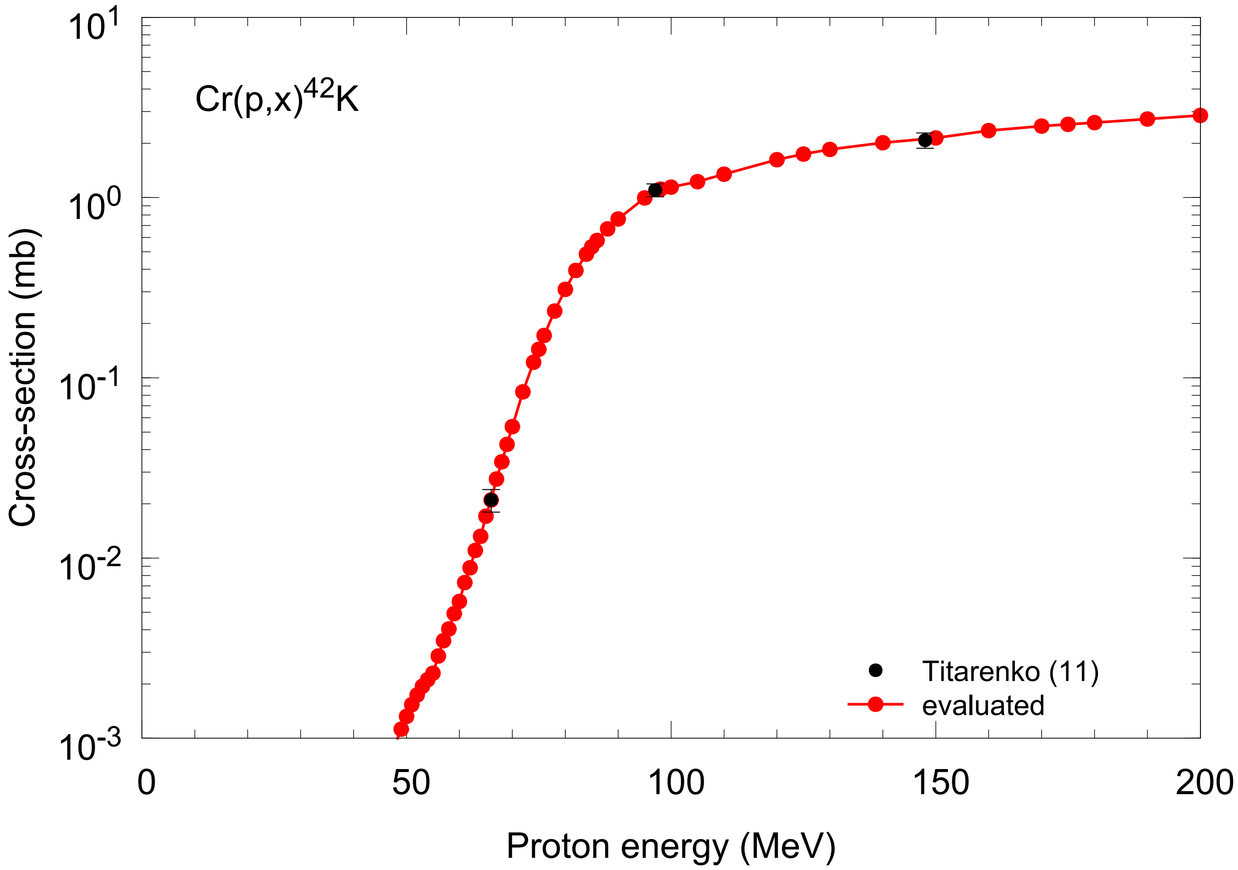

Cr(p,x)^{39}Cl(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



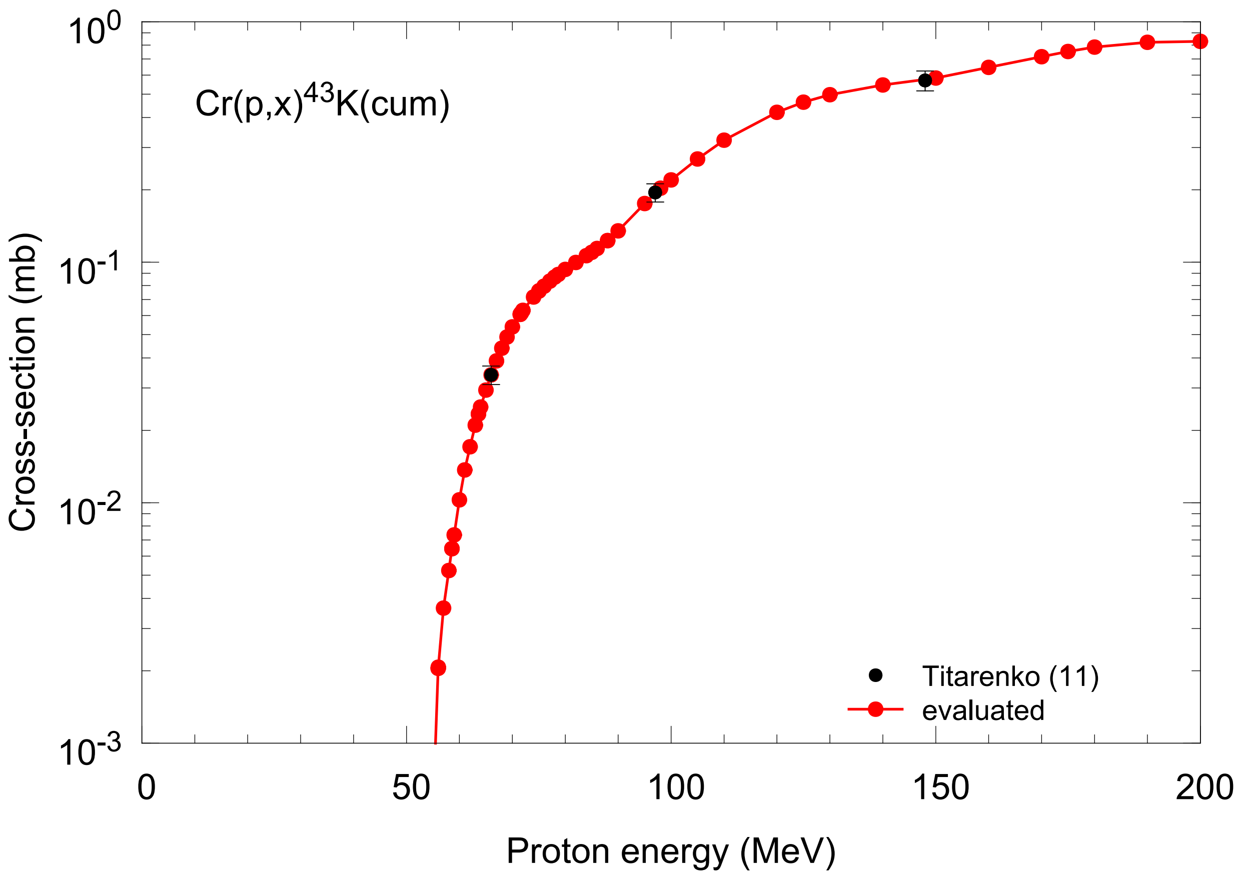
Cr(p,x)^{41}Ar(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



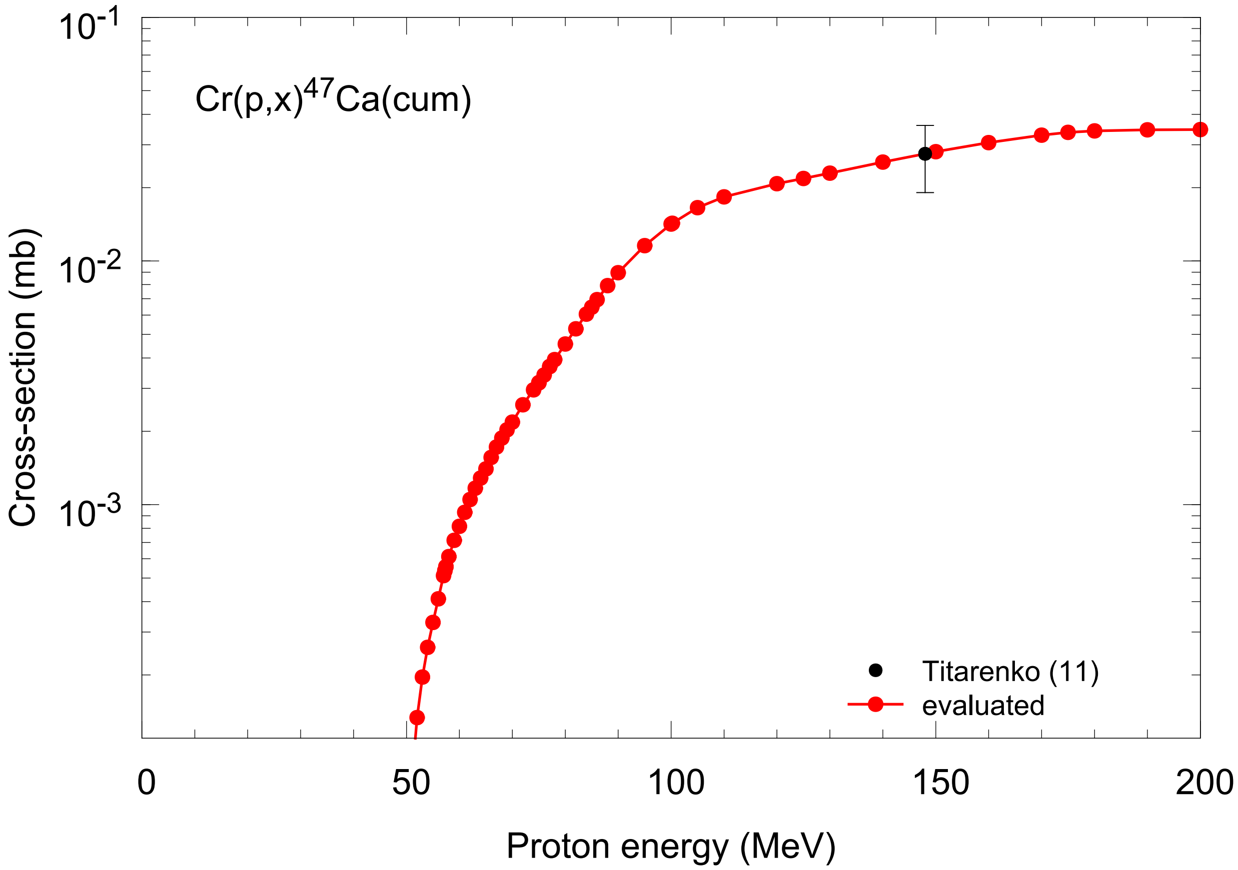
Cr(p,x)^{38g}K
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

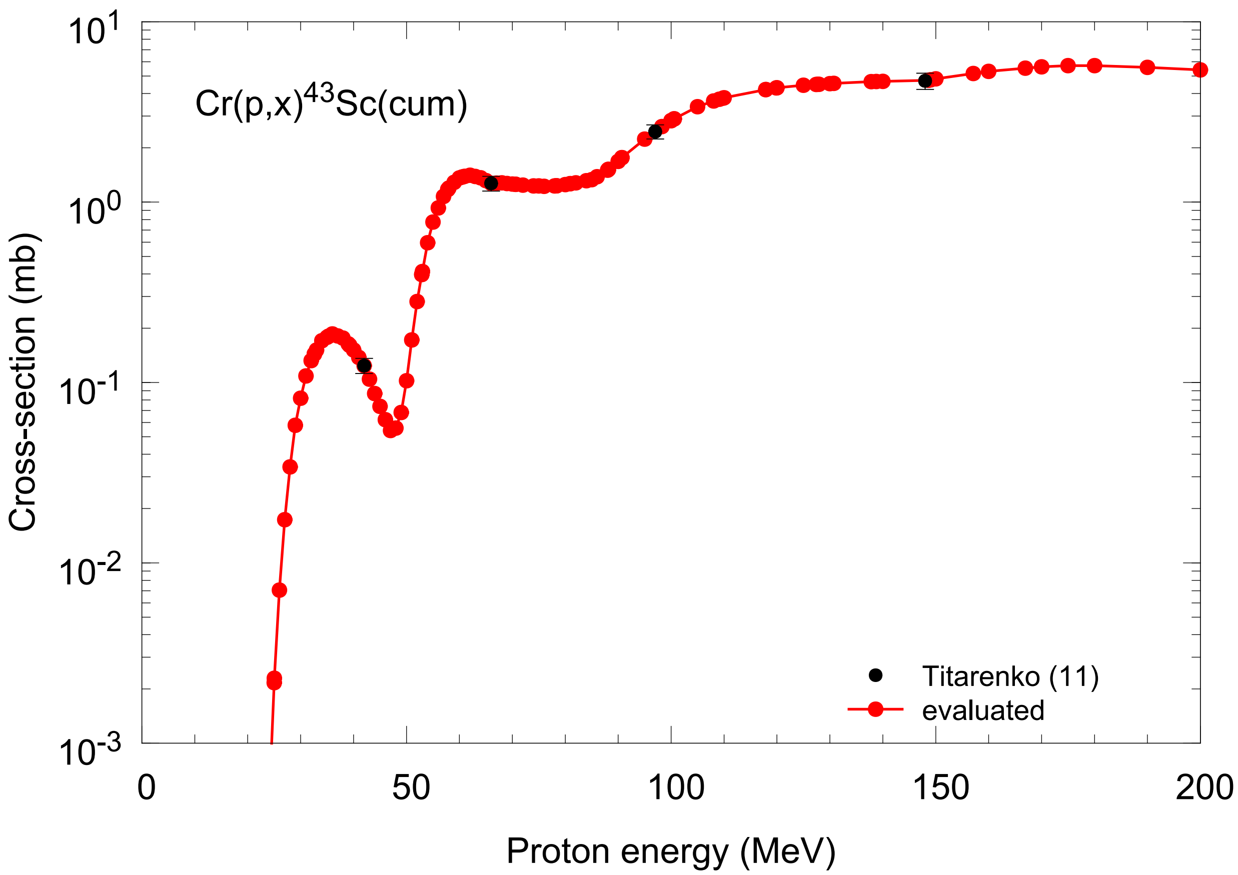


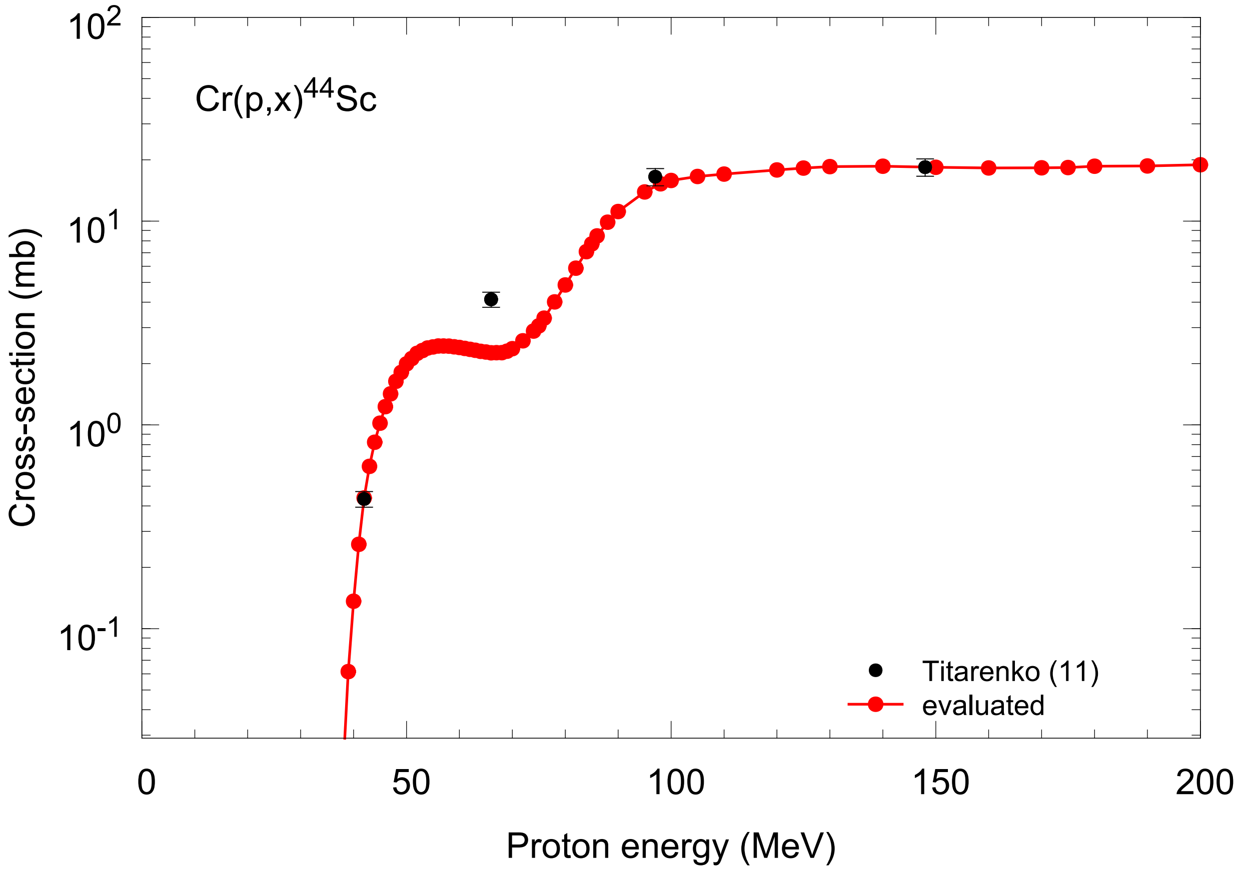
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Cross-section (mb)
$Cr(p,x)^{42}K$
Titarenko (11)
evaluated
0
50
100
150
200
Proton energy (MeV)



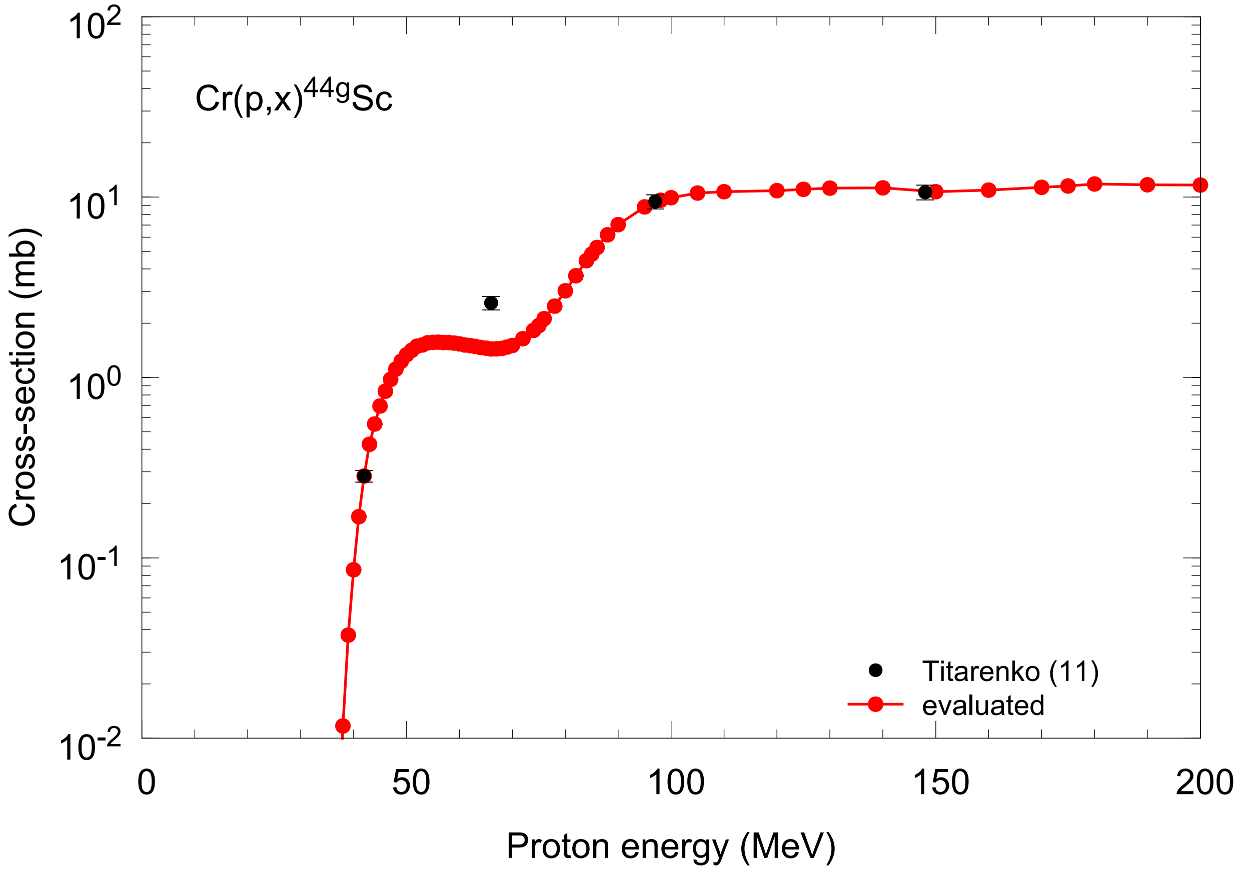
10^0
10^{-1}
10^{-2}
10^{-3}
Cross-section (mb)
$Cr(p,x)^{43}K(cum)$
Titarenko (11)
evaluated
0
50
100
150
200
Proton energy (MeV)


Cr(p,x)^{47}Ca(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200

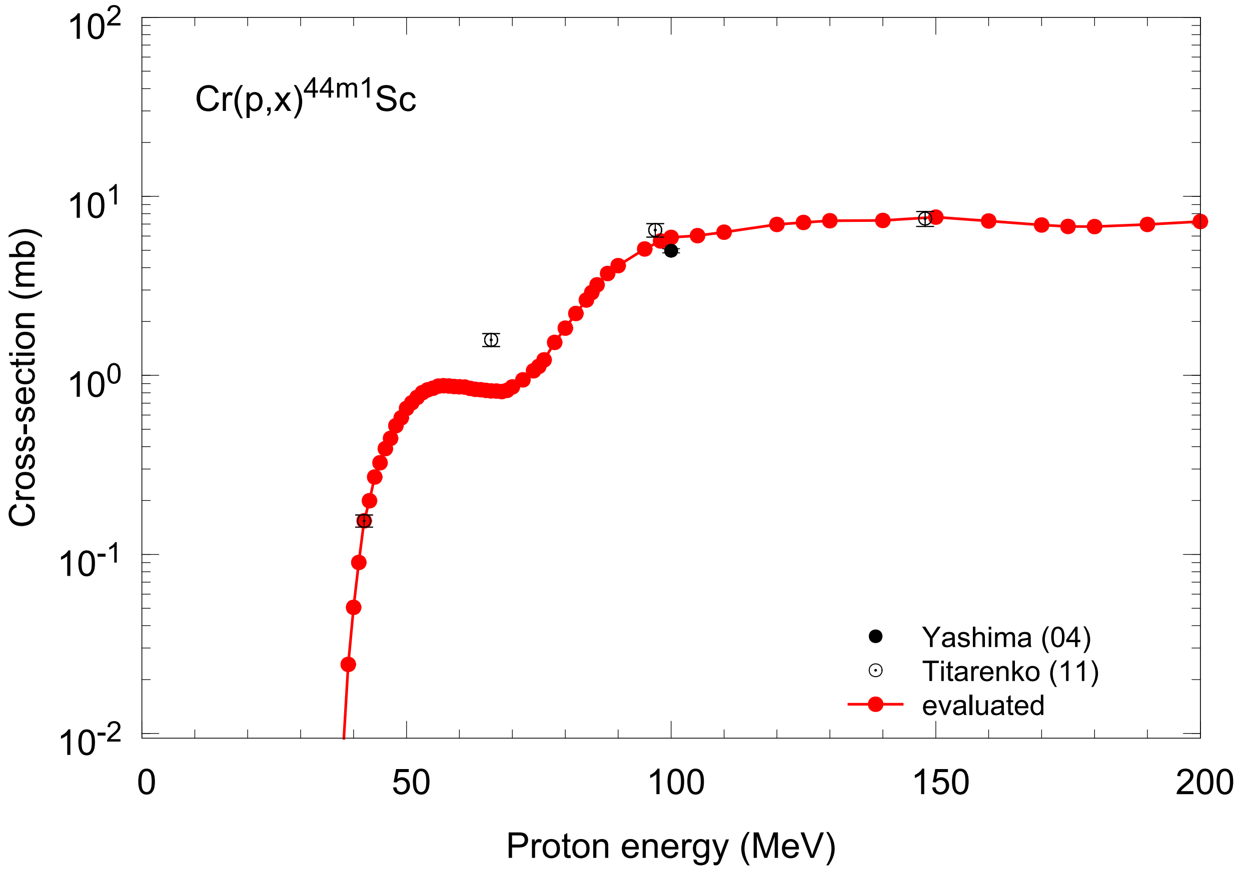

Cr(p,x)^{43}Sc(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200



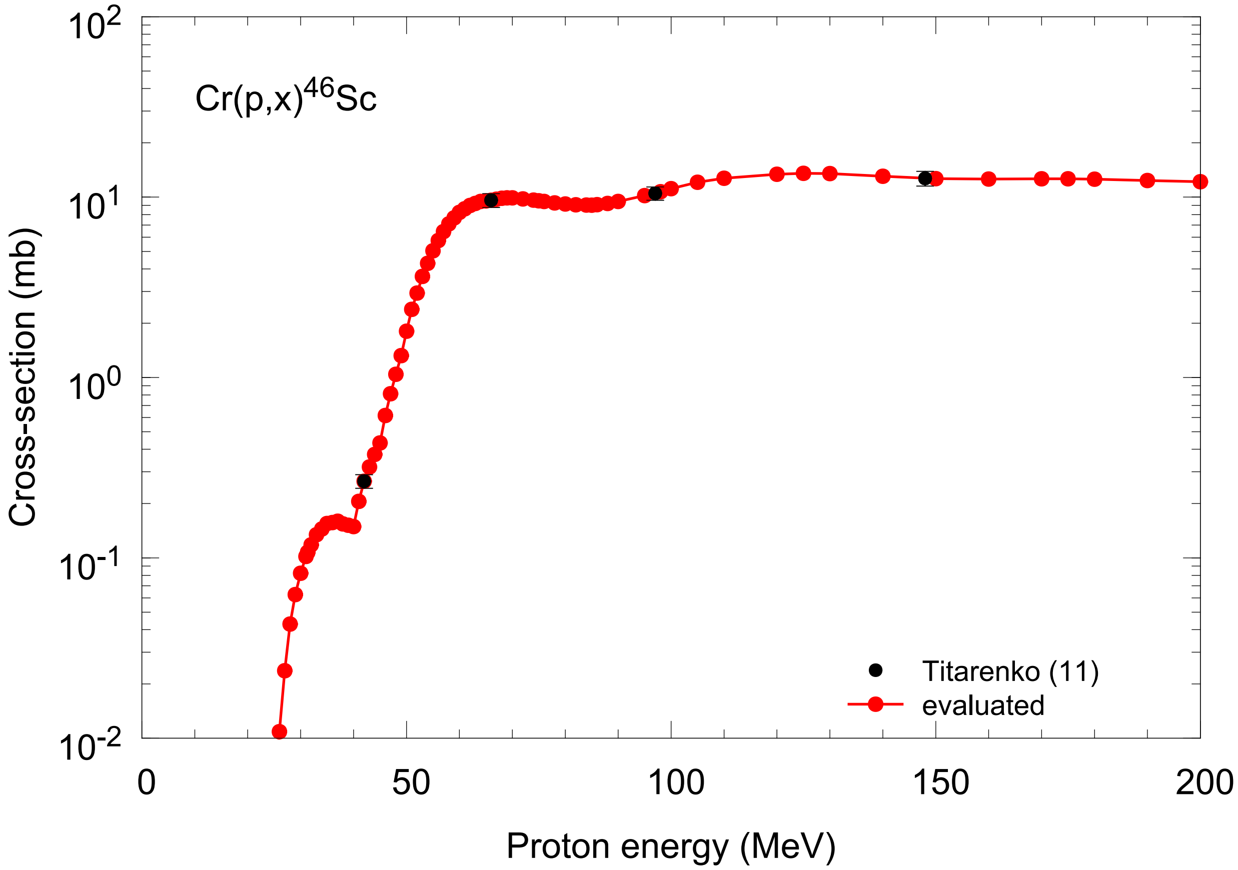
Cr(p,x)44Sc
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



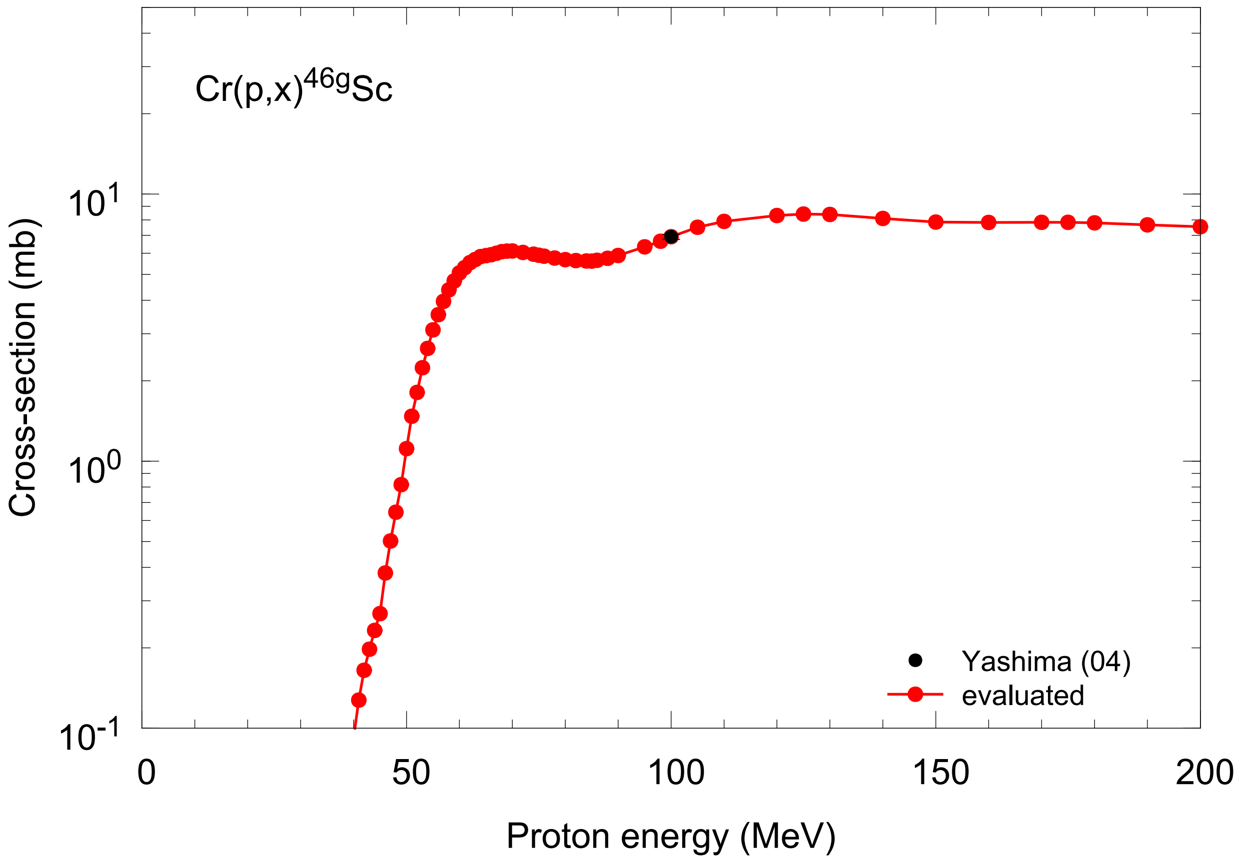
Cr(p,x)44gSc
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



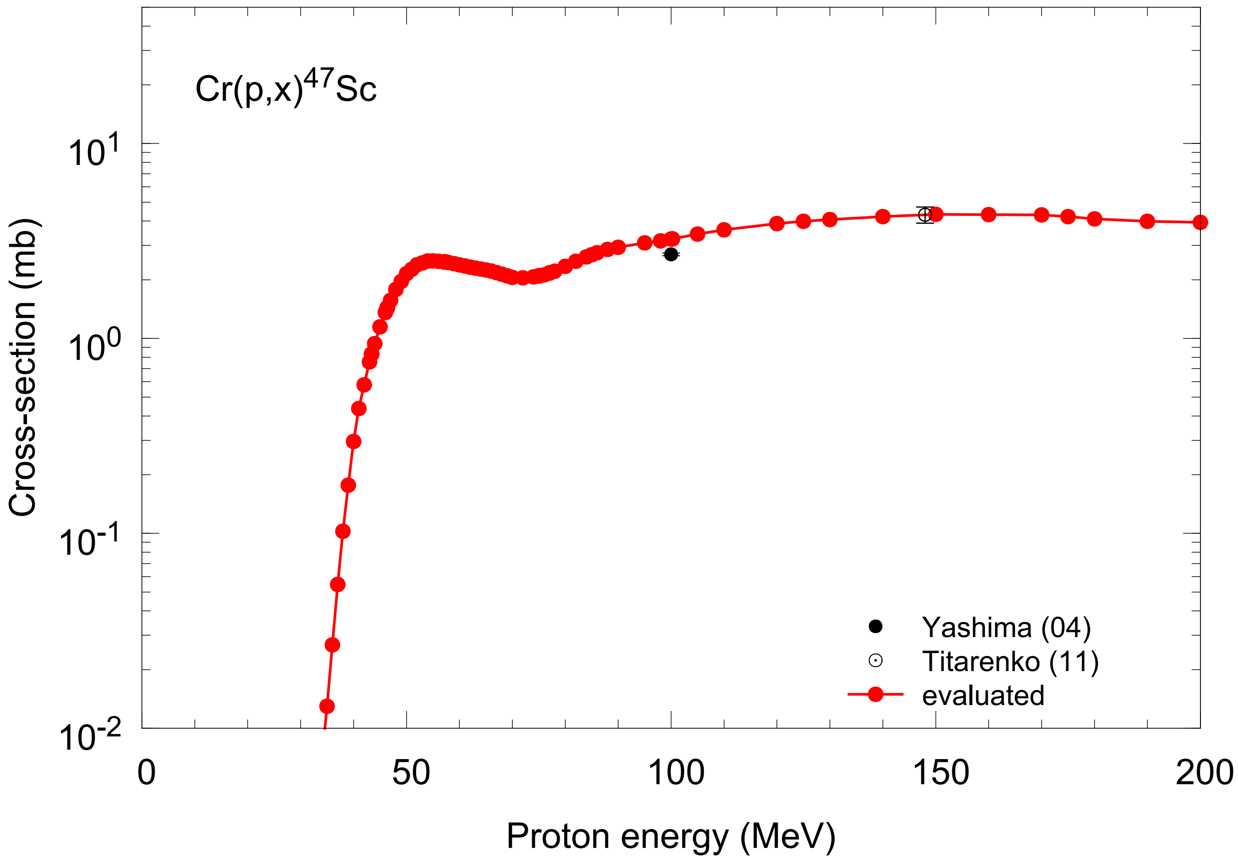
Cr(p,x)^{44m1}Sc
Cross-section (mb)
Proton energy (MeV)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Yashima (04)
Titarenko (11)
evaluated



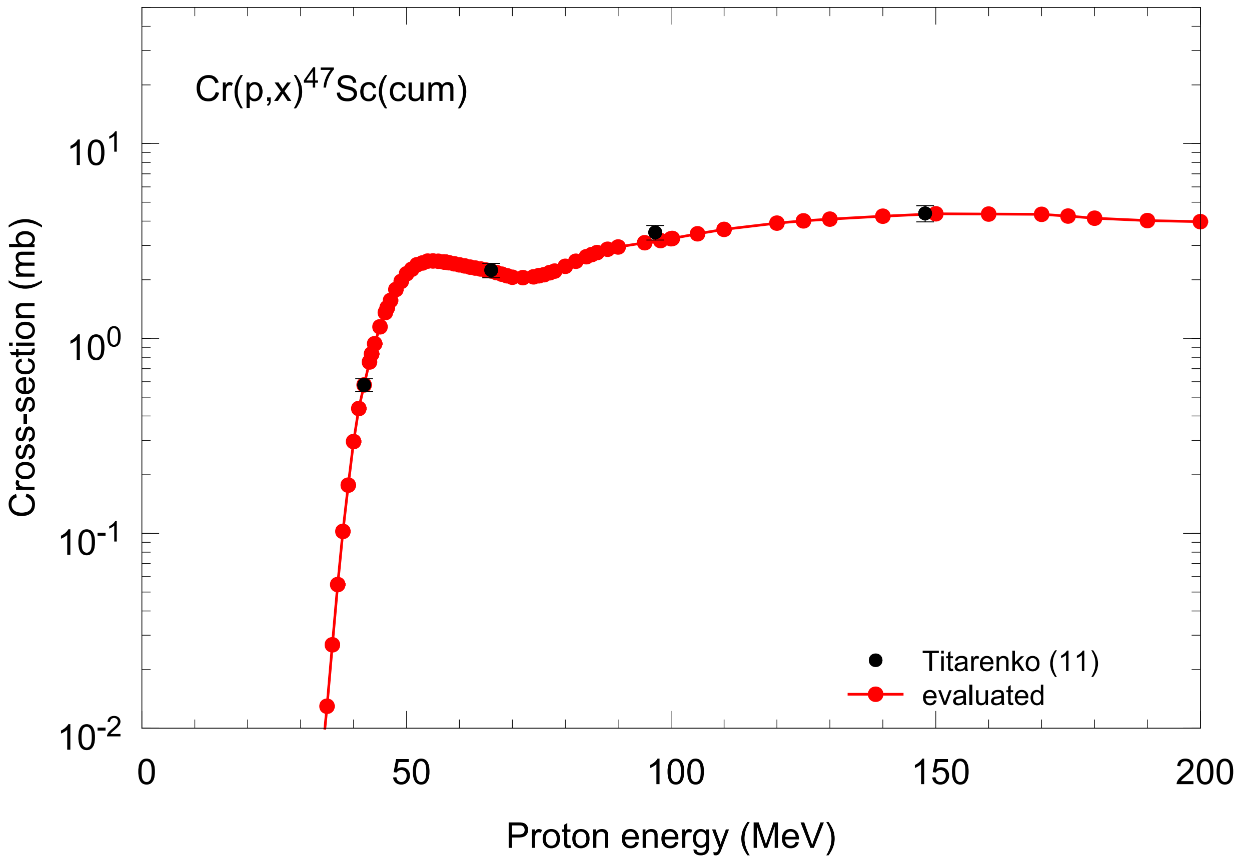
Cr(p,x)^{46}Sc
Cross-section (mb)
Proton energy (MeV)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Titarenko (11)
evaluated



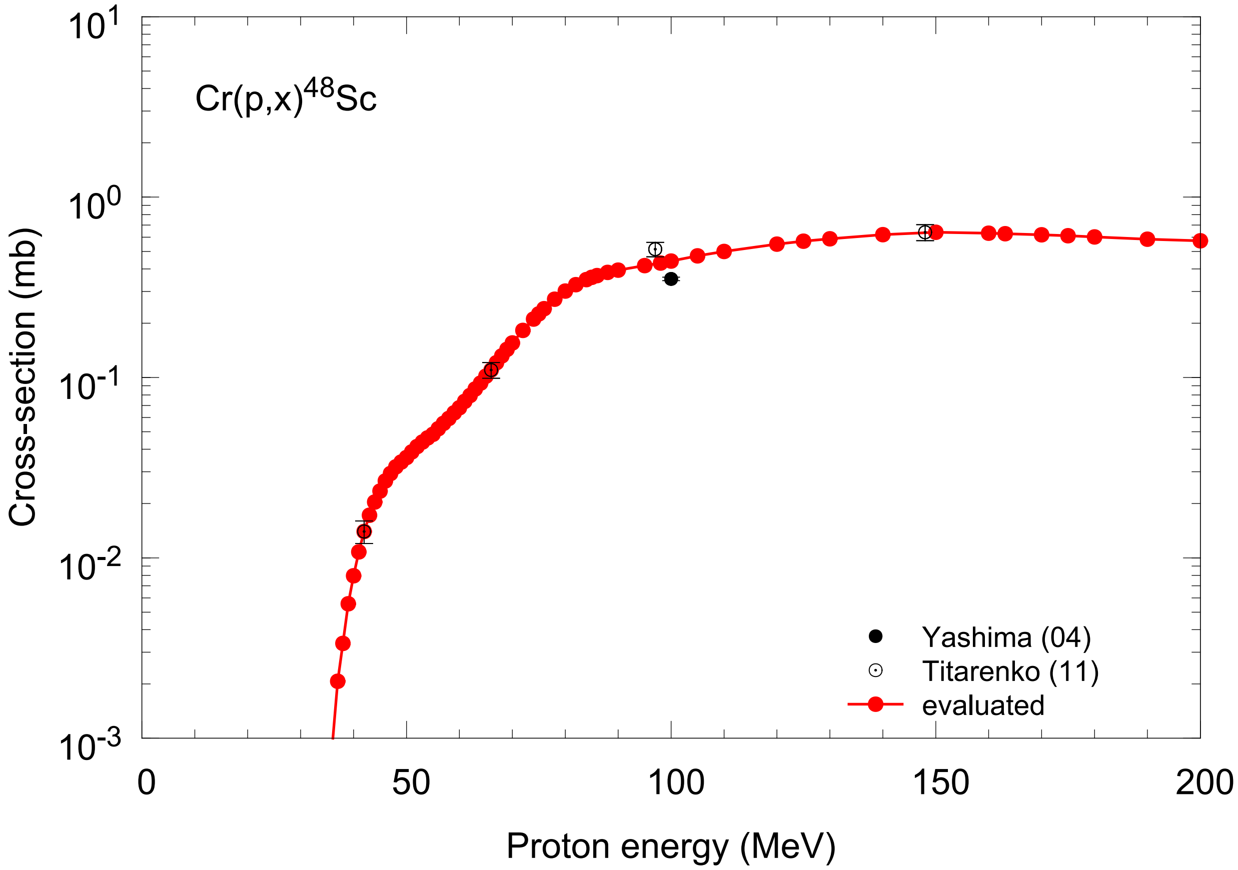
Cr(p,x)^{46g}Sc
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Yashima (04)
evaluated



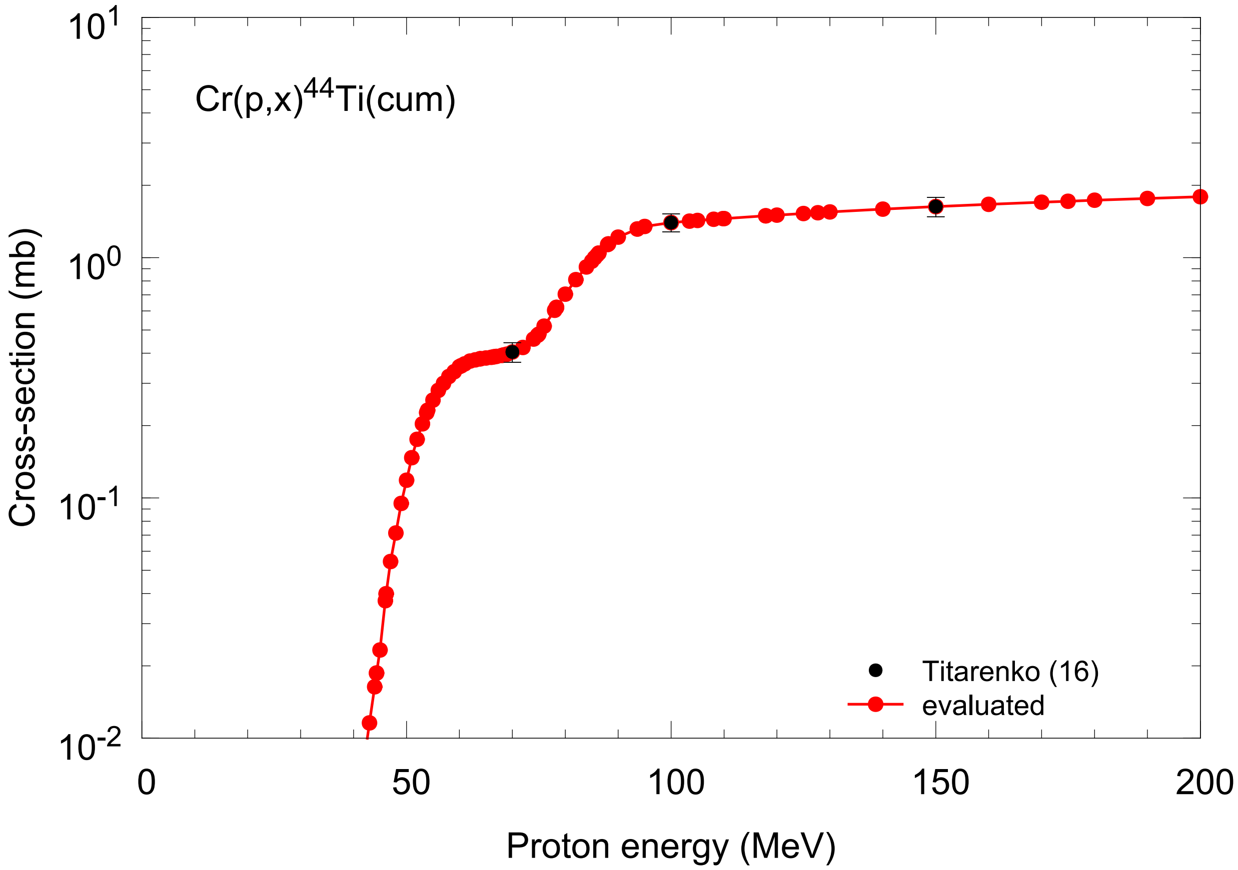
Cr(p,x)^{47}Sc
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Yashima (04)
Titarenko (11)
evaluated



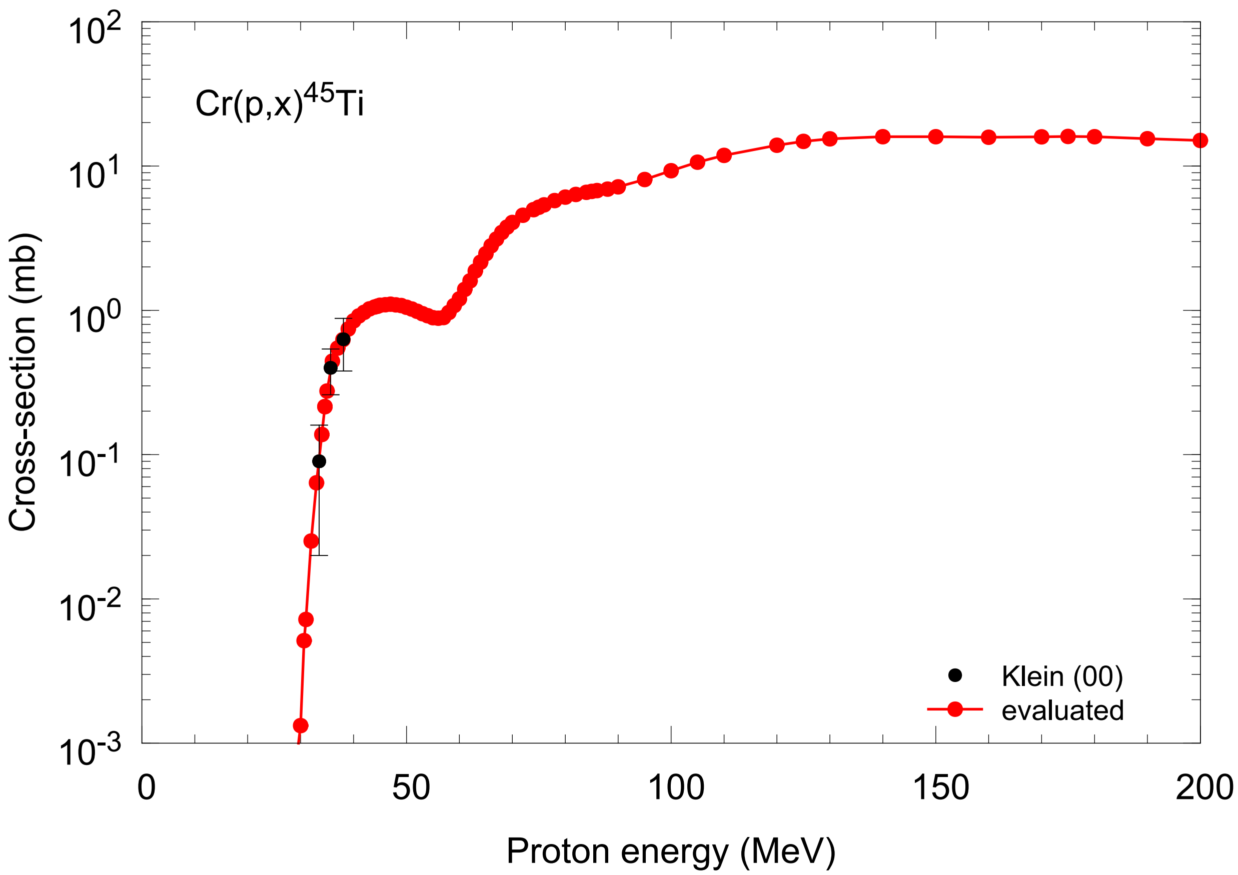
Cr(p,x)^{47}Sc(cum)
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Titarenko (11)
evaluated



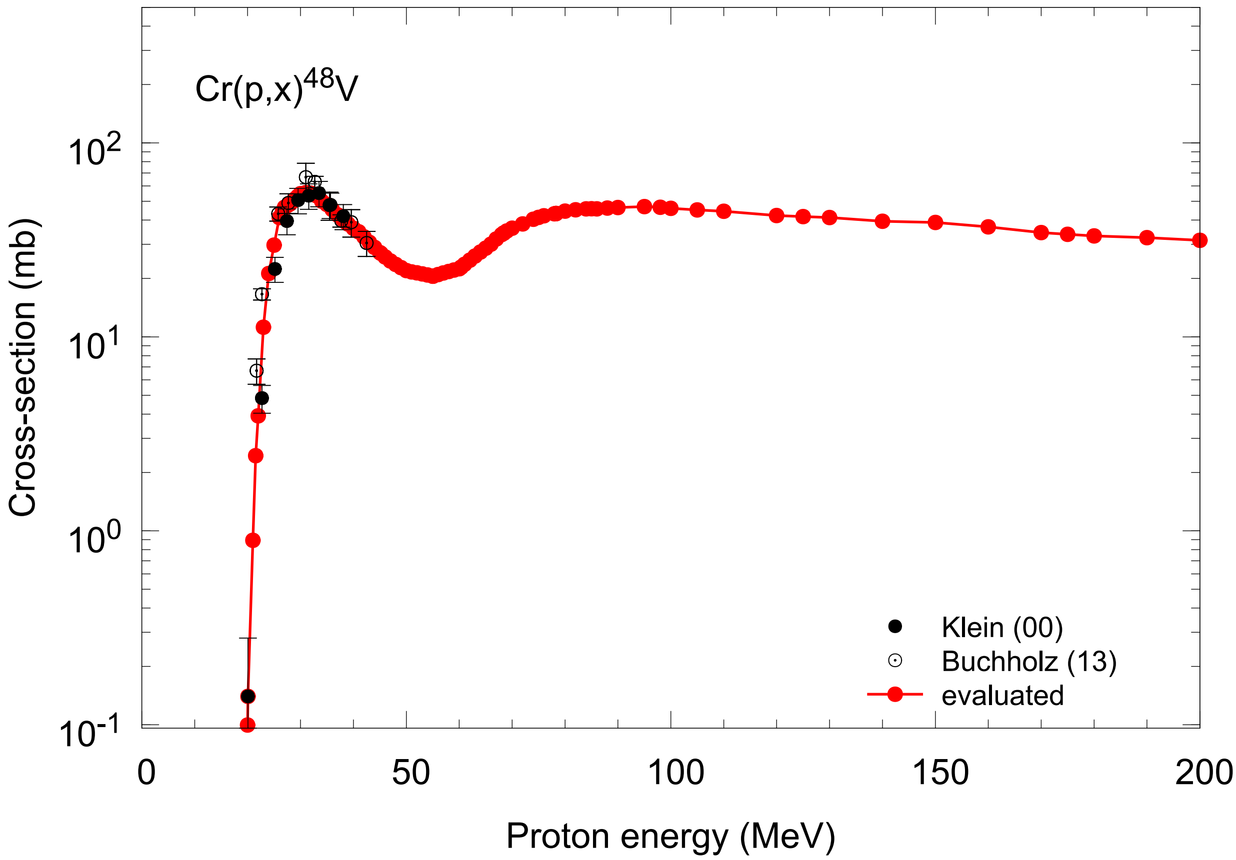
Cr(p,x)^{48}Sc
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Yashima (04)
Titarenko (11)
evaluated



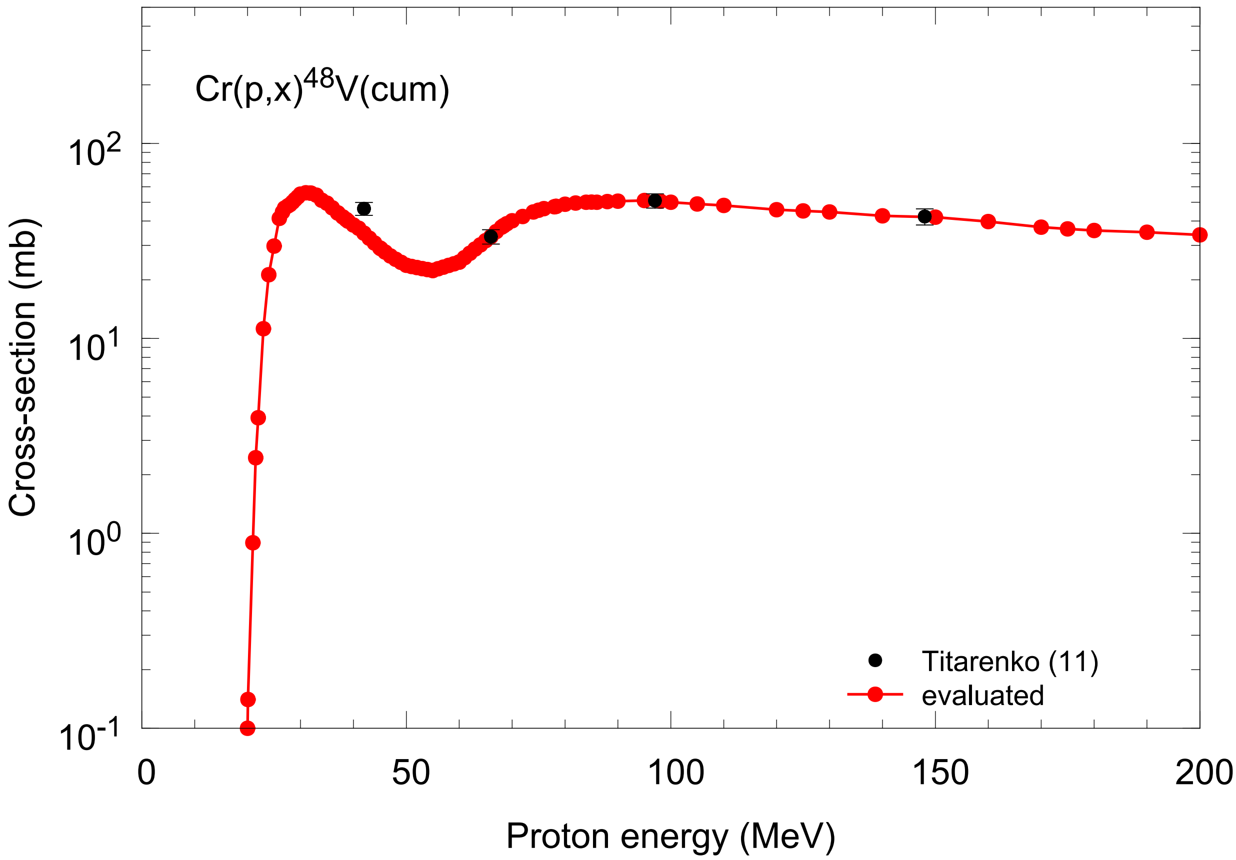
Cr(p,x)44Ti(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (16)
evaluated



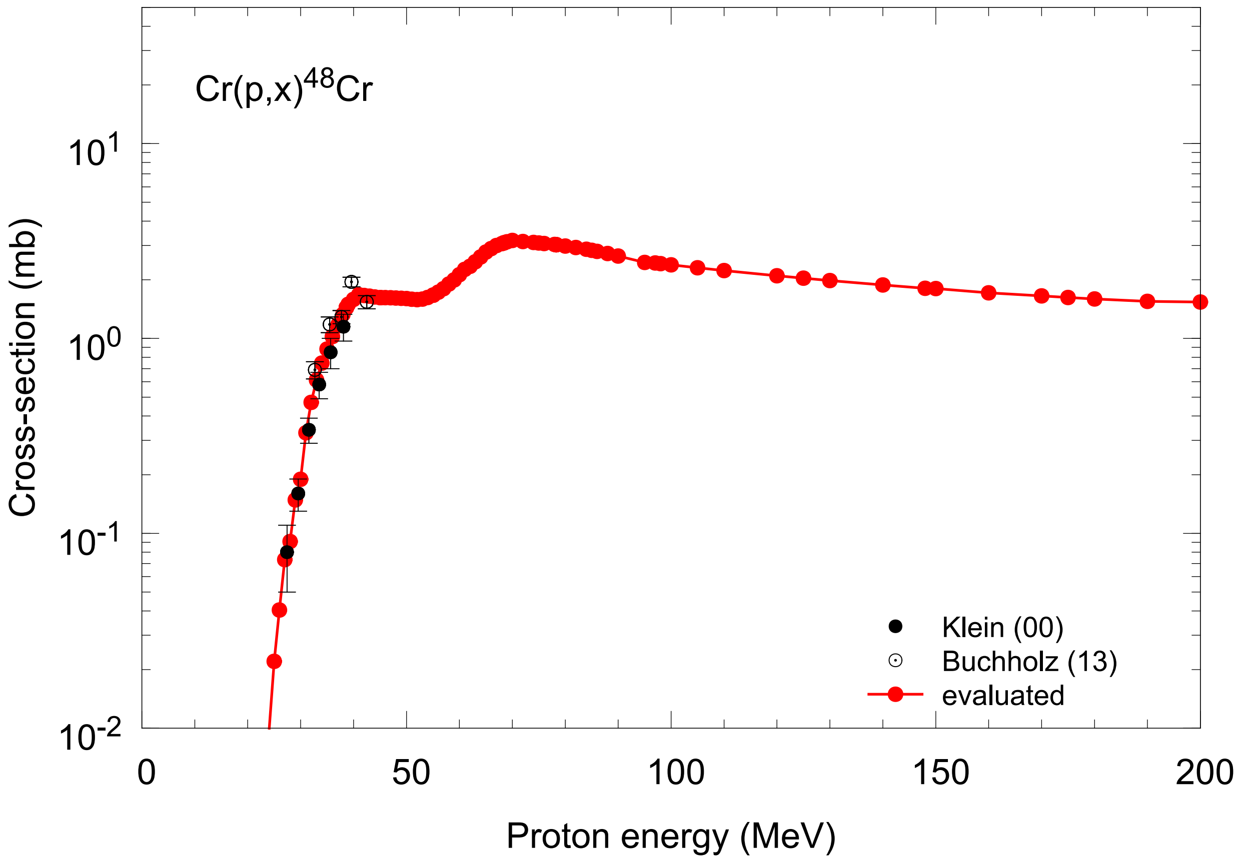
Cr(p,x)45Ti
Cross-section (mb)
Proton energy (MeV)
Klein (00)
evaluated

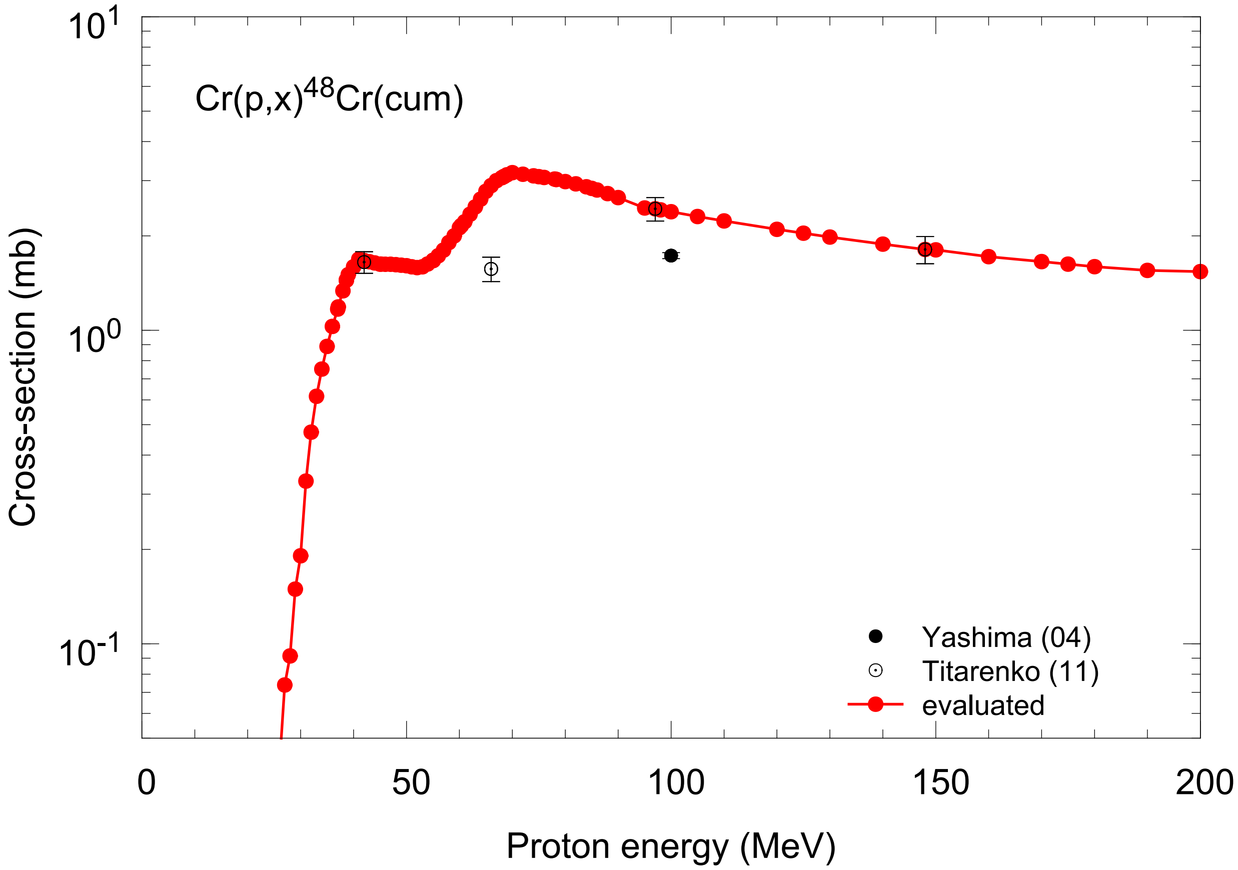


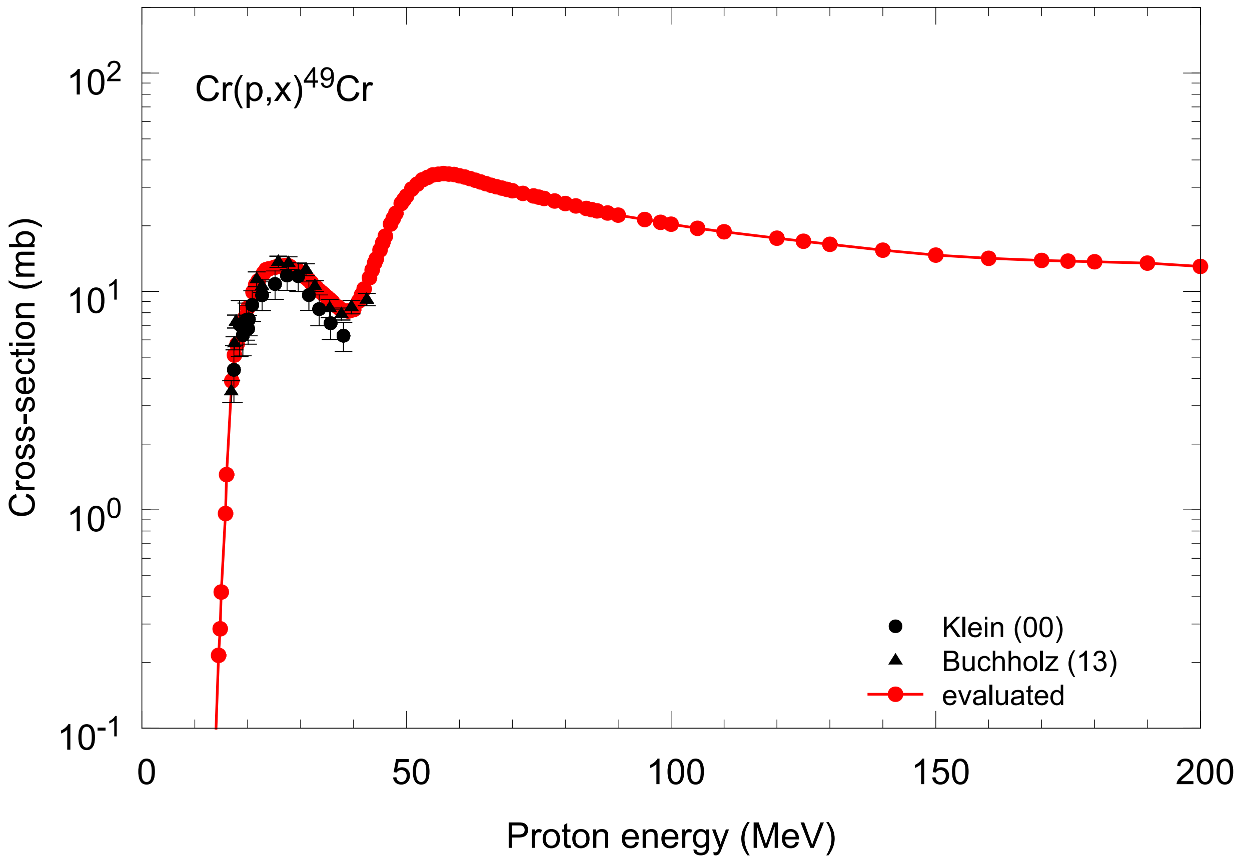
Cr(p,x)^{48}V
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Klein (00)
Buchholz (13)
evaluated



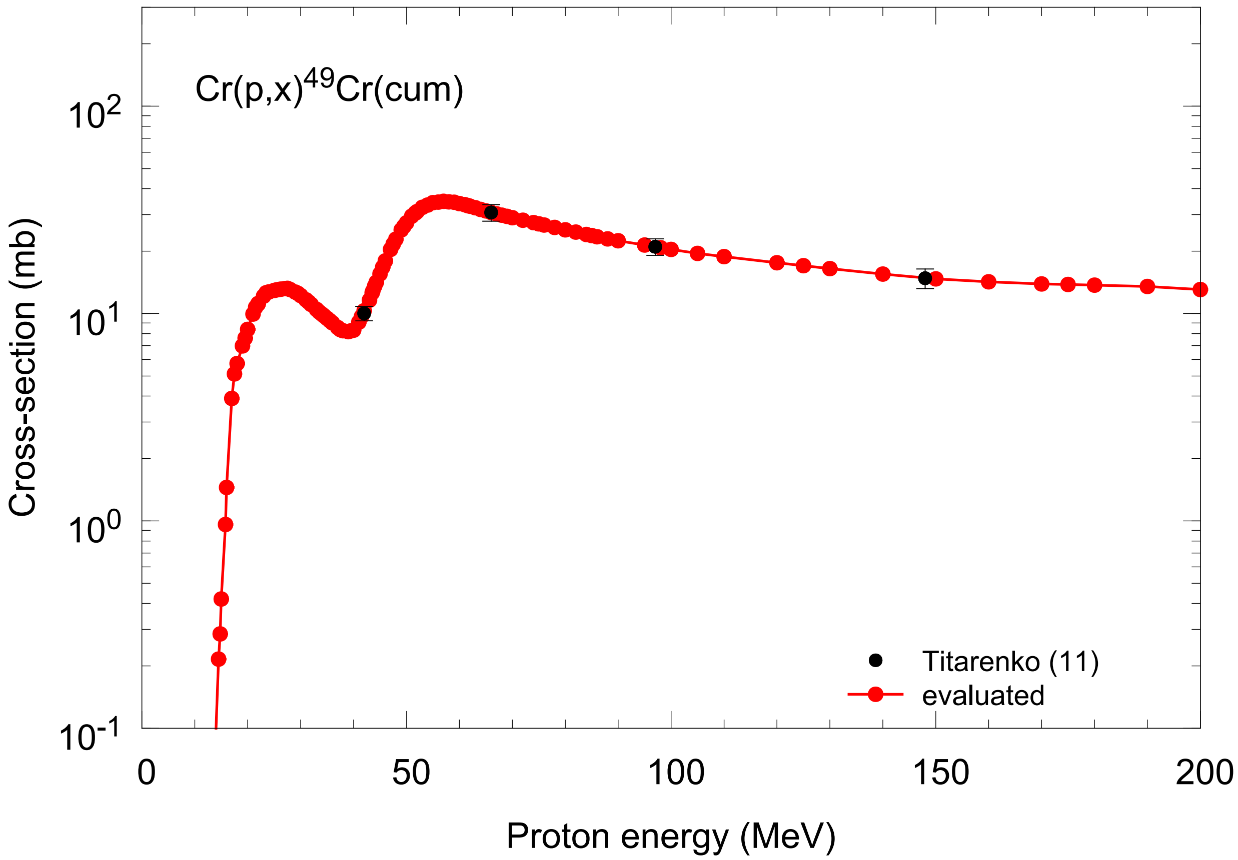
Cr(p,x)^{48}V(cum)
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Titarenko (11)
evaluated


Cr(p,x)^{48}Cr
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Klein (00)
Buchholz (13)
evaluated

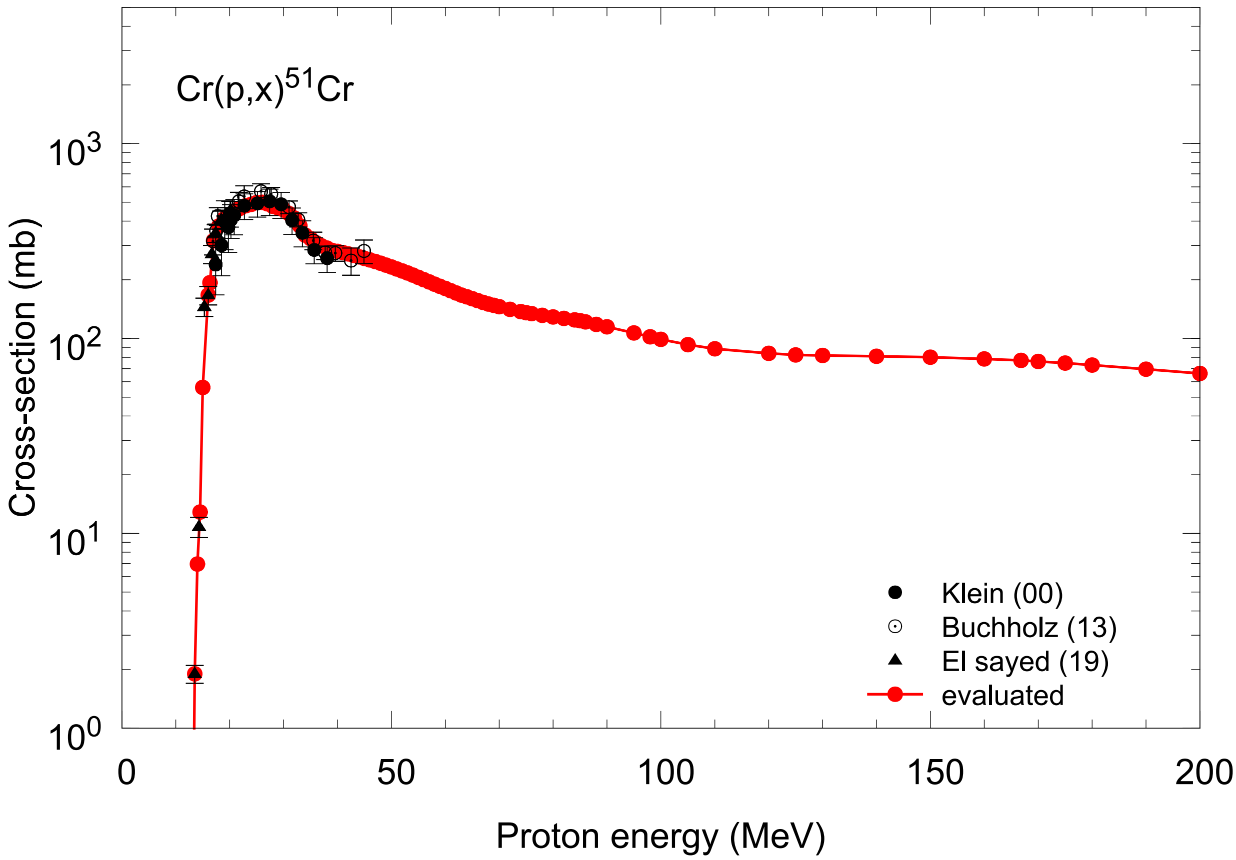

Cr(p,x)^{48}Cr(cum)
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Yashima (04)
Titarenko (11)
evaluated



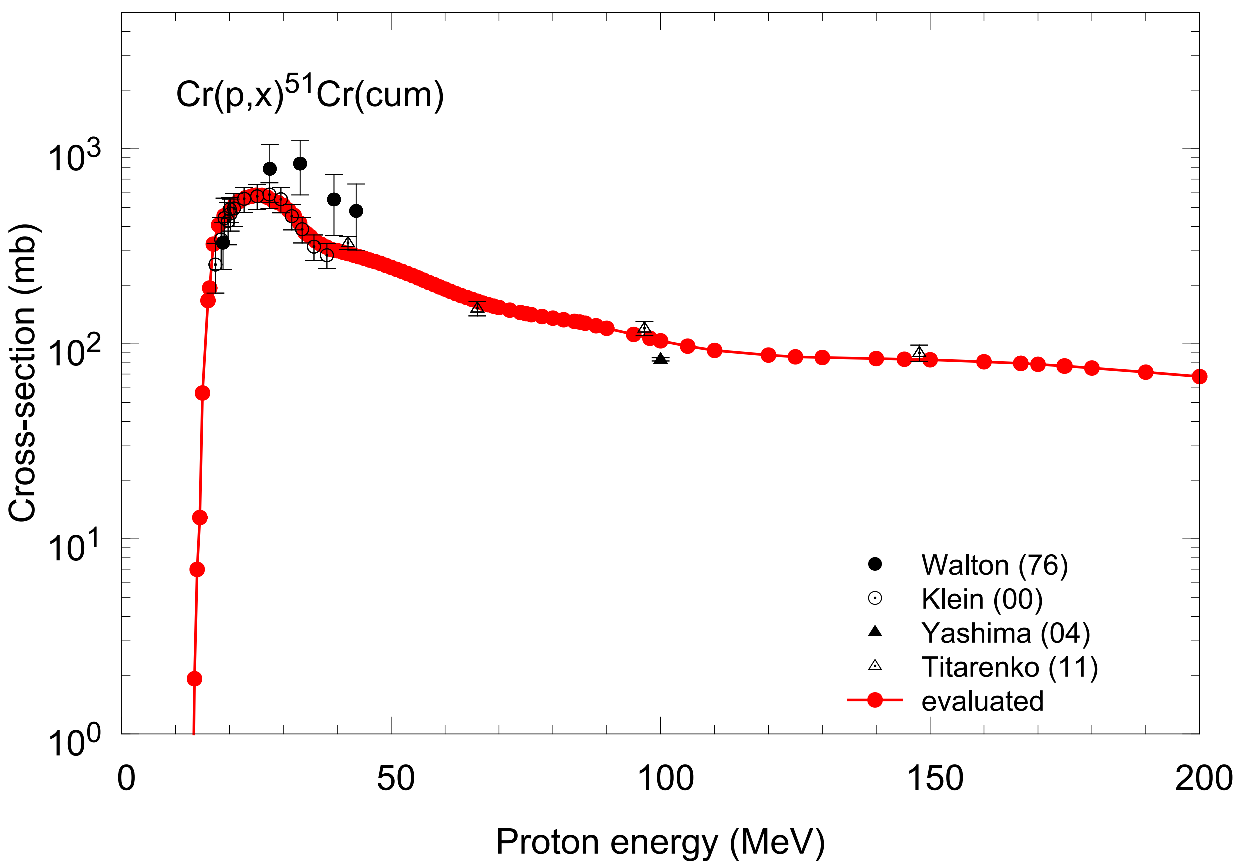
Cr(p,x)^{49}Cr
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Klein (00)
Buchholz (13)
evaluated



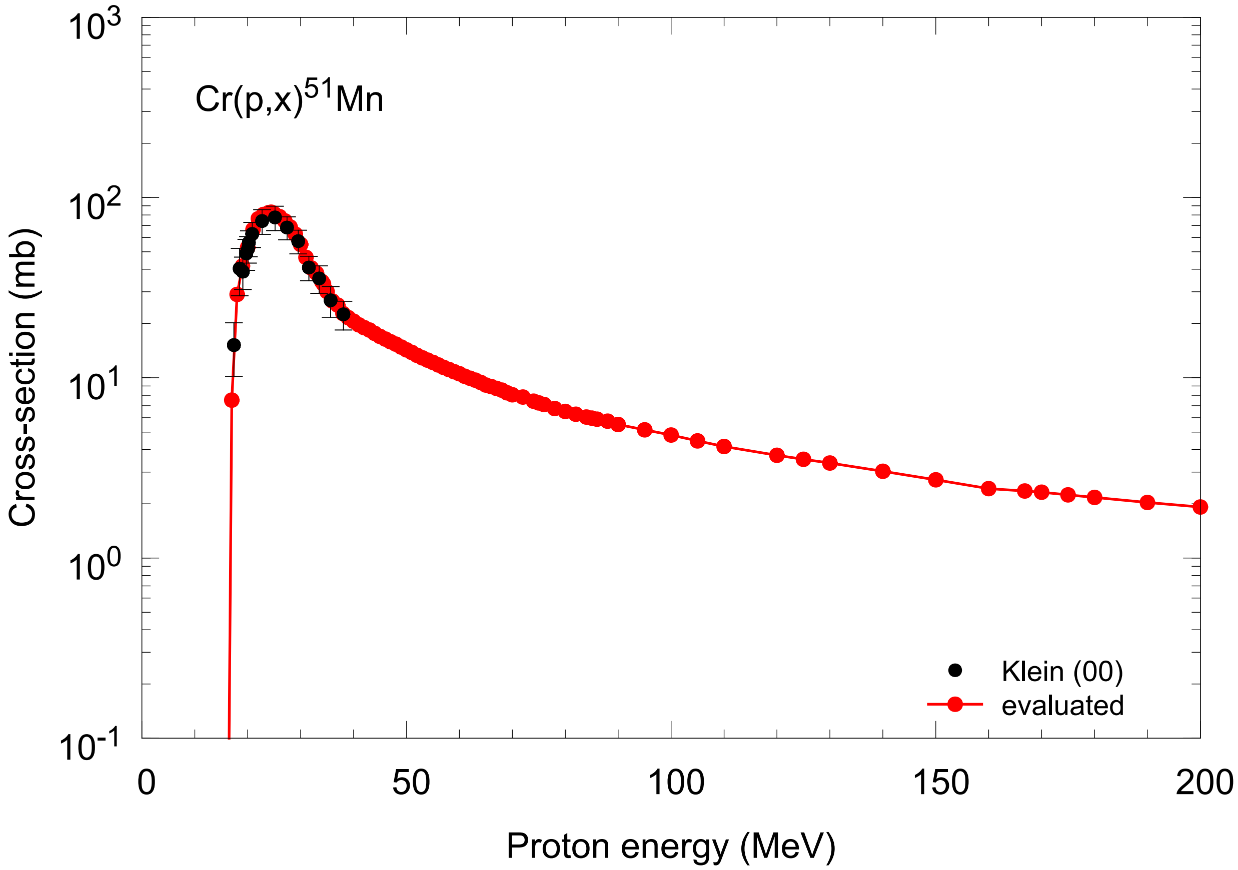
Cr(p,x)^{49}Cr(cum)
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Titarenko (11)
evaluated



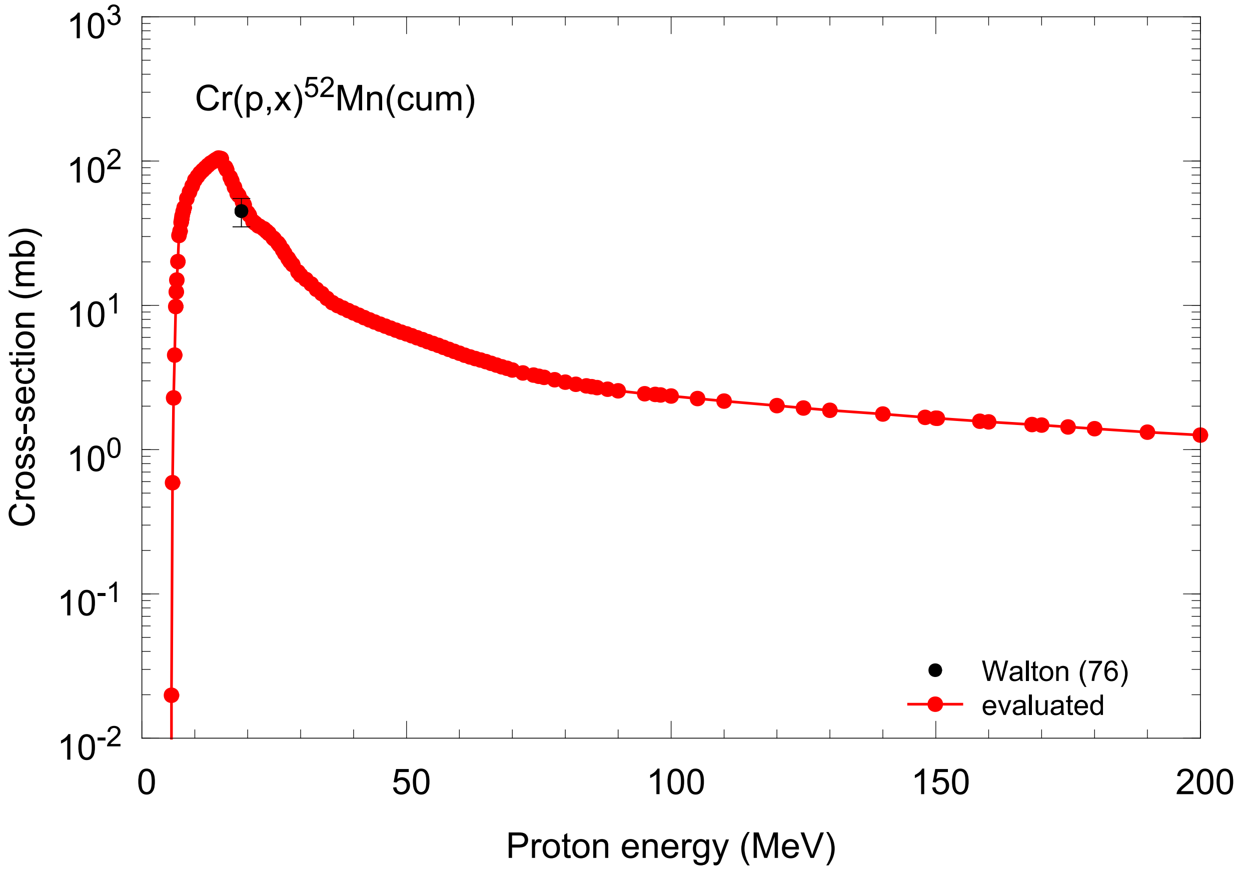
Cr(p,x)^{51}Cr
10^3
10^2
10^1
10^0
Cross-section (mb)
0
50
100
150
200
Proton energy (MeV)
Klein (00)
Buchholz (13)
El sayed (19)
evaluated



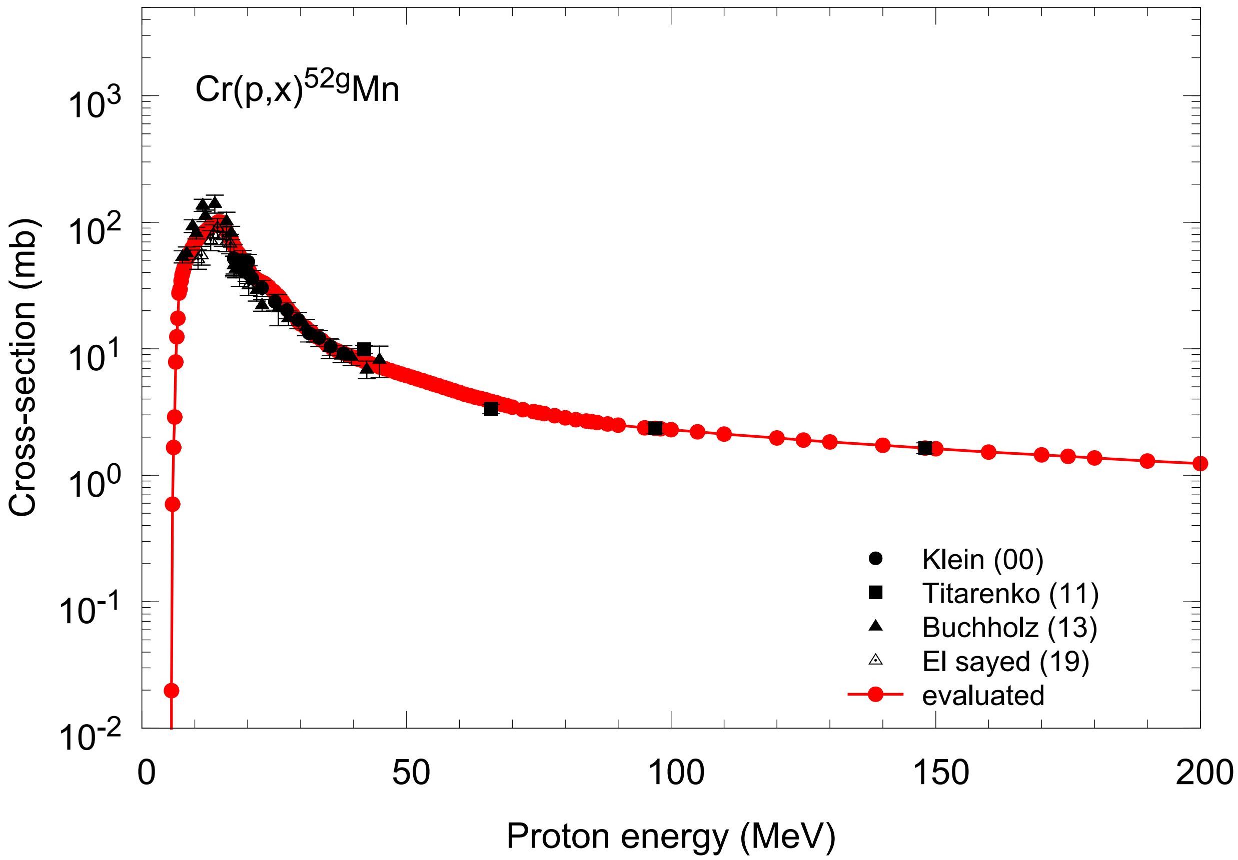
Cr(p,x)^{51}Cr(cum)
10^3
10^2
10^1
10^0
Cross-section (mb)
0
50
100
150
200
Proton energy (MeV)
Walton (76)
Klein (00)
Yashima (04)
Titarenko (11)
evaluated



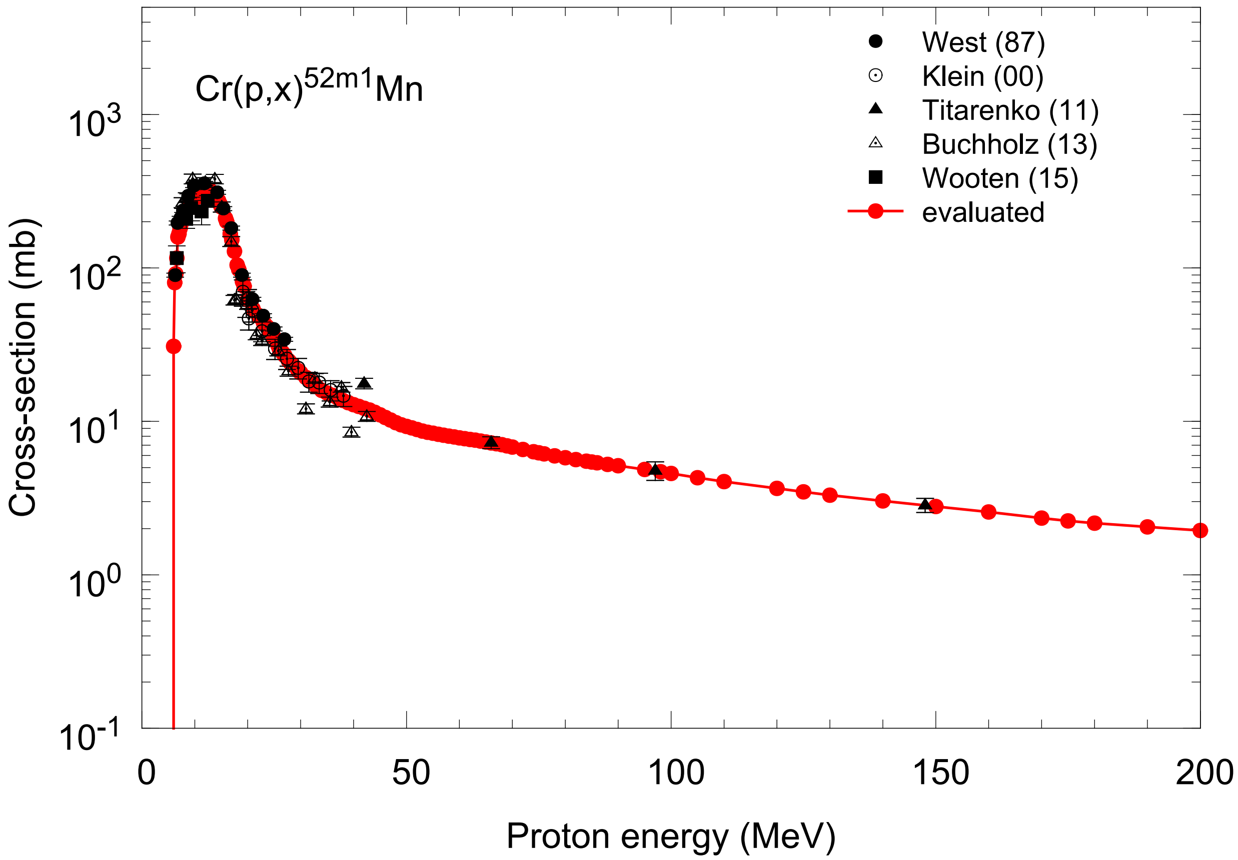
Cr(p,x)^{51}Mn
Klein (00)
evaluated
Cross-section (mb)
Proton energy (MeV)



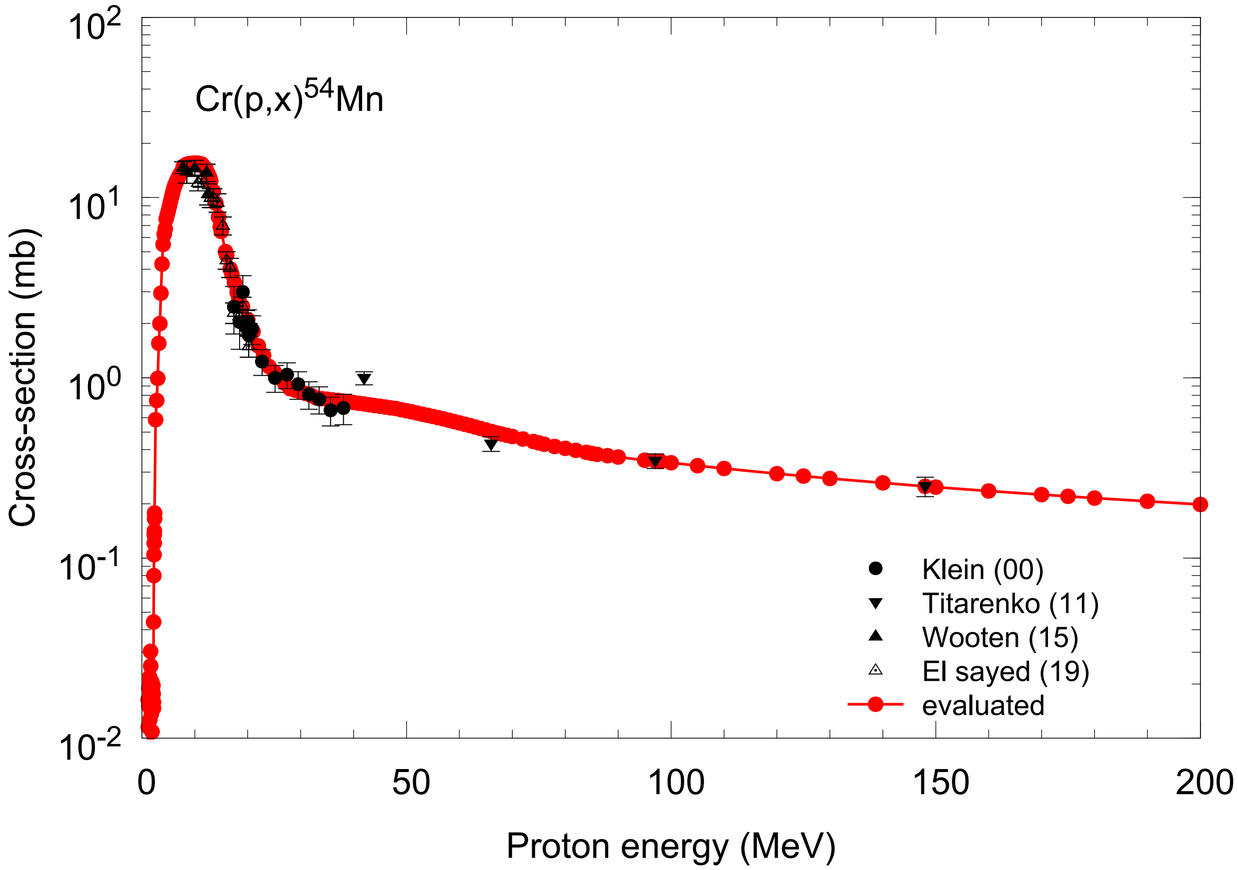
Cr(p,x)^{52}Mn(cum)
Walton (76)
evaluated
Cross-section (mb)
Proton energy (MeV)



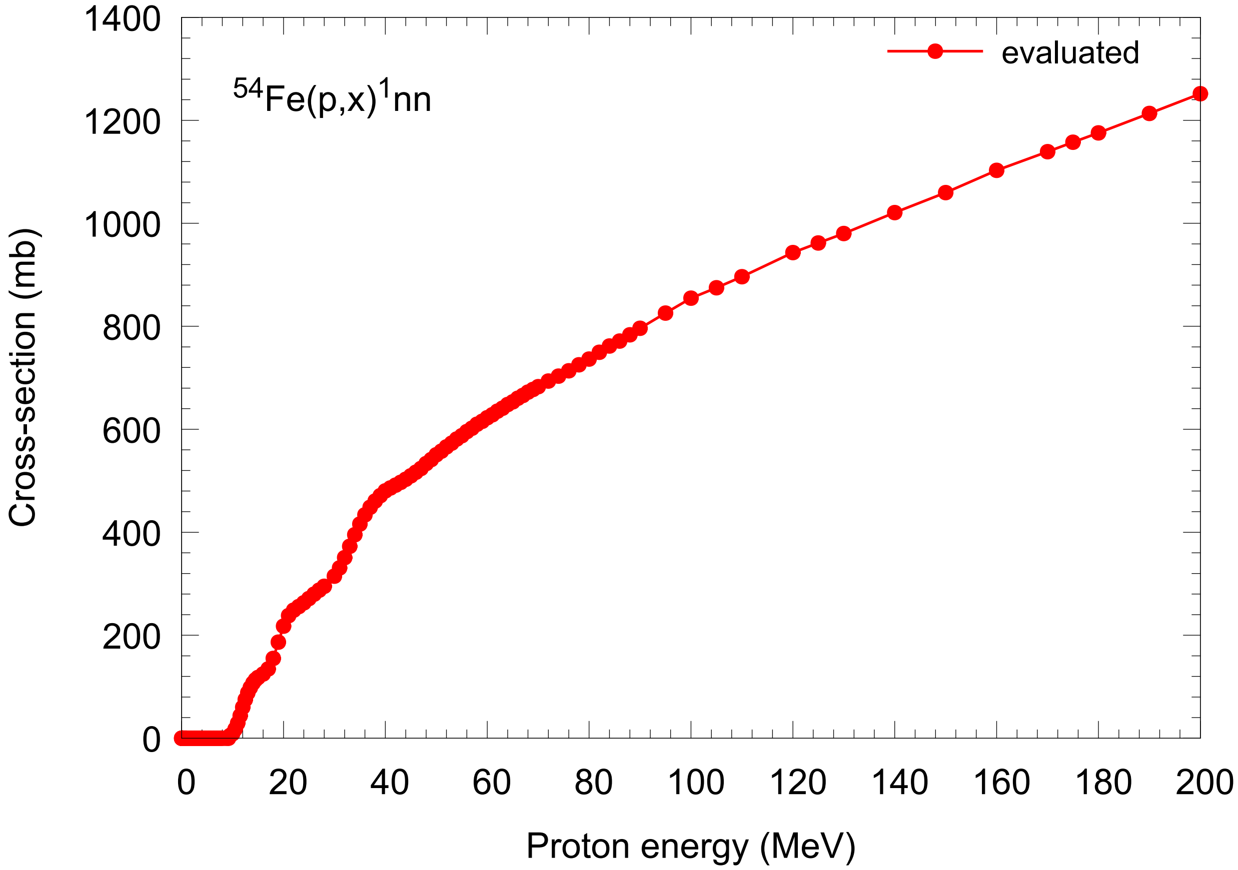
Cr(p,x)^{52g}Mn
Cross-section (mb)
Proton energy (MeV)
Klein (00)
Titarenko (11)
Buchholz (13)
El sayed (19)
evaluated



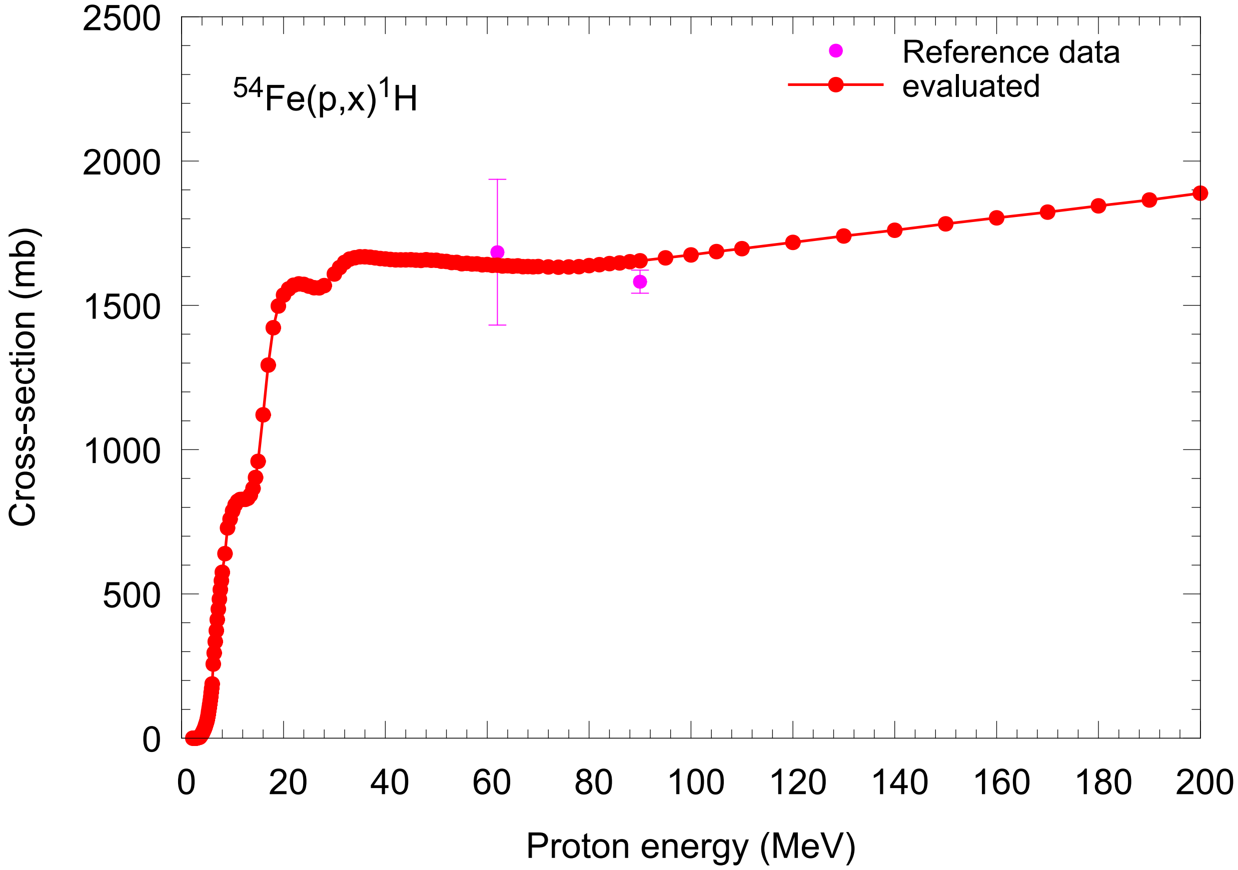
Cr(p,x)^{52m1}Mn
Cross-section (mb)
Proton energy (MeV)
West (87)
Klein (00)
Titarenko (11)
Buchholz (13)
Wooten (15)
evaluated



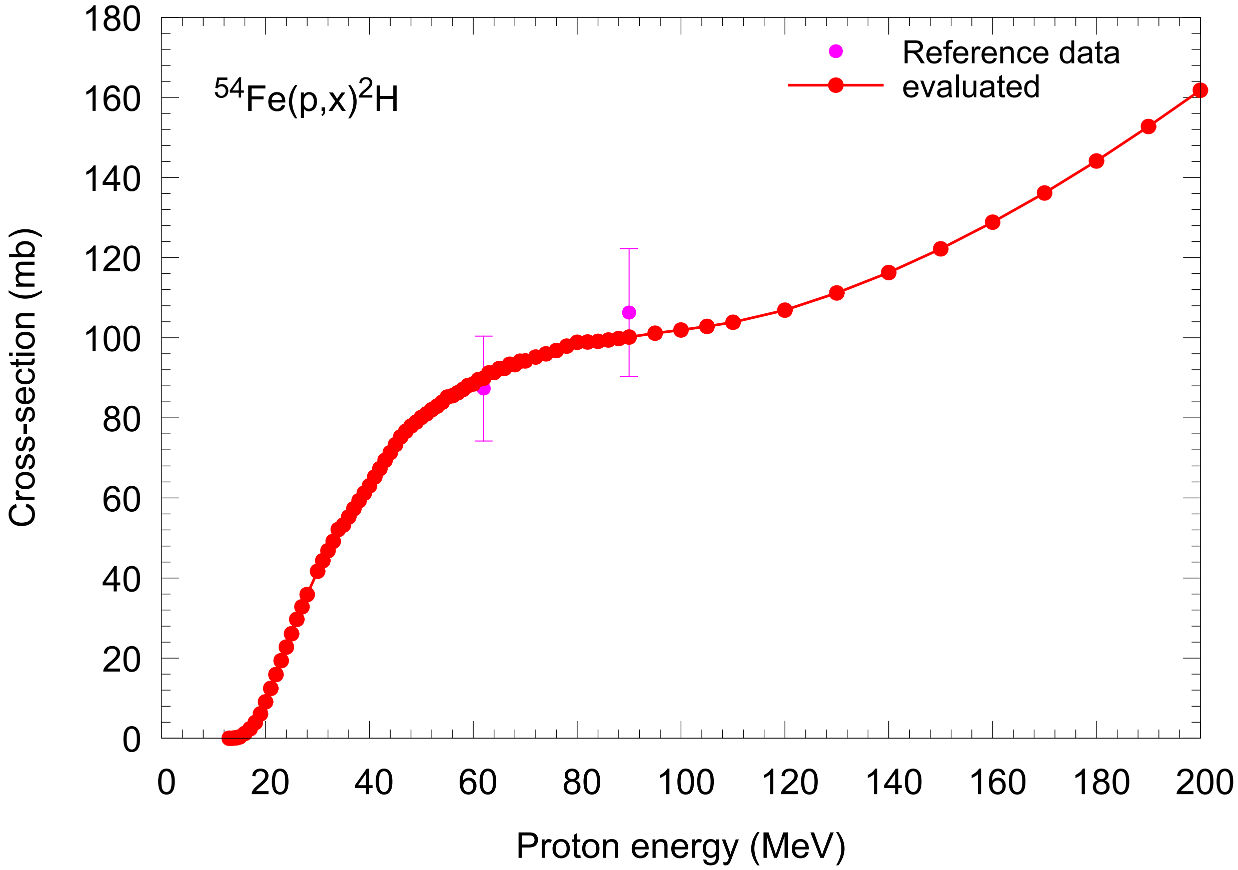
Cr(p,x)^{54}Mn
Cross-section (mb)
Proton energy (MeV)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Klein (00)
Titarenko (11)
Wooten (15)
El sayed (19)
evaluated

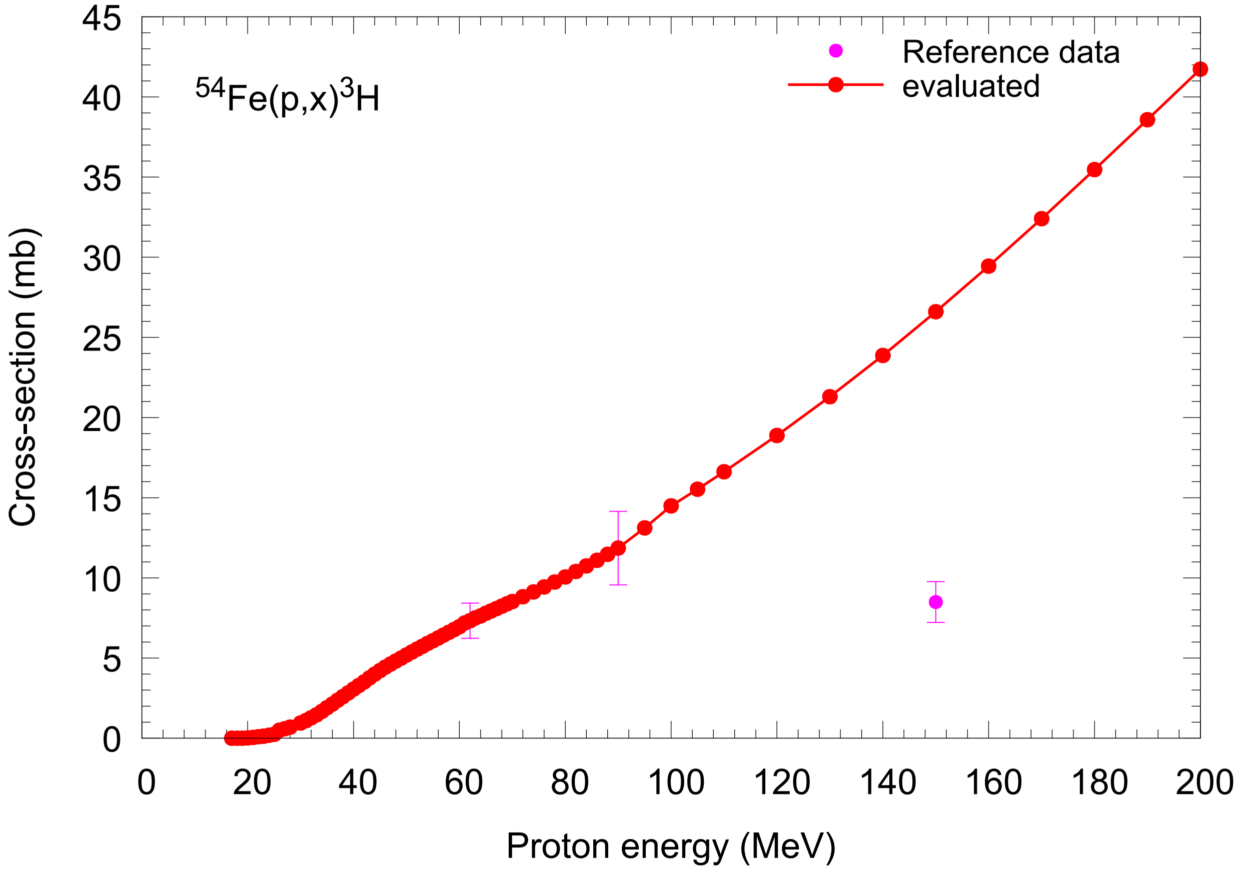


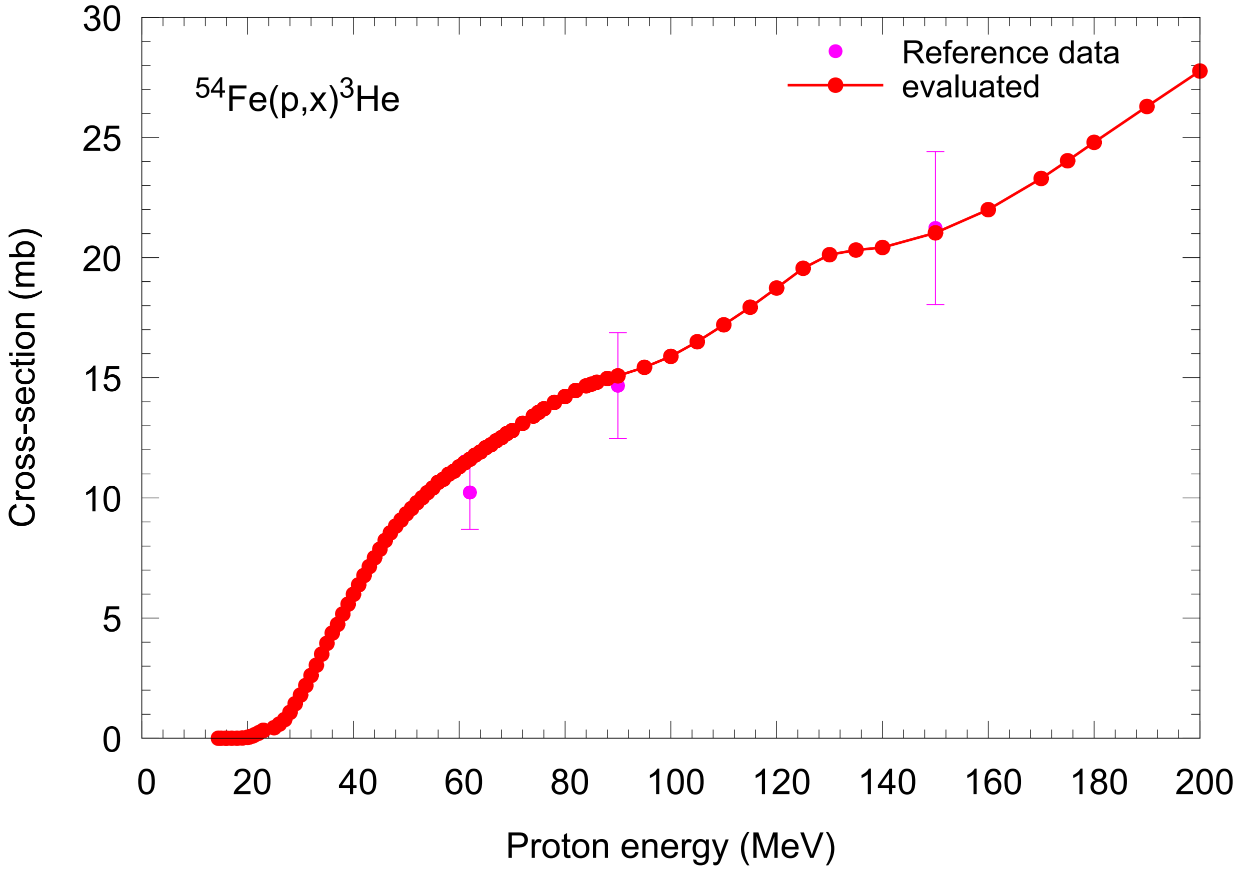
evaluated
$^{54}Fe(p,x)^{1}nn$
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
0
20
40
60
80
100
120
140
160
180
200



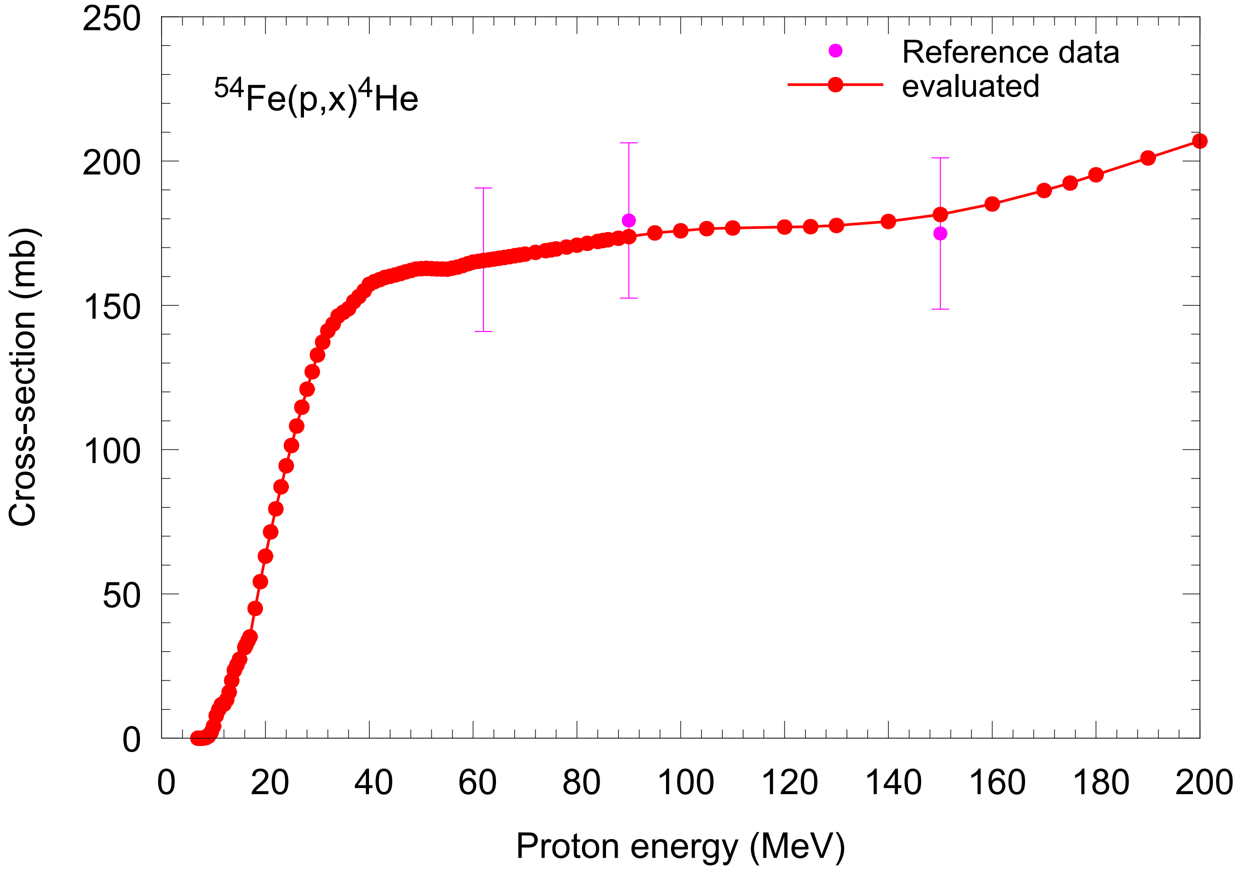
Reference data
evaluated
$^{54}Fe(p,x)^{1}H$
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
0
20
40
60
80
100
120
140
160
180
200


$^{54}Fe(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
200

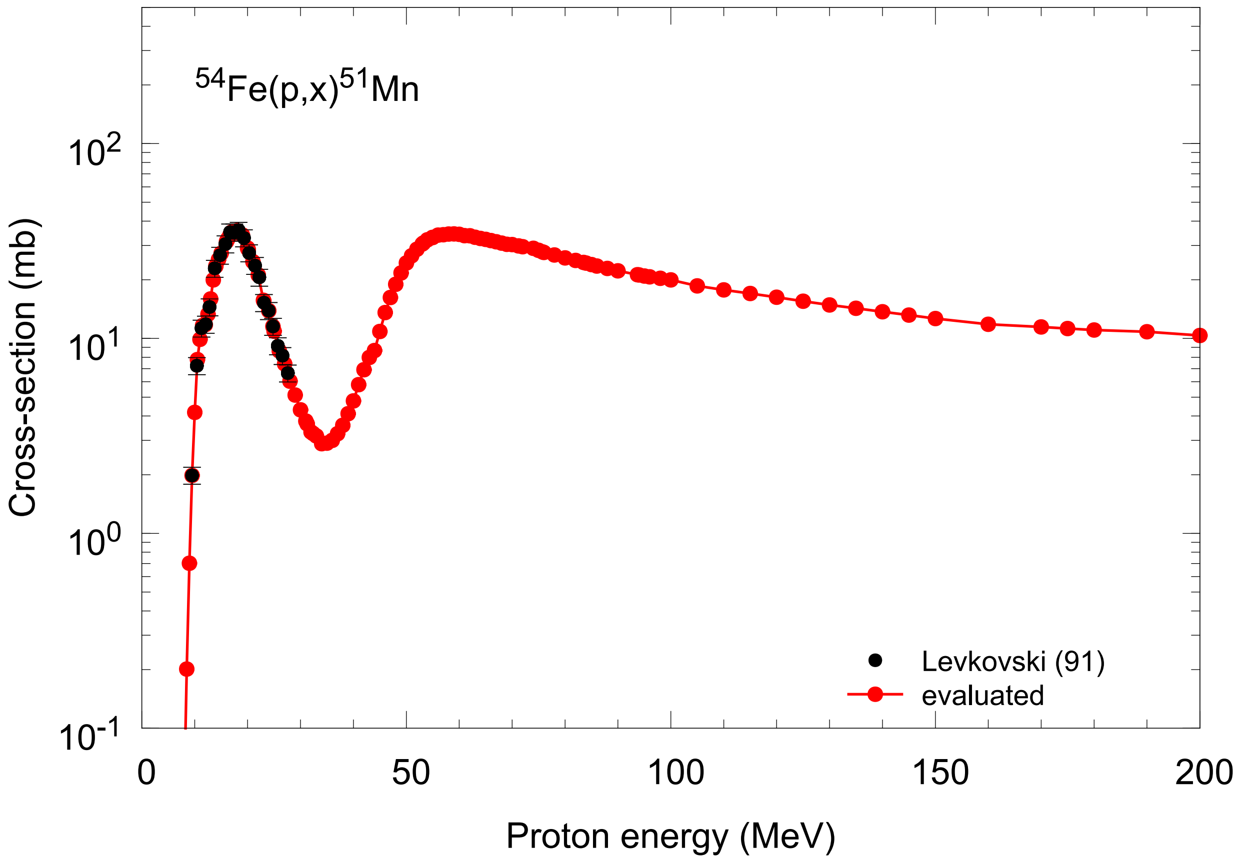

$^{54}Fe(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
40
45



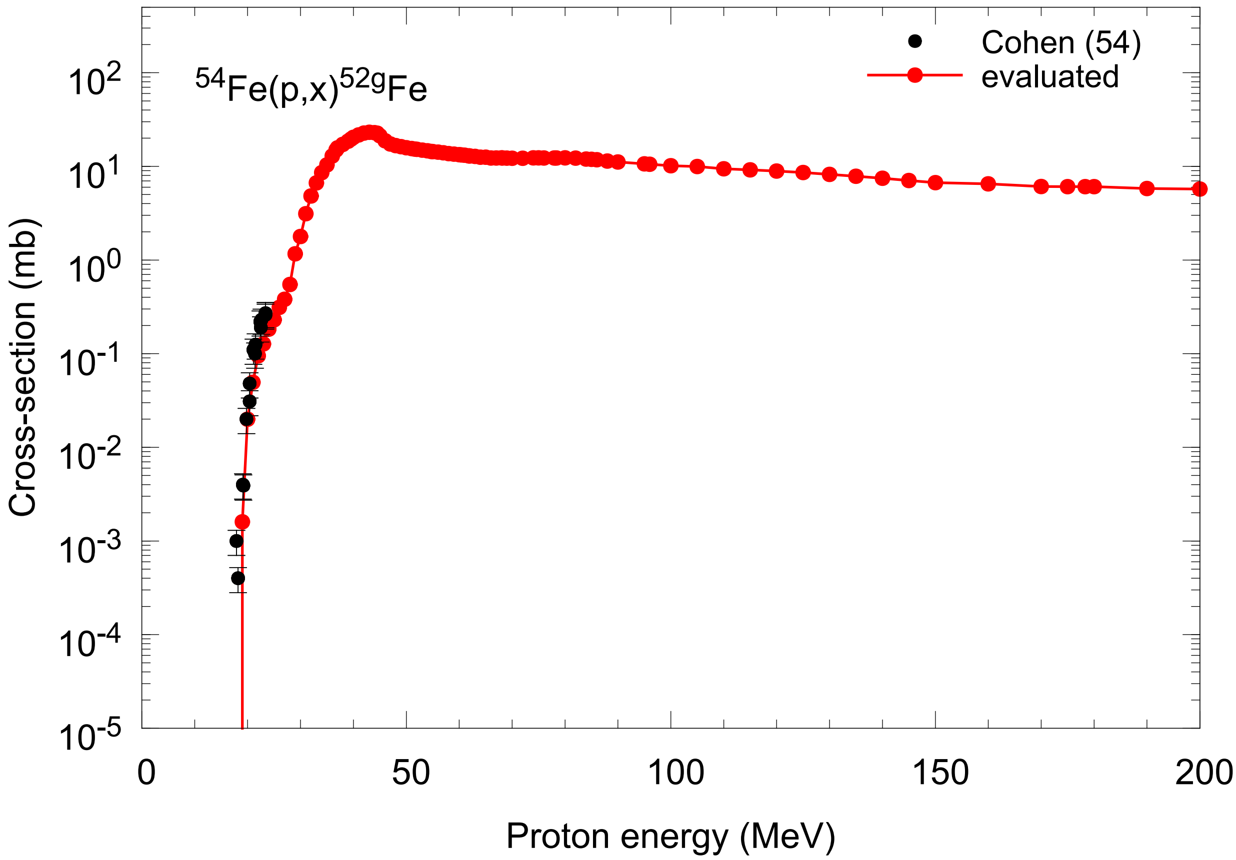
$^{54}Fe(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
0
20
40
60
80
100
120
140
160
180
200



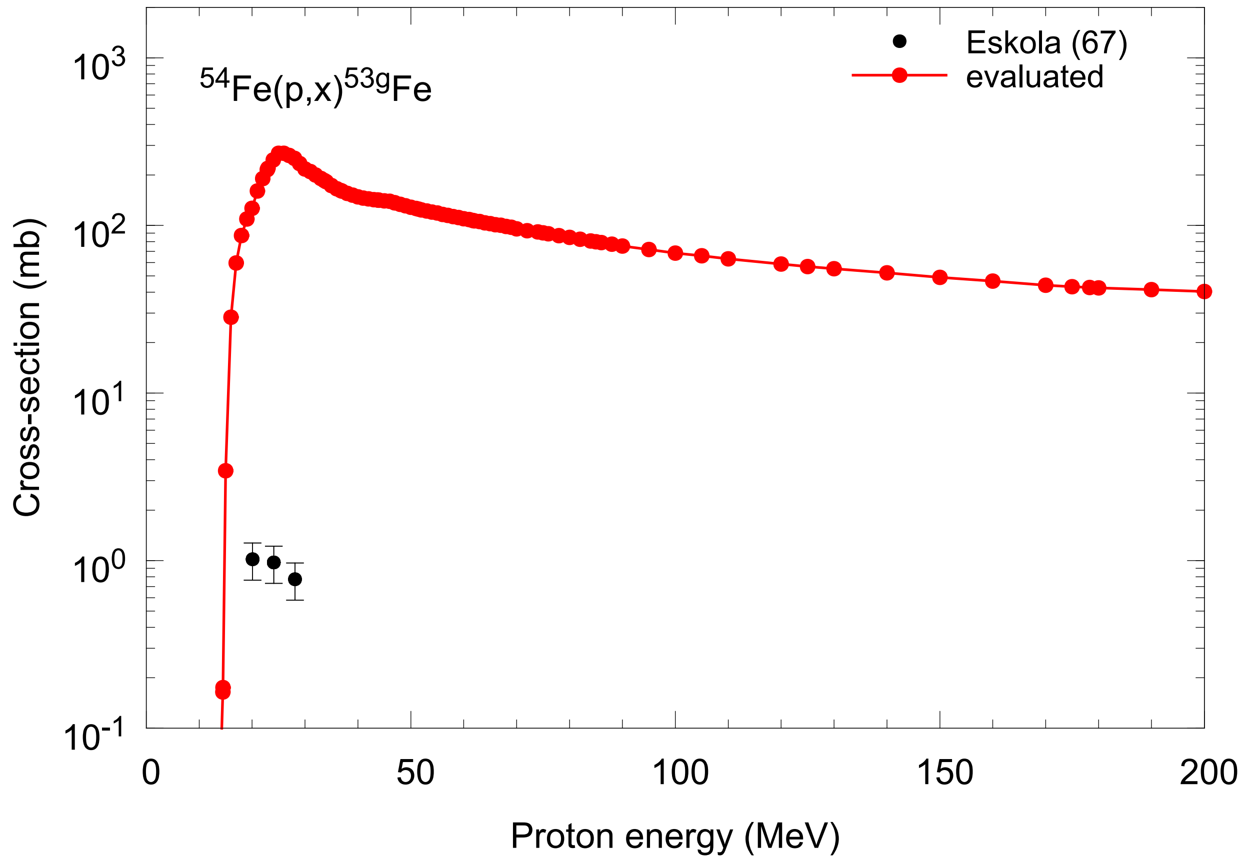
$^{54}Fe(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
0
20
40
60
80
100
120
140
160
180
200



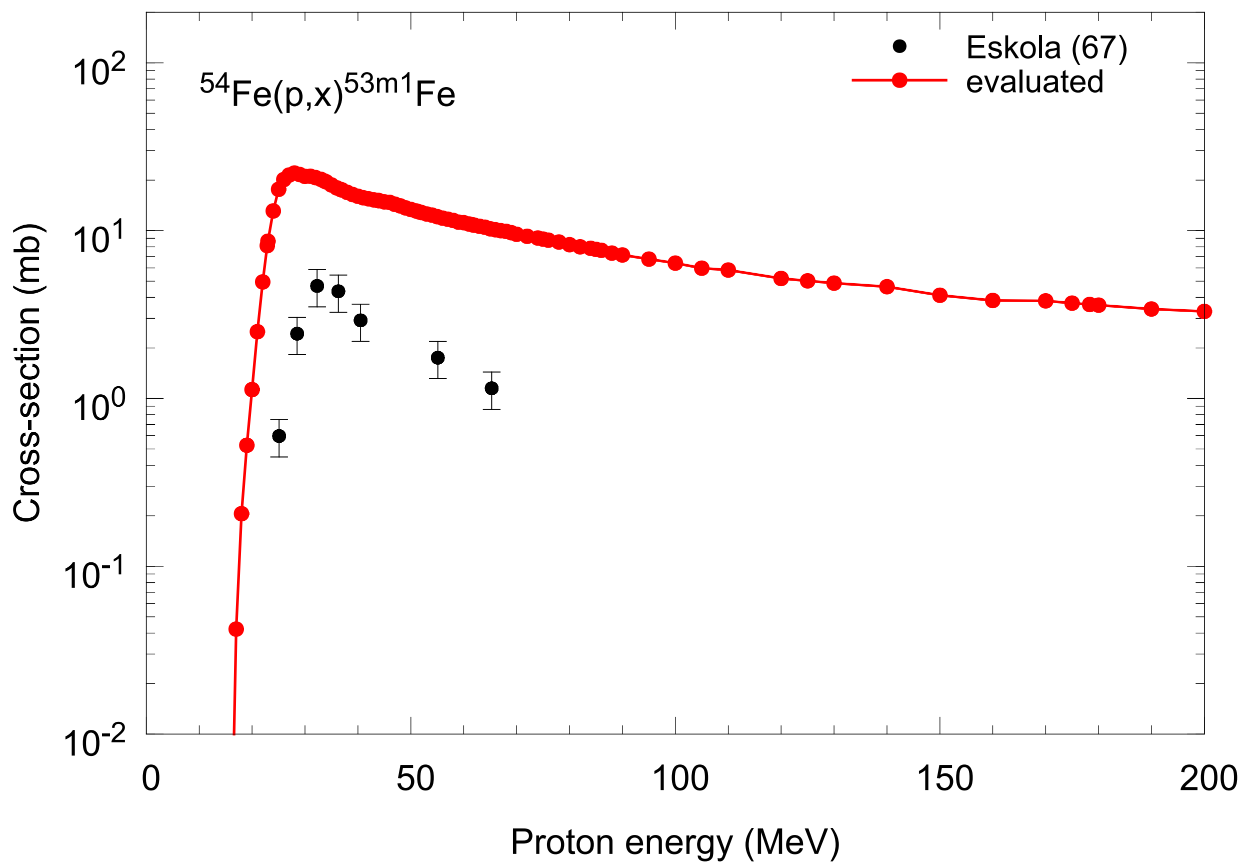
$^{54}Fe(p,x)^{51}Mn$
Levkovski (91)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{-1}
10^{0}
10^{1}
10^{2}
0
50
100
150
200



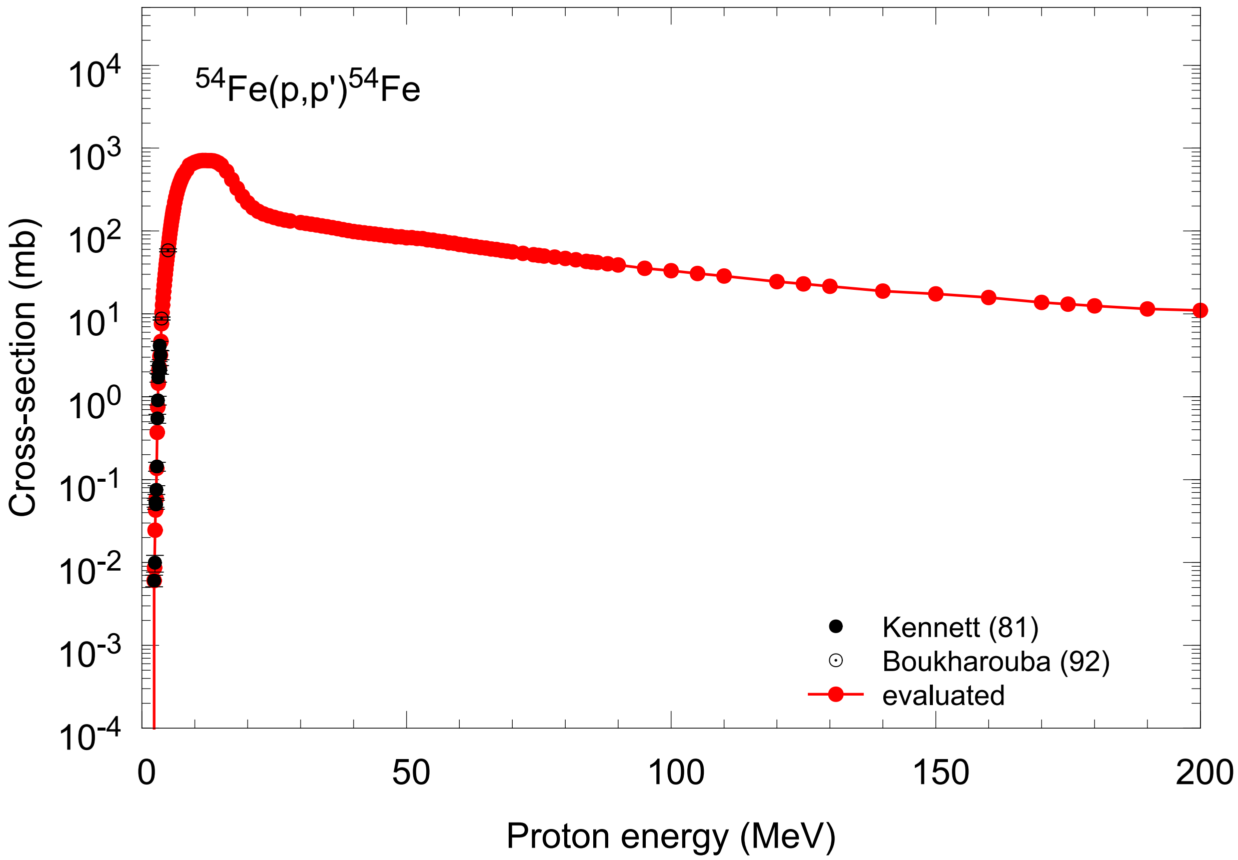
$^{54}Fe(p,x)^{52g}Fe$
Cohen (54)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
0
50
100
150
200



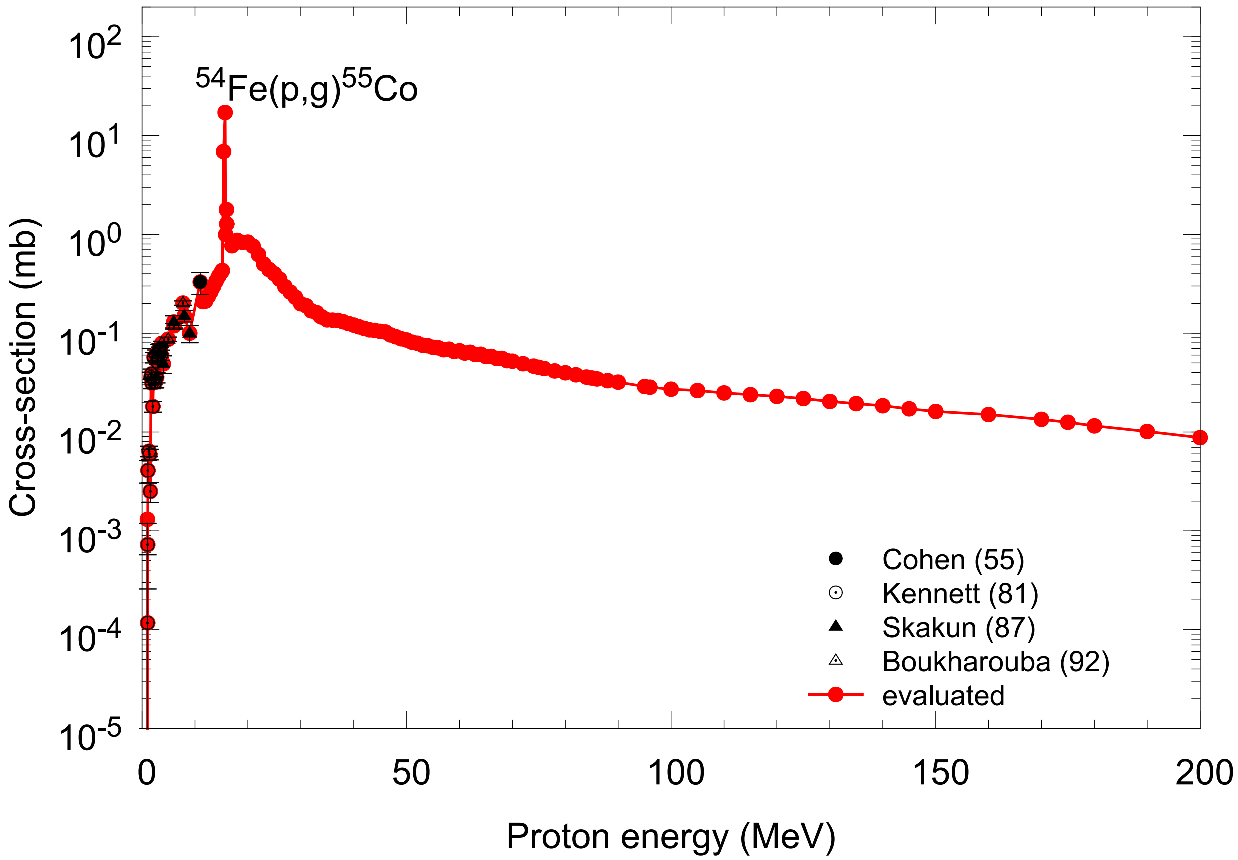
$^{54}Fe(p,x)^{53g}Fe$
Eskola (67)
evaluated
Cross-section (mb)
Proton energy (MeV)



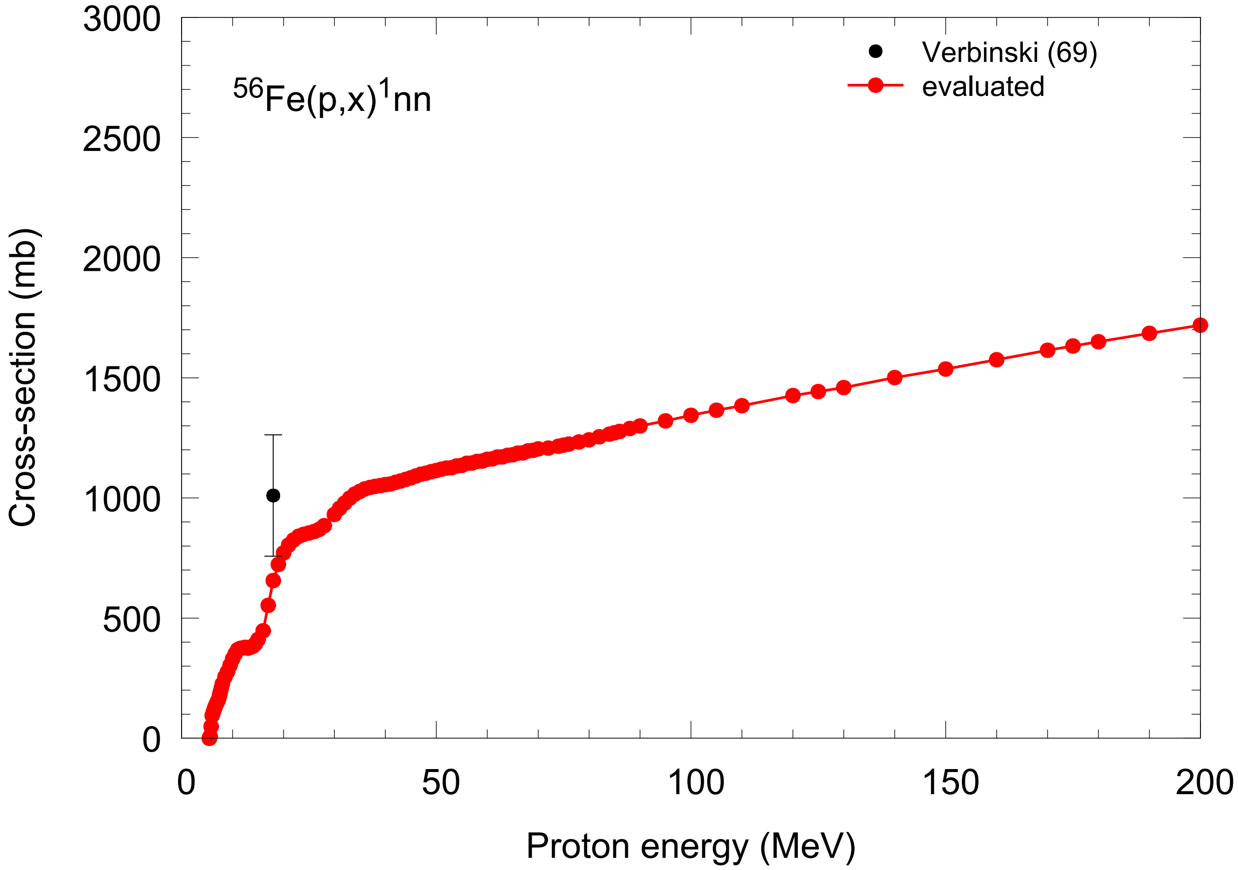
$^{54}Fe(p,x)^{53m1}Fe$
Eskola (67)
evaluated
Cross-section (mb)
Proton energy (MeV)



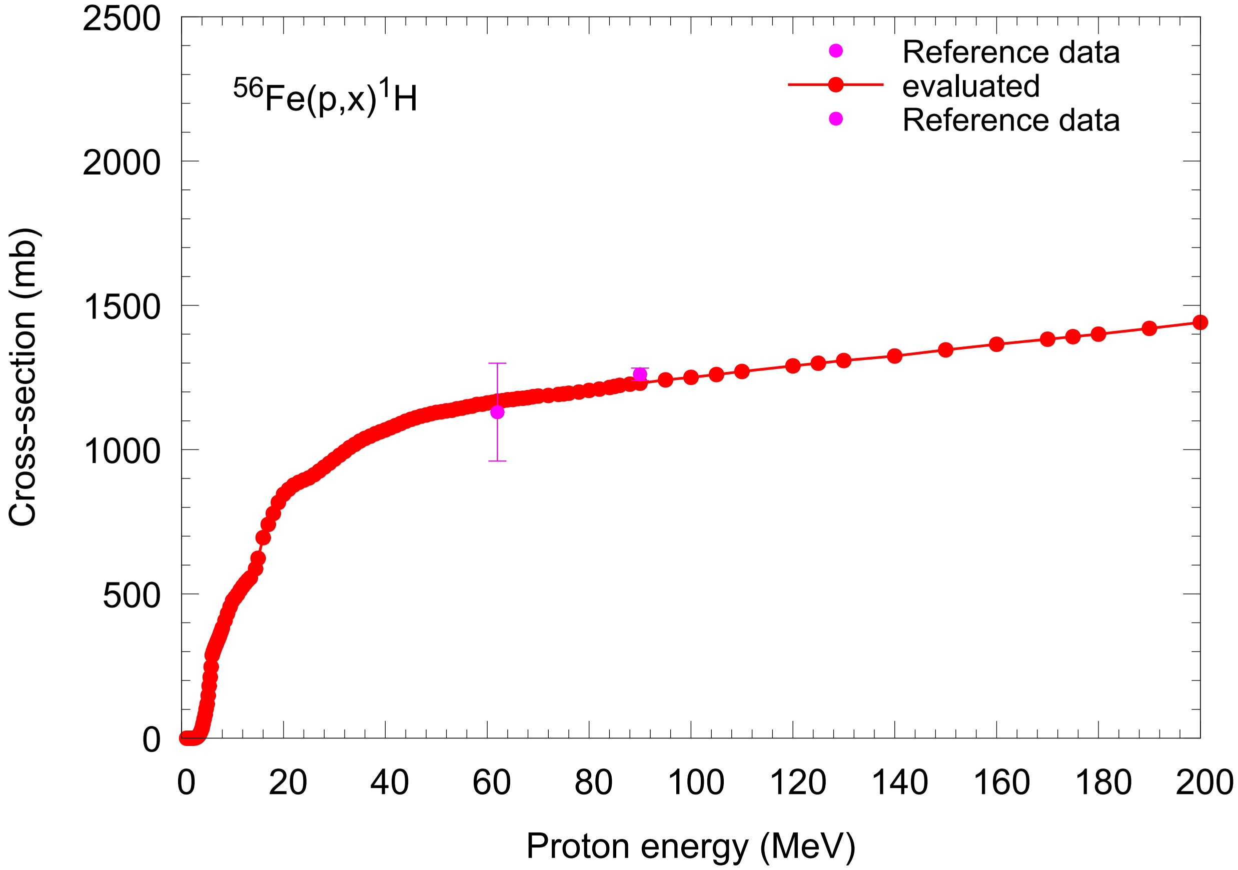
$^{54}Fe(p,p')^{54}Fe$
Cross-section (mb)
Proton energy (MeV)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Kennett (81)
Boukharouba (92)
evaluated



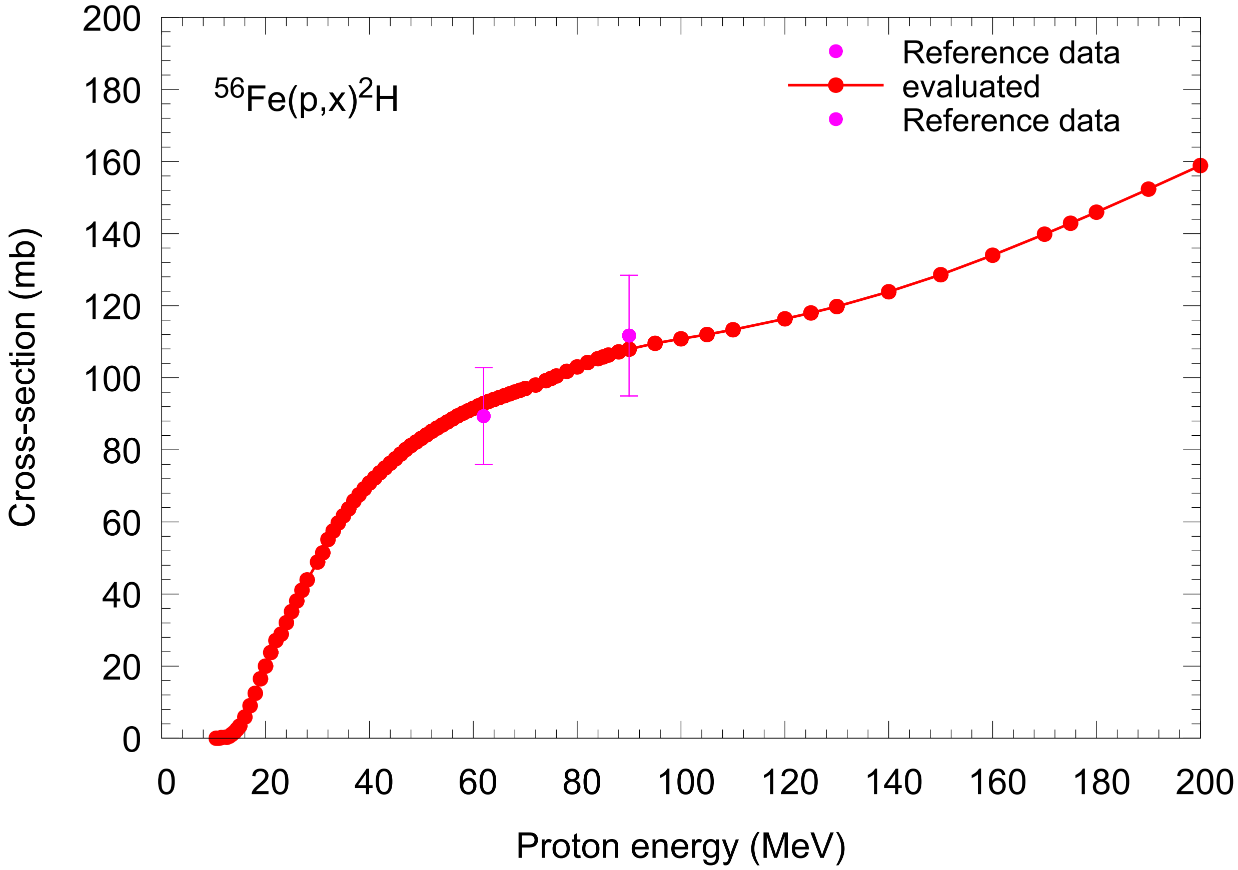
$^{54}Fe(p,g)^{55}Co$
Cross-section (mb)
Proton energy (MeV)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200
Cohen (55)
Kennett (81)
Skakun (87)
Boukharouba (92)
evaluated



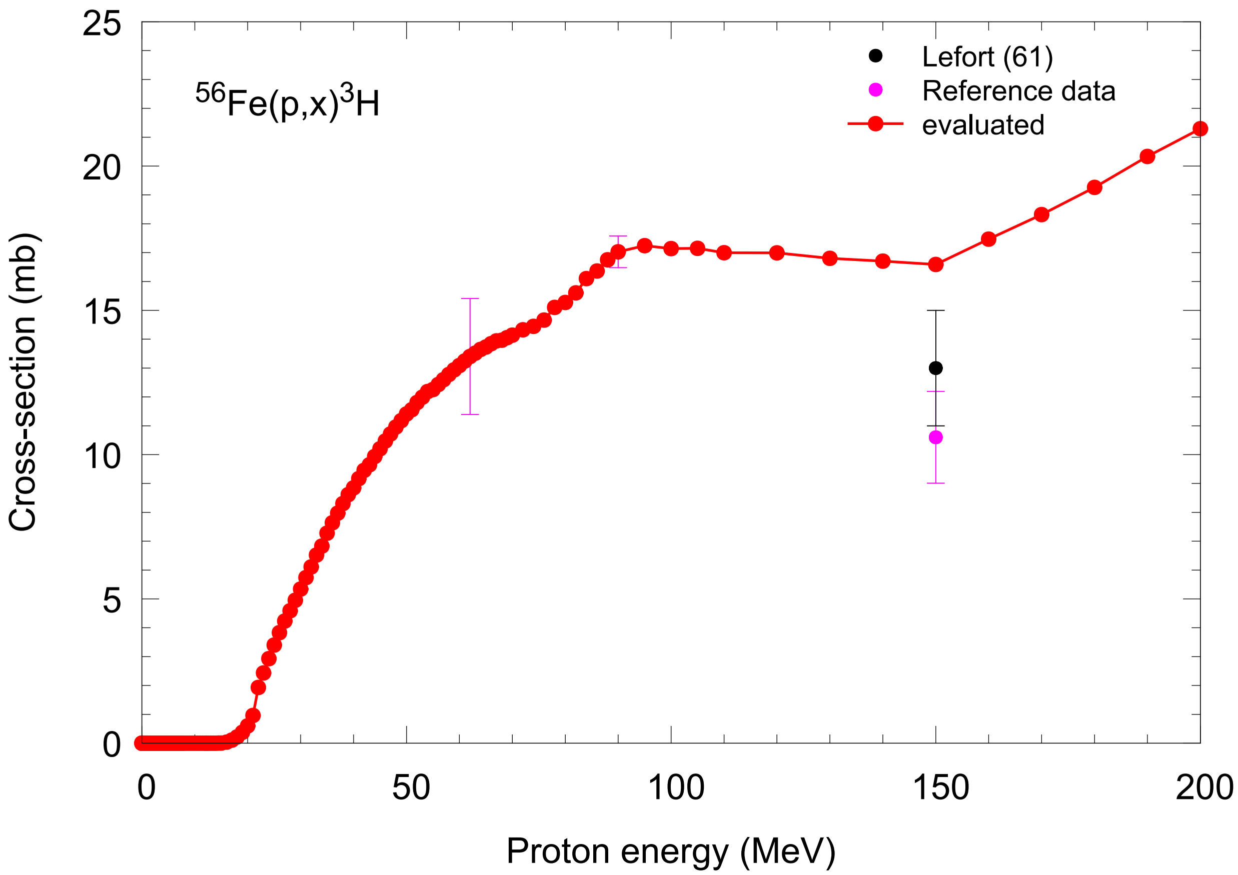
$^{56}Fe(p,x)^{1}nn$
Verbinski (69)
evaluated
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
3000
0
50
100
150
200



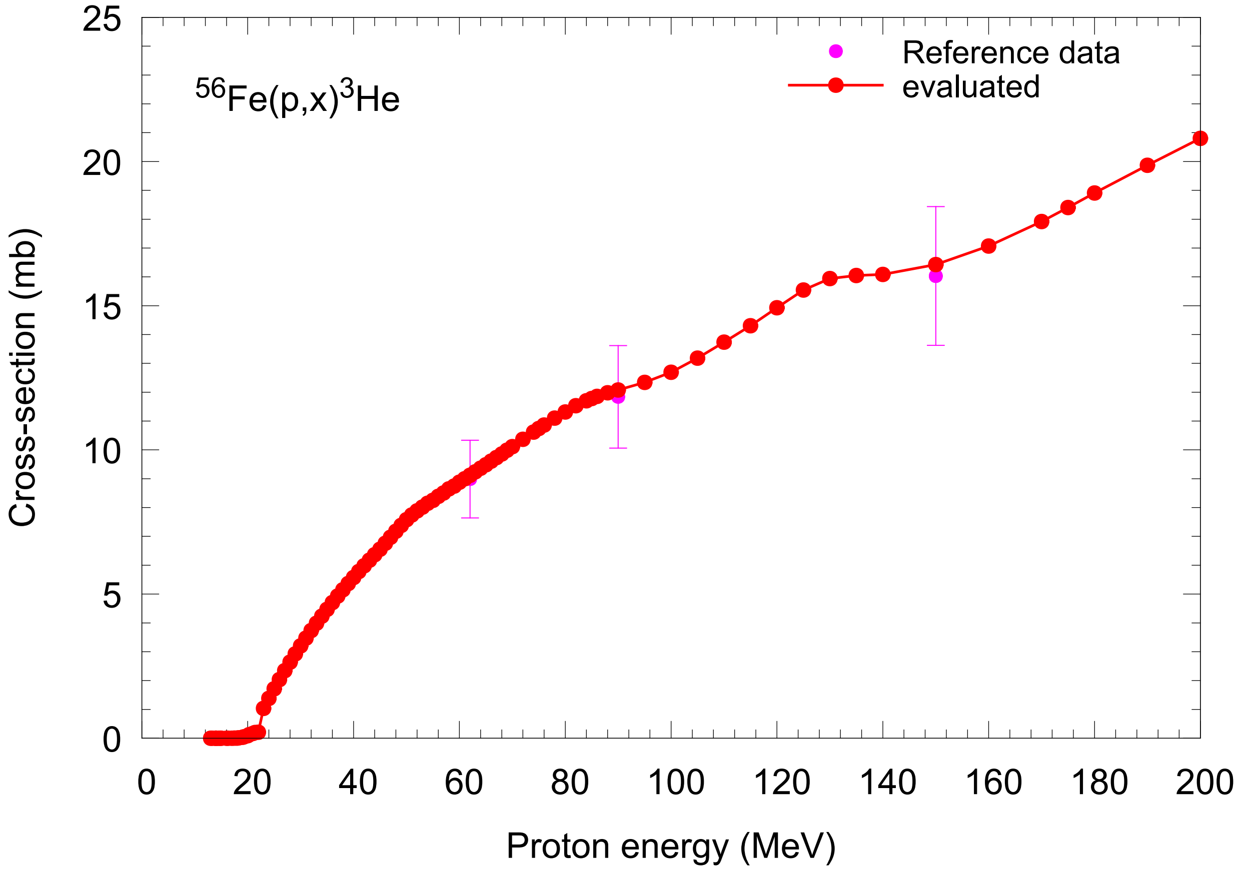
$^{56}Fe(p,x)^{1}H$
Reference data
evaluated
Reference data
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
0
20
40
60
80
100
120
140
160
180
200



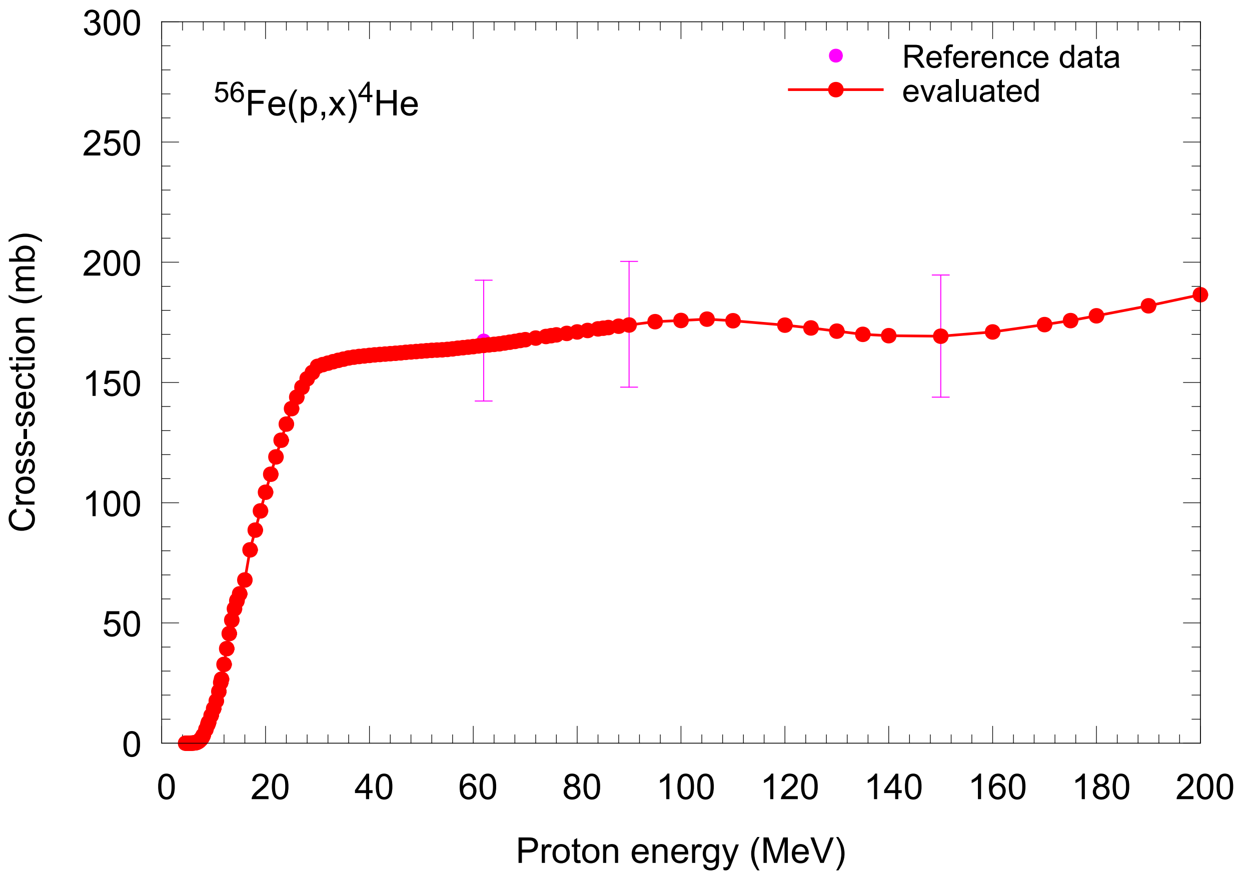
$^{56}Fe(p,x)^2H$
Reference data
evaluated
Reference data
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
200



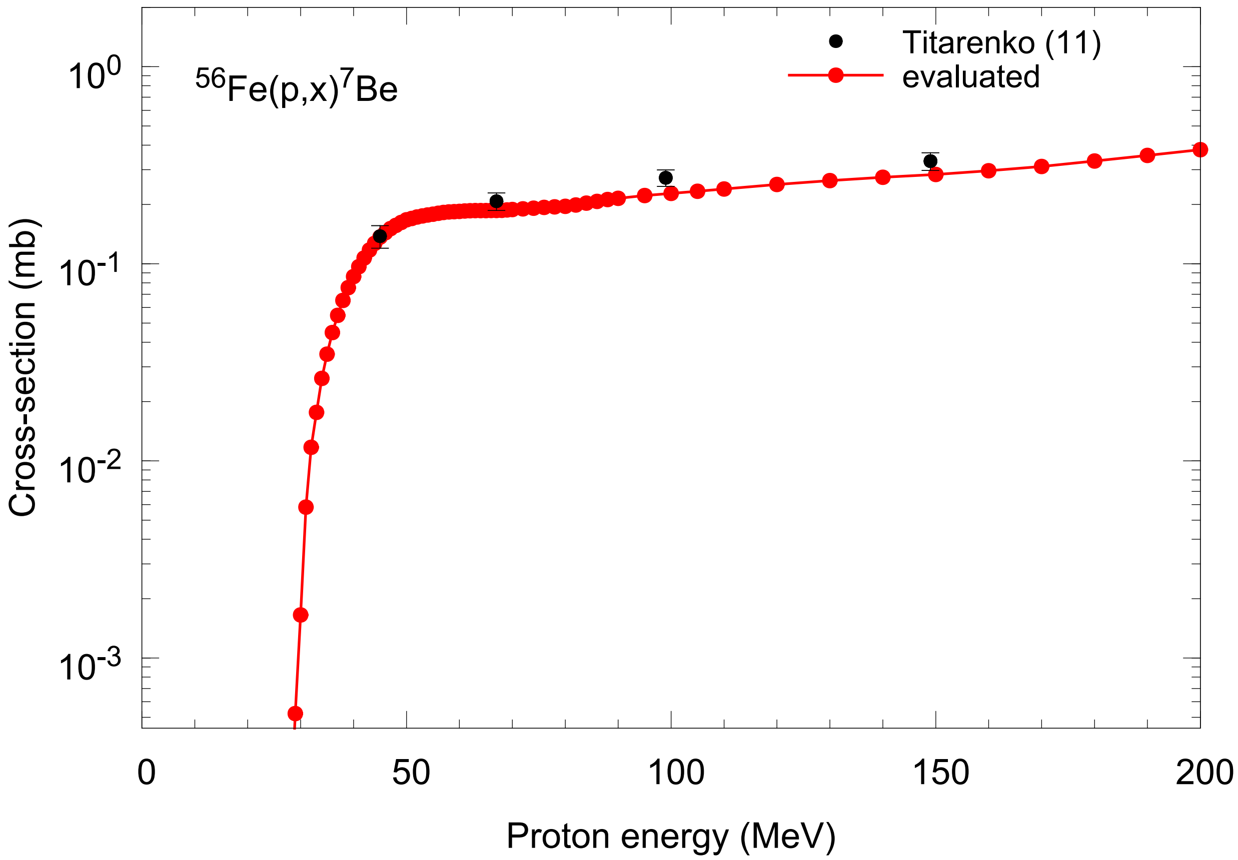
$^{56}Fe(p,x)^3H$
Lefort (61)
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
50
100
150
200



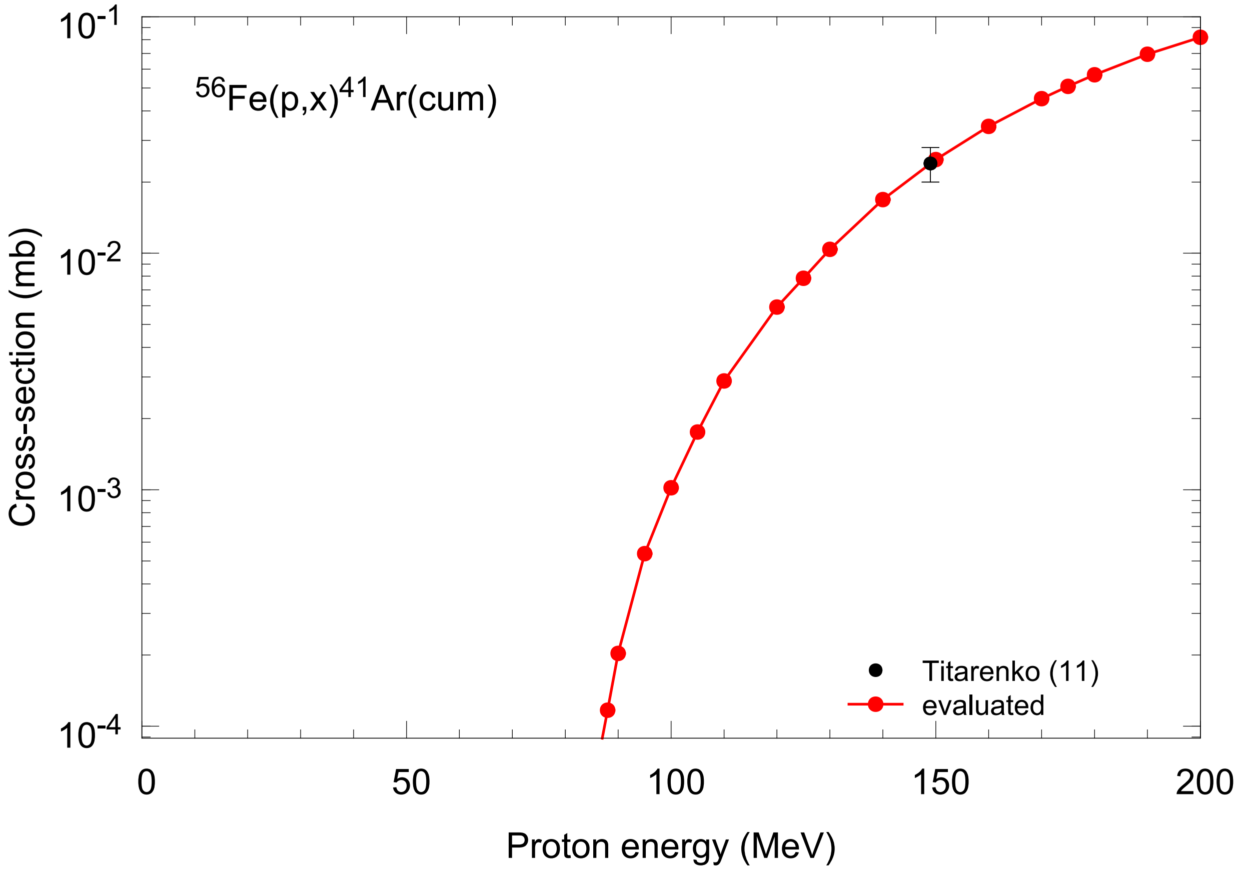
$^{56}Fe(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
0
20
40
60
80
100
120
140
160
180
200



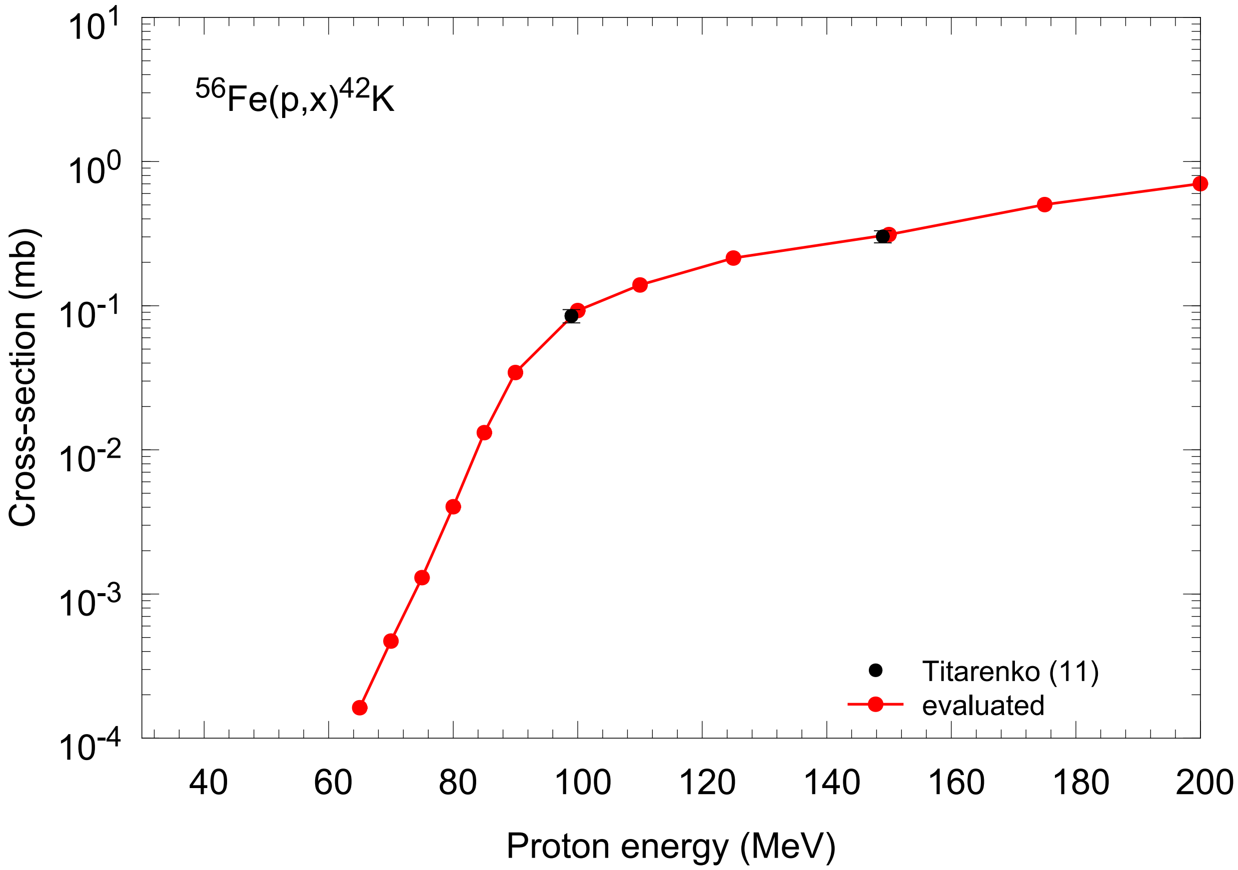
$^{56}Fe(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
300
0
20
40
60
80
100
120
140
160
180
200



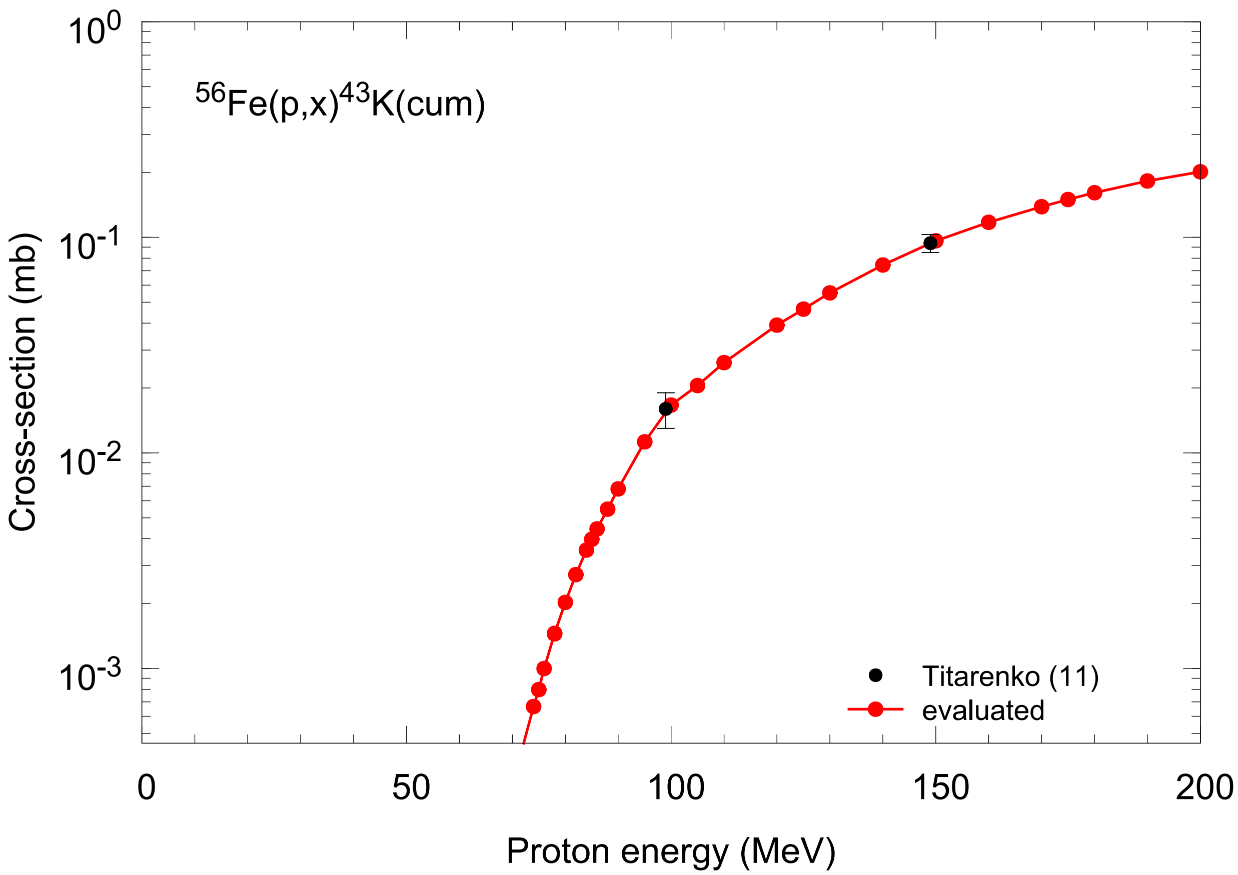
$^{56}Fe(p,x)^{7}Be$
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)



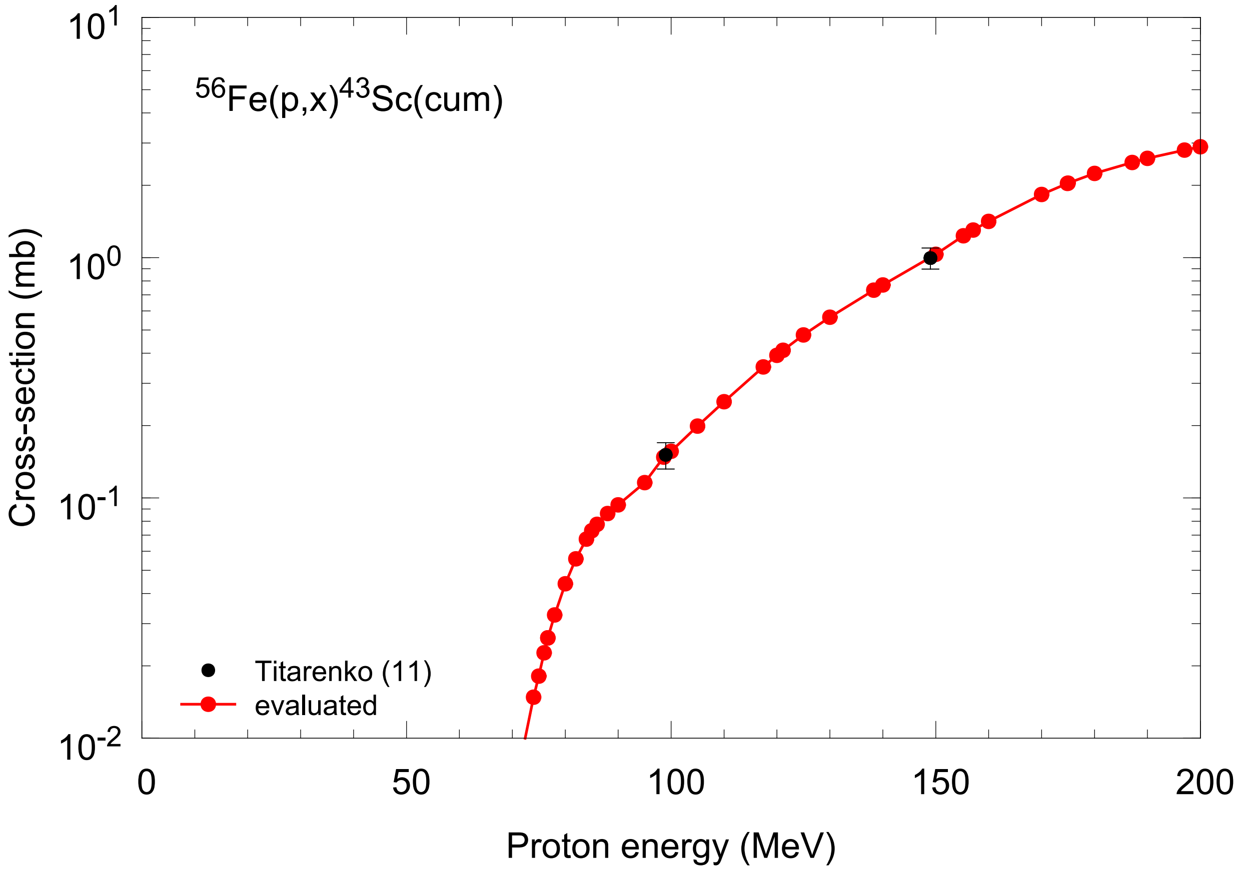
$^{56}Fe(p,x)^{41}Ar(cum)$
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)



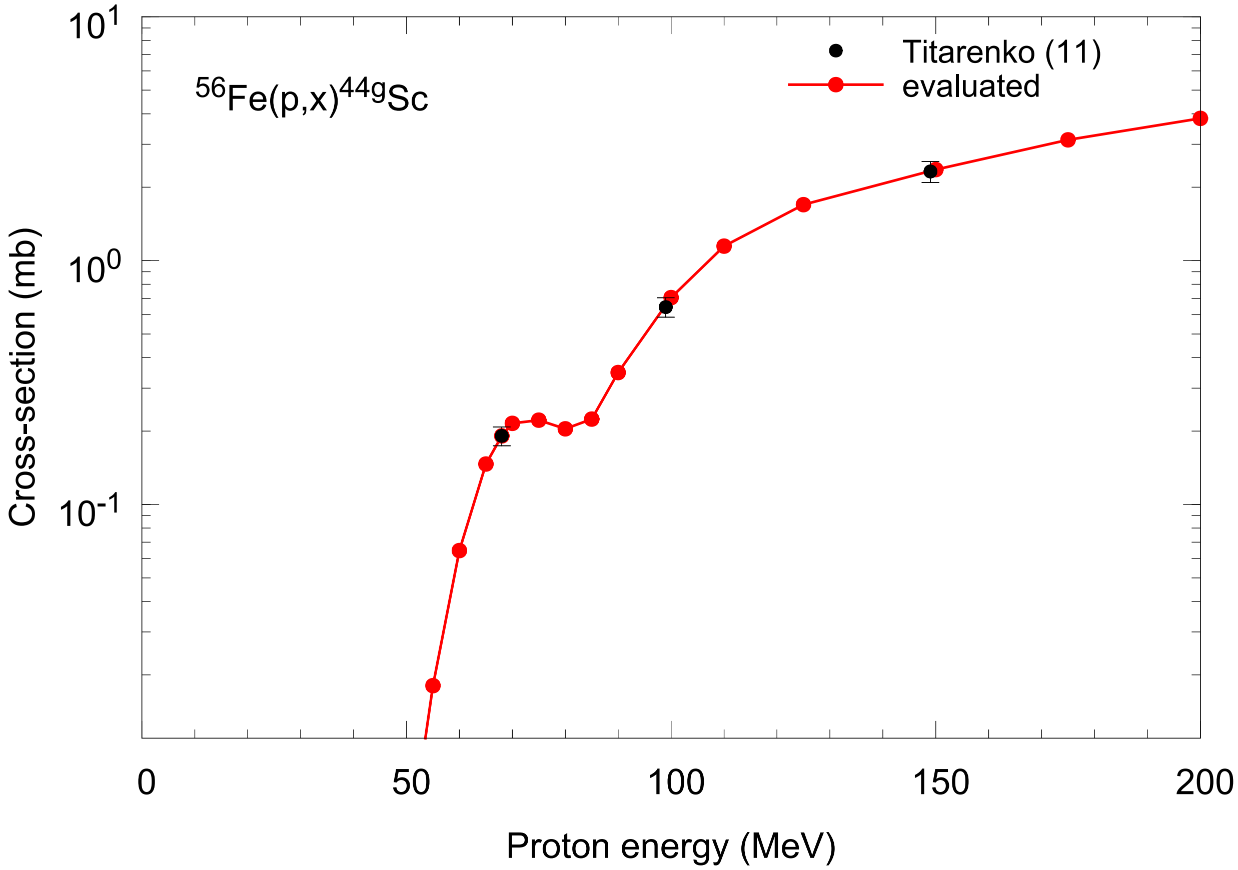
$^{56}Fe(p,x)^{42}K$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



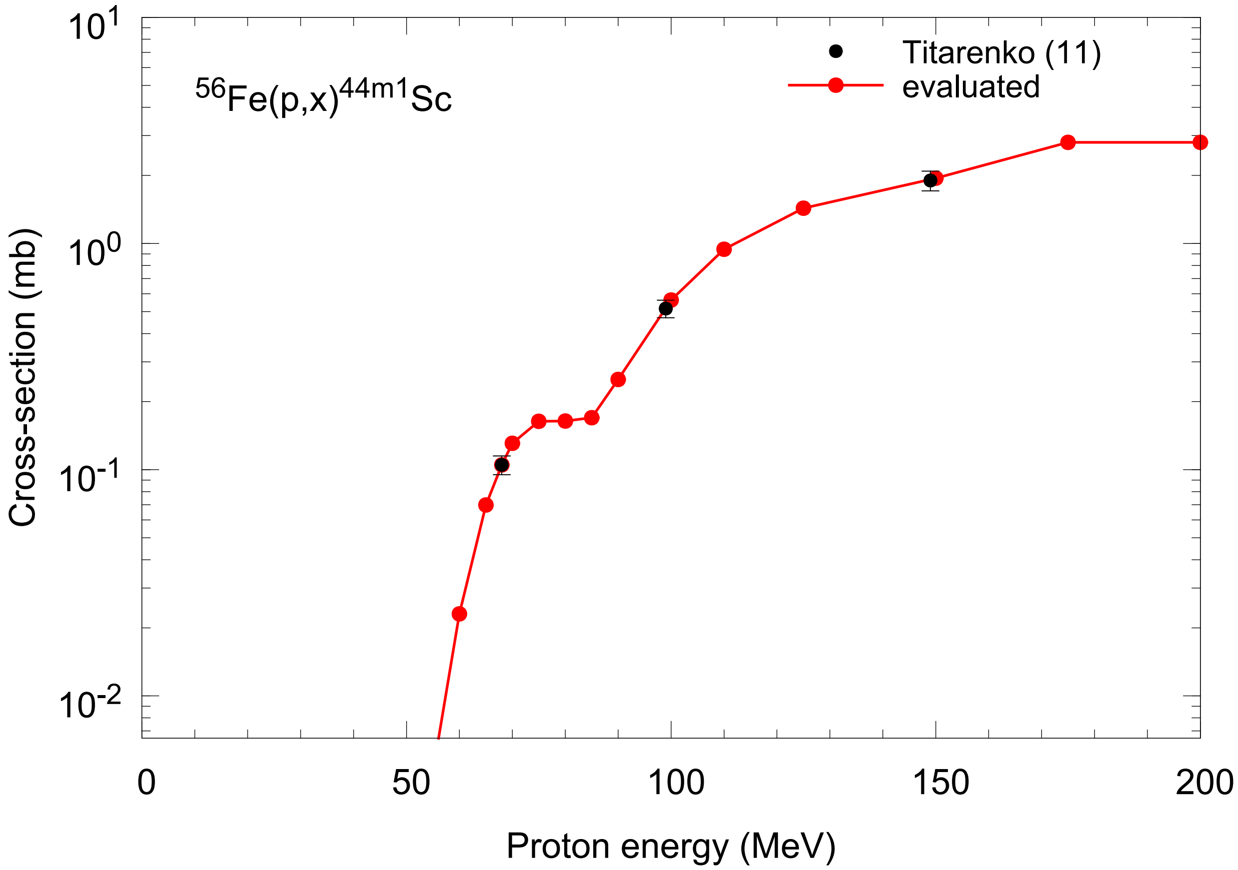
$^{56}Fe(p,x)^{43}K(cum)$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



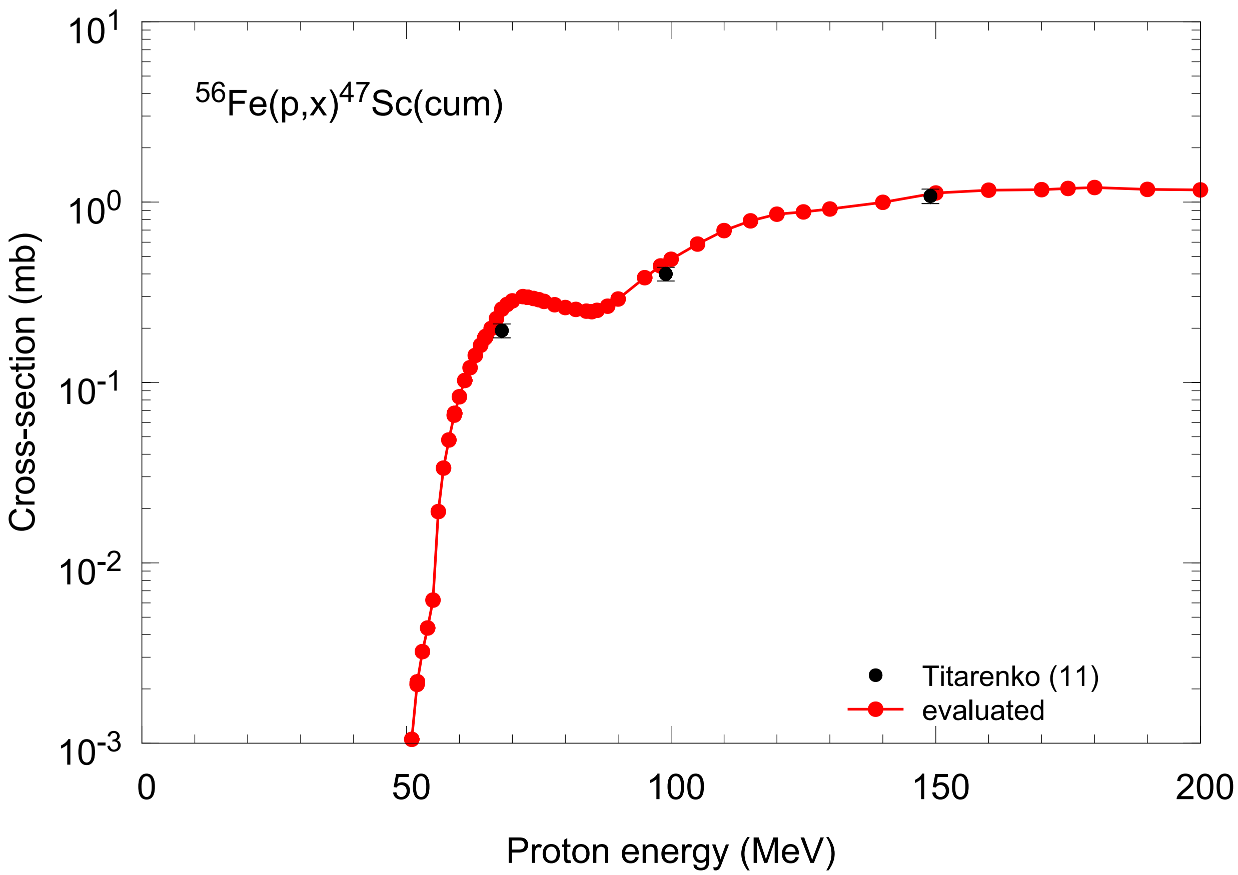
$^{56}Fe(p,x)^{43}Sc(cum)$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200



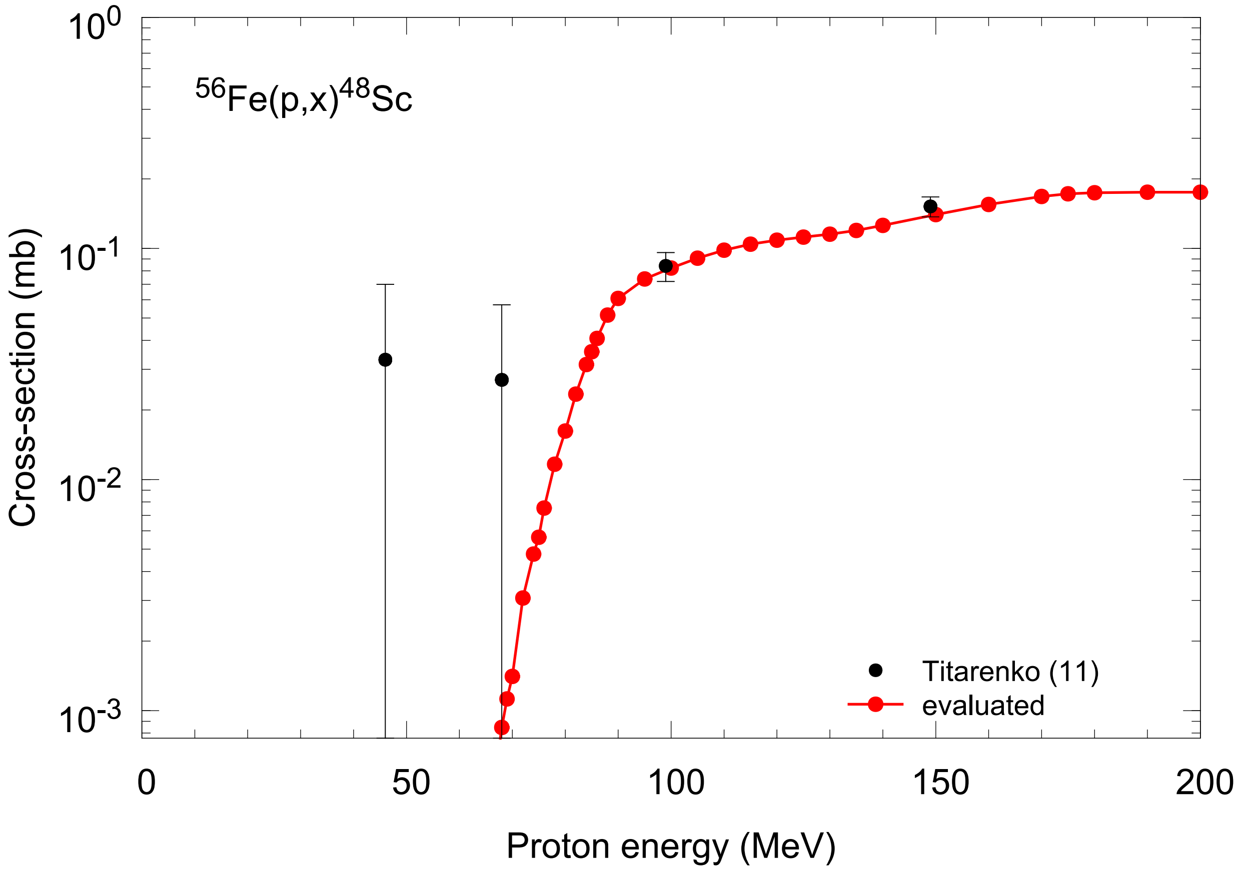
$^{56}Fe(p,x)^{44g}Sc$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated
10^{1}
10^{0}
10^{-1}
0
50
100
150
200



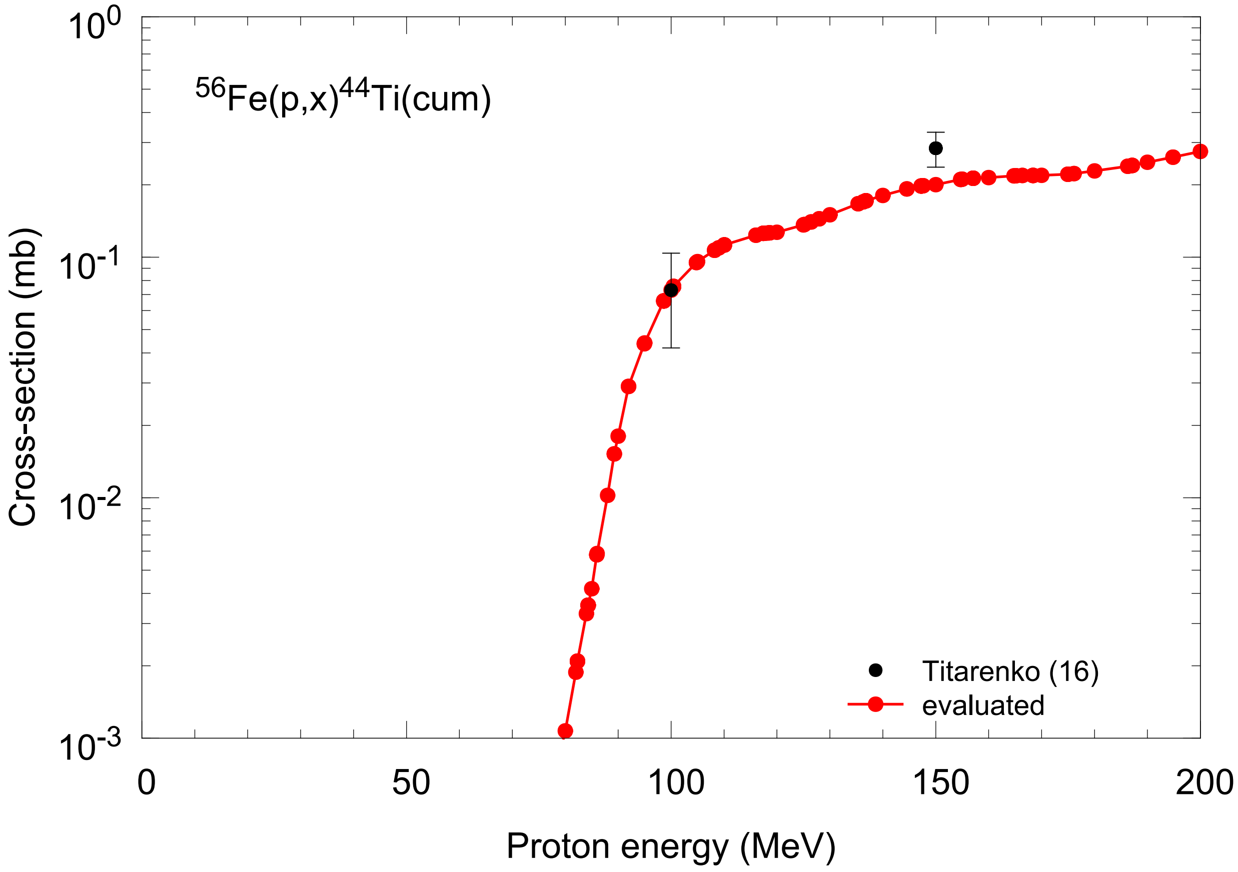
$^{56}Fe(p,x)^{44m1}Sc$
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200



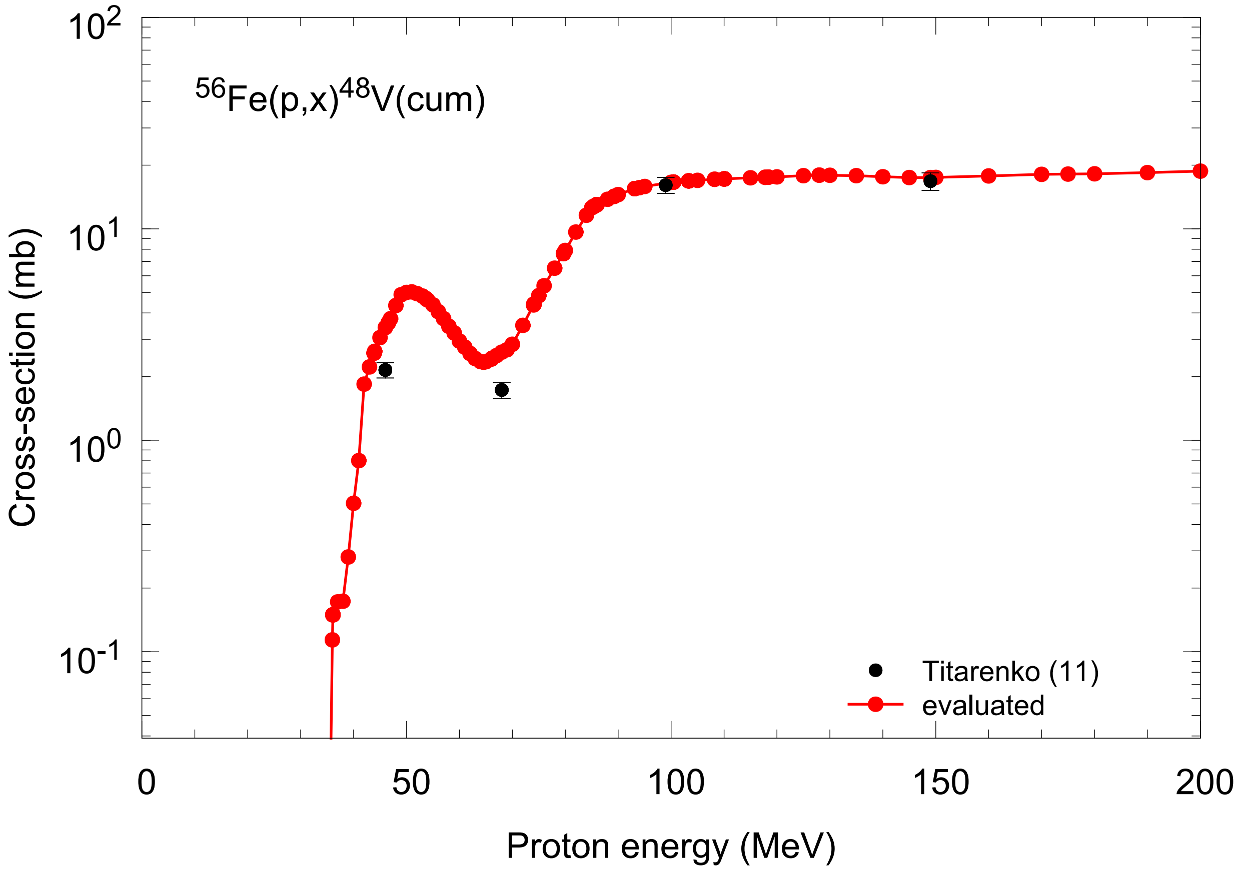
$^{56}Fe(p,x)^{47}Sc(cum)$
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200



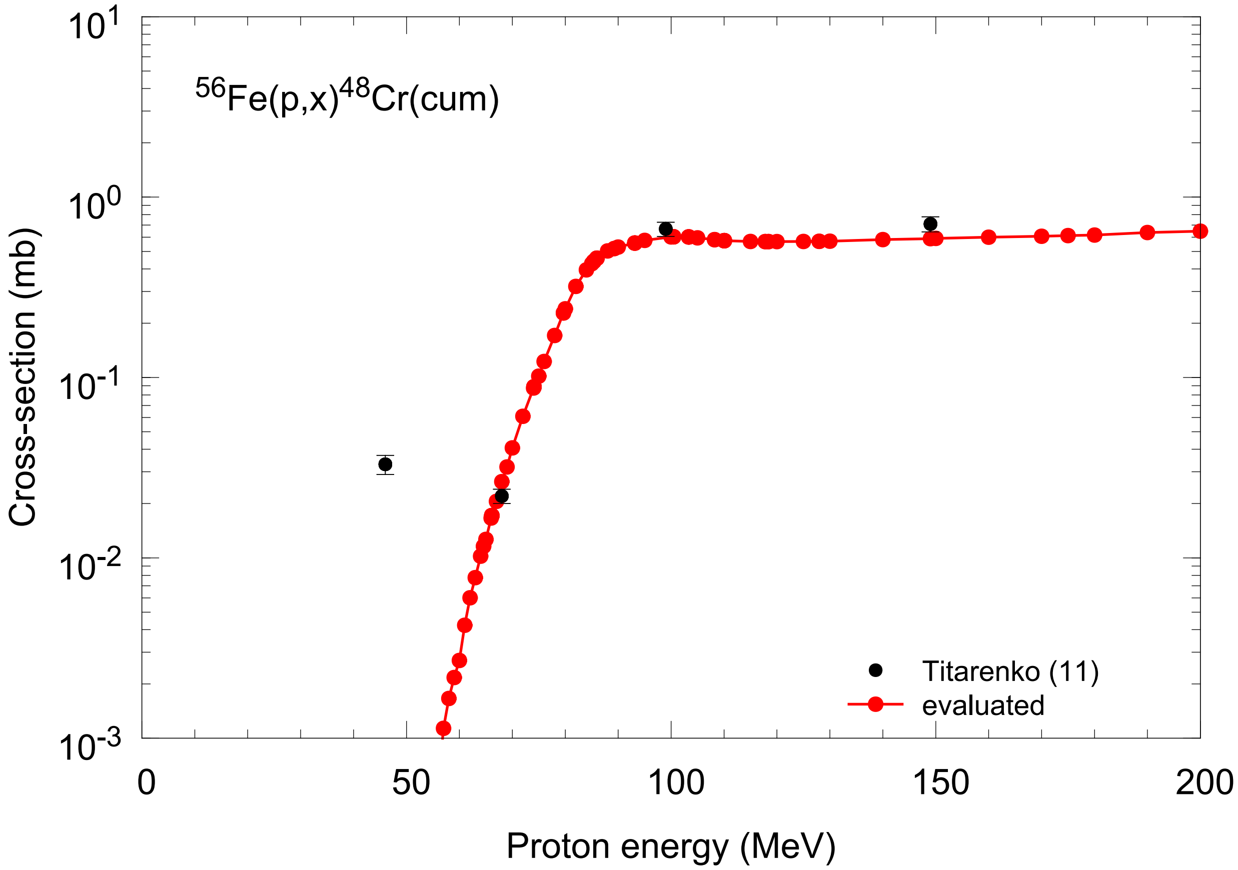
$^{56}Fe(p,x)^{48}Sc$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



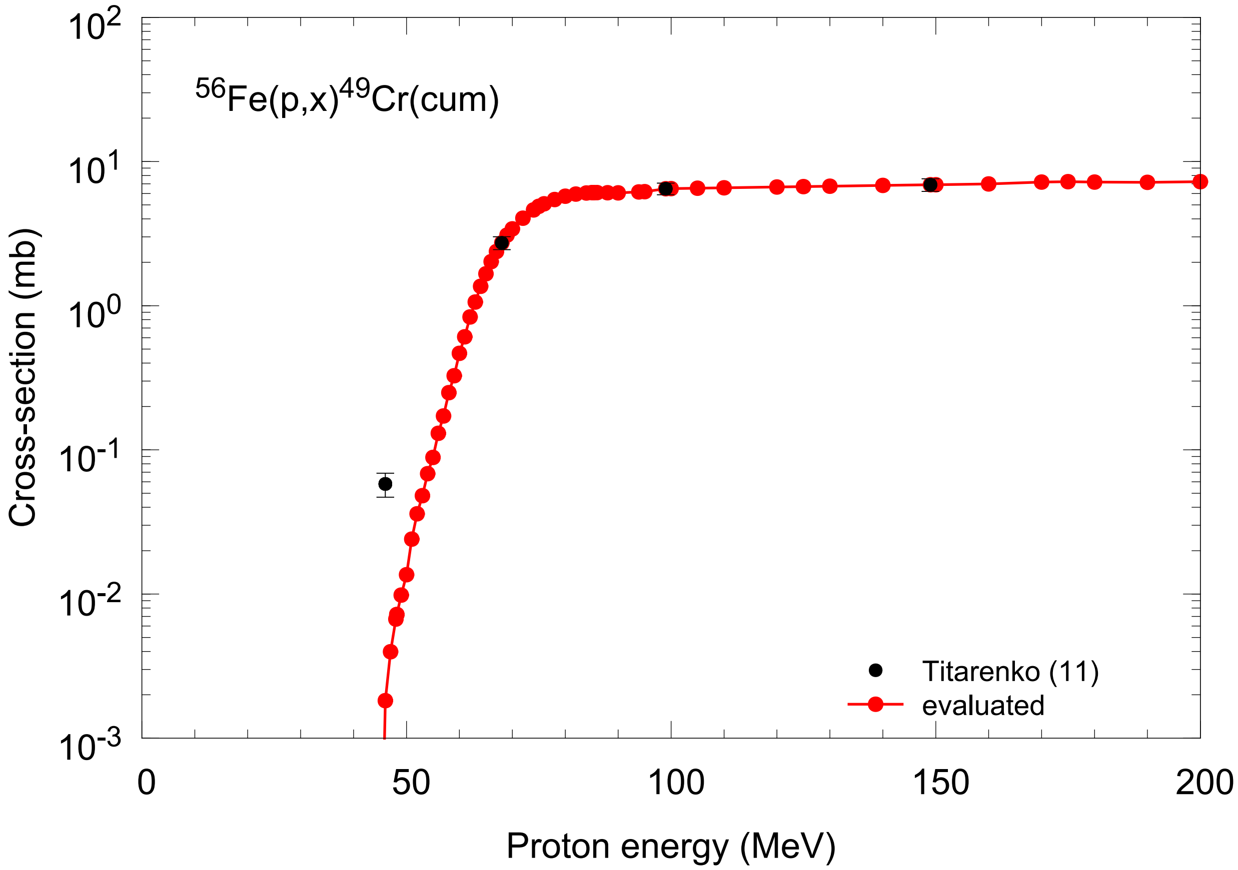
$^{56}Fe(p,x)^{44}Ti(cum)$
Cross-section (mb)
Proton energy (MeV)
Titarenko (16)
evaluated



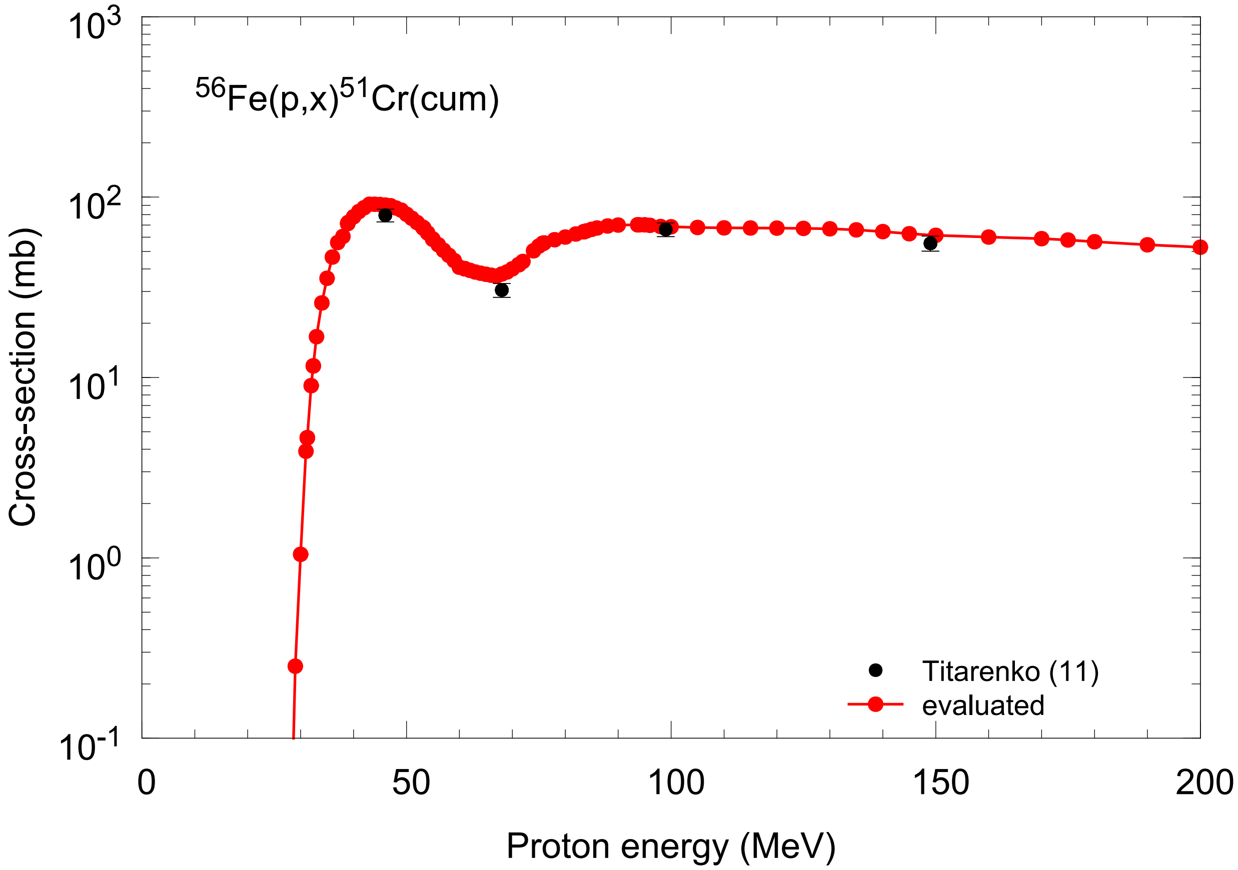
$^{56}Fe(p,x)^{48}V(cum)$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated



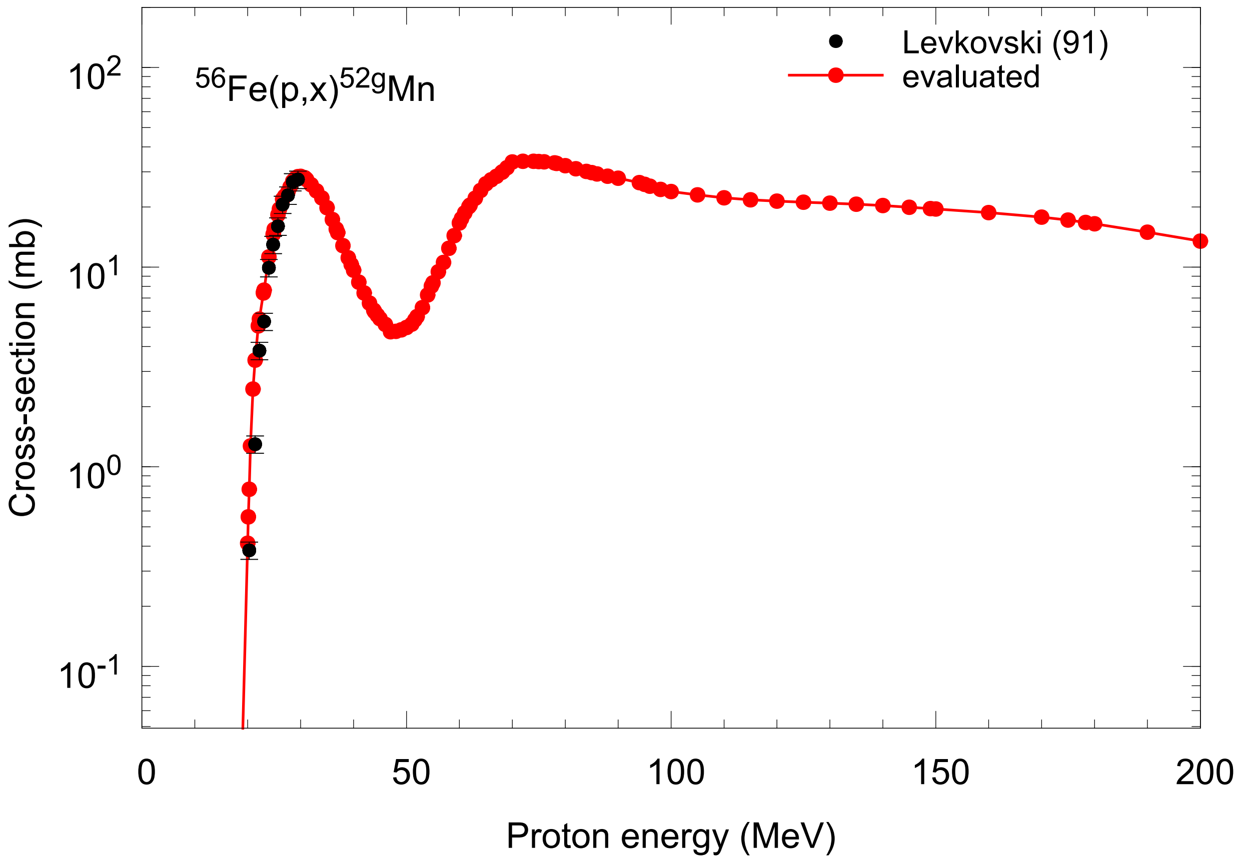
$^{56}Fe(p,x)^{48}Cr(cum)$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

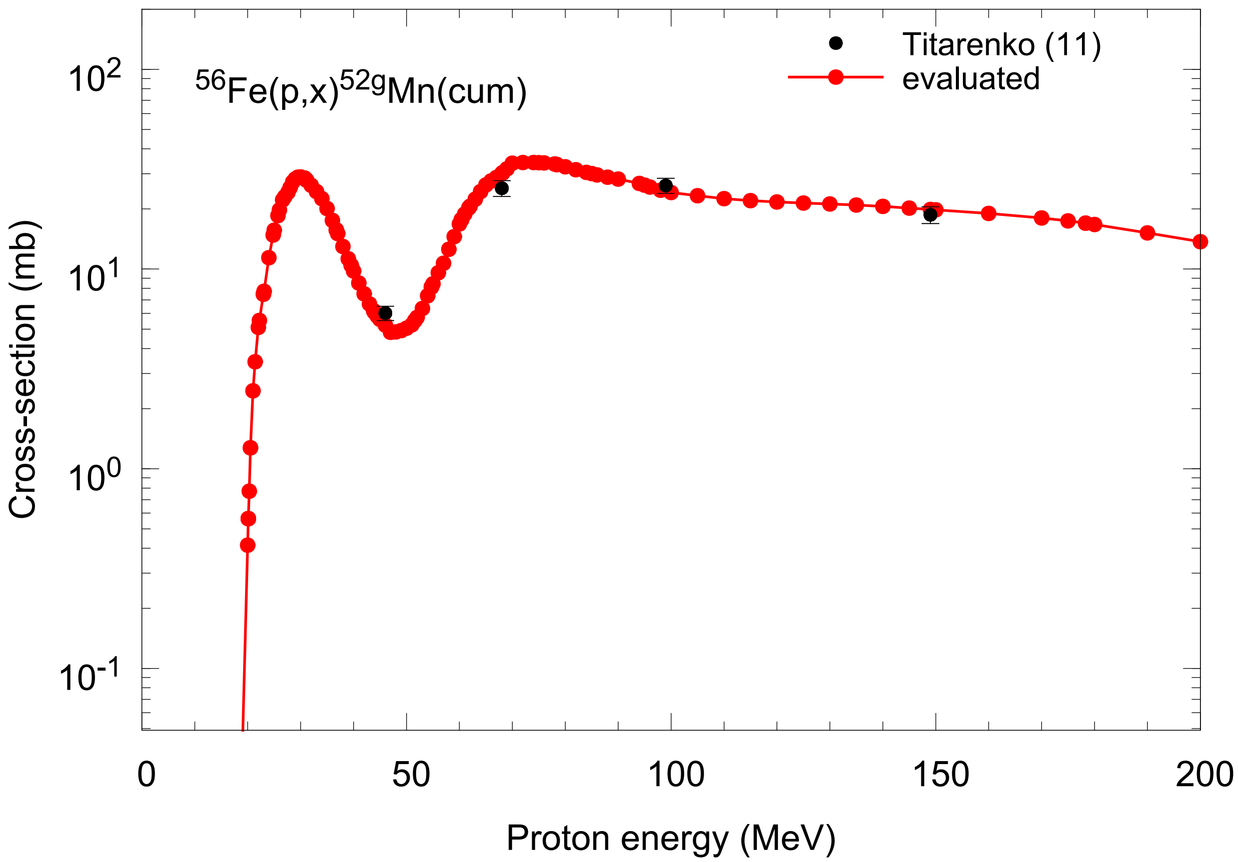


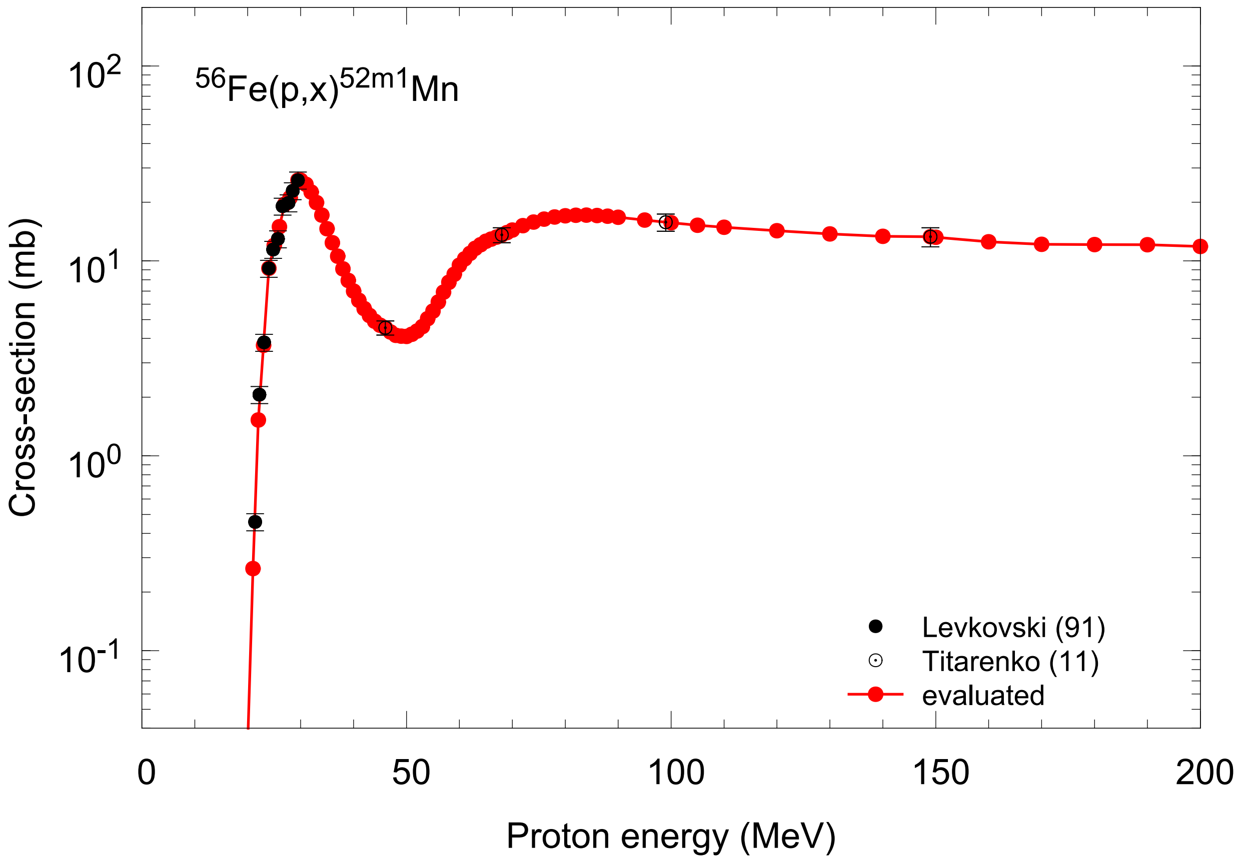
$^{56}Fe(p,x)^{49}Cr(cum)$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

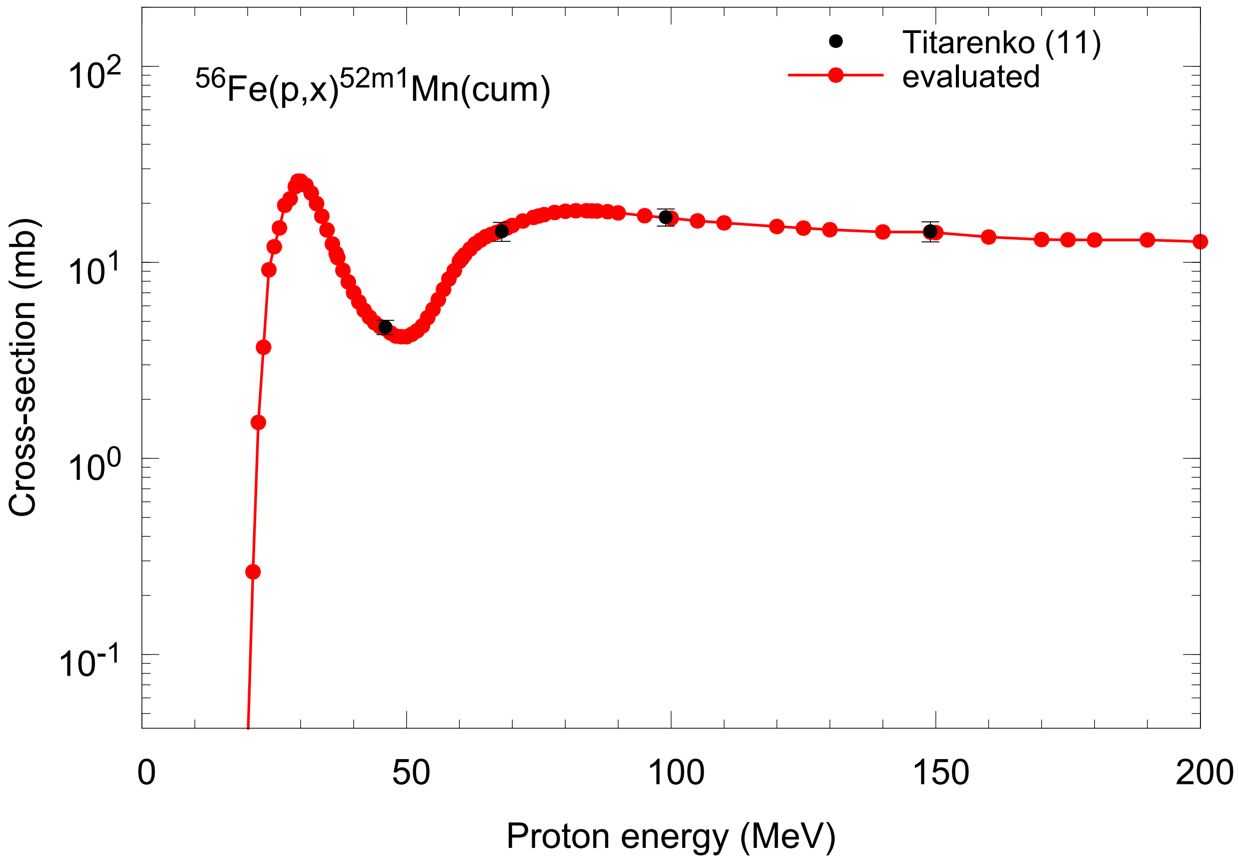


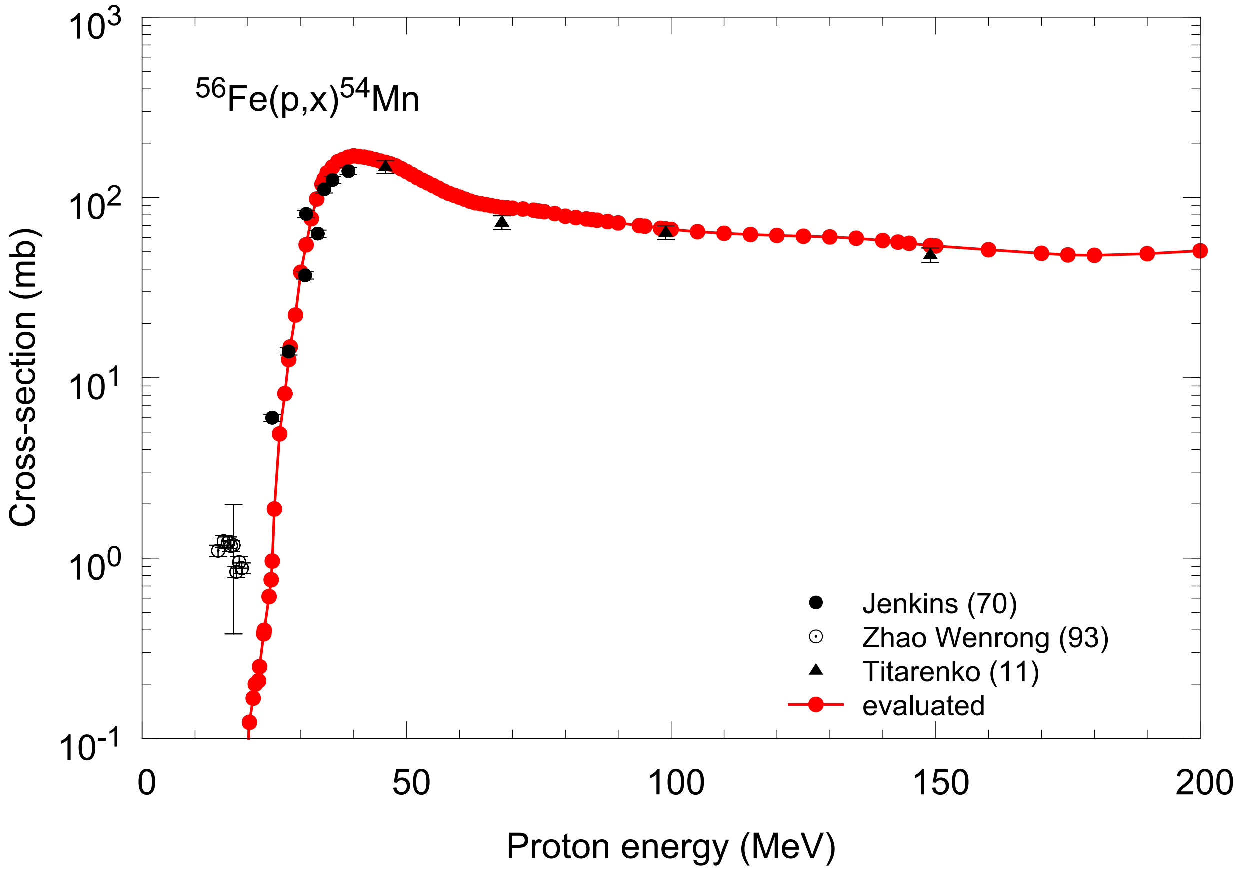
$^{56}Fe(p,x)^{51}Cr(cum)$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated


Levkovski (91)
evaluated
$^{56}Fe(p,x)^{52g}Mn$
Cross-section (mb)
Proton energy (MeV)

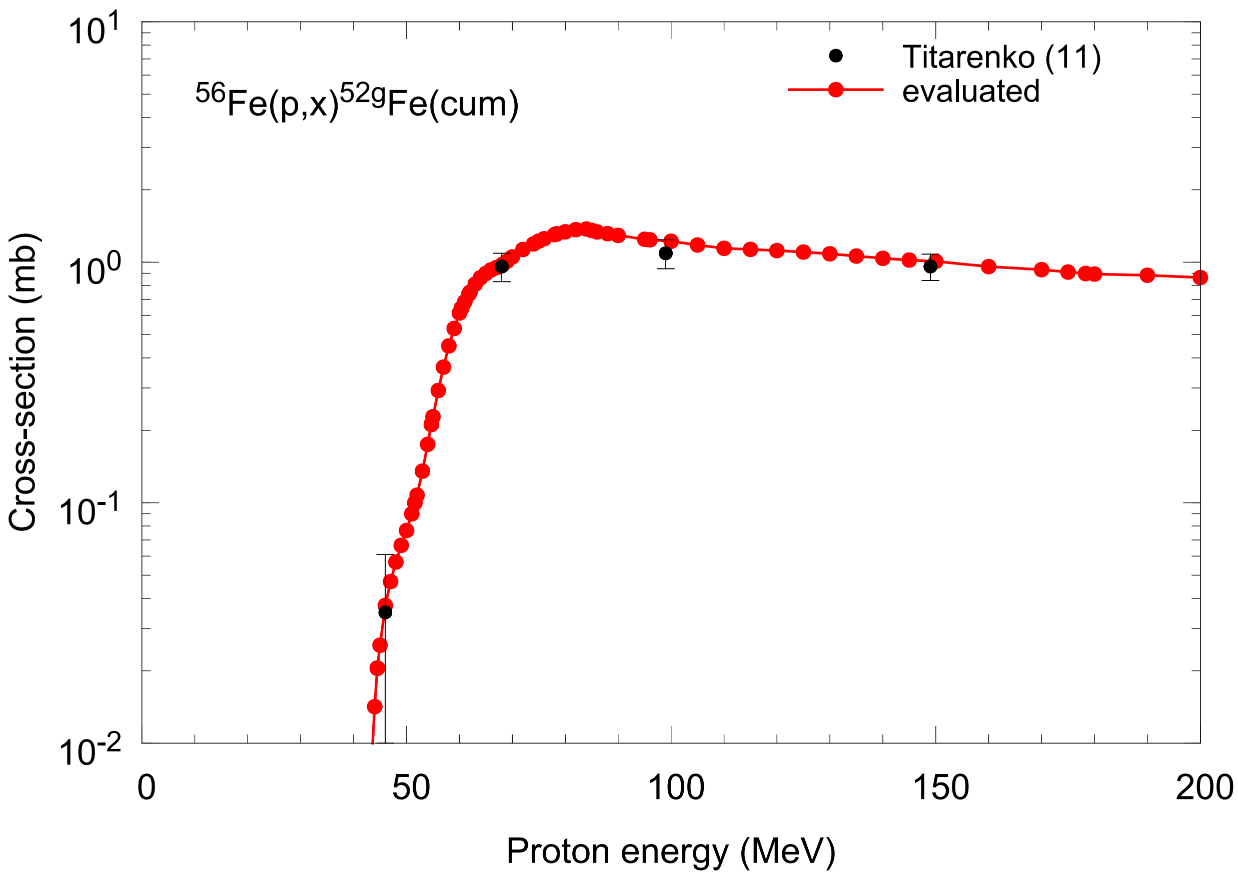

Titarenko (11)
evaluated
$^{56}Fe(p,x)^{52g}Mn(cum)$
Cross-section (mb)
Proton energy (MeV)


$^{56}Fe(p,x)^{52m1}Mn$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
Titarenko (11)
evaluated

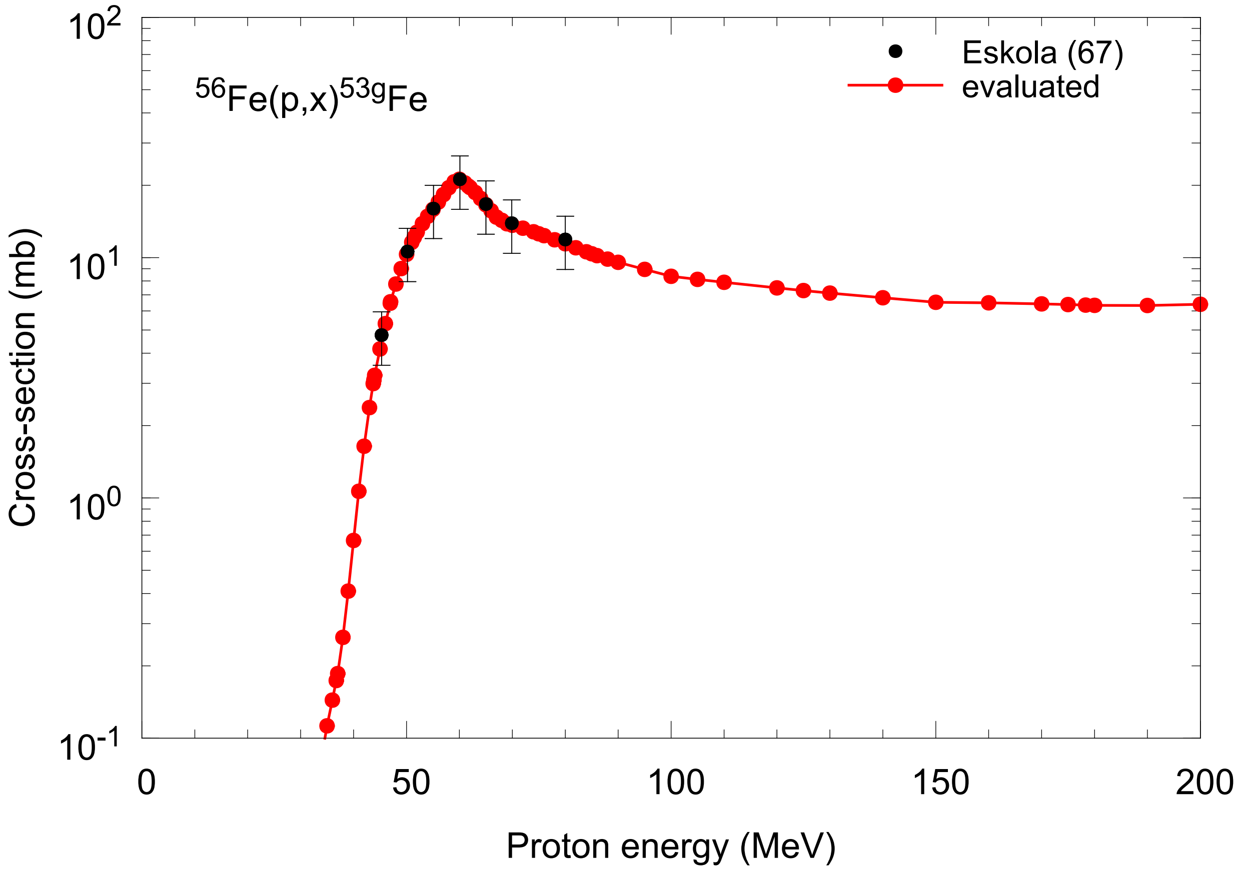

$^{56}Fe(p,x)^{52m1}Mn(cum)$
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

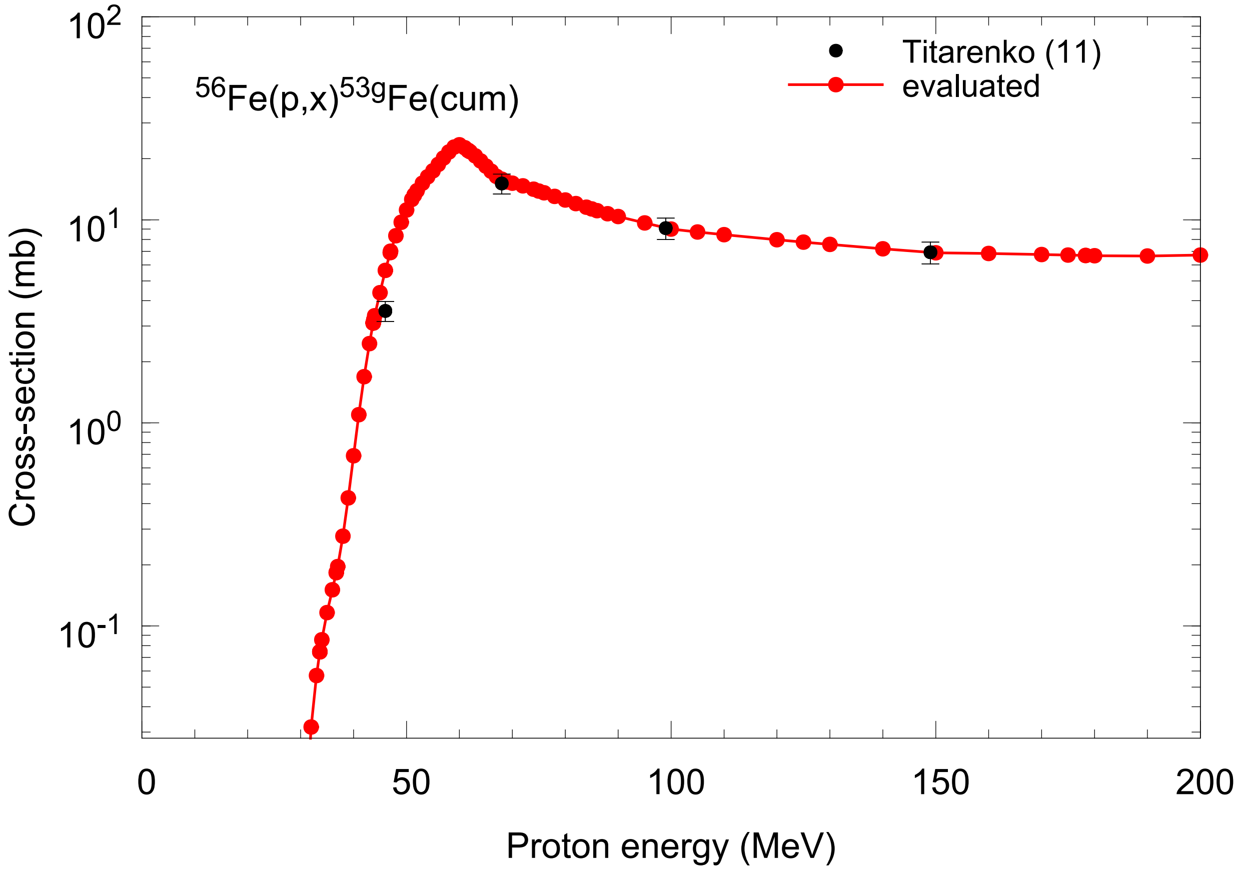


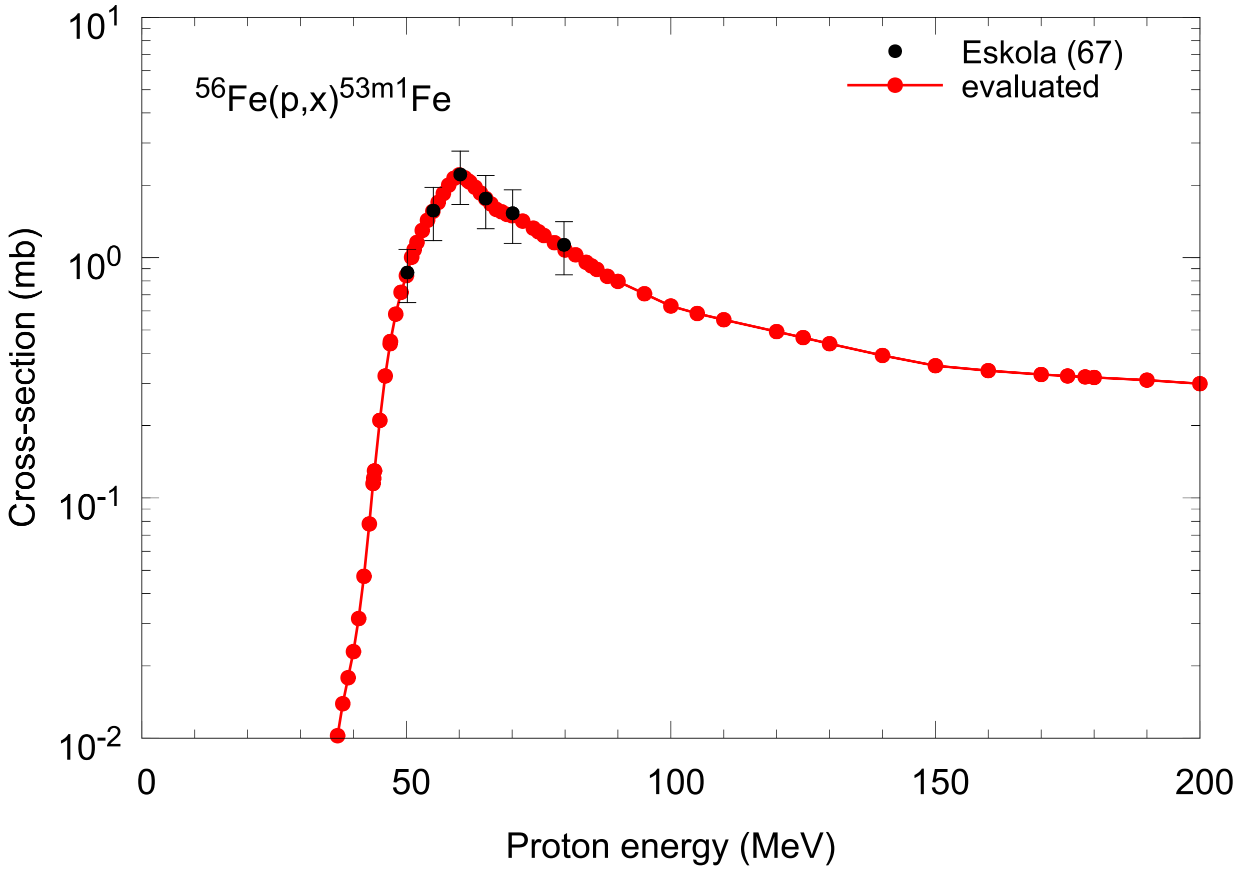
$^{56}Fe(p,x)^{54}Mn$
Jenkins (70)
Zhao Wenrong (93)
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)



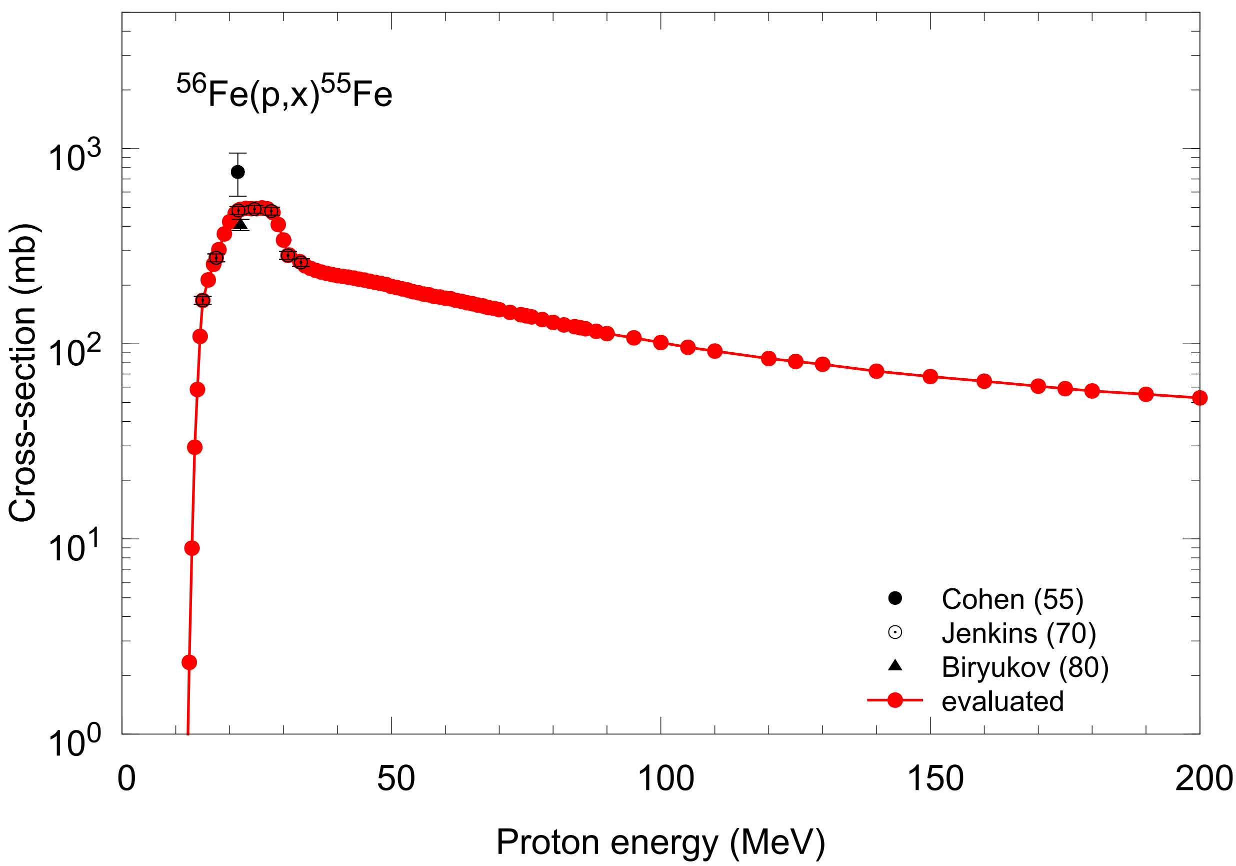
$^{56}Fe(p,x)^{52g}Fe(cum)$
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)


Eskola (67)
evaluated
$^{56}Fe(p,x)^{53g}Fe$
Cross-section (mb)
Proton energy (MeV)
10^2
10^1
10^0
10^{-1}
0
50
100
150
200

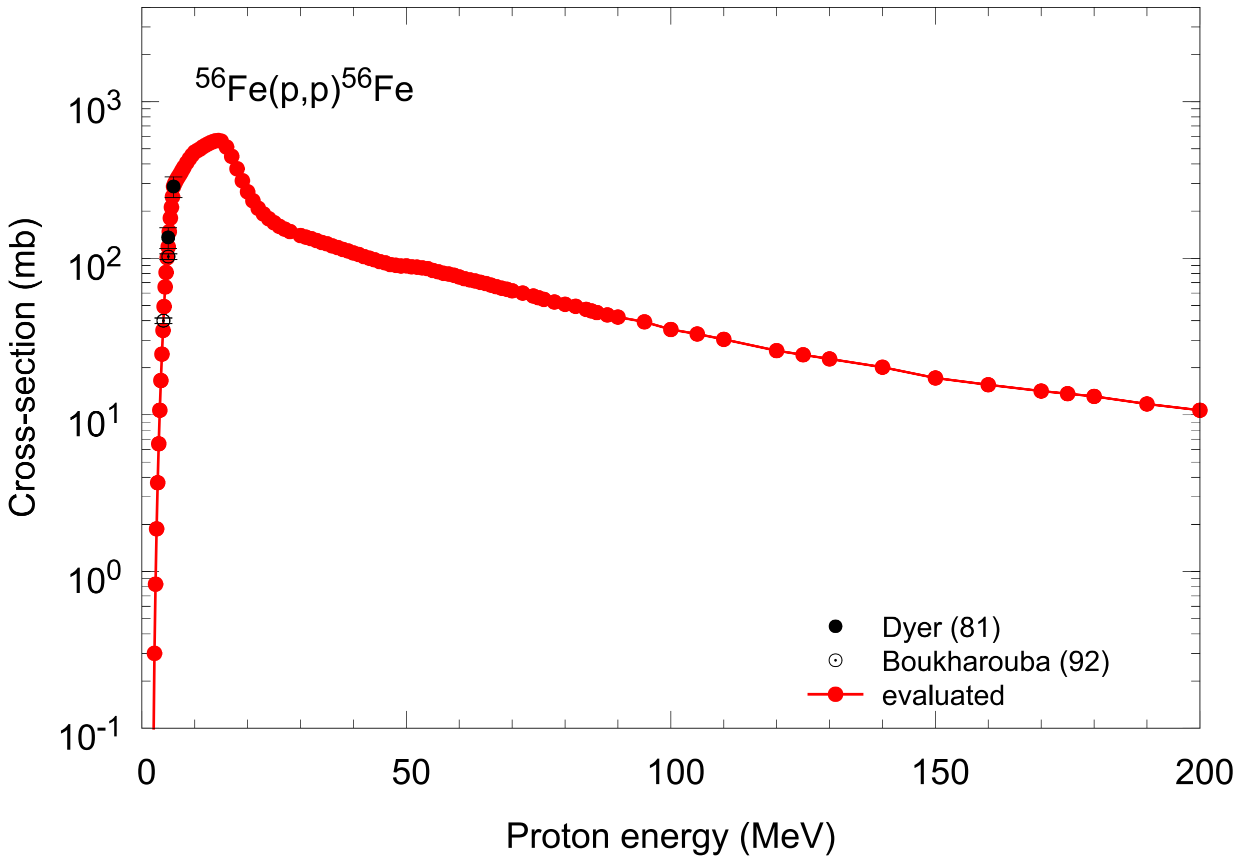

Titarenko (11)
evaluated
$^{56}Fe(p,x)^{53g}Fe(cum)$
Cross-section (mb)
Proton energy (MeV)
10^2
10^1
10^0
10^{-1}
0
50
100
150
200

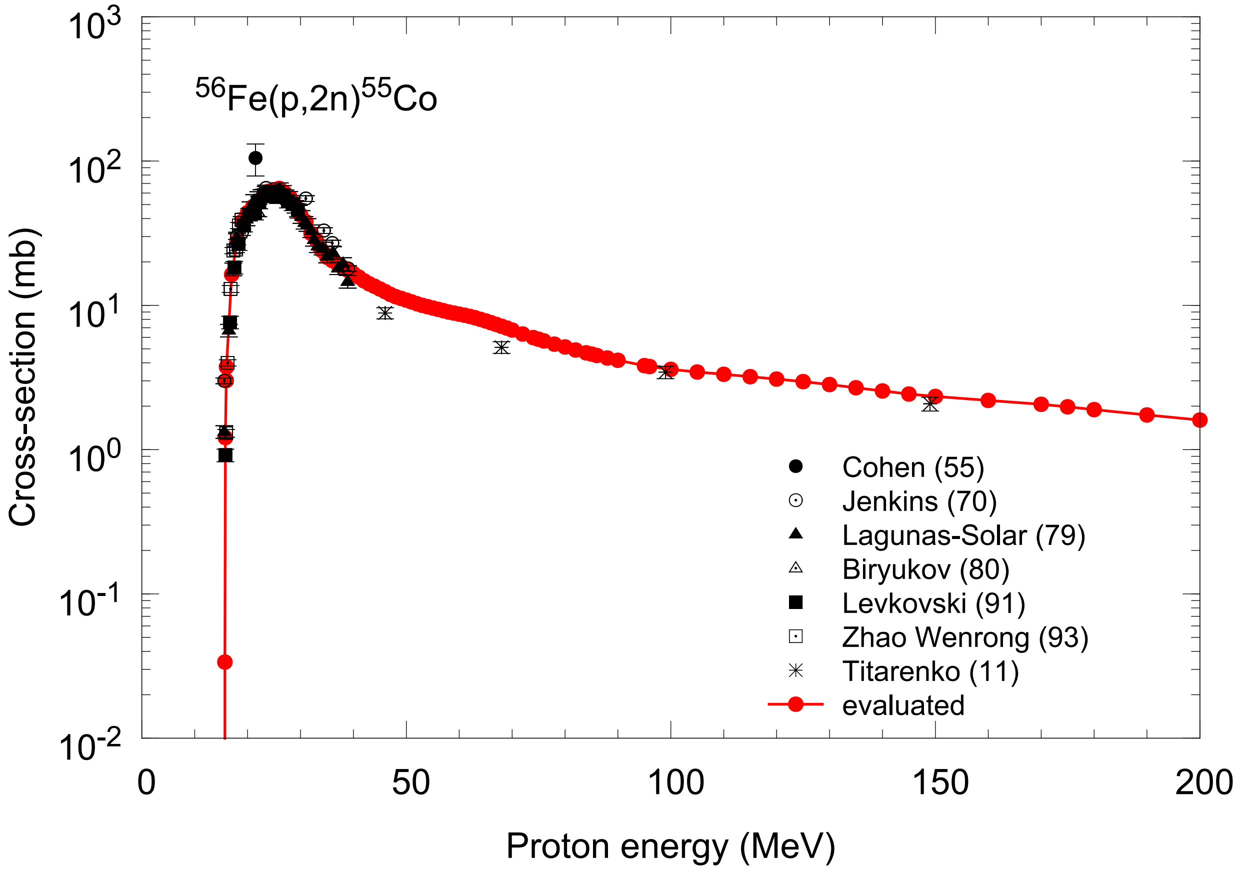


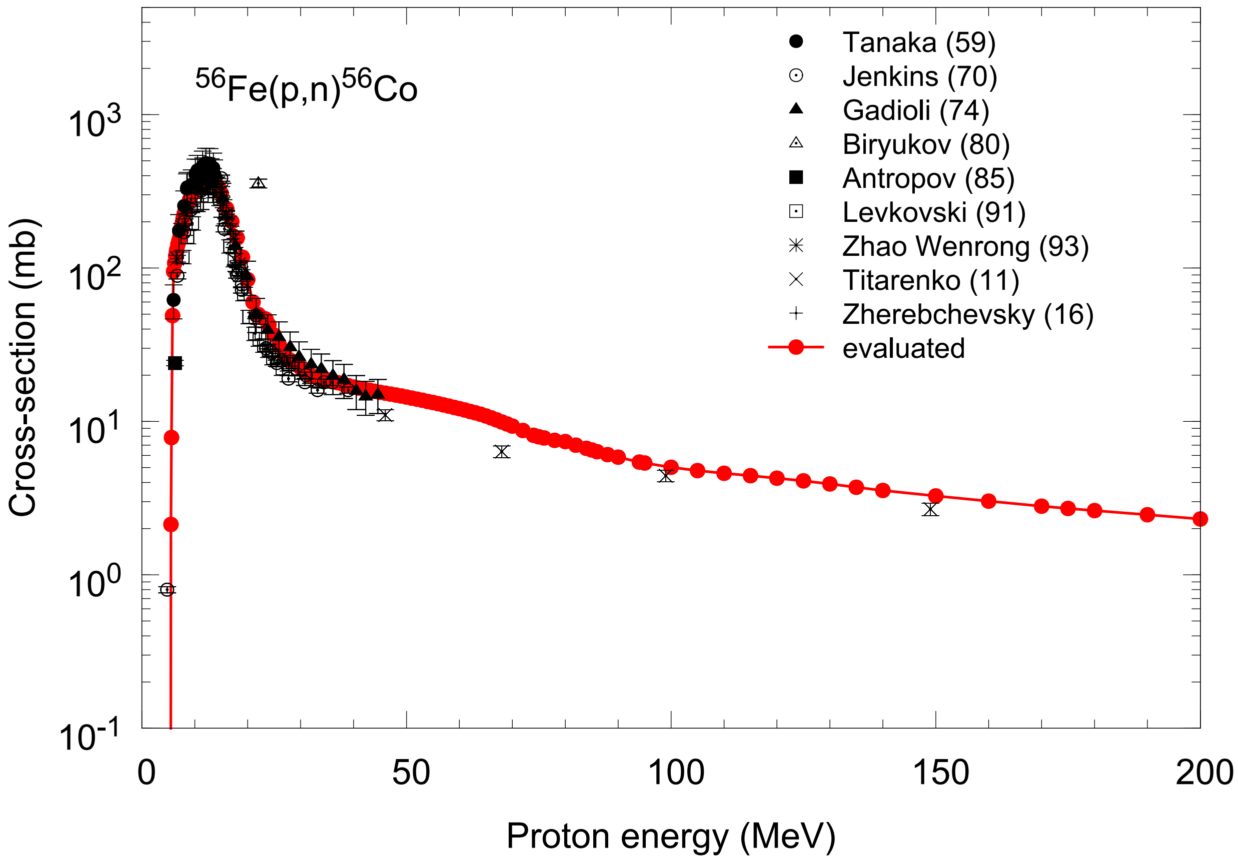
$^{56}Fe(p,x)^{53m1}Fe$
Eskola (67)
evaluated
Cross-section (mb)
Proton energy (MeV)

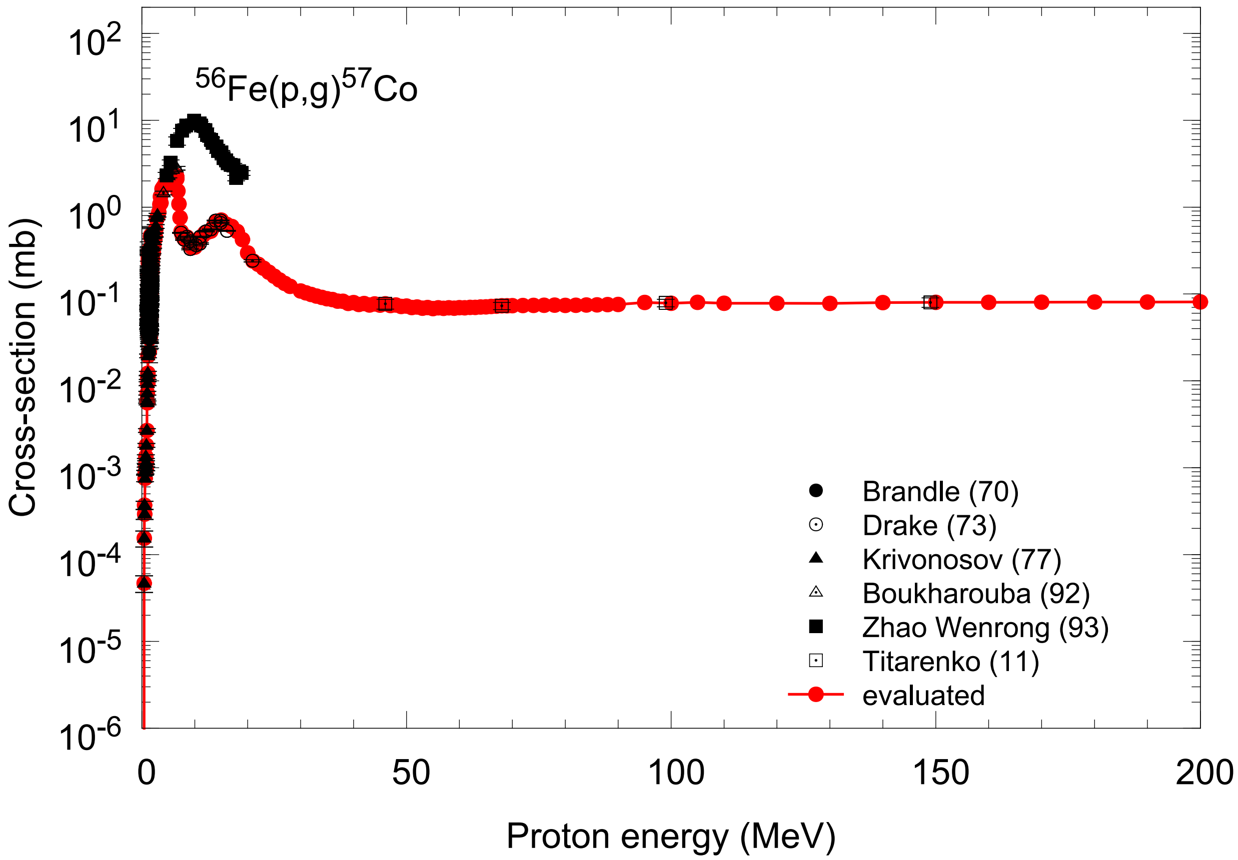


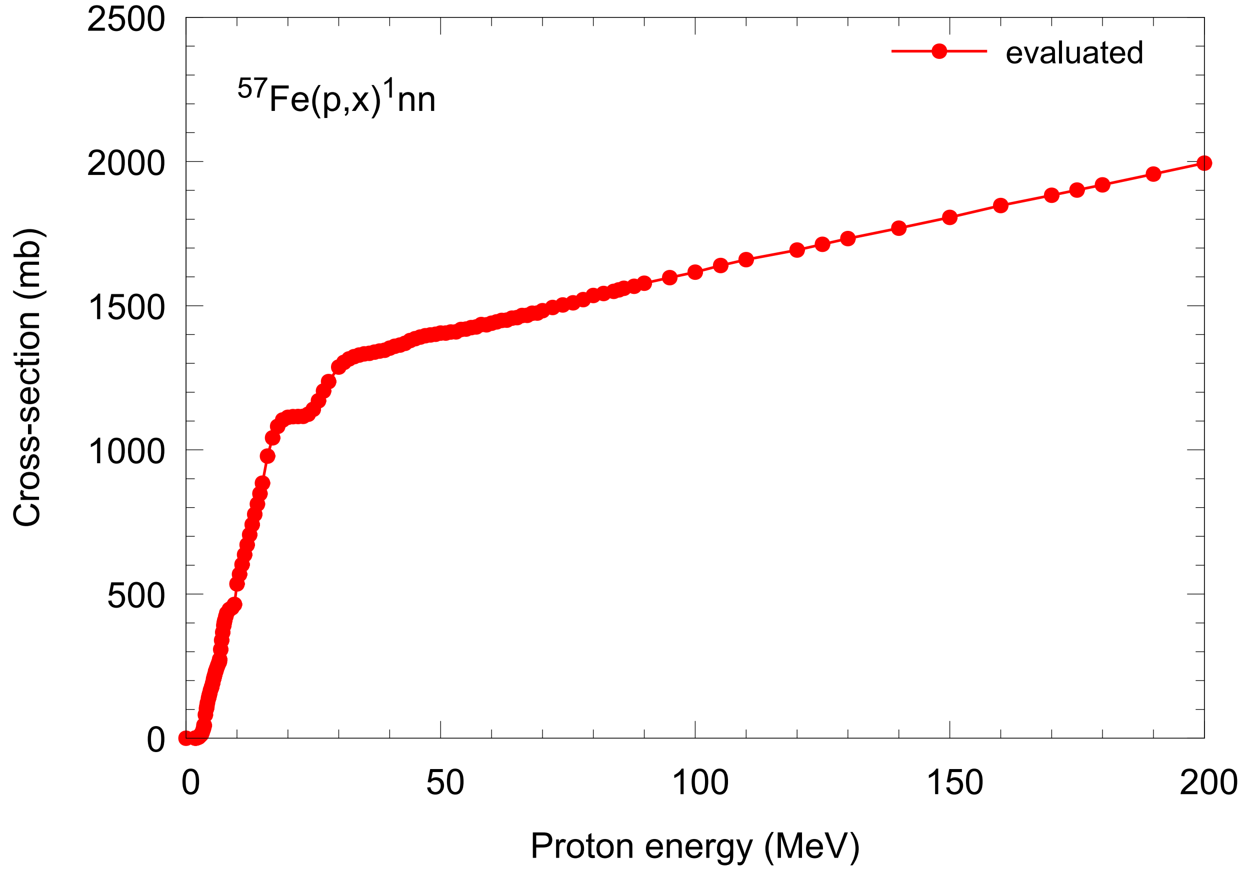
$^{56}Fe(p,x)^{55}Fe$
Cohen (55)
Jenkins (70)
Biryukov (80)
evaluated
Cross-section (mb)
Proton energy (MeV)


$^{56}Fe(p,p)^{56}Fe$
Cross-section (mb)
Proton energy (MeV)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Dyer (81)
Boukharouba (92)
evaluated

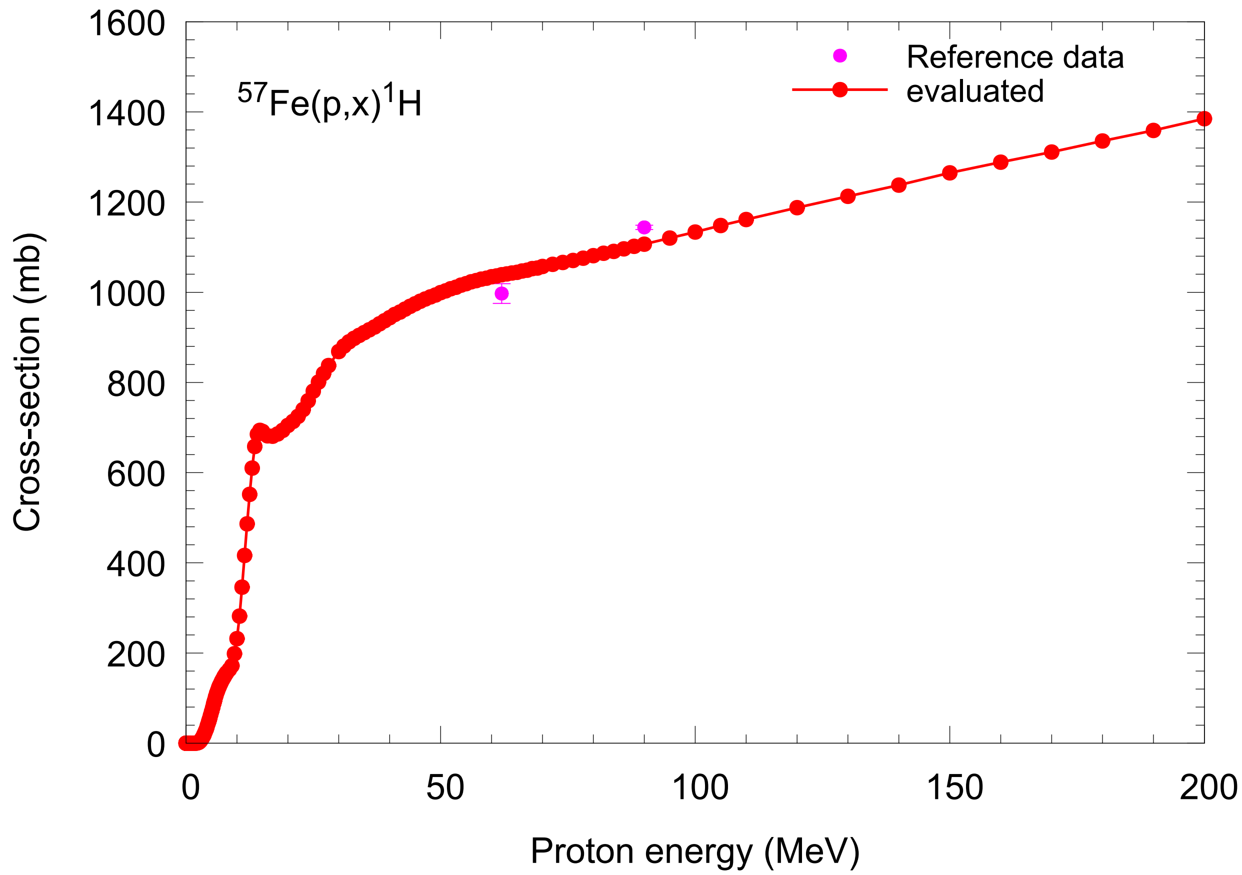

$^{56}Fe(p,2n)^{55}Co$
Cross-section (mb)
Proton energy (MeV)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Cohen (55)
Jenkins (70)
Lagunas-Solar (79)
Biryukov (80)
Levkovski (91)
Zhao Wenrong (93)
Titarenko (11)
evaluated


$^{56}Fe(p,n)^{56}Co$
Tanaka (59)
Jenkins (70)
Gadioli (74)
Biryukov (80)
Antropov (85)
Levkovski (91)
Zhao Wenrong (93)
Titarenko (11)
Zherebchevsky (16)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
0
50
100
150
200

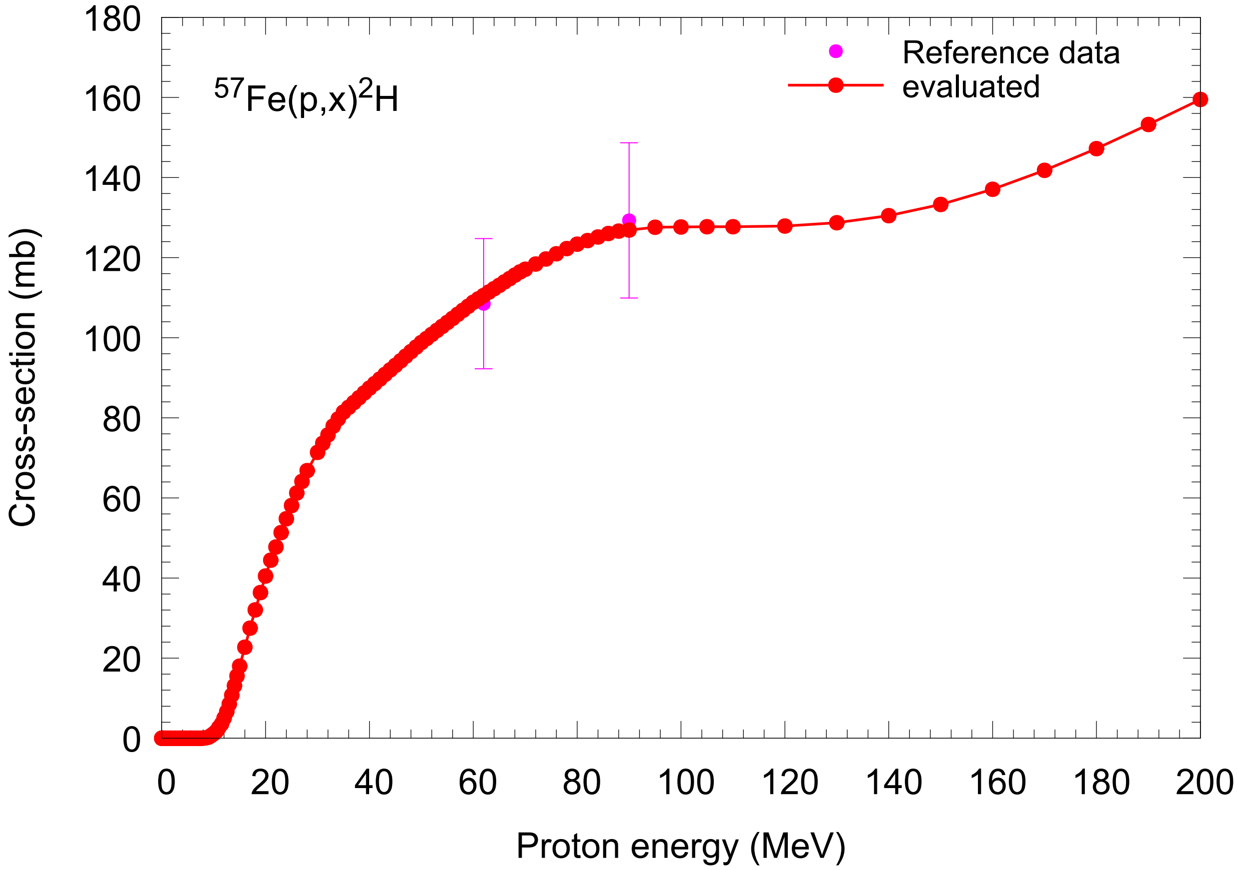

$^{56}Fe(p,g)^{57}Co$
Brandle (70)
Drake (73)
Krivonosov (77)
Boukharouba (92)
Zhao Wenrong (93)
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
0
50
100
150
200

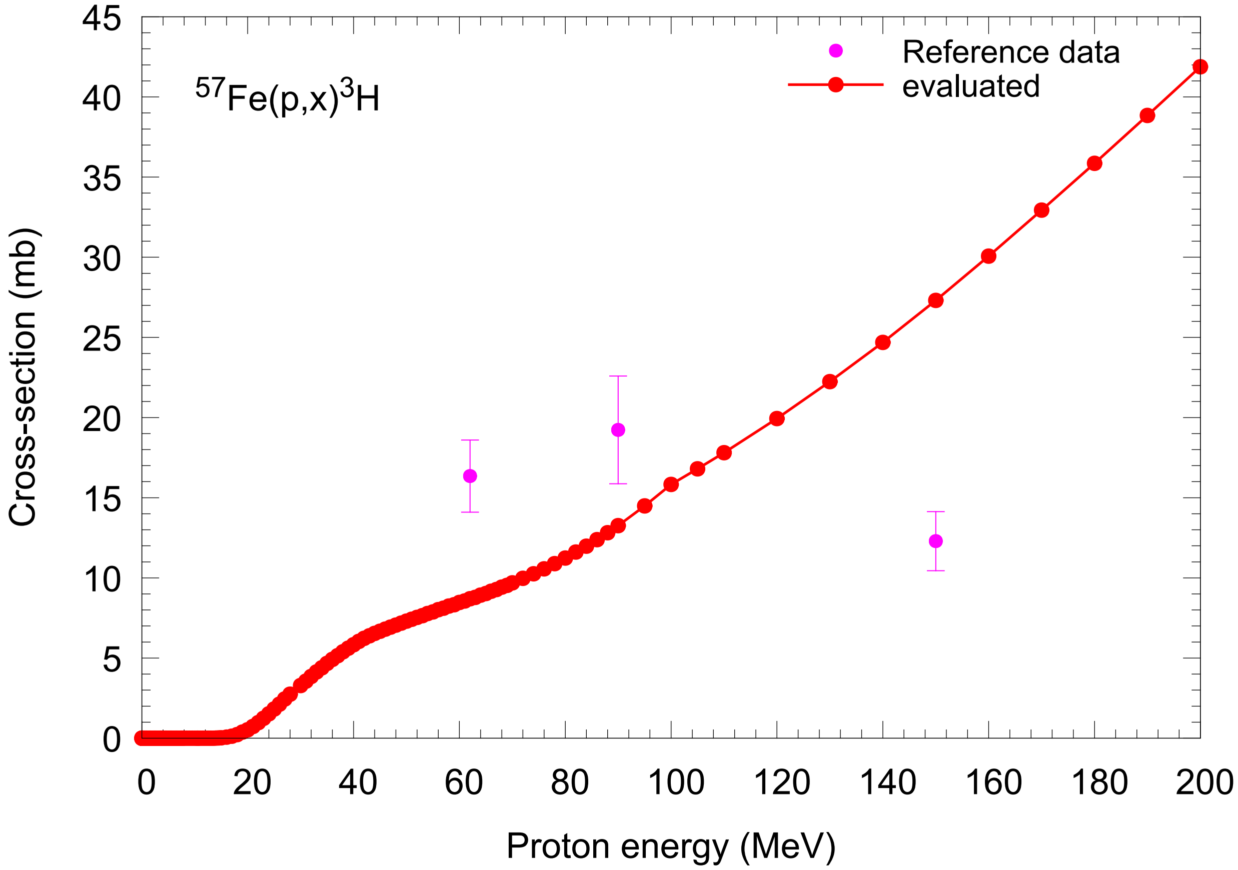


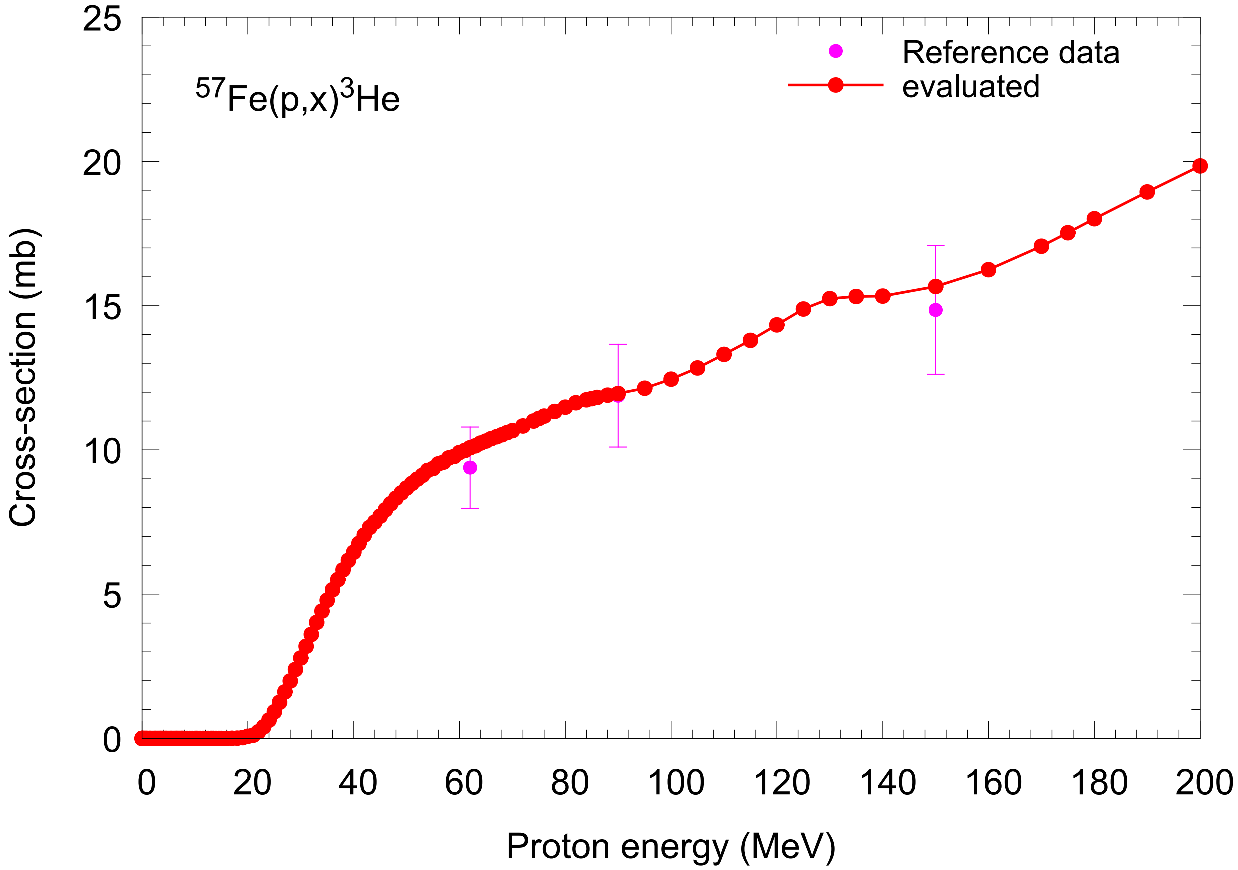
$^{57}Fe(p,x)^{1}nn$
evaluated
Cross-section (mb)
Proton energy (MeV)
2500
2000
1500
1000
500
0
0
50
100
150
200



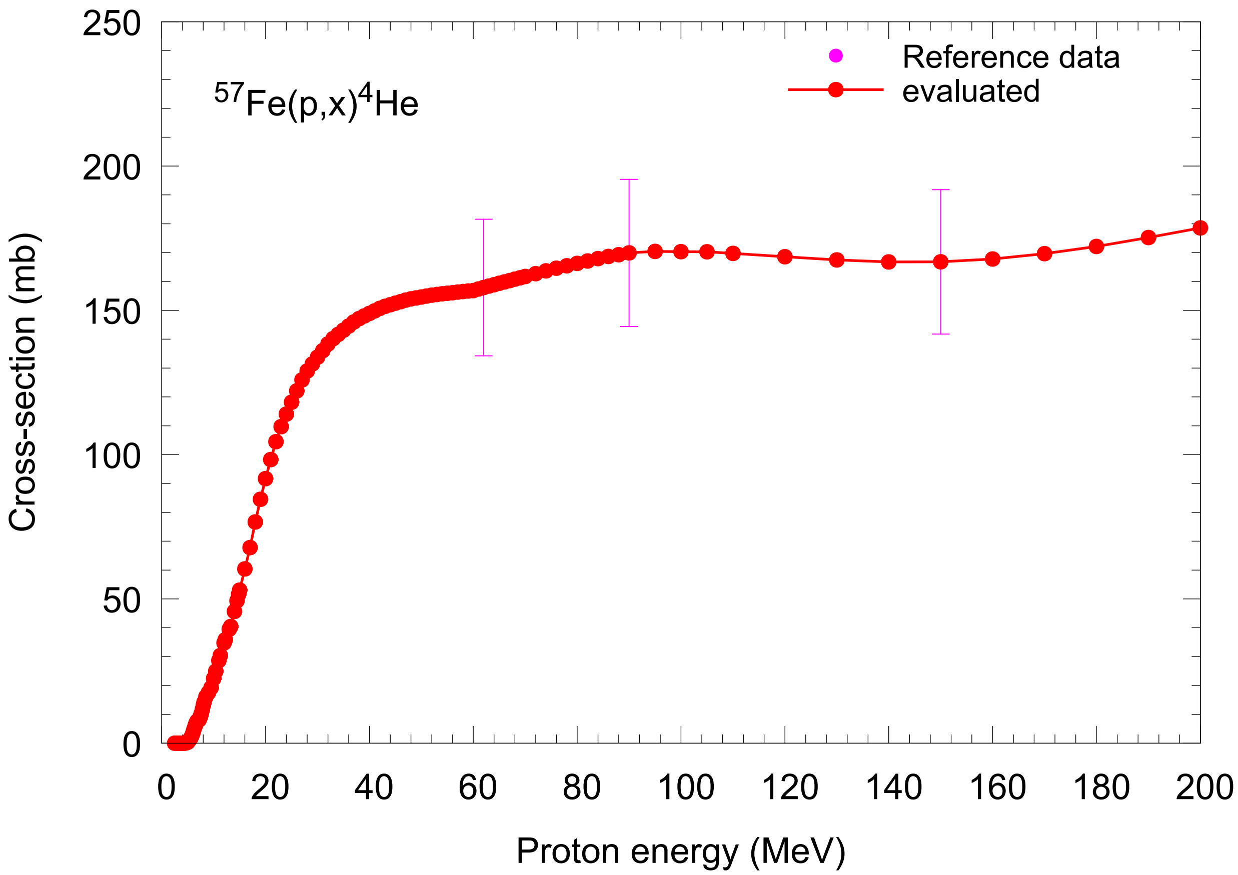
$^{57}Fe(p,x)^{1}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200


$^{57}Fe(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
200

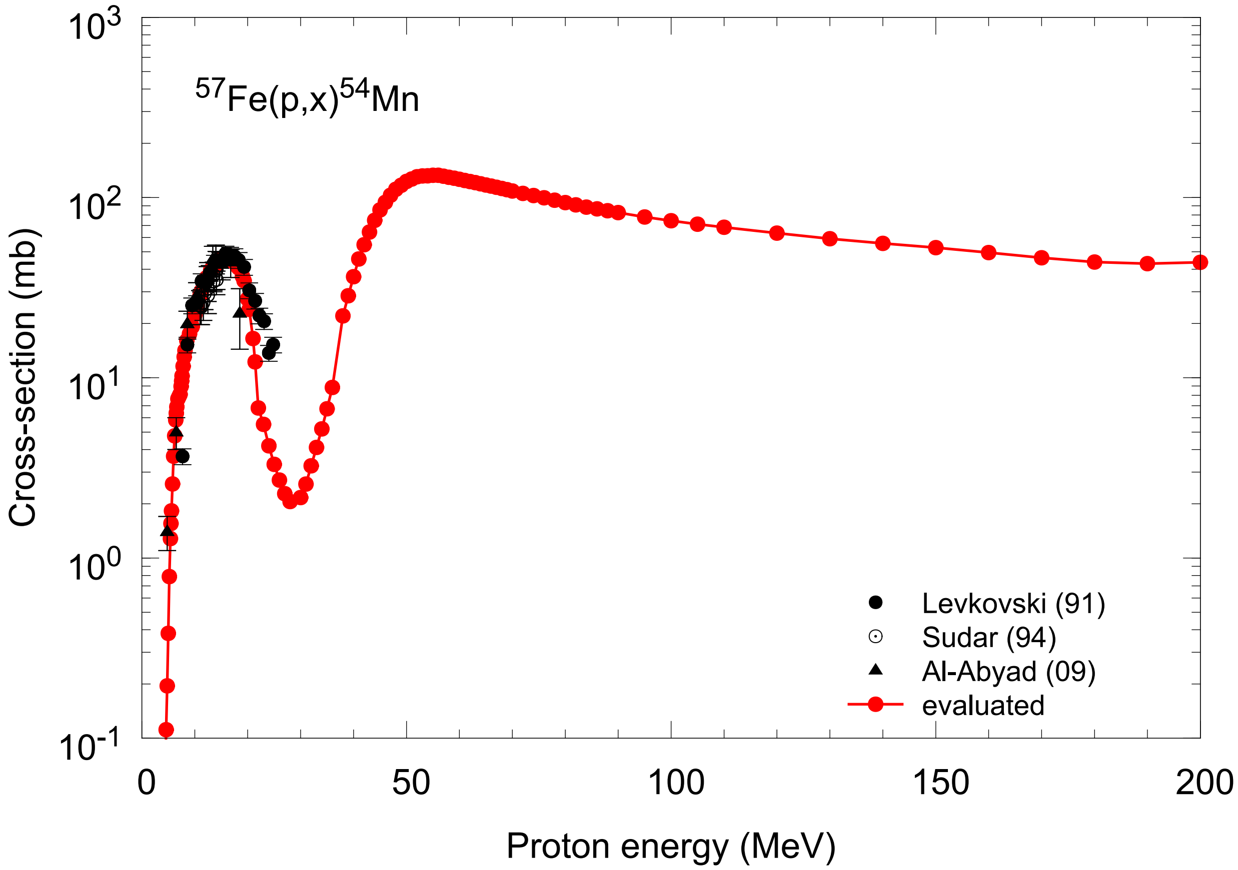

$^{57}Fe(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
40
45
60
80
100
120
140
160
180
200



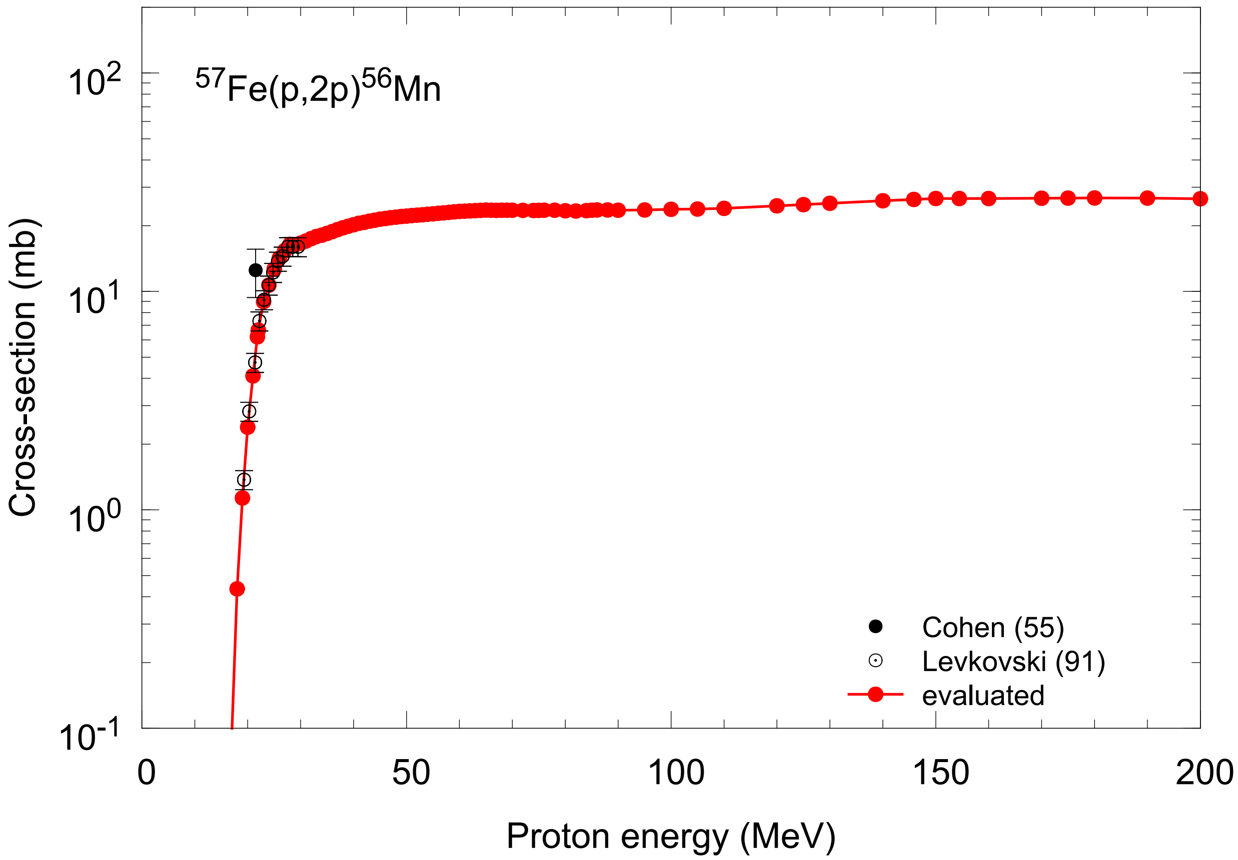
$^{57}Fe(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
0
20
40
60
80
100
120
140
160
180
200



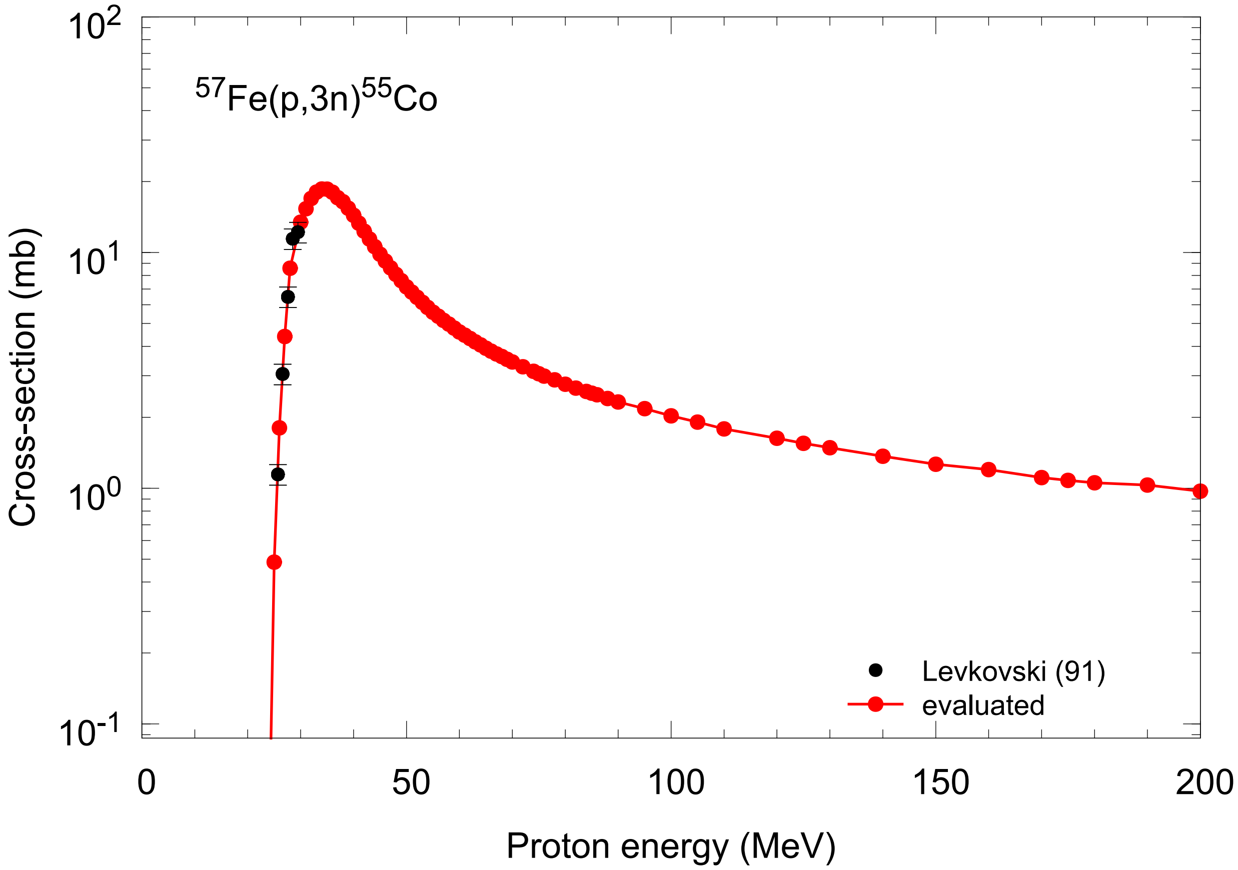
$^{57}Fe(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
0
20
40
60
80
100
120
140
160
180
200

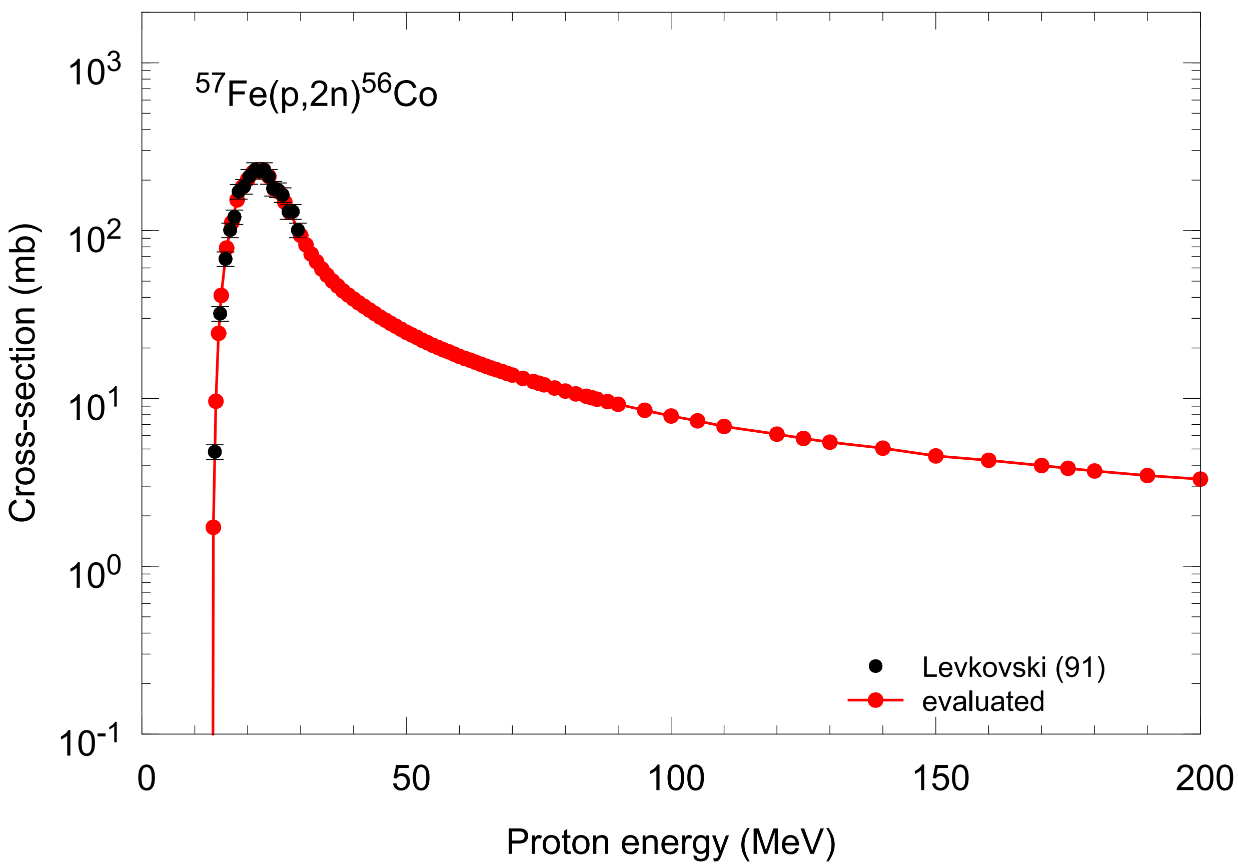


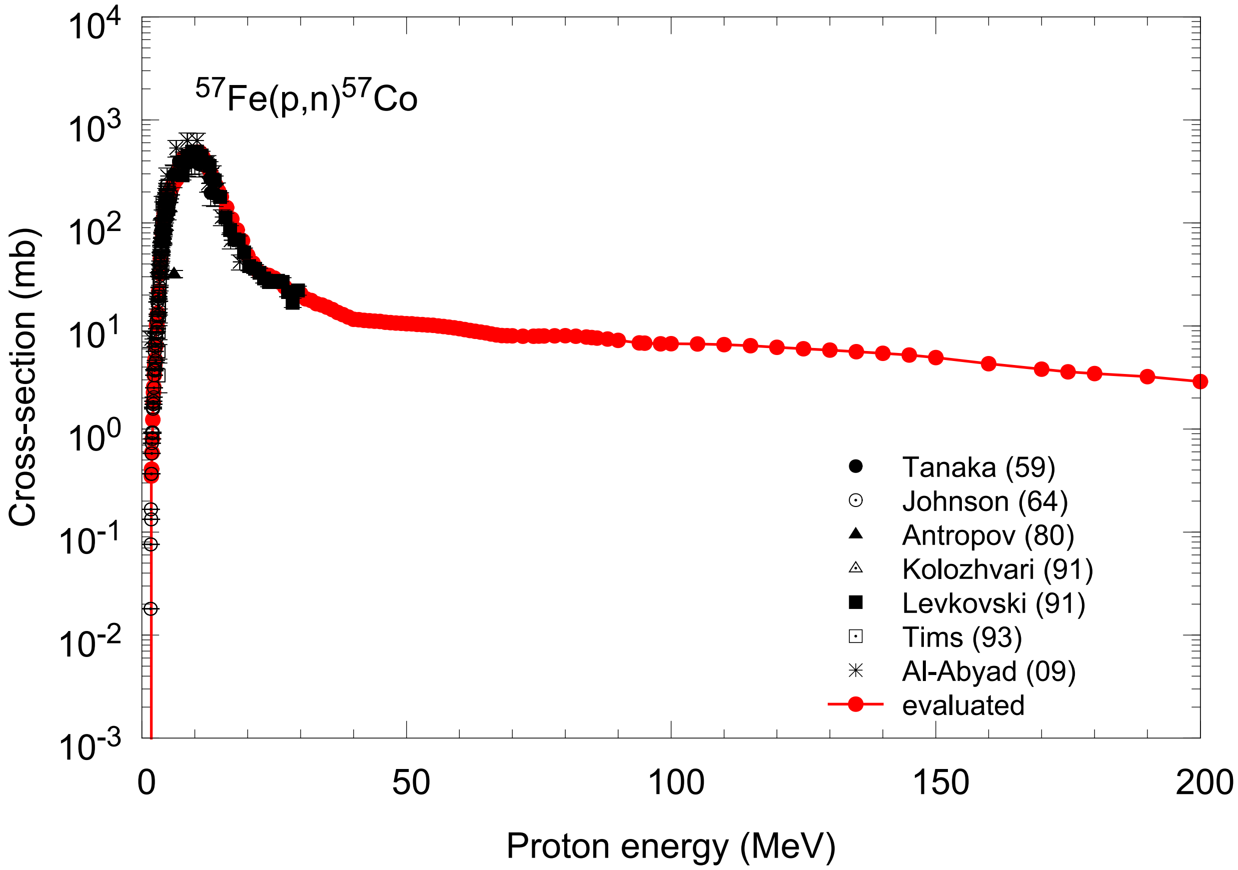
$^{57}Fe(p,x)^{54}Mn$
Cross-section (mb)
Proton energy (MeV)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Levkovski (91)
Sudar (94)
Al-Abyad (09)
evaluated



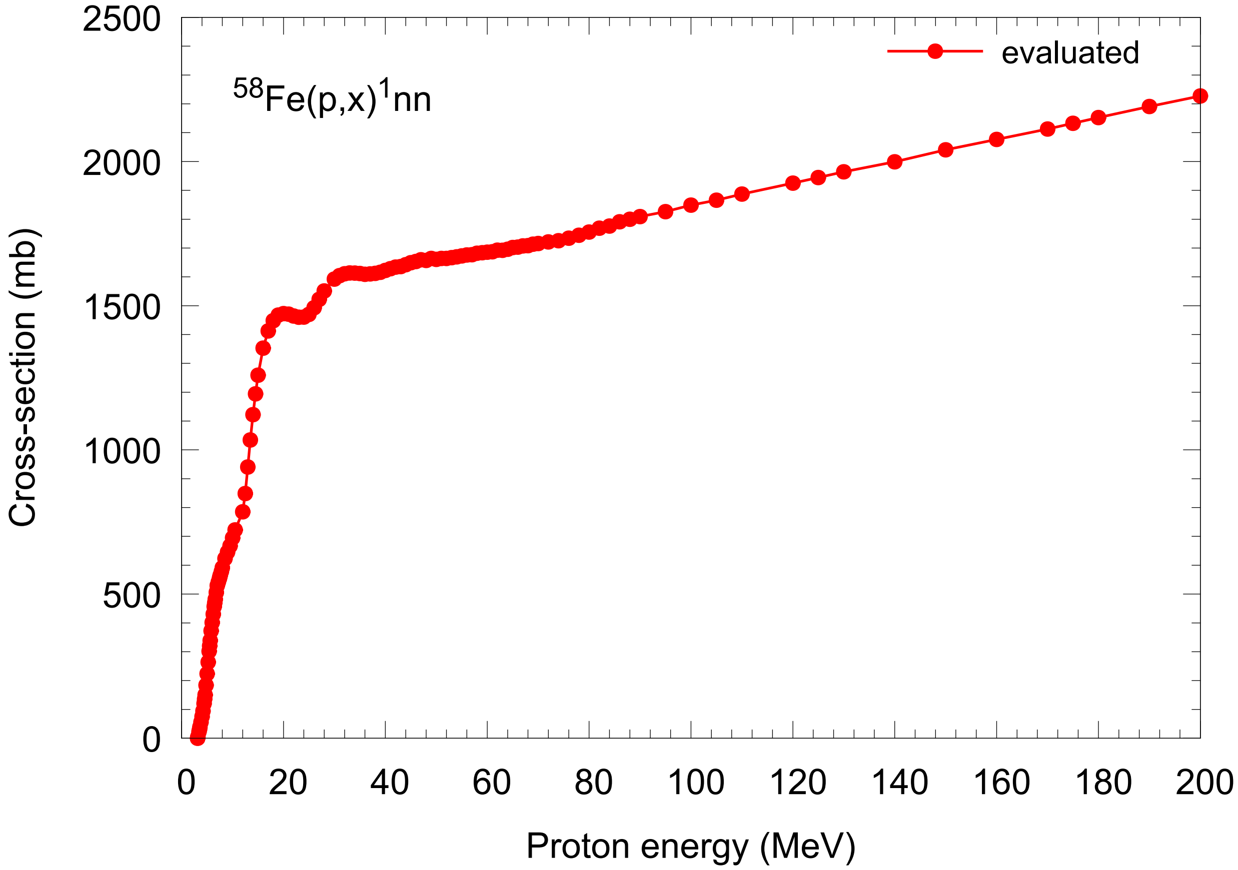
$^{57}Fe(p,2p)^{56}Mn$
Cross-section (mb)
Proton energy (MeV)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Cohen (55)
Levkovski (91)
evaluated


$^{57}Fe(p,3n)^{55}Co$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
evaluated

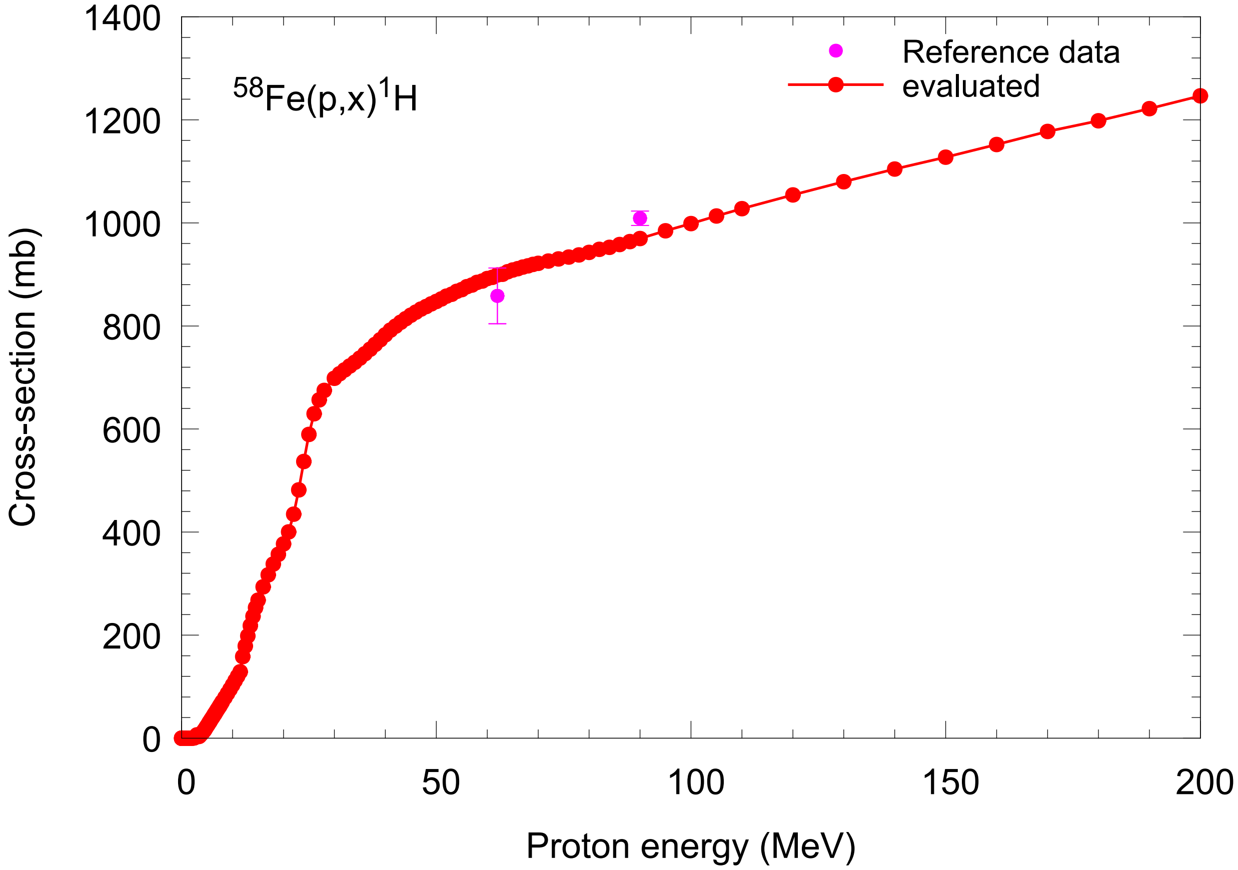

$^{57}Fe(p,2n)^{56}Co$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
evaluated



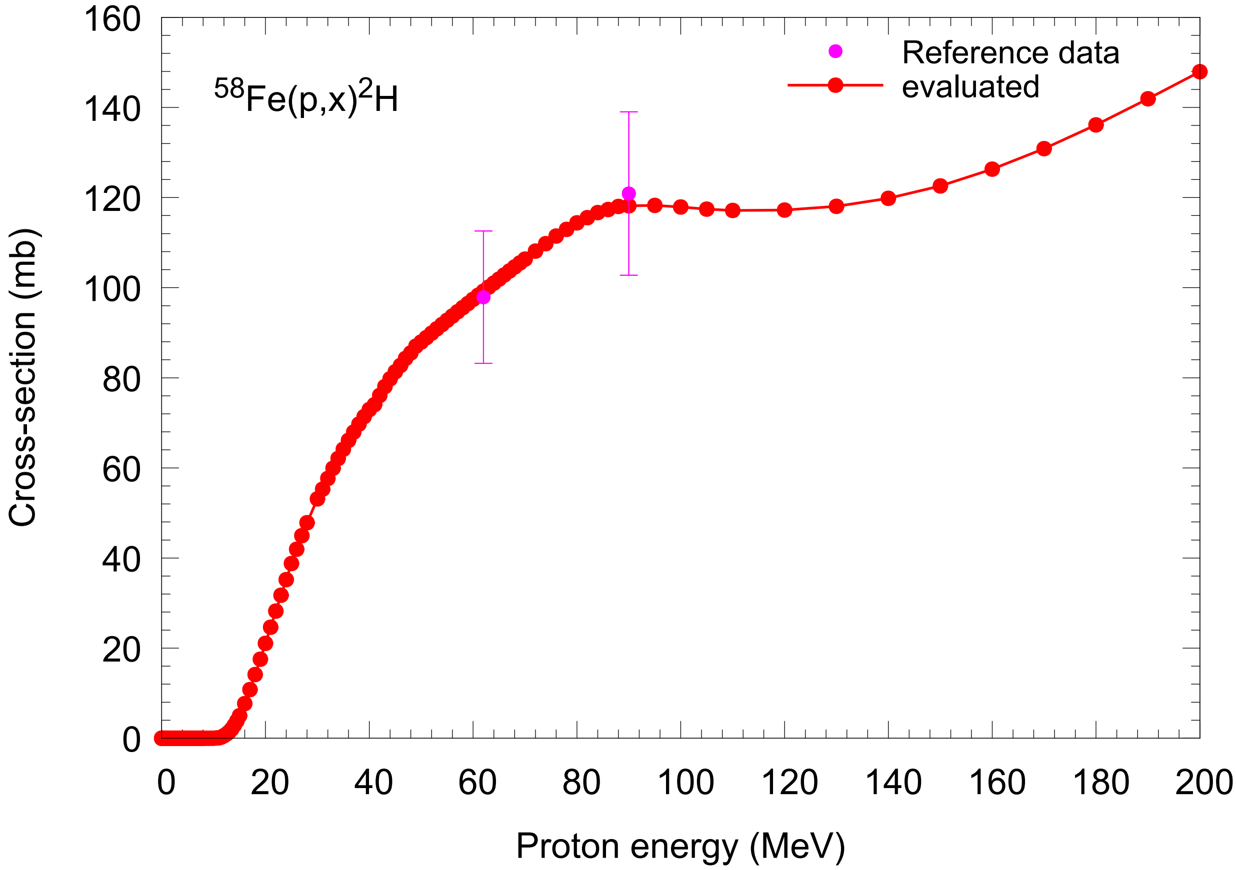
$^{57}Fe(p,n)^{57}Co$
Cross-section (mb)
Proton energy (MeV)
Tanaka (59)
Johnson (64)
Antropov (80)
Kolozhvari (91)
Levkovski (91)
Tims (93)
Al-Abyad (09)
evaluated



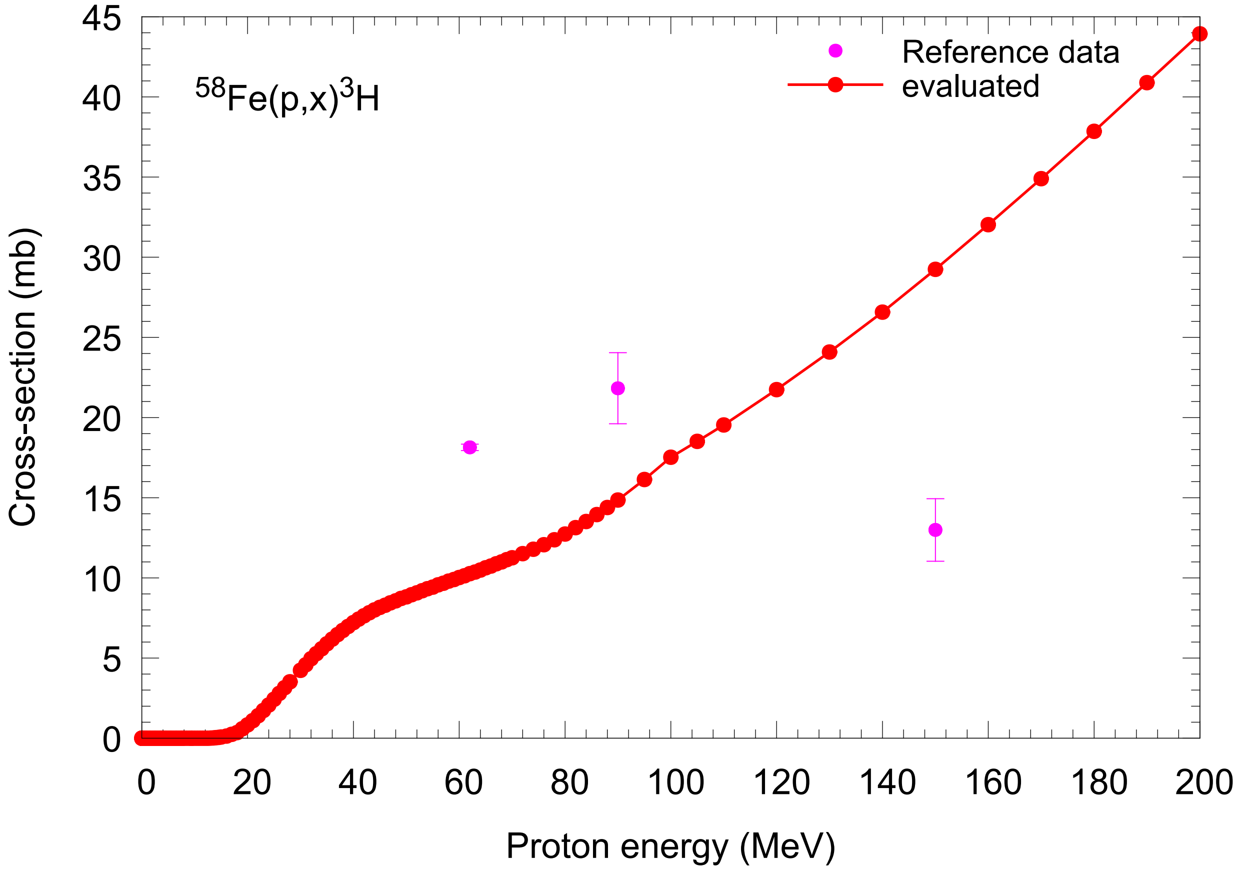
^{58}Fe(p,x)^{1}nn
evaluated
Cross-section (mb)
Proton energy (MeV)



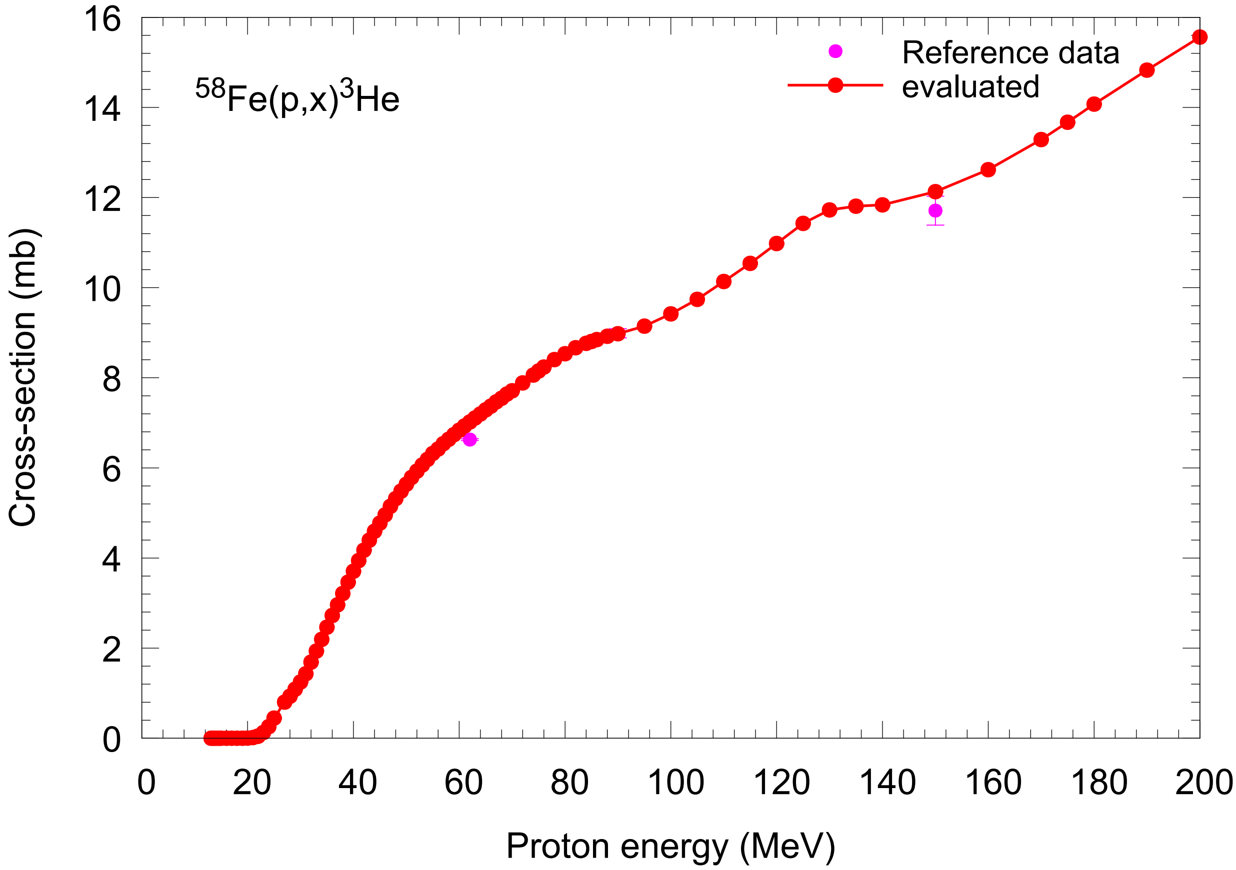
^{58}Fe(p,x)^{1}H
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)

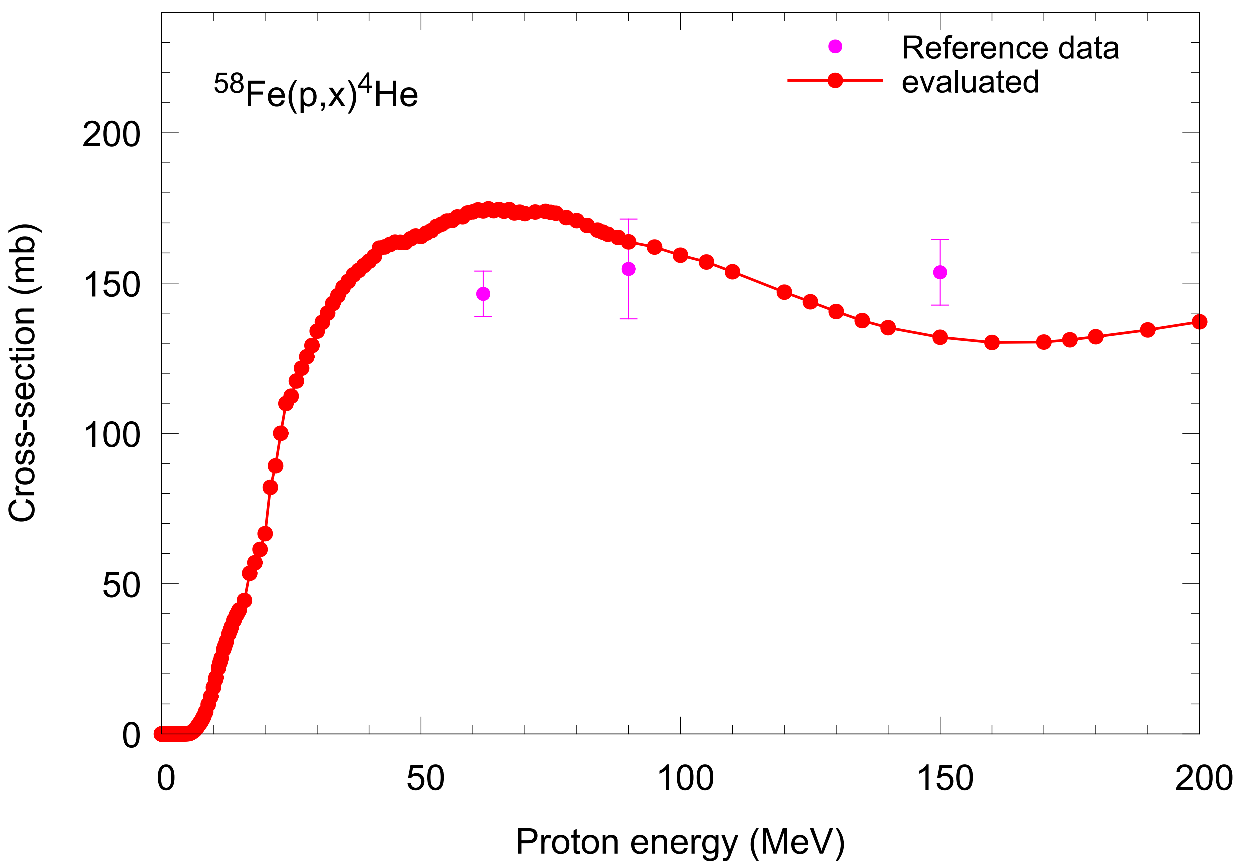


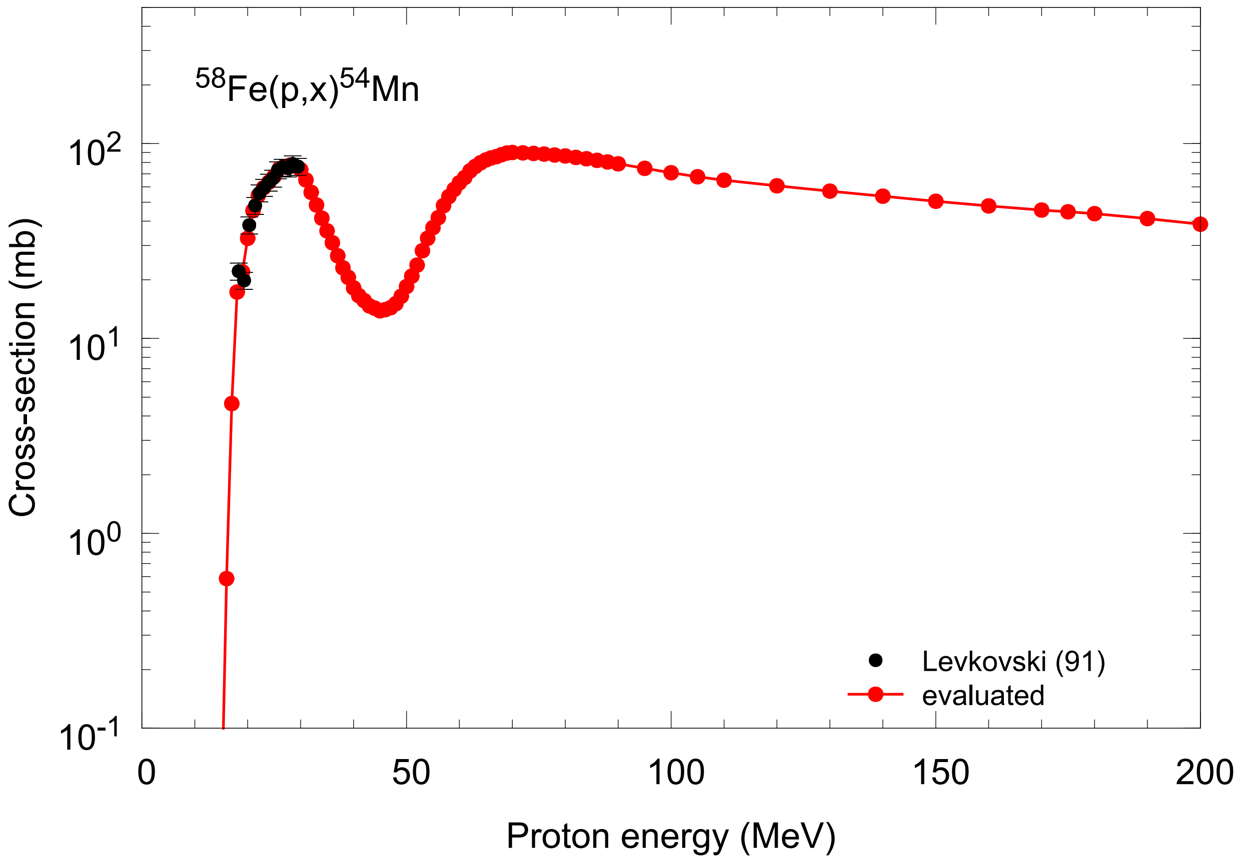
$^{58}Fe(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
20
40
60
80
100
120
140
160
180
200

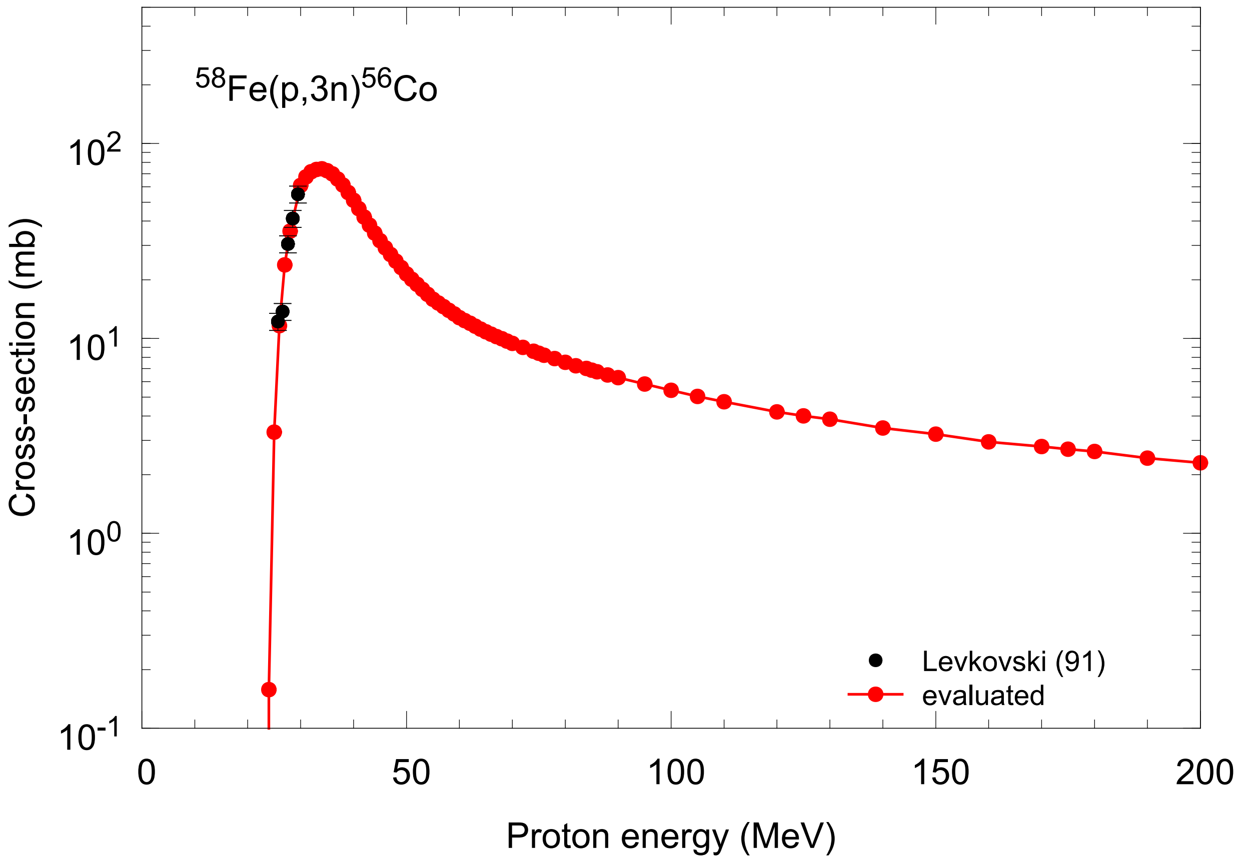


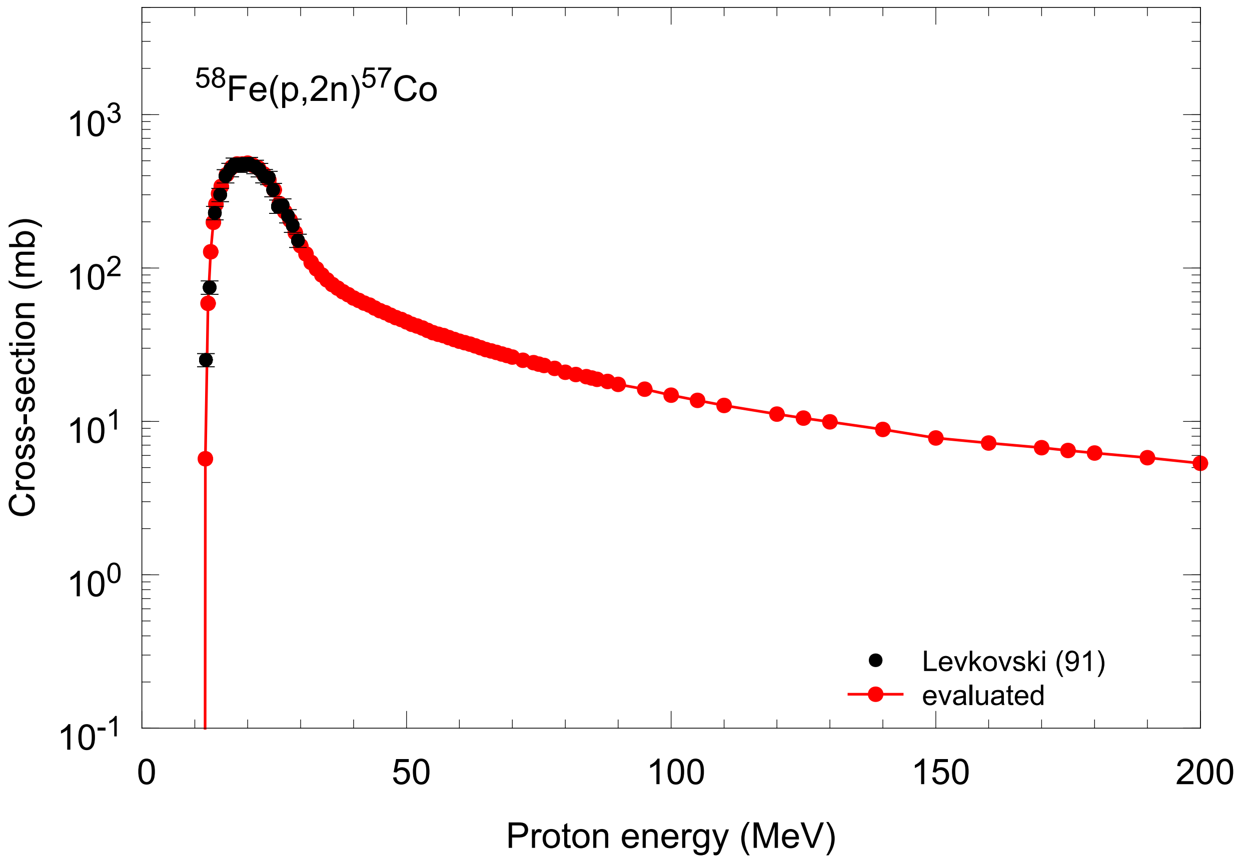
$^{58}Fe(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
40
45


$^{58}Fe(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
2
4
6
8
10
12
14
16
0
20
40
60
80
100
120
140
160
180
200

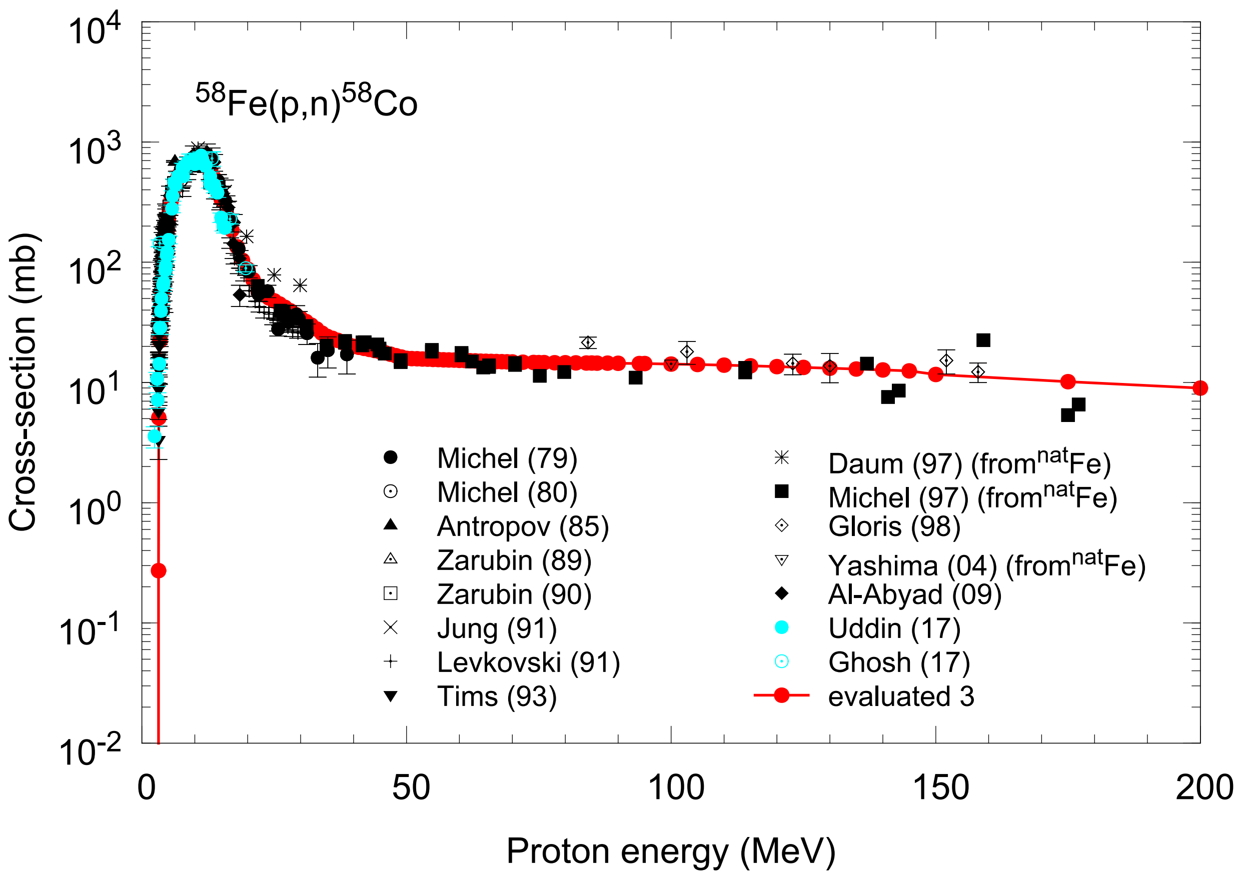

$^{58}Fe(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
0
50
100
150
200


$^{58}Fe(p,x)^{54}Mn$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Levkovski (91)
evaluated

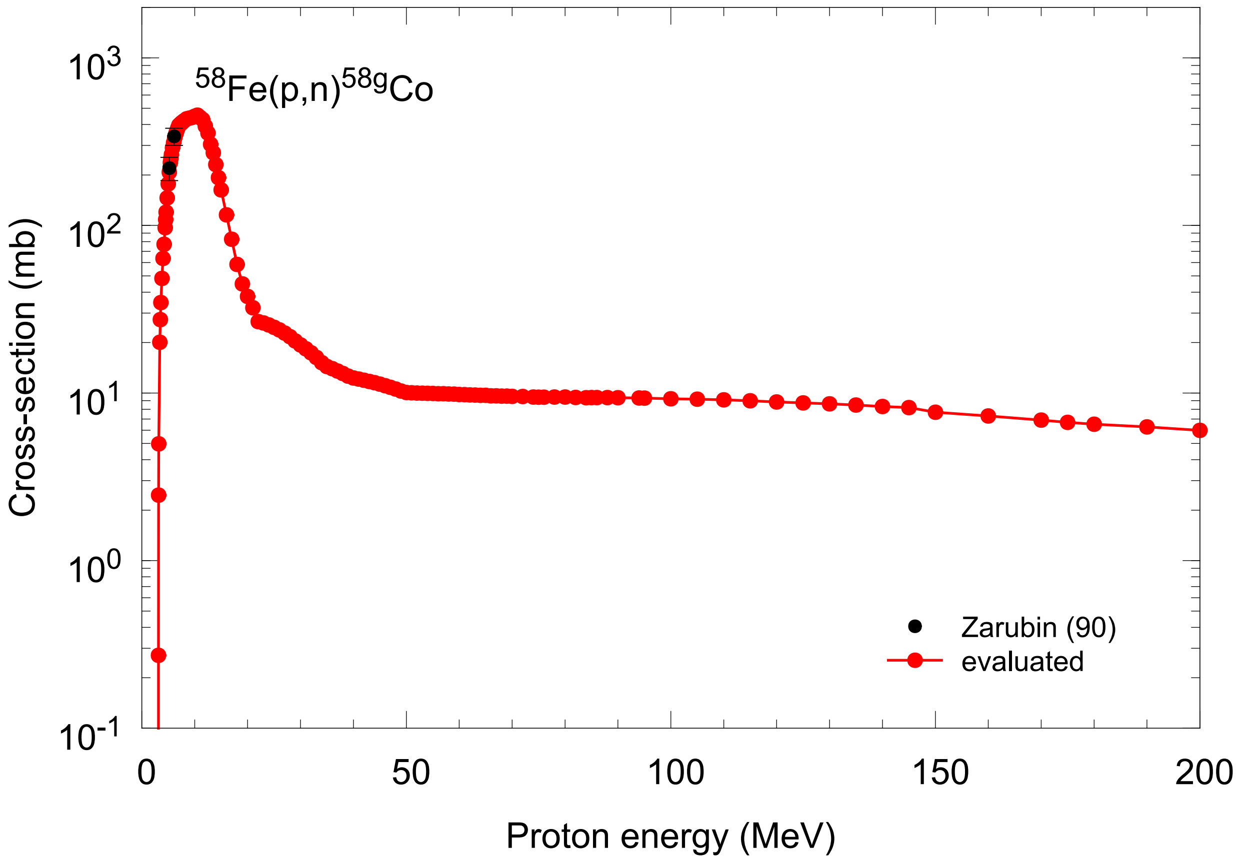

$^{58}Fe(p,3n)^{56}Co$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Levkovski (91)
evaluated



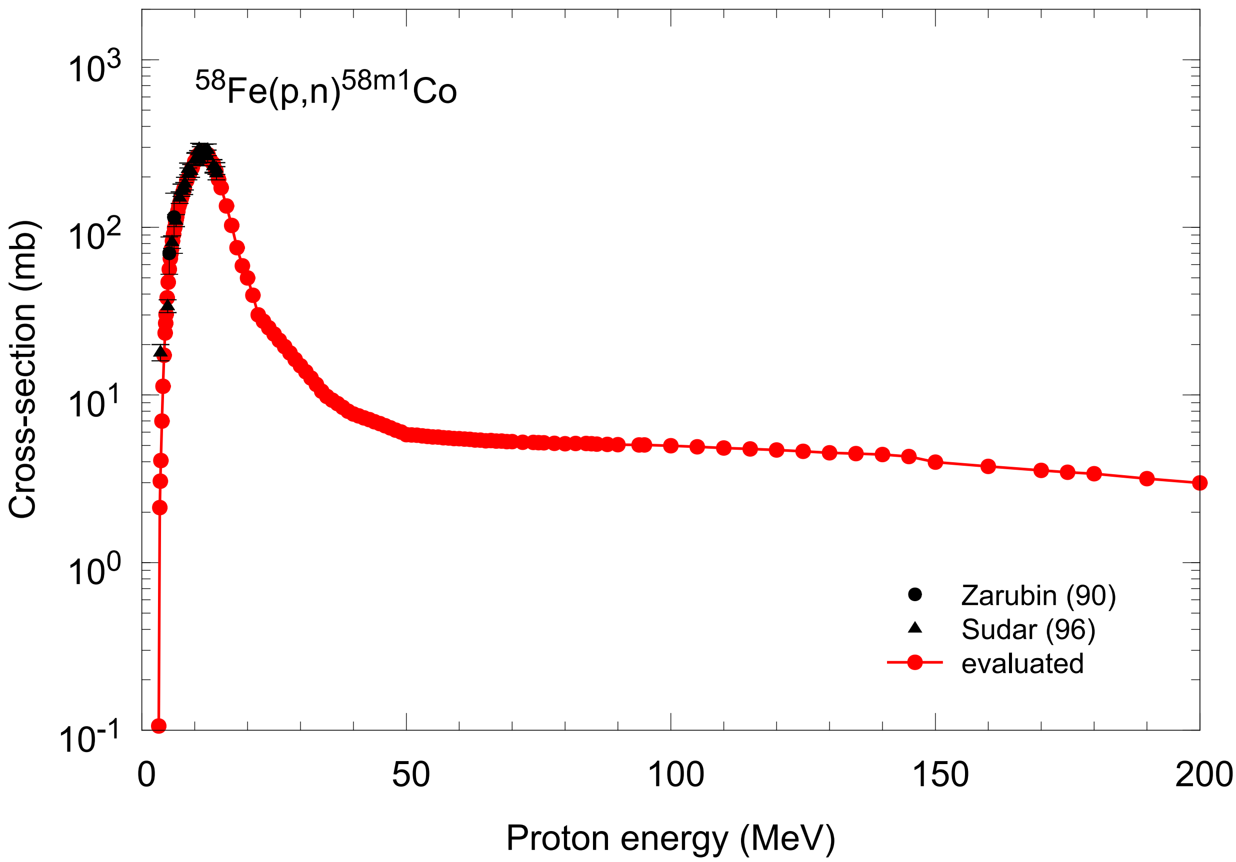
$^{58}Fe(p,2n)^{57}Co$
Cross-section (mb)
Proton energy (MeV)
Levkovski (91)
evaluated



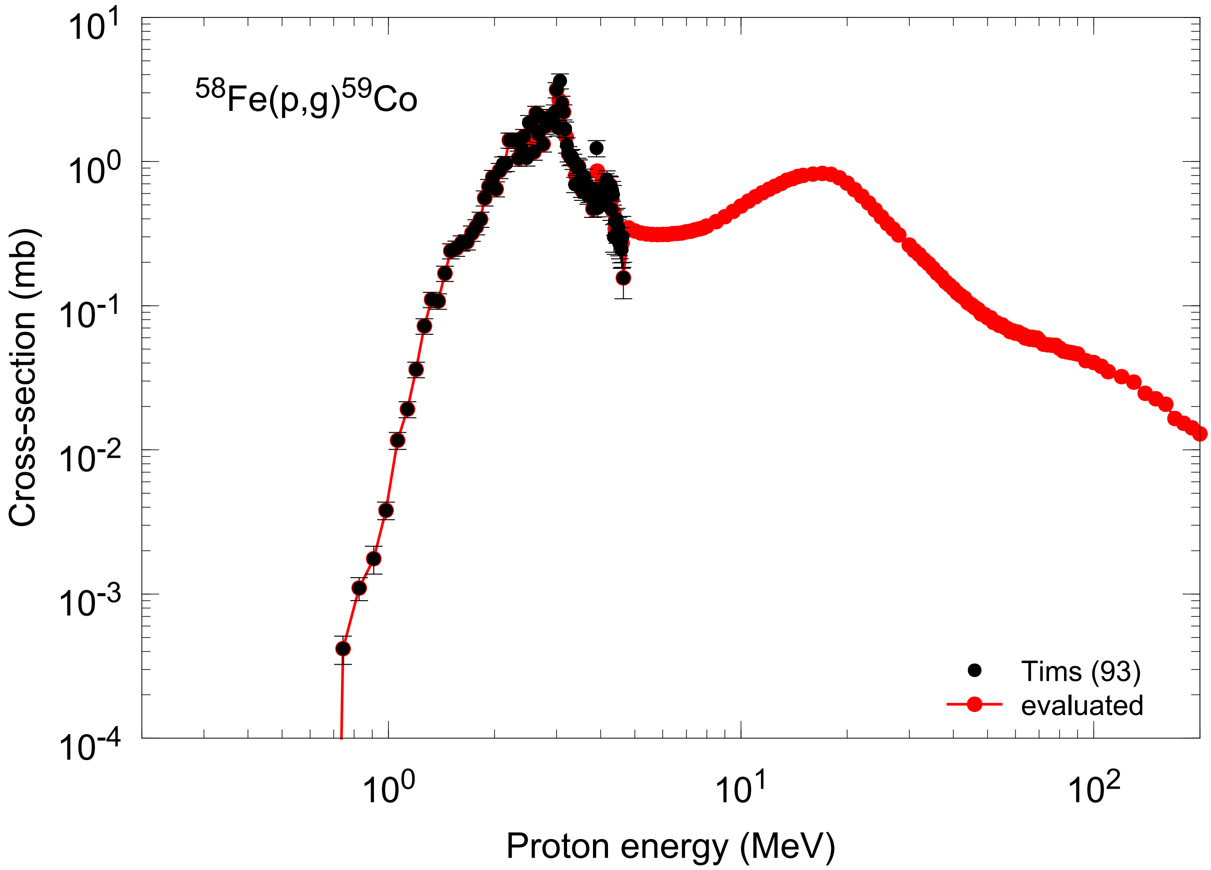
$^{58}Fe(p,n)^{58}Co$
Cross-section (mb)
Proton energy (MeV)
Michel (79)
Michel (80)
Antropov (85)
Zarubin (89)
Zarubin (90)
Jung (91)
Levkovski (91)
Tims (93)
Daum (97) (from ^{nat}Fe)
Michel (97) (from ^{nat}Fe)
Gloris (98)
Yashima (04) (from ^{nat}Fe)
Al-Abyad (09)
Uddin (17)
Ghosh (17)
evaluated 3



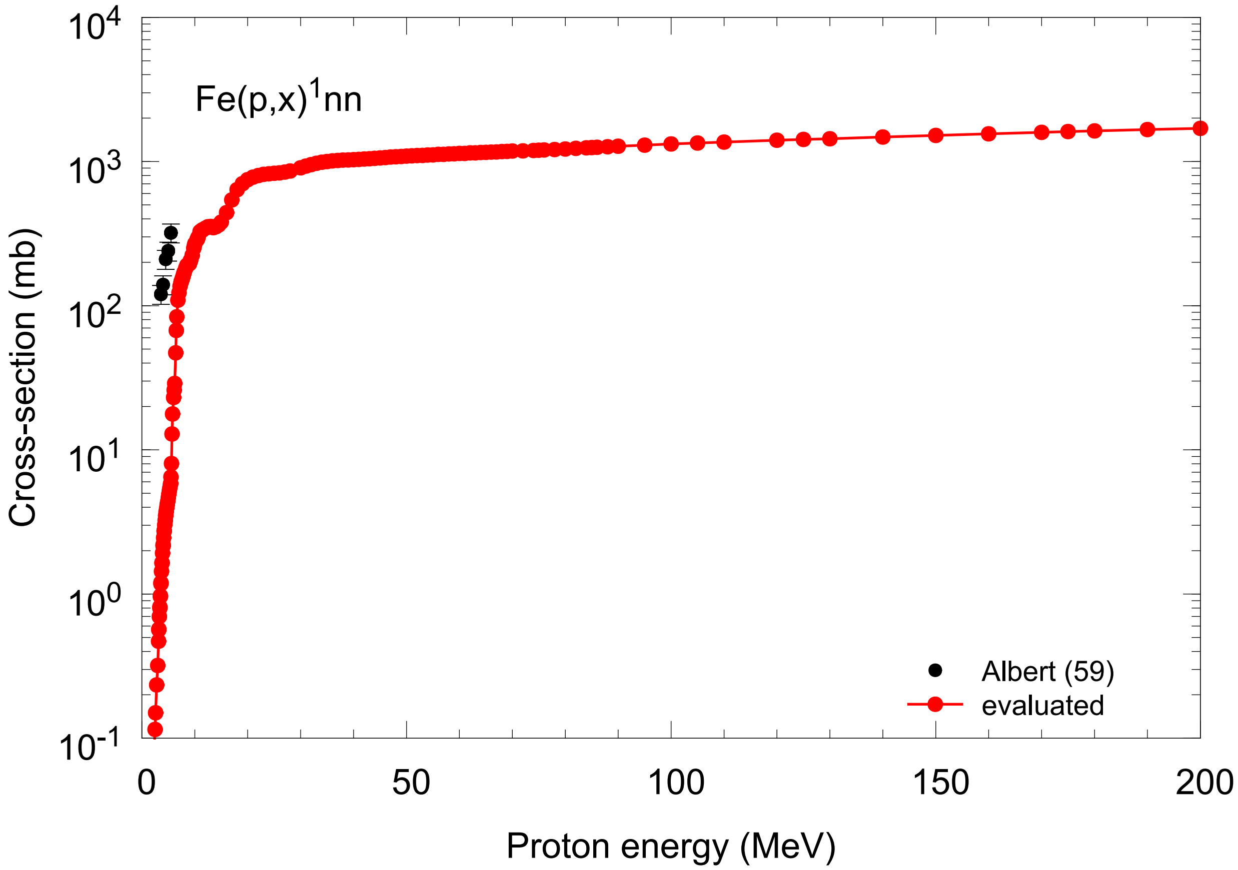
$^{58}Fe(p,n)^{58g}Co$
Zarubin (90)
evaluated
Cross-section (mb)
Proton energy (MeV)



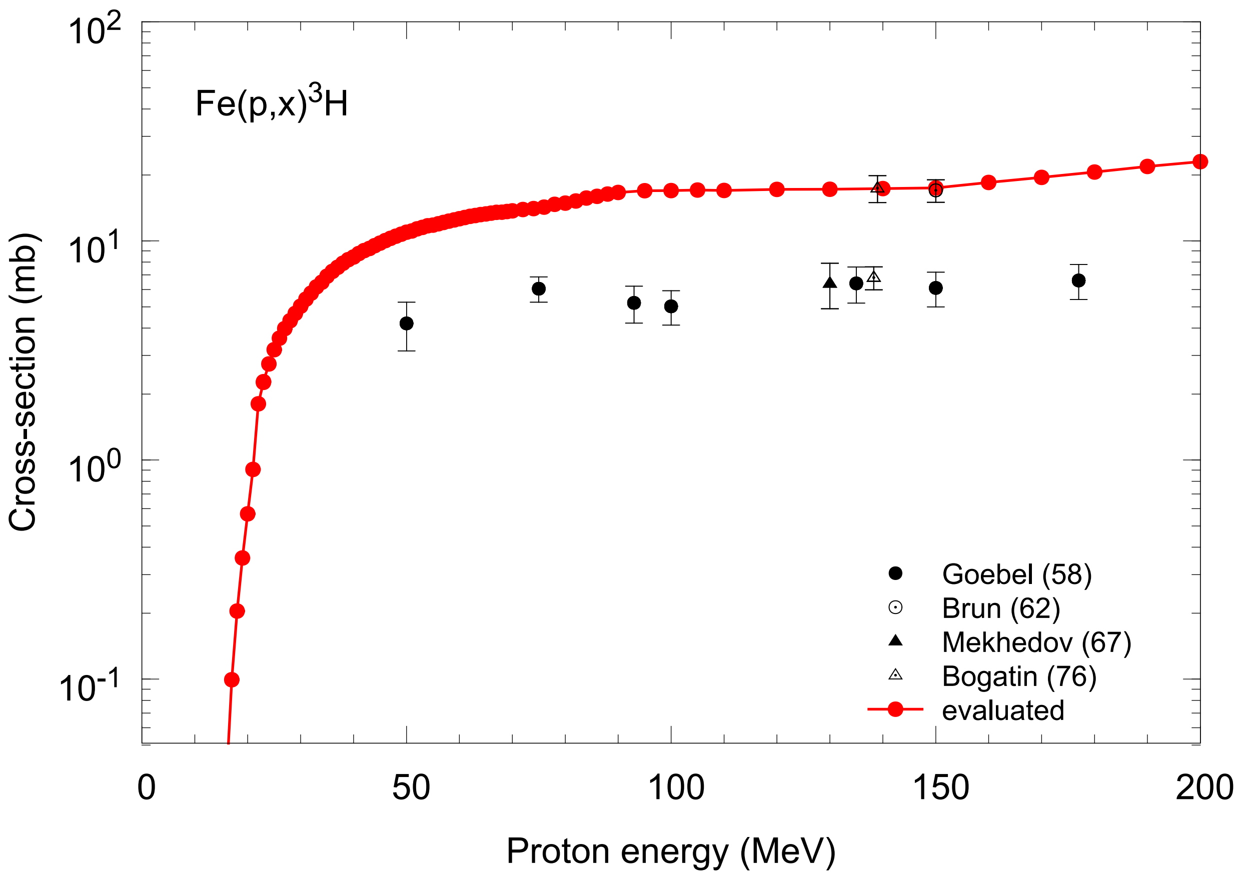
$^{58}Fe(p,n)^{58m1}Co$
Zarubin (90)
Sudar (96)
evaluated
Cross-section (mb)
Proton energy (MeV)



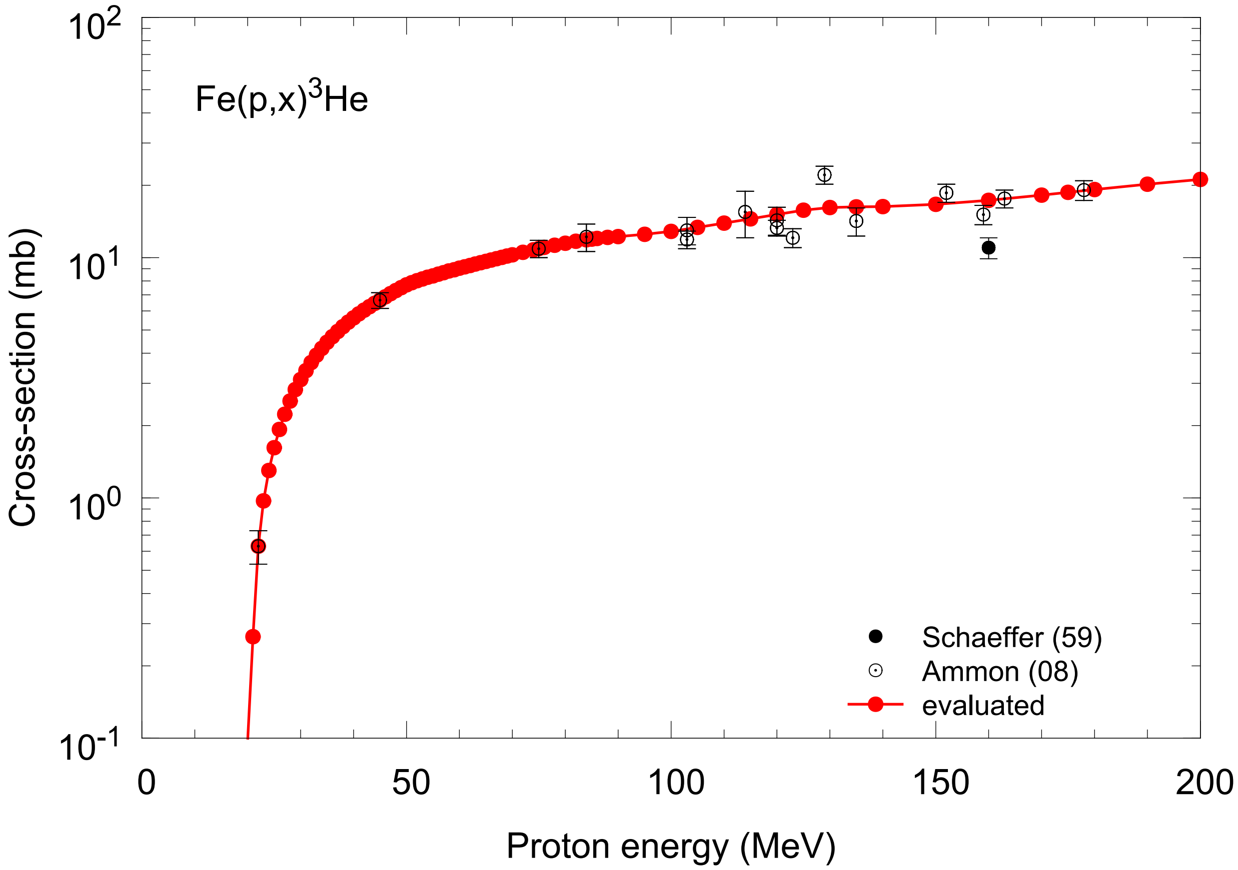
$^{58}Fe(p,g)^{59}Co$
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{0}
10^{1}
10^{2}
Proton energy (MeV)
Tims (93)
evaluated



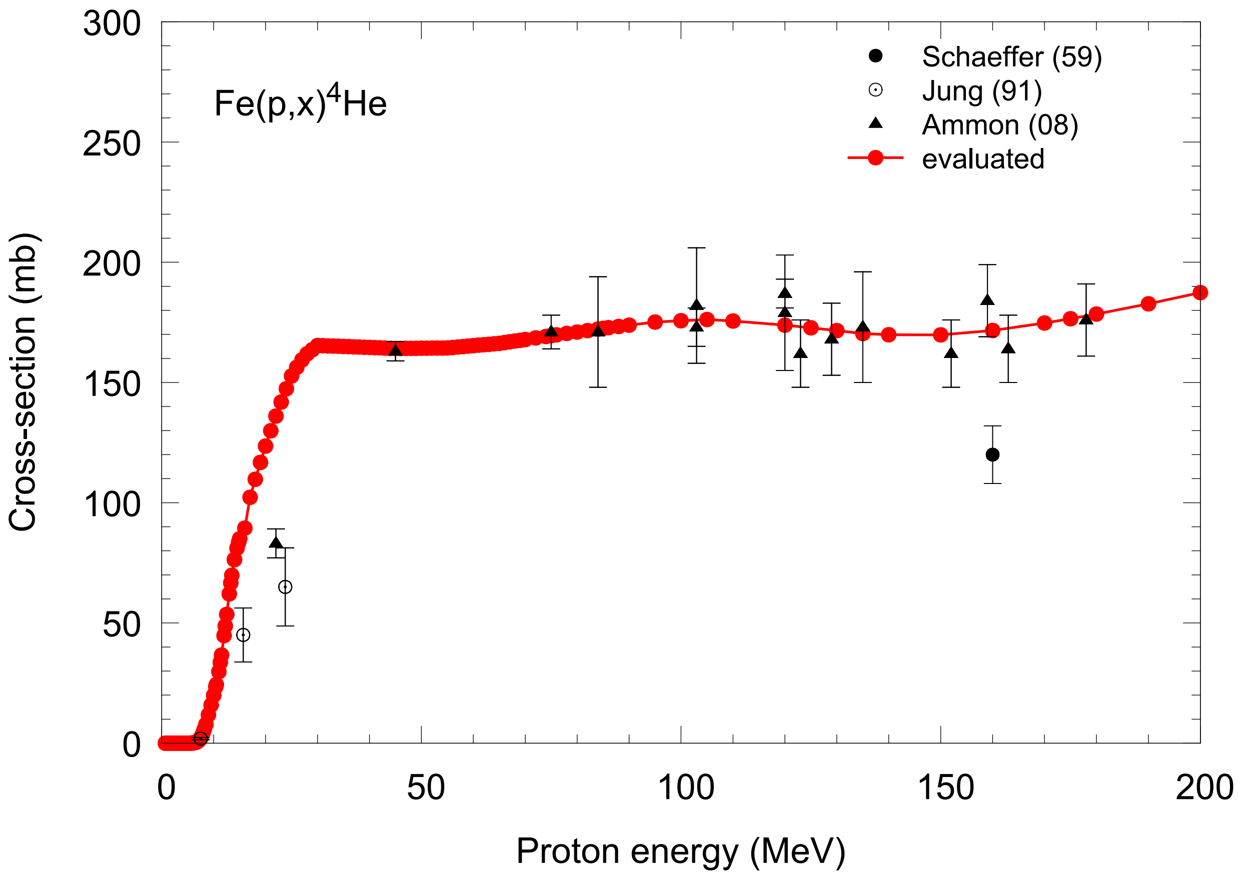
Fe(p,x)^{1}nn
Cross-section (mb)
10^4
10^3
10^2
10^1
10^0
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Albert (59)
evaluated



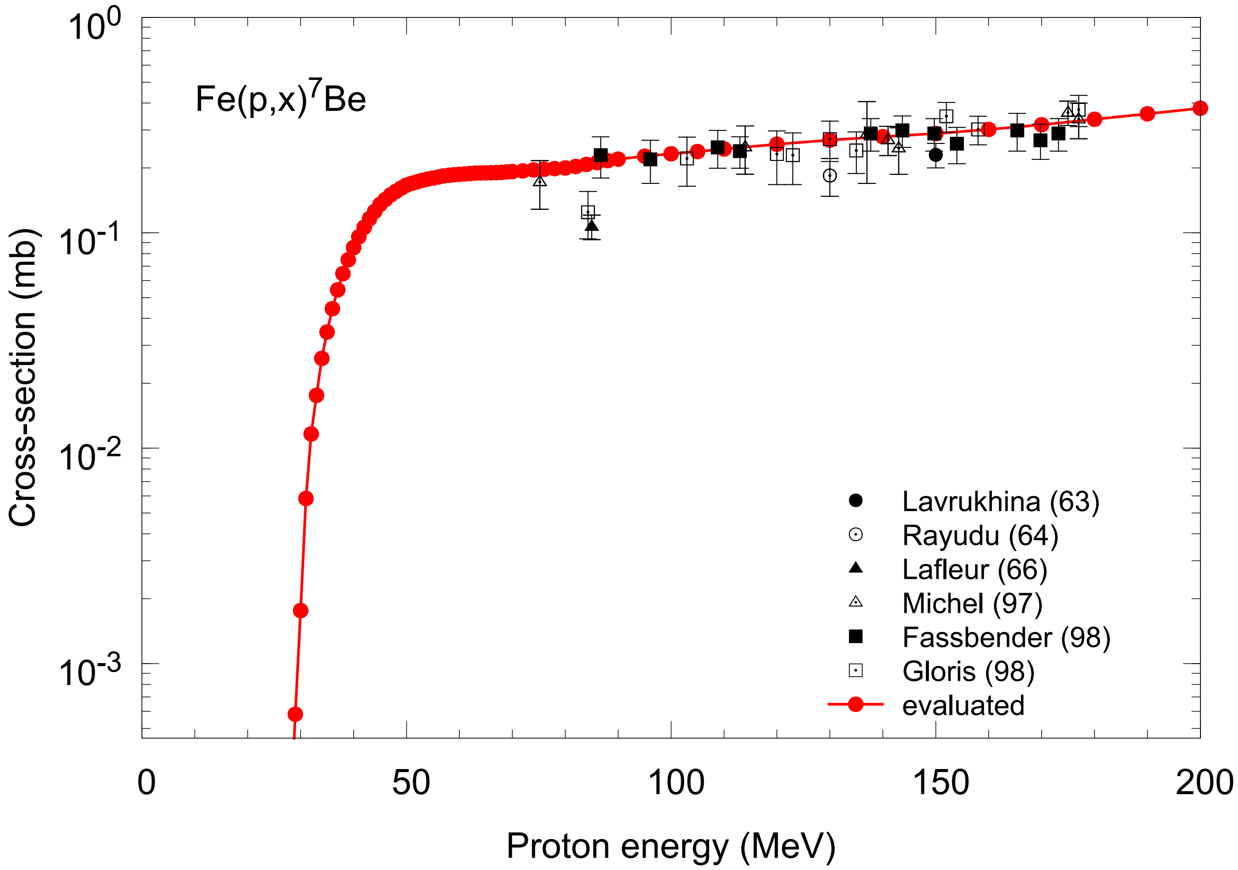
Fe(p,x)^{3}H
Cross-section (mb)
10^2
10^1
10^0
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Goebel (58)
Brun (62)
Mekhedov (67)
Bogatin (76)
evaluated

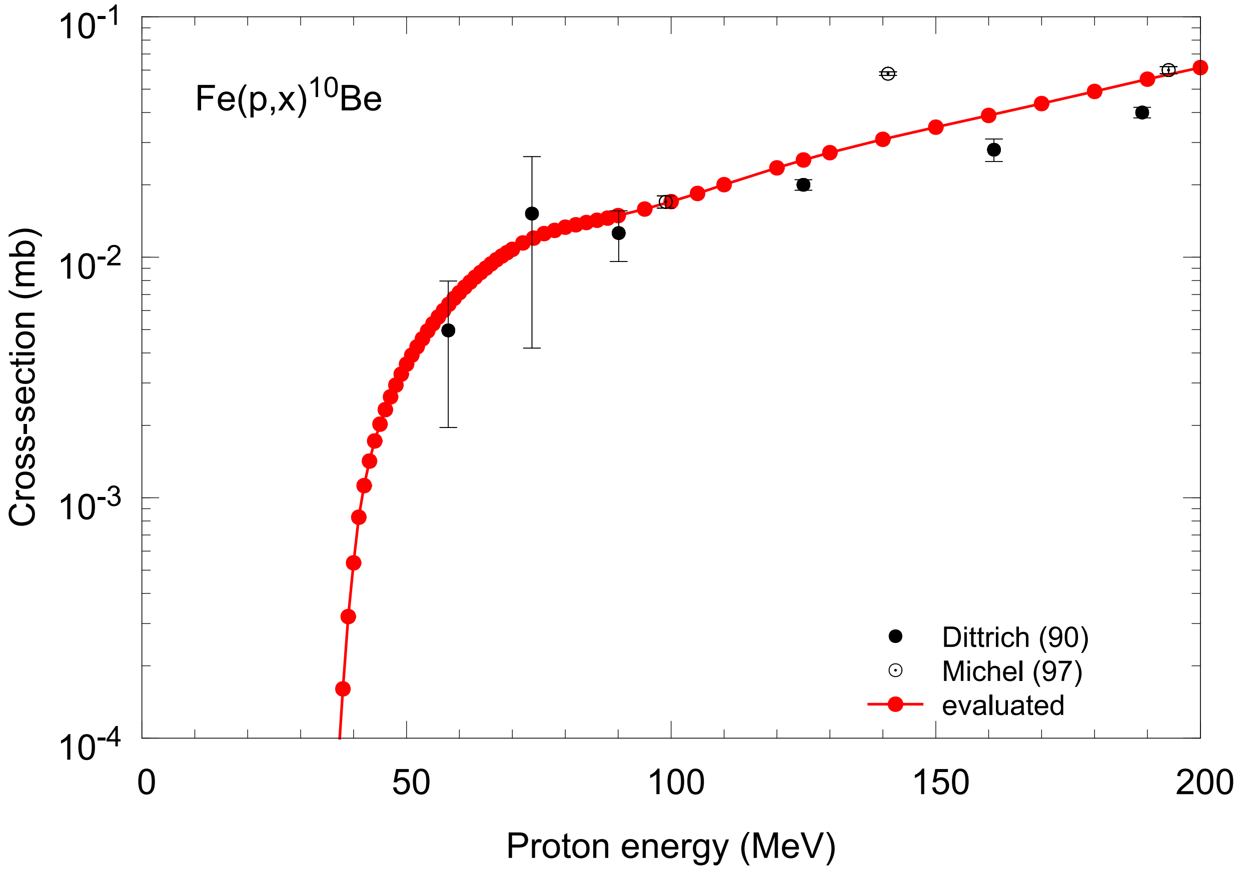


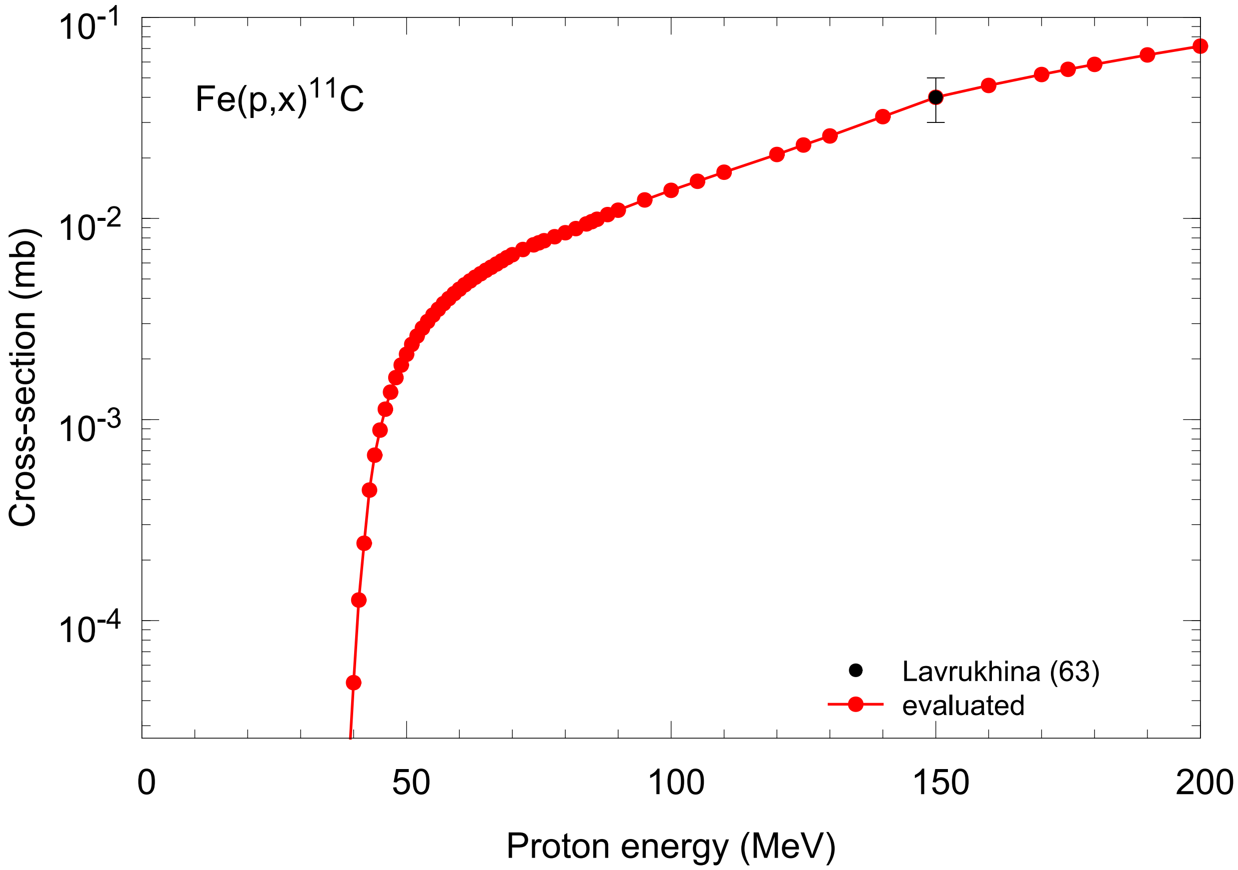
Fe(p,x)^{3}He
Schaeffer (59)
Ammon (08)
evaluated
Cross-section (mb)
10^2
10^1
10^0
10^{-1}
0
50
100
150
200
Proton energy (MeV)



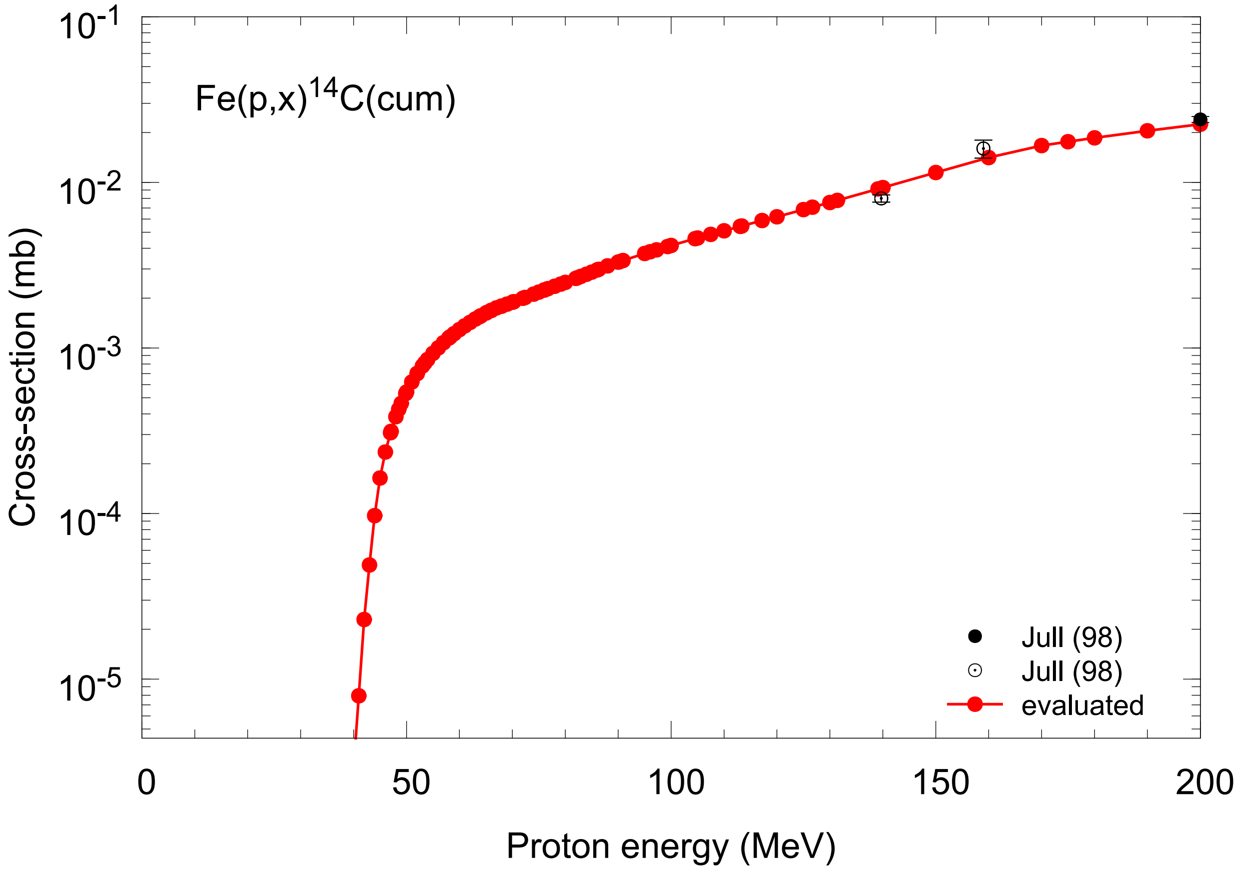
Fe(p,x)^{4}He
Schaeffer (59)
Jung (91)
Ammon (08)
evaluated
Cross-section (mb)
300
250
200
150
100
50
0
0
50
100
150
200
Proton energy (MeV)


Fe(p,x)^{7}Be
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Rayudu (64)
Lafleur (66)
Michel (97)
Fassbender (98)
Gloris (98)
evaluated

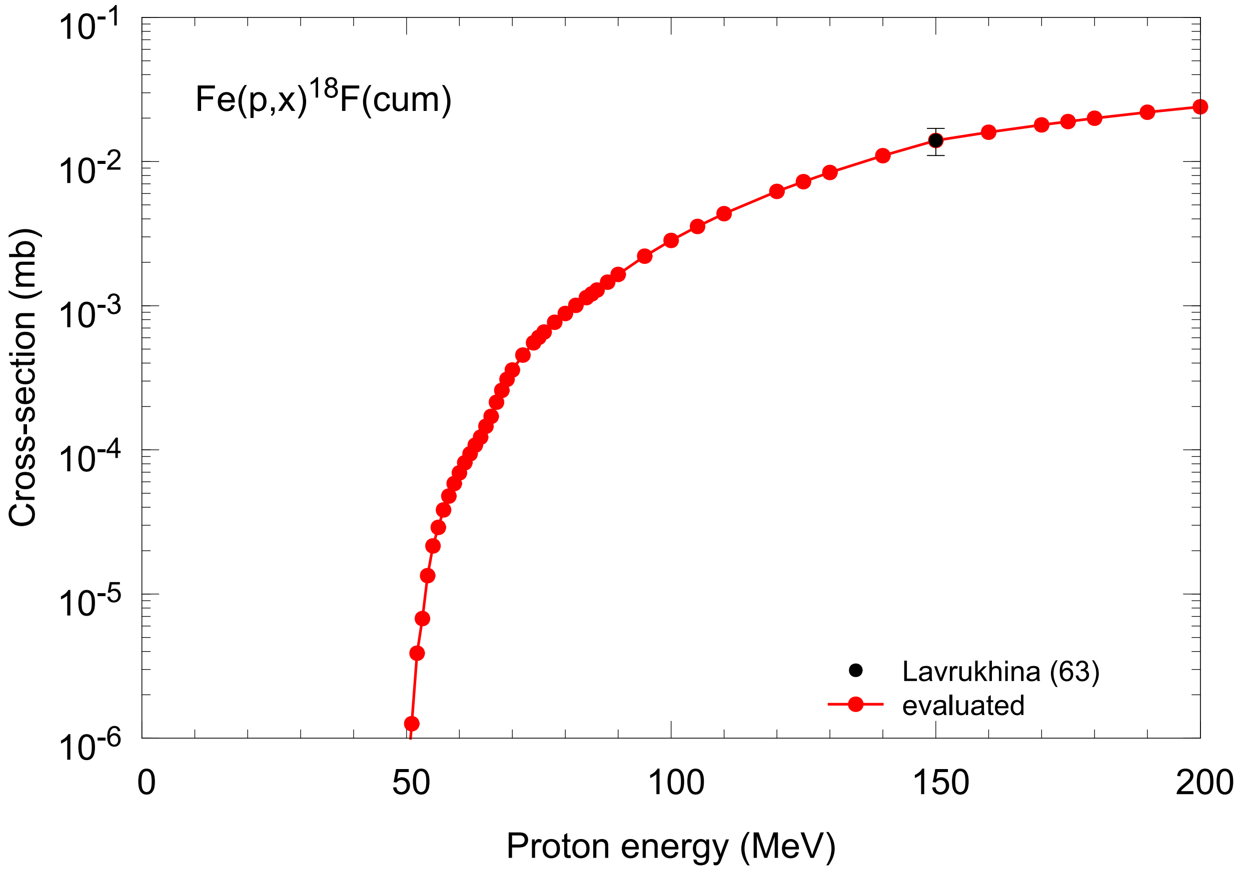

Fe(p,x)^{10}Be
Cross-section (mb)
Proton energy (MeV)
Dittrich (90)
Michel (97)
evaluated

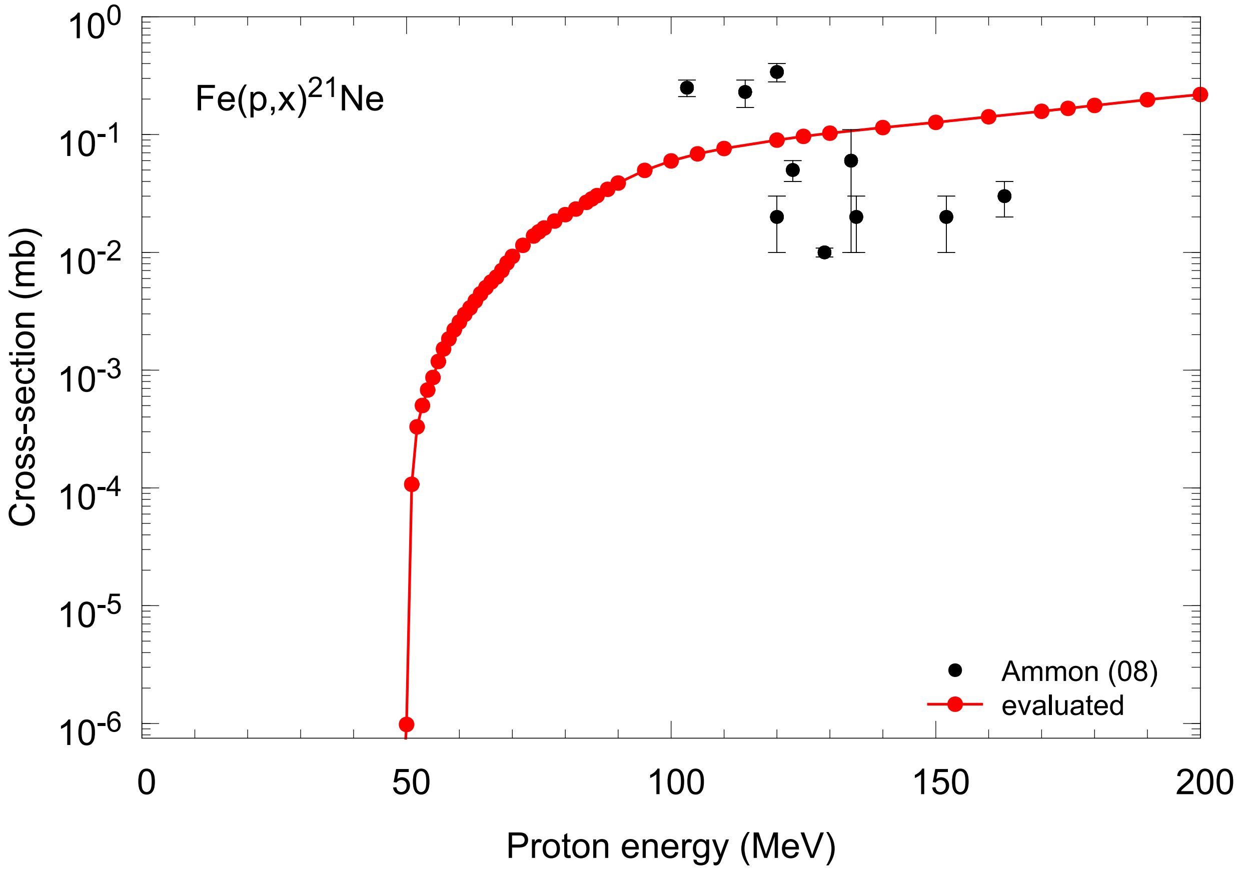


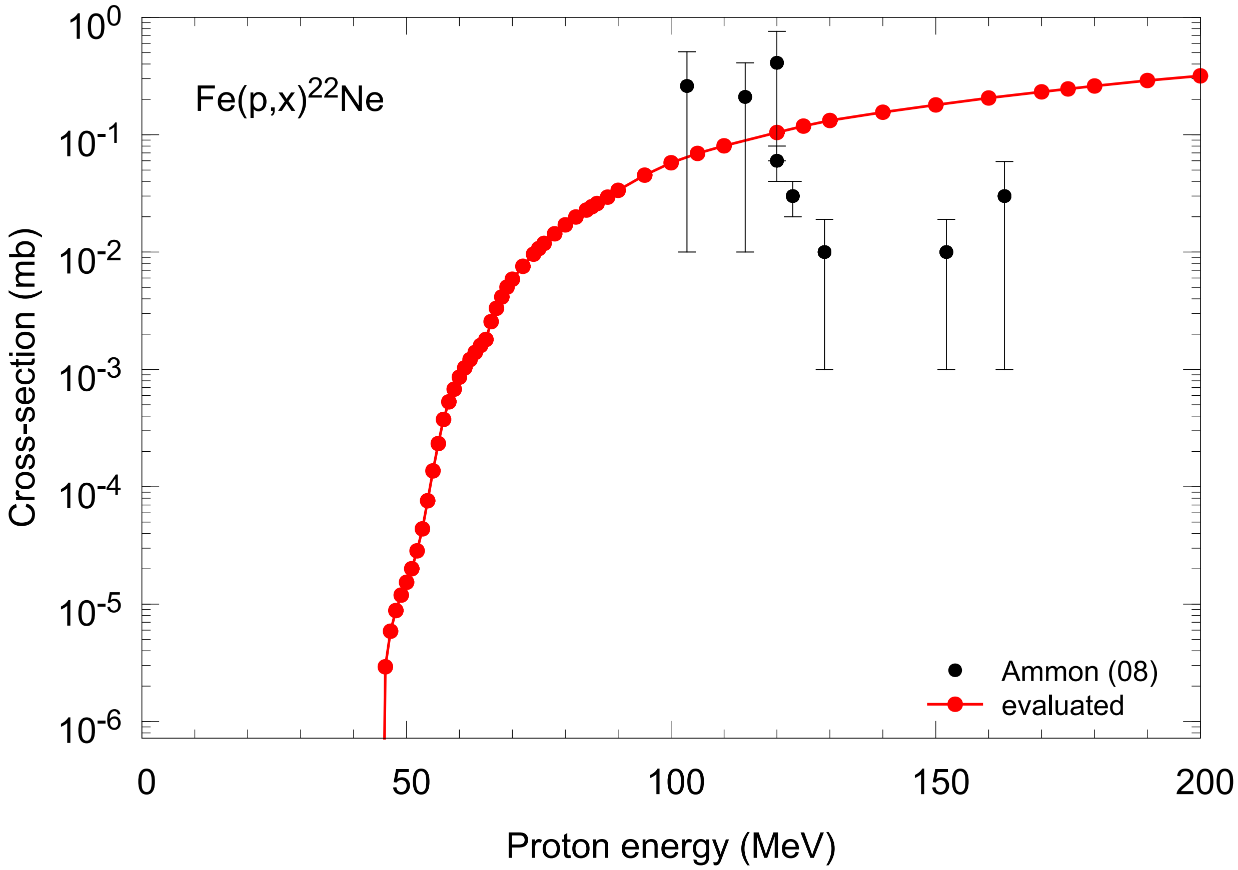
Fe(p,x)11C
Lavrukhina (63)
evaluated
Cross-section (mb)
Proton energy (MeV)

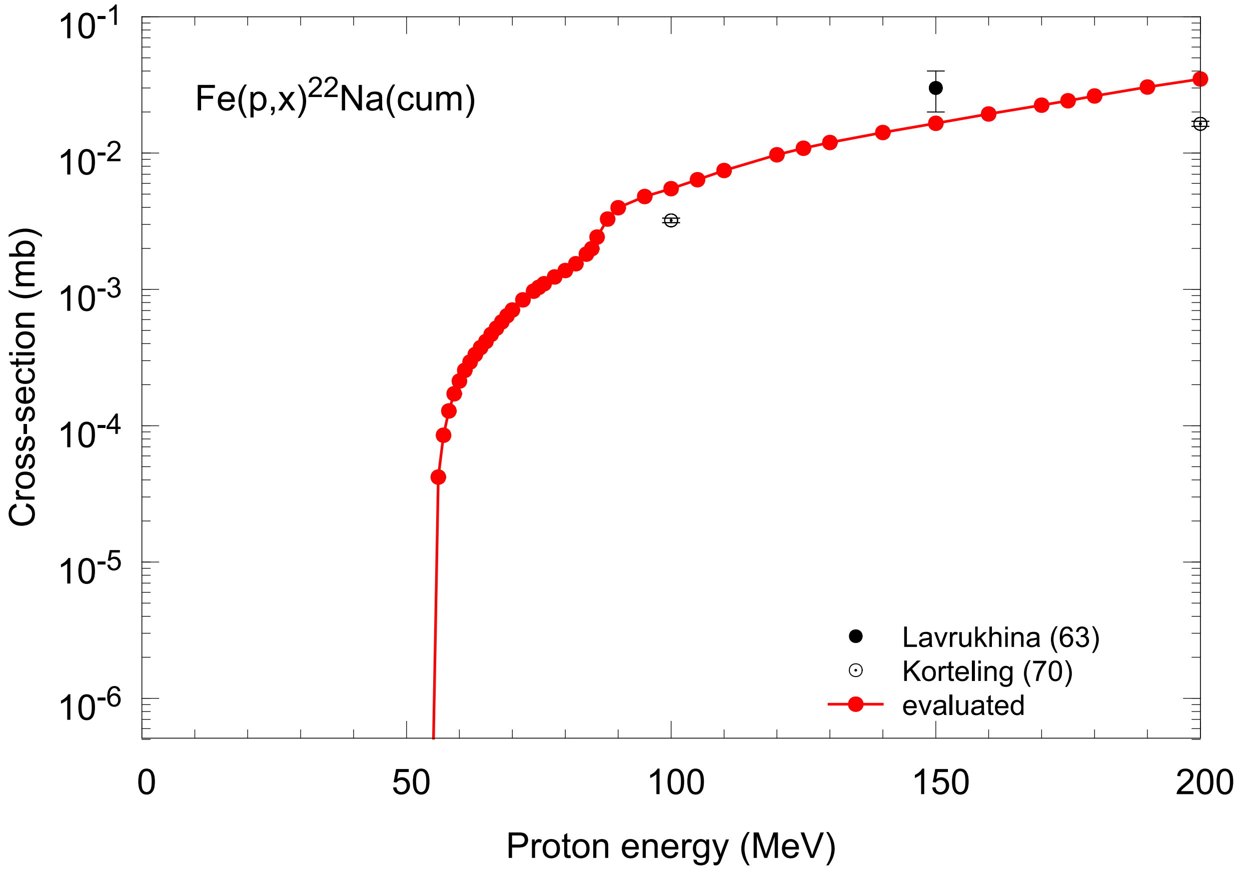


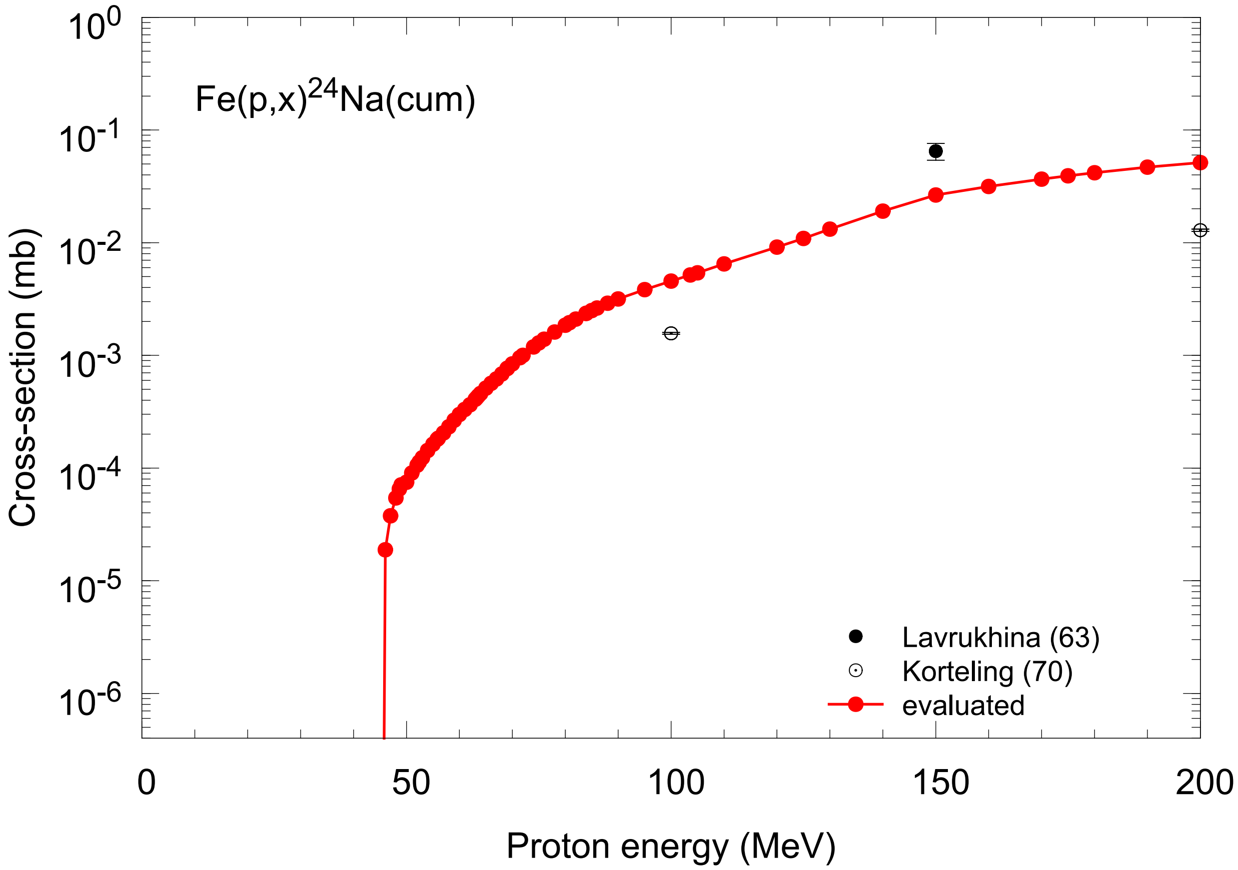
Fe(p,x)14C(cum)
Jull (98)
Jull (98)
evaluated
Cross-section (mb)
Proton energy (MeV)

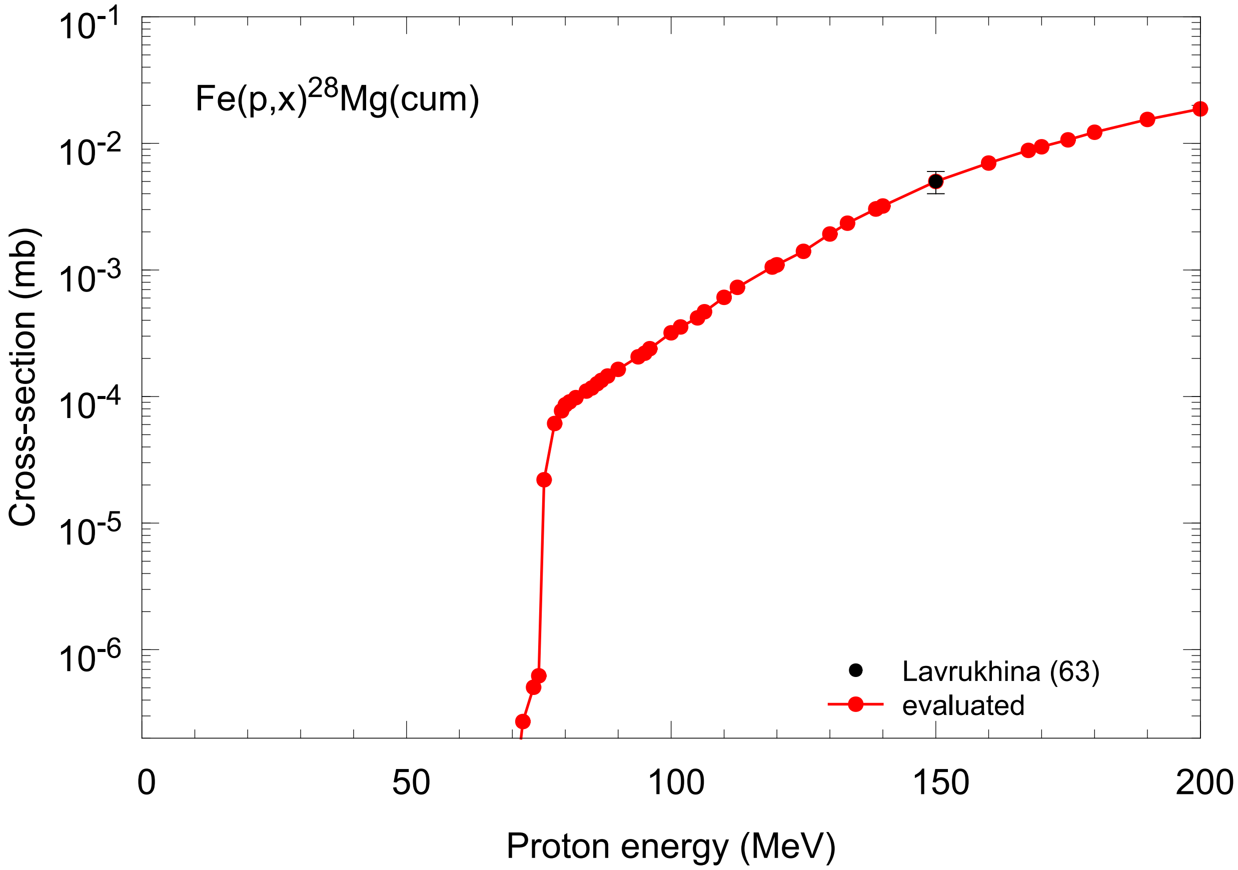

Fe(p,x)18F(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated
10-1
10-2
10-3
10-4
10-5
10-6
0
50
100
150
200

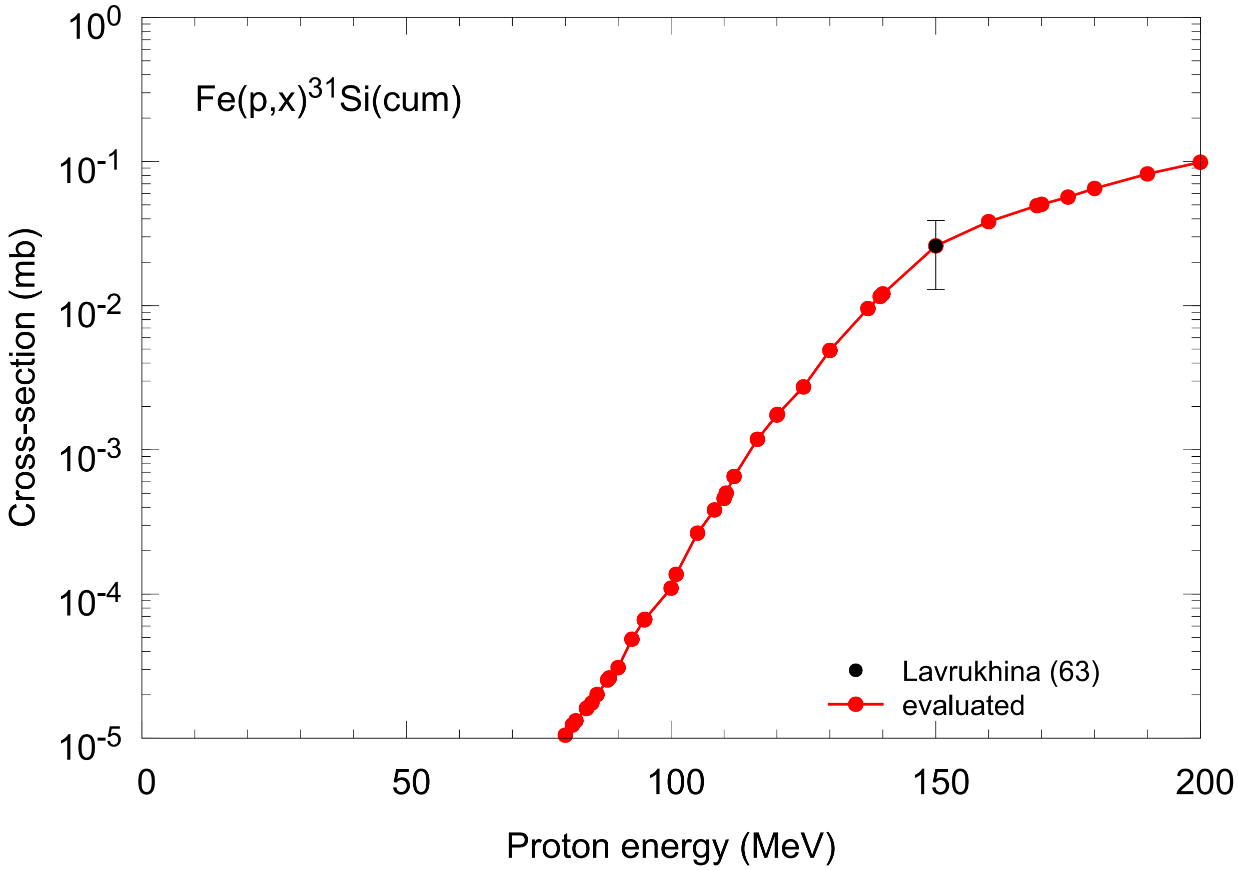

Fe(p,x)21Ne
Cross-section (mb)
Proton energy (MeV)
Ammon (08)
evaluated
100
10-1
10-2
10-3
10-4
10-5
10-6
0
50
100
150
200


Fe(p,x)^{22}Ne
Cross-section (mb)
Proton energy (MeV)
Ammon (08)
evaluated

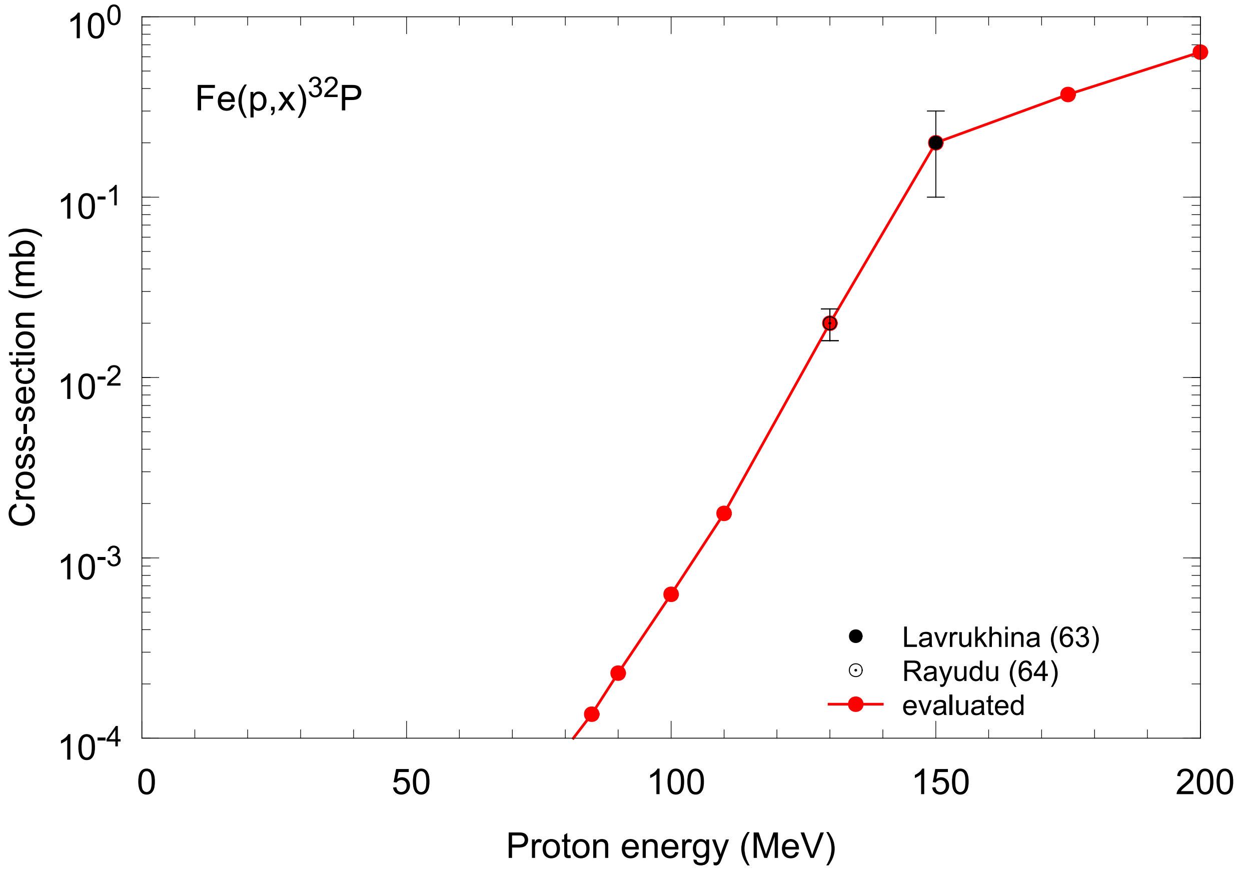

Fe(p,x)^{22}Na(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Korteling (70)
evaluated


Fe(p,x)^{24}Na(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Korteling (70)
evaluated

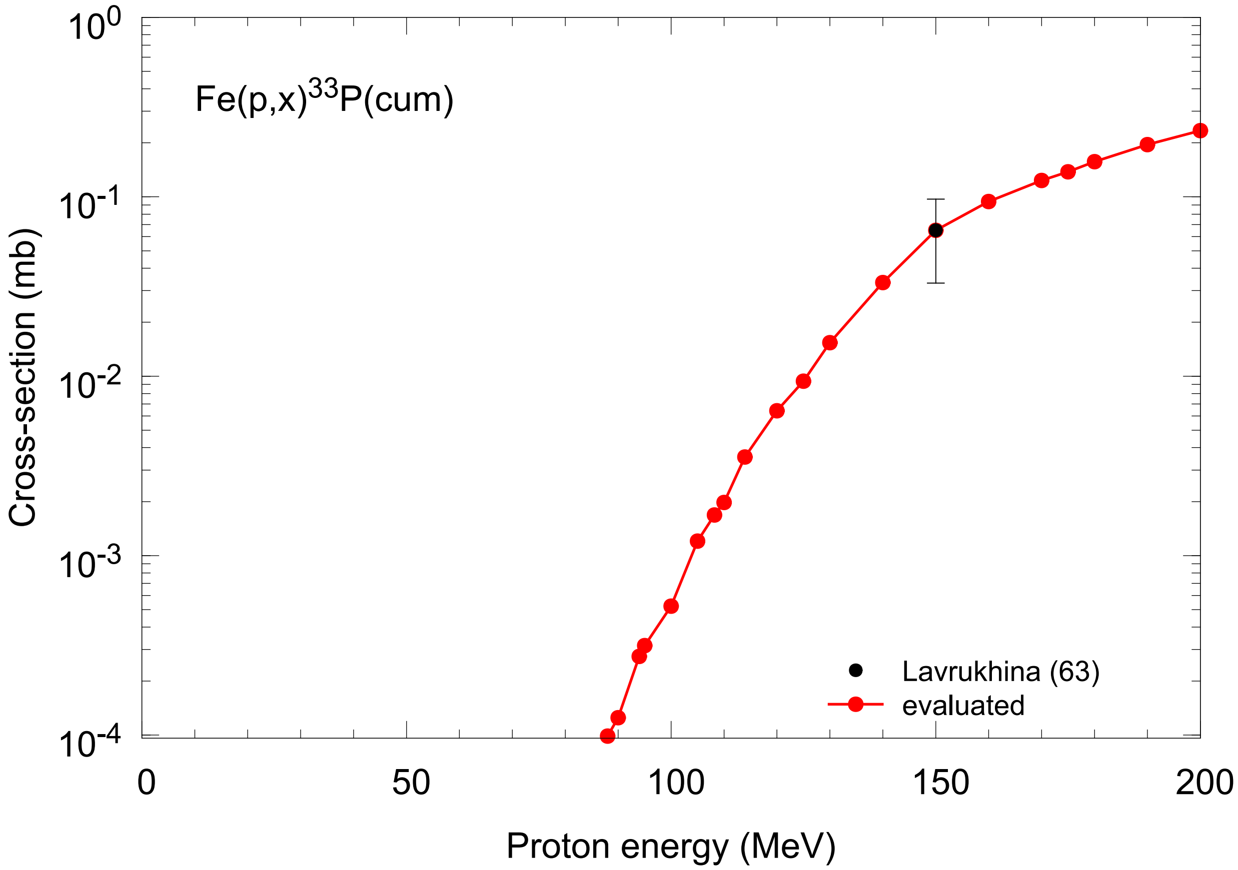

Fe(p,x)^{28}Mg(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated



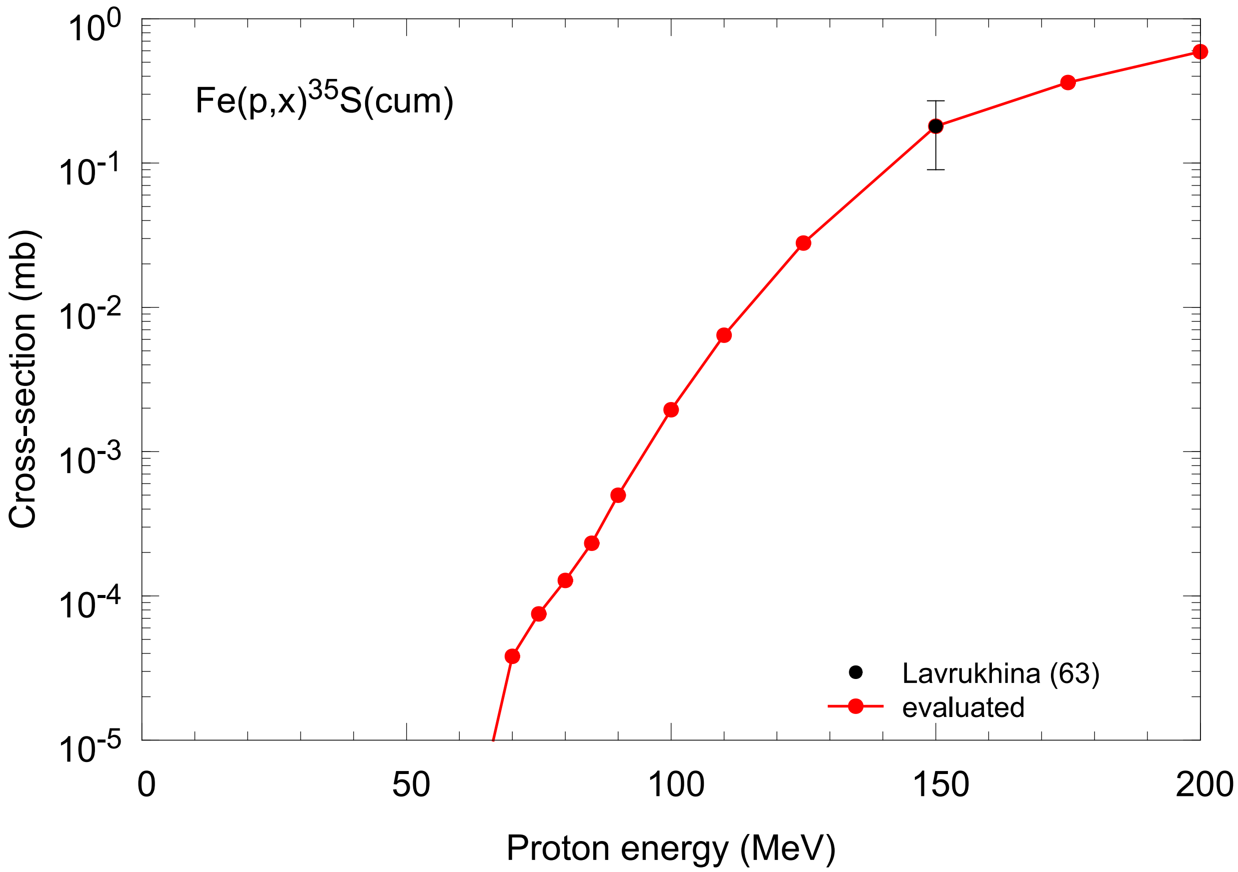
Fe(p,x)^{31}Si(cum)
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
evaluated



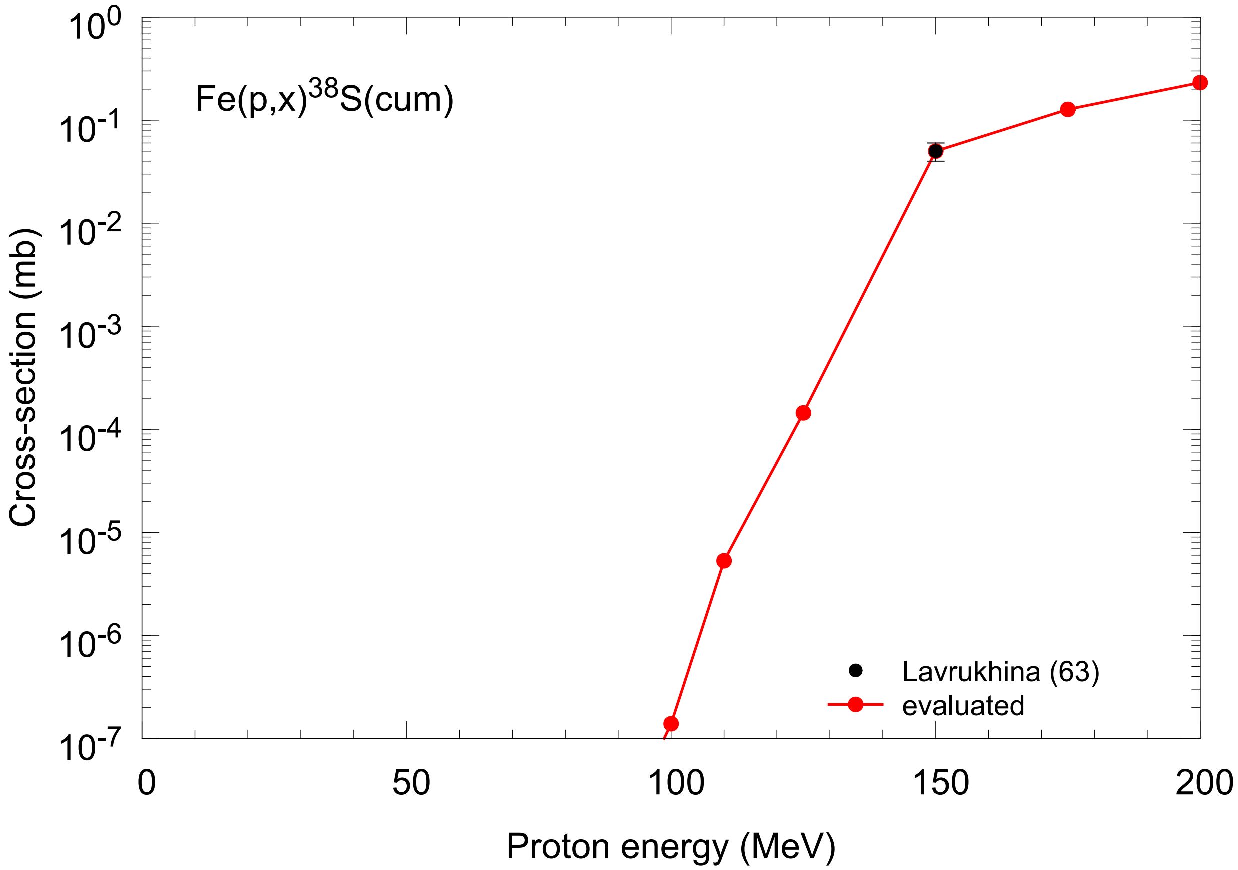
Fe(p,x)^{32}P
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
Rayudu (64)
evaluated

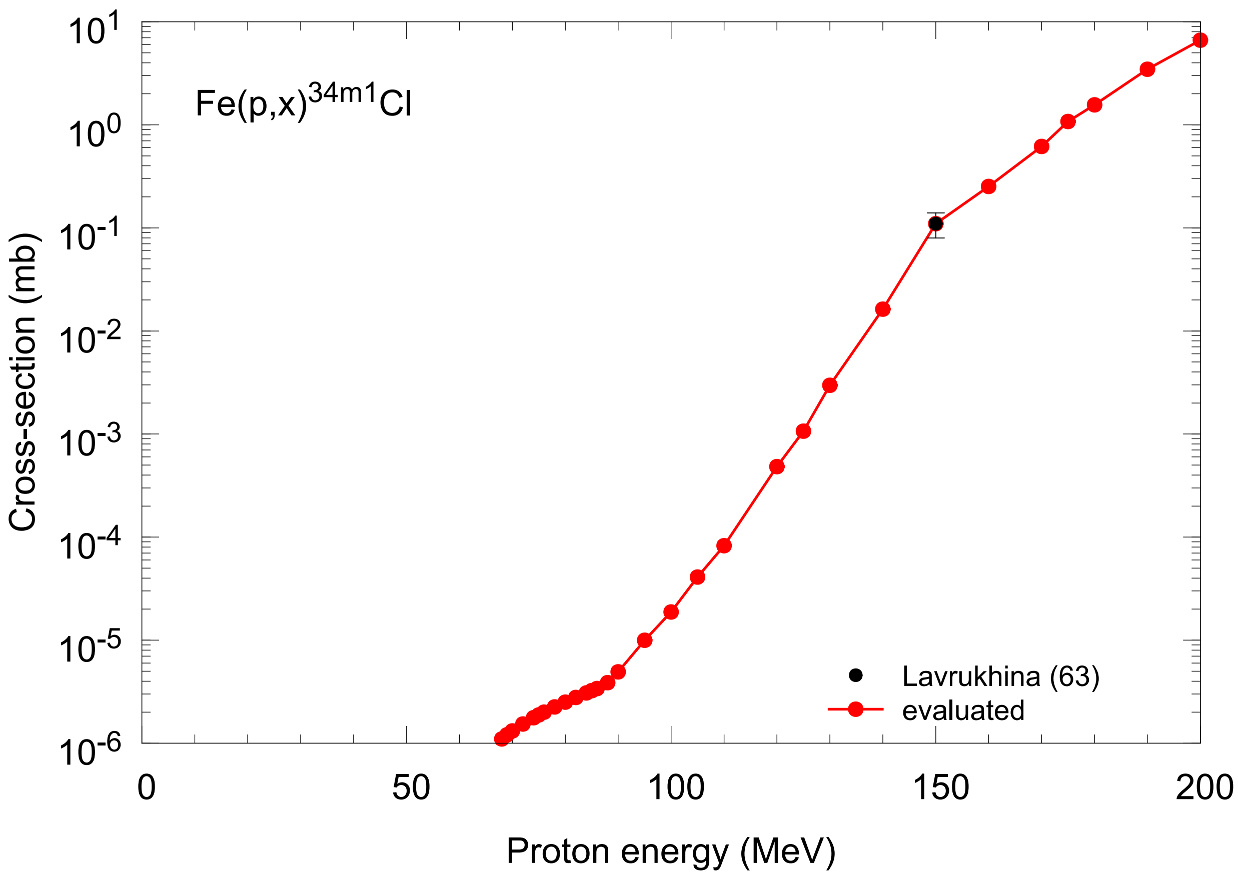


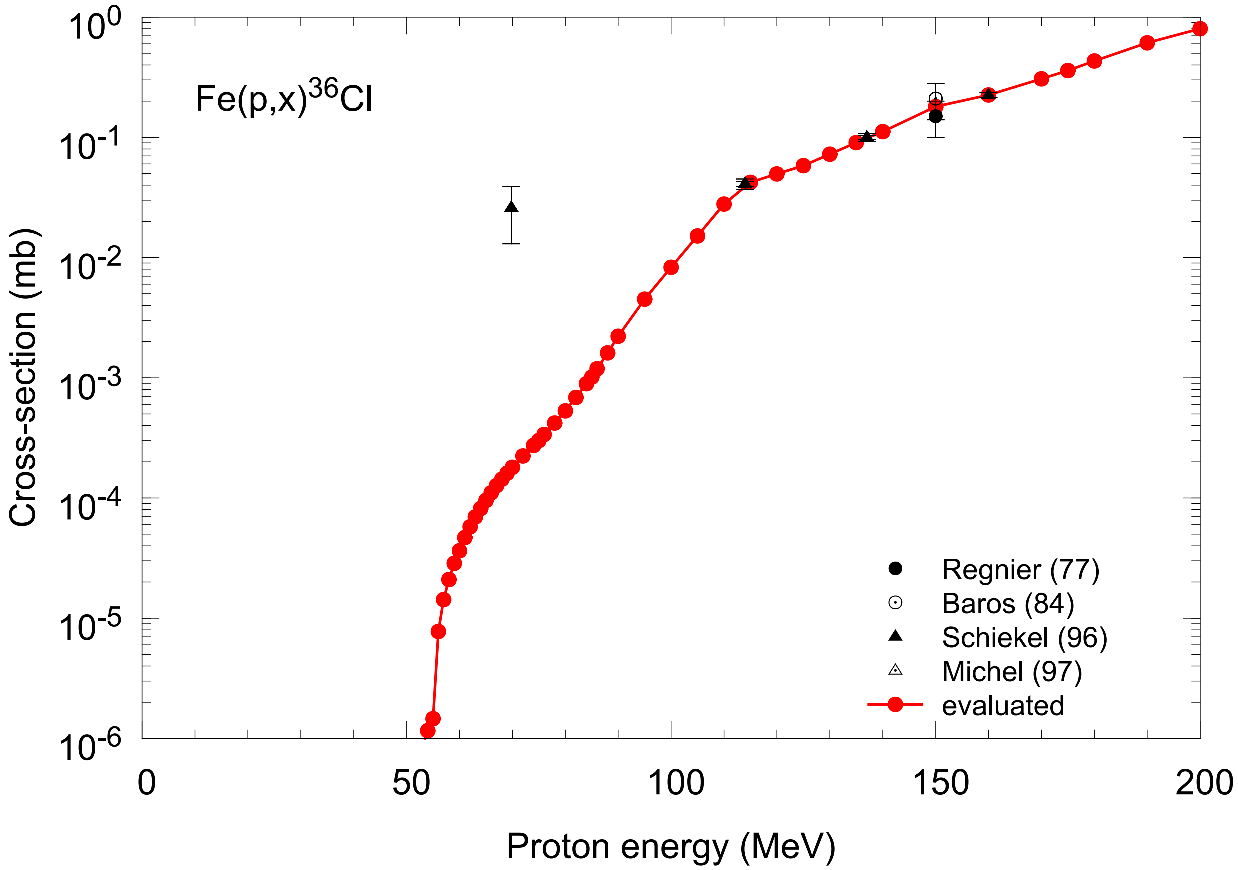
Fe(p,x)^{33}P(cum)
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
evaluated



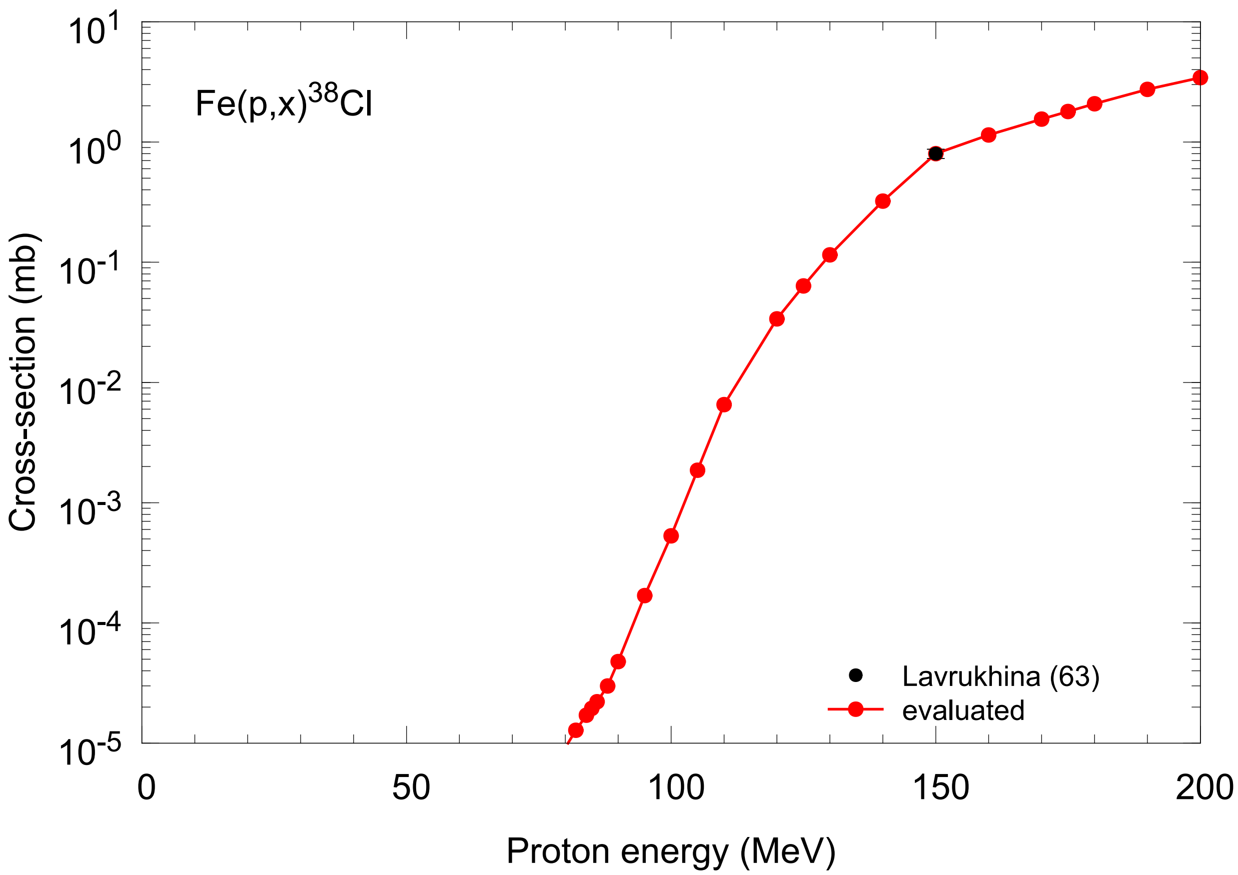
Fe(p,x)^{35}S(cum)
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
evaluated


Fe(p,x)^{38}S(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
0
50
100
150
200

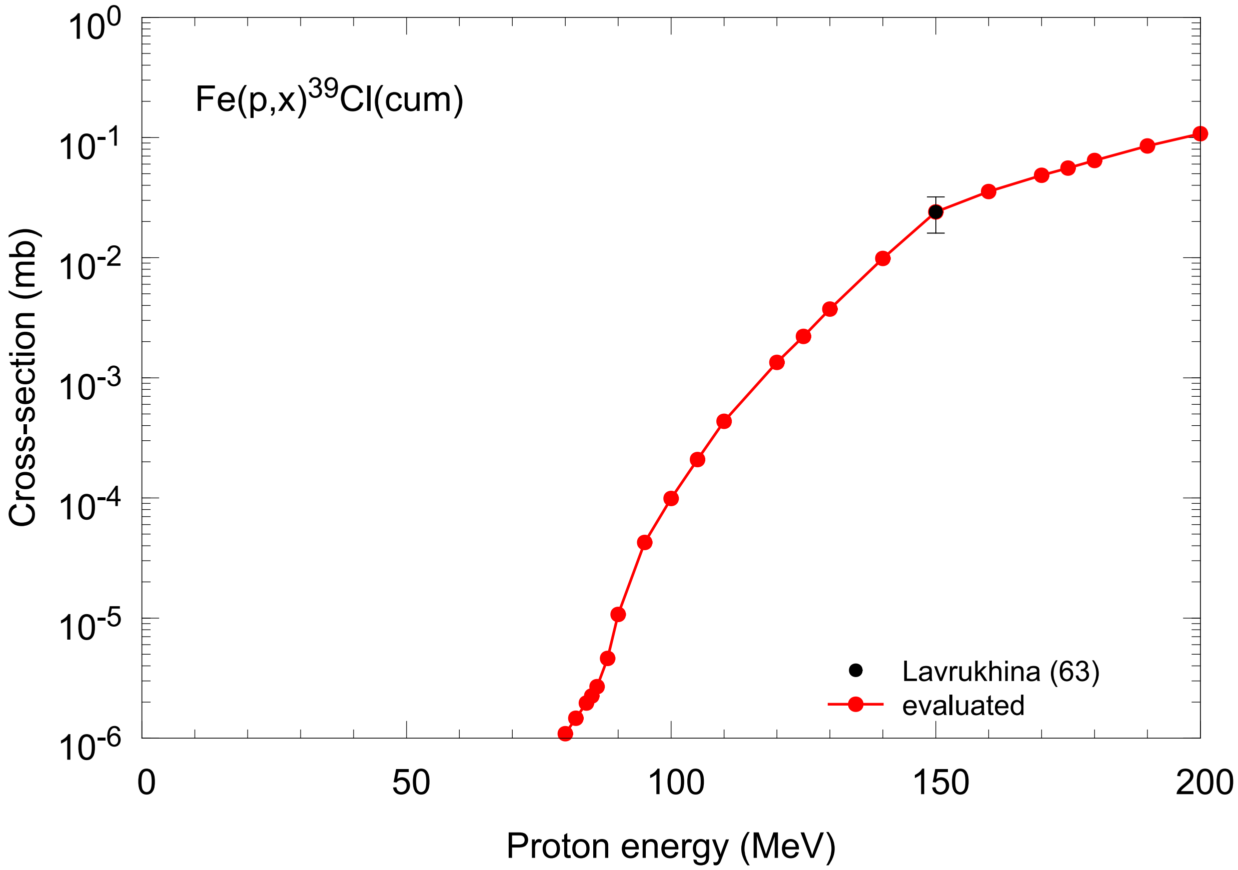

Fe(p,x)^{34m1}Cl
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
0
50
100
150
200

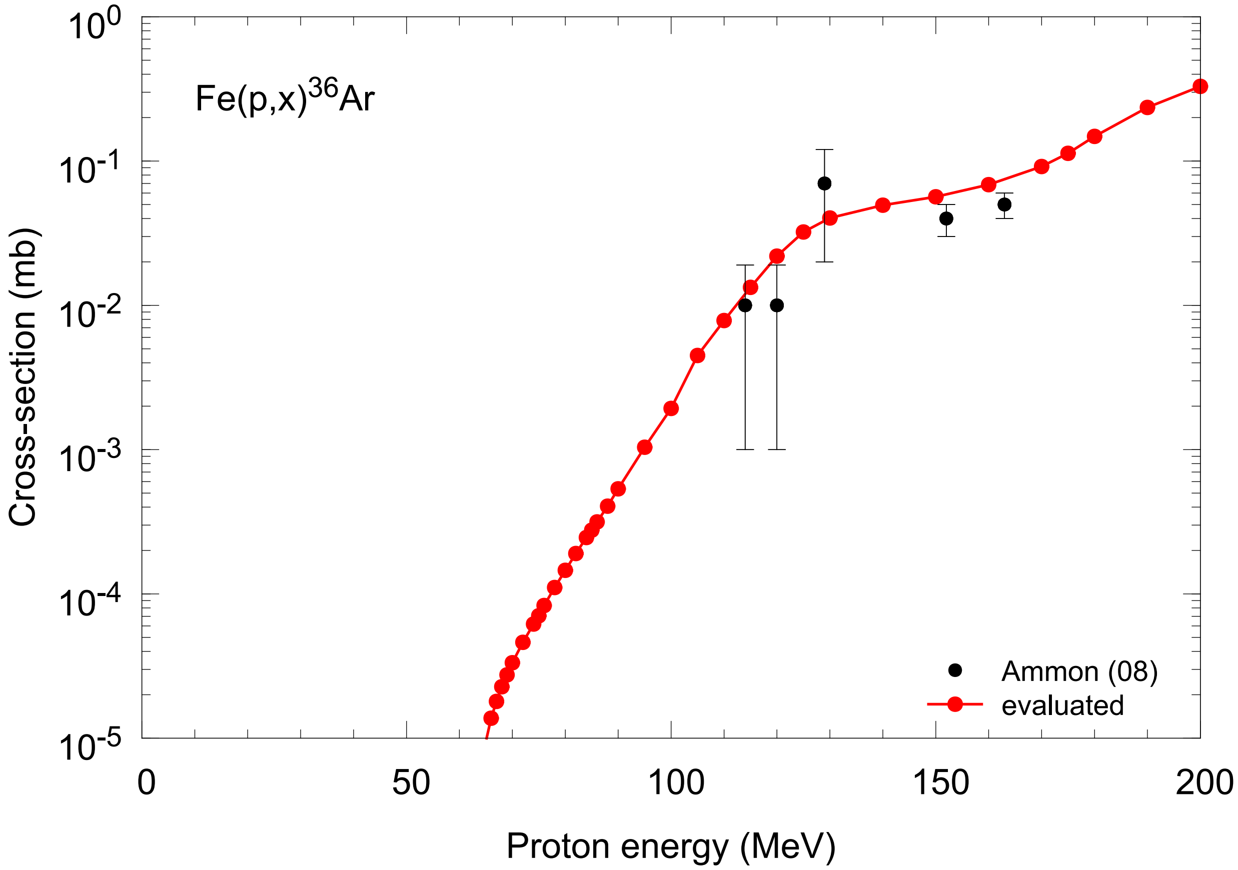


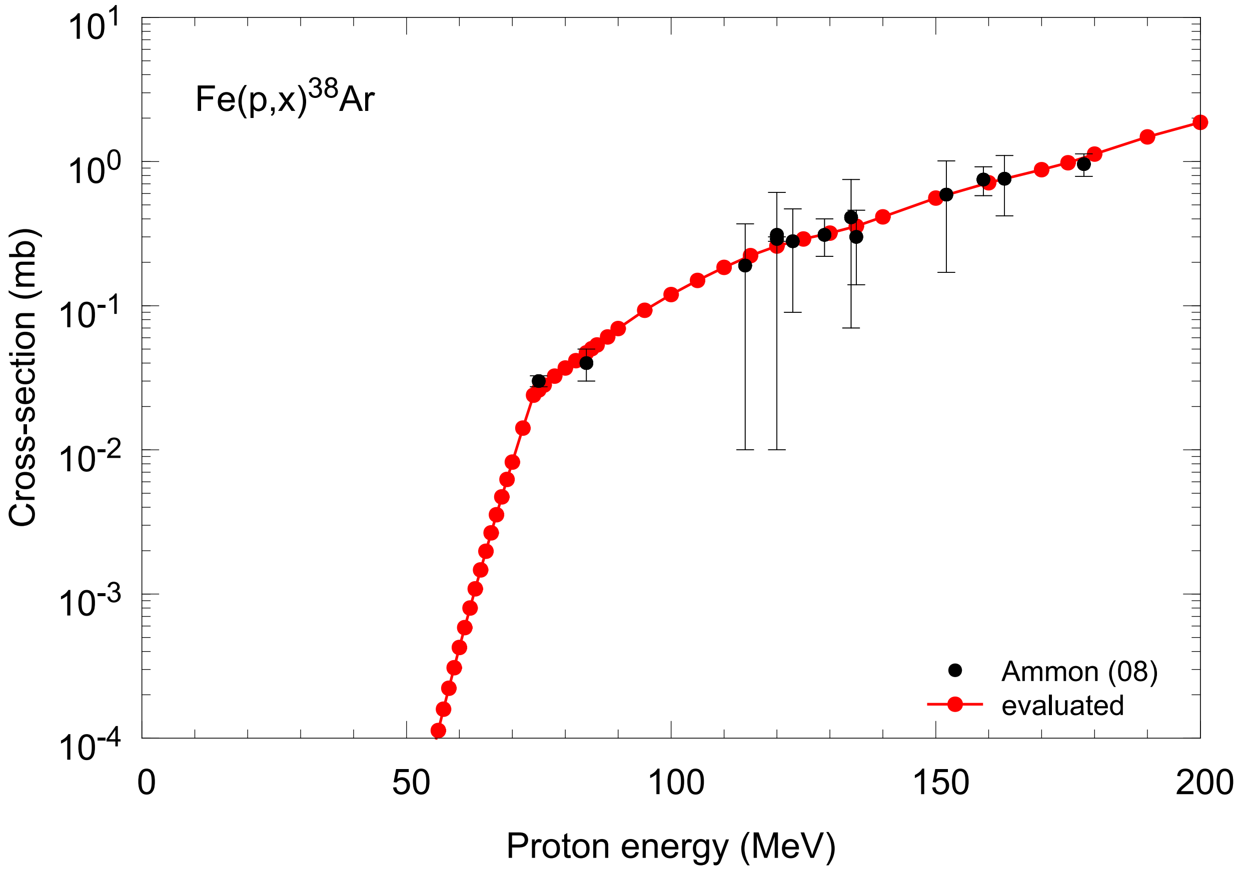
Fe(p,x)^{36}Cl
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
0
50
100
150
200
Proton energy (MeV)
Regnier (77)
Baros (84)
Schiekel (96)
Michel (97)
evaluated



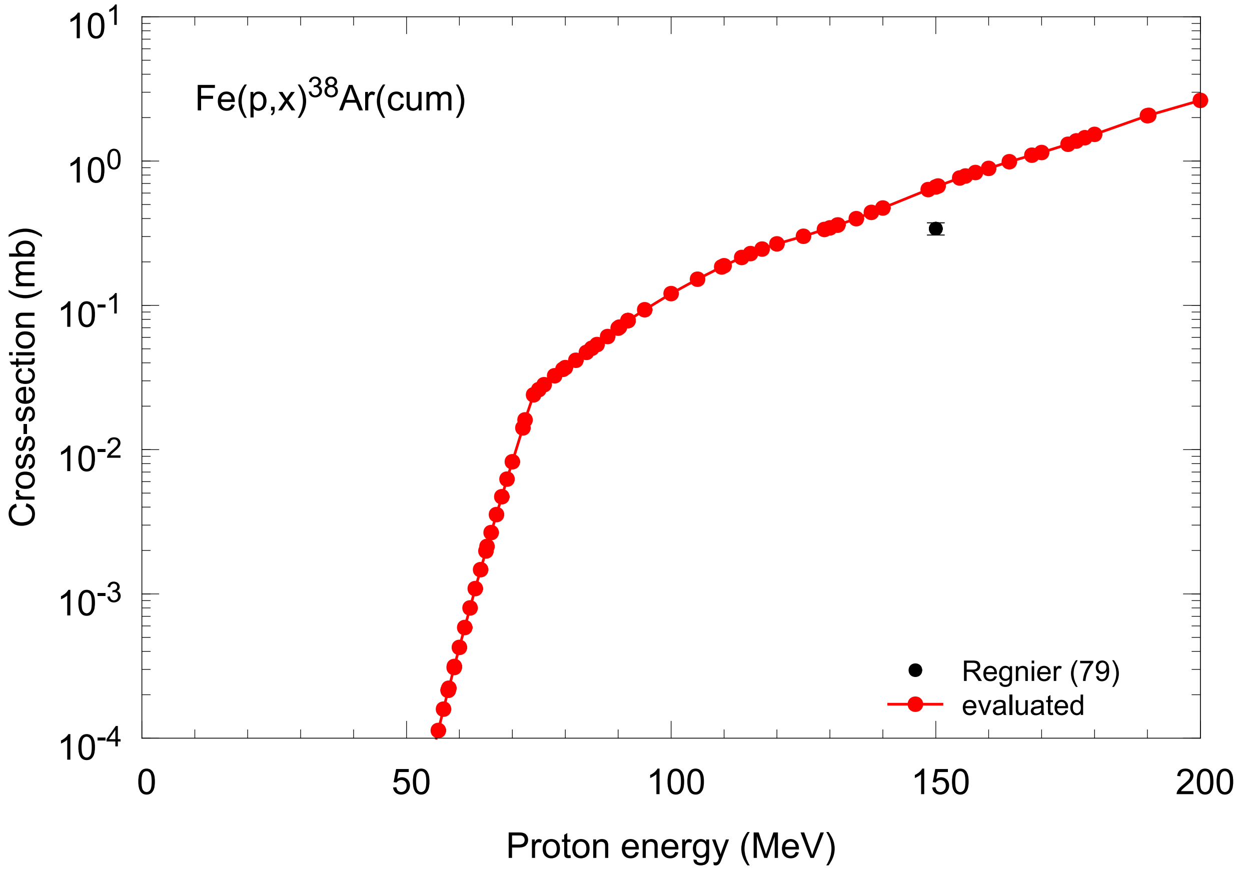
Fe(p,x)^{38}Cl
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
evaluated


Fe(p,x)^{39}Cl(cum)
Lavrukhina (63)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
0
50
100
150
200

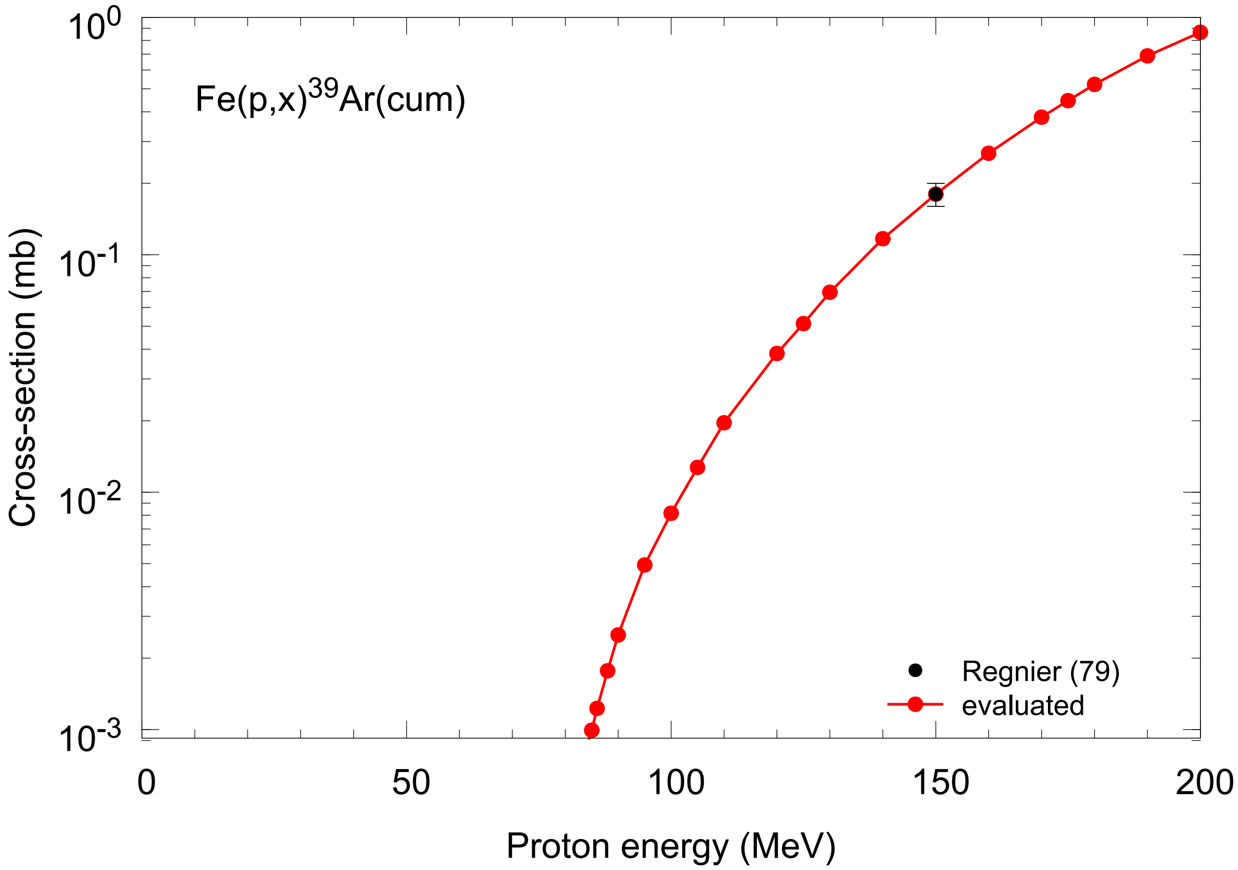

Fe(p,x)^{36}Ar
Ammon (08)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200

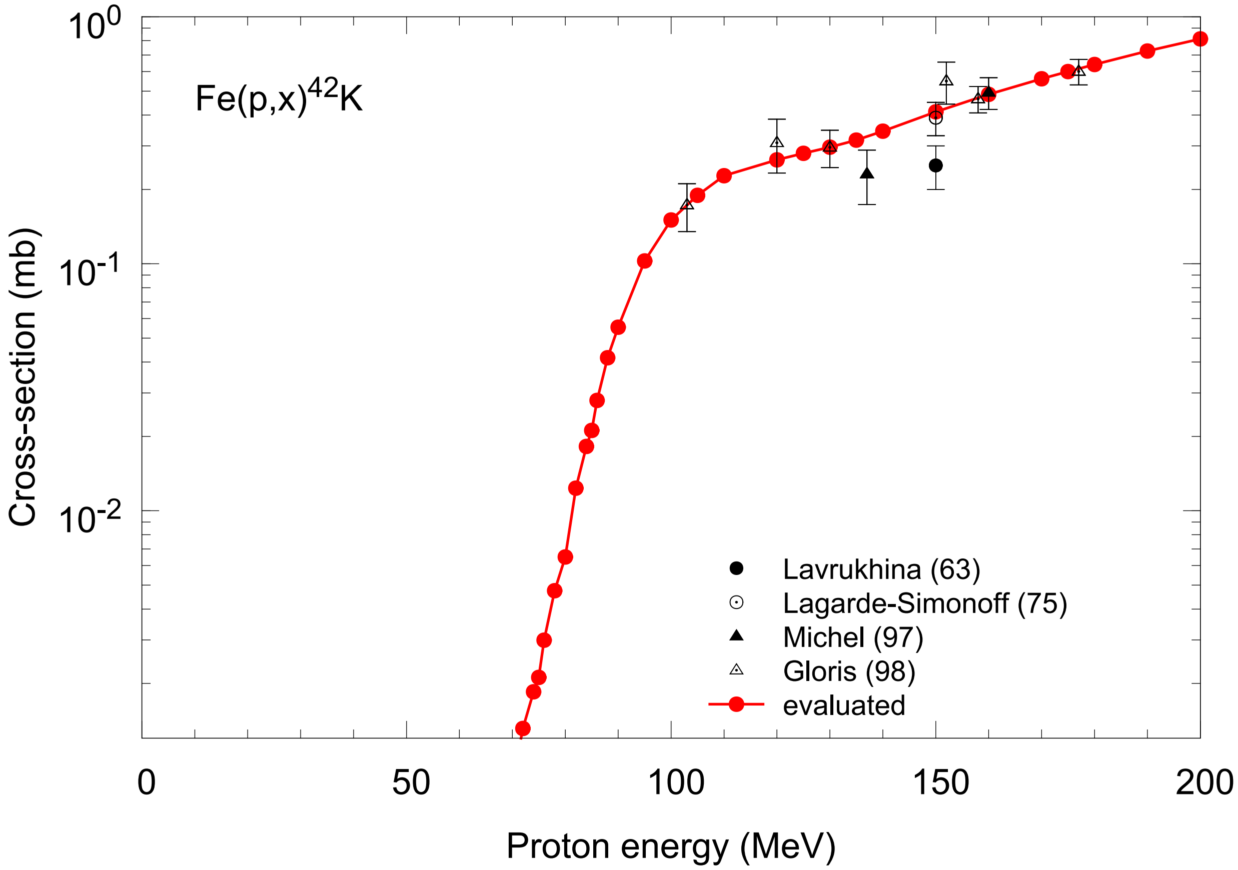


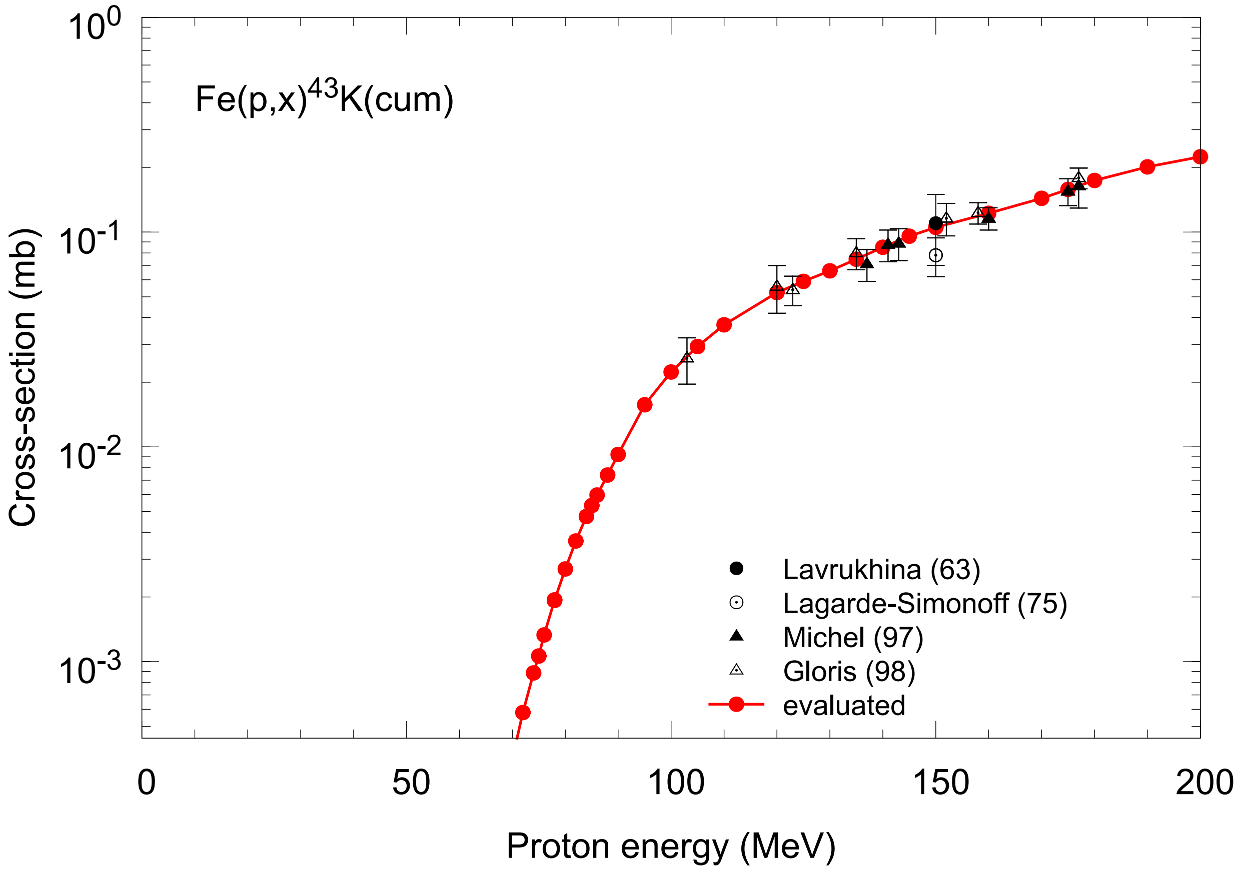
Fe(p,x)^{38}Ar
Ammon (08)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200



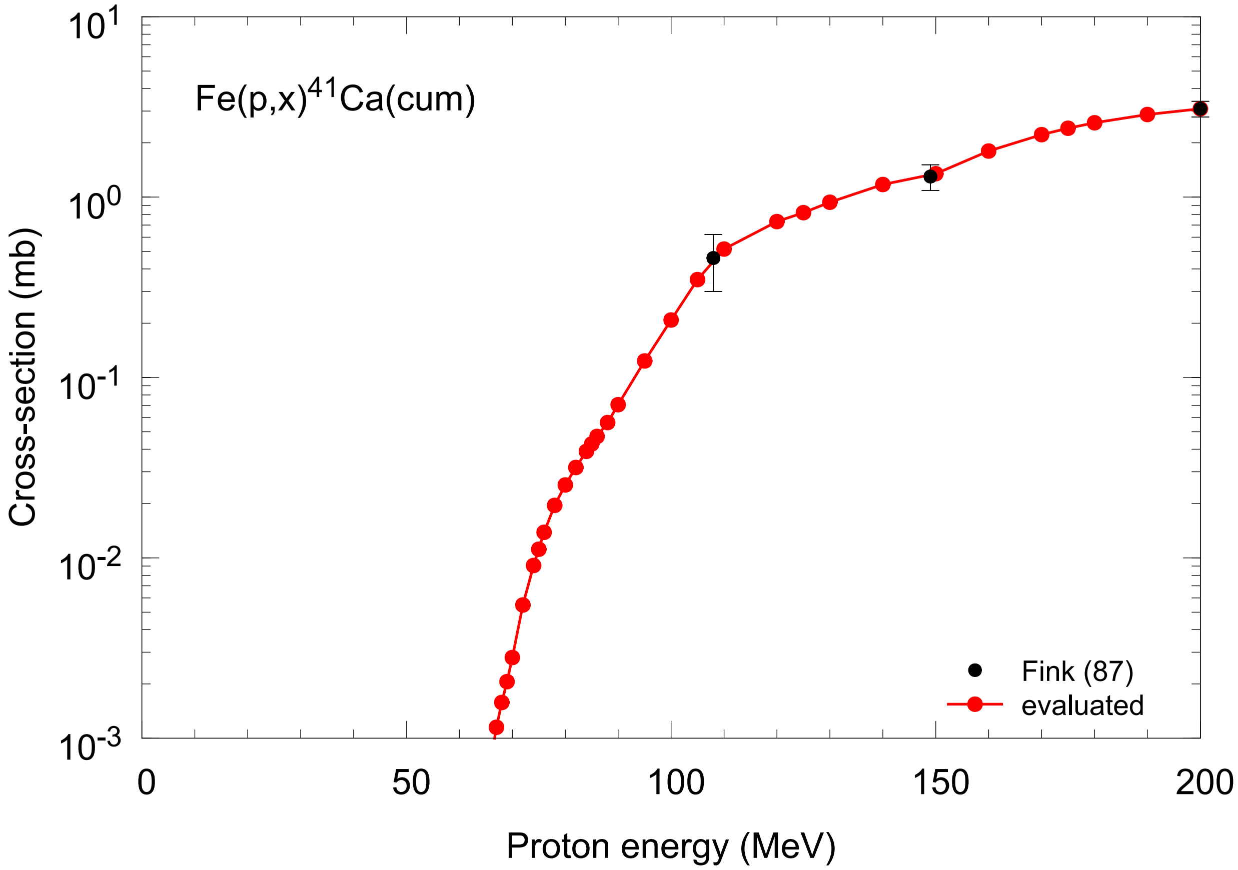
Fe(p,x)^{38}Ar(cum)
Regnier (79)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200


Fe(p,x)^{39}Ar(cum)
Regnier (79)
evaluated
Cross-section (mb)
Proton energy (MeV)

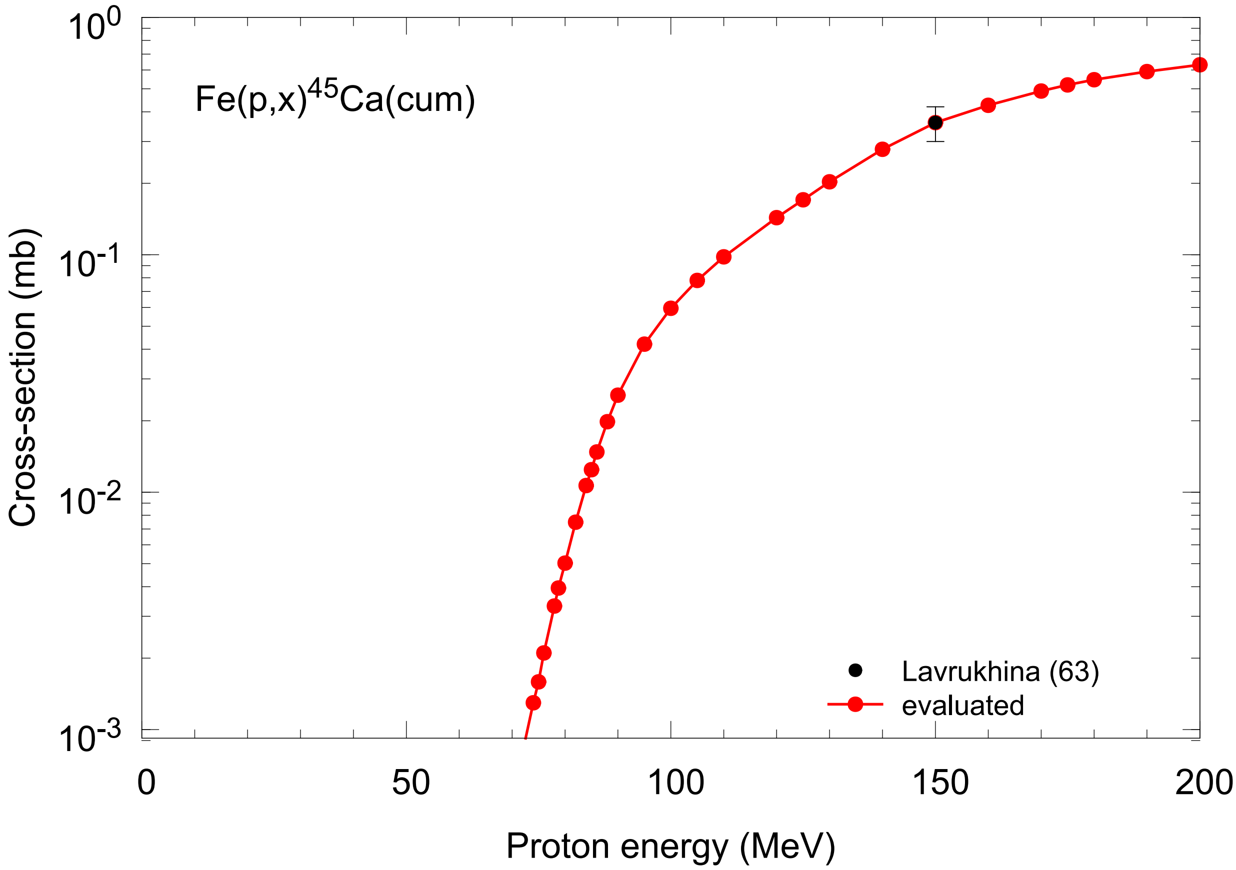

Fe(p,x)^{42}K
Lavrukhina (63)
Lagarde-Simonoff (75)
Michel (97)
Gloris (98)
evaluated
Cross-section (mb)
Proton energy (MeV)



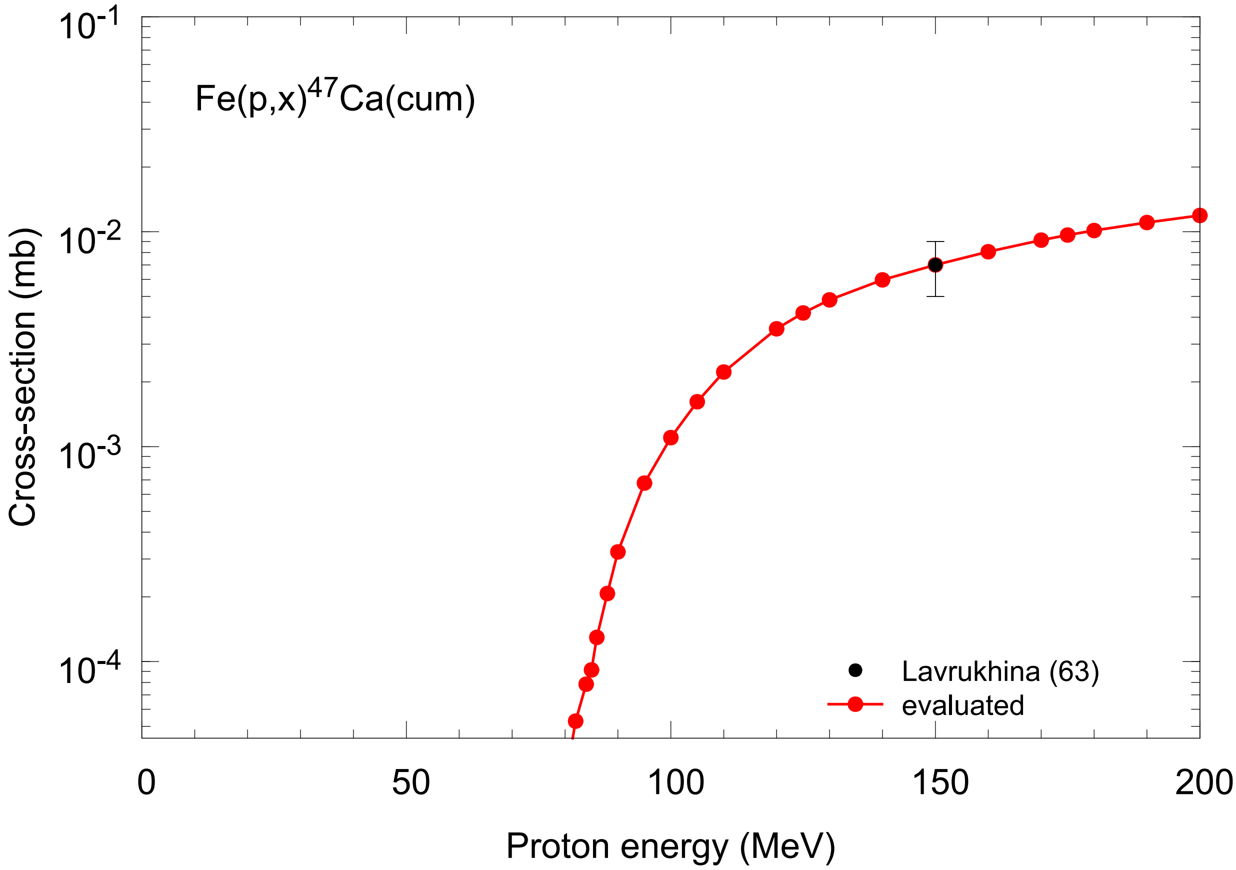
Fe(p,x)43K(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Lagarde-Simonoff (75)
Michel (97)
Gloris (98)
evaluated



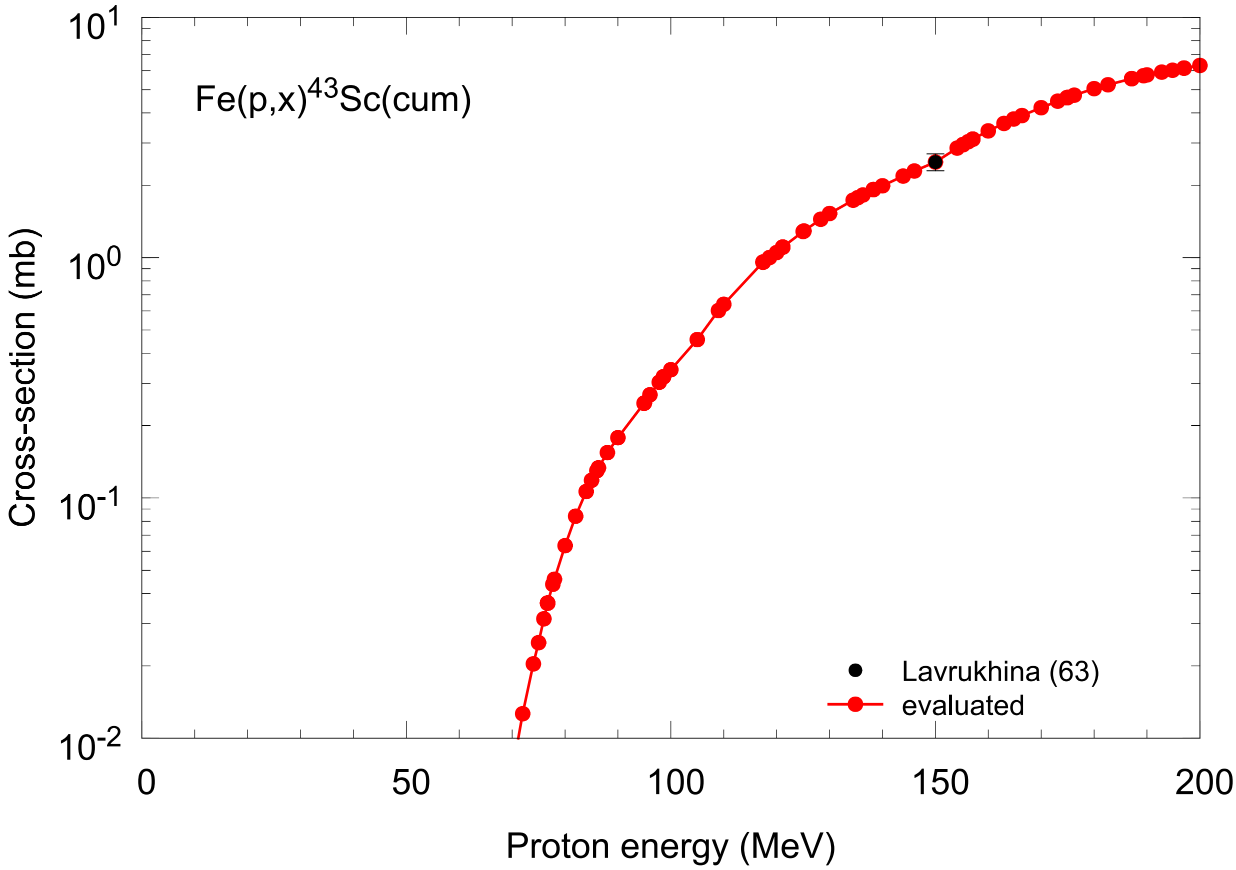
Fe(p,x)41Ca(cum)
Cross-section (mb)
Proton energy (MeV)
Fink (87)
evaluated



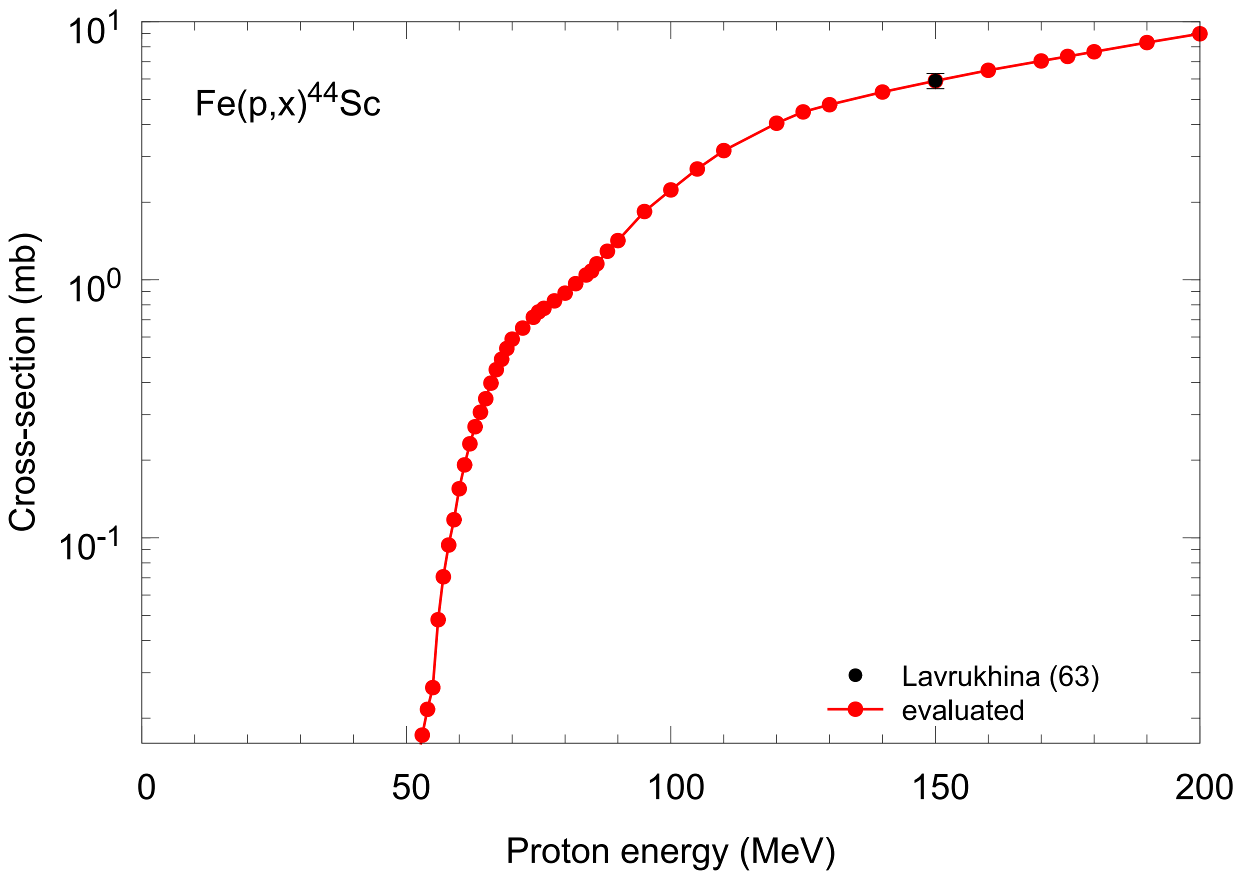
Fe(p,x)^{45}Ca(cum)
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
evaluated



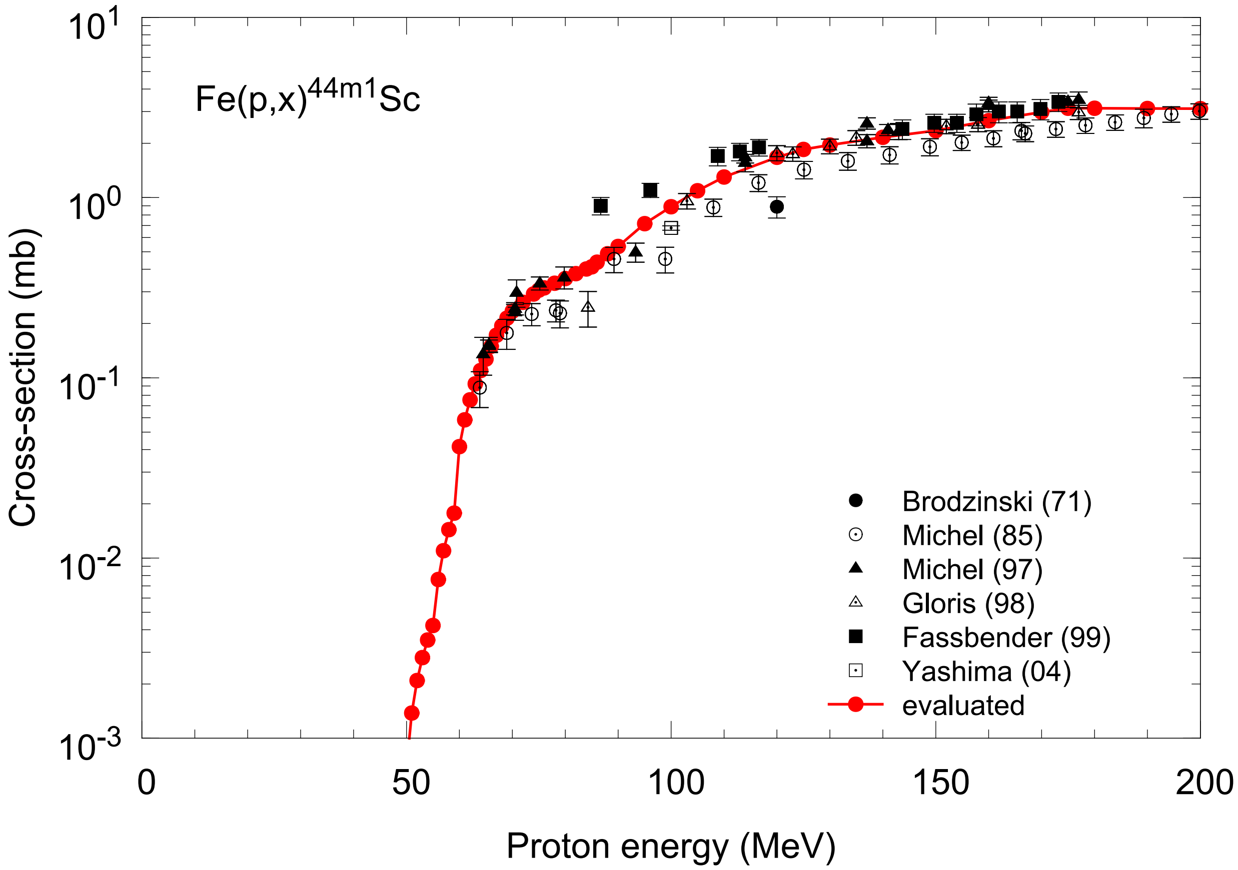
Fe(p,x)^{47}Ca(cum)
Cross-section (mb)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
evaluated



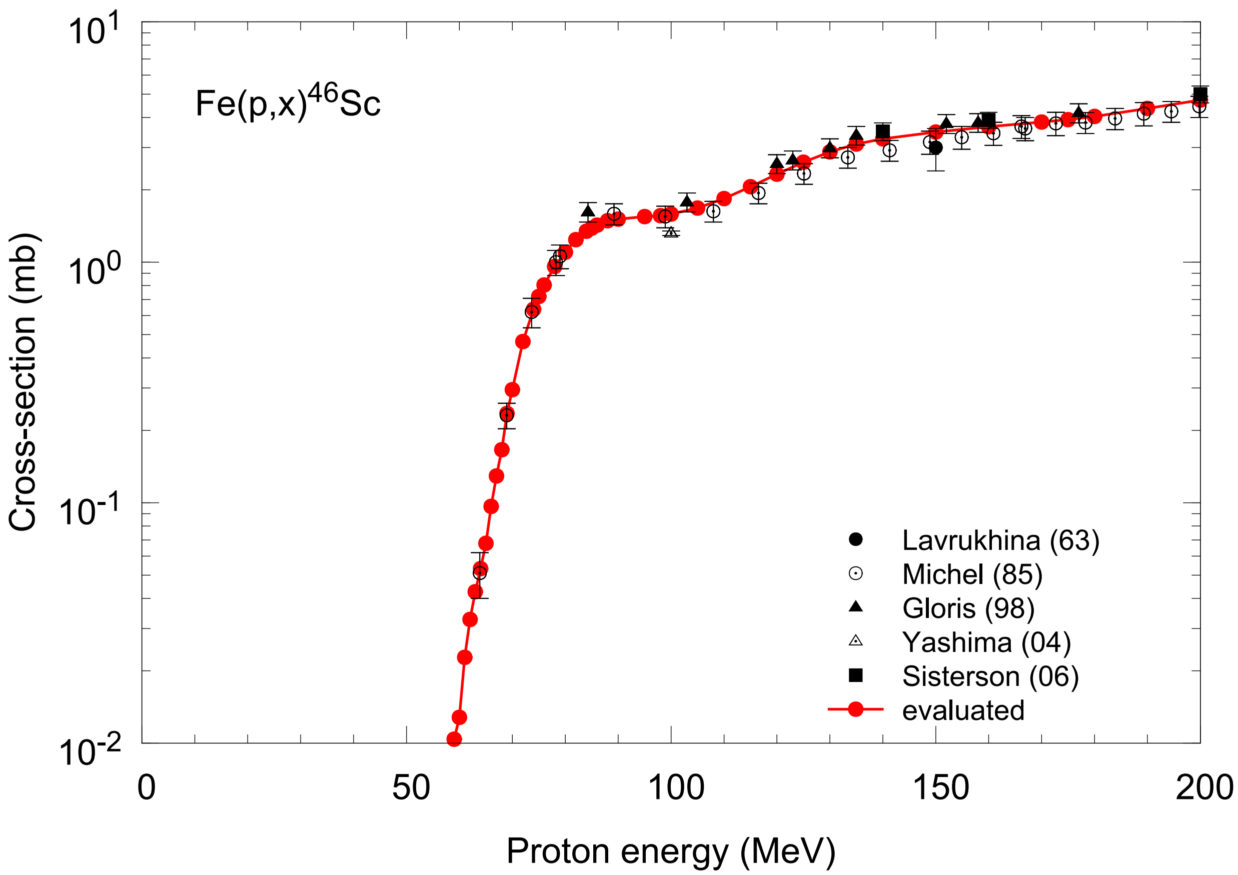
Fe(p,x)^{43}Sc(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated



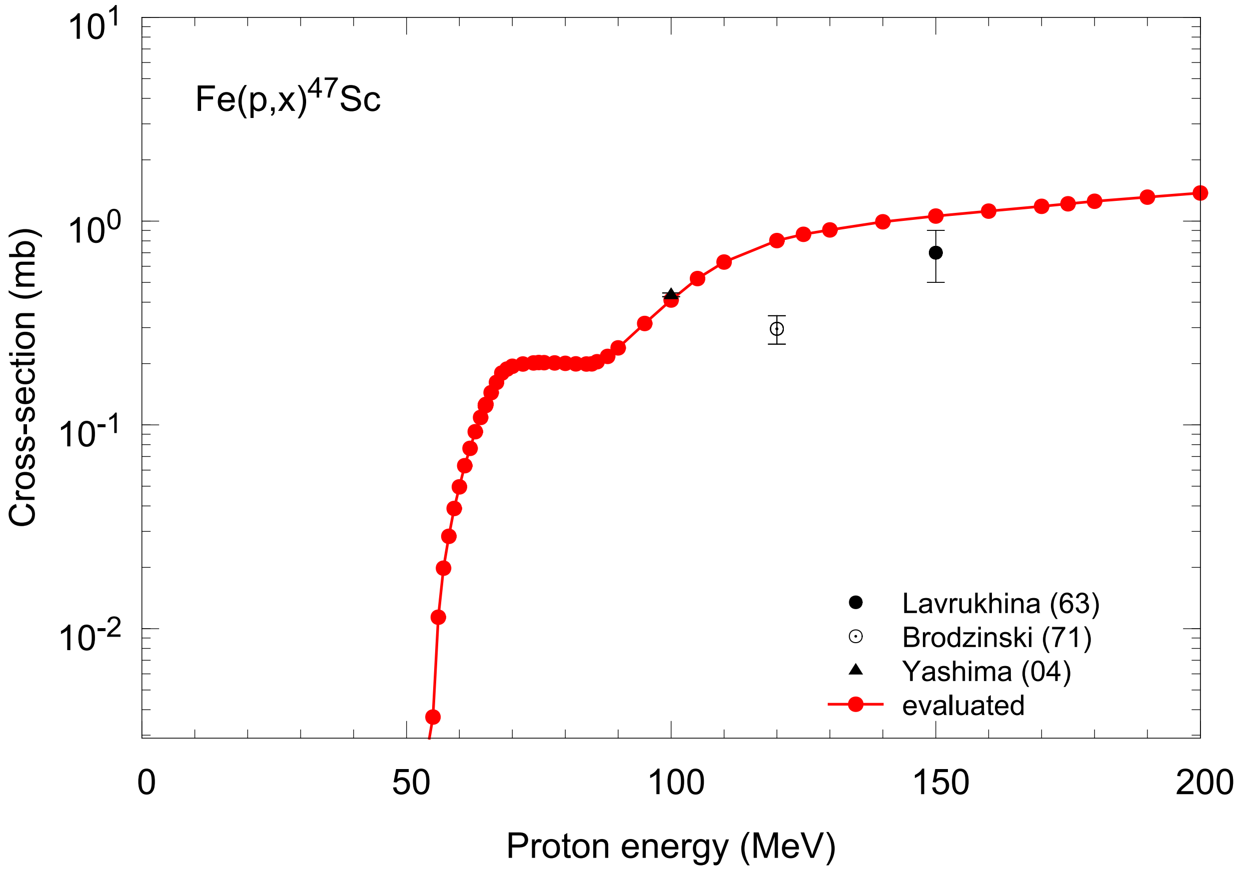
Fe(p,x)^{44}Sc
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated

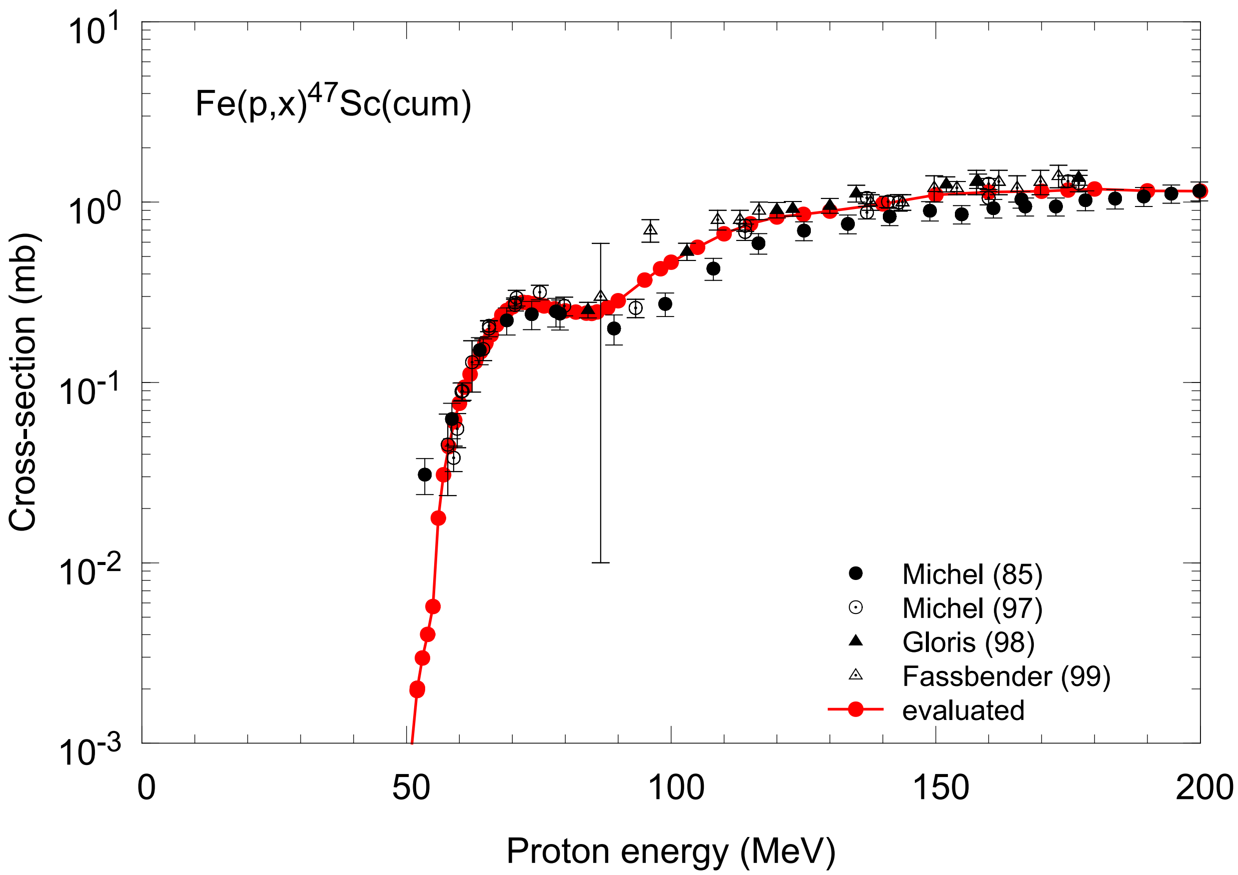


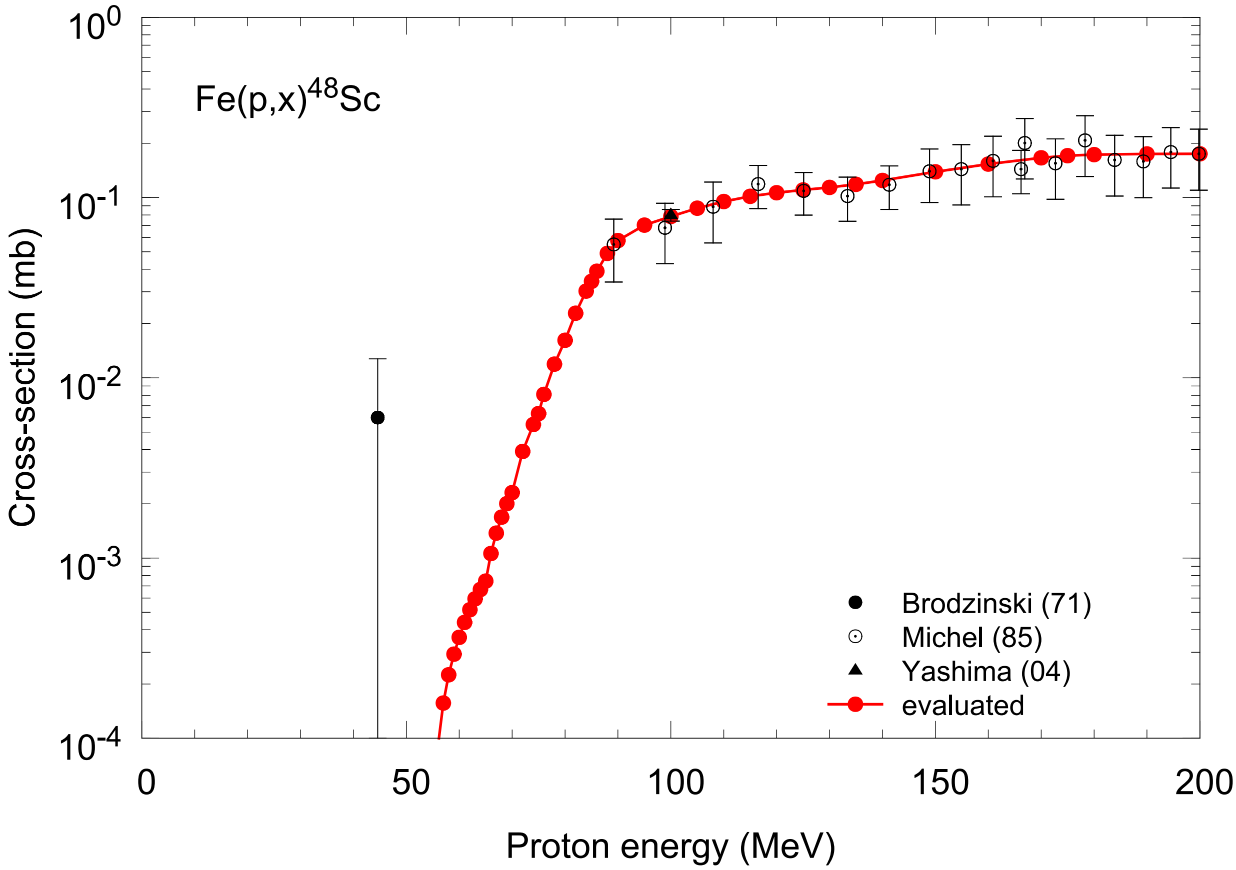
Fe(p,x)44m1Sc
Cross-section (mb)
Proton energy (MeV)
Brodzinski (71)
Michel (85)
Michel (97)
Gloris (98)
Fassbender (99)
Yashima (04)
evaluated



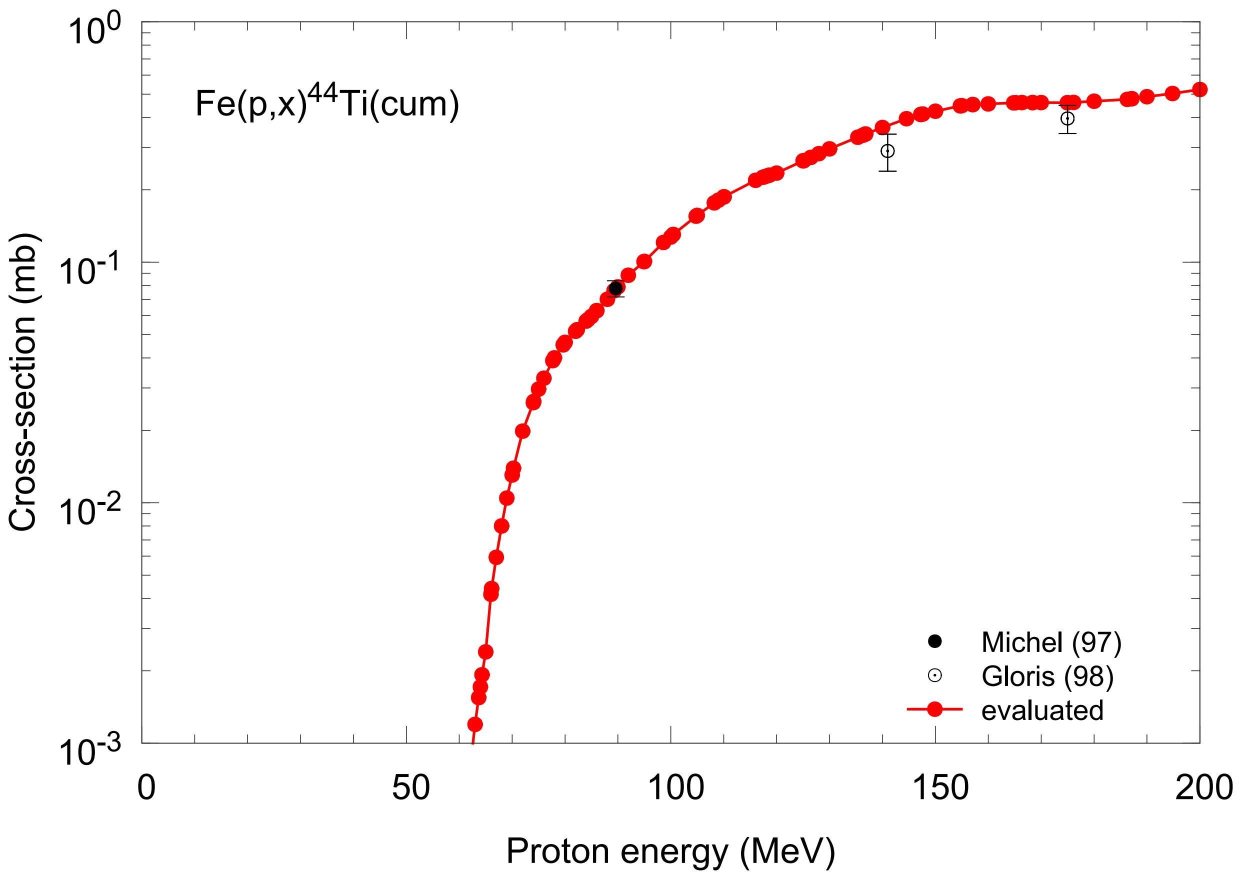
Fe(p,x)46Sc
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Michel (85)
Gloris (98)
Yashima (04)
Sisterson (06)
evaluated


Fe(p,x)^{47}Sc
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Brodzinski (71)
Yashima (04)
evaluated

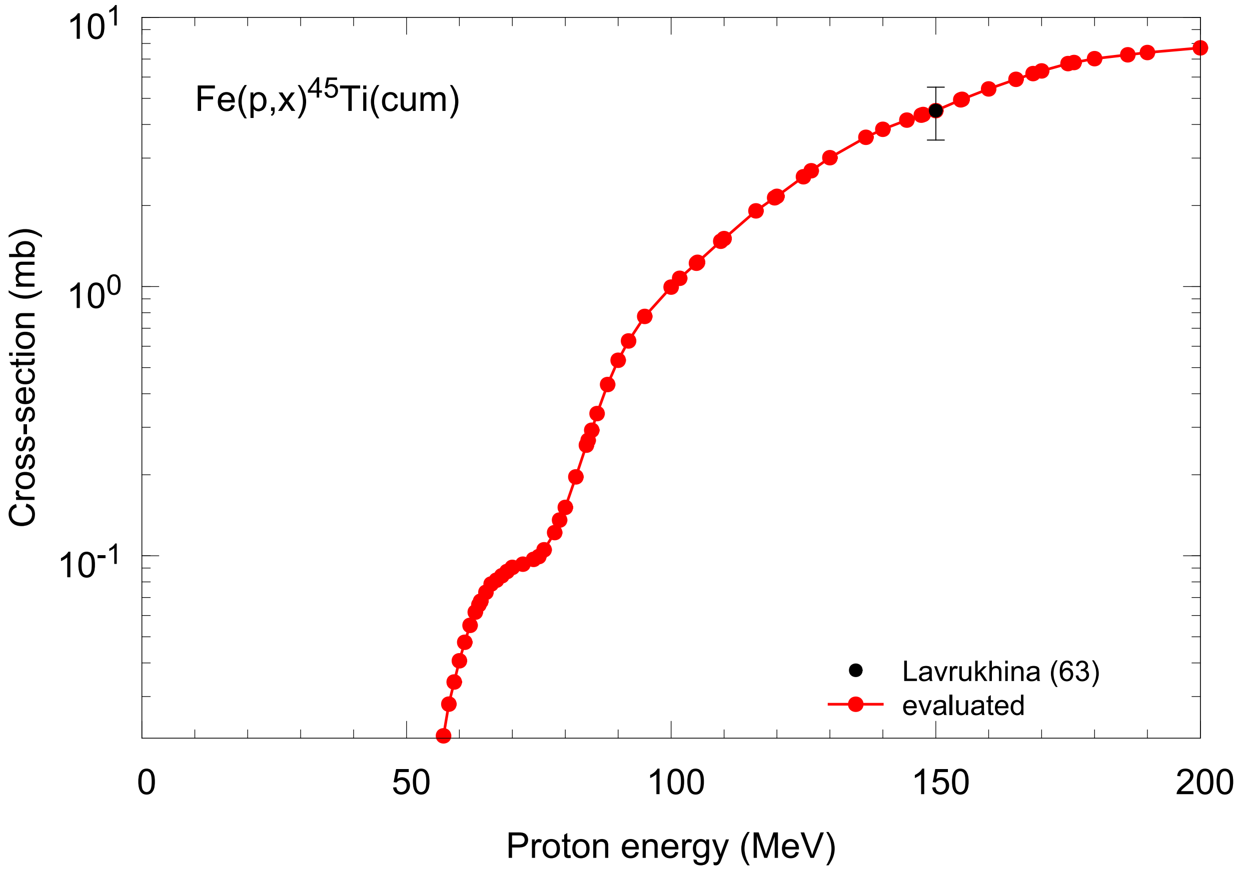

Fe(p,x)^{47}Sc(cum)
Cross-section (mb)
Proton energy (MeV)
Michel (85)
Michel (97)
Gloris (98)
Fassbender (99)
evaluated



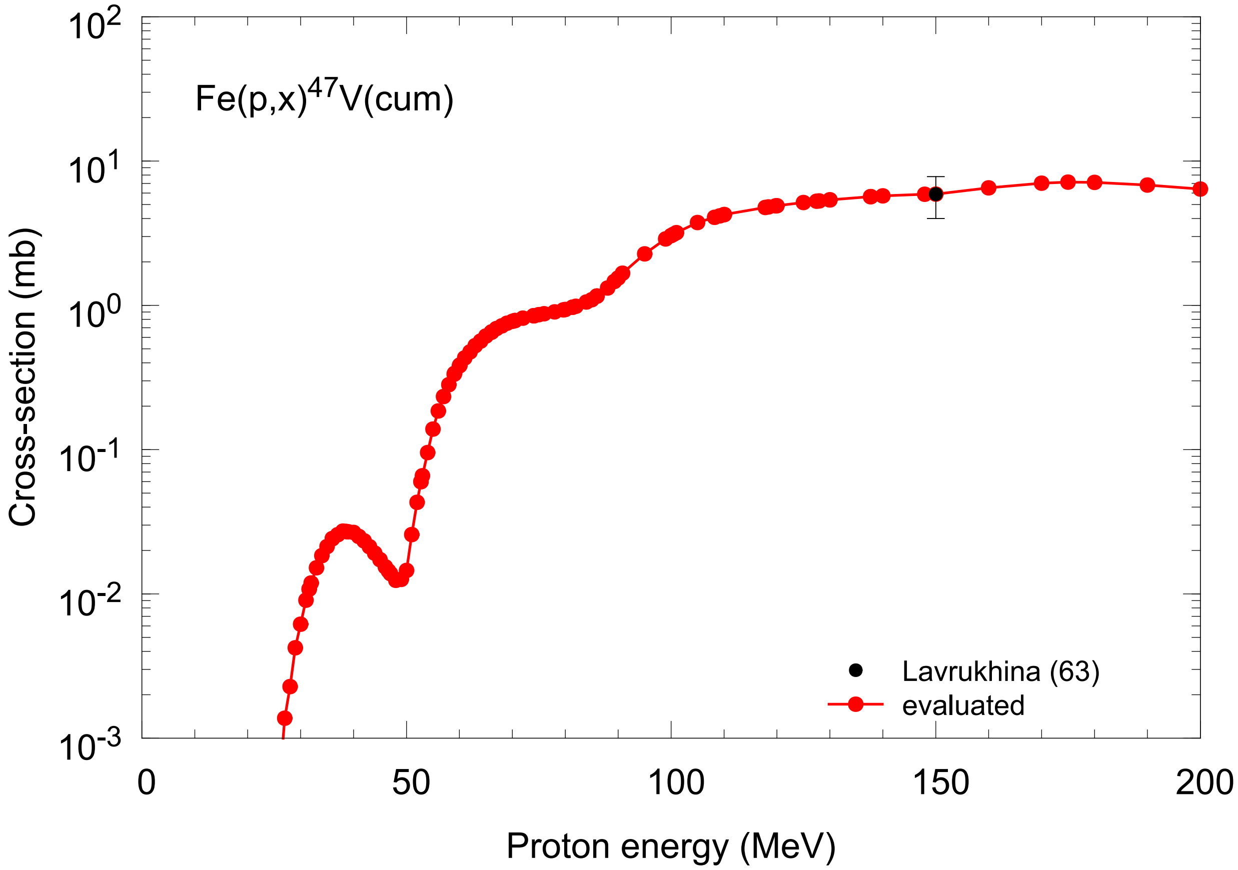
Fe(p,x)^{48}Sc
Cross-section (mb)
Proton energy (MeV)
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Brodzinski (71)
Michel (85)
Yashima (04)
evaluated



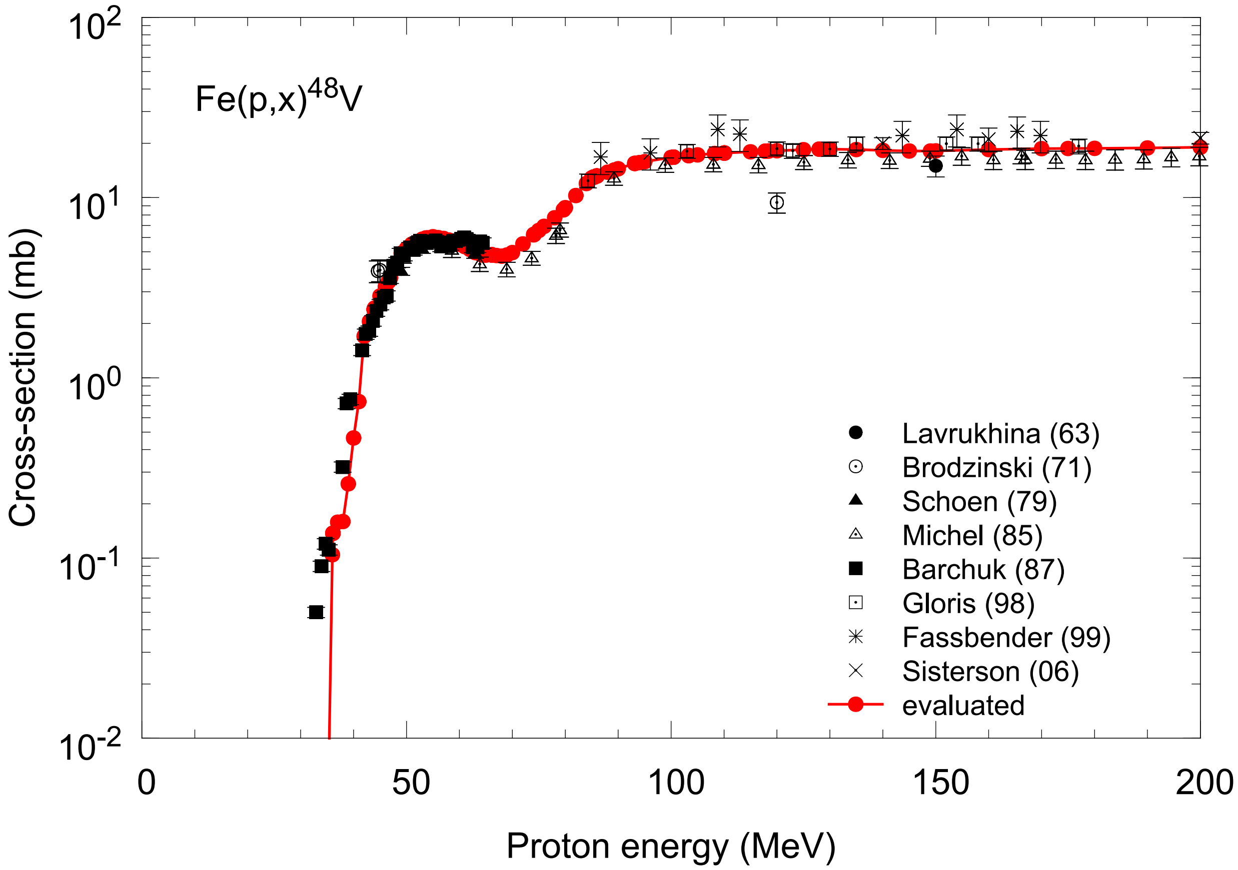
Fe(p,x)^{44}Ti(cum)
Cross-section (mb)
Proton energy (MeV)
10^0
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Michel (97)
Gloris (98)
evaluated

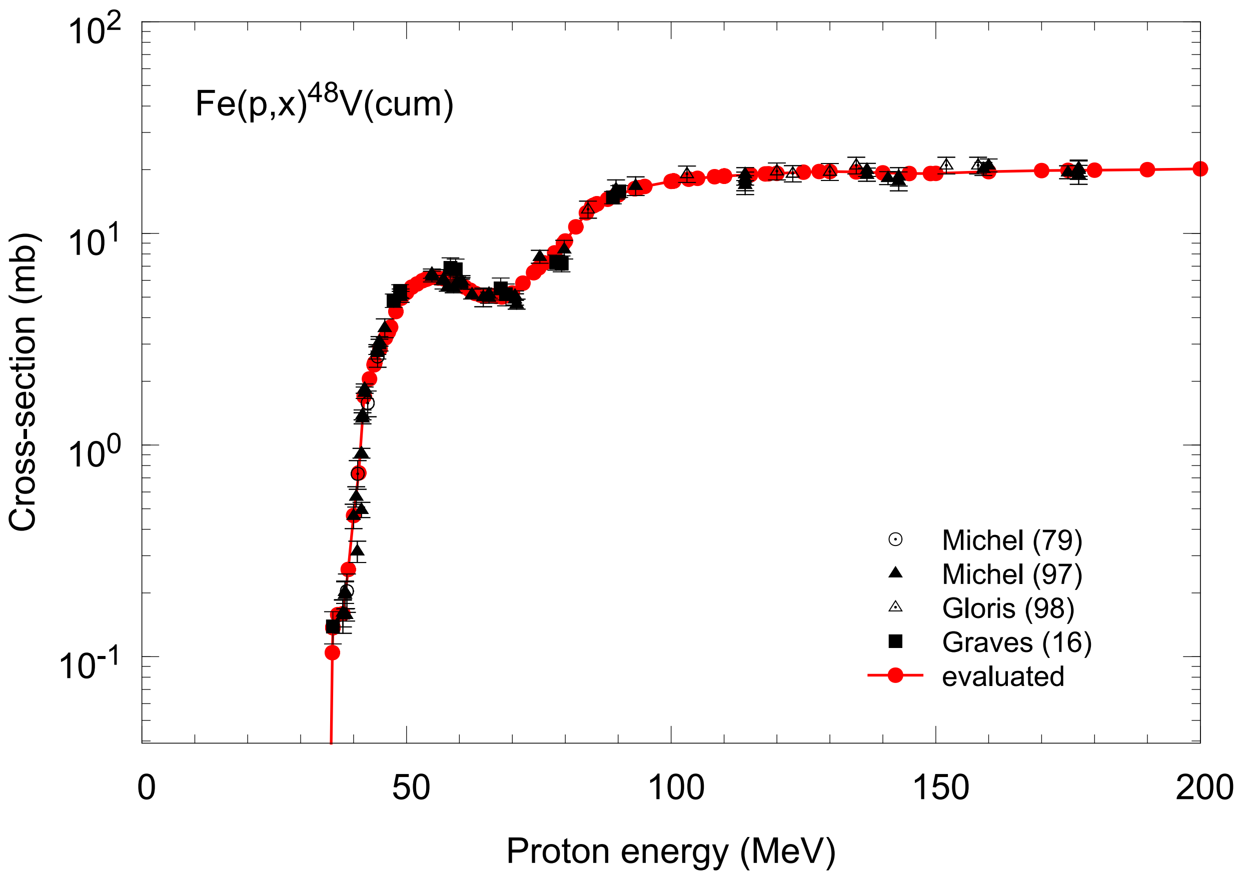


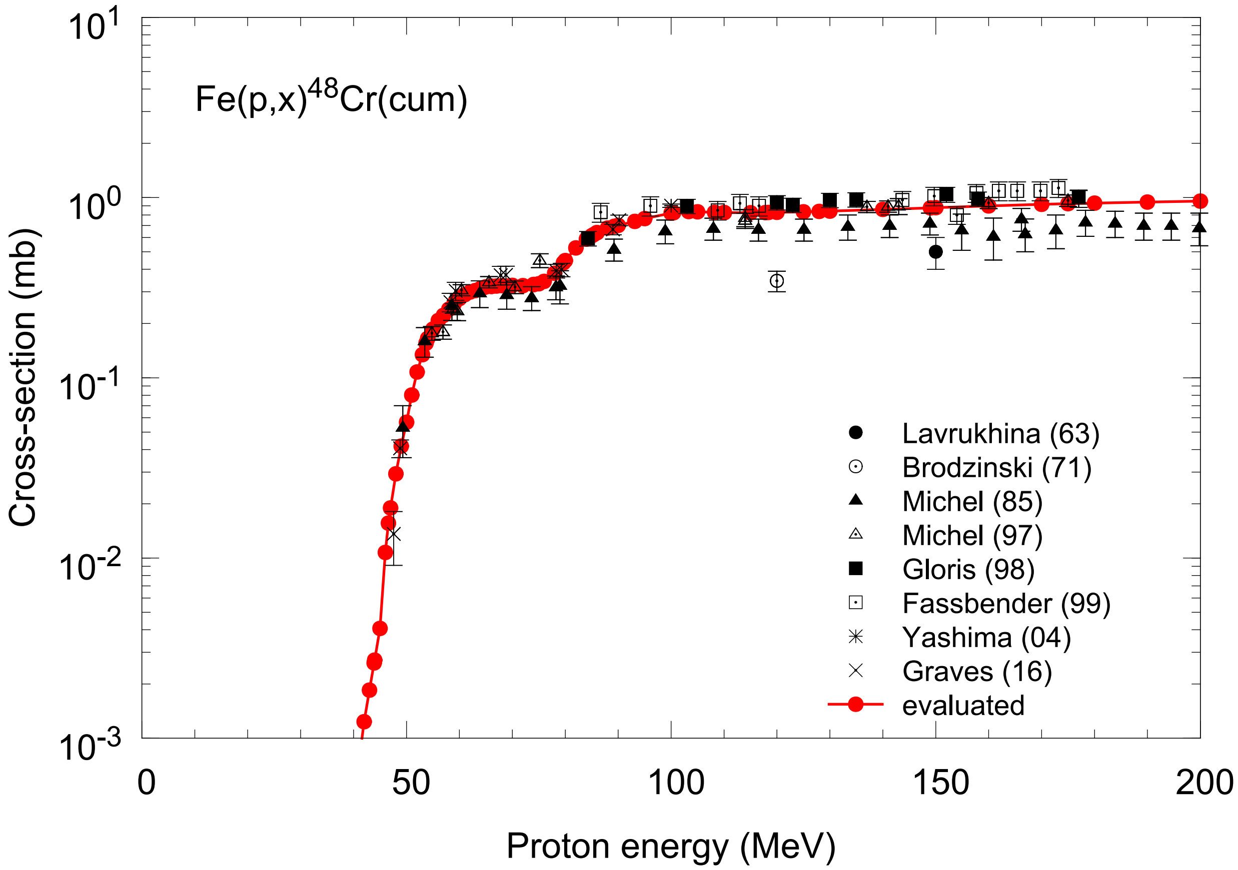
Fe(p,x)^{45}Ti(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated

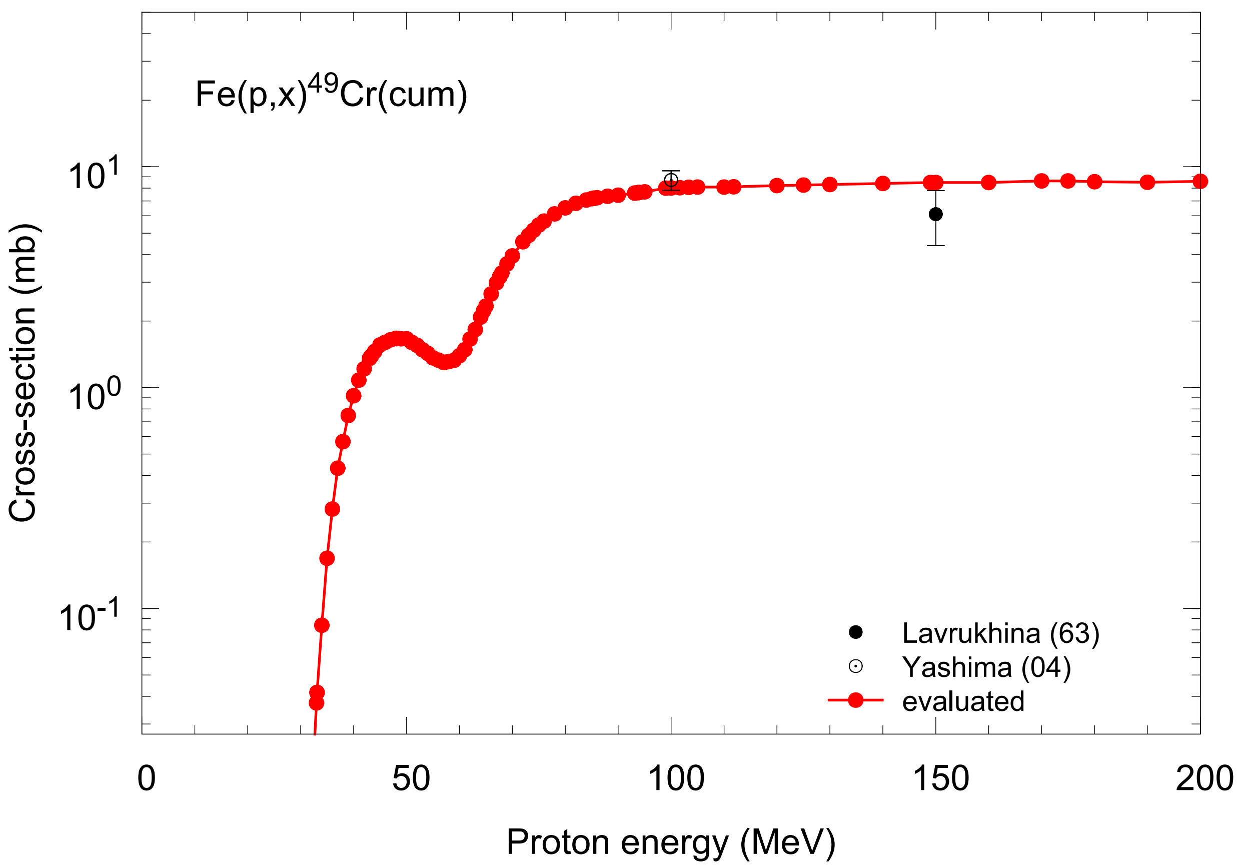


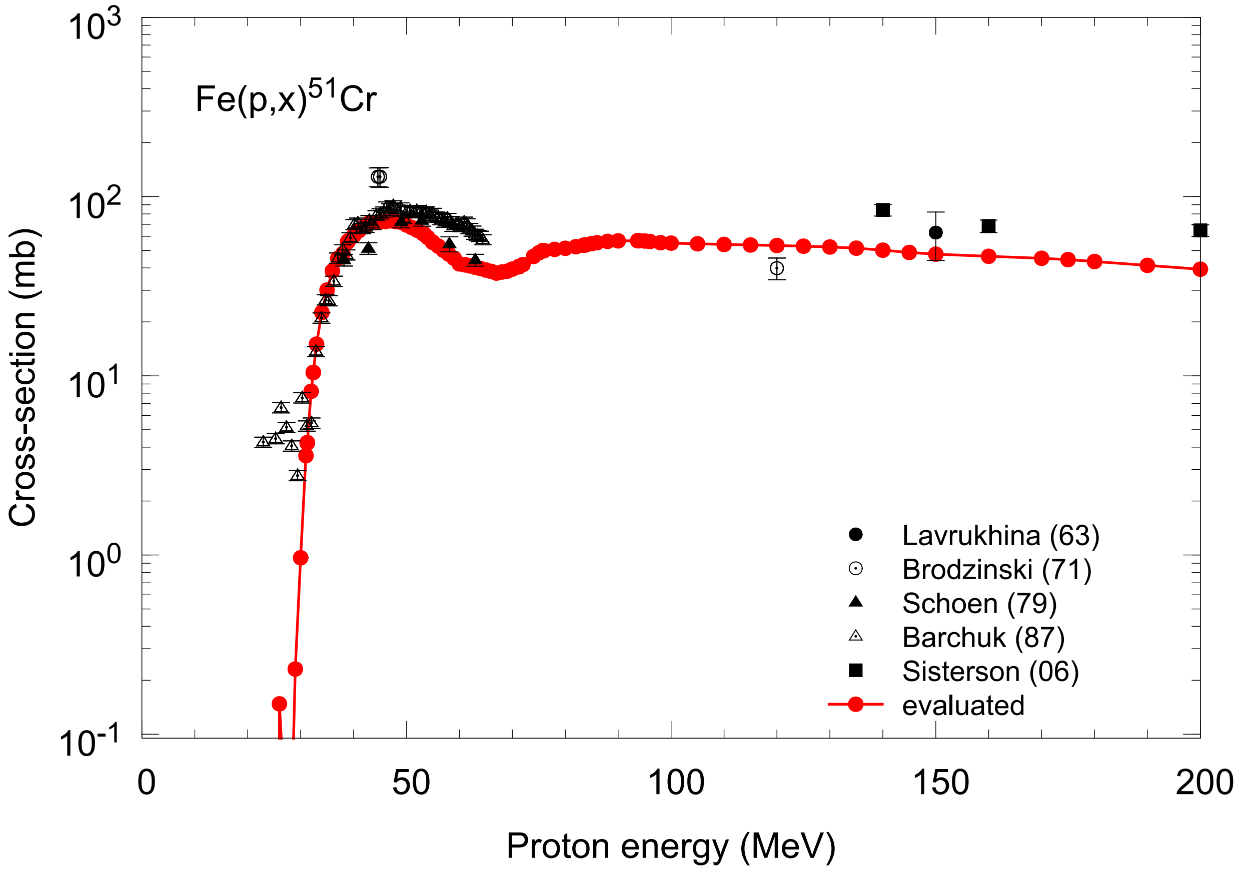
Fe(p,x)^{47}V(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated

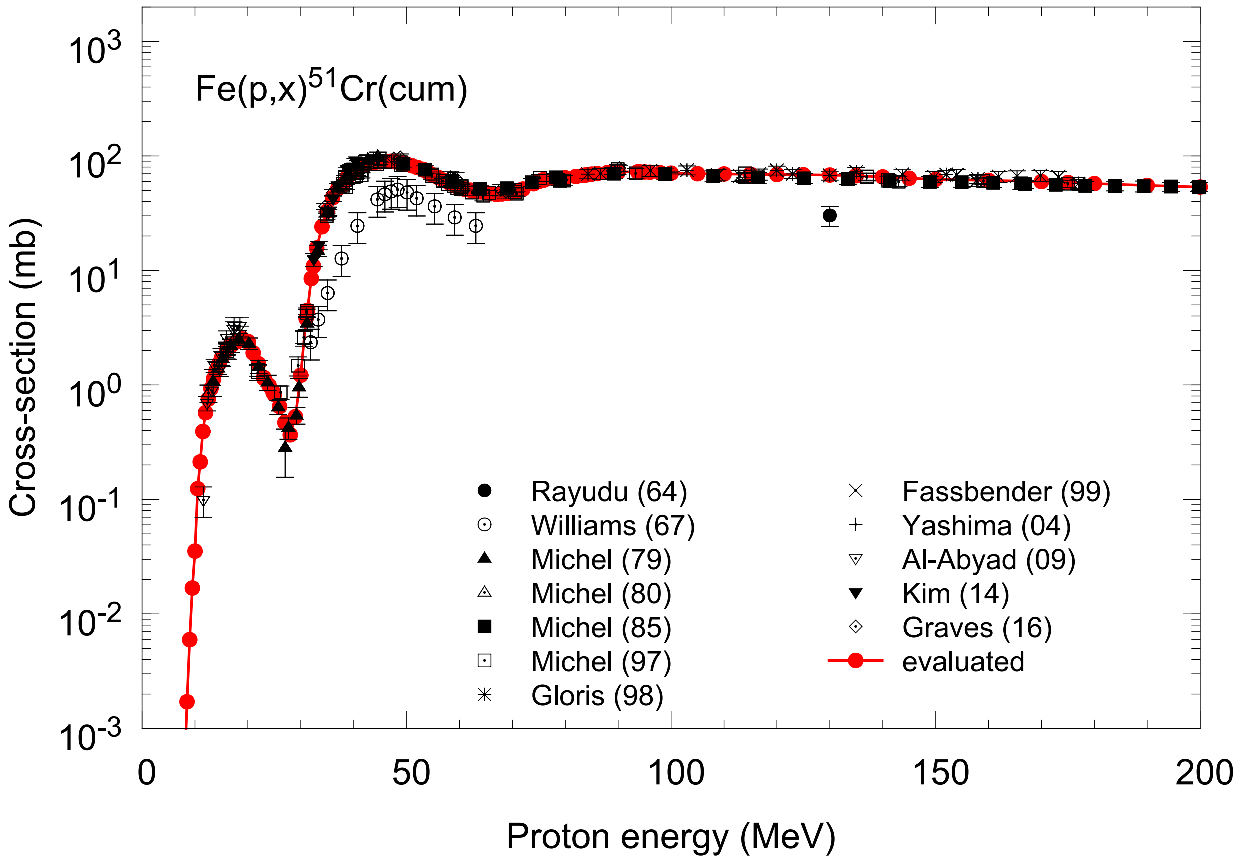

Fe(p,x)48V
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Brodzinski (71)
Schoen (79)
Michel (85)
Barchuk (87)
Gloris (98)
Fassbender (99)
Sisterson (06)
evaluated

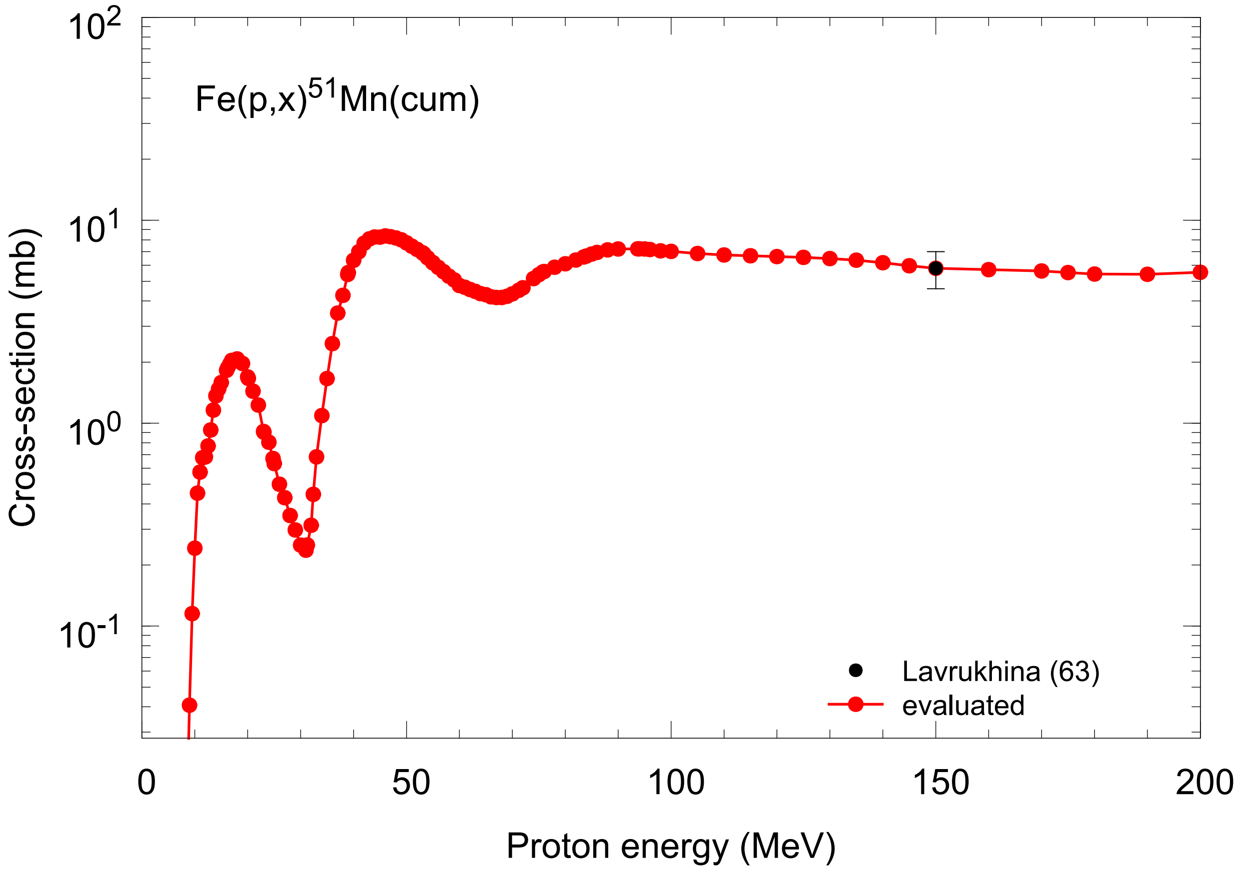

Fe(p,x)48V(cum)
Cross-section (mb)
Proton energy (MeV)
Michel (79)
Michel (97)
Gloris (98)
Graves (16)
evaluated

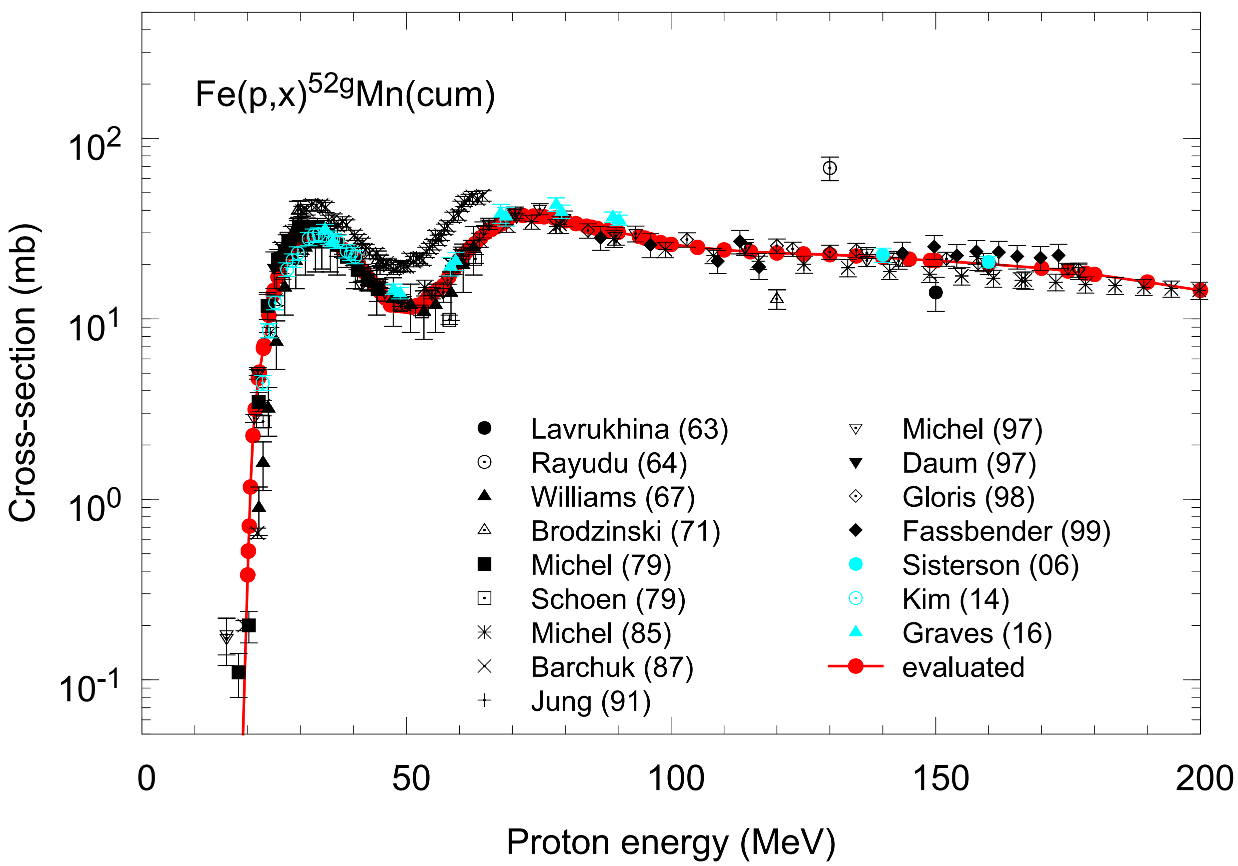

Fe(p,x)^{48}Cr(cum)
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
Brodzinski (71)
Michel (85)
Michel (97)
Gloris (98)
Fassbender (99)
Yashima (04)
Graves (16)
evaluated

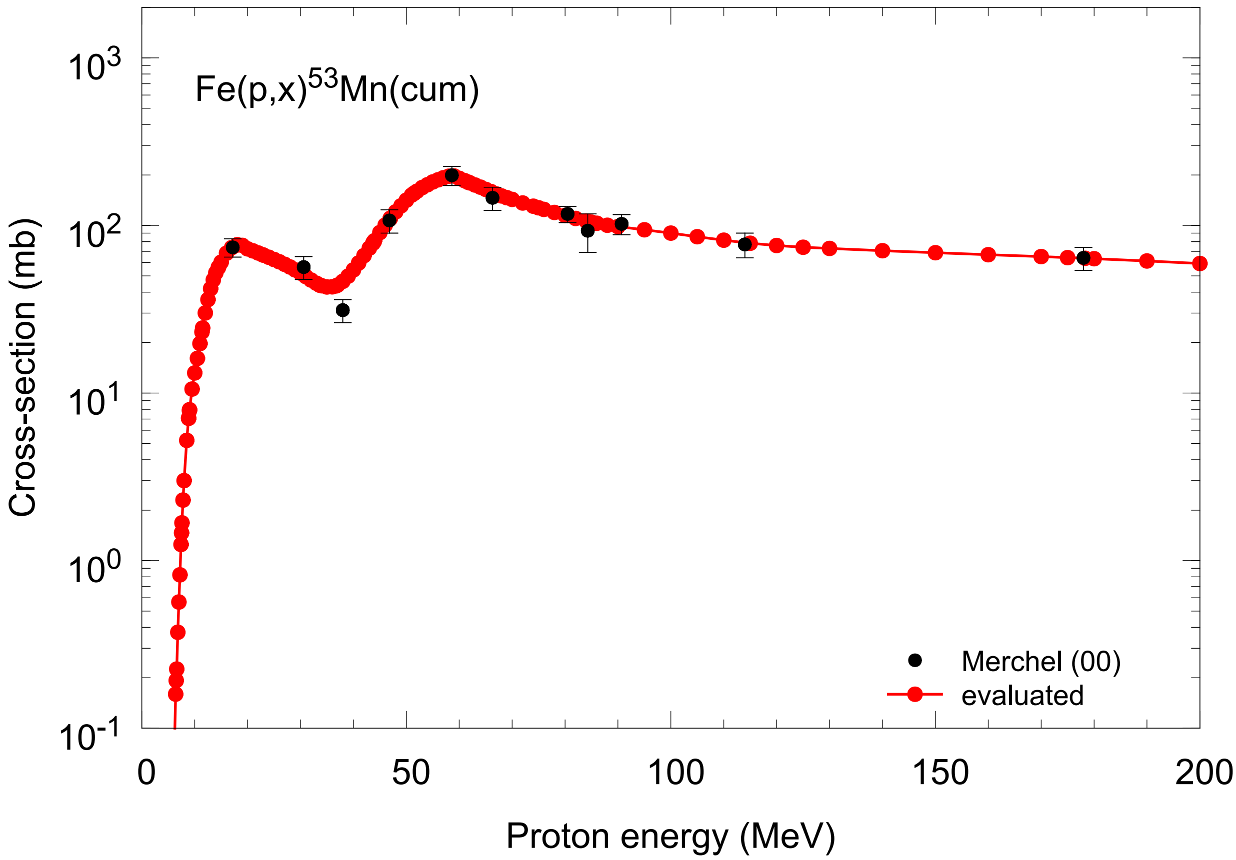

Fe(p,x)^{49}Cr(cum)
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
Yashima (04)
evaluated


Fe(p,x)^{51}Cr
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Brodzinski (71)
Schoen (79)
Barchuk (87)
Sisterson (06)
evaluated

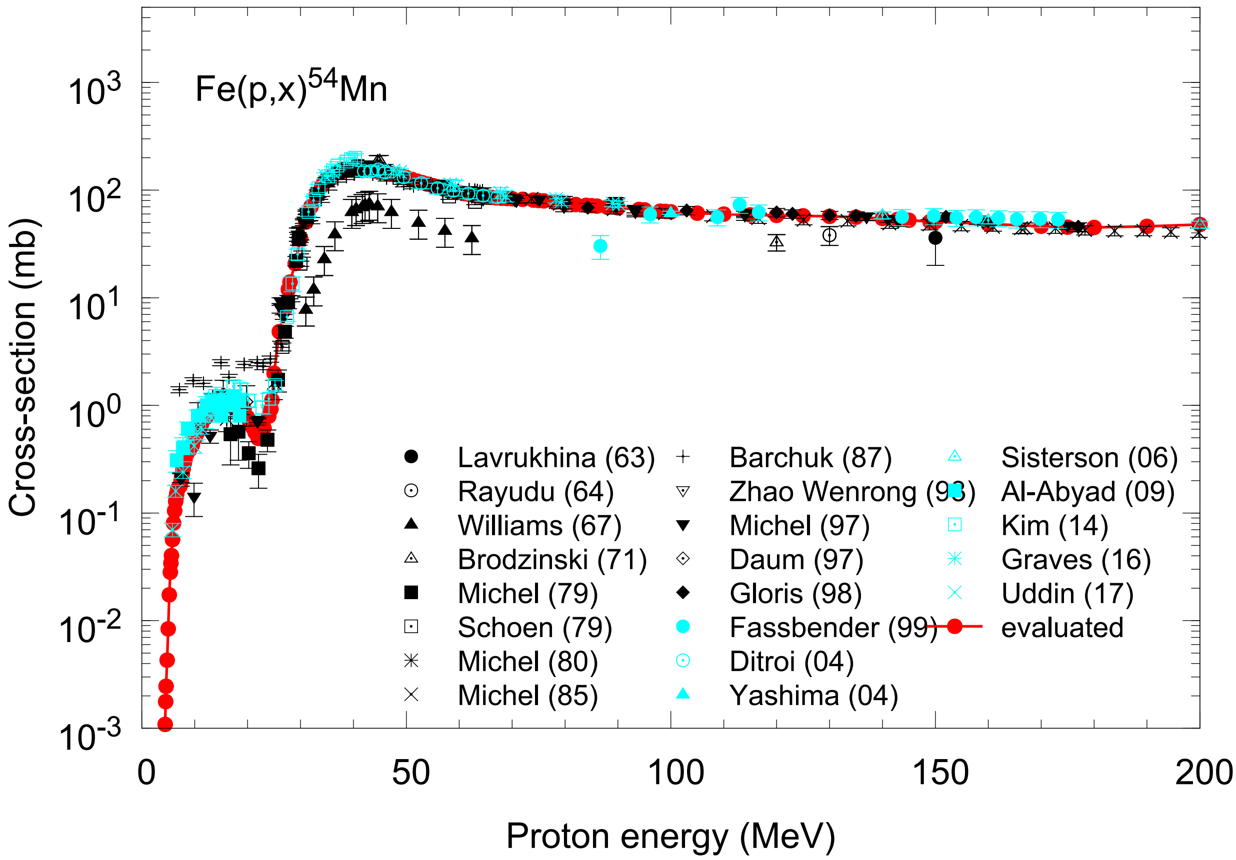

Fe(p,x)^{51}Cr(cum)
Cross-section (mb)
Proton energy (MeV)
Rayudu (64)
Williams (67)
Michel (79)
Michel (80)
Michel (85)
Michel (97)
Gloris (98)
Fassbender (99)
Yashima (04)
Al-Abyad (09)
Kim (14)
Graves (16)
evaluated


Fe(p,x)^{51}Mn(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
evaluated

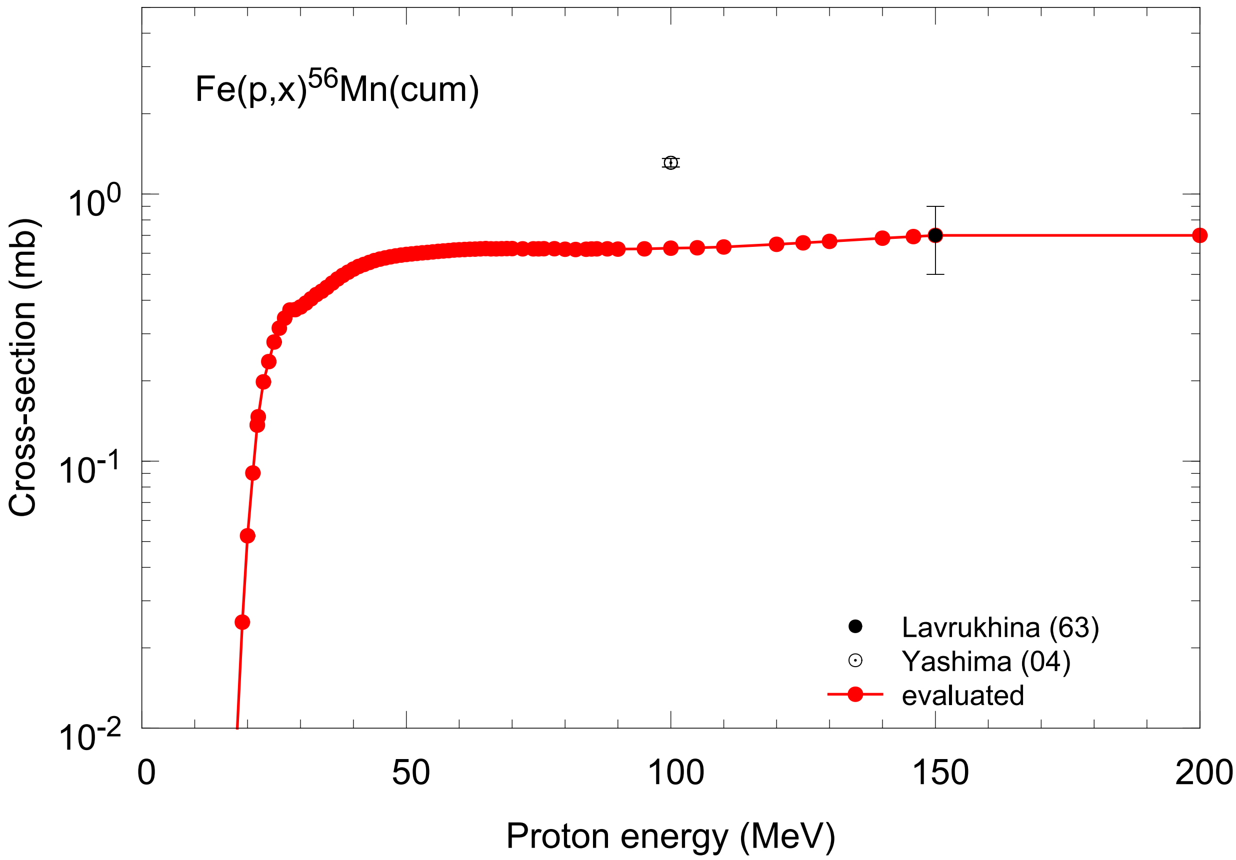

Fe(p,x)^{52g}Mn(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Rayudu (64)
Williams (67)
Brodzinski (71)
Michel (79)
Schoen (79)
Michel (85)
Barchuk (87)
Jung (91)
Michel (97)
Daum (97)
Gloris (98)
Fassbender (99)
Sisterson (06)
Kim (14)
Graves (16)
evaluated



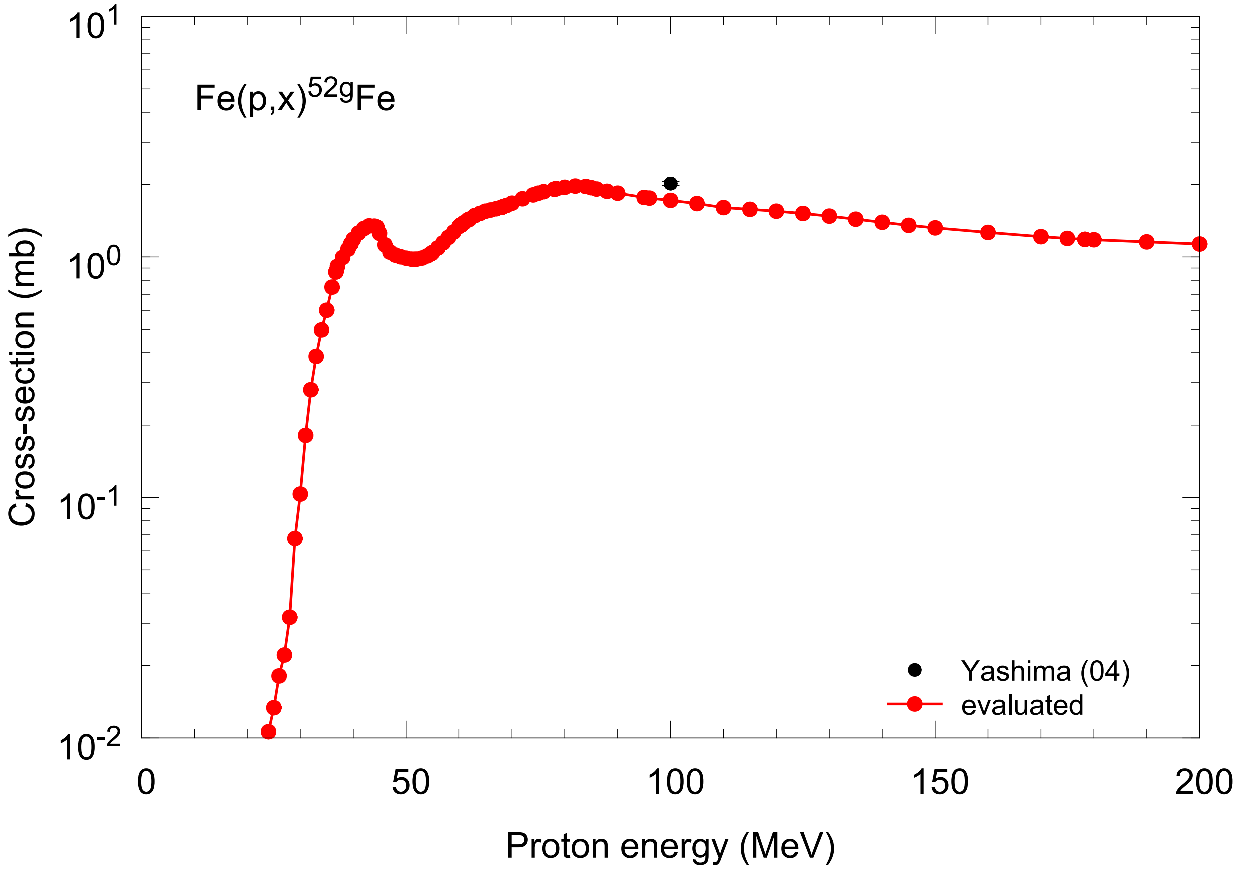
Fe(p,x)^{53}Mn(cum)
Cross-section (mb)
Proton energy (MeV)
Merchel (00)
evaluated



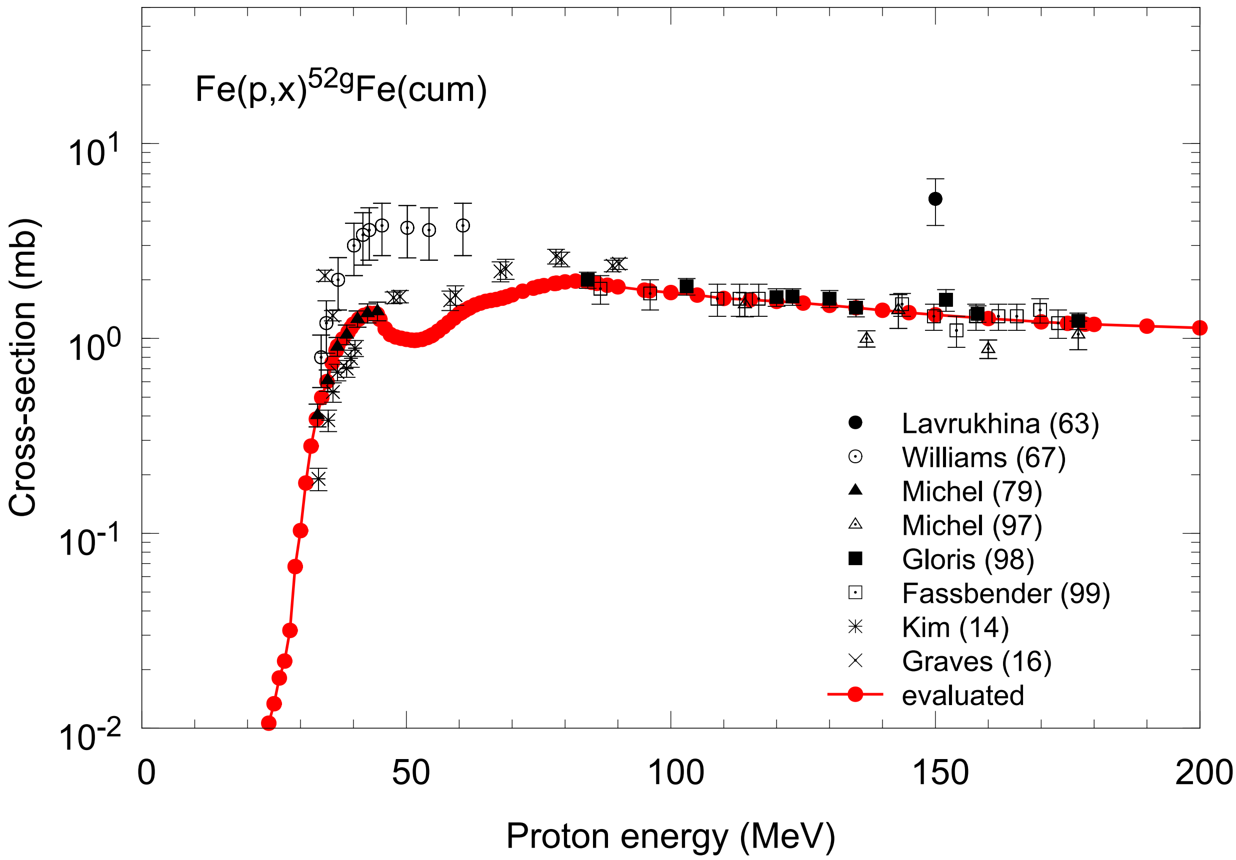
Fe(p,x)^{54}Mn
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Rayudu (64)
Williams (67)
Brodzinski (71)
Michel (79)
Schoen (79)
Michel (80)
Michel (85)
Barchuk (87)
Zhao Wenrong (93)
Michel (97)
Daum (97)
Gloris (98)
Fassbender (99)
Ditroi (04)
Yashima (04)
Sisterson (06)
Al-Abyad (09)
Kim (14)
Graves (16)
Uddin (17)
evaluated

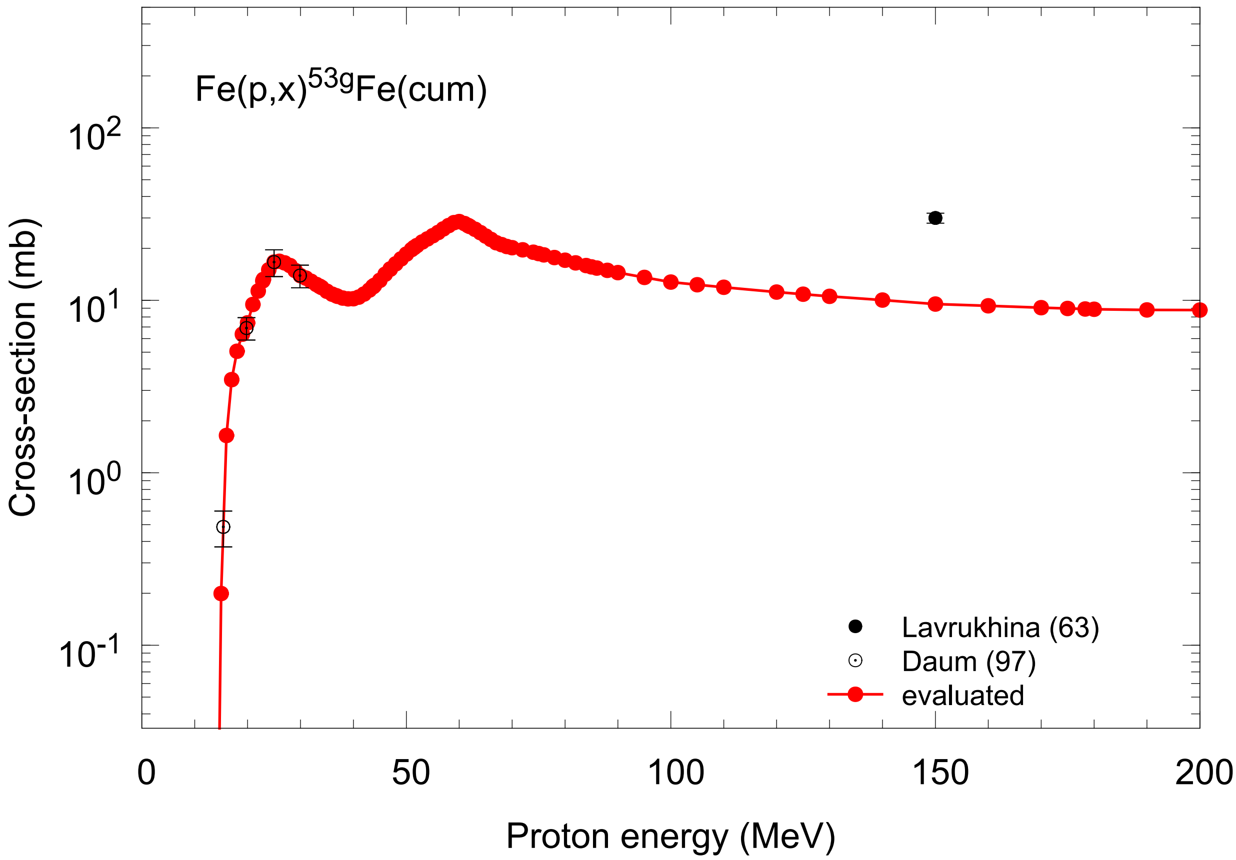


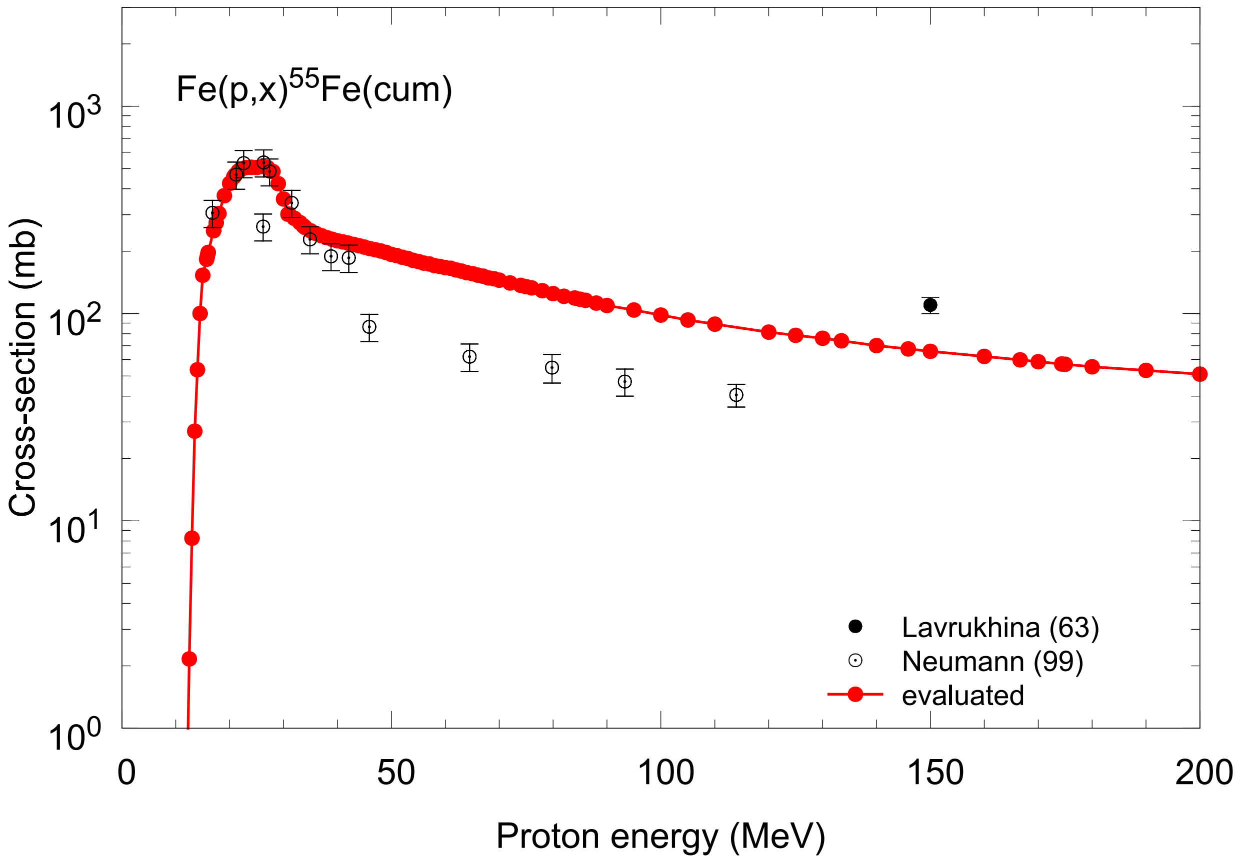
Fe(p,x)56Mn(cum)
Cross-section (mb)
10^0
10^-1
10^-2
0
50
100
150
200
Proton energy (MeV)
Lavrukhina (63)
Yashima (04)
evaluated

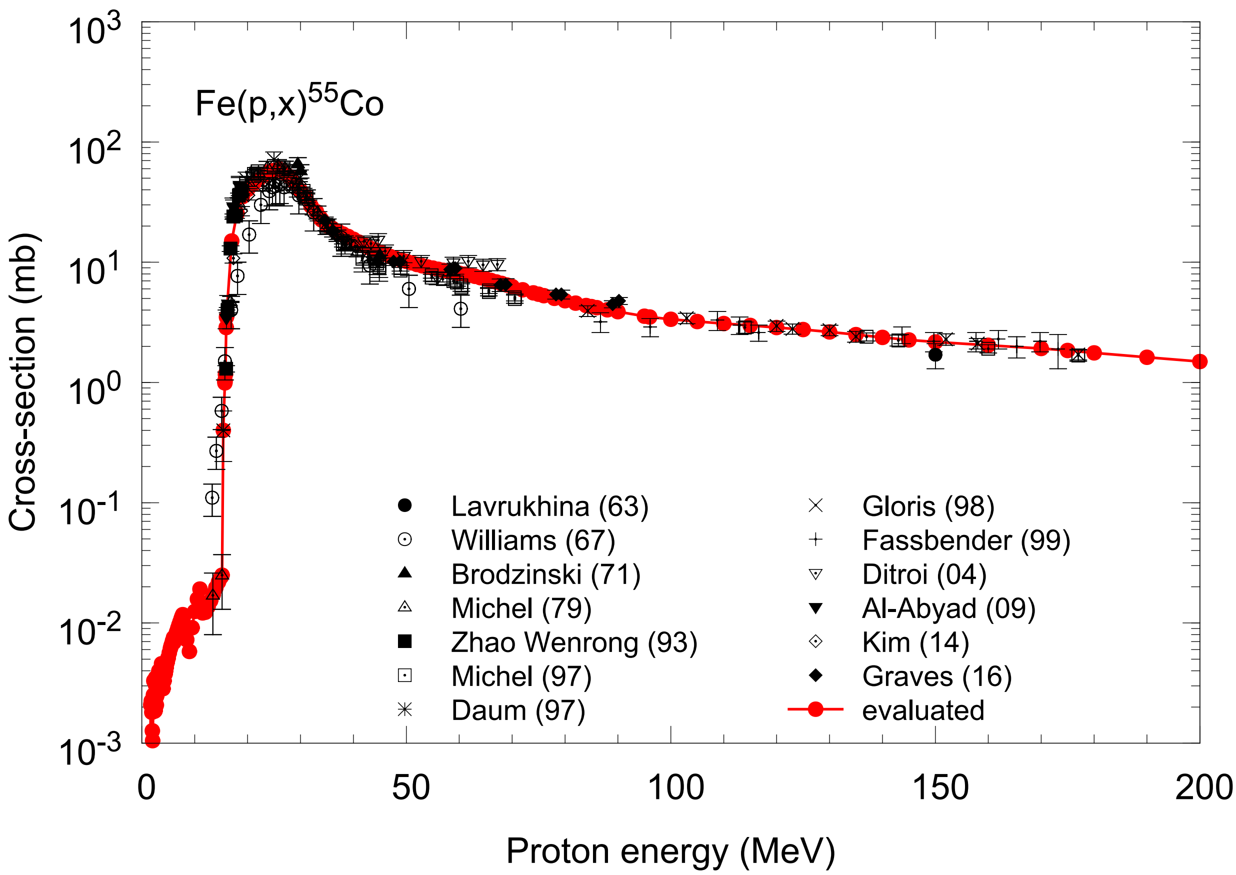


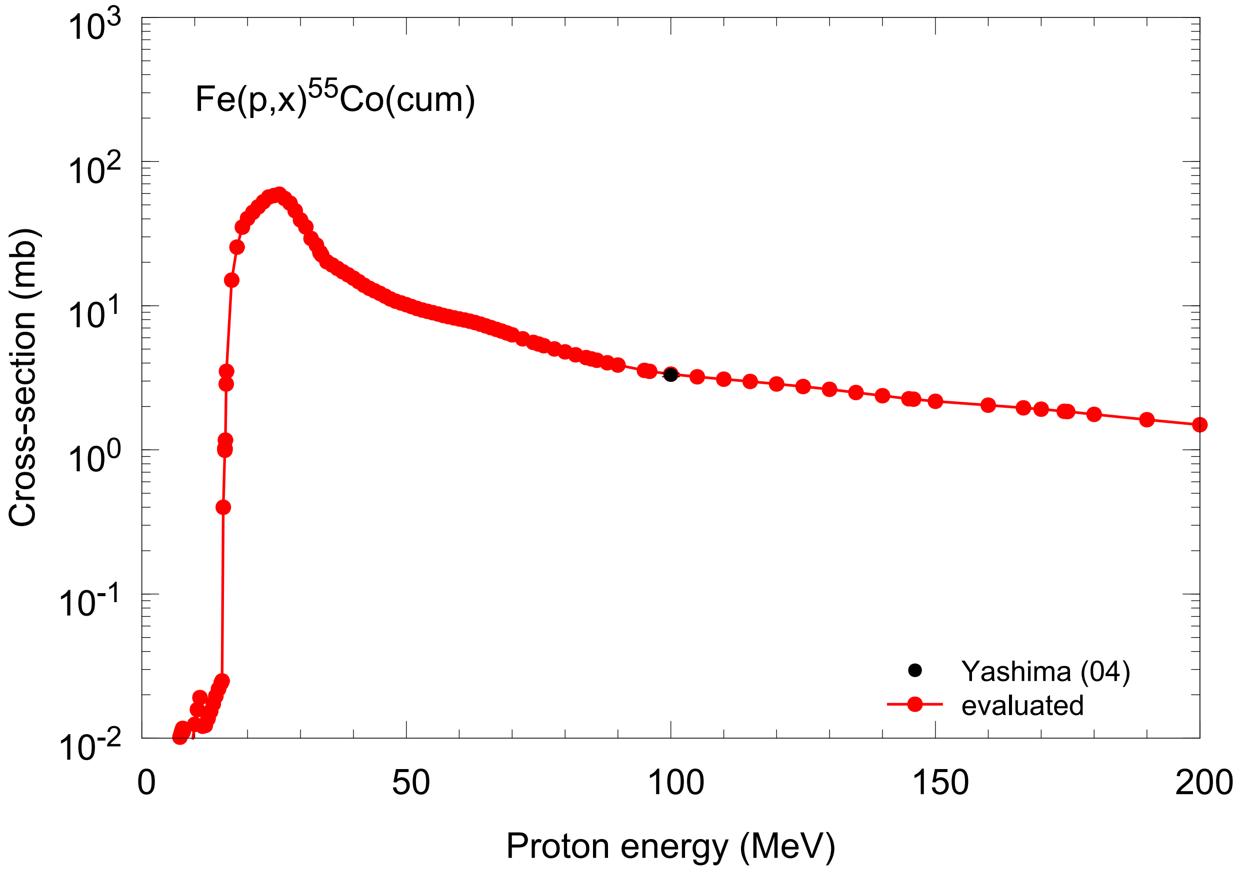
Fe(p,x)52gFe
Cross-section (mb)
10^1
10^0
10^-1
10^-2
0
50
100
150
200
Proton energy (MeV)
Yashima (04)
evaluated


Fe(p,x)52gFe(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Williams (67)
Michel (79)
Michel (97)
Gloris (98)
Fassbender (99)
Kim (14)
Graves (16)
evaluated

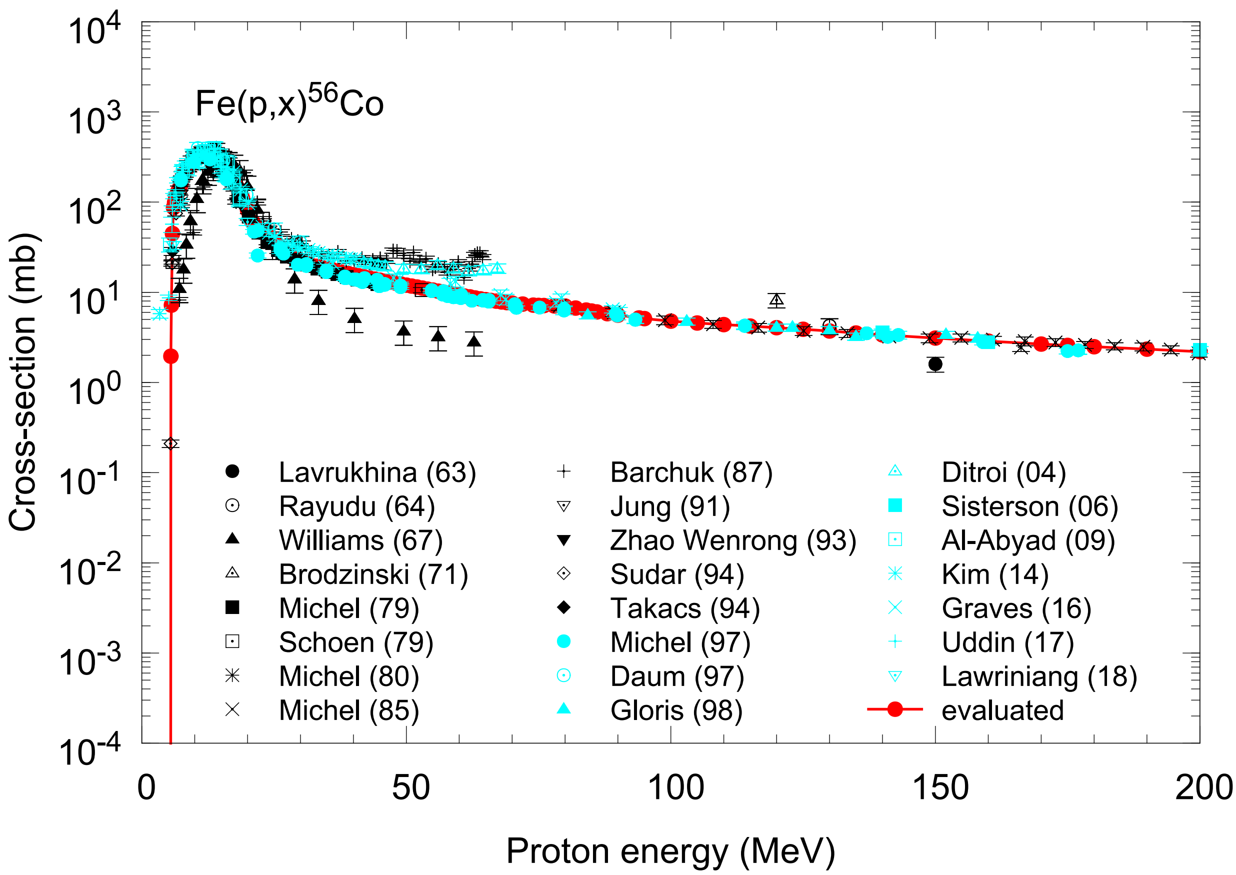

Fe(p,x)53gFe(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Daum (97)
evaluated


Fe(p,x)^{55}Fe(cum)
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Neumann (99)
evaluated

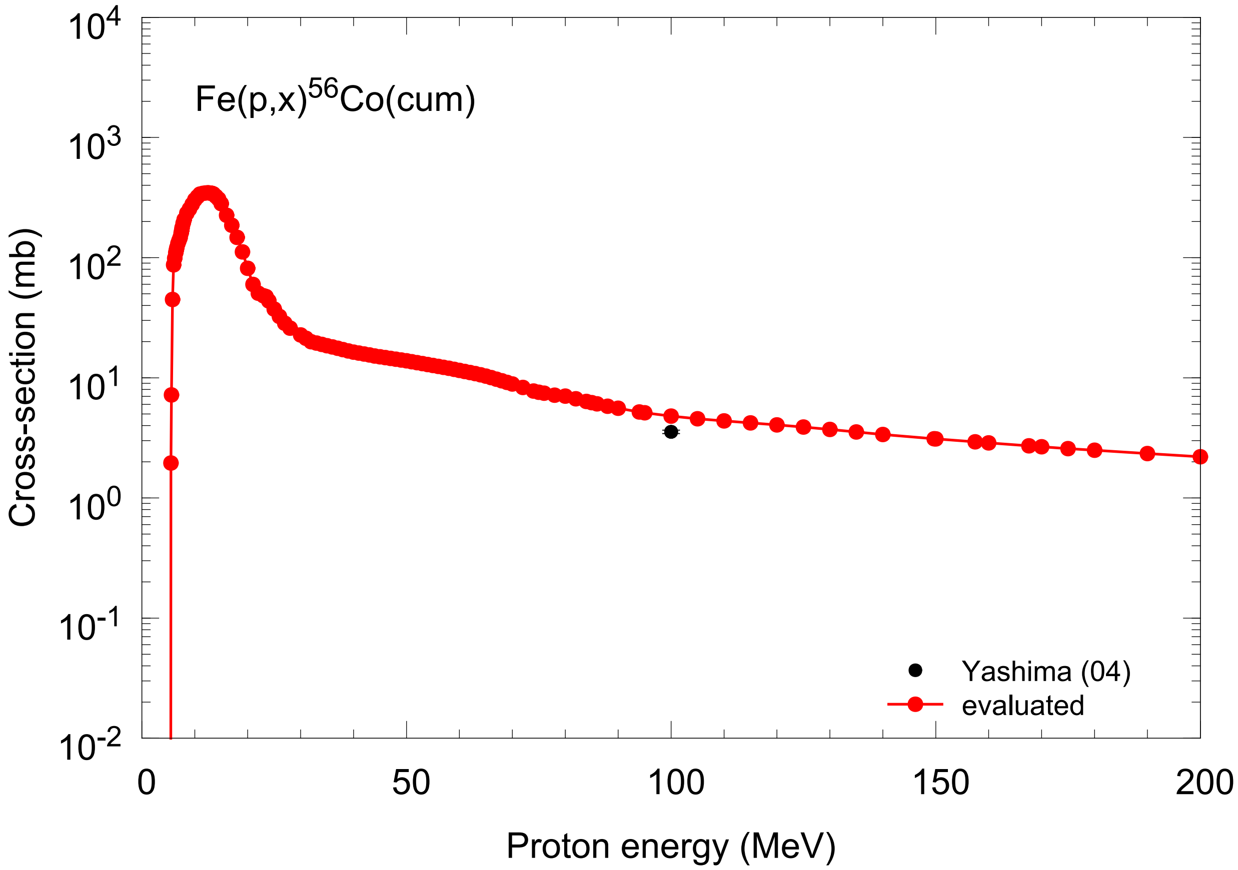

Fe(p,x)^{55}Co
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Williams (67)
Brodzinski (71)
Michel (79)
Zhao Wenrong (93)
Michel (97)
Daum (97)
Gloris (98)
Fassbender (99)
Ditroi (04)
Al-Abyad (09)
Kim (14)
Graves (16)
evaluated

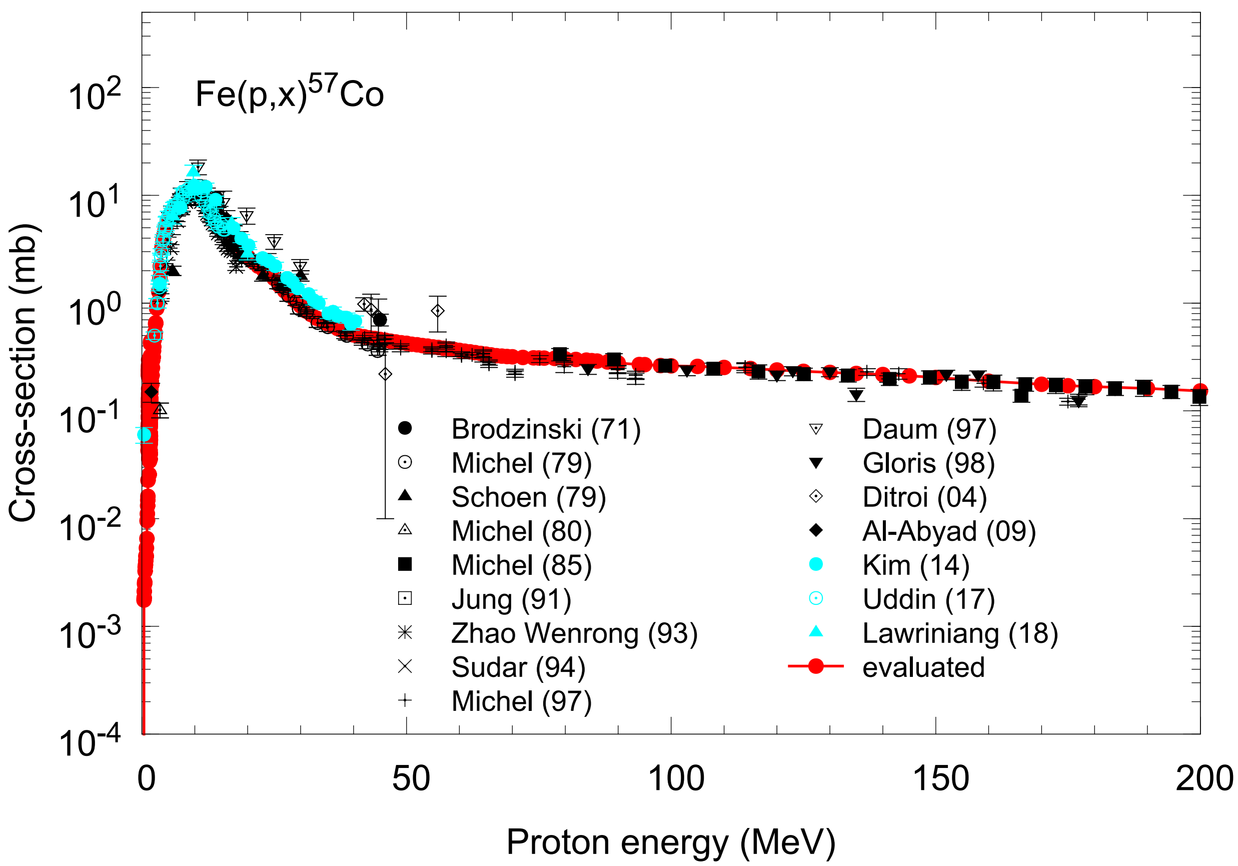


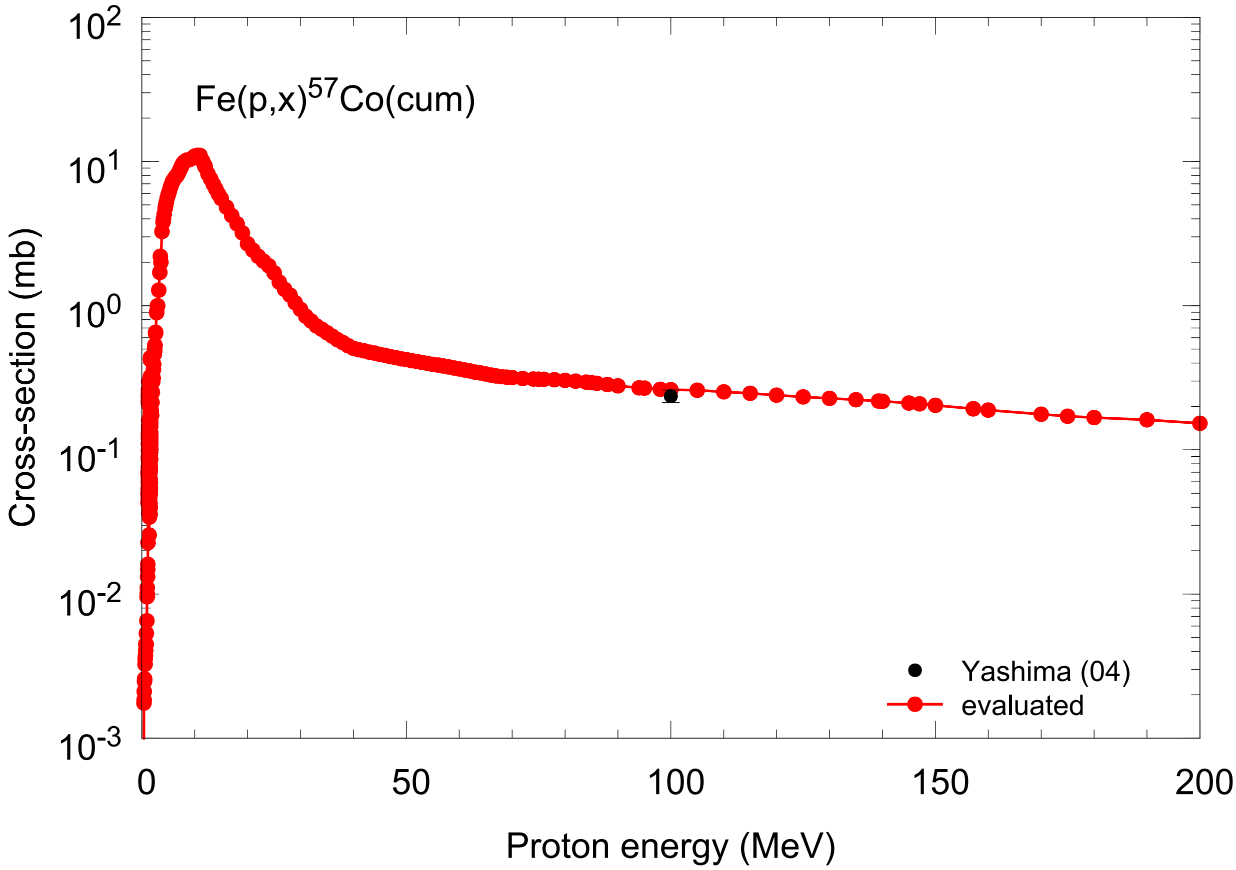
Fe(p,x)^{55}Co(cum)
Cross-section (mb)
Proton energy (MeV)
Yashima (04)
evaluated

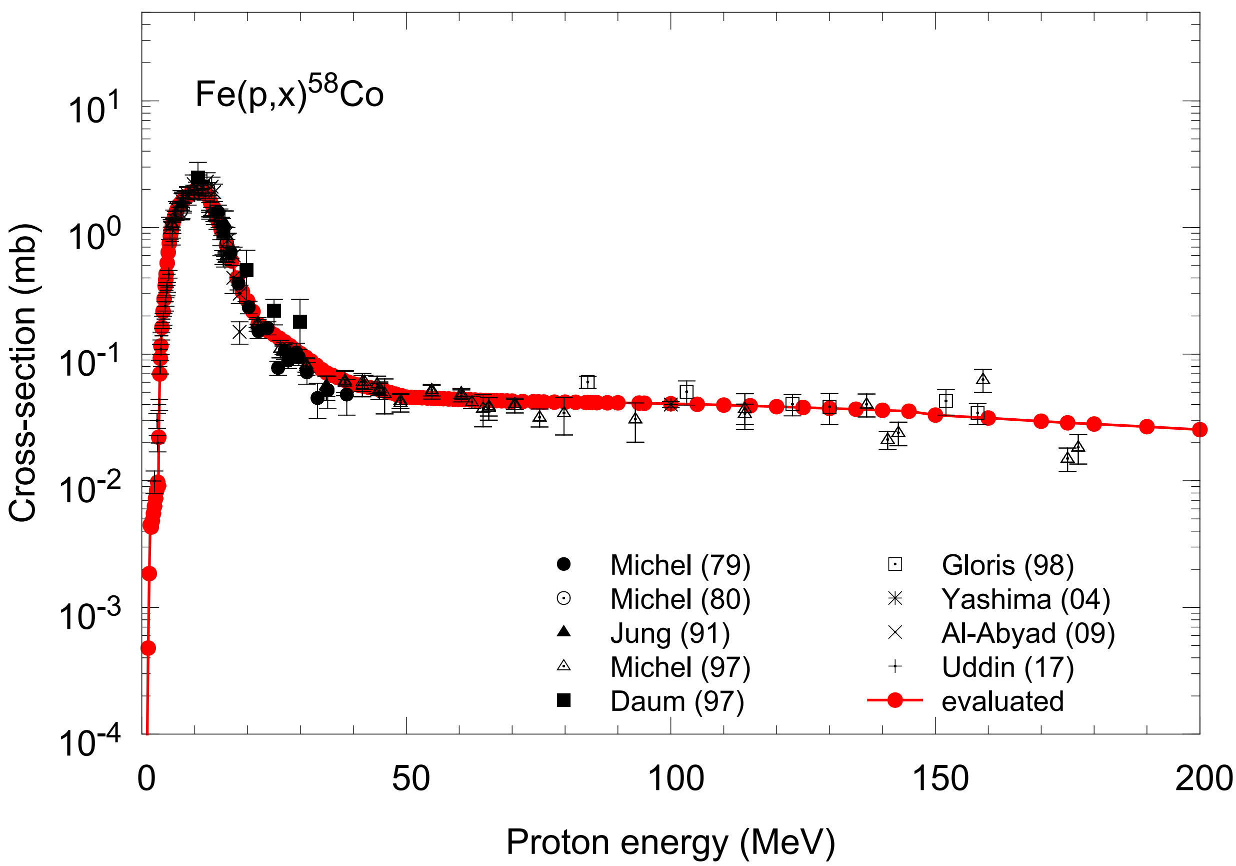


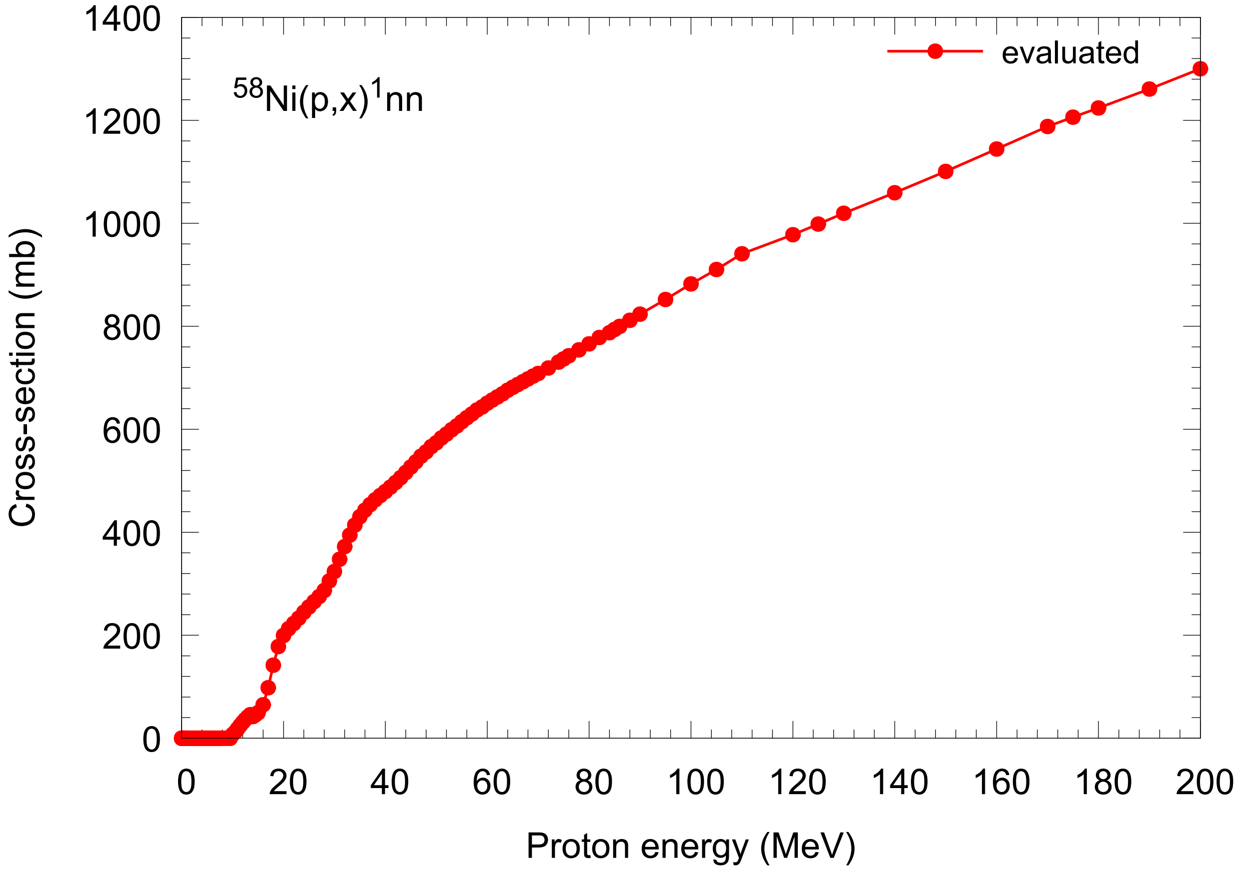
Fe(p,x)^{56}Co
Cross-section (mb)
Proton energy (MeV)
Lavrukhina (63)
Rayudu (64)
Williams (67)
Brodzinski (71)
Michel (79)
Schoen (79)
Michel (80)
Michel (85)
Barchuk (87)
Jung (91)
Zhao Wenrong (93)
Sudar (94)
Takacs (94)
Michel (97)
Daum (97)
Gloris (98)
Ditroi (04)
Sisterson (06)
Al-Abyad (09)
Kim (14)
Graves (16)
Uddin (17)
Lawriniang (18)
evaluated


Fe(p,x)^{56}Co(cum)
Cross-section (mb)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Yashima (04)
evaluated

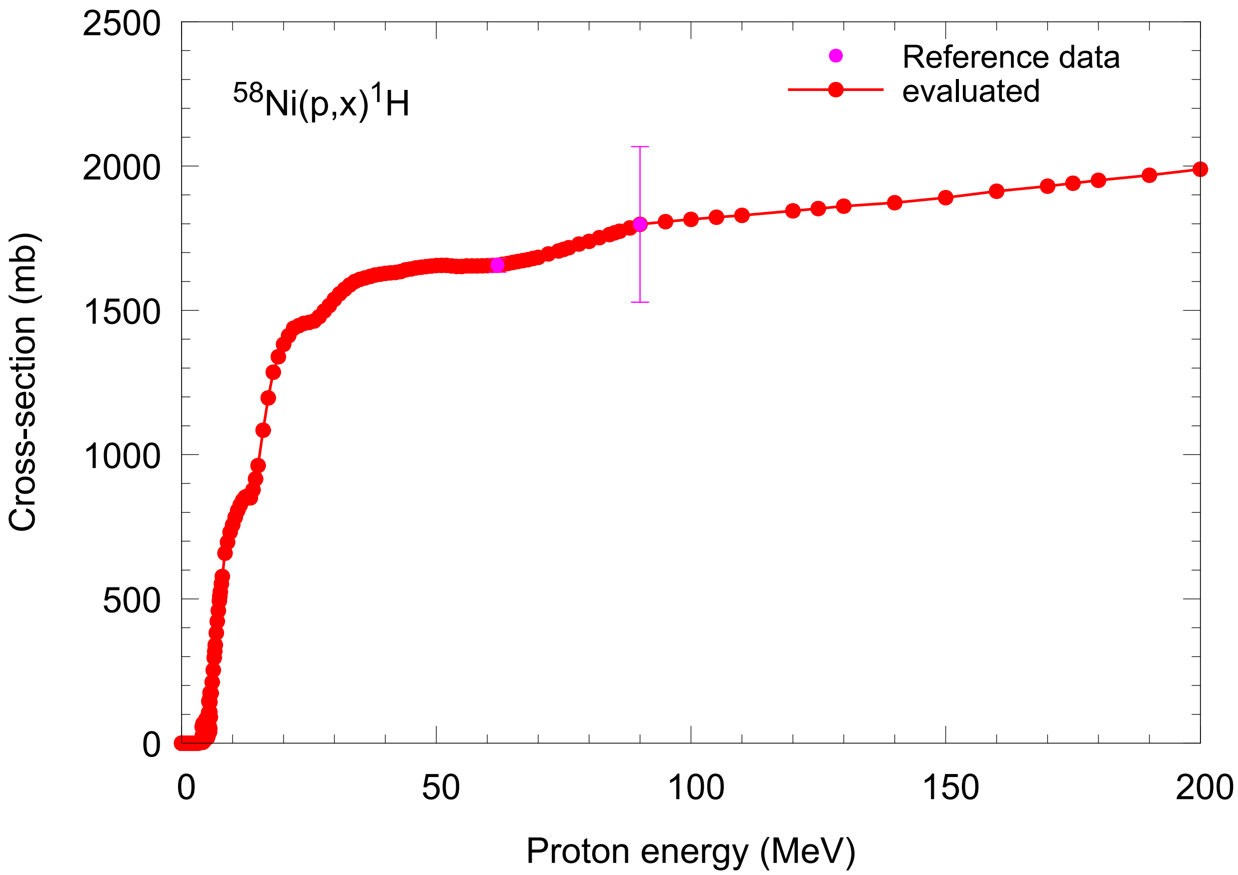

Fe(p,x)^{57}Co
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Proton energy (MeV)
Brodzinski (71)
Michel (79)
Schoen (79)
Michel (80)
Michel (85)
Jung (91)
Zhao Wenrong (93)
Sudar (94)
Michel (97)
Daum (97)
Gloris (98)
Ditroi (04)
Al-Abyad (09)
Kim (14)
Uddin (17)
Lawriniang (18)
evaluated


Fe(p,x)57Co(cum)
Cross-section (mb)
Proton energy (MeV)
Yashima (04)
evaluated
10^2
10^1
10^0
10^-1
10^-2
10^-3
0
50
100
150
200

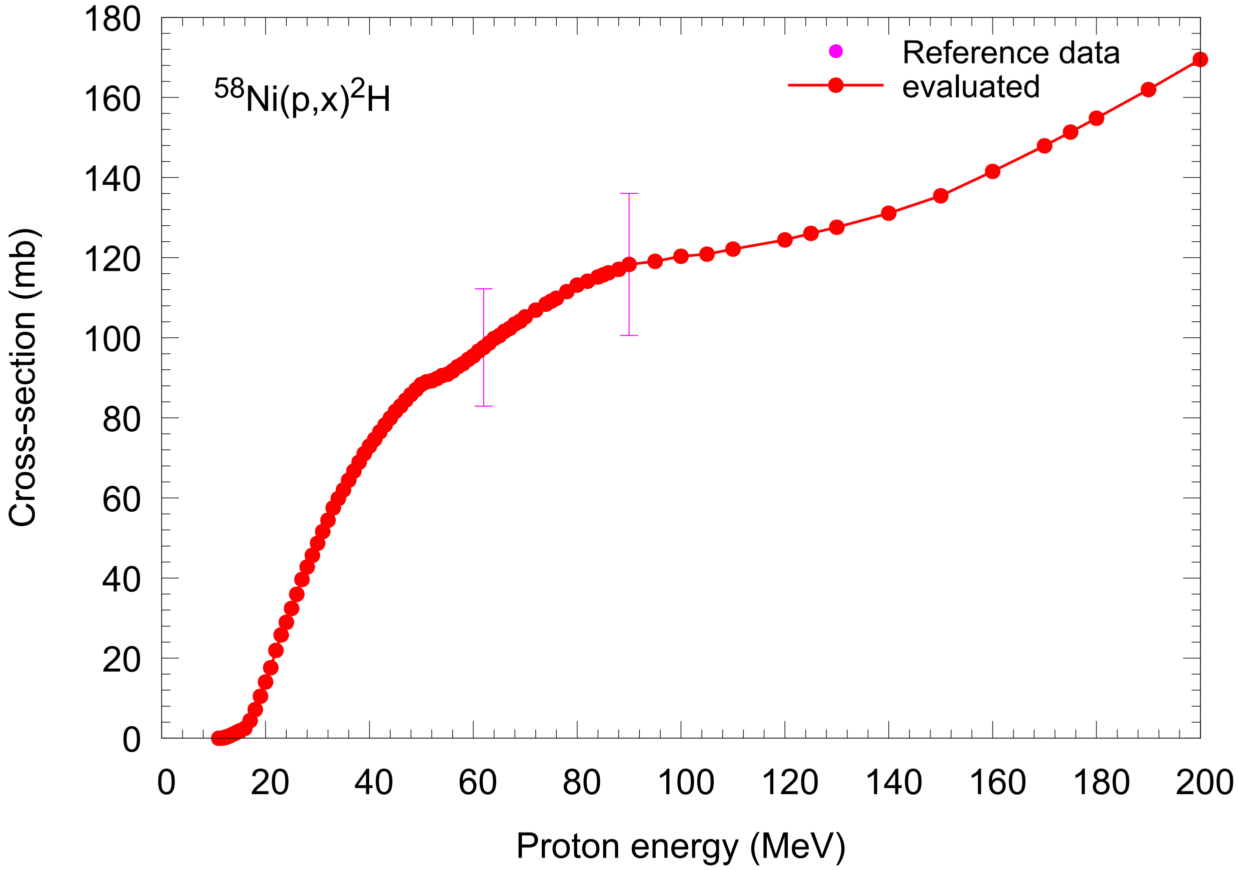

Fe(p,x)58Co
Cross-section (mb)
Proton energy (MeV)
Michel (79)
Michel (80)
Jung (91)
Michel (97)
Daum (97)
Gloris (98)
Yashima (04)
Al-Abyad (09)
Uddin (17)
evaluated
10^1
10^0
10^-1
10^-2
10^-3
10^-4
0
50
100
150
200



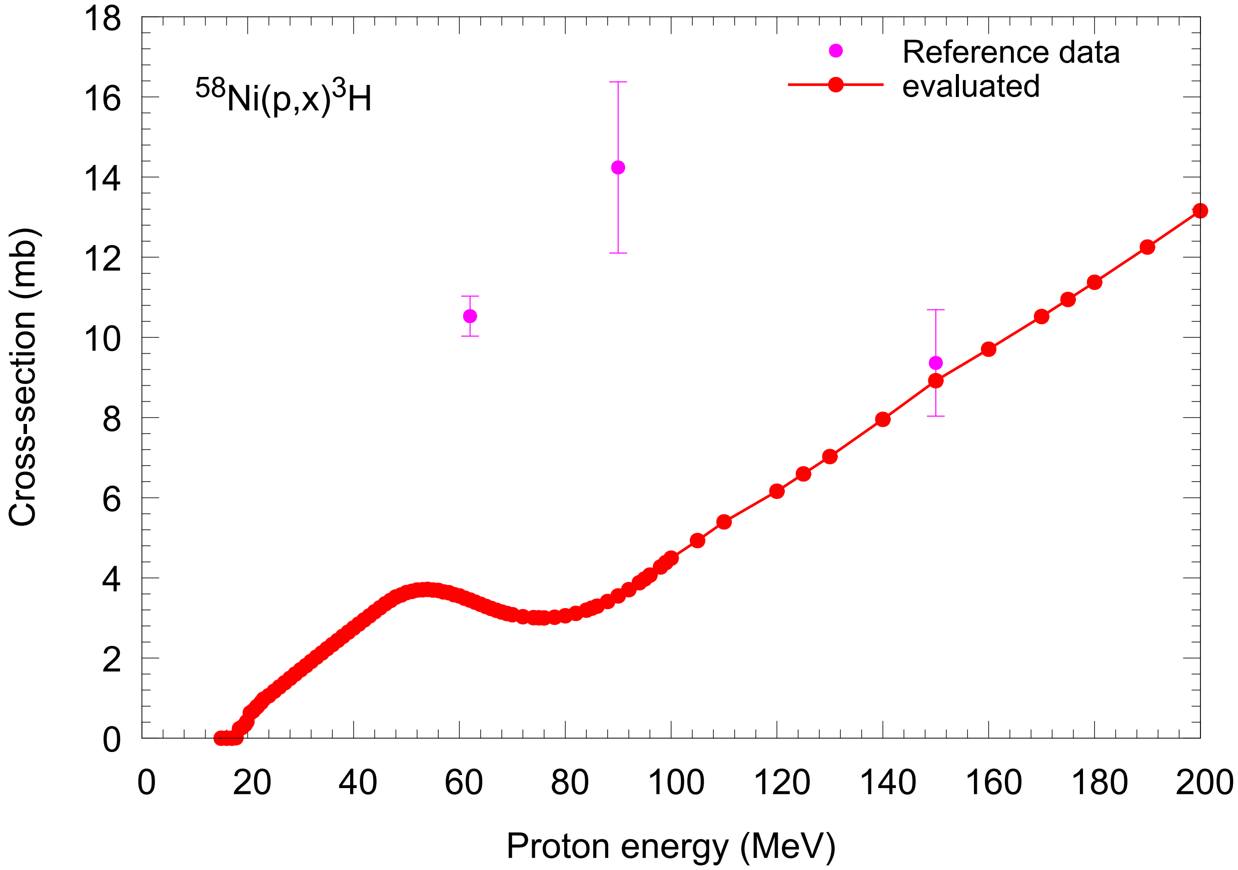
$^{58}Ni(p,x)^{1}nn$
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
0
20
40
60
80
100
120
140
160
180
200



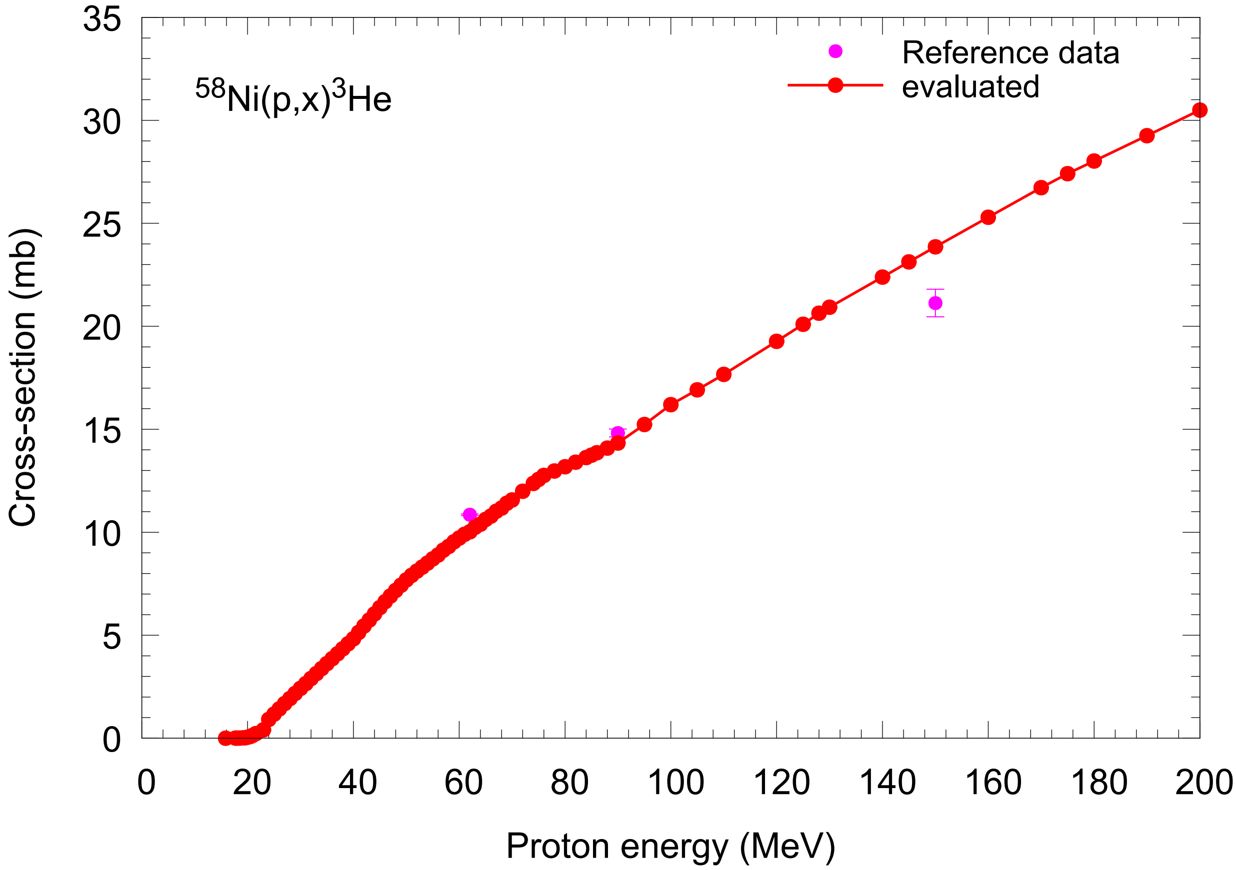
$^{58}Ni(p,x)^{1}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
0
50
100
150
200



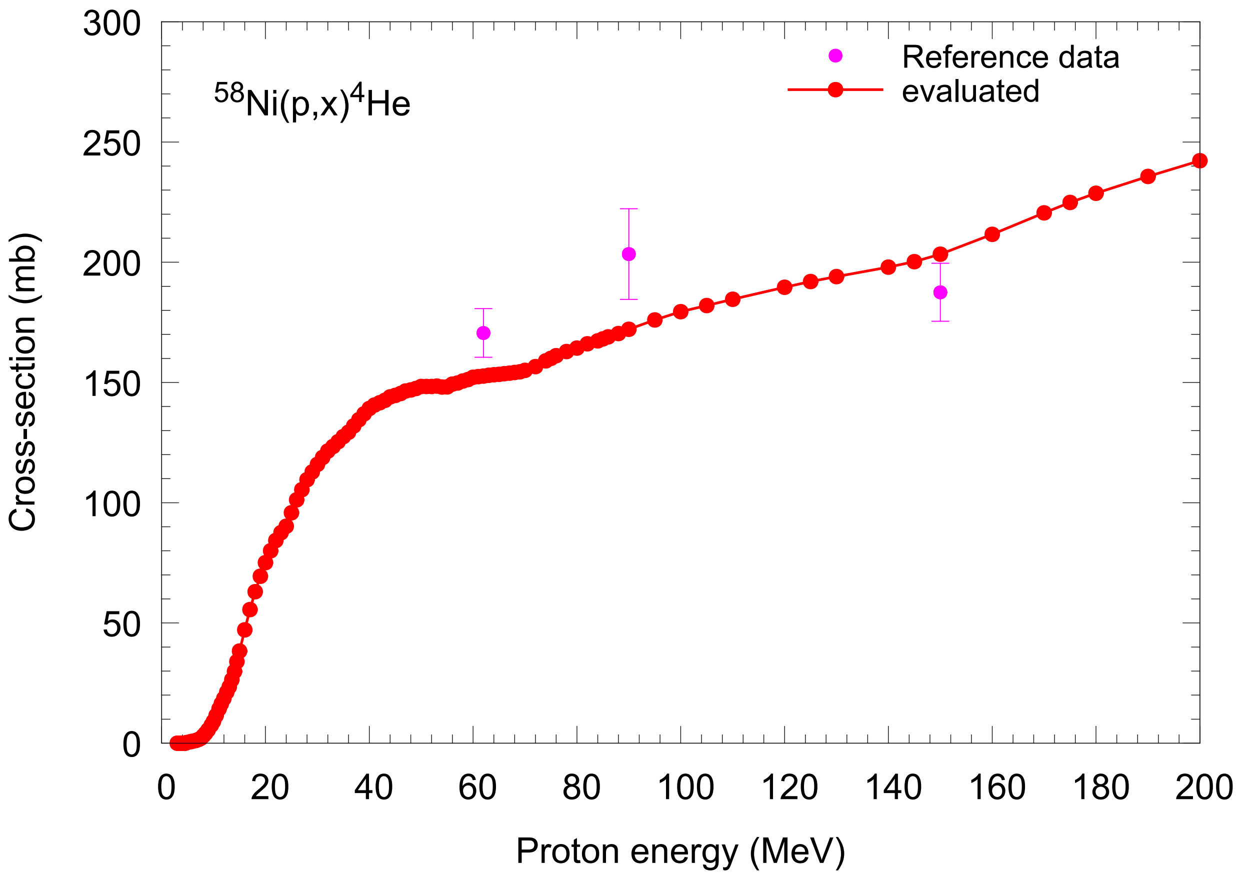
$^{58}Ni(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)



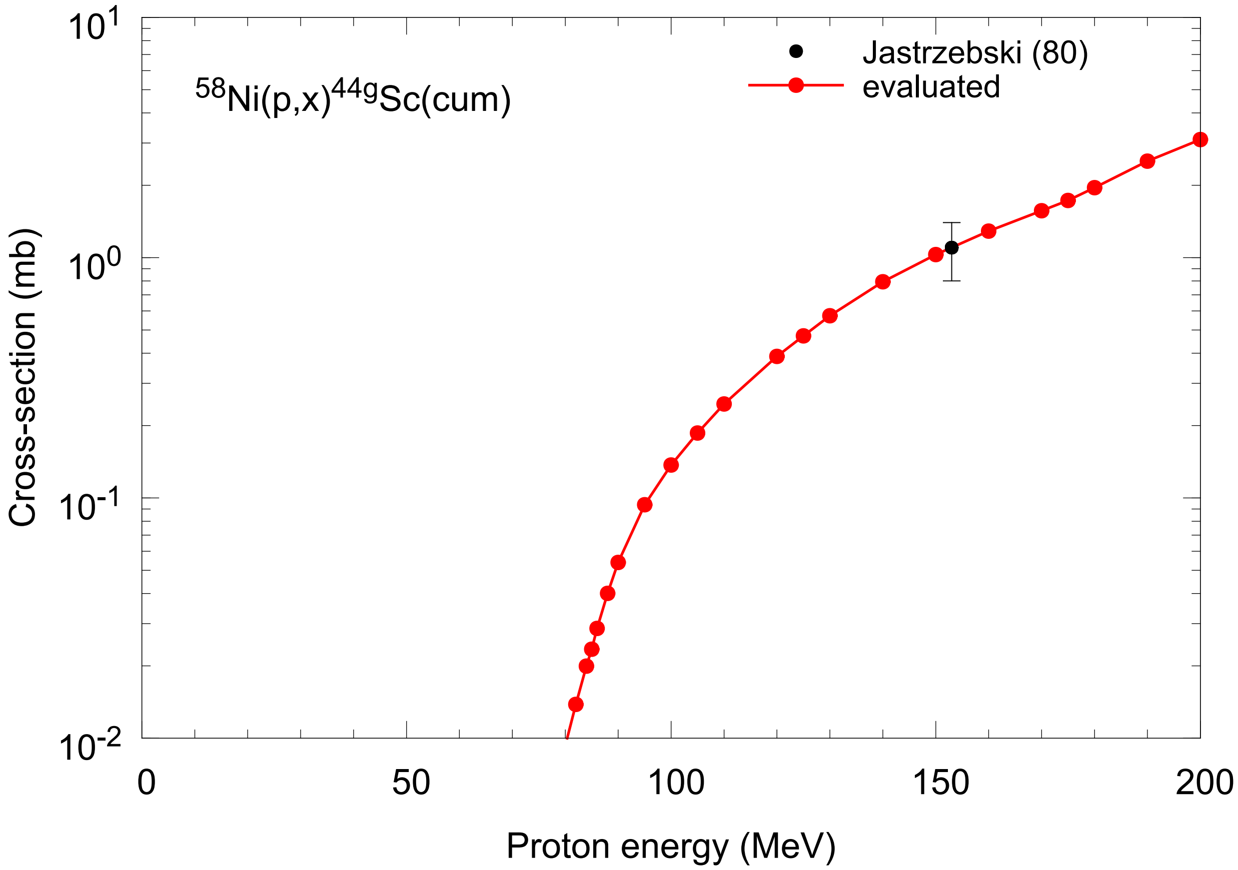
$^{58}Ni(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)



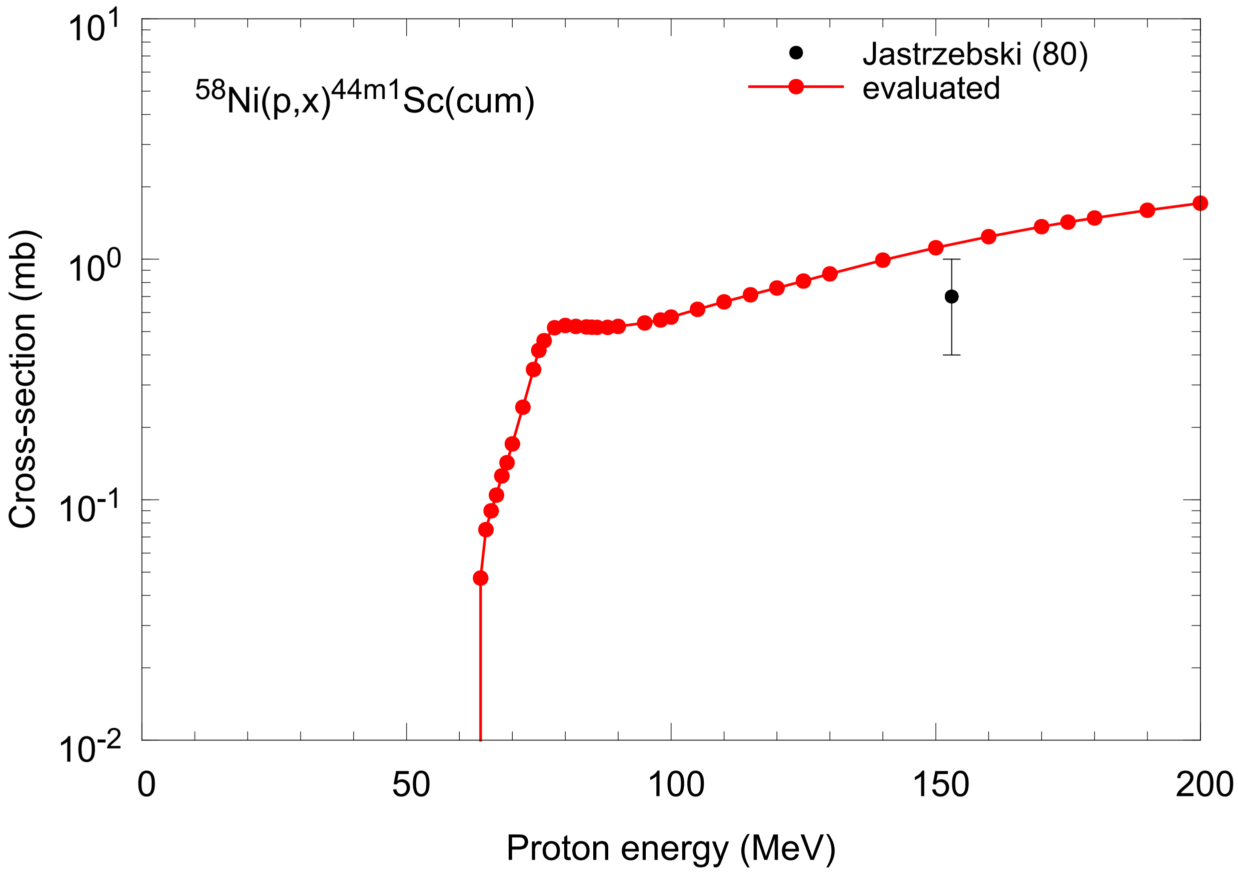
$^{58}Ni(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
0
20
40
60
80
100
120
140
160
180
200



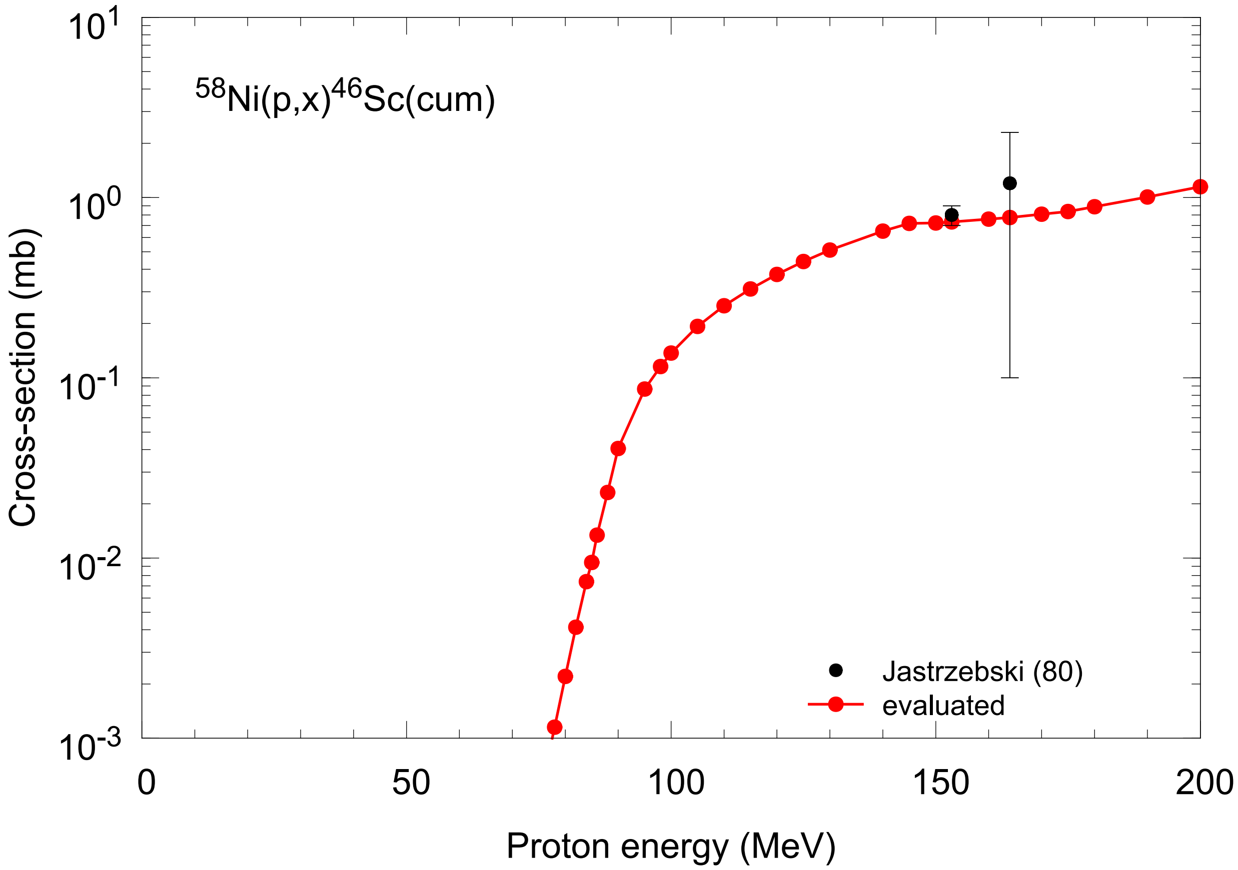
$^{58}Ni(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
300
0
20
40
60
80
100
120
140
160
180
200



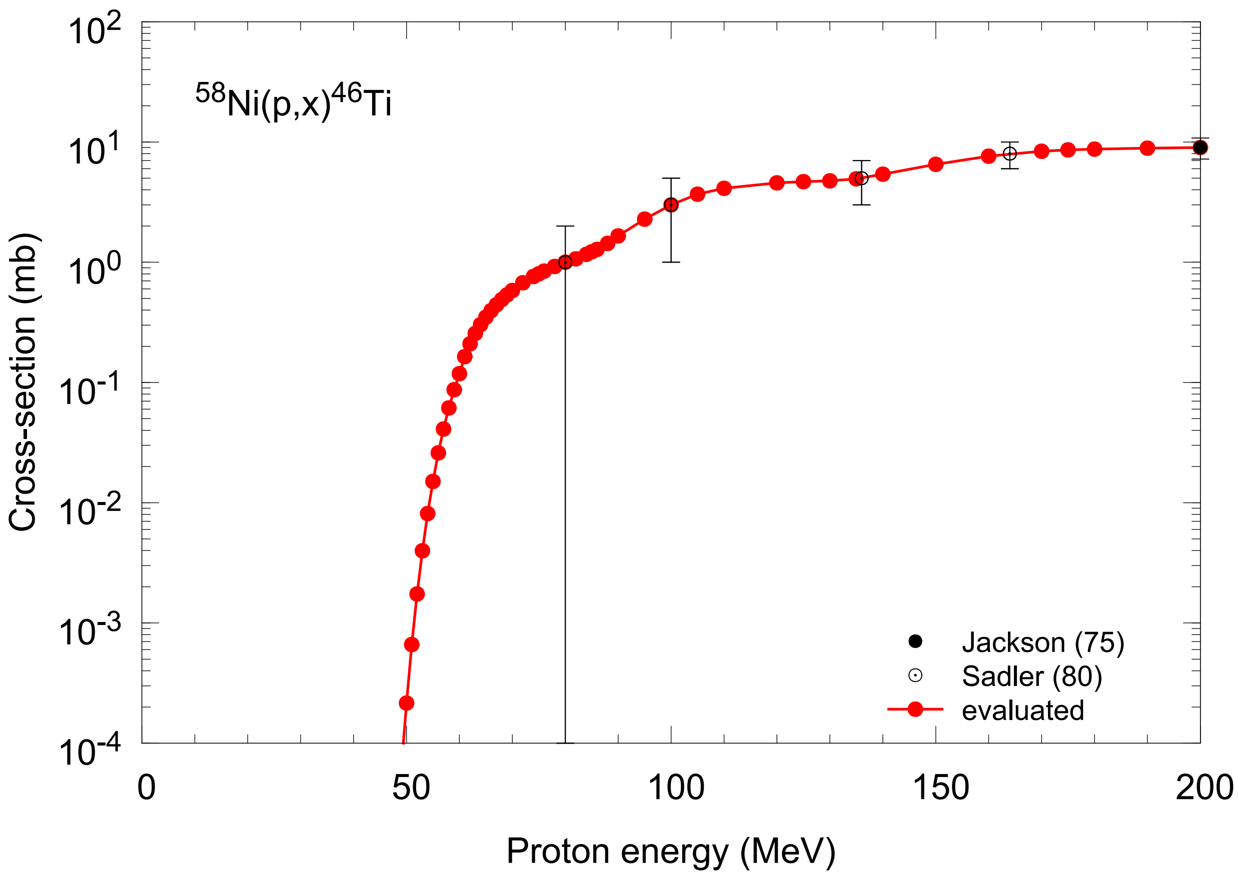
$^{58}Ni(p,x)^{44g}Sc(cum)$
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200



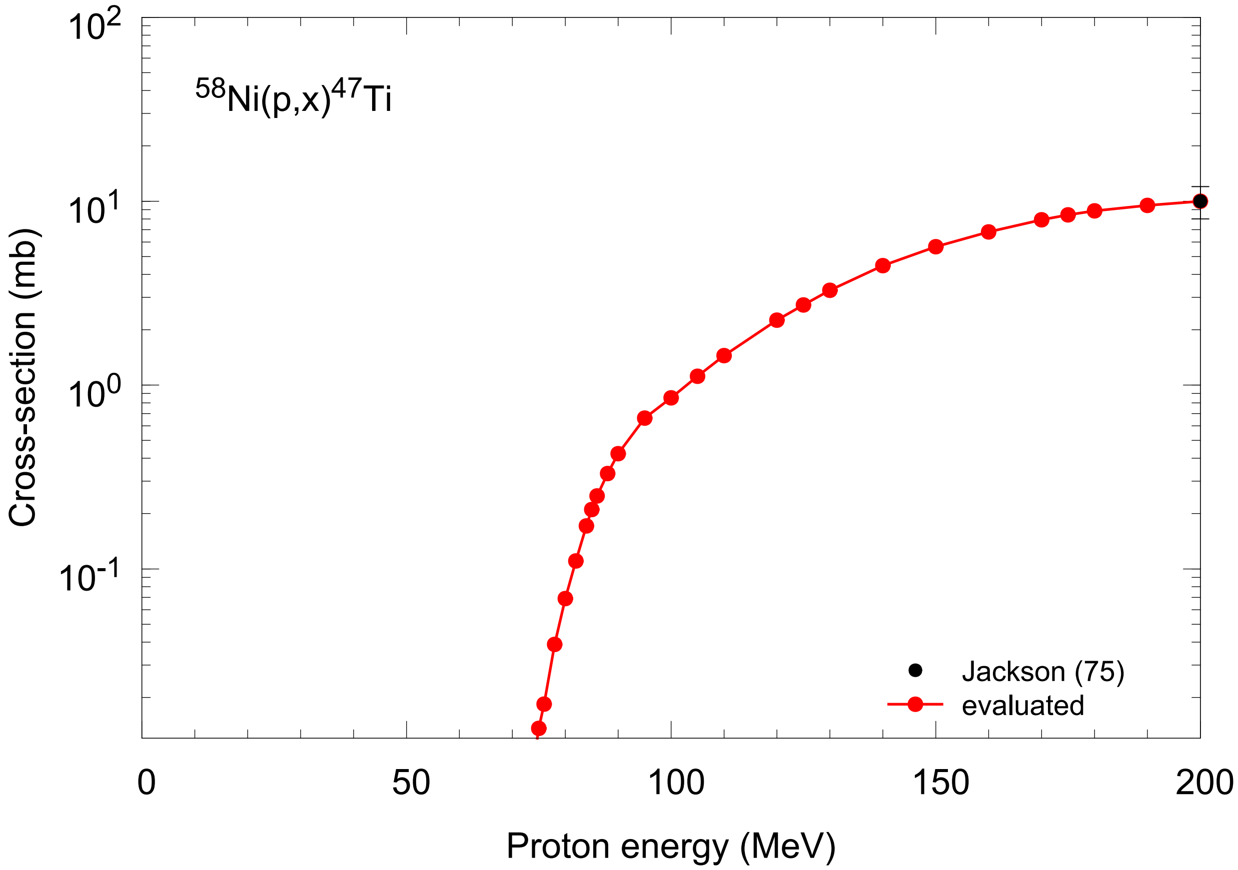
$^{58}Ni(p,x)^{44m1}Sc(cum)$
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200



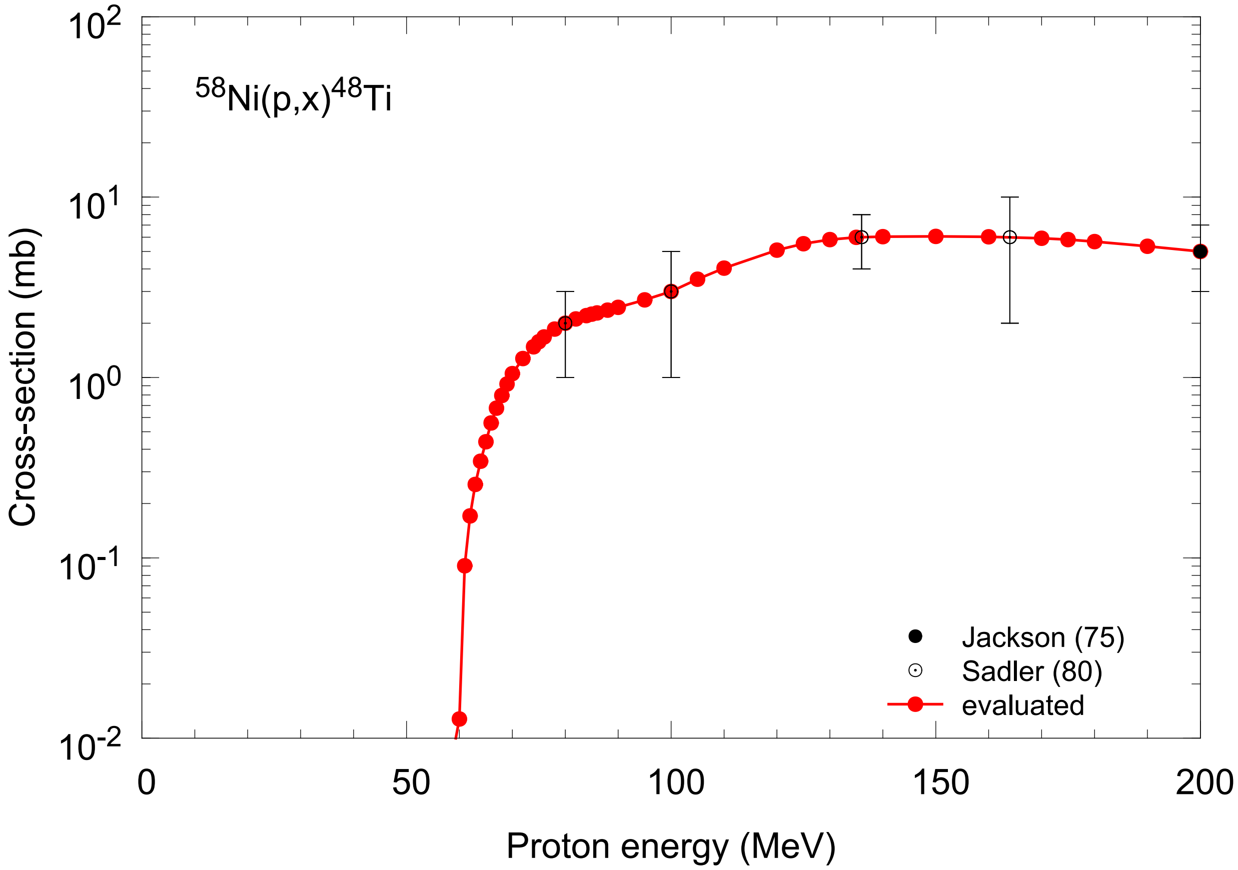
^{58}Ni(p,x)^{46}Sc(cum)
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



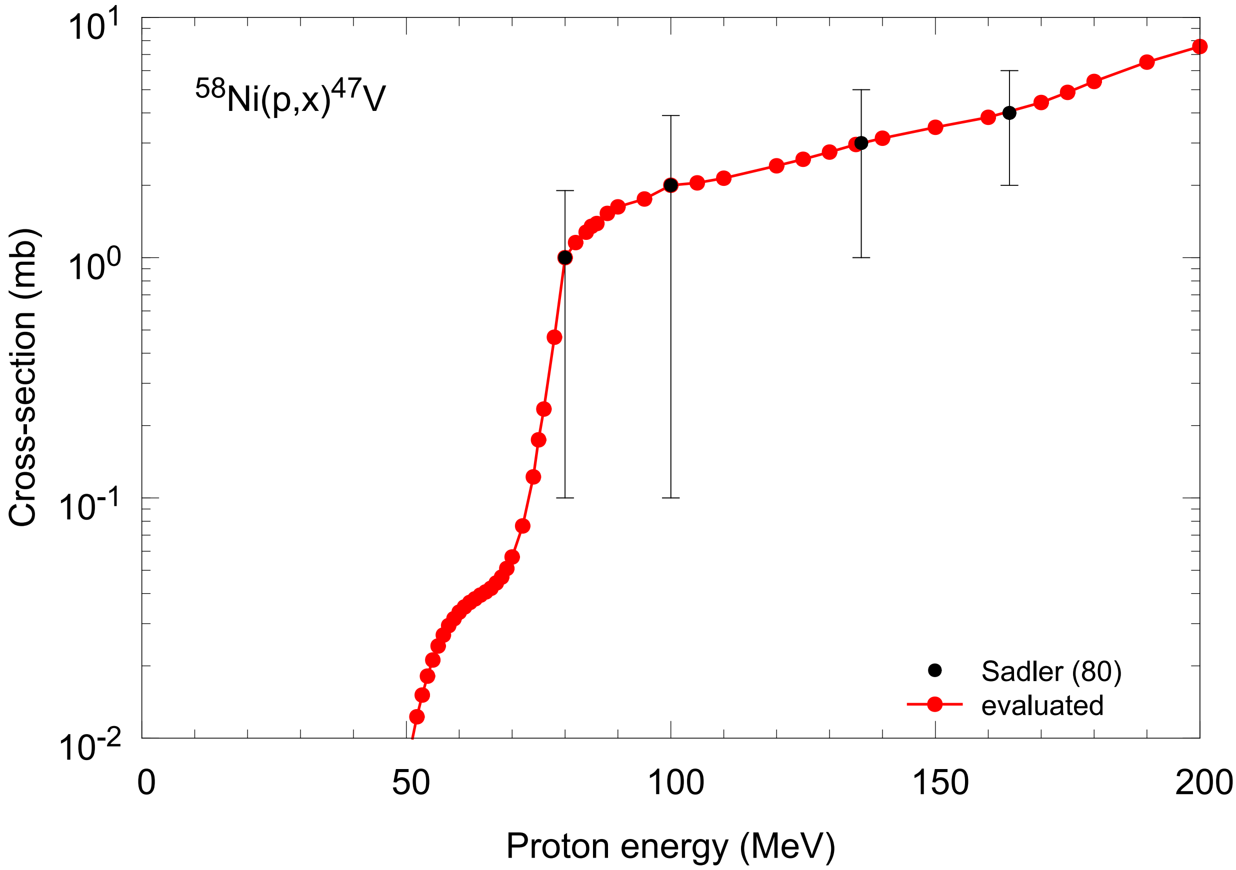
^{58}Ni(p,x)^{46}Ti
Jackson (75)
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



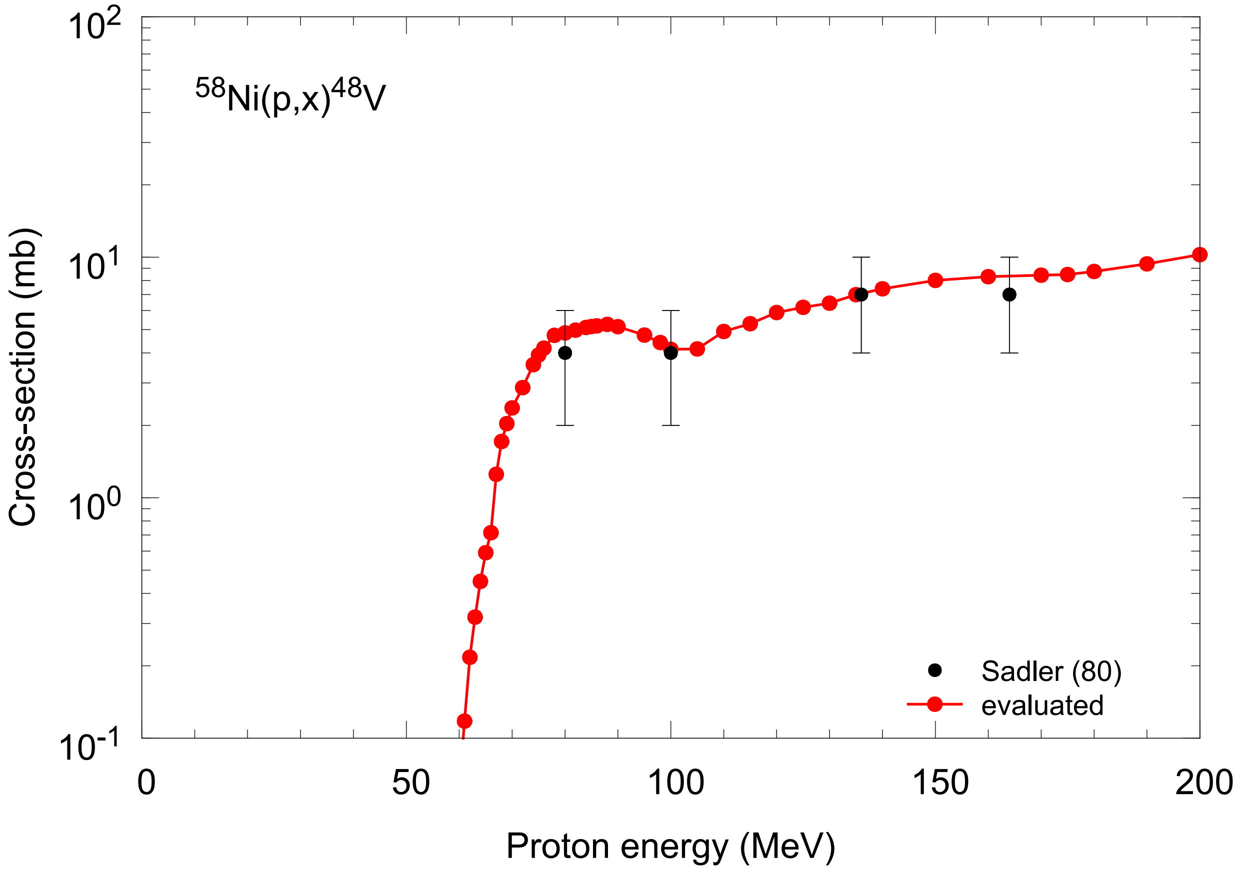
$^{58}Ni(p,x)^{47}Ti$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
evaluated



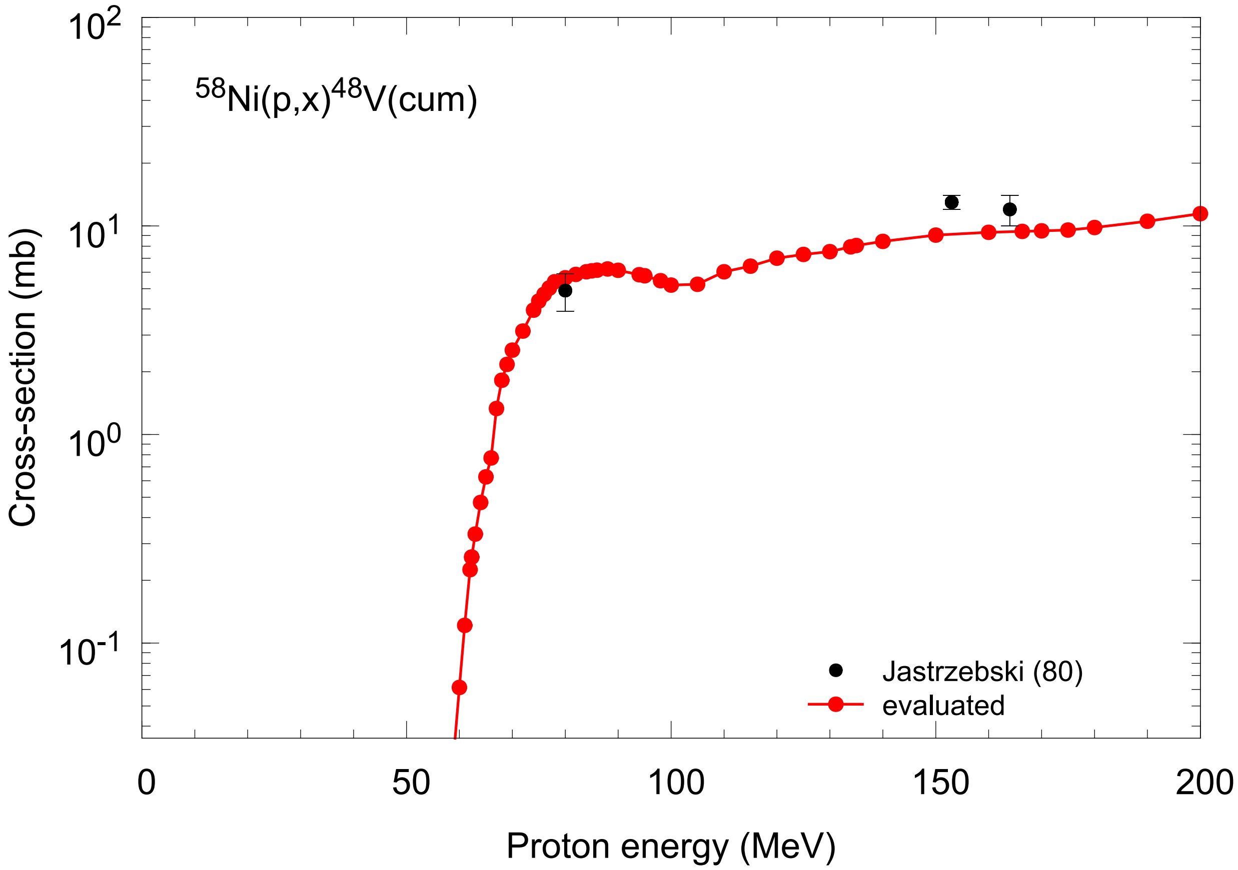
$^{58}Ni(p,x)^{48}Ti$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



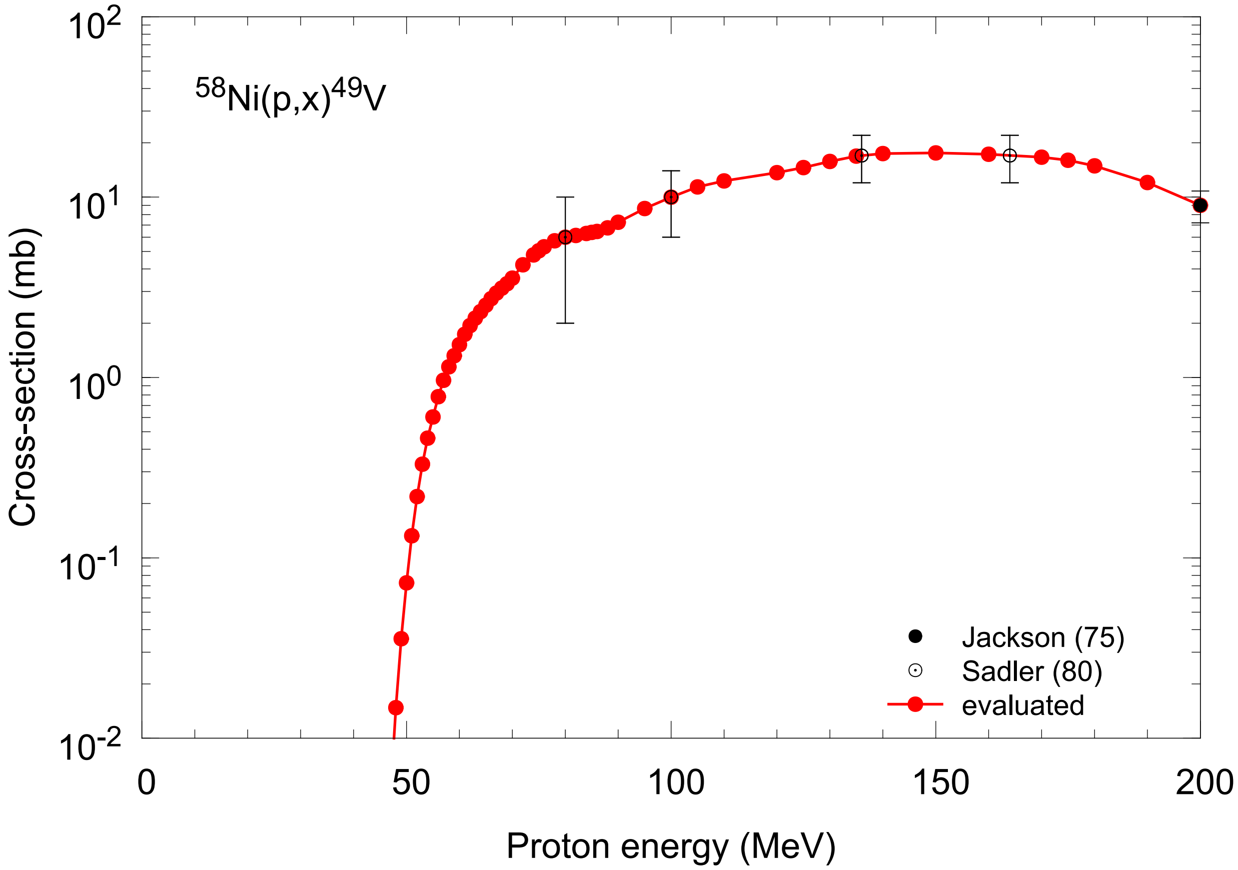
$^{58}Ni(p,x)^{47}V$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



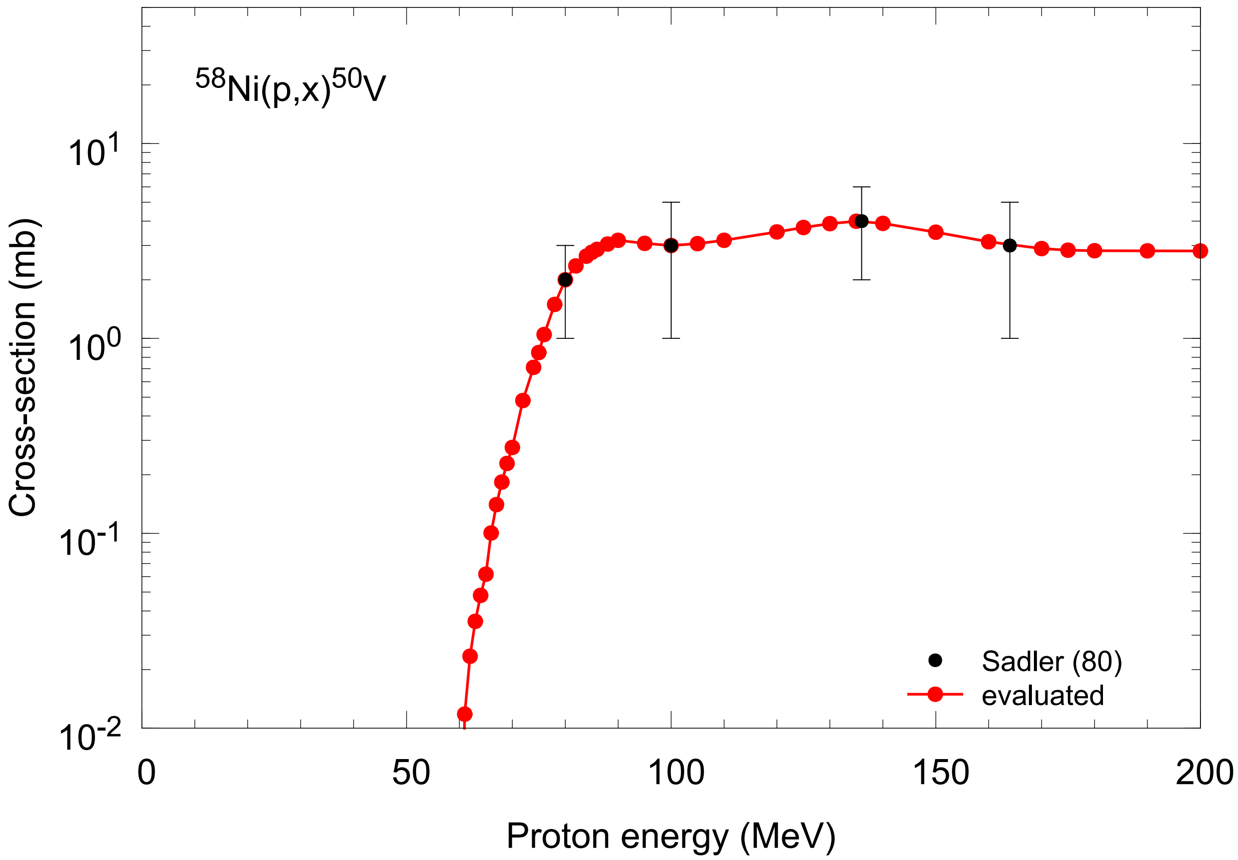
$^{58}Ni(p,x)^{48}V$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated

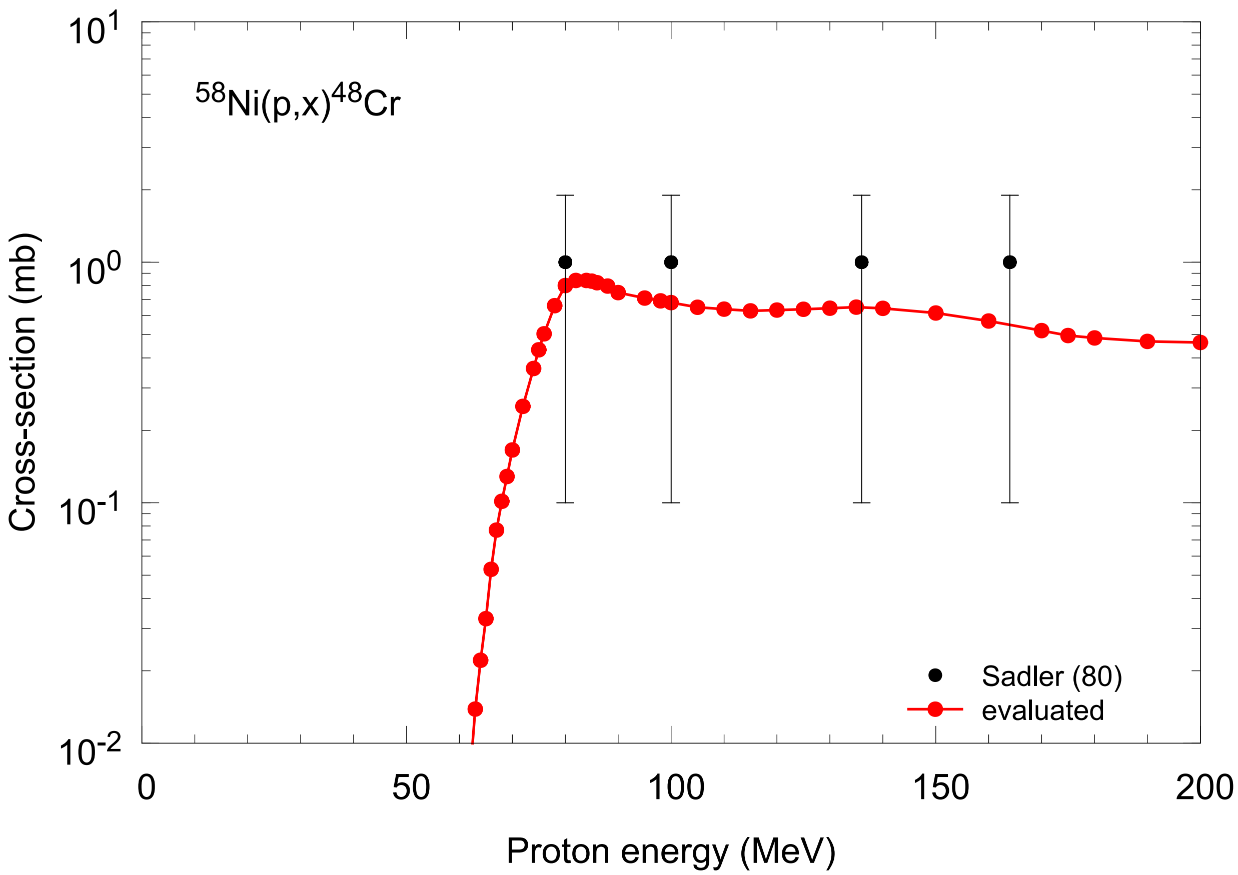


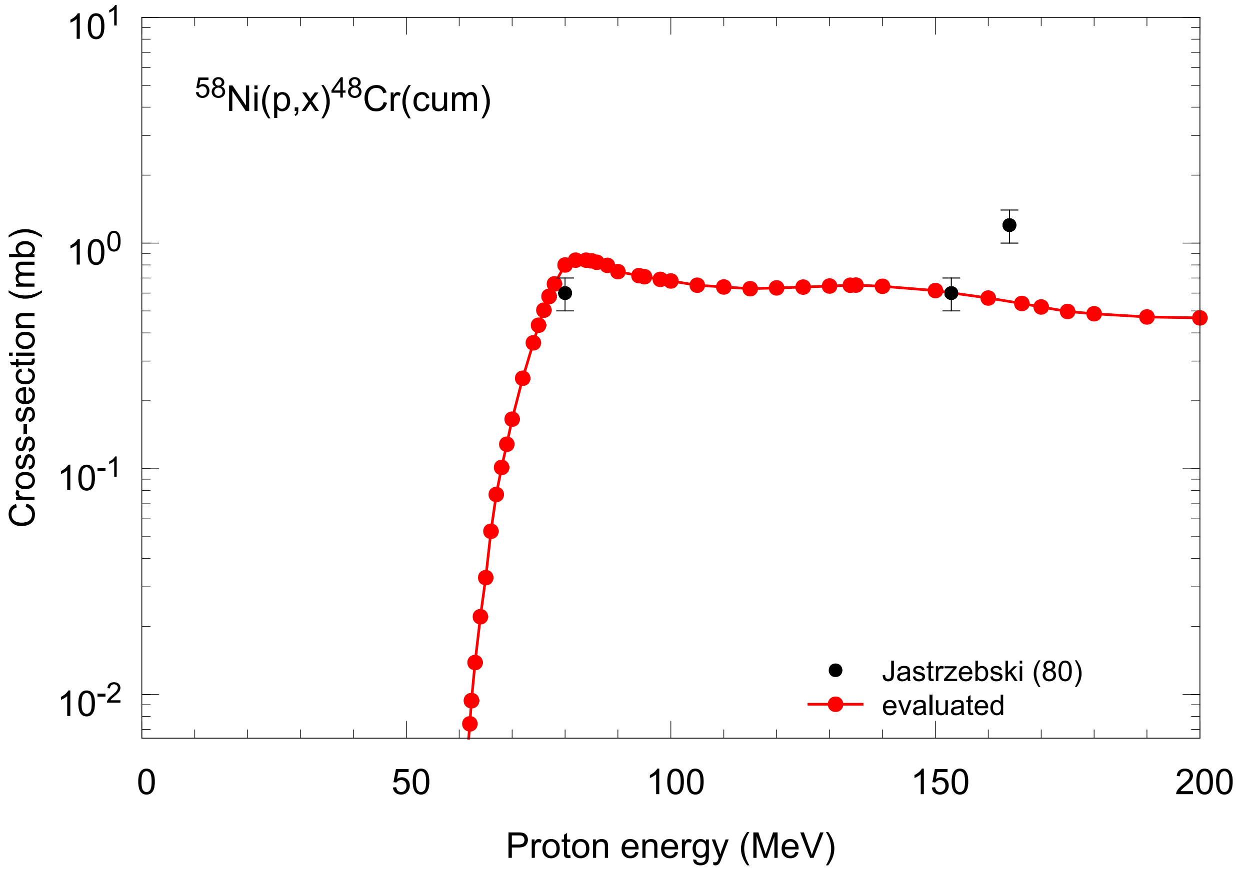
$^{58}Ni(p,x)^{48}V(cum)$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated

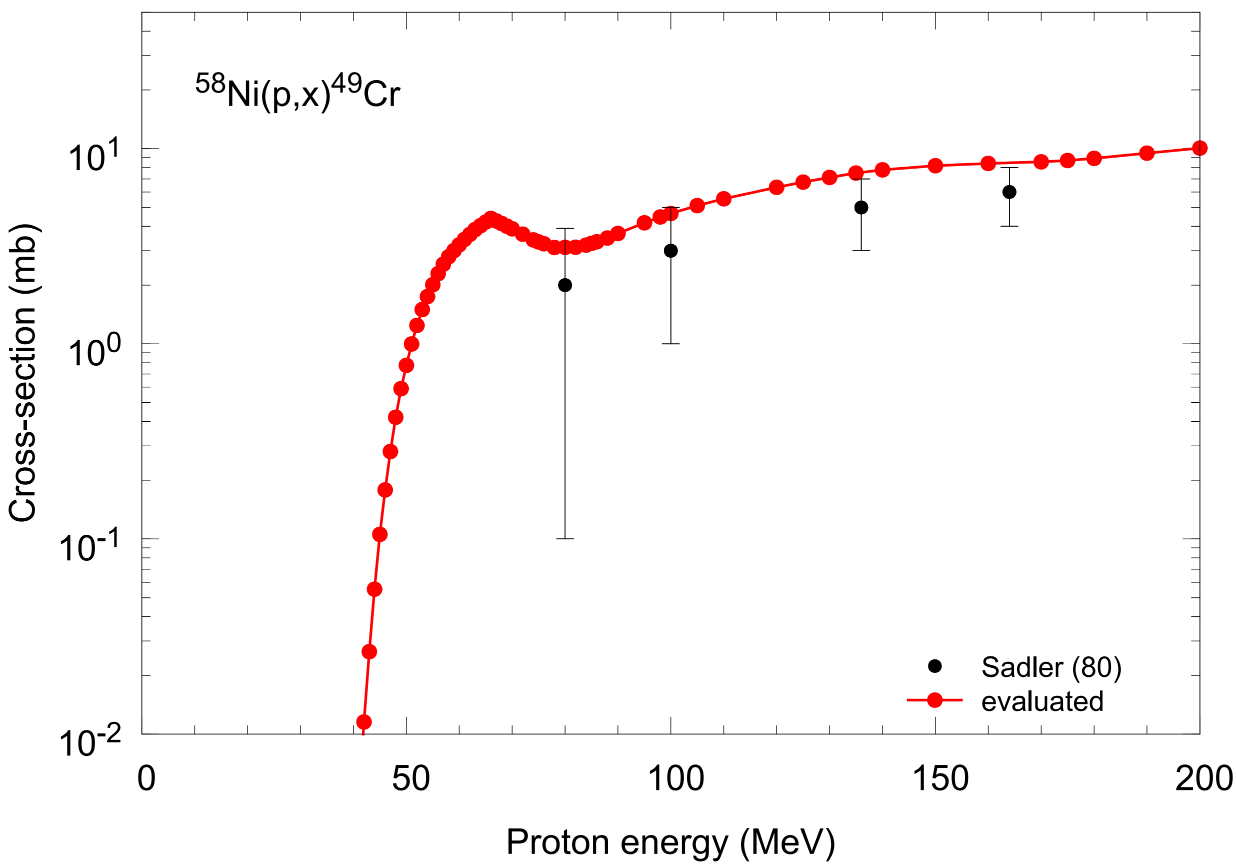


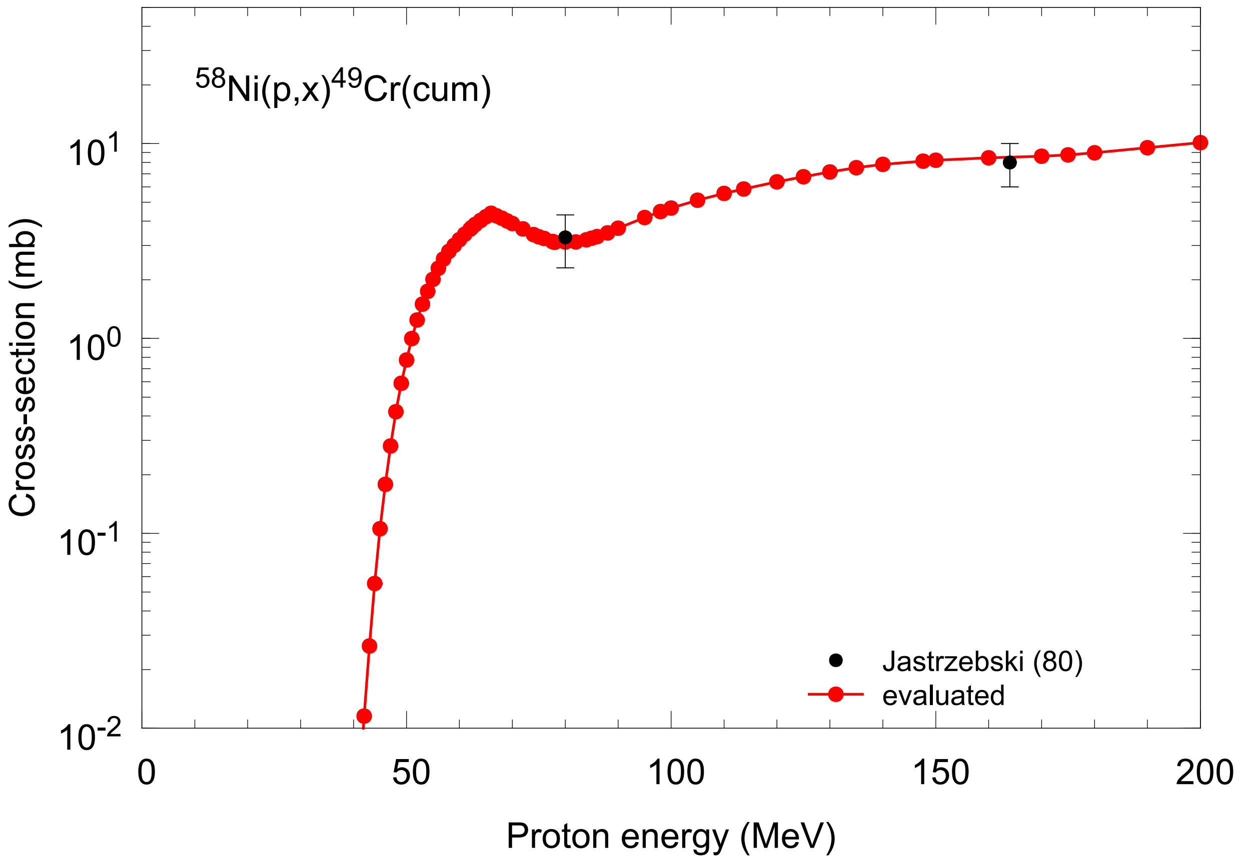
$^{58}Ni(p,x)^{49}V$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated


^{58}Ni(p,x)^{50}V
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
0
50
100
150
200
10^{-2}
10^{-1}
10^{0}
10^{1}

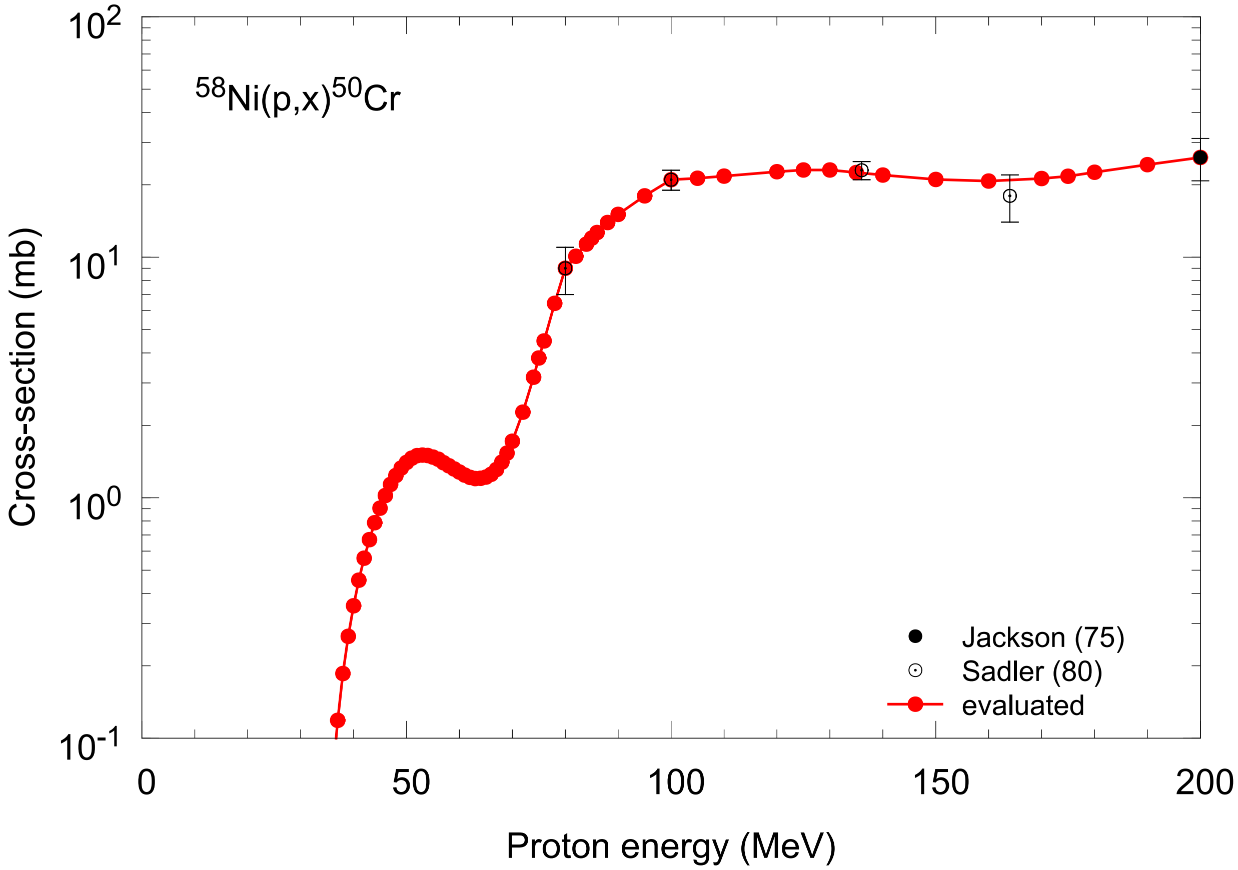

^{58}Ni(p,x)^{48}Cr
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
0
50
100
150
200
10^{-2}
10^{-1}
10^{0}
10^{1}


$^{58}Ni(p,x)^{48}Cr(cum)$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200

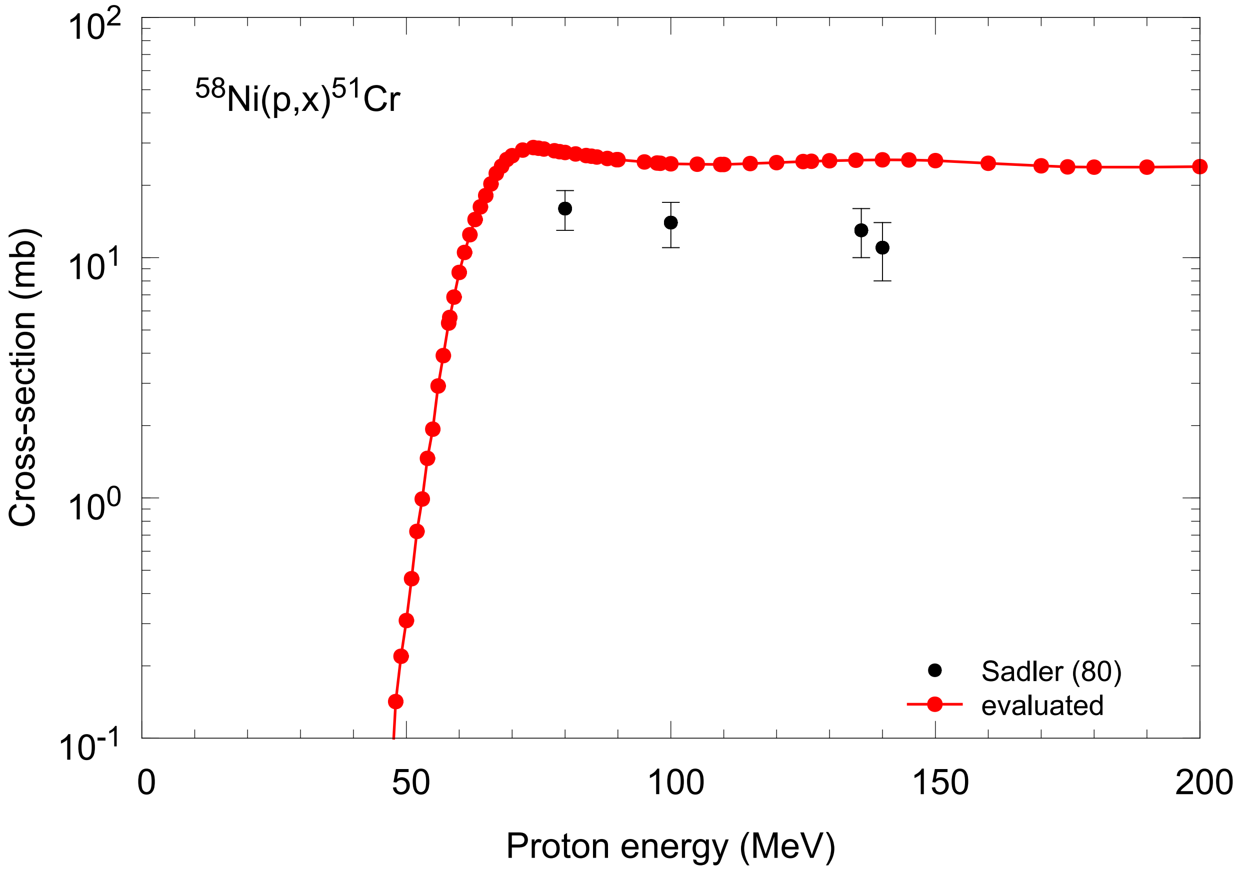

$^{58}Ni(p,x)^{49}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200



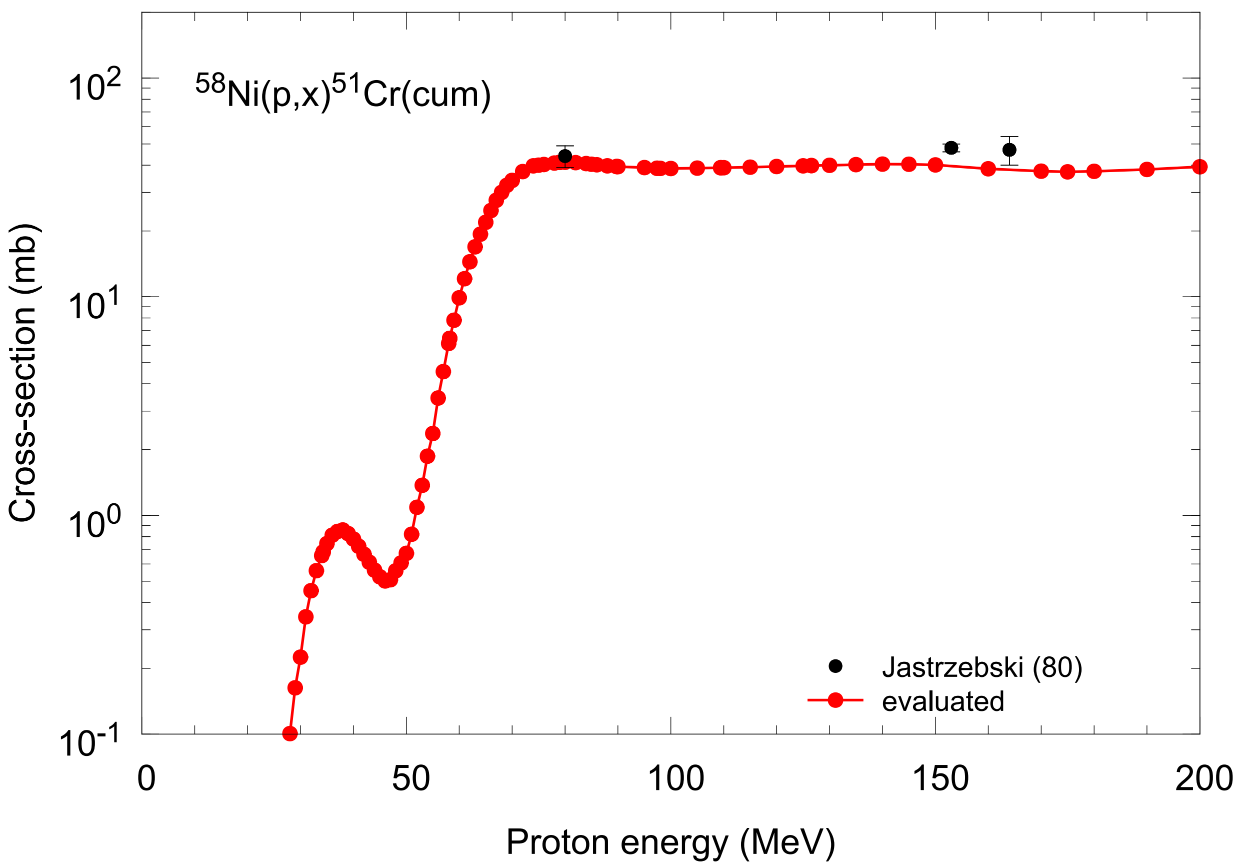
$^{58}Ni(p,x)^{49}Cr(cum)$
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Jastrzebski (80)
evaluated



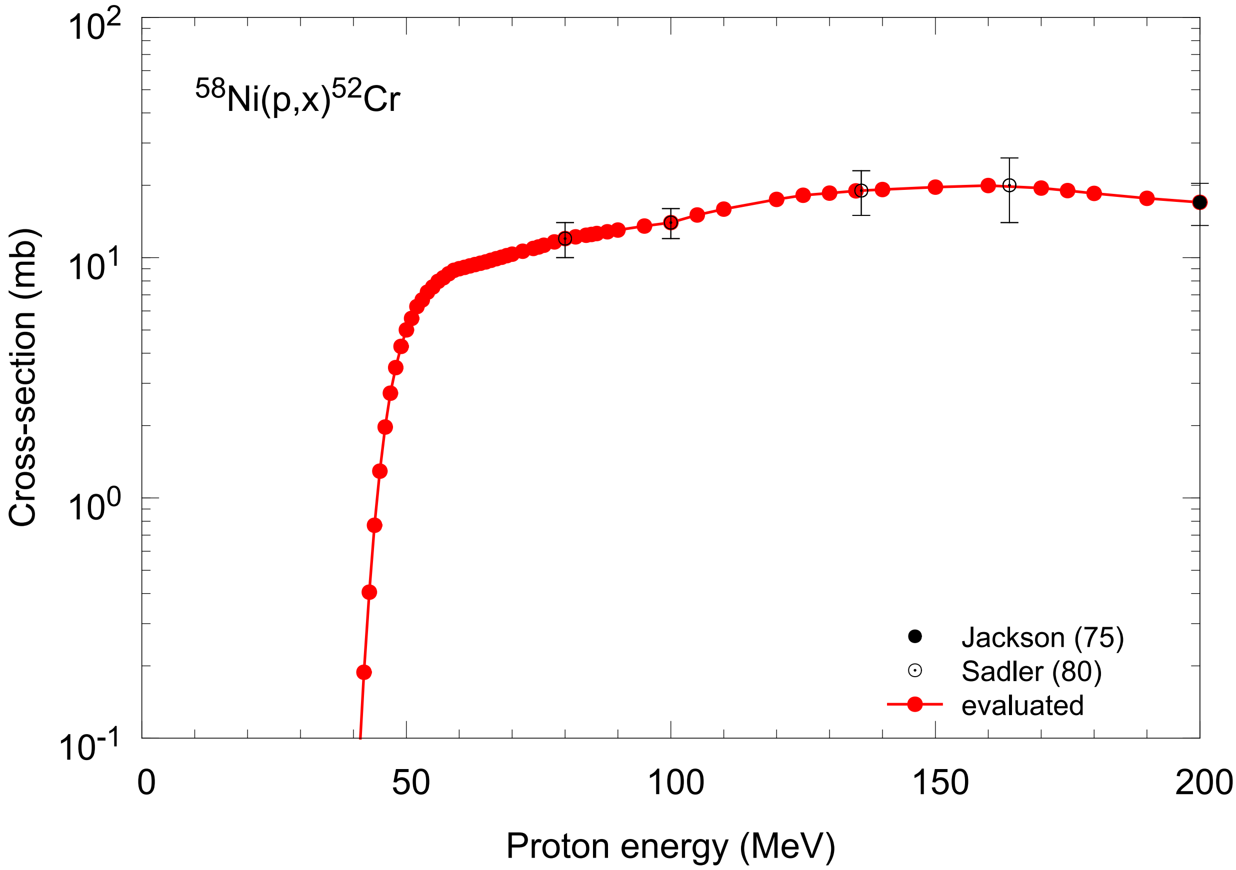
$^{58}Ni(p,x)^{50}Cr$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



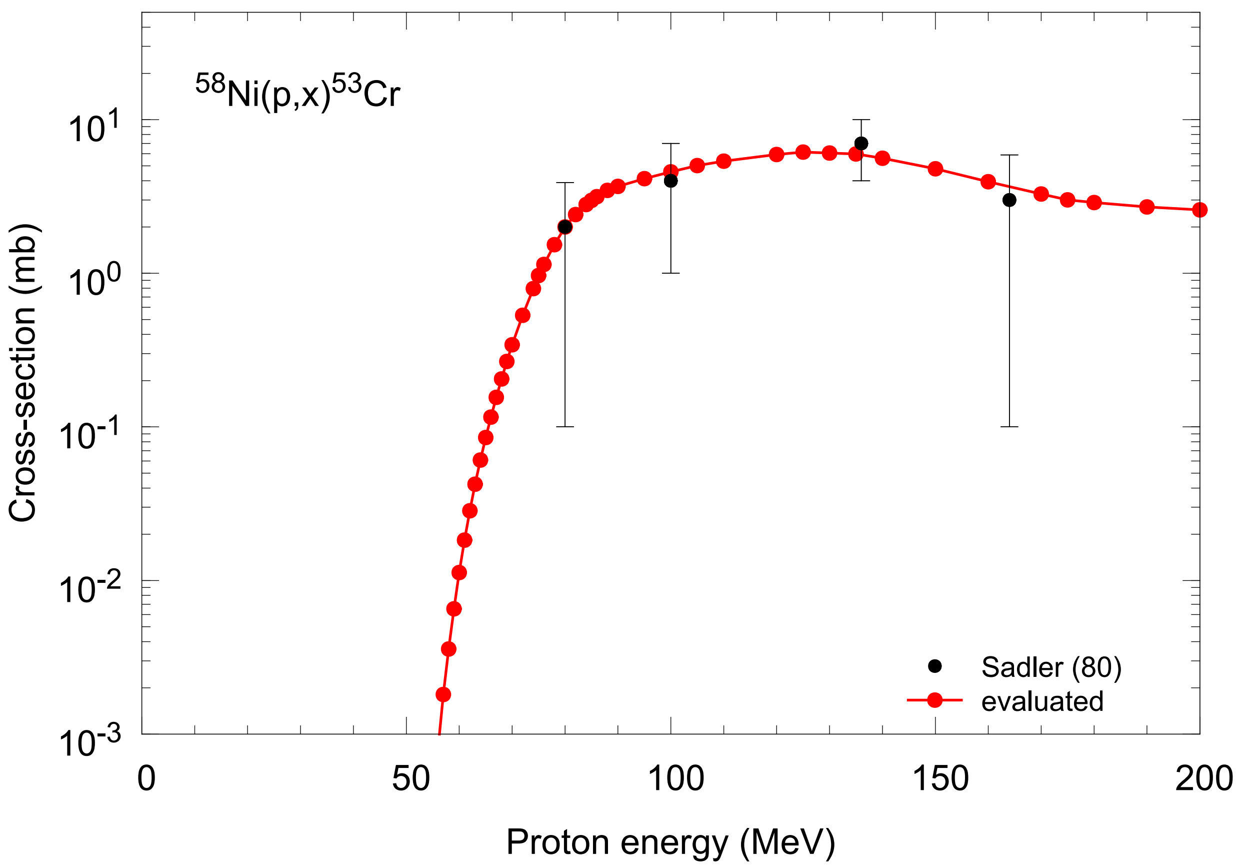
$^{58}Ni(p,x)^{51}Cr$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated



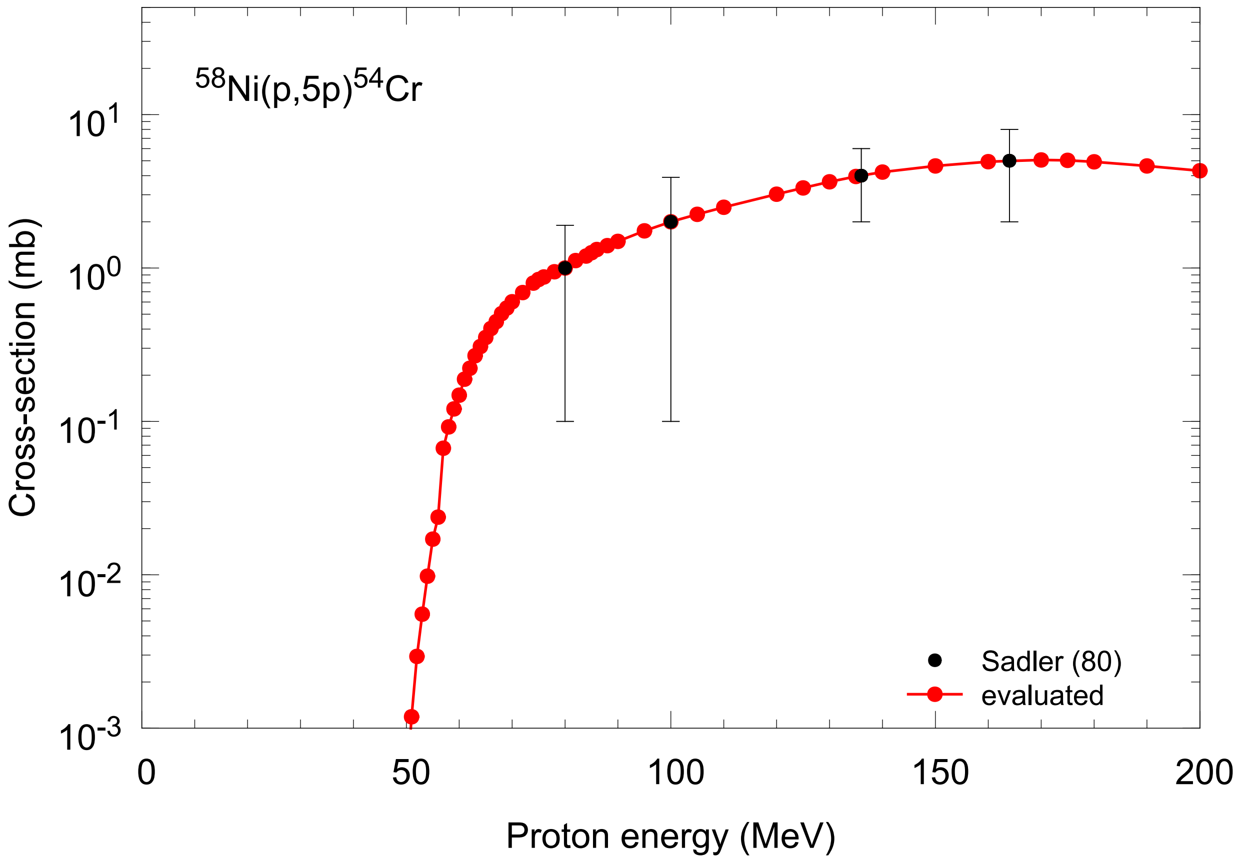
$^{58}Ni(p,x)^{51}Cr(cum)$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Jastrzebski (80)
evaluated

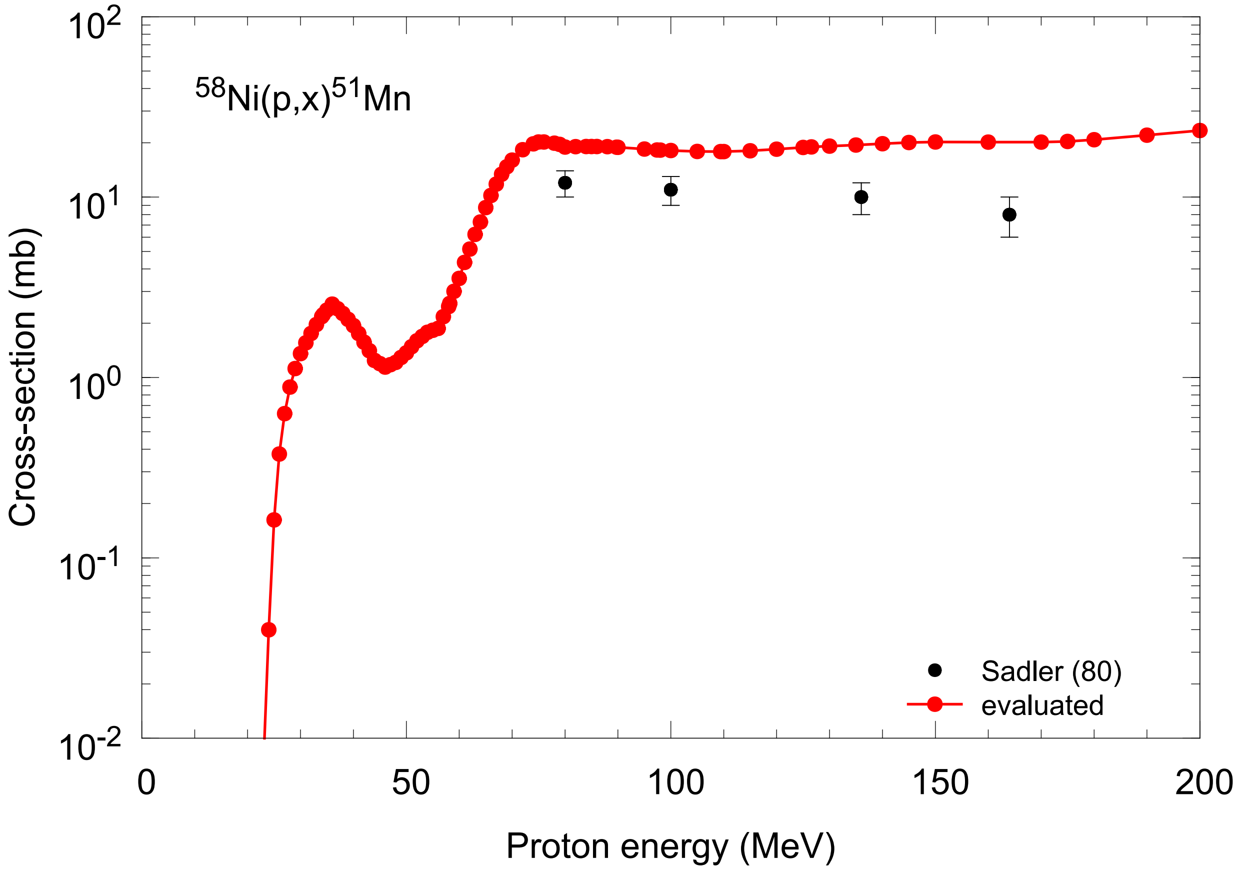


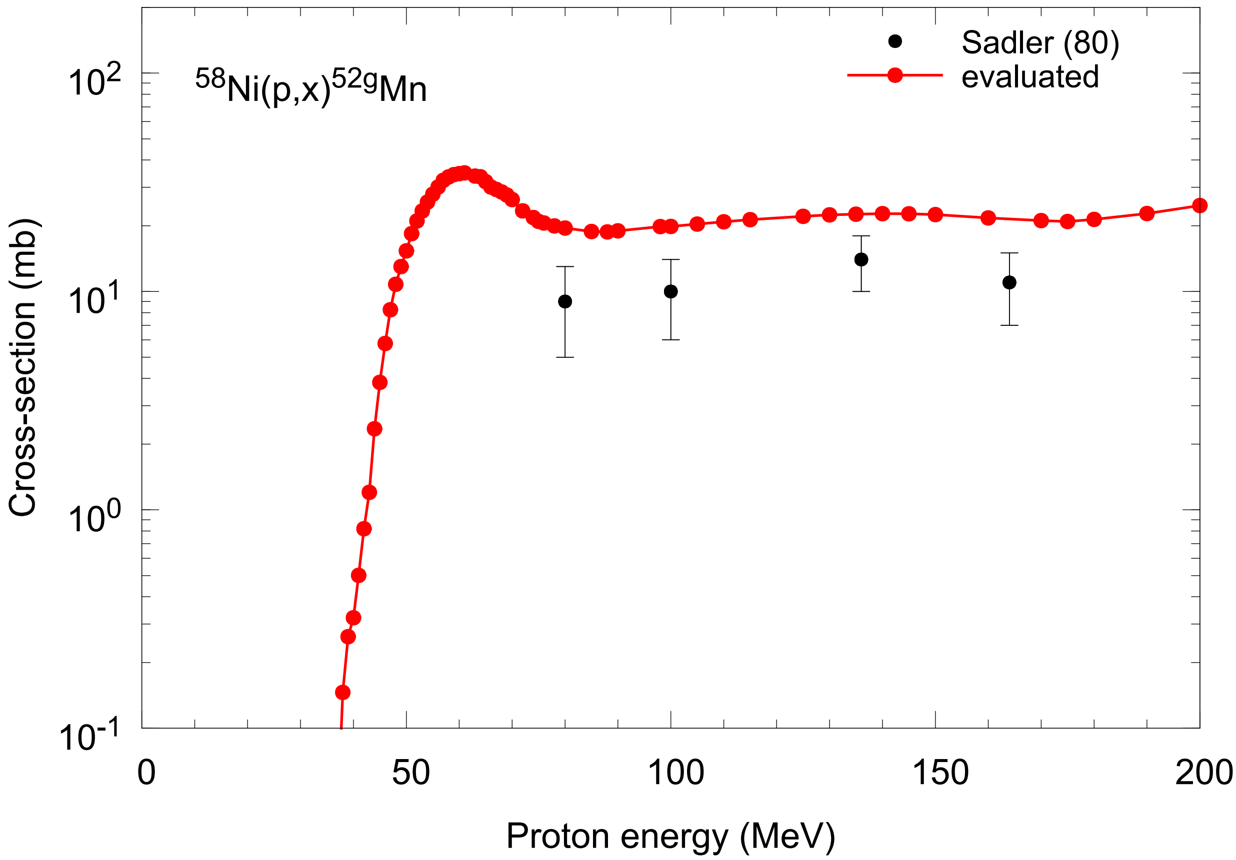
$^{58}Ni(p,x)^{52}Cr$
Cross-section (mb)
Proton energy (MeV)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Jackson (75)
Sadler (80)
evaluated



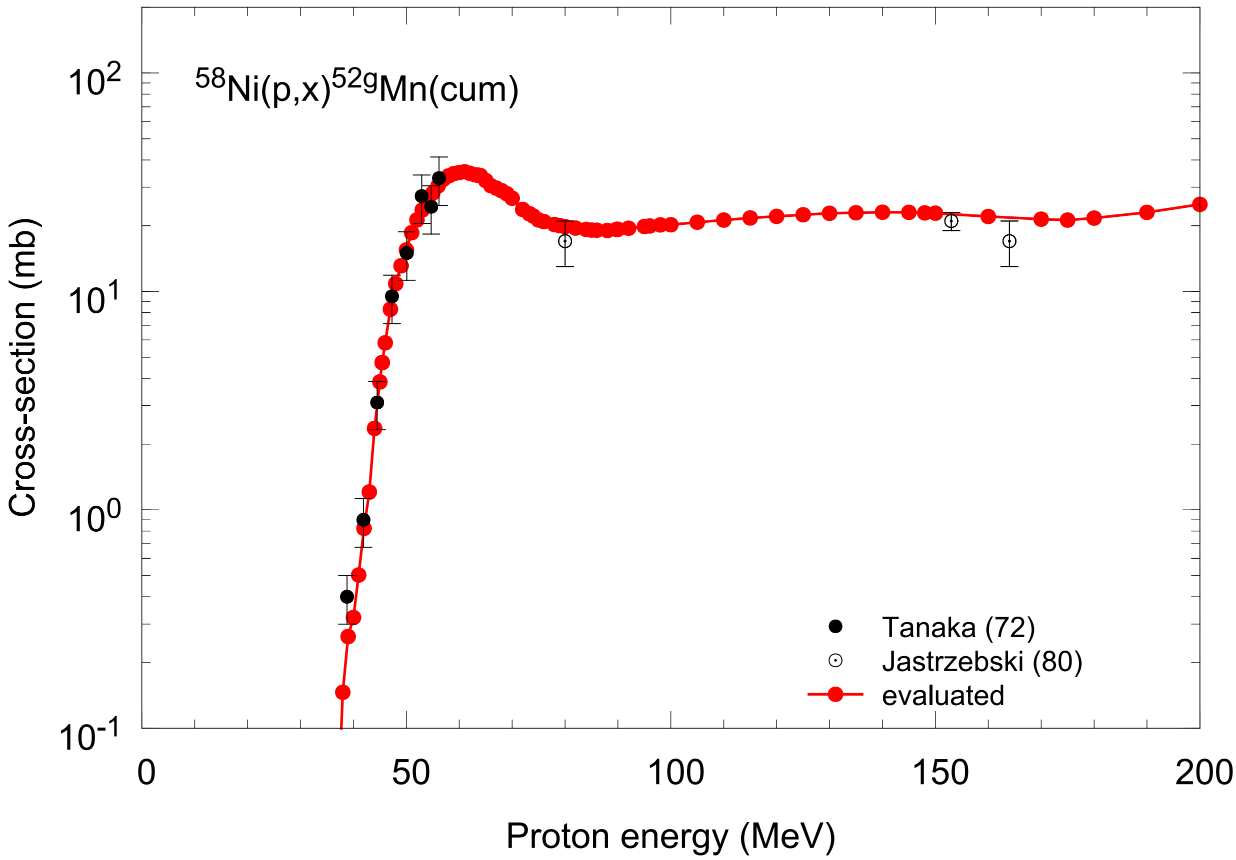
$^{58}Ni(p,x)^{53}Cr$
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Sadler (80)
evaluated


$^{58}Ni(p,5p)^{54}Cr$
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated

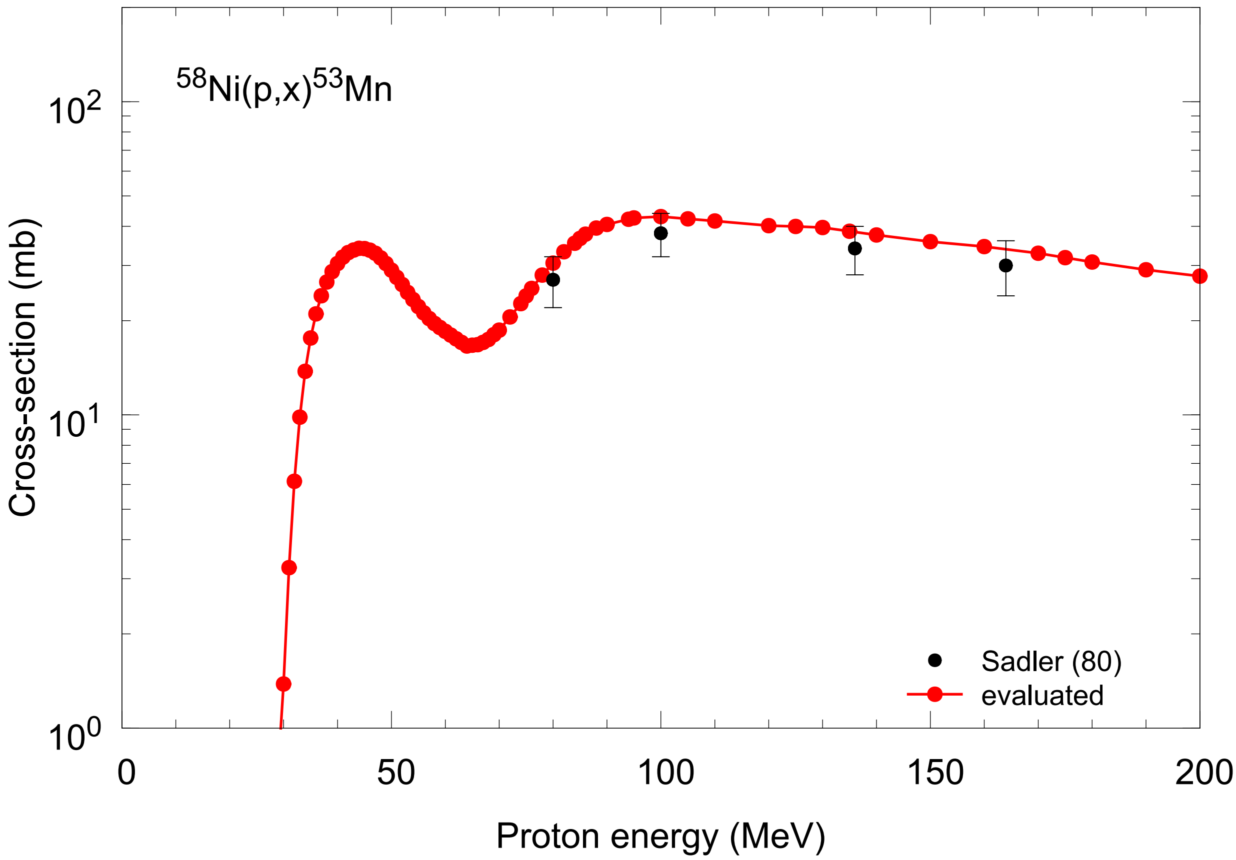

$^{58}Ni(p,x)^{51}Mn$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated



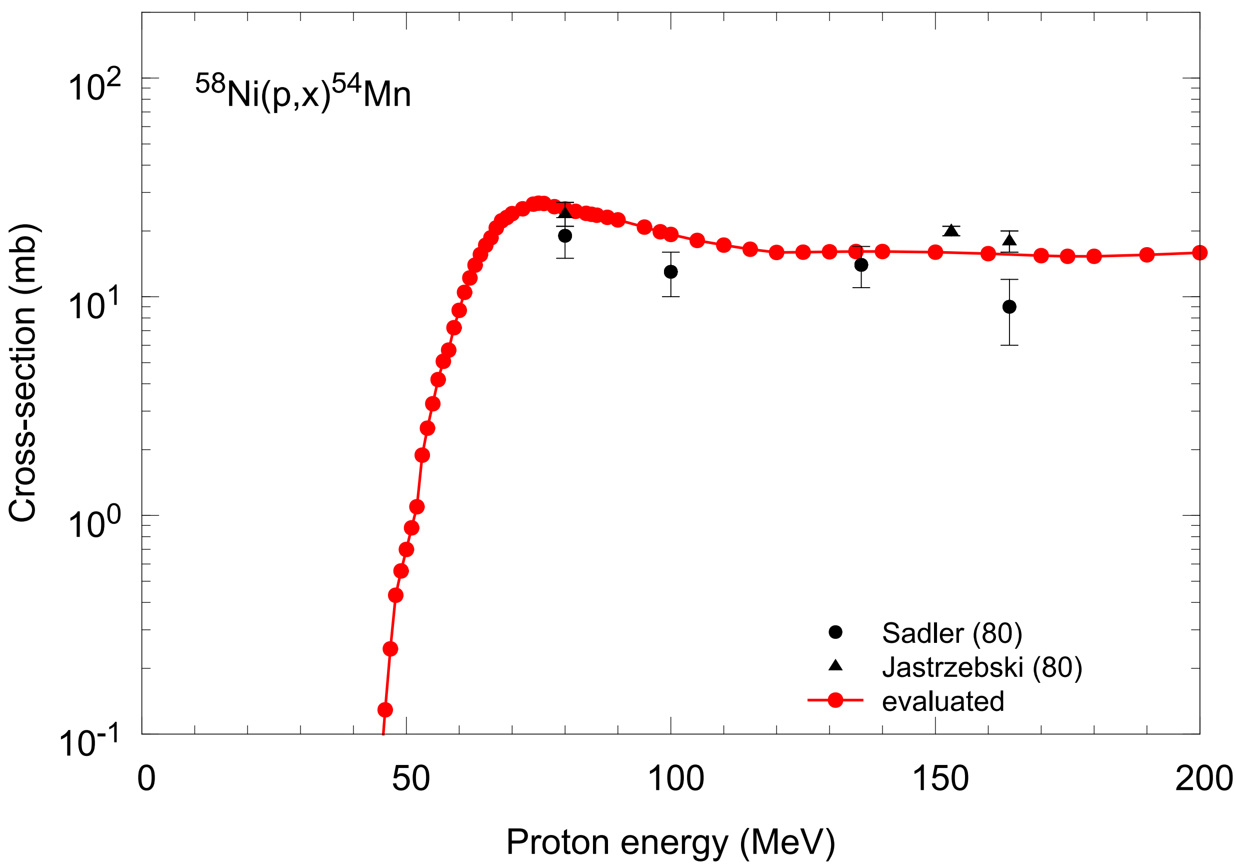
$^{58}Ni(p,x)^{52g}Mn$
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



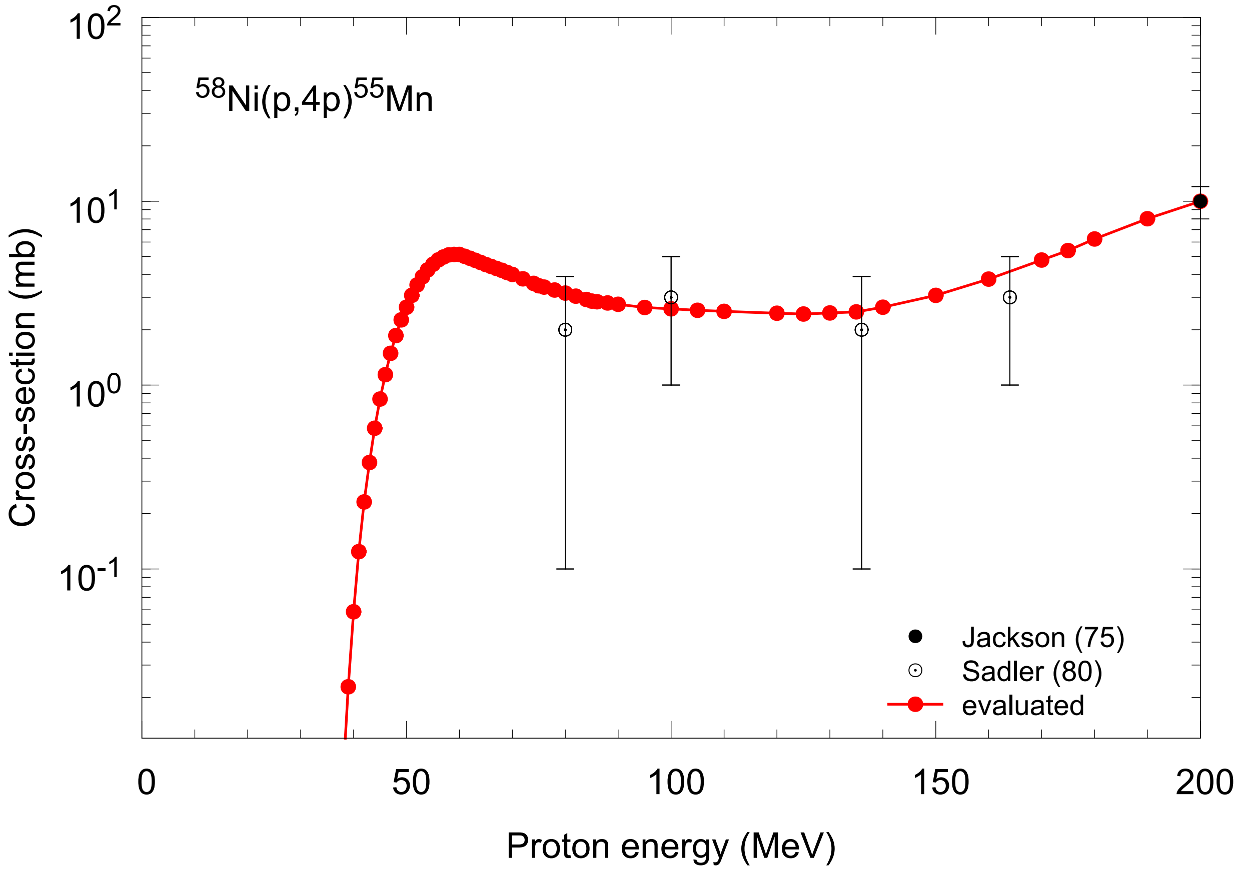
$^{58}Ni(p,x)^{52g}Mn(cum)$
Tanaka (72)
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



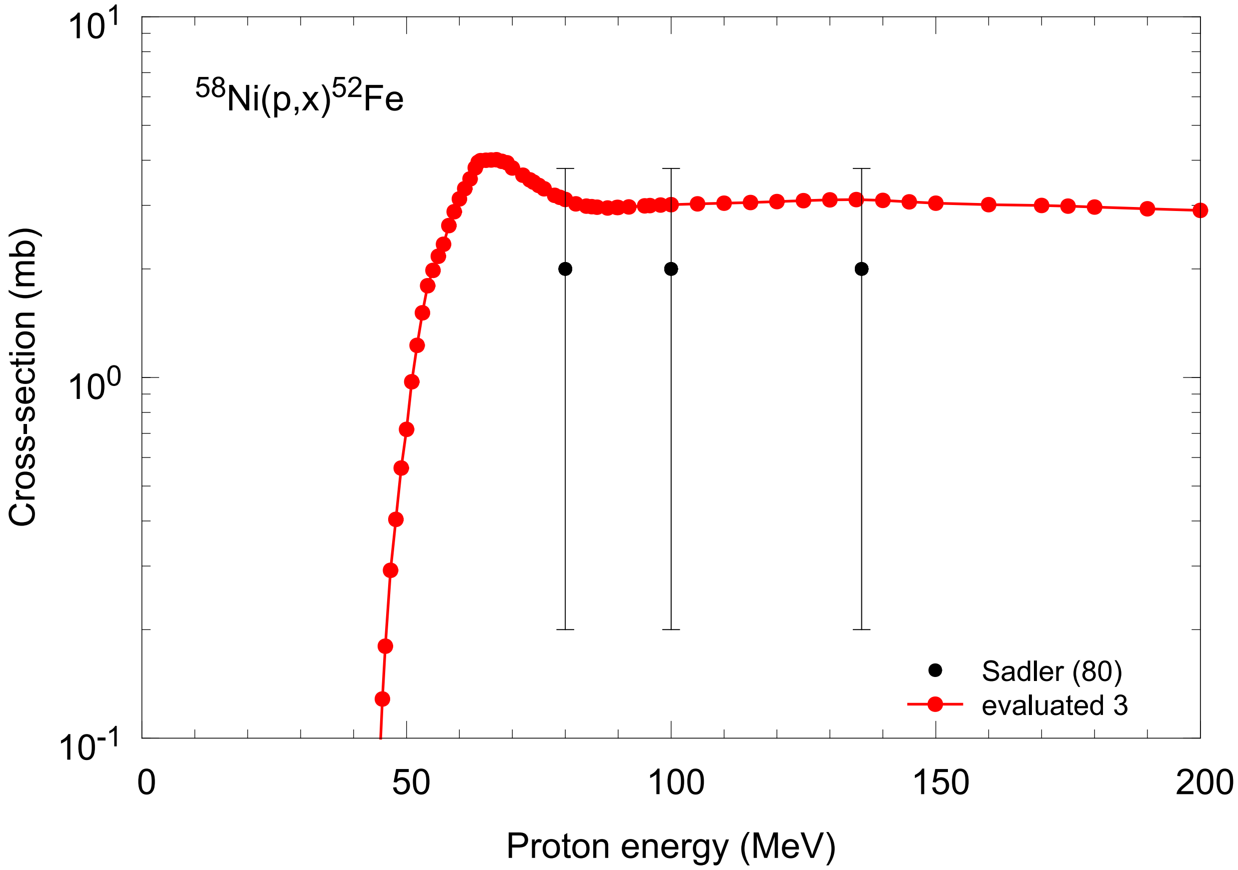
$^{58}Ni(p,x)^{53}Mn$
Cross-section (mb)
10^0
10^1
10^2
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated



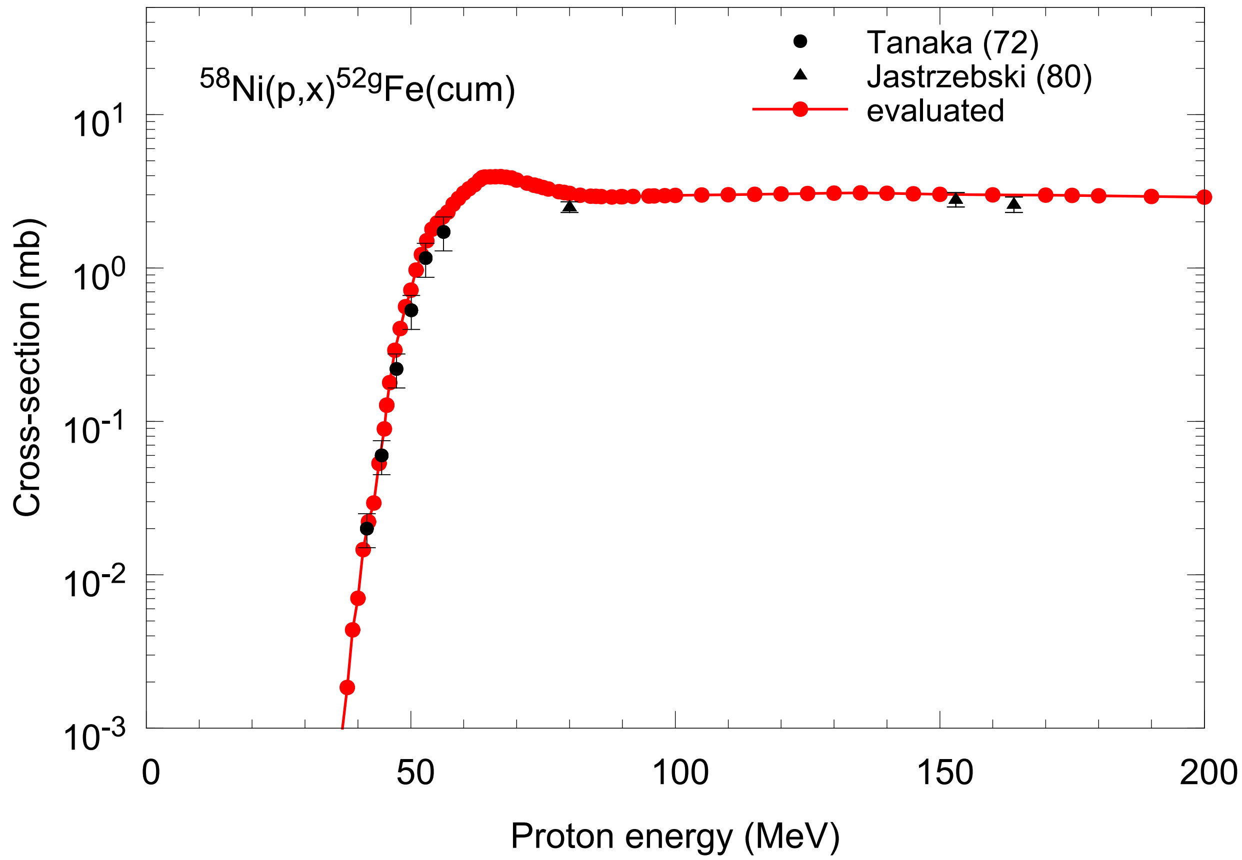
$^{58}Ni(p,x)^{54}Mn$
Cross-section (mb)
10^{-1}
10^0
10^1
10^2
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
Jastrzebski (80)
evaluated



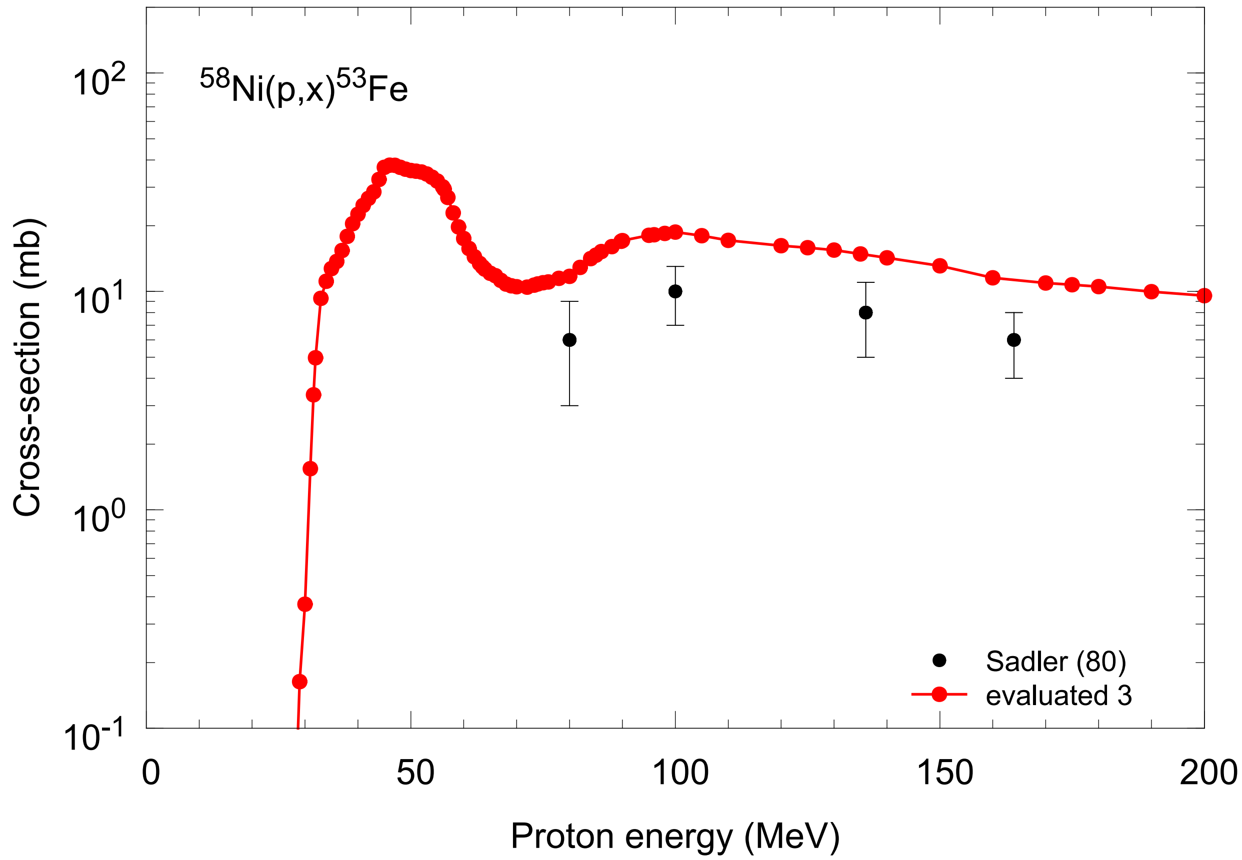
10^2
10^1
10^0
10^{-1}
Cross-section (mb)
$^{58}Ni(p,4p)^{55}Mn$
Jackson (75)
Sadler (80)
evaluated
0
50
100
150
200
Proton energy (MeV)



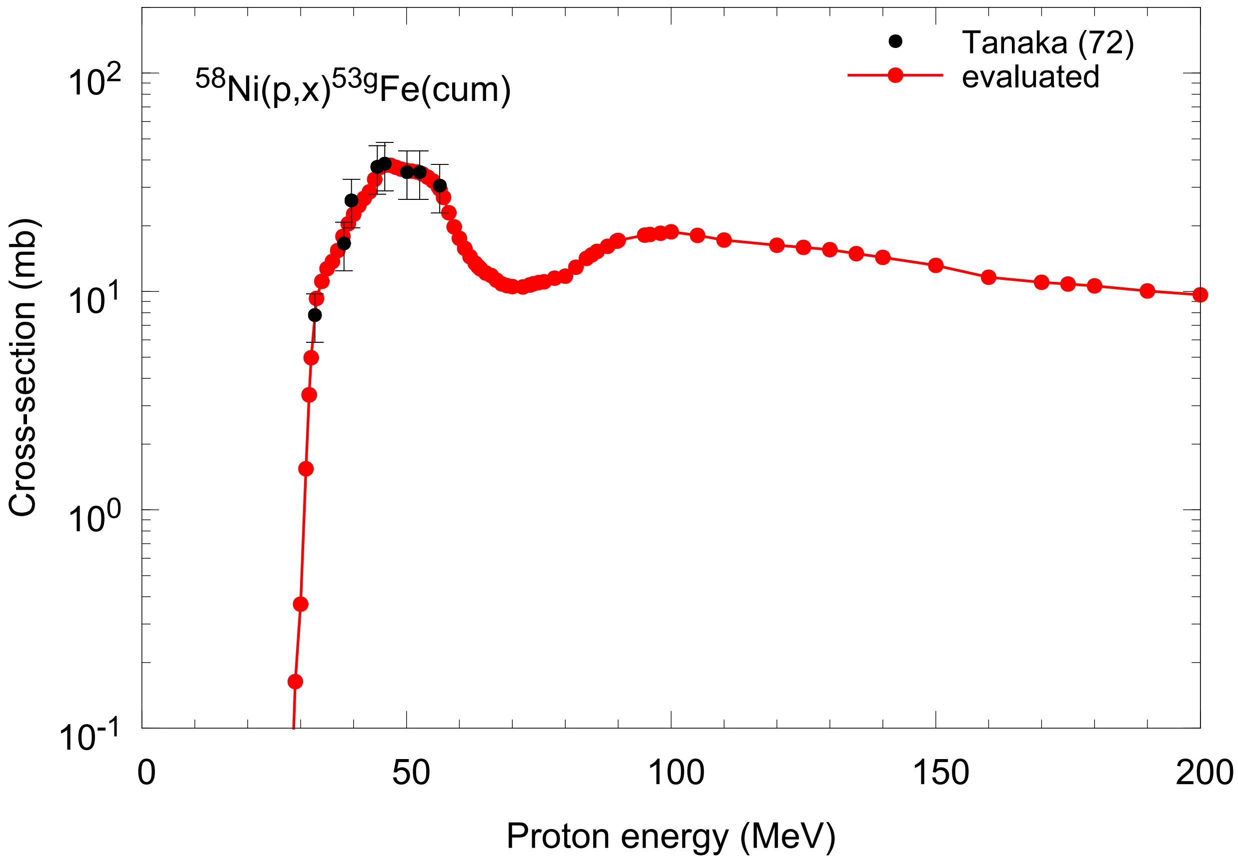
10^1
10^0
10^{-1}
Cross-section (mb)
$^{58}Ni(p,x)^{52}Fe$
Sadler (80)
evaluated 3
0
50
100
150
200
Proton energy (MeV)



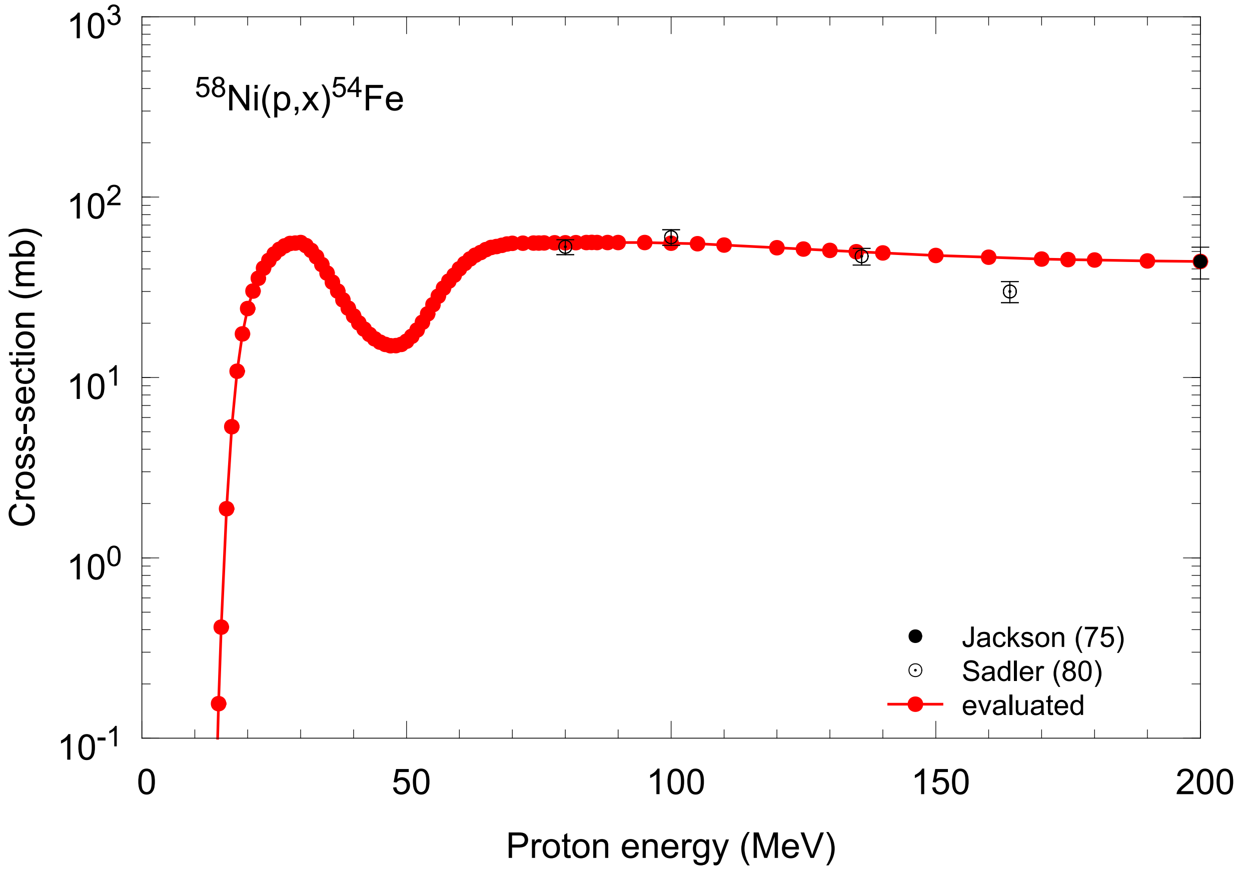
$^{58}Ni(p,x)^{52g}Fe(cum)$
Tanaka (72)
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



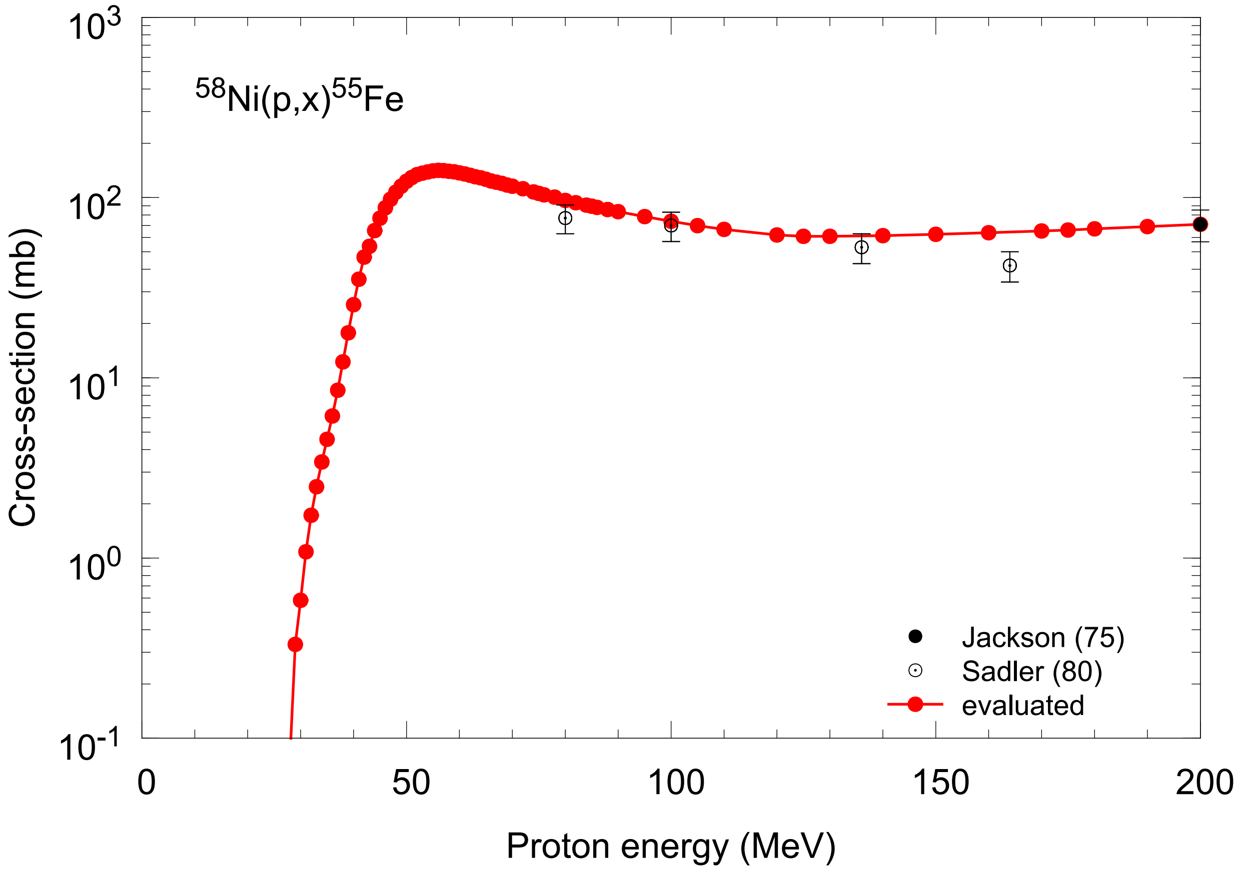
$^{58}Ni(p,x)^{53}Fe$
Sadler (80)
evaluated 3
Cross-section (mb)
Proton energy (MeV)



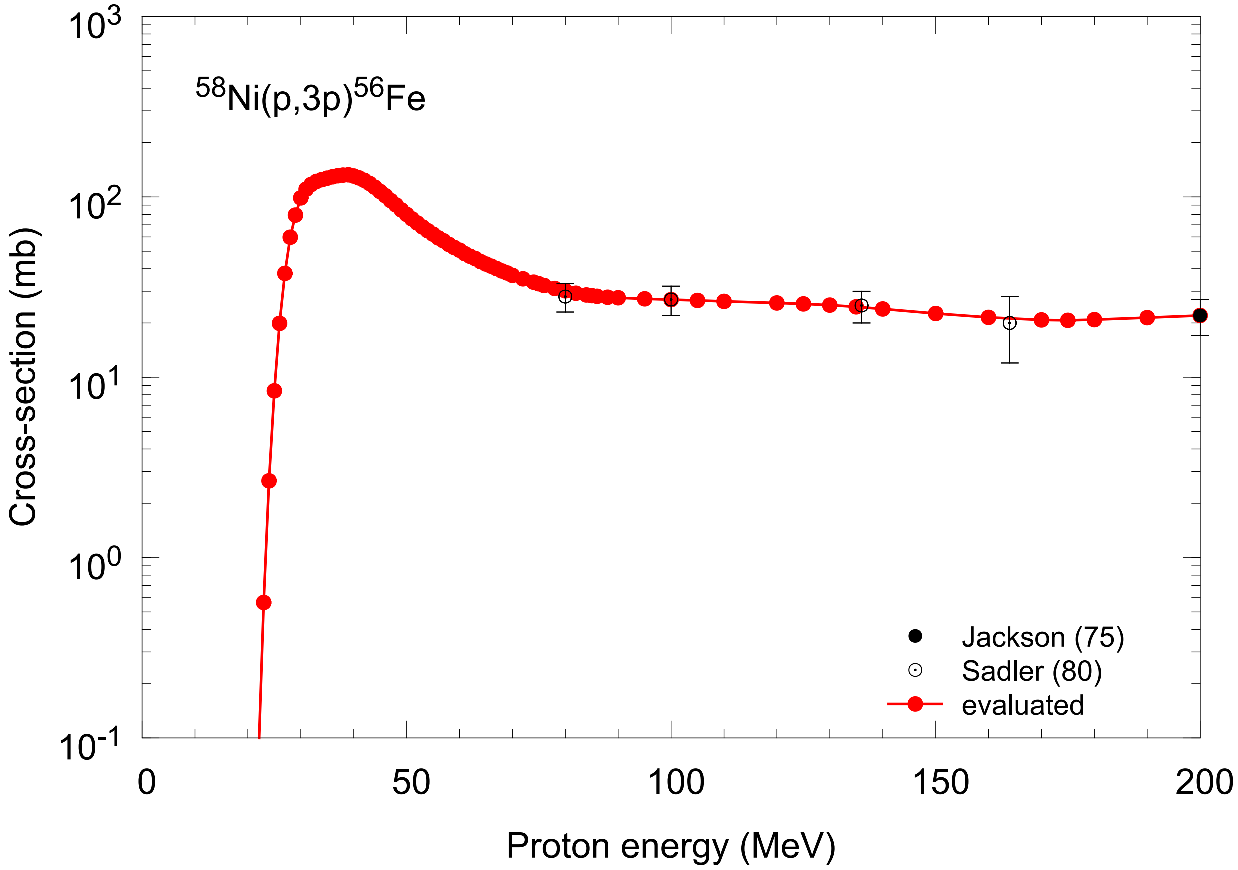
$^{58}Ni(p,x)^{53g}Fe(cum)$
Tanaka (72)
evaluated
Cross-section (mb)
Proton energy (MeV)



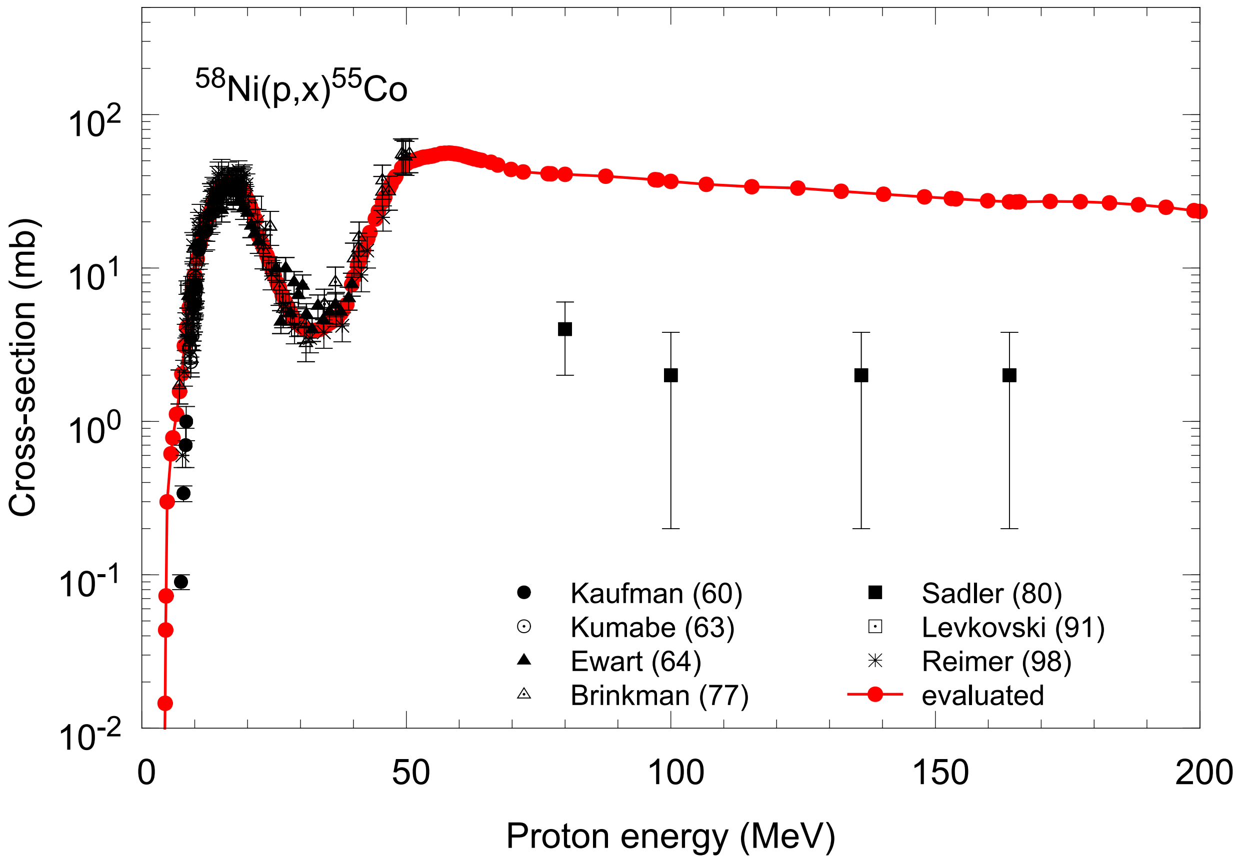
$^{58}Ni(p,x)^{54}Fe$
Jackson (75)
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



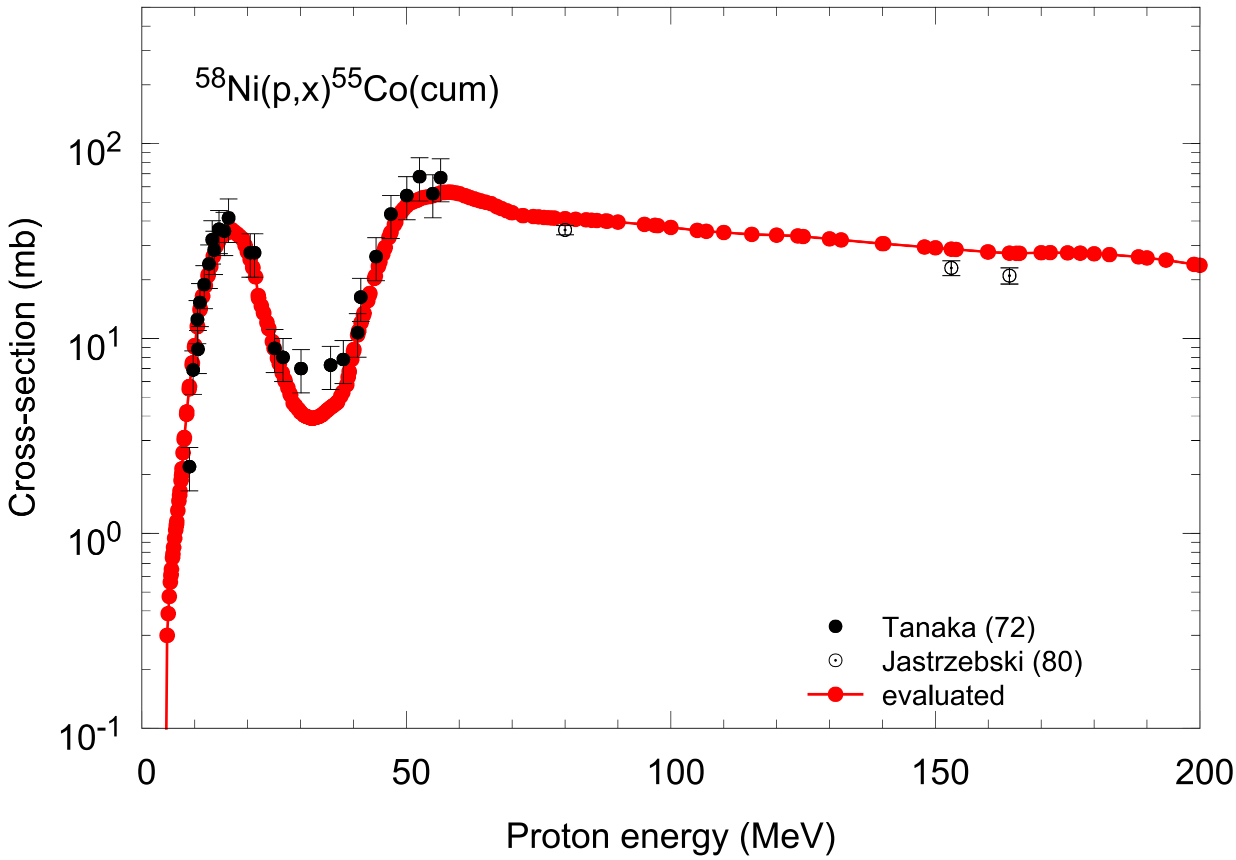
$^{58}Ni(p,x)^{55}Fe$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



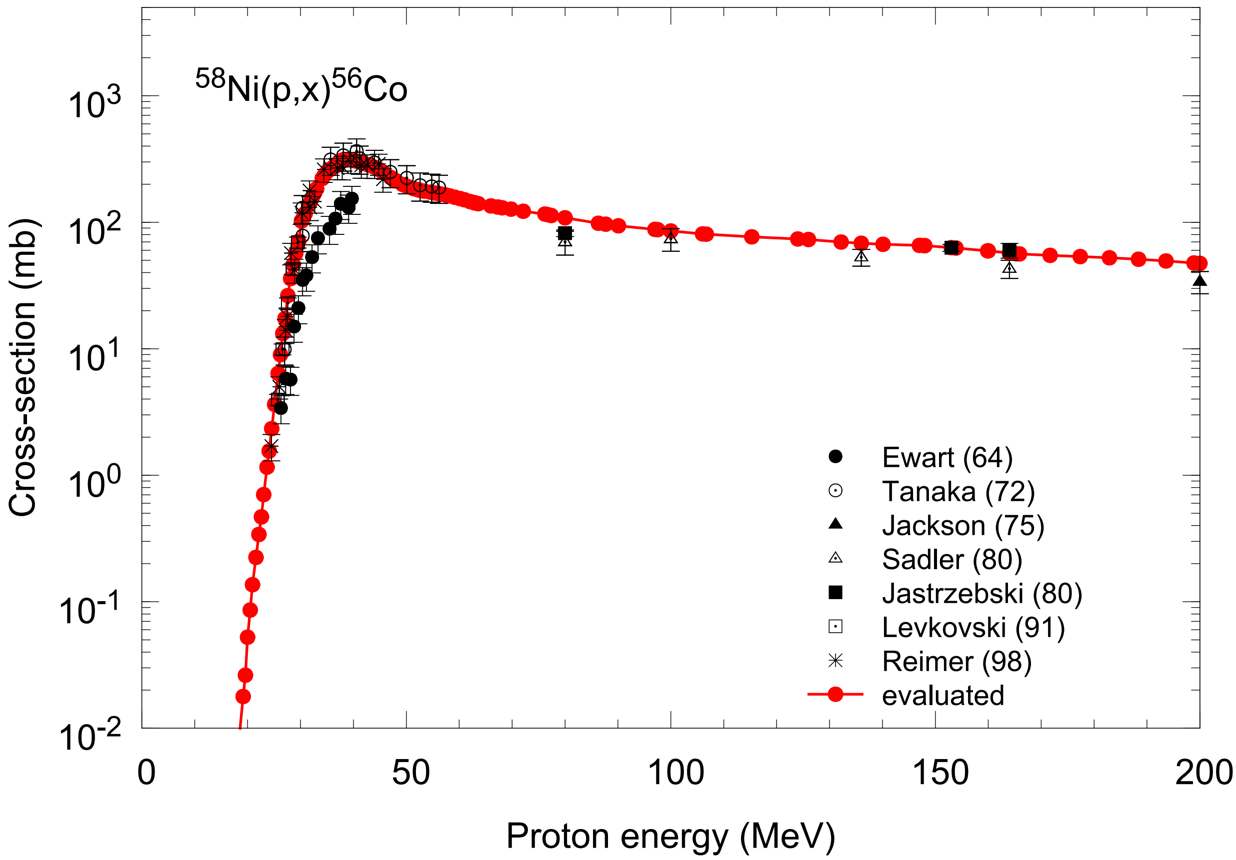
$^{58}Ni(p,3p)^{56}Fe$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



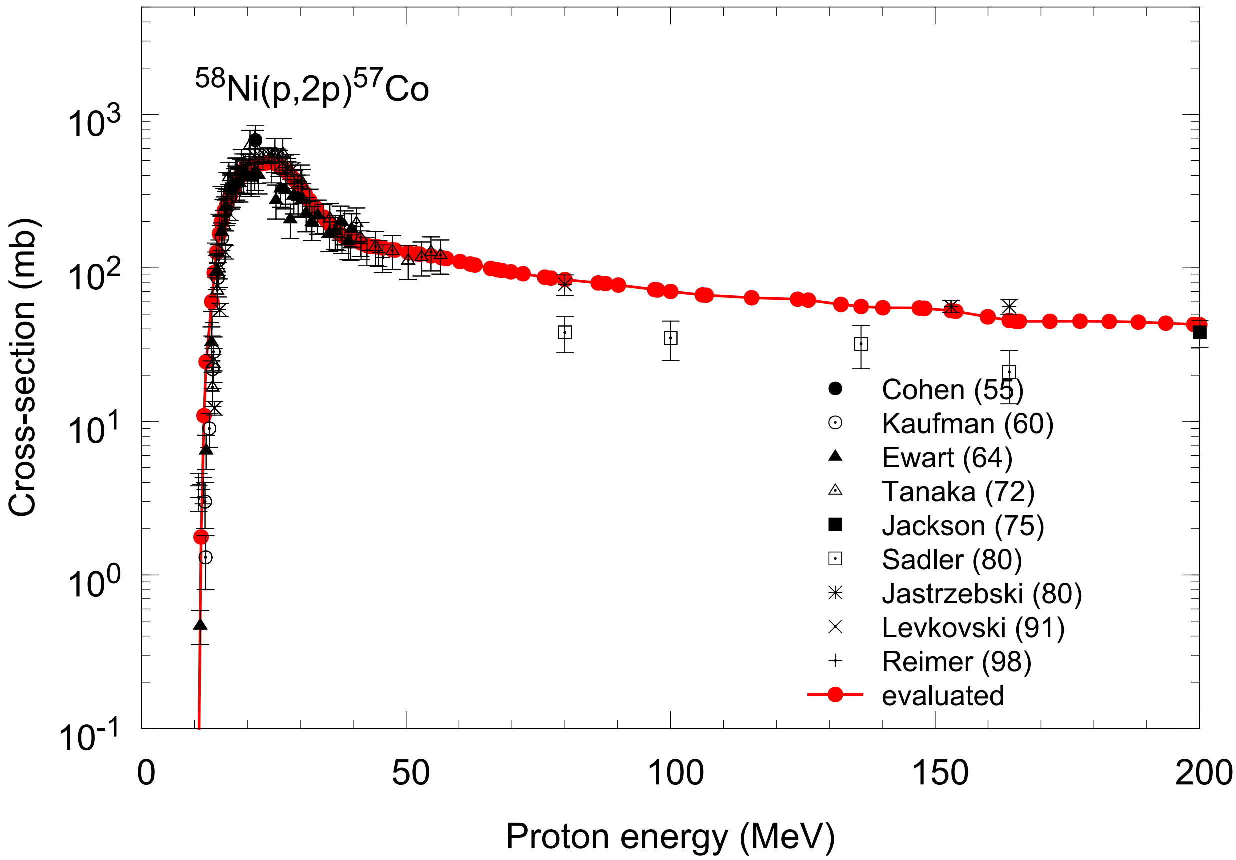
$^{58}Ni(p,x)^{55}Co$
Cross-section (mb)
Proton energy (MeV)
Kaufman (60)
Kumabe (63)
Ewart (64)
Brinkman (77)
Sadler (80)
Levkovski (91)
Reimer (98)
evaluated



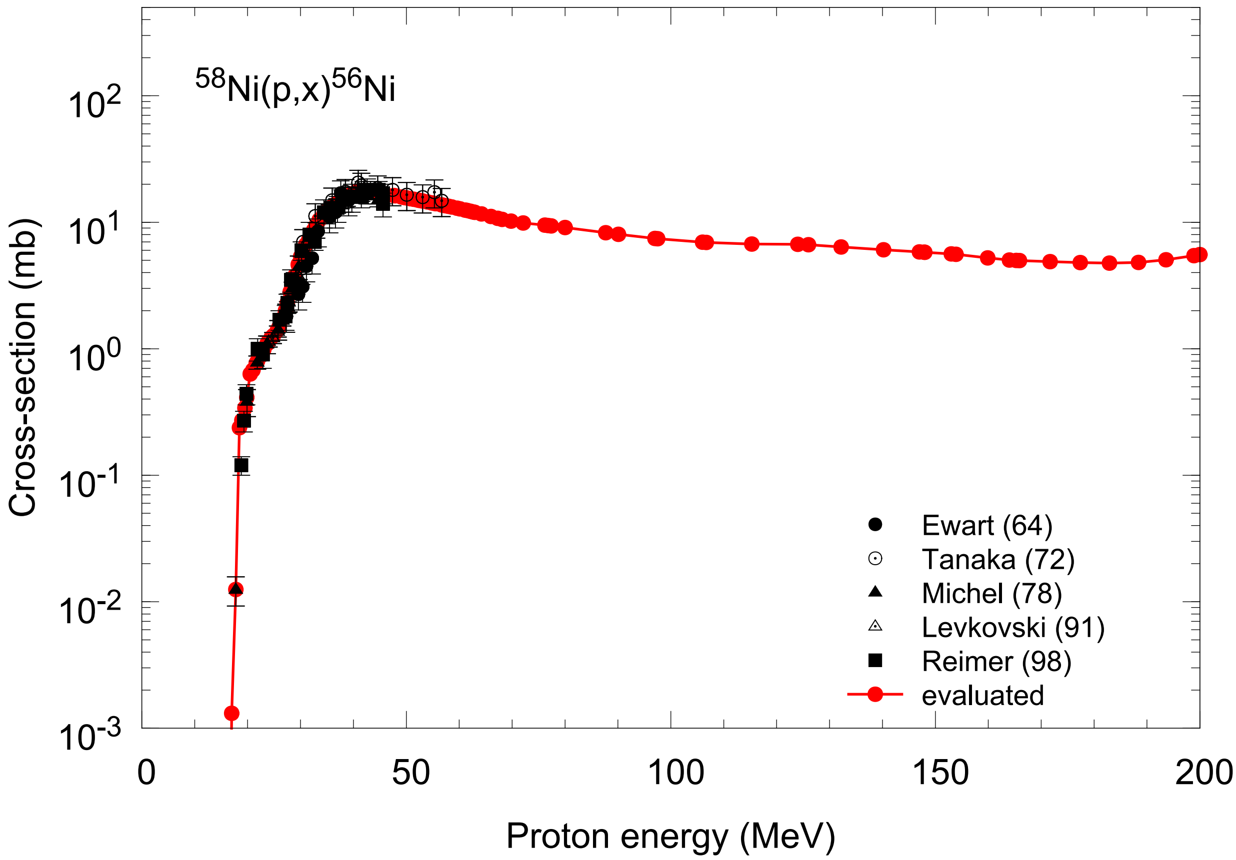
$^{58}Ni(p,x)^{55}Co(cum)$
Cross-section (mb)
Proton energy (MeV)
Tanaka (72)
Jastrzebski (80)
evaluated



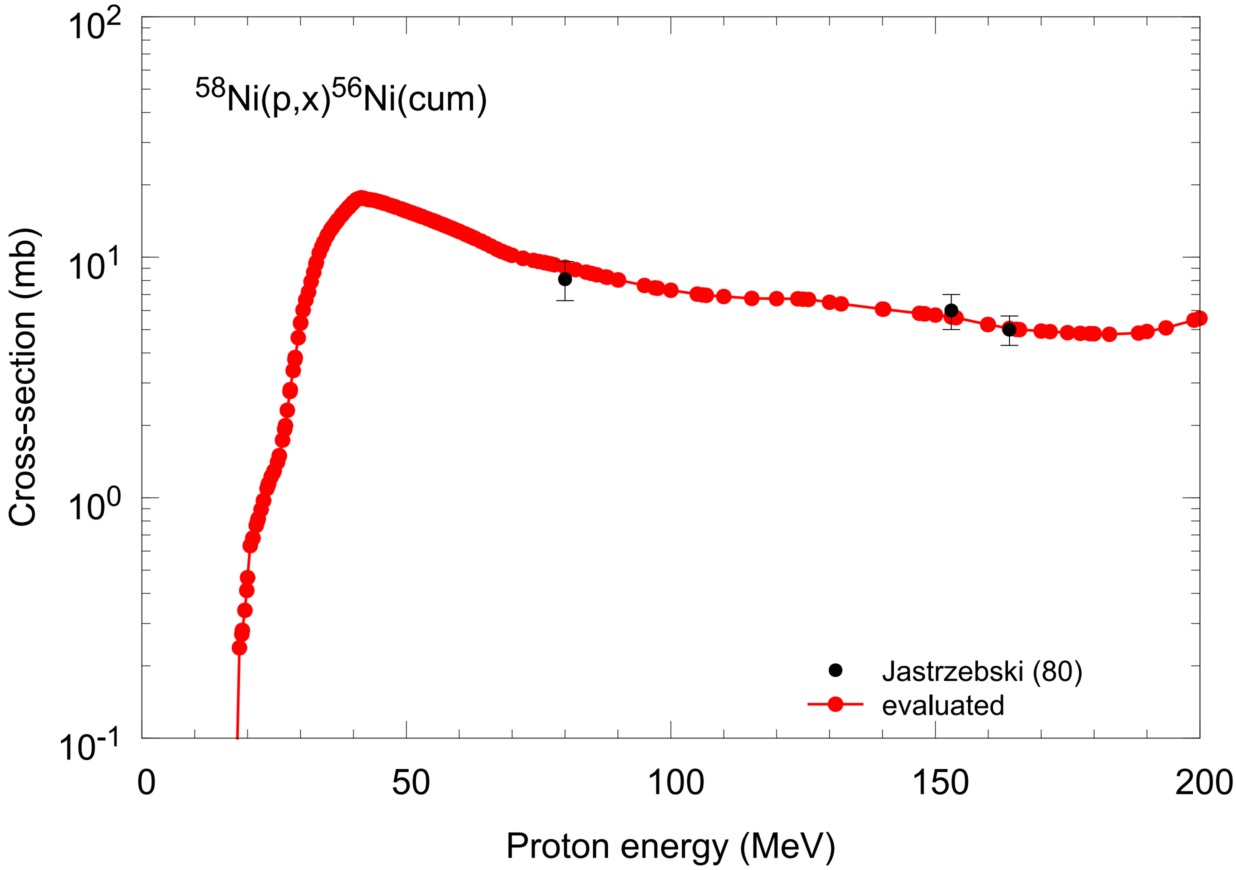
$^{58}Ni(p,x)^{56}Co$
Cross-section (mb)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Ewart (64)
Tanaka (72)
Jackson (75)
Sadler (80)
Jastrzebski (80)
Levkovski (91)
Reimer (98)
evaluated



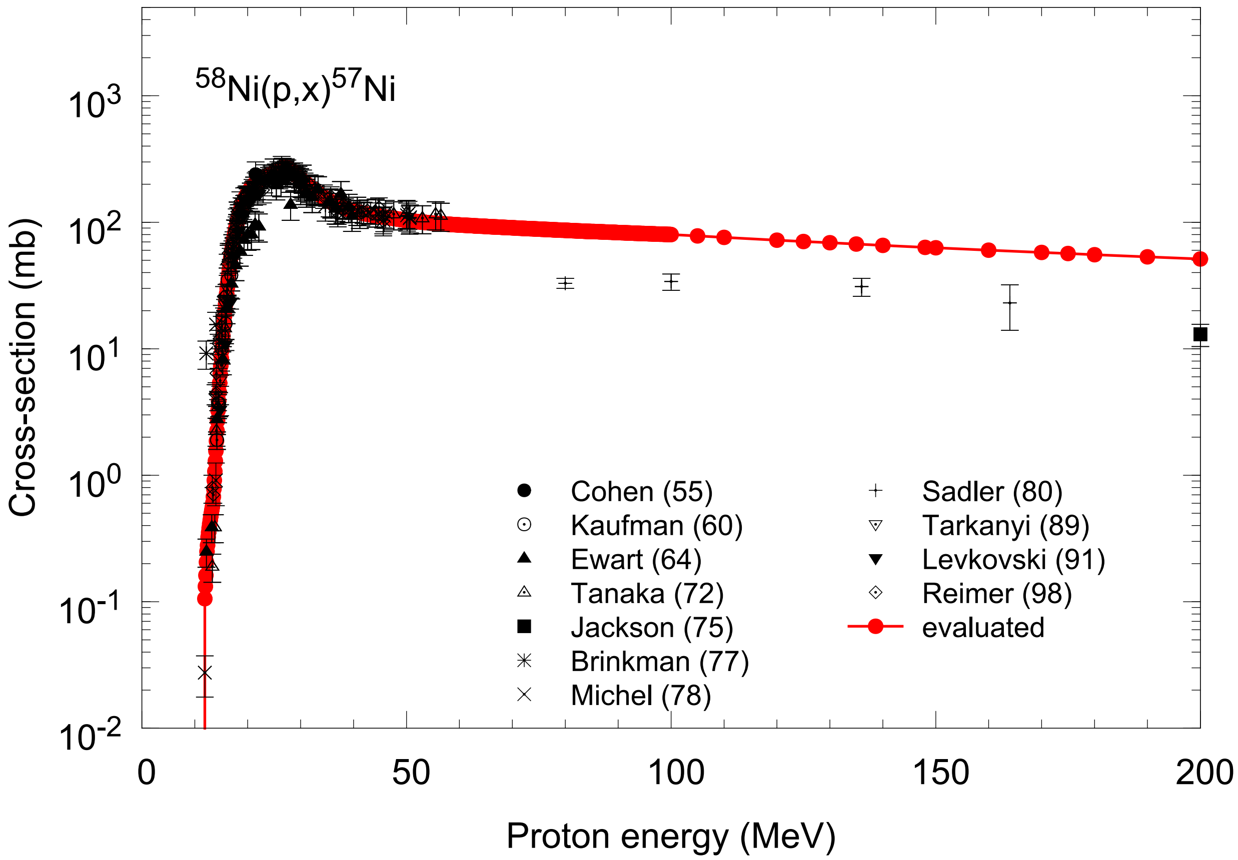
$^{58}Ni(p,2p)^{57}Co$
Cross-section (mb)
10^3
10^2
10^1
10^0
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Cohen (55)
Kaufman (60)
Ewart (64)
Tanaka (72)
Jackson (75)
Sadler (80)
Jastrzebski (80)
Levkovski (91)
Reimer (98)
evaluated

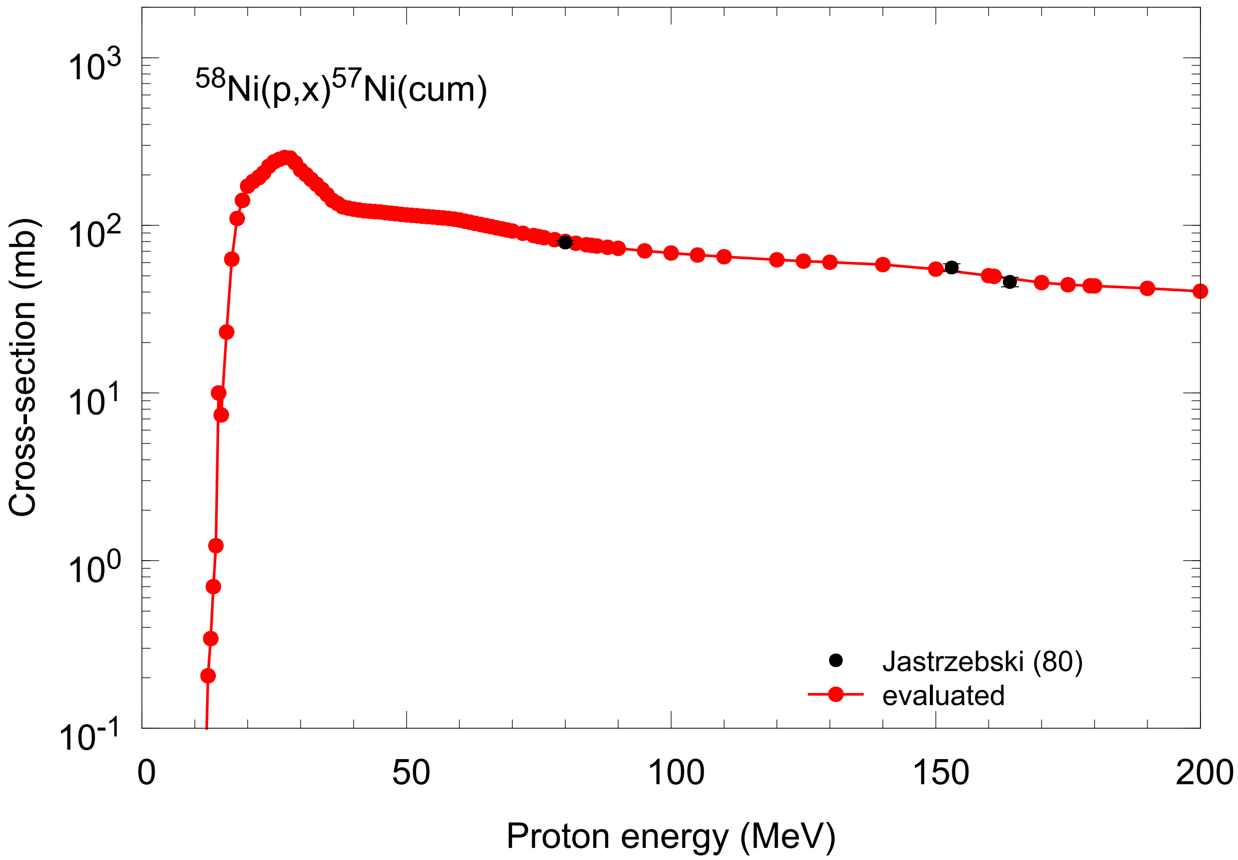


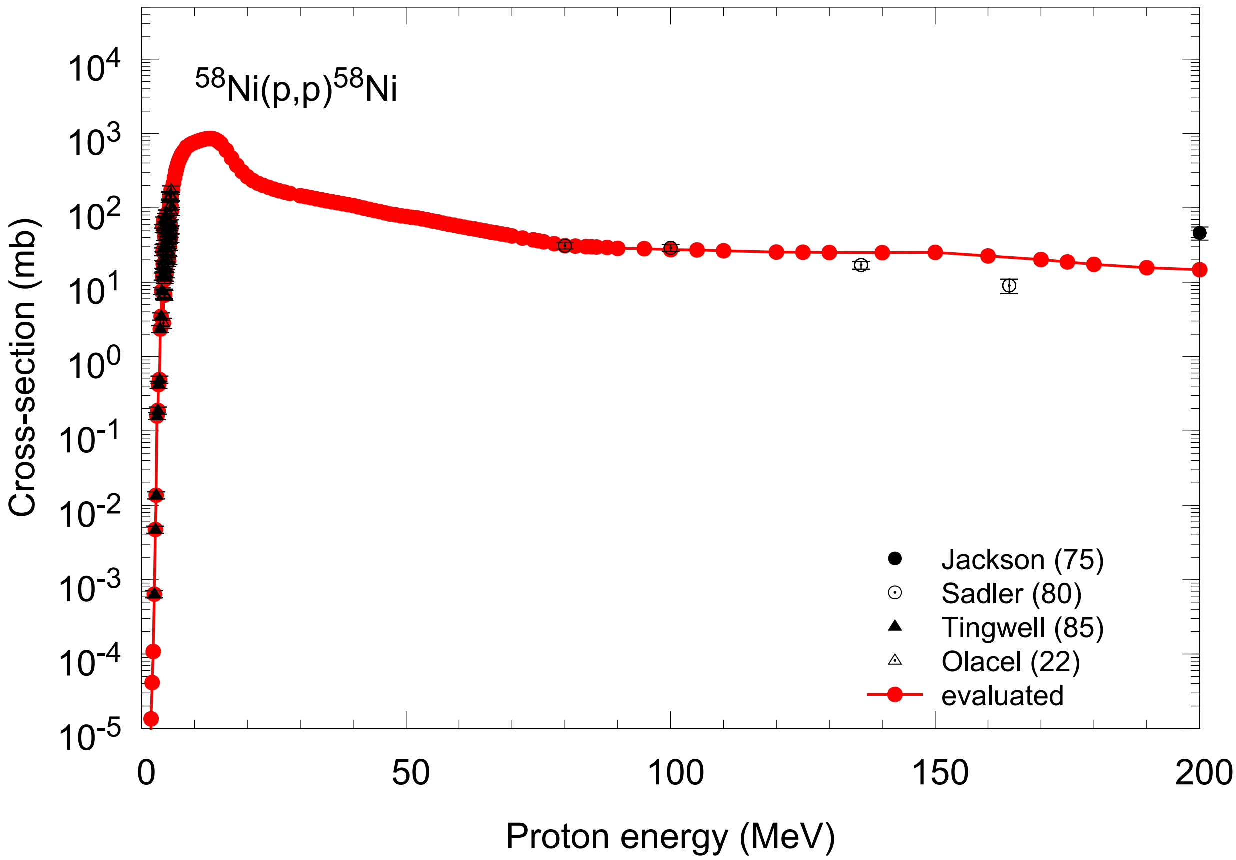
^{58}Ni(p,x)^{56}Ni
Cross-section (mb)
Proton energy (MeV)
Ewart (64)
Tanaka (72)
Michel (78)
Levkovski (91)
Reimer (98)
evaluated



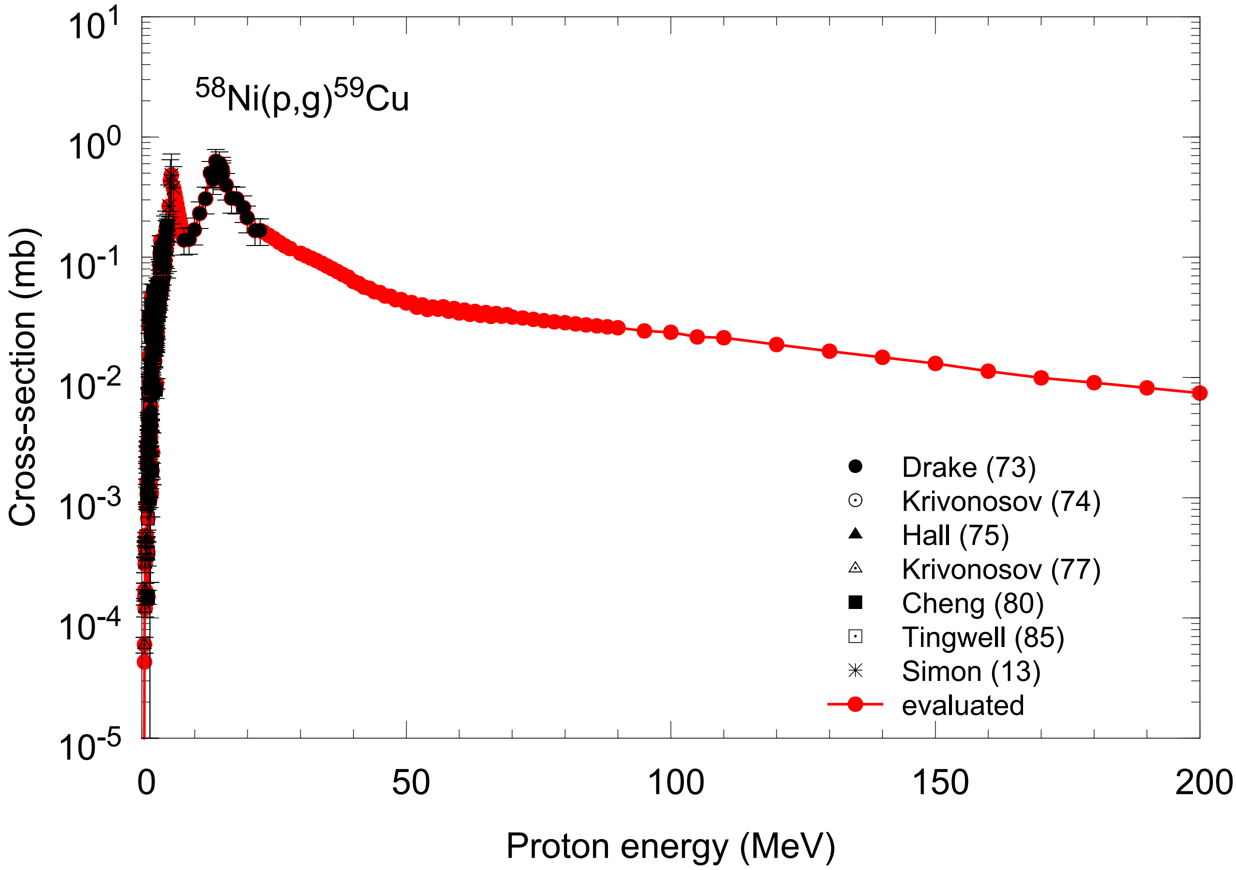
^{58}Ni(p,x)^{56}Ni(cum)
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated


$^{58}Ni(p,x)^{57}Ni$
Cross-section (mb)
Proton energy (MeV)
Cohen (55)
Kaufman (60)
Ewart (64)
Tanaka (72)
Jackson (75)
Brinkman (77)
Michel (78)
Sadler (80)
Tarkanyi (89)
Levkovski (91)
Reimer (98)
evaluated

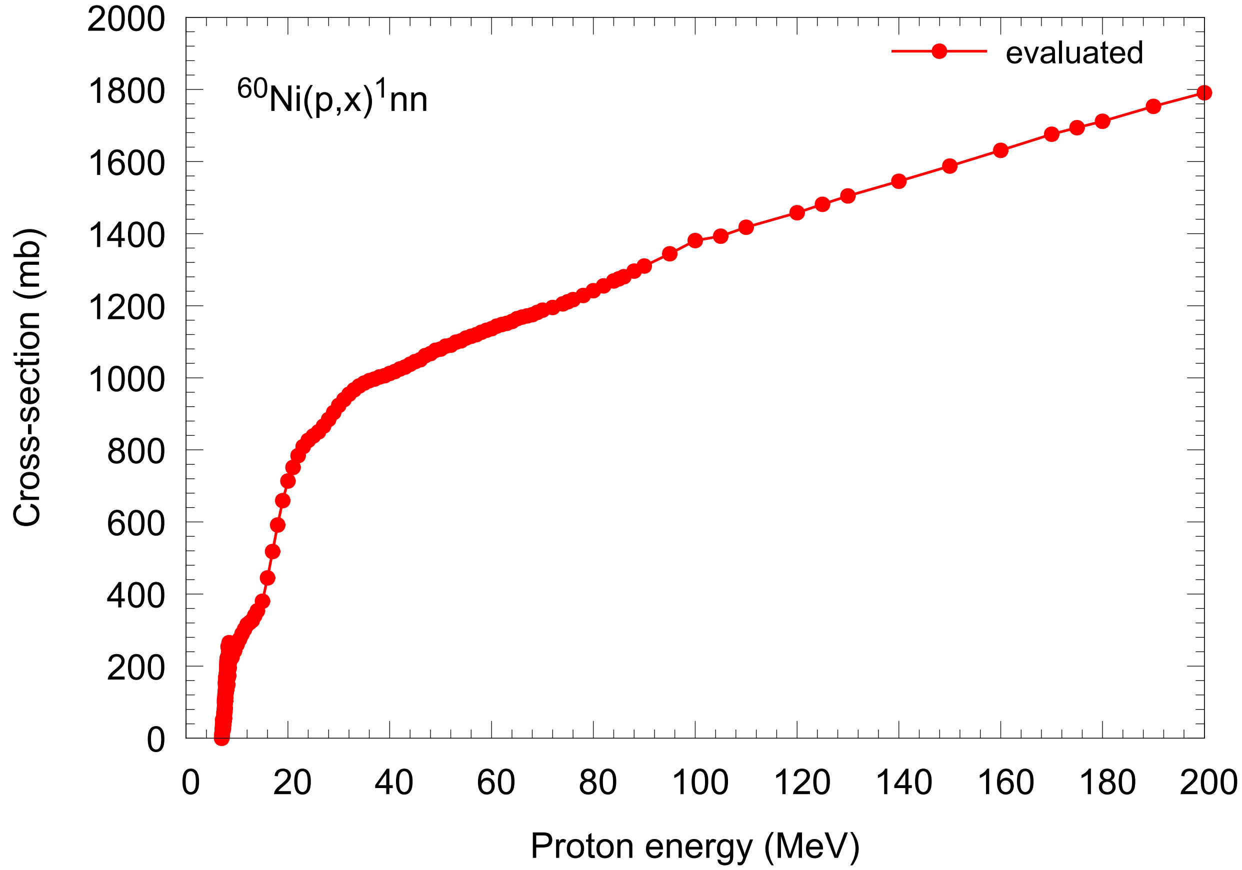

$^{58}Ni(p,x)^{57}Ni(cum)$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated



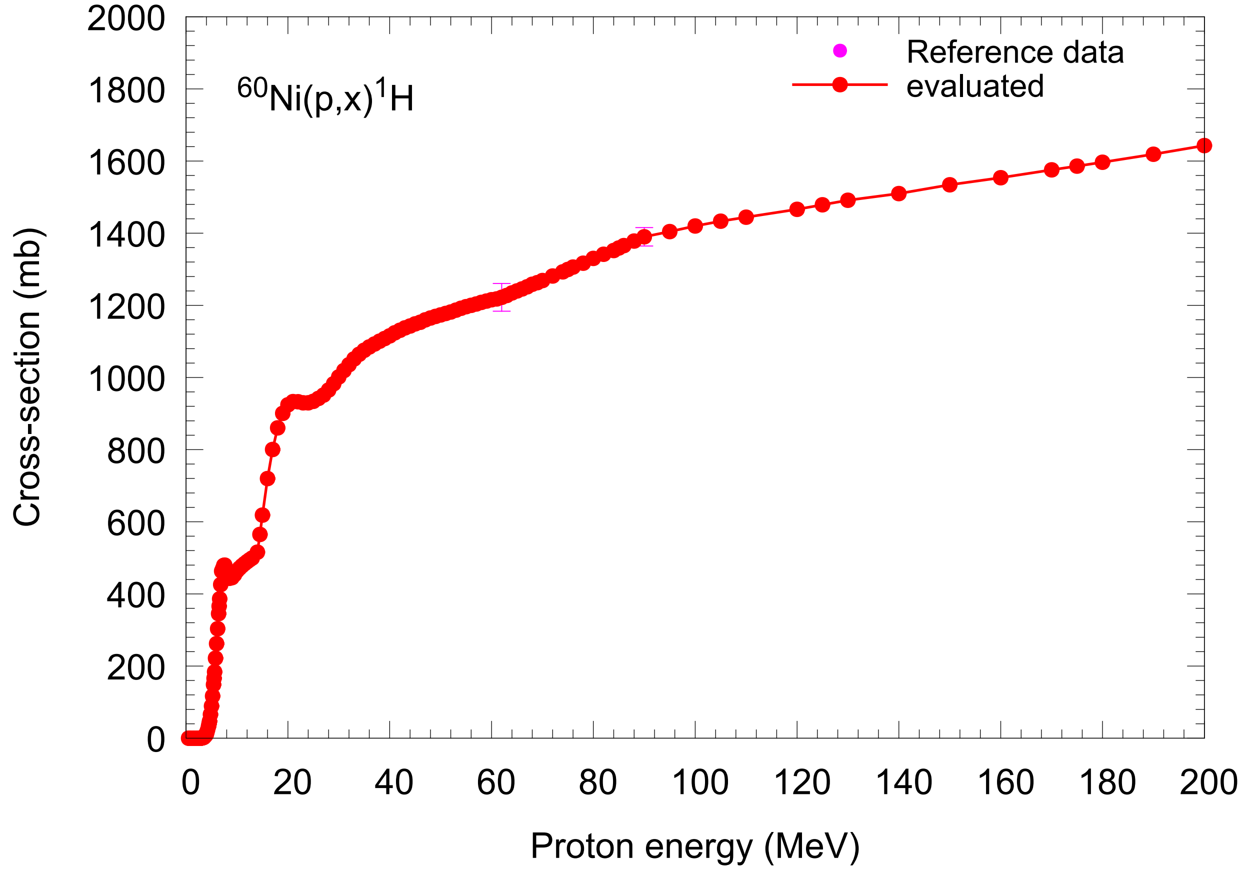
^{58}Ni(p,p)^{58}Ni
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
Tingwell (85)
Olacel (22)
evaluated



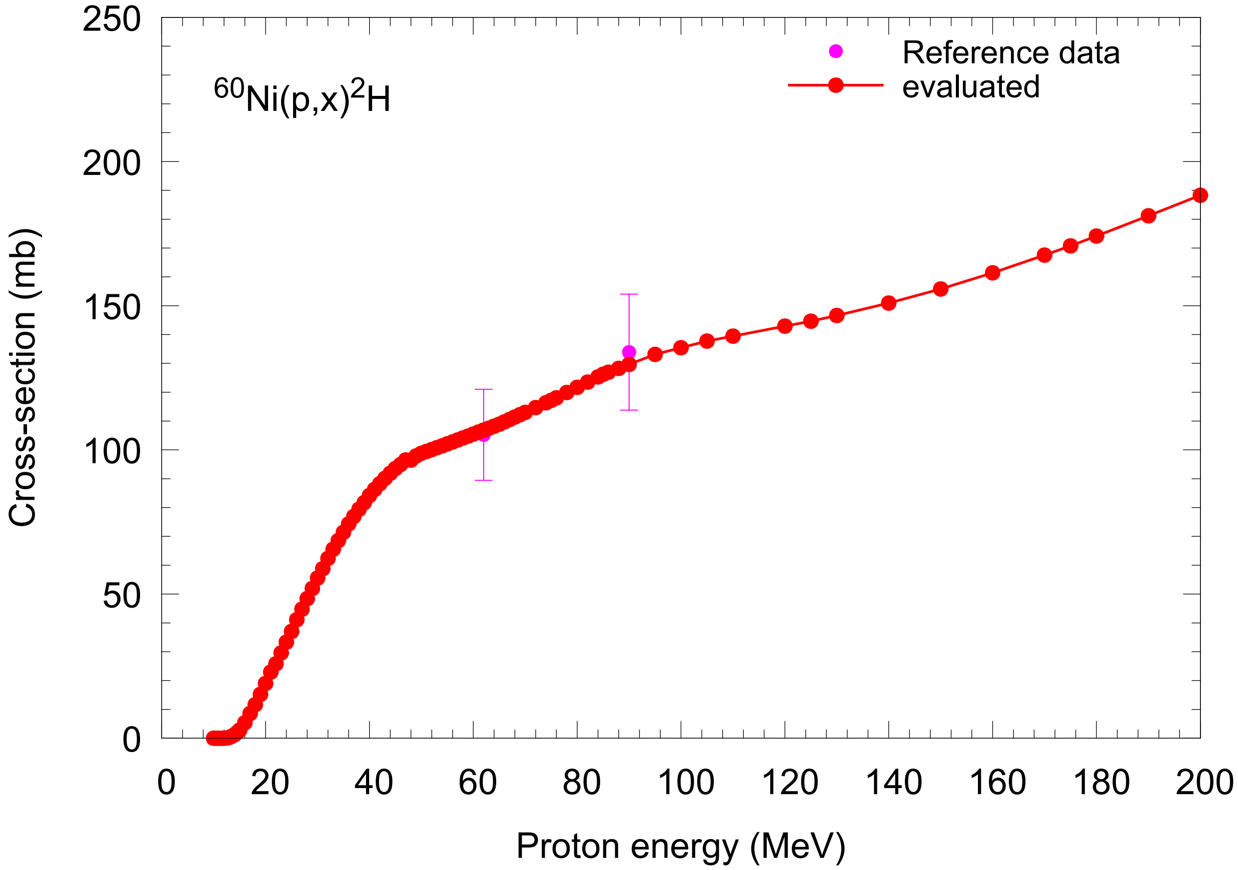
^{58}Ni(p,g)^{59}Cu
Cross-section (mb)
Proton energy (MeV)
Drake (73)
Krivonosov (74)
Hall (75)
Krivonosov (77)
Cheng (80)
Tingwell (85)
Simon (13)
evaluated



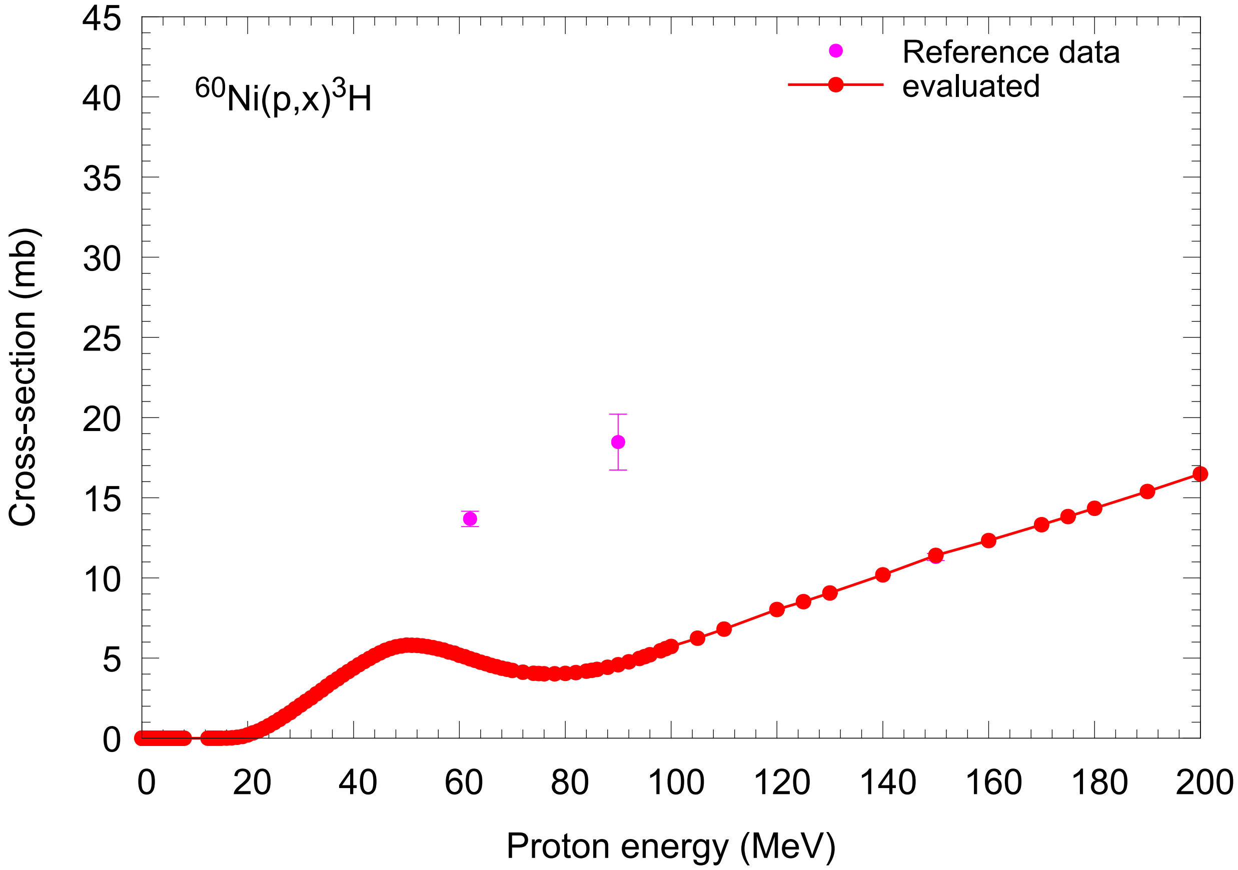
60Ni(p,x)1nn
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
20
40
60
80
100
120
140
160
180
200



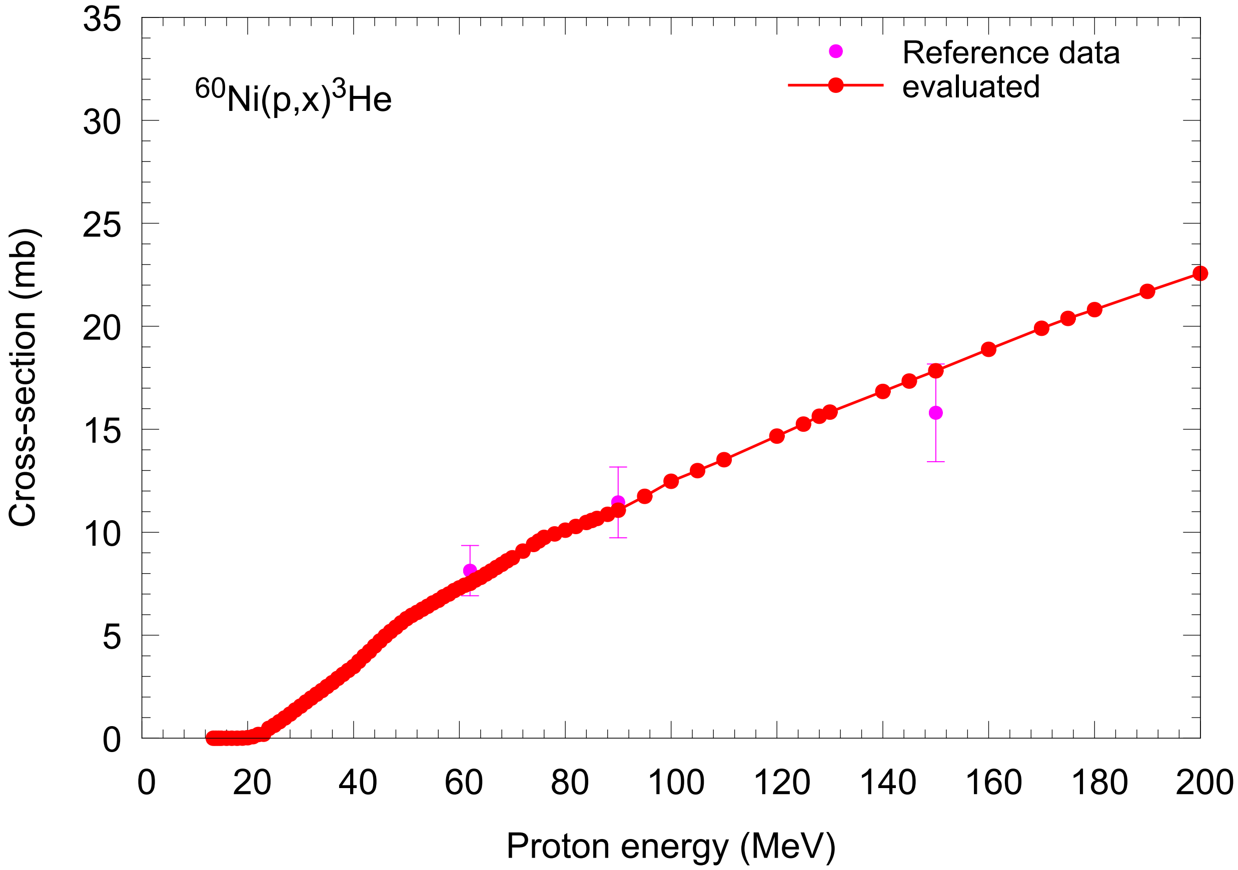
60Ni(p,x)1H
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
20
40
60
80
100
120
140
160
180
200



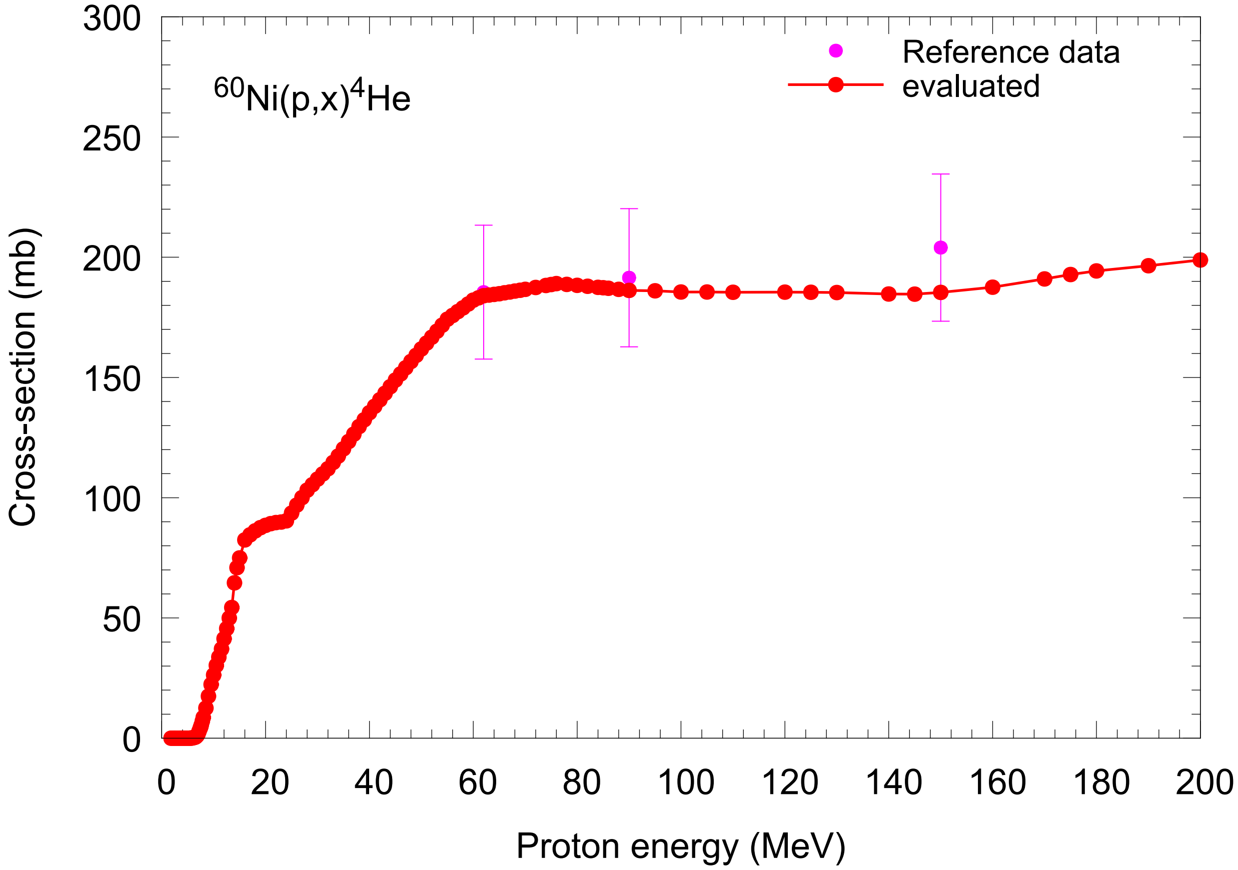
$^{60}Ni(p,x)^2H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
0
20
40
60
80
100
120
140
160
180
200



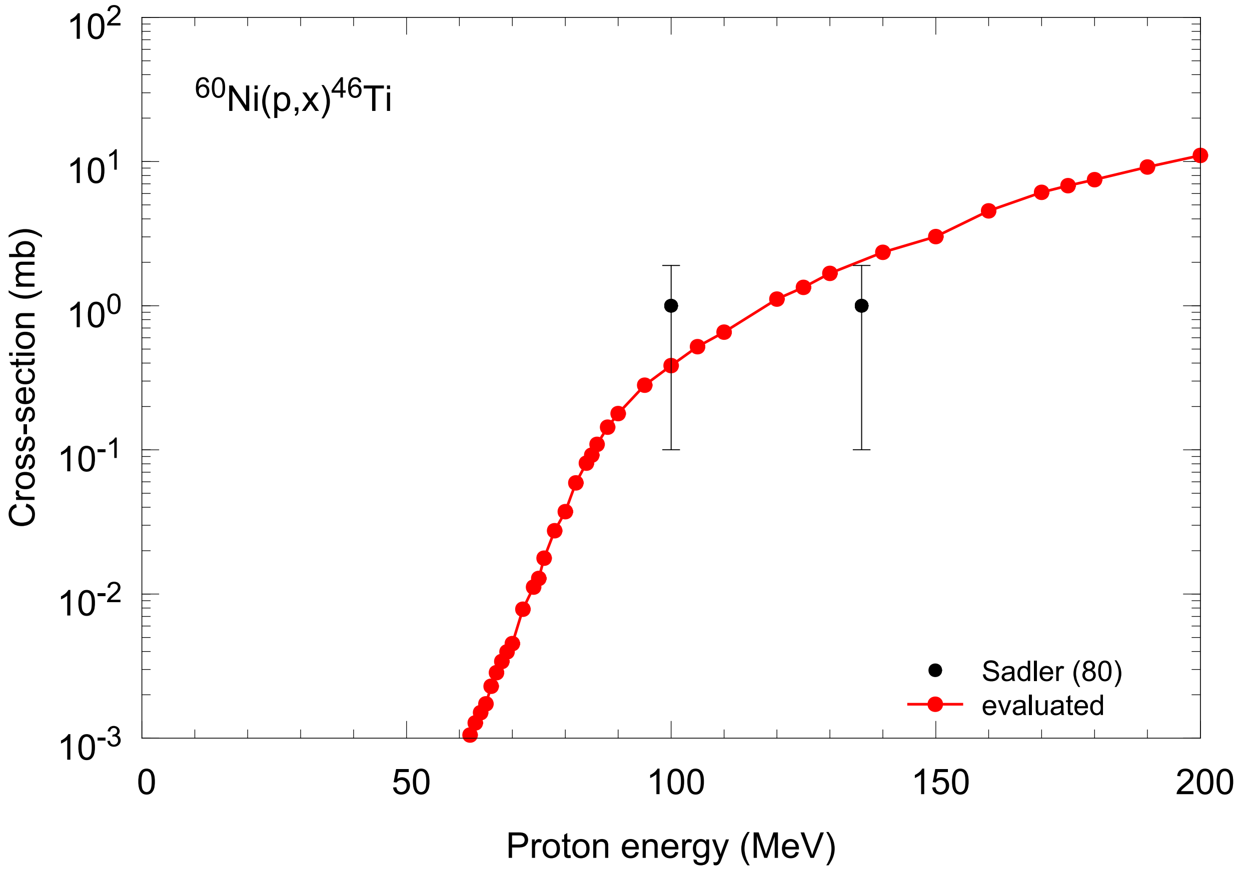
$^{60}Ni(p,x)^3H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
40
45
0
20
40
60
80
100
120
140
160
180
200



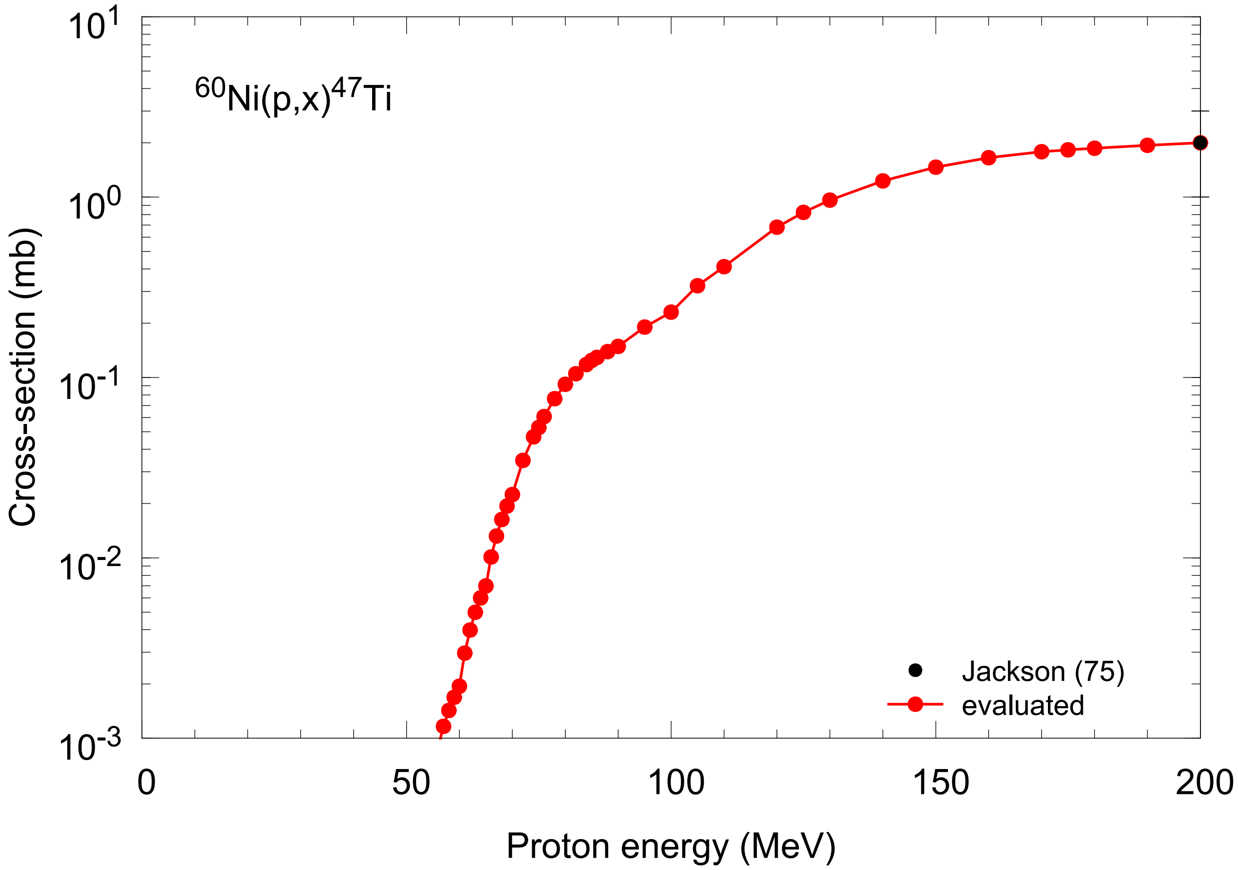
$^{60}Ni(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
0
20
40
60
80
100
120
140
160
180
200



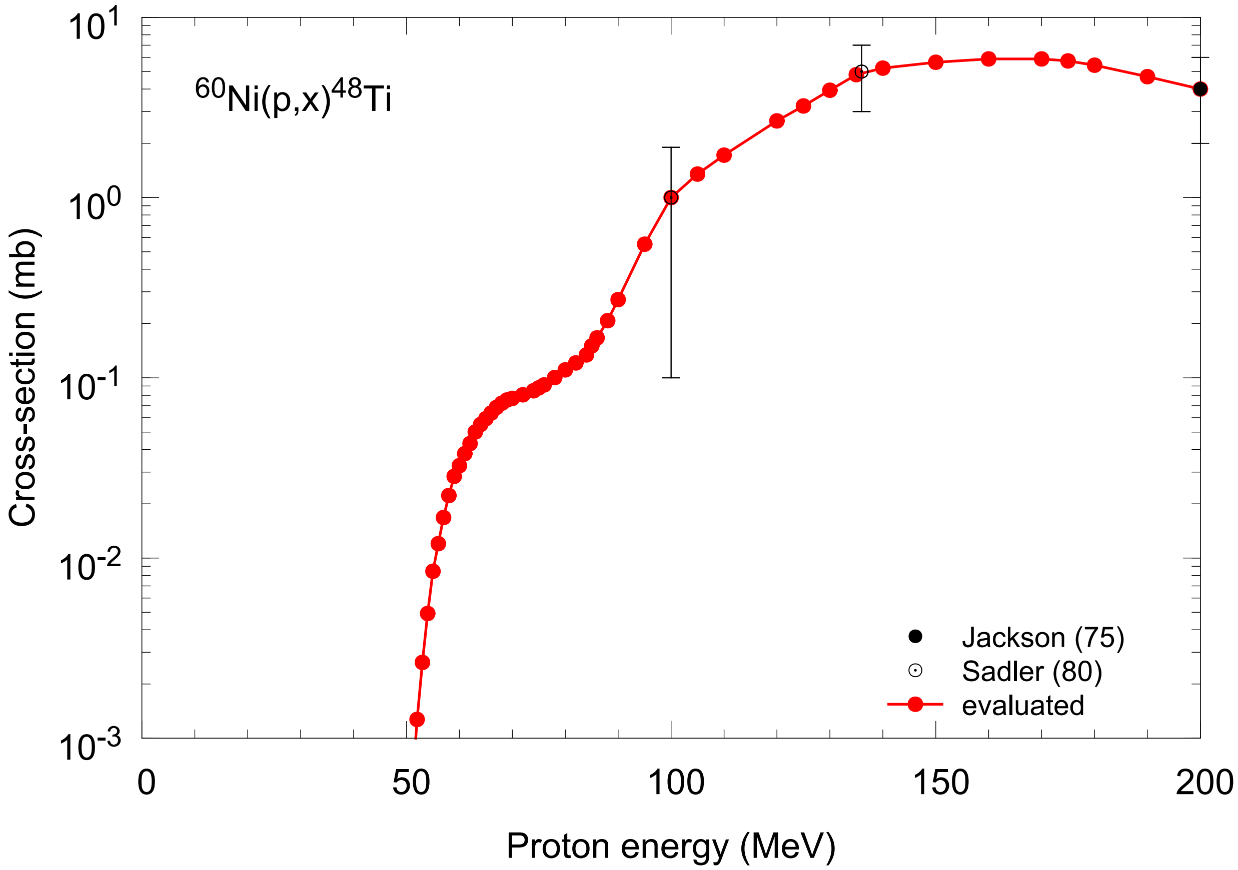
$^{60}Ni(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
300
0
20
40
60
80
100
120
140
160
180
200



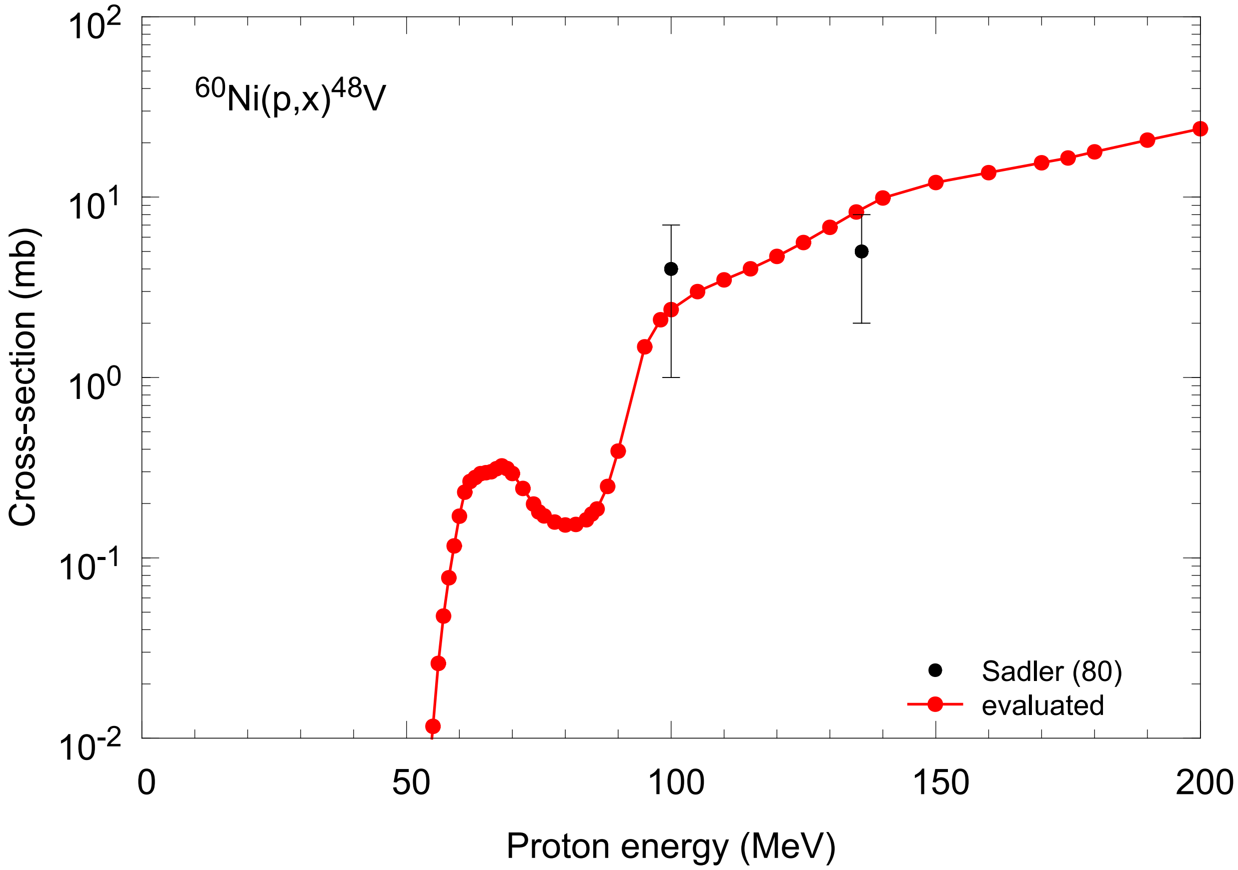
$^{60}Ni(p,x)^{46}Ti$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



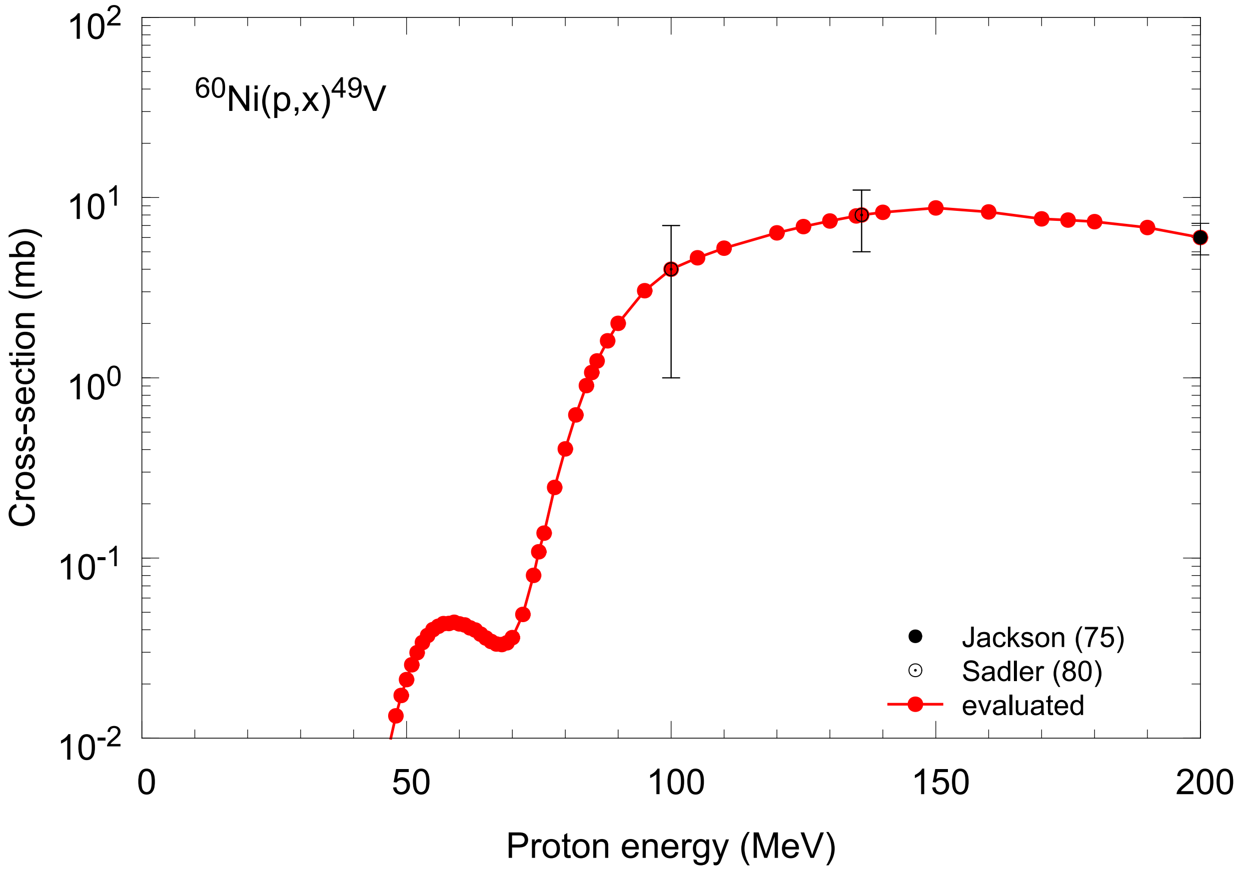
$^{60}Ni(p,x)^{47}Ti$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
evaluated



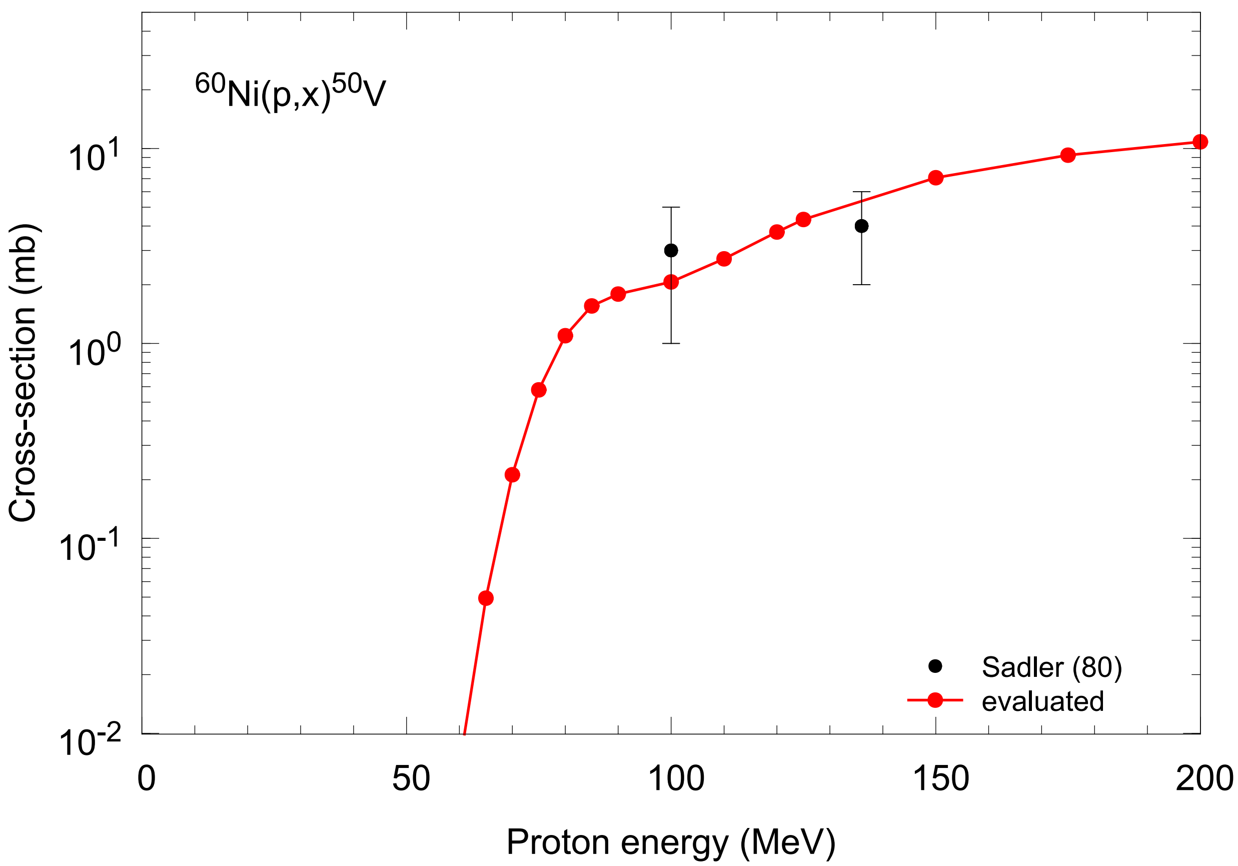
$^{60}Ni(p,x)^{48}Ti$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



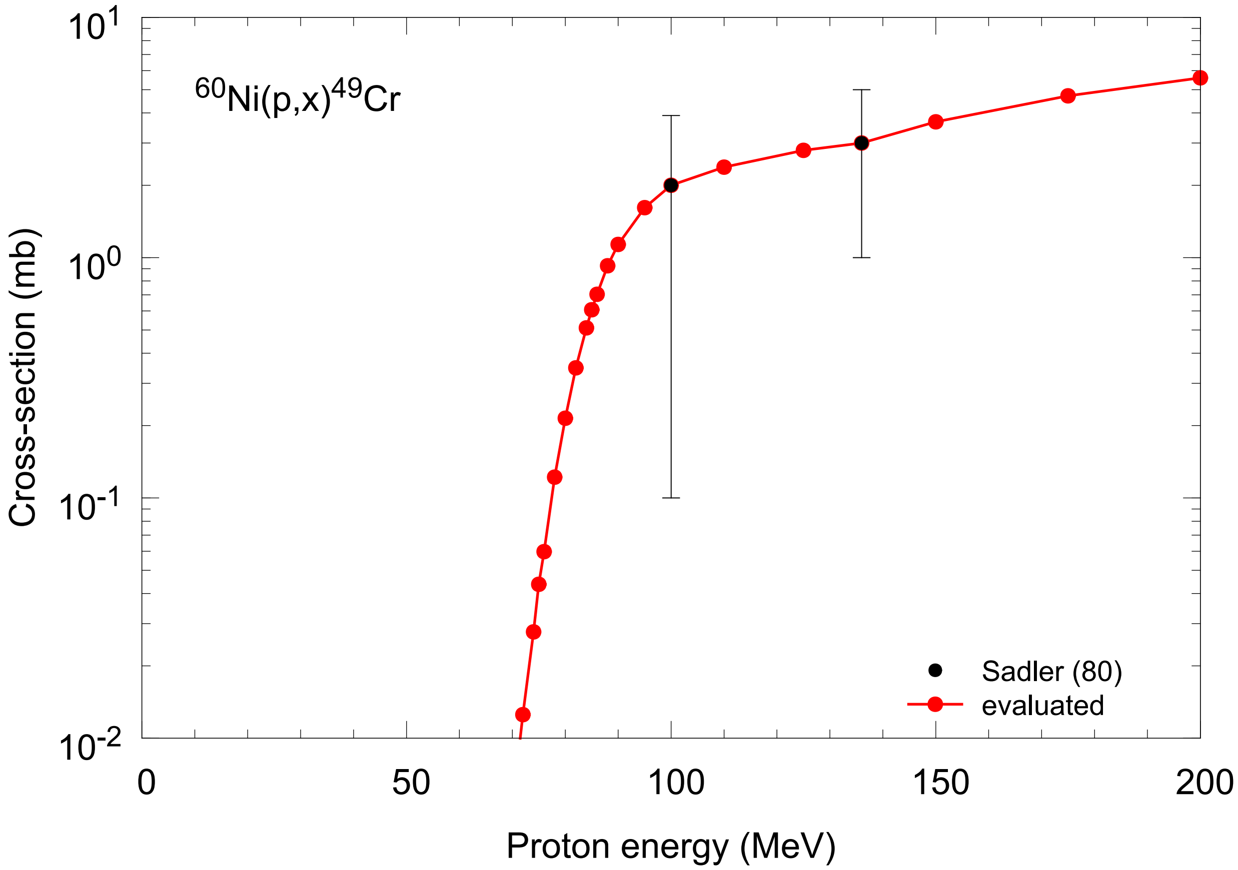
$^{60}Ni(p,x)^{48}V$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



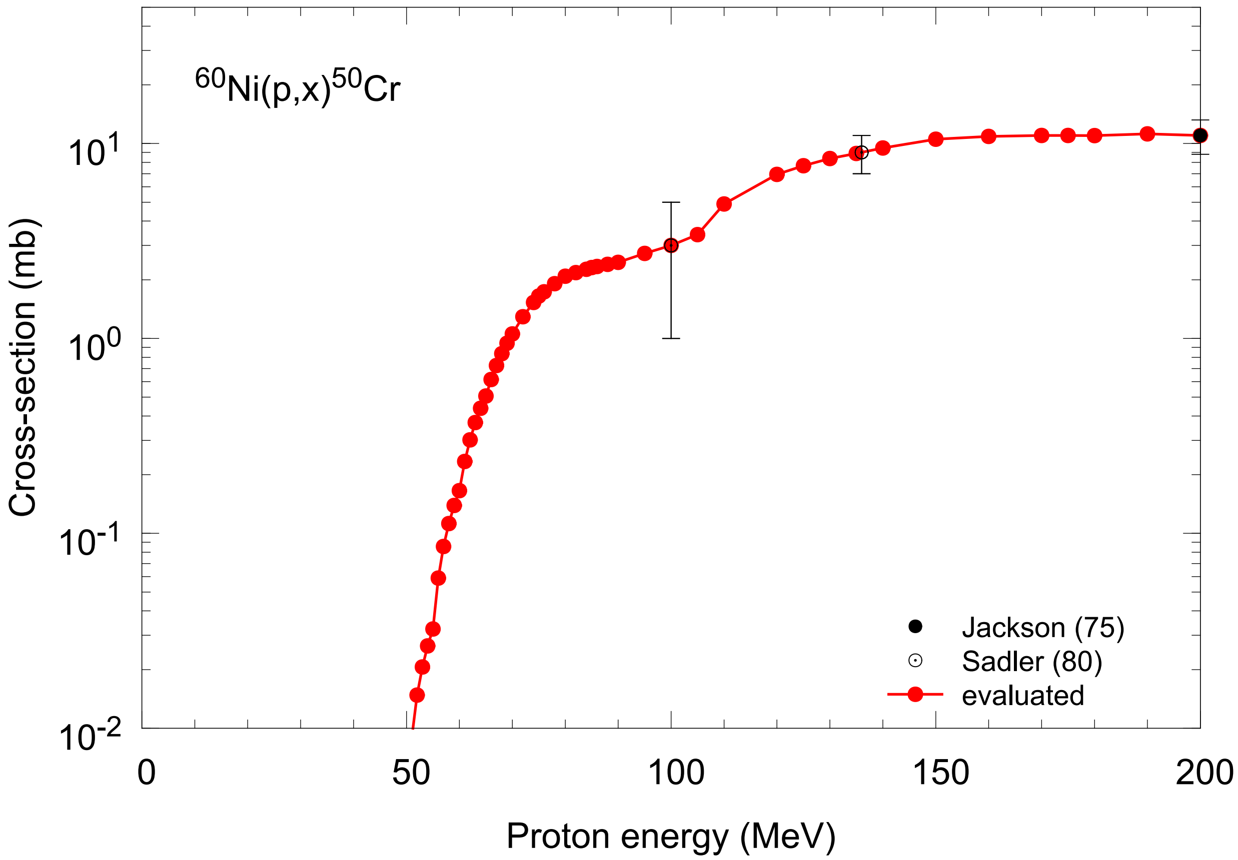
$^{60}Ni(p,x)^{49}V$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



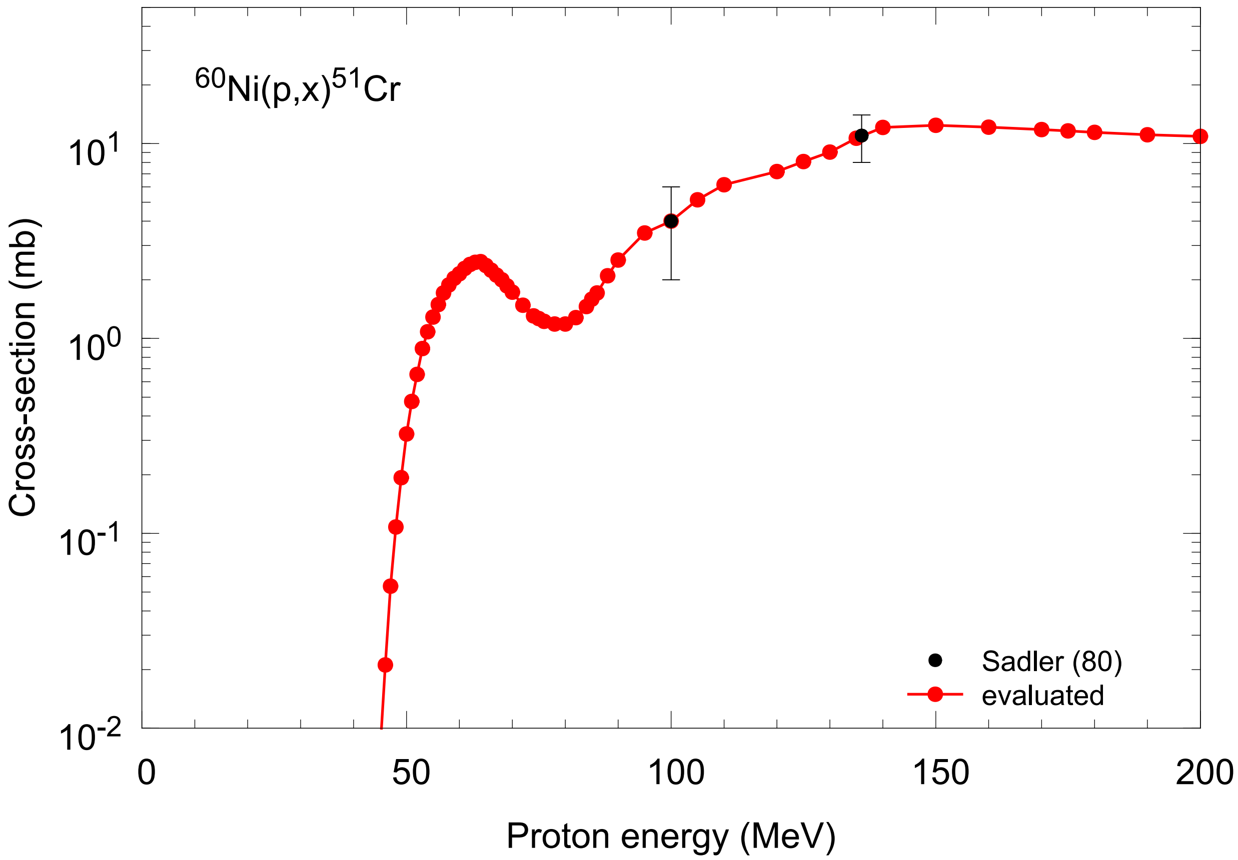
$^{60}Ni(p,x)^{50}V$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated

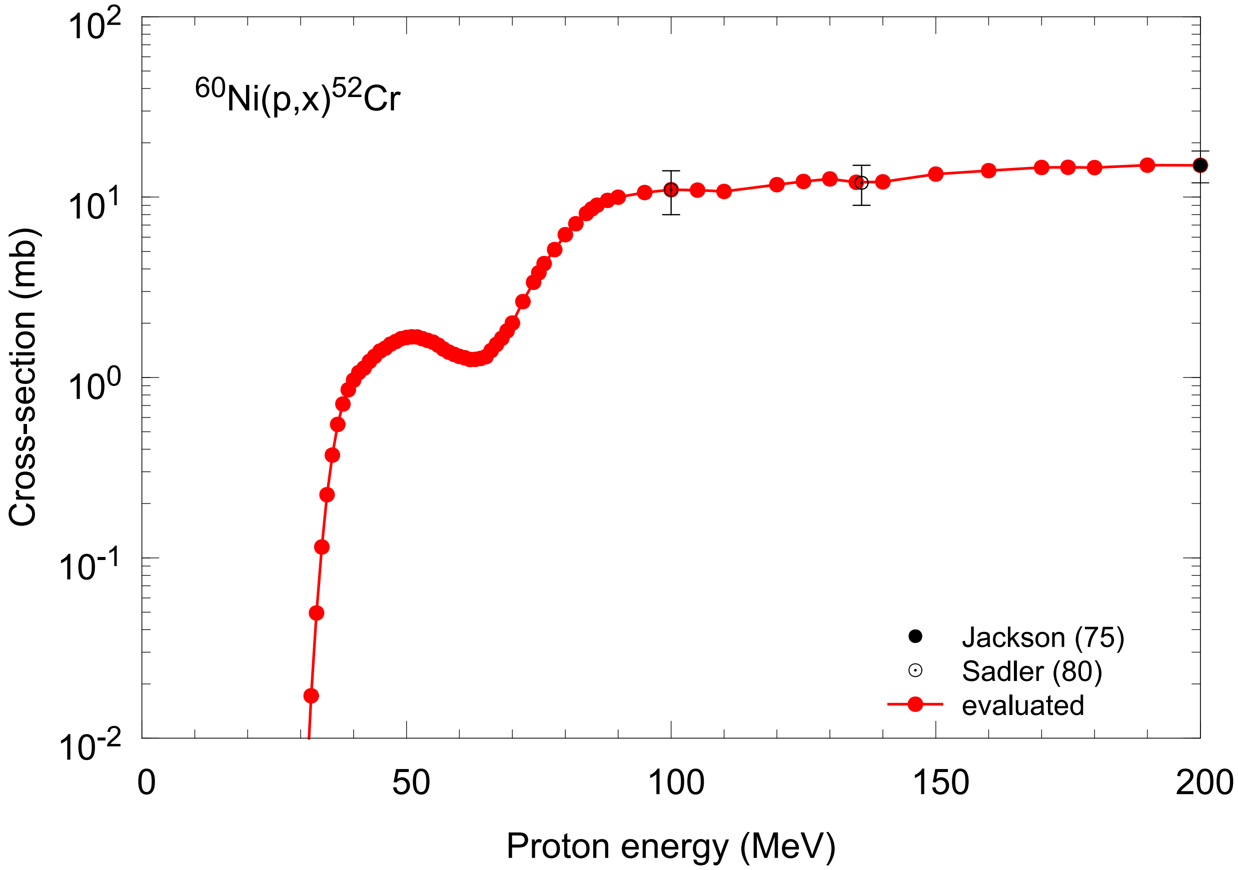


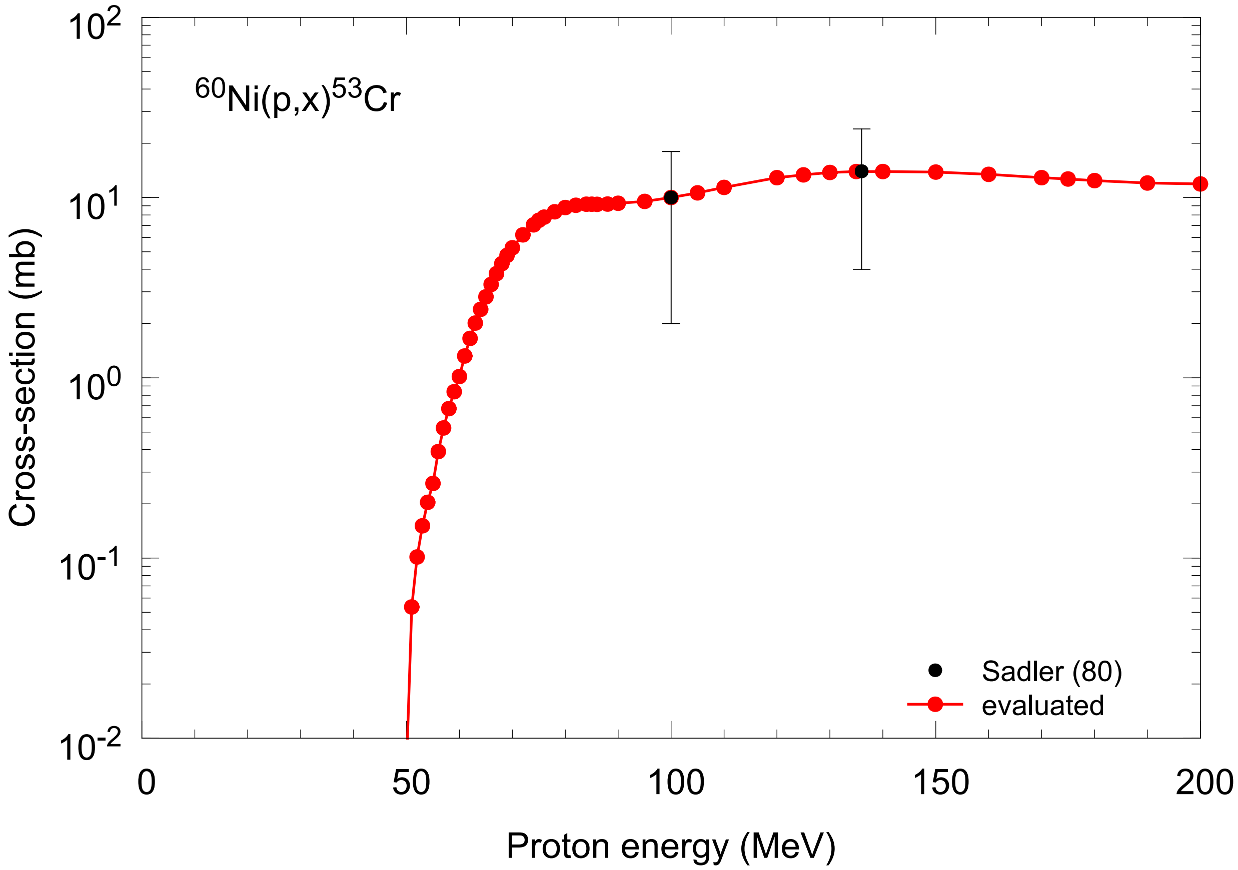
$^{60}Ni(p,x)^{49}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



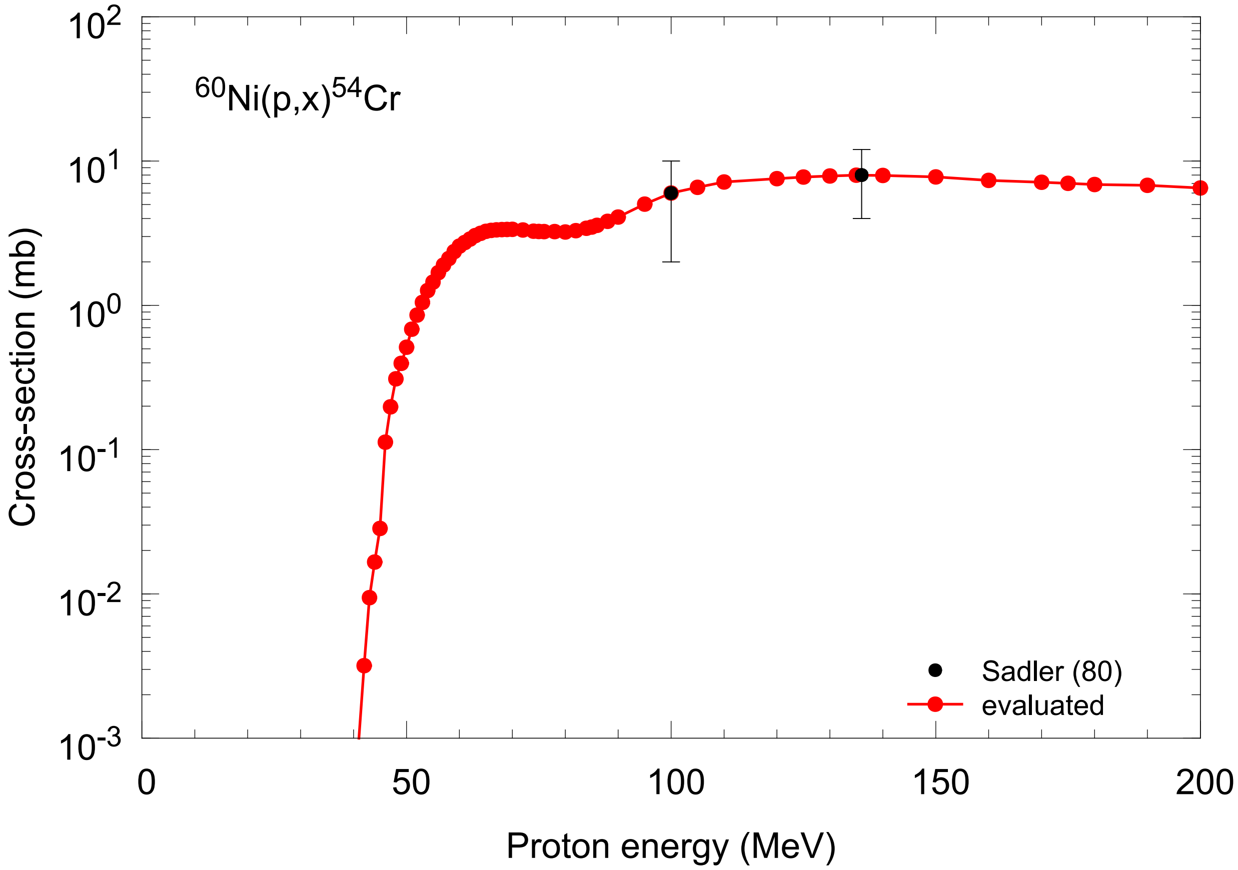
$^{60}Ni(p,x)^{50}Cr$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated


$^{60}Ni(p,x)^{51}Cr$
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated

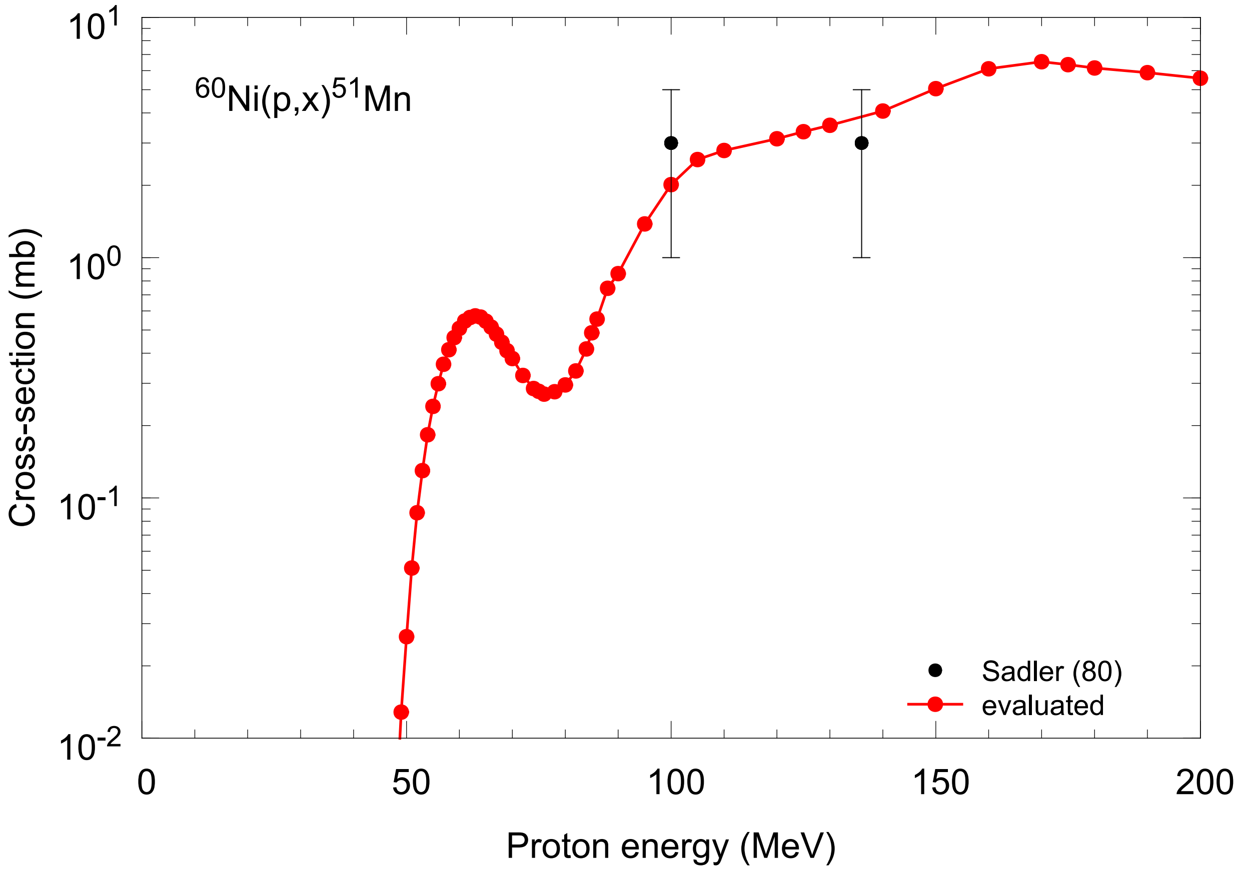

$^{60}Ni(p,x)^{52}Cr$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



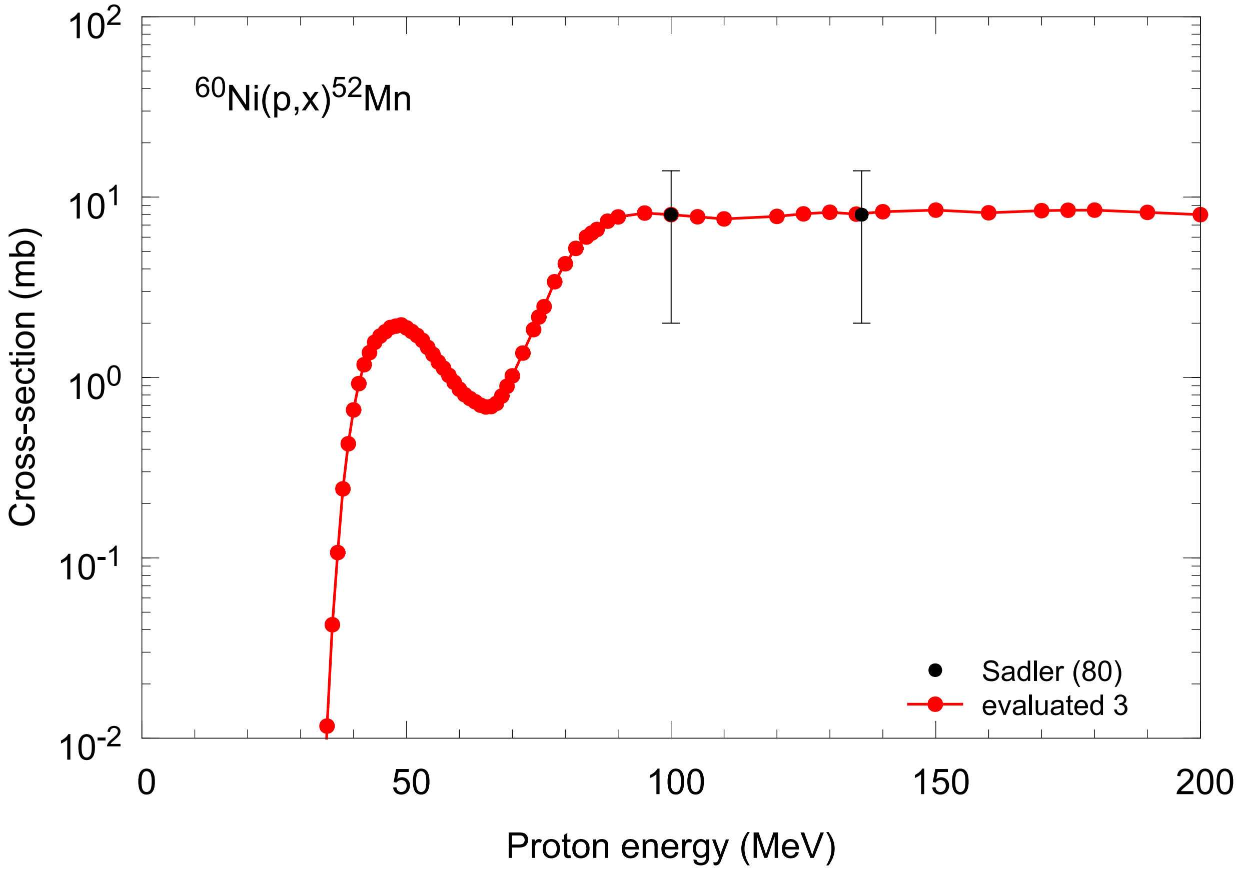
$^{60}Ni(p,x)^{53}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



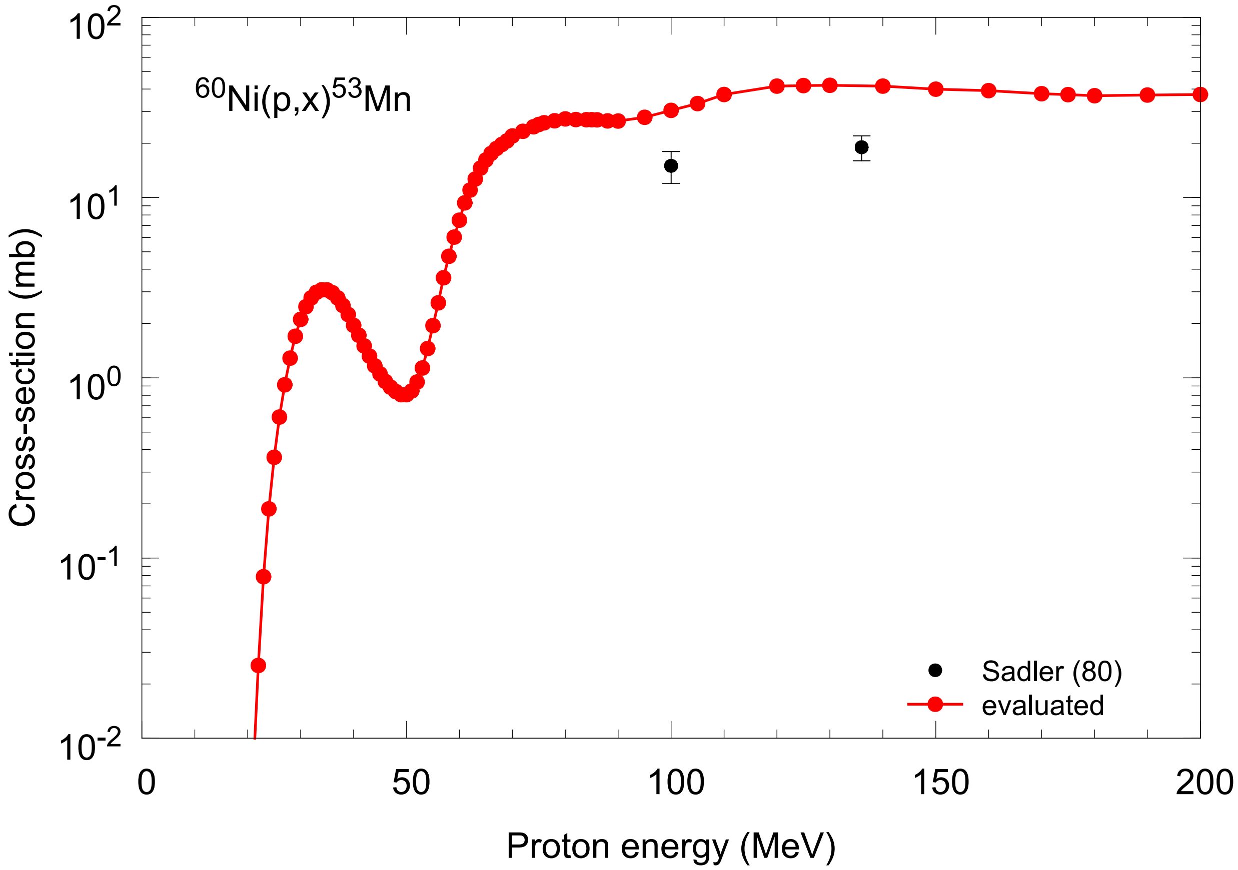
$^{60}Ni(p,x)^{54}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



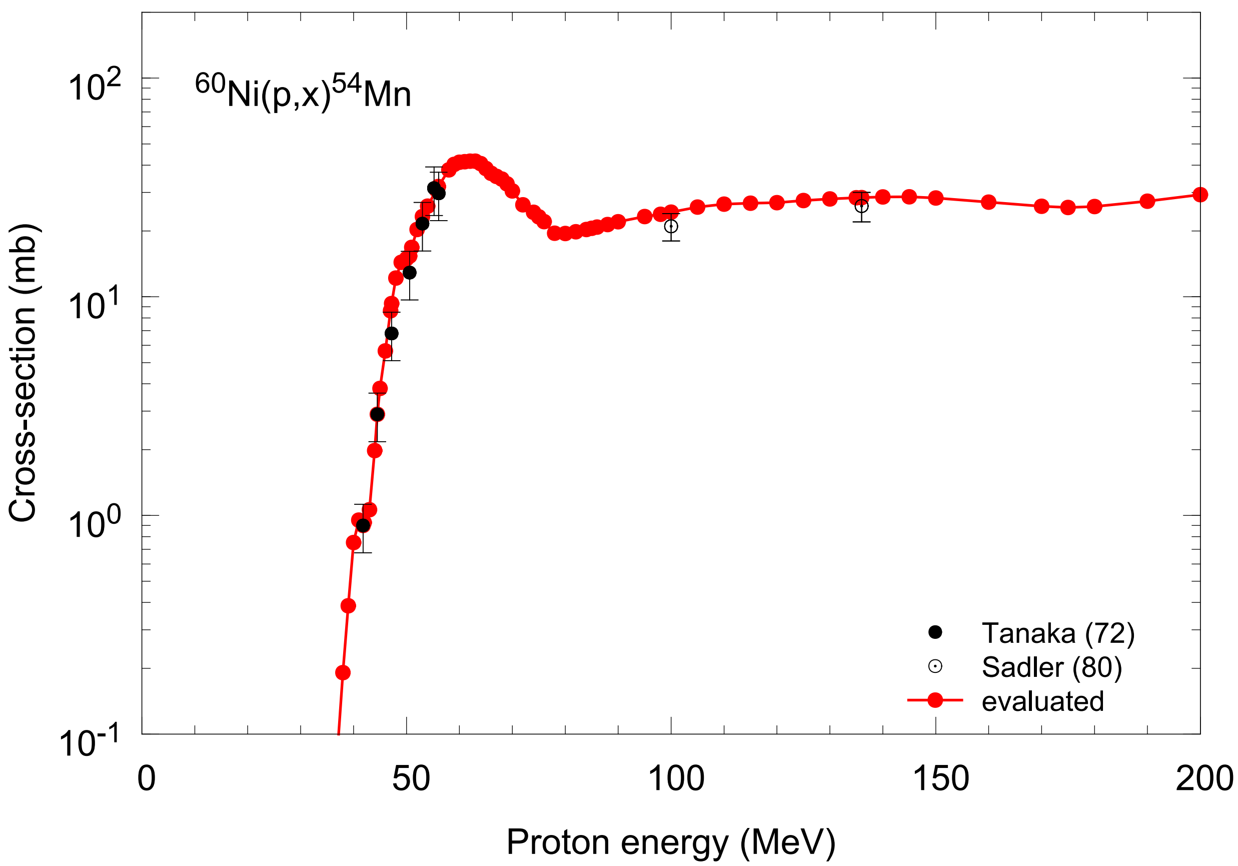
$^{60}Ni(p,x)^{51}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



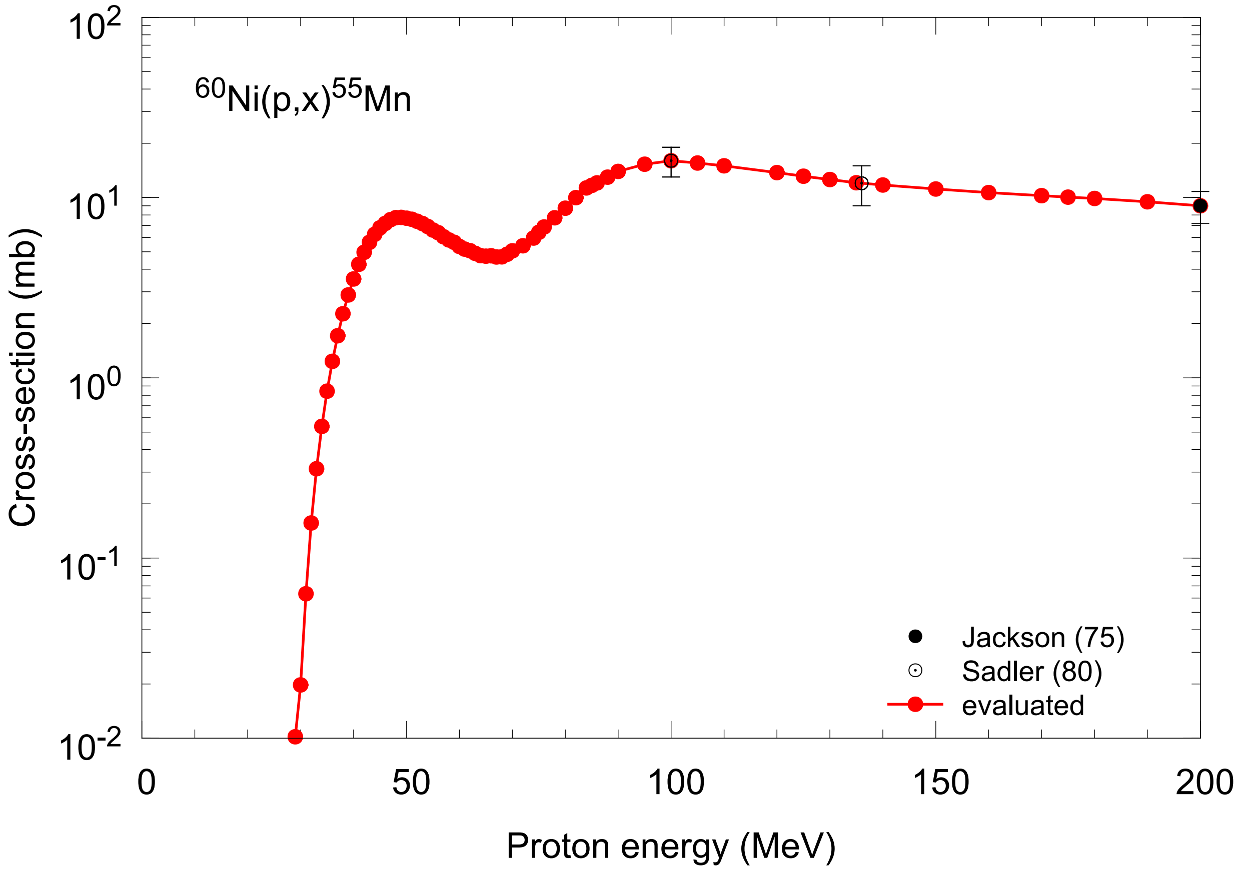
$^{60}Ni(p,x)^{52}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated 3



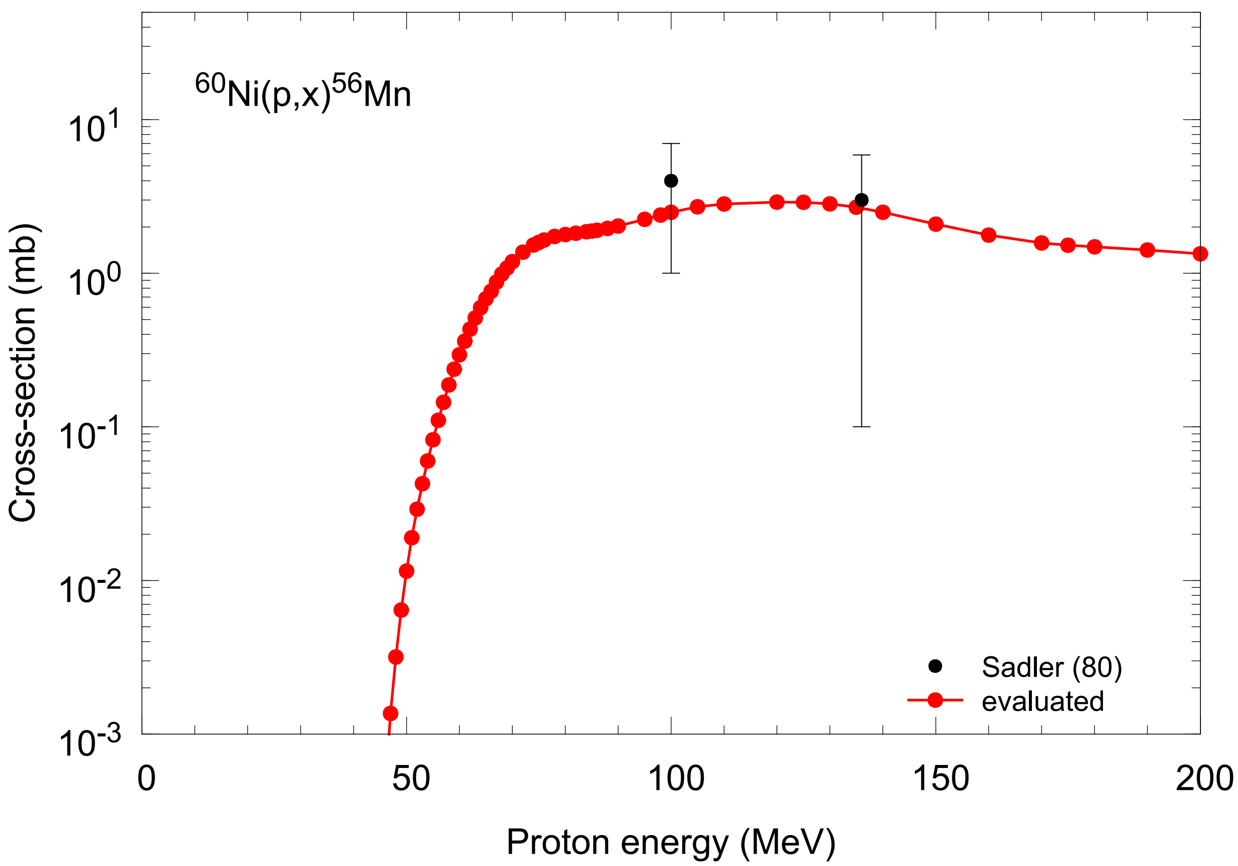
$^{60}Ni(p,x)^{53}Mn$
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



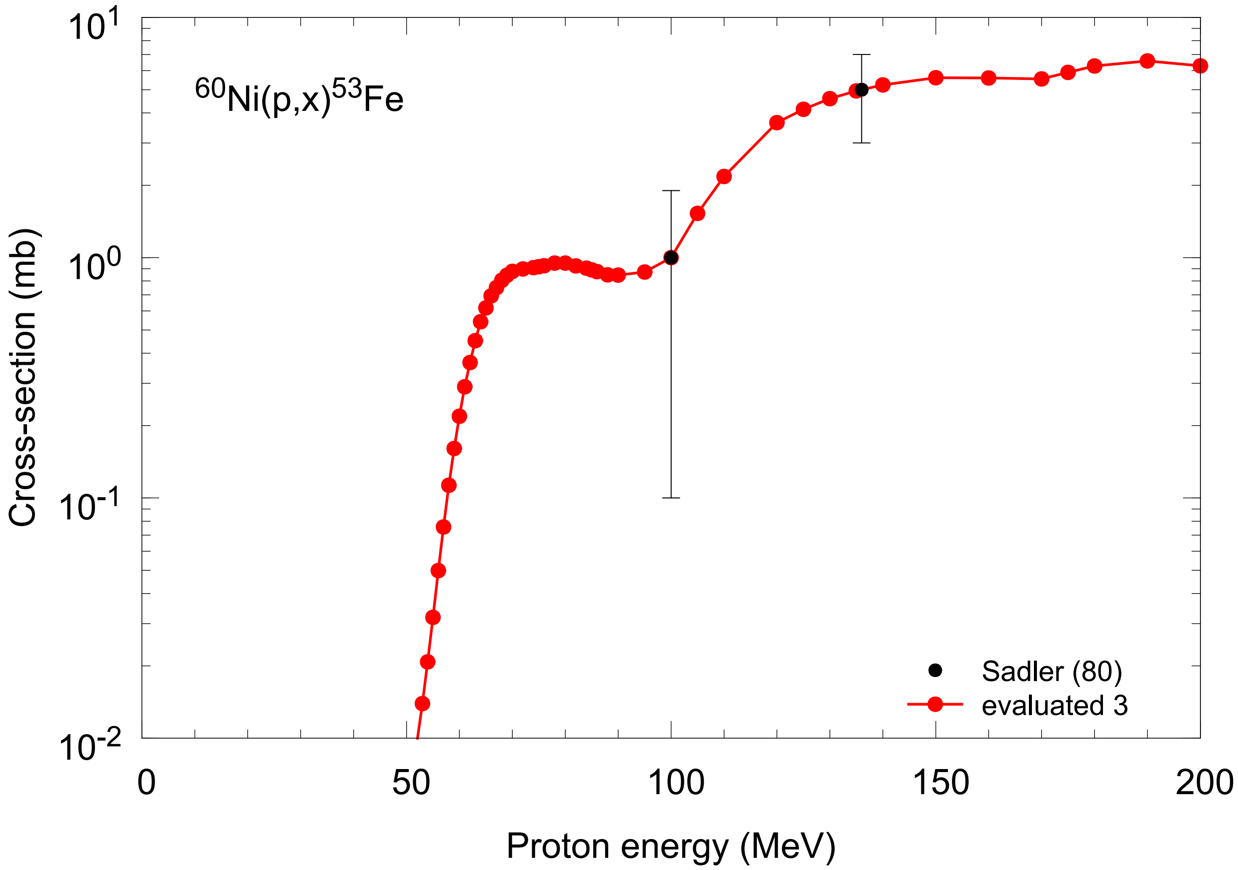
$^{60}Ni(p,x)^{54}Mn$
Tanaka (72)
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



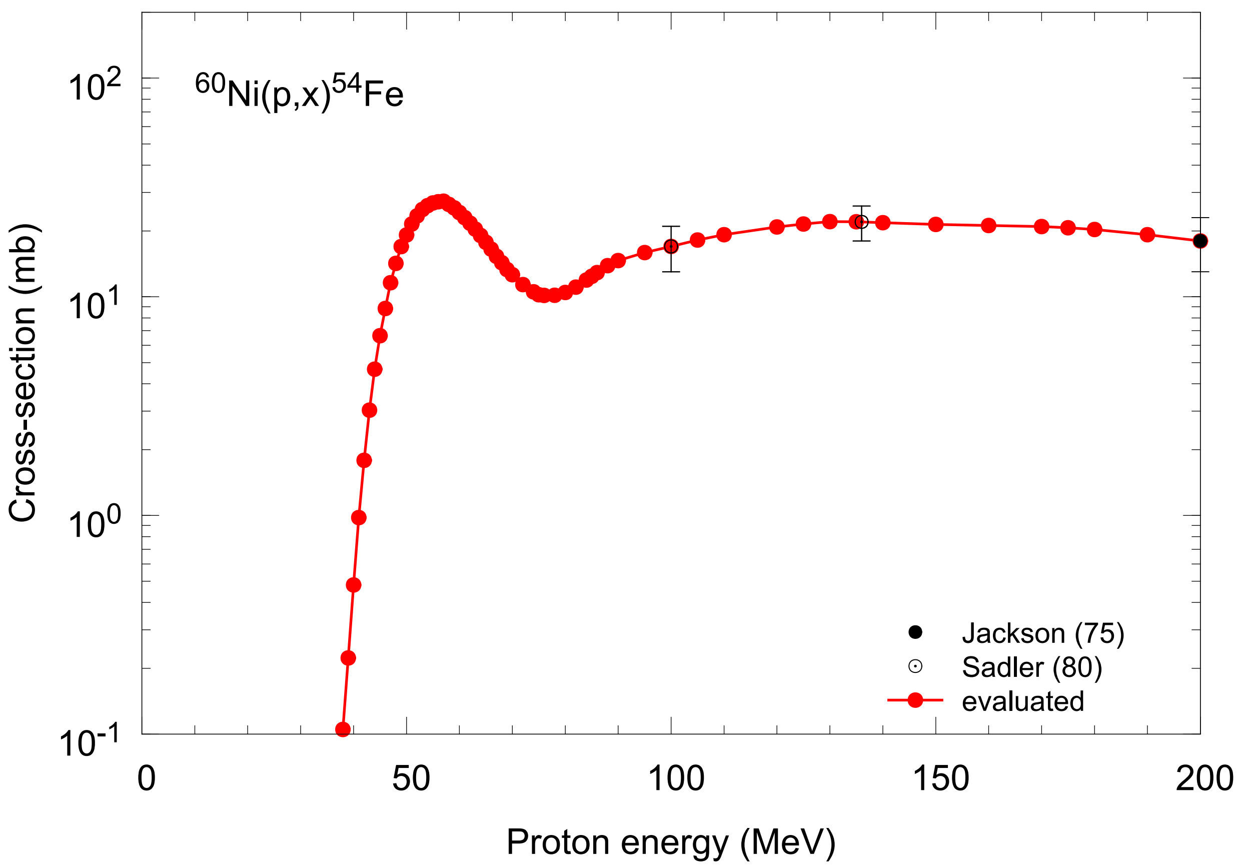
$^{60}Ni(p,x)^{55}Mn$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



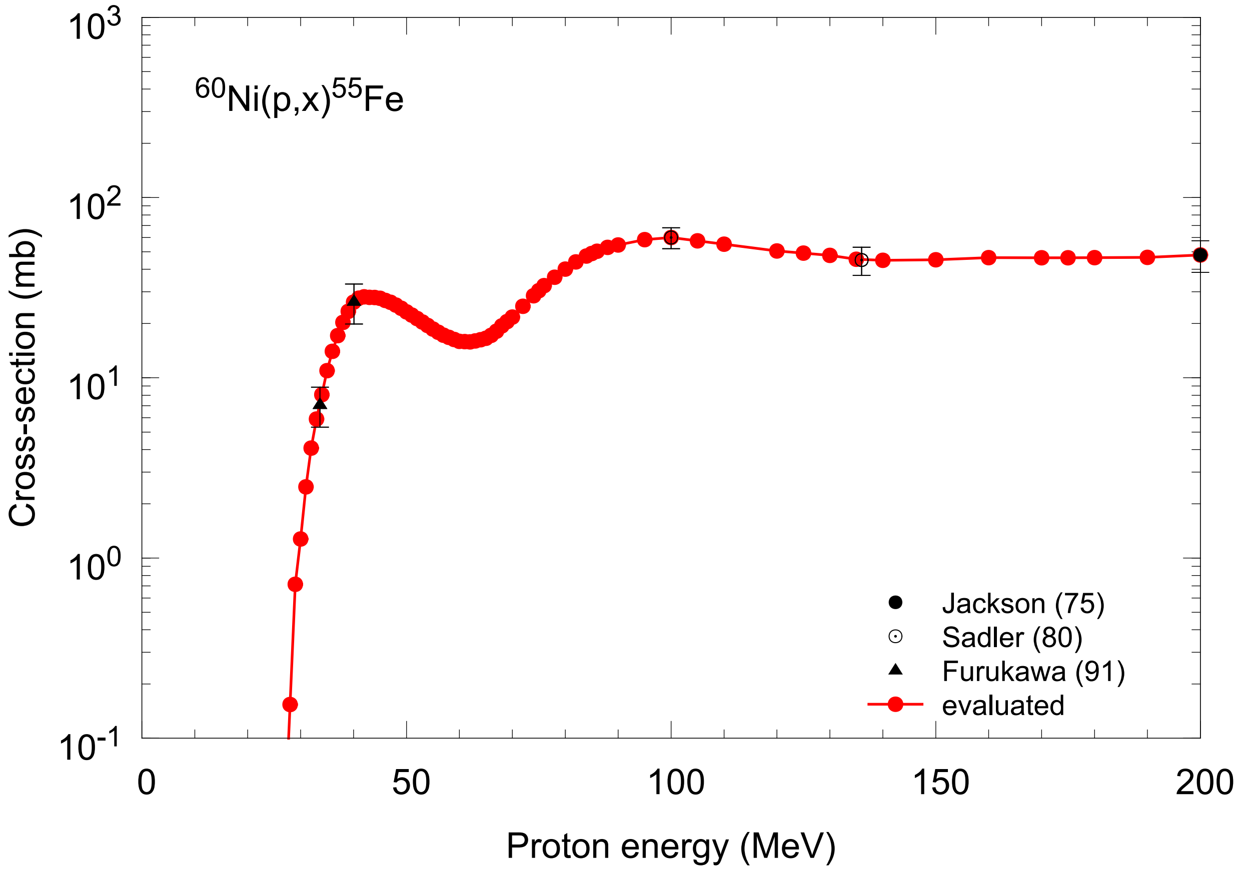
$^{60}Ni(p,x)^{56}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



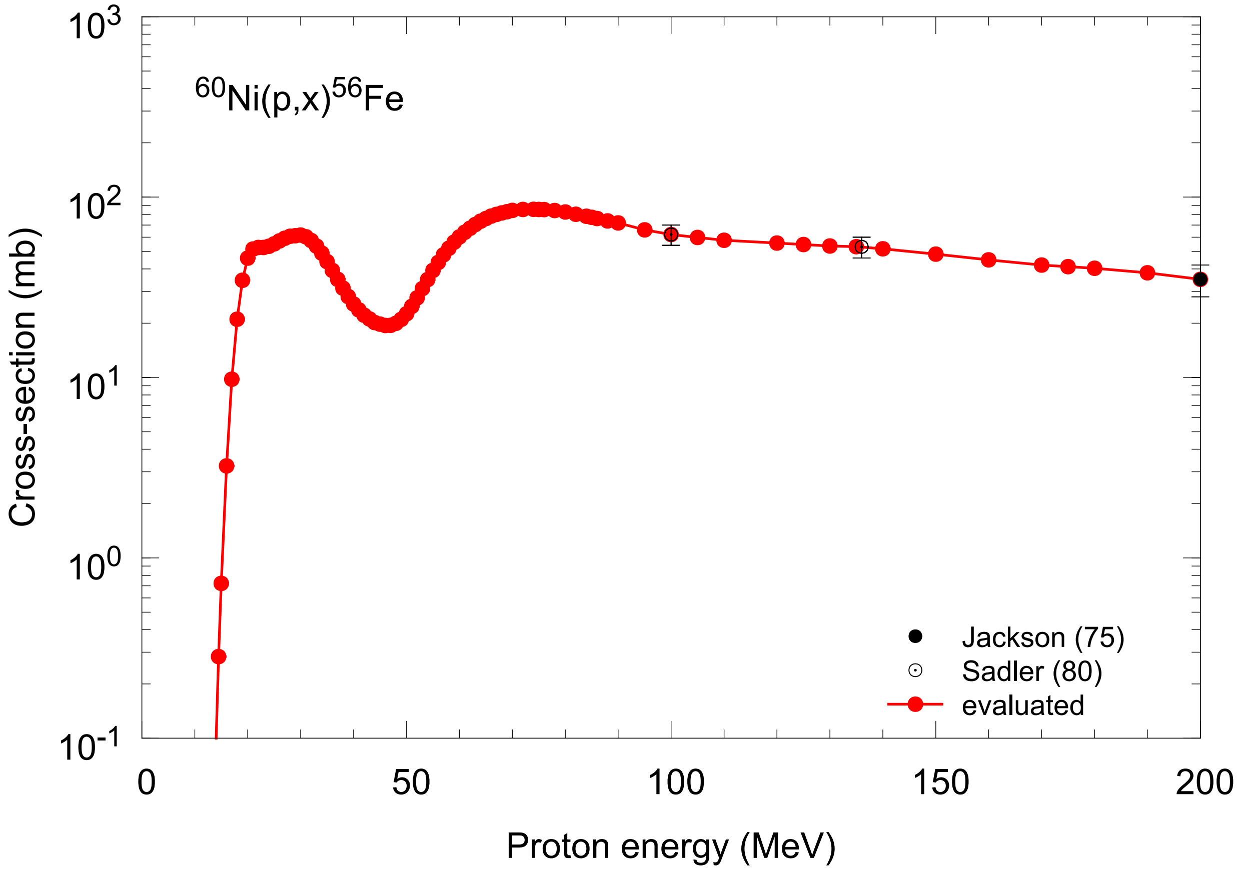
$^{60}Ni(p,x)^{53}Fe$
Sadler (80)
evaluated 3
Cross-section (mb)
Proton energy (MeV)



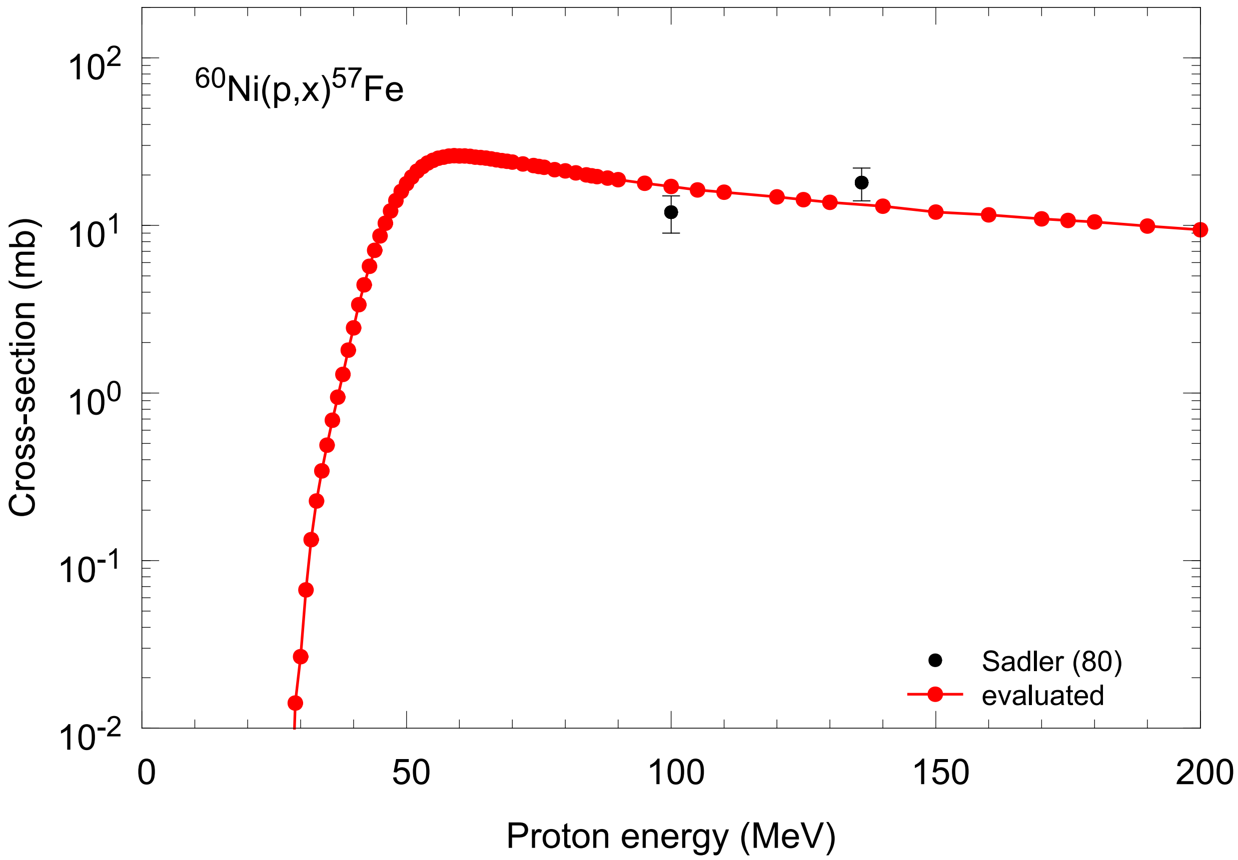
$^{60}Ni(p,x)^{54}Fe$
Jackson (75)
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)

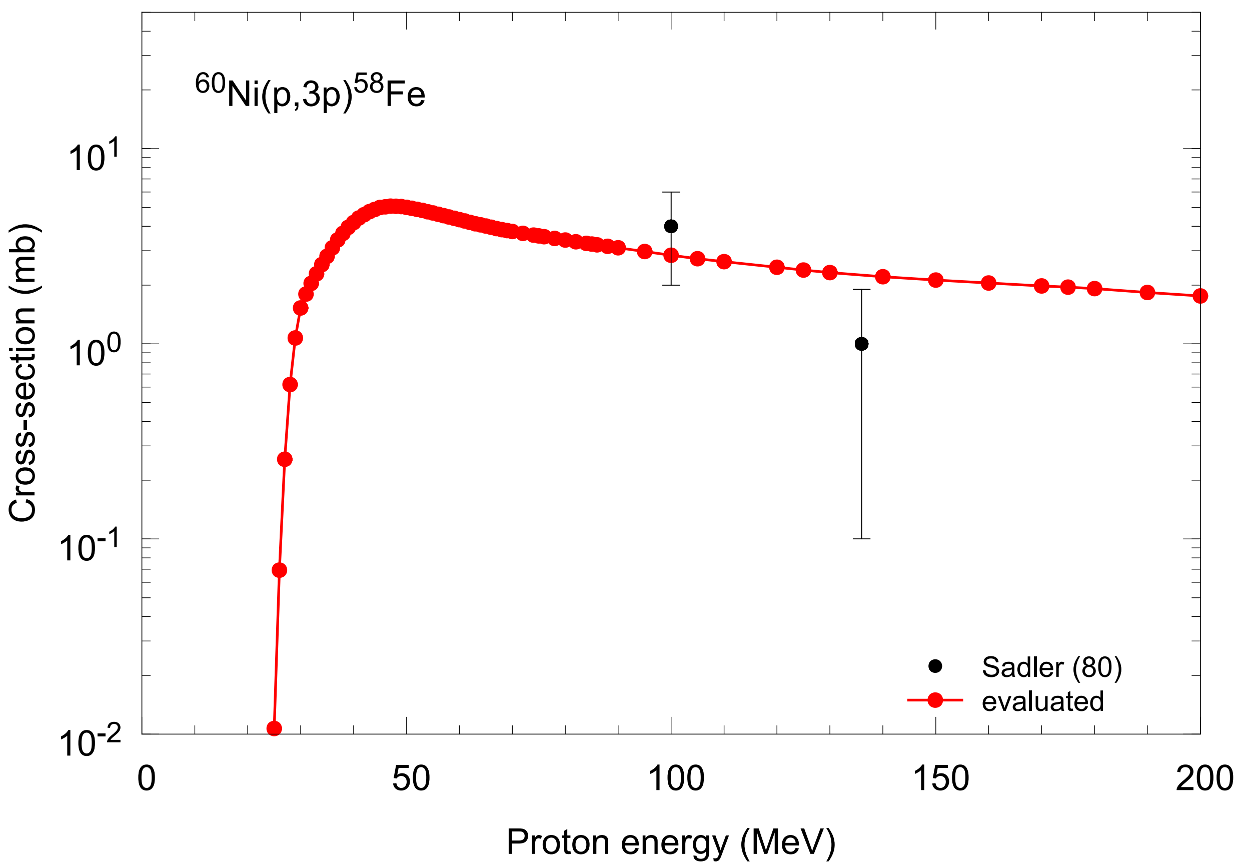


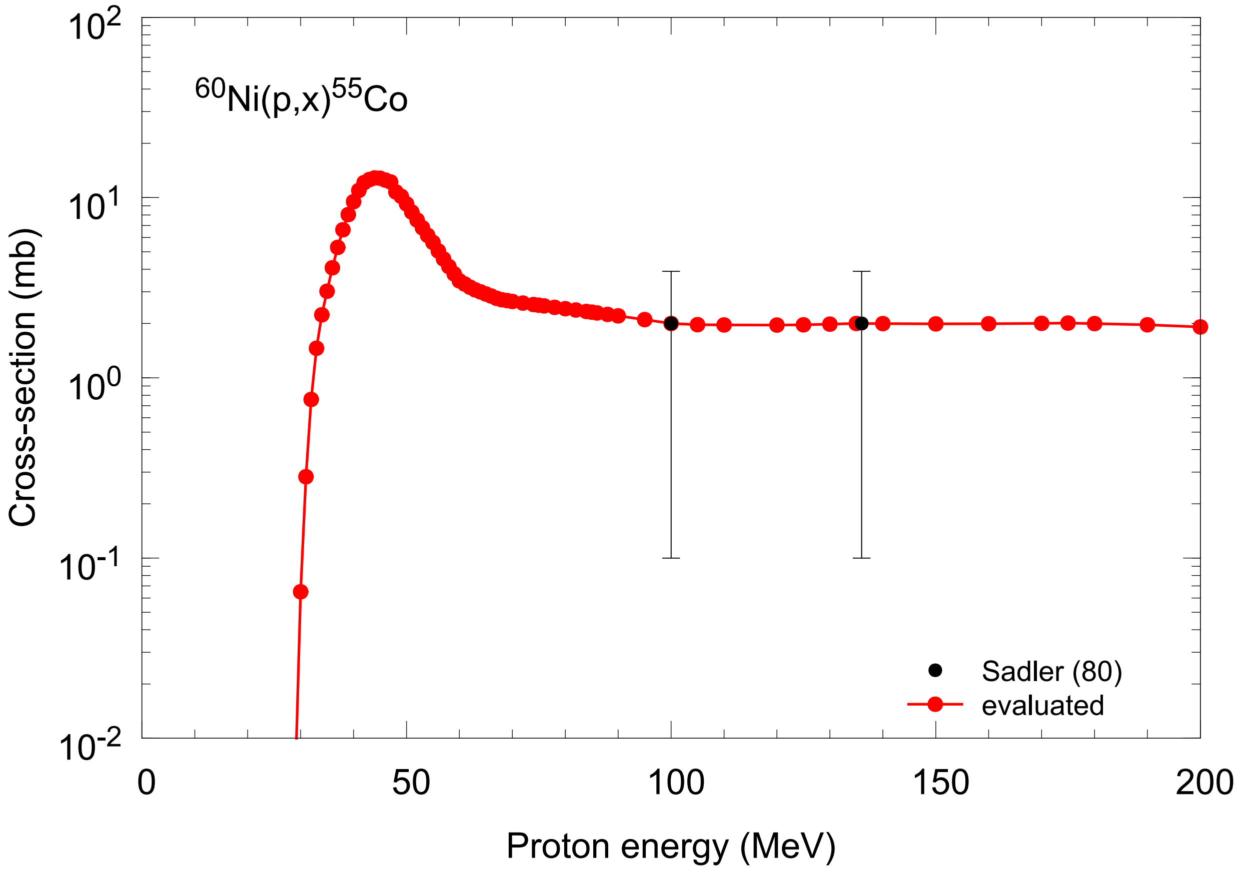
$^{60}Ni(p,x)^{55}Fe$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
Furukawa (91)
evaluated



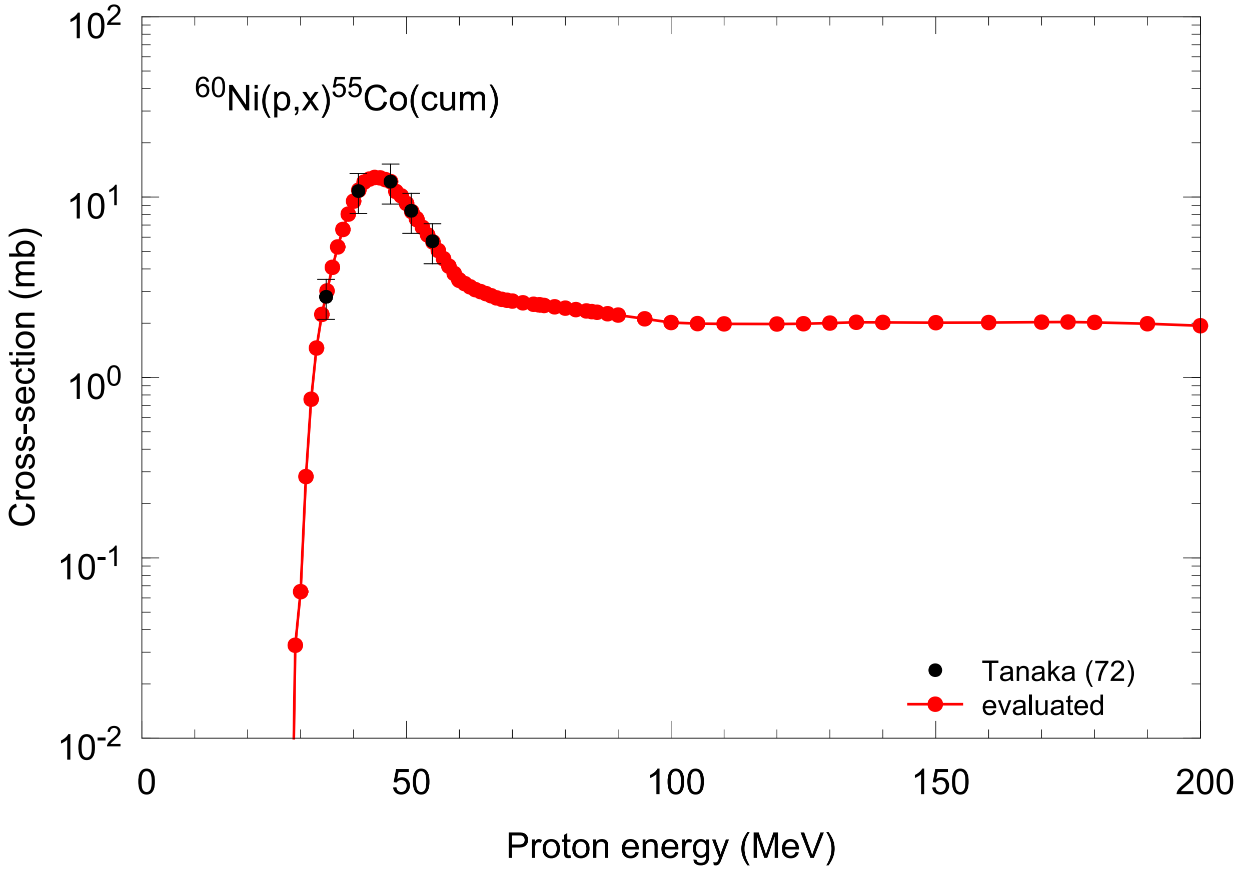
$^{60}Ni(p,x)^{56}Fe$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated


^{60}Ni(p,x)^{57}Fe
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated

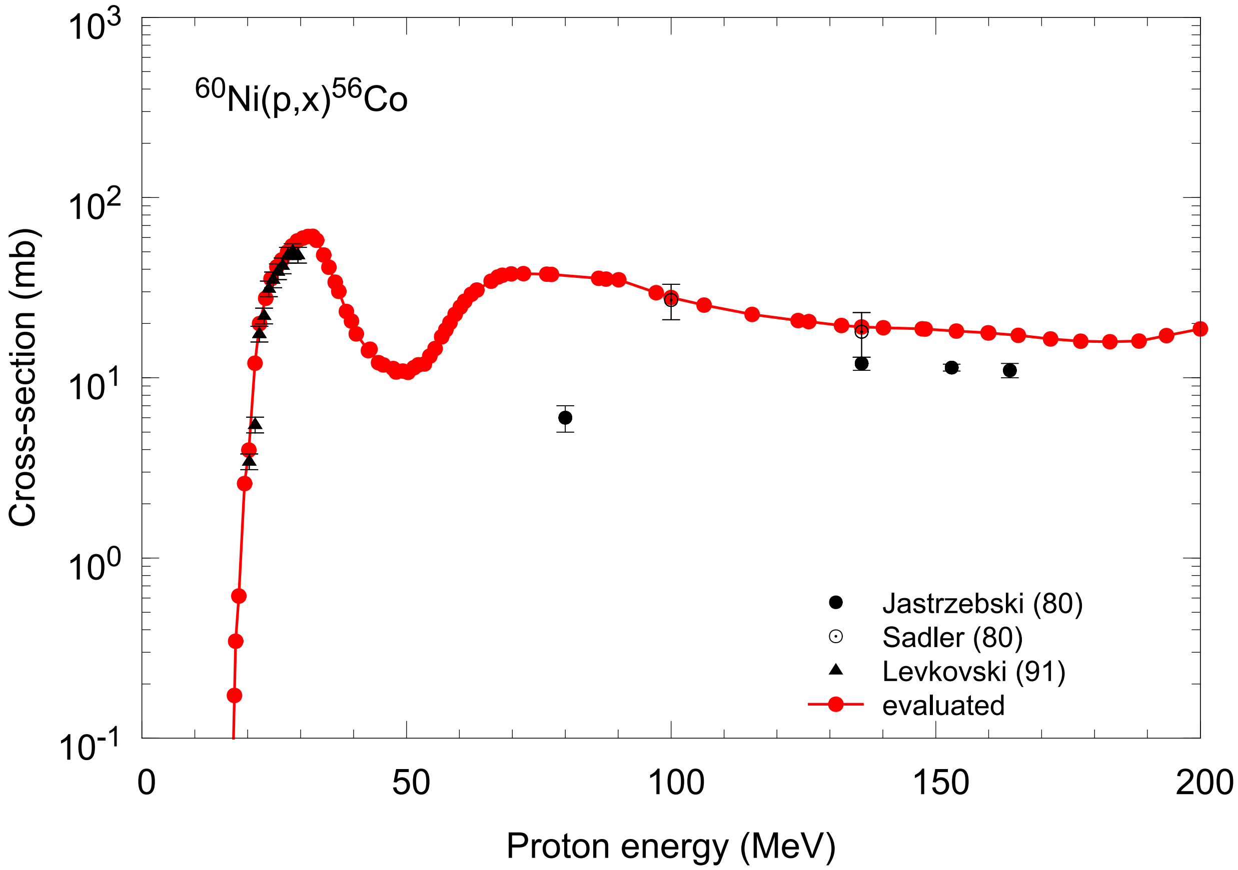

^{60}Ni(p,3p)^{58}Fe
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



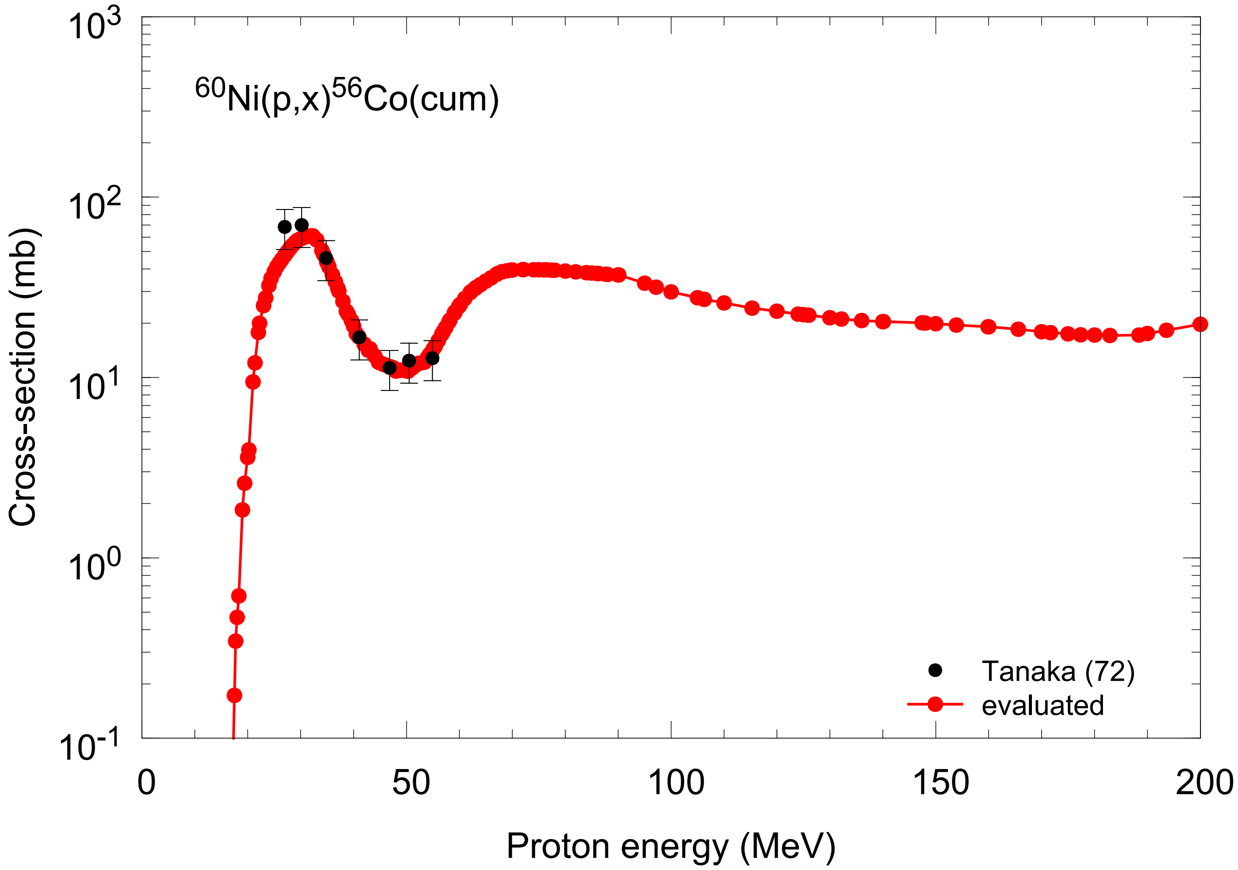
$^{60}Ni(p,x)^{55}Co$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



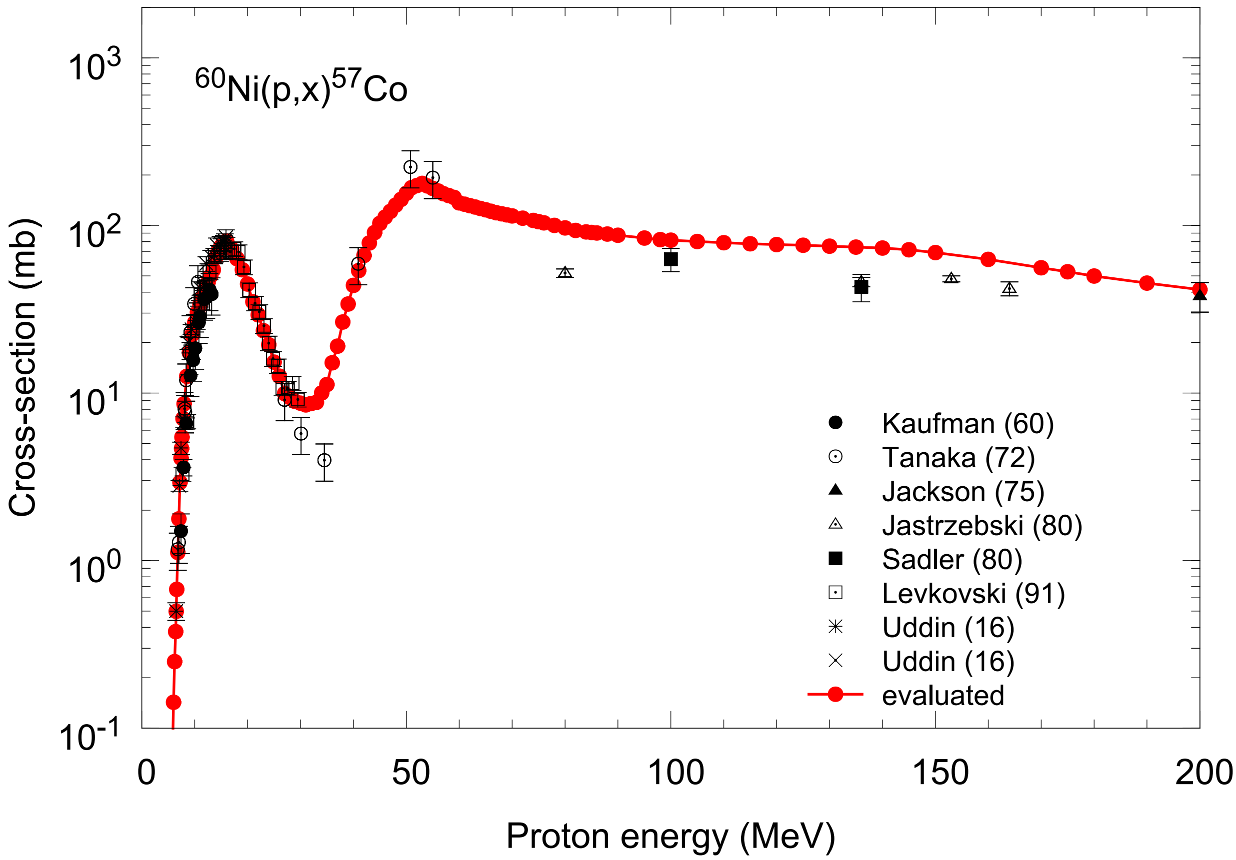
$^{60}Ni(p,x)^{55}Co(cum)$
Cross-section (mb)
Proton energy (MeV)
Tanaka (72)
evaluated



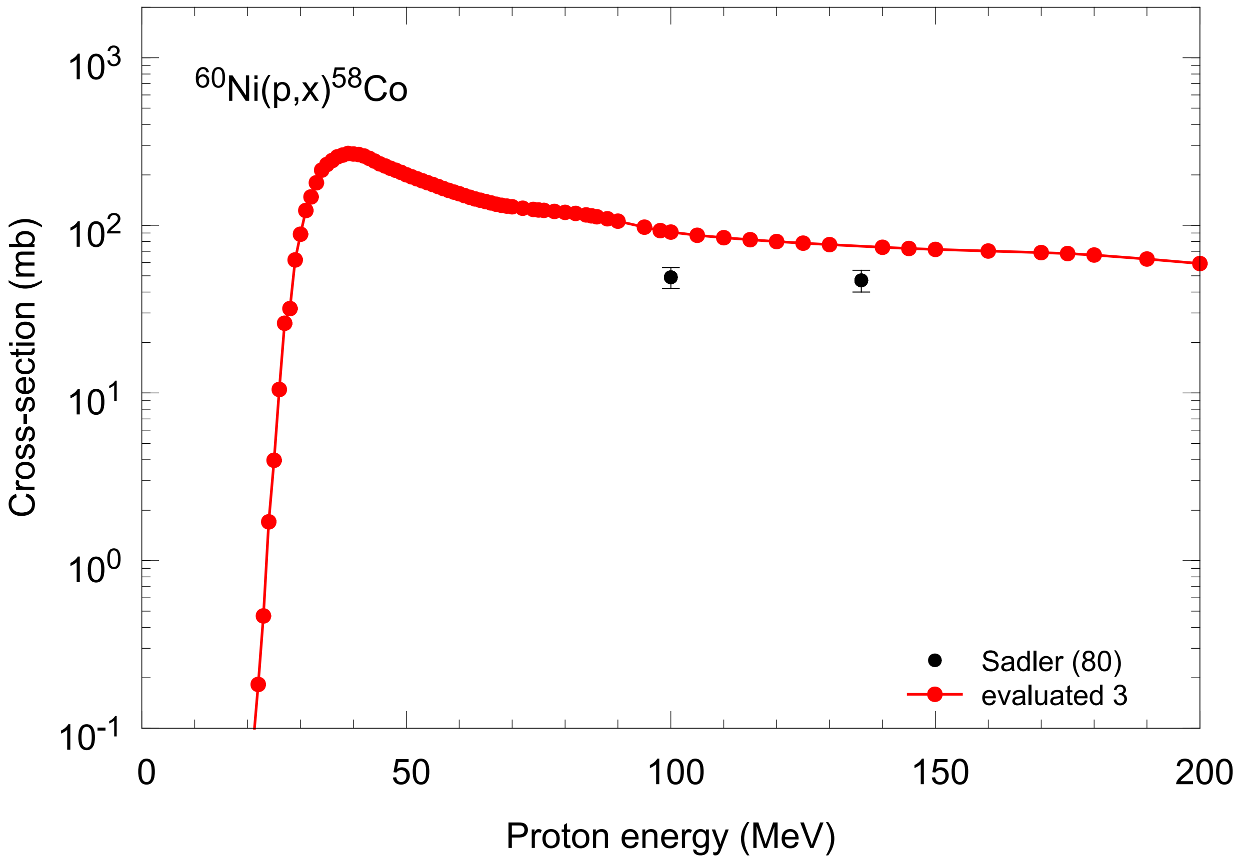
$^{60}Ni(p,x)^{56}Co$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
Sadler (80)
Levkovski (91)
evaluated



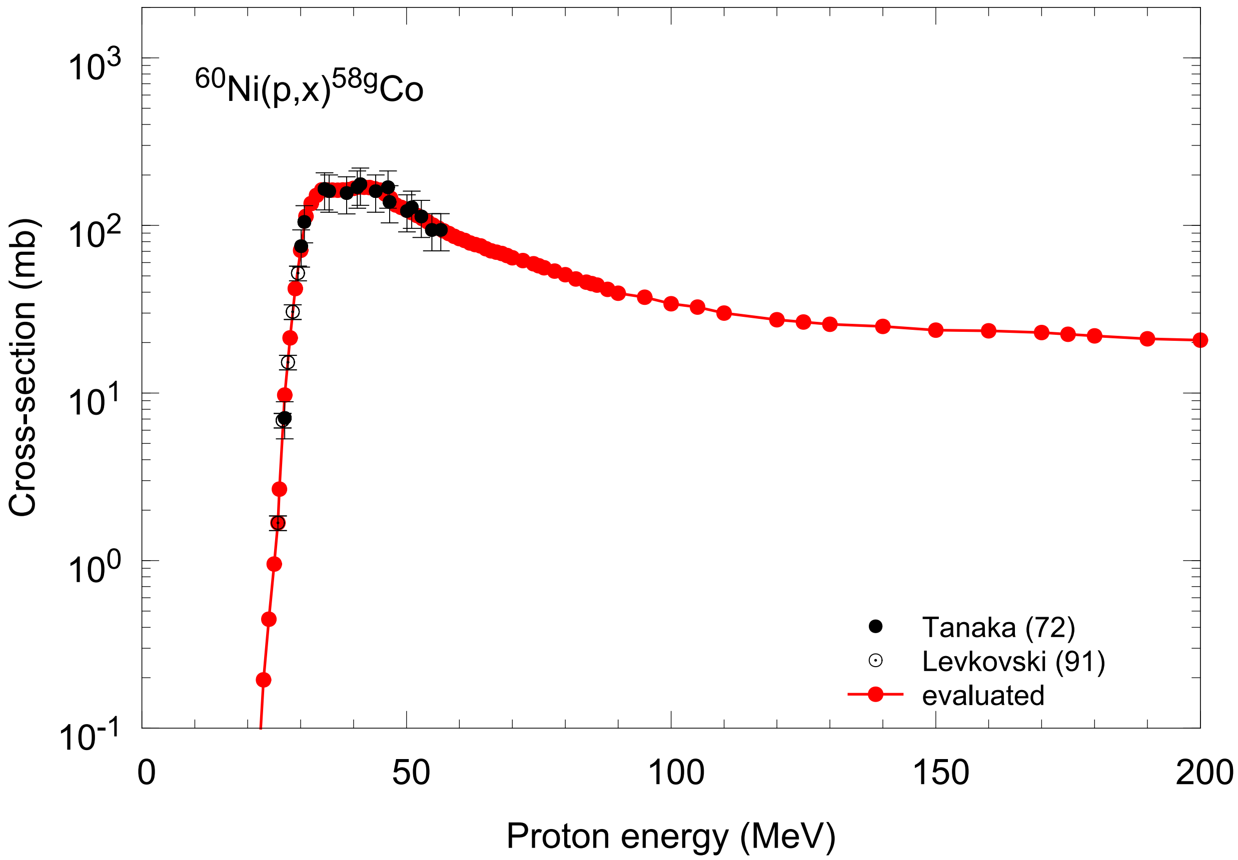
$^{60}Ni(p,x)^{56}Co(cum)$
Cross-section (mb)
Proton energy (MeV)
Tanaka (72)
evaluated



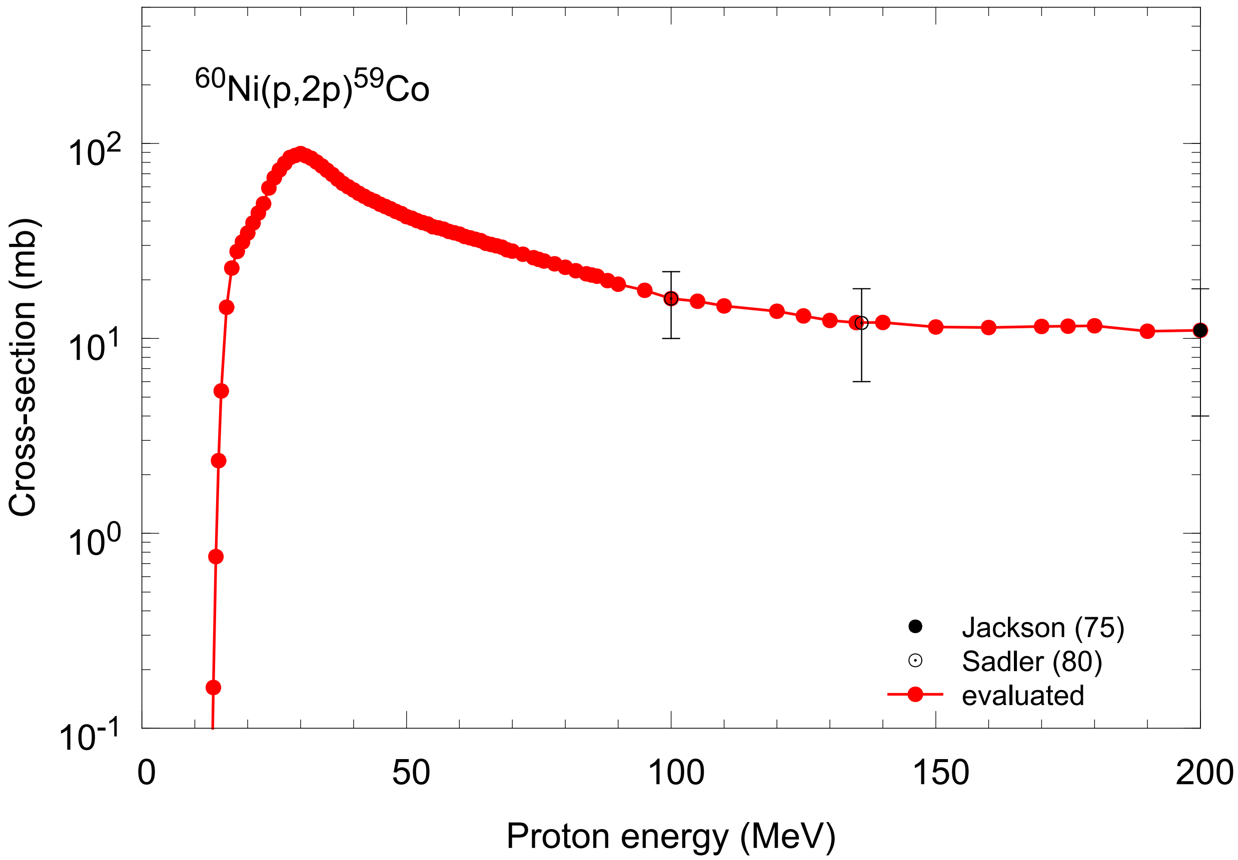
$^{60}Ni(p,x)^{57}Co$
Cross-section (mb)
Proton energy (MeV)
Kaufman (60)
Tanaka (72)
Jackson (75)
Jastrzebski (80)
Sadler (80)
Levkovski (91)
Uddin (16)
Uddin (16)
evaluated



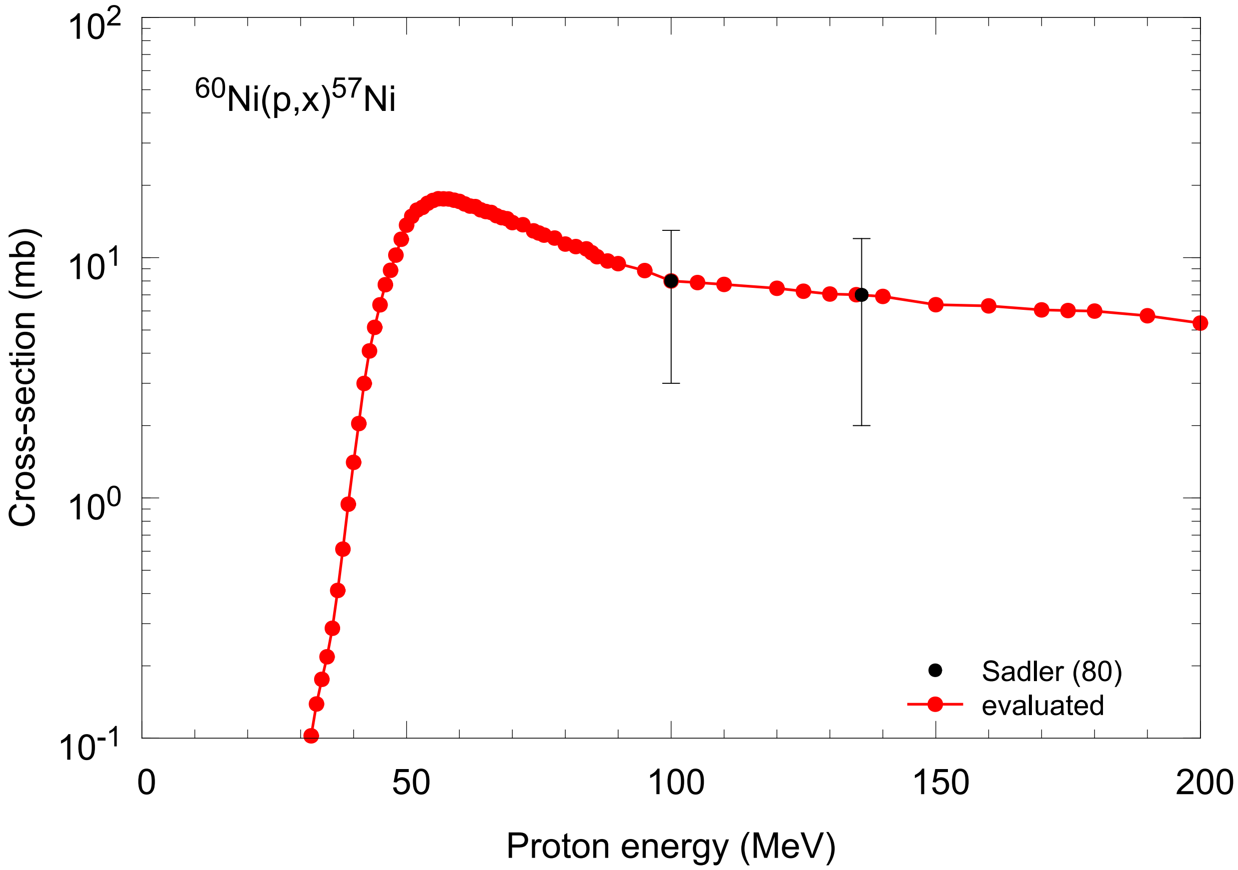
$^{60}Ni(p,x)^{58}Co$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated 3



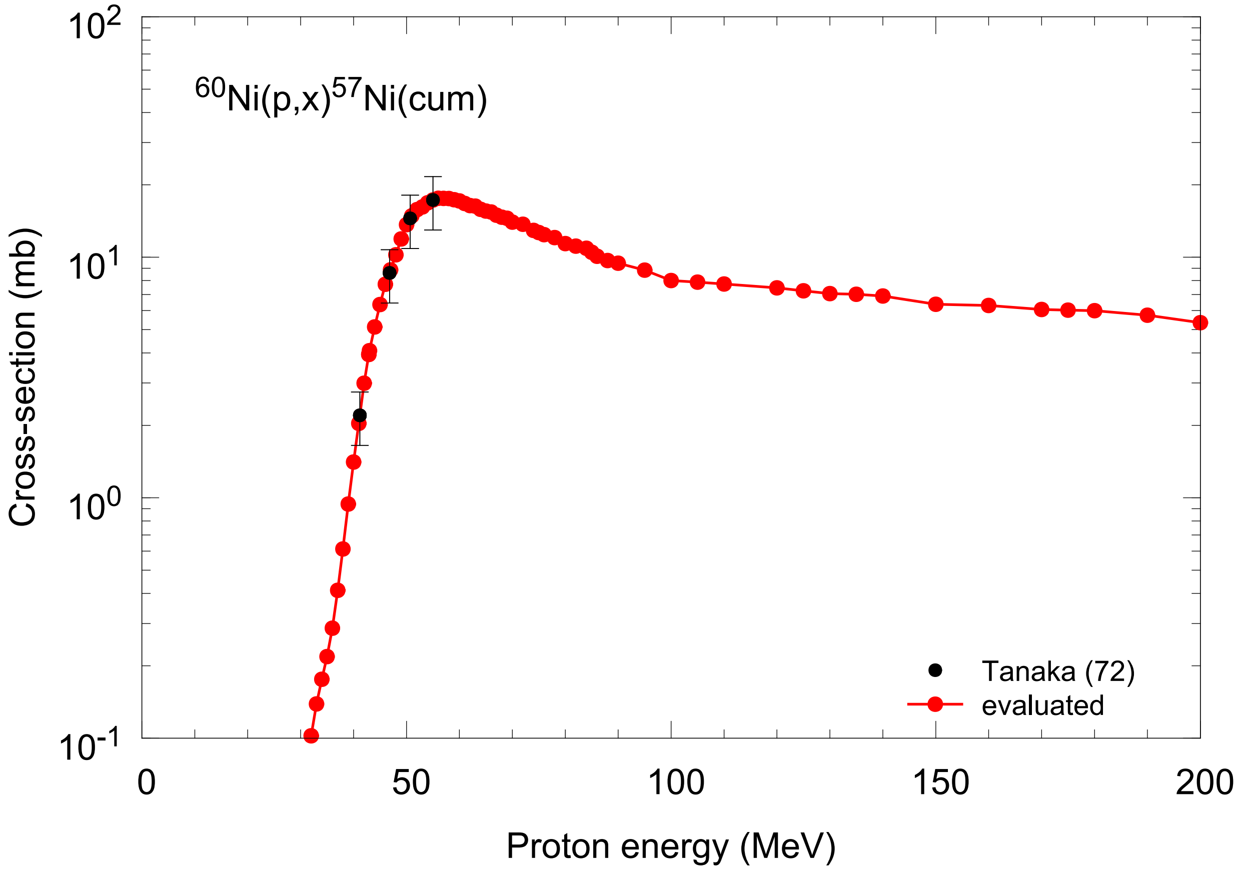
$^{60}Ni(p,x)^{58g}Co$
Cross-section (mb)
Proton energy (MeV)
Tanaka (72)
Levkovski (91)
evaluated



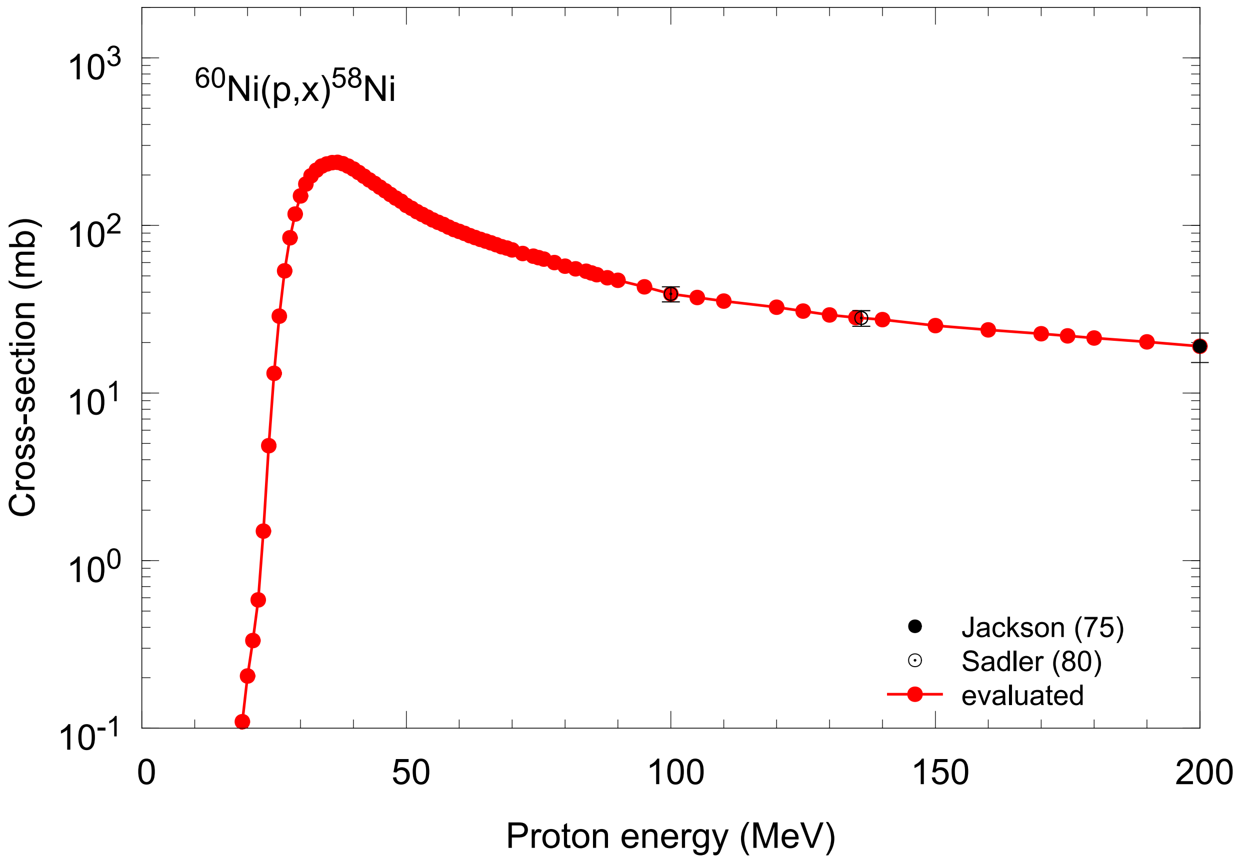
$^{60}Ni(p,2p)^{59}Co$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



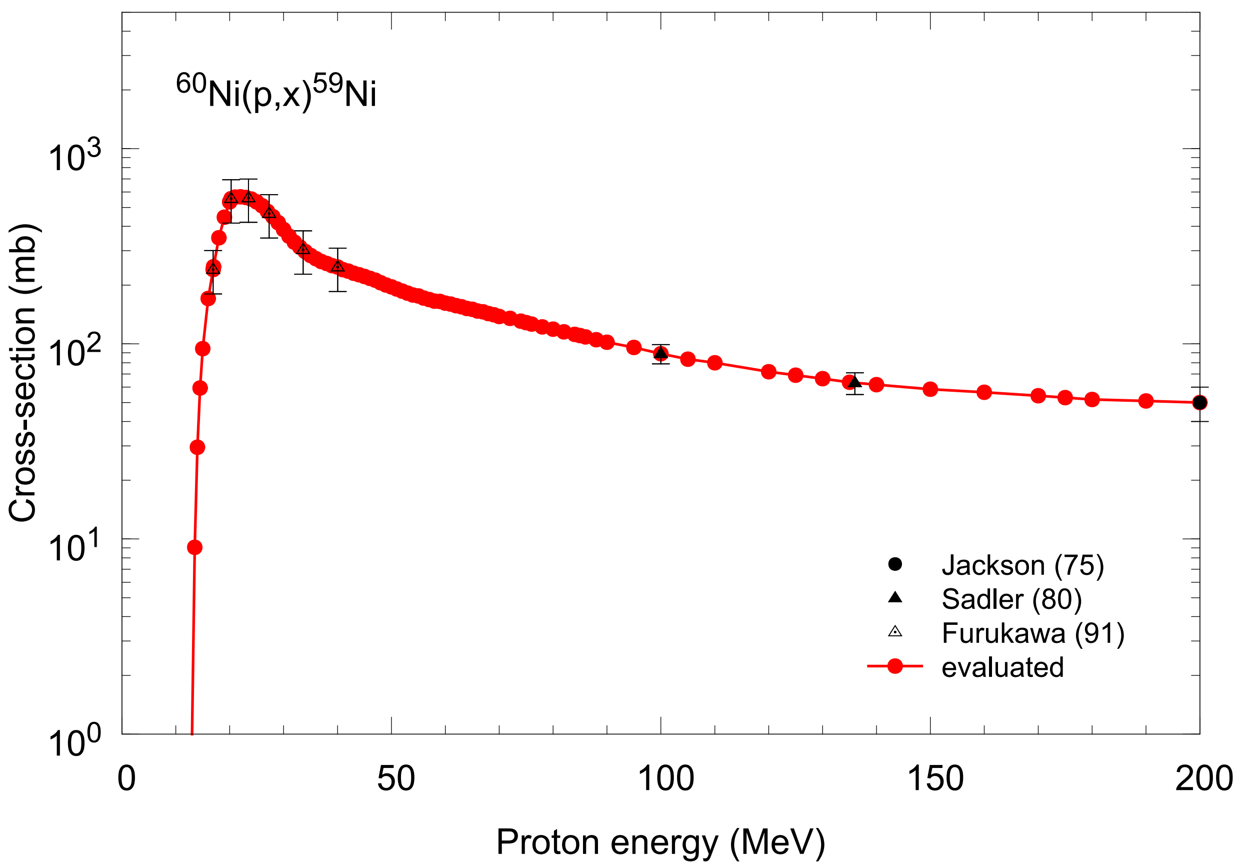
$^{60}Ni(p,x)^{57}Ni$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200



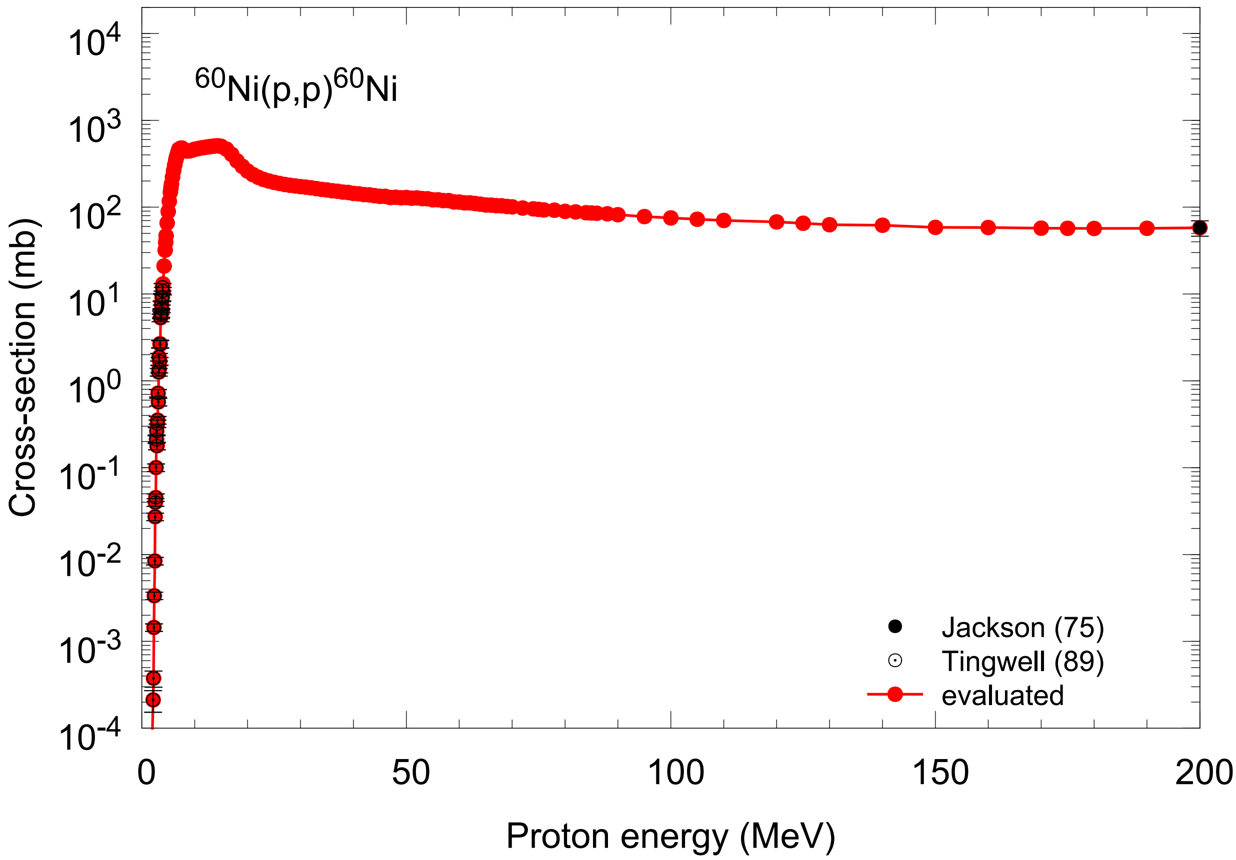
$^{60}Ni(p,x)^{57}Ni(cum)$
Cross-section (mb)
Proton energy (MeV)
Tanaka (72)
evaluated
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200



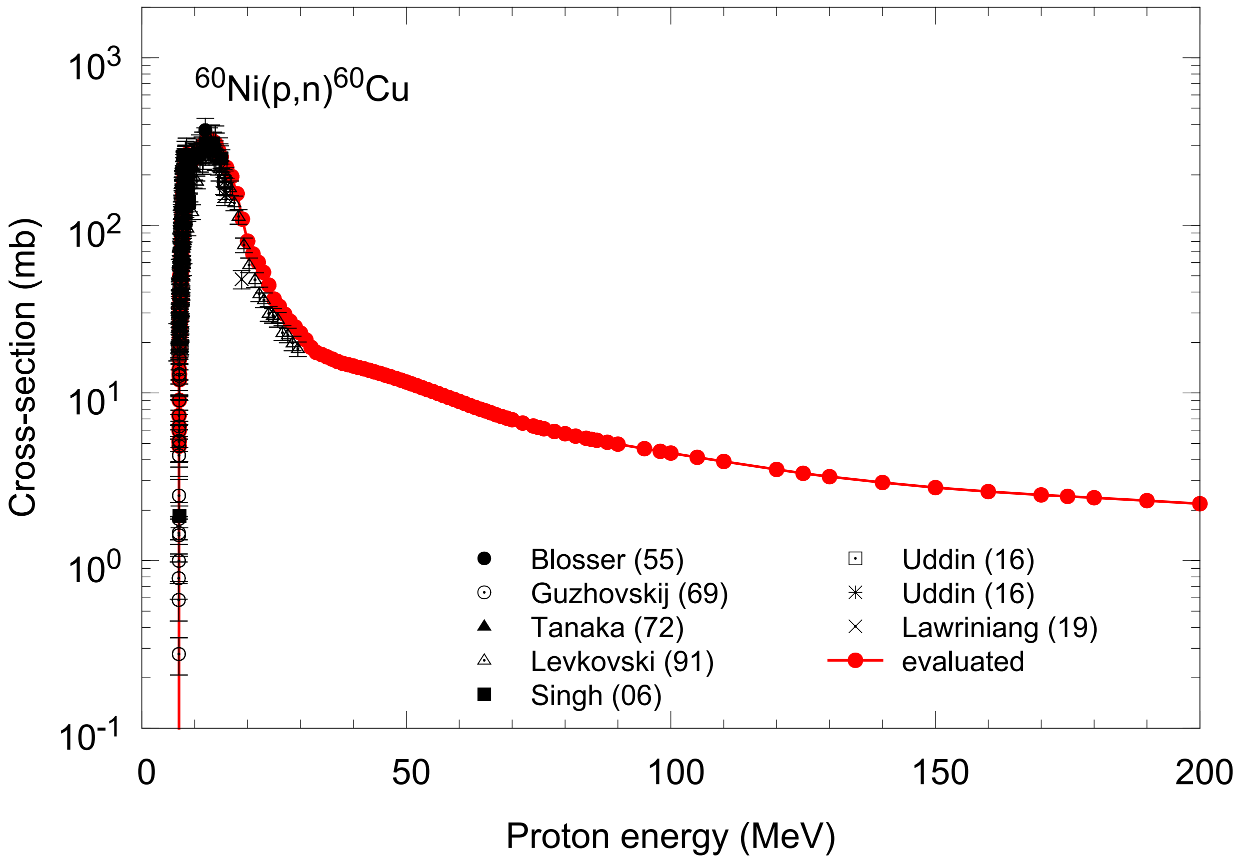
$^{60}Ni(p,x)^{58}Ni$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
evaluated



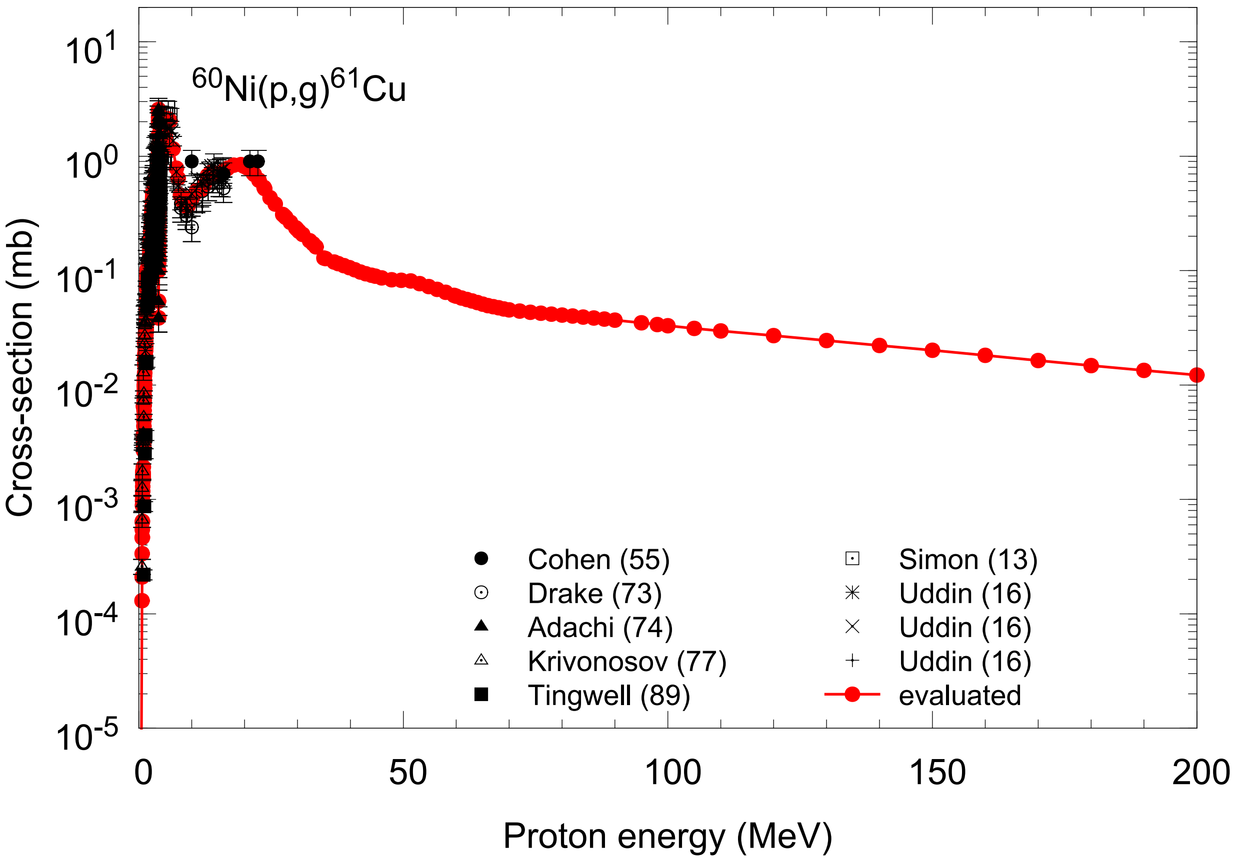
$^{60}Ni(p,x)^{59}Ni$
Cross-section (mb)
Proton energy (MeV)
Jackson (75)
Sadler (80)
Furukawa (91)
evaluated



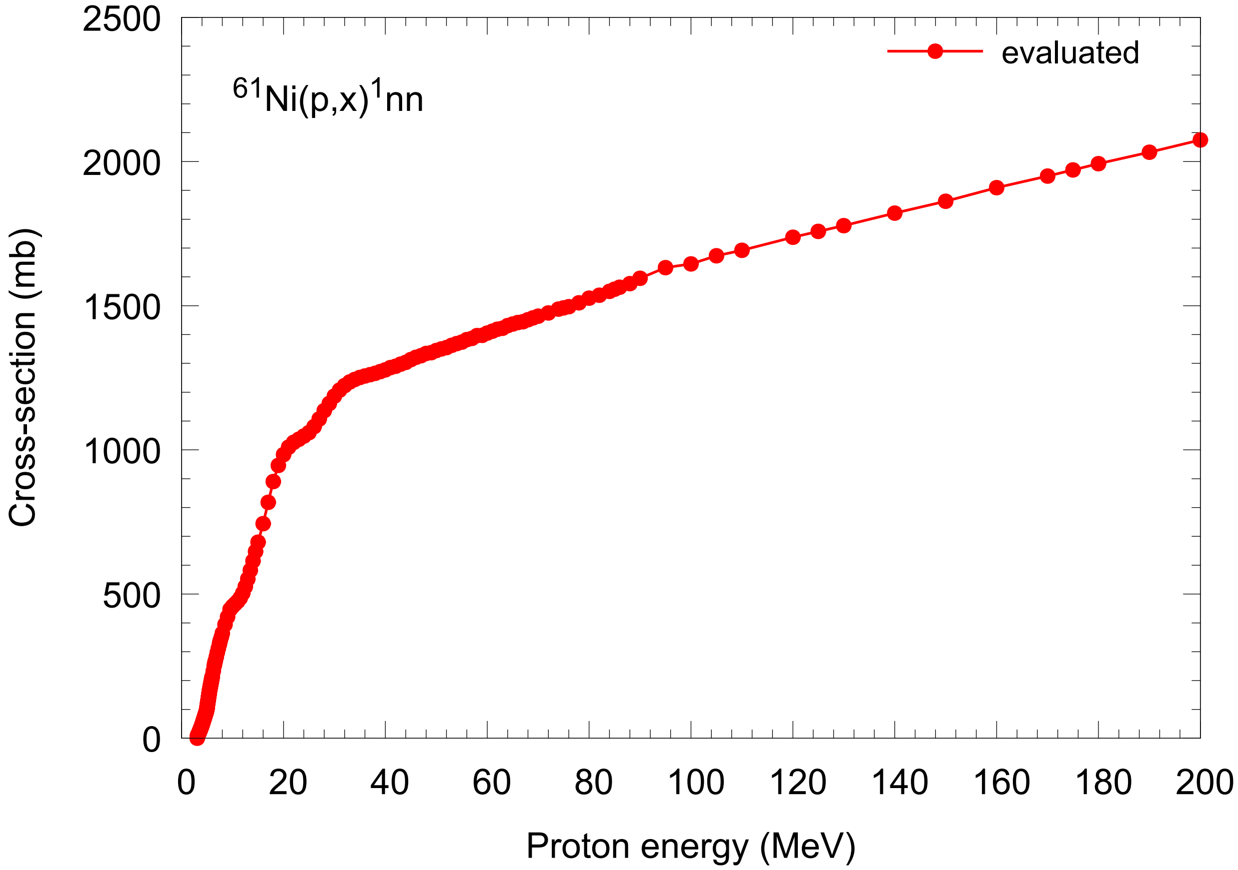
$^{60}Ni(p,p)^{60}Ni$
Cross-section (mb)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Proton energy (MeV)
Jackson (75)
Tingwell (89)
evaluated



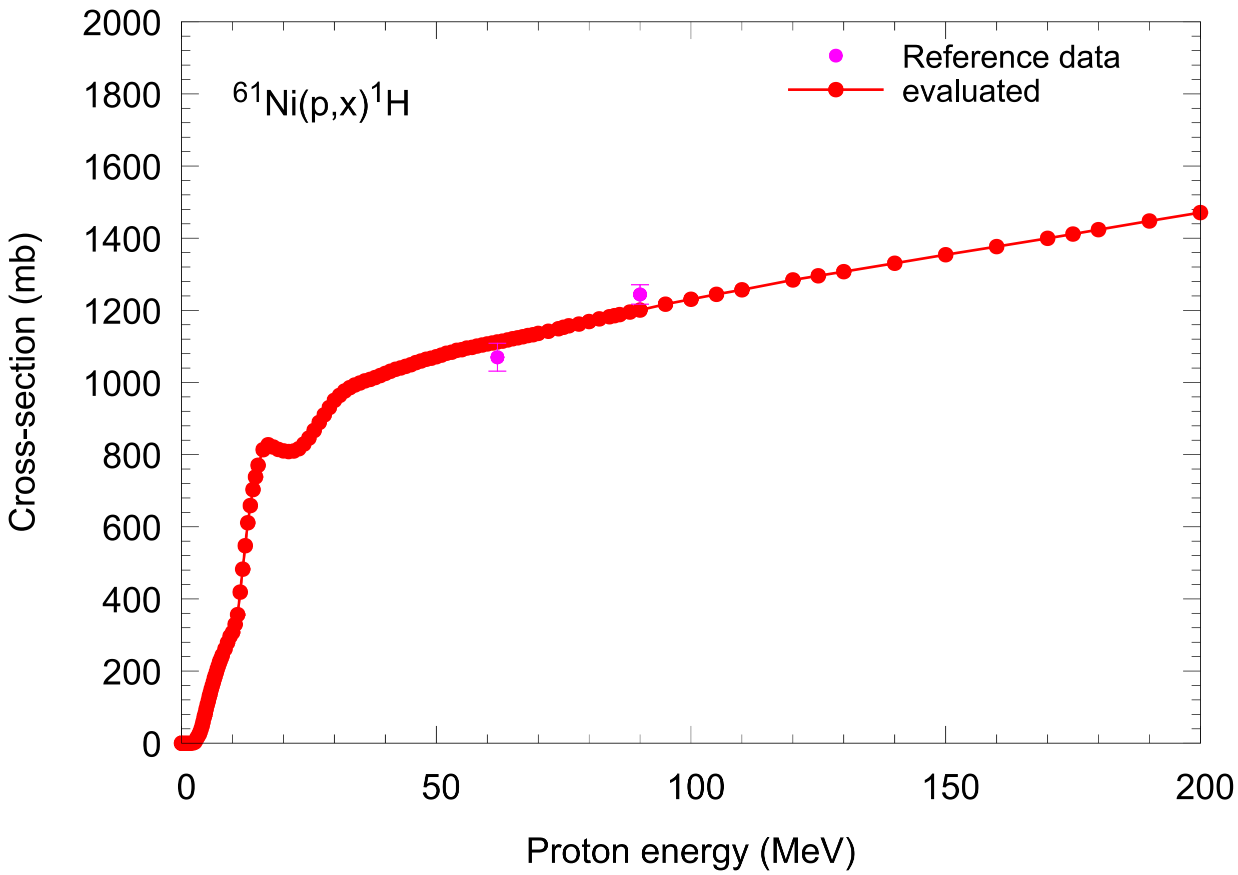
$^{60}Ni(p,n)^{60}Cu$
Cross-section (mb)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Blosser (55)
Guzhovskij (69)
Tanaka (72)
Levkovski (91)
Singh (06)
Uddin (16)
Uddin (16)
Lawriniang (19)
evaluated



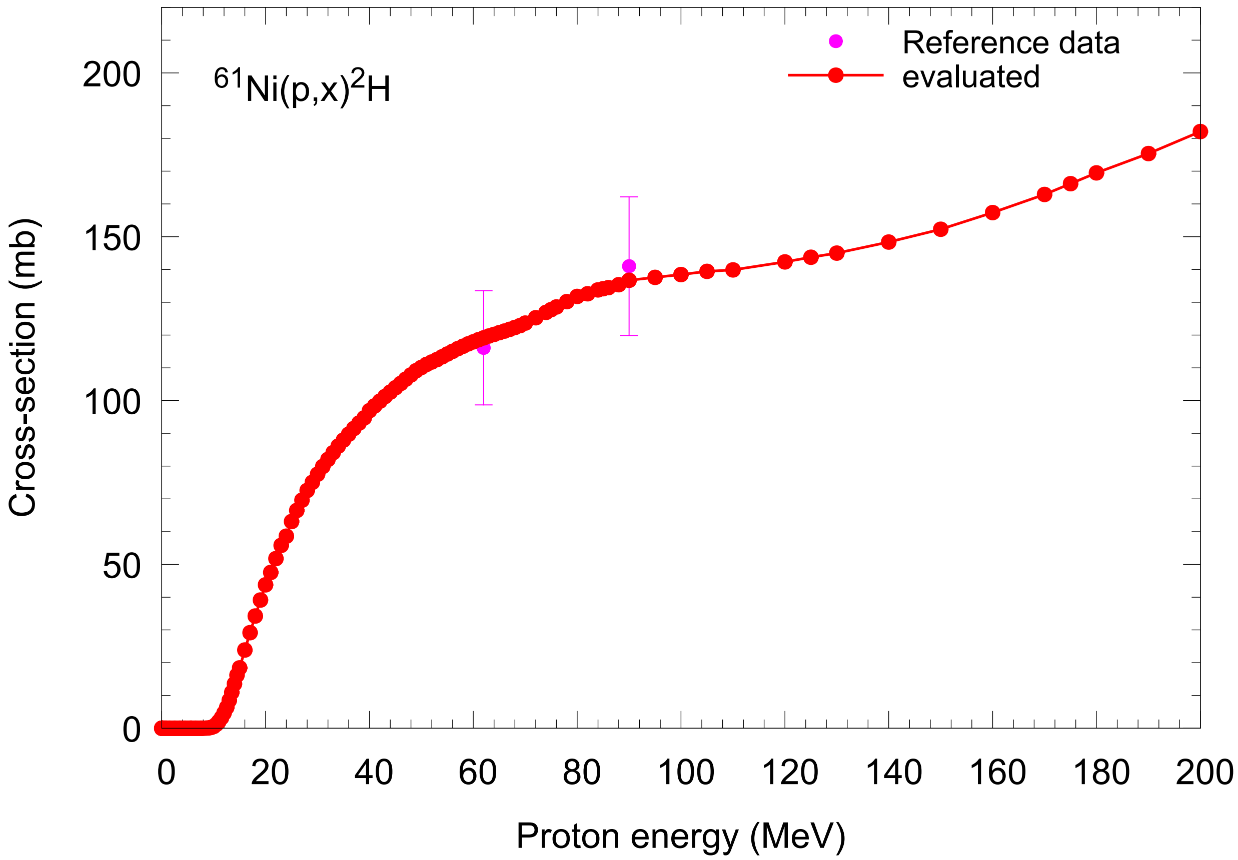
^{60}Ni(p,g)^{61}Cu
Cross-section (mb)
Proton energy (MeV)
Cohen (55)
Drake (73)
Adachi (74)
Krivonosov (77)
Tingwell (89)
Simon (13)
Uddin (16)
Uddin (16)
Uddin (16)
evaluated



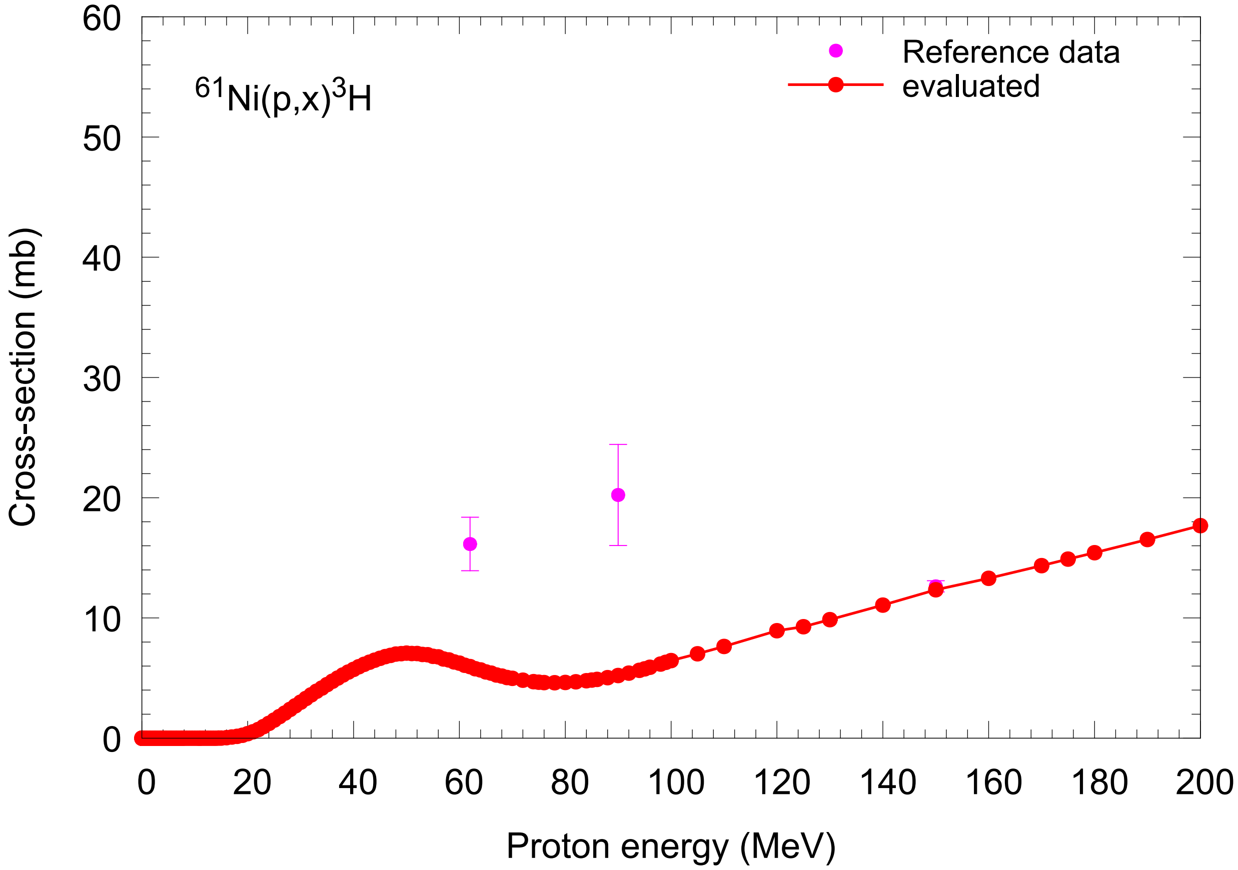
^{61}Ni(p,x)^{1}nn
evaluated
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
0
20
40
60
80
100
120
140
160
180
200



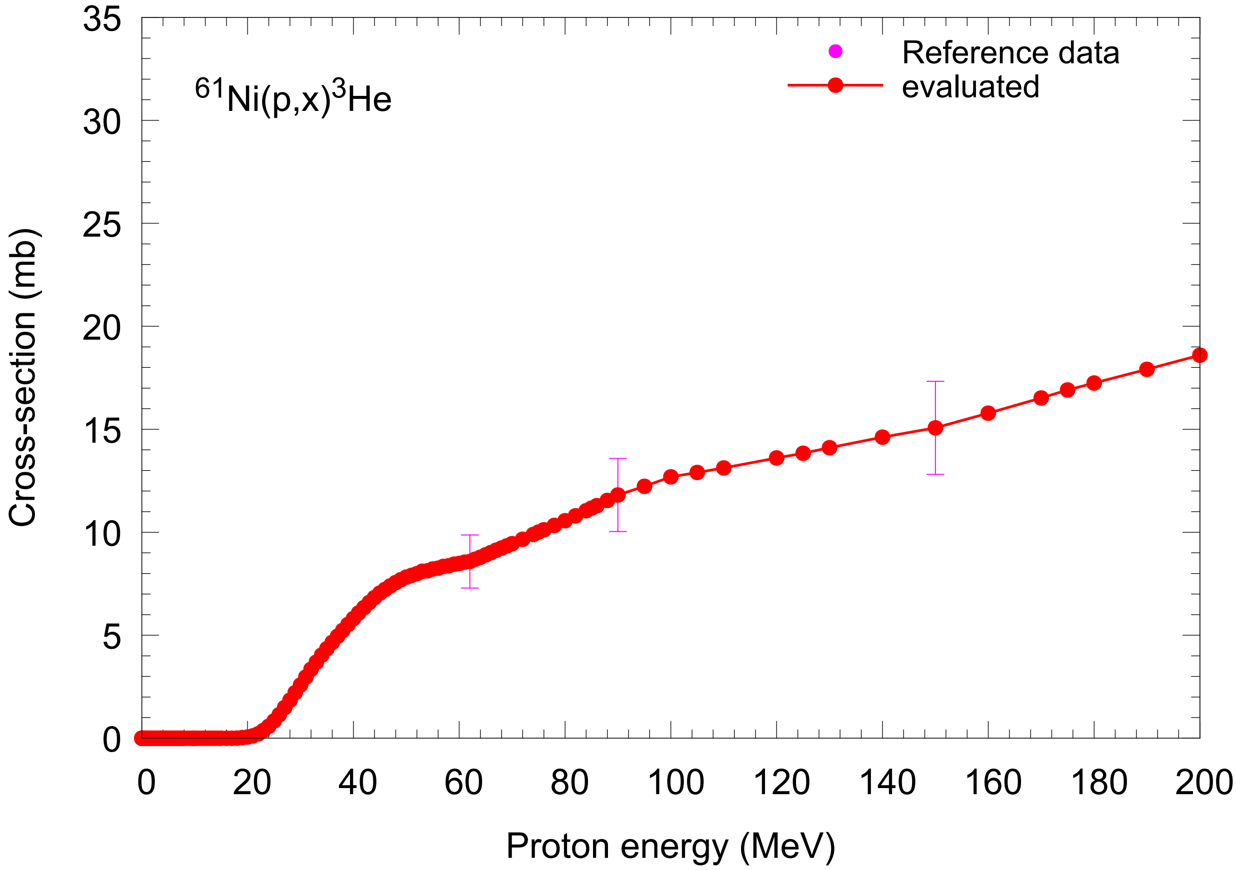
^{61}Ni(p,x)^{1}H
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
50
100
150
200



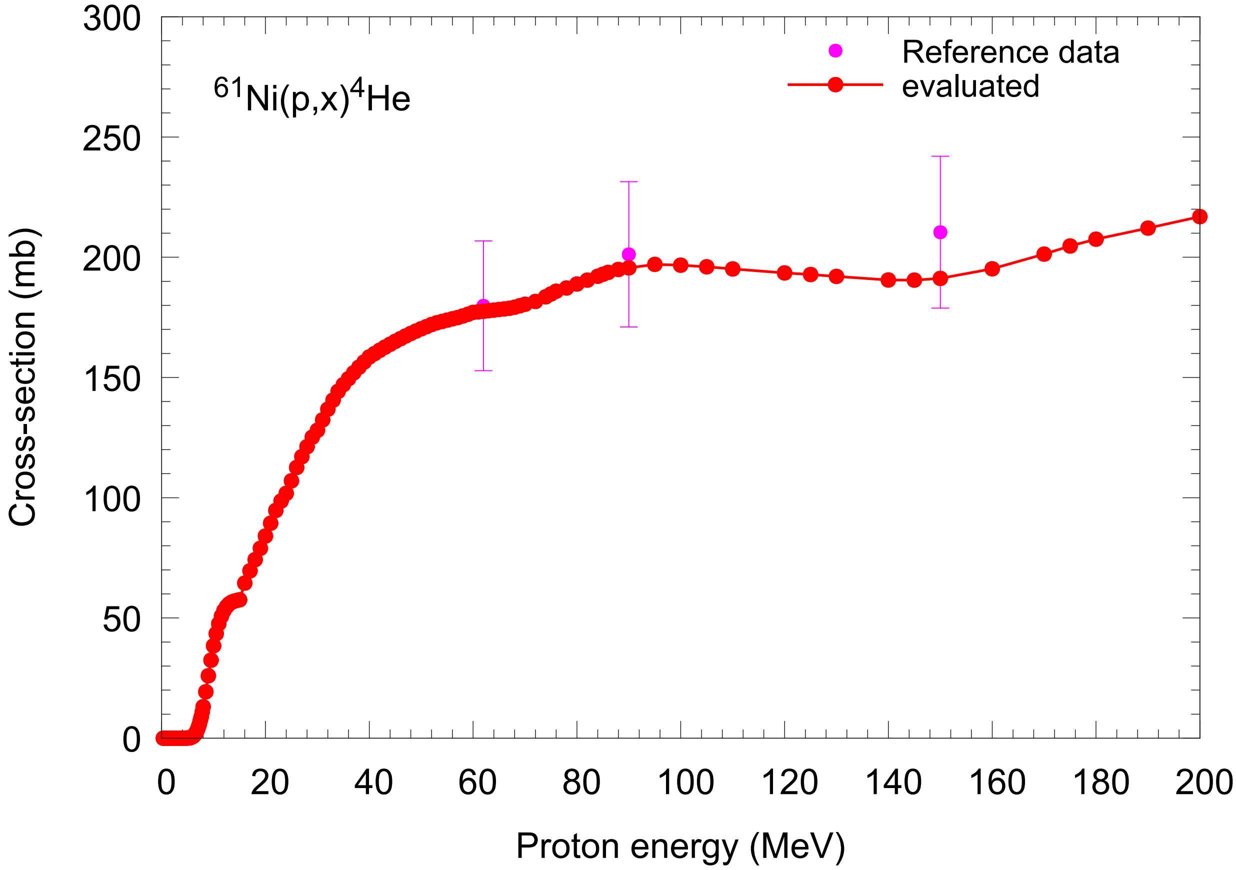
$^{61}Ni(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
0
20
40
60
80
100
120
140
160
180
200



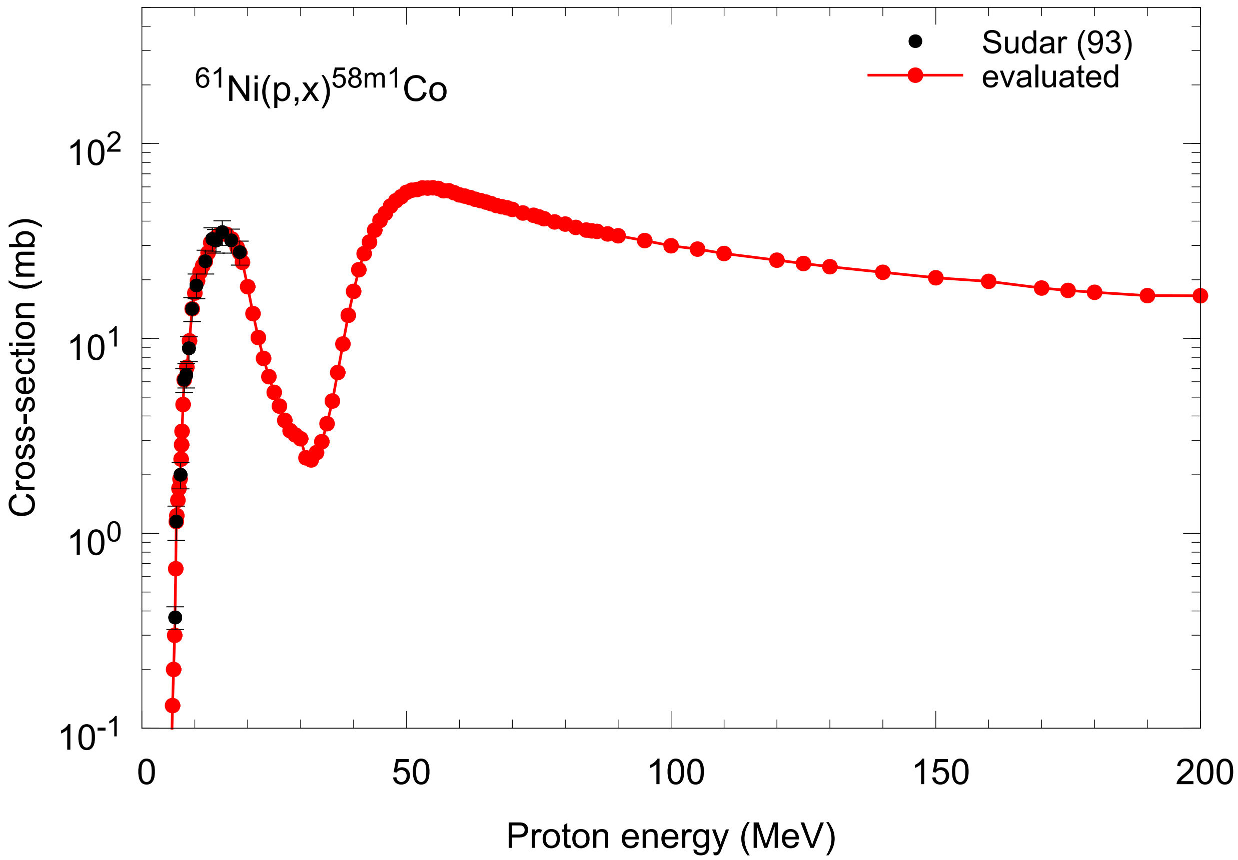
$^{61}Ni(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
10
20
30
40
50
60
0
20
40
60
80
100
120
140
160
180
200



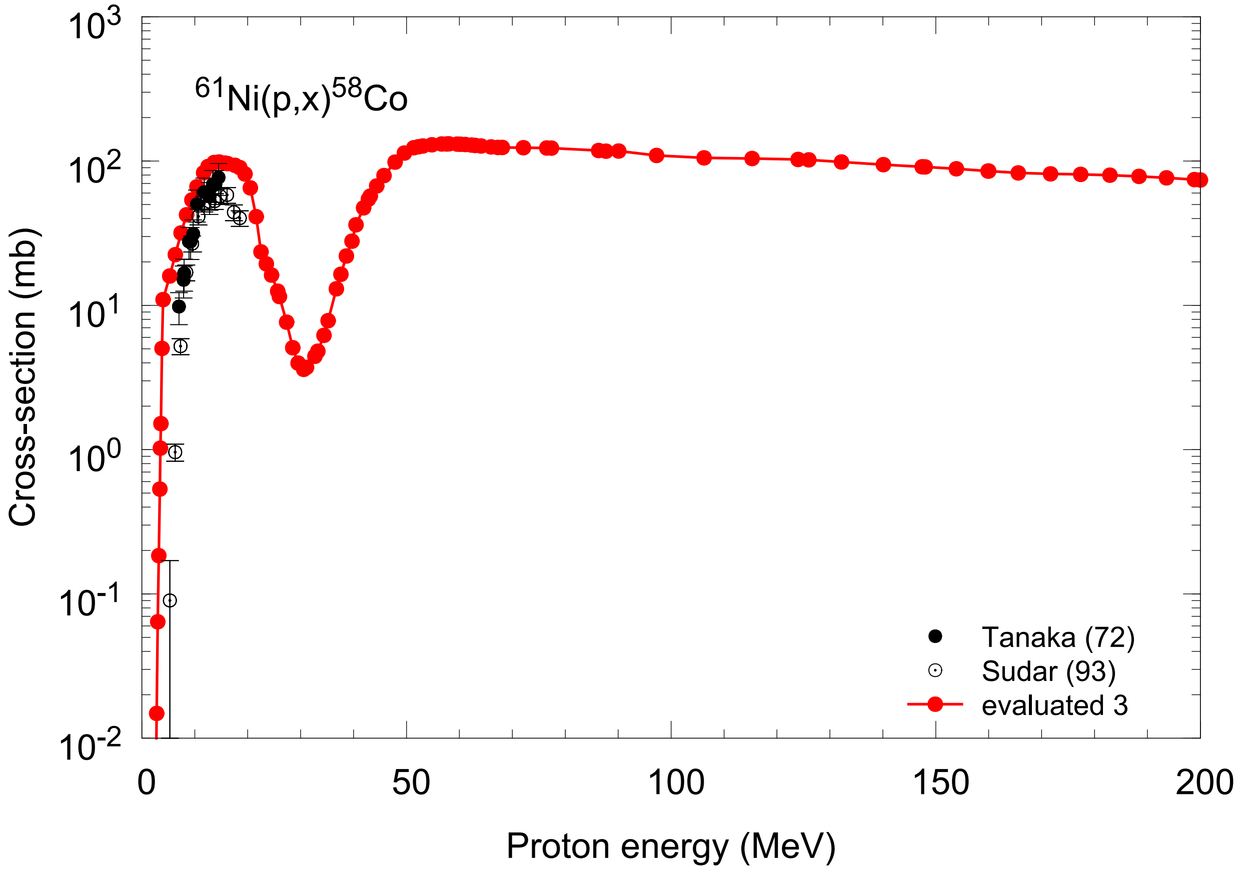
$^{61}Ni(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
0
20
40
60
80
100
120
140
160
180
200



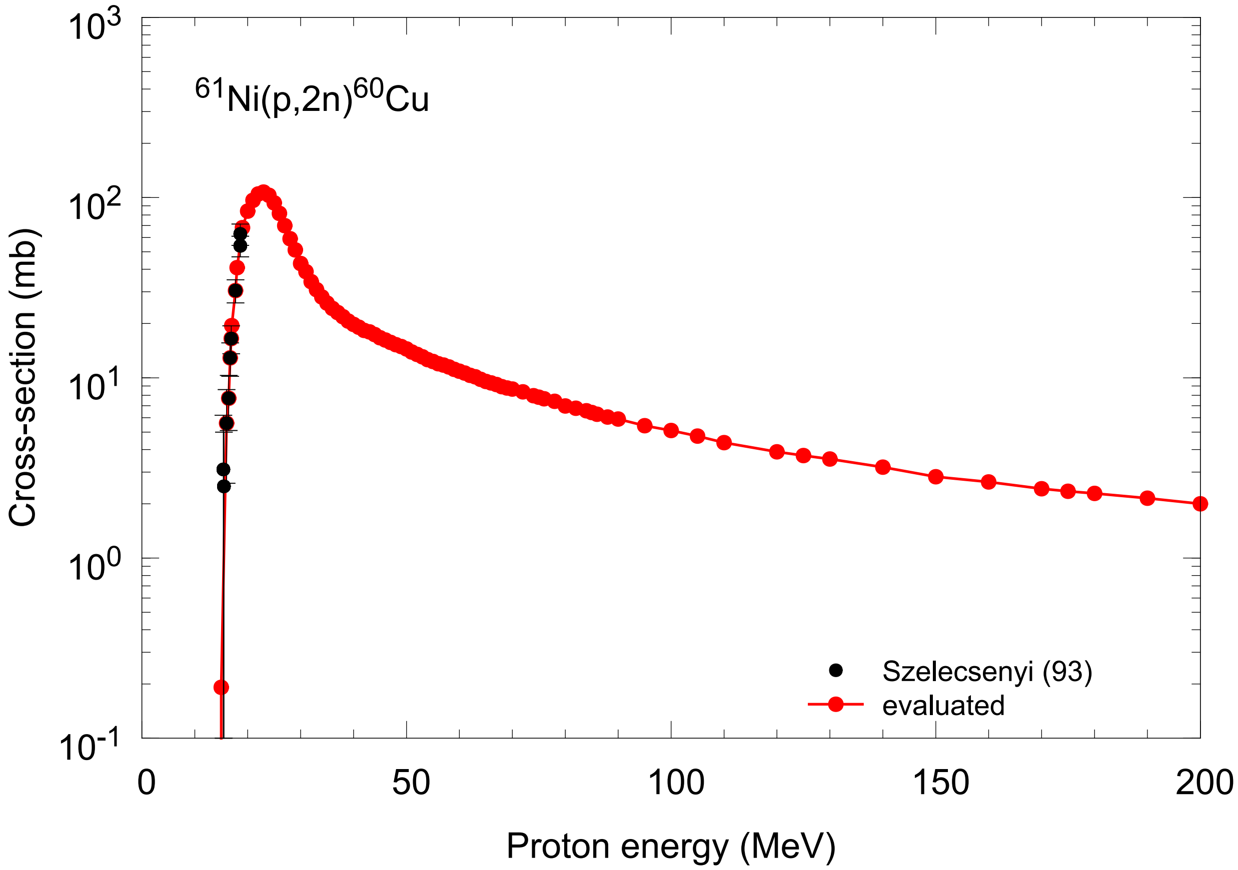
$^{61}Ni(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
300
0
20
40
60
80
100
120
140
160
180
200



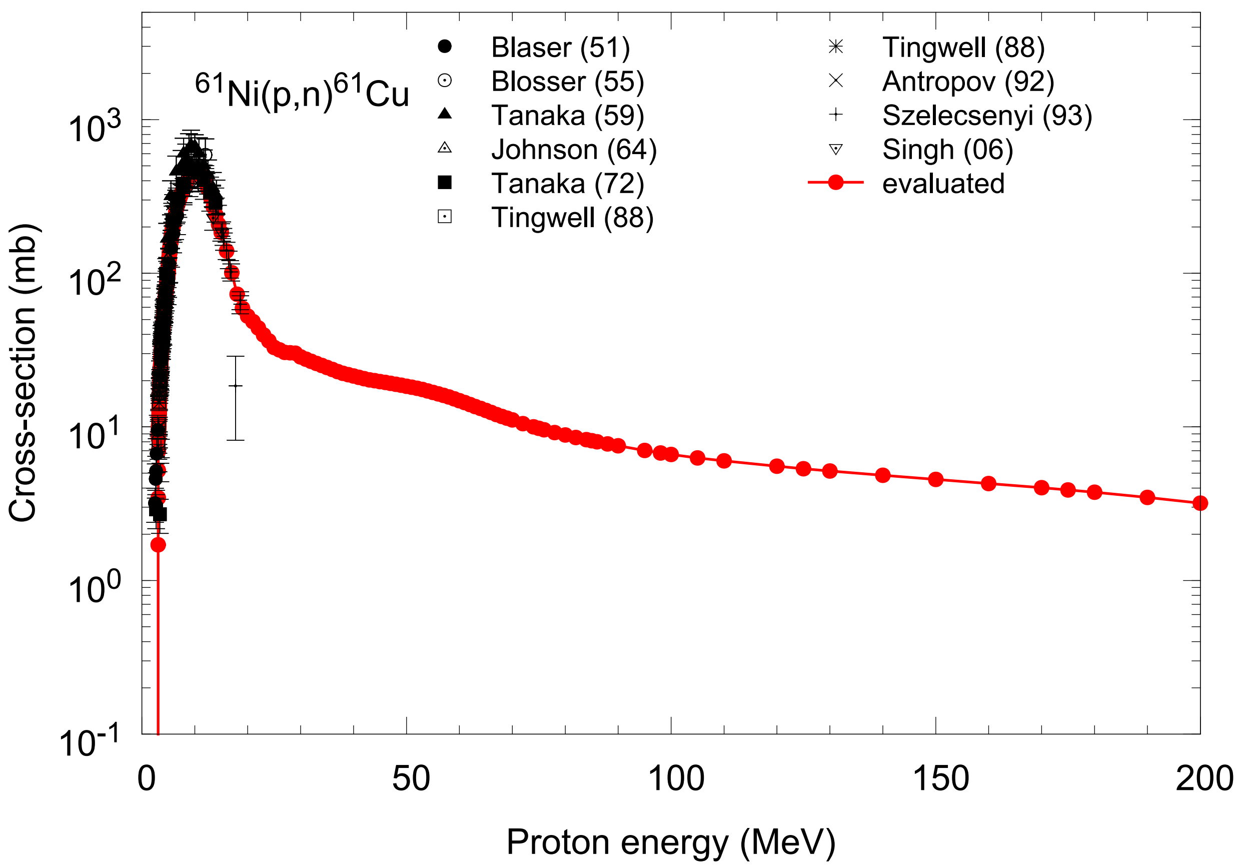
$^{61}Ni(p,x)^{58m1}Co$
Sudar (93)
evaluated
Cross-section (mb)
Proton energy (MeV)



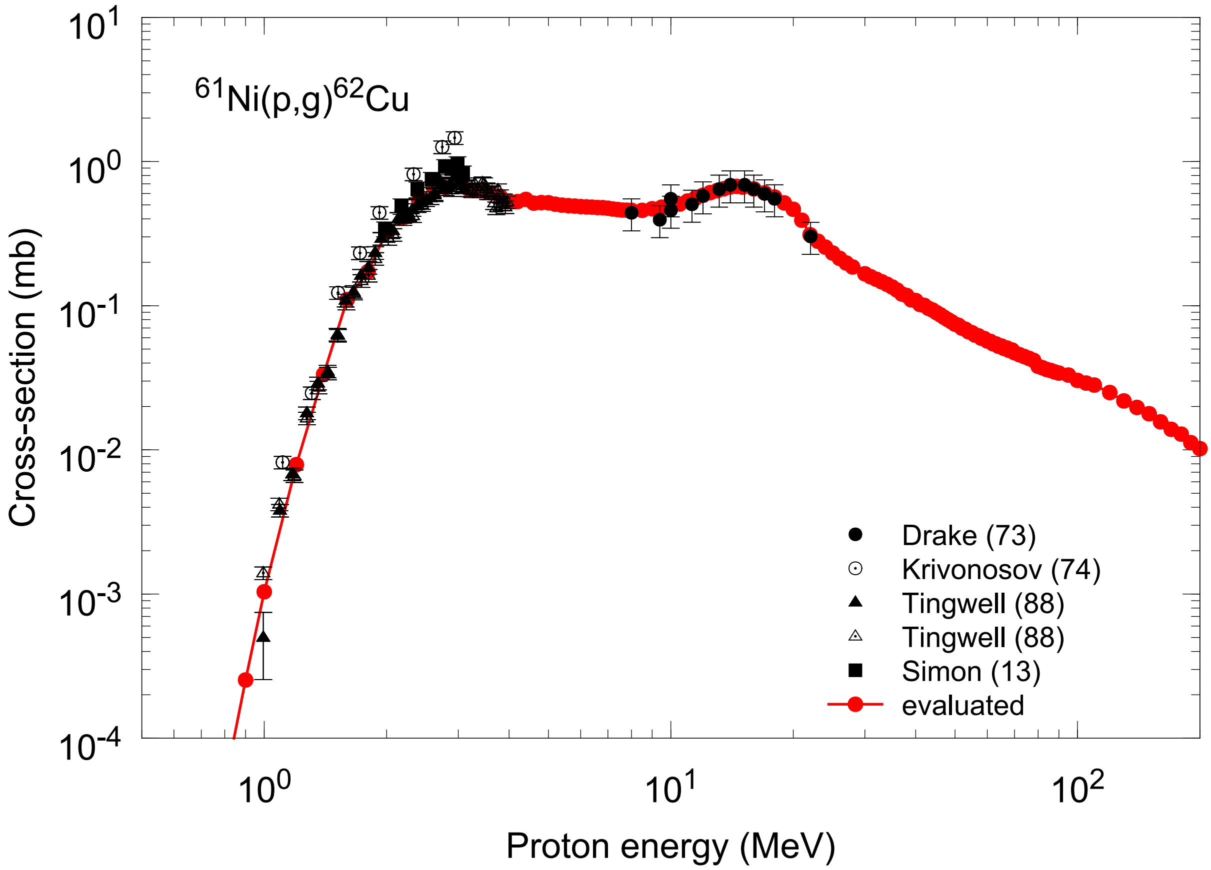
$^{61}Ni(p,x)^{58}Co$
Tanaka (72)
Sudar (93)
evaluated 3
Cross-section (mb)
Proton energy (MeV)

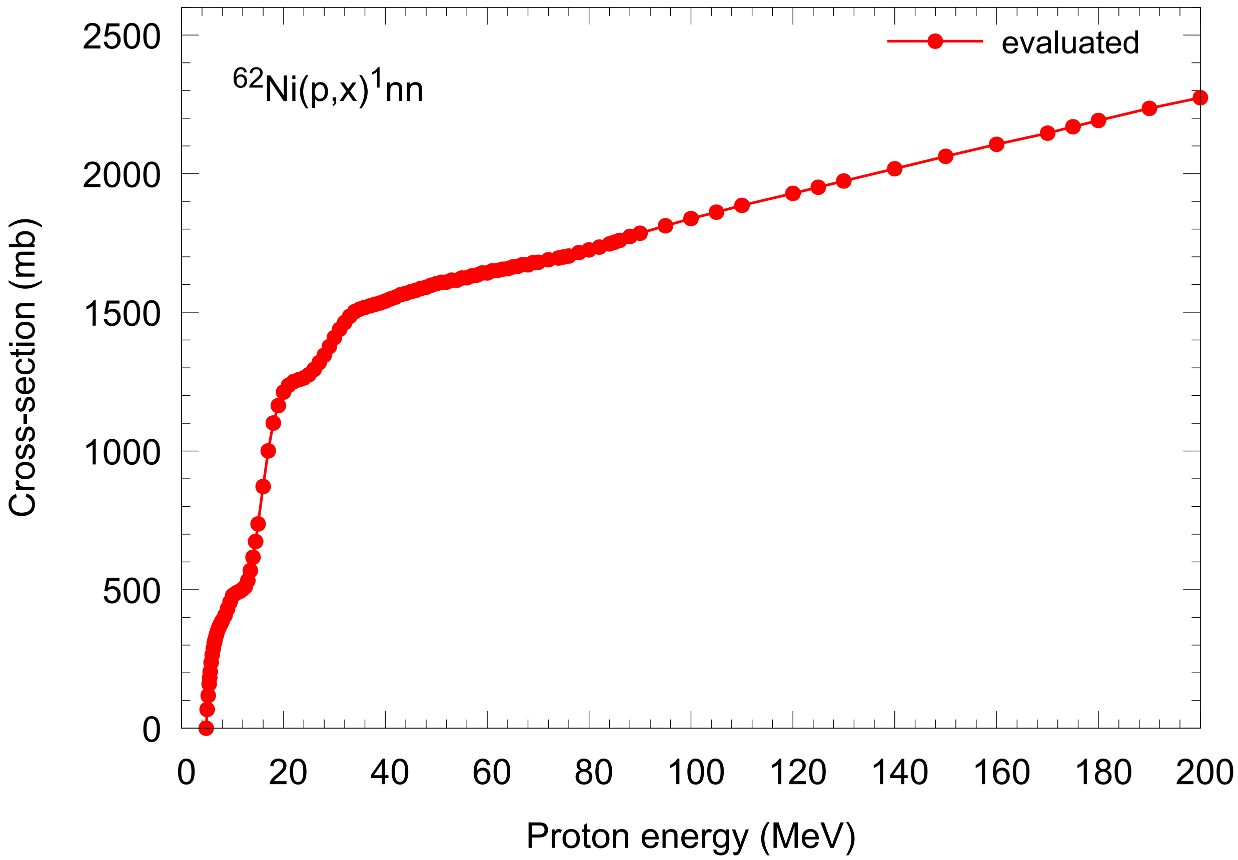


$^{61}Ni(p,2n)^{60}Cu$
Cross-section (mb)
Proton energy (MeV)
Szelecsenyi (93)
evaluated

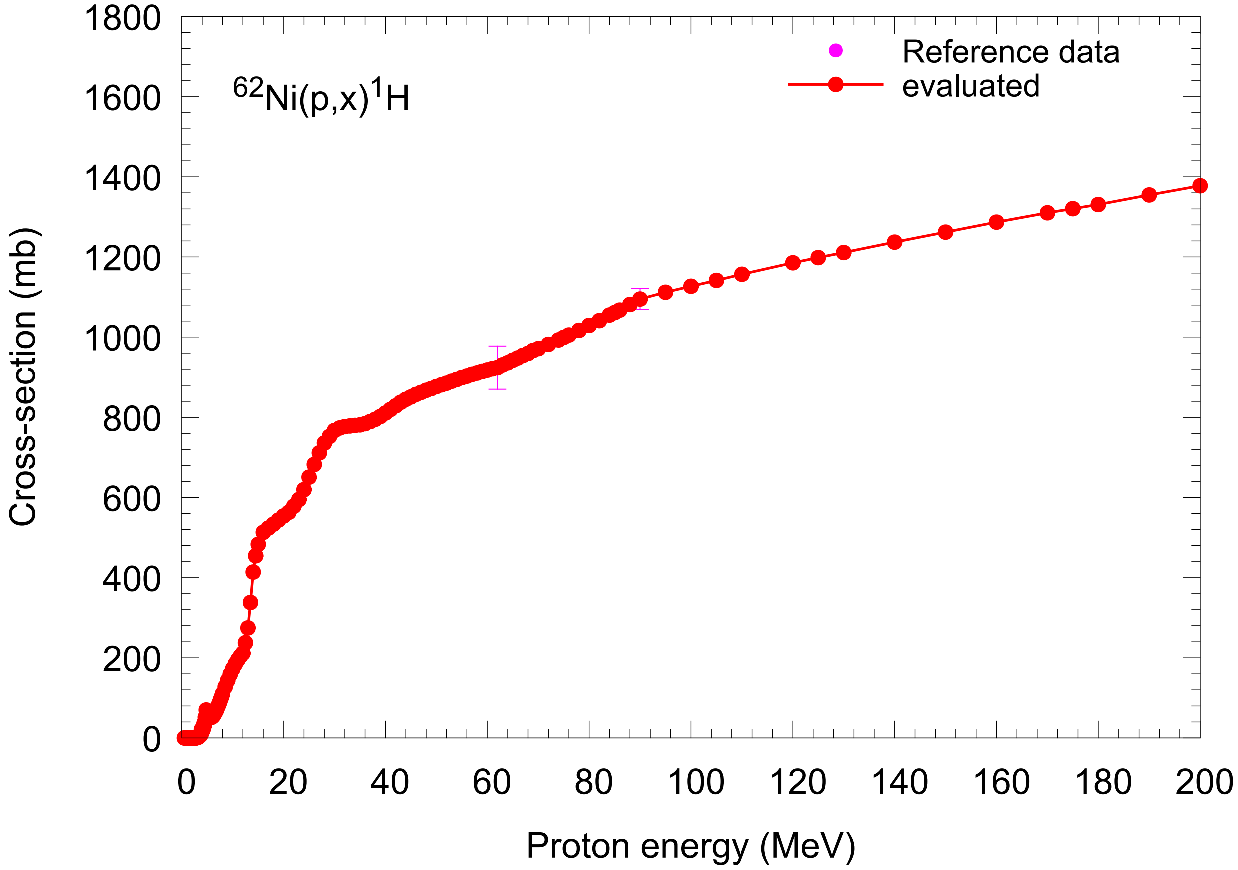


$^{61}Ni(p,n)^{61}Cu$
Blaser (51)
Blosser (55)
Tanaka (59)
Johnson (64)
Tanaka (72)
Tingwell (88)
Tingwell (88)
Antropov (92)
Szelecsenyi (93)
Singh (06)
evaluated
Cross-section (mb)
Proton energy (MeV)

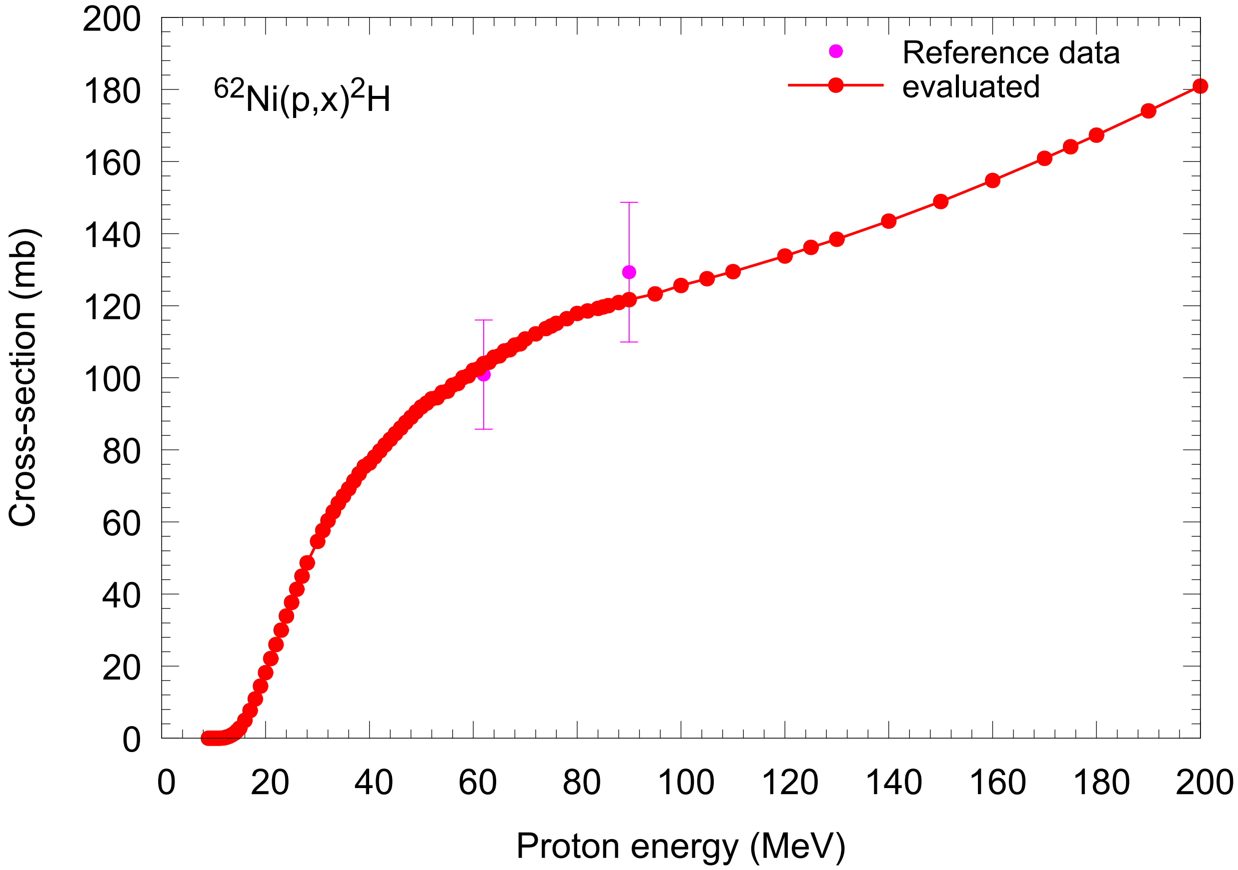

^{61}Ni(p,g)^{62}Cu
Cross-section (mb)
Proton energy (MeV)
Drake (73)
Krivonosov (74)
Tingwell (88)
Tingwell (88)
Simon (13)
evaluated



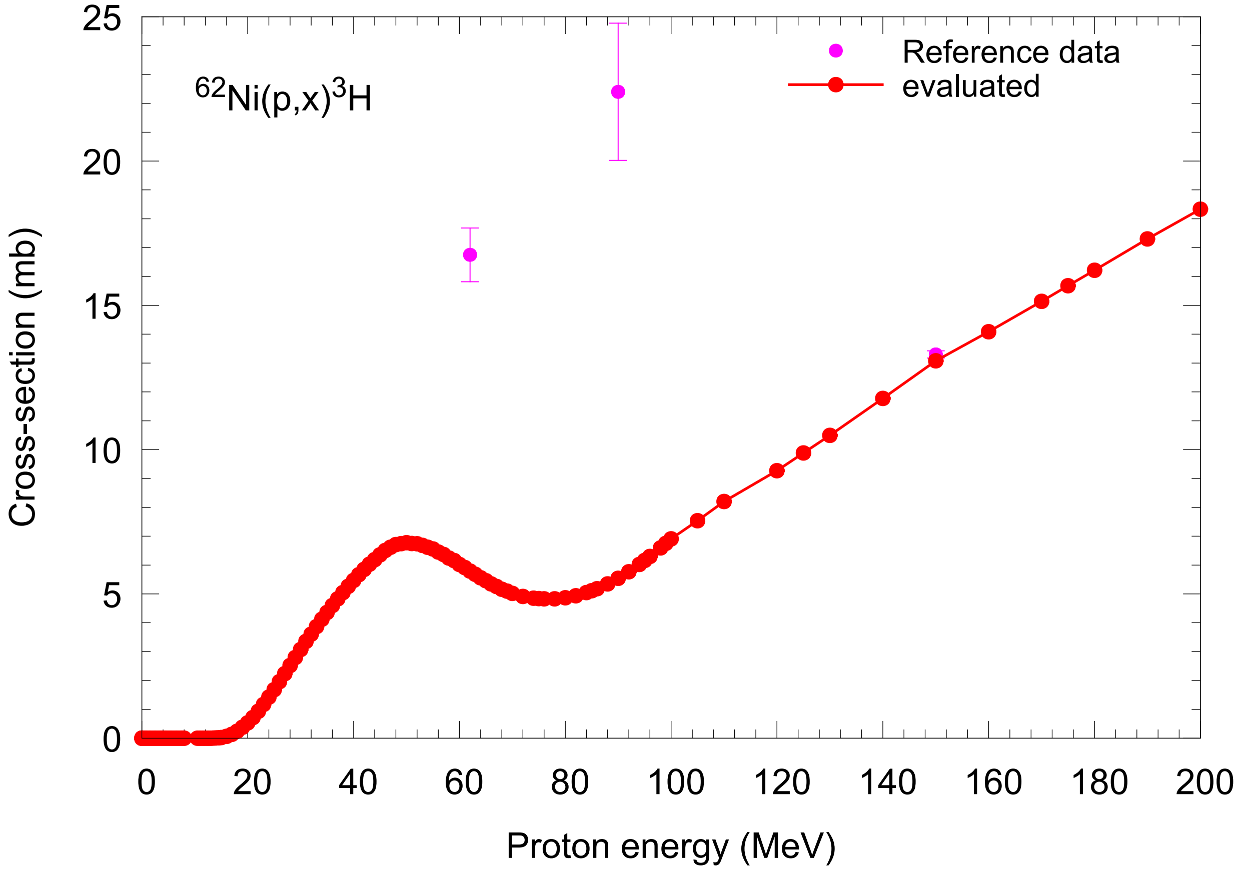
^{62}Ni(p,x)^{1}nn
evaluated
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
0
20
40
60
80
100
120
140
160
180
200



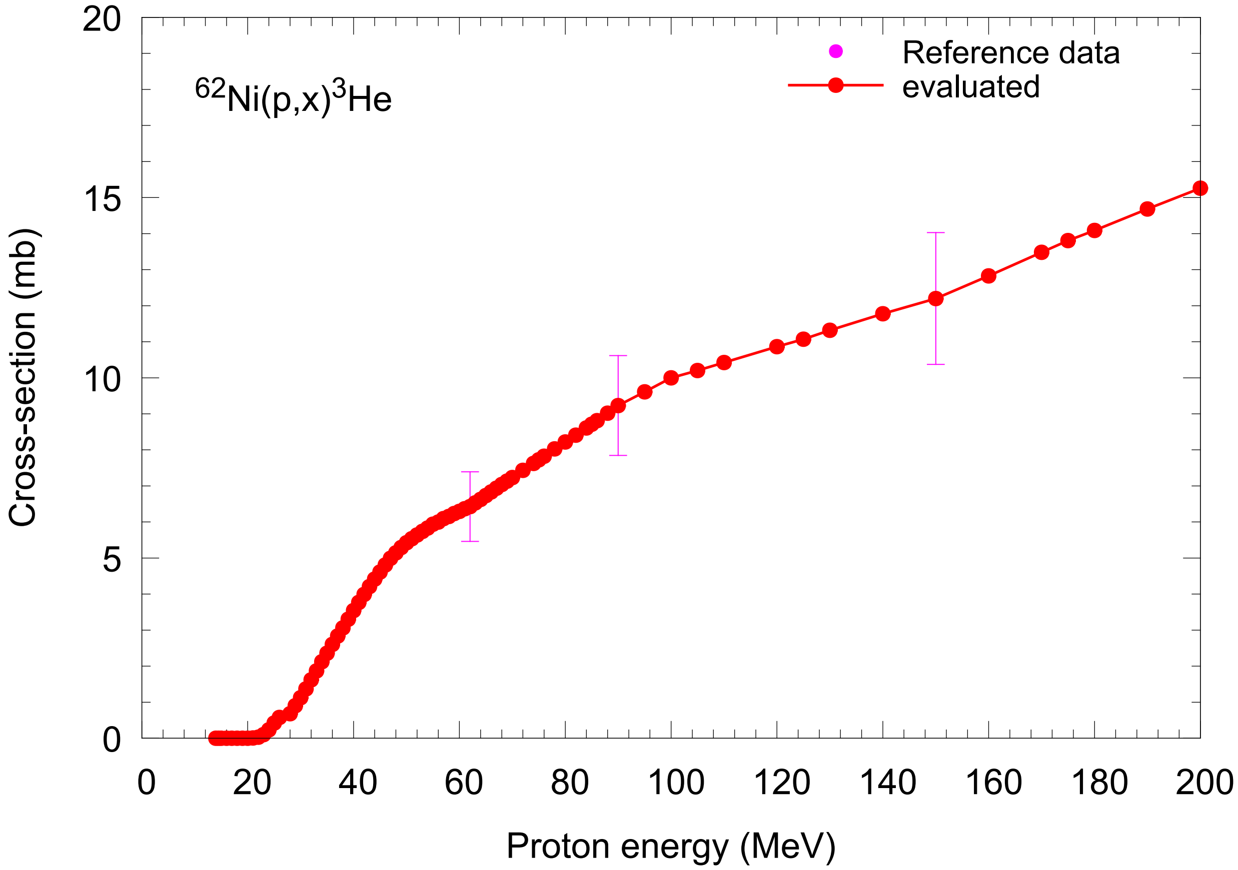
^{62}Ni(p,x)^{1}H
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
1600
1800
0
20
40
60
80
100
120
140
160
180
200

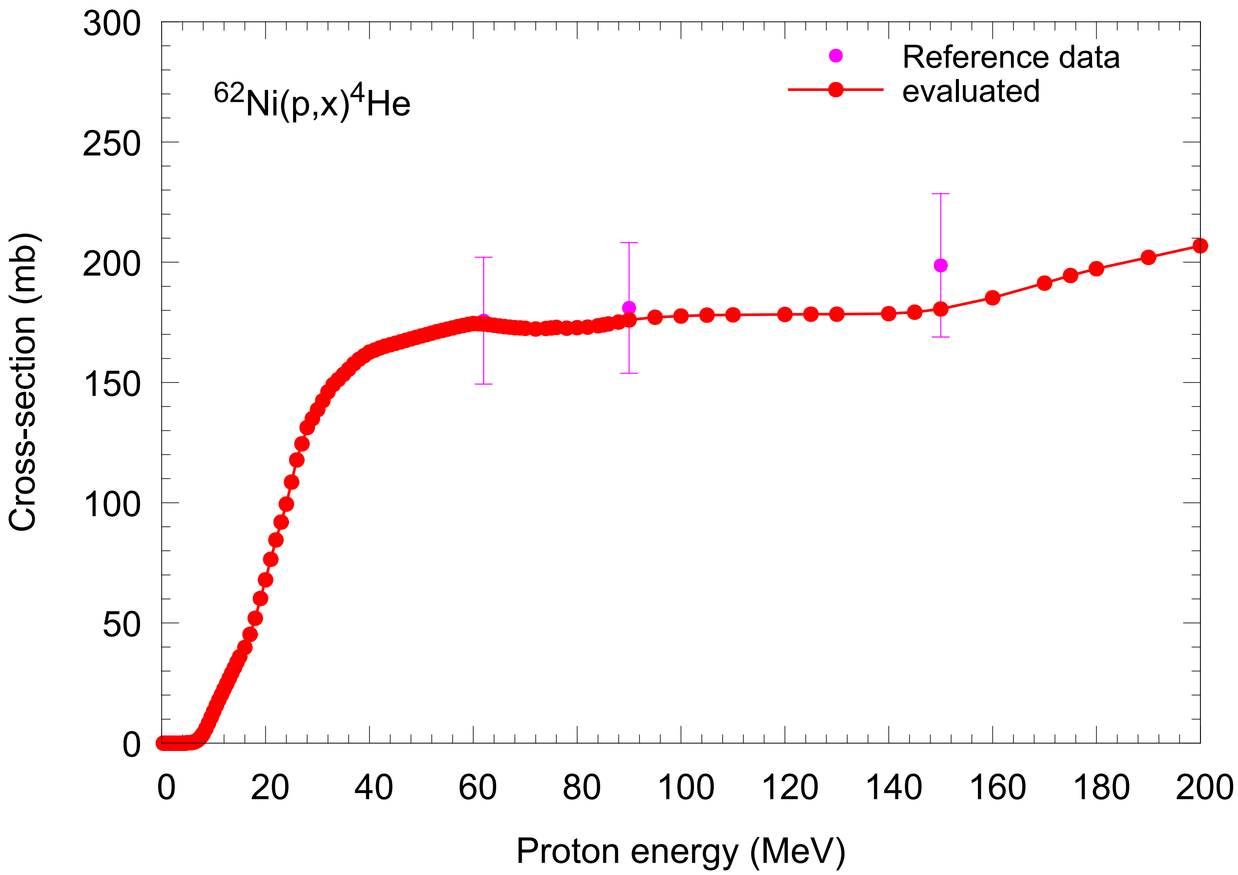


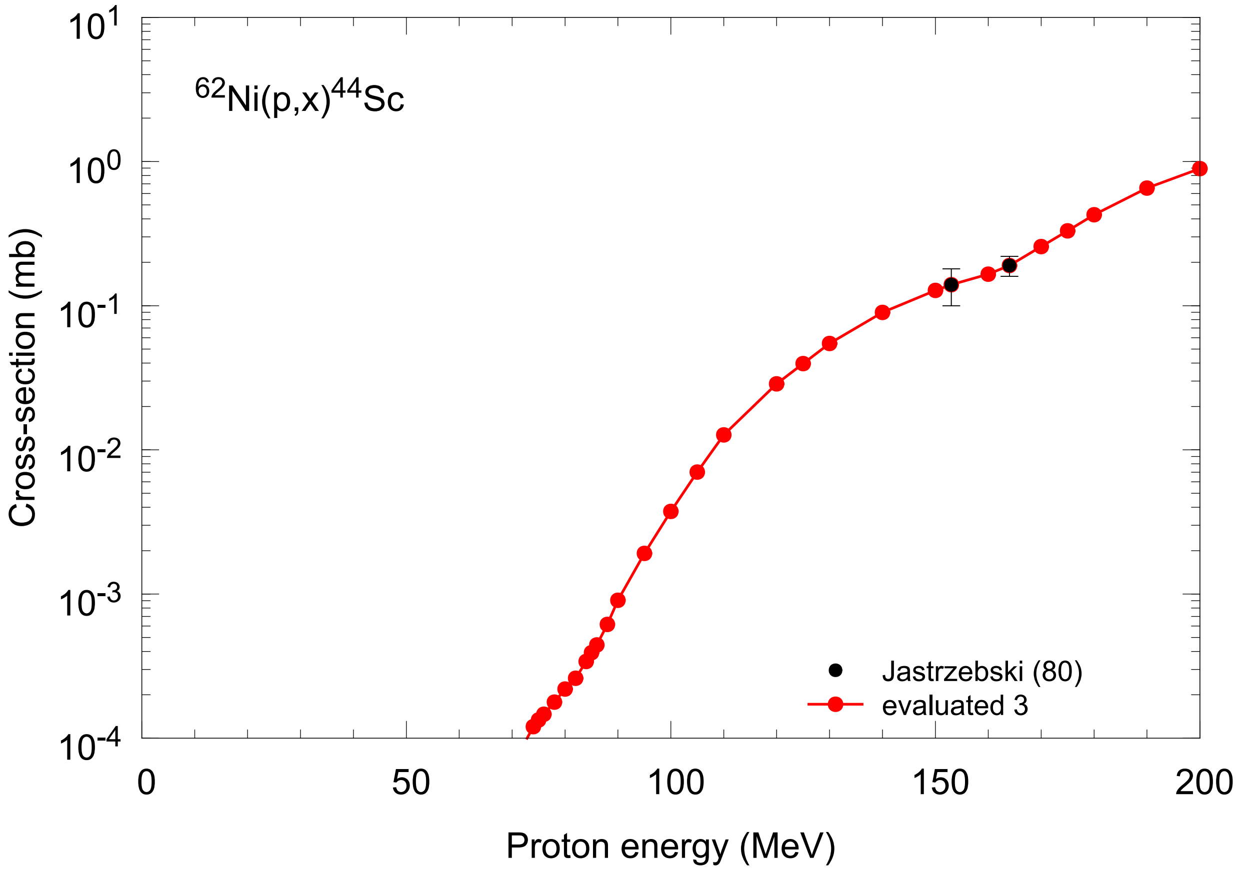
$^{62}Ni(p,x)^2H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)



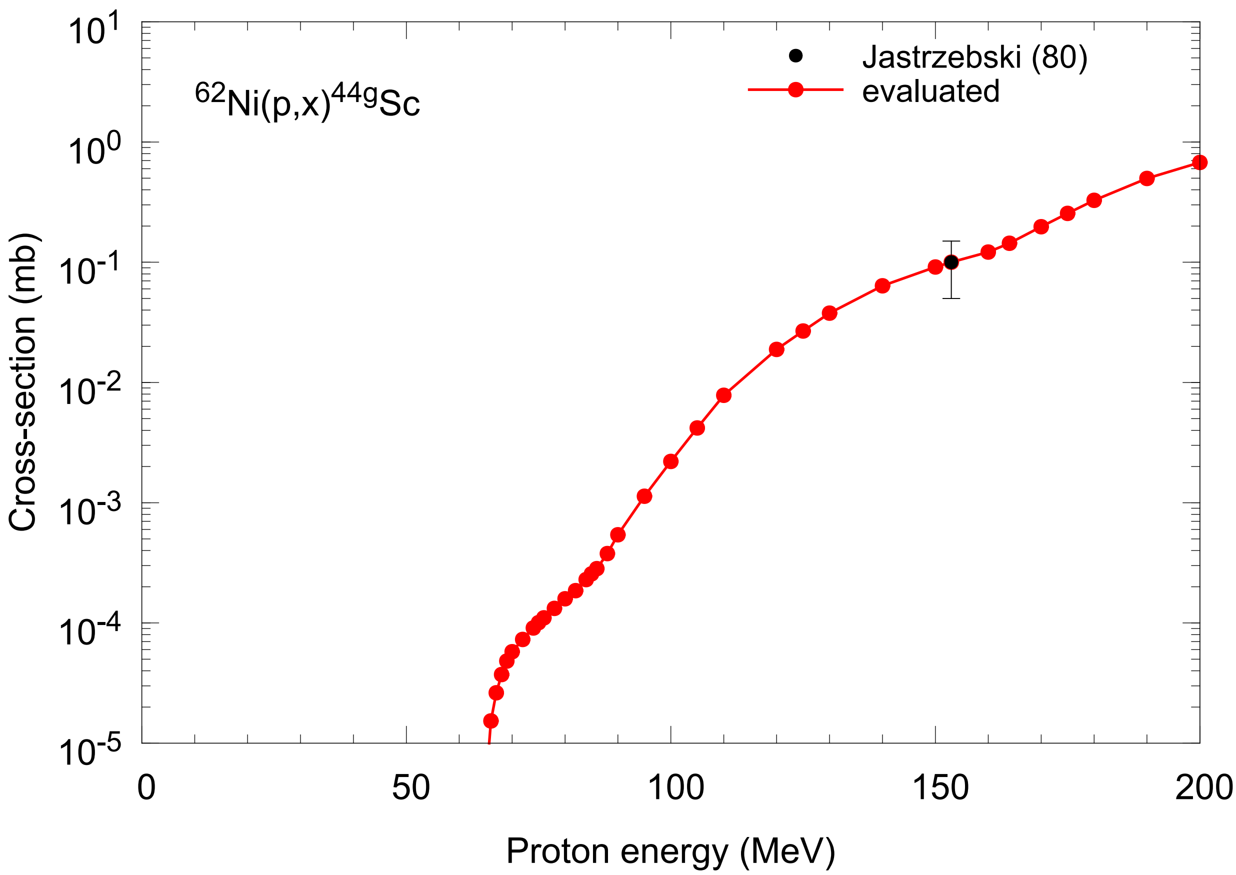
$^{62}Ni(p,x)^3H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)


Reference data
evaluated
$^{62}Ni(p,x)^{3}He$
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
0
20
40
60
80
100
120
140
160
180
200

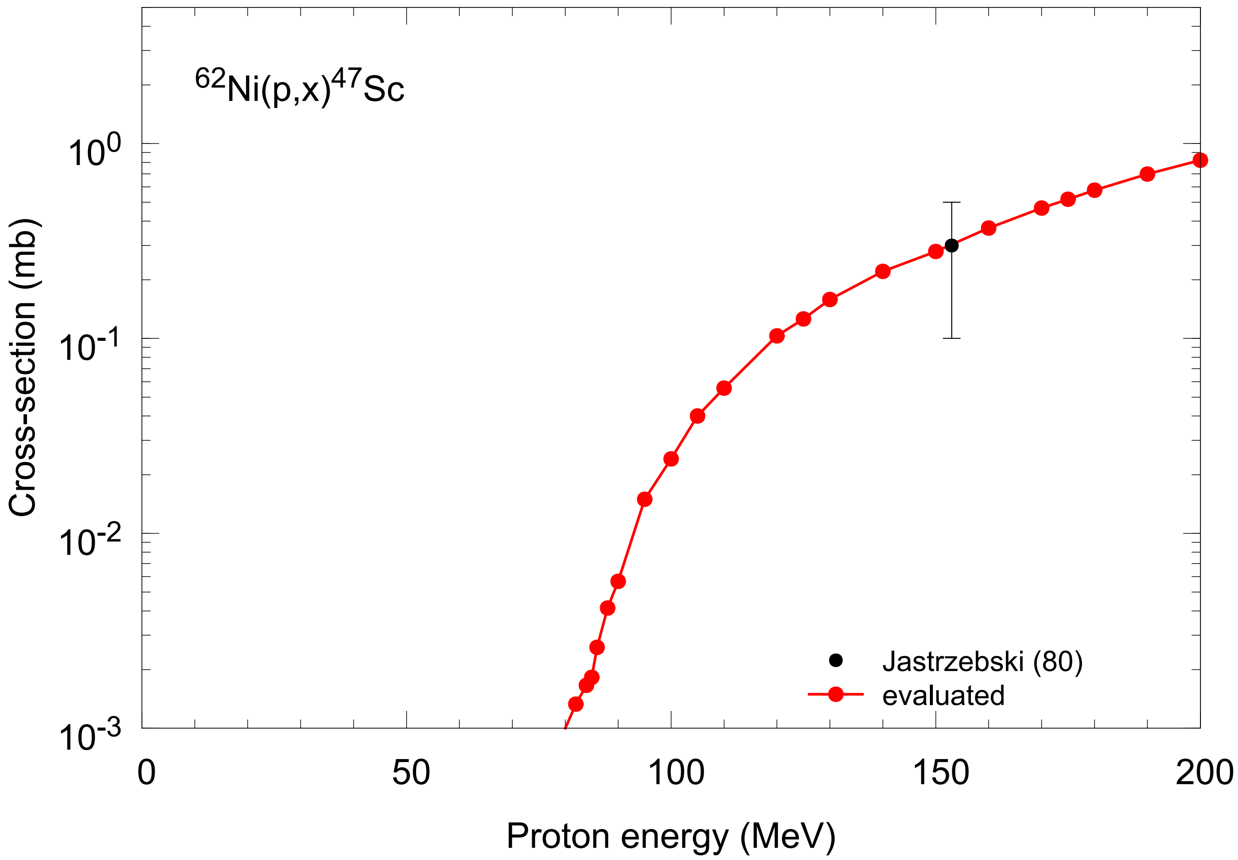

Reference data
evaluated
$^{62}Ni(p,x)^{4}He$
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
300
0
20
40
60
80
100
120
140
160
180
200



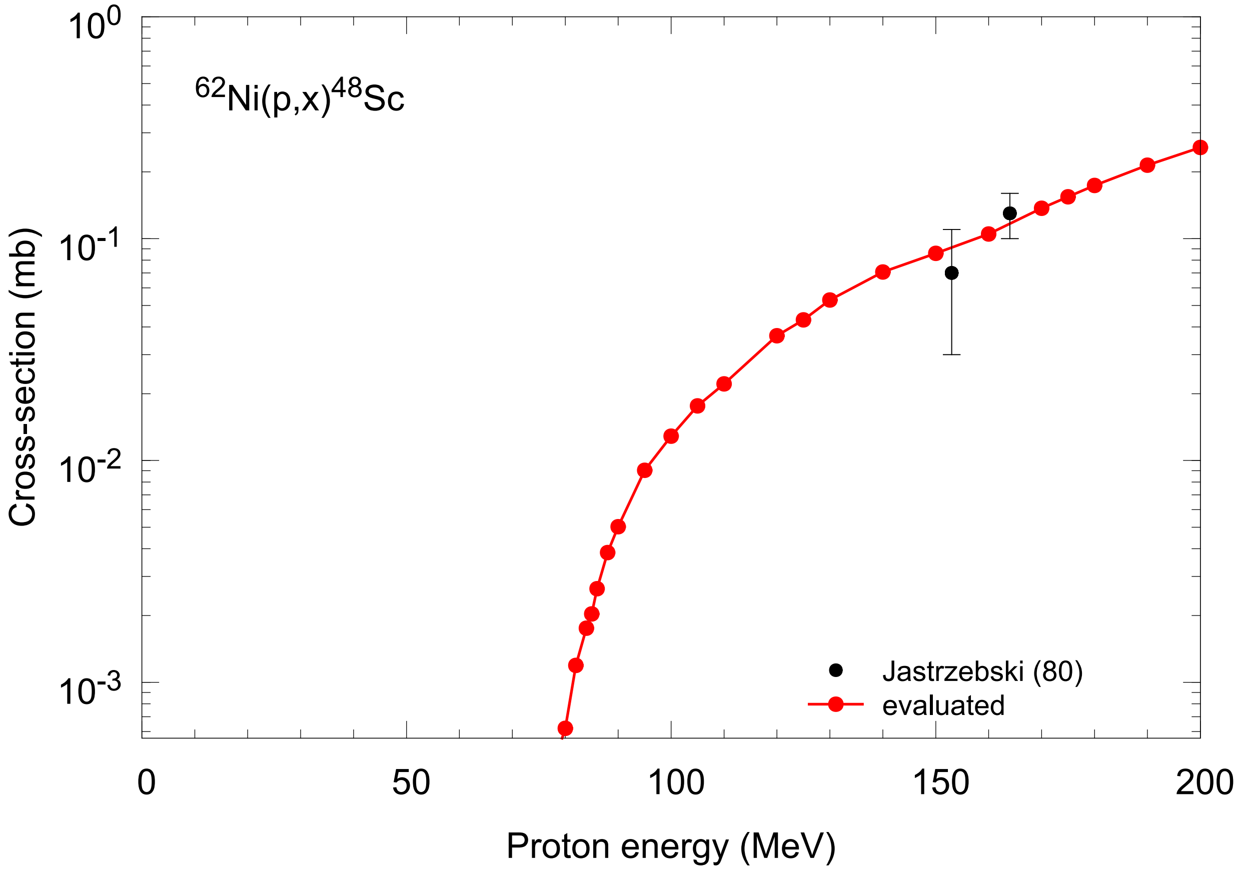
$^{62}Ni(p,x)^{44}Sc$
Jastrzebski (80)
evaluated 3
Cross-section (mb)
Proton energy (MeV)



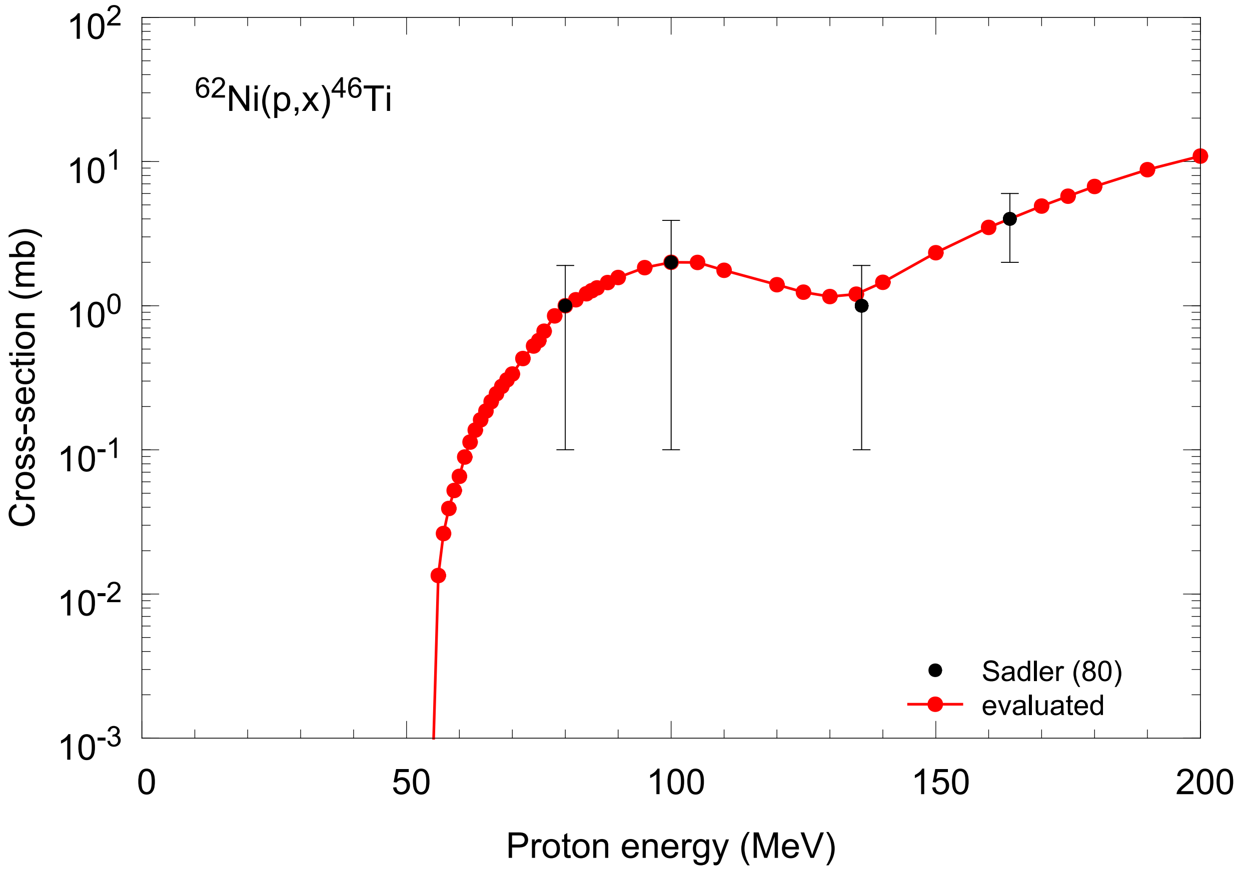
$^{62}Ni(p,x)^{44g}Sc$
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)

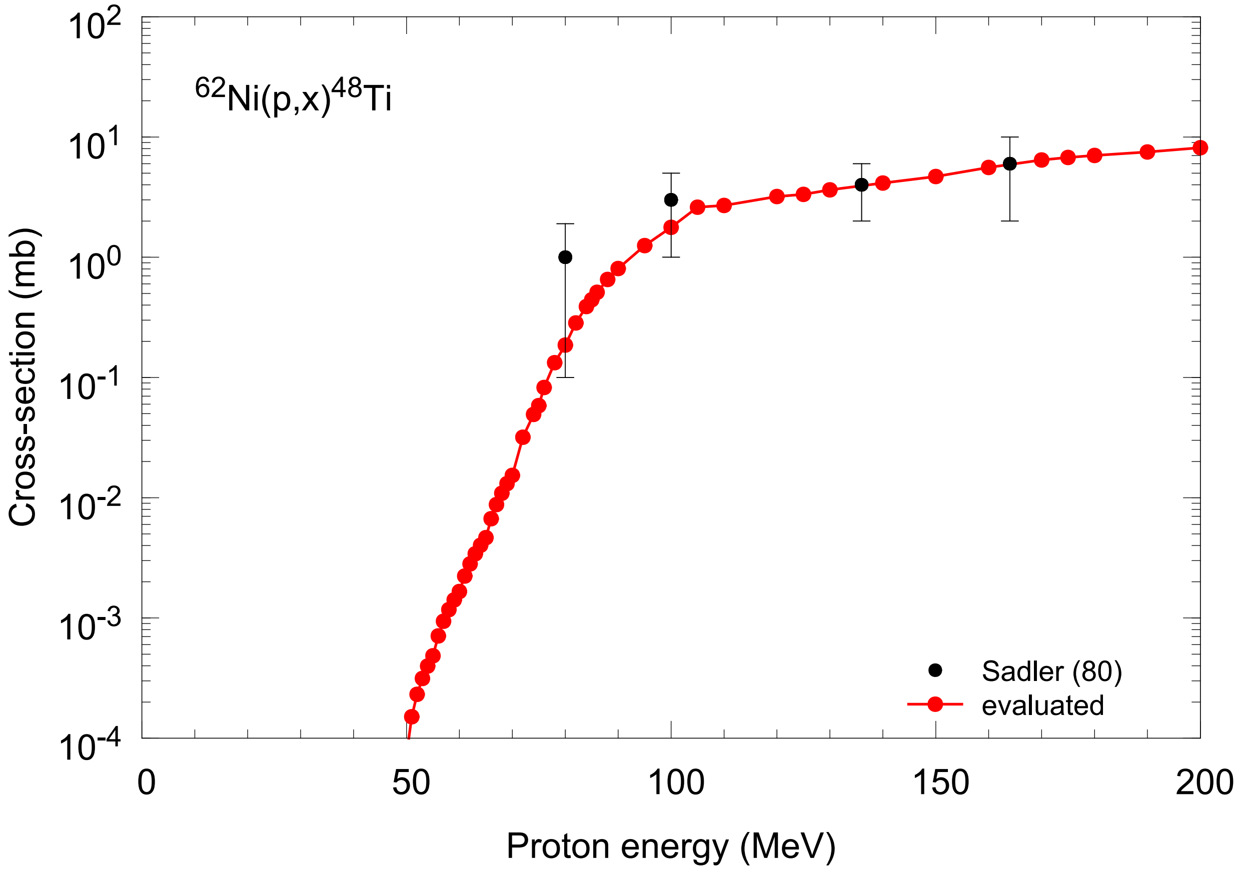


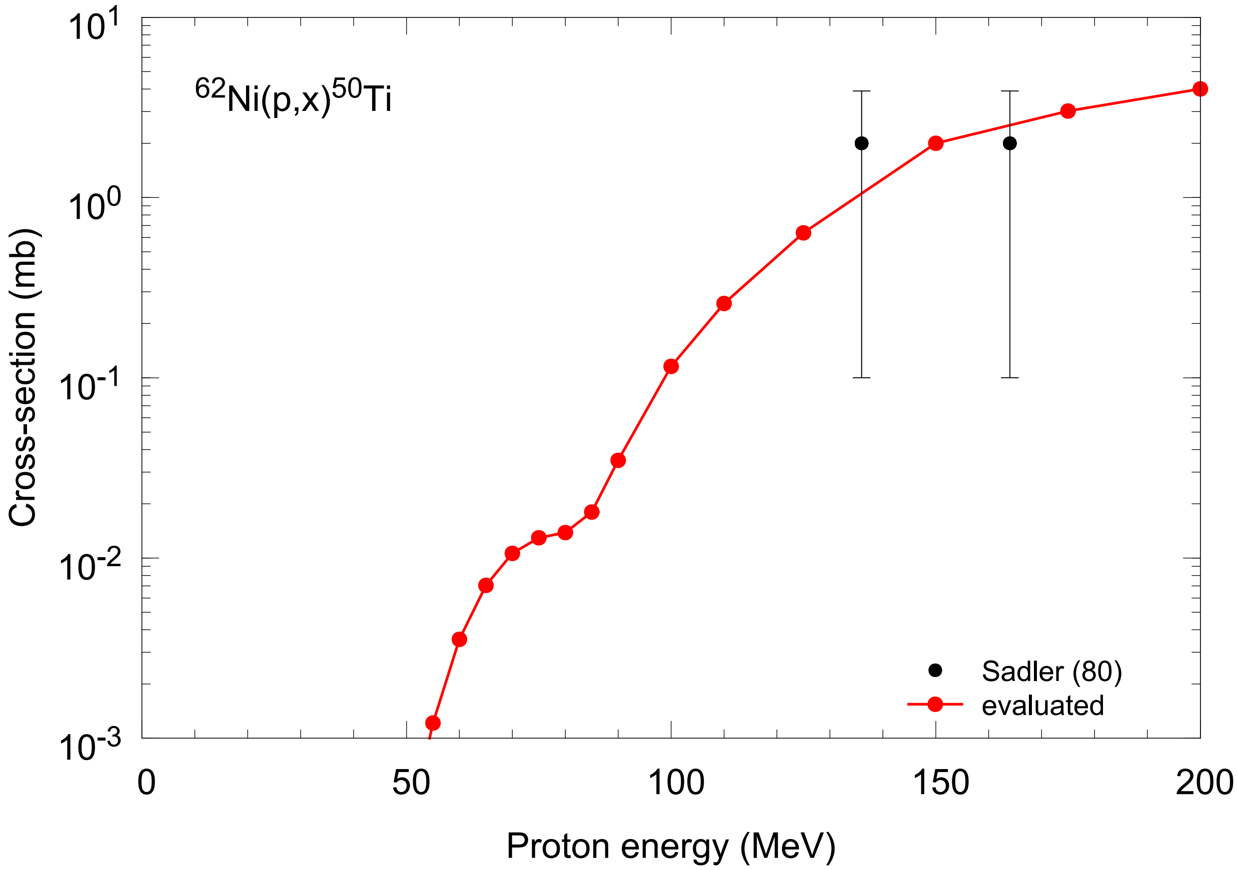
$^{62}Ni(p,x)^{47}Sc$
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Jastrzebski (80)
evaluated



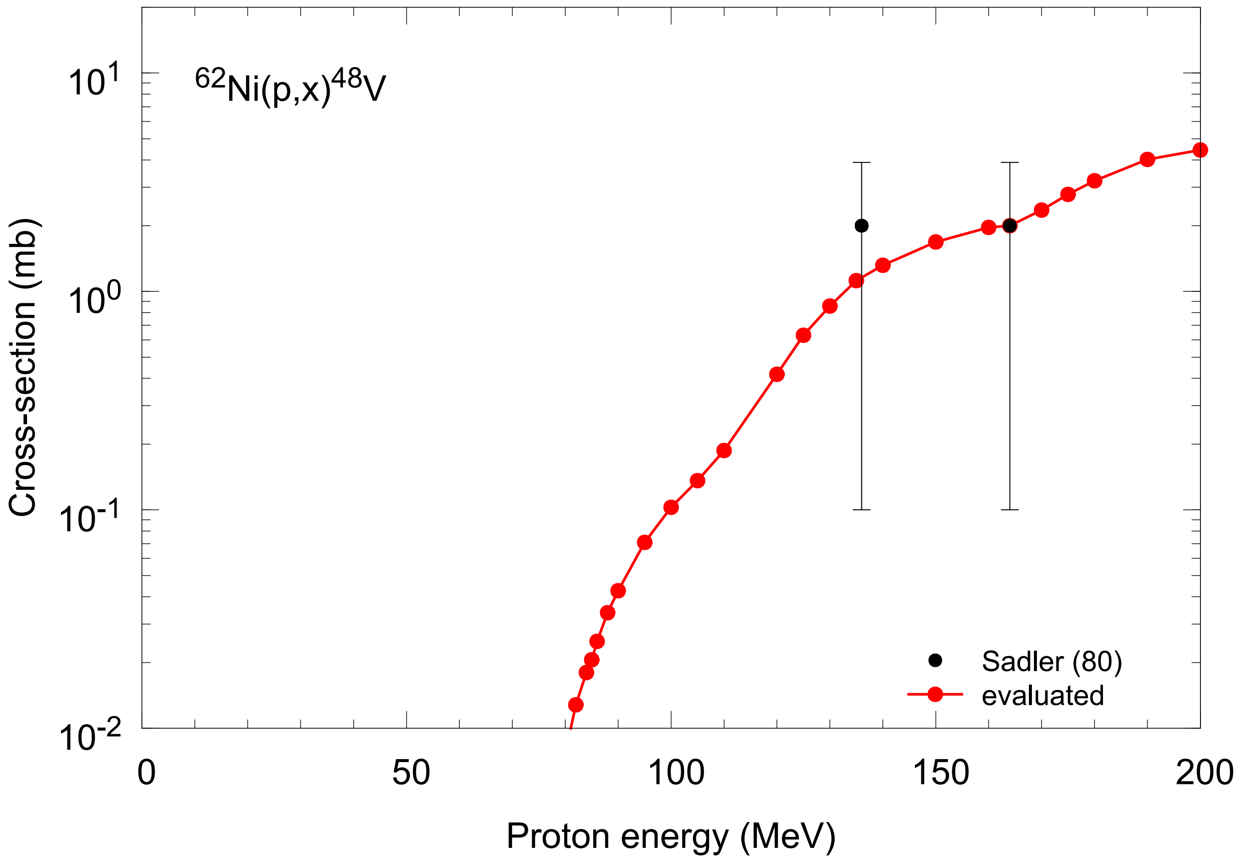
$^{62}Ni(p,x)^{48}Sc$
Cross-section (mb)
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Jastrzebski (80)
evaluated


^{62}Ni(p,x)^{46}Ti
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200

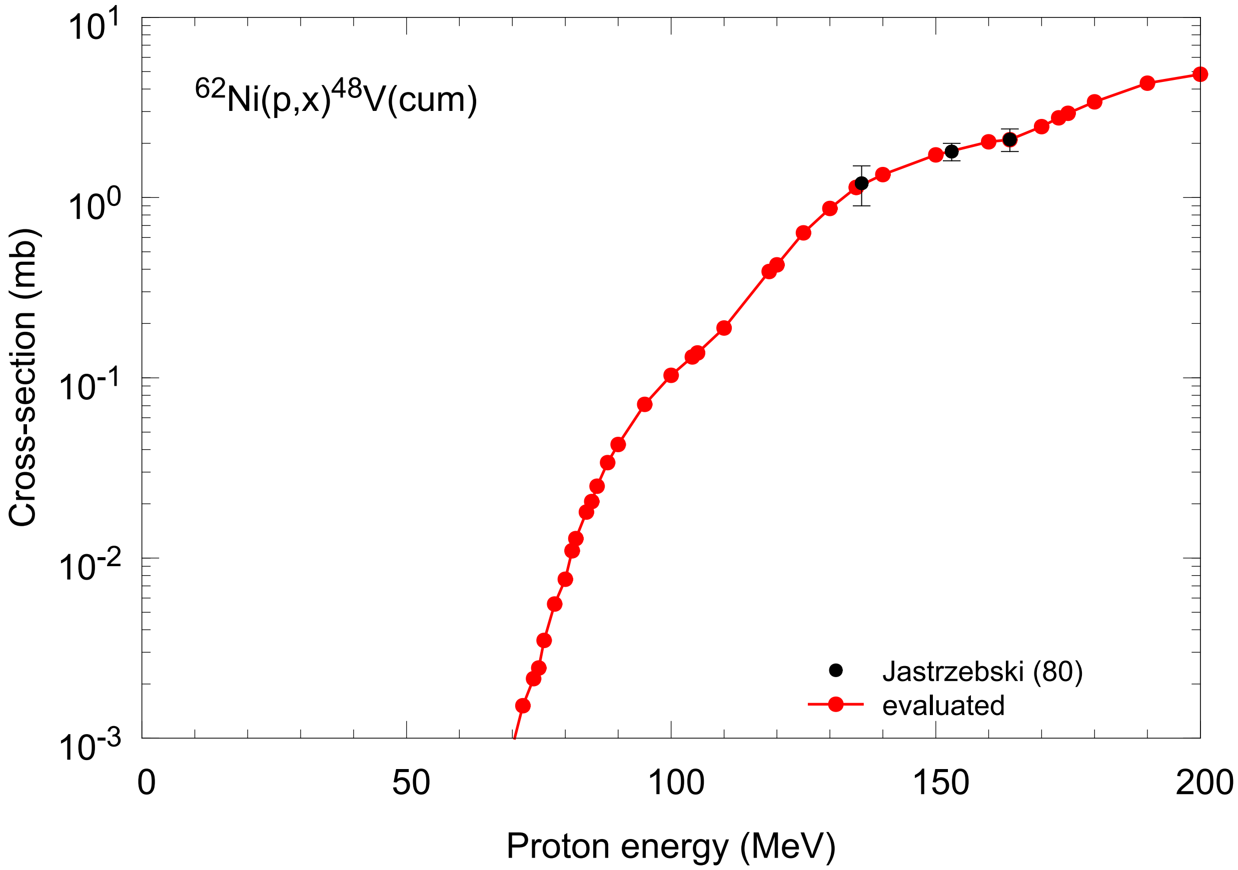

^{62}Ni(p,x)^{48}Ti
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200



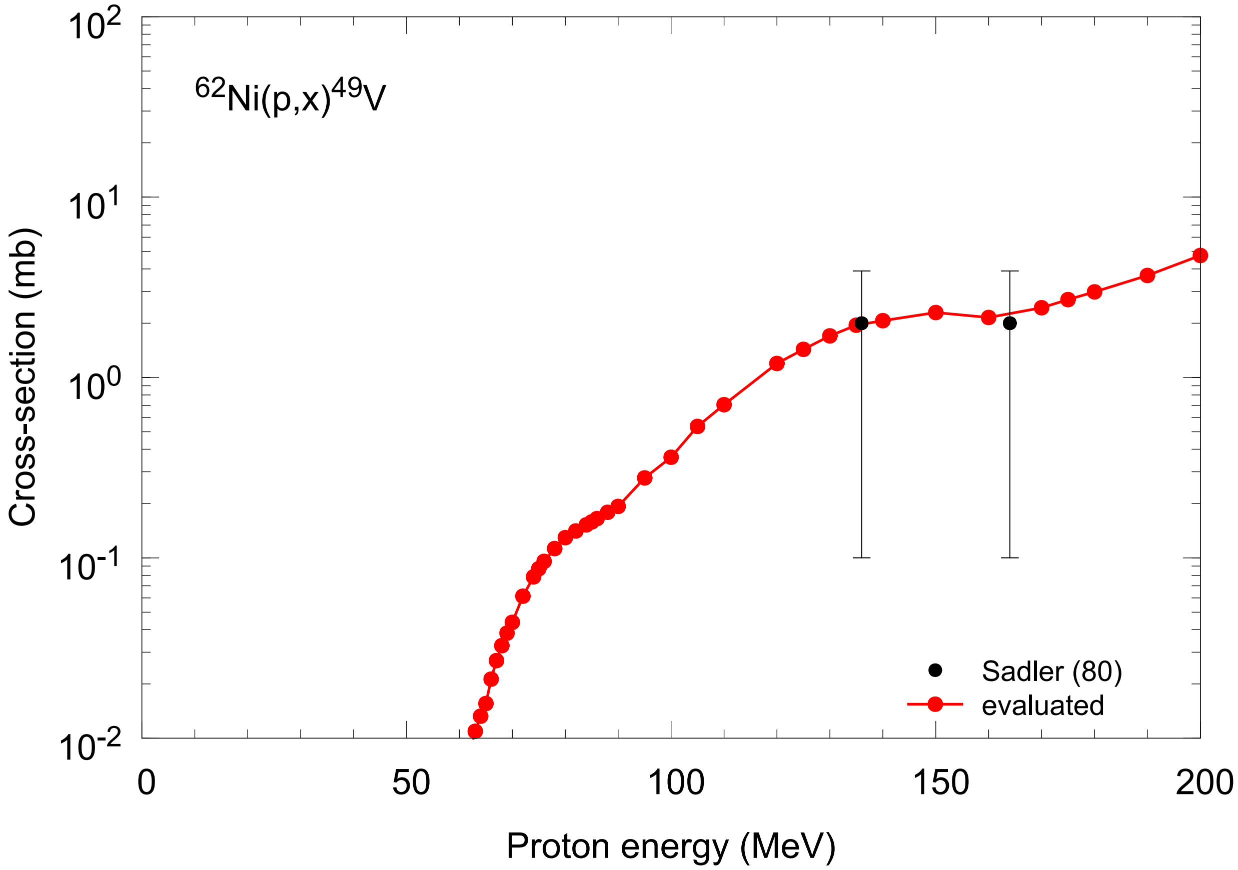
$^{62}Ni(p,x)^{50}Ti$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200



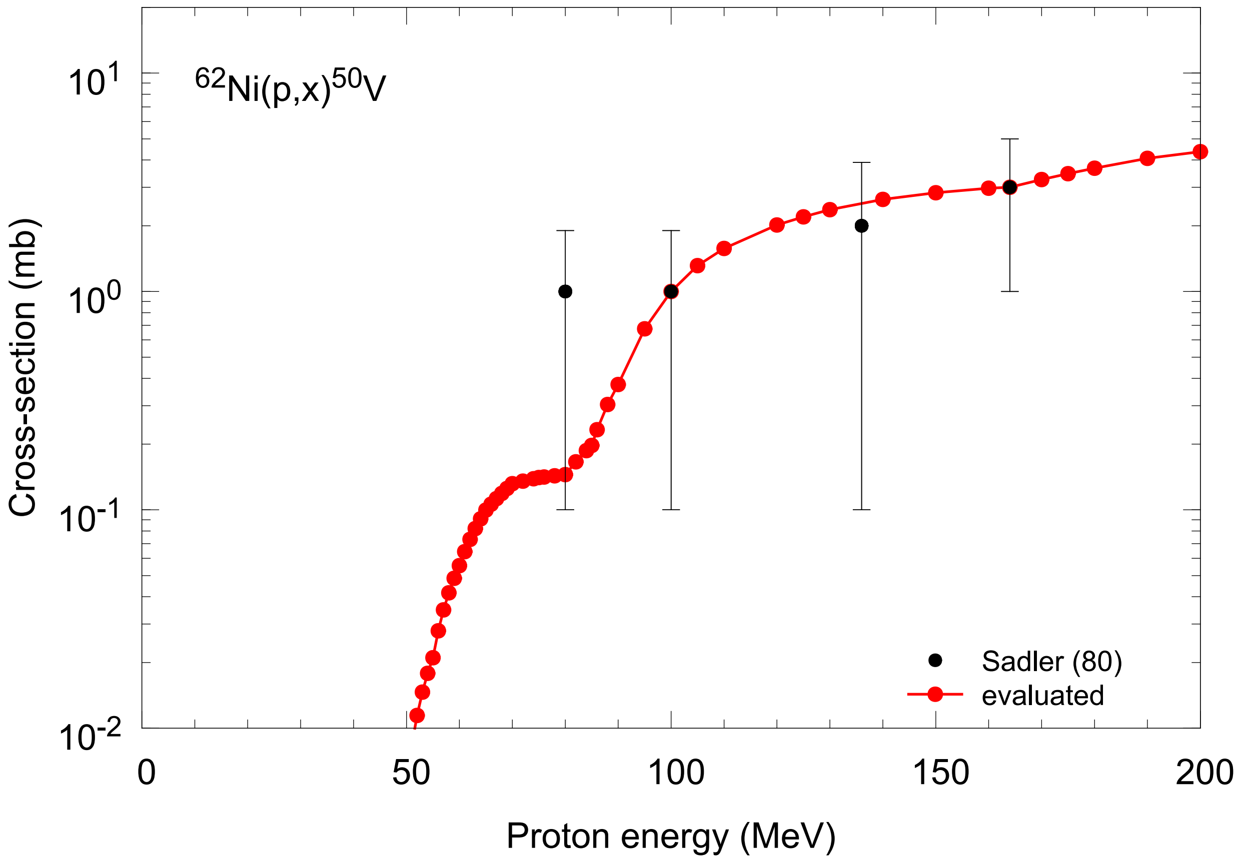
$^{62}Ni(p,x)^{48}V$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200



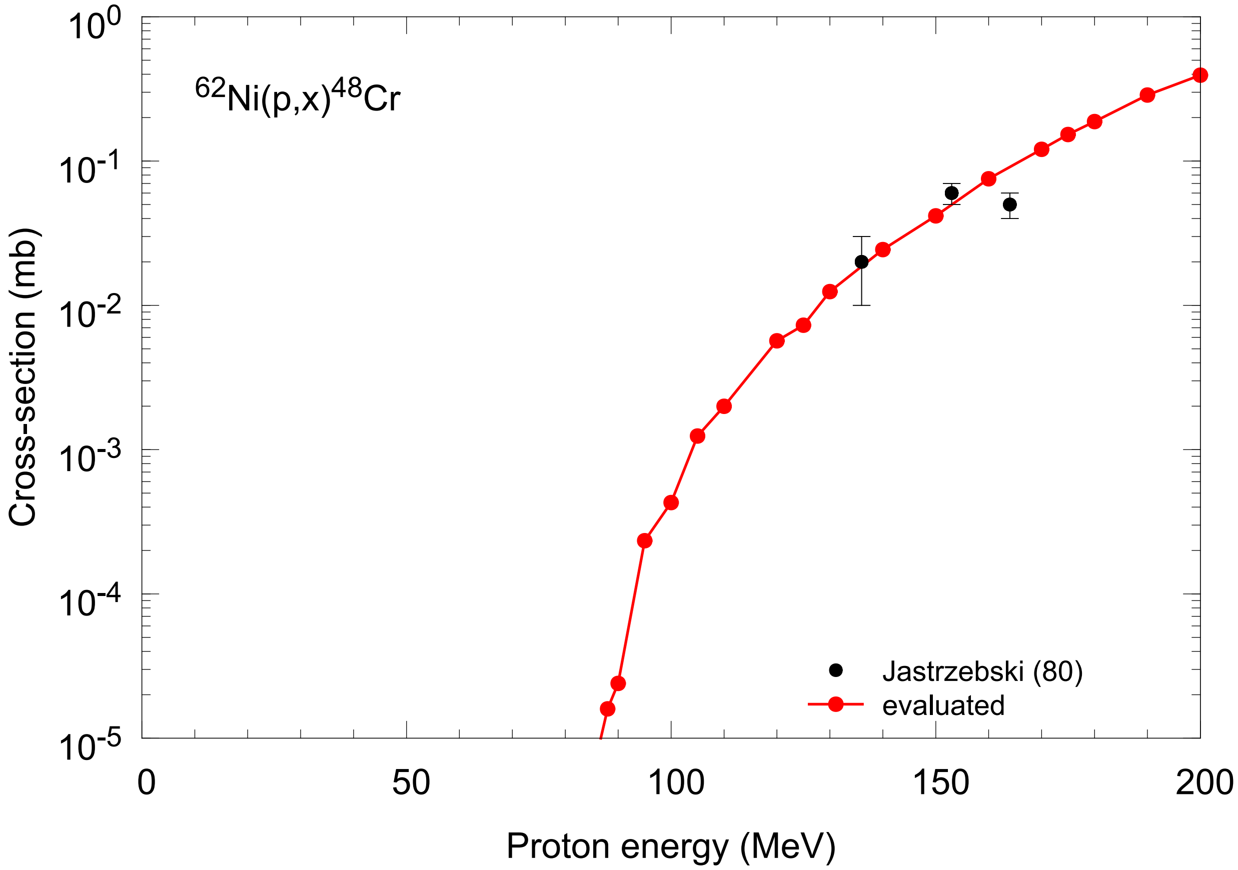
^{62}Ni(p,x)^{48}V(cum)
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



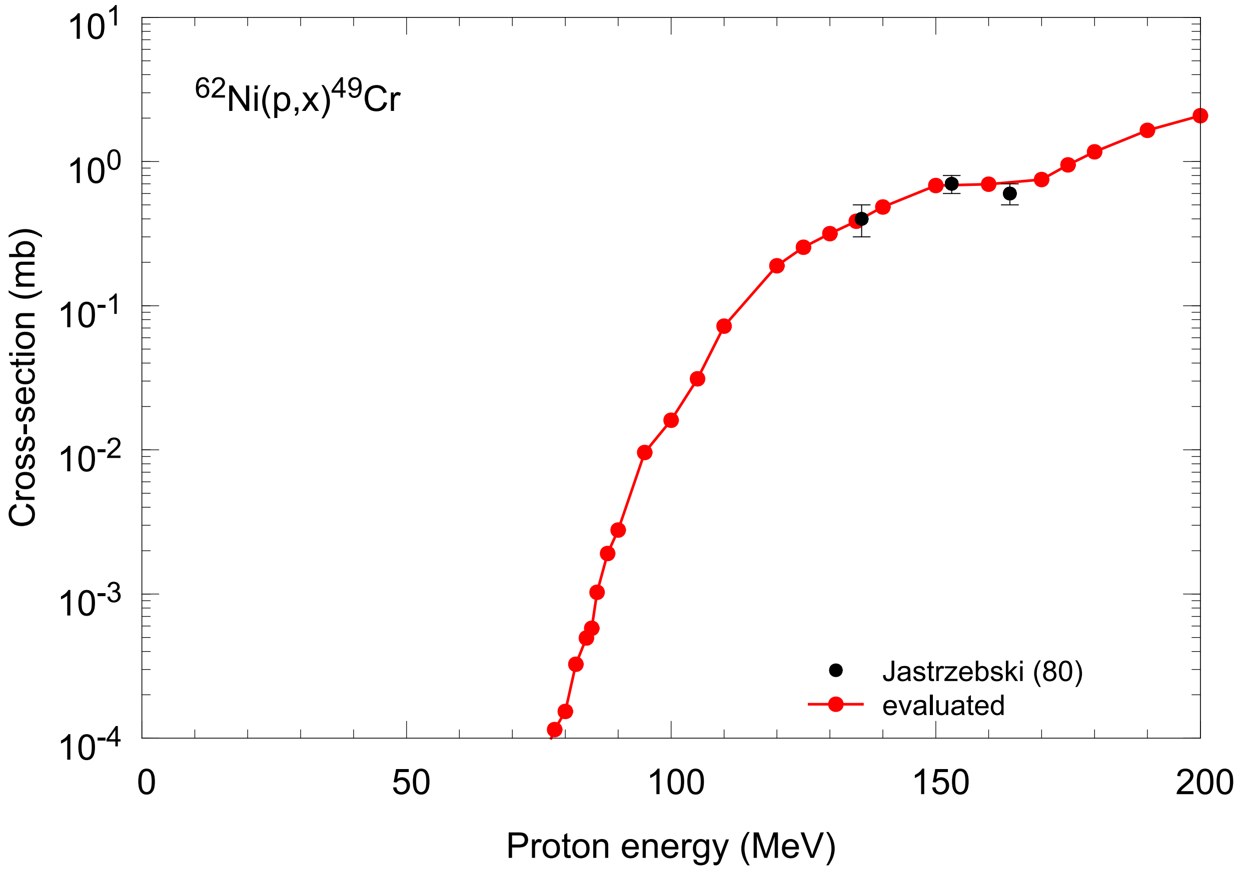
^{62}Ni(p,x)^{49}V
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



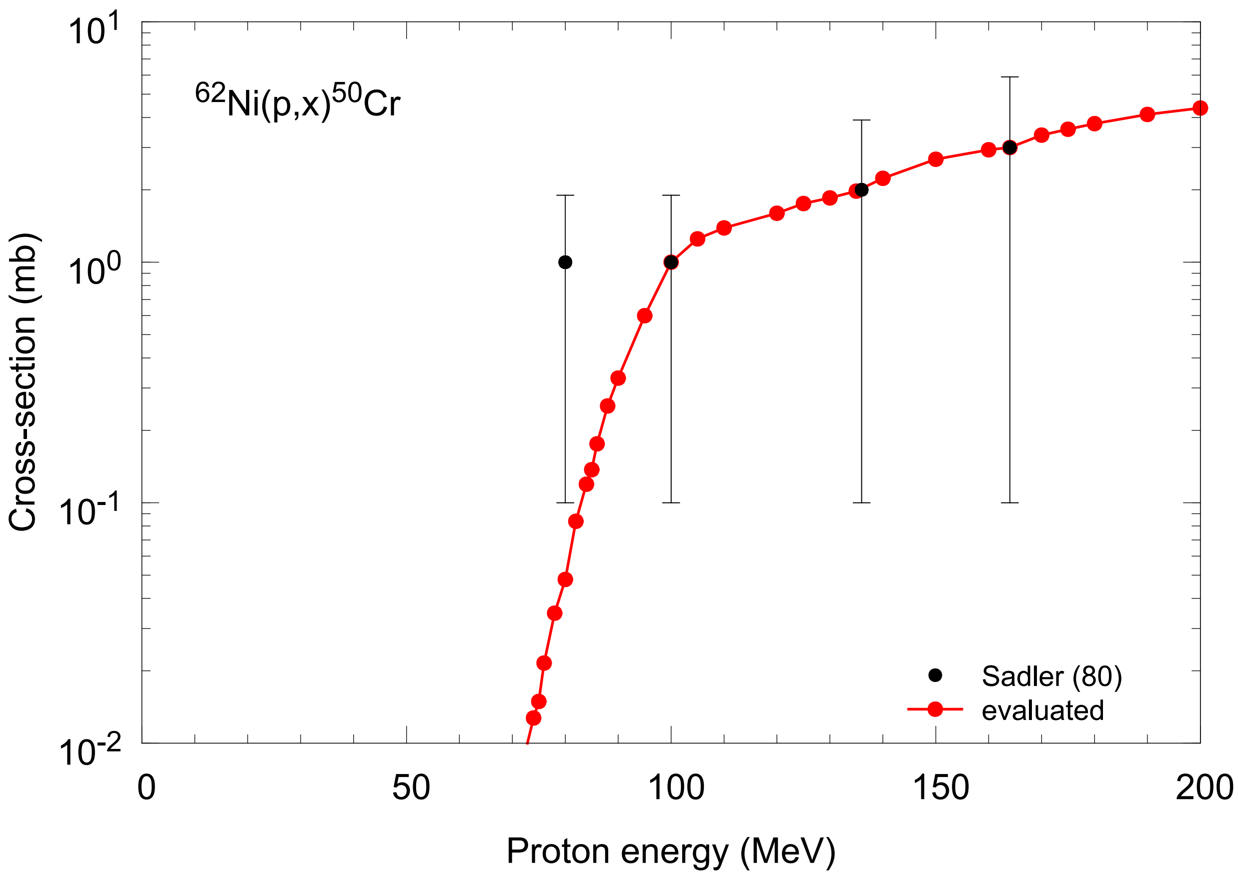
$^{62}Ni(p,x)^{50}V$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



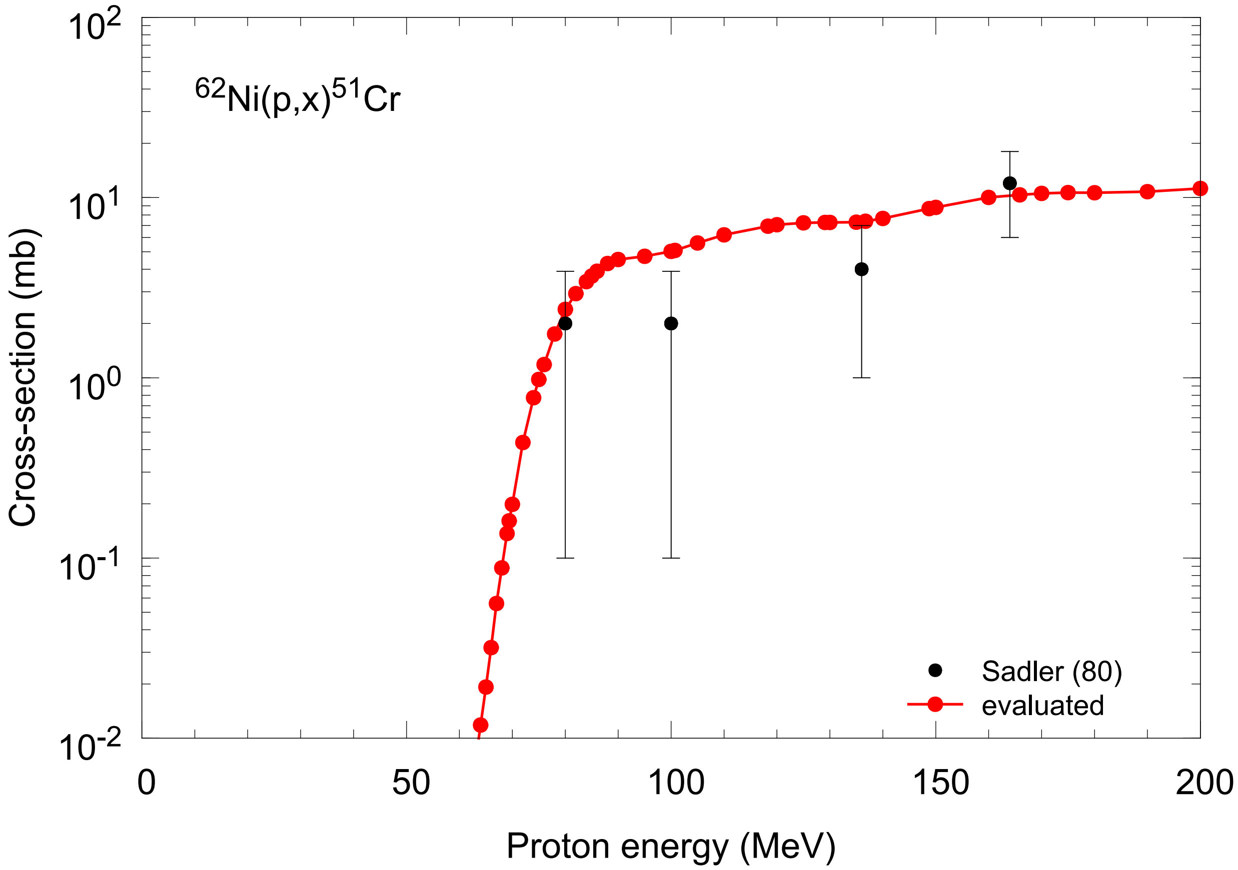
$^{62}Ni(p,x)^{48}Cr$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated



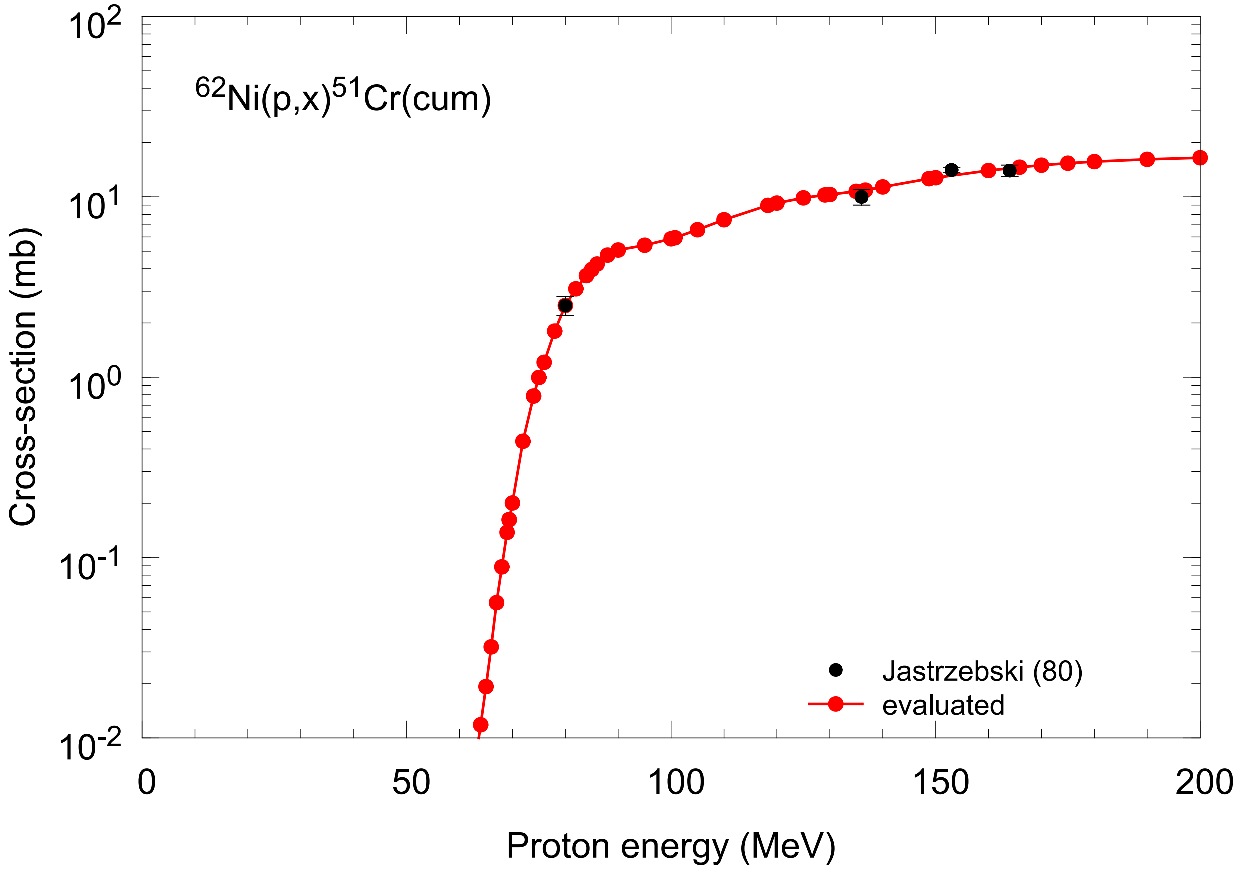
$^{62}Ni(p,x)^{49}Cr$
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



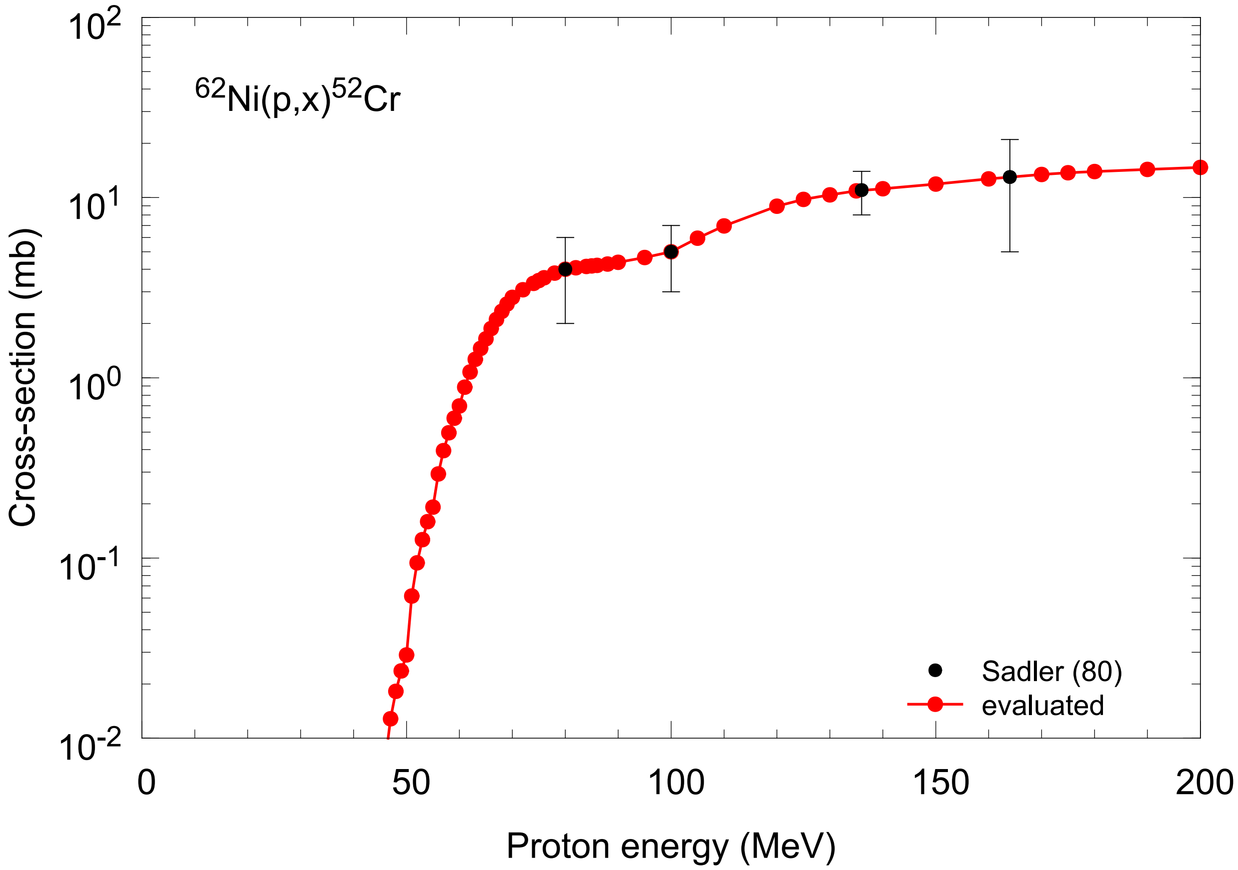
$^{62}Ni(p,x)^{50}Cr$
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



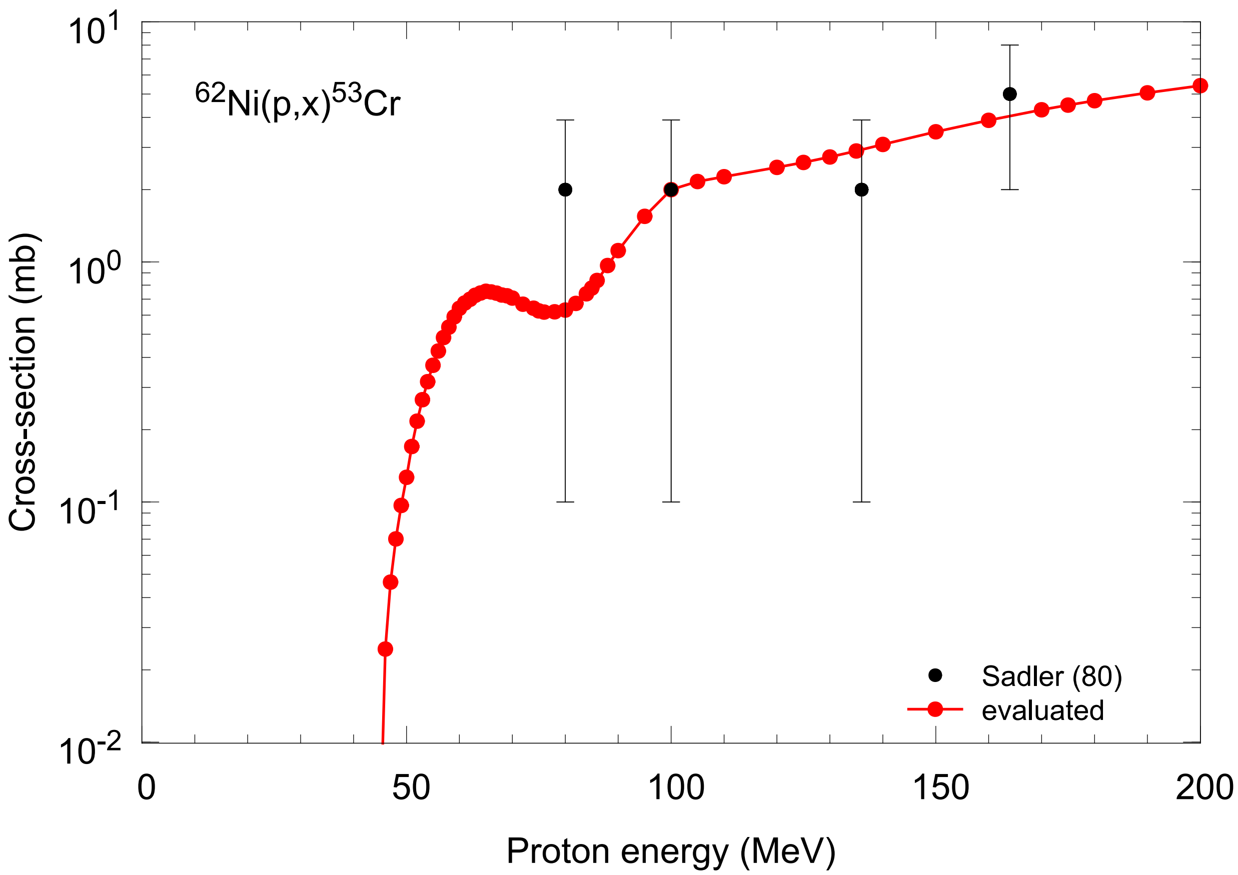
$^{62}Ni(p,x)^{51}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



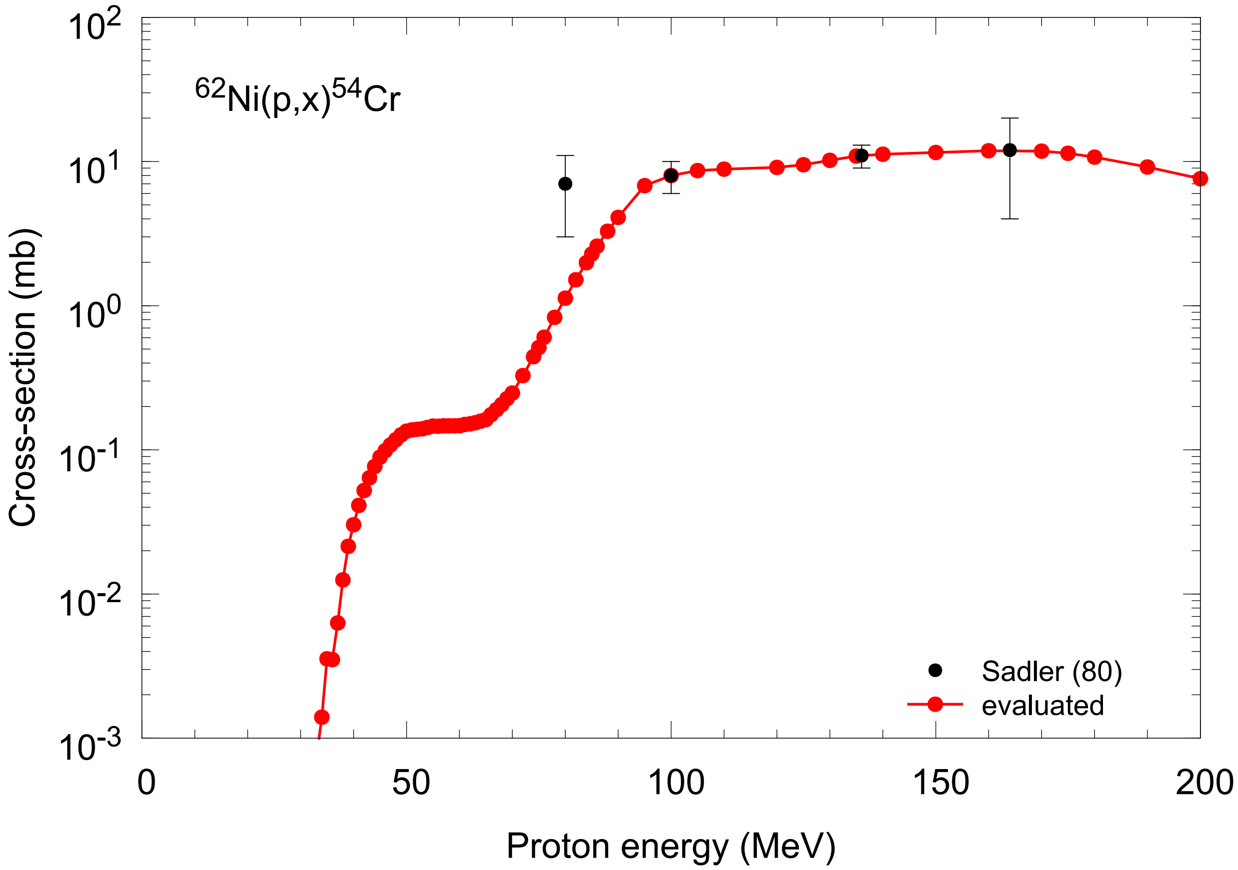
$^{62}Ni(p,x)^{51}Cr(cum)$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated

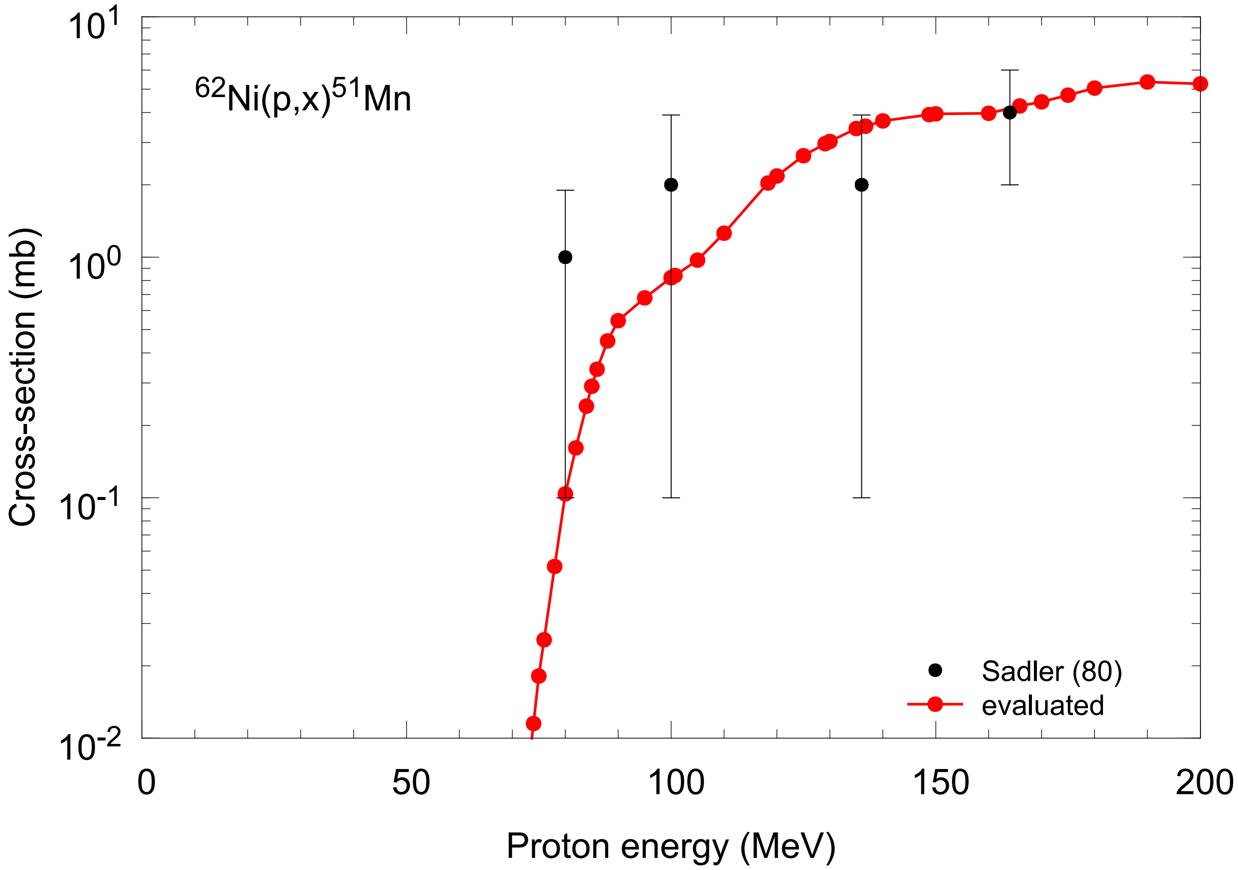


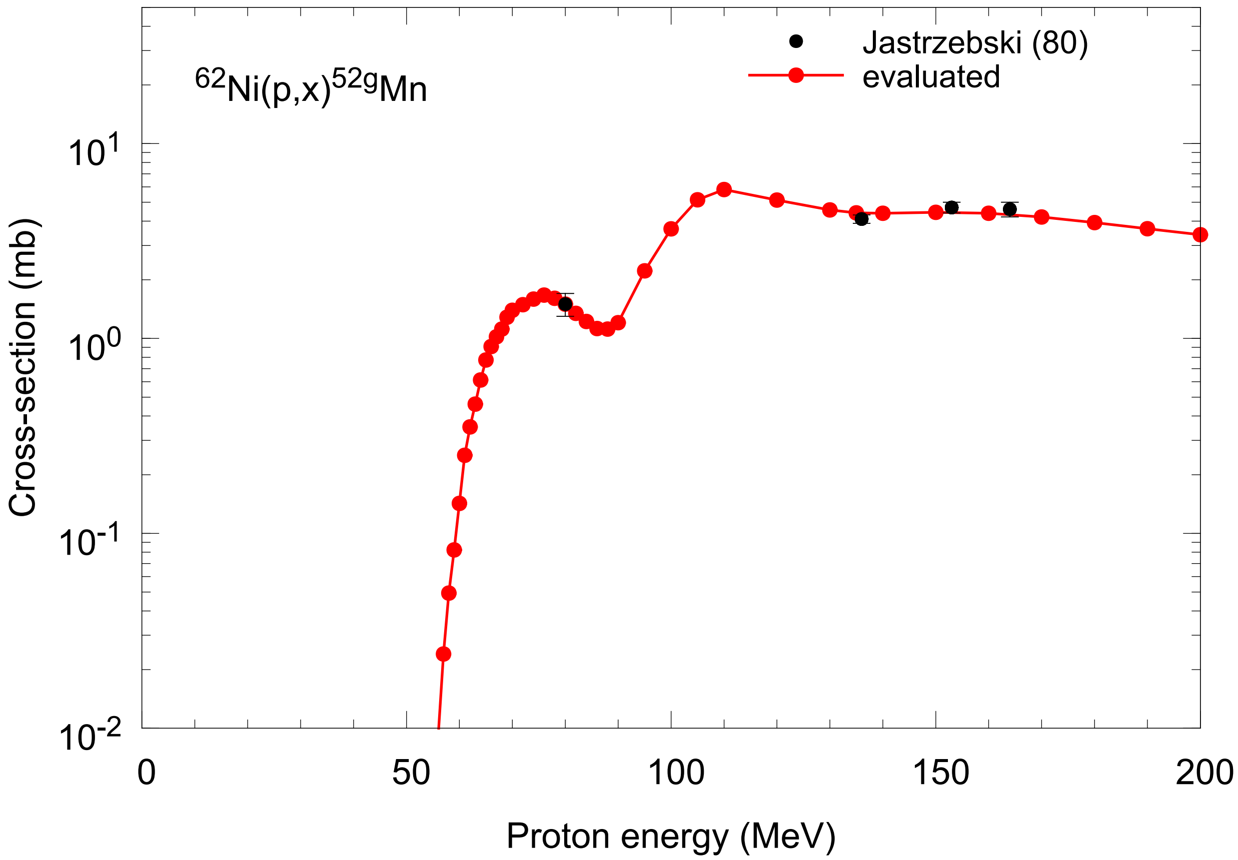
$^{62}Ni(p,x)^{52}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated

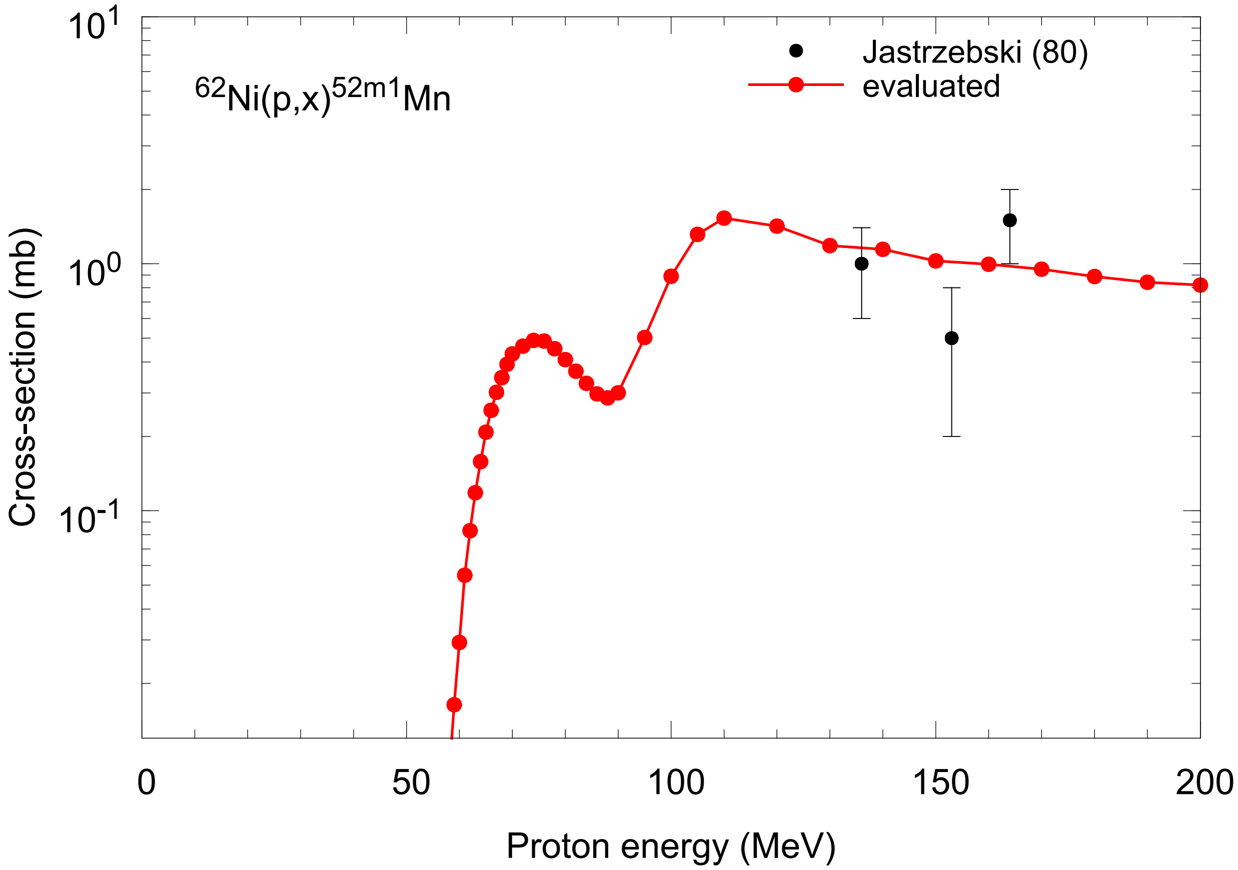


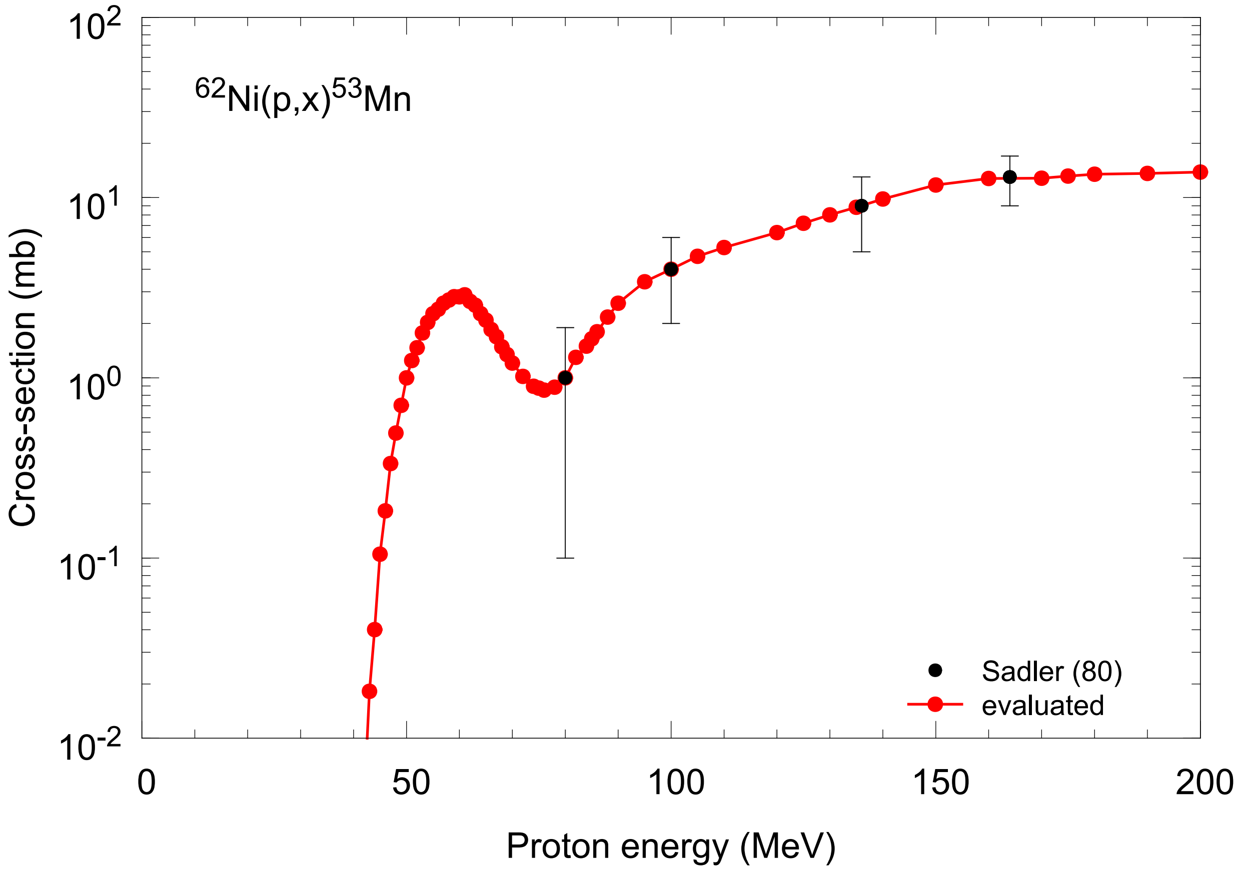
$^{62}Ni(p,x)^{53}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated


$^{62}Ni(p,x)^{54}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{-3}
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
0
50
100
150
200

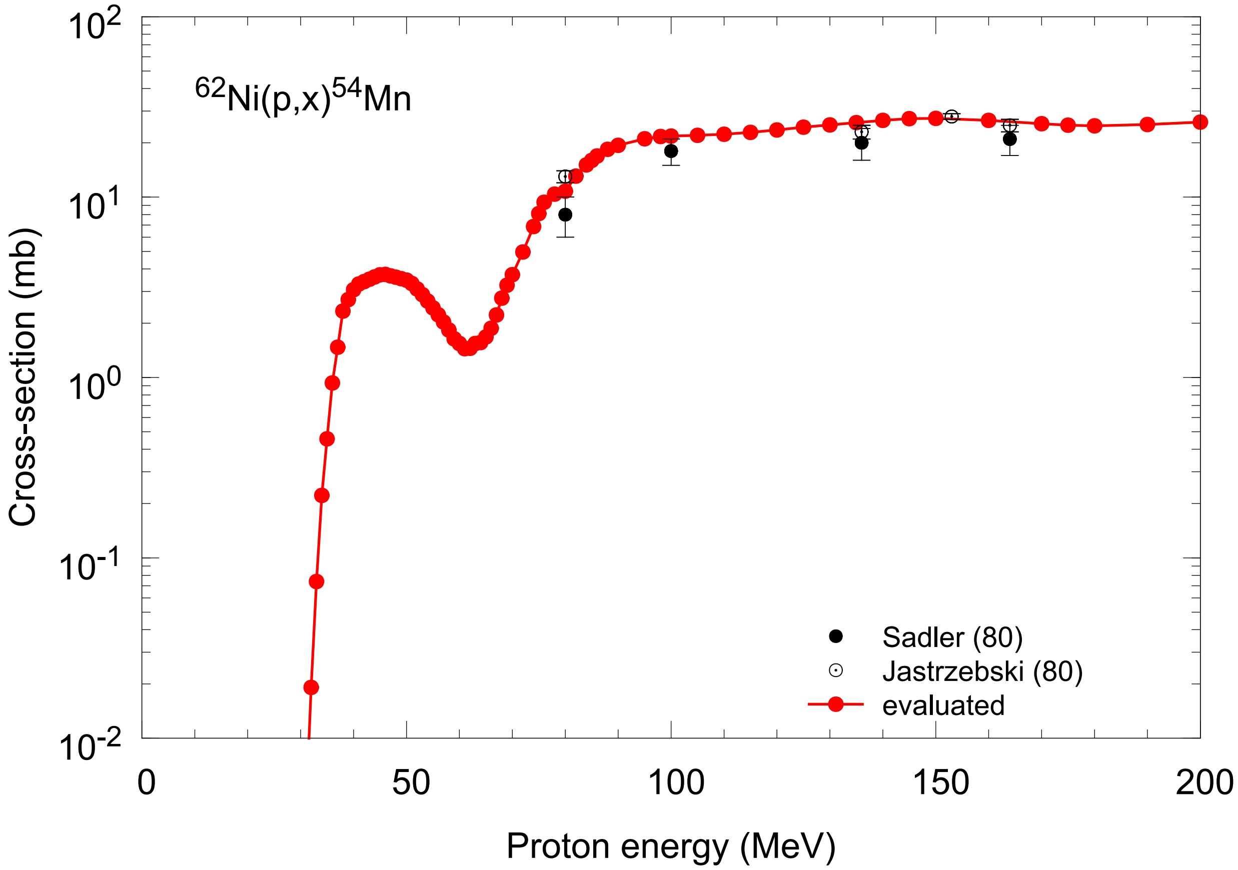

$^{62}Ni(p,x)^{51}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{-2}
10^{-1}
10^{0}
10^{1}
0
50
100
150
200


$^{62}Ni(p,x)^{52g}Mn$
Jastrzebski (80)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
Cross-section (mb)
0
50
100
150
200
Proton energy (MeV)

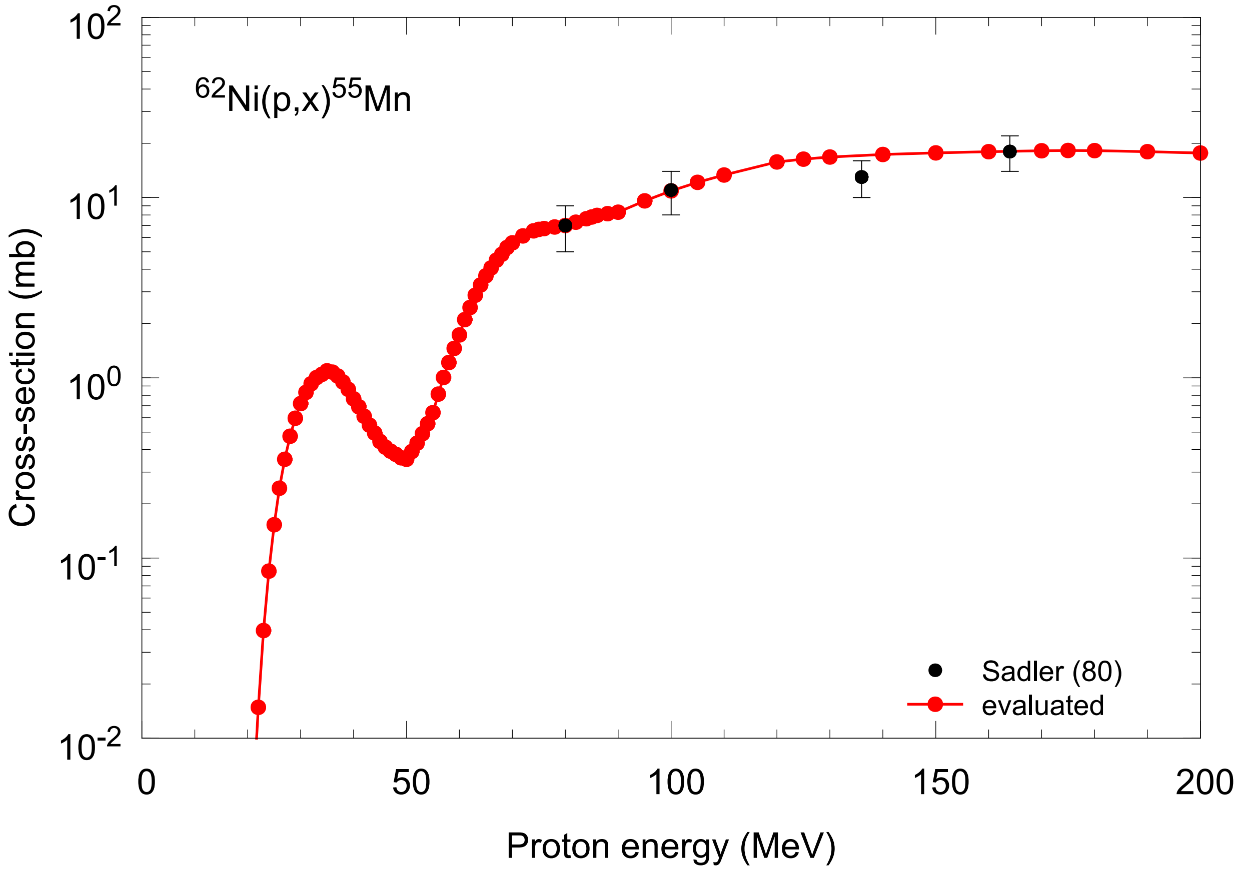

$^{62}Ni(p,x)^{52m1}Mn$
Jastrzebski (80)
evaluated
10^{1}
10^{0}
10^{-1}
Cross-section (mb)
0
50
100
150
200
Proton energy (MeV)



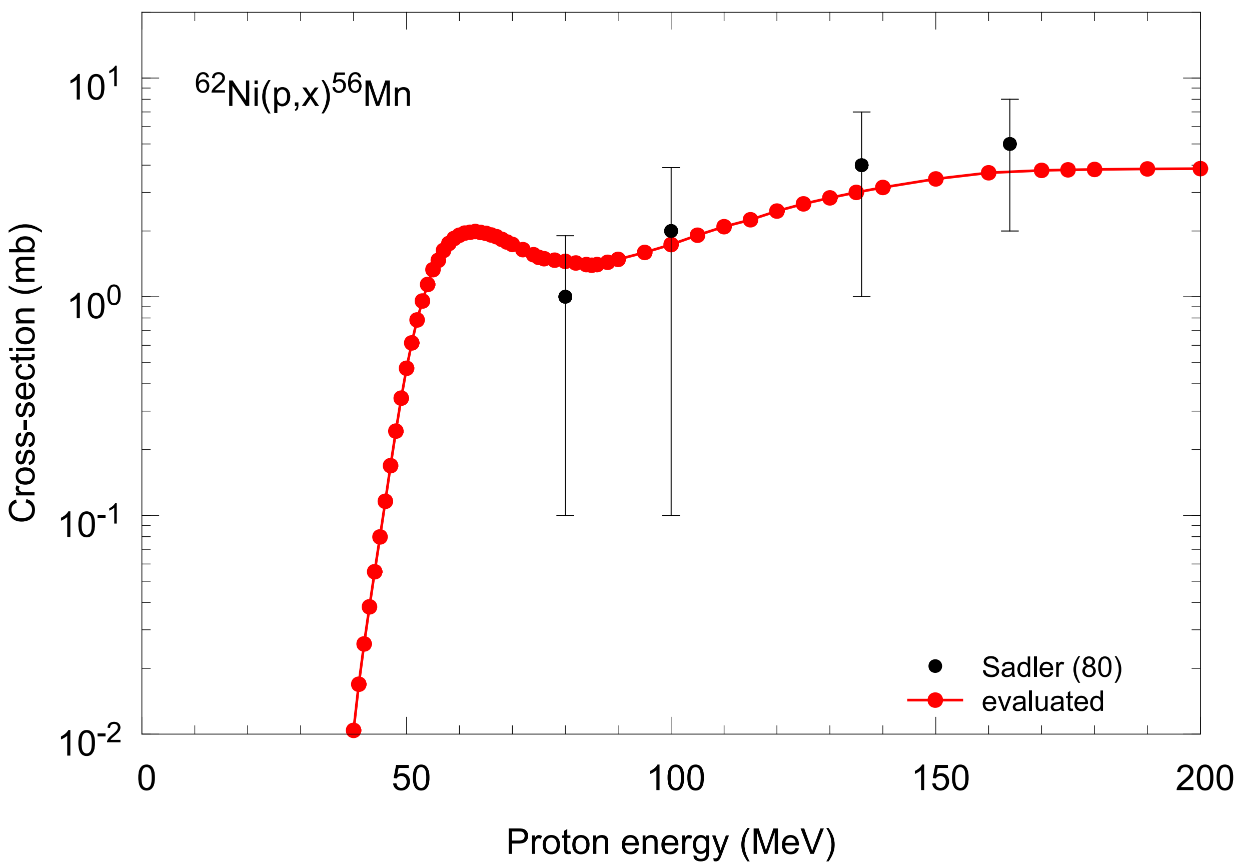
$^{62}Ni(p,x)^{53}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



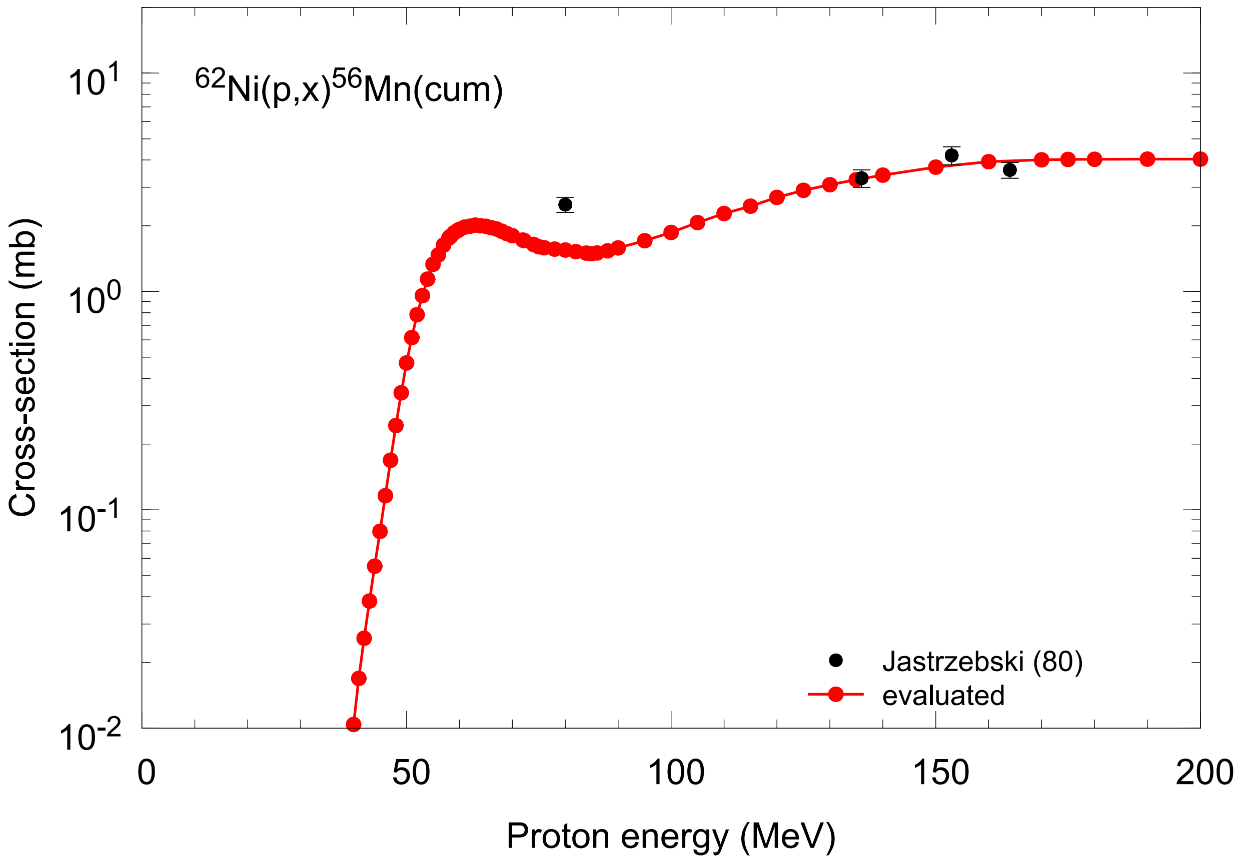
$^{62}Ni(p,x)^{54}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
Jastrzebski (80)
evaluated



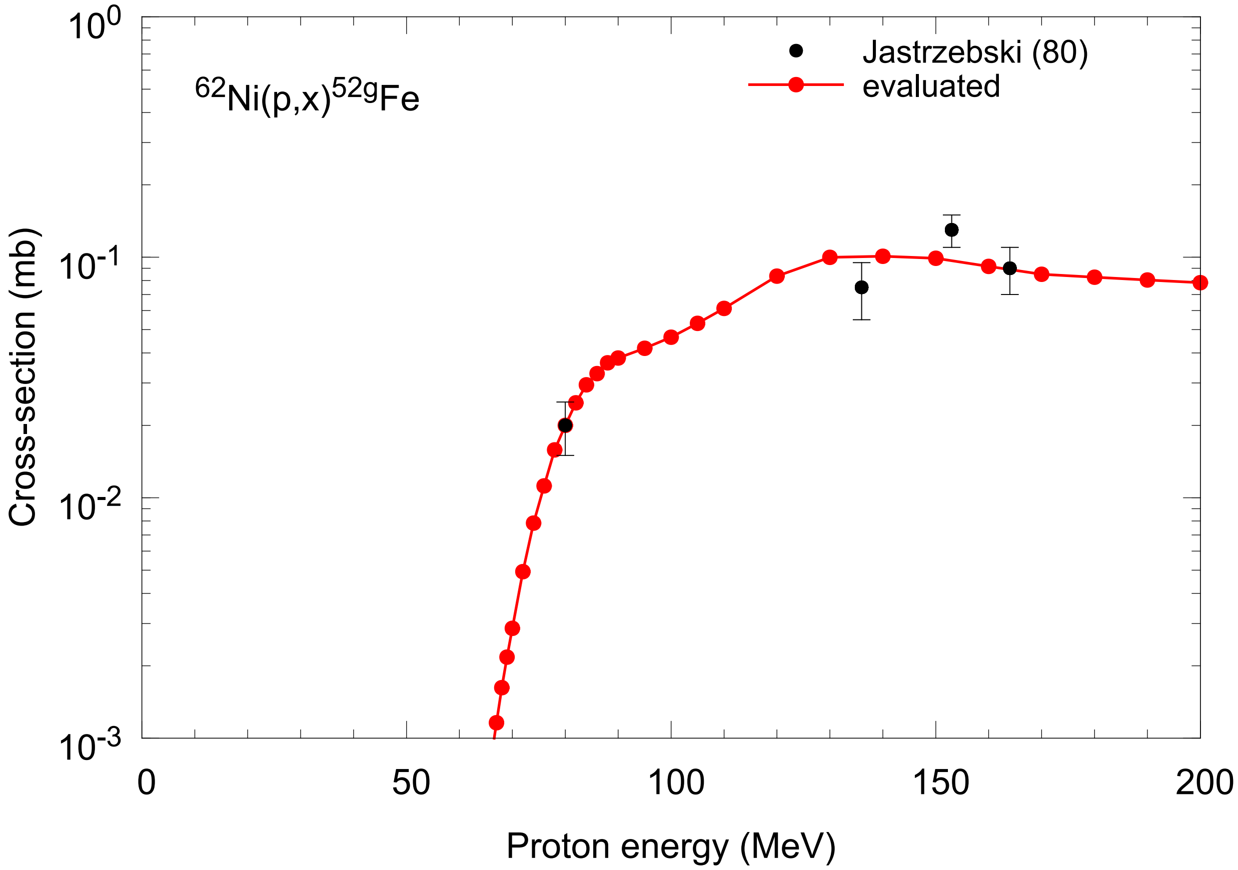
10^2
10^1
10^0
10^{-1}
10^{-2}
$^{62}Ni(p,x)^{55}Mn$
Sadler (80)
evaluated
0
50
100
150
200
Cross-section (mb)
Proton energy (MeV)



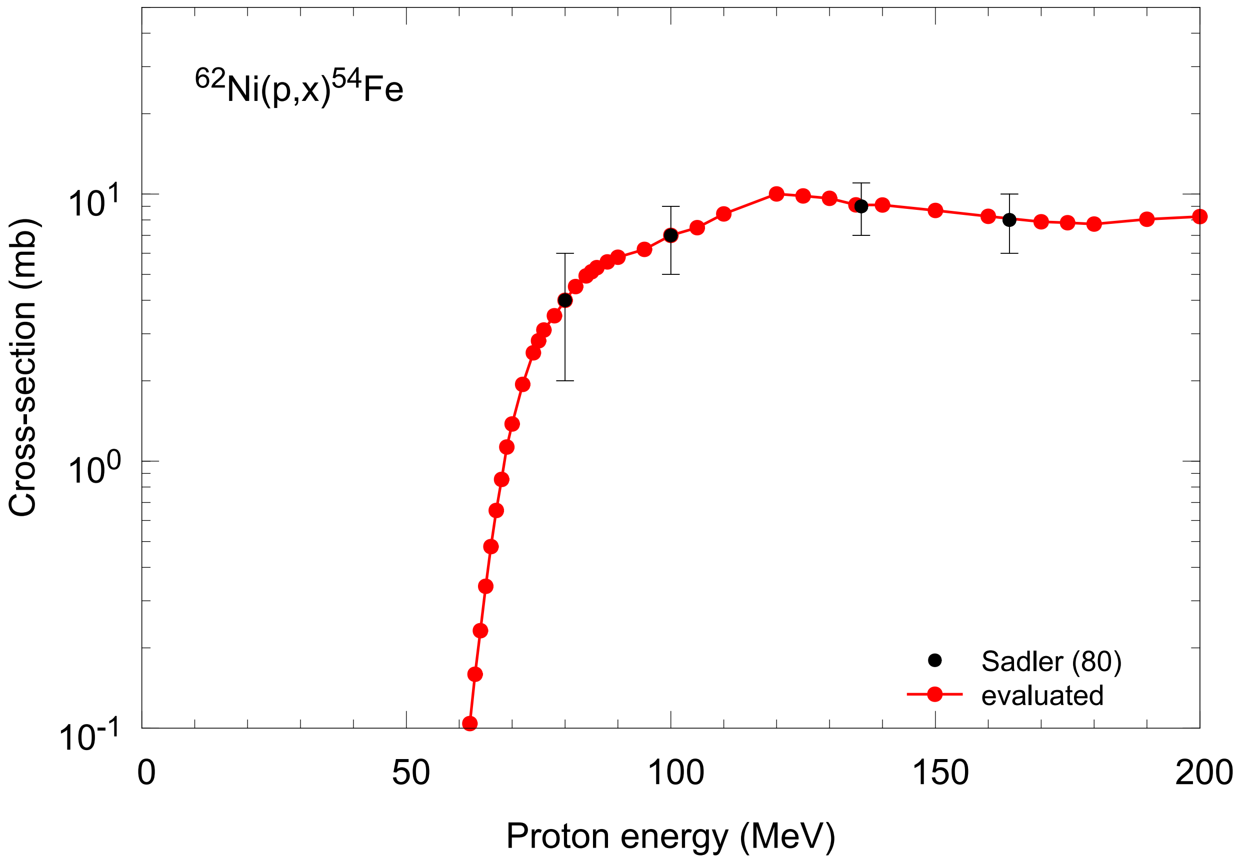
10^1
10^0
10^{-1}
10^{-2}
$^{62}Ni(p,x)^{56}Mn$
Sadler (80)
evaluated
0
50
100
150
200
Cross-section (mb)
Proton energy (MeV)



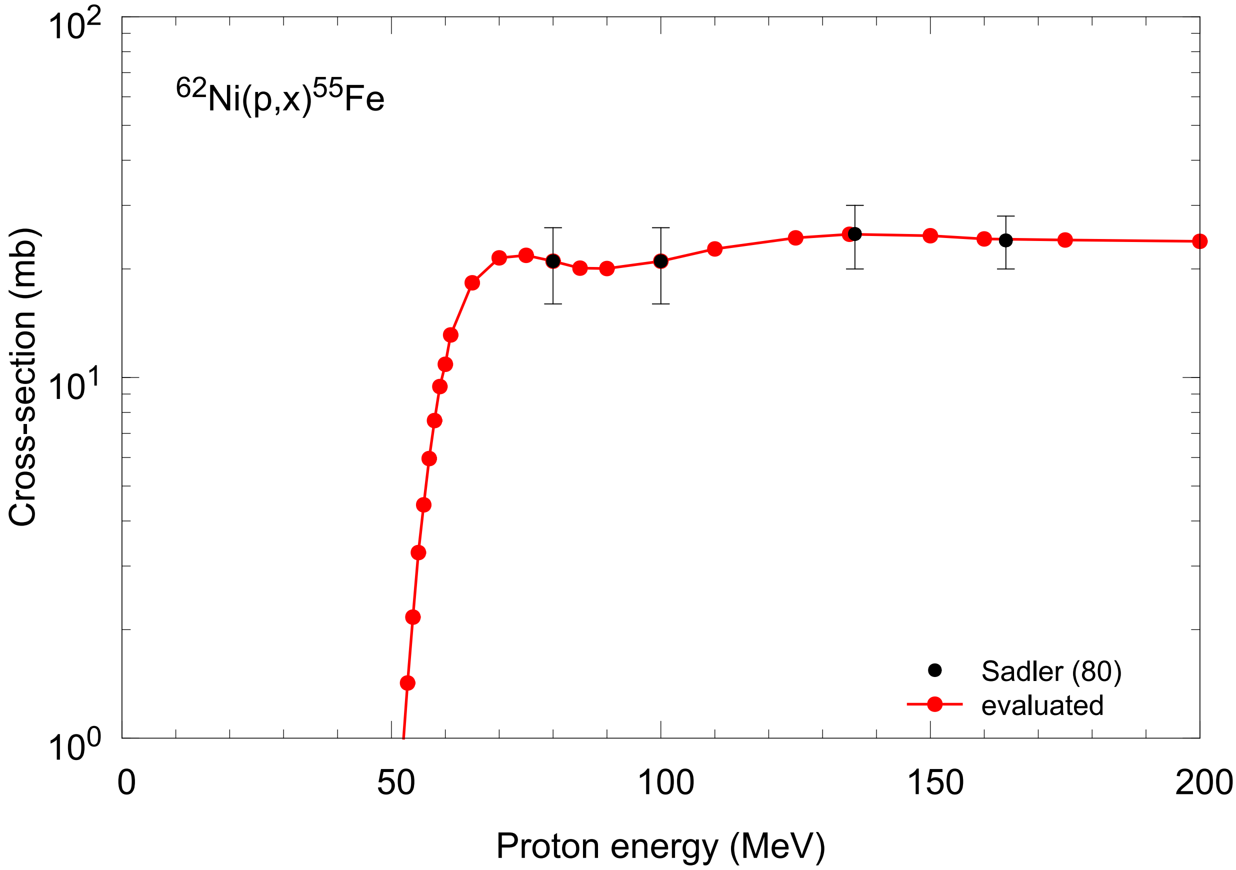
^{62}Ni(p,x)^{56}Mn(cum)
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



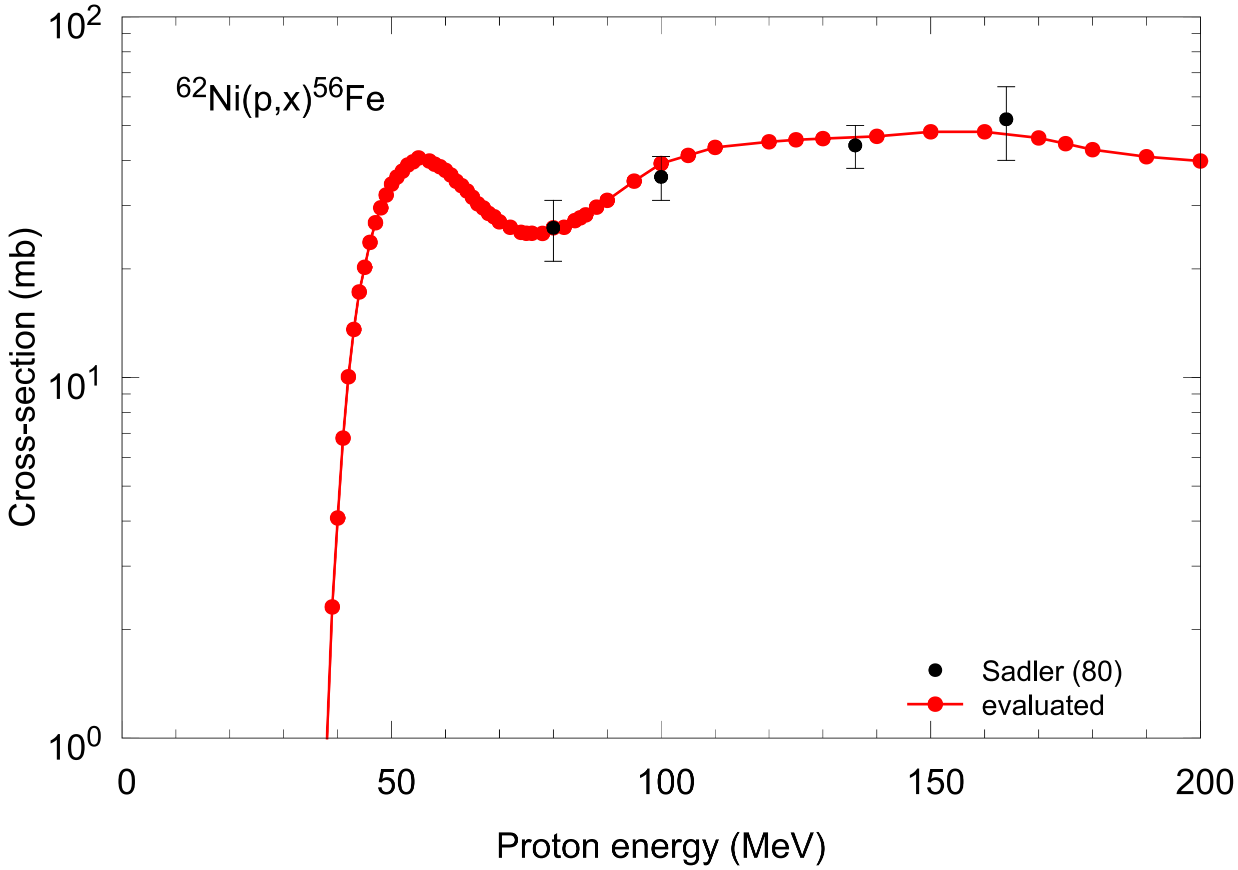
^{62}Ni(p,x)^{52g}Fe
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



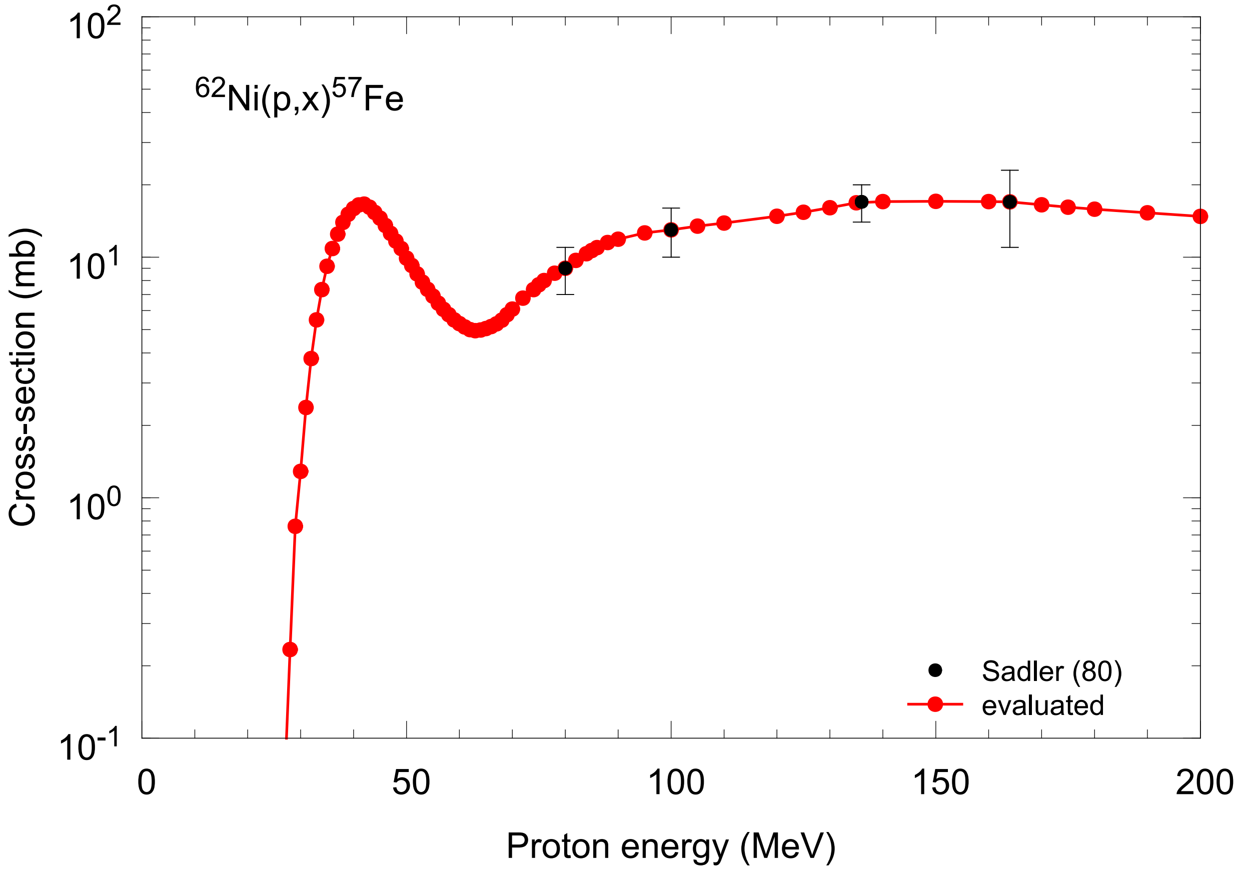
$^{62}Ni(p,x)^{54}Fe$
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated



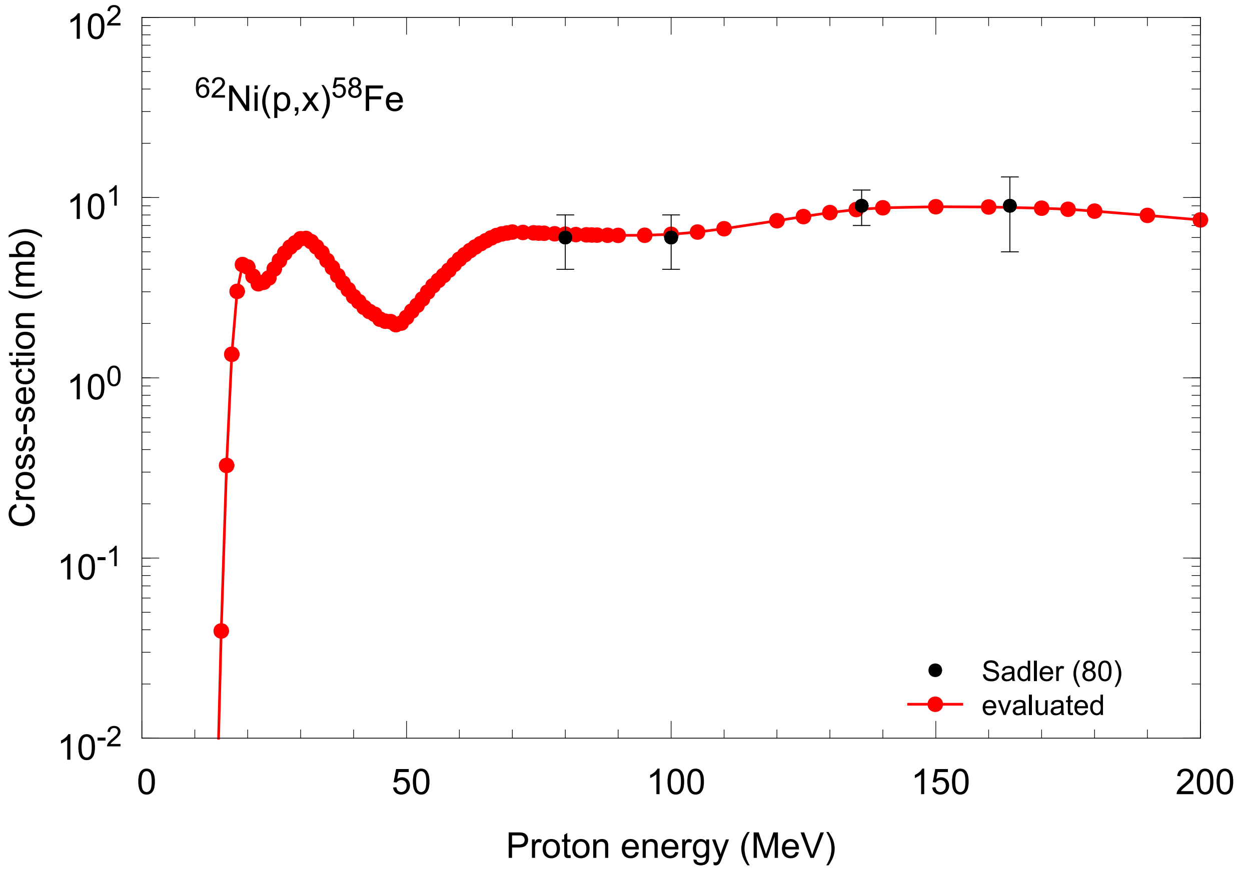
$^{62}Ni(p,x)^{55}Fe$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated



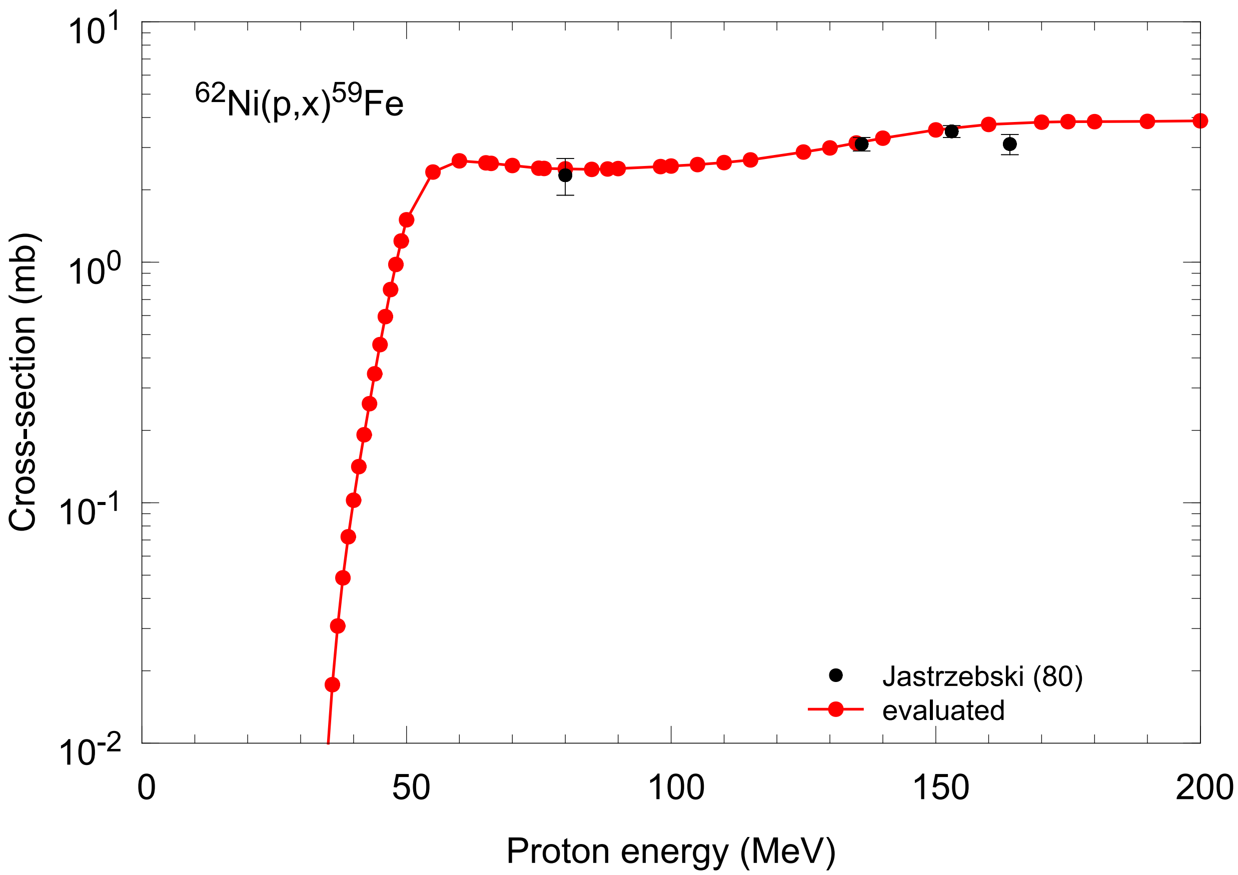
^{62}Ni(p,x)^{56}Fe
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



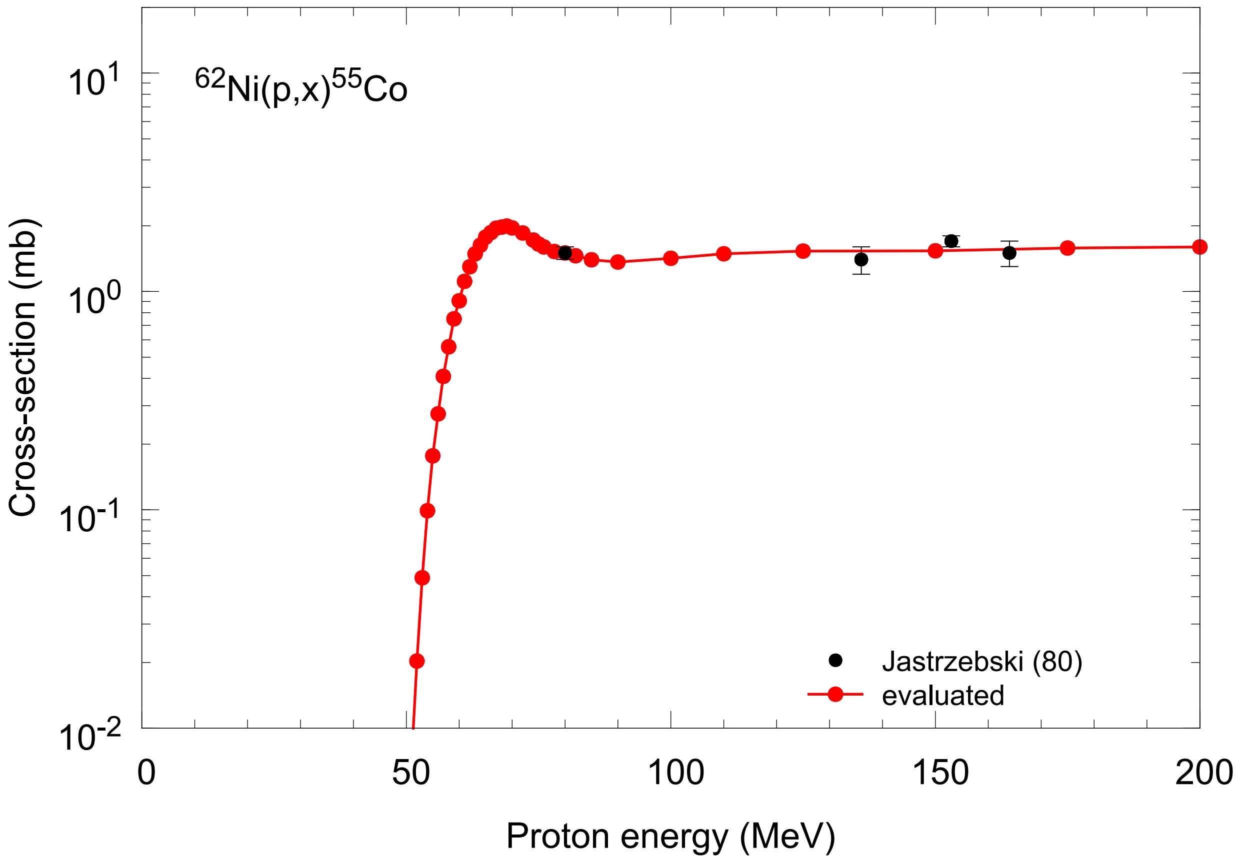
^{62}Ni(p,x)^{57}Fe
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



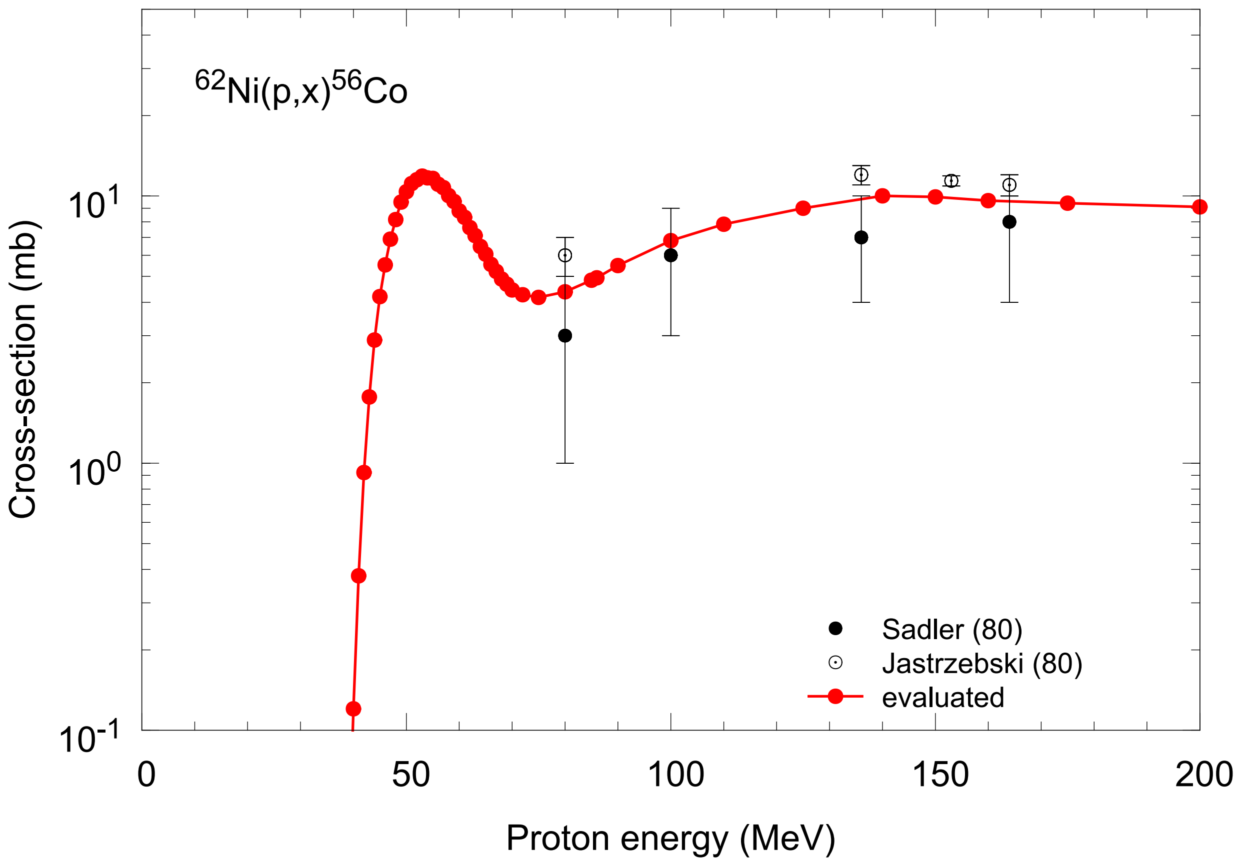
$^{62}Ni(p,x)^{58}Fe$
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



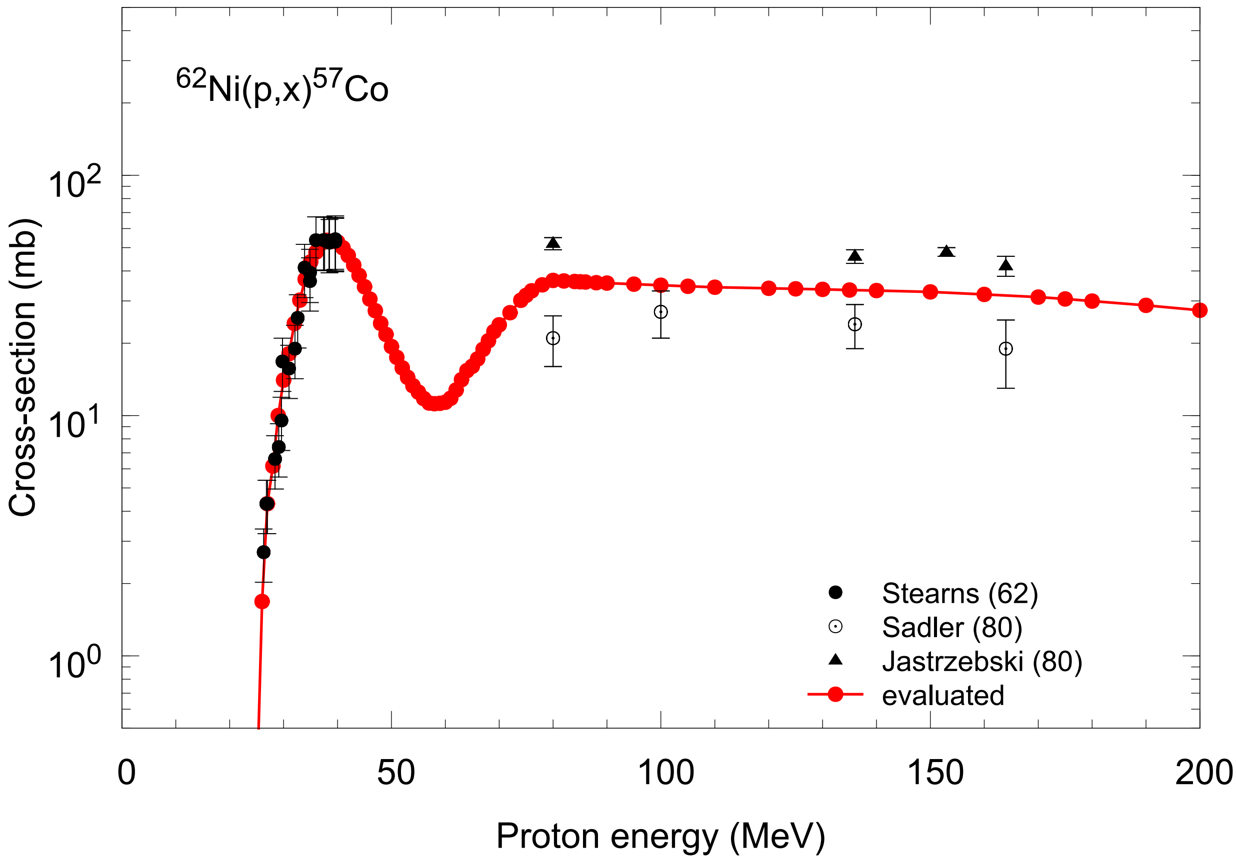
$^{62}Ni(p,x)^{59}Fe$
Jastrzebski (80)
evaluated
Cross-section (mb)
Proton energy (MeV)



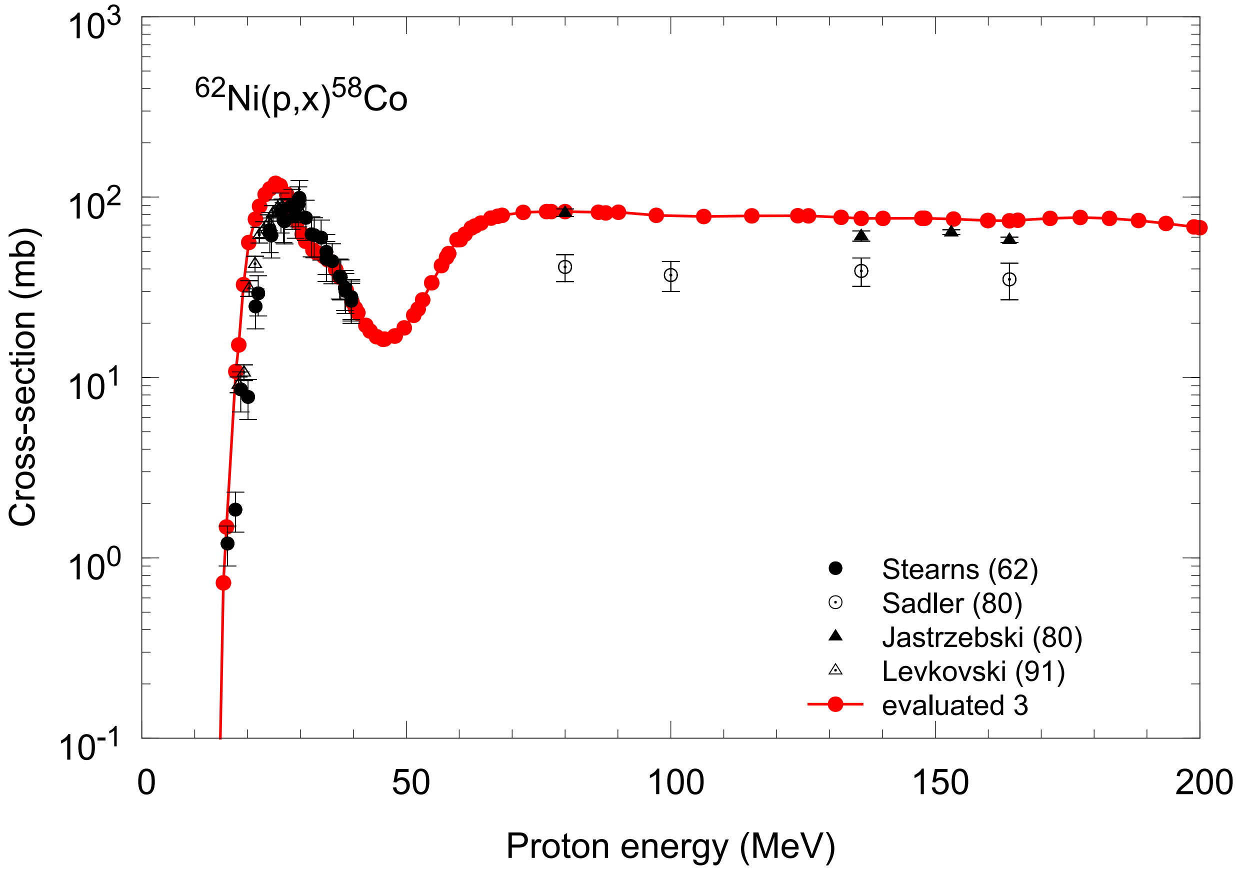
$^{62}Ni(p,x)^{55}Co$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated



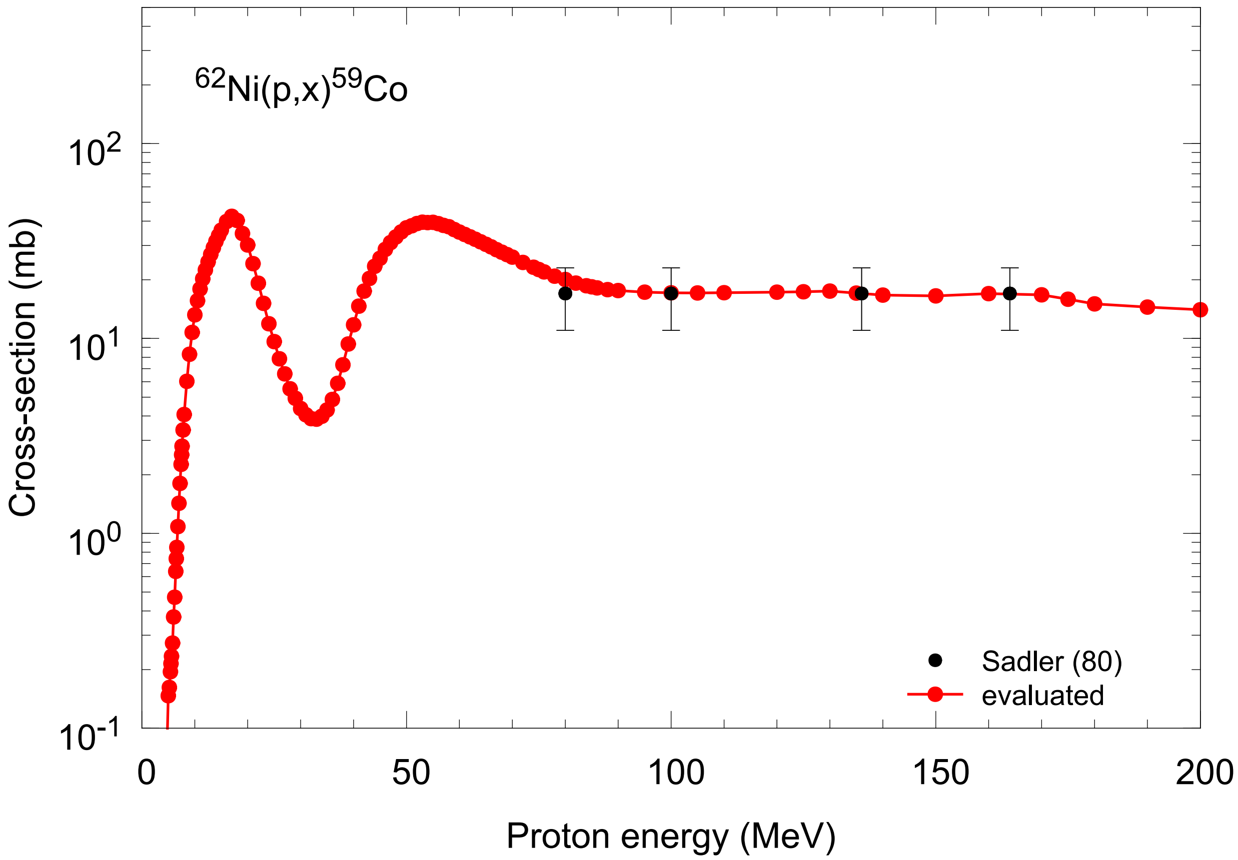
$^{62}Ni(p,x)^{56}Co$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
Jastrzebski (80)
evaluated



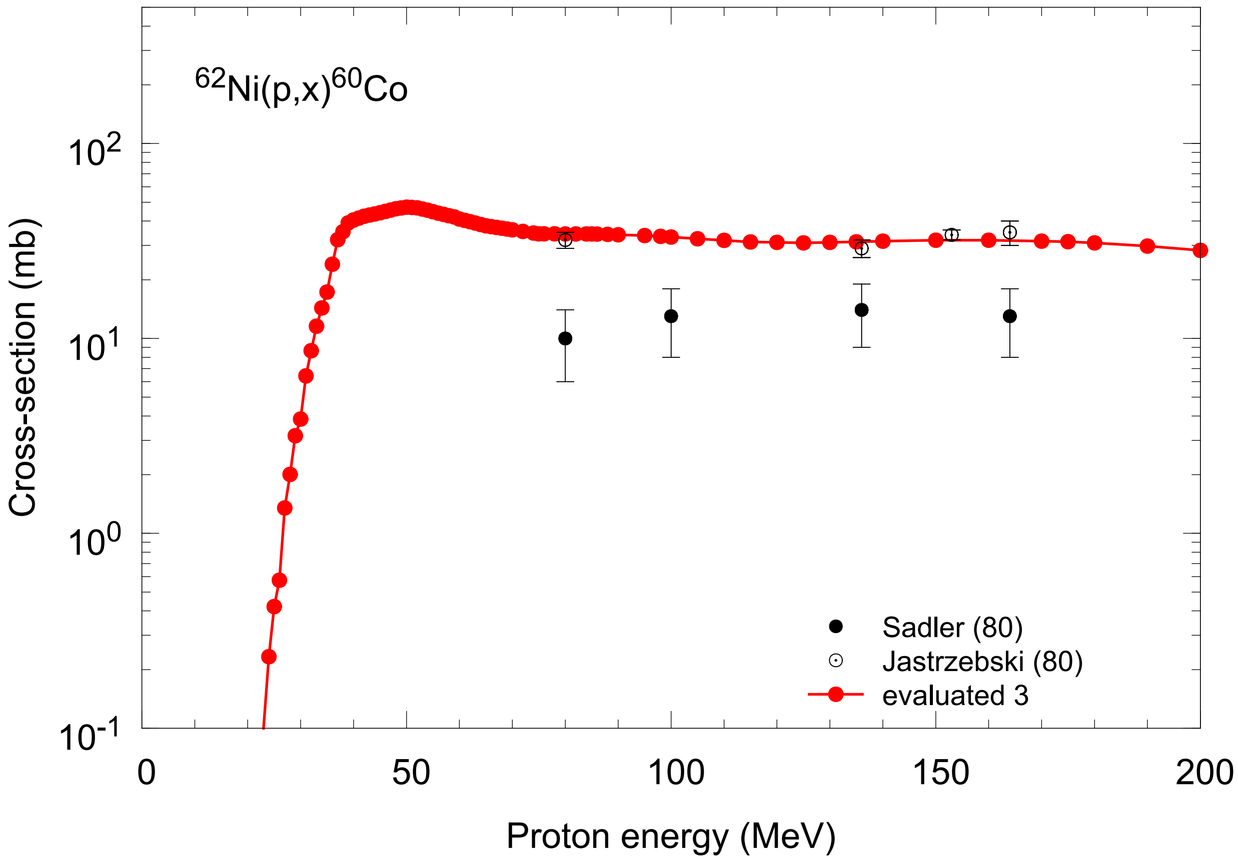
$^{62}Ni(p,x)^{57}Co$
Cross-section (mb)
10^2
10^1
10^0
0
50
100
150
200
Proton energy (MeV)
Stearns (62)
Sadler (80)
Jastrzebski (80)
evaluated



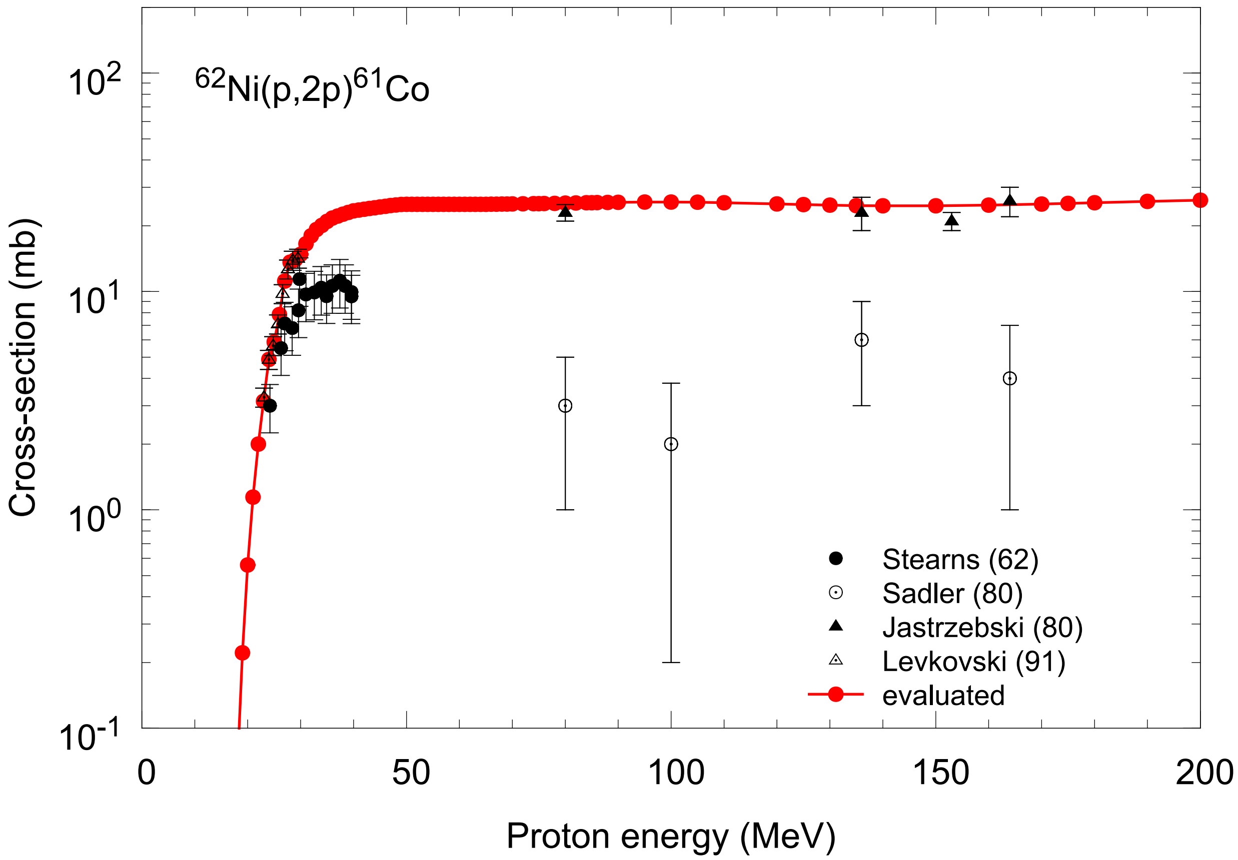
$^{62}Ni(p,x)^{58}Co$
Cross-section (mb)
10^3
10^2
10^1
10^0
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Stearns (62)
Sadler (80)
Jastrzebski (80)
Levkovski (91)
evaluated 3

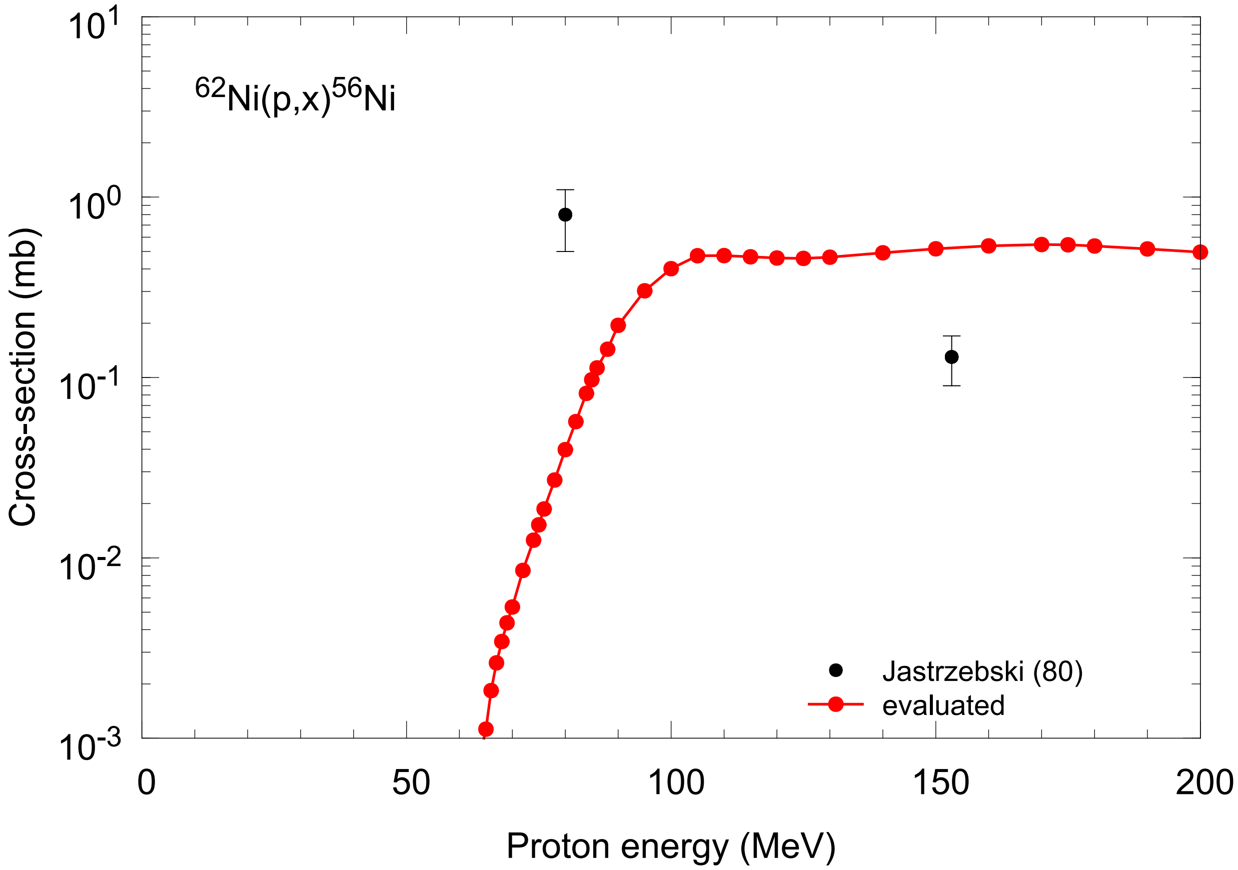


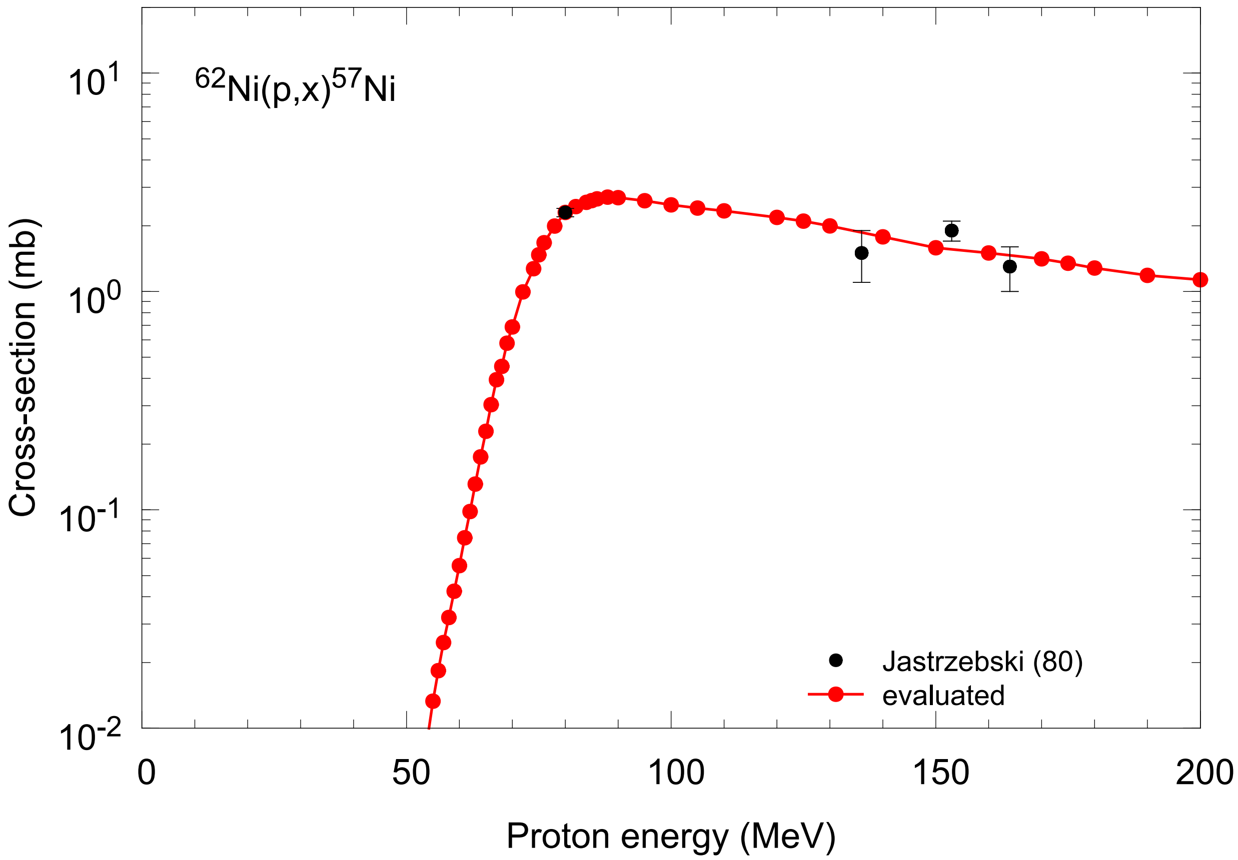
$^{62}Ni(p,x)^{59}Co$
Cross-section (mb)
10^2
10^1
10^0
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated



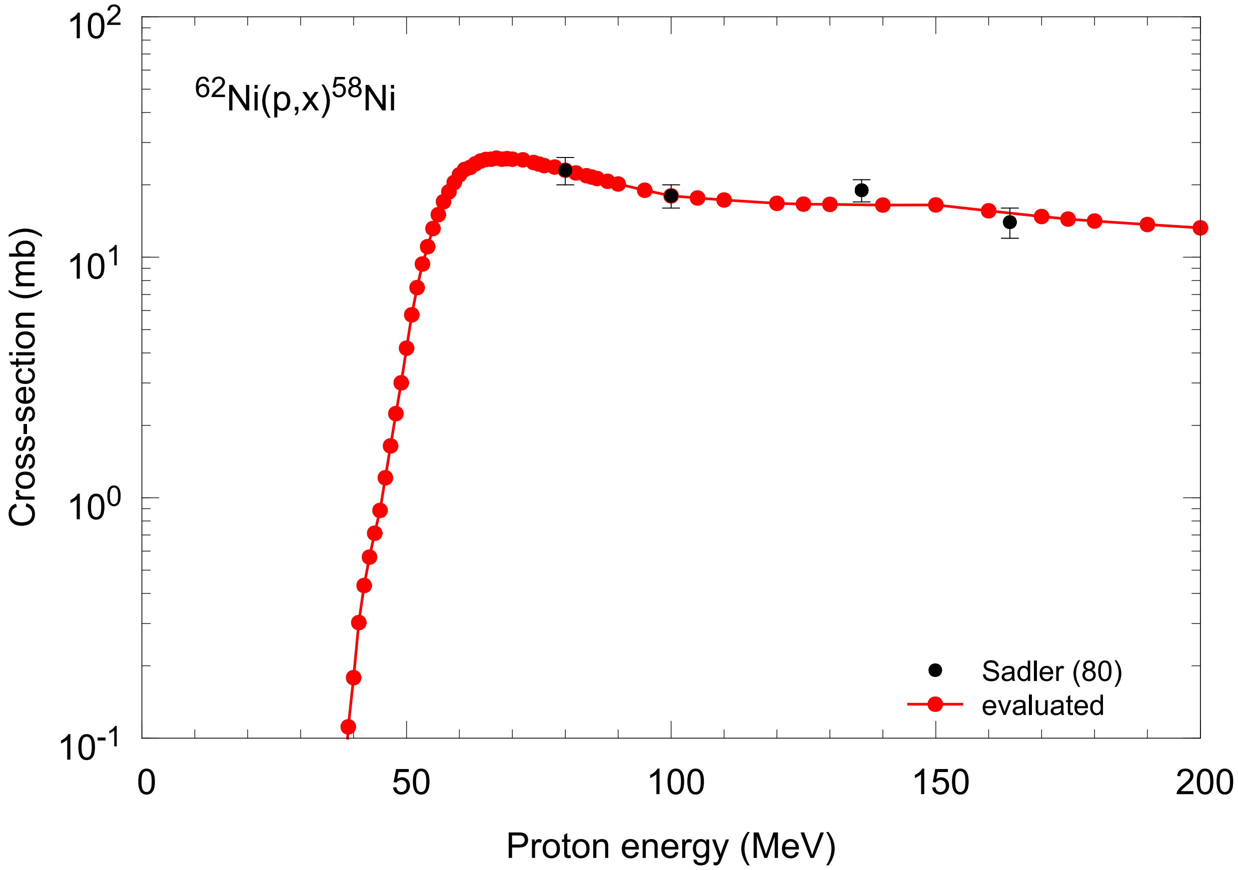
$^{62}Ni(p,x)^{60}Co$
Cross-section (mb)
10^2
10^1
10^0
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
Jastrzebski (80)
evaluated 3


$^{62}Ni(p,2p)^{61}Co$
Cross-section (mb)
Proton energy (MeV)
Stearns (62)
Sadler (80)
Jastrzebski (80)
Levkovski (91)
evaluated

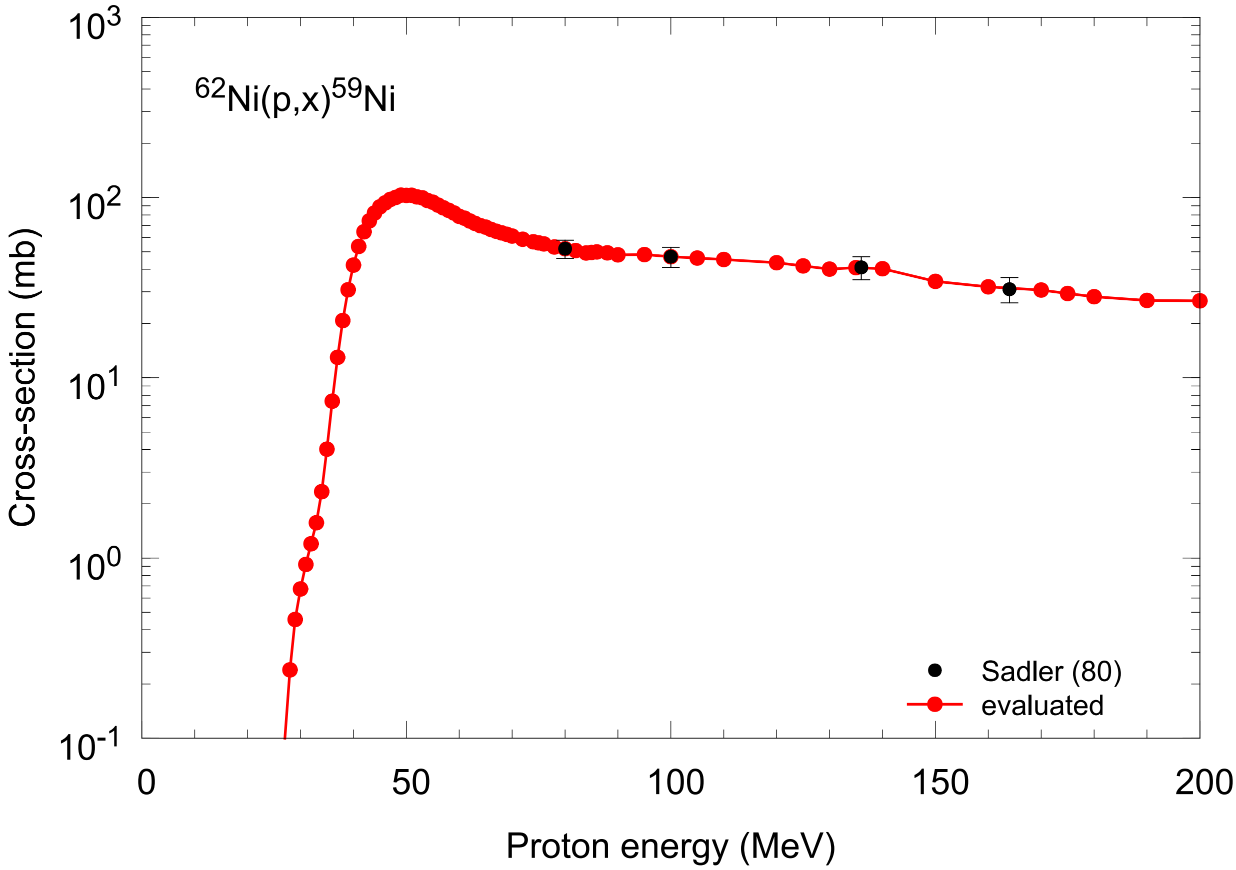

$^{62}Ni(p,x)^{56}Ni$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated



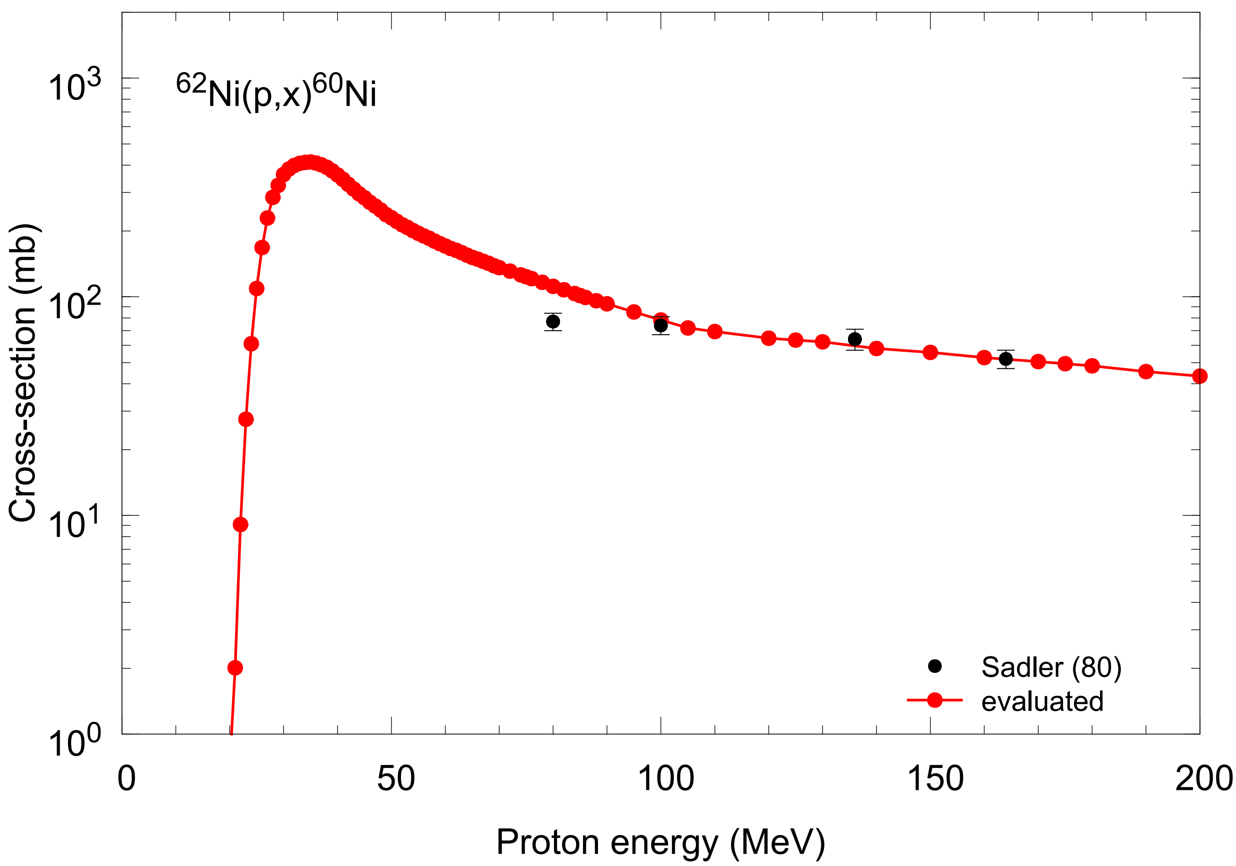
$^{62}Ni(p,x)^{57}Ni$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
evaluated



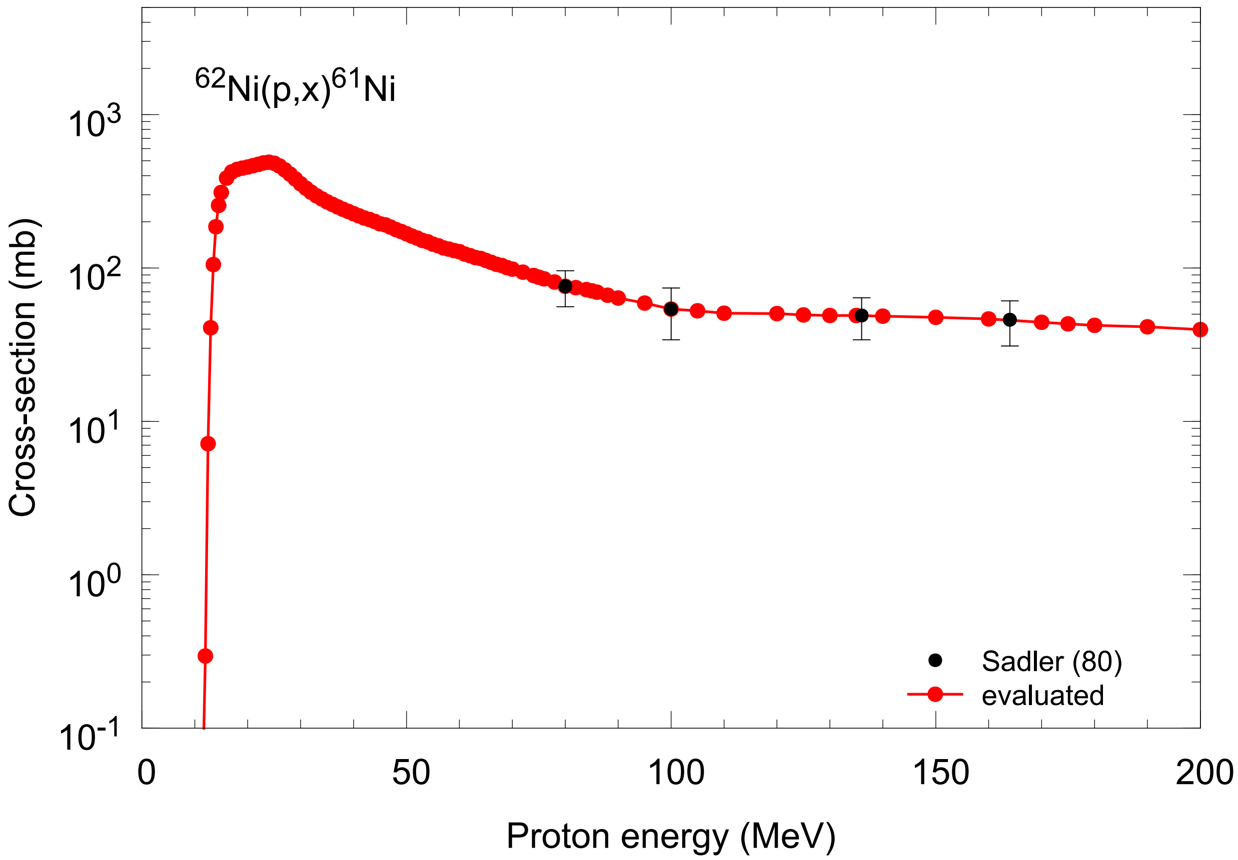
$^{62}Ni(p,x)^{58}Ni$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



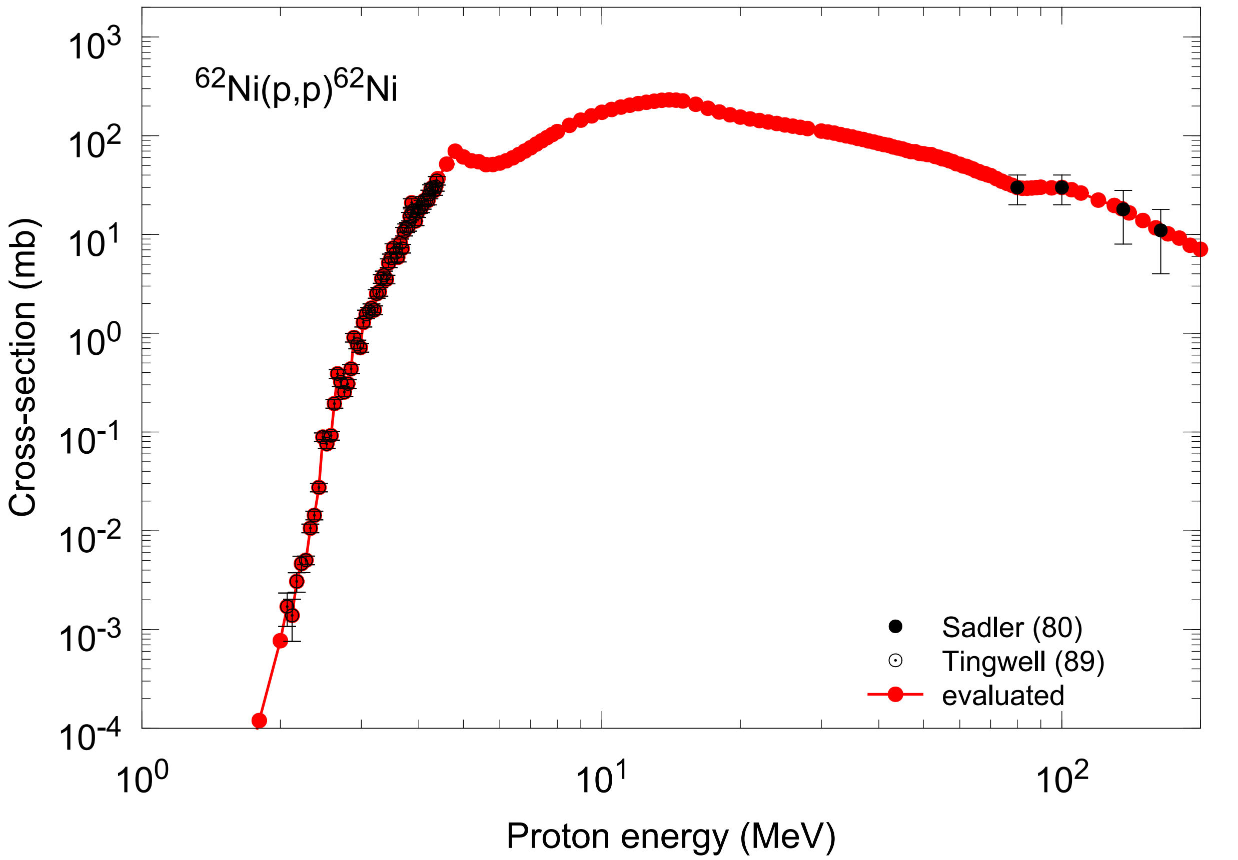
$^{62}Ni(p,x)^{59}Ni$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



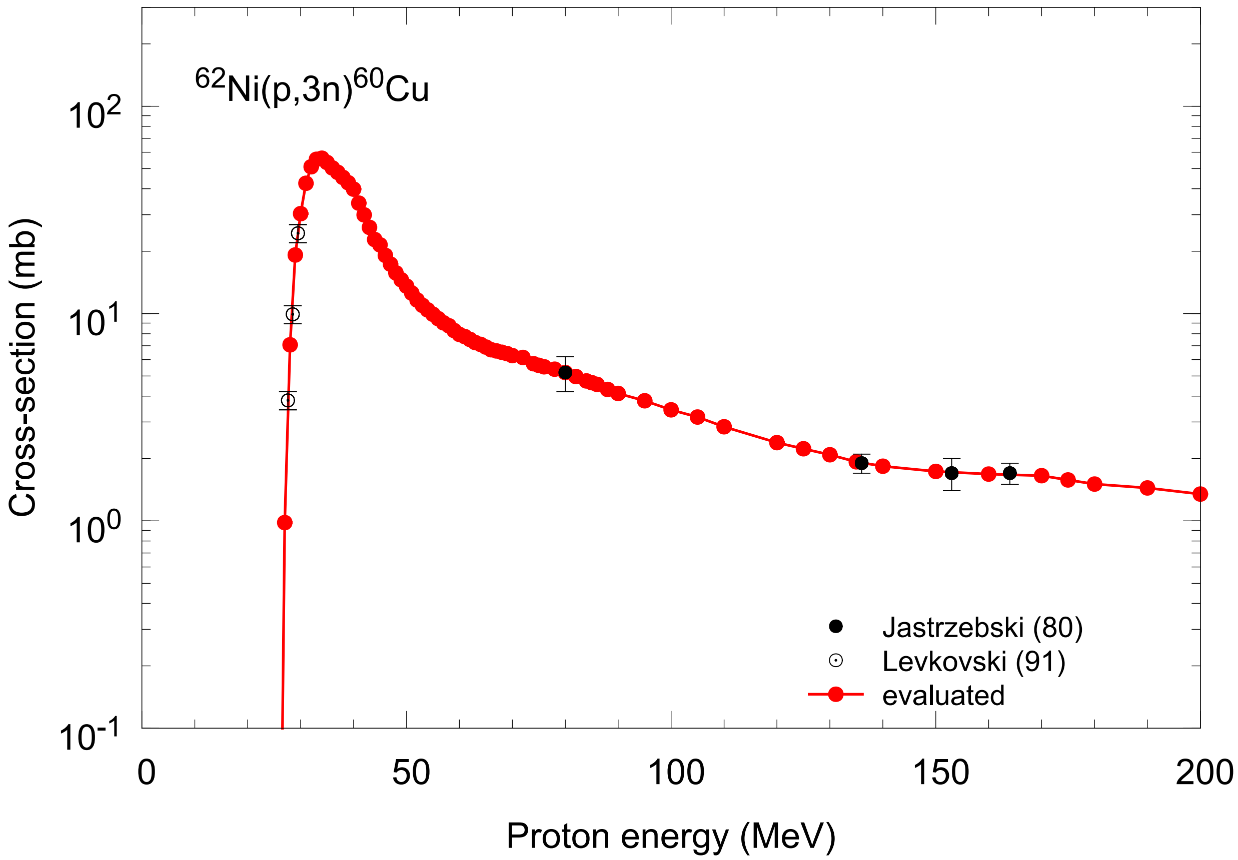
$^{62}Ni(p,x)^{60}Ni$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated

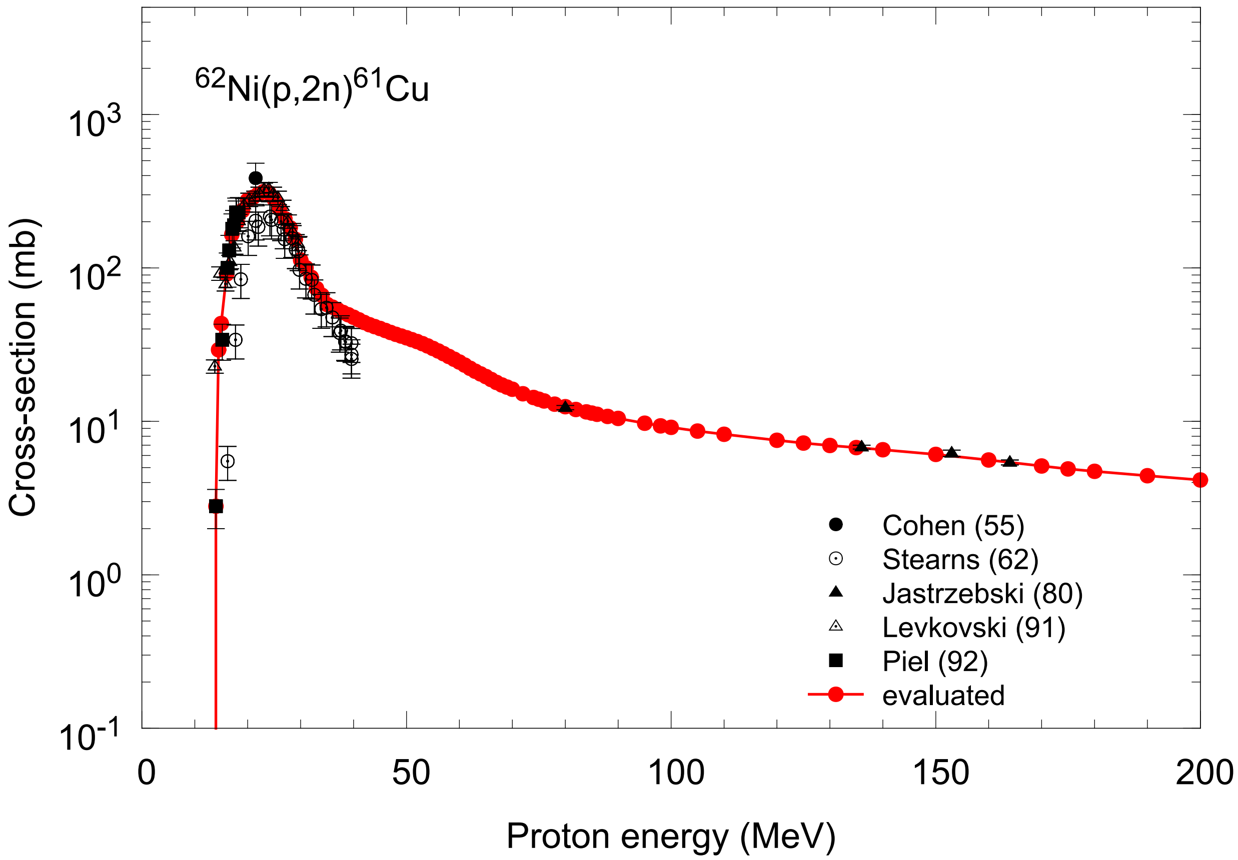


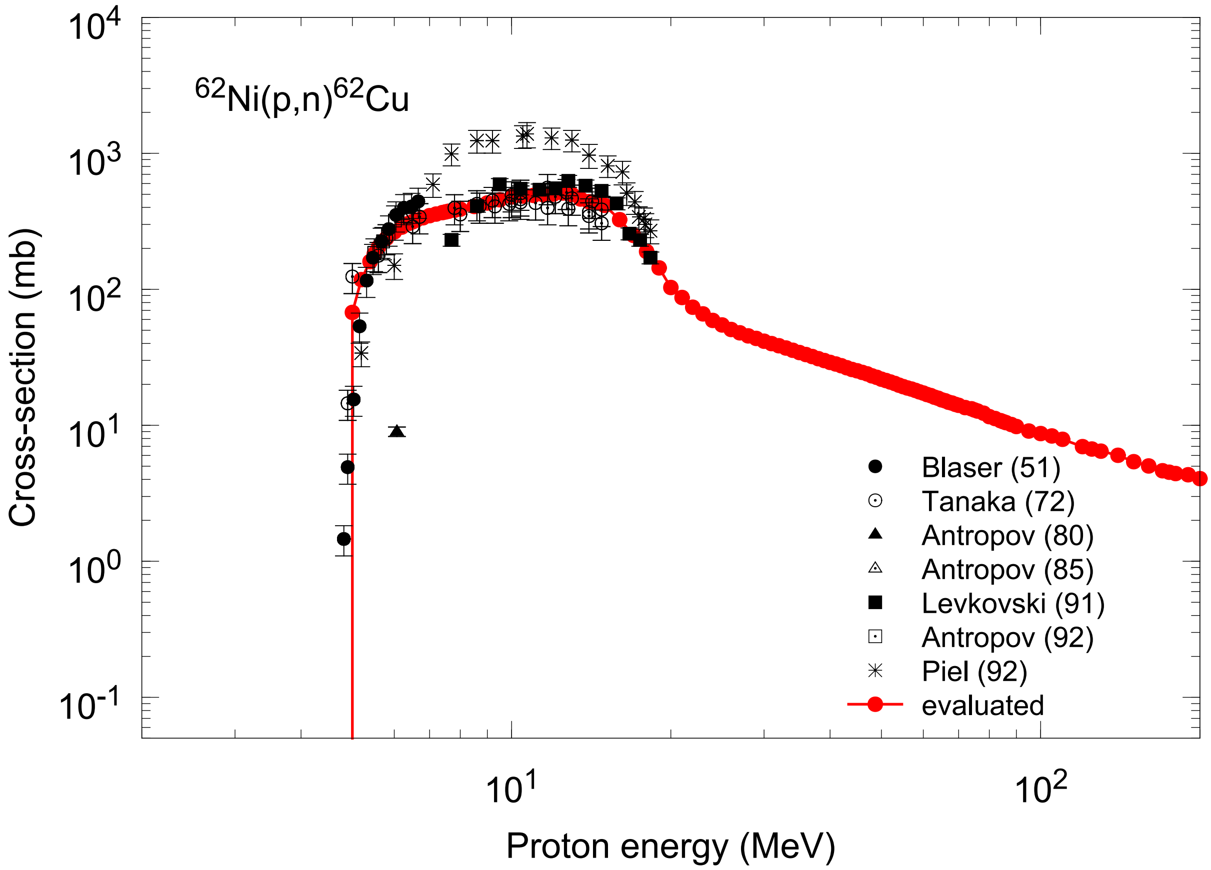
^{62}Ni(p,x)^{61}Ni
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



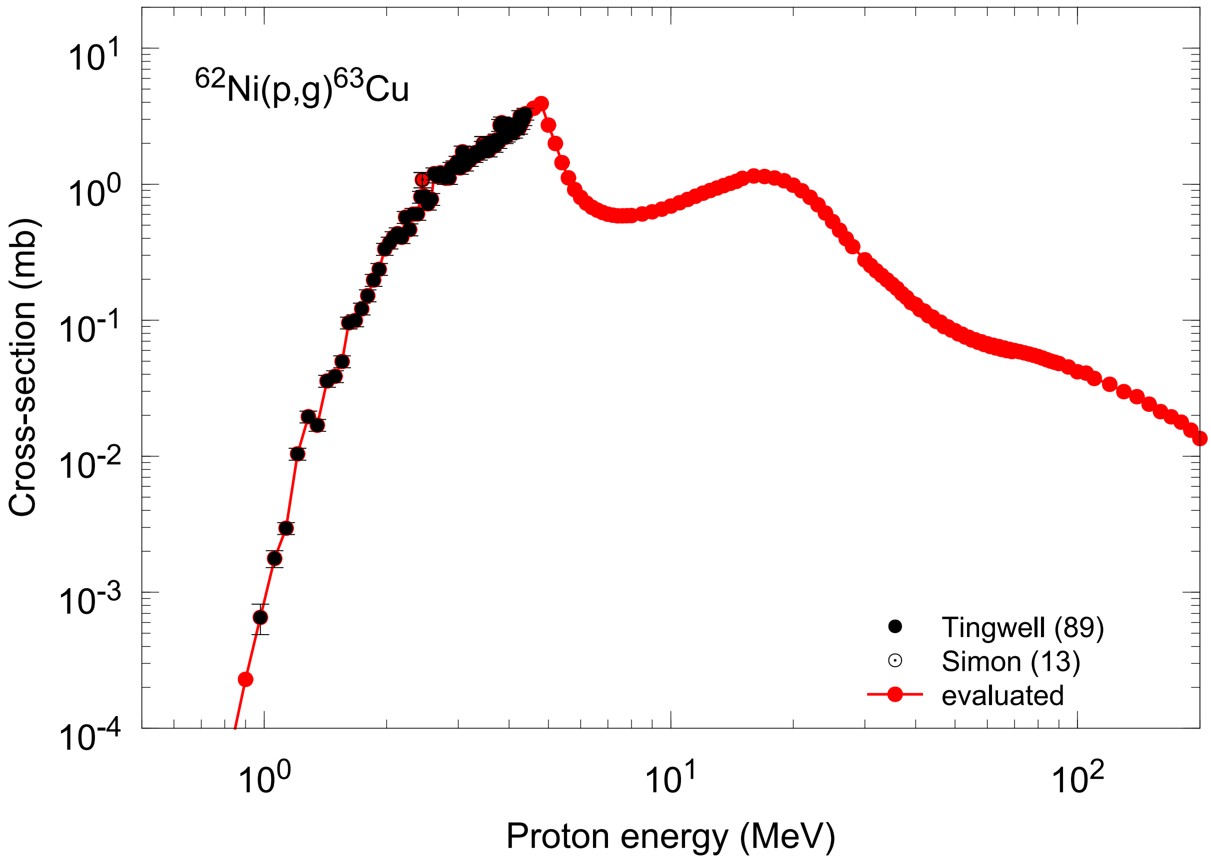
^{62}Ni(p,p)^{62}Ni
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
Tingwell (89)
evaluated


$^{62}Ni(p,3n)^{60}Cu$
Cross-section (mb)
Proton energy (MeV)
Jastrzebski (80)
Levkovski (91)
evaluated
10^2
10^1
10^0
10^-1
0
50
100
150
200

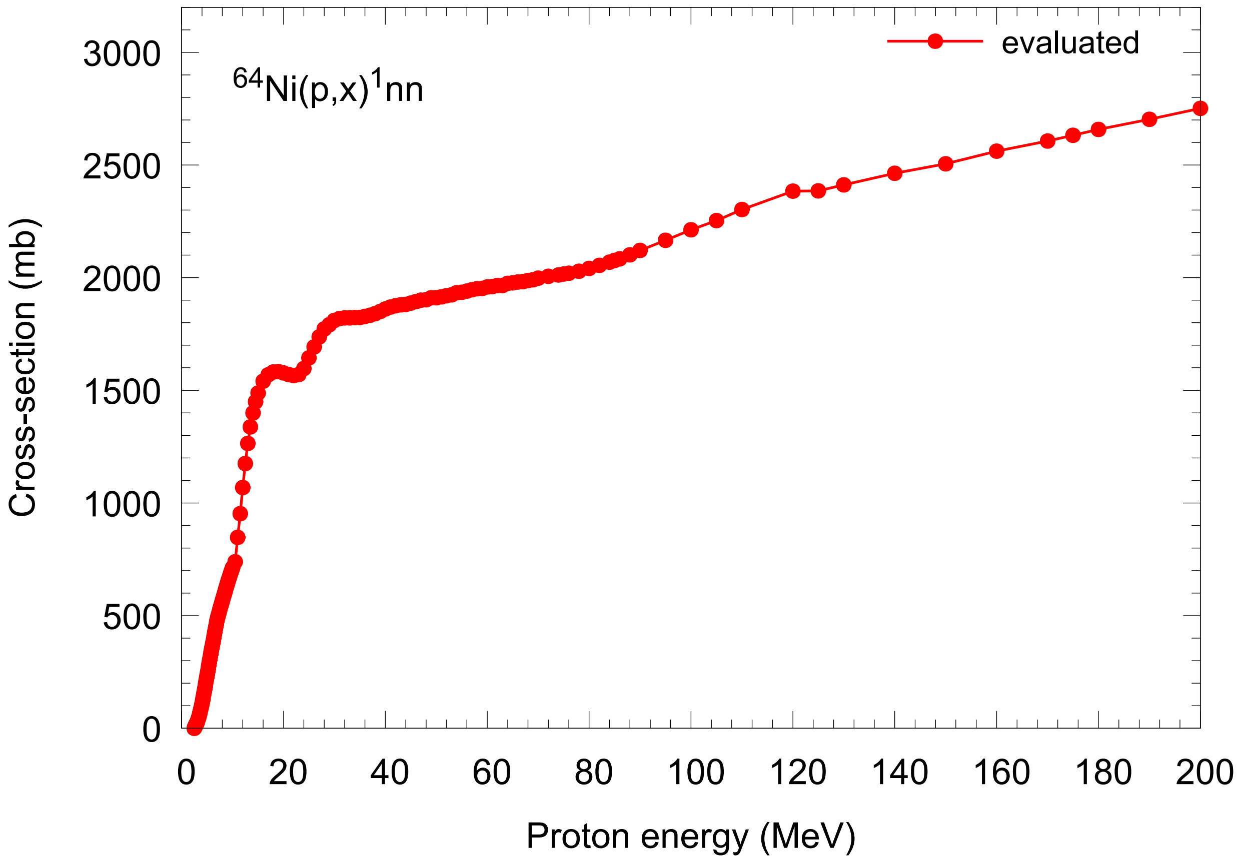

$^{62}Ni(p,2n)^{61}Cu$
Cross-section (mb)
Proton energy (MeV)
Cohen (55)
Stearns (62)
Jastrzebski (80)
Levkovski (91)
Piel (92)
evaluated
10^3
10^2
10^1
10^0
10^-1
0
50
100
150
200

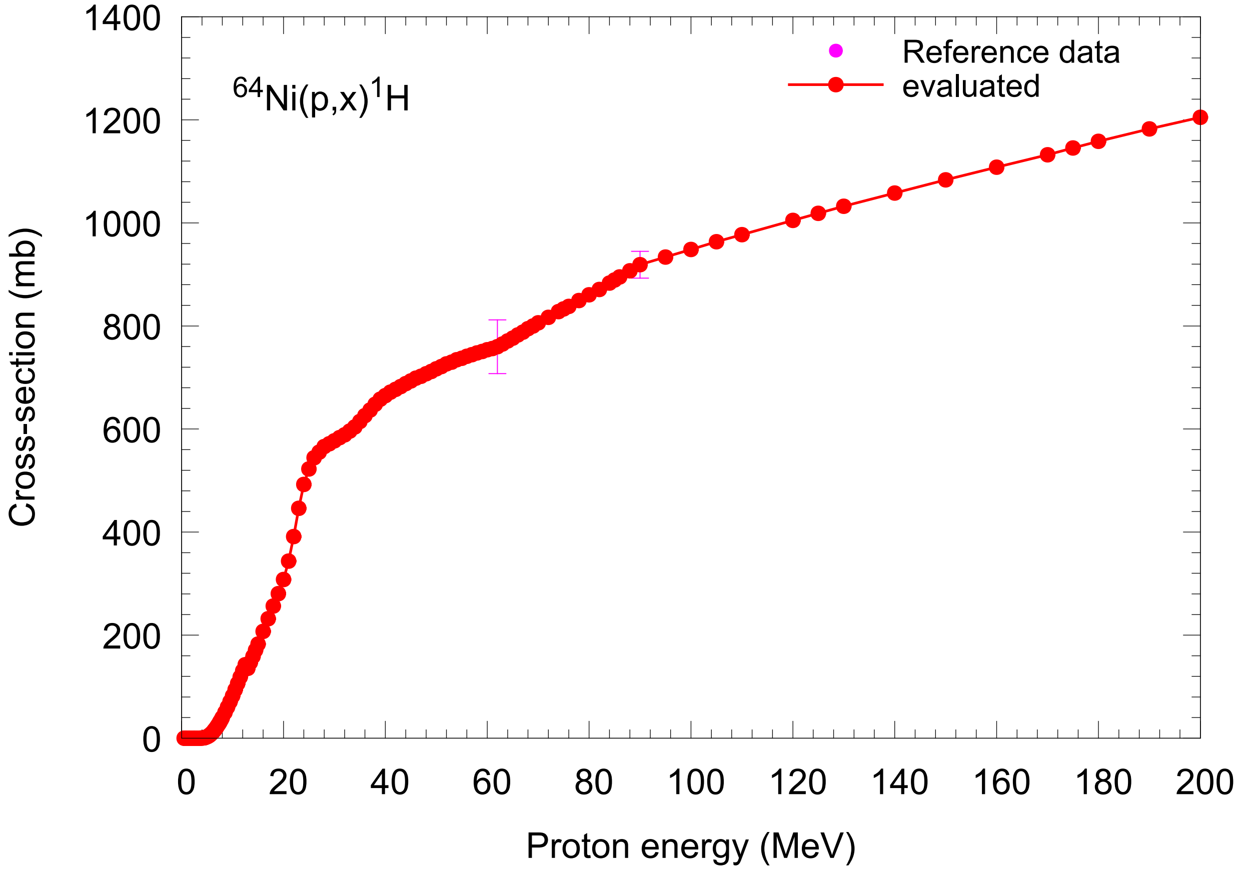


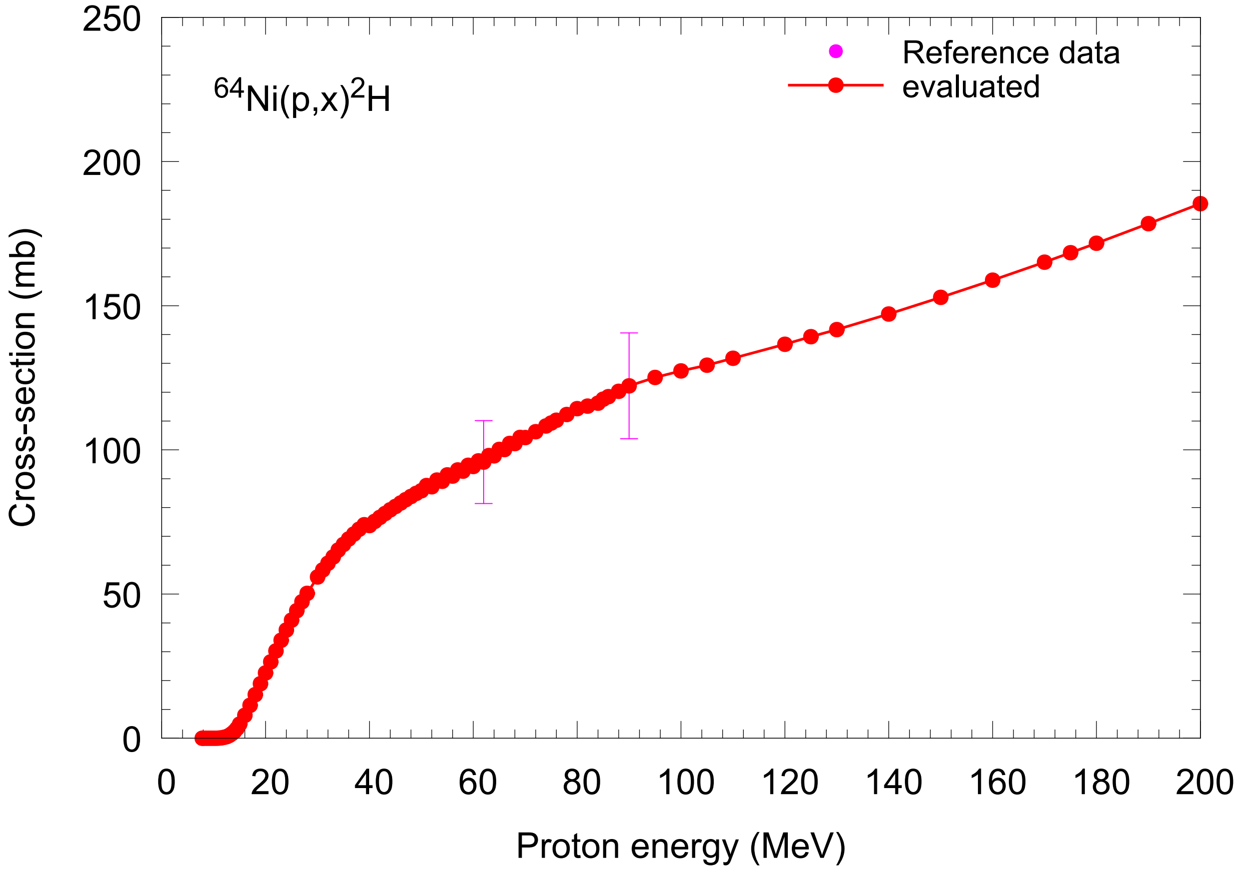
$^{62}Ni(p,n)^{62}Cu$
Cross-section (mb)
Proton energy (MeV)
Blaser (51)
Tanaka (72)
Antropov (80)
Antropov (85)
Levkovski (91)
Antropov (92)
Piel (92)
evaluated

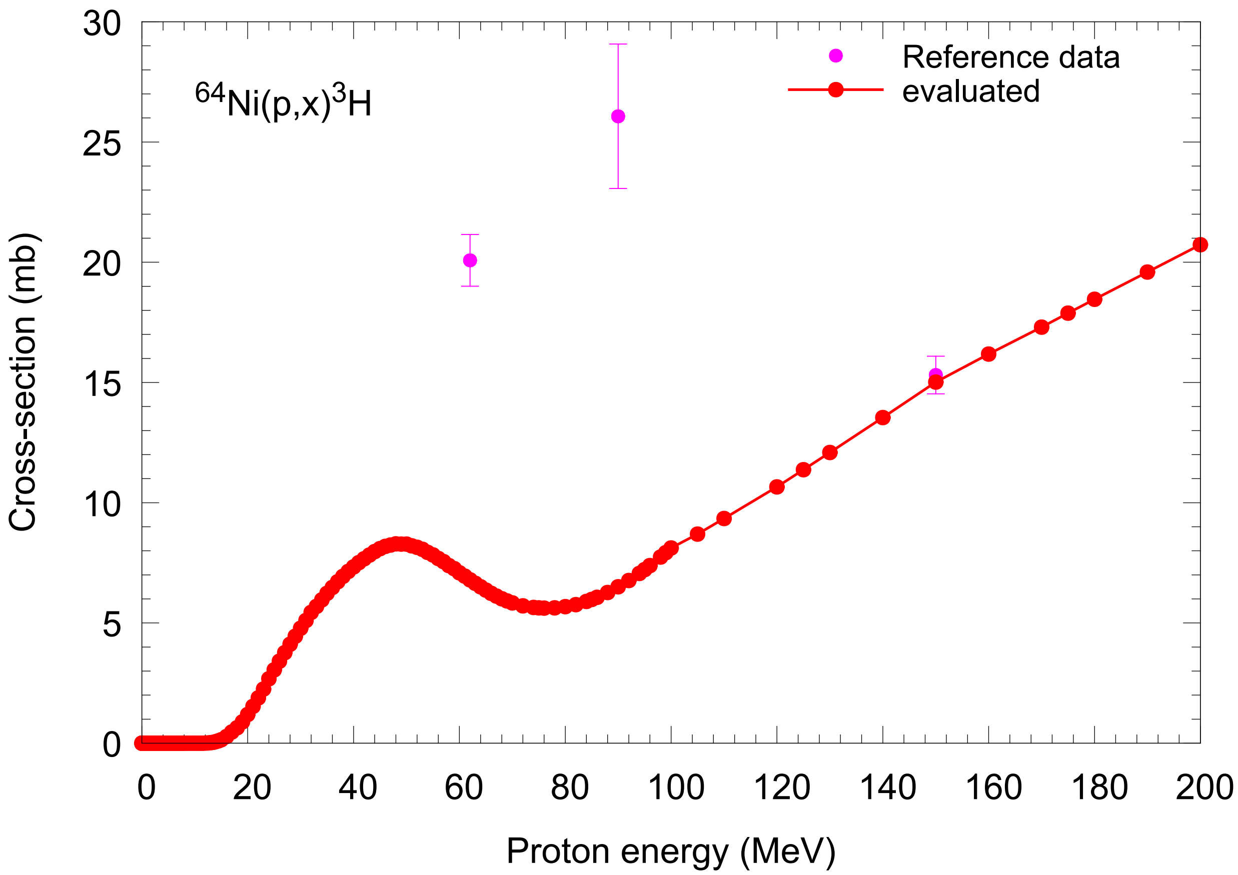


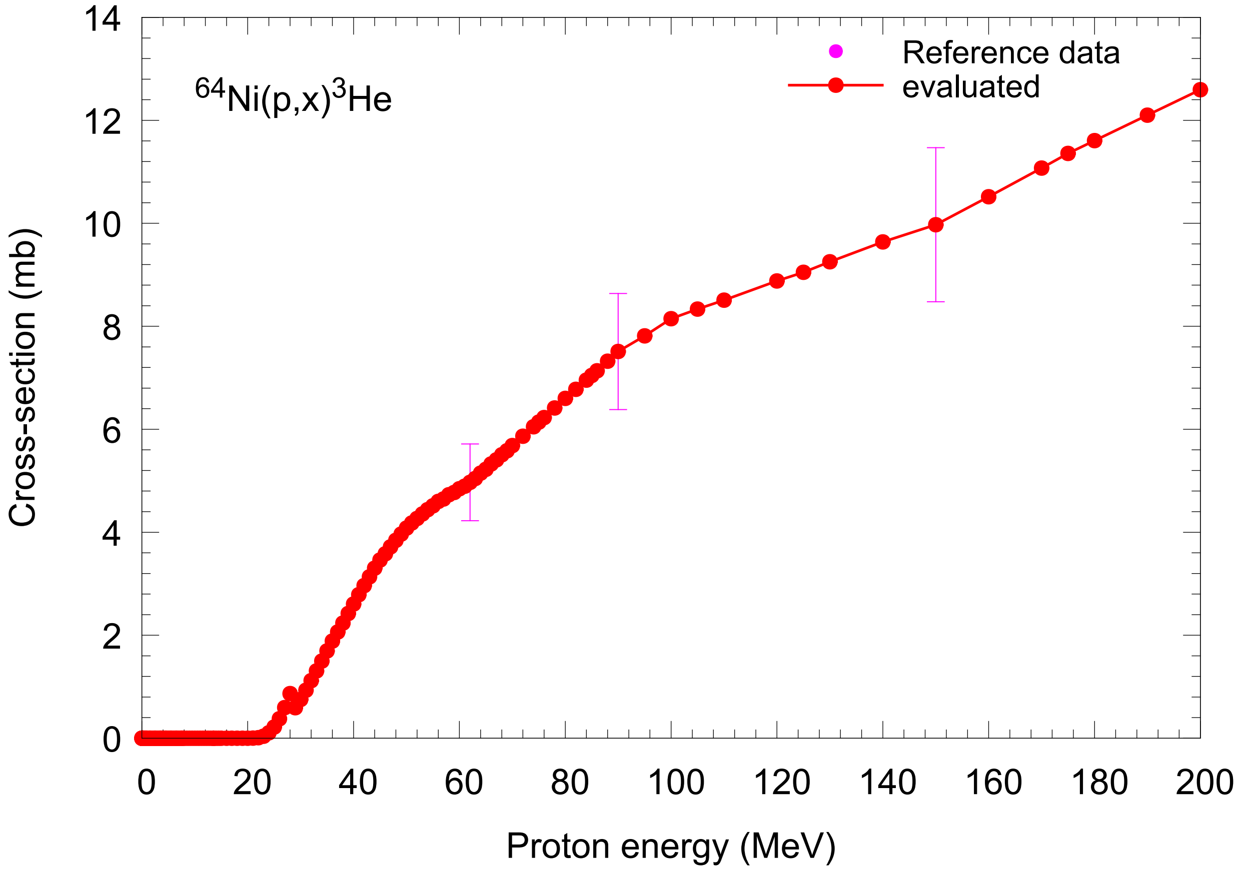
$^{62}Ni(p,g)^{63}Cu$
Cross-section (mb)
Proton energy (MeV)
Tingwell (89)
Simon (13)
evaluated


evaluated
^{64}Ni(p,x)^{1}nn
Cross-section (mb)
Proton energy (MeV)
0
500
1000
1500
2000
2500
3000
0
20
40
60
80
100
120
140
160
180
200

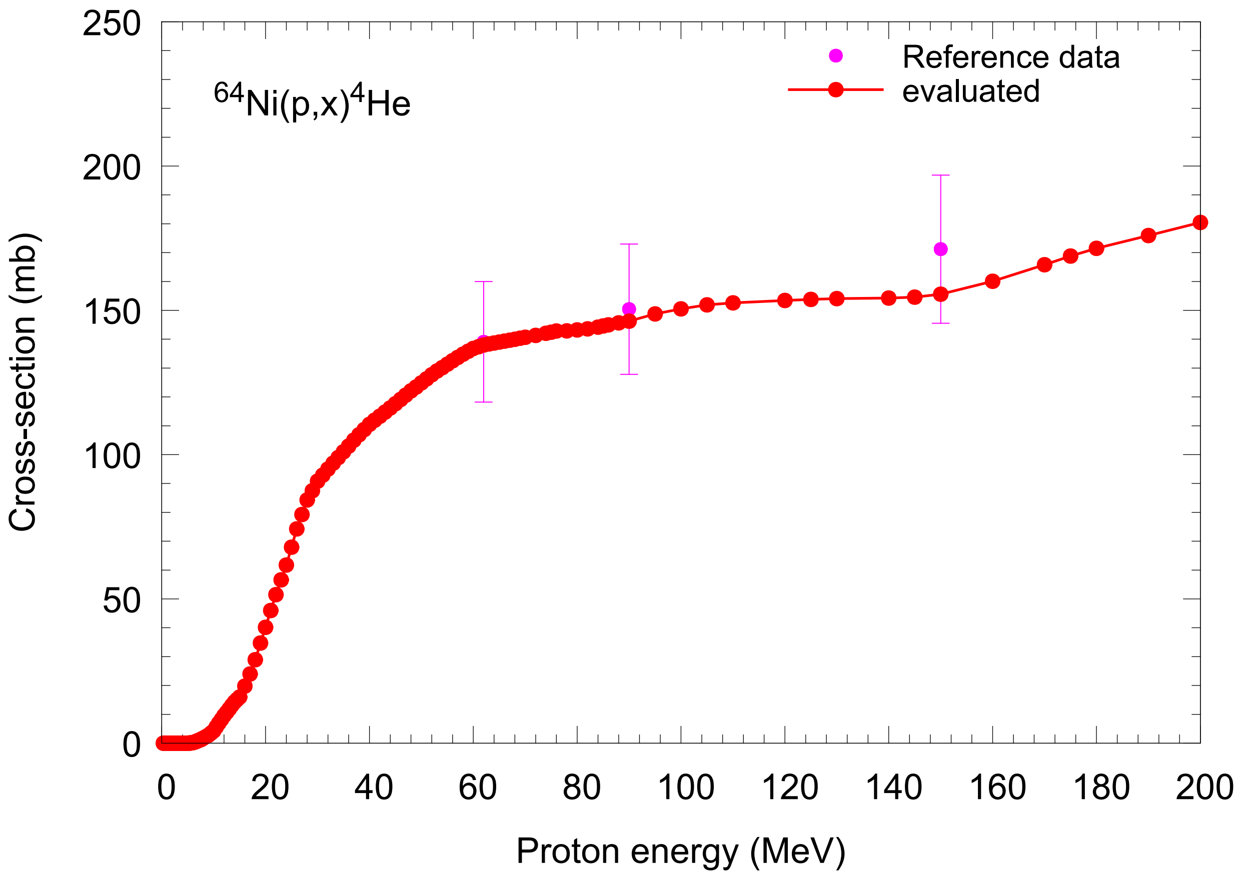

Reference data
evaluated
^{64}Ni(p,x)^{1}H
Cross-section (mb)
Proton energy (MeV)
0
200
400
600
800
1000
1200
1400
0
20
40
60
80
100
120
140
160
180
200


$^{64}Ni(p,x)^{2}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
0
20
40
60
80
100
120
140
160
180
200

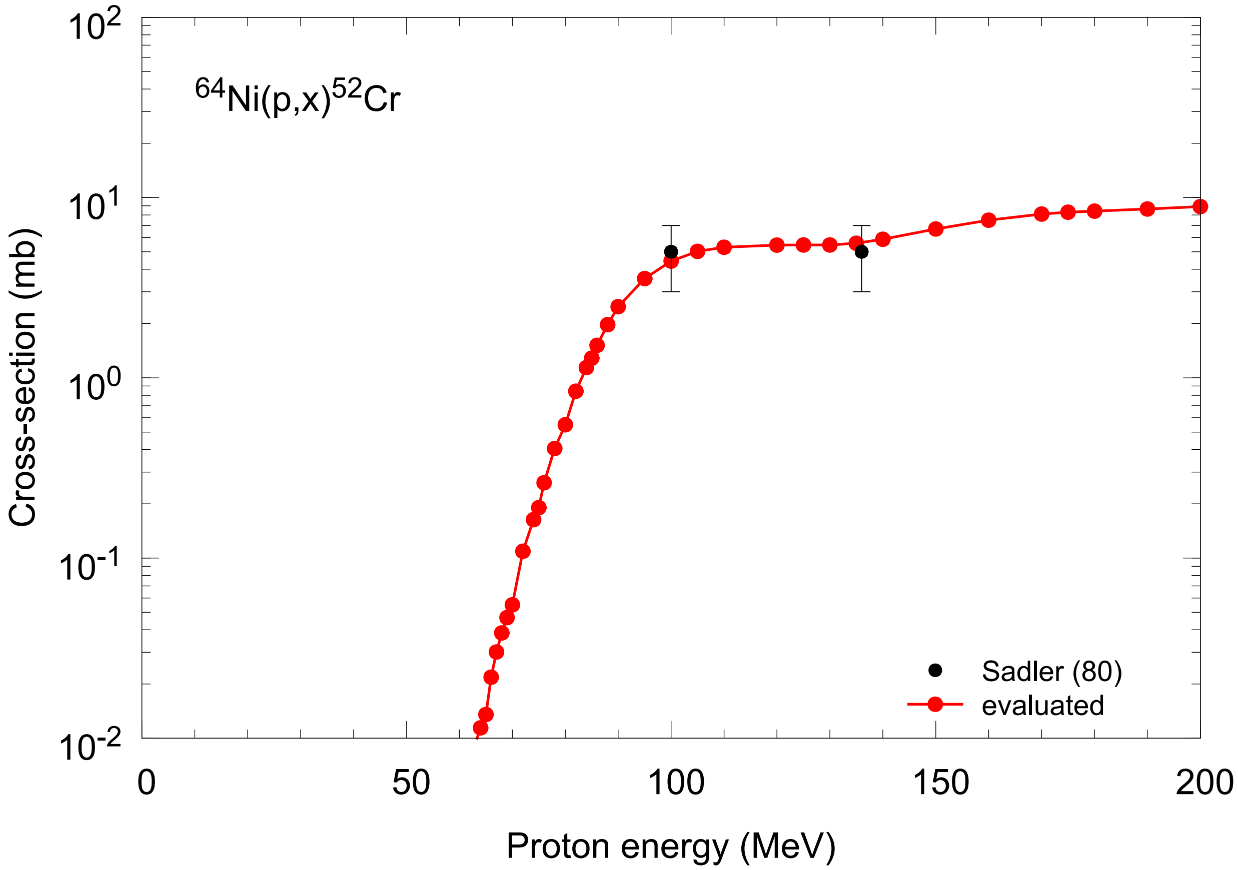

$^{64}Ni(p,x)^{3}H$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
0
20
40
60
80
100
120
140
160
180
200



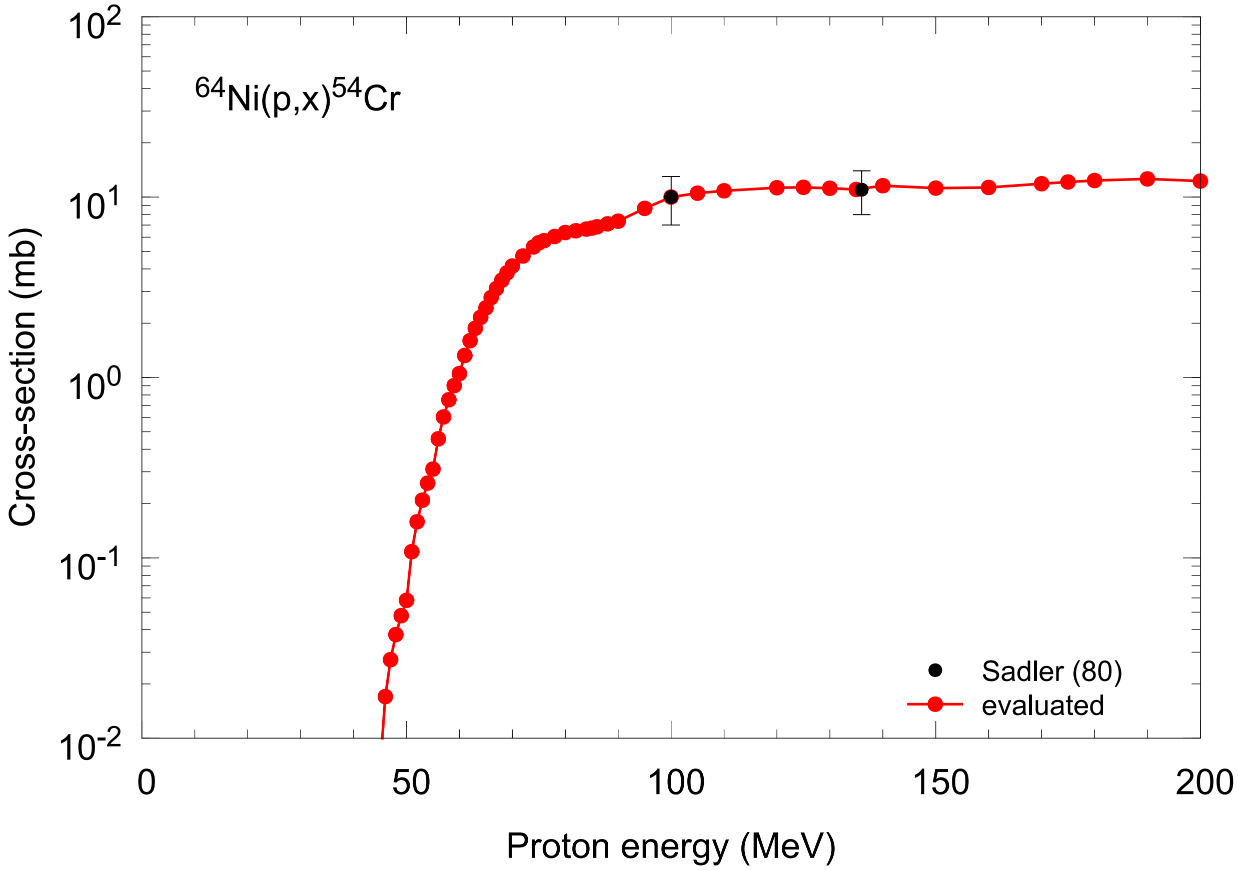
$^{64}Ni(p,x)^{3}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
2
4
6
8
10
12
14
0
20
40
60
80
100
120
140
160
180
200



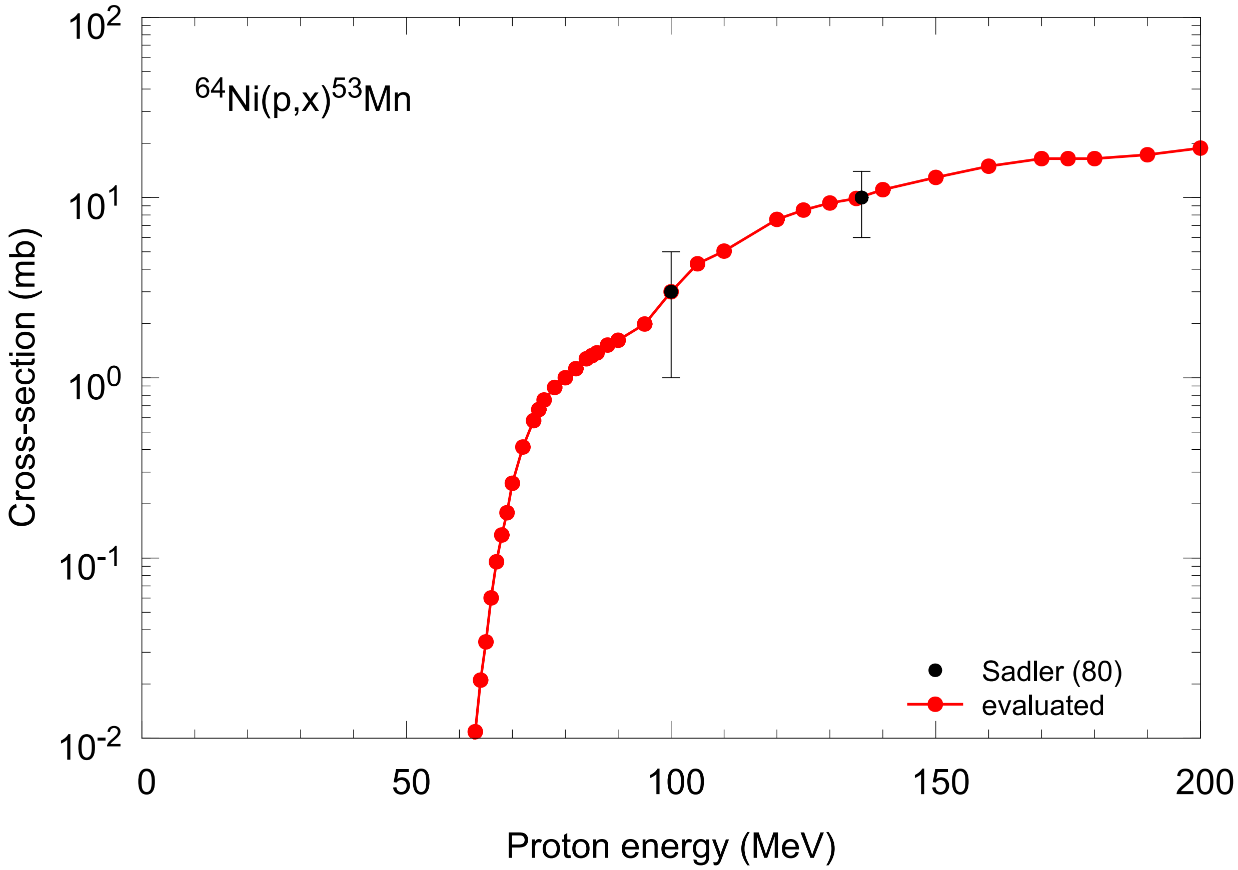
$^{64}Ni(p,x)^{4}He$
Reference data
evaluated
Cross-section (mb)
Proton energy (MeV)
0
50
100
150
200
250
0
20
40
60
80
100
120
140
160
180
200



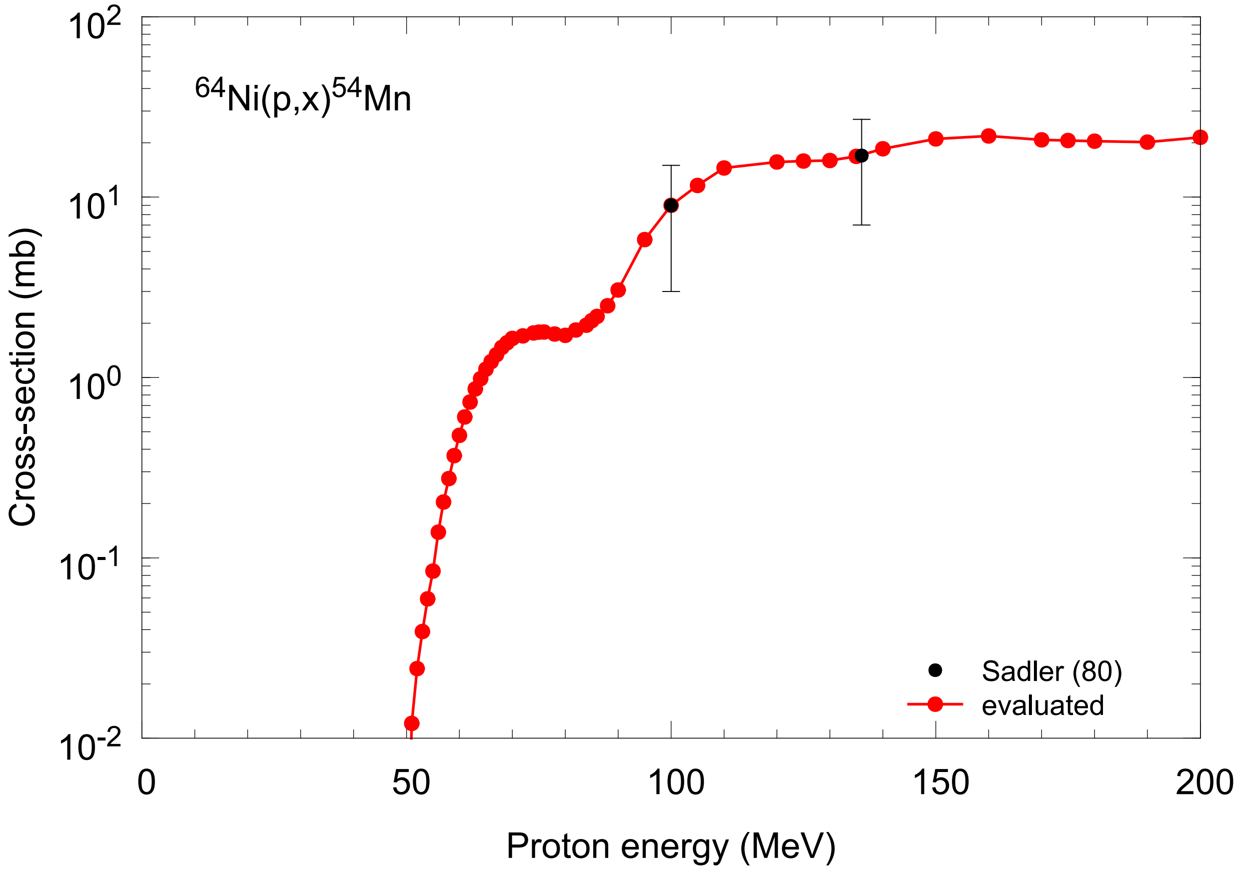
$^{64}Ni(p,x)^{52}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



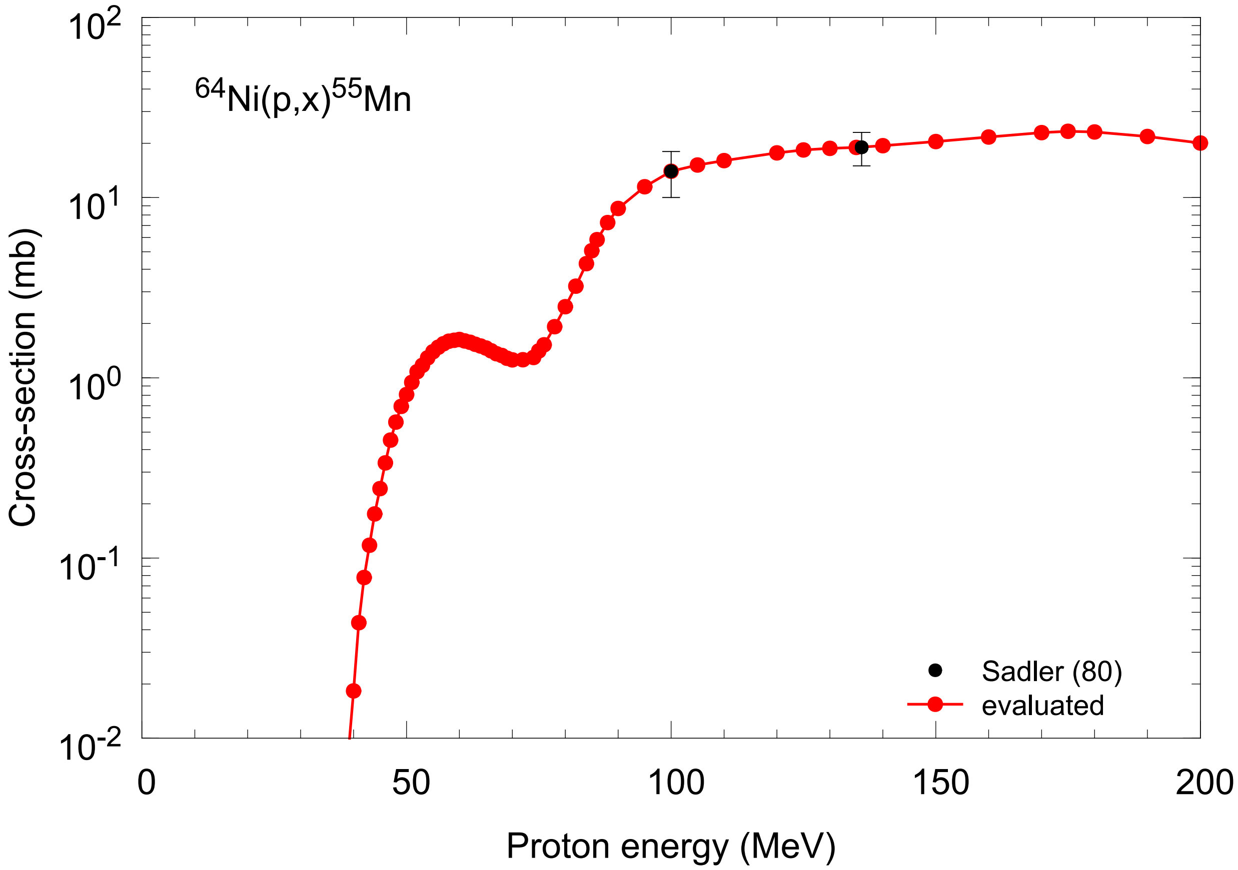
$^{64}Ni(p,x)^{54}Cr$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



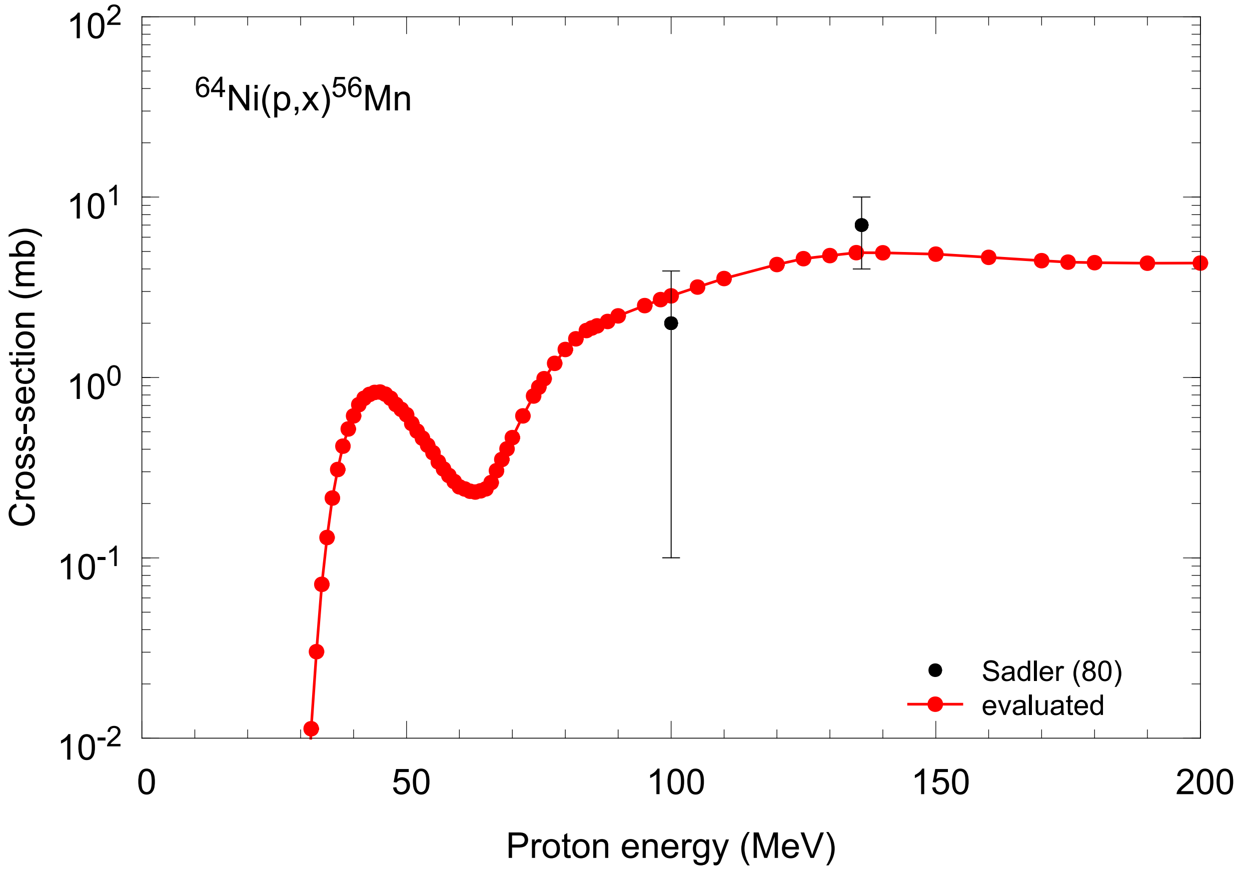
$^{64}Ni(p,x)^{53}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



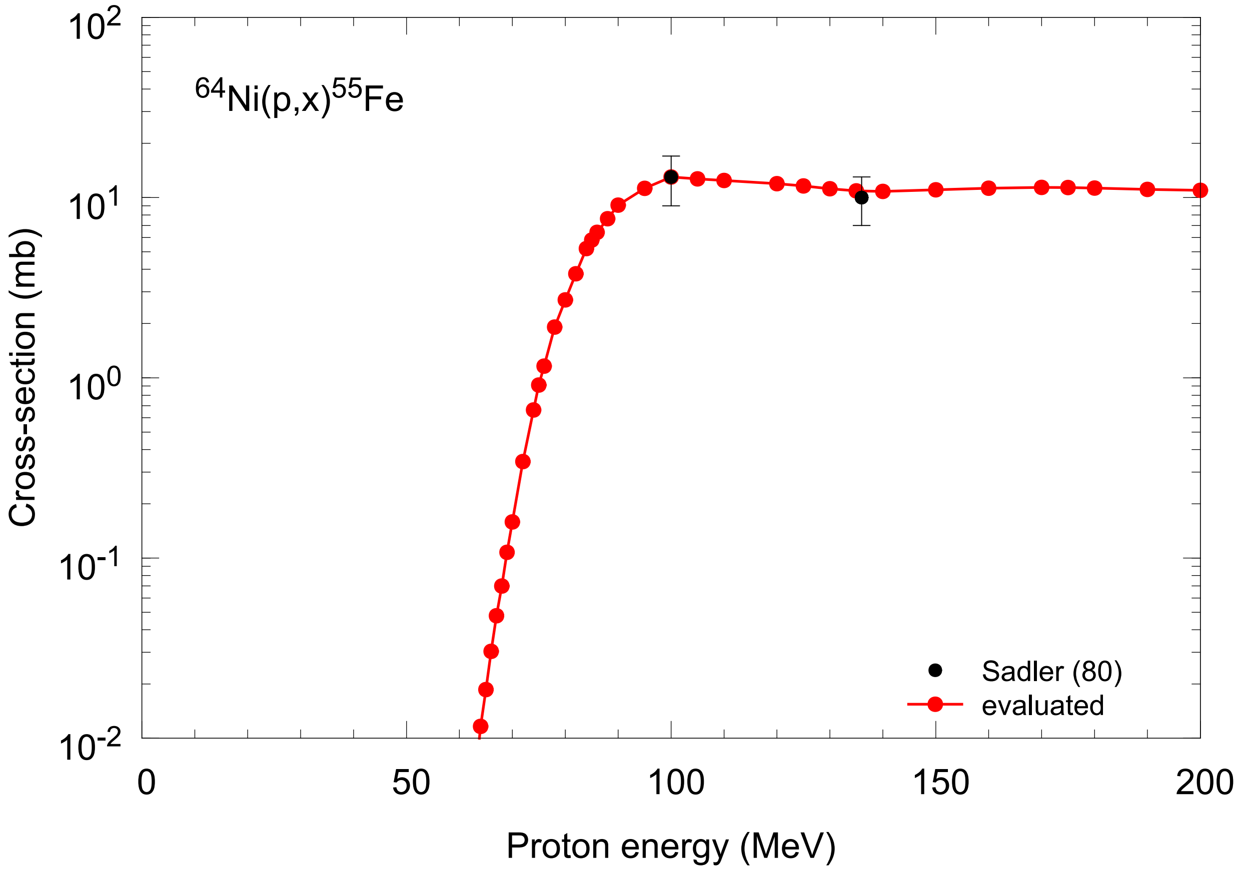
$^{64}Ni(p,x)^{54}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



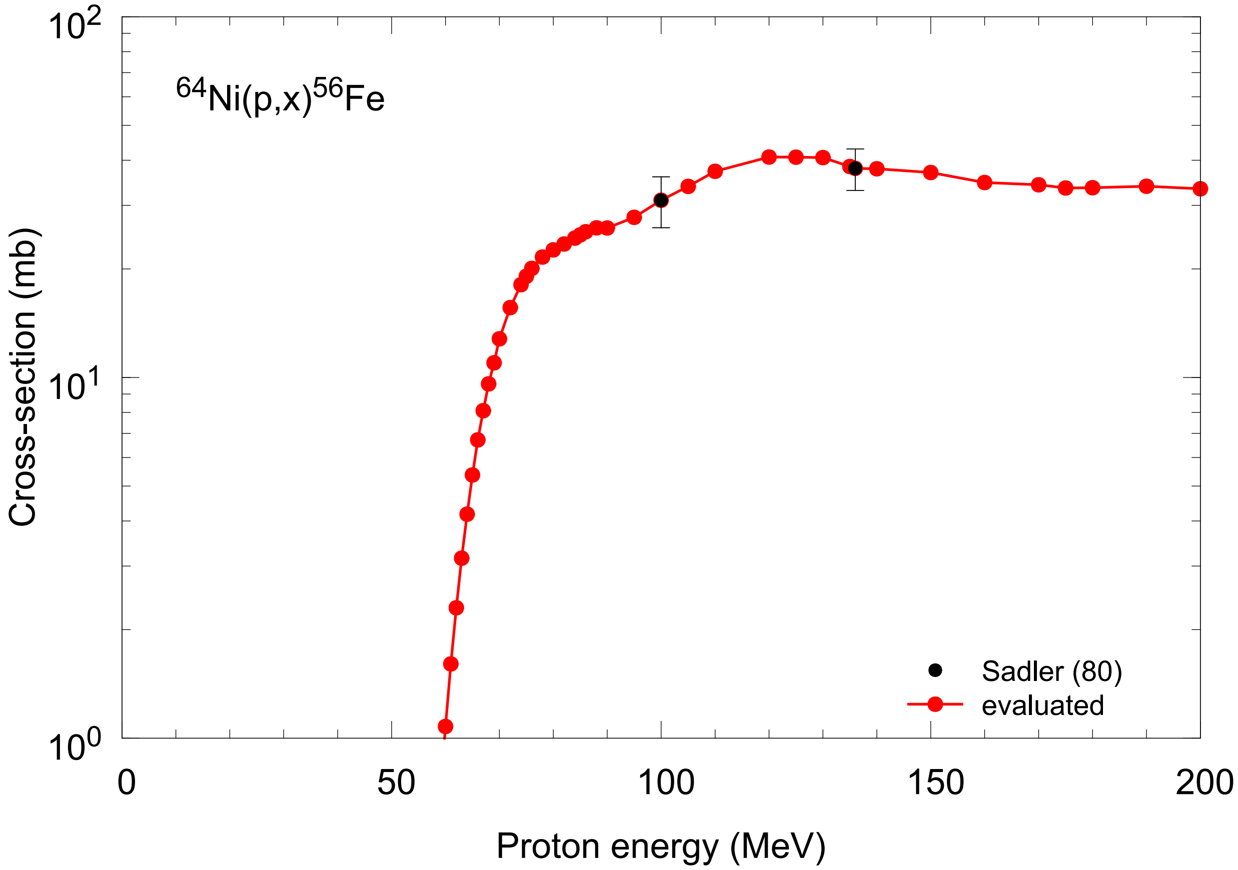
$^{64}Ni(p,x)^{55}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



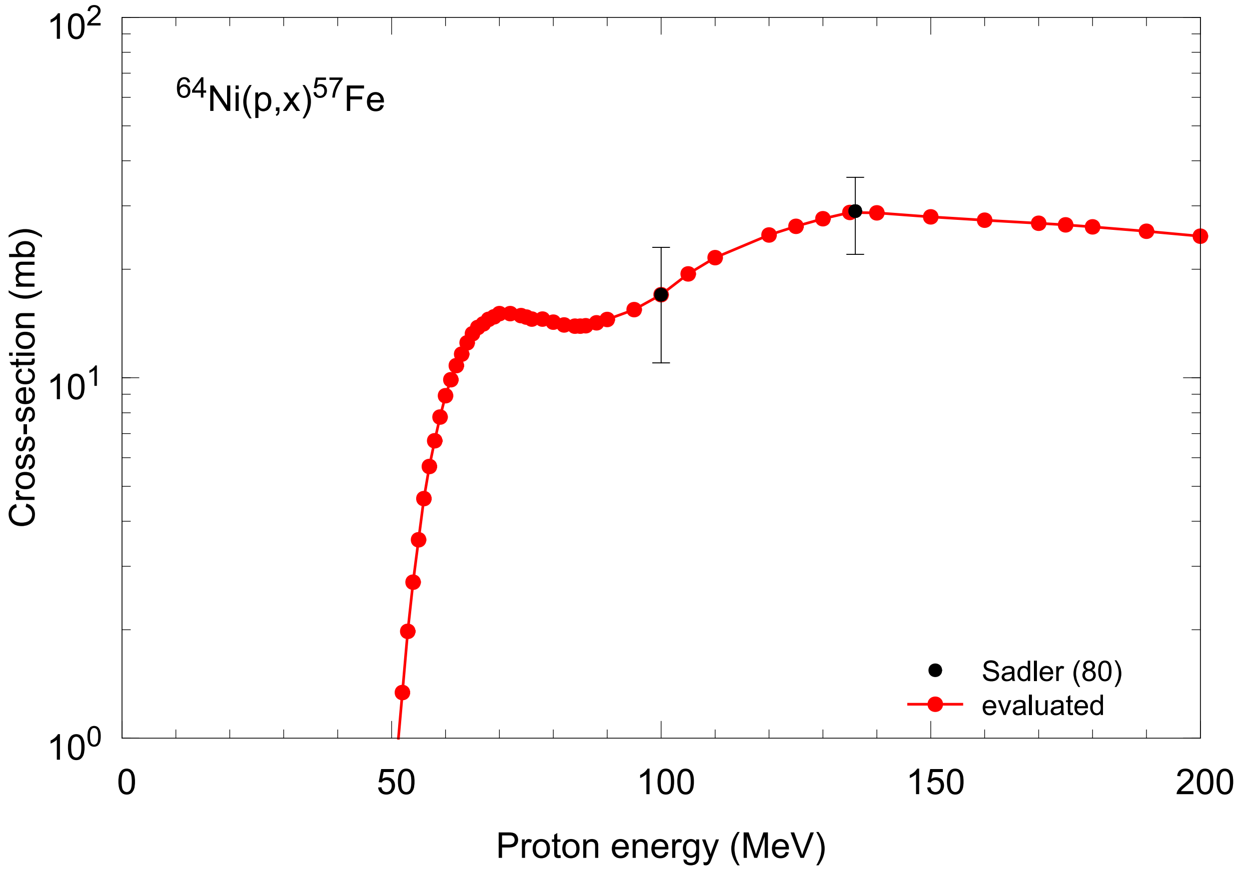
$^{64}Ni(p,x)^{56}Mn$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



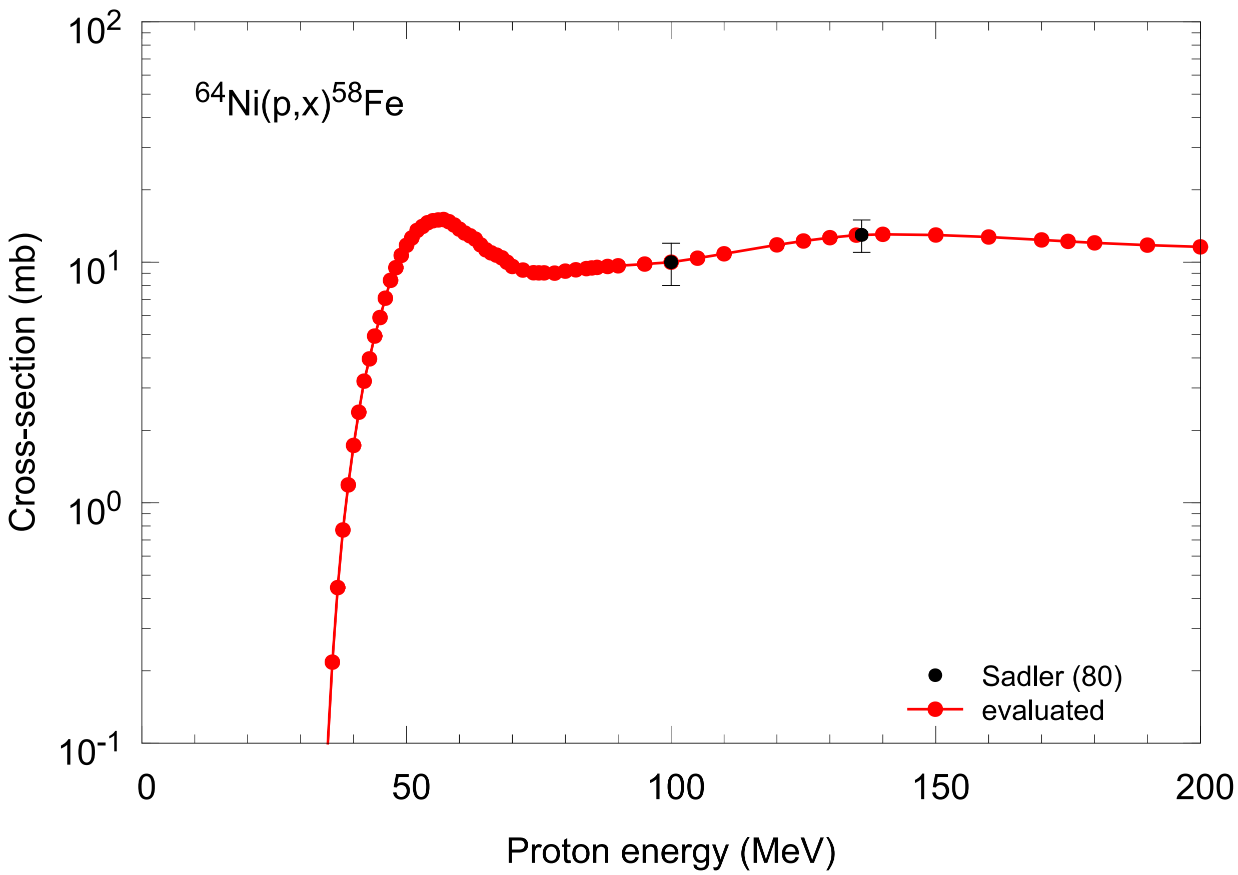
$^{64}Ni(p,x)^{55}Fe$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



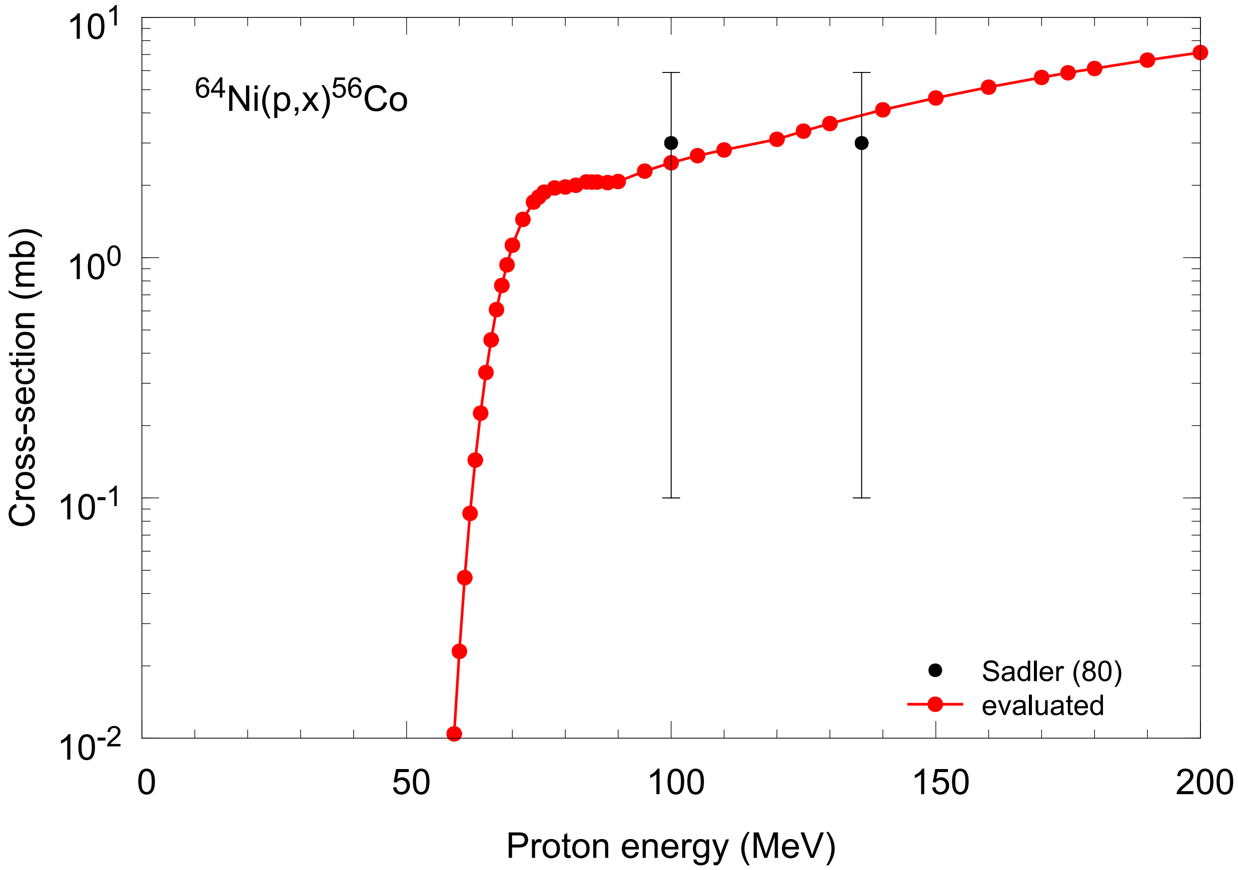
$^{64}Ni(p,x)^{56}Fe$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



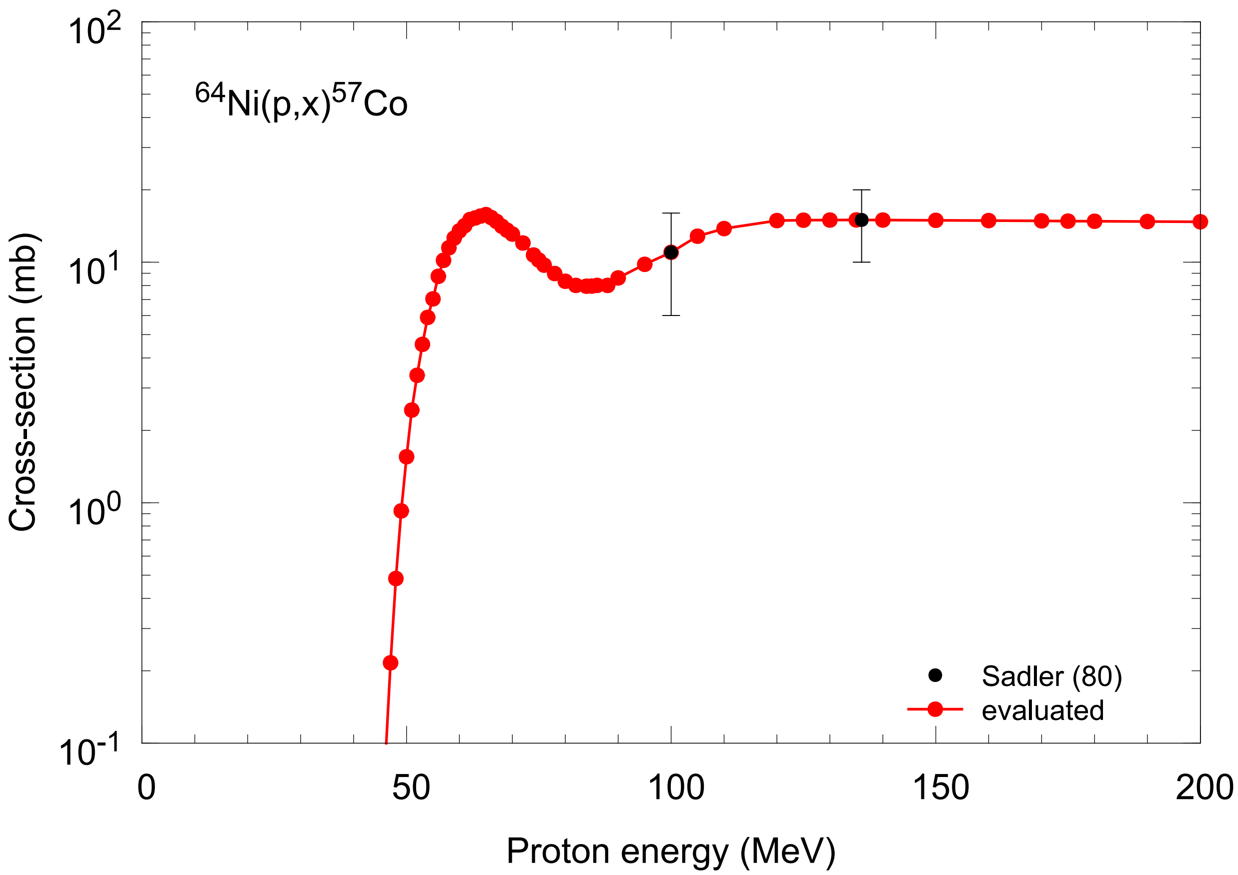
$^{64}Ni(p,x)^{57}Fe$
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^2
10^1
10^0
0
50
100
150
200



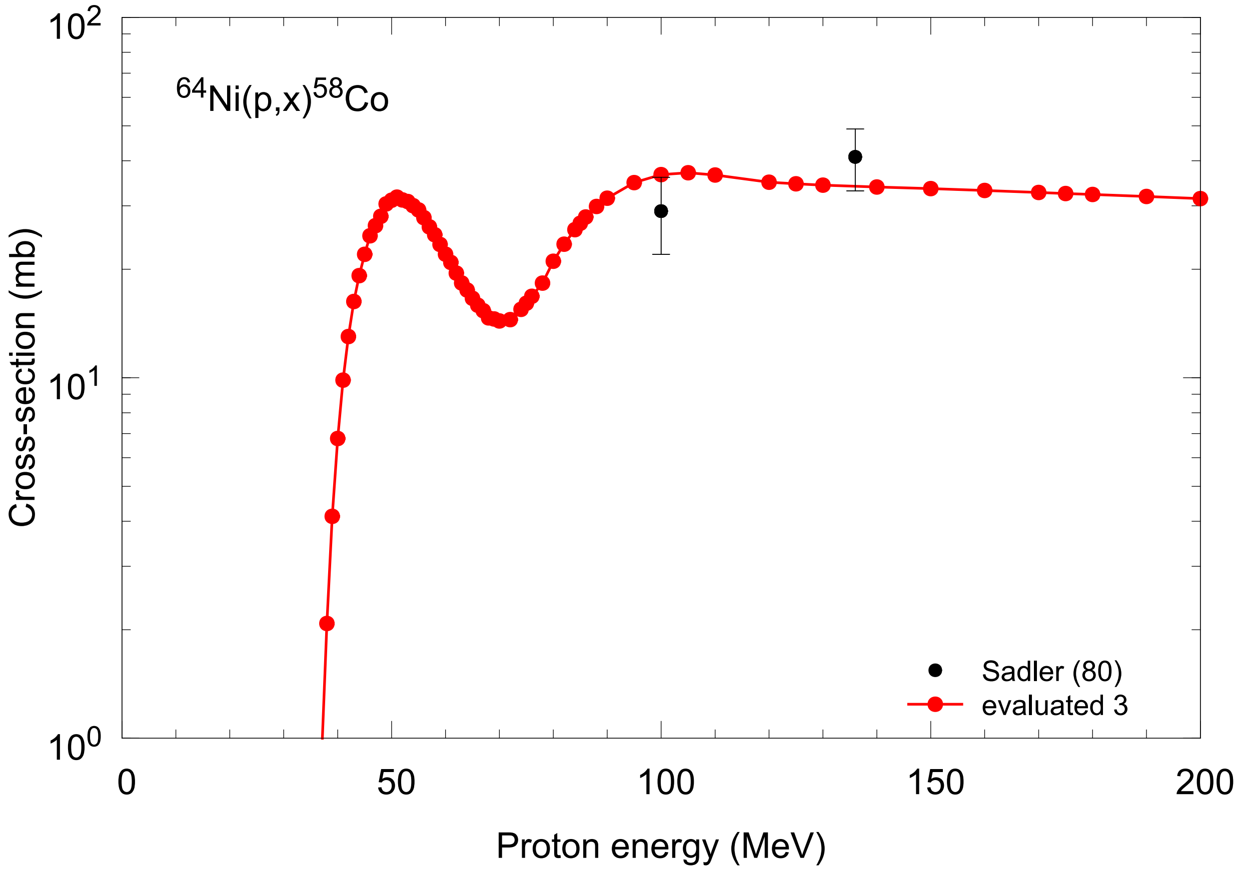
$^{64}Ni(p,x)^{58}Fe$
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^2
10^1
10^0
10^{-1}
0
50
100
150
200



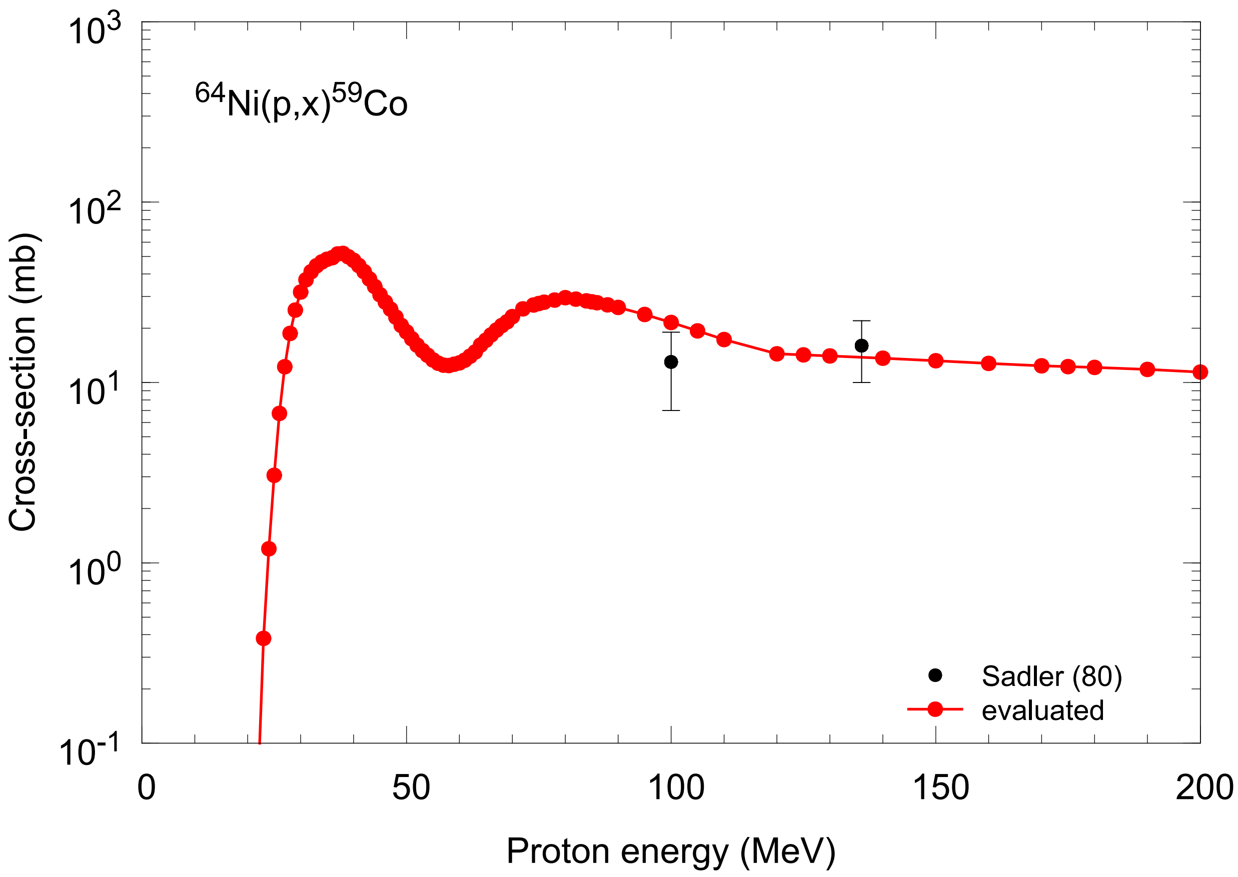
$^{64}Ni(p,x)^{56}Co$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200



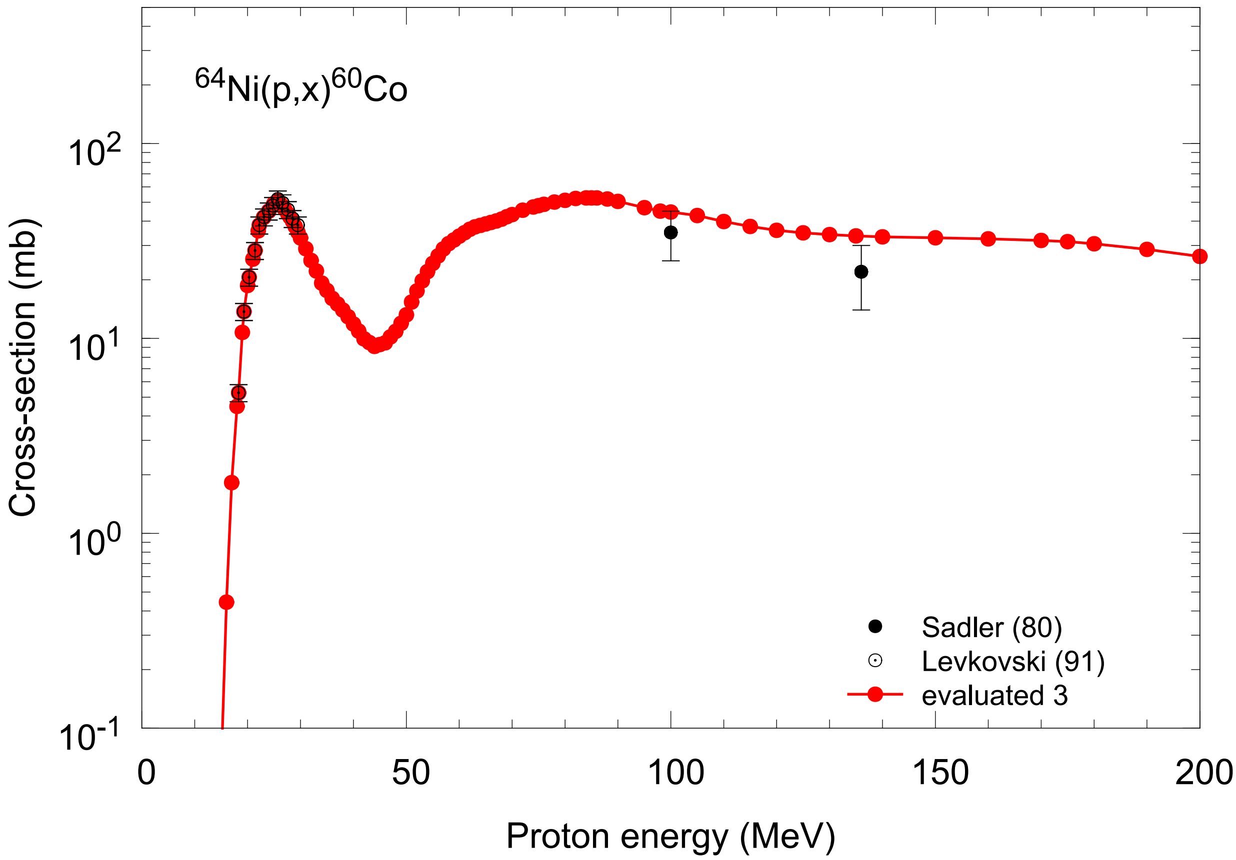
$^{64}Ni(p,x)^{57}Co$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200



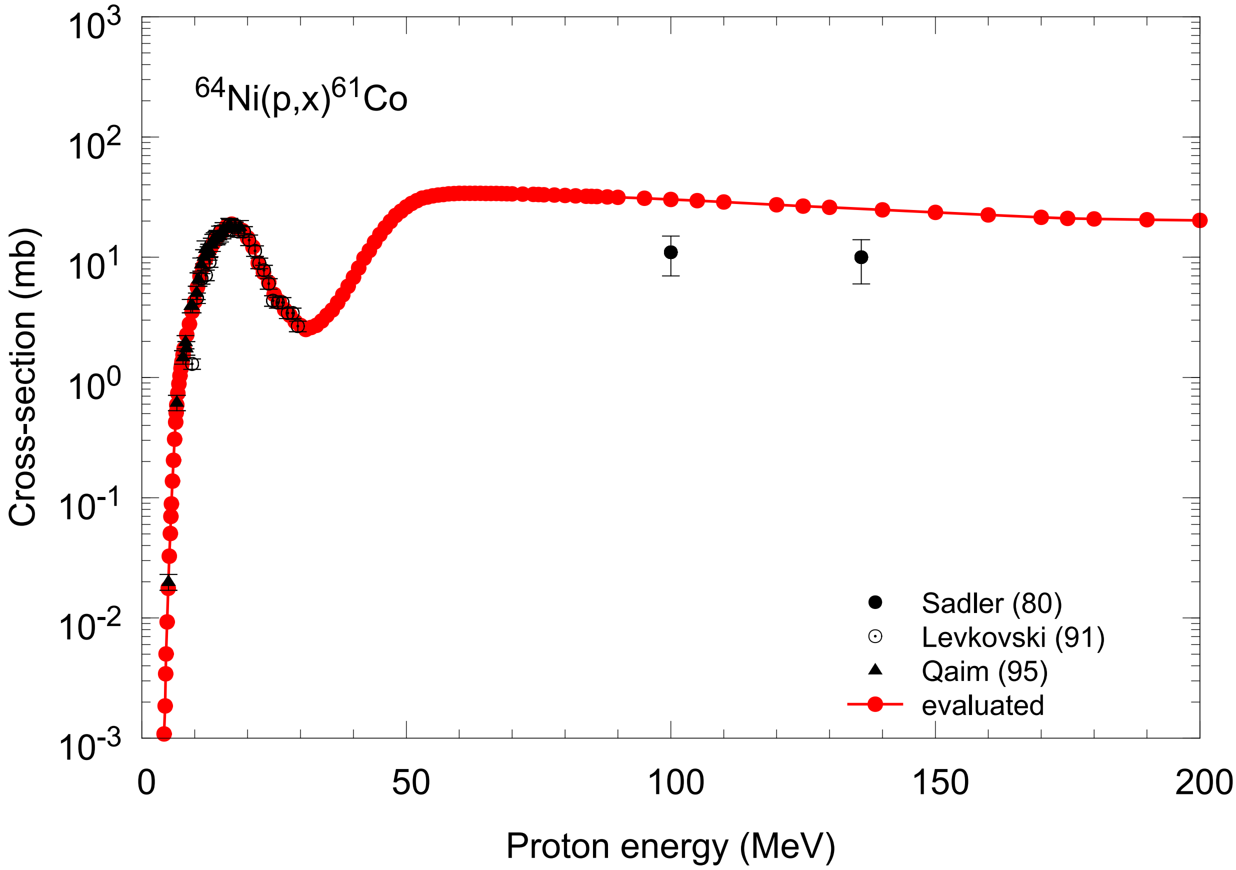
$^{64}Ni(p,x)^{58}Co$
Sadler (80)
evaluated 3
Cross-section (mb)
Proton energy (MeV)
10^2
10^1
10^0
0
50
100
150
200



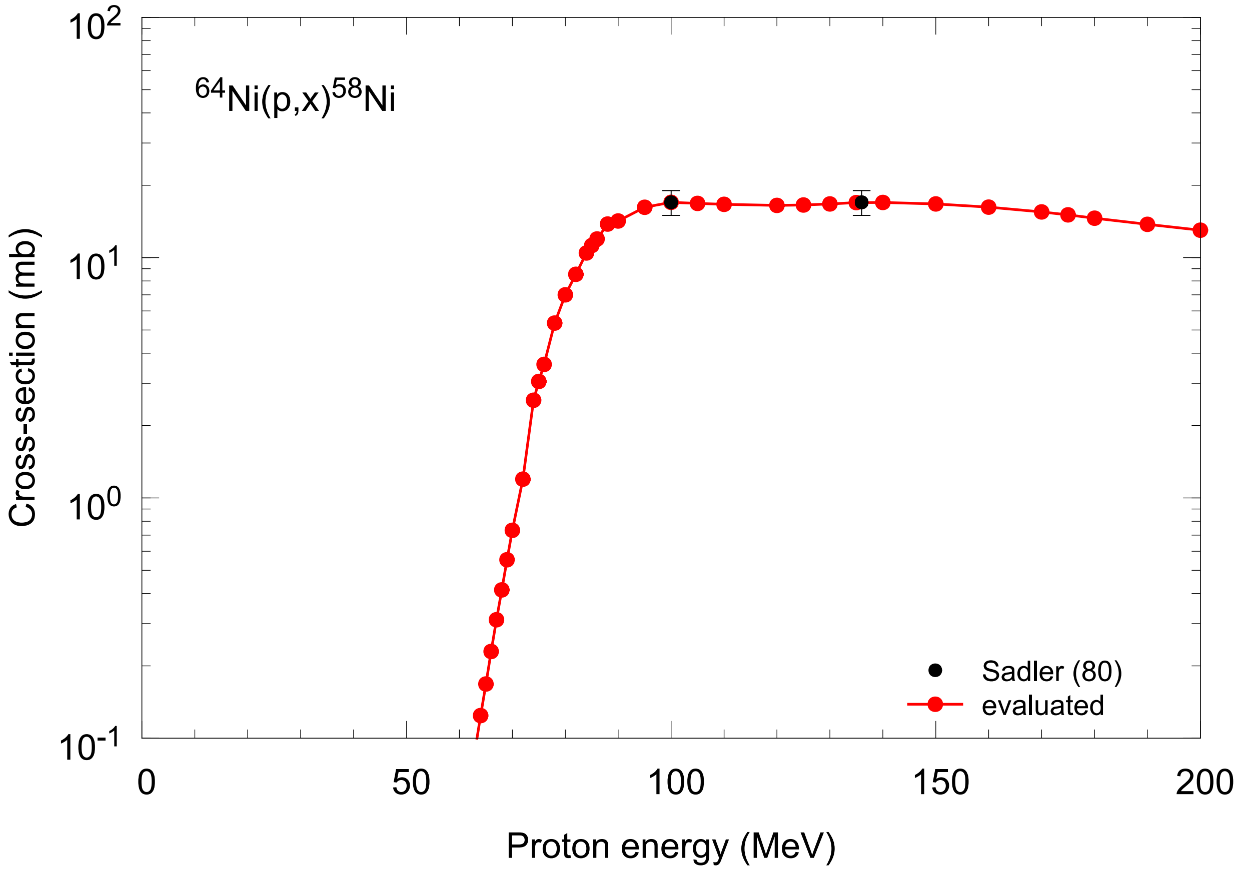
$^{64}Ni(p,x)^{59}Co$
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^3
10^2
10^1
10^0
10^{-1}
0
50
100
150
200



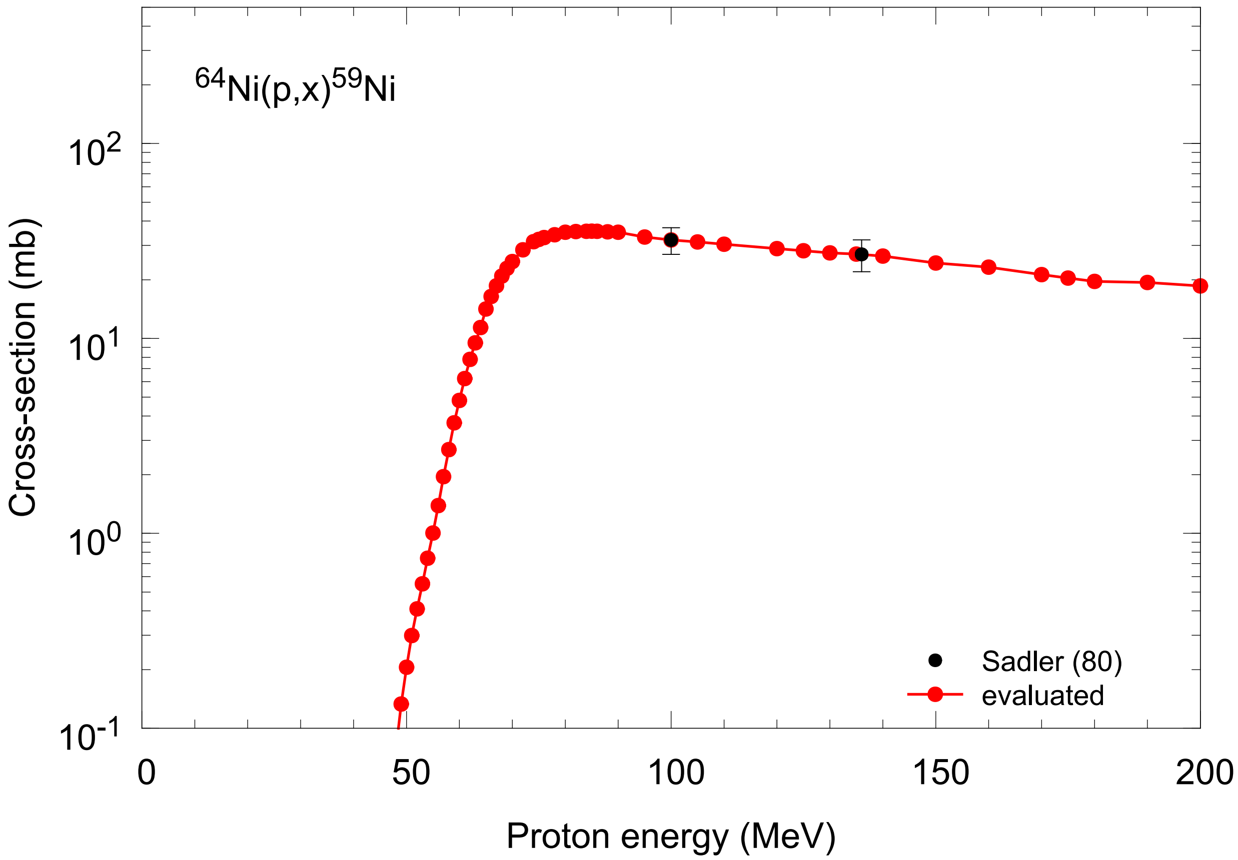
$^{64}Ni(p,x)^{60}Co$
Cross-section (mb)
10^2
10^1
10^0
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
Levkovski (91)
evaluated 3



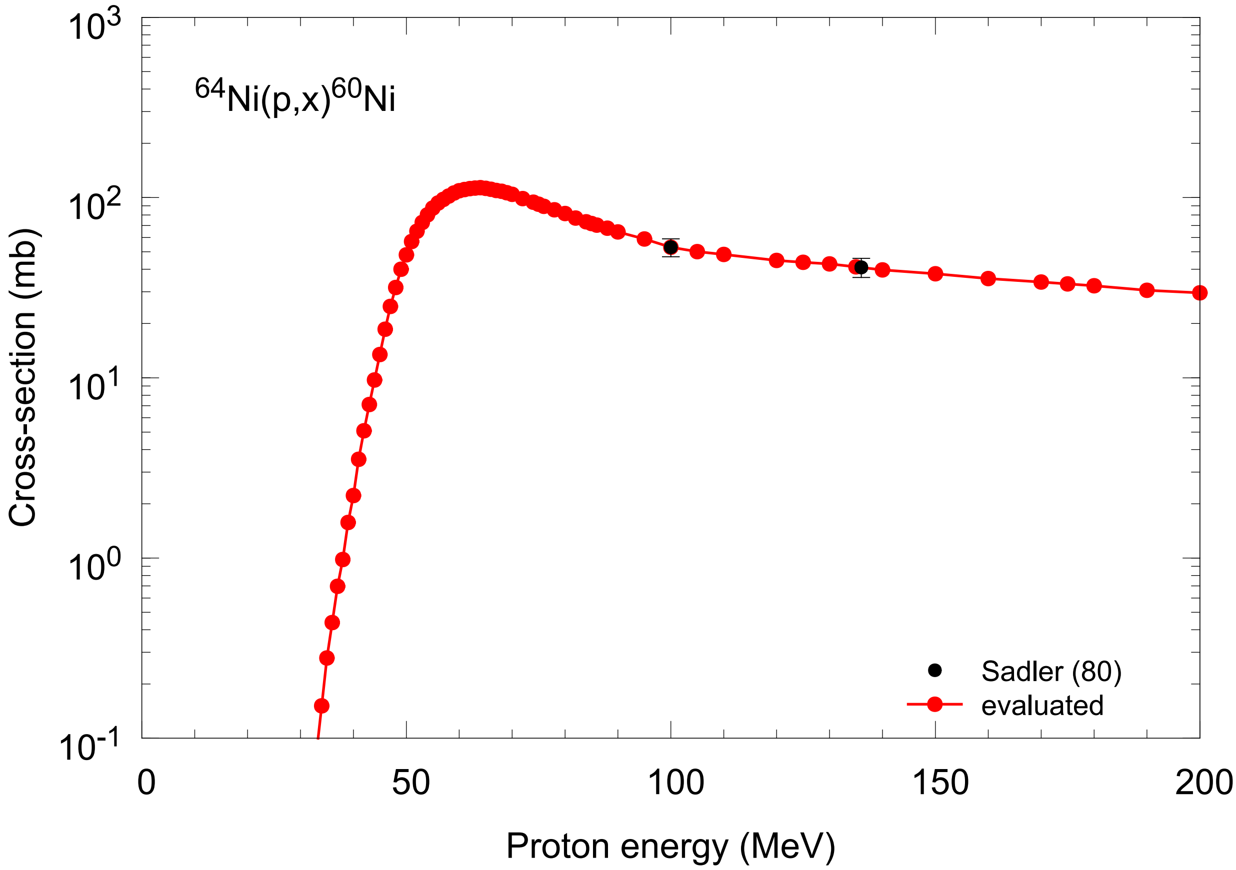
$^{64}Ni(p,x)^{61}Co$
Cross-section (mb)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
Levkovski (91)
Qaim (95)
evaluated



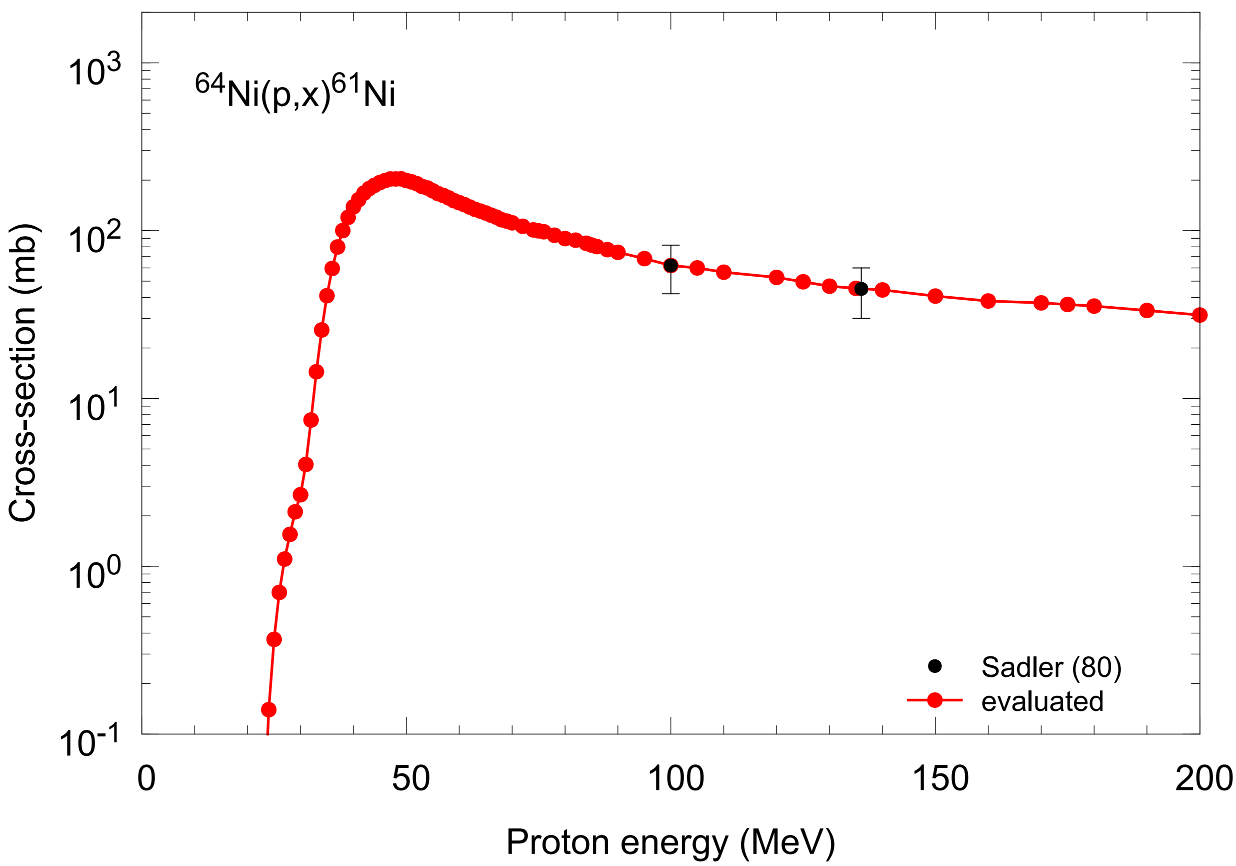
$^{64}Ni(p,x)^{58}Ni$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated



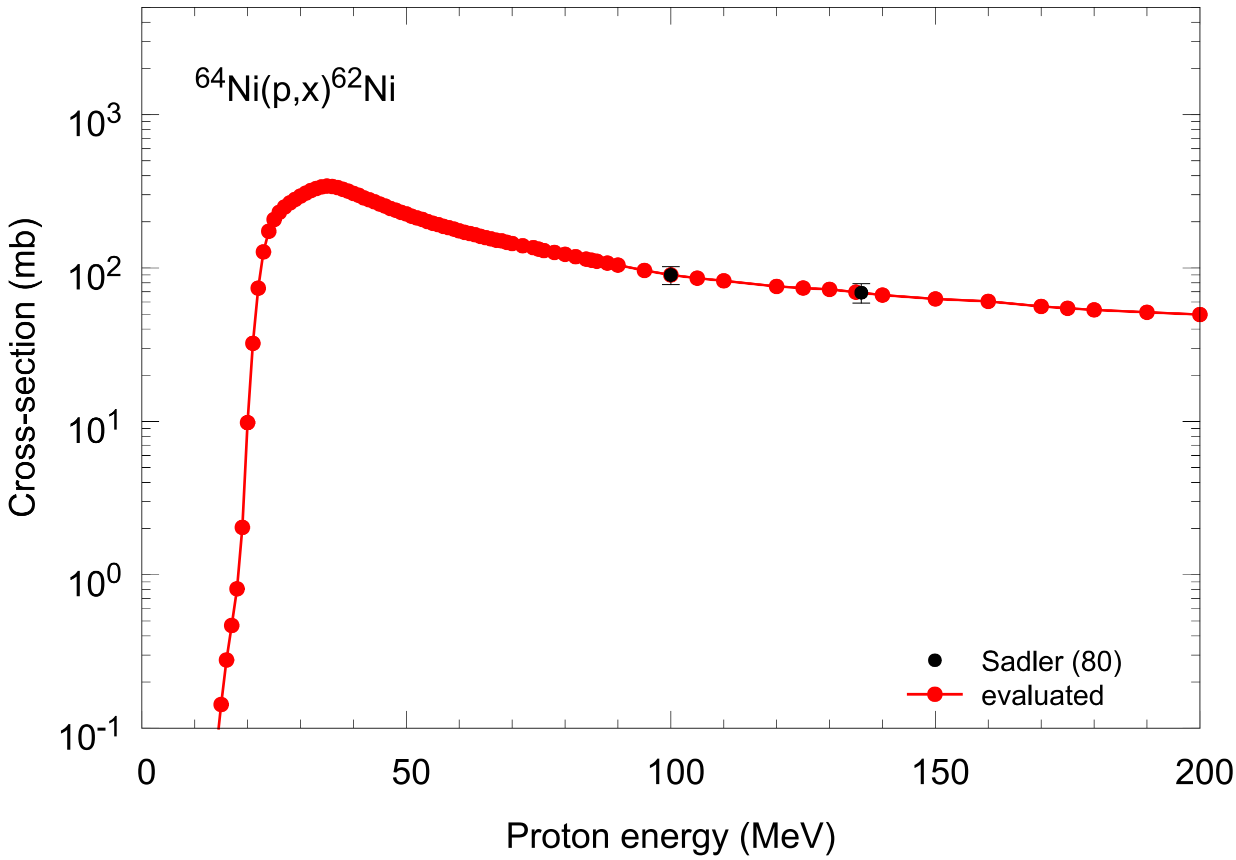
$^{64}Ni(p,x)^{59}Ni$
Cross-section (mb)
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200
Proton energy (MeV)
Sadler (80)
evaluated

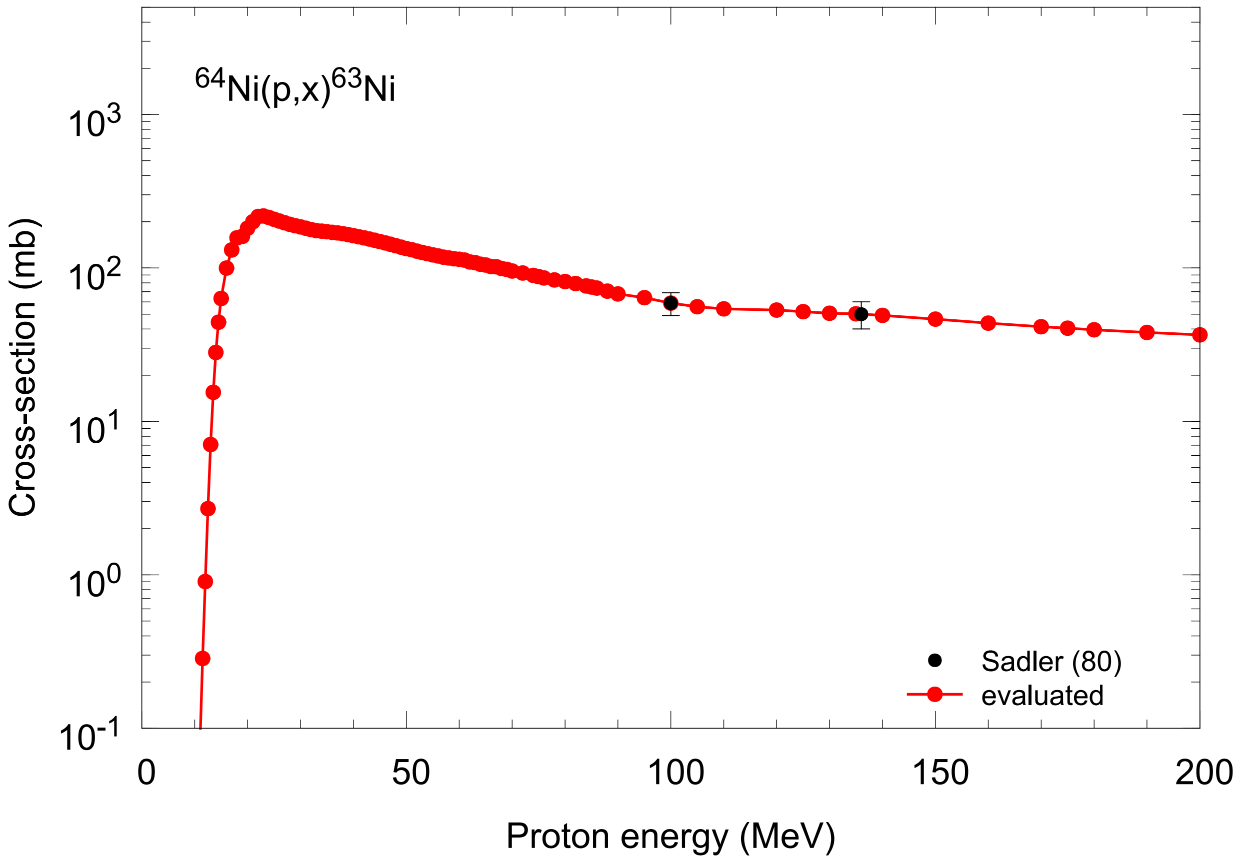


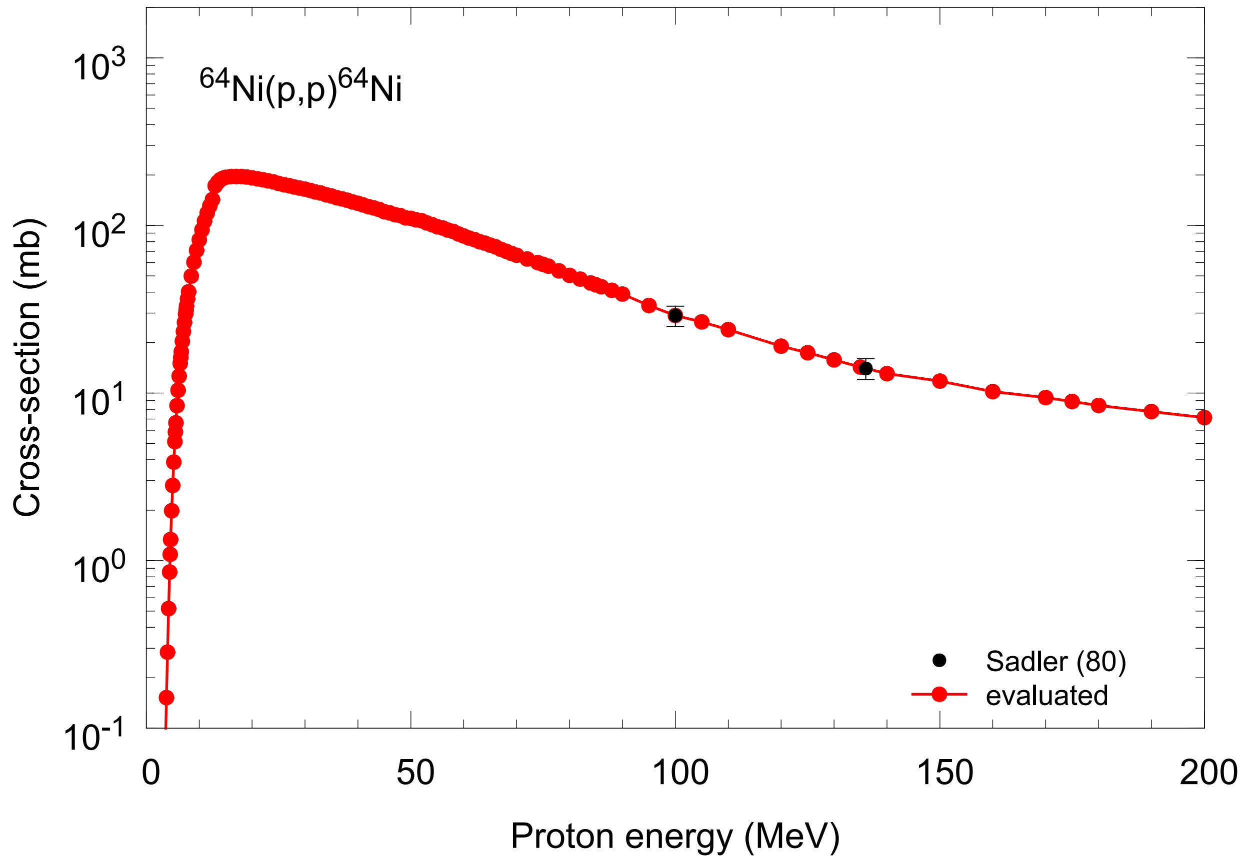
$^{64}Ni(p,x)^{60}Ni$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated



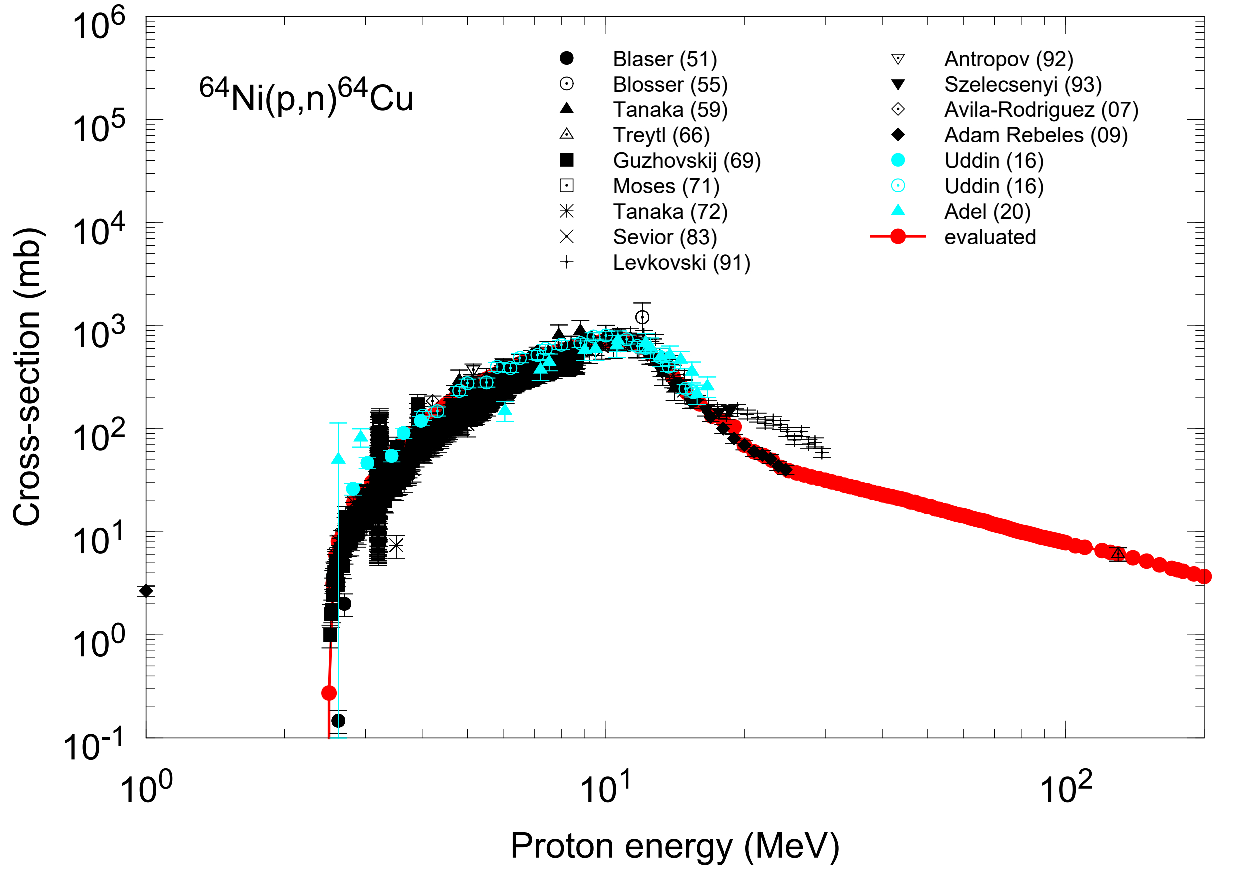
$^{64}Ni(p,x)^{61}Ni$
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated


^{64}Ni(p,x)^{62}Ni
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200

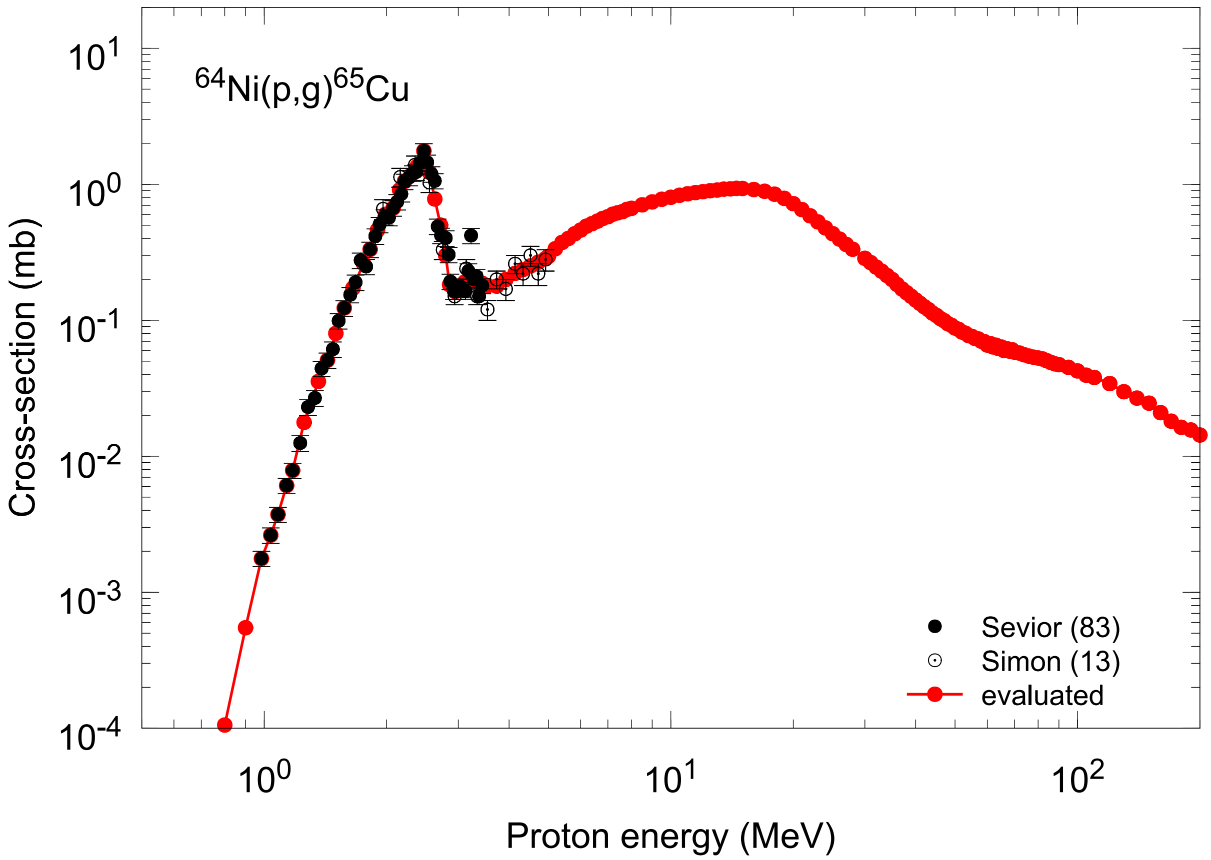

^{64}Ni(p,x)^{63}Ni
Cross-section (mb)
Proton energy (MeV)
Sadler (80)
evaluated
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
0
50
100
150
200



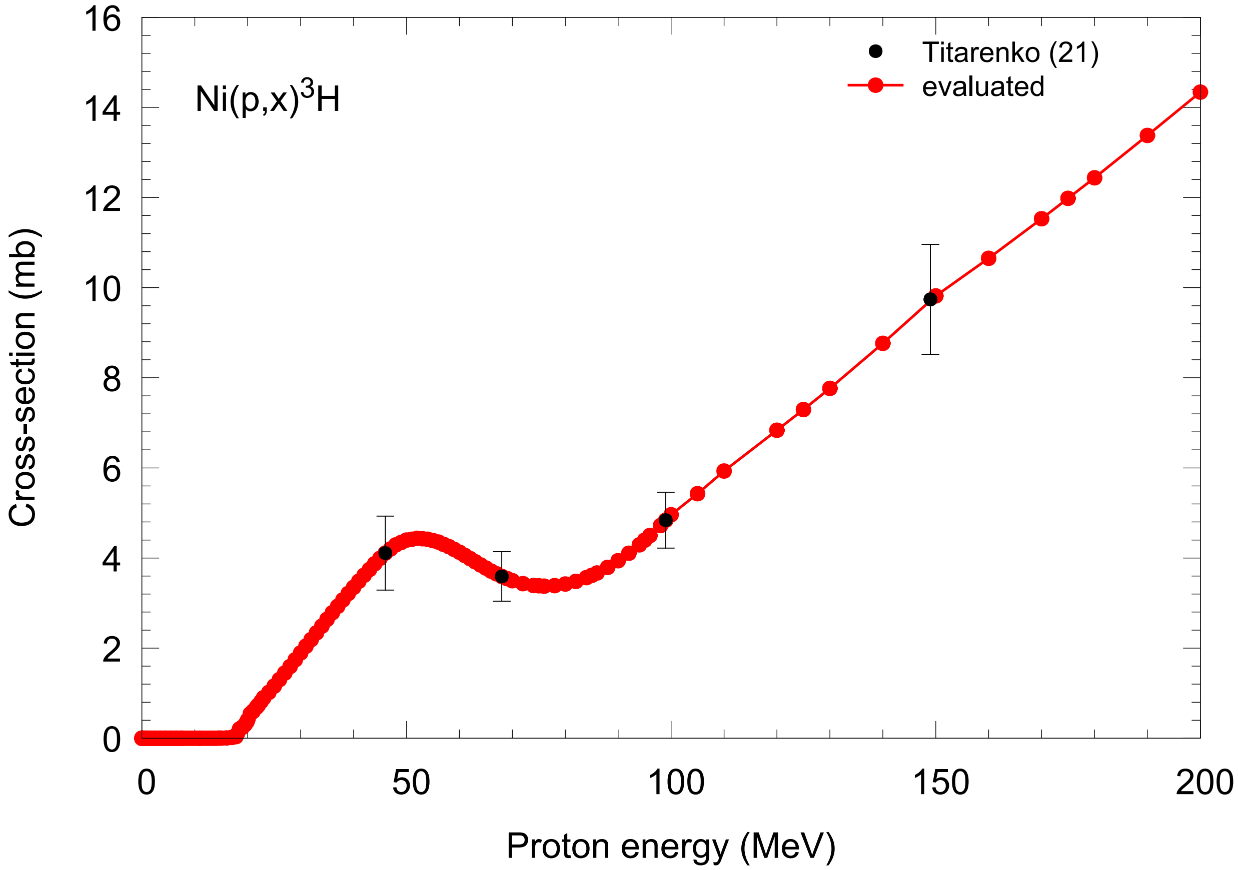
^{64}Ni(p,p)^{64}Ni
Sadler (80)
evaluated
Cross-section (mb)
Proton energy (MeV)

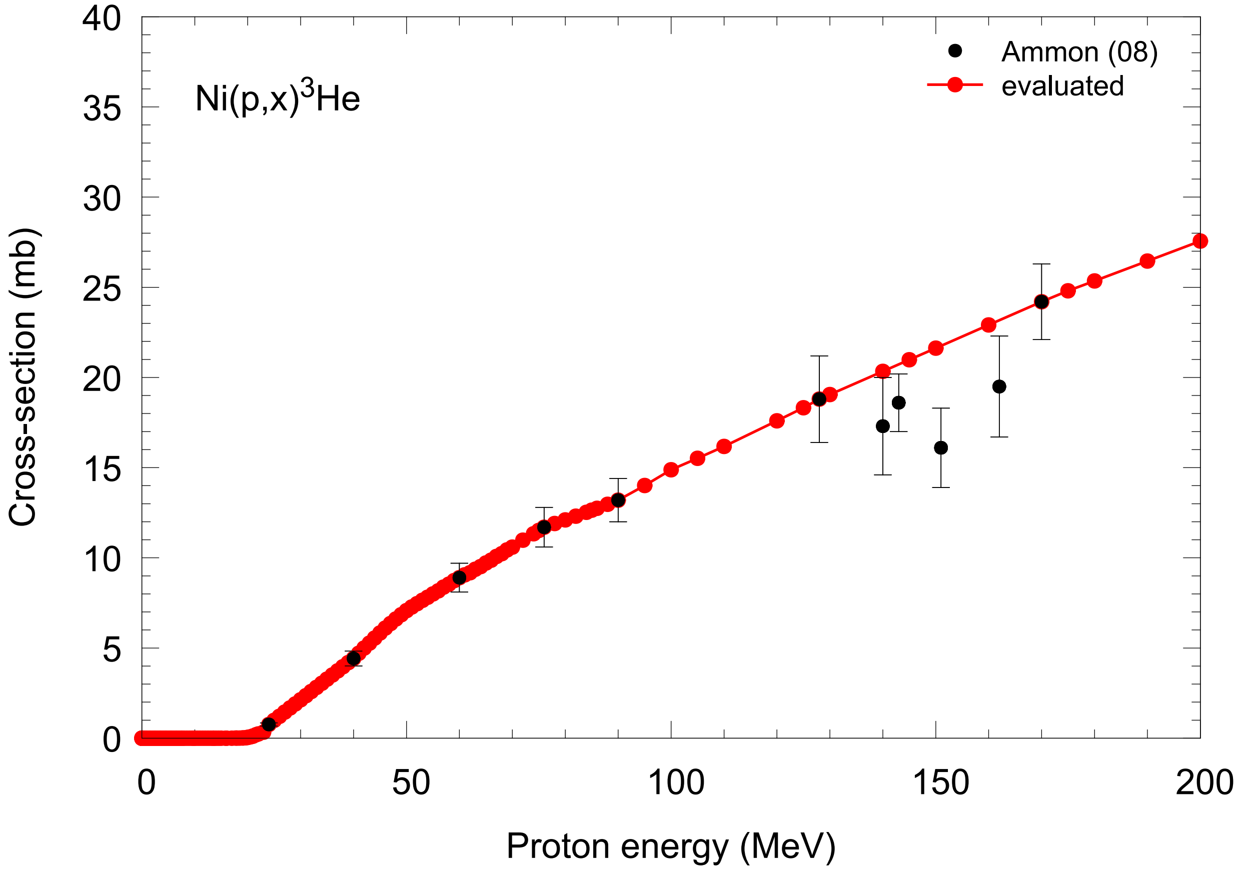


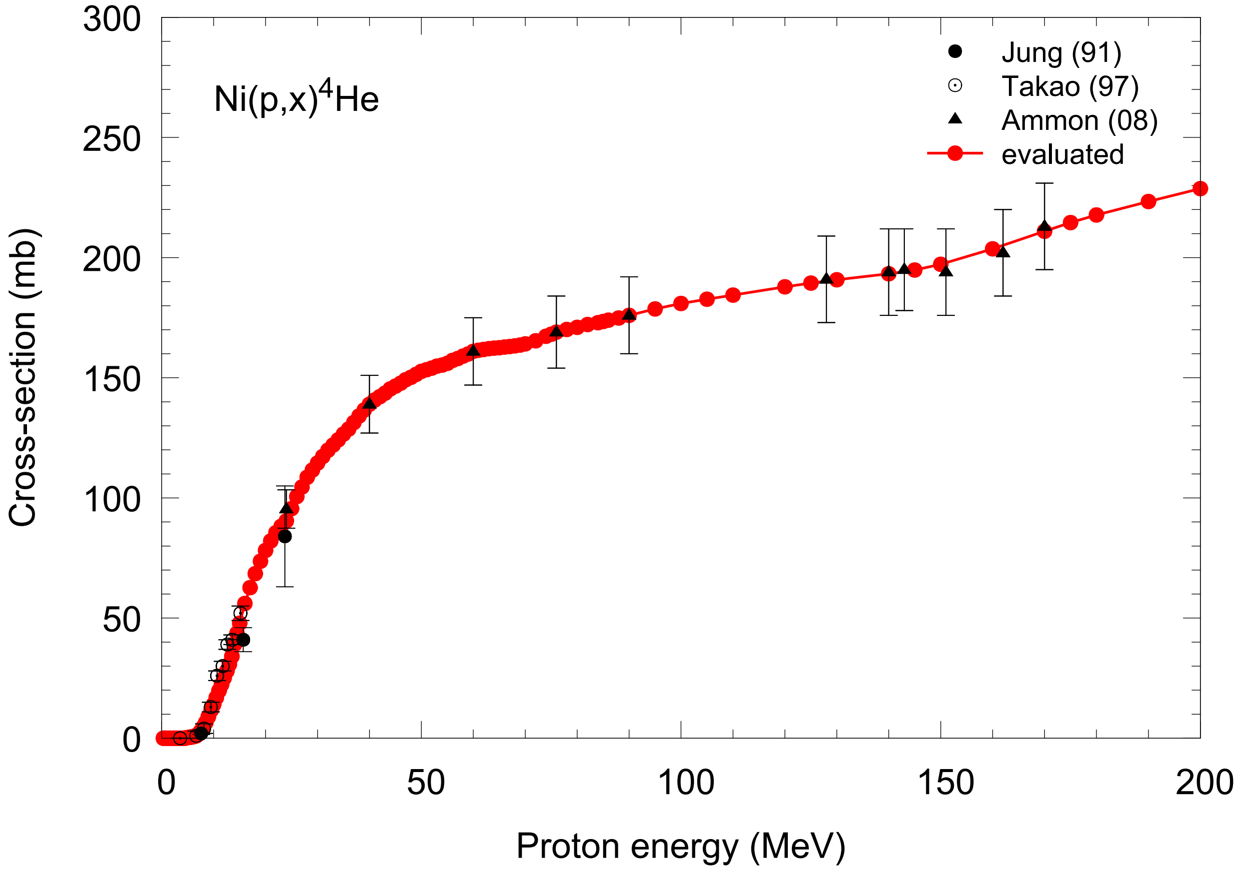
^{64}Ni(p,n)^{64}Cu
Blaser (51)
Blosser (55)
Tanaka (59)
Treytl (66)
Guzhovskij (69)
Moses (71)
Tanaka (72)
Sevior (83)
Levkovski (91)
Antropov (92)
Szelecsenyi (93)
Avila-Rodriguez (07)
Adam Rebeles (09)
Uddin (16)
Uddin (16)
Adel (20)
evaluated
Cross-section (mb)
Proton energy (MeV)



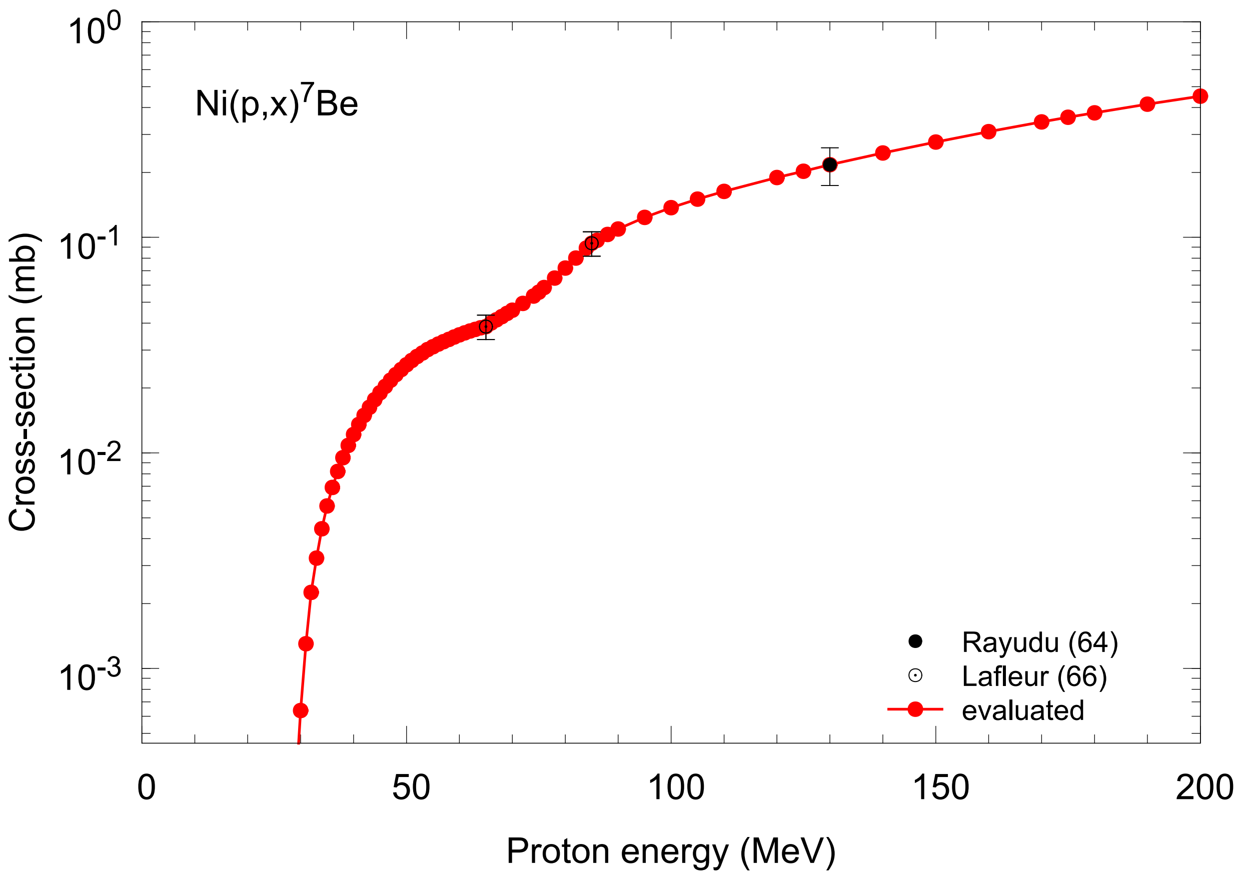
^{64}Ni(p,g)^{65}Cu
Cross-section (mb)
Proton energy (MeV)
Sevior (83)
Simon (13)
evaluated


Ni(p,x)^{3}H
Titarenko (21)
evaluated
Cross-section (mb)
Proton energy (MeV)
0
2
4
6
8
10
12
14
16
0
50
100
150
200

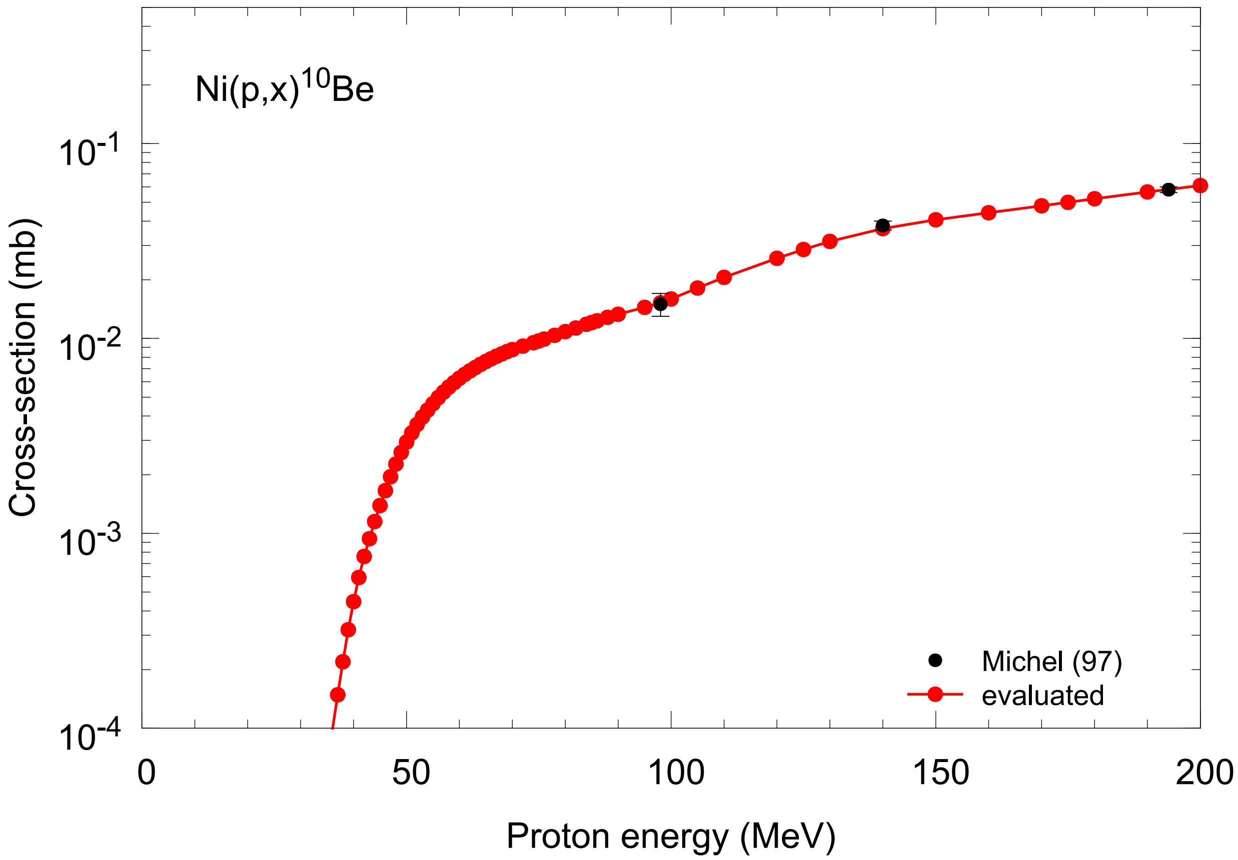

Ni(p,x)^{3}He
Ammon (08)
evaluated
Cross-section (mb)
Proton energy (MeV)
0
5
10
15
20
25
30
35
40
0
50
100
150
200

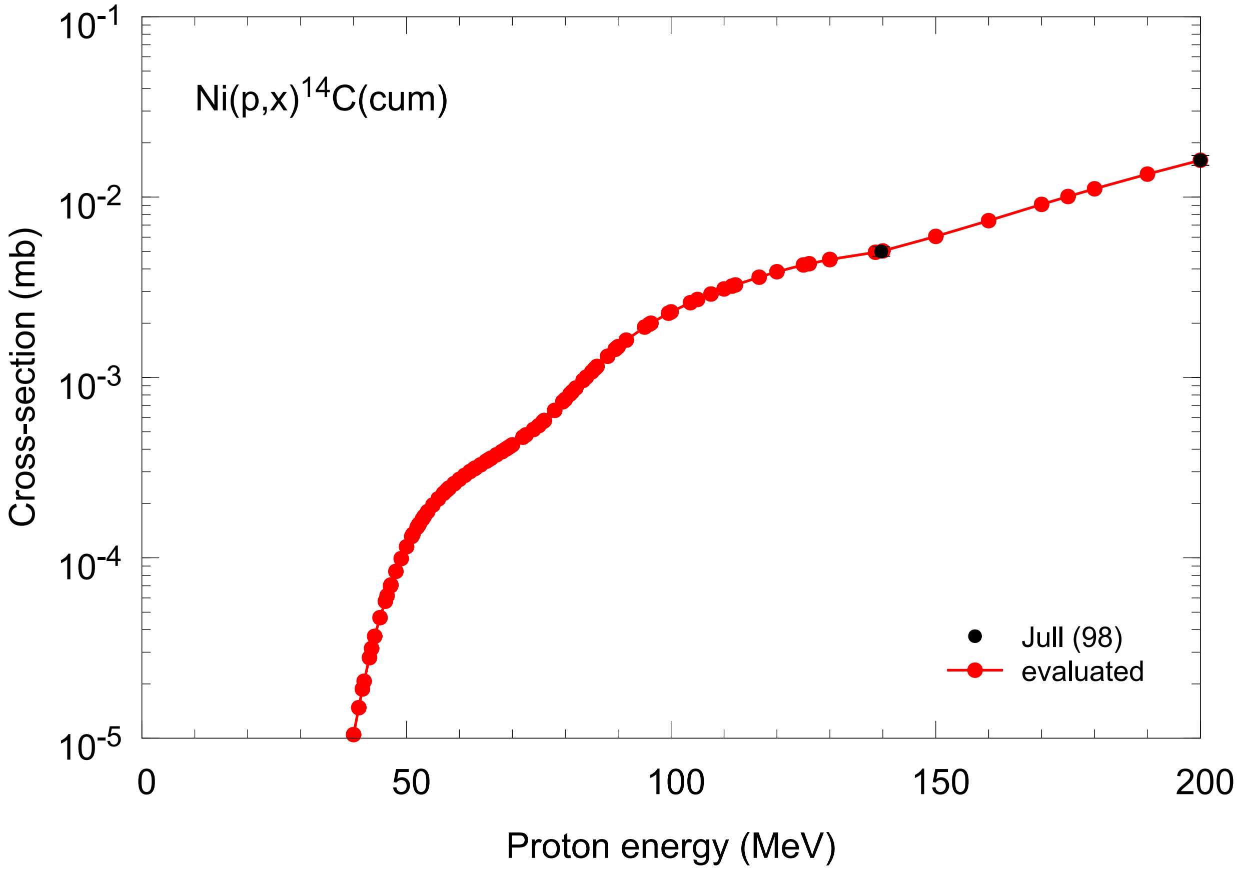


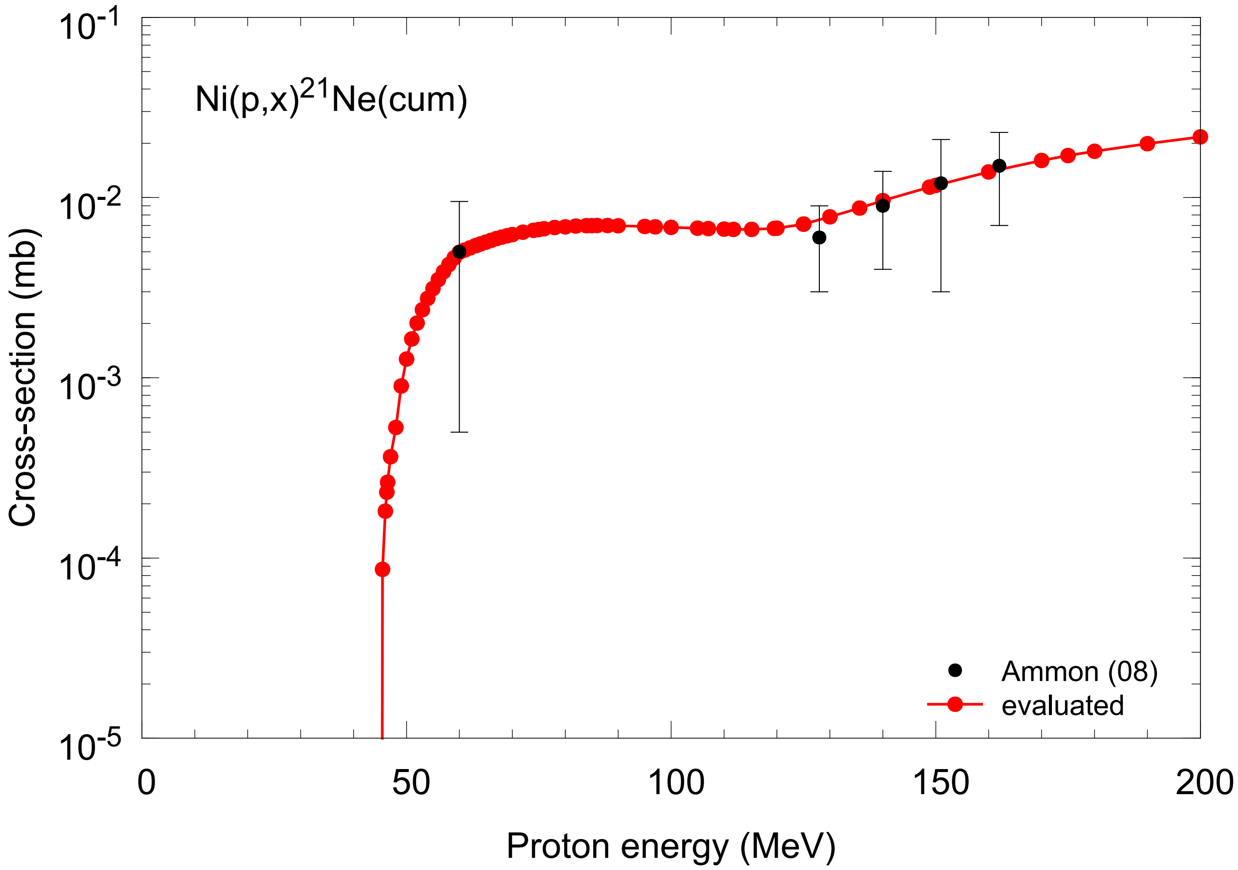
Ni(p,x)^{4}He
Jung (91)
Takao (97)
Ammon (08)
evaluated
Cross-section (mb)
Proton energy (MeV)

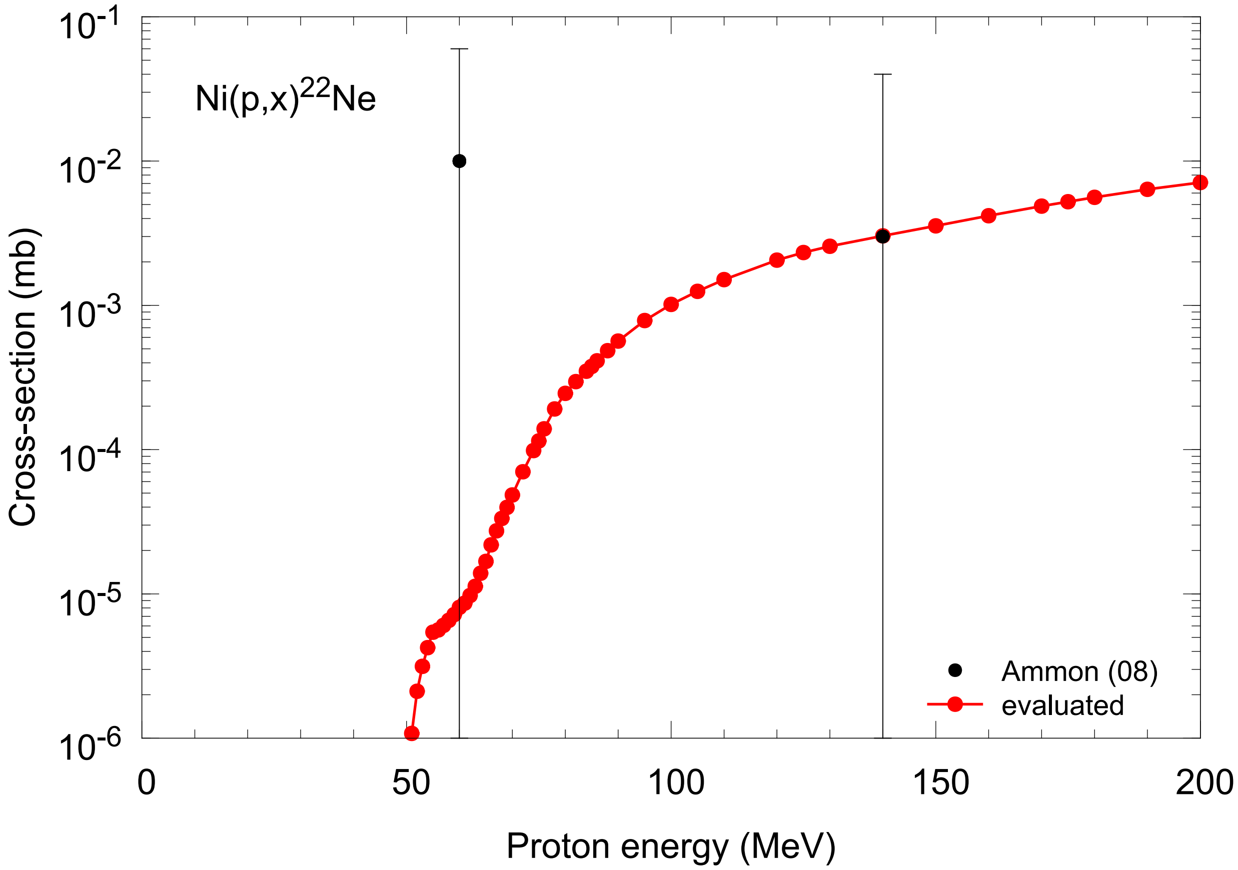


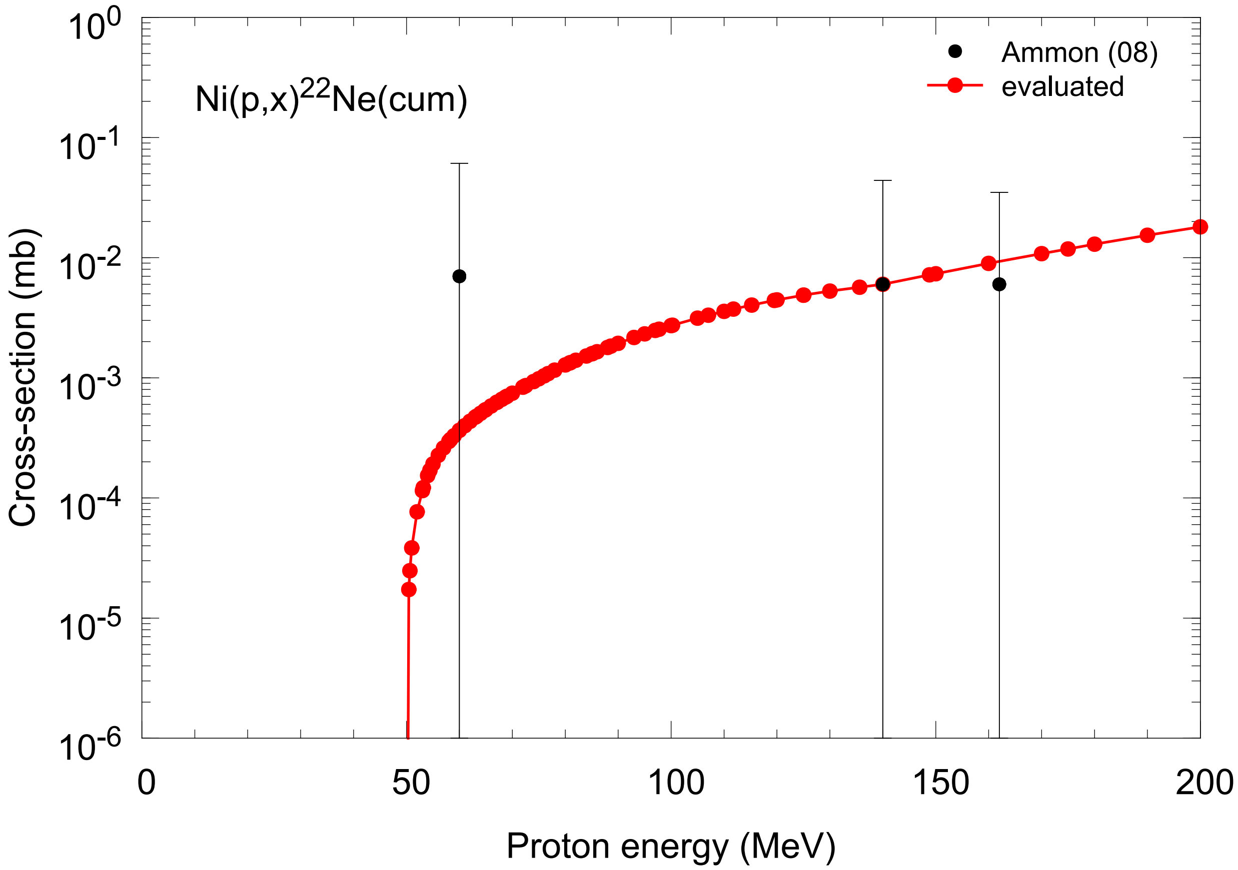
Ni(p,x)^{7}Be
Rayudu (64)
Lafleur (66)
evaluated
Cross-section (mb)
Proton energy (MeV)

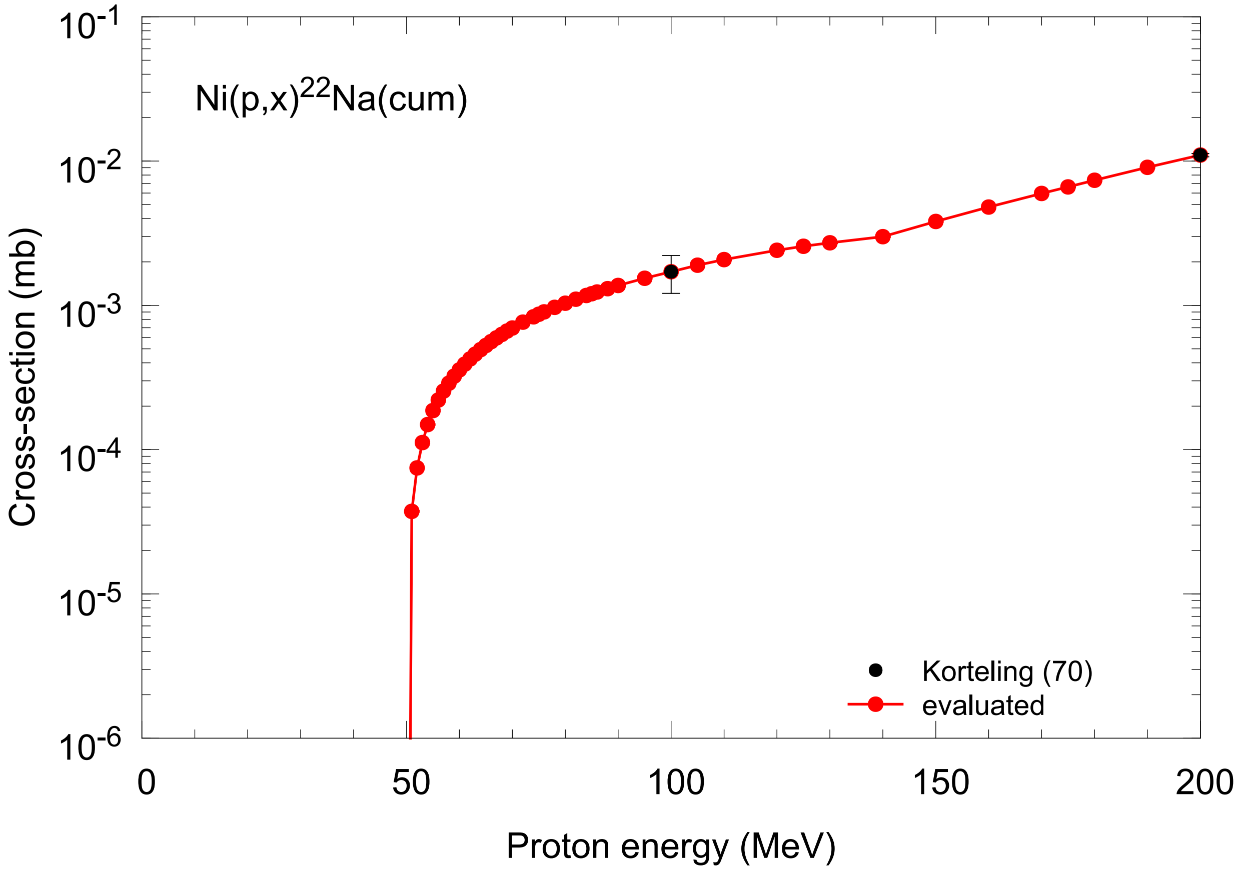

Ni(p,x)^{10}Be
Cross-section (mb)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Proton energy (MeV)
Michel (97)
evaluated

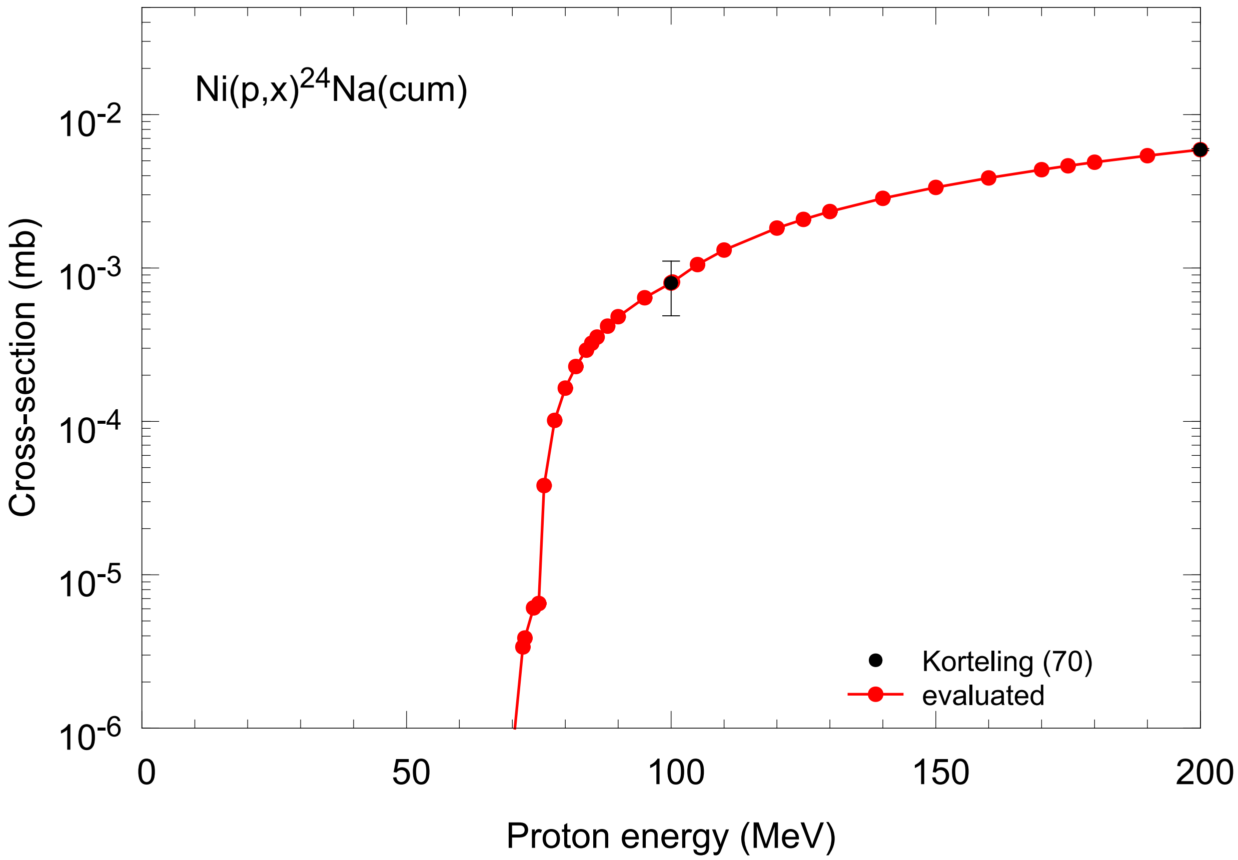

Ni(p,x)^{14}C(cum)
Cross-section (mb)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200
Proton energy (MeV)
Jull (98)
evaluated


Ni(p,x)^{21}Ne(cum)
Cross-section (mb)
Proton energy (MeV)
Ammon (08)
evaluated

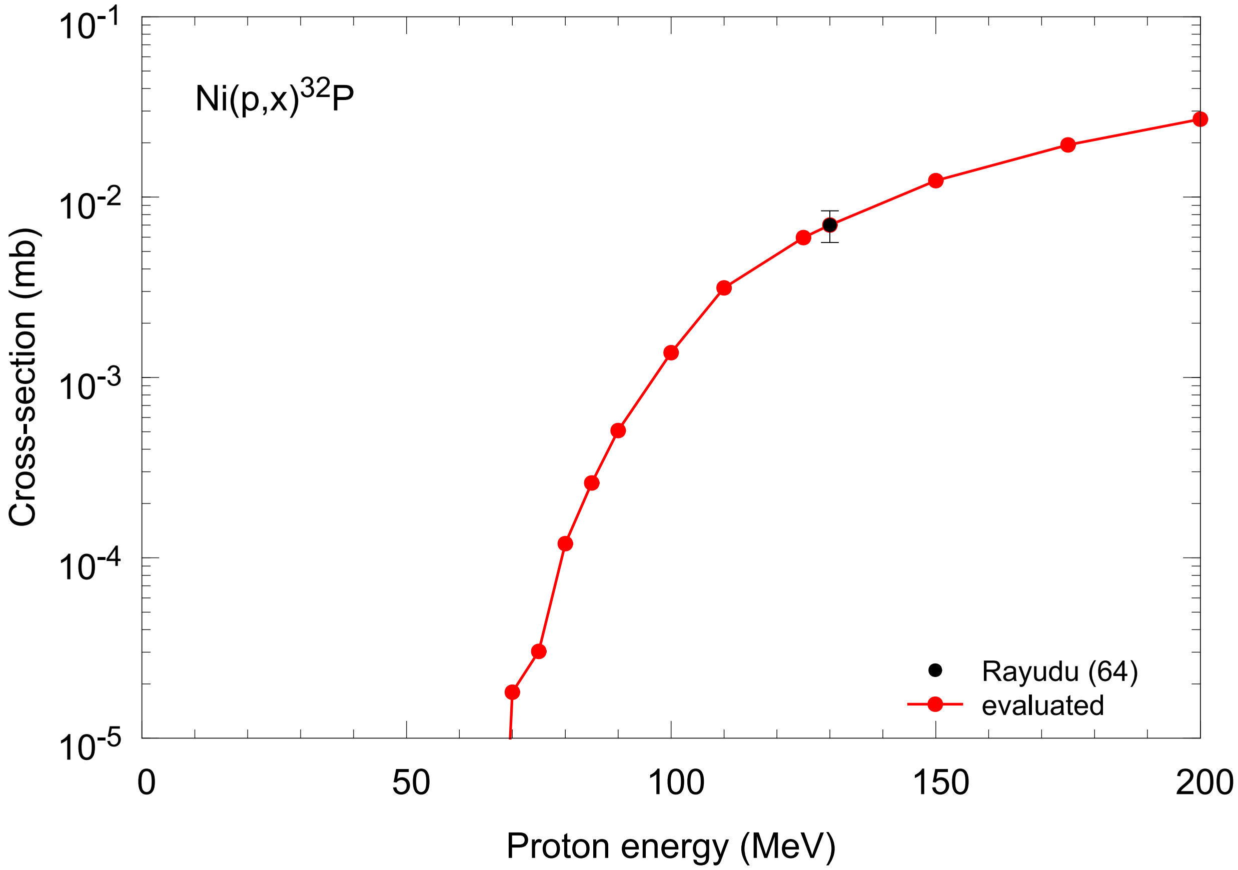

Ni(p,x)^{22}Ne
Cross-section (mb)
Proton energy (MeV)
Ammon (08)
evaluated


Ni(p,x)22Ne(cum)
Ammon (08)
evaluated
Cross-section (mb)
Proton energy (MeV)

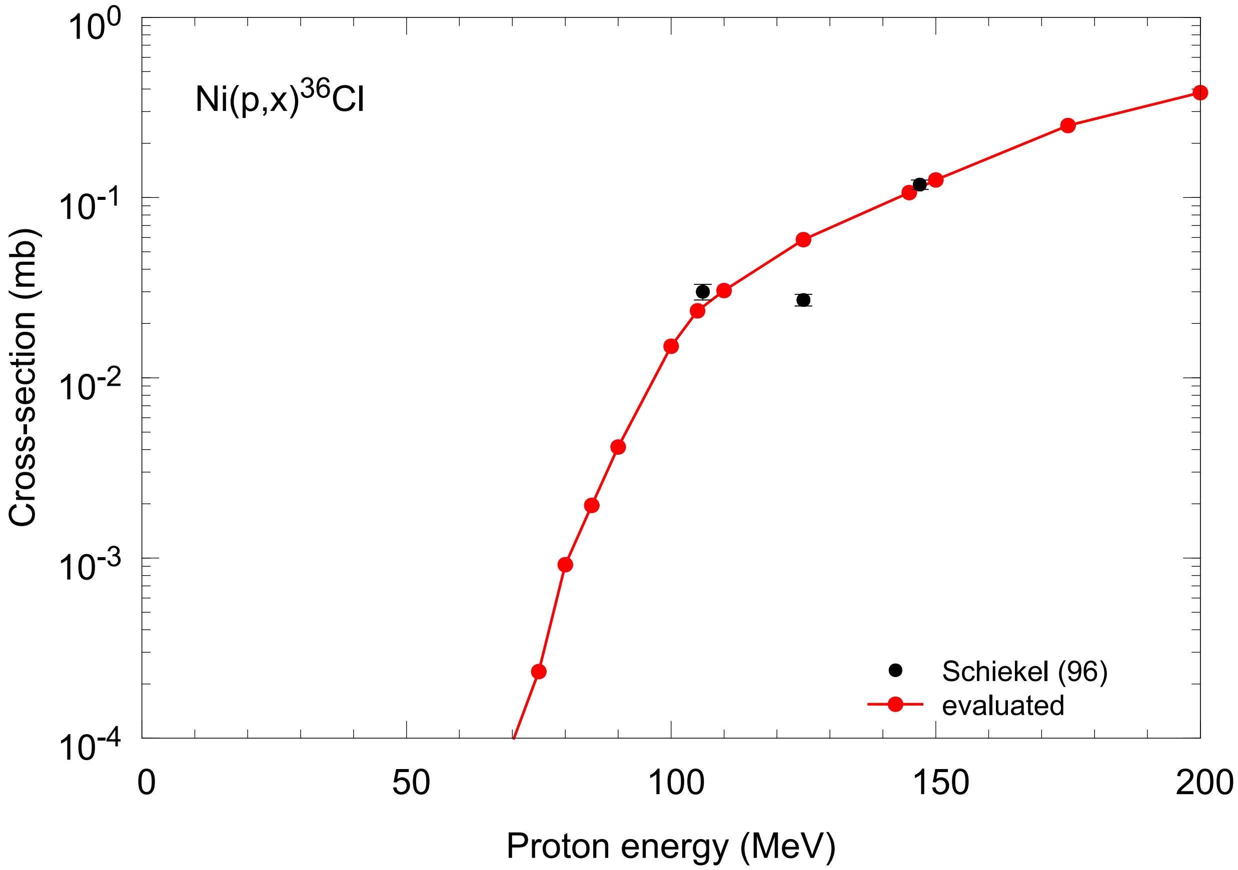

Ni(p,x)22Na(cum)
Korteling (70)
evaluated
Cross-section (mb)
Proton energy (MeV)



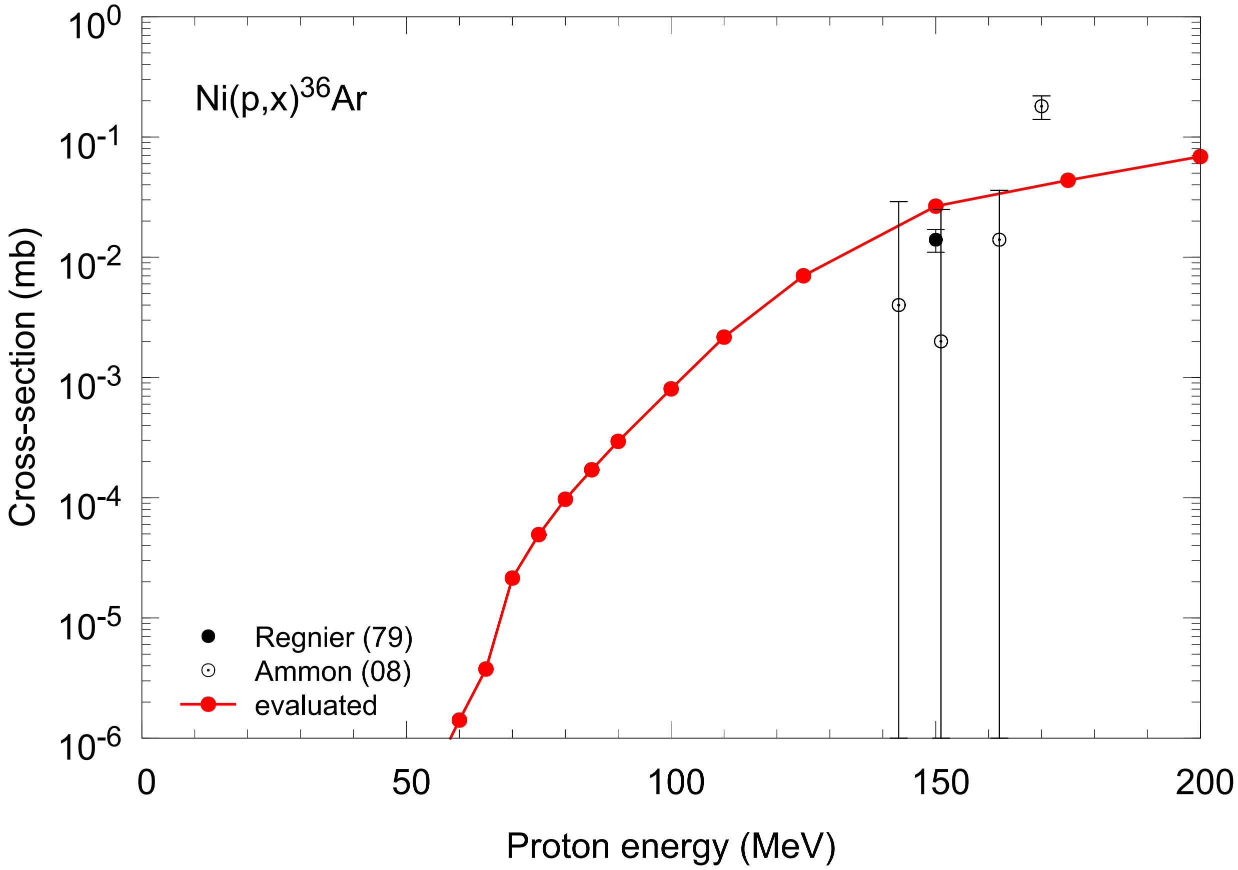
Ni(p,x)^{24}Na(cum)
Cross-section (mb)
Proton energy (MeV)
Korteling (70)
evaluated



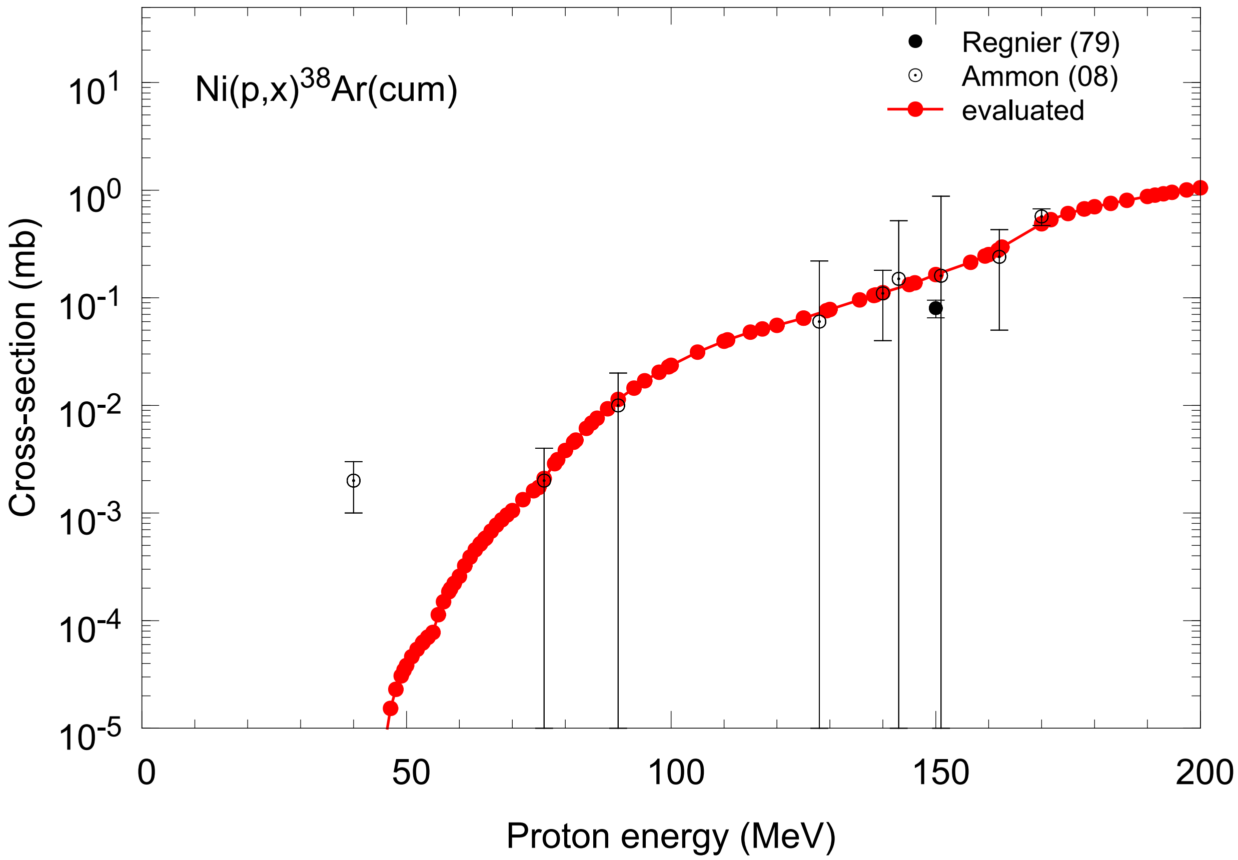
Ni(p,x)^{32}P
Cross-section (mb)
Proton energy (MeV)
Rayudu (64)
evaluated



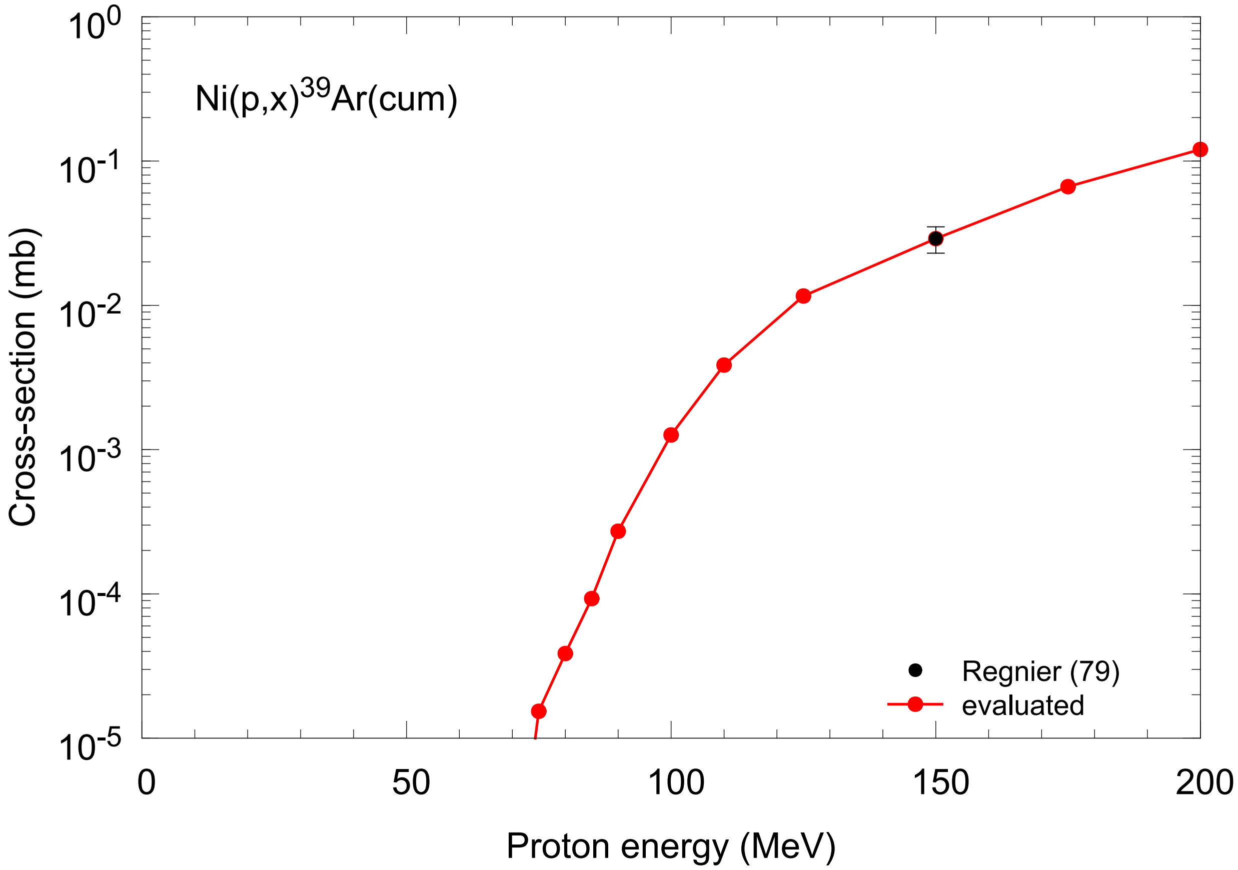
Ni(p,x)^{36}Cl
Schiekel (96)
evaluated
Cross-section (mb)
Proton energy (MeV)



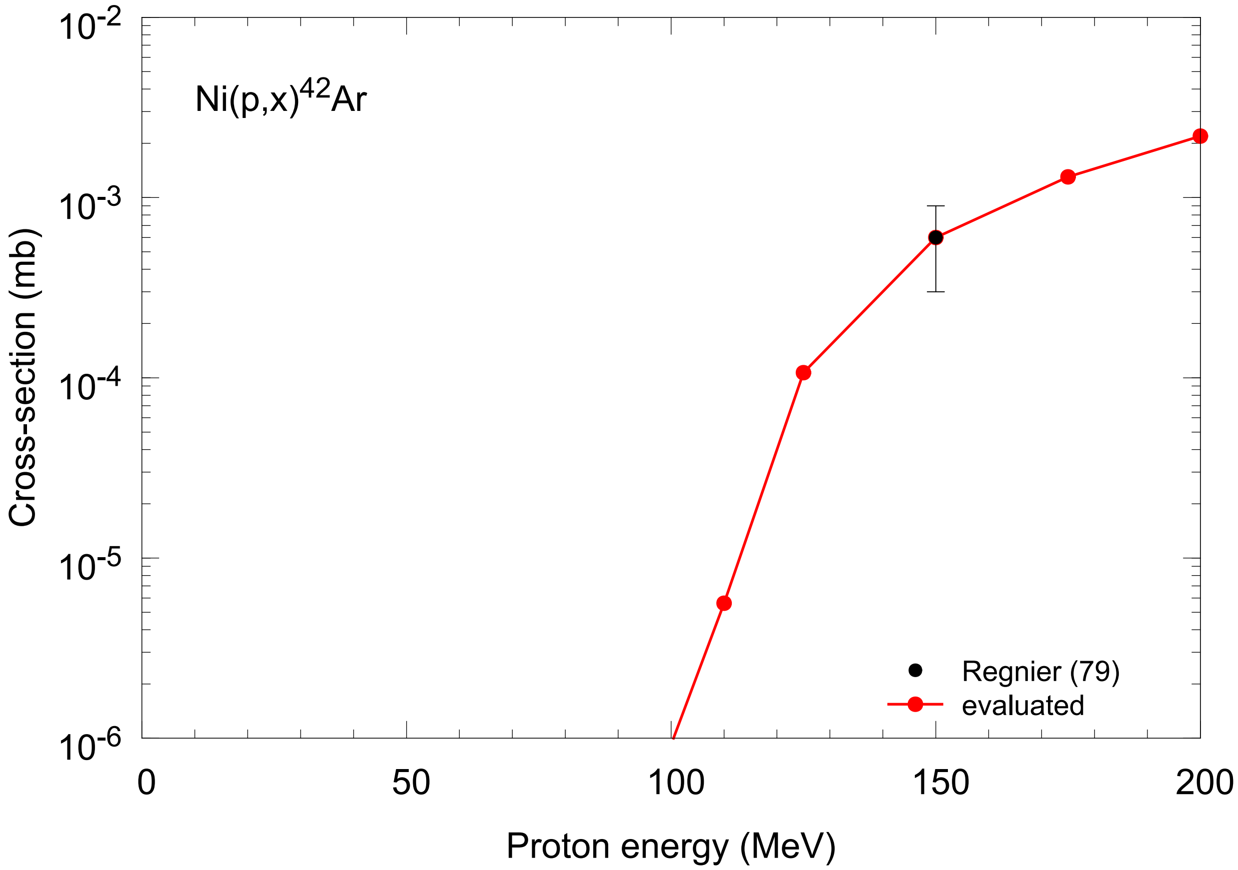
Ni(p,x)^{36}Ar
Regnier (79)
Ammon (08)
evaluated
Cross-section (mb)
Proton energy (MeV)

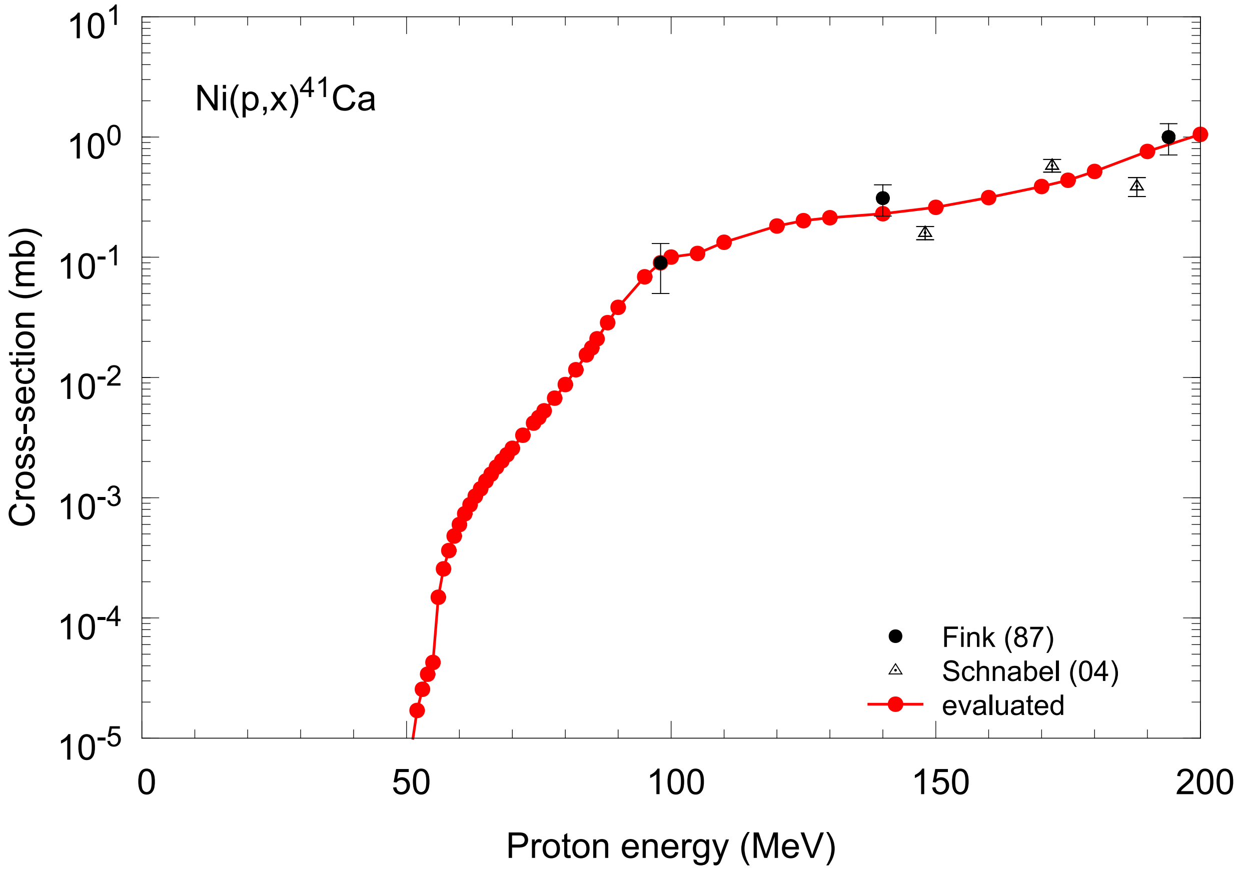


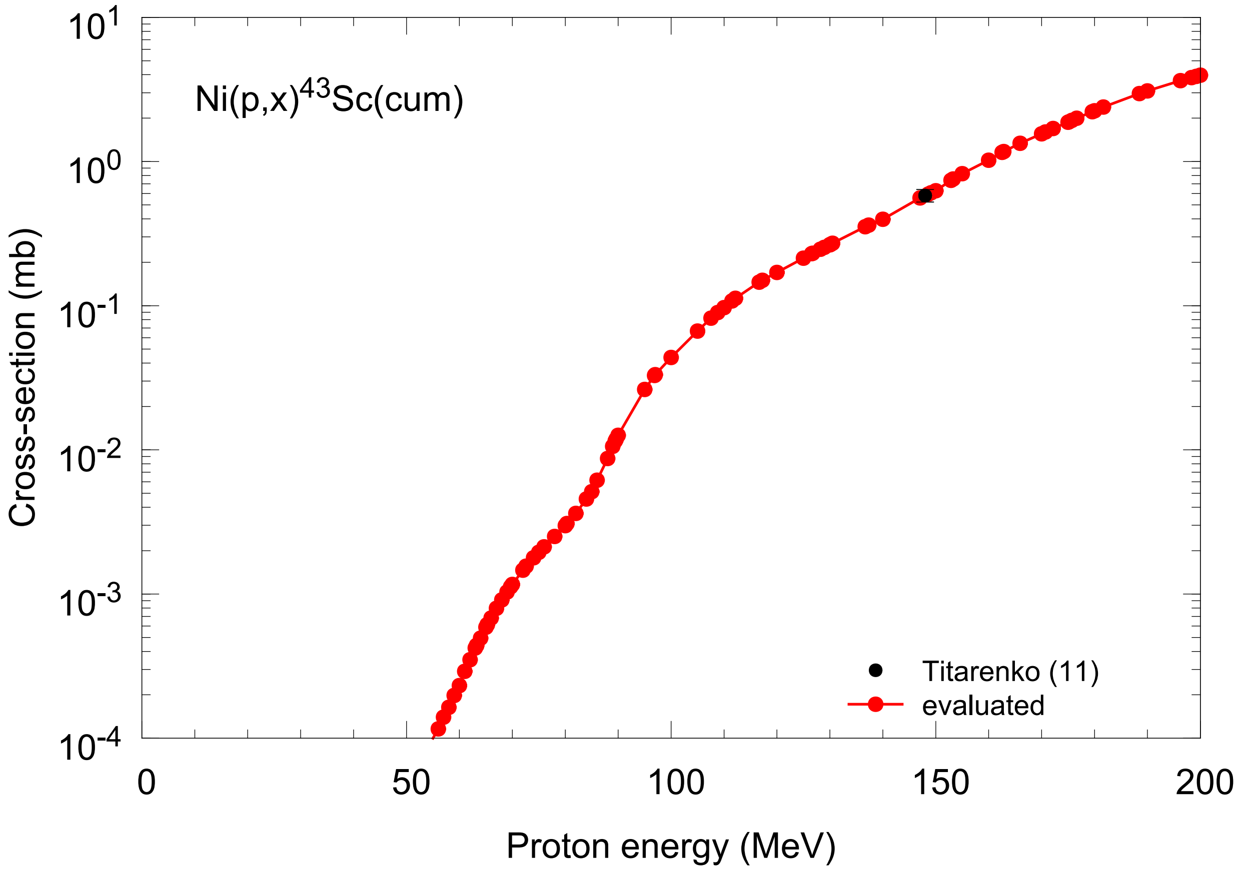
Ni(p,x)^{38}Ar(cum)
Regnier (79)
Ammon (08)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200

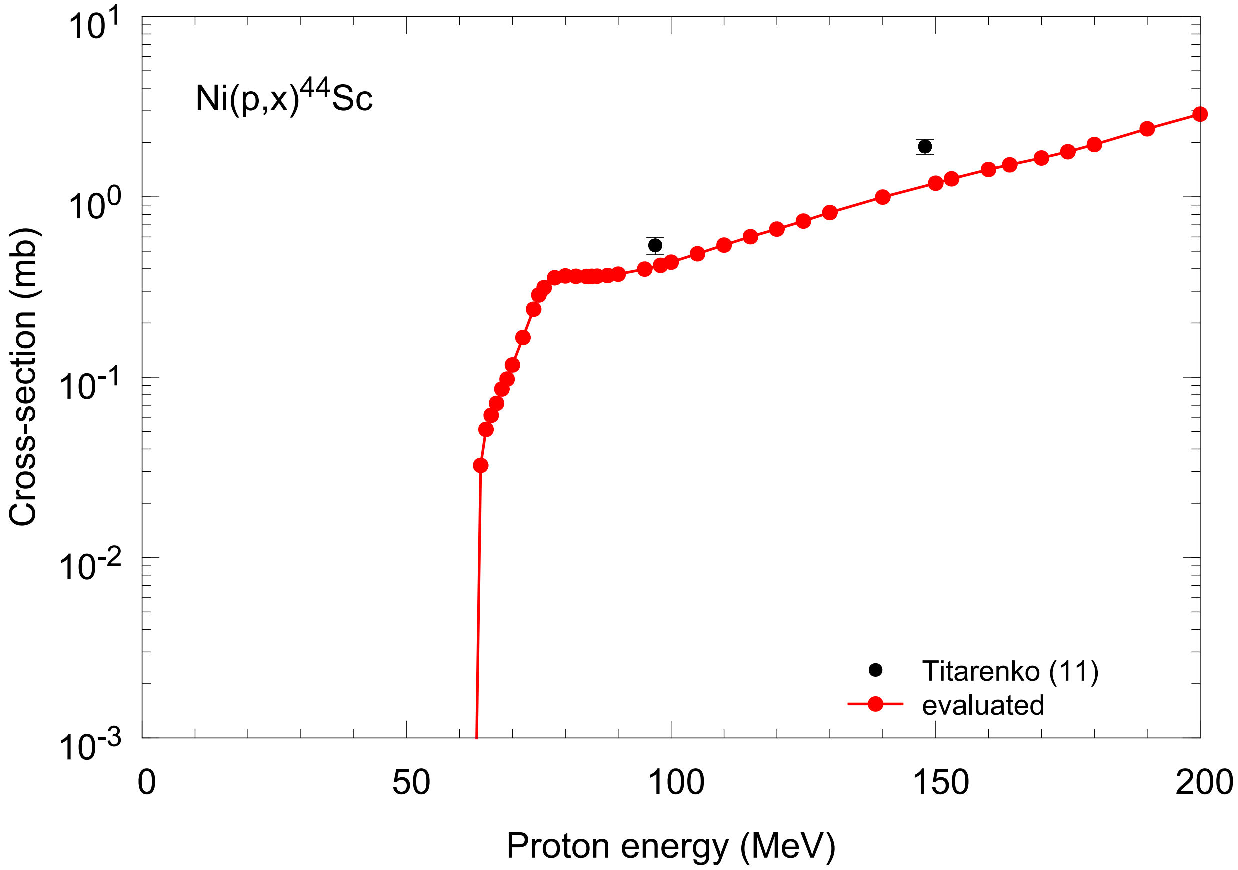


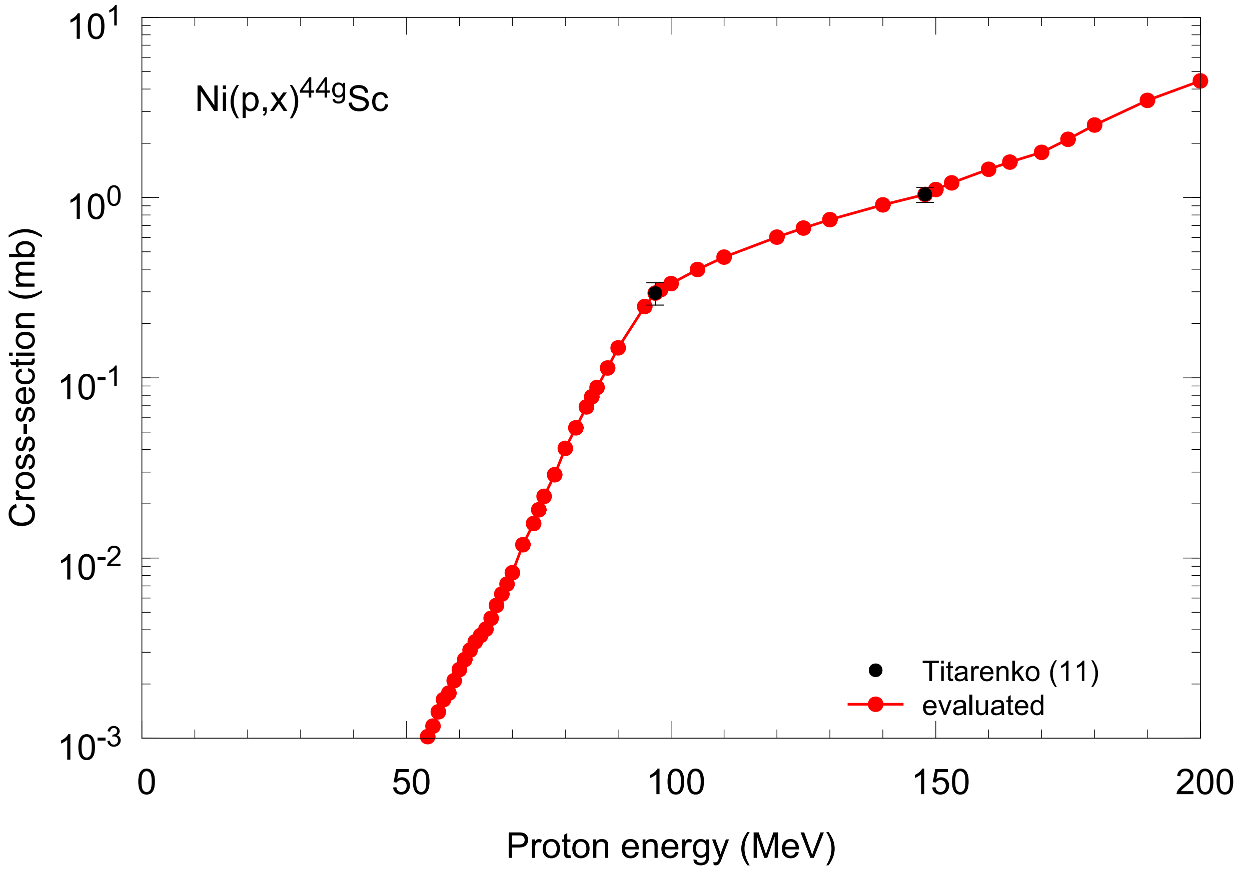
Ni(p,x)^{39}Ar(cum)
Regnier (79)
evaluated
Cross-section (mb)
Proton energy (MeV)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200

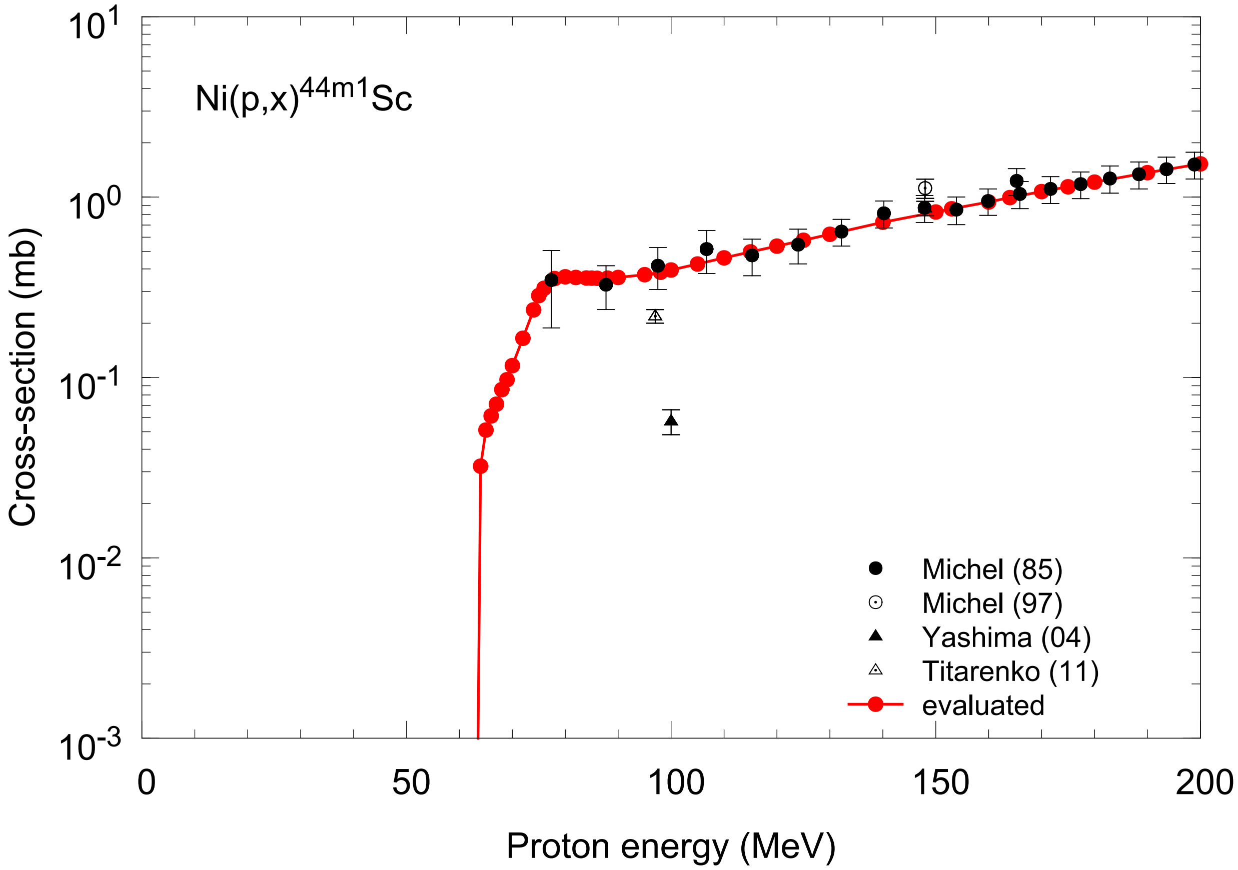

Ni(p,x)^{42}Ar
Cross-section (mb)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
0
50
100
150
200
Proton energy (MeV)
Regnier (79)
evaluated

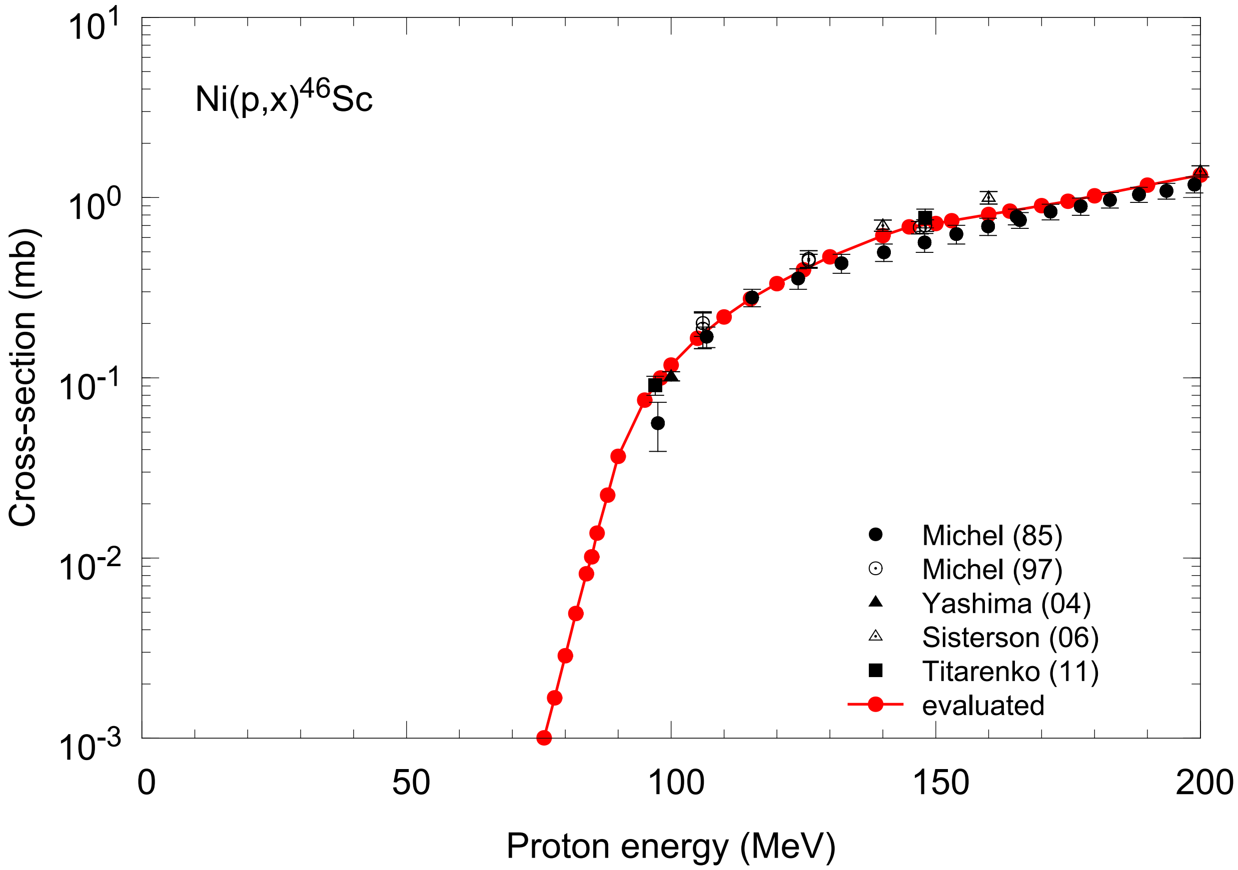

Ni(p,x)^{41}Ca
Cross-section (mb)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
0
50
100
150
200
Proton energy (MeV)
Fink (87)
Schnabel (04)
evaluated


Ni(p,x)^{43}Sc(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200

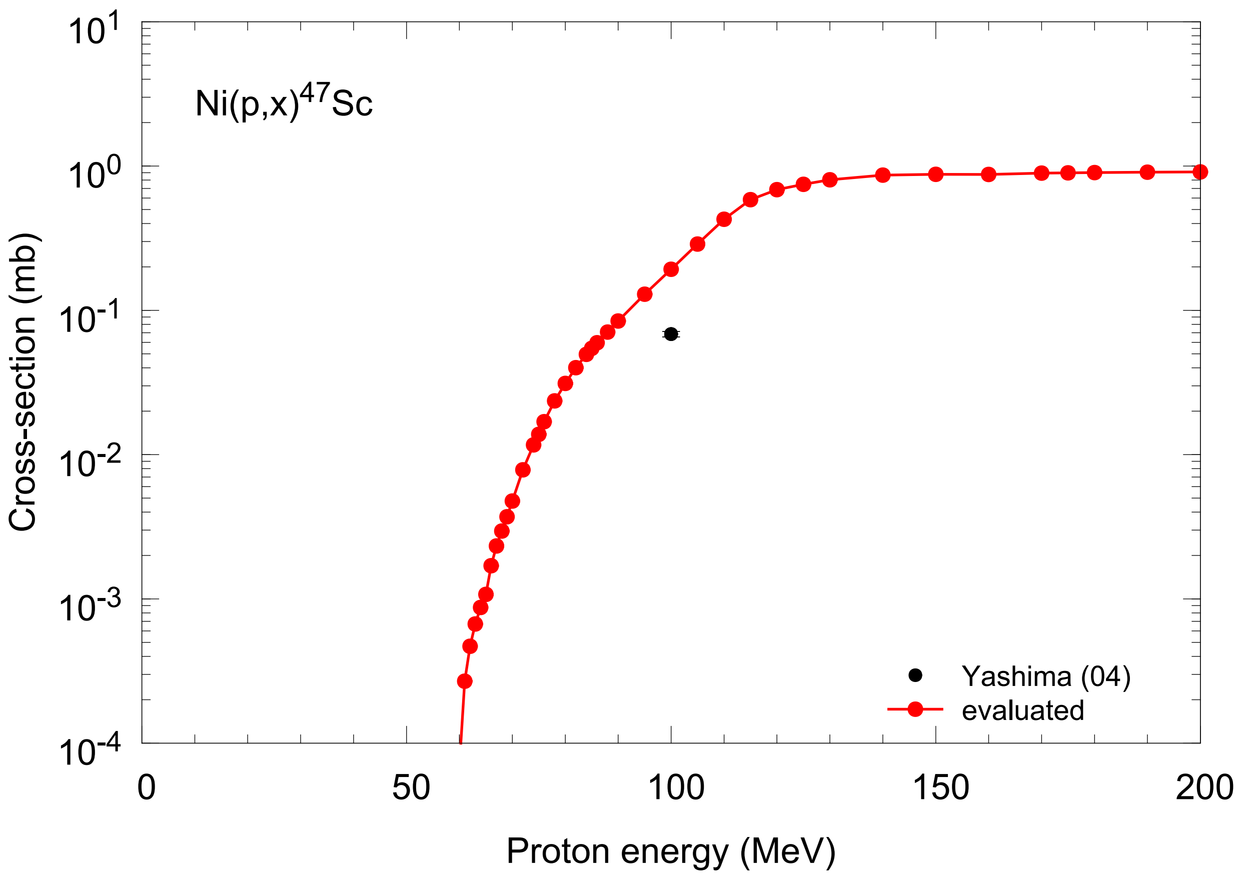

Ni(p,x)^{44}Sc
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200


Ni(p,x)^{44g}Sc
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

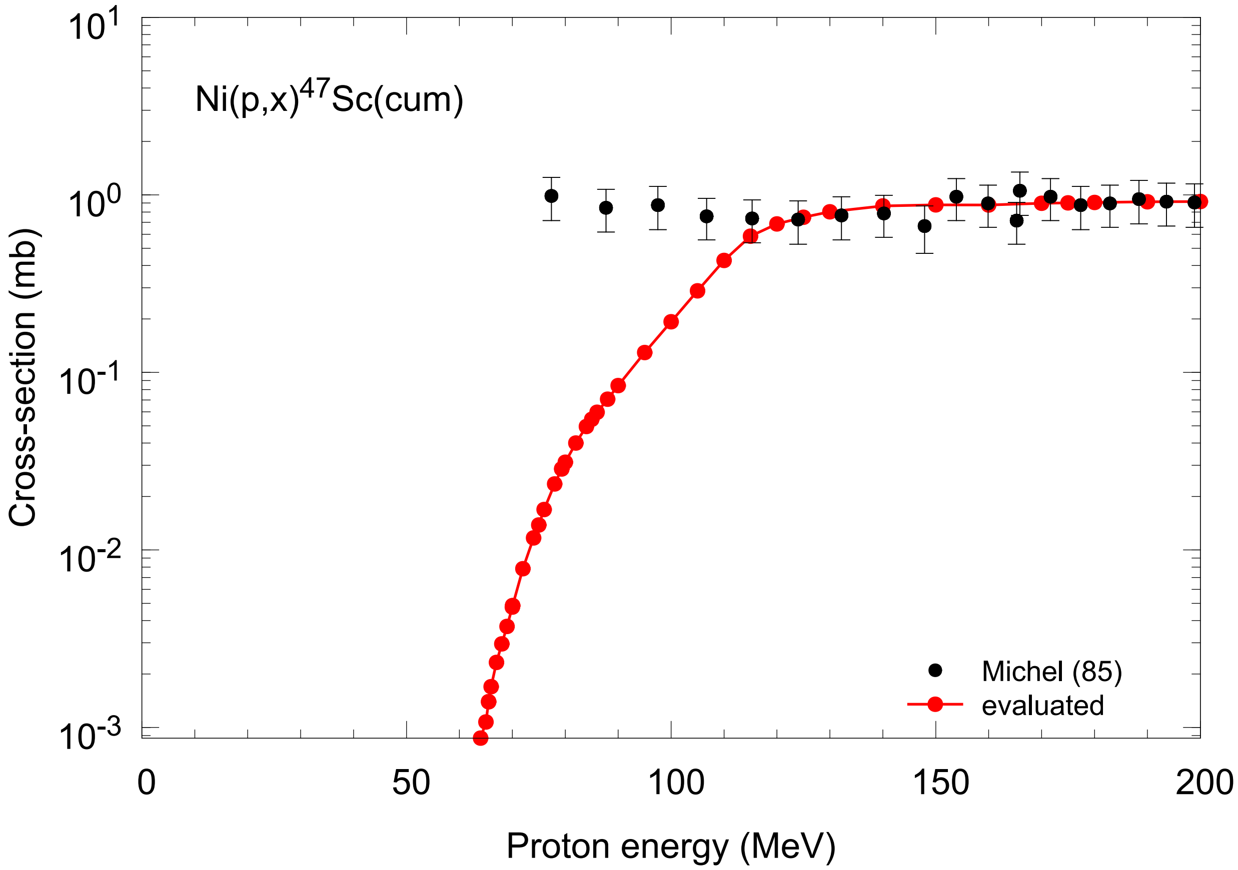

Ni(p,x)^{44m1}Sc
Cross-section (mb)
Proton energy (MeV)
Michel (85)
Michel (97)
Yashima (04)
Titarenko (11)
evaluated



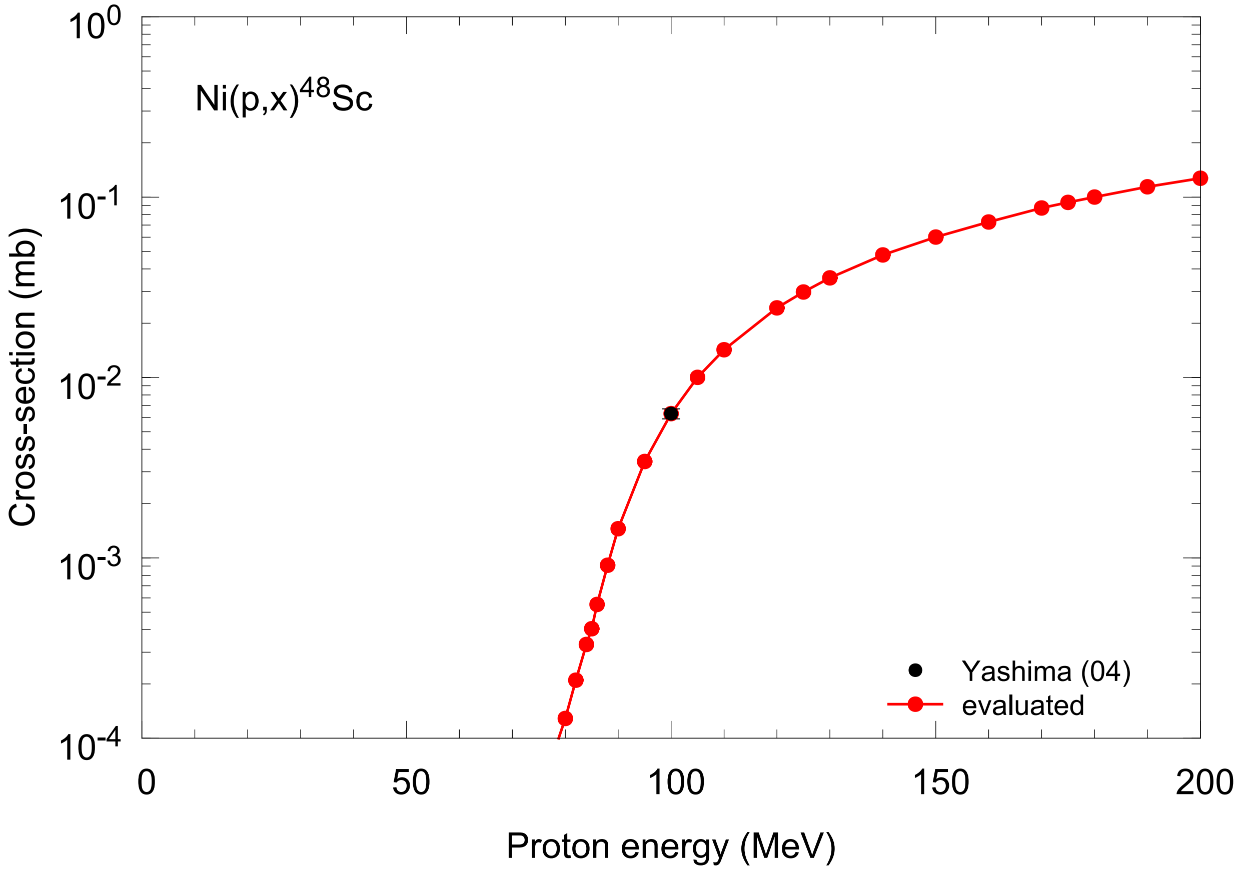
Ni(p,x)^{46}Sc
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200
Michel (85)
Michel (97)
Yashima (04)
Sisterson (06)
Titarenko (11)
evaluated



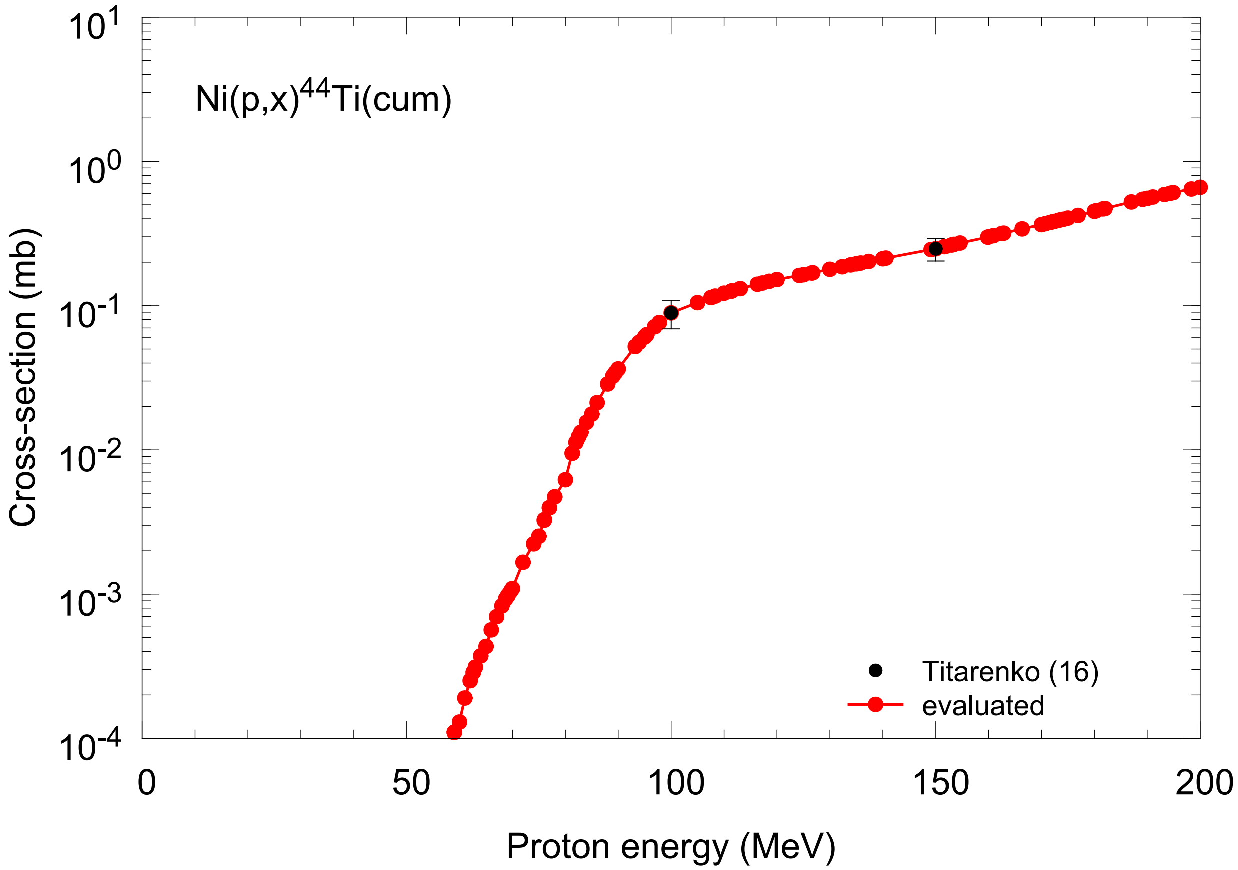
Ni(p,x)^{47}Sc
Cross-section (mb)
Proton energy (MeV)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Yashima (04)
evaluated



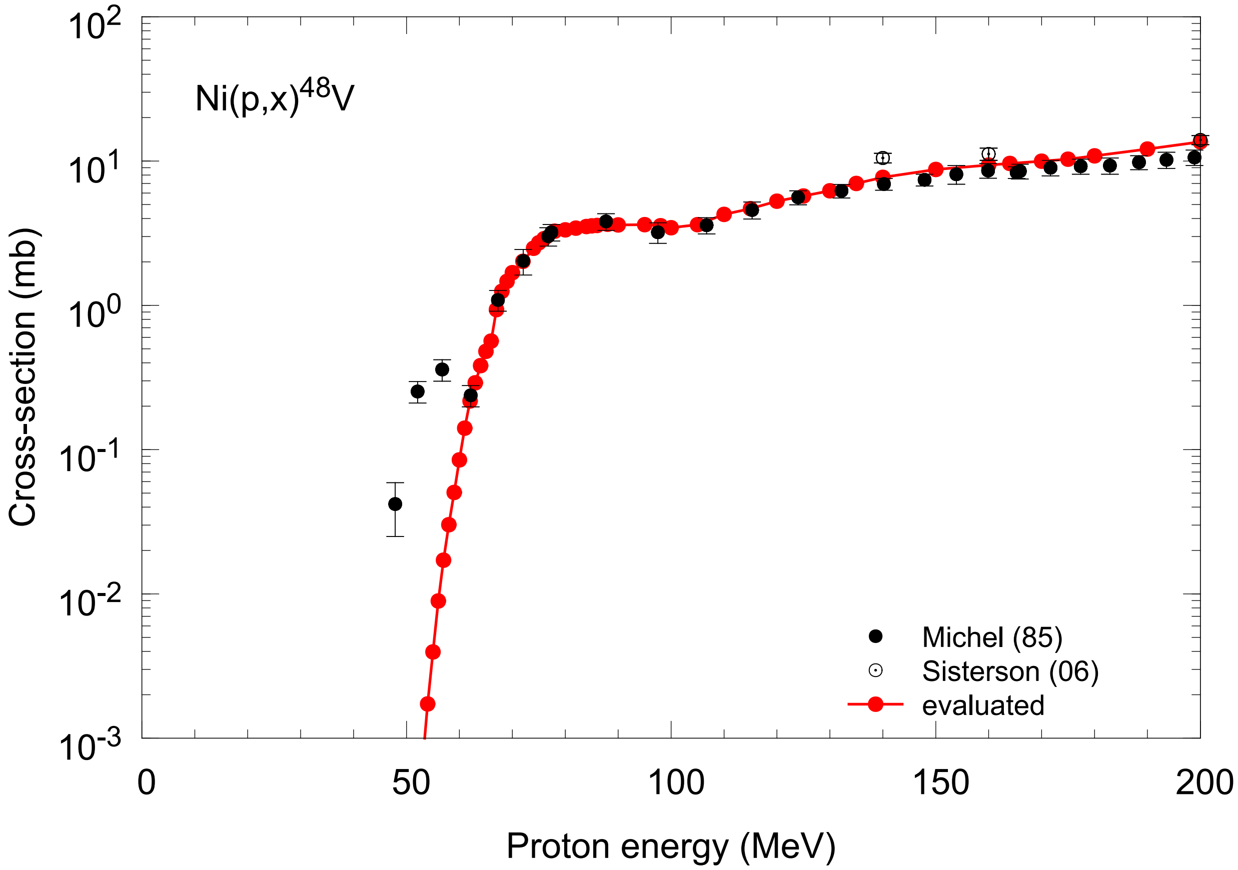
Ni(p,x)47Sc(cum)
Cross-section (mb)
Proton energy (MeV)
Michel (85)
evaluated



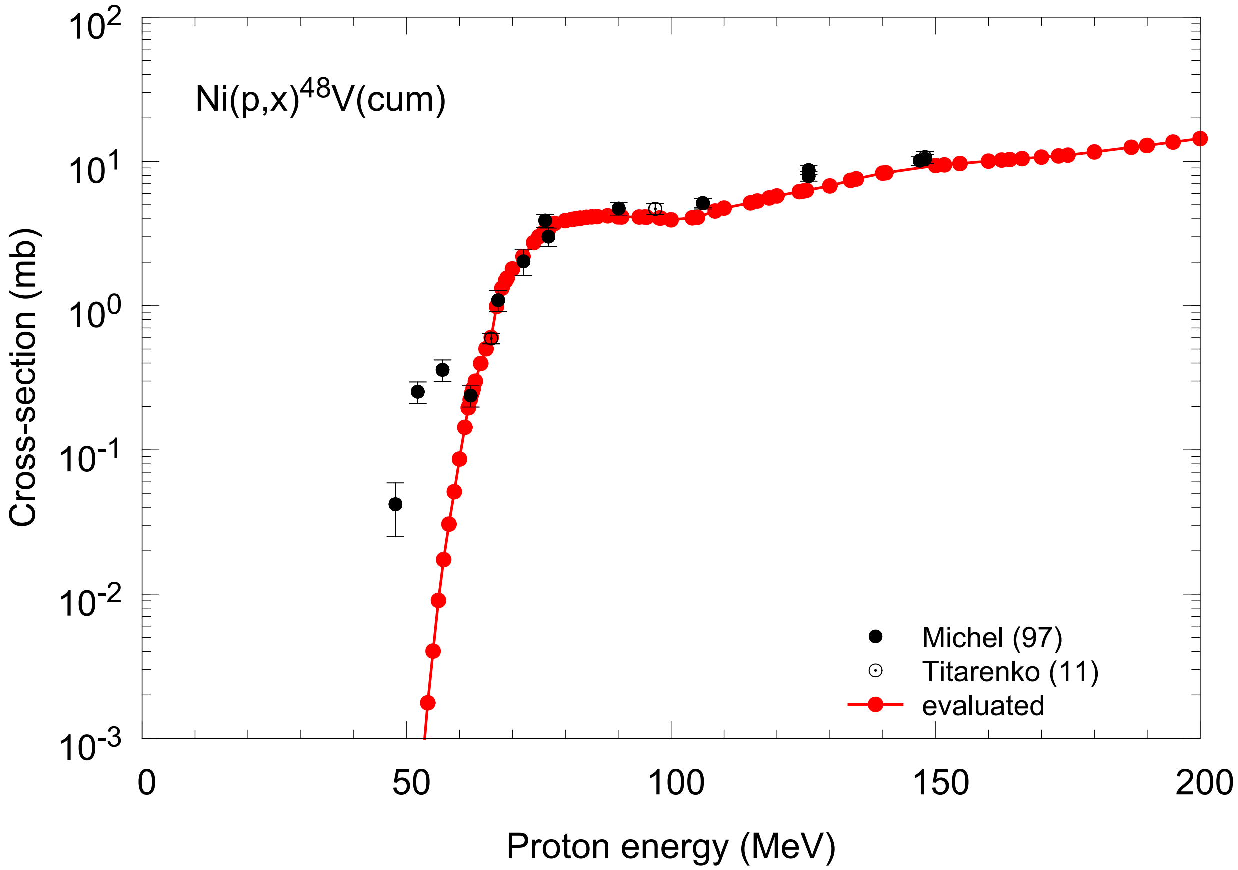
Ni(p,x)48Sc
Cross-section (mb)
Proton energy (MeV)
Yashima (04)
evaluated



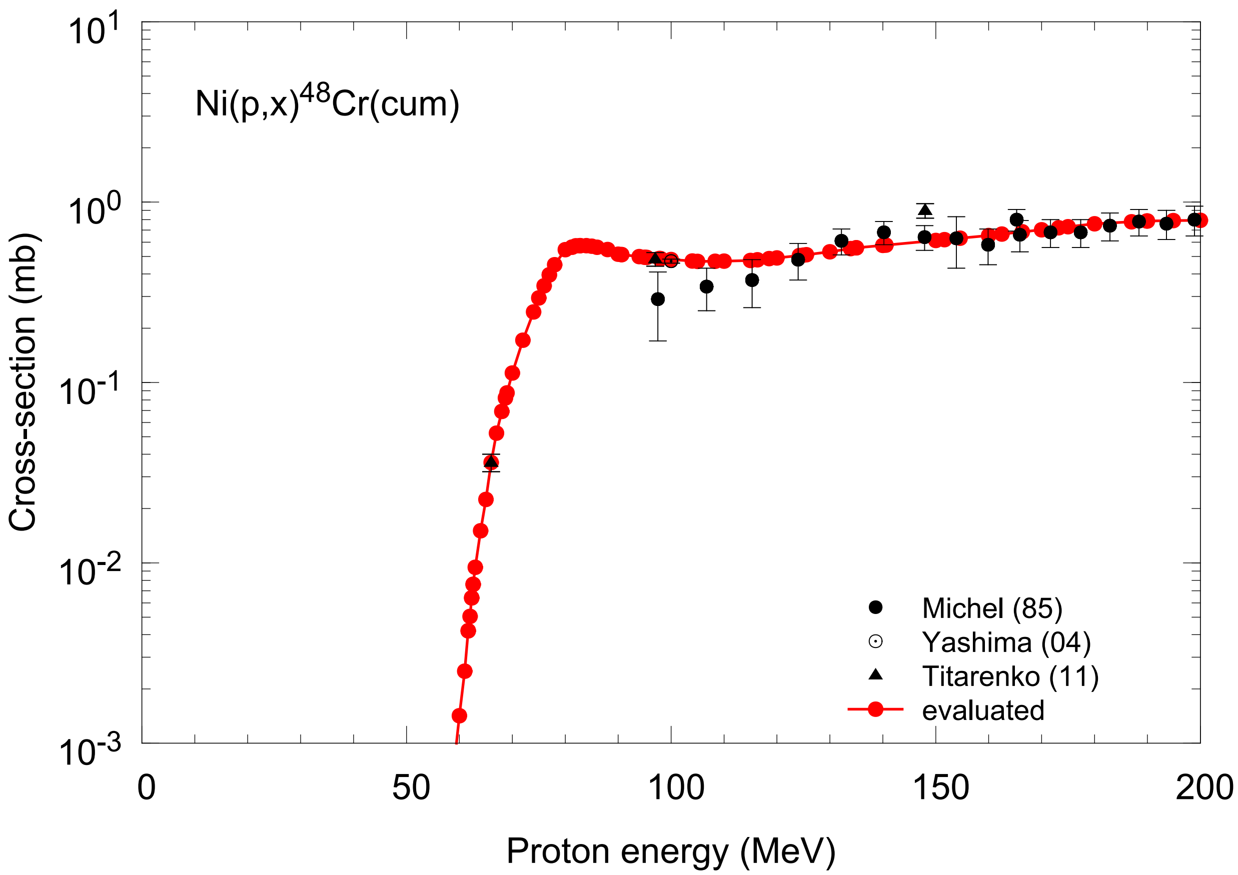
Ni(p,x)^{44}Ti(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (16)
evaluated



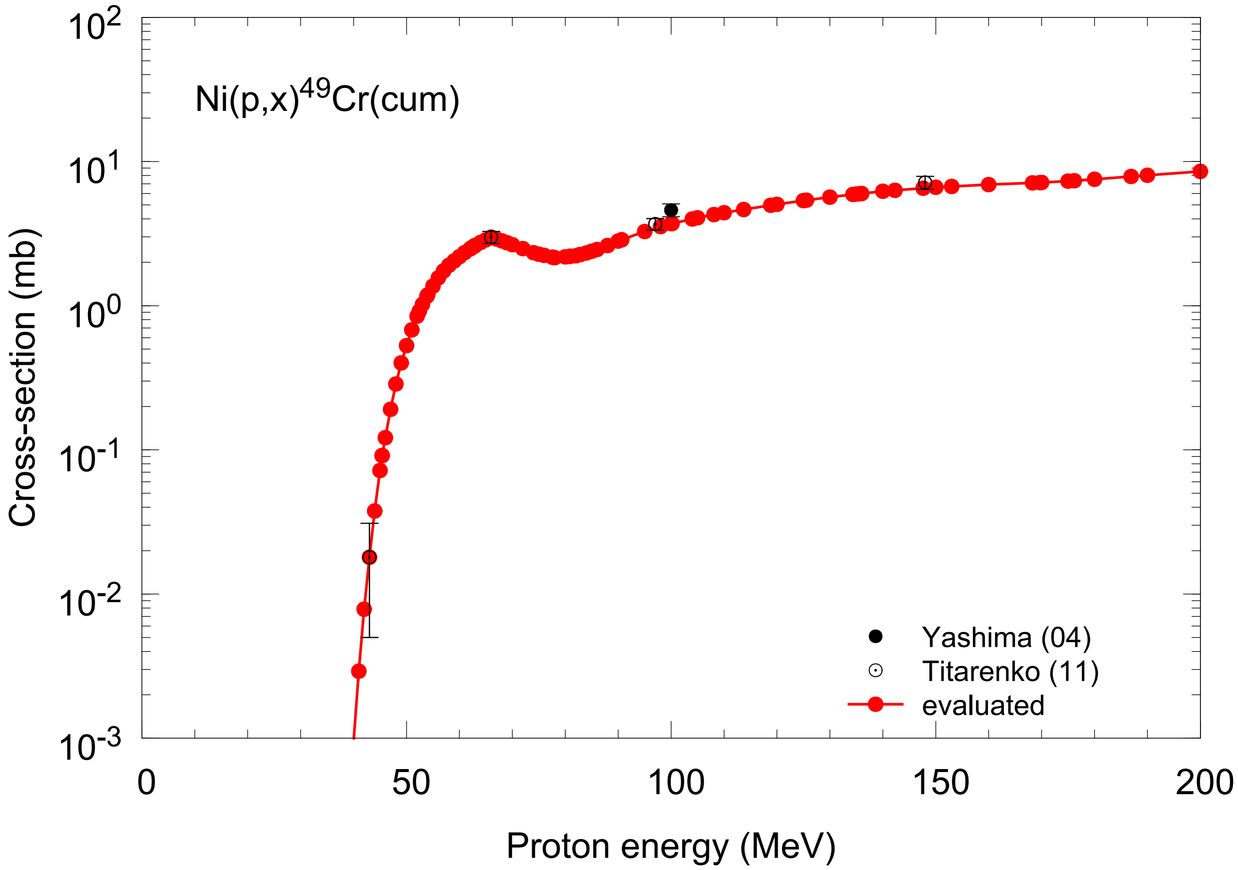
Ni(p,x)^{48}V
Cross-section (mb)
Proton energy (MeV)
Michel (85)
Sisterson (06)
evaluated



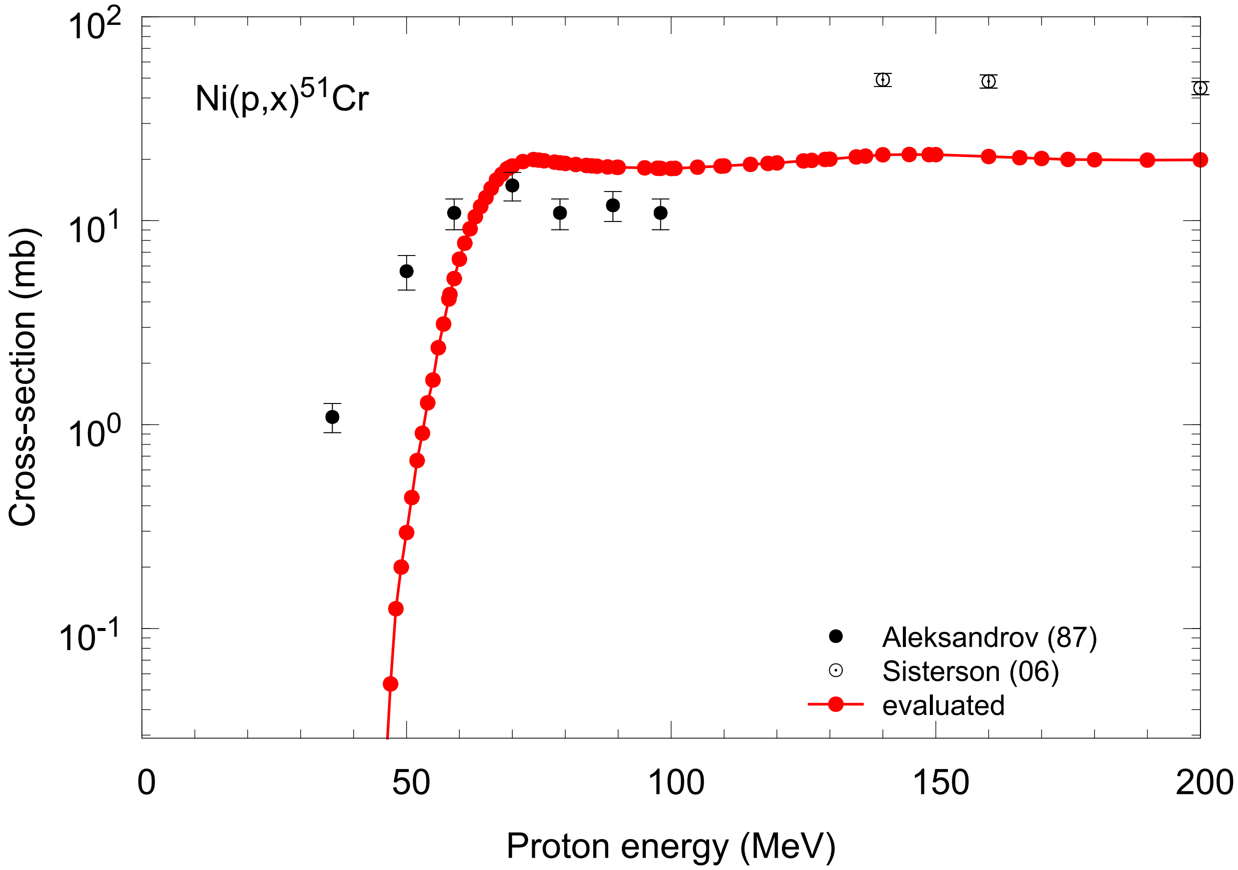
Ni(p,x)^{48}V(cum)
Michel (97)
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)



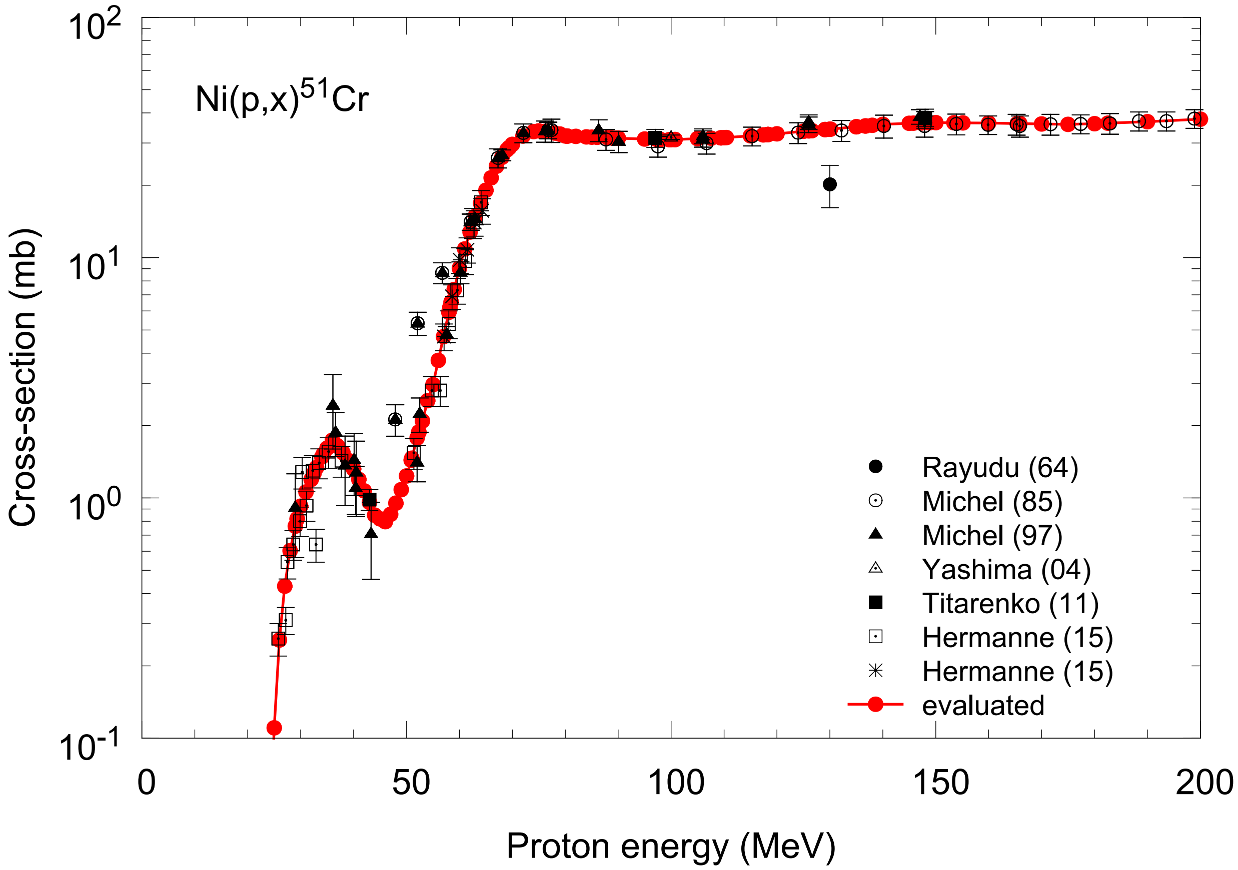
Ni(p,x)^{48}Cr(cum)
Michel (85)
Yashima (04)
Titarenko (11)
evaluated
Cross-section (mb)
Proton energy (MeV)



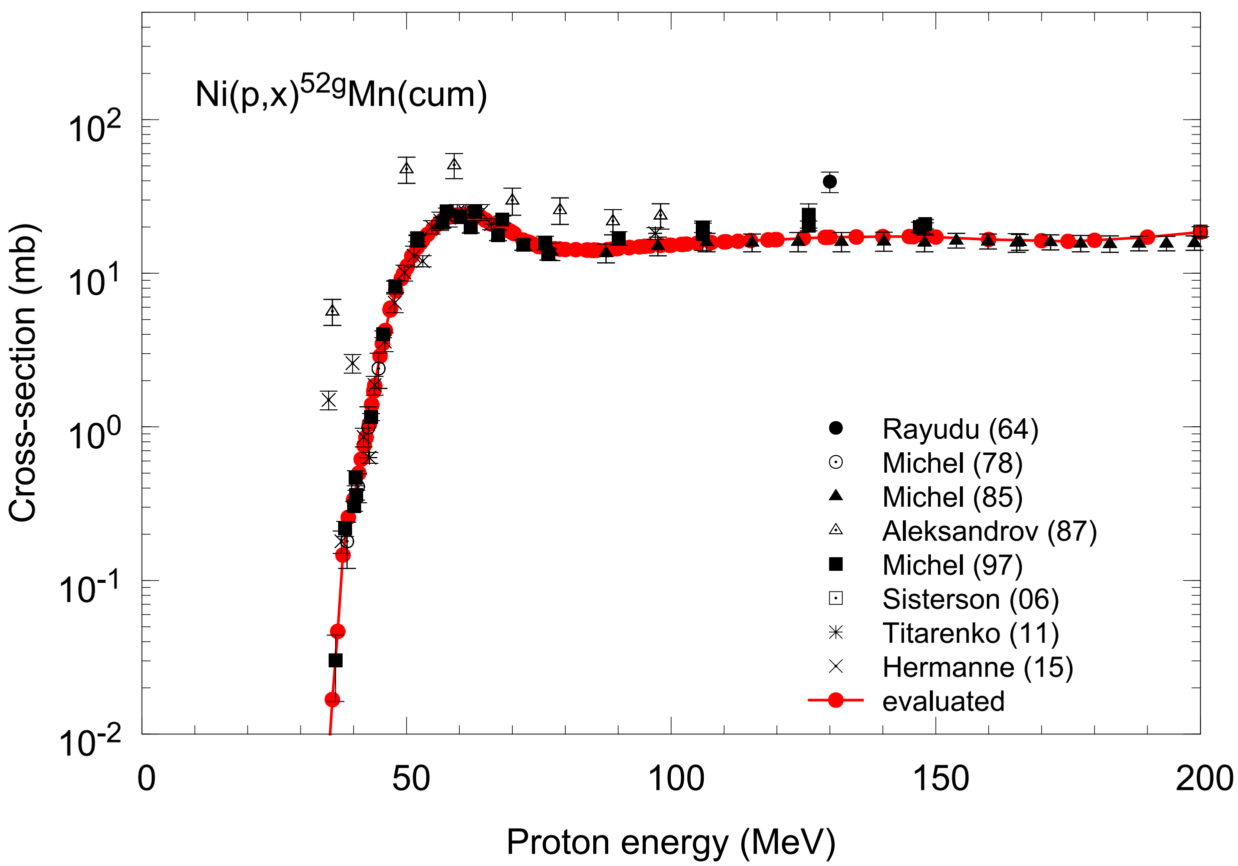
Ni(p,x)49Cr(cum)
Cross-section (mb)
Proton energy (MeV)
Yashima (04)
Titarenko (11)
evaluated



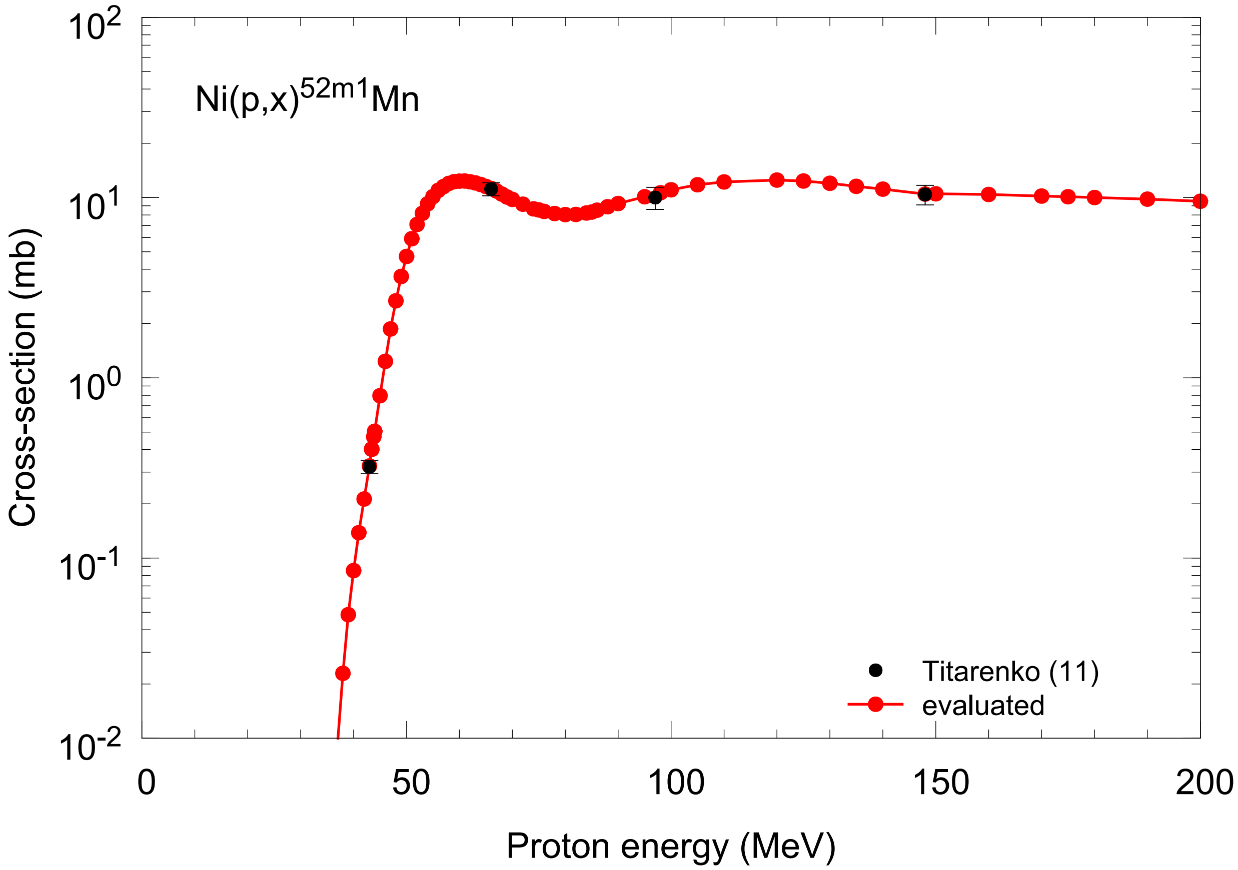
Ni(p,x)51Cr
Cross-section (mb)
Proton energy (MeV)
Aleksandrov (87)
Sisterson (06)
evaluated



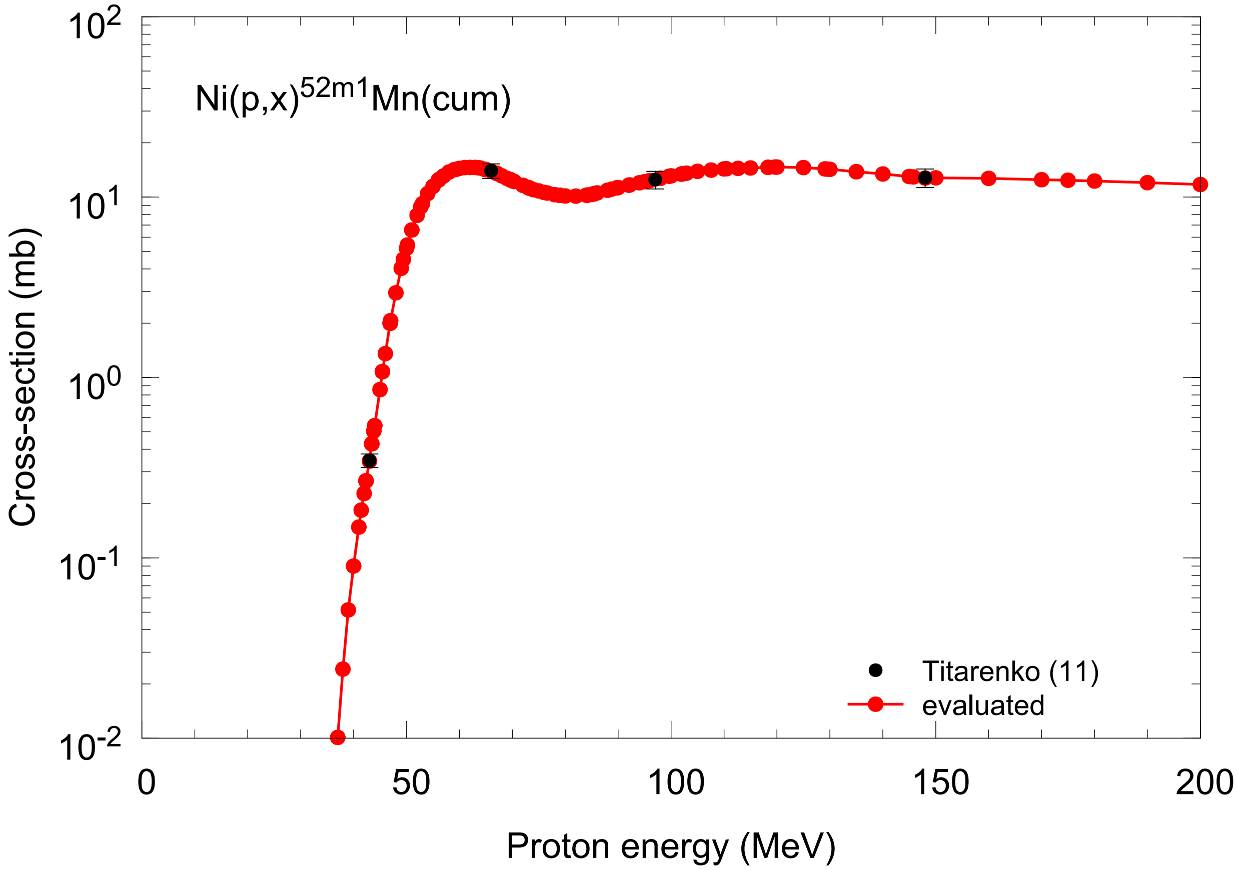
Ni(p,x)^{51}Cr
Cross-section (mb)
Proton energy (MeV)
Rayudu (64)
Michel (85)
Michel (97)
Yashima (04)
Titarenko (11)
Hermanne (15)
Hermanne (15)
evaluated



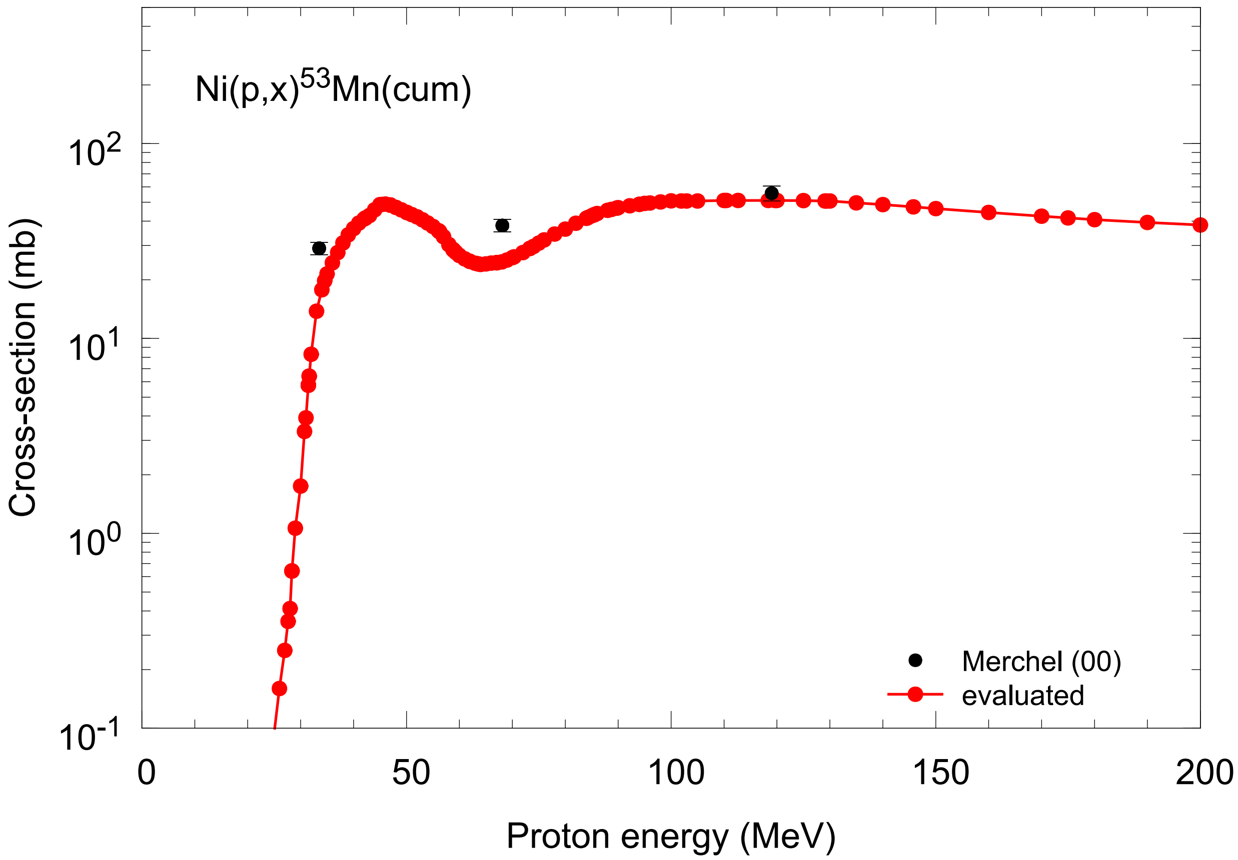
Ni(p,x)^{52g}Mn(cum)
Cross-section (mb)
Proton energy (MeV)
Rayudu (64)
Michel (78)
Michel (85)
Aleksandrov (87)
Michel (97)
Sisterson (06)
Titarenko (11)
Hermanne (15)
evaluated

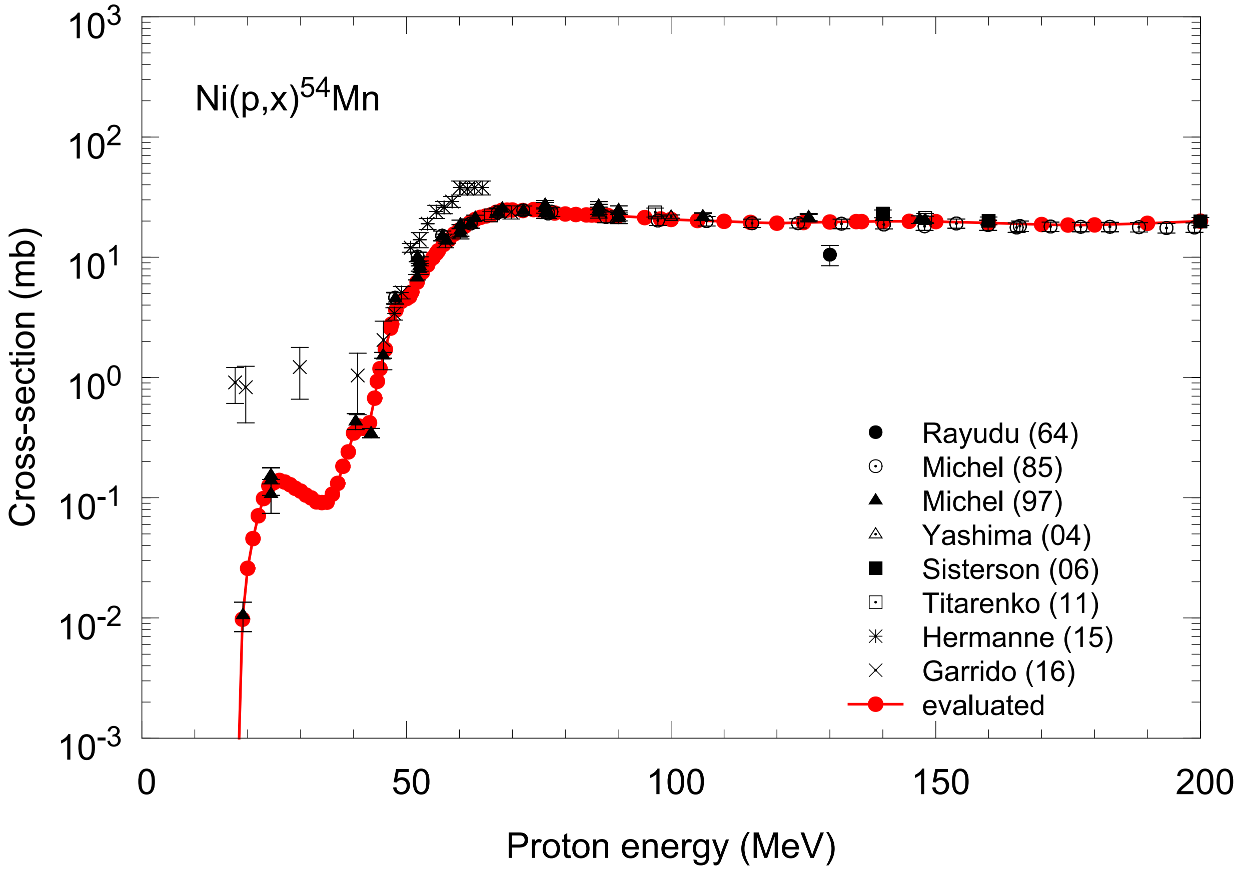


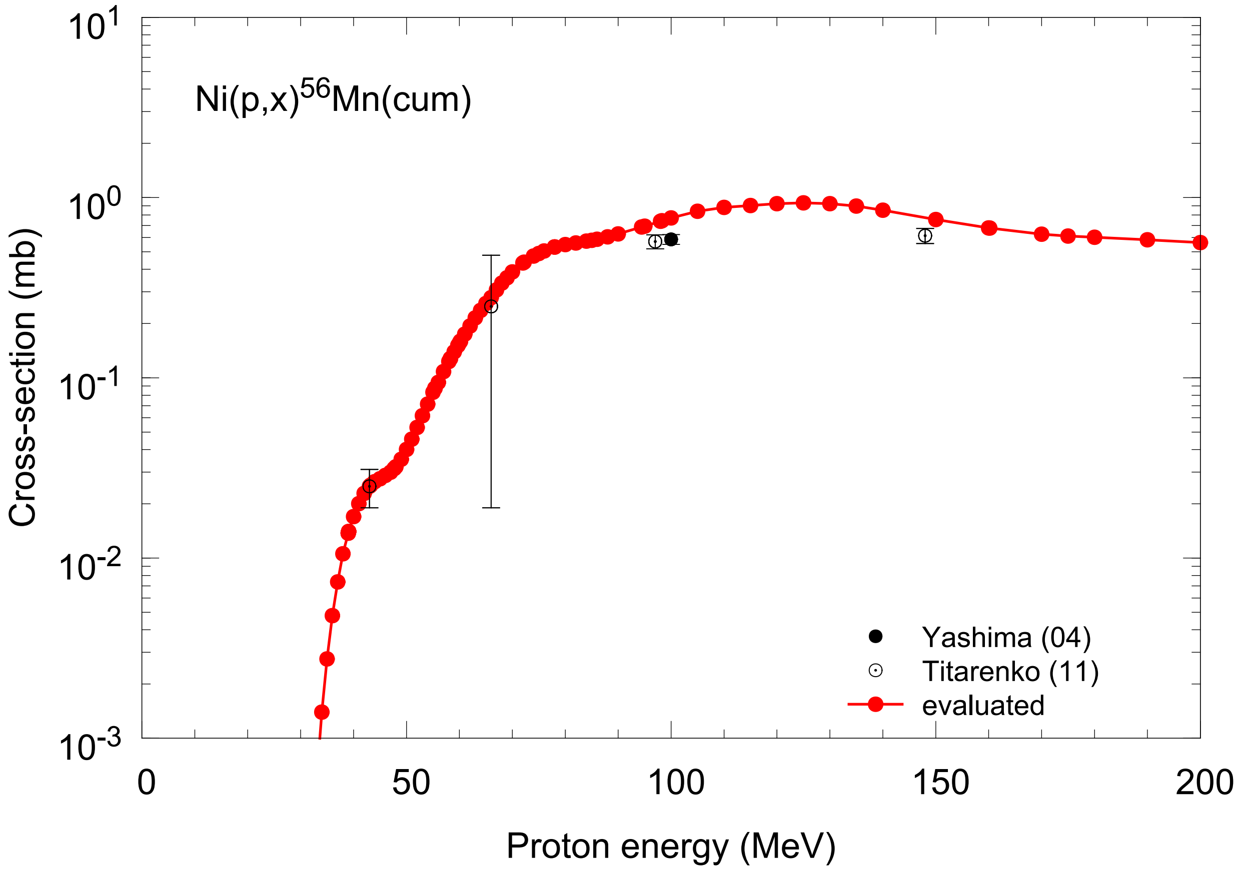
Ni(p,x)^{52m1}Mn
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

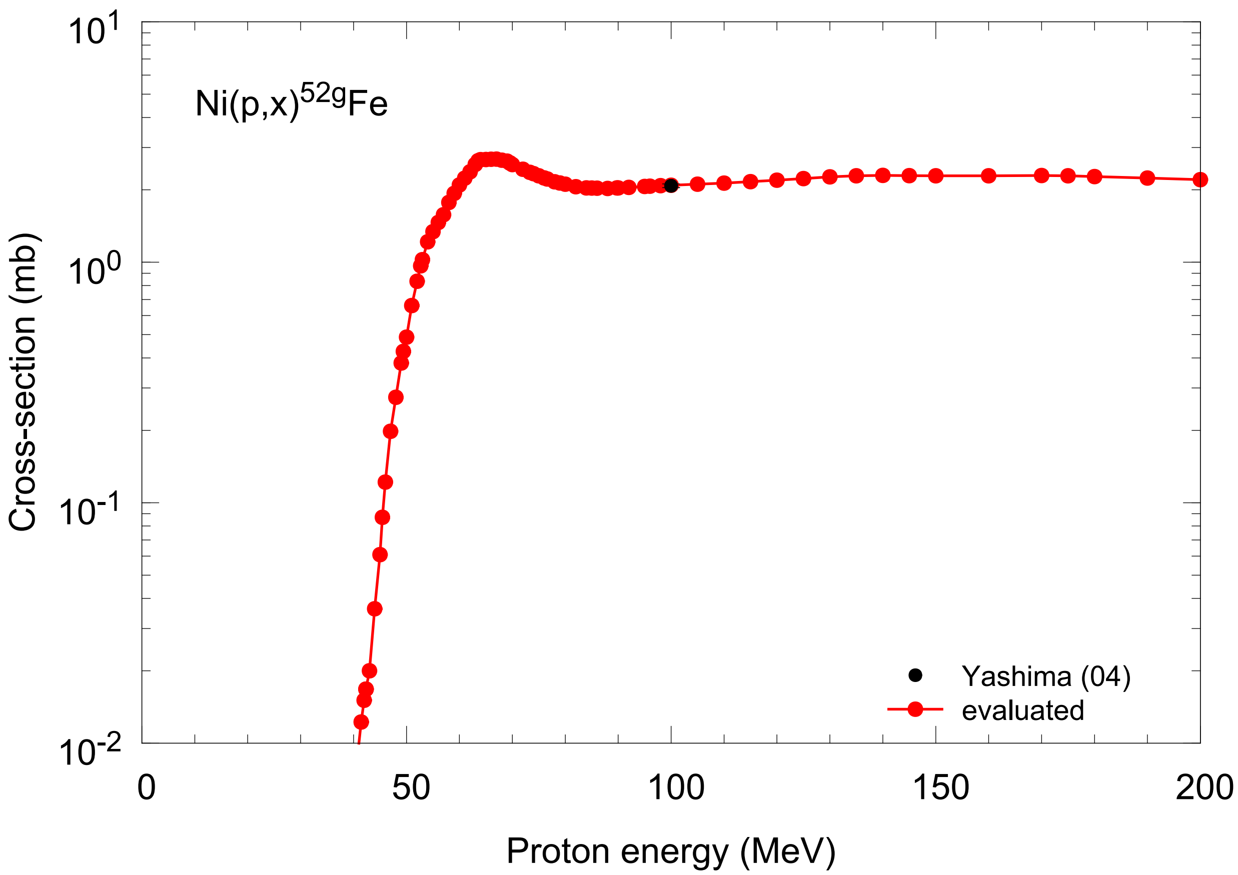


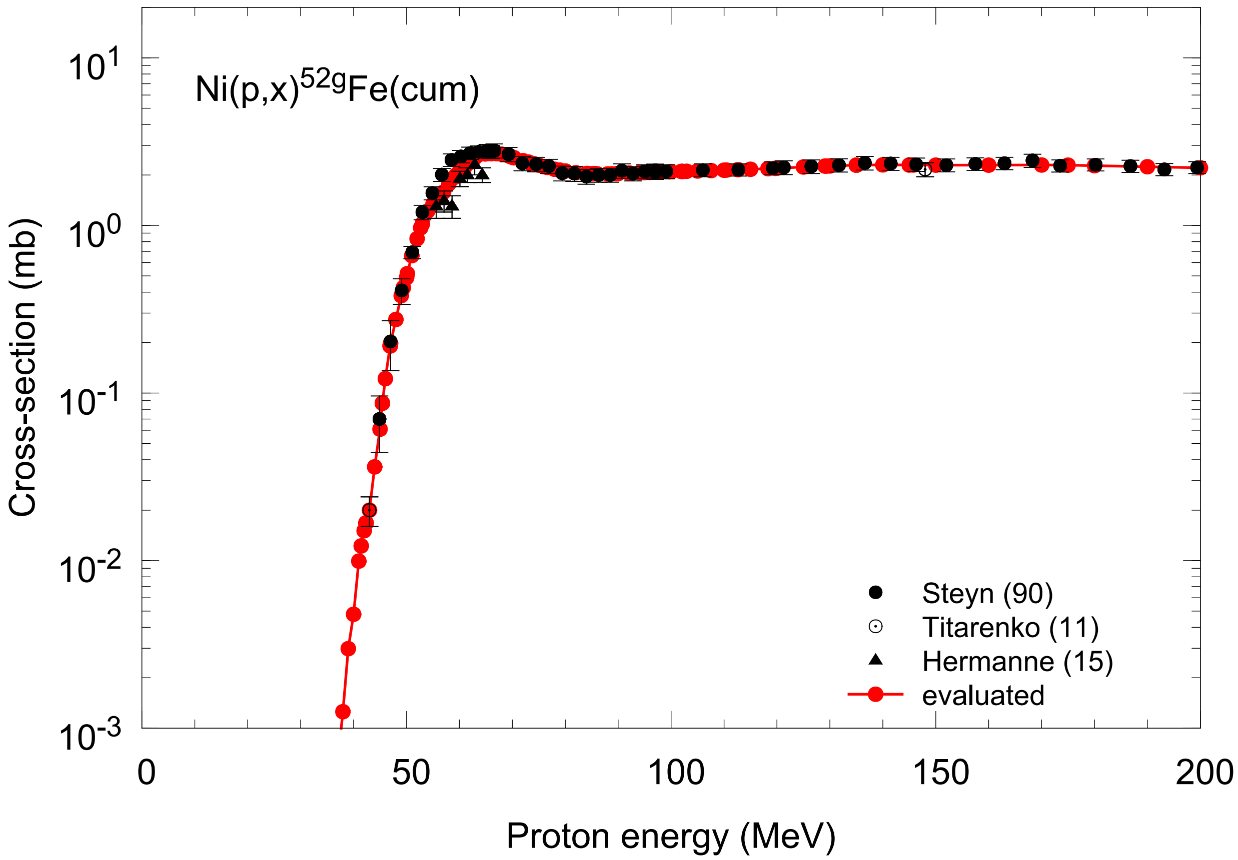
Ni(p,x)^{52m1}Mn(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

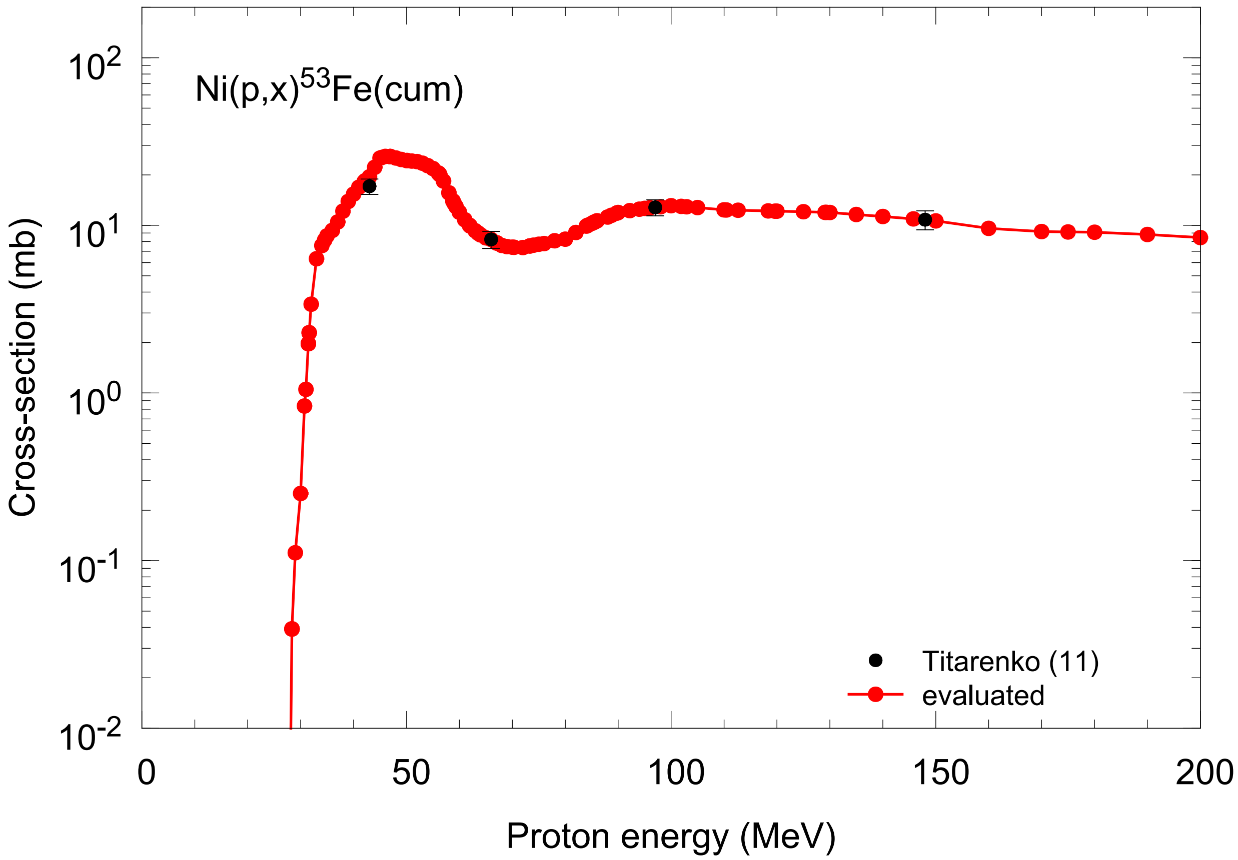

Ni(p,x)^{53}Mn(cum)
Merchel (00)
evaluated
Cross-section (mb)
Proton energy (MeV)

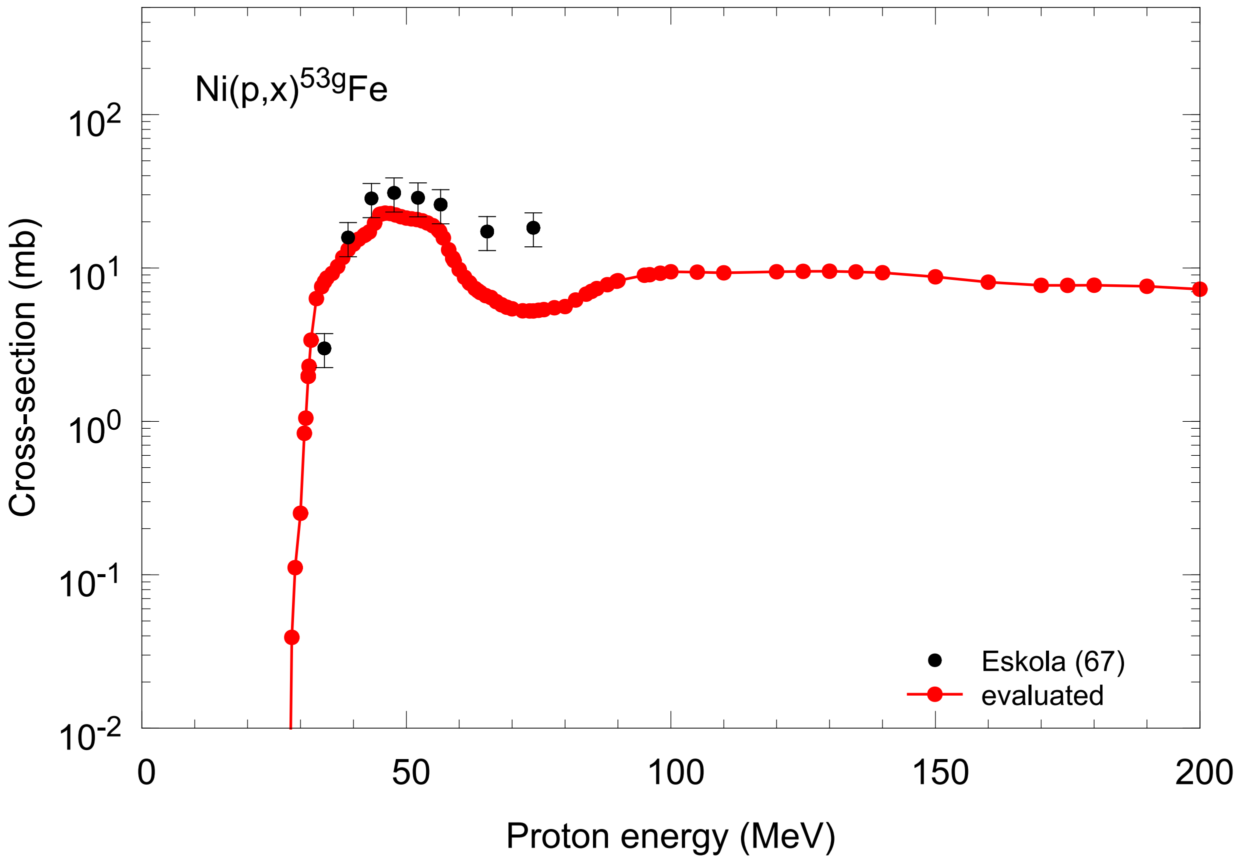

Ni(p,x)^{54}Mn
Rayudu (64)
Michel (85)
Michel (97)
Yashima (04)
Sisterson (06)
Titarenko (11)
Hermanne (15)
Garrido (16)
evaluated
Cross-section (mb)
Proton energy (MeV)

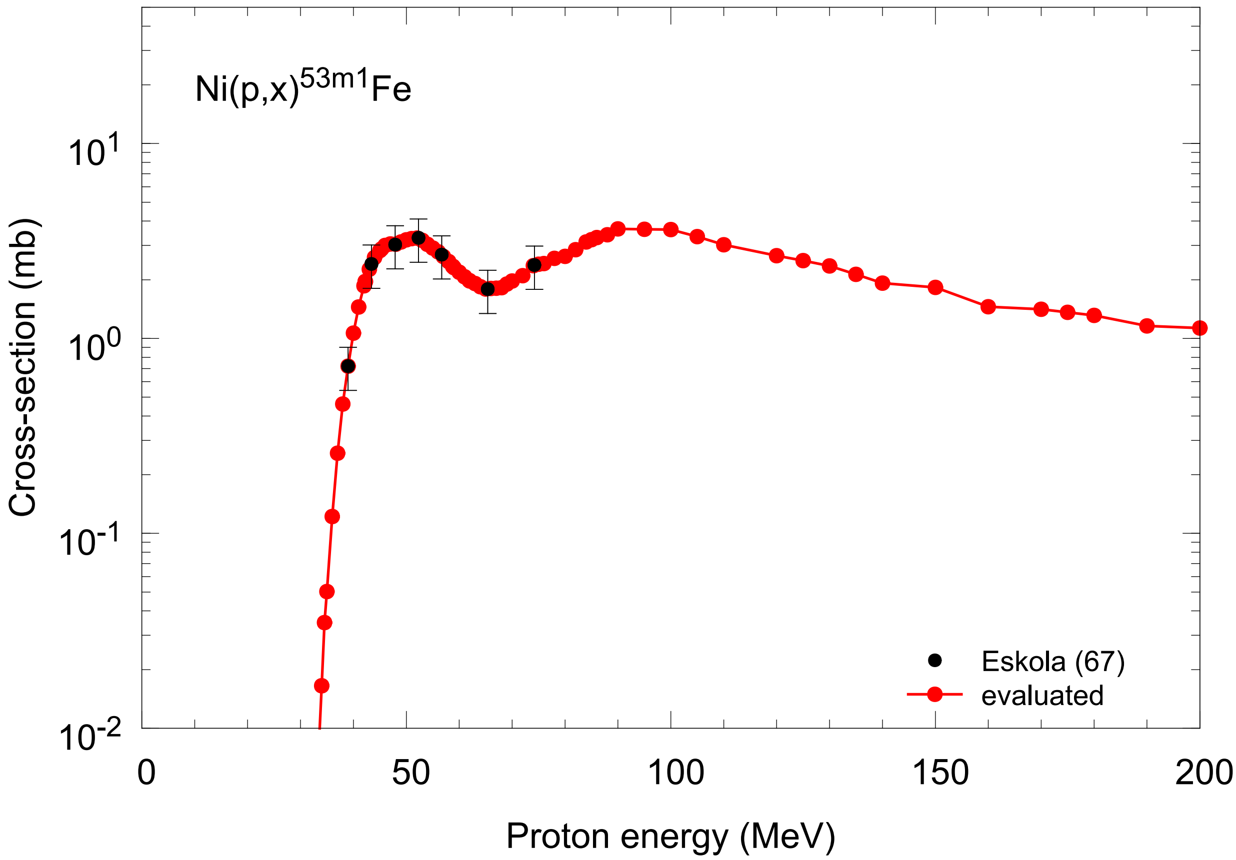

Ni(p,x)^{56}Mn(cum)
Cross-section (mb)
Proton energy (MeV)
Yashima (04)
Titarenko (11)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0
50
100
150
200

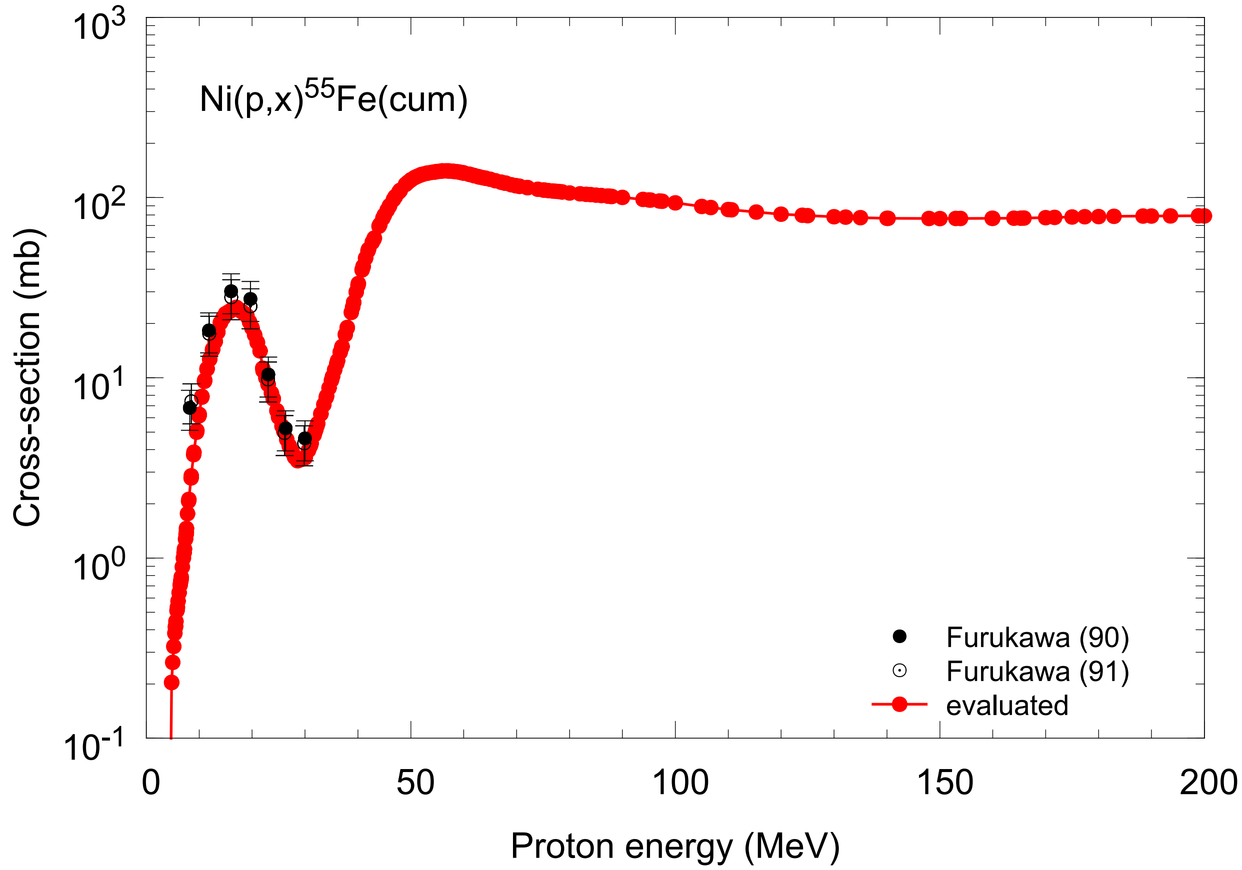

Ni(p,x)^{52g}Fe
Cross-section (mb)
Proton energy (MeV)
Yashima (04)
evaluated
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200

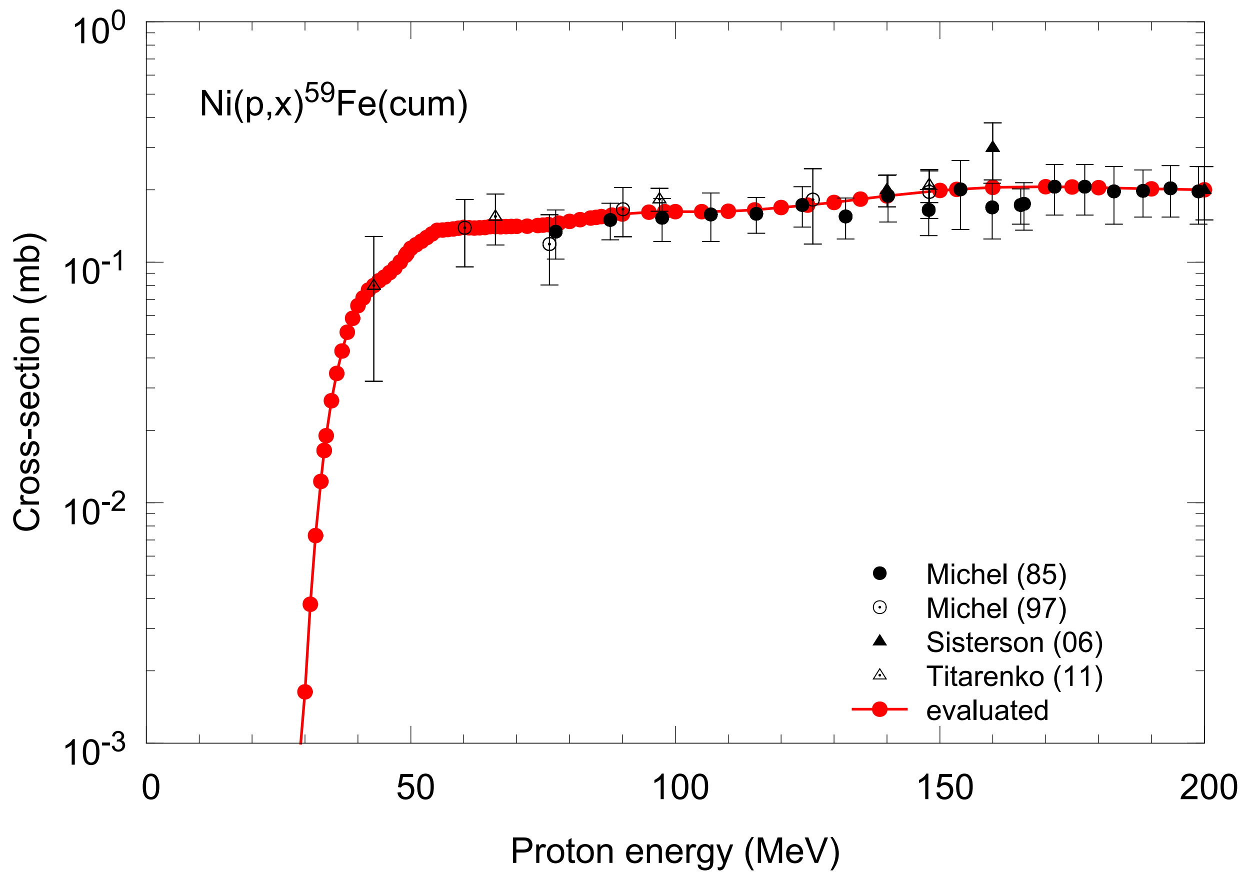

Ni(p,x)52gFe(cum)
Cross-section (mb)
Proton energy (MeV)
Steyn (90)
Titarenko (11)
Hermanne (15)
evaluated

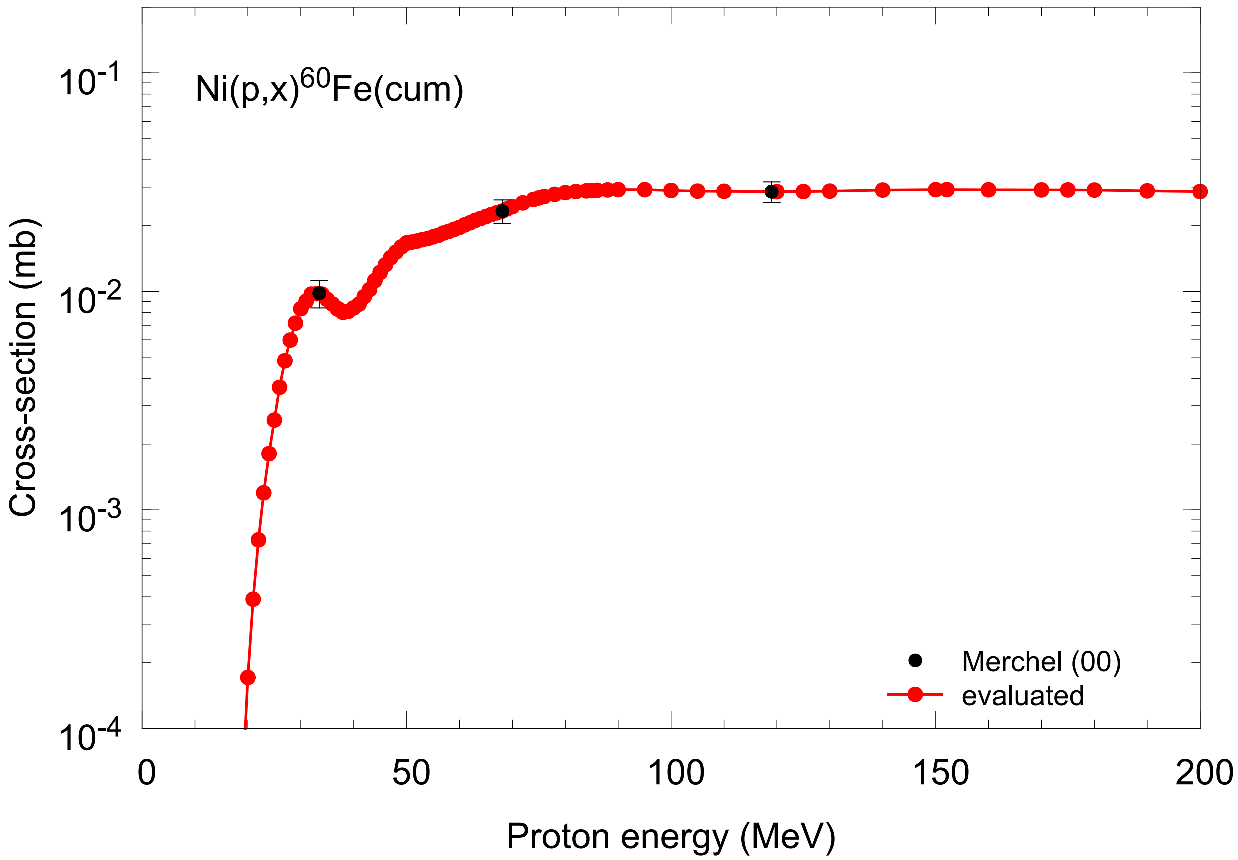

Ni(p,x)53Fe(cum)
Cross-section (mb)
Proton energy (MeV)
Titarenko (11)
evaluated

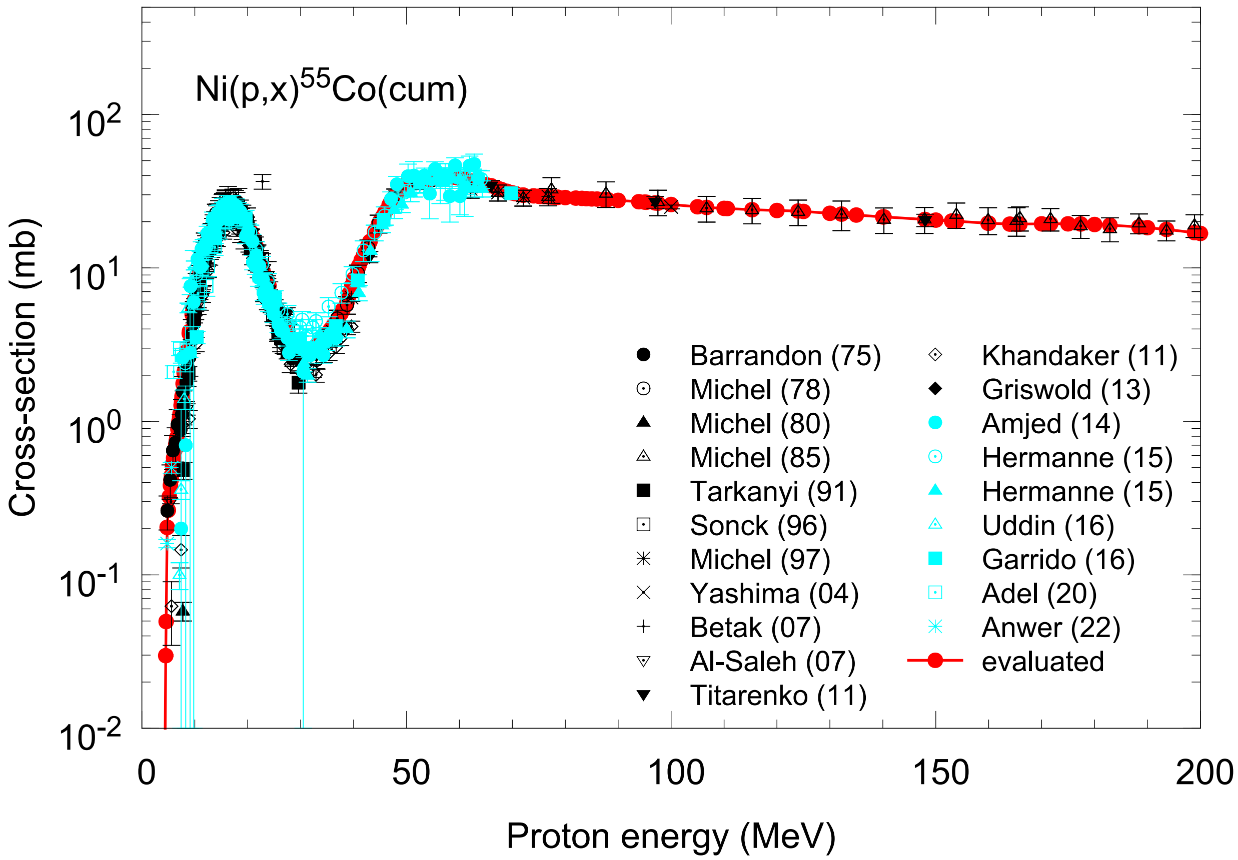

Ni(p,x)^{53g}Fe
Cross-section (mb)
Proton energy (MeV)
Eskola (67)
evaluated

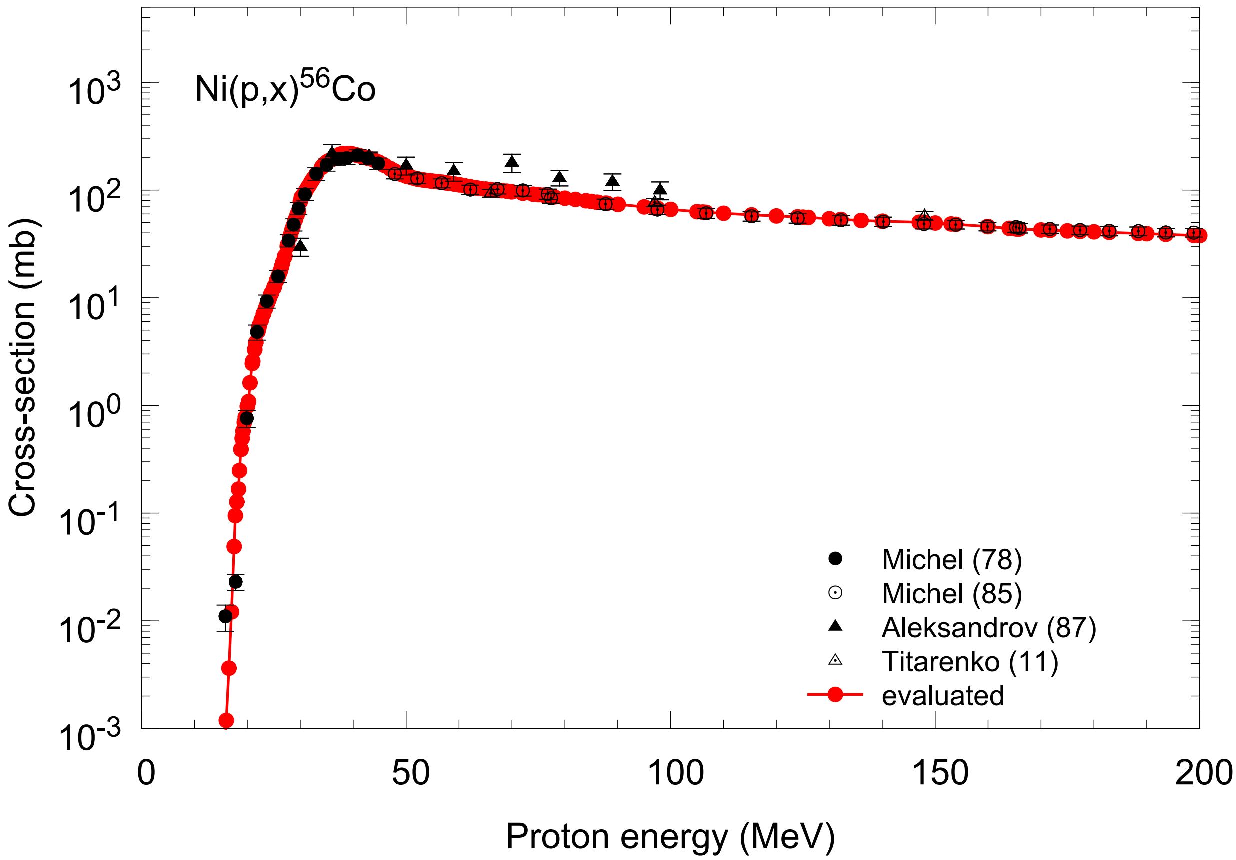

Ni(p,x)^{53m1}Fe
Cross-section (mb)
Proton energy (MeV)
Eskola (67)
evaluated


Ni(p,x)55Fe(cum)
Cross-section (mb)
Proton energy (MeV)
Furukawa (90)
Furukawa (91)
evaluated

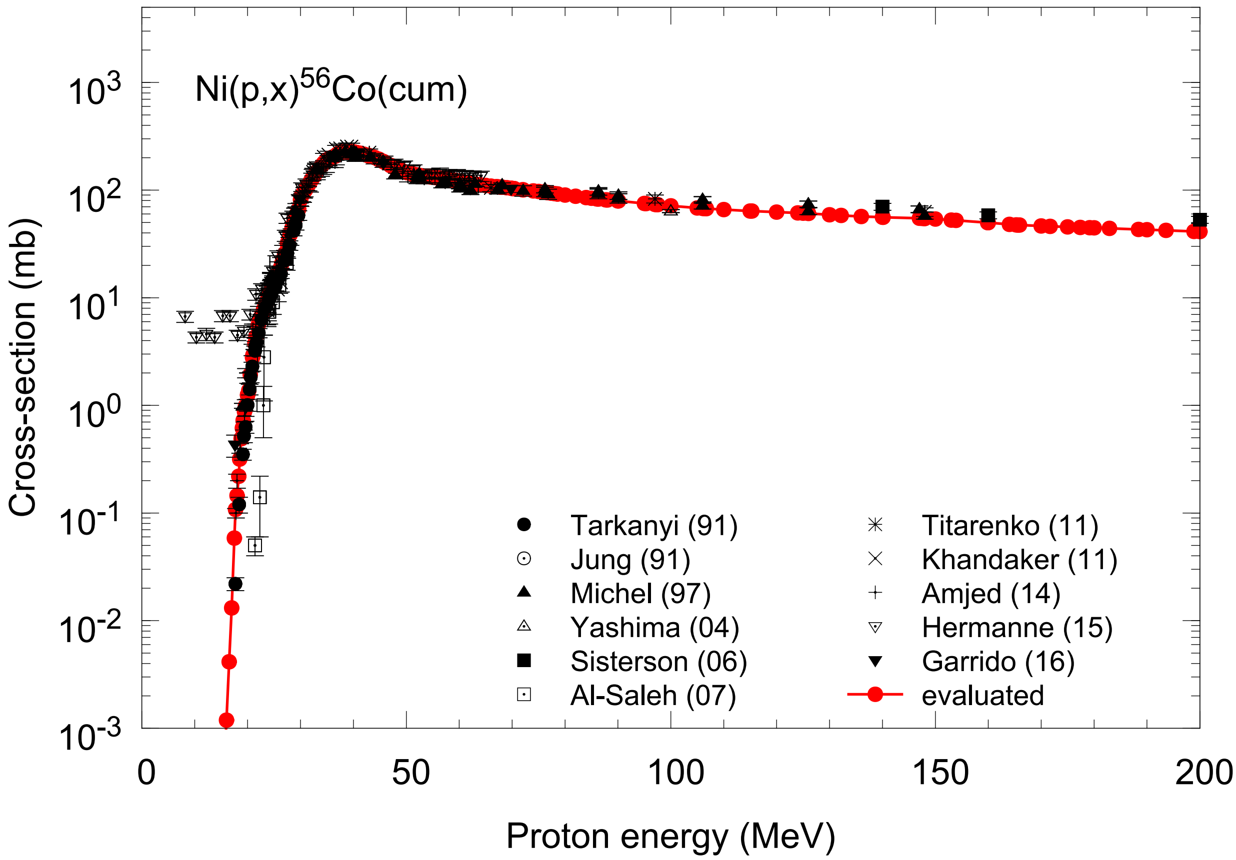

Ni(p,x)59Fe(cum)
Cross-section (mb)
Proton energy (MeV)
Michel (85)
Michel (97)
Sisterson (06)
Titarenko (11)
evaluated


Ni(p,x)^{60}Fe(cum)
Cross-section (mb)
Proton energy (MeV)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
50
100
150
200
Merchel (00)
evaluated

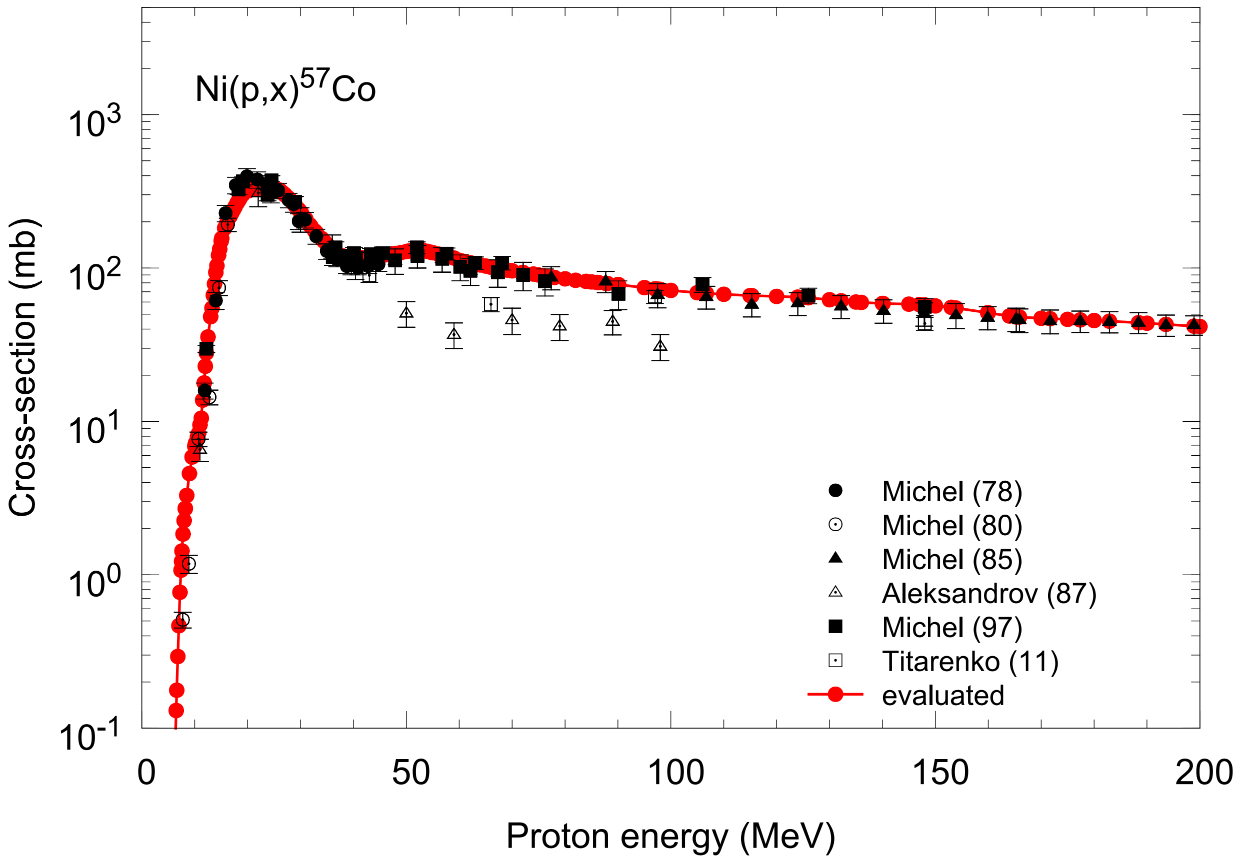

Ni(p,x)^{55}Co(cum)
Cross-section (mb)
Proton energy (MeV)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0
50
100
150
200
Barrandon (75)
Michel (78)
Michel (80)
Michel (85)
Tarkanyi (91)
Sonck (96)
Michel (97)
Yashima (04)
Betak (07)
Al-Saleh (07)
Titarenko (11)
Khandaker (11)
Griswold (13)
Amjed (14)
Hermanne (15)
Hermanne (15)
Uddin (16)
Garrido (16)
Adel (20)
Anwer (22)
evaluated

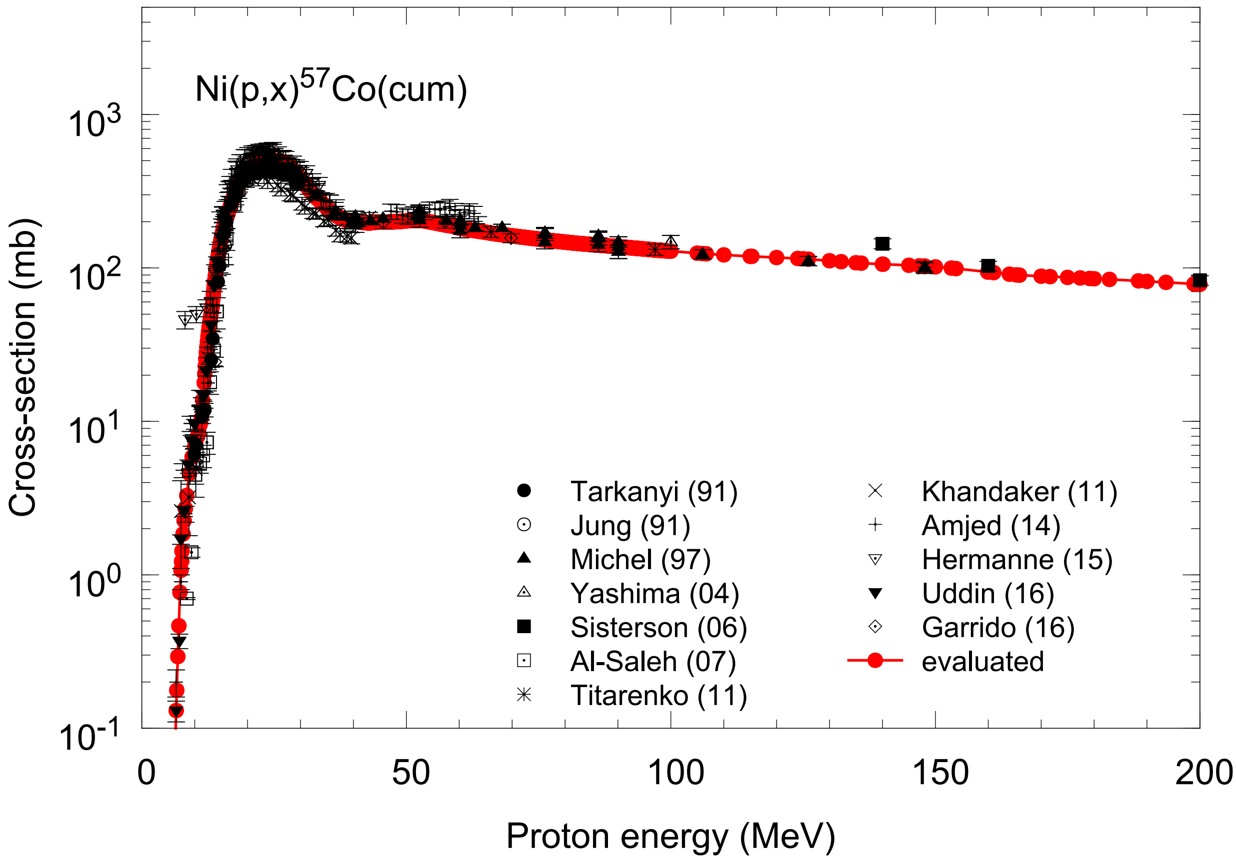


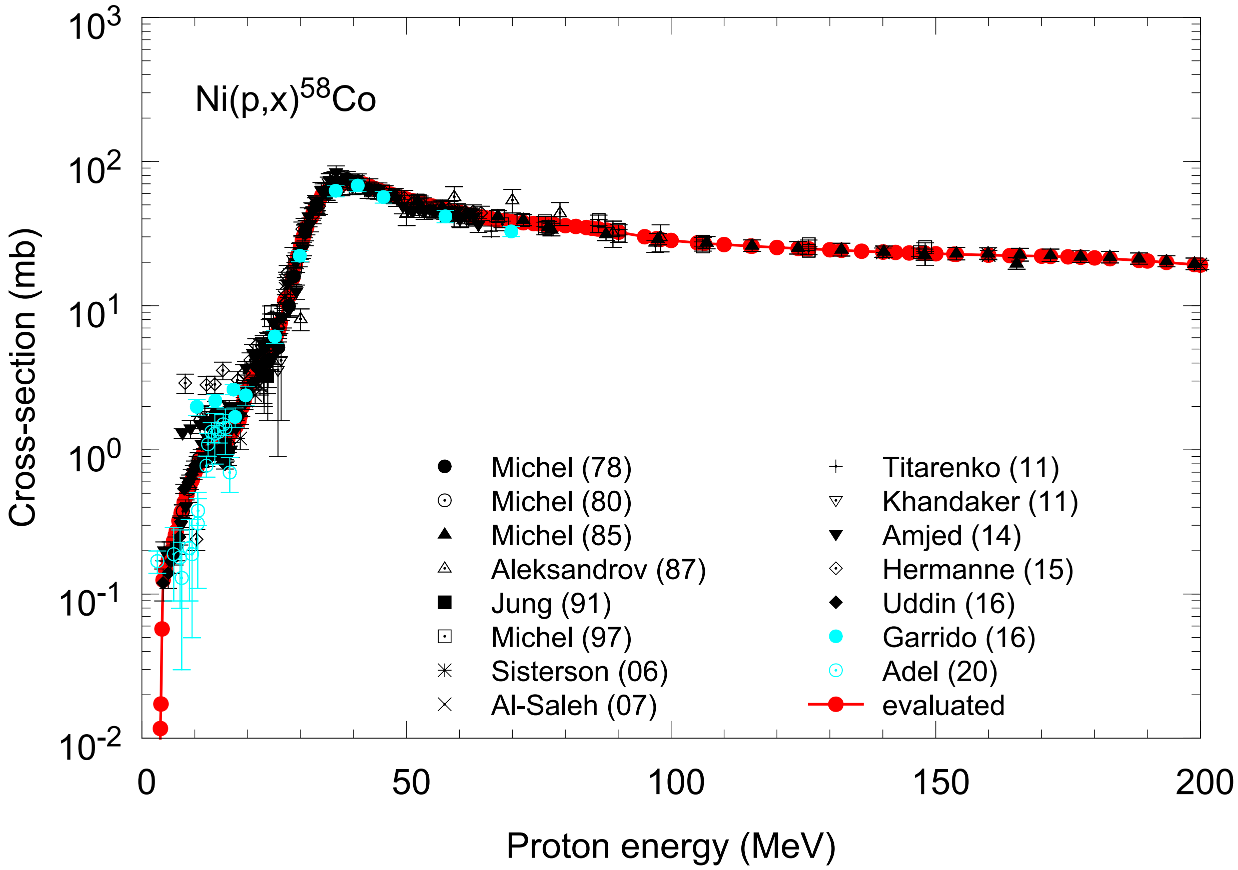
Ni(p,x)^{56}Co
Cross-section (mb)
Proton energy (MeV)
Michel (78)
Michel (85)
Aleksandrov (87)
Titarenko (11)
evaluated



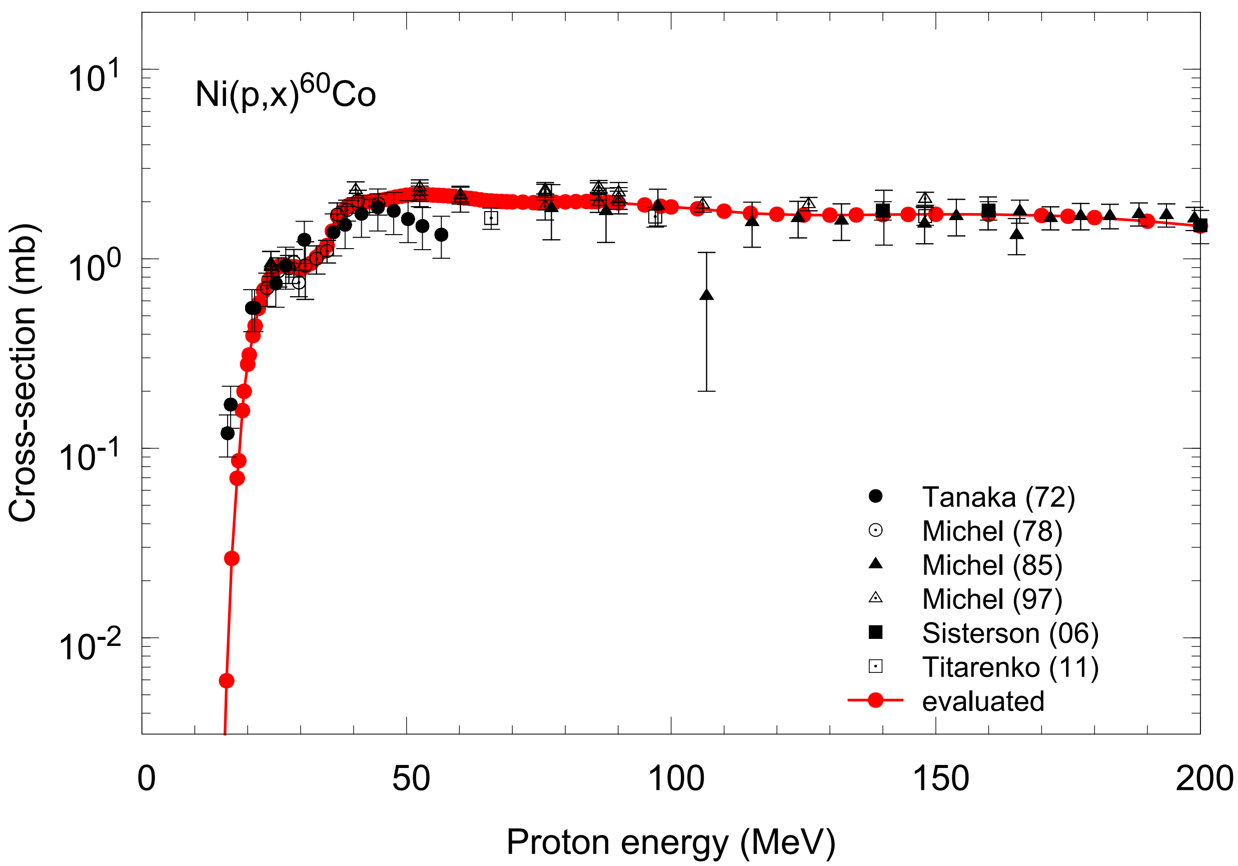
Ni(p,x)^{56}Co(cum)
Cross-section (mb)
Proton energy (MeV)
Tarkanyi (91)
Jung (91)
Michel (97)
Yashima (04)
Sisterson (06)
Al-Saleh (07)
Titarenko (11)
Khandaker (11)
Amjed (14)
Hermanne (15)
Garrido (16)
evaluated


Ni(p,x)^{57}Co
Cross-section (mb)
Proton energy (MeV)
Michel (78)
Michel (80)
Michel (85)
Aleksandrov (87)
Michel (97)
Titarenko (11)
evaluated

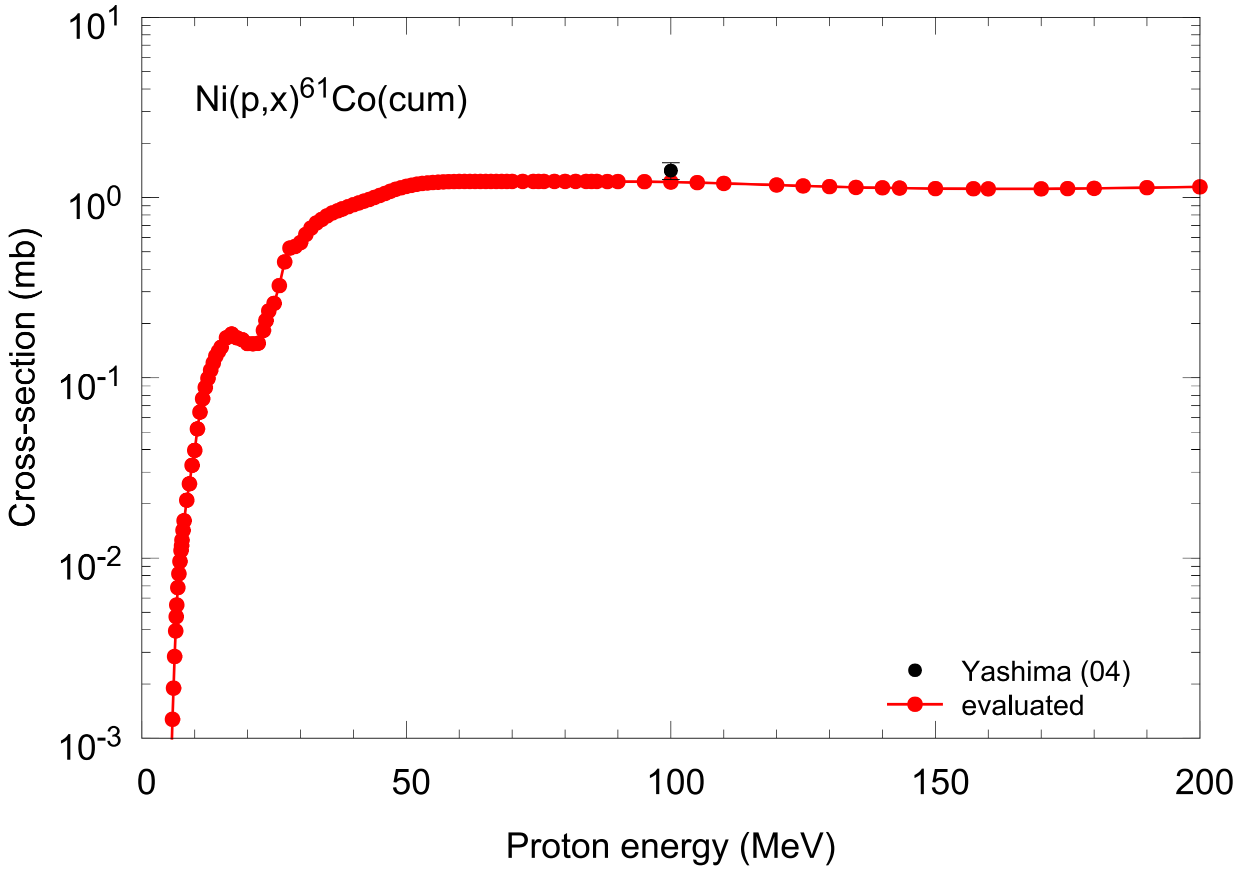

Ni(p,x)^{57}Co(cum)
Cross-section (mb)
Proton energy (MeV)
Tarkanyi (91)
Jung (91)
Michel (97)
Yashima (04)
Sisterson (06)
Al-Saleh (07)
Titarenko (11)
Khandaker (11)
Amjed (14)
Hermanne (15)
Uddin (16)
Garrido (16)
evaluated



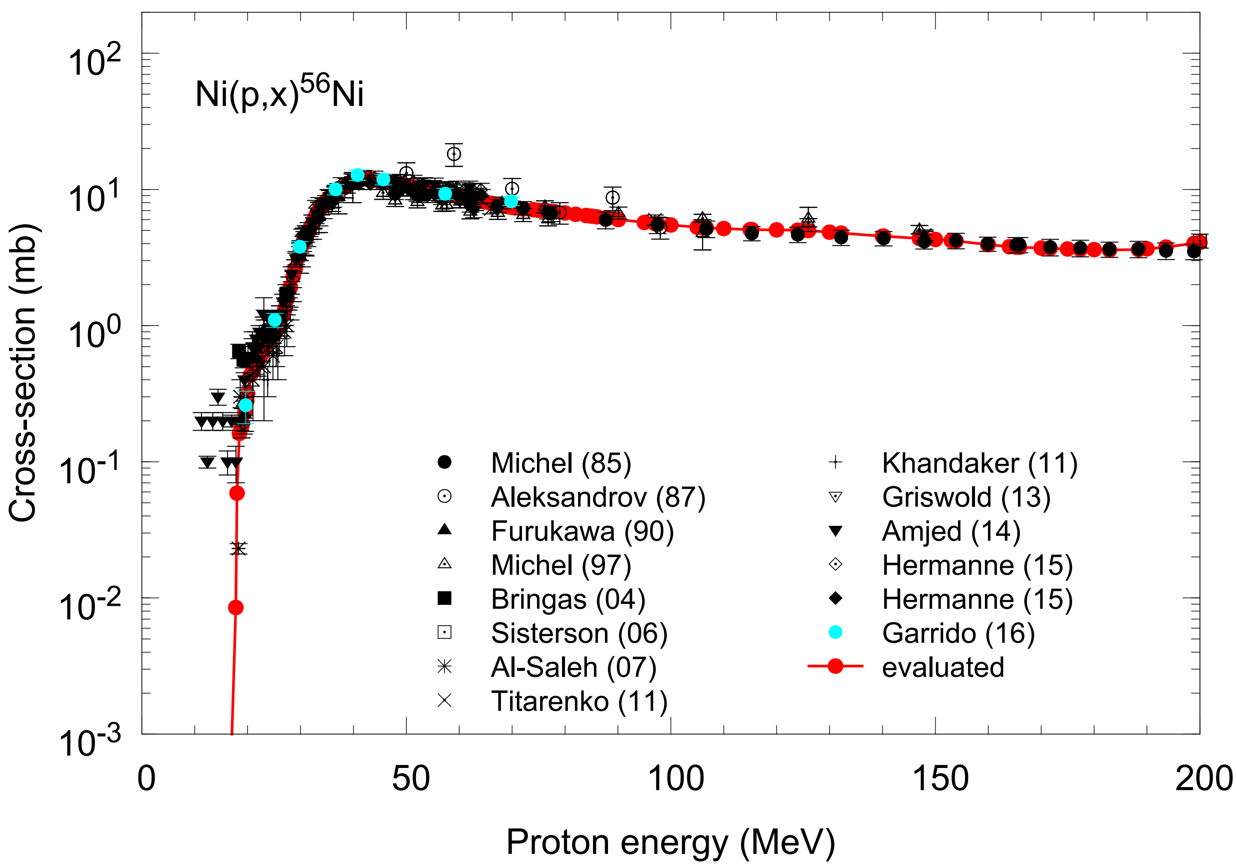
Ni(p,x)^{58}Co
Cross-section (mb)
Proton energy (MeV)
Michel (78)
Michel (80)
Michel (85)
Aleksandrov (87)
Jung (91)
Michel (97)
Sisterson (06)
Al-Saleh (07)
Titarenko (11)
Khandaker (11)
Amjed (14)
Hermanne (15)
Uddin (16)
Garrido (16)
Adel (20)
evaluated



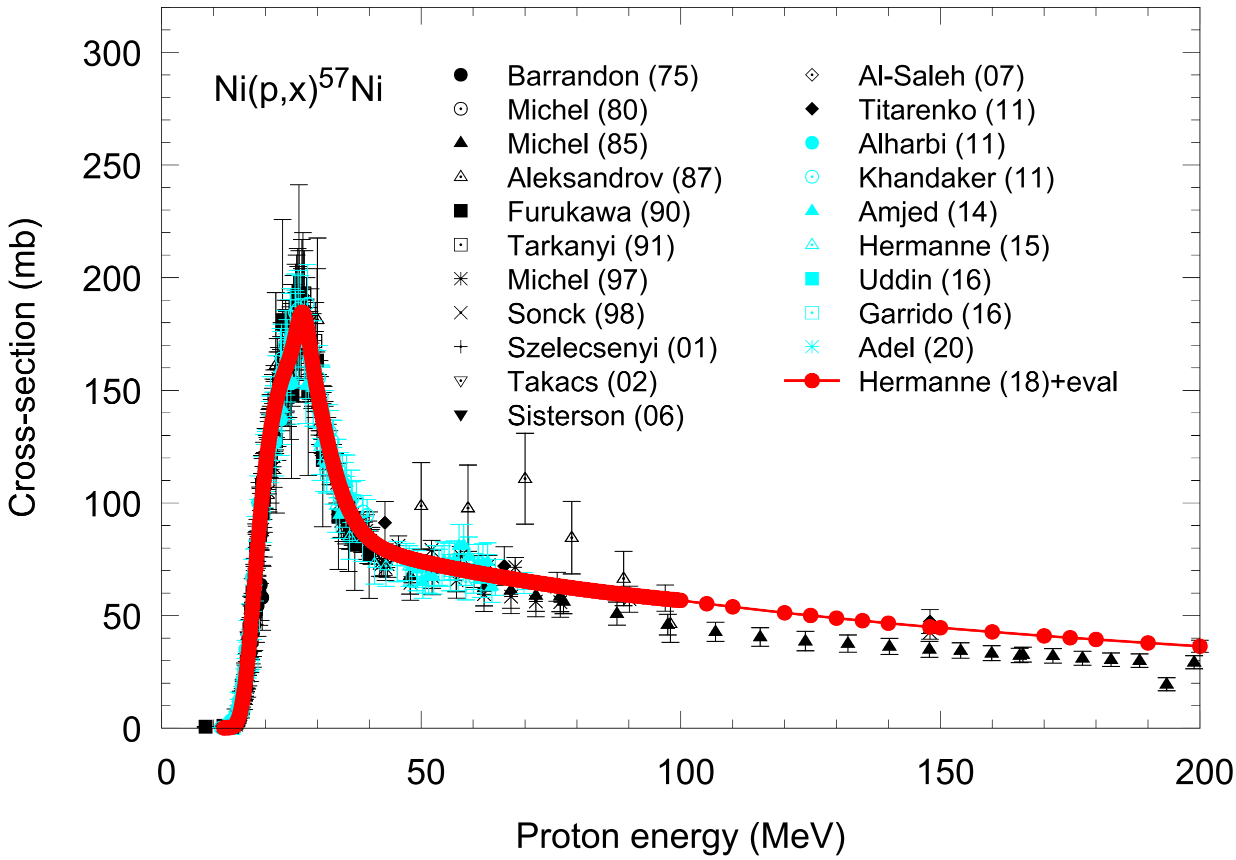
Ni(p,x)^{60}Co
Cross-section (mb)
Proton energy (MeV)
Tanaka (72)
Michel (78)
Michel (85)
Michel (97)
Sisterson (06)
Titarenko (11)
evaluated



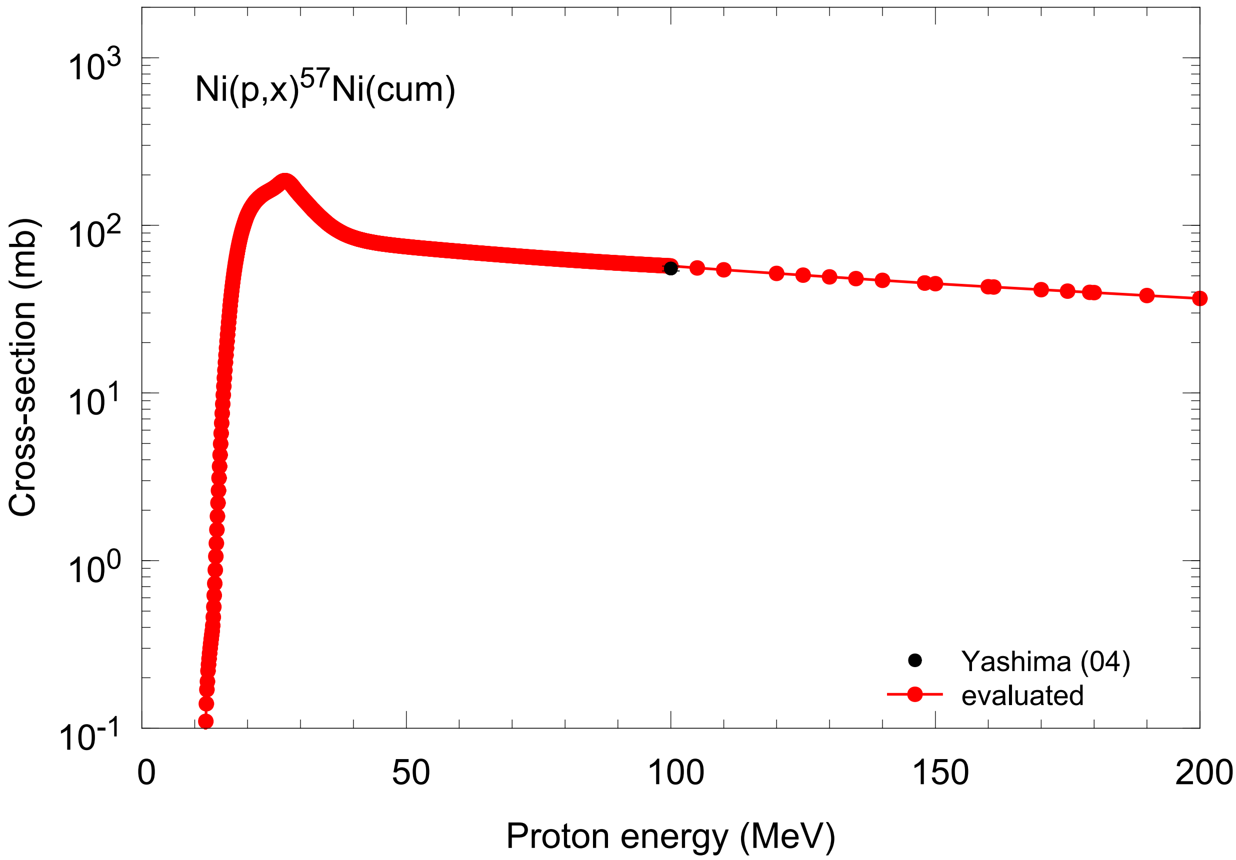
Ni(p,x)^{61}Co(cum)
Cross-section (mb)
Proton energy (MeV)
Yashima (04)
evaluated



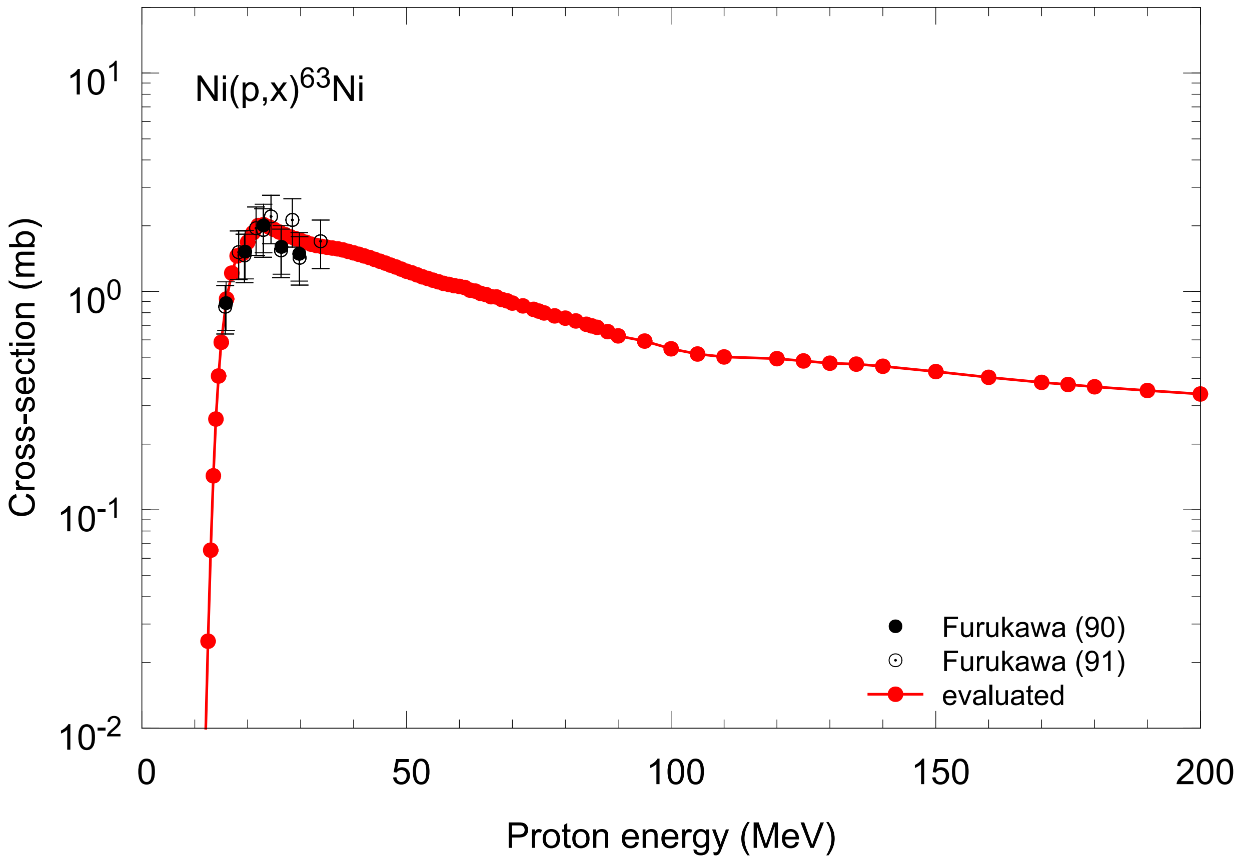
Ni(p,x)^{56}Ni
Cross-section (mb)
Proton energy (MeV)
Michel (85)
Aleksandrov (87)
Furukawa (90)
Michel (97)
Bringas (04)
Sisterson (06)
Al-Saleh (07)
Titarenko (11)
Khandaker (11)
Griswold (13)
Amjed (14)
Hermanne (15)
Hermanne (15)
Garrido (16)
evaluated

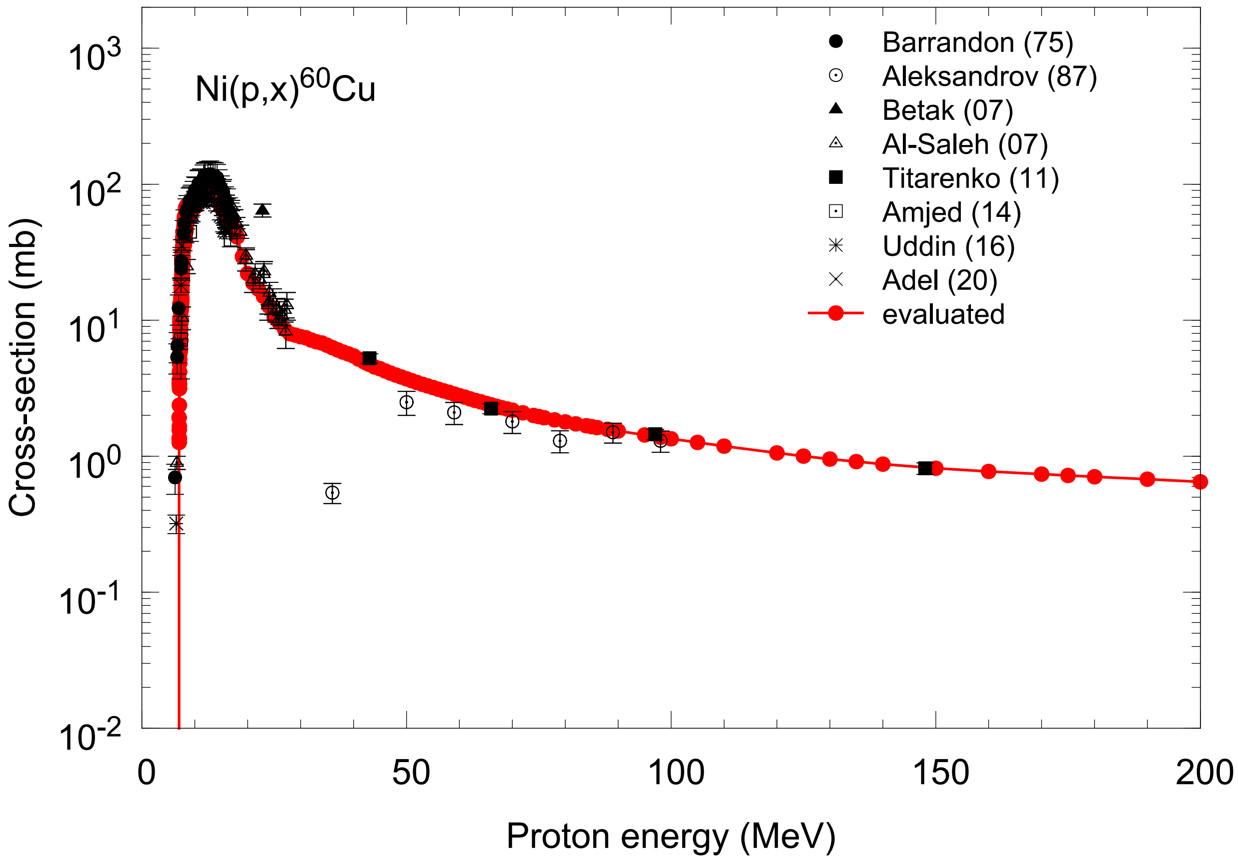


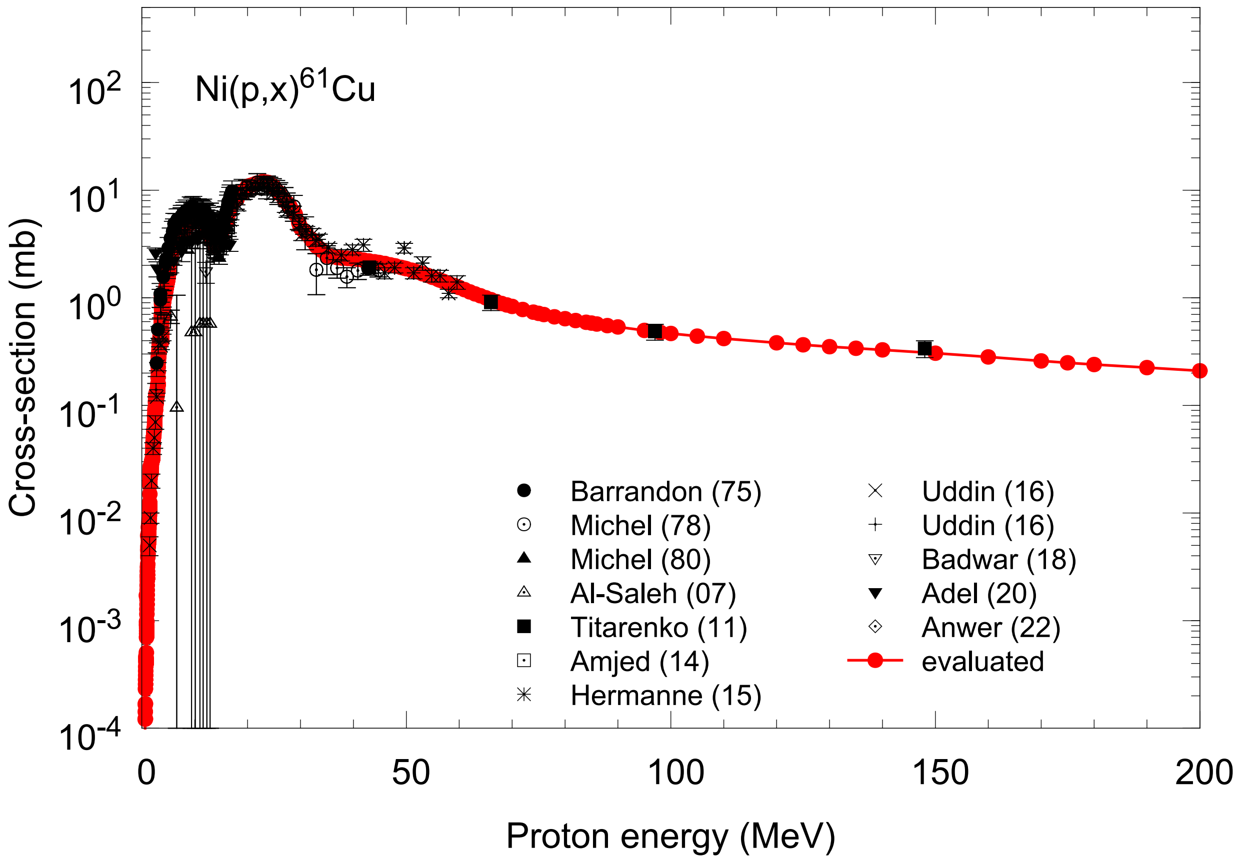
Ni(p,x)^{57}Ni
Barrandon (75)
Michel (80)
Michel (85)
Aleksandrov (87)
Furukawa (90)
Tarkanyi (91)
Michel (97)
Sonck (98)
Szelecsenyi (01)
Takacs (02)
Sisterson (06)
Al-Saleh (07)
Titarenko (11)
Alharbi (11)
Khandaker (11)
Amjed (14)
Hermanne (15)
Uddin (16)
Garrido (16)
Adel (20)
Hermanne (18)+eval
Cross-section (mb)
Proton energy (MeV)



Ni(p,x)^{57}Ni(cum)
Yashima (04)
evaluated
Cross-section (mb)
Proton energy (MeV)


Ni(p,x)63Ni
Cross-section (mb)
Proton energy (MeV)
Furukawa (90)
Furukawa (91)
evaluated


Ni(p,x)60Cu
Cross-section (mb)
Proton energy (MeV)
Barrandon (75)
Aleksandrov (87)
Betak (07)
Al-Saleh (07)
Titarenko (11)
Amjed (14)
Uddin (16)
Adel (20)
evaluated



Ni(p,x)^{61}Cu
Cross-section (mb)
Proton energy (MeV)
Barrandon (75)
Michel (78)
Michel (80)
Al-Saleh (07)
Titarenko (11)
Amjed (14)
Hermanne (15)
Uddin (16)
Uddin (16)
Badwar (18)
Adel (20)
Anwer (22)
evaluated

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