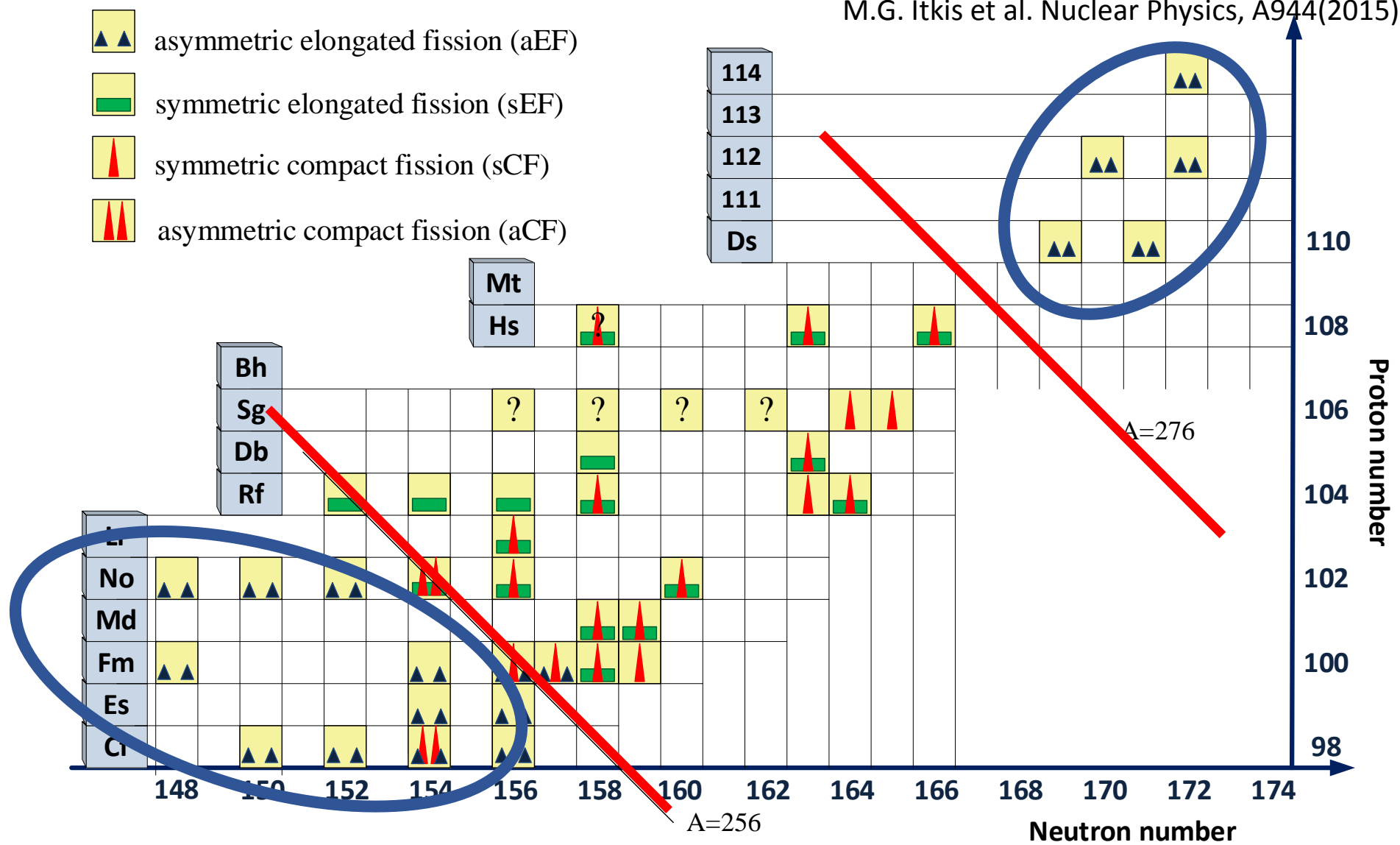


**Investigation of mass-energy distributions of
fragments formed in the
 $^{32}\text{S} + ^{232}\text{Th} \rightarrow ^{264}\text{Sg}$ reaction at energies below
and near the Coulomb barrier**

E.Galkina

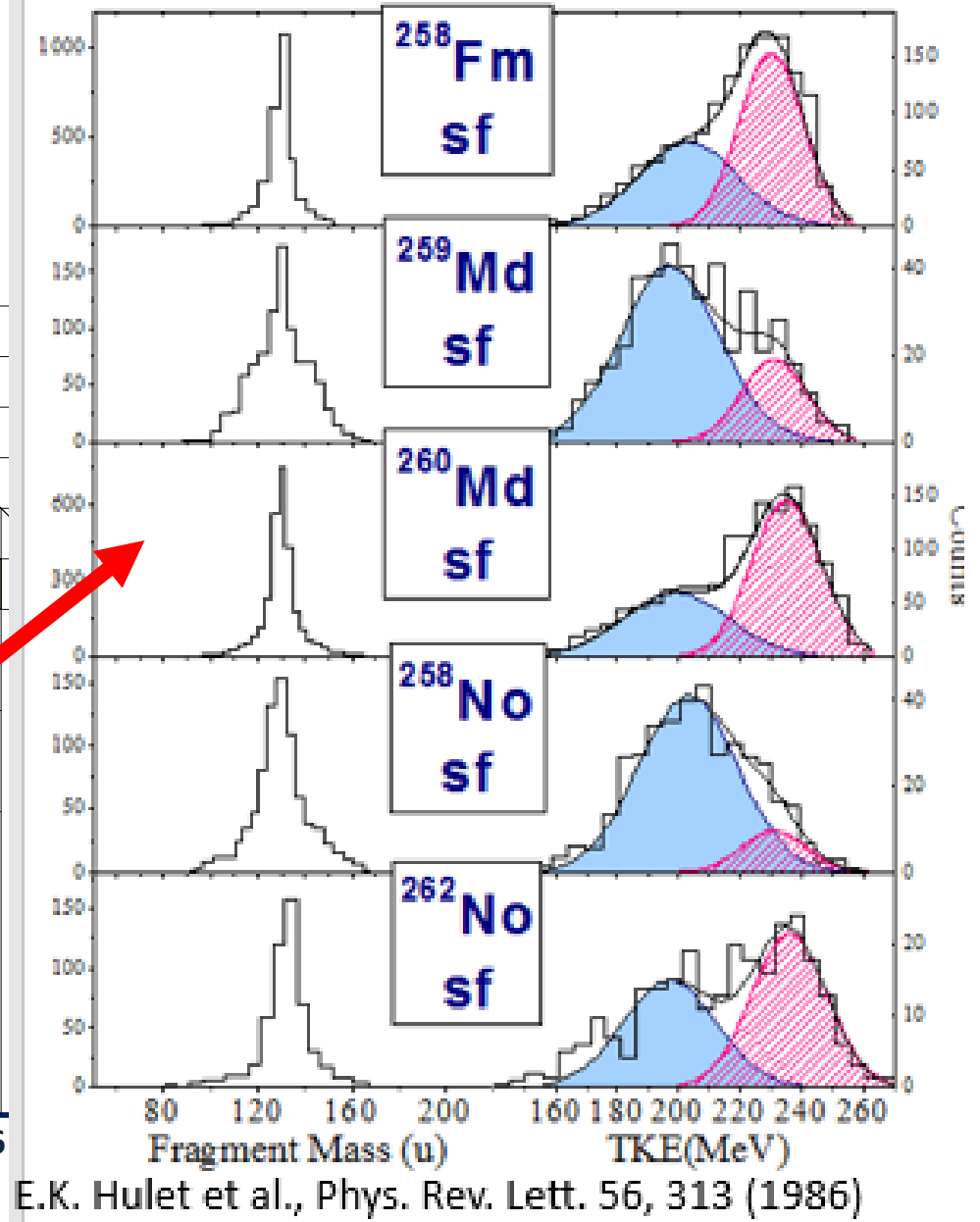
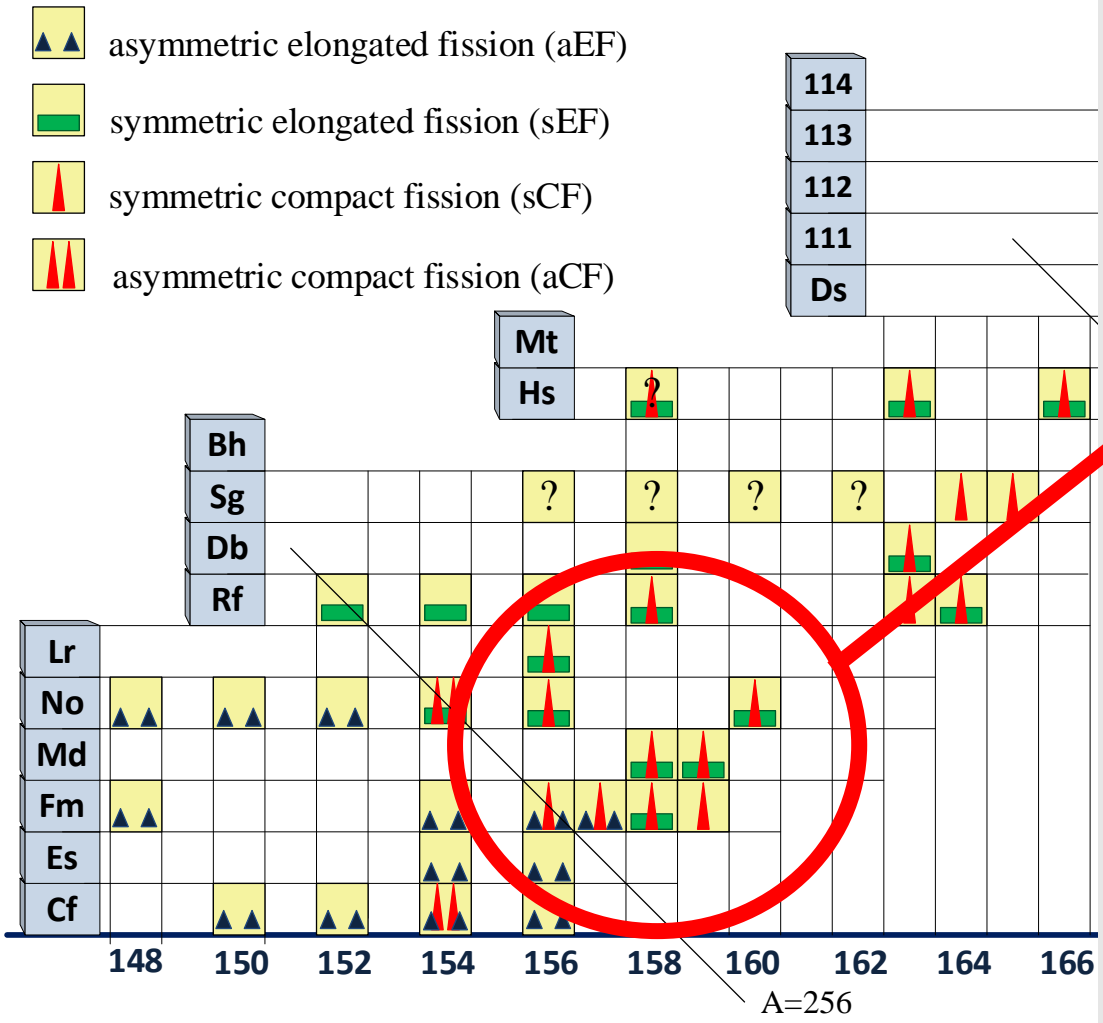
FLNR, JINR, Dubna, Russia

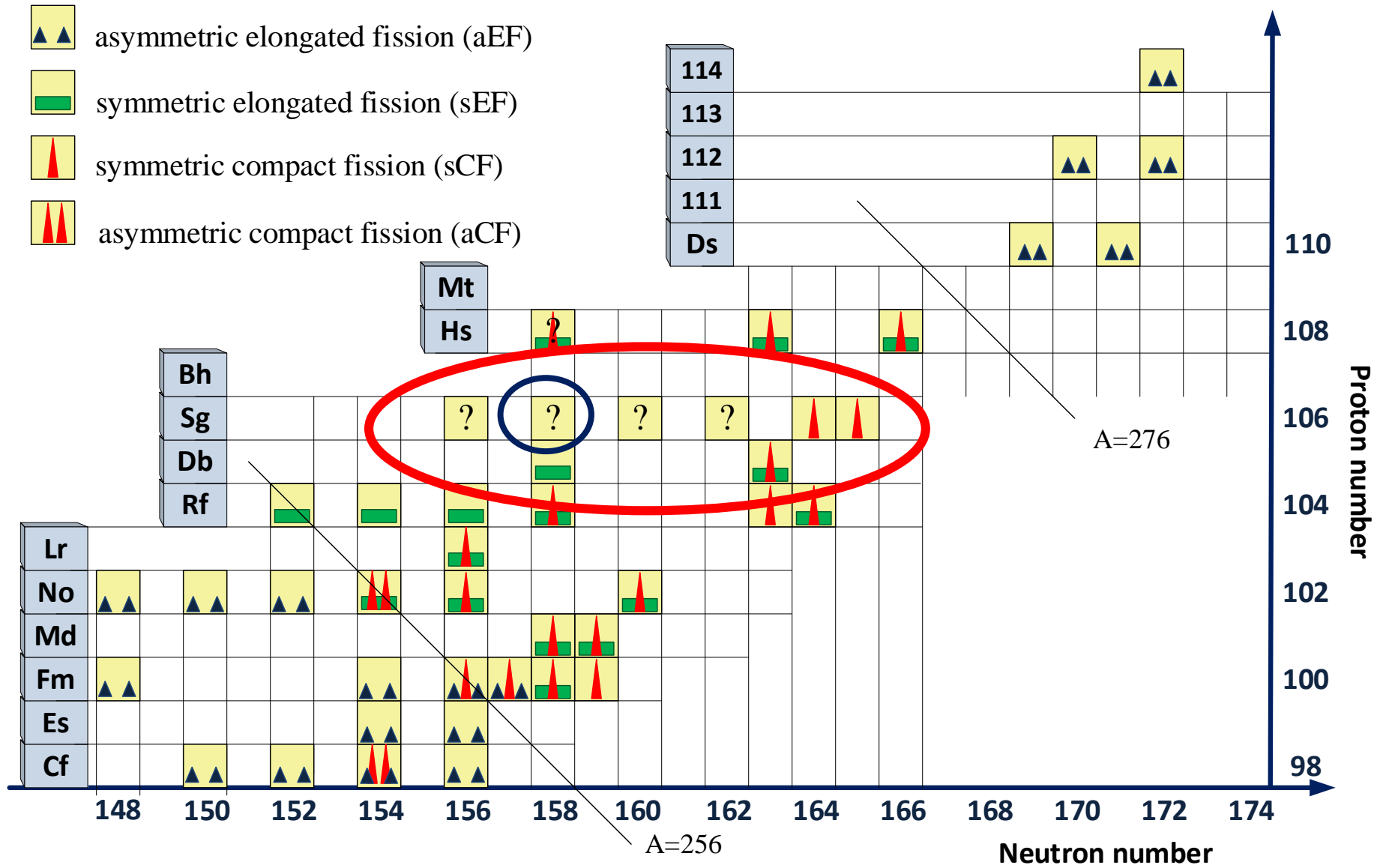




Type of mass distribution of fragments of stimulated and spontaneous fission depending on the nucleon composition of the fissile nucleus for the region of heavy and superheavy nuclei Cf – Fl.

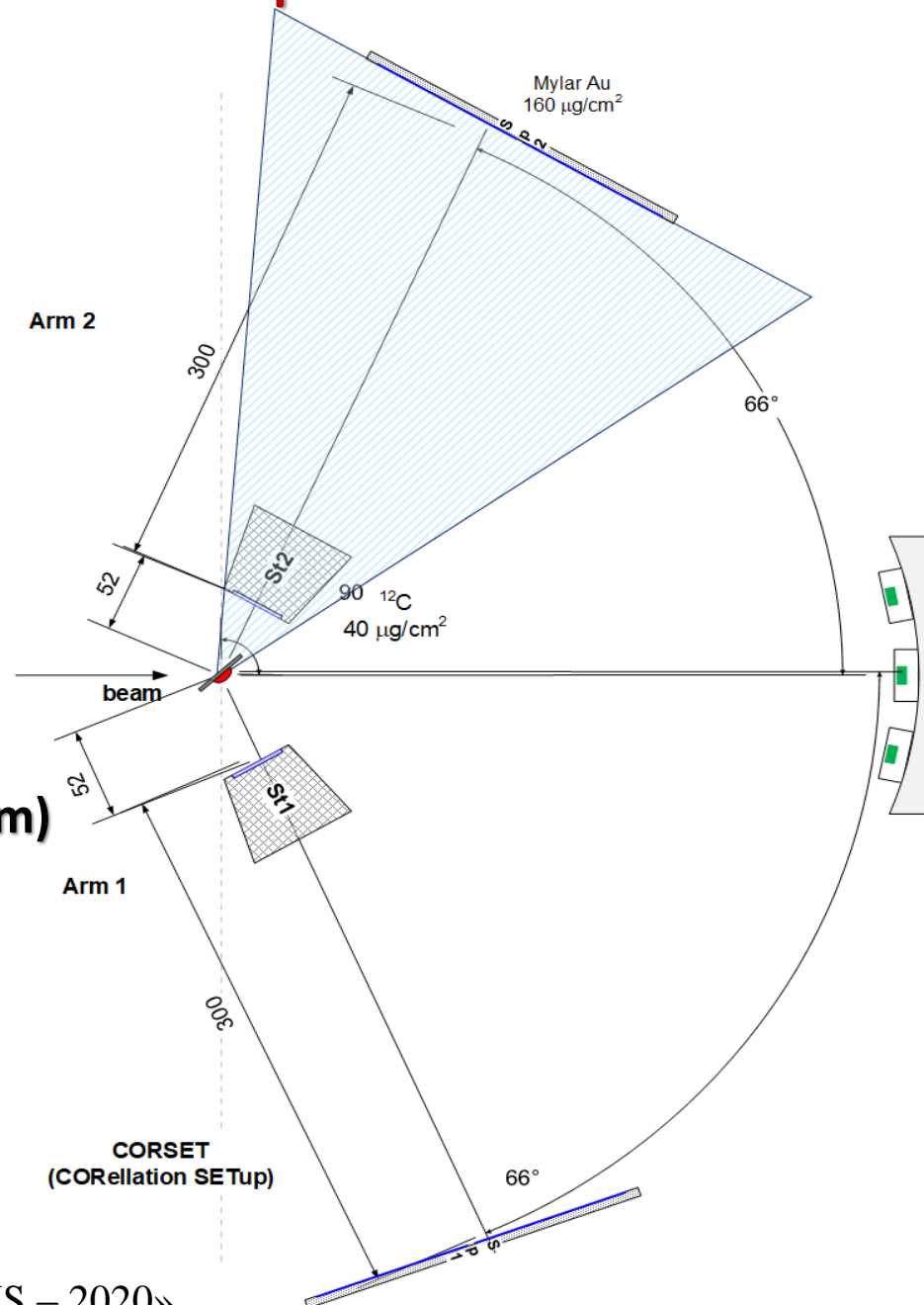
M.G. Itkis et al. Nuclear Physics, A944(2015), 204–237, 217.





Experimental setup and methods of data processing

- Time resolution 150 ps
- Mass resolution $\sim 3-5$ a.e.m
- Angular resolution 0.3°
- Geometric efficiency 1-8% (depends on the size of the detectors and the distance between them)



Measured parameters:

$$\text{TOF}_1, \text{TOF}_2, \theta_1, \theta_2$$



Conservation law for nucleon numbers:

$$M_{\text{proj}} + M_{\text{targ}} = M_1 + M_2 + v_{\text{pre}}$$

Impulse conservation law:

$$M_{\text{proj}} V_{\text{proj}} = M_1 V_1 + M_2 V_2$$



Received parameters:

$$M_{1,2}, \text{TKE}$$

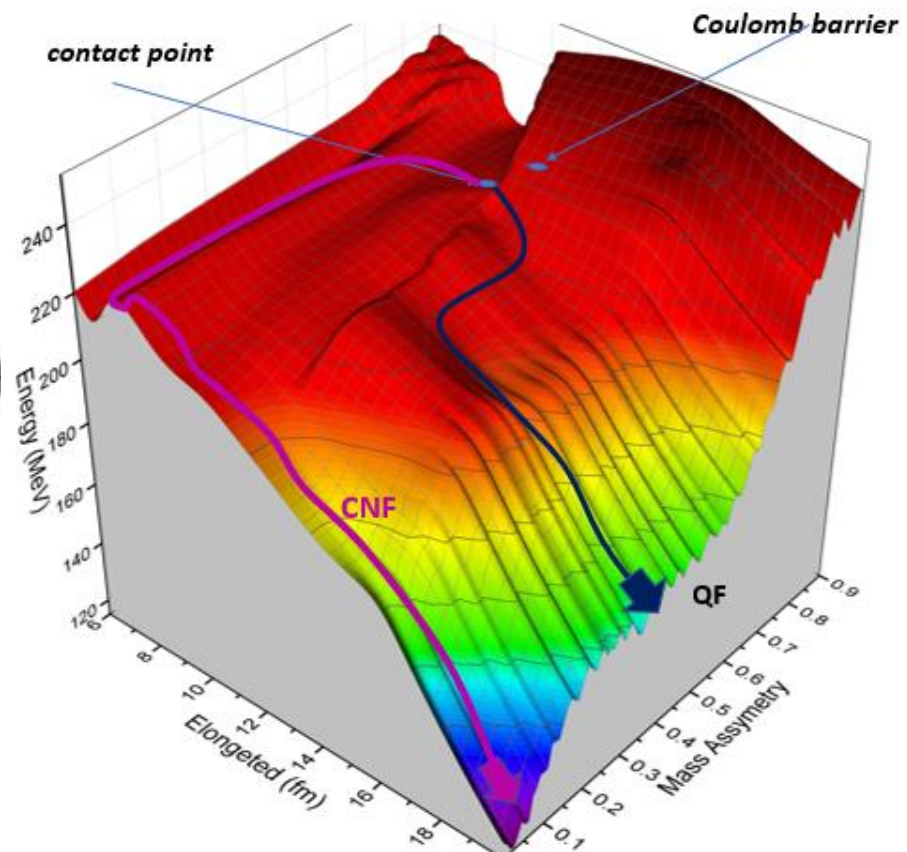
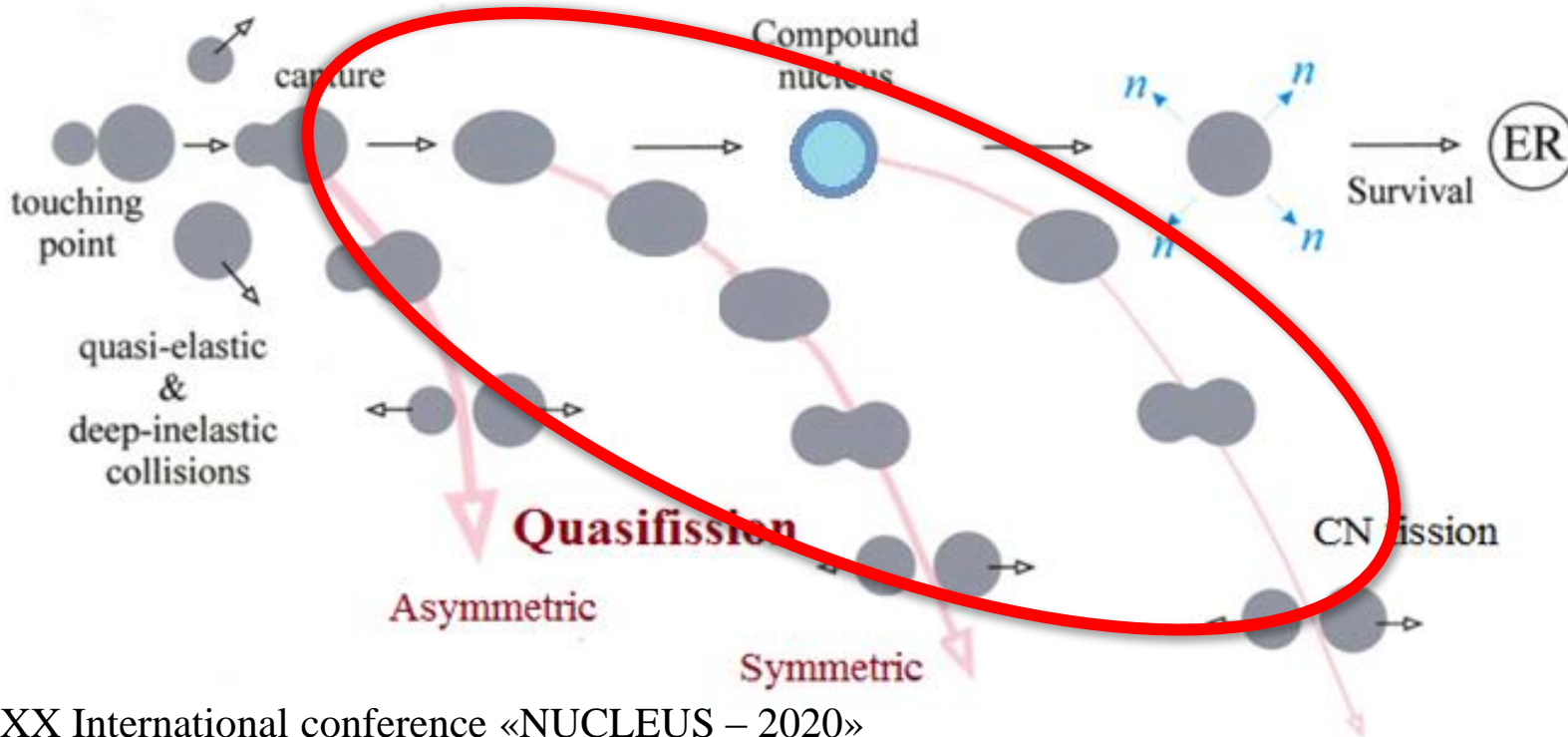
Characteristics of FF and QF

Fission of nuclei

- Mass distribution has a typical Gaussian shape with the dispersion depending on excitation energy and angular momentum of compound nucleus
- Symmetric angular distributions of fragments with respect to 90° in the center-of-mass system

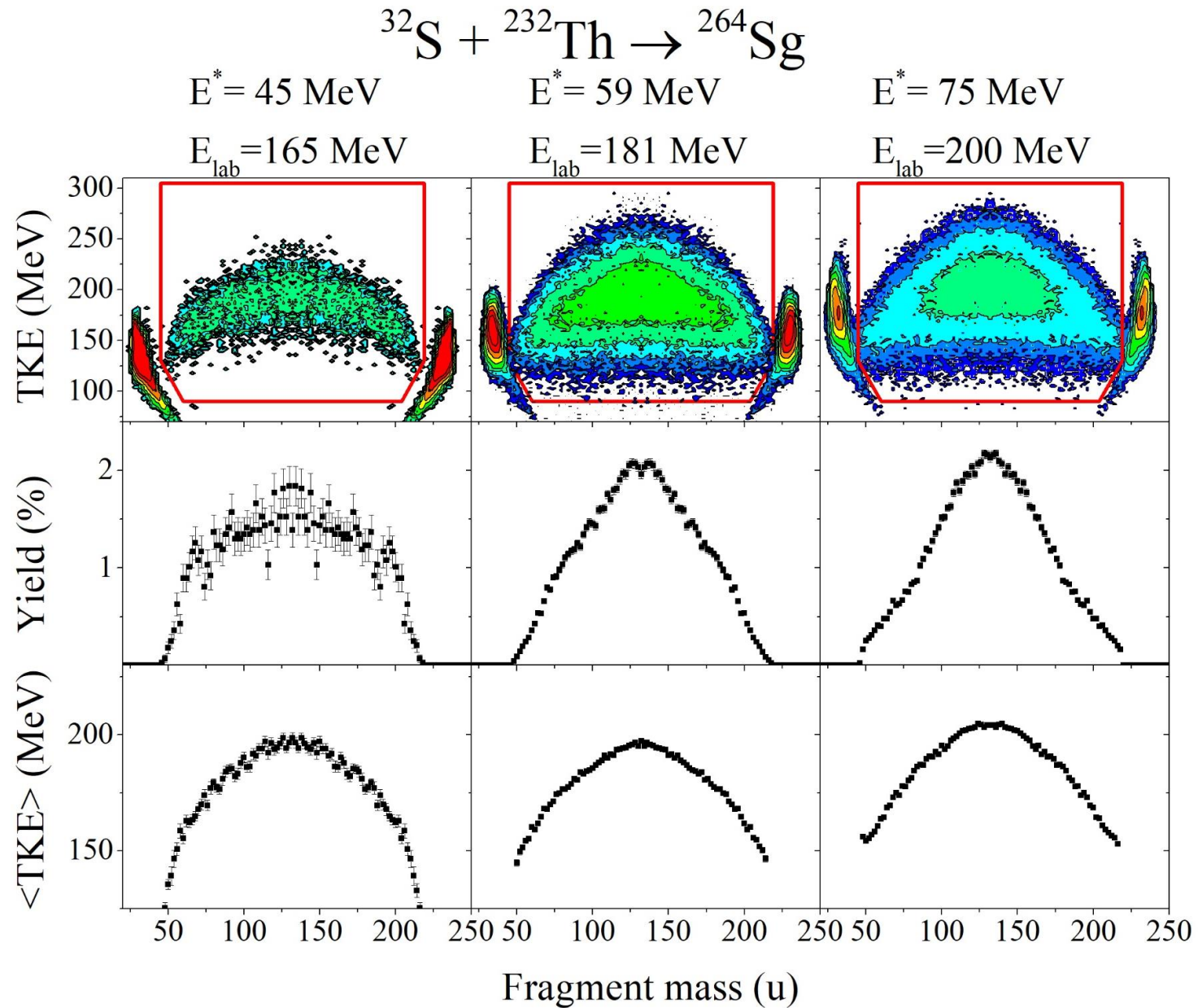
Quasifission

- Wide mass distribution
- Asymmetric angular distribution of fragments with respect to 90° in the center-of-mass system
- Higher kinetic energies than for compound nucleus fission

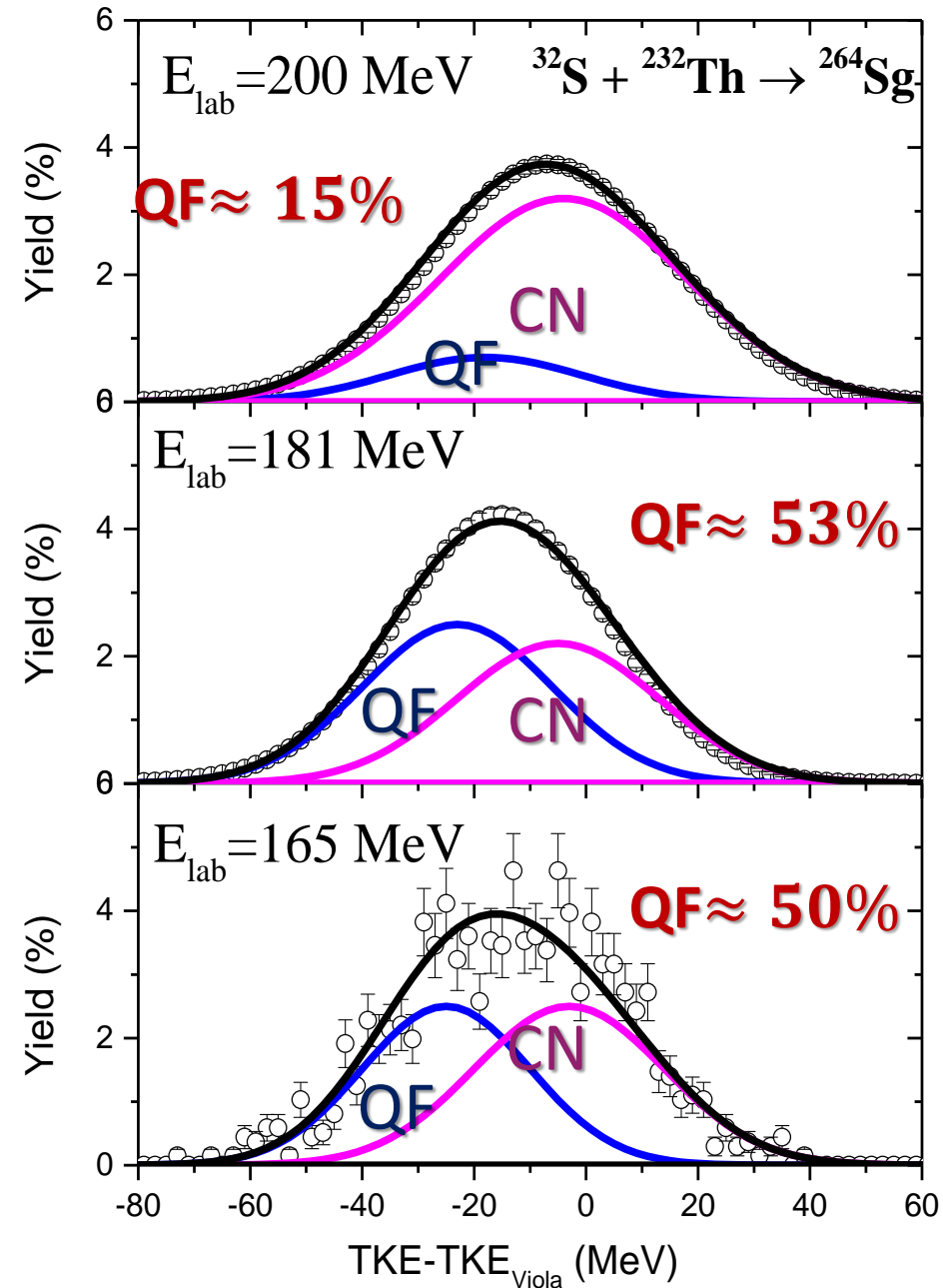


nrv.jinr.ru (proximity model)

Experimental mass energy distributions (MED)

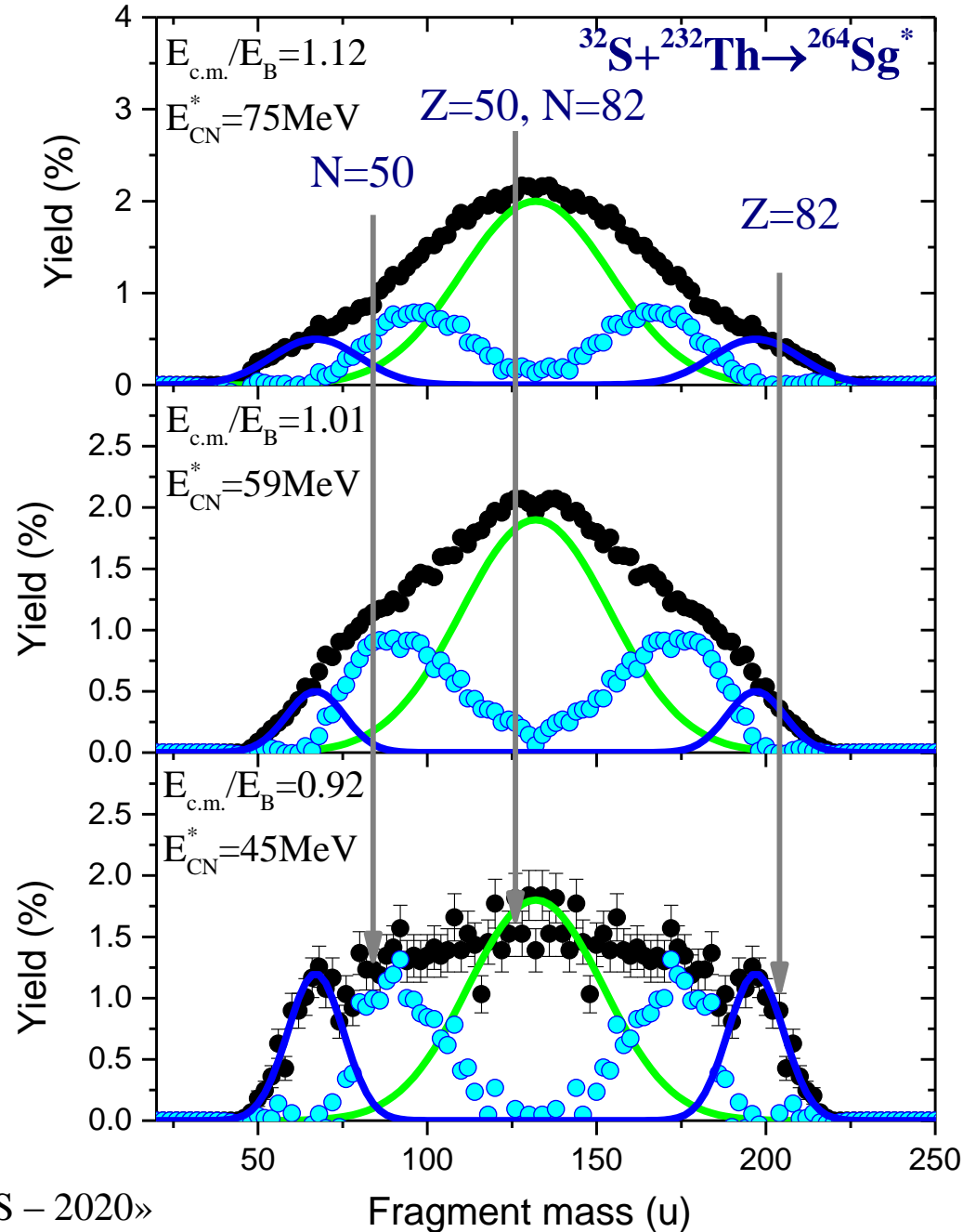


The results of the decomposition of energy distributions



$$A_{\text{CN}}/2 \pm 20 \text{ a.e.m}$$

The results of the decomposition of mass distributions



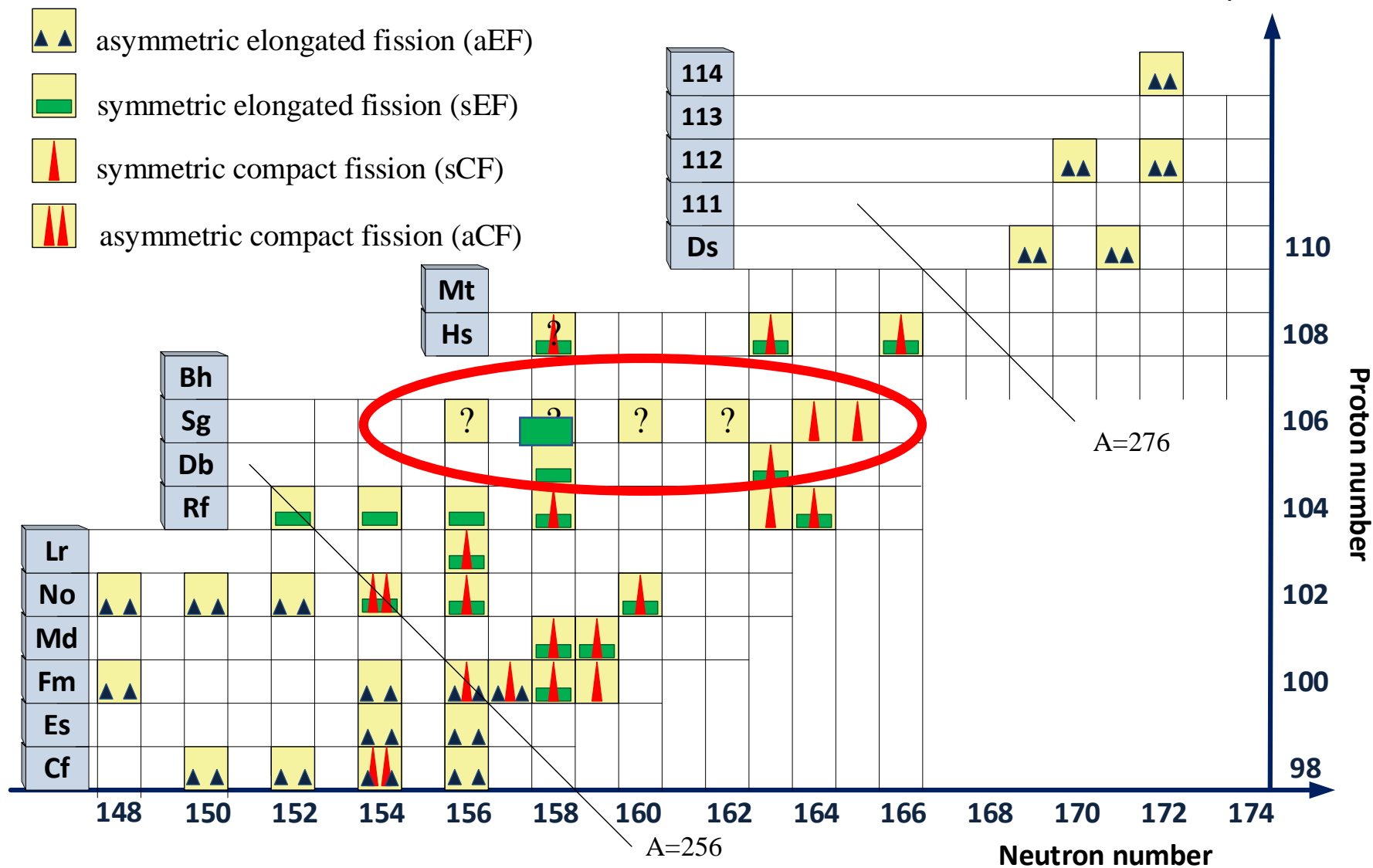
The green line is the distribution within the LDM model.

The blue lines are the distribution corresponding to the quasifission.

The blue dots are the difference between the experimental data and the descriptions of the quasifission component and the liquid drop.

Features of the fission of ^{264}Sg

M.G. Itkis et al. Nuclear Physics, A944(2015), 204–237, 217.



Summary:

1. Mass-energy distributions of fission fragments were obtained for all measured energies 165, 181, 200 MeV; the dependence of the distribution width on the excitation energy was plotted.
2. The separation of quasifission and fusion-fission processes is carried out. The contribution of quasi-fission was at an energy of 165 MeV ~ 50%, at 181 MeV -53% and at 200 MeV - 15%.
3. From the analysis of all the obtained experimental data, it was concluded that the process of fusion-fission of exciting ^{264}Sg nuclei has the character of a deformed symmetric fission

Collaboration

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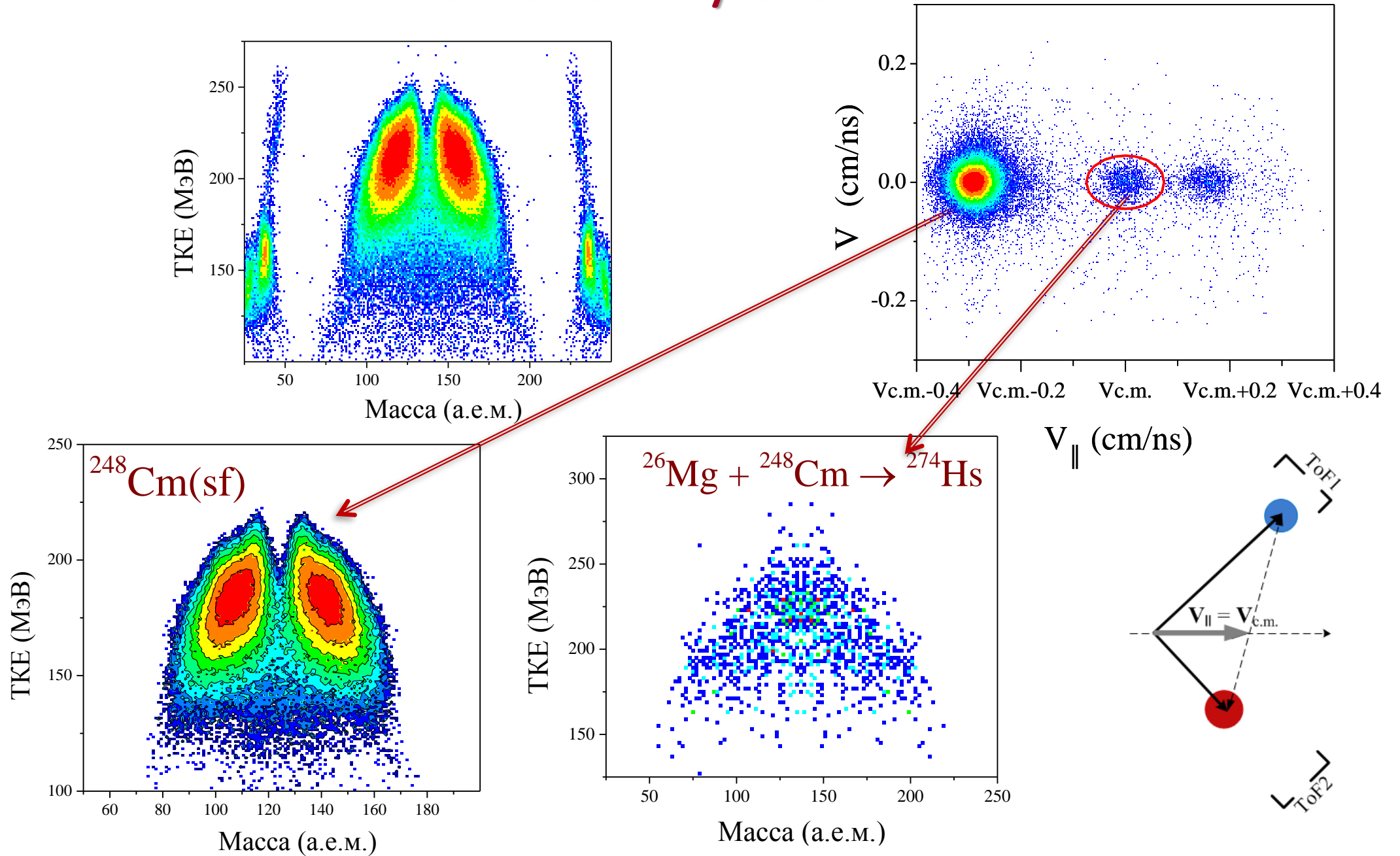
C. Borcea , I. Harca , D. M. Filipescu

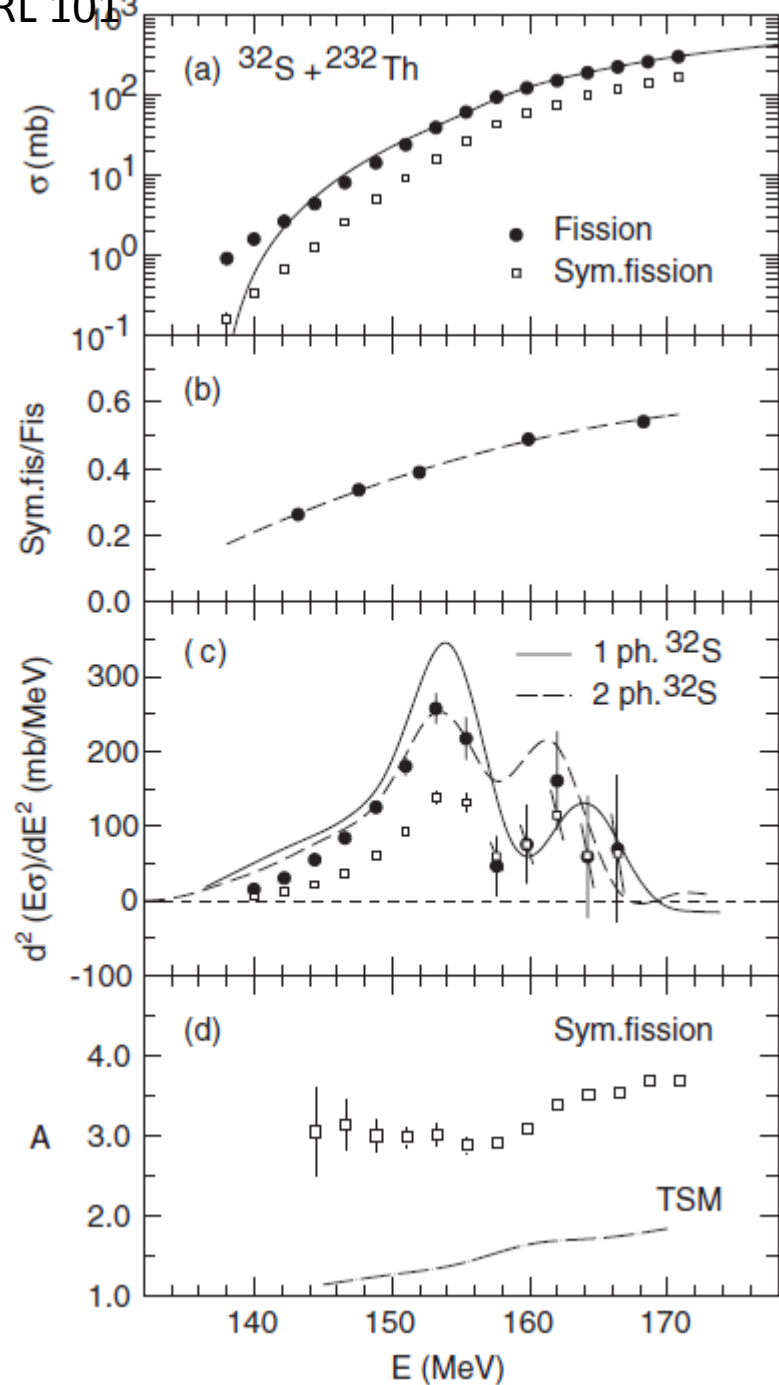
Horia Hulubei National Institute for Physics and Nuclear Engineering, Bucharest- Măgurele, Romania



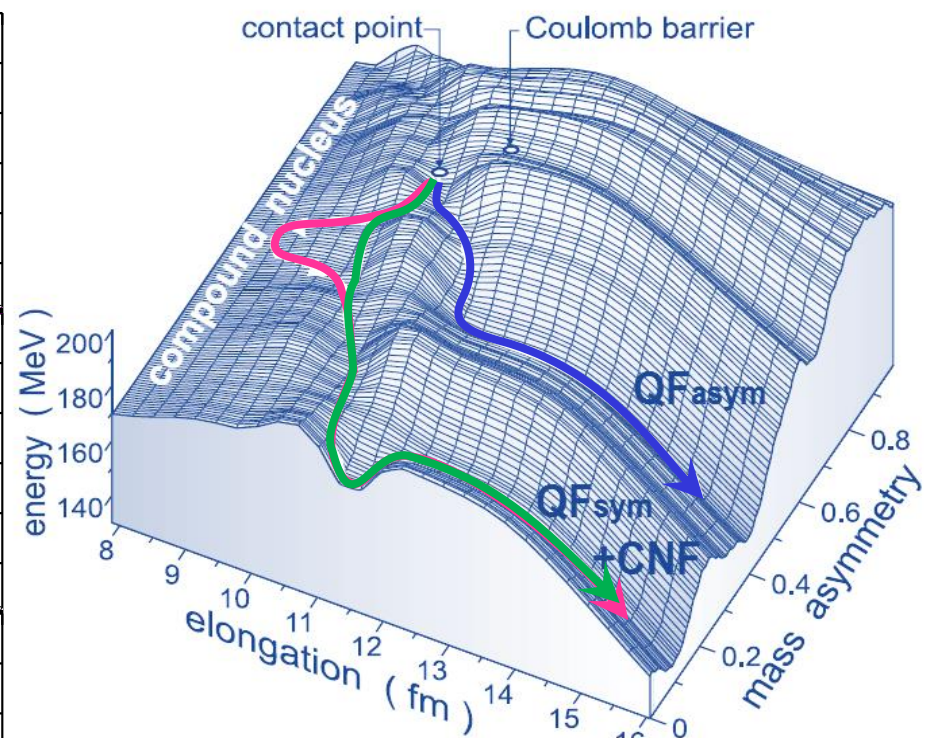
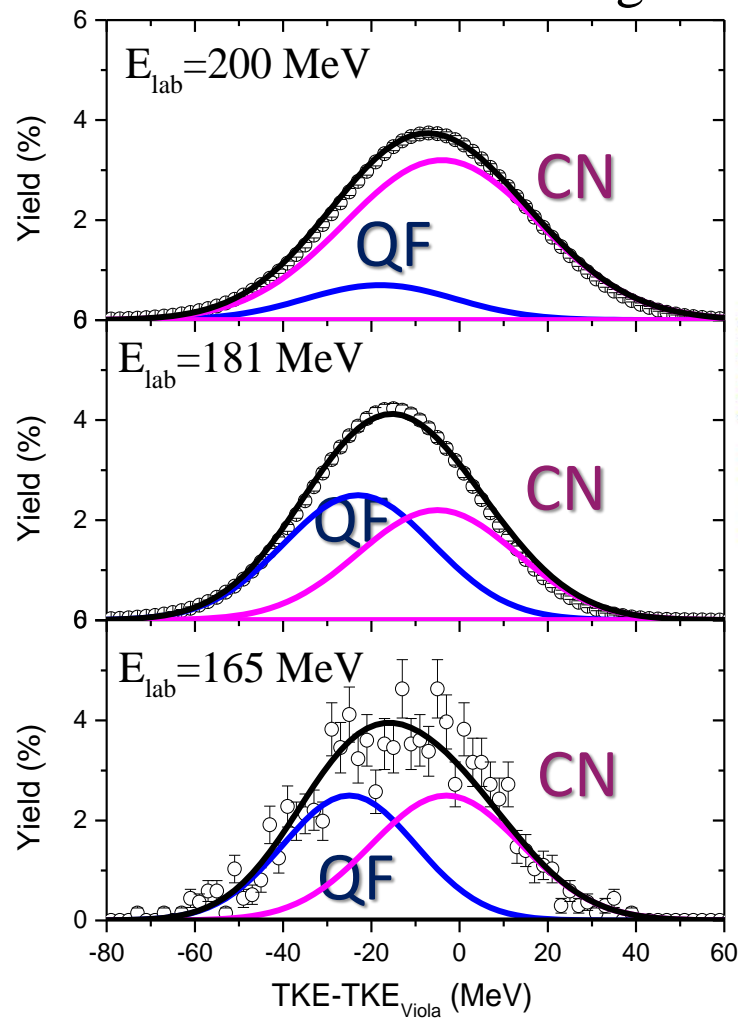
Thank you for attention!

Extraction of binary event channels



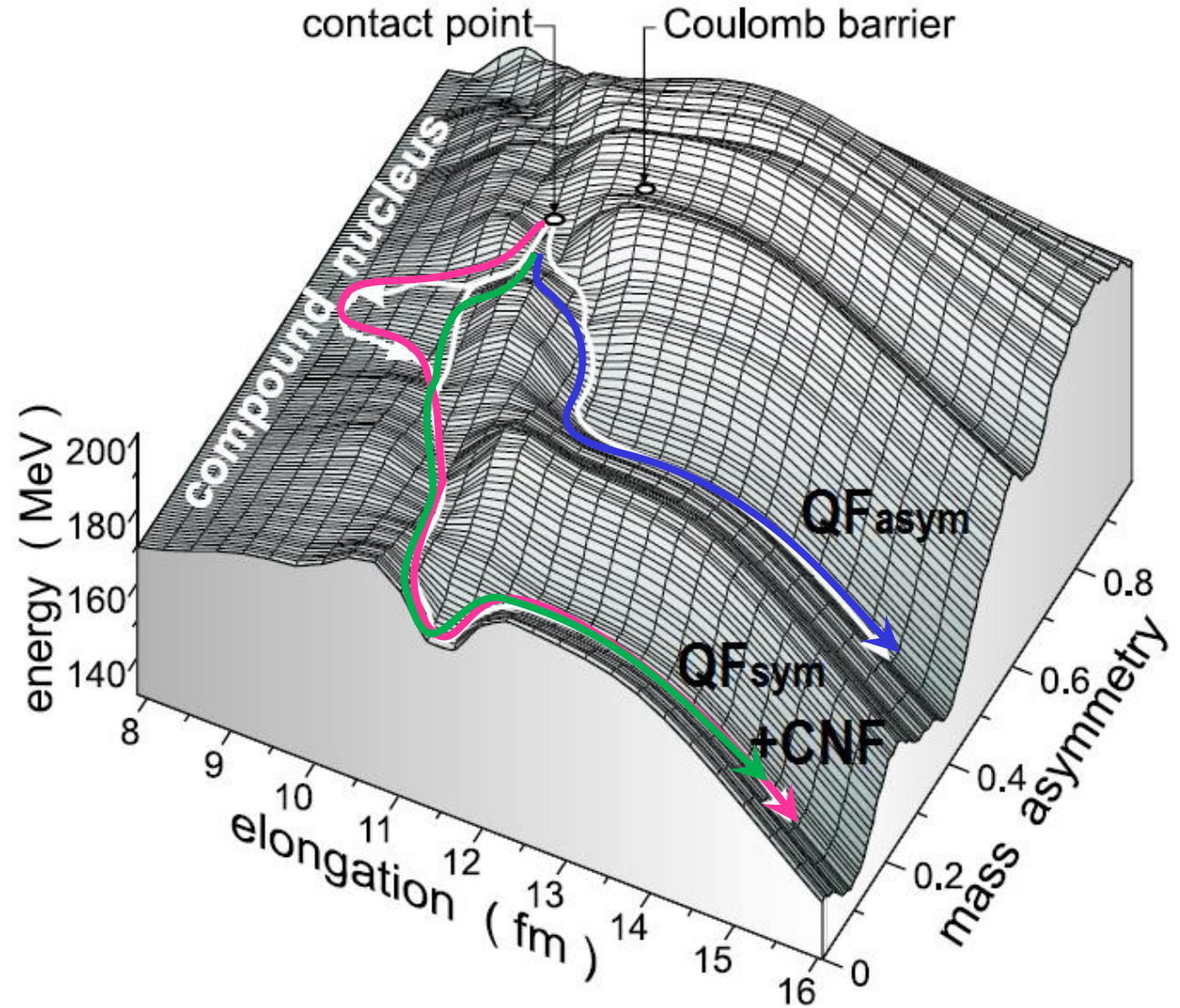
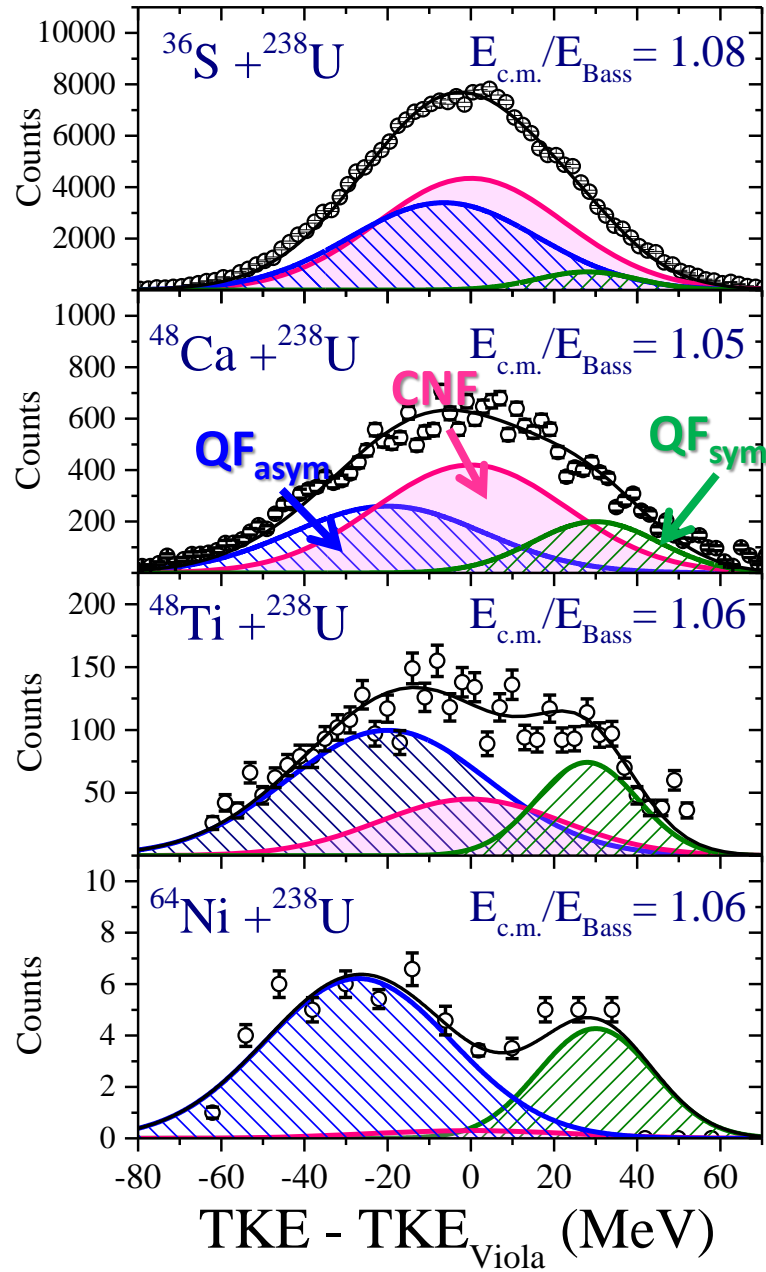


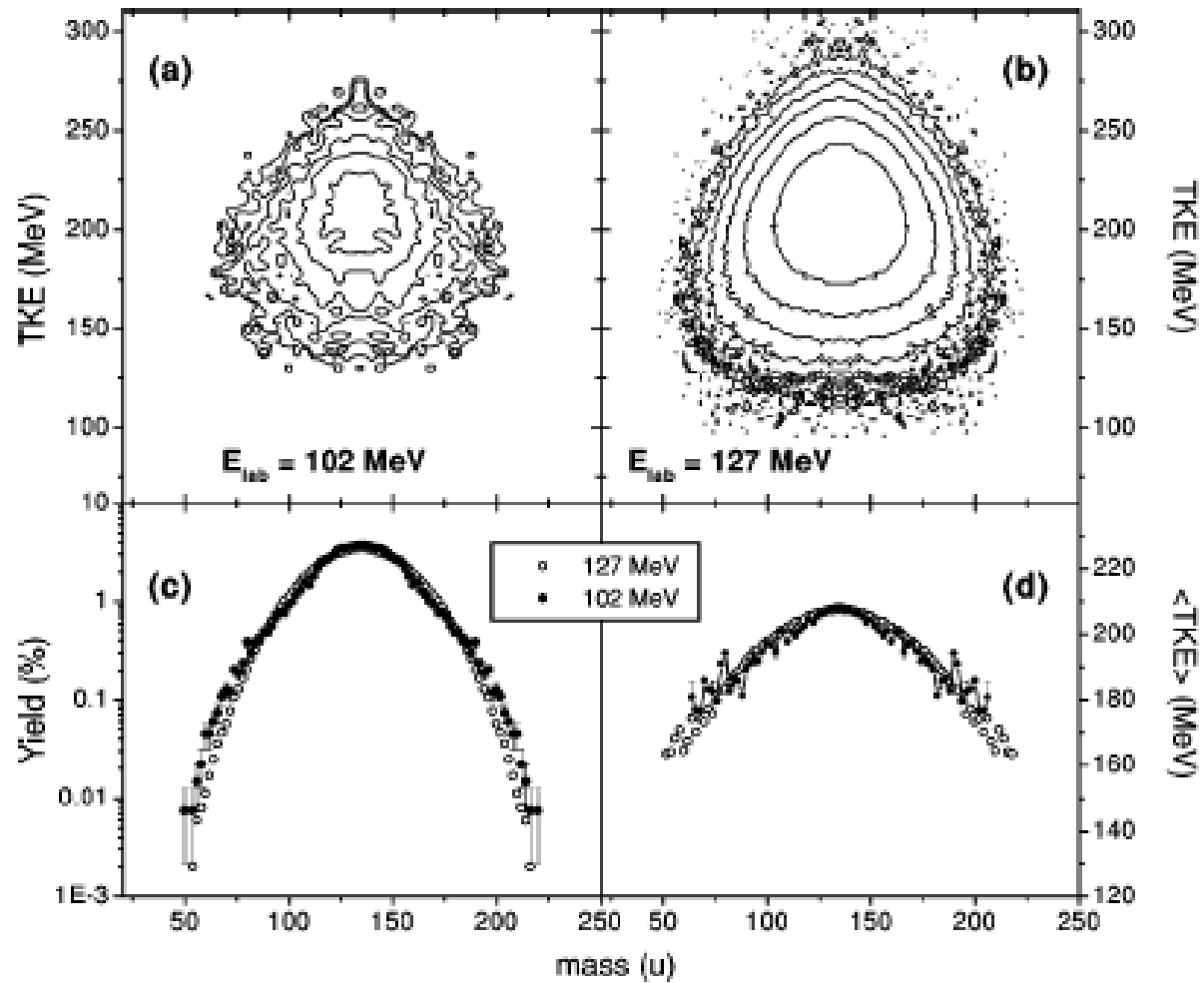
Analysis of TKE distributions for fragments with masses $A_{\text{CN}} \pm 20$ amu.

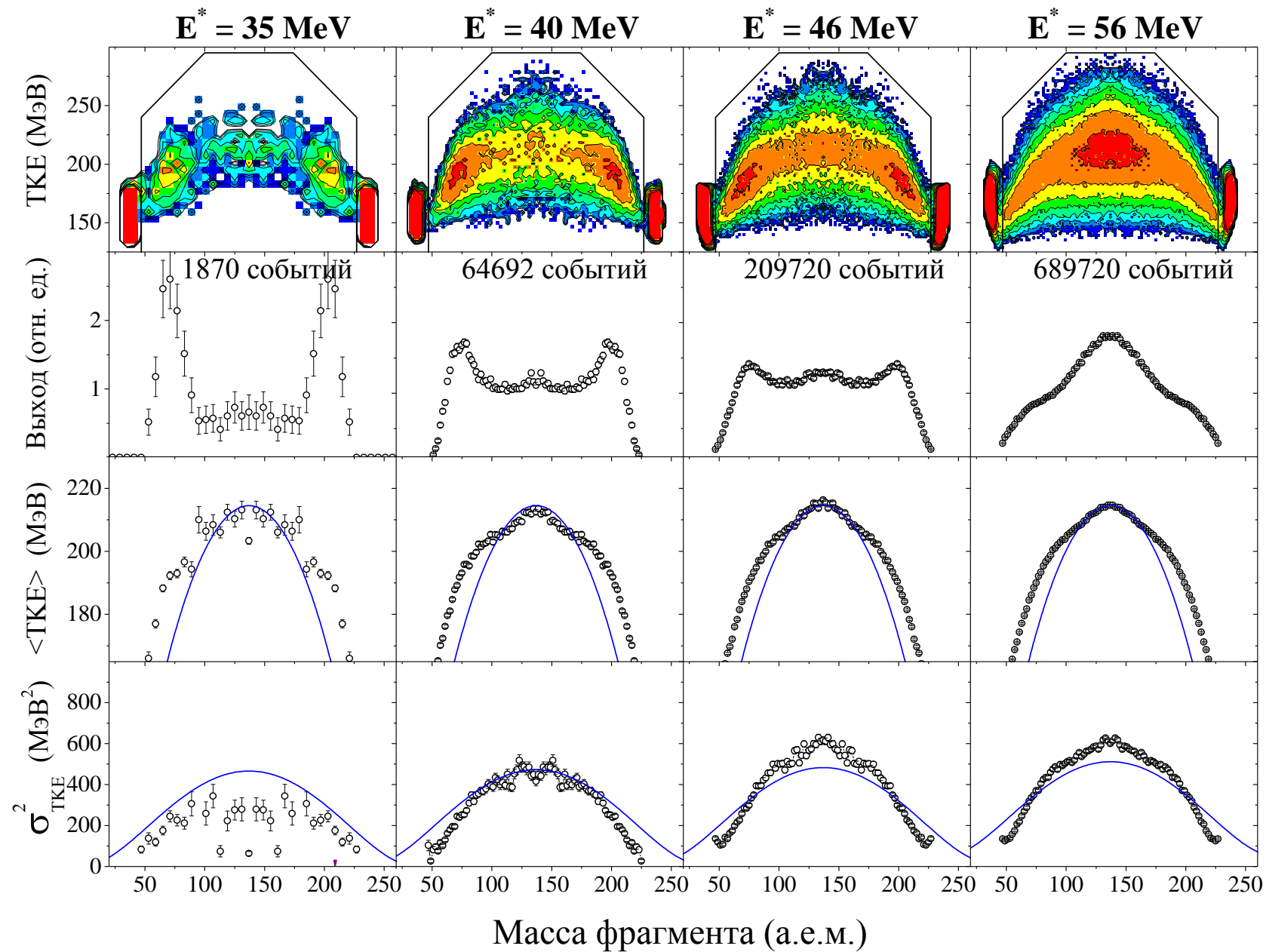
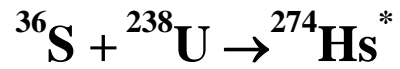


$$A_{\text{CN}}/2 \pm 20 u$$

Characteristics of the processes of CNF, QF processes







Study of the characteristics of the Mass-angular distributions of the reaction products



Phys. Rev. Lett. 101 (2008) 092701

PRL 101, 092701 (2008) PHYSICAL REVIEW LETTERS week ending 29 AUGUST 2008

