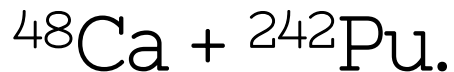
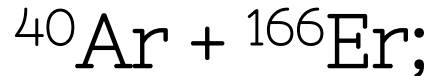
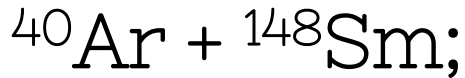


JINR

114 Flerovium
FLNO

Dubna

**DETERMINATION OF MASSES OF THE
SUPER HEAVY ELEMENTS IN THE
EXPERIMENTS ON SYNTHESIS OF 112
AND 114 ELEMENTS USING THE
REACTIONS**



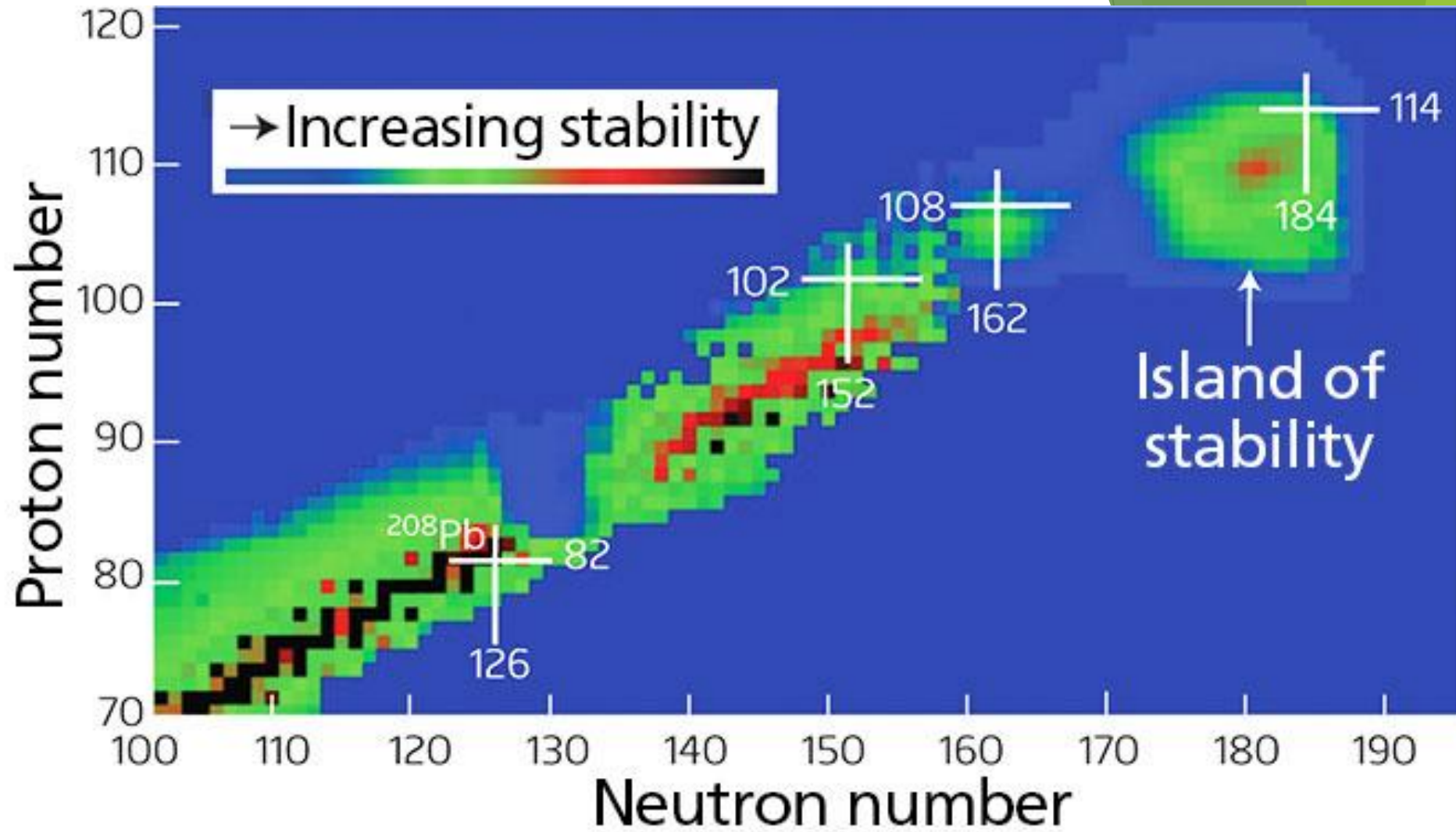
Presenters

Hrytskevich Dzenis
Dvarakouski Artsiom
Dorozhkin Vladislav
Hala Ramadan Mohamed

Supervisors: Viacheslav Vedeneev
Lubos Krupa

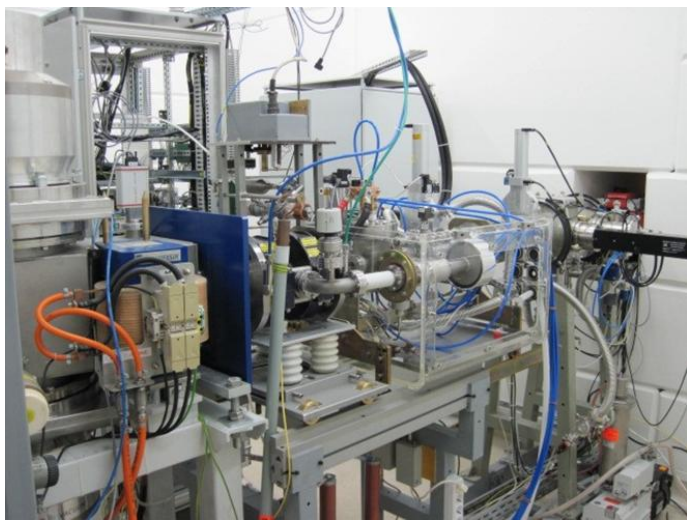
Contents

1. Describing the main part of MASHA (Mass Analyser of Super Heavy Atoms)
2. Review of superheavy elements synthesis Z=112 and Z=114 in the reactions with heavy ions $^{48}\text{Ca}+^{242}\text{Pu}$, carried out in the Flerov Laboratory for Nuclear Reactions (FLNR).
3. Main results of experiments of using reactions $^{40}\text{Ar} + ^{148}\text{Sm}$; $^{40}\text{Ar} + ^{166}\text{Er}$; $^{48}\text{Ca} + ^{242}\text{Pu}$ are describing.
4. Conclusion.

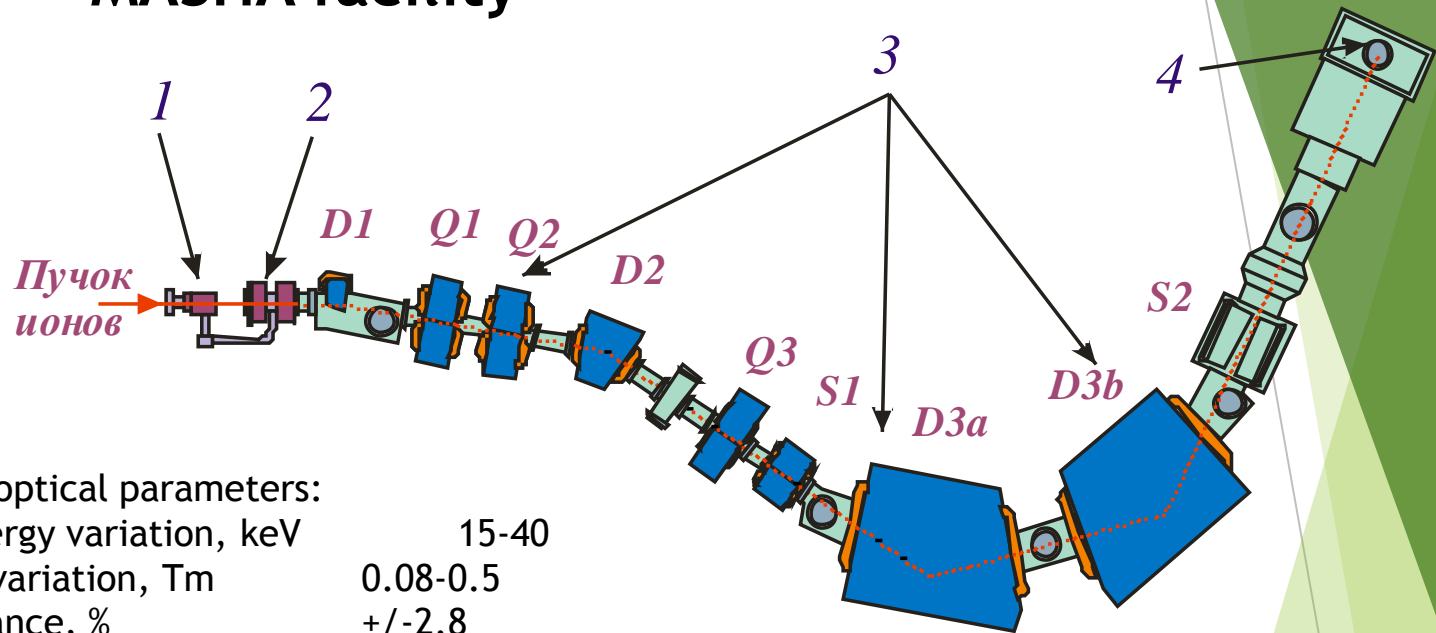


MASHA - Mass Analyzer of Super Heavy Atoms

Based on the beam line of Cyclotron U-400M
Constructed as the mass-spectrometer in a large
variety of masses (from 1 to 450 a.m.u.).
Fundamental investigations in nuclear physics.



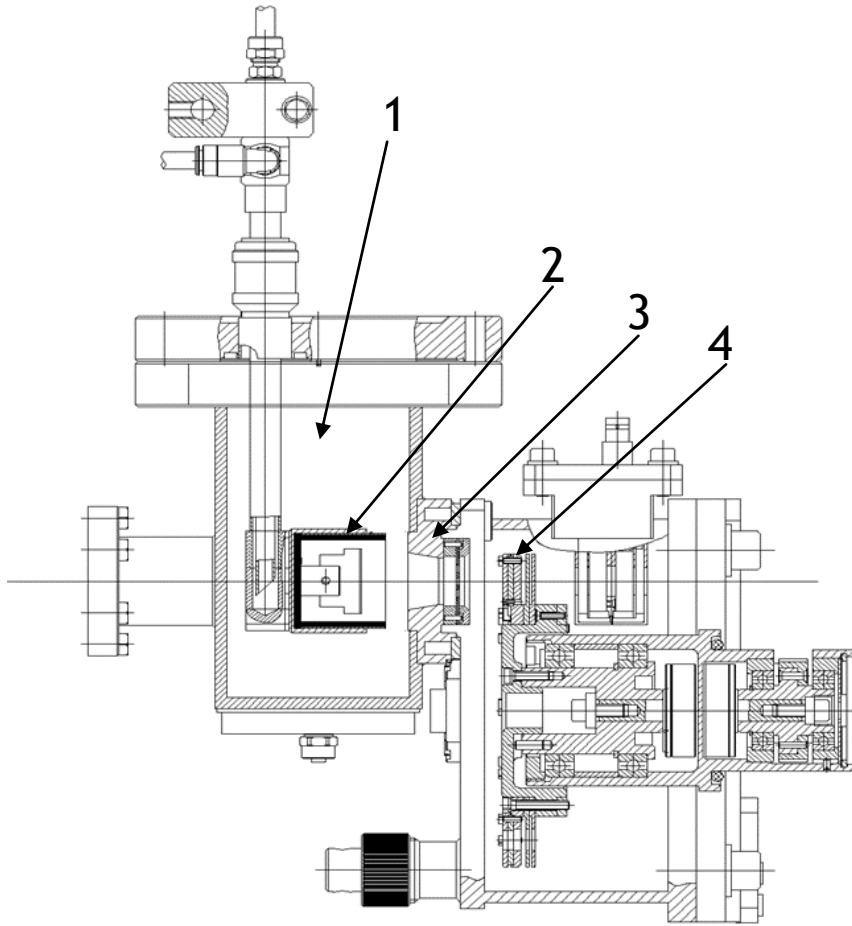
MASHA facility



General ion-optical parameters:

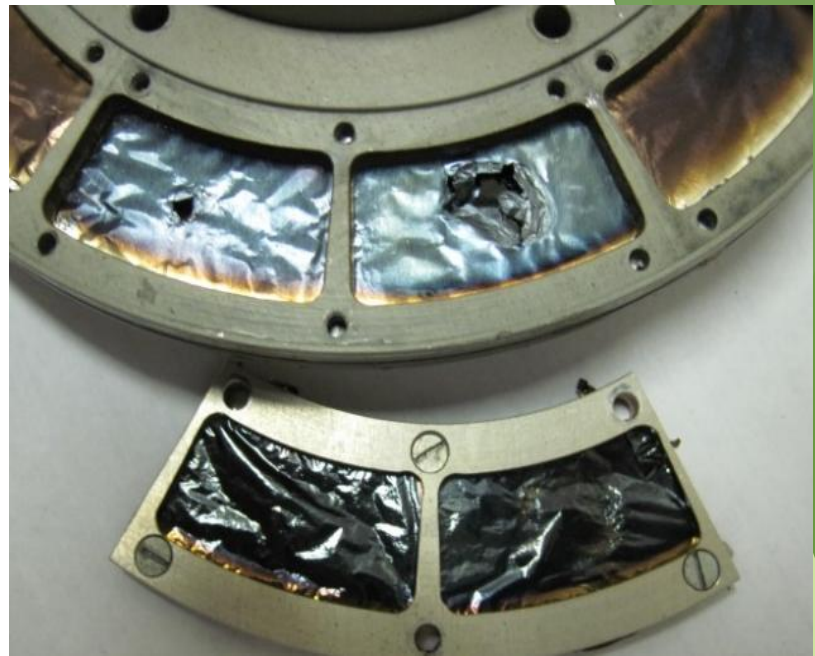
Range of energy variation, keV	15-40
Range of Br variation, Tm	0.08-0.5
Mass acceptance, %	+/-2.8
Angular acceptance, mrad	+/-14
Diameter the ion source exit hole, mm	5.0
Horizontal magnification at F1/F2	0.39/0.68
Mass dispersion at F1/F2, mm/%	1.5/39.0
Linear mass resolution at F1	75
Mass resolution at F2	1300

- 1 - Target block with hot catcher;
- 2 - Ion source;
- 3 - Mass separator;
- 4 - DAQ in the focal plane.



Hot catcher system

- 1 - Catcher camera;
- 2 - Graphite stopper (heating $\sim 1800\text{K}$);
- 3 - Division foil;
- 4 - Rotating target.



Target $^{242}\text{PuO}_2$ on $3.1\ \mu\text{m}$ Ti foil with addition of mass 1% of $^{\text{nat}}\text{Sm}$ as Sm_2O_3 inserion.

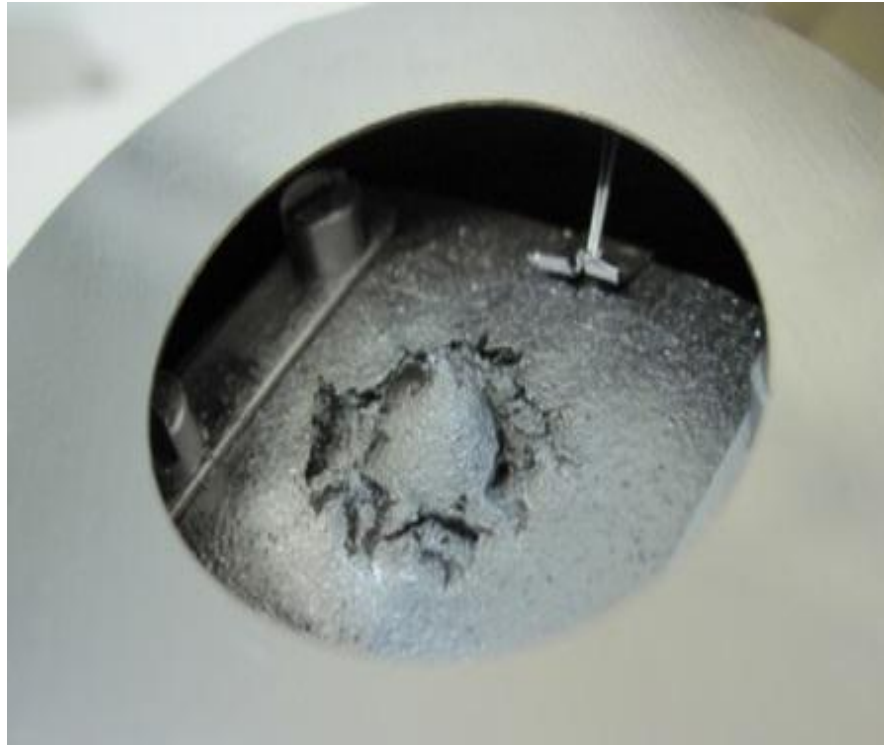
12 sectors, 14 mm width each and 30 mm arc length

Central diameter 120 mm.

Reaction $^{48}\text{Ca}(^{242}\text{Pu}, ^{283}\text{Cn})\alpha, 3n$. $T_{1/2}(^{287}\text{Fl})=0.48\ \text{s}$, $T_{1/2}(^{283}\text{Cn})=4\ \text{s}$.

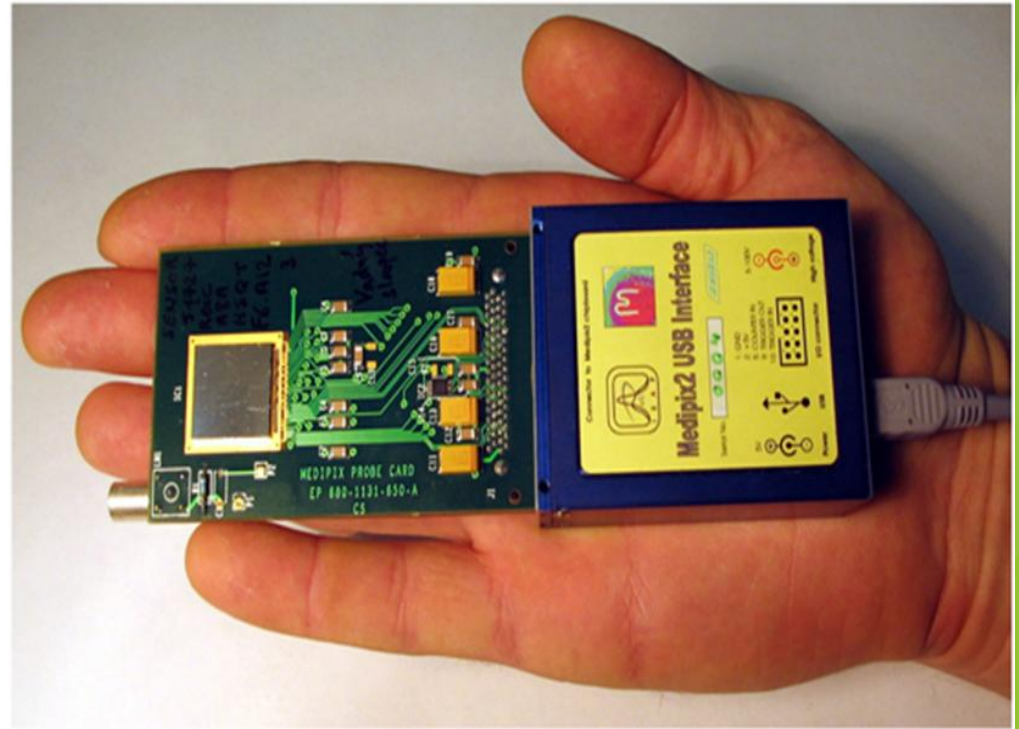
Beam parameters: $\sim 0.5\ \text{pmkA}$, ~ 2 months of irradiation. Beam spot diameter 14 mm.

Graphite stopper after irradiation (a few weeks)



TIMEPIX detector.

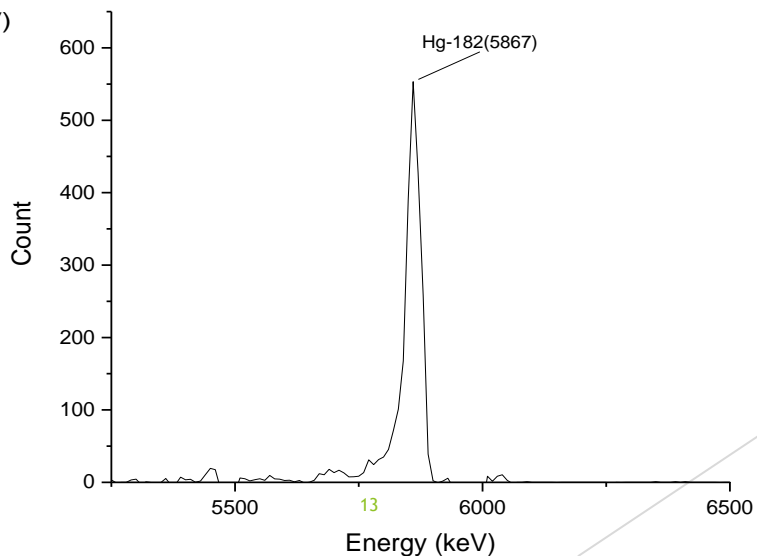
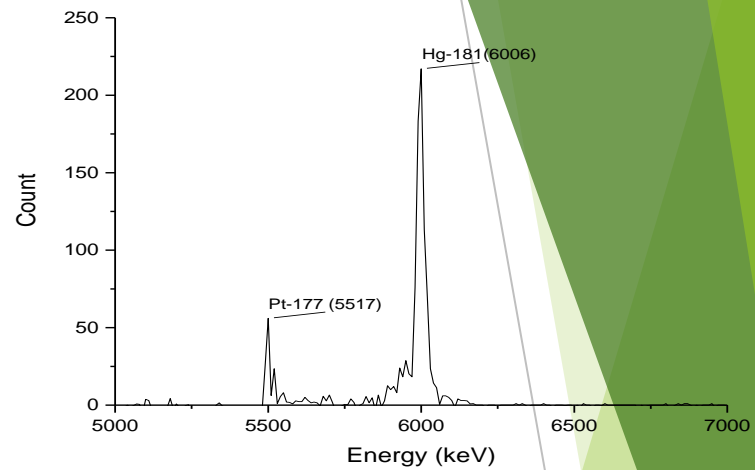
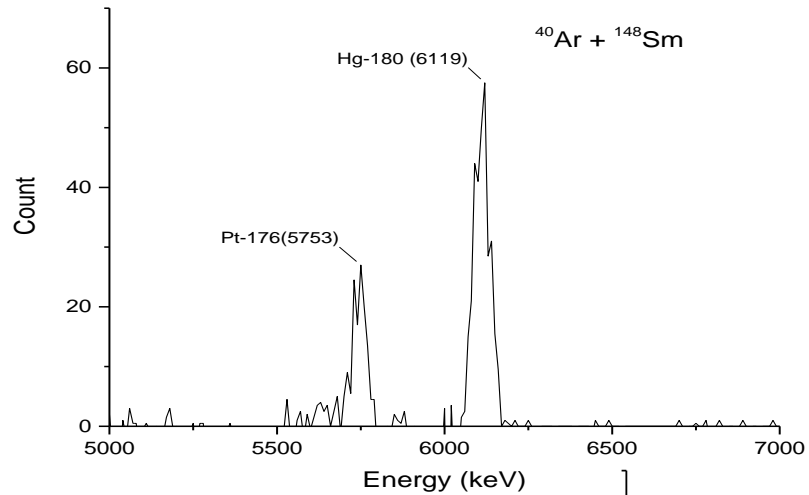
- Sensitive area 14*14 mm
- 256*256 pixels. Silicon sensor 300 mkm thickness.
- Each pixel has its own preamplifier and digitizer.
- Can detect any type of radiation: α -, β -particles, fission fragments and electromagnetic radiation (γ - and X-rays).

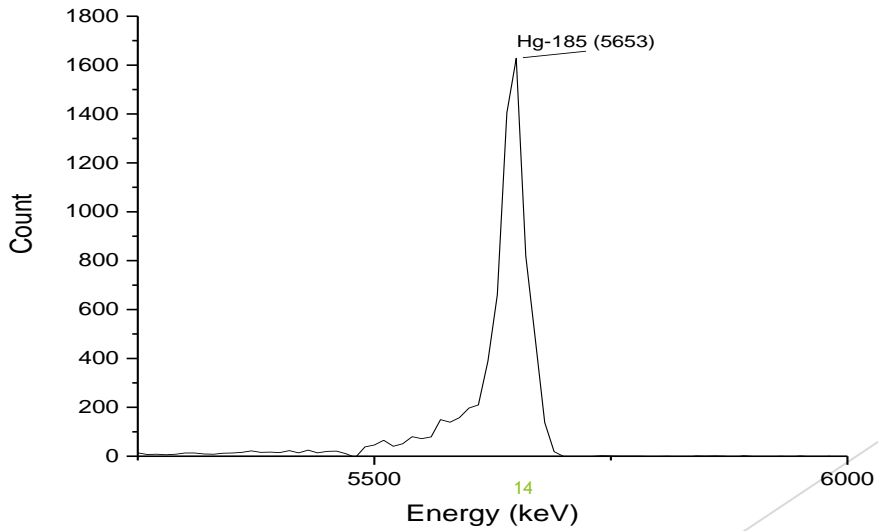
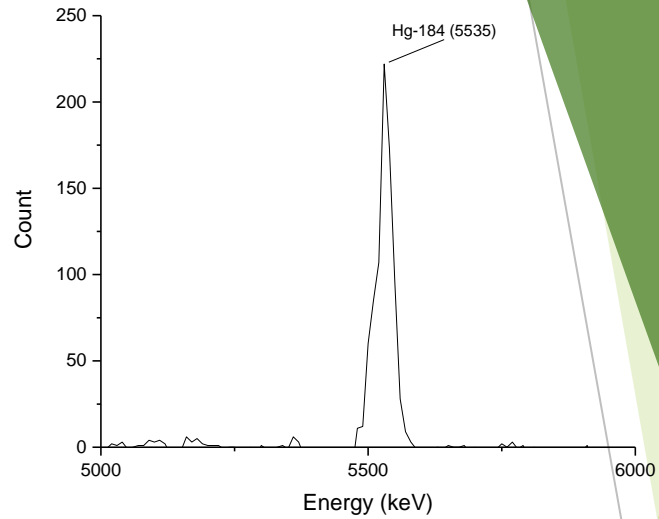
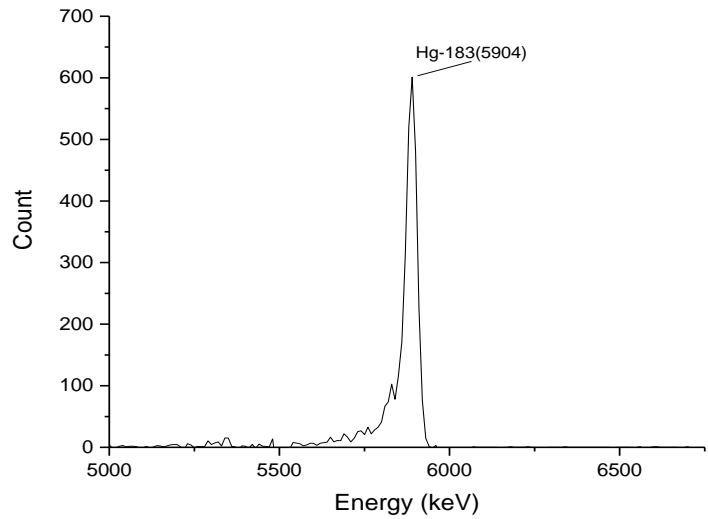


The main purpose

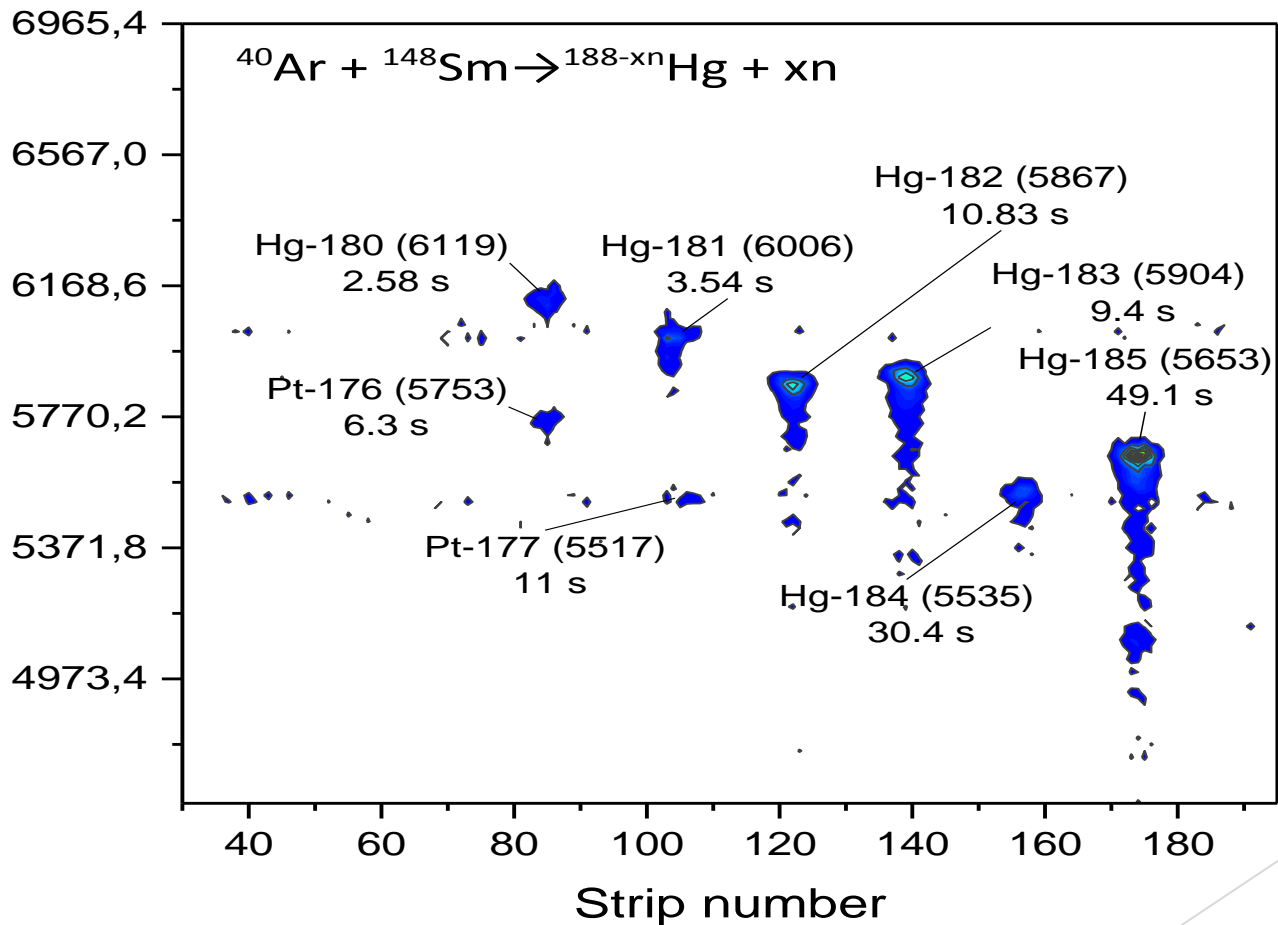
To measure the alpha decay of Hg and Rn isotopes,
produced in fusion reactions: $^{40}\text{Ar} + ^{148}\text{Sm}$; $^{40}\text{Ar} + ^{166}\text{Er}$;
 $^{48}\text{Ca} + ^{242}\text{Pu}$.

Mercury is similar to 112 and 114 elements in a row of chemical properties, e.g. with respect to the surface absorption energy, to 112 and 114 elements e.g. volatility so Hg is used for an online calibration of all parts of installation.

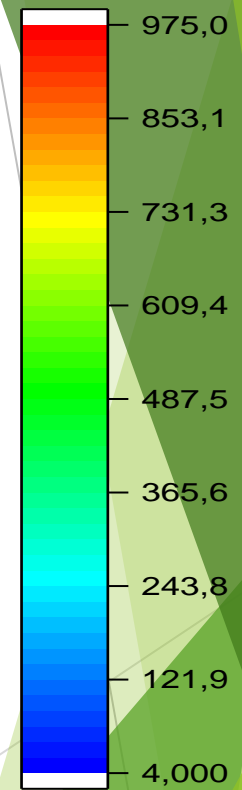


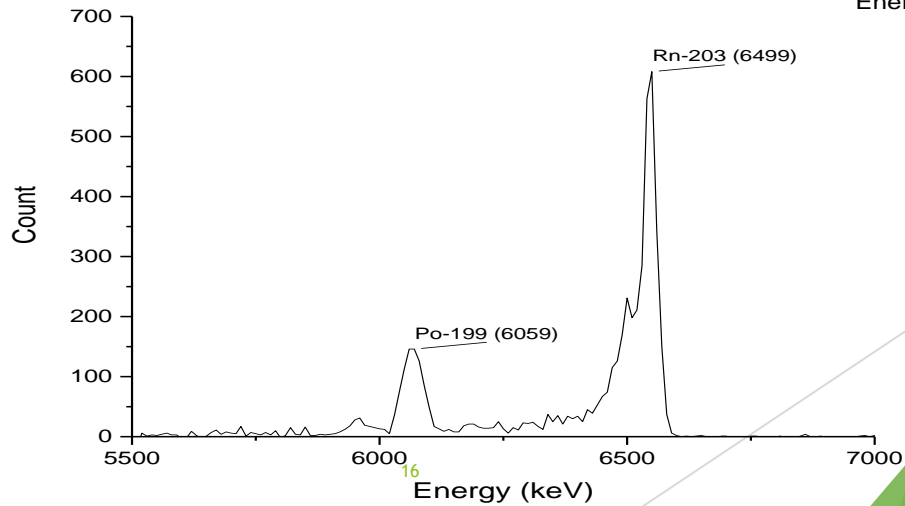
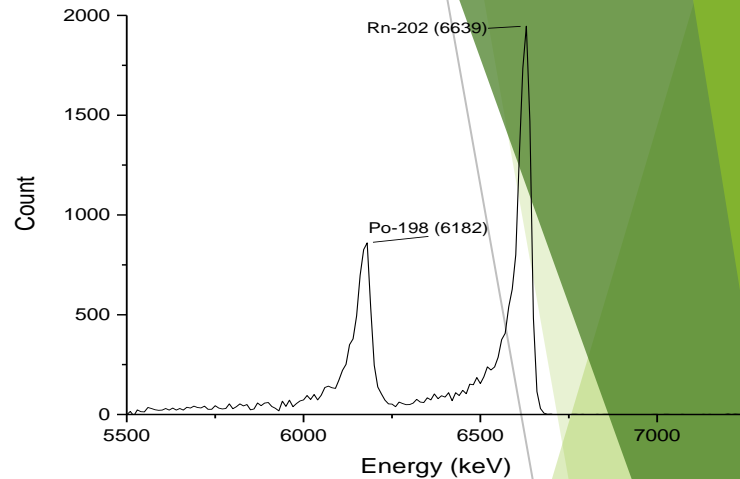
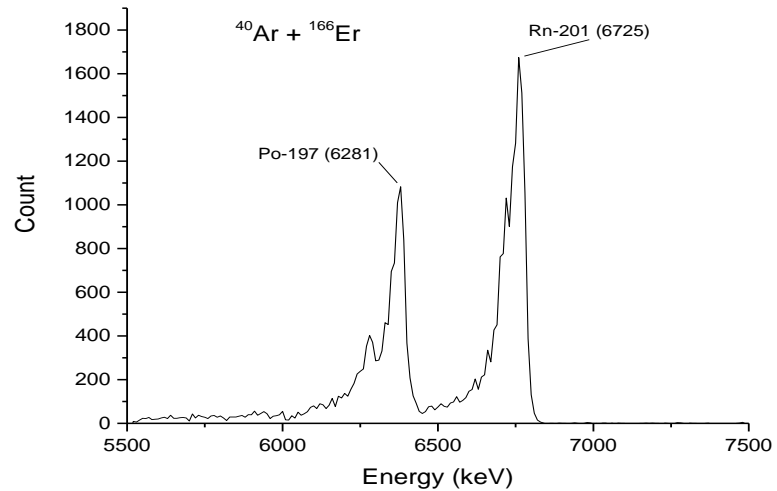


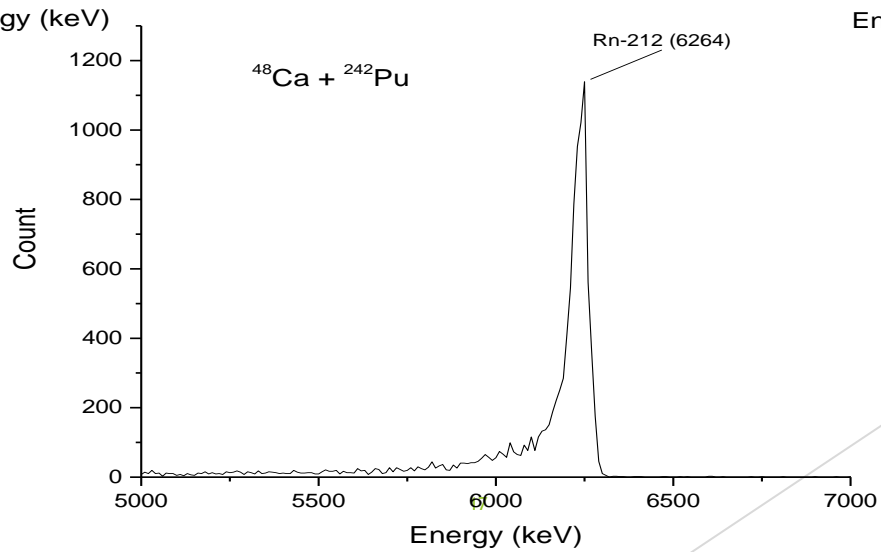
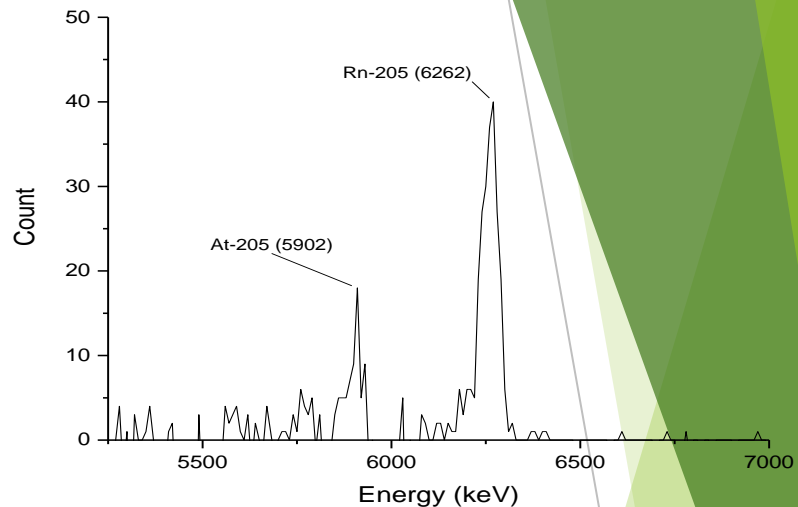
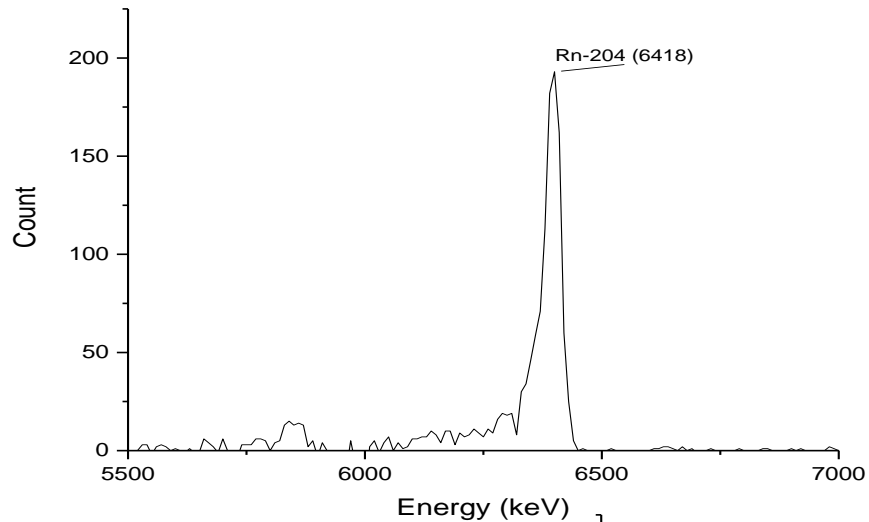
Energy (keV)

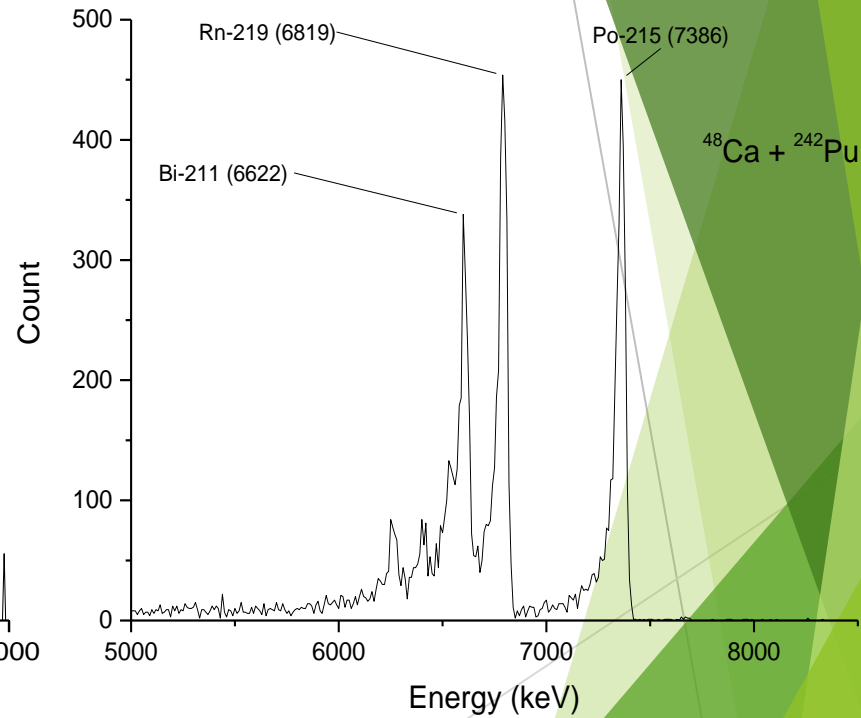
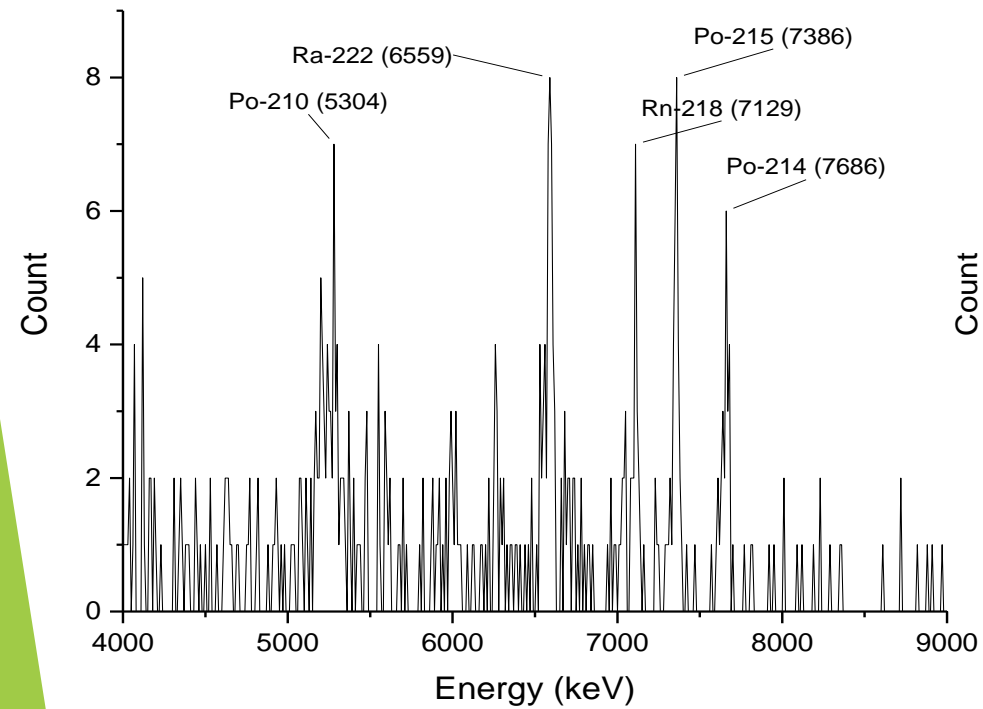


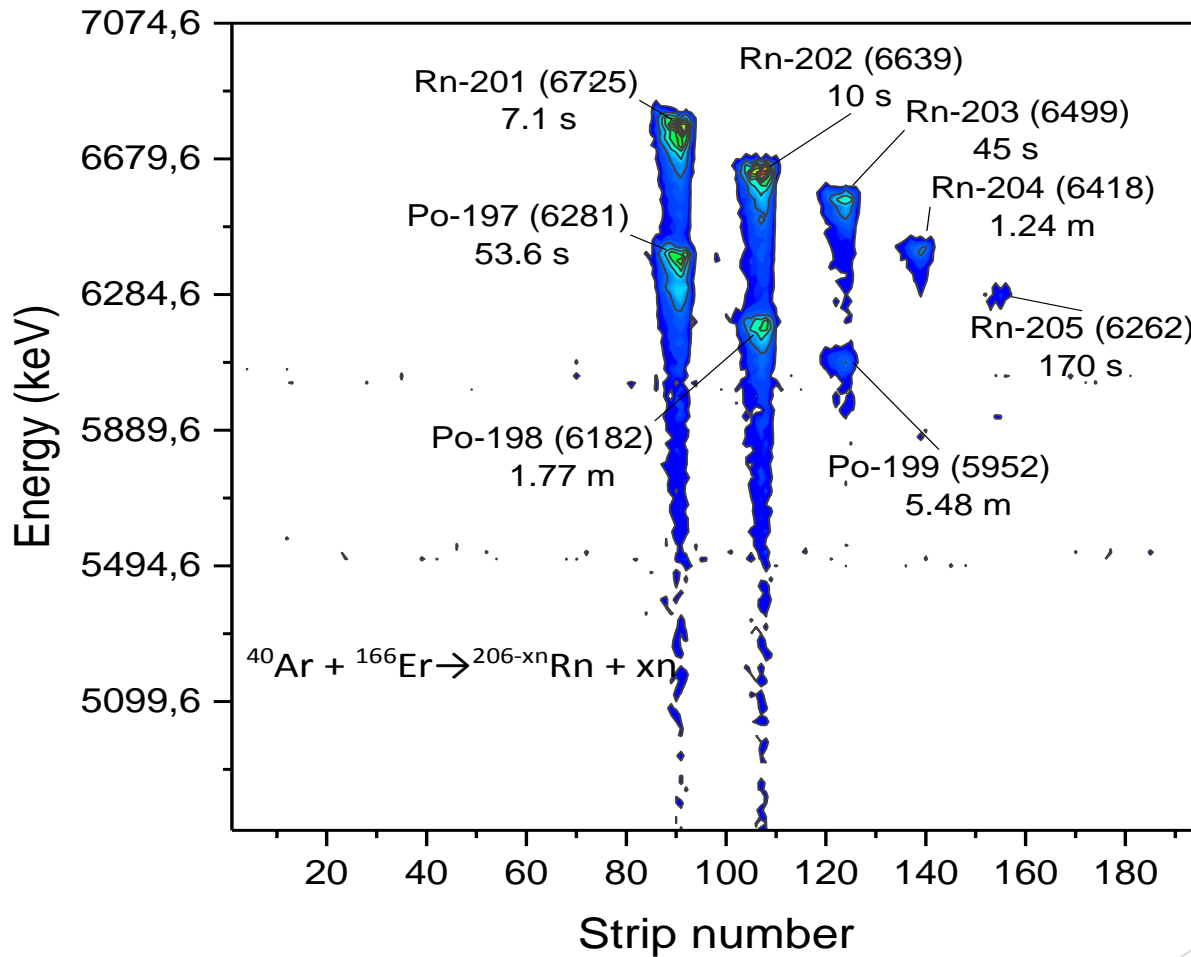
Counts



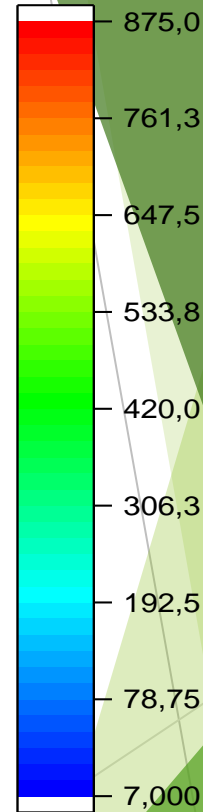


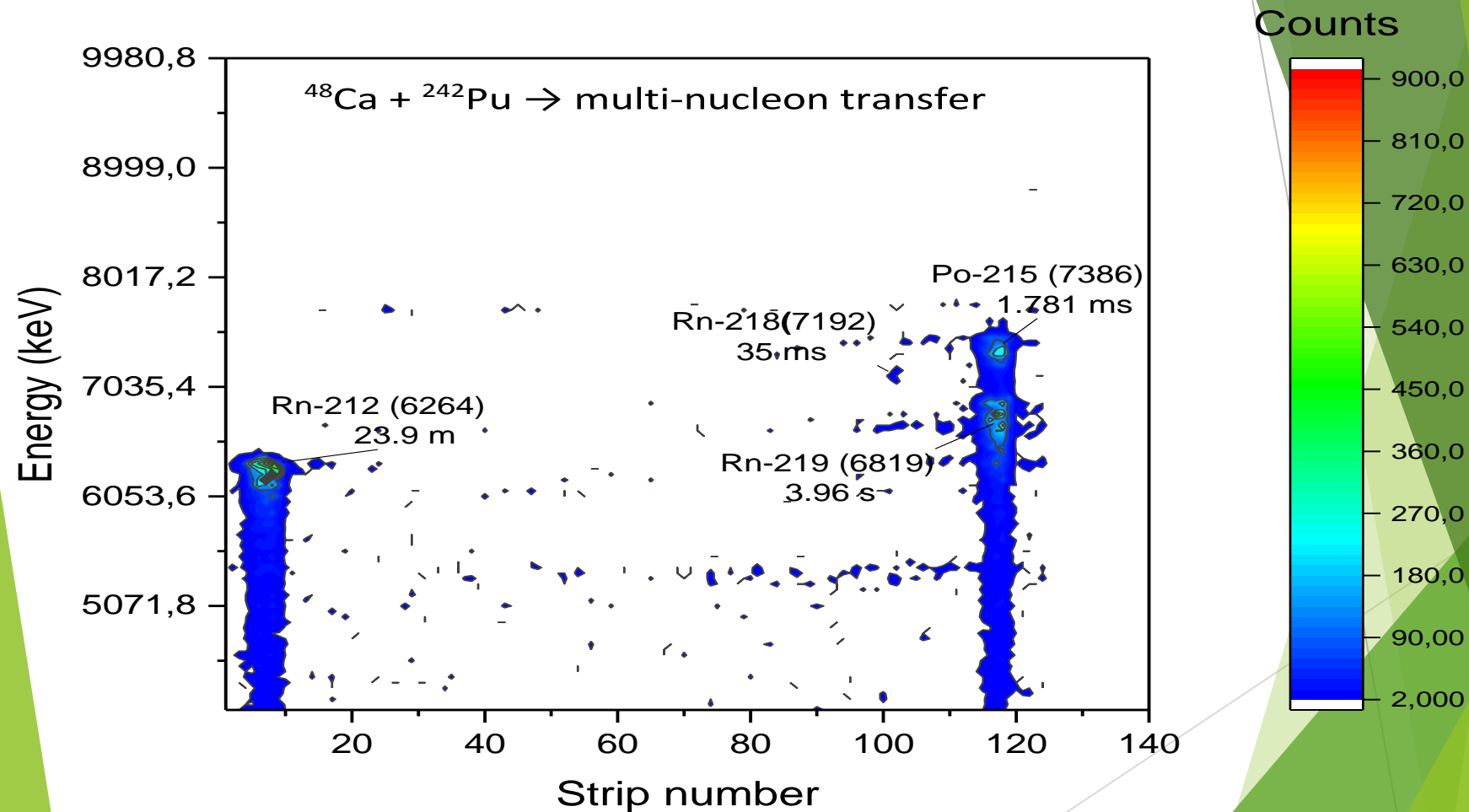






Counts





Conclusion

The main parts of MASHA facility were described. The energy calibration of the strip detector using pre-recorded data of shown reactions. Alpha spectrometry of known decay chains of radioactive Hg and Rn isotopes was chosen to perform the detector calibration. Results of completed calibration were represented.

Acknowledgments



to our supervisor
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and all MASHA team.

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