

Introduction of GSYS2.4.7 Digitizer



Vidya Thakur



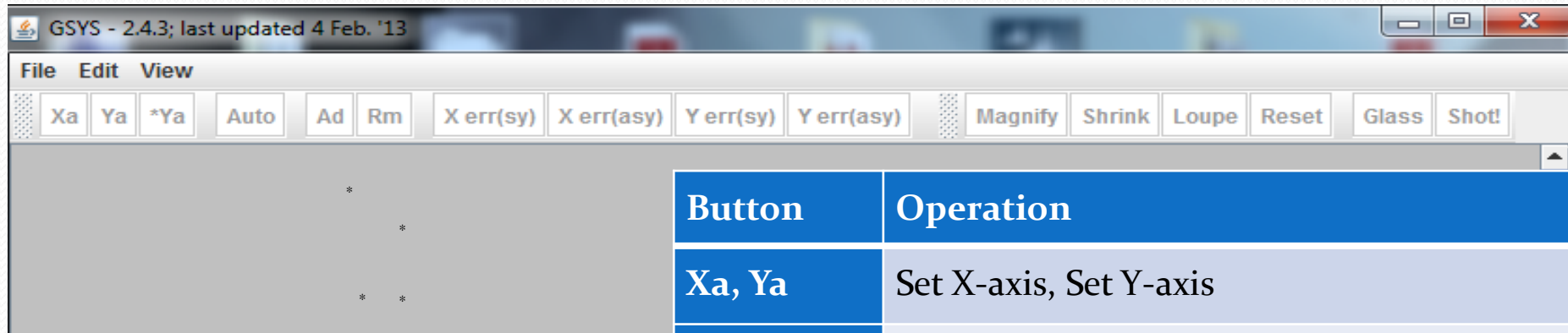
IET Bhaddal Ropar, Punjab, India

**The 7th DAE-BRNS Theme Meeting on
EXFOR Compilation of Nuclear Data
North East Hill University (NEHU), Shillong , India
6-10, March. 2017**

Introduction and Installation of GSYS 2.4.7 Digitizers

- Developed in 2005 by JCPRG (SAPPORO) group.
- Used by the EXFOR compilers in Japan and other countries.
- A software tool to digitize data points on the figure image.
- GSYS2.4.7 is the newest version.
- Works on [Window](#), [Linux](#) and [Mac](#).
- Support PNG, GIF and JPEG image format.
- Copy Gsys2.4.7.exe (for EXFOR compilers) on desktop.
<http://www.jcprg.org/gsys/>
- Click the icon “Gsys2.4.7.exe” to start in the Windows.
- Install Java 1.4 or later if it does not work.

Introduction of the Main Panel of GSYS 2.4.7



Button	Operation
Glass	To enlarge the particular data point.
Loupe	To enlarge a particular area.
Magnify	To enlarge the image.
Shrink	To obtained the original size.

Button	Operation
Xa, Ya	Set X-axis, Set Y-axis
*Ya	Set end point of Y-axis when starting point is the same as X axis
Auto	Set an axis by automatic axis detection.
Ad	Add data points.
Rm	To remove the uncorrected marked data point
X err(sy)	Set symmetric error for X direction
X err(asy)	Set asymmetric error for X direction.
Y err(sy)	Set symmetric error for Y direction.
Y err(asy)	Set asymmetric error for Y direction.

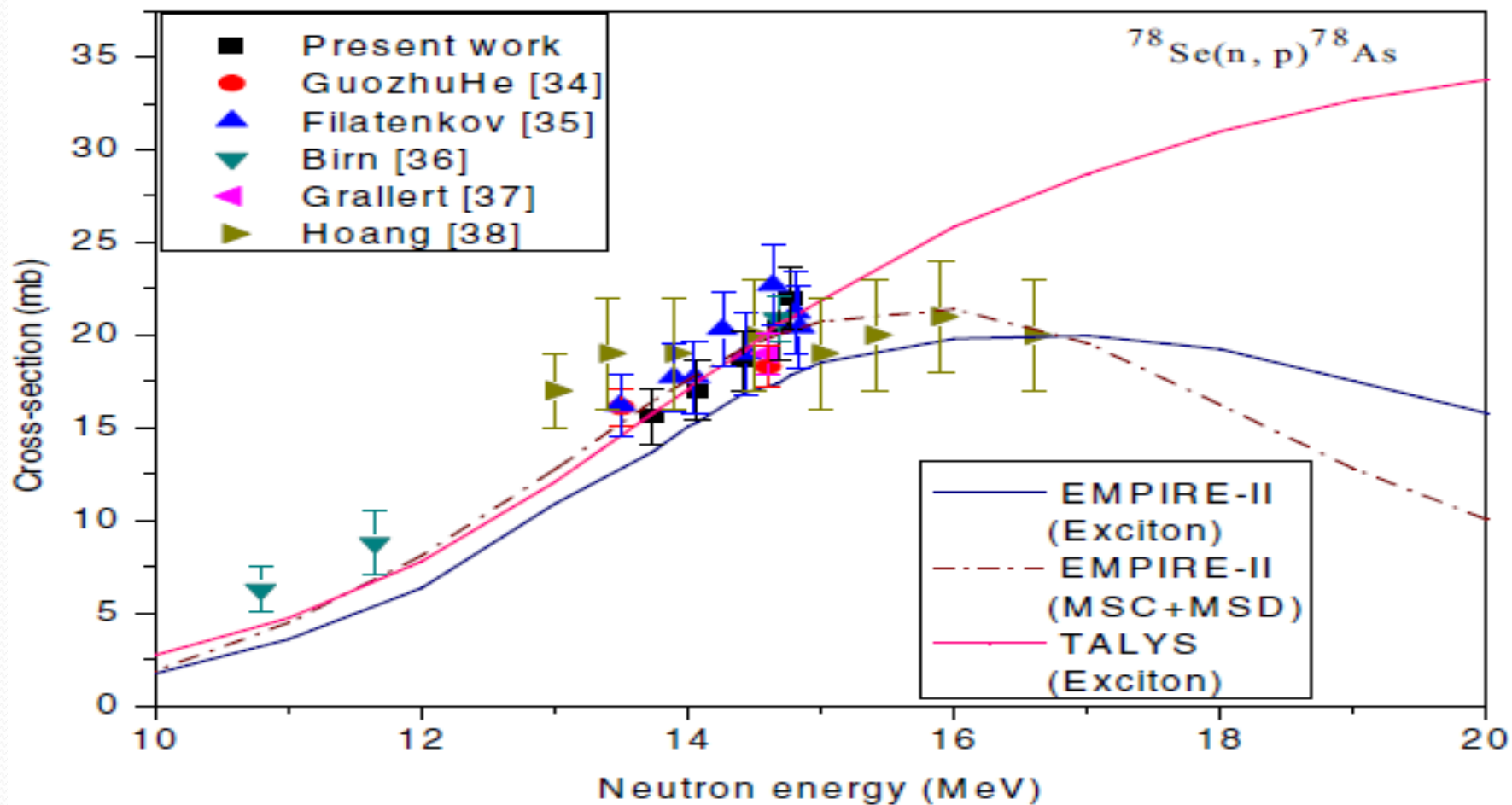


1. Load Image and Define Scales

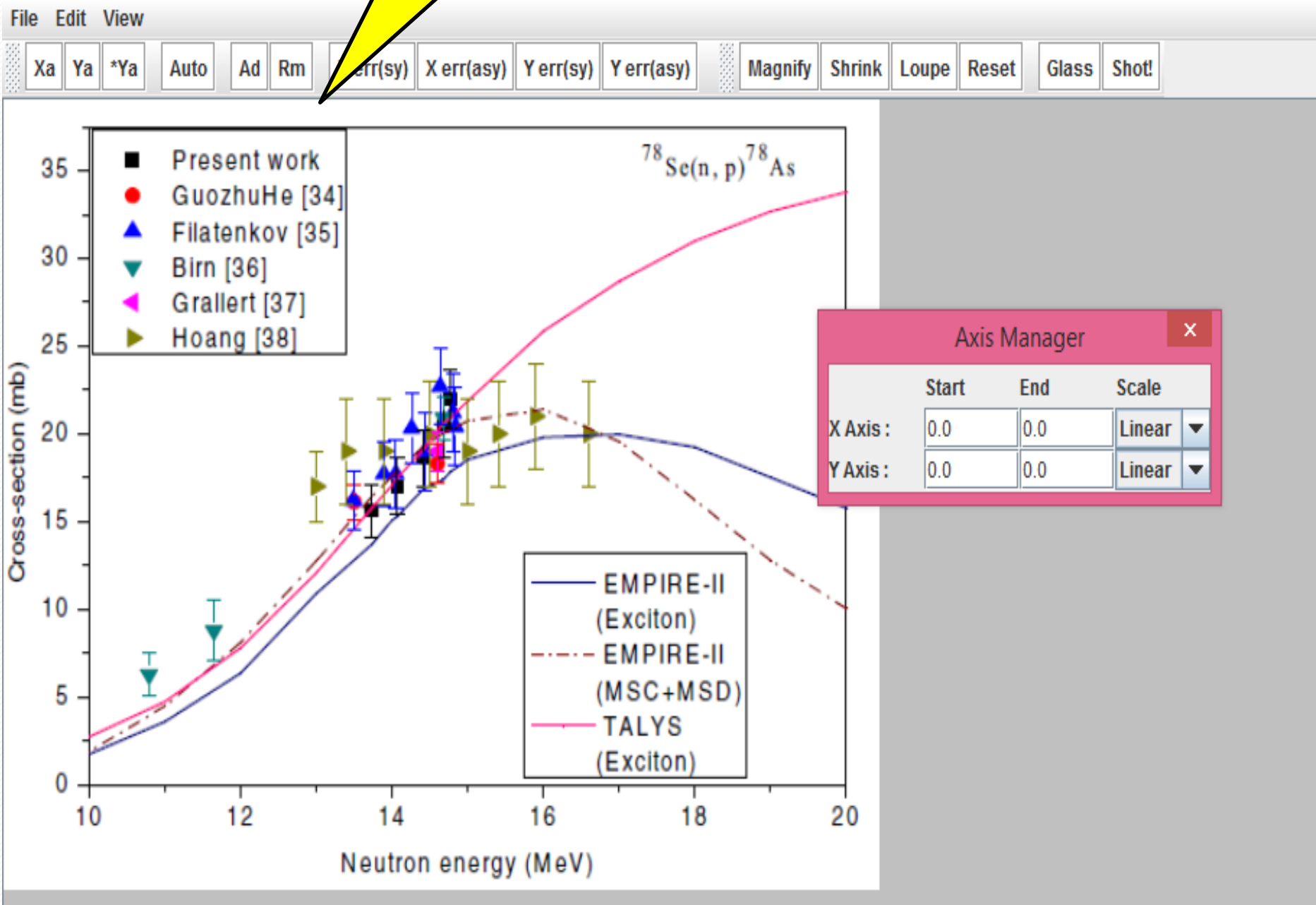


Welcome to GSYS !! Drag and drop your figure file or Start by selecting "Open Image File" from "File" menu

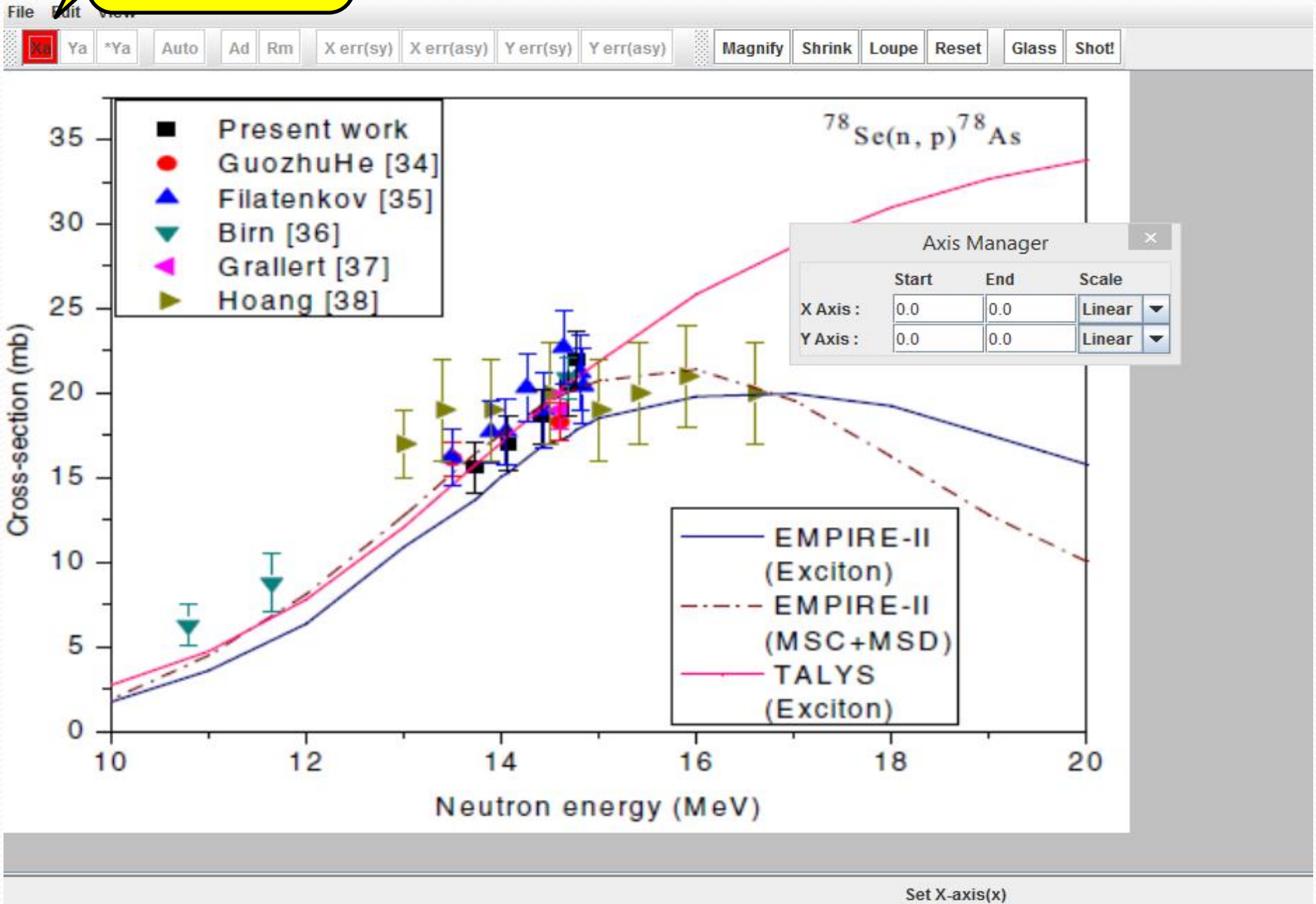
Fig.3 (PRC 90, 064609, 2014)



Drag and drop image

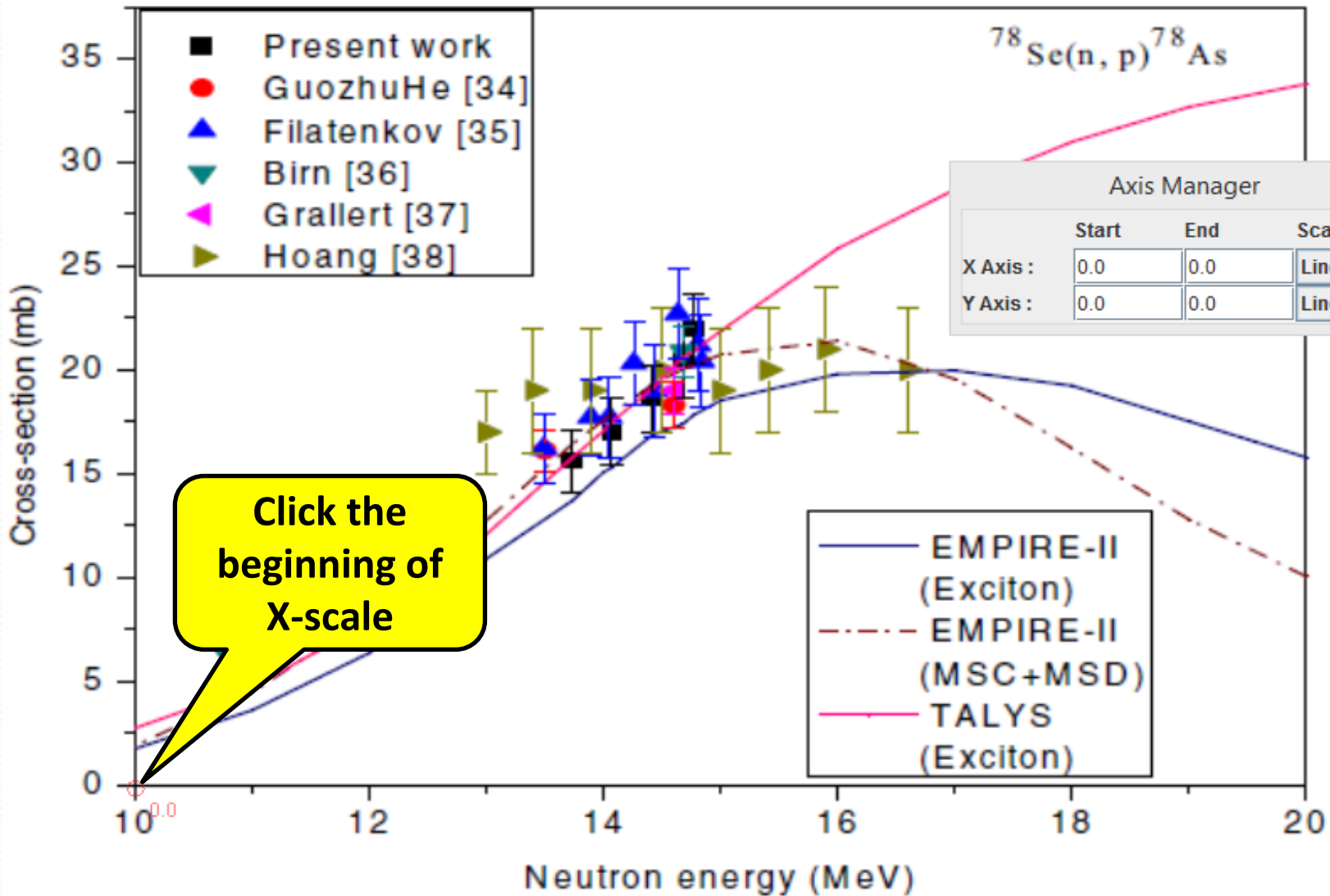


Click Xa



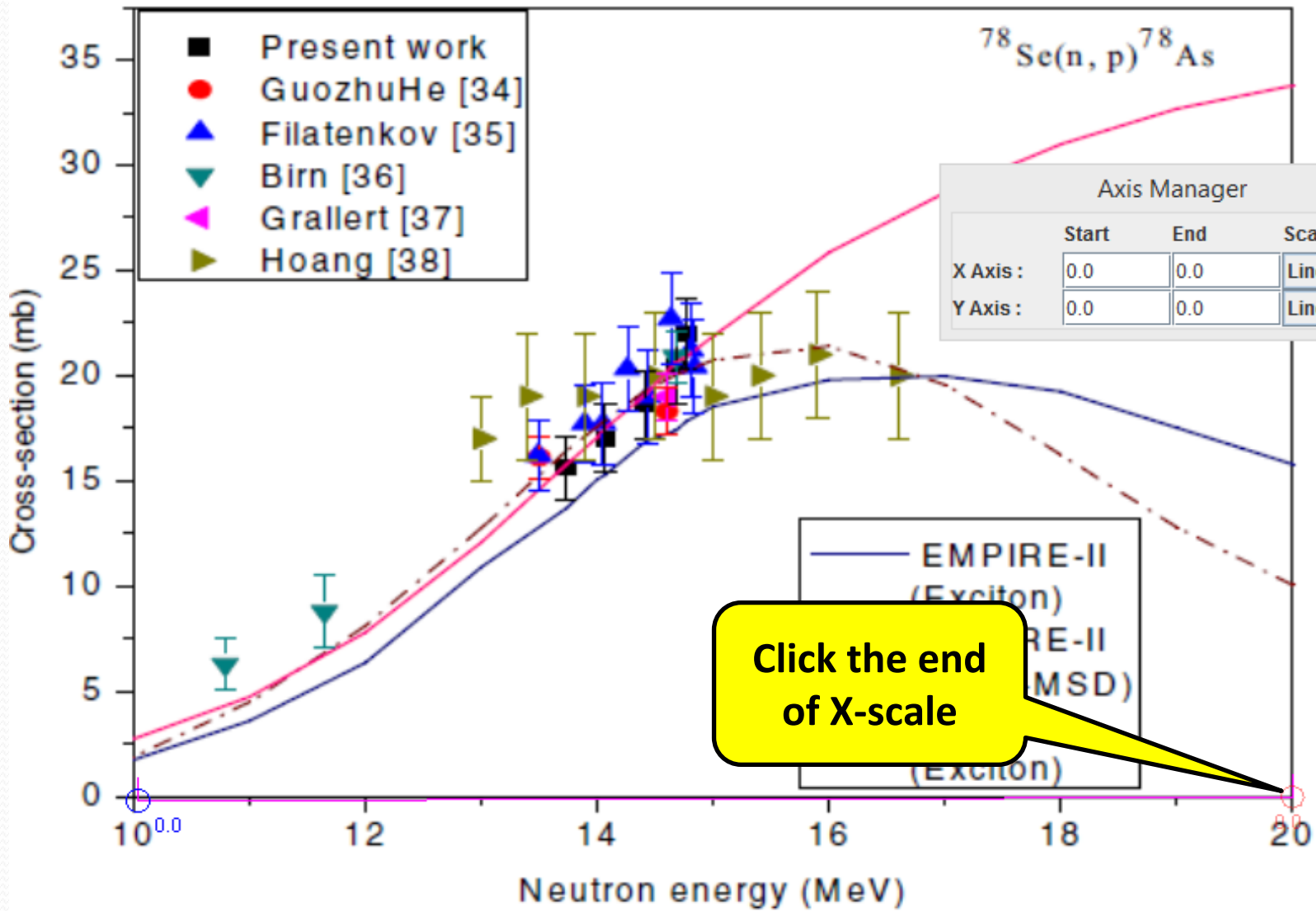
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

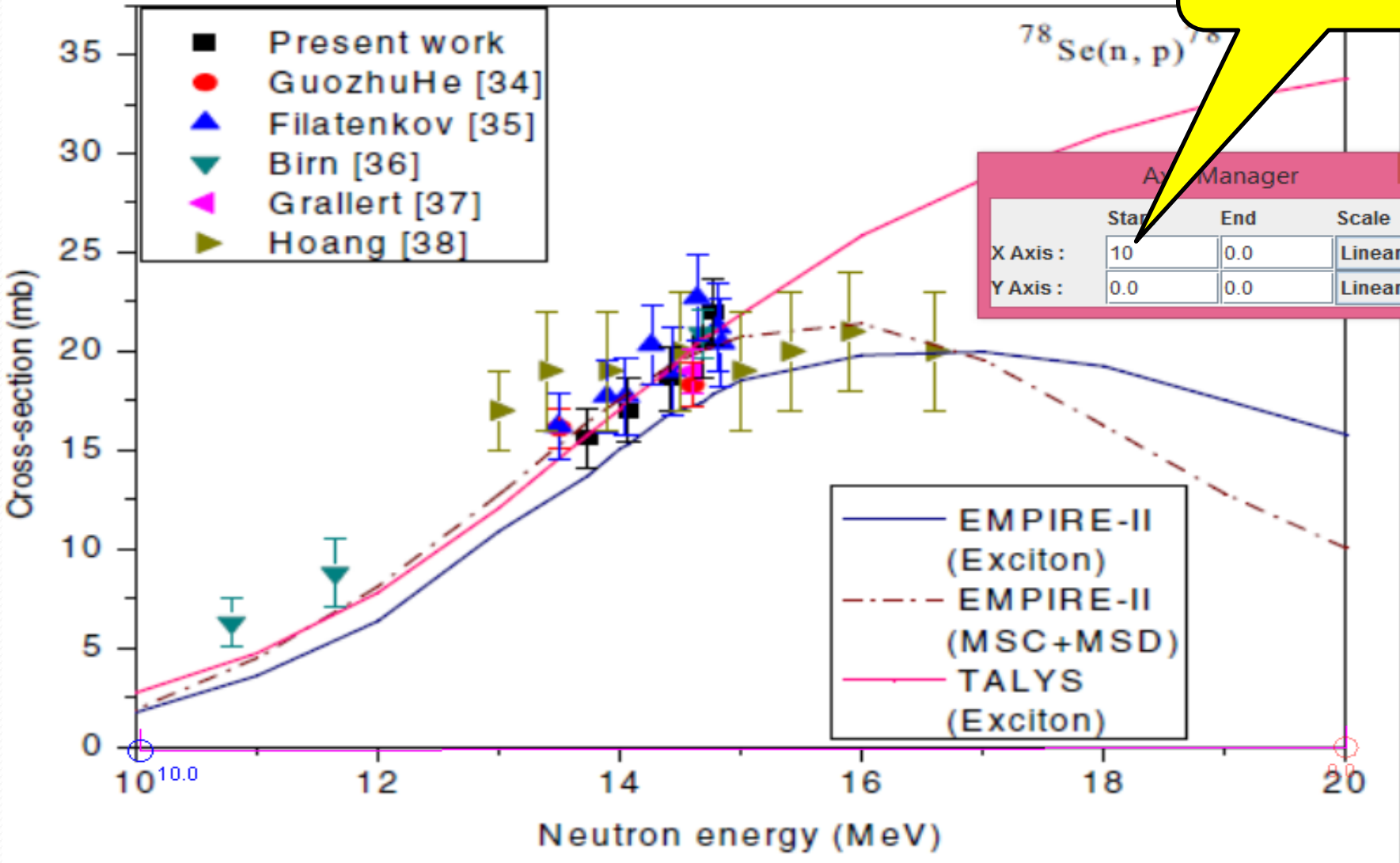
Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Re

Give the value for X initial tics



Axis Manager

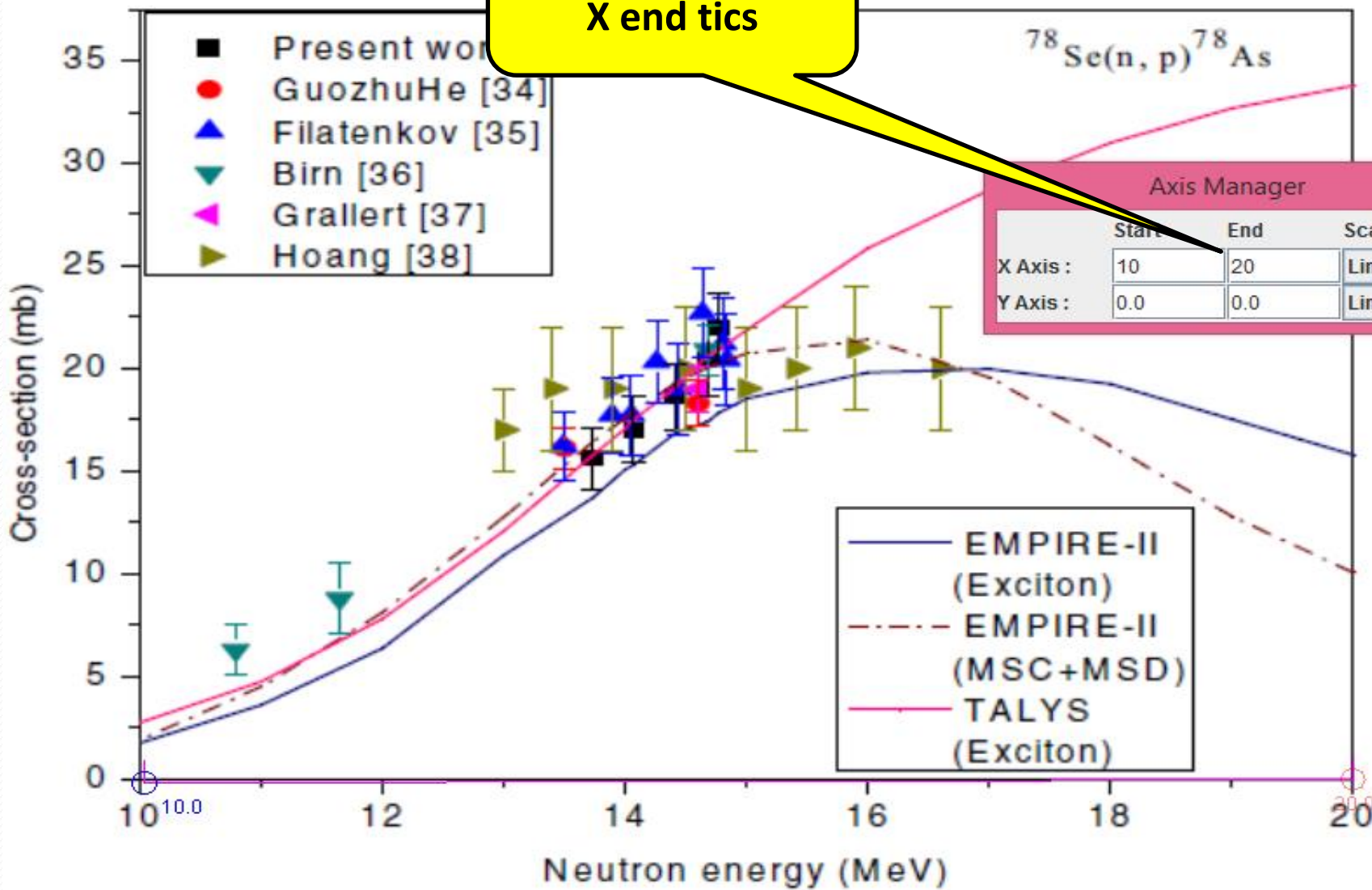
	Start	End	Scale
X Axis :	10	0.0	Linear
Y Axis :	0.0	0.0	Linear

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy

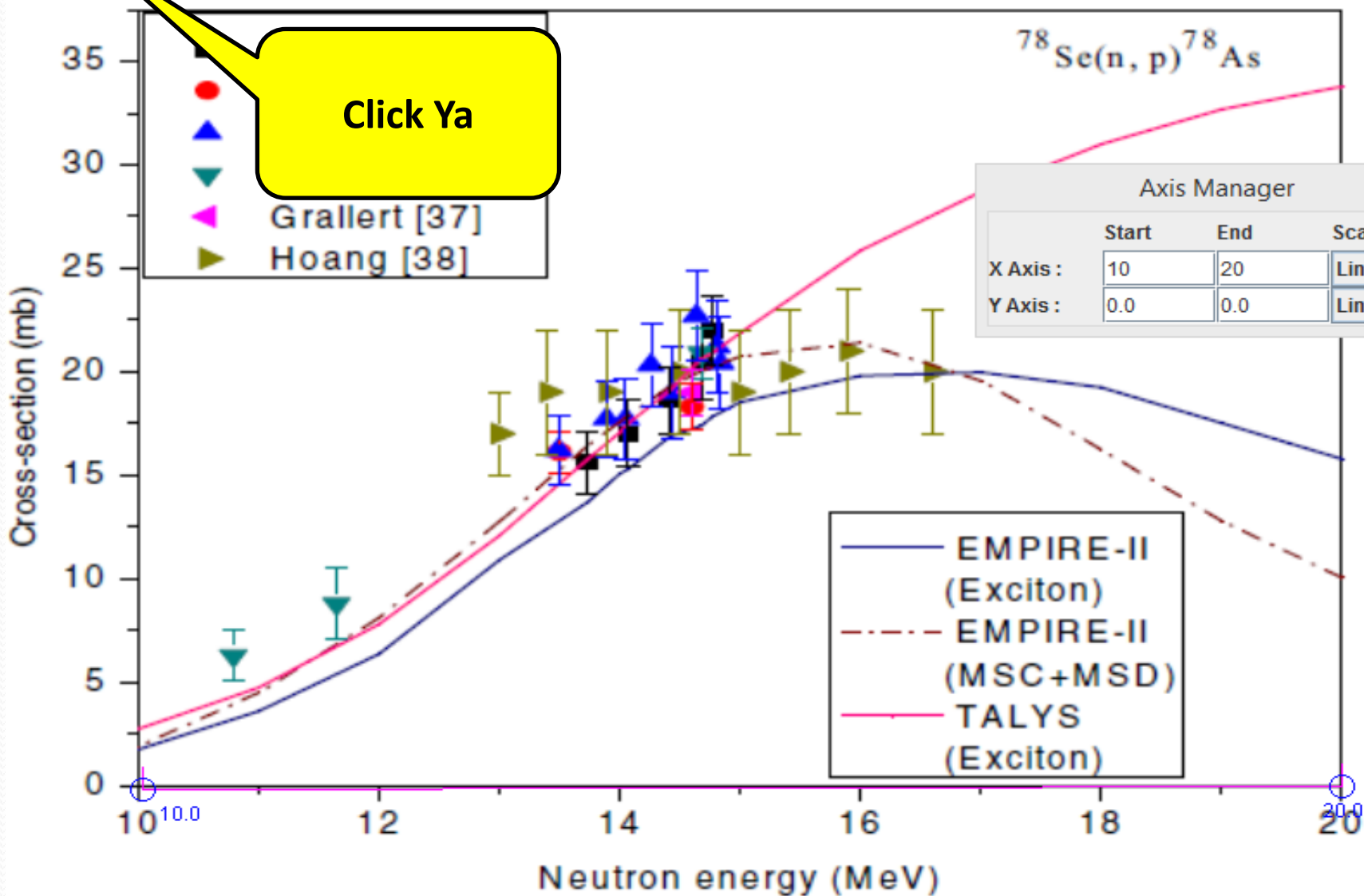
Magnify Shrink Loupe Reset Glass Shot!

Give the value for X end tics



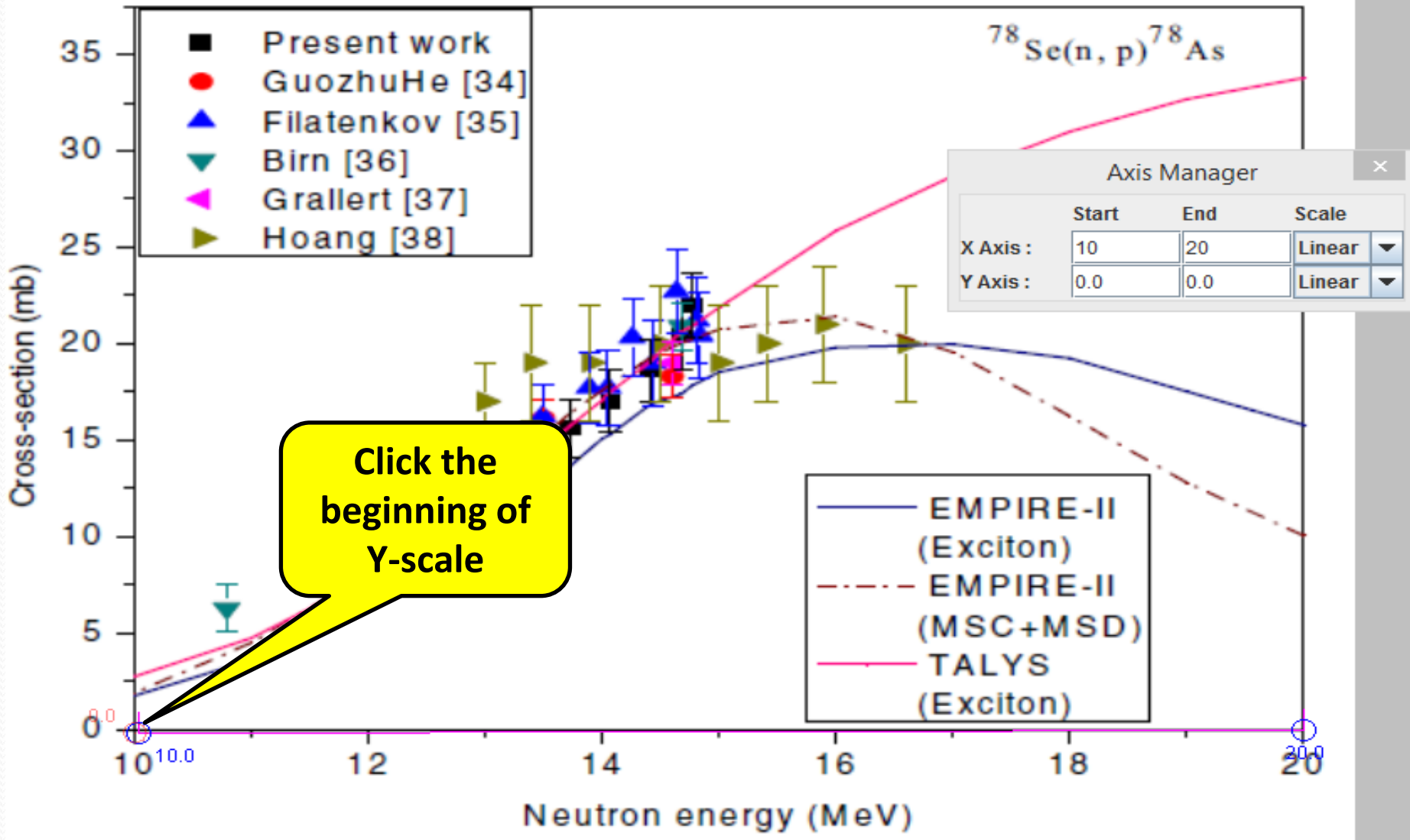
File Edit View

Xa **Ya** *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



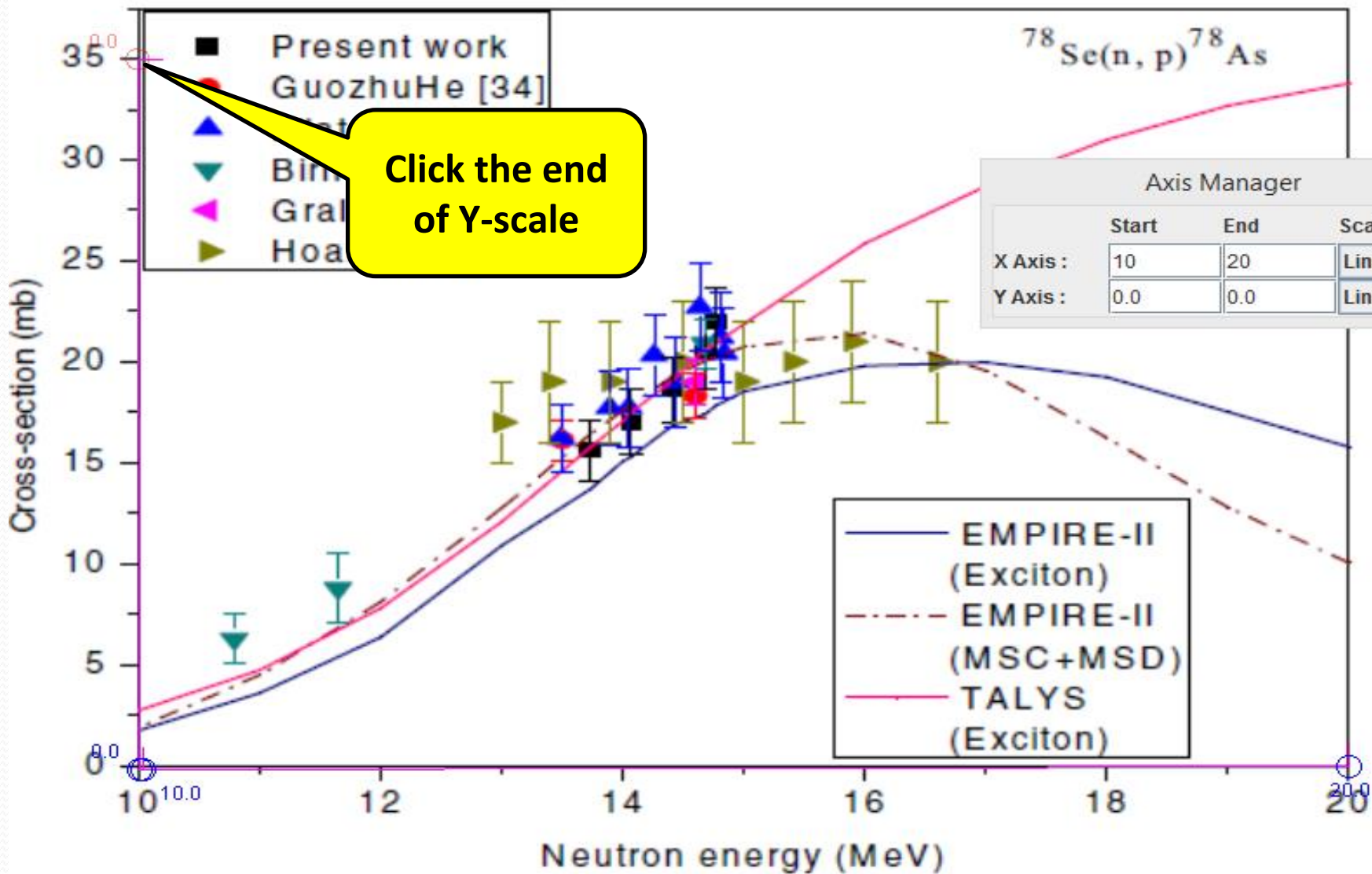
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



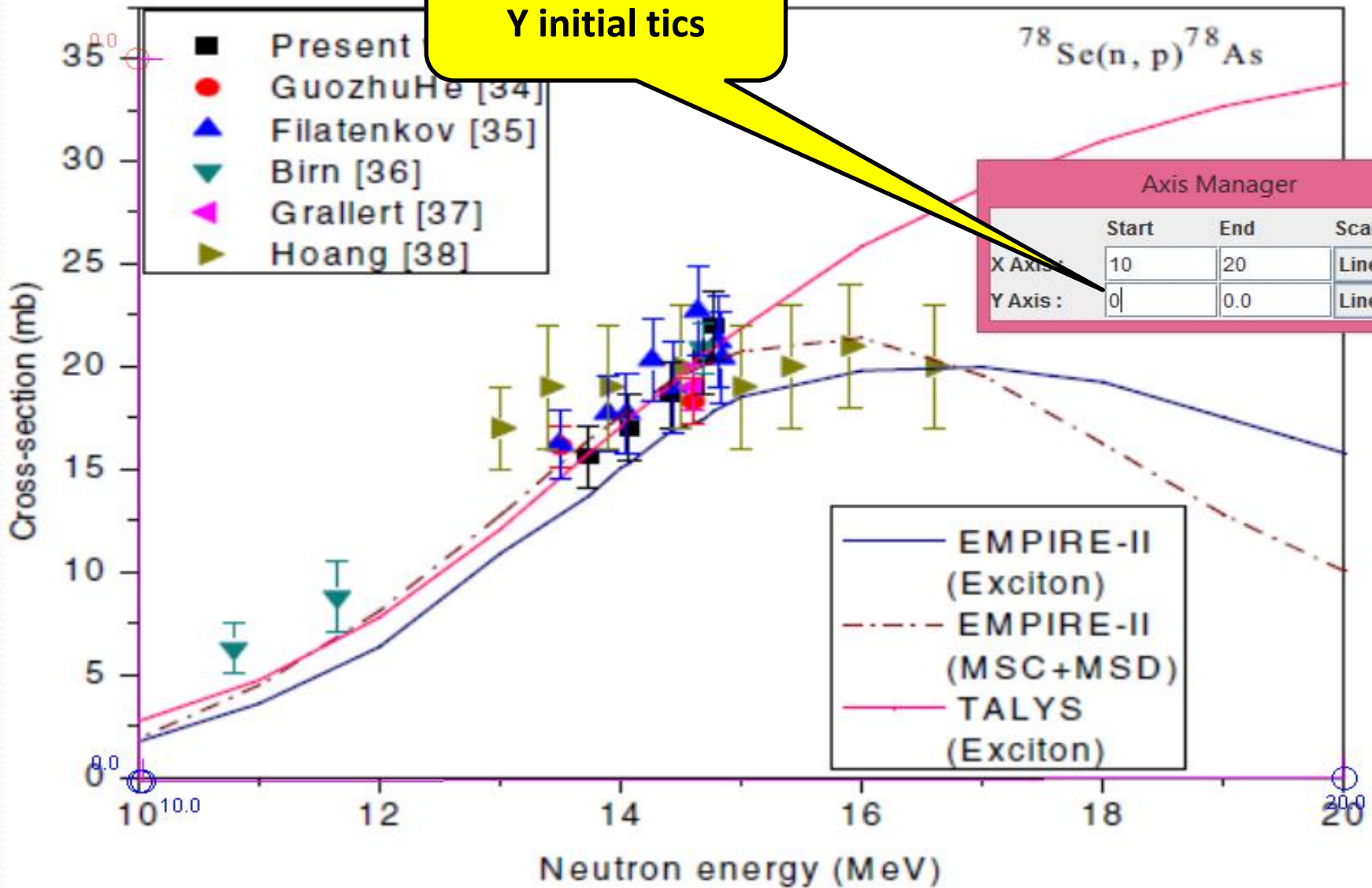
File Edit View

Xa Ya *Ya Auto Ad Rm X

asy)

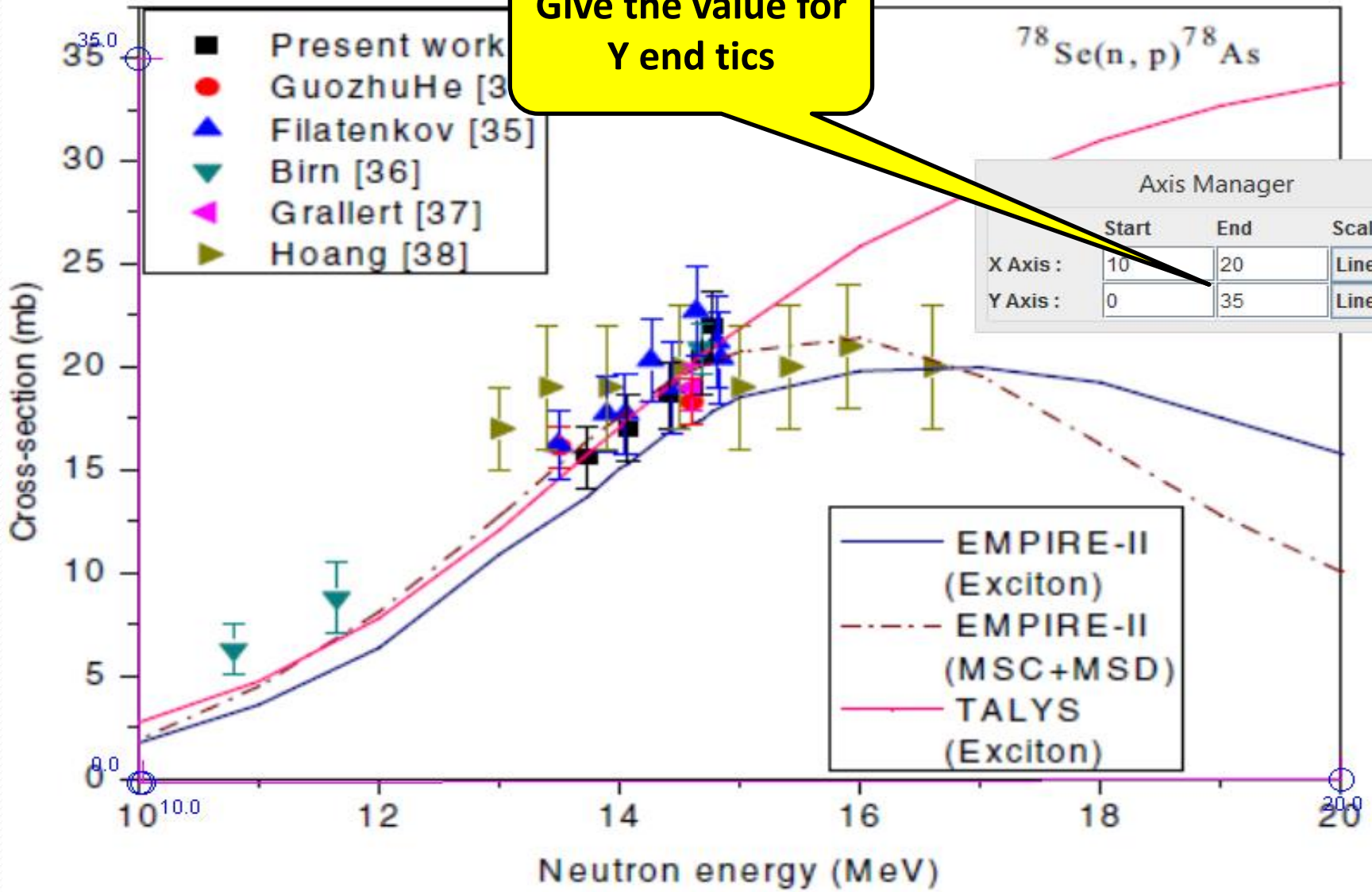
Magnify Shrink Loupe Reset Glass Shot!

Give the value for Y initial tics



File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(st) X err(st) X err(st) Magnify Shrink Loupe Reset Glass Shot!





2. Digitize Centre of Data Points

File Edit View

Xa Ya *Ya Auto

Ad

Click Ad

Y err(asy)

Magnify

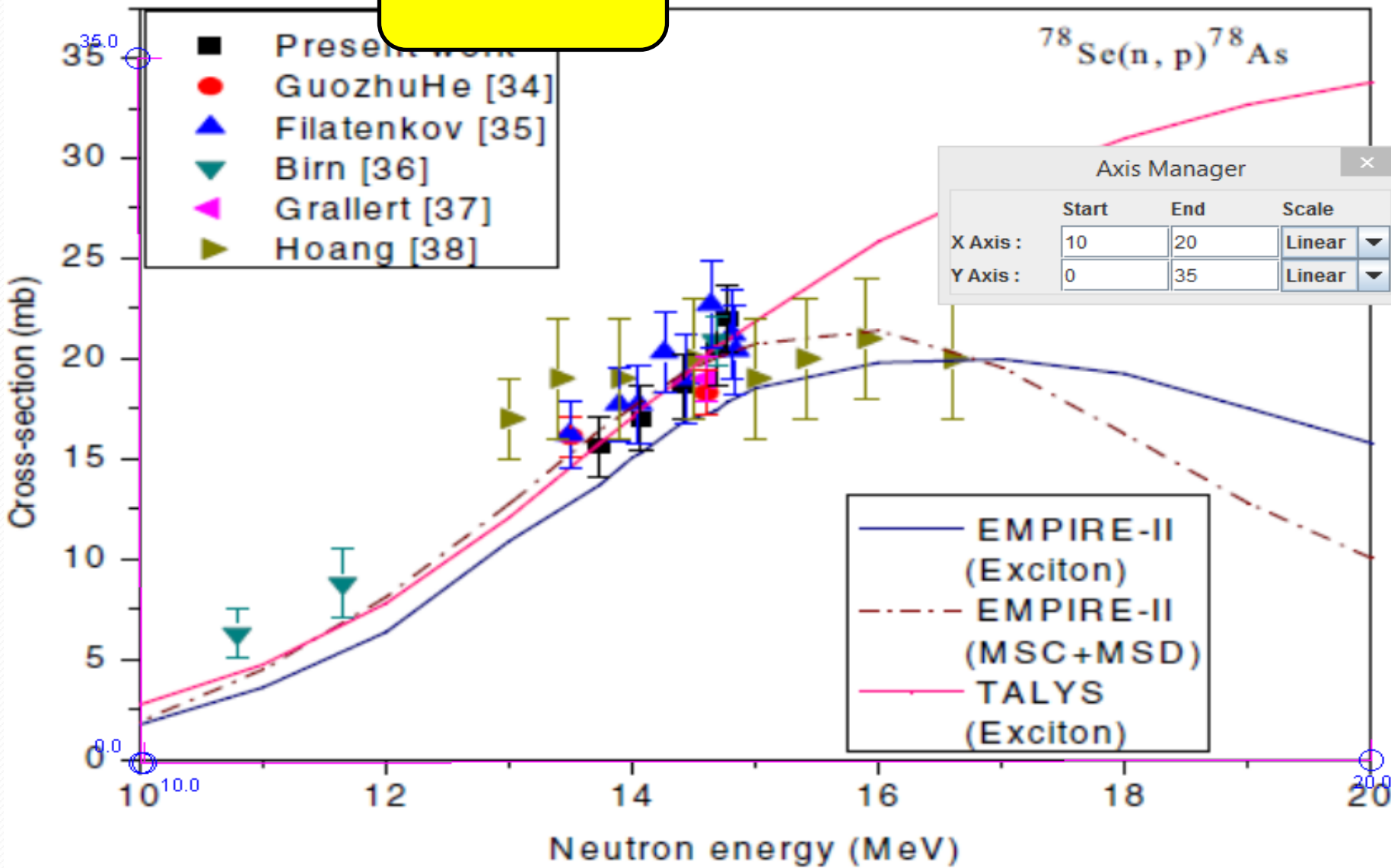
Shrink

Loupe

Reset

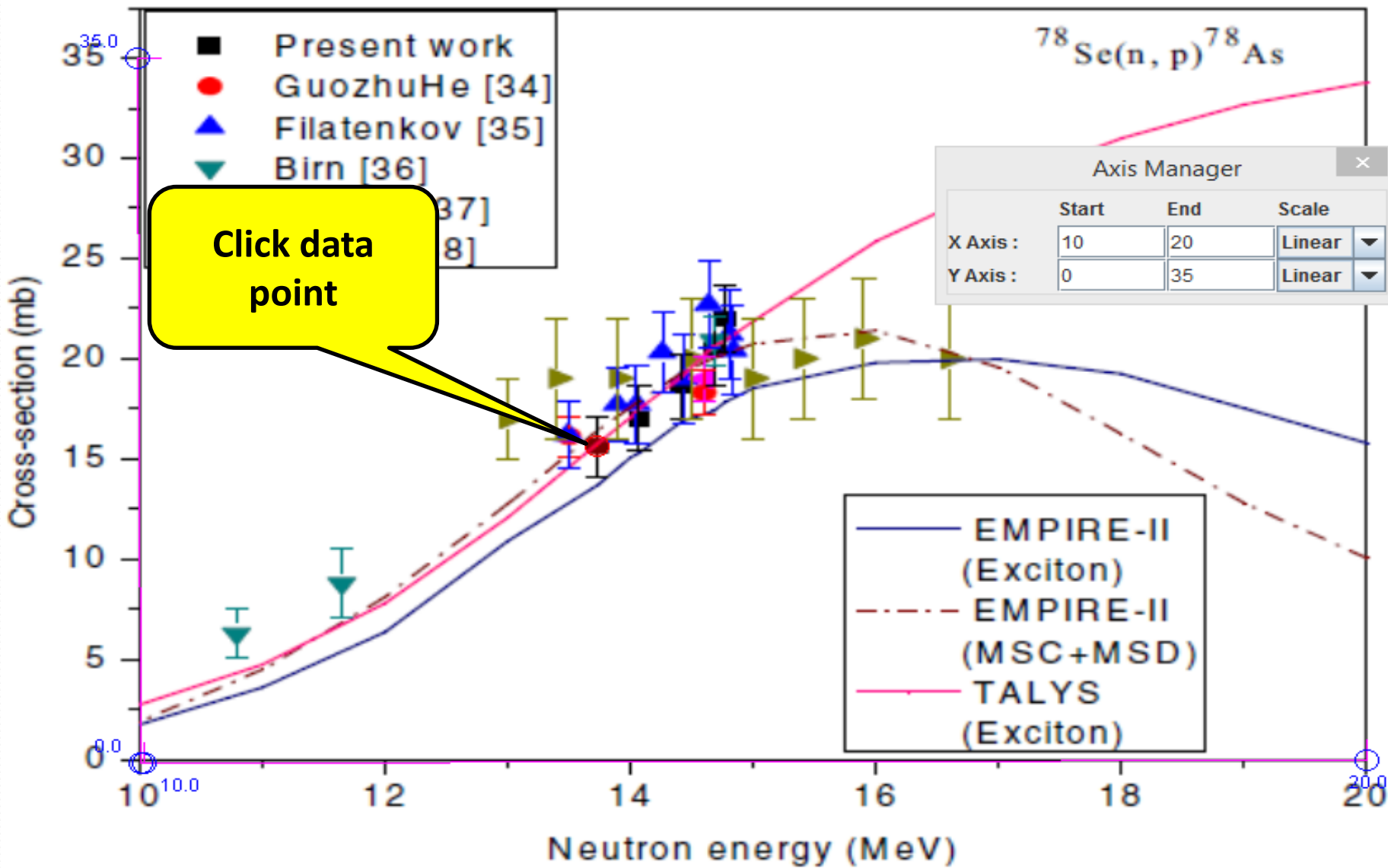
Glass

Shot!



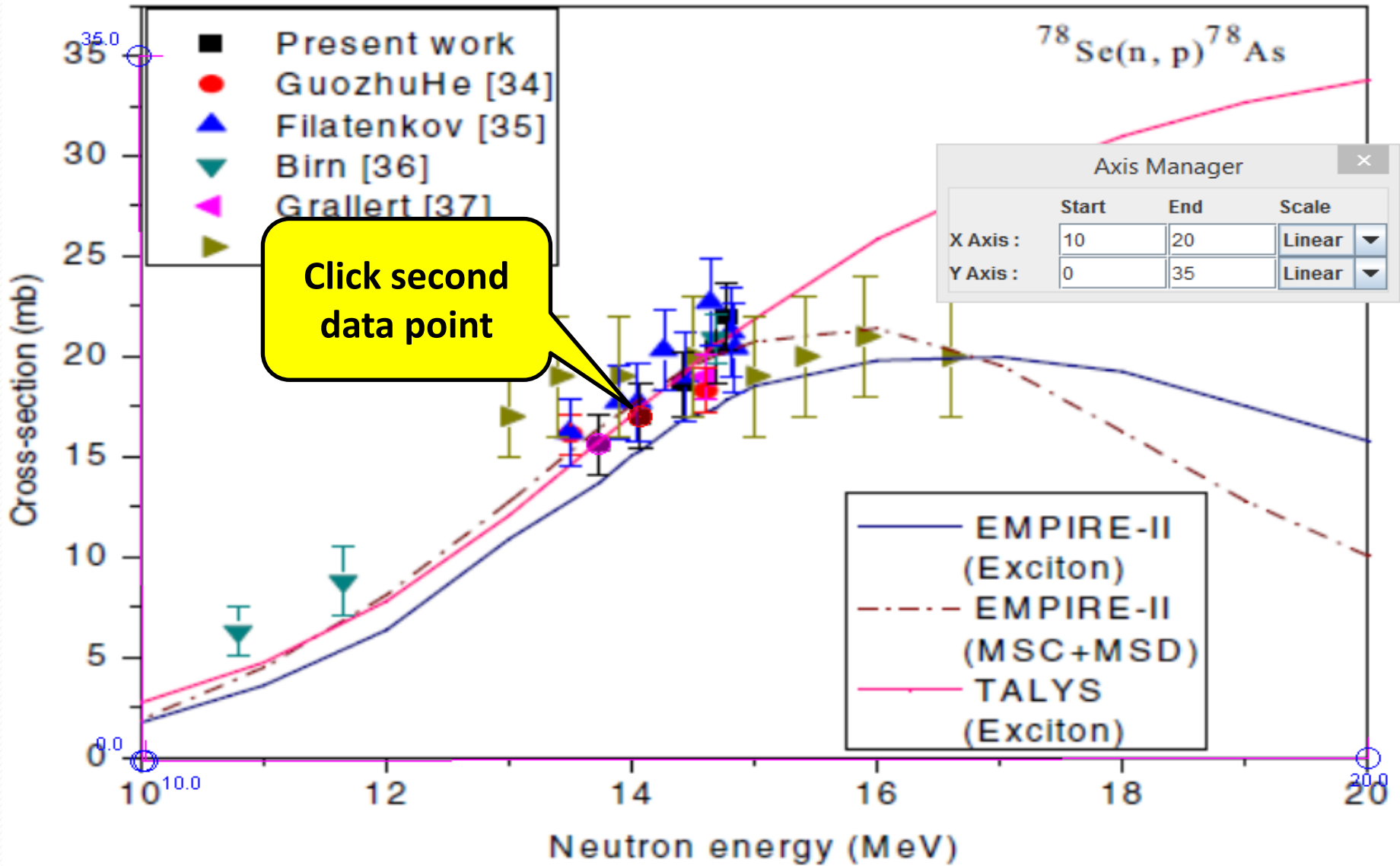
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



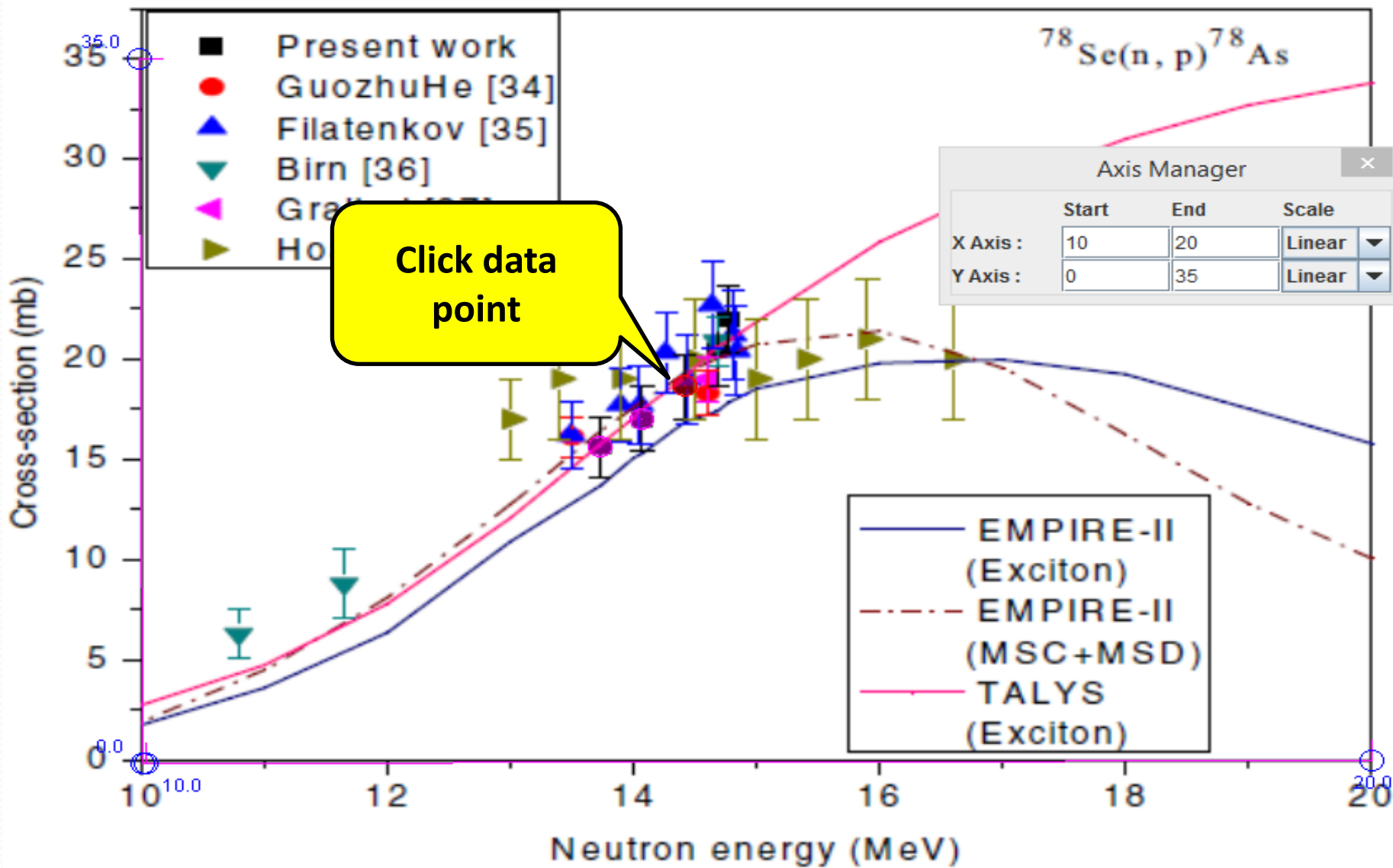
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya

Auto

Ad

Rm

X err(sy)

X err(asy)

Y err(sy)

Y err(asy)

Magnify

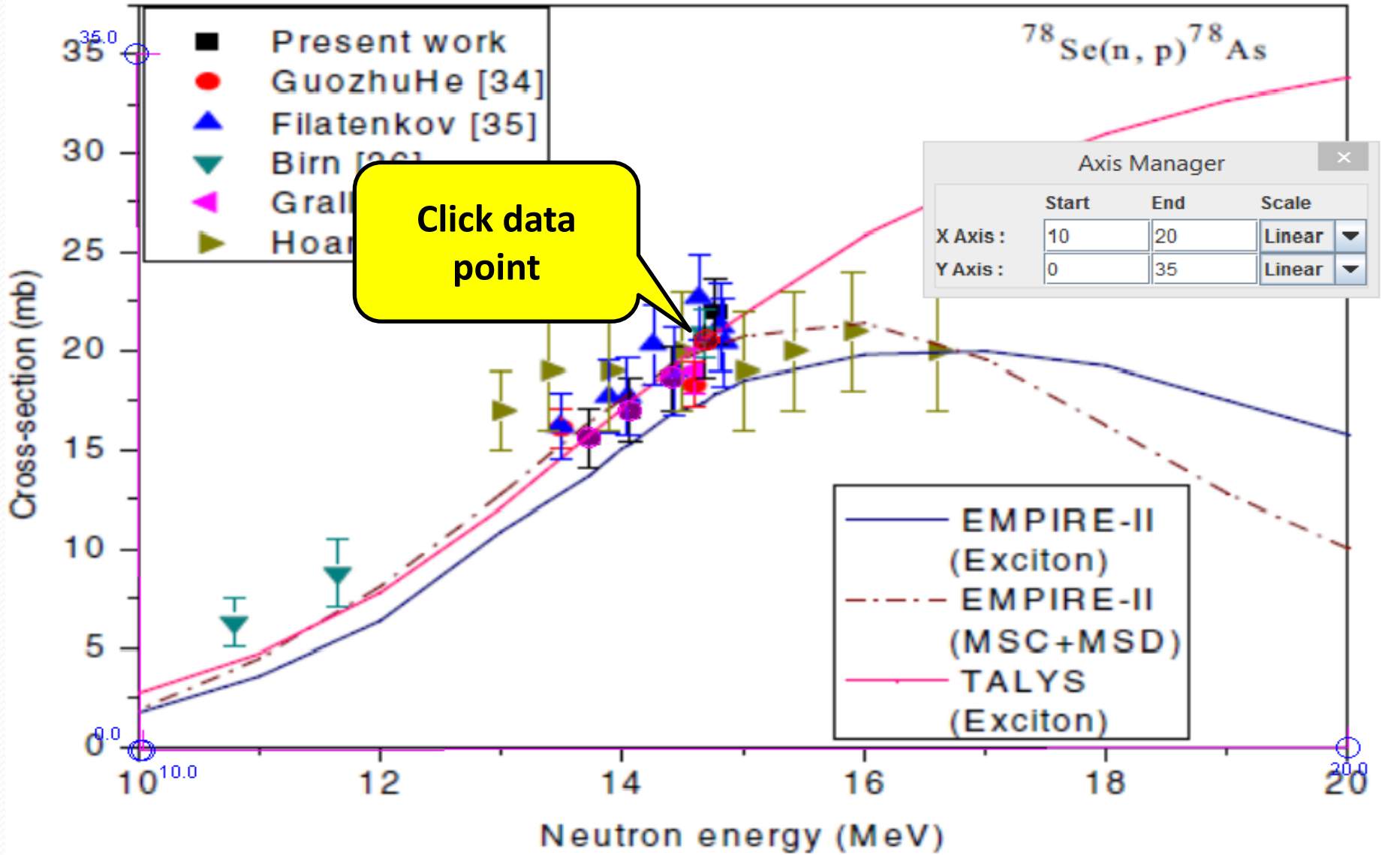
Shrink

Loupe

Reset

Glass

Shot!



File Edit View

Xa Ya *Ya

Auto

Ad

Rm

X err(sy)

X err(asy)

Y err(sy)

Y err(asy)

Magnify

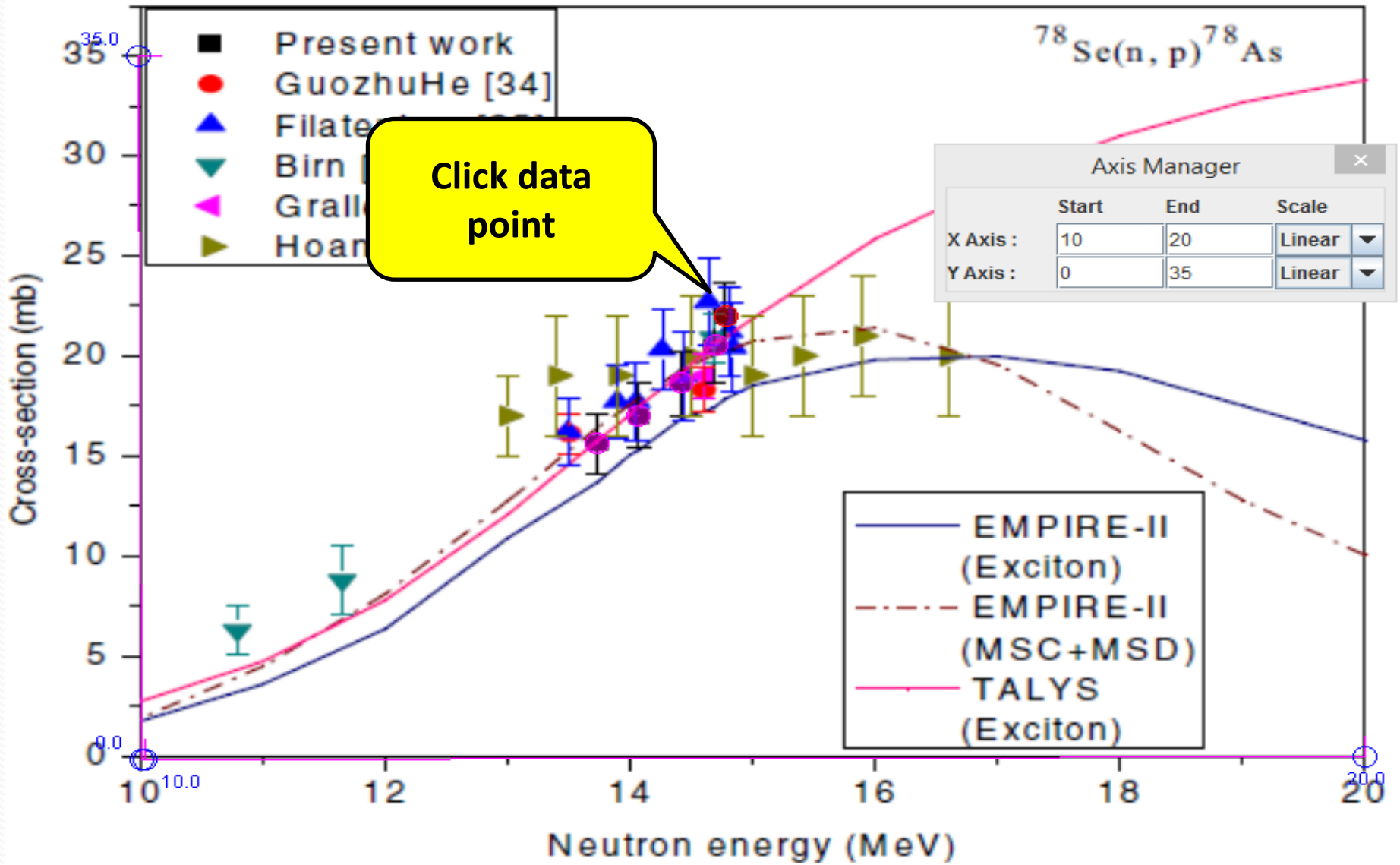
Shrink

Loupe

Reset

Glass

Shot!

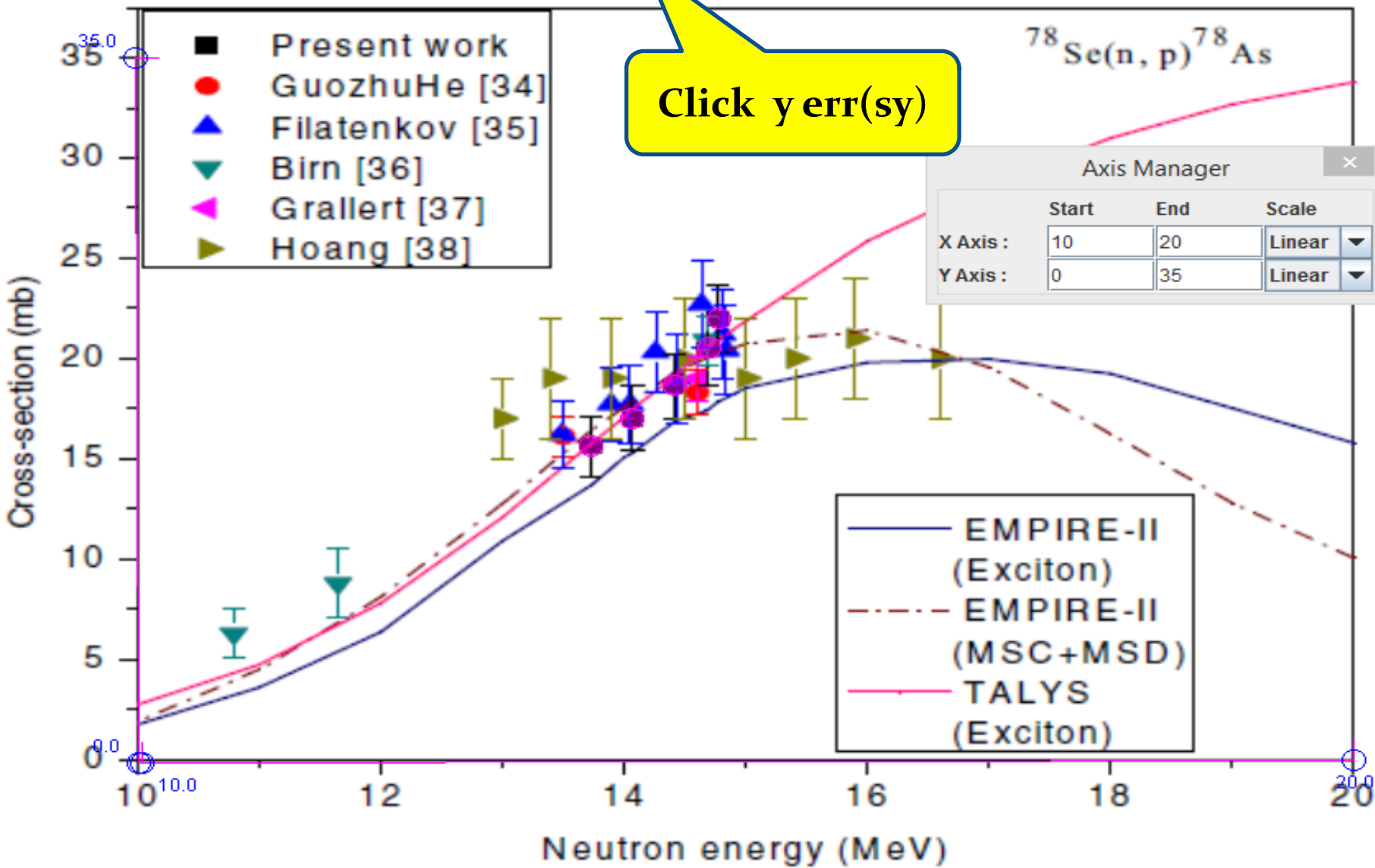




3. Digitize y -symmetric Error Bar

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya

Auto

Ad

Rm

X err(sy)

X err(asy)

Y err(sy)

Y err(asy)

Magnify

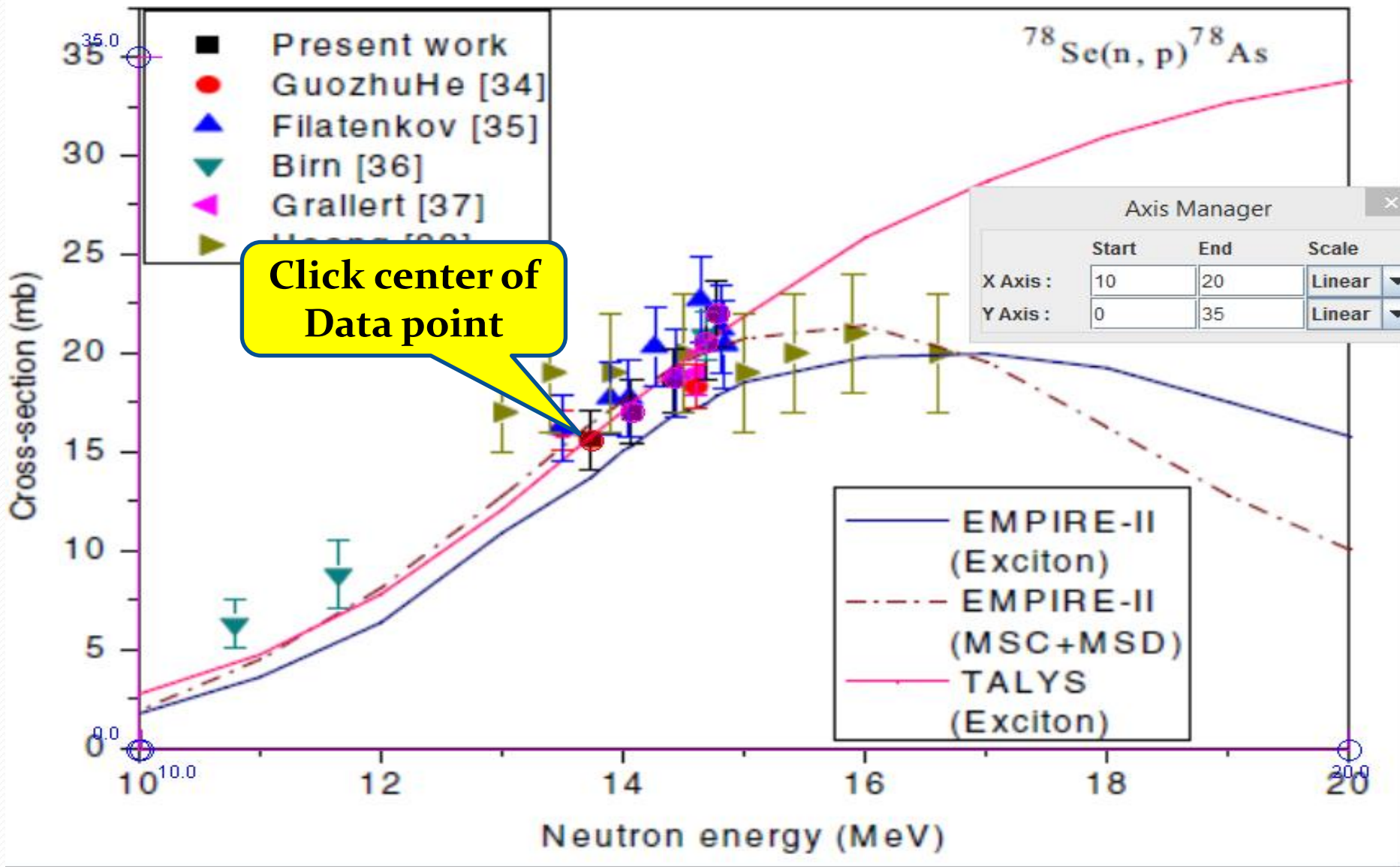
Shrink

Loupe

Reset

Glass

Shot!



File Edit View

Xa Ya *Ya

Auto

Ad

Rm

X err(sy) X err(asy)

Y err(sy)

Y err(asy)

Magnify

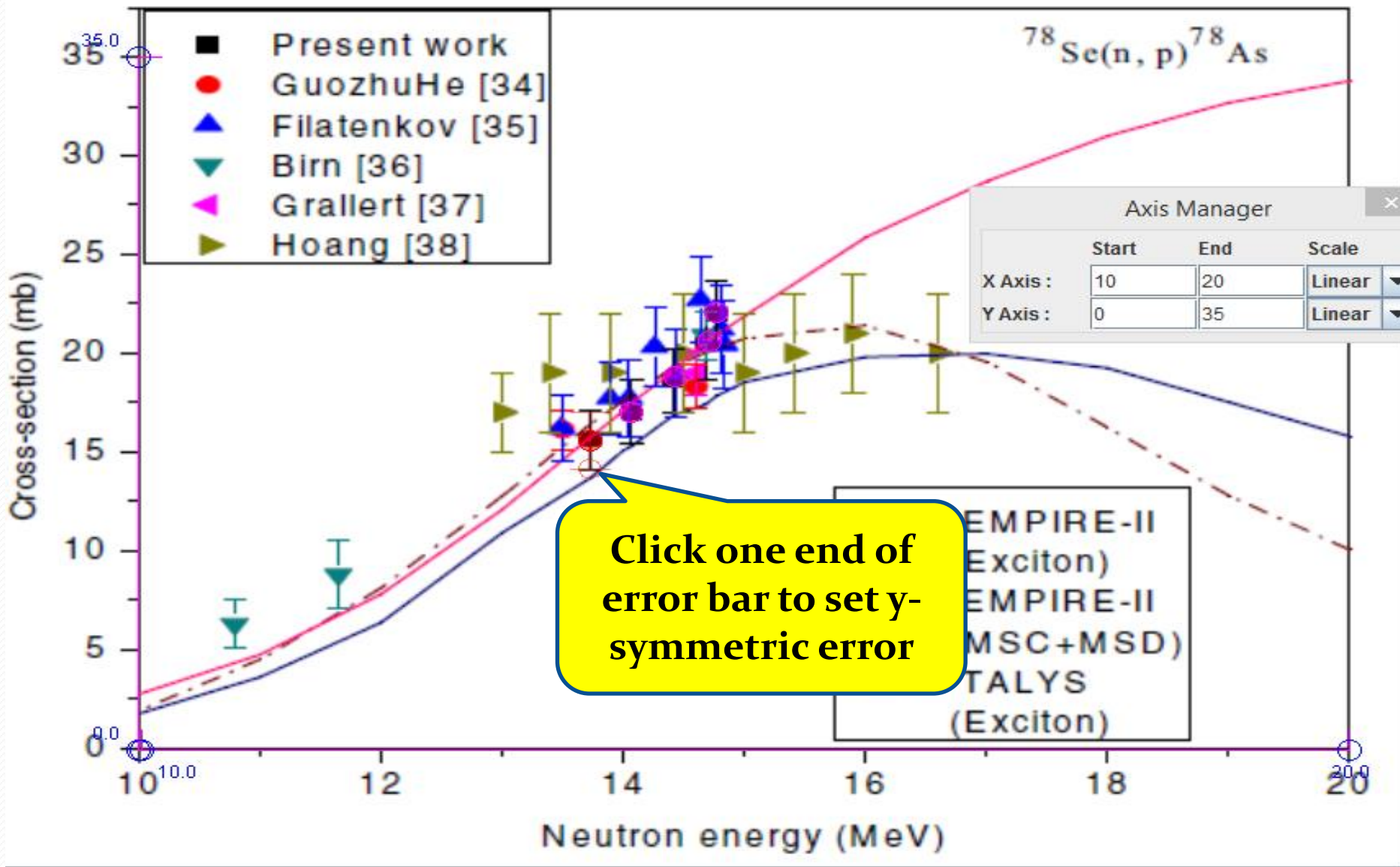
Shrink

Loupe

Reset

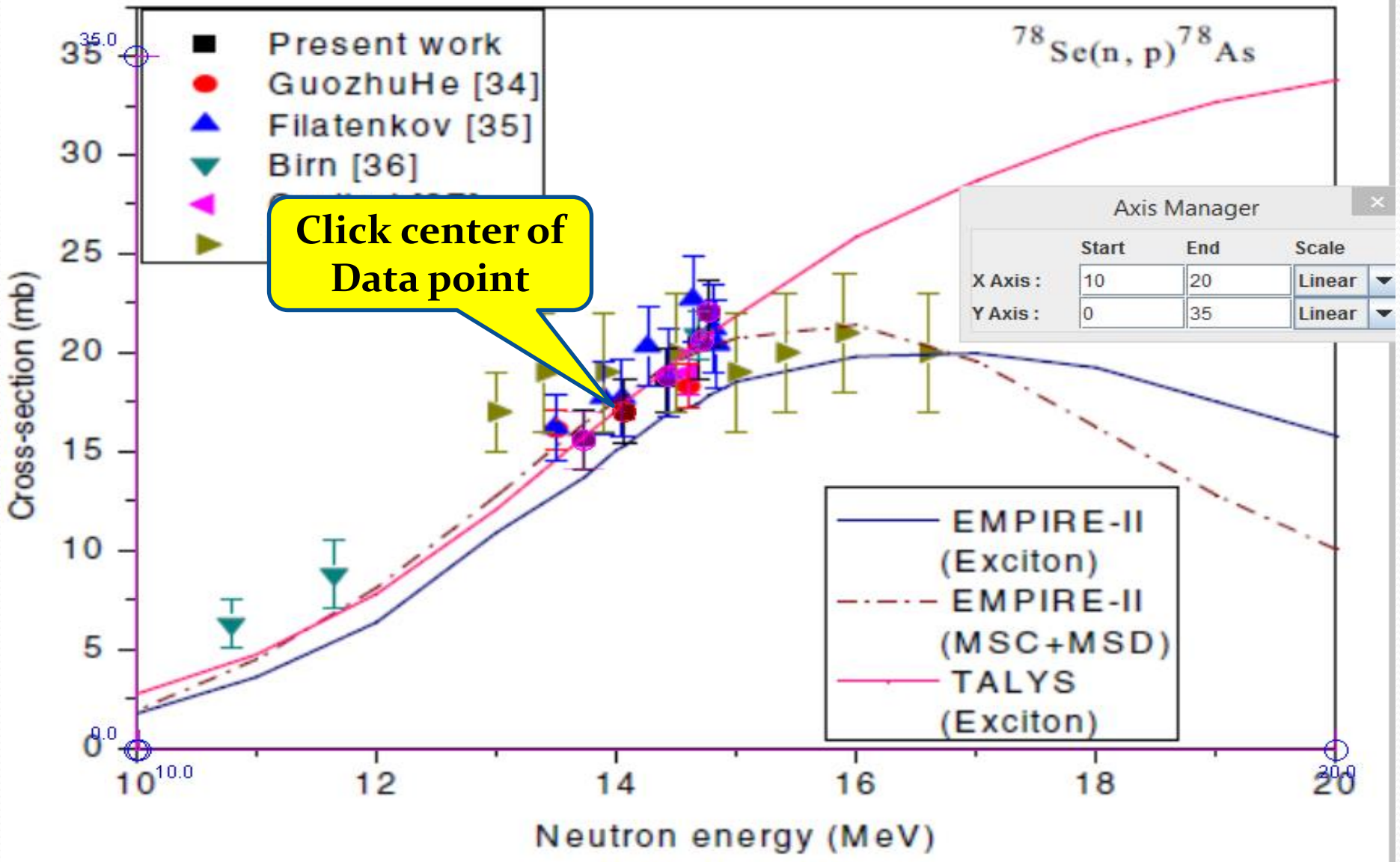
Glass

Shot!



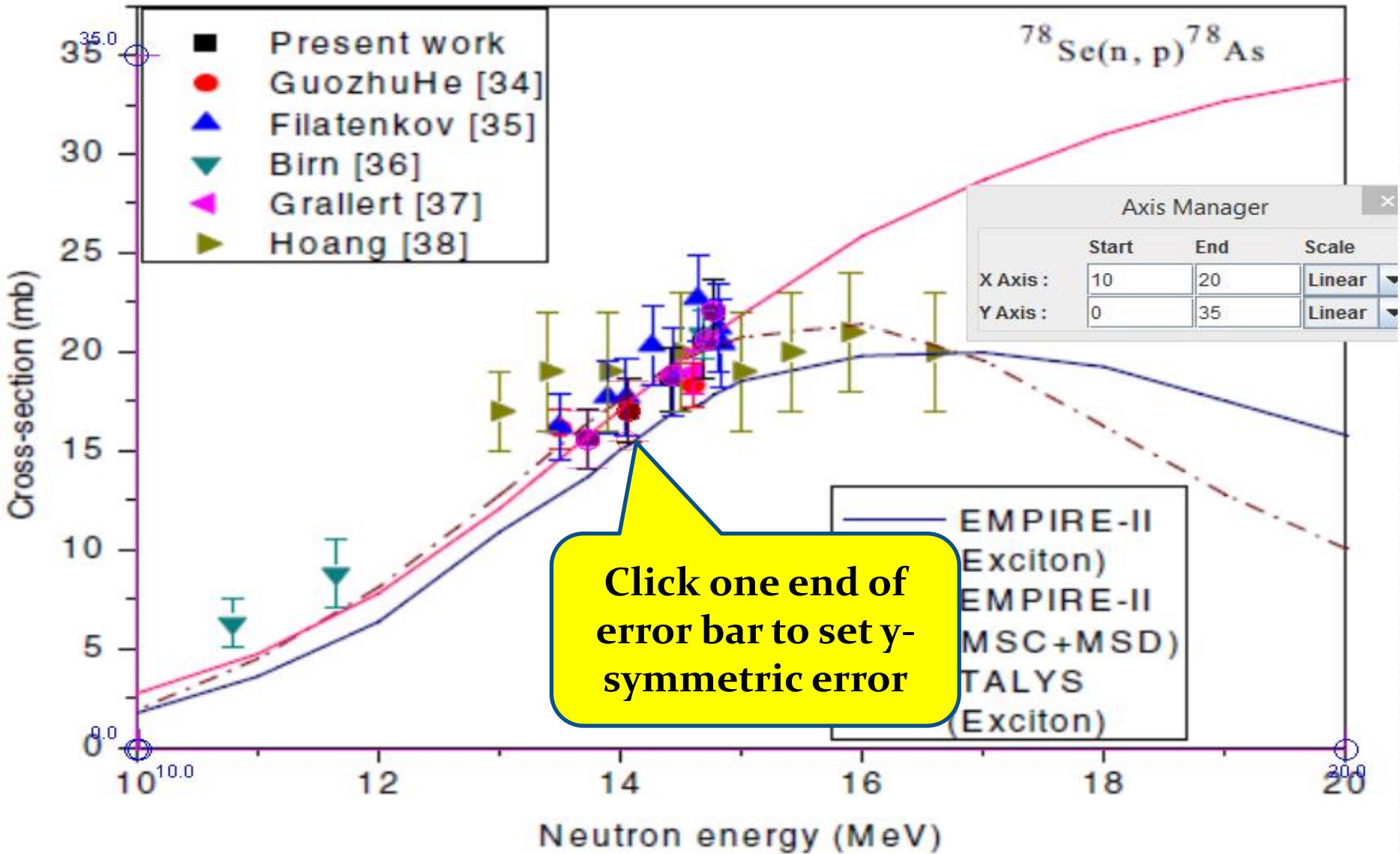
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



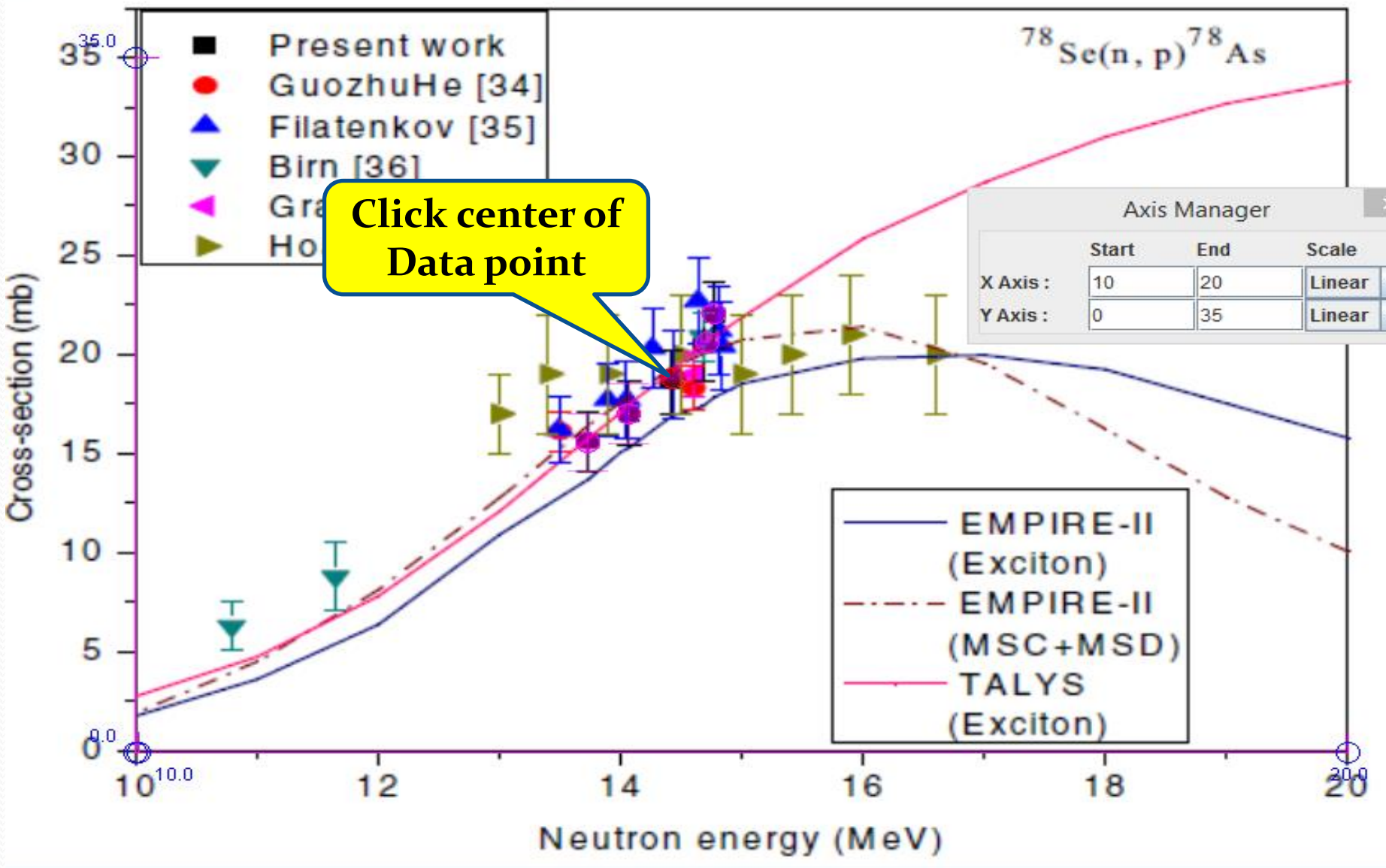
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya Auto

Y err(asy)

Magnify

Shrink

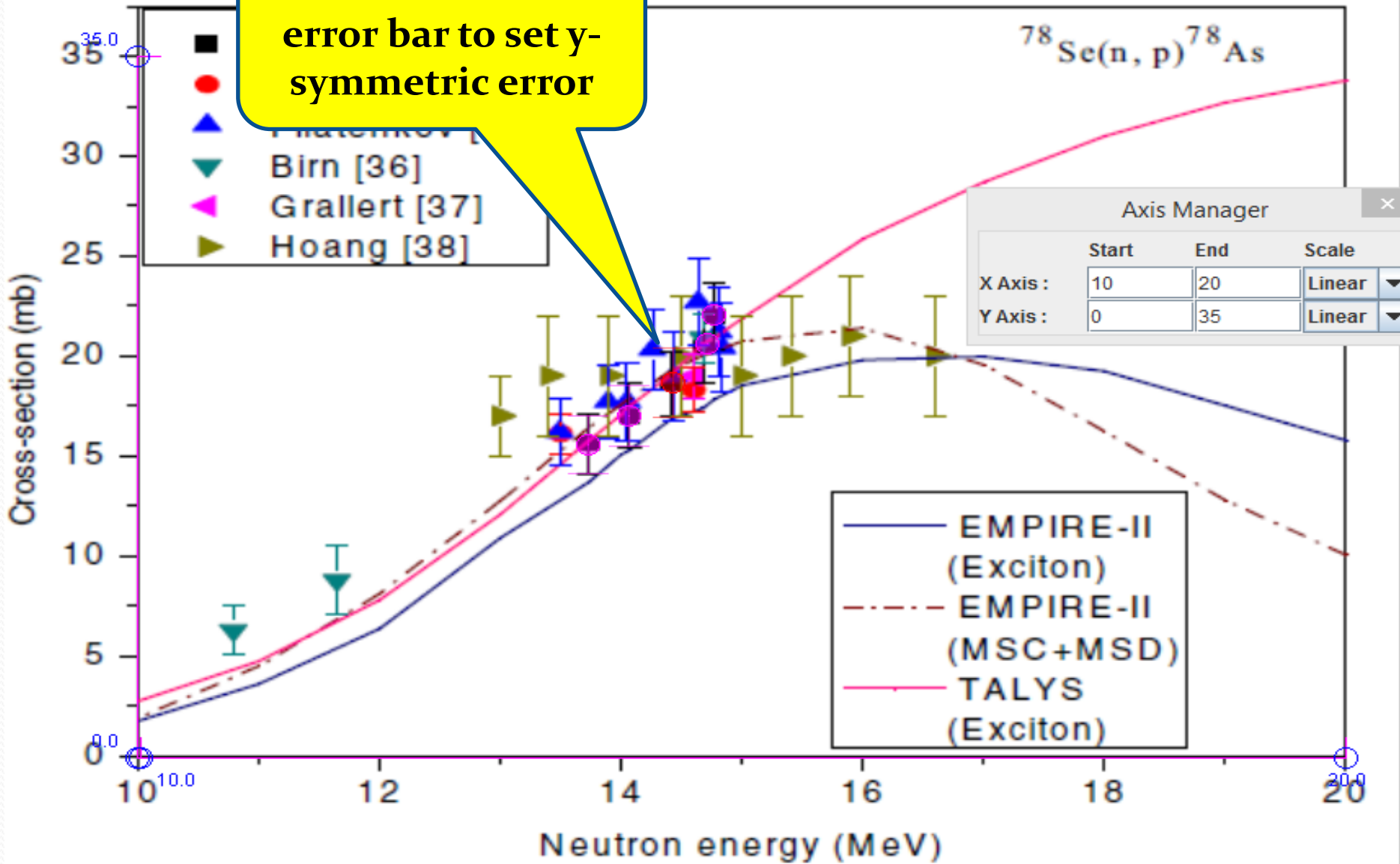
Loupe

Reset

Glass

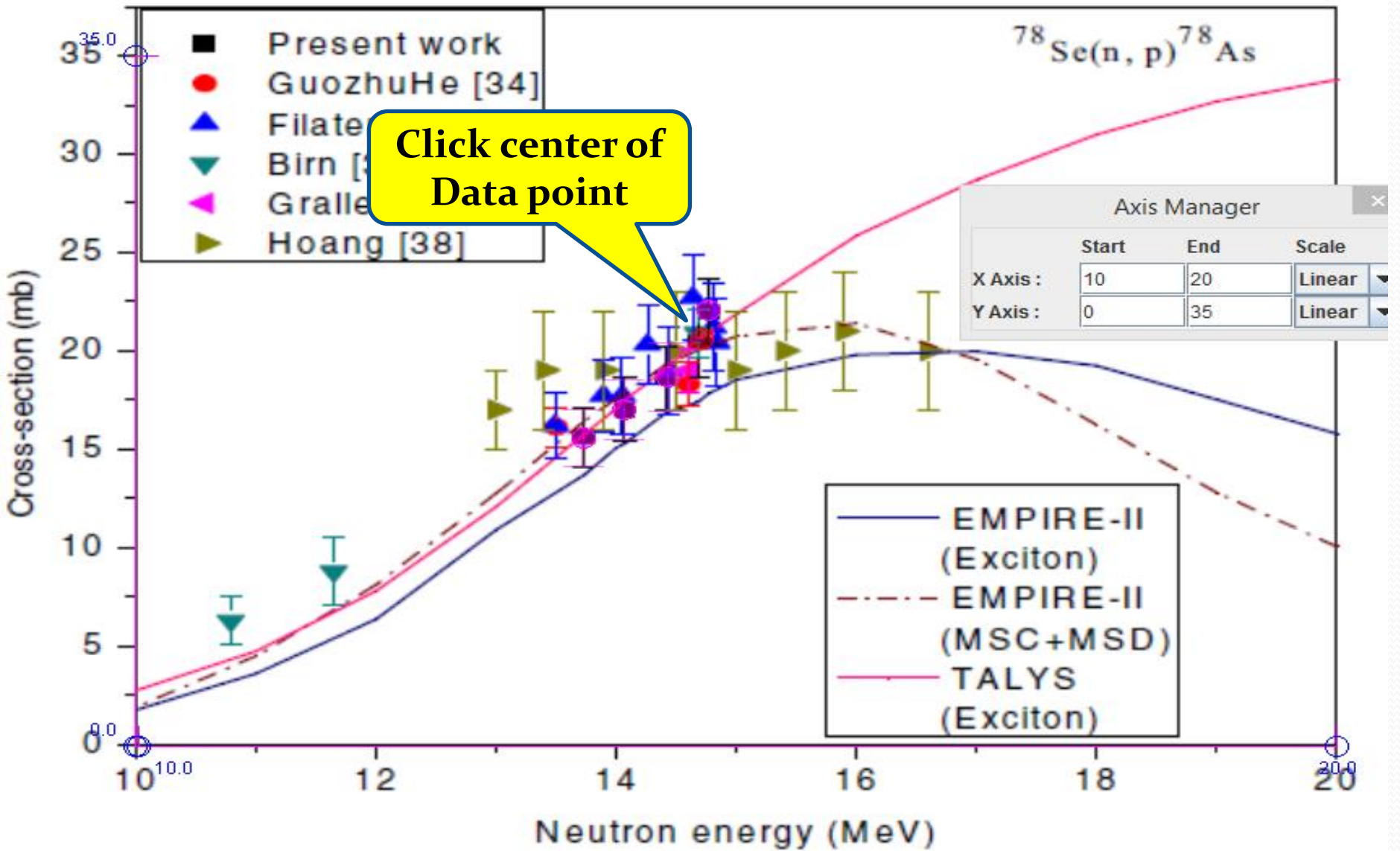
Shot!

Click one end of error bar to set y-symmetric error



File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya Auto

err(asy)

Magnify

Shrink

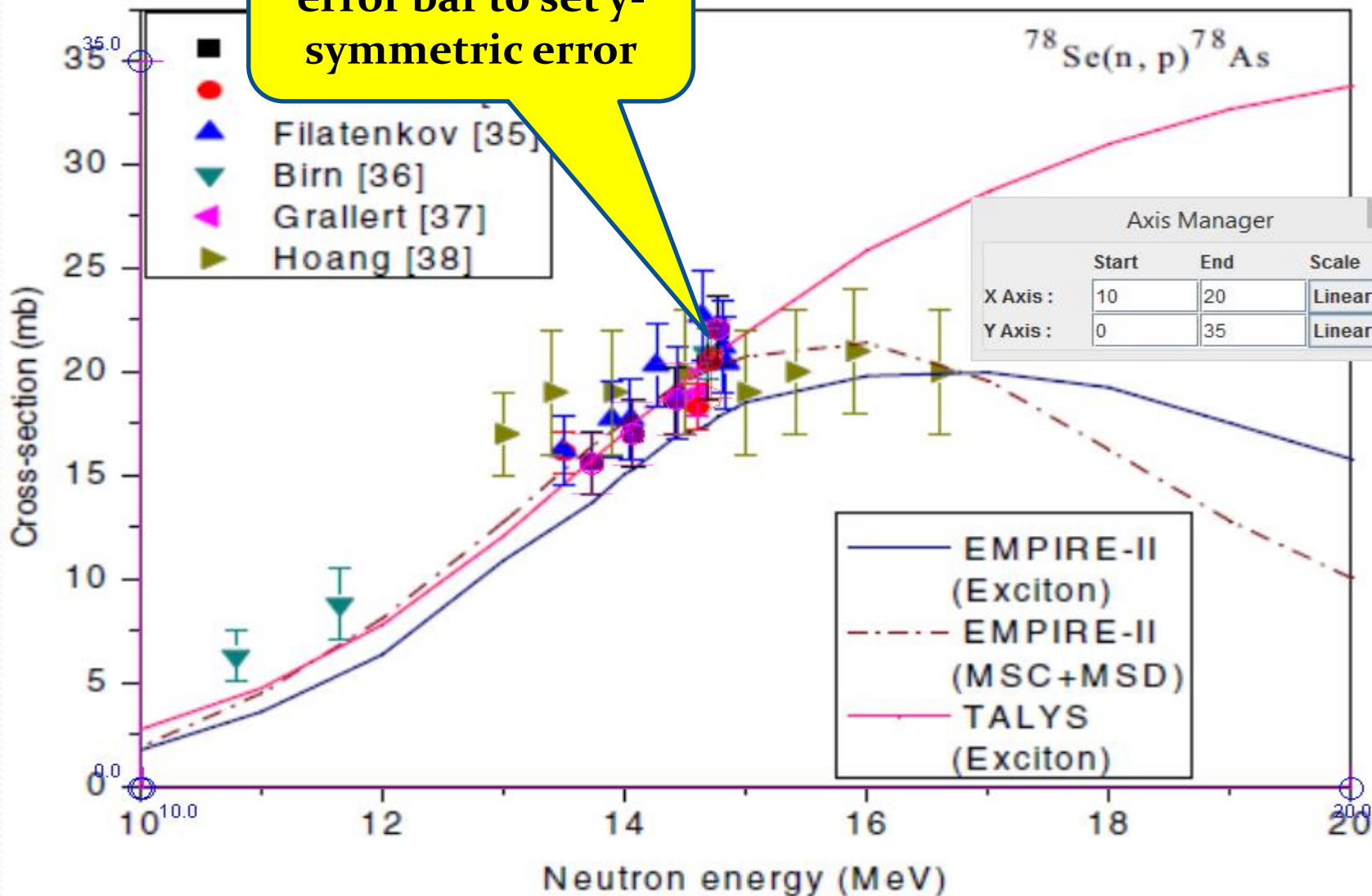
Loupe

Reset

Glass

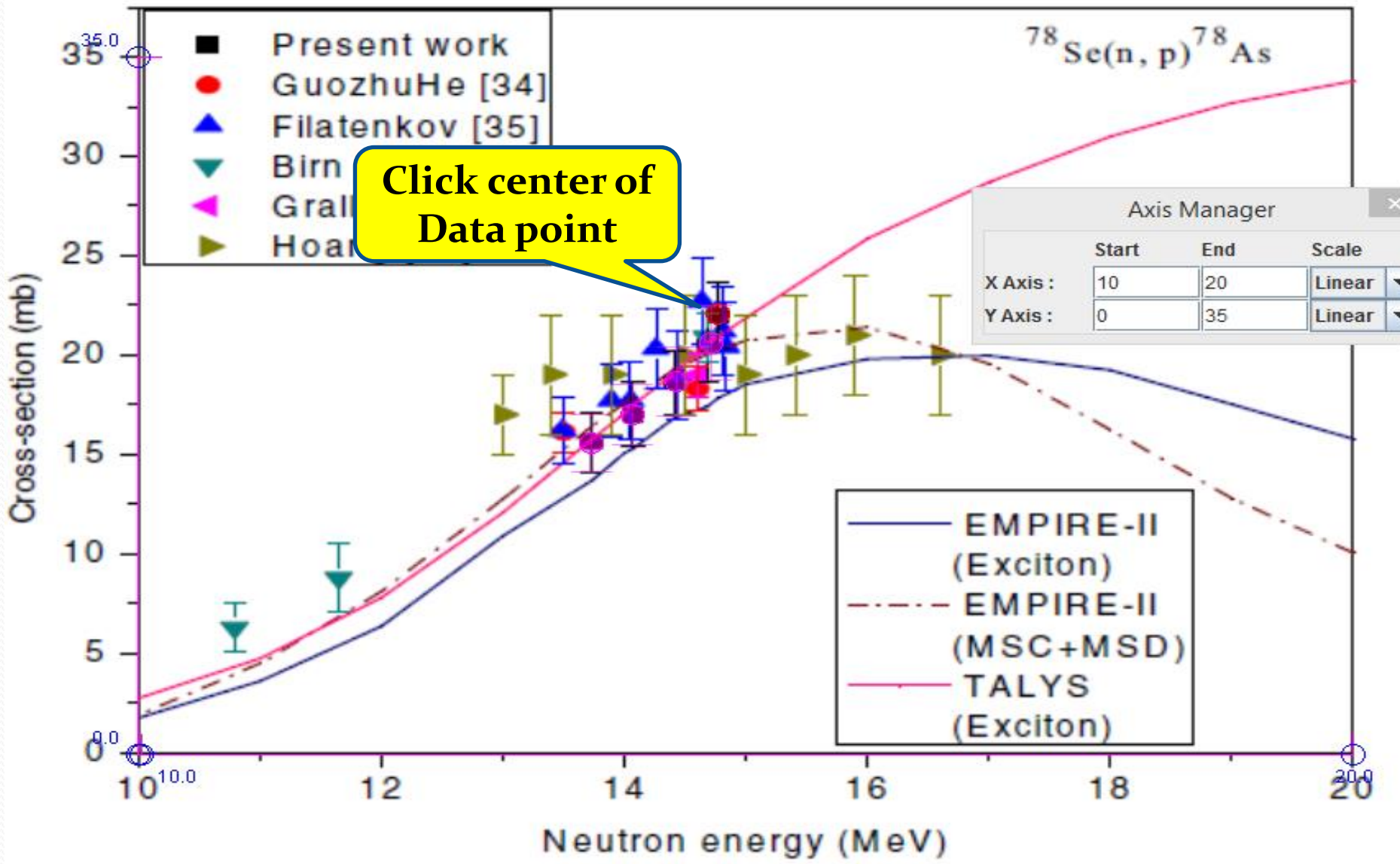
Shot!

Click one end of error bar to set y-symmetric error

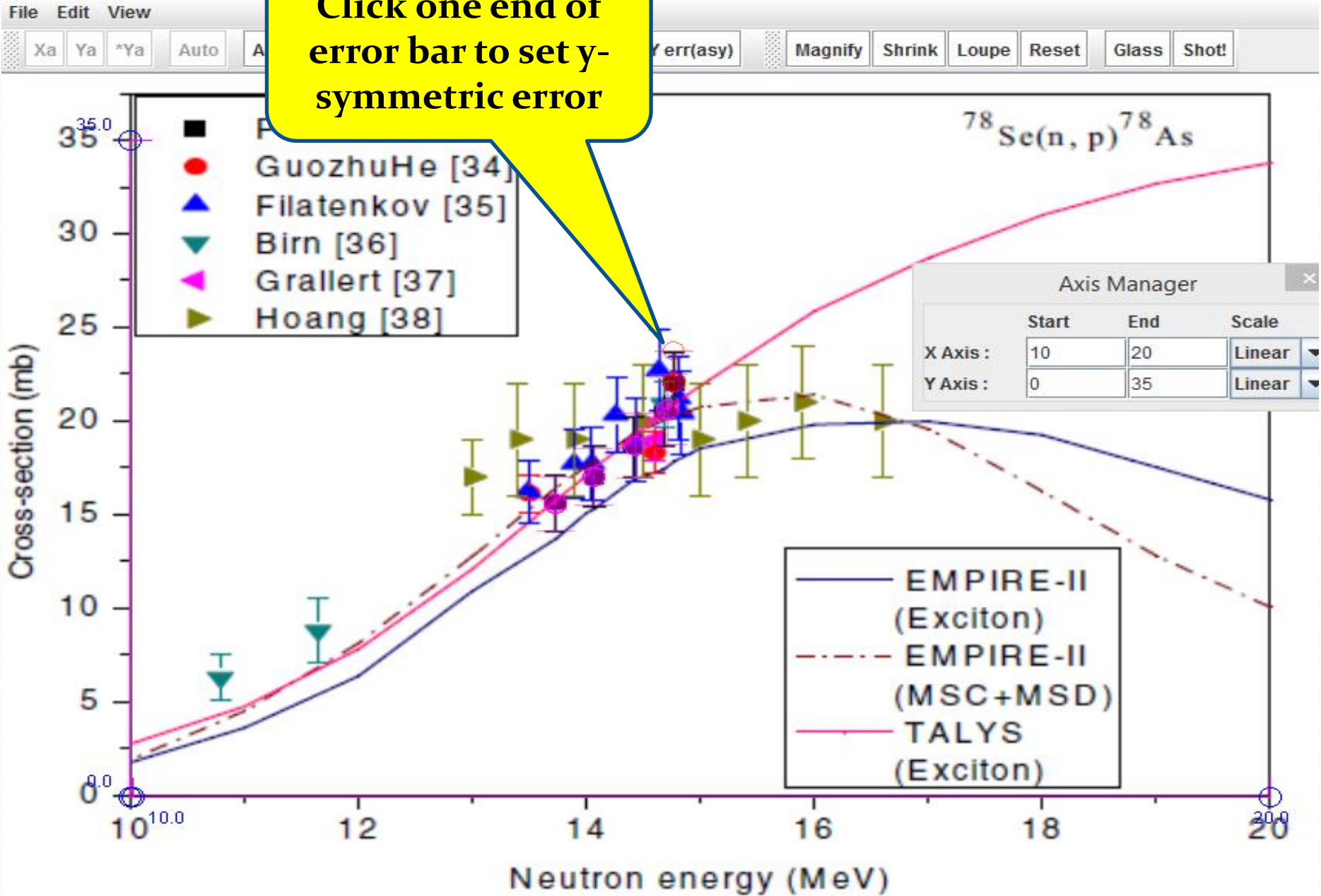


File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Click one end of error bar to set y-symmetric error





4. Output Numerical Data

File Edit View

Open Image File Ctrl-O

Input Numerical Data Ctrl-I

Output Numerical Data Ctrl-O

Exit Ctrl-Q

Rm

X err(sy)

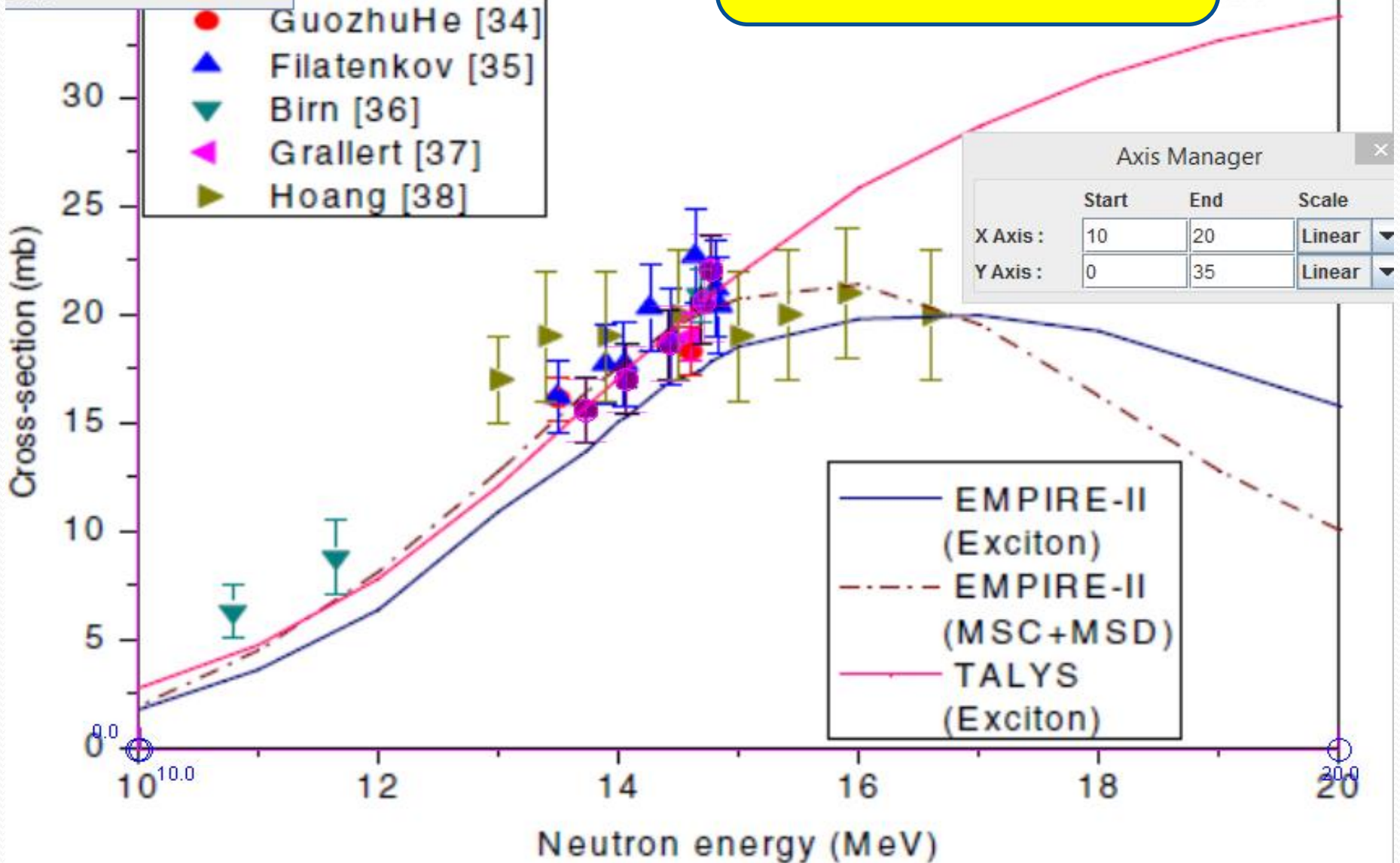
X err(asy)

Y err(sy)

Y err(asy)

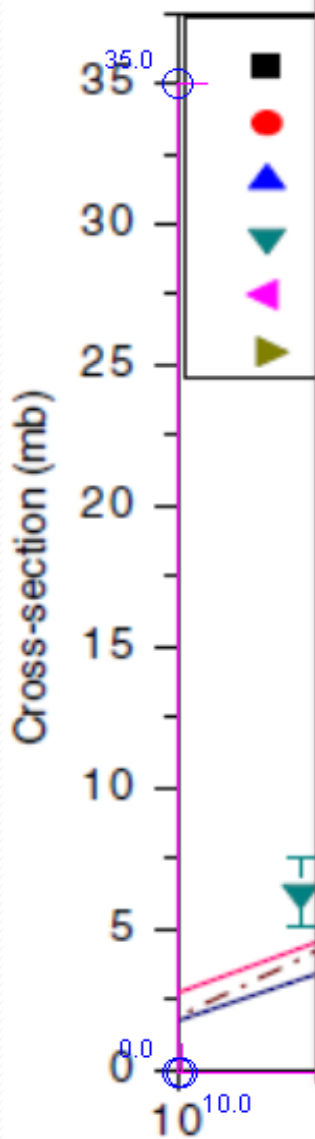
Shot!

Click File and select
Output Numerical data



File Edit View

Xa Ya *Ya Auto



Output Data [Close]

Write Save Sort X Sort Y No Sort Close

x(start)= 10.0 , x(end)= 20.0 , Scale: Linear , Point: Fixed , Digit: 3 decimal

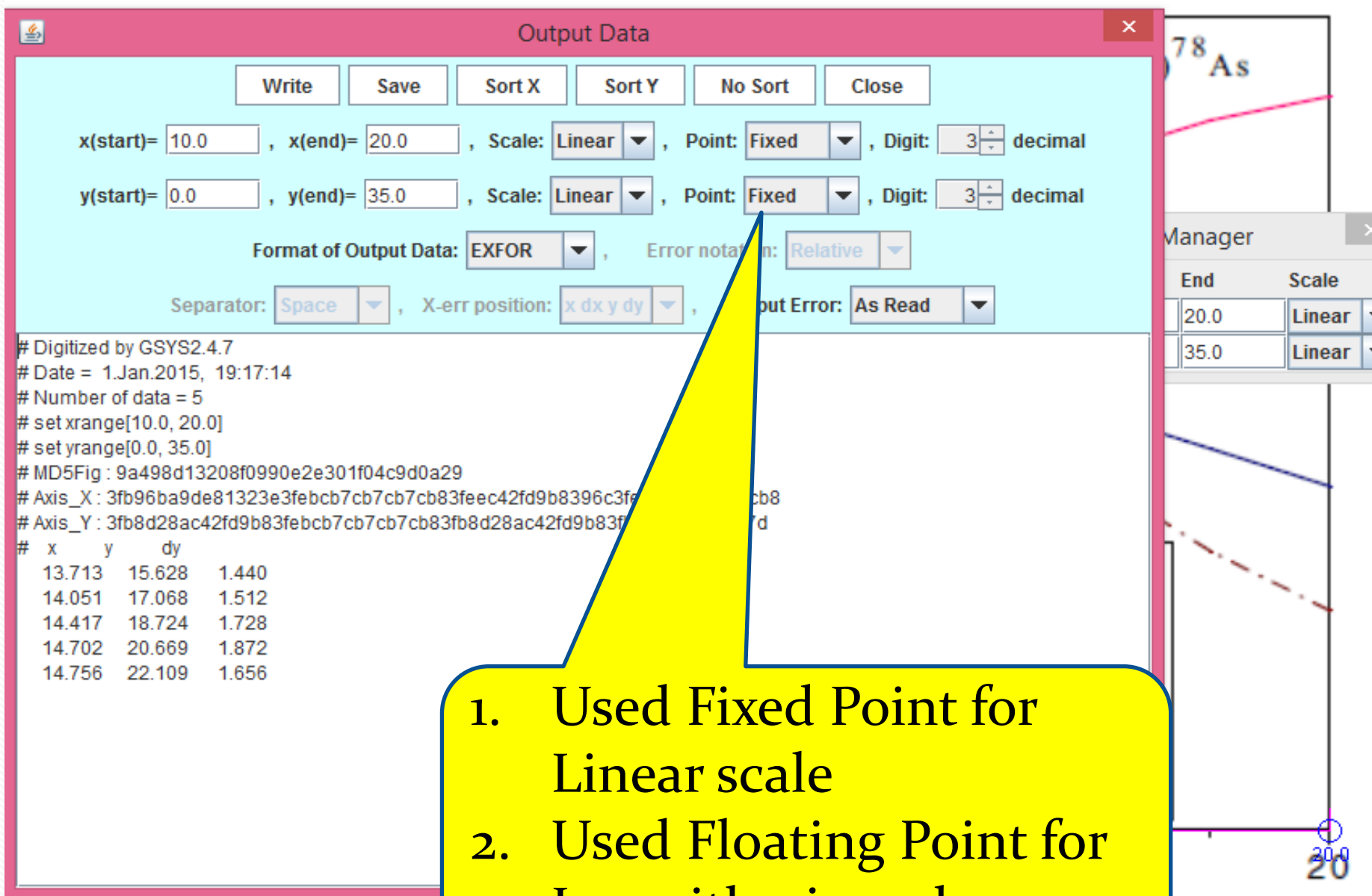
y(start)= 0.0 , y(end)= 35.0 , Scale: Linear , Point: Fixed , Digit: 3 decimal

Format of Output Data: EXFOR , Error notation: Relative

Separate space , X-err position: x dx y dy , Output Error: As Read

Click Write

Neutron energy (MeV)



1. Used Fixed Point for Linear scale
2. Used Floating Point for Logarithmic scale

File Edit View

Ya Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!

Click Save

Output Data

Write Save Sort X Sort Y No Sort Close

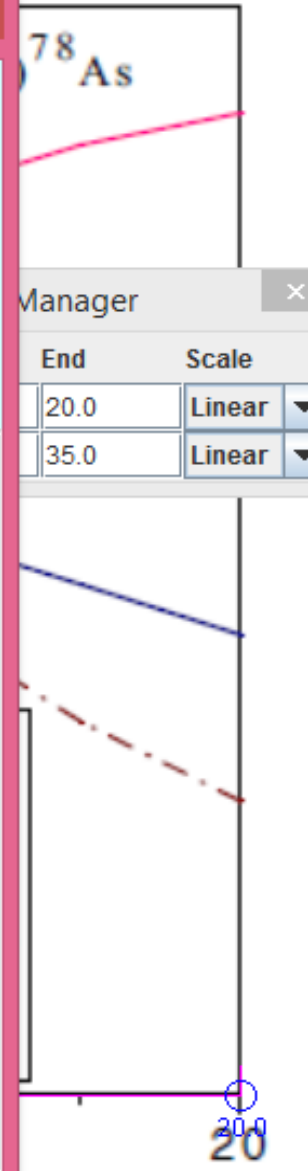
x(start)= 10.0 , x(end)= 20.0 , Scale: Linear , Point: Fixed , Digit: 3 decimal

y(start)= 0.0 , y(end)= 35.0 , Scale: Linear , Point: Fixed , Digit: 3 decimal

Format of Output Data: EXFOR , Error notation: Relative

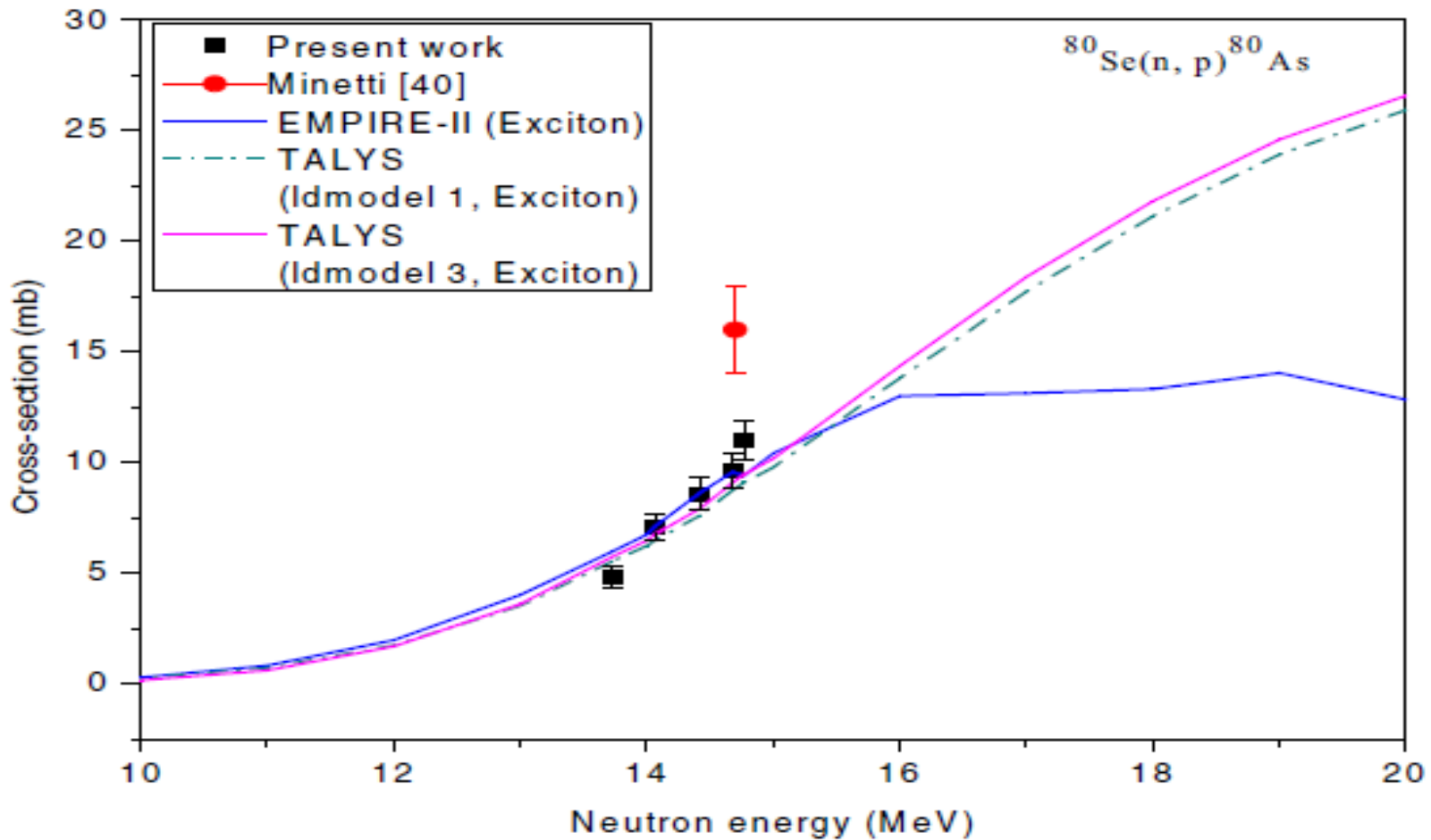
Separator: Space , X-err position: x dx y dy , Output Error: As Read

```
# Digitized by GSYS2.4.7
# Date = 1.Jan.2015, 19:17:14
# Number of data = 5
# set xrange[10.0, 20.0]
# set yrange[0.0, 35.0]
# MD5Fig : 9a498d13208f0990e2e301f04c9d0a29
# Axis_X : 3fb96ba9de81323e3febcb7cb7cb7cb83feec42fd9b8396c3febcb7cb7cb7cb8
# Axis_Y : 3fb8d28ac42fd9b83febcb7cb7cb7cb83fb8d28ac42fd9b83fb6f953edbf327d
# x y dy
13.713 15.628 1.440
14.051 17.068 1.512
14.417 18.724 1.728
14.702 20.669 1.872
14.756 22.109 1.656
```



Neutron energy (MeV)

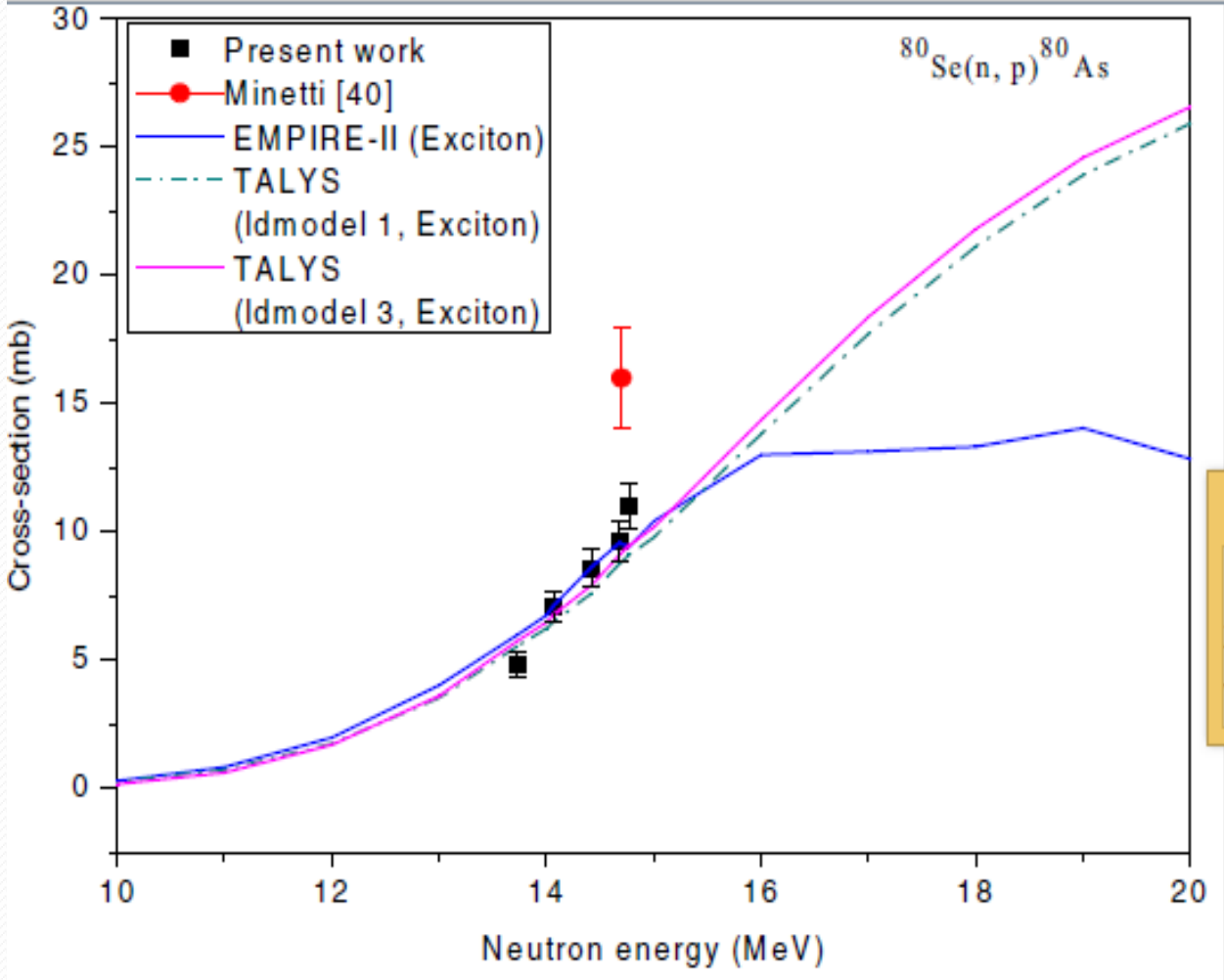
Fig.4 (PRC 90, 064609, 2014)



Drag and drop image

File Edit View

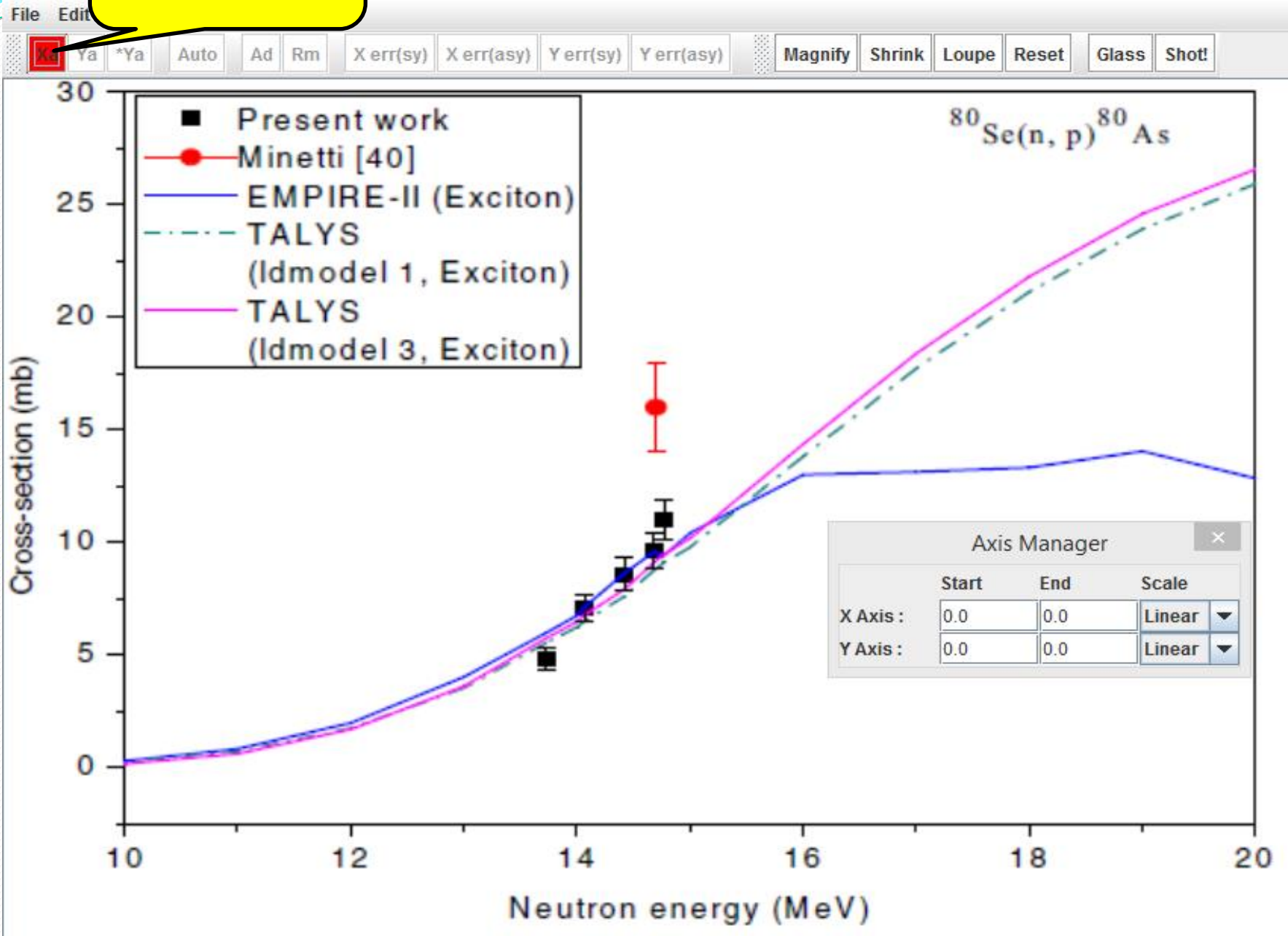
Xa Ya *Ya Auto Ad En X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!

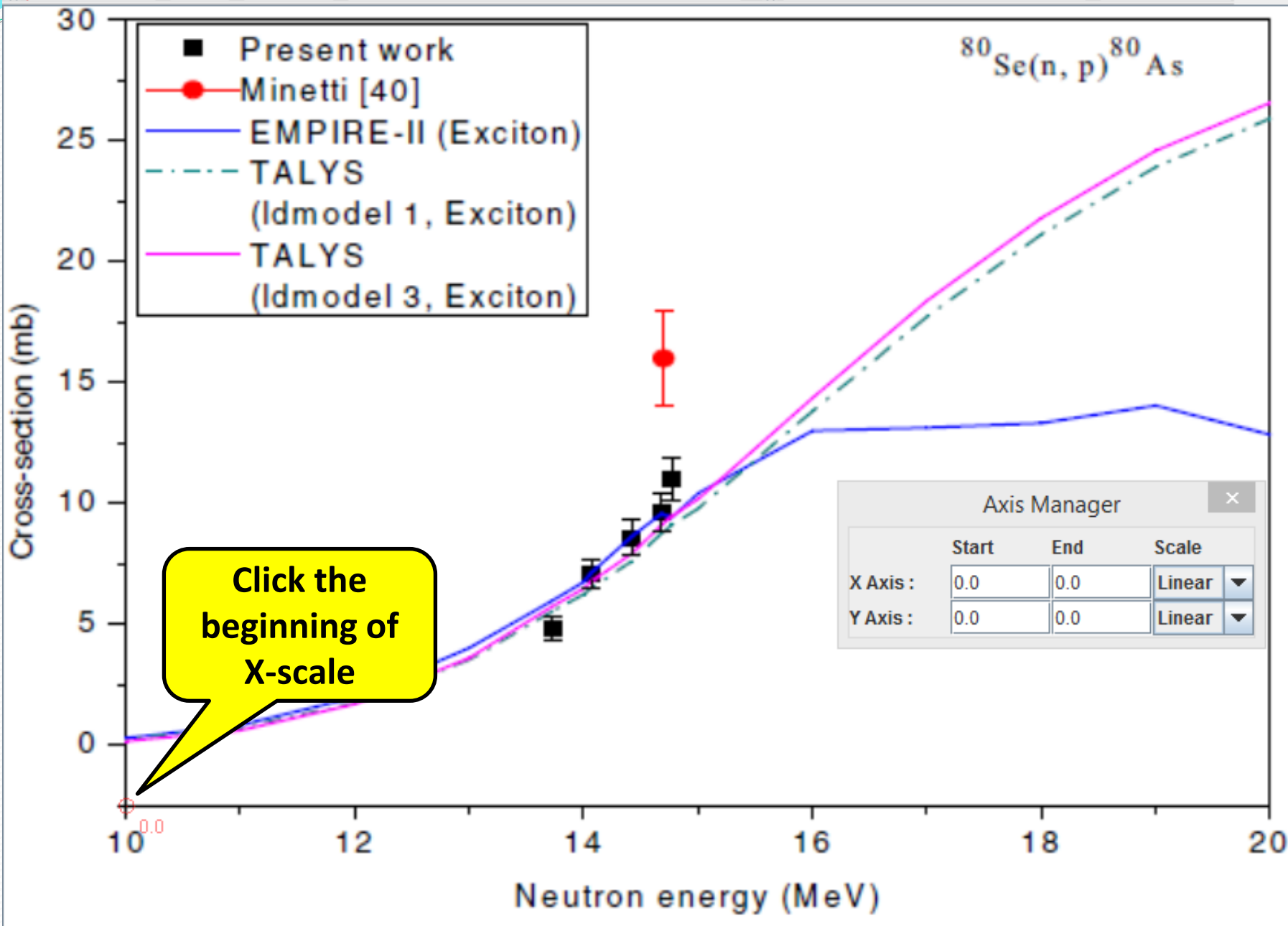


Axis Manager

	Start	End	Scale
X Axis :	0.0	0.0	Linear ▼
Y Axis :	0.0	0.0	Linear ▼

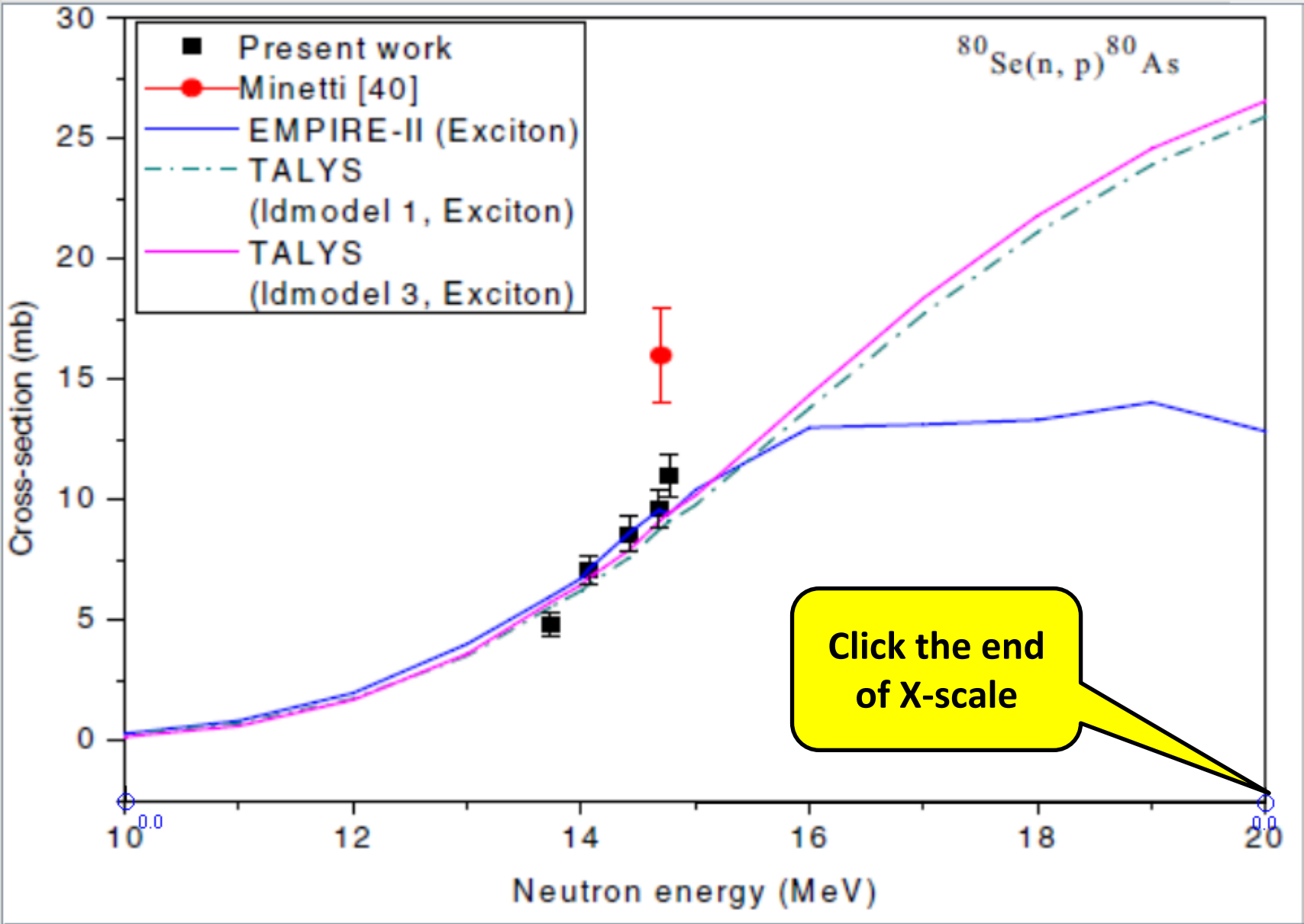
Click Xa





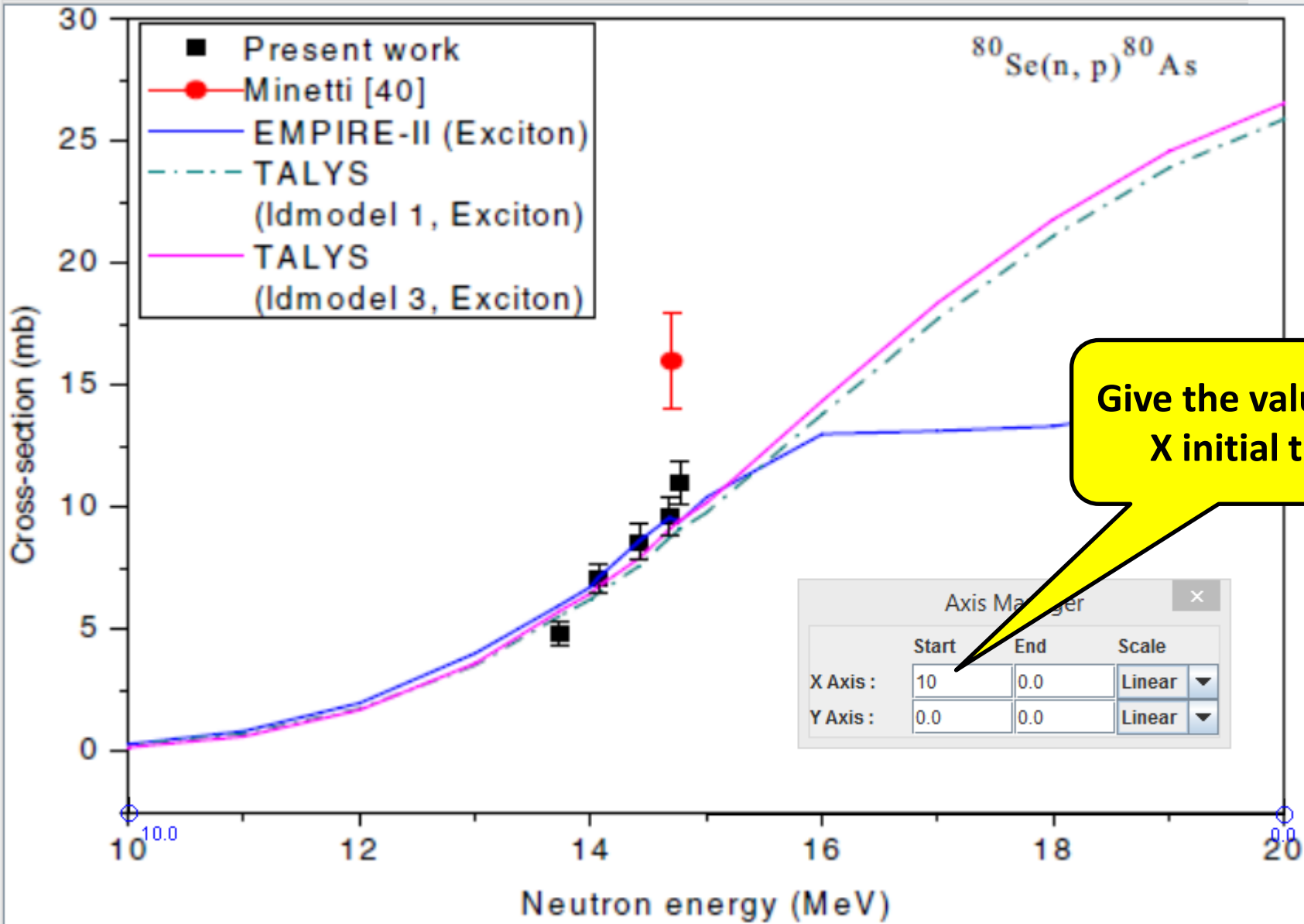
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!

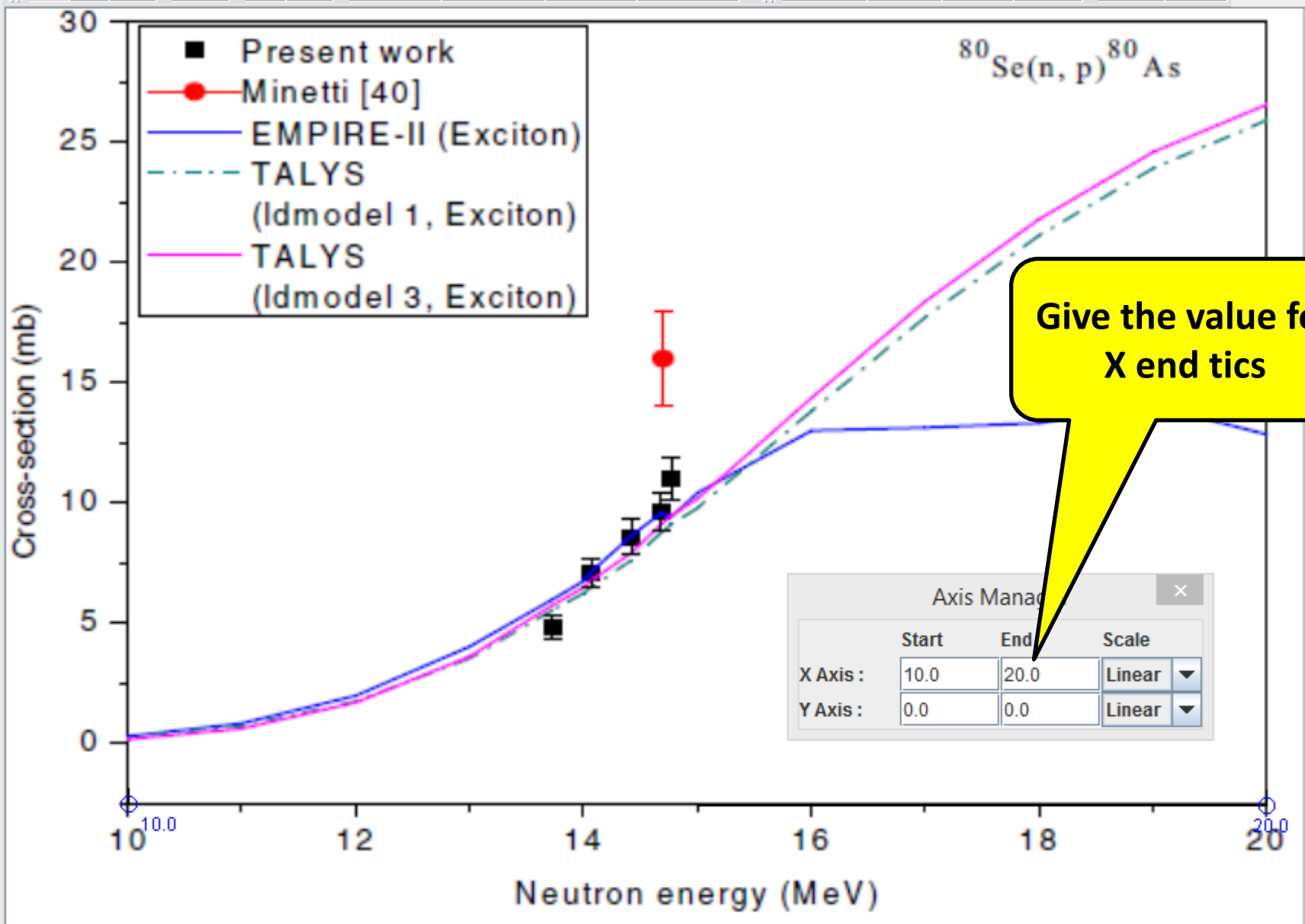


Give the value for X initial tics

Clicked (569, 326), Mouse (674, 168)

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!

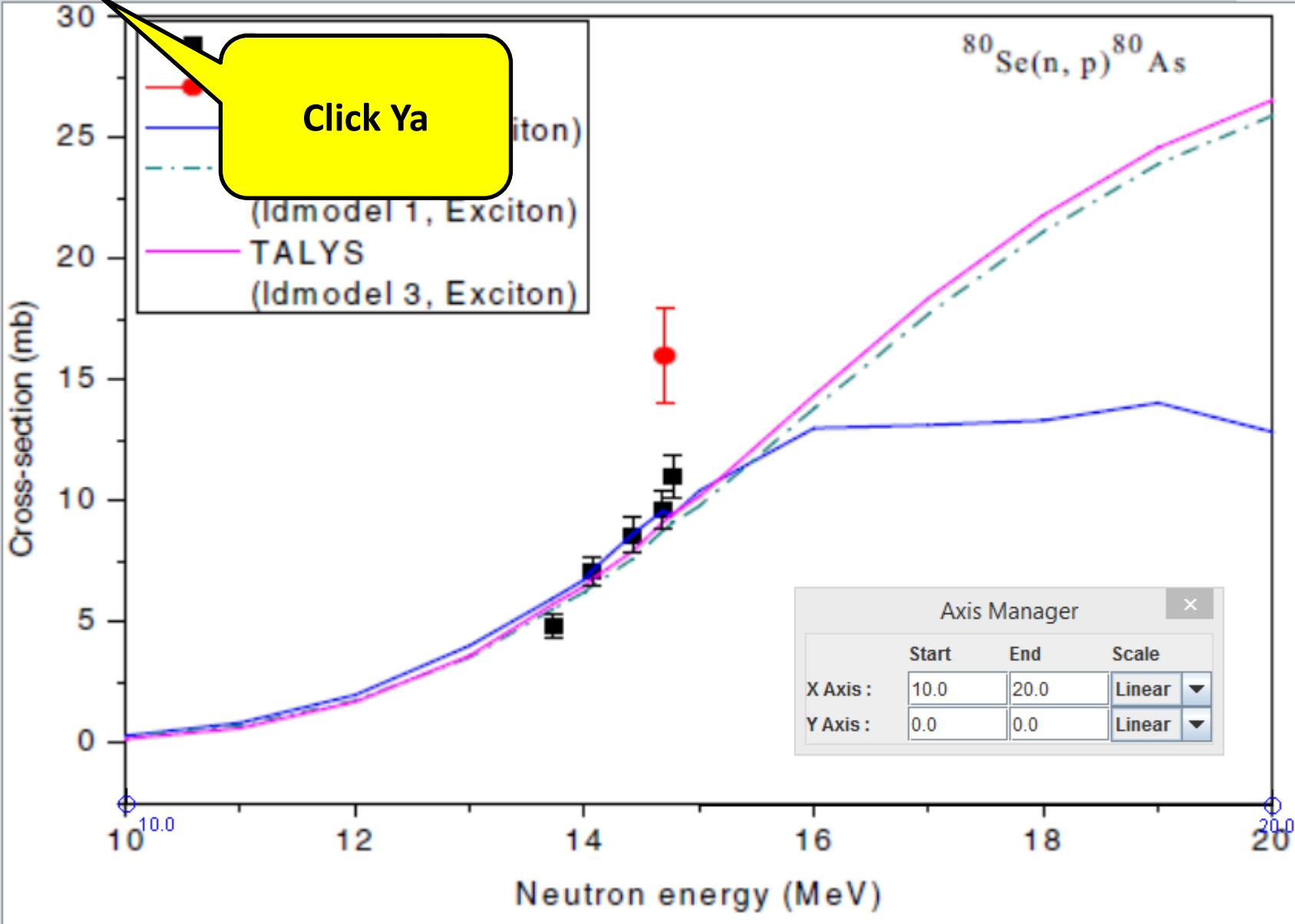


Give the value for X end tics

Clicked (569, 326), Mouse (482, 249)

File Edit View

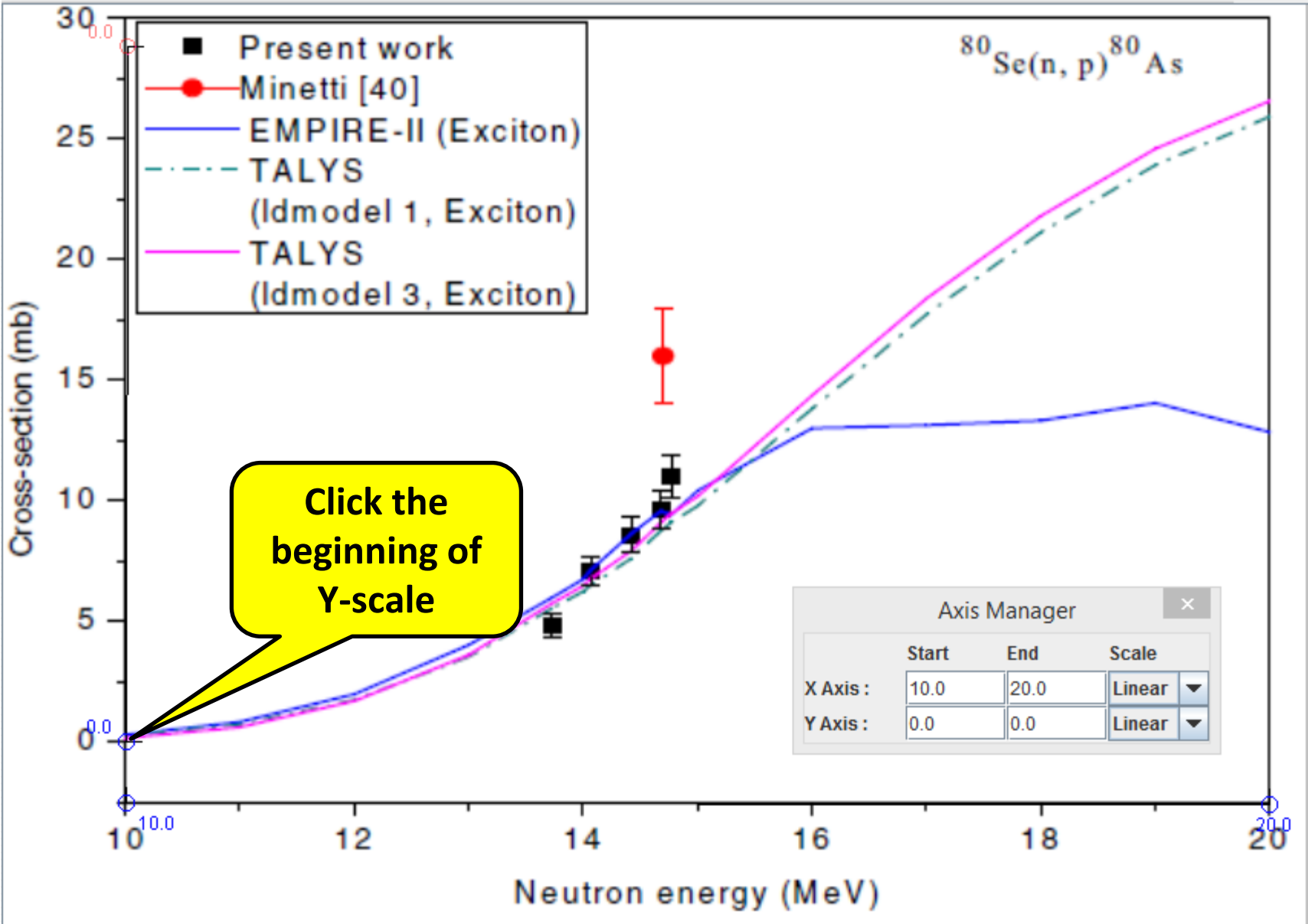
Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Click Ya

File Edit View

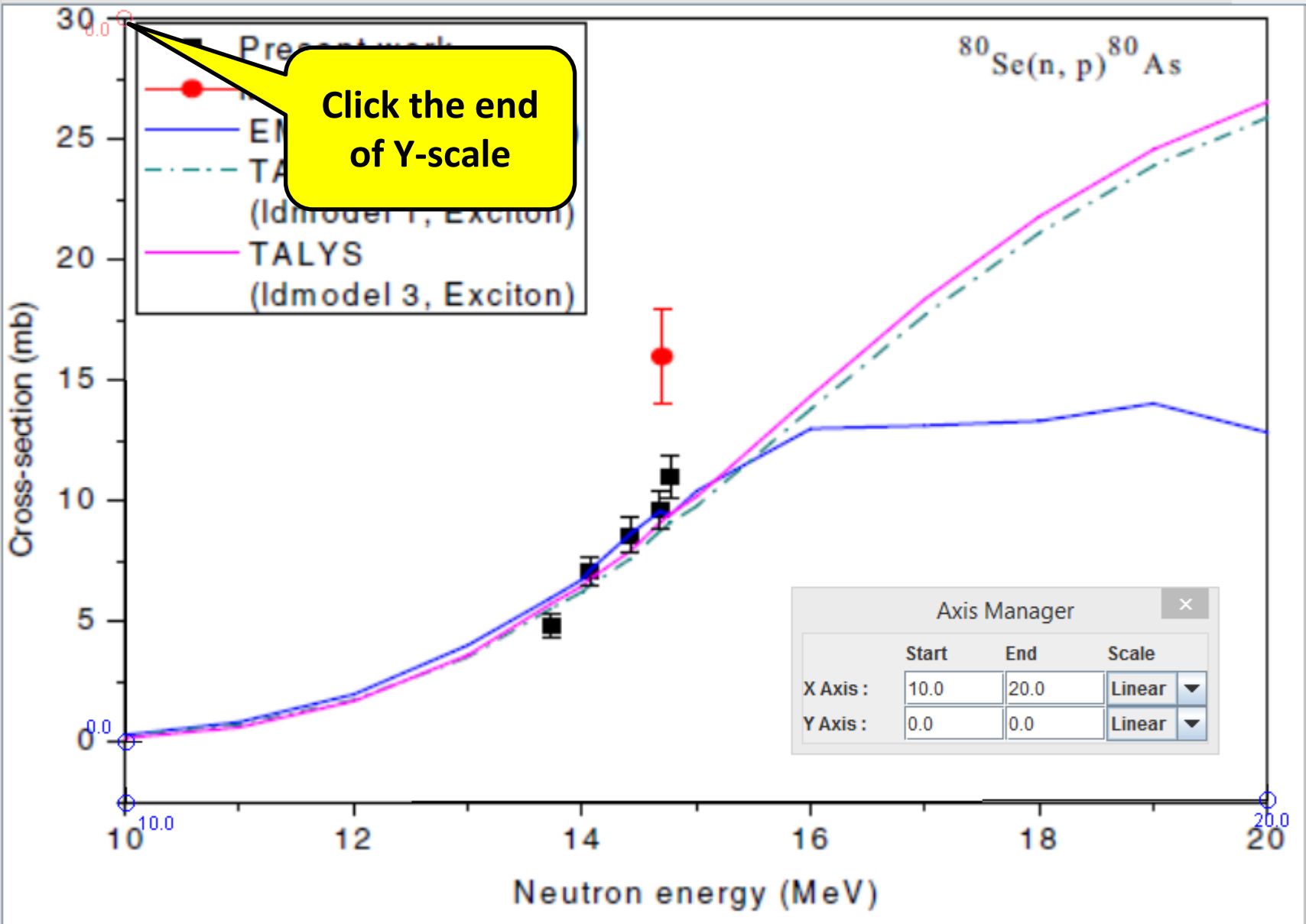
Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Y-axis (End) (81, 27), Mouse (434, 196)

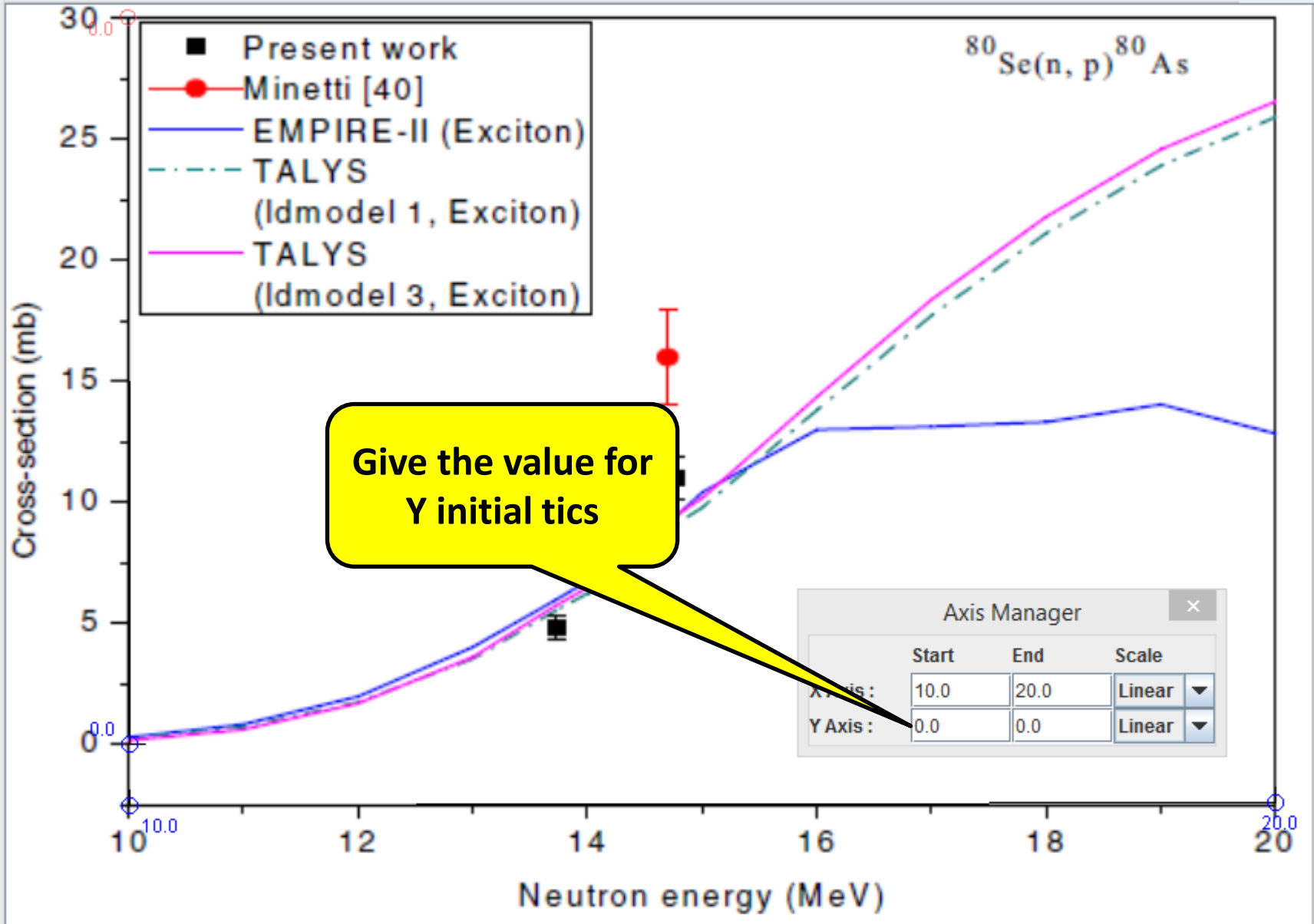
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!

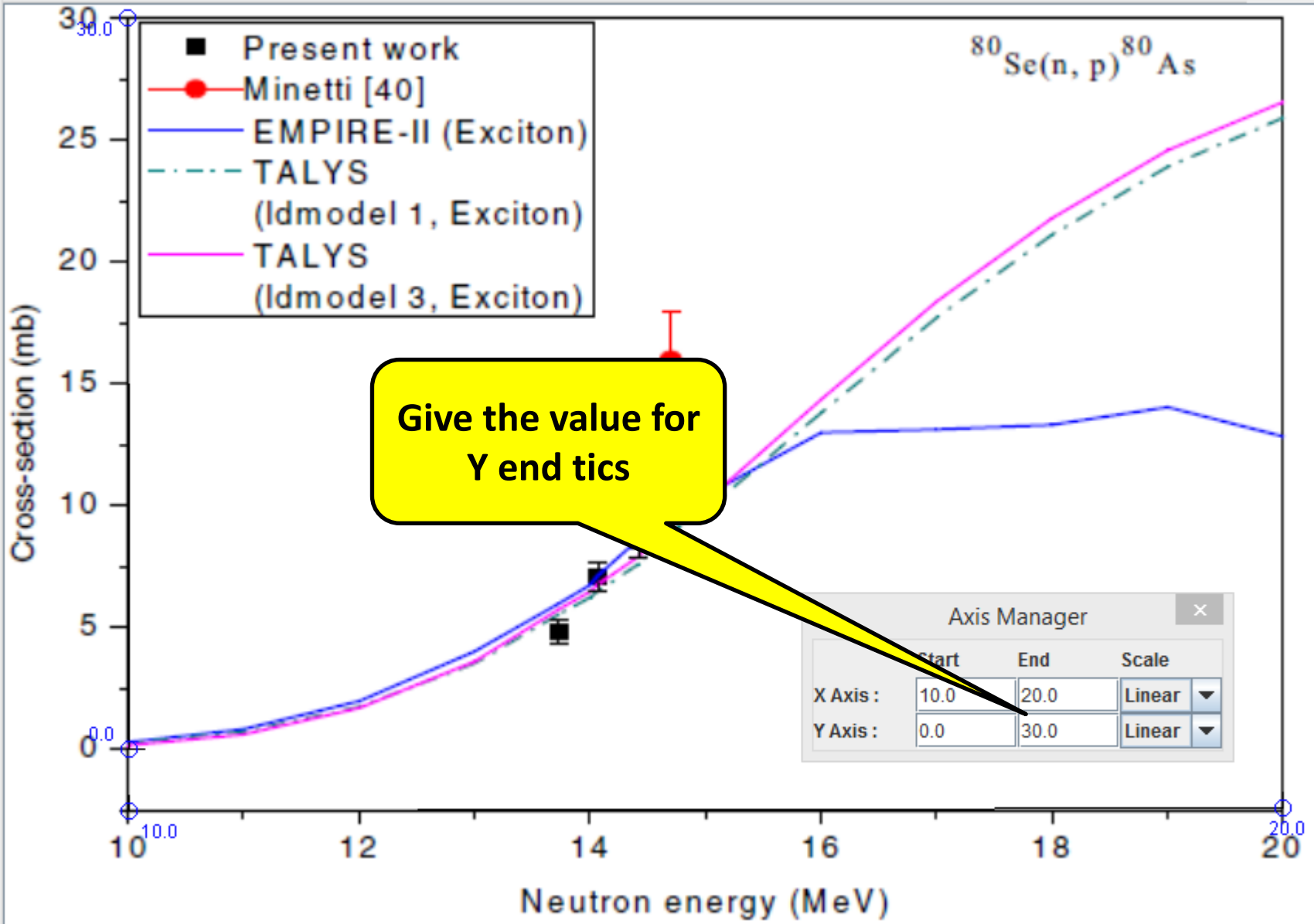


Give the value for Y initial tics

Y-axis (End) (79, 8), Mouse (584, 314)

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Give the value for Y end tics

Clicked (567, 103), Mouse (567, 146)



2. Digitize Centre of Data Points

File Edit View

Xa Ya *Ya Auto Ad

err(asy)

Magnify

Shrink

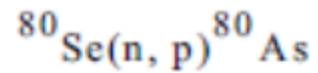
Loupe

Reset

Glass

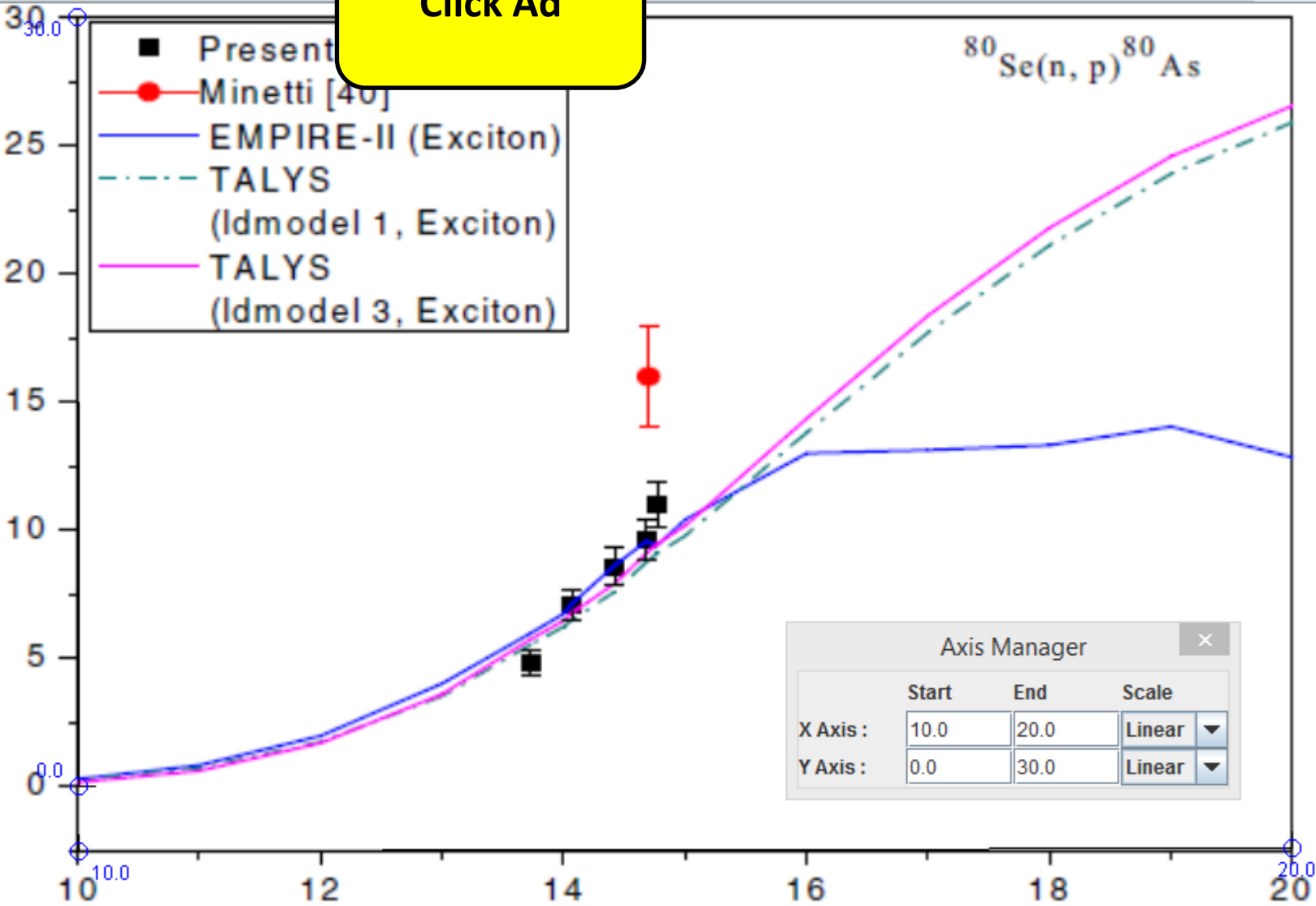
Shot!

Click Ad



- Present
- Minetti [40]
- EMPIRE-II (Exciton)
- - - TALYS (ldmodel 1, Exciton)
- TALYS (ldmodel 3, Exciton)

Cross-section (mb)



Axis Manager

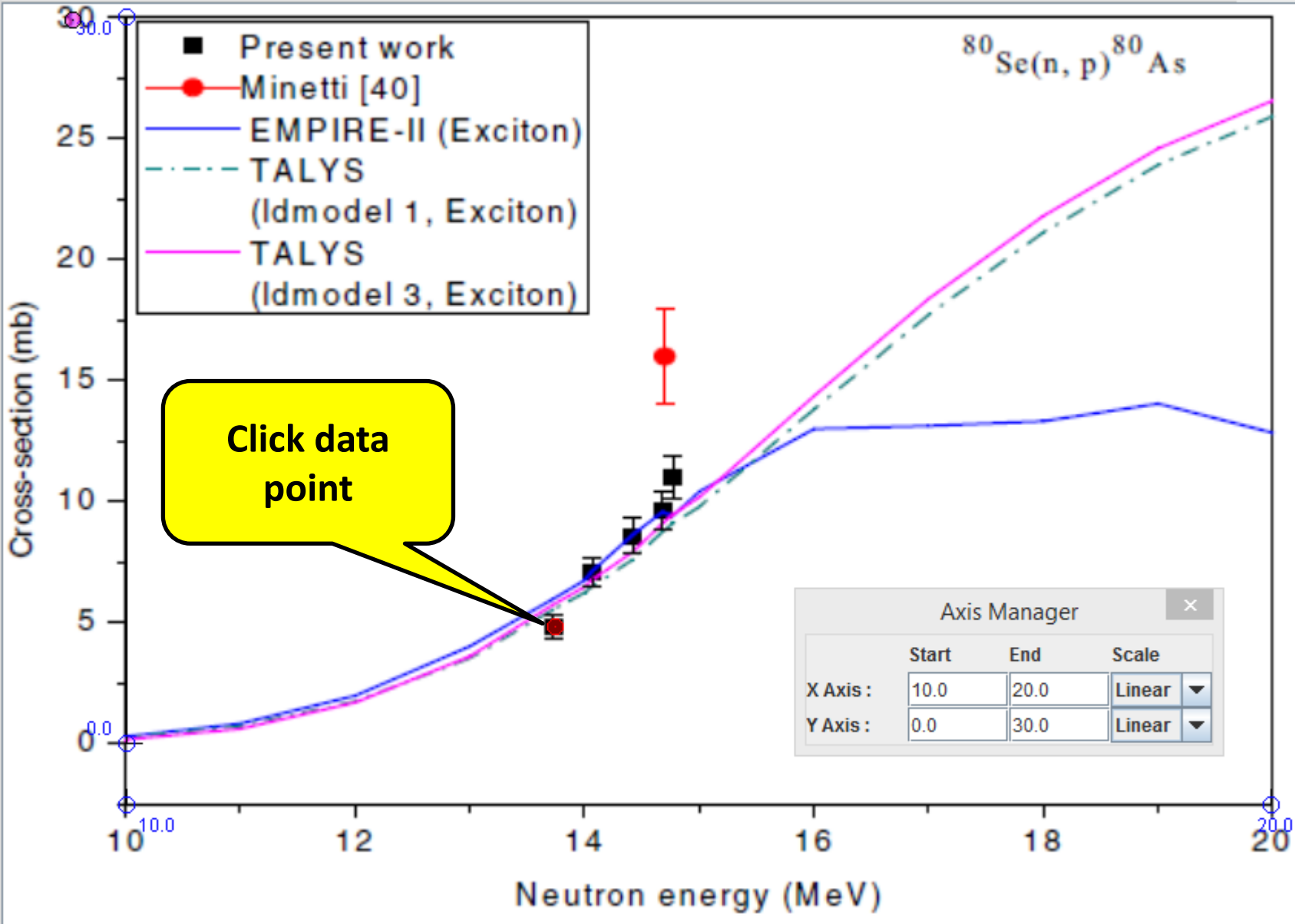
	Start	End	Scale
X Axis :	10.0	20.0	Linear
Y Axis :	0.0	30.0	Linear

Neutron energy (MeV)

Clicked (567, 103), Mouse (45, 10)

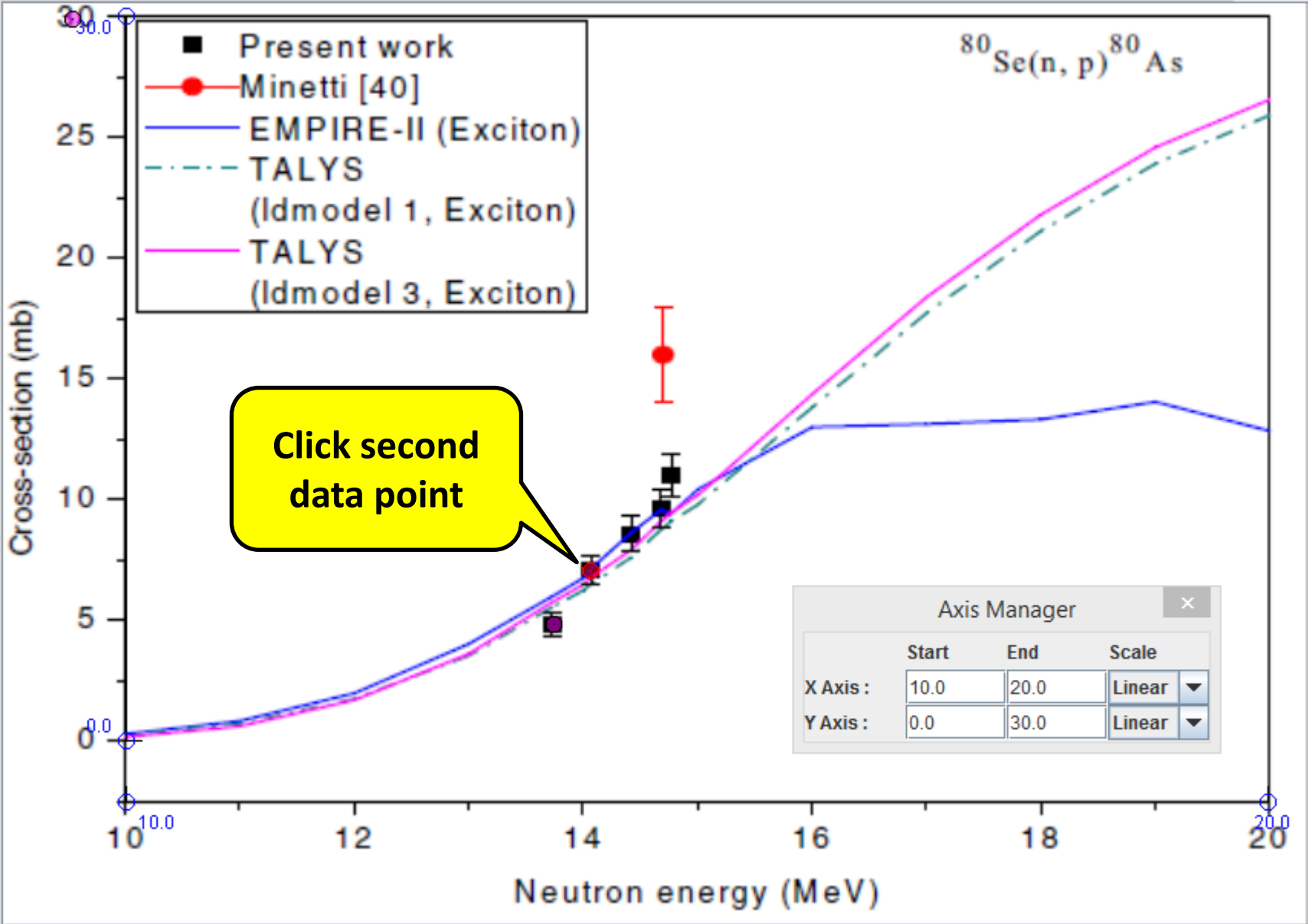
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



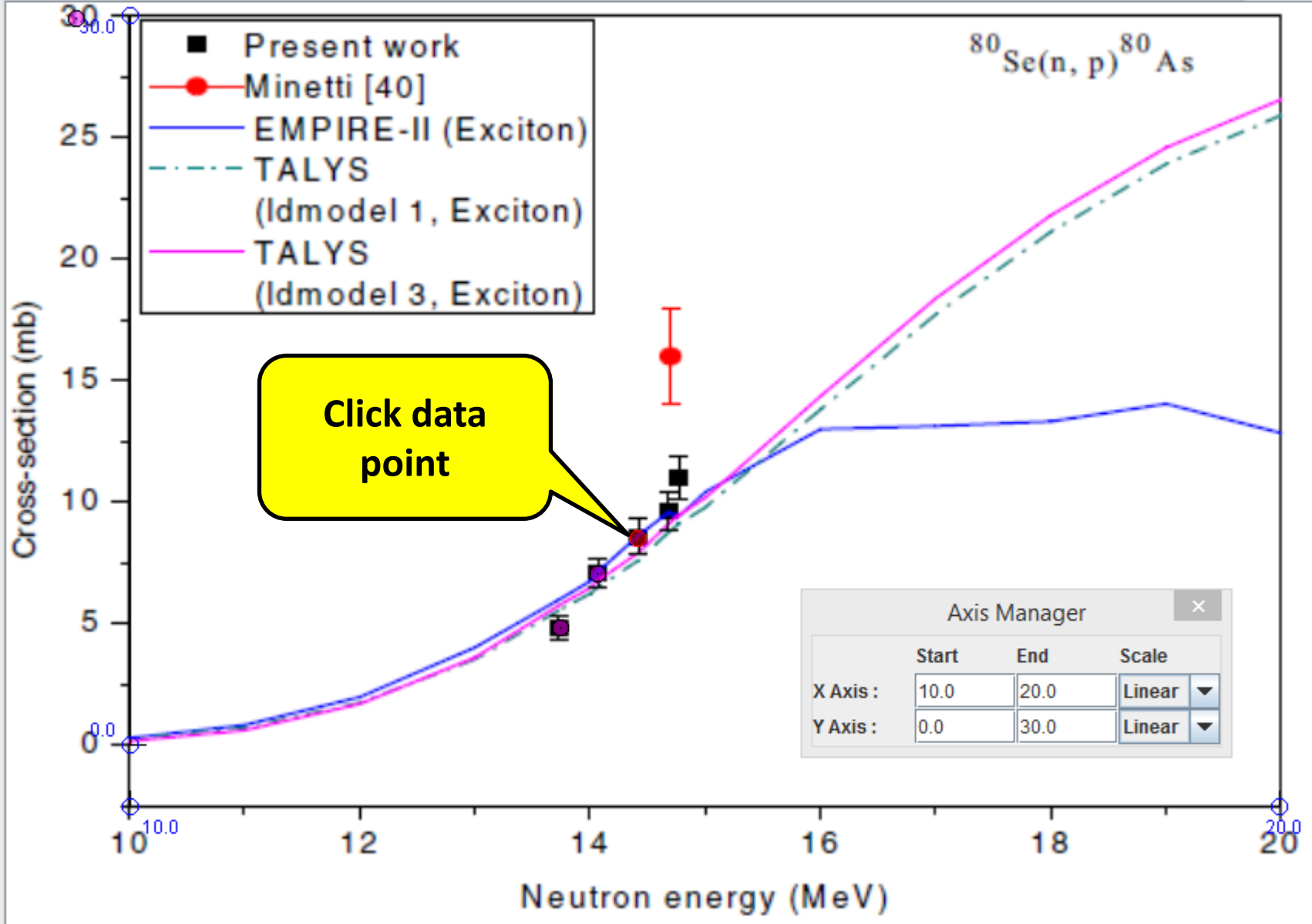
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



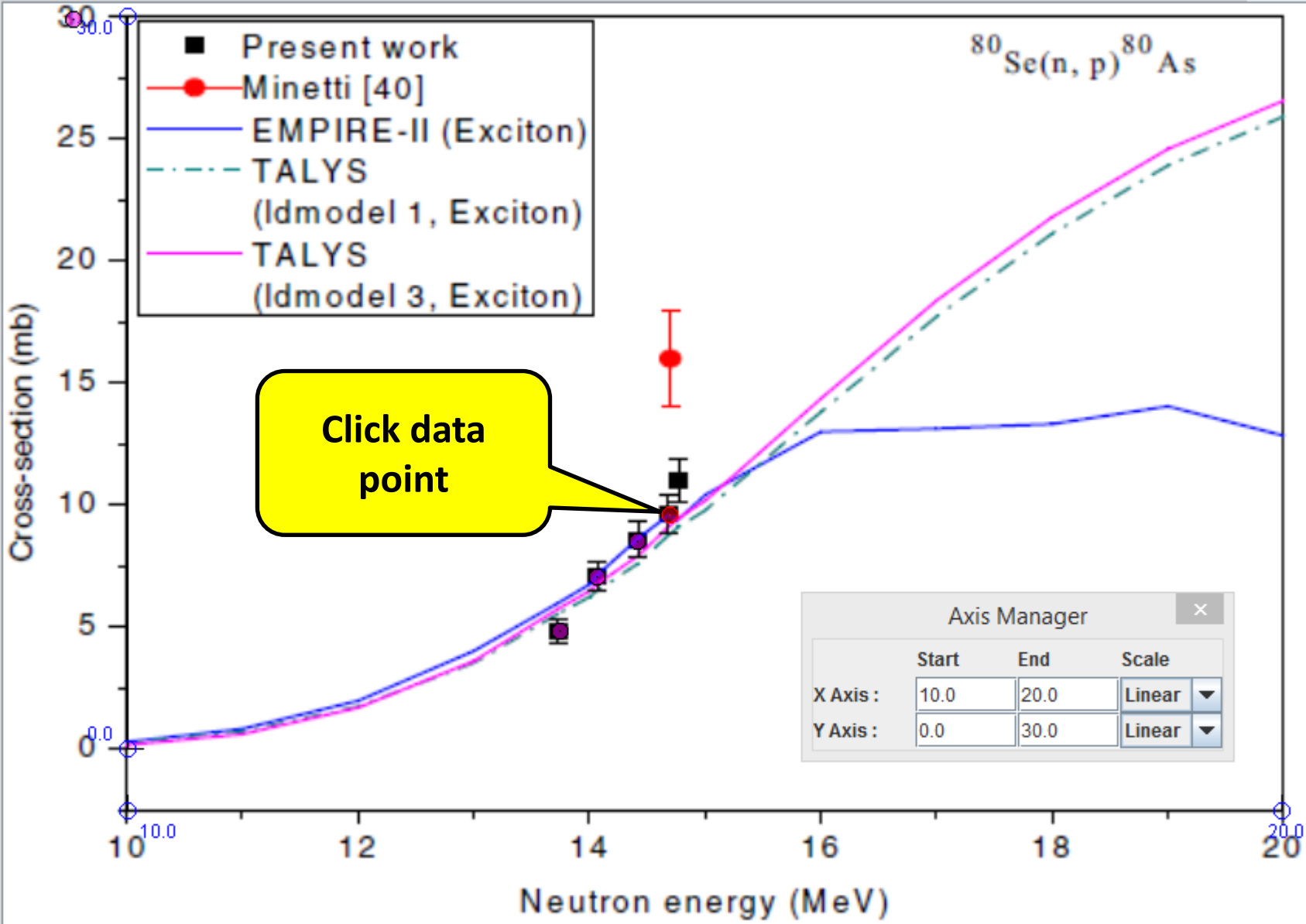
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



File Edit View

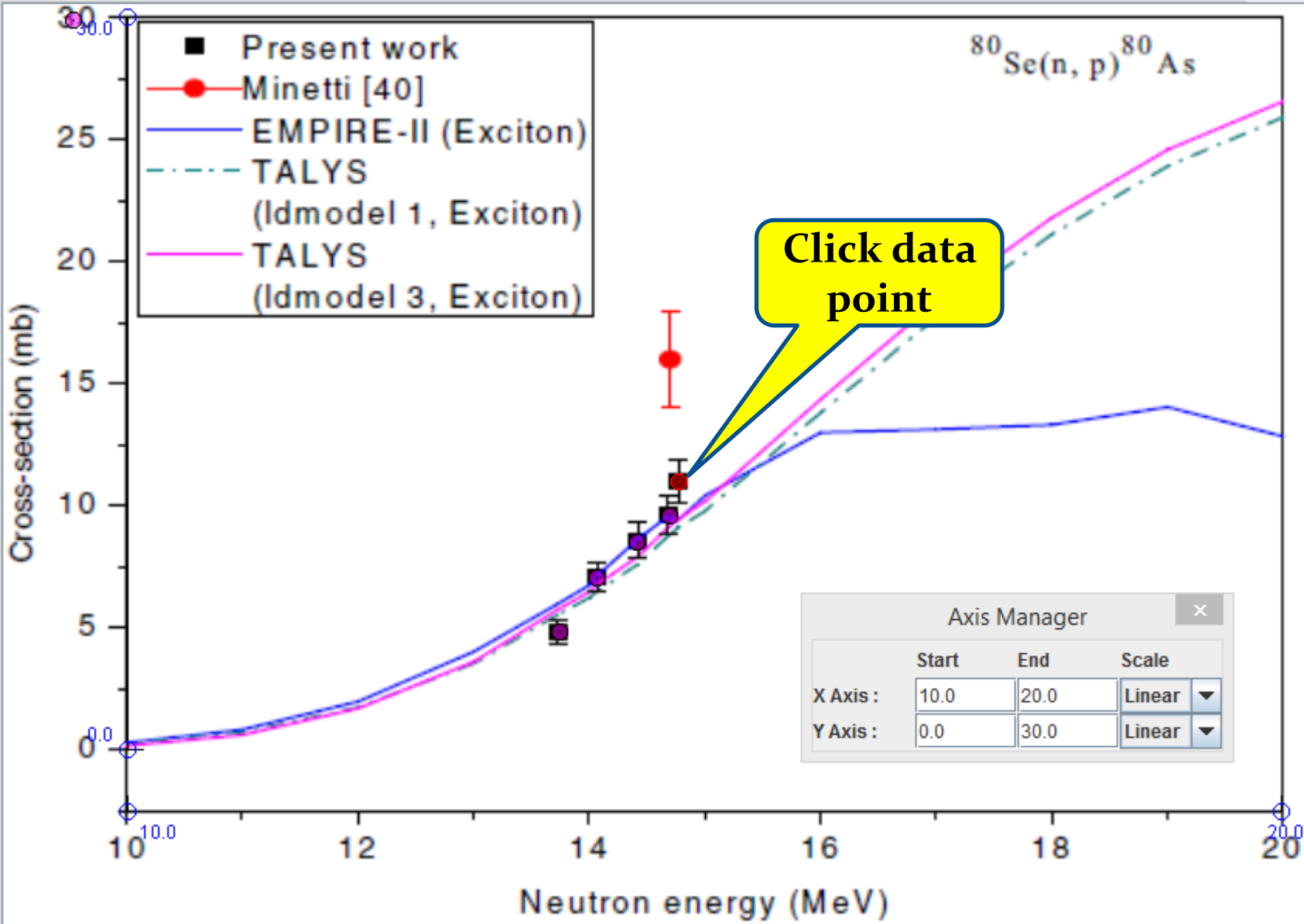
Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Set X Symmetric-Error Bar (F1)

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



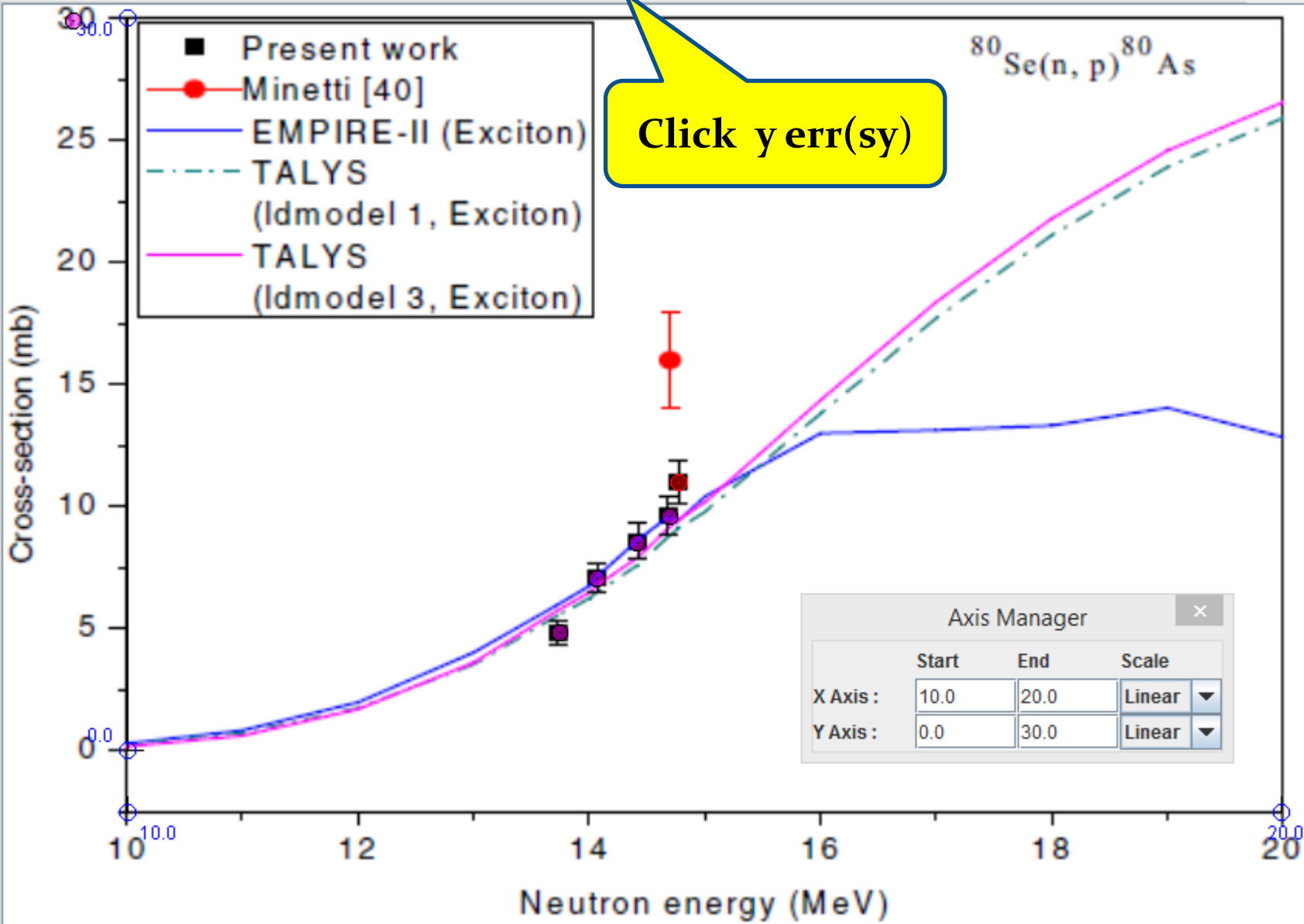
Snap Shot!



3. Digitize y -symmetric Error Bar

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!

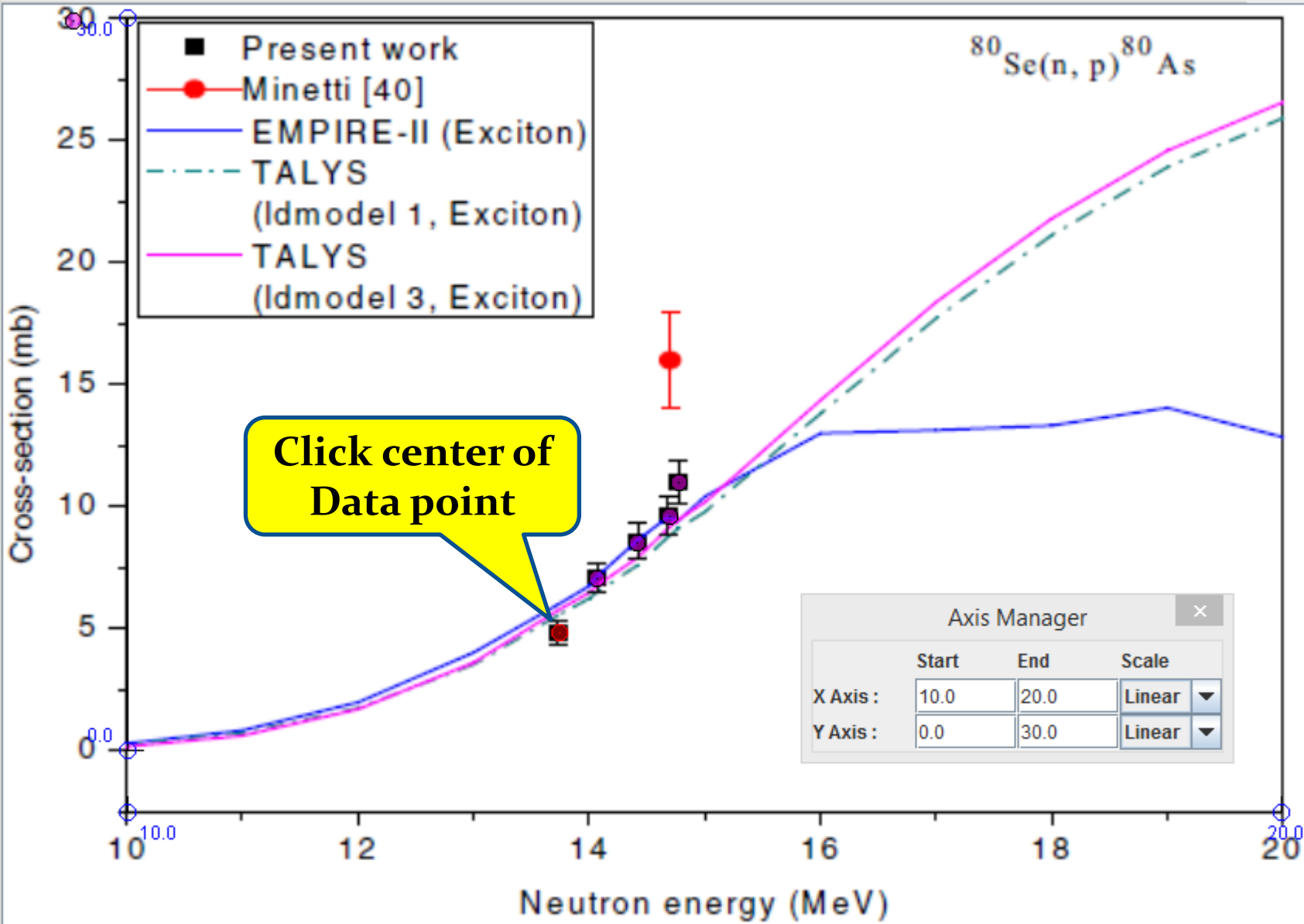


Axis Manager

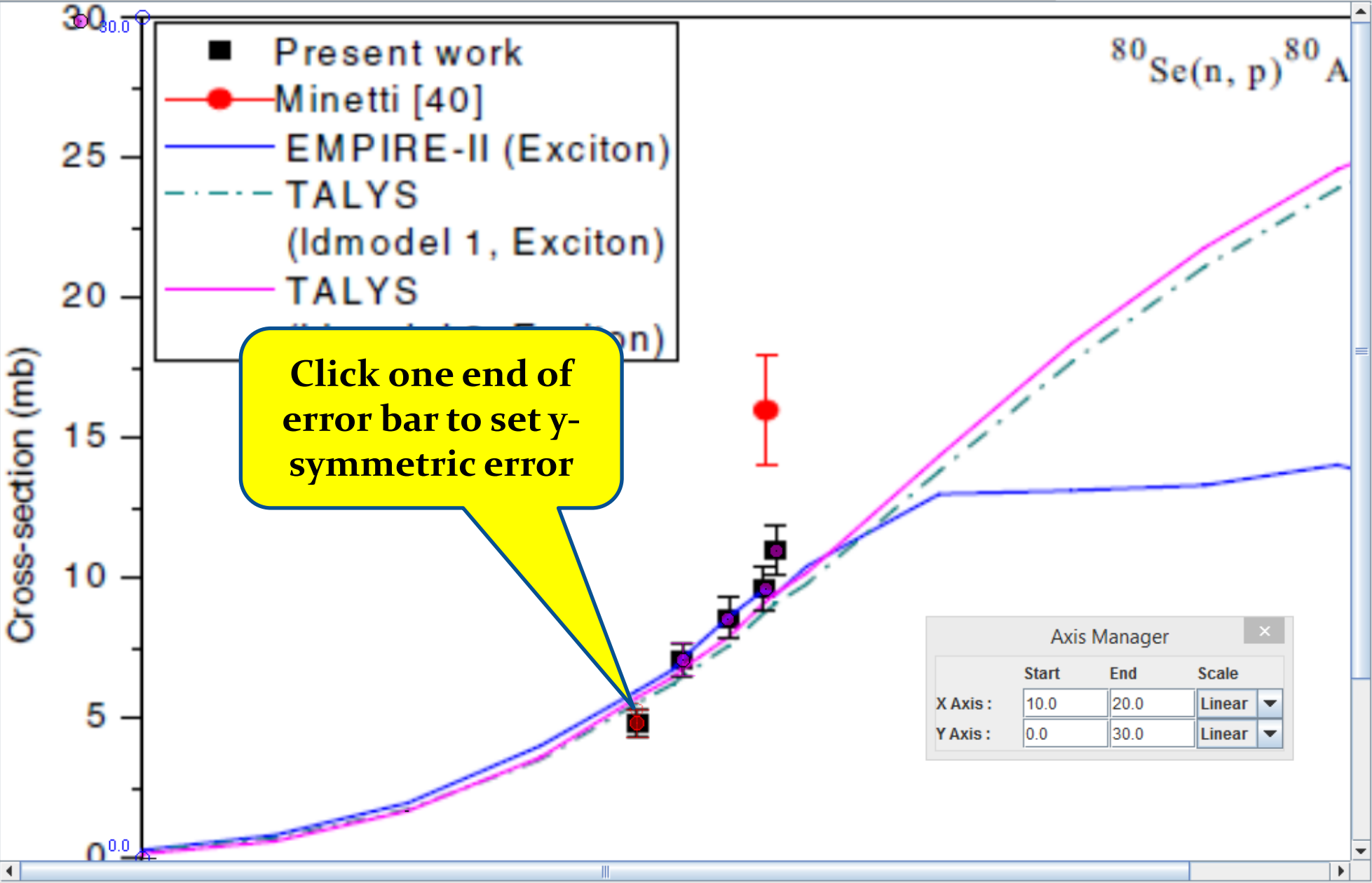
	Start	End	Scale
X Axis :	10.0	20.0	Linear
Y Axis :	0.0	30.0	Linear

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Reset the figure size



Click one end of error bar to set y-symmetric error

File Edit View

Xa

Ya

*Ya

Auto

Ad

Rm

X err(sy)

X err(asy)

Y err(sy)

Y err(asy)

Magnify

Shrink

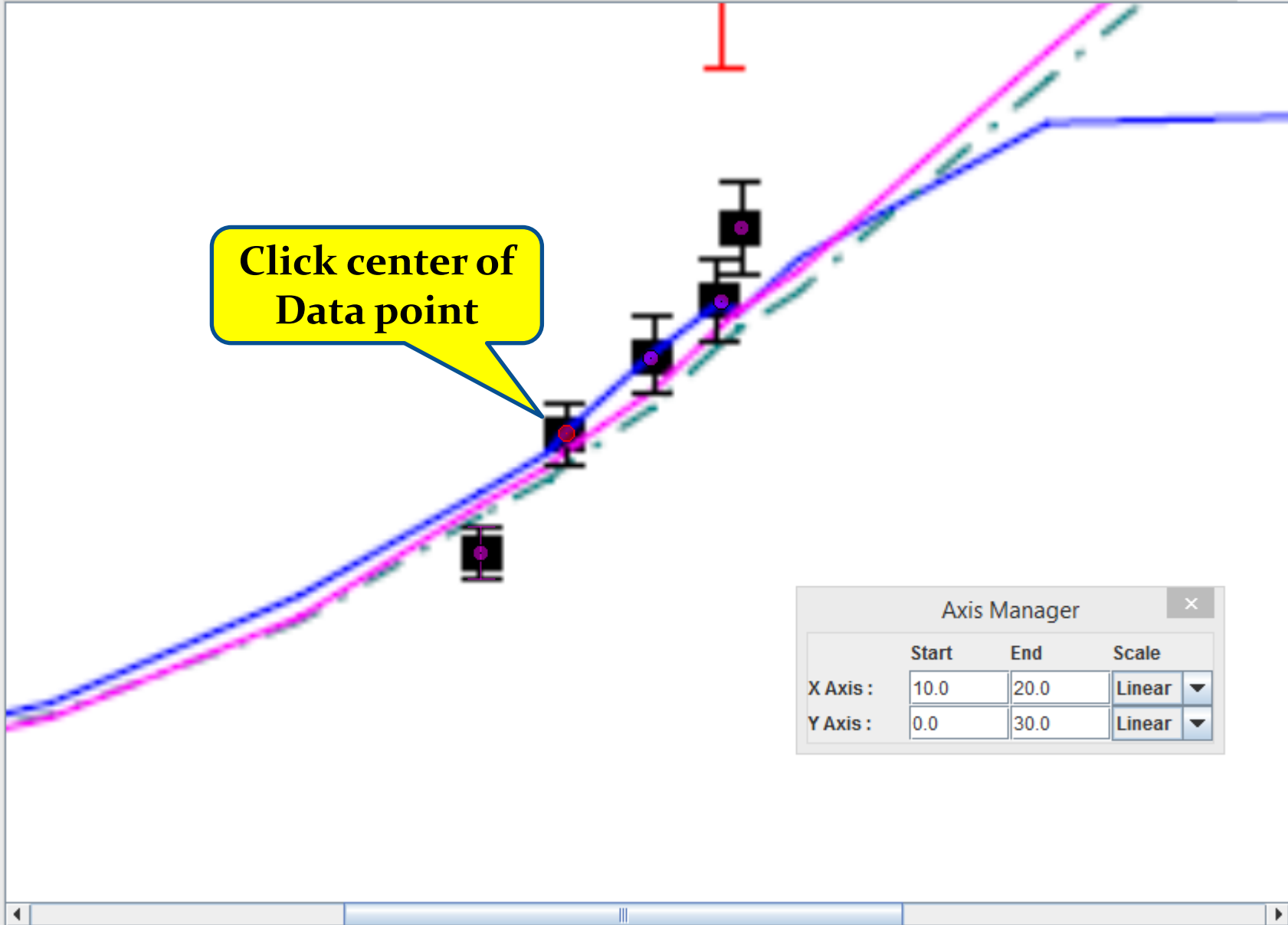
Loupe

Reset

Glass

Shot!

Click center of
Data point



Axis Manager

	Start	End	Scale
X Axis :	10.0	20.0	Linear
Y Axis :	0.0	30.0	Linear

GSYS(Graph Suchi Yomitori System)

File Edit View

Xa

Ya

*Ya

Auto

Ad

Rm

X err(sy)

X err(asy)

Y err(sy)

Y err(asy)

Magnify

Shrink

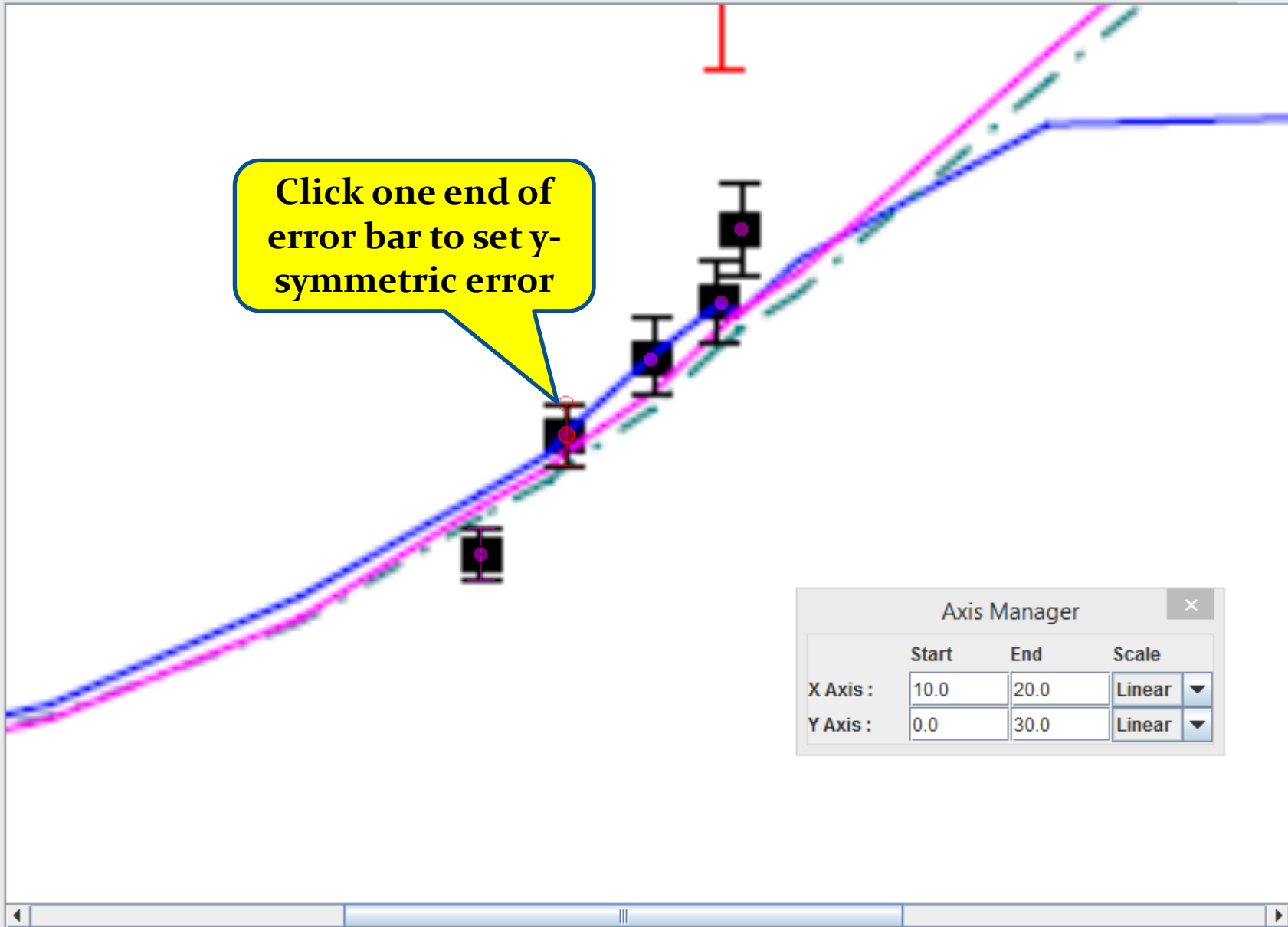
Loupe

Reset

Glass

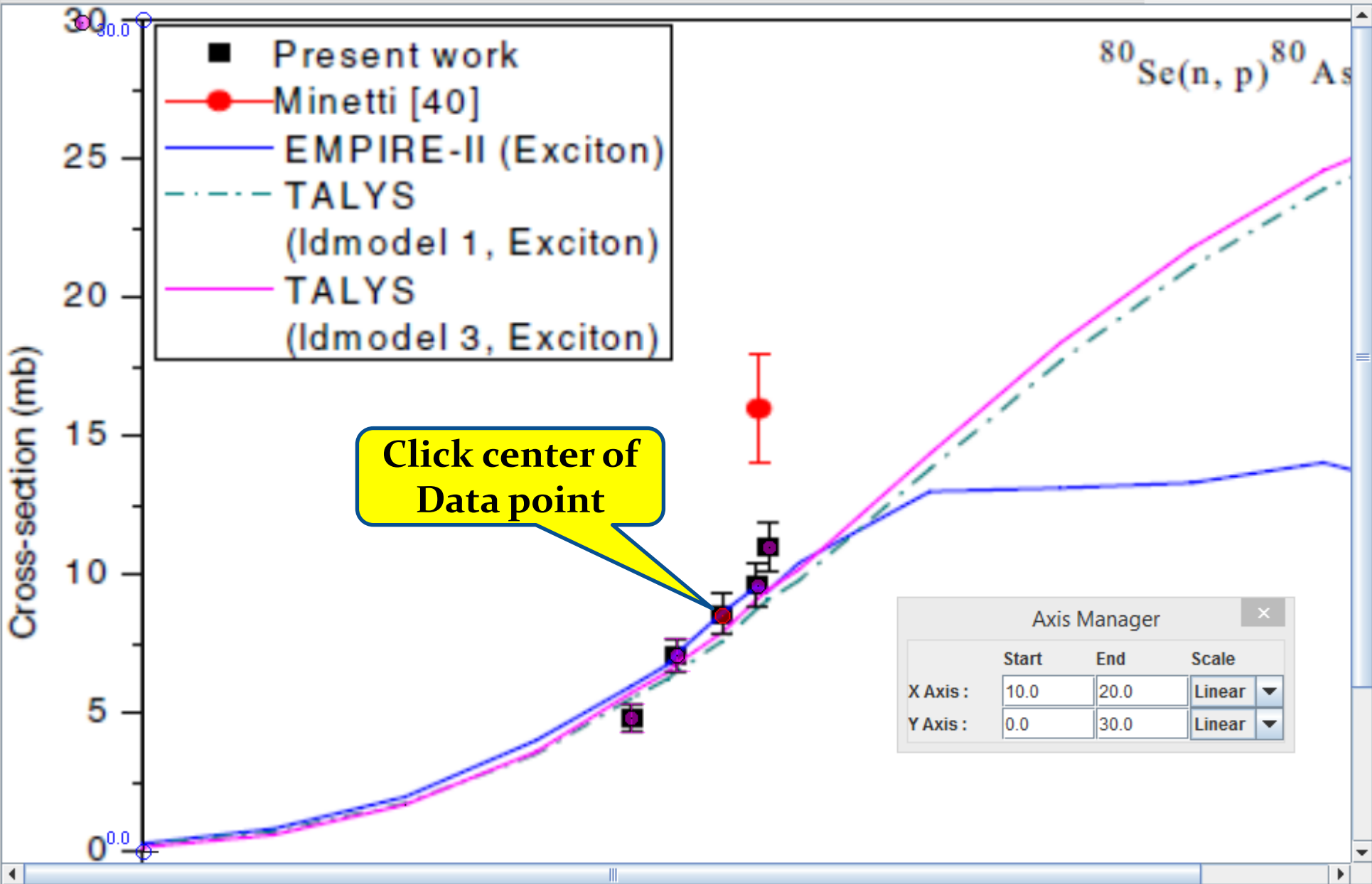
Shot!

Click one end of error bar to set y-symmetric error



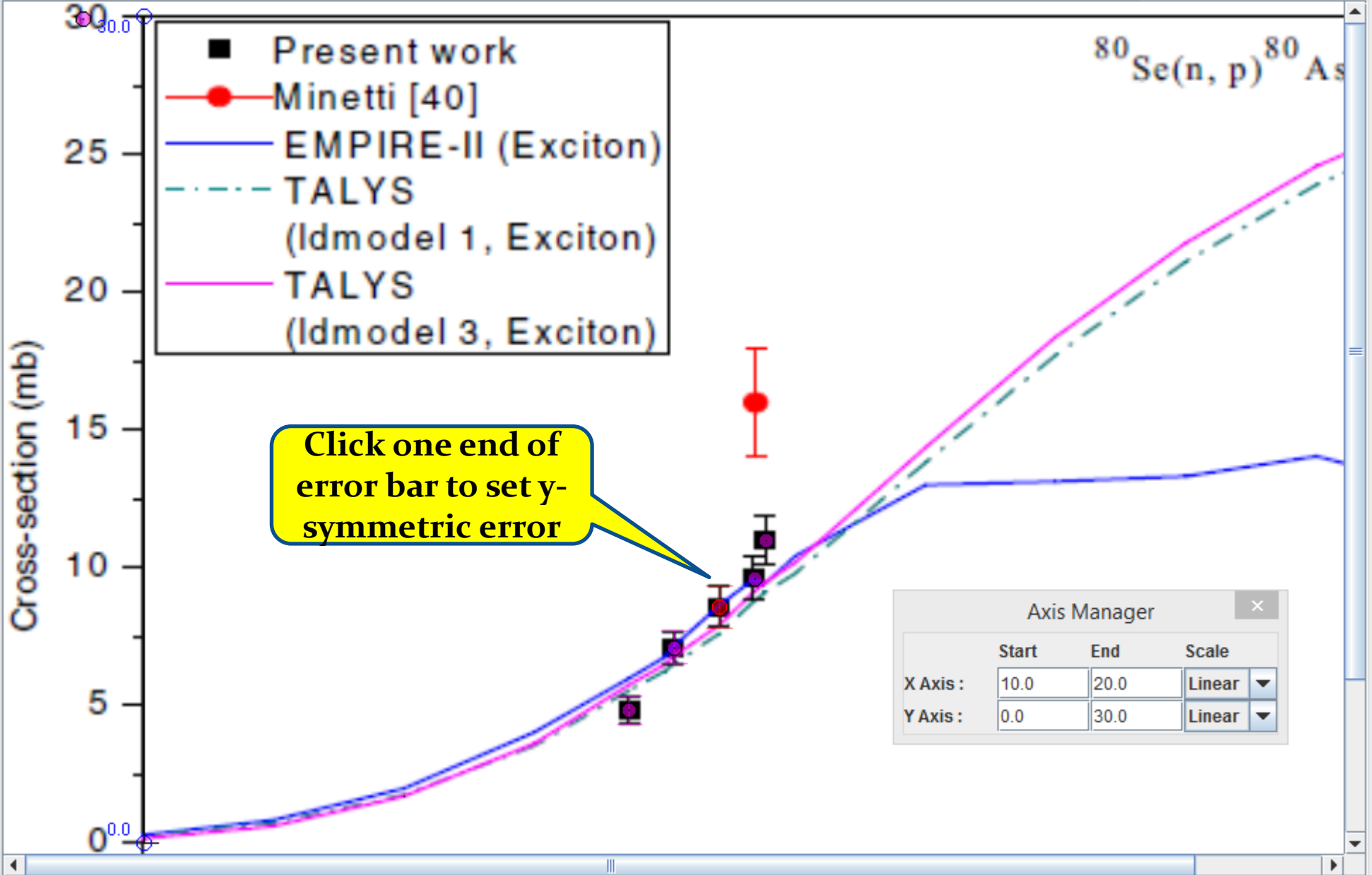
File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Click center of Data point

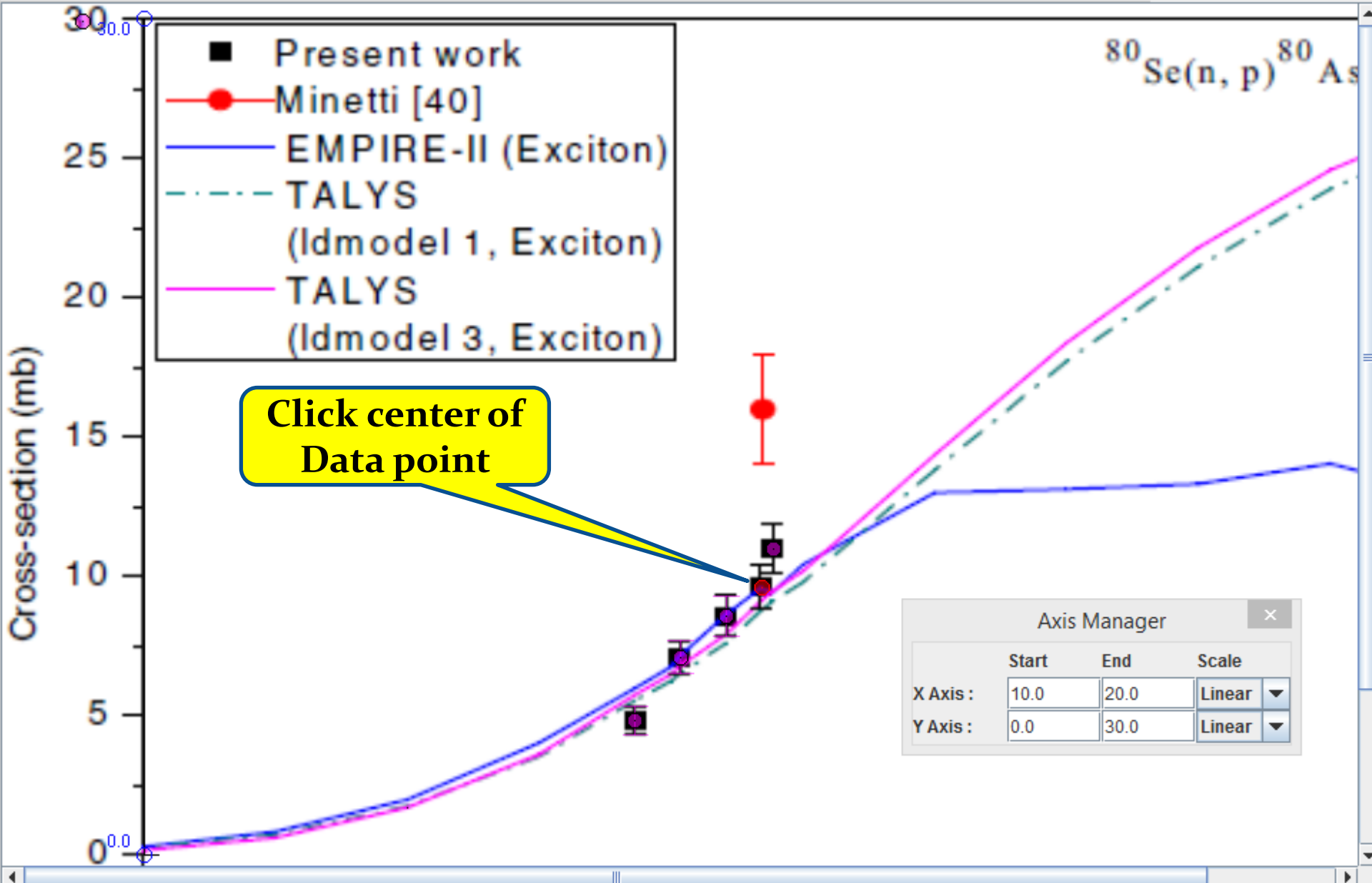
Point (506, 429), Mouse (500, 124), Digitized value (1.442E+01, 8.498E+00)



Click one end of error bar to set y-symmetric error

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!

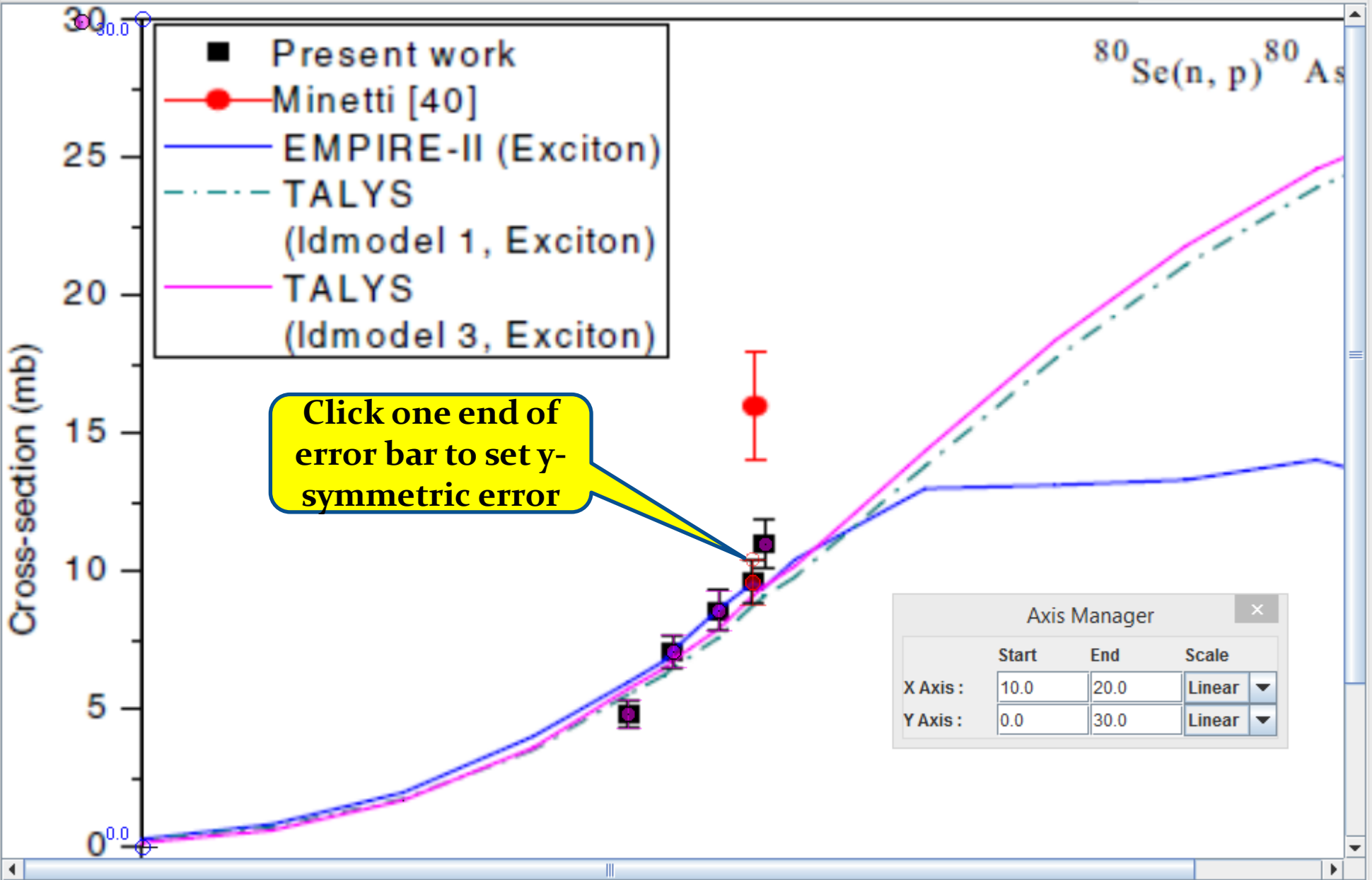


Click center of Data point

Point (531, 408), Mouse (686, 134), Digitized value (1.470E+01, 9.577E+00)

File Edit View

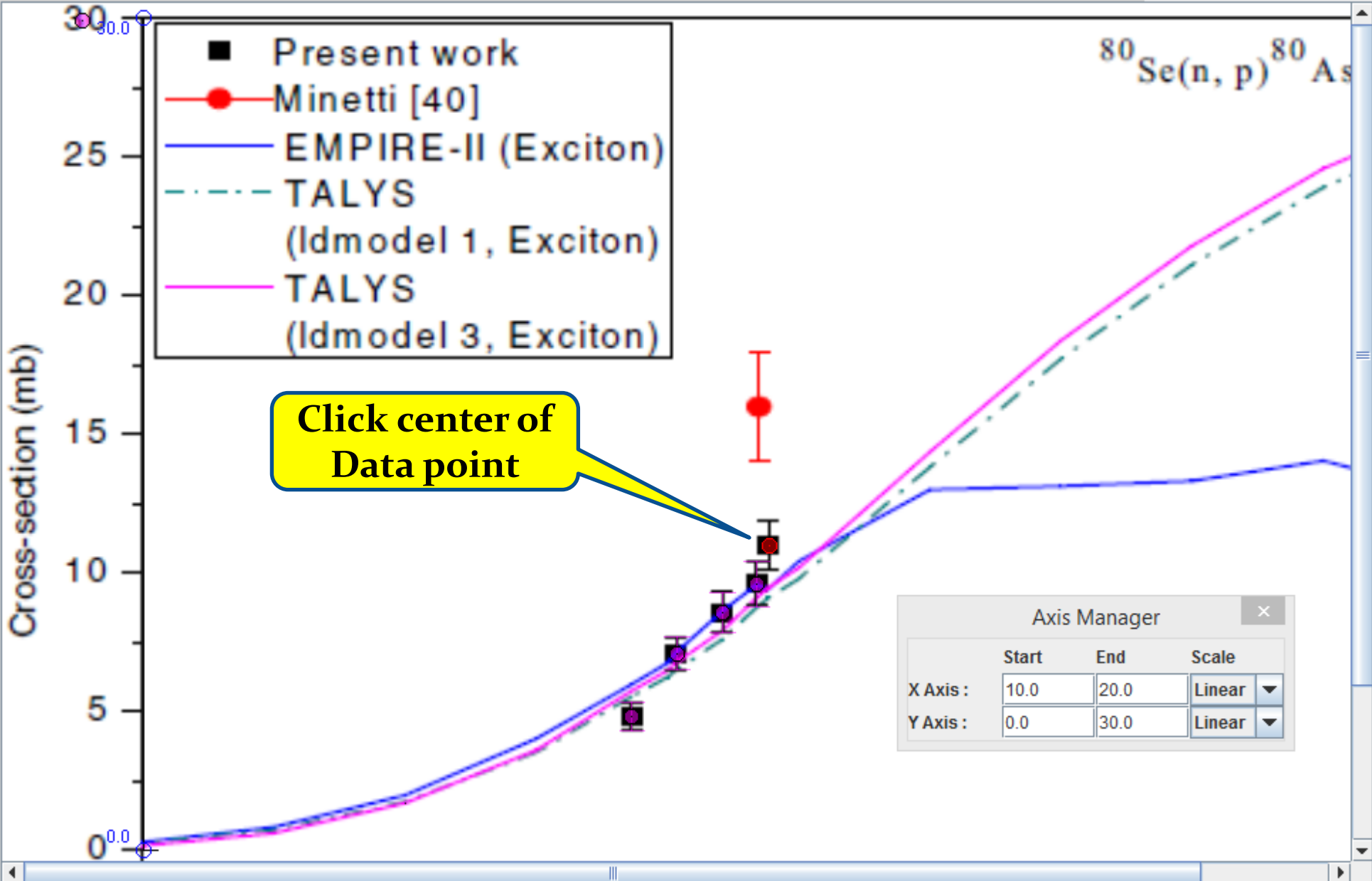
Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Click one end of error bar to set y-symmetric error

File Edit View

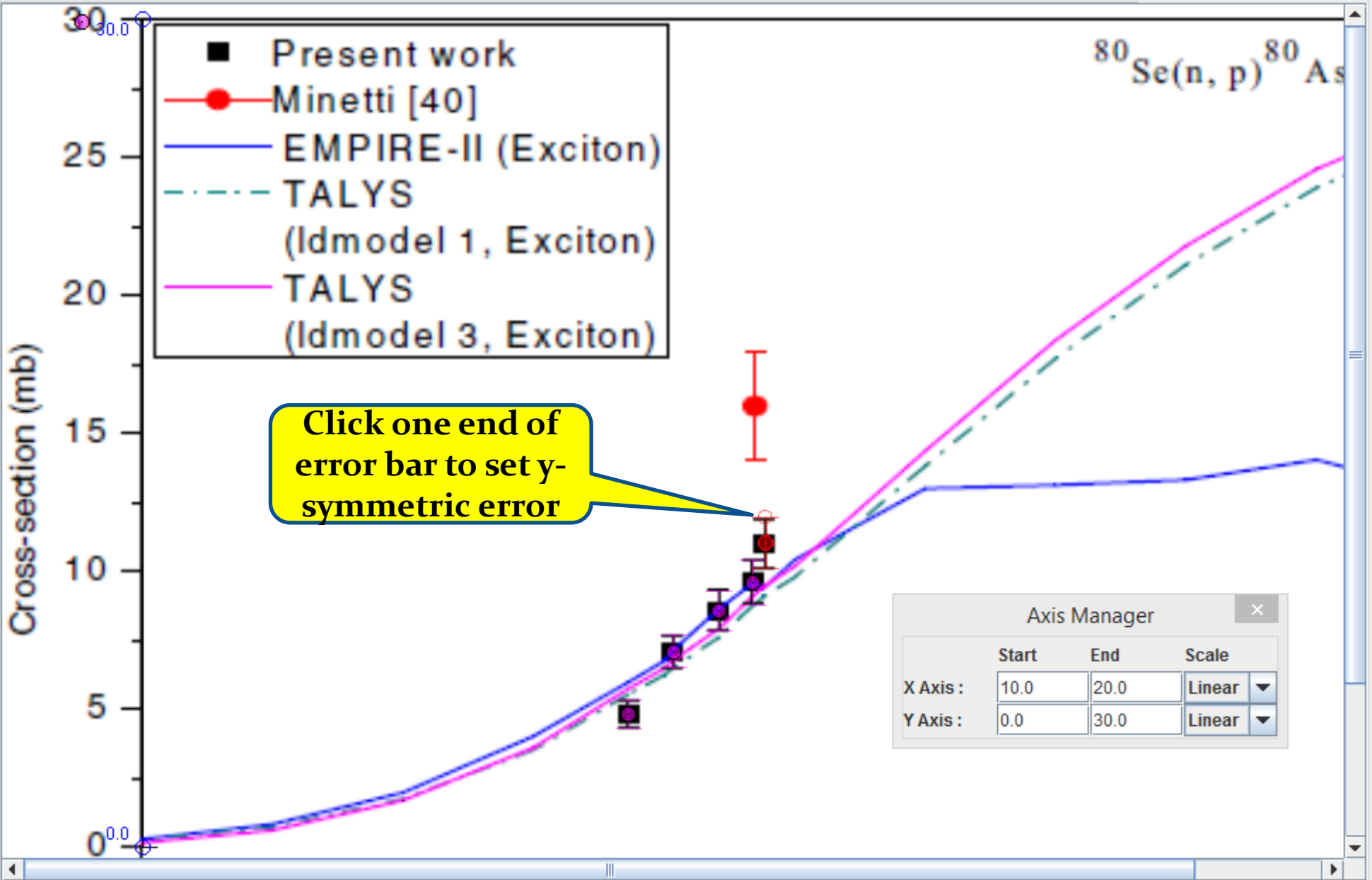
Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) **Y err(sy)** Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Click center of Data point

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!



Click one end of error bar to set y-symmetric error



4. Output Numerical Data

File Edit View

Open Image File Ctrl-O

Input Numerical Data Ctrl-I

Output Numerical Data Ctrl-S

Exit Ctrl-Q

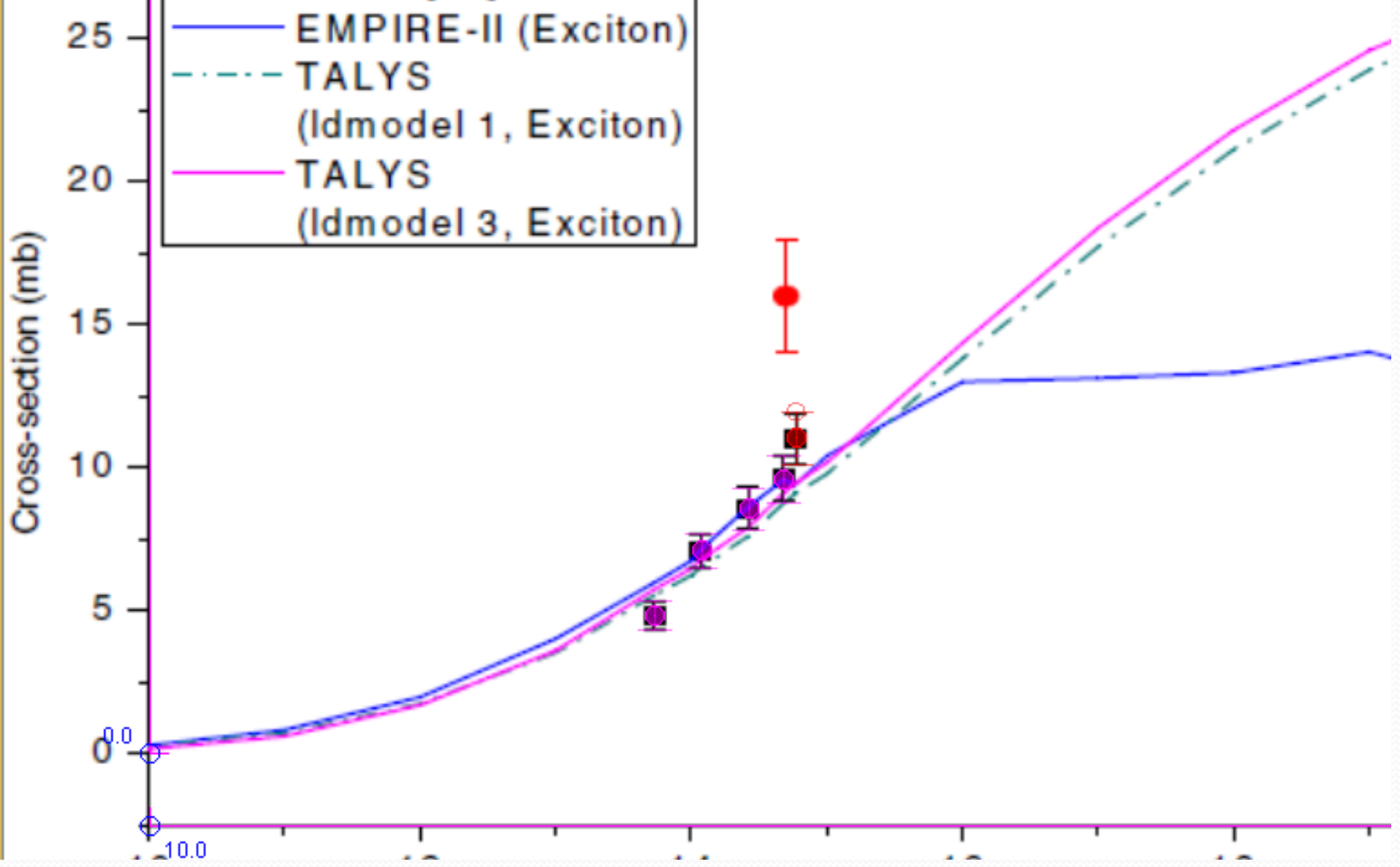
Rm X err(sy) X err(asy) Y err(sy)

reset Glass

Click File and select Output Numerical data

Present work
netti [40]

(n, p)⁸⁰ A:





Output Data



Write

Save

Sort X

Sort Y

No Sort

Close

x(start)= 10.0 , x(end)= 20.0 , Scale: Linear , Point: Floating , Digit: 3 decimal

y(start)= 0.0 , y(end)= 30.0 , Scale: Linear , Point: Floating , Digit: 3 decimal

Format of Output Data: EXFOR , Error notation: Relative

Sep: Space , X-err position: x dx y dy , Output Error: As Read

Click Write

Output Data

Write Save Sort X Sort Y No Sort Close

x(start)= 10.0 , x(end)= 20.0 , Scale: Linear , Point: Fixed , Digit: 3 decimal
y(start)= 0.0 , y(end)= 30.0 , Scale: Linear , Point: Fixed , Digit: 3 decimal

Format of Output Data: EXFOR , Error notation: Relative
Separator: Space , X-err position: x dx y dy , Output: As Read

```
# Digitized by GSYS2.4.7  
# Date = 1.Jan.2015, 20:47:11  
# Number of data = 5  
# set xrange[10.0, 20.0]  
# set yrange[0.0, 30.0]  
# MD5Fig : 5aa4c498729d06536e0e6867a1e6eb17  
# Axis_X : 3fb7cafe316497cb3febcb2e6de597373fef18b24be57f193febcb2e6d  
# Axis_Y : 3fb7cafe316497cb3fe9a9f4ecd4fa763fb7cafe316497cb3f8eaa4ffc  
# x y dy  
13.733 4.865 0.503  
14.082 7.129 0.593  
14.438 8.637 0.736  
14.689 9.679 0.790  
14.791 11.098 0.898
```

Axis Manager

rt	End	Scale
0	20.0	Linear
	30.0	Linear

1. Used Fixed Point for Linear scale
2. Used Floating Point for Logarithmic scale

File Edit View

Xa Ya *Ya Auto Ad Rm X err(sy) X err(asy) Y err(sy) Y err(asy) Magnify Shrink Loupe Reset Glass Shot!

Click Save

Output Data

Write Save Sort X Sort Y No Sort Close

x(start)= 10.0 , x(end)= 20.0 , Scale: Linear , Point: Fixed , Digit: 3 decimal

y(start)= 0.0 , y(end)= 30.0 , Scale: Linear , Point: Fixed , Digit: 3 decimal

Format of Output Data: EXFOR , Error notation: Relative

Separator: Space , X-err position: x dx y dy , Output Error: As Read

Axis Manager

rt	End	Scale
0	20.0	Linear
	30.0	Linear

```
# Digitized by GSYS2.4.7
# Date = 1.Jan.2015, 20:47:11
# Number of data = 5
# set xrange[10.0, 20.0]
# set yrange[0.0, 30.0]
# MD5Fig : 5aa4c498729d06536e0e6867a1e6eb17
# Axis_X : 3fb7cafe316497cb3febcb2e6de597373fef18b24be57f193febcb2e6de59737
# Axis_Y : 3fb7cafe316497cb3fe9a9f4ecd4fa763fb7cafe316497cb3f8eaa4ffc9c8a
# x y dy
13.733 4.865 0.503
14.082 7.129 0.593
14.438 8.637 0.736
14.689 9.679 0.790
14.791 11.098 0.898
```

- ❑ Enlarge the image for better accuracy.
- ❑ Pay special attention when x- and y-axis positions are determined for better accuracy.
- ❑ Use the fixed and floating decimal point expression for the numbers digitized from linear and logarithmic scale, respectively. Example:
 - 12.345 (a value digitized from linear scale)
 - 1.2345E+02 (a value digitized from logarithmic scale)
- ❑ Consider rounding of digitized values to reflect digitization accuracy. Consider rounding of digitized values to integers if values are for atomic numbers, mass numbers etc., and digitized values are close to integers.

Digitization Exercise

- Open GSYS2.4.7_Quick.doc.

(available on the IAEA website:

<https://www-nds.iaea.org/nrdc/india/ws2017/>

- Do digitization for Fig.3 and Fig.4.
- Put digitized values on the EXCEL sheet (dig-exc.xls) and check your performance by standard deviations.
- Do it for Fig.11, Fig.12 and Fig.13, too.



Thanks for your Attention