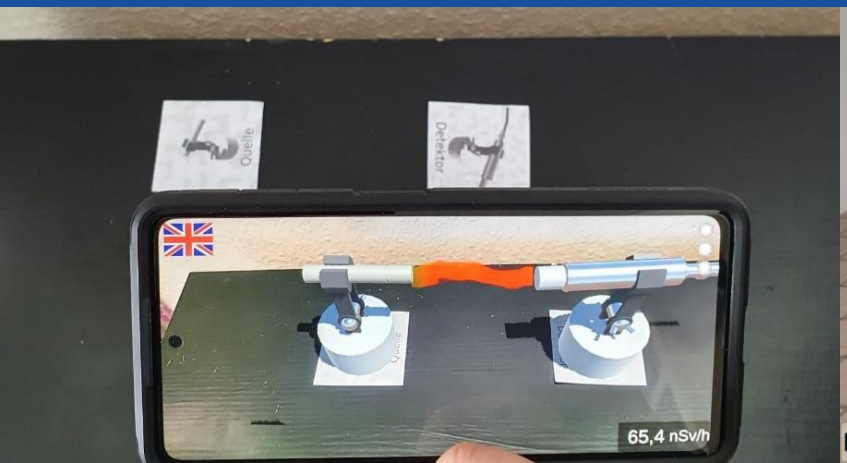
ISEs, AR and VR as training-tools

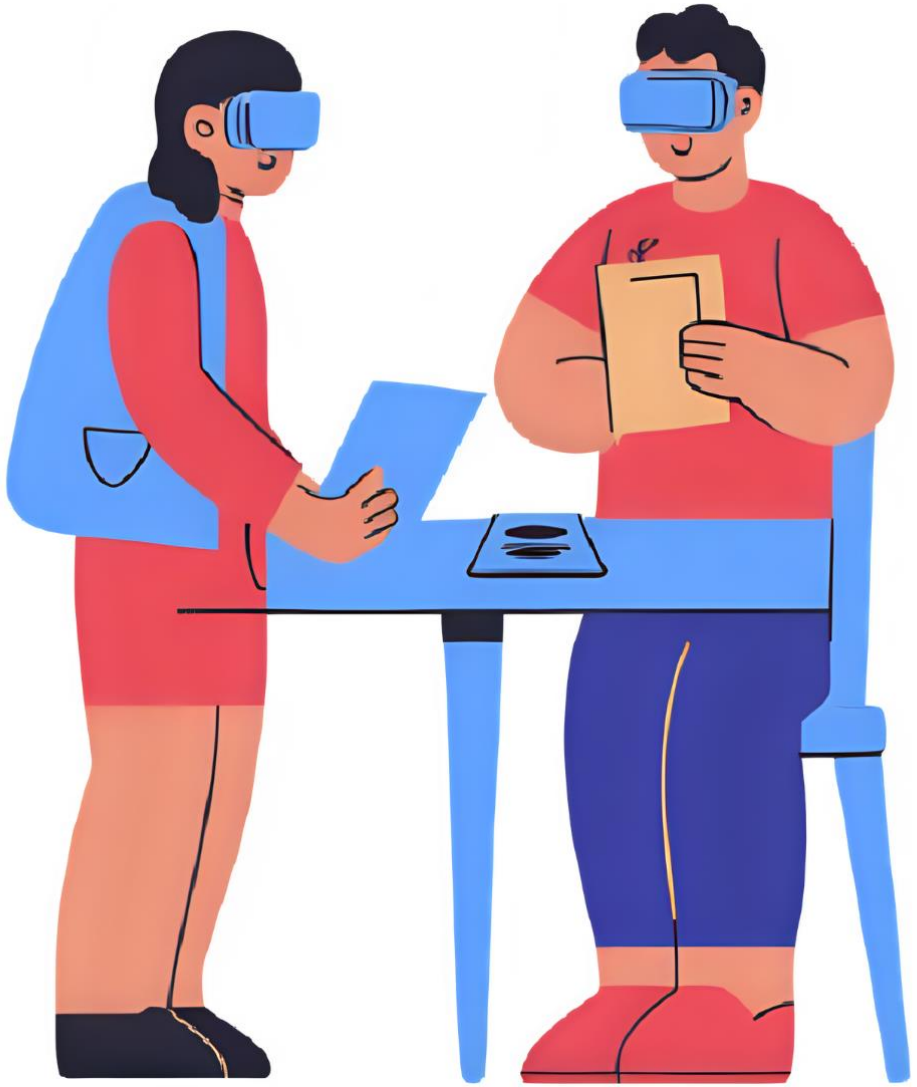
Emily-Marie Zube[1], Tobias Weissenborn[1], Hanne Schmitz[1], Elena Macerata[2], Charlotte Fischer[1], Janne Hillberg[1], Milo Albrecht[1]

[1]Institute of Radioecology and Radiation Protection (IRS), Leibniz University Hannover, Germany

[2] Department of Energy – Nuclear Engineering Division, Politecnico di Milano, Italy



Tomorrow: Practical Hands-On Training



AI generated pictures

Materials for schools

Fachverband für Strahlenschutz e.V.
Für Deutschland und die Schweiz
Mitgliedsgesellschaft der IRPA
International Radiation Protection Association

Methodically sorted material

Hier finden Sie methodisch sortiert Materialien, die für den Unterricht verwendet werden können.

Verfügbare Materialien

- Augemented Reality (AR)
- Interaktive Bildschirmexperimente (IBEs)
- Escape-Room-Spiele
- Einfache (reale) Experimente mit natürlicher Radioaktivität
- Virtual Reality Experimente (VRE)
- Schulwettbewerbe
- Software
- Strahlenschutzkompakte des Fachverbandes für Strahlenschutz

More Materials

EXPERIMENTE UND UNTERRICHTSMATERIALIEN

RadLab

Mobile Experimente für Schulen

Augmented Reality Experimente

App für Andriod und iOS

Escape Rooms

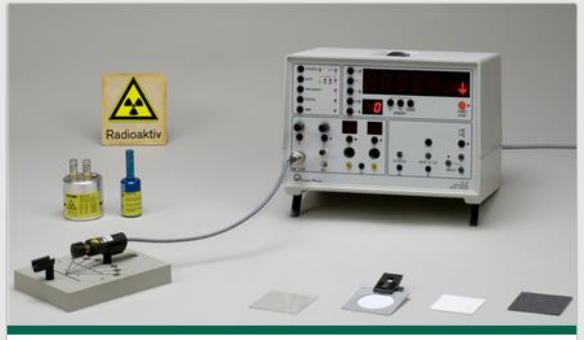
EXIT Spiele für den Unterricht

Interaktive virtuelle Experimente

Virtuelle Experimente zum Download

Interakt. Bildschirmexperimente

IBEs des IRS



IBE Sammlung FU Berlin

Interaktive Bildschirmexperimente

tzkurse.de/de/behoerden-schulen/angebote-fuer-schulen/radlab

Advantages of Interactive Screen Experiments

- *Supplementing* real experiments
- Low logistical effort
- Perfect for simulating complex procedures
- Interactive learning
- *Flexibility* and *accessibility*
- Reliability
- More *motivation*
- Improved learning outcomes and rapid knowledge acquisition

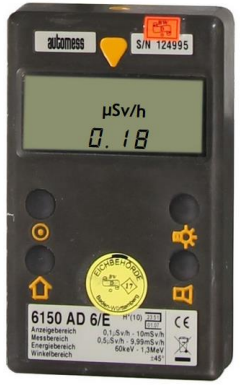
Examples: Interactive Screen Experiments

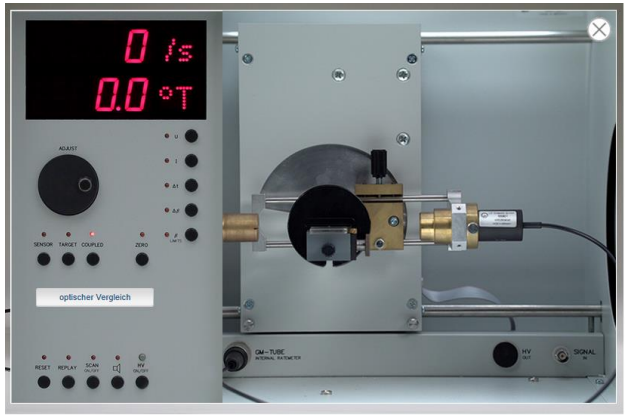
X-Ray Shielding

- Effect of different shielding materials und material thickness

Measuring Devices

- Getting to know different measuring devices
- Differences between the individual measuring devices



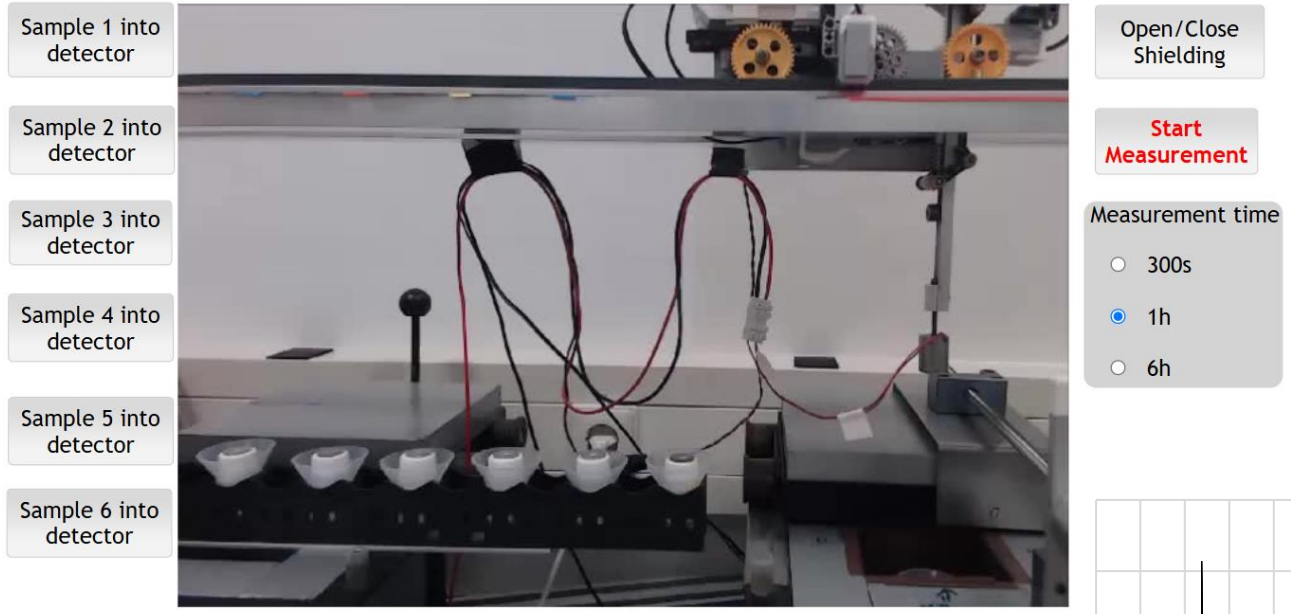


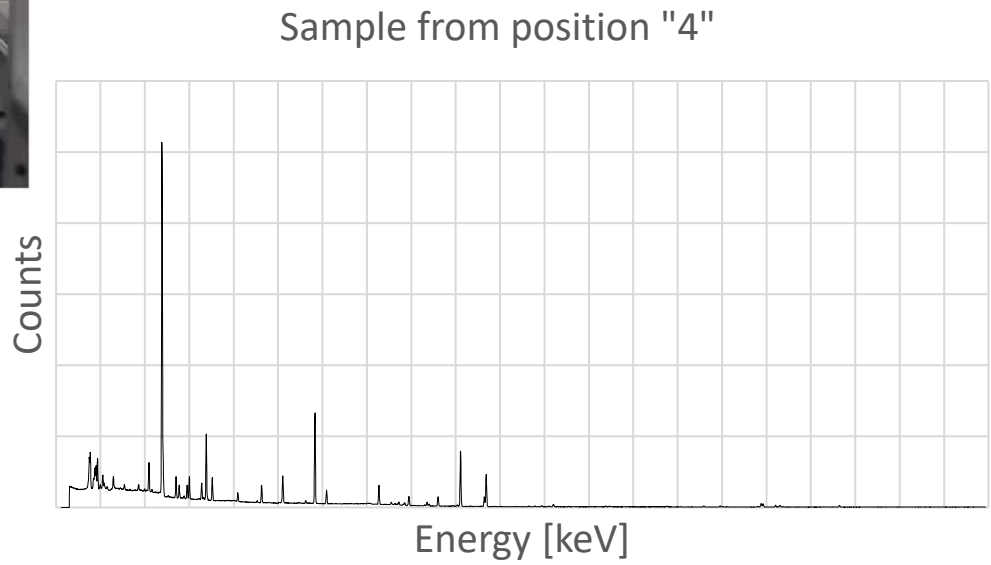
Angle-dependent Reflection

- Visualization of the Bragg condition
- Relationship between the orientation of the rotating crystal and the detector

GammaLab

Interactive Screen Experiments — RoboLabs

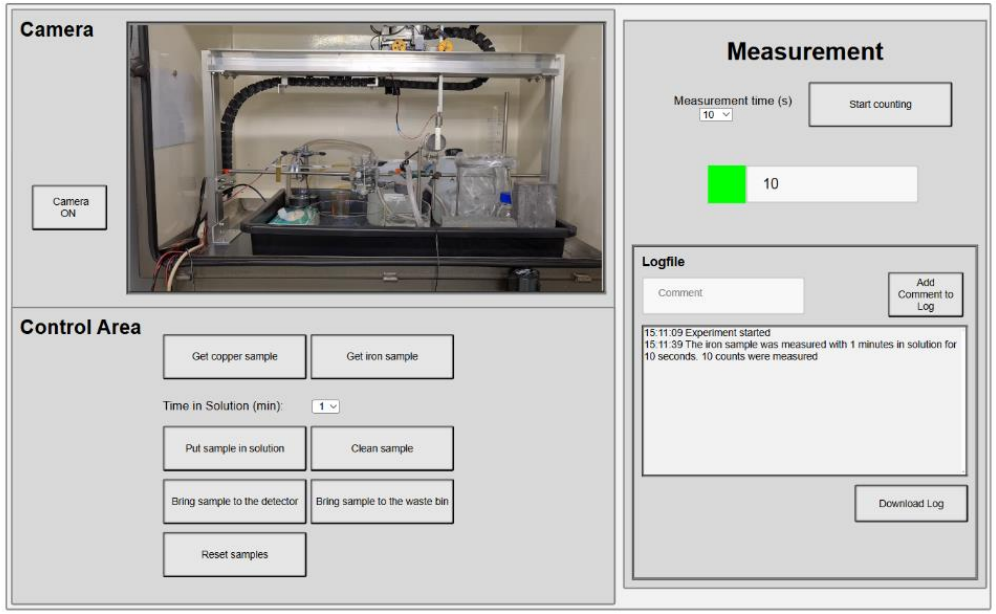


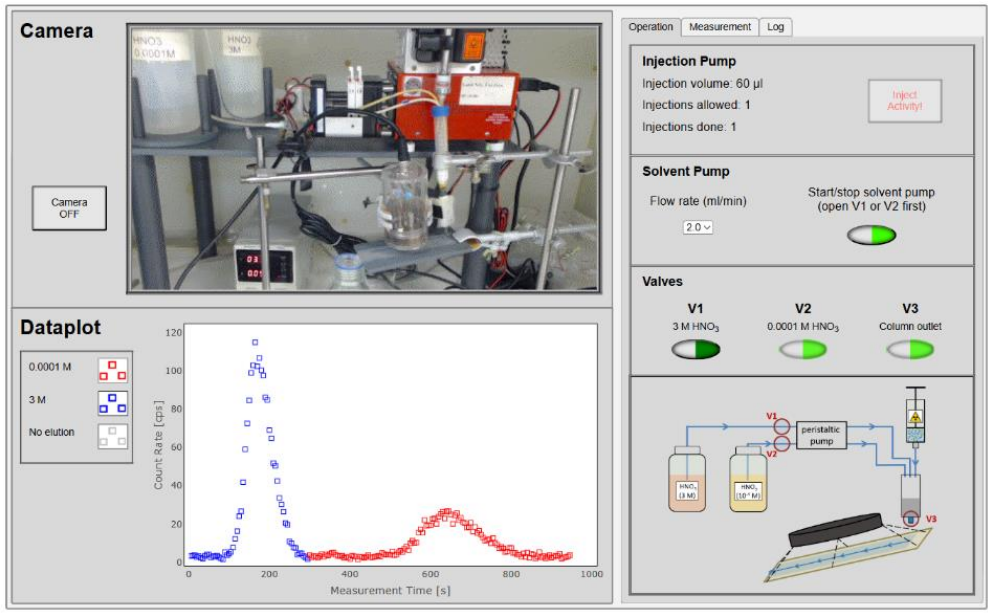


- Investigation and identification of different samples using gamma spectrometry

Contact us: robolab@irs.uni-hannover.de

Additionally





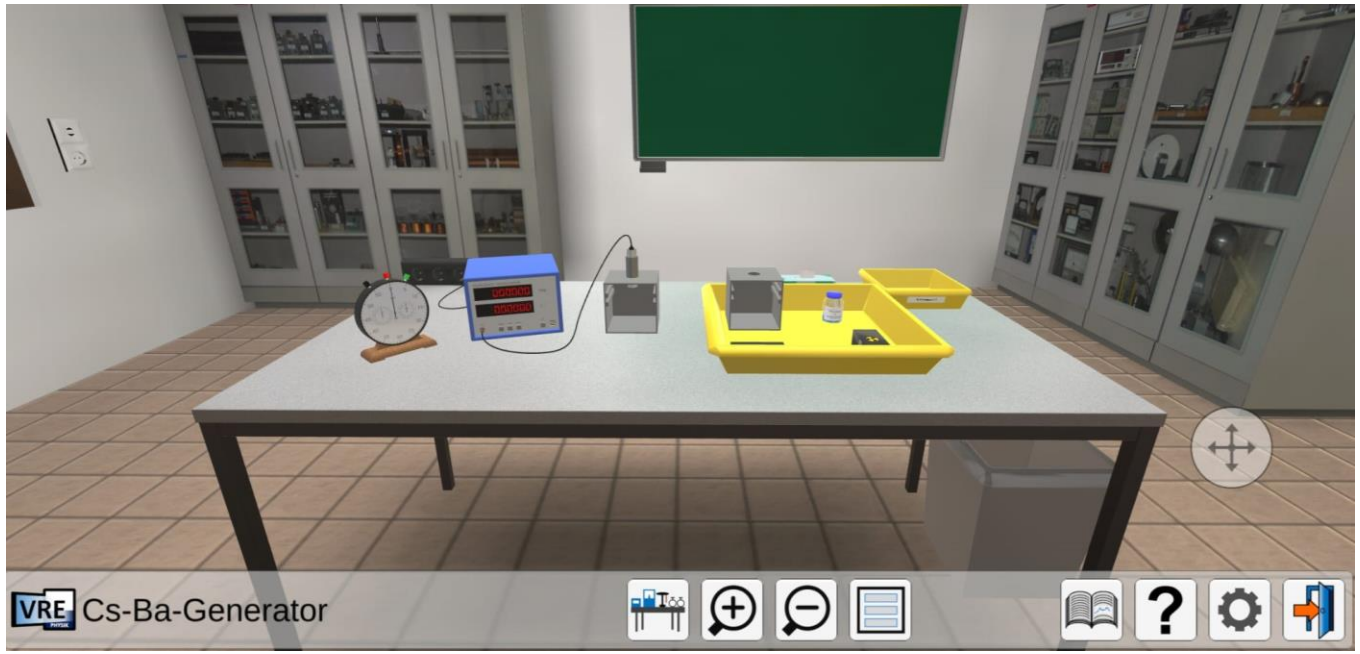
PAuLa (Programmable Autodeposition Lab)

- Autodeposition of Tc on different metal strips

IonLab

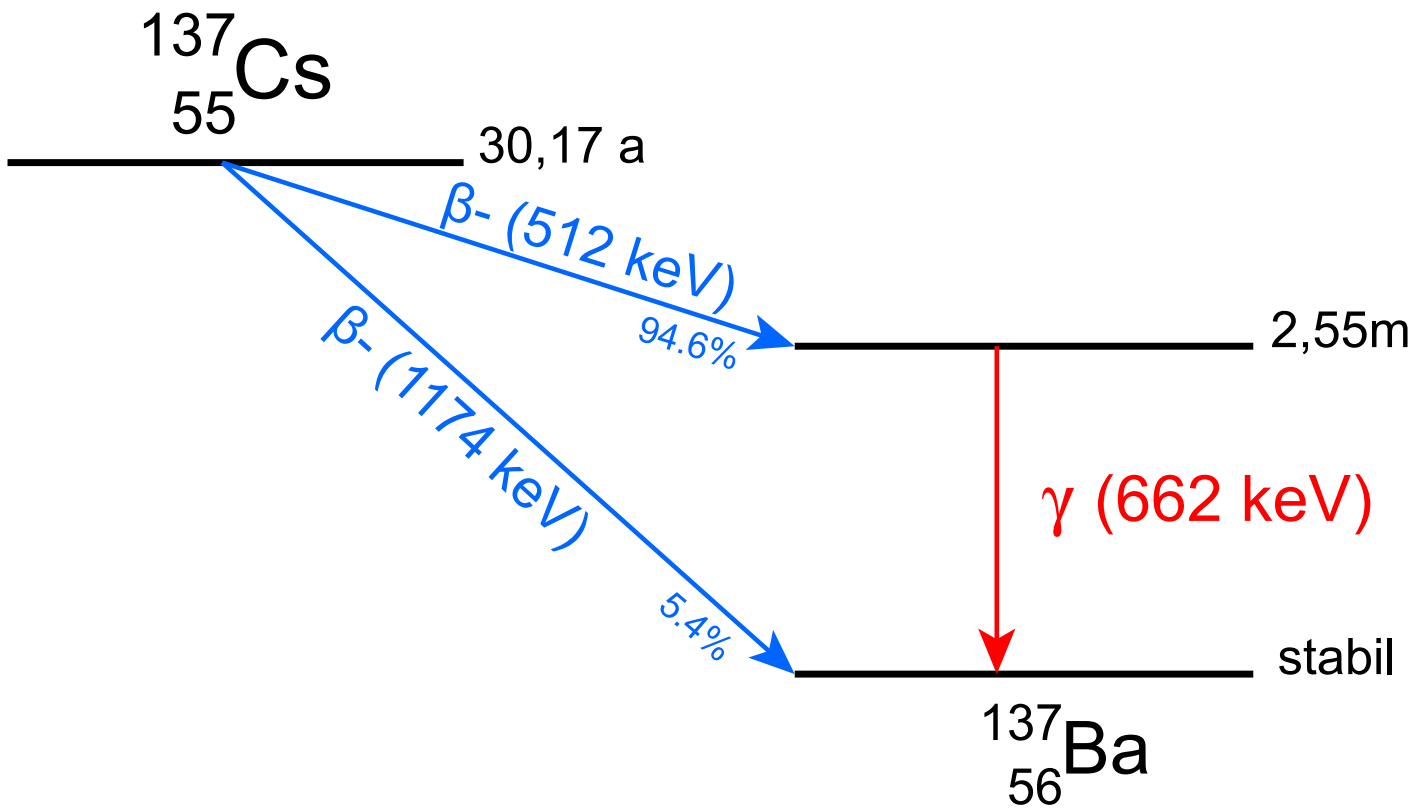
- Introduction to chromatography
- Sr-90/Y-90 separation via ion exchange resin

Determination of the Half-Life of Ba-137m

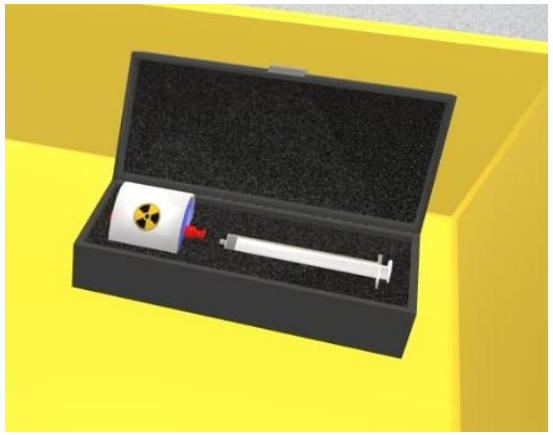


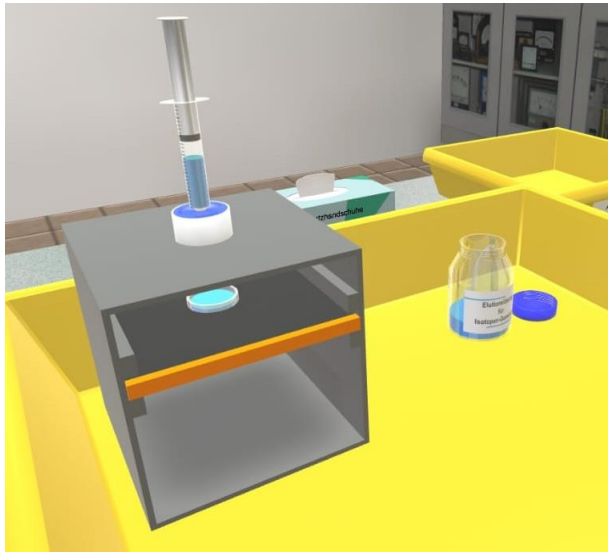
The Decay of Cs-137

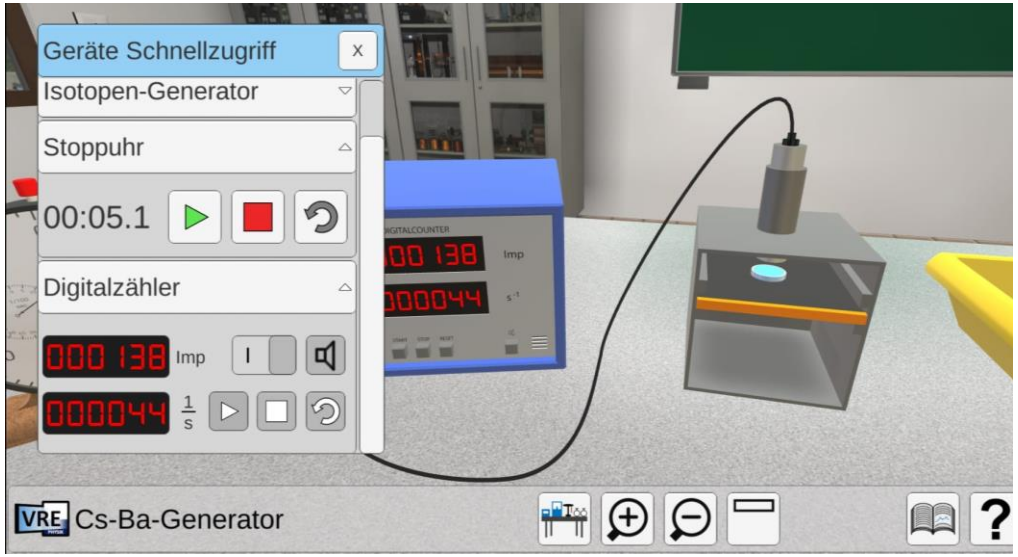
- 94.6% of the Cs-137 decays to Ba-137m with a half-life of 30.17a
- Ba-137m decays to Ba-137 with a half-life of 2.55m



Execution of the experiment



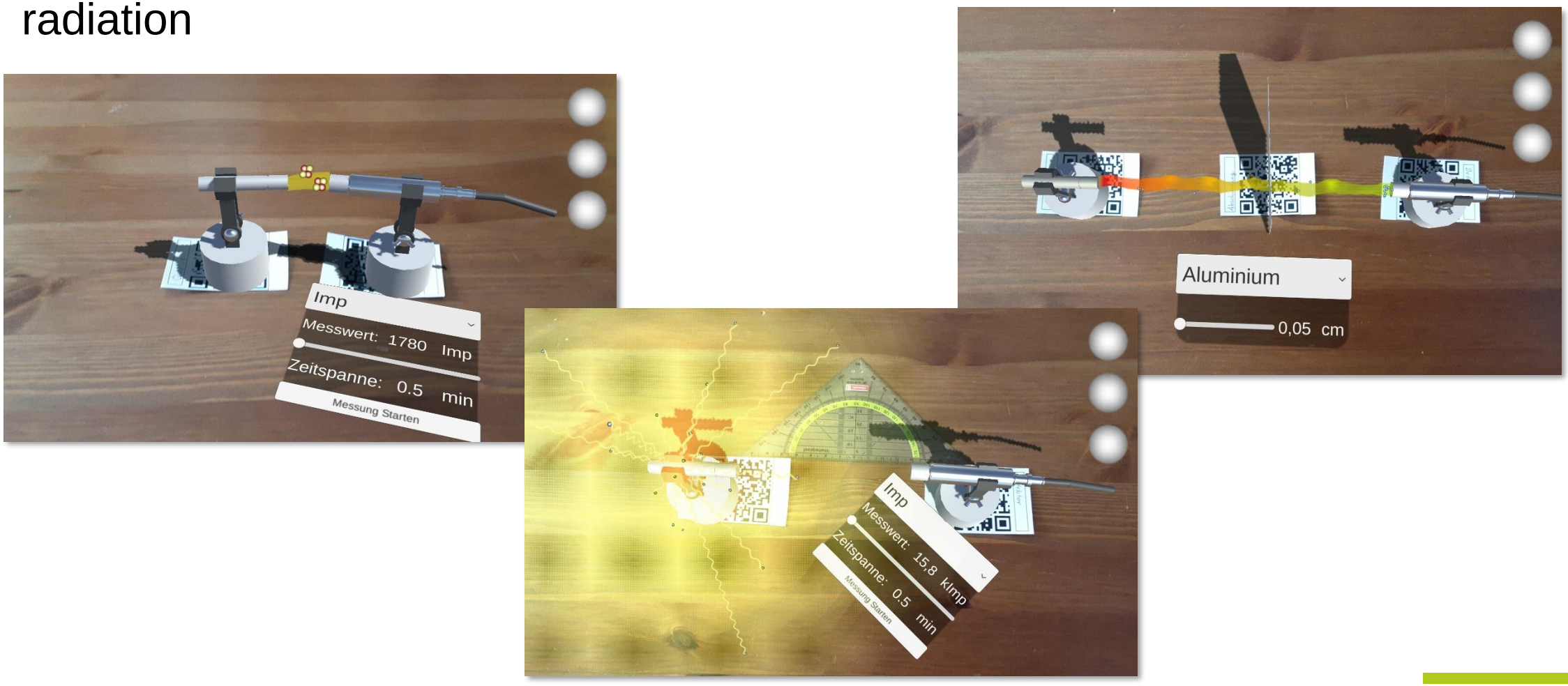




Augmented Reality

Our AR-App

- Experiments on the range and penetrating power of alpha, beta and gamma radiation



VR-App for the Chart of Nuclides

- Experience the chart of nuclides from a new perspective
- Several possibilities:
  - Pointing at it with the controller
  - Touching it with your hand
  - Walking over it when displayed on the ground

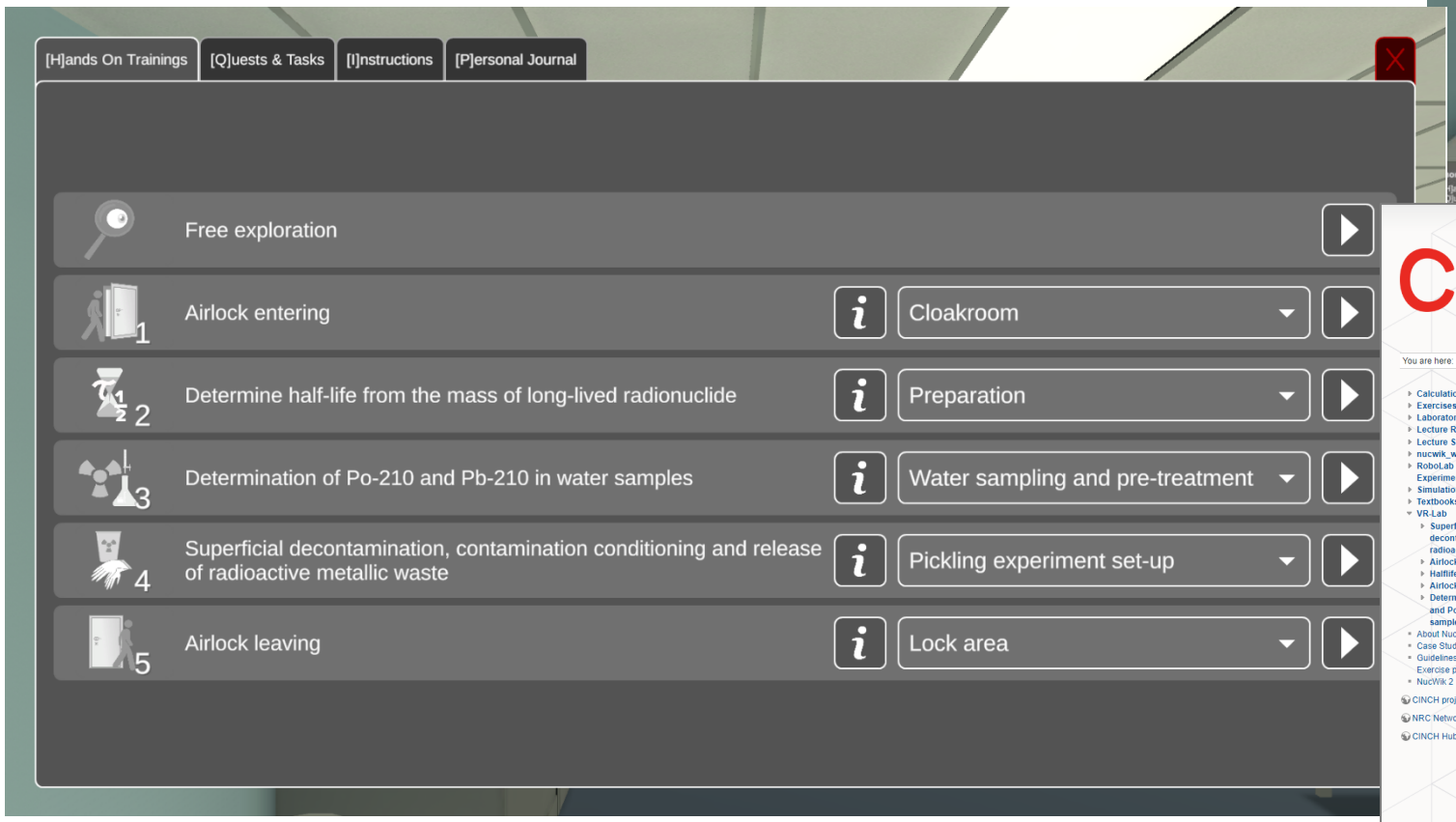
VR-App for the Chart of Nuclides

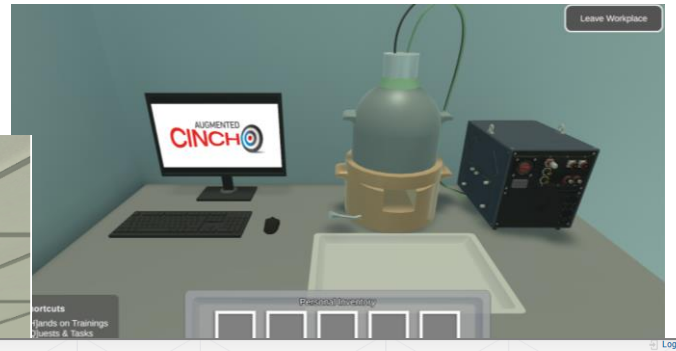
Virtual radiochemical lab developed within the A-CINCH Project

Several scenarios simulating the daily work in a radiochemistry laboratory.

Initially programmed as Virtual Reality/more immersive, desktop version available

A-CINCH VR-Labs





https://nucwik.cinch-project.eu/vrhub/start

A-CINCH VR-Labs

Airlock Entering
Airlock Leaving
Familiarize with safety requirements for entering/exit the lab.

Leibniz Universität Hannover

Determination of Po-210 and Pb-210 in Water Samples
Conduct analysis involving filtration, acidification, preconcentration, and separation techniques; analyze with proportional counter and spectrometer.

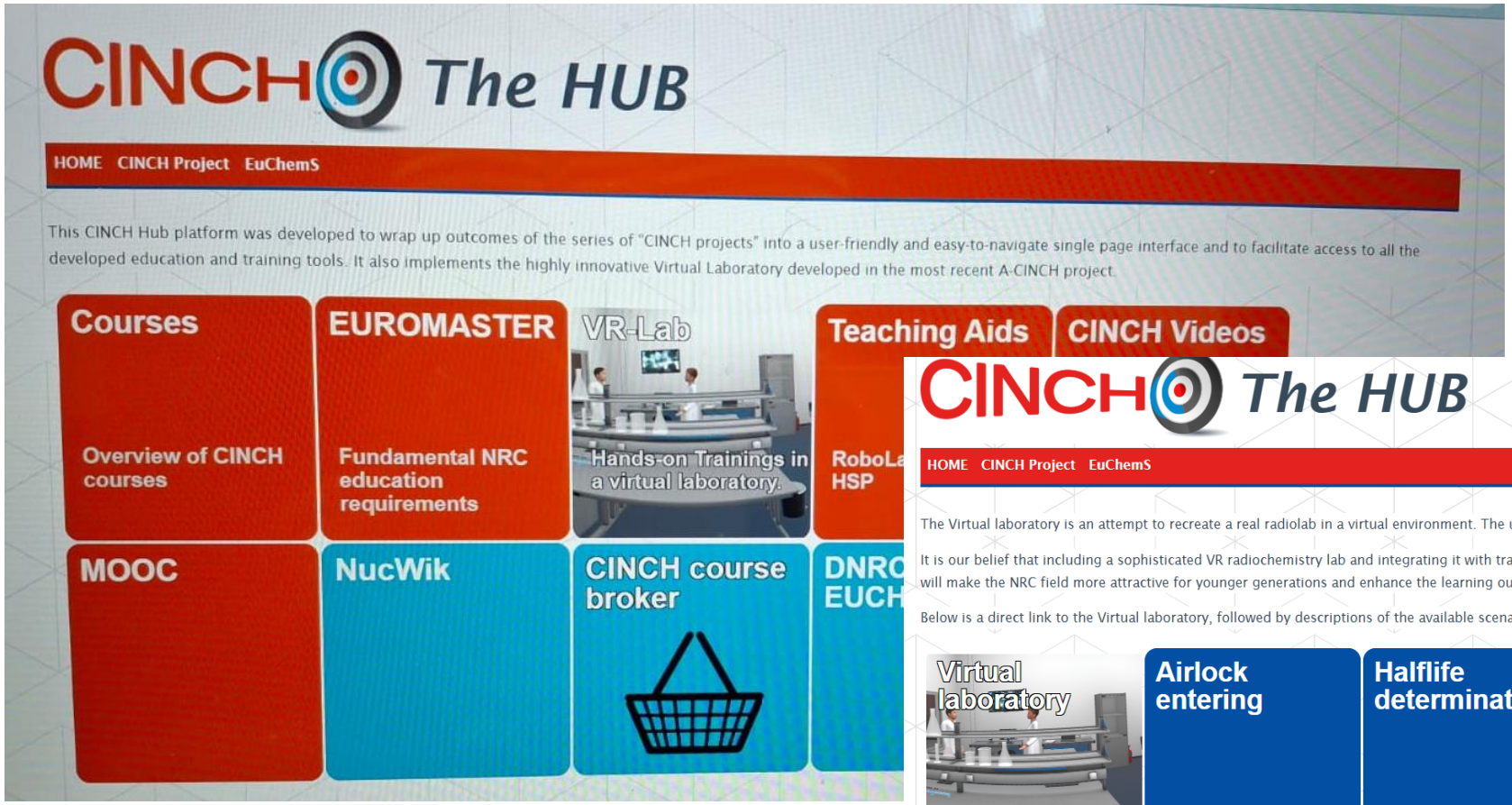
Jožef Stefan Institute

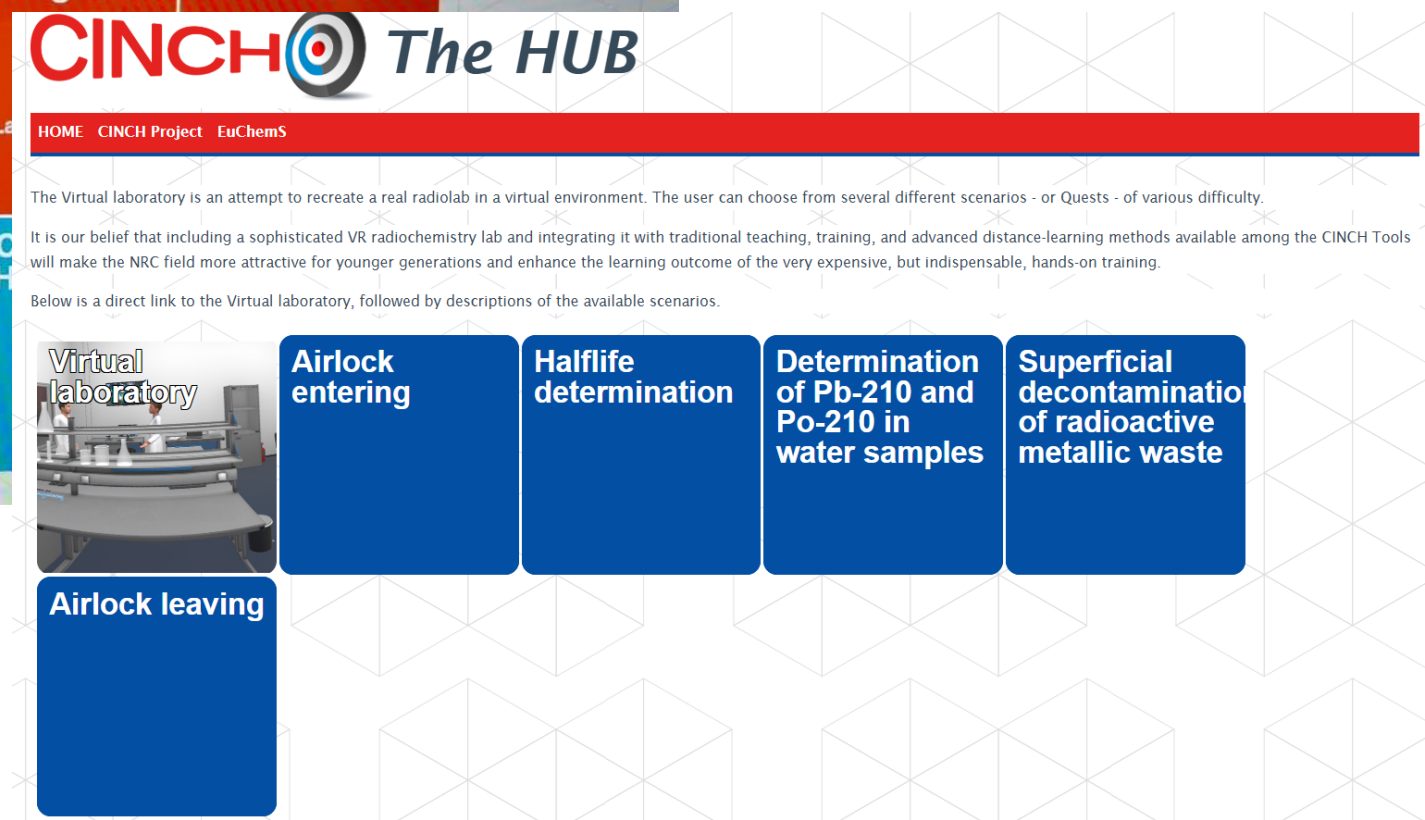
Determine Half-Life from the Mass of Long-Lived Radionuclide
Establish relationship between half-life and radionuclide quantity; determine sample activity.

CTU CZECH TECHNICAL UNIVERSITY IN PRAGUE

Superficial Decontamination of Radioactive Metallic Waste
Decontaminate metal scraps in four steps: dissolution, oxidation, precipitation, vitrification.

POLITECNICO MILANO 1863





https://hub.cinch-project.eu/

A new course @Politecnico

Analytical Methods and Processes for Waste Characterization and Valorization

Target: Master students in Nuclear Engineering and Chemical Engineering

A-CINCH VR lab

Educational Model

KICKOFF LESSON

Learning purpose and objectives

SELF-PACED LEARNING

Engaging with the VR lab

TEAMWORK

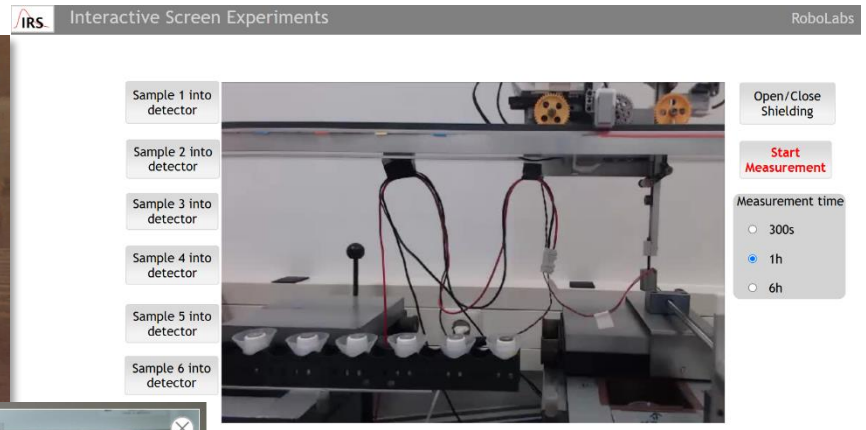
Collaboratively performing experimental activities

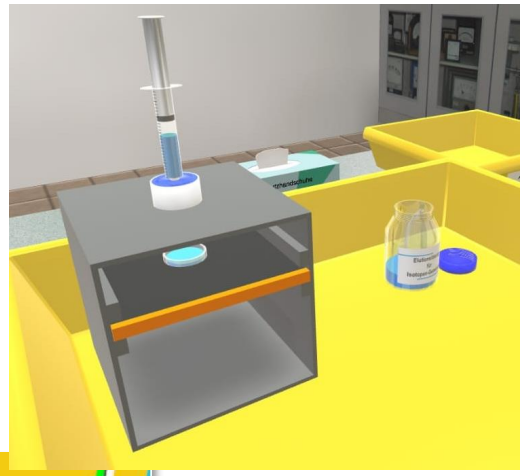
CLASSROOM DISCUSSION

Presenting and discussing results with teachers and peers

Preliminary Survey

Scan me!





H5P…

Thank you for your attention!

Let's try it tomorrow!

Have fun at the workshops!

Final Survey

Scan me!