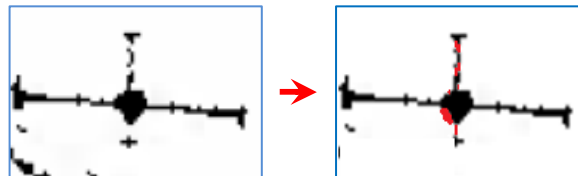


Some requirements for digitizing software and using advanced plotting for checking results.

V.Zerkin, IAEA, Nuclear Data Section, 13-Nov-2012

All three digitizers [1-3] presented on the Workshop presented show their essential progress. The most promising direction of the programs' development is further automation of operations. In particular, using automatic adjustment (focusing), i.e. search of the optimal location of the elements (images of symbol and scales) demonstrated by GSYS can allow reducing influence of human factor and finally to reach more stable results of digitization. There are still a lot of possibilities for improvements:

- 1) Auto-focusing of symbols: to implement in digitizer InpGraph, to extend in GSYS for cases with overlapping symbols (operator input number of symbols)
- 2) Editing defects on symbols and error-bars (?) and filling symbols (to make autofocusing more stable).
Example: improving image for automatic operations by editing (add/remove pixels)



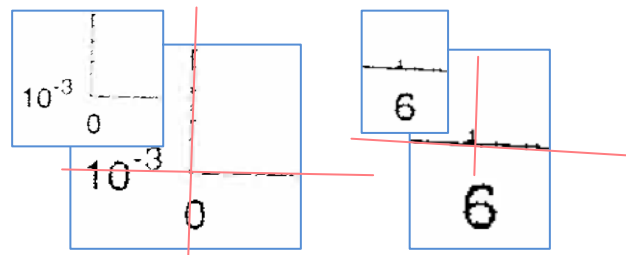
- 3) Precise calibration of scales using analytical approximation if necessary, e.g. as it is usually done for treatment of gamma spectra (calibration energy, FWHM and efficiency):

$$\text{Energy}(n\text{Channel}): E(n) = a_0 + a_1 \cdot n + a_2 \cdot n^2$$

$$\text{FWHM}(E) = \sqrt{a_0 + a_1 \cdot E}$$

$$\text{Efficiency}(E): \ln(\text{Eff}(E)) = a_0 + a_1 \cdot \ln(E) + a_2 \cdot \ln^2(E) + a_3 \cdot \ln^3(E) \dots + a_7 \cdot \ln^7(E)$$

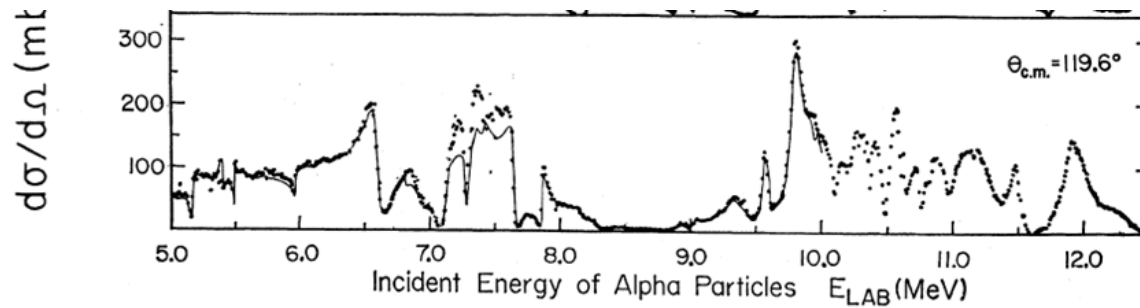
- 4) Auto-focusing of scales' crossings and strokes (needs recognition of lines, or "insert vectors and calculate their crossing")



- 5) Independent plotting (e.g. EXFOR-Uploading + Web-ZVView) can be used as objective checking of digitization result, e.g. it can allow finding mistakes in the scale definition and correct mistakes (labelling of axis) which cannot be found by "feedback" function of digitizers. Fig.1 presents direct comparison of the plotted digitized data with original plot (picture on the top was produced using existing tools without any software development).

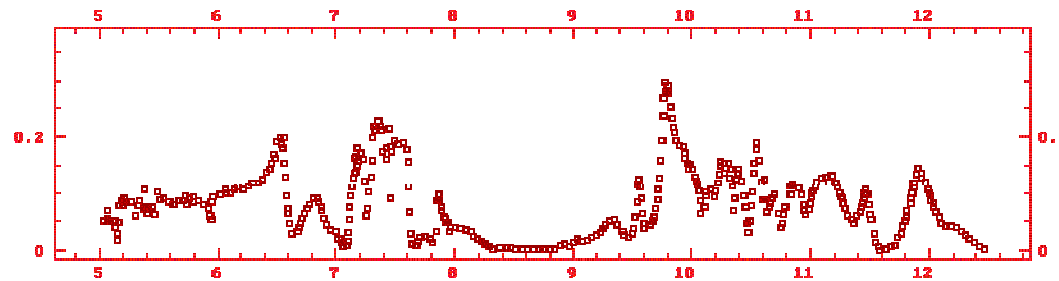
The Using ZVView plotting system with scale calibration for independent checking results of digitization.

Recently plotting package ZVView [4] was extended by 2-D scales calibration and output transformation functions. Fig.2 shows how manual 2-D scales calibration looks. Fig.3 was produced by ZVView distorting output plot using results of 2-D scales calibration from Fig.2. Fig.4 and 5 show direct comparison of the original plot with plot of the data - result of digitizing, distorted by ZVView (we can see too small upper error bars of the experimental data points between 5 and 10 MeV). Fig.6 shows an example of another way of output plot transformation implemented in ZVView – using analytical functions. The options of transformation of the plots can be also added to Web-ZVView package if users are interested.



PDF image

Plot from EXFOR
and Web-ZVView



Red image was
stretched and rotated
on 0.5° to make scales
coinciding with PDF

Two plots
together

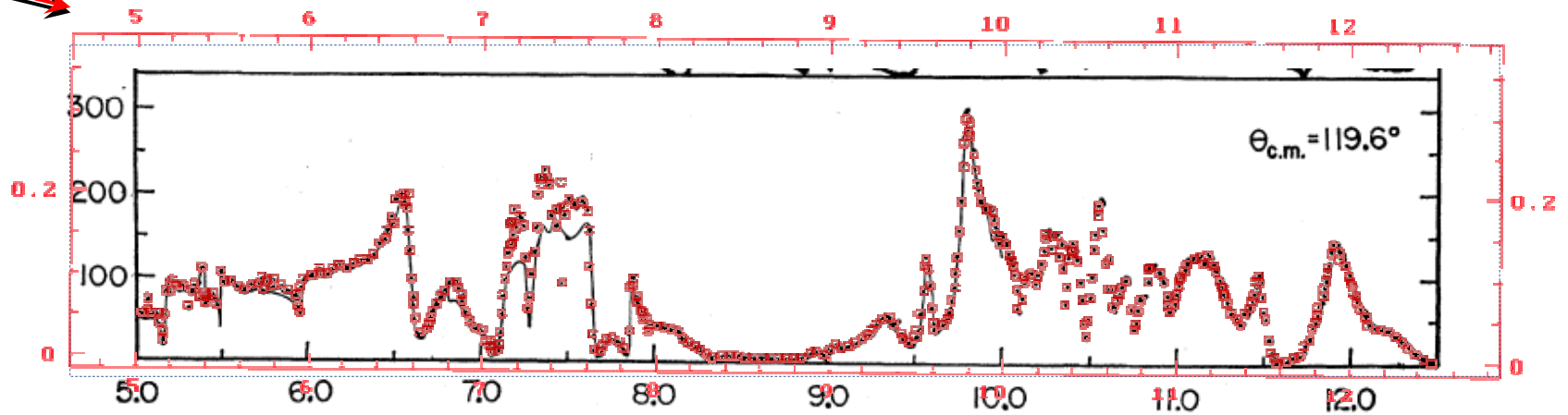


Fig.1. Independently produced plot (red) on top of PDF image (black) with precise coincidence of the scales

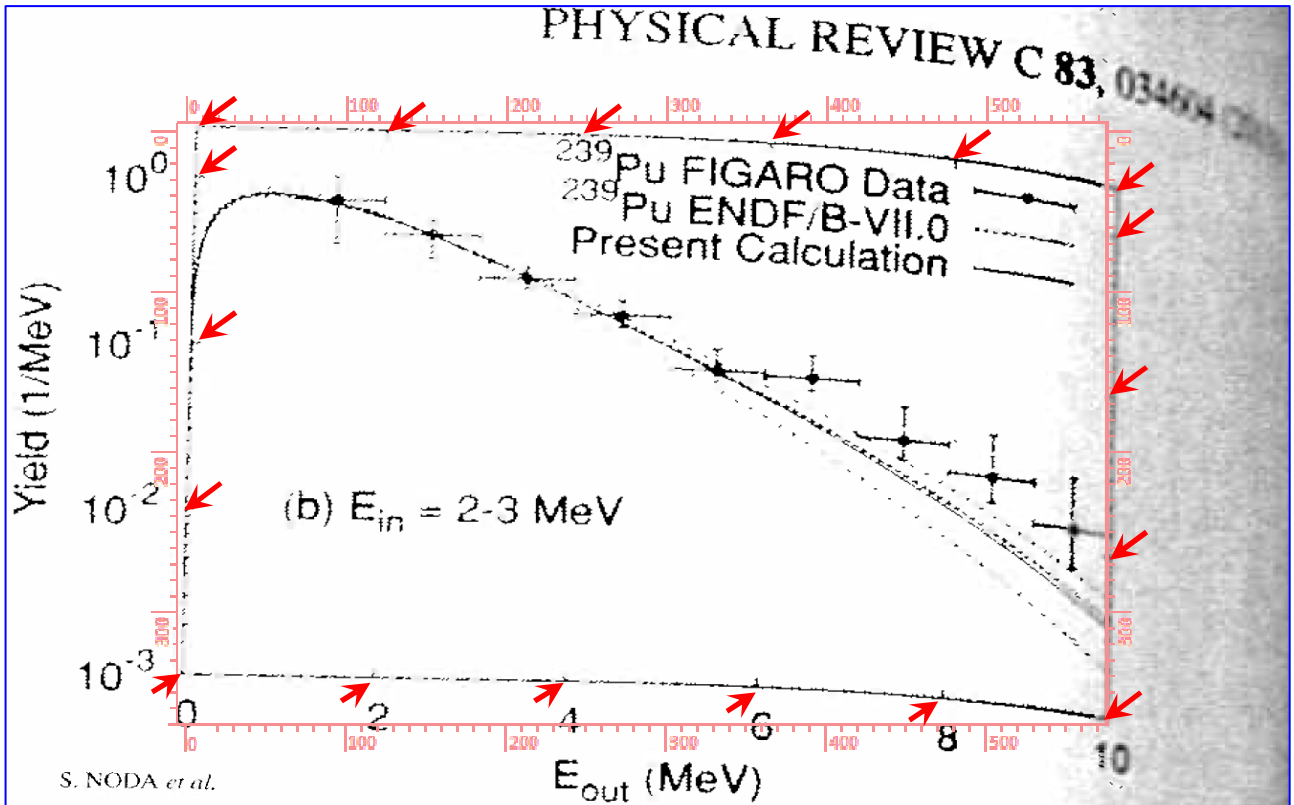


Fig.2 Difficult case: needs calibration of the scales and advanced algorithms to restore rectangular grid correctly

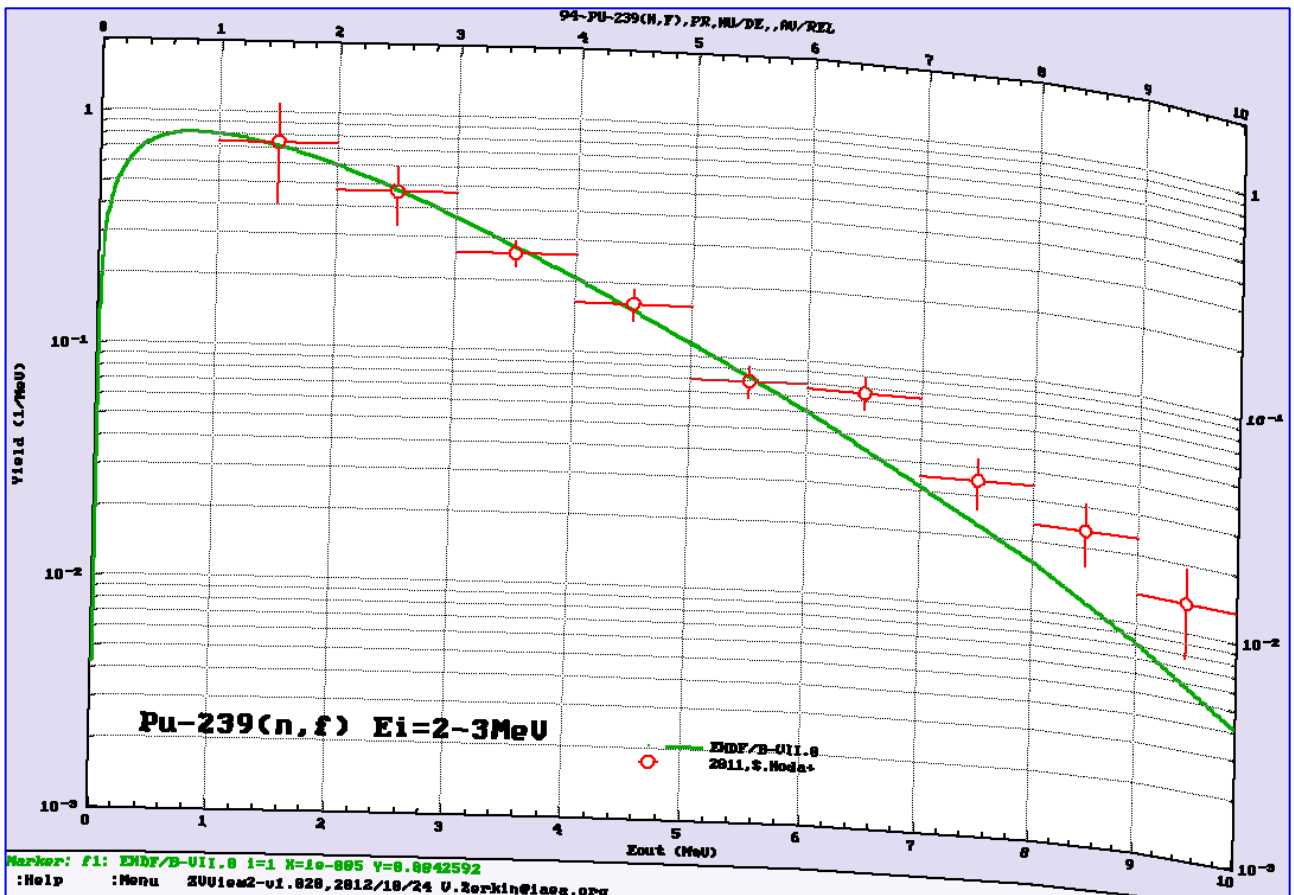


Fig.3. Plot of digitizing results distorted by extended version of ZVView. Transformation was done using 2-D scales calibration procedures (Fig.2.)

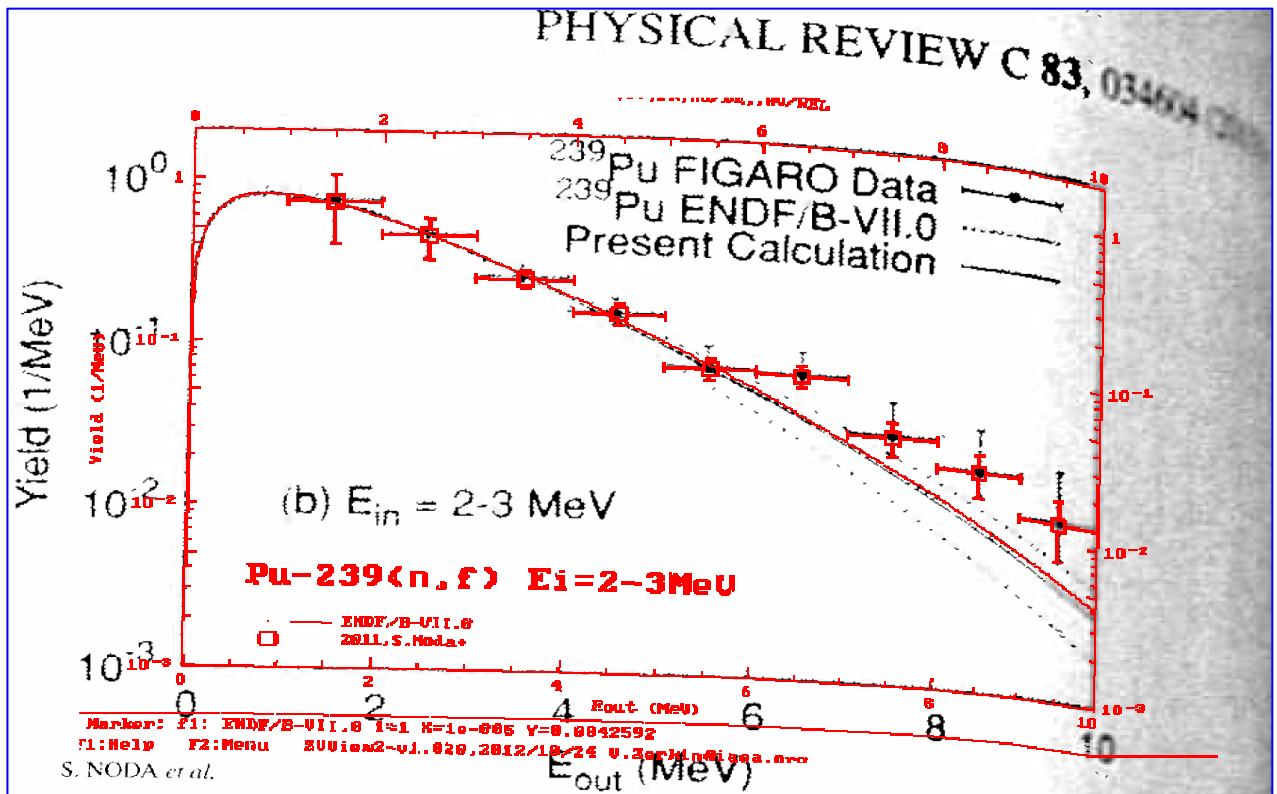


Fig.4. Direct comparison of original plot and the plot of the results of digitizing distorted by ZVView using calibration of the scales (Fig.2.)

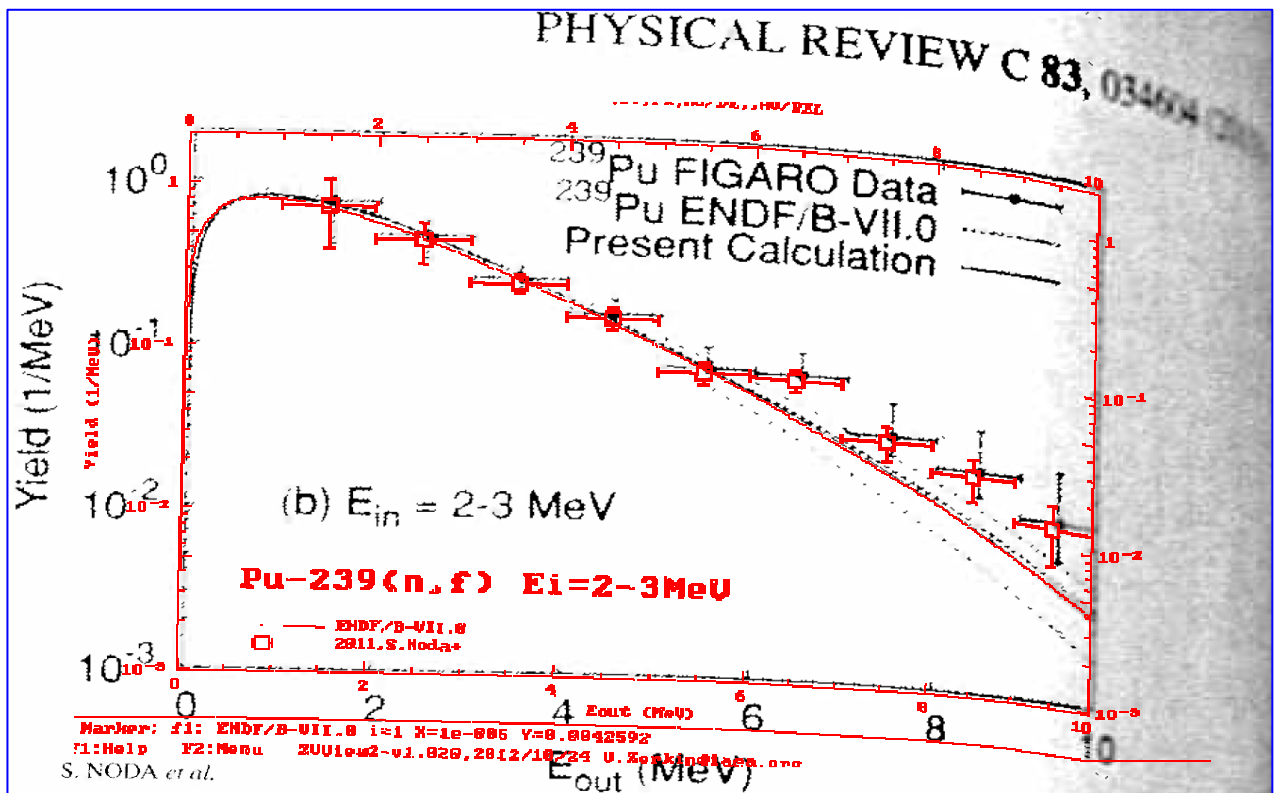


Fig.5. Direct comparison of the original plot and distorted plot of digitized data: the same as Fig.4, but with shifted beginning of coordinates for better visibility of the differences in error bars

