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Production of the radioisotopes for radiochemical analyzes

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Radiochemical analyzes

Research on Radioactive Contamination of the Environment

Research on separation techniques

Radiochemical procedure in brief

1. Mineralization (as result only salts and oxides)
2. Preconcentration (precipitation, extratction….)
3. Separation (ion exchange, extraction …)
4. Source preparation
5. Measurement(s)

Radiotracer – an isotope of given element* not present in sample which is used for control of chemical yield (recovery) of analyte.

*Somtimes as tracer the isotope of anlogue element can be used (for example Ba-133 in Ra analyses, or a stable element (for example Ni in Ni-63 analyses…)

Studies on obtaining (activation and separation) of radioactive tracers as suport for environmental radioactivity monitoring and research done by us with AIC-144 cyclotron

Some examples:

Sr-85: obtained from natural Rb

Tc-95m: obtained from nat. Ru or nat Mo

As-73: obtained from nat. Ge

Rb-83: Obtained via production of S-83 from

Gd-148 obtained from natural Eu

Np-235: obtained from U-235(p,n)Np-235

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Sr-85: Rb-95(p,n)Sr-85

Target: Salt

Separation: Extraction chromatography (Sr resin, Triskem)

Measurement: Gamma spectrometry

Customer: Own needs



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As-73: Ge-74(p,2n)As-73, Ge-73(p,n)As-73

Target: metallic

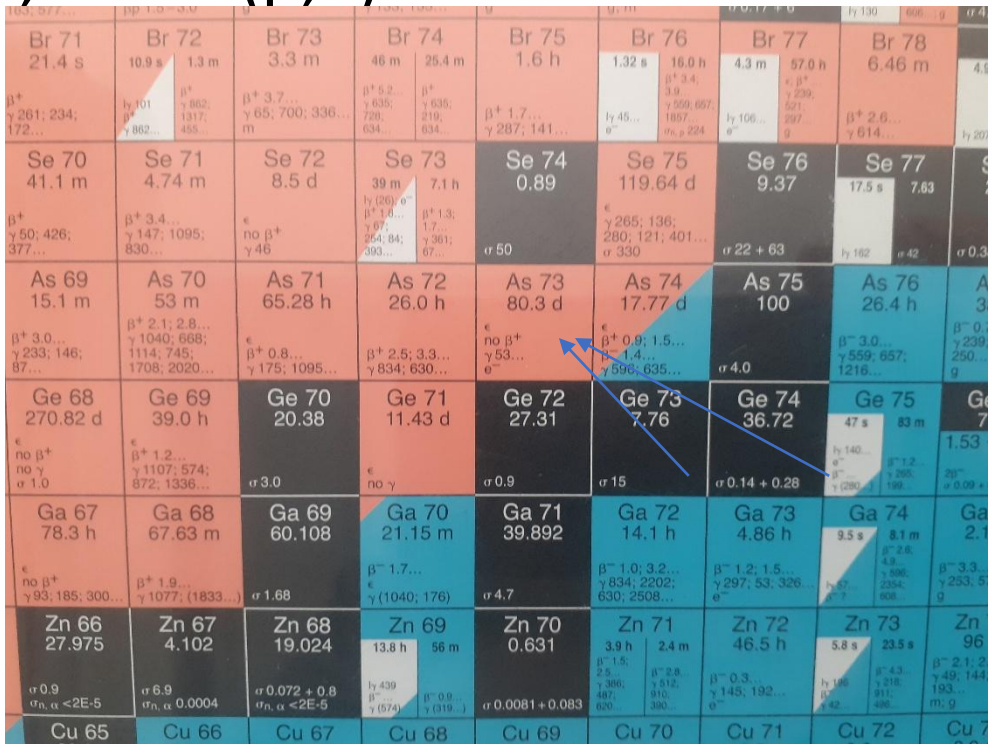
Separation:

Termochromatography

Measurement:

Gamma spectr.

For MEL/IAEA Monaco



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Tc-95m:

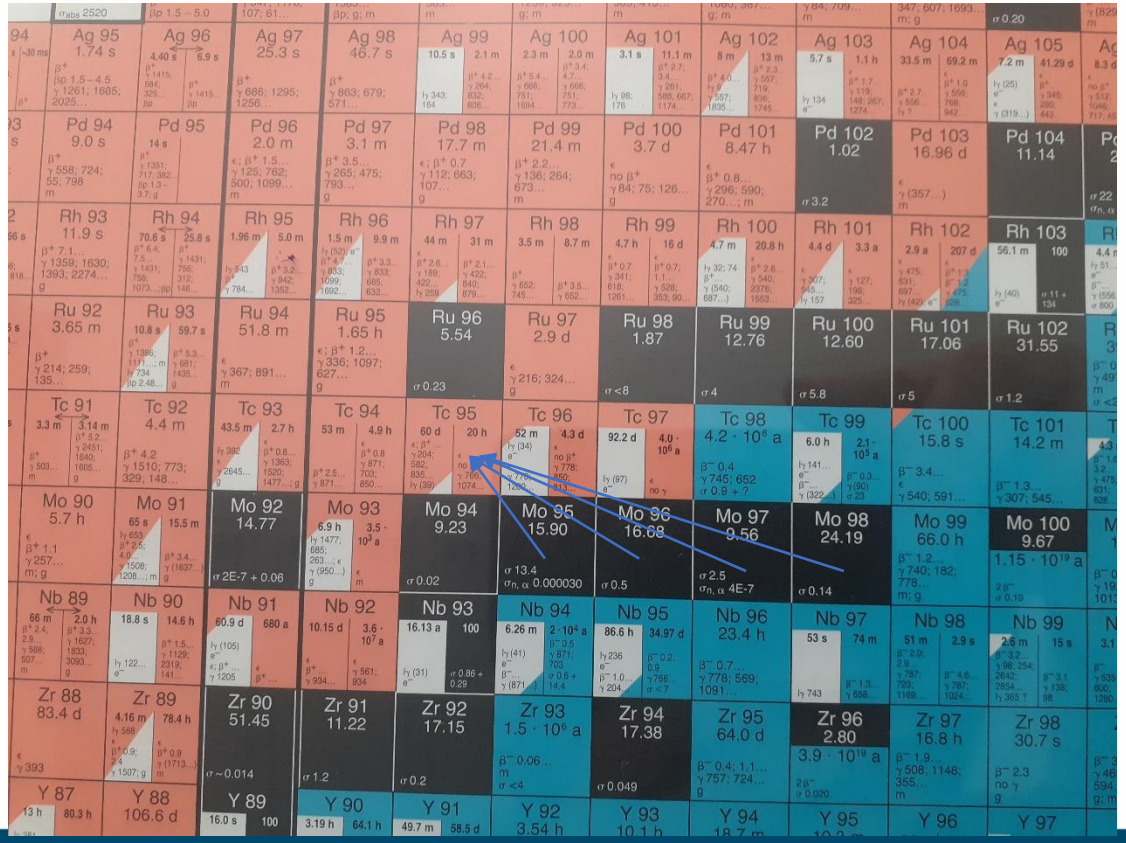
1. Nat Mo(p,xn)Tc-95m
2. Nat Ru(p,xn)Tc-95m

Target: salts

Sep. TEVA (Triskem)

Meas. Gamma spectr.

Own needs



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Rb-83: Rb-85(p,3n)Sr-83

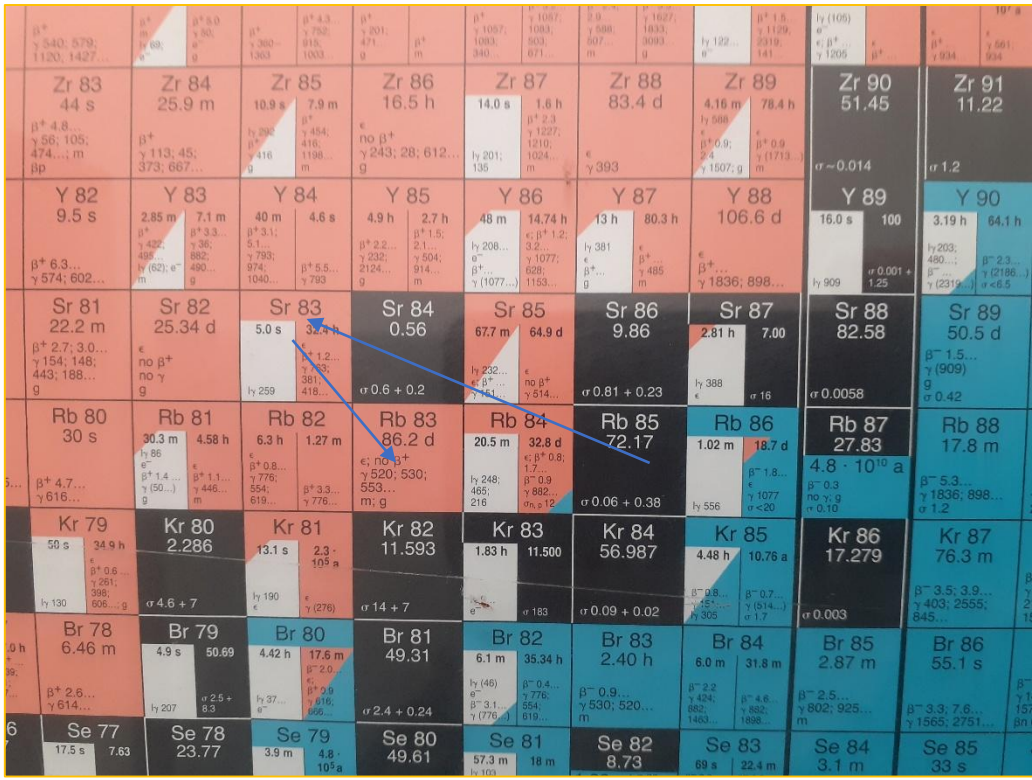
Sr-83(beta minus)Rb-83

Target: Rb salt

Double separation Sr-resin

Measurement: Gamma

Own needs (Cs analyses tracer)



Studies on obtaining (activation and separation) of radioactive tracers as suport for environmental radioactivity monitoring and research done by us with AIC-144 cyclotron

Eu-151(p,4n)Gd-148

Target: salt

Separation (none so far)

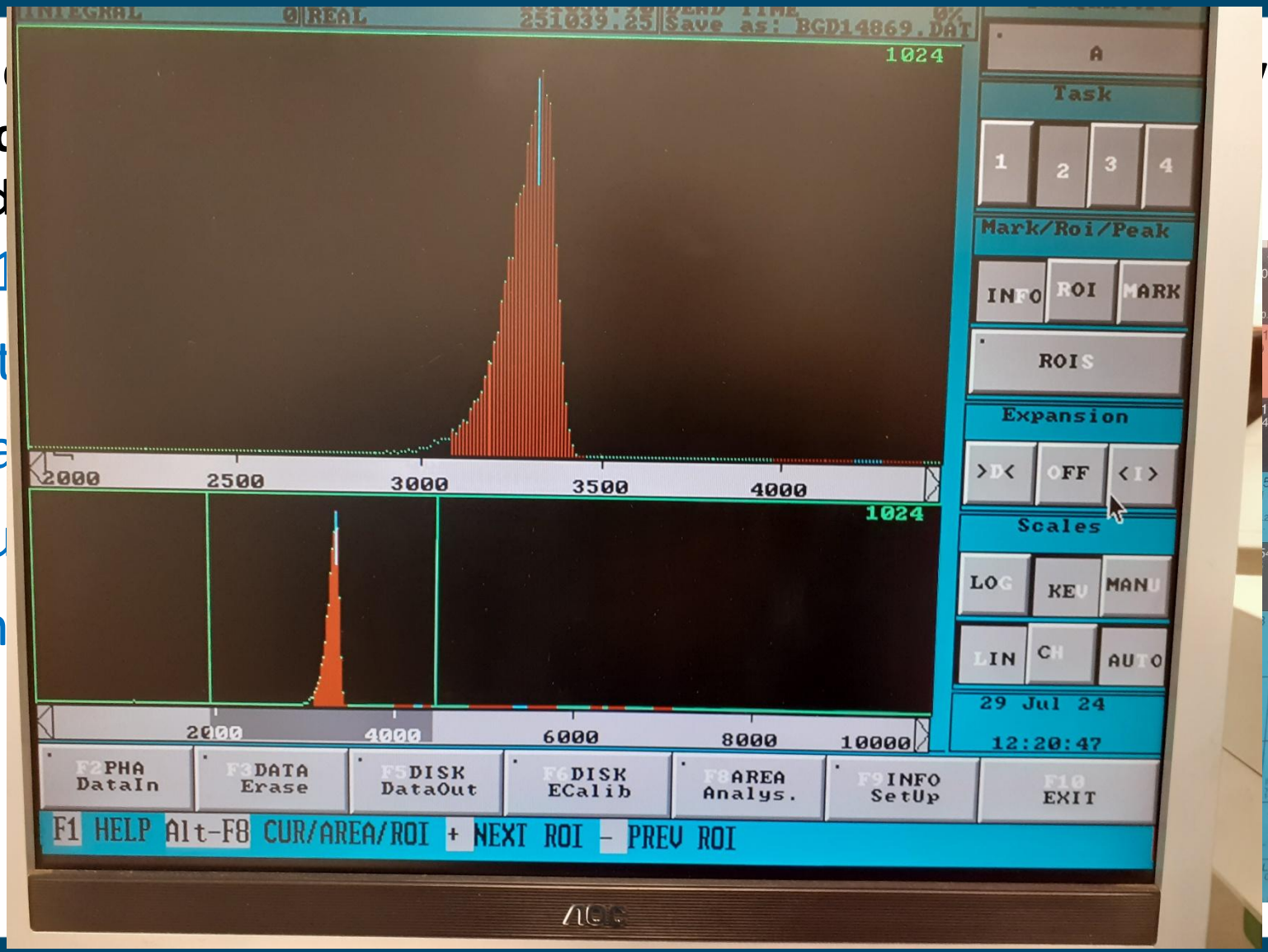
Measurements: alpha sp.

Own needs



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Studies on obtaining (activation and separation) of radioactive tracers as suport for environmental radioactivity monitoring and research done by us with AIC-144 cyclotron

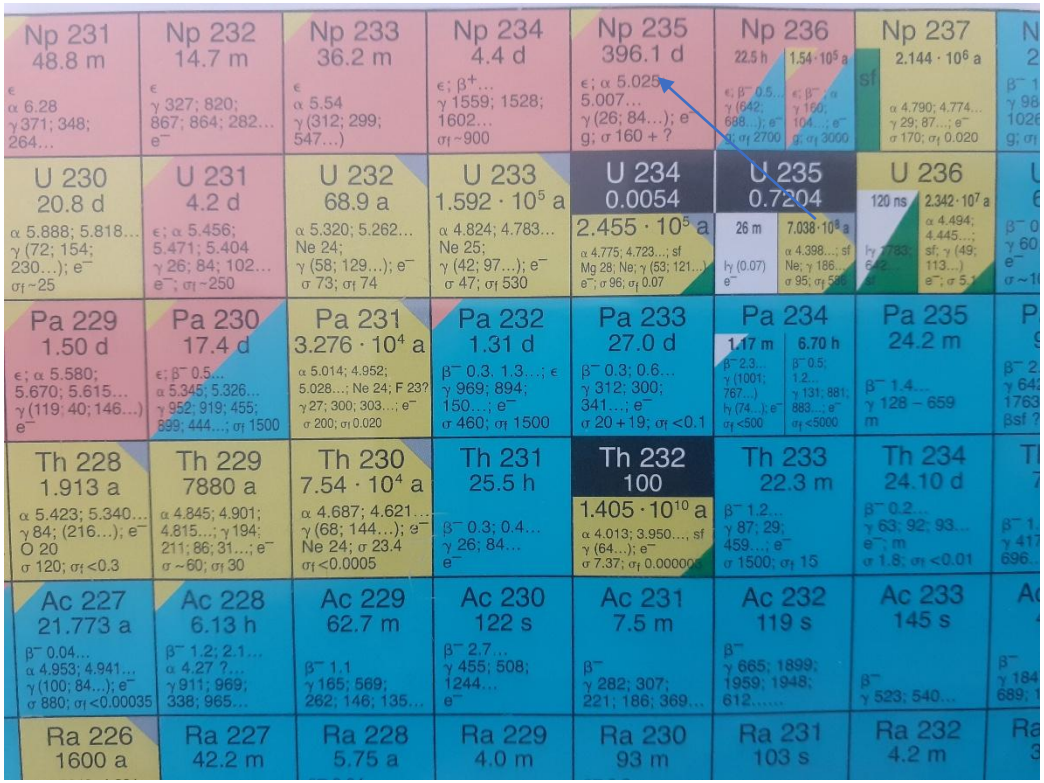
U-235(p,n)Np-235

Target: nitric salt

Separation: TEVA

Measurements: LSC

Own needs/research



Desired beam ions for new liniac

Primary Particle:

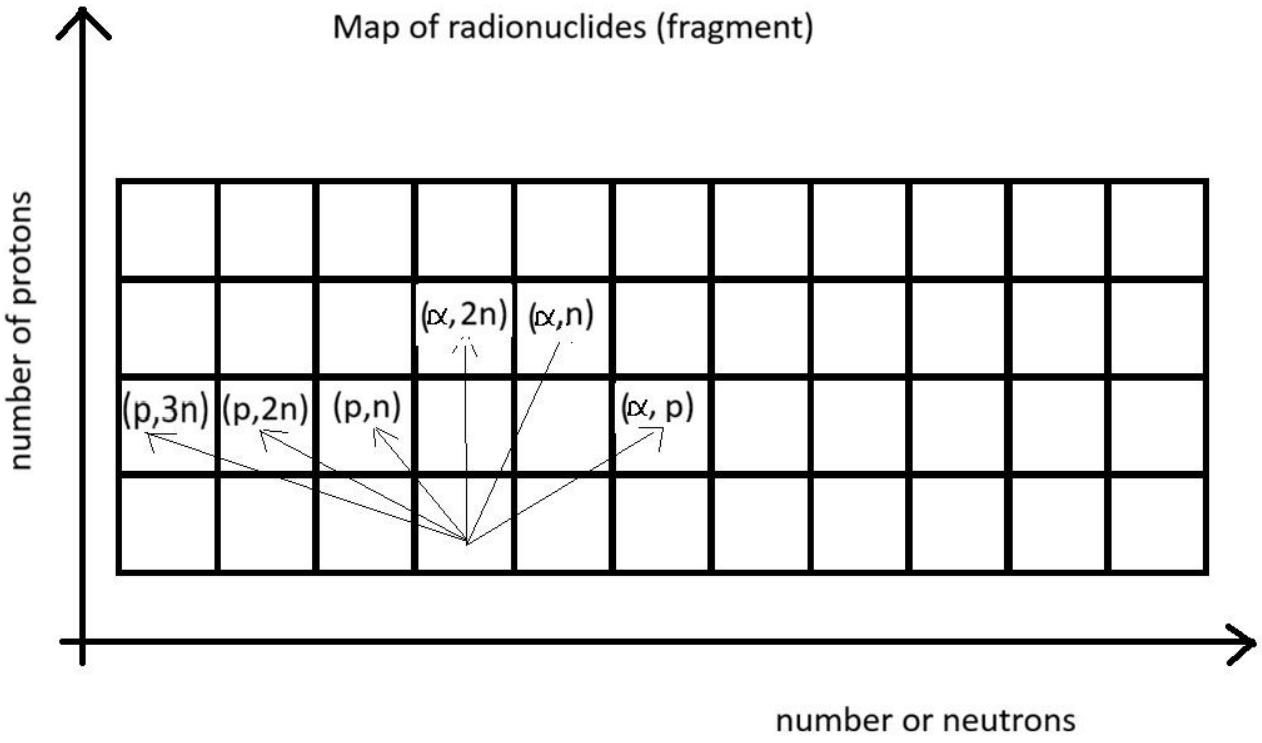
[x] Proton (p+)

[x] Deuteron (2H+ / d)

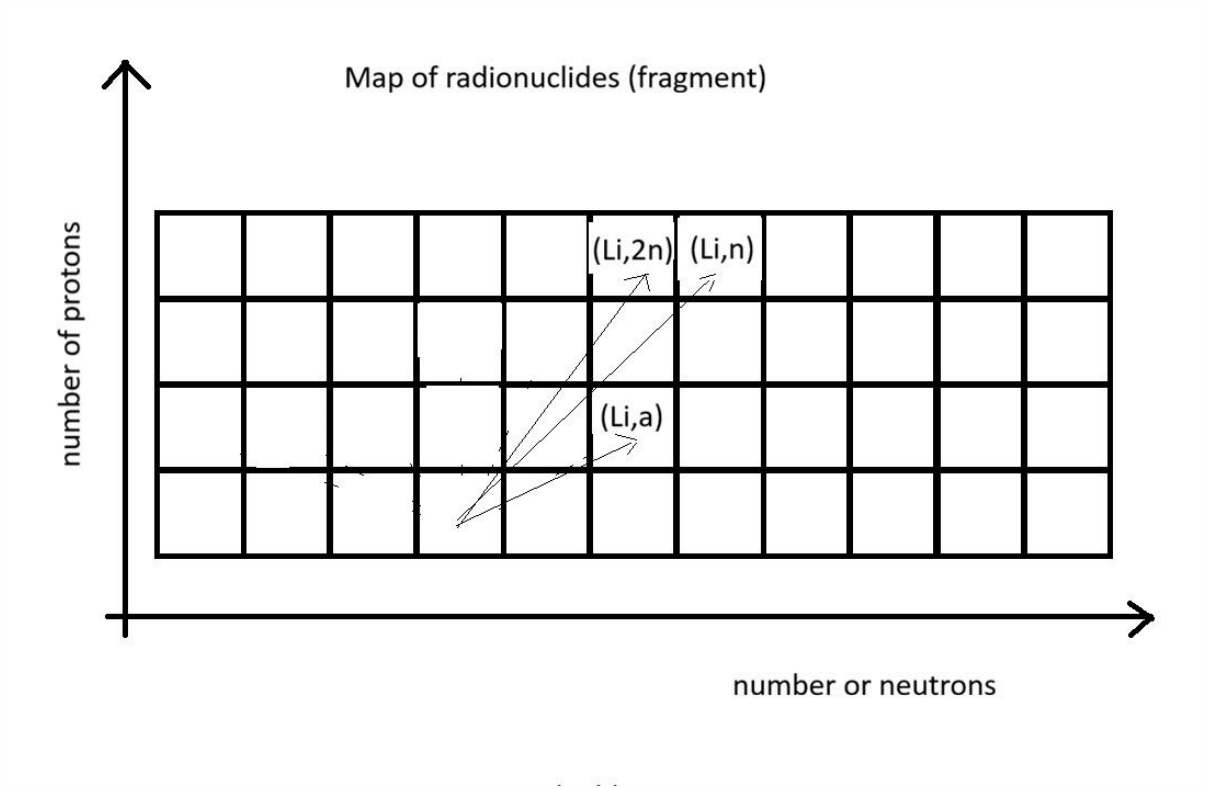
[x] Alpha (4He2+)

[x] Lithium-7 (7Li3+)

Reactions with p and alphas



Reactions with Lithium-7 (3+)



Additional Infrastructure Needs

Modification/upgrade of existing hot cell or construction of brand new lab for processing of irradiated targets, transport of targets to radiochemical lab together with targetry preparation bench/workshop:

- Box renovation (new equipment, restoration and testing of target transport system, installation of area monitoring)
- Glovebox stations for target preparation / separation in inert atmosphere
- New targetry workbench for construction of cooled targets, gas targets etc.







CONCLUSIONS

Planned is obtaining various radionuclides for both medical application (Dr Arshiya A. Ahmed talk) and **tracers for radiochemical analyses**.

High current of beam would be the key feature enabling obtaining sufficient activities for medical application.

The heavy ion beams are of the particular interest due to opening room for production of radioactive tracers not available in (*p,xn*) or (*d,xn*) reactions.

For production of tracers high currents are not necessary. High energy will open also opportunity to use spallation for radionuclide production, what sometime is a only one way of production of desired nuclide.

Therefore, for proposed here purpose a wide range of beam particles and also energies as well as high current are required.