

Синтез сверхтяжелых элементов на дубненском газонаполненном сепараторе

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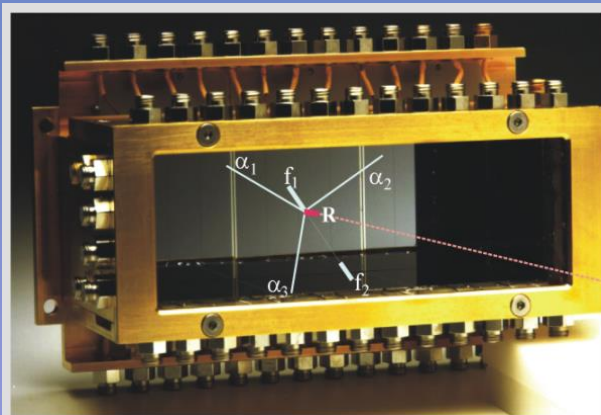


Increase of sensitivity of experiment

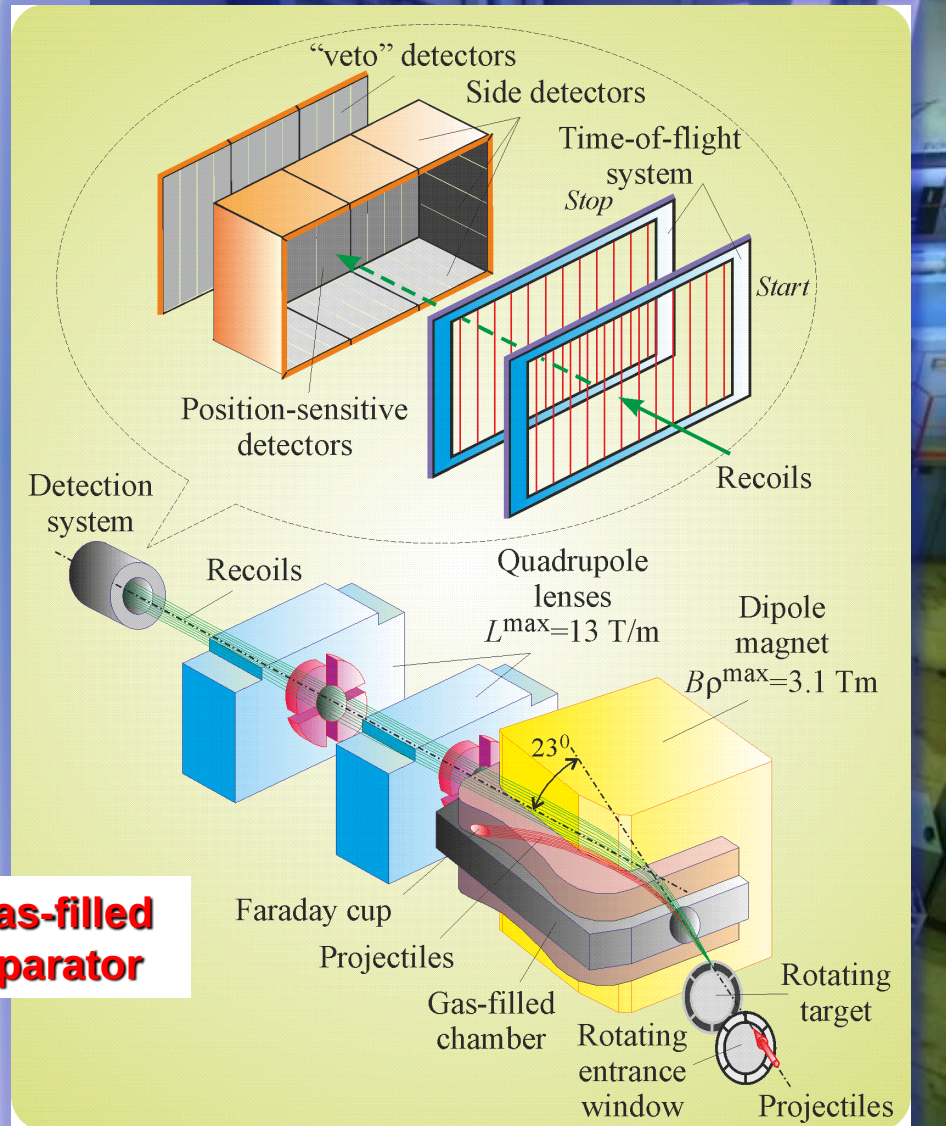
Target materials



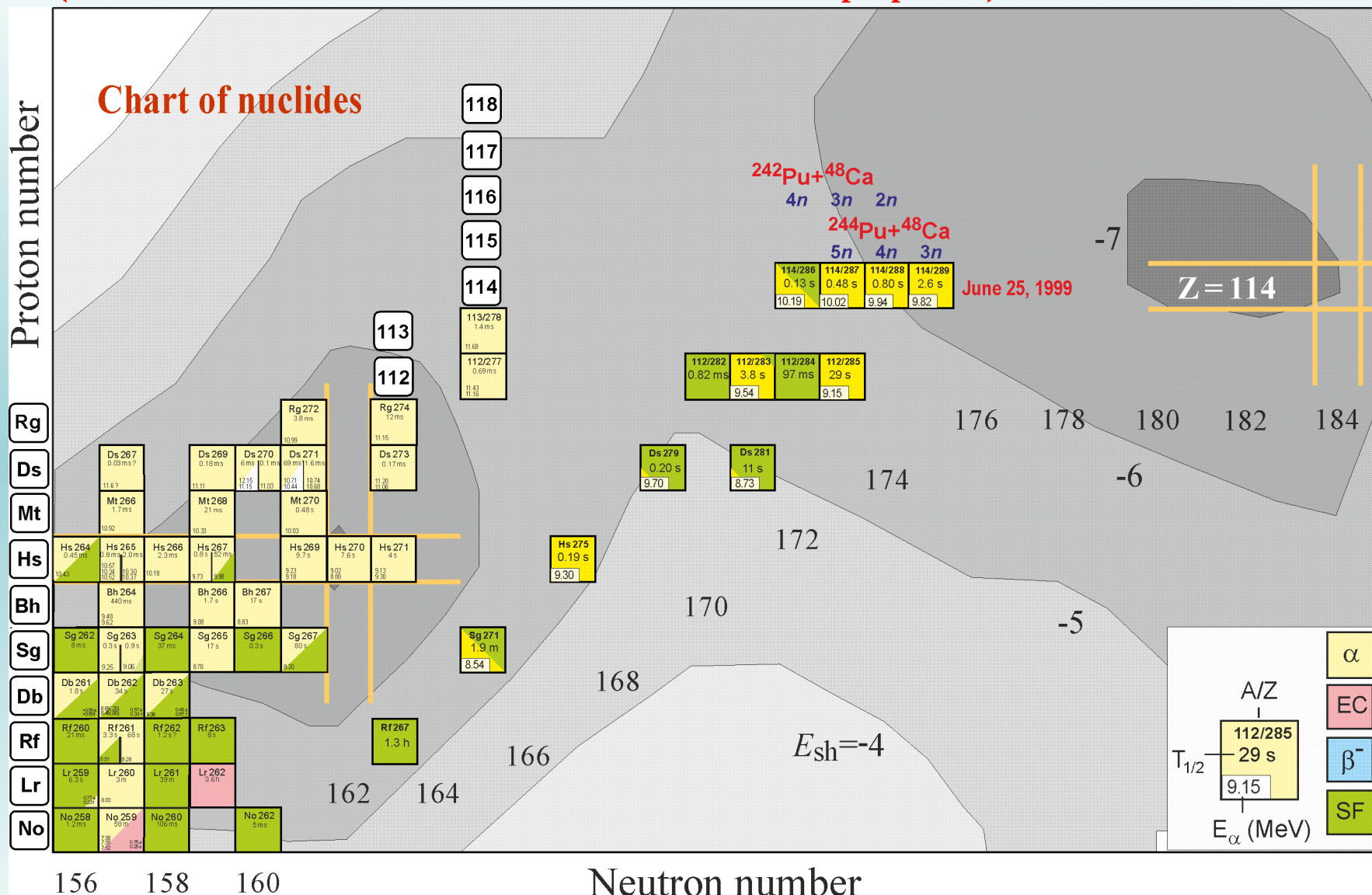
^{226}Ra , $^{233,238}\text{U}$, ^{237}Np , $^{242,244}\text{Pu}$,
 ^{243}Am , $^{245,248}\text{Cm}$, ^{249}Bk , ^{249}Cf
 10 - 15 mg



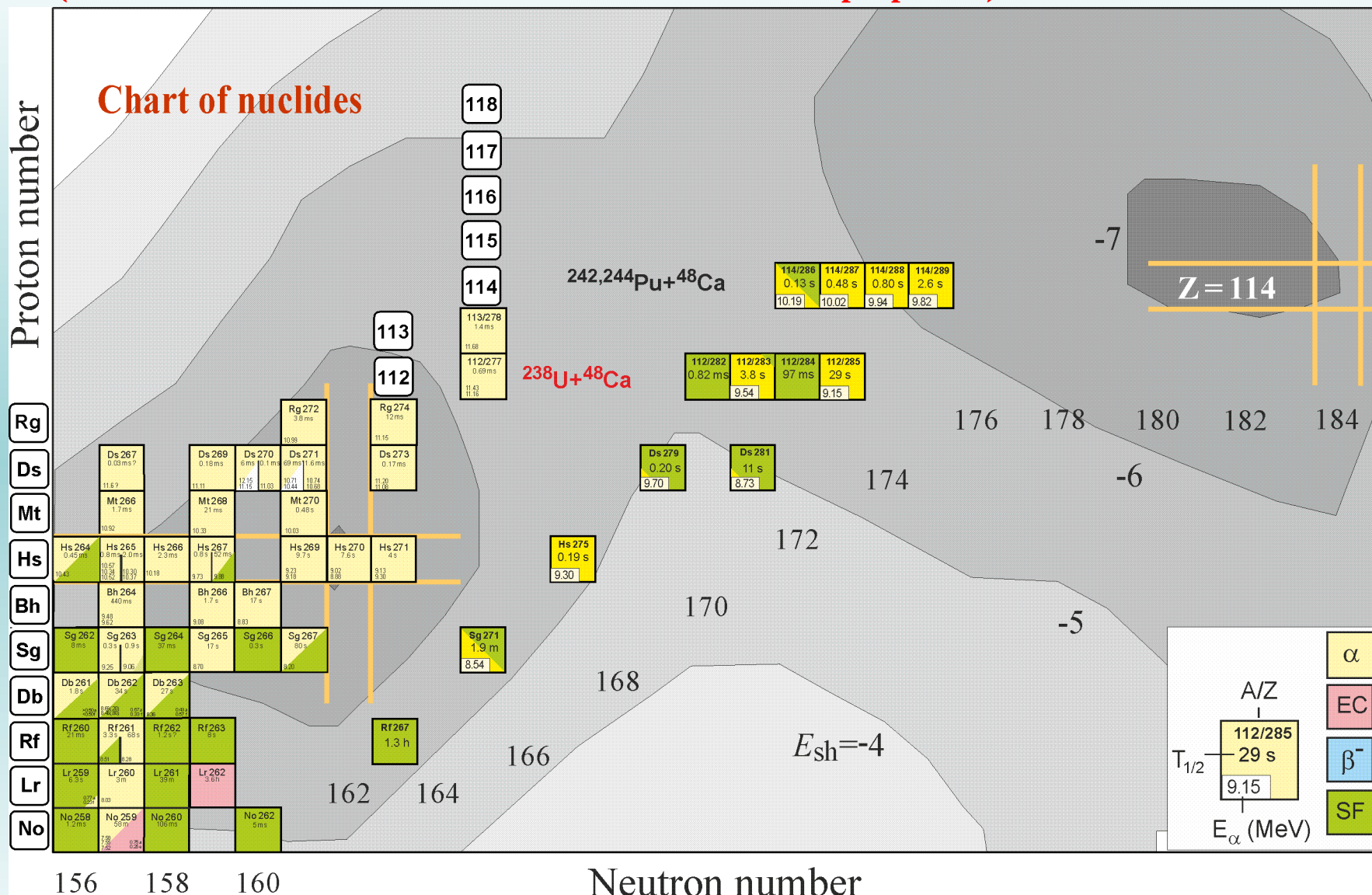
Dubna gas-filled recoil separator



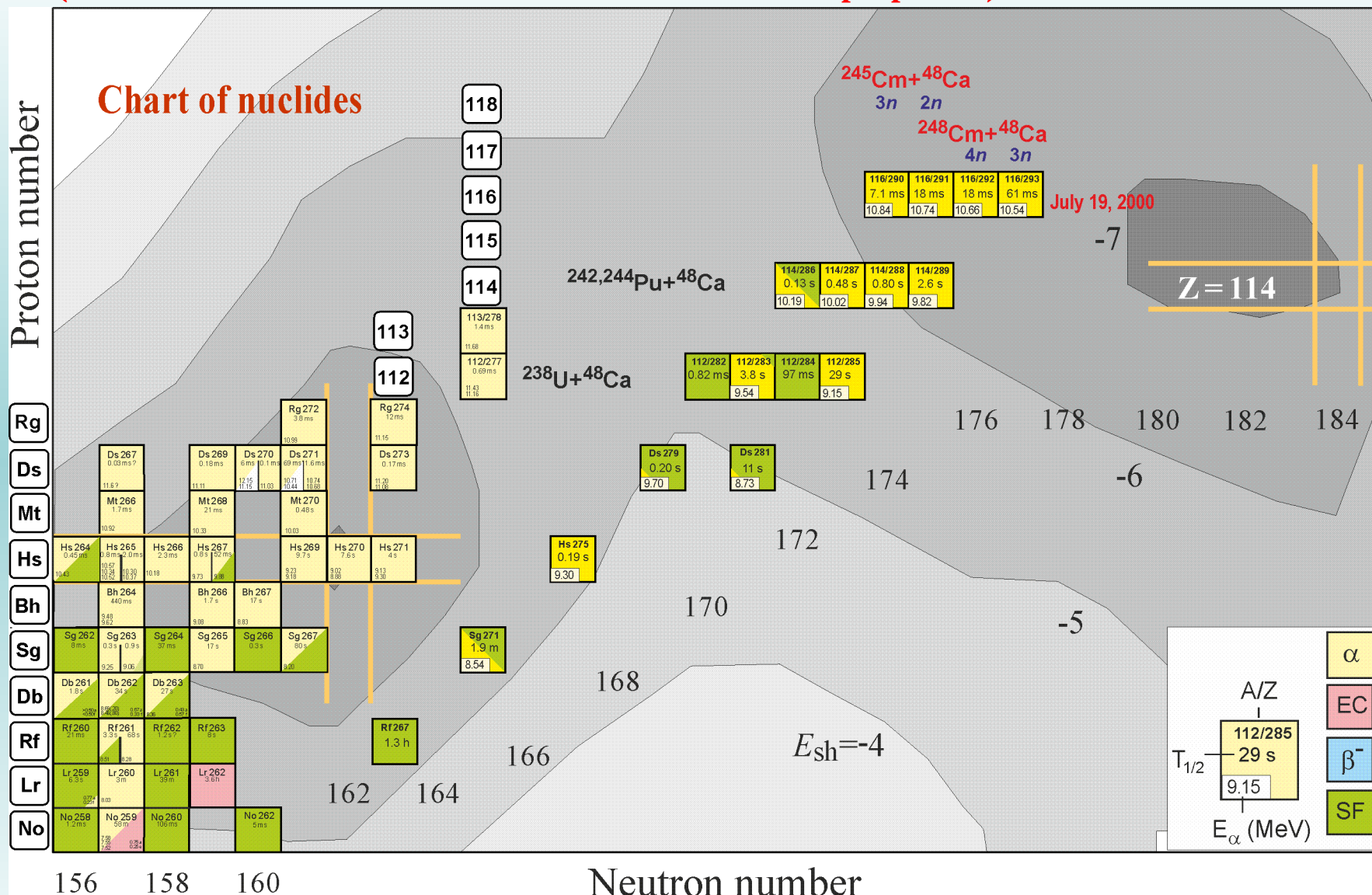
(cross bombardments, excitation functions, radioactive properties)



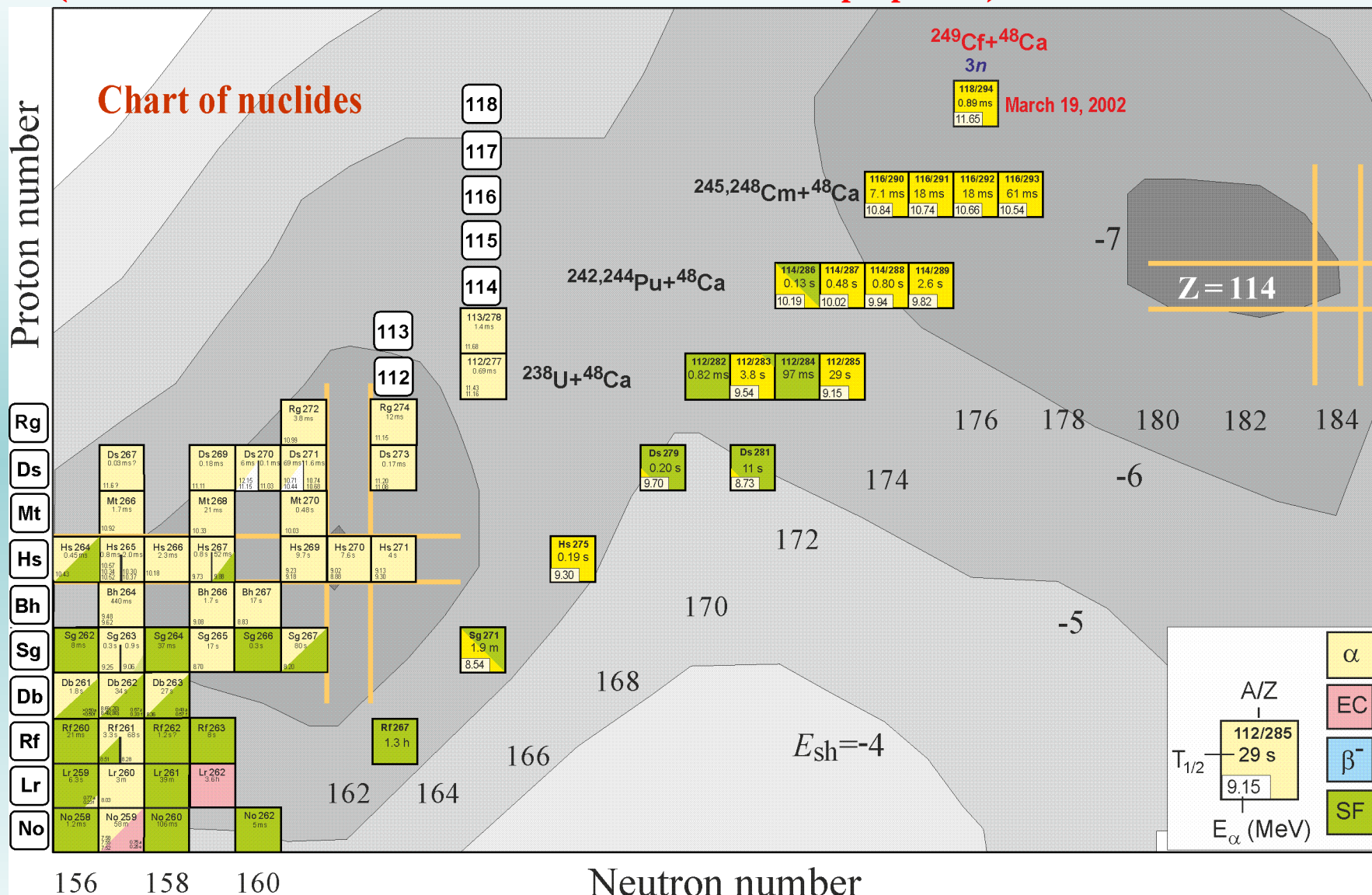
(cross bombardments, excitation functions, radioactive properties)



(cross bombardments, excitation functions, radioactive properties)

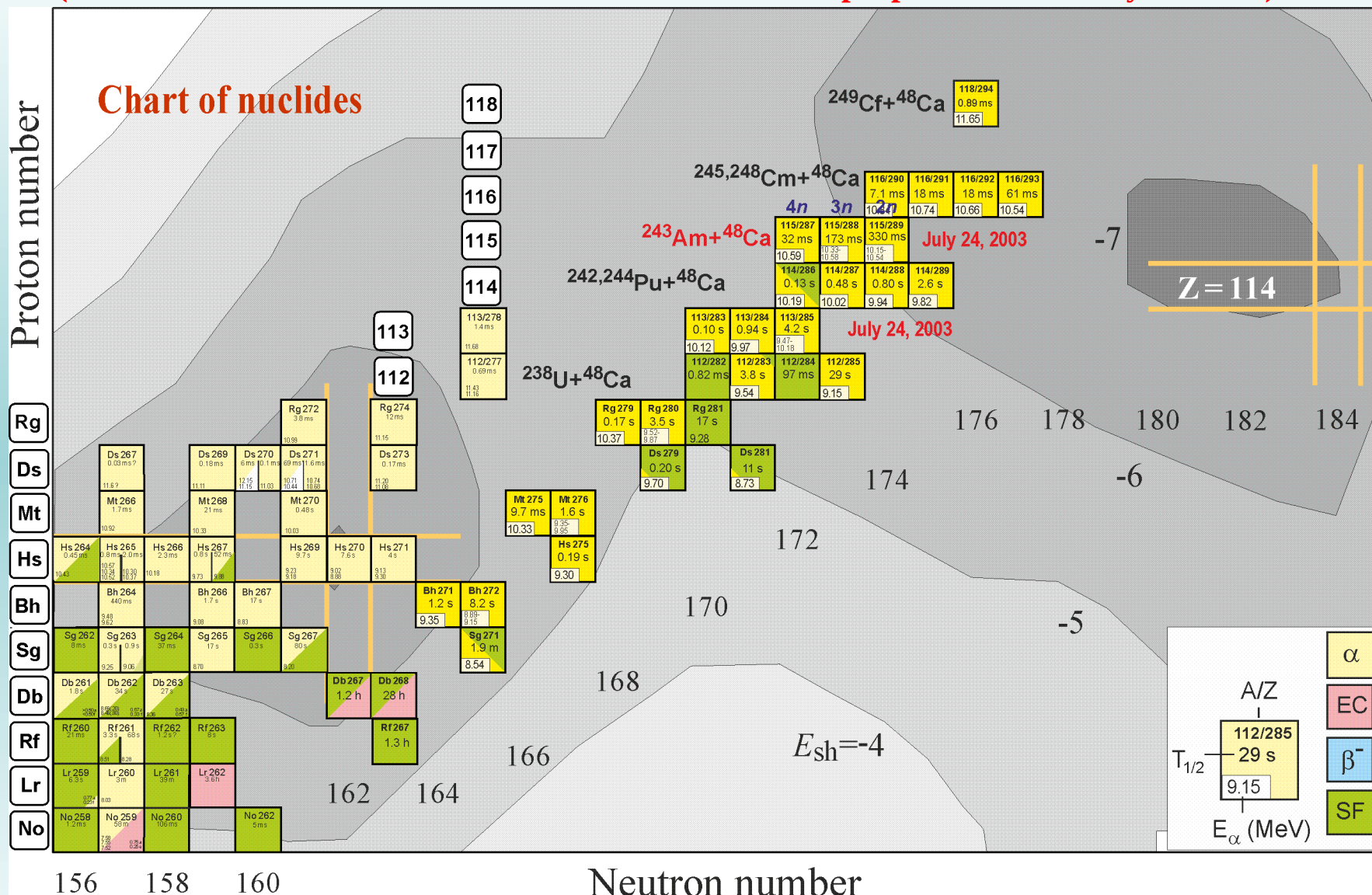


(cross bombardments, excitation functions, radioactive properties)

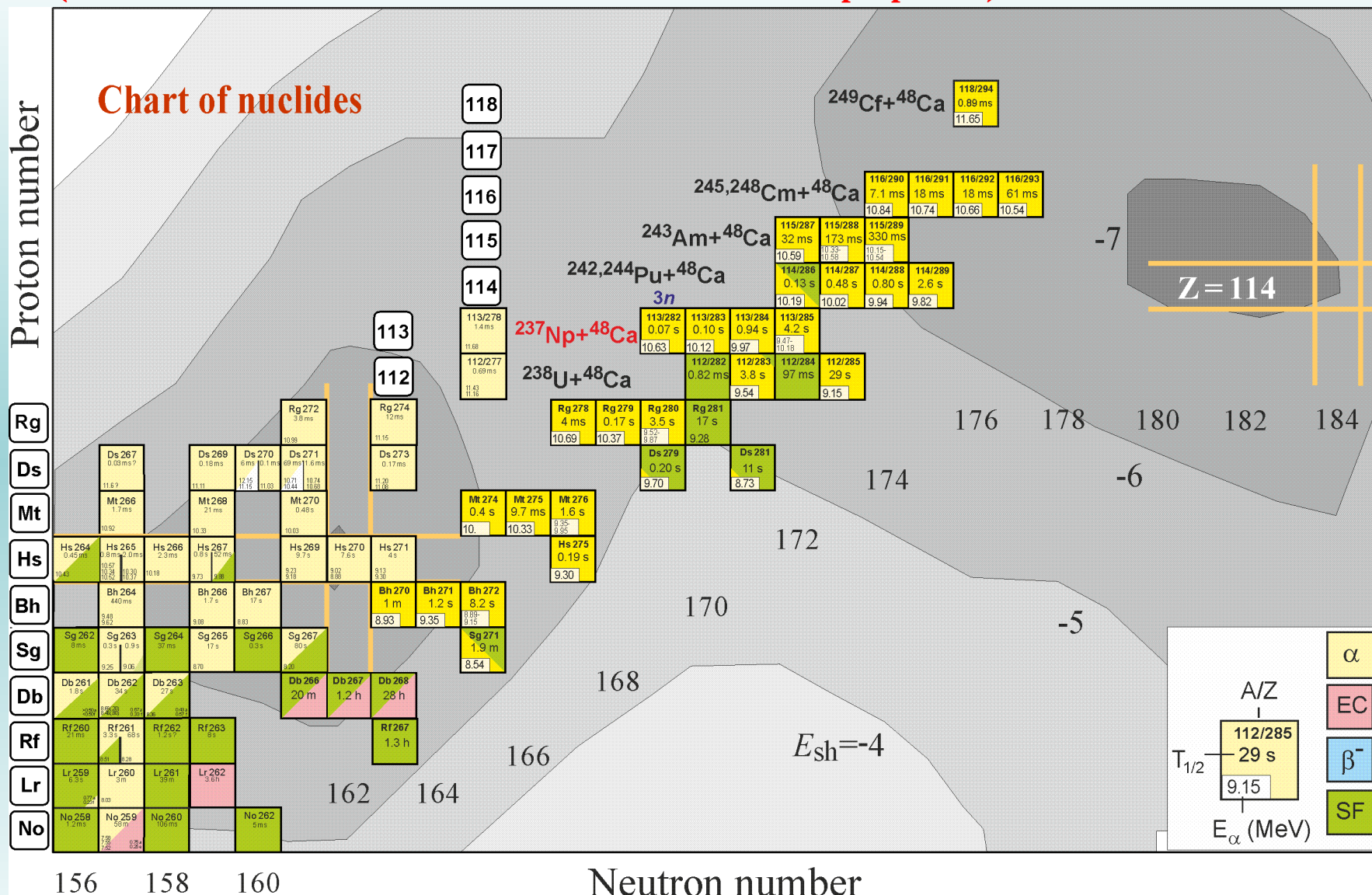


Synthesis of superheavy nuclei

(cross bombardments, excitation functions, radioactive properties, chemistry of ^{268}Db)

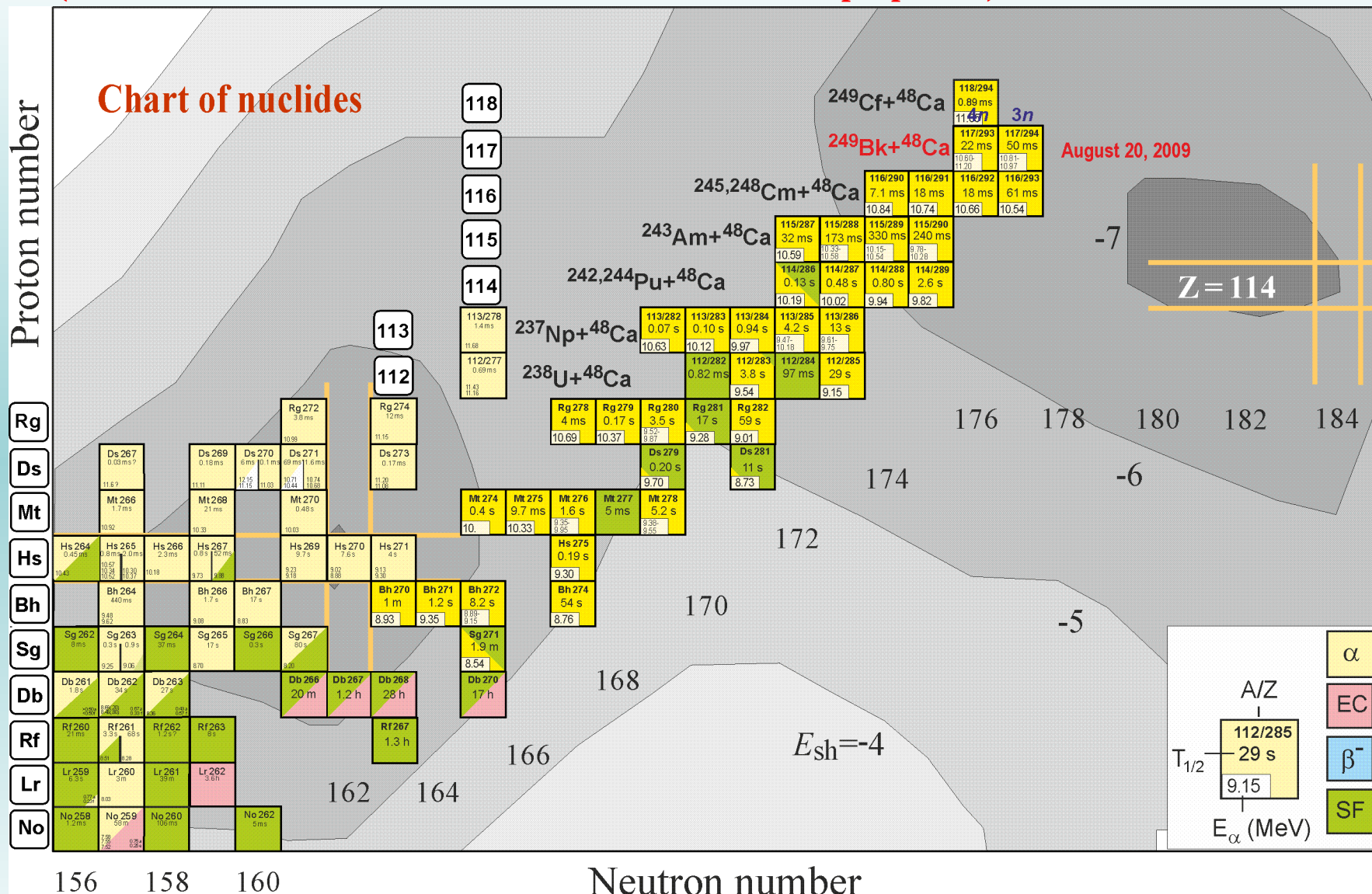


(cross bombardments, excitation functions, radioactive properties)

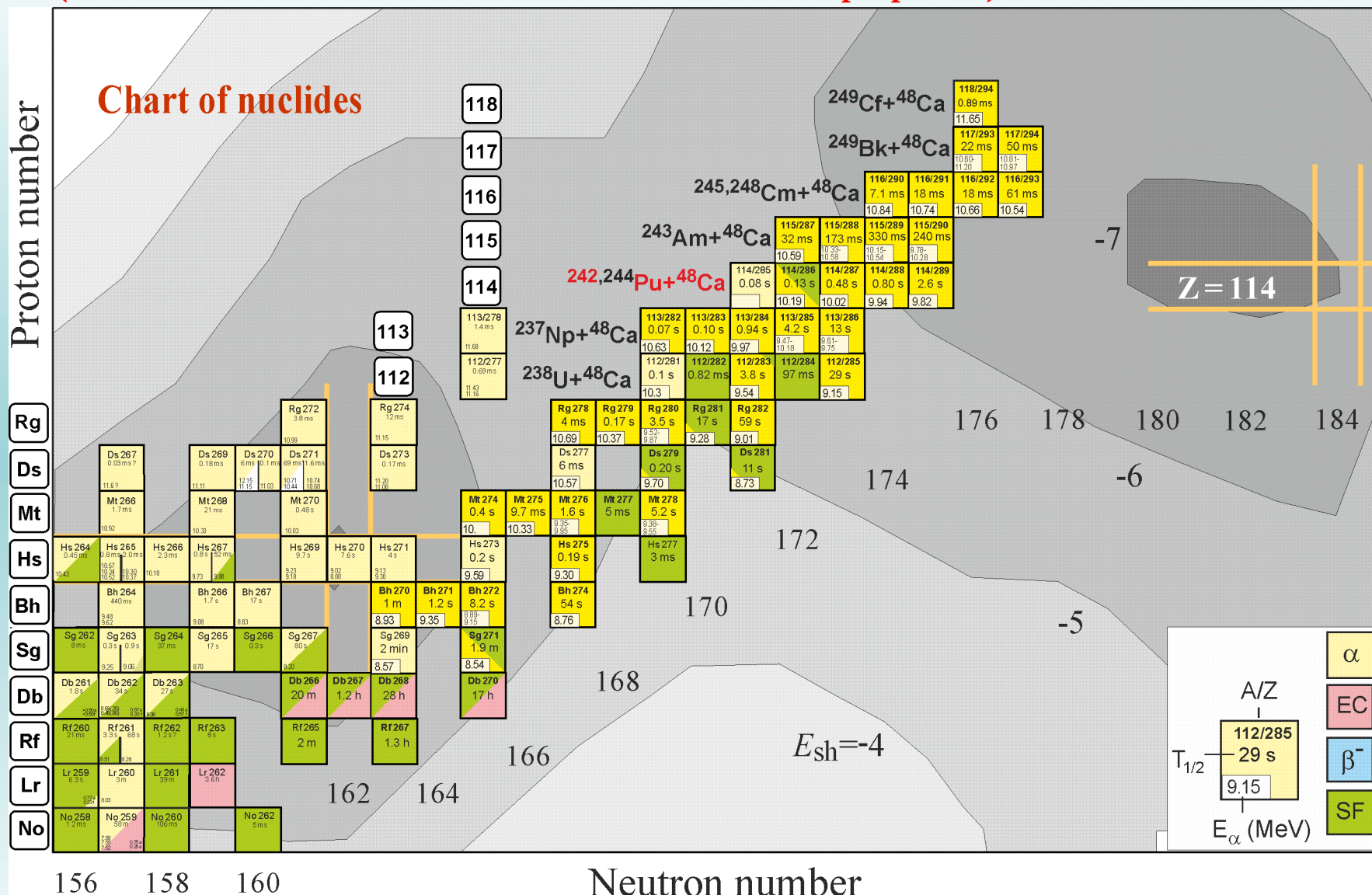


Synthesis of superheavy nuclei

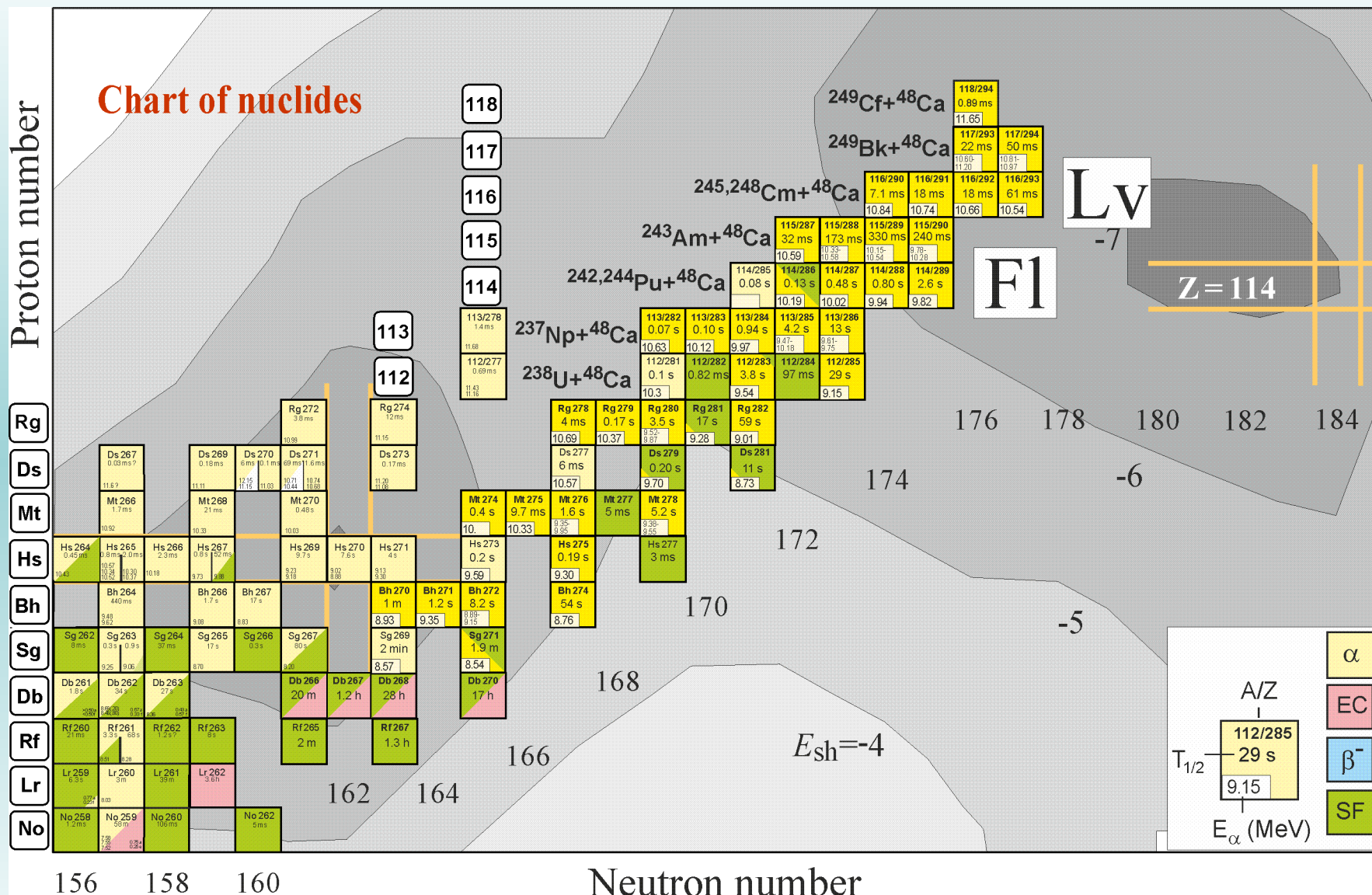
(cross bombardments, excitation functions, radioactive properties)



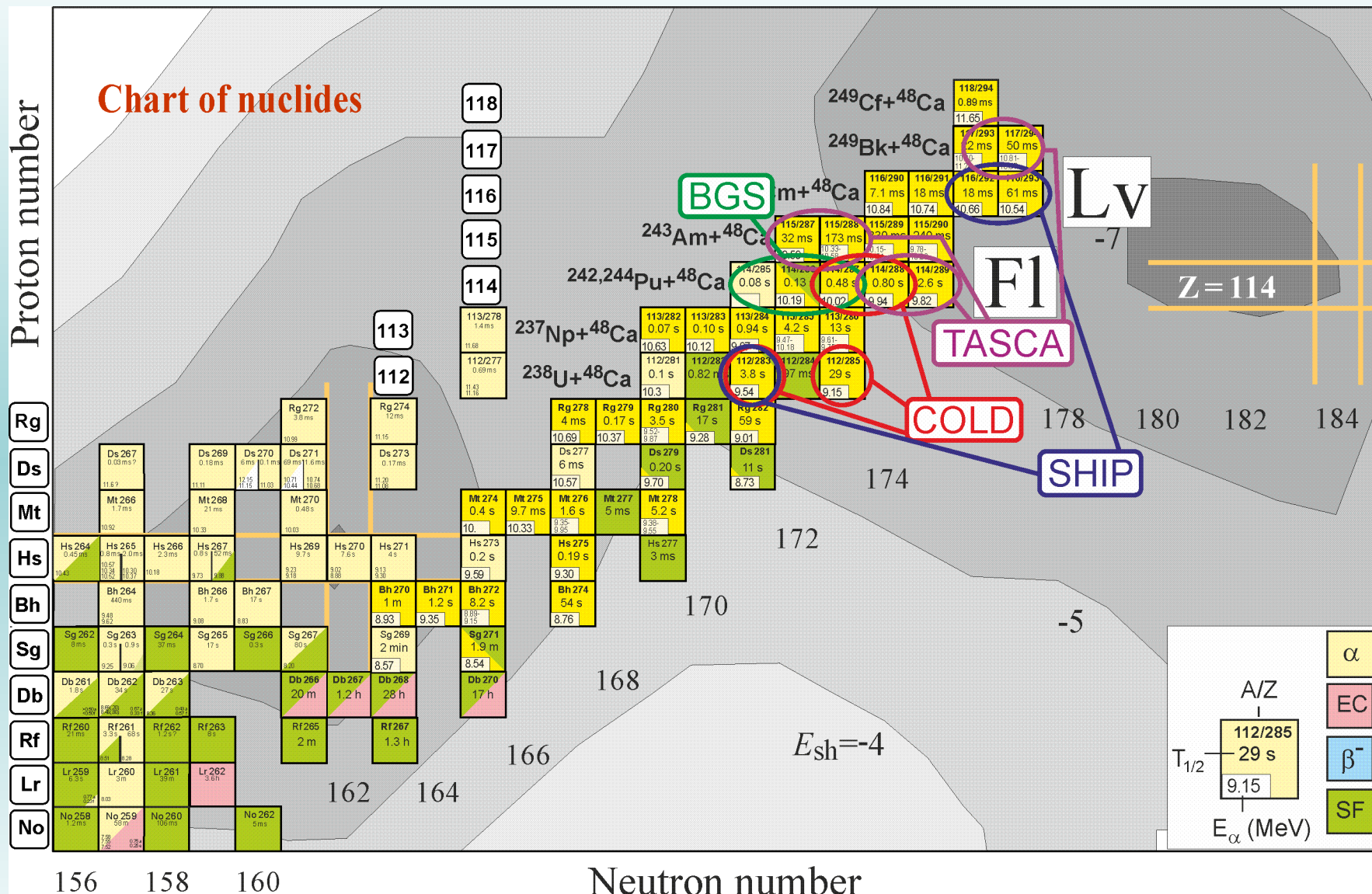
(cross bombardments, excitation functions, radioactive properties)



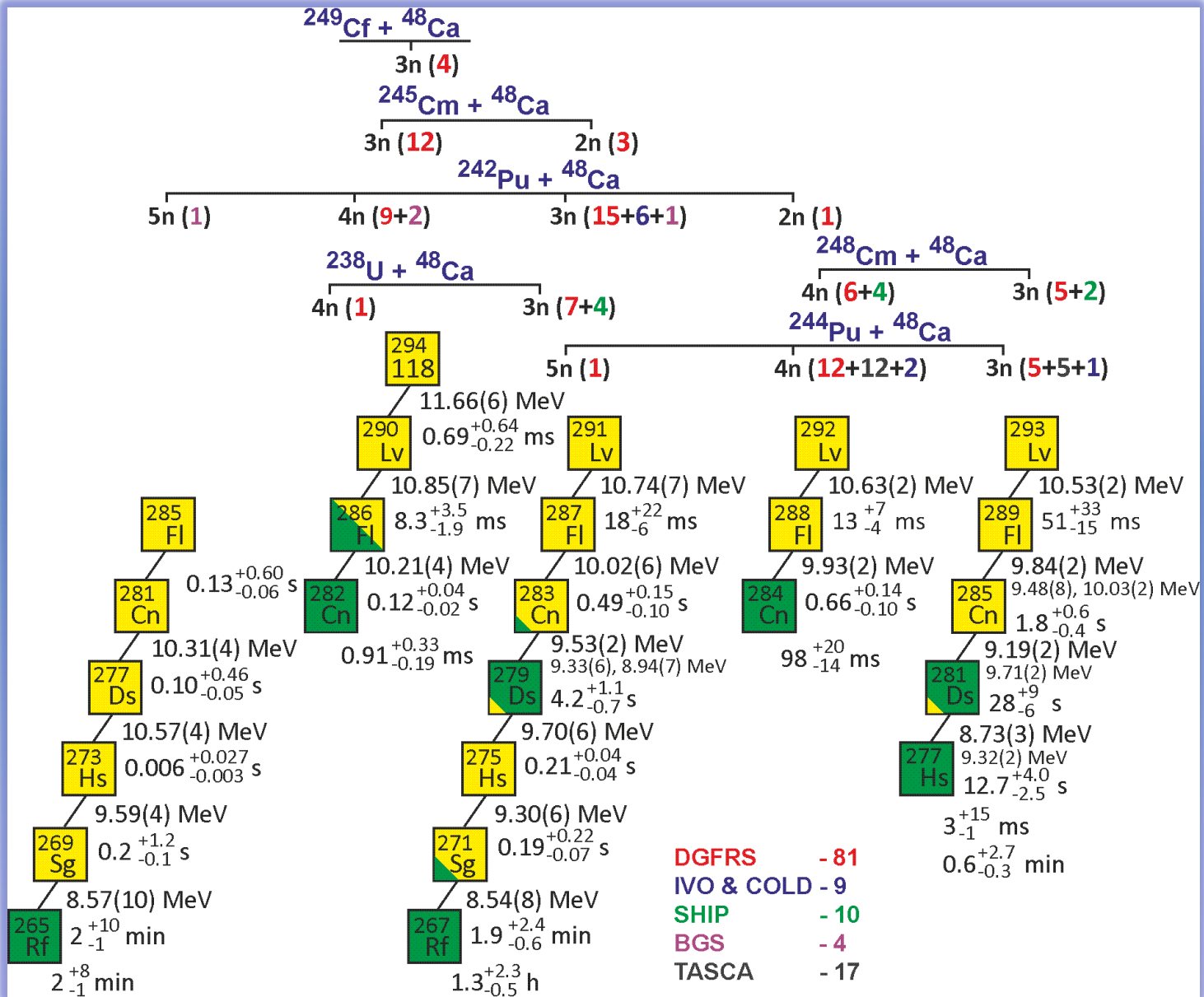
The names flerovium and livermorium for elements 114 and 116



Confirmation of the GDFRS results

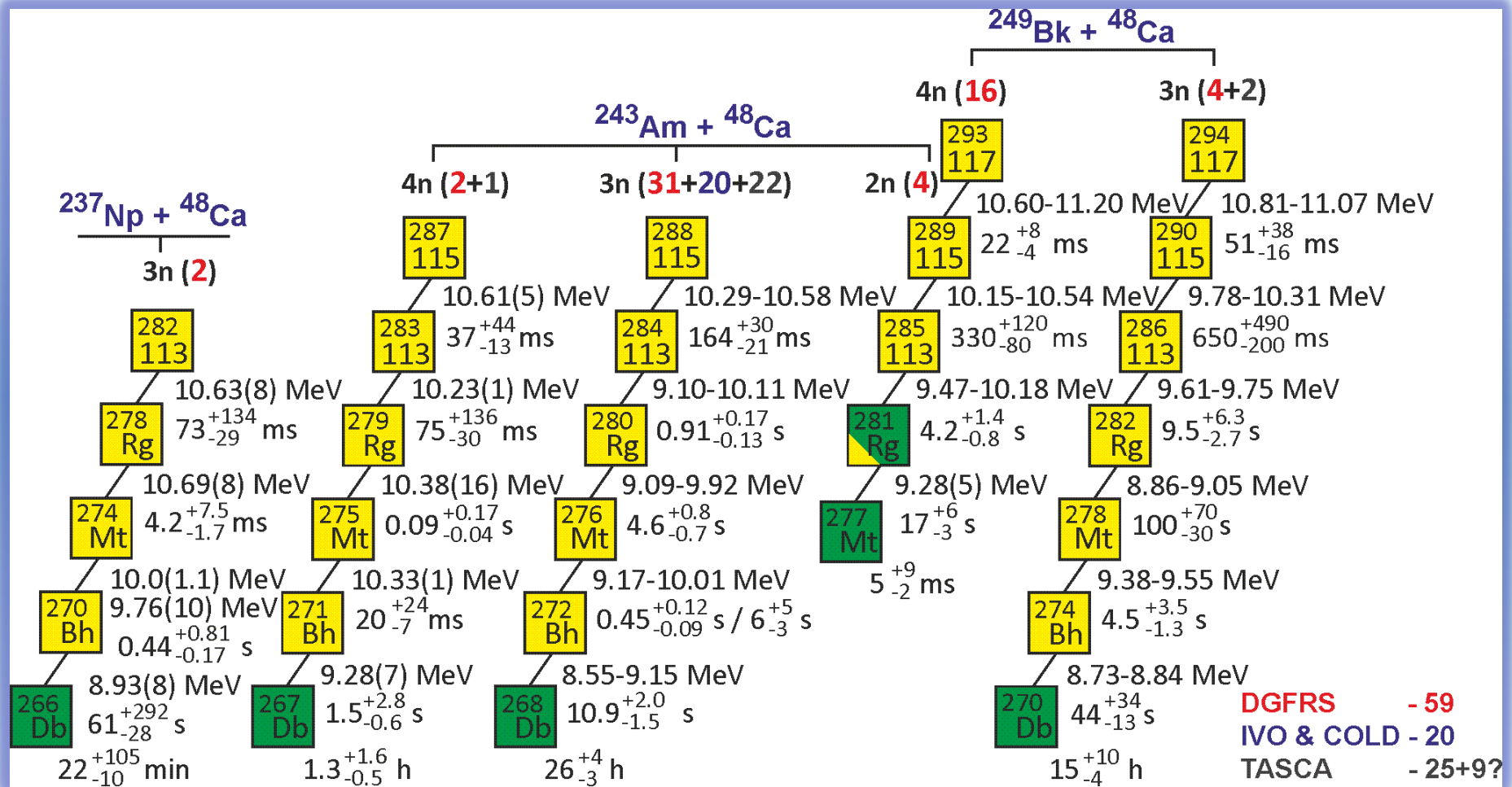


Decay properties of even-Z nuclei (6 reactions, 3 elements, 25 isotopes, 121 decay chains)



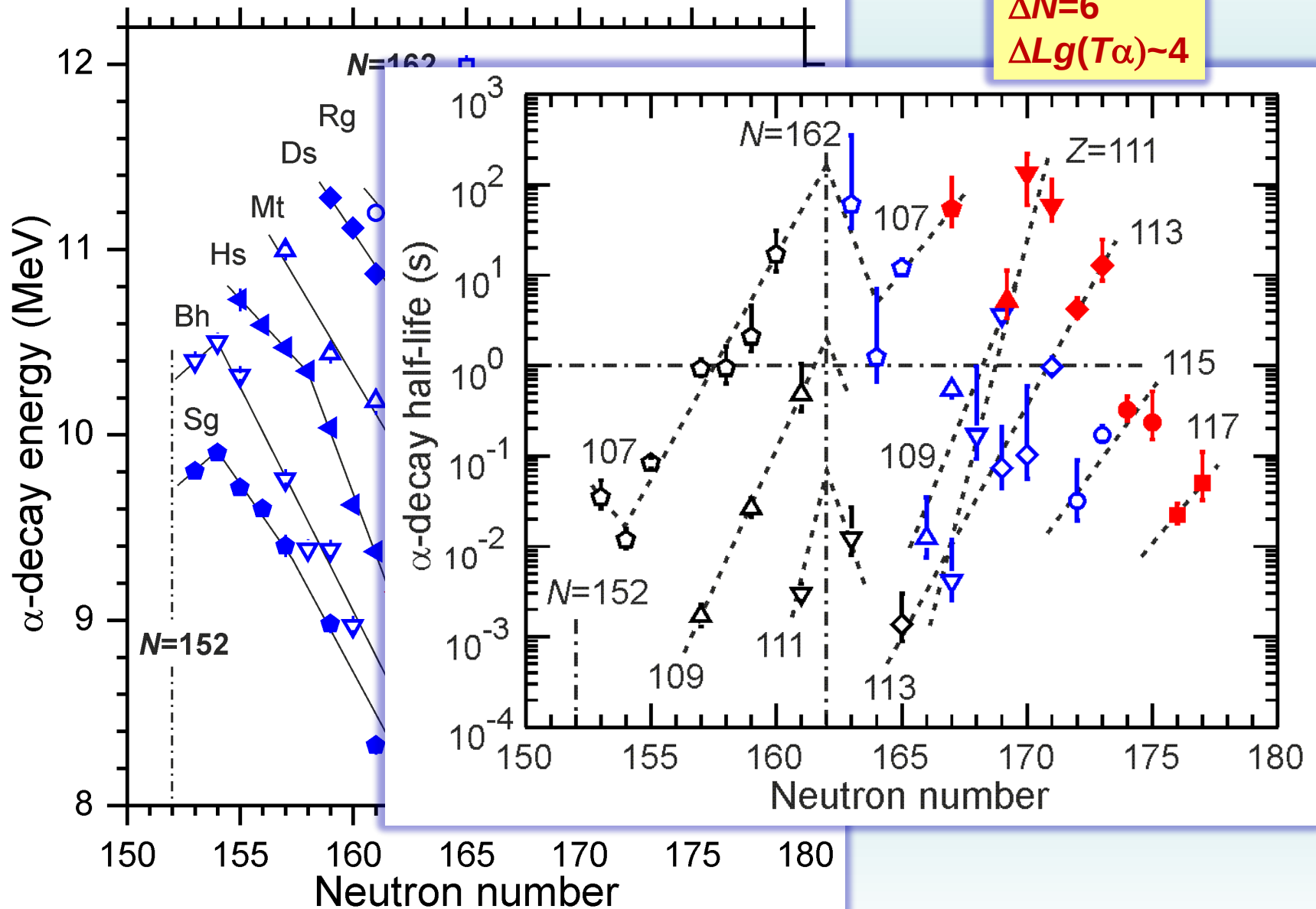
Decay properties of odd-Z nuclei

(3 reactions, 3 elements, 29 isotopes, 104+9? decay chains)

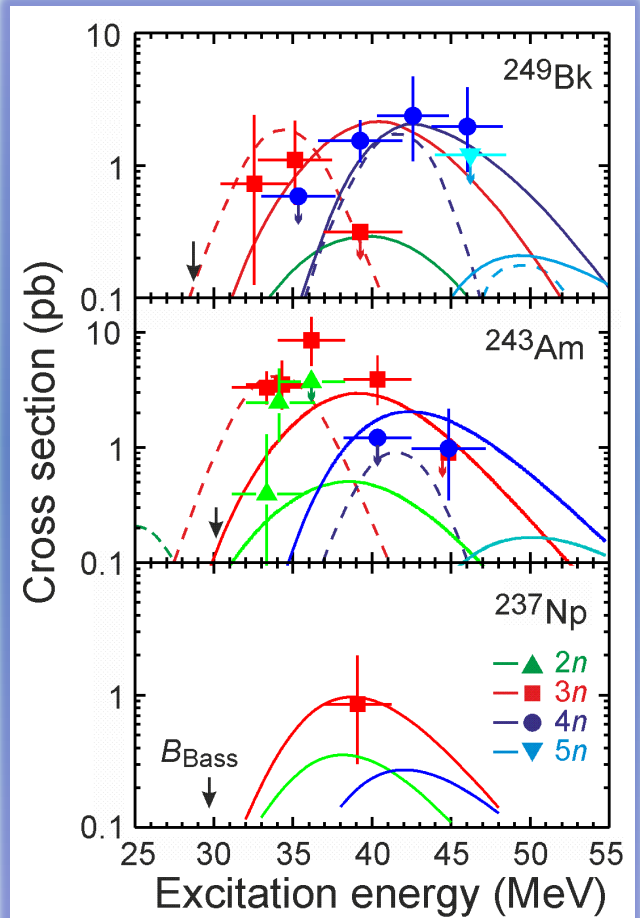
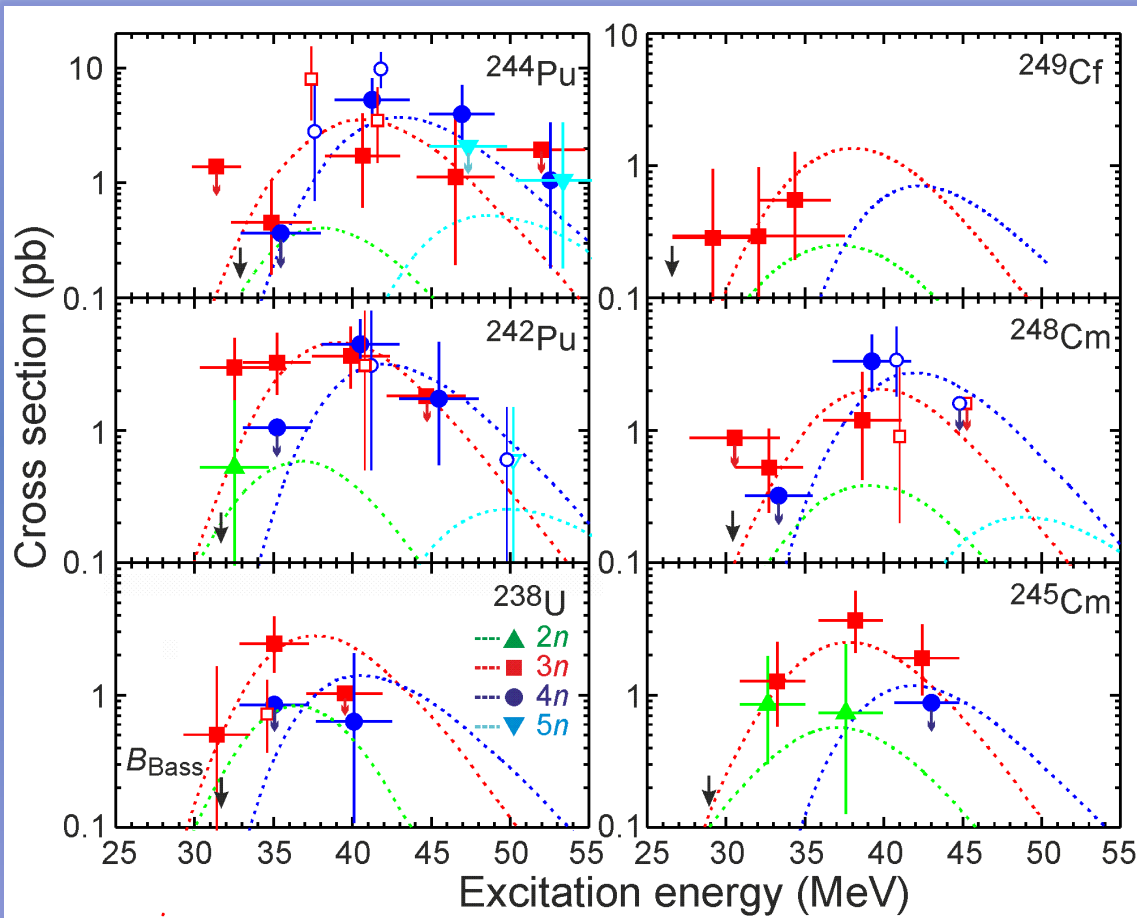


Alpha-decay energy of nuclei (increase of stability for higher N)

$Z=111, 113$
 $\Delta N=6$
 $\Delta Lg(T\alpha)\sim 4$



Production cross sections (excitation functions)



V.I. Zagrebaev *et al.*
K. Siwek-Wilczynska *et al.*

Заключение:

Экспериментальное обнаружение области повышенной стабильности СТЯ

Открыты шесть новых элементов с **$Z=113 - 118$**

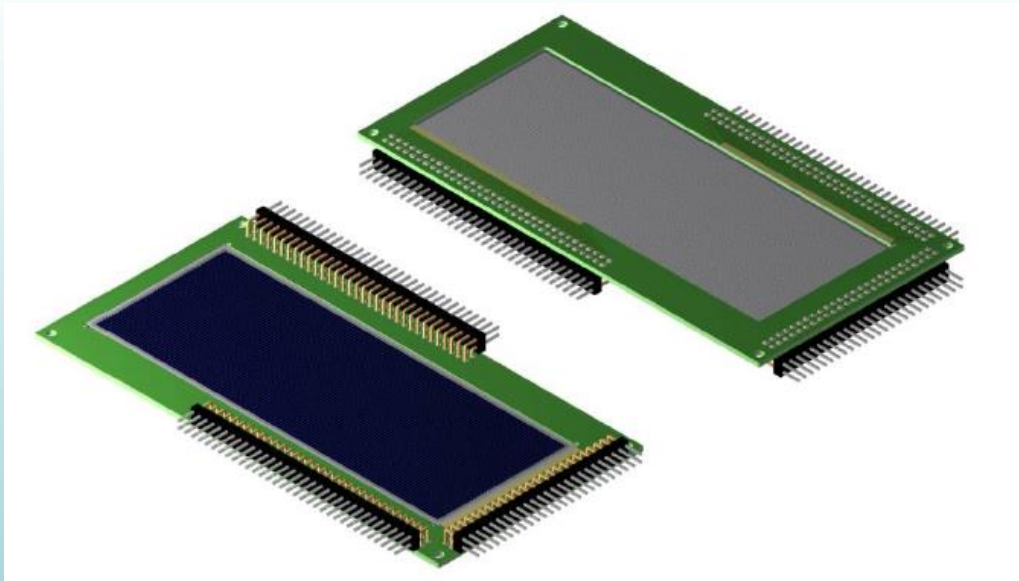
Исследованы свойства распада более 50 самых тяжелых ядер

Измерены поперечные сечения девяти реакций полного

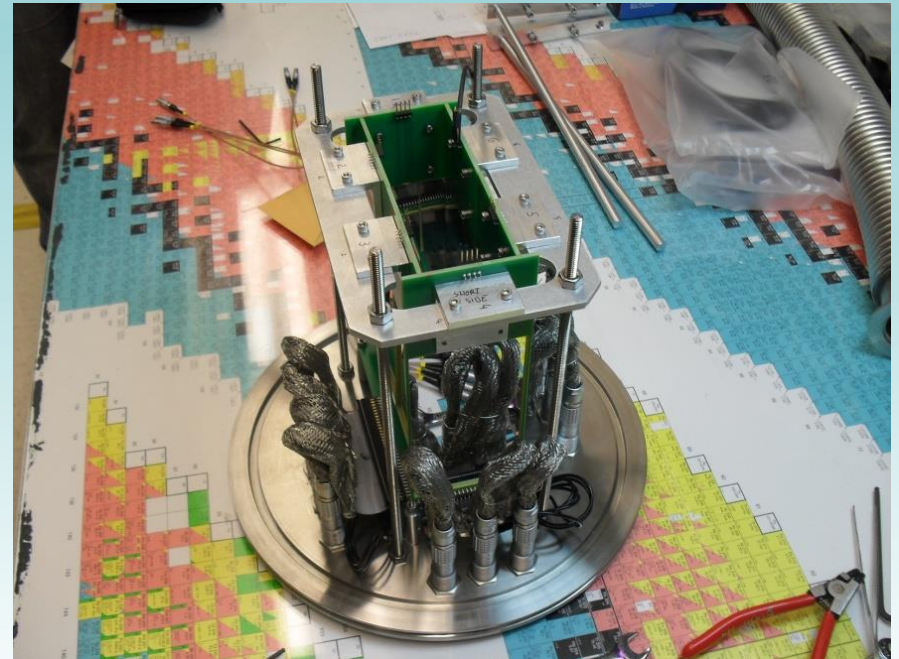
слияния $^{48}\text{Ca} + ^{238}\text{U} - ^{249}\text{Cf}$

Изучены химические свойства новых **112 (Cn)** и **114 (Fl)** элементов

БУДУЩЕЕ...



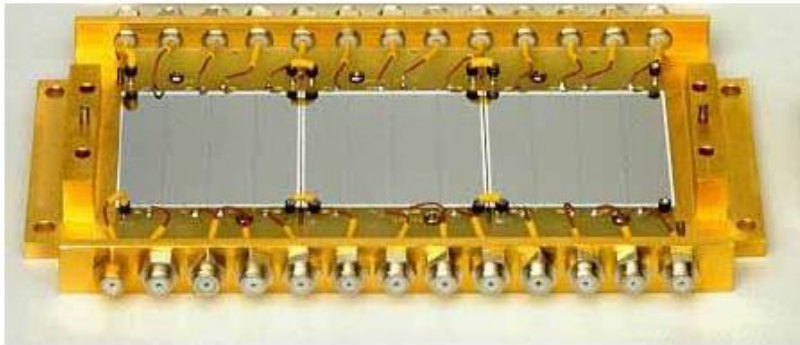
48*128 мм² (DSSSD)
65*120 мм² (6 side)
176 + 6 спектрометрических
тракта



Focal Plane Detector

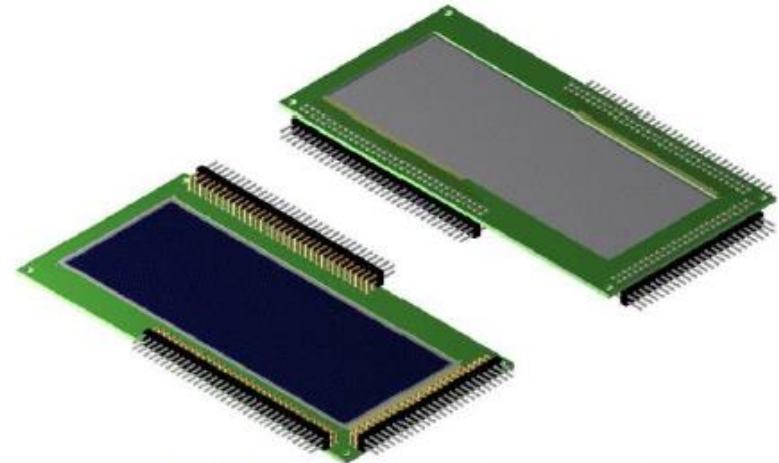
Consists of Double-Sided Silicon Strip Detector (DSSSD)

Old



- Three 40 x 40 mm detectors
- Total of 12 vertical strips
- Total of 20 horizontal cells
- **Equal to 240 single detectors**
with **space resolution $\approx 20 \text{ mm}^2$**

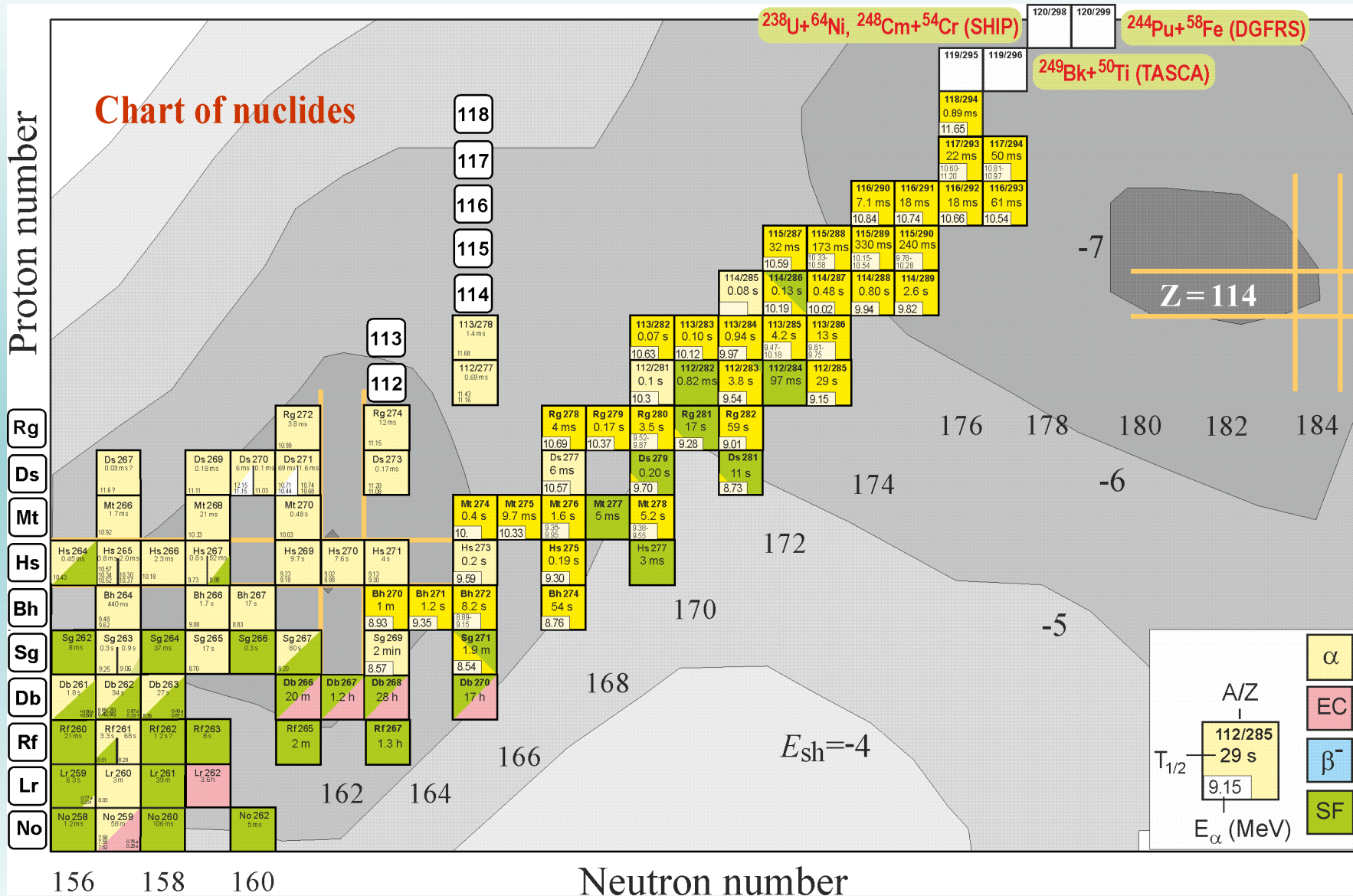
New



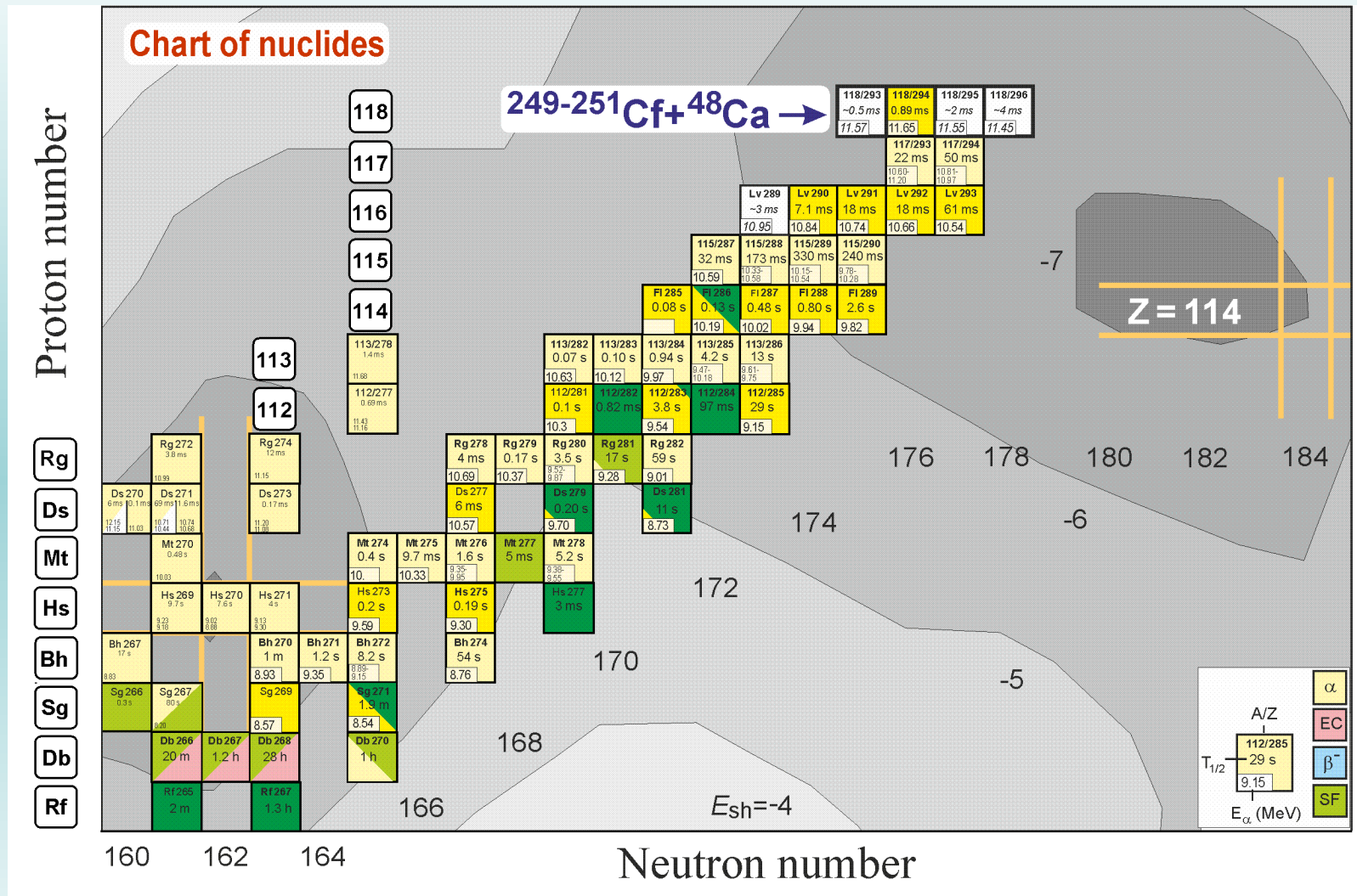
- Single 120 x 120 mm detector
- 128 vertical strips
- 48 horizontal cells
- **Equal to 6144 single detectors**
with **space resolution $\approx 1 \text{ mm}^2$**

For the new DSSSDs, modifications of the current electronics system are required.

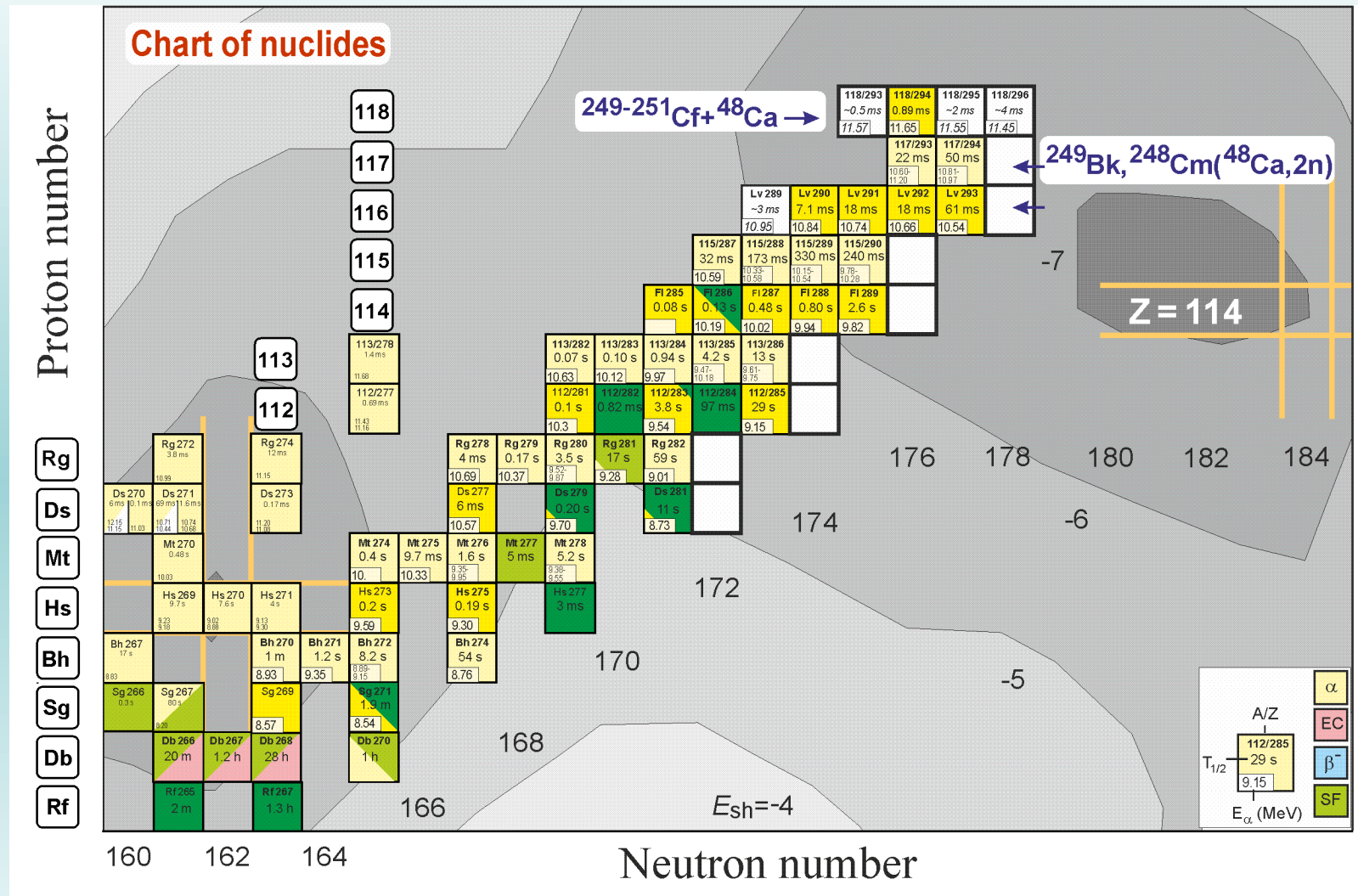
No events in experiments on the synthesis of elements 119 and 120



Synthesis of the heavies isotopes of element 118



Synthesis of the heavies isotopes in the 2n-evaporation channel



Synthesis of neutron-deficient isotopes

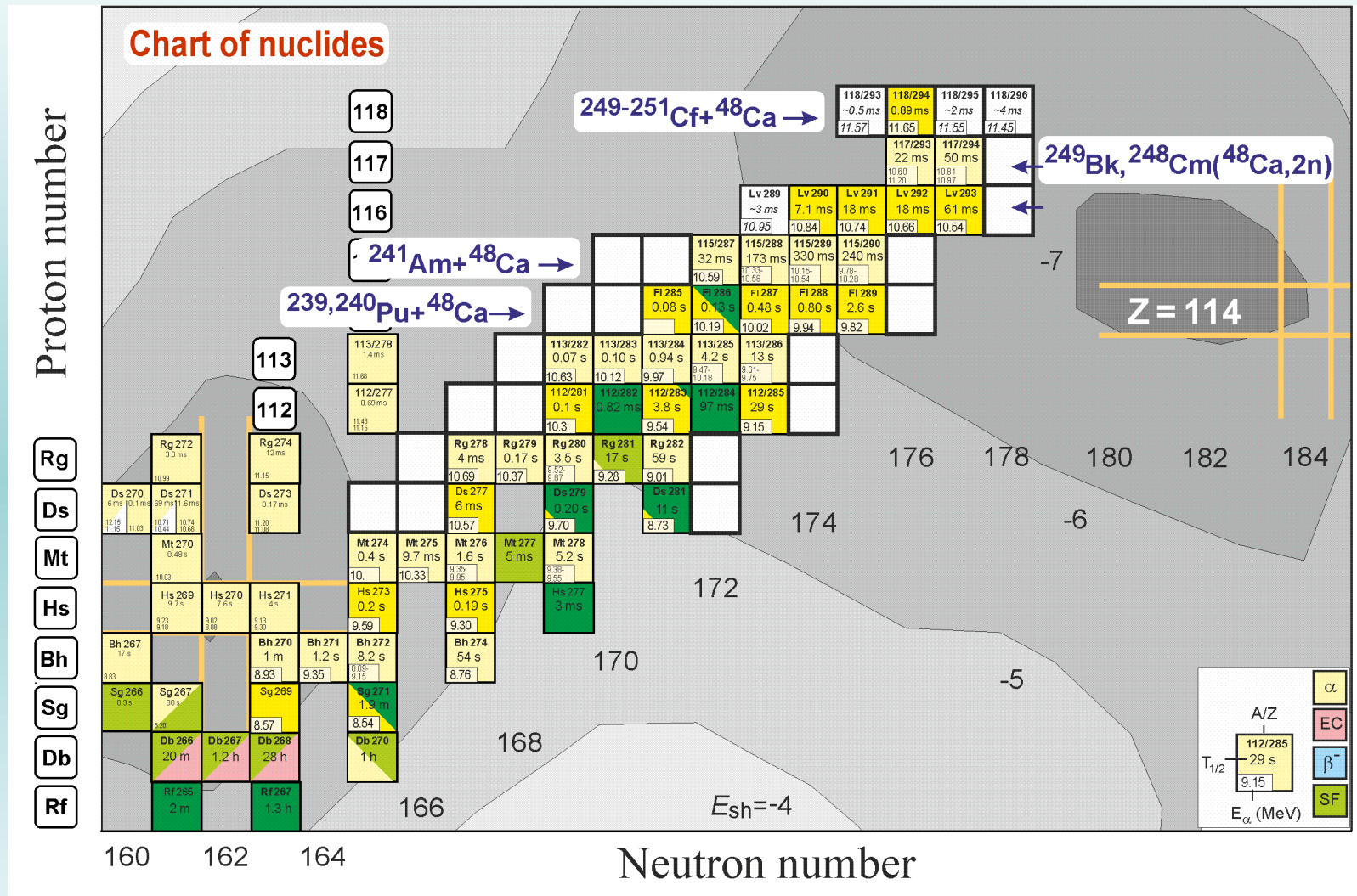


Chart of nuclides

Proton number

Neutron number

Legend:

- α (Yellow)
- EC (Pink)
- β^- (Blue)
- SF (Green)

Example Nuclide: $^{112}_{285}$ (29 s, $E_\alpha = 9.15$ MeV)

Key Regions:

- Spectroscopy:** Indicated by a large white arrow pointing to the region around Z=114, N=174-176.
- Island of Stability:** Indicated by a yellow box around Z=114, N=184.

Decay Modes:

- α (Yellow)
- EC (Pink)
- β^- (Blue)
- SF (Green)

Key Nuclides and Half-lives:

- $^{112}_{285}$ (29 s)
- $^{112}_{286}$ (13 s)
- $^{112}_{287}$ (1.3 ms)
- $^{112}_{288}$ (0.80 s)
- $^{112}_{289}$ (2.6 s)
- $^{112}_{290}$ (240 ms)
- $^{112}_{291}$ (18 ms)
- $^{112}_{292}$ (18 ms)
- $^{112}_{293}$ (61 ms)
- $^{112}_{294}$ (50 ms)
- $^{112}_{295}$ (~2 ms)
- $^{112}_{296}$ (~4 ms)

Key Reactions:

- $^{241}\text{Am} + ^{48}\text{Ca} \rightarrow$
- $^{239,240}\text{Pu} + ^{48}\text{Ca} \rightarrow$
- $^{249}\text{Bk}, ^{248}\text{Cm} + ^{48}\text{Ca} \rightarrow$

Key Parameters:

- $E_{\text{sh}} = -4$
- $Z = 114$

SHE Factory

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Спасибо за внимание

